# CAMERON COUNTY

EDDIE TREVIÑO, JR.

CAMERON COUNTY JUDGE

SOFIA C. BENAVIDES

JOEY LOPEZ

DAVID A. GARZA

GUS RUIZ

COMMISSIONER PRECINCT 1
COMMISSIONER PRECINCT 2
COMMISSIONER PRECINCT 3
COMMISSIONER PRECINCT 4

PETE SEPULVEDA

COUNTY ADMINISTRATOR

BENJAMIN L. WORSHAM, P.E., P.T.O.E., C.F.M.

COUNTY ENGINEER

SPECIFICATIONS, FORMS OF CONTRACT, BOND, AND PROPOSAL FOR:

## PASO REAL DRAINAGE IMPROVEMENTS PROJECT

Project No. 19-002H

BID #230801

DATED: JULY 2023

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### SECTION 1: BID PROPOSAL DOCUMENTS

A. BID PROPOSAL



### **INVITATION TO BID**

BID NUMBER: 230801

BID TITLE: THE PASO REAL DRAINAGE IMPROVEMENT PROJECT

DATE DUE: July 31, 2023 DUE NO LATER THAN 3:00 P.M.

Bids will be opened at the Cameron County Courthouse, 1100 East Monroe Street, Brownsville, Texas in the Purchasing Department  $-3^{rd}$  Floor - Room # 345 at **3:00 p.m**. (as per Purchasing Dept. time clock) on deadline due date. All Bidders are welcome to attend Bid opening. Bids received later than the date and time above will not be considered.

Please return bid <u>ORIGINAL ONE (1)</u> in sealed envelope. Be sure that return envelope shows the Bid Number, Description and is marked "SEALED BID".

### **RETURN BID TO:**

by U.S. mail or delivered to the office of Purchasing Dept., County Courthouse (Dancy Bldg.) 1100 E. Monroe St, 3<sup>rd</sup> Floor, Room 345, Brownsville, Texas 78520.

For additional information or to request addendum email: <a href="mailto:purchasing@co.cameron.tx.us">purchasing@co.cameron.tx.us</a>

### YOU MUST SIGN BELOW IN INK; FAILURE TO SIGN AND FULLY COMPLETE BID PROPOSAL WILL DISQUALIFY THE OFFER. All prices must be typewritten or handwritten in ink.

(Your signature attests to your offer to provide the goods and/or services in this bid according to the published provisions. When an award letter is issued, this Bid becomes the contract. If a Bid required specific Contract is to be utilized in addition to this Bid, this signed Bid will become part of that contract. When an additional Contract is required a Bid award does not constitute a contract award and Bid/Contract is not valid until contract is awarded by Commissioners Court and signed by County Judge.) Bidders/Participants must sign each bid/proposal page to ensure you have read each page's information, terms, conditions and/or required forms. Failure to sign or initial each bid/proposal page will disqualify the BID/PROPOSAL offer.

### **ACKNOWLEDGMENT OF RECEIPT**

### Please submit this page upon receipt

For any clarifications, please contact Mr. Roberto C. Luna, Interim Purchasing Agent and/or Dalia Loera, Bids & Proposals Coordinator at the Cameron County Purchasing Department office at: (956) 544-0871 or e-mail at: <a href="mailto:purchasing@co.cameron.tx.us">purchasing@co.cameron.tx.us</a>

Please fax or e-mail this page upon receipt of Bid package no later than Friday, July 28<sup>st</sup>, 2023 before 3:00 p.m. CST. All questions regarding this Bid should also be submitted no later than the stated date and time on Bid cover page.

Fax: (956) 550-7219 or E-mail: purchasing@co.cameron.tx.us

If you are unable to respond on this Bid solicitation, kindly indicate your reason for <u>"Not Responding/No-Participation"</u> below and fax or e-mail back to Cameron County Purchasing Department. This will insure you remain active on our vendor list.

Date:		
() Yes, I will be able to_submi	it a Bid.	
() No, I will not be able to sub	bmit a Bid for the following reason:	
Company Name:		
Company Representative Name:		
Company Address:		
Phone #:	Fax #:	
E-mail Address:		

### INSTRUCTIONS FOR SUBMITTING BIDS

These General Instructions apply to all offers made to Cameron County, Texas (herein after referred to as "County") by all prospective vendors (herein after referred to as "Bidder") on behalf of Solicitations including, but not limited to, Invitations to Bid.

Carefully read all instructions, requirements and specifications. Fill out all forms properly and completely. Submit your bid with all appropriate supplements and/or samples. Prior to returning your sealed bid response / submittal, all Addendums – if issued – should be reviewed and downloaded by entering the County Purchasing web at: <a href="https://www.cameroncounty.us/purchasing-bids-rfpq-addms-tabs/">https://www.cameroncounty.us/purchasing-bids-rfpq-addms-tabs/</a>

Addendums Column (updated Addendums). These Addendums must be signed and returned with your bid in order to avoid disqualification. All Tabulations can also be viewed and downloaded at this site. Annual Bid award information can be accessed at: <a href="https://www.cameroncounty.us/purchasing-bids-rfpq-addms-tabs/">https://www.cameroncounty.us/purchasing-bids-rfpq-addms-tabs/</a>

Review this document in its entirety. Be sure your Bid is complete, and double check your Bid for accuracy.

Cameron County is an Equal Employment Opportunity Employer.

GOVERNING FORMS: In the event of any conflict between the terms and provisions of these requirements and the specifications, the specifications shall govern. In the event of any conflict of interpretation of any part of this overall document, Cameron County's interpretation shall govern. Where substitutions are used, they must be of equivalent value or service, and specified by the bidder as such, in the columns to the right on the "Minimum Specifications' Forms". The County's specifications may be exceeded and should be noted by the Vendor as such. Any bid NOT MEETING the Minimum Requirements specified will be rejected.

GOVERNING LAW: This invitation to bid is governed by the competitive bidding requirements of the County Purchasing Act, Texas Local Government Code, 262.021 et seq., as amended. Bidders shall comply with all applicable federal, state and local laws and regulations. Bidders are further advised that these requirements shall be fully governed by the laws of the State of Texas and that Cameron County may request and rely on advice, decisions and opinions of the Attorney General of Texas and the County Attorney concerning any portion of these requirements.

Questions requiring only clarification of instructions or specifications will be handled verbally. If any questions result in a change or addition to this Bid, the Change(s) and addition(s) will be forwarded to all vendors involved (as quickly as possible) in the form of a written addendum only. Verbal changes to Bids must be backed-up by written addendum or written Q/A clarifications which would be posted on County Purchasing Web site. Without written Addendum or written Q/A clarification, verbal changes to Bids will not apply.

Sign the Vendor's Affidavit Notice, complete answers to Attachments A, B, C, D, E, F, G, H, I and return all with your Bid.

### CONFLICT OF INTEREST QUESTIONNAIRE:

For vendor or other person doing business with local governmental entity

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

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

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

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

Please review this entire document, if for any reason there is any information to disclose, relative to any questions in this Conflict of Interest form, you must file with County Clerk's Office subject to above instructions.

Can be downloaded at the following web site: <a href="https://www.cameroncounty.us/wp-content/uploads/Purchasing/docs/Conflict of Interest Questionnaire New 2015 .pdf">https://www.cameroncounty.us/wp-content/uploads/Purchasing/docs/Conflict of Interest Questionnaire New 2015 .pdf</a>

### DISCLOSURE OF INTERESTS:

This questionnaire must be filed with the records administrator (County Clerk's Office) of the local government and no later than the 7th business day after the person becomes aware of facts that require this statement to be filed. Cameron County, Texas requires all persons or firms seeking to do business with the County to provide the following information if the person becomes aware of facts that require this statement to be filed. Every question must be answered. If the question is not applicable, answer with "N/A."

Please review this entire document, if for any reason there is any information to disclose, relative to any questions in this disclosure of interest form, you must file with County Clerk's Office subject to above instructions.

Can be downloaded at the following web site: <a href="https://www.cameroncounty.us/wp-content/uploads/Purchasing/CIS.pdf">https://www.cameroncounty.us/wp-content/uploads/Purchasing/CIS.pdf</a>

### TEXAS ETHICS COMMISSION FORM 1295

All Bids prior to award or award of Contract by Commissioner's Court will require that the Texas Ethics Commission (TEC) Form 1295 Electronic (on line) Vendor filing procedure be completed by Vendor.

All Vendors being recommended to Commissioners Court for award or renewal of award on Agenda must register and obtain a TEC Certification for the specific award. This Certification Form 1295 must be electronically submitted and printed. Form must be emailed or delivered to County Purchasing

Department making the request for form. This process must be completed prior to Commissioners Court Agenda for approval consideration of Bid award. There is no charge for this TEC online process.

Texas Ethics Commission (TEC) Form 1295 must be completed (by firm – on line "New Form 1295 Certificate of Interested Parties Electronic Filing Application" Site at: https://www.ethics.state.tx.us/whatsnew/elf info form1295.htm)

If any Vendors have questions as to TEC Form 1295 visit the County Purchasing Web site left column tab "Vendor – TEC Form 1295" for more information. TEC Web site links can be found at this location including Question / Answers and Video instructions.

Tab Link: <a href="https://www.cameroncounty.us/vendors-tec-form-1295/">https://www.cameroncounty.us/vendors-tec-form-1295/</a>

BIDDER SHALL SUBMIT BID ON THE FORM PROVIDED, SIGN THE VENDOR AFFIDAVIT, AND RETURN ENTIRE BID PACKET. In the event of inclement weather and County Offices are officially closed on a bid deadline day, bids will be received unit 2:00 p.m. of the next business day. Bids will be opened at the Cameron County Courthouse, 1100 East Monroe Street, Brownsville, Texas in the Purchasing Department – 3rd Floor – Room # 345 (as per Purchasing Dept. time clock.

BIDS SUBMITTED AFTER THE SUBMISSION DEADLINE SHALL BE RETURNED UNOPENED AND WILL BE CONSIDERED VOID AND UNACCEPTABLE.

BIDDERS MAY ATTEND PUBLICLY HELD COMM COURT MEETING FOR AWARD OF THIS SOLICITATION. All responding bidders are welcome to attend the publicly held Commissioners Court meeting relative to the outcome / award of this solicitation. Court Meeting agenda date and times may be obtained at the following web site: https://www.cameroncountytx.gov/commissioners-court-agendas/

SUCCESSFUL VENDOR WILL BE NOTIFIED BY MAIL. All responding vendors will receive written notification regarding the outcome of the award.

OPEN RECORDS ACCESS TO ALL INFORMATION SUBMITTED. All information included will be open to the public, other bidders, media as per the Open Records Act and not be confidential in nature. If you deem any information as confidential, it should not be made part of your bid package.

### **PLEASE NOTE CAREFULLY**

THIS IS THE ONLY APPROVED INSTRUCTION FOR USE ON YOUR BID. ITEMS BELOW APPLY TO AND BECOME A PART OF TERMS AND CONDITIONS OF BID. ANY EXCEPTIONS THERETO MUST BE IN WRITING.

- 1. Each bid shall be placed in a separate envelope completely and properly identified with the name and number of the bid. Bids must be in the Purchasing Department BEFORE the hour and date specified.
- Bids MUST give full firm name and address of the bidder. Failure to manually sign bid will disqualify it. Person signing bid should show TITLE or AUTHORITY TO BIND THE FIRM IN A CONTRACT.

- 3. Bids CANNOT be altered or amended after deadline time. Any alterations made before deadline time must be initiated by bidder or his authorized agent. No bid can be withdrawn after opening time without approval by the Commissioners Court based on a written acceptable reason.
- 4. The County is exempt from State Sales Tax and Federal Excise Tax. DO NOT INCLUDE TAX IN BID. Cameron County claims exemption from all sales and/or use taxes under Texas Tax Code 151.309, as amended. Texas Limited Sales Tax Exemption Certificates will be furnished upon written request to the Cameron County Purchasing Agent.
- 5. Any Catalog, brand name or manufacturer's reference used in a bid invitation is descriptive-NOT restrictive-it is to indicate type and quality desired. Bids on brand of like nature and quality will be considered. If bid is based on other than reference specifications, Bid must show manufacturer, brand or trade name, lot number, etc., of article offered. If other than brand(s) specified is offered, illustrations and complete descriptions should be made part of the bid. If bidder takes no exception to specifications or reference data, he will be required to furnish brand names, numbers, etc. as specified.
- 6. Samples, when requested, must be furnished free of expense to the County. If not destroyed in examination, they will be returned to the bidder on request, at his expense. Each sample should be marked with bidder's name, address, and County bid number. DO NOT ENCLOSE OR ATTACH SAMPLE TO BID. County user Dept.(s) reserves the right to make the final determination as to equivalents.
- 7. Written and verbal inquires pertaining to bids must give Bid Number and Company.
- 8. NO substitutions or cancellations permitted without written approval of Purchasing Agent.
- 9. The County reserves the right to accept or reject all or any part of any bid, waiver minor technicalities. The County of Cameron reserves the right to award by item category or by total bid. Prices should be itemized. County also reserves the right to award either with or without trade-in, if applicable. Cameron County reserves the right to award if only one (1) Bid was received. Cameron County retains the option to re-bid at any time if in its best interest and is not automatically bound to renewal or re-bid. The County reserves the right to hold all Bids for 60 days from the due date of receipt without actions. The County reserves the right to add additional County Departments (at a later time during this bid award) as the need arises. The County also reserves the right to consider CO-OP Interlocal Agreements / pricing if determined to be more advantageous to the County.
- 10. Bid unit price on quantity specified extend and show total. In case or errors in extension, UNIT prices shall govern. If both alphabetic and numeric (unit prices) are required and a discrepancy is found between both on the same line item whichever unit price confirms the line total will govern. If neither confirms then the alphabetic price will govern. If there is no line total requested then the alphabetic unit price shall govern. If combined / sum of line totals do not match the Bid total then the Bid total will be corrected to reflect the sum of the line totals. If there is a discrepancy between the alphabetic and numeric Base Bid Total / Total Bid amount, the alphabetic Base Bid Total / Total Bid will take precedence. Bids subject to unlimited price increase will not be considered, but limited to Preventive Maintenance Annual Local Labor Union Wage Rate

adjustments. ALL PRICING WILL REMAIN FIRM UNLESS THIS BID ALLOWS FOR OPEN MARET PRICE INCREASES (AS SO SPECIFIED WITHIN). When inserting number of days or percentage % in Bid (ex: number of days to deliver or install or complete work, etc. or percentage over vendor's cost or percentage discount off list price) avoid using a range (ex: 30-90 days or 15% to 20 % cost plus) but use only one number for number of days or percentage. If a range is used the County will consider the higher number or worst-case scenario from the County's standpoint in making bid comparisons / tabulations.

- 11. This is a bid inquiry only and implies no obligation on the part of Cameron County.
- 12. Acceptance of and final payment for the item will be contingent upon satisfactory performance of the product received by Cameron County.
- 13. Partial bids will not be accepted unless awarded by complete category or line item. To be awarded by Total Bid
- 14. BASIS OF BID AWARD The contract will be awarded to the responsible and responsive bidders meeting the specifications and having the lowest possible total extended price of the Base Bid (unit cost), consistent with the quality needed for effective use. All prices quoted will be firm. Award to successful bidder will be made by Cameron County Commission action. Bid pricing shall be firm for the entire term of the awarded contract. Prices established in continuing agreements and annual term contracts may be negotiated and approved by Cameron County Commission Court due to inflation and increased operating costs (i.e. dramatic increase in petroleum-based products, minimum wage, etc.). Any price increase proposed must be submitted thirty (30) calendar days prior to the anniversary date of the annual term contract and shall be supported with proper documentation, as provided by the U.S. Department of Labor Consumer Price Index (CPI), http://www.bls.gov/cpi/. Cameron County will reserve the right to approve or disapprove any request for increased prices.

Cameron County may at its option and expense have the material tested at any time for compliance. The Contractor's payment shall be deducted the full amount of expense to the County for any tests which fail to show compliance with the specifications.

Supplied materials which tests show to not-be- in-compliance shall be removed from County's property, stockpile or roadbed at the contractor's expense. Additionally, no payment will be made to the supplier by the County, for the materials which do not meet the specifications. The quantity of such material shall be determined by County's administrative staff, whose decision shall be final

Revisions on unit prices: it is agreed that bid prices may be superseded during the contract period only if such revisions are the result of increased in the Gulf coast area. A written notice stipulating in detail the price revision must be furnished to the County before revised prices go into effect. Also, such revisions must be supported by continuing written notices for each 30-day period such revisions are in effect. Discounts, delivery, and services accepted as part of this bid are not subject to revision.

15. Multi-Level Contract Award: It is the intent of this solicitation to procure a term contract that shall be awarded to a total of three (3) general suppliers. There shall be contract award to a Level1 –

Primary Supplier, Level 2 – Secondary Supplier, Level 3 – Tertiary Supplier. Levels shall be determined on a net unit cost basis, with the lowest unit cost awarded Level 1 status, next lowest unit cost equates to Level 2 and so on. No more than one level shall be awarded to any contractor participating in this solicitation.

If at any time the Primary Level 1 Supplier cannot fulfill its obligations upon receipt of a "Purchase Order" for a specific amount of material(s), then the County has as its option the authority to award that specific amount of material(s) to the Secondary Level 2 Supplier at the previously established and awarded unit cost amount. Should the Level 2 Supplier be unable to fulfill its obligation, then the County has as its option the authority to award that specific amount of material(s) to the Tertiary Level 3 Supplier.

In the event that all 3 contractors renege on the County issued Purchase Order, then the contract shall be rescinded and the County will re-bid a new term contract. The 3 contractors under the rescinded contract shall be ineligible to bid on the subsequent solicitation.

- 16. It is expected that the bidder will meet all state and federal safety standards and laws in effect on the date of the bid for the item(s) being specified, and the particular use for which they are meant. It is the responsibility of the bidder or proposer to ask any and all questions the bidder or proposer feels to be pertinent to the bid or proposal. Cameron County shall not be required to attempt to anticipate such questions for bidders or proposers. Cameron County will endeavor to respond promptly to all questions asked.
- 17. If a Bid Bond is required in this Bid it must be included in Bidders Sealed Bid package and be current / valid through award.
- 18. Alternate Bid pricing: Bidders should include all alternate pricing on your Bid price page. Cameron County will not award Bid to a Bidder if an alternate price is left blank and County will be making an award to include alternate(s) which has been left blank. In order to avoid not being considered for award include all alternate pricing on your Bid price page.
- 19. All property of Cameron County must remain (at all times) within the United States without exception unless prior Agenda approval has been given by Commissioners Court.
- 20. Availability of Funds: This procurement is subject to the availability of funding. Cameron County's obligation hereunder is contingent upon the availability of appropriated funds from which payment for the Contract purposes can be made. No legal liability on the part of the County for any payment shall arise until funds are made available to the County for this Contract and until the Contractor receives notice of such availability, to be confirmed in writing by the County. Any award of Contract hereunder will be conditioned upon said availability of funds for the Contract.
- 21. Non-Appropriation Clause:

Notwithstanding any provisions for this agreement, the parties agree that the services are payable by Cameron County from appropriations, grants, and monies from the General Fund and other sources. In the event sufficient appropriation, grants, and monies are not made available to Cameron County to pay these services for any fiscal year, this Agreement shall terminate without further obligation of County. In such event, the Cameron County Administrator shall certify to

contractor that sufficient funds have not been made available to County to meet the obligations of this Agreement; such certification shall be conclusive upon parties.

PURCHASE ORDER AND DELIVERY: The successful Bidder shall not deliver products or provide services without a Cameron County Purchase Order, signed by an authorized agent of the Cameron County Purchasing Department. The fastest, most reasonable delivery time shall be indicated by the Bidder in the proper place on the Pricing/Delivery Information form. Any special information concerning delivery should also be included, on a separate sheet, if necessary. All items shall be shipped F.O.B. INSIDE DELIVERY unless otherwise stated in the specifications.

This shall be understood to include bringing merchandise to the appropriate room or place designated by the using department. Every tender or delivery of goods must fully comply with all provisions of these requirements and the specifications including time, delivery and quality. Nonconformance shall constitute a breach which must be rectified prior to expiration of the time for performance. Failure to rectify within the performance period will be considered cause to reject future deliveries and cancellation of the contract by Cameron County without prejudice to other remedies provided by law. Where delivery times are critical, Cameron County reserves the right to award accordingly.

NO PLACEMENT OF DEFECTIVE TENDER: Every tender or delivery of goods must fully comply with all provisions of this contract as to time of delivery, quality and the like. If a tender is made which does not fully conform, this shall constitute a breach and Seller shall not have the right to substitute a conforming tender provided, where the time for performance has not yet expired, the Seller may seasonably notify Buyer of their intention to cure and may then make a conforming tender within the contract time but not afterward.

PLACE OF DELIVERY: The place of delivery shall be that set forth on the purchase order. Any change thereto shall be affected by modification as provided for in clause 20, "Modifications", hereof. The terms of this agreement are "no arrival, no sale".

DELIVERY TERMS AND TRANSPORTATION CHARGES: Bid must show number of days required to place material in receiving agency's designated location under normal conditions. Failure to state delivery time obligates bidder to complete delivery in 14 calendar days. A five-day difference in delivery promise may break a tie. Unrealistically short or long delivery promises may cause bid to be disregarded. Consistent failure to meet delivery promises without valid reason may cause removal from bidder list.

An accurate delivery date must be quoted on the "Bid Form". When there are various items, a delivery date must be included with each item quoted. Freight and shipping charges to Cameron County must be included in the bid price. Final location will be supplied to the vendor on award of bid, F.O.B. destination. Delivery locations will be: Various County Building locations. Delivery days after receipt of order (ARO). Specify all (various) dates by categories or item if different \_\_\_\_\_\_\_\_.

If delay is foreseen, contractor shall give written notice to Director of Purchasing. The County has the right to extend delivery date if reasons appear valid. Contractor must keep County advised at all times of status of order. Default in promised delivery (without accepted reasons) or failure to meet specifications,

authorized the County to purchase supplies elsewhere and charge full increase in cost and handling to defaulting contractor.

Delivery shall be made during normal working hours only, 8:00 a.m. to 5:00 p.m. unless otherwise noted in bid.

VARIATON IN QUANTITY: The County assumes no liability for commodities produced, processed or shipped in excess of the amount specified herein.

SELLER TO PACKAGE GOODS: Seller will package goods in accordance with good commercial practice. Each shipping container shall be clearly and permanently packed as follows: (a) Seller's name and address; (b) Consignee's name, address and purchase order or purchase release number and the supply agreement number if applicable; (c) Container number and total number of containers, e.g. box 1 of 4 boxes; and (d) the number of the container bearing the packing slip. Seller shall bear cost of packaging unless otherwise provided. Goods shall be suitably packed to secure lowest transportation costs and to conform with requirements of common carriers and any applicable specifications. Buyer's count or weight shall be final and conclusive on shipments not accompanied by packing lists.

SHIPMENT UNDER RESERVATION PROHIBITED: Seller is not authorized to ship the goods under reservation, and no tender of a bill of lading will operate as a tender of goods.

TITLE AND RISK OF LOSS: The title and risk of loss of the goods shall not pass to Buyer until Buyer actually receives and takes possession of the goods at the point or points of delivery.

INSPECTION: Upon receiving item(s), they will be inspected for compliance with the Bid Specifications. If the item(s) do not pass inspection, the vendor will be required to pick up the rejected item(s) at the delivery point, provide the necessary replacement, and return the item(s) to the original point of delivery. All items proposed shall be new, in first class condition, including containers suitable for shipment and storage (Cameron County prefers recycled packaging whenever possible), unless otherwise indicated in bid. Verbal agreements to the contrary will not be recognized. All materials and services shall be subject to Purchaser's approval. Unsatisfactory material will be returned at Seller's expense.

Cameron County reserves the right to inspect any item(s) or service location for compliance with specifications and requirements and needs of the using department. If a Bidder cannot furnish a sample of a bid item, where applicable, for review, or fails to satisfactorily show an ability to perform, the County can reject the bid as inadequate.

TESTING: Cameron County reserves the right to test equipment, supplies, material and goods bid for quality, compliance with specifications and ability to meet the needs of the user. Demonstration units must be available for review. Should the goods or services fail to meet requirements and/or be unavailable for evaluation, the bid is subject to rejection.

SPECIAL TOOLS AND TEST EQUIPMENT: If the price stated on the face hereof includes the cost of any special tooling or special test equipment fabricated or required by Seller for the purpose of filling this

order, such special tooling equipment and any process sheets related thereto shall become the property of the Buyer and to the extent feasible shall be identified by the Seller as such.

INVOICES AND PAYMENTS: (a) The vendor shall submit separate invoices, in duplicate, on each purchase order after each delivery. Invoices shall indicate the purchase order number, shall be itemized and transportation charges, if any, shall be listed separately. A copy of the bill of lading and the freight weigh bill when applicable, should be attached to the invoice. Mail to: Cameron County, ATTN: Auditor's Office, 1100 East Monroe St., Brownsville, Texas 78520. Payment shall not be due until the above instruments are submitted after delivery or services rendered. Our Vendors must keep the Auditor advised of any changes in your remittance addresses. (b) County's only obligation to pay Vendor is to pay from funds budgeted and available for the purpose of the purchase. Lack of funds shall render this contract null and void to the extent funds are not available and any delivered but unpaid for goods will be returned to Vendor by the County. (c) Do not include Federal Excise, State or City Sales Tax. County shall furnish tax exemption certificate if required.

Any invoice, which cannot be verified by the contract price and/or is otherwise incorrect, will be returned to the Vendor for correction. Under term contracts, when multiple deliveries and/or services are required, the Vendor may invoice following each delivery and the County will pay on invoice. Contracts providing for a monthly charge will be billed and paid on a monthly basis only. Prior to any and all payments made for good and/or services provided under this contract, the Vendor should provide his Taxpayer Identification Number or social security number as applicable. This information must be on file with the Cameron County Auditor's office. Failure to provide this information may result in a delay in payment and/or back-up withholding as required by the Internal Revenue Services.

Vendor shall submit seven (7) copies of an itemized invoice showing BID number and purchase order number to:

CAMERON COUNTY AUDITOR ACCOUNTS PAYABLE 1100 EAST MONROE ST., BROWNSVILLE, TEXAS 78520

Please note that any payment due under this bid award will be applied towards any debt, including but not limited to delinquent taxes that is owed to Cameron County.

PAYMENT DISCOUNT: Indicate the payment discount (s) available depending on the when invoices are paid. For example, 1/30 means a 1% discount if paid within 30 days, 2/15 means a 2% discount if paid within 15 days, etc.

Payment in full will be made within thirty (30) days of delivery, inspection, and receipt of invoice.

All costs quotations must include all the various features needed to satisfy the requirements. Note: No amounts will be paid for the items in this BID in excess of the amounts quoted.

### Criminal Background Checks are Mandatory:

Checks are mandatory for all personnel performing work on Cameron County sites. Contractors, consultants, and subcontractors are required to take all reasonable steps to assure that their employees

do not represent a threat to the County or Facilities. Failure to comply with this requirement may result in immediate termination of any award or contract. The selected contractor shall provide a complete list of names (including supervisors) that may be working on campus. The contractor(s) shall remove from the Cameron County work place any of its employees who are found to be unacceptable by Cameron County. Such requests shall not be unreasonable, are the sole decision of Cameron County, and are not subject to negotiation. Contractor shall provide proper identification for all contractor employees. While on Cameron County premises, all contractor employees must wear attire that identifies them as contractor's employee with identification visible from both the front and the back. Vehicles shall be clearly identified as company vehicles and be maintained in a neat clean and sanitary condition. At least one person in each vehicle, preferably the driver, must be able to speak, read and write. It shall be the contractor's responsibility to see that employees render quiet and courteous service.

### CHECK LIST

Bidders are asked to review the package to be sure that all applicable parts are included. If any portion of the package is missing, notify the Purchasing Department immediately. It is the Bidder's responsibility to be familiar with all the Requirements and Specifications. Be sure you understand the following before you return your bid packet.

_X	Cover Sheet
	Your company name, address and your signature (IN INK) should appear on this page.
<u>X</u>	Instructions to Bidders
	You should be familiar with all of the Instructions to Bidders.
_X	Special Requirements
	This section provides information you must know in order to make an offer properly.
<u>X</u>	Specifications / Scope of Work
	This section contains the detailed description of the product/service sought by the County.
Attac	chments
_X	Attachments A, B, C, D, E, F, G, H, I
	Be sure to complete these forms and return with packet.
<u>X</u>	Bid Guaranty & Performance Bond Information & Requirements
	This form applies only to certain bids/proposals. All public work contracts over \$25,000 require a Paymer
	Bond and over \$100,000 must also have a Performance Bond in a form approved by the County. Please rea
	carefully and fill our completely.
X_	_ Minimum Insurance Requirements
	Included when applicable
	Worker's Compensation Insurance Coverage Rule 110.110
	This requirement is applicable for a building or construction contract.
	Financial Statement
	When this information is required, you must use this form.
Othe	r - Final Reminders To double check before submitting BID
	Is your bid sealed with bid #, title, Bidder's Name, & return address, on outside?
	Did you complete, sign and submit page 1?
	Did you provide the number of copies as required on the cover page?
	Did you visit our website for any addendums?

https://www.cameroncounty.us/purchasing-bids-rfpq-addms-tabs/

If not interested in Bidding please let us know why e-mail to: <a href="mailto:Purchasing@co.cameron.tx.us">Purchasing@co.cameron.tx.us</a>

### **INSTRUCTIONS TO BIDDERS**

(Special Provisions)

1. It shall be the bidder's responsibility to ensure delivery of his proposal to the proper place and at the proper time.

### 2. Bids shall be addressed as follows:

SEALED BID FOR: BID # 230801 THE PASO REAL DRAINAGE PROJECT

Attn: Roberto C. Luna, Interim Purchasing Agent

Cameron County Courthouse, Purchasing Dept, 3rd Floor

1100 E. Monroe Street Brownsville, TX 78520

Bid Date: July 31, 2023

Time: 3:00 P.M. C.S.T.

### 3. Use of Separate Bid Forms:

These Contract Documents include a complete set of bidding and Contract forms which are for the convenience of bidders and are not to be detached from the Contract Document, filled out, or executed. Separate copies of Bid Forms are furnished for that purpose.

### 4. Interpretations of Addenda:

No oral interpretation will be made to any Bidder as to the meaning of the Contract Documents or any part thereof. Every request for such an interpretation shall be made in writing to the County Engineer. Any inquiry received seven or more days prior to the date fixed for opening of Bids will be given consideration. Every interpretation made to a Bidder will be in the form of an Addendum to the Contract Documents, and when issued, will be on file in the office of the Engineer at least three days before Bids are opened. In addition, all Addenda will be mailed or telecopied to each person holding contract Documents, but it shall be the Bidder's responsibility to inquire as to the Addenda issued. All such Addenda shall become part of the Contract and all Bidders shall be bound by such Addenda, whether or not received by the Bidders.

### 5. Inspection of Site:

Each Bidder should visit the site of the proposed work and fully acquaint himself with the existing conditions there, relating to construction and labor, and should fully inform himself as to the facilities involved, the difficulties and restrictions attending the performance of the Contract. The Bidder should thoroughly examine and familiarize himself with the Drawings, Technical Specifications, and all other Contract documents. The Contractor by the execution of the Contract shall in no way be relieved of any obligation under it, due to his failure to receive or examine any

form or legal instrument or to visit the site and acquaint himself with the conditions there existing, and the Owner will be justified in rejecting any claim based on facts regarding which the Contractor should have been on notice as a result thereof.

### 6. Alternative Bids:

No alternative bids will be considered unless alternative bids are specifically requested by the technical specifications, or bid proposal package. Base bids must be provided for each item, even though an alternative bid item is also specified.

### 7. Bids:

- A. All Bids must be submitted on forms supplied by the Owner and shall be subject to all requirements of the Contract Documents including the Drawings, and these INSTRUCTIONS TO BIDDERS. All Bids must be regular in every respect and no interlineation, excisions or special conditions shall be made or included in the Bid Form by the Bidder.
- B. Bid Documents including the Bid, the Bid Guaranty, the Non-Collusion Affidavit and the Statement of Bidder's Qualifications (If required) shall be enclosed in an envelope, which shall be sealed and clearly labeled with the words "Bid Documents", name of Bidder, date and time of the Bid opening in order to guard against premature opening of the Bid.
- C. The Owner may consider as irregular any Bid on which there is an alteration to or departure from the Bid Form hereto attached and at its option may reject the same.
- D. If the contract is awarded, it will be awarded by the Owner to a responsible Bidder on the basis of the lowest Bid and the selected Alternative Bid items, if any. The Contract will require the completion of the work according to the Contract Documents.
- E. Each Bidder shall include in his Bid the following information:

### **Principals**

Names

Social Security Number

Home Addresses, including City, State & Zip Code

Firm

Name

**Treasury Number** 

Address

City, State & Zip Code

### 8. Bid Guaranty:

A. The Bid must be accompanied by a Bid Guaranty which shall not be less than 5 percent (5%) of the amount of the Bid. At the option of the Bidder, the guaranty may be a certified check, bank draft, negotiable U.S. Government Bonds (at par value), or a bid bond in the form attached. The Bid bond shall be secured by a guaranty or a surety company Licensed

to do business in the State of Texas. The amount of such Bid bond shall be within the maximum amount specified for such Company. No Bid will be considered unless it is accompanied by the required guaranty. Certified check or bank draft must be made payable to the order of County of Cameron. Cash deposits will not be accepted. The Bid guaranty shall insure the execution of the Agreement and the furnishing of the surety bond or bonds by the successful Bidder, all as required by the Contract documents.

- B. Revised Bids submitted before the opening of Bids, whether forwarded by mail or telegram, if representing an increase in excess of ten percent (10%) of the original Bid, the Bid will not be considered.
- C. Certified checks or bank drafts, or the amount thereof, Bid Bonds and negotiable U.S. Government bonds of unsuccessful Bidders will be returned as soon as practical after the opening of the Bids.

### 9. Collusive Agreement:

- A. Each Bidder submitting a Bid to the Owner for any portion of the work contemplated by the documents on which bidding is based shall execute and attach thereto, an affidavit substantially in the form herein provided, to the effect that he has not entered into a collusive agreement with any other person, firm, or corporation in regard to any Bid submitted.
- B. Before executing any subcontract, the successful Bidder shall submit the name of any proposed subcontractor for prior approval and an affidavit substantially in the form to be provided by the Owner. Copies are available upon request.

### 10. Statement of Bidder's Qualifications:

Each Bidder shall submit on the form furnished for that purpose a statement of the Bidder's qualifications, his experience records in organization and equipment available in the contract, his organization and equipment available for the work contemplated and, when specifically requested by the Owner, a detailed financial statement. The Owner shall have the right to take such steps as it deems necessary to determine the ability of the Bidder to perform his obligations under the Contract and the Bidder shall furnish the owner all such information and data for this purpose as it may request.

The right is reserved to reject any Bid where an investigation of the available evidence or information does not satisfy the Owner that the Bidder is qualified to carry out properly the terms of the contract.

### 11. Sub-Contractors:

All Sub-Contractors must be approved by the Owner. A list of all proposed Sub-Contractors must be furnished to the Owner, prior to the start of construction.

### 12. Interpretation of Quoted Prices:

In case of difference in written words and figures in a Proposal, the amount stated in written words shall govern.

### 13. Unit Prices:

The unit price for each of the several items in the proposal of each Bidder shall include its pro rata share of overhead for both labor and materials so that the sum of the products obtained by multiplying the quantity shown for each item by the unit price Bid represents the total Bid. Any Bid not conforming to this requirement may be rejected as informal. The special attention of all Bidders is called to this provision, for should conditions make it necessary to revise the quantities, no limit will be fixed for such increased or decreased quantities nor extra compensation allowed, provided the net monetary value of all such additive and subtractive changes in quantities of such items of work (i.e., difference in cost shall not increase or decrease the original contract award price by more than twenty-five percent (25%), except for work not covered in the Drawings and Technical Specifications.

### 14. Rejection of Bids:

Bids may be rejected if they show any alteration of works or figures, additions not called for, conditional or uncalled for alternate bids, incomplete bids, any alteration or words or figures, or erasures not initialed by the person or persons signing the proposal, or irregularities of any kind.

### 15. Time for Receiving Bids:

Bids received prior to the advertised hour of opening shall be kept securely sealed. The officer appointed to open the bids shall decide when the specified time has arrived and no bid received thereafter will be considered; except that when a bid arrives by mail after the time fixed for opening, but before the reading of all other bids is completed, and it is shown to the satisfaction of the County that the late arrival of the bid was solely due to delay in the mails for which the bidder was not responsible, such bid will be received and considered.

### 16. Opening of Bids:

The County shall, at the time and place fixed for the opening of bids, cause each bid to be publicly opened and read aloud, irrespective of any irregularities therein. Bidders and other interested individuals may be present.

### 17. Withdrawal of Bids:

Bids may be withdrawn on written or telegraphic request dispatched by the Bidder in time for delivery in the normal course of business to the time fixed for opening; provided, that written confirmation of any telegraphic withdrawal over the signature of the Bidder is placed in the mail and postmarked prior to the time set for Bid opening. The bid guaranty of any Bidder withdrawing his Bid in accordance with the foregoing conditions will be returned promptly.

### 18. Award of Contract: Rejection of Bids

- A. The Contract will be awarded to the responsible Bidder submitting the lowest responsive Bid complying with the conditions of the Invitation for Bids. The Bidder to whom the award is made will be notified at the earliest possible date. The Owner, however, reserves the right to reject any and all Bids and to waive any informality in Bids received whenever such rejection or waiver is in its interest.
- B. The Owner reserves the right to consider as unqualified to do work of general construction any Bidder who does not habitually perform with his own forces the major portions of the work involved in construction of the improvements embraced in this Contract.
- C. Time is of the essence in this Contract and the Owner may weigh the calendar days or working days bid in award of the Contract. The calendar days or working days will be valued equal to the liquidated damages charged per day of delay.

### 19. Execution of Agreement: Performance and Payment Bond

- A. Subsequent to the award and within ten (10) days after the prescribed forms are presented for signature, the successful Bidder shall execute and deliver the Owner an Agreement in the form included in the Contract Documents in such number of copies as the Owner may require (not to exceed six (6) copies).
- B. Having satisfied all conditions of award as set forth elsewhere in these documents, the successful Bidder shall, within the period specified in paragraph "a" above, furnish a surety bond in a penal sum not less than the amount of the Contract as awarded, as security for the faithful performance of the Contract, and for the payment of all persons, firms or corporations to whom the Contractor may become legally indebted for labor, materials, tools, equipment, or services of any nature including utility and transportation services, employed or used by him, in performing the work. Such bond shall be in the same form as that included in the Contract Documents and shall bear the same date as, or a date sub-sequent to that of the Agreement. The current <a href="Power of Attorney">Power of Attorney</a> for the person who signs for any surety company and issued be attached to such bond. This bond shall be signed by a guaranty or surety company authorized to do business in the State of Texas.
- C. The failure of the successful Bidder to execute such Agreement and to supply the required bond or bonds within ten (10) days after the prescribed forms are presented for signature, or within such extended period as the Owner may grant, based upon reasons determined sufficient by the Owner, shall constitute a default, and the Owner may either award the Contract to the next lowest responsible Bidder or re-advertise for Bids, and may charge against the Bidder the difference between the amount of the Bid and the amount of which a Contract for the work is subsequently executed, irrespective of whether the amount thus due exceeds the amount of the Bid Bond. If a more favorable Bid is received by re-

advertising, the defaulting bidder shall have no claim against the Local Public Agency for a refund.

- D. Full (100%) performance and payment bonds are required on all contracts in excess of \$25,000.00. The only exception is that if the contract is less than \$50,000.00, the entity may hold all payment, with no interim payments made, until final completion and presentation of lien releases from all subcontractors and suppliers, in lieu of the performance bond. Such bonds must be issued by a corporate surety authorized to do business in the State of Texas.
- 20. This project will be awarded for construction in accordance with these specifications and upon approval by the Owner.

### 21. Insurance:

See Special Conditions of the Agreement.

### 22. Certificate of Insurance:

The successful bidder will furnish a completed Certificate of Insurance with the executed contract. This Certificate of Insurance shall include all applicable policies and their numbers. These policies will cover all sub-contractors and the sub-contractors Certificate of Insurance will also be submitted covering the same amount stated above for the Contractor.

- 23. In case of discrepancies or conflicts between the specifications, bid documents or contract documents, the following order of priority shall govern:
  - A. Bid Documents
  - B. Instructions to Bidders
  - C. Special Instructions to Bidders
  - D. Supplemental General Conditions
  - E. Technical Specifications
  - F. Standard Form of Agreement
  - G. General Conditions of the Agreement
  - H. Special Conditions of the Agreement
  - I. Other Contract Documents
- 24. The award of the low bid does not constitute award of a contract. A contract will be binding on both parties when executed by both parties and a purchase order is issued.

### **Technical Special Instructions to Bidders**

### 1. DRAWINGS/PLANS

The Contractor shall review the drawings for this particular project and plan his work to be compatible with conditions shown on the drawings.

Discrepancies between drawings and specifications shall promptly be brought to the attention of the County Engineer.

### 2. PROVISIONS FOR TRAFFIC

The Contractor shall be required to accommodate traffic circulation at all times. The traveling public shall be protected from hazards through the construction site area.

The Contractor shall provide for barricades, signs, cones, lights, signals and other such type devices for protection of the Public and for handling traffic within the project area, and such will be provided in accordance with the Texas Manual on Uniform Traffic Control Devices, (TMUTCD). (The Engineer may direct that additional control devices or flagmen be placed if in his opinion they are warranted)

The above shall be provided at no additional cost to the Owner.

### 3. UNDERGROUND UTILITES

The drawings show as much information as can be reasonably obtained by an Engineering survey party and from City, County and Utility Company records regarding the location and nature of pipelines, storm sewers, water lines, sanitary sewer, telephone conduits, etc. However, the accuracy or completeness of such information is not guaranteed. It shall be the Contractor's responsibility to locate such underground features sufficiently in advance to preclude damage to same, by contacting owners of same or any other means required to complete construction. The Contractor shall be responsible to remove and relocate all drainage culverts, fencing, mail boxes and etc. at no additional cost to the Owner.

In the event of damage to underground facilities whether shown or not in the drawings, the Contractor shall make the necessary repairs to place the facilities back in service at no increase in the Contractor's price and all such repairs shall conform to the requirements of the company or agency servicing the facility. Payment will be made only on those utility adjustments for which a bid item has been proposed on this contract. All other utility adjustments damaged or disturbed by the Contractor will be returned to satisfactory service at no additional cost to the owner

### 4. WORK ON PRIVATE PROPERTY

The Contractor will contact all property owners and make arrangements for accessing these properties to perform this work. The Contractor shall then inspect each site to determine all particulars involved in performing this work. The Contractor shall then review the proposed work with the property owner and the Engineer or their designated representatives.

The Contractor shall specifically note that all yard areas, landscaping, or other improvements shall be replaced to their original or better condition unless otherwise approved in writing by the

property owner. It is strongly recommended that the Contractor obtain adequate photographic or video documentation of all existing property conditions and/or improvements prior to beginning any work on private property and upon completion of the work and site restoration. Any disputes arising between the property owner and the Contractor on properties that have not been properly documented will typically be ruled in favor of the property owner. All work done on private property shall carry the same one-year warranty as provided for in the contract documents.

- 5. TESTING OF MATERIALS Testing shall be done by an independent laboratory and paid for directly by the owner. The cost of any failure shall be reimbursed to the owner by the Contractor. Testing results shall be submitted to the Engineer for review and approval.
- 6. SURPLUS EXCAVATION Soil taken from the excavation may be spread on the adjacent areas with permission from the property owners. Written approval must be provided to the Engineer prior to placement. If no adjacent areas can be found it shall be the Contractor's responsibility to complete legal disposal. Old concrete, objectionable material and all obstructions are to be removed off the project regardless whether or not they are shown on the plans. Separate payment will be made for this work. Material must be disposed of in a legal manner.
- 7. FINAL GRADING CLEAN-UP It is the intent of these specifications that the entire project site be uniformly graded and dressed to provide a smooth pleasing appearance of all disturbed areas.
- 8. DEMOLITION/CONSTRUCTION NOTICE REQUIREMENT Contractor shall notify the Cameron County Engineering Department at least 72 hours prior to commencing demolition/construction. Contractor shall notify other Entities and Utility Companies affected by this project at least 48 hours prior to commencing demolition/construction.

### **BID PROPOSAL FORM**

(GENERAL CONTRACT)

Project: BID # 230801 THE PASO REAL DRAINAGE PROJECT

Place: Cameron County Purchasing Department, 1100 E. Monroe Street 3<sup>rd</sup> Floor, **Attention**:

Mr. Roberto C. Luna, Interim Purchasing Agent

Due Date: <u>July 31, 2023</u>

Time: Before 3:00 p.m.

1. Pursuant to and in compliance with the Invitation to Bid and the proposed Contract Documents, prepared by Architect Gomez Mendez Saenz, Inc. relating to the above referenced project, the undersigned, having become thoroughly familiar with the terms and conditions of the proposed Contract Documents and with local conditions affecting the performance and costs of the work at the place where the work is to be completed, and having fully inspected the site in all particulars, hereby proposes and agrees to fully perform the work within the time stated and in strict accordance with the proposed Contract Documents, and addenda, thereto, including furnishing of any and all labor and materials for all roofing, for the following sum of money:

### A. BASED BID:

All labor, materials, services and equipment, necessary for completion of the wo
shown on the drawings and described in the specifications.

DOLLARS (\$	. )
Same in Words:	

- 2. If awarded this Contract the undersigned will execute a satisfactory Construction Contract, Performance Bond, Labor and Material Payment Bond and proof of insurance coverage, with the Owner for the entire work as per the Contract Documents within 5 days after notice of award. It is agreed that this proposal is subjected to the Owner's acceptance for a period of Thirty (30) days from the above date.
- 3. Contractor shall be substantially completed within 60 working days.
- 4. Enclosed is a Certified Check or Bidders Bond in the amount of \$ \_\_\_\_\_\_ compliance with the specification requirements. (5% of the highest amount bid). The above check or Bidders Bond is to become the property of the Owner in the event the Construction Contract (when offered by the Owner) and the bonds and proof of insurance coverage are not executed within the time set forth above.
- 5. The undersigned agrees to the following:
  - A. To furnish all materials as shown and specified in the plans and specifications.
  - B. To start work within 10 days after notice to proceed.
  - C. To work a minimum of 5 working days per week.

6.		amount of all allo ations, in the Base F	•		General R	equirement	s, Division 1	, of the
7.	Receipt	is acknowledged of	the following ad	dendas:				
	No.	Dated	No.		Dated _			
	No.	Dated Dated	No.		Dated			
8.	Bidder a	grees that the Ow lities.	ner has the righ	t to accept	or reject	any or all b	oids and to w	aive all
Respec	tfully sub	mitted,						
Зу:				_ Date _				
	Signatu	re						
Γitle:								
Addres	s:							
Seal - i	f Bidder i	s a corporation)						

BID # 230801 THE PASO REAL DRAINAGE IMPROVEMENT PROJECT				
	Itemized Bid Tab			

			PASO REAL IMPROVEMENTS	PRO	JECT		
UNIT	CODE	ALT	UNIT BID PRICE ONLY, WRITTEN IN WORDS	UNIT	APPROX. QUANT- ITIES	UNIT BID PRICE ONLY, WRITTEN IN FIGURES	ITEM COST WRITTEN IN FIGURES
100	6002		PREPARING ROW	STA	10.0		
			DOLLARS				
110	6004		andCENTS	CY	224.0		
110	6004		EXCAVATION (ROADWAY AND CHANNEL)DOLLARS	Ci	224.0		
			and CENTS				
247	6060		FL BS (CMP IN PLC) (TY EGR 4) (FNAL POS)	CY	10.0		
			DOLLARS				
			andCENTS				
400	6002		STRUCTURAL EXCAVATION (BOX)	CY	3010		
			DOLLARS				
			andCENTS				
400	6006		CUT & RESTORE PAVEMENT	SY	47		
			and CENTS				
400	6010		STRUCTURAL EXCAVATION (SPL)	CY	401		
400	0010		DOLLARS	'	401		
			and CENTS				
400	6011		SAND BACKFILL	CY	2		
			DOLLARS				
			andCENTS				
402	6001		TRENCH EXCAVATION PROTECTION	LF	910		
			DOLLARS				
420	CO74		andCENTS	CV	4		
420	6074		CONCRETE STRUCTURES CLASS C CONC (MISC)  DOLLARS	CY	4		
			andCENTS				
432	6001		RIPRAP (CONC) (4 IN)	CY	15.0		
			DOLLARS				
			andCENTS				
462	6005		CONC BOX CULV (4X4)	LF	1800		
			DOLLARS				
			and CENTS				
464	6039		RC PIPE (CL III) (24") (SPL)	EA	16		
			DOLLARS				
465	6003		MANHOLE (COMPL) (PRM) (60 IN)	EA	6		
403	0003		DOLLARS		٥		
			andCENTS				
466	6197		WINGWALL (PW-2)(WH=8FT)	EA	1		
			DOLLARS				
			andCENTS				

			PASO REAL IMPROVEMENTS	PRO	JECT		
UNIT	CODE	ALT	UNIT BID PRICE ONLY, WRITTEN IN WORDS	UNIT	APPROX. QUANT- ITIES	UNIT BID PRICE ONLY, WRITTEN IN FIGURES	ITEM COST WRITTEN IN FIGURES
471	6001		GRATE	EA	4		
			DOLLARS				
			andCENTS				
496	6007		REMOVE STORM (PIPE)	LF	87		
			DOLLARS				
			andCENTS				
506	6021		CONSTRUCTION EXIT (INSTALL)	SY	156		
			DOLLARS				
			andCENTS				
506	6024		CONSTRUCTION EXIT (REMOVE)	SY	156		
			DOLLARS				
			andCENTS				
506	6038		TEMP SEDMT CONT FENCE (INSTALL)	LF	1920		
			DOLLARS				
			and CENTS				
506	6039		TEMP SEDMT CONT FENCE (REMOVE)	LF	1920		
			DOLLARS				
			andCENTS				
506	6041		BIO DEG EROSN CONT LOGS (12" DIA) (INSTALL)	LF	48		
			DOLLARS				
			and CENTS				
506	6043		BIO DEG EROSN CONT LOGS (12" DIA) (REMOVE)	LF	48		
			DOLLARS				
			andCENTS	_			
500	6001		MOBILIZATION	LS	1		
			DOLLARS				
			andCENTS				
502	6038		BARRICADES, SIGNS AND TRAFFIC HANDLING	МО	6		
			DOLLARS				
			andCENTS				
N/A	N/A		CONSTRUCTION STAKING	LS	1		
			DOLLARS				
			andCENTS				

TOTAL BID \$

(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will prevail.) The above unit prices shall include all labor, materials (except where requested otherwise), bailing, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for. Bidder understands that the Owner reserves the right to reject any or all bids to waive any minor informalities in the bidding.

### LIST OF SUBCONTRATORS

To be submitted in a separate envelope with the Bid Proposal

Project: <u>BID # 230801 THE PASO REAL DRAINAGE IMPROVEMENT PROJECT</u>

To: Cameron County

The undersigned submit the following names of subcontractors to be used in performing the Contract. Each subcontractor is required to submit a standard AIA Qualification Statement clearly indicating prior historical restoration project experience and references.

### **SUBCONTRACTORS**

1.	Site Work and Paving		
2.	Concrete		
3.	Masonry		
4.	Finish Carpentry		
5.	Excavation	 	 
6.	Utility	 	 
7.	Traffic Control	 	 
8.	Plumbing	 	
9.	Electrical		
10.	Environmental		
11.	Other		

All Qualification Statements will be reviewed by the Architect, who will make appropriate recommendations to the Owner.

### ADDENDUM ACKNOWLEDGEMENT

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

Respectfully Sub	mitted:	
Name:		
By:	(Print)	
	(Signature)	
Address:		
	(P.O. Box/Street)	
-	(City) (State) (Zip)	
Telephone:		
	(Area Code)	

**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 PRESENT	S, that we the undersigned, as
PRINCIPAL, AND	, as SURETY are held and firmly bound unto <b>CAMERON</b>
<b>COUNTY</b> hereinafter called the OWNE	R Dollars, (\$) lawful money of the
• • •	ch sum well and truly to be made, we bind ourselves, our heirs, and assigns, jointly and severally, firmly by these presents.
	ON IS SUCH, that Whereas the Principal has submitted the, 20, for
opening of the same, or if no period be within the period specified therefore, prescribed forms are presented to him Agency in accordance with the Bid as ac as may be required, for the faithful per of the withdrawal of said Bid within the give such bond within the time specified amount specified in said Bid and the accordance with the said Bid and the accordance with the said Bid and the accordance within the said Bid and the accordance with the Bid as accordance with the	not withdraw said Bid within the period specified therein after the specified, within thirty (30) days after the said opening, and shall, or if no period be specified, within then (10) days after the for signature, enter into a written Contract with the Local Public ccepted, and give bond with good and sufficient surety or sureties, formance and proper fulfillment of such contract; or in the event the period specified, or the failure to enter into such Contract and d, if the Principal shall pay the Owner the difference between the amount for which the Owner may procure the required work of the former, them the above obligation shall be void and of orce and virtue.
IN WITNESS WHEREOF, the above-bou	unded parties have executed this instrument under their several
seals this day of	20, the name and corporate seal of each corporate party
being here to affixed and these presen of its governing body.	t signed by its undersigned representative, pursuant to authority
ATTEST:	
BY:	Affix Corporate Seal
ATTEST:	
BY:	Affix Corporate Seal
ATTEST:	
BY:	Affix Corporate Seal

Countersigned	
BY:	Attorney-in-Fact, State of
CERTIFICATE AS TO CORPORATE	<u>PRINCIPAL</u>
l,	ر certify that I am the ك Secretary of the Corporation named as Principa
in the within bond; that_, who sig	ned the said bond on behalf of the Principal was then of said corporation
that I know his signature, and hi	s signature there to is genuine; and that said bond was duly signed, and
attested to for and in behalf of s	aid corporation by authority of this governing body.
Title	(Corporate Seal)

Power-of-Attorney for person signing for surety company must be attached to bond.

### STATEMENT OF BIDDERS QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. The statement must be notarized. If necessary, may be answered on separate attached sheets. Bidders may submit any additional information he desires.

Name of Bidder:	Date Organized:		
Address:	Date Incorporated	Date Incorporated:	
Number of years in contracting business u	under present name		
Contracts on Hand:			
Contract	Amount (\$)	Completion Date	
Type of work performed by your company Have you ever failed to complete any wor	k awarded to you?		
Have you ever defaulted on a contract? _			
List the projects most recently completed Project	by your firm (include projects of Amount \$	similar importance): Mo./Yr. Completed	
Major equipment available for this contra			

#### BID # 230801 THE PASO REAL DRAINAGE IMPROVEMENT PROJECT

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

Credit available: \$	Ba	nk reference:		
,	•	, ,	firm or corporation to furnish any and for verification of the recitals	l al
comprising this Statemen	nt of Bidders Qualific	cations.		
Executed this	day of		, 20	
By: (signature)		Title:		
(print name)				

# CERTIFICATE AS TO CORPORATE PRINCIPAL

l,	, certify that I am the	, Secretary of
	oration named as Principal in the within bond; that	
bond on b	oehalf of the Principal was then	of said corporation; that I know his/her
signature	, and his/her signature thereto is genuine; and t	that said bond was duly signed, sealed, and
attested t	o, for and in behalf of said corporation by authorit	ty of this governing body.
Camanata		
Corporate	<u> </u>	
Seal		
Title:		

<sup>\*</sup> Power-of-attorney for person signing for surety company must be attached to bond.

# SECTION 1: BID PROPOSAL DOCUMENTS

B. BID FORMS

	ATTACHMENT	Α
Bidders Name	Date:	
	VENDOR REFERENCES	
· ·	urrent customers who can verify the quality of service your compan omers of similar size and scope of work to this bid.	У
	REFERENCE ONE	
Government/Company Name:		
Address:		
Contact Person and Title:	·	
Phone:	E-mail address:	
Contract Period:	Scope of Work	
	REFERENCE TWO	
Government/Company Name:		
Address:		
Contact Person and Title:		
Phone:	E-mail address:	
Contract Period:	Scope of Work	
	REFERENCE THREE	
Government/Company Name:		
Address:		
Contact Person and Title:		
Phone:	E-mail address:	
Contract Period:	Scope of Work	

#### ATTACHMENT B

#### **AFFIDAVIT**

The undersigned certifies that the bid prices contained in this bid have been carefully checked and are submitted as correct and final and if bid is accepted (within 90 days unless otherwise noted by vendor), agrees to furnish any and/or all items upon which prices are offered, at the price(s) and upon the conditions contained in the Specifications.

STATE OF TEXAS **COUNTY OF CAMERON** BEFORE ME, the undersigned authority, A Notary Public in and for the State of Texas, on this day personally appeared \_\_ who, after having first been duly sworn, upon oath did depose and say; That the foregoing bid submitted by hereinafter called "Bidder" is the duly authorized agent of said company and that the person signing said proposal has been duly authorized to execute the same. Bidder affirms that they are duly authorized to execute this contract, that this company, corporation, firm, partnership or individual has not prepared this bid in collusion with any other Bidder. The bidder is not a member of any trust, pool, or combination to control the price of products or services bid on, or to influence any person to bid or not to bid thereon. I further affirm that the bidder has not given, offered to give, nor intends to give, at any time hereafter, any economic opportunity, future employment, gift, loan, gratuity, special discounts, trip, favor, or service to a public servant in connection with the submitted Bid. The contents of this bid as to prices, terms or conditions of said bid have not been communicated by the undersigned nor by any employee or agent to any other person engaged in this type of business prior to the official opening of this bid. Name and Address of Bidder: Signature Title Telephone No. \_\_\_\_\_

Notary Public in and for the State of Texas

THIS FORM MUST BE RETURNED WITH YOUR BID

SWORN TO AND SUBSCRIBE BEFORE ME THIS \_\_\_\_ day of \_\_\_\_\_ , 20 .

## Attachment C

#### **RESIDENCE CERTIFICATION**

Pursuant to Texas Government Code  $\delta$ 2252.001 *et seq.*, as amended, Cameron County requests Residence Certification.  $\delta$ 2252.001 *et seq.* of the Government Code provides some restrictions on the awarding of governmental contracts; pertinent provisions of  $\delta$ 2252.001 are stated below:

"Nonresident bidder" refers to a person who is not a resident.

"Resident bidder" refers to a person whose principal place of business is in this state, including a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

I certify that	is a Resident Bidder of
Texas as defined in Government Code $\delta$ 2252.001.	
I certify that	is a Nonresident
Bidder as defined in Government Code $\delta \text{2252.001}$ and ou	r principal place of business is
	·
(City and State)	

#### Attachment D

CAMERON COUNTY EXPRESSLY REQUESTS THAT BIDDERS / PROPOSERS NOT DISCUSS THIS ENGAGEMENT OR THIS BIDDER'S / PROPOSER'S PLANS, EXPERIENCE OR CREDENTIALS WITH OTHER BIDDERS / PROPOSERS OR ANY MEMBER OF COMMISSIONERS' COURT, ANY COUNTY OFFICIAL, OR ANY EVALUATION COMMITTEE MEMBER APPOINTED BY COMMISSIONERS COURT. EXCLUDED ARE PRE-BID OR PRE-PROPOSAL CONFERENCES, EVALUATION COMMITTEE SCHEDULED VENDOR PRESENTATIONS OR VENDOR INTERVIEWS, OR EVALUATION COMMITTEE SCHEDULED EQUIPMENT OR SERVICES DEMONSTRATIONS. YOU MAY CONTACT THE PURCHASING AGENT /PURCHASING DEPARTMENT AT ANY TIME.

FROM BID OPENING DATE THROUGH COMMISSIONERS COURT MEETING FOR SELECTION, VENDORS SHALL NOT APPROACH THE COUNTY JUDGE OR COMMISSIONERS TO DISCUSS MATTERS PERTAINING TO THIS BID.

1.	Has any individual with the firm submitting this Proposal/Bid/Response made any contact with any member of Commissioners Court, any County Official, or an Evaluation Committee member concerning this Invitation to Bid/RFP/RFQ, other than questions to the Assistant County Auditor/Purchasing Officer?					
2.	Has any individual with the firm submitting this Proposal/Bid/Response made any contact with any other Bidder or Proposer concerning this Invitation to Bid/RFP/RFQ?					
Signat	ure of person submitting this Bid Date					

Δtt	tar	٠h	m	۵	nt	F

#### ORDER NO. 2007O2005

THE STATE OF TEXAS §

\$
COUNTY OF CAMERON §

# ORDER ADOPTING CONTRACTING RULES FOR PERSONS INDEBTED TO COUNTY

WHEREAS, pursuant to V.T.C.A., Local Government Code, Section 262.0276, a commissioner's court is authorized to adopt rules permitting a county to refuse to enter into a contract or other transaction with a person indebted to the county;

WHEREAS, the Commissioners Court of Cameron County finds it is in the best interest of Cameron County to adopt such rules;

NOW THEREFORE, BE IT ORDERED by the Commissioners Court of Cameron County, that the following rules be adopted regarding Cameron County and persons interested in doing business with Cameron County:

- 1. Cameron County may refuse to enter into a contract or other transaction with a person with a past due debt to Cameron County, including delinquent ad valorem taxes, even if the person is the lowest bidder or successful proposer; and
- 2. For purposes of this Order, a debt is past due if it is not received in the County Treasurer's Office by the due date in a written agreement or notice, and ad valorem taxes are past due if not received in the County Tax Assessor/Collector's Office by February 1<sup>st</sup> following the January 1<sup>st</sup> on which the ad valorem taxes are due.
- 3. For purposes of this Order, a person includes an individual, sole proprietorship, corporation, nonprofit corporation, partnership, joint venture, limited liability company, and any other entity that proposes or otherwise seeks to enter into a contract or other transaction with Cameron County requiring approval by the Commissioners Court.

ADOPTED this <u>13</u> day of March, 2007.	
Is the person or the firm submitting this Bid current	with all local and State taxes?
Signature of person submitting this Bid	 Date

#### Attachment F

#### Certification Regarding Debarment & Suspension Ineligibility

As is required by the Federal Regulations Implementing Executive Order 12549, Debarment and Suspension, 45 CFR Part 76, Government-wide Debarment and Suspension, in the applicant certifies, to the best of his or her knowledge and belief, that both it and its principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency;
- b. Have not within a three-year period preceding this bid/proposal and/or application been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state or local) transaction or contract under a public transaction, violation of federal or state antitrust statutes or commission of embezzlement, theft, theory, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- c. Are not presently indicted for or otherwise criminally or civilly charged by a government entity with commission of any of the offenses enumerated herein; and
- d. Have not within a three-year period preceding this bid/proposal and/or application had one or more public transactions terminated of cause or default.

Signature
Print Name
Title
Telephone No.
relephone No.
Date

If the Bidder / Proposer is unable to certify to all of the statements in this Certification, such Bidder / Proposer should attach an explanation to this Bid / Proposal.

#### BID # 230801 THE PASO REAL DRAINAGE IMPROVEMENT PROJECT

#### SWORN STATEMENT ON DEBARMENT

This SV	VORN statement is s	ubmitted with project i	number		
Ву:					
	(PRINT INDIVIDUALS NAME AND TITLE)				
For:					
		ENTITY SUBMITTING S\		 NT)	
whose	business address is:				
CITY		STATE	ZIP	PHONE	
and if a	applicable its Federal	Employee Identification	on Number (FEIN	) is:	
	executives, partr management of to of a public entity The entity submexecutives, partr management of CONVICTED OF A	ners, shareholders, en the entity, nor any affil crime. hitting this SWORN st hers, shareholders, em the entity, or an affi	WORN statement ployees, membiate of the entity statement, or on a ployees, membiliate of the entity statement is not preserved.	the transport of its officers, directly nor any of its officers, directly has been charged with and consider or more of its officers, directly has been charged who are active tity has been charged with the ent on any Federal list of debarrons.	in the nvicted ectors, in the
AUTHC	PRIZED SIGNATURE		(Printed N	lame)	
(Title)					
		efore me this d			
Person	ally known	OR Produced ide		HOW TYPE OF IDENTIFICATION	
Notary	Public State of	, County of	_	mmission expires	
(PRINT	ED/TYPED/ OR STAM	IPED COMMISSIONED I	NAME OF NOTAF	RY PUBLIC)	

## Attachment F-2

## **Architects, Engineers, Construction**

The applicant certifies, to the best of his or her knowledge and belief, that the information noted below for it and its principals are accurate:

a.	a. List all previous law suits with Public entities ar years.	nd the results of such suits over the past 7
b.	b. List all projects that have exceeded Budget, wh 5 years.	at % over budget and why – over the past
C.	c. List all projects that have exceeded the project and why – over the past 5 years.	completion due date, how many days over
	(attach pages if necessary due to	space limitations)
	Signat	cure
	Print	Name
	Title	
	Telep	hone No.
	Date	

If the Bidder / Proposer is unable to certify to all of the statements in this Certification, such Bidder / Proposer should attach an explanation to this Bid / Proposal.

#### Attachment G

# Certification Regarding Resolution Requiring Minimum Wage Rate

As is required by Resolution No. 2008R12092:
A RESOLUTION IN SUPPORT OF MAINTAINING A HIGHER MINIMUM WAGE REQUIREMENT FOR ALL
CONTRACTORS DOING WORK FOR CAMERON COUNTY

The applicant (Bidder) certifies, to the best of his or her knowledge and belief, that the Prime Contractor and Subcontractor contracts shall explicitly include a <u>minimum wage of \$8.50 per hour for all full time</u> and part time employees hired by the prime and subcontractors for any and all work performed for Cameron County in this Bid.

Signature
Print Name
Title
Telephone No.
Date

If the Bidder / Proposer is unable to certify to all of the statements in this Certification, such Bidder / Proposer should attach an explanation to this Bid / Proposal.

# BID # 230801 THE PASO REAL DRAINAGE IMPROVEMENT PROJECT

Company Name:

Please answer each individual question. If it does not pertain to your company, please write "N/A" and sign at the bottom of page.

Attachment H

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.	OFFICEUSEONLY
This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).  By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the	Date Received
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.	
1 Name of vendor who has a business relationship with local governmental entity.	
Check this box if you are filing an update to a previously filed questionnaire. (The law requires that you fill business day after the date on which you became aware that incomplete or inaccurate.)	
3 Name of local government officer about whom the information is being disclosed.	
Name of Officer	
4 Describe each employment or other business relationship with the local government officer, or a fan	nily member of the
officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local gove A and B for each employment or business relationship described. Attach additional pages to this Form CIC	
A. Is the local government officer or a family member of the officer receiving or likely than investment income, from the vendor?	to receive taxable income, other
Yes No	
B. Is the vendor receiving or likely to receive taxable income, other than investment incor local government officer or a family member of the officer AND the taxable income governmental entity?	*
Yes No	
5 Describe each employment or business relationship that the vendor named in Section 1 maintains with	a corporation or
other business entity with respect to which the local government officer serves as an officer or director, or one percent or more.	holds an ownership interest of
Check this box if the vendor has given the local government officer or a family member of the of Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).	ficer one or more gifts as described in
7	
Signature of vendor doing business with the governmental entity	rate
Form provided by Texas Ethics Commission <a href="https://www.ethics,state.tx.us">www.ethics,state.tx.us</a> 1/1/2021	Revised

# 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 <a href="http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm">http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm</a>. For easy reference, below are some of the sections cited on this form.

<u>Local Government Code § 176.001(1-a)</u>: "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.

Form provided by Texas Ethics Commission

www.ethics,state.tx.us

Revised 1/1/2021

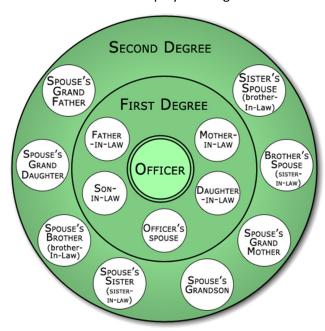
#### **NEPOTISM CHART**

#### **AFFINITY KINSHIP**

Relationship by Marriage

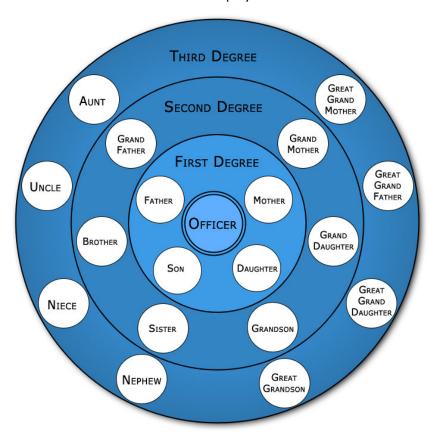
#### The chart below shows

- Affinity Kinship (relationship by marriage)
- Consanguinity Kinship (relationship by blood) for purposes of interpreting nepotism as defined in VTCA Government Code, Chapter 573, §§573.021 -.025



#### **CONSANGUINITY KINSHIP**

Relationship by Blood



#### DISCLOSURE OF INTERESTS

# MUST BE FILLED OUT AND SUBMITTED WITH THE BID/RFP/RFQ IF DISCLOSING: BIDDER / PROPOSER MUST ALSO FILE WITH THE COUNTY CLERK'S OFFICE THE PURCHASING DEPT. WILL NOT BE FILING ON THE BIDDER'S BEHALF

Cameron County, Texas requires all persons or firms seeking to do business with the County to provide the following information. Every question must be answered. If the question is not applicable, answer with "N/A." By law this questionnaire must be filed with the records administrator (County Clerk's Office) of the local government.

FIRM NAME:					_	
FIRM is:	1. Corporation (	) 2. Partnership()	3. Sole Owner (	)	- - 4. Association (	)
	5. Other ( )		<del></del>			

#### **DISCLOSURE QUESTIONS**

If additional space is necessary, please use the reverse side of this page or attach separate sheet.

- 1. State the names of each "employee, elected official, or member of Commissioners Court" of Cameron County having <u>Substantial Interest in Business Entity</u> **Local Govt. Code 171.002** 
  - a. For purpose of this chapter, a person has a substantial interest in a business entity if:
    - i. the person owns 10 percent or more of the voting stock or shares of the business entity or owns either 10 percent or more or \$15,000 or more of the fair market value of the business entity: or
    - ii. funds received by the person from the business entity exceeds 10 percent of the person's gross income for the previous year.
  - b. A person has a substantial interest in real property if the interest is an equitable or legal ownership with a fair market value of \$2,500 or more.
  - c. A local public official is considered to have a substantial interest under this section if a person related to the official in the first degree by consanguinity or affinity, as determined under Chapter 573, Government Code, has a substantial interest under this section.

<u>Name</u>	<u>Title</u>	<u>Department</u>

# **DISCLOSURE OF INTERESTS (CONTINUED)**

#### **CERTIFICATE**

I certify that all information provided is true and correct as of the date of this statement, that I have not knowingly withheld disclosure of any information requested; and that supplemental statements will be promptly submitted to the Cameron County as changes occur.

Certifying Person:	Title:				
	(Type or Print)				
Signature of Certifying Person		Date:			



# **HOUSE BILL 89 VERIFICATION (REVISED)**

l,	, the undersigned representative of
	[Person Name] [Company or Business Name]
	fter referred to as Company) being an adult over the age of eighteen (18) years of age, does hereby depose and
verify t	that the Company named above, under the provisions of Subtitle F, Title 10, Texas Government Code Chapter
§2270:	
	Does not currently boycott the country of Israel; and
2.	Will not boycott the country of Israel during the term of the contract with Cameron County, Texas.
	Signature:
Pursua	nt to Section §2270.001, Texas Government Code:
<ol> <li>2.</li> <li>3.</li> </ol>	"Boycott Israel" means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes; and "Company" means a for-profit sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or any limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company or affiliate of those entities or business associations that exist to make a profit.  Pursuant to Section §2270.002 of the Texas Government Code, Respondent certifies that either (i) it meets an exemption criterion under Section §2270.002; or (ii) it does not boycott Israel and will not boycott Israel during the term of the contract resulting from this solicitation. Respondent shall state any facts that make it exempt
	from the boycott certification in its Response. (HB 793 – exemptions).
EXEMF	PTIONS APPLY TO THE FOLLOWING:
	$\square$ between a governmental entity and a company with less than 10 full-time employees
	$\square$ has a value of less than \$100,000 paid wholly or partly from public funds of the governmental entity

THIS FORM MUST BE RETURNED WITH YOUR BID

RESPONDER'S SIGNATURE/INITIALS: \_\_\_\_\_

# SECTION 2: CONTRACT DOCUMENTS

# **STANDARD FORM OF AGREEMENT**

STATE OF TEXAS	§	
COUNTY OF CAMERON	§	
20, A.D., by and between	called County, and, of, Parermed Contractor.	Party
mentioned, to be made and conditions expressed in the be (Contractor), hereby agrees we the construction of certain in THE PASO REAL DRAINAGE therewith, under the terms Conditions of the Agreement cost and expense to furnished the Proposal attached hereto, Conditions of the Agreement which include all maps, plat matter thereof, and the speciand the General Conditions Specifications and Plans and	t for and in consideration of the payments and agreements herein performed by the Party of the First Part (County), and under bond bearing every date herewith, the said Party of the Second with said Party of the First Part (County), to commence and commprovements described as follows: Cameron County, BID # 23 GE IMPROVEMENT PROJECT and any extra work in connect as stated in the General Conditions of the Agreement, Spatt, Technical Specifications and Plans and at his (or their) own points all the materials, supplies, machinery, equipment, the rance, and other accessories, with the conditions and prices state in accordance with all General Conditions of the Agreement, Spatt, Technical Specifications and Plans and in accordance with the First, blueprints and other drawings and printed or written explanations therefore, together with the Contractor's written approach the Agreement, Special Conditions of the Agreement, Technical Construction Bonds hereto attached, all of which are made and constitute the entire contract.	er the Part plete 30801 ection pecial roper tools, ted in pecial plans, actory royal, mical
notice to do so shall have	by agrees to commence work within days after the date we been given to him, and to substantially complete same we of the written notice to commence work.	
include alternates #submitted therefore, subject t	pay the Contractor in current funds the sum of \$	_

Contractor further agrees not to do any work unless he has received a valid Purchase Order issued by Cameron County for payment of the work to be accomplished.

This instrument contains the entire agreement between the parties relating to the rights herein granted and obligations herein assumed. Any oral representations or modifications concerning this instrument shall be of no force or effect, excepting a subsequent modification in writing, signed by the party to be charged. This Agreement may be amended, provided that no amendment, modification, or alteration of the terms of this agreement shall be binding unless the same is in writing and duly executed by the parties hereto.

Cameron County Judge, Cameron County 78520, and Cameron County Engineer, 139	
This Agreement shall be governed by Cameron County.	y the laws of the State of Texas and venue shall be in
IN WITNESS WHEREOF, the partiquadruplicate in the year and day first above	es of these presents have executed this Agreement in e written.
PARTY OF THE FIRST PART (Contractor)	PARTY OF THE SECOND PART (County) Eddie Treviño Jr. Cameron County Judge
ATTESTED BY:	
Sylvia Garza Perez, County Clerk	

PERFORMANCE BOND	
KNOW ALL MEN BY THESE PRESENT that:	
(Name of Contractor or Company)	
(Address)	
a	_
(Corporation/Partnership)	
hereinafter called PRINCIPAL, and	
(Name of Surety Company)	
(Address)	
hereinafter called SURETY, are held and firmly bound unto CAMERON COUI in the penal sum of \$ dollars and	
money of the United States, for the payment of which sum well and truly	
successors, and assigns, jointly and severally, firmly in these presents.	
THE CONDITION OF THE OBLIGATION is such that whereas, the Principal e	
with the OWNER dated the day of, 20, a copy of	which is hereto attached and
made a part hereof for the construction of:	

#### BID # 230801 THE PASO REAL DRAINAGE Improvement PROJECT

NOW THEREFORE, the condition of this obligation is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise, it shall remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same in any way accompanying the same in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

#### BID # 230801 THE PASO REAL DRAINAGE IMPROVEMENT PROJECT

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions in Chapter 2253, Public Work Performance and Payment Bonds, of Texas Government Code, Title 10, General Government, Subtitle F, State and Local Contracts and Fund Management.

IN WITNESS WHEREOF, this instrume		of which shall be deemed an
original, this theday of	, 20 (fluffiber)	
(Principal)		
ATTEST:		
	BY	(s)
(Principal Secretary)		
	(SEAL)	
(Witness as to Principal)		
(Address)		
ATTEST:		
(Surety)	(Attorney in Fact)	
ВУ		
(Witness as to Surety)	(Address)	
(Address)		

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

PAYMENT BOND		
KNOW ALL MEN BY THESE PRESENT that:		
(Name of Contractor or Company)		_
(Address)		_
a		
(Corporation/Partnership)		
hereinafter called PRINCIPAL, and		
(Name of Surety Company)		_
(Address)		_
hereinafter called SURETY, are held and firn	nly bound unto CAMERON CO	UNTY, hereinafter called OWNER
in the penal sum of \$	dollars and	cents in lawfu
money of the United States, for the payme	ent of which sum well and trul	y to be made we bind ourselves
successors, and assigns, jointly and several	ly, firmly in these presents.	
THE CONDITION OF THE OBLIGATION is suc	ch that whereas, the Principal	entered into a certain contract
with the OWNER dated the $_{}$ day of $_{}$	, 20, a copy o	of which is hereto attached and
made a part hereof for the construction of	:	

#### BID # 230801 THE PASO REAL DRAINAGE Improvement PROJECT

NOW THEREFORE, if the Principal shall promptly make payment to all persons, firms, SUB-CONTRACTORS, and corporation furnishing materials or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK whether by SUB-CONTRACTOR or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or the WORK to be performed or the SPECIFICATIONS accompanying the same in any way affect its obligation on this bond, and it does hereby

#### BID # 230801 THE PASO REAL DRAINAGE IMPROVEMENT PROJECT

waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the SPECIFICATIONS

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

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions in Chapter 2253, Public Work Performance and Payment Bonds, of Texas Government Code, Title 10, General Government, Subtitle F, State and Local Contracts and Fund Management.

IN WITNESS WHEREOF, this insoriginal, this theday of	strument is executed in parts, one of which s , 20 <sup>(number)</sup>	hall be deemed an
(Principal)		
ATTEST:		
(Principal Secretary)	BY	(s)
(Finicipal Secretary)	(SEAL)	
(Witness as to Principal)		
(Address)		
ATTEST:		
(Surety)	(Attorney in Fact)	
ВУ		
(Witness as to Surety)	(Address)	
(Address)		

#### BID # 230801 THE PASO REAL DRAINAGE IMPROVEMENT PROJECT

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

# ATTORNEY'S REVIEW CERTIFICATION

I, the undersigned,	Dylbia L. Jefferies Vega	,	the	duly	authorized	and	acting	legal
representative of the _	County of Cameron, Texas				, do hereby	certify	as follo	ws:
the agreements representatives agreements on and legally bind	ed the attached contract(s) and some some some some some some some some	e prop have rties;	er par e full and th	ties, ac power at the	cting through and author agreements	their d ity to shall c	uly auth execute onstitute	orized e said e valid
Attorney's signature: _					Date:			
Print Attorney's Name	Dylhia I. Jefferies Vega							

NOTICE OF A	WARD		
то:			
PROJECT:	BID # 230801 THE PASO REAL	DRAINAGE IMPR	ROVENT PROJECT
	es considered the BID submited and Invitation to Bid of		the above described WORK in response 
You are hereby	notified that your BID has I	been accepted	in the amount of
required CONT	•	nd, Payment Bo	ecute the Agreement and furnish the ond and certificates of insurance within i.
of the Notice, sacceptance of	said OWNER will be entitled	to consider all as forfeiture o	onds within ten (10) days from the date your rights arising out of the OWNER'S of your BID SECURITY. The OWNER will
	ed to return an acknowledge day of, 20	ed copy of the I	NOTICE OF AWARD to the OWNER.
		OWNER: BY:	CAMERON COUNTY
		TITLE:	County Engineer
	ACCEP	TANCE OF NOT	TICE
	above NOTICE OF AWARD is	s hereby ackno	wledged by, this the
		BY:	
		TITLE:	

## REQUIRED CONTRACT CLAUSES FOR CONTRACTS UNDER FEDERAL AWARD

## 2 C.F.R. § 200.327 & 2 C.F.R. PART 200, APPENDIX II, REQUIRED CONTRACT CLAUSES FOR NON-FEDERAL ENTITY CONTRACTS UNDER FEDERAL AWARDS

The United States Office of Management and Budget (OMB) issued in 2 C.F.R. 200: *Uniform Administrative Requirements, Cost Principals and Audit Requirements for Federal Awards* (Uniform Guidance). Subpart D: Post Federal Award Requirements: **2 CFR §§200.317-200.327** of the Uniform Guidance contain provisions applicable to procurements made with federal grant funding. [Except as otherwise provided, updated Post Federal Award Requirements (i.e.: 2 CFR §§200.317-200.327) apply to declarations and awards issued on or after November 12, 2020]. <a href="https://www.ecfr.gov/current/title-2/subtitle-A/chapter-II/part-200#subject-group-ECFR45ddd4419ad436d">https://www.ecfr.gov/current/title-2/subtitle-A/chapter-II/part-200#subject-group-ECFR45ddd4419ad436d</a> *See Appendix "B"* 

As a non-Federal entity, the County of Cameron's ("County") contracts must contain the applicable contract clauses described in Appendix II to the Uniform Guidance (Contract Provisions for non-Federal Entity Contracts Under Federal Awards), which are set forth below. (2 C.F.R. §200.327). If applicable, the following clauses shall supersede any existing, similar clauses stated within the bid document, contract, and/or Terms and Conditions. The term "Contractor" used herein refers to the proposer, bidder or other entity/individual responding to the applicable procurement packet.

If applicable, the regulations in 2 CFR, Part 200 and Appendix II to the Uniform Guidance, as it may be amended from time to time, and the contract clauses below, are incorporated by reference as part of this procurement packet and any resulting agreement.

To procure goods and services using funds under a federal grant or contract, specific federal laws, regulations, and requirements may apply in addition to those under state law. The following provisions are required and apply when federal funds are expended by the County of Cameron for any contract resulting from this procurement process.

#### 1. Remedies.

- a. Applicability. This requirement applies to all Federal grant and cooperative agreement programs.
- b. <u>Standard.</u> Contracts for more than the simplified acquisition threshold currently set at \$150,000, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate. <u>See</u> 2 C.F.R. Part 200, Appendix II, A.
- c. <u>Statement</u>. Pursuant to Federal Rule (A) above, when federal funds are expended by the County, the County reserves all rights and privileges under the applicable laws and regulations with respect to this procurement in the event of breach of contract by either party. Contractor shall comply with all applicable Federal, State of Texas, and local laws, rules, and regulations and shall obtain all applicable licenses and permits for the conduct of its business and the performance of the services, and any provision of equipment and material ("Applicable Law"). All transactions related to any of the Contract Documents shall be governed by the laws of the State of Texas, and trial of any action brought in connection with the bid or the Contract Documents shall be held exclusively in a state court in the County of Cameron, Texas.

#### 2. Termination for Cause and Convenience.

- a. Applicability. This requirement applies to all Federal grant and cooperative agreement programs.
- b. <u>Standard.</u> All contracts in excess of \$10,000 shall address termination for cause and for convenience by the non-Federal entity including the manner by which it will be affected and the basis for settlement as follows. See 2 C.F.R. Part 200, Appendix II, B.
- c. <u>Statement</u>. *Termination*. County may terminate this Agreement for any reason upon ten (10) days written notice to the other party. County may terminate this Agreement immediately upon written notice if Contractor breaches this Agreement. In the event of any termination, Contractor shall promptly deliver to the County any and all Work Materials prepared for the County prior to the effective date of such termination, all of which shall become County's sole property. After receipt of the Work Materials, County will pay Contractor for the services which the County determines were satisfactorily performed as of the effective date of the termination.

Excuses for Non-Performance. Either party shall be absolved from its obligations under this contract when and to the extent that performance is delayed or prevented (and in the County of Cameron's case when and to the extent that its need for the articles, materials or work to be supplied hereunder is reduced or eliminated) by reason of acts of God, fire explosion, war riots, strikes, labor disputes, or governmental laws, orders or regulations.

Default. If Contractor or Subcontractor shall breach any provision hereof or shall become insolvent, enter voluntary or involuntary bankruptcy or receivership proceedings or make an assignment to the benefit of creditors, County of Cameron shall have the right (without limiting any other rights or remedies which it may have hereunder or by operation of law) to terminate this contract by written notice to Contractor whereupon County shall be relieved of all further obligation hereunder except the obligation to pay the reasonable value of Contractor's prior performance (at not exceeding the contract rate), and Contractor shall be liable to County for all costs incurred by County in completing or procuring the completion of performance in excess of the contract price herein specified. The County's right to require strict performance of any obligation hereunder shall not be affected by any previous waiver, forbearance of course of dealing. Time is of the essence thereof.

#### 3. Equal Employment Opportunity.

- a. Applicability: This requirement applies to all Federal grant and cooperative agreement programs.
- b. <u>Standard</u>. Except as otherwise provided under 41 C.F.R. Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 C.F.R. § 60-1.3 must include the equal opportunity clause provided under 41 C.F.R. § 60- 1.4(b), in accordance with Executive Order 11246, Equal Employment Opportunity (30 Fed. Reg. 12319, 12935, 3 C.F.R. Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, Amending Executive Order 11246 Relating to Equal Employment Opportunity, and implementing regulations at 41 C.F.R. Part 60 (Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor). See 2 C.F.R. Part 200, Appendix II, C.

#### c. Key Definitions:

(1) Federally Assisted Construction Contract. The regulation at 41 C.F.R. § 60-1.3 defines a "federally assisted construction contract" as any agreement or modification thereof between any applicant and a person for construction work which is paid for in whole or in part with funds obtained from the Government or borrowed on the credit of the Government pursuant to any Federal program involving a grant, contract, loan, insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, or any application or modification thereof approved

- by the Government for a grant, contract, loan, insurance, or guarantee under which the applicant itself participates in the construction work.
- (2) Construction Work. The regulation at 41 C.F.R. § 60-1.3 defines "construction work" as the construction, rehabilitation, alteration, conversion, extension, demolition or repair of buildings, highways, or other changes or improvements to real property, including facilities providing utility services. The term also includes the supervision, inspection, and other onsite functions incidental to the actual construction
- d. <u>Statement</u>: Contractor will comply with the Nondiscrimination Civil Rights Act of 1964, as amended and all Federal regulations relative to nondiscrimination in Federally assisted programs. <u>The regulation at 41 C.F.R. Part 60-1.4(b) requires the insertion of the following contract clause:</u>

#### "During the performance of this contract, the contractor agrees as follows:

- (1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
- (2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.
- (3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- (4) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- (5) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- (6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions as may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
- (7) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract

or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States."

#### 4. Davis Bacon Act and Copeland Anti-Kickback Act.

- a. <u>Applicability of Davis-Bacon Act</u>. The Davis-Bacon Act only applies to the emergency Management Preparedness Grant Program, Homeland Security Grant Program, Nonprofit Security Grant Program, Tribal Homeland Security Grant Program, Port Security Grant Program, and Transit Security Grant Program. <u>It does not apply to other Federal grant and cooperative agreement programs, including the Public Assistance Program</u>.
- b. <u>Standard</u>. All prime construction contracts in excess of \$2,000 awarded by non-Federal entities must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. §§ 3141-3144 and 3146-3148) as supplemented by Department of Labor regulations at 29 C.F.R. Part 5 (Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction).

In accordance with the statute, contractors must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week.

The non-Federal entity must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.

In contracts subject to the Davis-Bacon Act, the contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (40 U.S.C. § 3145), as supplemented by Department of Labor regulations at 29 C.F.R. Part 3 (Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States). The Copeland Anti-Kickback Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to FEMA or applicable Federal entity. See 2 C.F.R. Part 200, Appendix II, ¶ D.

c. <u>Statement</u>. The regulation at 29 C.F.R. § 5.5(a) does provide the required contract clause that applies to compliance with both the Davis-Bacon and Copeland Acts. However, as discussed in the previous subsection, the Davis-Bacon Act does not apply to Public Assistance recipients and subrecipients. In situations where the Davis-Bacon Act does not apply, neither does the Copeland "Anti-Kickback Act." However, for purposes of grant programs where both clauses do apply, FEMA or applicable Federal entity requires the following contract clause:

- (1) Contractor. The contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this contract.
- (2) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clause above and such other clauses as Federal requirements may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.
- (3) *Breach*. A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12."

#### 5. Contract Work Hours and Safety Standards Act.

- a. <u>Applicability</u>: This requirement applies to all Federal grant and cooperative agreement programs.
- b. <u>Standard</u>. Where applicable (see 40 U.S.C. § 3701), all contracts awarded by the non-Federal entity in excess of \$100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. §§ 3702 and 3704, as supplemented by Department of Labor regulations at 29 C.F.R. Part 5.

Under 40 U.S.C. § 3702, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week.

The requirements of 40 U.S.C. § 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence. See 2 C.F.R. Part 200, Appendix II, E.

The regulation at 29 C.F.R. § 5.5(b) provides the required contract clause concerning compliance with the Contract Work Hours and Safety Standards Act:

#### c. Statement.

"Compliance with the Contract Work Hours and Safety Standards Act.

- (1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with

respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this section.

- (3) Withholding for unpaid wages and liquidated damages. The County of Cameron shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.
- (4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this section."

#### 6. Rights to Inventions Made Under a Contract or Agreement.

- a. <u>Applicability</u>: <u>Stafford Act Disaster Grants</u>. This requirement <u>does not apply to the Public Assistance</u>, Hazard Mitigation Grant Program, Fire Management Assistance Grant Program, Crisis Counseling Assistance and Training Grant Program, Disaster Case Management Grant Program, and Federal Assistance to Individuals and Households Other Needs Assistance Grant Program, as FEMA or Federal awards under these programs do not meet the definition of "funding agreement."
- b. <u>Standard</u>. If the FEMA or Federal award meets the definition of "funding agreement" under 37 C.F.R. § 401.2(a) and the non-Federal entity wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the non-Federal entity must comply with the requirements of 37 C.F.R. Part 401 (Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements), and any implementing regulations issued by FEMA or applicable awarding agency. <u>See 2 C.F.R. Part 200, Appendix II</u>, F.
- c. <u>Key Definition</u>: The regulation at 37 C.F.R. § 401.2(a) currently defines "funding agreement" as any contract, grant, or cooperative agreement entered into between any Federal agency, other than the County of Cameron, and any contractor for the performance of experimental, developmental, or research work funded in whole or in part by the Federal government. This term also includes any assignment, substitution of parties, or subcontract of any type entered into for the performance of experimental, developmental, or research work under a funding agreement as defined in the first sentence of this paragraph.

#### 7. Clean Air Act and the Federal Water Pollution Control Act.

- a. <u>Applicability and Standard</u>: Contracts of amounts in excess of \$150,000 must contain a provision that requires the contractor to agree to comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act (42 U.S.C. §§ 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. §§ 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency. <u>See 2 C.F.R. Part 200, Appendix II, G.</u>
- b. Statement: Included in contracts as provided in section "7a" above.

- (1) The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq. and the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.
- (2) The contractor agrees to report each violation to the Federal awarding agency (e.g. Federal Emergency Management Agency-FEMA) and the Regional Office of the Environmental Protection Agency. Contractor understands and agrees that each violation reported to the County of Cameron will, in turn, be reported as required to assure notification to the Federal awarding agency and the appropriate Environmental Protection Agency Regional Office.
- (3) The contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance provided by the applicable Federal awarding agency (e.g. FEMA).

#### 8. Debarment and Suspension.

- a. <u>Applicability</u>: This requirement applies to all Federal grant and cooperative agreement programs.
- b. <u>Standard</u>. Non-Federal entities and contractors are subject to the debarment and suspension regulations implementing Executive Order 12549, *Debarment and Suspension* (1986) and Executive Order 12689, *Debarment and Suspension* (1989) at 2 C.F.R. Part 180 and the Department of Homeland Security's regulations at 2 C.F.R. Part 3000 (Non-procurement Debarment and Suspension).

These regulations restrict awards, subawards, and contracts with certain parties that are debarred, suspended, or otherwise excluded from or ineligible for participation in Federal assistance programs and activities. See 2 C.F.R. Part 200, Appendix II, H; and Chapter IV, 6.d and Appendix C, 2. A contract award must not be made to parties listed in the SAM Exclusions. SAM Exclusions is the list maintained by the General.

Services Administration that contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549. SAM exclusions can be accessed at <a href="https://www.sam.gov">www.sam.gov</a> See 2 C.F.R. § 180.530; Chapter IV, 6.d and Appendix C, 2.

In general, an "excluded" party cannot receive a Federal grant award or a contract within the meaning of a "covered transaction," to include subawards and subcontracts. This includes parties that receive Federal funding indirectly, such as contractors to recipients and subrecipients. The key to the exclusion is whether there is a "covered transaction," which is any non-procurement transaction (unless excepted) at either a "primary" or "secondary" tier. Although "covered transactions" do not include contracts awarded by the Federal Government for purposes of the non-procurement common rule and DHS's implementing regulations, it does include some contracts awarded by recipients and subrecipient.

Specifically, a covered transaction includes the following contracts for goods or services:

- (1) The contract is awarded by a recipient or subrecipient in the amount of at least \$25,000.
- (2) The contract requires the approval of FEMA or applicable Federal entity, regardless of amount.
- (3) The contract is for Federally-required audit services.
- (4) A subcontract is also a covered transaction if it is awarded by the contractor of a recipient or subrecipient and requires either the approval of FEMA or applicable Federal entity or is in excess of \$25,000.

c. <u>Statement</u>. <u>The following provides a debarment and suspension clause. It incorporates a method of verifying that contractors are not excluded or disqualified:</u>

For maximum protection, provide a print or electronic document for every prime and subcontractor, from <a href="www.sam.gov">www.sam.gov</a> in order to ensure that they are not debarred, suspended, or otherwise excluded from or ineligible for participation in Federal assistance programs and activities.

This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such the contractor is required to verify that none of the contractor, its principals (defined at 2 C.F.R. §180.995), or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. 180.940) or disqualified (defined at 2 C.F.R. § 180.935).

The contractor must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

This certification is a material representation of fact relied upon by (insert name of subrecipient). If it is later determined that the contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to (name of state City serving as recipient and name of subrecipient), the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

The bidder or proposer agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions."

#### 9. Byrd Anti-Lobbying Amendment.

- a. <u>Applicability</u>: This requirement applies to all Federal grant and cooperative agreement programs.
- b. <u>Standard</u>. Contractors that apply or bid for an award of \$100,000 or more must file the required certification. See 2 C.F.R. Part 200, Appendix II, I; 44 C.F.R. Part 18; Chapter IV, 6.c; Appendix C, 4. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any City, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. § 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award. See Chapter IV, 6.c and Appendix C, 4.
- c. Statement. The following statement in bold provides a Byrd Anti-Lobbying contract clause:

#### (IF APPLICABLE, PLEASE FILL IN BLANKS AND SIGN)

"Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352 (as amended)

Contractors who apply or bid for an award of \$100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient."

#### APPENDIX A, 44 C.F.R. PART 18 - CERTIFICATION

REGARDING LOBBYING Certification for Contracts, Grants,

Loans, and Cooperative Agreements

(To be submitted with each bid or offer exceeding \$100,000)		
The undersigned Contractor,		
certifies, to the best of his or her knowledge, that:		

- 1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- 2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form- LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- 3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. § 1352 (as amended by the Lobbying

Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The Contractor,	, certifie
or affirms the truthfulness and accuracy of	
and disclosure, if any. In addition, the Conti the provisions of 31 U.S.C. § 3801 <i>et seq</i>	ē
disclosure, if any.	,, apply to this tertification and
Signature of Contractor's Authorized Officia	il
Name and Title of Contractor's Authorized (	_ Official
D. (	
Date	

#### 10. Procurement of Recovered Materials.

- a. Applicability: This requirement applies to all Federal grant and cooperative agreement programs.
- b. <u>Standard</u>. A non-Federal entity that is a **state agency or agency of a political subdivision** of a state and its contractors must comply with Section 6002 of the Solid Waste Disposal Act, Pub. L. No. 89-272 (1965) (codified as amended by the Resource Conservation and Recovery Act at 42 U.S.C. § 6962). See 2 C.F.R. Part 200, Appendix II, ¶ J; 2 C.F.R. § 200.323; *PDAT Supplement*, Chapter V, 7.

The requirements of Section 6002 include procuring only items designated in guidelines of the EPA at 40 C.F.R. Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired by the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

- c. <u>Statement</u>. The following provides the clause that a state agency or agency of a political subdivision of a state and its contractors can include in contracts meeting the above contract thresholds:
  - (1) In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA- designated items unless the product cannot be acquired—
    - (i) Competitively within a timeframe providing for compliance with the contract performance schedule;
    - (ii) Meeting contract performance requirements; or
    - (iii) At a reasonable price.
  - (2) Information about this requirement, along with the list of EPA-designate items, is available at EPA's Comprehensive Procurement Guidelines web site, <a href="https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program">https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program</a>.
  - (3) The Contractor also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act."

## 11. <u>Prohibition on Contracting for Covered Telecommunications Equipment or Services – 2</u> <u>CFR § 200.216 (FEMA Interim Policy #405-143-1 effective August 13, 2020).</u>

- a. <u>Applicability</u>: This requirement applies to all Federal grant and cooperative agreement programs and/or as provided below, and is effective August 13, 2020.
- b. Standard. A non-Federal entity is prohibited against using federal funds to purchase telecommunications and video surveillance equipment and services (such as but not limited to mobile phones, land lines, internet, video surveillance, and cloud servers) from certain companies/entities in covered foreign countries for national security reasons. This regulation is being incorporated into federal grants and contracts received by the County through 2 CFR 200.216 and/or Federal Acquisition Regulations (FAR) clause 52.204-25; as well as guidance provided through Federal Emergency Management Agency (FEMA) Policy #405-143-1. See 2 C.F.R. Part 200, Appendix II, ¶K

Currently, applicable federal provisions provide that Covered Foreign country means the People's Republic of China and covered telecommunications equipment or services means

i. Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation, (or any subsidiary or affiliate of such entities);

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- ii. For the purpose of public safety, security of Government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities);
- iii. Telecommunications or video surveillance services provided by such entities or using such equipment; or
- iv. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

The definition of "Affiliate" can be found in FAR 2.101. Listing of subsidiaries and affiliates can be found in Supplement Number 4 to 15 CFR Part 744.

c. <u>Statement</u>. Federal awards recipients and subrecipients, as well as their contractors and subcontractors, include the following required contract clause in applicable new, extended, or renewed contracts and subcontracts as per the provisions discussed above.

## PROHIBITION ON CONTRACTING FOR COVERED TELECOMMUNICATIONS EQUIPMENT OR SERVICES

(a) Definitions. As used in this clause, the terms backhaul; covered foreign country; covered telecommunications equipment or services; interconnection arrangements; roaming; substantial or essential component; and telecommunications equipment or services have the meaning as defined in FEMA Policy, #405-143-1 Prohibitions on Expending FEMA Award Funds for Covered Telecommunications Equipment or Services As used in this clause

#### (b) Prohibitions.

- (1) Section 889(b) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. No. 115-232, and 2 C.F.R. § 200.216 prohibit the head of an executive agency on or after Aug.13, 2020, from obligating or expending grant, cooperative agreement, loan, or loan guarantee funds on certain telecommunications products or from certain entities for national security reasons.
- (2) Unless an exception in paragraph (c) of this clause applies, the contractor and its subcontractors may not use grant, cooperative agreement, loan, or loan guarantee funds from the Federal Emergency Management Agency to:
  - Procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system;
  - (ii) Enter into, extend, or renew a contract to procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system;
  - (iii) Enter into, extend, or renew contracts with entities that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system; or
  - (iv) Provide, as part of its performance of this contract, subcontract, or other contractual instrument, any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

#### (c) Exceptions.

- (1) This clause does not prohibit contractors from providing
  - a. A service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements; or
  - b. Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles.
- (2) By necessary implication and regulation, the prohibitions also do not apply to:
  - a. Covered telecommunications equipment or services that:
    - i. Are not used as a substantial or essential component of any system; and

- ii. Are not used as critical technology of any system.
- b. Other telecommunications equipment or services that are not considered covered telecommunications equipment or services.

#### (d) Reporting requirement.

- (1) In the event the contractor identifies covered telecommunications equipment or services used as a substantial or essential component of any system, or as critical technology as part of any system, during contract performance, or the contractor is notified of such by a subcontractor at any tier or by any other source, the contractor shall report the information in paragraph (d)(2) of this clause to the recipient or subrecipient, unless elsewhere in this contract are established procedures for reporting the information.
- (2) The Contractor shall report the following information pursuant to paragraph (d)(1) of this clause:
  - (i) Within one business day from the date of such identification or notification: The contract number; the order number(s), if applicable; supplier name; supplier unique entity identifier (if known); supplier Commercial and Government Entity (CAGE) code (if known); brand; model number (original equipment manufacturer number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or recommended.
  - (ii) Within 10 business days of submitting the information in paragraph (d)(2)(i) of this clause: Any further available information about mitigation actions undertaken or recommended. In addition, the contractor shall describe the efforts it undertook to prevent use or submission of covered telecommunications equipment or services, and any additional efforts that will be incorporated to prevent future use or submission of covered telecommunications equipment or services.
- (e) Subcontracts. The Contractor shall insert the substance of this clause, including this paragraph (e), in all subcontracts and other contractual instruments.

#### 12. Domestic Preferences for Procurements

- a. <u>Applicability</u>: This requirement of this section must be included in all subawards including all contracts and purchase orders for work or products under Federal award applies to all contracts and purchase orders for work or products using federal funds.
- b. <u>Standard</u>. As appropriate, and to the extent consistent with law, Non-Federal Entities should, to the greatest extent practicable under a federal award, provide a preference for the purchase, acquisition, or use of goods, products or materials produced in the United States. This includes, but is not limited to, iron, aluminum, steel, cement, and other manufactured products. See 2 C.F.R. Part 200.322 and 2 C.F.R. Part 200, Appendix II, L
- c. <u>Statement</u>. <u>The following provides the required Domestic Preferences for Procurements contracts clause that is incorporated herein by reference.</u>

#### "Domestic Preference for Procurements

As appropriate, and to the extent consistent with law, the contractor should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States. This includes, but is not limited to iron, aluminum, steel, cement, and other manufactured products.

For purposes of this clause:

• Produced in the United States means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. • Manufactured products mean items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber."

# ADDITIONAL REQUIRED CONTRACT CLAUSES FOR NON-FEDERAL ENTITY CONTRACTS UNDER FEDERAL AWARDS WITH THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

Additional FEMA or applicable Federal Requirements. In addition to the requirements above, non-Federal entity contracts under Federal award subject to financial assistance from FEMA are required to contain the following additional contract clauses. The Uniform Guidance authorizes FEMA to require additional provisions for non-Federal entity contracts. FEMA, pursuant to this authority, requires or recommends the following:

These clauses are incorporated by reference as part of this procurement packet and any resulting agreement.

#### 1. Changes.

- a. <u>Standard</u>. To be eligible for FEMA assistance under the non-Federal entity's Federal grant or cooperative agreement, the cost of the change, modification, change order, or constructive change must be allowable, allocable, within the scope of its grant or cooperative agreement, and reasonable for the completion of project scope. FEMA or applicable Federal entity recommends, therefore, that a non-Federal entity include a changes clause in its contract that describes how, if at all, changes can be made by either party to alter the method, price, or schedule of the work without breaching the contract. The language of the clause may differ depending on the nature of the contract and the end-item procured.
- b. Statement. The following provides a contract clause regarding access to records:

"The contractor shall secure written authorization before proceeding with any additional work, whether requested by the County or required to complete the contract. The cost for any changes to the contract price, whether requested by the

County or the Contractor will be approved only after submitting the contractor's true costs for the work and related equipment costs and site expenses."

#### 2. Access to Records.

- a. <u>Standard</u>. All non-Federal entities must place into their contracts a provision that all contractors and their successors, transferees, assignees, and subcontractors acknowledge and agree to comply with applicable provisions governing Department and FEMA or applicable Federal entity access to records, accounts, documents, information, facilities, and staff. See DHS Standard Terms and Conditions, v 3.0, XXVI (2013).
- b. Statement. The following provides a contract clause regarding access to records:

"Access to Records. The following access to records requirements applies to this contract:

- (1) The contractor agrees to provide the City of Concord, the FEMA or applicable Federal Administrator, the Comptroller General of the United States, or any of their authorized representatives access to any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, and transcriptions.
- (2) The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.
- (3) The contractor agrees to provide the FEMA or applicable Federal Administrator or his authorized representatives access to construction or other work sites pertaining to the work being completed under the contract."

#### 3. DHS Seal, Logo, and Flags.

- a. <u>Standard</u>. All non-Federal entities must place in their contracts a provision that a contractor shall not use the DHS seal(s), logos, crests, or reproductions of flags or likenesses of DHS City officials without specific FEMA or applicable Federal entity preapproval. See DHS Standard Terms and Conditions, v3.0, XXV (2013).
- b. Statement. The following provides a contract clause regarding DHS Seal, Logo, and Flags:

"The contractor shall not use the DHS seal(s), logos, crests, or reproductions of flags or likenesses of DHS City officials without specific FEMA or applicable Federal entity pre- approval."

#### 4. Compliance with Federal Law, Regulations, and Executive Orders.

- a. <u>Standard</u>. All non-Federal entities must place into their contracts an acknowledgement that FEMA or applicable Federal financial assistance will be used to fund the contract along with the requirement that the contractor will comply with all applicable Federal law, regulations, executive orders, and FEMA or applicable Federal policies, procedures, and directives.
- b. <u>Statement. The following provides a contract clause regarding Compliance with Federal Law, Regulations and Executive Orders:</u>

"This is an acknowledgement that Federal financial assistance will be used to fund the contract only. The contractor will comply will all applicable Federal law, regulations, executive orders, FEMA or applicable Federal policies, procedures, and directives."

#### 5. No Obligation by Federal Government.

- a. <u>Standard</u>. The non-Federal entity must include a provision in its contract that states that the Federal Government is not a party to the contract and is not subject to any obligations or liabilities to the non-Federal entity, contractor, or any other party pertaining to any matter resulting from the contract.
- b. <u>Statement</u>. The following provides a contract clause regarding no obligation by the Federal Government:

"The Federal Government is not a party to this contract and is not subject to any obligations or liabilities to the non-Federal entity, contractor, or any other party pertaining to any matter resulting from the contract."

#### 6. Program Fraud and False or Fraudulent Statements or Related Acts.

- a. <u>Standard</u>. The non-Federal entity must include a provision in its contract that the contractor acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to its actions pertaining to the contract.
- b. <u>Statement</u>. <u>The following provides a contract clause regarding Fraud and False or Fraudulent Related Acts:</u>

"The contractor acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to the contractor's actions pertaining to this contract."

# 7. FEMA Contract requirement regarding Prohibition on Contracting for Covered Telecommunications Equipment or Services – 2 CFR § 200.216 (FEMA Interim Policy #405-143-1 effective August 13, 2020).

FEMA recipients and subrecipients and their contractors and subcontractors are required per 2 C.F.R. Part 200, Appendix II K to include a contract provision in all FEMA-funded contracts and subcontracts, including any purchase orders. To satisfy this requirement, the contract provision found in Number 11 above is incorporated by reference by the County of Cameron in all new, extended, or renewed contracts and subcontracts. Applicable County contractors and subcontractors shall also comply with the applicable law and requirements. (*See* Number 11 above).

#### 8. FEMA Contract requirement regarding Domestic Preferences for Procurements

For purchases in support of FEMA declarations and awards issued on or after November 12, 2020, all FEMA recipients and subrecipients are required per 2 C.F.R. Part 200, Appendix II ¶ L to include in all contracts and purchase orders for work or products the contract provision included in number 12 above encouraging domestic preference for procurements.

Contractor agrees to comply with all federal, state and local laws, rules, regulations and ordinances, as applicable. It is further acknowledged that the Contractor read and understands all provisions, laws, acts, regulations, etc. as specifically noted above and certifies compliance with the same.

Vendor's Name/Company Name:	
Printed Name and Title of Authorized Representative:	
Signature of Authorized Representative:	
Date:	

# Appendix A FHWA 1273

#### I. General

II. Nondiscrimination III. No segregated Facilities FHWA-1273 -- Revised May 1, 2012

### REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final

- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

#### **ATTACHMENTS**

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

#### I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

#### II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60- 1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

- 1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:
  - a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.
  - b. The contractor will accept as its operating policy the following statement:
  - "It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the job training."
- 2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.
- 3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
  - a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
  - b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
- c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.
- d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
- e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
- **4. Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.
  - a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.
  - b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.
  - c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.
- **5. Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

- a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
- b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
- c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
- d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

#### 6. Training and Promotion:

- he contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.
- b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).
- c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
- d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

#### 7. Unions:

If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

- a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.
- b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
- c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.
- d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.
- 8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.
- 9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.
  - a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.
  - b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

#### 10. Assurance Required by 49 CFR 26.13(b):

- a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.
- b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract.

The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

- 11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.
  - a. The records kept by the contractor shall document the following:
    - (1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;
    - (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and
    - (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;
  - b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on <a href="Form FHWA-1391">Form FHWA-1391</a>. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

#### **III. NONSEGREGATED FACILITIES**

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

#### IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA 1273 format and FHWA program requirements.

#### 1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the

employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH–1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

- b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
  - (i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
  - (ii) The classification is utilized in the area by the construction industry; and
  - (iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
  - (2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
  - (3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or

#### Super Circular – Procurement Standards 2 CFR Parts 200.317 – 200.327

Procurement Standards https://www.ecfr.gov/current/title-2/subtitle-A/chapter-II/part-200#subject-group-ECFR45ddd4419ad436d

#### § 200.317 Procurements by states.

When procuring property and services under a Federal award, a State must follow the same policies and procedures it uses for procurements from its non-Federal funds. The State will comply with §§ 200.321, 200.322, and 200.323 and ensure that every purchase order or other contract includes any clauses required by § 200.327. All other non-Federal entities, including subrecipients of a State, must follow the procurement standards in §§ 200.318 through 200.327.

#### § 200.318 General procurement standards.

- (a) The non-Federal entity must have and use documented procurement procedures, consistent with State, local, and tribal laws and regulations and the standards of this section, for the acquisition of property or services required under a Federal award or subaward. The non-Federal entity's documented procurement procedures must conform to the procurement standards identified in §§ 200.317 through 200.327.
- (b) Non-Federal entities must maintain oversight to ensure that contractors perform in accordance with the terms, conditions, and specifications of their contracts or purchase orders.

(c)

- (1) The non-Federal entity must maintain written standards of conduct covering conflicts of interest and governing the actions of its employees engaged in the selection, award and administration of contracts. No employee, officer, or agent may participate in the selection, award, or administration of a contract supported by a Federal award if he or she has a real or apparent conflict of interest. Such a conflict of interest would arise when the employee, officer, or agent, any member of his or her immediate family, his or her partner, or an organization which employs or is about to employ any of the parties indicated herein, has a financial or other interest in or a tangible personal benefit from a firm considered for a contract. The officers, employees, and agents of the non-Federal entity may neither solicit nor accept gratuities, favors, or anything of monetary value from contractors or parties to subcontracts. However, non-Federal entities may set standards for situations in which the financial interest is not substantial or the gift is an unsolicited item of nominal value. The standards of conduct must provide for disciplinary actions to be applied for violations of such standards by officers, employees, or agents of the non-Federal entity.
- (2) If the non-Federal entity has a parent, affiliate, or subsidiary organization that is not a State, local government, or Indian tribe, the non-Federal entity must also maintain written standards of conduct covering organizational conflicts of interest. Organizational conflicts of interest means that because of relationships with a parent company, affiliate, or subsidiary organization, the non-Federal entity is unable or appears to be unable to be impartial in conducting a procurement action involving a related organization.
- (d) The non-Federal entity's procedures must avoid acquisition of unnecessary or duplicative items. Consideration should be given to consolidating or breaking out procurements to obtain a more economical purchase. Where appropriate, an analysis will be made of lease versus purchase alternatives, and any other appropriate analysis to determine the most economical approach.
- (e) To foster greater economy and efficiency, and in accordance with efforts to promote cost-effective use of shared services across the Federal Government, the non-Federal entity is encouraged to enter into state and local intergovernmental agreements or inter-entity agreements where appropriate for procurement or use of common or shared goods and services. Competition requirements will be met with documented procurement actions using strategic sourcing, shared services, and other similar procurement arrangements.
- (f) The non-Federal entity is encouraged to use Federal excess and surplus property in lieu of purchasing new equipment and property whenever such use is feasible and reduces project costs.

- (g) The non-Federal entity is encouraged to use value engineering clauses in contracts for construction projects of sufficient size to offer reasonable opportunities for cost reductions. Value engineering is a systematic and creative analysis of each contract item or task to ensure that its essential function is provided at the overall lower cost.
- (h) The non-Federal entity must award contracts only to responsible contractors possessing the ability to perform successfully under the terms and conditions of a proposed procurement. Consideration will be given to such matters as contractor integrity, compliance with public policy, record of past performance, and financial and technical resources. See also § 200.214.
- (i) The non-Federal entity must maintain records sufficient to detail the history of procurement. These records will include, but are not necessarily limited to, the following: Rationale for the method of procurement, selection of contract type, contractor selection or rejection, and the basis for the contract price.

(j)

- (1) The non-Federal entity may use a time-and-materials type contract only after a determination that no other contract is suitable and if the contract includes a ceiling price that the contractor exceeds at its own risk. Time-and-materials type contract means a contract whose cost to a non-Federal entity is the sum of:
  - (i) The actual cost of materials; and
  - (ii) Direct labor hours charged at fixed hourly rates that reflect wages, general and administrative expenses, and profit.
- (2) Since this formula generates an open-ended contract price, a time-and-materials contract provides no positive profit incentive to the contractor for cost control or labor efficiency. Therefore, each contract must set a ceiling price that the contractor exceeds at its own risk. Further, the non-Federal entity awarding such a contract must assert a high degree of oversight in order to obtain reasonable assurance that the contractor is using efficient methods and effective cost controls.
- (k) The non-Federal entity alone must be responsible, in accordance with good administrative practice and sound business judgment, for the settlement of all contractual and administrative issues arising out of procurements. These issues include, but are not limited to, source evaluation, protests, disputes, and claims. These standards do not relieve the non-Federal entity of any contractual responsibilities under its contracts. The Federal awarding agency will not substitute its judgment for that of the non-Federal entity unless the matter is primarily a Federal concern. Violations of law will be referred to the local, state, or Federal authority having proper jurisdiction.

[85 FR 49543, Aug. 13, 2020, as amended at 86 FR 10440, Feb. 22, 2021]

#### § 200.319 Competition.

- (a) All procurement transactions for the acquisition of property or services required under a Federal award must be conducted in a manner providing full and open competition consistent with the standards of this section and § 200.320.
- (b) In order to ensure objective contractor performance and eliminate unfair competitive advantage, contractors that develop or draft specifications, requirements, statements of work, or invitations for bids or requests for proposals must be excluded from competing for such procurements. Some of the situations considered to be restrictive of competition include but are not limited to:
  - (1) Placing unreasonable requirements on firms in order for them to qualify to do business;
  - (2) Requiring unnecessary experience and excessive bonding;
  - (3) Noncompetitive pricing practices between firms or between affiliated companies;
  - (4) Noncompetitive contracts to consultants that are on retainer contracts;
  - (5) Organizational conflicts of interest;
  - (6) Specifying only a "brand name" product instead of allowing "an equal" product to be offered and describing the performance or other relevant requirements of the procurement; and
  - (7) Any arbitrary action in the procurement process.

- (c) The non-Federal entity must conduct procurements in a manner that prohibits the use of statutorily or administratively imposed state, local, or tribal geographical preferences in the evaluation of bids or proposals, except in those cases where applicable Federal statutes expressly mandate or encourage geographic preference. Nothing in this section preempts state licensing laws. When contracting for architectural and engineering (A/E) services, geographic location may be a selection criterion provided its application leaves an appropriate number of qualified firms, given the nature and size of the project, to compete for the contract.
- (d) The non-Federal entity must have written procedures for procurement transactions. These procedures must ensure that all solicitations:
  - (1) Incorporate a clear and accurate description of the technical requirements for the material, product, or service to be procured. Such description must not, in competitive procurements, contain features which unduly restrict competition. The description may include a statement of the qualitative nature of the material, product or service to be procured and, when necessary, must set forth those minimum essential characteristics and standards to which it must conform if it is to satisfy its intended use. Detailed product specifications should be avoided if at all possible. When it is impractical or uneconomical to make a clear and accurate description of the technical requirements, a "brand name or equivalent" description may be used as a means to define the performance or other salient requirements of procurement. The specific features of the named brand which must be met by offers must be clearly stated; and
  - (2) Identify all requirements which the offerors must fulfill and all other factors to be used in evaluating bids or proposals.
- (e) The non-Federal entity must ensure that all prequalified lists of persons, firms, or products which are used in acquiring goods and services are current and include enough qualified sources to ensure maximum open and free competition. Also, the non-Federal entity must not preclude potential bidders from qualifying during the solicitation period.
- (f) Noncompetitive procurements can only be awarded in accordance with § 200.320(c).

#### § 200.320 Methods of procurement to be followed.

The non-Federal entity must have and use documented procurement procedures, consistent with the standards of this section and §§ 200.317, 200.318, and 200.319 for any of the following methods of procurement used for the acquisition of property or services required under a Federal award or sub-award.

(a) *Informal procurement methods*. When the value of the procurement for property or services under a Federal award does not exceed the *simplified acquisition threshold (SAT)*, as defined in § 200.1, or a lower threshold established by a non-Federal entity, formal procurement methods are not required. The non-Federal entity may use informal procurement methods to expedite the completion of its transactions and minimize the associated administrative burden and cost. The informal methods used for procurement of property or services at or below the SAT include:

#### (1) Micro-purchases -

- (i) *Distribution*. The acquisition of supplies or services, the aggregate dollar amount of which does not exceed the micropurchase threshold (See the definition of *micro-purchase* in § 200.1). To the maximum extent practicable, the non-Federal entity should distribute micro-purchases equitably among qualified suppliers.
- (ii) *Micro-purchase awards*. Micro-purchases may be awarded without soliciting competitive price or rate quotations if the non-Federal entity considers the price to be reasonable based on research, experience, purchase history or other information and documents it files accordingly. Purchase cards can be used for micro-purchases if procedures are documented and approved by the non-Federal entity.
- (iii) *Micro-purchase thresholds*. The non-Federal entity is responsible for determining and documenting an appropriate micro-purchase threshold based on internal controls, an evaluation of risk, and its documented procurement procedures. The micro-purchase threshold used by the non-Federal entity must be authorized or not prohibited under State, local, or tribal laws or regulations. Non-Federal entities may establish a threshold higher than the Federal threshold established in the Federal Acquisition Regulations (FAR) in accordance with <u>paragraphs (a)(1)(iv)</u> and <u>(v)</u> of this section.
- (iv) Non-Federal entity increase to the micro-purchase threshold up to \$50,000. Non-Federal entities may establish a threshold higher than the micro-purchase threshold identified in the FAR in accordance with the requirements of this section. The non-Federal entity may self-certify a threshold up to \$50,000 on an annual basis and must maintain documentation to be made available to the Federal awarding agency and auditors in accordance with § 200.334. The self-

certification must include a justification, clear identification of the threshold, and supporting documentation of any of the following:

- (A) A qualification as a low-risk auditee, in accordance with the criteria in § 200.520 for the most recent audit;
- (B) An annual internal institutional risk assessment to identify, mitigate, and manage financial risks; or,
- (C) For public institutions, a higher threshold consistent with State law.
- (v) *Non-Federal entity increase to the micro-purchase threshold over \$50,000*. Micro-purchase thresholds higher than \$50,000 must be approved by the cognizant agency for indirect costs. The non-federal entity must submit a request with the requirements included in <u>paragraph (a)(1)(iv)</u> of this section. The increased threshold is valid until there is a change in status in which the justification was approved.

#### (2) Small purchases -

- (i) *Small purchase procedures.* The acquisition of property or services, the aggregate dollar amount of which is higher than the micro-purchase threshold but does not exceed the simplified acquisition threshold. If small purchase procedures are used, price or rate quotations must be obtained from an adequate number of qualified sources as determined appropriate by the non-Federal entity.
- (ii) *Simplified acquisition thresholds.* The non-Federal entity is responsible for determining an appropriate simplified acquisition threshold based on internal controls, an evaluation of risk and its documented procurement procedures which must not exceed the threshold established in the FAR. When applicable, a lower simplified acquisition threshold used by the non-Federal entity must be authorized or not prohibited under State, local, or tribal laws or regulations.
- (b) Formal procurement methods. When the value of the procurement for property or services under a Federal financial assistance award exceeds the SAT, or a lower threshold established by a non-Federal entity, formal procurement methods are required. Formal procurement methods require following documented procedures. Formal procurement methods also require public advertising unless a non-competitive procurement can be used in accordance with § 200.319 or paragraph (c) of this section. The following formal methods of procurement are used for procurement of property or services above the simplified acquisition threshold or a value below the simplified acquisition threshold the non-Federal entity determines to be appropriate:
  - (1) **Sealed bids.** A procurement method in which bids are publicly solicited and a firm fixed-price contract (lump sum or unit price) is awarded to the responsible bidder whose bid, conforming with all the material terms and conditions of the invitation for bids, is the lowest in price. The sealed bids method is the preferred method for procuring construction, if the conditions.
    - (i) In order for sealed bidding to be feasible, the following conditions should be present:
      - (A) A complete, adequate, and realistic specification or purchase description is available;
      - (B) Two or more responsible bidders are willing and able to compete effectively for the business; and
      - (C) The procurement lends itself to a firm fixed price contract and the selection of the successful bidder can be made principally on the basis of price.
    - (ii) If sealed bids are used, the following requirements apply:
      - (A) Bids must be solicited from an adequate number of qualified sources, providing them sufficient response time prior to the date set for opening the bids, for local, and tribal governments, the invitation for bids must be publicly advertised;
      - (B) The invitation for bids, which will include any specifications and pertinent attachments, must define the items or services in order for the bidder to properly respond;
      - (C) All bids will be opened at the time and place prescribed in the invitation for bids, and for local and tribal governments, the bids must be opened publicly;
      - (D) A firm fixed price contract award will be made in writing to the lowest responsive and responsible bidder. Where specified in bidding documents, factors such as discounts, transportation cost, and life cycle costs must be considered in determining which bid is lowest. Payment discounts will only be used to determine the low bid when prior experience indicates that such discounts are usually taken advantage of; and

- (E) Any or all bids may be rejected if there is a sound documented reason.
- (2) *Proposals.* A procurement method in which either a fixed price or cost-reimbursement type contract is awarded. Proposals are generally used when conditions are not appropriate for the use of sealed bids. They are awarded in accordance with the following requirements:
  - (i) Requests for proposals must be publicized and identify all evaluation factors and their relative importance. Proposals must be solicited from an adequate number of qualified offerors. Any response to publicized requests for proposals must be considered to the maximum extent practical;
  - (ii) The non-Federal entity must have a written method for conducting technical evaluations of the proposals received and making selections;
  - (iii) Contracts must be awarded to the responsible offeror whose proposal is most advantageous to the non-Federal entity, with price and other factors considered; and
  - (iv) The non-Federal entity may use competitive proposal procedures for qualifications-based procurement of architectural/engineering (A/E) professional services whereby offeror's qualifications are evaluated and the most qualified offeror is selected, subject to negotiation of fair and reasonable compensation. The method, where price is not used as a selection factor, can only be used in procurement of A/E professional services. It cannot be used to purchase other types of services though A/E firms that are a potential source to perform the proposed effort.
- (c) *Noncompetitive procurement.* There are specific circumstances in which noncompetitive procurement can be used. Noncompetitive procurement can only be awarded if one or more of the following circumstances apply:
  - (1) The acquisition of property or services, the aggregate dollar amount of which does not exceed the micro-purchase threshold (see <u>paragraph (a)(1)</u> of this section);
  - (2) The item is available only from a single source;
  - (3) The public exigency or emergency for the requirement will not permit a delay resulting from publicizing a competitive solicitation;
  - (4) The Federal awarding agency or pass-through entity expressly authorizes a noncompetitive procurement in response to a written request from the non-Federal entity; or
  - (5) After solicitation of a number of sources, competition is determined inadequate.

#### § 200.321 Contracting with small and minority businesses, women's business enterprises, and labor surplus area firms.

- (a) The non-Federal entity must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible.
- (b) Affirmative steps must include:
  - (1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
  - (2) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
  - (3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
  - (4) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;
  - (5) Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce; and
  - (6) Requiring the prime contractor, if subcontracts are to be let, to take the affirmative steps listed in <u>paragraphs</u> (b)(1) through (5) of this section.

#### § 200.322 Domestic preferences for procurements.

- (a) As appropriate and to the extent consistent with law, the non-Federal entity should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award.
- (b) For purposes of this section:
  - (1) "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.
  - (2) "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

#### § 200.323 Procurement of recovered materials.

A non-Federal entity that is a state agency or agency of a political subdivision of a state and its contractors must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

#### § 200.324 Contract cost and price.

- (a) The non-Federal entity must perform a cost or price analysis in connection with every procurement action in excess of the Simplified Acquisition Threshold including contract modifications. The method and degree of analysis is dependent on the facts surrounding the particular procurement situation, but as a starting point, the non-Federal entity must make independent estimates before receiving bids or proposals.
- (b) The non-Federal entity must negotiate profit as a separate element of the price for each contract in which there is no price competition and in all cases where cost analysis is performed. To establish a fair and reasonable profit, consideration must be given to the complexity of the work to be performed, the risk borne by the contractor, the contractor's investment, the amount of subcontracting, the quality of its record of past performance, and industry profit rates in the surrounding geographical area for similar work.
- (c) Costs or prices based on estimated costs for contracts under the Federal award are allowable only to the extent that costs incurred or cost estimates included in negotiated prices would be allowable for the non-Federal entity under <u>subpart E of this</u> <u>part</u>. The non-Federal entity may reference its own cost principles that comply with the Federal cost principles.
- (d) The cost plus a percentage of cost and percentage of construction cost methods of contracting must not be used.

#### § 200.325 Federal awarding agency or pass-through entity review.

- (a) The non-Federal entity must make available, upon request of the Federal awarding agency or pass-through entity, technical specifications on proposed procurements where the Federal awarding agency or pass-through entity believes such review is needed to ensure that the item or service specified is the one being proposed for acquisition. This review generally will take place prior to the time the specification is incorporated into a solicitation document. However, if the non-Federal entity desires to have the review accomplished after a solicitation has been developed, the Federal awarding agency or pass-through entity may still review the specifications, with such review usually limited to the technical aspects of the proposed purchase.
- (b) The non-Federal entity must make available upon request, for the Federal awarding agency or pass-through entity preprocurement review, procurement documents, such as requests for proposals or invitations for bids, or independent cost estimates, when:

- (1) The non-Federal entity's procurement procedures or operation fails to comply with the procurement standards in this part;
- (2) The procurement is expected to exceed the Simplified Acquisition Threshold and is to be awarded without competition or only one bid or offer is received in response to a solicitation;
- (3) The procurement, which is expected to exceed the Simplified Acquisition Threshold, specifies a "brand name" product;
- (4) The proposed contract is more than the Simplified Acquisition Threshold and is to be awarded to other than the apparent low bidder under a sealed bid procurement; or
- (5) A proposed contract modification changes the scope of a contract or increases the contract amount by more than the Simplified Acquisition Threshold.
- (c) The non-Federal entity is exempt from the pre-procurement review in <u>paragraph (b)</u> of this section if the Federal awarding agency or pass-through entity determines that its procurement systems comply with the standards of this part.
  - (1) The non-Federal entity may request that its procurement system be reviewed by the Federal awarding agency or passthrough entity to determine whether its system meets these standards in order for its system to be certified. Generally, these reviews must occur where there is continuous high-dollar funding, and third-party contracts are awarded on a regular basis;
  - (2) The non-Federal entity may self-certify its procurement system. Such self-certification must not limit the Federal awarding agency's right to survey the system. Under a self-certification procedure, the Federal awarding agency may rely on written assurances from the non-Federal entity that it is complying with these standards. The non-Federal entity must cite specific policies, procedures, regulations, or standards as being in compliance with these requirements and have its system available for review.

#### § 200.326 Bonding requirements.

For construction or facility improvement contracts or subcontracts exceeding the Simplified Acquisition Threshold, the Federal awarding agency or pass-through entity may accept the bonding policy and requirements of the non-Federal entity provided that the Federal awarding agency or pass-through entity has made a determination that the Federal interest is adequately protected. If such a determination has not been made, the minimum requirements must be as follows:

- (a) A bid guarantee from each bidder equivalent to five percent of the bid price. The "bid guarantee" must consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of the bid, execute such contractual documents as may be required within the time specified.
- (b) A performance bond on the part of the contractor for 100 percent of the contract price. A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's requirements under such contract.
- (c) A payment bond on the part of the contractor for 100 percent of the contract price. A "payment bond" is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.

#### § 200.327 Contract provisions.

The non-Federal entity's contracts must contain the applicable provisions described in appendix II to this part.

## PART 200 - UNIFORM ADMINISTRATIVE REQUIREMENTS, COST PRINCIPLES, AND AUDIT REQUIREMENTS FOR FEDERAL AWARDS https://www.ecfr.gov/current/title-2/subtitle-A/chapter-II/part-200

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§ 200.331 Subrecipient and contractor determinat	ions.
§ 200.332 Requirements for pass-through entities	<u>.</u>
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§ 200.334 Retention requirements for records. § 200.335 Requests for transfer of records. § 200.336 Methods for collection, transmission, and storage of information. § 200.337 Access to records. § 200.338 Restrictions on public access to records. Remedies for Noncompliance 200.339 - 200.343§ 200.339 Remedies for noncompliance. § 200.340 Termination. § 200.341 Notification of termination requirement. § 200.342 Opportunities to object, hearings, and appeals. § 200.343 Effects of suspension and termination. Closeout 200.344 § 200.344 Closeout. Post-Closeout Adjustments and Continuing 200.345 Responsibilities § 200.345 Post-closeout adjustments and continuing responsibilities. Collection of Amounts Due 200.346

§ 200.346 Collection of amounts due.

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#### XII PROCUREMENTS SUBJECT TO FEDERAL FUNDING

- 12.01 **Additional Standards.** In addition to the procedures specified elsewhere in this Purchasing Manual, which are incorporated herein by reference, the County shall abide by the following purchasing procedures applicable to procurements that are subject to federal funding as referenced in 2 CFR 200: Uniform Administrative Requirements, Costs Principles and Audit Requirements for Federal Awards (Uniform Guidance), which is hereby incorporated by reference. These procedures are in addition to all other relevant procedures in this Purchasing Manual, except that in the event of a conflict these procedures will control if a purchase is made using federal funds.
- 12.02 Background. The United States Office of Management and Budget (OMB) Issued the Uniform Guidance, which reforms rules applicable to entities receiving federal grant funding by streamlining and superseding eight OMB circulars (A-2I, A-87, A-122, A-110, A-102, A-133, A-50 and A-89). The new procurement standards are found in Subpart D: Post Federal Award Requirements: 2 CFR §200.317 through §200.327
- **12.03** Compliance Requirements -Procurement. The following is an overview of the procurement standards and procedures applicable when procuring property and services under a Federal award in accordance with 1CFR §200.317 through §200.327, which are hereby incorporated by reference.
- 12.03.1 The County, as a non-Federal entity other than a State, will follow §§ 200.318 General procurement standards through 200.327 Contract provisions. [See §200.317].
- 12.03.2 Procurement Procedures: The County will use its own documented procurement procedures which reflect applicable State and local laws and regulations, provided that the procurement conform to applicable Federal statutes and the procurement requirements identified in 2 CFR part 200. [See §200.3/8(a)] When preparing a federally funded contract, the County Purchasing Dept, Planning Dept., and County Attorney will review the required federal clauses in Appendix II and make sure that all clauses required for the contract is included.
- 12.03.3 Conflicts of Interest/Standards of Conduct: The County will maintain written standards of conduct covering conflicts of interest and governing the actions of its employees engaged in the selection, awarded and administration of contracts. In addition to the following the County incorporates standards referenced above and Standards of Conduct in applicable County Personnel Manuals. [See §200.318(c)].
  - a No employee, officer, or agent may participate in the selection, award, or administration of contracts supported by Federal award if he or she has a real or apparent conflict of interest. Such a conflict of interest would arise when the employee, officer, or agent, any member of his or her immediate family, his or her partner, or an organization which employs or is about to employ any of the parties indicated herein, has a financial or other interest in or a tangible personal benefit from a firm considered for a contract. Addressed in County's Bids, RFP's, RFQ's (Attachment B-No\*Collusion Affidavit), (Attachment G-Conflict of Interest Questionnaire) Purchasing Manual (Ethics Policy) [See §200.318(c)(J)].
  - b. Officers, employees, and agents of the County may neither solicit nor accept gratuities, favors, or anything of monetary value from contractors or parties to subcontracts. However, the County may set standards for situations in which the financial interest is not substantial or the gift is an unsolicited item of nominal value. If this is done these standards will be promulgated like other County policies and procedures. Addressed in County's Bids, RFP's, RFQ's (Attachment B-Non-Collusion Affidavit), (Attachment G-Conflict of Interest Questionnaire, Attachment H-Disclosure of Interest Questionnaire) Purchasing Manual (Ethics Policy) {See§200.318(c)(1)}.
  - c. If the County has an affiliate or subsidiary organization that is not a government entity, the County will also maintain written standards of conduct concerning organizational conflicts of interest arising from its relationship with the affiliate or subsidiary.
  - d The County will disclose any potential conflicts of interest in writing to the Federal awarding agency or pass-through entity in accordance with applicable Federal awarding agency policy. [See 2 CFR § 200. I 12). Additionally, the County will disclose. in a timely manner. in writing to the Federal awarding agency or pass-through entity all violations of Federal criminal law involving fraud, bribery, or gratuity violations potentially affecting the Federal award. Further, if applicable, the County will make post-award reports as provided by Appendix XII to Part 200.

- e. Violations of this policy may result in disciplinary action consistent with County disciplinary policy, including but not limited to dismissal. Further, violations may be referred to the appropriate law enforcement agency for investigation and possible prosecution.
- 12.03.4 Oversight: Once the Contract is awarded, oversight must be maintained to ensure that contractors perform in accordance with the terms, conditions, and specifications of their contracts or purchase orders. County Contract monitor will be utilized to track and pelform quantity and quality control responsibilities in monitoring role towards compliance verification. [See §200.3 J8(b)].
- 12.03.5 All proposed procurement actions shall be reviewed to avoid the purchase of unnecessary or duplicative items as stated in Independent Procedure IP "Prevention of Unnecessary and Duplicative Purchases".

Where applicable, consideration will be given to consolidating or breaking out procurements to obtain a more economical purchase. Review of all potentially related consolidation in sourcing of items towards economy of scale.

Where appropriate, an analysis will be made of lease versus purchase alternatives, and any other appropriate analysis to determine the most economical approach County will consider leasing of items whenever determined to be more cost effective versus purchase of items which are not necessarily required beyond the immediate or project related intended use. [See §200.318MJ

12.03.06 The County may enter into state and local intergovernmental agreement. or inter-entity agreements where appropriate for procurement or use of common or shared goods and services. County will explore interlocal agreement option with other entities towards sharing of goods and services in an effort preduce overall cost. The County also approved Resolution 20/9R2007 on February 5,2019. [See §200.318(e)]

12.03.07 Federal excess and surplus property may be used in lieu of purchasing new equipment and property whenever such use is feasible and reduces project costs. .State and Federal Surplus sites will be reviewed for potential adaptations to meet project needs. [See §200.318(/)]

12.03.08 Deliberately omitted.

12.03.09 Contracts should be awarded only to responsible contractors possessing the ability to perform successfully under the terms and conditions of a proposed procurement Consideration will be given to such matters as contractor integrity, compliance with public policy, record of past performance, and financial and technical resources, as well as whether the contractor is suspended or debarred receiving federal funds. (See Bids, RFP 's, RFQ sAttachment F- Certificate Regarding Debarment, Suspension Ineligibility, Attachment F-2-Swom Statement of Debarment, Attachment F-3-Architects, Engineers, Construction Pe1formance, Attachment I-House Bill 89 Verification, Texas Ethics Commission Form 1295) [See §200.318(h)].

- 12.03.10 The County will maintain records sufficient lo detail the history of procurement. The County's Records Retention Policy as adopted by Commissioners Court and presented by the County Clerks Dept. (Official Records Manager for the County) Purchasing Bids, RFP's, RFQ's, and contracts is five (5) years (in accordance with §200.318(i).
- 12.03.11 The County may not enter a contract with time and materials based pricing unless there is a not-to-exceed clause and the Purchaser determines that other fee structures are not suitable.
- 12.03.12 The County alone shall be responsible for all contractual and administrative issues arising out of procurements in accordance with good administrative practice and sound business judgment. County Civil legal Division will coordinate these mailers as they arise. County protest procedures apply to Bid. RFP 's, RFQ 's and written quotations. Once a contract has been executed, any disputes are dealt with at the time they arise. County Civil legal Department addresses contract disputes on behalf of the County.
- 12.3.13 Discounts, transportation costs, or life cycle costs will only be considered when they are specified in the bidding documents. These will only be considered whey specified in the bidding documents. These are not considered if not specified in the Bid!RFP documents.
- **12.04 Competition.** All procurement transactions will be conducted in a manner providing fill and open competition consistent with rhe standards \( d \) 2 CFR \( \) 200.319. Note 12.06 below identifies sources towards maximizing competitive solicitations. Purchasers will review all Bid specifications and requirements towards eliminating unduly restrictive requirements.
- 12.04.01.01 In order to ensure objective contractor performance and eliminate unfair competitive advantage, contractors that develop or draft specifications, requirements, statements of work, or invitations for bids or requests for proposals will be excluded from competing for such procurements.

12.04.01.02 The County will avoid the following actions in procurement of goods and services:

- (1) Placing unreasonable requirements on firms in order for them to qualify to do business;
- (2) Requiring unnecessary experience and excessive bonding;
- (3) Noncompetitive pricing practices between firms or between affiliated companies;
- (4) Noncompetitive contracts to consultants that are on retainer contracts;

- (5) Organizational conflicts of interest;
- (6) Except where required and justified as a sole source purchase, Specifying only a "brand name" product instead of allowing "an equal" product to be offered and describing the pelformance or other relevant requirements of the procurement; and
- (7) Any arbitrary action in the procurement process . §200.319(a)

**12.04.02** <u>Geographical Limitation:</u> Unless specifically excepted as provided in 2 CFR §200.319(b). the County will not impose state or local geographical preferences in the evaluation of bids or proposals for federally funded contracts.

12.04.03.01 Contract solicitations: Purchaser shall incorporate a clear and accurate description of the technical requirements for the material product, or service to be procured Detailed specifications and materials I product description must be clearly identified.

12.04.03.02 Contract solicitations shall specify all requirements which the potential vendors must fulfill to submit bids or proposals, and identify all other factors to be used in evaluating bids or proposals. Scoring criteria shall be utilized in evaluation and analysis of Proposals.

12.04.04 All prequalified lists of persons, firms, or products which are used in acquiring goods and services shaft be kept current and include enough qualified sources to ensure minimum open and free competition, and potential bidders will not be precluded from qualifying during the solicitation period [See §200.3!9(d)]. County Purchasing Department age 1 /// and updated Bidders // list See I2.06 below.

12.05 Methods of Procurement with Federal Funds. The County will use one of the following five procurement methods as discussed in 2 CFR §200.320 when making purchases with federal filnds. Should State or local procurement requirements applicable to a purchase being made with federal funds be more restrictive than Federal requirements, the more restrictive requirements or methods will be followed. The type of procurement process 10 use will depend on the cost and type o9f services or item {s} being purchased.

<u>Micro-purchase</u> = County under \$500 - No quotations I competitive process required – Vendors for purchases under \$500 shall be rotated – requisition and Purchase Order required. (Travel regulations and Gas purchases included..

<u>Small purchase procedures</u> - informal Bids = County \$500 to \$14,999 and Commissioners Court approval \$15,000 to \$24,999 - Three written quotations required, requisition, Purchase Order.

<u>Sealed Formal Bids</u> \$25,000 and more unless exception applies

<u>Competitive proposals</u> = County proposal process for Professional Services, IT & High Tech and Commissioners Court approved instances of projects not suitable for detailed specifications.

<u>Requesr.for Qualifications</u> = Qualifications based no price proposals (Engineering & Architecture, Land Surveying, Professional services. Cameron County follows the Professional Services Procurement Act Govt. Code ch 2254 Subch A

Non-competitive proposals Sole Source - under \$15,000 Sole Source letter Department Head, Vendor, Purchasing Agent. Commissioners Court approval required \$15,000 to include Sole Source feller Department Head, Vendor, Purchasing Agent.

<u>Emergency Purchases</u> over \$15,000 requires Commissioners Court approval/ratification whenever time is crucial in preventing an escalating health and safety concern or preventing a crucial incident asper Texas State Statute 262.024

<u>Special & Discretionary Purchases</u> asper Texas State Statute 262.024. For procurement of Federally funded land surveying Cameron County will contact the federal awarding agency or pass-through entity (TCEQ), for RESTORE projects to request authorization for noncompetitive procurement under 2 CFR 200.320(c)(4).

Personal service -as per

Under the Micro-Purchase dollar threshold rotation of available vendors will be utilized

Over the Micro-Purchase dollar threshold will comply with State of Texas, Local Government Code Ch 262.024 (a) (4).

- 12.06 Contracting with Small and Minority Businesses, Women's Business Enterprises, and Labor Surplus Area Firms. The County takes all necessary affirmative steps (and will include in all related contracts langue towards Contractor Certification of Small, Minority, or Women Business ownership when possible) as described in §200.321 to assure minority businesses, Women's Business Enterprises. and labor surplus are used when possible. The County utilizes the following sites towards outreach for County Bidding opportunities for Small, Minority, Women Businesses; U.S. Small Business Administration, ESBD State of Texas Bid Posting Site, Associated General Contractors, Dodge Reports, Reed Construction Data, Texas Smart Buy Electronic State Business Daily Search (ESBD). Bk/Net, MWBE@texas.agriculture.gov,.Coop Vendors list, County Current Bidders list.(County will require Prime Contractors to follow all of the affirmative steps when Prime Contractor will be letting subcontracts. The requirements for Prime Contractors as laid out by the County will be be targeted towards creating maximum participation foe small, minority, and women's business enterprises as follows: will be on the solicitation list and will be notified when they are potential sources, will divide total requirements when economically feasible into smaller tasks or quantities, establish delivery schedules as requirements permit, contact the agencies as listed above as an outreach network towards attracting these types of businesses. This information will also be included in all contracts.) County utilization of/Section 3/H UD (see Purchasing Website) addresses Davis-Bacon, Equal Employment, Vicinity Hiring Preference, Economic Opportunities, HUB, SBA, Local Vendor, and MWBE requirements.
- **12.07 Procurement of Recovered Materials.** The County and (where applicable) its contractors will comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. {See §200.322}.

County will (as per EPA 40CFPpart 247) procure only items containing highest percentage of recovered materials practicable and allow for satisfactory competition based on the \$10,000 year threshold. County will establish affirmative procurement program for recovered materials.

- **12.08** Contract Cost and Price. The County will abide by the provisions of \$200.324 (as required wuler County Resolution #20/90R2009), including, but not limited to performing a cost or price analysis and negotiating profit as discussed therein
- 12.8.1 Negotiation Based on Cost Estimates; Negotiatio11 of Profit. In negotiating a contract price based on a cost analysis, the County will require that all estimated costs used to develop the negotiated price must be allowable costs under 2 CFR Parr 200. Subpart E. A comparison between estimated costs and current customary market pricing will be analyzed in an effort to establish allowable cost and ultimately establish negotiated pricing. The County will also require that the profit element be negotiated separately, whether it is included as a separate price element or whether it is rolled into a lump sum price (or similar fixed price). Profit margin will also be compared relative to comparable current market rates to assess potential variances. This cost analysis will be achieved through verification of previous similar purchases, comparison with other public entities, recommendations from professional consultants or project Engineer, or data research (ie: Smart Procure) similar to the specific type of procurement. In addition and in order to establish a/air and reasonable profit, the County will also consider the contractor's risk and investment, complexity of work to be performed at a level of subcontracting, quality and track record of previous performance, and industry profit rates in the approximate SMSA /geographic area/or similar work. At the outset independent estimates will be obtained by the County before receiving Bids or Proposal this also applies to all sole source purchases. All estimates must be allowable subject to analysis as per conditions noted above.
- 12.8.2 Cost Plus Percentage of Cost Prohibited. The County will not enter into a cost plus percentage of cost contract, or a cost plus percentage of construction cost contract. (as per 200.324 d) Engineer and County will examine all Change order pricing as submitted. Profit margin will not be determined based on a percentage of cost and percentage of construction cost methods of contracting must not be used Costs based on estimated costs of contracts under Federal award are allowable only to the extent that costs incurred or cost estimates included in negotiated prices would be allowable for the non-Federal entity under Subpart E Cost Principles of this part. County will reimburse Contractor's Direct and indirect Costs plus a Fixed fee for the project.
- **12.9 Contract Provisions**. Pursuant to \$200.327 the County will include in all federally-funded contracts, the applicable provisions described in Appendix 11to 2 CFR Part 200-Contract Provisions for non-Federal Entity Contracts under Federal Awards. When preparing a federally funded contract the County Purchasing Dept., Planning Dept., and County Attorney will review the required federal dames in Appendix ff and make sure that all clauses required/or the contract is included.
- **1210 Personnel Cost Calculation** Pursuant to 2 Code of Federal Regulations (CFR) Part 200, Subpart E the County adopted Resolution #2019R02008 on February 5, 2019 Policy and Procedure to Ensure Accurate Completion of Personnel Cost Calculation.
- **211 Cost Price Analysis** Pursuant to 2 Code of Federal Regulations (CFR) Part 200, the County adopted Resolution # 2019R02009 on February 5, 2019 -Policy and Procedure to Ensure Cost Price Analysis requirement.
- **1212 Debarment Check** Pursuant/ a 2 Code of Federal Regulations (CFR) Part 200.318, the County adopted Resolution # 2019R020I0 on February 5, 2019 Policy and Procedure to Ensure Debarment Check is adequately performed.

12.13 Single Proposal requirements Proposal is reviewed for compliance. Determination is made by County as to benefit of resolution or RFP towards a more competitive solicitation. Pricing is reviewed relative to current market costs for comparison. If all is determined to be cost effective and advantageous to County, recommendation is made by Evaluation Committee to Commissioners Court for award Commissioners Court must make a determination that price is fair and reasonable prior to awarding RFP. Prior to Court award of sole Bid. RFP, or RFQ County Purchasing Dept. will contact the federal awarding agency or pass-through entity (TCEQ for RESTORE projects) to request authorization for noncompetitive procurement under 2 CFR 200.320(c)(2) to proceed towards Commissioners Court approval. Informal Bids not exceeding \$14,999 will require at least 3 informal Bids for comparative I competitive purposes. If the County is unable to obtain at least 3 competitive Bids or Proposals. I funable to obtain more than one (1) Bid or Proposal the County Purchasing Dept. will review pricing relative to current market costs for comparison purposes (utilizing comparable bid results, engineer recent historic data, Smart Procure comparable data) will contact the federal awarding agency or pass-through entity (TCEQ, for RESTORE projects) to request authorization for noncompetitive procurement under 2 CFR 200.320(c)(2) prior to proceeding with Agenda towards Commissioners Court approval..

12.14 **Domestic Preferences for Procurement** County will (in awards of iron, aluminum, steel, cement and other goods / manufactured products produced in the United States) utilize and purchase from these suppliers and subawards with apreference towards purchases from these Companies. (see 200.322)

12.15 **Bid Bonds** Willalways be required for construction contracts:

County Purchasing Act: Required

Payment Bond - \$25,000 + (2253.21)

Performance Bond - \$100,000 + (2253.21)

Bid Bond-a) If the contract is for the construction of public works or is under a contract exceeding \$100,000, the bid specifications or request for proposals may require the bidder to furnish a good and sufficient bid bond in **the amount of five percent of the total contract (262.032)** 

Federal funded projects: exceeding \$150,000 (on exception sought from the federal awarding agency. For all Federal funded projects \$150,000 and over Bid Bonds will be mandatory equivalent to five percent of the bid price. A performance bond and payment bond will also be required - both at 100 percent of contract price.

12.16 Telecommunications and Surveillance Services or Equipment Proposal is reviewed for compliance with 2 CFR Appendix II (K) 200-216 prior to proceeding with Agenda towards Commissioners Court approval. Determination is made by County as to ensure that neither loan or grant funds will be utilized for the purchase or obtaining Telecommunications and Surveillance Services or Equipment from one of the following Vendors or any of their subsidiaries or affiliates:

Huawei Technologies Co. ZTE Corp. Hytera Communications Corp. Hangzhou Hikvision Digital Technology Co. Dahua Technology Co.

as well as related services (Telecomm. or Video Surveillance provided by entities or using these Companies equipment. Additional Companies determined as by the Secretary of Defense, FBI, National Intelligence are to also be added to the restricted list of firms.

In addition, the vendors listed above will be identified to verify that these firms will not be utilized for contract extension/renewal, essential components, critical technology, or components of a system.

Proposals will be reviewed for compliance with 2 CFR 200-471 prior to proceeding with Agenda towards Commissioners Court approval prior to obligating or expending funds. County will review all proposals related to Telecommunication and/or video surveillance equipment or service related costs in order to verify that costs associated with procuring, obtaining, extending, entering into, or renewing a contract for equipment, services, or systems are not utilized.

# SECTION 3: GENERAL CONDITIONS

#### **TERMS & CONDITIONS**

ADDENDA: If RFB specifications, terms or conditions are revised, the Cameron County Purchasing Department will issue an addendum addressing the nature of the changes and notify interested potential bidders. Bidders must acknowledge receipt and consideration of any such changes by signing the addendum and including it in the package containing the Bidder's submittal.

ADVERTISING: Unless otherwise required by law, bidders responding to County RFBs shall not publish and shall keep confidential their intentions and actions respecting any response to the RFB.

AWARD: Cameron County may hold RFB responses until award is made. Cameron County reserves the right to reject any or all responses to RFBs. Cameron County reserves the right to award a contract, if any, based on the bidder's response when compared to the EVALUATION CRITERIA (AS STATED IN THE RFB) and, in accordance with the laws of the State of Texas, reserves the right to waive any formality or irregularity, to make awards to more than one bidder. Commissioners Court reserves the right to determine the method and procedures for the final award of the bid at any time they may choose, regardless of the Point System used by the Evaluation Committee.

BONDS: If the contract that may be entered into with the County will likely require a performance guarantee or bond, the Purchasing Department will attach a separate page to the RFB explaining those requirements.

CANCELLATION AND TERMINATION: In any contract resulting from the RFB, the County shall have the right to cancel all or any part of the undelivered portion of the contract if (1) Bidder breaches any of the terms hereof, including, but not limited to, applicable warranties, and/or the (2) Bidder becomes insolvent or files for bankruptcy. Such right of cancellation is in addition to, and not in lieu of, any other remedies which the County may have in law or equity. Cancellation of work hereunder shall be effected by the delivery of a "Notice of Cancellation of Undelivered Work" specifying the extent to which performance of work, including all goods and services, under the contract is cancelled and the date upon which such cancellation becomes effective.

The performance of work under any resulting contract may be terminated in whole, or in part, by the County in accordance with this provision. The County shall have the right to terminate all or any part of the contract if (1) the Bidder breaches any of the terms hereof, including, but not limited to, applicable warranties, and/or (2) Bidder becomes insolvent or files for bankruptcy. Such right of termination is in addition to, and not in lieu of, any other remedies which the County may have in law or equity. Termination of work hereunder shall be affected by the delivery of a "Notice of Termination" specifying the extent to which performance of work, including all goods and services, under the contract is terminated and the date upon which such termination becomes effective.

CHANGE ORDERS: No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting contract. All change orders to the contract will be made in writing by mutual consent of the Bidder and the County.

CONTRACT RENEWALS: Contract Renewals must receive Commissioners Court approval. For contract renewal status and information, please contact Elisa Cisneros at 956-982-5405 e-mail: Elisa.Cisneros2@co.cameron.tx.us Cameron County Purchasing Dept. or Dylbia Jeffries 956-550-1340 djefferies@co.cameron.tx.us at the Cameron County Civil Legal Division. Any price escalations are limited to those stated by the original contract terms. All contracts with a one (1) year renewal option require that the Bidder must notify Cameron County of any anticipated price increases in writing at least three months (90 calendar days) prior to the annual renewal award date unless otherwise specified within the specific provisions of the contract up for renewal. This allows the County sufficient time to find an alternative vendor, if possible. If Bidder fails to notify the County within time noted it shall be assumed that there will be no price increase for the following year's award period if renewed. This procedure does not apply to any contract which allows for Open Market Price increases or Cost allowance increases.

DISCRIMINATION: In order to encourage fair employment practices, the Bidder agrees as follows: 1.) Bidder will not discriminate against any employee or applicant for employment because of race, sex, color, age, religion, handicap, or national origin; 2) in all solicitations or advertisements for employees, the Bidder will state that all qualified applicants will receive consideration without regard to race, color, sex, age, religion, handicap or national origin; 3) the Bidder will furnish such relevant information and reports as requested by the County for the purpose of determining compliance with these regulations; and 4) failure of the Bidder to comply with these laws will be deemed a breach of contract and it may be cancelled, terminated or suspended in a whole or in part as a result therof..

DISQUALIFICATION OF BIDDER: Upon submitting a response to this RFB, Bidder certifies that the Bidder has not violated the antitrust laws of this state codified in Texas Business and Commerce Code 15.01, et seq., as amended, or the federal antitrust laws, and has not communicated directly or indirectly its RFB considerations, plan or response to any competitor or any other person engaged in such line of business. Any and all responses may be rejected if the County believes that collusion exists among the Bidders. If multiples are submitted by a Bidder and, after all responses to the RFBs are opened one or more of the responses are withdrawn the result will be that all of the responses submitted by that Bidder will be withdrawn; however, nothing herein prohibits a Bidder from submitting multiples for different products or services.

EVALUATION: All responses will be evaluated in accordance with law and reviewed to assure they are in the best interest of Cameron County. Evaluations shall be based on criteria bearing on price, and performance of the items or services in the user environment. Any specific criteria section or sections identified elsewhere in the RFB response may be evaluated by one or more evaluators once the basis and details of this process have been approved by the Purchasing Officer and acknowledged by the Evaluation Committee. Detailed information pertaining to this selective evaluation process is available to Bidders and

the Commissioners Court upon request. Evaluation sheets and any summary of all responses are subject to review by the Cameron County Purchasing Department and Evaluation Committee's recommendation to Cameron County Commissioners Court. Compliance with all RFB requirements, delivery terms and needs of the using department are considerations in evaluating responses. Pricing is NOT the only criterion for making a recommendation (see criteria and relative importance of price and other evaluation factors, if any, specified elsewhere in this RFB). The Cameron County Purchasing Department reserves the right to contact any Bidder, at any time, to clarify, verify or request information with regard to that Bidder's response.

#### PROTEST PROCEDURES:

Procedure - This protest procedure is available to Bidders responding to this RFB and requesting a debriefing conference.

Debriefing Conference — A debriefing conference must be requested in writing to the Purchasing Department within five (5) business days from the date of the RFB award by the Cameron County Commissioners' Court. Debriefing questions must be submitted in writing to the Purchasing Department no later than two (2) business days before the scheduled date for the Debriefing Conference. These questions will be answered at the debriefing conference. Follow-up questions must be submitted (in writing) no later than one (1) business day after the date of the Debriefing Conference and answered no later than two (2) business days after the date of the Debriefing Conference. Follow-up answers will be sent via e-mail or fax (if e-mail not available). For RFBs, Bidders are given the opportunity to ask questions of the Evaluation Committee relative to their responses and the Committee's scores.

#### Protests are made:

- 1. To the Purchasing Department after the debriefing conference. Bidder protests shall be received, in writing, by the Purchasing Department within five (5) business days after the debriefing conference.
- 2. To the Protest Committee, only after the protest to the Purchasing Department was not satisfactorily resolved. Protests to the Protest Committee shall be made within five (5) business days after the Bidder has received notification from the County Purchasing Department of its decision.

#### Grounds for protest:

- 1. Numerical errors were made.
- 2. The County failed to follow procedures established in the RFB, the Purchasing policy on acquisitions or applicable state or federal laws or regulations.
- 3. Bias, discrimination or conflict of interest on the part of an evaluator. Protests not based on these criteria shall not be considered.

Format and Content - Protesting Bidders shall include, in their written protest to the Cameron County Purchasing Department, all facts and arguments upon which they rely. Bidders shall, at a minimum, provide:

- 1. Information about the protesting Bidder; name of firm, mailing address, phone number and name of individual responsible for submission of the protest.
- 2. Information about the acquisition and the acquisition method.
- 3. Specific and complete statement of the County's action(s) being protested. 4. Specific reference to the grounds for the protest.
- 4. Description of the relief or corrective action requested.
- 5. For protests to the Protest Committee, a copy of the Purchasing Department's written decision on the protest.

#### **Review Process:**

- 1. Upon receipt of a Bidder's protest, the Purchasing Department shall postpone further steps in the acquisition process until the Bidder protest has been resolved.
- 2. The Department's internal protest review procedures consist of the following:
  - a. The Purchasing Department shall perform an objective review of the protest by individuals not involved in the acquisition protested. The review shall be based on the written protest material submitted by the Bidder.
  - b. A written decision will be delivered to the Bidder within five business days after receipt of the protest, unless more time is needed. The protesting Bidder shall be notified if additional time is necessary.

#### Final Determination:

The final determination shall:

- 1. Find the protest lacking in merit and uphold the agency's action; or
- 2. Find only technical or harmless errors in the agency's acquisition process, determine the agency to be in substantial compliance, and reject the protest; or 3. Find merit in the protest and provide the agency options which may include recommendations to a) correct its errors and reevaluate all RFBs, and/or b) reissue the Bidder solicitation document; or c) make other findings and determine other courses of action as appropriate.

#### Protest Committee Review Process:

Protests to the Protest Committee may be made only for Protest Committee approved acquisitions, and only after review by County Purchasing Department. Protests of the decisions of County Purchasing Department shall be made by letter to the Protest Committee, who may establish procedures to resolve the protest. Protests shall be received by the Protest Committee within five business days after the decision of Purchasing Department in order to be considered. The Committee's decision is final, with no further administrative appeal available.

FISCAL FUNDING: A multi-year lease or lease/purchase arrangement (if requested by the Special Requirements/Instructions), or any contract continuing as a result of an extension option, must include a "fiscal funding out" clause. If, for any reason, funds are not appropriated to continue the lease or contract, said lease or contract shall become null and void on the last day of the current appropriation of funds. After expiration of the lease, leased equipment shall be removed by the Bidder from the using department without penalty of any kind or form to Cameron County. All charges and physical activity related to delivery, installation, removal and redelivery shall be the responsibility of the Bidder.

GRATUITIES AND PROHIBITION AGAINST PERSONAL INTEREST IN CONTRACTS: Any elected or appointed official who has any substantial interest, either direct or indirect, in any business entity seeking to contract with the County, shall, before any vote or decision on any matter involving the business entity, file an affidavit stating the nature and extent of interest and shall abstain from any participation in the matter. This is not required if the vote or decision will not have any special effect on the entity other than its effect on the public. However, if a majority of the governing body is also required to file, and do file similar affidavits, then the member is not required to abstain from further participation. Attached and included in this RFB is a disclosure of all of this Company's business or pecuniary financial relationships with officers or employees of Cameron County or County entities (if any such relationships exist) which must be filled out, attached and included with the RFB response. The County may, by written notice to the Bidder, cancel this contract without liability to Bidder if it is determined by County that gratuities, in the form of entertainment, gifts, or otherwise, were offered or given by the Bidder, or any agent, or representative of the Bidder, to any officer or employee of Cameron County with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending or the making or any determinations with respect to the performance of such a contract. In the event this contract is cancelled by County pursuant to this provision, County shall be entitled, in addition to any other rights and remedies, to recover or withhold the amount of the costs incurred by Bidder in providing such gratuities. Consistent and continued RFB responses that end in a tie could cause rejection of any RFB response by the County and/or investigation for Anti-Trust violations. Bidder guarantees that he has not retained a person to solicit or secure any contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except for retention of bona fide employees or bona fide established commercial selling agencies maintained by the Bidder for the purpose of securing business.

HISTORICALLY UNDERUTILIZED BUSINESS (HUB) CERTIFICATION: If Bidder is a Certified Historically Underutilized Business (HUB), please include a copy of your HUB Certificate with your RFB response. This information will assist Cameron County in the percentage tracking of HUB utilization.

LOCAL BIDDER'S PRINCIPAL PLACE OF BUSINESS - 3% PREFERENCE: (consideration of location) This local preference consideration is allowable for Equipment and Supplies but not allowed for Services and/or Construction related requests. The County Commissioner's Court may award to the lowest Bidder or the Bidder whose principal place of business is within Cameron County if the Commissioner's Court determines, in writing, that the local Bidder offers the County the best combination of contract price and additional economic development opportunities for Cameron County created by the contract award,

including the employment of residents of Cameron County and increased tax revenues to Cameron County. This option exists only within 3% of the lowest price. In order to provide the County Commissioners Court adequate information in considering this option, the Bidder should submit with each bid response the following information for Commissioners Court's review with all information requested complete with detailed, current and quantifiable numeric data:

- 1. Where is your principal place of business (Business Headquarters) City, County, State, Signature of Bidder, Title, Date? Along with this information, submit information with responses to the following questions:
  - a. Why and how Bidder believes that the local Bidder offers the County additional economic development opportunities for Cameron County created by the contract award?
  - b. How will award to local Bidder benefit the employment of residents of Cameron County?
  - c. How many employees does Bidder employ within Cameron County and how many employees are affected financially by award/purchase?
  - d. How will award to local Bidder increased tax revenues to Cameron County?

This information should be provided and updated with each bid response submitted to the County. If Bidder is local and within 3% of the lowest bid price, this information will be submitted to Commissioner's Court along with tabulation sheet. There has been no mandatory requirement or Policy established by Commissioners Court which requires submitting answers to these questions or attending Commissioners Court meetings for the awarding of RFBs relative to the 3% local preference, however individual Commissioners may or may not have preferences (relative to these issues) when making their decision. This paragraph will be revised upon policy change made by Commissioners Court.

INSURANCE: The Bidder shall secure and maintain, throughout the duration of the Contract, insurance of such types and in such amounts as may be necessary to protect the Bidder and the interests of the County against all hazards or risks of loss as hereinafter specified. The form and limits of such insurance, together with the insurer, shall be acceptable to the County. It shall be the responsibility of the Bidder to maintain adequate insurance coverage at all times. Failure of the Bidder to maintain adequate coverage shall not relieve the Bidder of any contractual responsibility or obligation.

MAINTENANCE: Maintenance required for equipment requested in RFBs should be available in Cameron County by a manufacturer authorized maintenance facility. Costs for this service shall be shown on the Pricing/Delivery Information form. If Cameron County opts to include maintenance, it shall be so stated in the purchase order and said cost will be included. Service will commence only upon expiration of applicable warranties and should be priced accordingly.

MATERIAL SAFETY DATA SHEETS: Under the "Hazardous Communication Act", commonly known as the "Texas Right To Know Act", a Bidder must provide to the County with each delivery, material safety data sheets which are applicable to hazardous substances defined in the Act. Failure of the Bidder to furnish this documentation will be cause to reject any bid applying thereto.

NAME BRANDS: Specifications may reference name brands and model numbers. It is not the intent of Cameron County to restrict responses to RFBs in such cases, but to establish a desired quality level of merchandise or to meet a pre-established standard common to similar existing items. Bidders may offer items of equal stature and standard, but the burden of proof of such stature and standard rests with Bidders. Cameron County shall act as sole judge in determining equality and acceptability of products offered.

PRICING: Prices for all goods and/or services shall be firm for the duration of the contract and shall be stated on the Pricing/Delivery Information form. Prices shall be all inclusive: No price changes, additions, or subsequent qualifications will be honored during the term of the contract. All prices must be written in ink or typewritten. Pricing on all transportation, freight, drayage and other charges are to be prepaid by the Bidder and included in the price. If there are any additional charges of any kind, other than those mentioned above, specified or unspecified, Bidder MUST indicate the items required and attendant costs or forfeit the right to payment for such items. Where unit pricing and extended pricing differ, unit pricing prevails.

RECYCLED MATERIALS: Cameron County encourages the use of products made of recycled materials and shall give preference in purchasing to products made of recycled materials if the products meet applicable specifications as to quantity and quality. County will be the sole judge in determining product preference application.

SCANNED RE-TYPED RESPONSE: If in its RFB response, Bidder either electronically scans, re-types, or in some way reproduces the County's published RFB package, then in event of any conflict between the terms and provisions of the County's published RFB specifications, or any portion thereof, and the terms and provisions of the RFB response made by Bidder, the County's RFB specifications as published shall control. Furthermore, if an alteration of any kind to the County's published RFB specifications is only discovered after the contract is executed and is or is not being performed, the contract is subject to immediate cancellation.

SILENCE OF SPECIFICATIONS: The apparent silence of specifications as to any detail, or the apparent omission from it of a detailed description concerning any point, shall be regarded as meaning that only the best commercial practices are to prevail and that only material and workmanship of the finest quality are to be used. All interpretations of specifications shall be made on the basis of this statement. The items furnished under this contract shall be new, unused of the latest product in production to commercial trade and shall be of the highest quality as to materials used and workmanship. The manufacturer furnishing these items shall be experienced in design and construction of such items and shall be an established supplier of the item needed in the RFB. Substitute items will not be accepted unless approved (in advance).

SUPPLEMENTAL MATERIALS: Bidders are responsible for including all pertinent product data in the returned RFB package. Literature, brochures, data sheets, specification information, completed forms requested as part of the RFB package and any other facts which may affect the evaluation and

subsequent contract award should be included. Materials such as legal documents and contractual agreements, which the Bidder wishes to include as a condition of an RFB response, must also be in the returned in the RFB response package. Failure to include all necessary and proper supplemental materials may be cause to reject the Bidder's entire RFB.

TITLE TRANSFER: Title and Risk of Loss of goods shall not pass to Cameron County until Cameron County actually receives and takes possession of the goods at the point or points of delivery. Receiving times may vary with the using department. Generally, deliveries may be made between 8:30 a.m. and 4:00 p.m., Monday through Friday. Bidders are advised to consult the using department for instructions. The place of delivery shall be shown under the "Special Requirements/Instructions" section of this RFB package and/or on the Purchase Order as a "Deliver To:" with the address.

USAGE REPORTS: Cameron County reserves the right to request, and receive at no additional cost up to two (2) times during the contract period, a usage report detailing the products and/or services furnished to date under a contract resulting from this RFB. The reports must be furnished no later than five (5) working days after written request and itemize all purchases to date by Cameron County department with a description, of each item purchased, including the manufacturer, quantity of each item purchased, the per unit and extended price of each item purchased, and the total amount and price of all items purchased.

#### WARRANTY PRICE:

- a) The price to be paid by the County shall be that contained in Bidder's response to the RFB which Bidder warrants to be no higher than Bidder's current prices on orders by others for products of the kind and specification covered by this agreement for similar quantities under similar or like conditions and methods of purchase. In the event Bidder breaches this warranty, the prices of the items shall be reduced to the Bidder's current prices on orders by others, or in the alternative, County may cancel this contract without liability to Bidder for breach or Bidder's actual expense.
- b) The Bidder warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for commission, percentage, brokerage, or contingent fee excepting bona fide employees of bona fide established commercial or selling agencies maintained by the Bidder for the purpose of securing business. For breach or violation of this warranty, the County shall have the right in addition to any other right or rights to cancel this contract without liability and to deduct from the contract price, or otherwise recover the full amount of such commission, percentage, brokerage or contingent fee.

Bidders shall furnish all data pertinent to warranties or guarantees which may apply to items in the RFB. Bidders may not limit or exclude any implied warranties.

Bidder warrants that products sold and services provided to the County shall conform to the highest commercial and/or professional standards in the industry and laws established by the U.S. Department of Labor, U.S. Department of Homeland Security, Occupational Safety and Health Administration and O.S.H.A. Act of 1970. In the event any product does not conform to OSHA Standards, where applicable, Cameron County may return the product for correction or replacement at the Bidder's expense. If Bidder

fails to make the appropriate correction within a reasonable time, Cameron County may correct at the Bidder's expense.

WARRANTY ITEMS/PRODUCTS: Bidder warrants that products sold and services provided to the County shall conform to the highest commercial and/or professional standards in the industry and laws established by the U.S. Department of Labor, U.S. Department of Homeland Security, Occupational Safety and Health Administration and O.S.H.A. Act of 1970. In the event product does not conform to OSHA Standards, where applicable, Cameron County may return the product for correction or replacement at the Bidder's expense. If Bidder fails to make the appropriate correction within a reasonable time, Cameron County may correct at the Bidder's expense.

Bidder shall not limit or exclude any implied warranties and any attempt to do so shall render this contract voidable at the option of the County.

Bidder warrants that the goods furnished will conform to the specifications, drawings and descriptions listed in the RFB invitation and to the sample(s) furnished by Bidder, if any. In the event of a conflict between the specifications, drawings and descriptions, the specifications shall govern. All items must be new, in first class condition, unless otherwise specified. The design, strength, and quality of materials must conform to the highest standards of manufacturing practice.

Items supplied under this contract shall be subject to the County's approval. Successful Bidder shall warrant that all items/services shall conform to the proposed specifications and/or all warranties as stated in the Uniform Commercial Code and be free from all defects in material, workmanship and title. Any items found defective or not meeting specifications shall be picked up and promptly replaced by the successful Bidder at no expense to the County.

SAFETY WARRANTY: As noted above, Bidder warrants that the products sold to County shall conform to the standards promulgated by the U.S. Department of Labor under the Occupational Safety and Health Act of 1970. In the event the product does not conform to OSHA standards, County may return the product for correction or replacement at the Bidder's expense. In the event Bidder fails to make the appropriate correction within a reasonable time, correction made by County will be at Bidder's expense. Have you attached the required warranty information to the RFB (if applicable)? "Yes" or "No"

#### APPLICABLE LAW

To the extent it is applicable, this agreement shall be governed by the Uniform Commercial Code. Wherever the term "Uniform Commercial Code" is used, it shall be construed as meaning "the Uniform Commercial Code" as adopted in the State of Texas as effective and in force on the date of this agreement. Otherwise, Texas state and federal law shall apply.

ASSIGNMENT DELEGATION: No right, obligation or interest in this contract shall be assigned or delegated to another by Bidder without the written permission of the County. Any attempted assignment or delegation by Bidder shall be wholly void and totally ineffective for all purposes unless made in conformity with this paragraph.

CONTRACT OBLIGATION: Cameron County Commissioners Court must award any resulting contract and the County Judge or other person authorized by the Cameron County Commissioners Court must sign the contract before it becomes binding on Cameron County or the Bidder. Department Heads are NOT authorized to sign agreements for Cameron County. Binding agreements shall remain in effect until all products and/or services covered by this RFB have been delivered and accepted and all contract requirements have been satisfied

ERRORS AND OMISSIONS: Errors and Omissions in the RFB or any provision herein described will not be construed as to relieve the Bidder of any responsibility or obligation requisite to the complete and satisfactory implementation, operation, and support of all obligations under any resulting contract.

FORCE MAJEURE: If, by reason of Force Majeure, either party hereto shall be rendered unable wholly, or in part, to carry out its obligations under this RFB and any resulting contract, then such party shall give notice and full particulars of Force Majeure in writing to the other party within a reasonable time after occurrence of the event or cause relied upon, and the obligation of the party giving such notice, so far as it is affected by such Force Majeure, shall be suspended during the continuance of the inability then claimed, except as hereinafter provided, but for no longer period, and such party shall endeavor to remove or overcome such inability with all reasonable dispatch. The term "Force Majeure" as employed herein, shall mean acts of God, strikes, lockouts, or other industrial disturbances, act of public enemy, orders of any kind of government of the United States or the State of Texas or any civil or military authority, insurrections, riots, epidemics, landslides, lightening, earthquakes, fires, hurricanes, storms, floods, washouts, droughts, arrests, restraint of government and people, civil disturbances, explosions, breakage or accidents to machinery, pipelines or canals, or other causes not reasonably within the control of the party claiming such inability. It is understood and agreed that the settlement of strikes and lockouts shall be entirely with the discretion of the party having the difficulty, and that the above requirement that any Force Majeure shall be remedied with all reasonable dispatch shall not require the settlement of strikes and lockouts by acceding to the demands of the opposing party or parties when such settlement is unfavorable in the judgment of the party having the difficulty.

HOLD HARMLESS AGREEMENT: The successful Bidder, shall indemnify and hold Cameron County harmless from all claims for personal injury, death and/or property damage resulting directly or indirectly from Bidder's performance. Bidder shall procure and maintain, with respect to the subject matter of this RFB, appropriate insurance coverage including, as a minimum, public liability and property damage with adequate limits to cover Bidder's liability as may arise directly or indirectly from work performed and goods or services sold and under the terms of this RFB. Certification of such coverage must be provided to the County upon request.

INFRINGEMENTS: There will be no warranty by County against infringements. As part of this contract for sales, Bidder agrees to ascertain whether goods manufactured in accordance with the specifications attached to this agreement will give rise to the rightful claim of any third person by way of infringement or the like. County makes no warranty that the production of goods according to the specification will not

give rise to such a claim, and in no event shall County be liable to Bidder for indemnification in the event Bidder gets sued on the grounds of infringement or the like. If Bidder is of the opinion that an infringement or the like will result, Bidder shall notify County to that effect in writing within two (2) weeks after the signing of this agreement. If County does not receive notice and is subsequently held liable for the infringement or the like, Bidder will hold County harmless. If Bidder in good faith ascertains that production of the goods in accordance with the specifications will result in infringement or the like, this contract shall be null and void, except that County will pay Bidder the reasonable cost of Bidder's search as to infringement. The Bidder agrees to protect the County from claims involving infringement of patents or copyrights.

INTERPRETATION PAROLE EVIDENCE: Unless a separate contract or addendum hereof is prepared and entered into following the award of this RFB to a successful bidder, this writing is intended by the parties as a final expression of the terms of this RFB and the general terms of any resulting contract. No course of prior dealings between the parties and no usage of the trade shall be relevant to supplement or explain any term. Acceptance or acquiescence in a course of performance rendered under this RFB and any resulting contract shall not be relevant to determine meaning even though the accepting or acquiescing party has knowledge of the performance and opportunity for objection. Whenever a term defined by the Uniform Commercial Code is used in this agreement, the definition contained in the Code is to control, if applicable.

LATE RESPONSES: RFB responses must be received by the County before the hour and date specified. Responses received after the time and date specified will be disqualified and may be returned to sender. The County is not responsible for lateness or non-delivery of mail, delivered to wrong office, carrier, etc.

MODIFICATIONS: This contract can be modified or rescinded only by a writing signed by both of the parties or their duly authorized agents.

O.S.H.A: Bidder must meet all Federal and State OSHA requirements.

REMEDIES: The successful Bidder and County agree that both parties have all rights, duties, defenses and remedies available under law.

RIGHT TO ASSURANCE: During the RFB process and any resulting contract, whenever a Bidder or the County in good faith has reason to question the other's intent to perform, demand may be made that the other party give written assurance of intent. In the event that a demand is made and no assurance is given within five (5) days, such failure may be treated as an anticipatory repudiation of the RFB and any resulting contract.

SEVERABILITY: If any section, subsection, paragraph, sentence, clause, phrase or word of these requirements or the specifications shall be held invalid, such holding shall not affect the remaining portions of these requirements and the specifications and it is hereby declared that such remaining

portions would have been included in these requirements and the specifications as though the invalid portion had been omitted.

VENUE: Both parties agree that venue for any litigation arising from this contract shall lie in Cameron County, Texas.

BIDDER SHALL CONFIRM ACCEPTANCE OF RFB TERMS: The Bidder shall specifically state acceptance of these terms and conditions as a basis for providing the County with a response to this RFB.

THESE TERMS INCORPORATED: These General Terms and Conditions shall be incorporated in the response to the RFB and any resulting contract. The Bidder shall specifically state acceptance of these terms and conditions as a basis for providing the County with a response to this RFB.

OTHER TERMS: The Bidder shall state any exceptions desired to these terms and conditions and may suggest alternate wording that addresses the intent of the term or condition. The County may accept or reject any suggestions in accordance with law.

#### GENERAL CONDITIONS OF THE AGREEMENT

#### Contract and Contract Documents

The project to be constructed subject to all applicable Federal and State laws and regulations.

The Plans, Specifications, Supplemental Conditions (or Special Conditions), and Addenda shall form part of this contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth:

#### **DEFINITIONS**

Whenever used in any of the contract Documents, the following meanings shall be given to the terms here in defined:

- A. The term "Contract" means the Contract executed between the County of Cameron, hereinafter called the "County" and, \_\_\_\_\_\_\_\_ hereinafter called "Contractor", of which these GENERAL CONDITIONS form a part.
- B. The term "Project Area" means the area within which is the specified Contract limits of the Improvements contemplated to be constructed in whole or in part under this contract.
- C. The term "Engineer" means the Cameron County Engineer, Engineer in charge, serving the **County** with architectural or engineering services, his successor, or any other person or persons, employed by the **County** for the purpose of directing or having in charge the work embraced in this Contract.
- D. The term "Architect" means the architect contracted for the project by Cameron County.
- E. The term "Contract Documents" means and shall include the following: Executed Contract, Addenda (if any), Invitation for Bids, Instructions to Bidders, Signed Copy of Bid, General Conditions, Special Conditions, Technical Specifications, and Drawings (as listed in the Schedule of Drawings).

#### ADMINISTRATION OF THE CONTRACT BY ARCHITECT AND ENGINEER

The Engineer and Architect will provide administration of the Contract and will be the Owner's representatives (1) during construction and (2) until final payment is due. The Architect will advise and consult with the Owner and Engineer.

The Architect may appoint an employee or other person to assist him during the construction. These representatives will be instructed to assist the **Contractor** in interpreting the Contract Documents; however, such assistance shall not relieve the Contractor from any responsibility as set forth by the Contract Documents. The fact that the Architect's representative may have allowed work not in accordance with the Contract Documents shall not prevent the Architect from insisting that the faulty work be corrected with the Contract Documents and the Contractor shall correct same.

#### SUPERVISION BY CONTRACTOR

A. Except where the **Contractor** is an individual and gives his personal supervision to the work, the **Contractor** shall provide a competent superintendent, satisfactory to the **County** and the

**Engineer,** on the work at all times during working hours with full authority to act for him. The **Contractor** shall also provide an adequate staff for the proper coordination and expediting of his work.

- B. The **Contractor** shall lay out his own work and he shall be responsible for all work executed by him under the Contract. He shall verify all figures and elevations before proceeding with the work and will be held responsible for any error resulting from his failure to do so.
- C. The Contractor expressly recognizes that the Architect does not owe him any duty to supervise or direct his work as to protect the Contractor from the consequences of his own acts or omissions.

#### **SUBCONTRACTS**

- A. The **Contractor** shall not execute an agreement with any subcontractor or permit any subcontractor to perform any work included in this contract until he has verified the subcontractor as eligible to participate in federally funded contracts.
- B. No proposed subcontractor shall be disapproved by the **County** except for cause.
- C. The **Contractor** shall be as fully responsible to the **County** for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them.
- D. The **Contractor** shall cause appropriate provisions to be inserted in all subcontracts relative to the work that require compliance by each subcontractor with the applicable provisions of this Contract.
- E. Nothing contained in the Contract shall create any contractual relation between any subcontractor and the **County**.

#### FITTING AND COORDINATION OF WORK

The **Contractor** shall be responsible for the proper fitting of all work and for the coordination of the operations of all trades, subcontractors, or material suppliers engaged upon this Contract.

#### PAYMENTS TO CONTRACTOR

#### A. Partial Payments

1. The **Contractor** shall prepare his requisition for partial payment for work completed to date and shall submit up to one requisition per month within the last five (5) days of the month, with the required number of copies, to the Architect and Engineer for their approval, on a notarized AIA G702 Application and Certificate for Payment form, and continuation sheet. In any contract where the total contract price at time of execution of the contract is \$5,000,000.00 or more and the contract provides for retainage of five percent (5%) of periodic contract payments. If the total contract price is less than \$5,000,000.00, then the retainage amount will be 10%. The amount of the payment due the Contractor shall be determined by adding to the total value of work completed to date, the value of materials properly stored on the site and deducting (1) five percent (5%) or ten percent (10%) of the total amount, to be retained until final payment and (2) the amount of all previous payments. The total value of work completed to date shall be

- based on the estimated quantities of work completed and on the unit prices contained in the agreement. The value of materials properly stored on the site or bonded warehouse shall be based upon the estimated quantities of such materials and the invoice prices, Copies of all invoices shall be available for inspection of the Architect and Engineer.
- 2. Monthly or partial payments made by the county to the Contractor are monies advanced for the purpose of assisting the contractor to expedite the work of construction. The Contractor shall be responsible for the care and protection of all materials and work upon which payments have been made until final acceptance of such work and materials by the County. Such payments shall not constitute a waiver of the right of the County to require the fulfillment of all terms of the Contract and the delivery of all improvements embraced in this Contract complete and satisfactory to the County in all details. Such payments will be made by the County within thirty days of receipt of the invoice by the County Auditor's Office in the form of a check.

#### B. Final Payment

- After final inspection and acceptance by the County and Architect of all work under the Contract, the Contractor shall prepare his requisition for final payment which shall be based upon the careful inspection of each item of work at the applicable unit prices stipulated in the Agreement. The total amount of the final payment due the Contractor under this contract shall be the amount computed as described above less all previous payments.
- 2. The County before paying the final estimate shall require the Contractor to furnish releases (AIA G706A Contractor's Affidavit of Release of Liens form) or receipts from all subcontractors having performed any work and all persons having supplied materials, equipment (installed on the Project) and services to the Contractor, if the County deems it necessary in order to protect its interest. The County may, if it deems such action advisable, make payment in part or in full to the Contractor without requiring the furnishing of such releases or receipts and any payments made shall in no way impair the obligations of any surety or sureties furnished under this Contract. Other close out documents shall include AIA G706 Contractor's Affidavit of Payment of Debts and Claims, AIA G707 Consent of Surety Company to Final Payment.
- 3. Any amount due the **County** under Liquidated Damages shall be deducted from the final payment due the contractor.
- C. Payments Subject to Submission of Certificates
  - Each payment to the **Contractor** by the **County** shall be made subject to submission by the **Contractor** of all written certifications required of him and his subcontractors.
- D. Withholding Payments
  - The **County** may withhold from any payment due the **Contractor** whatever is deemed necessary to protect the **County**, and if so elects, may also withhold any amounts due from the **Contractor** to any subcontractors or material dealers, for work performed or material furnished by them. The foregoing provisions shall be construed solely for the benefit of the **County** and will not require

the **County** to determine or adjust any claims or disputes between the **Contractor** and his subcontractors or material dealers, or to withhold any moneys for their protection unless the **County** elects to do so. The failure or refusal of the County to withhold any moneys from the **Contractor** shall in no way impair the obligations of any surety or sureties under any bond or bonds furnished under this Contract.

#### CHANGES IN THE WORK

- A. The **County** may make changes in the scope of work required to be performed by the **Contractor** under the Contract without relieving or releasing the **Contractor** from any of his obligations under the Contract or any guarantee given by him pursuant to the Contract provisions, and without affecting the validity of the guaranty bonds, and without relieving or releasing the surety or sureties of said bonds. All such work shall be executed under the terms of the original Contract unless it is expressly provided otherwise.
- B. Except for the purpose of affording protection against any emergency endangering health, life, limb or property, the Contractor shall make no change in the materials used or in the specified manner of constructing and/or installing the improvements or supply additional labor, services or materials beyond that actually required for the execution of the Contract, unless in pursuance of a written order from the **County** authorizing the **Contractor** to proceed with the change. No claim for an adjustment of the Contract Price will be valid unless so ordered.
- C. If applicable unit prices are contained in the Agreement, the **County** may order the **Contractor** to proceed with desired unit prices specified in the Contract; provided that in case of a unit price contract the net value of all changes does not increase the original total amount of the agreement by more than twenty-five percent (25%) or decrease the original the total amount by twenty-five percent (25%).
- D. Each change order shall include in its final form:
  - 1. A detailed description of the change in the work.
  - 2. The Contractor's proposal (if any) or a confirmed copy thereof.
  - 3. A definite statement as to the resulting change in the contract price and/or time.
  - 4. The statement that all work involved in the change shall be performed in accordance with contract requirements except as modified by the change order.
  - 5. The procedures as outlined in this Section for a unit price contract also apply in any lump sum contract.
  - 6. The signatures of authorized representatives of Contractor and County.

#### CLAIMS FOR EXTRA COST

A. If the **Contractor** claims that any instructions by Drawings or otherwise involve extra cost or extension of time, he shall, within ten days after the receipt of such instructions, and in any event before proceeding to execute the work, submit his protest thereto in writing to the **County**, stating clearly and in detail the basis of his objections. No such claim will be considered unless so made.

- B. Claims for additional compensation for extra work, due to alleged errors in ground elevations, contour lines, or bench marks, will not be recognized unless accompanied by certified survey data, made prior to the time the original ground was disturbed, clearly showing that errors exist which resulted, or would result, in handling more material, or performing more work, than would be reasonably estimated from the Drawings and maps issued.
- C. Any discrepancies, which may be discovered between actual conditions and those represented by the Drawings and maps, shall be reported at once to the Architect and the Engineer and work shall not proceed except at the Contractors risk, until written instructions have been received by him from the Engineer.
- D. If, on the basis of the available evidence, the **County** determines that an adjustment of the Contract Price and/or time is justifiable, a change order shall be executed.

#### EXTRA WORK

The term "EXTRA WORK" as used in the agreement shall be understood to mean and include all work that may be required by the Engineer or **County** to be done by the **Contractor** to accomplish any change, alteration or addition to the work shown upon the plans, or reasonably implied by the specifications, and not covered by the Contractor's proposal. It is agreed that the Contractor shall perform all Extra Work under the direction of the Engineer when presented with a written Work Order signed by the Engineer; Subject, however, to the right of the **Contractor** to require a written confirmation of such Extra Work Order by the **County**. It is also agreed that the compensation to be paid the **Contractor** for performing said Extra Work shall be determined by one or more of the following methods:

- a) By agreed unit prices;
- b) By agreed lump sum;
- c) If neither Method (a) nor Method (b) can be agreed the "actual field cost" of the work plus ten (10) percent.

In the event said Extra Work be performed and paid for under Method (c), then the provisions of this paragraph shall apply and the "actual field cost" is hereby defined to include the cost of all workmen, such as foremen, time keepers, mechanics and laborers, and materials, supplies, trucks, rental of machinery and equipment for the time actually employed or used on such Extra Work plus actual transportation changes necessarily incurred if the kind of equipment or machinery is not already on the job, together with the power, fuel, lubricants, water and similar operating expenses, also all necessary incidental expenses incurred directly on account of such Extra Work, including Social Security, Old Age Benefits and other payroll taxes, and a rate-able proportion of premiums on Construction and Maintenance Bonds, Public Liability and Property Damage and Workmen's Compensation, and all other insurance as may be required by any law or ordinance, or directed by the Engineer or County, or by them agreed. The Engineer may direct the form in which accounts of the "actual field cost" shall be kept and may also specify in writing, before the work commences, the method of doing the work and the type and kind of machinery and equipment to be used, otherwise these matters shall be determined by the Contractor. Where practicable the terms and prices for the use of machinery and equipment shall be incorporated in the Written Extra Work Order.

The ten (10) percent of the "actual field cost" to be paid the **Contractor** shall cover and compensate him for his profit, overhead, general superintendence and field office expense, and all other elements of cost and expense not embraced within the "actual field cost" as above defined, save that where the Contractor's Camp or Field Office must be maintained primarily on account of such Extra Work, then the cost to maintain and operate same, excluding staff, shall be included in the "actual field cost".

No claim for extra work of any kind will be allowed unless ordered in writing by the Engineer. In case any orders or instructions, either oral or written, appear to the Contractor to involve extra work for which he should receive compensation, he shall make written request to the Engineer for written order authorizing Extra Work. Should a difference of opinion arise as to what does or does not constitute extra work, or as to the payment therefore, and the Engineer insists upon its performance, the **Contractor** shall proceed with the work after making written order and shall keep an accurate account of the "actual field cost" thereof, as provided under Method (c). The **Contractor** will thereby preserve the right to submit the matter for payment, as herein above described. Change orders shall be executed on form similar to AIA G701Change Order document.

#### TERMINATION, DELAYS, AND LIQUIDATED DAMAGES

A. Right of the County to Terminate Contract.

In the event that any of the provisions of this contract are violated by the **Contractor**, or by any of his subcontractors, the **County** may serve written notice upon the **Contractor** and the Surety of its intention to terminate the contract. The notices shall contain the reasons for such intention to terminate the contract, and unless such violation or delay shall cease and satisfactory arrangement of correction be made within ten days, the contract shall, upon the expiration of said ten (10) days, cease and terminate. In the event of any such termination, the **County** shall immediately serve notice thereof upon the Surety and the **Contractor**. The Surety shall have the right to take over and perform the contract. Provided, however, that if the Surety does not commence performance thereof within ten (10) days from the date of the mailing to such Surety of notice of termination, the **County** may take over the work and complete the project by bid/contract or by force account at the expense of the **Contractor** and his Surety shall be liable to the **County** for any excess cost incurred In such event the **County** may take possession of and utilize in completing the work, such materials, appliances, and plant as may be on the site of the work and necessary therefore.

- B. Liquidated Damages for Delays.
  - If the work is not complete within the time stipulated in the applicable bid for Lump Sum or Unit Price Contract provided, the **Contractor** shall pay to the **County** as fixed, agreed, and liquidated damages (it being possible to determine the actual damage occasioned by the delay) the amount of Three Hundred Dollars (\$300.00) for each calendar day of delay, until the work is completed. The **Contractor** and his sureties shall be liable to the **County** for the amount thereof.
- C. Hindrance and Delays.

No damages for delays shall be paid to the **Contractor** by the **County**, except for any unreasonable delays caused by the **County**.

#### D. Excusable Delays.

The right of the **Contractor** to proceed shall not be terminated nor shall the **Contractor** be charged with liquidated damages for any delays in the completion of the work due to:

- Any acts of the Government, including controls or restrictions upon or requisitioning of materials, equipment, tools, or labor by reason of war, national defense, or any other national emergency;
- 2. Any acts of the **County**;
- 3. Causes not reasonably foreseeable by the parties to this Contract at the time of the execution of the Contract which are beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God or of the public enemy, acts of another Contractor in the performance of some other contract with the County, fires, floods, epidemics, quarantine, restrictions, strikes, freight embargoes, and weather of unusual severity such as hurricanes, tornadoes, cyclones and other extreme weather conditions.

Provided, however, that the **Contractor** promptly notifies the **County** within ten (10) days in writing of the cause of the delay. Upon receipt of such notification, the **County** shall ascertain the facts and the cause and extent of delay. If, upon the basis of the facts and the terms of this contract, the delay is properly excusable, the **County** shall extend the time for completing the work for a period of time commensurate with the period of excusable delay.

The **Contractor** shall include a time to complete the scope of work stated in calendar days that includes anticipated number of working days that construction may be unable to take place, due to inclement weather and muddy ground. Extensions to the completion date will be granted only if, in the opinion of the Architect, climatological conditions that impede the progress of construction significantly exceed conditions for the local area. A guide for average climatological conditions will be the "Local Climatological Data" bulletin published by the Department of Commerce.

#### ASSIGNMENT OR NOVATION

The **Contractor** shall not assign or transfer, whether by an assignment or novation, any of its rights, duties, benefits, obligations, liabilities, or responsibilities under this **Contract** without the written consent of the **County**; provided, however, that assignments to banks or other financial institutions may be made without the consent of the **County**. No assignment or novation of this Contract shall be valid unless the assignment or novation expressly provides that the assignment of any of the **Contractors** rights or benefits under the Contract is subject to a prior lien for labor performed, services rendered, and materials, tools, and equipment supplied for the performance of the work under this Contract in favor of all persons, firms, or corporations rendering such labor or services or supplying such materials, tools, or equipment.

#### **DISPUTES**

A. All disputes arising under this Contract or its interpretation except those disputes covered by FEDERAL LABOR STANDARDS PROVISIONS whether involving law or fact or both, or extra work,

and all claims for alleged breach of contract shall, within ten (10) days of commencement of the dispute, be presented by the **Contractor** to the Architect and Engineer for review and decision. Any claim not presented within the time limit specified in this paragraph shall be deemed to have been waived, except that if the claim is of a continuing character and notice of the claim is not given within ten (10) days of its commencement, the claim will be considered only for a period commencing ten (10) days prior to the receipt of the Architect and Engineer.

- B. The **Contractor** shall submit in detail his claim and his proof thereof.
- C. If the **Contractor** does not agree with any decision of the Architect and Engineer, he shall in no case allow the dispute to delay the work but shall notify the Architect and Engineer promptly that he is proceeding with the work under protest.

#### TECHNICAL SPECIFICATIONS AND DRAWINGS

Anything mentioned in the Technical Specifications and not shown on the Drawings or vice versa shall be of like effect as if shown on or mentioned in both. In case of difference between Drawings and Technical Specifications, the Technical Specifications shall govern. In case of any discrepancy in Drawings, or Technical Specifications, the matter shall be immediately submitted to the Architect and Engineer, without whose decision, said discrepancy shall not be adjusted by the **Contractor**, save only at his own risk and expense.

#### SHOP DRAWINGS

- A. All required shop drawings, machinery details, layout drawings, etc. shall be submitted to the Architect and the Engineer in copies for approval sufficiently in advance of requirements to afford ample time for checking, including time for correcting, resubmitting and rechecking if necessary. The Contractor may proceed, only at his own risk, with manufacture or installation of any equipment or work covered by said shop drawings, etc. until they are approved and no claim, by the Contractor, for extension of the contract time shall be granted by reason of his failure in this respect.
- B. Shop drawings and samples shall be dated and marked to show the names of the Project, Architect, Contractor, Originating Subcontractor, Manufacturer or Supplier. Shop drawings shall completely identify specification section and locations at which materials or equipment is to be installed. All shop drawings are to be reviewed first by the General Contractor who shall affix his signature. Any drawings submitted without the Contractor's stamp of approval will not be considered and will be returned to him for proper resubmission. If any drawings show variations from the requirements of the Contract because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment of contract price and/or time, otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract even though the drawings have been approved.
- C. The **Contractor** shall submit and, if necessary, resubmit one (1) reproducible and four (4) copies of the shop drawings.

D. If a shop drawing is in accordance with the contract or involves only a minor adjustment in the interest of the **County** not involving a change in contract price or time; the Engineer may approve the drawing. The approval shall not relieve the **Contractor** from his responsibility for adherence to the contract or for any error in the drawing.

#### REQUESTS FOR SUPPLEMENTARY INFORMATION

It shall be the responsibility of the **Contractor** to make timely requests of the **County** for any additional information not already in his possession which should be furnished by the **County** under the terms of this Contract, and which he will require in the planning and execution of the work. Such requests may be submitted from time to time as the need approaches, but each shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay. Each request shall be in writing, and list the various items and the latest date by which each will be required by the **Contractor**. The first list shall be submitted within two weeks after Contract award and shall be as complete as possible at that time. The **Contractor** shall, if requested, furnish promptly any assistance and information the Engineer may require in responding to these requests of the **Contractor**. The **Contractor** shall be fully responsible for any delay in his work or to others arising from his failure to comply fully with the provision of this section.

#### MATERIALS AND WORKMANSHIP

- A. Unless otherwise specifically provided for in the technical specifications, all workmanship, equipment, materials and articles incorporated in the work shall be new and the best grade of the respective kinds for the purpose. Where equipment, materials, articles or workmanship are referred to in the technical specifications as "equal to" any particular standard, the Engineer shall decide the question of equality.
- B. The **Contractor** shall certify in writing that no materials used in the work contain asbestos materials in them excess of amounts allowed by Local/State standards, laws, codes rules and regulations; the Federal Environmental Protection Agency (EPA) standards and/or the Federal Occupational Safety and Health Administration (OSHA) standards, whichever is most restrictive. The **Contractor** shall provide this written certification to the Engineer.
- C. The **Contractor** shall furnish to the **County** for approval the manufacturer's detailed specifications for all machinery, mechanical and other special equipment, which he contemplates installing together with full information as to type, performance characteristics, and all other pertinent information as required, and shall likewise submit for approval full information concerning all other materials or articles which he proposes to incorporate.
- D. Products are generally specified by ASTM or other reference standard, and/or by manufacture's name and model number or trade name. When specified only by reference standard, the **Contractor** may select any product meeting this standard by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the **Contractor** has the option of using any product and manufacturer combination listed. When only one product manufacturer is specified this is the basis of the Contract, without substitution or exception.

- E. Substitutions will not be considered if they are indicated or implied on shop drawing submissions without formal request, or for their implementation they require a substantial revision of the Contract Documents in order to accommodate their use.
- F. No request for the substitution of products in place of those specified shall be considered after the Contract has been executed.
- G. Not later than seven (7) days from the Contract Date, the **Contractor** shall provide a list showing the name of the manufacturers proposed to be used for each of the products identified in the General Requirements of the Specifications, and where applicable, the name of the installing subcontractor.
- H. Machinery, mechanical and other equipment, materials or articles installed or used without such prior approval shall be at the risk of subsequent rejection.
- I. Materials specified by reference to the number or symbol of a specific standard, shall comply with requirements in the latest revision thereof and any amendment or supplement thereto in effect on the date of the Invitation for Bids, except as limited to type, class or grade, or modified in the technical specifications shall have full force and effect as though printed therein.
- J. The **County** may require the **Contractor** to dismiss from the work such employee or employees as the **County** or the Engineer may deem incompetent, or careless, or insubordinate.

#### SAMPLES, CERTIFICATES AND TESTS

- A. The **Contractor** shall submit all material or equipment samples, certificates, affidavits, etc., as called for in the contract documents or required by the Engineer, promptly after award of the contract and acceptance of the Contractor's bond. No such material or equipment shall be manufactured or delivered to the site, except at the Contractor's own risk, until the required samples or certificates have been approved in writing by the Engineer. Any delay in the work caused by late or improper submission of samples or certificates for approval shall not be considered just cause for an extension of the contract time.
- B. Each sample submitted by the **Contractor** shall carry a label giving the name of the **Contractor**, the project for which it is intended, and the name of the producer. The accompanying certificate or letter from the **Contractor** shall state that the sample complies with contract requirements, shall give the name and brand of the product, its place of origin, the name and address of the producer and all specifications or other detailed information which will assist the Engineer in making a prompt decision regarding the acceptability of the sample. It shall also include the statement that all materials or equipment furnished for use in the project will comply with the samples and/or certified statements.
- C. Approval of any materials shall be general only and shall not constitute a waiver of the **County's** right to demand full compliance with Contract requirements. After actual deliveries, the Engineer will have such check tests made as he deems necessary in each instance and may reject materials and equipment and accessories for cause, even though such materials and articles have been given general approval. If materials, equipment or accessories which fail to meet check tests have been incorporated in the work, the Engineer will have the right to cause their removal and

- replacement by proper materials or to demand and secure such reparation by the **Contractor** as is equitable.
- D. Except as otherwise specifically stated in the Contract, the costs of sampling and testing will be divided as follows:
  - The Contractor shall furnish without extra cost, including packing and delivery charges, all samples required for testing purposes, except those samples taken on the project by the Engineer;
  - 2. The **Contractor** shall assume all costs of re-testing materials, which fail to meet contract requirements;
  - 3. The **Contractor** shall assume all costs of testing materials offered in substitution for those found deficient;
  - 4. The **County** will pay all other expenses.

#### PERMITS AND CODES

- A. The **Contractor** shall give all notices required by and comply with all applicable laws, ordinances, and codes of the Local Government. All construction work and/or utility installations shall comply with all applicable ordinances, and codes including all written waivers. Before installing any work, the **Contractor** shall examine the drawings and technical specifications for compliance with applicable ordinances and codes and shall immediately report any discrepancy to the **County**. Where the requirements of the drawings and technical specifications fail to comply with such applicable ordinances or codes, the Architect will adjust the Contract by Change Order at his expense to conform to such ordinances or codes (unless waivers in writing covering the difference have been granted by the governing body or department).
  - Should the **Contractor** fail to observe the foregoing provisions and proceed with the construction and/or install any utility at variance with any applicable ordinance or code, including any written waivers (notwithstanding the fact that such installation is in compliance with the drawings and technical specifications), the **Contractor** shall remove such work without cost to the **County**,
- B. The **Contractor** shall at his own expense, secure and pay for all permits for street pavement, sidewalks, shed, removal of abandoned water taps, sealing of house connection drains, pavement cuts, buildings, electrical, plumbing, water, gas and sewer permits required by the local regulatory body or any of its agencies.
- C. The Contractor shall comply with applicable local laws and ordinances governing the disposal of surplus excavation, materials, debris and rubbish on or off the Project Area and commit no trespass on any public or private property in any operation due to or connected with the Improvements contained in this Contract.

#### CARE OF WORK

A. The **Contractor** shall be responsible for all damages to person or property that occur as a result of his fault or negligence in connection with the prosecution of the work and shall be responsible

- for the proper care and protection of all materials delivered and work performed until completion and final acceptance.
- B. The **Contractor** shall provide sufficient competent watchmen, both day and night, including Saturdays, Sundays, and holidays, from the time the work is commenced until final completion and acceptance.
- C. In an emergency affecting the safety of life, limb or property, including adjoining property, the Contractor, without special instructions or authorization from the County is authorized to act at his discretion to prevent such threatened loss or injury, and he shall so act. He shall likewise act if instructed to do so by the County.
- D. The **Contractor** shall avoid damage as a result of his operations to existing sidewalks, streets, curbs, pavements, utilities (except those which are to be replaced or removed), adjoining property, etc., and he shall at his own expense completely repair any damage thereto caused by his operations.
- E. The **Contractor** shall shore up, brace, underpin, secure, and protect as maybe necessary, all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be in any way affected by the excavations or other operations connected with the construction of the improvements included in this Contract. The **Contractor** shall be responsible for the giving of any and all required notices to any adjoining or adjacent property owner or other party before the commencement of any work. The **Contractor** shall indemnify and save harmless the County from any damages on account of settlements or the loss of lateral support of adjoining property and from all loss or expense and all damages for which the **County** may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

#### **ACCIDENT PREVENTION**

- A. No laborer or mechanic employed in the performance of this Contract shall be required to work in surroundings or under working conditions, which are unsanitary, hazardous, or dangerous to his health or safety as determined under construction safety and health standards promulgated by the Secretary of Labor.
- B. The **Contractor** shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of his prosecution of the work.
- C. The Contractor shall maintain an accurate record of all cases of death, occupational disease, or injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the Contract. The Contractor shall promptly furnish the County with reports concerning these matters.
- D. The **Contractor** shall indemnify and save harmless the **County** from any claims for damages resulting from property damage, personal injury and/or death suffered or alleged to have been suffered by any person as a result of any work conducted under this contract.
- **E.** The **Contractor** shall provide trench protection for all trenches in excess of a depth of five (5) feet, in the manner specified in the technical specifications and drawings.

#### SANITARY FACILITIES

The contractor shall furnish, install and maintain ample sanitary facilities for the workmen. As the needs arise, a sufficient number of enclosed temporary toilets shall be conveniently placed as required. Drinking water shall be provided from an approved source, so piped or transported as to keep it safe and fresh and served from single service containers or satisfactory types of sanitary drinking stands or fountains. All such facilities and services shall be furnished in strict accordance with existing and governing health regulations.

#### USE OF PREMISES

- A. The **Contractor** shall confine his equipment, storage of materials, and construction operations to the contract limits as shown on the drawings and as prescribed by ordinances or permits, or as may be desired by the **County**, and shall not unreasonably encumber the site or public rights of way with his materials and construction equipment.
- B. The Contractor shall comply with all reasonable instructions of the County and all existing state and local regulations regarding signs, advertising, traffic, fires, explosives, danger signals, and barricades
- C. Smoking and chewing of tobacco products is prohibited in the enclosed new construction.

#### REMOVAL OF DEBRIS, CLEANING, ETC.

The **Contractor** shall, periodically or as directed during the progress of the work, remove and legally dispose of all surplus excavated material and debris, and keep the Project Area and public rights of way reasonably clear. Upon completion of the work, he shall remove all temporary construction facilities, debris and unused materials provided for work, and put the whole site of the work and public rights of way in a neat and clean condition.

#### INSPECTION

- A. All materials and workmanship shall be subject to inspection, examination, or test by the **County**, the Architect, and the Engineer at any and all times during manufacture or construction and at any and all places where such manufacture or construction occurs. The **County** shall have the right to reject defective material and workmanship or require its correction. Unacceptable workmanship shall be satisfactorily corrected. Rejected material shall be promptly segregated and removed from the Project Area and replaced with material of specified quality without charge. If the **Contractor** fails to proceed at once with the correction of rejected workmanship or defective material, the **County** may by contract or otherwise have the defects remedied or rejected materials removed from the Project Area and charge the cost of the same against any Monies which may be due the **Contractor**, without prejudice to any other rights or remedies of the **County**.
- B. The Contractor shall furnish promptly all materials reasonably necessary for any tests, which may be required. All tests by the County will be performed in such manner as not to delay the work unnecessarily and will be made in accordance with the provisions of the technical specifications.

- C. The **Contractor** shall notify the **County** sufficiently in advance of back filling or concealing any facilities to permit proper inspection. If any facilities are concealed without approval or consent of the **County**, the **Contractor** shall uncover for inspection and recover such facilities at his own expense, when so requested by the **County**.
- D. Should it be considered necessary or advisable by the County at any time before final acceptance of the entire work to make an examination of work already completed by uncovering the same, the Contractor shall on request promptly furnish all necessary facilities, labor, and material. If such work is found to be defective in any important or essential respect, due to fault of the Contractor or his subcontractors, the Contractor shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the actual cost of labor and material necessarily involved in the examination and replacement, shall be allowed the Contractor and he shall, in addition, if completion of the work of the entire Contract has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.
- E. Inspection of materials and appurtenances to be incorporated in the improvements included in this Contract may be made at the place of production, manufacture or shipment, whenever the quantity justifies it, and such inspection and acceptance, unless otherwise stated in the technical specifications, shall be final, except as regards (1) latent defects, (2) departures from specific requirements of the Contract, (3) damage or loss in transit, or (4) fraud or such gross mistakes as amount to fraud. Subject to the requirements contained in the preceding sentence, the inspection of materials as a whole or in part will be made at the Project Site.
- F. Neither inspection, testing, approval nor acceptance of the work in whole or in part, by the **County** or its agents shall relieve the **Contractor** or his sureties of full responsibility for materials furnished or work performed not in strict accordance with the Contract.

#### REVIEW BY COUNTY

The **County** and its authorized representatives and agents shall have access to and be permitted to observe and review all work, materials, equipment, payrolls, personnel records, employment conditions, material invoices, and other relevant data and records pertaining to this Contract, provided, however that all instructions and approval with respect to the work will be given to the **Contractor** only by the **County** through its authorized representatives or agents.

#### FINAL INSPECTION

When the Improvements included in this Contract are substantially completed, the Architect shall notify the **County** in writing that the work will be ready for final inspection on a definite date, which shall be stated in the notice. The **County** will make the arrangements necessary to have final inspection commenced on the date stated in the notice, or as soon thereafter as is practicable. The AIA Certificate of Substantial Completion G704 form shall be used to determine date of substantial completion.

#### DEDUCTION FOR UNCORRECTED WORK

If the **County** deems it not expedient to require the **Contractor** to correct work not done in accordance with the Contract Documents, an equitable deduction from the Contract Price will be made by agreement between the **Contractor** and the **County** and subject to settlement, in case of dispute, as herein provided.

#### INSURANCE

The **Contractor** shall not commence work under this contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the **County**.

- A. Compensation Insurance: The **Contractor** shall procure and shall maintain during the life of this contract Workers Compensation Insurance as required by the State of Texas for all of his employees to be engaged in work at the site of the project under this contract and, in case of any such work sublet, the **Contractor** shall require the subcontractor similarly to provide Worker's Compensation Insurance for all of the employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractors Workers Compensation Insurance.
- B. Contractors Public Liability and Property Damage Insurance and Vehicle Insurance: The **Contractor** shall procure and shall maintain during the life of this contract Contractor's Public Liability Insurance, Contractor's Property Damage Insurance and Vehicle Liability Insurance in the following amounts: See Special Conditions of the Agreement.
- C. Proof of Insurance: The Contractor shall furnish the County with certificates showing the type, amount, class of operations covered, effective dates and date of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be canceled or materially altered, except after ten (10) days written notice has been received by the County."

#### **INDEMNITY**

Contractor shall indemnify, defend and hold harmless the Architect and Cameron County, its officials, officers, agents, and employees, from any and all liabilities, claims, demands, actions, losses, damages and costs, including all costs of defense thereof, of any nature whatsoever, for injury to or death of persons or loss or damage to property, or for any other reason (except for those resulting from the negligence of the County's or Architects' officials, officers, agents, and employees) occurring on the premises or in any manner arising out of or connected with Contractor's contractual obligations, including any claims, liabilities and actions based upon the acts or omissions of Contractor's officers, agents and employees.

#### WARRANTY OF TITLE

No material, supplies, or equipment to be installed or furnished under this Contract shall be purchased subject to any chattel mortgage or under a conditional sale, lease-purchase or other agreement by which an interest is retained by the seller or supplier. The **Contractor** shall warrant good title to all materials, supplies, and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed by him to the **County** free from any claims, liens, or charges. Neither the Contractor -nor any person, firm, or

corporation furnishing any material or labor for any work covered by this Contract shall have any right to a lien upon any improvement or appurtenance. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any law permitting such persons to look to funds due the **Contractor** in the hands of the **County**. The provisions of this paragraph shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

#### WARRANTY OF WORKMANSHIP AND MATERIALS

Neither the final certificate of payment nor any provision in the Contract nor partial or entire use of the improvements included in this Contract by the **County** or the public shall constitute an acceptance of work not done in accordance with the Contract or relieve the **Contractor** of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The **Contractor** shall promptly remedy any defects in the work and pay for any damage to other work resulting therefrom, which shall appear within a period of twelve (12) months from the date of final acceptance of the work.

#### COMPLIANCE WITH AIR AND WATER ACTS

In compliance with the Clean Air Act, as amended, 41 U.S.C. Sec 7401 ET. Seq., and the regulations of the Environmental Protection Agency with respect thereto, the **Contractor** agrees that:

- 1. Any facility to be utilized in the performance of this contract or any subcontract shall not be a facility listed on the EPA List of Violating Facilities pursuant to 40 CFR 15.20.
- 2. He will comply with all requirements of Section 114 of the Clean Air Act, as amended.

#### EQUAL EMPLOYMENT OPPORTUNITY

- A. The **Contractor** will not discriminate against any employee or the applicant for employment because of race, color, religion, sex, or national origin.
- B. The **Contractor** will cause the foregoing provision to be inserted in all subcontracts for any work covered by this contract so that such provisions will be binding upon each subcontractor, provided that the foregoing provisions shall not apply to contracts or subcontracts for standard commercial supplies or raw materials.
- C. Nothing herein provided shall be construed as a limitation upon the application of other laws, which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents.

#### AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS

The **Contractor** will not discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant for employment is qualified.

#### NON-SEGREGATED FACILITIES

The **Contractor** certifies that he does not and will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not and will not permit his employees any segregated facilities at any of his establishments, or permit his employees to per-form their services at any location, under his control, where segregated facilities are maintained. As used in this paragraph the term "segregated facilities" means any waiting rooms, work areas, rest rooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation. And housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise.

#### JOB OFFICES

- A. The **Contractor** will maintain such office and storage facilities on the site as are necessary for the proper conduct of the work. Subcontractors may do the same. These shall be located so as to cause no interference to any work to be performed on the site. The **County** shall be consulted with regard to locations.
- **B.** Upon completion of the improvements, or as directed by the **County**, the **Contractors** shall remove all such temporary structures and facilities from the site, and leave the site of the work in the condition required by the Contract.

#### CONTRACT DOCUMENTS AND DRAWINGS

The **Contractor** will be furnished a maximum number of TWENTY (20) free of charge, copies of Drawings and Project Manuals. Additional sets will be furnished at the cost of reproduction, postage, and handling.

#### CONTRACT PERIOD

The work to be performed under this contract shall commence within the time stipulated by the **County** in the Notice to Proceed, and shall be fully completed within 60 working days thereafter.

#### ABANDONMENT BY CONTRACTOR

In case the **Contractor** should abandon or fail to resume work within ten (10) days after written notification from the **County** or the Engineer, or the **Contractor** fails to comply with the orders of the Engineer when such orders are consistent with this contract or this Agreement or with the specifications hereto attached, then and in that case, the Surety on the bonds shall be notified in writing and directed to complete the work, and a copy of said notice shall be delivered to the **Contractor**.

After receiving said notice of abandonment, the **Contractor** shall not remove from the work any machinery, equipment, tools, materials or supplies then on the job, but the same, together with any materials and equipment under contract for work, may be held for use on the work by the **County** or the Surety on the construction bond, or another **Contractor**, in completion of the work; and the **Contractor** shall not receive any rental or credit therefore (except when used in connection with extra work, where credit shall be allowed as provided for under "Extra Work"), it being understood that the use of such

equipment and materials will ultimately reduce the cost to complete the work and be reflected in the final settlement.

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

- A. The **County** may thereupon employ such force of men and use such machinery, equipment, tools, materials and supplies as said **County** may deem necessary to complete the work and charge the expense of such labor, material, machinery, equipment, tools and supplies to said **Contractor** and the expense so charged shall be deducted and paid by the **County** out of such money as may be due, or that may thereafter at any time become due to the **Contractor** under and by virtue of this Agreement. In case such expense is more than the sum which would have been payable under this contract if the same had been completed by the Contractor, then the Contractor and/or his surety shall pay the amount of such excess to the County;
- B. The County, under sealed bids, after five (5) days' notice published one or more times in a newspaper having a general circulation in the County of the location of the work, may let a contract for the completion of the work under substantially the same terms and conditions which are provided in this contract. In case of any increase in cost to the County under the new contract as compared to what would have been the cost under this contract, such increase shall be charged to the Contractor and the Surety shall be and remain bound thereto. When the work shall have been substantially completed the Contractor and his Surety shall be notified and Certificates of Completion and Acceptance shall be issued as provided herein-above, a complete itemized statement of the contract accounts, certified to by the Engineer as being correct, shall then be prepared and delivered to the Contractor and his Surety, whereupon the Contractor and/or his Surety shall pay the balance due as reflected by said statement within twenty-one (21) days after the date of such Certificate of Completion.

In the event the statement of the account shows that the cost to complete the work is less than that which would have been the cost to the **County** had the work been completed by the **Contractor** under the terms of this contract and when the **Contractor** and/or his Surety shall pay the balance shown to be due by them to the **County**, then all machinery, equipment tools, materials or supplies left on the site of the work shall be turned over to the **Contractor** and/or his Surety. Should the cost to complete the work exceed the contract price and the **Contractor** and/or his Surety fail to pay the amount due the **County** within the time designated hereinabove, and there remains any machinery, equipment, tools, material or supplies on the site of the work, notice thereof, together with an itemized list of such equipment and materials, shall be mailed to the **Contractor** and his Surety at the respective addresses designated in this contract provided, however, that actual written notice given in any manner will satisfy this condition. After mailing or otherwise giving such notice, such property shall be held at the risk of the **Contractor** and his Surety subject only to the duty of the **County** to exercise ordinary care to protect such property. After fifteen (15) days from the date of said notice the **County** may sell such machinery,

equipment, tools, materials or supplies and apply the net sum derived from such sale to the credit of the **Contractor**, as the **County** may elect.

The **County** shall release any machinery, equipment, tools, materials or supplies, which remain on the work and belong to persons other than the **Contractor** or his Surety, to their proper Localities without notice to the **Contractor**.

#### ABANDONMENT BY THE COUNTY

In case the **County** shall fail to comply with the terms of this contract and should fail or refuse to comply with said terms within ten (15) days after written notifications by the **Contractor**, the **Contractor** may suspend or wholly abandon the work, and may remove therefrom all machinery, tools and equipment. And thereupon the Engineer shall make an estimate of the total earned by the **Contractor**, which estimate shall include the value of all work actually completed by said **Contractor** at the prices stated in the attached proposal, the value of all partially completed work at a fair and equitable price, and the amount of all extra work performed at the prices agreed upon, or provided for by the terms of this contract, and a reasonable sum to cover the cost of any provisions made by the **Contractor**, to carry the whole work to completion and which cannot be utilized. The Engineer shall then make a final statement of the balance due the **Contractor** by deducting from the above estimate all previous payments by the **County**, all other sums that may have been retained by the **County**, under the terms of this Agreement, and shall certify same to the **County** who shall pay to the **Contractor** on or before thirty (30) days after the date of the notification by the **Contractor**, the balance shown by said final statement as due the Contractor under the terms of this Agreement.

#### **BONDS**

It is further agreed by the parties of this contract that the **Contractor** shall execute a performance bond and a payment bond, each in the sum of one hundred (100%) percent, in the forms provided for this purpose, and it agreed that this contract shall not be in effect until such bonds are furnished and approved by the **County**.

#### RIGHTS AND REMEDIES

Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

No action or failure to act by the **County** or Architect or **Contractor** shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such act or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

#### Resolution No. 2008R12092

# A RESOLUTION IN SUPPORT OF MAINTAINING A HIGHER MINIMUM WAGE REQUIREMENT FOR ALL CONTRACTORS DOING WORK FOR CAMERON COUNTY.

Whereas, Cameron County, Texas, has in recent years shown unprecedented growth and experienced increasing cost of living expenses; and

**Whereas**, there exists within Cameron County, and particularly among the elected officials, a desire to improve the living conditions and income potential of the members of the local work force; and

**Whereas**, the Cameron County Commissioners' Court desires to provide an opportunity for an increase in the standard of living for employees in our area; and

**Whereas**, the Cameron County Commissioners' Court desires to continue awarding contracts to contractors who support their workers;

Cameron County Commissioners' Court does hereby pass this resolution to demonstrate support for an increase in the minimum wage of all workers employed by the contractors doing work for the County of Cameron;

Now therefore, the Cameron County Commissioners' Court hereby resolves to establish a minimum wage requirement for all contractors bidding on and being awarded contracts for goods or services to be provided to the County of Cameron,

THEREFORE, UPON THE PASSAGE OF THIS RESOLUTION, IT IS HEREBY DECREED, ORDAINED AND RESOLVED that the County of Cameron, Texas will require that all prime and subcontractor contracts explicitly include a minimum wage of \$8.50 per hour for all full time and part time employees hired by prime and subcontractors who bid for and perform all types of contractual work for the County.

Done on this the 16th day of December, 2008

Carlos Cascos County Judge

Attested by:

#### SPECIAL INSURANCE CONDITIONS OF THE AGREEMENT

The following minimum limits of insurance coverage will be required:

CONTRACTOR shall maintain, at his sole cost, at all times while performing work hereunder, the insurance coverage set forth below with companies satisfactory to the Company with full policy limits applying but not less than as stated. A Certificate evidencing the required insurance and specifically quitting the indemnification provision set forth in this agreement shall be delivered to the Company prior to commencement of the work and shall provide that any change restricting or reducing coverage or the cancellation of any policies under which certificates are issued shall not be valid as respects the Company's interest therein until the Company has received 30 days' notice in writing of such change or cancellation.

- (1) <u>Workman's Compensation Insurance</u> as required by laws and regulations applicable to and covering employees of CONTRACTOR engaged in the performance of the work under this agreement.
- (2) <u>Employer's Liability Insurance</u> protecting CONTRACTOR against common law liability, in the absence of statutory liability, for employee bodily injury arising out of the master/servant relationship with a limit of not less than \$100,000.
- (3) <u>Comprehensive General Liability Insurance including products/completed operation with limits of liability of not less than: Bodily Injury \$500,000 each Person, \$500,000 each occurrence/aggregate; Property Damage \$500,000 each occurrence/aggregate OR Combined Coverage limit \$5,000,000.</u>
- (4) <u>Automobile Liability Insurance including non-owned and hired vehicle coverage with limits of liability of not less than:</u> Bodily Injury \$250,000 each Person, \$500,000 each occurrence; Property Damage \$250,000 each occurrence.
- (5) Excess Liability Insurance Comprehensive General Liability, Comprehensive Automobile Liability and coverage afforded by the policies described above, with minimum limits of \$500,000 excess of the specified limits.
- (6) <u>Builder's "All-Risk Insurance"</u> protecting the respective interest of Company and CONTRACTOR and its "Field Sub-contractors" covering loss or damage during the course of construction of the project described in this agreement and all property at the job site or in transit thereof which shall become a part of such project. Such insurance shall be maintained until such project is completed and accepted. This insurance shall be terminated with respect to portions of such project when such portions are completed and accepted.

# SECTION 4: TECHNICAL SPECIFICATIONS

## **Item 100**

# **Preparing Right of Way**



#### 1. DESCRIPTION

Prepare the right of way and designated easements for construction operations by removing and disposing of all obstructions when removal of such obstructions is not specifically shown on the plans to be paid by other Items.

#### 2. CONSTRUCTION

Protect designated features on the right of way and prune trees and shrubs as directed. Do not park equipment, service equipment, store materials, or disturb the root area under the branches of trees designated for preservation. Treat cuts on trees with an approved tree wound dressing within 20 min. of making a pruning cut or otherwise causing damage to the tree when shown on the plans. Follow all local and state regulations when burning. Pile and burn brush at approved locations as directed. Coordinate work with state and federal authorities when working in state or national forests or parks. Test, remove, and dispose of hazardous materials in accordance with Article 6.10., "Hazardous Materials."

Clear areas shown on the plans of all obstructions, except those landscape features that are to be preserved. Such obstructions include remains of houses and other structures, foundations, floor slabs, concrete, brick, lumber, plaster, septic tank drain fields, basements, abandoned utility pipes or conduits, equipment, fences, retaining walls, and other items as specified on the plans. Remove vegetation and other landscape features not designated for preservation, curb and gutter, driveways, paved parking areas, miscellaneous stone, sidewalks, drainage structures, manholes, inlets, abandoned railroad tracks, scrap iron, and debris, whether above or below ground. Removal of live utility facilities is not included in this Item. Remove culverts, storm sewers, manholes, and inlets in proper sequence to maintain traffic and drainage.

Notify the Engineer in writing when items not shown on the plans and not reasonably detectable (buried with no obvious indication of presence) are encountered and required to be removed. These items will be handled in accordance with Article 4.5., "Differing Site Conditions."

Remove obstructions not designated for preservation to 2 ft. below natural ground in areas receiving embankment. Remove obstructions to 2 ft. below the excavation level in areas to be excavated. Remove obstructions to 1 ft. below natural ground in all other areas. Cut trees and stumps off to ground level when allowed by the plans or directed. Plug the remaining ends of abandoned underground structures over 3 in. in diameter with concrete to form a tight closure. Backfill, compact, and restore areas where obstructions have been removed unless otherwise directed. Use approved material for backfilling. Dispose of wells in accordance with Item 103, "Disposal of Wells."

Accept ownership, unless otherwise directed, and dispose of removed materials and debris at locations off the right of way in accordance with local, state, and federal requirements.

#### 3. MEASUREMENT

This Item will be measured by the acre; by the 100-ft. station, regardless of the width of the right of way; or by each tree removed.

#### 4. PAYMENT

For "acre" and "station" measurement, the work performed in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Preparing Right of Way." For "each"

measurement, the work performed in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Preparing Right of Way (Tree)" of the diameter specified. This price is full compensation for pruning of designated trees and shrubs; removal and disposal of structures and obstructions; backfilling of holes; furnishing and placing concrete for plugs; and equipment, labor, tools, and incidentals.

Total payment of this Item will not exceed 10% of the original contract amount until final acceptance. The remainder will be paid on the estimate after the final acceptance under Article 5.12., "Final Acceptance."

## **Item 105**

# Removing Treated and Untreated Base and Asphalt Pavement



#### 1. DESCRIPTION

Break, remove, and store or dispose of existing asphalt pavement, including surface treatments, and treated or untreated base materials.

#### 2. CONSTRUCTION

Break material retained by the Department into pieces not larger than 24 in. unless otherwise shown on the plans. Remove existing asphalt pavement before disturbing stabilized base. Avoid contamination of the asphalt materials and damage to adjacent areas. Repair material damaged by operations outside the designated locations.

Stockpile materials designated salvageable at designated sites when shown on the plans or as directed. Prepare stockpile site by removing vegetation and trash and by providing for proper drainage. Material not designated to be salvaged will become the property of the Contractor. When this material is disposed of, do so in accordance with federal, state, and local regulations.

#### 3. MEASUREMENT

This Item will be measured by the 100-ft. station along the baseline of each roadbed, by the square yard of existing treated or untreated base and asphalt pavement in its original position, or by the cubic yard of existing treated or untreated base and asphalt pavement in its original position, as calculated by the average end area method. Square yard and cubic yard measurement will be established by the widths and depths shown on the plans and the lengths measured in the field.

#### 4. PAYMENT

The work performed in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Removing Treated and Untreated Base and Asphalt Pavement" of the depth specified. This price is full compensation for breaking the material, loading, hauling, unloading, stockpiling or disposing; repair to areas outside designated locations for removal; and equipment, labor, tools, and incidentals.

# Item 110

## **Excavation**



#### 1. DESCRIPTION

Excavate areas as shown on the plans or as directed. Remove materials encountered to the lines, grades, and typical sections shown on the plans and cross-sections.

#### 2. CONSTRUCTION

Accept ownership of unsuitable or excess material and dispose of material in accordance with local, state, and federal regulations at locations outside the right of way.

Maintain drainage in the excavated area to avoid damage to the roadway section. Correct any damage to the subgrade caused by weather at no additional cost to the Department.

Shape slopes to avoid loosening material below or outside the proposed grades. Remove and dispose of slides as directed.

- 2.1. Rock Cuts. Excavate to finish subgrade. Manipulate and compact subgrade in accordance with Section 132.3.4., "Compaction Methods," unless excavation is to clean homogenous rock at finish subgrade elevation. Use approved embankment material compacted in accordance with Section 132.3.4., "Compaction Methods," to replace undercut material at no additional cost if excavation extends below finish subgrade.
- 2.2. **Earth Cuts**. Excavate to finish subgrade. Scarify subgrade to a uniform depth at least 6 in. below finish subgrade elevation in areas where base or pavement structure will be placed on subgrade. Manipulate and compact subgrade in accordance with Section 132.3.4., "Compaction Methods."

Take corrective measures as directed if unsuitable material is encountered below subgrade elevations.

2.3. **Subgrade Tolerances**. Excavate to within 1/2 in. in cross-section and 1/2 in. in 16 ft. measured longitudinally for turnkey construction. Excavate to within 0.1 ft. in cross-section and 0.1 ft. in 16 ft. measured longitudinally for staged construction.

#### 3. MEASUREMENT

This Item will be measured by the cubic yard in its original position as computed by the method of average end areas.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

Limits of measurement for excavation in retaining wall areas will be as shown on the plans.

Shrinkage or swelling factors will not be considered in determining the calculated quantities.

#### 4. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Excavation (Roadway)," "Excavation (Channel)," "Excavation (Special)," or "Excavation (Roadway and Channel)." This price is full compensation for

authorized excavation; drying; undercutting subgrade and reworking or replacing the undercut material in rock cuts; hauling; disposal of material not used elsewhere on the project; scarification and compaction; and equipment, labor, materials, tools, and incidentals.

Drying required deeper than 6 in. below subgrade elevation will be paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method." Excavation and replacement of unsuitable material below subgrade elevations will be performed and paid for in accordance with the applicable bid items. However, if Item 132, "Embankment," is not included in the Contract, payment for replacement of unsuitable material will be paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

When a slide not due to the Contractor's negligence or operation occurs, payments for removal and disposal of the slide material will be in accordance with Article 9.7., "Payment for Extra Work and Force Account Method." Excavation in backfill areas of retaining walls will not be measured or paid for directly but will be subsidiary to pertinent Items.

# Item 132 Embankment



#### 1. DESCRIPTION

Furnish, place, and compact materials for construction of roadways, embankments, levees, dikes, or any designated section of the roadway where additional material is required.

#### 2. MATERIALS

Furnish approved material capable of forming a stable embankment from required excavation in the areas shown on the plans or from sources outside the right of way. Provide one or more of the following types as shown on the plans:

■ Type A. Granular material that is free from vegetation or other objectionable material and meets the requirements of Table 1.

Table 1
Testing Requirements

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Property	Test Method	Specification Limit	
Liquid limit	<u>Tex-104-E</u>	<b>≤</b> 45	
Plasticity index (PI)	<u>Tex-106-E</u>	<b>≤</b> 15	
Bar linear shrinkage	<u>Tex-107-E</u>	≥ 2	

Perform the Linear Shrinkage test only as indicated in <u>Tex-104-E</u>.

- Type B. Materials such as rock, loam, clay, or other approved materials.
- Type C. Material meeting the specification requirements shown on the plans. Type C may be further designated as Type C1, C2, etc.
- Type D. Material from required excavation areas shown on the plans.

Meet the requirements of the pertinent retaining wall Items for retaining wall backfill material.

#### 3. CONSTRUCTION

Meet the requirements of Item 7, "Legal Relations and Responsibilities," when off right of way sources are used. Notify the Engineer before opening a material source to allow for required testing. Complete preparation of the right of way in accordance with Item 100, "Preparing Right of Way," for areas to receive embankment.

Backfill tree-stump holes or other minor excavations with approved material and tamp. Restore the ground surface, including any material disked loose or washed out, to its original slope. Compact the ground surface by sprinkling in accordance with Item 204, "Sprinkling," and by rolling using equipment complying with Item 210, "Rolling," when directed.

Scarify and loosen the unpaved surface areas, except rock, to a depth of at least 6 in. unless otherwise shown on the plans. Bench slopes before placing material. Begin placement of material at the toe of slopes. Do not place trees, stumps, roots, vegetation, or other objectionable material in the embankment. Simultaneously recompact scarified material with the placed embankment material. Do not exceed the layer depth specified in Section 132.3.4., "Compaction Methods."

Construct embankments to the grade and sections shown on the plans. Construct the embankment in layers approximately parallel to the finished grade for the full width of the individual roadway cross-sections unless otherwise shown on the plans. Ensure that each section of the embankment conforms to the detailed sections or slopes. Maintain the finished section, density, and grade until the project is accepted.

3.1. **Earth Embankments**. Earth embankment is mainly composed of material other than rock. Construct embankments in successive layers, evenly distributing materials in lengths suited for sprinkling and rolling.

Treat material in accordance with Item 260, "Lime Treatment (Road-Mixed)" or Item 275, "Cement Treatment (Road-Mixed)" when required. Obtain approval to incorporate rock and broken concrete produced by the construction project in the lower layers of the embankment. Place the rock and concrete outside the limits of the completed roadbed when the size of approved rock or broken concrete exceeds the layer thickness requirements in Section 132.3.4., "Compaction Methods." Cut and remove all exposed reinforcing steel from the broken concrete.

Move the material dumped in piles or windrows by blading or by similar methods and incorporate it into uniform layers. Featheredge or mix abutting layers of dissimilar material for at least 100 ft. to ensure there are no abrupt changes in the material. Break down clods or lumps of material and mix embankment until a uniform material is attained.

Apply water free of industrial wastes and other objectionable matter to achieve the uniform moisture content specified for compaction.

Roll and sprinkle each embankment layer in accordance with Section 132.3.4.1., "Ordinary Compaction," when ordinary compaction is specified. Compact the layer to the required density in accordance with Section 132.3.4.2., "Density Control," when density control is specified.

Rock Embankments. Rock embankment is mainly composed of rock. Construct rock embankments in successive layers for the full width of the roadway cross-section with a depth of 18 in. or less. Increase the layer depth for large rock sizes as approved. Do not exceed a depth of 2-1/2 ft. in any case. Fill voids created by the large stone matrix with smaller stones during the placement and filling operations.

3.2.

Ensure the depth of the embankment layer is greater than the maximum dimension of any rock. Do not place rock greater than 2 ft. in its maximum dimension, unless otherwise approved. Construct the final layer with graded material so that the density and uniformity is in accordance with Section 132.3.4., "Compaction Methods." Break up exposed oversized material as approved.

Roll and sprinkle each embankment layer in accordance with Section 132.3.4.1., "Ordinary Compaction," when ordinary compaction is specified. Compact each layer to the required density in accordance with Section 132.3.4.2., "Density Control," when density control is specified. Proof-roll each rock layer as directed, where density testing is not possible, in accordance with Item 216, "Proof Rolling," to ensure proper compaction.

- 3.3. **Embankments Adjacent to Culverts and Bridges**. Compact embankments adjacent to culverts and bridges in accordance with Item 400, "Excavation and Backfill for Structures."
- 3.4. Compaction Methods. Begin rolling longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least 1/2 the width of the roller. Begin rolling at the lower side and progress toward the high side on super elevated curves. Alternate roller trips to attain slightly different lengths. Compact embankments in accordance with Section 132.4.1., "Ordinary Compaction," or Section 132.3.4.2., "Density Control," as shown on the plans.
- 3.4.1. **Ordinary Compaction**. Use approved rolling equipment complying with Item 210, "Rolling," to compact each layer. Use specific equipment when required by the plans or the Engineer. Do not allow the loose depth of any layer to exceed 8 in., unless otherwise approved. Bring each layer to the moisture content directed

before and during rolling operations. Compact each layer until there is no evidence of further consolidation. Maintain a level layer to ensure uniform compaction. Recompact and refinish the subgrade at no additional expense to the Department if the required stability or finish is lost for any reason.

3.4.2. Density Control. Compact each layer to the required density using equipment complying with Item 210, "Rolling." Determine the maximum lift thickness based on the ability of the compacting operation and equipment to meet the required density. Do not exceed layer thickness of 16 in. loose or 12 in. compacted material unless otherwise approved. Maintain a level layer to ensure uniform compaction.

The Engineer will use  $\underline{\text{Tex-}114\text{-E}}$  to determine the maximum dry density (D<sub>a</sub>) and optimum moisture content (W<sub>opt</sub>). Meet the requirements for field density and moisture content in Table 2 unless otherwise shown on the plans.

Table 2
Field Density Control Requirements

Description	Density	Moisture Content	
	<u>Tex-115-E</u>		
PI ≤ 15	≥ 98% D <sub>a</sub>		
15 < PI ≤ 35	≥ 98% D <sub>a</sub> and ≤ 102% D <sub>a</sub>	≥ W <sub>opt.</sub>	
PI > 35	$\geq$ 95% D <sub>a</sub> and ≤ 100% D <sub>a</sub>	≥ W <sub>opt.</sub>	

Each layer is subject to testing by the Engineer for density and moisture content. During compaction, the moisture content of the soil should not exceed the value shown on the moisture-density curve, above optimum, required to achieve:

- 98% dry density for soils with a PI greater than 15 but less than or equal to 35 or
- 95% dry density for soils with PI greater than 35.

Remove small areas of the layer to allow for density tests as required. Replace the removed material and recompact at no additional expense to the Department. Proof-roll in accordance with Item 216, "Proof Rolling," when shown on the plans or as directed. Correct soft spots as directed.

- 3.5. **Maintenance of Moisture and Reworking**. Maintain the density and moisture content once all requirements in Table 2 are met. Maintain the moisture content no lower than 4% below optimum for soils with a PI greater than 15. Rework the material to obtain the specified compaction when the material loses the required stability, density, moisture, or finish. Alter the compaction methods and procedures on subsequent work to obtain specified density as directed.
- 3.6. Acceptance Criteria.
- 3.6.1. Grade Tolerances.
- 3.6.1.1. Staged Construction. Grade to within 0.1 ft. in the cross-section and 0.1 ft. in 16 ft. measured longitudinally.
- 3.6.1.2. **Turnkey Construction**. Grade to within 1/2 in. in the cross-section and 1/2 in. in 16 ft. measured longitudinally.
- 3.6.2. **Gradation Tolerances**. Ensure no more than 1 of the 5 most recent gradation tests is outside the specified limits on any individual sieve by more than 5% when gradation requirements are shown on the plans.
- 3.6.3. **Density Tolerances**. Ensure no more than 1 of the 5 most recent density tests for compaction work is outside the specified density limits, and no test is outside the limits by more than 3 pcf.
- 3.6.4. Plasticity Tolerances. Ensure no more than 1 of the 5 most recent PI tests for material is outside the specified limit by more than 2 points.

#### 4. MEASUREMENT

Embankment will be measured by the cubic yard. Measurement will be further defined for payment as follows:

- 4.1. Final. The cubic yard will be measured in its final position using the average end area method. The volume is computed between the original ground surface or the surface upon which the embankment is to be constructed and the lines, grades, and slopes of the embankment. In areas of salvaged topsoil, payment for embankment will be made in accordance with Item 160, "Topsoil." Shrinkage or swell factors will not be considered in determining the calculated quantities.
- 4.2. **Original**. The cubic yard will be measured in its original and natural position using the average end area method.
- 4.3. **Vehicle.** The cubic yard will be measured in vehicles at the point of delivery.

When measured by the cubic yard in its final position, this is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

Shrinkage or swell factors are the Contractor's responsibility. When shown on the plans, factors are for informational purposes only.

Measurement of retaining wall backfill in embankment areas is paid for as embankment unless otherwise shown on the plans. Limits of measurement for embankment in retaining wall areas are shown on the plans.

#### 5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Embankment (Final)," "Embankment (Original)," or "Embankment (Vehicle)" of the compaction method and type specified. This price is full compensation for furnishing embankment; hauling; placing, compacting, finishing, and reworking; disposal of waste material; and equipment, labor, tools, and incidentals.

When proof rolling is directed, it will be paid for in accordance with Item 216, "Proof Rolling."

All sprinkling and rolling, except proof rolling, will not be paid for directly but will be considered subsidiary to this Item, unless otherwise shown on the plans.

Where subgrade is constructed under this Contract, correction of soft spots in the subgrade will be at the Contractor's expense. Where subgrade is not constructed under this Contract, correction of soft spots in the subgrade will be paid in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

# Item 161 Compost



#### 1. DESCRIPTION

Furnish and place compost as shown on the plans.

#### 2. MATERIALS

Furnish compost that has been produced by aerobic (biological) decomposition of organic matter and meets the requirements of Table 1. Compost feedstock may include, but is not limited to, leaves and yard trimmings, biosolids, food scraps, food-processing residuals, manure or other agricultural residuals, forest residues, bark, and paper. Ensure compost and wood chips do not contain any visible refuse, other physical contaminants, or any substance considered harmful to plant growth. Do not use materials that have been treated with chemical preservatives as a compost feedstock or as wood chips. Do not use mixed municipal solid waste compost. Provide compost meeting all applicable 40 CFR 503 standards for Class A biosolids and TCEQ health and safety regulations as defined in the TAC, Chapter 332, including the time and temperature standards in Subchapter B, Part 23. Meet the requirements of the United States Composting Council (USCC) Seal of Testing Assurance (STA) program.

Before delivery of the compost, provide quality control (QC) documentation that includes the following:

- the feedstock by percentage in the final compost product,
- a statement that the compost meets federal and state health and safety regulations,
- a statement that the composting process has met time and temperature requirements,
- a copy of the producer's STA certification, and
- a copy of the lab analysis, performed by an STA-certified lab, verifying that the compost meets the requirements of Table 1.

Provide a copy of the current TCEQ compliance statement signed by the facility manager when furnishing biosolids compost.

Table 1
Physical Requirements for Compost

Property	Test Method	Requirement
Particle Size	TMECC¹ 02.02-B, "Sample Sieving for Aggregate Size Classification"	95% passing 5/8" 70% passing 3/8"
Heavy Metals Content	TMECC 04.06, "Heavy Metals and Hazardous Elements": 04.06-As, Arsenic 04.06-Cd, Cadmium 04.06-Cu, Copper 04.06-Pb, Lead 04.06-Hg, Mercury 04.06-Mo, Molybdenum 04.06-Ni, Nickel 04.06-Se, Selenium 04.06-Zn, Zinc	Pass
Salinity	TMECC 04.10-A, "1:5 Slurry Method, Mass Basis"	5.0 dS/m Max <sup>2</sup>
pH	TMECC 04.11-A, "1:5 Slurry pH"	5.5–8.5
Maturity	TMECC 05.05-A, "% Emergence and Relative Seedling Vigor"	> 80%
Organic Matter Content	TMECC 05.07-A, "Loss-On-Ignition Organic Matter Method"	25-65% (dry mass)
Stability	TMECC 05.08-B, "Carbon Dioxide Evolution Rate"	≤8
Fecal Coliform	TMECC 07.01-B, "Fecal Coliforms"	1,000 MPN/g Max

Test Methods for the Examination of Composting and Compost, published by the United States Department of Agriculture and the USCC.

A soluble salt content up to 10.0 dS/m for compost used in compost-manufactured topsoil will be acceptable.

Maintain compost in designated stockpiles at the producer's site. The Department reserves the right to sample compost at the jobsite. Material may be tested to verify compliance with this Specification by a STA-certified lab. Make payment to the STA-certified lab approved by the Department. Submit lab invoices for passing tests to the Department for reimbursement. Maintain a complete record of all test reports for the previous and current calendar year.

- 2.1. Compost Manufactured Topsoil (CMT). Use CMT consisting of 75% topsoil blended with 25% compost measured by volume. Use topsoil conforming to Article 160.2., "Materials."
- 2.2. **Erosion Control Compost (ECC)**. Use ECC consisting of 50% untreated wood chips blended with 50% compost measured by volume. Use wood chips less than or equal to 5 in. in length with 95% passing a 2-in. screen and less than 30% passing a 1-in. screen.
- 2.3. **General Use Compost (GUC)**. Use GUC consisting of 100% compost.

#### 3. CONSTRUCTION

Prepare the types of compost for use on the project and stockpile at the jobsite.

- 3.1. Compost Manufactured Topsoil (CMT). After excavation and embankment work is complete, remove and dispose of objectionable material from the topsoil before blending. Use equipment capable of blending CMT uniformly to the full depth as specified. Roll the CMT with a light corrugated drum.
- 3.2. **Erosion Control Compost (ECC)**. Use only on slopes 3:1 or flatter. Apply a 2-in. uniform layer after excavation and embankment work is complete unless otherwise shown on the plans or directed. Use a light roller or other suitable equipment when rolling is specified.
- 3.3. **General Use Compost (GUC)**. Apply in a uniform layer as a top dressing on established vegetation to the depth shown on the plans. Do not bury existing vegetation. Apply GUC as a backfill ingredient, in a planting soil mixture, for planting bed preparation, or as mulch, when shown on the plans.

#### 4. MEASUREMENT

This Item will be measured by the 100-ft. station along the baseline of each roadbed, by the square yard complete in place, or by the cubic yard in vehicles at the point of delivery.

For ECC cubic yard measurement, the quantity will be the composite material, compost and topsoil or wood chips.

#### 5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Compost Manufactured Topsoil," "Erosion Control Compost," and "General Use Compost" as follows:

For measurement by the station and square yard, payment will be for the depth specified;

For measurement by the cubic yard, payment will be made for material measured in vehicles.

This price is full compensation for loading, hauling, stockpiling, blending, placing, rolling, sprinkling, equipment, labor, materials (including topsoil for CMT and wood chips for ECC), tools, and incidentals. Costs associated with passing quality assurance (QA) testing will be paid for in accordance with the requirements of Article 9.7., "Payment for Extra Work and Force Account Method," at invoice price with no add-ons.

## **Item 247**

## Flexible Base



#### 1. DESCRIPTION

Construct a foundation course composed of flexible base.

#### 2. MATERIALS

Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of the proposed material sources and of changes to material sources. The Engineer may sample and test project materials at any time before compaction throughout the duration of the project to assure specification compliance. Use Tex-100-E material definitions.

2.1. **Aggregate.** Furnish aggregate of the type and grade shown on the plans and meeting the requirements of Table 1. Each source must meet Table 1 requirements for liquid limit, plasticity index, and wet ball mill for the grade specified. Do not use additives, such as but not limited to lime, cement, or fly ash to modify aggregates to meet the requirements of Table 1 unless shown on the plans.

Table 1
Material Requirements

Property	Test Method	Grade 1–2	Grade 3	Grade 4 <sup>2</sup>	Grade 5
Sampling	Tex-400-A				
Master gradation sieve size (cumulative % retained)					
2-1/2"		0	0		0
1-3/4"	T 140 F	0–10	0–10		0–5
7/8"	Tex-110-E	10–35	_	As shown on the	10–35
3/8"	1	30–65	_	plans	35–65
#4	1	45–75	45–75		45–75
#40	1	65–90	50-85		70–90
Liquid Limit, % Max	Tex-104-E	40	40	As shown on the plans	35
Plasticity Index, Max <sup>1</sup>	T 400 F	10	12	As shown on the plans	10
Plasticity index, Min <sup>1</sup>	- Tex-106-E	As shown on the plans			
Wet ball mill, % Max	Tex-116-E	40	-	As shown on the plans	40
Wet ball mill, % Max increase passing the #40 sieve	- 1ex-110-E	20	-	As shown on the plans	20
Min compressive strength, psi					
lateral pressure 0 psi	Tex-117-E	35	-	As shown on the	-
lateral pressure 3 psi	167-11/-F	-	_	plans	90
lateral pressure 15 psi		175	_		175

- 1. Determine plastic index in accordance with Tex-107-E (linear shrinkage) when liquid limit is unattainable as defined in Tex-104-E.
- 2. Grade 4 may be further designated as Grade 4A, Grade 4B, etc.
- 2.1.1. **Material Tolerances**. The Engineer may accept material if no more than 1 of the 5 most recent gradation tests has an individual sieve outside the specified limits of the gradation.

When target grading is required by the plans, no single failing test may exceed the master grading by more than 5 percentage points on sieves No. 4 and larger or 3 percentage points on sieves smaller than No. 4.

The Engineer may accept material if no more than 1 of the 5 most recent plasticity index tests is outside the specified limit. No single failing test may exceed the allowable limit by more than 2 points.

- 2.1.2. **Material Types**. Do not use fillers or binders unless approved. Furnish the type specified on the plans in accordance with the following:
- 2.1.2.1. **Type A**. Crushed stone produced and graded from oversize quarried aggregate that originates from a single, naturally occurring source. Do not use gravel or multiple sources.
- 2.1.2.2. **Type B.** Crushed or uncrushed gravel. Blending of 2 or more sources is allowed.
- 2.1.2.3. **Type C**. Crushed gravel with a minimum of 60% of the particles retained on a No. 4 sieve with 2 or more crushed faces as determined by Tex-460-A, Part I. Blending of 2 or more sources is allowed.
- 2.1.2.4. **Type D**. Type A material or crushed concrete. Crushed concrete containing gravel will be considered Type D material. Crushed concrete must meet the requirements in Section 247.2.1.3.2., "Recycled Material (Including Crushed Concrete) Requirements," and be managed in a way to provide for uniform quality. The Engineer may require separate dedicated stockpiles in order to verify compliance.
- 2.1.2.5. **Type E**. Caliche, iron ore or as otherwise shown on the plans.
- 2.1.3. **Recycled Material**. Recycled asphalt pavement (RAP) and other recycled materials may be used when shown on the plans. Request approval to blend 2 or more sources of recycled materials.
- 2.1.3.1. **Limits on Percentage**. Do not exceed 20% RAP by weight, when RAP is allowed, unless otherwise shown on the plans. The percentage limitations for other recycled materials will be as shown on the plans.
- 2.1.3.2. Recycled Material (Including Crushed Concrete) Requirements.
- 2.1.3.2.1. Contractor-Furnished Recycled Materials. Provide recycled materials that have a maximum sulfate content of 3,000 ppm when tested in accordance with Tex-145-E. When the Contractor furnishes the recycled materials, including crushed concrete, the final product will be subject to the requirements of Table 1 for the grade specified. Certify compliance with DMS-11000, "Evaluating and Using Nonhazardous Recyclable Materials Guidelines," for Contractor furnished recycled materials. In addition, recycled materials must be free from reinforcing steel and other objectionable material and have at most 1.5% deleterious material when tested in accordance with Tex-413-A. For RAP, do not exceed a maximum percent loss from decantation of 5.0% when tested in accordance with Tex-406-A. Test RAP without removing the asphalt.
- 2.1.3.2.2. **Department-Furnished Required Recycled Materials**. When the Department furnishes and requires the use of recycled materials, unless otherwise shown on the plans:
  - Department-required recycled material will not be subject to the requirements in Table 1,
  - Contractor-furnished materials are subject to the requirements in Table 1 and this Item,
  - the final product, blended, will be subject to the requirements in Table 1, and
  - for final product, unblended (100% Department-furnished required recycled material), the liquid limit, plasticity index, wet ball mill, and compressive strength is waived.

Crush Department-furnished RAP so that 100% passes the 2 in. sieve. The Contractor is responsible for uniformly blending to meet the percentage required.

- 2.1.3.2.3. **Department-Furnished and Allowed Recycled Materials**. When the Department furnishes and allows the use of recycled materials or allows the Contractor to furnish recycled materials, the final blended product is subject to the requirements of Table 1 and the plans.
- 2.1.3.3. **Recycled Material Sources**. Department-owned recycled material is available to the Contractor only when shown on the plans. Return unused Department-owned recycled materials to the Department stockpile location designated by the Engineer unless otherwise shown on the plans.

The use of Contractor-owned recycled materials is allowed when shown on the plans. Contractor-owned surplus recycled materials remain the property of the Contractor. Remove Contractor-owned recycled materials from the project and dispose of them in accordance with federal, state, and local regulations before project acceptance. Do not intermingle Contractor-owned recycled material with Department-owned recycled material unless approved.

- 2.2. **Water**. Furnish water free of industrial wastes and other objectionable matter.
- 2.3. **Material Sources**. Expose the vertical faces of all strata of material proposed for use when non-commercial sources are used. Secure and process the material by successive vertical cuts extending through all exposed strata, when directed.

#### 3. EQUIPMENT

Provide machinery, tools, and equipment necessary for proper execution of the work.

- 3.1. Provide rollers in accordance with Item 210, "Rolling." Provide proof rollers in accordance with Item 216, "Proof Rolling," when required.
- 3.2. When ride quality measurement is required, provide a high speed or lightweight inertial profiler certified at the Texas A&M Transportation Institute. Provide equipment certification documentation. Display a current decal on the equipment indicating the certification expiration date.

#### 4. CONSTRUCTION

Construct each layer uniformly, free of loose or segregated areas, and with the required density and moisture content. Provide a smooth surface that conforms to the typical sections, lines, and grades shown on the plans or as directed.

Stockpile base material temporarily at an approved location before delivery to the roadway. Build stockpiles in layers no greater than 2 ft. thick. Stockpiles must have a total height between 10 and 16 ft. unless otherwise approved. After construction and acceptance of the stockpile, loading from the stockpile for delivery is allowed. Load by making successive vertical cuts through the entire depth of the stockpile.

Do not add or remove material from temporary stockpiles that require sampling and testing before delivery unless otherwise approved. Charges for additional sampling and testing required as a result of adding or removing material will be deducted from the Contractor's estimates.

Haul approved flexible base in clean trucks. Deliver the required quantity to each 100-ft. station or designated stockpile site as shown on the plans. Prepare stockpile sites as directed. When delivery is to the 100-ft. station, manipulate in accordance with the applicable Items.

4.1. **Preparation of Subgrade or Existing Base**. Remove or scarify existing asphalt concrete pavement in accordance with Item 105, "Removing Treated and Untreated Base and Asphalt Pavement," when shown on the plans or as directed. Shape the subgrade or existing base to conform to the typical sections shown on the plans or as directed.

When new base is required to be mixed with existing base, deliver, place, and spread the new flexible base in the required amount per station. Manipulate and thoroughly mix the new base with existing material to provide a uniform mixture to the specified depth before shaping.

Proof roll the roadbed in accordance with Item 216, "Proof Rolling," before pulverizing or scarifying when shown on the plans or directed. Correct soft spots as directed.

4.2. **Placing.** Spread and shape flexible base into a uniform layer with an approved spreader the same day as delivered unless otherwise approved. Construct layers to the thickness shown on the plans. Maintain the

shape of the course. Control dust by sprinkling, as directed. Correct or replace segregated areas as directed, at no additional expense to the Department.

Place successive base courses and finish courses using the same construction methods required for the first course.

4.3. **Compaction**. Compact using density control unless otherwise shown on the plans. Multiple lifts are permitted when shown on the plans or approved. Bring each layer to the moisture content directed. When necessary, sprinkle the material in accordance with Item 204, "Sprinkling."

Begin rolling longitudinally at the sides and proceed towards the center, overlapping on successive trips by at least 1/2 the width of the roller unit. Begin rolling at the low side and progress toward the high side on superelevated curves. Offset alternate trips of the roller. Operate rollers at a speed between 2 and 6 mph as directed.

Rework, recompact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish requirements before the next course is placed or the project is accepted. Continue work until specification requirements are met. Perform the work at no additional expense to the Department.

Before final acceptance, the Engineer will select the locations of tests and measure the flexible base depth in accordance with Tex-140-E. Correct areas deficient by more than 1/2 in. in thickness by scarifying, adding material as required, reshaping, recompacting, and refinishing at the Contractor's expense.

- 4.3.1. **Ordinary Compaction**. Roll with approved compaction equipment as directed. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing approved material as required, reshaping, and recompacting.
- 4.3.2. **Density Control**. Compact to at least 100% of the maximum dry density determined by Tex-113-E, unless otherwise shown on the plans. Maintain moisture during compaction within ±2 percentage points of the optimum moisture content as determined by Tex-113-E. Measure the moisture content of the material in accordance with Tex-115-E or Tex-103-E during compaction daily and report the results the same day to the Engineer, unless otherwise shown on the plans or directed. Do not achieve density by drying the material after compaction.

The Engineer will determine roadway density and moisture content of completed sections in accordance with Tex-115-E. The Engineer may accept the section if no more than 1 of the 5 most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.

4.4. **Finishing**. After completing compaction, clip, skin, or tight-blade the surface with a maintainer or subgrade trimmer to a depth of approximately 1/4 in. Remove loosened material and dispose of it at an approved location. Seal the clipped surface immediately by rolling with a pneumatic tire roller until a smooth surface is attained. Add small increments of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades as shown on the plans or as directed.

Correct grade deviations greater than 1/4 in. in 16 feet measured longitudinally or greater than 1/4 in. over the entire width of the cross-section in areas where surfacing is to be placed. Correct by loosening and adding, or removing material. Reshape and re-compact in accordance with Section 247.4.3., "Compaction."

- 4.5. **Curing**. Cure the finished section until the moisture content is at least 2 percentage points below optimum or as directed before applying the next successive course or prime coat.
- 4.6. **Ride Quality**. This section applies to the final travel lanes that receive a 1 or 2 course surface treatment for the final surface, unless otherwise shown on the plans. Measure ride quality of the base course after placement of the prime coat and before placement of the surface treatment, unless otherwise approved. Use a certified profiler operator from the Department's MPL. When requested, furnish the Engineer documentation for the person certified to operate the profiler.

Provide all profile measurements to the Engineer in electronic data files within 3 days after placement of the prime coat using the format specified in Tex-1001-S. The Engineer will use Department software to evaluate longitudinal profiles to determine areas requiring corrective action. Correct 0.1-mi.sections having an average international roughness index (IRI) value greater than 100.0 in. per mile to an IRI value of 100.0 in. per mile or less for each wheelpath, unless otherwise shown on the plans.

Re-profile and correct sections that fail to maintain ride quality until placement of the next course, as directed. Correct re-profiled sections until specification requirements are met, as approved. Perform this work at no additional expense to the Department.

#### 5. MEASUREMENT

Flexible base will be measured as follows:

- Flexible Base (Complete In Place). The ton, square yard, or any cubic yard method.
- Flexible Base (Roadway Delivery). The ton or any cubic yard method.
- Flexible Base (Stockpile Delivery). The ton, cubic yard in vehicle, or cubic yard in stockpile.

Measurement by the cubic yard in final position and square yard is a plans quantity measurement. The quantity to be paid for is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

Measurement is further defined for payment as follows.

- 5.1. **Cubic Yard in Vehicle.** By the cubic yard in vehicles of uniform capacity at the point of delivery.
- 5.2. **Cubic Yard in Stockpile**. By the cubic yard in the final stockpile position by the method of average end areas.
- 5.3. **Cubic Yard in Final Position**. By the cubic yard in the completed and accepted final position. The volume of base course is computed in place by the method of average end areas between the original subgrade or existing base surfaces and the lines, grades, and slopes of the accepted base course as shown on the plans.
- 5.4. **Square Yard**. By the square yard of surface area in the completed and accepted final position. The surface area of the base course is based on the width of flexible base as shown on the plans.
- 5.5. **Ton**. By the ton of dry weight in vehicles as delivered. The dry weight is determined by deducting the weight of the moisture in the material at the time of weighing from the gross weight of the material. The Engineer will determine the moisture content in the material in accordance with Tex-103-E from samples taken at the time of weighing.

When material is measured in trucks, the weight of the material will be determined on certified scales, or the Contractor must provide a set of standard platform truck scales at a location approved by the Engineer. Scales must conform to the requirements of Item 520, "Weighing and Measuring Equipment."

#### 6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for the types of work shown below. No additional payment will be made for thickness or width exceeding that shown on the typical section or provided on the plans for cubic yard in the final position or square yard measurement.

Sprinkling and rolling, except proof rolling, will not be paid for directly but will be subsidiary to this Item unless otherwise shown on the plans. When proof rolling is shown on the plans or directed, it will be paid for in accordance with Item 216, "Proof Rolling."

Where subgrade is constructed under this Contract, correction of soft spots in the subgrade will be at the Contractor's expense. Where subgrade is not constructed under this Contract, correction of soft spots in the subgrade will be paid in accordance with pertinent Items or Article 4.4., "Changes in the Work."

- Flexible Base (Complete In Place). Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle," "In Stockpile," or "In Final Position" will be specified. For square yard measurement, a depth will be specified. This price is full compensation for furnishing materials, temporary stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials, spreading, blading, mixing, shaping, placing, compacting, reworking, finishing, correcting locations where thickness is deficient, curing, furnishing scales and labor for weighing and measuring, and equipment, labor, tools, and incidentals.
- 6.2. **Flexible Base (Roadway Delivery)**. Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle," "In Stockpile," or "In Final Position" will be specified. The unit price bid will not include processing at the roadway. This price is full compensation for furnishing materials, temporary stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials, furnishing scales and labor for weighing and measuring, and equipment, labor, tools, and incidentals.
- Flexible Base (Stockpile Delivery). Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle" or "In Stockpile" will be specified. The unit price bid will not include processing at the roadway. This price is full compensation for furnishing and disposing of materials, preparing the stockpile area, temporary or permanent stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials to the stockpile, furnishing scales and labor for weighing and measuring, and equipment, labor, tools, and incidentals.

### **Item 251**

## **Reworking Base Courses**



#### 1. DESCRIPTION

Refinish or rework existing base material with or without asphaltic concrete pavement. Incorporate new base material when shown on the plans.

#### 2. MATERIALS

Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of the proposed material sources and of changes to material sources. The Engineer will verify that the specification requirements are met before the sources can be used. The Engineer may sample and test project materials at any time before compaction. Use Tex-100-E for material definitions.

- 2.1. **Flexible Base**. Furnish new base material that meets the requirements of Item 247, "Flexible Base," for the type and grade shown on the plans.
- 2.2. **Water**. Furnish water free of industrial wastes and other objectionable matter.

#### 3. EQUIPMENT

Provide machinery, tools, and equipment necessary for proper execution of the work.

- 3.1. **Compaction Equipment**. Provide rollers in accordance with Item 210, "Rolling." Provide rollers in accordance with Item 216, "Proof Rolling," when required.
- 3.2. **Pulverization Equipment**. Provide pulverization equipment that:
  - cuts and pulverizes material uniformly to the proper depth with cutters that plane to a uniform surface over the entire width of the cut,
  - provides a visible indication of the depth of cut at all times, and
  - uniformly mixes the materials.

#### 4. CONSTRUCTION

Perform work to the width and depth shown on the typical sections for the type of work shown on the plans. Construct and shape exposed subgrade to conform to typical sections as shown on the plans or as directed. Proof roll in accordance with Item 216, "Proof Rolling," when shown on the plans. Correct soft spots as directed.

Before scarifying, clean the existing base of objectionable materials by blading, brooming, or other approved methods, unless otherwise shown on the plans. Perform this work in accordance with applicable Items.

- 4.1. Types of Work.
- 4.1.1. **Type A**. Scarifying only.
- 4.1.2. **Type B.** Scarifying, salvaging, and re-laying.

- 4.1.3. **Type C**. Scarifying and reshaping.
- 4.1.4. **Type D**. Refinishing.
- 4.2. **Performance of Work**.
- 4.2.1. **Scarifying**. Loosen and break existing base material, with or without existing asphaltic concrete pavement. Remove asphalt concrete pavement, surface treatment, plant-mix seal, and micro-surfacing when shown on the plans and in accordance with applicable items. Prevent contamination of asphalt material during and after removal. When the existing pavement consists of only a surface treatment, do not remove before scarifying. Scarify existing material for its full width and depth unless otherwise shown on the plans. Do not disturb the underlying subgrade. Break material into particles of not more than 2-1/2 in. unless otherwise shown on the plans.
- 4.2.2. **Salvaging**. Remove the existing base material and stockpile. Windrow if allowed. Perform salvage operations without interfering with traffic, proper drainage, or the general requirements of the work. Remove scarified material using a method approved by the Engineer. Keep material free of contamination.
- 4.2.3. **Re-Laying**. Prepare subgrade as shown on the plans or as directed before relaying salvaged material. Proof roll in accordance with Item 216, "Proof Rolling," when shown on the plans. Correct soft spots as directed.

Return and rework salvaged base material, with or without additional new base material, on the prepared roadbed. Place salvaged material on the prepared subgrade and sprinkle, blade, and shape the base to conform to the typical sections shown on the plans or as directed. Place new base material and uniformly mix with salvaged material when shown on the plans. Correct, or remove and replace, segregated material with satisfactory material, as directed.

- 4.2.4. **Reshaping**. Rework scarified base material with or without additional new base material. Mix and shape scarified base to conform to the typical sections shown on the plans. When shown on the plans, furnish new base material, and uniformly mix with scarified material before shaping. Do not disturb the underlying subgrade. Correct, or remove and replace, segregated material with satisfactory material as directed.
- 4.2.5. **Refinishing**. Blade existing base surface to remove irregularities. Cure before placing the pavement on the refinished base, as shown on the plans or as directed.
- 4.3. **Compaction**. Compact using ordinary compaction or density control as shown on the plans. Bring each layer to the moisture content directed. When necessary, sprinkle the material in accordance with Item 204, "Sprinkling."

Begin rolling longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least one-half the width of the roller unit. On superelevated curves, begin rolling at the low side and progress toward the high side. Offset alternate trips of the roller. Operate rollers at a speed between 2 and 6 mph, as directed.

Rework, recompact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish before the next course is placed or the project is accepted. Continue work until specification requirements are met. Perform the work at no additional expense to the Department.

- 4.3.1. **Ordinary Compaction**. Roll with approved compaction equipment as directed. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing approved material as required, reshaping, and recompacting.
- 4.3.2. **Density Control**. Determine the moisture content in the mixture at the beginning of and during compaction in accordance with Tex-103-E. Compact to at least 98% of the maximum density determined by Tex-113-E, unless otherwise shown on the plans.

The Engineer will determine roadway density of completed sections in accordance with Tex-115-E. The Engineer may accept the section if no more than 1 of the 5 most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.

4.4. **Finishing**. Immediately after completing compaction, clip, skin, or tight-blade the surface with a maintainer or subgrade trimmer to a depth of approximately 1/4 in. Remove and dispose of loosened material at an approved location. Seal the clipped surface immediately by rolling with a pneumatic tire roller until a smooth surface is attained. Add small amounts of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades shown on the plans or as directed.

In areas where surfacing is to be placed, correct grade deviations in excess of 1/4 in. in 16 ft. measured longitudinally for the entire width of the cross-section. Correct by loosening, adding, or removing material. Reshape and recompact in accordance with Section 251.4.3., "Compaction."

4.5. **Curing**. Cure the finished section until the moisture content is at least 2% below optimum or as directed before applying the next successive course or prime coat.

#### 5. MEASUREMENT

This Item will be measured by the station, square yard, cubic yard, or ton.

Square yard and cubic yard in original position measurement will be established by the widths and depths shown on the plans and the lengths measured in the field.

When material is measured in trucks, the weight of the material will be determined on certified scales, or the Contractor must provide a set of standard platform truck scales at a location approved by the Engineer. Scales must conform to the requirements of Item 520, "Weighing and Measuring Equipment."

Measurement is further defined for payment as follows.

- 5.1. **Station**. By the 100-ft. station measured along the centerline of each roadbed.
- 5.2. **Square Yard**. By the square yard of existing base or pavement in its original position. When square yard measurement is used, limits of measurement will be as shown on the plans.
- 5.3. **Cubic Yard in Vehicle.** By the cubic yard of salvaged material in vehicles as delivered at the stockpile.
- 5.4. **Cubic Yard in Stockpile**. By the cubic yard of salvaged material in the final stockpile position by the method of average end areas.
- 5.5. **Cubic Yard in Original Position**. By the cubic yard in its original position measured by the method of average end areas.
- 5.6. **Ton**. By the ton of dry weight in the trucks as delivered at the stockpile. The dry weight is determined by deducting the weight of the moisture in the material at the time of weighing from the gross weight of the material. The Engineer will determine the moisture content in the material in accordance with Tex-103-E from samples taken at the time of truck weighing.

#### 6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Reworking Base Material" for the type, scarified depth, and compaction method shown on the plans. For cubic yard measurements, the measurement location (vehicle, stockpile, or original position) will be specified. No additional payment will be made for thickness or width exceeding that shown on the typical sections or provided on the plans for station, square yard, and cubic yard in the original position measurement. This price is full compensation for furnishing and

disposing of materials, blading, brooming, scarifying, salvaging, replacing, stockpiling, reshaping, refinishing, compacting, finishing, curing, and equipment, labor, tools, and incidentals.

Furnishing and delivering new base will be paid for in accordance with Section 247.6.2., "Flexible Base (Roadway Delivery)." Mixing, spreading, blading, shaping, compacting, and finishing new or existing base material will not be paid for directly but will be subsidiary to this Item.

Sprinkling and rolling, except proof rolling, will not be paid for directly but will be subsidiary to this Item, unless otherwise shown on the plans. When proof rolling is shown on the plans or directed by the Engineer, it will be paid for in accordance with Item 216, "Proof Rolling."

Where subgrade is constructed under this Contract, correction of soft spots in the subgrade or existing base will be at the Contractor's expense. Where subgrade is not constructed under this Contract, correction of soft spots in the subgrade or existing base will be in accordance with pertinent Items or Article 4.4., "Changes in the Work."

Removal of existing asphalt concrete pavement will be paid for in accordance with pertinent Items or Article 4.4., "Changes in the Work."

Additional restrictions for measurement and payment are as follows:

- Type A. Work will be restricted to station and square yard measurement.
- **Type B**. Work will be restricted to station, square yard, and cubic yard in the original position measurement.
- **Type C**. Work will be restricted to station, square yard, and cubic yard in the original position measurement.
- Type D. Work will be restricted to station and square yard measurement.

### **Item 260**

## **Lime Treatment (Road-Mixed)**



#### 1. DESCRIPTION

Mix and compact lime, water, and subgrade or base (with or without asphaltic concrete pavement) in the roadway.

#### 2. MATERIALS

Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of the proposed material sources and of changes to material sources. Obtain verification from the Engineer that the specification requirements are met before using the sources. The Engineer may sample and test project materials at any time before compaction. Use Tex-100-E for material definitions.

- 2.1. Lime. Furnish lime that meets the requirements of DMS-6350 "Lime and Lime Slurry," and DMS-6330, "Pre-Qualification of Lime Sources." Use hydrated lime, commercial lime slurry, quicklime, or carbide lime slurry as shown on the plans. Do not use quicklime when sulfates are present in quantities greater than 3,000 ppm. When furnishing quicklime, provide it in bulk.
- 2.2. **Subgrade**. The Engineer will determine the sulfate content of the existing subgrade in accordance with Tex-145-E and organic content in accordance with Tex-148-E before lime treatment begins. Suspend operations when material to be treated has a sulfate content greater than 7,000 ppm or an organic content greater than 1.0% and proceed as directed.
- 2.3. **Flexible Base**. Unless otherwise shown on the plans, furnish base material that meets the requirements of Item 247, "Flexible Base," for the type and grade shown on the plans, before the addition of lime.
- Water. Furnish water free of industrial wastes and other objectionable material.
- 2.5. **Asphalt**. When asphalt or emulsion is permitted for curing purposes, furnish materials that meet the requirements of Item 300, "Asphalts, Oils, and Emulsions," as shown on the plans or as directed.
- 2.6. **Mix Design**. The Engineer will determine the target lime content and optimum moisture content in accordance with Tex-121-E or prior experience with the project materials. The Contractor may propose a mix design developed in accordance with Tex-121-E. The Engineer will use Tex-121-E to verify the Contractor's proposed mix design before acceptance. Reimburse the Department for subsequent mix designs or partial designs necessitated by changes in the material or requests by the Contractor. Limit the amount of recycled asphalt pavement to no more than 50% of the mix unless otherwise shown on the plans or directed.

#### 3. EQUIPMENT

Provide machinery, tools, and equipment necessary for proper execution of the work. Provide rollers in accordance with Item 210, "Rolling." Provide proof rollers in accordance with Item 216, "Proof Rolling," when required.

- Storage Facility. Store quicklime and dry hydrated lime in closed, weatherproof containers.
- 3.2. **Slurry Equipment**. Use slurry tanks equipped with agitation devices to slurry hydrated lime or quicklime on the project or other approved location. The Engineer may approve other slurrying methods.

- 3.3. Provide a pump for agitating the slurry when the distributor truck is not equipped with an agitator. Equip the distributor truck with a sampling device in accordance with Tex-600-J, Part I, when using commercial lime slurry or carbide lime slurry.
- 3.4. **Hydrated Lime Distribution Equipment**. Provide equipment to spread lime evenly across the area to be treated. Provide equipment with a rotary vane feeder to spread lime, when shown on the plans.
- 3.5. **Pulverization Equipment**. Provide pulverization equipment that:
  - cuts and pulverizes material uniformly to the proper depth with cutters that plane to a uniform surface over the entire width of the cut.
  - provides a visible indication of the depth of cut at all times, and
  - uniformly mixes the materials.

#### 4. CONSTRUCTION

Construct each layer uniformly, free of loose or segregated areas, and with the required density and moisture content. Provide a smooth surface that conforms to the typical sections, lines, and grades shown on the plans or as directed.

4.1. **Preparation of Subgrade or Existing Base for Treatment**. Before treating, remove existing asphalt pavement in accordance with Item 105, "Removing Treated and Untreated Base and Asphalt Pavement," when shown on the plans or as directed. Shape existing material in accordance with applicable bid items to conform to typical sections shown on the plans and as directed.

Unless otherwise approved, proof roll the roadbed in accordance with Item 216, "Proof Rolling," before pulverizing or scarifying existing material. Correct soft spots as directed.

When material is imported from a borrow source, notify the Engineer of the location of the borrow source well in advance to allow time for testing and approval to avoid delay to the project. Stockpile as directed. The Engineer will test the borrow source and determine the sulfate and organic contents. When the borrow source has a sulfate content greater than 3,000 ppm or an organic content greater than 1.0%, proceed as directed.

When new base material is required to be mixed with existing base, deliver, place, and spread the new material in the required amount per station. Manipulate and thoroughly mix new base with existing material to provide a uniform mixture to the specified depth before shaping.

- 4.2. **Pulverization**. Pulverize or scarify existing material after shaping so that 100% passes a 2-1/2 in. sieve. If the material cannot be uniformly processed to the required depth in a single pass, excavate and windrow the material to expose a secondary grade to achieve processing to plan depth.
- 4.3. **Application of Lime**. Uniformly apply lime using dry or slurry placement as shown on the plans or as directed. Add lime at the percentage determined in Section 260.2.6., "Mix Design." Apply lime only on an area where mixing can be completed during the same working day.

Start lime application only when the air temperature is at least 35°F and rising or is at least 40°F. The temperature will be taken in the shade and away from artificial heat. Suspend application when the Engineer determines that weather conditions are unsuitable.

Minimize dust and scattering of lime by wind. Do not apply lime when wind conditions, in the opinion of the Engineer, cause blowing lime to become dangerous to traffic or objectionable to adjacent property owners. When pebble grade quicklime is placed dry, mix the material and lime thoroughly at the time of lime application. Use of quicklime can be dangerous. Inform users of the recommended precautions for handling and storage.

- 4.3.1. **Dry Placement**. Before applying lime, bring the prepared roadway to approximately 2 percentage points above optimum moisture content. When necessary, sprinkle in accordance with Item 204, "Sprinkling." Distribute the required quantity of hydrated lime or pebble grade quicklime with approved equipment. Only hydrated lime may be distributed by bag. Do not use a motor grader to spread hydrated lime.
- 4.3.2. **Slurry Placement**. Provide slurry free of objectionable materials, at or above the minimum dry solids content, and with a uniform consistency that will allow ease of handling and uniform application. Deliver commercial lime slurry or carbide lime slurry to the jobsite, or use hydrated lime or quicklime to prepare lime slurry at the jobsite or other approved location, as specified. When dry quicklime is applied as slurry, use 80% of the amount shown on the plans.

Distribute slurry uniformly by making successive passes over a measured section of roadway until the specified lime content is reached. Uniformly spread the residue from quicklime slurry over the length of the roadway being processed, unless otherwise directed.

4.4. **Mixing**. Begin mixing within 6 hr. of application of lime. Hydrated lime exposed to the open air for 6 hr. or more between application and mixing, or that experiences excessive loss due to washing or blowing, will not be accepted for payment.

Thoroughly mix the material and lime using approved equipment. When treating subgrade, bring the moisture content above the optimum moisture content to insure adequate chemical reaction of the lime and subgrade materials. Allow the mixture to mellow for 1 to 4 days, as directed. When pebble grade quicklime is used, allow the mixture to mellow for 2 to 4 days, as directed. Sprinkle the treated materials during the mixing and mellowing operation, as directed, to achieve adequate hydration and proper moisture content. When the material to be treated has a sulfate content greater than 3,000 ppm but less than or equal to 7,000 ppm, mellow for a minimum of 7 days. Maintain in a continuously moist condition by sprinkling in accordance with Item 204, "Sprinkling." After mellowing, resume mixing until a homogeneous, friable mixture is obtained. After mixing, the Engineer may sample the mixture at roadway moisture and test in accordance with Tex-101-E, Part III, to determine compliance with the gradation requirements in Table 1.

Table 1
Gradation Requirements (Minimum % Passing)

Oracation requirements (minimum 70 r assing)				
Sieve Size	Base	Subgrade		
1-3/4"	100	100		
3/4"	85	85		
#4	_	60		

4.5.

**Compaction**. Compact the mixture using density control, unless otherwise shown on the plans. Multiple lifts are permitted when shown on the plans or approved. Bring each layer to the moisture content directed. Sprinkle the treated material in accordance with Item 204, "Sprinkling" or aerate the treated material to adjust the moisture content during compaction so that it is no more than 1.0 percentage points below optimum and 2.0 percentage points above optimum as determined by Tex-121-E. Measure the moisture content of the material in accordance with Tex-115-E or Tex-103-E during compaction daily and report the results the same day, unless otherwise shown on the plans or directed.

Begin rolling longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least 1/2 the width of the roller unit. On superelevated curves, begin rolling at the low side and progress toward the high side. Offset alternate trips of the roller. Operate rollers at a speed between 2 and 6 mph as directed.

Before final acceptance, the Engineer will select the locations of tests in each unit and measure the treated depth in accordance with Tex-140-E. Correct areas deficient by more than 1/2 in. in thickness or more than 1/2% in target lime content by adding lime as required, reshaping, recompacting, and refinishing at the Contractor's expense.

Rework, recompact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish before the next course is placed or the project is accepted. Continue work until specification

requirements are met. Rework in accordance with Section 260.4.6., "Reworking a Section." Perform the work at no additional expense to the Department.

- 4.5.1. Ordinary Compaction. Roll with approved compaction equipment, as directed. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing treated material as required, reshaping, and recompacting.
- 4.5.2. **Density Control**. The Engineer will determine roadway density and moisture content of completed sections in accordance with Tex-115-E. The Engineer may accept the section if no more than 1 of the 5 most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.
- 4.5.2.1. **Subgrade**. Compact to at least 95% of the maximum density determined in accordance with Tex-121-E, unless otherwise shown on the plans.
- 4.5.2.2. **Base**. Compact the bottom course to at least 95% of the maximum density determined in accordance with Tex-121-E, unless otherwise shown on the plans. Compact subsequent courses treated under this Item to at least 98% of the maximum density determined in accordance with Tex-121-E, unless otherwise shown on the plans.
- 4.6. **Reworking a Section**. When a section is reworked within 72 hr. after completion of compaction, rework the section to provide the required density. When a section is reworked more than 72 hr. after completion of compaction, add additional lime at 25% of the percentage determined in Section 260.2.6., "Mix Design." Reworking includes loosening, adding material or removing unacceptable material if necessary, mixing as directed, compacting, and finishing. When density control is specified, determine a new maximum density of the reworked material in accordance with Tex-121-E, and compact to at least 95% of this density.
- 4.7. **Finishing**. Immediately after completing compaction of the final course, clip, skin, or tight-blade the surface of the lime-treated material with a maintainer or subgrade trimmer to a depth of approximately 1/4 in. Remove loosened material and dispose of at an approved location. Roll the clipped surface immediately with a pneumatic tire roller until a smooth surface is attained. Add small amounts of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades shown on the plans or as directed.

Finish grade of constructed subgrade to within 0.1 ft. in the cross-section and 0.1 ft. in 16 ft. measured longitudinally.

Correct grade deviations of constructed base greater than 1/4 in. in 16 ft. measured longitudinally or greater than 1/4 in. over the entire width of the cross-section in areas where surfacing is to be placed. Remove excess material, reshape, and roll with a pneumatic-tire roller. Correct as directed if material is more than 1/4 in. low. Do not surface patch. The 72-hr. time limit required for completion of placement, compaction, and finishing does not apply to finishing required just before applying the surface course.

4.8. **Curing**. Cure for the minimum number of days shown in Table 2 by sprinkling in accordance with Item 204, "Sprinkling," or by applying an asphalt material at a rate of 0.05 to 0.20 gal. per square yard as directed. Maintain moisture during curing. Upon completion of curing, maintain the moisture content in accordance with Section 132.3.5., "Maintenance of Moisture and Reworking," for subgrade and Section 247.4.5., "Curing" for bases before placing subsequent courses. Do not allow equipment on the finished course during curing except as required for sprinkling, unless otherwise approved. Apply seals or additional courses within 14 calendar days of final compaction.

Table 2
Minimum Curing Requirements before Placing Subsequent Courses<sup>1</sup>

minimum during requirements before r lacing dubocquent doubtee			
Untreated Material	Curing (Days)		
PI ≤ 35	2		
PI > 35	5		

Subject to the approval of the Engineer. Proof rolling may be required as an indicator of adequate curing.

#### 5. MEASUREMENT

5.1. **Lime**. When lime is furnished in trucks, the weight of lime will be determined on certified scales, or the Contractor must provide a set of standard platform truck scales at a location approved by the Engineer. Scales must conform to the requirements of Item 520, "Weighing and Measuring Equipment."

When lime is furnished in bags, indicate the manufacturer's certified weight. Bags varying more than 5% from that weight may be rejected. The average weight of bags in any shipment, as determined by weighing 10 bags taken at random, must be at least the manufacturer's certified weight.

- 5.1.1. **Hydrated Lime**.
- 5.1.1.1. **Dry**. Lime will be measured by the ton (dry weight).
- 5.1.1.2. **Slurry**. Lime slurry will be measured by the ton (dry weight) of the hydrated lime used to prepare the slurry at the jobsite.
- 5.1.2. **Commercial Lime Slurry**. Lime slurry will be measured by the ton (dry weight) as calculated from the minimum percent dry solids content of the slurry, multiplied by the weight of the slurry in tons delivered.
- 5.1.3. Quicklime.
- 5.1.3.1. **Dry**. Lime will be measured by the ton (dry weight) of the quicklime.
- 5.1.3.2. **Slurry**. Lime slurry will be measured by the ton (dry weight) of the quicklime used to prepare the slurry multiplied by a conversion factor of 1.28 to give the quantity of equivalent hydrated lime, which will be the basis of payment.
- 5.1.4. **Carbide Lime Slurry**. Lime slurry will be measured by the ton (dry weight) as calculated from the minimum percent dry solids content of the slurry, multiplied by the weight of the slurry in tons delivered.
- 5.2. **Lime Treatment**. Lime treatment will be measured by the square yard of surface area. The dimensions for determining the surface area are established by the widths shown on the plans and the lengths measured at placement.

#### 6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid in accordance with Section 260.6.1., "Lime," and Section 260.6.2., "Lime Treatment."

Furnishing and delivering new base will be paid for in accordance with Section 247.6.2., "Flexible Base (Roadway Delivery)." Mixing, spreading, blading, shaping, compacting, and finishing new or existing base material will be paid for in accordance with Section 260.6.2., "Lime Treatment." Removal and disposal of existing asphalt concrete pavement will be paid for in accordance with pertinent Items or Article 4.4., "Changes in the Work."

Sprinkling and rolling, except proof rolling, will not be paid for directly but will be subsidiary to this Item, unless otherwise shown on the plans. When proof rolling is shown on the plans or directed by the Engineer, it will be paid for in accordance with Item 216, "Proof Rolling."

Where subgrade is constructed under this Contract, correction of soft spots in the subgrade or existing base will be at the Contractor's expense. Where subgrade is not constructed under this Contract, correction of soft spots in the subgrade or existing base will be paid for in accordance with pertinent Items or Article 4.4., "Changes in the Work."

Where subgrade to be treated under this Contract has sulfates greater than 7,000 ppm, work will be paid for in accordance with Article 4.4., "Changes in the Work."

Asphalt used solely for curing will not be paid for directly but will be subsidiary to this Item. Asphalt placed for curing and priming will be paid for under Item 310, "Prime Coat."

- 6.1. **Lime**. Lime will be paid for at the unit price bid for "Lime" of one of the following types:
  - Hydrated Lime (Dry),
  - Hydrated Lime (Slurry),
  - Commercial Lime Slurry,
  - Quicklime (Dry),
  - Quicklime (Slurry), or
  - Carbide Lime Slurry.

This price is full compensation for materials, delivery, equipment, labor, tools, and incidentals.

Lime used for reworking a section in accordance with Section 260.4.6., "Reworking a Section," will not be paid for directly but will be subsidiary to this Item.

6.2. Lime Treatment. Lime treatment will be paid for at the unit price bid for "Lime Treatment (Existing Material)," "Lime Treatment (New Base)," or "Lime Treatment (Mixing Existing Material and New Base)," for the depth specified. No payment will be made for thickness or width exceeding that shown on the plans. This price is full compensation for shaping existing material, loosening, mixing, pulverizing, spreading, applying lime, compacting, finishing, curing, curing materials, blading, shaping and maintaining shape, replacing mixture, disposing of loosened materials, processing, hauling, preparing secondary subgrade, water, equipment, labor, tools, and incidentals.

### **Item 341**

## **Dense-Graded Hot-Mix Asphalt**



#### 1. DESCRIPTION

Construct a hot-mix asphalt (HMA) pavement layer composed of a compacted, dense-graded mixture of aggregate and asphalt binder mixed hot in a mixing plant. Pay adjustments will apply to HMA placed under this specification unless the HMA is deemed exempt in accordance with Section 341.4.9.4., "Exempt Production."

#### 2. MATERIALS

Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications.

Notify the Engineer of all material sources and before changing any material source or formulation. The Engineer will verify that the specification requirements are met when the Contractor makes a source or formulation change, and may require a new laboratory mixture design, trial batch, or both. The Engineer may sample and test project materials at any time during the project to verify specification compliance in accordance with Item 6, "Control of Materials."

- 2.1. Aggregate. Furnish aggregates from sources that conform to the requirements shown in Table 1 and as specified in this Section. Aggregate requirements in this Section, including those shown in Table 1, may be modified or eliminated when shown on the plans. Additional aggregate requirements may be specified when shown on the plans. Provide aggregate stockpiles that meet the definitions in this Section for coarse, intermediate, or fine aggregate. Aggregate from reclaimed asphalt pavement (RAP) is not required to meet Table 1 requirements unless otherwise shown on the plans. Supply aggregates that meet the definitions in Tex-100-E for crushed gravel or crushed stone. The Engineer will designate the plant or the quarry as the sampling location. Provide samples from materials produced for the project. The Engineer will establish the Surface Aggregate Classification (SAC) and perform Los Angeles abrasion, magnesium sulfate soundness, and Micro-Deval tests. Perform all other aggregate quality tests listed in Table 1. Document all test results on the mixture design report. The Engineer may perform tests on independent or split samples to verify Contractor test results. Stockpile aggregates for each source and type separately. Determine aggregate gradations for mixture design and production testing based on the washed sieve analysis given in Tex-200-F, Part II.
- 2.1.1. Coarse Aggregate. Coarse aggregate stockpiles must have no more than 20% material passing the No. 8 sieve. Aggregates from sources listed in the Department's Bituminous Rated Source Quality Catalog (BRSQC) are preapproved for use. Use only the rated values for hot-mix listed in the BRSQC. Rated values for surface treatment (ST) do not apply to coarse aggregate sources used in hot-mix asphalt.

For sources not listed on the Department's BRSQC:

- build an individual stockpile for each material;
- request the Department test the stockpile for specification compliance; and
- once approved, do not add material to the stockpile unless otherwise approved.

Provide aggregate from non-listed sources only when tested by the Engineer and approved before use. Allow 30 calendar days for the Engineer to sample, test, and report results for non-listed sources.

Provide coarse aggregate with at least the minimum SAC shown on the plans. SAC requirements only apply to aggregates used on the surface of travel lanes. SAC requirements apply to aggregates used on surfaces

other than travel lanes when shown on the plans. The SAC for sources on the Department's *Aggregate Quality Monitoring Program* (AQMP) (Tex-499-A) is listed in the BRSQC.

2.1.1.1. Blending Class A and Class B Aggregates. Class B aggregate meeting all other requirements in Table 1 may be blended with a Class A aggregate to meet requirements for Class A materials. Ensure that at least 50% by weight, or volume if required, of the material retained on the No. 4 sieve comes from the Class A aggregate source when blending Class A and B aggregates to meet a Class A requirement. Blend by volume if the bulk specific gravities of the Class A and B aggregates differ by more than 0.300. Coarse aggregate from RAP and Recycled Asphalt Shingles (RAS) will be considered as Class B aggregate for blending purposes.

The Engineer may perform tests at any time during production, when the Contractor blends Class A and B aggregates to meet a Class A requirement, to ensure that at least 50% by weight, or volume if required, of the material retained on the No. 4 sieve comes from the Class A aggregate source. The Engineer will use the Department's mix design Excel template, when electing to verify conformance, to calculate the percent of Class A aggregate retained on the No. 4 sieve by inputting the bin percentages shown from readouts in the control room at the time of production and stockpile gradations measured at the time of production. The Engineer may determine the gradations based on either washed or dry sieve analysis from samples obtained from individual aggregate cold feed bins or aggregate stockpiles. The Engineer may perform spot checks using the gradations supplied by the Contractor on the mixture design report as an input for the Excel template; however, a failing spot check will require confirmation with a stockpile gradation determined by the Engineer.

2.1.1.2. Micro-Deval Abrasion. The Engineer will perform a minimum of one Micro-Deval abrasion test in accordance with Tex-461-A for each coarse aggregate source used in the mixture design that has a Rated Source Soundness Magnesium (RSSM) loss value greater than 15 as listed in the BRSQC. The Engineer will perform testing before the start of production and may perform additional testing at any time during production. The Engineer may obtain the coarse aggregate samples from each coarse aggregate source or may require the Contractor to obtain the samples. The Engineer may waive all Micro-Deval testing based on a satisfactory test history of the same aggregate source.

The Engineer will estimate the magnesium sulfate soundness loss for each coarse aggregate source, when tested, using the following formula:

 $Mg_{est.} = (RSSM)(MD_{act.}/RSMD)$ 

where:

Mgest = magnesium sulfate soundness loss MDact = actual Micro-Deval percent loss RSMD = Rated Source Micro-Deval

When the estimated magnesium sulfate soundness loss is greater than the maximum magnesium sulfate soundness loss specified, the coarse aggregate source will not be allowed for use unless otherwise approved. The Engineer will consult the Geotechnical, Soils, and Aggregates Branch of the Construction Division, and additional testing may be required before granting approval.

2.1.2. Intermediate Aggregate. Aggregates not meeting the definition of coarse or fine aggregate will be defined as intermediate aggregate. Supply intermediate aggregates, when used, that are free from organic impurities. The Engineer may test the intermediate aggregate in accordance with Tex-408-A to verify the material is free from organic impurities. Supply intermediate aggregate from coarse aggregate sources, when used, that meet the requirements shown in Table 1 unless otherwise approved.

Test the stockpile if 10% or more of the stockpile is retained on the No. 4 sieve, and verify that it meets the requirements in Table 1 for crushed face count (Tex-460-A) and flat and elongated particles (Tex-280-F).

2.1.3. **Fine Aggregate**. Fine aggregates consist of manufactured sands, screenings, and field sands. Fine aggregate stockpiles must meet the gradation requirements in Table 2. Supply fine aggregates that are free

from organic impurities. The Engineer may test the fine aggregate in accordance with Tex-408-A to verify the material is free from organic impurities. No more than 15% of the total aggregate may be field sand or other uncrushed fine aggregate. Use fine aggregate, with the exception of field sand, from coarse aggregate sources that meet the requirements shown in Table 1 unless otherwise approved.

Test the stockpile if 10% or more of the stockpile is retained on the No. 4 sieve and verify that it meets the requirements in Table 1 for crushed face count (Tex-460-A) and flat and elongated particles (Tex-280-F).

Table 1
Aggregate Quality Requirements

/ tggi egate wat	Aggregate quality requirements				
Property	Test Method	Requirement			
Coarse Aggregate					
SAC	Tex-499-A (AQMP)	As shown on the plans			
Deleterious material, %, Max	Tex-217-F, Part I	1.5			
Decantation, %, Max	Tex-217-F, Part II	1.5			
Micro-Deval abrasion, %	Tex-461-A	Note <sup>1</sup>			
Los Angeles abrasion, %, Max	Tex-410-A	40			
Magnesium sulfate soundness, 5 cycles, %, Max	Tex-411-A	30			
Crushed face count,2 %, Min	Tex-460-A, Part I	85			
Flat and elongated particles @ 5:1, %, Max	Tex-280-F	10			
Fine A	ggregate				
Linear shrinkage, %, Max	Tex-107-E	3			
Combined Aggregate <sup>3</sup>					
Sand equivalent, %, Min Tex-203-F 45					
4 11 14 6 4 6 1 1 1 1 1 1 1 1 1 1 1 1 1		1 10			

- Used to estimate the magnesium sulfate soundness loss in accordance with Section 341.2.1.1.2., "Micro-Deval Abrasion."
- 2. Only applies to crushed gravel.

2.2.

Aggregates, without mineral filler, RAP, RAS, or additives, combined as used in the job-mix formula (JMF).

Table 2
Gradation Requirements for Fine Aggregate

Sieve Size	% Passing by Weight or Volume
3/8"	100
#8	70–100
#200	0–30

Mineral Filler. Mineral filler consists of finely divided mineral matter such as agricultural lime, crusher fines, hydrated lime, or fly ash. Mineral filler is allowed unless otherwise shown on the plans. Use no more than 2% hydrated lime or fly ash unless otherwise shown on the plans. Use no more than 1% hydrated lime if a substitute binder is used unless otherwise shown on the plans or allowed. Test all mineral fillers except hydrated lime and fly ash in accordance with Tex-107-E to ensure specification compliance. The plans may require or disallow specific mineral fillers. Provide mineral filler, when used, that:

- is sufficiently dry, free-flowing, and free from clumps and foreign matter as determined by the Engineer;
- does not exceed 3% linear shrinkage when tested in accordance with Tex-107-E; and
- meets the gradation requirements in Table 3.

Table 3
Gradation Requirements for Mineral Filler

Sieve Size	% Passing by Weight or Volume
#8	100
#200	55–100

- 2.3. **Baghouse Fines**. Fines collected by the baghouse or other dust-collecting equipment may be reintroduced into the mixing drum.
- 2.4. **Asphalt Binder**. Furnish the type and grade of performance-graded (PG) asphalt specified on the plans.

2.5. **Tack Coat.** Furnish CSS-1H, SS-1H, or a PG binder with a minimum high-temperature grade of PG 58 for tack coat binder in accordance with Item 300, "Asphalts, Oils, and Emulsions." Specialized or preferred tack coat materials may be allowed or required when shown on the plans. Do not dilute emulsified asphalts at the terminal, in the field, or at any other location before use.

The Engineer will obtain at least one sample of the tack coat binder per project in accordance with Tex-500-C, Part III, and test it to verify compliance with Item 300, "Asphalts, Oils, and Emulsions." The Engineer will obtain the sample from the asphalt distributor immediately before use.

- 2.6. **Additives.** Use the type and rate of additive specified when shown on the plans. Additives that facilitate mixing, compaction, or improve the quality of the mixture are allowed when approved. Provide the Engineer with documentation such as the bill of lading showing the quantity of additives used in the project unless otherwise directed.
- 2.6.1. **Lime and Liquid Antistripping Agent.** When lime or a liquid antistripping agent is used, add in accordance with Item 301, "Asphalt Antistripping Agents." Do not add lime directly into the mixing drum of any plant where lime is removed through the exhaust stream unless the plant has a baghouse or dust collection system that reintroduces the lime into the drum.
- 2.6.2. **Warm Mix Asphalt (WMA)**. Warm Mix Asphalt (WMA) is defined as HMA that is produced within a target temperature discharge range of 215°F and 275°F using approved WMA additives or processes from the Department's MPL.

WMA is allowed for use on all projects and is required when shown on the plans. When WMA is required, the maximum placement or target discharge temperature for WMA will be set at a value below 275°F.

Department-approved WMA additives or processes may be used to facilitate mixing and compaction of HMA produced at target discharge temperatures above 275°F; however, such mixtures will not be defined as WMA.

2.7. **Recycled Materials**. Use of RAP and RAS is permitted unless otherwise shown on the plans. Do not exceed the maximum allowable percentages of RAP and RAS shown in Table 4. The allowable percentages shown in Table 4 may be decreased or increased when shown on the plans. Determine asphalt binder content and gradation of the RAP and RAS stockpiles for mixture design purposes in accordance with Tex-236-F. The Engineer may verify the asphalt binder content of the stockpiles at any time during production. Perform other tests on RAP and RAS when shown on the plans. Asphalt binder from RAP and RAS is designated as recycled asphalt binder. Calculate and ensure that the ratio of the recycled asphalt binder to total binder does not exceed the percentages shown in Table 5 during mixture design and HMA production when RAP or RAS is used. Use a separate cold feed bin for each stockpile of RAP and RAS during HMA production.

Surface, intermediate, and base mixes referenced in Tables 4 and 5 are defined as follows:

- Surface. The final HMA lift placed at or near the top of the pavement structure;
- Intermediate. Mixtures placed below an HMA surface mix and less than or equal to 8.0 in. from the riding surface; and
- Base. Mixtures placed greater than 8.0 in. from the riding surface.
- 2.7.1. RAP. RAP is salvaged, milled, pulverized, broken, or crushed asphalt pavement. Crush or break RAP so that 100% of the particles pass the 2 in. sieve. Fractionated RAP is defined as 2 or more RAP stockpiles, divided into coarse and fine fractions.

Use of Contractor-owned RAP including HMA plant waste is permitted unless otherwise shown on the plans. Department-owned RAP stockpiles are available for the Contractor's use when the stockpile locations are shown on the plans. If Department-owned RAP is available for the Contractor's use, the Contractor may use Contractor-owned fractionated RAP and replace it with an equal quantity of Department-owned RAP. This allowance does not apply to a Contractor using unfractionated RAP. Department-owned RAP generated through required work on the Contract is available for the Contractor's use when shown on the plans.

Perform any necessary tests to ensure Contractor- or Department-owned RAP is appropriate for use. The Department will not perform any tests or assume any liability for the quality of the Department-owned RAP unless otherwise shown on the plans. The Contractor will retain ownership of RAP generated on the project when shown on the plans.

The coarse RAP stockpile will contain only material retained by processing over a 3/8-in. or 1/2-in. screen unless otherwise approved. The fine RAP stockpile will contain only material passing the 3/8-in. or 1/2-in. screen unless otherwise approved. The Engineer may allow the Contractor to use an alternate to the 3/8-in. or 1/2-in. screen to fractionate the RAP. The maximum percentages of fractionated RAP may be comprised of coarse or fine fractionated RAP or the combination of both coarse and fine fractionated RAP.

Do not use Department- or Contractor-owned RAP contaminated with dirt or other objectionable materials. Do not use Department- or Contractor-owned RAP if the decantation value exceeds 5% and the plasticity index is greater than 8. Test the stockpiled RAP for decantation in accordance with Tex-406-A, Part I. Determine the plasticity index in accordance with Tex-106-E if the decantation value exceeds 5%. The decantation and plasticity index requirements do not apply to RAP samples with asphalt removed by extraction or ignition.

Do not intermingle Contractor-owned RAP stockpiles with Department-owned RAP stockpiles. Remove unused Contractor-owned RAP material from the project site upon completion of the project. Return unused Department-owned RAP to the designated stockpile location.

Table 4
Maximum Allowable Amounts of RAP<sup>1</sup>

Maximum Allowable		Maximum Allowable			
Fractionated RAP <sup>2</sup> (%)		Unfractionated RAP <sup>3</sup> (%)		(%)	
Surface	Intermediate	Base	Surface	Intermediate	Base
20.0	30.0	40.0	10.0	10.0	10.0

- 1. Must also meet the recycled binder to total binder ratio shown in Table 5.
- 2. Up to 5% RAS may be used separately or as a replacement for fractionated RAP.
- 3. Unfractionated RAP may not be combined with fractionated RAP or RAS.

2.7.2.

RAS. Use of post-manufactured RAS or post-consumer RAS (tear-offs) is permitted unless otherwise shown on the plans. Up to 5% RAS may be used separately or as a replacement for fractionated RAP in accordance with Table 4 and Table 5. RAS is defined as processed asphalt shingle material from manufacturing of asphalt roofing shingles or from re-roofing residential structures. Post-manufactured RAS is processed manufacturer's shingle scrap by-product. Post-consumer RAS is processed shingle scrap removed from residential structures. Comply with all regulatory requirements stipulated for RAS by the TCEQ. RAS may be used separately or in conjunction with RAP.

Process the RAS by ambient grinding or granulating such that 100% of the particles pass the 3/8 in. sieve when tested in accordance with Tex-200-F, Part I. Perform a sieve analysis on processed RAS material before extraction (or ignition) of the asphalt binder.

Add sand meeting the requirements of Table 1 and Table 2 or fine RAP to RAS stockpiles if needed to keep the processed material workable. Any stockpile that contains RAS will be considered a RAS stockpile and be limited to no more than 5.0% of the HMA mixture in accordance with Table 4.

Certify compliance of the RAS with DMS-11000, "Evaluating and Using Nonhazardous Recyclable Materials Guidelines." Treat RAS as an established nonhazardous recyclable material if it has not come into contact with any hazardous materials. Use RAS from shingle sources on the Department's MPL. Remove substantially all materials before use that are not part of the shingle, such as wood, paper, metal, plastic, and felt paper. Determine the deleterious content of RAS material for mixture design purposes in accordance with Tex-217-F, Part III. Do not use RAS if deleterious materials are more than 0.5% of the stockpiled RAS unless otherwise approved. Submit a sample for approval before submitting the mixture design. The Department will perform the testing for deleterious material of RAS to determine specification compliance.

- 2.8. **Substitute Binders**. Unless otherwise shown on the plans, the Contractor may use a substitute PG binder listed in Table 5 instead of the PG binder originally specified, if the substitute PG binder and mixture made with the substitute PG binder meet the following:
  - the substitute binder meets the specification requirements for the substitute binder grade in accordance with Section 300.2.10., "Performance-Graded Binders"; and
  - the mixture has less than 10.0 mm of rutting on the Hamburg Wheel test (Tex-242-F) after the number of passes required for the originally specified binder. Use of substitute PG binders may only be allowed at the discretion of the Engineer if the Hamburg Wheel test results are between 10.0 mm and 12.5 mm.

Table 5
Allowable Substitute PG Binders and Maximum Recycled Binder Ratios

Originally Specified	Allowable Substitute PG Binder	Maximum Ratio of Recycled Binder <sup>1</sup> to Total Binder (%)		
PG Binder	Allowable Substitute PG Binder	Surface	Intermediate	Base
	HN	IA		
76-22 <sup>2</sup>	70-22 or 64-22	20.0	20.0	20.0
10-22-	70-28 or 64-28	30.0	35.0	40.0
70-22 <sup>2</sup>	64-22	20.0	20.0	20.0
10-22-	64-28 or 58-28	30.0	35.0	40.0
64-22 <sup>2</sup>	58-28	30.0	35.0	40.0
76-28 <sup>2</sup>	70-28 or 64-28	20.0	20.0	20.0
70-20-	64-34	30.0	35.0	40.0
70-28 <sup>2</sup>	64-28 or 58-28	20.0	20.0	20.0
70-20-	64-34 or 58-34	30.0	35.0	40.0
64-28 <sup>2</sup>	58-28	20.0	20.0	20.0
04-20-	58-34	30.0	35.0	40.0
	WM	IA <sup>3</sup>		
76-22 <sup>2</sup>	70-22 or 64-22	30.0	35.0	40.0
70-22 <sup>2</sup>	64-22 or 58-28	30.0	35.0	40.0
64-22 <sup>4</sup>	58-28	30.0	35.0	40.0
76-28 <sup>2</sup>	70-28 or 64-28	30.0	35.0	40.0
70-28 <sup>2</sup>	64-28 or 58-28	30.0	35.0	40.0
64-284	58-28	30.0	35.0	40.0

- Combined recycled binder from RAP and RAS.
- 2. Use no more than 20.0% recycled binder when using this originally specified PG binder.
- 3. WMA as defined in Section 341.2.6.2., "Warm Mix Asphalt (WMA)."
- 4. When used with WMA, this originally specified PG binder is allowed for use at the maximum recycled binder ratios shown in this table.

#### 3. EQUIPMENT

Provide required or necessary equipment in accordance with Item 320, "Equipment for Asphalt Concrete Pavement."

#### 4. CONSTRUCTION

Produce, haul, place, and compact the specified paving mixture. In addition to tests required by the specification, Contractors may perform other QC tests as deemed necessary. At any time during the project, the Engineer may perform production and placement tests as deemed necessary in accordance with Item 5, "Control of the Work." Schedule and participate in a mandatory pre-paving meeting with the Engineer on or before the first day of paving unless otherwise shown on the plans.

4.1. **Certification**. Personnel certified by the Department-approved hot-mix asphalt certification program must conduct all mixture designs, sampling, and testing in accordance with Table 6. Supply the Engineer with a list of certified personnel and copies of their current certificates before beginning production and when personnel changes are made. Provide a mixture design developed and signed by a Level 2 certified specialist. Provide Level 1A certified specialists at the plant during production operations. Provide Level 1B certified specialists to conduct placement tests.

Table 6 Test Methods, Test Responsibility, and Minimum Certification Levels

	thods, Test Responsibility, and Minimi	um Certification Leve	els	
Test Description	Test Method	Contractor	Engineer	Level <sup>1</sup>
	1. Aggregate and Recycled Materia			
Sampling	Tex-221-F	✓	✓	1A
Dry sieve	Tex-200-F, Part I	✓	✓	1A
Washed sieve	Tex-200-F, Part II	✓	✓	1A
Deleterious material	Tex-217-F, Parts I & III	✓	✓	1A
Decantation	Tex-217-F, Part II	✓	<b>✓</b>	1A
Los Angeles abrasion	Tex-410-A		✓	TxDOT
Magnesium sulfate soundness	Tex-411-A		✓	TxDOT
Micro-Deval abrasion	Tex-461-A		✓	2
Crushed face count	Tex-460-A	✓	✓	2
Flat and elongated particles	Tex-280-F	✓	✓	2
Linear shrinkage	Tex-107-E	✓	✓	2
Sand equivalent	Tex-203-F	✓	✓	2
Organic impurities	Tex-408-A	✓	✓	2
	2. Asphalt Binder & Tack Coat Sa	ampling		<u>=</u>
Asphalt binder sampling	Tex-500-C, Part II	√	✓	1A/1B
Tack coat sampling	Tex-500-C, Part III	· ·	· ✓	1A/1B
Table Sout Guillyining	3. Mix Design & Verificatio		-	17 ( 10
Design and JMF changes	Tex-204-F	···· ✓	✓	2
Mixing	Tex-205-F	· ·	<b>→</b>	2
Molding (TGC)	Tex-203-1	<b>→</b>	<b>→</b>	1A
Molding (SGC)	Tex-200-F Tex-241-F	<b>∨</b> ✓	<b>√</b>	1A
		<b>∨</b> ✓	<b>∨</b>	
Laboratory-molded density	Tex-207-F	<b>✓</b>		1A
VMA <sup>2</sup> (calculation only)	Tex-204-F		<b>√</b>	2
Rice gravity	Tex-227-F	<b>√</b>	✓	1A
Ignition oven correction factors <sup>3</sup>	Tex-236-F	✓	✓	2
Indirect tensile strength	Tex-226-F	<b>√</b>	✓	2
Hamburg Wheel test	Tex-242-F	✓	✓	2
Boil test	Tex-530-C	✓	✓	1A
	4. Production Testing			
Selecting production random numbers	Tex-225-F, Part I		✓	1A
Mixture sampling	Tex-222-F	✓	✓	1A
Molding (TGC)	Tex-206-F	✓	✓	1A
Molding (SGC)	Tex-241-F	✓	✓	1A
Laboratory-molded density	Tex-207-F	✓	✓	1A
VMA <sup>2</sup> (calculation only)	Tex-204-F	✓	✓	1A
Rice gravity	Tex-227-F	✓	✓	1A
Gradation & asphalt binder content <sup>3</sup>	Tex-236-F	✓	✓	1A
Control charts	Tex-233-F	✓	<b>✓</b>	1A
Moisture content	Tex-212-F	✓	✓	1A
Hamburg Wheel test	Tex-242-F	✓	✓	2
Micro-Deval abrasion	Tex-461-A		✓	2
Boil test	Tex-530-C	✓	✓	1A
Abson recovery	Tex-211-F		✓	TxDOT
Overlay test	Tex-248-F		✓	TxDOT
Cantabro loss	Tex-245-F		✓	2
	5. Placement Testing			<del>_</del>
Selecting placement random numbers	Tex-225-F, Part II		✓	1A/1B
Trimming roadway cores	Tex-207-F	✓	✓	1A/1B
In-place air voids	Tex-207-F	<b>√</b>	<b>√</b>	1A/1B
Establish rolling pattern	Tex-207-F	· ·	•	1B
Control charts	Tex-237-F	<b>→</b>	✓	1A
Ride quality measurement	Tex-255-F Tex-1001-S	<b>∨</b> ✓	<b>√</b>	Note <sup>4</sup>
Ride quality measurement Segregation (density profile)	Tex-207-F, Part V	<b>✓</b>	<b>∨</b>	Note⁴ 1B
		<b>✓</b>	<b>√</b>	
Longitudinal joint density	Tex-207-F, Part VII	<b>✓</b>	<b>✓</b>	1B
Thermal profile	Tex-244-F			1B

- 1. Level 1A, 1B, and 2 are certification levels provided by the Hot Mix Asphalt Center certification program.
- 2. Voids in mineral aggregates.
- Refer to Section 341.4.9.2.3., "Production Testing," for exceptions to using an ignition oven.
   Profiler and operator are required to be certified at the Texas A&M Transportation Institute facility when Surface Test Type B is specified.

Reporting and Responsibilities. Use Department-provided Excel templates to record and calculate all test data, including mixture design, production and placement QC/QA, control charts, thermal profiles, segregation density profiles, and longitudinal joint density. Obtain the latest version of the Excel templates at http://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/forms/site-manager.html or from the Engineer. The Engineer and the Contractor will provide any available test results to the other party when requested. The maximum allowable time for the Contractor and Engineer to exchange test data is as given in Table 7 unless otherwise approved. The Engineer and the Contractor will immediately report to the other party any test result that requires suspension of production or placement, a payment penalty, or that fails to meet the specification requirements. Record and submit all test results and pertinent information on Department-provided Excel templates to the Engineer electronically by means of a portable USB flash drive, compact disc, or via email.

Subsequent sublots placed after test results are available to the Contractor, which require suspension of operations, may be considered unauthorized work. Unauthorized work will be accepted or rejected at the discretion of the Engineer in accordance with Article 5.3., "Conformity with Plans, Specifications, and Special Provisions."

Table 7
Reporting Schedule

Description	Reported By	Reported To	To Be Reported Within
	Production 0	Quality Control	•
Gradation <sup>1</sup>			
Asphalt binder content <sup>1</sup>			
Laboratory-molded density <sup>2</sup>	Contractor	Engineer	1 working day of completion of the sublot
Moisture content <sup>3</sup>			
Boil test <sup>3</sup>			
	Production Qu	ality Assurance	
Gradation <sup>3</sup>			
Asphalt binder content <sup>3</sup>			
Laboratory-molded density <sup>1</sup>	Engineer	Contractor	1 working day of completion of the sublet
Hamburg Wheel test <sup>2</sup>	Engineer	Contractor	1 working day of completion of the sublot
Boil test <sup>3</sup>			
Binder tests <sup>2</sup>			
	Placement Q	uality Control	
In-place air voids <sup>2</sup>			
Segregation <sup>1</sup>	Contractor	Contractor Engineer	1 working day of completion of the lot
Longitudinal joint density <sup>1</sup>	Contractor		i working day or completion of the lot
Thermal profile <sup>1</sup>			
	Placement Qu	ality Assurance	
In-place air voids <sup>1</sup>			
Segregation <sup>2</sup>			1 working day of receipt of the trimmed
Longitudinal joint density <sup>2</sup>	Engineer	Contractor	1 working day of receipt of the trimmed cores for in-place air voids <sup>4</sup>
Thermal profile <sup>2</sup>			cores for in-place all volus.
Aging ratio <sup>2</sup>			
Pay adjustment summary	Engineer	Contractor	2 working days of performing all required tests and receiving Contractor test data

1. These tests are required on every sublot.

4.2.

- 2. Optional test. To be reported as soon as results become available.
- 3. To be performed at the frequency specified on the plans.
- 2 days are allowed if cores cannot be dried to constant weight within 1 day.

The Engineer will use the Department-provided Excel template to calculate all pay adjustment factors for the lot. Sublot samples may be discarded after the Engineer and Contractor sign off on the pay adjustment summary documentation for the lot.

Use the procedures described in Tex-233-F to plot the results of all quality control (QC) and quality assurance (QA) testing. Update the control charts as soon as test results for each sublot become available. Make the control charts readily accessible at the field laboratory. The Engineer may suspend production for failure to update control charts.

4.3. **Quality Control Plan (QCP)**. Develop and follow the QCP in detail. Obtain approval for changes to the QCP made during the project. The Engineer may suspend operations if the Contractor fails to comply with the QCP.

Submit a written QCP before the mandatory pre-paving meeting. Receive approval of the QCP before beginning production. Include the following items in the QCP:

- 4.3.1. **Project Personnel**. For project personnel, include:
  - a list of individuals responsible for QC with authority to take corrective action;
  - current contact information for each individual listed; and
  - current copies of certification documents for individuals performing specified QC functions.
- 4.3.2. **Material Delivery and Storage**. For material delivery and storage, include:
  - the sequence of material processing, delivery, and minimum quantities to assure continuous plant operations;
  - aggregate stockpiling procedures to avoid contamination and segregation;
  - frequency, type, and timing of aggregate stockpile testing to assure conformance of material requirements before mixture production; and
  - procedure for monitoring the quality and variability of asphalt binder.
- 4.3.3. **Production**. For production, include:
  - loader operation procedures to avoid contamination in cold bins;
  - procedures for calibrating and controlling cold feeds:
  - procedures to eliminate debris or oversized material;
  - procedures for adding and verifying rates of each applicable mixture component (e.g., aggregate, asphalt binder, RAP, RAS, lime, liquid antistrip, WMA);
  - procedures for reporting job control test results; and
  - procedures to avoid segregation and drain-down in the silo.
- 4.3.4. **Loading and Transporting.** For loading and transporting, include:
  - type and application method for release agents; and
  - truck loading procedures to avoid segregation.
- 4.3.5. **Placement and Compaction**. For placement and compaction, include:
  - proposed agenda for mandatory pre-paving meeting, including date and location;
  - proposed paving plan (e.g., paving widths, joint offsets, and lift thicknesses);
  - type and application method for release agents in the paver and on rollers, shovels, lutes, and other utensils;
  - procedures for the transfer of mixture into the paver, while avoiding segregation and preventing material spillage;
  - process to balance production, delivery, paving, and compaction to achieve continuous placement operations and good ride quality;
  - paver operations (e.g., operation of wings, height of mixture in auger chamber) to avoid physical and thermal segregation and other surface irregularities; and
  - procedures to construct quality longitudinal and transverse joints.
- 4.4. Mixture Design.
- 4.4.1. **Design Requirements**. The Contractor may design the mixture using a Texas Gyratory Compactor (TGC) or a Superpave Gyratory Compactor (SGC) unless otherwise shown on the plans. Use the typical weight design example given in Tex-204-F, Part I, when using a TGC. Use the Superpave mixture design procedure given

in Tex-204-F, Part IV, when using a SGC. Design the mixture to meet the requirements listed in Tables 1, 2, 3, 4, 5, 8, 9, and 10.

- 4.4.1.1. Target Laboratory-Molded Density When The TGC Is Used. Design the mixture at a 96.5% target laboratory-molded density. Increase the target laboratory-molded density to 97.0% or 97.5% at the Contractor's discretion or when shown on the plans or specification.
- 4.4.1.2. **Design Number of Gyrations (Ndesign) When The SGC Is Used**. Design the mixture at 50 gyrations (Ndesign). Use a target laboratory-molded density of 96.0% to design the mixture; however, adjustments can be made to the Ndesign value as noted in Table 9. The Ndesign level may be reduced to no less than 35 gyrations at the Contractor's discretion.

Use an approved laboratory from the Department's MPL to perform the Hamburg Wheel test, and provide results with the mixture design, or provide the laboratory mixture and request that the Department perform the Hamburg Wheel test. The Engineer will be allowed 10 working days to provide the Contractor with Hamburg Wheel test results on the laboratory mixture design.

The Engineer will provide the mixture design when shown on the plans. The Contractor may submit a new mixture design at any time during the project. The Engineer will verify and approve all mixture designs (JMF1) before the Contractor can begin production.

Provide the Engineer with a mixture design report using the Department-provided Excel template. Include the following items in the report:

- the combined aggregate gradation, source, specific gravity, and percent of each material used;
- asphalt binder content and aggregate gradation of RAP and RAS stockpiles;
- the target laboratory-molded density (or Ndesign level when using the SGC);
- results of all applicable tests;
- the mixing and molding temperatures;
- the signature of the Level 2 person or persons that performed the design;
- the date the mixture design was performed; and
- a unique identification number for the mixture design.

Table 8

Master Gradation Limits (% Passing by Weight or Volume) and VMA Requirements

master Gradation Limits (% Passing by Weight of Volume) and VMA Requirements						
Sieve	Α	В	С	D	F	
	Coarse	Fine	Coarse	Fine	Fine	
Size	Base	Base	Surface	Surface	Mixture	
2"	100.0 <sup>1</sup>	_	-	-	_	
1-1/2"	98.0-100.0	100.0 <sup>1</sup>	_	_	_	
1"	78.0-94.0	98.0-100.0	100.0 <sup>1</sup>	_	_	
3/4"	64.0-85.0	84.0-98.0	95.0-100.0	100.0 <sup>1</sup>	_	
1/2"	50.0-70.0	_	_	98.0-100.0	100.0 <sup>1</sup>	
3/8"	_	60.0-80.0	70.0-85.0	85.0-100.0	98.0-100.0	
#4	30.0-50.0	40.0-60.0	43.0-63.0	50.0-70.0	70.0–90.0	
#8	22.0-36.0	29.0-43.0	32.0-44.0	35.0-46.0	38.0-48.0	
#30	8.0-23.0	13.0-28.0	14.0-28.0	15.0-29.0	12.0-27.0	
#50	3.0-19.0	6.0-20.0	7.0-21.0	7.0-20.0	6.0-19.0	
#200	2.0-7.0	2.0-7.0	2.0-7.0	2.0-7.0	2.0-7.0	
	Design VMA, % Minimum					
_	12.0	13.0	14.0	15.0	16.0	
	Production (Plant-Produced) VMA, % Minimum					
_	11.5	12.5	13.5	14.5	15.5	

<sup>1.</sup> Defined as maximum sieve size. No tolerance allowed.

Table 9
Laboratory Mixture Design Properties

Mixture Property	Test Method	Requirement	
Target laboratory-molded density, % (TGC)	Tex-207-F	96.5 <sup>1</sup>	
Design gyrations (Ndesign for SGC)	Tex-241-F	50 <sup>2</sup>	
Indirect tensile strength (dry), psi	Tex-226-F	85–200 <sup>3</sup>	
Boil test <sup>4</sup>	Tex-530-C	-	

- Increase to 97.0% or 97.5% at the Contractor's discretion or when shown on the plans or specification.
- 2. Adjust within a range of 35–100 gyrations when shown on the plans or specification or when mutually agreed between the Engineer and Contractor.
- 3. The Engineer may allow the IDT strength to exceed 200 psi if the corresponding Hamburg Wheel rut depth is greater than 3.0 mm and less than 12.5 mm.
- Used to establish baseline for comparison to production results. May be waived when approved.

Table 10 Hamburg Wheel Test Requirements

High-Temperature Binder Grade	Test Method	Minimum # of Passes <sup>1</sup> @ 12.5 mm <sup>2</sup> Rut Depth, Tested @ 50°C
PG 64 or lower		10,000
PG 70	Tex-242-F	15,000
PG 76 or higher		20,000

- 1. May be decreased or waived when shown on the plans.
- When the rut depth at the required minimum number of passes is less than 3 mm, the Engineer may require the Contractor to increase the target laboratory-molded density (TGC) by 0.5% to no more than 97.5% or lower the Ndesign level (SGC) to no less than 35 gyrations.
- 4.4.2. **Job-Mix Formula Approval**. The job-mix formula (JMF) is the combined aggregate gradation, target laboratory-molded density (or Ndesign level), and target asphalt percentage used to establish target values for hot-mix production. JMF1 is the original laboratory mixture design used to produce the trial batch. When WMA is used, JMF1 may be designed and submitted to the Engineer without including the WMA additive. When WMA is used, document the additive or process used and recommended rate on the JMF1 submittal. The Engineer and the Contractor will verify JMF1 based on plant-produced mixture from the trial batch unless otherwise approved. The Engineer may accept an existing mixture design previously used on a Department project and may waive the trial batch to verify JMF1. The Department may require the Contractor to reimburse the Department for verification tests if more than 2 trial batches per design are required.
- 4.4.2.1. Contractor's Responsibilities.
- 4.4.2.1.1. **Providing Gyratory Compactor**. Use a TGC calibrated in accordance with Tex-914-K when electing or required to design the mixture in accordance with Tex-204-F, Part I, for molding production samples. Furnish an SGC calibrated in accordance with Tex-241-F when electing or required to design the mixture in accordance with Tex-204-F, Part IV, for molding production samples. Locate the SGC, if used, at the Engineer's field laboratory and make the SGC available to the Engineer for use in molding production samples.
- 4.4.2.1.2. **Gyratory Compactor Correlation Factors**. Use Tex-206-F, Part II, to perform a gyratory compactor correlation when the Engineer uses a different gyratory compactor. Apply the correlation factor to all subsequent production test results.
- 4.4.2.1.3. **Submitting JMF1**. Furnish a mix design report (JMF1) with representative samples of all component materials and request approval to produce the trial batch. Provide approximately 10,000 g of the design mixture if opting to have the Department perform the Hamburg Wheel test on the laboratory mixture, and request that the Department perform the test.
- 4.4.2.1.4. Supplying Aggregates. Provide approximately 40 lb. of each aggregate stockpile unless otherwise directed.

- 4.4.2.1.5. **Supplying Asphalt**. Provide at least 1 gal. of the asphalt material and sufficient quantities of any additives proposed for use.
- 4.4.2.1.6. **Ignition Oven Correction Factors**. Determine the aggregate and asphalt correction factors from the ignition oven in accordance with Tex-236-F. Provide the Engineer with split samples of the mixtures before the trial batch production, including all additives (except water), and blank samples used to determine the correction factors for the ignition oven used for QA testing during production. Correction factors established from a previously approved mixture design may be used for the current mixture design if the mixture design and ignition oven are the same as previously used, unless otherwise directed.
- 4.4.2.1.7. **Boil Test**. Perform the test and retain the tested sample from Tex-530-C until completion of the project or as directed. Use this sample for comparison purposes during production. The Engineer may waive the requirement for the boil test.
- 4.4.2.1.8. **Trial Batch Production**. Provide a plant-produced trial batch upon receiving conditional approval of JMF1 and authorization to produce a trial batch, including the WMA additive or process if applicable, for verification testing of JMF1 and development of JMF2. Produce a trial batch mixture that meets the requirements in Table 4, Table 5, and Table 11. The Engineer may accept test results from recent production of the same mixture instead of a new trial batch.
- 4.4.2.1.9. **Trial Batch Production Equipment**. Use only equipment and materials proposed for use on the project to produce the trial batch.
- 4.4.2.1.10. **Trial Batch Quantity**. Produce enough quantity of the trial batch to ensure that the mixture meets the specification requirements.
- 4.4.2.1.11. **Number of Trial Batches**. Produce trial batches as necessary to obtain a mixture that meets the specification requirements.
- 4.4.2.1.12. **Trial Batch Sampling**. Obtain a representative sample of the trial batch and split it into 3 equal portions in accordance with Tex-222-F. Label these portions as "Contractor," "Engineer," and "Referee." Deliver samples to the appropriate laboratory as directed.
- 4.4.2.1.13. **Trial Batch Testing**. Test the trial batch to ensure the mixture produced using the proposed JMF1 meets the mixture requirements in Table 11. Ensure the trial batch mixture is also in compliance with the Hamburg Wheel requirement in Table 10. Use a Department-approved laboratory to perform the Hamburg Wheel test on the trial batch mixture or request that the Department perform the Hamburg Wheel test. The Engineer will be allowed 10 working days to provide the Contractor with Hamburg Wheel test results on the trial batch. Provide the Engineer with a copy of the trial batch test results.
- 4.4.2.1.14. Development of JMF2. Evaluate the trial batch test results after the Engineer grants full approval of JMF1 based on results from the trial batch, determine the optimum mixture proportions, and submit as JMF2. Adjust the asphalt binder content or gradation to achieve the specified target laboratory-molded density. The asphalt binder content established for JMF2 is not required to be within any tolerance of the optimum asphalt binder content established for JMF1; however, mixture produced using JMF2 must meet the voids in mineral aggregates (VMA) requirements for production shown in Table 8. If the optimum asphalt binder content for JMF2 is more than 0.5% lower than the optimum asphalt binder content for JMF1, the Engineer may perform or require the Contractor to perform Tex-226-F on Lot 1 production to confirm the indirect tensile strength does not exceed 200 psi. Verify that JMF2 meets the mixture requirements in Table 5.
- 4.4.2.1.15. **Mixture Production**. Use JMF2 to produce Lot 1 as described in Section 341.4.9.3.1.1., "Lot 1 Placement," after receiving approval for JMF2 and a passing result from the Department's or a Department-approved laboratory's Hamburg Wheel test on the trial batch. If desired, proceed to Lot 1 production, once JMF2 is approved, at the Contractor's risk without receiving the results from the Department's Hamburg Wheel test on the trial batch.

Notify the Engineer if electing to proceed without Hamburg Wheel test results from the trial batch. Note that the Engineer may require up to the entire sublot of any mixture failing the Hamburg Wheel test to be removed and replaced at the Contractor's expense.

- 4.4.2.1.16. **Development of JMF3**. Evaluate the test results from Lot 1, determine the optimum mixture proportions, and submit as JMF3 for use in Lot 2.
- 4.4.2.1.17. **JMF Adjustments**. If JMF adjustments are necessary to achieve the specified requirements, make the adjustments before beginning a new lot. The adjusted JMF must:
  - be provided to the Engineer in writing before the start of a new lot;
  - be numbered in sequence to the previous JMF;
  - meet the mixture requirements in Table 4 and Table 5;
  - meet the master gradation limits shown in Table 8; and
  - be within the operational tolerances of JMF2 listed in Table 11.
- 4.4.2.1.18. **Requesting Referee Testing**. Use referee testing, if needed, in accordance with Section 341.4.9.1., "Referee Testing," to resolve testing differences with the Engineer.

Table 11
Operational Tolerances

Description	Test Method	Allowable Difference Between Trial Batch and JMF1 Target	Allowable Difference from Current JMF Target	Allowable Difference between Contractor and Engineer <sup>1</sup>
Individual % retained for #8 sieve and larger	Toy 200 F	Must be Within	±5.0 <sup>2,3</sup>	±5.0
Individual % retained for sieves smaller than #8 and larger than #200	Tex-200-F or Tex-236-F	Master Grading Limits in Table 8	±3.0 <sup>2,3</sup>	±3.0
% passing the #200 sieve		III Table 0	±2.0 <sup>2,3</sup>	±1.6
Asphalt binder content, %	Tex-236-F	±0.5	±0.3 <sup>3</sup>	±0.3
Laboratory-molded density, %		±1.0	±1.0	±1.0
In-place air voids, %	Tex-207-F	N/A	N/A	±1.0
Laboratory-molded bulk specific gravity		N/A	N/A	±0.020
VMA, %, min	Tex-204-F	Note <sup>4</sup>	Note <sup>4</sup>	N/A
Theoretical maximum specific (Rice) gravity	Tex-227-F	N/A	N/A	±0.020

- 1. Contractor may request referee testing only when values exceed these tolerances.
- 2. When within these tolerances, mixture production gradations may fall outside the master grading limits; however, the % passing the #200 will be considered out of tolerance when outside the master grading limits.
- 3. Only applies to mixture produced for Lot 1 and higher.
- 4. Test and verify that Table 8 requirements are met.

#### 4.4.2.2. Engineer's Responsibilities.

4.4.2.2.1. **Gyratory Compactor**. For mixtures designed in accordance with Tex-204-F, Part I, the Engineer will use a Department TGC, calibrated in accordance with Tex-914-K, to mold samples for trial batch and production testing. The Engineer will make the Department TGC and the Department field laboratory available to the Contractor for molding verification samples, if requested by the Contractor.

For mixtures designed in accordance with Tex-204-F, Part IV, the Engineer will use a Department SGC, calibrated in accordance with Tex-241-F, to mold samples for laboratory mixture design verification. For molding trial batch and production specimens, the Engineer will use the Contractor-provided SGC at the field laboratory or provide and use a Department SGC at an alternate location. The Engineer will make the Contractor-provided SGC in the Department field laboratory available to the Contractor for molding verification samples.

- 4.4.2.2.2. **Conditional Approval of JMF1 and Authorizing Trial Batch**. The Engineer will review and verify conformance of the following information within 2 working days of receipt:
  - the Contractor's mix design report (JMF1);
  - the Contractor-provided Hamburg Wheel test results;

- all required materials including aggregates, asphalt, additives, and recycled materials; and
- the mixture specifications.

The Engineer will grant the Contractor conditional approval of JMF1 if the information provided on the paper copy of JMF1 indicates that the Contractor's mixture design meets the specifications. When the Contractor does not provide Hamburg Wheel test results with laboratory mixture design, 10 working days are allowed for conditional approval of JMF1. The Engineer will base full approval of JMF1 on the test results on mixture from the trial batch.

Unless waived, the Engineer will determine the Micro-Deval abrasion loss in accordance with Section 341.2.1.1.2., "Micro-Deval Abrasion." If the Engineer's test results are pending after 2 working days, conditional approval of JMF1 will still be granted within 2 working days of receiving JMF1. When the Engineer's test results become available, they will be used for specification compliance.

After conditionally approving JMF1, including either Contractor- or Department-supplied Hamburg Wheel test results, the Contractor is authorized to produce a trial batch.

- 4.4.2.2.3. **Hamburg Wheel Testing of JMF1**. If the Contractor requests the option to have the Department perform the Hamburg Wheel test on the laboratory mixture, the Engineer will mold samples in accordance with Tex-242-F to verify compliance with the Hamburg Wheel test requirement in Table 10.
- 4.4.2.2.4. **Ignition Oven Correction Factors**. The Engineer will use the split samples provided by the Contractor to determine the aggregate and asphalt correction factors for the ignition oven used for QA testing during production in accordance with Tex-236-F.
- 4.4.2.2.5. **Testing the Trial Batch**. Within 1 full working day, the Engineer will sample and test the trial batch to ensure that the mixture meets the requirements in Table 11. If the Contractor requests the option to have the Department perform the Hamburg Wheel test on the trial batch mixture, the Engineer will mold samples in accordance with Tex-242-F to verify compliance with the Hamburg Wheel test requirement in Table 10.

The Engineer will have the option to perform the following tests on the trial batch:

- Tex-226-F, to verify that the indirect tensile strength meets the requirement shown in Table 9; and
- Tex-530-C, to retain and use for comparison purposes during production.
- 4.4.2.2.6. **Full Approval of JMF1**. The Engineer will grant full approval of JMF1 and authorize the Contractor to proceed with developing JMF2 if the Engineer's results for the trial batch meet the requirements in Table 11. The Engineer will notify the Contractor that an additional trial batch is required if the trial batch does not meet these requirements.
- 4.4.2.2.7. **Approval of JMF2**. The Engineer will approve JMF2 within one working day if the mixture meets the requirements in Table 5 and the gradation meets the master grading limits shown in Table 8. The asphalt binder content established for JMF2 is not required to be within any tolerance of the optimum asphalt binder content established for JMF1; however, mixture produced using JMF2 must meet the VMA requirements shown in Table 8. If the optimum asphalt binder content for JMF2 is more than 0.5% lower than the optimum asphalt binder content for JMF1, the Engineer may perform or require the Contractor to perform Tex-226-F on Lot 1 production to confirm the indirect tensile strength does not exceed 200 psi.
- 4.4.2.2.8. **Approval of Lot 1 Production**. The Engineer will authorize the Contractor to proceed with Lot 1 production (using JMF2) as soon as a passing result is achieved from the Department's or a Department-approved laboratory's Hamburg Wheel test on the trial batch. The Contractor may proceed at its own risk with Lot 1 production without the results from the Hamburg Wheel test on the trial batch.

If the Department's or Department-approved laboratory's sample from the trial batch fails the Hamburg Wheel test, the Engineer will suspend production until further Hamburg Wheel tests meet the specified values. The Engineer may require up to the entire sublot of any mixture failing the Hamburg Wheel test be removed and replaced at the Contractor's expense.

- 4.4.2.2.9. **Approval of JMF3 and Subsequent JMF Changes**. JMF3 and subsequent JMF changes are approved if they meet the mixture requirements shown in Table 4, Table 5, and the master grading limits shown in Table 8, and are within the operational tolerances of JMF2 shown in Table 11.
- 4.5. **Production Operations.** Perform a new trial batch when the plant or plant location is changed. Take corrective action and receive approval to proceed after any production suspension for noncompliance to the specification. Submit a new mix design and perform a new trial batch when the asphalt binder content of:
  - any RAP stockpile used in the mix is more than 0.5% higher than the value shown on the mixture design report; or
  - RAS stockpile used in the mix is more than 2.0% higher than the value shown on the mixture design report.
- 4.5.1. **Storage and Heating of Materials**. Do not heat the asphalt binder above the temperatures specified in Item 300, "Asphalts, Oils, and Emulsions," or outside the manufacturer's recommended values. Provide the Engineer with daily records of asphalt binder and hot-mix asphalt discharge temperatures (in legible and discernible increments) in accordance with Item 320, "Equipment for Asphalt Concrete Pavement," unless otherwise directed. Do not store mixture for a period long enough to affect the quality of the mixture, nor in any case longer than 12 hr. unless otherwise approved.
- 4.5.2. **Mixing and Discharge of Materials**. Notify the Engineer of the target discharge temperature and produce the mixture within 25°F of the target. Monitor the temperature of the material in the truck before shipping to ensure that it does not exceed 350°F (or 275°F for WMA) and is not lower than 215°F. The Department will not pay for or allow placement of any mixture produced above 350°F.

Produce WMA within the target discharge temperature range of 215°F and 275°F when WMA is required. Take corrective action any time the discharge temperature of the WMA exceeds the target discharge range. The Engineer may suspend production operations if the Contractor's corrective action is not successful at controlling the production temperature within the target discharge range. Note that when WMA is produced, it may be necessary to adjust burners to ensure complete combustion such that no burner fuel residue remains in the mixture.

Control the mixing time and temperature so that substantially all moisture is removed from the mixture before discharging from the plant. Determine the moisture content, if requested, by oven-drying in accordance with Tex-212-F, Part II, and verify that the mixture contains no more than 0.2% of moisture by weight. Obtain the sample immediately after discharging the mixture into the truck, and perform the test promptly.

4.6. **Hauling Operations**. Clean all truck beds before use to ensure that mixture is not contaminated. Use a release agent shown on the Department's MPL to coat the inside bed of the truck when necessary.

Use equipment for hauling as defined in Section 341.4.7.3.3., "Hauling Equipment." Use other hauling equipment only when allowed.

4.7. Placement Operations. Collect haul tickets from each load of mixture delivered to the project and provide the Department's copy to the Engineer approximately every hour, or as directed. Use a hand-held thermal camera or infrared thermometer, when a thermal imaging system is not used, to measure and record the internal temperature of the mixture as discharged from the truck or Material Transfer Device (MTD) before or as the mix enters the paver and an approximate station number or GPS coordinates on each ticket. Calculate the daily yield and cumulative yield for the specified lift and provide to the Engineer at the end of paving operations for each day unless otherwise directed. The Engineer may suspend production if the Contractor fails to produce and provide haul tickets and yield calculations by the end of paving operations for each day.

Prepare the surface by removing raised pavement markers and objectionable material such as moisture, dirt, sand, leaves, and other loose impediments from the surface before placing mixture. Remove vegetation from pavement edges. Place the mixture to meet the typical section requirements and produce a smooth, finished surface with a uniform appearance and texture. Offset longitudinal joints of successive courses of hot-mix by at least 6 in. Place mixture so that longitudinal joints on the surface course coincide with lane lines, or as

directed. Ensure that all finished surfaces will drain properly. Place the mixture at the rate or thickness shown on the plans. The Engineer will use the guidelines in Table 12 to determine the compacted lift thickness of each layer when multiple lifts are required. The thickness determined is based on the rate of 110 lb./sq. yd. for each inch of pavement unless otherwise shown on the plans.

Table 12
Compacted Lift Thickness and Required Core Height

Mixture	Compacted Lift Thickness Guidelines		Minimum Untrimmed Core	
Type	Minimum (in.)	Maximum (in.)	Height (in.) Eligible for Testing	
Α	3.00	6.00	2.00	
В	2.50	5.00	1.75	
С	2.00	4.00	1.50	
D	1.50	3.00	1.25	
F	1.25	2.50	1.25	

#### 4.7.1. Weather Conditions.

- 4.7.1.1. **When Using a Thermal Imaging System**. The Contractor may pave any time the roadway is dry and the roadway surface temperature is at least 32°F; however, the Engineer may restrict the Contractor from paving surface mixtures if the ambient temperature is likely to drop below 32°F within 12 hr. of paving. Provide output data from the thermal imaging system to demonstrate to the Engineer that no recurring severe thermal segregation exists in accordance with Section 341.4.7.3.1.2., "Thermal Imaging System."
- 4.7.1.2. When Not Using a Thermal Imaging System. Place mixture when the roadway surface temperature is at or above the temperatures listed in Table 13 unless otherwise approved or as shown on the plans. Measure the roadway surface temperature with a hand-held thermal camera or infrared thermometer. The Engineer may allow mixture placement to begin before the roadway surface reaches the required temperature if conditions are such that the roadway surface will reach the required temperature within 2 hr. of beginning placement operations. Place mixtures only when weather conditions and moisture conditions of the roadway surface are suitable as determined by the Engineer. The Engineer may restrict the Contractor from paving if the ambient temperature is likely to drop below 32°F within 12 hr. of paving.

Table 13
Minimum Pavement Surface Temperatures

Originally Specified High	Minimum Pavement Surface Temperatures (°F) Subsurface Layers or Surface Layers Placed in Night Paving Operations Daylight Operations	
Originally Specified High Temperature Binder Grade		
PG 64 or lower	45	50
PG 70	55 <sup>1</sup>	60 <sup>1</sup>
PG 76 or higher	60 <sup>1</sup>	60 <sup>1</sup>

- Contractors may pave at temperatures 10°F lower than these values when utilizing a
  paving process including WMA or equipment that eliminates thermal segregation. In such
  cases, use a hand-held thermal camera operated in accordance with Tex-244-F to
  demonstrate to the satisfaction of the Engineer that the uncompacted mat has no more
  than 10°F of thermal segregation.
- 4.7.2. **Tack Coat**. Clean the surface before placing the tack coat. The Engineer will set the rate between 0.04 and 0.10 gal. of residual asphalt per square yard of surface area. Apply a uniform tack coat at the specified rate unless otherwise directed. Apply the tack coat in a uniform manner to avoid streaks and other irregular patterns. Apply a thin, uniform tack coat to all contact surfaces of curbs, structures, and all joints. Allow adequate time for emulsion to break completely before placing any material. Prevent splattering of tack coat when placed adjacent to curb, gutter, and structures. Roll the tack coat with a pneumatic-tire roller to remove streaks and other irregular patterns when directed.

#### 4.7.3. Lay-Down Operations.

4.7.3.1. **Thermal Profile**. Use a hand-held thermal camera or a thermal imaging system to obtain a continuous thermal profile in accordance with Tex-244-F. Thermal profiles are not applicable in areas described in Section 341.4.9.3.1.4., "Miscellaneous Areas."

- 4.7.3.1.1. Thermal Segregation.
- 4.7.3.1.1.1. **Moderate**. Any areas that have a temperature differential greater than 25°F, but not exceeding 50°F, are deemed as having moderate thermal segregation.
- 4.7.3.1.1.2. **Severe**. Any areas that have a temperature differential greater than 50°F are deemed as having severe thermal segregation.
- 4.7.3.1.2. **Thermal Imaging System**. Review the output results when a thermal imaging system is used, and provide the automated report described in Tex-244-F to the Engineer daily unless otherwise directed. Modify the paving process as necessary to eliminate any recurring (moderate or severe) thermal segregation identified by the thermal imaging system. The Engineer may suspend paving operations if the Contractor cannot successfully modify the paving process to eliminate recurring severe thermal segregation. Density profiles are not required and not applicable when using a thermal imaging system. Provide the Engineer with electronic copies of all daily data files that can be used with the thermal imaging system software to generate temperature profile plots upon completion of the project or as requested by the Engineer.
- 4.7.3.1.3. Thermal Camera. Take immediate corrective action to eliminate recurring moderate thermal segregation when a hand-held thermal camera is used. Evaluate areas with moderate thermal segregation by performing density profiles in accordance with Section 341.4.9.3.3.2., "Segregation (Density Profile)." Provide the Engineer with the thermal profile of every sublot within one working day of the completion of each lot. Report the results of each thermal profile in accordance with Section 341.4.2., "Reporting and Responsibilities." The Engineer will use a hand-held thermal camera to obtain a thermal profile at least once per project. No production or placement bonus will be paid for any sublot that contains severe thermal segregation. Suspend operations and take immediate corrective action to eliminate severe thermal segregation unless otherwise directed. Resume operations when the Engineer determines that subsequent production will meet the requirements of this Section. Evaluate areas with severe thermal segregation by performing density profiles in accordance with Section 341.4.9.3.3.2., "Segregation (Density Profile)." Remove and replace the material in any areas that have both severe thermal segregation and a failing result for Segregation (Density Profile) unless otherwise directed. The sublot in question may receive a production and placement bonus if applicable when the defective material is successfully removed and replaced.
- 4.7.3.2. **Windrow Operations**. Operate windrow pickup equipment so that when hot-mix is placed in windrows, substantially all the mixture deposited on the roadbed is picked up and loaded into the paver.
- 4.7.3.3. **Hauling Equipment**. Use belly dumps, live bottom, or end dump trucks to haul and transfer mixture; however, with exception of paving miscellaneous areas, end dump trucks are only allowed when used in conjunction with an MTD with remixing capability or when a thermal imaging system is used unless otherwise allowed.
- 4.7.3.4. **Screed Heaters**. Turn off screed heaters to prevent overheating of the mat if the paver stops for more than 5 min. The Engineer may evaluate the suspect area in accordance with Section 341.4.9.3.3.4., "Recovered Asphalt Dynamic Shear Rheometer (DSR)," if the screed heater remains on for more than 5 min. while the paver is stopped.
- 4.8. **Compaction**. Compact the pavement uniformly to contain between 3.8% and 8.5% in-place air voids. Take immediate corrective action to bring the operation within 3.8% and 8.5% when the in-place air voids exceed the range of these tolerances. The Engineer will allow paving to resume when the proposed corrective action is likely to yield between 3.8% and 8.5% in-place air voids.

Obtain cores in areas placed under Exempt Production, as directed, at locations determined by the Engineer. The Engineer may test these cores and suspend operations or require removal and replacement if the inplace air voids are less than 2.7% or more than 9.9%. Areas defined in Section 341.4.9.3.1.4., "Miscellaneous Areas," are not subject to in-place air void determination.

Furnish the type, size, and number of rollers required for compaction as approved. Use a pneumatic-tire roller to seal the surface unless excessive pickup of fines occurs. Use additional rollers as required to

remove any roller marks. Use only water or an approved release agent on rollers, tamps, and other compaction equipment unless otherwise directed.

Use the control strip method shown in Tex-207-F, Part IV, on the first day of production to establish the rolling pattern that will produce the desired in-place air voids unless otherwise directed.

Use tamps to thoroughly compact the edges of the pavement along curbs, headers, and similar structures and in locations that will not allow thorough compaction with rollers. The Engineer may require rolling with a trench roller on widened areas, in trenches, and in other limited areas.

Complete all compaction operations before the pavement temperature drops below 160°F unless otherwise allowed. The Engineer may allow compaction with a light finish roller operated in static mode for pavement temperatures below 160°F.

Allow the compacted pavement to cool to 160°F or lower before opening to traffic unless otherwise directed. Sprinkle the finished mat with water or limewater, when directed, to expedite opening the roadway to traffic.

4.9. Acceptance Plan. Pay adjustments for the material will be in accordance with Section 341.6., "Payment."

Sample and test the hot-mix on a lot and sublot basis. Suspend production until test results or other information indicates to the satisfaction of the Engineer that the next material produced or placed will result in pay factors of at least 1.000, if the production pay factor given in Section 341.6.1., "Production Pay Adjustment Factors," for 2 consecutive lots or the placement pay factor given in Section 341.6.2., "Placement Pay Adjustment Factors," for 2 consecutive lots is below 1.000.

4.9.1. **Referee Testing**. The Construction Division is the referee laboratory. The Contractor may request referee testing if a "remove and replace" condition is determined based on the Engineer's test results, or if the differences between Contractor and Engineer test results exceed the maximum allowable difference shown in Table 11 and the differences cannot be resolved. The Contractor may also request referee testing if the Engineer's test results require suspension of production and the Contractor's test results are within specification limits. Make the request within 5 working days after receiving test results and cores from the Engineer. Referee tests will be performed only on the sublot in question and only for the particular tests in question. Allow 10 working days from the time the referee laboratory receives the samples for test results to be reported. The Department may require the Contractor to reimburse the Department for referee tests if more than 3 referee tests per project are required and the Engineer's test results are closer to the referee test results than the Contractor's test results.

The Construction Division will determine the laboratory-molded density based on the molded specific gravity and the maximum theoretical specific gravity of the referee sample. The in-place air voids will be determined based on the bulk specific gravity of the cores, as determined by the referee laboratory and the Engineer's average maximum theoretical specific gravity for the lot. With the exception of "remove and replace" conditions, referee test results are final and will establish pay adjustment factors for the sublot in question. The Contractor may decline referee testing and accept the Engineer's test results when the placement pay adjustment factor for any sublot results in a "remove and replace" condition. Placement sublots subject to be removed and replaced will be further evaluated in accordance with Section 341.6.2.2., "Placement Sublots Subject to Removal and Replacement."

#### 4.9.2. **Production Acceptance**.

4.9.2.1. **Production Lot**. A production lot consists of 4 equal sublots. The default quantity for Lot 1 is 1,000 tons; however, when requested by the Contractor, the Engineer may increase the quantity for Lot 1 to no more than 4,000 tons. The Engineer will select subsequent lot sizes based on the anticipated daily production such that approximately 3 to 4 sublots are produced each day. The lot size will be between 1,000 tons and 4,000 tons. The Engineer may change the lot size before the Contractor begins any lot.

If the optimum asphalt binder content for JMF2 is more than 0.5% lower than the optimum asphalt binder content for JMF1, the Engineer may perform or require the Contractor to perform Tex-226-F on Lot 1 to

confirm the indirect tensile strength does not exceed 200 psi. Take corrective action to bring the mixture within specification compliance if the indirect tensile strength exceeds 200 psi unless otherwise directed.

- 4.9.2.1.1. Incomplete Production Lots. If a lot is begun but cannot be completed, such as on the last day of production or in other circumstances deemed appropriate, the Engineer may close the lot. Adjust the payment for the incomplete lot in accordance with Section 341.6.1., "Production Pay Adjustment Factors." Close all lots within 5 working days unless otherwise allowed.
- 4.9.2.2. **Production Sampling**.
- 4.9.2.2.1. **Mixture Sampling**. Obtain hot-mix samples from trucks at the plant in accordance with Tex-222-F. The sampler will split each sample into 3 equal portions in accordance with Tex-200-F and label these portions as "Contractor," "Engineer," and "Referee." The Engineer will perform or witness the sample splitting and take immediate possession of the samples labeled "Engineer" and "Referee." The Engineer will maintain the custody of the samples labeled "Engineer" and "Referee" until the Department's testing is completed.
- 4.9.2.2.1.1. **Random Sample**. At the beginning of the project, the Engineer will select random numbers for all production sublots. Determine sample locations in accordance with Tex-225-F. Take one sample for each sublot at the randomly selected location. The Engineer will perform or witness the sampling of production sublots.
- 4.9.2.2.1.2. **Blind Sample**. For one sublot per lot, the Engineer will obtain and test a "blind" sample instead of the random sample collected by the Contractor. Test either the "blind" or the random sample; however, referee testing (if applicable) will be based on a comparison of results from the "blind" sample. The location of the Engineer's "blind" sample will not be disclosed to the Contractor. The Engineer's "blind" sample may be randomly selected in accordance with Tex-225-F for any sublot or selected at the discretion of the Engineer. The Engineer will use the Contractor's split sample for sublots not sampled by the Engineer.
- 4.9.2.2.2. Informational Cantabro and Overlay Testing. When requested or shown on the plans, select one random sublot from Lot 2 or higher for Cantabro and Overlay testing during the first week of production. Obtain and provide the Engineer with approximately 90 lb. (40 kg) of mixture in sealed containers, boxes, or bags labeled with the Control-Section-Job (CSJ), mixture type, lot, and sublot number. The Engineer will ship the mixture to the Construction Division for Cantabro and Overlay testing. Results from these tests will not be used for specification compliance.
- 4.9.2.2.3. **Asphalt Binder Sampling**. Obtain a 1-qt. sample of the asphalt binder for each lot of mixture produced. Obtain the sample at approximately the same time the mixture random sample is obtained. Sample from a port located immediately upstream from the mixing drum or pug mill in accordance with Tex-500-C, Part II. Label the can with the corresponding lot and sublot numbers and deliver the sample to the Engineer. The Engineer may also obtain independent samples. If obtaining an independent asphalt binder sample, the Engineer will split a sample of the asphalt binder with the Contractor. The Engineer will test at least one asphalt binder sample per project to verify compliance with Item 300, "Asphalts, Oils, and Emulsions."
- 4.9.2.3. **Production Testing**. The Contractor and Engineer must perform production tests in accordance with Table 14. The Contractor has the option to verify the Engineer's test results on split samples provided by the Engineer. Determine compliance with operational tolerances listed in Table 11 for all sublots.

Take immediate corrective action if the Engineer's laboratory-molded density on any sublot is less than 95.0% or greater than 98.0% to bring the mixture within these tolerances. The Engineer may suspend operations if the Contractor's corrective actions do not produce acceptable results. The Engineer will allow production to resume when the proposed corrective action is likely to yield acceptable results.

The Engineer may allow alternate methods for determining the asphalt binder content and aggregate gradation if the aggregate mineralogy is such that Tex-236-F does not yield reliable results. Provide evidence that results from Tex-236-F are not reliable before requesting permission to use an alternate method unless otherwise directed. Use the applicable test procedure as directed if an alternate test method is allowed.

Table 14
Production and Placement Testing Frequency

Description	Test Method	Minimum Contractor Testing Frequency	Minimum Engineer Testing Frequency
Individual % retained for #8 sieve and larger Individual % retained for sieves smaller than #8 and larger than #200 % passing the #200 sieve	Tex-200-F or Tex-236-F	1 per sublot	1 per 12 sublots <sup>1</sup>
Laboratory-molded density Laboratory-molded bulk specific gravity In-place air voids	Tex-207-F	N/A	1 per sublot <sup>1</sup>
VMA Segregation (density profile) <sup>2</sup> Longitudinal joint density	Tex-204-F Tex-207-F, Part V Tex-207-F, Part VII	1 per sublot	1 per project
Moisture content Theoretical maximum specific (Rice) gravity	Tex-212-F, Part II Tex-227-F	When directed N/A	1 per sublot <sup>1</sup>
Asphalt binder content Hamburg Wheel test	Tex-236-F Tex-242-F	1 per sublot N/A	1 per lot <sup>1</sup>
Recycled Asphalt Shingles (RAS) <sup>3</sup> Thermal profile <sup>2</sup>	Tex-242-F Tex-217-F, Part III Tex-244-F	N/A N/A 1 per sublot	
Asphalt binder sampling and testing	Tex-500-C	1 per lot (sample only)	1 per project
Tack coat sampling and testing	Tex-500-C, Part III	N/A	
Boil test <sup>4</sup>	Tex-530-C	1 per lot	
Cantabro loss <sup>5</sup> Overlay test <sup>5</sup>	Tex-245-F Tex-248-F	1 per project (sample only)	

- 1. For production defined in Section 341.4.9.4., "Exempt Production," the Engineer will test one per day if 100 tons or more are produced. For Exempt Production, no testing is required when less than 100 tons are produced.
- 2. Not required when a thermal imaging system is used.
- 3. Testing performed by the Construction Division or designated laboratory.
- 4. The Engineer may reduce or waive the sampling and testing requirements based on a satisfactory test history.
- 5. Testing performed by the Construction Division and for informational purposes only.
- 4.9.2.4. **Operational Tolerances**. Control the production process within the operational tolerances listed in Table 11. When production is suspended, the Engineer will allow production to resume when test results or other information indicates the next mixture produced will be within the operational tolerances.
- 4.9.2.4.1. **Gradation**. Suspend operation and take corrective action if any aggregate is retained on the maximum sieve size shown in Table 8. A sublot is defined as out of tolerance if either the Engineer's or the Contractor's test results are out of operational tolerance. Suspend production when test results for gradation exceed the operational tolerances for 3 consecutive sublots on the same sieve or 4 consecutive sublots on any sieve unless otherwise directed. The consecutive sublots may be from more than one lot.
- 4.9.2.4.2. **Asphalt Binder Content**. A sublot is defined as out of operational tolerance if either the Engineer's or the Contractor's test results exceed the values listed in Table 11. No production or placement bonus will be paid for any sublot that is out of operational tolerance for asphalt binder content. Suspend production and shipment of the mixture if the Engineer's or the Contractor's asphalt binder content deviates from the current JMF by more than 0.5% for any sublot.
- 4.9.2.4.3. **Voids in Mineral Aggregates (VMA)**. The Engineer will determine the VMA for every sublot. For sublots when the Engineer does not determine asphalt binder content, the Engineer will use the asphalt binder content results from QC testing performed by the Contractor to determine VMA.

Take immediate corrective action if the VMA value for any sublot is less than the minimum VMA requirement for production listed in Table 8. Suspend production and shipment of the mixture if the Engineer's VMA results on 2 consecutive sublots are below the minimum VMA requirement for production listed in Table 8. No production or placement bonus will be paid for any sublot that does not meet the minimum VMA requirement for production listed in Table 8 based on the Engineer's VMA determination.

Suspend production and shipment of the mixture if the Engineer's VMA result is more than 0.5% below the minimum VMA requirement for production listed in Table 8. In addition to suspending production, the Engineer may require removal and replacement or may allow the sublot to be left in place without payment.

4.9.2.4.4. Hamburg Wheel Test. The Engineer may perform a Hamburg Wheel test at any time during production, including when the boil test indicates a change in quality from the materials submitted for JMF1. In addition to testing production samples, the Engineer may obtain cores and perform Hamburg Wheel tests on any areas of the roadway where rutting is observed. Suspend production until further Hamburg Wheel tests meet the specified values when the production or core samples fail the Hamburg Wheel test criteria in Table 10. Core samples, if taken, will be obtained from the center of the finished mat or other areas excluding the vehicle wheel paths. The Engineer may require up to the entire sublot of any mixture failing the Hamburg Wheel test to be removed and replaced at the Contractor's expense.

If the Department's or Department approved laboratory's Hamburg Wheel test results in a "remove and replace" condition, the Contractor may request that the Department confirm the results by re-testing the failing material. The Construction Division will perform the Hamburg Wheel tests and determine the final disposition of the material in question based on the Department's test results.

- 4.9.2.5. Individual Loads of Hot-Mix. The Engineer can reject individual truckloads of hot-mix. When a load of hot-mix is rejected for reasons other than temperature, contamination, or excessive uncoated particles, the Contractor may request that the rejected load be tested. Make this request within 4 hr. of rejection. The Engineer will sample and test the mixture. If test results are within the operational tolerances shown in Table 11, payment will be made for the load. If test results are not within operational tolerances, no payment will be made for the load.
- 4.9.3. Placement Acceptance.
- 4.9.3.1. **Placement Lot**. A placement lot consists of 4 placement sublots. A placement sublot consists of the area placed during a production sublot.
- 4.9.3.1.1. **Lot 1 Placement.** Placement bonuses for Lot 1 will be in accordance with Section 341.6.2., "Placement Pay Adjustment Factors"; however, no placement penalty will be assessed for any sublot placed in Lot 1 when the in-place air voids are greater than or equal to 2.7% and less than or equal to 9.9%. Remove and replace any sublot with in-place air voids less than 2.7% or greater than 9.9%.
- 4.9.3.1.2. **Incomplete Placement Lots**. An incomplete placement lot consists of the area placed as described in Section 341.4.9.2.1.1., "Incomplete Production Lots," excluding areas defined in Section 341.4.9.3.1.4., "Miscellaneous Areas." Placement sampling is required if the random sample plan for production resulted in a sample being obtained from an incomplete production sublot.
- 4.9.3.1.3. **Shoulders, Ramps, Etc.** Shoulders, ramps, intersections, acceleration lanes, deceleration lanes, and turn lanes are subject to in-place air void determination and pay adjustments unless designated on the plans as not eligible for in-place air void determination. Intersections may be considered miscellaneous areas when determined by the Engineer.
- 4.9.3.1.4. **Miscellaneous Areas**. Miscellaneous areas include areas that typically involve significant handwork or discontinuous paving operations, such as temporary detours, driveways, mailbox turnouts, crossovers, gores, spot level-up areas, and other similar areas. Temporary detours are subject to in-place air void determination when shown on the plans. Miscellaneous areas also include level-ups and thin overlays when the layer thickness specified on the plans is less than the minimum untrimmed core height eligible for testing shown in Table 12. The specified layer thickness is based on the rate of 110 lb./sq. yd. for each inch of pavement unless another rate is shown on the plans. When "level up" is listed as part of the item bid description code, a pay adjustment factor of 1.000 will be assigned for all placement sublots as described in Section 341.6, "Payment." Miscellaneous areas are not eligible for random placement sampling locations. Compact miscellaneous areas in accordance with Section 341.4.8., "Compaction." Miscellaneous areas are not subject to in-place air void determination, thermal profiles testing, segregation (density profiles), or longitudinal joint density evaluations.

4.9.3.2. Placement Sampling. The Engineer will select random numbers for all placement sublots at the beginning of the project. The Engineer will provide the Contractor with the placement random numbers immediately after the sublot is completed. Mark the roadway location at the completion of each sublot and record the station number. Determine one random sample location for each placement sublot in accordance with Tex-225-F. Adjust the random sample location by no more than necessary to achieve a 2-ft. clearance if the location is within 2 ft. of a joint or pavement edge.

Shoulders, ramps, intersections, acceleration lanes, deceleration lanes, and turn lanes are always eligible for selection as a random sample location; however, if a random sample location falls on one of these areas and the area is designated on the plans as not subject to in-place air void determination, cores will not be taken for the sublot and a 1.000 pay factor will be assigned to that sublot.

Provide the equipment and means to obtain and trim roadway cores on site. On-site is defined as in close proximity to where the cores are taken. Obtain the cores within one working day of the time the placement sublot is completed unless otherwise approved. Obtain two 6-in. diameter cores side-by-side from within 1 ft. of the random location provided for the placement sublot. For Type D and Type F mixtures, 4-in. diameter cores are allowed. Mark the cores for identification, measure and record the untrimmed core height, and provide the information to the Engineer. The Engineer will witness the coring operation and measurement of the core thickness. Visually inspect each core and verify that the current paving layer is bonded to the underlying layer. Take corrective action if an adequate bond does not exist between the current and underlying layer to ensure that an adequate bond will be achieved during subsequent placement operations.

Trim the cores immediately after obtaining the cores from the roadway in accordance with Tex-207-F if the core heights meet the minimum untrimmed value listed in Table 12. Trim the cores on site in the presence of the Engineer. Use a permanent marker or paint pen to record the lot and sublot numbers on each core as well as the designation as Core A or B. The Engineer may require additional information to be marked on the core and may choose to sign or initial the core. The Engineer will take custody of the cores immediately after they are trimmed and will retain custody of the cores until the Department's testing is completed. Before turning the trimmed cores over to the Engineer, the Contractor may wrap the trimmed cores or secure them in a manner that will reduce the risk of possible damage occurring during transport by the Engineer. After testing, the Engineer will return the cores to the Contractor.

The Engineer may have the cores transported back to the Department's laboratory at the HMA plant via the Contractor's haul truck or other designated vehicle. In such cases where the cores will be out of the Engineer's possession during transport, the Engineer will use Department-provided security bags and the Roadway Core Custody protocol located at http://www.txdot.gov/business/specifications.htm to provide a secure means and process that protects the integrity of the cores during transport.

Decide whether to include the pair of cores in the air void determination for that sublot if the core height before trimming is less than the minimum untrimmed value shown in Table 12. Trim the cores as described above before delivering to the Engineer if electing to have the cores included in the air void determination. Deliver untrimmed cores to the Engineer and inform the Engineer of the decision to not have the cores included in air void determination if electing to not have the cores included in air void determination. The placement pay factor for the sublot will be 1.000 if cores will not be included in air void determination.

Instead of the Contractor trimming the cores on site immediately after coring, the Engineer and the Contractor may mutually agree to have the trimming operations performed at an alternate location such as a field laboratory or other similar location. In such cases, the Engineer will take possession of the cores immediately after they are obtained from the roadway and will retain custody of the cores until testing is completed. Either the Department or Contractor representative may perform trimming of the cores. The Engineer will witness all trimming operations in cases where the Contractor representative performs the trimming operation.

Dry the core holes and tack the sides and bottom immediately after obtaining the cores. Fill the hole with the same type of mixture and properly compact the mixture. Repair core holes with other methods when approved.

- 4.9.3.3. **Placement Testing**. Perform placement tests in accordance with Table 14. After the Engineer returns the cores, the Contractor may test the cores to verify the Engineer's test results for in-place air voids. The allowable differences between the Contractor's and Engineer's test results are listed in Table 11.
- 4.9.3.3.1. In-Place Air Voids. The Engineer will measure in-place air voids in accordance with Tex-207-F and Tex-227-F. Before drying to a constant weight, cores may be pre-dried using a Corelok or similar vacuum device to remove excess moisture. The Engineer will average the values obtained for all sublots in the production lot to determine the theoretical maximum specific gravity. The Engineer will use the average air void content for in-place air voids.

The Engineer will use the vacuum method to seal the core if required by Tex-207-F. The Engineer will use the test results from the unsealed core to determine the placement pay adjustment factor if the sealed core yields a higher specific gravity than the unsealed core. After determining the in-place air void content, the Engineer will return the cores and provide test results to the Contractor.

4.9.3.3.2. **Segregation (Density Profile)**. Test for segregation using density profiles in accordance with Tex-207-F, Part V. Density profiles are not required and are not applicable when using a thermal imaging system. Density profiles are not applicable in areas described in Section 341.4.9.3.1.4., "Miscellaneous Areas."

Perform a density profile every time the paver stops for more than 60 sec. on areas that are identified by either the Contractor or the Engineer as having thermal segregation and on any visibly segregated areas unless otherwise approved. Perform a minimum of one profile per sublot if the paver does not stop for more than 60 sec. and there are no visibly segregated areas or areas that are identified as having thermal segregation.

Provide the Engineer with the density profile of every sublot in the lot within one working day of the completion of each lot. Report the results of each density profile in accordance with Section 341.4.2., "Reporting and Responsibilities."

The density profile is considered failing if it exceeds the tolerances in Table 15. No production or placement bonus will be paid for any sublot that contains a failing density profile. When a hand-held thermal camera is used instead of a thermal imaging system, the Engineer will measure the density profile at least once per project. The Engineer's density profile results will be used when available. The Engineer may require the Contractor to remove and replace the area in question if the area fails the density profile and has surface irregularities as defined in Section 341.4.9.3.3.5., "Irregularities." The sublot in question may receive a production and placement bonus if applicable when the defective material is successfully removed and replaced.

Investigate density profile failures and take corrective actions during production and placement to eliminate the segregation. Suspend production if 2 consecutive density profiles fail unless otherwise approved. Resume production after the Engineer approves changes to production or placement methods.

Table 15
Segregation (Density Profile) Acceptance Criteria

Mixture Type	Maximum Allowable Density Range (Highest to Lowest)	Maximum Allowable Density Range (Average to Lowest)
Type A & Type B	8.0 pcf	5.0 pcf
Type C, Type D & Type F	6.0 pcf	3.0 pcf

### 4.9.3.3.3. Longitudinal Joint Density.

4.9.3.3.3.1. **Informational Tests**. Perform joint density evaluations while establishing the rolling pattern and verify that the joint density is no more than 3.0 pcf below the density taken at or near the center of the mat. Adjust the rolling pattern, if needed, to achieve the desired joint density. Perform additional joint density evaluations, at least once per sublot, unless otherwise directed.

4.9.3.3.3.2. **Record Tests**. Perform a joint density evaluation for each sublot at each pavement edge that is or will become a longitudinal joint. Joint density evaluations are not applicable in areas described in Section 341.4.9.3.1.4., "Miscellaneous Areas." Determine the joint density in accordance with Tex-207-F, Part VII. Record the joint density information and submit results on Department forms to the Engineer. The evaluation is considered failing if the joint density is more than 3.0 pcf below the density taken at the core random sample location and the correlated joint density is less than 90.0%. The Engineer will make independent joint density verification at least once per project and may make independent joint density verifications at the random sample locations. The Engineer's joint density test results will be used when available.

Provide the Engineer with the joint density of every sublot in the lot within one working day of the completion of each lot. Report the results of each joint density in accordance with Section 341.4.2., "Reporting and Responsibilities."

Investigate joint density failures and take corrective actions during production and placement to improve the joint density. Suspend production if the evaluations on 2 consecutive sublots fail unless otherwise approved. Resume production after the Engineer approves changes to production or placement methods.

- 4.9.3.3.4. Recovered Asphalt Dynamic Shear Rheometer (DSR). The Engineer may take production samples or cores from suspect areas of the project to determine recovered asphalt properties. Asphalt binders with an aging ratio greater than 3.5 do not meet the requirements for recovered asphalt properties and may be deemed defective when tested and evaluated by the Construction Division. The aging ratio is the DSR value of the extracted binder divided by the DSR value of the original unaged binder. Obtain DSR values in accordance with AASHTO T 315 at the specified high temperature performance grade of the asphalt. The Engineer may require removal and replacement of the defective material at the Contractor's expense. The asphalt binder will be recovered for testing from production samples or cores in accordance with Tex-211-F.
- 4.9.3.3.5. **Irregularities**. Identify and correct irregularities including segregation, rutting, raveling, flushing, fat spots, mat slippage, irregular color, irregular texture, roller marks, tears, gouges, streaks, uncoated aggregate particles, or broken aggregate particles. The Engineer may also identify irregularities, and in such cases, the Engineer will promptly notify the Contractor. If the Engineer determines that the irregularity will adversely affect pavement performance, the Engineer may require the Contractor to remove and replace (at the Contractor's expense) areas of the pavement that contain irregularities and areas where the mixture does not bond to the existing pavement.

If irregularities are detected, the Engineer may require the Contractor to immediately suspend operations or may allow the Contractor to continue operations for no more than one day while the Contractor is taking appropriate corrective action.

- 4.9.4. **Exempt Production**. The Engineer may deem the mixture as exempt production for the following conditions:
  - anticipated daily production is less than 1,000 tons;
  - total production for the project is less than 5,000 tons;
  - when mutually agreed between the Engineer and the Contractor; or
  - when shown on the plans.

For exempt production, the Contractor is relieved of all production and placement sampling and testing requirements, and the production and placement pay factors are 1.000. All other specification requirements apply, and the Engineer will perform acceptance tests for production and placement listed in Table 14 when 100 tons or more per day are produced.

For exempt production:

- produce, haul, place, and compact the mixture in compliance with the specification and as directed;
- control mixture production to yield a laboratory-molded density that is within ±1.0% of the target laboratory-molded density as tested by the Engineer;
- compact the mixture in accordance with Section 341.4.8., "Compaction"; and

- when a thermal imaging system is not used, the Engineer may perform segregation (density profiles) and thermal profiles in accordance with the specification.
- 4.9.5. **Ride Quality**. Measure ride quality in accordance with Item 585, "Ride Quality for Pavement Surfaces," unless otherwise shown on the plans.

### 5. MEASUREMENT

Hot mix will be measured by the ton of composite hot-mix, which includes asphalt, aggregate, and additives. Measure the weight on scales in accordance with Item 520, "Weighing and Measuring Equipment."

### 6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under Section 341.5., "Measurement," will be paid for at the unit bid price for "Dense Graded Hot-Mix Asphalt" of the mixture type, SAC, and binder specified. These prices are full compensation for surface preparation, materials including tack coat, placement, equipment, labor, tools, and incidentals.

Pay adjustments for bonuses and penalties will be applied as determined in this Item; however, a pay adjustment factor of 1.000 will be assigned for all placement sublots for "level ups" only when "level up" is listed as part of the item bid description code. A pay adjustment factor of 1.000 will be assigned to all production and placement sublots when "exempt" is listed as part of the item bid description code.

Payment for each sublot, including applicable pay adjustment bonuses, will only be paid for sublots when the Contractor supplies the Engineer with the required documentation for production and placement QC/QA, thermal profiles, segregation density profiles, and longitudinal joint densities in accordance with Section 341.4.2., "Reporting and Responsibilities." When a thermal imaging system is used, documentation is not required for thermal profiles or segregation density profiles on individual sublots; however, the thermal imaging system automated reports described in Tex-244-F are required.

Trial batches will not be paid for unless they are included in pavement work approved by the Department.

Pay adjustment for ride quality will be determined in accordance with Item 585, "Ride Quality for Pavement Surfaces."

6.1. **Production Pay Adjustment Factors**. The production pay adjustment factor is based on the laboratory-molded density using the Engineer's test results. A pay adjustment factor will be determined from Table 16 for each sublot using the deviation from the target laboratory-molded density defined in Table 9. The production pay adjustment factor for completed lots will be the average of the pay adjustment factors for the 4 sublots sampled within that lot.

Table 16
Production Pay Adjustment Factors for Laboratory-Molded Density<sup>1</sup>

Absolute Deviation from	Production Pay Adjustment Factor
Target Laboratory-Molded Density	(Target Laboratory-Molded Density)
0.0	1.050
0.1	1.050
0.2	1.050
0.3	1.044
0.4	1.038
0.5	1.031
0.6	1.025
0.7	1.019
0.8	1.013
0.9	1.006
1.0	1.000
1.1	0.965
1.2	0.930
1.3	0.895
1.4	0.860
1.5	0.825
1.6	0.790
1.7	0.755
1.8	0.720
> 1.8	Remove and replace

- If the Engineer's laboratory-molded density on any sublot is less than 95.0% or greater than 98.0%, take immediate corrective action to bring the mixture within these tolerances. The Engineer may suspend operations if the Contractor's corrective actions do not produce acceptable results. The Engineer will allow production to resume when the proposed corrective action is likely to yield acceptable results.
- 6.1.1. Payment for Incomplete Production Lots. Production pay adjustments for incomplete lots, described under Section 341.4.9.2.1.1., "Incomplete Production Lots," will be calculated using the average production pay factors from all sublots sampled. A production pay factor of 1.000 will be assigned to any lot when the random sampling plan did not result in collection of any samples.
- 6.1.2. **Production Sublots Subject to Removal and Replacement**. If after referee testing, the laboratory-molded density for any sublot results in a "remove and replace" condition as listed in Table 16, the Engineer may require removal and replacement or may allow the sublot to be left in place without payment. The Engineer may also accept the sublot in accordance with Section 5.3.1., "Acceptance of Defective or Unauthorized Work." Replacement material meeting the requirements of this Item will be paid for in accordance with this Section.
- 6.2. Placement Pay Adjustment Factors. The placement pay adjustment factor is based on in-place air voids using the Engineer's test results. A pay adjustment factor will be determined from Table 17 for each sublot that requires in-place air void measurement. A placement pay adjustment factor of 1.000 will be assigned to the entire sublot when the random sample location falls in an area designated on the plans as not subject to in-place air void determination. A placement pay adjustment factor of 1.000 will be assigned to quantities placed in areas described in Section 341.4.9.3.1.4., "Miscellaneous Areas." The placement pay adjustment factor for completed lots will be the average of the placement pay adjustment factors for up to 4 sublots within that lot.

Table 17 Placement Pay Adjustment Factors for In-Place Air Voids

In-Place   Air Voids   Adjustment Factor   Air Voids   A	Placement Pay Adjustment Factors for In-Place Air Voids			
< 2.7				
2.7         0.710         6.5         1.040           2.8         0.740         6.6         1.038           2.9         0.770         6.7         1.036           3.0         0.800         6.8         1.034           3.1         0.830         6.9         1.032           3.2         0.860         7.0         1.030           3.3         0.890         7.1         1.028           3.4         0.920         7.2         1.026           3.5         0.950         7.3         1.024           3.6         0.980         7.4         1.022           3.7         0.998         7.5         1.020           3.8         1.002         7.6         1.018           3.9         1.006         7.7         1.016           4.0         1.010         7.8         1.014           4.1         1.014         7.9         1.012           4.2         1.018         8.0         1.010           4.3         1.022         8.1         1.008           4.4         1.026         8.2         1.006           4.5         1.030         8.3         1.004	ctor			
2.8         0.740         6.6         1.038           2.9         0.770         6.7         1.036           3.0         0.800         6.8         1.034           3.1         0.830         6.9         1.032           3.2         0.860         7.0         1.030           3.3         0.890         7.1         1.028           3.4         0.920         7.2         1.026           3.5         0.950         7.3         1.024           3.6         0.980         7.4         1.022           3.7         0.998         7.5         1.020           3.8         1.002         7.6         1.018           3.9         1.006         7.7         1.016           4.0         1.010         7.8         1.014           4.1         1.014         7.9         1.012           4.2         1.018         8.0         1.010           4.3         1.022         8.1         1.008           4.4         1.026         8.2         1.006           4.5         1.030         8.3         1.004           4.6         1.034         8.4         1.002				
2.9         0.770         6.7         1.036           3.0         0.800         6.8         1.034           3.1         0.830         6.9         1.032           3.2         0.860         7.0         1.030           3.3         0.890         7.1         1.028           3.4         0.920         7.2         1.026           3.5         0.950         7.3         1.024           3.6         0.980         7.4         1.022           3.7         0.998         7.5         1.020           3.8         1.002         7.6         1.018           3.9         1.006         7.7         1.016           4.0         1.010         7.8         1.014           4.1         1.014         7.9         1.012           4.2         1.018         8.0         1.010           4.3         1.022         8.1         1.008           4.4         1.026         8.2         1.006           4.5         1.030         8.3         1.004           4.5         1.030         8.3         1.004           4.6         1.034         8.4         1.002				
3.0         0.800         6.8         1.034           3.1         0.830         6.9         1.032           3.2         0.860         7.0         1.030           3.3         0.890         7.1         1.028           3.4         0.920         7.2         1.026           3.5         0.950         7.3         1.024           3.6         0.980         7.4         1.022           3.7         0.998         7.5         1.020           3.8         1.002         7.6         1.018           3.9         1.006         7.7         1.016           4.0         1.010         7.8         1.014           4.1         1.014         7.9         1.012           4.2         1.018         8.0         1.010           4.3         1.022         8.1         1.008           4.4         1.026         8.2         1.006           4.5         1.030         8.3         1.004           4.6         1.034         8.4         1.002           4.7         1.038         8.5         1.000           4.8         1.042         8.6         0.998				
3.1         0.830         6.9         1.032           3.2         0.860         7.0         1.030           3.3         0.890         7.1         1.028           3.4         0.920         7.2         1.026           3.5         0.950         7.3         1.024           3.6         0.980         7.4         1.022           3.7         0.998         7.5         1.020           3.8         1.002         7.6         1.018           3.9         1.006         7.7         1.016           4.0         1.010         7.8         1.014           4.1         1.014         7.9         1.012           4.2         1.018         8.0         1.010           4.3         1.022         8.1         1.008           4.4         1.026         8.2         1.006           4.5         1.030         8.3         1.004           4.6         1.034         8.4         1.002           4.7         1.038         8.5         1.000           4.8         1.042         8.6         0.998           4.9         1.046         8.7         0.996				
3.2         0.860         7.0         1.030           3.3         0.890         7.1         1.028           3.4         0.920         7.2         1.026           3.5         0.950         7.3         1.024           3.6         0.980         7.4         1.022           3.7         0.998         7.5         1.020           3.8         1.002         7.6         1.018           3.9         1.006         7.7         1.016           4.0         1.010         7.8         1.014           4.0         1.010         7.8         1.014           4.1         1.014         7.9         1.012           4.2         1.018         8.0         1.010           4.3         1.022         8.1         1.008           4.4         1.026         8.2         1.006           4.5         1.030         8.3         1.004           4.6         1.034         8.4         1.002           4.7         1.038         8.5         1.000           4.8         1.042         8.6         0.998           4.9         1.046         8.7         0.996	-			
3.3       0.890       7.1       1.028         3.4       0.920       7.2       1.026         3.5       0.950       7.3       1.024         3.6       0.980       7.4       1.022         3.7       0.998       7.5       1.020         3.8       1.002       7.6       1.018         3.9       1.006       7.7       1.016         4.0       1.010       7.8       1.014         4.1       1.014       7.9       1.012         4.2       1.018       8.0       1.010         4.3       1.022       8.1       1.008         4.4       1.026       8.2       1.006         4.5       1.030       8.3       1.004         4.6       1.034       8.4       1.002         4.7       1.038       8.5       1.000         4.8       1.042       8.6       0.998         4.9       1.046       8.7       0.996         5.0       1.050       8.8       0.994         5.1       1.050       9.0       0.990         5.3       1.050       9.1       0.960         5.4       1.050	-			
3.4     0.920     7.2     1.026       3.5     0.950     7.3     1.024       3.6     0.980     7.4     1.022       3.7     0.998     7.5     1.020       3.8     1.002     7.6     1.018       3.9     1.006     7.7     1.016       4.0     1.010     7.8     1.014       4.1     1.014     7.9     1.012       4.2     1.018     8.0     1.010       4.3     1.022     8.1     1.008       4.4     1.026     8.2     1.006       4.5     1.030     8.3     1.004       4.6     1.034     8.4     1.002       4.7     1.038     8.5     1.000       4.8     1.042     8.6     0.998       4.9     1.046     8.7     0.996       5.0     1.050     8.8     0.994       5.1     1.050     9.0     0.990       5.3     1.050     9.1     0.960       5.4     1.050     9.2     0.930       5.6     1.050     9.4     0.870				
3.5         0.950         7.3         1.024           3.6         0.980         7.4         1.022           3.7         0.998         7.5         1.020           3.8         1.002         7.6         1.018           3.9         1.006         7.7         1.016           4.0         1.010         7.8         1.014           4.1         1.014         7.9         1.012           4.2         1.018         8.0         1.010           4.3         1.022         8.1         1.008           4.4         1.026         8.2         1.006           4.5         1.030         8.3         1.004           4.6         1.034         8.4         1.002           4.7         1.038         8.5         1.000           4.8         1.042         8.6         0.998           4.9         1.046         8.7         0.996           5.0         1.050         8.9         0.992           5.2         1.050         9.0         0.990           5.3         1.050         9.1         0.960           5.4         1.050         9.2         0.930				
3.5         0.950         7.3         1.024           3.6         0.980         7.4         1.022           3.7         0.998         7.5         1.020           3.8         1.002         7.6         1.018           3.9         1.006         7.7         1.016           4.0         1.010         7.8         1.014           4.1         1.014         7.9         1.012           4.2         1.018         8.0         1.010           4.3         1.022         8.1         1.008           4.4         1.026         8.2         1.006           4.5         1.030         8.3         1.004           4.6         1.034         8.4         1.002           4.7         1.038         8.5         1.000           4.8         1.042         8.6         0.998           4.9         1.046         8.7         0.996           5.0         1.050         8.9         0.992           5.2         1.050         9.0         0.990           5.3         1.050         9.1         0.960           5.4         1.050         9.2         0.930				
3.6         0.980         7.4         1.022           3.7         0.998         7.5         1.020           3.8         1.002         7.6         1.018           3.9         1.006         7.7         1.016           4.0         1.010         7.8         1.014           4.1         1.014         7.9         1.012           4.2         1.018         8.0         1.010           4.3         1.022         8.1         1.008           4.4         1.026         8.2         1.006           4.5         1.030         8.3         1.004           4.6         1.034         8.4         1.002           4.7         1.038         8.5         1.000           4.8         1.042         8.6         0.998           4.9         1.046         8.7         0.996           5.0         1.050         8.8         0.994           5.1         1.050         9.0         0.990           5.3         1.050         9.1         0.960           5.4         1.050         9.2         0.930           5.5         1.050         9.3         0.900				
3.7         0.998         7.5         1.020           3.8         1.002         7.6         1.018           3.9         1.006         7.7         1.016           4.0         1.010         7.8         1.014           4.1         1.014         7.9         1.012           4.2         1.018         8.0         1.010           4.3         1.022         8.1         1.008           4.4         1.026         8.2         1.006           4.5         1.030         8.3         1.004           4.6         1.034         8.4         1.002           4.7         1.038         8.5         1.000           4.8         1.042         8.6         0.998           4.9         1.046         8.7         0.996           5.0         1.050         8.8         0.994           5.1         1.050         9.0         0.990           5.3         1.050         9.1         0.960           5.4         1.050         9.2         0.930           5.5         1.050         9.3         0.900           5.6         1.050         9.4         0.870				
3.8         1.002         7.6         1.018           3.9         1.006         7.7         1.016           4.0         1.010         7.8         1.014           4.1         1.014         7.9         1.012           4.2         1.018         8.0         1.010           4.3         1.022         8.1         1.008           4.4         1.026         8.2         1.006           4.5         1.030         8.3         1.004           4.6         1.034         8.4         1.002           4.7         1.038         8.5         1.000           4.8         1.042         8.6         0.998           4.9         1.046         8.7         0.996           5.0         1.050         8.8         0.994           5.1         1.050         8.9         0.992           5.2         1.050         9.0         0.990           5.3         1.050         9.1         0.960           5.4         1.050         9.2         0.930           5.5         1.050         9.3         0.900           5.6         1.050         9.4         0.870				
3.9       1.006       7.7       1.016         4.0       1.010       7.8       1.014         4.1       1.014       7.9       1.012         4.2       1.018       8.0       1.010         4.3       1.022       8.1       1.008         4.4       1.026       8.2       1.006         4.5       1.030       8.3       1.004         4.6       1.034       8.4       1.002         4.7       1.038       8.5       1.000         4.8       1.042       8.6       0.998         4.9       1.046       8.7       0.996         5.0       1.050       8.8       0.994         5.1       1.050       8.9       0.992         5.2       1.050       9.0       0.990         5.3       1.050       9.1       0.960         5.4       1.050       9.2       0.930         5.5       1.050       9.3       0.900         5.6       1.050       9.4       0.870				
4.0       1.010       7.8       1.014         4.1       1.014       7.9       1.012         4.2       1.018       8.0       1.010         4.3       1.022       8.1       1.008         4.4       1.026       8.2       1.006         4.5       1.030       8.3       1.004         4.6       1.034       8.4       1.002         4.7       1.038       8.5       1.000         4.8       1.042       8.6       0.998         4.9       1.046       8.7       0.996         5.0       1.050       8.8       0.994         5.1       1.050       8.9       0.992         5.2       1.050       9.0       0.990         5.3       1.050       9.1       0.960         5.4       1.050       9.2       0.930         5.5       1.050       9.3       0.900         5.6       1.050       9.4       0.870				
4.1       1.014       7.9       1.012         4.2       1.018       8.0       1.010         4.3       1.022       8.1       1.008         4.4       1.026       8.2       1.006         4.5       1.030       8.3       1.004         4.6       1.034       8.4       1.002         4.7       1.038       8.5       1.000         4.8       1.042       8.6       0.998         4.9       1.046       8.7       0.996         5.0       1.050       8.8       0.994         5.1       1.050       8.9       0.992         5.2       1.050       9.0       0.990         5.3       1.050       9.1       0.960         5.4       1.050       9.2       0.930         5.5       1.050       9.3       0.900         5.6       1.050       9.4       0.870				
4.2       1.018       8.0       1.010         4.3       1.022       8.1       1.008         4.4       1.026       8.2       1.006         4.5       1.030       8.3       1.004         4.6       1.034       8.4       1.002         4.7       1.038       8.5       1.000         4.8       1.042       8.6       0.998         4.9       1.046       8.7       0.996         5.0       1.050       8.8       0.994         5.1       1.050       8.9       0.992         5.2       1.050       9.0       0.990         5.3       1.050       9.1       0.960         5.4       1.050       9.2       0.930         5.5       1.050       9.3       0.900         5.6       1.050       9.4       0.870				
4.3       1.022       8.1       1.008         4.4       1.026       8.2       1.006         4.5       1.030       8.3       1.004         4.6       1.034       8.4       1.002         4.7       1.038       8.5       1.000         4.8       1.042       8.6       0.998         4.9       1.046       8.7       0.996         5.0       1.050       8.8       0.994         5.1       1.050       8.9       0.992         5.2       1.050       9.0       0.990         5.3       1.050       9.1       0.960         5.4       1.050       9.2       0.930         5.5       1.050       9.3       0.900         5.6       1.050       9.4       0.870				
4.4       1.026       8.2       1.006         4.5       1.030       8.3       1.004         4.6       1.034       8.4       1.002         4.7       1.038       8.5       1.000         4.8       1.042       8.6       0.998         4.9       1.046       8.7       0.996         5.0       1.050       8.8       0.994         5.1       1.050       8.9       0.992         5.2       1.050       9.0       0.990         5.3       1.050       9.1       0.960         5.4       1.050       9.2       0.930         5.5       1.050       9.3       0.900         5.6       1.050       9.4       0.870				
4.5       1.030       8.3       1.004         4.6       1.034       8.4       1.002         4.7       1.038       8.5       1.000         4.8       1.042       8.6       0.998         4.9       1.046       8.7       0.996         5.0       1.050       8.8       0.994         5.1       1.050       8.9       0.992         5.2       1.050       9.0       0.990         5.3       1.050       9.1       0.960         5.4       1.050       9.2       0.930         5.5       1.050       9.3       0.900         5.6       1.050       9.4       0.870				
4.6       1.034       8.4       1.002         4.7       1.038       8.5       1.000         4.8       1.042       8.6       0.998         4.9       1.046       8.7       0.996         5.0       1.050       8.8       0.994         5.1       1.050       8.9       0.992         5.2       1.050       9.0       0.990         5.3       1.050       9.1       0.960         5.4       1.050       9.2       0.930         5.5       1.050       9.3       0.900         5.6       1.050       9.4       0.870				
4.7     1.038     8.5     1.000       4.8     1.042     8.6     0.998       4.9     1.046     8.7     0.996       5.0     1.050     8.8     0.994       5.1     1.050     8.9     0.992       5.2     1.050     9.0     0.990       5.3     1.050     9.1     0.960       5.4     1.050     9.2     0.930       5.5     1.050     9.3     0.900       5.6     1.050     9.4     0.870				
4.8       1.042       8.6       0.998         4.9       1.046       8.7       0.996         5.0       1.050       8.8       0.994         5.1       1.050       8.9       0.992         5.2       1.050       9.0       0.990         5.3       1.050       9.1       0.960         5.4       1.050       9.2       0.930         5.5       1.050       9.3       0.900         5.6       1.050       9.4       0.870				
4.9     1.046     8.7     0.996       5.0     1.050     8.8     0.994       5.1     1.050     8.9     0.992       5.2     1.050     9.0     0.990       5.3     1.050     9.1     0.960       5.4     1.050     9.2     0.930       5.5     1.050     9.3     0.900       5.6     1.050     9.4     0.870				
5.0     1.050     8.8     0.994       5.1     1.050     8.9     0.992       5.2     1.050     9.0     0.990       5.3     1.050     9.1     0.960       5.4     1.050     9.2     0.930       5.5     1.050     9.3     0.900       5.6     1.050     9.4     0.870				
5.1     1.050     8.9     0.992       5.2     1.050     9.0     0.990       5.3     1.050     9.1     0.960       5.4     1.050     9.2     0.930       5.5     1.050     9.3     0.900       5.6     1.050     9.4     0.870				
5.2     1.050     9.0     0.990       5.3     1.050     9.1     0.960       5.4     1.050     9.2     0.930       5.5     1.050     9.3     0.900       5.6     1.050     9.4     0.870				
5.3     1.050     9.1     0.960       5.4     1.050     9.2     0.930       5.5     1.050     9.3     0.900       5.6     1.050     9.4     0.870				
5.4     1.050     9.2     0.930       5.5     1.050     9.3     0.900       5.6     1.050     9.4     0.870				
5.5       1.050       9.3       0.900         5.6       1.050       9.4       0.870				
5.6 1.050 9.4 0.870				
5.7 1.050 9.5 0.840				
5.8 1.050 9.6 0.810				
5.9 1.050 9.7 0.780				
6.0 1.050 9.8 0.750				
6.1 1.048 9.9 0.720				
6.2 1.046 > 9.9 Remove and Re	olace			
6.3 1.044	2.400			

6.2.1. Payment for Incomplete Placement Lots. Pay adjustments for incomplete placement lots described under Section 341.4.9.3.1.2., "Incomplete Placement Lots," will be calculated using the average of the placement pay factors from all sublots sampled and sublots where the random location falls in an area designated on the plans as not eligible for in-place air void determination. A placement pay adjustment factor of 1.000 will be assigned to any lot when the random sampling plan did not result in collection of any samples.

Placement Sublots Subject to Removal and Replacement. If after referee testing, the placement pay adjustment factor for any sublot results in a "remove and replace" condition as listed in Table 17, the Engineer will choose the location of 2 cores to be taken within 3 ft. of the original failing core location. The Contractor will obtain the cores in the presence of the Engineer. The Engineer will take immediate possession of the untrimmed cores and submit the untrimmed cores to the Construction Division, where they will be trimmed if necessary and tested for bulk specific gravity within 10 working days of receipt.

The average bulk specific gravity of the cores will be divided by the Engineer's average maximum theoretical specific gravity for that lot to determine the new pay adjustment factor of the sublot in question. If the new pay adjustment factor is 0.700 or greater, the new pay adjustment factor will apply to that sublot. If the new pay adjustment factor is less than 0.700, no payment will be made for the sublot. Remove and replace the

failing sublot, or the Engineer may allow the sublot to be left in place without payment. The Engineer may also accept the sublot in accordance with Section 5.3.1., "Acceptance of Defective or Unauthorized Work." Replacement material meeting the requirements of this Item will be paid for in accordance with this Section.

6.3. **Total Adjusted Pay Calculation**. Total adjusted pay (TAP) will be based on the applicable pay adjustment factors for production and placement for each lot.

TAP = (A+B)/2

#### where:

A = Bid price × production lot quantity × average pay adjustment factor for the production lot B = Bid price × placement lot quantity × average pay adjustment factor for the placement lot + (bid price × quantity placed in miscellaneous areas × 1.000)

Production lot quantity = Quantity actually placed - quantity left in place without payment

Placement lot quantity = Quantity actually placed - quantity left in place without payment - quantity placed in miscellaneous areas

# **Excavation and Backfill for Structures**



# 1. DESCRIPTION

Excavate for placement and construction of structures and backfill structures. Cut and restore pavement.

### 2. MATERIALS

Use materials that meet the requirements of the following Items.

- Item 401, "Flowable Backfill"
- Item 421, "Hydraulic Cement Concrete"
- DMS-4600, "Hydraulic Cement"

#### 3. CONSTRUCTION

- 3.1. Excavation.
- 3.1.1. **General**. Excavate to the lines and grades shown on the plans or as directed. Provide slopes, benching, sheeting, bracing, pumping, and bailing as necessary to maintain the stability and safety of excavations up to 5 ft. deep. Excavation protection for excavations deeper than 5 ft. are governed by Item 402, "Trench Excavation Protection," and Item 403, "Temporary Special Shoring." Use satisfactory excavated material as backfill or as embankment fill in accordance with Item 132, "Embankment." Dispose of material not incorporated into the final project off the right of way in accordance with federal, state, and local regulations.

Keep any topsoil that has been removed separate, and replace it, as nearly as feasible, in its original position when excavating for installation of structures across private property or beyond the limits of the embankment. Restore the area to an acceptable condition.

Excavate drilled shafts in accordance with Item 416, "Drilled Shaft Foundations."

- 3.1.1.1. **Obstructions**. Remove obstructions to the proposed construction, including trees and other vegetation, debris, and structures, over the width of the excavation to a depth of 1 ft. below the bottom of excavation. Remove as required to clear the new structure and plug in an approved manner if abandoned storm drains, sewers, or other drainage systems are encountered. Restore the bottom of the excavation to grade by backfilling after removing obstructions in accordance with this Item. Dispose of surplus materials in accordance with federal, state, and local regulations.
- 3.1.1.2. **Excavation in Streets**. Cut pavement and base to neat lines when structures are installed in streets, highways, or other paved areas. Restore pavement structure after completion of excavation and backfilling.

Maintain and control traffic in accordance with the approved traffic control plan and the TMUTCD.

3.1.1.3. **Utilities**. Comply with the requirements of Article 7.19., "Responsibility for Damage Claims." Conduct work with minimum disturbance of existing utilities, and coordinate work in or near utilities with the utility owners. Inform utility owners before work begins, allowing them enough time to identify, locate, reroute, or make other adjustments to utility lines.

Avoid cutting or damaging underground utility lines that are to remain in place. Promptly notify the utility company if damage occurs. Provide temporary flumes across the excavation while open if an active sanitary

sewer line is damaged during excavation, and restore the lines when backfilling has progressed to the original bedding lines of the cut sewer.

3.1.1.4. **De-Watering**. Construct or place structures in the presence of water only if approved. Place precast members, pipe, and concrete only on a dry, firm surface. Remove water by bailing, pumping, well-point installation, deep wells, underdrains, or other approved method.

Remove standing water in a manner that does not allow water movement through or alongside concrete being placed if structures are approved for placement in the presence of water. Pump or bail only from a suitable sump separated from the concrete work while placing structural concrete or for a period of at least 36 hr. thereafter. Pump or bail during placement of seal concrete only to the extent necessary to maintain a static head of water within the cofferdam. Pump or bail to de-water inside a sealed cofferdam only after the seal has aged at least 36 hr.

Place a stabilizing material in the bottom of the excavation if the bottom of an excavation cannot be dewatered to the point the subgrade is free of mud or it is difficult to keep reinforcing steel clean. Use flexible base, cement-stabilized base or backfill, lean concrete, or other approved stabilizing material. Provide concrete with at least 275 lb. of cement per cubic yard, if lean concrete is used, and place to a minimum depth of 3 in. Stabilizing material placed for the convenience of the Contractor will be at the Contractor's expense.

3.1.2. **Bridge Foundations and Retaining Walls**. Do not disturb material below the bottom of footing grade. Do not backfill to compensate for excavation that has extended below grade. Fill the area with concrete at the time the footing is placed if excavation occurs below the proposed footing grade. Additional concrete placed will be at the Contractor's expense.

Take core samples to determine the character of the supporting materials if requested. Provide an intact sample adequate to judge the character of the founding material. Take these cores when the excavation is close to completion. Cores should be approximately 5 ft. deeper than the proposed founding grade.

Remove loose material if the founding stratum is rock or another hard material, and clean and cut it to a firm surface that is level, stepped, or serrated, as directed. Clean out soft seams, and fill with concrete at the time the footing is placed.

Place the foundation once the Engineer has inspected the excavation and authorized changes have been made to provide a uniform bearing condition if the material at the footing grade of a retaining wall, bridge bent, or pier is a mixture of compressible and incompressible material.

3.1.3. Cofferdams. The term "cofferdam" designates any temporary or removable structure constructed to hold surrounding earth, water, or both out of the excavation whether the structure is formed of soil, timber, steel, concrete, or a combination of these. Use pumping wells or well points for de-watering cofferdams if required.

Submit details and design calculations for sheet-pile or other types of cofferdams requiring structural members bearing the seal of a licensed professional engineer for review before constructing the cofferdam. The Department reserves the right to reject designs. Design structural systems to comply with the AASHTO Standard Specifications for Highway Bridges or AASHTO LRFD Bridge Design Specifications. Interior dimensions of cofferdams must provide enough clearance for the construction, inspection, and removal of required forms and, if necessary, enough room to allow pumping outside the forms. Extend sheet-pile cofferdams well below the bottom of the footings, and make concrete seals as well braced and watertight as practicable.

Use Class E concrete for foundation seals unless otherwise specified. Place concrete foundation seals in accordance with Item 420, "Concrete Substructures." Seals placed for the convenience of the Contractor will be at the Contractor's expense.

Make the excavation deep enough to allow for swelling of the material at the base of the excavation during pile-driving operations when the Engineer judges it to be impractical to de-water inside a cofferdam and a

concrete seal is to be placed around piling driven within the cofferdam. Remove swelling material to the bottom of the seal grade after driving the piling. Remove the foundation material to exact footing grades where it is possible to de-water inside the cofferdam without placing a seal after driving piling. Do not backfill a foundation to compensate for excavation that has been extended below grade; fill such areas below grade with concrete at the time the seals or footings are placed.

Remove cofferdams after completing the substructure without disturbing or damaging the structure unless otherwise provided.

3.1.4. **Culverts and Storm Drains**. When the design requires special bedding conditions for culverts or storm drains, an excavation diagram will be shown on the plans. Do not exceed these limits of excavation.

Construct pipe structures in an open cut with vertical sides extending to a point 1 ft. above the pipe unless otherwise shown on the plans. When site conditions or the plans do not prohibit sloping the cut, the excavation may be stepped or laid back to a stable slope beginning 1 ft. above the pipe. Maintain the stability of the excavation throughout the construction period.

Construct the embankment for pipe to be installed in fill above natural ground to an elevation at least 1 ft. above the top of the pipe, and then excavate for the pipe.

3.1.4.1. **Unstable Material**. Remove the material to a depth of no more than 2 ft. below the grade of the structure when unstable soil is encountered at established footing grade, unless the Engineer authorizes additional depth. Replace soil removed with stable material in uniform layers no greater than 8 in. deep (loose measurement). Each layer must have enough moisture to be compacted by rolling or tamping as required to provide a stable foundation for the structure.

Use special materials such as flexible base, cement-stabilized base, cement-stabilized backfill, or other approved material when it is not feasible to construct a stable foundation as outlined above.

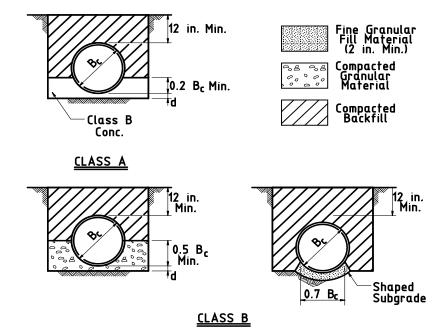
- 3.1.4.2. **Incompressible Material**. Remove the incompressible material to 6 in. below the footing grade, backfill with an approved compressible material, and compact in accordance with Section 400.3.3., "Backfill," if rock, part rock, or other incompressible material is encountered at established footing grade while placing prefabricated elements.
- 3.2. **Shaping and Bedding**. Place at least 2 in. of fine granular material for precast box sections on the base of the excavation before placing the box sections. Use bedding as shown in Figure 1 for pipe installations. Use Class C bedding unless otherwise shown on the plans. The Engineer may require the use of a template to secure reasonably accurate shaping of the foundation material. Undercut the excavation at least 4 in. where cement-stabilized backfill is indicated on the plans and backfill with stabilized material to support the pipe or box at the required grade.

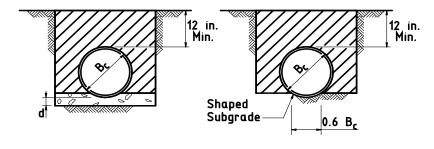
B<sub>c</sub> - Outside diameter or horizontal dimension

D - Inside diameter of pipe

d - Min. bedding material below pipe

D	d
≤ 27"	3"
30" to 60"	4"
≥ 66"	6"





# CLASS C

Figure 1 Bedding Diagrams

#### 3.3. Backfill.

3.3.1. General. Backfill the excavation after placement of the permanent structure as soon as practical. Use backfill free from stones large enough to interfere with compaction; large or frozen lumps that will not break down readily under compaction; and wood or other extraneous material. Obtain backfill material from excavation or from other sources.

Place backfill in layers no greater than 10 in. deep (loose measurement) in areas not supporting a completed roadbed, retaining wall, or embankment. Place backfill in uniform layers no greater than 8 in. deep (loose measurement) in areas supporting a portion of a roadbed, retaining wall, or embankment. Compact each layer to meet the density requirements of the roadbed, retaining wall, embankment material, or as shown on the plans.

Bring each layer of backfill material to the moisture content needed to obtain the required density. Use mechanical tamps or rammers to compact the backfill. Rollers may be used to compact backfill if feasible.

Cohesionless materials may be used for backfilling. Use cohesionless materials that conform to the requirements of Table 1.

Table 1
Cohesionless Material Gradation Limits

Sieve Size	eve Size Percent Retained	
3"	0	
#10	See Note <sup>1</sup>	
#200	90–100	

 No. 10 sieve requirements are 0 to 30% retained when used as aggregate for cement-stabilized backfill.

Compact cohesionless materials using vibratory equipment, water-ponding, or a combination of both.

3.3.2. **Bridge Foundations, Retaining Walls, Manholes/Inlets, and Box Culverts**. Place backfill against the structure only after the concrete has reached the design strength required in Item 421, "Hydraulic Cement Concrete."

Backfill retaining walls with material meeting the requirements of Item 423, "Retaining Walls." Backfill around bridge foundations, manholes/inlets and culverts using material with particles no more than 4 in. in greatest dimension and a gradation that permits thorough compaction. Use rock or gravel mixed with soil if the percentage of fines is enough to fill all voids and ensure a uniform and thoroughly compacted mass of proper density.

Use mechanical tamps and rammers to avoid damage to the structure where backfill material is being placed too close to the structure to permit compaction with blading and rolling equipment.

Avoid wedging action of backfill against structures. Step or serrate slopes bounding the excavation to prevent such action. Place backfill uniformly around bridge foundations. Place backfill equally and in uniform layers along both sides of manholes/inlets and culverts.

The Engineer may require backfilling of structures excavated into hard, erosion-resistant material, and subject to erosive forces, with stone or lean concrete.

Box culverts may be opened to traffic as soon as enough backfill and embankment has been placed over the top to protect culverts against damage from heavy construction equipment. Repair damage to culvert caused by construction traffic at no additional expense to the Department.

3.3.3. Pipe. Bring backfill material to the proper moisture condition after installing bedding and pipe as required and place it equally along both sides of the pipe in uniform layers no greater than 8 in. deep (loose measurement). Compact each lift mechanically. Thoroughly compact materials placed under the haunches of the pipe to prevent damage or displacement of the pipe. Place backfill in this manner to the top-of-pipe elevation. Place and compact backfill above the top of the pipe in accordance with Section 400.3.3.1., "General."

The Engineer may reject backfill material containing more than 20% by weight of material retained on a 3 in. sieve with large lumps not easily broken down or that cannot be spread in loose layers. Material excavated by a trenching machine will generally meet the requirements of this Section as long as large stones are not present.

Place and compact additional material where pipe extends beyond the toe of slope of the embankment and the depth of cover provided by backfill to the original ground level is less than the minimum required by the specifications for the type of pipe involved until the minimum cover has been provided.

3.3.4. **Cement-Stabilized Backfill**. Backfill the excavation to the elevations shown with cement-stabilized backfill when shown on the plans. Use cement-stabilized backfill that contains aggregate conforming to the gradation limits shown in Table 1, water, and a minimum of 7% hydraulic cement based on the dry weight of the aggregate, in accordance with Tex-120-E.

Place cement-stabilized backfill equally along the sides of structures to prevent strain on or displacement of the structure. Fill voids when placing cement-stabilized backfill. Use hand-operated tampers if necessary to fill voids.

3.3.5. **Flowable Backfill**. Backfill the excavation with flowable backfill to the elevations indicated when shown on the plans. Prevent the structure from being displaced during the placement of the flowable fill, and prevent flowable fill from entering manholes/inlets and culverts, and drainage structures.

## 4. MEASUREMENT

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

4.1. **Structural Excavation**. Unless shown on the plans as a pay item, structural excavation quantities shown are for information purposes only.

When structural excavation is specified as a pay item, structural excavation for pipe headwalls, inlets, manholes, culvert or storm drain extensions less than 15 ft. long, bridge abutments, retaining walls, and side road and private entrance pipe culverts will not be measured. No allowance will be made for variance from plans quantity incurred by an alternate bid.

When specified as a pay item, structural excavation will be measured by the cubic yard as computed by the average end areas method. Excavation diagrams on the plans take precedence over the provisions of this Article.

- 4.1.1. Boundaries of Measurement.
- 4.1.1.1. **Pipe**.
- 4.1.1.1.1. **Pipe up to 42 Inches**. For pipe up to 42 in. nominal or equivalent diameter, no material outside of vertical planes 1 ft. beyond and parallel to the horizontal projection of the outside surfaces of the pipe will be included.
- 4.1.1.1.2. **Pipe Larger than 42 Inches**. For pipes larger than 42 in. nominal or equivalent diameter, no material outside of vertical planes located 2 ft. beyond and parallel to the horizontal projection of the outside surfaces of the pipe will be included.

Quantities for excavation in fill above natural ground include 1 ft. above the top of the pipe regardless of the height of completed fill. Excavation for pipe will be measured between the extreme ends of the completed structure including end appurtenances as shown on the plans and from centerline to centerline of inlets, manholes, etc.

- 4.1.1.2. **Structural Plate Structures**. No material outside of vertical planes 3 ft. beyond and parallel to the horizontal projection of the outside surfaces of the structure will be included. When the quality of the existing soil or embankment is less than that of the proposed backfill material, the limits of measurement will be extended to vertical planes located 1/2 of the span beyond the horizontal projection of the outside surfaces of the structure.
- 4.1.1.3. **Footings, Walls, Boxes, and Other Excavation**. No material outside of vertical planes 1 ft. beyond and parallel to the edges of the footings or outside walls will be included whether or not a cofferdam or shoring is

used. When plans provide the option of cast-in-place or precast boxes, measurement will be based on the cast-in-place option.

Where excavation in addition to that allowed for the footings is required for other portions of the structure, measurement for the additional excavation will be limited laterally by vertical planes 1 ft. beyond the face of the member and parallel to it, and vertically to a depth of 1 ft. below the bottom of the member.

- 4.1.1.4. **Excavation near Roadways and Channels**. At structure sites other than culverts and pipe excavations, the measurement of structural excavation will include only material below or outside the limits of the completed road or channel excavation. Roadway and channel excavation will be paid under Item 110, "Excavation." For culverts except side road and private entrance culverts, excavation within the limits of the structure and below or outside the limits of the completed roadway excavation will be measured as structural excavation.
- 4.1.2. **Falsework**. No measurement will be made for excavation necessary for placing forms or falsework that exceeds the limits given in Section 400.4.1.1., "Boundaries of Measurement."
- 4.1.3. Swelling. Measurement will not include materials removed below footing grades to compensate for anticipated swelling due to pile-driving, nor will it include material required to be removed due to swelling beyond the specified limits during pile-driving operations.
- 4.1.4. **Cave-Ins**. Measurement will not include additional volume caused by slips, slides, cave-ins, silting, or fill material resulting from the action of the elements or the Contractor's operation.
- 4.1.5. **Undercut**. Where rock or other incompressible or unstable material is undercut to provide a suitable foundation for pipe or box sections, such material below grade directed to be removed will be measured for payment.
- 4.1.6. **Grade Change**. Additional measurement will be made of the volume of excavation involved in the lowering or raising of the elevation of a footing, foundation, or structure unit, when such grade change is authorized.
- 4.2. **Cement-Stabilized Backfill**. Cement-stabilized backfill will be measured by the cubic yard as shown on the plans.
- 4.3. **Cutting and Restoring Pavement**. Cutting and restoring pavement will be measured by the square yard as shown on the plans. Excavation below pavement or base will be measured as structural excavation of the pertinent type.

#### 5. PAYMENT

5.1. **Structural Excavation**. Unless specified as a pay item, structural excavation and backfill performed, and material furnished in accordance with this Item will not be paid for directly but are subsidiary to pertinent Items.

When structural excavation is specified as a pay item, the excavation and backfill work performed, and materials furnished will be paid for at the unit price bid for "Structural Excavation," "Structural Excavation (Box)," "Structural Excavation (Pipe)," and "Structural Excavation (Bridge)." This price includes concrete to compensate for excavation that has extended below grade for bridge foundations and retaining walls, and backfilling and compacting areas that were removed as part of structural excavation.

Cofferdams or other measures necessary for supporting excavations less than 5 ft. deep will not be measured or paid for directly but will be subsidiary to the Contract.

Foundation seal concrete for cofferdams, when required, will be paid for as provided in the pertinent Items. If no direct method of payment is provided in the Contract, the work will be measured and paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method." Seal placed for the convenience of the Contractor will not be paid for.

Unless otherwise provided, stone or lean concrete backfill around structures as provided for in Section 400.3.3.2., "Bridge Foundations, Retaining Walls, Manholes/Inlets, and Box Culverts," will be measured and paid for as extra work in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

When structural excavation is specified as a pay item, a partial payment of 50% of the bid price will be made for structural excavation completed to the satisfaction of the Engineer but not backfilled. The remaining amount will be paid upon completion of backfilling. When the Contractor elects to excavate beyond plan requirements, no measurement will be made of the additional volume.

- 5.2. Removal and Replacement of Unsuitable or Incompressible Material. Removal and replacement of material will be paid for if directed. Removal and replacement of material or placement of special material made necessary by the softening of founding material due to the Contractor's sequence of work or operation, will be at the Contractor's expense. Special material used or additional excavation made for the Contractor's convenience will not be paid for.
- 5.2.1. **Structural Excavation as a Pay Item**. Where special materials are not required or specified, payment for the removal and replacement of unstable or incompressible material will be made at a price equal to 200% of the unit price bid per cubic yard for Structural Excavation. When the Contractor elects to remove and replace material deeper than directed, no measurement will be made on that portion below the directed elevation. This price is full compensation for removing the unstable or incompressible material; furnishing, hauling, placing, and compacting suitable replacement material; and equipment, labor, tools, and incidentals.

When the plans specify or when directed, the use of special materials such as flexible base, cement-stabilized base, cement-stabilized backfill, or other special material, payment for excavation below footing grades will be made at the unit price bid for Structural Excavation. Payment for furnishing, hauling, placing, and compacting the flexible base, cement-stabilized base, cement-stabilized backfill, or other special materials will be made at the unit price bid for these items in the Contract, or, if the required material is not a bid item, in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

5.2.2. **Structural Excavation Not a Pay Item**. Where special materials for backfill are not required or specified, payment for the authorized removal and replacement of unstable or incompressible material will be measured and paid for at \$15 per cubic yard of material removed. This price is full compensation for removing the unstable or incompressible material; furnishing, hauling, placing, and compacting suitable replacement material; and equipment, labor, tools, and incidentals.

When the plans specify or when directed, the use of special materials such as flexible base, cement-stabilized base, cement-stabilized backfill, or other special material, excavation below the footing grades will be paid for at \$10 per cubic yard. Payment for furnishing, hauling, placing, and compacting the flexible base, cement-stabilized base, cement-stabilized backfill, or other special materials will be made at the unit price bid for these items, or, if the required material is not a bid item, in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

5.3. **Lowering of a Structure Foundation**. If the Engineer requires a structure foundation to be lowered to an elevation below the grade shown on the plans, overexcavation will be paid in accordance with Table 2.

Table 2
Payment for Required Overexcavation

Variance of Revised	Payment Terms	Variance of Revised Footing Grade from Plan Grade
Footing Grade from Plan Grade	"Structural Excavation" is a Bid Item	"Structural Excavation" is not a Bid Item
Up to and including 5 ft.	Unit price equal to 115% of unit price bid for "Structural Excavation"	\$10 per cubic yard
Over 5 ft. up to 10 ft.	Unit price equal to 125% of unit price bid for "Structural Excavation"	\$12 per cubic yard
Over 10 ft.	In accordance with Article 9.7., "Payment for Extra Work and Force Account Method."	

- 5.4. **Cement-Stabilized Backfill**. Cement-stabilized backfill will be paid for at the unit price bid for "Cement-Stabilized Backfill."
- 5.5. **Cutting and Restoring Pavement**. Cutting and restoring pavement will be paid for at the unit price bid for "Cutting and Restoring Pavement" of the type specified.

Work done to repair damage to base or pavement incurred outside the limits shown on the plans, or the limits authorized, will not be measured for payment.

The unit prices bid are full compensation for excavation including removing obstructions and plugging drainage systems; bedding and backfilling including placing, sprinkling and compaction of material; soundings; cleaning and filling seams; constructing and removing cofferdams; de-watering, sheeting, or bracing excavations up to and including 5 ft. deep; pumps; drills; explosives; disposition of surplus material; cutting pavement and base to neat lines; and materials, hauling, equipment, labor, tools, and incidentals.

Flowable backfill will be paid for as provided in Item 401, "Flowable Backfill." Protection methods for open excavations deeper than 5 ft. will be measured and paid for as required under Item 402, "Trench Excavation Protection," or Item 403, "Temporary Special Shoring."

# **Trench Excavation Protection**



# 1. DESCRIPTION

Furnish and place excavation protection for trenches 5 ft. or greater in depth.

# 2. CONSTRUCTION

Provide vertical or sloped cuts, benches, shields, support systems, or other systems providing the necessary protection in accordance with OSHA Standards and Interpretations, 29 CFR Part 1926, Subpart P, "Excavations."

# 3. MEASUREMENT

This Item will be measured by the foot along the long axis of the trench where the depth of trench exceeds 5 ft. This measurement includes all required trench protection, including trench ends.

# 4. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Trench Excavation Protection." This price is full compensation for excavation and backfill required for excavation protection; furnishing, placing, and removing shoring, sheeting, or bracing; de-watering or diversion of water; jacking and jack removal; and equipment, labor, materials, tools, and incidentals.

# **Temporary Special Shoring**



## 1. DESCRIPTION

Furnish and install temporary shoring to hold the surrounding earth, water, or both out of the work area.

# 2. MATERIALS

Furnish new or used materials. Furnish materials that meet the requirements of Item 423, "Retaining Walls," when using temporary Mechanically Stabilized Earth (MSE) walls. Furnish materials that meet the requirements of Item 410, "Soil Nail Anchors," or Item 411, "Rock Nail Anchors," when using temporary nailed walls (rock or soil).

# 3. CONSTRUCTION

The Contractor is responsible for the temporary special shoring design unless complete details are included on the plans. Submit details and design calculations bearing the seal of a licensed professional engineer before constructing the shoring. The Department reserves the right to reject designs. Design the shoring to comply with OSHA Standards and Interpretations, 29 CFR 1926, Subpart P, "Excavations." Design structural systems to comply with AASHTO Standard Specifications for Highway Bridges or AASHTO LRFD Bridge Design Specifications. Design shoring subject to railroad loading to comply with the AREMA Manual for Railway Engineering and any additional requirements of the railway being supported.

Provide vertical or sloped cuts, benches, shields, support systems, or other systems to provide the necessary protection in accordance with the approved design. Construct temporary MSE walls, when used, in accordance with Item 423, "Retaining Walls." Construct temporary nailed walls (rock or soil), when used, in accordance with Item 410, "Soil Nail Anchors," or Item 411, "Rock Nail Anchors."

# 4. MEASUREMENT

This Item will be measured by the square foot of surface area of a vertical plane at the face of the shoring between the top of the ground being supported and the minimum protection grade line shown on the plans. If no minimum protection grade is shown on the plans, the lowest required excavated elevation will be used. Shoring projecting above the level of the ground being supported will not be measured. When excavation techniques (e.g., sloped cuts or benching) are used to provide the necessary protection, the surface area for payment will be calculated based on the area described by a vertical plane adjacent to the structure.

### 5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Special Shoring." This price is full compensation for excavation and backfill; furnishing, placing and removing shoring, sheeting, or bracing; dewatering or diversion of water; jacking and jack removal; and equipment, labor, materials, tools, and incidentals.

No payment will be made for special shoring made necessary by the selection of an optional design or sequence of work that creates the need for shoring.

# **Concrete Substructures**



## 1. DESCRIPTION

Construct concrete substructures including footings, columns, caps, abutments, piers, culverts, other bridge substructure elements, and other concrete structures as indicated.

## 2. MATERIALS

- 2.1. **Concrete**. Provide concrete in accordance with Item 421, "Hydraulic Cement Concrete." Provide the class of concrete for each type of structure or unit as shown on the plans or in pertinent governing specifications.
- 2.2. **Grout or Mortar**. Provide grout for dowelling anchors or precast connections in accordance with <u>DMS-4675</u>, "Cementitious Grouts and Mortars for Miscellaneous Applications."
- 2.3. Latex Curing Materials. Provide an acrylic-polymer latex admixture (acrylic resin emulsion per <u>DMS-4640</u>, "Chemical Admixtures for Concrete") suitable for producing polymer-modified concrete or mortar. Do not allow latex to freeze.
- 2.4. Reinforcing Steel. Provide reinforcing steel in accordance with Item 440, "Reinforcement for Concrete."
- 2.5. **Expansion Joint Material**. Provide materials in accordance with DMS-6310, "Joint Sealants and Fillers."
  - Provide preformed fiber expansion joint material that conforms to the dimensions shown on the plans.
  - Provide preformed bituminous fiber material unless otherwise specified.
  - Provide asphalt board that conforms to dimensions shown on the plans.
  - Provide re-bonded neoprene filler that conforms to the dimensions shown on the plans.
- 2.6. **Waterstop**. Provide rubber or polyvinyl chloride (PVC) waterstops in accordance with <u>DMS-6160</u>, "Water Stops, Nylon Reinforced Neoprene Sheet, and Elastomeric Pads," unless otherwise shown on the plans.
- 2.7. **Curing Materials**. Provide membrane curing compounds in accordance with <u>DMS-4650</u>, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants."

Provide cotton mats that consist of a filling material of cotton "bat" or "bats" (at least 12 oz. per square yard) completely covered with unsized cloth (at least 6 oz. per square yard) stitched longitudinally with continuous parallel rows of stitching spaced at less than 4 in., or tuft both longitudinally and transversely at intervals less than 3 in. Provide cotton mats that are free from tears and in good general condition. Provide a flap at least 6 in. wide consisting of 2 thicknesses of the covering and extending along 1 side of the mat.

Provide polyethylene sheeting that is at least 4 mils thick and free from visible defects. Provide only clear or opaque white sheeting when the ambient temperature during curing exceeds 90°F or when applicable to control temperature during mass pours.

Provide burlap-polyethylene mats made from burlap impregnated on 1 side with a film of opaque white pigmented polyethylene, free from visible defects. Provide laminated mats that have at least 1 layer of an impervious material such as polyethylene, vinyl plastic, or other acceptable material (either as a solid sheet or impregnated into another fabric) and are free of visible defects.

Provide burlap material which complies with AASHTO M 182, Class 3 (10 oz. per square yard) with the following additions:

- Manila hemp may also be used to make burlap.
- Do not use burlap fabricated from bags.
- Do not use burlap containing any water soluble ingredient which will retard the setting time of concrete.

Provide used burlap complying with the requirements stated above and that has only been used previously for curing concrete. "Like new" cleanliness is not expected, but contamination with any substance foreign to the concrete curing process, such as grease or oil, will be cause for rejection.

2.8. **Epoxy**. Provide epoxy materials in accordance with <u>DMS-6100</u>, "Epoxies and Adhesives," unless otherwise specified.

### 3. EQUIPMENT

3.1. **Transporting and Placing Equipment**. Use appropriate transporting and placing equipment such as buckets, chutes, buggies, belt conveyors, pumps, or other equipment as necessary. Ensure concrete is not transported or conveyed through equipment made of aluminum.

Use tremies to control the fall of concrete or for underwater placement. Use tremies that are watertight and of large enough diameter to allow the placement of the concrete but less than 14 in. in diameter. Construct the tremie so the bottom can be sealed and opened once the tremie has been fully charged with concrete for underwater placements.

Use pumps with lines at least 5 in. inside diameter (I.D.) where Grade 2 or smaller coarse aggregate is used, and at least 8 in. I.D. for Grade 1 coarse aggregate.

- 3.2. **Vibrators**. Use immersion-type vibrators for consolidation of concrete. Provide at least 1 standby vibrator for emergency use. Furnish vibrator head covered by a rubberized or elastomeric cover when used near epoxy coated reinforcing steel.
- 3.3. **Temperature Recording Equipment**. Use strip chart temperature recording devices, recording maturity meters in accordance with <u>Tex-426-A</u>, or other approved devices that are accurate to within ±2°F within the range of 32°F to 212°F for mass concrete operations, cold weather placements, and as otherwise specified.
- 3.4. **Artificial Heating Equipment**. Use artificial heating equipment as necessary for maintaining the concrete temperatures as specified in Section 420.4.7.11., "Placing Concrete in Cold Weather."
- 3.5. **Spraying Equipment**. Use mechanically powered pressure sprayers, either air or airless, with appropriate atomizing nozzles for the application of membrane curing. Use hand-pressurized spray equipment with 2 or 3 fan-spray nozzles if approved. Ensure the spray from each nozzle overlaps the spray from adjacent nozzles by approximately 50%.
- 3.6. **Concrete Testing Equipment**. Provide testing equipment for use by the Engineer in accordance with Section 421.3.3., "Testing Equipment."

### 4. CONSTRUCTION

Obtain approval for proposed construction methods before starting work. Approval of construction methods and equipment does not relieve the Contractor's responsibility for safety or correctness of methods, adequacy of equipment, or completion of work in full accordance with the Contract.

Unless otherwise shown on the plans, it is the Contractor's option to perform testing on structural concrete (structural classes of concrete are identified in Table 8 of Section 421.4.1., "Classification of Concrete Mix Designs,") to determine the in-situ strength to address the schedule restrictions in Section 420.4.1., "Schedule Restrictions." The Engineer may require the Contractor to perform this testing for concrete placed in cold weather. Make enough test specimens for Contractor-performed testing to ensure strength requirements are met for the operations listed in Section 420.4.1., "Schedule Restrictions." Make at least

1 set of test specimens for each element cast each day. Cure these specimens under the same conditions as the portion of the structure involved for all stages of construction. Ensure safe handling, curing, and storage of all test specimens. Provide testing personnel, and sample and test the hardened concrete in accordance with Section 421.4.8., "Sampling and Testing of Concrete." The maturity method, <u>Tex-426-A</u>, may be used for in-situ strength determination for schedule restrictions if approved. Coring will not be allowed for in-situ strength determination for schedule restrictions. Provide the Engineer the opportunity to witness all testing operations. Report all test results to the Engineer.

If the Contractor does not wish to perform schedule restriction testing, the Engineer's 7-day lab-cured tests, performed in accordance with Article 421.5., "Acceptance of Concrete," will be used for schedule restriction determinations. The Engineer may require additional time for strength gain to account for field curing conditions such as cold weather.

- 4.1. **Schedule Restrictions**. Construct and open completed structures to traffic with the following limitations unless otherwise shown on the plans:
- 4.1.1. **Setting Forms**. Attain at least 2,500 psi compressive strength before erecting forms on concrete footings supported by piling or drilled shafts, or on individual drilled shafts. Erect forms on spread footings and culvert footings after the footing concrete has aged at least 2 curing days as defined in Section 420.4.10., "Curing Concrete." Place concrete only after the forms and reinforcing steel have been inspected by the Engineer.

Support tie beam or cap forms by falsework on previously placed tie beams only if the tie beam concrete has attained a compressive strength of 2,500 psi and the member is properly supported to eliminate stresses not provided for in the design. Maintain curing as required until completion of the curing period.

Place superstructure forms or falsework on the substructure only if the substructure concrete has attained a compressive strength of 3,000 psi.

- 4.1.2. **Removal of Forms and Falsework**. Keep in place weight-supporting forms and falsework for bridge components and culvert slabs until the concrete has attained a compressive strength of 2,500 psi in accordance with Section 420.4.11., "Removal of Forms and Falsework." Keep all forms for mass placements in place for 4 days following concrete placement unless otherwise approved based on the outcome of the heat control plan outlined in Section 420.4.7.14., "Mass Placements."
- 4.1.3. **Placement of Superstructure Members**. Erect or place superstructure members or precast substructure members only after the substructure concrete has attained a compressive strength of 3,000 psi.
- 4.1.4. **Opening to Traffic.** Direct traffic culverts may be opened to construction traffic when the design strength specified in Section 421.4.1., "Classification of Concrete Mix Design," has been attained if curing is maintained. Obtain approval before opening direct traffic culverts to the traveling public. Open other noncritical structural and nonstructural concrete for service upon the completion of curing unless otherwise specified or directed.
- 4.1.5. **Post-Tensioned Construction**. Ensure strength requirements on the plans for structural elements designed to be post-tensioned are met for stressing and staged loading of structural elements.
- 4.1.6. **Backfilling**. Backfill in accordance with Section 400.3.3., "Backfill."
- 4.2. Plans for Falsework and Forms. Submit plans for falsework and forms for the following items: vertical forms for piers and single column bents; load supporting forms for caps and tie-beams; form attachments for bridges to be widened; and other items as indicated or directed. Provide design calculations when requested. Show all essential details of proposed forms, falsework, and bracing. Have a licensed professional engineer design, seal, and sign these plans. Department approval is not required, except as noted in Table 1 of Item 5, "Control of the Work," when forms or falsework are located such that public safety can be affected, but the Department reserves the right to request modifications to the plans. The Contractor is responsible for the adequacy of these plans. Design job-fabricated formwork assuming a weight of 150 pcf for concrete, and

include a liveload allowance of 50 psf of horizontal surface of the form. Do not exceed 125% of the allowable stresses used by the Department for the design of structures.

4.3. Falsework. Design and construct falsework to safely carry the maximum anticipated loads, including wind loads, and to provide the necessary rigidity. Consult AASHTO's Guide Design Specifications for Bridge Temporary Works and Construction Handbook for Bridge Temporary Works for falsework and shoring information not indicated below. Submit details in accordance with Section 420.4.2., "Plans for Falsework and Forms."

Design job-fabricated falsework assuming a weight of 150 pcf for concrete, and include a minimum liveload allowance of 50 psf of horizontal surface of the form. Do not exceed 125% of the allowable stresses used by the Department for the design of structures.

Do not exceed the manufacturer's maximum allowable working loads for moment and shear or end reaction for commercially produced structural units used in falsework. Include a minimum liveload allowance of 35 psf of horizontal form surface in determining the maximum allowable working load for commercially produced structural units.

Provide timber that is sound, in good condition, and free from defects that would impair its strength. Provide timber that meets or exceeds the species, size, and grade requirements in the submitted falsework plans.

Provide wedges made of hardwood or metal in pairs to adjust falsework to desired elevations to ensure even bearing. Do not use wedges to compensate for incorrectly cut bearing surfaces.

Use sills or grillages large enough to support the superimposed load without settlement. Take precautions to prevent settling of the supporting material unless the sills or grillages are founded on solid rock, shale, or other hard materials.

Place falsework that cannot be founded on a satisfactory spread footing on piling or drilled shafts with enough bearing capacity to support the superimposed load without settlement. Drive falsework piling to the required resistance determined by the applicable formula in Item 404, "Driving Piling." Design drilled shafts for falsework to carry the superimposed load using both skin friction and point bearing.

Weld in conformance with Item 448, "Structural Field Welding." Securely brace each falsework bent to provide the stiffness required, and securely fasten the bracing to each pile or column it crosses.

Remove falsework when it is no longer required or as indicated on the submitted falsework plan. Pull or cut off foundations for falsework at least 2 ft. below finished ground level. Completely remove falsework, piling, or drilled shafts in a stream, lake, or bay to the approved limits to prevent obstruction to the waterway.

- 4.4. **Forms**. Submit formwork plans in accordance with Section 420.4.2., "Plans for Falsework and Forms."
- 4.4.1. **General**. Provide forms of either timber or metal except where otherwise specified or permitted.

Design forms for the pressure exerted by a liquid weighing 150 pcf. Take the rate of concrete placement into consideration in determining the depth of the equivalent liquid. Include a minimum liveload allowance of 50 psf of horizontal surface for job-fabricated forms. Do not exceed 125% of the Department's allowable stresses for the design of structures.

Do not exceed the manufacturer's maximum allowable working loads for moment and shear or end reaction for commercially produced structural units used for forms. Include a minimum liveload allowance of 35 psf of horizontal form surface in determining the maximum allowable working load for commercially produced structural units.

Provide steel forms for round columns unless otherwise approved. Refer to Item 427, "Surface Finishes for Concrete," for additional requirements for off-the-form finishes.

Provide commercial form liners for imprinting a pattern or texture on the concrete surface as shown on the plans and specified in Section 427.4.3.5., "Form Liner Finish."

Provide forming systems that are practically mortar-tight, rigidly braced, and strong enough to prevent bulging between supports, and maintain them to the proper line and grade during concrete placement. Maintain forms in a manner that prevents warping and shrinkage. Do not allow offsets at form joints to exceed 1/16 in.

Use only material that is inert, non-biodegradable, and nonabsorptive for forms to be left in place.

Construct all forms to permit their removal without marring or damaging the concrete. Clean all forms and footing areas of any extraneous matter before placing concrete. Provide openings in forms if needed for the removal of laitance or foreign matter.

Treat the facing of all forms with bond-breaking coating of composition that will not discolor or injuriously affect the concrete surface. Take care to prevent coating of the reinforcing steel.

Complete all preparatory work before requesting permission to place concrete.

Cease placement if the forms show signs of bulging or sagging at any stage of the placement, and remove the portion of the concrete causing this condition immediately as directed. Reset the forms and securely brace them against further movement before continuing the placement.

4.4.2. **Timber Forms**. Provide properly seasoned, good-quality lumber that is free from imperfections that would affect its strength or impair the finished surface of the concrete. Provide timber or lumber that meets or exceeds the requirements for species and grade in the submitted formwork plans.

Maintain forms or form lumber that will be reused so it stays clean and in good condition. Do not use any lumber that is split, warped, bulged, or marred, or that has defects in any way that will produce inferior work. Promptly remove such lumber from the work.

Provide form lining for all formed surfaces except:

- the inside of culvert barrels, inlets, manholes, and box girders;
- surfaces that are subsequently covered by backfill material or are completely enclosed; and
- any surface formed by a single finished board or by plywood.

Provide form lining of an approved type such as masonite or plywood. Do not provide thin membrane sheeting such as polyethylene sheets for form lining.

Use plywood at least 3/4 in. thick. Place the grain of the face plies on plywood forms parallel to the span between the supporting studs or joists unless otherwise indicated on the submitted form drawings.

Use plywood for forming surfaces that remain exposed that meets the requirements for B-B Plyform Class I or Class II Exterior of the U.S. Department of Commerce Voluntary Product Standard PS 1.

Space studs and joists so the facing form material remains in true alignment under the imposed loads.

Space wales closely enough to hold forms securely to the designated lines, scabbed at least 4 ft. on each side of joints to provide continuity. Place a row of wales near the bottom of each placement.

Place facing material with parallel and square joints, securely fastened to supporting studs.

Place forms with the form panels symmetrical (long dimensions set in the same direction) for surfaces exposed to view and receiving only an ordinary surface finish as defined in Section 420.4.13., "Ordinary Surface Finish." Make horizontal joints continuous.

Make molding for chamfer strips or other uses of materials of a grade that will not split when nailed and can be maintained to a true line without warping. Dress wood molding on all faces. Fill forms at all sharp corners and edges with triangular chamfer strips measuring 3/4 in. on the sides unless otherwise shown on the plans.

Use metal form ties of an approved type or a satisfactory substitute of a type that permits ease of removal of the metal to hold forms in place. Cut back wire ties at least 1/2 in. from the face of the concrete.

Use devices to hold metal ties in place that are able to develop the strength of the tie and adjust to allow for proper alignment.

Entirely remove metal and wooden spreaders that separate the forms as the concrete is being placed.

Provide adequate clean-out openings for narrow walls and other locations where access to the bottom of the forms is not readily attainable.

4.4.3. **Metal Forms**. Requirements for timber forms regarding design, mortar-tightness, filleted corners, beveled projections, bracing, alignment, removal, reuse, and wetting also apply to metal forms except metal forms do not require lining unless specifically noted on the plans.

Use form metal thick enough to maintain the true shape without warping or bulging. Countersink all bolt and rivet heads on the facing sides. Design clamps, pins, or other connecting devices to hold the forms rigidly together and to allow removal without damage to the concrete. Use metal forms that present a smooth surface and line up properly. Keep metal free from rust, grease, and other foreign materials.

- 4.5. **Drains.** Install and construct weep holes and roadway drains as shown on the plans.
- 4.6. Placing Reinforcement and Post-Tensioning. Place reinforcement as provided in Item 440, "Reinforcement for Concrete." Do not weld reinforcing steel supports to other reinforcing steel except where shown on the plans.

Place post-tensioning ducts, anchorages, and other hardware in accordance with the approved prestressing details and Item 426, "Post-Tensioning." Keep ducts free of obstructions until all post-tensioning operations are complete.

4.7. **Placing Concrete**. 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.

Do not place concrete when impending weather conditions would impair the quality of the finished work. Place concrete in early morning or at night or adjust the placement schedule for more favorable weather when conditions of wind, humidity, and temperature are such that concrete cannot be placed without the potential for weather-related distress.

Adequately illuminate the entire placement site as approved when mixing, placing, and finishing concrete in non-daylight hours.

Furnish adequate shelter to protect the concrete against damage from rainfall or freezing temperatures as outlined in this Item if changes in weather conditions require protective measures after work starts. Continue operations during rainfall only if approved. Use protective coverings for the material stockpiles. Cover aggregate stockpiles only to the extent necessary to control the moisture conditions in the aggregates.

Allow at least 1 curing day after the concrete has achieved initial set before placing strain on projecting reinforcement to prevent damage to the concrete.

4.7.1. **Placing Temperature**. Place concrete according to the following temperature limits for the classes of concrete defined in Section 421.4.1., "Classification of Concrete Mix Designs."

- Place Class C, F, H, K, or SS concrete only when its temperature at time of placement is between 50°F and 95°F. Increase the minimum placement temperature to 60°F if slag cement is used in the concrete.
- Place Class S concrete, used in this Item only as indicated for culvert top slabs, only when its temperature is between 50°F and 85°F. Increase the minimum placement temperature to 60°F if slag cement is used in the concrete.
- Place Class A, B, and D concrete only when its temperature at the time of placement is greater than 50°F.
- Place mass concrete in accordance with Section 420.4.7.14., "Mass Placements," only when its temperature at the time of placement is between 50°F and 75°F.
- 4.7.2. **Transporting Time**. Begin the discharge of concrete delivered in truck mixers within the times listed in Table 14 of Item 421, "Hydraulic Cement Concrete."
- 4.7.3. **Workability of Concrete**. Place concrete with a slump as specified in Section 421.4.2.5., "Slump." Water may be added to the concrete before discharging any concrete from the truck to adjust for low slump provided that the maximum mix design water–cement ratio is not exceeded. Mix concrete in accordance with Section 421.4.6., "Mixing and Delivering Concrete," after introduction of any additional water or chemical admixtures. Do not add water or chemical admixtures after any concrete has been discharged.
- 4.7.4. **Transporting Concrete**. Transport concrete by buckets, chutes, buggies, belt conveyors, pumps, or other methods.

Protect concrete transported by conveyors from sun and wind to prevent loss of slump and workability. Shade or wrap with wet burlap pipes through which concrete is pumped as necessary to prevent loss of slump and workability.

Arrange and use chutes, troughs, conveyors, or pipes so the concrete ingredients will not be separated. Terminate such equipment in vertical downspouts when necessary to prevent segregation. Extend open troughs and chutes, if necessary, down inside the forms or through holes left in the forms.

Keep all transporting equipment clean and free from hardened concrete coatings. Discharge water used for cleaning clear of the concrete.

4.7.5. **Preparation of Surfaces**. Thoroughly wet all forms and hardened concrete on which concrete is to be placed before placing concrete on them. Remove any remaining puddles of excess water before placing concrete. Provide surfaces that are in a moist, saturated surface-dry condition when concrete is placed on them.

Ensure the subgrade or foundation is moist before placing concrete on grade. Lightly sprinkle the subgrade if dry.

4.7.6. **Expansion Joints**. Construct joints and devices to provide for expansion and contraction in accordance with plan details.

Use light wire or nails to anchor any preformed fiber joint material to the concrete on 1 side of the joint.

Ensure finished joints conform to the plan details with the concrete sections completely separated by the specified opening or joint material.

Remove all concrete within the joint opening soon after form removal and again where necessary after surface finishing to ensure full effectiveness of the joint.

4.7.7. **Construction Joints**. A construction joint is the joint formed by placing plastic concrete in direct contact with concrete that has attained its initial set. Monolithic placement means the manner and sequence of concrete placing does not create a construction joint.

Make construction joints of the type and at the locations shown on the plans. Additional joints in other members are not permitted without approval. Place authorized additional joints using details equivalent to those shown on the plans for joints in similar locations.

Make construction joints square and normal to the forms unless otherwise required. Use bulkheads in the forms for all vertical joints.

Thoroughly roughen the top surface of a concrete placement terminating at a horizontal construction joint as soon as practical after initial set is attained.

Thoroughly clean the hardened concrete surface of all loose material, laitance, dirt, and foreign matter, and saturate it with water. Remove all free water and moisten the surface before concrete or bonding grout is placed against it. Ensure the surface of the existing concrete is in a saturated surface-dry condition (SSD) just before placing subsequent concrete. Wet the existing concrete by ponding water on the surface for 24 hr. before placing subsequent concrete. Use high-pressure water blasting if ponding is not possible to achieve SSD conditions 15 to 30 min. before placing the concrete. An SSD condition is achieved when the surface remains damp when exposed to sunlight for 15 min.

Draw forms tight against the existing concrete to avoid mortar loss and offsets at joints.

Bonding agents are not required unless indicated otherwise. Coat the joint surface with bonding mortar, grout, epoxy, or other material if a bonding agent is required as indicated on the plans. Provide Type V epoxy per <a href="DMS-6100">DMS-6100</a>, "Epoxies and Adhesives," for bonding fresh concrete to hardened concrete. Place the bonding epoxy on a clean, dry surface, and place the fresh concrete while the epoxy is still tacky. Place bonding mortar or grout on a surface that is SSD, and place the concrete before the bonding mortar or grout dries. Place other bonding agents in accordance with the manufacturer's recommendations.

4.7.8. **Handling and Placing**. Minimize segregation of the concrete and displacement of the reinforcement when handling and placing concrete. Produce a uniform, dense compact mass.

Ensure concrete free-falls no more than 5 ft. except in the case of drilled shafts, thin walls such as in culverts, or as allowed by other Items. Remove any hardened concrete splatter ahead of the plastic concrete.

Fill each part of the forms by depositing concrete as near its final position as possible. Do not deposit large quantities of concrete at 1 point and run or move the concrete along to fill the forms.

Deposit concrete in the forms in layers of suitable depth but no more than 36 in. deep unless otherwise permitted.

Avoid cold joints in a monolithic placement. Sequence successive layers or adjacent portions of concrete so they can be vibrated into a homogeneous mass with the previously placed concrete before it sets. Allow no more than 1 hr. to elapse between adjacent or successive placements of concrete when re-vibration of the concrete is shown on the plans except as otherwise allowed by an approved placing procedure. This time limit may be extended by 1/2 hr. if the concrete contains at least the minimum recommended dosage of a Type B or D admixture.

4.7.9. **Consolidation**. Carefully consolidate concrete and flush mortar to the form surfaces with immersion type vibrators. Do not use vibrators that operate by attachment to forms or reinforcement except where approved on steel forms.

Vibrate the concrete immediately after deposit. Systematically space points of vibration to ensure complete consolidation and thorough working of the concrete around the reinforcement, embedded fixtures, and into the corners and angles of the forms. Insert the vibrators vertically where possible. Vibrate the entire depth of each lift, allowing the vibrator to penetrate several inches into the preceding lift. Do not use the vibrator to move the concrete to other locations in the forms. Do not drag the vibrator through the concrete. Thoroughly consolidate concrete along construction joints by operating the vibrator along and close to but not against the joint surface. Continue the vibration until the concrete surrounding reinforcements and fixtures is completely

consolidated. Hand-spade or rod the concrete if necessary to ensure flushing of mortar to the surface of all forms.

4.7.10. **Installation of Dowels and Anchor Bolts**. Install dowels and anchor bolts by casting them in-place or by grouting with grout, epoxy, or epoxy mortar unless noted otherwise. Form or drill holes for grouting. Follow the manufacturer's recommended installation procedures for pre-packaged grout or epoxy anchor systems. Test anchors if required on the plans or by other Items.

Drill holes for anchor bolts to accommodate the bolt embedment required by the plans. Make holes for dowels at least 12 in. deep unless otherwise shown on the plans. Make the hole diameter at least twice the dowel or bolt diameter, but not exceeding the dowel or bolt diameter plus 1-1/2 in. when using cementitious grout or epoxy mortar. Make the hole diameter 1/16 to 1/4 in. greater than the dowel or bolt diameter when using neat epoxy unless indicated otherwise by the epoxy manufacturer.

Thoroughly clean holes of all loose material, oil, grease, or other bond-breaking substance, and blow them clean with filtered compressed air. Use a wire brush followed by oil-free compressed air to remove all loose material from the holes, repeating as necessary until no more material is removed. Ensure holes are in a surface-dry condition when epoxy type materials are used and in a surface-moist condition when cementitious grout is used. Develop and demonstrate for approval a procedure for cleaning and preparing the holes for installation of the dowels and anchor bolts. Completely fill the void between the hole and dowel or bolt with grouting material. Follow exactly the requirements for cleaning outlined in the product specifications for pre-packaged systems.

Provide hydraulic cement grout for cast-in-place or grouted systems in accordance with <u>DMS-4675</u>, "Cementitious Grouts and Mortars for Miscellaneous Applications." Provide a Type III epoxy per <u>DMS-6100</u>, "Epoxies and Adhesives," when neat epoxy is used for anchor bolts or dowels. Provide Type VIII epoxy per <u>DMS-6100</u>, "Epoxies and Adhesives," when an epoxy grout is used. Provide grout, epoxy, or epoxy mortar as the binding agent unless otherwise indicated on the plans.

Provide other anchor systems as required on the plans.

4.7.11. Placing Concrete in Cold Weather. Protect concrete placed under weather conditions where weather may adversely affect results. Permission given by the Engineer for placing during cold weather does not relieve the Contractor of responsibility for producing concrete equal in quality to that placed under normal conditions. Remove and replace concrete as directed at the Contractor's expense if it is determined unsatisfactory due to poor conditions.

Do not place concrete in contact with any material coated with frost or with a temperature of 32°F or lower. Do not place concrete when the ambient temperature in the shade is below 40°F and falling unless approved. Place concrete when the ambient temperature in the shade is at least 35°F and rising or above 40°F.

Provide and install recording thermometers, maturity meters, or other suitable temperature measuring devices to verify all concrete is effectively protected as follows:

- Maintain the temperature at all surfaces of concrete in bents, piers, culvert walls, retaining walls, parapets, wingwalls, top slabs of non-direct traffic culverts, and other similar formed concrete at or above 40°F for 72 hr. from the time of placement.
- Maintain the temperature of all other concrete, including the bottom slabs (footings) of culverts, placed on or in the ground above 32°F for 72 hr. from the time of placement.

Use additional covering, insulated forms, or other means and, if necessary, supplement the covering with artificial heating. Avoid applying heat directly to concrete surfaces. Cure as specified in Section 420.4.10., "Curing Concrete," during this period until all requirements for curing have been satisfied.

Have all necessary heating and covering material ready for use before permission is granted to begin placement when impending weather conditions indicate the possible need for temperature protection.

- 4.7.12. Placing Concrete in Hot Weather. Keep the concrete at or below the maximum temperature at time of placement as specified in Section 420.4.7.1., "Placing Temperature." Sprinkle and shade aggregate stockpiles or use ice, liquid nitrogen systems, or other approved methods as necessary to control the concrete temperature.
- 4.7.13. Placing Concrete in Water. Deposit concrete in water only when shown on the plans or with approval. Make forms or cofferdams tight enough to prevent any water current passing through the space in which the concrete is being deposited. Do not pump water during the concrete placing or until the concrete has set for at least 36 hr.

Place the concrete with a tremie or pump, or use another approved method, and do not allow it to fall freely through the water or disturb it after it is placed. Keep the concrete surface level during placement.

Support the tremie or operate the pump so it can be easily moved horizontally to cover all the work area and vertically to control the concrete flow. Submerge the lower end of the tremie or pump hose in the concrete at all times. Use continuous placing operations until the work is complete.

Design the concrete mix in accordance with Item 421, "Hydraulic Cement Concrete," with a minimum cement content of 650 lb. per cubic yard for concrete to be placed under water. Include an anti-washout admixture in the mix design as necessary to produce a satisfactory finished product.

- 4.7.14. **Mass Placements**. Develop and obtain approval for a heat control plan for monolithic placements designated on the plans as mass concrete to ensure the following during the heat dissipation period:
  - the temperature differential between the central core of the placement and the exposed concrete surface does not exceed 35°F and
  - the temperature at the central core of the placement does not exceed 160°F.

Use the ConcreteWorks© software available from the Department, or another approved method based on the guidelines in ACI 207, "Mass Concrete," to develop the heat control plan. The Department will make available technical assistance on the use of ConcreteWorks©. Develop the heat control plan using historical temperature ranges for the anticipated time of the mass placement. Re-create the plan if the work schedule shifts by more than one month.

The heat control plan may include a combination of the following elements:

- selection of concrete ingredients including aggregates, gradation, and cement types, to minimize heat of hydration;
- use of ice or other concrete cooling ingredients;
- use of liquid nitrogen dosing systems;
- controlling rate or time of concrete placement;
- use of insulation or supplemental external heat to control heat loss;
- use of supplementary cementing materials;
- use of a cooling system to control the core temperature; or
- vary the duration formwork remains in place.

Furnish and install 2 pairs of temperature recording devices, maturity meters, or other approved equivalent devices. Install devices to measure the surface temperature no more than 3 in. from the surface. Install devices to measure the core temperature a distance of half the least dimension from the nearest surface near the point of maximum predicted heat. Use these devices to simultaneously measure the temperature of the concrete at the core and the surface. Maintain temperature control methods for 4 days unless otherwise approved based on the submitted heat control plan. Do not use maturity meters to predict strength of mass concrete. Revise the heat control plan as necessary to maintain the temperature limitations shown above.

If the core temperature exceeds 160°F, the mass concrete element will be subject to review and acceptance by the Engineer using forensic analyses to determine its potential reduction in service life or performance. Proceed with subsequent construction on the affected element only when notified regarding acceptance.

Repair any resulting cracking if the temperature differential between the central core of the placement and the nearest concrete surface exceeds 35°F at no expense to the Department and revise the heat control plan as necessary to prevent further occurrences.

4.7.15. **Placing Concrete in Foundation and Substructure**. Do not place concrete in footings until the depth and character of the foundation has been inspected and permission has been given to proceed.

Place concrete footings upon seal concrete after the cofferdams are free from water and the seal concrete is cleaned. Perform any necessary pumping or bailing during the concreting from a suitable sump located outside the forms.

Construct or adjust all temporary wales or braces inside cofferdams as the work proceeds to prevent unauthorized construction joints.

Omit forms when footings can be placed in a dry excavation without the use of cofferdams, if approved, and fill the entire excavation with concrete to the elevation of the top of footing.

Place concrete in columns monolithically between construction joints unless otherwise directed. Columns and caps or tie beams supported on them may be placed in the same operation or separately. Allow for settlement and shrinkage of the column concrete, if placed in the same operation, by placing it to the lower level of the cap or tie beam, and delay placement between 1 and 2 hr. before proceeding with the cap or tie beam placement.

4.7.16. Placing Concrete in Box Culverts. Allow between 1 and 2 hr. to elapse where the top slab and walls are placed monolithically in culverts more than 4 ft. in clear height before placing the top slab to allow for settlement and shrinkage in the wall concrete.

Accurately finish the footing slab at the proper time to provide a smooth uniform surface. Finish top slabs that carry direct traffic as specified in Item 422, "Concrete Superstructures." Give top slabs of fill type culverts a float finish.

- 4.8. **Extending Existing Substructures**. Verify pertinent dimensions and elevations of the existing structure before ordering any required materials.
- 4.8.1. **Removal**. Remove portions of the existing structure to the lines and dimensions shown on the plans or as directed. Dispose of these materials as shown on the plans or as directed. Repair any portion of the remaining structure damaged as a result of the construction.

Do not use explosives to remove portions of the existing structure unless approved in writing. Do not use a demolition ball, other swinging weight, or impact equipment unless shown on the plans. Use pneumatic or hydraulic tools for final removal of concrete at the "break" line. Use removal equipment, as approved that will not damage the remaining concrete.

- 4.8.2. **Reuse of Removed Portions of Structure**. Detach and remove all portions of the old structure that are to be incorporated into the extended structure to the lines and details as specified on the plans or as directed. Move the unit to be reused to the new location specified using approved methods. Place the reinforcement and extension concrete according to the plan details.
- 4.8.3. **Splicing Reinforcing Steel**. Splice new reinforcing bars to exposed bars in the existing structure using lap splices in accordance with Item 440, "Reinforcement for Concrete," unless otherwise shown on the plans. The new reinforcing steel does not need to be tied to the existing steel where spacing or elevation does not match that of the existing steel provided the lap length is attained. Weld in accordance with Item 448, "Structural Field Welding," when welded splices are permitted. Install any required dowels in accordance with Section 420.4.7.10., "Installation of Dowels and Anchor Bolts."
- 4.8.4. **Concrete Preparation**. Roughen and clean concrete surfaces that are in contact with new construction before placing forms. Prepare these construction joint surfaces in accordance with Section 420.4.7.7., "Construction Joints."

4.9. Treatment and Finishing of Horizontal Surfaces. Strike off to grade and finish all unformed upper surfaces. Do not use mortar topping for surfaces constructed under this Section.

Float the surface with a suitable float after the concrete has been struck off.

Slope the tops of caps and piers between bearing areas from the center slightly toward the edge, and slope the tops of abutment and transition bent caps from the backwall to the edge, as directed, so water drains from the surface. Give the concrete a smooth trowel finish. Construct bearing areas for steel units in accordance with Section 441.3.11.6., "Bearing and Anchorage Devices." Give the bearing area under the expansion ends of concrete slabs and slab and girder spans a steel-trowel finish to the exact grades required. Give bearing areas under elastomeric bearing pads or nonreinforced bearing seat buildups a textured, wood float finish. Do not allow the bearing area to vary from a level plane more than 1/16 in. in all directions.

Cast bearing seat buildups or pedestals for concrete units integrally with the cap or a construction joint. Provide a latex-based mortar, an epoxy mortar, or an approved proprietary bearing mortar for bearing seat buildups cast with a construction joint. Mix mortars in accordance with the manufacturer's recommendations. Construct pedestals of Class C concrete, reinforced as shown on the plans or as indicated in Figure 1 and Figure 2. The Engineer of Record will design pedestals higher than 12 in.

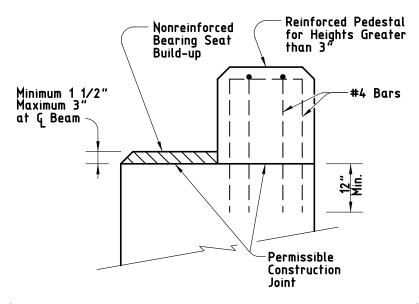


Figure 1
Section through Bearing Seat Buildups

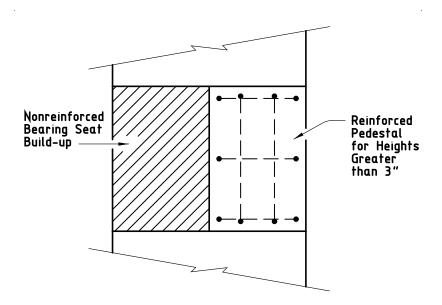


Figure 2
Plan View of Bearing Seat Buildups

4.10. **Curing Concrete**. Obtain approval of the proposed curing methods, equipment, and materials before placing concrete. The Engineer may require the same curing methods for like portions of a single structure. Inadequate curing or facilities may delay all concrete placements on the job until remedial action is taken.

A curing day is a calendar day when the temperature, taken in the shade away from artificial heat, is above 50°F for at least 19 hr. or, on colder days if the temperature of all surfaces of the concrete is maintained above 40°F, for the entire 24 hr. The required curing period begins when all concrete has attained its initial set unless indicated otherwise. <u>Tex-440-A</u> may be used to determine when the concrete has attained its initial set.

Cure all concrete for 4 consecutive days except as allowed for the curing options listed below. Use form or membrane curing for vertical surfaces unless otherwise approved. Use only water curing for horizontal surfaces of HPC or mass concrete. Use water or membrane curing for horizontal or unformed surfaces for all other concrete.

Use one of the following curing options for vertical surfaces, unless indicated otherwise.

- Form cure for 48 hr. after placement.
- Form cure for 12 hr. after placement followed by membrane curing.
- For HPC Concrete, form cure for 48 hr. after placement followed by membrane curing.
- For mass concrete, form cure as required by the heat control plan followed by membrane curing if forms are removed before 4 days.

Apply membrane curing, if used, within 2 hr. of form removal.

Use only water curing in accordance with this Section for the top surface of any concrete unit upon which concrete is to be placed and bonded at a later interval (stub walls, caps with backwalls, risers, etc.).

Cure all other concrete as specified in the pertinent Items. Use the following methods for curing concrete, subject to the requirements of this Item.

4.10.1. **Form Curing**. When forms are left in intimate contact with the concrete, other curing methods are not required except for exposed surfaces and for cold weather protection. Use another approved curing method if forms are removed before the 4-day required curing period.

- 4.10.2. **Water Curing**. Keep all exposed surfaces of the concrete wet continuously for the required curing time. Use water curing in accordance with concrete mixing water in Section 421.2.5., "Water." Do not use seawater or water that stains or leaves an unsightly residue.
- 4.10.2.1. Blankets. Keep the concrete continuously wet by maintaining wet cotton or burlap mats in direct contact with the concrete for the required curing time. Weight the mats adequately to provide continuous contact with all concrete. Cover surfaces that cannot be cured by direct contact with mats, forming an enclosure well anchored to the forms or ground so outside air cannot enter the enclosure. Provide sufficient moisture inside the enclosure to keep all surfaces of the concrete wet.
- 4.10.2.2. Water Spray. Overlap sprays or sprinklers to keep all unformed surfaces continuously wet.
- 4.10.2.3. **Ponding**. Cover the surfaces with at least 2 in. of clean granular material, kept wet at all times, or at least 1 in. deep water. Use a dam to retain the water or saturated granular material.
- 4.10.3. **Membrane Curing**. Choose either Type 1-D or Type 2 membrane-curing compound unless otherwise shown on the plans. Use the same type of curing compound on an individual member.

Apply membrane curing just after free moisture has disappeared at a rate of approximately 180 sq. ft. per gallon. Do not spray curing compound on projecting reinforcing steel or concrete that will later form a construction joint. Do not apply membrane curing to dry surfaces. Dampen formed surfaces and surfaces that have been given a first rub so they are moist at the time of application of the membrane.

Leave the film unbroken for the minimum curing period specified when membrane is used for complete curing. Correct damaged membrane immediately by reapplication of membrane. Polyethylene sheeting, burlap-polyethylene mats, or laminated mats in close contact with the concrete surfaces are equivalent to membrane curing.

4.11. **Removal of Forms and Falsework**. Remove forms for vertical surfaces after the concrete has aged a minimum of 12 hr. after initial set provided the removal can be done without damage to the concrete unless otherwise directed. Keep forms for mass placements in place for 4 days following concrete placement unless otherwise approved based on the outcome of the heat control plan outlined in Section 420.4.7.14., "Mass Placements."

Leave in place weight-supporting forms and falsework spanning more than 1 ft. for all bridge components and culvert slabs except as directed otherwise until the concrete has attained a compressive strength of 2,500 psi. Remove forms for other structural components as necessary.

Remove inside forms (walls and top slabs) for box culverts and sewers after concrete has attained a compressive strength of 1,800 psi if an approved overhead support system is used to transfer the weight of the top slab to the walls of the box culvert or sewer before removal of the support provided by the forms.

Forms or parts of forms may be removed only if constructed to permit removal without disturbing forms or falsework required to be left in place for a longer period on other portions of the structure.

Remove all metal appliances used inside forms for alignment to a depth of at least 1/2 in. from the concrete surface. Make the appliances so metal may be removed without undue chipping or spalling of the concrete, and so it leaves a smooth opening in the concrete surface when removed. Do not burn off rods, bolts, or ties.

Remove all forms and falsework unless otherwise directed.

- 4.12. **Defective Work**. Repair defective work as soon as possible. Remove and replace at the expense of the Contractor any defect that cannot be repaired to the satisfaction of the Engineer.
- 4.13. **Ordinary Surface Finish**. Apply an ordinary surface finish to all concrete surfaces. Provide flat or textured surfaces as specified with uniform appearance. Address defects and surface irregularities not consistent with the intent of the expected finish by the following:

- Chip away all loose or broken material to sound concrete where porous, spalled, or honeycombed areas are visible after form removal.
- Repair spalls in accordance with the procedures outlined in the *Concrete Repair Manual* available on the Department's website.
- Clean and fill holes or spalls caused by the removal of form ties, etc., with latex grout, cement grout, or epoxy grout as approved. Fill only the holes. Do not blend the patch with the surrounding concrete. On surfaces to receive a rub finish in accordance with Item 427, "Surface Finishes for Concrete," chip out exposed parts of metals chairs to a depth of 1/2 in. and repair the surface.
- Remove all fins, rust staining, runs, drips, or mortar from surfaces that will be exposed. Smooth all form marks and chamfer edges by grinding or dry-rubbing.
- Ensure all repairs are dense, well-bonded, and properly cured. Finish exposed large repairs to blend with the surrounding concrete where a higher class of finish is not specified.

Apply an ordinary surface finish as the final finish to the following exposed surfaces unless noted otherwise:

- inside and top of inlets,
- inside and top of manholes,
- inside of sewer appurtenances, and
- inside of culvert barrels.

Form marks and chamfer edges do not need to be smoothed for the inside of culvert barrels.

#### 5. MEASUREMENT

This Item will be measured by the cubic yard, square yard, foot, square foot, or by each structure.

5.1. **General**. Concrete quantities will be based on the dimensions shown on the plans or those established in writing by the Engineer.

In determining quantities, no deductions will be made for chamfers less than 2 in. or for embedded portions of steel or prestressed concrete beams, piling, anchor bolts, reinforcing steel, drains, weep holes, junction boxes, electrical or telephone conduit, ducts and voids for prestressed tendons, or embedded portions of light fixtures.

Variation in concrete headwall quantity incurred when an alternate bid for pipe is permitted will not be cause for payment adjustment.

Quantities revised by a change in design, measured as specified, will be increased or decreased and included for payment.

5.2. **Plans Quantity**. Structure elements designated in Table 1 and measured by the cubic yard are plans quantity measurement items. The quantity to be paid for plans quantity items is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

No adjustment will be made for footings or other in-ground elements where the Contractor has been allowed to place concrete in an excavation without forms.

# Table 1 Plans Quantity Payment (Cubic Yard Measurement Only)

Culverts and culvert wing walls	Abutments
Headwalls for pipe	Footings
Retaining walls	Pile bent caps
Inlets and manholes	Post-tensioned elements

**Note**—Other elements, including pier and bent concrete, may be paid for as "plans quantity" when shown on the plans.

5.3. **Measured in Place**. Items not paid for as "plans quantity" will be measured in place.

#### 6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for the class of concrete and element identified and by the special designation when appropriate. This price is full compensation for furnishing, hauling, and mixing concrete materials; furnishing, bending, fabricating, splicing, welding and placing the required reinforcement; clips, blocks, metal spacers, ties, wire, or other materials used for fastening reinforcement in place; furnishing, placing, and stressing post-tensioning system; placing, finishing, and curing concrete; mass placement controls; applying ordinary surface finish; furnishing and placing drains, metal flashing strips, and expansion-joint material; excavation, subgrade preparation; and forms and falsework, equipment, labor, tools, and incidentals.

Price will be adjusted in accordance with Article 421.6., "Measurement and Payment" when required to address non-compliance of project acceptance testing.

Design and installation of foundations for falsework is at the Contractor's expense.

In addition to the work described above, for extending structures the unit prices bid for the various classifications of concrete shown are full compensation for removing and disposing of, if necessary, the designated portion of the existing structure; removing, stockpiling if necessary, and replacing headwall units for reuse; cleaning, bending, and cutting of exposed reinforcing steel; splicing of new reinforcing steel to existing reinforcing steel; installation of dowels; and cleaning and preparing existing concrete surfaces.

## **Item 421**

## **Hydraulic Cement Concrete**



#### 1. DESCRIPTION

Furnish hydraulic cement concrete for concrete pavements, concrete structures, and other concrete construction.

#### 2. MATERIALS

Use materials from prequalified sources listed on the Department website. Provide coarse and fine aggregates from sources listed in the Department's *Concrete Rated Source Quality Catalog* (CRSQC). Use materials from non-listed sources only when tested and approved by the Engineer before use. Allow 30 calendar days for the Engineer to sample, test, and report results for non-listed sources. Do not combine approved material with unapproved material.

- 2.1. **Cement**. Furnish cement conforming to <u>DMS-4600</u>, "Hydraulic Cement."
- 2.2. Supplementary Cementing Materials (SCM).
  - Fly Ash. Furnish fly ash, ultra-fine fly ash (UFFA), and modified Class F fly ash (MFFA) conforming to DMS-4610, "Fly Ash."
  - Slag Cement. Furnish Slag Cement conforming to DMS-4620, "Slag Cement."
  - Silica Fume. Furnish silica fume conforming to DMS-4630, "Silica Fume."
  - Metakaolin. Furnish metakaolin conforming to DMS-4635, "Metakaolin."
- 2.3. **Cementitious Material**. Cementitious materials are the cement and supplementary cementing materials used in concrete.
- 2.4. Chemical Admixtures. Furnish admixtures conforming to <u>DMS-4640</u>, "Chemical Admixtures for Concrete."
- 2.5. Water. Furnish mixing and curing water that is free from oils, acids, organic matter, or other deleterious substances. Water from municipal supplies approved by the Texas Department of Health will not require testing. Provide test reports showing compliance with Table 1 before use when using water from other sources.

Water that is a blend of concrete wash water and other acceptable water sources, certified by the concrete producer as complying with the requirements of both Table 1 and Table 2, may be used as mix water. Test the blended water weekly for 4 weeks for compliance with Table 1 and Table 2 or provide previous test results. Then test every month for compliance. Provide water test results upon request.

Table 1
Chemical Limits for Mix Water

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Contaminant	Test Method	Maximum Concentration (ppm or mg\L)
Chloride (CI)	ASTM C114	
Prestressed concrete		500
Bridge decks & superstructure		500
All other concrete		1,000
Sulfate (SO4)	ASTM C114	2,000
Alkalies (Na2O + 0.658K2O)	ASTM C114	600
Total solids	ASTM C1603	50,000

Table 2
Acceptance Criteria for Questionable Water Supplies

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Property	Test Method	Limits					
Compressive strength, min % control at 7 days	ASTM C31, ASTM C39 <sup>1,2</sup>	90					
Time of set, deviation from control, h:min.	ASTM C403	From 1:00 early to 1:30 later					

- Base comparisons on fixed proportions and the same volume of test water compared to the control mix using 100% potable water or distilled water.
- 2. Base comparisons on sets consisting of at least 2 standard specimens made from a composite sample.

Do not use mix water that has an adverse effect on the air-entraining agent, on any other chemical admixture, or on strength or time of set of the concrete. Use mixing and curing water free of iron and other impurities that may cause staining or discoloration when using white hydraulic cement.

#### 2.6. Aggregate.

2.6.1. Coarse Aggregate. Provide coarse aggregate consisting of durable particles of gravel, crushed blast furnace slag, recycled crushed hydraulic cement concrete, crushed stone, or combinations which are free from frozen material and from injurious amounts of salt, alkali, vegetable matter, or other objectionable material, either free or as an adherent coating. Provide coarse aggregate of uniform quality throughout.

Provide coarse aggregate with the requirements listed in Table 3 unless otherwise shown on the plans.

Table 3
Coarse Aggregate Requirements

Description	Test Method	Limit
Weight of Clay Lumps, % Max		0.25
Weight of Shale, % Max	Tex-413-A	1.0
Weight of Laminate and Friable Particle, % Max		5.0
L.A. Abrasion Wear, % Max	<u>Tex-410-A</u>	40
5-Cycle Magnesium Sulfate Soundness, 1,2 non-air-entrained concrete, % Max	Tex-411-A	25
5-Cycle Magnesium Sulfate Soundness, 1,3 air-entrained concrete, % Max	16X-411-A	18
Loss by Decantation, % Max	<u>Tex-406-A</u>	1.5

- 1. Recycled crushed hydraulic cement concrete is not subject to 5-cycle magnesium sulfate soundness requirements.
- 2. Allowed when air-entrained concrete is used at the Contractor's option.
- 3. Only when air-entrained concrete is required by the plans.

Increase the loss by decantation limit to 3.0% for all classes of concrete and 5.0% for Class A, B, and P if the material finer than the No. 200 sieve is determined to be at least 85% calcium carbonate in accordance with <a href="Tex-406-A">Tex-406-A</a>, Part III, in the case of coarse aggregates made primarily from crushing stone unless otherwise shown on the plans. Provide test results upon request.

Provide coarse aggregate or combination of aggregates conforming to the gradation requirements shown in Table 4 when tested in accordance with Tex-401-A unless otherwise specified.

Table 4
Coarse Aggregate Gradation Chart

Aggregate	Maximum Percent Passing on Each Sieve									
Grade No. <sup>1</sup>	Nominal Size	2-1/2"	2"	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#8
1	2"	100	80-100	50-85		20-40			0–10	
2	1-1/2"		100	95–100		35–70		10–30	0–10	
3	1-1/2"		100	95–100		60–90	25-60		0–10	
4 (57)	1"			100	95-100		25-60		0–10	0–5
5 (67)	3/4"				100	90-100		20-55	0–10	0–5
6 (7)	1/2"					100	90-100	40-70	0–15	0–5
7	3/8"						100	70–95	0-25	
8	3/8"						100	95–100	20–65	0–10

Corresponding ASTM C33 gradation shown in parentheses.

2.6.2. **Fine Aggregate.** Provide fine aggregate consisting of clean, hard, durable particles of natural, manufactured sand, recycled crushed hydraulic cement concrete, slag, lightweight aggregate, or a combination thereof. Provide fine aggregate free from frozen material and from injurious amounts of salt, alkali, vegetable matter, or other objectionable material.

Provide fine aggregates with the requirements in Table 5 unless otherwise shown on the plans.

Table 5
Fine Aggregate Requirements

Description	Test Method	Limit
Weight of Clay Lumps, % Max	<u>Tex-413-A</u>	0.50
Organic Impurities <sup>1</sup>	<u>Tex-408-A</u>	Color not darker than standard
Sand Equivalent	<u>Tex-203-F</u>	80
Fineness Modulus	<u>Tex-402-A</u>	2.3 to 3.1

<sup>1.</sup> Only when air-entrained concrete is specified.

Provide fine aggregate or combinations of aggregates conforming to the gradation requirements shown in Table 6 when tested in accordance with Tex-401-A unless otherwise specified.

Table 6
Fine Aggregate Gradation Chart (Grade 1)

Sieve Size	Percent Passing
3/8"	100
#4	95–100
#8	80–100
#16	50-85
#30	25–65
#50	10-35 <sup>1</sup>
#100	0–10
#200	0-32

- 6–35 when sand equivalent value is greater than 85.
- 2. 0–6 for manufactured sand.
- 2.6.3. Intermediate Aggregate. Provide intermediate aggregate consisting of clean, hard, durable particles of natural, manufactured sand, slag, recycled crushed hydraulic cement concrete, lightweight aggregate, or a combination thereof when optimized aggregate gradation (OAG) concrete is specified or when used at the Contractor's option. Provide intermediate aggregate free from frozen material and injurious amounts of salt, alkali, vegetable matter, or other objectionable material.

Provide intermediate aggregate with the requirements in Table 7.

Table 7
Intermediate Aggregate Requirements

Description	Test Method	Limit					
Weight of Clay Lumps, % Max	<u>Tex-413-A</u>	0.50					
L.A. Abrasion Wear, <sup>1</sup> % Max	Tex-410-A	40					
5-Cycle Magnesium Sulfate Soundness, 1,2,3 non-air-entrained concrete, % Max	Tex-411-A	25					
5-Cycle Magnesium Sulfate Soundness, 1,2,4 air-entrained concrete, % Max	16X-411-A	18					
Organic Impurities <sup>5</sup>	Tex-408-A	Color not darker than					
		standard					
Loss by Decantation, <sup>1</sup> % Max	Tex-406-A	1.5					

- Only applies to the portion retained on the No. 4 sieve, if more than 30% of the intermediate aggregate is retained on the No. 4 sieve.
- 2. Recycled crushed hydraulic cement concrete is not subject to 5-cycle magnesium sulfate soundness requirements.
- 3. Allowed when air-entrained concrete is used at the Contractor's option.
- 4. Only when air-entrained concrete is required by the plans.
- 5. Only applies to the portion passing the 3/8 in. sieve, if more than 30% of the intermediate aggregate is passing the 3/8 in. sieve.

For the portion retained on the No. 4 sieve, if more than 30% of the intermediate aggregate is retained on the No. 4 sieve, and in the case of aggregates made primarily from crushing stone, unless otherwise shown on the plans, the loss by decantation may be increased to 3.0% for all classes of concrete and 5.0% for Class A, B, and P if the material finer than the No. 200 sieve is determined to be at least 85% calcium carbonate in accordance with <a href="Tex-406-A">Tex-406-A</a>, Part III. Provide test results upon request.

2.7. **Mortar and Grout**. Furnish pre-packaged grouts conforming to <u>DMS-4675</u>, "Cementitious Grouts and Mortars for Miscellaneous Applications," when specified for applications other than post-tension grouting.

Section 421.4.2.6., "Mix Design Options," does not apply for mortar and grout.

- 2.8. Storage of Materials.
- 2.8.1. **Cement and Supplementary Cementing Materials**. Store all cement and supplementary cementing materials in weatherproof enclosures that will protect them from dampness or absorption of moisture.

When permitted, small quantities of packaged cementitious material may be stored in the open, on a raised platform, and under waterproof covering for up to 48 hr.

2.8.2. **Aggregates**. Handle and store concrete aggregates in a manner that prevents contamination with foreign materials. Clear and level the sites for the stockpiles of all vegetation if the aggregates are stored on the ground and do not use the bottom 6-in. layer of aggregate without cleaning the aggregate before use.

Maintain separate stockpiles and prevent intermixing when conditions require the use of 2 or more grades of coarse aggregates. Separate the stockpiles using physical barriers where space is limited. Store aggregates from different sources in different stockpiles unless the Engineer authorizes pre-blending of the aggregates. Minimize segregation in stockpiles. Remix and test stockpiles when segregation is apparent.

Sprinkle stockpiles to control moisture and temperature as necessary. Maintain reasonably uniform moisture content in aggregate stockpiles.

2.8.3. **Chemical Admixtures**. Store admixtures in accordance with manufacturer's recommendations and prevent admixtures from freezing.

#### 3. EQUIPMENT

3.1. Concrete Plants and Mixing Equipment. Except for volumetric stationary plant or truck (auger) mixers, each plant and truck mixer must be currently certified by the National Ready Mixed Concrete Association (NRMCA) or have an inspection report signed and sealed by a licensed professional engineer showing concrete measuring, mixing, and delivery equipment meets all requirements of ASTM C94. A new

certification or signed and sealed report is required every time a plant is moved. Plants with a licensed professional engineer's inspection require re-inspection every 2 yr. Provide a copy of the certification or the signed and sealed inspection report to the Engineer. Remove equipment or facilities from service until corrected when they fail to meet specification requirements.

When allowed on the plans or by the Engineer, for concrete classes not identified as structural concrete in Table 8 or for Class C concrete not used for bridge-class structures, the Engineer may inspect and approve all plants and trucks instead of the NRMCA or non-Department engineer-sealed certifications. The criteria and frequency of Engineer approval of plants and trucks is the same used for NRMCA certification.

Inspect and furnish inspection reports on the condition of blades and fins and their percent wear from the original manufacturer's design for truck mixers and agitators annually. Repair mixing equipment exhibiting 10% or more wear before use. If an inspection within 12 mo. is not practical, a 2-mo. grace period (for a maximum of 14 mo. between inspections) is permitted.

- 3.1.1. Scales. Check all scales before beginning of operations, after each move, or whenever their accuracy or adequacy is questioned, and at least once every 6 mo. Immediately correct deficiencies, and recalibrate. Provide a record of calibration showing scales in compliance with ASTM C94 requirements. Check batching accuracy of volumetric water batching devices at least every 90 days. Check batching accuracy of chemical admixture dispensing devices at least every 6 mo. Perform daily checks as necessary to ensure measuring accuracy.
- 3.1.2. **Volumetric Mixers**. Provide volumetric mixers with rating plates defining the capacity and the performance of the mixer in accordance with the Volumetric Mixer Manufacturers Bureau or equivalent. Provide volumetric mixers that comply with ASTM C685. Provide test data showing mixers meet the uniformity test requirements of Tex-472-A.

Unless allowed on the plans or by the Engineer, volumetric truck (auger) mixers may not supply classes of concrete identified as structural concrete in Table 8.

3.1.3. **Agitators and Truck and Stationary Mixers**. Provide stationary and truck mixers capable of combining the ingredients of the concrete into a thoroughly mixed and uniform mass and capable of discharging the concrete so at least 5 of the 6 requirements of Tex-472-A are met.

Perform concrete uniformity tests on mixers or agitators in accordance with <u>Tex-472-A</u> as directed, to resolve issues of mix uniformity and mixer performance.

Perform the mixer or agitator uniformity test at the full rated capacity of the equipment. Remove all equipment that fails the uniformity test from service.

Inspect and maintain mixers and agitators. Keep them free of concrete buildup, and repair or replace worn or damaged blades or fins.

Ensure all mixers have a plate affixed showing manufacturer's recommended operating speed and rated capacity for mixing and agitating.

3.2. **Hauling Equipment**. Provide hauling equipment capable of maintaining the mixed concrete in a thoroughly mixed and uniform mass, and discharging the concrete with a satisfactory degree of uniformity.

Provide equipment with smooth, mortar-tight metal containers equipped with gates that prevent accidental discharge of the concrete when using non-agitating equipment for transporting concrete.

Maintain hauling equipment clean and free of built-up concrete.

3.3. **Testing Equipment**. Furnish and maintain the following in accordance with the pertinent test procedure unless otherwise shown on the plans or specified:

- sieves necessary to perform aggregate gradation analysis when optimized aggregate gradation is specified.
- equipment necessary to perform Tex-415-A and Tex-422-A,
- equipment necessary to perform <u>Tex-409-A</u> or <u>Tex-425-A</u>,
- test molds,
- curing facilities,
- maturity meters if used, and
- wheelbarrow or other container acceptable for the sampling of the concrete.

Provide strength-testing equipment when required in accordance with the Contract-controlling test unless shown otherwise.

#### 4. CONSTRUCTION

4.1. Classification of Concrete Mix Designs. Provide classes of concrete meeting the requirements shown in Table 8.

A higher-strength class of concrete with equal or lower water-to-cementitious material (w/cm) ratio may be substituted for the specified class of concrete when approved.

4.2. Mix Design Proportioning. Furnish mix designs using ACI 211, <u>Tex-470-A</u>, or other approved procedures for the classes of concrete listed in Table 8 unless a design method is indicated on the plans. Perform mix design proportioning by absolute volume method unless otherwise approved. Perform cement replacement using equivalent weight method unless otherwise approved.

Do not exceed the maximum w/cm ratio listed in Table 8 when designing the mixture.

- 4.2.1. **Cementitious Materials**. Do not exceed 700 lb. of cementitious material per cubic yard of concrete unless otherwise specified or approved.
  - Use cement of the same type and from the same source for monolithic placements.
  - Do not use supplementary cementing materials when white hydraulic cement is specified.

Table 8 Concrete Classes

Concrete Classes							
Class of Concrete	Design Strength, Min f'c (psi)	Max w/cm Ratio	Coarse Aggregate Grades <sup>2,3,4</sup>	Cement Types	Mix Design Options	Exceptions to Mix Design Options	General Usage⁵
A	3,000	0.60	1–4, 8	I, II, I/II, IL, IP, IS, IT. V	1, 2, 4, &	When the cementitious material content does not exceed 520 lb./cu. yd., Class C fly ash may be used instead of Class F fly ash.	Curb, gutter, curb & gutter, conc. retards, sidewalks, driveways, back-up walls, anchors, non-reinforced drilled shafts
В	2,000	0.60	2–7	11, V			Riprap, traffic signal controller foundations, small roadside signs, and anchors
C <sub>e</sub>	3,600	0.45	1–6	I, II, I/II, IP, IS, IT, <sup>7</sup> V	1–8		Drilled shafts, bridge substructure, bridge railing, culverts except top slab of direct traffic culverts, headwalls, wing walls, inlets, manholes, concrete traffic barrier (cast-in-place)
E	3,000	0.50	2–5	I, II, I/II, IL, IP, IS, IT, <sup>7</sup> V	1–8	When the cementitious material content does not exceed 520 lb./cu. yd., Class C fly ash may be used instead of Class F fly ash.	Seal concrete

#### Table 8 (continued)

	Concrete Classes								
Class of Concrete	Design Strength, Min f'c (psi)	Max w/cm Ratio	Coarse Aggregate Grades <sup>2,3,4</sup>	Cement Types	Mix Design Options	Exceptions to Mix Design Options	General Usage⁵		
F <sup>6</sup>	Note 8	0.45	2–5	I, II, I/II, IP, IS, IT,7V			Railroad structures; occasionally for bridge piers, columns, or bents		
He	Note 8	0.45	3–6	I, II, I/II, III, IP, IS, IT, <sup>7</sup> V	1–5	Do not use Type III cement in mass placement concrete. Up to 20% of blended cement may be replaced with listed SCMs when Option 4 is used for precast concrete.	Precast concrete, post-tension members		
S <sup>6</sup>	4,000	0.45	2–5	I, II, I/II, IP, IS, IT, <sup>7</sup> V	1–8		Bridge slabs, top slabs of direct traffic culverts, approach slabs		
Р	See Item 360, "Concrete Pavement."	0.50	2–3	I, II, I/II, IL, IP, IS, IT, V	1–8	When the cementitious material content does not exceed 520 lb./cu. yd., Class C fly ash may be used instead of Class F fly ash.	Concrete pavement		
CO <sub>6</sub>	4,600	0.40	6				Bridge deck concrete overlay		
LMC <sup>6</sup>	4,000	0.40	6–8	I, II, I/II, IP, IS,	1–8		Latex-modified concrete overlay		
SS <sup>6</sup>	3,600	0.45	4–6	IT, <sup>7</sup> V		Use a minimum cementitious material content of 658 lb./cu. yd. of concrete.	Slurry displacement shafts, underwater drilled shafts		
K <sub>6</sub>	Note 8	0.40	Note 8	I, II, I/II, III IP, IS, IT, <sup>7</sup> V			Note 8		
HES	Note 8	0.45	Note 8	I, IL, II, I/II, III		Mix design options do not apply. 700 lb. of cementitious material per cubic yard limit does not apply.	Concrete pavement, concrete pavement repair		
"X" (HPC) <sub>6,9,10</sub>	Note 11	0.45	Note 11	I, II, I/II, III IP, IS, IT,7 V	1–5, & 8	Maximum fly ash replacement for Options 1 and 3 may be increased to 45%. Up to 20% of a blended cement may be replaced with listed SCMs for Option 4. Do not use Option 8 for precast concrete.			
"X" (SRC) 6.9.10	Note 11	0.45	Note 11	I/II, II, IP, IS, IT, <sup>7</sup> V	1–4 , & 7	Do not use Class C Fly Ash Type III-MS may be used where allowed. Type I and Type III cements may be used with Options 1–3, with a maximum w/cm of 0.40. Up to 20% of blended cement may be replaced with listed SCMs when Option 4 is used for precast concrete. Do not use Option 7 for precast concrete.			

Class of Concrete	Design Strength, Min f'c (psi)	Max w/cm Ratio	224	Cement Types	Mix Design Options	Exceptions to Mix Design Options	General Usage⁵
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- 3. Design strength must be attained within 56 days.
- Do not use Grade 1 coarse aggregate except in massive foundations with 4 in. minimum clear spacing between reinforcing steel bars, unless otherwise permitted. Do not use Grade 1 aggregate in drilled shafts.
- Use Grade 8 aggregate in extruded curbs unless otherwise approved.
- 6. Other grades of coarse aggregate maybe used in non-structural concrete classes when allowed by the Engineer.
- 7. For information only.
- 8. Structural concrete classes.
- 9. Do not use Type IT cements containing > 5% limestone.
- 10. As shown on the plans or specified.
- 11. "X" denotes class of concrete shown on the plans or specified.
- 12. (HPC): High Performance Concrete, (SRC): Sulfate Resistant Concrete.
- 13. Same as class of concrete shown on the plans.
- 4.2.2. **Aggregates**. Recycled crushed hydraulic cement concrete may be used as a coarse or fine aggregate in Class A, B, E, and P concrete. Limit recycled crushed concrete fine aggregate to a maximum of 20% of the fine aggregate.

Use light-colored aggregates when white hydraulic cement is specified.

Use fine aggregate with an acid insoluble residue of at least 60% by weight when tested in accordance with Tex-612-J in all concrete subject to direct traffic.

Use the following equation to determine if the aggregate combination meets the acid insoluble residue requirement when blending fine aggregate or using an intermediate aggregate:

$$\frac{(A_1 \times P_1) + (A_2 \times P_2) + (A_{ia} \times P_{ia})}{100} \ge 60\%$$

#### where:

 $A_1$  = acid insoluble (%) of fine aggregate 1

 $A_2$  = acid insoluble (%) of fine aggregate 2

 $A_{ia}$  = acid insoluble (%) of intermediate aggregate passing the 3/8 in. sieve

 $P_1$  = percent by weight of fine aggregate 1 of the fine aggregate blend

 $P_2$  = percent by weight of fine aggregate 2 of the fine aggregate blend

 $P_{ia}$  = percent by weight of intermediate aggregate passing the 3/8 in. sieve

Alternatively to the above equation, blend fine aggregate with a micro-deval loss of less than 12%, when tested in accordance with <u>Tex-461-A</u>, with at least 40% of a fine aggregate with an acid insoluble residue of at least 60%.

4.2.3. **Chemical Admixtures**. Do not use Type C, Type E, Type F, or Type G admixtures in Class S bridge deck concrete. Do not use chemical admixtures containing calcium chloride in any concrete.

Use a 30% calcium nitrite solution when a corrosion-inhibiting admixture is required. The corrosion-inhibiting admixture must be set neutral unless otherwise approved. Dose the admixture at the rate of gallons of admixture per cubic yard of concrete shown on the plans.

4.2.4. **Air Entrainment**. Use an approved air-entraining admixture when air-entrained concrete is specified, or when an air-entraining admixture is used at the Contractor's option, and do not exceed the manufacturer's recommended dosage. Ensure the minimum entrained air content is at least 3.0% for all classes of concrete except Class P when air-entrained concrete is specified, during trial batch, or when providing previous field data.

4.2.5. **Slump**. Provide concrete with a slump in accordance with Table 9 unless otherwise specified. When approved, the slump of a given concrete mix may be increased above the values shown in Table 9 using chemical admixtures, provided the admixture-treated concrete has the same or lower water-to-cementitious material ratio and does not exhibit segregation or excessive bleeding. Request approval to exceed the slump limits in Table 9 sufficiently in advance for proper evaluation by the Engineer.

Perform job-control testing of slump in accordance with Section 421.4.8.3.1., "Job-Control Testing."

Table 9
Placement Slump Requirements

General Usage <sup>1</sup>	Placement Slump Range, <sup>2</sup> in.
Walls (over 9 in. thick), caps, columns, piers, approach slabs, concrete overlays	3 to 5
Bridge slabs, top slabs of direct traffic culverts, latex-modified concrete for bridge deck overlays	3 to 5-1/2
Inlets, manholes, walls (less than 9 in. thick), bridge railing, culverts, concrete traffic barrier, concrete pavement (formed), seal concrete	4 to 5-1/2
Precast concrete	4 to 9
Underwater concrete placements	6 to 8-1/2
Drilled shafts, slurry displaced and underwater drilled shafts	See Item 416, "Drilled Shaft Foundations."
Curb, gutter, curb and gutter, concrete retards, sidewalk, driveways, anchors, riprap, small roadside sign foundations, concrete pavement repair, concrete repair	As approved

- 1. For information only.
- 2. For fiber reinforced concrete, perform slump before addition of fibers.
- 4.2.6. Mix Design Options.
- 4.2.6.1. **Option 1**. Replace 20% to 35% of the cement with Class F fly ash.
- 4.2.6.2. **Option 2.** Replace 35% to 50% of the cement with slag cement or MFFA.
- 4.2.6.3. **Option 3**. Replace 35% to 50% of the cement with a combination of Class F fly ash, slag cement, MFFA, UFFA, metakaolin, or silica fume; however, no more than 35% may be fly ash, and no more than 10% may be silica fume.
- 4.2.6.4. **Option 4.** Use Type IP, Type IS, or Type IT cement as allowed in Table 5 for each class of concrete. Up to 10% of a Type IP, Type IS, or Type IT cement may be replaced with Class F fly ash, slag cement, or silica fume. Use no more than 10% silica fume in the final cementitious material mixture if the Type IT cement contains silica fume, and silica fume is used to replace the cement.
- 4.2.6.5. **Option 5**. Replace 35% to 50% of the cement with a combination of Class C fly ash and at least 6% of silica fume, UFFA, or metakaolin. However, no more than 35% may be Class C fly ash, and no more than 10% may be silica fume.
- 4.2.6.6. **Option 6.** Use a lithium nitrate admixture at a minimum dosage determined by testing conducted in accordance with <u>Tex-471-A</u>. Before use of the mix, provide an annual certified test report signed and sealed by a licensed professional engineer, from a laboratory on the Department's MPL, certified by the Construction Division as being capable of testing according to <u>Tex-471-A</u>.
- 4.2.6.7. **Option 7**. Ensure the total alkali contribution from the cement in the concrete does not exceed 3.5 lb. per cubic yard of concrete when using hydraulic cement not containing SCMs calculated as follows:

lb. alkali per cu. yd. = 
$$\frac{\text{(lb. cement per cu. yd.)} \times \text{(% Na}_2\text{O equivalent in cement)}}{100}$$

In the above calculation, use the maximum cement alkali content reported on the cement mill certificate.

4.2.6.8. **Option 8.** Perform annual testing as required for any deviations from Options 1–5 or use mix design options listed in Table 10. Laboratories performing ASTM C1260, ASTM C1567, and ASTM C1293 testing must be listed on the Department's MPL. Before use of the mix, provide a certified test report signed and sealed by a licensed professional engineer demonstrating the proposed mixture conforms to the requirements of Table 10.

Provide a certified test report signed and sealed by a licensed professional engineer, when HPC is required, and less than 20% of the cement is replaced with SCMs, demonstrating ASTM C1202 test results indicate the permeability of the concrete is less than 1,500 coulombs tested immediately after either of the following curing schedules:

- Moisture cure specimens 56 days at 73°F.
- Moisture cure specimens 7 days at 73°F followed by 21 days at 100°F.

Table 10
Option 8 Testing and Mix Design Requirements

	Option o resting and mix Design Requirements					
Scenario	ASTM C1260 Result		Testing Requirements for Mix Design Materials			
Ser	Mix Design	Mix Design	or Prescriptive Mix Design Options <sup>1</sup>			
တ	Fine Aggregate	Coarse Aggregate				
Α	> 0.10%	> 0.10%	Determine the dosage of SCMs needed to limit the 14-day expansion of each aggregate <sup>2</sup> to 0.08% when tested individually in accordance with ASTM C1567; or of 400% Close C flux showith a manifestation of 2003 acceptance.			
			Use a minimum of 40% Class C fly ash with a maximum CaO <sup>3</sup> content of 25%.			
В	≤ 0.10%	≤ 0.10%	Use a minimum of 40% Class C fly ash with a maximum CaO <sup>3</sup> content of 25%; or			
В		AOTH 04000 4	Use any ternary combination which replaces 35% to 50% of cement.			
	≤ 0.10%	ASTM C1293 1 yr.	Use a minimum of 20% of any Class C fly ash; or			
		Expansion ≤ 0.04%	Use any ternary combination which replaces 35% to 50% of cement.			
С	≤ 0.10%	> 0.10%	Determine the dosage of SCMs needed to limit the 14-day expansion of coarse and intermediate <sup>2</sup> aggregate to 0.08% when tested individually in accordance with ASTM C1567; or  Use a minimum of 40% Class C fly ash with a maximum CaO <sup>3</sup> content			
			of 25%.			
D	> 0.10%	≤ 0.10%	Use a minimum of 40% Class C fly ash with a maximum CaO <sup>3</sup> content of 25%; or Use any ternary combination which replaces 35% to 50% of cement.			
	> 0.10%	ASTM C1293 1 yr. Expansion ≤ 0.04%	Determine the dosage of SCMs needed to limit the 14-day expansion of fine aggregate to 0.08% when tested in accordance with ASTM C1567.			

- Do not use Class C fly ash if the ASTM C1260 value of the fine, intermediate, or coarse aggregate is 0.30% or greater, unless the fly ash is used as part of a ternary system.
- 2. Intermediate size aggregates will fall under the requirements of mix design coarse aggregate.
- 3. Average the CaO content from the previous ten values as listed on the mill certificate.
- **Optimized Aggregate Gradation (OAG) Concrete**. The gradation requirements in Table 3 and Table 4 do not apply when OAG concrete is specified or used by the Contractor unless otherwise shown on the plans. Use <u>Tex-470-A</u> to establish the optimized aggregate gradation. Use at least 420 lb. per cubic yard of cementitious material when OAG concrete is used unless otherwise approved. Use a coarse aggregate with a maximum nominal size of 1-1/2 in. for Class P concrete. Use a coarse aggregate for all other classes of concrete with a maximum nominal size not larger than:
  - 1/5 the narrowest dimension between sides of forms, or
  - 1/3 the depth of slabs, or

4.2.7.

3/4 the minimum clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, bundled tendons, or ducts.

Make necessary adjustments to individual aggregate stockpile proportions during OAG concrete production when the gradation deviates from the optimized gradation requirements.

4.2.8. **Self-Consolidating Concrete (SCC)**. Provide SCC meeting the following requirements shown in Table 11 when approved for use in precast concrete. Use concrete with a slump flow that can be placed without vibration and will not segregate or excessively bleed.

Request approval to exceed the slump flow limits sufficiently in advance for proper evaluation by the Engineer.

Table 11
Mix Design Requirements for SCC

mix besign requirements for 600					
Tests	Test Method	Acceptable Limits			
Slump Flow for Precast Concrete	ASTM C1611	22 to 27 <sup>1</sup>			
T <sub>50</sub> , sec	ASTM C1611	2 to 7			
VSI Rating	ASTM C1611	0 or 1			
Passing Ability, in.	ASTM C1621	≤ 2			
Segregation Column, %	ASTM C1610	≤ 10			
Bleeding, %	ASTM C232	≤ 2.5			

These slump flow limits are generally acceptable for most applications. However, slump flow limits may be adjusted during mix design approval process and when approved by the Engineer.

4.3. **Concrete Trial Batches**. Perform preliminary and final trial batches when required by the plans, or when previous satisfactory field data is not available. Submit previous satisfactory field data to the Engineer showing the proposed mix design conforms to specification requirements when trial batches are not required and before concrete is placed.

Perform preliminary and final trial batches for all self-consolidating concrete mix designs.

- 4.3.1. **Preliminary Trial Batches**. Perform all necessary preliminary trial batch testing when required, and provide documentation including mix design, material proportions, and test results substantiating the mix design conforms to specification requirements.
- 4.3.2. **Final Trial batches**. Make all final trial batches using the proposed ingredients in a mixer that is representative of the mixers to be used on the job when required. Make the batch size at least 50% of the mixer's rated capacity. Perform fresh concrete tests for air content and slump, and make, cure, and test strength specimens for compliance with specification requirements. Test at least one set of design strength specimens, consisting of 2 specimens per set, at 7-day, 28-day, and at least one additional age unless otherwise directed. Before placing, provide the Engineer the option of witnessing final trial batches, including the testing of the concrete. If not provided this option, the Engineer may require additional trial batches, including testing, before the concrete is placed.

Conduct all testing listed in Table 11 when performing trial batches for self-consolidating concrete. Make an additional mixture with 3% more water than the preliminary trial batch. Make necessary adjustments to the mix design if this additional mixture does not meet requirements of Table 11. Cast and evaluate mock-ups for precast concrete that are representative of the actual product as directed. Provide the Engineer the option of witnessing final trial batches, including the testing of the concrete and the casting of the mock-ups before placement. If not provided this option, the Engineer may require additional trial batches, including testing and mock-ups, before the concrete is placed.

Establish 7-day compressive strength target values using the following formula for each Class A, B, and E concrete mix designs to be used:

 $Target\ value = \textbf{Minimum}\ design\ strength \times \frac{7\ -\ day\ avg\ .trial\ batch\ strength}{28\ -\ day\ avg\ .trial\ batch\ strength}$ 

Submit previous satisfactory field data, data from a new trial batch, or other evidence showing the change will not adversely affect the relevant properties of the concrete when changes are made to the type, brand, or source of aggregates, cement, SCM, water, or chemical admixtures. Submit the data for approval before making changes to the mix design. A change in vendor does not necessarily constitute a change in materials

or source. The Engineer may waive new trial batches when there is a prior record of satisfactory performance with the ingredients. During concrete production, dosage changes of chemical admixtures used in the trial batches will not require a re-evaluation of the mix design.

The Contractor has the option of performing trial batches in conjunction with concrete placements except for SCC mixtures, when new trial batches are required during the course of the project. If the concrete fails to meet any requirement, the Engineer will determine acceptability and payment adjustments.

Establish the strength–maturity relationship in accordance with <u>Tex-426-A</u> when the maturity method is specified or permitted. When using the maturity method, any changes in any of the ingredients, including changes in proportions, will require the development of a new strength–maturity relationship for the mix.

- 4.3.3. **Mix Design of Record**. Once a trial batch or previously satisfactory field data substantiates the mix design, the proportions and mixing methods used become the mix design of record. Do not exceed mix design water-to-cementitious material ratio.
- 4.4. **Production Testing.**
- 4.4.1. **Aggregate Moisture Testing**. Determine moisture content per <u>Tex-409-A</u> or <u>Tex-425-A</u> for coarse, intermediate, and fine aggregates at least twice a week, when there is an apparent change, or for new shipments of aggregate. When aggregate hoppers or storage bins are equipped with properly maintained electronic moisture probes for continuous moisture determination, moisture tests per <u>Tex-409-A</u> or <u>Tex-425-A</u> are not required. Electronic moisture probes, however, must be verified at least every 90 days against <u>Tex-409-A</u> and be accurate to within 1.0% of the actual moisture content.

When producing SCC, and when aggregate hoppers or storage bins are not equipped with electric moisture probes, determine the moisture content of the aggregates before producing the first concrete batch each day. Thereafter, determine the moisture content every 4 hr. or when there is an apparent change while SCC is being produced.

- 4.4.2. **Aggregate Gradation Testing**. Perform a sieve analysis in accordance with <u>Tex-401-A</u> on each stockpile used in the blend at least one day before producing OAG concrete when producing optimized aggregate gradation concrete. Perform sieve analysis on each stockpile after every 10,000 cubic yards of OAG concrete produced. Provide sieve analysis data to the Engineer.
- 4.5. Measurement of Materials.
- 4.5.1. **Non-Volumetric Mixers**. Measure aggregates by weight. Correct batch weight measurements for aggregate moisture content. Measure mixing water, consisting of water added to the batch, ice added to the batch, water occurring as surface moisture on the aggregates, and water introduced in the form of admixtures, by volume or weight. Measure ice by weight. Measure cement and supplementary cementing materials in a hopper and on a separate scale from those used for other materials. Measure the cement first when measuring the cumulative weight. Measure concrete chemical admixtures by weight or volume. Measure batch materials within the tolerances of Table 12.

Table 12
Mix Design Batching Tolerances—Non-Volumetric Mixers

mix beeign batering relevances from verametric mixers				
Material	Tolerance (%)			
Cement, wt.	-1 to +3			
SCM, wt.	-1 to +3			
Cement + SCM (cumulative weighing), wt.	-1 to +3			
Water, wt. or volume	±31			
Fine aggregate, wt.	±2			
Coarse aggregate, wt.	±2			
Fine + coarse aggregate (cumulative weighing), wt.	±1			
Chemical admixtures, wt. or volume	±3			

Allowable deviation from target weight not including water withheld or moisture in the aggregate. The Engineer will verify the water-to-cementitious material ratio is within specified limits.

Ensure the quantity measured, when measuring cementitious materials at less than 30% of scale capacity, is accurate to not less than the required amount and not more than 4% in excess. Ensure the cumulative quantity, when measuring aggregates in a cumulative weigh batcher at less than 30% of the scale capacity, is measured accurate to  $\pm 0.3\%$  of scale capacity or  $\pm 3\%$  of the required cumulative weight, whichever is less.

Measure cement in number of bags under special circumstances when approved. Use the weights listed on the packaging. Weighing bags of cement is not required. Ensure fractional bags are not used except for small hand-mixed batches of approximately 5 cu. ft. or less and when an approved method of volumetric or weight measurement is used.

4.5.2. **Volumetric Mixers.** Provide an accurate method of measuring all ingredients by volume, and calibrate equipment to assure correct measurement of materials within the specified tolerances. Base tolerances on volume—weight relationship established by calibration, and measure the various ingredients within the tolerances of Table 13. Correct batch measurements for aggregate moisture content.

Table 13
Mix Design Batching Tolerances—Volumetric Mixers

Material	Tolerance
Cement, wt. %	0 to +4
SCM, wt. %	0 to +4
Fine aggregate, wt. %	±2
Coarse aggregate, wt. %	±2
Admixtures, wt. or volume %	±3
Water, wt. or volume %	±1

#### 4.6. Mixing and Delivering Concrete.

4.6.1. **Mixing Concrete**. Operate mixers and agitators within the limits of the rated capacity and speed of rotation for mixing and agitation as designated by the manufacturer of the equipment. Provide concrete in a thoroughly mixed and uniform mass with a satisfactory degree of uniformity when tested in accordance with Tex-472-A.

Do not top-load new concrete onto returned concrete.

Adjust mixing times and batching operations as necessary when the concrete contains silica fume to ensure the material is completely and uniformly dispersed in the mix. The dispersion of the silica fume within the mix will be verified by the Construction Division, Materials and Pavements Section, using cylinders made from trial batches. Make necessary changes to the batching operations, if uniform dispersion is not achieved, until uniform and complete dispersion of the silica fume is achieved.

Mix concrete by hand methods or in a small motor-driven mixer when permitted, for small placements of less than 2 cu. yd. For such placements, proportion the mix by volume or weight.

4.6.2. **Delivering Concrete**. Deliver concrete to the project in a thoroughly mixed and uniform mass, and discharge the concrete with a satisfactory degree of uniformity. Conduct testing in accordance with <u>Tex-472-A</u> when there is a reason to suspect the uniformity of concrete and as directed.

Maintain concrete delivery and placement rates sufficient to prevent cold joints.

Adding chemical admixtures or the portion of water withheld is only permitted at the jobsite, under the supervision of the Engineer, to adjust the slump or slump flow of the concrete. Do not add water or chemical admixtures to the batch after more than an amount needed to conduct slump testing has been discharged. Turn the drum or blades at least 30 additional revolutions at mixing speed to ensure thorough and uniform mixing of the concrete. When this water is added, do not exceed the approved mix design water-to-cementitious material ratio.

Before unloading, furnish the delivery ticket for the batch of concrete containing the information required on Department Form 596, "Concrete Batch Ticket." The Engineer will verify all required information is provided on the delivery tickets. The Engineer may suspend concrete operations until the corrective actions are implemented if delivery tickets do not provide the required information. The Engineer will verify the design water-to-cementitious material ratio is not exceeded.

Begin the discharge of concrete delivered in truck mixers within the times listed in Table 14. Concrete may be discharged after these times provided the concrete temperature and slump meet the requirements listed in this Item and other pertinent Items. Perform these tests with certified testing personnel per Section 421.4.8.1., "Certification of Testing Personnel." Provide the Engineer the option of witnessing testing of the concrete. If not provided this option, the Engineer may require additional testing before the concrete is placed.

Table 14
Concrete Discharge Times

Consiste Discharge Times						
Fresh Concrete Temperature, °F	Max Time After Batching for Concrete Not Containing Type B or D Admixtures, min.	Max Time After Batching for Concrete Containing Type B or D Admixtures, <sup>1</sup> min.				
90 and above	45	75				
75 ≤ T < 90	60	90				
T < 75	90	120				

- Concrete must contain at least the minimum manufacturer's recommended dosage of Type B or D admixture.
- 4.7. **Placing, Finishing, and Curing Concrete**. Place, finish, and cure concrete in accordance with the pertinent Items.
- 4.8. **Sampling and Testing of Concrete**. Unless otherwise specified, all fresh and hardened concrete is subject to testing as follows:
- 4.8.1. **Certification of Testing Personnel**. Contractor personnel performing testing must be either ACI-certified or qualified by a Department-recognized equivalent written and performance testing program for the tests being performed. Personnel performing these tests are subject to Department approval. Use of a commercial laboratory is permitted at the Contractor's option. All personnel performing testing using the maturity method must be qualified by a training program recognized by the Department before using this method on the job.
- 4.8.2. **Fresh Concrete**. Provide safe access and assistance to the Engineer during sampling. Fresh concrete will be sampled for testing at the discharge end if using belt conveyors or pumps. When it is impractical to sample at the discharge end, a sample will be taken at the time of discharge from the delivery equipment and correlation testing will be performed and documented to ensure specification requirements are met at the discharge end.
- 4.8.3. **Testing of Fresh Concrete**. Test for the fresh properties listed in Table 15.

Table 15
Fresh Concrete Tests

Tests	Test Methods			
Slump <sup>1</sup>	<u>Tex-415-A</u>			
Temperature <sup>1</sup>	<u>Tex-422-A</u>			
Air Content <sup>1,2</sup>	<u>Tex-414-A, Tex-416-A</u> , or ASTM C457			

- 1. Job-control testing performed by the Contractor.
- 2. Only required when air-entrained concrete is specified on the plans.

Concrete with a slump lower than the minimum placement slump in Table 9 after the addition of all water withheld, or concrete exhibiting segregation and excessive bleeding will be rejected.

4.8.3.1. **Job-Control Testing**. Perform job-control testing as specified in Table 16 unless otherwise specified. Provide the Engineer the opportunity to witness the testing. The Engineer may require a retest if not given the opportunity to witness. Immediately notify the Engineer of any nonconformity issues. Furnish a copy of all test results to the Engineer daily.

Table 16
Job-Control Testing Frequencies

Concrete Placements	Frequency
Bridge Deck Placements	Test the first few loads, then every 60 cu. yd. or fraction thereof.
All Other Structural Class Concrete Placements	One test every 60 cu. yd. or fraction thereof per class per day.
Non-Structural Class Concrete Placements	One test every 180 cu. yd. or fraction thereof.

Immediately resample and retest the concrete slump when the concrete exceeds the slump range at time of placement. If the concrete exceeds the slump range after the retest, and is used at the Contractor's option, the Engineer will make strength specimens as specified in Article 421.5., "Acceptance of Concrete."

4.8.3.2. **Strength Specimen Handling**. Remove specimens from their molds and deliver Department test specimens to curing facilities within 24 to 48 hr. after molding, in accordance with pertinent test procedures unless otherwise shown on the plans or directed. Clean and prepare molds for reuse if necessary.

#### 5. ACCEPTANCE OF CONCRETE

The Engineer will sample and test the fresh and hardened concrete for acceptance. The test results will be reported to the Contractor and the concrete supplier. Investigate the quality of the materials, the concrete production operations, and other possible problem areas to determine the cause for any concrete that fails to meet the required strengths as outlined below. Take necessary actions to correct the problem including redesign of the concrete mix. The Engineer may suspend all concrete operations under the pertinent Items if the Contractor is unable to identify, document, and correct the cause of the low strengths in a timely manner. Resume concrete operations only after obtaining approval for any proposed corrective actions. Concrete failing to meet the required strength as outlined below will be evaluated using the procedures listed in Article 421.6., "Measurement and Payment."

- 5.1. **Structural Class of Concrete**. For concrete classes identified as structural concrete in Table 8, the Engineer will make and test 7-day and 28-day specimens. Acceptance will be based on attaining the design strength given in Table 8.
- 5.2. Class P and Class HES. The Engineer will base acceptance in accordance with Item 360, "Concrete Pavement," and Item 361, "Repair of Concrete Pavement."
- 5.3. **All Other Classes of Concrete**. For concrete classes not identified as structural concrete in Table 8, the Engineer will make and test 7-day specimens. The Engineer will base acceptance on the 7-day target value established in accordance with Section 421.4.3., "Concrete Trial Batches."

#### 6. MEASUREMENT AND PAYMENT

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly but will be subsidiary to pertinent Items.

The following procedure will be used to evaluate concrete where one or more project acceptance test specimens fail to meet the required design strength specified in this Item or on the plans:

- The concrete for a given placement will be considered structurally adequate and accepted at full price if the average of all test results for specimens made at the time of placement meets the required design strength provided no single test result is less than 85% of the required design strength.
- The Engineer will perform a structural review of the concrete to determine its adequacy to remain in service if the average of all test results for specimens made at the time of placement is less than the required design strength or if any test results are less than 85% of the required design strength. If the insitu concrete strength is needed for the structural review, take cores at locations designated by the Engineer in accordance with <a href="Tex-424-A">Tex-424-A</a>. The Engineer will test the cores. The coring and testing will be at the Contractor's expense.
- If all of the tested cores meet the required design strength, the concrete will be paid for at full price.
- If any of the tested cores do not meet the required design strength, but the average strength attained is determined to be structurally adequate, the Engineer will determine the limits of the payment adjustment using the following formula:

$$A = B_p \left[ -5.37 \left( \frac{S_a}{S_s} \right)^2 + 11.69 \left( \frac{S_a}{S_s} \right) - 5.32 \right]$$

#### where:

A = Amount to be paid per unit of measure for the entire placement in question

 $S_a$  = Actual average strength from cylinders or cores. Use values from cores, if taken.

 $S_s$  = Minimum required strength (specified)

 $B_p$  = Unit Bid Price

- If the structural review determines the concrete is not adequate to remain in service, the Engineer will determine the limits of the concrete to be removed.
- The decision to reject structurally inadequate concrete or to apply the payment adjustment factor will be made no later than 56 days after placement.

## **Item 423**

## **Retaining Walls**



#### 1. DESCRIPTION

Furnish, construct, and install retaining walls.

#### 2. MATERIALS

- 2.1. **General**. Furnish materials in accordance with the following:
  - Item 420, "Concrete Substructures,"
  - Item 421, "Hydraulic Cement Concrete,"
  - Item 440, "Reinforcement for Concrete,"
  - Item 445, "Galvanizing,"
  - Item 458, "Waterproofing Membranes for Structures," and
  - Item 556, "Pipe Underdrains."

Use concrete for retaining walls that conforms to the requirements of Table 1 unless otherwise shown on the plans.

Table 1
Concrete for Retaining Walls

Application	Concrete
Cast-in-place, non-reinforced	Class A
Cast-in-place, reinforced	Class C
Precast	Class H, f'c = 4,000 psi

Furnish concrete for machine-made concrete block units in accordance with ASTM C90, Class 1, Type II, except the minimum 28-day compressive strength must be 4,000 psi with maximum moisture absorption of 7%.

Provide Type 1 filter fabric in accordance with <u>DMS-6200</u>, "Filter Fabric." Provide filter fabric rated as UV-resistant when used as part of the exposed facing for a temporary wall.

Joint fillers, pads, waterstops, and other incidental materials must be as shown on the plans or approved by the Engineer.

Epoxy coat all steel used in concrete panels and coping including connectors, dowels, stirrups, and reinforcing steel when the plans call for epoxy coating of steel earth reinforcements.

- 2.2. **Definitions**. This Item uses the following terms:
  - **Permanent Wall**. A retaining wall with a design service life of 75 years. All walls are presumed to be permanent walls unless otherwise specified on the plans.
  - Temporary Wall. A retaining wall so designated by description, with a design service life of 3 years.
  - Mechanically Stabilized Earth (MSE) Wall. A wall consisting of a volume of select backfill with tensile earth reinforcement elements distributed throughout. Permanent MSE walls use a precast concrete panel as a facing element. Temporary MSE walls use welded wire fabric with filter fabric backing as a facing element.
  - Concrete Block Wall. A retaining wall that uses machine-made, precast concrete block units as facing elements. The walls may use a volume of select fill with tensile earth reinforcements distributed throughout, or may use only the facing unit and unit fill weight for support.

- 2.3. Fabrication.
- 2.3.1. **Cast-in-Place**. Meet Item 420, "Concrete Substructures."
- 2.3.2. Formed Precast. Meet Item 424, "Precast Concrete Structural Members (Fabrication)."
- 2.3.3. **Machine-Made Precast**. Furnish machine-made concrete block units in accordance with ASTM C90, sampled and tested in accordance with ASTM C140. Furnish units with molded dimensions within 1/8 in. of specified dimensions, except height must be within 1/16 in.
- 2.4. Backfill.
- 2.4.1. **Non-Select**. Furnish non-select backfill for walls other than temporary and permanent MSE and concrete block walls as indicated on the plans. Non-select fill will meet Item 132, "Embankment," of the type specified on the plans. Provide material with a maximum plasticity index of 30 if no type is specified as determined by Tex-106-E.
- 2.4.2. **Select**. Select backfill is required in specific areas of permanent and temporary MSE and concrete block-type retaining walls. Provide select backfill that is free from organic or otherwise deleterious materials and that conforms to the gradation limits shown in Table 2 as determined by <u>Tex-401-A</u>.

Provide backfill that does not contain shale, caliche, or other soft, poor-durability coarse aggregate particles. Reclaimed Asphalt Pavement (RAP) is not allowed. Crushed Concrete or manufactured sand is allowed for temporary walls with a service life of 3 years or less. Test each source of backfill for durability/soundness using <a href="Tex-411-A">Tex-411-A</a>, 5-cycle magnesium sulfate soundness. Backfill material with a maximum 5-cycle soundness loss exceeding 25% will be rejected. Alternately, <a href="Tex-461-A">Tex-461-A</a>, Micro-Deval abrasion may be used if the corresponding results show loss is not greater than 20%, otherwise <a href="Tex-411-A">Tex-411-A</a> governs aggregate verification.

Type AS, BS, and DS particles larger than 1/4 in. must be angular or completely crushed. Provide mechanically crushed gravel or stone backfill. Gravel from each aggregate source will have a minimum of 95% two or more mechanically induced crushed faces, as <a href="Tex-460-A">Tex-460-A</a>, Part I determines. Rounded rock or rounded gravel is not allowed. Natural sand meeting the requirements of this Section is permitted for use.

Table 2
Select Backfill Gradation Limits

Type	Sieve Size	Percent Retained
	3"	0
	1/2"	50–100
AS	#4	See Note
	#40	85–100
	#200	95–100
	3"	0
BS	#4	See Note
ВО	#40	40–100
	#200	85–100
	3"	0
CS	#4	See Note
	#200	75–100
	3"	0
DS	3/8"	85–100
	#200	95–100

**Note**—Use No. 4 sieve for determination of rock backfill as described in this main paragraph, "Backfill."

When the backfill gradation results in 85% or more material retained on the No. 4 sieve, the backfill will be considered rock backfill. All Type DS backfill is considered rock backfill.

In addition to the requirements for Type CS select fill, the fraction finer than the No. 200 sieve must have a Plasticity Index (PI) in accordance with Tex-106-E not greater than 6.

Furnish Type BS backfill for permanent walls; Type CS backfill for temporary walls; and Type DS backfill for areas of walls subject to inundation unless otherwise shown on the plans, or below the 100-year flood elevation as noted on the plans.

Furnish backfill meeting the requirements of this Section but with a maximum particle size of 3/4 in. when nonmetallic or epoxy coated earth reinforcements are used.

2.4.3. **Drainage Aggregate**. Use drainage aggregate to fill the void within concrete block units and in the zone 1 ft. behind the units. Provide drainage aggregate that is free from organic or otherwise deleterious materials and that conforms to the gradation limits in Table 3 as <u>Tex-110-E</u> determines.

Table 3
Drainage Aggregate Gradation Limits

Sieve Size	Percent Retained
1"	0
3/4"	25–50
1/2"	50–100
#4	75–100

- 2.4.4. Cement-Stabilized Backfill. Use cement-stabilized backfill when required or as approved. Stabilize

  Type CS backfill with 5% hydraulic cement by dry weight of the backfill material. Use a stationary plant to
  thoroughly mix the backfill material, cement, and water. Place and compact the backfill within 2 hours of
  mixing. Provide special drainage provisions when cement-stabilized backfill is used, as shown on the plans.
- 2.4.5. **Electrochemical**. Provide backfill meeting the following additional requirements for permanent retaining wall systems using galvanized metallic earth reinforcements:
  - The pH is between 5.5 and 10.0 as <u>Tex-128-E</u> determines.
  - Resistivity is more than 3,000 ohm-cm as Tex-129-E determines.
  - Material with resistivity between 1,500 and 3,000 ohm-cm may be used if the chloride content is less than 100 ppm and the sulfate content is less than 200 ppm as <u>Tex-620-J</u> determines.

Perform electrochemical testing on the raw, unstabilized backfill material when cement-stabilized backfill is used.

2.5. **Earth Reinforcements.** Furnish earth reinforcements that meet the design requirements. Galvanize or epoxy coat all steel elements for permanent walls in contact with soil. Epoxy coat in accordance with Item 440, "Reinforcement for Concrete," except provide a minimum 18-mil coating thickness. Epoxy coat the reinforcing only when shown on the plans or as approved. Use connection hardware that is likewise nonmetallic or epoxy coated when using nonmetallic or epoxy coated earth reinforcements.

#### 3. CONSTRUCTION

- 3.1. **General**. Construct retaining walls in accordance with details shown on the plans, on the approved working drawings, and to the pertinent requirements of the following Items:
  - Item 110, "Excavation"
  - Item 132, "Embankment"
  - Item 400, "Excavation and Backfill for Structures"
  - Item 420, "Concrete Substructures"
  - Item 458, "Waterproofing Membranes for Structures"
  - Item 556, "Pipe Underdrains"

Construct required piling or drilled shafts in accordance with the pertinent specification.

3.2. **Options**. When optional design details are shown on the plans, the Contractor is required to use the same facing design within an area of continuous retaining walls.

Provide drawings for review indicating the proposed design arrangement when proposing the use of 2 or more systems.

- 3.3. **Working Drawings**. When proprietary wall systems are used for permanent or temporary walls, submit casting drawings, construction drawings, and design calculations bearing the seal of a licensed professional engineer for review and approval following the Department's *Guide to Electronic Shop Drawing Submittal* process. Upon completion of construction, submit a set of reproducible as-built drawings.
- 3.3.1. **Casting Drawings**. Include all information necessary for casting wall elements, including railing and coping when prefabricated. Show shape and dimensions of panels; size, quantity, and details of the reinforcing steel; quantity, type, size, and details of connection and lifting hardware; and additional necessary details.
- 3.3.2. Construction Drawings. Include a numbered panel layout showing horizontal and vertical alignment of the walls as well as the existing and proposed groundlines. Include all information needed to erect the walls, including the proposed leveling pad elevations; the type and details of the soil reinforcing system (if applicable); the details and manufacturer of all pads, fillers, and filter fabric; the limits and dimensions of structural backfill; details necessary to incorporate coping, railing, inlets, drainage, and electrical conduit; and additional necessary details.

Leveling pad elevations may vary from the elevations shown on the plans. Provide at least 1 ft. of cover from the top of the leveling pad to finish grade unless a different minimum cover or a specified minimum leveling pad elevation is shown.

- 3.3.3. Design Calculations. Include calculations covering the range of heights and loading conditions on the project. Calculations for both internal and external stability as described on the plans will be required. Include a summary of all design parameters used; material types, strength values, and assumed allowables; loads and loading combinations; and factor-of-safety parameters.
- 3.4. **Permanent MSE Walls.** Grade the foundation for the structure level to a width equal or exceeding the length of the reinforcing system. Perform proof rolling on retaining wall foundation area to identify any loose, soft, or unsuitable materials in accordance with Item 216, "Proof Rolling." Material not meeting a maximum rut depth of 1 in. per pass of pneumatic tire roller should continue to be rolled or removed and replaced with suitable material. Pneumatic tire rolling will be waived for portions of wall with a reinforcement length of 8'; for these conditions proof rolling will be required with a smooth-wheeled vibratory roller or other approved roller.

Place drilled shafts and piling located within the MSE volume before construction of the wall. Place any required pipe underdrain before construction of the wall. Complete MSE wall construction before construction of abutment caps and abutment wing walls. Completion of walls and abutment should be in conjunction with project phasing or to allow for completion of walls that meets the proper placement and compaction at abutments.

Place the concrete leveling pad as shown on the construction drawings. Provide a wood float finish, and wait a minimum of 24 hr. before beginning panel erection. No curing or strength testing of the leveling pad concrete is required.

Shim the first row of panels as necessary to achieve correct alignment. Use plastic shims or other material that will not deteriorate. Remove and replace the leveling pad or provide a grout level-up as directed if the required shim height exceeds 1 in.

Place filter fabric behind the wall along the joint between the leveling pad and the panels. Grout areas where filter fabric spans more than 6 in. at leveling pad steps.

Place and compact fill material over the leveling pad to an elevation even with or above the surrounding ground after backfilling the first row of panels. Do not allow water to accumulate and stand at the base of the wall

Place filter fabric behind all wall joints and at the intersection of retaining walls with other structures, including riprap. Cover joints at least 6 in. on each side and use adhesive to hold the filter fabric in place.

Exercise care while lifting, setting, and aligning panels to prevent damage to the panels. Discontinue any operation that results in chipping, spalling, or cracking of panels. Remove and replace damaged panels, or repair as approved by the Engineer.

Provide external bracing for the initial row of panels. Use wooden wedges, clamps, or other means necessary to maintain position and stability of panels during placement and compaction of backfill. Remove wooden wedges as soon as the panel or coping above the wedged element is erected and backfilled. Remove all wedges after completing the wall.

Review plumbness and position of each row of panels before placing the subsequent row. Remove and rebuild any portion of the wall that is out of tolerance. Modify panel batter and bracing, and backfill material, placement, and compaction methods as required to maintain wall tolerances.

Construct walls to a local vertical and horizontal alignment tolerance of 3/4 in. when measured along a 10-ft. straightedge relative to vertical and horizontal wall control line. Construct walls to an overall vertical tolerance (plumbness from top to bottom) of 1/2 in. per 10 ft. of wall height. Construct walls so the maximum offset at any panel joint is between 3/8 in. and 3/4 in. and no joint is open to the extent the filter fabric is visible from the front of the wall.

Place backfill to closely follow the erection of each row of panels. Place the select and embankment backfill to the same elevation where possible, and operate the compaction equipment over the interface. Do not create a continuous, distinct, vertical joint between the select and embankment backfill. Complete the embankment after construction of the retaining wall.

Maintain the stability of the interface area between the existing ground and the select fill when building a wall against existing ground. Remove and recompact any material that loosens, caves, or fails.

Compact backfill to provide at least 95% of density determined in accordance with <u>Tex-114-E</u>. Field density determination will be made in accordance with <u>Tex-115-E</u>.

Sprinkle backfill as required to ensure adequate uniformly distributed moisture in each lift before and during compaction. Place fill in lifts of 8 in. or less (loose measurement). Place fill in a manner that avoids segregation of the fill. Decrease the lift thickness if necessary to obtain the required compaction. Use hand-operated or walk-behind compaction equipment in the 3 ft. wide strip adjacent to the wall panels. Do not displace panels or distort or damage the reinforcement system during compaction. Modify backfill material, placement, and compaction methods as necessary to meet density requirements while maintaining wall tolerances.

Place rock backfill or material the Engineer determines too coarse for density testing in accordance with Section 132.3.4.1., "Ordinary Compaction."

Place and compact the backfill to the reinforcement level, at each earth reinforcement level, before placing the reinforcement. Place earth reinforcements perpendicular to the face of the wall. Remove slack in connections before placing backfill. Pre-tension each layer of reinforcement to remove slack before placing backfill for systems using nonmetallic earth reinforcements. Use devices capable of mechanically applying and holding the required force. Do not operate tracked equipment directly on any reinforcement.

Cover the rock backfill with filter fabric before placing the 2 ft. of backfill immediately below the pavement structure or top of wall when rock backfill is used. Overlap the fabric at least 18 in. at splices, and extend it past the edge of the rock backfill at least 18 in. Use backfill that contains sufficient fines to fill the voids in a

compacted state above the filter fabric. Place a horizontal layer of filter fabric as noted above when transitioning from rock backfill to finer grained backfill anywhere within the wall volume.

Prevent surface water or rainwater from damaging the retaining walls during construction. Shape the backfill to prevent water from ponding or flowing on the backfill or against the wall face. Remove and replace any portion of the retaining wall damaged or moved out of tolerance by erosion, sloughing, or saturation of the retaining wall or embankment backfill.

3.5. **Temporary MSE Walls**. Provide a facing system rigid enough to maintain a smooth and straight wall face both during and after construction.

Grade and compact the foundation for the structure as described in Section 423.3.4., "Permanent MSE Walls."

Place earth reinforcement and facing system in accordance with the approved working drawings. Backfill the 2-ft. zone immediately behind the facing with clean, coarse rock meeting the requirements of Coarse Aggregate Grade 1, 2, or 3 of Item 421, "Hydraulic Cement Concrete," or of Type DS backfill as described in Section 423.2.4.2., "Select." Cement-stabilized backfill as described in Section 423.2.4.4., "Cement-Stabilized Backfill," may be used in place of the coarse rock.

Place and compact backfill in accordance with Section 423.3.4., "Permanent MSE Walls."

Construct walls to a vertical and horizontal alignment tolerance of 3 in. when measured along a 10-ft. straightedge. Construct walls to an overall vertical tolerance (plumbness from top to bottom) of 2 in. per 10 ft. of wall height. Place adjacent facing elements so the maximum out-of-plane offset at any facing element joint is less than 1 in. Place facing elements and filter fabric with no gaps in the facing or fabric.

Prevent surface water or rainwater from damaging the retaining walls during and after construction. Place temporary berms or curbs, shape the backfill, or use other approved methods to prevent water from flowing against or over the wall face. Remove and replace any portion of the wall damaged or moved out of tolerance by erosion, sloughing, or saturation of the retaining wall or embankment backfill.

3.6. Concrete Block Retaining Walls. The concrete block units may be sampled and tested by the Engineer before shipment or upon delivery to the construction site. Display for approval, samples of block units indicating the color, texture, and finish. Store, transport, and handle all block units carefully to prevent cracking or damage.

Grade and compact the foundation for the structure, and place the leveling pad as described in Section 423.3.4., "Permanent MSE Walls."

Place the concrete block facing units in accordance with the approved working drawings. Fill the voids within the units and fill the 1-ft. zone immediately behind the facing with drainage aggregate as described in Section 423.2.4.3., "Drainage Aggregate." Systems tested without unit fill may omit the fill as indicated on the approved drawings. Systems with approved filter fabric details may omit the drainage aggregate in the 1-ft. zone immediately behind the facing.

Place reinforcements and backfill for walls using earth reinforcements in accordance with the requirements of Section 423.3.4., "Permanent MSE Walls." Pay particular attention to the connection details of the earth reinforcements to the concrete block units.

Construct walls to a vertical and horizontal alignment tolerance of 1-1/2 in. when measured along a 10-ft. straightedge. Construct walls to an overall vertical tolerance (deviation from the vertical or battered control line, top to bottom) of 1 in. per 10 feet of wall height. Place adjacent facing elements so the maximum out-of-plane offset at any facing element joint is less than 1 in. Place facing elements with maximum 1/4-in. gaps between block units.

Prevent surface water or rainwater from damaging the retaining walls during construction. Shape the backfill to prevent water from ponding or flowing on the backfill or against the wall face. Remove and replace all portions of the retaining wall damaged or moved out of tolerance by erosion, sloughing, or saturation of the retaining wall or embankment backfill.

#### 4. MEASUREMENT

This Item will be measured by the square foot of the front surface area of the wall. Unless otherwise shown on the plans, the area will be measured from 1 ft. below finished grade of the ground line on the face of the exterior wall to the top of the wall including any coping required (not including railing).

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

#### 5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Retaining Walls" of the type or special surface finish specified. This price is full compensation for excavation in back of retaining walls and for footings; furnishing and placing footings, leveling pads, copings, and traffic railing foundations; furnishing, placing, and compacting backfill (except in embankment areas), including cement for stabilization; proof rolling; furnishing and placing concrete, reinforcing steel, waterproofing material, filter material and drain pipe, joint material, water stop, and filter fabric when required; fabricating, curing, and finishing all panels; furnishing and placing earth reinforcement, anchorage systems, and fasteners; wall erection; and equipment, labor, tools, and incidentals.

Retaining wall backfill areas that are also in embankment areas will be considered part of the quantities measured and paid for under Item 132, "Embankment."

When drilled shafts are required, they will be measured and paid for as specified in Item 416, "Drilled Shaft Foundations." When piling is required, it will be measured and paid for as specified on the plans for piling of the appropriate type.

## Item 432 Riprap



#### 1. DESCRIPTION

Furnish and place concrete, stone, cement-stabilized, or special riprap.

#### 2. MATERIALS

Furnish materials in accordance with the following Items.

- Item 420, "Concrete Substructures,"
- Item 421, "Hydraulic Cement Concrete,"
- Item 431, "Pneumatically Placed Concrete,"
- Item 440. "Reinforcement for Concrete." and
- DMS-6200, "Filter Fabric."
- 2.1. **Concrete Riprap**. Use Class B Concrete unless otherwise shown on the plans.
- 2.2. Pneumatically Placed Concrete Riprap. Use Class II concrete that meets Item 431, "Pneumatically Placed Concrete," unless otherwise shown on the plans.
- 2.3. **Stone Riprap**. Use durable natural stone with a bulk specific gravity of at least 2.50 as determined by <a href="Tex-403-A">Tex-403-A</a> unless otherwise shown on the plans. Provide stone that, when tested in accordance with <a href="Tex-411-A">Tex-411-A</a>, has weight loss of no more than 18% after 5 cycles of magnesium sulfate solution.

Perform a size verification test on the first 5,000 sq. yd. of finished riprap stone for all types of stone riprap at a location determined by the Engineer. Test the riprap stone in accordance with ASTM D5519. Additional tests may be required. Do not place additional riprap until the initial 5,000 sq. yd. of riprap has been approved.

Provide grout or mortar in accordance with Item 421, "Hydraulic Cement Concrete," when specified. Provide grout with a consistency that will flow into and fill all voids.

Provide filter fabric in accordance with <u>DMS-6200</u>, "Filter Fabric." Provide Type 2 filter fabric for protection stone riprap unless otherwise shown on the plans. Provide Type 2 filter fabric for Type R, F, or Common stone riprap when shown on the plans.

- 2.3.1. Type R. Use stones between 50 and 250 lb. with at least 50% of the stones heavier than 100 lb.
- 2.3.2. **Type F**. Use stones between 50 and 250 lb. with at least 40% of the stones heavier than 100 lb. Use stones with at least 1 broad flat surface.
- 2.3.3. **Common**. Use stones between 50 and 250 lb. Use stones that are at least 3 in. in their least dimension. Use stones that are at least twice as wide as they are thick. When shown on the plans or approved, material may consist of broken concrete removed under the Contract or from other approved sources. Cut exposed reinforcement flush with all surfaces before placement of each piece of broken concrete.
- 2.3.4. **Protection**. Use boulders or quarried rock that meets the gradation requirements of Table 1. Both the width and the thickness of each piece of riprap must be at least 1/3 of the length. When shown on the plans or as approved, material may consist of broken concrete removed under the Contract or from other approved sources. Cut exposed reinforcement flush with all surfaces before placement of each piece of broken

concrete. Determine gradation of the finished, in-place, riprap stone under the direct supervision of the Engineer in accordance with ASTM D5519.

Table 1
In-Place Protection Riprap Gradation Requirements

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Size	Maximum Size	90% Size <sup>1</sup>	50% Size <sup>2</sup>	8% Size <sup>3</sup>	
Size	(lb.)	(lb.)	(lb.)	Minimum (lb.)	
12 in.	200	80–180	30–75	3	
15 in.	320	170–300	60–165	20	
18 in.	530	290-475	105–220	22	
21 in.	800	460-720	175–300	25	
24 in.	1,000	550-850	200-325	30	
30 in.	2,600	1,150-2,250	400–900	40	

- Defined as that size such that 10% of the total riprap stone, by weight, is larger and 90% is smaller.
- Defined as that size such that 50% of the total riprap stone, by weight, is larger and 50% is smaller
- Defined as that size such that 92% of the total riprap stone, by weight, is larger and 8% is smaller.

The Engineer may require in-place verification of the stone size. Determine the in-place size of the riprap stone by taking linear transects along the riprap and measuring the intermediate axis of the stone at select intervals. Place a tape measure along the riprap and determine the intermediate axis size of the stone at 2 ft. intervals. Measure a minimum of 100 stones, either in a single transect or in multiple transects, then follow ASTM D5519 Test Procedure Part B to determine the gradation. Table 2 is a guide for comparing the stone size in inches to the stone weight shown in Table 1.

Table 2
Protection Riprap Stone Size<sup>1</sup>

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	Dmax	D90	D50	D8	
Size	(in.)	(in.)	(in.)	(in.)	
12 in.	13.76	10.14-13.29	7.31-9.92	3.39	
15 in.	16.10	13.04–15.75	9.21-12.91	6.39	
18 in.	19.04	15.58-18.36	11.10-14.21	6.59	
21 in.	21.85	18.17-21.09	13.16–15.75	6.88	
24 in.	23.53	19.28-22.29	13.76–16.18	7.31	
30 in.	32.36	24.65-30.84	17.34-22.72	8.05	

Based on a Specific Gravity of 2.5 and using the following equation for the intermediate axis diameter D = {(12\*W)/(Gs\*62.4\*0.85)}<sup>1/3</sup>

where:

D = intermediate axis diameter in in.;

W = weight of stone in lbs.;

Gs = Specific Gravity of stone.

**Note**—If the Specific Gravity of the stone is different than 2.5, then the above equation can be used to determine the appropriate size using the actual Specific Gravity.

If required, provide bedding stone that, in-place, meets the gradation requirements shown in Table 3 or as otherwise shown on the plans. Determine the size distribution in Table 3 in accordance with ASTM D6913.

Table 3
Protection Riprap Bedding Material Gradation Requirements

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Sieve Size (Sq. Mesh)	Size (Sq. Mesh) % by Weight Passing		
3"	100		
1-1/2"	50–80		
3/4"	20–60		
#4	0–15		
#10	0–5		

- 2.4. **Cement-Stabilized Riprap**. Provide aggregate that meets Item 247, "Flexible Base," for the type and grade shown on the plans. Use cement-stabilized riprap with 7% hydraulic cement by dry weight of the aggregate.
- 2.5. **Special Riprap**. Furnish materials for special riprap according to the plans.

#### 3. CONSTRUCTION

Dress slopes and protected areas to the line and grade shown on the plans before the placement of riprap. Place riprap and toe walls according to details and dimensions shown on the plans or as directed.

3.1. **Concrete Riprap**. Reinforce concrete riprap with 6 × 6 – W2.9 × W2.9 welded wire fabric or with No. 3 or No. 4 reinforcing bars spaced at a maximum of 18 in. in each direction unless otherwise shown. Alternative styles of welded wire fabric that provide at least 0.058 sq. in. of steel per foot in both directions may be used if approved. A combination of welded wire fabric and reinforcing bars may be provided when both are permitted. Provide a minimum 6-in. lap at all splices. Provide horizontal cover of at least 1 in. and no more than 3 in. at the edge of the riprap. Place the first parallel bar no more than 6 in. from the edge of concrete. Use approved supports to hold the reinforcement approximately equidistant from the top and bottom surface of the slab. Adjust reinforcement during concrete placement to maintain correct position.

Sprinkle or sprinkle and consolidate the subgrade before the concrete is placed as directed. All surfaces must be moist when concrete is placed.

Compact and shape the concrete once it has been placed to conform to the dimensions shown on the plans. Finish the surface with a wood float after it has set sufficiently to avoid slumping to secure a smooth surface or broom finish as approved.

Cure the riprap immediately after the finishing operation according to Item 420, "Concrete Substructures."

- 3.2. **Stone Riprap**. Provide the following types of stone riprap when shown on the plans:
  - Dry Riprap. Stone riprap with voids filled with only spalls or small stones.
  - **Grouted Riprap**. Type R, F, or Common stone riprap with voids grouted after all the stones are in place.
  - Mortared Riprap. Type F stone riprap laid and mortared as each stone is placed.

Use spalls and small stones lighter than 25 lb. to fill open joints and voids in stone riprap, and place to a tight fit.

Place mortar or grout only when the air temperature is above 35°F. Protect work from rapid drying for at least 3 days after placement.

Place filter fabric with the length running up and down the slope unless otherwise approved. Ensure fabric has a minimum overlap of 2 ft. Secure fabric with nails or pins. Use nails at least 2 in. long with washers or U-shaped pins with legs at least 9 in. long. Space nails or pins at a maximum of 10 ft. in each direction and 5 ft. along the seams. Alternative anchorage and spacing may be used when approved.

3.2.1. **Type R**. Construct riprap as shown in Figure 1 on the *Stone Riprap Standard* and as shown on the plans. Place stones in a single layer with close joints so most of their weight is carried by the earth and not the adjacent stones. Place the upright axis of the stones at an angle of approximately 90° to the embankment slope. Place each course from the bottom of the embankment upward with the larger stones in the lower courses.

Fill open joints between stones with spalls. Place stones to create a uniform finished top surface. Do not exceed a 6-in. variation between the tops of adjacent stones. Replace, embed deeper, or chip away stones that project more than the allowable amount above the finished surface.

Prevent earth, sand, or foreign material from filling the spaces between the stones when the plans require Type R stone riprap to be grouted. Wet the stones thoroughly after they are in place, fill the spaces between the stones with grout, and pack. Sweep the surface of the riprap with a stiff broom after grouting.

- 3.2.2. **Type F**.
- 3.2.2.1. **Dry Placement**. Construct riprap as shown in Figure 2 on the *Stone Riprap Standard*. Set the flat surface on a prepared horizontal earth bed, and overlap the underlying course to secure a lapped surface. Place the large stones first, roughly arranged in close contact. Fill the spaces between the large stones with suitably sized stones placed to leave the surface evenly stepped and conforming to the contour required. Place stone to drain water down the face of the slope.
- 3.2.2.2. **Grouting**. Construct riprap as shown in Figure 3 on the *Stone Riprap Standard*. Size, shape, and lay large flat-surfaced stones to produce an even surface with minimal voids. Place stones with the flat surface facing upward parallel to the slope. Place the largest stones near the base of the slope. Fill spaces between the larger stones with stones of suitable size, leaving the surface smooth, tight, and conforming to the contour required. Place the stones to create a plane surface with a variation no more than 6 in. in 10 ft. from true plane. Provide the same degree of accuracy for warped and curved surfaces. Prevent earth, sand, or foreign material from filling the spaces between the stones. Wet the stones thoroughly after they are in place, fill the spaces between them with grout, and pack. Sweep the surface with a stiff broom after grouting.
- 3.2.2.3. **Mortaring**. Construct riprap as shown in Figure 2 on the *Stone Riprap Standard*. Lap courses as described for dry placement. Wet the stones thoroughly before placing mortar. Bed the larger stones in fresh mortar as they are being place and shove adjacent stones into contact with one another. Spread excess mortar forced out during placement of the stones uniformly over them to fill all voids completely. Point up all joints roughly either with flush joints or shallow, smooth-raked joints as directed.
- 3.2.3. **Common.** Construct riprap as shown in Figure 4 on the *Stone Riprap Standard*. Place stones on a bed excavated for the base course. Bed the base course of stone well into the ground with the edges in contact. Bed and place each succeeding course in even contact with the preceding course. Use spalls and small stones to fill any open joints and voids in the riprap. Ensure the finished surface presents an even, tight surface, true to the line and grades of the typical sections.

Prevent earth, sand, or foreign material from filling the spaces between the stones when the plans require grouting common stone riprap. Wet the stones thoroughly after they are in place; fill the spaces between them with grout; and pack. Sweep the surface with a stiff broom after grouting.

- 3.2.4. **Protection**. Construct riprap as shown in Figure 5 on the *Stone Riprap Standard*. Place riprap stone on the slopes within the limits shown on the plans. Place stone for riprap on the filter fabric to produce a reasonably well-graded mass of riprap with the minimum practicable percentage of voids. Construct the riprap to the lines and grades shown on the plans or staked in the field. A tolerance of +6 in. and -0 in. from the slope line and grades shown on the plans is allowed in the finished surface of the riprap. Place riprap to its full thickness in a single operation. Avoid displacing the filter fabric. Ensure the entire mass of stones in their final position is free from objectionable pockets of small stones and clusters of larger stones. Do not place riprap in layers, and do not place it by dumping it into chutes, dumping it from the top of the slope, pushing it from the top of the slope, or any method likely to cause segregation of the various sizes. Obtain the desired distribution of the various sizes of stones throughout the mass by selective loading of material at the quarry or other source or by other methods of placement that will produce the specified results. Rearrange individual stones by mechanical equipment or by hand if necessary to obtain a reasonably well-graded distribution of stone sizes. Use the bedding thickness shown and place stone for riprap on the bedding material to produce a reasonably well-graded mass of riprap with the minimum practicable percentage of voids if required on the plans.
- 3.3. Pneumatically Placed Concrete Riprap, Class II. Meet Item 431, "Pneumatically Placed Concrete." Provide reinforcement following the details on the plans and Item 440, "Reinforcement for Concrete." Support reinforcement with approved supports throughout placement of concrete.

Give the surface a wood-float finish or a gun finish as directed. Cure the riprap with membrane-curing compound immediately after the finishing operation in accordance with Item 420, "Concrete Substructures."

- 3.4. **Cement-Stabilized Riprap**. Follow the requirements of the plans and the provisions for concrete riprap except when reinforcement is not required. The Engineer will approve the design and mixing of the cement-stabilized riprap.
- 3.5. **Special Riprap**. Construct special riprap according to the plans.

#### 4. MEASUREMENT

This Item will be measured by the cubic yard of material complete in place. Volume will be computed on the basis of the measured area in place and the thickness and toe wall width shown on the plans.

If required on the plans, the pay quantity of the bedding material for stone riprap for protection to be paid for will be measured by the cubic yard as computed from the measured area in place and the bedding thickness shown on the plans.

#### 5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Riprap" of the type, thickness, and void-filling technique (Dry, Grout, Mortar) specified, as applicable. This price is full compensation for furnishing, hauling, and placing riprap and for filter fabric, expansion joint material, concrete and reinforcing steel, grout and mortar, scales, test weights, equipment, labor, tools, and incidentals.

Payment for excavation of toe wall trenches, for all necessary excavation below natural ground or bottom of excavated channel, and for shaping of slopes for riprap will be included in the unit price bid per cubic yard of riprap.

When bedding is required for protection stone riprap, payment will be made at the unit price for "Bedding Material" of the thickness specified. This price is full compensation for furnishing, hauling, placing, and maintaining the bedding material until placement of the riprap cover is completed and accepted; excavation required for placement of bedding material; and equipment, scales, test weights, labor, tools, and incidentals. No payment will be made for excess thickness of bedding nor for material required to replace embankment material lost by rain wash, wind erosion, or otherwise.

## **Item 432**

## Riprap



#### 1. DESCRIPTION

Furnish and place concrete, stone, cement-stabilized, or special riprap.

#### 2. MATERIALS

Furnish materials in accordance with the following Items.

- Item 420. "Concrete Substructures"
- Item 421, "Hydraulic Cement Concrete"
- Item 431, "Pneumatically Placed Concrete"
- Item 440, "Reinforcement for Concrete"
- DMS-6200, "Filter Fabric"
- 2.1. **Concrete Riprap**. Use Class B Concrete unless otherwise shown on the plans.
- 2.2. **Pneumatically Placed Concrete Riprap**. Use Class II concrete that meets Item 431, "Pneumatically Placed Concrete," unless otherwise shown on the plans.
- 2.3. **Stone Riprap**. Use durable natural stone with a bulk specific gravity of at least 2.50 as determined by Tex-403-A unless otherwise shown on the plans. Provide stone that, when tested in accordance with Tex-411-A, has weight loss of no more than 18% after 5 cycles of magnesium sulfate solution.

Perform a size verification test on the first 5,000 sq. yd. of finished riprap stone for all types of stone riprap at a location determined by the Engineer. Test the riprap stone in accordance with ASTM D5519. Additional tests may be required. Do not place additional riprap until the initial 5,000 sq. yd. of riprap has been approved.

Provide grout or mortar in accordance with Item 421, "Hydraulic Cement Concrete," when specified. Provide grout with a consistency that will flow into and fill all voids.

Provide filter fabric in accordance with DMS-6200, "Filter Fabric." Provide Type 2 filter fabric for protection stone riprap unless otherwise shown on the plans. Provide Type 2 filter fabric for Type R, F, or Common stone riprap when shown on the plans.

- 2.3.1. Type R. Use stones between 50 and 250 lb. with at least 50% of the stones heavier than 100 lb.
- 2.3.2. **Type F**. Use stones between 50 and 250 lb. with at least 40% of the stones heavier than 100 lb. Use stones with at least 1 broad flat surface.
- 2.3.3. **Common**. Use stones between 50 and 250 lb. Use stones that are at least 3 in. in their least dimension. Use stones that are at least twice as wide as they are thick. When shown on the plans or approved, material may consist of broken concrete removed under the Contract or from other approved sources. Cut exposed reinforcement flush with all surfaces before placement of each piece of broken concrete.
- 2.3.4. **Protection**. Use boulders or quarried rock that meets the gradation requirements of Table 1. Both the width and the thickness of each piece of riprap must be at least 1/3 of the length. When shown on the plans or as approved, material may consist of broken concrete removed under the Contract or from other approved sources. Cut exposed reinforcement flush with all surfaces before placement of each piece of broken

concrete. Determine gradation of the finished, in-place, riprap stone under the direct supervision of the Engineer in accordance with ASTM D5519.

Table 1
In-Place Protection Riprap Gradation Requirements

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Size	Maximum Size	90% Size <sup>1</sup>	50% Size <sup>2</sup>	8% Size <sup>3</sup>
Size	(lb.)	(lb.)	(lb.)	Minimum (lb.)
12 in.	200	80–180	30–75	3
15 in.	320	170–300	60–165	20
18 in.	530	290-475	105–220	22
21 in.	800	460–720	175–300	25
24 in.	1,000	550-850	200-325	30
30 in.	2,600	1,150-2,250	400–900	40

- Defined as that size such that 10% of the total riprap stone, by weight, is larger and 90% is smaller
- Defined as that size such that 50% of the total riprap stone, by weight, is larger and 50% is smaller.
- Defined as that size such that 92% of the total riprap stone, by weight, is larger and 8% is smaller.

The Engineer may require in-place verification of the stone size. Determine the in-place size of the riprap stone by taking linear transects along the riprap and measuring the intermediate axis of the stone at select intervals. Place a tape measure along the riprap and determine the intermediate axis size of the stone at 2 ft. intervals. Measure a minimum of 100 stones, either in a single transect or in multiple transects, then follow ASTM D5519 Test Procedure Part B to determine the gradation. Table 2 is a guide for comparing the stone size in inches to the stone weight shown in Table 1.

Table 2
Protection Riprap Stone Size<sup>1</sup>

	Dmax	D90	D50	D8
Size	(in.)	(in.)	(in.)	(in.)
12 in.	13.76	10.14–13.29	7.31–9.92	3.39
15 in.	16.10	13.04–15.75	9.21-12.91	6.39
18 in.	19.04	15.58–18.36	11.10–14.21	6.59
21 in.	21.85	18.17-21.09	13.16–15.75	6.88
24 in.	23.53	19.28–22.29	13.76–16.18	7.31
30 in.	32.36	24.65-30.84	17.34-22.72	8.05

Based on a Specific Gravity of 2.5 and using the following equation for the intermediate axis diameter D = {(12\*W)/(Gs\*62.4\*0.85)}<sup>1/3</sup>

where:

D = intermediate axis diameter in in.;

W = weight of stone in lbs.;

Gs = Specific Gravity of stone.

**Note**—If the Specific Gravity of the stone is different than 2.5, then the above equation can be used to determine the appropriate size using the actual Specific Gravity.

If required, provide bedding stone that, in-place, meets the gradation requirements shown in Table 3 or as otherwise shown on the plans. Determine the size distribution in Table 3 in accordance with ASTM D6913.

Table 3
Protection Riprap Bedding Material Gradation Requirements

· · · · · · · · · · · · · · · · · · ·			
Sieve Size (Sq. Mesh)	Mesh) % by Weight Passing		
3"	100		
1-1/2"	50–80		
3/4"	20–60		
#4	0–15		
#10	0–5		

- 2.4. **Cement-Stabilized Riprap**. Provide aggregate that meets Item 247, "Flexible Base," for the type and grade shown on the plans. Use cement-stabilized riprap with 7% hydraulic cement by dry weight of the aggregate.
- 2.5. **Special Riprap**. Furnish materials for special riprap according to the plans.

#### 3. CONSTRUCTION

Dress slopes and protected areas to the line and grade shown on the plans before the placement of riprap. Place riprap and toe walls according to details and dimensions shown on the plans or as directed.

3.1. **Concrete Riprap**. Reinforce concrete riprap with 6 × 6 – W2.9 × W2.9 welded wire fabric or with No. 3 or No. 4 reinforcing bars spaced at a maximum of 18 in. in each direction unless otherwise shown. Alternative styles of welded wire fabric that provide at least 0.058 sq. in. of steel per foot in both directions may be used if approved. A combination of welded wire fabric and reinforcing bars may be provided when both are permitted. Provide a minimum 6-in. lap at all splices. Provide horizontal cover of at least 1 in. and no more than 3 in. at the edge of the riprap. Place the first parallel bar no more than 6 in. from the edge of concrete. Use approved supports to hold the reinforcement approximately equidistant from the top and bottom surface of the slab. Adjust reinforcement during concrete placement to maintain correct position.

Sprinkle or sprinkle and consolidate the subgrade before the concrete is placed as directed. All surfaces must be moist when concrete is placed.

Compact and shape the concrete once it has been placed to conform to the dimensions shown on the plans. Finish the surface with a wood float after it has set sufficiently to avoid slumping to secure a smooth surface or broom finish as approved.

Cure the riprap immediately after the finishing operation according to Item 420, "Concrete Substructures."

- 3.2. **Stone Riprap**. Provide the following types of stone riprap when shown on the plans:
  - Dry Riprap. Stone riprap with voids filled with only spalls or small stones.
  - **Grouted Riprap**. Type R, F, or Common stone riprap with voids grouted after all the stones are in place.
  - Mortared Riprap. Type F stone riprap laid and mortared as each stone is placed.

Use spalls and small stones lighter than 25 lb. to fill open joints and voids in stone riprap, and place to a tight fit.

Place mortar or grout only when the air temperature is above 35°F. Protect work from rapid drying for at least 3 days after placement.

Place filter fabric with the length running up and down the slope unless otherwise approved. Ensure fabric has a minimum overlap of 2 ft. Secure fabric with nails or pins. Use nails at least 2 in. long with washers or U-shaped pins with legs at least 9 in. long. Space nails or pins at a maximum of 10 ft. in each direction and 5 ft. along the seams. Alternative anchorage and spacing may be used when approved.

3.2.1. **Type R**. Construct riprap as shown in Figure 1 on the *Stone Riprap Standard* and as shown on the plans. Place stones in a single layer with close joints so most of their weight is carried by the earth and not the adjacent stones. Place the upright axis of the stones at an angle of approximately 90° to the embankment slope. Place each course from the bottom of the embankment upward with the larger stones in the lower courses.

Fill open joints between stones with spalls. Place stones to create a uniform finished top surface. Do not exceed a 6-in. variation between the tops of adjacent stones. Replace, embed deeper, or chip away stones that project more than the allowable amount above the finished surface.

Prevent earth, sand, or foreign material from filling the spaces between the stones when the plans require Type R stone riprap to be grouted. Wet the stones thoroughly after they are in place, fill the spaces between the stones with grout, and pack. Sweep the surface of the riprap with a stiff broom after grouting.

- 3.2.2. **Type F**.
- 3.2.2.1. **Dry Placement**. Construct riprap as shown in Figure 2 on the *Stone Riprap Standard*. Set the flat surface on a prepared horizontal earth bed, and overlap the underlying course to secure a lapped surface. Place the large stones first, roughly arranged in close contact. Fill the spaces between the large stones with suitably sized stones placed to leave the surface evenly stepped and conforming to the contour required. Place stone to drain water down the face of the slope.
- 3.2.2.2. **Grouting**. Construct riprap as shown in Figure 3 on the *Stone Riprap Standard*. Size, shape, and lay large flat-surfaced stones to produce an even surface with minimal voids. Place stones with the flat surface facing upward parallel to the slope. Place the largest stones near the base of the slope. Fill spaces between the larger stones with stones of suitable size, leaving the surface smooth, tight, and conforming to the contour required. Place the stones to create a plane surface with a variation no more than 6 in. in 10 ft. from true plane. Provide the same degree of accuracy for warped and curved surfaces. Prevent earth, sand, or foreign material from filling the spaces between the stones. Wet the stones thoroughly after they are in place, fill the spaces between them with grout, and pack. Sweep the surface with a stiff broom after grouting.
- 3.2.2.3. **Mortaring**. Construct riprap as shown in Figure 2 on the *Stone Riprap Standard*. Lap courses as described for dry placement. Wet the stones thoroughly before placing mortar. Bed the larger stones in fresh mortar as they are being place and shove adjacent stones into contact with one another. Spread excess mortar forced out during placement of the stones uniformly over them to fill all voids completely. Point up all joints roughly either with flush joints or shallow, smooth-raked joints as directed.
- 3.2.3. **Common**. Construct riprap as shown in Figure 4 on the *Stone Riprap Standard*. Place stones on a bed excavated for the base course. Bed the base course of stone well into the ground with the edges in contact. Bed and place each succeeding course in even contact with the preceding course. Use spalls and small stones to fill any open joints and voids in the riprap. Ensure the finished surface presents an even, tight surface, true to the line and grades of the typical sections.

Prevent earth, sand, or foreign material from filling the spaces between the stones when the plans require grouting common stone riprap. Wet the stones thoroughly after they are in place; fill the spaces between them with grout; and pack. Sweep the surface with a stiff broom after grouting.

- 3.2.4. Protection. Construct riprap as shown in Figure 5 on the Stone Riprap Standard. Place riprap stone on the slopes within the limits shown on the plans. Place stone for riprap on the filter fabric to produce a reasonably well-graded mass of riprap with the minimum practicable percentage of voids. Construct the riprap to the lines and grades shown on the plans or staked in the field. A tolerance of +6 in. and -0 in. from the slope line and grades shown on the plans is allowed in the finished surface of the riprap. Place riprap to its full thickness in a single operation. Avoid displacing the filter fabric. Ensure the entire mass of stones in their final position is free from objectionable pockets of small stones and clusters of larger stones. Do not place riprap in layers, and do not place it by dumping it into chutes, dumping it from the top of the slope, pushing it from the top of the slope, or any method likely to cause segregation of the various sizes. Obtain the desired distribution of the various sizes of stones throughout the mass by selective loading of material at the quarry or other source or by other methods of placement that will produce the specified results. Rearrange individual stones by mechanical equipment or by hand if necessary to obtain a reasonably well-graded distribution of stone sizes. Use the bedding thickness shown and place stone for riprap on the bedding material to produce a reasonably well-graded mass of riprap with the minimum practicable percentage of voids if required on the plans.
- 3.3. Pneumatically Placed Concrete Riprap, Class II. Meet Item 431, "Pneumatically Placed Concrete." Provide reinforcement following the details on the plans and Item 440, "Reinforcement for Concrete." Support reinforcement with approved supports throughout placement of concrete.

Give the surface a wood-float finish or a gun finish as directed. Cure the riprap with membrane-curing compound immediately after the finishing operation in accordance with Item 420, "Concrete Substructures."

- 3.4. Cement-Stabilized Riprap. Follow the requirements of the plans and the provisions for concrete riprap except when reinforcement is not required. The Engineer will approve the design and mixing of the cement-stabilized riprap.
- 3.5. **Special Riprap**. Construct special riprap according to the plans.

#### 4. MEASUREMENT

This Item will be measured by the cubic yard of material complete in place. Volume will be computed on the basis of the measured area in place and the thickness and toe wall width shown on the plans.

If required on the plans, the pay quantity of the bedding material for stone riprap for protection to be paid for will be measured by the cubic yard as computed from the measured area in place and the bedding thickness shown on the plans.

#### 5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Riprap" of the type, thickness, and void-filling technique (Dry, Grout, Mortar) specified, as applicable. This price is full compensation for furnishing, hauling, and placing riprap and for filter fabric, expansion joint material, concrete and reinforcing steel, grout and mortar, scales, test weights, equipment, labor, tools, and incidentals.

Payment for excavation of toe wall trenches, for all necessary excavation below natural ground or bottom of excavated channel, and for shaping of slopes for riprap will be included in the unit price bid per cubic yard of riprap.

When bedding is required for protection stone riprap, payment will be made at the unit price for "Bedding Material" of the thickness specified. This price is full compensation for furnishing, hauling, placing, and maintaining the bedding material until placement of the riprap cover is completed and accepted; excavation required for placement of bedding material; and equipment, scales, test weights, labor, tools, and incidentals. No payment will be made for excess thickness of bedding nor for material required to replace embankment material lost by rain wash, wind erosion, or otherwise.

### **Item 440**

### **Reinforcement for Concrete**



#### 1. DESCRIPTION

Furnish and place reinforcement of the type, size, and details shown on the plans.

#### 2. MATERIALS

Use deformed steel bar reinforcement unless otherwise specified or allowed.

2.1. **Approved Mills**. Before furnishing steel, producing mills of reinforcing steel for the Department must be preapproved in accordance with <u>DMS-7320</u>, "Qualification Procedure for Reinforcing Steel Producing Mills," by the Construction Division. The Department's MPL has a list of approved producing mills. Reinforcing steel obtained from unapproved sources will not be accepted.

Contact the Construction Division with the name and location of the producing mill for stainless reinforcing steel, low carbon/chromium reinforcing steel, or dual-coated reinforcing steel at least 4 weeks before ordering any material.

- 2.2. **Deformed Steel Bar Reinforcement.** Provide deformed reinforcing steel conforming to one of the following:
  - ASTM A615, Grades 60, 75, or 80;
  - ASTM A996, Type A, Grade 60;
  - ASTM A996, Type R, Grade 60, permitted in concrete pavement only (Furnish ASTM A996, Type R bars as straight bars only and do not bend them. Bend tests are not required.); or
  - ASTM A706, Grades 60 or 80.

Provide the grade of reinforcing steel shown on the plans. Provide Grade 60 if no grade is shown.

The nominal size, area, and weight of reinforcing steel bars this Item covers are shown in Table 1.

Table 1
Size, Area, and Weight of Reinforcing Steel Bars

Bar Size	Diameter	Area	Weight per Foot
Number (in.)	(in.)	(sq. in.)	(lbs.)
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	7.650
18	2.257	4.00	13.60

2.3. **Smooth Steel Bar Reinforcement**. Provide smooth bars for concrete pavement with a yield strength of at least 60 ksi and meeting ASTM A615. Provide steel conforming to ASTM A615 or meet the physical requirements of ASTM A36 for smooth bars that are larger than No. 3. Designate smooth bars by size number up to No. 4 and by diameter in inches above No. 4.

2.4. **Spiral Reinforcement**. Provide bars or wire for spiral reinforcement of the grade and minimum size or gauge shown on the plans.

Provide smooth or deformed wire conforming to ASTM A1064. Provide bars conforming to ASTM A615; ASTM A996, Type A; or ASTM A675, Grade 80, meeting dimensional requirements of ASTM A615.

2.5. **Weldable Reinforcing Steel**. Provide reinforcing steel conforming to ASTM A706 or with a maximum carbon equivalent (C.E.) of 0.55% if welding of reinforcing steel is required or desired. Provide a report showing the percentages of elements necessary to establish C.E. for reinforcing steel that does not meet ASTM A706, in order to be structurally welded. These requirements do not pertain to miscellaneous welds on reinforcing steel as defined in Section 448.4.2.1.1., "Miscellaneous Welding Applications."

Calculate C.E. using the following formula:

$$C.E. = \%C + \frac{\%Mn}{6} + \frac{\%Cu}{40} + \frac{\%Ni}{20} + \frac{\%Cr}{10} - \frac{\%Mo}{50} - \frac{\%V}{10}$$

Do not weld stainless reinforcing steel without permission from the Engineer. Provide stainless reinforcing steel suitable for welding, if required, and submit welding procedures and electrodes to the Engineer for approval.

2.6. **Welded Wire Reinforcement**. Provide welded wire reinforcement (WWR) conforming to ASTM A1064. Observe the relations shown in Table 2 among size number, diameter in inches, and area when ordering wire by size numbers, unless otherwise specified. Precede the size number for deformed wire with "D" and for smooth wire with "W."

Designate WWR as shown in the following example:  $6 \times 12 - W16 \times W8$  (indicating 6-in. longitudinal wire spacing and 12-in. transverse wire spacing with smooth No. 16 wire longitudinally and smooth No. 8 wire transversely).

Table 2
Wire Size Number, Diameter, and Area

Size Number (in.)	Diameter (in.)	Area (sq. in.)
31	0.628	0.310
30	0.618	0.300
28	0.597	0.280
26	0.575	0.260
24	0.553	0.240
22	0.529	0.220
20	0.505	0.200
18	0.479	0.180
16	0.451	0.160
14	0.422	0.140
12	0.391	0.120
10	0.357	0.100
8	0.319	0.080
7	0.299	0.070
6	0.276	0.060
5.5	0.265	0.055
5	0.252	0.050
4.5	0.239	0.045
4	0.226	0.040
3.5	0.211	0.035
2.9	0.192	0.035
2.5	0.178	0.025
2	0.160	0.020
1.4	0.134	0.014
1.2	0.124	0.012
0.5	0.080	0.005

**Note**—Size numbers (in.) are the nominal cross-sectional area of the wire in hundredths of a square inch. Fractional sizes between the sizes listed above are also available and acceptable for use.

2.7. Epoxy Coating. Provide epoxy coated reinforcing steel as shown on the plans. Before furnishing epoxy coated reinforcing steel, an epoxy applicator must be pre-approved in accordance with <u>DMS-7330</u>, "Qualification Procedure for Reinforcing Steel Epoxy Coating Applicators." The Department's MPL has a list of approved applicators.

Furnish coated reinforcing steel meeting the requirements in Table 3.

Table 3
Epoxy Coating Requirements for Reinforcing Steel

Material	Specification
Bar	ASTM A775 or A934
Wire or WWR	ASTM A884 Class A or B
Mechanical couplers	As shown on the plans
Hardware	As shown on the plans

Use epoxy coating material and coating repair material that complies with <u>DMS-8130</u>, "Epoxy Powder Coating for Reinforcing Steel." Patch no more than 1/4-in. total length in any foot at the applicator's plant.

Maintain identification of all reinforcing steel throughout the coating and fabrication process and until delivery to the project site.

Furnish 1 copy of a written certification verifying the coated reinforcing steel meets the requirements of this Item and 1 copy of the manufacturer's control tests.

2.8. **Mechanical Couplers**. Use couplers of the type specified in <u>DMS-4510</u>, "Mechanical Couplers for Reinforcing Steel," Article 4510.5.A, "General Requirements," when mechanical splices in reinforcing steel bars are shown on the plans.

Furnish only couplers pre-qualified in accordance with <u>DMS-4510</u>, "Mechanical Couplers for Reinforcing Steel." Ensure sleeve-wedge type couplers are not used on coated reinforcing. Sample and test couplers for use on individual projects in accordance with <u>DMS-4510</u>, "Mechanical Couplers for Reinforcing Steel." Furnish couplers only at locations shown on the plans.

Furnish couplers for stainless reinforcing steel with the same alloy designation as the reinforcing steel.

- 2.9. **Fibers**. Supply fibers conforming to <u>DMS-4550</u> "Fibers for Concrete" at the minimum dosage listed in the Department's MPL, when allowed by the plans. Use non-metallic fibers when shown on the plans.
- 2.10. **Stainless Reinforcing Steel**. Provide deformed steel bars of the types listed in Table 4 and conforming to ASTM A955, Grade 60 or higher when stainless reinforcing steel is required on the plans.

Table 4
Acceptable Types of Deformed Stainless Steel Bar

7 toocptable 1 ypes of Beformed Stanfiess Steel Bai				
UNS Designation	S31653	S31803	S24100	S32304
AISI Type	316LN	2205	XM-28	2304

- 2.11. **Low Carbon/Chromium Reinforcing Steel**. Provide deformed steel bars conforming to ASTM A1035, Grade 100 when low carbon/chromium reinforcing steel is required on the plans.
- 2.12. Dual-Coated Reinforcing Steel. Provide deformed bars conforming to ASTM A1055, Grade 60 or higher when dual-coated reinforcing steel is required on the plans.
- 2.13. Glass Fiber Reinforced Polymer Bars (GFRP). Provide bars conforming to the AASHTO LRFD Bridge Design Guide Specifications for GFRP-Reinforced Concrete Bridge Decks and Traffic Railings, Section 4, "Material Specifications" when GFRP bars are required on the plans. Provide sample certification demonstrating the GFRP bar supplier has produced bar that meets the Material Specifications 2 mo. before fabrication. Furnish certification upon shipment that the GFRP bar supplied meets the Material Specifications.

#### 3. CONSTRUCTION

3.1. **Bending**. Fabricate reinforcing steel bars as prescribed in the CRSI *Manual of Standard Practice* to the shapes and dimensions shown on the plans. Fabricate in the shop if possible. Field-fabricate, if permitted, using a method approved by the Engineer. Replace improperly fabricated, damaged, or broken bars at no additional expense to the Department. Repair damaged or broken bars embedded in a previous concrete placement using a method approved by the Engineer.

Unless otherwise shown on the plans, the inside diameter of bar bends, in terms of the nominal bar diameter (d), must be as shown in Table 5.

Table 5
Minimum Inside Diameter of Bar Bends

Bend	Bar Size Number (in.)	Pin Diameter
Bends of 90° and greater in stirrups, ties,	3, 4, 5	4d
and other secondary bars that enclose another bar in the bend	6, 7, 8	6d
Danda in main hara and in accordant	3 through 8	6d
Bends in main bars and in secondary bars not covered above	9, 10, 11	8d
Dais Hot covered above	14, 18	10d

Bend-test representative specimens as described for smaller bars in the applicable ASTM specification where bending No. 14 or No. 18 Grade 60 bars is required. Make the required 90° bend around a pin with a diameter of 10 times the nominal diameter of the bar.

Bend stainless reinforcing steel in accordance with ASTM A955.

3.2. **Tolerances**. Fabrication tolerances for bars are shown in Figure 1.

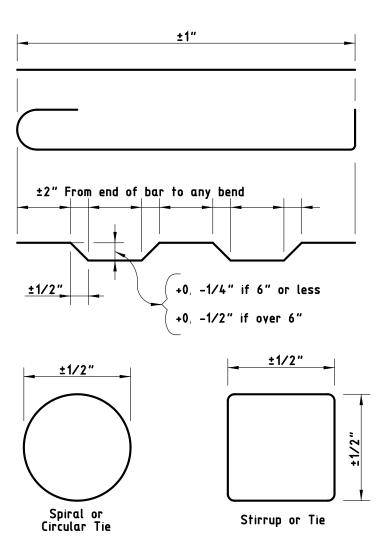


Figure 1 Fabrication Tolerances for Bars

3.3. Storage. Store reinforcement above the ground on platforms, skids, or other supports, and protect it from damage and deterioration. Ensure reinforcement is free from dirt, paint, grease, oil, and other foreign materials when it is placed in the work. Use reinforcement free from defects such as cracks and delaminations. Rust, surface seams, surface irregularities, or mill scale will not be cause for rejection if the minimum cross-sectional area of a hand wire-brushed specimen meets the requirements for the size of steel specified.

Do not allow stainless reinforcing steel to be in direct contact with uncoated reinforcing steel, nor with galvanized reinforcing steel. This does not apply to stainless steel wires and ties. Store stainless reinforcing steel separately, off the ground on wooden supports.

- 3.4. **Splices**. Lap-splice, weld-splice, or mechanically splice bars as shown on the plans. Additional splices not shown on the plans will require approval. Splices not shown on the plans will be permitted in slabs no more than 15 in. in thickness, columns, walls, and parapets.
  - Do not splice bars less than 30 ft. in plan length unless otherwise approved. For bars exceeding 30 ft. in plan length, the distance center-to-center of splices must be at least 30 ft. minus 1 splice length, with no more than 1 individual bar length less than 10 ft. Make lap splices not shown on the plans, but otherwise

permitted, in accordance with Table 6. Maintain the specified concrete cover and spacing at splices, and place the lap-spliced bars in contact, securely tied together.

Table 6
Minimum Lap Requirements for Steel Bar Sizes through No. 11

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Bar Size Number (in.)	Uncoated Lap Length	Coated Lap Length
3	1 ft. 4 in.	2 ft. 0 in.
4	1 ft. 9 in.	2 ft. 8 in.
5	2 ft. 2 in.	3 ft. 3 in.
6	2 ft. 7 in.	3 ft. 11 in.
7	3 ft. 5 in.	5 ft. 2 in.
8	4 ft. 6 in.	6 ft. 9 in.
9	5 ft. 8 in.	8 ft. 6 in.
10	7 ft. 3 in.	10 ft. 11 in.
11	8 ft. 11 in.	13 ft. 5 in.

- Do not lap No. 14 or No. 18 bars.
- Lap spiral steel at least 1 turn.

3.5.

- Splice WWR using a lap length that includes the overlap of at least 2 cross wires plus 2 in. on each sheet or roll. Splices using bars that develop equivalent strength and are lapped in accordance with Table 6 are permitted.
- Lap the existing longitudinal bars with the new bars as shown in Table 6 for box culvert extensions with less than 1 ft. of fill. Lap at least 1 ft. 0 in. for extensions with more than 1 ft. of fill.
- Ensure welded splices conform to the requirements of the plans and of Item 448, "Structural Field Welding." Field-prepare ends of reinforcing bars if they will be butt-welded. Delivered bars must be long enough to permit weld preparation.
- Install mechanical coupling devices in accordance with the manufacturer's recommendations at locations shown on the plans. Protect threaded male or female connections, and ensure the threaded connections are clean when making the connection. Do not repair damaged threads.
- Mechanical coupler alternate equivalent strength arrangements, to be accomplished by substituting larger bar sizes or more bars, will be considered if approved in writing before fabrication of the systems.

**Placing**. Place reinforcement as near as possible to the position shown on the plans. Do not vary bars from plan placement by more than 1/12 of the spacing between bars in the plane of the bar parallel to the nearest surface of concrete. Do not vary bars from plan placement by more than 1/4 in in the plane of the bar perpendicular to the nearest surface of concrete. Provide a minimum 1-in. clear cover of concrete to the nearest surface of bar unless otherwise shown on the plans.

For bridge slabs, the clear cover tolerance for the top mat of reinforcement is -0, +1/2 in.

Locate the reinforcement accurately in the forms, and hold it firmly in place before and during concrete placement by means of bar supports that are adequate in strength and number to prevent displacement and keep the reinforcement at the proper distance from the forms. Provide bar supports in accordance with the CRSI *Manual of Standard Practice*. Use Class 1 supports, approved plastic bar supports, precast mortar, or concrete blocks when supports are in contact with removable or stay-in-place forms. Use Class 3 supports in slab overlays on concrete panels or on existing concrete slabs. Bar supports in contact with soil or subgrade must be approved.

Use Class 1A supports with epoxy coated reinforcing steel. Provide epoxy or plastic coated tie wires and clips for use with epoxy coated reinforcing steel.

Use mortar or concrete with a minimum compressive strength of 5,000 psi for precast bar supports. Provide a suitable tie wire in each block for anchoring to the bar.

Place individual bar supports in rows at 4-ft. maximum spacing in each direction. Place continuous type bar supports at 4-ft. maximum spacing. Use continuous bar supports with permanent metal deck forms.

The exposure of the ends of longitudinals, stirrups, and spacers used to position the reinforcement in concrete pipe and storm drains is not cause for rejection.

Tie reinforcement for bridge slabs and top slabs of direct traffic culverts at all intersections, except tie only alternate intersections where spacing is less than 1 ft. in each direction. Tie the bars at enough intersections to provide a rigid cage of reinforcement for reinforcement cages for other structural members. Fasten mats of WWR securely at the ends and edges.

Clean mortar, mud, dirt, debris, oil, and other foreign material from the reinforcement before concrete placement. Do not place concrete until authorized.

Stop placement until corrective measures are taken if reinforcement is not adequately supported or tied to resist settlement, reinforcement is floating upward, truss bars are overturning, or movement is detected in any direction during concrete placement.

- 3.6. Handling, Placing, and Repairing Epoxy Coated Reinforcing Steel.
- 3.6.1. Handling. Provide systems for handling coated reinforcing steel with padded contact areas. Pad bundling bands or use suitable banding to prevent damage to the coating. Lift bundles of coated reinforcement with a strongback, spreader bar, multiple supports, or a platform bridge. Transport the bundled reinforcement carefully, and store it on protective cribbing. Do not drop or drag the coated reinforcement.
- 3.6.2. **Placing**. Do not flame-cut coated reinforcement. Saw or shear-cut only when approved. Coat cut ends as specified in Section 440.3.6.3., "Repairing Coating."

Do not weld or mechanically couple coated reinforcing steel except where specifically shown on the plans. Remove the epoxy coating at least 6 in. beyond the weld limits before welding and 2 in. beyond the limits of the coupler before assembly. Clean the steel of oil, grease, moisture, dirt, welding contamination (slag or acid residue), and rust to a near-white finish after welding or coupling. Check the existing epoxy for damage. Remove any damaged or loose epoxy back to sound epoxy coating.

Coat the splice area after cleaning with epoxy repair material to a thickness of 7 to 17 mils after curing. Apply a second application of repair material to the bar and coupler interface to ensure complete sealing of the ioint.

3.6.3. **Repairing Coating**. Use material that complies with the requirements of this Item and ASTM D3963 for repairing of the coating. Make repairs in accordance with procedures recommended by the manufacturer of the epoxy coating powder. Apply at least the same coating thickness as required for the original coating for areas to be patched. Repair all visible damage to the coating.

Repair sawed and sheared ends, cuts, breaks, and other damage promptly before additional oxidation occurs. Clean areas to be repaired to ensure they are free from surface contaminants. Make repairs in the shop or field as required.

3.7. Handling and Placing Stainless Reinforcing Steel. Handle, cut, and place stainless reinforcing steel bar using tools that are not used on carbon steel. Do not use carbon steel tools, chains, slings, etc. when handling stainless steel. Use only nylon or polypropylene slings. Cut stainless steel reinforcing using shears, saws, abrasive cutoff wheels, or torches. Remove any thermal oxidation using pickling paste. Do not field bend stainless steel reinforcing without approval.

Use 16 gauge fully annealed stainless steel tie wire conforming to the material properties listed in Section 440.2.10., "Stainless Reinforcing Steel." Support all stainless reinforcing steel on solid plastic, stainless steel, or epoxy coated steel chairs. Do not use uncoated carbon steel chairs in contact with stainless reinforcing steel.

3.8. **Bending, Handling, Repairing, and Placing GFRP Bars**. Fabricate, handle, repair, and place GFRP bars in accordance with the AASHTO LRFD Bridge Design Guide Specifications for GFRP-Reinforced Concrete Bridge Decks and Traffic Railings, Section 5, Construction Specifications.

### 4. MEASUREMENT AND PAYMENT

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly but will be considered subsidiary to pertinent Items.

## **Item 462**

# **Concrete Box Culverts and Drains**



#### 1. DESCRIPTION

Furnish, construct, and install concrete box culverts and drains.

#### 2. MATERIALS

- 2.1. **General**. Furnish materials in accordance with the following.
  - Item 420, "Concrete Substructures"
  - Item 421, "Hydraulic Cement Concrete"
  - Item 440, "Reinforcement for Concrete"
  - Item 464, "Reinforced Concrete Pipe"

Provide cast-in-place or precast, formed or machine-made, box culverts, and drains. Use Class S concrete for top slabs of cast-in-place concrete culverts for culverts with overlay, a 1- to 2-course surface treatment or a top slab that is the final riding surface unless otherwise shown on the plans. Use Class C concrete for the rest of the culvert and for all other cast-in-place boxes. Culverts with fill do not require Class S concrete.

Furnish material for machine-made precast boxes in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

- 2.2. Fabrication.
- 2.2.1. Cast-in-Place. Meet Item 420, "Concrete Substructures" and Item 422, "Concrete Superstructures."
- 2.2.2. Formed Precast. Meet Item 424, "Precast Concrete Structural Members (Fabrication)."
- 2.2.3. **Machine-Made Precast**. Machine-made precast box culvert fabrication plants must be approved in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification." The Department's MPL shows approved machine-made precast box culvert plants. Fabricate machine-made precast boxes in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."
- 2.3. Testing.
- 2.3.1. Cast-in-Place. Provide test specimens that meet Item 421, "Hydraulic Cement Concrete."
- 2.3.2. Formed Precast. Make, cure, and test compressive test specimens in accordance with Tex-704-I.
- 2.3.3. **Machine-Made Precast**. Make, cure, and test compressive test specimens in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."
- 2.3.4. **Testing Equipment**. The producer must furnish all equipment required for testing concrete for boxes produced in a precasting plant.
- 2.4. **Lifting Holes.** Provide no more than 4 lifting holes in each section for precast boxes. Lifting holes may be cast, cut into fresh concrete after form removal, or drilled. Provide lifting holes large enough for adequate

lifting devices based on the size and weight of the box section. Use lifting holes no larger than 3 in. in diameter. Cut no more than 5 in. in any direction of reinforcement per layer for lifting holes.

- 2.5. **Marking**. Mark precast boxes with the following:
  - name or trademark of fabricator and plant location;
  - ASTM designation;
  - date of manufacture;
  - box size:
  - minimum and maximum fill heights;
  - designated fabricator's approval stamp;
  - boxes to be used for jacking and boring (when applicable);
  - designation "SR" for boxes meeting sulfate-resistant concrete plan requirements (when applicable); and
  - match-marks for proper installation, when required under Section 462.2.6., "Tolerances."

Mark 1 end of each box section, for boxes without lifting holes, on the inside and outside walls to indicate the top or bottom as it will be installed.

Indent markings into the box section or paint them on each box with waterproof paint.

2.6. **Tolerances**. Ensure precast sections meet the permissible variations listed in ASTM C1577 and that the sides of a section at each end do not vary from being perpendicular to the top and bottom by more than 1/2 in. when measured diagonally between opposite interior corners.

Ensure wall and slab thicknesses are not less than shown on the plans except for occasional deficiencies not greater than 3/16 in. or 5%, whichever is greater. If proper jointing is not affected, thicknesses in excess of plan requirements are acceptable.

Deviations from the above tolerances will be acceptable if the sections can be fitted at the plant or jobsite and the joint opening at any point does not exceed 1 in. Use match-marks for proper installation on sections that have been accepted in this manner.

- 2.6.1. **Boxes for Jacking Operations**. Use boxes for jacking operations (as defined in Item 476, "Jacking, Boring, or Tunneling Pipe or Box,") meeting the following additional requirements:
  - The box ends must be square such that no point deviates more than 3/8 in. from a plane placed on the end of the box that is perpendicular to the box sides, and
  - The slab and wall thicknesses must not be less than specified on the plans and must not exceed the specified thickness by more than 1/2 in.
- 2.7. Defects and Repair. Fine cracks on the surface of the member that do not extend to the plane of the nearest reinforcement are acceptable unless the cracks are numerous and extensive. Repair cracks that extend into the plane of the reinforcing steel in an approved manner. Excessive damage, honeycomb, or cracking will be subject to structural review. The Engineer may accept boxes with repairs that are sound, properly finished, and cured in conformance with pertinent specifications. Discontinue further production of precast sections when fine cracks on the surface indicate poor curing practices until corrections are made and proper curing is provided.

Repair machine-made precast boxes in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

2.8. **Storage and Shipment**. Store precast sections on a level surface. Do not place any load on the sections until design strength is reached and curing is complete. Shipment of sections is permissible when the design strength and curing requirements have been met.

Store and ship machine-made precast boxes in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

#### 3. CONSTRUCTION

- 3.1. **Excavation, Shaping, Bedding, and Backfill.** Excavate, shape, bed, and backfill in accordance with Item 400, "Excavation and Backfill for Structures," except where jacking, boring, or tunneling methods are shown on the plans or permitted. Jack, bore, or tunnel in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." Immediate backfilling is permitted for all box structures where joints consist of materials other than mortar. Take precautions in placing and compacting the backfill to avoid any movement of the boxes or damage to the joints. Remove and replace boxes damaged by the Contractor at no expense to the Department.
- 3.2. Placement of Boxes. Place the box sections in conformance with the plans or as directed when precast boxes are used to form multiple barrel structures. Place material to be used between barrels as shown on the plans or as directed. Start the laying of boxes on the bedding at the outlet end and proceed toward the inlet end with the abutting sections properly matched unless otherwise authorized. Fit, match, and lay the boxes to form a smooth, uniform conduit true to the established lines and grades. Lower the box sections into the trench, for trench installations, without damaging the box or disturbing the bedding and the sides of the trench. Carefully clean the ends of the box before it is placed. Prevent the earth or bedding material from entering the box as it is laid. Remove and re-lay, without extra compensation, boxes that are not in alignment or show excessive settlement after laying. Form and place cast-in-place boxes in accordance with Item 420, "Concrete Substructures."
- 3.3. **Jointing**. Use any of the jointing materials in accordance with the joint requirements specified in Item 464, "Reinforced Concrete Pipe," unless otherwise shown on the plans. Box joints for rubber gasketed material may be substituted for tongue and groove joints, provided they meet the requirements of ASTM C1677 for design of the joints and permissible variations in dimensions.
- 3.4. **Connections and Stub Ends**. Make connections of boxes to existing boxes, pipes, drains, or drain appurtenances as shown on the plans. Mortar or concrete the bottom of existing structures if necessary to eliminate any drainage pockets created by the connections. Connect boxes to any required headwalls, wingwalls, safety end treatments or riprap, or other structures as shown on the plans or as directed. Repair any damage to the existing structure resulting from making the connections. Finish stub ends for connections to future work not shown on the plans by installing watertight plugs into the free end of the box.

Fill lifting holes with mortar or concrete and cure for precast boxes. Precast concrete or mortar plugs may be used.

3.5. **Extending**. Break back and extend existing culverts in accordance with Section 420.4.8 "Extending Existing Substructures" and Section 422.4.5 "Extending Existing Slabs" as applicable.

#### 4. MEASUREMENT

This Item will be measured by the foot. Measurement will be made between the ends of the culvert or drain along the flow line, not including safety end treatments. Safety end treatments will be measured in accordance with Item 467, "Safety End Treatment." Measurement of spurs, branches, or new connection box section will be made from the intersection of the flow line with the outside surface of the structure into which it connects. Where inlets, headwalls, wingwalls, catch basins, manholes, junction chambers, or other structures are included in lines of culverts or drains, the length of box section tying into the structure wall will be included for measurement, but no other portion of the structure length or width will be included.

The measured length of multiple barrel structures will be the sum of the lengths of the barrels.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

#### 5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Concrete Box Culvert" of the size specified. This price is full compensation for constructing, furnishing, and transporting sections; preparation and shaping of the bed; backfill material between box sections; jointing of sections; jointing material; cutting of sections on skew or slope; connections to new or existing structures; breaking back, removing and disposing of portions of the existing structure and replacing portions of the existing structure as required to make connections; concrete and reinforcing steel; and equipment, labor, materials, tools, and incidentals.

Protection methods for excavations greater than 5 ft. deep will be measured and paid for as required under Item 402, "Trench Excavation Protection," or Item 403, "Temporary Special Shoring." Excavation, shaping, bedding, and backfill will be paid for in accordance with Item 400, "Excavation and Backfill for Structures." When jacking, boring, or tunneling is used at the Contractor's option, payment will be made under this Item. When jacking, boring, or tunneling is required, payment will be made under Item 476, "Jacking, Boring, or Tunneling Pipe or Box."

# Item 464

# **Reinforced Concrete Pipe**



#### 1. DESCRIPTION

Furnish and install reinforced concrete pipe, materials for precast concrete pipe culverts, or precast concrete storm drain mains, laterals, stubs, and inlet leads.

#### 2. MATERIALS

2.1. Fabrication. Fabrication plants must be approved by the Construction Division in accordance with <a href="DMS-7310">DMS-7310</a>, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification," before furnishing precast reinforced concrete pipe for Department projects. The Department's MPL has a list of approved reinforced concrete pipe plants.

Furnish material and fabricate reinforced concrete pipe in accordance with <u>DMS-7310</u>, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

#### 2.2. Design.

2.2.1. General. The class and D-load equivalents are shown in Table 1. Furnish arch pipe in accordance with ASTM C506 and the dimensions shown in Table 2. Furnish horizontal elliptical pipe in accordance with ASTM C507 and the dimensions shown in Table 3. For arch pipe and horizontal elliptical pipe the minimum height of cover required is 1 ft.

Table 1 Circular Pipe ASTM C76 & ASTM C655

Class	D-Load
	800
II	1,000
III	1,350
IV	2,000
V	3,000

Table 2 Arch Pipe

Design	Equivalent	Rise	Span
Size	Diameter (in.)	(in.)	(in.)
1	18	13-1/2	22
2	21	15-1/2	26
3	24	18	28-1/2
4	30	22-1/2	36-1/4
5	36	26-5/8	43-3/4
6	42	31-5/16	51-1/8
7	48	36	58-1/2
8	54	40	65
9	60	45	73
10	72	54	88

Table 3
Horizontal Elliptical Pipe

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Design	Equivalent	Rise	Span
Size	Diameter (in.)	(in.)	(in.)
1	18	14	23
2	24	19	30
3	27	22	34
4	30	24	38
5	33	27	42
6	36	29	45
7	39	32	49
8	42	34	53
9	48	38	60
10	54	43	68

- 2.2.2. **Jacking, Boring, or Tunneling**. Design pipe for jacking, boring, or tunneling considering the specific installation conditions such as the soil conditions, installation methods, anticipated deflection angles, and jacking stresses. Provide design notes and drawings signed and sealed by a Texas licensed professional engineer when requested.
- 2.3. **Marking**. Furnish each section of reinforced concrete pipe marked with the following information specified in <a href="DMS-7310">DMS-7310</a>, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."
  - class or D-load of pipe,
  - ASTM designation,
  - date of manufacture,
  - pipe size,
  - name or trademark of fabricator and plant location,
  - designated fabricator's approval stamp,
  - pipe to be used for jacking and boring (when applicable), and
  - designation "SR" for pipe meeting sulfate-resistant concrete plan requirements (when applicable).

Clearly mark 1 end of each section during the process of manufacture or immediately thereafter for pipe with elliptical reinforcement. Mark the pipe on the inside and outside of opposite walls to show the location of the top or bottom of the pipe as it should be installed unless the external shape of the pipe is such that the correct position of the top and bottom is obvious. Mark the pipe section by indenting or painting with waterproof paint.

- 2.4. **Inspection**. Provide access for inspection of the finished pipe at the project site before and during installation.
- 2.5. **Causes for Rejection**. Individual section of pipe may be rejected for any of the conditions stated in the Annex of <a href="Miss-7310">DMS-7310</a>, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."
- 2.6. **Repairs**. Make repairs if necessary as stated in the Annex of <u>DMS-7310</u>, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."
- 2.7. **Jointing Materials**. Use any of the following materials for the making of joints unless otherwise shown on the plans. Furnish a manufacturer's certificate of compliance for all jointing materials except mortar.
- 2.7.1. **Mortar**. Provide mortar for joints that meets the requirements of Section 464.3.3., "Jointing."
- 2.7.2. **Cold-Applied, Plastic Asphalt Sewer Joint Compound**. Provide a material that consists of natural or processed asphalt base, suitable volatile solvents, and inert filler. Ensure the consistency is such that the ends of the pipe can be coated with a layer of the compound up to 1/2 in. thick by means of a trowel. Provide

a joint compound that cures to a firm, stiff plastic condition after application. Provide a material of a uniform mixture. Stir any small separation found in the container into a uniform mix before using.

Provide a material that meets the requirements of Table 4 when tested in accordance with <u>Tex-526-C</u>.

Table 4
Cold-Applied, Plastic Asphalt Sewer Joint Compound Material Requirements

Total rippinous, riscours reprint control compound indicate ricquirements		
Composition	Analysis	
Asphalt base, 100%–% volatiles–% ash, % by weight	28–45	
Volatiles, 212°F evaporation, 24 hr., % by weight	10–26	
Mineral matter, determined as ash, % by weight	30–55	
Consistency, cone penetration, 150 q, 5 sec., 77°F	150–275	

- 2.7.3. **Rubber Gaskets**. Provide gaskets that conform to ASTM C1619 Class A or C. Meet the requirements of ASTM C443 for design of the pipe joints and permissible variations in dimensions.
- 2.7.4. Pre-Formed Flexible Joint Sealants. Pre-formed flexible joint sealants may be used for sealing joints of tongue-and-groove concrete pipe. Provide flexible joint sealants that meet the requirements of ASTM C990. Use flexible joint sealants that do not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength. Supply in extruded rope form of suitable cross-section. Provide a size of the pre-formed flexible joint sealant in accordance with the manufacturer's recommendations and large enough to properly seal the joint. Protect flexible joint sealants with a suitable wrapper able to maintain the integrity of the jointing material when the wrapper is removed.

#### 3. CONSTRUCTION

- 3.1. **Excavation, Shaping, Bedding, and Backfill.** Excavate, shape, bed, and backfill in accordance with Item 400, "Excavation and Backfill for Structures," except where jacking, boring, or tunneling methods are permitted. Jack, bore, or tunnel the pipe in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." Immediate backfilling is permitted if joints consist of materials other than mortar. Take special precautions in placing and compacting the backfill to avoid any movement of the pipe or damage to the joints. Do not use heavy earth-moving equipment to haul over the structure until a minimum of 4 ft. of permanent or temporary compacted fill has been placed over the structure unless otherwise shown on the plans or permitted in writing. Remove and replace pipe damaged by the Contractor at no expense to the Department.
- 3.2. Laying Pipe. Start the laying of pipe on the bedding at the outlet end with the spigot or tongue end pointing downstream, and proceed toward the inlet end with the abutting sections properly matched, true to the established lines and grades unless otherwise authorized. Fit, match, and lay the pipe to form a smooth, uniform conduit. Cut cross trenches in the foundation to allow the barrel of the pipe to rest firmly upon the bedding where bell-and-spigot pipe is used. Cut cross trenches no more than 2 in. larger than the bell ends of the pipe. Lower sections of pipe into the trench without damaging the pipe or disturbing the bedding and the sides of the trench. Carefully clean the ends of the pipe before the pipe is placed. Prevent the earth or bedding material from entering the pipe as it is laid. Lay the pipe in the trench, when elliptical pipe with circular reinforcing or circular pipe with elliptical reinforcing is used, so the markings for the top or bottom are not more than 5° from the vertical plane through the longitudinal axis of the pipe. Remove and re-lay, without extra compensation, pipe that is not in alignment or shows excessive settlement after laying.

Lay multiple lines of reinforced concrete pipe with the centerlines of the individual barrels parallel. Use the clear distances between outer surfaces of adjacent pipes shown in Table 5 unless otherwise shown on the plans. Use the equivalent diameter from Table 2 or Table 3 for arch pipe or horizontal elliptical pipe to determine the clear distance requirement in Table 5.

Table 5
Minimum Clear Distance between Pipes

<b>Equivalent Diameter</b>	Min Clear Distance
18 in.	9 in.
24 in.	11 in.
30 in.	1 ft. 1 in.
36 in.	1 ft. 3 in.
42 in.	1 ft. 5 in.
48 in.	1 ft. 7 in.
54 in.	1 ft. 11 in.
60 to 84 in.	2 ft.

- 3.3. **Jointing**. Make available an appropriate rolling device similar to an automobile mechanic's "creeper" for conveyance through small-size pipe structures.
- 3.3.1. **Joints Sealed with Hydraulic Cement Mortar**. Use Type S mortar meeting the requirements of ASTM C270. Clean and wet the pipe ends before making the joint. Plaster the lower half of the bell or groove and the upper half of the tongue or spigot with mortar. Pack mortar into the joint from both inside and outside the pipe after the pipes are tightly jointed. Finish the inside smooth and flush with adjacent joints of pipe. Form a bead of semicircular cross-section over tongue-and-groove joints outside the pipe, extending at least 1 in. on each side of the joint. Form the mortar for bell-and-spigot joints to a 45° fillet between the outer edge of the bell and the spigot. Cure mortar joints by keeping the joints wet for at least 48 hr. or until the backfill has been completed, whichever comes first. Place fill or backfill once the mortar jointing material has cured for at least 6 hr. Conduct jointing only when the atmospheric temperature is above 40°F. Protect mortared joints against freezing by backfilling or other approved methods for at least 24 hr.

Driveway culverts do not require mortar banding on the outside of the pipe.

Furnish pipes, with approval, that are large enough for a person to enter with the groove between 1/2 in. and 3/4 in. longer than the tongue. Such pipe may be laid and backfilled without mortar joints. Clean the space on the interior of the pipe between the end of the tongue and the groove of all foreign material, thoroughly wet and fill with mortar around the entire circumference of the pipe, and finish flush after the backfilling has been completed.

- 3.3.2. **Joints Using Cold-Applied, Plastic Asphalt Sewer Joint Compound**. Ensure both ends of the pipes are clean and dry. Trowel or otherwise place a 1/2–in. thick layer of the compound in the groove end of the pipe covering at least 2/3 of the joint face around the entire circumference. Shove home the tongue end of the next pipe with enough pressure to make a tight joint. Remove any excess mastic projecting into the pipe after the joint is made. Backfill after the joint has been inspected and approved.
- 3.3.3. Joints Using Rubber Gaskets. Make the joint assembly according to the recommendations of the gasket manufacturer. Make joints watertight when using rubber gaskets. Backfill after the joint has been inspected and approved.
- 3.3.4. **Joints Using Pre-Formed Flexible Joint Sealants**. Install pre-formed flexible joint sealants in accordance with the manufacturer's recommendations. Place the joint sealer so no dirt or other deleterious materials come in contact with the joint sealing material. Pull or push home the pipe with enough force to properly seal the joint. Remove any joint material pushed out into the interior of the pipe that would tend to obstruct the flow. Store pre-formed flexible joint sealants in an area warmed naturally or artificially to above 70°F in an approved manner when the atmospheric temperature is below 60°F. Apply flexible joint sealants to pipe joints immediately before placing pipe in trench, and connect pipe to previously laid pipe. Backfill after the joint has been inspected and approved.
- 3.4. **Connections and Stub Ends**. Make connections of concrete pipe to existing pipes, pipe storm drains, or storm drain appurtenances as shown on the plans.

Mortar or concrete the bottom of existing structures if necessary to eliminate any drainage pockets created by the connections. Repair any damage to the existing structure resulting from making the connections.

Make connections between concrete pipe and corrugated metal pipe with a suitable concrete collar and a minimum thickness of 4 in. unless otherwise shown on the plans.

Finish stub ends for connections to future work not shown on the plans by installing watertight plugs into the free end of the pipe.

Fill lift holes with concrete, mortar, or precast concrete plugs after the pipe is in place.

#### 4. MEASUREMENT

This Item will be measured by the foot. Measurement will be made between the ends of the pipe barrel along the flow line, not including safety end treatments. Safety end treatments will be measured in accordance with Item 467, "Safety End Treatment." Pipe that will be jacked, bored, or tunneled will be measured in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." Measurement of spurs, branches, or new connecting pipe will be made from the intersection of the flow line with the outside surface of the pipe into which it connects. Where inlets, headwalls, catch basins, manholes, junction chambers, or other structures are included in lines of pipe, the 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 included.

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

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

#### 5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Reinforced Concrete Pipe," "Reinforced Concrete Pipe (Arch)," or "Reinforced Concrete Pipe (Elliptical)" of the size and D-load specified or of the size and class specified. This price is full compensation for constructing, furnishing, transporting, placing, and joining pipes; shaping the bed; cutting pipes on skew or slope; connecting to new or existing structures; breaking back, removing, and disposing of portions of the existing structure; replacing portions of the existing structure; cutting pipe ends on skew or slope; and equipment, labor, tools, and incidentals.

Protection methods for excavations greater than 5 ft. deep will be measured and paid for as required under Item 402, "Trench Excavation Protection," or Item 403, "Temporary Special Shoring." Excavation, shaping, bedding, and backfill will be paid for in accordance with Item 400, "Excavation and Backfill for Structures." When jacking, boring, or tunneling is used at the Contractor's option, payment will be made under this Item. When jacking, boring or tunneling is required, payment will be made under Item 476, "Jacking, Boring or Tunneling Pipe or Box."

# Item 465 Junction Boxes, Manholes, and Inlets



#### 1. DESCRIPTION

Construct junction boxes, manholes, and inlets, complete in place or to the stage detailed, including furnishing and installing frames, grates, rings, and covers.

#### 2. MATERIALS

Furnish materials in accordance with the following:

- Item 420, "Concrete Substructures,"
- Item 421, "Hydraulic Cement Concrete,"
- Item 440, "Reinforcement for Concrete," and
- Item 471, "Frames, Grates, Rings, and Covers."

Cast-in-place junction boxes, manholes, inlets, risers, and appurtenances are acceptable unless otherwise shown. Alternate designs for cast-in-place items must be acceptable to the Engineer and must conform to functional dimensions and design loading. Alternate designs must be designed and sealed by a licensed professional engineer.

- 2.1. Concrete. Furnish Class H concrete as referenced in Item 421 "Hydraulic Cement Concrete," except that Mix Design Options 1–8 will be allowed for formed precast junction boxes, manholes, and inlets. Furnish concrete per <u>DMS-7310</u>, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification," for machine-made precast junctions boxes, manholes, and inlets. Furnish Class C concrete for cast-in-place manholes and inlets unless otherwise shown on the plans.
- 2.2. **Mortar**. Furnish mortar conforming to <u>DMS-4675</u>, "Cementitious Grouts and Mortars for Miscellaneous Applications."
- 2.3. **Timber**. Provide sound timber that is a minimum of 3 in. nominal thickness and reasonably free of knots and warps for temporary covers when used with Stage I construction (see Article 465.3., "Construction").
- 2.4. Other Materials. Use commercial-type hardware as approved.

#### 3. CONSTRUCTION

Construct all types of junction boxes, manholes, and inlets either complete or in 2 stages, described as Stage I and Stage II.

Construct the Stage I portion of junction boxes, manholes, and inlets as shown on the plans or as specified in this Item. Furnish and install a temporary cover as approved.

Furnish and install the storm drain pipe and a temporary plug for the exposed end of the storm drain pipe from the storm drain to a point below the top of curb indicated on the plans for Stage I construction of cast iron or steel inlet units.

Construct Stage II after the pavement structure is substantially complete unless otherwise approved.

Construct the remaining wall height and top of junction box, manhole, or inlet for Stage II, and furnish and install any frames, grates, rings and covers, curb beams, or collecting basins required.

Construct cast-in-place junction boxes, manholes, and inlets in accordance with Item 420, "Concrete Substructures." Forms will be required for all concrete walls. Outside wall forms for cast-in-place concrete may be omitted with approval if the surrounding material can be trimmed to a smooth vertical face.

3.1. Precast Junction Boxes, Manholes, and Inlets. Construct formed precast junction boxes, manholes, and inlets in accordance with Item 420, "Concrete Substructures," except as otherwise noted in this Item. Construct machine-made precast junction boxes, manholes, and inlets in accordance with ASTM C478 except as otherwise noted in this Item. Mix and place concrete for machine-made junction boxes, manholes, and inlets per the requirements of <a href="DMS-7310">DMS-7310</a>, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification." Conform to the product permissible variations and rejection criteria stated in ASTM C478 for machine-made precast junction boxes, manholes, and inlets. Cure all precast units in accordance with Item 424, "Precast Concrete Structural Members (Fabrication)."

Multi-project fabrication plants as defined in Item 424 "Precast Concrete Structural Members (Fabrication)," that produce manholes and inlets will be approved by the Construction Division in accordance with <a href="Miss-7340"><u>DMS-7340</u></a>, "Qualification Procedure for Multi-Project Fabrication Plants of Precast Concrete Junction Boxes, Manholes and Inlets." The Department's MPL has a list of approved multi-project plants.

- 3.1.1. **Lifting Holes**. Provide no more than 4 lifting holes in each section for precast units. Lifting holes may be cast, cut into fresh concrete after form removal, or drilled. Provide lifting holes large enough for adequate lifting devices based on the size and weight of the section. The maximum hole diameter is 3 in. at the inside surface of the wall and 4 in. at the outside surface. Cut no more than 5 in. in any direction of reinforcement per layer for lifting holes. Repair spalled areas around lifting holes.
- 3.1.2. **Marking**. Clearly mark each precast junction box, manhole, and inlet unit with the following information:
  - name or trademark of fabricator and plant location;
  - product designation;
  - ASTM designation (if applicable);
  - date of manufacture;
  - designated fabricator's approval stamp; and
  - designation "SR" for product meeting sulfate-resistant concrete plan requirements (when applicable).
- 3.1.3. **Storage and Shipment**. Store precast units on a level surface. Do not ship units until design strength requirements have been met.
- 3.2. **Excavation, Shaping, Bedding, and Backfill.** Excavate, shape, bed, and backfill in accordance with Item 400, "Excavation and Backfill for Structures." Immediate backfilling is permitted for all junction box, manhole, and inlet structures where joints consist of rubber boots, rubber gaskets, or bulk or preformed joint sealant. Take precautions in placing and compacting the backfill to avoid any movement of junction boxes, manholes, and inlets. Remove and replace junction boxes, manholes, and inlets damaged by the Contractor at no expense to the Department.
- 3.3. **Junction Boxes, Manholes, and Inlets for Precast Concrete Pipe Storm Drains**. Construct junction boxes, manholes, and inlets for precast concrete pipe storm drains before completion of storm drain lines into or through the junction box, manhole, or inlet. Neatly cut all storm drains at the inside face of the walls of the junction box, manhole, or inlet.
- 3.4. **Junction Boxes, Manholes, and Inlets for Box Storm Drains**. Place bases or risers of junction boxes, manholes, and inlets for box storm drains before or in conjunction with placement of the storm drain. Backfill the junction box, manhole, or inlet and storm drain as a whole.
- 3.5. **Inverts**. Shape and route floor inverts passing out or through the junction box, manhole, or inlet as shown on the plans. Shape by adding and shaping mortar or concrete after the base is placed or by placing the required additional material with the base.

- 3.6. **Finishing Complete Junction Boxes, Manholes, and Inlets**. Complete junction boxes, manholes, and inlets in accordance with the plans. Backfill to original ground elevation in accordance with Item 400, "Excavation and Backfill for Structures."
- 3.7. **Finishing Stage I Construction**. Complete Stage I construction by constructing the walls to the elevations shown on the plans and backfilling to required elevations in accordance with Item 400, "Excavation and Backfill for Structures."
- 3.8. **Stage II Construction**. Construct subgrade and base course or concrete pavement construction over Stage I junction box, manhole, or inlet construction unless otherwise approved. Excavate to expose the top of Stage I construction and complete the junction box, manhole or inlet in accordance with the plans and these Specifications, including backfill and cleaning of all debris from the bottom of the junction box, manhole, or inlet.
- 3.9. **Inlet Units**. Install cast iron or steel inlet units in conjunction with the construction of concrete curb and gutter. Set the inlet units securely in position before placing concrete for curb and gutter. Form openings for the inlets and recesses in curb and gutter as shown on the plans. Place and thoroughly consolidate concrete for curb and gutter adjacent to inlets and around the inlet castings and formed openings and recesses without displacing the inlet units.

#### 4. MEASUREMENT

All junction boxes, manholes, and inlets satisfactorily completed in accordance with the plans and specifications will be measured by each junction box, manhole, or inlet, complete, or by each junction box, manhole, or inlet completed to the stage of construction required by the plans.

#### 5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for as follows:

- 5.1. **Complete Manholes.** Payment for complete manholes will be made at the unit price bid for "Manhole (Complete)" of the type specified.
- 5.2. **Complete Inlets**. Payment for inlets will be made at the unit price bid for "Inlet (Complete)," of the type specified.
- 5.3. **Complete Junction Boxes**. Payment for junction boxes will be made at the unit price bid for "Junction Box (Complete)" of the type specified.
- 5.4. **Manholes Stage I**. Payment for Manholes, Stage I, will be made at the unit price bid for each "Manhole (Stage I)" of the type specified.
- 5.5. **Manholes Stage II**. Payment for Manholes, Stage II, will be made at the unit price bid for each "Manhole (Stage II)" of the type specified.
- 5.6. **Inlets Stage I**. Payment for Inlets, Stage I, will be made at the unit price bid for each "Inlet (Stage I)" of the type specified.
- 5.7. **Inlets Stage II**. Payment for Inlets, Stage II, will be made at the unit price bid for each "Inlet (Stage II)" of the type specified.
- 5.8. **Junction Boxes Stage I**. Payment for Junction Boxes, Stage I, will be made at the unit price bid for each "Junction Box (Stage I)" of the type specified.

5.9. **Junction Boxes Stage II**. Payment for Junction Boxes, Stage II, will be made at the unit price bid for each "Junction Box (Stage II)" of the type specified.

This price is full compensation for concrete, reinforcing steel, mortar, frames, grates, rings and covers, excavation, and backfill and for all other materials, tools, equipment, labor, and incidentals

### **Item 466**

# **Headwalls and Wingwalls**



#### 1. DESCRIPTION

Furnish, construct, and install concrete headwalls and wingwalls for drainage structures and underpasses.

#### 2. MATERIALS

- 2.1. **General**. Furnish materials in accordance with the following.
  - Item 420, "Concrete Substructures"
  - Item 421, "Hydraulic Cement Concrete"
  - Item 440, "Reinforcement for Concrete"

Use Class C concrete for cast-in-place and precast concrete units unless otherwise shown on the plans. Furnish cast-in-place or precast headwalls and wingwalls unless otherwise shown on the plans.

- 2.2. Fabrication.
- 2.2.1. **General**. Fabricate cast-in-place concrete units and precast units in accordance with Item 420 "Concrete Substructures." Use the following definitions for headwalls and wingwalls:
  - "Headwalls" refers to all walls, including wings, at the ends of single-barrel and multiple-barrel pipe culvert structures.
  - "Wingwalls" refers to all walls at the ends of single-barrel or multiple-barrel box culvert structures.
- 2.2.2. **Lifting Holes**. Provide no more than 4 lifting holes in each section for precast units. Lifting holes may be cast, cut into fresh concrete after form removal, or drilled. Provide lifting holes large enough for adequate lifting devices based on the size and weight of the section. The maximum hole diameter is 3 in. at the inside surface of the wall and 4 in. at the outside surface. Cut no more than 1 longitudinal wire or 2 circumferential wires per layer of reinforcing steel when locating lift holes. Repair spalled areas around lifting holes.
- 2.2.3. **Marking**. Clearly mark each precast unit before shipment from the casting or fabrication yard with the following:
  - the date of manufacture.
  - the name or trademark of the manufacturer, and
  - the type and size designation.
- 2.2.4. **Storage and Shipment**. Store precast units on a level surface. Do not place any loads on precast concrete units until design strength is reached. Do not ship units until design strength requirements have been met.
- 2.2.5. Causes for Rejection. Precast units may be rejected for not meeting any one of the specification requirements. Individual units may also be rejected for fractures or cracks passing through the wall or surface defects indicating honeycombed or open texture surfaces. Remove rejected units from the project, and replace them with acceptable units meeting the requirements of this Item.
- 2.2.6. Defects and Repairs. Occasional imperfections in manufacture or accidental damage sustained during handling may be repaired. The repaired units will be acceptable if they conform to the requirements of this Item and the repairs are sound, properly finished, and cured in conformance with pertinent specifications.

#### 3. CONSTRUCTION

- 3.1. **General**. Remove portions of existing structures and drill, dowel, and grout in accordance with Item 420, "Concrete Substructures."
- 3.2. **Excavation, Shaping, Bedding, and Backfill.** Excavate, shape, bed, and backfill in accordance with Item 400, "Excavation and Backfill for Structures." Take special precautions in placing and compacting the backfill to avoid any movement or damage to the units. Bed precast units on foundations of firm and stable material accurately shaped to conform to the bases of the units.
- 3.3. **Placement of Precast Units**. Provide adequate means to lift and place the precast units. Fill lifting holes with mortar or concrete and cure. Precast concrete or mortar plugs may be used.
- 3.4. **Connections**. Make connections to new or existing structures in accordance with the details shown on the plans. Furnish jointing material in accordance with Item 464, "Reinforced Concrete Pipe," or as shown on the plans.

Remove a length of the existing pipe from the headwall to the joint when removing existing headwalls as shown on the plans or as approved. Re-lay the removed pipe if approved, or furnish and lay a length of new pipe.

#### 4. MEASUREMENT

This is a plans quantity measurement item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

- 4.1. **Headwalls**. Headwalls will be measured by each end of a structure.
- 4.2. **Wingwalls**. Wingwalls will be measured by one of the following methods:
- 4.2.1. **Square Foot**. Wingwalls will be measured by the square foot of the front surface area of the wall of each type. The area will be measured from the top of the footing or apron to the top of the wall unless otherwise shown on the plans. If there is no footing or apron, then measurement is from the bottom of the wall.
- 4.2.2. **Each**. Wingwalls will be measured by each end of a structure.

#### 5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the price bid for "Headwalls" of the type and pipe size (diameter or design) specified, "Wingwalls" of the type specified when measurement is by the square foot, or "Wingwalls" of the type and wall height specified when measurement is by each. For payment purposes, the wingwall height will be rounded to the nearest foot. All wingwalls and headwalls of the same type will be paid for equally when skew does not affect the type. This price is full compensation for constructing, furnishing, transporting, and installing the headwalls or wingwalls; connecting to existing structure; breaking back, removing and disposing of portions of the existing structure, and replacing portions of the existing structure as required to make connections; excavation and backfill; and concrete, reinforcing steel, corrugated metal pipe or reinforced concrete pipe, equipment, labor, tools, and incidentals.

Apron concrete or riprap between or around the wingwalls of single- or multiple-barrel box culvert structures will be measured and paid for in accordance with Item 432, "Riprap."

The removal and re-laying of existing pipe or the furnishing of new pipe to replace existing pipe will not be paid for directly but will be considered subsidiary to this Item.

## **Item 471**

# Frames, Grates, Rings, and Covers



#### 1. DESCRIPTION

Furnish and install frames, grates, rings, and covers for inlets, manholes, and other structures.

#### 2. MATERIALS

2.1. Frame, Grate, Ring, and Cover Castings. Provide clean castings conforming to the shape and dimensions shown on the plans. Ensure all gray and ductile iron castings conform to the AASHTO Designation M 306. Cast or machine the bearing surfaces for traffic service castings between manhole rings and covers and between grates and frames with such precision as to prevent rocking.

Provide gray iron castings in accordance with ASTM A48 Class 35B and AASHTO M 306 for traffic service applications unless otherwise specified. Provide gray iron castings in accordance with ASTM A48 Class 35B for sidewalk or pedestrian applications unless otherwise specified. Provide ductile iron castings in accordance with ASTM A536, Grade 70-50-05, unless otherwise specified. Provide steel castings in accordance with ASTM A27, Grade 70-36, unless otherwise specified. Ensure all traffic service castings and gratings meet or exceed the H20 proof-load requirements of AASHTO M 306. Load test results and material certifications must be made available upon request.

Ensure all traffic service (heavy duty) rated castings and grating meet the proof-load testing requirements of AASHTO M 306. Ensure all load tests are conducted with a calibrated NIST certified load cell. Ensure materials are loaded with a 9 × 9-in. load block to an applied load of 40,000 lb. for one minute without deformation or failure. Load test results and material certifications must be made available upon request.

Provide castings within ±1/16 in. per foot of plan dimensions, and within ±5% of plan weight.

- 2.2. **Welded Steel Grates and Frames**. Provide welded steel grates and frames as an assembly in accordance with the member size, dimensions, and details shown on the plans. Fabricate these assemblies in accordance with Item 441, "Steel Structures." Use steel that meets ASTM A36 or equivalent.
- 2.3. **Documentation**. Furnish a manufacturer's certification stating the casting meets the proof-load testing requirements of AASHTO M 306 for traffic service castings.

#### 3. CONSTRUCTION

Construct and install frames, grates, rings, and covers in accordance with the details shown on the plans. Weld in accordance with Item 448, "Structural Field Welding." Tack weld grates and covers to the frame or ring when directed.

Galvanize steel castings, welded steel grates, and frames in accordance with Item 445, "Galvanizing." Galvanizing is not required for iron castings unless used in conjunction with structural steel shapes or shown on the plans.

Provide galvanized bolts and nuts in accordance with Item 445, "Galvanizing."

#### 4. MEASUREMENT

Frames, grates, rings, and covers, when a part of the complete manhole or inlet, will not be measured for payment but will be considered subsidiary to Item 465, "Junction Boxes, Manholes, and Inlets." Frames,

grates, rings, and covers, when not a part of a Manhole (complete) or Inlet (complete), will be measured by the each.

## 5. PAYMENT

When payment is required in accordance with "Measurement," payment for frames, grates, rings, and covers will be made at the unit price bid for "Grate," "Frame," "Grate and Frame," "Frame and Cover," or "Ring and Cover" with the type and number of grates specified, if necessary. This price is full compensation for equipment, materials, labor, tools, and incidentals.

## **Item 496**

# **Removing Structures**



#### 1. DESCRIPTION

Remove and either dispose of or salvage structures.

#### 2. CONSTRUCTION

- 2.1. Demolition Plans. Follow the demolition sequence shown on the plans for bridge structures to be removed, or submit a demolition plan if indicated on the plans. Include in the required demolition plan the type and location of equipment to be used, the method and sequence of removal of the structural elements, and a narrative indicating the stability of the partially demolished structure is maintained throughout the demolition process. Have these plans signed and sealed by a licensed professional engineer when demolished structure intersects active roadways and as otherwise shown on the plans. Submit required demolition plans at least 14 days before starting work unless otherwise directed. Department approval of these plans is not required, but the Department reserves the right to request modifications to the plans when work could affect the safety of the traveling public and when around other transportation facilities to remain in place. Notify the Department 30 days before starting any bridge demolition work to allow for required notifications to other agencies.
- 2.2. Removal.
- Pipes. Avoid damaging appurtenances determined by the Engineer to be salvageable.
- 2.2.2. Concrete, Brick, or Stone Structures. Portions of structures that will not interfere with the proposed construction may remain in place 2 ft. or more below the permanent ground line. Square off remaining structures and cut reinforcement flush with the surface of the concrete.
- 2.2.3. **Steel Structures**. Dismantle steel to be retained by the Department or re-erected by cold-cutting fastener heads and punching or drilling the remaining portion of the fastener, air-arc gouging welded connections, and flame-cutting beams along a straight line. The Engineer may approve other methods of cutting. Cut beams at the locations shown on the plans. Match-mark steel to be re-erected with paint in accordance with the erection drawings. Remove steel piles or cut off 2 ft. or more below the permanent ground line.
- 2.2.4. **Timber Structures**. Remove all fasteners from timber determined by the engineer to be salvageable. Remove timber piles or cut off 2 ft. or more below the permanent ground line.
- 2.3. **Salvage**. Avoid damage to materials shown on the plans to be salvaged. Deliver materials to be retained by the Department to the location shown on the plans. Block up salvaged steel materials off the ground.
- 2.4. **Disposal**. Material removed that is not deemed to be salvageable is the property of the Contractor. Dispose of removed material off the right of way in accordance with federal, state, and local regulations.
- 2.5. Backfill. Backfill excavation and voids to the original ground line if resulting from the removal of structures. Place backfill that will support any portion of the roadbed or embankment to the same requirements for placing embankment. Backfill other areas in 10 in. layers, loose measurement, and compact to the density of adjacent undisturbed material.

#### 3. MEASUREMENT

This Item will be measured by each structure or by the foot.

### 4. PAYMENT

The work performed in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Removing Structures" of the type of structure specified. This price is full compensation for demolition plan preparation, loading, hauling, disposal, stockpiling, removal of appurtenances, excavation and backfill, equipment, labor, tools, and incidentals.

# Item 500 Mobilization



#### 1. DESCRIPTION

Establish and remove offices, plants, and facilities. Move personnel, equipment, and supplies to and from the project or the vicinity of the project site to begin work or complete work on Contract Items. Bonds and insurance are required for performing mobilization.

For Contracts with emergency mobilization, provide a person and method of contact available 24 hrs. a day, 7 days a week unless otherwise shown on the plans. The time of notice will be the transmission time of the written notice or notice provided orally by the Department's representative.

#### 2. MEASUREMENT

This Item will be measured by the lump sum or each as the work progresses. Mobilization is calculated on the base bid only and will not be paid for separately on any additive alternate items added to the Contract.

#### 3. PAYMENT

For this Item, the adjusted Contract amount will be calculated as the total Contract amount less the lump sum for mobilization. Except for Contracts with callout or emergency work, mobilization will be paid in partial payments as follows:

- Payment will be made upon presentation of a paid invoice for the payment or performance bonds and required insurance,
- Payment will be made upon verification of documented expenditures for plant and facility setup. The combined amount for all these facilities will be no more than 10% of the mobilization lump sum or 1% of the total Contract amount, whichever is less.
- When 1% of the adjusted Contract amount for construction Items is earned, 50% of the mobilization lump sum bid or 5% of the total Contract amount, whichever is less, will be paid. Previous payments under this Item will be deducted from this amount,
- When 5% of the adjusted Contract amount for construction Items is earned, 75% of the mobilization lump sum bid or 10% of the total Contract amount, whichever is less, will be paid. Previous payments under the Item will be deducted from this amount,
- When 10% of the adjusted Contract amount for construction Items is earned, 90% of the mobilization lump sum bid or 10% of the total Contract amount, whichever is less, will be paid. Previous payments under this Item will be deducted from this amount,
- Upon final acceptance, 97% of the mobilization lump sum bid will be paid. Previous payments under this Item will be deducted from this amount, and
- Payment for the remainder of the lump sum bid for "Mobilization" will be made after all submittals are received, final quantities have been determined and when any separate vegetative establishment and maintenance, test, and performance periods provided for in the Contract have been successfully completed.

For projects with extended maintenance or performance periods, payment for the remainder of the lump sum bid for "Mobilization" will be made 6 months after final acceptance.

For Contracts with callout or emergency work, "Mobilization," will be paid as follows:

- Payment will be made upon presentation of a paid invoice for the payment of performance bonds and required insurance,
- Mobilization for callout work will be paid for each callout work request, and
- Mobilization for emergency work will be paid for each emergency work request.

## Item 502

# Barricades, Signs, and Traffic Handling



#### 1. DESCRIPTION

Provide, install, move, replace, maintain, clean, and remove all traffic control devices shown on the plans and as directed.

#### 2. CONSTRUCTION

Comply with the requirements of Article 7.2., "Safety".

Implement the traffic control plan (TCP) shown on the plans.

Install traffic control devices straight and plumb. Make changes to the TCP only as approved. Minor adjustments to meet field conditions are allowed.

Submit Contractor-proposed TCP changes, signed and sealed by a licensed professional engineer, for approval. The Engineer may develop, sign, and seal Contractor-proposed changes. Changes must conform to guidelines established in the TMUTCD using approved products from the Department's Compliant Work Zone Traffic Control Device List.

Maintain traffic control devices by taking corrective action when notified. Corrective actions include, but are not limited to, cleaning, replacing, straightening, covering, and removing devices. Maintain the devices such that they are properly positioned and spaced, legible, and have retroreflective characteristics that meet requirements day or night and in all weather conditions.

The Engineer may authorize or direct in writing the removal or relocation of project limit advance warning signs. When project limit advance warning signs are removed before final acceptance, provide traffic control in accordance with the TMUTCD for minor operations as approved.

Remove all traffic control devices upon completion of the work as shown on the plans or as directed.

#### 3. MEASUREMENT

Barricades, Signs, and Traffic Handling will be measured by the month. Law enforcement personnelwith patrol vehicles will be measured by the hour for each person.

#### 4. PAYMENT

4.1. **Barricades, Signs, and Traffic Handling.** Except for Contracts with callout work and work orders, the work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Barricades, Signs, and Traffic Handling." This price is full compensation for installation, maintenance, adjustments, replacements, removal, materials, equipment, labor, tools, and incidentals.

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Barricades, Signs, and Traffic Handling." This price is

full compensation for installation, maintenance, adjustments, replacements, removal, materials, equipment, labor, tools, and incidentals.

When the plans establish pay items for particular work in the TCP, that work will be measured and paid under pertinent Items.

- 4.1.1. Initiation of Payment. Payment for this Item will begin on the first estimate after barricades, signs, and traffic handling devices have been installed in accordance with the TCP and construction has begun.
- 4.1.2. **Paid Months**. Monthly payment will be made each succeeding month for this Item provided the barricades, signs, and traffic handling devices have been installed and maintained in accordance with the TCP until the Contract amount has been paid.

If, within the time frame established by the Engineer, the Contractor fails to provide or properly maintain signs and barricades in compliance with the Contract requirements, as determined by the Engineer, the Contractor will be considered in noncompliance with this Item. No payment will be made for the months in question, and the total final payment quantity will be reduced by the number of months the Contractor was in noncompliance.

- 4.1.3. **Maximum Total Payment Before Acceptance**. The total payment for this Item will not exceed 10% of the total Contract amount before final acceptance in accordance with Article 5.12., "Final Acceptance." The remaining balance will be paid in accordance with Section 502.4.5., "Balance Due."
- 4.1.4. **Total Payment Quantity**. The quantity paid under this Item will not exceed the total quantity shown on the plans except as modified by change order and as adjusted by Section 502.4.2., "Paid Months." An overrun of the plans quantity for this Item will not be allowed for approving designs; testing; material shortages; closed construction seasons; curing periods; establishment, performance, test, and maintenance periods; failure to complete the work in the number of months allotted; nor delays caused directly or indirectly by requirements of the Contract.
- 4.1.5. **Balance Due**. The remaining unpaid months of barricades less non-compliance months will be paid on final acceptance of the project, if all work is complete and accepted in accordance with Article 5.12., "Final Acceptance."
- 4.1.6. **Contracts with Callout Work and Work Orders**. The work performed and the materials furnished with this Item and measured as provided under "Measurement," will be considered subsidiary to pertinent Items, except for federally funded Contracts.
- 4.2. **Law Enforcement Personnel**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement," will be paid by Contractor force account for "Law Enforcement Personnel." This price is full compensation for furnishing all labor, materials, supplies, equipment, patrol vehicle, fees, and incidentals necessary to complete the work as directed.

## Item 506

# Temporary Erosion, Sedimentation, and Environmental Controls



#### 1. DESCRIPTION

Install, maintain, and remove erosion, sedimentation, and environmental control measures to prevent or reduce the discharge of pollutants in accordance with the Storm Water Pollution Prevention Plan (SWP3) on the plans and the Texas Pollutant Discharge Elimination System (TPDES) General Permit TXR150000. Control measures are defined as Best Management Practices used to prevent or reduce the discharge of pollutants. Control measures include, but are not limited to, rock filter dams, temporary pipe slope drains, temporary paved flumes, construction exits, earthwork for erosion control, pipe, construction perimeter fence, sandbags, temporary sediment control fence, biodegradable erosion control logs, vertical tracking, temporary or permanent seeding, and other measures. Erosion and sediment control devices must be selected from the *Erosion Control Approved Products* or *Sediment Control Approved Products* lists. Perform work in a manner to prevent degradation of receiving waters, facilitate project construction, and comply with applicable federal, state, and local regulations. Ensure the installation and maintenance of control measures is performed in accordance with the manufacturer's or designer's specifications.

Provide the Contractor Certification of Compliance before performing SWP3 or soil disturbing activities. By signing the Contractor Certification of Compliance, the Contractor certifies they have read and understand the requirements applicable to this project pertaining to the SWP3, the plans, and the TPDES General Permit TXR150000. The Contractor is responsible for any penalties associated with non-performance of installation or maintenance activities required for compliance. Ensure the most current version of the certificate is executed for this project.

#### 2. MATERIALS

Furnish materials in accordance with the following:

- Item 161, "Compost"
- Item 432, "Riprap"
- Item 556, "Pipe Underdrains"

#### 2.1. Rock Filter Dams.

- 2.1.1. **Aggregate**. Furnish aggregate with approved hardness, durability, cleanliness, and resistance to crumbling, flaking, and eroding. Provide the following:
  - Types 1, 2, and 4 Rock Filter Dams. Use 3 to 6 in. aggregate.
  - Type 3 Rock Filter Dams. Use 4 to 8 in. aggregate.
- 2.1.2. **Wire**. Provide minimum 20 gauge galvanized wire for the steel wire mesh and tie wires for Types 2 and 3 rock filter dams. Type 4 dams require:
  - a double-twisted, hexagonal weave with a nominal mesh opening of 2-1/2 × 3-1/4 in.;
  - minimum 0.0866 in. steel wire for netting;
  - minimum 0.1063 in. steel wire for selvages and corners; and
  - minimum 0.0866 in. for binding or tie wire.
- 2.1.3. **Sandbag Material**. Furnish sandbags meeting Section 506.2.8., "Sandbags," except that any gradation of aggregate may be used to fill the sandbags.

2.2. **Temporary Pipe Slope Drains**. Provide corrugated metal pipe, polyvinyl chloride (PVC) pipe, flexible tubing, watertight connection bands, grommet materials, prefabricated fittings, and flared entrance sections that conform to the plans. Recycled and other materials meeting these requirements are allowed if approved.

Furnish concrete in accordance with Item 432, "Riprap."

- 2.3. **Temporary Paved Flumes**. Furnish asphalt concrete, hydraulic cement concrete, or other comparable non-erodible material that conforms to the plans. Provide rock or rubble with a minimum diameter of 6 in. and a maximum volume of 1/2 cu. ft. for the construction of energy dissipaters.
- 2.4. **Construction Exits.** Provide materials that meet the details shown on the plans and this Section.
- 2.4.1. **Rock Construction Exit.** Provide crushed aggregate for long- and short-term construction exits. Furnish aggregates that are clean, hard, durable, and free from adherent coatings such as salt, alkali, dirt, clay, loam, shale, soft or flaky materials, and organic and injurious matter. Use 4- to 8-in. aggregate for Type 1. Use 2- to 4-in. aggregate for Type 3.
- 2.4.2. **Timber Construction Exit**. Furnish No. 2 quality or better railroad ties and timbers for long-term construction exits, free of large and loose knots and treated to control rot. Fasten timbers with nuts and bolts or lag bolts, of at least 1/2 in. diameter, unless otherwise shown on the plans or allowed. Provide plywood or pressed wafer board at least 1/2 in. thick for short-term exits.
- 2.4.3. **Foundation Course**. Provide a foundation course consisting of flexible base, bituminous concrete, hydraulic cement concrete, or other materials as shown on the plans or directed.
- 2.5. **Embankment for Erosion Control**. Provide rock, loam, clay, topsoil, or other earth materials that will form a stable embankment to meet the intended use.
- 2.6. **Pipe**. Provide pipe outlet material in accordance with Item 556, "Pipe Underdrains," and details shown on the plans.
- 2.7. Construction Perimeter Fence.
- 2.7.1. **Posts**. Provide essentially straight wood or steel posts that are at least 60 in. long. Furnish soft wood posts with a minimum diameter of 3 in., or use nominal 2 × 4 in. boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 × 1-1/5 in. Furnish T- or L-shaped steel posts with a minimum weight of 0.5 lb. per foot.
- 2.7.2. Fence. Provide orange construction fencing as approved.
- 2.7.3. Fence Wire. Provide 11 gauge or larger galvanized smooth or twisted wire. Provide 16 gauge or larger tie wire.
- 2.7.4. **Flagging**. Provide brightly-colored flagging that is fade-resistant and at least 3/4 in. wide to provide maximum visibility both day and night.
- 2.7.5. Staples. Provide staples with a crown at least 1/2 in. wide and legs at least 1/2 in. long.
- 2.7.6. **Used Materials.** Previously used materials meeting the applicable requirements may be used if approved.
- 2.8. **Sandbags**. Provide sandbag material of polypropylene, polyethylene, or polyamide woven fabric with a minimum unit weight of 4 oz. per square yard, a Mullen burst-strength exceeding 300 psi, and an ultraviolet stability exceeding 70%.

Use natural coarse sand or manufactured sand meeting the gradation given in Table 1 to fill sandbags. Filled sandbags must be 24 to 30 in. long, 16 to 18 in. wide, and 6 to 8 in. thick.

Table 1
Sand Gradation

Cana Gradation		
Sieve Size	Retained (% by Weight)	
#4	Maximum 3%	
#100	Minimum 80%	
#200	Minimum 95%	

Aggregate may be used instead of sand for situations where sandbags are not adjacent to traffic. The aggregate size must not exceed 3/8 in.

- 2.9. **Temporary Sediment Control Fence**. Provide a net-reinforced fence using woven geo-textile fabric. Logos visible to the traveling public will not be allowed.
- 2.9.1. Fabric. Provide fabric materials in accordance with DMS-6230, "Temporary Sediment Control Fence Fabric."
- 2.9.2. **Posts**. Provide essentially straight wood or steel posts with a minimum length of 48 in., unless otherwise shown on the plans. Furnish soft wood posts at least 3 in. in diameter, or use nominal 2 × 4 in. boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 × 1-1/2 in. Furnish T- or L-shaped steel posts with a minimum weight of 1.3 lb. per foot.
- 2.9.3. **Net Reinforcement**. Provide net reinforcement of at least 12-1/2 gauge galvanized welded wire mesh, with a maximum opening size of 2 × 4 in., at least 24 in. wide, unless otherwise shown on the plans.
- 2.9.4. **Staples.** Provide staples with a crown at least 3/4 in. wide and legs 1/2 in. long.
- 2.9.5. **Used Materials**. Use recycled material meeting the applicable requirements if approved.
- 2.10. Biodegradable Erosion Control Logs.
- 2.10.1. Core Material. Furnish core material that is biodegradable or recyclable. Use compost, mulch, aspen excelsior wood fibers, chipped site vegetation, agricultural rice or wheat straw, coconut fiber, 100% recyclable fibers, or any other acceptable material unless specifically called out on the plans. Permit no more than 5% of the material to escape from the containment mesh. Furnish compost meeting the requirements of Item 161, "Compost."
- 2.10.2. **Containment Mesh**. Furnish containment mesh that is 100% biodegradable, photodegradable, or recyclable such as burlap, twine, UV photodegradable plastic, polyester, or any other acceptable material.

Furnish biodegradable or photodegradable containment mesh when log will remain in place as part of a vegetative system.

Furnish recyclable containment mesh for temporary installations.

2.10.3. **Size**. Furnish biodegradable erosion control logs with diameters shown on the plans or as directed. Stuff containment mesh densely so logs do not deform.

#### 3. QUALIFICATIONS, TRAINING, AND EMPLOYEE REQUIREMENTS

3.1. Contractor Responsible Person Environmental (CRPE) Qualifications and Responsibilities. Provide and designate in writing at the preconstruction conference a CRPE and alternate CRPEwho have overall responsibility for the storm water management program. The CRPE will implement storm water and erosion control practices; will oversee and observe storm water control measure monitoring and management; will monitor the project site daily and produce daily monitoring reports as long as there are BMPs in place or soil disturbing activities are evident to ensure compliance with the SWP3 and TPDES General Permit TXR150000. During time suspensions when work is not occurring or on contract non-work days, daily inspections are not required unless a rain event has occurred. The CRPE will provide recommendations on

how to improve the effectiveness of control measures. Attend the Department's preconstruction conference for the project. Ensure training is completed as identified in Section 506.3.3., "Training," by all applicable personnel before employees work on the project. Document and submit a list, signed by the CRPE, of all applicable Contractor and subcontractor employees who have completed the training. Include the employee's name, the training course name, and date the employee completed the training. Provide the most current list at the preconstruction conference or before SWP3 or soil disturbing activities. Update the list as needed and provide the updated list when updated.

- 3.2. Contractor Superintendent Qualifications and Responsibilities. Provide a superintendent that is competent, has experience with and knowledge of storm water management, and is knowledgeable of the requirements and the conditions of the TPDES General Permit TXR150000. The superintendent will manage and oversee the day to day operations and activities at the project site; work with the CRPE to provide effective storm water management at the project site; represent and act on behalf of the Contractor; and attend the Department's preconstruction conference for the project.
  - 3.3. **Training**. All Contractor and subcontractor employees involved in soil disturbing activities, small or large structures, storm water control measures, and seeding activities must complete training as prescribed by the Department.

#### 4. CONSTRUCTION

- 4.1. **Contractor Responsibilities**. Implement the SWP3 for the project site in accordance with the plans and specifications, TPDES General Permit TXR150000, and as directed. Coordinate storm water management with all other work on the project. Develop and implement an SWP3 for project-specific material supply plants within and outside of the Department's right of way in accordance with the specific or general storm water permit requirements. Prevent water pollution from storm water associated with construction activity from entering any surface water or private property on or adjacent to the project site.
- 4.2. **Implementation**. The CRPE, or alternate CRPE, must be accessible by phone and able to respond to project-related storm water management or other environmental emergencies 24 hr. per day.
- 4.2.1. Commencement. Implement the SWP3 as shown and as directed. Contractor-proposed recommendations for changes will be allowed as approved. Conform to the established guidelines in the TPDES General Permit TXR150000 to make changes. Do not implement changes until approval has been received and changes have been incorporated into the plans. Minor adjustments to meet field conditions are allowed and will be recorded in the SWP3.
- 4.2.2. Phasing. Implement control measures before the commencement of activities that result in soil disturbance. Phase and minimize the soil disturbance to the areas shown on the plans. Coordinate temporary control measures with permanent control measures and all other work activities on the project to assure economical, effective, safe, and continuous water pollution prevention. Provide control measures that are appropriate to the construction means, methods, and sequencing allowed by the Contract. Exercise precaution throughout the life of the project to prevent pollution of ground waters and surface waters. Schedule and perform clearing and grubbing operations so that stabilization measures will follow immediately thereafter if project conditions permit. Bring all grading sections to final grade as soon as possible and implement temporary and permanent control measures at the earliest time possible. Implement temporary control measures when required by the TPDES General Permit TXR150000 or otherwise necessitated by project conditions.

Do not prolong final grading and shaping. Preserve vegetation where possible throughout the project, and minimize clearing, grubbing, and excavation within stream banks, bed, and approach sections.

#### 4.3. **General**.

4.3.1. **Temporary Alterations or Control Measure Removal**. Altering or removal of control measures is allowed when control measures are restored within the same working day.

- 4.3.2. **Stabilization**. Initiate stabilization for disturbed areas no more than 14 days after the construction activities in that portion of the site have temporarily or permanently ceased. Establish a uniform vegetative cover or use another stabilization practice in accordance with the TPDES General Permit TXR150000.
- 4.3.3. **Finished Work**. Remove and dispose of all temporary control measures upon acceptance of vegetative cover or other stabilization practice unless otherwise directed. Complete soil disturbing activities and establish a uniform perennial vegetative cover. A project will not be considered for acceptance until a vegetative cover of 70% density of existing adjacent undisturbed areas is obtained or equivalent permanent stabilization is obtained in accordance with the TPDES General Permit TXR150000. An exception will be allowed in arid areas as defined in the TPDES General Permit TXR150000.
- 4.3.4. **Restricted Activities and Required Precautions**. Do not discharge onto the ground or surface waters any pollutants such as chemicals, raw sewage, fuels, lubricants, coolants, hydraulic fluids, bitumens, or any other petroleum product. Operate and maintain equipment on-site to prevent actual or potential water pollution. Manage, control, and dispose of litter on-site such that no adverse impacts to water quality occur. Prevent dust from creating a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property. Wash out concrete trucks only as described in the TPDES General Permit TXR150000. Use appropriate controls to minimize the offsite transport of suspended sediments and other pollutants if it is necessary to pump or channel standing water (i.e., dewatering). Prevent discharges that would contribute to a violation of Edwards Aquifer Rules, water quality standards, the impairment of a listed water body, or other state or federal law.
- 4.4. Installation, Maintenance, and Removal Work. Perform work in accordance with the SWP3, according to manufacturers' guidelines, and in accordance with the TPDES General Permit TXR150000. Install and maintain the integrity of temporary erosion and sedimentation control devices to accumulate silt and debris until soil disturbing activities are completed and permanent erosion control features are in place or the disturbed area has been adequately stabilized as approved.

The Department will inspect and document the condition of the control measures at the frequency shown on the plans and will provide the Construction SWP3 Field Inspection and Maintenance Reports to the Contractor. Make corrections as soon as possible before the next anticipated rain event or within 7 calendar days after being able to enter the worksite for each control measure. The only acceptable reason for not accomplishing the corrections with the time frame specified is when site conditions are "Too Wet to Work." Take immediate action if a correction is deemed critical as directed. When corrections are not made within the established time frame, all work will cease on the project and time charges will continue while the control measures are brought into compliance. Commence work once the Engineer reviews and documents the project is in compliance. Commencing work does not release the Contractor of the liability for noncompliance of the SWP3, plans, or TPDES General Permit TXR150000.

The Engineer may limit the disturbed area if the Contractor cannot control soil erosion and sedimentation resulting from the Contractor's operations. Implement additional controls as directed.

Remove devices upon approval or as directed. Finish-grade and dress the area upon removal. Stabilize disturbed areas in accordance with the permit, and as shown on the plans or directed. Materials removed are considered consumed by the project. Retain ownership of stockpiled material and remove it from the project when new installations or replacements are no longer required.

4.4.1. **Rock Filter Dams for Erosion Control**. Remove trees, brush, stumps, and other objectionable material that may interfere with the construction of rock filter dams. Place sandbags as a foundation when required or at the Contractor's option.

Place the aggregate to the lines, height, and slopes specified, without undue voids for Types 1, 2, 3, and 5. Place the aggregate on the mesh and then fold the mesh at the upstream side over the aggregate and secure it to itself on the downstream side with wire ties, or hog rings for Types 2 and 3, or as directed. Place rock filter dams perpendicular to the flow of the stream or channel unless otherwise directed. Construct filter dams according to the following criteria unless otherwise shown on the plans:

- 4.4.1.1. Type 1 (Non-Reinforced).
  - **Height**. At least 18 in. measured vertically from existing ground to top of filter dam.
  - Top Width. At least 2 ft.
  - Slopes. No steeper than 2:1.
- 4.4.1.2. **Type 2 (Reinforced)**.
  - **Height**. At least 18 in. measured vertically from existing ground to top of filter dam.
  - Top Width. At least 2 ft.
  - Slopes. No steeper than 2:1.
- 4.4.1.3. **Type 3 (Reinforced)**.
  - **Height**. At least 36 in. measured vertically from existing ground to top of filter dam.
  - Top Width. At least 2 ft.
  - Slopes. No steeper than 2:1.
- 4.4.1.4. **Type 4 (Sack Gabions)**. Unfold sack gabions and smooth out kinks and bends. Connect the sides by lacing in a single loop–double loop pattern on 4- to 5-in. spacing for vertical filling. Pull the end lacing rod at one end until tight, wrap around the end, and twist 4 times. Fill with stone at the filling end, pull the rod tight, cut the wire with approximately 6 in. remaining, and twist wires 4 times.

Place the sack flat in a filling trough, fill with stone, connect sides, and secure ends as described above for horizontal filling.

Lift and place without damaging the gabion. Shape sack gabions to existing contours.

- 4.4.1.5. **Type 5**. Provide rock filter dams as shown on the plans.
- 4.4.2. **Temporary Pipe Slope Drains**. Install pipe with a slope as shown on the plans or as directed. Construct embankment for the drainage system in 8-in. lifts to the required elevations. Hand-tamp the soil around and under the entrance section to the top of the embankment as shown on the plans or as directed. Form the top of the embankment or earth dike over the pipe slope drain at least 1 ft. higher than the top of the inlet pipe at all points. Secure the pipe with hold-downs or hold-down grommets spaced a maximum of 10 ft. on center. Construct the energy dissipaters or sediment traps as shown on the plans or as directed. Construct the sediment trap using concrete or rubble riprap in accordance with Item 432, "Riprap," when designated on the plans.
- 4.4.3. **Temporary Paved Flumes**. Construct paved flumes as shown on the plans or as directed. Provide excavation and embankment (including compaction of the subgrade) of material to the dimensions shown on the plans unless otherwise indicated. Install a rock or rubble riprap energy dissipater, constructed from the materials specified above, to a minimum depth of 9 in. at the flume outlet to the limits shown on the plans or as directed.
- 4.4.4. **Construction Exits**. Prevent traffic from crossing or exiting the construction site or moving directly onto a public roadway, alley, sidewalk, parking area, or other right of way areas other than at the location of construction exits when tracking conditions exist. Construct exits for either long- or short-term use.
- 4.4.4.1. **Long-Term**. Place the exit over a foundation course as required. Grade the foundation course or compacted subgrade to direct runoff from the construction exits to a sediment trap as shown on the plans or as directed. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed.
- 4.4.4.1.1. Type 1. Construct to a depth of at least 8 in. using crushed aggregate as shown on the plans or as directed.
- 4.4.4.1.2. **Type 2**. Construct using railroad ties and timbers as shown on the plans or as directed.

- 4.4.4.2. **Short-Term**.
- 4.4.4.2.1. **Type 3**. Construct using crushed aggregate, plywood, or wafer board. This type of exit may be used for daily operations where long-term exits are not practical.
- 4.4.4.2.2. **Type 4**. Construct as shown on the plans or as directed.
- 4.4.5. **Earthwork for Erosion Control**. Perform excavation and embankment operations to minimize erosion and to remove collected sediments from other erosion control devices.
- 4.4.5.1. **Excavation and Embankment for Erosion Control Features**. Place earth dikes, swales, or combinations of both along the low crown of daily lift placement, or as directed, to prevent runoff spillover. Place swales and dikes at other locations as shown on the plans or as directed to prevent runoff spillover or to divert runoff. Construct cuts with the low end blocked with undisturbed earth to prevent erosion of hillsides. Construct sediment traps at drainage structures in conjunction with other erosion control measures as shown on the plans or as directed.

Create a sediment basin, where required, providing 3,600 cu. ft. of storage per acre drained, or equivalent control measures for drainage locations that serve an area with 10 or more disturbed acres at one time, not including offsite areas.

- 4.4.5.2. **Excavation of Sediment and Debris**. Remove sediment and debris when accumulation affects the performance of the devices, after a rain, and when directed.
- 4.4.6. **Construction Perimeter Fence**. Construct, align, and locate fencing as shown on the plans or as directed.
- 4.4.6.1. Installation of Posts. Embed posts 18 in. deep or adequately anchor in rock, with a spacing of 8 to 10 ft.
- 4.4.6.2. **Wire Attachment**. Attach the top wire to the posts at least 3 ft. from the ground. Attach the lower wire midway between the ground and the top wire.
- 4.4.6.3. **Flag Attachment**. Attach flagging to both wire strands midway between each post. Use flagging at least 18 in. long. Tie flagging to the wire using a square knot.
- 4.4.7. **Sandbags for Erosion Control**. Construct a berm or dam of sandbags that will intercept sediment-laden storm water runoff from disturbed areas, create a retention pond, detain sediment, and release water in sheet flow. Fill each bag with sand so that at least the top 6 in. of the bag is unfilled to allow for proper tying of the open end. Place the sandbags with their tied ends in the same direction. Offset subsequent rows of sandbags 1/2 the length of the preceding row. Place a single layer of sandbags downstream as a secondary debris trap. Place additional sandbags as necessary or as directed for supplementary support to berms or dams of sandbags or earth.
- 4.4.8. **Temporary Sediment-Control Fence**. Provide temporary sediment-control fence near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the fence into erosion-control measures used to control sediment in areas of higher flow. Install the fence as shown on the plans, as specified in this Section, or as directed.
- 4.4.8.1. **Installation of Posts**. Embed posts at least 18 in. deep, or adequately anchor, if in rock, with a spacing of 6 to 8 ft. and install on a slight angle toward the runoff source.
- 4.4.8.2. **Fabric Anchoring**. Dig trenches along the uphill side of the fence to anchor 6 to 8 in. of fabric. Provide a minimum trench cross-section of 6 × 6 in. Place the fabric against the side of the trench and align approximately 2 in. of fabric along the bottom in the upstream direction. Backfill the trench, then hand-tamp.
- 4.4.8.3. **Fabric and Net Reinforcement Attachment**. Attach the reinforcement to wooden posts with staples, or to steel posts with T-clips, in at least 4 places equally spaced unless otherwise shown on the plans. Sewn

vertical pockets may be used to attach reinforcement to end posts. Fasten the fabric to the top strand of reinforcement by hog rings or cord every 15 in. or less.

4.4.8.4. **Fabric and Net Splices**. Locate splices at a fence post with a minimum lap of 6 in. attached in at least 6 places equally spaced unless otherwise shown on the plans. Do not locate splices in concentrated flow areas.

Requirements for installation of used temporary sediment-control fence include the following:

- fabric with minimal or no visible signs of biodegradation (weak fibers),
- fabric without excessive patching (more than 1 patch every 15 to 20 ft.),
- posts without bends, and
- backing without holes.
- 4.4.9. **Biodegradable Erosion Control Logs**. Install biodegradable erosion control logs near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the biodegradable erosion control logs into the erosion measures used to control sediment in areas of higher flow. Install, align, and locate the biodegradable erosion control logs as specified below, as shown on the plans, or as directed.

Secure biodegradable erosion control logs in a method adequate to prevent displacement as a result of normal rain events, prevent damage to the logs, and as approved, such that flow is not allowed under the logs. Temporarily removing and replacing biodegradable erosion logs as to facilitate daily work is allowed at the Contractor's expense.

- 4.4.10. **Vertical Tracking**. Perform vertical tracking on slopes to temporarily stabilize soil. Provide equipment with a track undercarriage capable of producing a linear soil impression measuring a minimum of 12 in. long × 2 to 4 in. wide × 1/2 to 2 in. deep. Do not exceed 12 in. between track impressions. Install continuous linear track impressions where the 12 in. length impressions are perpendicular to the slope. Vertical tracking is required on projects where soil disturbing activities have occurred unless otherwise approved.
- 4.5. Monitoring and Documentation. Monitor the control measures on a daily basis as long as there are BMPs in place and/or soil disturbing activities are evident to ensure compliance with the SWP3 and TPDES General Permit TXR150000. During time suspensions when work is not occurring or contract non-work days, daily inspections are not required unless a rain event has occurred. Monitoring will consist of, but is not limited to, observing, inspecting, and documenting site locations with control measures and discharge points to provide maintenance and inspection of controls as described in the SWP3. Keep written records of daily monitoring. Document in the daily monitoring report the control measure condition, the date of inspection, required corrective actions, responsible person for making the corrections, and the date corrective actions were completed. Maintain records of all monitoring reports at the project site or at an approved place. Provide copies within 7 days. Together, the CRPE and an Engineer's representative will complete the Construction Stage Gate Checklist on a periodic basis as directed.

#### MEASUREMENT

- 5.1. **Rock Filter Dams**. Installation or removal of rock filter dams will be measured by the foot or by the cubic yard. The measured volume will include sandbags, when used.
- 5.1.1. **Linear Measurement**. When rock filter dams are measured by the foot, measurement will be along the centerline of the top of the dam.
- 5.1.2. **Volume Measurement**. When rock filter dams are measured by the cubic yard, measurement will be based on the volume of rock computed by the method of average end areas.
- 5.1.2.1. **Installation**. Measurement will be made in final position.
- 5.1.2.2. **Removal**. Measurement will be made at the point of removal.

- 5.2. **Temporary Pipe Slope Drains**. Temporary pipe slope drains will be measured by the foot.
- 5.3. **Temporary Paved Flumes**. Temporary paved flumes will be measured by the square yard of surface area. The measured area will include the energy dissipater at the flume outlet.
- 5.4. **Construction Exits.** Construction exits will be measured by the square yard of surface area.
- 5.5. Earthwork for Erosion and Sediment Control.
- 5.5.1. **Equipment and Labor Measurement**. Equipment and labor used will be measured by the actual number of hours the equipment is operated and the labor is engaged in the work.
- 5.5.2. Volume Measurement.
- 5.5.2.1. **In Place**.
- 5.5.2.1.1. **Excavation**. Excavation will be measured by the cubic yard in its original position and the volume computed by the method of average end areas.
- 5.5.2.1.2. **Embankment**. Embankment will be measured by the cubic yard in its final position by the method of average end areas. The volume of embankment will be determined between:
  - the original ground surfaces or the surface upon that the embankment is to be constructed for the feature and
  - the lines, grades and slopes of the accepted embankment for the feature.
- 5.5.2.2. In Vehicles. Excavation and embankment quantities will be combined and paid for under "Earthwork (Erosion and Sediment Control, In Vehicle)." Excavation will be measured by the cubic yard in vehicles at the point of removal. Embankment will be measured by the cubic yard in vehicles measured at the point of delivery. Shrinkage or swelling factors will not be considered in determining the calculated quantities.
- 5.6. **Construction Perimeter Fence**. Construction perimeter fence will be measured by the foot.
- 5.7. **Sandbags for Erosion Control**. Sandbags will be measured as each sandbag or by the foot along the top of sandbag berms or dams.
- 5.8. **Temporary Sediment-Control Fence**. Installation or removal of temporary sediment-control fence will be measured by the foot.
- 5.9. **Biodegradable Erosion Control Logs**. Installation or removal of biodegradable erosion control logs will be measured by the foot along the centerline of the top of the control logs.
- 5.10. **Vertical Tracking**. Vertical tracking will not be measured or paid for directly but is considered subsidiary to this Item.

#### 6. PAYMENT

The following will not be paid for directly but are subsidiary to pertinent Items:

- erosion-control measures for Contractor project-specific locations (PSLs) inside and outside the right of way (such as construction and haul roads, field offices, equipment and supply areas, plants, and material sources);
- removal of litter, unless a separate pay item is shown on the plans;
- repair to devices and features damaged by Contractor operations;
- added measures and maintenance needed due to negligence, carelessness, lack of maintenance, and failure to install permanent controls;

- removal and reinstallation of devices and features needed for the convenience of the Contractor;
- finish grading and dressing upon removal of the device; and
- minor adjustments including but not limited to plumbing posts, reattaching fabric, minor grading to maintain slopes on an erosion embankment feature, or moving small numbers of sandbags.

Stabilization of disturbed areas will be paid for under pertinent Items except vertical tacking which is subsidiary.

Furnishing and installing pipe for outfalls associated with sediment traps and ponds will not be paid for directly but is subsidiary to the excavation and embankment under this Item.

- 6.1. **Rock Filter Dams**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:
- 6.1.1. Installation. Installation will be paid for as "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.
- 6.1.2. **Removal**. Removal will be paid for as "Rock Filter Dams (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

When the Engineer directs that the rock filter dam installation or portions thereof be replaced, payment will be made at the unit price bid for "Rock Filter Dams (Remove)" and for "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

6.2. **Temporary Pipe Slope Drains**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Pipe Slope Drains" of the size specified. This price is full compensation for furnishing materials, removal and disposal, furnishing and operating equipment, labor, tools, and incidentals.

Removal of temporary pipe slope drains will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the pipe slope drain installation or portions thereof be replaced, payment will be made at the unit price bid for "Temporary Pipe Slope Drains" of the size specified, which is full compensation for the removal and reinstallation of the pipe drain.

Earthwork required for the pipe slope drain installation, including construction of the sediment trap, will be measured and paid for under "Earthwork for Erosion and Sediment Control."

Riprap concrete or stone, when used as an energy dissipater or as a stabilized sediment trap, will be measured and paid for in accordance with Item 432, "Riprap."

6.3. **Temporary Paved Flumes**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Paved Flume (Install)" or "Temporary Paved Flume (Remove)." This price is full compensation for furnishing and placing materials, removal and disposal, equipment, labor, tools, and incidentals.

When the Engineer directs that the paved flume installation or portions thereof be replaced, payment will be made at the unit prices bid for "Temporary Paved Flume (Remove)" and "Temporary Paved Flume (Install)." These prices are full compensation for the removal and replacement of the paved flume and for equipment, labor, tools, and incidentals.

Earthwork required for the paved flume installation, including construction of a sediment trap, will be measured and paid for under "Earthwork for Erosion and Sediment Control."

6.4. **Construction Exits**. Contractor-required construction exits from off right of way locations or on-right of way PSLs will not be paid for directly but are subsidiary to pertinent Items.

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" for construction exits needed on right of way access to work areas required by the Department will be paid for at the unit price bid for "Construction Exits (Install)" of the type specified or "Construction Exits (Remove)." This price is full compensation for furnishing and placing materials, excavating, removal and disposal, cleaning vehicles, labor, tools, and incidentals.

When the Engineer directs that a construction exit or portion thereof be removed and replaced, payment will be made at the unit prices bid for "Construction Exit (Remove)" and "Construction Exit (Install)" of the type specified. These prices are full compensation for the removal and replacement of the construction exit and for equipment, labor, tools, and incidentals.

Construction of sediment traps used in conjunction with the construction exit will be measured and paid for under "Earthwork for Erosion and Sediment Control."

- 6.5. Earthwork for Erosion and Sediment Control.
- 6.5.1. Initial Earthwork for Erosion and Sediment Control. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Excavation (Erosion and Sediment Control, In Place)," "Embankment (Erosion and Sediment Control, In Vehicle)," "Embankment (Erosion and Sediment Control, In Vehicle)," or "Earthwork (Erosion and Sediment Control, In Vehicle)."

This price is full compensation for excavation and embankment including hauling, disposal of material not used elsewhere on the project; embankments including furnishing material from approved sources and construction of erosion-control features; and equipment, labor, tools, and incidentals.

Sprinkling and rolling required by this Item will not be paid for directly but will be subsidiary to this Item.

6.5.2. Maintenance Earthwork for Erosion and Sediment Control for Cleaning and Restoring Control

Measures. The work performed and materials furnished in accordance with this Item and measured as
provided under "Measurement" will be paid under a Contractor Force Account Item from invoice provided to
the Engineer.

This price is full compensation for excavation, embankment, and re-grading including removal of accumulated sediment in various erosion control installations as directed, hauling, and disposal of material not used elsewhere on the project; excavation for construction of erosion-control features; embankments including furnishing material from approved sources and construction of erosion-control features; and equipment, labor, tools, and incidentals.

Earthwork needed to remove and obliterate erosion-control features will not be paid for directly but is subsidiary to pertinent Items unless otherwise shown on the plans.

Sprinkling and rolling required by this Item will not be paid for directly but will be subsidiary to this Item.

6.6. **Construction Perimeter Fence**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Construction Perimeter Fence." This price is full compensation for furnishing and placing the fence; digging, fence posts, wire, and flagging; removal and disposal; and materials, equipment, labor, tools, and incidentals.

Removal of construction perimeter fence will be not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the perimeter fence installation or portions thereof be removed and replaced, payment will be made at the unit price bid for "Construction Perimeter Fence," which is full compensation for the removal and reinstallation of the construction perimeter fence.

6.7. **Sandbags for Erosion Control**. Sandbags will be paid for at the unit price bid for "Sandbags for Erosion Control" (of the height specified when measurement is by the foot). This price is full compensation for materials, placing sandbags, removal and disposal, equipment, labor, tools, and incidentals.

Removal of sandbags will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the sandbag installation or portions thereof be replaced, payment will be made at the unit price bid for "Sandbags for Erosion Control," which is full compensation for the reinstallation of the sandbags.

- 6.8. **Temporary Sediment-Control Fence**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:
- 6.8.1. Installation. Installation will be paid for as "Temporary Sediment-Control Fence (Install)." This price is full compensation for furnishing and operating equipment finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.
- 6.8.2. **Removal**. Removal will be paid for as "Temporary Sediment-Control Fence (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.
- 6.9. **Biodegradable Erosion Control Logs**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:
- 6.9.1. **Installation**. Installation will be paid for as "Biodegradable Erosion Control Logs (Install)" of the size specified. This price is full compensation for furnishing and operating equipment finish backfill and grading, staking, proper disposal, labor, materials, tools, and incidentals.
- 6.9.2. **Removal**. Removal will be paid for as "Biodegradable Erosion Control Logs (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.
- 6.10. **Vertical Tracking**. Vertical tracking will not be measured or paid for directly but is considered subsidiary to this Item.

# Item 556 Pipe Underdrains



#### 1. DESCRIPTION

Install pipe underdrains.

#### 2. MATERIALS

- 2.1. **Pipe**. Furnish the types and sizes of pipe specified on the plans. Use only one type of pipe for any underdrain system on the project. Use perforated pipe in areas to be drained, and use non-perforated pipe between the perforated pipe and the outfall.
- 2.1.1. **Type 1**. Corrugated steel pipe (CSP) conforming to any type specified in AASHTO M 36, fabricated from corrugated galvanized sheet.
- 2.1.2. **Type 2**. Corrugated aluminum pipe conforming to AASHTO M 196, Type I or IA, fabricated from corrugated sheet.
- 2.1.3. **Type 3**. Bituminous-coated corrugated steel pipe conforming to the requirements of Type 1 and uniformly coated inside and out with a minimum thickness of 0.05 in. of bituminous material meeting the requirements of Table 1 when tested in accordance with ASTM A849, Material Class A or Material Class PA.

Table 1
Requirements of Bituminous Material

Test	Requirements
Solubility, % by wt., in trichloroethylene	99.5 Min
Brittleness	Pass
Flow, in.	0.25 Max

- 2.1.4. **Type 4**. Bituminous-coated corrugated aluminum pipe conforming to the requirement of Type 2 and uniformly coated inside and out with a minimum thickness of 0.05 in. of bituminous material meeting the requirements of Table 1 when tested in accordance with ASTM A849, Material Class A or Material Class PA.
- 2.1.5. **Type 5**. Acrylonitrile-butadiene-styrene (ABS) pipe conforming to ASTM D2751, SDR-35. Perforations must meet the requirements of AASHTO M 278.
- 2.1.6. **Type 6**. Corrugated polyethylene plastic tubing conforming to AASHTO M 252.
- 2.1.7. **Type 7**. Corrugated polyvinyl chloride (PVC) pipe conforming to ASTM F949.
- 2.1.8. Type 8. Smooth-wall PVC pipe conforming to AASHTO M 278, Class PS 46.
- 2.1.9. **Type 9**. As shown on the plans.
- 2.2. **Filter Material**. Furnish hard, durable, and clean sand, gravel, crushed stone, or crushed shell meeting the gradation by percent weight specified in Table 2 unless otherwise shown on the plans. Filter material must be free of clay balls or other organic or deleterious matter as determined by <u>Tex-413-A</u>. Do not furnish crushed limestone unless shown on the plans. Use only one type of filter material for any underdrain system on a project.

Sieve Size Type A Type B Type C Type D 1-1/2 0-10 3/4" 0-10 20-40 3/8" 15-35 #4 0-10 40-60 0–5 35-55 #8 0-20 #16 15-50 #20 35-65<sup>1</sup> 35-65<sup>1</sup> 35-65<sup>1</sup> #30 40-75 #50 75-100<sup>1</sup> 75-100<sup>1</sup> 75-100<sup>1</sup> 70-90 #100 90-100

Table 2
Percent Retained on Sieve (Tex-401-A)

Loss by decantation as determined by <u>Tex-406-A</u> must not exceed 1% of the material retained on a No. 4 sieve or 4% of the material passing a No. 4 sieve. Use Type B or Type C filter material around the underdrains unless otherwise shown on the plans. Do not place Type A or Type D filter material within 6 in. of perforations.

- 2.3. Filter Fabric. Meet DMS-6200, "Filter Fabric," Type 1.
- Riprap. Provide concrete riprap in accordance with Item 432, "Riprap," when required.

#### 3. CONSTRUCTION

Begin excavation of the trench at the outfall and proceed toward its upper end, following the lines and grades shown on the plans or as directed. Hold the minimum horizontal limits of excavation for filter material to the dimensions shown in Table 3 or as shown on the plans.

Table 3
Minimum Horizontal Limits of Excavation for Filler Material

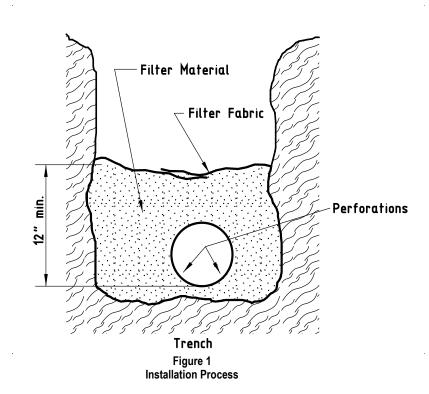
Depth of Trench (ft.)	Distance Outside Neat Lines of Pipe Underdrains (ft.)
0 to 6	1.00
Over 6 to 10	1.50
Over 10 to 15	2.00
Over 15	2.50

Place filter fabric in the bottom and sides of the trench in areas to be drained before placing pipe or filter material, as shown in Figure 1. Provide enough width of fabric to overlap on top of the filter material. Center perforated pipe in the excavated ditch with the perforations below the horizontal axis. Join the pipe with appropriate couplers if required. Join plastic pipe in accordance with the manufacturer's recommendations. Do not use tarpaper strips. Obtain approval for pipe placement before placing filter material.

Place filter material at least 12 in. above the bottom of the pipe or as shown on the plans. Do not allow filter material to displace the pipe.

Lap filter fabric over the top of the filter material after placing pipe and filter material according to the manufacturer's recommendation or as shown on the plans.

<sup>1.</sup> Of the portion finer than No. 4 sieve.



Install non-perforated pipe sections between the perforated pipe and the outfall. The sections of non-perforated pipe do not require filter fabric or filter material.

Place approved plugs in the upper ends of all pipe. Cover exposed outfall ends with 1/2-in. galvanized hardware cloth as directed. Provide Class B concrete riprap, when required, in accordance with Item 432, "Riprap," and details shown on the plans. Place the riprap to the contour and grade of the embankment slope. Cut the pipe to the slope of the riprap.

Backfill the remainder of the trench with suitable material in layers not to exceed 6 in.

#### 4. MEASUREMENT

This Item will be measured by the foot along the top of the pipe and will include the length of elbows, Y's, T's, and other branches.

#### 5. PAYMENT

The work performed and material furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Pipe Underdrains" of the pipe type and size specified. This price is full compensation for pipe, couplers, plugs, screens, filter material, filter fabric, riprap, excavation, backfill, equipment, labor, materials, tools, and incidentals.

Protection methods for excavations deeper than 5 ft. will be measured and paid for in accordance with Item 402, "Trench Excavation Protection."

#### **Test Procedure for**

### **CEMENT TREATED MATERIALS**

Texas
Department
of Transportation

**TxDOT Designation: Tex-120-E** 

Effective Date: April 2022

#### SCOPE 1. 1.1 This test method consists of two parts for the laboratory compaction of cement treated materials. Cement treated materials may include subgrade (soils), reclaimed roadway (existing materials), existing materials blended with flexible base, or flexible base only. 1.2 Part I is used to determine the optimum moisture content and maximum dry density (M-D) curve in accordance with Tex-113-E for cement treated materials prepared in the laboratory or sampled from the roadway after mixing. This part may also be used to verify a M-D curve with material sampled from the roadway after mixing. 1.2.1 Specimens are compacted using an automatic tamper (compaction) device equipped with a Soil Compactor Analyzer (SCA), All specimens are 6 in, in diameter and $8 \pm 0.250$ in, in height. 1.3 Part II is a mixture design procedure used to determine a target cement content from materials prepared in the laboratory based on the unconfined compressive strength (UCS). This part may also be used to verify the UCS of material sampled from the roadway after mixing. 1.3.1 The target cement content is determined from the UCS of compacted specimens after seven days of curing in an environment with a minimum humidity of 95%. The humidity may be measured using a handheld hygrometer.

Part II includes an optional moisture conditioning procedure that includes submerging compacted specimens

#### 2. APPARATUS

1.3.2

- 2.1 As outlined in test methods:
  - Tex-100-E;
  - Tex-101-E;
  - Tex-113-E;
  - <u>Tex-117-E</u>; and
  - **Tex-400-A.**
- 2.2 Container, adequate height and volume to completely submerge compacted specimens.

completely in water for 24 hr. after seven days of curing.

2.3 Handheld hygrometer.

2.4	Load cell, minimum 10K (for use with automated load frame).	
3.	REPORTING	
3.1	Report all data and pertinent information pertinent using SiteManager form 'Tx120-21.xlsm'.	
3.2	This form is available from the Materials & Tests Division/Soils & Aggregates Section and online at the following link <a href="https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/forms/site-manager.html">https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/forms/site-manager.html</a> .	
4.	MATERIAL SAMPLING AND PREPARATION	
4.1	This test procedure does not claim to address the safety concerns associated with its use. It is the responsibility of the user of this test procedure to establish the appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations before use.	
4.2	Obtain a minimum of 1 gal. of cement in a sealed container from a fresh supply of an approved source from the Department's Material Producer List unless otherwise directed.	
4.3	When testing materials for Part I, sample a minimum of 100 lb. in accordance with <u>Tex-100-E</u> for soils or <u>Tex-400-A</u> for flexible base and prepare in accordance with <u>Tex-101-E</u> , Part II.	
4.4	When testing materials for Part II, sample a minimum of 300 lb. in accordance with <u>Tex-100-E</u> for soils or <u>Tex-400-A</u> for flexible base and prepare in accordance with <u>Tex-101-E</u> , Part II.	
4.5	When reclaimed asphalt pavement (RAP) is included and greater than 1-3/4 in., resize the RAP to pass the 1-3/4 in. sieve.  Note 1-Heating the RAP to a maximum temperature of 140°F can assist in resizing the RAP.	
4.6	When testing material from the roadway after reclamation and mixing, sample the treated material before the start of compaction.	
4.6.1	Screen the cement treated material using a 7/8 in. sieve and a 1/4 in. sieve at the field moisture content, without drying.	
4.6.2	Separate the material retained on the sieve from the material passing the sieve.	
4.6.3	Cover the materials to retain field moisture.	
PART I-	-MOISTURE-DENSITY CURVE	
5.	PROCEDURE	
5.1	This test procedure does not claim to address the safety concerns associated with its use. It is the responsibility of the user of this test procedure to establish the appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations before use.	
5.2	Select a percentage of cement.	

DADTII	MIVILIDE DECICALTO DETERMINE THE TARGET CEMENT CONENT
6.3	Maximum Dry Density, 0.1 pcf.
6.2	Optimum Moisture Content, 0.1%; and
6.1	Cement Content, 0.1%;
6.	TEST REPORT
5.4.2.4	Weigh material to the nearest 0.001 lb.
5.4.2.3	Determine the mass of material needed to achieve the desired moisture content.
5.4.2.2	Adjust the moisture content of material by adding or removing moisture as needed. When removing moisture, do not oven dry the material. Stir frequently and as needed to achieve the necessary mass of material.
5.4.2.1	Estimate the field moisture content. Place material in a pan and weigh to the nearest 0.001 lb.
5.4.2	Determine the M-D curve for this material in accordance with the applicable Sections of <u>Tex-113-E</u> . Alternatively, compact samples to only verify a M-D curve that was produced from laboratory prepared materials in Section 5.3.
5.4.1	Recombine the material from Article 4., "Material Sampling and Preparation," to produce samples for laboratory compaction.
5.4	Using Roadway Mixed and Treated Material.
5.3.1	Prior to compaction of <u>Tex-113-E</u> , add the cement uniformly to ensure even distribution of the cement throughout the sample. The amount of cement added is a percentage based on the dry mass of the material to be treated.
5.3	Determine the optimum moisture content and maximum dry density (M-D) curve for the material prepared from Article 4., "Material Sampling and Preparation," in accordance with the applicable Sections of Tex-113-E.

#### PART II—MIXTURE DESIGN TO DETERMINE THE TARGET CEMENT CONENT

#### 7. **PROCEDURE** 7.1 This test procedure does not claim to address the safety concerns associated with its use. It is the responsibility of the user of this test procedure to establish the appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations before use. 7.2 Determine the optimum moisture content and maximum dry density (M-D) curve using 5% cement for the material prepared from Article 4., "Material Sampling and Preparation," in accordance with the applicable Sections of Tex-113-E. 7.2.1 Before compaction of Tex-113-E, add the cement uniformly to ensure even distribution of the cement throughout the sample. The amount of cement added is a percentage based on the dry mass of the material

to be treated.

7.3	Recombine the material prepared from Article 4., "Material Sampling and Preparation," and mold three samples at 3, 5, and 7% cement in accordance with the applicable Sections of <a href="Tex-113-E">Tex-113-E</a> to determine the unconfined compressive strength (UCS) at each percentage. Samples may be molded at fewer, more, or different percentages of cement as deemed necessary.		
7.3.1	Calculate the moisture content for each cement content using equation from Section 8.1 of this test procedure.		
7.3.2	Before compaction of <u>Tex-113-E</u> , add the cement uniformly to ensure even distribution of the cement throughout the sample. The amount of cement added is a percentage based on the dry mass of the material to be treated.		
7.3.3	Place a card on each specimen labeling the laboratory identification number and the percent of cement.		
7.3.4	Proceed to Section 7.5 for curing the specimens.		
7.4	Using Roadway Mixed and Treated Material to Verify UCS.		
7.4.1	Recombine the material from Article 4., Material Sampling and Preparation," and mold three samples in accordance with the applicable Sections of <a href="Tex-113-E">Tex-113-E</a> .		
7.4.1.1	Estimate the field moisture content. Place material in a pan and weigh to the nearest 0.001 lb.		
7.4.1.2	Adjust the moisture content of material by adding or removing moisture as needed. When removing moistur do not oven dry the material. Stir frequently and as needed to achieve the necessary mass of material.		
7.4.1.3	Determine the mass of material needed to achieve the desired moisture content.		
7.4.1.4	Weigh material to the nearest 0.001 lb.		
7.5	Curing.		
7.5.1	Store the compacted specimens the same day as molded with the top and bottom porous stones in an environment with a minimum humidity of 95% for seven days. Do not use a triaxial cell.		
7.5.2	When the humidity is unknown, use a handheld hygrometer to measure the humidity to ensure it is a minimum of 95%.		
7.5.3	When necessary, place a pan on top of the top porous stone to protect the specimen from any dripping water.		
7.6	After seven days of curing, remove the test specimens from the environmentalroom and use a cloth to remove any free water on the surface of the specimens.		
7.7	Weigh the specimens to the nearest 0.001 lb. and measure the sample height with the micrometer dial assembly to the nearest 0.001 in.		
7.8	Measure the UCS in accordance with the applicable Sections of <u>Tex-117-E</u> , Part II.		
7.9	Determine the target cement content using the template from Article 3., "Reporting," with the UCS test results from Section 7.8.		
7.10	Optional Moisture Conditioning by 24-hr. Water Submersion.		

7.10.1	Use the M-D curve with the calculated moisture content from Sections 7.2, 7.3, or 7.4 from this procedure.		
7.10.2	Recombine the material prepared from Article 4., Materail Sampling and Preparatoin," and mold three samples in accordance with the applicable Sections of Tex-113-E.		
7.10.2.1	Prior to compaction of <u>Tex-113-E</u> , add the cement uniformly to ensure even distribution of the cement throughout the sample. The amount of cement added is a percentage based on the dry mass of the material to be treated.		
7.10.3	Cure the compacted specimens in accordance with Section 7.5.		
7.10.4	Place the specimens with the bottom porous stone only, into the container identified in Section 2.2.		
7.10.5	Fill the container to approximately 1/2 to 1 in. above the top of the specimens with tap water in a manner that does not disturb and contact the specimens.		
7.10.6	Soak each specimen in the container for 24 hr. ±1 hr.		
7.10.7	Remove each specimen from the container and use an absorptive cloth or paper towel to remove free water on the surface of the specimen.		
7.10.8	Measure the UCS in accordance with the applicable Sections of <u>Tex-117-E</u> , Part II.		
0	CALCULATIONS		
8.	CALCULATIONS		
8.1	Use the following equation to determine the percent moisture content at different cement percentages.		
	Use the following equation to determine the percent moisture content at different cement percentages.		
	Use the following equation to determine the percent moisture content at different cement percentages.  **Moisture Content = **Optimum Moisture + (0.25 x ** Cement Difference)*		
	Use the following equation to determine the percent moisture content at different cement percentages.  **Moisture Content = **Optimum Moisture + (0.25 x ** Cement Difference)*  Where:		
	Use the following equation to determine the percent moisture content at different cement percentages.  **Moisture Content = **Optimum Moisture + (0.25 x ** Cement Difference)*  **Where:  **Moisture Content = Moisture content of samples prepared for laboratory compaction;		
	Use the following equation to determine the percent moisture content at different cement percentages.  **Moisture Content = **Optimum Moisture + (0.25 x **Cement Difference)*  **Where:  **Moisture Content = Moisture content of samples prepared for laboratory compaction;  **Optimum Moisture = Optimum moisture content from the Moisture-Density curve; and  **Cement Difference = Difference in cement content between the cement content used for the Moisture-		
8.1	Use the following equation to determine the percent moisture content at different cement percentages.  **Moisture Content = **Optimum Moisture + (0.25 x **Cement Difference)*  **Where:  **Moisture Content = Moisture content of samples prepared for laboratory compaction;  **Optimum Moisture = Optimum moisture content from the Moisture-Density curve; and  **Cement Difference = Difference in cement content between the cement content used for the Moisture-Density curve and the chosen molding cement content.		
9.	Use the following equation to determine the percent moisture content at different cement percentages.  % Moisture Content = % Optimum Moisture + (0.25 x % Cement Difference)  Where:  % Moisture Content = Moisture content of samples prepared for laboratory compaction;  % Optimum Moisture = Optimum moisture content from the Moisture-Density curve; and  % Cement Difference = Difference in cement content between the cement content used for the Moisture-Density curve and the chosen molding cement content.		
9. 9.1	Use the following equation to determine the percent moisture content at different cement percentages.  % Moisture Content = % Optimum Moisture + (0.25 x % Cement Difference)  Where:  % Moisture Content = Moisture content of samples prepared for laboratory compaction;  % Optimum Moisture = Optimum moisture content from the Moisture-Density curve; and  % Cement Difference = Difference in cement content between the cement content used for the Moisture-Density curve and the chosen molding cement content.  TEST REPORT  Target Cement Content, 0.1%;		

## DMS - 6200 FILTER FABRIC

#### **EFFECTIVE DATE: MAY 2010**

- **6200.1. Description.** This Specification governs the sampling, testing, and material requirements of filter fabrics.
- **6200.2. Units of Measurements.** The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.

#### 6200.3. Definitions.

- **A. Filter Fabric**—a special fabric usually used in drainage applications to allow water flow without clogging or binding by soil particles.
  - **1.** Type 1—Type 1 is a standard weight fabric for retaining walls and soil separation.
  - **2.** Type 2—Type 2 is a high strength fabric for rock riprap or other severe use.
- **6200.4. Material Producer List.** The Materials and Pavements Section of the Construction Division (CST/M&P) maintains a material producer list (MPL) of products conforming to this Specification. Materials on the MPL, entitled "<u>Silt Fence, Filter Fabric, and Fabric Underseal</u>," require no further testing unless deemed necessary by the Project Engineer or CST/M&P. Refer to DMS-6320 for further details on qualifying for the Quality Monitoring Program and obtaining a place on the MPL.
- **6200.5. Sampling and Testing.** Sample in accordance with Tex-735-I. Perform testing in accordance with the test methods listed in Table 1.

#### 6200.6. Material Requirements.

- **A.** General Requirements. Both types of filter fabric have the following qualities:
  - The fabric consists exclusively of manmade thermoplastic fibers, is a non-woven geotextile fabric, and forms a mat of uniform quality.
  - Fabric fibers are continuous and random throughout the fabric.
  - The fabric is mildew resistant and rot-proof, and it is satisfactory for use in a wet soil and aggregate environment.
- **B. Physical Requirements.** The fabric must conform to the requirements listed in Table 1 when tested in accordance with the test methods specified.

minimum

**Physical Properties Test Method** Type 1 Type 2 Fabric Weight, on an  $136.0 \text{ g/m}^2 (4 \text{ oz/yd}^2),$  $203.0 \text{ g/m}^2 (6 \text{ oz/yd}^2),$ ambient temperature air-Tex-616-J minimum minimum dried, tension-free sample. 0.5, min ASTM D 4491 1.0, min Permittivity 1/sec. 445 N (100 lbs.) 890 N (200 lbs.) Tensile Strength, N ASTM D 4632 minimum minimum 70-100 80-120 **Apparent Opening Size ASTM D 4751** Elongation at yield, % **ASTM D 4632** 20-100 20-100 156 N (35 lbs.) 334 N (75 lbs.) Trapezoidal Tear, N **ASTM D 4533** 

Table 1
Filter Fabric Requirements

**6200.7. Packaging.** Provide fabric in the length and width specified on the plans, specified in the purchase order awarded by the State or as approved.

minimum

Wind fabric onto suitable cylindrical forms or cores to aid in handling and unrolling.

Package fabric individually in a suitable container to protect the geotextile from damage due to ultraviolet light and moisture during normal storage and handling.

**6200.8. Identification**. Identify each roll with a tag or label affixed to the outside of the roll on one end. List the following information on the tag or label:

- Unique roll number, serially designated;
- Lot number or control numbers, if any;
- Name of fabric producer;
- Style or catalog designation of the fabric, if any;
- Roll width in meters (inches); and
- Roll length in meters (yards).

**6200.9. Archived Versions.** Archived versions are available.

#### **DMS-7305**

## Fabrication and Qualification Procedure for Multi-Project Fabrication Plants of Precast Concrete Drainage Structures



Effective Date: May 2022

#### 1. DESCRIPTION

This Specification governs the fabrication requirements and qualification processes for fabrication plants producing precast concrete drainage structures listed in Article 4., "Precast Concrete Drainage Structures," of this Specification for Department projects. Precast concrete drainage units must meet the requirements of this Specification and the pertinent Items of the Department's *Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges.* 

#### 2. DEFINITIONS

The following definitions apply to this Specification.

- Cosmetic Damage. Any damage with a maximum depth of 3/8 in.
- **Diameter.** The internal diameter of round pipe. For arch and elliptical pipe reference Item 464, "Reinforced Concrete Pipe," to determine the design size using the equivalent diameter.
- **Design Strength.** The minimum concrete compressive strength at 28 days.
- Dry Cast Concrete. Fresh concrete with a relative zero slump.
- Engineer. The Chief Engineer of the Department or the authorized representative of the Chief Engineer.
- Formed Precast Units. Precast drainage units fabricated with wet cast (conventional or SCC) concrete.
- Machine-Made Precast Units. Precast drainage units fabricated with dry cast concrete.
- Multi-Project Fabrication Plant. A facility at an offsite location fabricating precast members. This definition also applies to single-contract offsite facilities.
- Precast Units. Precast drainage units fabricated by a process utilizing either dry or wet cast concrete.
- Self-Consolidating Concrete (SCC). Wet cast concrete meeting the slump flow requirements of Item 421, "Hydraulic Cement Concrete," is highly workable, flows through densely reinforced or complex structural elements under its own weight, and adequately fill voids without segregation or excessive bleeding without the need for vibration.
- Temperature Probe. Thermocouple for measuring concrete temperature or air temperature.
- Temperature Recording Device. Data logger for recording temperatures from the temperature probes.
- Wet Cast Concrete. Fresh concrete meeting the placement slump or slump flow requirements of Item 421.

#### 3. MATERIAL PRODUCER LIST

For the precast concrete drainage structures listed under Article 4., "Precast Concrete Drainage Structures," the Materials and Tests Division (MTD) maintains the MPLs of fabrication plants conforming to the requirements of this Specification. Precast drainage structures produced by fabricators appearing on the applicable MPL require no further Department inspection and testing unless deemed necessary by the Department project engineer or MTD. Precast concrete drainage structures used on Department projects must be produced by fabrication plants listed on the applicable MPL.

#### 4. PRECAST CONCRETE DRAINAGE STRUCTURES

Precast concrete drainage structures include:

- Concrete Box Culverts (formed precast and machine-made precast) referenced in Item 462, "Concrete Box Culverts and Drains."
- Junction Boxes, Manholes, and Inlets (formed precast and machine-made precast) referenced in Item 465. "Junction Boxes, Manholes, and Inlets," and
- Reinforced Concrete Pipe (formed precast and machine-made precast) referenced in Item 464.

#### 5. BIDDERS' AND SUPPLIERS' REQUIREMENTS

Use of pre-qualified product does not relieve the Contractor of the responsibility to provide product that meets this Specification. The Department may inspect or test material at any time and reject any material that does not meet the Specifications.

#### 6. PRE-QUALIFICATION PROCEDURE

6.1. **Pre-Qualification Request.** Submit a request for evaluation under DMS-7305 to DMS\_Prequal@txdot.gov.

Include the following information in the request:

- company and fabrication plant name;
- physical and mailing addresses;
- contact person, titles, phone number, and email address;
- list of precast products (box culvert, RC pipe, junction boxes, manholes, or inlets);
- written plant QC and Production Procedures for each production method (i.e. formed precast or machine-made precast, SCC, vibratory, centrifugal, etc.) for each product as defined in Article 4., "Precast Concrete Drainage Structures";
- list of all on-site QC personnel with copies of current QC certifications and a detailed description of their QC related experience, as required by Article 12., "Quality Control Personnel and Testing";
- list of welding shops fabricating the supplied welded steel grates and frames (if applicable);
- the attained plant certifications, ACPA QCast Plant Certification (Texas Version) or NPCA Plant Certification (Texas Version), for box culvert and RC pipe fabrication plants and for precast junction box, manhole, and inlet fabrication plants. In addition to being certified, fabrication plants must receive an overall audit score of at least an 80 on the most recent audit; and
- copy of the most recent ACPA or NPCA audit report, with the Texas addendum included, and written response to any specific deficiencies noted in the ACPA or NPCA audit report and the Texas addendum. The Engineer must approve any proposed deviations from the Specifications required in the ACPA or NCPA plant certification program.
- 6.2. **Evaluation.** MTD will review the qualification request documentation. If the qualification request includes the required information, MTD will perform an initial Department-directed plant audit for each product type to ensure compliance with this Specification. The Department will evaluate all fabrication plants for adequate equipment, processes, production methods, organization, experience, knowledge, and competent personnel to produce Specification compliant product.
- 6.2.1. **Qualification.** If the required submittals and audits verify compliance with this Specification, the Department will list the fabrication plant on the applicable MPL. This approval is limited to the type of product and production method submitted in accordance with Section 6.1., "Pre-qualification Procedure." Discrepancies identified in the audit must be adequately addressed in a manner acceptable to the Department before being placed on the MPL. MTD reserves the right to perform additional audits (announced or unannounced) at its discretion for the plant to remain on the MPL as an approved fabrication plant of precast concrete drainage structures.

Fabrication plants listed on the MPL must annually attain and immediately submit the following to maintain approval status:

- current ACPA or NPCA Plant Certification (Texas Version) for the applicable precast concrete drainage structures. In addition to being certified, fabrication plants must receive an overall audit score of at least an 80 on the most recent audit;
- copy of the most recent ACPA or NPCA audit report, with the Texas addendum included, and written responses to any deficiencies noted in the ACPA or NPCA audit report and to any failed items in the Texas addendum:
- copy of any other correspondence relating to the plant's ACPA or NPCA Plant Certification status;
- successful completion of any Department-directed audits and any follow-up plant audits by adequately implementing corrective actions for all deficiencies; and
- copies of current QC personnel certifications for on-site QC personnel when changes occur.

Fabrication plants must also perform the following to maintain approval status:

- maintain the laboratory, equipment, and batch plant in adequate condition to function properly for the intended use; and
- perform two internal compliance audits per year (summer and winter) using Department furnished audit checklist. Compliance audits must be completed within 14 days from the start of an audit and performed by qualified QC personnel approved by the Department. Consecutive internal audits must be performed at intervals of 5 to 7 mo. Submit audit findings and corrective actions for each deficiency which must be implemented within 15 days from the completion of the audit.

Failure to promptly comply with the above may result in disqualification, which includes removal from the MPL.

- 6.2.2. **Failure.** Fabrication plants not qualified under this Specification may not furnish precast concrete drainage structures for use on Department projects and must show evidence of correction of all deficiencies before reconsideration for qualification.
- Random Inspection and Testing. The Department reserves the right to inspect, sample, test, conduct random audits and review documentation at any time to ensure compliance with this Specification. Provide facilities and access to allow for inspection of materials, the process of fabrication, and the finished precast concrete drainage structures. Coordinate the scheduling of any inspections the Department requests to perform.
- 6.4. Disqualification. Any fabricator failing to comply with the requirements of this Specification is subject to disqualification, which includes removal from the MPL. A disqualified fabricator is prohibited from furnishing product to Department projects and may not bid any work let during the disqualification period. The disqualification period will be a minimum of 30 days or as determined by MTD.

Causes for disqualification and removal from the MPL may include, but are not limited to:

- repetitive poor quality and workmanship;
- falsification of or incomplete documentation;
- lack of certified or qualified QC personnel;
- not following approved QC and production procedures; or
- certifying or furnishing product not meeting specifications.

If a fabricator has been disqualified, all previously produced products will be subject to review and possible removal from assigned projects. If the Department disqualifies a fabricator, the Department may permit subcontracting remaining product quantities for active projects to another Department-approved fabrication plant for the specific product.

- 6.5. **Re-Qualification.** Once the disqualification period established by MTD has elapsed, the fabricator may begin the re-qualification process by providing the Department with an implemented reconciliation plan including, at a minimum:
  - evidence of corrected deficiencies and corrective measures to prevent reoccurrences;
  - passing an additional ACPA or NPCA audit for the applicable precast concrete drainage structures, and Department-directed audit; and
  - ensuring compliance with all requirements in this Specification.

The disqualified fabricator will bear all costs associated with re-qualification.

6.6. **Inactive Fabricator.** If a fabricator does not furnish any precast concrete drainage structures to Department projects for a period of two years, MTD may remove the fabricator from the MPL due to inactivity.

MTD will consider future qualification after the fabricator is awarded a Contract to furnish precast concrete drainage structures to a Department project and complies with this Specification.

#### 7. MATERIALS

- 7.1. **Aggregate.** Maintain aggregates above saturated surface dry condition when using mixer moisture probes. Sprinkle or shade aggregates as needed.
- 7.2. **Concrete.** Provide concrete and component materials in accordance with Item 421, except as otherwise noted in this Specification. Furnish Class H concrete with the following stipulations:
  - Use one of the mix design Options 1-8 meeting the requirements in Section 421.4.2.6., "Mix Design Options."
  - Instead of Options 1-8, when the cementitious material content does not exceed 520 lb. per cubic yard, any fly ash listed in the MPL may be used at a cement replacement of 20% to 50%.
  - Use coarse aggregate grades 3-8 for formed precast units.
  - Aggregate gradation requirements will not apply for machine-made precast units.
  - Proportion the concrete materials with a water to cementitious (w/c) ratio between 0.28 and 0.45 and with an allowable variation during production of ± 0.02 from the approved mix design.

Provide concrete meeting the approved mix design.

When sulfate resistant concrete (SRC) is required, furnish concrete meeting the Class "X" (SRC) requirements in accordance with Table 8, "Concrete Classes," of Item 421.

Aggregate hoppers or storage bins for fine and coarse aggregate must be equipped with electric moisture probes for SCC unless approved.

- 7.2.1. **Mixing of Concrete.** Volumetric mixers may be permitted if approved. Do not use volumetric mixers for SCC. Do not place discharged concrete back into the concrete mixer.
- 7.2.1.1. Formed Precast Units. Mix concrete for a period of 1 min. for 1 cu. yd. and 15 sec. for each additional cubic yards of rated capacity of the mixer. Count the mixing time from the time all materials are in the drum. Increase mixing time, if necessary, to achieve a uniform mix.
- 7.2.1.2. **Machine-Made Precast Units.** Mix concrete for a period of 35 sec. for 1 cu. yd. and 15 sec. for each additional cubic yard of rated capacity of the mixer. Count the mixing time from the time all materials are in the drum. Increase mixing time, if necessary, to achieve a uniform mix.
- 7.2.2. **Concrete Trial Batches.** Provide a work plan, preliminary, and final trial batch data for proposed concrete mix designs per <u>Tex-703-l</u> for precast units.

Submit Form PC-342-R for proposed concrete mix designs for all precast units before use.

- 7.3. **Reinforcing Steel.** Provide and store reinforcing steel in accordance with Item 440, "Reinforcement for Concrete." Base metal rod to be cold-drawn for helical RC pipe cage production must comply with Section 6.1.1., "Buy America," requirements but does not need to be furnished by a Department-approved reinforcing steel mill.
- 7.4. **Hydraulic Cement Concrete Curing Materials.** Furnish concrete curing compounds in accordance with DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants."

#### 8. FABRICATION

Provide precast drainage structures conforming to the design shown on the plans and to the following, except as otherwise noted in this Specification:

- ASTM C 76 or ASTM C 655, unless otherwise shown on the plans, for circular pipe,
- ASTM C 478 for circular reinforced manhole structures,
- ASTM C 506 for arch pipe,
- ASTM C 507 for horizontal elliptical pipe, and
- ASTM C 1577, for box culverts, unless otherwise shown on the plans.

Maintain on file Department-approved shop drawings for precast drainage structures when required.

#### 8.1. Equipment.

- 8.1.1. **Batch Plant.** Provide concrete plants and mixing equipment, hauling equipment, and testing equipment in accordance with Article 421.3., "Equipment." Truck mixers are not permitted for machine-made precast units. Volumetric mixers must not be permitted unless approved. Check batching accuracy of volumetric water batching devices in conformance with NRMCA guidelines.
- 8.1.2. **Forms.** Maintain forms free from dents, grease, or other foreign materials that may affect the appearance of the member, and clean forms thoroughly before each casting operation and immediately before applying a form-release agent. Provide external forms complying with the requirements of Section 424.4.2.1.1., "External Forms."
- 8.1.3. **Temperature Recording Equipment.** Concrete temperature probes, curing enclosure air temperature probes, and temperature recording devices referenced in Item 424, "Precast Concrete Structural Members (Fabrication)," must meet the following:
  - temperature recording devices must be able to generate a graphic displaying the temperature profile of the entire curing period at intervals not to exceed 15 min.; and
  - calibrate temperature recording devices at least once per year, or more frequently, if recommended by the manufacturer. Temperature recording devices must be accurate to within ± 2°F in the range of 0 - 200°F. The graph generated by the temperature recording device must be readable to within 5°F.

Provide a minimum of one standby temperature recording device in the plant for emergency use.

- 8.2. **Placing Reinforcing Steel.** Place reinforcing steel in accordance with the plans, Item 440, and the required ASTM standard, if applicable.
- 8.3. **Concrete Placement.** Place concrete only when its temperature at time of placement is a minimum of 45°F and a maximum 95°F.
- 8.3.1. **Consolidation of Concrete.** Consolidate concrete in accordance with Section 424.4.2.5.3., "Consolidation of Concrete," except that concrete for machine-made RC pipe may be consolidated by other approved compaction methods. Do not consolidate SCC with vibration.

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#### 8.3.2. **Construction Joints.** Make construction joints in accordance with Section 420.4.7.7., "Construction Joints."

8.4. **Curing of Concrete.** Cure concrete to promote early cement hydration by providing adequate moisture on exposed surfaces and by maintaining the required concrete temperature or curing enclosure air temperature at the concrete surface. Begin curing after form removal and maintain adequate moisture on the surfaces to prevent shrinkage that may cause cracking. Provide interim curing, when conditions warrant, that will not damage the concrete surface. Make immediate corrections to provide effective curing when shrinkage cracks on the surface indicate poor curing practices.

Cure precast units in accordance with Section 424.4.2.7., "Curing of Concrete," with the following stipulations:

- ambient temperature at the concrete surface may be monitored instead of the internal concrete temperature in accordance with Table 2, "Temperature Probe Requirements," of Item 424. Maintain enclosure or concrete temperature at or above 45°F during the curing period;
- cure machine-made precast units using steam, water, membrane curing compound or a combination thereof. Other methods must be approved;
- for machine-made precast units cured with steam or water, cure for a sufficient duration to prevent plastic shrinkage cracks and so the concrete will develop the specified compressive strength at 28 days or less, or the specified D-load will be obtained, whichever is applicable;
- for machine-made precast units cured using a membrane curing compound, leave the membrane intact until all concrete strength requirements are met or the specified D-load is obtained, whichever is applicable;
- when steam curing precast units, use a minimum of one temperature recording device per day per the following:
  - every 250-pipe sections, or fraction thereof, and
  - every 30-sections, or fraction thereof, for all other precast units; and
- when accelerated curing is used, enclosure temperature must be raised uniformly at a maximum rate of 40°F per hour.

Provide curing enclosures with unique identification numbers that do not allow steam to escape. When probes are not placed in all steam enclosures each day, rotate the placement of probes so each enclosure is monitored at least once every two weeks.

- 8.5. **Workmanship.** Repair damaged precast units in conformance with the applicable Annex of this Specification, except for the following:
  - cosmetic damage as defined in Article 1., "Definitions," and
  - membrane curing compounds meeting the requirements of <u>DMS-4650</u> may be used instead of moist curing for repairs.

Before certification of product, remove:

- concrete, paste, dirt, oil, or other bond-breaking substances from exposed reinforcing steel; and
- laitance, dirt, oil, or other bond-breaking substances from concrete surfaces to be in contact with cast-inplace concrete.
- 8.6. **Storage of Precast Units.** Store precast units on a level surface and in a manner preventing damage to the members. Do not place any load on box culverts until design strength is reached and curing is completed.
- 8.7. **Shipping.**
- 8.7.1. **Machine-Made Precast RC Pipe.** Do not ship machine-made precast pipe fewer than three days after casting unless a representative three-edge bearing (3EB) test is performed before shipping confirming D-Load strength compliance. Concrete core or cylinder compression testing may be performed instead of 3EB testing for 66-in. diameter and larger machine-made precast pipe.

- 8.7.2. **All Other Precast Units.** Ship precast units after design strength, curing, and all other requirements have been met. Test for design strength in accordance with Table 1, "Contractor Minimum Materials QC Sampling and Testing Frequencies."
- 8.8. **Marking.** Mark each precast unit with the following by indenting, or painting with waterproof paint:
  - name or trademark of fabricator and plant location,
  - ASTM designation and product designation (when applicable),
  - date of manufacture,
  - product size,
  - designation "TX" for precast units fabricated under DMS-7305,
  - fabricator's designated approval stamp for each approved unit, and
  - designation "SR" meeting sulfate-resistant concrete plan requirements (when applicable).

Note: Place the "TX" designation the day after casting or immediately after form removal. All product markings for precast units must be legible until the time of shipment.

- 8.8.1. **Precast Box Culverts Marking.** Mark box culverts with the following in addition to the product markings specified in Section 8.8., "Marking":
  - provide a unique identification number for each unit during fabrication,
  - minimum and maximum fill heights,
  - match mark for proper installation, when required per Section 8.11.3., "Precast Box Culverts,"
  - boxes to be used for jacking and boring (when applicable), and
  - for box culverts without lifting holes, mark one end of each box section on the inside and outside walls to indicate the top and bottom as it will be installed.
- 8.8.2. **RC Pipe Marking.** Mark RC pipe with the following in addition to the product markings specified in Section 8.8., "Marking":
  - class or D-Load of pipe, and
  - RC pipe to be used for jacking and boring (when applicable).

Clearly mark one end of each section during the process of manufacture or immediately thereafter for pipe with elliptical reinforcement. Mark the pipe on the inside and outside of opposite walls to show the location of the top or bottom of the pipe as it should be installed unless the external shape of the pipe clearly indicates the correct position of the top and bottom.

- 8.9. Lifting Holes.
- 8.9.1. **Precast Box Culverts.** Provide no more than four lifting holes in each section. Lifting holes may be cast, cut into fresh concrete after form removal, or drilled. Provide lifting holes of sufficient size for adequate lifting devices based on the size and weight of the box section. Do not use lifting holes larger than 3 in. in diameter. Do not displace more than 5 in. in any direction of reinforcement per layer for lifting holes. Repairs must be per the applicable Annex of this Specification.
- 8.9.2. **RC Pipe.** Do not place more than two holes for lifting and placing in each section of precast pipe. Cast, cut, or drill the lifting holes in the wall of the pipe. The maximum hole diameter is 3 in. at the inside of the pipe wall and 4 in. at the outside surface. Do not displace more than 5 in. in any direction of reinforcement per layer for lifting holes. Repairs must be per the applicable Annex of this Specification.
- 8.10. **Physical Testing Requirements.** For physical test requirements, refer to Table 1, supplemented by the following:
- 8.10.1. All Precast Units with the Exception of Machine-Made RC Pipe. Concrete strength may be determined with cores when 28-day concrete cylinders fail to achieve the minimum required compressive design

strength. Obtain a core from three different sections selected at random from the lot represented by the failed cylinders. Cores must be obtained, prepared, and tested for compressive strength in accordance with ASTM C 497. For material acceptance, the average of the three cores must obtain 100% of the required compressive design strength as specified in the Contract. Failed test results from compressive strength cores will be cause for rejection of the lot.

- 8.10.2. **Machine-Made RC Pipe.** Test for the load to produce a 0.01-in. crack or 15% in excess of the required D-Load, whichever is less. Three-edge bearing test specimens meeting the requirements of this Specification, including Annex A1, "Round Sections," may be certified for use.
- 8.10.2.1. **Machine-Made RC Pipe 66 in. Diameter and Larger.** As an alternate to the three-edge bearing test, concrete pipe 66 in. in diameter and larger may be accepted on the basis of compressive strength cylinders or cores cut from the wall of the pipe. Plug and seal cores holes in the pipe wall after testing. For acceptance, cylinder and core test results must obtain 100% of the required compressive design strength as specified in the Contract within 28 days of fabrication.

If the compressive strength of the cylinders or the compressive strength of the original cores do not meet 100% of the design strength by an age of 28 days, obtain a core from three different sections selected at random from the lot represented by the original failed test specimens. Cores must be obtained, prepared, and tested for compressive strength in accordance with ASTM C 497. For material acceptance, the average of the three cores must obtain 100% of the required compressive design strength as specified in the Contract. Failed test results from compressive strength cores will be cause for rejection of the lot.

- 8.11. Tolerances.
- 8.11.1. **Precast Circular Manholes.** Ensure circular manholes meet the following:
  - permissible variations listed in ASTM C 478, and
  - for wall thicknesses in excess of plan requirements, proper jointing is not affected.
- 8.11.2. **Precast Junction Boxes and Inlets.** Ensure junction boxes and inlets meet the following:
  - dimensional, squareness, slab and wall thickness tolerances listed ASTM C 913 with the following stipulations:
    - $\blacksquare$  the maximum tolerance for dimensions over 20-ft. is  $\pm$  1/2-in.,
    - $\blacksquare$  the maximum squareness tolerance for measured lengths over 20-ft. is  $\pm$  3/4-in., and
  - for slab and wall thicknesses in excess of plan requirements, proper jointing is not affected.
- 8.11.3. **Precast Box Culverts.** Ensure box culvert sections meet the following:
  - permissible variations listed in ASTM C 1577,
  - for slab and wall thicknesses in excess of plan requirements, proper jointing is not affected, and
  - the sides of the section at each end must not vary from being perpendicular to the top and bottom by more than 1/2 in. when measured diagonally between opposite interior corners. Deviations from this tolerance will be acceptable if the sections can be fitted at the plant and joint openings at any point do not exceed 1 in. Use match marks for proper installation on sections accepted in this manner.
- 8.11.3.1. **Boxes for Jacking Operations.** For boxes to be used for jacking operations (as defined in Item 476, "Jacking, Boring, and Tunneling Pipe or Boxes,") meet the following additional requirements:
  - box ends must be square with no point deviating more than 3/8 in. from any plane placed on the end of the box perpendicular to the box sides, and
  - slab and wall thickness must not be less than specified on the plans and must not exceed the specified thickness by more than 1/2 in.
- 8.11.4. **RC Pipe.** Ensure RC pipe meets the permissible variations of the applicable ASTM specification.

#### 9. QUALITY CONTROL AND PRODUCTION PROCEDURES

Maintain and electronically submit for approval QC and production procedures, including the following, at minimum, to ensure product compliance with Department Specifications. Quality Control and Production Procedures must include enough detail to provide instructions to plant personnel on how and when to perform duties.

- work plan, trial batch, and pilot test data for proposed concrete mix designs per <u>Tex-703-I</u>, (except slump, air content, unit weight, yield, and initial set of concrete does not apply for dry cast concrete);
- maintaining and cleaning forms;
- sampling aggregate for free moisture and absorption testing;
- storing reinforcing steel;
- verifying correct reinforcing steel cages are constructed and provided for each unit (reference Article 440.3., "Construction," for formed precast junction boxes and inlets and ASTM C 478 for precast manhole circular sections); for machine-made precast units only, instead of verifying reinforcing steel cages for each unit, provide a frequency meeting the minimum requirements in Section 10.2., "Precast Concrete Box Culverts and RC Pipe";
- procedures for verifying steel cage designs meet the appropriate ASTM and Department Specifications for box culverts and RC pipe before fabrication;
- delivery of concrete;
- properly positioning and maintaining reinforcing steel and embedment placement before and during casting;
- placing and consolidation of concrete for precast units;
- maintaining concrete placement temperatures within specified limits;
- finishing unformed concrete surfaces;
- protecting concrete from inclement weather during placement;
- procedures for minimizing damage, including repetitive damage to finished product during stripping, handling, and transporting;
- curing concrete for precast units;
- procedures for concrete fittings and transitions. Provide procedures for fabrication and QC inspection (pre-pour and post-pour), that include, at a minimum, reinforcement placement, welding reinforcing steel, concrete placement, consolidation, and curing:
- storing precast sections in accordance with Section 8.6., "Storage of Precast Units," and in a manner that prevents damage to the members;
- inspecting finished product, including dimensions, to ensure compliance with the Contract, approved shop drawings (if applicable), and standard drawings. Dimensional checks must be performed on each formed precast junction box, manhole and inlet, and at the minimum frequency specified in Article
- 10, "Documentation," for all other precast units. Provide procedures for visual post pour inspection of each precast unit before performing any repairs including repairs to cosmetic damage;
- minimizing repetitive fabrication issues or damage to units (such as concrete grout leakage, open texture, honeycombing, and spalling);
- identifying and marking deficient units (repairable and unacceptable units), and isolating unacceptable units (including removal of the fabricator's approval stamp); and
- verifying product is marked with fabricator's approval stamp, is properly identified, and is not damaged or in need of repair at time of shipping.

Submit updated procedures for approval before use when requesting changes to the approved Quality Control and Production Procedures. Include date of revision and highlight changes for each submittal.

#### 10. DOCUMENTATION

At a minimum, maintain the following documentation and make available to the Department. Submit electronically when requested:

- 10.1. **General.** The following documentation is required to be maintained on file by precast concrete drainage structure fabrication plants:
  - personnel certifications (retain until superseded);
  - appropriate special provisions and general notes (project specific or statewide) and approved shop drawings (when required) or project specific Contract plans (retain until final acceptance of project);
  - certifications and shipping invoices for concrete component materials (documentation must have the pertinent material information as listed on the Department's MPL) (minimum 1 yr. retention);
  - certifications and shipping invoices for each lot number of repair materials (documentation must have the pertinent material information as listed on the Department's MPL) (minimum 1 yr. retention);
  - mill test reports and shipping invoices for reinforcing steel. Renforcing steel must be produced by Department approved mills listed on the Department's MPL (minimum 1 yr. retention);
  - aggregate test results for materials sampled at the fabrication plant or ready mix plant for formed precast units (minimum 6 mo. retention);
  - moisture correlation test results for aggregate bin moisture probes (minimum 6 mo. retention);
  - completed Department Form PC-8, "Precast Concrete Worksheet," (minimum 7 yr. retention);
  - current concrete mix designs and accompanying preliminary trial batches and final trial batch test data using Department Form D9-PC-342R) (minimum 7 yr. retention after final use);
  - certifications for approved concrete repair materials (minimum 1 yr. retention);
  - current NRMCA certification or current inspection report in accordance with Section 421.3.1., "Concrete Plants and Mixing Equipment," (retain until superseded);
  - for volumetric mixers, if approved, test data for <u>Tex-472-A</u> and a certification of compliance with ASTM C 685 (retain until superseded);
  - current calibration records for concrete plant scales (reference Section 421.3.1.1., "Scales,") (retain until superseded);
  - plant laboratory qualification documentation, as required in the applicable sections of <u>Tex-237-F</u> and <u>Tex-498-A</u> (retain until superseded);
  - Department Form 596, "Concrete Batch Ticket," or equivalent (minimum 3 mo. retention);
  - current inspection report for truck mixers and agitators, when used (reference Section 421.3.1. for precast formed units)(retain until superseded);
  - current calibration records for compression testing machines and other equipment (retain until superseded);
  - current list of certified QC personnel including copies of their certifications as required in this Specification; and
  - internal audit findings and corrective actions (minimum 1 yr. retention).
- 10.2. **Precast Concrete Box Culverts and RC Pipe.** The following additional documents must be maintained on file by fabrication plants of precast box culverts and RC pipe:
  - shop drawings for box culverts, when required, approved by the Department per Article 8, "Fabrication," (minimum 2 yr. retention or until superseded);
  - mill test reports and shipping invoices received for reinforcing steel rod to be subsequently cold-drawn during helical RC pipe cage production (minimum 2 yr. retention);
  - all required test results (including tensile strength, bend, and reduction of area) for circumferential wire reinforcement cold-drawn during helical RC pipe cage production at the fabricator's facility (minimum two year retention). Test circumferential wire in the cold-drawn state;

- completed reinforcing steel cage inspection worksheets for RC pipe for each pipe size, class, and wall design at the start of each production run and after every 6 hr. of production thereafter. If discrepancies exist, increase minimum cages inspected to four or more until discrepancies are resolved (minimum 2 yr. retention);
- completed reinforcing steel inspection worksheets for box culverts for each size, and fill heights at the start of each production run and after every 6 hr. of production thereafter. If discrepancies exist, increase minimum cages inspected to four or more until discrepancies are resolved (minimum 2 yr. retention);
- completed post-pour inspection worksheets for RC pipe. Measure and document post-pour dimensional inspections for a minimum two pipe sections per size, class, wall design, and cast date. If discrepancies exist, increase minimum sections inspected to four or more until discrepancies are resolved (minimum 2 yr. retention). Provide visual post pour inspection of all RC pipe before performing any repairs including repairs to cosmetic damage;
- completed post-pour inspection worksheets for box culverts. Measure and document post-pour dimensional inspections for a minimum two box sections, or per the applicable plant certification requirement, whichever is greater, per size, fill heights, and cast date. If discrepancies exist, increase the minimum sections to four or more until discrepancies are resolved (minimum 2 yr. retention). Provide visual post pour inspection of all boxes before performing any repairs including repairs to cosmetic damage; and
- welded splice test results for RC pipe steel reinforcement (minimum 2 yr. retention).
- 10.3. **Precast Concrete Junction Boxes, Manholes, and Inlets.** The following additional documents must be maintained on file, with copies furnished to the project site, by fabrication plants of precast junction boxes, manholes, and inlets:
  - mill test reports (for steel material) and certifications (for cast iron material) for frames, grates, rings, and covers. Maintain copies of these documents with a completed FORM-D-9-USA-1 (Department Form 1818) "Material Statement," on file (retain until final acceptance of project);
  - galvanizing certifications for galvanized steel and iron items. Maintain copies of these certifications on file (retain until final acceptance of project); and
  - manufacturer's certification stating frame, grate, ring, and cover castings meet the proof-load testing requirements of AASHTO M 306 for traffic service castings (reference Section 471.2.3., "Documentation,") (retain until final acceptance of project).

#### 11. CERTIFICATION OF PRODUCT

QC personnel must, at a minimum, within 14 days of the product cast date:

- verify product conformance with the shop drawings (when required) and all Contract requirements;
- verify inspections and repairs are complete. Place an identifying mark on products indicating the inspections and repairs are complete;
- mark completed and approved precast concrete products by placing the fabricator's approval stamp on each member within 14 days of product cast date or when required concrete compressive strength has been met. Place this marking on precast products after all specification requirements have been met. The Department-approved stamp must be legible and listed on the MPL before use; and
- mark unacceptable precast concrete products with a permanent mark, acceptable to the Engineer, near the product identification marks, or remove the "TX" designation from the product marking.Note: The identification requirements for unacceptable precast units also apply to product damaged in the storage yard.

Sign Department Form PC-8 certifying material, inspections, documentation, repairs (if applicable), and final product acceptance were properly performed and inspected immediately after all specification requirements have been met including concrete compressive strength.

#### 12. QUALITY CONTROL PERSONNEL AND TESTING

Provide an adequate number of qualified personnel to ensure all fabrication operations meet Department specifications and to perform all required inspections in Section 12.5.1., "Inspection," and the testing in Table 1. QC personnel must be on-site and independent of production personnel, as determined by the Engineer. QC personnel must be proficient in utilizing the applicable specifications and test methods and in verifying compliance with the QC and production procedures referenced in Article 9, "Quality Control and Production Procedures." Personnel performing these duties are subject to Department approval. Immediately contact MTD when Quality Control personnel changes occur.

12.1. **Quality Control Supervisor (On-Site).** QC Supervisors must be on-site working primarily in the production areas directly overseeing the QC technicians and performing routine inspection during production operations. QC Supervisors must have the authority and management's support to make general inspection-related decisions. QC Supervisors must maintain the certifications required for the specific drainage structures produced, and fabrication process used, as stated below:

#### 12.1.1. Box Culverts and RC Pipe Fabrication Plants.

- ACI Concrete Field Testing Technician Grade I;\*
- ACI Aggregate Testing Technician Level 1; \*
- ACI Concrete Strength Testing Technician; and
- PCI Level I Quality Control Technician, or NPCA Production and Quality School Level II QA/QC certification, or ACPA Quality School certification. (Re-certification required every 5 yr.)
- (\*) Not required for fabricators of machine-made precast box culverts and RC pipe.

#### 12.1.2. **Junction Boxes, Manhole, and Inlet Fabrication Plants.**

- ACI Concrete Field Testing Technician Grade I;\*
- ACI Aggregate Testing Technician Level 1;\*
- ACI Concrete Strength Testing Technician; and
- PCI Level I Quality Control Technician, or NPCA Production and Quality School Level II QA/QC, or ACPA Quality School certification; (Re-certification required every 5 yr.)
- (\*) Not required for fabricators of machine-made precast junction boxes, manholes, and inlets.
- 12.2. **Quality Control Technicians (On-Site).** QC Technicians must maintain the certifications required for the specific drainage structures produced, and fabrication process used, as stated below:

#### 12.2.1. Box Culverts and RC Pipe Fabrication Plants.

- ACI Concrete Field Testing Technician Grade I, for QC personnel performing fresh concrete testing per Table 11;
- ACI Aggregate Testing Technician Level 1, for QC personnel performing aggregate testing per Table 12;
- ACI Concrete Strength Testing Technician for QC personnel performing compressive strength tests per Tex-418-A (ASTM C39);
- PCI Level I Quality Control Technician, or NPCA Production and Quality School Level II QA/QC, or ACPA Quality School certification required for QC personnel performing the required inspections of box culverts: and
- PCI Level I Quality Control Technician, or NPCA Production and Quality School Level I, or ACPA Quality School certification for QC personnel performing three-edge bearing tests and the required inspections of RC pipe. (Re-certification required every 5 yr.)

<sup>1</sup>For fresh dry cast concrete temperature testing, QC personnel with current PCI Level I Quality Control Technician, or ACPA Quality School, or NPCA Production and Quality School Level I certification may perform this test.

<sup>2</sup>For aggregate moisture content testing, Fabricator personnel qualified by the QC Supervisor for this particular test may perform it.

#### 12.2.2. Junction Boxes, Manholes, and Inlets Fabrication Plants.

- ACI Concrete Field Testing Technician Grade I for QC personnel performing fresh concrete testing per Table 11:
- ACI Aggregate Testing Technician Level 1 for QC personnel performing aggregate testing per Table 12;
- ACI Concrete Strength Testing Technician for QC personnel performing compressive strength tests per Tex-418-A (ASTM C 39); and
- PCI Level I Quality Control Technician, or NPCA Production and Quality School Level I, or ACPA Quality School certification for QC personnel performing the required inspections. (Re-certification required every 5 yr.)

<sup>1</sup>For fresh dry cast concrete temperature testing; QC personnel with current PCI Level I Quality Control Technician, or ACPA Quality School, or NPCA Production and Quality School Level I certification may perform this test.

<sup>2</sup>For aggregate moisture content testing, Fabricator personnel qualified by the QC Supervisor for this particular test may perform it.

- 12.3. **Fabricator Safety Point of Contact.** Designate a safety point of contact. Fabricator must adhere to applicable safety regulations and own safety program.
- 12.4. **Commercial Laboratories.** The fabrication plant may use commercial laboratory personnel or facilities to perform the testing in Table 1 provided they meet the following requirements:
  - technicians must possess the following:
    - current ACI Concrete Strength Testing Technician certification, for QC personnel performing concrete compressive strength testing;
    - current ACI Aggregate Testing Technician Level 1 certification, for personnel performing aggregate testing per Table 1; and
  - for testing performed at the commercial lab, the lab must be AASHTO-accredited in the specific tests to be conducted.
- 12.5. **Responsibilities.** QC is solely the responsibility of the fabricator. Perform the following activities, at a minimum, to ensure the quality and acceptability of the fabricated products.
- 12.5.1. **Inspection.** QC personnel must follow approved procedures and verify correct fabrication processes for each member and will inspect all finished products. QC personnel must ensure at a minimum:
  - proper preparation or evaluation of concrete mix designs per <u>Tex-703-l</u>;
  - proper form dimensions, condition, cleanliness, and placement;
  - proper placement of reinforcing steel and embedments;
  - proper procedures for batching, mixing, placing, consolidating, finishing, and curing of concrete;
  - proper procedure for final inspection of product;
  - proper procedure for damage evaluation and repairs in accordance with this Specification and the Department's Concrete Repair Manual;
  - proper procedures for storage of applicable component materials;
  - proper handling, storage, and loading of members, including verifying unacceptable units are marked in accordance with Article 11, "Certification of Product," and
  - acceptable product is properly and legibly marked, stamped approved, and product is not damaged or in need of repair in storage and before shipping.

#### 13. PLANT TESTING EQUIPMENT

- 13.1. **Laboratory Testing Equipment.** Laboratory equipment must comply with applicable section of <u>Tex-237-F</u> and <u>Tex-498-A</u> and is subject to Department approval. Calibrate all equipment and house it on-site in a weatherproof enclosure. Recalibrate equipment at the Contractor's expense per <u>Tex-498-A</u> and as follows:
  - as required by the manufacturer,
  - when suspect results, malfunction, repair work occurs, or
  - as directed by the Engineer.
- 13.2. Concrete Compression Testing Machine and Three-Edge Bearing Testing Machine. Calibrate the concrete compression testing machine and three-edge bearing testing machine in accordance with ASTM C 497. Calibrate at least once every 12 mo. or whenever accuracy is guestioned.

Table 1
Contractor Minimum Materials QC Sampling and Testing Frequencies

Contractor Minimum Materials QC Sampling and Testing Frequencies  Material Test Method Frequency		
iviateriai		Frequency
Fine Aggregate	SieveAnalysis¹ per <u>Tex-401-A</u> Fineness Modulus¹ per <u>Tex-402-A</u>	<ul> <li>All Formed Precast Units - one per 1,000-cu. yd. of concrete production, Min one biweekly per source<sup>2</sup></li> <li>All Machine-Made Precast Units – Not Required</li> </ul>
	Sand Equivalent <sup>1</sup> per Tex-203-F	
	Specific Gravity and Absorption <sup>3</sup> per Tex-403-A	
	Unit Weight³ per <u>Tex-404-A</u>	One per 6 mo. and when the material source changes.
	Moisture Content <sup>1 or 4</sup> per <u>Tex-409-A</u> , <u>Tex-425-A</u> , or ASTM C 566	One before the first batch of concrete placed each day and when there is an apparent change. <sup>5</sup>
	Sieve Analysis¹ per <u>Tex-401-A</u>	<ul> <li>All Formed Precast Units - one per 1,000-cu. yd. of concrete production, Min one biweekly per source<sup>2</sup></li> </ul>
	Decantation <sup>1</sup> per <u>Tex-406-A</u>	All Machine-Made Precast Units – Not Required
Coarse Aggregate	Specific Gravity and Absorption <sup>3</sup> per <u>Tex-403-A</u>	One per 6 mo. and when the material source changes.
	Unit Weight³ per <u>Tex-404-A</u>	One per office and when the material source changes.
	Moisture Content <sup>1 or 4</sup> per <u>Tex-409-A</u> , or ASTM C 566	One before the first batch of concrete placed each day and when there is an apparent change. <sup>5</sup>
Reinforcing Steel (RC Pipe only)	ASTM A 1064 when base metal rod is cold-drawn during helical cage production. Required tests: tensile, bend, and reduction of area. Test in the cold drawn state.	Per ASTM A 1064
	ASTM A 370 or C 497 for Welded Lap Splices <sup>6</sup> not lapped to a Min  20 diameters for deformed bars and wire or  40 diameters for plain bars and wire	Once every 6 mo. per wire diameter.
Non-Self- Consolidating Concrete (Conventional or Dry Cast Concrete)	Unit Weight <sup>7</sup> per ASTM C 138	<ul> <li>Formed Precast - one per month per mix design and when a new mix design is established<sup>8</sup></li> <li>Machine-Made Precast – Not Required</li> </ul>
	Slump <sup>7</sup> per ASTM C 143	<ul> <li>Formed Precast Units - one from first concrete batch, one for each set of compressive strength cylinders, and one from another concrete batch<sup>9, 10</sup></li> <li>Machine-Made Precast – Not Required</li> </ul>
	Temperature <sup>7 or 11</sup> per ASTM C 1064	<ul> <li>One for the first batch of concrete placed and one for each set of compressive strength cylinders<sup>9, 10</sup></li> <li>Record a Min of one temperature reading during most extreme air temperature condition during casting</li> </ul>
	Make Test Cylinders per Tex-447-A <sup>7</sup> for formed precast or ASTM C 497 <sup>12</sup> . <sup>13</sup> for precast machinemade units Cure Test Cylinders:  Formed Precast - per Tex-704-I Section 4.2.2.  Machine-Made Precast Units & Concrete Fittings and Transitions - in the same manner and for the same duration as the units they represent until tested	<ul> <li>Formed Precast Units - one set during last 25% of casting and in accordance with Tex-704-I. Cylinders may be made before the last 25% of casting when curing with membrane curing compound</li> <li>Machine-Made Precast Units Except Machine-Made RC Pipe- a minimum of six test specimens for each day's production, mix design, and curing condition</li> <li>Machine-Made RC Pipe<sup>14</sup></li> <li>Box Culvert &amp; RC Pipe Concrete Fittings and Transitions – a Min of two test specimens for each mix design per month.<sup>15</sup></li> </ul>

Non-Self- Consolidating Concrete (Conventional or Dry Cast Concrete) Continued	Compressive Strength <sup>16</sup> per ASTM C 39	Box Culverts, Junction Boxes, Manholes, and Inlets – a Min of one set consisting of two cylinder test specimens per each day's production run, mix design, and curing method; retests per Section 8.10.1., "All Precast Units with the Exception of Machine-Made RC Pipe."  RC Pipe –
		<ul> <li>Formed Precast – a Min of one set consisting of two cylinder test specimens per each day's production lot; retests per Section 8.10.1., "All Precast Units with the Exception of Machine-Made RC Pipe,"</li> <li>Machine-Made Precast RC Pipe –         <ul> <li>a) RC pipe &lt; 66-in. diameter – material acceptance is determined by 3EB test</li> <li>b) RC pipe ≥ 66-in. diameter<sup>14</sup></li> </ul> </li> </ul>
		Box Culvert & RC Pipe Concrete Fittings and Transitions – a Min of one set consisting of two test specimens per month. 17, 15
	Initial Time of Set <sup>7</sup> per ASTM C 403	Formed Precast Units - when a new mix design with accelerating admixture is established or accelerated curing will be used, and as directed.
	Slump Flow and VSI Rating <sup>7</sup> per ASTM C 1611	One for each of the first two batches of concrete placed, one for every fifth continuous batch (not delivered load) thereafter, and one for each set of compressive strength cylinders. 9, 10
	Temperature <sup>7</sup> per ASTM C 1064	One for the first batch of concrete placed and one for each set of compressive strength cylinders. 9, 10  Record a minimum of one temperature reading during most extreme air temperature condition during casting.
	Unit Weight <sup>7, 18</sup> per ASTM C 138	One per month and when a new mix design is established.8
Self- Consolidating Concrete	Make Test Cylinders per <u>Tex-447-A7</u> . Cure Test Cylinders per <u>Tex-704-I</u> Section 4.2.2.	One set during last 25% of casting and in accordance with <u>Tex-704-I</u> . Cylinders may be made prior to the last 25% of casting when curing with membrane curing compound.
(SCC)	Compressive Strength <sup>16</sup> per ASTM C 39	A Min of one set consisting of two test specimens per each day's production lot; retests per Section 8.10.1.
	T-50 <sup>7</sup> per ASTM C 1611	
l	Passing Ability (J-ring) <sup>7</sup> per ASTM C 1621	Two per year (summer and winter) and when a new mix design is
	Segregation Column <sup>7</sup> per ASTM C 1610	established. <sup>19</sup>
	Bleeding <sup>7, 18</sup> per ASTM C 232	
	Initial Time of Set <sup>7, 18</sup> per ASTM C 403	When a new mix design with accelerating admixture is established or accelerated curing will be used, and as directed.
RC Pipe (circular, arch, and elliptical)	Three Edge Bearing Test <sup>20, 13</sup> or Concrete Cores <sup>8</sup> per Section 8.10.2., "Machine-Made RC Pipe," and per ASTM C 497	Formed Precast – Not Required. Acceptance based on cylinder strength test results     Machine-Made Precast -     RC pipe < 66-in. diameter – material acceptance must be determined by 3EB test per ACPA or NPCA and a Min of one test per year. Retests per the applicable ASTM     RC pipe ≥ 66-in. diameter¹⁴ – one 3EB test for every 100 sections and a Min of one test per year for each size, class, and curing method; or one core from each day's production run, mix design, and curing method²¹
QC personnel with current ACI Aggregate Testing Technician Level 1 must perform these tests.		

- QC personnel with current ACI Aggregate Testing Technician Level 1 must perform these tests.
   For new aggregate sources and after a failing test for existing sources, increase testing frequency to one per 500-cu. yd. of concrete production, tested prior to use, until obtaining three consecutive passing tests. Do not use failed aggregate in the concrete without approval.
- QC personnel with current ACI Aggregate Testing Technician Level 1 must perform these tests or aggregate material suppler may perform the test and provide certified test results. Use results from these tests to proportion new concrete mix designs and to adjust existing concrete mix designs.
- Fabricator personnel qualified by the QC Supervisor for this particular test may perform this test.

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- 5. When aggregate weighing hopper or storage bins are equipped with properly maintained electric moisture probes for continuous moisture determination, these moisture tests are not required daily. Electric moisture probes, however, must be verified weekly against <u>Tex-409-A</u>, or ASTM C 566 test results to ensure the compared values do not vary more than 0.3%. The sample for moisture verification test must be representative of the material located where the electric moisture probe is registering moisture readings. Electric moisture probes are required for SCC unless approved by the Engineer. If approved, test moisture content every 4 hr. and when there is an apparent change while SCC is being produced.
- 6. Perform a minimum of three pull tests (tensile strength test). Weld splice test specimens from welded wire reinforcement must develop at least 50% of the minimum specified tensile strength of the steel referenced in ASTM A 1064. Retest must be in accordance with ASTM A 370.
- 7. QC personnel with current ACI Concrete Field Testing Technician Grade I certification must perform these tests.
- 8. When the fresh unit weight of concrete varies from the established value by more than ± 2-lb. per cubic foot., check the air content per ASTM C 231 or ASTM C 173 first to determine if air content has changed from the initial mix design. If air content is correct, check aggregate unit weight, gradation, moisture content, specific gravity, and that the mix proportions have not changes. Verify the fresh unit weight of concrete after making adjustments.
- 9. Per mix design per cast date.
- 10. If a test fails, test every delivered load until three consecutive tests pass.
- 11. QC personnel with current PCI Level I Quality Control Technician, NPCA Production and Quality School Level I, or ACPA Quality School certification may perform this test for fresh dry cast concrete.
- 12. After molding, inscribe the cylinder identification into the top of the cylinders with minimal disturbance to the surface finish, or tag each cylinder using an approved tagging system.
- 13. QC personnel with current PCI Level I Quality Control Technician, NPCA Production and Quality School Level I, or ACPA Quality School certification must perform this test.
- 14. For machine-made RC pipe 66-in. and larger in diameter, instead of 3EB or concrete core testing, a minimum of five cylinders may be prepared per day, mix design, and curing method in accordance with ASTM C 497. For product acceptance, test a set of two cylinders to verify design strength in accordance ASTM C 39. When compressive strength specimens fail to meet 100% of the design strength by an age of 28 days, retest in accordance with Section 8.10.2.1., "Machine-Made RC Pipe 66-in. Diameter and Larger." Cylinder compression testing is not allowed for acceptance testing of machine-made RC pipe less than 66-in. in diameter.
- 15. If using the same concrete mix design as the parent members, this additional testing is not required provided no adjustments were made to the original concrete mix design.
- 16. QC personnel with current ACI Concrete Strength Testing Technician certification must perform this test. Commercial laboratories meeting the requirements of Section 12.4., "Commercial Laboratories," may perform this test.
- 17. The average strength of the test specimens must meet the minimum design strength requirement of the parent member (box culvert or RC pipe section).
- 18. Follow ASTM C 1758 for filling of test specimens.
- 19. Notify MTD when this testing is to be performed. Retests not allowed. If test fails discontinue the use of the mix design, determine cause of failure, and discuss corrective actions required with MTD before fabricating additional product.
- 20. Test for the load to produce a 0.01-in. crack or 15% in excess of the required D-Load, whichever is less. Test the youngest RC pipe section in the lot.
- 21. When compressive strength cores fail to meet 100% of the design strength by an age of 28 days, retest in accordance with Section 8.10.2.1.

## ANNEX (Mandatory Information) CRITERIA FOR EVALUATION OF PRECAST DRAINAGE STRUCTURES

**Scope.** Use the following requirements to determine if the type and extent of damage will be cause for rejection. If the damage is within the defined criteria, perform repairs using the repair procedure specified. The requirements contained in this Annex do not apply to cosmetic damage as defined in Article 2.

Evaluation requirements are included for the following conditions:

- fractures or cracks,
- manufacturing defects,
- spalls, and
- damaged ends.

**Definitions.** The following definitions apply only to the Annex portion of this Specification:

- Slab Sections any circular or noncircular flat section without walls,
- Honeycomb voids that may extend deeper than the surface due to inadequate concrete consolidation, grout leakage, or a dry or stiff concrete mix,
- Open Texture surface voids typically due to an insufficient quantity of mortar or a dry or stiff concrete mix,
- Round Sections any circular, hollow section with a straight wall or conical shape. It includes RC pipe sections, and round shape sections for manhole and inlet structures,
- Square and Rectangular Sections any noncircular, three or four-sided shape section. It includes box culvert and junction box sections, and square or rectangular shape sections for manhole and inlet structures,
- Slab Off a separation (delamination) of freshly placed concrete, while in the plastic state that typically occurs at a steel reinforcement plane, and
- **Spall** physical damage (breakage) of hardened concrete that may occur during handling, storage, etc.

#### A1. ROUND SECTIONS

#### A1.1. Fractures or Cracks.

#### A1.1.1. Causes for Rejection Due to Fractures or Cracks:

- any fracture or crack passing through the wall of the section (See Condition #1 in Figure A1.1, "Rejectable Fractures or Cracks");
- any fracture or crack 0.01 in. wide or greater at the surface and 12 in. or longer regardless of position in the wall of the section (See Condition #2 in Figure A1.1); or
- any fractures or cracks not covered above that are numerous and extensive.

If a visible crack exists on the inside wall and QC is unable to observe the opposite side of the wall in question, the producer will have the option of either eliminating the obstruction or removing the section from the lot.

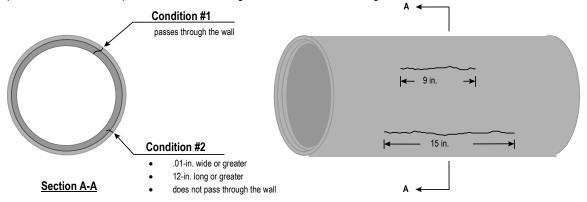


Figure A1.1
Rejectable Fractures or Cracks

Condition #1—Crack passes through the wall, regardless of crack width or length.

Condition #2—Crack is at least 0.01 in. wide and at least 12 in. long, even though it does not pass through the wall.

#### A1.1.2. Acceptable Conditions Due to Fractures or Cracks:

- two end cracks that do not exceed the depth of the joint (See Figure A1.2, "Acceptable Fractures or Cracks.") If the area between the cracks is found to be sound, then no repair is required. If the area is not sound, then remove unsound concrete and evaluate per Section A1.4., "Concrete Spalls"; or
- fractures or cracks not passing through the wall, provided they are:
  - less than 0.01 in. wide, or
  - 0.01 in. or greater and less than 12 in. long and are repaired with a cementitious repair material in accordance with the requirements of <u>DMS-4655</u>, "Concrete Repair Materials."

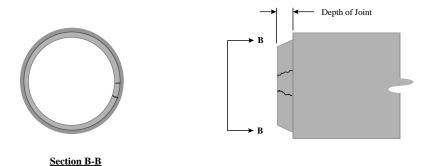


Figure A1.2

Acceptable Fractures or Cracks

Two end cracks that do not exceed depth of joint

#### A1.2. Manufacturing Defects.

- **A1.2.1.** Causes for Rejection Due to Manufacturing Defects. Any defect that indicates imperfect proportioning, mixing, or molding, including:
  - offsets in form seams that would prevent adequate concrete cover over reinforcing steel;

- excessive moisture in concrete causing the walls to sag during production or creating undesirable "rifling" type tool marks 1/4 in. or greater in height inside the barrel, see Figure A1.3, "Rejectable Manufacturing Defects 'Rifling' Tool Marks;"
- delamination along the body of the pipe exceeding four inches in length when determined by hammer testing, or chipping to sound concrete;
- evidence of inadequate concrete cover for reinforcing steel; or
- evidence of fresh concrete segregation, i.e., slick surface or sand streaking.

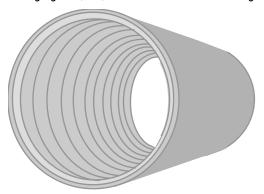


Figure A1.3
Rejectable Manufacturing Defects "Rifling" Tool Marks
If marks are 1/4 in. or greater in height

**A1.2.2.** Acceptable Conditions Due to Manufacturing Defects. Delamination along the body of the pipe not exceeding 4 in. in length when determined by hammer testing or chipping to sound concrete. Repair in accordance with Chapter 3, Section 2, "Intermediate Spall Repair," of the Department's Concrete Repair Manual.

#### A1.2.3. Causes for Rejection of Surface Defects Due to Honeycomb or Open Texture:

- honeycomb or open texture on the inside surface of the barrel that exposes reinforcing steel, regardless of size;
- honeycomb or open texture located on the outside surface of the barrel that:
  - exceeds 18 in. in any direction, or
  - greater than 2 in. in depth;
- open texture that causes undesirable concrete permeability (See Figure A1.4, "Rejectable Manufacturing Defect");
   or
- any less severe surface condition that affects the majority of the surface and could reduce the durability and service life of the member (See Figure A1.4).

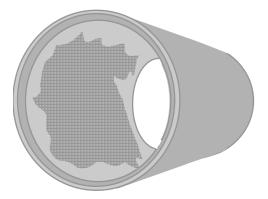


Figure A1.4
Rejectable Manufacturing Defect

- A1.2.4. Acceptable Conditions of Surface Defects Due to Honeycomb or Open Texture. Honeycomb or open texture surface conditions less severe than stated in Section A1.2.3., "Causes for Rejection of Surface Defects Due to Honeycomb or Open Texture," are acceptable if properly repaired as follows:
  - Areas with a maximum depth of 1 in. Repair in accordance with Chapter 3, Section 1, "Minor Spall Repair," of the Department's Concrete Repair Manual, with the exception that cementitious repair materials in accordance with the requirements of DMS-4655 may be used.
  - Areas with a depth greater than 1 in. and up to 2 in. Repair in accordance with Chapter 3, Section 2, or Chapter 3, Section 3, "Major Spall Repair and Concrete Replacement," of the Department's Concrete Repair Manual.

## A1.3. Slab Offs.

## A1.3.1. Causes for Rejection Due to Slab Offs:

- slab off areas in less than 42-in. diameter pipe sections not repaired while the concrete is in the plastic state; or
- slab off areas greater than 18 in. in any direction in 42-in. diameter or greater pipe sections not repaired while the concrete is in the plastic state.
- **A1.3.2. Acceptable Conditions due to Slab Offs.** Slab off areas extending to the reinforcing steel may be repaired while the concrete is in the plastic state per one of the following methods:
  - placing the member back in the form and filling the slab off areas with concrete using standard casting techniques;
     or
  - pipe sections with a single slab off area may be repaired by trowel-applying batched concrete from the same mix design into the slab off area if not greater than 18 in. in any direction.

For 42-in. diameter sections and greater only, slab off areas not greater than 18 in. in any direction and extending to the reinforcing steel may be repaired once concrete is no longer in the plastic state per one of the following options:

- Areas with a maximum depth of 1 in. Repair in accordance with Chapter 3, Section 1, of the Department's Concrete Repair Manual with the exception that cementitious repair materials in accordance with the requirements of DMS-4655 may be used; or
- Areas with a depth greater than 1 in. and up to 2 in. Repair in accordance with Chapter 3, Section 2, or Chapter 3, Section 3, of the Department's Concrete Repair Manual.

## A1.4. Concrete Spalls.

**A1.4.1.** Causes for Rejection Due to Spalls. Any spall in the wall extending to the reinforcing steel, for sections less than 42-in. in diameter, will be cause for rejection, except spalls at lifting holes that extend to reinforcing steel may be authorized for repair by QC per Section A1.4.2., "Acceptable Conditions due to Spalls." See Figure A1.5, "Rejectable and Repairable Manufacturing Defects-Spalls."

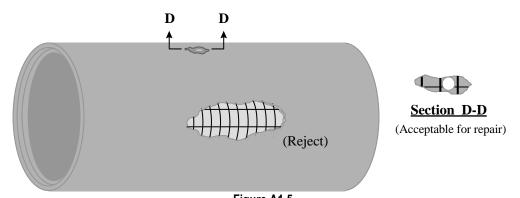


Figure A1.5
Rejectable and Repairable Manufacturing Defects—Spalls

A1.4.2. Acceptable Conditions due to Spalls:

- repair spalled areas at lifting holes that extend to reinforcing steel in accordance with Chapter 3, Section 2, of the Department's Concrete Repair Manual; or
- repair spalled areas in the wall not greater than 18 in. in any direction and <u>not</u> extending to the steel reinforcement, except at lifting holes, in accordance with Chapter 3, Section 1, of the Department's *Concrete Repair Manual*, with the exception that cementitious repair materials in accordance with the requirements of <u>DMS-4655</u> may be used.

For 42-in. diameter sections and greater only, spalled areas not greater than 18 in. in any direction and extending to the reinforcing steel may be repaired per one of the following options:

- Spalled Areas with a maximum depth of 1 in. Repair in accordance with Chapter 3, Section 1, of the Department's *Concrete Repair Manual* with the exception that cementitious repair materials in accordance with the requirements of DMS-4655 may be used, and
- Spalled Areas with a depth greater than 1 in. and up to 2 in. Repair in accordance with Chapter 3, Section 2, or Chapter 3, Section 3, of the Department's Concrete Repair Manual.

## A1.5. Damaged Ends.

A1.5.1. Causes for Rejection for Damaged Ends. Joint end damage 1 in. and greater in depth that exceeds the length dimensions noted in Table A1.1, "Permissible Repair Criteria." See Figures A1.6, "Damaged End – Bell End," and A1.7, "Damaged End – Spigot End."

Table A1.1

Permissible Repair Criteria
(End Damage 1 in. and Greater in Depth Within the Joint)

Size (in.)	Permissible Cumulative Damage Length (in.)	Permissible Individual Damage Length (in.)
Designation	(50% circumference Max) <sup>1</sup>	(25% circumference Max) <sup>2</sup>
12	18-1/2	9
15	23-1/2	11-3/4
18	28-1/4	14
24	37-3/4	19
27	42-1/4	21-1/4
30	47	23-1/2
36	56-1/2	28-1/4
42	66	33
48	75-1/4	37-1/2
54	84-3/4	42-1/2
60	94-1/4	47

<sup>1. 1 +</sup> L2 + L3 must not exceed 50% of the circumference. See example.

## Example:

Circumference =  $\pi$  d, where d = diameter.

To determine the circumference of a 24-in. section, multiply the diameter by  $\pi$ :

 $(\pi = 3.1416)$ , Circumference = 24-in. x 3.1416 = 75.4-in.,

Determine 50% of the circumference:

75.4-in. × 0.50 = 37.7-in. (37-3/4-in.) – permissible cumulative damage length (L1 + L2 + L3)

Determine 25% of the circumference:

75.4-in. x 0.25 = 18.85-in. (19-in.) – permissible individual damage length (L1, L2, or L3)

Materials and Tests Division

<sup>2.</sup> L1, L2, or L3 must not exceed 25% of the circumference. See example.

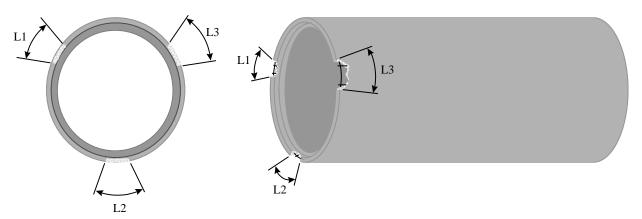


Figure A1.6
Damaged End—Bell End

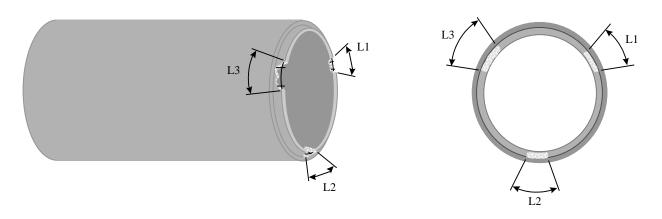


Figure A1.7
Damaged End—Spigot End

- **A1.5.2. Acceptable End Damage.** Damage to either the bell or spigot end of the section may be authorized for repair and accepted by QC per the following:
  - Areas with a maximum depth of 1 in. from the end of the bell or spigot which may involve the entire joint end. Repair in accordance with Chapter 3, Section 1, of the Department's Concrete Repair Manual with the exception that cementitious repair materials in accordance with the requirements of DMS-4655 may be used; or
  - Areas with a depth greater than 1 in. from the end of the bell or spigot, not exceeding the depth of the joint, and not exceeding the length dimensions noted in Table A1.1. Repair in accordance with Chapter 3, Section 2, or Chapter 3, Section 3, of the Department's Concrete Repair Manual.

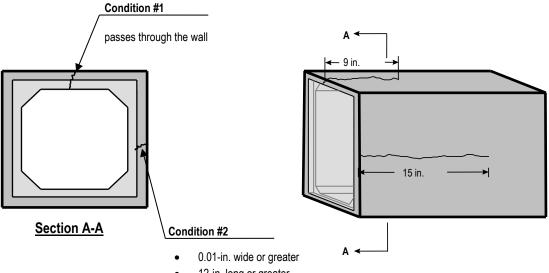
## A2. SQUARE AND RECTANGULAR SECTIONS

## A2.1. Fractures or Cracks.

## A2.1.1. Causes for Rejection Due to Fractures or Cracks:

- any fracture or crack that passes through the wall or slab of the section (See Condition #1 in Figure A2.1, "Rejectable Fractures or Cracks");
- any fracture or crack that is 0.01 in. wide or greater at the surface and 12 in. or longer and extends beyond the first layer of steel reinforcement, regardless of the position in the wall or slab (See Condition #2 in Figure A2.1); or
- any fractures or cracks not covered above that are numerous and extensive.

If a visible crack exists on the inside wall or slab and QC is unable to observe the opposite side of the wall or slab in question, the producer must either eliminate the obstruction or remove the section from the lot.



- 12-in. long or greater
- does not pass through the wall
- extends beyond the first layer reinforcement

Figure A2.1 Rejectable Fractures or Cracks

Condition #1—Crack passes through the wall, regardless of crack width or length.

Condition #2—Crack is at least 0.01 in. wide and at least 12 in. long, extends beyond the first layer of steel reinforcement, even though it does not pass through the wall.

## A2.1.2. Acceptable Conditions Due to Fractures or Cracks.

- Two end cracks that do not exceed the depth of the joint are acceptable if sound, no repair is required (See Figure A2.2, "Acceptable Fractures or Cracks.") If the area is not sound, then remove unsound concrete and evaluate damaged area per Section A2.4., "Concrete Spalls," of the Annex.
- Greater than or equal to 0.01 in. wide and not extending beyond the first layer of the steel reinforcement repair in accordance with Chapter 3, Section 2, of the Department's *Concrete Repair Manual*.

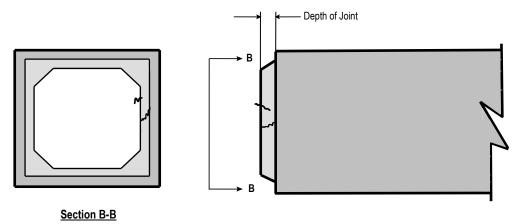


Figure A2.2

Acceptable Fractures or Cracks
Two end cracks that do not exceed depth of joint

- **A2.1.3. Fractures or Cracks in Sections above Pipe Connections.** If the area between the cracks is not sound, then remove unsound concrete and evaluate as a spall per Section A1.4. Fracture or crack located at the area above a pipe connection of a precast base drop inlet or junction box, as shown below in Figure A2.3, "Fractures or Cracks in Areas above Pipe Connections," must be evaluated per the following:
  - fracture or crack located at a thin area that is unreinforced does not require repair;
  - reinforced areas with a depth less than 3 in. Repair fracture or crack with cementitious repair materials in accordance with the requirements of DMS-4655; or
  - reinforced area with a depth greater than 3 in. Evaluate fracture or crack per Section A2.1.1., "Causes for Rejection Due to Fractures or Cracks."

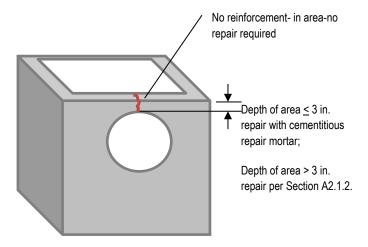
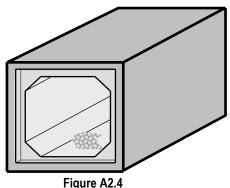


Figure A2.3 Fractures or Cracks in Areas above Pipe Connections

## A2.2. Manufacturing Defects.

- **A2.2.1.** Causes for Rejection Due to Manufacturing Defects. Any defect that indicates imperfect proportioning, mixing, or molding including (See Figure A2.4, "Rejectable Manufacturing Defects"):
  - offsets in form seams that would prevent adequate concrete cover over reinforcing steel,
  - excessive moisture in concrete causing walls or slabs to sag during production,
  - delamination in the body of the section when viewed from the ends or when determined from hammer testing,
  - evidence of inadequate concrete cover for reinforcing steel, or
  - evidence of fresh concrete segregation, i.e. slick surface or sand streaking.



Rejectable Manufacturing Defect

A2.2.2. Causes for Rejection of Surface Defects Due to Honeycomb or Open Texture:

- honeycomb or open texture on the top surface of the bottom slab that exposes reinforcing steel, regardless of size;
- open texture on the top surface of the bottom slab causing undesirable concrete permeability;
- honeycomb or open texture at locations other than the top surface of the bottom slab, extending to steel reinforcement, that exceeds 18 in. in any direction; or
- any less severe surface condition that affects the majority of the surface and could reduce the durability and service life of the member.
- **A2.2.3.** Acceptable Conditions of Surface Defects Due to Honeycomb or Open Texture. Honeycomb or open texture surface conditions less severe than stated in Section A2.2.2., "Causes for Rejection of Surface Defects Due to Honeycomb or Open Texture." are acceptable if properly repaired.
  - Areas with a maximum depth of 1 in. Repair in accordance with Chapter 3, Section 1, of the Department's Concrete Repair Manual with the exception that cementitious repair materials in accordance with the requirements of DMS-4655 may be used; or
  - Areas with a depth greater than 1 in. and up to 2 in. Repair in accordance with Chapter 3, Section 2, or Chapter 3, Section 3, of the Department's Concrete Repair Manual.

## A2.3. Slab Offs.

## A2.3.1. Causes for Rejection Due to Slab Offs:

- slab off areas occurring on the top surface of the bottom slab not repaired while the concrete is in the plastic state,
- slab off areas not repaired while the concrete is in the plastic state and exceeding 18 in. in any direction (See Figure A2.5, "Rejectable and Repairable Slab Offs,") or
- more than two slab off areas in a section.
- **A2.3.2.** Acceptable Conditions Due to Slab Offs. Slab off areas extending to the reinforcing steel (See Figure A2.5) may be repaired while the concrete is the plastic state per one of the following methods:
  - placing the member back in the form and filling the slab off area with concrete using standard casting techniques,
     or
  - trowel-applying batched concrete from the same mix design into the slab off area if not greater than 18 in. in any direction

Slab off areas not greater than 18 in. in any direction and extending to the reinforcing steel may be repaired once concrete is no longer in the plastic state per one of the following methods provided the affected areas is not at the top of the bottom slab:

- Areas with a maximum depth of 1 in. Repair in accordance with Chapter 3, Section 1, of the Department's Concrete Repair Manual with the exception that cementitious repair materials in accordance with the requirements of DMS-4655 may be used: or
- Areas with a depth greater than 1 in. and up to 2 in. Repair in accordance with Chapter 3, Section 2, of the Department's Concrete Repair Manual with the exception that batch concrete from the same mix design used in the member may be used; or
- Areas with a depth greater than 2 in. Repair in accordance with Chapter 3, Section 3, of the Department's Concrete Repair Manual.

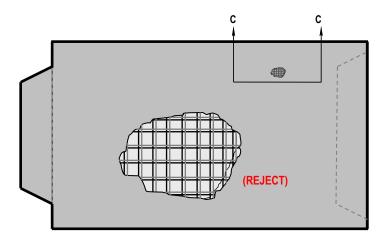




Figure A2.5
Rejectable and Repairable Slab Offs

## A2.4. Concrete Spalls.

## A2.4.1 Causes for Rejection Due to Spalls:

- more than two spalls within the same slab or wall, or
- any spall in the slab or wall section extending to the reinforcing steel that exceeds 18 in. in any direction.

## A2.4.1. Acceptable Conditions Due to Spalls:

- repair spalled areas at lifting holes that extend to reinforcing steel in accordance with Chapter 3, Section 2, of the Department's Concrete Repair Manual:
- repair spalled areas in the wall not greater than 18 in. in any direction and not extending to the steel reinforcement, except at lifting holes, in accordance with Chapter 3, Section 1, of the Department's Concrete Repair Manual, with the exception that cementitious repair materials in accordance with the requirements of <a href="DMS-4655">DMS-4655</a> may be used.

Spalled areas not greater than 18 in. in any direction and extending to the reinforcing steel may be repaired per one of the following methods:

- Areas with a maximum depth of 1 in. Repair in accordance with Chapter 3, Section 1, of the Department's Concrete Repair Manual with the exception that cementitious repair materials in accordance with the requirements of DMS-4655 may be used,
- Areas with a depth greater than 1 in. and up to 2 in. Repair in accordance with Chapter 3, Section 2, of the Department's Concrete Repair Manual with the exception that batch concrete from the same mix design used in the member may be used, or
- Areas with a depth greater than 2 in. Repair in accordance with Chapter 3, Section 3, of the Department's Concrete Repair Manual.

## A2.5. Damaged Ends.

- **A2.5.1** Causes for Rejection for Damaged Ends. Any individual or cumulative joint end damage greater than 1 in. in depth and the cumulative damage length exceeds 20% of the perimeter of the section.
- **A.2.5.2** Acceptable Conditions for Damaged Ends. Damaged areas at the tongue or groove end of the section (See Figure A2.6, "Damaged End Groove End,") may be repaired as follows:
  - Areas with a maximum depth of 1 in. from the end of the tongue or groove which may involve the entire joint end. Repair in accordance with Chapter 3, Section 1, of the Department's *Concrete Repair Manual* with the exception that cementitious repair materials in accordance with the requirements of <u>DMS-4655</u> may be used;

- Areas with a depth greater than 1 in. and up to 2 in. from the end of the tongue or groove, not exceeding the depth of the joint, and the cumulative damage length does not exceed 20% of the perimeter of the section. Repair in accordance with Chapter 3, Section 2, or Chapter 3, Section 3, of the Department's Concrete Repair Manual; or
- Areas with a depth greater than 2 in. from the end of the tongue or groove, not exceeding the depth of the joint, and the cumulative damage length does not exceed 20% of the perimeter of the section. Repair in accordance with Chapter 3, Section 3, of the Department's Concrete Repair Manual.

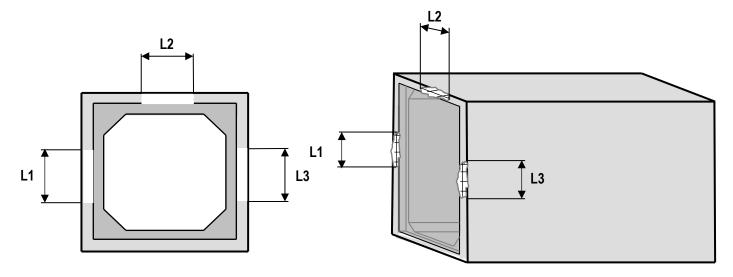


Figure A2.6
Damaged End—Groove End

Example: Multiple spalls on a rectangular section

To determine the permissible damage length of a 10 ft. × 5 ft. section, determine the perimeter of the section by adding the length of each side:

Conversion from foot to inches: 10 ft. = 120 in. 5 ft. = 60 in.

Perimeter of a 10 ft. x 5 ft. section equals:

 $(120 \text{ in.} \times 2) + (60 \text{ in.} \times 2) = 240 \text{ in.} + 120 \text{ in.} = 360 \text{ in.}$ 

Maximum permissible damage is 20% of the perimeter of the section:

 $360 \text{ in. } \times 20\% = 72 \text{ in.}$ 

Therefore: total damage length of L1 + L2 + L3 must be less than or equal to 72 in.

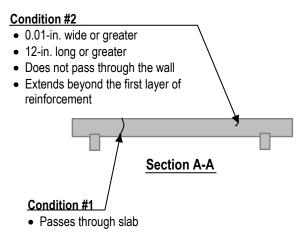
#### A3. SLAB SECTIONS.

## A3.1. Fractures or Cracks.

## A3.1.1. Causes for Rejection Due to Fractures or Cracks:

- any fracture or crack that passes through the slab section (See Condition #1 in Figure A3.1, "Rejectable Fractures or Cracks.")
- any fracture or crack that is 0.01 in. wide or greater at the surface and 12 in. or longer and extends beyond the first layer of steel reinforcement (See Condition #2 in Figure A3.1); or
- any fractures or cracks not covered above that are numerous and extensive.

If a visible crack exists and QC is unable to observe opposite side, the producer will have the option of either eliminating the obstruction or removing the section from the lot.



Rejectable Fractures or Cracks

Condition #1—Crack passes through the slab, regardless of crack width or length.

Condition #2—Crack is at least 0.01 in. wide and at least 12 in. long, extends beyond the first layer of steel reinforcement, even though it does not pass through the slab.

- **A3.1.2.** Acceptable Conditions Due to Fractures or Cracks. Fractures or cracks not passing through the slab (See Figure 3.2, "Acceptable Fractures or Cracks,") provided they are:
  - less than 0.01 in. wide acceptable without repair, or
  - in. wide or greater, regardless of length, and not extending beyond the first layer of steel reinforcement repair with cementitious repair materials in accordance with the requirements of DMS-4655.

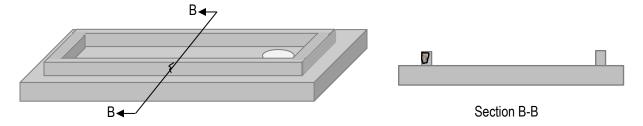


Figure A.3.2
Acceptable Fractures or Cracks

## A3.2. Manufacturing Defects.

- **A3.2.1.** Causes for Rejection Due to Manufacturing Defects. Any defect that indicates imperfect proportioning, mixing, or molding (See Figure A3.3, "Rejectable Manufacturing Defect,") including:
  - offsets in form seams that would prevent adequate concrete cover over reinforcing steel,
  - evidence of fresh concrete segregation, i.e. slick surface or sand streaking, or
  - evidence of inadequate concrete cover for reinforcing steel.

## A3.2.2. Causes for Rejection of Surface Defects Due to Honeycomb or Open Texture:

- honeycomb or open texture extending to steel reinforcement, that exceeds 18 in. in any direction, or
- defects with a depth greater than 2 in., and
- any less severe surface condition that affects the majority of the surface and could reduce the durability and service life of the member.

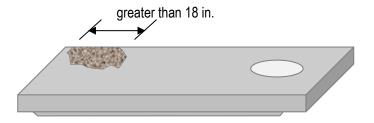


Figure A.3.3
Rejectable Manufacturing Defect

- A3.2.3. Acceptable Conditions of Surface Defects Due to Honeycomb or Open Texture. Honeycomb or open texture surface conditions less severe than stated in Section A3.2.2., "Causes for Rejection Due to Manufacturing Defects," are acceptable if properly repaired.
  - Areas with a maximum depth of 1 in. Repair in accordance with Chapter 3, Section 1, of the Department's Concrete Repair Manual with the exception that cementitious repair materials in accordance the requirements of DMS-4655 may be used.
  - Areas with a depth greater than 1 in. and up to 2 in. Repair in accordance with Chapter 3, Section 2, of the Department's Concrete Repair Manual with the exception that batch concrete from the same mix design used in the member may be used.

## A3.3. Concrete Spalls.

## A3.3.1. Causes for Rejection Due to Spalls:

- more than two spalled areas in a section,
- spalls with a depth greater than 2 in., or
- any spall in the section extending to the reinforcing steel that exceeds 18 in. in any direction (See Figure A3.4, "Rejectable Spalls.")



Figure A.3.4 Rejectable Spalls

- **A3.3.2.** Acceptable Conditions Due to Spalls. Spalled areas not greater than 18 in. in any direction and extending to the reinforcing steel may be repaired per one of the following methods:
  - Areas with a maximum depth of 1 in. Repair in accordance with Chapter 3, Section 1, of the Department's Concrete Repair Manual with the exception that cementitious repair materials in accordance with the requirements of DMS-4655 may be used.
  - Areas with a depth greater than 1 in. and up to 2 in. Repair in accordance with Chapter 3 Section 2, or Chapter 3, Section 3, of the Department's Concrete Repair Manual.

# **SECTION 5: DRAWINGS**



# PASO REAL DRAINAGE IMPROVEMENTS PROJECT NO. 19-002H JULY 2023

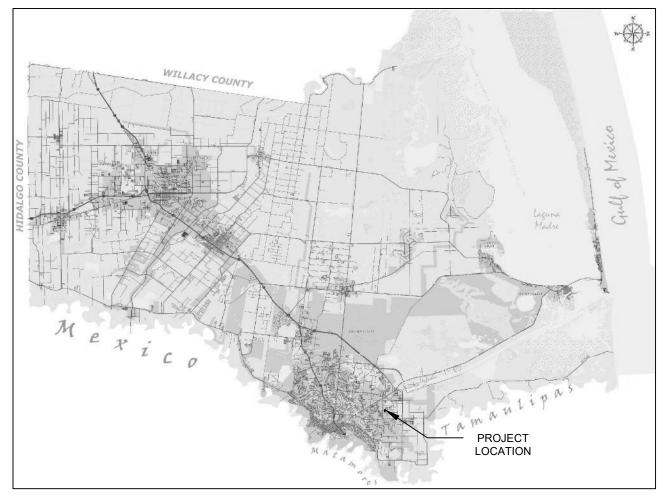
PROJECT LIMITS: FROM NORTH OF HOUSTON ROAD 0.19 OF ACRES TO DRAINAGE DITCH

LATITUDE: <u>N25° 55' 27"</u> LONGITUDE: <u>W97° 25' 38"</u>

TOTAL PROJECT AREA: 0.21 ACRES

# **CAMERON COUNTY COMMISSIONERS COURT**

EDDIE TREVIÑO, JR. ———————————————————————————————————	- COUNTY JUDGE
SOFIA BENAVIDES —	- COMMISSIONER PRECINCT 1
JOEY LOPEZ ————————————————————————————————————	- COMMISSIONER PRECINCT 2
DAVID A. GARZA ———————————————————————————————————	- COMMISSIONER PRECINCT 3
GUSTAVO RUIZ ————————————————————————————————————	- COMMISSIONER PRECINCT 4
PETE SEPULVEDA, JR.——————	- COUNTY ADMINISTRATOR



**LOCATION MAP** 

PRECINCT: 1 SCALE: 1:5,000



7/14/2023

BENJAMIN L. WORSHAM, P.E., COUNTY ENGINEER

DATE

## **GENERAL**

- 1 TITLE SHEET
- 2 INDEX OF SHEETS
- 3 PROJECT LAYOUT
- 4 SURVEY CONTROL INDEX
- 5 SURVEY CONTROL INDEX
- 6 SURVEY CONTROL INDEX
- 7 ESTIMATED QUANTITIES
- 8-A GENERAL NOTES
- 8-B GENERAL NOTES
- 8-C GENERAL NOTES

## TRAFFIC CONTROL PLAN

- 9 TRAFFIC CONTROL GENERAL NOTES AND SEQUENCE OF CONSTRUCTION
- 10 PASO REAL TRAFFIC CONTROL PLAN HOUSTON RD. TO N. MINNESOTA AVE.
- 11 [S]BC (1) 14
- 12 [S]BC (2) 14
- 13 [S]BC (3) 14
- 14 [S]BC (4) 14
- 15 [S]BC (5) 14
- 16 [S]BC (6) 14
- 17 [S]BC (7) 14
- 18 [S]BC (8) 14
- 19 [S]BC (9) 14
- 20 [S]BC (10) 14
- 21 [S]BC (11) 14 22 [S]BC (12) - 14
- 23 [S] TCP (2-2) 18

## ROADWAY AND DRAINAGE DETAILS

- 24 PASO REAL UTILITY AND DRAINAGE
- 25 PASO REAL UTILITY AND DRAINAGE
- 26 PASO REAL UTILITY AND DRAINAGE
- 27 SWAGE LINE IMPROVEMENTS
- 28 PASO REAL CULVERT LAYOUTS
- 29 PASO REAL CULVERT DETAILS
- 30 ROADSIDE DITCH REGRADING31 ROADSIDE DITCH REGRADING
- 32 ASPHALT STABILIZED CUT & RESTORE DETAILS
- 33 [S] SCP-MD
- 34 [S] SCP-4
- 35 [S] FW-O

- 36 [S] PRM
- 37 [S] PSL(1 OF 2)
- 8 [S] PSL(2 OF 2)
- 39 [S] TE(HMAC)-11
- 40 [D] MISCELLANEOUS PIPE STANDARD

## **ENVIRONMENTAL**

41 EROSION & SEDIMENT CONTROL PLAN

[D] -DENOTES DISTRICT STANDARD

[S] -DENOTES STATE STANDARD

- 42 [S] EC (2) 16
- 43 [S] EC (3) 16
- 44 [D] TECL-06 (PHR)

BENJAMIN L. WORSHAM
110425

SSIONAL ENGR

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH A "[S]" OR "[D]" HAVE BEEN ISSUED BY ME OR UNDER MY RESPONSIBLE SUPERVISION, AS BEING APPLICABLE TO THIS PROJECT

PASO REAL DRAINAGE IMPROVEMENTS

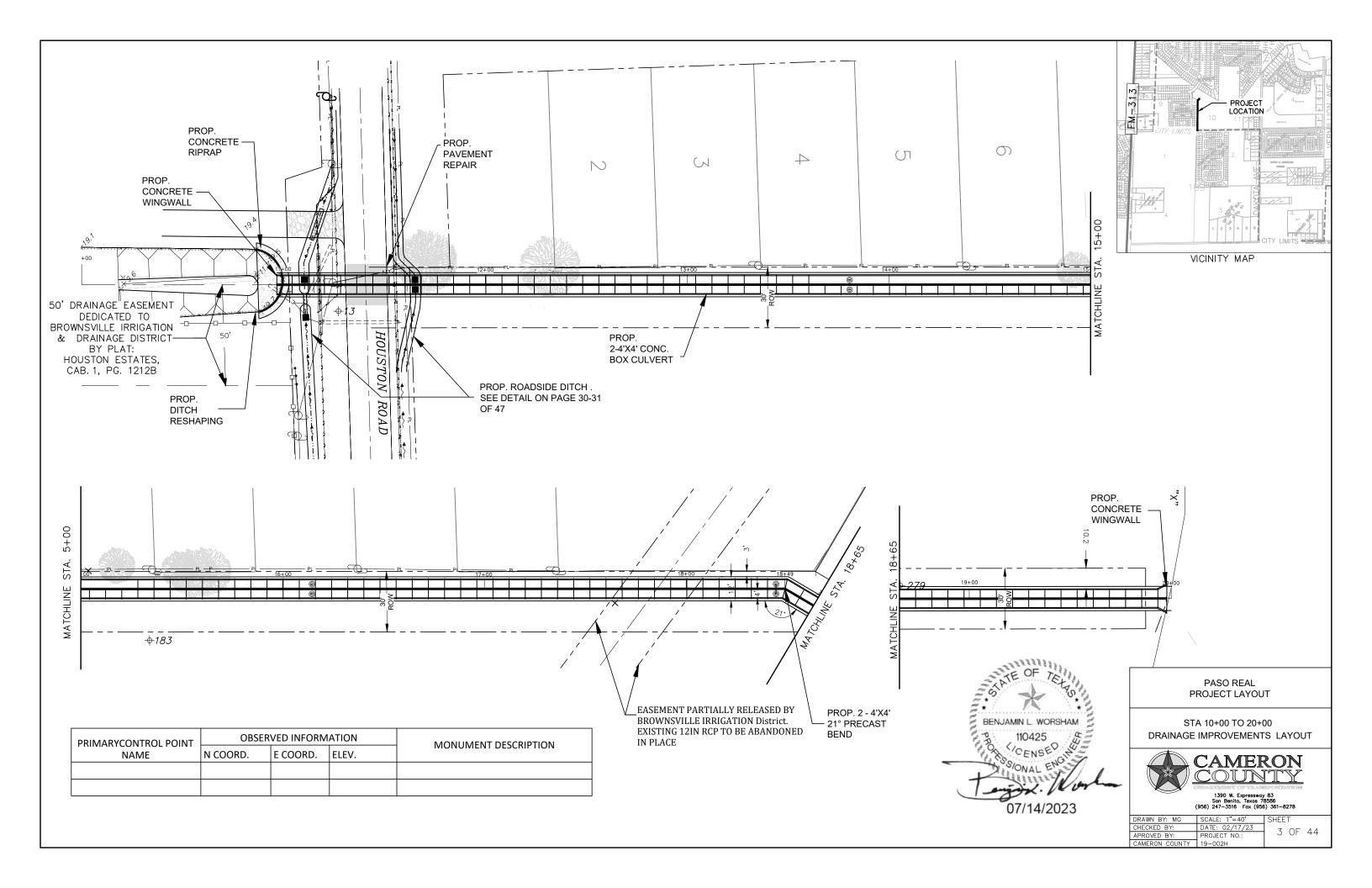
INDEX



1390 W. Expressway 83 San Benito, Texas 78586 (956) 247-3516 Fax (956) 361-8278

DRAWN BY: MG	SCALE:
CHECKED BY:	DATE: 02/17/2
APROVED BY:	PROJECT NO.:
CAMERON COUNTY	10-0024

2 OF 44



	SUMMARY OF PROPOSED DRAINAGE IMPROVEMENTS															
	ITEM 100	ITEM 110	ITEM 247			ITEM 400		ITEM 402	ITEM 420	ITEM 432	ITEM 462	ITEM 464	ITEM 465	ITME 466	ITEM 471	ITEM 496
	6002	6004	6060	6002	6006	6010	6011	6001	6074	6001	6005	6039	6003	6197	6001	6007
SHEET NO.	PREPARING ROW	EXCAVATION (ROADWAY AND CHANNEL)	FL BS (CMP IN PLC) (TY EGR 4) (FNAL POS)	STRUCT EXCAV (BOX)	CUT & RESTORE PAV	STRUCT EXCAV (SPL)	SAND BACKFILL	TRENCH EXCAVATION PROTECTION	CONCRETE STRUCTURES CLASS C CONC (MISC)	RIPRAP (CONC)(4 IN)	CONC BOX CULV (4X4)	RC PIPE (CL III) (24") (SPL)	MANHOLE (COMPL) (PRM)(60 IN)	WINGWALL (PW-2) (WH=8FT)	GRATE	REMOVE STORM (PIPE)
	STA	(CY)	(CY)	(CY)	(SY)	(CY)	(CY)	(LF)	(CY)	(CY)	(LF)	(LF)	(EA)	(EA)	(EA)	(LF)
24		224	10	938	47	136	2	310	4	15	610	16	2		4	87
25	10			1565		178		400			800		2			
26				507		87		200			390		2	1		
TOTAL	10	224	10	3010	47	401	2	910	4	15	1800	16	6	1	4	87

SUMMARY OF PRPOPOSED SEDIMENT CONTROL DEVICES										
	ITEM 506									
	6021 6024 6038 6039 6041 6									
SHEET NO.	CONST EXIT (INSTALL)	CONST EXIT (REMOVE)	I CONT FENCE		BIO DEG EROSN CONT LOGS (12" DIA) (REMOVE)	BIO DEG EROSN CONT LOGS (12" DIA) (REMOVE)				
	(SY)	(SY)	(LF)	(LF)	(LF)	(LF)				
24	156	156	730	730	48	48				
25			800	800						
26			390	390						
TOTAL	156	156	1920	1920	48	48				

SUMMARY OF PROPOSEDMISCELLANEOUS ITEMS								
	ITEM 500	ITEM 502	N/A					
	6001	6038	N/A					
		BARRICADES,						
	MOBILIZATION	SIGNS AND	CONST STAKING					
		TRAFFIC	CONSTSTAKING					
		HANDLING						
	(LS)	(MO)	(LS)					
	1	6	1					
TOTAL	1	6	1					

PASO REAL ESTIMATED QUANTITIES

STA 10+00 TO 20+00 DRAINAGE IMPROVEMENTS LAYOUT



 DRAWN BY: MG
 SCALE:
 SHEET

 CHECKED BY:
 DATE: 02/24/23
 7 OF 44

 APROVED BY:
 PROJECT NO.:
 7 OF 44

 CAMERON COUNTY
 19-002H

## **GENERAL NOTES:**

USE THE TEXAS DEPARTMENT OF TRANSPORTATION'S "STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES" (NOVEMBER 2014) FOR ITEM SPECIFICATIONS INFORMATION AND REQUIREMENTS.

\*

## **GENERAL REQUIREMENTS**

FOR ALL PITS OR QUARRIES, COMPLY WITH THE "TEXAS AGGREGATE QUARRY AND PIT SAFETY ACT."

CONTACT THE 1-800 CALL SERVICES FOR LOCATIONS OF UTILITIES BEFORE BEGINNING ANY SCARIFYING OR EXCAVATING OPERATIONS. VERIFY UTILITY LOCATIONS, DEPTH, AND EXERCISE EXTREME CAUTION WHEN EXCAVATING AND/OR SCARIFYING AROUND THESE UTILITIES.

ALL WORK SHALL BE COMPLETED TO THE SATISFACTION OF CAMERON COUNTY.

LOCATIONS OF UNDERGROUND FACILITIES ARE FROM BEST KNOWN INFORMATION AVAILABLE. NEITHER THE OWNER NOR ENGINEER, WARRANT THE ACCURACY OF THE INFORMATION PROVIDED. ANY DEVIATIONS SHALL BE CALLED TO THE PROJECT MANAGER AND ENGINEER'S ATTENTION IMMEDIATELY.

AS DIRECTED BY THE COUNTY, THE CONTRACTOR SHALL INSTALL APPROPRIATE TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH THE TXMUTCD LATEST EDITION. AND AS APPROVED BY THE ENGINEER.

ALL EXCESS MATERIALS AND DEBRIS RESULTING FROM THE PROPOSED IMPROVEMENTS SHALL BECOME THE PROPERTY OF THE CONTRACTOR. THESE MATERIALS AND DEBRIS SHALL BE REMOVED FROM THE SITE AND PROPERLY DISPOSED AT THE COST OF THE CONTRACTOR.

ANY DAMAGES TO EXISTING FENCES, WALKS, OR PRIVATE PROPERTY SHALL BE REPAIRED BY THE CONTRACTOR AT HIS EXPENSE.

NO OPEN EXCAVATION SHALL BE LEFT OPEN OVERNIGHT. ALL EXCAVATIONS WHICH CANNOT BE BACKFILLED OVERNIGHT SHALL BE PROTECTED AT ALL TIMES WITH LONGITUDINAL CHANNELIZING DEVICES THAT CONFORM TO THE TXMUTCD REQUIREMENTS, OR AS APPROVED BY THE ENGINEER.

THE PREPARATION OF THESE PLANS REFLECTS INFORMATION, PROVIDED BY OTHERS, ON THE APPROXIMATE LOCATION AND EXISTENCE OF EXISTING UTILITY AND ADJACENT PHYSICAL FEATURES. HOWEVER, THEY DO NOT IMPLY OR AFFIRM THAT ALL UTILITY OR PHYSICAL FEATURES ARE SHOWN. GENERALLY, UTILITY SERVICE CONNECTIONS ARE NOT INDICATED ON THESE PLANS. CONTRACTOR IS RESPONSIBLE FOR NOTIFICATIONS OF THE OWNER IMMEDIATELY UPON ENCOUNTERING UNFORESEEN CONFLICTS.

PUBLIC AND PRIVATE UTILITY LINES AND CUSTOMER SERVICE LINES MAY EXIST THAT ARE NOT SHOWN ON THE CONSTRUCTION DRAWINGS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LOCATE, MAINTAIN, AND PROTECT THE INTEGRITY OF THESE LINES. HAND EXCAVATION MAYBE REQUIRED. THIS OPERATION SHALL BE CONSIDERED SUBSIDIARY TO THE PROJECT COST AND REFLECTED IN THE UNIT BID PRICES FOR VARIOUS ITEMS LISTED IN THE PROPOSAL.

THE CONTRACTOR SHALL BE RESPONSIBLE TO REPAIR ANY SURFACE IRREGULARITIES, AS DIRECTED BY THE COUNTY, CAUSED BY THE CONTRACTOR'S WORKING OPERATIONS.

DEWATERING MAY BE REQUIRED DURING THE DURATION OF THE PROJECT. SAID WATERING SHALL BE CONSIDERED SUBSIDIARY TO THE PROJECT'S BID ITEMS.

THE CONTRACTOR SHALL CLEANUP AND RESTORE THE AREA OF OPERATIONS TO A CONDITION AS GOOD OR BETTER THEN THAT WHICH EXISTED PRIOR TO INSTALLATION OF ALL ITEMS TO BE CONSTRUCTED.

PREPARATION OF THE RIGHT OF WAY SHALL BE CONSIDERED SUBSIDIARY TO THE PROJECT'S LISTED BID ITEMS. RIGHT OF WAY PREPARATION SHALL BE RESTRICTED TO AREAS THE COUNTY OR PROJECT MANAGER HAS ESTABLISHED FOR CLEARING.

## ITEM 132: EMBANKMENT

EMBANKMENT (FINAL POS)(ORDINARY COMPACTION) SHALL BE TYPE "D" AND COMPACTED TO 95% STANDARD PROCTOR AT OPTIMUM MOISTURE OR ABOVE.

## ITEM 247: FLEXIBLE BASE

THE PERCENT OF DENSITY AS DETERMINED BY COMPACTION RATIO (TEX-113-E) FOR THE NEW FLEXIBLE BASE SHALL BE A MINIMUM OF 98%.

THE CONTRACTOR'S ATTENTION IS CALLED TO THE FACT THAT CERTAIN EXISTING AND/OR PROPOSED STRUCTURES MAYBE WITHIN THE LIMITS OF THE FLEXIBLE BASE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION OPERATIONS WITHOUT DAMAGE TO THESE STRUCTURES.

PASO REAL DRAINAGE IMPROVEMENTS

**GENERAL NOTES** 

8-A OF 44



CHECKED BY: DATE: 02/24/23

CHECKED BY: PROJECT NO.:

COMMERCIAL COLUMNY

19\_003H

FOR WATER ADDED UNDER ITEM 247, THE SULFATE CONTENT WILL NOT EXCEED 3000-PPM AND THE CHLORIDE CONTENT WILL NOT EXCEED 3000-PPM.

PROOF ROLL CONSTRUCTED FLEXIBLE BASE IN ACCORDANCE WITH ITEM 216."PROOF ROLLING." CORRECT SOFT SPOTS AS DIRECTED.

## **ITEM 310:PRIME COAT**

THE CONTRACTOR SHALL EXERCISE DILIGENCE IN THE APPLICATION OF ASPHALT BY THE USE OF FLAGGING AND ROLLING PROCEDURES TO KEEP FROM SPRAYING OR SPATTERING THE TRAVELING PUBLIC WITH ASPHALTIC MATERIAL.

DO NOT APPLY SUBSEQUENT COURSES OVER THE INITIAL PRIME COAT ANY EARLIER THAN THE DAY AFTER THE PRIME COAT WAS APPLIED, UNLESS OTHERWISE AUTHORIZED OR DIRECTED BY THE ENGINEER.

## ITEM 340:DENSE-GRADED HOT-MIX ASPHALT

THE CONTRACTOR SHALL EXERCISE DILIGENCE IN THE APPLICATION OF "TACK COAT" BY THE USE OF FLAGGING AND ROLLING PROCEDURE TO KEEP FROM SPRAYING OR SPLATTERING THE TRAVELING PUBLIC WITH ASPHALTIC MATERIAL.

BLADING (NOT TO EXCEED MORE THAN 3-FT. FROM THE PAVEMENT EDGE) MAY ALSO BE NECESSARY TO CLEAN DIRT AND GRASS FROM PAVEMENT EDGE AND TURNOUT AREAS AS WORK UNDER THIS BID ITEM. THE COST OF THIS BLADING WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED SUBSIDIARY TO THIS BID ITEM.

WHEN SAC "B" AGGREGATE IS USED, MATERIAL PROPERTIES ARE REQUIRED TO BE 10 OR LESS ON THE MAGNESIUM SULFATE SOUNDNESS TEST AND 20 OR LESS ON THE MICRO-DEVAL TEST.

## ITEM 400: EXCAVATION AND BACKFILL FOR STRUCTURES

IF THE CONTRACTOR ELECTS TO CUT PAVEMENT (EXISTING/DETOUR) FOR STRUCTURAL WORK BEYOND THAT REQUIRED BY THE CONSTRUCTION PHASING SHOWN IN THE PLANS AND APPROVED BY THE ENGINEER, IT SHALL BE RESTORED AT HIS EXPENSE AND BACKFILLED TO ITS ORIGINAL CONDITION OR BETTER IN ACCORDANCE WITH ITEM 400.

UNLESS SHOWN OTHERWISE IN THE PLANS, USE A 1-FT. DEPTH FOR ITEM 400 STRUCTURAL EXCAVATION (SPECIAL) FOR GRAVEL BEDDING NEEDED BELOW DRAINAGE STRUCTURES WITH UNSTABLE MATERIAL.

STRUCTURAL EXCAVATION SPECIAL (GRAVEL):
USE DURABLE NATURAL STONE WHEN TESTED IN ACCORDANCE WITH TEX411-A, HAS WEIGHT LOSS OF NO MORE THAN 18% AFTER 5 CYCLES OF
MAGNESIUM SULFATE SOLUTION. PROVIDE GRAVEL CONFORMING TO AN
AGGREGATE GRADE NO. 1 AS SHOWN ON TABLE 4 OF ARTICLE 421.2.

## ITEM 432: RIPRAP

PROVIDE CLASS "A" CONCRETE MINIMUM FOR RIPRAP APRONS PLACED AROUND ALL BOX CULVERT AND PIPE SAFETY END TREATMENTS. PROVIDE 1/4-INCH THICK DUMMY JOINTS AT LEAST EVERY 15-FT FOR RIPRAP APRONS PLACED AROUND BOX AND PIPE CULVERTS.

DO NOT USE FIBER REINFORCED CONCRETE RIPRAP ON SIDE SLOPES EQUAL TO OR STEEPER THAN 6:1 UNLESS APPROVED BY THE ENGINEER.

## ITEM 462: CONCRETE BOX CULVERTS AND DRAINS

PROVIDE JOINTS IN PRE-CAST CONCRETE BOX CULVERTS USING ANY OF THE METHODS SPECIFIED IN ITEM 464, EXCEPT MORTAR JOINTS.

PROVIDE PRE-CAST CONCRETE BOXES TO EXPEDITE TRAFFIC HANDLING UNLESS OTHERWISE SHOWN ON PLANS.

PROVIDE THE COUNTY WITH THE CASTING SCHEDULE OF ALL PER-CAST CONCRETE BOXES PRIOR TO BEGINNING ANY FABRICATION.

## ITEM 464: REINFORCED CONCRETE PIPE

DO NOT MORTAR JOINTS.

ALL REINFORCED CONCRETE PIPE SHALL INCLUDE RUBBER GASKETS UNLESS SHOWN OTHERWISE ON THE PLANS OR DIRECTED BY THE ENGINEER.

PASO REAL
DRAINAGE IMPROVEMENTS

**GENERAL NOTES** 



8-B OF 44

HECKED BY: DATE: 02/24/23
PROVED BY: PROJECT NO.:

## ITEM 471: FRAMES, GRATES, RINGS, AND COVERS

ALL GRATES WILL BE TACK WELDED TO THE FRAMES IN A MANNER SATISFACTORY TO THE ENGINEER.

## ITEM 502:BARRICADES, SIGNS, AND TRAFFIC HANDLING

REPLACE/RELOCATE ALL REGULATORY SIGNS REMOVED DUE TO CONSTRUCTION OPERATIONS WITH THE SAME SIGN ON FIXED SUPPORT(S) IMMEDIATELY UPON ITS REMOVAL. FIRST OBTAIN PROJECT ENGINEER APPROVAL BEFORE RE-MOVING ANY REGULATORY ROADWAY SIGN. REQUIRED FLAGGERS ARE TO BE AVAILABLE TO DIRECT TRAFFIC DURING SIGN INTERMEDIATE DOWN TIME.

FROM THE BEGINNING TO THE END OF THE PROJECT, ALL TRAFFIC CONTROL DEVICES NEED TO BE IN ACCEPTABLE CONDITION AS PER THE TEXAS QUALITY GUIDELINES FOR WORK ZONE TRAFFIC CONTROL DEVICES.

## ITEM 504: FIELD OFFICE AND LABORATORY

FOR THIS PROJECT, A FIELD OFFICE WILL NOT BE REQUIRED AT THE PROJECT SITE.

# PASO REAL DRAINAGE IMPROVEMENTS

**GENERAL NOTES** 



San Benito, Texas 78586 (956) 247-3516 Fax (956) 361-8278

 DRAWN BY:
 MG
 SCALE:
 SHELI

 CHECKED BY:
 DATE:
 02/24/23
 ARROVED BY:
 PROJECT NO.:

 CAMERON COLINTY
 19-002H
 BROWN COLINTY
 PROJECT NO.:
 BROWN COLINTY

## TRAFFIC CONTROL PLAN NOTES:

USE A POWER-BROOM WHEN CLEANING THE ROADWAY AS NEEDED.

REMOVE & DISPOSE ALL MATERIAL NOT DEEMED SALVAGEABLE BY THE ENGINEER, UNLESS OTHERWISE SHOW ON THE PLANS.

DO NOT BLOCK DRAINAGE WHEN HANDLING & STOCKPILING EXCAVATED MATERIAL.

MAINTAIN ACCESS TO DRIVEWAYS AND INTERSECTIONS THROUGH ALL PHASES OF CONSTRUCTION.

MAINTAIN POSITIVE DRAINAGE DURING ALL PHASES OF CONSTRUCTION.

## TRAFFIC CONTROL DEVICES:

AT THE COMMENCEMENT OF THE PROJECT, ALL TRAFFIC CONTROL DEVICES SHALL BE IN ACCEPTABLE CONDITION, AND MAINTAINED THROUGHOUT THE DURATION OF THE PROJECT, AS PER GUIDELINES FOR TEMPORARY TRAFFIC CONTROL DEVICES AND FEATURES.

NOTIFY THE COUNTY ENGINEER IN WRITING (E-MAIL IS ACCEPTABLE) ONCE THE TRAFFIC CONTROL PLAN (TCP) AND ALL TRAFFIC CONTROL DEVICES HAVE BEEN INSTALLED AS PER PLANS ON THE PROJECT SO THAT THE DEPARTMENT'S RESPONSIBLE PERSON ACCOMPANIED BY THE CONTRACTOR'S RESPONSIBLE PERSON CAN CONDUCT A NIGHT INSPECTION ON THE SAID TCP AND TRAFFIC CONTROL DEVICES. COMMENCEMENT OF WORK WILL NOT BE AUTHORIZED NOR ALLOWED UNTIL THE CE NOTIFIES THE CONTRACTOR IN WRITING (E-MAIL IS ACCEPTABLE) TO PROCEED WITH THE WORK.

CONTRACTOR SHALL HAVE A SUFFICIENT AMOUNT OF TRAFFIC CONTROL DEVICES IN ACCEPTABLE CONDITION TO REPLACE ANY DAMAGED TRAFFIC CONTROL DEVICE WITHIN 24 HOURS OF NOTIFICATION.

PROVIDE ADDITIONAL SIGNS AND BARRICADES AS NECESSARY TO ADDRESS FIELD CONSTRUCTIBILITY & VISIBILITY. THESE ADDITIONAL SIGNS WILL BE CONSIDERED SUBSIDIARY TO ITEM 502.

REMOVE OR COMPLETELY COVER ALL EXISTING SIGNS WHICH ARE IN CONFLICT WITH THE TRAFFIC CONTROL PLAN.

ADJUST STOP SIGNS AS NEED ON INTERSECTING STREETS DURING THE VARIOUS CONSTRUCTION PHASES. DO NOT REMOVE ANY EXISTING STOP SIGNS UNTIL TEMPORARY SIGNS ARE IN PLACE.

COORDINATE THE TRAFFIC CONTROL PLAN AND THE VARIOUS SEQUENCES OF CONSTRUCTION WITH ADJACENT CONSTRUCTION PROJECTS IF APPLICABLE. TO ENSURE THE UNINTERRUPTED AND SAFE FLOW OF TRAFFIC.

NOTIFY THE ENGINEER IN WRITING WHEN MAJOR TRAFFIC CHANGES ARE TO BE MADE. NOTIFICATIONS MUST BE GIVEN A MINIMUM OF THREE WORKING DAYS PRIOR TO THE CHANGE.

## SAFETY:

PROTECT EXPOSED PITS THAT MUST REMAIN OPEN DURING NON-WORKING HOURS AS PER OSHA REQUIREMENTS.

## **SEQUENCE OF WORK NARRATIVE:**

## PHASE 1 - DRAINAGE/CHANNEL CONSTRUCTION

INSTALL ALL TRAFFIC CONTROL DEVICES AND SIGNING AS SHOWN IN THE TCP AND DETOUR LAYOUTS.

INSTALL EROSION & SEDIMENT MEASURES.

BEGIN CONSTRUCTION AT THE DOWNSTREAM END OF THE PROJECT (STA 10+95). WORK PROGRESS SHALL BE FROM DOWNSTREAM (STA 10+95) TO UPSTREAM (20+00)

CONTRACTOR SHALL STABILIZED UPON THE COMPLETION OF 500 LINEAR FOOT SEGMENTS.

AT THE HOUSTON CULVERT CROSSINGS, THE CONTRACTOR WILL BE REQUIRED TO FULLY COMPLETE THE CULVERT INSTALLATION, AND STREET REPAIRS BEFORE PROCEEDING WITH ADDITIONAL WORK UNLESS OTHERWISE APPROVED BY THE COUNTY ENGINEER.

## PHASE 2 - FINAL CLEAN UP

CONTRACTOR SHALL INSTALL FINAL STABILIZATION AND ESTABLISH PERMANENT VEGETATION FOR SUBSTANTIAL COMPLETION.

PERFORM FINAL PROJECT CLEAN UP FOR ACCEPTANCE OF THE PROJECT.

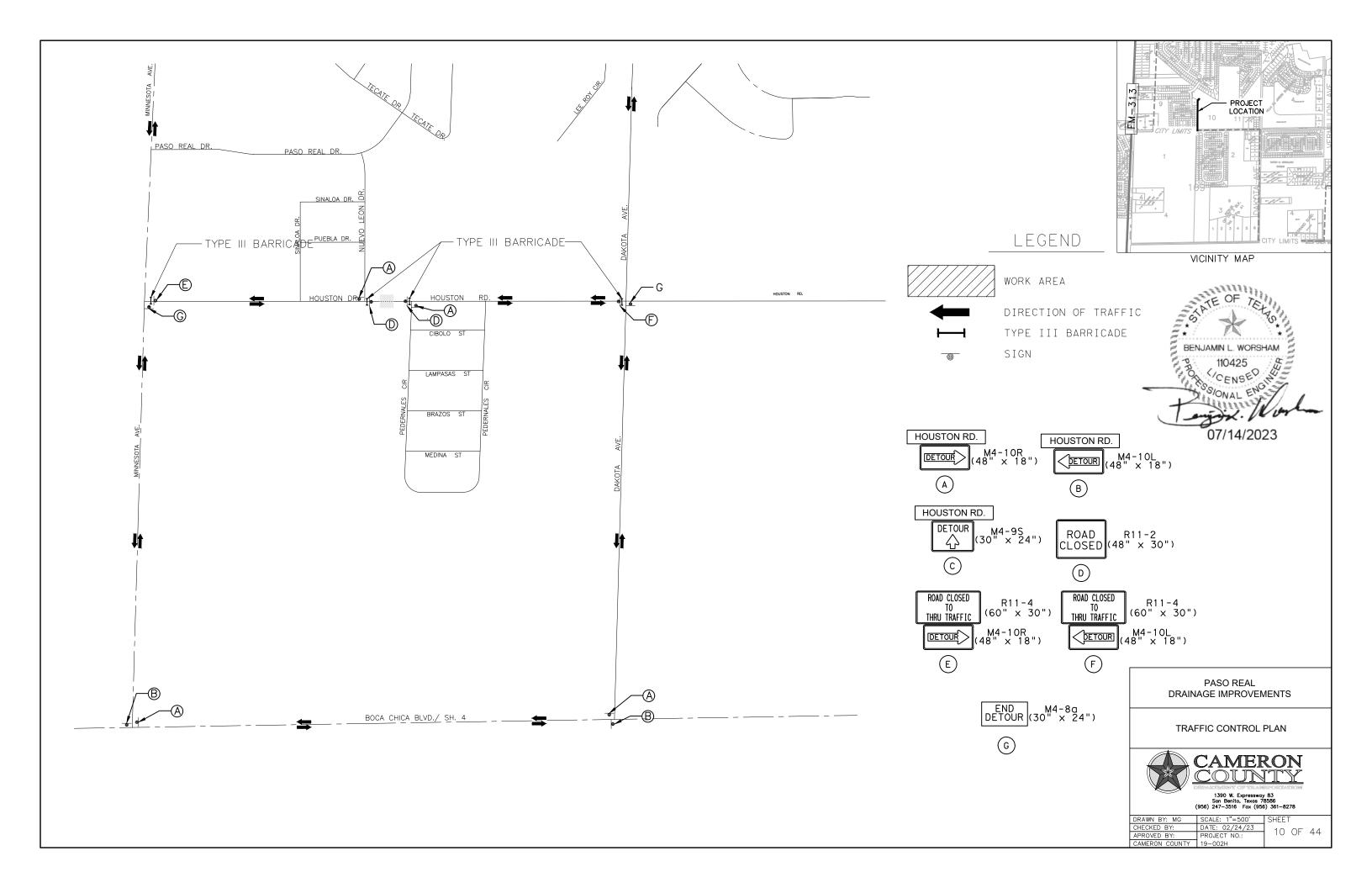
PASO REAL DRAINAGE IMPROVEMENTS

TRAFFIC CONTROL PLAN NOTES



RAWN BY: MG	
HECKED BY:	DATE: 02/24/23
PROVED BY:	PROJECT NO.:

9 OF 44

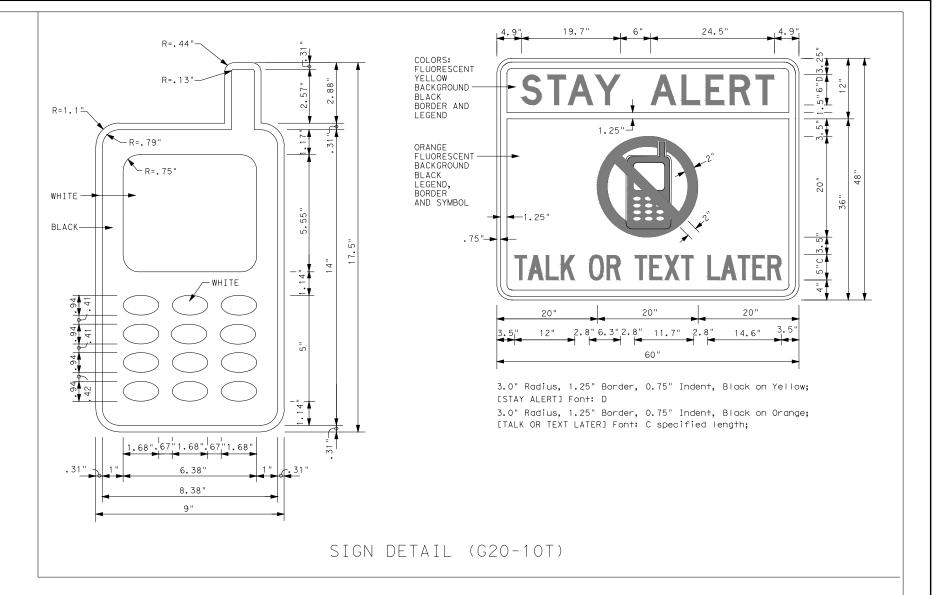


#### BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

- 1. 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. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.
- 11. Except for devices required by Note 10, 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 APPAREL 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.



Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation Traffic Operations Division - TE Phone (512) 416-3118

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

SHEET 1 OF 12 /



BARRICADE AND CONSTRUCTION

GENERAL NOTES

AND REQUIREMENTS

BC(1) - 14

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channelizing devices.

 $\stackrel{\textstyle \swarrow}{\cancel{\times}}$  May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer. (See note 2 below)

- 1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D) sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
- 2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK" (G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume. This information shall be shown in the plans.
- 3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
- 4. The "ROAD WORK NEXT X MILES" (G20-1aT) sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
- 5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
- 6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION ROAD WORK <⇒ NEXT X MILES ROAD WORK G20-1bT NEXT X MILES ⇒ 1000'-1500' INTERSECTED 1 Block - City Hwy 1000'-1500' - Hwy 1 Block - City ROADWAY  $\Rightarrow$ CSJ WORK G20-5aP WORK Limi+ G20-5aP ZONE TRAFFIC G20-5T TRAFFI R20-5T FINES R20-5T FINES DOUBLE DOUBL I R20-5aTP WHEN WORKERS ARE PRESENT G20-6T R20-5aTP CONTRACTOR ROAD WORK G20-2

## CSJ LIMITS AT T-INTERSECTION

- 1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
- 2. If construction closes the road at a T-intersection the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also).
  The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING 1,5,6

SIZE

Sign Conventional Expressway/ Number Road Freeway or Series CW204 CW21 48" × 48" 48" × 48" CW22 CW23 CW25 CW1, CW2, CW7, CW8, 36" × 36" 48" × 48" CW9, CW11 CW14 CW3. CW4. CW5, CW6, 48" × 48" 48" × 48" CW8-3, CW10, CW12

Sian <sup>Δ</sup> Postad

SPACING

Speed	Spacing "X"	
MPH	Feet (Apprx.)	
30	120	
35	160	
40	240	
45	320	
50	400	
55	500 <sup>2</sup>	
60	600²	
65	700 2	
70	800 <sup>2</sup>	
75	900 <sup>2</sup>	
80	1000 <sup>2</sup>	
*	* 3	

- \* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.
- Δ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

#### GENERAL NOTES

- 1. Special or larger size signs may be used as necessary.
- 2. Distance between signs should be increased as required to have 1500 feet
- 3. Distance between signs should be increased as required to have 1/2 mile or more advance warning
- 4.  $36" \times 36"$  "ROAD WORK AHEAD" (CW20-1D) signs may be used on low volume crossroads at the discretion of the Engineer. See Note 2 under "Typical Location of Crossroad Signs".
- 5. Only diamond shaped warning sign sizes are indicated.
- 6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS	SAMPLE LAYOUT OF SIGNING FOR WORK BEGIN	NING AT THE CSJ LIMITS
ROAD CW20-1D  ROAD WORK AREA AHEAD  3X  CW20-1D  CW1-4R  AHEAD  CW20-1D  CW13-1P	** * * * * * * * * * * * * * * * * * *	G20-9TP X ZONE LIMIT R20-5TX X  R20-5TX X  R20-5TP X  R20-5atp X  X  X  X  X  X  X  X  A  A  A  A  A  A
	\$\\ \chi_000000000000000000000000000000000000	
Channelizing Devices	NO-PASSING R2-1 LI  CSJ Limit PEND coordinate	EED MIT WORK ZONE G20-2bT * *
When extended distances occur between minimal work spaces, the Engineer/ "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work area within the project limits. See the applicable TCP sheets for exact locat	Inspector should ensure additional ROAD WORK with sign s to remind drivers they are still G20-2 ** location	NOTES

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS

**X** ★ G20-5aP STAY ALERT X OBEY SPEED ROAD WORK NEXT X MILES TRAFFI \* \* G20-5T WARNING LIMIT ROAD ROAD ROAD <del>X</del> ★ R20-5T FINES SIGNS WORK CLOSED WORK R11-2 STATE LAW CW1 - 41 1/2 MILE TALK OR TEXT LATER AHEAD XXR20-5aTP WHEN WORKERS ARE PRESENT G20-6T Type 3 CW1-6 XX CW13-1P G20-10T R20-3T Barricade or CONTRACTOR channelizina devices  $\triangleleft$ - Channelizing Devices -CSJ Limit  $\Rightarrow$ B SPEED R2-1 LIMIT X ROAD WORK  $\times \times$ G20-2 \* \*

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer No decimals shall be used.

- $\stackrel{\textstyle (\times)}{\star}$  The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
- X X Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.
- $\stackrel{\textstyle \times}{\times}$  Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.
- $\stackrel{\textstyle \times}{}$  Contractor will install a regulatory speed limit sign at the end of the work zone.

	LEGEND
ш	Type 3 Barricade
000	Channelizing Devices
-	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

SHEET 2 OF 12



**Operations** Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2) - 14

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# TYPICAL APPLICATION OF WORK 70NF SPFFD LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.

See General Note 4

Signing shown for one direction only. See BC(2) for additional advance signing.

WORK

ZONE

SPEED

LIMIT

G20-5aP

R2-1

See General

Note 4

G20-5aP

(750' - 1500')

70NF

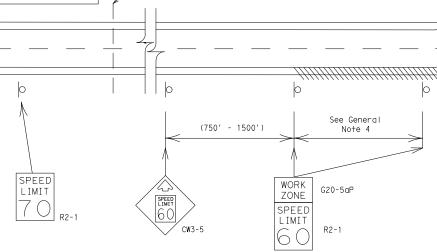
SPEED

LIMIT

CSJ LIMITS

SPEED

LIMIT



LIMITS

## GUIDANCE FOR USE:

Signing shown for

one direction only.

See BC(2) for

additional advance

## LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

- a) rough road or damaged pavement surface
- b) substantial alteration of roadway geometrics (diversions)
- c) construction detours
- d) arade
- e) width

f) other conditions readily apparent to the driver As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the travelled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present. signs shall be removed or covered. (See Removing or Covering on BC(4)).

## GENERAL NOTES

WORK

ZONE

SPEED

LIMIT

G20-5aP

R2-1

- 1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- 2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- 3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- 4. Frequency of work zone speed limit signs should be:

40 mph and greater 0.2 to 2 miles

35 mph and less

0.2 to 1 mile

- 5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- 6. Fabrication, erection and maintenance of the "ADVANCE SPEED LIMIT" (CW3-5) sign. "WORK ZONE"(G20-5aP) plague and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
- 7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- 8. Techniques that may help reduce traffic speeds include but are not limited to: A. Law enforcement.
- B. Flagger stationed next to sign.
- C. Portable changeable message sign (PCMS).
- D. Low-power (drone) radar transmitter.
- E. Speed monitor trailers or signs.
- 9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- 10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

SHEET 3 OF 12



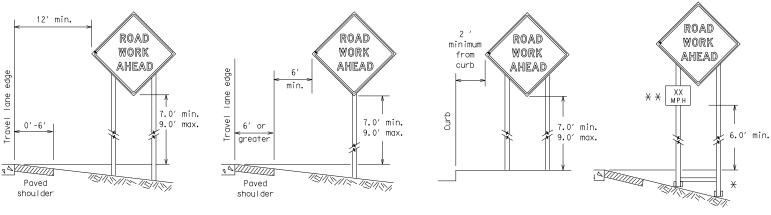


BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3) - 14

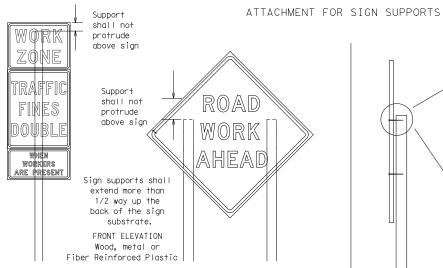
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#### TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



\* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

\* \* When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plagues (advisory or distance) should not cover the surface of the parent sign.



Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attachina sign substrates to other types of

SIDE ELEVATION

Wood

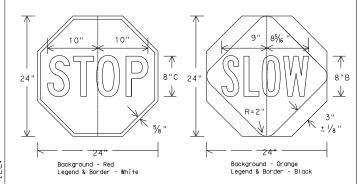
Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Attachment to wooden supports

sign supports

#### STOP/SLOW PADDLES

- 1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24" as detailed below.
- 2. When used at night, the STOP/SLOW paddle shall be retroreflectorized.
- 3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
- 4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



## CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

- 1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information. Drivers proceeding through a work zone need the same, if not better route auidance as normally installed on a roadway without construction.
- 2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition.
- When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
- If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocatina existina sians.
- If permanent signs are to be removed and relocated using temporary supports. the Contractor shall use crashworthy supports as shown on the BC sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
- Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

#### GENERAL NOTES FOR WORK ZONE SIGNS

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
- The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
- The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
- The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or
- damaged or marred reflective sheeting as directed by the Engineer/Inspector.

  Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
- 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)

- 1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
  - Long-term stationary work that occupies a location more than 3 days.
- Intermediate-term stationary work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
- Short-term stationary daytime work that occupies a location for more than 1 hour in a single daylight period.
- Short, duration work that occupies a location up to 1 hour.
- Mobile work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

#### SIGN MOUNTING HEIGHT

- The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except 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 no more than 2 feet above
- the around.
- Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
- 5. Requilatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration. SIZE OF SIGNS
- 1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

#### SIGN SUBSTRATES

- The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
- "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" thick by 6" wide. fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6' 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 requirements of DMS-8300
- 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 background.
- 3. Orange sheeting, meeting the requirements of DMS-8300 Type B<sub>FL</sub> or Type C<sub>FL</sub>, shall be used for rigid signs with orange backgrounds. SIGN LETTERS
- 1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of 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 traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
- Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
- When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting. Burlap shall NOT be used to cover signs.
- 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

- 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. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
- Sandbaas 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 sian 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.

SHEET 4 OF 12 /



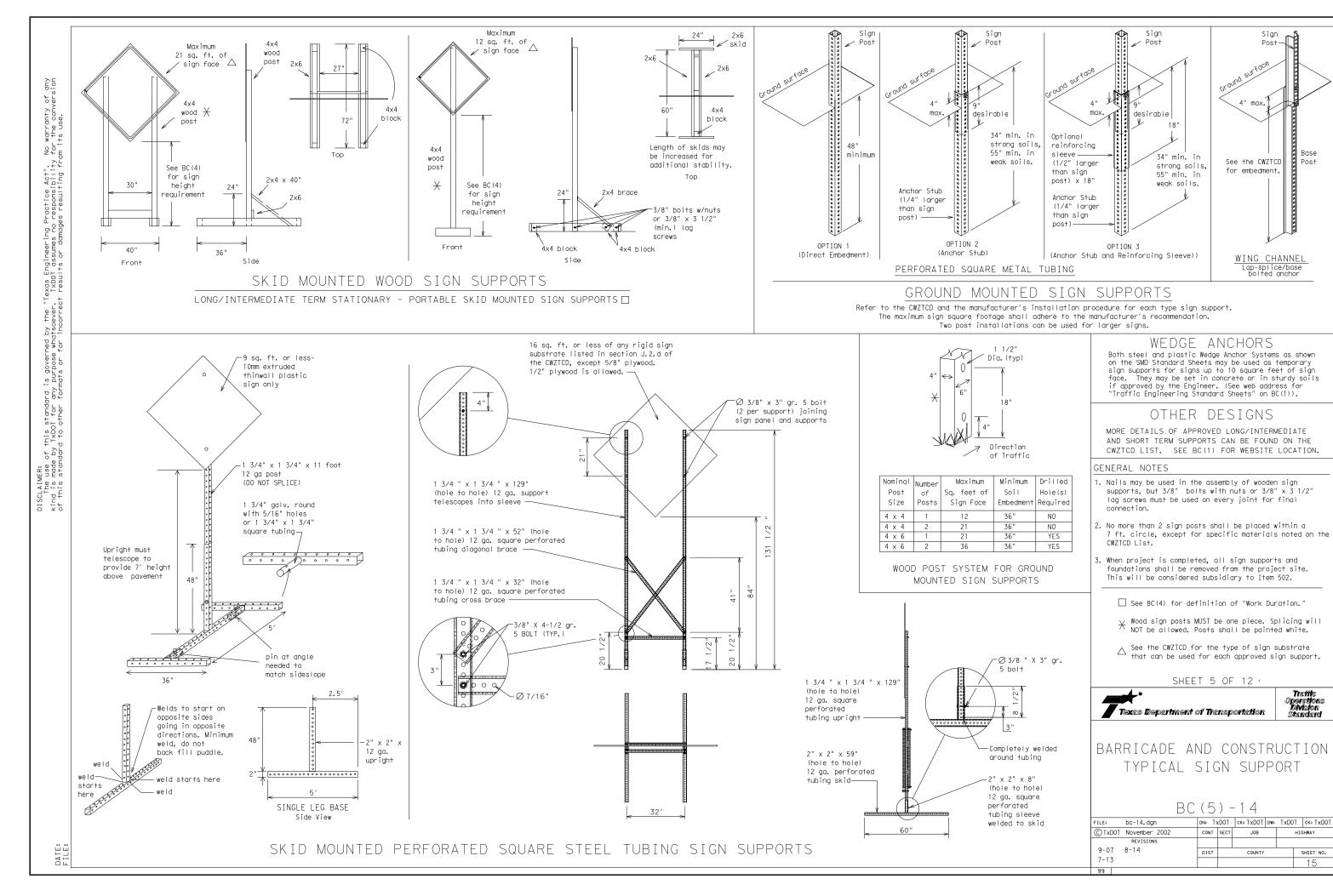


BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4) - 14

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

#### PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
- Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- 5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- 6. When in use the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- 7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight.

  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.
- 8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- 10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
- Do not use the word "Danger" in message.
   Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- 13. Do not display messages that scroll horizontally or vertically across the face of the sign.
- 14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
- 15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
- 16. Each line of text should be centered on the message board rather than left or right justified.
- 17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Cannot	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT RIE	Saturday	SAT
Fast	F	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
	EMER	Slippery	SLIP
Emergency		South	S
Emergency Vehicle Entrance, Enter	EMER VEH ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
	EXPWY	Street	ST
Expressway XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
	FRWY, FWY	Temporary	TEMP
Freeway Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving		Traffic	TRAF
Hazardous Material	HAZ DRIVING	Travelers	TRVLRS
High-Occupancy	HOV	Tuesday	TUES
Vehicle		Time Minutes	TIME MIN
Highway	HWY	Upper Level	UPR LEVEL
Hour (s)	HR, HRS	Vehicles (s)	VEH, VEHS
Information	INFO	Warning	WARN
It Is	ITS	Wednesday	WED
Junction	JCT	Weight Limit	WT LIMIT
Left	LET	West	W
Left Lane	LFT LN	Westbound	(route) W
Lane Closed	LN CLOSED	Wet Pavement	WET PVMT
Lower Level	LWR LEVEL	Will Not	WONT

#### Roadway

designation # IH-number, US-number, SH-number, FM-number

# RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES (The Engineer may approve other messages not specifically covered here.)

Action to Take/Effect on Travel

## Phase 1: Condition Lists

Road/Lane/Ramp	Closure List	Other Cond	ition List
FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED	ROADWORK XXX FT	ROAD REPAIRS XXXX FT
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT	FLAGGER XXXX FT	LANE NARROWS XXXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT	RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
RIGHT X LANES CLOSED	RIGHT X LANES OPEN	MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
CENTER LANE CLOSED	DAYTIME LANE CLOSURES	LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED	DETOUR X MILE	ROUGH ROAD XXXX FT
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE	ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
EXIT CLOSED	RIGHT LN TO BE CLOSED	BUMP XXXX FT	US XXX EXIT X MILES
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI	TRAFFIC SIGNAL XXXX FT	LANES SHIFT

imes LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

#### APPLICATION GUIDELINES

- 1. Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
- 6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

## Phase 2: Possible Component Lists

Location

Warning

\*\* Advance

	List	Location List	Warning List	** Advance Notice List
MERGE RIGHT	FORM X LINES RIGHT	AT FM XXXX	SPEED LIMIT XX MPH	TUE-FRI XX AM- X PM
DETOUR NEXT X EXITS	USE XXXXX RD EXIT	BEFORE RAILROAD CROSSING	MAXIMUM SPEED XX MPH	APR XX- XX X PM-X AM
USE EXIT XXX	USE EXIT I-XX NORTH	NEXT X MILES	MINIMUM SPEED XX MPH	BEGINS MONDAY
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N	PAST US XXX EXIT	ADVISORY SPEED XX MPH	BEGINS MAY XX
TRUCKS USE US XXX N	WATCH FOR TRUCKS	XXXXXXX TO XXXXXXX	RIGHT LANE EXIT	MAY X-X XX PM - XX AM
WATCH FOR TRUCKS	EXPECT DELAYS	US XXX TO FM XXXX	USE CAUTION	NEXT FRI-SUN
EXPECT DELAYS	PREPARE TO STOP		DRIVE SAFELY	XX AM TO XX PM
REDUCE SPEED XXX FT	END SHOULDER USE		DRIVE WITH CARE	NEXT TUE AUG XX
USE OTHER ROUTES	WATCH FOR WORKERS			TONIGHT XX PM- XX AM
STAY IN LANE	*	X X Sec	e Application Guidelines No	te 6.

#### WORDING ALTERNATIVES

- 1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- 2. Roadway designations IH, US, SH, FM and LP can be interchanged as
- 3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- 4. Highway names and numbers replaced as appropriate.
- 5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- 6. AHEAD may be used instead of distances if necessary.
- 7. FT and MI, MILE and MILES interchanged as appropriate. 8. AT, BEFORE and PAST interchanged as needed.
- 9. Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR
CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4)
PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE
UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION
OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS
SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

#### FULL MATRIX PCMS SIGNS

XXXXXXXX BLVD

CLOSED

- 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 CHANGEABLE MESSAGE SIGNS" above.
- 2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
- 3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
- 4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

SHEET 6 OF 12 /



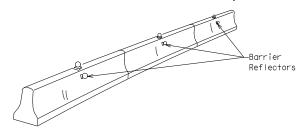


BARRICADE AND CONSTRUCTION
PORTABLE CHANGEABLE
MESSAGE SIGN (PCMS)

BC(6)-14

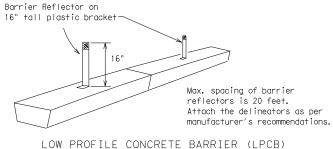
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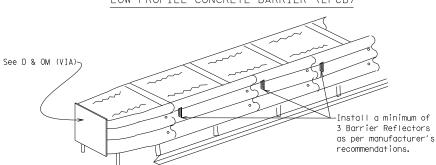
- 1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1). 2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The
- cost of the reflectors shall be considered subsidiary to Item 512.



#### CONCRETE TRAFFIC BARRIER (CTB)

- 3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without domaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
- 4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional) while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
- 5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- 6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- 7. Maximum spacing of Barrier Reflectors is forty (40) feet.
- 8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- 9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- 10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- 11. Single slope barriers shall be delineated as shown on the above detail.



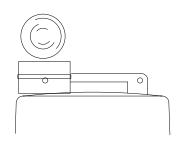


## DELINEATION OF END TREATMENTS

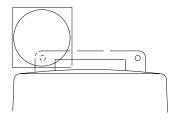
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

# BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 sauare inches

## WARNING LIGHTS

- 1. Warning lights shall meet the requirements of the TMUTCD.
- 2. Warning lights shall NOT be installed on barricades.
- 3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall
- not be used with signs manufactured with Type B<sub>FL</sub> or C<sub>FL</sub> Sheeting meeting the requirements of Departmental Material Specification DMS-8300.

  4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".

  5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will
- certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

#### WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

- 1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.

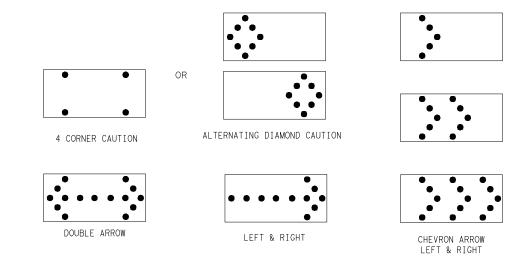
  2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- 3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
- 4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
- 5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- 7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

## WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

- 1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
- 2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CW7TCD.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- 4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
- The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- 9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

- 1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
- Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used. The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic
- control devices that should be used in conjunction with the Flashing Arrow Board. The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage.
- The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
- The sequential arrow display is NOT ALLOWED.
   The flashing arrow display is the TxDOT standard; however, the sequential Chevron display may be used during daylight operations.
- 11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.

  12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.

  13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility,
- flash rate and dimming requirements on this sheet for the same size arrow.
- 14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS									
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE						
В	30 × 60	13	3/4 mile						
С	48 × 96	15	1 mile						

ATTENTION Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

Traffic Operations Division Standard

# FLASHING ARROW BOARDS

SHEET 7 OF 12 '

#### TRUCK-MOUNTED ATTENUATORS

- 1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
- 2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- 3. Refer to the CWZTCD for a list of approved TMAs. 4. TMAs are required on freeways unless otherwise noted
- 5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
- 6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an



BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

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#### GENERAL NOTES

- 1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- 2. 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 cones in proper position and location.
- 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.
- 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" (CWZTCD).
- 5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
- The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

#### GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

- 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 normal handling 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.
- 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 top 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.
- 7. 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.
- to be held down while separating the drum body from the base.

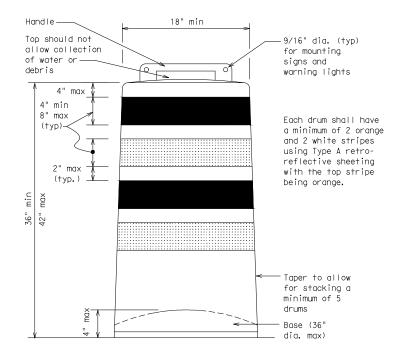
  8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
- 9. Drum body shall have a maximum unballasted weight of 11 lbs.
- 10.Drum and base shall be marked with manufacturer's name and model number.

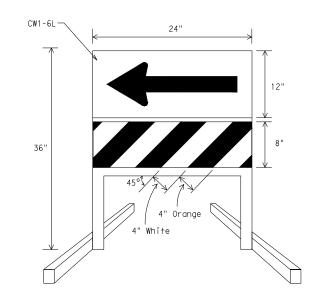
## RETROREFLECTIVE SHEETING

- 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 reflective sheeting shall be supplied unless otherwise specified in the plans.
- 2. 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.

#### BALLAST

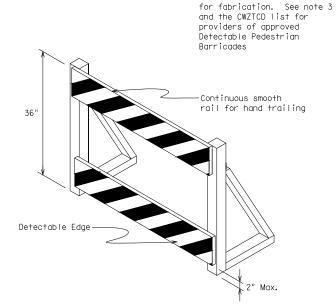
- 1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other 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.
- 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 for this type of ballast on the CWZTCD list.
- 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.
- 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.





## DIRECTION INDICATOR BARRICADE

- The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
   If used, the Direction Indicator Barricade should be used
- If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
- 3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type  $B_{FL}$  or Type  $C_{FL}$  Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
- Double arrows on the Direction Indicator Barricade will not be allowed.
- Approved manufacturers are shown on the CWZTCD List.
   Ballast shall be as approved by the manufacturers instructions.



This detail is not intended

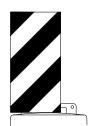
#### DETECTABLE PEDESTRIAN BARRICADES

- When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
- shall be placed across the full width of the closed sidewalk.

  3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
- 4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" and should not be used as a control for pedestrian movements.
- 5. Warning lights shall not be attached to detectable pedestrian barricades.
- 6. Detectable pedestrian barricades may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign (Maximum Sign Dimension) Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24"
Vertical Panel
mount with diagonals
sloping down towards
travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED
ON PLASTIC DRUMS

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- 2. Chevrons and other work zone signs with an orange background shall be manufactured with Type  $\rm B_{FL}$  or Type  $\rm C_{FL}$ Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
- Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- 4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection
- 6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- 7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
- 8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

SHEET 8 OF 12 '



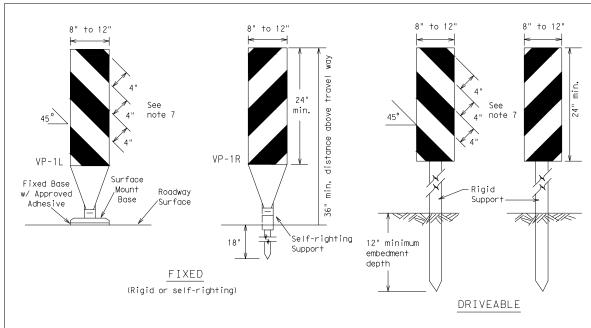
Traffic Operations Division Standard

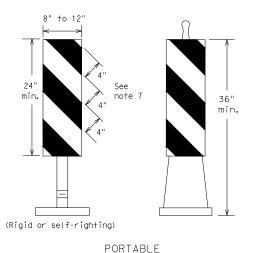
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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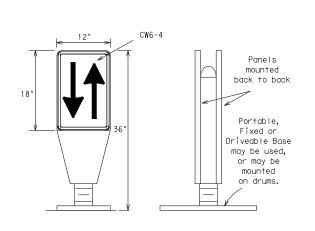




1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.

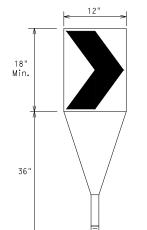
- 2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of VP's for drop-offs.
- VP's should be mounted back to back if used at the edge
  of cuts adjacent to two-way two lane roadways. Stripes
  are to be reflective orange and reflective white and
  should always slope downward toward the travel lane.
   VP's used on expressways and freeways or other high
- speed roadways, may have more than 270 square inches of retroreflective area facing traffic. 5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List"
- (CWZTCD).
  6. Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
- 7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



- 1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
- The OTLD may be used in combination with 42" cones or VPs.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
- 4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type  $B_{FL}\,$  or Type  $C_{FL}\,$  conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



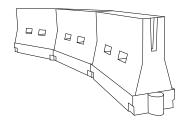
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
- 3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
- 4. To be effective, the chevron should be visible for at least 500 feet.
- 5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B<sub>FL</sub> or Type C<sub>FL</sub> conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
- For Long Term Stationary use on tapers or transitions on freeways and divided highways self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

# CHEVRONS

#### GENERAL NOTES

- Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
- 3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- 4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
- 5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
- 6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
- 7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



#### LONGITUDINAL CHANNELIZING DEVICES (LCD)

- 1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
- 2. LCDs may be used instead of a line of cones or drums.
- 3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- 4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
- 5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
- 6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10) placed near the top of the LCD along the full length of the device.

#### WATER BALLASTED SYSTEMS USED AS BARRIERS

- 1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
- 2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delinection or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
- Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- 4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
- 5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed	Formula	Desirable Taper Lengths  X X			Spacing of Channelizing Devices		
<del>*</del>		10' Offset	11' Offset	12′ Offset	On a Taper	On a Tangent	
30	, ws²	150′	165′	180′	30′	60′	
35	L= WS	205′	225′	245′	35′	70′	
40	80	265′	295′	320′	40′	80′	
45		450′	495′	540′	45′	90′	
50		500′	550′	600′	50′	100′	
55	L=WS	550′	605′	660′	55′	110′	
60		600′	660′	720′	60′	120′	
65		650′	715′	780′	65′	130′	
70		700′	770′	840′	70′	140′	
75		750′	825′	900′	75′	150′	
80		800′	880′	960′	80′	160′	

\*\*X\*\*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

SHEET 9 OF 12





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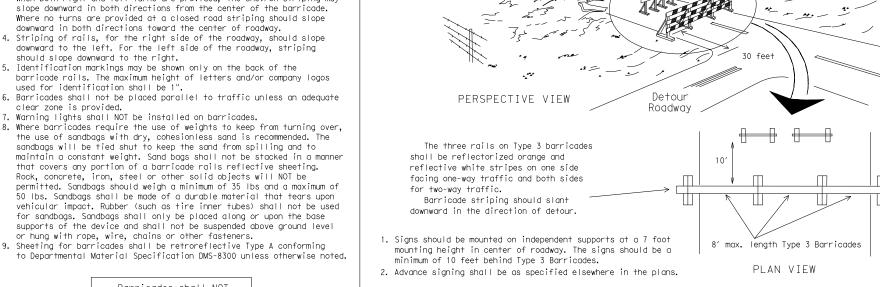
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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#### TYPE 3 BARRICADES

- 1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
- 2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
- 3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road striping should slope downward in both directions toward the center of roadway.
- downward to the left. For the left side of the roadway, striping should slope downward to the right.
- barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
- 6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
- 8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. 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 for sandbaas. Sandbaas shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
- 9. Sheeting for barricades shall be retroreflective Type A conforming



Each roadway of a divided highway shall be

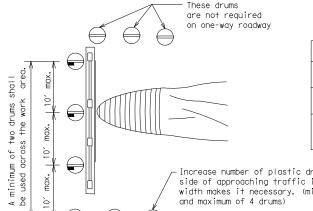
barricaded in the same manner.

1. Where positive redirectional capability is provided, drums may be omitted. 2. Plastic construction fencing may be used with drums for safety as required in the plans. 3. Vertical Panels on flexible support

> may be substituted for drums when the shoulder width is less than 4 feet. 4. When the shoulder width is greater

than 12 feet, steady-burn lights may be omitted if drums are used.

5. Drums must extend the length of the culvert widening.



PLAN VIEW

LEGEND

Plastic drum

Plastic drum with steady burn light or yellow warning reflector

Steady burn warning light or yellow warning reflector

Increase number of plastic drums on the side of approaching traffic if the crown width makes it necessary. (minimum of 2

Typical

PERSPECTIVE VIEW

Plastic Drum

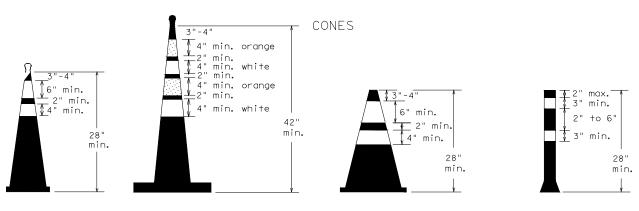
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

# Barricades shall NOT be used as a sign support. Width of Reflective 7 inches. TYPICAL STRIPING DETAIL FOR BARRICADE RAIL 4' min., 8' max.

Stiffener 18

Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



NAME ADDRESS CITY STATE

ROAD CLOSED

**DETOUR** 

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION

R11-2

M4-10L

Two-Piece cones

Tubular Marker

Alternate Alternate 4 Drums, vertical panels or 42" cones Approx. Approx. at 50' maximum spacing Min. 2 drums Min. 2 drums or 1 Type 3 or 1 Type 3 barricade barricade STOCKPILE On one-way roads Desirable downstream drums stockpile location Channelizing devices parallel to traffic or barricade may be is outside should be used when stockpile is omitted here clear zone. within 30' from travel lane.  $\triangleleft$ 

TRAFFIC CONTROL FOR MATERIAL STOCKPILES

 $\Rightarrow$ 

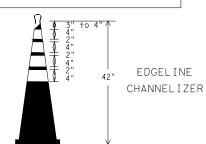
28" Cones shall have a minimum weight of 9 1/2 lbs.

One-Piece cones

42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

- 1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
- 2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
- 3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
- 4. Cones or tubular markers used at night shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A.
- 5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
- 6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
- 7. Cones or tubular markers used on each project should be of the same size and shape.

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



- 1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
- 2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
- 3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
- 4. The base must weigh a minimum of 30 lbs.

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**Traffic** Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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## WORK ZONE PAVEMENT MARKINGS

#### GENERAL

- The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
- 2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- 5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ (STPM).
- 6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
- 7. All work zone pavement markings shall be installed in accordance with Item 662. "Work Zone Pavement Markings."

#### RAISED PAVEMENT MARKERS

- 1. Raised pavement markers are to be placed according to the patterns
- All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

## PREFABRICATED PAVEMENT MARKINGS

- Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
- Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

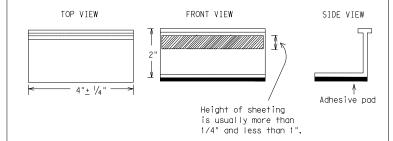
#### MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- 2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
- 3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
- 4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

#### REMOVAL OF PAVEMENT MARKINGS

- Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
- The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
- 3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
- 4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- 5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- 6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
- 7. Over-painting of the markings SHALL NOT BE permitted.
- 8. Removal of raised pavement markers shall be as directed by the Fnaineer.
- Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
- 10.Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

## Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
  - A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
  - B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
- 3. Small design variances may be noted between tab manufacturers.
- 4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

#### RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as: YELLOW - (two amber reflective surfaces with yellow body). WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIO	NS
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

SHEET 11 OF 12,

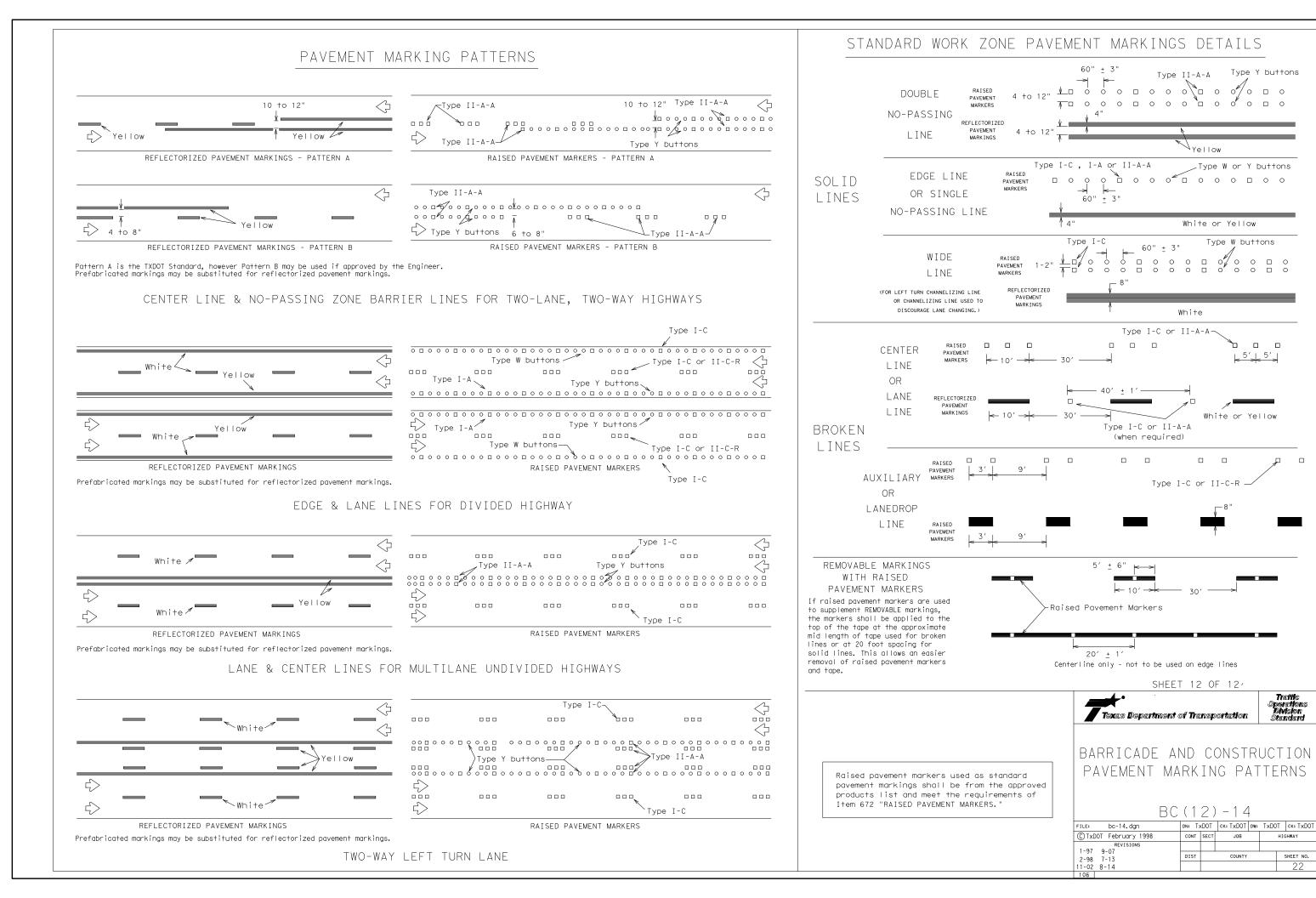




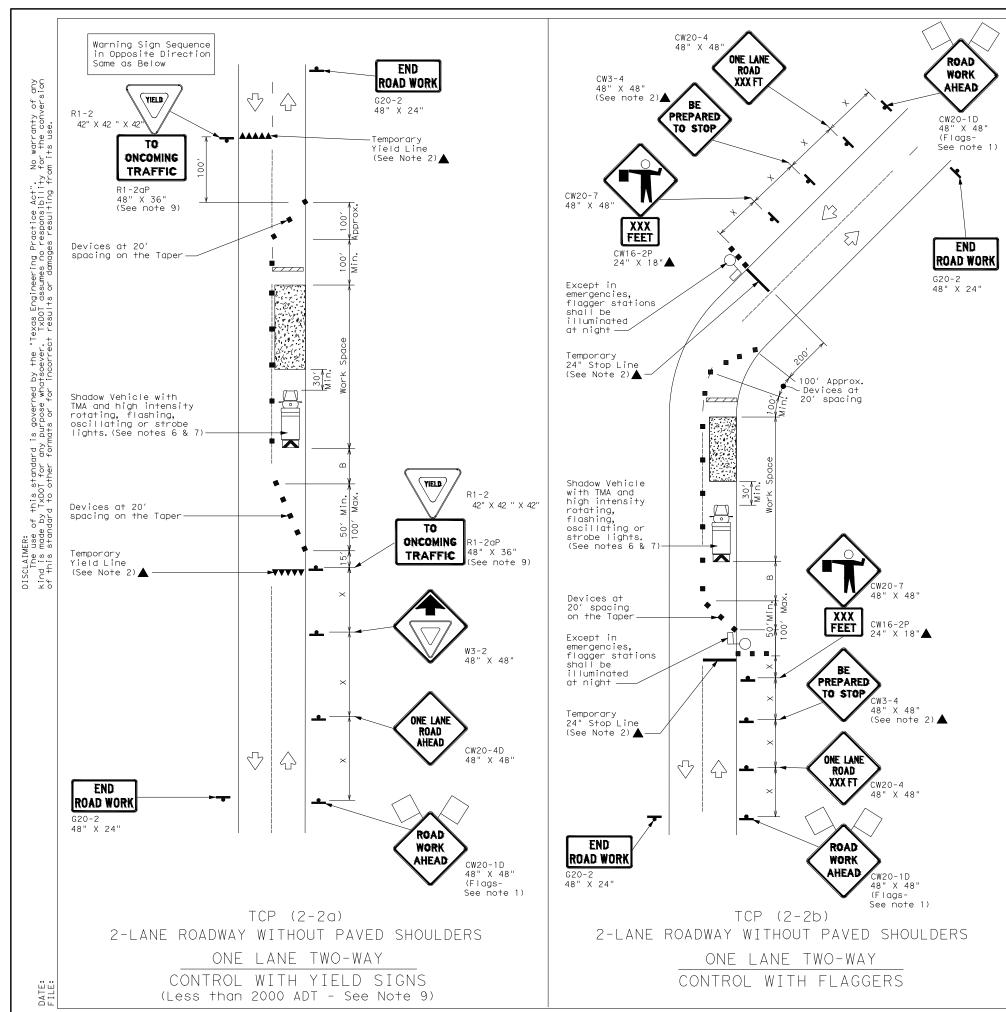
BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

	\ I	1 /	1	1		
FILE: bc-14.dgn	DN: TxDOT		ск: TxDOT	DW:	TxDOT	ck: TxD0T
© TxDOT February 1998	CONT	SECT	JOB		н	IGHWAY
REVISIONS 2-98 9-07						
1-02 7-13	DIST		COUNTY			SHEET NO.
11-02 8-14						21
105						



SHEET NO.



	LEGEND							
	Type 3 Barricade		Channelizing Devices					
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)					
	Trailer Mounted Flashing Arrow Board	(S	Portable Changeable Message Sign (PCMS)					
_	Sign	∿	Traffic Flow					
$\Diamond$	Flag	ILO	Flagger					

Posted Speed	Formula	Minimum Desirable Taper Lengths XX			Spacir Channe		Minimum Sign Spacing "X"	Suggested Longitudinal Buffer Space	Stopping Sight Distance
*		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	Distance	"B"	
30		150′	165′	180′	30′	60′	120′	90′	200′
35	$L = \frac{WS}{60}$	205′	225′	245'	35′	70′	160′	120′	250′
40	60	265′	295′	320′	40′	80′	240′	155′	305′
45		450′	495′	540′	45′	90′	320′	195′	360′
50		500′	550′	600′	50′	100′	400′	240′	425′
55	L=WS	550′	605′	660′	55′	110′	500′	295′	495′
60	- " 3	600′	660′	720′	60′	120′	600′	350′	570′
65		650′	715′	780′	65 <i>′</i>	130′	700′	410′	645′
70		700′	770′	840′	70′	140′	800′	475′	730′
75		750′	825′	900′	75′	150′	900′	540′	820′

\* Conventional Roads Only

\*\* Taper lengths have been rounded off.

L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE							
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY			
	1	1	1				

#### GENERAL NOTES

- 1. Flags attached to signs where shown, are REQUIRED.
- All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol
  may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved
  by the Engineer.
- 3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
- 4. Flaggers should use two-way radios or other methods of communication to control traffic.
- 5. Length of work space should be based on the ability of flaggers to communicate.
- 6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
- 7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

#### TCP (2-2a)

- 8. The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block.
- In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.

  9. The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.

## TCP (2-2b)

- 10.Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
- 11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
- 12.Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situtations.

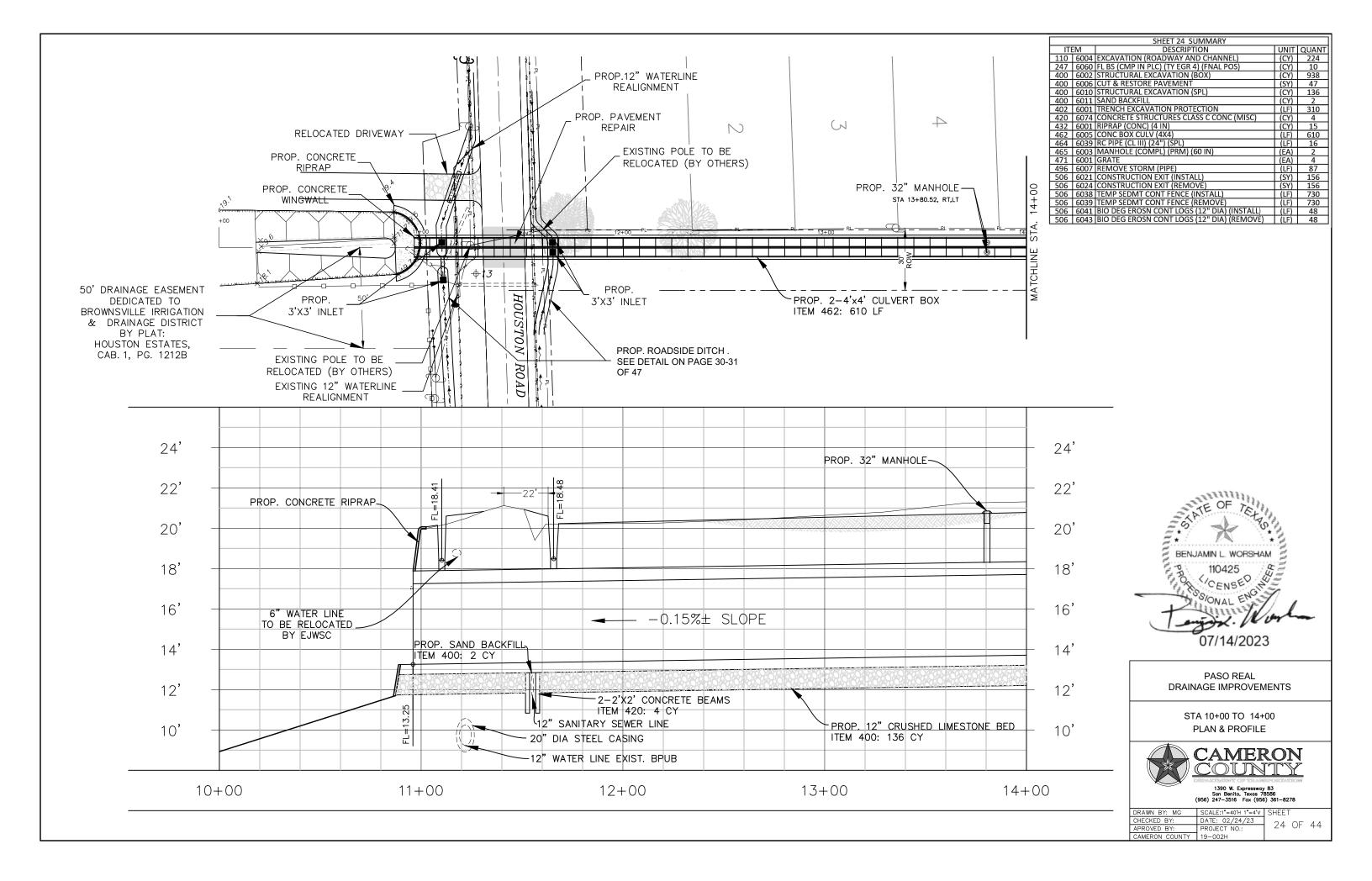


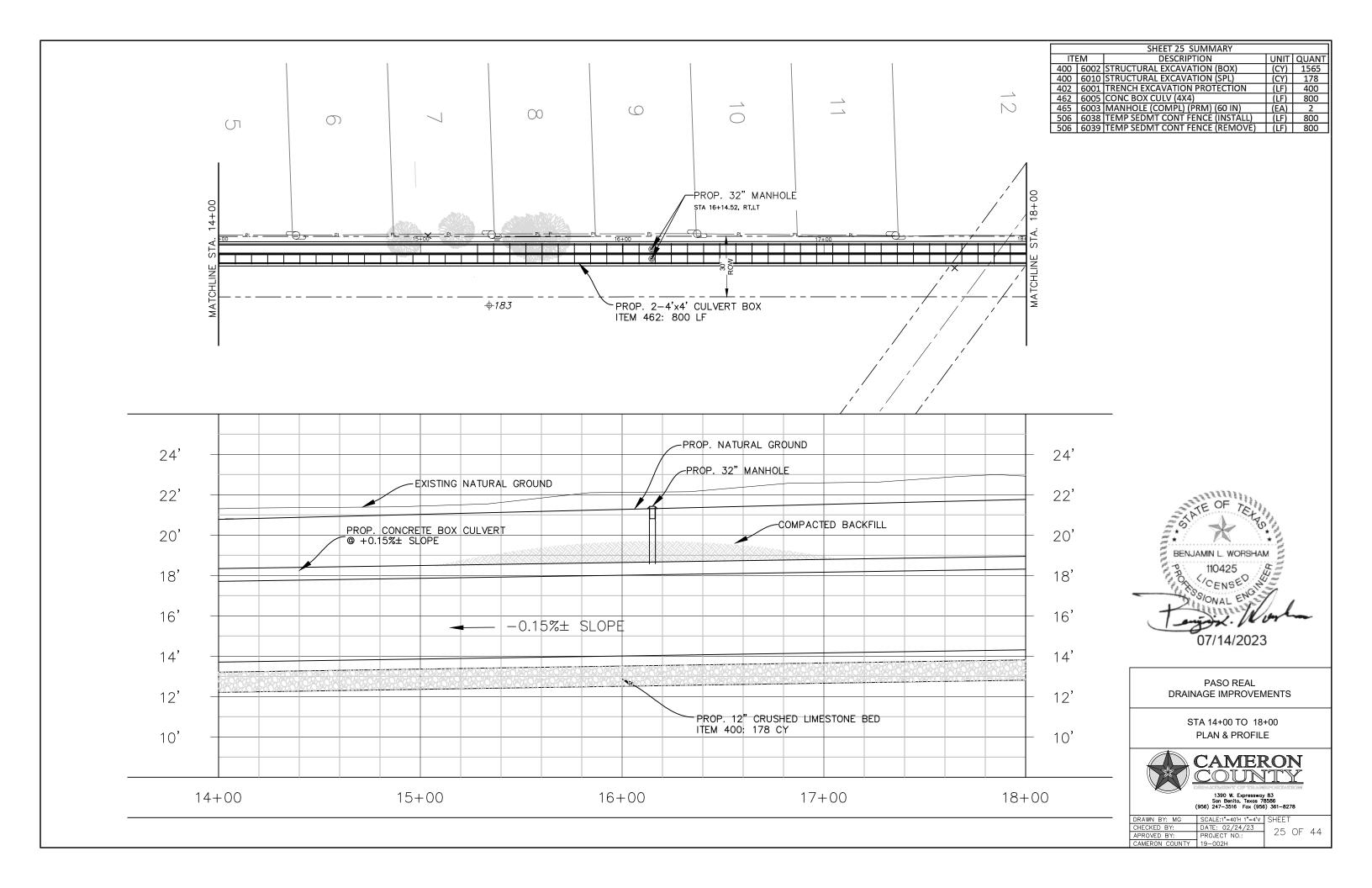
Traffic Operations Division Standard

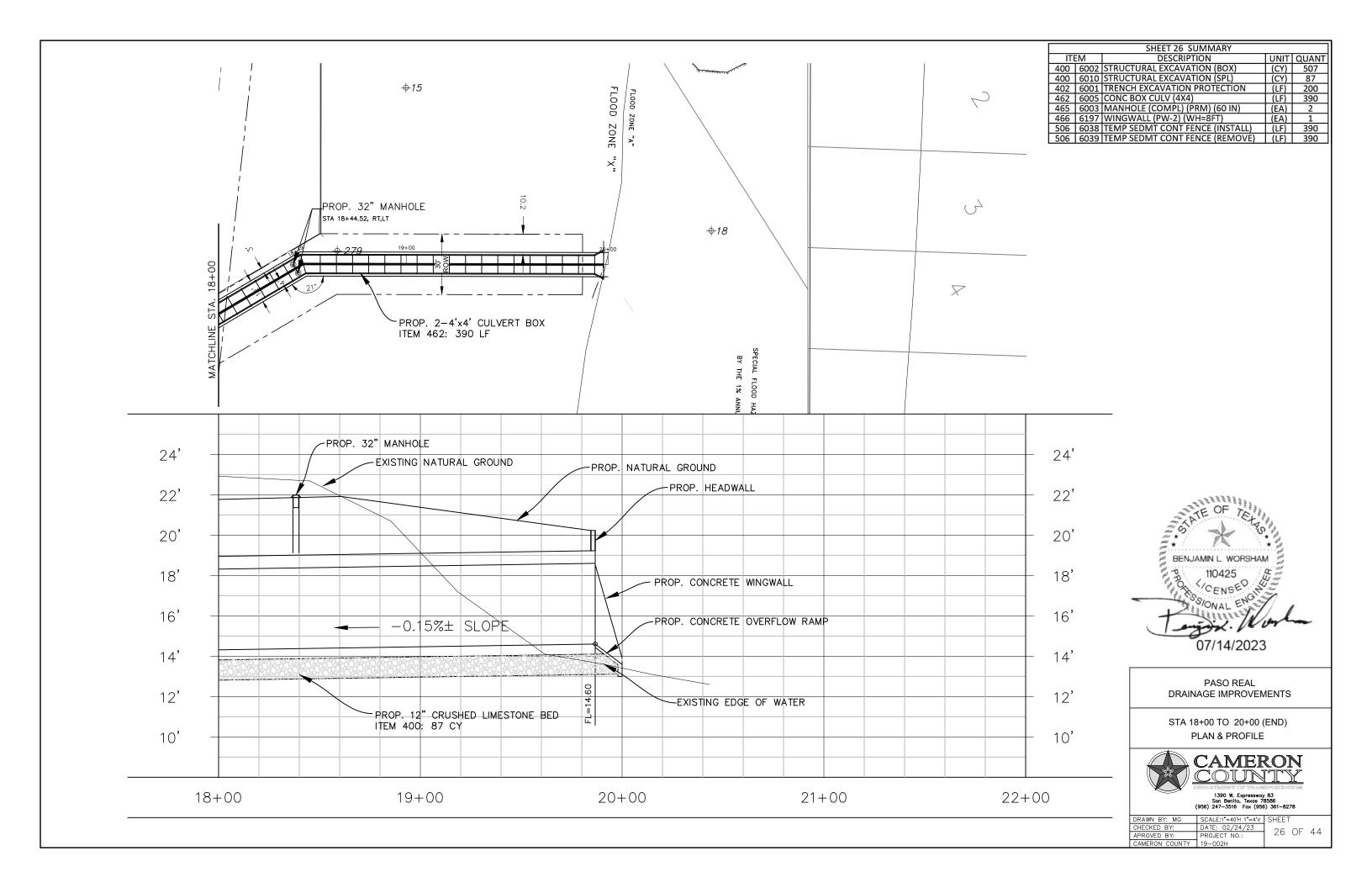
TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

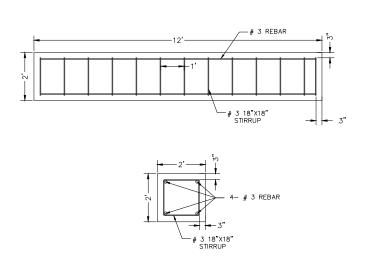
TCP(2-2)-18

FILE:	tcp2	-2-18. agn		DN:		CK: DW:			CK:	
© TxI	TxDOT December 1985			CONT	SECT	JOB	HIGHWA		HWAY	
8-05	7-03	VISIONS								
	1-97 2-12		DIST	COUNTY				HEET NO.		
4-98	2-18								23	
162										

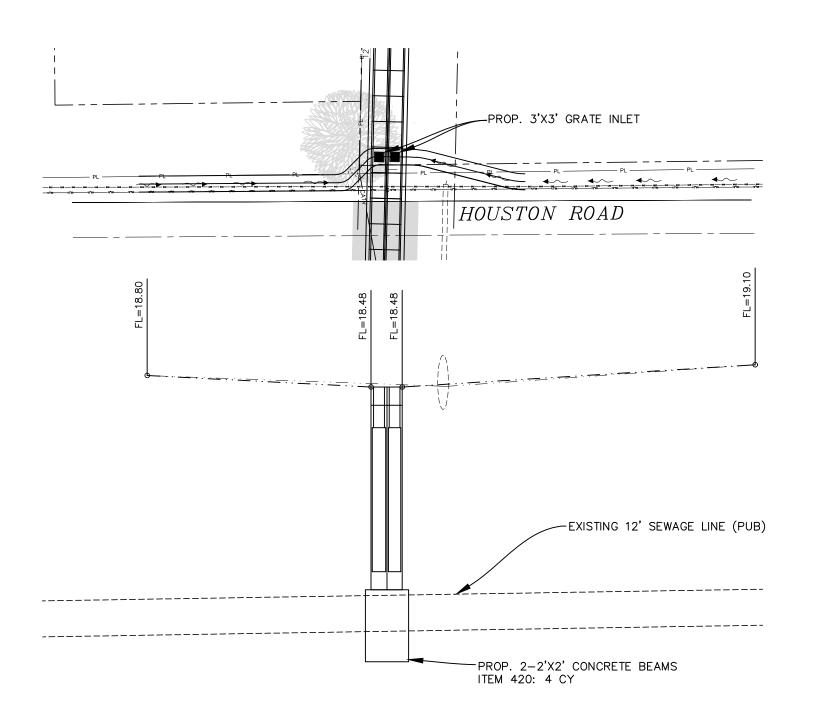


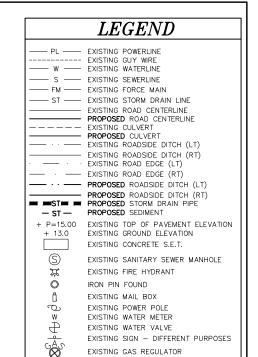






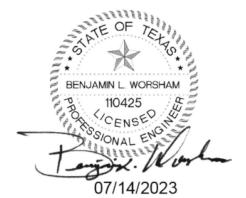
PROPOSED CONCRETE BEAM SCALE: 1"= 4'





FLOW LINE DIRECTION

SCALE=1"=30'

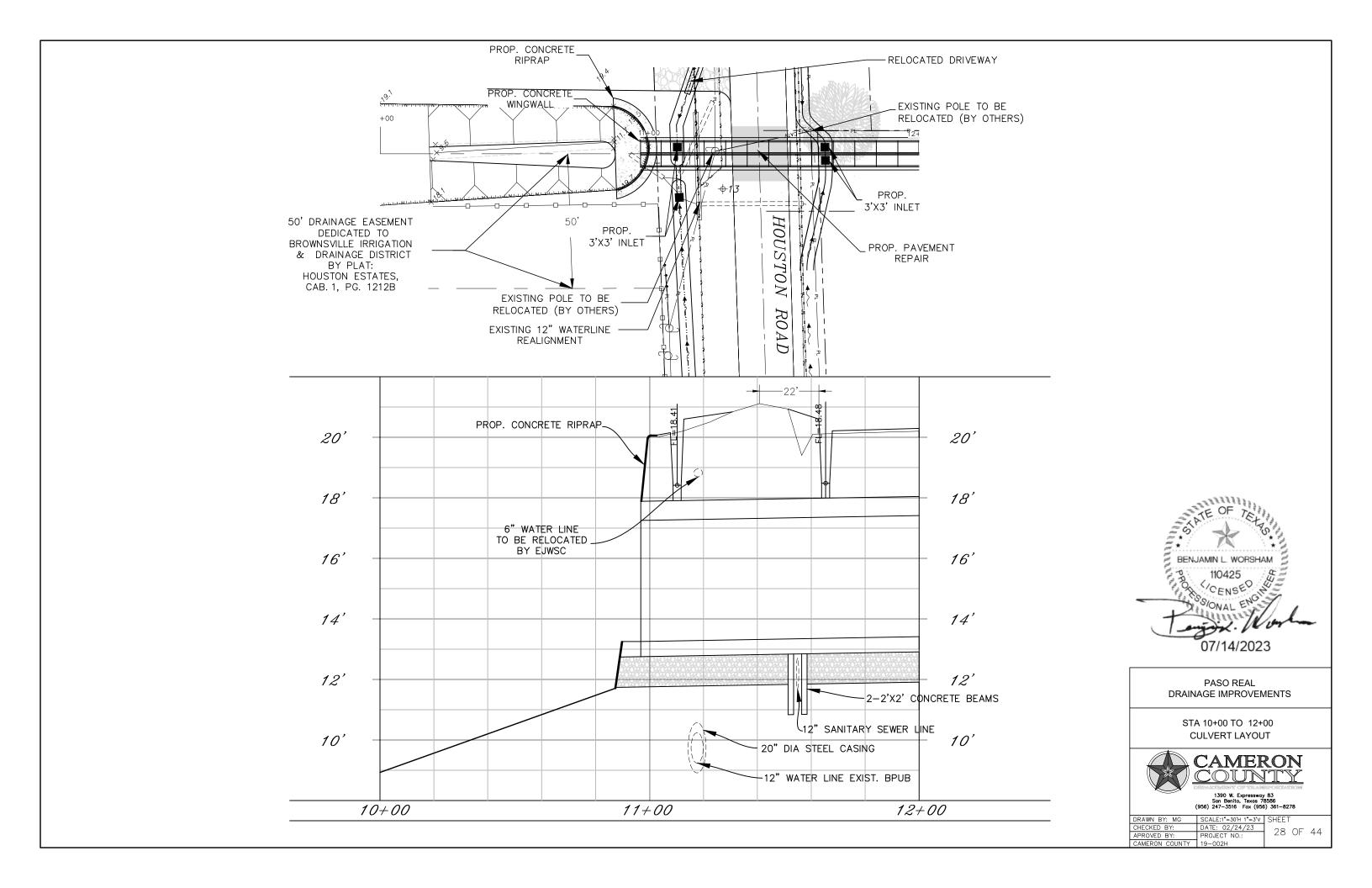


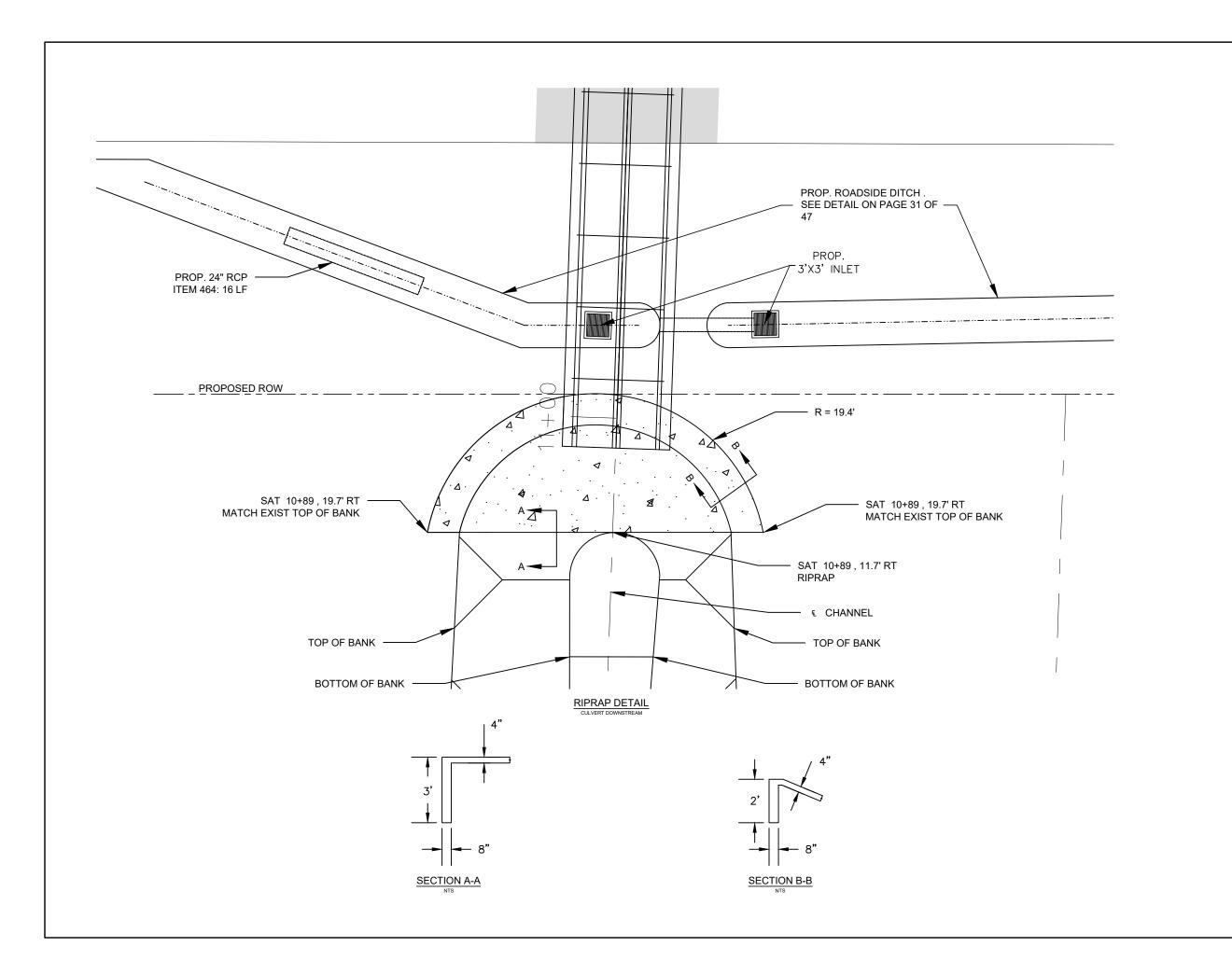
PASO REAL DRAINAGE IMPROVEMENTS

SEWAGE IMPROVEMENTS



1390 W. Expressway 83 San Benito, Texas 78586 (956) 247–3516 Fax (956) 361–8278







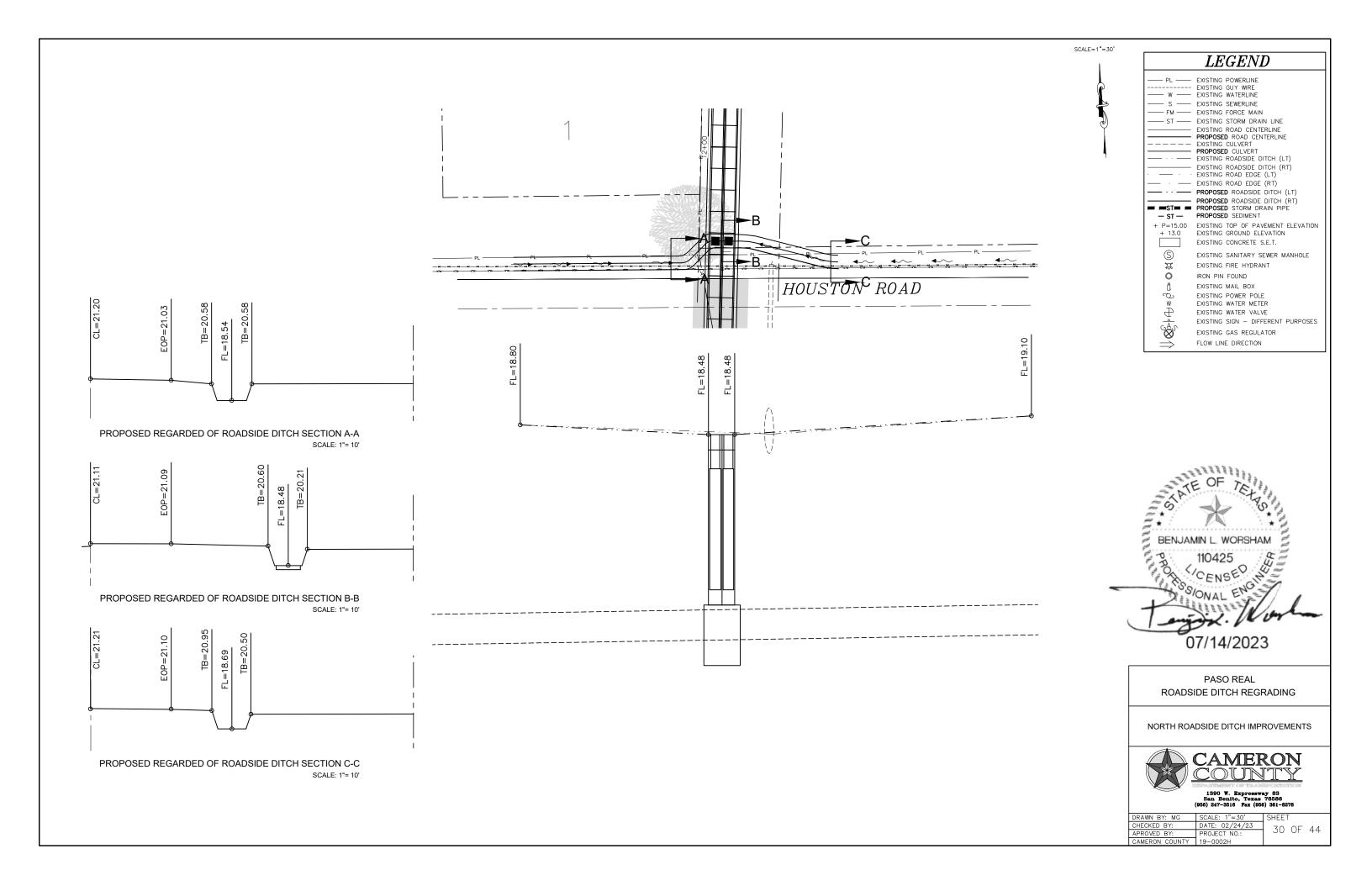
PASO REAL DRAINAGE IMPROVEMENTS

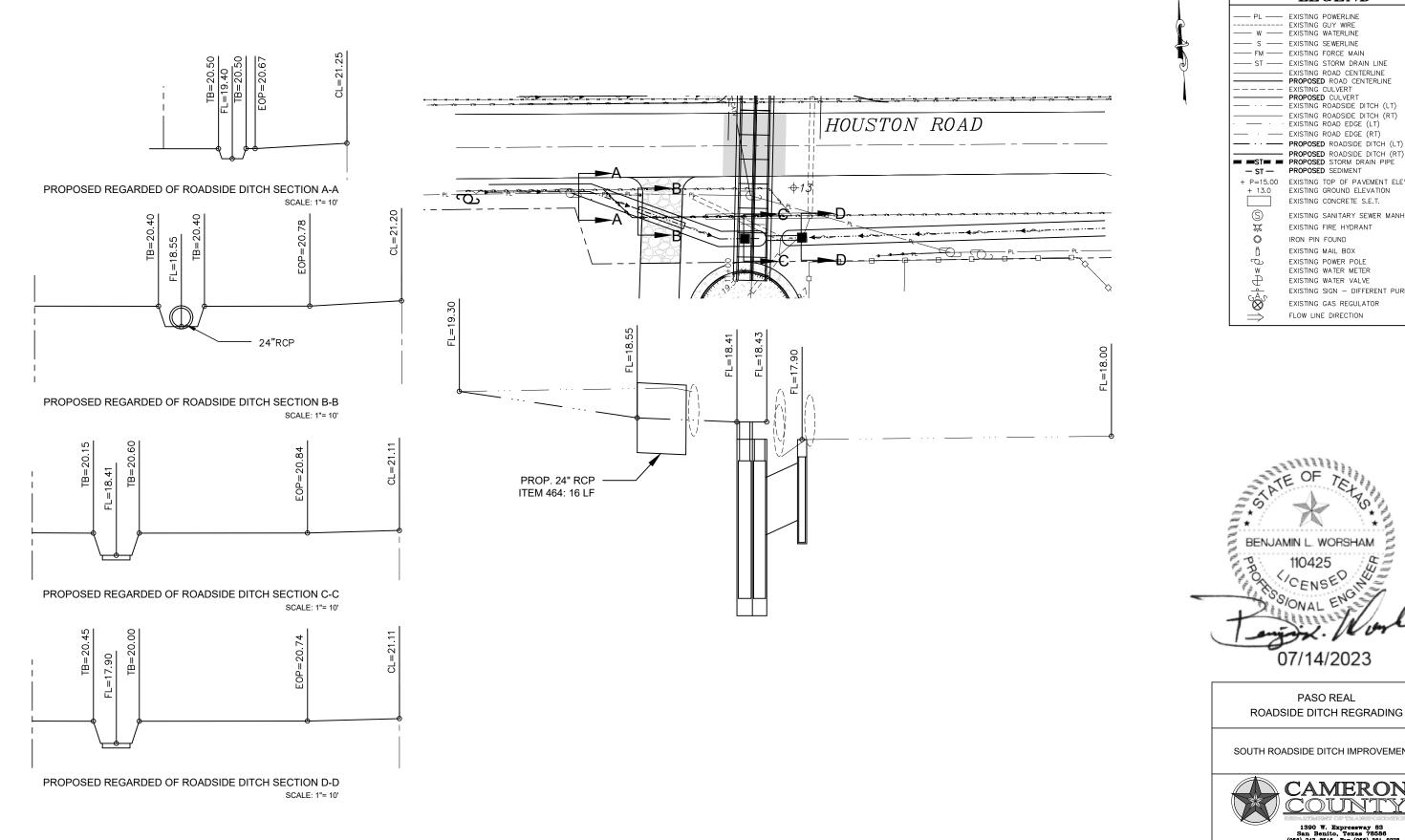
CULVERT DETAILS



1390 W. Expressway 83 San Benito, Texas 78586 (956) 247-3516 Fax (956) 361-8278

DRAWN BY: MG	SCALE: 1"=10"	SHEET
CHECKED BY:	DATE: 02/24/23	29 OF 44
APROVED BY:	PROJECT NO.:	29 OF 44
CAMERON COUNTY	19-002H	





LEGEND

PL — EXISTING POWERLINE
EXISTING GUY WIRE
W — EXISTING WATERLINE — S —— EXISTING SEWERLINE - FM - EXISTING FORCE MAIN — ST — EXISTING STORM DRAIN LINE - EXISTING ROAD CENTERLINE PROPOSED ROAD CENTERLINE

---EXISTING CULVERT PROPOSED CULVERT
EXISTING ROADSIDE DITCH (LT) EXISTING ROADSIDE DITCH (RT)

SCALE=1"=30'

- PROPOSED ROADSIDE DITCH (RT) PROPOSED STORM DRAIN PIPE - ST - PROPOSED SEDIMENT

+ P=15.00 EXISTING TOP OF PAVEMENT ELEVATION + 13.0 EXISTING GROUND ELEVATION EXISTING CONCRETE S.E.T.

EXISTING SANITARY SEWER MANHOLE EXISTING FIRE HYDRANT X 0 IRON PIN FOUND

EXISTING MAIL BOX ф EXISTING POWER POLE EXISTING WATER METER EXISTING WATER VALVE

EXISTING SIGN - DIFFERENT PURPOSES EXISTING GAS REGULATOR

FLOW LINE DIRECTION

BENJAMIN L. WORSHAM 07/14/2023

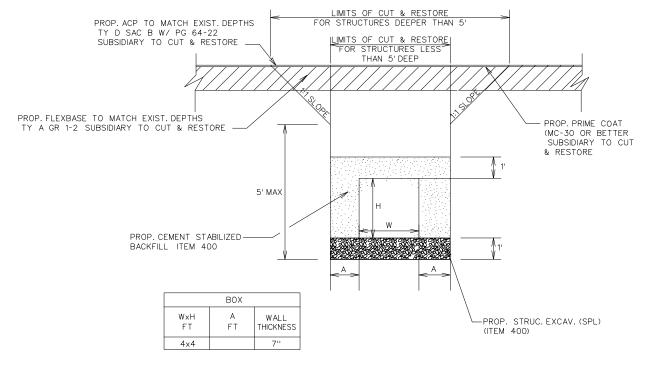
> PASO REAL ROADSIDE DITCH REGRADING

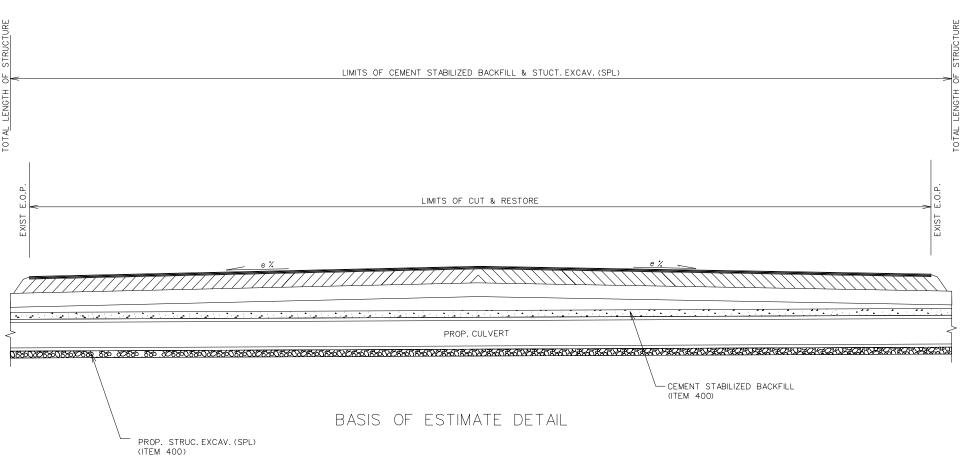
SOUTH ROADSIDE DITCH IMPROVEMENTS



1390 W. Expressway 83 San Benito, Texas 78586 (956) 247-3516 Fax (956) 361-8278

DRAWN BY: MG SCALE:1"=30'H 1"=3'V SHEET DATE: 02/24/23 PROJECT NO.: CHECKED BY: 31 OF 44





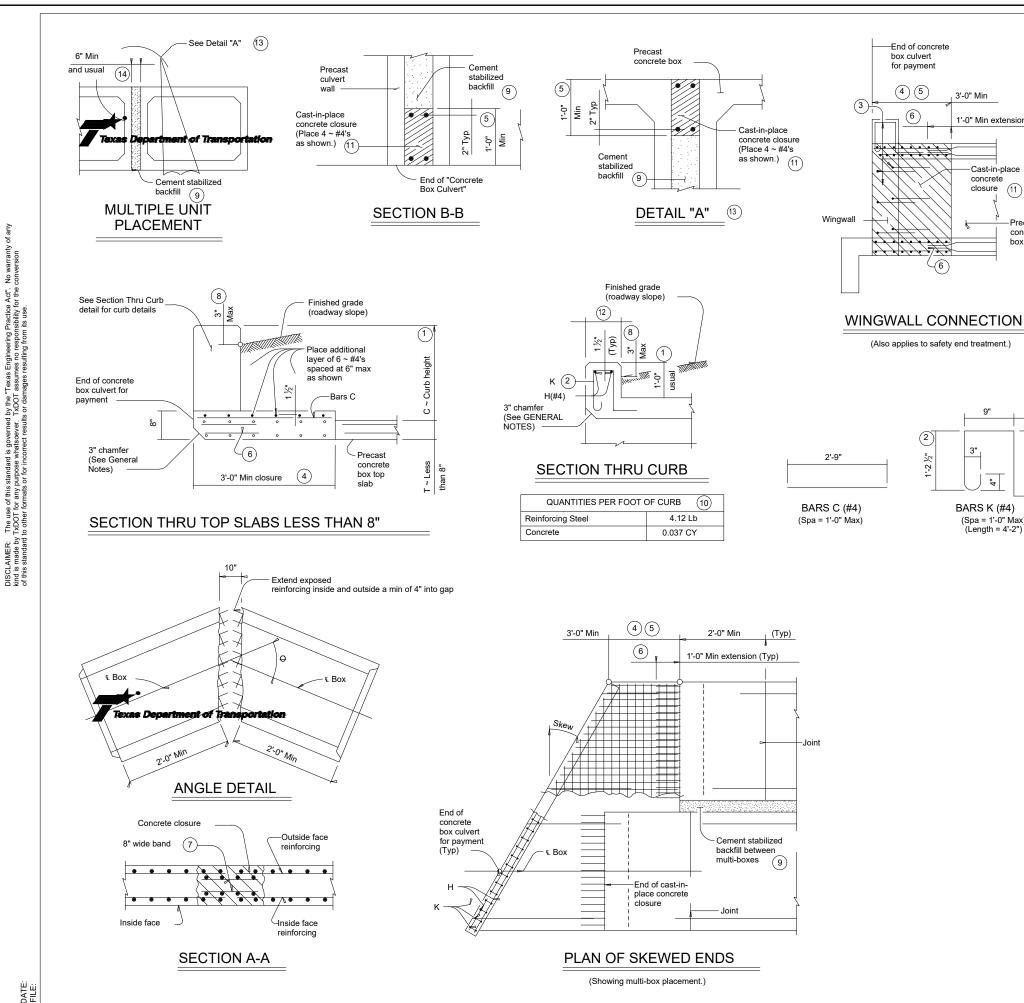


PASO REAL ROAD RESTORE

ASPHALT STABILIZED CUT & RESTORE



DRAWN BY: MG	SCALE:	SHEET
CHECKED BY:	DATE: 02/24/23	32 OF 44
APROVED BY:	PROJECT NO.:	JZ UF 44
CAMERON COUNTY	19-0002H	



- 1) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail, or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- 2 For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

3'-0" Min

(6)

1'-0" Min extension

Cast-in-place

closure (11)

BARS K (#4)

(Spa = 1'-0" Max)

(Length = 4'-2")

Precast concrete box

- (3) Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.
- 4 Provide a 3'-0" Min cast-in-place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast-in-place closure flush with the inside and outside faces of the precast box section.
- For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'-0" Min cast-in-place closure in the top slab, bottom slab, and exterior wall. See Section B-B detail when interior walls are cast full length.
- 6 Extend precast box reinforcing a minimum of 1'-0" into concrete closure (Typ).
- 7 Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.
- $\begin{tabular}{ll} \hline 8 \\ \hline & For vehicle safety, the following requirements must be met: \\ \hline & For structures without bridge rail, construct curbs no more than 3" above \\ \hline \end{tabular}$ 
  - For structures with bridge rail, construct curbs flush with finished grade. Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- (9) Cement stabilized backfill between boxes is considered part of the box culvert
- (10) All curb concrete and reinforcing is considered part of the box culvert for payment.
- Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment
- 12 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
- (13) For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in
- This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes

# MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement. Provide Class C concrete (fc = 3,600 psi) for the closures. Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures." Any additional concrete required for the closures will be considered

subsidiary to the box culvert.

Designed according to AASHTO LRFD Bridge Design Specifications. Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown

Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bars dimensions are out-to-out of bars.

**HL93 LOADING** 



# **BOX CULVERTS PRECAST** MISCELLANEOUS DETAILS

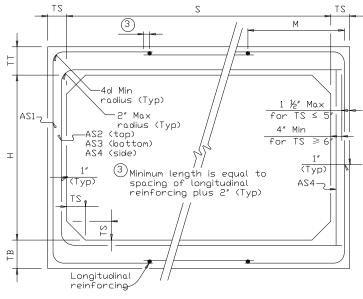
# SCP-MD

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©TxDOT	February 2020	CONT	SECT	JOB			HIG	HWAY	′
	REVISIONS								
		DIST		COUN	TY		:	SHEE	T NO.
								3	3

# DISCLAIMER: The use of this standard is governed by the 'Texas Engineering Practice Act'. No warranty kind is made by IXDIT for any purpose whatsoever. IXDIT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

# BOX DATA

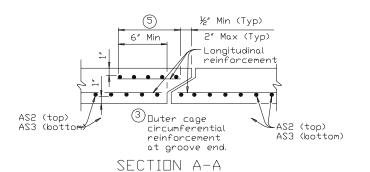
	SECTIO	N DIMEI	SNDIS		Fill	М		RE	INFORC:	NG (sq	j. in. /	<b>(€)</b>		l (1) Lift
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	Height (ft.)	(Min) (in.)	AS1	AS2	EZA	AS4	AS5	AS7	82A	Weight (tons)
4	2	7.5	6	5	< 2	-	0.18	0.27	0.15	0.12	0.18	0.18	0.14	4.5
4	2	5	5	5	2 < 3	38	0.18	0.19	0.17	0.12	-	-	-	3.6
4	2	5	5	5	3 - 5	38	0.13	0.13	0.13	0.12	-	-	-	3.6
4	2	5	5	5	10	38	0.12	0.12	0.12	0.12	-	-	-	3.6
4	2	5	5	5	15	38	0.14	0.16	0.16	0.12	-	-	-	3.6
4	2	5	5	5	20	38	0.18	0.20	0.21	0.12	-	-	-	3.6
4	2	5	5	5	25	38	0.23	0.25	0.25	0.12	-	-	-	3.6
4	2	5	5	5	30	38	0.28	0.30	0.30	0.12	-	-	-	3.6
4	3	7.5	6	5	< 2	_	0.18	0.31	0.18	0.12	0.18	0.18	0.14	5.0
4	3	5	5	_	2 < 3	38	0.15	0.23	0.20	0.12	_	_	_	4.1
4	3	5	5	5	3 - 5	38	0.12	0.16	0.16	0.12	_	_	-	4.1
4	3	5	5	5	10	38	0.12	0.14	0.14	0.12	_	_	-	4.1
4	3	5	5	5	15	38	0.12	0.18	0.18	0.12	-	-	-	4.1
4	3	5	5	5	20	38	0.14	0.23	0.24	0.12	-	-	-	4.1
4	3	5	5	5	25	38	0.17	0.29	0.29	0.12	-	-	-	4.1
4	3	5	5	5	30	38	0.21	0.35	0.35	0.12	-	-	-	4.1
4	4	7.5	6	5	< 2	_	0.18	0.33	0.20	0.12	0.18	0.18	0.14	5.5
4	4	5	5	5	5 ( 3	38	0.12	0.26	0.23	0.12	-	-	-	4.6
4	4	5	5	5	3 - 5	38	0.12	0.18	0.18	0.12	_	_	_	4.6
4	4	5	5	5	10	38	0.12	0.15	0.15	0.12	_	_	_	4.6
4	4	5	5	5	15	38	0.12	0.19	0.20	0.12	_	_	-	4.6
4	4	5	5	5	20	38	0.12	0.25	0.25	0.12	_	_	_	4.6
4	4	5	5	5	25	38	0.14	0,31	0.31	0.12	_	_	_	4.6
4	4	5	5	5	30	38	0.17	0.37	0.37	0.12	_	_	_	4.6



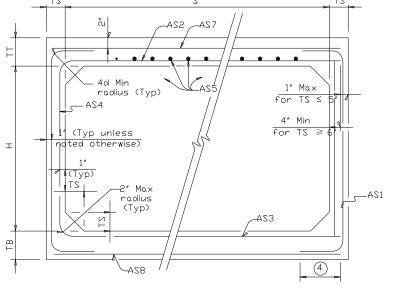
CORNER OPTION "A"

CORNER OPTION "B"

FILL HEIGHT 2 FT AND GREATER



(Showing top and bottom slab joint reinforcement.)



CORNER OPTION "A"

CORNER OPTION "B"

# FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)

# MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f'c = 5,000 psi).

# GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD)

standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING



SINGLE BOX CULVERTS PRECAST

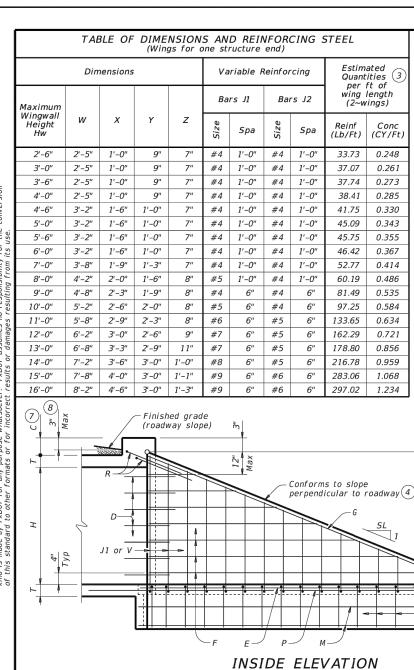
4'-0" SPAN

SCP-4

FILE: scp04sts-20.dgn	DN: TxD	DΤ	ck: TxDOT	אם Tx	:DOT	ck: TxDOT
©⊺xDOT February 2020	CONT	SECT	JOB		HIO	HWAY
REVISIONS .						
	DIST		COUN.	ГҮ		SHEET NO.
						34

 $\bigcirc$ For box length = 8'-0"

②AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



	81.49	0.535	Reint (LD/Ft)
			Conc (CY/Ft)
_	97.25	0.584	
	133.65	0.634	
	162.29	0.721	
	178.80	0.856	
	216.78	0.959	
	283.06	1.068	
	297.02	1.234	
m d	s to slope	coadway 4	HW HW
	<u> </u>		J2 0-1
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		_	4

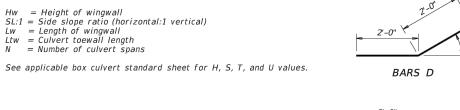
	REINF	WINGV ORCINO vings)	
Bar	Size	No.	Spa
D	#5	~	1'-0"
Ε	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
М	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"
	LVERT	ESTIM, TOEW TITIES	
Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~

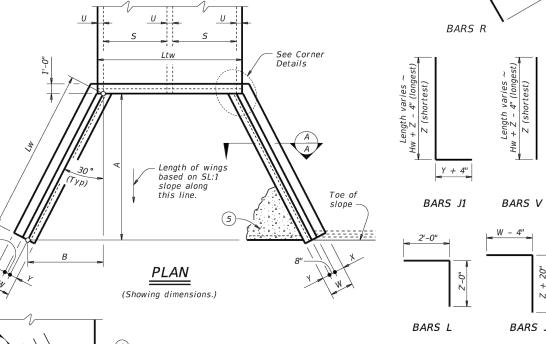
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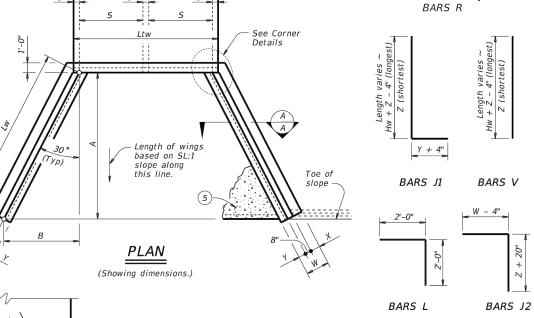
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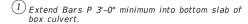
Reinf (Lh/Ft)

# WING DIMENSION FORMULAS: (All values are in feet.) Hw = H + T + C - 0.250' A = (Hw - 0.333') (SL) B = (A) tangent (30°)For cast-in-place culverts: Ltw = (N)(S) + (N + 1)(U)For precast culverts: Ltw = (N)(2U + S) + (N - 1)(0.5')Total wingwall area (two wings $\sim$ SF) = (Hw + 0.333') (Lw)









2) Adjust as necessary to maintain 1 1#2" clear cover and 4" minimum between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values

4 Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20' When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.

6 At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.

7) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

8) For vehicle safety, the following requirements must be met:

• For structures without bridge rail, construct curbs no more than 3" above finished grade.

• For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

# MATERIAL NOTES:

60°

Provide Class C concrete (f'c=3,600 psi). Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

In riprap concrete synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing unless noted otherwise.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.

When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer. See Box Culvert Supplement (BCS) standard sheet for

additional dimensions and information.
The quantities for concrete and reinforcing steel

resulting from the formulas given on this sheet are for Contractor's information only.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.

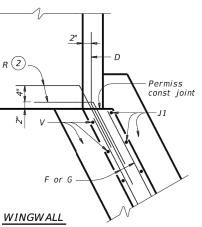


Bridge Division Standard

CONCRETE WINGWALLS WITH FLARED WINGS FOR 0° SKEW BOX CULVERTS

FW-0

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©TxD0T	February 2020	CONT	SECT		JOB		н	IGHWAY
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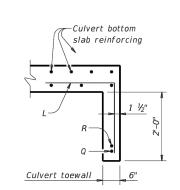


(Showing reinforcing, Culvert and culvert

toewall reinforcing not shown for clarity.)

CORNER DETAILS (Culvert and culvert toewall reinforcing not shown for clarity.) **FOOTING** 

AND TOEWALL



SECTION B-B 5

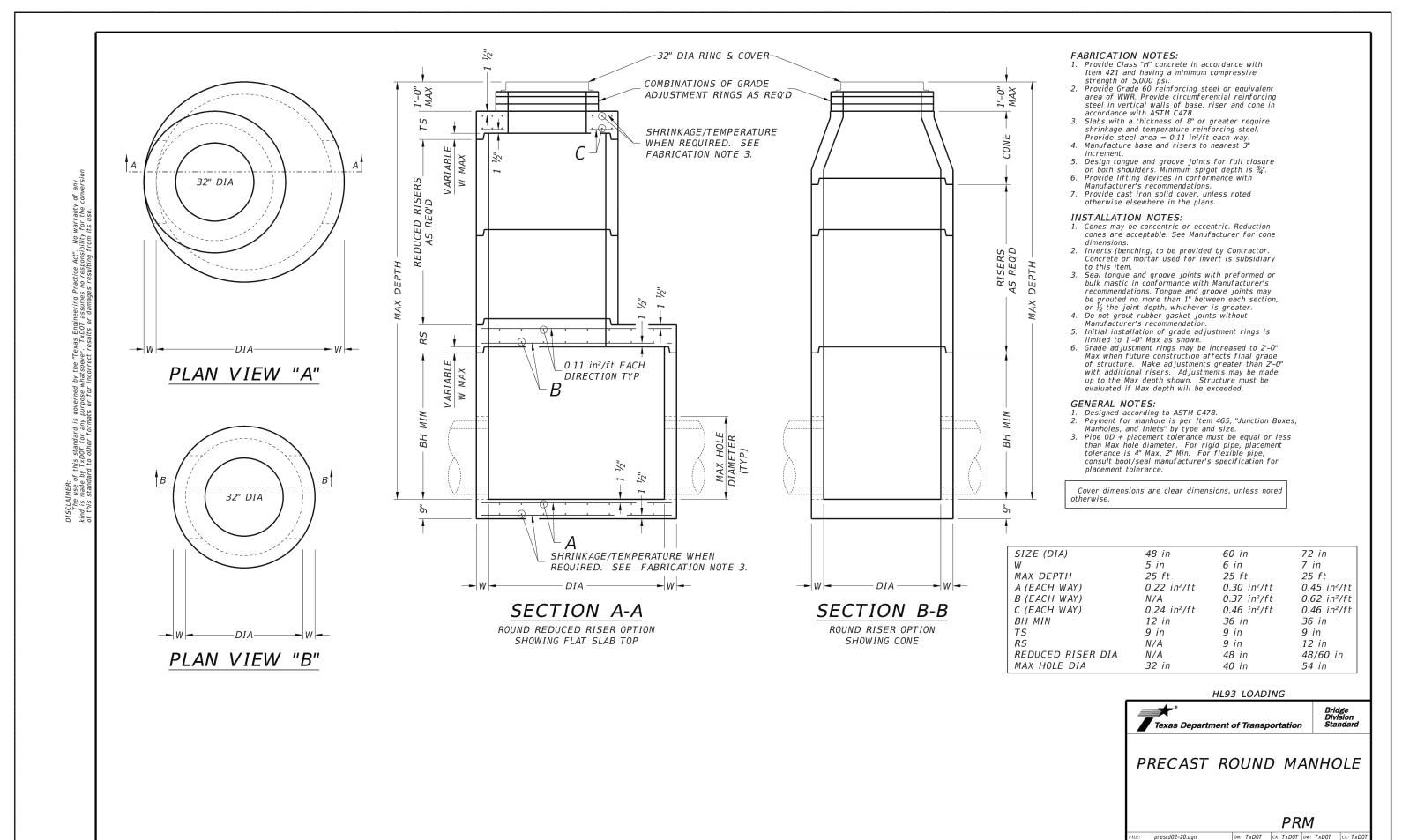
(Typ)

-J2

Const joint

Wingwall toewall \_\_\_\_6"

SECTION A-A



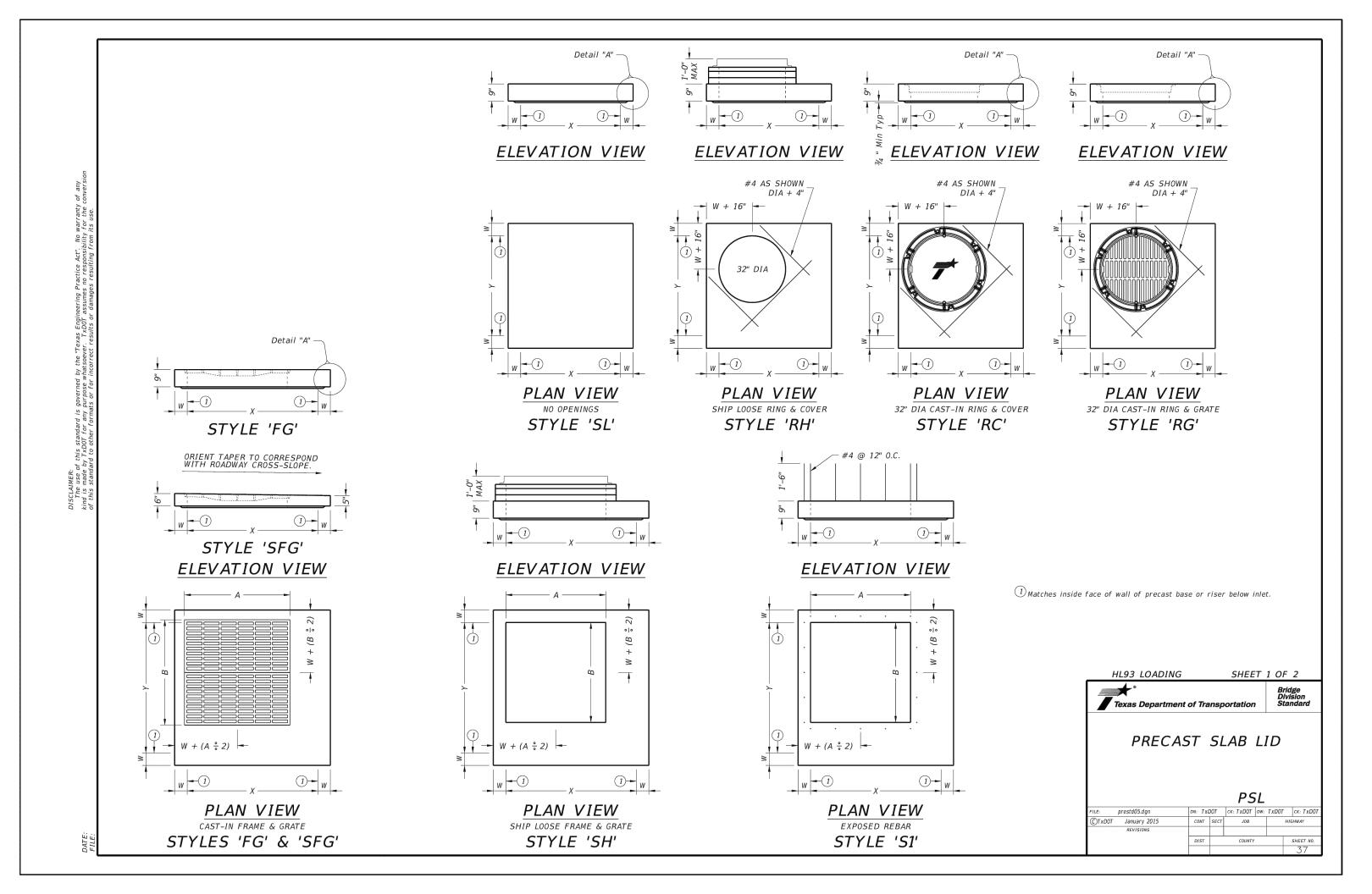
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CONT SECT

JOB

36

DATE:

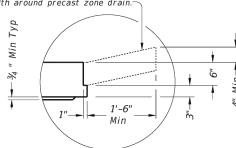


		w 2		Reint Steel	Reint S
Style	Size (X x Y)	W	A x B (nominal)	Area	Area
SL	3' x 3'	6"	n/a	0.37 in²/ft	0.37 in <sup>2</sup>
RH,RC,RG,SH,S1,FG	3'x3'	6"	3'x3' or 32" Dia	0.37 in²/ft	0.37 in <sup>2</sup>
SFG	3'x3'	6"	3'x3'	0.32 in²/ft	0.32 in <sup>2</sup>
SL	4' x 4'	6"	n/a	0.34 in²/ft	0.34 in <sup>2</sup>
RH,RC,RG,SH,S1,FG	4' x 4'	6"	3'x3' or 32" Dia	0.41 in²/ft	0.41 in <sup>2</sup>
SH,S1,FG	4' x 4'	6"	4' x 4'	0.41 in²/ft	0.41 in <sup>2</sup>
SFG	4' x 4'	6"	4' x 4'	0.32 in²/ft	0.32 in <sup>2</sup>
SL	3' x 5'	6"	n/a	0.39 in²/ft	0.39 in <sup>2</sup>
RH,RC,RG,SH,S1,FG	3' x 5'	6"	3'x3' or 32" Dia	0.48 in²/ft	0.48 in <sup>2</sup>
SH,S1,FG	3' x 5'	6"	3' x 5'	0.48 in²/ft	0.48 in <sup>2</sup>
SFG	3' x 5'	6"	3' x 5'	0.32 in²/ft	0.32 in <sup>2</sup>
SL	4' x 5'	6"	n/a	0.42 in²/ft	0.42 in <sup>2</sup>
RH,RC,RG,SH,S1,FG	4' x 5'	6"	3'x3' or 32" Dia	0.42 in²/ft	0.42 in <sup>2</sup>
SH,S1,FG	4' x 5'	6"	4' x 4'	0.63 in²/ft	0.63 in <sup>2</sup>
SH,S1,FG	4' x 5'	6"	3' x 5'	0.66 in²/ft	0.66 in <sup>2</sup>
SL	5' x 5'	6"	n/a	0.36 in²/ft	0.36 in <sup>2</sup>
RH,RC,RG,SH,S1,FG	5' x 5'	6"	3'x3' or 32" Dia	0.43 in²/ft	0.43 in <sup>2</sup>
SH,S1,FG	5' x 5'	6"	4' x 4'	0.63 in²/ft	0.63 in <sup>2</sup>
SH,S1,FG	5' x 5'	6"	3' x 5'	0.63 in²/ft	0.63 in <sup>2</sup>
SL	5'x6'	6"/8"	n/a	0.48 in²/ft	0.48 in <sup>2</sup>
RH,RC,RG,SH,S1,FG	5'x6'	6"/8"	3'x3' or 32" Dia	0.48 in²/ft	0.48 in <sup>2</sup>
SH,S1,FG	5' x6'	6"/8"	4' x 4'	0.60 in²/ft	0.60 in <sup>2</sup>
SH,S1,FG	5'x6'	6"/8"	3' x 5'	0.60 in²/ft	0.60 in <sup>2</sup>
SL	6'x6'	6"/8"	n/a	0.43 in²/ft	0.43 in <sup>2</sup>
RH,RC,RG,SH,S1,FG	6'x6'	6"/8"	3'x3' or 32" Dia	0.56 in²/ft	0.56 in <sup>2</sup>
SH,S1,FG	6'x6'	6"/8"	4' x 4'	0.56 in²/ft	0.56 in <sup>2</sup>
SH,S1,FG	6' x 6'	6"/8"	3'x5'	0.59 in²/ft	0.59 in <sup>2</sup>
SL	8' x8'	8"/10"	n/a	0.45 in²/ft	0.45 in <sup>2</sup>
RH,RC,RG,SH,S1,FG	8' x8'	8"/10"	3'x3' or 32" Dia	0.45 in²/ft	0.45 in <sup>2</sup>
SH,S1,FG	8' x8'	8"/10"	4' x 4'	0.45 in²/ft	0.45 in <sup>2</sup>
SH,S1,FG	8' x8'	8"/10"	3' x 5'	0.45 in²/ft	0.45 in <sup>2</sup>

Short Span

2) See sheet PDD for corresponding wall thickness (W) of base unit or riser.

Construct cast-in-place reinforced concrete apron. when shown elsewhere in plans. Use Class "A" concrete. Apron is subsidiary to PSL. Apron is 1'-6" Min width around precast zone drain.



# DETAIL "A"

(Reinforcing not shown for clarity) When an apron is to be cast around PSL, use detail above to create an apron ledge on all 4 sides.

# FABRICATION NOTES:

- 1. Locate penetration (Style 'RH'), ring and cover (Style 'RC'), ring and grate (Style 'RG'), and frame and grate (Style 'FG') in a corner. Only one penetration is allowed per
- Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
- 3. Provide Grade 60 reinforcing steel or equivalent area of WWR.
- Provide clear cover of 34" to reinforcing from lower outside shoulder of slab for structural reinforcement, and 2" from top of slab for shrinkage and temperature
- reinforcement. Place short span reinforcing closest to surface.

  5. Slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing. Provide steel area = 0.11 in²/ft each way.
- 6. No substitution is allowed for diagonal #4 bars around openings.7. Design tongue and groove joints for full closure on both shoulders. Minimum
- 8. Provide lifting devices in conformance with Manufacturer's recommendations.

# INSTALLATION NOTES:

- 1. Precast slab lids are intended for direct traffic and may be placed in roadway. 2. Seal tongue and groove joints with preformed or bulk mastic in conformance
- with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
- Do not grout rubber gasket joints without Manufacturer's recommendation.
   Initial installation of grade adjustment rings for Styles 'RH' and 'SH' is limited
- to 1'-0" Max as shown.
  5. Grade adjustment rings for Styles 'RH' and 'SH' may be increased to 2'-0" Max
- when future construction affects final grade of structure. Make adjustments greater than 2'-0" with additional risers. Adjustments can be made up to Max depth shown on sheet PDD. Structure must be evaluated if Max depth will be
- exceeded.
  6. Orient long dimension of grate slots perpendicular to traffic, unless noted otherwise on plans

# GENERAL NOTES:

1. Designed according to ASTM C913.
2. Payment for lid is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

Cover dimensions are clear dimensions, unless noted otherwise.

> HL93 LOADING SHEET 2 OF 2 Bridge Division Standard



PRECAST SLAB LID

PSL

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l		DIST		COUNTY			SHEET	NO.
							38	3

# GENERAL NOTES

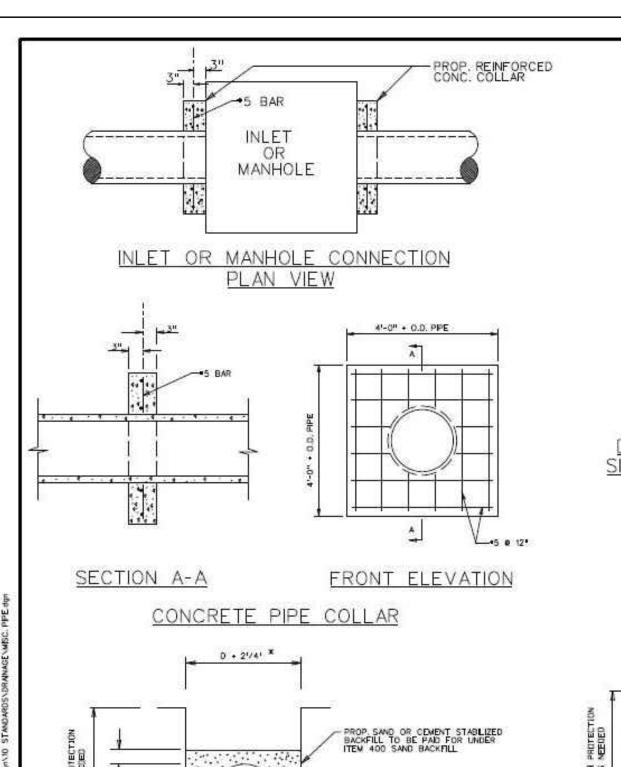
- UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
- 2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
- 3. PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
- 4. THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
- 5. THE TAPERED EDGE SHALL BE PRODUCED BY USE OF A SCREED ATTACHMENT CAPABLE OF PRODUCING A SMOOTH COMPACTED SURFACE. ADDITIONAL COMPACTING EFFORT BEHIND THE SCREED IS NOT REQUIRED.



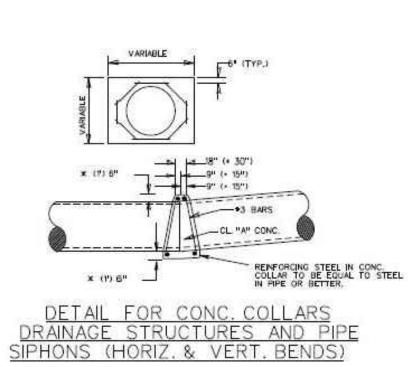
# TAPERED EDGE DETAILS HMAC PAVEMENT

TE (HMAC) - 11

(NOT TO SCALE)



\* FOR PIPE 42" DIAMETER OR LESS PLACE "OF FILL ON EACH SIDE OF THE PIPE. FOR PIPE LARGER THAN 42" DIAMETER PLACE 2" OF FILL ON EACH SIDE OF THE PIPE.



NOTE: PROP. CONC. COLLAR WILL NOT BE PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO THE BIOS ITEMS INVOLVED.

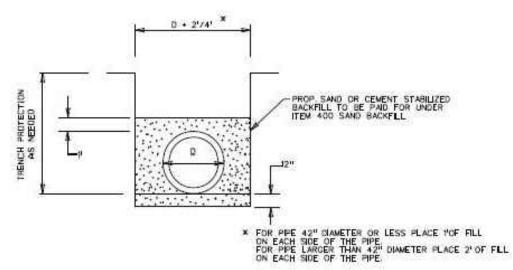
\* FOR 42" DIAMETER AND LARGER PIPE

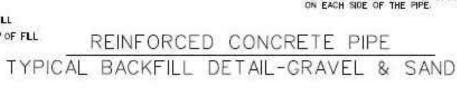
TYPICAL REINFORCED CONC. PIPE
CONNECTION WITHOUT MANHOLE

C TxD0T 2019

RCP. PIPE

ROUND EDGES WITH MORTAR







BRG.

PROP. GRAVEL BEDDING TO BE PAID UNDER ITEM 400 STRUCT. EXCAV. (SPL)

SPIRAL RIB CMP

TYPICAL BACKFILL DETAIL GRAVEL & SAND

MISCELLANEOUS
PIPE STANDARD

REV. 2/19

MISC.PIPE.DGN

REV. 2/19

AUG. 1000 REV. 1000 REV.

PHARR DISTRICT STANDARD

CONNECTING PIPE

NO PART OF PIPE SHALL BE PROJECT INTO STORM SEWER

TYPE 4 (SACK GABIONS)

—(RFD4)—

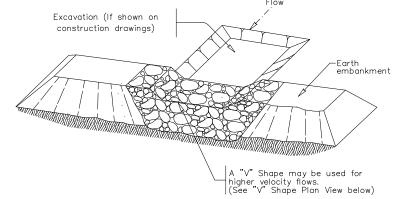
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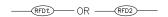
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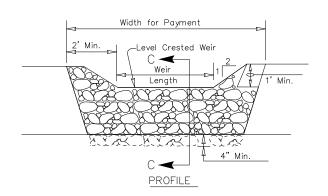
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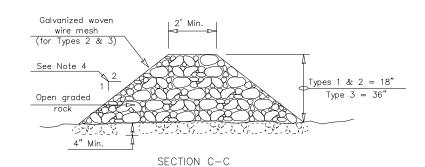
nse



# FILTER DAM AT SEDIMENT TRAP







# ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60  ${\sf GPM/FT^2}$  of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

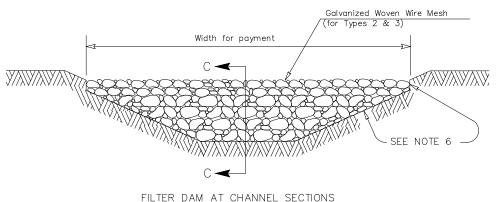
Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

<u>Type 4 (Sack gabions) (3" to 6" aggregate): Type 4</u> May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

SECTION A-A



RFDI OR — RFD2 OR — RFD3

# GENERAL NOTES

- If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
- Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
- 3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
- 4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
- 5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
- 6. Filter dams should be embedded a minimum of 4" into existing ground.
- 7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
- 8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified.

  The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
- 9. Sack Gabions should be staked down with 3/4" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 1/2" x 3 1/4"
- 10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
- 11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

# PLAN SHEET LEGEND

Type 1 Rock Filter Dam

Type 2 Rock Filter Dam —

Type 3 Rock Filter Dam



Design Division Standard

TEMPORARY EROSION,
SEDIMENT AND WATER
POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

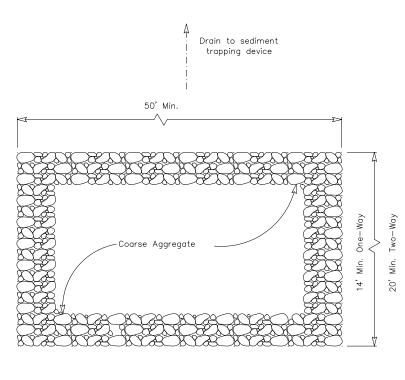
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© TxD0T: JULY 2016 CONT SECT JOB HIGHWAY

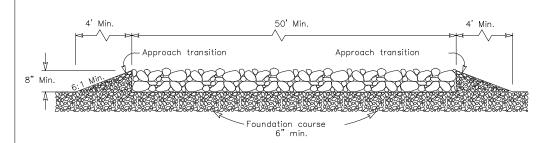
REVISIONS

DIST COUNTY SHEET NO.

42



# PLAN VIEW



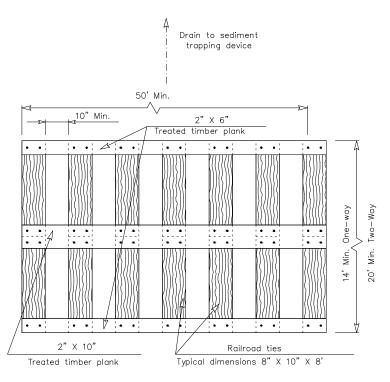
# ELEVATION VIEW

# CONSTRUCTION EXIT (TYPE 1)

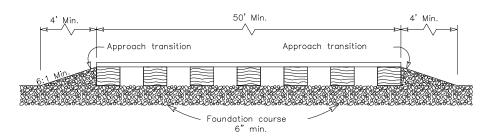
ROCK CONSTRUCTION (LONG TERM)

# GENERAL NOTES (TYPE 1)

- 1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
- 2. The coarse aggregate should be open graded with a size of 4" to 8".
- 3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
- 4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
- 5. The construction exit shall be graded to allow drainage to a sediment trapping device.
- 6. The guidelines shown hereon are suggestions only and may be modified
- 7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



PLAN VIEW



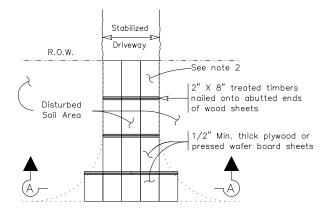
# ELEVATION VIEW

# CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

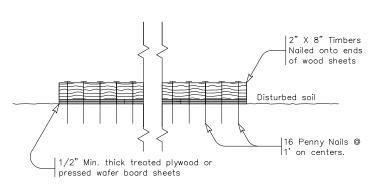
# GENERAL NOTES (TYPE 2)

- 1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
- The treated timber planks shall be attached to the railroad ties with 1/2"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
- 3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
- 4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
- 5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
- 6. The construction exit should be graded to allow drainage to a sediment trapping device.
- 7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
- 8. Construct exits with a width of at least 14 ft. for one—way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



Paved Roadway

PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3) SHORT TERM

# GENERAL NOTES (TYPE 3)

- 1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
- 2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
- 3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
- 4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

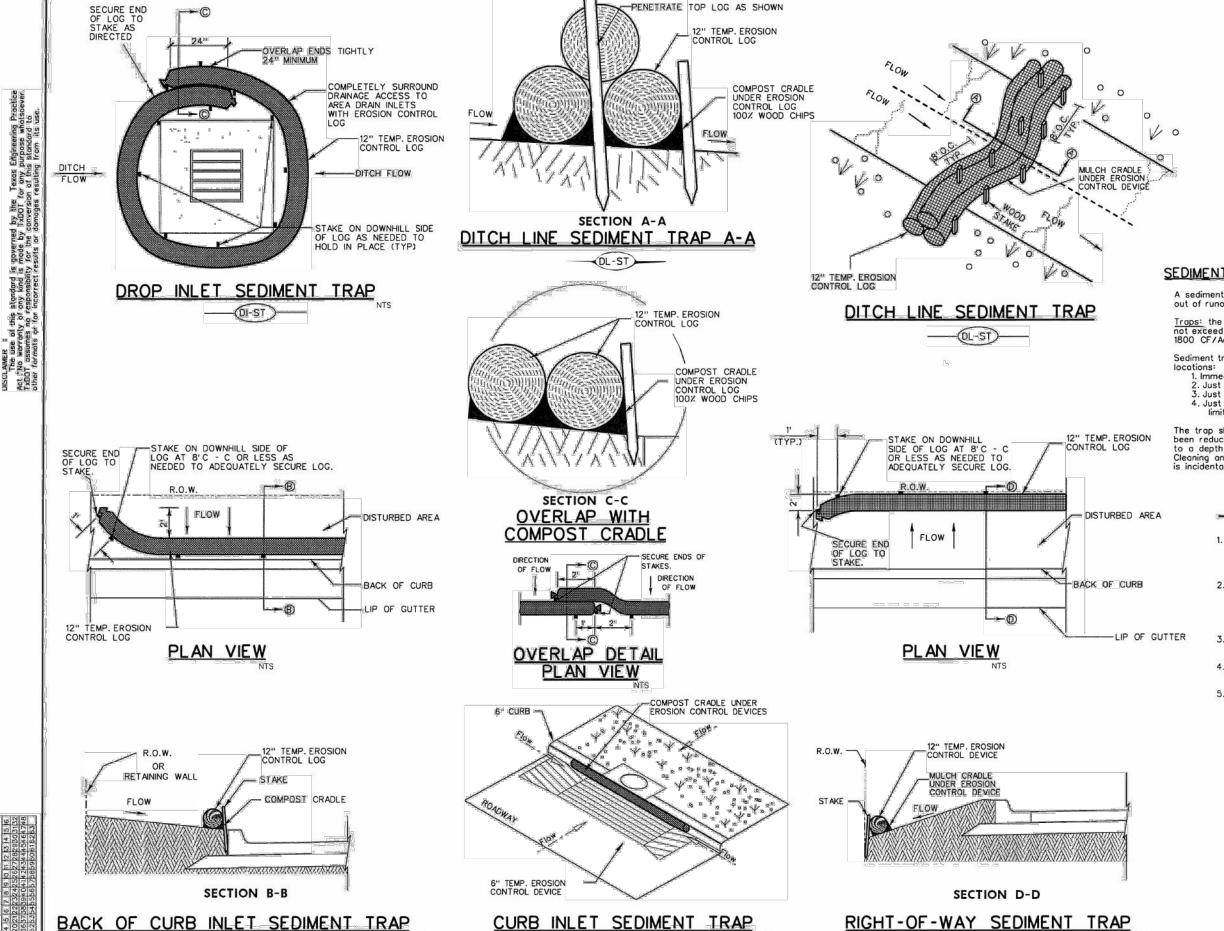


TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

> CONSTRUCTION EXITS EC(3)-16

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HIGHWAY SHEET NO. 43



CI-ST

(BOCI-ST)

PLANS SHEET LEGEND

-(DI-ST) DROP INLET SEDIMENT TRAP OL-ST) DITCH LINE SEDIMENT TRAP BOCI-ST) BACK OF CURB INLET SEDIMENT TRAP ROW-ST) RIGHT OF WAY SEDIMENT TRAP √CI-ST CURB INLET SEDIMENT TRAP

# SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment trap may be used to precipitate sediment out of runoff draining from an unstabilized area.

Traps: the drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Sediment traps should be placed in the following

- 1. Immediately preceding drain inlets
  2. Just before the drainage enters a water course
  3. Just before the drainage leaves the right of way
  4. Just before the drainage leaves the construction limits where drainage flows away from the project

The trap should be cleaned when the capacity has been reduced by  $\frac{1}{2}$  or the sediment has accumulated to a depth of 1', whichever is less. Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for seperately.

# GENERAL NOTES

- 1. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR
- RECOMMENDATIONS AND AS REQUIRED FOR
  THE PURPOSE INTENDED. MAXIMUM LENGTH
  OF LOGS SHALL BE 30'FOR 12" DIAMETER LOGS.

  2. UNLESS OTHERWISE DIRECTED, USE
  BIODEGRADABLE OR PHOTODEGRADABLE
  CONTAINMENT MESH ONLY WHERE LOG WILL
  REMAIN IN PLACE AS PART OF A VEGETATIVE
  SYSTEM. FOR TEMPORARY INSTALLATIONS,
  USE DECYCLABLE CONTAINMENT MESH
- USE RECYCLABLE CONTAINMENT MESH.

  3. STUFF LOGS WITH SUFFICIENT FILTER MATERIAL
  TO ACHIEVE DENSITY THAT WILL HOLD SHAPE
- WITHOUT EXCESSIVE DEFORMATION.
  4. STAKES SHALL BE 2" X 2" WOOD
  4'LONG, EMBEDDED SUCH THAT
  2" PROTRUDES ABOVE LOG.

(ROW-ST)

COMPOST CRADLE MATERIAL IS INCIDENTAL AND WILL NOT BE PAID FOR SEPARATELY.

PHARR DISTRICT STANDARD



TEMPORARY EROSION CONTROL LOGS TECL-17 (PHR)

PASO REA	ROJECT NO.	Р	DIV.NO.
SHEET NO.	COUNTY	DISTRICT	STATE
	CAMERON	PHARR	TEXAS
	JOB	SECTION	CONTROL
44			