

*Fort Bend County, Texas  
Invitation for Bid*



*Construction of Fort Bend Parkway Entrance Ramp  
for Fort Bend County Mobility Bond Project No. 20219x  
BID 24-015*

**SUBMIT BIDS TO:**

Fort Bend County  
Purchasing Department  
Travis Annex  
301 Jackson, Suite 201  
Richmond, TX 77469

**Note:** All correspondence must include the term  
“Purchasing Department” in address to assist in  
proper delivery

**SUBMIT NO LATER THAN:**

Tuesday, November 21, 2023  
2:00 PM (Central)

**LABEL ENVELOPE:**

**BID 24-015  
Fort Bend Parkway Entrance Ramp**

***ALL BIDS MUST BE RECEIVED IN AND TIME/DATE STAMPED BY THE PURCHASING OFFICE  
OF FORT BEND COUNTY ON OR BEFORE THE SPECIFIED TIME/DATE STATED ABOVE.***

***BIDS RECEIVED AS REQUIRED WILL THEN BE OPENED AND PUBLICLY READ.***

***BIDS RECEIVED AFTER THE SPECIFIED TIME, WILL BE RETURNED UNOPENED.***

Results will not be given by phone.  
Results will be provided to bidder in writing  
after Commissioners Court award.

Requests for information must be in  
writing and directed to:  
Brooke Lindemann  
Senior Buyer  
[Brooke.Lindemann@fortbendcountytexas.gov](mailto:Brooke.Lindemann@fortbendcountytexas.gov)

**Vendor Responsibilities:**

- Download and complete any addendums. (Addendums will be posted on the Fort Bend County website no  
Later than 48 hours prior to bid opening)
- Submit response in accordance with requirements stated on the cover of this document.
- DO NOT submit responses via email or fax.



## COUNTY PURCHASING AGENT

Fort Bend County, Texas

### Vendor Information

Jaime Kovar  
Purchasing Agent

Office (281-341-8640)

Legal Company Name <small>(top line of W9)</small>				
Business Name <small>(if different from legal name)</small>				
Federal ID # or S.S. #		DUNS #		
Type of Business	<input type="checkbox"/> Corporation/LLC <input type="checkbox"/> Partnership <input type="checkbox"/> Sole Proprietor/Individual <input type="checkbox"/> Tax Exempt Organization	Age in Business?		
Publicly Traded Business	<input type="checkbox"/> No <input type="checkbox"/> Yes      Ticker Symbol _____			
Remittance Address				
City/State/Zip				
Physical Address				
City/State/Zip				
Phone/Fax Number	Phone: _____      Fax: _____			
Contact Person				
E-mail				
Check all that apply to the company listed above and provide certification number.	DBE-Disadvantaged Business Enterprise <input type="checkbox"/>	<b>Certification #</b> _____ <b>Certification #</b> _____ <b>Certification #</b> _____ <b>Certification #</b> _____	<u>Cert Date</u>	<u>Exp Date</u>
	SBE-Small Business Enterprise <input type="checkbox"/>		_____	_____
	HUB-Texas Historically Underutilized Business <input type="checkbox"/>		_____	_____
	WBE-Women's Business Enterprise <input type="checkbox"/>		_____	_____
			_____	_____
Company's gross annual receipts	<\$500,000 _____	\$500,000-\$4,999,999 _____		
	\$5,000,000-\$16,999,999 _____	\$17,000,000-\$22,399,999 _____		
	>\$22,400,000 _____			
NAICs codes (Please enter all that apply)				
Signature of Authorized Representative				
Printed Name				
Title				
Date				

**THIS FORM MUST BE SUBMITTED WITH THE SOLICITATION RESPONSE**

**1.0 GENERAL REQUIREMENTS:**

- 1.1 Read this entire document carefully. Follow all instructions. You are responsible for fulfilling all requirements and specifications. Be sure you understand them.
- 1.2 General Requirements apply to all advertised bids; however, these may be superseded, whole or in part, by the scope, special requirements, specifications, special specifications or other data contained herein.
- 1.3 Governing Law: Bidder is advised that these requirements shall be fully governed by the laws of the State of Texas and that Fort Bend 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.
- 1.4 Bid Form Completion: Fill out, sign, and return to the Fort Bend County Purchasing Department one (1) complete bid form. An authorized representative of the bidder must sign the Contract Sheet. The Contract will be binding only when signed by the County Judge, Fort Bend County and a purchase order authorizing the item(s) desired has been issued. The use of corrective fluid is not acceptable and may result in the disqualification of bid. If an error is made, the bidder must draw a line through error and initial each change.
- 1.5 Bid Returns: Bidders must return all completed bids to the Fort Bend County Purchasing Department at 301 Jackson, Suite 201 Richmond Texas no later than 2:00 P.M. on the date specified. Late bids will not be accepted. Bids must be submitted in a sealed envelope, addressed as follows: Fort Bend County Purchasing Agent, Travis Annex, 301 Jackson, Suite 201 Richmond, Texas 77469.
- 1.6 Addenda: No interpretation of the meaning of the drawings, specifications or other bid documents will be made to any bidder orally. All requests for such interpretations must be made in writing addressed to Brooke Lindemann, Senior Buyer, 301, Jackson, Suite 201, Richmond, Texas, 77469, E-mail: [Brooke.Lindemann@fortbendcountytexas.gov](mailto:Brooke.Lindemann@fortbendcountytexas.gov). Any and all interpretations and any supplemental instructions will be in the form of written addenda to the contract documents which will be posted on Fort Bend County's website. Addenda will **ONLY** be issued by the Fort Bend County Purchasing Agent. It is the sole responsibility of each bidder to insure receipt of any and all addenda. All addenda issued will become part of the contract documents. Bidders must sign and include it in the returned bid package. Deadline for submission of questions and/or clarification is no later than **Tuesday, November 14, 2023 at 9:30AM (central)** Requests received after the deadline will not be responded to due to the time constraints of this bid process.
- 1.7 References: All bidders must submit, **WITH BID**, at least three (3) references from clients for whom a project similar to that specified herein has been

Initials of Bidder: \_\_\_\_\_

successfully accomplished. References must include clients name, contact person and telephone number.

- 1.8 Bid Bond: All bidders must submit, **WITH BID**, a cashier's check or certified check for at least five percent (5%) of the total bid price, payable to the order of Fort Bend County, or a Bid Bond in the same amount issued by a surety, acceptable to Fort Bend County, authorized to do business in the State of Texas, as a guarantee that the Bidder will do the work described herein at the rates stated herein. Unsuccessful bidder's Cashier's Check or Certified Check will be returned only after a written request to do so have been received in the Office of the Fort Bend County Purchasing Agent.
- 1.9 Material Safety Data Sheets: Under the "Hazardous Communication Act", commonly known as the "Texas Right to Know Act", a bidder must provide to Fort Bend County and using departments, with each delivery, material safety data sheets, which are, applicable to hazardous substances defined in the Act. Bidders are obligated to maintain a current, updated file in the Fort Bend County Purchasing Department. Failure of the bidder to maintain such a file will be cause to reject any bid applying thereto.
- 1.10 Pricing: Prices for all goods and/or services shall be firm for the duration of this Contract and shall be stated on the bid sheet. Prices shall be all inclusive. No price changes, additions, or subsequent qualifications will be honored during the course of the Contract. All prices must be written in ink or typewritten. 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.
- 1.11 Term Contracts: If the Contract is intended to cover a specific time period, said time will be given in the specifications under scope.
- 1.12 Recycled Materials: Fort Bend 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. Fort Bend County will be the sole judge in determining product preference application.
- 1.13 Evaluation: Evaluation shall be used as a determinant as to which bid items or services are the most efficient and/or most economical for Fort Bend County. It shall be based on all factors which have a bearing on price and performance of the items in the user environment. All bids are subject to tabulation by the Fort Bend County Purchasing Department and recommendation to Fort Bend County Commissioners Court. Compliance with all bid requirements, delivery and needs of the using department are considerations in evaluating bids. Pricing is **NOT** the only criteria for making a recommendation. The Fort Bend County Purchasing Department reserves the right to contact any bidder, at any time, to clarify, verify or request information with regard to any bid.

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- 1.14 Disqualification of Bidder: Upon signing this bid document, a bidder offering to sell supplies, materials, services, or equipment to Fort Bend County certifies that the bidder has not violated the antitrust laws of this state codified in section 15.01, et seq., Business & Commerce Code, or the federal antitrust laws, and has not communicated directly or indirectly the bid made to any competitor or any other person engaged in such line of business. Any or all bids may be rejected if Fort Bend County believes that collusion exists among the bidders. Bids in which the prices are obviously unbalanced may be rejected. If multiple bids are submitted by a bidder and after the bids are opened, one of the bids is withdrawn, the result will be that all of the bids submitted by that bidder will be withdrawn; however, nothing herein prohibits a vendor from submitting multiple bids for different products or services.
  
- 1.15 Awards: Fort Bend County reserves the right to award this Contract on the basis of lowest and best bid in accordance with the laws of the State of Texas, to waive any formality or irregularity, to make awards to more than one bidder, to reject any or all bids. In the event the lowest dollar bidder meeting specifications is not awarded a contract, the bidder may appear before the Commissioners Court and present evidence concerning its responsibility.
  
- 1.16 Contract Obligation: Fort Bend County Commissioners Court must award the Contract and the County Judge or other person authorized by the Fort Bend County Commissioners Court must sign the Contract before it becomes binding on Fort Bend County or the bidders. Department heads are not authorized to sign agreements for Fort Bend County. Binding agreements shall remain in effect until all products and/or services covered by this purchase have been satisfactorily delivered and accepted.

**2.0 SCOPE:**

It is the intent of Fort Bend County to contract with one (1) vendor for all materials, supplies, equipment, tools, services, labor and supervision necessary to complete Construction of Fort Bend Parkway Entrance Ramp, hereinafter referred to as the "Project," as specified herein.

**3.0 PRE-BID CONFERENCE:**

A pre-bid conference will be conducted on **Tuesday, November 7, 2023 at 9:00 AM (CST)**. The pre-bid conference will be held at the Fort Bend County Purchasing Department located in the Travis Annex at 301 Jackson, Suite 201, Richmond, Texas 77469. All bidders are encouraged to attend.

**4.0 LIQUIDATED DAMAGES:**

The County and the Contractor recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by the County if the work is not complete on time. Accordingly, instead of requiring any such proof, the County and the Contractor agree that as liquidated damages for delay (but not as a penalty) the Contractor shall

Initials of Bidder: \_\_\_\_\_

pay the County \$1,500.00 for each day that expires after the time specified herein for completion until the Work is complete, unless contract time has been adjusted by extension of time approved by Commissioner's Court.

The Contractor will be placed on one (1) year probation if liquidated damages are accrued. During the probation period, if the Contractor accrues liquidated damages on another project, they will be disqualified from being awarded any County work for two (2) years.

**5.0 COMPLETION TIME & PAYMENT:**

5.1 Fort Bend County shall pay the Contractor in current funds for the Contractor's performance of the Contract the contract sum, as stated herein, after receipt of notice to proceed and a purchase order issued by the Fort Bend County Purchasing Agent.

5.2 Based upon Applications for payment submitted to the County Auditor, Fort Bend County shall make progress payments on account of the contract sum to the Contractor as provided below and elsewhere in the contract documents.

5.2.1 The period covered by each application for payment shall be one calendar month ending on the last day of the month.

5.2.2 Provided an application for payment is received by the County Auditor not later than the 15th day of a month, Fort Bend County shall make payment to the Contractor not later than the 15th day of the next month. If an application for payment is received by the County Auditor after the application deadline fixed above, payment shall be made by Fort Bend County not later than 30 days after the County Auditor receives the application for payment.

5.2.3 Application for payment shall indicate the percentage of completion of each portion of the Project as of the end of the period covered by the application for payment.

5.2.4 Subject to the provisions of the contract documents, the amount of each progress payment shall be computed as follows:

5.2.4.1 Take that portion of the contract sum properly allocable to completed Project less retainage of ten percent (10%).

5.2.4.2 Add that portion of the contract sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved by Fort Bend County, suitably stored off the site at a location agreed upon in writing), less retainage of ten percent (10%).

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5.2.4.3 Subtract the aggregate of previous payments made by Fort Bend County.

5.2.4.4 The progress payment amount as determined in above shall be further modified under the following circumstances:

Add, upon substantial completion of the Project, a sum sufficient to increase the total payments to one hundred percent (100%) of the contract sum, less such amounts as Fort Bend County shall determine for incomplete work and unsettled claims.

5.2.4.5 Final payment, constituting the entire unpaid balance of the contract sum, shall be made by Fort Bend County to the Contractor when the Contract has been fully performed by the Contractor.

5.3 Before the first application for payment, the Contractor shall submit to the Facilities Management and Planning Department a schedule of values allocated to various portions of the work, prepared in such form and supported by such data to substantiate its accuracy as the Facilities Management and Planning Department may require. This schedule, unless objected to by the Facilities Management and Planning Department shall be used as a basis for reviewing the Contractor's application for payment.

5.4 Contractor must provide with each application for payment a contractor's affidavit certifying bills against the Contractor for labor, material and expendable equipment employed in the performance of Contractor have been paid in full prior to acceptance of final payment from Fort Bend County.

5.5 The Contractor will permit Fort Bend County, or any duly authorized agent of Fort Bend County, to inspect and examine the books and records of the Contractor for the purpose of verifying the amount of work performed under the Contract. Fort Bend County's right to inspect survives the termination of the Contract for a period of five years.

**6.0 LIMIT OF APPROPRIATION:**

Prior to the execution of this Contract, Contractor has been advised by County, and Contractor clearly understands and agrees, such understanding and agreement being of the absolute essence to this Contract, that County shall have available only those funds specifically allocated in this Contract to fully discharge any and all liabilities which may be incurred by County in bringing this Project to an absolute conclusion, resulting in a complete, fully furnished, fully equipped and fully usable facility, and that the total of any and all basic construction costs, costs of providing the required services and materials, all fees and compensation of any sort to the Contractor, and any and all costs for any and all things or purposes coming inuring under or out of this Contract, irrespective of the nature thereof, shall not exceed said specifically allocated sum, notwithstanding any word, statement or thing contained in or inferred from the preceding

Initials of Bidder: \_\_\_\_\_

provision of this Contract which might in any light by any person be interpreted to the contrary.

**7.0 RIGHT TO ASSURANCE:**

Whenever Fort Bend County in good faith has reason to question the Contractor's intent to perform, Fort Bend County may demand that the Contractor give written assurance of its intent to perform. In the event that a demand is made and no assurance is given within five (5) days, Fort Bend County may treat this failure as an anticipatory repudiation of the Contract.

**8.0 PERFORMANCE & PAYMENT BONDS:**

Performance and Payment Bonds: In the event the total accepted bid price exceeds \$25,000 the Contractor must provide to the Office of the County Purchasing Agent, a performance bond and a payment bond, each in the amount of 100% of the total contract sum within ten (10) calendar days after receipt of notification of bid award. Such bonds shall be executed by a corporate surety duly authorized and admitted to do business in the State of Texas and licensed in the State of Texas to issue surety bonds with a Best Rating of "A" or better. Fort Bend County reserves the right to accept or reject any surety company proposed by the Contractor. In the event Fort Bend County rejects, the proposed surety company, the Contractor will be afforded five (5) additional days to submit the required bonds issued by a surety company acceptable to Fort Bend County. **The awarded contractor must provide performance and payment bonds that name Fort Bend County and Fort Bend County Toll Road Authority as the owner.**

**9.0 POWER OF ATTORNEY:**

An attorney-in-fact who signs a bid bond, performance bond or payment bond must file with each bond a certified and effectively dated copy of his or her power of attorney.

**10.0 INSURANCE:**

10.1 All respondents shall submit, with response, a current certificate of insurance indicating coverage in the amounts stated below. In lieu of submitting a certificate of insurance, respondents may submit, with response, a notarized statement from an Insurance company, authorized to conduct business in the State of Texas, and acceptable to Fort Bend County, guaranteeing the issuance of an insurance policy, with the coverage stated below, to the firm named therein, if successful, upon award of this Contract.

10.2 At contract execution, contractor shall furnish County with properly executed certificates of insurance which shall evidence all insurance required and provide that such insurance shall not be canceled, except on 30 days prior written notice to County. Contractor shall provide certified copies of insurance endorsements and/or policies if requested by County. Contractor shall maintain such insurance coverage from the time Services commence until Services are completed and provide replacement certificates, policies and/or endorsements for any such insurance expiring prior to completion of Services. Contractor shall obtain such

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insurance written on an Occurrence form (or a Claims Made form for Professional Liability insurance) from such companies having Best's rating of A/VII or better, licensed or approved to transact business in the State of Texas, and shall obtain such insurance of the following types and minimum limits:

- 10.2.1 Workers' Compensation insurance. Substitutes to genuine Workers' Compensation Insurance will not be allowed.
- 10.2.2 Employers' Liability insurance with limits of not less than \$1,000,000 per injury by accident, \$1,000,000 per injury by disease, and \$1,000,000 per bodily injury by disease.
- 10.2.3 Commercial general liability insurance with a limit of not less than \$1,000,000 each occurrence and \$2,000,000 in the annual aggregate. Policy shall cover liability for bodily injury, personal injury, and property damage and products/completed operations arising out of the business operations of the policyholder.
- 10.2.4 Business Automobile Liability coverage with a combined Bodily Injury/Property Damage limit of not less than \$1,000,000 each accident. The policy shall cover liability arising from the operation of licensed vehicles by policyholder.
- 10.3 County and the members of Commissioners Court shall be named as additional insured to all required coverage except for Workers' Compensation and Professional Liability (if required). All Liability policies including Workers' Compensation written on behalf of contractor, excluding Professional Liability, shall contain a waiver of subrogation in favor of County and members of Commissioners Court.
- 10.4 If required coverage is written on a claims-made basis, contractor warrants that any retroactive date applicable to coverage under the policy precedes the effective date of the contract; and that continuous coverage will be maintained or an extended discovery period will be exercised for a period of two (2) years beginning from the time that work under the agreement is completed.
- 10.5 Contractor shall not commence any portion of the work under this Contract until it has obtained the insurance required herein and certificates of such insurance have been filed with and approved by Fort Bend County.
- 10.6 No cancellation of or changes to the certificates, or the policies, may be made without sixty (60) days prior, written notification to Fort Bend County.
- 10.7 Approval of the insurance by Fort Bend County shall not relieve or decrease the liability of the Contractor.

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**11.0 INDEMNIFICATION:**

Respondent shall save harmless County from and against all claims, liability, and expenses, including reasonable attorney's fees, arising from activities of respondent, its agents, servants or employees, performed under this agreement that result from the negligent act, error, or omission of respondent or any of respondent's agents, servants or employees.

- 11.1 Respondent shall timely report all such matters to Fort Bend County and shall, upon the receipt of any such claim, demand, suit, action, proceeding, lien or judgment, not later than the fifteenth day of each month; provide Fort Bend County with a written report on each such matter, setting forth the status of each matter, the schedule or planned proceedings with respect to each matter and the cooperation or assistance, if any, of Fort Bend County required by Respondent in the defense of each matter.
- 11.2 Respondent's duty to defend, indemnify and hold Fort Bend County harmless shall be absolute. It shall not abate or end by reason of the expiration or termination of any contract unless otherwise agreed by Fort Bend County in writing. The provisions of this section shall survive the termination of the contract and shall remain in full force and effect with respect to all such matters no matter when they arise.
- 11.3 In the event of any dispute between the parties as to whether a claim, demand, suit, action, proceeding, lien or judgment appears to have been caused by or appears to have arisen out of or in connection with acts or omissions of Respondent, Respondent shall never-the-less fully defend such claim, demand, suit, action, proceeding, lien or judgment until and unless there is a determination by a court of competent jurisdiction that the acts and omissions of Respondent are not at issue in the matter.
- 11.4 Respondent's indemnification shall cover, and Respondent agrees to indemnify Fort Bend County, in the event Fort Bend County is found to have been negligent for having selected Respondent to perform the work described in this request.
- 11.5 The provision by Respondent of insurance shall not limit the liability of Respondent under an agreement.
- 11.6 Respondent shall cause all trade contractors and any other contractor who may have a contract to perform construction or installation work in the area where work will be performed under this request, to agree to indemnify Fort Bend County and to hold it harmless from all claims for bodily injury and property damage that may arise from said Respondent's operations. Such provisions shall be in form satisfactory to Fort Bend County.
- 11.7 Loss Deduction Clause - Fort Bend County shall be exempt from, and in no way liable for, any sums of money which may represent a deductible in any insurance

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policy. The payment of deductibles shall be the sole responsibility of Respondent and/or trade contractor providing such insurance.

**12.0 PREVAILING WAGES:**

This project is subject to the prevailing wage rate requirements of Chapter 2258 of the Government Code. All persons employed by Contractor shall be compensated at not less than the rates shown below. Contractor shall keep detailed records of each of its workers and said records shall be made available to County for inspection at all reasonable times. The Contractor shall pay Fort Bend County sixty dollars (\$60.00) for each worker employed by the Contractor for the provision of services described herein for each calendar day or part of the day that the worker is paid less than the below stated rates. Contractors may also visit [www.wdol.gov/dba.aspx](http://www.wdol.gov/dba.aspx).

General Decision Number: TX20230038 01/06/2023

Superseded General Decision Number: TX20220038

State: Texas

Construction Type: Highway

Counties: Austin, Brazoria, Chambers, Fort Bend, Galveston, Hardin, Harris, Jefferson, Liberty, Montgomery, Orange, San Jacinto and Waller Counties in Texas.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022, Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022, Executive Order 13658 generally applies to the contract. The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

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

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

Modification Number    Publication Date  
 0                                      01/06/2023

SUTX2011-013 08/10/2011

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER (Paving and Structures)	\$ 12.98 **	
ELECTRICIAN	\$ 27.11	
FORM BUILDER/FORM SETTER		
Paving & Curb	\$ 12.34 **	
Structures	\$ 12.23 **	
LABORER		
Asphalt Raker	\$ 12.36 **	
Flagger	\$ 10.33 **	
Laborer, Common	\$ 11.02 **	
Laborer, Utility	\$ 11.73 **	
Pipelayer	\$ 12.12 **	
Work Zone Barricade Servicer	\$ 11.67 **	
PAINTER (Structures)	\$ 18.62	
POWER EQUIPMENT OPERATOR:		
Asphalt Distributor	\$ 14.06 **	
Asphalt Paving Machine	\$ 14.32 **	
Broom or Sweeper	\$ 12.68 **	
Concrete Pavement Finishing Machine	\$ 13.07 **	
Concrete Paving, Curing, Float, Texturing Machine	\$ 11.71 **	
Concrete Saw	\$ 13.99 **	
Crane, Hydraulic 80 Tons or less	\$ 13.86 **	
Crane, Lattice boom 80 tons or less	\$ 14.97 **	
Crane, Lattice boom over 80 Tons	\$ 15.80	
Crawler Tractor	\$ 13.68 **	
Excavator, 50,000 pounds or less	\$ 12.71 **	

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Excavator, Over 50,000 pounds	\$ 14.53 **
Foundation Drill, Crawler Mounted	\$ 17.43
Foundation Drill, Truck Mounted	\$ 15.89 **
Front End Loader 3 CY or Less	\$ 13.32 **
Front End Loader, Over 3 CY	\$ 13.17 **
Loader/Backhoe	\$ 14.29 **
Mechanic	\$ 16.96
Milling Machine	\$ 13.53 **
Motor Grader, Fine Grade	\$ 15.69 **
Motor Grader, Rough	\$ 14.23 **
Off Road Hauler	\$ 14.60 **
Pavement Marking Machine	\$ 11.18 **
Piledriver	\$ 14.95 **
Roller, Asphalt	\$ 11.95 **
Roller, Other	\$ 11.57 **
Scraper	\$ 13.47 **
Spreader Box	\$ 13.58 **

Servicer	\$ 13.97 **
Steel Worker	
Reinforcing Steel	\$ 15.15 **
Structural Steel Welder	\$ 12.85 **
Structural Steel	\$ 14.39 **

**TRUCK DRIVER**

Low Boy Float	\$ 16.03 **
Single Axle	\$ 11.46 **
Single or Tandem Axle Dump	\$ 11.48 **
Tandem Axle Tractor w/Semi Trailer	\$ 12.27 **

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

\*\* Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$16.20) or 13658 (\$12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family

Initials of Bidder: \_\_\_\_\_

member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union

Initials of Bidder: \_\_\_\_\_

data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Initials of Bidder: \_\_\_\_\_

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

**13.0 PERMITS:**

It shall be the sole responsibility of the successful bidder to obtain all required permits in the name of Fort Bend County.

**14.0 CONTRACTOR'S RESPONSIBILITY FOR WORK:**

14.1 Preconstruction Work. Contractor shall do (or cause to be done) the following as preconstruction work:

14.1.1 On an as needed basis as determined by Fort Bend County, cause the Contractor's personnel to meet with Fort Bend County and the Engineer to discuss the status of the Project.

14.1.2 Review drawings and specifications with the Engineer to permit the Contractor and the Engineer to determine the compliance of the proposed facility with applicable building codes.

14.2 Construction Work. Contractor shall do (or cause to be done) the following as construction work:

14.2.1 Perform (or cause to be performed) all preparatory work at the construction site required herein, including (without limitation) soil and concrete testing and demolition of improvements existing at the construction site and all actions necessary for compliance with all laws and regulations as to actions to be taken by owners or contractors before construction begins, including without limitation those in regard to archaeological and environmental requirements.

14.2.2 Construct and install (or cause to be constructed and installed) the Project on the construction site in accordance with this Contract and the drawings and specifications approved by Fort Bend County.

14.2.3 Furnish (or cause to be furnished) all materials, supplies, equipment, tools, labor, supervision, utilities, transportation, and other materials and services necessary to complete the Project described herein.

14.2.4 Materials testing necessary for the Project and required by laws and regulations, construction industry standards as approved by Fort Bend County and this Contract; the frequency of testing shall be approved by

Initials of Bidder: \_\_\_\_\_



**Fort Bend County. It is the contractor's responsibility to engage a material testing laboratory to perform testing on the structural concrete to be used for foundation work in this project. The cost of testing shall be incidental to bid item for drill shaft foundation. Testing of concrete shall comply with current TXDOT criteria. Contractor has to submit the name of the testing laboratory, intended to be used by the contractor for this project, for County's approval.**

14.3 Standards for Review and Approval. Fort Bend County acknowledges that in order to meet the deadlines for the completion of the Project, and in order to accomplish the efficient completion of the Project, the Contractor may submit matters to Fort Bend County in stages for approval or consent. Upon receipt of any matter submitted by the Contractor for review and approval, Fort Bend County shall review the same and shall diligently and promptly (but in any event within 14 calendar days for any such matter, other than a proposed change order, and within 28 calendar days for a proposed change order) give the Contractor notice of Fort Bend County's approval or disapproval, setting forth in detail all reasons for any disapproval. Fort Bend County's right to disapprove any such matter submitted (other than a proposed change order) shall be limited to the elements thereof (a) which do not conform substantially to matters previously approved, (b) which are new elements not previously presented and approved and the Contractor is unable to demonstrate that such new element is reasonably necessary for completion of the Project, or (c) which depict matters that are violations of this Contract or applicable laws and regulations.

14.3.1 If Fort Bend County disapproves of a particular matter or Proposed Change Order, the Contractor shall have the right to resubmit such matter or Proposed Change Order to Fort Bend County, altered to satisfy Fort Bend County's basis for disapproval. Any resubmission shall be subject to review and approval by Fort Bend County.

14.3.2 Fort Bend County and the Contractor shall attempt in good faith to resolve any disputes concerning the approval of any aspect of the Project expeditiously, so as not to delay the completion of the Project in accordance with this Contract.

14.3.3 Expedited Approvals. Fort Bend County recognizes the importance of expeditious action upon all matters submitted to Fort Bend County for review and approval and of expeditious response to those aspects of the Project requiring approval by governmental authorities having jurisdiction there over. Fort Bend County agrees to exercise its rights of review and approval hereunder with due diligence, reasonableness, and good faith. Fort Bend County shall use its reasonable efforts to expedite any required review of the Project or other matters by any governmental authority.

Initials of Bidder: \_\_\_\_\_

14.4 Changes.

14.4.1 General. Fort Bend County may make changes to the Project by altering, adding to, or deducting from the Project. All changes in the Project which (a) require an adjustment in the contract sum or an adjustment in the final completion date or (b) involve a material change in the overall scope or function of the Project shall be requested and authorized before commencing such changes by use of written change order notices, Proposed Change Orders and Change Orders, which change order procedure shall be the exclusive means to effect such changes in the Project.

14.4.2 Change Order Procedure. If at any time Fort Bend County desires to make any change in the Project requiring the issuance of a Change Order, Fort Bend County shall so advise the Contractor in writing by delivery to the Contractor of a written notice describing the change. Upon receipt of such notice initiated by Fort Bend County, the Contractor shall within a reasonable period of time advise Fort Bend County of the Contractor's proposal for the adjustments, if any, in the contract sum, the schedule of values, and the final completion date attributable to such change by delivering a written notice thereof (the "Proposed Change Order") to Fort Bend County. Such Proposed Change Order shall contain a description of the proposed change and shall set forth the Contractor's estimate of the increase or decrease, if any, in the contract sum and the change, if any, in the schedule of values and the final completion date attributable to such change. If the Contractor desires to make a change in the Project requiring the issuance of a change order, the Contractor shall deliver to Fort Bend County a Proposed Change Order. Upon execution by Fort Bend County, a Proposed Change Order shall constitute (and be defined herein as) a "Change Order" for purposes of this Contract. The Contractor shall forthwith perform the work as changed in accordance with such Change Order. All work performed pursuant to a Change Order shall be performed in accordance with the terms of this Contract. All Proposed Change Orders shall be submitted for approval by Fort Bend County. No action, acquiescence or inaction by Fort Bend County or any representative of Fort Bend County shall be construed to be a waiver of requirements set forth in this Contract in regard to Change Orders or ratification of a violation of such requirements, and all acts in violation of this provision shall be considered void.

14.4.3 Change Order Authorization. Each Change Order shall be signed by Fort Bend County and an authorized representative of the Contractor.

14.4.4 Contract Sum Adjustments. The contract sum and the schedule of values shall be adjusted only as a result of a Change Order requiring such adjustment. Any extra work performed without a proper Change Order shall be considered voluntary and not subject to additional compensation.

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The Contractor shall not be entitled to an adjustment in the contract sum (or a Change Order permitting such adjustment) or to damages as a result of any delays in the Project caused by the acts or omissions of Fort Bend County, provided that this sentence is not applicable to delays that constitute more than 90 days in any 365-day period or cause the Project to be interrupted for a continuous period of 45 days through no fault of the Contractor.

- 14.4.5 When Fort Bend County and the Contractor agree upon the adjustments in the contract sum, the schedule of values, and the final completion date attributable to such adjustment, such agreement will be documented by preparation and if approved by the Fort Bend County Commissioners Court, execution of an appropriate Change Order.
- 14.5 Site Access. Prior to the transfer date, Fort Bend County and the Contractor shall have uninterrupted access to the construction site. Subsequent to the transfer date, Fort Bend County will permit the Contractor, the Engineer, and their representatives and subcontractors to enter upon the Project at times reasonably necessary to complete the punch list items.
- 14.6 Applicable Laws and Regulations. Contractor shall in its performance of the Project comply with all applicable laws and regulations. Any delays in the prosecution of the Project caused by any changes in the laws and regulations or the application or enforcement of the laws and regulations may entitle the Contractor to an extension of time.
- 14.7 Familiarity with Project. The Contractor represents and accepts that it has: (a) visited the property(ies), (b) taken such other steps as may be necessary to ascertain the nature and location of the Project and the general and local conditions which affect the Project or the cost thereof, (c) investigated the labor situation as regards to the Project, (d) examined the property(ies), the obstacles which may be encountered and all other observable conditions having a bearing upon the performance of the Project, the superintendence of the Project, the time of completion and all other relevant matters, and (e) reported to Fort Bend County the results of all of the foregoing. The Contractor represents that it is familiar with all phases of the Project and the matters that may affect the Project or its prosecution under this Contract.
- 14.8 Standard of Performance. The Contractor shall prosecute (or cause to be prosecuted) the Project in accordance with the best efforts for the construction and development of projects similar to the Project in the State of Texas, using qualified, careful, and efficient contractors and workers and in conformity with the provisions of this Contract. The Contractor shall perform the work in a good and workmanlike manner.
- 14.9 Warranty of Contractor. The Contractor warrants to Fort Bend County that: (i) the Contractor possesses the skill and knowledge ordinarily possessed by well-

Initials of Bidder: \_\_\_\_\_

informed members of its trade or profession and the Contractor will use its best efforts to ensure that the services provided under this Contract will be performed, delivered, and conducted in accordance with the best professional standards and in accordance with industry standards, and (ii) the Contractor is fully experienced and properly qualified to perform the class of work provided for herein, and that it is properly equipped, organized and financed to perform such work, and (iii) following the date of acceptance of this Contract, the services provided by the Contractor to Fort Bend County will conform to the representations contained in this Contract, including all attachments, schedules and exhibits. All warranties provided by the Contractor in this Contract shall be cumulative, shall be deemed consistent and not in conflict, are intended to be given full force and effect and to be interpreted expansively to give the broadest warranty protection to Fort Bend County.

- 14.10 Contractor's Personnel. Contractor shall employ only competent, skilled personnel for the Project. Prior to the final completion date, the Contractor shall maintain a superintendent who shall be authorized to act on behalf of the Contractor and with whom Fort Bend County may consult at all reasonable times. The superintendent shall not be transferred from the Project without Fort Bend County's consent (which shall not be unreasonably withheld or delayed); provided, however, the superintendent shall not be assigned solely to the Project and shall be entitled to spend reasonable time working on matters unrelated to the Project so long as such work on other matters does not render the superintendent unavailable to the Project or unavailable to Fort Bend County. However, such obligation to furnish the superintendent and such staff personnel shall not be construed (a) to preclude the promotion within the Contractor's organization of any person assigned to the Project or (b) to give rise to any liability of the Contractor if any person assigned to the Project (including, without limitation, the superintendent) leaves the Contractor's employment. If the superintendent is transferred from the Project, Fort Bend County shall have the right to approve the replacement superintendent (which approval will not be unreasonably withheld or delayed). The Contractor, the Architect, and the other subcontractors shall comply with all applicable health, safety, and loss prevention rules of applicable governmental authorities. The Contractor shall, at its own expense, remove from the Project any person who fails to comply with such rules and instructions. The Contractor shall at all times enforce strict discipline and good order among its employees and shall not employ on the Project any unfit person or anyone not skilled in the work assigned to him. Fort Bend County may, upon written notice to the Contractor, require the Contractor to remove an individual immediately from providing services for the following reasons: violation of the terms and conditions of this Contract; violation of Fort Bend County's or the Contractor's work rules and regulations; criminal activity; or violation of state, federal, or municipal statutes. Fort Bend County may, upon thirty (30) days written notice to the Contractor, require the removal of any individual from providing services without cause.

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- 14.11 Inspection. The Project and all parts thereof shall be subject to inspection from time to time by inspectors designated by Fort Bend County. No such inspections shall relieve The Contractor of any of its obligations hereunder. Neither failure to inspect nor failure to discover or reject any of the work as not in accordance with the drawings and specifications or any provision of this Contract shall be construed to imply an acceptance of such work or to relieve the Contractor of any of its obligations hereunder. Fort Bend County agrees that its right of inspection shall be used reasonably and in a timely manner so as not to delay orderly completion of the Project.
- 14.12 Protection Against Risks. The Contractor shall take all precautions which are necessary and adequate, against conditions created during the progress of the Project which involve a risk of bodily harm to persons or a risk of damage or loss to any property. The Contractor shall regularly inspect all work, materials and equipment to discover and determine any such conditions and shall be responsible for discovery, determination, and correction of any such conditions. The Contractor shall comply with all federal, state, and local occupational hazard and safety standards, codes and regulations applicable in the jurisdiction where the Project is being performed. The Contractor shall include the substance of this clause in its entirety in all subcontracts for any work to be performed at the construction site.
- 14.13 Equipment. Except as expressly provided herein to the contrary, the Contractor shall furnish (or cause to be furnished) all construction, transportation, installation, tools, and other equipment and facilities required for the performance of the Project within the times specified herein. Such equipment and facilities shall be serviceable and kept fit for the uses intended. Defective items shall be removed from the construction site promptly and at the Contractor's cost. The Contractor shall schedule (or cause to be scheduled) its other operations so as to not interfere with its duty to timely furnish the necessary equipment and facilities and personnel to operate the same at the times necessary for the orderly completion of the Project.
- 14.14 Materials. Except as may be specifically provided otherwise in the Contract or approved in advance by Fort Bend County, the Contractor shall provide Fort Bend County with copies of material testing reports and to cause all materials, equipment, and fabricated items incorporated in the Project to be new and of a suitable grade of their respective kinds for their intended use.

**15.0 TERMINATION:**

- 15.1 Fort Bend County may terminate the Contract if the Contractor:
- 15.1.1 Persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials.

Initials of Bidder: \_\_\_\_\_

- 15.1.2 Fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractor.
  - 15.1.3 Persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction.
  - 15.1.4 Otherwise is guilty of substantial breach of a provision of the Contract Documents.
- 15.2 When any of the above reasons exists, Fort Bend County may, without prejudice to any other rights or remedies of Fort Bend County and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:
- 15.2.1 Take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor.
  - 15.2.2 Finish the Project by whatever reasonable method Fort Bend County may deem expedient.
- 15.3 Either party may terminate this Contract at any time by providing thirty (30) days written notice.
- 15.4 When Fort Bend County terminates the Contract for one of the reasons stated in this section, the Contractor shall not be entitled to receive further payment until the Project is finished. Therefore, the Contractor shall be promptly paid for all work actually and satisfactorily completed.

**16.0 COMPLETION, TRANSFER, & ACCEPTANCE:**

- 16.1 Final Completion. Upon the occurrence of the final completion date, the punch list items shall be promptly commenced and thereafter completed within thirty (30) days after final completion.
- 16.2 Transfer and Acceptance. Upon the occurrence of final completion, care, custody and control of the Project shall pass to Fort Bend County. As referenced herein, the "Transfer Date" shall mean the date on which the care, custody and control of the Project passes to Fort Bend County. Subsequent to the Transfer Date all risk of loss with respect to the Project shall be by Fort Bend County and the Contractor shall be thereafter obligated to cover the Project with their Insurance.

Initials of Bidder: \_\_\_\_\_

**17.0 SUSPENSION BY FORT BEND COUNTY FOR CONVENIENCE:**

- 17.1 Fort Bend County may, without cause, order the Contractor in writing to suspend, delay or interrupt the Project in whole or in part for such period of time as Fort Bend County may determine.
- 17.2 An adjustment shall be made for increase in the cost of performance, caused by suspension, delay or interruption. No adjustment shall be made to the extent:
  - 17.2.1 That performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible.
  - 17.2.2 That an equitable adjustment is made or denied under another provision of this Contract.
- 17.3 Adjustments made in the cost of performance may have a mutually agreed fixed or percentage fee.

**18.0 INDEPENDENT CONTRACTOR:**

The Contractor shall be an independent contractor and any provisions of this Contract that may appear to give Fort Bend County the right to direct the Contractor as to the details of the manner of doing the Project shall be deemed to mean that the Contractor shall follow the desires of Fort Bend County in the results of the Project only and not in the means whereby the Project is to be accomplished. The Contractor shall be responsible as to the details of completing the Project. Neither the agents, representatives, nor employees of the Contractor, shall be deemed to be the agents, representatives, or employees of Fort Bend County. The Contractor further represents that it accepts a fiduciary role and responsibility with respect to Fort Bend County and will, to its best abilities, act in the best interests of Fort Bend County and the timely completion of the Project. The Contractor agrees and understands that neither it nor any of its agents or employees may act in the name of Fort Bend County except and unless specifically authorized in writing by Fort Bend County to do so. The Contractor shall furnish construction administration and management services and use the Contractor's best efforts to complete the Project in an expeditious and economical manner consistent with the interests of Fort Bend County.

**19.0 NOTICE**

- 19.1 All written notices, demands, and other papers or documents to be delivered to Fort Bend County under this Contract shall be delivered to the Engineering Department, 301 Jackson, Richmond, Texas 77469, or at such other place or places as Fort Bend County may from time to time designate by written notice delivered to the Contractor. For purposes of notice under this Contract, a copy of any notice or communication hereunder shall also be forwarded to the following address: Fort Bend County, 301 Jackson Street, Richmond, Texas 77469, Attention: County Judge.

Initials of Bidder: \_\_\_\_\_

- 19.2 All written notices, demands, and other papers or documents to be delivered to the Contractor under this Contract shall be delivered to the Authorized Representative identified in the Contract documents or such other place or places as the Contractor may designate by written notice delivered to Fort Bend County.

**20.0 RECORDS:**

- 20.1 Fort Bend County shall be the absolute and unqualified owner of all drawings, preliminary layouts, record drawings, sketches and other documents prepared pursuant to the Contract by Contractor.
- 20.2 The Contractor agrees to maintain and preserve for a period of at least five years after the earlier of the expiration of the defects period or termination of this Contract, accurate and complete records relating to the performance of the Project. The Contractor agrees to, upon request, provide Fort Bend County with such records.

**21.0 SUCCESSORS & ASSIGNS:**

- 21.1 Fort Bend County and the Contractor bind themselves and their successors, executors, administrators and assigns to the other party of this Contract and to the successors, executors, administrators and assigns of such other party, in respect to all covenants of this Contract.
- 21.2 Neither Fort Bend County nor the Contractor shall assign, sublet or transfer its interest in this Contract without the prior written consent of the other.
- 21.3 Nothing herein shall be construed as creating any personal liability on the part of any officer or agent of any public and/or governmental body that may be a party hereto.

**22.0 PUBLIC CONTACT:**

Contact with the news media, citizens of Fort Bend County or governmental agencies shall be the sole responsibility of Fort Bend County. Under no circumstances, whatsoever, shall Contractor release any material or information developed in the performance of its services hereunder without the express written permission of Fort Bend County, except where required to do so by law.

**23.0 MODIFICATIONS:**

This instrument contains the entire Contract between the parties relating to the rights herein granted and obligations herein assumed. Any oral or written representations or modifications concerning this instrument shall be of no force and effect excepting a subsequent written modification signed by both parties hereto.

Initials of Bidder: \_\_\_\_\_



**24.0 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 practice is 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. Manufacturer furnishing these items shall be experienced in design and construction of such items and shall be an established supplier of the item bid.

**25.0 SEVERABILITY:**

In the event one or more of the provisions contained in these requirements or the specifications shall for any reason be held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provision hereof and these requirements or the specifications shall be construed as if such invalid, illegal, or unenforceable provision had never been contained herein.

**26.0 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, Fort Bend County's interpretation shall govern.

**27.0 TAX EXEMPT:**

Fort Bend County is exempt from state and local sales and use taxes under Section 151.309 of the Texas Tax Code. This Contract is deemed to be a separate contract for Texas tax purposes, and as such, Fort Bend County hereby issues its Texas Exemption for the purchase of any items qualifying for exemption under this Contract. Contractor is to issue its Texas Resale Certificate to vendors and subcontractors for such items qualifying for this exemption, and further, contractor should state these items at cost.

**28.0 ENTIRE AGREEMENT:**

The Parties agree that this Contract contains all of the terms and conditions of the understanding of the parties relating to the subject matter hereof. All prior negotiations, discussions, correspondence and preliminary understandings between the parties and others relating hereto are superseded by this Contract. By entering into this Contract, the parties do not intend to create any obligations, express or implied, other than those specifically set out in this Contract.

**29.0 APPLICABLE LAW & VENUE**

This Contract shall be construed under and in accord with the laws of the State of Texas, and all obligations of the parties created hereunder are performable in Fort Bend County, Texas, and that

Initials of Bidder: \_\_\_\_\_

venue for any litigation arising out of or related to this Contract shall lie solely in the court of appropriate jurisdiction located in Fort Bend County, Texas.

**30.0 ENCLOSURE:**

The following being incorporated herein by reference for all purposes as though fully set forth herein word for word.

Enclosure #1 – Specifications and Plans

**31.0 PRICING:** Complete excel unit pricing form.

**32.0 PROJECT DURATION:**

Bidder agrees, if awarded the contract, to complete all work required by the contract documents **within \_\_\_\_\_ calendar days (maximum 540 days)** after issuance of a purchase order by the County Purchasing Agent and notice to proceed by the Engineering Department.

**33.0 AWARD:**

This contract will be awarded to the overall lowest and best bid.

**34.0 TEXAS ETHICS COMMISSION FORM 1295:**

34.1 Effective January 1, 2016 all contracts executed by Commissioners Court, regardless of the dollar amount, will require completion of Form 1295 "Certificate of Interested Parties", per the new Government Code Statute §2252.908. All vendors submitting a response to a formal Bid, RFP, SOQ or any contracts, contract amendments, renewals or change orders are required to complete the Form 1295 online through the State of Texas Ethics Commission website. Please visit: <https://www.ethics.state.tx.us/filinginfo/1295/>

34.2 On-line instructions:

34.2.1 Name of governmental entity is to read: Fort Bend County.

34.2.2 Identification number used by the governmental entity is: B24-015.

34.2.3 Description is the title of the solicitation: Construction of Fort Bend Parkway Entrance Ramp

34.3 Apparent low bidder(s) will be required to provide the Form 1295 within three (3) calendar days from notification; however, if your company is publicly traded you are not required to complete this form.

Initials of Bidder: \_\_\_\_\_

**35.0 STATE LAW REQUIREMENTS FOR CONTRACTS:**

The contents of this section are required by Texas Law and are included by County regardless of content.

- 35.1 Agreement to Not Boycott Israel Chapter 2271 Texas Government Code: Contractor verifies that if Contractor employs ten (10) or more full-time employees and this Agreement has a value of \$100,000 or more, Contractor does not boycott Israel and will not boycott Israel during the term of this Agreement.
- 35.2 Texas Government Code Section 2251.152 Acknowledgment: By signature on vendor form, Contractor represents pursuant to Section 2252.152 of the Texas Government Code, that Contractor is not listed on the website of the Comptroller of the State of Texas concerning the listing of companies that are identified under Section 806.051, Section 807.051 or Section 2253.153.

**36.0 HUMAN TRAFFICKING:**

By acceptance of this contract, Contractor acknowledges that Fort Bend County is opposed to human trafficking and that no County funds will be used in support of services or activities that violate human trafficking laws

**37.0 ADDITIONAL REQUIRED FORMS:**

All vendors submitting are required to complete and return with submission:

- 37.1 Vendor Form
- 37.2 W9 Form
- 37.3 Tax Form/Debt/Residence Certification
- 37.4 Contractor Acknowledgement of Stormwater Management Program

Initials of Bidder: \_\_\_\_\_

**Contract Sheet  
Bid 24-015**

**THE STATE OF TEXAS  
COUNTY OF FORT BEND**

This memorandum of agreement made and entered into on the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between Fort Bend County in the State of Texas (hereinafter designated County), acting herein by County Judge KP George, by virtue of an order of Fort Bend County Commissioners Court, and \_\_\_\_\_ (hereinafter designated Contractor).

**(company name)**

WITNESSETH:

The Contractor and the County agree that the bid and specifications for the **Construction of Fort Bend Parkway Entrance Ramp for Fort Bend County Mobility Bond Project No. 20219x** which are hereto attached and made a part hereof, together with this instrument and the bond (when required) shall constitute the full agreement and contract between parties and for furnishing the items set out and described; the County agrees to pay the prices stipulated in the accepted bid.

It is further agreed that this contract shall not become binding or effective until signed by the parties hereto and a purchase order authorizing the items desired has been issued.

Executed at Richmond, Texas this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

**Fort Bend County, Texas**

**By:** \_\_\_\_\_  
County Judge, KP George

**By:** \_\_\_\_\_  
Signature of Contractor

**By:** \_\_\_\_\_  
Printed Name and Title

# Request for Taxpayer Identification Number and Certification

**Give Form to the  
 requester. Do not  
 send to the IRS.**

<b>Print or type See Specific Instructions on page 2.</b>	<b>1</b> Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.	
	<b>2</b> Business name/disregarded entity name, if different from above	
	<b>3</b> Check appropriate box for federal tax classification; check only <b>one</b> of the following seven boxes: <input type="checkbox"/> Individual/sole proprietor or single-member LLC <input type="checkbox"/> C Corporation <input type="checkbox"/> S Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Trust/estate <input type="checkbox"/> Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶ _____ <b>Note.</b> For a single-member LLC that is disregarded, do not check LLC; check the appropriate box in the line above for the tax classification of the single-member owner. <input type="checkbox"/> Other (see instructions) ▶ _____	<b>4</b> Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3): Exempt payee code (if any) _____ Exemption from FATCA reporting code (if any) _____ <i>(Applies to accounts maintained outside the U.S.)</i>
	<b>5</b> Address (number, street, and apt. or suite no.)	Requester's name and address (optional)
	<b>6</b> City, state, and ZIP code	
	<b>7</b> List account number(s) here (optional)	

## Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

<b>Social security number</b>									
				-			-		
<b>or</b>									
<b>Employer identification number</b>									
				-					

**Note.** If the account is in more than one name, see the instructions for line 1 and the chart on page 4 for guidelines on whose number to enter.

## Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

**Certification instructions.** You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 3.

<b>Sign Here</b>	Signature of U.S. person ▶	Date ▶
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## General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

**Future developments.** Information about developments affecting Form W-9 (such as legislation enacted after we release it) is at [www.irs.gov/fw9](http://www.irs.gov/fw9).

### Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following:

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)

- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

*If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding? on page 2.*

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and
4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting?* on page 2 for further information.

**Note.** If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

**Definition of a U.S. person.** For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien;
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States;
- An estate (other than a foreign estate); or
- A domestic trust (as defined in Regulations section 301.7701-7).

**Special rules for partnerships.** Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

In the cases below, the following person must give Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States:

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the entity;
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the trust; and
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

**Foreign person.** If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person, do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Publication 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

**Nonresident alien who becomes a resident alien.** Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items:

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.
2. The treaty article addressing the income.
3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.
4. The type and amount of income that qualifies for the exemption from tax.
5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

**Example.** Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

## Backup Withholding

**What is backup withholding?** Persons making certain payments to you must under certain conditions withhold and pay to the IRS 28% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

**Payments you receive will be subject to backup withholding if:**

1. You do not furnish your TIN to the requester,
2. You do not certify your TIN when required (see the Part II instructions on page 3 for details),

3. The IRS tells the requester that you furnished an incorrect TIN,

4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or

5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code* on page 3 and the separate Instructions for the Requester of Form W-9 for more information.

Also see *Special rules for partnerships* above.

## What is FATCA reporting?

The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all United States account holders that are specified United States persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code* on page 3 and the Instructions for the Requester of Form W-9 for more information.

## Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account; for example, if the grantor of a grantor trust dies.

## Penalties

**Failure to furnish TIN.** If you fail to furnish your correct TIN to a requester, you are subject to a penalty of \$50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

**Civil penalty for false information with respect to withholding.** If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a \$500 penalty.

**Criminal penalty for falsifying information.** Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

**Misuse of TINs.** If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

## Specific Instructions

### Line 1

You must enter one of the following on this line; **do not** leave this line blank. The name should match the name on your tax return.

If this Form W-9 is for a joint account, list first, and then circle, the name of the person or entity whose number you entered in Part I of Form W-9.

a. **Individual.** Generally, enter the name shown on your tax return. If you have changed your last name without informing the Social Security Administration (SSA) of the name change, enter your first name, the last name as shown on your social security card, and your new last name.

**Note. ITIN applicant:** Enter your individual name as it was entered on your Form W-7 application, line 1a. This should also be the same as the name you entered on the Form 1040/1040A/1040EZ you filed with your application.

b. **Sole proprietor or single-member LLC.** Enter your individual name as shown on your 1040/1040A/1040EZ on line 1. You may enter your business, trade, or "doing business as" (DBA) name on line 2.

c. **Partnership, LLC that is not a single-member LLC, C Corporation, or S Corporation.** Enter the entity's name as shown on the entity's tax return on line 1 and any business, trade, or DBA name on line 2.

d. **Other entities.** Enter your name as shown on required U.S. federal tax documents on line 1. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on line 2.

e. **Disregarded entity.** For U.S. federal tax purposes, an entity that is disregarded as an entity separate from its owner is treated as a "disregarded entity." See Regulations section 301.7701-2(c)(2)(iii). Enter the owner's name on line 1. The name of the entity entered on line 1 should never be a disregarded entity. The name on line 1 should be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner's name is required to be provided on line 1. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on line 2, "Business name/disregarded entity name." If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

**Line 2**

If you have a business name, trade name, DBA name, or disregarded entity name, you may enter it on line 2.

**Line 3**

Check the appropriate box in line 3 for the U.S. federal tax classification of the person whose name is entered on line 1. Check only one box in line 3.

**Limited Liability Company (LLC).** If the name on line 1 is an LLC treated as a partnership for U.S. federal tax purposes, check the "Limited Liability Company" box and enter "P" in the space provided. If the LLC has filed Form 8832 or 2553 to be taxed as a corporation, check the "Limited Liability Company" box and in the space provided enter "C" for C corporation or "S" for S corporation. If it is a single-member LLC that is a disregarded entity, do not check the "Limited Liability Company" box; instead check the first box in line 3 "Individual/sole proprietor or single-member LLC."

**Line 4, Exemptions**

If you are exempt from backup withholding and/or FATCA reporting, enter in the appropriate space in line 4 any code(s) that may apply to you.

**Exempt payee code.**

- Generally, individuals (including sole proprietors) are not exempt from backup withholding.
- Except as provided below, corporations are exempt from backup withholding for certain payments, including interest and dividends.
- Corporations are not exempt from backup withholding for payments made in settlement of payment card or third party network transactions.
- Corporations are not exempt from backup withholding with respect to attorneys' fees or gross proceeds paid to attorneys, and corporations that provide medical or health care services are not exempt with respect to payments reportable on Form 1099-MISC.

The following codes identify payees that are exempt from backup withholding. Enter the appropriate code in the space in line 4.

- 1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)
- 2—The United States or any of its agencies or instrumentalities
- 3—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities
- 4—A foreign government or any of its political subdivisions, agencies, or instrumentalities
- 5—A corporation
- 6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or possession
- 7—A futures commission merchant registered with the Commodity Futures Trading Commission
- 8—A real estate investment trust
- 9—An entity registered at all times during the tax year under the Investment Company Act of 1940
- 10—A common trust fund operated by a bank under section 584(a)
- 11—A financial institution
- 12—A middleman known in the investment community as a nominee or custodian
- 13—A trust exempt from tax under section 664 or described in section 4947

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 7
Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 4
Payments over \$600 required to be reported and direct sales over \$5,000 <sup>1</sup>	Generally, exempt payees 1 through 5 <sup>2</sup>
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

<sup>1</sup> See Form 1099-MISC, Miscellaneous Income, and its instructions.

<sup>2</sup> However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney reportable under section 6045(f), and payments for services paid by a federal executive agency.

**Exemption from FATCA reporting code.** The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements. A requester may indicate that a code is not required by providing you with a Form W-9 with "Not Applicable" (or any similar indication) written or printed on the line for a FATCA exemption code.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37)

B—The United States or any of its agencies or instrumentalities

C—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Regulations section 1.1472-1(c)(1)(i)

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Regulations section 1.1472-1(c)(1)(i)

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state

G—A real estate investment trust

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940

I—A common trust fund as defined in section 584(a)

J—A bank as defined in section 581

K—A broker

L—A trust exempt from tax under section 664 or described in section 4947(a)(1)

M—A tax exempt trust under a section 403(b) plan or section 457(g) plan

**Note.** You may wish to consult with the financial institution requesting this form to determine whether the FATCA code and/or exempt payee code should be completed.

**Line 5**

Enter your address (number, street, and apartment or suite number). This is where the requester of this Form W-9 will mail your information returns.

**Line 6**

Enter your city, state, and ZIP code.

**Part I. Taxpayer Identification Number (TIN)**

**Enter your TIN in the appropriate box.** If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN. However, the IRS prefers that you use your SSN.

If you are a single-member LLC that is disregarded as an entity separate from its owner (see *Limited Liability Company (LLC)* on this page), enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

**Note.** See the chart on page 4 for further clarification of name and TIN combinations.

**How to get a TIN.** If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local SSA office or get this form online at [www.ssa.gov](http://www.ssa.gov). You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at [www.irs.gov/businesses](http://www.irs.gov/businesses) and clicking on Employer Identification Number (EIN) under Starting a Business. You can get Forms W-7 and SS-4 from the IRS by visiting [IRS.gov](http://IRS.gov) or by calling 1-800-TAX-FORM (1-800-829-3676).

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

**Note.** Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

**Caution:** A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.

**Part II. Certification**

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if items 1, 4, or 5 below indicate otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on line 1 must sign. Exempt payees, see *Exempt payee code* earlier.

**Signature requirements.** Complete the certification as indicated in items 1 through 5 below.

- 1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983.** You must give your correct TIN, but you do not have to sign the certification.
- 2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983.** You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.
- 3. Real estate transactions.** You must sign the certification. You may cross out item 2 of the certification.
- 4. Other payments.** You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).
- 5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions.** You must give your correct TIN, but you do not have to sign the certification.

**What Name and Number To Give the Requester**

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account)	The actual owner of the account or, if combined funds, the first individual on the account <sup>1</sup>
3. Custodian account of a minor (Uniform Gift to Minors Act)	The minor <sup>2</sup>
4. a. The usual revocable savings trust (grantor is also trustee) b. So-called trust account that is not a legal or valid trust under state law	The grantor-trustee <sup>1</sup>  The actual owner <sup>1</sup>
5. Sole proprietorship or disregarded entity owned by an individual	The owner <sup>3</sup>
6. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulations section 1.671-4(b)(2)(i)(A))	The grantor*
For this type of account:	Give name and EIN of:
7. Disregarded entity not owned by an individual	The owner
8. A valid trust, estate, or pension trust	Legal entity <sup>4</sup>
9. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
10. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
11. Partnership or multi-member LLC	The partnership
12. A broker or registered nominee	The broker or nominee
13. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
14. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulations section 1.671-4(b)(2)(i)(B))	The trust

<sup>1</sup> List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

<sup>2</sup> Circle the minor's name and furnish the minor's SSN.

<sup>3</sup> You must show your individual name and you may also enter your business or DBA name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

<sup>4</sup> List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships* on page 2.

\*Note. Grantor also must provide a Form W-9 to trustee of trust.

**Note.** If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

**Secure Your Tax Records from Identity Theft**

Identity theft occurs when someone uses your personal information such as your name, SSN, or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Publication 4535, Identity Theft Prevention and Victim Assistance.

Victims of identity theft who are experiencing economic harm or a system problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

**Protect yourself from suspicious emails or phishing schemes.** Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to [phishing@irs.gov](mailto:phishing@irs.gov). You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration (TIGTA) at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at: [spam@uce.gov](mailto:spam@uce.gov) or contact them at [www.ftc.gov/idtheft](http://www.ftc.gov/idtheft) or 1-877-IDTHEFT (1-877-438-4338).

Visit [IRS.gov](http://IRS.gov) to learn more about identity theft and how to reduce your risk.

**Privacy Act Notice**

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.



Job No.: \_\_\_\_\_

**TAX FORM/DEBT/ RESIDENCE CERTIFICATION**  
**(for Advertised Projects)**

Taxpayer Identification Number (T.I.N.): \_\_\_\_\_

Company Name submitting Bid/Proposal: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

Are you registered to do business in the State of Texas?  Yes  No

If you are an individual, list the names and addresses of any partnership of which you are a general partner or any assumed name(s) under which you operate your business

\_\_\_\_\_  
\_\_\_\_\_

I. **Property:** List all taxable property in Fort Bend County owned by you or above partnerships as well as any d/b/a names. Include real and personal property as well as mineral interest accounts. (Use a second sheet of paper if necessary.)

<u>Fort Bend County Tax Acct. No.*</u>	<u>Property address or location**</u>
_____	_____
_____	_____
_____	_____
_____	_____

\* *This is the property account identification number assigned by the Fort Bend County Appraisal District.*  
 \*\* *For real property, specify the property address or legal description. For business personal property, specify the address where the property is located. For example, office equipment will normally be at your office, but inventory may be stored at a warehouse or other location.*

II. **Fort Bend County Debt** - Do you owe any debts to Fort Bend County (taxes on properties listed in I above, tickets, fines, tolls, court judgments, etc.)?  
 Yes  No      If yes, attach a separate page explaining the debt.

III. **Residence Certification** - Pursuant to Texas Government Code §2252.001 *et seq.*, as amended, Fort Bend County requests Residence Certification. §2252.001 *et seq.* of the Government Code provides some restrictions on the awarding of governmental contracts; pertinent provisions of §2252.001 are stated below:

- (3) "Nonresident bidder" refers to a person who is not a resident.
  - (4) "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 §2252.001.  
[Company Name]
- I certify that \_\_\_\_\_ is a Nonresident Bidder as defined in Government Code §2252.001 and our principal place of business is \_\_\_\_\_.  
[Company Name]  
[City and State]

**Mandatory Form**



**Contractor Acknowledgement of Storm Water Management Program**

I hereby acknowledge that I am aware of the stormwater management program and standard operating procedures developed by Fort Bend County in compliance with the TPDES General Permit No. TXR040000. I agree to comply with all applicable best management practices and standard operating procedures while conducting my services for Fort Bend County. I agree to conduct all services in a manner that does not introduce illicit discharges of pollutants to streets, stormwater inlets, drainage ditches or any portion of the drainage system. The following materials and/or pollutant sources must not be discharged to the drainage system as a result of any services provided:

1. Grass clippings, leaves, mulch, rocks, sand, dirt or other waste materials resulting from landscaping activities, (except those materials resulting from ditch mowing or maintenance activities)
2. Herbicides, pesticides and/or fertilizers, (except those intended for aquatic use)
3. Detergents, fuels, solvents, oils and/or lubricants, other equipment and/or vehicle fluids,
4. Other hazardous materials including paints, thinners, chemicals or related waste materials,
5. Uncontrolled dewatering discharges, equipment and/or vehicle wash waters,
6. Sanitary waste, trash, debris, or other waste products
7. Wastewater from wet saw machinery,
8. Other pollutants that degrade water quality or pose a threat to human health or the environment.

Furthermore, I agree to notify Fort Bend County immediately of any issue caused by or identified by:

---

(Company/Contractor)

that is believed to be an immediate threat to human health or the environment.

---

Contractor Signature

---

Date

---

Printed Name

---

Title

## **Table of Contents**

- I. List of Technical Specifications
- II. Bid Forms
- III. Summary of Work
- IV. SWPPP Documents
- V. USACE Nationwide Permit
- VI. Environmental Critical Issues Analysis
- VII. Geotechnical Report

## **List of Technical Specifications**

**Job No. 20219x; Fort Bend Parkway Ramp at Carey Chase Dr.  
South of BW 8 EBR to North of Channel B-1  
Fort Bend County Precinct 2  
List of Specs**

**EARTHWORK AND LANDSCAPE**

<b><u>SPEC NO. (TxDOT)</u></b>	<b><u>DESCRIPTION</u></b>
100	Preparing Right of Way
104	Removing Concrete
105	Removing Treated and Untreated Base and Asphalt Pavement
110	Excavation
132	Embankment
162	Sodding for Erosion Control
164	Seeding for Erosion Control
166	Fertilizer
168	Vegetative Watering

**SUBGRADE TREATMENTS AND BASE**

<b><u>SPEC NO. (TxDOT)</u></b>	<b><u>DESCRIPTION</u></b>
260	Lime Treatment (Road-Mixed)
276	Cement Treatment (Plant-Mixed)
292	Asphalt Treatment (Plant-Mixed)

**SURFACE COURSES AND PAVEMENTS**

<b><u>SPEC NO. (TxDOT)</u></b>	<b><u>DESCRIPTION</u></b>
340	Dense-Graded Hot-Mix Asphalt (Small Quantity)
360	Concrete Pavement
3021	Wide Flange Pavement Terminals

**STRUCTURES**

<b><u>SPEC NO. (TxDOT)</u></b>	<b><u>DESCRIPTION</u></b>
400	Excavation and Backfill for Structures
402	Trench Excavation Protection
403	Temporary Special Shoring
416	Drilled Shaft Foundations
420	Concrete Substructures
422	Concrete Superstructures
423	Retaining Walls
425	Precast Prestressed Concrete Structural Members
432	Riprap
450	Railing
454	Bridge Expansion Joints
464	Reinforced Concrete Pipe
465	Junction Boxes, Manholes, and Inlets
467	Safety End Treatment
479	Adjusting Manholes and Inlets
496	Removing Structures

**Job No. 20219x; Fort Bend Parkway Ramp at Carey Chase Dr.  
South of BW 8 EBR to North of Channel B-1  
Fort Bend County Precinct 2  
List of Specs**

**MISCELLANEOUS CONSTRUCTION**

<b><u>SPEC NO. (TxDOT)</u></b>	<b><u>DESCRIPTION</u></b>
502	Barricades, Signs, and Traffic Handling
506	Temporary Erosion, Sedimentation, and Environmental Controls
508	Constructing Detours
512	Portable Traffic Barrier
529	Concrete Curb, Gutter, and Combined Curb and Gutter
540	Metal Beam Guard Fence
544	Guardrail End Treatments
545	Crash Cushion Attenuators
550	Chain Link Fence
556	Pipe Underdrains

**LIGHTING AND SIGNALS**

<b><u>SPEC NO. (TxDOT)</u></b>	<b><u>DESCRIPTION</u></b>
610	Roadway Illumination Assemblies
618	Conduit
620	Electrical Conductors
624	Ground Boxes
628	Electrical Services
690	Maintenance of Traffic Signals
6027	Preparation of Existing Conduits, Ground Boxes or Manholes

**SIGNING AND PAVEMENT MARKINGS**

<b><u>SPEC NO. (TxDOT)</u></b>	<b><u>DESCRIPTION</u></b>
644	Small Roadside Sign Assemblies
647	Large Roadside Sign Supports and Assemblies
658	Delineator and Object Marker Assemblies
662	Work Zone Pavement Markings
666	Retroreflectorized Pavement Markings
668	Prefabricated Pavement Markings
672	Raised Pavement Markers
677	Eliminating Existing Pavement Markings and Markers
678	Pavement Surface Preparation for Markings
6001	Portable Changeable Message Sign
6185	Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)

**Texas Department of Transportation Specifications (TxDOT)**  
<https://ftp.txdot.gov/pub/txdot-info/des/spec-book-1114.pdf>

**Bid Form**  
(excel form)

## **Summary of Work**





## Summary of Work

PROJECT: Fort Bend Parkway Ramp at Carey Chase Dr.	LIMITS: South of BW 8 EBFR to North of Channel B-1
PROJECT NO.: FBC 20219x pursuant to SOQ 14-025	DATE: May 31, 2023
PROJECT OWNER.: Fort Bend County	PURPOSE: Summary of Work

### 1. WORK COVERED BY CONTRACT DOCUMENTS

- A. Work of the Contract is for the replacement and extension of the Fort Bend Parkway Toll Road southbound entrance ramp, from approximately five hundred (500) feet south of the Beltway 8 Eastbound Frontage Road intersection. The ramp extension will include constructing a one hundred-five (105) foot bridge over Carey Chase Drive, including constructing Mechanically Stabilized Earth (MSE) retaining walls, storm sewer system, grading, and detention pond excavation. The work of the contract includes demolition and construction of the ramp as follows:

Demolition of existing Fort Bend Parkway southbound entrance ramp reinforced concrete pavement, existing curb, existing signs, including clearing and grubbing, and excavating and embankment of project site to the required elevation to achieve the proposed profile and maintain drainage. The project primarily consists of construction of 24' wide, reinforced concrete pavement for proposed ramp, 105' single-span bridge, retaining walls, underground storm sewer system with curb inlets, grate inlets, manholes, culvert extensions, headwalls, detention pond excavation, proposed signing and pavement markings, temporary asphalt pavement widening to maintain traffic on ramp during construction, grading to create proposed elevations and drainage swales and ditches, seeding and sodding the natural ground within the project limits, etc. as shown in the construction plans and bid documents.

#### B. EXTRA WORK ITEMS

Contractor must obtain written authorization from Fort Bend County to commence work listed in the "Extra Work Items" in the Bid Form.

#### C. WORK SEQUENCE

Time is of the essence in this Work. The Contractor is responsible for providing a construction schedule and coordinating construction operations with the Fort Bend County and their agents.

The Contractor is responsible for submitting the haul routes required to complete the work for the Fort Bend for approval.

**End Document**

**SWPPP Documents**



## Summary of Work For SWPPP

PROJECT: Fort Bend Parkway Ramp at Carey Chase Dr.	LIMITS: South of BW 8 EBFR to North of Channel B-1
PROJECT NO.: FBC 20219x pursuant to SOQ 14-025	DATE: May 31, 2023
PROJECT OWNER.: Fort Bend County	PURPOSE: Summary of Work for SWPPP

Work of the Contract is for the replacement and extension of the Fort Bend Parkway Toll Road southbound entrance ramp, from approximately five hundred (500) feet south of the Beltway 8 Eastbound Frontage Road intersection. The ramp extension will include constructing a one hundred-five (105) foot bridge over Carey Chase Drive, including constructing Mechanically Stabilized Earth (MSE) retaining walls, storm sewer system, grading, and detention pond excavation. The work of the contract includes demolition and construction of the ramp as follows:

Demolition of existing Fort Bend Parkway southbound entrance ramp reinforced concrete pavement, existing curb, existing signs, including clearing and grubbing, and excavating and embankment of project site to the required elevation to achieve the proposed profile and maintain drainage. The project primarily consists of construction of 24' wide, reinforced concrete pavement for proposed ramp, 105' single-span bridge, retaining walls, underground storm sewer system with curb inlets, grate inlets, manholes, culvert extensions, headwalls, detention pond excavation, proposed signing and pavement markings, temporary asphalt pavement widening to maintain traffic on ramp during construction, grading to create proposed elevations and drainage swales and ditches, seeding and sodding the natural ground within the project limits, etc. as shown in the construction and SWPPP plans and bid documents.

**End Document**

## Responsibilities of Operators

**Primary Operator:** Contractor

Responsibilities of Primary Operator(s):

- a) Implement SWPPP
- b) Install and maintain all structural controls
- c) Comply with all Primary Operator permit requirements set forth in TPDES Construction General Permit No. TXR150000.

**Secondary Operator:** Fort Bend County

Responsibilities of Secondary Operator:

- a) Assistance in the development of the SWPPP
- b) Provide notification to Primary Operator of the need to obtain permit coverage under the TPDES Construction General Permit No. TXR150000.

## Primary Operator(s)

### POLLUTION PREVENTION PLAN CERTIFICATION

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designated to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

\*Secondary Operator has fulfilled notification requirements set forth in the Construction General Permit TXR150000 Part II. Section E. 3.(e) by notifying the Primary Operator(s) of the requirements for obtaining permit coverage. The Primary Operator(s) acknowledge that the only responsibility of the Secondary Operator for participating in this shared SWPPP is assistance in the preparation of the SWPPP. All other responsibilities including but not limited to: Implementation of the SWPPP, installation/maintenance of the structural controls, submittal of the NOI, etc., will be fulfilled by the primary operator(s).

Signed: \_\_\_\_\_  
Primary Operator

Date: \_\_\_\_\_

**USACE Nationwide Permit Review**



## USACE Nationwide Permit Review

PROJECT: Fort Bend Parkway Ramp at Carey Chase Dr.	LIMITS: South of BW 8 EBFR to North of Channel B-1
PROJECT NO.: FBC 20219x pursuant to SOQ 14-025	DATE: May 31, 2023
PROJECT OWNER.: Fort Bend County	PURPOSE: USACE Nationwide Permit Review

The WOTUS investigation revealed the project area contains a stormwater drainage channel and a stormwater retention pond. Consultant BIO-WEST believes that **these features would not be considered jurisdictional by the USACE.**

The threatened and endangered species survey indicates the project area does not contain suitable critical habitat or individuals of any federally listed species.

The desktop archival review revealed that no previous cultural resources surveys have been performed within the project area. The area surrounding the project site has been heavily disturbed and it is unlikely that a pedestrian archeological survey would be required. In the event cultural resources are uncovered during the construction activities, please refer to your unanticipated discoveries plan and contact your environmental consulting representative immediately.

### Professional Recommendations

It is BIO-WEST's professional judgment that in accordance with the findings of this investigation and the proposed plans for site development that **no agency coordination would be required, and no WOTUS**, threatened or endangered species, or cultural and historic resources will be impacted by the proposed project.

Please refer to attached Environmental Critical Issues Analysis for additional information.

**End Document**

## **Environmental Critical Issues Analysis**





April 18, 2022

Mr. Gabriel Odreman, P.E.  
RPS Group, Inc.  
575 N Dairy Ashford Rd Suite 700  
Houston, TX 77079

RE: Environmental Critical Issues Analysis  
2020 Fort Bend County Mobility: Project 20219x FB Parkway Ramp  
Fort Bend County, Texas

Dear Mr. Odreman:

This letter of findings provides the results of an Environmental Critical Issues Analysis (ECIA) performed by BIO-WEST, Inc. (BIO-WEST) for the proposed 2020 Fort Bend County Mobility Project: 20219x FB Parkway Ramp located in Missouri City, Texas (Appendix A). The area of investigation (project area) is focused on an approximately 2.10 acres of land located south of the interchange of the Fort Bend County Toll Road and Sam Houston Beltway 8, along the southwest bound lanes of Hillcroft Avenue. The center of the this investigation and proposed roadway is located at approximately 29.610495°N, 95.496500° (WGS 1984).

### **Wetlands Investigation**

Waters of the United States (WOTUS), which includes wetlands, are regulated by the Clean Water Act (CWA) under the authority of the United States Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA). On August 30, 2021, the EPA and USACE were in receipt of the U.S. District Court for the District of Arizona's order vacating and remanding the Navigable Waters Protection Rule (NWPR) in the case of *Pascua Yaqui Tribe v. U.S. Environmental Protection Agency*. In light of this order, the agencies have halted implementation of the NWPR nationwide and are interpreting WOTUS consistent with the pre-2015 regulatory regime until further notice.

Under 40 CFR 230.3(s), WOTUS means:

- All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
- All interstate waters including interstate wetlands;
- All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters which are or could be used by interstate or foreign travelers for recreational or other purposes; or from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or which are used or could be used for industrial purposes by industries in interstate commerce;
- All impoundments of waters otherwise defined as WOTUS under this definition;
- Tributaries of waters identified in paragraphs (s)(1) through (4) of this section;
- The territorial sea;
- Wetlands adjacent to waters (other than waters that are themselves wetlands); waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other

than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not WOTUS.

WOTUS do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the CWA, the final authority regarding CWA jurisdiction remains with EPA.

The purpose of the study was to determine the approximate sizes and locations of areas that could potentially be classified as WOTUS, which includes, but is not limited to, wetlands and creeks/streams. To classify an area as a wetland, specific technical criteria with regards to vegetation, soils and hydrology must be met. Study methods included the following: 1) review of U.S. Geological Survey (USGS) topographic maps, Natural Resources Conservation Service maps and local county soil survey maps; 2) review of historical color, black and white, and infrared aerial photographs; and 3) review of the U.S. Federal Emergency Management Agency floodplain maps and the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps. A wetland delineation according to the 2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region was not conducted.

If the technical criteria are met, an evaluation is conducted to determine whether or not the USACE and/or EPA would call the area in question an adjacent wetland/WOTUS and thus claim jurisdiction. To classify a WOTUS as adjacent, the Rapanos Guidance states one of the following three criteria is satisfied:

- There is an unbroken surface or shallow sub-surface connection to jurisdictional waters. This hydrologic connection may be intermittent.
- They are physically separated from jurisdictional waters by man-made dikes/barriers, natural river berms, beach dunes, and the like.
- Their proximity to a jurisdictional water is reasonably close, supporting the science-based inference that such wetlands have an ecological interconnection with jurisdictional waters.

Almost all naturally occurring rivers, streams, and tributaries feeding said rivers and streams will most likely be considered WOTUS. However, certain man-made ditches, road side ditches, and upland drainage ditches constructed in and draining only uplands may not be considered jurisdictional, especially with the absence of an ordinary high water mark (OHWM). The OHWM is the line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas. An OHWM combined with a defined bed and bank can be used by the USACE to determine the jurisdictionality of creeks, streams, channels, and other linear WOTUS.

According to the Almeda, Fort Bend County, Texas USGS Topographic Map (1995), the project area is flat with a drainage channel bisecting and paralleling the proposed project area.

The USFWS NWI maps were referenced to identify any features present within the subject area (Figure 3.0). According to the NWI maps, a single feature is present within the subject area; the drainage channel is listed as a PEM wetland.

During the field verification visit, the drainage channel was identified but no other features were noted. The drainage channel is a well maintained channel utilized for stormwater drainage of the surrounding area. An additional feature, a stormwater retention pond was also noted during the field visit. Based upon

the review of available data and field verification, it is the professional judgement of BIO-WEST that these features would not be considered jurisdictional by the USACE within the project area.

These findings were interpreted from a desktop evaluation of historical aerial photography, infrared aerial imagery, national wetlands inventory data, county soils maps, USGS Topographic maps of the area, as well as from the field investigation.

### **Threatened and Endangered Species Survey**

BIO-WEST performed a field evaluation of the project area for the presence of federally listed threatened and endangered species (T&E) and their critical habitat. BIO-WEST reviewed available information, provided by the USFWS Information, Planning, and Conservation (IPaC) system, regarding the potential presence of federally listed T&E species and/or their habitats near the project area. In addition, aerial photographs and topographic maps were reviewed to identify potentially suitable T&E species habitat, if present, near the project area.

A total of five species, including two endangered and three threatened species, were identified by the IPaC search. Of the five listed species, two species are conditional to wind energy projects and consist of the piping plover (*Charadrius melodus*) and the red knot (*Calidris canutus rufa*). Therefore, these species are not applicable to the current proposed project and are not further discussed in this report.

The remaining species include the endangered whooping crane (*Grus americana*), Texas prairie-dawn (*Hymenoxys texana*), and the threatened eastern black rail (*Laterallus jamaicensis ssp. jamaicensis*).

The species listed do not have suitable habitat within the project area and therefore are not considered for this project due to the absence of suitable habitat for individuals of these species.

### **Desktop Cultural Resources Review**

A desktop archival review of the proposed expansion was completed using the online Texas Archeological Sites Atlas, maintained by the Texas Historical Commission (THC). Results show that there are no sites recorded within or adjacent to the footprint of the proposed subject property. A review of historic aerial imagery suggests that the subject property has been previously highly disturbed by activities associated with the construction of the Hillcroft Avenue, the drainage canal and pond, and the Fort Bend Parkway.

If fieldwork is required on publicly owned land in the state of Texas investigation must be permitted through and comply with regulations outlined in the Antiquities Code of Texas (Section 191.092 of the Code). Projects funded, permitted, or approved by Federal agencies must comply with guidelines and requirements set forth in Section 106 of the National Historic Preservation Act of 1966, as amended. Projects requiring Section 106 compliance and/or investigation as part of a permit under the Antiquities Code of Texas require agency review and concurrence prior to initiation.

## **Conclusions and Findings**

- The WOTUS investigation revealed the project area contains a stormwater drainage channel and a stormwater retention pond. BIO-WEST believes that these features would not be considered jurisdictional by the USACE.
- The threatened and endangered species survey indicates the project area does not contain suitable critical habitat or individuals of any federally listed species.
- The desktop archival review revealed that no previous cultural resources surveys have been performed within the project area. The area surrounding the project site has been heavily disturbed and it is unlikely that a pedestrian archeological survey would be required. In the event cultural resources are uncovered during the construction activities, please refer to your unanticipated discoveries plan and contact your environmental consulting representative immediately.

## **Professional Recommendations**

It is BIO-WEST's professional judgment that in accordance with the findings of this investigation and the proposed plans for site development that no agency coordination would be required, and no WOTUS, threatened or endangered species, or cultural and historic resources will be impacted by the proposed project.

BIO-WEST greatly appreciates the opportunity to provide environmental services. If you have any questions, please feel free to contact us at (832) 595-9064.

Sincerely,



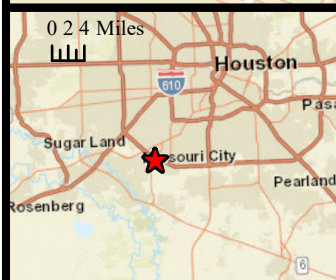
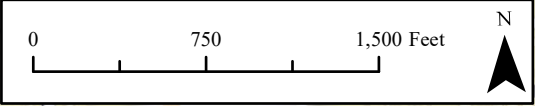
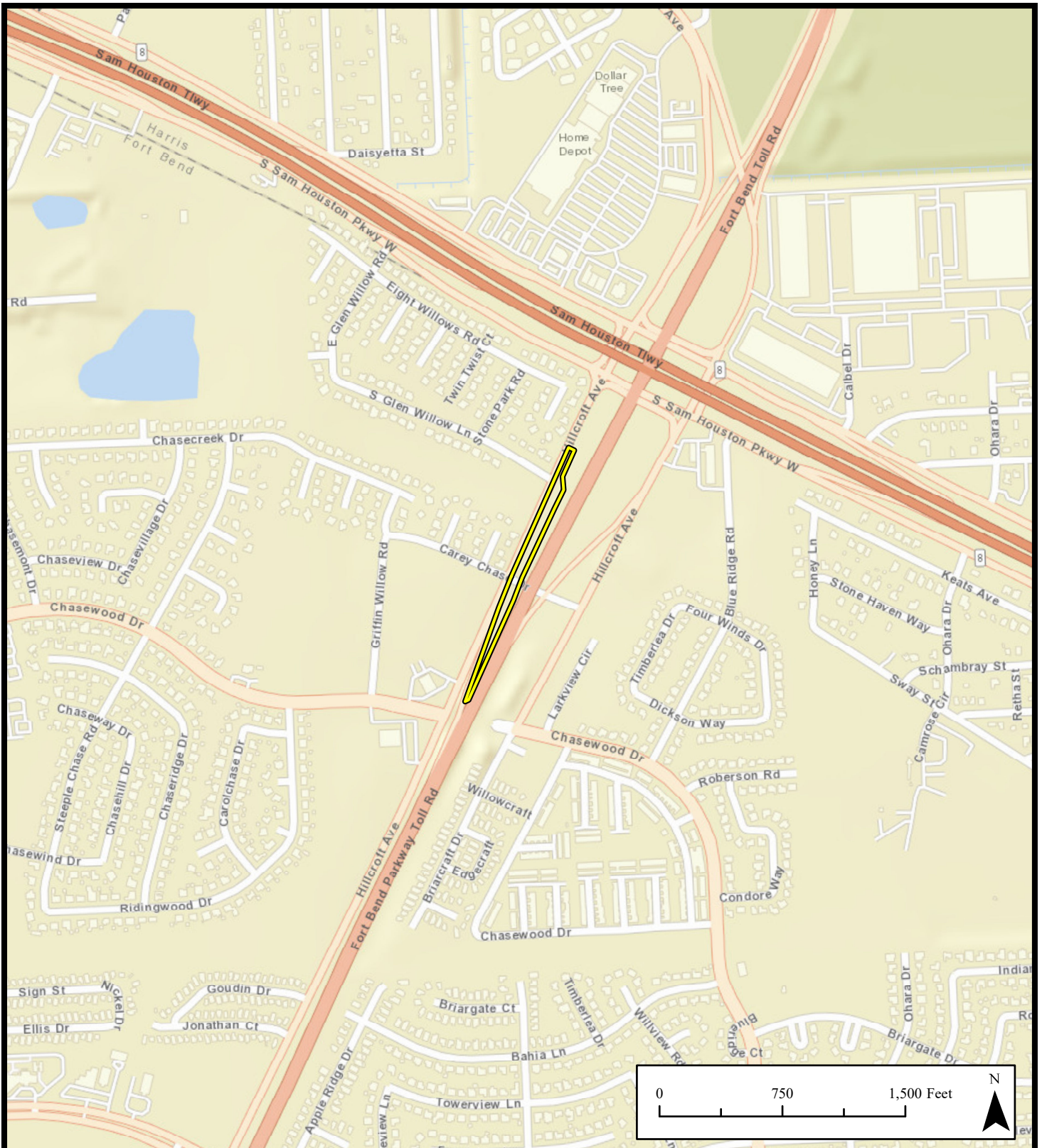
Andy Boswell  
Senior Ecologist/Senior Project Manager

## Literature Cited


- Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.
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- Texas Historical Commission. 2022. Texas Historic Sites Atlas. Accessed March 2022. <https://atlas.thc.state.tx.us/Map>.
- [USDA] U.S. Department of Agriculture, Natural Resources Conservation Service. 202. Web Soil Survey. Accessed March 2022 at <http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>.
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- [USFWS] U.S. Fish and Wildlife Service. 2022b. Information for Planning and Consultation (IPaC). IPaC Resource List. Accessed March 2022 at <https://ecos.fws.gov/ipac>
- [USGS] U.S. Geological Survey. 1995. Almeda (Fort Bend County), Texas quadrangle. 7.5' Quadrangle topographic map.
- [WTI] Wetland Training Institute, Inc. 2012. *Nationwide Permits Complete: 2012 Edition*. Robert J. Pierce and Sam Collinson, eds., David E. Dearing, contributing author.


## **Appendix A**


### **Figures**



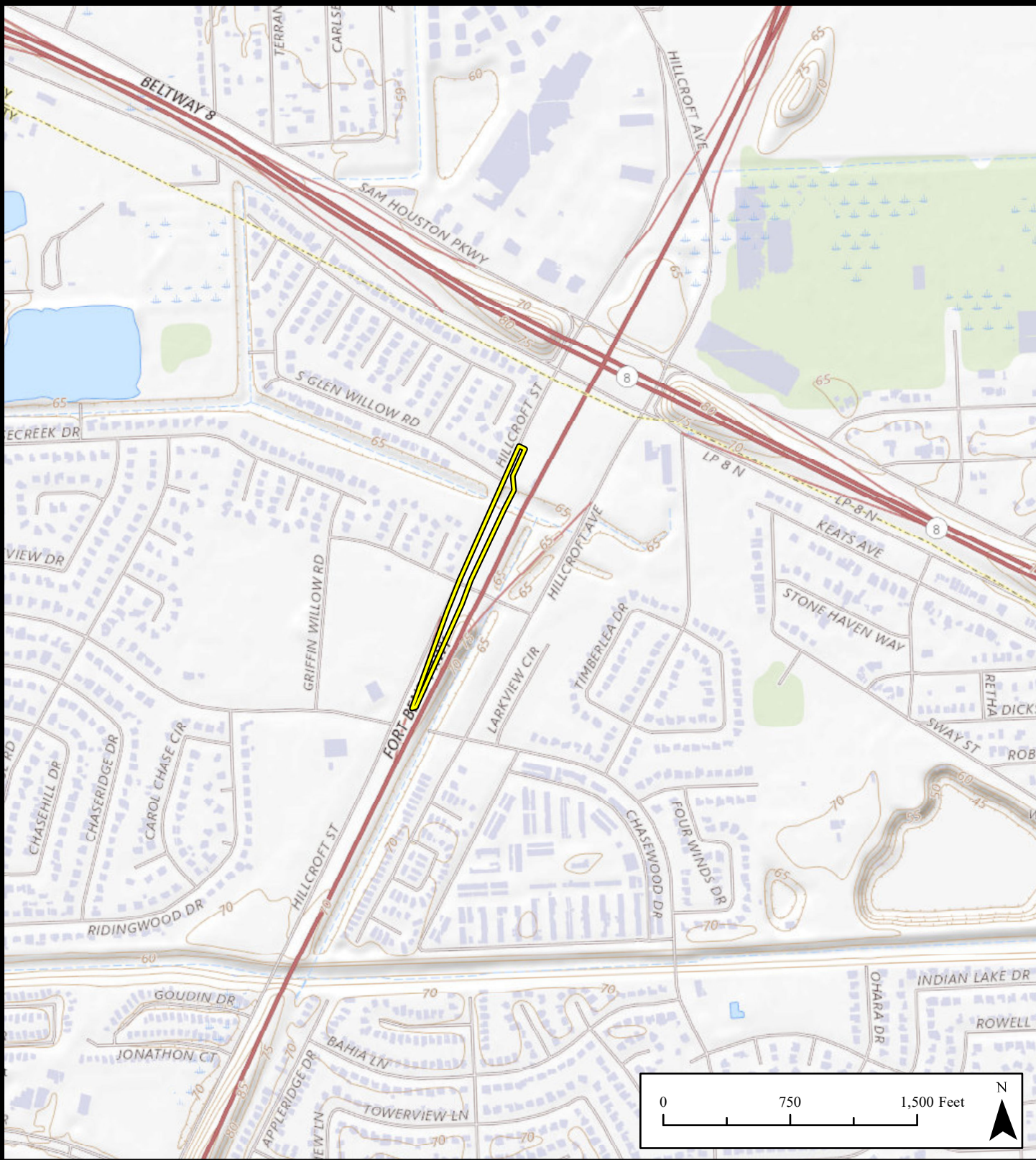
**Legend**

 FB Parkway Ramp Project Boundary

Prepared by: 



**Figure 1.0**  
**Location**  
Fort Bend County, Texas



**Legend**

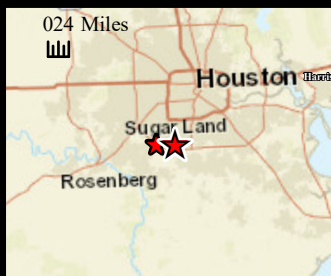
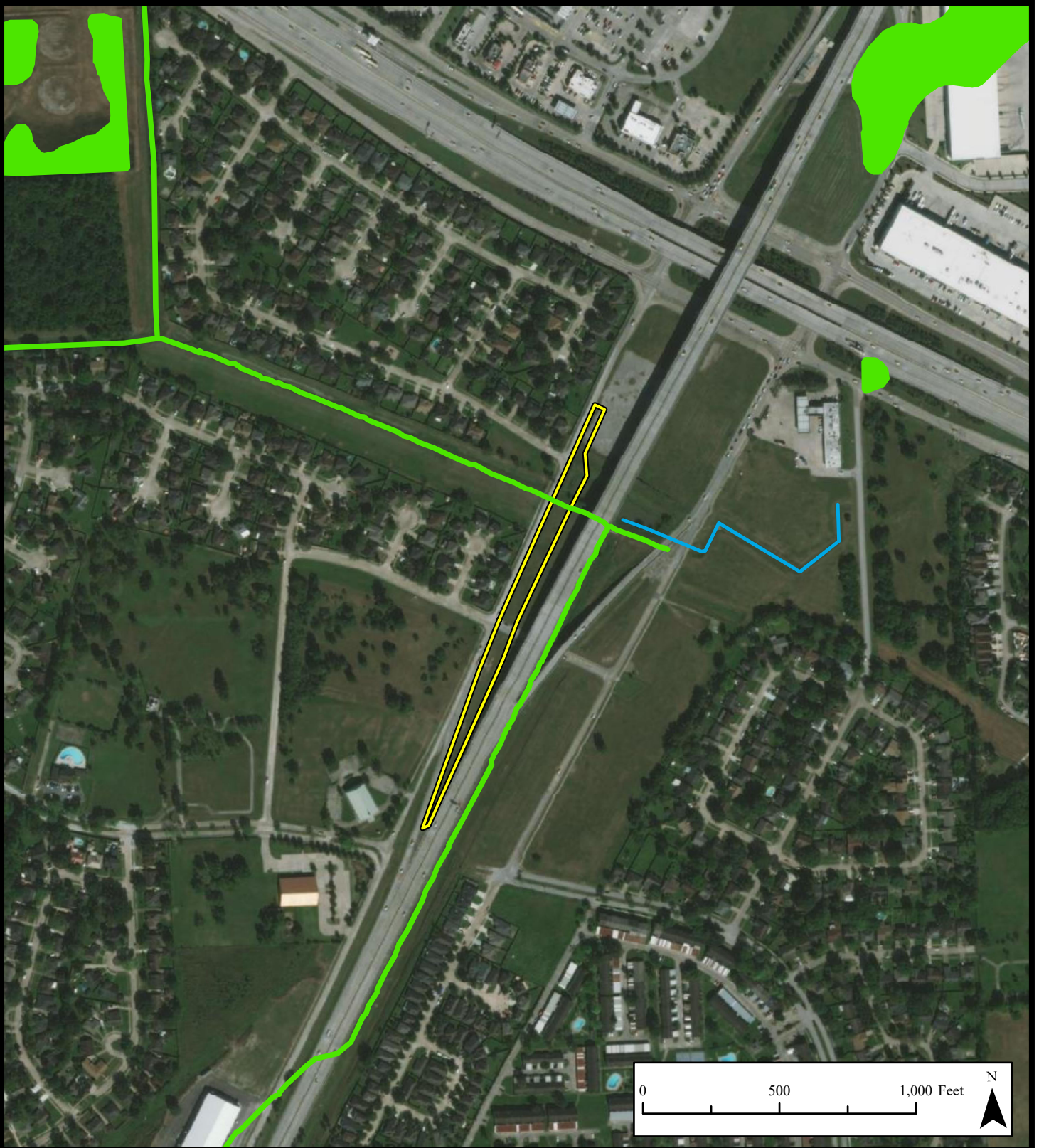
 FB Parkway Ramp Project Boundary



**Figure 2.0**  
**Topographic**  
Fort Bend County, Texas

Prepared by:  BIO-WEST





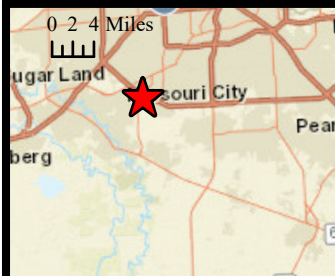
**Legend**

- FB Parkway Ramp Project Boundary
- Palustrine
- Riverine



**Figure 3.0**  
**National Wetland Inventory**  
 Fort Bend County, Texas


Prepared by: BIO-WEST



**Legend**

 FB Parkway Ramp Project Boundary

Prepared by: 



**Figure 4.0**  
**Waters of the U.S.**  
 Fort Bend County, Texas

**Appendix B**

**Cultural Resources Review**



*Since 1987*

March 14, 2022

Andy Boswell  
BIO-WEST, Inc.  
1625 Cottonwood School Road  
Rosenberg, Texas 77471

**Re: Cultural resources assessment of the Fort Bend Parkway South Beltway Ramp in Fort Bend County, Texas.**

Dear Mr. Boswell,

Gray & Pape, Inc., of Houston, Texas, was contracted by BIO-WEST, Inc. to conduct an assessment of the effect that the above-referenced project would have on archaeological and historic properties in Fort Bend County, Texas. Based on the research completed for this assessment, it is the opinion of Gray & Pape that archaeological survey of the subject property is not warranted. This letter documents the results of research activities.

#### SUBJECT PROPERTY DESCRIPTION

The project area is located on the *Almeda, TX* 7.5-minute United States Geological Survey (USGS) topographic quadrangle map (Figure 1). The project entails rebuilding the on-ramp to the Fort Bend Parkway. The project is approximately 510 meters (1,672 feet) long and subsumes approximately 0.8 hectares (2.1 acres). Project plans call for the ramp to be built at an elevated level to pass over an existing detention pond. The subject property is located east of Missouri City, Texas, between Hillcroft Avenue and the Fort Bend Parkway Toll Road, south of the Sam Houston Tollway. Sims Bayou is located nearly 1.6 kilometers (1 mile) to the north, and the Blue Ridge State Prison Farm property is northeast of the subject property. The subject property currently consists of an existing detention basin, grass covered road right-of-way (ROW), and road-side ditch (Figure 2). A current check of the Public GIS Viewers for the Railroad Commission of Texas and Texas General Land Office (TxGLO) show at least three pipelines intersect the northern portion of the subject property (2022).

#### SURFACE GEOLOGY AND SOILS

Soils mapped within the subject property consist entirely of Bernard-Edna complex, 0-1% slopes. They include soils that are mostly composed of clay and loam deposits (Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture [SSS NRCS USDA] 2022).

3/14/2022 Created in ArcGIS 10.8.1 for G&P Project 22-72315.001

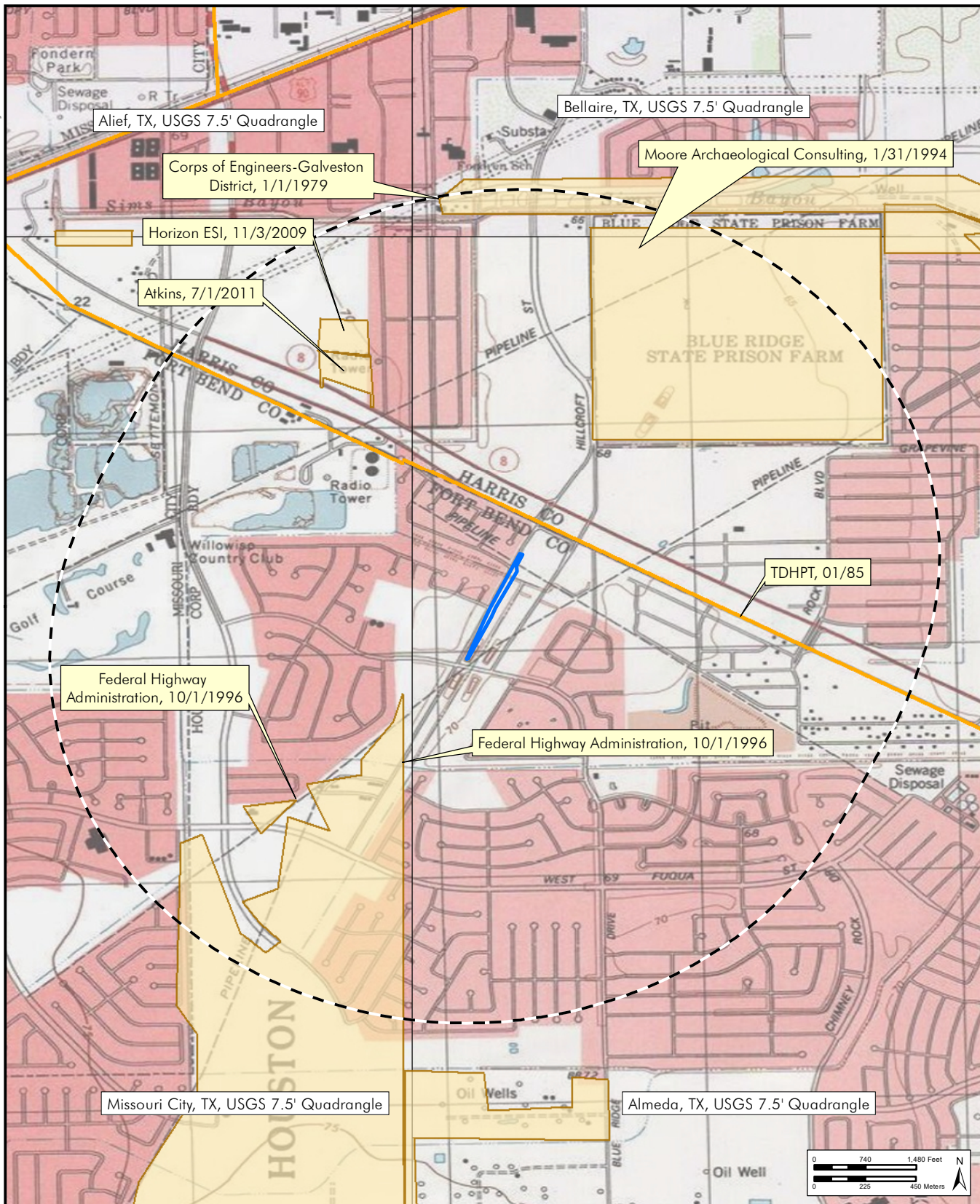
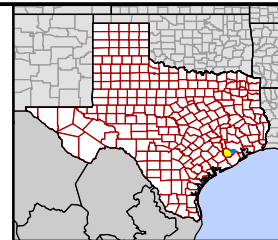


Figure 1  
Subject property location in  
Fort Bend County, Texas.

- Subject Property
- Previous Area Survey
- Study Radius (1.6-km/1-mi)
- USGS Quadrangle Boundary
- Previous Linear Survey



3/19/2022 Created in ArcGIS 10.8.1 for G&P Project 22-72315.001.

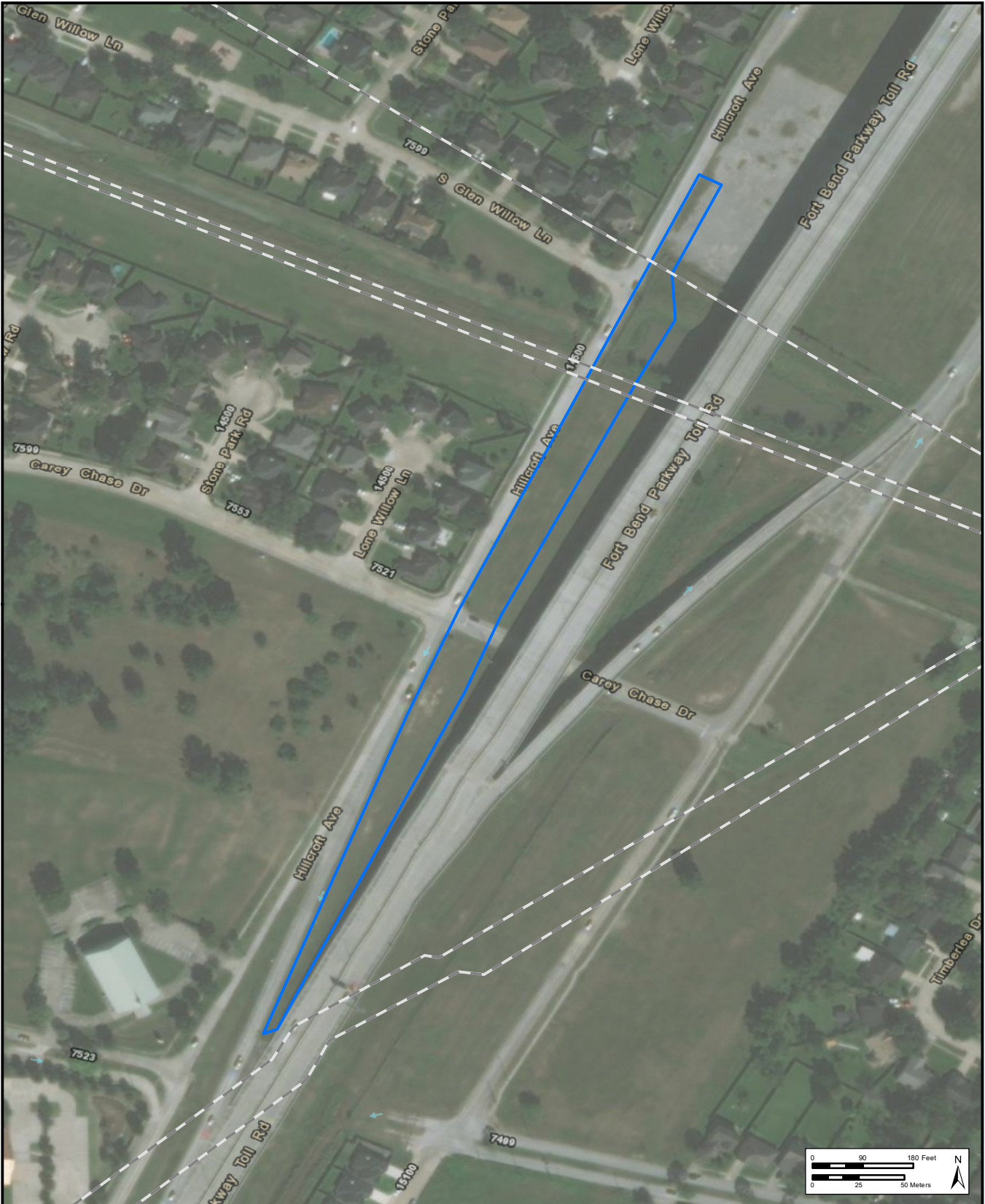


Figure 2  
Subject property location overlaid on an aerial background  
circa 10/30/2020.

- Existing Pipelines
- Subject Property

Table 1. Soil series and complexes intersected by the subject property.

SYM	Name/Complex	Parent Material	Location	Land Use	Drainage
Bb	Bernard clay loam, 0-1% slopes	Clayey fluviomarine deposits from igneous, metamorphic, and sedimentary rock	Flat coastal plains	Growing corn, cotton, grain sorghums, and rice	Somewhat poorly drained
Ea	Edna loam, 0-% slopes	Loamy fluviomarine deposits from the Beaumont Formation of Pleistocene age	Coastal plains	Growing rice and native range for beef cattle	Somewhat poorly drained

## ARCHIVAL RESEARCH RESULTS

Site file research was completed using the online Texas Archeological Sites Atlas, maintained by the Texas Historical Commission (THC). The site file research revealed that no identified historic properties, historic markers, cemeteries, or National Register properties are located within the current subject property.

No portion of the subject property has been previously surveyed. Six surveys have been previously conducted within 1.6 kilometers (1 mile) of the subject property (Figure 1).

Table 2. Previously recorded archaeological projects within 1.6 kilometers (1 mile) of the subject property.

Project Type	TAC Permit #	Investigating Firm/ Agency	Field Work Date	Report Author	Sponsoring Agency	THC Review Date
Area Survey	Unknown	Unknown	1979	Unknown	Corps of Engineers- Gal Dist.	Unknown
Linear Survey	Unknown	Unknown	1985	Unknown	TDHPT	Unknown
Area Survey	1357	Moore Archeological Consulting	1994	Moore, Roger G. and William E. Moore	TAC; HCFCFCD	Unknown
Area Survey	Unknown	Unknown	1996	Unknown	Federal Highway Administration	Unknown
Area Survey	Unknown	Horizon ESI	2009	Owens, Jeffrey D.	Housing and Urban Development	12/2009
Area Survey	5969	Atkins	2011	Cordova, Karla J & J. Philip Washington	Harris County	8/2011

No archaeological sites are located within 1.6 kilometers (1 mile) of the subject property. The closest resource, a prehistoric open campsite, is located 6.23 kilometers (3.87 miles) southwest of the subject property. Chert debitage and a burned rock were present at the site. No further work was recommended for this site. Eligibility for listing as a State Antiquities Landmark or for the National Register of Historic Places was not given (THC 2022).

A review of the earliest topographic map (1915) and aerial photograph (1953) show the location largely composed primarily agricultural fields (Google, Inc. 2022; Nationwide Environmental Title Research, LLC [NETR] 2022). A pipeline ROW already passes the location by 1953 and another appears by 1958. A drainage canal and the beginnings of what is now Hillcroft Avenue appears by 1969. Residential development of the location appears by 1995 and by 2004 construction is visible on the Fort Bend Parkway. At the same time, the portion of the drainage canal that passes under the parkway is seen to be converted into a pond. The subject property has not changed significantly since then with the exception of a cement pad, constructed between 2011 and 2012 and used for parking, that partially overlaps the northern end of the subject property (Google, Inc. 2022; NETR 2022).

## CONCLUSIONS

There are no sites recorded within or adjacent to the footprint of the proposed subject property. However, the subject property has not been previously surveyed. Previous surveys in the vicinity have not resulted in the recording of archaeological sites and cemeteries within 1.6 kilometers (1 mile) of the subject. A review of historic aerial imagery suggests that the subject property has been previously highly disturbed by activities associated with the construction of the Hillcroft Avenue, the drainage canal and pond, and the Fort Bend Parkway. Based on the results of archival research outlined in this letter, a review of recent and historic aerial photography and maps, and an analysis of topographic and geological characteristics associated with the subject area, it is the opinion of Gray & Pape that an archaeological survey would not be warranted.

Please note, if fieldwork is required on publicly owned land in the state of Texas investigation must be permitted through and comply with regulations outlined in the Antiquities Code of Texas (Section 191.092 of the Code). Projects funded, permitted, or approved by Federal agencies must comply with guidelines and requirements set forth in Section 106 of the National Historic Preservation Act of 1966, as amended. Projects requiring Section 106 compliance and/or investigation as part of a permit under the Antiquities Code of Texas require agency review and concurrence prior to initiation.

If you should have any questions or comments or are in need of additional information or agency consultation services, please do not hesitate to contact me. I can be reached by phone at (713) 299-6917, or by email at [tscott@graypape.com](mailto:tscott@graypape.com).

Sincerely,



Tony Scott  
Senior Principal Investigator  
Gray & Pape, Inc.  
GP#21-72315.001



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# **Geotechnical Report**



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**GEOTECHNICAL ENGINEERING STUDY  
FOR**

**PROPOSED RAMP-BRIDGE CROSSOVER  
FORT BEND TOLLWAY  
MISSOURI CITY, FORT BEND COUNTY, TEXAS**

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Project No. AHA21-060-00  
November 5, 2021

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Houston, TX 77042

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**RE: Geotechnical Engineering Study  
Proposed Ramp-Bridge Crossover  
Fort Bend Tollway  
Missouri City, Fort Bend County, Texas**

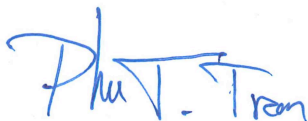
Dear Mr. Johnson:

**RABA KISTNER, Inc. (RKI)** is pleased to submit this report of our Geotechnical Engineering Study for the above-referenced project. This study was performed in accordance with the Subcontract Agreement for Professional Services Agreement between AIG Technical Services, LLC (CLIENT) and Raba Kistner Consultants, Inc. dated July 6, 2021. The purpose of this study was to drill 5 borings in the vicinity of the proposed ramp and bridge structures to perform laboratory testing to evaluate and characterize subsurface conditions, and to prepare an engineering report presenting bridge foundation design and construction considerations.

The following report contains our design recommendations and considerations based on our current understanding of the information provided to us at the time of this study. There may be alternatives for value engineering of the bridge foundations. **RKI** recommends that a meeting be held with the CLIENT and the design team to evaluate if alternatives are available.

We appreciate the opportunity to be of professional service to you on this project. Should you have any questions about the information presented in this report, or if we may be of additional assistance with value engineering or on the materials testing-quality control program during construction, please call.

Very truly yours,  
**RABA KISTNER, INC.**



Phu T. Tran, P.E.  
Project Engineer



John D. Brown, P.E.  
Manager, Geotechnical Manager



12/30/2022

PT/JDB: tlx  
Attachments  
Copies Submitted: Above (1-Electronic)

**GEOTECHNICAL ENGINEERING STUDY**

For

**PROPOSED RAMP-BRIDGE CROSSOVER  
FORT BEND TOLLWAY  
MISSOURI CITY, FORT BEND COUNTY, TEXAS**

Prepared for

**AIG Technical Services, LLC**  
Houston, Texas

Prepared by

**RABA KISTNER, INC.**  
Houston, Texas

**PROJECT NO. AHA21-060-00**

November 5, 2021

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**ATTACHMENTS**

The following figures and appendices are attached and complete this report:

Site Map .....	Figure 1
Boring Location Map .....	Figure 2
Geology Map .....	Figure 3
Generalized Subsurface Profile .....	Figure 4
Drilling Logs .....	Appendix A
Results of Soil Analyses .....	Appendix B
One-Dimensional Consolidation Results .....	Appendix C
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Foundation Capacity Curves .....	Appendix E
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Important information About Your Geotechnical Engineering Study

## INTRODUCTION

**RABA KISTNER, Inc. (RKI)** has completed the authorized subsurface exploration and prepared geotechnical engineering recommendations for the proposed ramp and bridge along Fort Bend Parkway Tollway located at the northwest corner of the intersection of Fort Bend Parkway Toll Road and Sam Houston Parkway. This report briefly describes the procedures utilized during this study and presents our findings along with design recommendations for the bridge foundations and construction considerations.

## PROJECT DESCRIPTION

This study consists of the design and construction of a new ramp and bridge crossover, approximately 2,600 LF, for the Fort Bend Parkway Toll Road located at the northwest corner of the intersection of Fort Bend Parkway Toll Road and Sam Houston Parkway. The new on-ramp will consist of one lane of traffic. The ramp structure will be supported partially on a mechanically stabilized earth (MSE) embankment and a drilled shaft foundation.

We understand that the proposed ramp and bridges will be supported on deep foundations consisting of straight-sided drilled piers. The diameter of straight-sided drilled piers will be 36-inch for the abutments. At this time, we are not aware of any major site grade changes planned for the project.

## LIMITATIONS

This engineering report has been prepared following accepted Geotechnical Engineering practices for the use of AIG Technical Services, LLC. (CLIENT) and its representatives for design purposes. This report may not contain sufficient information for purposes of other parties or other uses. This report is not intended for use in determining construction means and methods. The attachments and report text should not be used separately.

The recommendations submitted in this report are based on the data obtained from 5 borings drilled at this site, our understanding of the project information provided to us by others, and the assumption that site grading will result in only minor changes in the existing topography. If the project information described in this report is incorrect, is altered, or if new information is available, we should be retained to review and modify our recommendations, if required.

This report may not reflect the actual variations of the subsurface conditions across the site. The nature and extent of variations across the site may not become evident until construction commences. The construction process itself may also alter subsurface conditions. If variations appear evident at the time of construction, it may be necessary to re-evaluate our recommendations after performing on-site observations and tests to establish the engineering impact of the variations.

The scope of our Geotechnical Engineering Study does not include an environmental assessment of the air, soil, or water conditions either on or adjacent to the site. No environmental opinions are presented in this report. **RKI's** scope of work does not include the investigation, detection, or design related to the prevention of any biological pollutants. The term "biological pollutants" includes, but is not limited to, mold, fungi, spores, bacteria, and viruses, and the byproduct of any such biological organisms.



If final grade elevations are significantly different from the grades existing at the time of our study, we should be informed about these changes. If needed and/or desired, we will reexamine our analyses and make supplemental recommendations.

### BORINGS AND LABORATORY TESTS

Subsurface conditions at the project sites were evaluated by drilling 5 borings. An overview of the project areas and surrounding site features is shown in Figure 1, Site Map. Borings were conducted at the locations indicated in the table below and as shown on the Boring Location Map, Figure 2. A map overviewing the regional geology is shown in Figure 3, Geological Map. The boreholes were drilled to depths ranging from 30 ft to 100 ft below the existing pavement/ground elevations. The borings are also shown on the Generalized Subsurface Profile, Figure 4.

The boring locations were surveyed by the CLIENT and drilled to the approximate depth presented on the attached Wincore drilling logs, Appendix A, below the pavement/ground elevations existing at the time of our study. Drilling was performed using a truck-mounted rig and buggy-mounted drilling rig for the boreholes. Table 1 presents the approximate boring locations along Fort Bend Parkway Toll Road.

Table 1: Approximate Boring Locations						
Boring No.	Coordinates Degrees Decimals (DD)		Station	Offset From Centerline* (ft)	Ground Surface Elevation (ft)	Maximum Depth of Drilling (ft)
	Latitude	Longitude				
B-1	29.608661	-95.497567	29+00		64	50
B-2	29.609925	-95.496886	31+00		64	100
B-3	29.610261	-95.496697	32+00		64	100
B-4	29.611322	-95.496125	33+00		64	50
B-5	29.612319	-95.495564	34+00		64	30

\*This information has not been provided yet.

The borings were drilled utilizing a combination of the straight flight auger and mud rotary methods. The borings were backfilled with cement-bentonite grout. Table 2 presents the collected samples during our drilling operations.

Table 2: Summary of Soil Samples	
Type of Sample	Number Collected
Undisturbed Shelby Tube (ST)	24
Grab Sample	65

During drilling operations, the Shelby tube and grab samples were collected. In addition to sampling, Texas Cone Penetration (TCP) tests were performed at 5-ft intervals. Each sample was visually classified in the laboratory by a member of our Geotechnical Engineering staff following the Unified Soil Classification System (USCS). The geotechnical engineering properties of the strata were evaluated by the laboratory tests shown in Table 3.

<b>Table 3: Summary of Laboratory Tests</b>	
<b>Laboratory Test</b>	<b>Number Conducted</b>
Determining Moisture Content in Soil Materials (Tex-103-E)	91
Determining Liquid Limits of Soils (Tex-104-E)	17
Determining Plastic Limits of Soils (Tex-105-E)	17
Calculating Plasticity Index of Soils (Tex-106-E)	17
Particle Size Analysis of Soils (Tex-110-E)	29
Unconfined Compressive Strength (ASTM D2166)	4
Unconsolidated-Undrained Triaxial Compression (ASTM D2850)	2
One-Dimensional Consolidation (ASTM D2435)	2
Consolidated Undrained (CU) Triaxial Compression (ASTM D4767)	1

The results of all laboratory tests are presented in graphical or numerical form on the Wincore drilling logs illustrated in Appendix A. The results of the laboratory and field testing are also tabulated in Appendix B for ease of reference.

Samples will be retained in our laboratory for 30 days after the submittal of this report. Other arrangements may be provided at the request of the CLIENT.

## **GENERAL SITE CONDITIONS**

### **GEOLOGY**

The Bureau of Economic Geology, Geologic Atlas of Texas, Houston Sheet (Revised 1982) shows the subject site to be located on the Beaumont Formation. The Beaumont Formation is the youngest coast-parallelizing Pleistocene unit in the Texas Gulf Coast. Most of the Beaumont Formation was deposited as an overlapping group of fluvial or deltaic plains by ancestors of modern streams now draining into the Gulf of Mexico. The Beaumont formation is comprised of clay, silt, and sand; includes mainly stream channel, point-bar, natural levee, backswamp, and to a lesser extent coastal marsh and mud-flat deposits; concretions of calcium carbonate, iron oxide, and iron-manganese oxides in zone of weathering; surface almost featureless, characterized by relict river channels shown by meander patterns and pimple mounds on meanderbelt ridges, separated by areas of low, relatively smooth, featureless backswamp deposits without pimple mounds; formation thickness is +/- 100 ft.

**STRATIGRAPHY**

The subsurface conditions encountered at the boring locations are shown on the generalize subsurface profile in Figure 4 and the drilling logs in Appendix A. The depths of the individual strata and the physical characteristics vary from boring to boring. Consequently, the individual drilling logs should be consulted for the boring specific (detailed) stratigraphic information. These drilling logs represent our interpretation of the subsurface conditions based on the field logs, visual examination of field samples by our geotechnical engineering personnel, and laboratory test results of selected field samples. Each stratum has been designated by grouping soils that possess similar physical and engineering characteristics. The lines designating the interfaces between strata on the drilling logs represent approximate boundaries. Transitions between strata may be gradual.

Stratum I soils consist of cohesive, moderately plastic to plastic, firm to hard consistency, dark gray to gray to yellowish brown to reddish brown lean clay (CL), sandy lean clay (CL), fat clay (CH), fat clay with sand (CH), and sandy fat clay (CH). Roots, sand and silt seams, and calcareous nodules were noted within the Stratum I soils. Measured moisture contents range from 12 to 29 percent. Measured plasticity indices (PI) range from 16 to 38. Based on grain size analyses, the percentage of fines (percent passing a No. 200 sieve) within this stratum ranges from 53 to 97 percent. Undrained shear strength values range from 0.34 to 1.52 tsf, based on four (4) unconfined compressive and two (2) unconsolidated-undrained triaxial strength tests. The tested samples measured dry unit weights ranging from 97 to 112 pcf. SPT N-values ranging from 11 to 89 blows per foot were recorded within stratum I.

Stratum II soils consist of medium dense to very dense relative density, light gray to yellowish brown to tan, cohesionless silty sand (SM), poorly graded sand (SP), and poorly graded sand with silt (SP-SM), and semi-cohesive clayey sand (SC) and hard consistency sandy silty clay (CL-ML). Measured moisture contents range from 18 to 27 percent. Measured PI range from non-plastic to 21. Based on grain size analyses, the percentage of fines (percent passing a No. 200 sieve) within this stratum ranges from 4 to 44 percent. SPT N-values ranging from 12 to greater than 100 blows per 5-inch penetration were registered within the Stratum II soils. Stratum II soils were the predominant soils encountered during drilling.

**DEPTH-TO-WATER CONSIDERATIONS**

Short-term depth-to-water measurements were performed in the borings for this study. Free water was encountered in all borings during the drilling operations. Water level readings were obtained in the open boreholes about 15 minutes of encountering water. The readings are listed in the following table 4:

<b>Table 4: Water Level Readings Summary</b>				
<b>Boring No.</b>	<b>Approximate Depth to Free Water During Drilling (ft)*</b>	<b>Approximate Elevation (ft)</b>	<b>Approximate Water Level Depth After 15 Minutes (ft)*</b>	<b>Approximate Elevation (ft)</b>
B-1	9.6	54.4	7.5	56.5
B-2	11.5	52.5	8.7	55.3

Table 4: Water Level Readings Summary				
Boring No.	Approximate Depth to Free Water During Drilling (ft)*	Approximate Elevation (ft)	Approximate Water Level Depth After 15 Minutes (ft)*	Approximate Elevation (ft)
B-3	9.5	54.5	9.0	55
B-4	14.5	49.5	10.5	53.5
B-5	14.7	49.3	10.3	53.7

\*Depth below the existing grade at the time of the geotechnical engineering study

It is important to note that short-term depth-to-water measurements presented in Table 4 may not represent the natural groundwater, especially in cohesive soils. More appropriate measurements for groundwater levels should be measured with a long-term standpipe piezometer readings.

### **CU TEST**

A consolidated-undrained triaxial compression test with pore pressure measurements was performed on a cohesive soil sample recovered from the Stratum I clays. The laboratory test results and estimated stress parameters are presented in the following table.

**Table 5: CU Test Results**

Boring No.	Depth (ft)	Soil Classification	Principle Stress Difference (ksf)	Axial Strain (%)	Effective Stress		Total Stress	
					Friction Angle, $\phi'$ (deg)	Cohesion, $c'$ (ksf)	Friction Angle, $\phi$ (deg)	Cohesion, $c$ (ksf)
B-5	8-10	Sandy Lean Clay	3.27	14	19.8	0.32	18.6	0.18

### **BRIDGE FOUNDATION RECOMMENDATIONS**

Based on the Entrance Ramp 1A *Bridge Layout* drawings dated October 18, 2020, we understand that the proposed bridge with the overall length of 105 feet. The proposed bridge will be supported on 36-inch diameter drilled shafts. The foundation loads for the new foundations are 90 tons per shaft at the abutments. We understand that site grade changes are planned along the site to accommodate the new bridge.

### **AXIAL CAPACITY**

We have computed allowable downward vertical capacities for 36-inch diameter drilled shaft. The drilled shaft may be designed as end-bearing and friction units using the capacities presented graphically on the foundation capacity curves on Appendix E. The curves are based on subsurface information obtained from Borings B-2 and B-3. Please note that the foundation capacity curves are for vertical foundations only.

Friction resistance was neglected to the elevations presented on the “Foundation Capacity” curves to account for soil moisture changes, anticipated embankment fill material, and construction disturbance.

The “Foundation Capacity” curves were developed using the WinCore software program and the TxDOT Geotechnical Manual dated March 2018. The unit skin friction value was limited to 1.3 tons per square foot (tsf) for drilled shaft. A factor of safety of 2 is incorporated by the software program when generating the “Foundation Capacity” curves for the drilled shaft. The WinCore software program also computes the unit skin friction tables and the accumulative friction curves for Borings B-2 and B-3. The unit skin friction tables and the accumulative skin friction curves are presented in Appendices F and G.

### **AXIAL GROUP EFFECTS**

In some cases, the total allowable axial capacity for foundation groups may be less than the sum of the individual foundation capacities within the groups. This is common when the center-to-center spacing of foundations are less than three pile widths. It is our understanding that the foundations for each abutment and bent will have a center-to-center spacing greater than three pile widths. Therefore, we do not anticipate reduction in the individual foundation capacity to affect the axial capacity for the foundation groups. We should reevaluate the axial group effects if the foundations within the groups are spaced less than three pile widths center-to-center.

### **LATERAL CAPACITY**

We provide the soil parameters in the tables below for evaluating the lateral capacity of the 36-inch diameter drilled shafts by using the LPile software program. We understand that detailed lateral capacity analysis will be performed by others. We recommend that appropriate measures be taken during the LPILE analysis to account for sloping ground surface.

<b>Table 6: Soil Parameters for Lateral Capacity Analysis: Abutment 1*</b>							
<b>Assumed Behavior for Analysis</b>	<b>Approximate** Elevation (ft)</b>	<b>c (psf)</b>	<b>φ (deg)</b>	<b>k<sub>s</sub> (pci)</b>	<b>ε<sub>50</sub></b>	<b>γ<sub>t</sub> (pcf)</b>	<b>γ' (pcf)</b>
Stiff Clay without free water (Reese)	64 – 50	1,000	--	100	0.01	125	63
API Sand (O' Neill)	50 – 16	--	33	125	--	117	55
Stiff Clay without free water (Reese)	16 – -14	3,000	--	1,000	0.005	125	63
API Sand (O' Neill)	-14 – -36	--	35	125	--	117	55

\* Soil parameters are based on Boring B-2

\*\* Ground surface elevations at the boring locations was obtained from Google Earth Pro.

<b>Table 7: Soil Parameters for Lateral Capacity Analysis: North Abutment 2*</b>							
<b>Assumed Behavior for Analysis</b>	<b>Approximate** Elevation (ft)</b>	<b>c (psf)</b>	<b>φ (deg)</b>	<b>k<sub>s</sub> (pci)</b>	<b>ε<sub>50</sub></b>	<b>γ<sub>t</sub> (pcf)</b>	<b>γ' (pcf)</b>
Stiff Clay without free water (Reese)	64 – 59	2,000	--	500	0.007	125	63

Table 7: Soil Parameters for Lateral Capacity Analysis: North Abutment 2*							
Assumed Behavior for Analysis	Approximate** Elevation (ft)	c (psf)	$\phi$ (deg)	$k_s$ (pci)	$\epsilon_{50}$	$\gamma_t$ (pcf)	$\gamma'$ (pcf)
API Sand (O' Neill)	59 – 41	--	28	60	--	117	55
API Sand (O' Neill)	41 – 21	--	35	125	--	117	55
Stiff Clay without free water (Reese)	21 – -14	3,000	--	1,000	0.005	125	63
API Sand (O' Neill)	-14 – -36	--	35	125	--	117	55

\* Soil parameters are based on Boring B-3

\*\* Ground surface elevations at the boring locations was obtained from Google Earth Pro.

Where:      c = undrained cohesion  
                $\phi$  = friction angle  
                $k_s$  = p-y modulus (static)  
                $\epsilon_{50}$  = strain factor  
                $\gamma_t$  = total unit weight  
                $\gamma'$  = effective unit weight

The parameters presented above are generally based on correlations with the TCP blow counts and laboratory unconfined compression/unconsolidated-undrained triaxial tests, and recommended values for the LPILE program for the strength of materials encountered in our borings and are not necessarily based on laboratory test results.

### LATERAL GROUP EFFECTS

The lateral load capacity of a single isolated drilled pier is generally based on an acceptable lateral deflection. For the same lateral deflection, the lateral load-carrying capacity of a pier within a group may be less than that of an individual pier. Leading row piers generally experience less reduction in lateral capacity as compared to trailing row piers for the same head deflection criteria. The pier group arrangement and the center-to-center spacing between adjacent piers have a significant impact on lateral group effects. Piers spaced greater than about five pier diameters, center-to-center, generally have limited group effects. Table 8 represents the p-Multipliers for the corresponding center-to-center pier spacings based on Table 10.7.2.4-1 in the *American Association of State Highway and Transportation Officials (AASHTO) Load Resistance Factored Design (LRFD) Bridge Design Specifications, 8<sup>th</sup> Edition 2017*.

Table 8: P-Multipliers for Lateral Group Effects			
Pier Center to Center (in the direction of loading)	P-Multipliers		
	Row 1	Row 2	Row 3 and higher
3 Diameters	0.8	0.4	0.3

Table 8: P-Multipliers for Lateral Group Effects			
Pier Center to Center (in the direction of loading)	P-Multipliers		
	Row 1	Row 2	Row 3 and higher
5 Diameters	1.0	0.85	0.7

**ESTIMATED SETTLEMENTS**

Based on the subsurface conditions encountered at the project site, we estimate the total vertical settlement is on the order of 1/2 to 1 inch for a single, isolated drilled pier due to structural loads alone. The estimated differential settlement may be on the order of the total vertical settlement.

It should be noted that groups of drilled piers may settle more than individual piers subject to the same load per pier. The settlement of pier groups is dependent on several variables, including the dimension of the pier group, the pier length, the sustained structural loads, and the compressibility characteristics of the foundation soils. For the pier groups planned for this project, we do not anticipate groups greater than 5-by-5, or pier spacing less than 2.5 pier diameters.

**MSE RETAINING WALL STRUCTURES RECOMMENDATIONS**

Based on the *Retaining Wall Plan and Profile (Entrance Ramp 1A Bridge Layout)* drawing dated October 18, 2021, we understand that the proposed MSE retaining wall structures consist of two retaining walls (i.e., south and north segments). Each retaining wall structure is associated with embankments. A description of the retaining wall structures are described below:

- The South MSE Retaining Wall has an overall length of approximately 430-ft. This retaining wall begins at STA 27+62.00 and ends at STA 30+92.00. It has a maximum height on the order of 19 feet. The retaining wall has relatively flat embankment slopes in most areas along the wall.
- The North MSE Retaining Wall has an overall length of approximately 430-ft. This retaining wall begins at STA 32+00.00 and ends at STA 36+30.00. It has a maximum height on the order of 19 feet. The retaining wall has relatively flat embankment slopes in most areas along the wall.

MSE retaining wall structures are constructed in fill conditions by placing alternate layers of cement stabilized backfill and reinforcing elements. This reinforced mass is used to retain clay and unreinforced granular soil embankments, which are called the retained fill. General fill material is used behind the retaining fill. More information on backfill material used to constructed MSE retaining wall structures is presented in the TxDOT Houston District Sheet CSBE-RW, "Cement Stabilized Backfill Embankment," and TxDOT Houston District Sheet MSRW-CSB, "Mechanically Stabilized Retaining Wall - Cement Stabilized Backfill."

The retained fill will exert lateral forces on the reinforced mass, which can cause it to slide on its base, rotate around the toe of the retaining wall structure, experience bearing capacity failure, and/or experience global stability failure. Resistance to these factors is produced by the frictional forces generated within the

reinforced mass by the interaction of the weight of the cement stabilized backfill on the reinforcing elements.

Thus, the stability of a retaining wall is analyzed for the following conditions:

- External Stability:
  - Determining the resistance against bearing capacity failure;
  - Determining the resistance against base sliding;
  - Determining the resistance against overturning;
  - Limiting the eccentricity of the resultant forces;
  - Determining global stability; and
  - Estimating the overall settlement.
  
- Internal Stability:
  - Determining the tensile strength of the reinforcements; and
  - Determining of the pullout resistance of the reinforcements.

The internal stability is performed by the MSE wall designer. This section provides our geotechnical recommendations for the external stability of the MSE retaining wall structures.

#### **BEARING CAPACITY FAILURE, BASE SLIDING, OVERTURNING, AND ECCENTRICITY**

We have evaluated the external stability of the MSE retaining wall structures for bearing capacity failure, base sliding, overturning, and the eccentricity of the resultant forces by using the MSEW Version 3.0 software program developed by Adama Engineering, Inc. In our analyses, the following information was used:

- Cement stabilized backfill and retaining fill material as specified per the TxDOT Houston District Sheet MSRW-CSB, "Mechanically Stabilized Retaining Wall - Cement Stabilized Backfill";
- Cement stabilized backfill properties: total unit weight = 125 pcf and  $\phi = 45$  degrees;
- Retaining fill properties: total unit weight = 125 pcf and  $\phi = 30$  degrees (maximum Liquid Limit not exceeding 40 and Plasticity Index between 4 and 20);
- 2-foot embedment depth below finished grade or existing grade;
- Horizontal ground at the top of the wall structure;
- Minimum strap length equal to 0.7 times the height of the wall, but no less than 8 ft;
- Traffic surcharge of 250 psf applied at the top of the wall structure; and
- Near-surface subgrade parameters: total unit weight = 125 psf, undrained shear strength of cohesive soil = 1,500 psf.

The minimum factors of safety and eccentricity set forth by TxDOT for the external failure modes are as follows:

- Bearing Capacity Failure = 2.0
- Base Sliding = 1.5
- Overturning = 2.0
- Eccentricity within the middle third of the width of the reinforced mass



The results of our analysis for bearing capacity failure, base sliding, overturning, and the eccentricity of the resultant forces are presented in Table 9.

Table 9: Summary of External Stability Analysis (CSB Only)										
MSE Wall No.	H <sub>d</sub> (ft)	B (ft)	B/H	E (ft)	Design Soil Parameters		F.S. Bearing	F.S. Sliding	F.S. Overturning	Eccentricity (e/L)
					S <sub>u</sub> (psf)	φ (deg)				
RWALL 1/2	19.0	16.5	0.9	2	1,500	0	2.76	3.27	6.71	0.0746

Where:

- H<sub>d</sub> = Total Wall Height
- B = Base of Wall
- E = Embedment Depth
- S<sub>u</sub> = Undrained Shear Strength
- φ = Friction Angle
- F.S. = Factor of Safety

**GLOBAL STABILITY**

While there are many different methods of stability analysis and numerous available computer programs, we have selected the program Slide version 7.0, a slope stability computer program, developed by Rocscience. The Spencer method was used to evaluate the factors of safety for the most critical MSE retaining wall structures. This method uses moment and two-dimensional force equilibrium analyses to determine the factors of safety for the slopes. The groundwater was assumed at the base of the MSE retaining wall structures.

Total stress cohesion (c<sub>t</sub>) and total stress angle of internal friction (φ<sub>t</sub>) for the cohesive soils for the short-term condition were based upon the laboratory results of the consolidation undrained triaxial tests and our experience with similar soils. Effective stress cohesion (c') and effective stress angle of internal friction (φ') for the cohesive soils for the long term condition were based upon the laboratory results of the consolidation undrained triaxial tests and our experience with similar soils. Total/effective stress cohesion and total/effective stress angle on internal friction for the granular soils were based on our experience with similar soils.

The global stability analyses were performed for the following two design conditions:

- Short-Term (End of Construction) Condition – The end of construction condition models the initial undrained condition of the soil. Total stress shear strength parameters were used for analysis.
- Long-Term Condition – Effective stress shear strength parameters were used for analysis. Long-term condition represents steady-state piezometric and stress conditions. The long-term condition models a case in which the soils rely on their available drained shear strength for long-term stability.

The critical surface along which the calculated minimum factor of safety is obtained is considered the critical surface of failure. As mentioned earlier, TxDOT recommends a minimum factor of safety of 1.3 or 1.5 for global stability. The minimum factor of safety of 1.5 is for walls that support bridge abutments.

In our analysis, we evaluated the global stability at a maximum wall height of about 19 feet with the reinforced mass and cement stabilized backfill behind the wall. The critical surfaces and soil parameters used in our analysis are illustrated in Figures 5 and 6, and the calculated minimum factors are also summarized in Tables 10 and 11.

<b>Table 10: Summary of Global Stability Analyses: South MSE Retaining Wall</b>			
<b>Boring No.</b>	<b>Wall Height (ft)</b>	<b>Condition</b>	<b>Factor of Safety</b>
B-2	19	Short-Term	1.54
		Long-Term	1.58

<b>Table 11: Summary of Global Stability Analyses: North MSE Retaining Wall</b>			
<b>Boring No.</b>	<b>Wall Height (ft)</b>	<b>Condition</b>	<b>Factor of Safety</b>
B-3	19	Short-Term	1.56
		Long-Term	1.60

**ESTIMATED SETTLEMENTS**

The MSE retaining structures will settle due to the underlying foundation soils as well as compression of the backfill material. The amount of settlement of the underlying foundation soils will be a function of the immediate and consolidation settlements of the subgrade soils within the influence of the resulting stress distribution from the surcharge of the MSE retaining structures. We anticipate that immediate settlement would occur during the construction phase, and consolidation settlement would occur years after the construction phase. We assume that it will take up to 3 months to construct the MSE retaining wall structures.

A detailed settlement analysis was performed with the Settle3D software program developed by Rocscience, Inc. Soil parameters used for the settlement analysis was based on the consolidation laboratory results, empirical correlations with soil index parameters, and our local experience. Also, we estimated the elastic modulus of the granular soils to approximate the immediate settlement based on the relative in-situ density of the encountered granular soils. The settlement results at the end of construction and after construction are presented in Table 12. Our detailed settlement analyses are presented in Figure 7.

<b>Table 12: Summary of Estimated Settlements: MSE Retaining Walls</b>		
<b>Location</b>	<b>Estimated Settlements (inch)</b>	
	<b>Consolidation</b>	<b>Total</b>
	End of Construction	
Near Abutment Walls	2.75	4.25
	After Construction	
	3	4.5

**CONSTRUCTION CONSIDERATIONS**

**SITE DRAINAGE**

Drainage is an important key to the successful performance of any structure. Good drainage should be established prior to and maintained after construction to help prevent water from ponding within or adjacent to bridge overpass and MSE retaining wall structures.

**SITE PREPARATION**

All areas to support select fill should be stripped of all vegetation and organic topsoil. Exposed subgrades should be thoroughly proofrolled in order to locate and densify any weak, compressible zones as specified by 2014 TxDOT Standard Specification, Item 216. A minimum of 5 passes of a fully-loaded dump truck or a similar heavily-loaded piece of construction equipment should be used for planning purposes. Proofrolling operations should be observed by the Geotechnical Engineer or his representative to document subgrade condition and preparation. Weak or soft areas identified during proofrolling should be removed and replaced with suitable, compacted on-site clays, free of organics, oversized materials, and degradable or deleterious materials.

Upon completion of the proofrolling operations and just prior to fill placement, the exposed subgrade should be moisture conditioned by scarifying to a minimum depth of 6 inches and recompacting to a minimum of 95 percent of the maximum density as determined from TxDOT Tex-114-E for plasticity indices greater than 20 and TxDOT Tex-113-E for plasticity indices less than 20. The moisture content of the subgrade should be maintained within the range of optimum moisture content to 3 percentage points above optimum moisture content until permanently covered.

**FILL MATERIALS**

Materials used as borrow fill for final site grading preferably shall consists of the following as indicated in the plans:

- 2014 TxDOT Standard Specifications, Item 132, Type A - Granular fill

- 2014 TxDOT Standard Specifications, Item 132, Type C - Material meeting specifications requirements shown on plans

Select borrow fill should be placed in accordance to TxDOT Item 132 and compacted utilizing Density Control.

Materials classified in accordance with the Unified Soil Classification System (USCS) such as clayey gravel (GC), clayey sand (SC), and lean clay (CL), may be considered satisfactory for use as Type C borrow fill materials at the project site. It is important that the material utilized as fill match the subgrade values used in our design.

Retaining fill materials shall have a maximum liquid limit not exceeding 40, a plasticity index between 4 and 20, and a maximum particle size not exceeding 4 inches or one-half the loose lift thickness, whichever is smaller. The fill should be placed on competent surfaces in lifts not exceeding 8 in. loose measure. The fill should also be compacted to at least 95% of the standard Proctor maximum dry density at moisture content within two percentage points of the optimum (Tex-114-E). We suggest that fill placement be tested and documented by the Geotechnical Engineer or a qualified representative. In addition, if these materials are utilized, grain size analyses and Atterberg Limits must be performed during placement at a rate of one test each per 5,000 cubic yards of material due to the high degree of variability associated with pit-run materials.

General fill shall have a maximum liquid limit not exceeding 65, a minimum plasticity index of 5, and may be onsite soils free of organic and deleterious material. General fill should only be used outside the areas of critical structures. The fill should be placed on competent surfaces in lifts not exceeding 8 in. loose measure. The fill should also be compacted to at least 95% of the standard Proctor maximum dry density at moisture content within two percentage points of the optimum (Tex-114-E). We suggest that fill placement be tested and documented by the Geotechnical Engineer or a qualified representative.

If the above listed materials are being considered for bidding purposes, the materials should be submitted to the Geotechnical Engineer for pre-approval at a minimum of 10 working days or more prior to the bid date. Failure to do so will be the responsibility of the Contractor. The Contractor will also be responsible for ensuring that the properties of all delivered fill materials are similar to those of the pre-approved submittal. It should also be noted that when using alternative fill materials, difficulties may be experienced with respect to moisture control during and subsequent to fill placement, as well as with erosion, particularly when exposed to inclement weather. This may result in sloughing of beam trenches and/or pumping of the fill materials.

#### **BACKFILL MATERIALS FOR MSE RETAINING WALL STRUCTURES**

Materials used as select backfill for MSE retaining wall structures should be free from organic otherwise deleterious materials and conform to the backfill requirements specified in 2014 TxDOT Standard Specification, Item 423. More information on cement stabilized backfill is presented in TxDOT Houston District Sheet CSBE-RW, "Cement Stabilized Backfill Embankment," and TxDOT Houston District Sheet MSR-W-CSB, "Mechanically Stabilized Retaining Wall - Cement Stabilized Backfill".

### **INSTALLATION OF DRILLED PIERS**

Drilled pier construction should follow 2014 TxDOT Standard Specifications, Item 416, Drilled Shaft Foundations. Presented below are additional considerations.

- Each drilled pier excavation should be examined by a **RKI** or qualified representative who is familiar with the geotechnical aspects of the soil stratigraphy, the structural configuration, foundation design details and assumptions, prior to placing concrete. This is to observe that:
  - The pier has been excavated to the specified dimensions at the correct depth;
  - The pier has been drilled plumb within specified tolerances along its total length; and
  - Excessive cuttings, buildup and soft, compressible materials have been removed from the bottom of the excavation.

The following paragraphs present our recommendations for temporary casing and slurry techniques, reinforcement and concrete placement, and load tests.

#### **Temporary Casing and Slurry Techniques**

As previously noted, free water was observed in our borings below El. 44 ft and El. 26 ft. Groundwater seepage and/or side sloughing will be encountered at the time of construction. We recommend that the foundation contractor review TxDOT Item 416 for the requirements on temporary casing and slurry techniques.

#### **Reinforcement and Concrete Placement**

Reinforcing steel should be checked for size and placement before concrete placement. Placement of concrete should be accomplished as soon as possible after excavation to reduce changes in the moisture content or the state of stress of the foundation materials. No foundation element should be left open overnight without concreting.

#### **Load Tests**

Load tests, if required, should be performed in accordance with TxDOT 2014 Standard Specifications, Item 405, Foundation Test Load procedures. The successful General Contractor should be responsible for providing all equipment, personnel, jacks, and construction (including reaction piles) necessary to conduct these tests.

### **EXCAVATION SLOPING AND BENCHING**

If utility trenches or other excavations extend to or below a depth of 5-ft below construction grade, the contractor or others shall be required to develop a trench safety plan to protect personnel entering the trench or trench vicinity. The collection of specific geotechnical data and the development of such a plan, which could include designs for sloping and benching or various types of temporary shoring, are beyond the scope of the current study. Any such designs and safety plans shall be developed in accordance with

current Occupational Safety and Health Administration (OSHA) trench safety guidelines (29 CFR 1926 Subpart P Appendix A) and other applicable industry standards.

### **EXCAVATION EQUIPMENT**

Our boring logs are not intended for use in determining construction means and methods and may therefore be misleading if used for that purpose. We recommend that earthwork and Utility Contractors interested in bidding on the work perform their own tests in the form of test pits or test piers to determine the quantities of the different materials to be excavated, as well as the preferred excavation methods and equipment for this project site.

### **BEDDING AND BACKFILLING OF UTILITIES**

Utilities that project through rigid units should be designed with either some degree of flexibility or with sleeves. Such design features will help reduce the risk of damage to the utility lines as vertical movements occur.

Our experience indicates that significant settlement of backfill can occur in utility trenches, particularly when trenches are deep, when backfill materials are placed in thick lifts with insufficient compaction, and when water can access and infiltrate the trench backfill materials. The potential for water to access the backfill is increased where water can infiltrate base materials due to insufficient penetration of curbs, and at sites where geological features can influence water migration into utility trenches. It is our belief that another factor that can significantly impact settlement is the migration of fines within the backfill into the open voids in the underlying free-draining bedding material. Bedding and backfilling should be in accordance with 2014 TxDOT Standard Specifications, Item 400.

## **CONSTRUCTION RELATED SERVICES**

### **CONSTRUCTION MATERIALS TESTING AND OBSERVATION SERVICES**

As presented in the attachment to this report, *Important Information About Your Geotechnical Engineering Report*, subsurface conditions can vary across a project site. The conditions described in this report are based on interpolations derived from a limited number of data points. Variations will be encountered during construction, and only the geotechnical design engineer will be able to determine if these conditions are different than those assumed for design.

Construction problems resulting from variations or anomalies in subsurface conditions are among the most prevalent on construction projects and often lead to delays, changes, cost overruns, and disputes. These variations and anomalies can best be addressed if the geotechnical engineer of record, **RKI** is retained to perform construction observation and testing services during the construction of the project. This is because:

- **RKI** has an intimate understanding of the geotechnical engineering report's findings and recommendations. **RKI** understands how the report should be interpreted and can provide such interpretations on site, on the client's behalf.

- **RKI** knows what subsurface conditions are anticipated at the site.
- **RKI** is familiar with the goals of the owner and project design professionals, having worked with them in the development of the geotechnical workscope. This enables **RKI** to suggest remedial measures (when needed) which help meet the owner's and the design teams' requirements.
- **RKI** has a vested interest in client satisfaction, and thus assigns qualified personnel whose principal concern is client satisfaction. This concern is exhibited by the manner in which contractors' work is tested, evaluated and reported, and in selection of alternative approaches when such may become necessary.
- **RKI** cannot be held accountable for problems which result due to misinterpretation of our findings or recommendations when we are not on hand to provide the interpretation which is required.

**BUDGETING FOR CONSTRUCTION TESTING**

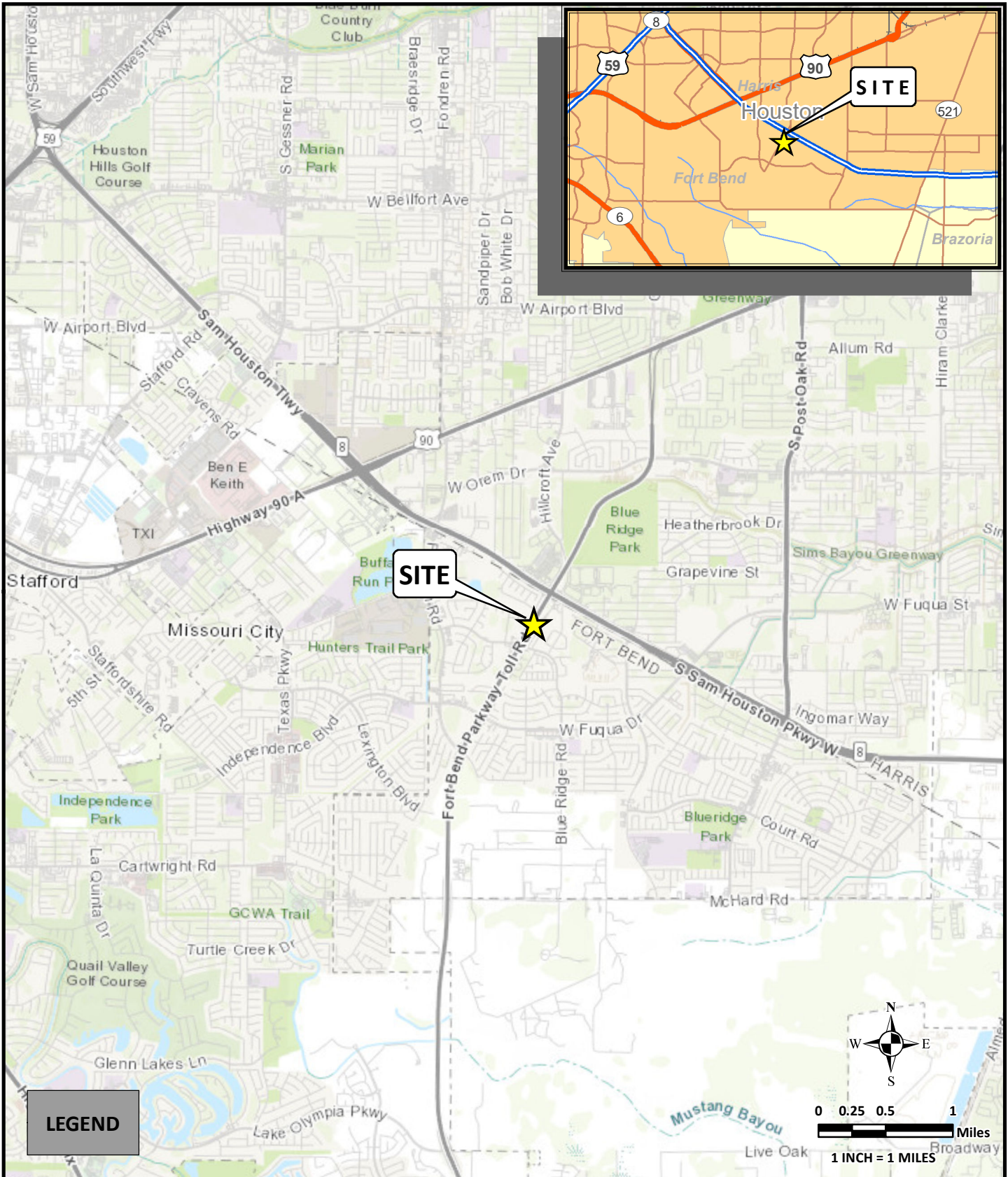
Appropriate budgets need to be developed for the required construction testing and observation activities. At the appropriate time before construction, we advise that **RKI** and the project designers meet and jointly develop the testing budgets, as well as review the testing specifications as it pertains to this project.

Once the construction testing budget and scope of work are finalized, we encourage a preconstruction meeting with the selected contractor to review the scope of work to make sure it is consistent with the construction means and methods proposed by the contractor. **RKI** looks forward to the opportunity to provide continued support on this project, and would welcome the opportunity to meet with the Project Team to develop both a scope and budget for these services.

\* \* \* \* \*

# ATTACHMENTS





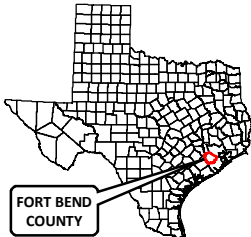
**LEGEND**



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(713)996-8990 TEL  
(713)996-8993 FAX  
[www.rkci.com](http://www.rkci.com)  
TBPE Firm Number 3257

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

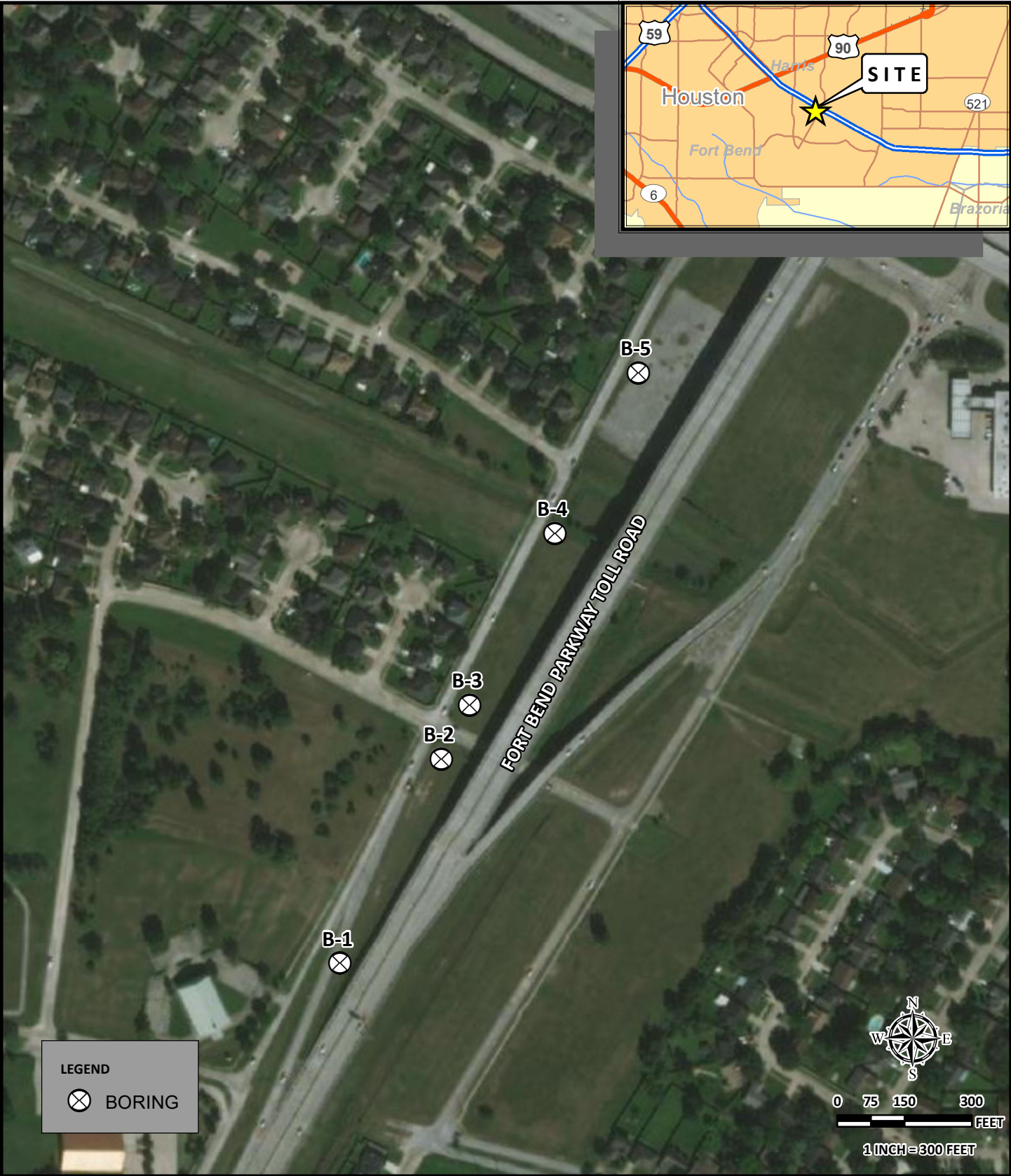
**SITE MAP**  
RAMP-BRIDGE CROSSOVER  
FORT BEND TOLLWAY  
MISSOURI CITY, FORT BEND COUNTY, TEXAS



PROJECT No.:  
AHA21-060-00  
ISSUE DATE: 10/22/2021  
DRAWN BY: JMR  
CHECKED BY: JN  
REVIEWED BY: JDB

**FIGURE**  
**1**

NOTE: This Drawing is Provided for Illustration Only, May Not be to Scale and is Not Suitable for Design or Construction Purposes



**LEGEND**

⊗ BORING

0 75 150 300  
FEET

1 INCH = 300 FEET



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SOURCE: ESRI Imagery Basemap

**BORING LOCATION MAP**

RAMP-BRIDGE CROSSOVER  
FORT BEND TOLLWAY  
MISSOURI CITY, FORT BEND COUNTY, TEXAS

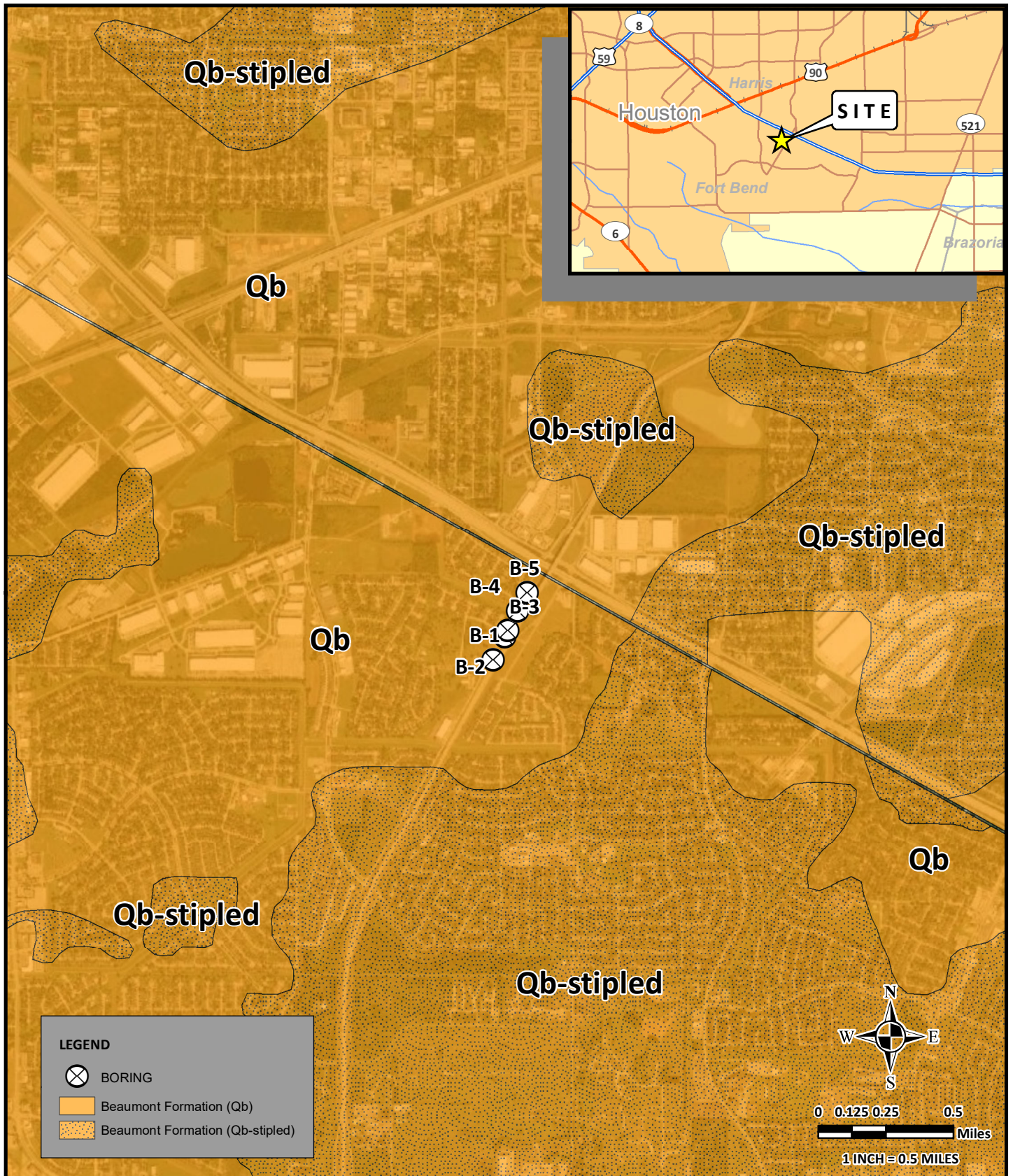
**REVISIONS:**

No.	DATE	DESCRIPTION

PROJECT No.: AHA21-060-00	
ISSUE DATE:	10/22/2021
DRAWN BY:	JMR
CHECKED BY:	JN
REVIEWED BY:	JDB

**FIGURE**  
**2**

NOTE: This Drawing is Provided for Illustration Only, May Not be to Scale and is Not Suitable for Design or Construction Purposes



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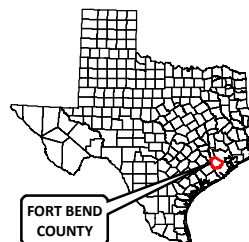
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SOURCE: Bureau of Economic Geology, University of Texas at Austin, Geologic Atlas of Texas, Houston Sheet, 1987; ESRI Imagery Basemap

### GEOLOGY MAP

RAMP-BRIDGE CROSSOVER  
FORT BEND TOLLWAY  
MISSOURI CITY, FORT BEND COUNTY, TEXAS



PROJECT No.:  
AHA21-060-00

ISSUE DATE: 10/22/2021

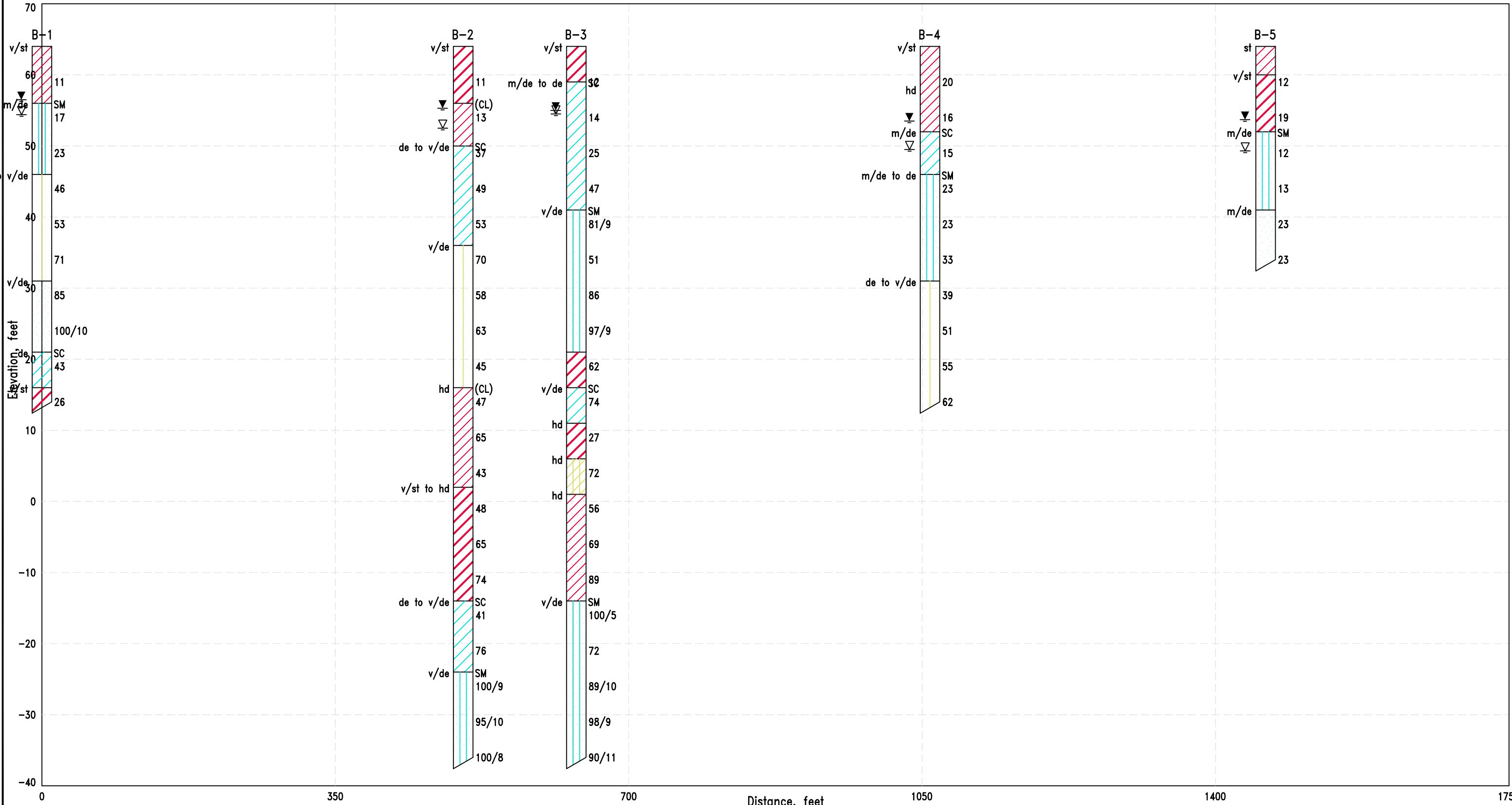
DRAWN BY: JMR

CHECKED BY: JN

REVIEWED BY: JDB

### FIGURE

**3**



**ABBREVIATION USED:**

v/lo - Very Loose	v/so - Very Soft
lo - Loose	so - Soft
m/de - Medium Dense	fm - Firm
De - Dense	st - Stiff
v/de - Very Dense	v/st - Very Stiff
	hd - Hard

▽ Free water level measured during drilling.  
 ▽ Water level measured 24 hrs or later after drilling.

**LITHOLOGY GRAPHICS:**

SANDY LEAN CLAY	SILTY SAND	SP-SM	SP	CLAYEY SAND	FAT CLAY
LEAN CLAY	SANDY SILTY CLAY	SANDY FAT CLAY			

Engineers, Geologists, Hygienists  
 and Environmental Scientists

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**SUBSURFACE SOIL PROFILE**

Proposed FBC Ramp/Bridge Crossover  
 Fort Bend Tollway and Sam Houston Tollway  
 Missouri City, Fort Bend County, TX

FIGURE 4



# DRILLING LOG

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
CSJ

Hole B-1  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/2/21  
Grnd. Elev. 0.00 ft  
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
5	[Diagonal Hatching]	4 (6) 7 (6)	CLAY, stiff to very stiff, dark grayish, with roots, sandy (CL)			20				-%200 = 68
						18	46	28		
						15				
-8.	[Diagonal Hatching]	8 (6) 9 (6)	SAND, medium dense, light brownish, silty (SM)			21				-%200 = 17
						21	0	0		
						22				
15	[Dotted Pattern]	10 (6) 13 (6)	SAND, medium dense, light brownish, silty (SM)			22				-%200 = 5
						22				
						22				
-18.	[Dotted Pattern]	21 (6) 25 (6)	SAND, dense to very dense, light brownish, poorly graded w/ silt (SP-SM)			22				-%200 = 5
						25				
						23				
25	[Dotted Pattern]	24 (6) 29 (6)	SAND, dense to very dense, light brownish, poorly graded w/ silt (SP-SM)			23				-%200 = 4
						25				
						25				
30	[Dotted Pattern]	30 (6) 41 (6)	SAND, dense to very dense, light brownish, poorly graded w/ silt (SP-SM)			25				-%200 = 4
						25				
						25				
-33.	[Dotted Pattern]	39 (6) 46 (6)	SAND, very dense, light brownish, poorly graded (SP)			25				-%200 = 4
						22				
						22				
35	[Dotted Pattern]	50 (6) 50 (4)	SAND, very dense, light brownish, poorly graded (SP)			22				-%200 = 4
						22				
40	[Dotted Pattern]	50 (6) 50 (4)	SAND, very dense, light brownish, poorly graded (SP)			22				-%200 = 4
						22				

Remarks: Free-water was encountered at a depth of about 9.6 ft and rose to a depth of about 7.5 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal

Logger: Mustafa Salloom

Organization: Raba-Kistner, Inc.



# DRILLING LOG

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
CSJ

Hole B-1  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/2/21  
Grnd. Elev. 0.00 ft  
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
-43.			SAND, very dense, light brownish, poorly graded (SP)							
45		27 (6) 16 (6)	SAND, dense, dark tannish and light grayish, with Clay, this sample like half sand and half clay with sand, clayey (SC)			25	26	10		-%200 = 43
-48.			CLAY, very stiff, light grayish (CH)			22				
-50.		12 (6) 14 (6)								
55										
60										
65										
70										
75										
80										

Remarks: Free-water was encountered at a depth of about 9.6 ft and rose to a depth of about 7.5 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal

Logger: Mustafa Salloom

Organization: Raba-Kistner, Inc.

# DRILLING LOG



WinCore  
Version 3.3

County **Fort Bend**  
Highway **Sam Houston**  
CSJ

Hole **B-2**  
Structure **Bridge**  
Station  
Offset

District **Houston**  
Date **10/2/21**  
Grnd. Elev. **0.00 ft**  
GW Elev. **N/A**

Elev. (ft)	L O G	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
5	/ / / / /	5 (6) 6 (6)	CLAY, very stiff to firm, light brownish and light grayish, with roots, w/ sand (CH)			20	51	32		-%200 = 78
				0	28	23				
						18	54	36		-%200 = 83
						27				
-8.	/ / / / /	6 (6) 7 (6)	CLAY, firm, light reddish and light grayish, with CN 8-12ft, and sample 12-14 like half and half (CH) and (Sand) (CL)		9	28	34	17		-%200 = 89
						22				
						24				
						23				
-14.	. / . / . / . / .	13 (6) 24 (6)	SAND, dense to very dense, light brownish, clayey (SC)							-%200 = 24
						24				
						24				
-20.	. / . / . / . / .	21 (6) 28 (6)								
						24				
						24				
-25.	. / . / . / . / .	25 (6) 28 (6)								
						26				
						26				
-28.	. / . / . / . / .	31 (6) 39 (6)	SAND, very dense to dense, light brownish, poorly graded w/ silt (SP-SM)							-%200 = 11
						22				
						22				
-35.	. / . / . / . / .	26 (6) 32 (6)								
						26				
40	.	27 (6) 36 (6)								

Remarks: Free-water was encountered at a depth of about 11.5 ft and rose to a depth of about 8.7 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal

Logger: Mustafa Salloom

Organization: Raba-Kistner, Inc.



# DRILLING LOG

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
CSJ

Hole B-2  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/2/21  
Grnd. Elev. 0.00 ft  
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
			SAND, very dense to dense, light brownish, poorly graded w/ silt (SP-SM)			22				
45		19 (6) 26 (6)								
-48.			CLAY, hard, light greenish gray, with sand in a 48 to 53 ft, and clayey sand, with sample 53- 55 ft like half clayey sand and half fat clay color is change to radish and gray (CL)			22	35	16		-%200 = 85
50		22 (6) 25 (6)				24				
55		35 (6) 30 (6)				24				
60		18 (6) 25 (6)								
-62.			CLAY, very stiff to hard, light greenish gray (CH)	53	42	21	52	28		
65		20 (6) 28 (6)				29				
70		31 (6) 34 (6)				23				
75		35 (6) 39 (6)								
-78.			SAND, dense to very dense, light tannish to light brownish, clayey (SC)			24				-%200 = 30
80		28 (6) 23 (6)								

Remarks: Free-water was encountered at a depth of about 11.5 ft and rose to a depth of about 8.7 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal

Logger: Mustafa Salloom

Organization: Raba-Kistner, Inc.





# DRILLING LOG

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
CSJ

Hole B-2  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/2/21  
Grnd. Elev. 0.00 ft  
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
			SAND, dense to very dense, light tannish to light brownish, clayey (SC)							
85		35 (6) 41 (6)				21				
-88.										
90		50 (6) 50 (3)	SAND, very dense, light tanish to light brownish, some clayey sand, silty (SM)							-%200 = 15
						21				
95		45 (6) 50 (4)								
						21				
-100. 100		50 (5) 50 (3)								
105										
110										
115										
120										

Remarks: Free-water was encountered at a depth of about 11.5 ft and rose to a depth of about 8.7 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal

Logger: Mustafa Salloom

Organization: Raba-Kistner, Inc.



# DRILLING LOG

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
CSJ

Hole B-3  
Structure Bridge  
Station  
Offset

District Houston  
Date 9/29/21  
Grnd. Elev. 0.00 ft  
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks	
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)		
-5. 5  10  15  20  -23. 25  30  35  40	[Diagonal hatching pattern]	6 (6) 6 (6)	CLAY, very stiff, dark grayish and light grayish brown, with Roots from 0_2, with CN from 4_5 and FS, w/ sand (CH)			22				-%200 = 82	
						21	53	35			
						18					
						19	38	21			
						25					
						23					
						21					
						24					
						25					
						19 (6) 28 (6)			24		0
		11 (6) 14 (6)	SAND, very dense, light brownish, silty (SM)								
		5 (6) 9 (6)									
		21 (6) 30 (6)									
		40 (6) 46 (6)									
		31 (6) 50 (3)									
		47 (6) 50 (3)									

Remarks: Free-water was encountered at a depth of about 9.5 ft and rose to a depth of about 9.0 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal

Logger: Mustafa Salloom

Organization: Raba-Kistner, Inc.

# DRILLING LOG



WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
CSJ

Hole B-3  
Structure Bridge  
Station  
Offset

District Houston  
Date 9/29/21  
Grnd. Elev. 0.00 ft  
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
-43.			SAND, very dense, light brownish, silty (SM)							
				37	9	29	54	27		
45		28 (6) 34 (6)	CLAY, firm, light greenish gray, with clayey sand (CH)							
-48.						24				-%200 = 25
50		35 (6) 39 (6)	SAND, very dense, light grayish gray, clayey (SC)							
-53.						19				
55		9 (6) 16 (6)	CLAY, hard, light greenish gray, with CN 53-58 ft, w/ sand (CH)							
-58.						21	24	6		
60		27 (6) 45 (6)	CLAY, hard, light greenish gray, and sample it's not good i do it GS 58-60 Ft, sandy (CL-ML) (CL)							
-63.						23				-%200 = 65
65		26 (6) 30 (6)	CLAY, hard, light grayish gray, with clay, no sample 73-75 it's fat clay radishes and gray and clayey sand half and half, sandy (CL)							
						20				
70		32 (6) 37 (6)								
						28				
75		34 (6) 45 (6)								
-78.						20				-%200 = 13
80		50 (3) 50 (2)	SAND, very dense, light whiteish gray, no 83 Ft the color has changed to brown to 100ft, silty (SM)							

Remarks: Free-water was encountered at a depth of about 9.5 ft and rose to a depth of about 9.0 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal

Logger: Mustafa Salloom

Organization: Raba-Kistner, Inc.



# DRILLING LOG

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
CSJ

Hole B-3  
Structure Bridge  
Station  
Offset

District Houston  
Date 9/29/21  
Grnd. Elev. 0.00 ft  
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
			SAND, very dense, light whiteish gray, no 83 Ft the color has changed to brown to 100ft, silty (SM)							
85		35 (6) 37 (6)				27				
							25			
90		39 (6) 50 (4)								
							22			-%200 = 17
95		48 (6) 50 (3)								
						21				
-100. 100		40 (6) 50 (5)								
105										
110										
115										
120										

Remarks: Free-water was encountered at a depth of about 9.5 ft and rose to a depth of about 9.0 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal

Logger: Mustafa Salloom

Organization: Raba-Kistner, Inc.



# DRILLING LOG

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
CSJ

Hole B-4  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/4/21  
Grnd. Elev. 0.00 ft  
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
5	[Hatched Pattern]	9 (6) 11 (6)	CLAY, very stiff to firm, dark gray, sandy (CL)			17	40	24		-%200 = 61
						12				
						14				
10	[Hatched Pattern]	8 (6) 8 (6)				14	40	24		-%200 = 53
						15				
-12.	[Hatched Pattern]			0	22	18				-%200 = 29
						18				
15	[Dotted Pattern]	7 (6) 8 (6)	SAND, medium dense, brown and gray, clayey (SC)			23				
						24				
-18.	[Dotted Pattern]	10 (6) 13 (6)	SAND, medium dense to dense, brown and gray, silty (SM)			25				-%200 = 18
						23				
						23				
30	[Dotted Pattern]	15 (6) 18 (6)				21				-%200 = 11
						21				
-33.	[Dotted Pattern]	17 (6) 22 (6)	SAND, dense to very dense, brown and gray, poorly graded w/ silt (SP-SM)							
						21				
40	[Dotted Pattern]	22 (6) 29 (6)								

Remarks: Free-water was encountered at a depth of about 14.5 ft and rose to a depth of about 10.5 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal

Logger: Mustafa Salloom

Organization: Raba-Kistner, Inc.



# DRILLING LOG

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
CSJ

Hole B-4  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/4/21  
Grnd. Elev. 0.00 ft  
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
45		26 (6) 29 (6)	SAND, dense to very dense, brown and gray, poorly graded w/ silt (SP-SM)			22				
						22				
50		27 (6) 35 (6)								
55										
60										
65										
70										
75										
80										

Remarks: Free-water was encountered at a depth of about 14.5 ft and rose to a depth of about 10.5 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal

Logger: Mustafa Salloom

Organization: Raba-Kistner, Inc.



# DRILLING LOG

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
CSJ

Hole B-5  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/4/21  
Grnd. Elev. 0.00 ft  
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
-4.			CLAY, stiff, gray, sandy (CL)			20	47	29		-%200 = 64
				0	26	24				
5		5 (6) 7 (6)	CLAY, very stiff to stiff, brownish gray, sandy (CH)			19	56	38		-%200 = 66
						16				
						19				
10		9 (6) 10 (6)								
						20				
-12.			SAND, medium dense, gray, silty (SM)			22				-%200 = 15
						25				
15		4 (6) 8 (6)								
						21				
20		6 (6) 7 (6)								
						23				-%200 = 5
-23.			SAND, medium dense, gray, poorly graded w/ silt (SP-SM)							
						24				
25		10 (6) 13 (6)								
-30.										
30		9 (6) 14 (6)								
35										
40										

Remarks: Free-water was encountered at a depth of about 14.7 ft and rose to a depth of about 10.3 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal

Logger: Mustafa Salloom

Organization: Raba-Kistner, Inc.

# RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ramp-Bridge Crossover  
 Fort Bend Tollway  
 Missouri City, Fort Bend County, Texas

10/22/2021

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-1	0.0 to 2.0		20								
	2.0 to 4.0		18	46	18	28	CL		68	1.00	TV
	4.0 to 6.0		15							1.50	TV
	5.0 to 6.5	11									
	6.5 to 8.0		21								
	8.0 to 10.0		21			NP	SM		17		
	10.0 to 11.5	17									
	11.5 to 12.0		21								
	12.0 to 14.0		22								
	14.0 to 16.0		22								
	15.0 to 16.5	23									
	18.0 to 20.0		22						5		
	20.0 to 21.5	46									
	23.0 to 25.0		25								
	25.0 to 26.5	53									
	28.0 to 30.0		23								
	30.0 to 31.5	71									
	33.0 to 35.0		25						4		
	35.0 to 36.5	85									
	38.0 to 40.0		22								
40.0 to 41.5	100/10										
43.0 to 45.0		25	26	16	10	SC		43			
45.0 to 46.5	43										
48.0 to 50.0		22									
50.0 to 51.5	26										
B-2	0.0 to 2.0		20	51	19	32	CH		78		
	2.0 to 4.0		23							1.02	UC
	4.0 to 6.0		18	54	18	36	CH		83	2.00	TV
	5.0 to 6.5	11									
	6.5 to 8.0		27							0.50	TV
	8.0 to 10.0		28	34	17	17	CL	102	89	0.34	UC
	10.0 to 11.5	13									
	11.5 to 12.0		22							0.50	TV
	12.0 to 14.0		24								
	14.0 to 16.0		23						24		
	15.0 to 16.5	37									
	18.0 to 20.0		24								
20.0 to 21.5	49										
23.0 to 25.0		24									

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial  
 CU = Consolidated Undrained Triaxial

PROJECT NO. AHA21-060-00





# RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ramp-Bridge Crossover  
 Fort Bend Tollway  
 Missouri City, Fort Bend County, Texas

10/22/2021

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-2	25.0 to 26.5	53									
	28.0 to 30.0		26						11		
	30.0 to 31.5	70									
	33.0 to 35.0		22								
	35.0 to 36.5	58									
	38.0 to 40.0		26								
	40.0 to 41.5	63									
	43.0 to 45.0		22								
	45.0 to 46.5	45									
	48.0 to 50.0		22	35	19	16	CL		85		
	50.0 to 51.5	47									
	53.0 to 55.0		24								
	55.0 to 56.5	65									
	58.0 to 60.0		24								
	60.0 to 61.5	43									
	63.0 to 65.0		21	52	24	28				1.52	UU
	65.0 to 66.5	48									
	68.0 to 70.0		29								
	70.0 to 71.5	65									
	73.0 to 75.0		23								
75.0 to 76.5	74										
78.0 to 80.0		24						30			
80.0 to 81.5	41										
83.0 to 85.0		21									
85.0 to 86.5	76										
88.0 to 90.0		19						15			
90.0 to 91.5	100/9										
93.0 to 95.0		21									
95.0 to 96.5	95/10										
98.0 to 100.0		21									
100.0 to 101.5	100/8										
B-3	0.0 to 2.0		22							1.25	TV
	2.0 to 4.0		21	53	18	35	CH		82	1.25	TV
	4.0 to 6.0		18							1.75	TV
	5.0 to 6.5	12									
	6.0								44		
	6.5 to 8.0		19	38	17	21				1.25	TV
8.0 to 10.0		25									
10.0 to 11.5	14		23								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial  
 CU = Consolidated Undrained Triaxial

PROJECT NO. AHA21-060-00

# RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ramp-Bridge Crossover  
 Fort Bend Tollway  
 Missouri City, Fort Bend County, Texas

10/22/2021

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-3	11.5 to 12.0										
	12.0 to 14.0		21								
	14.0 to 16.0		24								
	15.0 to 16.5	25									
	18.0 to 20.0		25								
	20.0 to 21.5	47									
	23.0 to 25.0		24			NP	SM		16		
	25.0 to 26.5	81/9									
	28.0 to 30.0		25								
	30.0 to 31.5	51									
	33.0 to 35.0		23								
	35.0 to 36.5	86									
	38.0 to 40.0		21								
	40.0 to 41.5	97/9									
	43.0 to 45.0		29	54	27	27		97		0.34	UU
	45.0 to 46.5	62									
	48.0 to 50.0		24						25		
	50.0 to 51.5	74									
	53.0 to 55.0		19							2.50	TV
	55.0 to 56.5	27									
	58.0 to 60.0		21	24	18	6					
	60.0 to 61.5	72									
	63.0 to 65.0		23						65		
	65.0 to 66.5	56									
	68.0 to 70.0		20								
	70.0 to 71.5	69									
	73.0 to 75.0		28								
	75.0 to 76.5	89									
	78.0 to 80.0		20						13		
	80.0 to 81.5	100/5									
83.0 to 85.0		27									
85.0 to 86.5	72										
88.0 to 90.0		25									
90.0 to 91.5	89/10										
93.0 to 95.0		22						17			
95.0 to 96.5	98/9										
98.0 to 100.0		21									
100.0 to 101.5	90/11										
B-4	0.0 to 2.0		17	40	16	24	CL		61	1.25	TV

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 CU = Consolidated Undrained Triaxial

PROJECT NO. AHA21-060-00

# RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ramp-Bridge Crossover  
 Fort Bend Tollway  
 Missouri City, Fort Bend County, Texas

10/22/2021

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-4	2.0 to 4.0		12							2.25	TV
	4.0 to 5.0		14								
	5.0 to 6.5	20									
	6.5 to 8.5		14	40	16	24	CL		53	2.25	TV
	8.0 to 10.0		15							1.75	TV
	10.0 to 11.5	16									
	11.5 to 12.0		18							0.79	UC
	12.0 to 14.0		18						29		
	14.0 to 15.0		23								
	15.0 to 16.5	15									
	18.0 to 20.0		24						18		
	20.0 to 21.5	23									
	23.0 to 25.0		25								
	25.0 to 26.5	23									
	28.0 to 30.0		23								
	30.0 to 31.5	33									
	33.0 to 35.0		21						12		
	35.0 to 36.5	39									
	38.0 to 40.0		21								
	40.0 to 41.5	51									
43.0 to 45.0		22									
45.0 to 46.5	55										
48.0		22									
50.0 to 51.5	62										
B-5	0.0 to 2.0		20	47	18	29	CL		64		
	2.0 to 4.0		24							0.93	UC
	4.0 to 5.0		19	56	18	38	CH		66	1.50	TV
	5.0 to 6.5	12									
	6.5 to 8.0		16							1.50	TV
	8.0 to 10.0		19							0.75	TV
	10.0 to 11.5	19									
	11.5 to 12.0		20								
	12.0 to 14.0		22						15		
	14.0 to 15.0		25								
	15.0 to 16.5	12									
	18.0 to 20.0		21								
	20.0 to 21.5	13									
23.0 to 25.0		23						5			
25.0 to 26.5	23										

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial  
 CU = Consolidated Undrained Triaxial

PROJECT NO. AHA21-060-00

# RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ramp-Bridge Crossover  
 Fort Bend Tollway  
 Missouri City, Fort Bend County, Texas

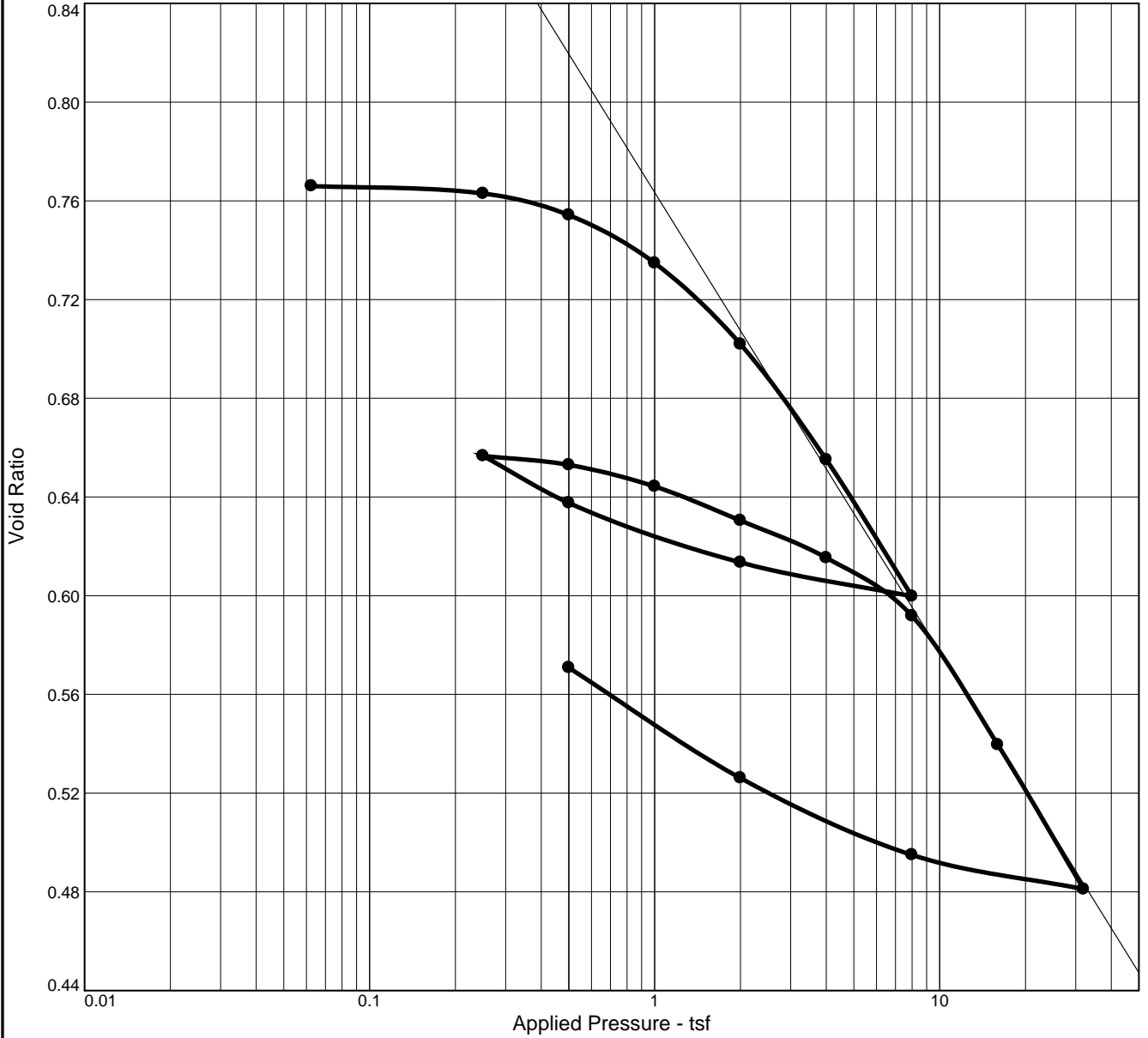
10/22/2021

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-5	28.0 to 30.0 30.0 to 31.5	23	24								

PP = Pocket Penetrometer    TV = Torvane    UC = Unconfined Compression    FV = Field Vane    UU = Unconsolidated Undrained Triaxial  
 CU = Consolidated Undrained Triaxial

PROJECT NO. AHA21-060-00

# CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P <sub>c</sub> (tsf)	C <sub>c</sub>	C <sub>r</sub>	Initial Void Ratio
Saturation	Moisture									
88.8 %	25.0 %	96.1	38	24	2.72	0.42	1.3	0.19	0.025	0.767

<b>MATERIAL DESCRIPTION</b>								<b>USCS</b>	<b>AASHTO</b>
Lean Clay (CL), light brown								CL	

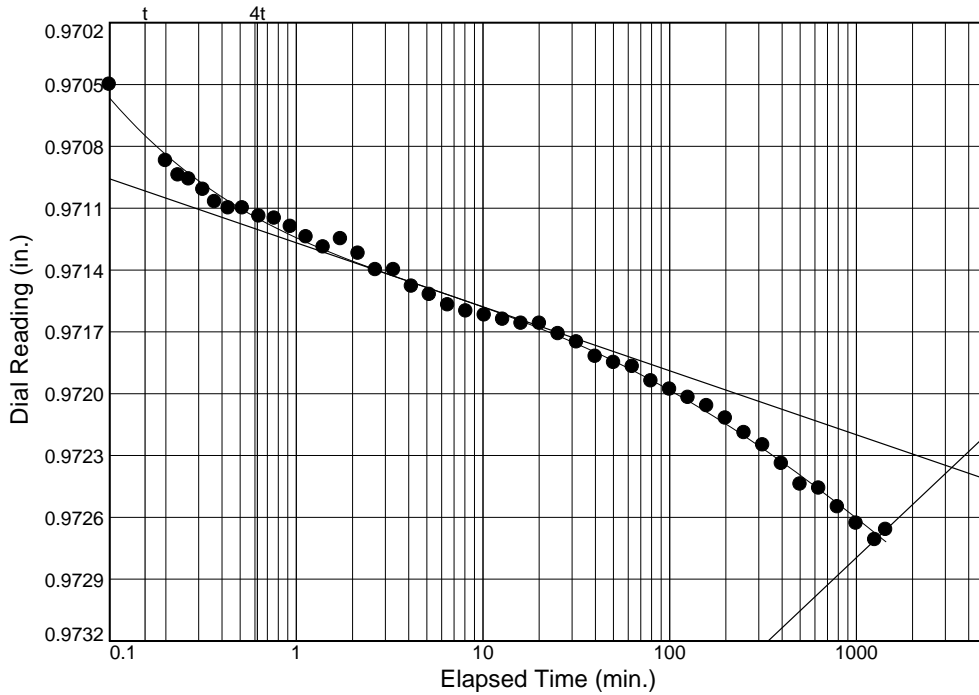
<p><b>Project No.</b> AHA21-060-00    <b>Client:</b> AIG Technical</p> <p><b>Project:</b> Ramp-Bridge Crossover Fort Bend Tollway</p> <p><b>Location:</b> B-2    <b>Depth:</b> 6-8    <b>Sample Number:</b> 4</p>	<p><b>Remarks:</b></p> <p>Specific Gravity Assumed SG = 2.72 %-200 = 89 Swell Pressure = 285 psf</p>
RABA-KISTNER, INC.	

**Tested By:** Reza                      **Checked By:** JDB

# Dial Reading vs. Time

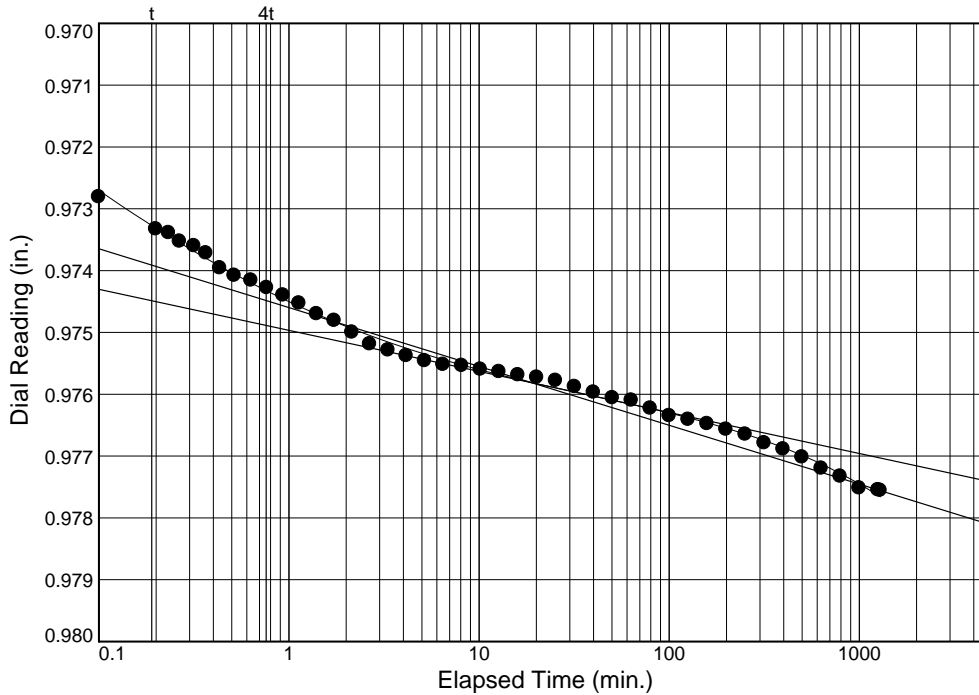
Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

Location: B-2      Depth: 6-8      Sample Number: 4



Load No.= 2  
 Load= 0.25 tsf  
 $D_0 = 0.9703$   
 $D_{50} = 0.9714$   
 $D_{100} = 0.9724$   
 $T_{50} = 1.94 \text{ min.}$

$C_v @ T_{50}$   
 $0.247 \text{ ft.}^2/\text{day}$



Load No.= 3  
 Load= 0.50 tsf  
 $D_0 = 0.9722$   
 $D_{50} = 0.9740$   
 $D_{100} = 0.9758$   
 $T_{50} = 0.49 \text{ min.}$

$C_v @ T_{50}$   
 $0.979 \text{ ft.}^2/\text{day}$

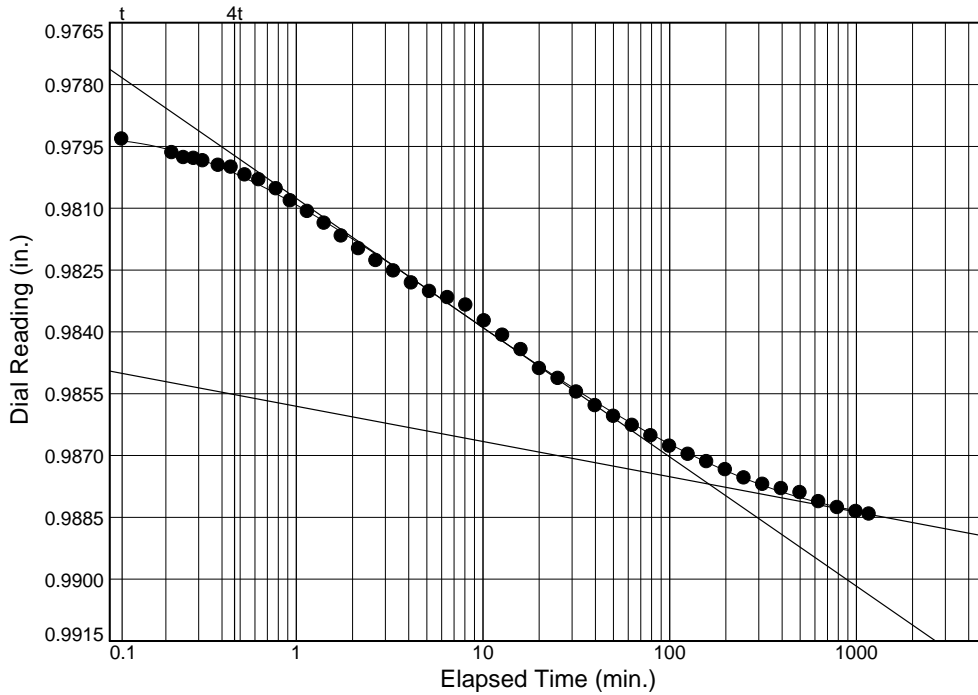
$C_\alpha = 0.002$

Raba-Kistner, Inc.

# Dial Reading vs. Time

Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

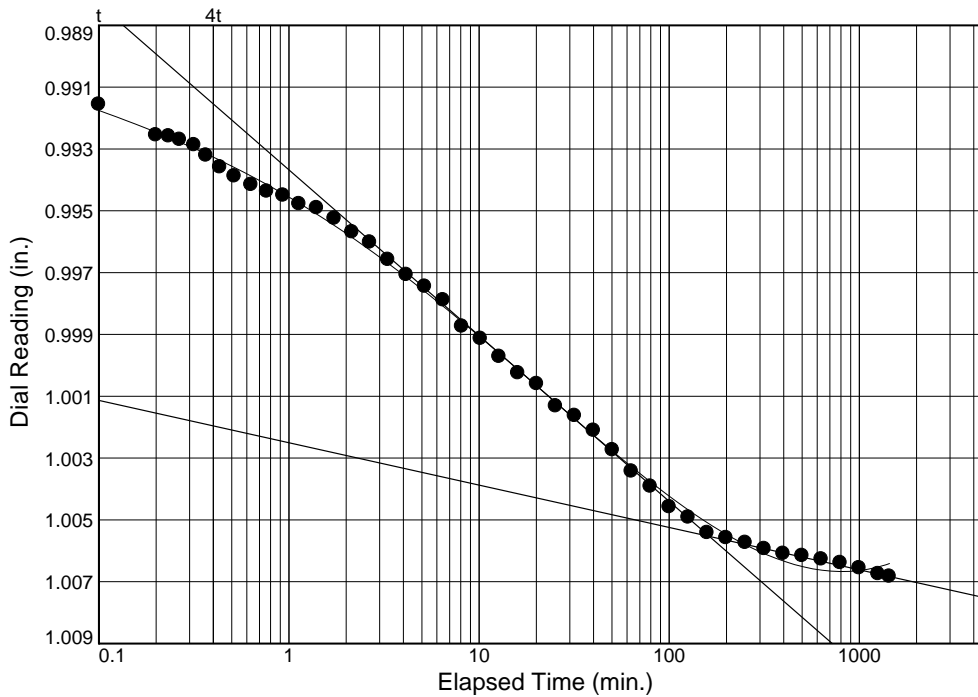
Location: B-2      Depth: 6-8      Sample Number: 4



Load No.= 4  
 Load= 1.00 tsf  
 $D_0 = 0.9786$   
 $D_{50} = 0.9831$   
 $D_{100} = 0.9877$   
 $T_{50} = 5.74 \text{ min.}$

$C_v @ T_{50}$   
 $0.082 \text{ ft.}^2/\text{day}$

$C_\alpha = 0.002$



Load No.= 5  
 Load= 2.00 tsf  
 $D_0 = 0.9902$   
 $D_{50} = 0.9979$   
 $D_{100} = 1.0055$   
 $T_{50} = 5.89 \text{ min.}$

$C_v @ T_{50}$   
 $0.077 \text{ ft.}^2/\text{day}$

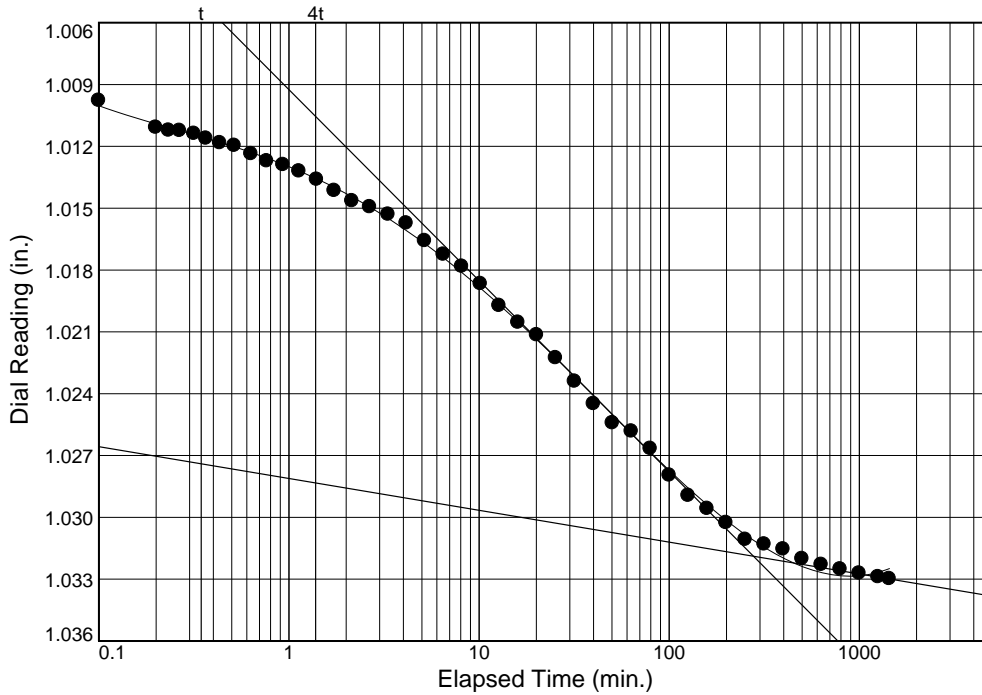
$C_\alpha = 0.002$

Raba-Kistner, Inc.

# Dial Reading vs. Time

Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

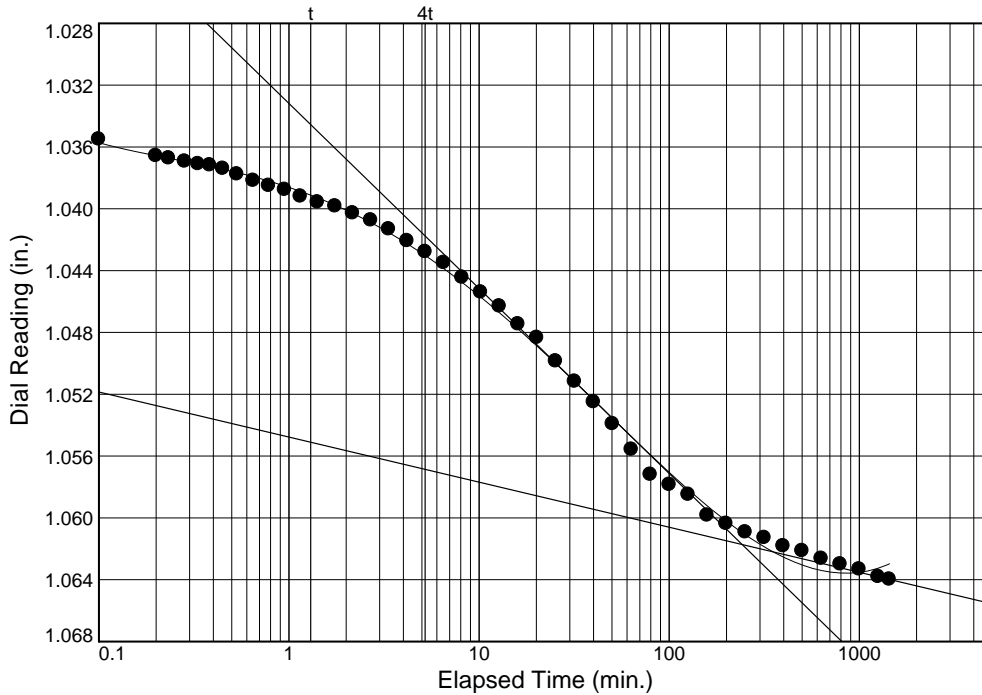
Location: B-2      Depth: 6-8      Sample Number: 4



Load No.= 6  
 Load= 4.00 tsf  
 $D_0 = 1.0095$   
 $D_{50} = 1.0207$   
 $D_{100} = 1.0319$   
 $T_{50} = 16.83 \text{ min.}$

$C_v @ T_{50}$   
 $0.026 \text{ ft.}^2/\text{day}$

$C_\alpha = 0.003$



Load No.= 7  
 Load= 8.00 tsf  
 $D_0 = 1.0352$   
 $D_{50} = 1.0485$   
 $D_{100} = 1.0617$   
 $T_{50} = 18.50 \text{ min.}$

$C_v @ T_{50}$   
 $0.022 \text{ ft.}^2/\text{day}$

$C_\alpha = 0.005$

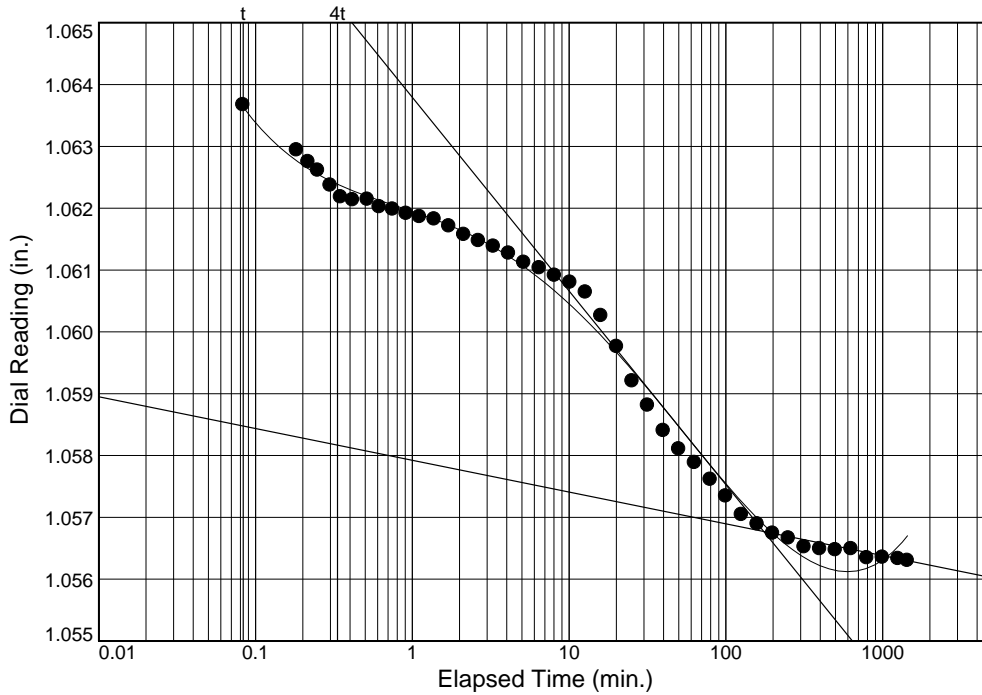
Raba-Kistner, Inc.



# Dial Reading vs. Time

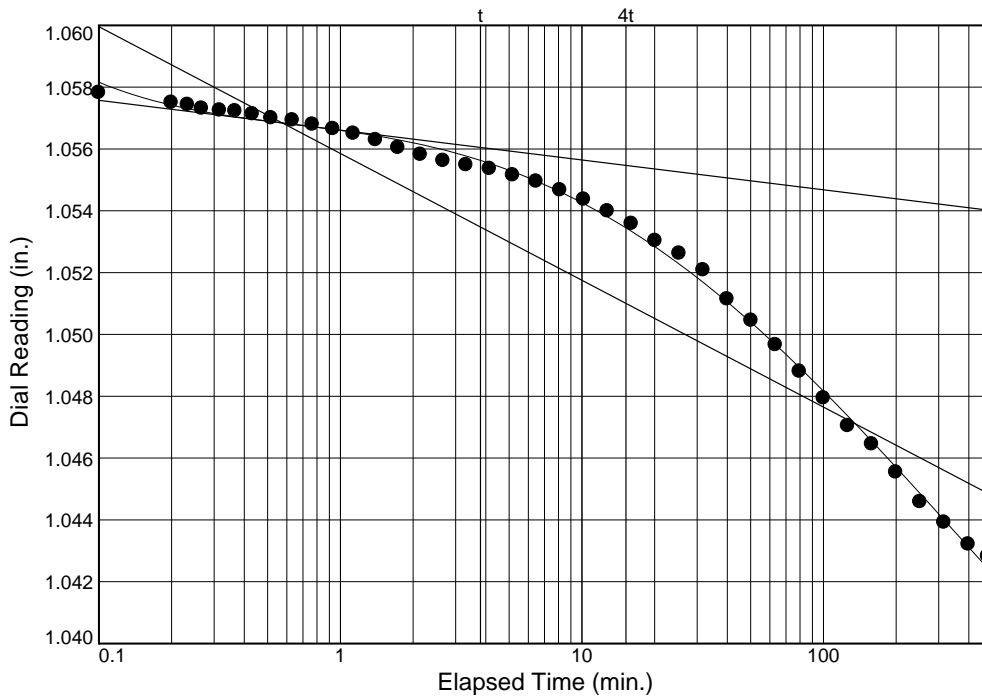
Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

Location: B-2      Depth: 6-8      Sample Number: 4



Load No.= 8  
 Load= 2.00 tsf  
 $D_0 = 1.0649$   
 $D_{50} = 1.0608$   
 $D_{100} = 1.0568$   
 $T_{50} = 6.74 \text{ min.}$

$C_v @ T_{50}$   
 0.059 ft.<sup>2</sup>/day



Load No.= 9  
 Load= 0.50 tsf  
 $D_0 = 1.0578$   
 $D_{50} = 1.0573$   
 $D_{100} = 1.0568$   
 $T_{50} = 0.23 \text{ min.}$

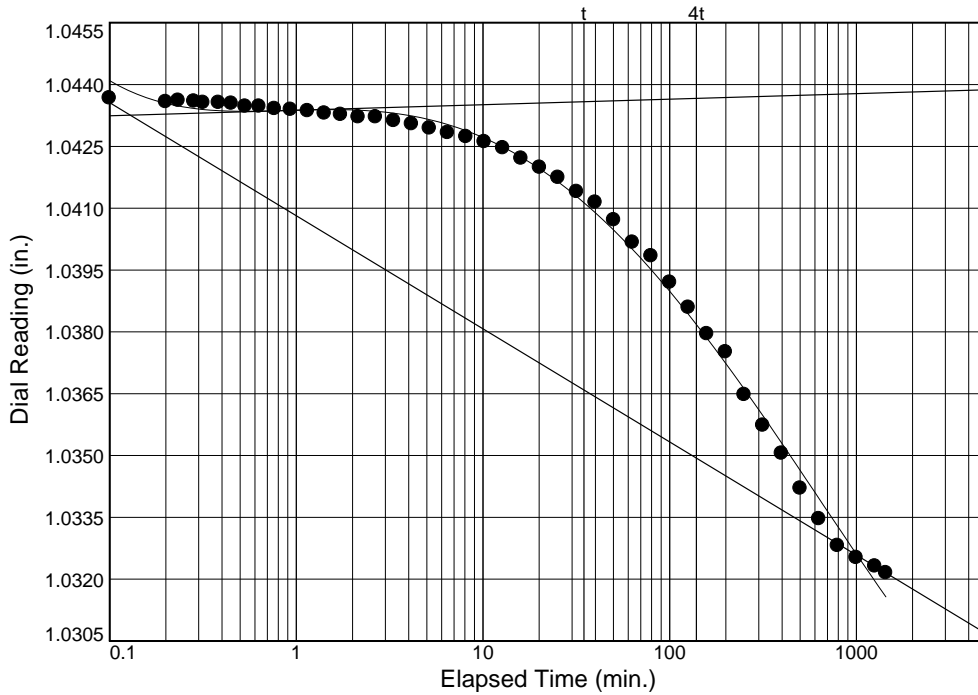
$C_v @ T_{50}$   
 1.795 ft.<sup>2</sup>/day

Raba-Kistner, Inc.

# Dial Reading vs. Time

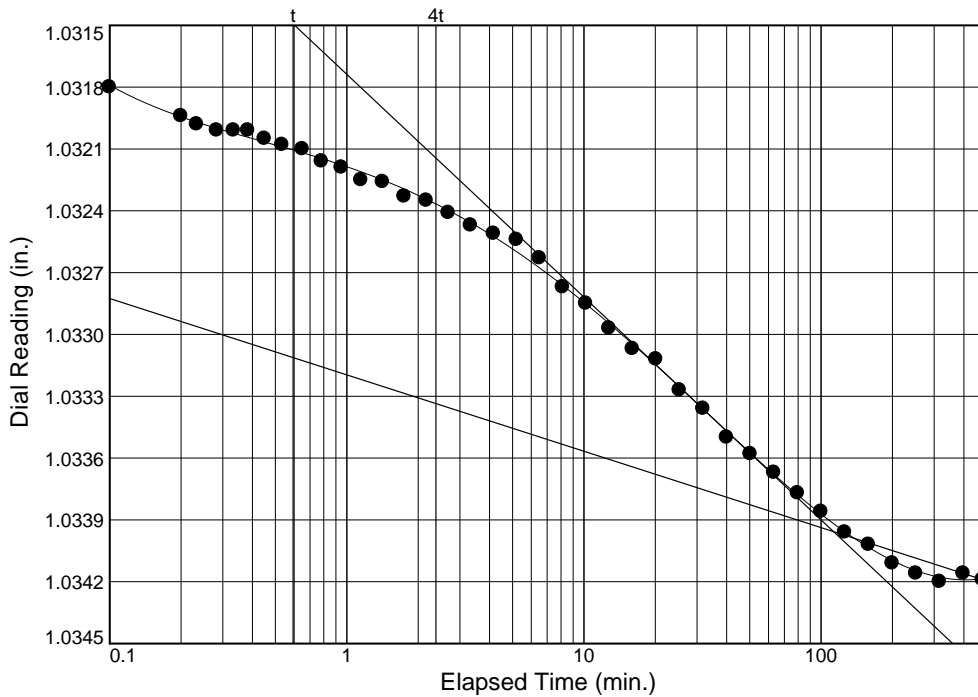
Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

Location: B-2      Depth: 6-8      Sample Number: 4



Load No.= 10  
 Load= 0.25 tsf  
 $D_0 = 1.0441$   
 $D_{50} = 1.0437$   
 $D_{100} = 1.0433$   
 $T_{50} = 0.16 \text{ min.}$

$C_v @ T_{50}$   
 2.623 ft.<sup>2</sup>/day



Load No.= 11  
 Load= 0.50 tsf  
 $D_0 = 1.0318$   
 $D_{50} = 1.0329$   
 $D_{100} = 1.0340$   
 $T_{50} = 11.45 \text{ min.}$

$C_v @ T_{50}$   
 0.037 ft.<sup>2</sup>/day

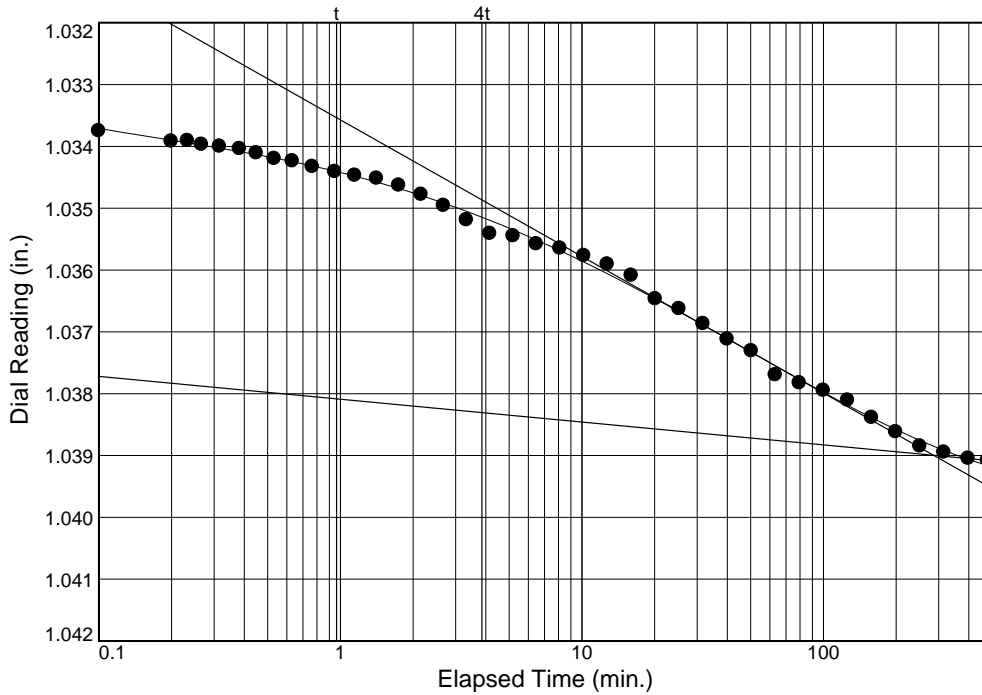
$C_\alpha = 0.001$

Raba-Kistner, Inc.

# Dial Reading vs. Time

Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

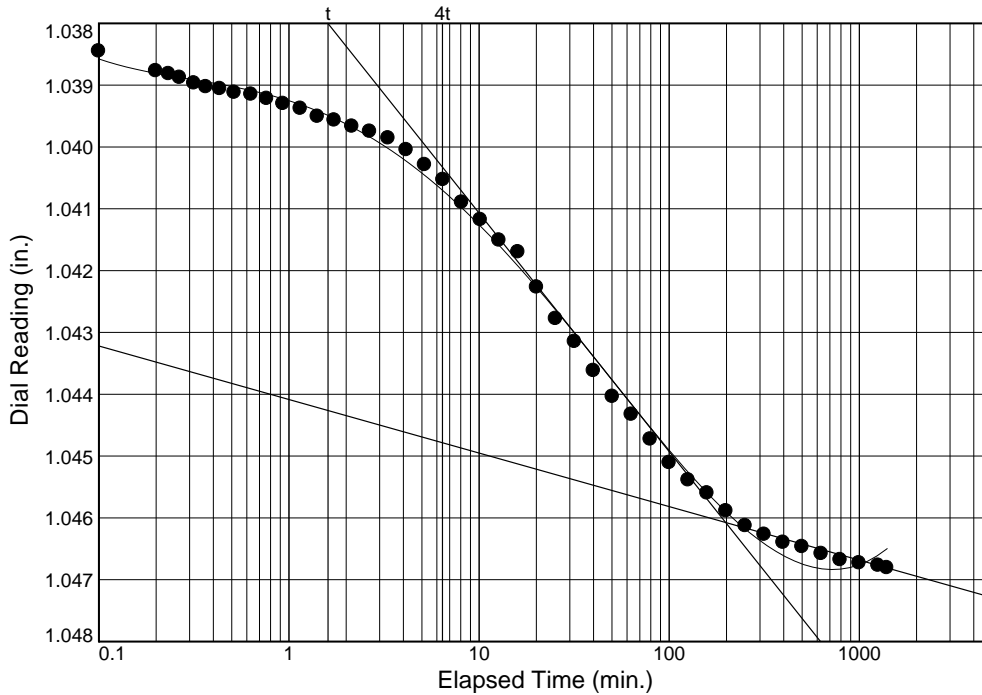
Location: B-2      Depth: 6-8      Sample Number: 4



Load No.= 12  
 Load= 1.00 tsf  
 $D_0 = 1.0337$   
 $D_{50} = 1.0363$   
 $D_{100} = 1.0390$   
 $T_{50} = 17.40$  min.

$C_v @ T_{50}$   
 0.024 ft.<sup>2</sup>/day

$C_\alpha = 0.001$



Load No.= 13  
 Load= 2.00 tsf  
 $D_0 = 1.0383$   
 $D_{50} = 1.0422$   
 $D_{100} = 1.0461$   
 $T_{50} = 18.87$  min.

$C_v @ T_{50}$   
 0.022 ft.<sup>2</sup>/day

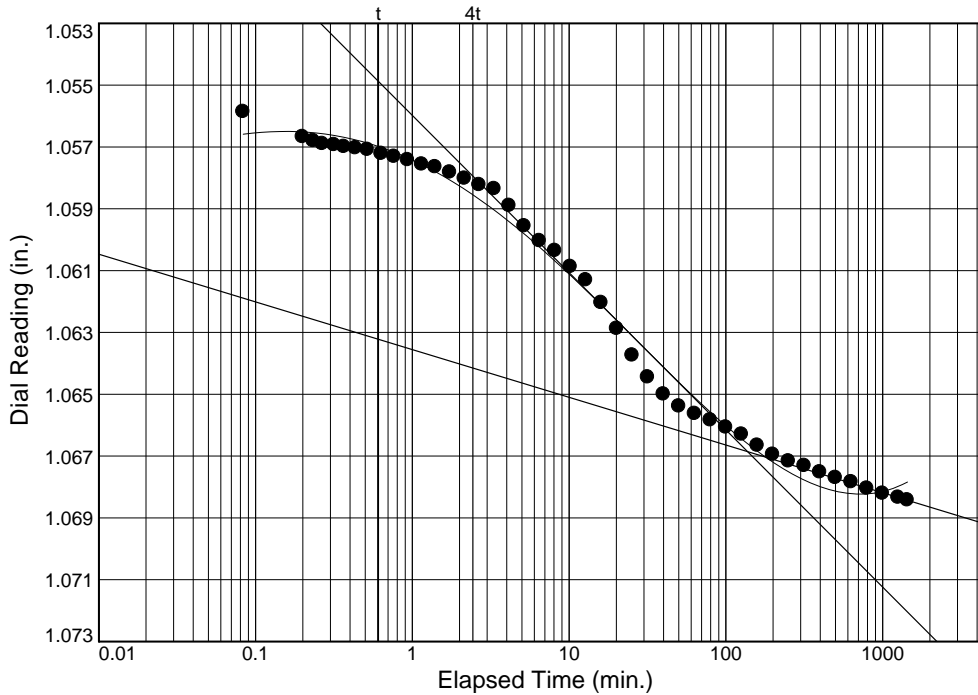
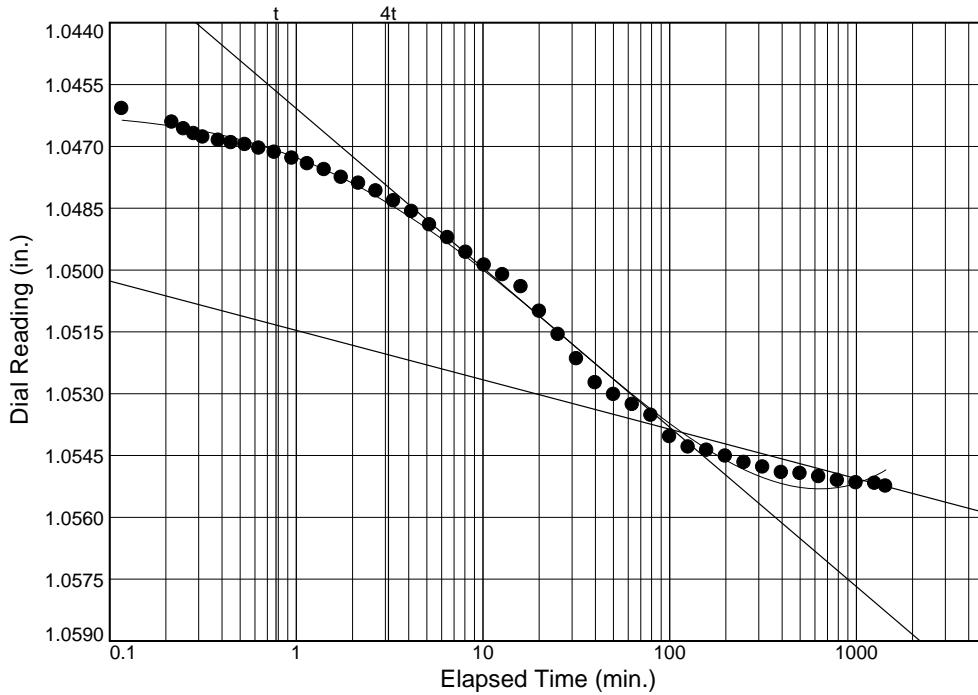
$C_\alpha = 0.002$

Raba-Kistner, Inc.

# Dial Reading vs. Time

Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

Location: B-2      Depth: 6-8      Sample Number: 4

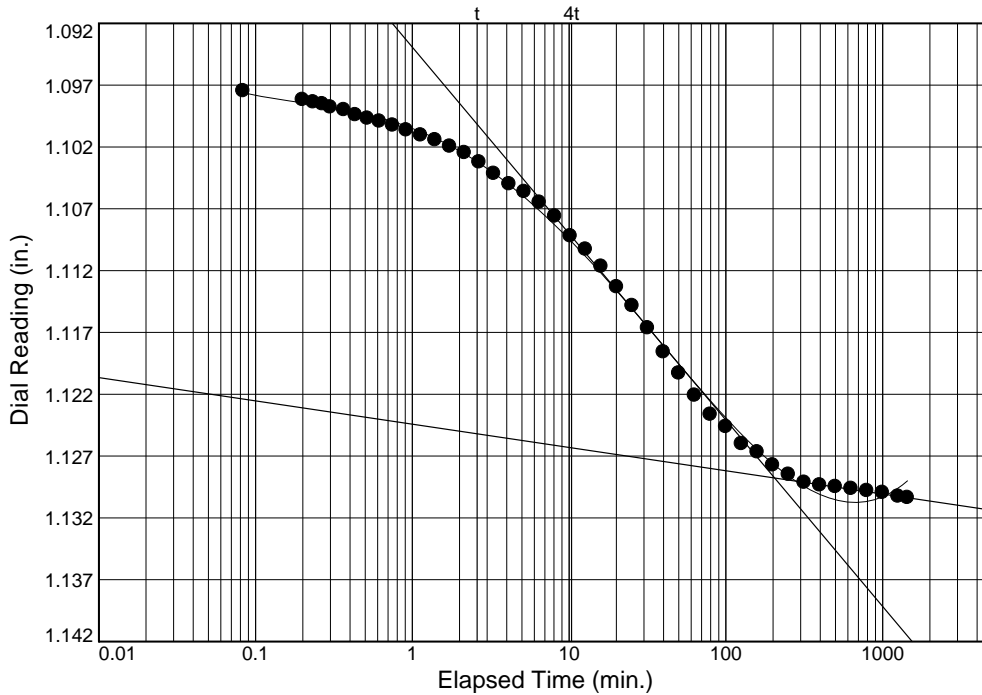
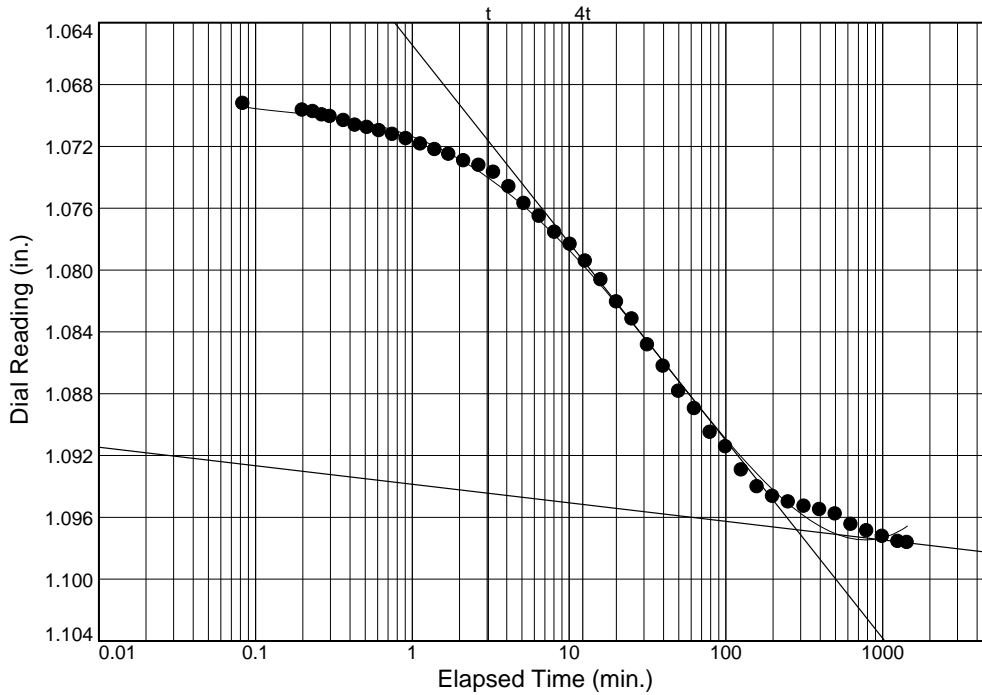


Raba-Kistner, Inc.

# Dial Reading vs. Time

Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

Location: B-2      Depth: 6-8      Sample Number: 4

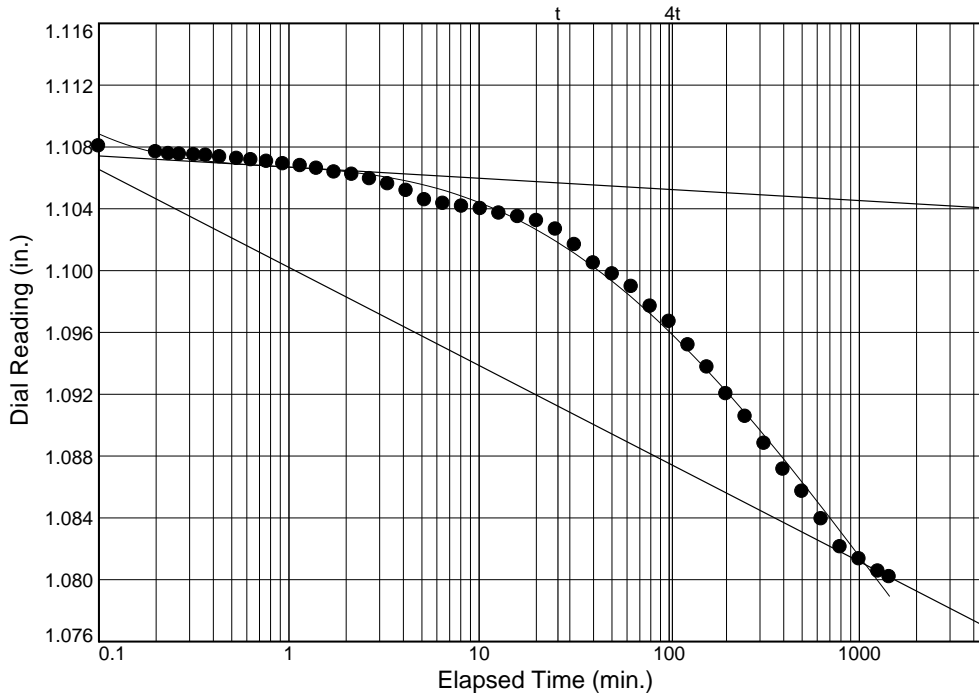
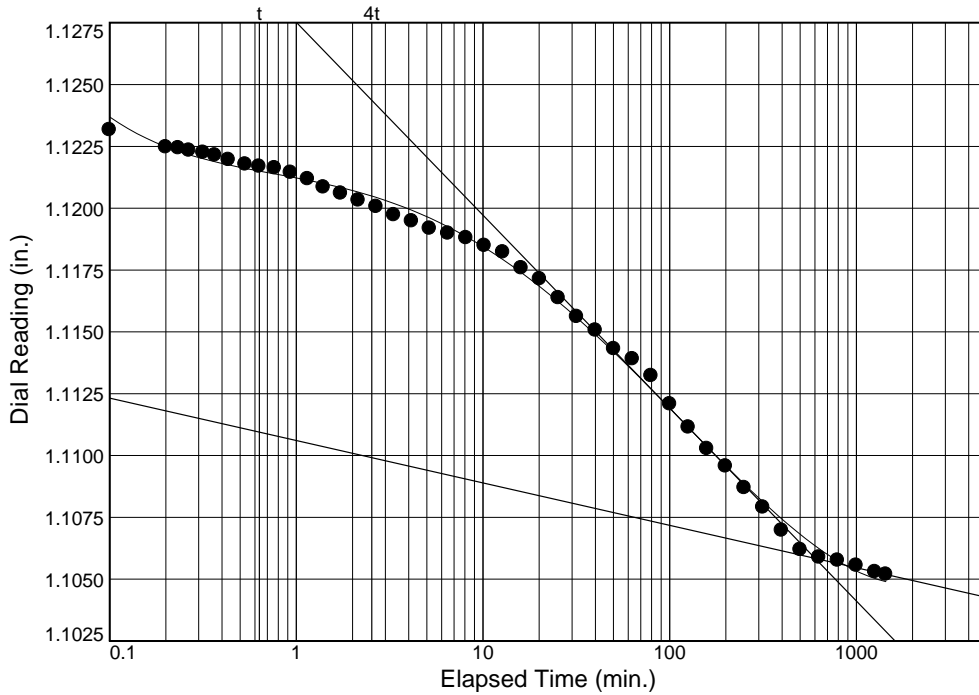


Raba-Kistner, Inc.

# Dial Reading vs. Time

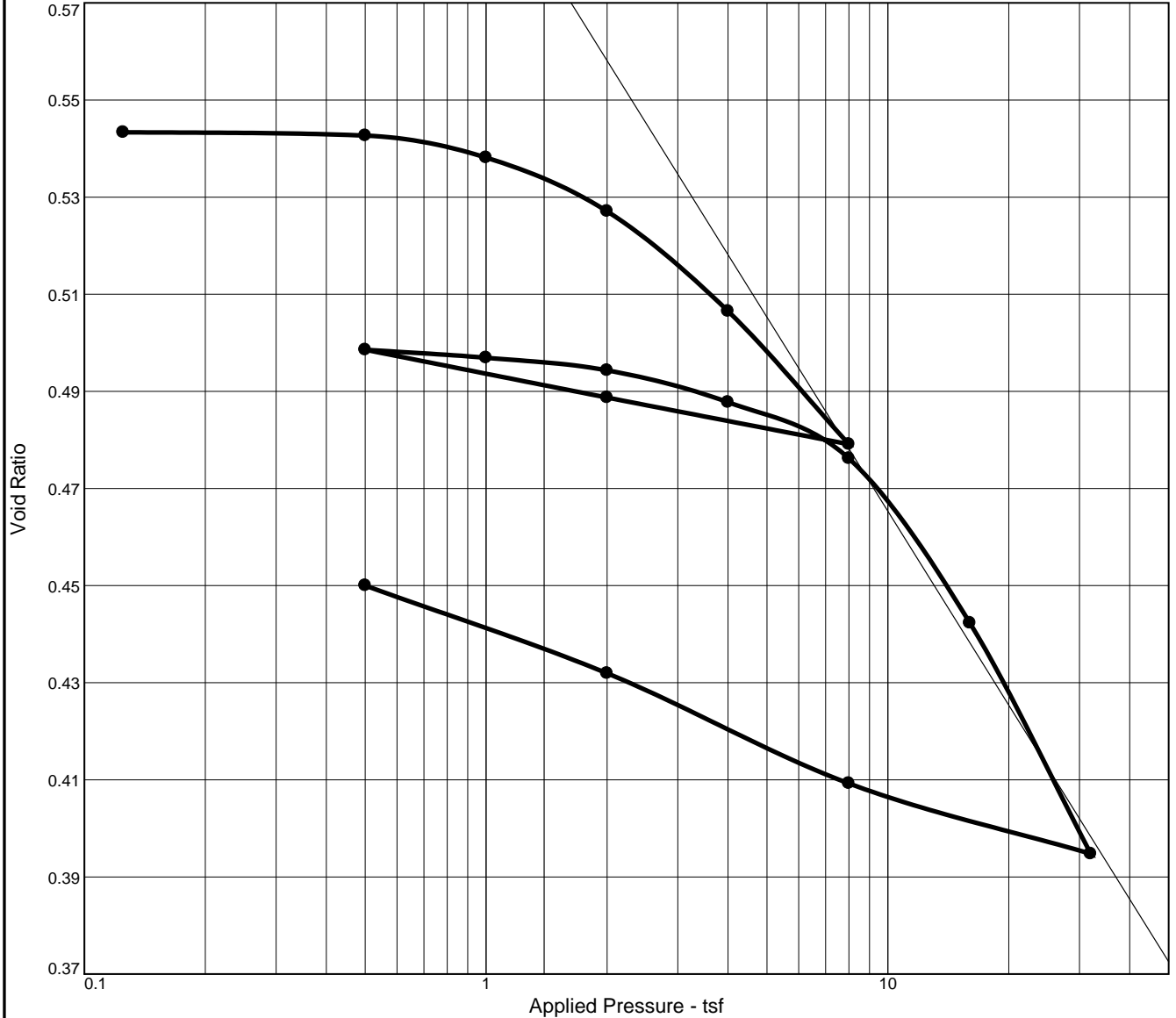
Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

Location: B-2      Depth: 6-8      Sample Number: 4



Raba-Kistner, Inc.

## CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P <sub>c</sub> (tsf)	C <sub>c</sub>	C <sub>r</sub>	Initial Void Ratio
Saturation	Moisture									
90.1 %	18.1 %	109.9	41	23	2.72	2.10	3.4	0.13	0.02	0.546

<b>MATERIAL DESCRIPTION</b>								<b>USCS</b>	<b>AASHTO</b>
Lean Clay (CL), gray								CL	

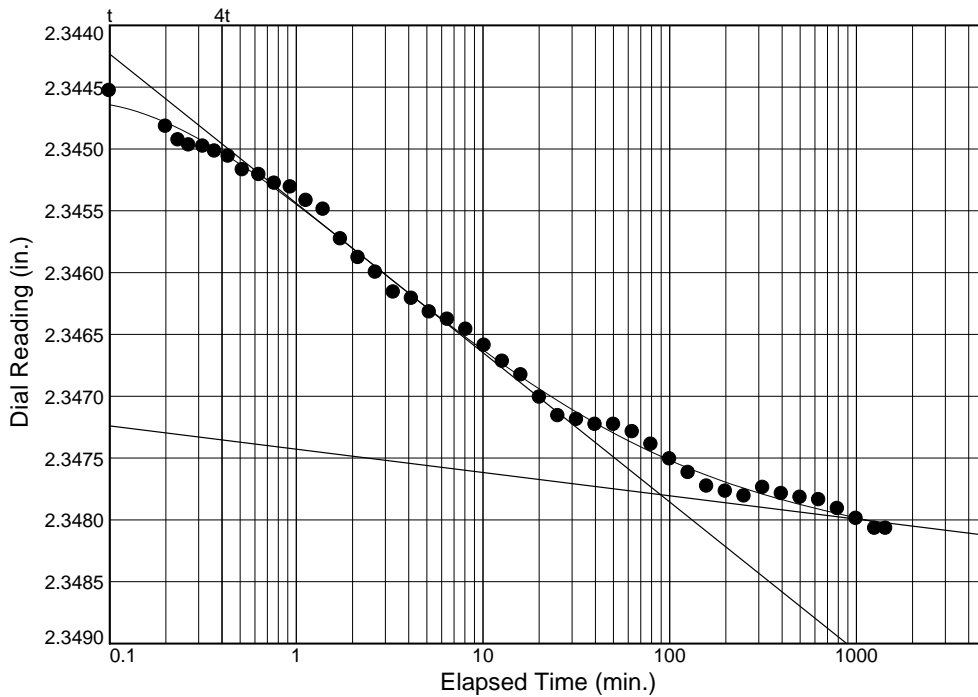
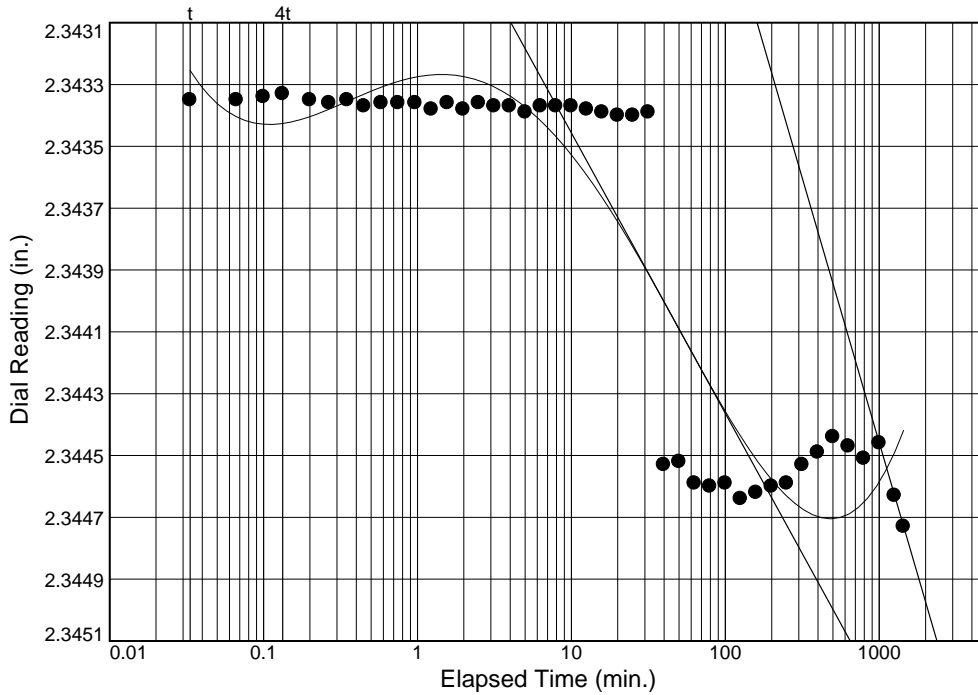
<b>Project No.</b> AHA21-060-00 <b>Client:</b> AIG Technical <b>Project:</b> Ramp-Bridge Crossover Fort Bend Tollway <b>Location:</b> B-3 <b>Depth:</b> 2 <b>Sample Number:</b> 16	<b>Remarks:</b> Specific Gravity Assumed SG = 2.72 %-200 = 88 Swell Pressure = 511 psf
RABA-KISTNER, INC.	

**Tested By:** Reza \_\_\_\_\_ **Checked By:** JDB \_\_\_\_\_

# Dial Reading vs. Time

Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

Location: B-3      Depth: 2      Sample Number: 16



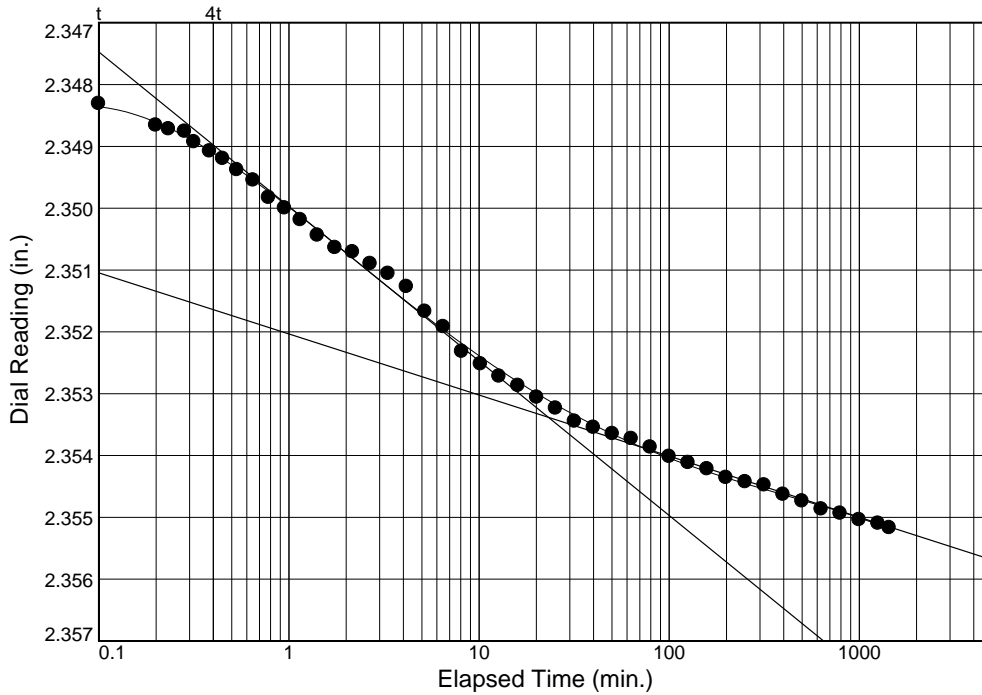
Raba-Kistner, Inc.



# Dial Reading vs. Time

Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

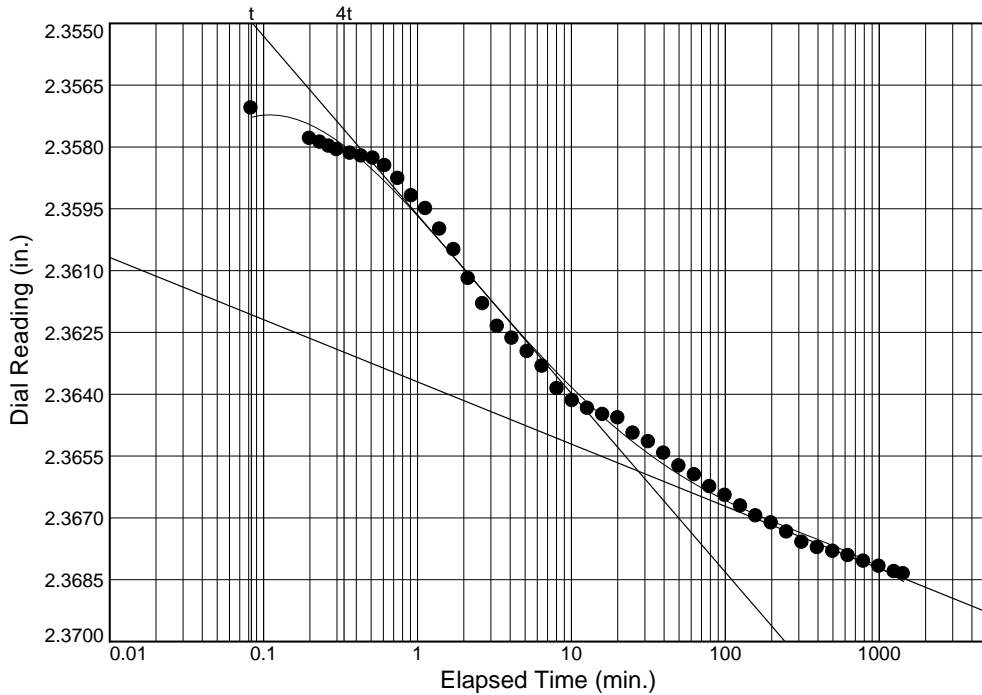
Location: B-3      Depth: 2      Sample Number: 16



Load No.= 4  
 Load= 2.00 tsf  
 $D_0 = 2.3476$   
 $D_{50} = 2.3505$   
 $D_{100} = 2.3534$   
 $T_{50} = 1.62 \text{ min.}$

$C_v @ T_{50}$   
 $0.294 \text{ ft.}^2/\text{day}$

$C_\alpha = 0.002$



Load No.= 5  
 Load= 4.00 tsf  
 $D_0 = 2.3566$   
 $D_{50} = 2.3612$   
 $D_{100} = 2.3659$   
 $T_{50} = 2.32 \text{ min.}$

$C_v @ T_{50}$   
 $0.202 \text{ ft.}^2/\text{day}$

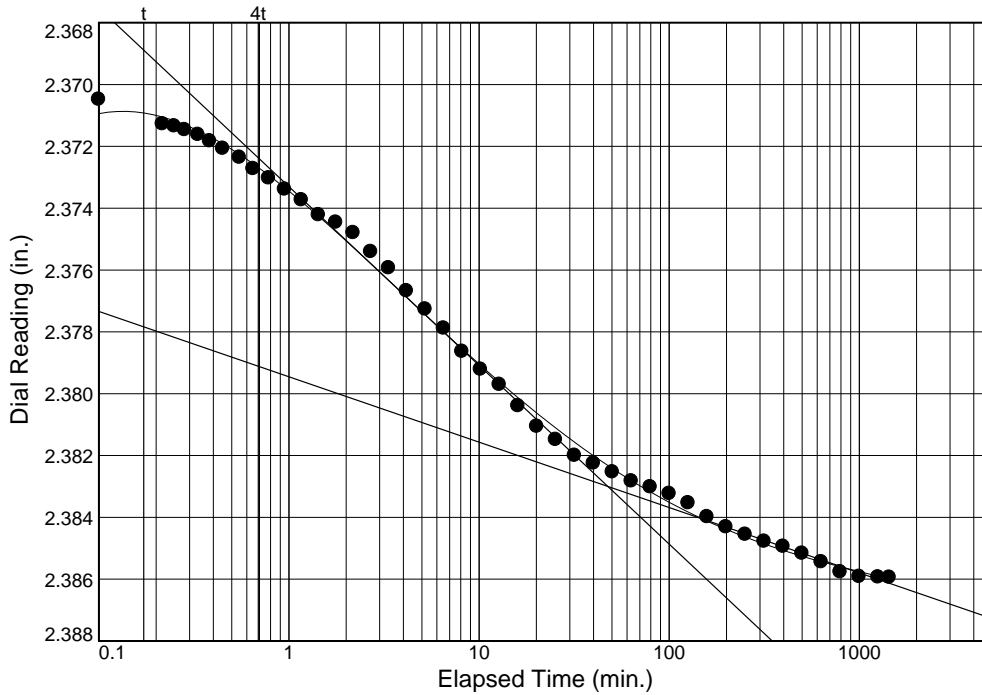
$C_\alpha = 0.002$

Raba-Kistner, Inc.

# Dial Reading vs. Time

Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

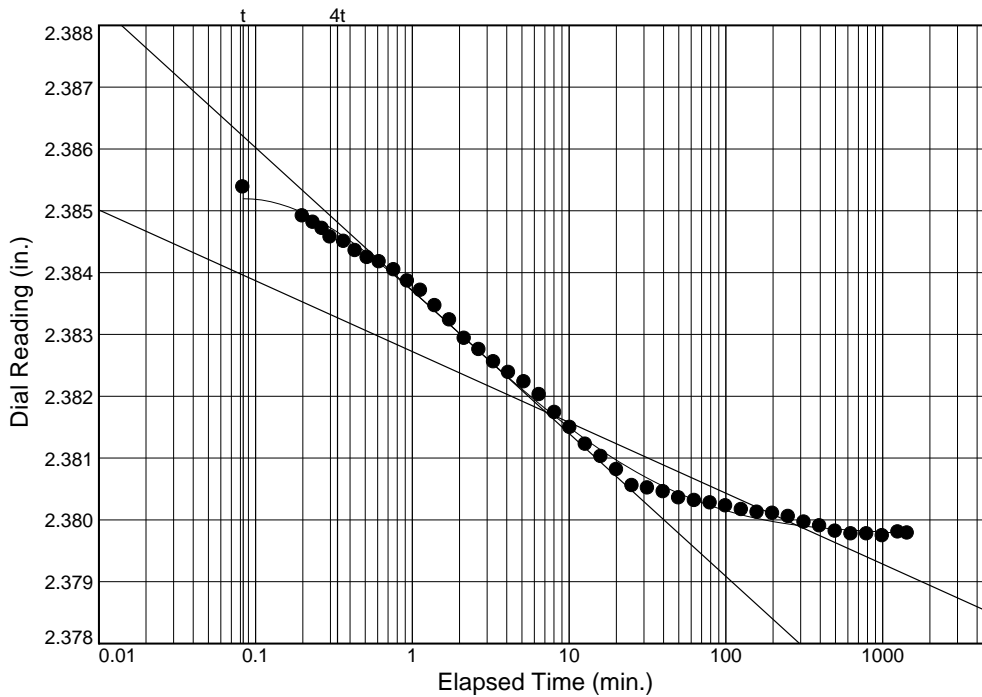
Location: B-3      Depth: 2      Sample Number: 16



Load No.= 6  
 Load= 8.00 tsf  
 $D_0 = 2.3692$   
 $D_{50} = 2.3761$   
 $D_{100} = 2.3830$   
 $T_{50} = 3.02 \text{ min.}$

$C_v @ T_{50}$   
 $0.150 \text{ ft.}^2/\text{day}$

$C_{\alpha} = 0.003$



Load No.= 7  
 Load= 2.00 tsf  
 $D_0 = 2.3857$   
 $D_{50} = 2.3837$   
 $D_{100} = 2.3818$   
 $T_{50} = 0.96 \text{ min.}$

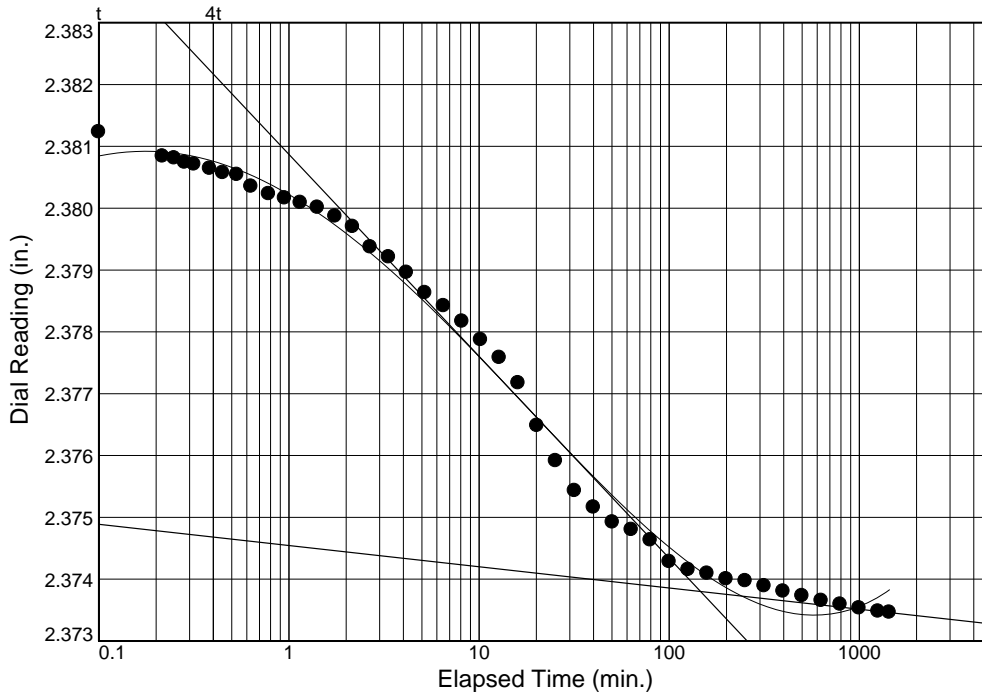
$C_v @ T_{50}$   
 $0.464 \text{ ft.}^2/\text{day}$

Raba-Kistner, Inc.

# Dial Reading vs. Time

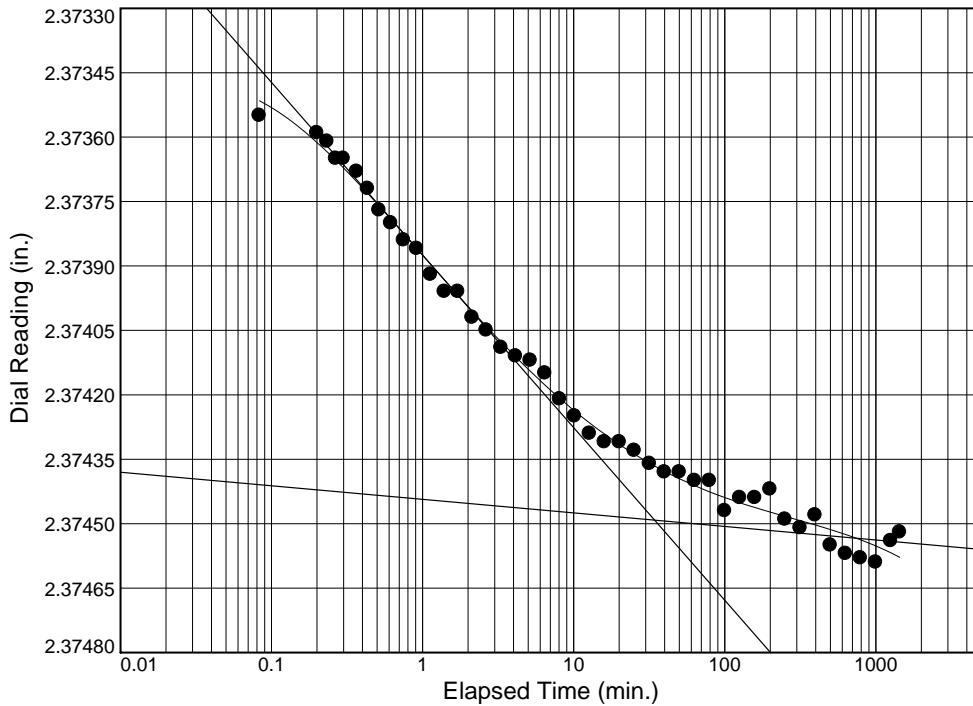
Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

Location: B-3      Depth: 2      Sample Number: 16



Load No.= 8  
 Load= 0.50 tsf  
 $D_0 = 2.3809$   
 $D_{50} = 2.3774$   
 $D_{100} = 2.3738$   
 $T_{50} = 11.82 \text{ min.}$

$C_v @ T_{50}$   
 $0.038 \text{ ft.}^2/\text{day}$



Load No.= 9  
 Load= 1.00 tsf  
 $D_0 = 2.3729$   
 $D_{50} = 2.3737$   
 $D_{100} = 2.3745$   
 $T_{50} = 0.30 \text{ min.}$

$C_v @ T_{50}$   
 $1.527 \text{ ft.}^2/\text{day}$

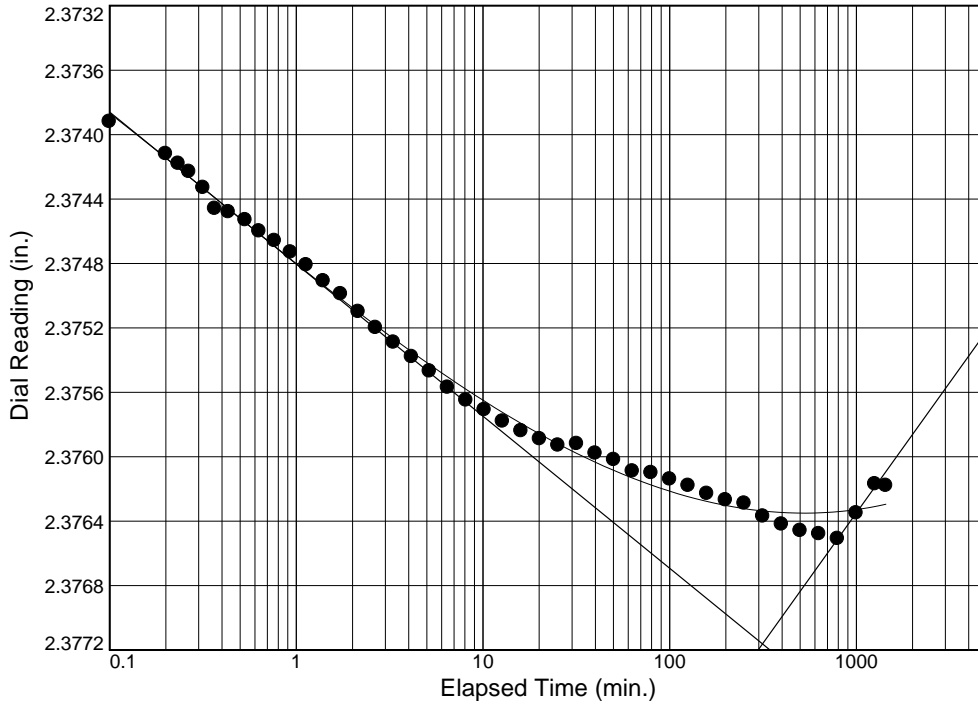
$C_\alpha = 0.000$

Raba-Kistner, Inc.

# Dial Reading vs. Time

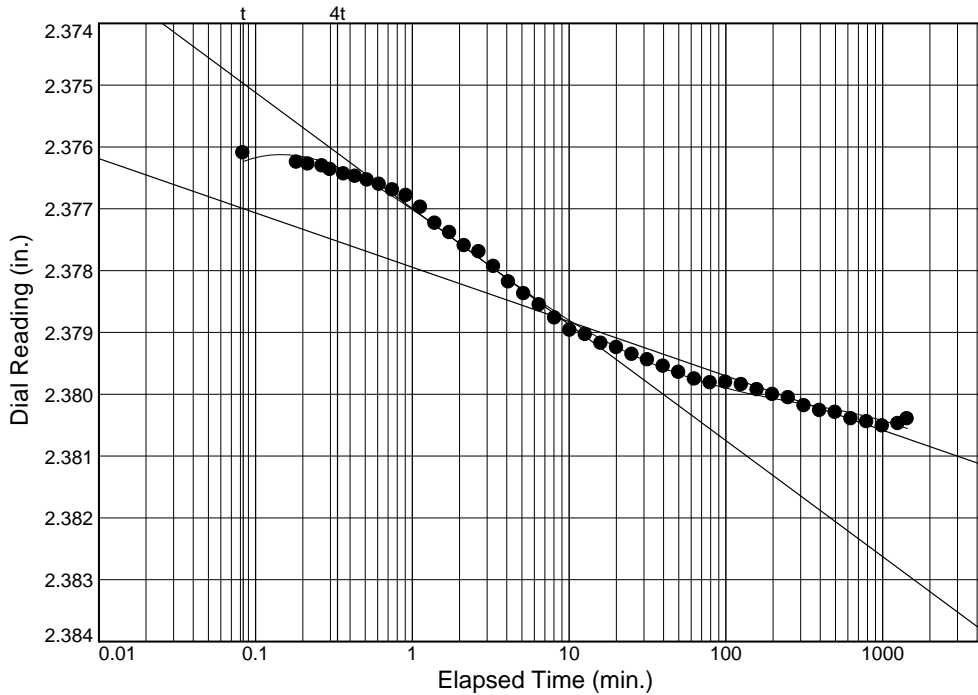
Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

Location: B-3      Depth: 2      Sample Number: 16



Load No.= 10  
 Load= 2.00 tsf  
 $D_0 = 2.3724$   
 $D_{50} = 2.3748$   
 $D_{100} = 2.3772$   
 $T_{50} = 0.95 \text{ min.}$

$C_v @ T_{50}$   
 0.479 ft.<sup>2</sup>/day



Load No.= 11  
 Load= 4.00 tsf  
 $D_0 = 2.3761$   
 $D_{50} = 2.3775$   
 $D_{100} = 2.3788$   
 $T_{50} = 1.78 \text{ min.}$

$C_v @ T_{50}$   
 0.254 ft.<sup>2</sup>/day

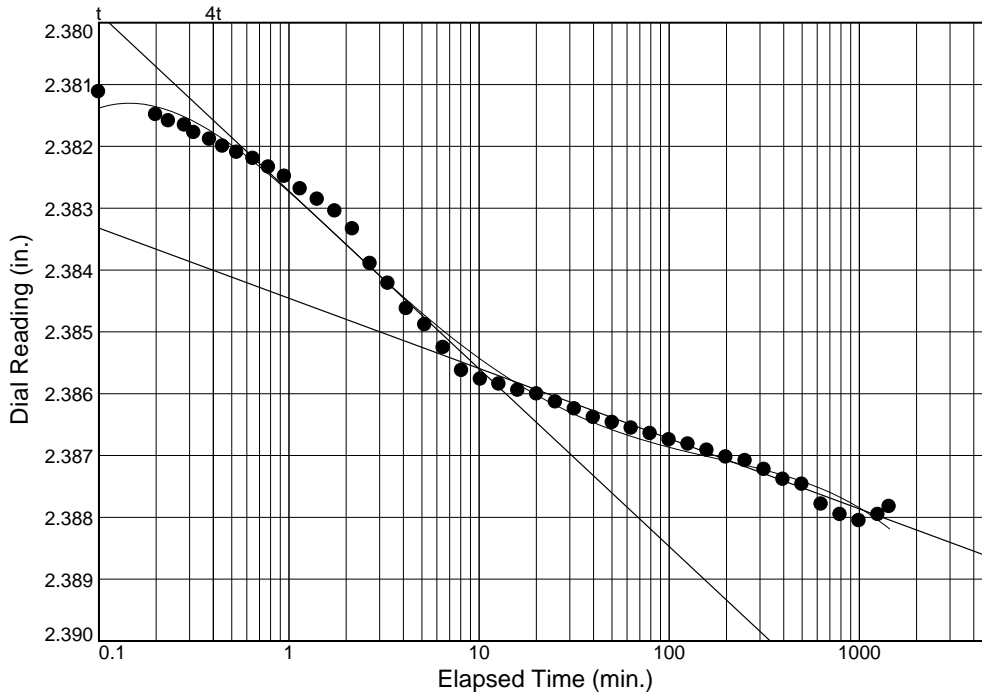
$C_\alpha = 0.001$

Raba-Kistner, Inc.

# Dial Reading vs. Time

Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

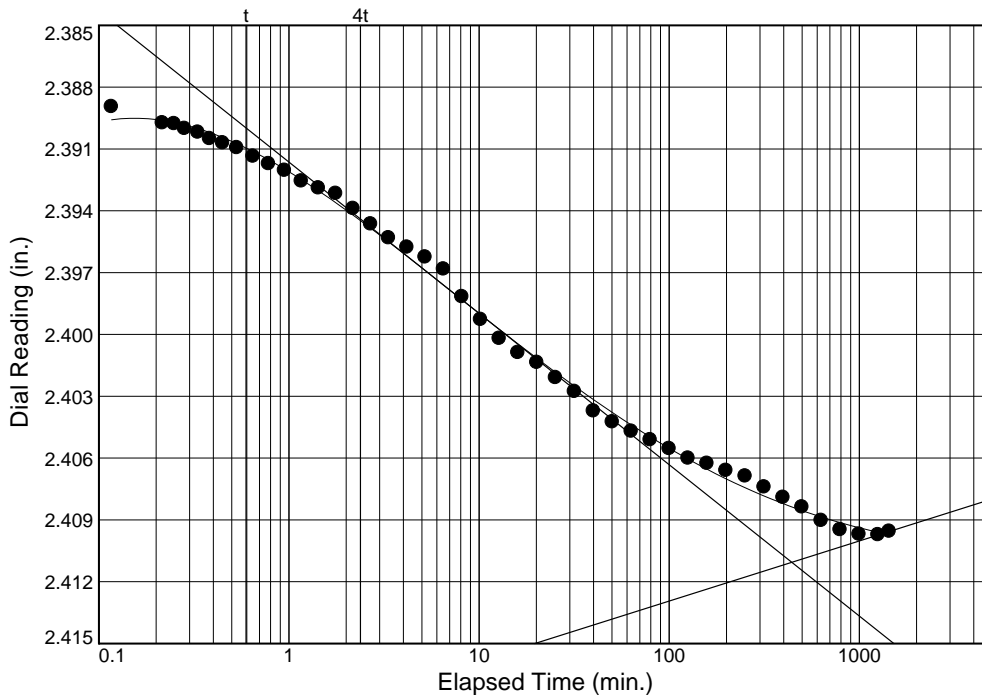
Location: B-3      Depth: 2      Sample Number: 16



Load No.= 12  
 Load= 8.00 tsf  
 $D_0 = 2.3810$   
 $D_{50} = 2.3833$   
 $D_{100} = 2.3856$   
 $T_{50} = 1.57 \text{ min.}$

$C_v @ T_{50}$   
 $0.285 \text{ ft.}^2/\text{day}$

$C_\alpha = 0.002$



Load No.= 13  
 Load= 16.00 tsf  
 $D_0 = 2.3874$   
 $D_{50} = 2.3992$   
 $D_{100} = 2.4111$   
 $T_{50} = 10.87 \text{ min.}$

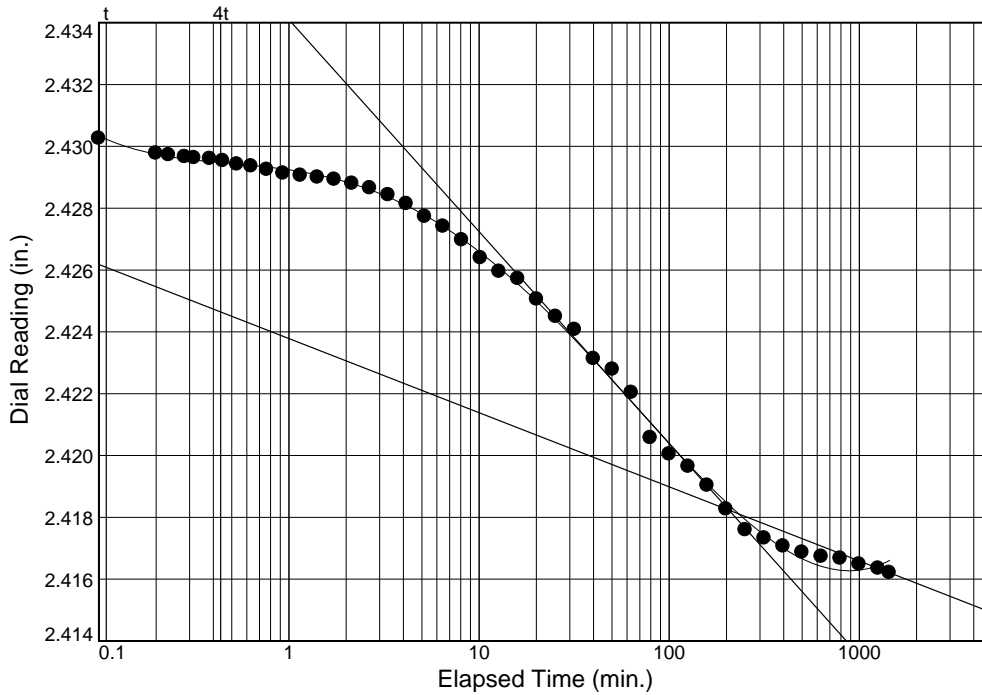
$C_v @ T_{50}$   
 $0.040 \text{ ft.}^2/\text{day}$

Raba-Kistner, Inc.

# Dial Reading vs. Time

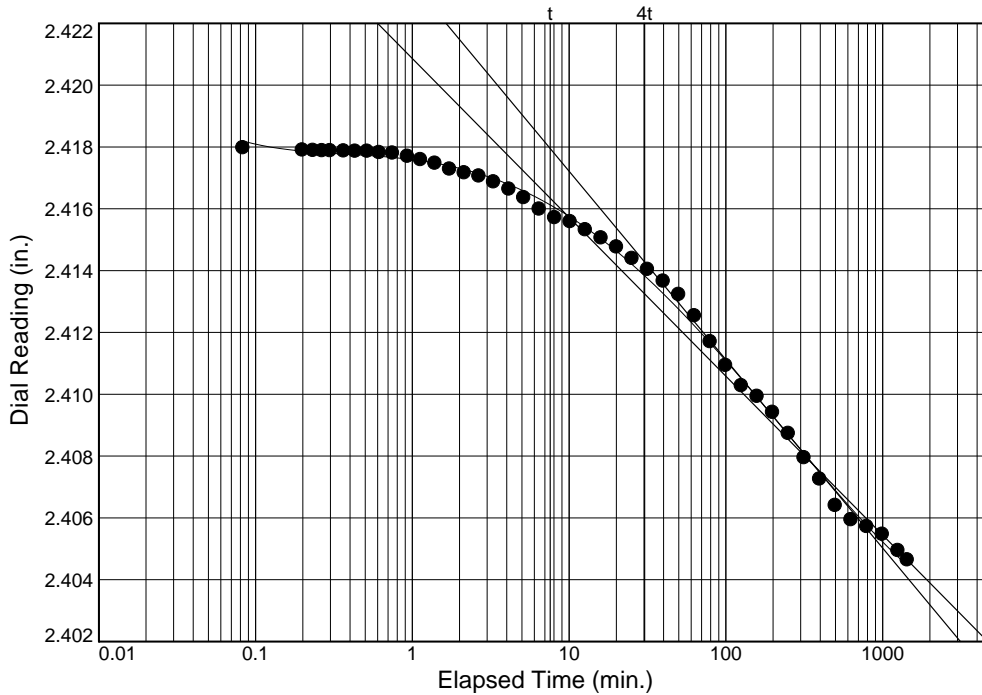
Project No.: AHA21-060-00  
 Project: Ramp-Bridge Crossover

Location: B-3      Depth: 2      Sample Number: 16



Load No.= 16  
 Load= 2.00 tsf  
 $D_0 = 2.4310$   
 $D_{50} = 2.4246$   
 $D_{100} = 2.4182$   
 $T_{50} = 23.15 \text{ min.}$

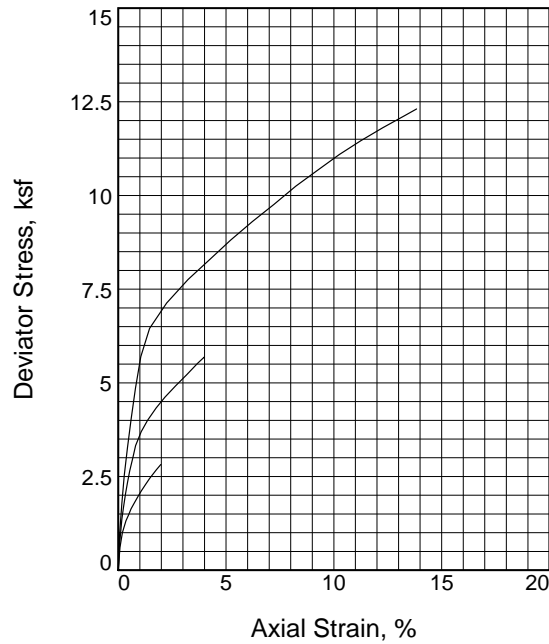
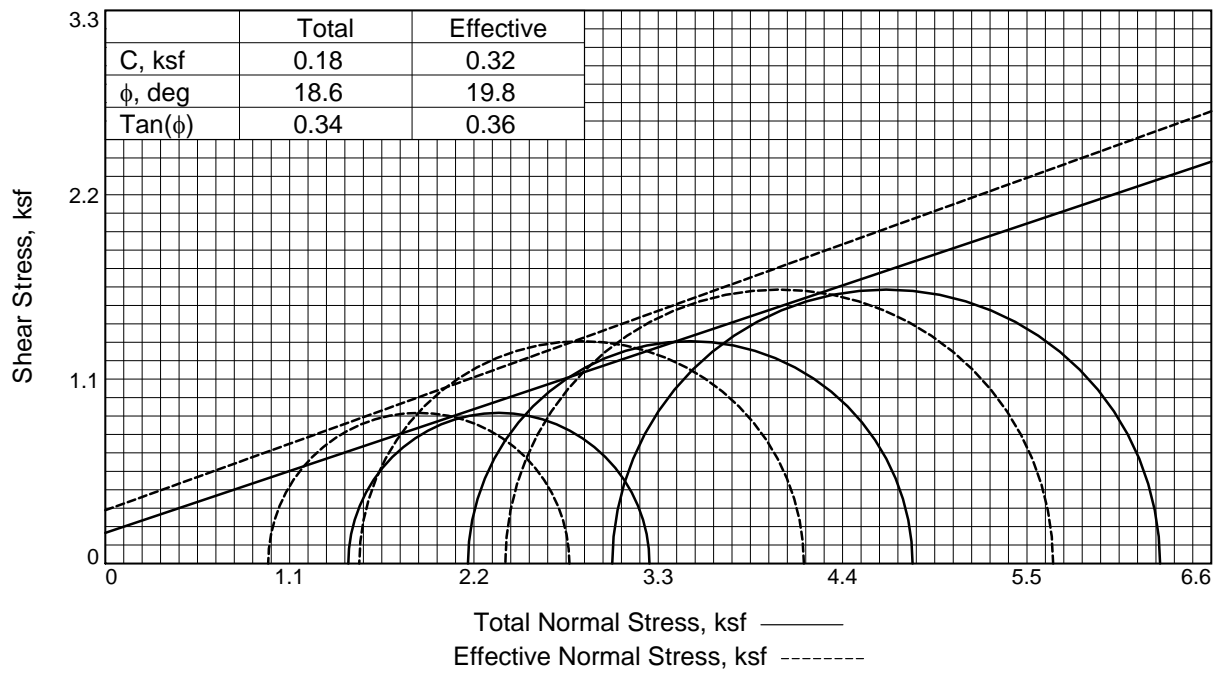
$C_v @ T_{50}$   
 $0.018 \text{ ft.}^2/\text{day}$



Load No.= 17  
 Load= 0.50 tsf  
 $D_0 = 2.4184$   
 $D_{50} = 2.4131$   
 $D_{100} = 2.4077$   
 $T_{50} = 43.47 \text{ min.}$

$C_v @ T_{50}$   
 $0.010 \text{ ft.}^2/\text{day}$

Raba-Kistner, Inc.



Sample No.	1	2	3	
Initial	Water Content, %	17.6	17.6	17.6
	Dry Density, pcf	114.4	114.4	114.4
	Saturation, %	99.5	99.5	99.5
	Void Ratio	0.4783	0.4783	0.4783
	Diameter, in.	2.76	2.76	2.76
	Height, in.	5.72	5.72	5.72
At Test	Water Content, %	18.4	17.9	17.4
	Dry Density, pcf	112.9	113.9	115.0
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4981	0.4849	0.4717
	Diameter, in.	2.78	2.80	2.84
	Height, in.	5.71	5.59	5.36
Strain rate, in./min.	0.000	0.000	0.000	
Back Pressure, psi	75.08	75.07	74.49	
Cell Pressure, psi	85.15	90.10	95.50	
Fail. Stress, ksf	1.80	2.65	3.27	
Total Pore Pr., ksf	11.29	11.46	11.36	
Ult. Stress, ksf	2.82	5.68	12.31	
Total Pore Pr., ksf	11.10	10.66	8.21	
$\bar{\sigma}_1$ Failure, ksf	2.77	4.17	5.66	
$\bar{\sigma}_3$ Failure, ksf	0.97	1.52	2.39	

**Type of Test:**

CU with Pore Pressures

**Sample Type:** Shelby Tube

**Description:** Sandy Lean Clay (CL), gray

LL= 34      PL= 16      PI= 18

**Assumed Specific Gravity=** 2.71

**Remarks:** -%200 = 56

**Client:** AIG Technical

**Location:** B-5

**Sample Number:** 5

**Proj. No.:** AHA21-060-00

**Project:** Ramp-Bridge Crossover

Fort Bend Tollway

Missouri City, Fort Bend County, Texas

**Depth:** 8-10

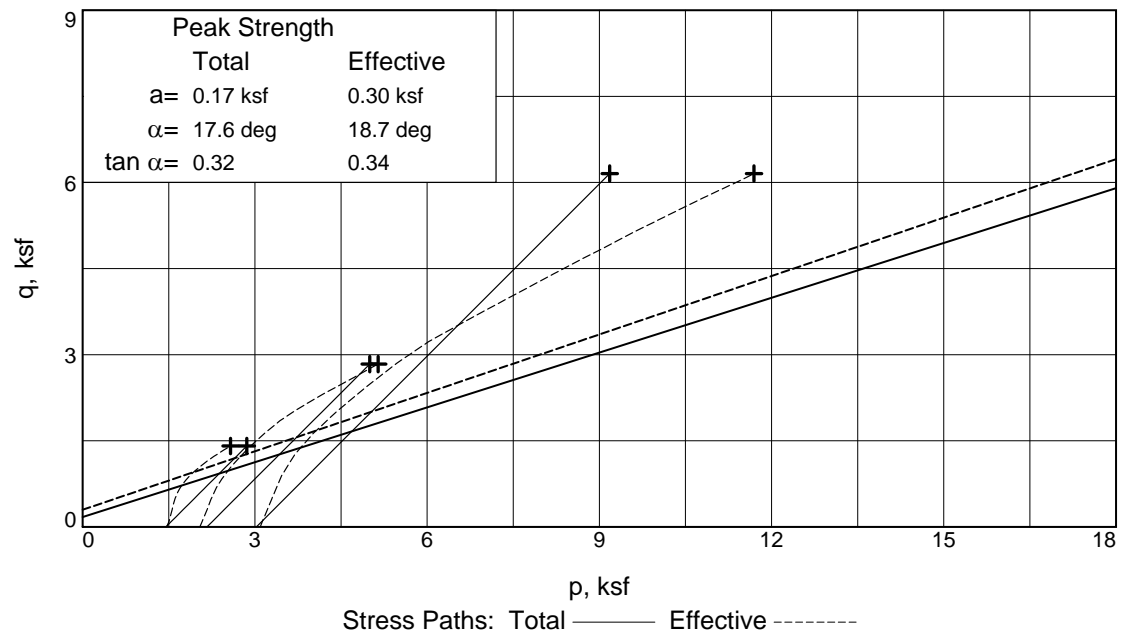
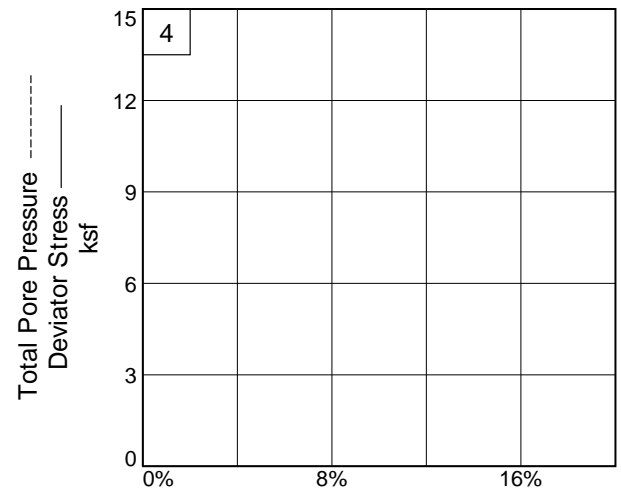
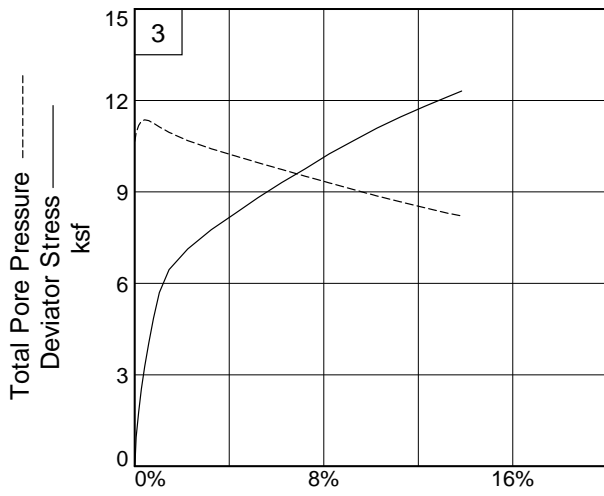
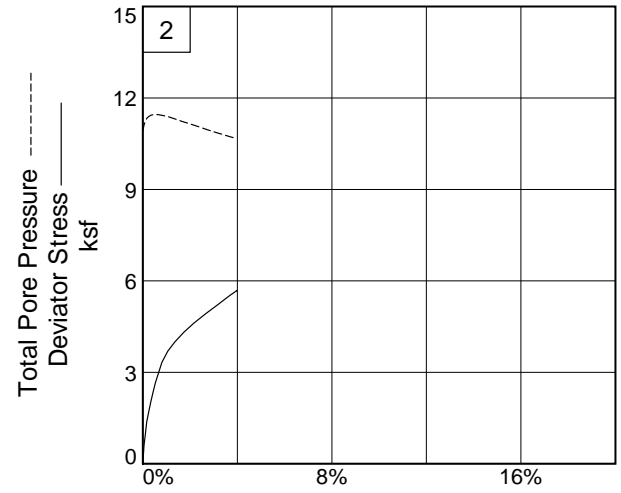
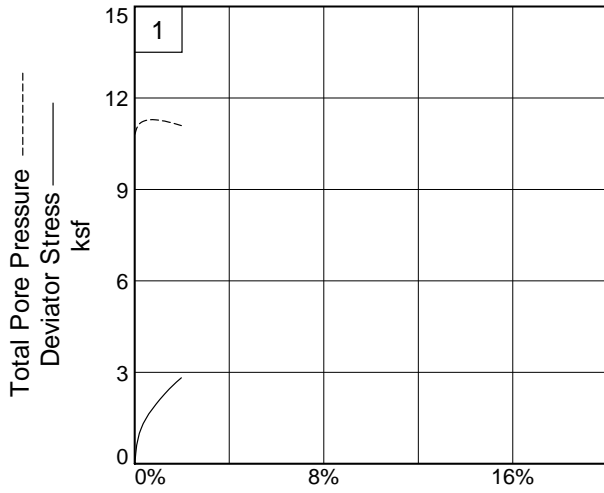
**Date Sampled:** 10/18/21

TRIAxIAL SHEAR TEST REPORT

**RABA-KISTNER, INC.**

Tested By: Reza

Checked By: JDB



**Client:** AIG Technical

**Project:** AHA21-060-00

**Location:** B-5

**Depth:** 8-10

**Sample Number:** 5

**Project No.:** Ramp-Bridge Crossover

**Raba-Kistner, Inc.**

**Tested By:** Reza

**Checked By:** JDB





# FOUNDATION CAPACITY

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
Control

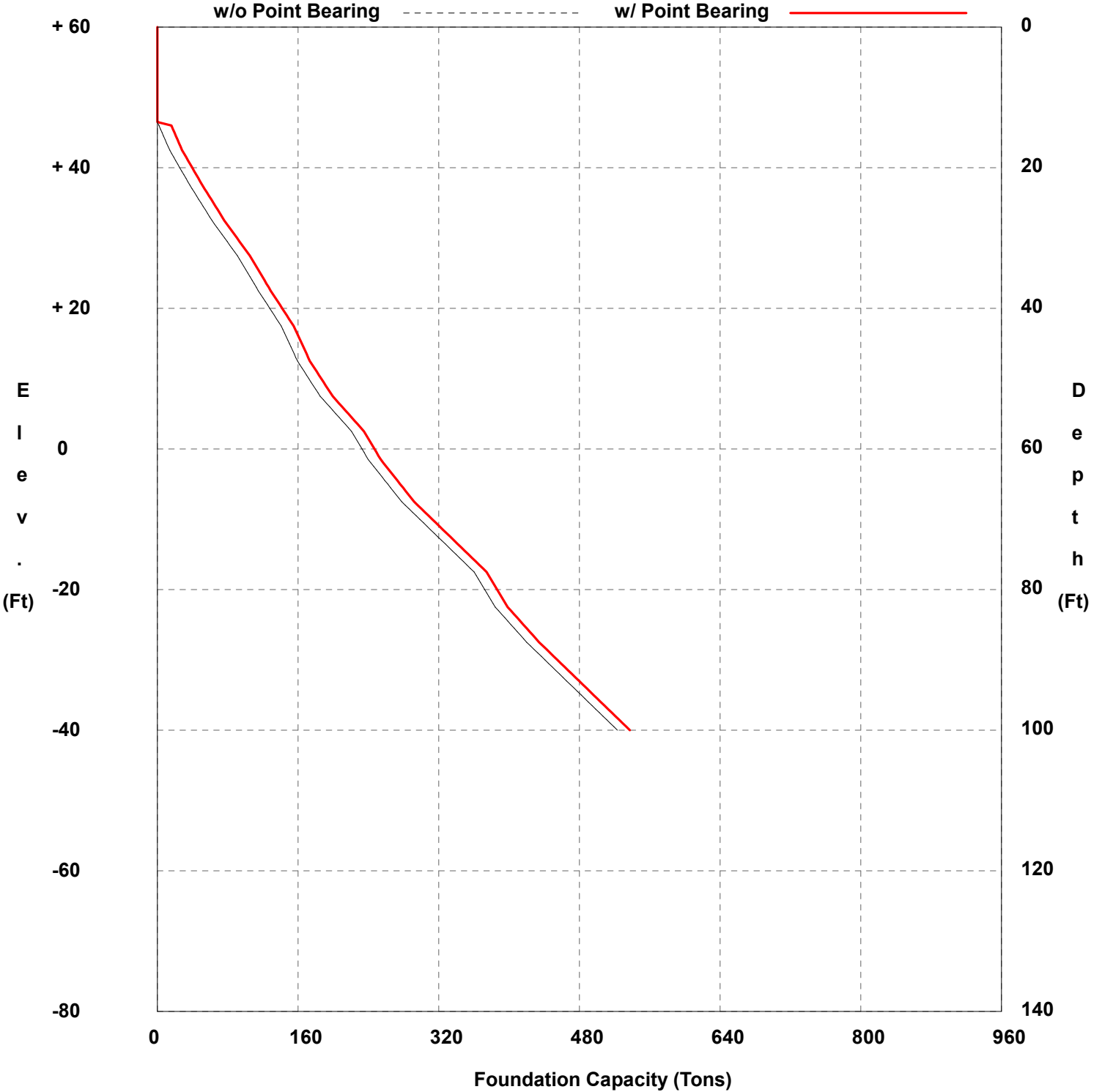
Hole B-2  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/2/21  
Grnd. Elev. 60.00 ft  
GW Elev. N/A

36 inch Drilled Shaft  
90 ton Design Load  
Tip Elevation = + 30

+60 Top Hole Elevation  
+50 Disregard Elevation  
Skin Friction Limit = 1.3 tsf

Disregard above hard strata disabled  
Pb: 2 Diameters Below Tip Checked  
TCP Capacity Values Used  
0.7 Soil Reduction Factor Used





# FOUNDATION CAPACITY

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
Control

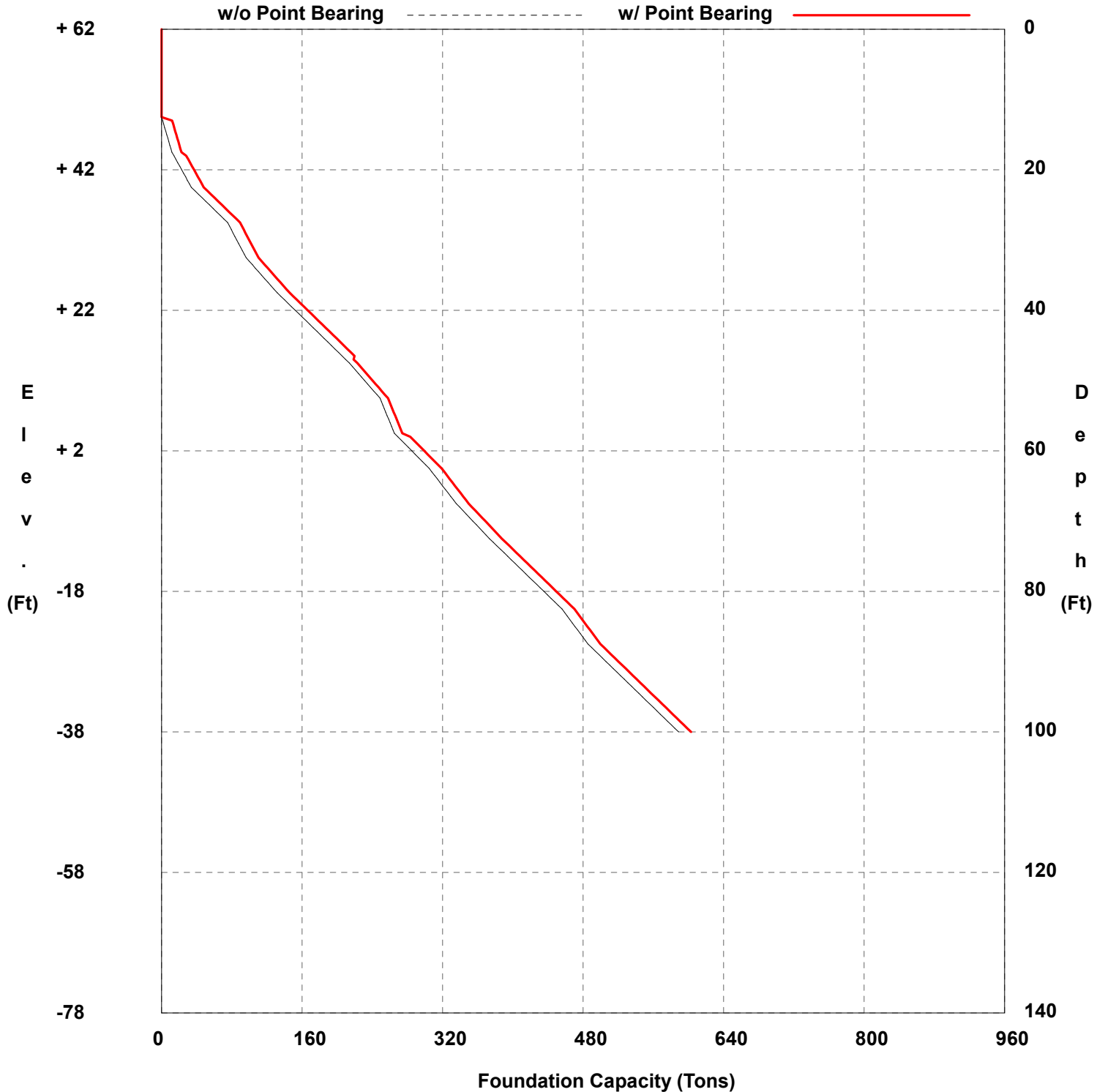
Hole B-3  
Structure Bridge  
Station  
Offset

District Houston  
Date 9/29/21  
Grnd. Elev. 62.00 ft  
GW Elev. N/A

36 inch Drilled Shaft  
90 ton Design Load  
Tip Elevation = + 34

+62 Top Hole Elevation  
+52 Disregard Elevation  
Skin Friction Limit = 1.3 tsf

Disregard above hard strata disabled  
Pb: 2 Diameters Below Tip Checked  
TCP Capacity Values Used  
0.7 Soil Reduction Factor Used





# SOIL STRENGTH ANALYSIS

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
Control

Hole B-1  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/2/21  
Grnd. Elev. 62.00 ft  
GW Elev. N/A

TCP Capacity Values Used

Skin Friction Limit = 1.25 tsf

Soil reduction factor of 0.7 applied

Strata No.	Elev. (Feet)		Design Type	Soil Factor	TCP N Value	TCP Unit Friction (TSF)	Accumulative Friction (T/F)
	From	To					
1	62.0	54.0	CL	60	0	0.00	0.00
2	54.0	49.0	OTHER	80	0	0.00	0.00
2	49.0	44.0	OTHER	80	23	0.20	1.01
3	44.0	39.0	OTHER	80	46	0.40	3.02
3	39.0	34.0	OTHER	80	53	0.46	5.34
3	34.0	29.0	OTHER	80	71	0.62	8.44
4	29.0	24.0	OTHER	80	85	0.74	12.16
4	24.0	19.0	OTHER	80	100	0.88	16.54
5	19.0	14.0	SC	70	43	0.43	18.69
6	14.0	12.0	CH	50	26	0.36	19.42



# SOIL STRENGTH ANALYSIS

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
Control

Hole B-2  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/2/21  
Grnd. Elev. 60.00 ft  
GW Elev. N/A

TCP Capacity Values Used

Skin Friction Limit = 1.25 tsf

Soil reduction factor of 0.7 applied

Strata No.	Elev. (Feet)		Design Type	Soil Factor	TCP N Value	TCP Unit Friction (TSF)	Accumulative Friction (T/F)
	From	To					
1	60.0	52.0	CH	50	0	0.00	0.00
2	52.0	46.0	CL	60	0	0.00	0.00
3	46.0	42.0	SC	70	37	0.37	1.48
3	42.0	37.0	SC	70	49	0.49	3.93
3	37.0	32.0	SC	70	53	0.53	6.58
4	32.0	27.0	OTHER	80	70	0.61	9.64
4	27.0	22.0	OTHER	80	58	0.51	12.18
4	22.0	17.0	OTHER	80	63	0.55	14.94
4	17.0	12.0	OTHER	80	45	0.39	16.91
5	12.0	7.0	CL	60	47	0.55	19.65
5	7.0	2.0	CL	60	65	0.76	23.44
5	2.0	-2.0	CL	60	43	0.50	25.45
6	-2.0	-8.0	CH	50	48	0.67	29.48
6	-8.0	-13.0	CH	50	65	0.88	33.85
6	-13.0	-18.0	CH	50	74	0.88	38.23
7	-18.0	-23.0	SC	70	51	0.51	40.78
7	-23.0	-28.0	SC	70	76	0.76	44.58
8	-28.0	-33.0	OTHER	80	100	0.88	48.95
8	-33.0	-37.5	OTHER	80	100	0.88	52.89
8	-37.5	-40.0	OTHER	80	100	0.88	55.08



# SOIL STRENGTH ANALYSIS

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
Control

Hole B-3  
Structure Bridge  
Station  
Offset

District Houston  
Date 9/29/21  
Grnd. Elev. 62.00 ft  
GW Elev. N/A

TCP Capacity Values Used

Skin Friction Limit = 1.25 tsf

Soil reduction factor of 0.7 applied

Strata No.	Elev. (Feet)		Design Type	Soil Factor	TCP N Value	TCP Unit Friction (TSF)	Accumulative Friction (T/F)
	From	To					
1	62.0	57.0	CH	50	0	0.00	0.00
2	57.0	54.0	SC	70	0	0.00	0.00
2	54.0	49.0	SC	70	0	0.00	0.00
2	49.0	44.0	SC	70	25	0.25	1.25
2	44.0	39.0	SC	70	47	0.47	3.60
3	39.0	34.0	OTHER	80	100	0.88	7.98
3	34.0	29.0	OTHER	80	51	0.45	10.21
3	29.0	24.0	OTHER	80	86	0.75	13.97
3	24.0	19.0	OTHER	80	100	0.88	18.34
4	19.0	14.0	CH	50	62	0.87	22.68
5	14.0	9.0	SC	70	74	0.74	26.38
6	9.0	4.0	CH	50	25	0.35	28.13
7	4.0	-1.0	CL	60	72	0.84	32.33
8	-1.0	-6.0	CL	60	56	0.65	35.60
8	-6.0	-11.0	CL	60	69	0.81	39.63
8	-11.0	-16.0	CL	60	79	0.88	44.00
9	-16.0	-21.0	OTHER	80	100	0.88	48.38
9	-21.0	-26.0	OTHER	80	72	0.63	51.53
9	-26.0	-31.0	OTHER	80	100	0.88	55.90
9	-31.0	-35.5	OTHER	80	100	0.88	59.84
9	-35.5	-38.0	OTHER	80	100	0.88	62.03



# SOIL STRENGTH ANALYSIS

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
Control

Hole B-4  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/4/21  
Grnd. Elev. 62.00 ft  
GW Elev. N/A

TCP Capacity Values Used

Skin Friction Limit = 1.25 tsf

Soil reduction factor of 0.7 applied

Strata No.	Elev. (Feet)		Design Type	Soil Factor	TCP N Value	TCP Unit Friction (TSF)	Accumulative Friction (T/F)
	From	To					
1	62.0	54.0	CL	60	0	0.00	0.00
1	54.0	50.0	CL	60	0	0.00	0.00
2	50.0	44.0	SC	70	15	0.15	0.90
3	44.0	39.0	OTHER	80	23	0.20	1.91
3	39.0	34.0	OTHER	80	23	0.20	2.91
3	34.0	29.0	OTHER	80	33	0.29	4.36
4	29.0	24.0	OTHER	80	39	0.34	6.06
4	24.0	19.0	OTHER	80	51	0.45	8.29
4	19.0	14.5	OTHER	80	55	0.48	10.46
4	14.5	12.0	OTHER	80	62	0.54	11.82



# SOIL STRENGTH ANALYSIS

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
Control

Hole B-5  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/4/21  
Grnd. Elev. 60.00 ft  
GW Elev. N/A

TCP Capacity Values Used

Skin Friction Limit = 1.25 tsf

Soil reduction factor of 0.7 applied

Strata No.	Elev. (Feet)		Design Type	Soil Factor	TCP N Value	TCP Unit Friction (TSF)	Accumulative Friction (T/F)
	From	To					
1	60.0	56.0	CL	60	0	0.00	0.00
2	56.0	52.0	CH	50	0	0.00	0.00
2	52.0	48.0	CH	50	0	0.00	0.00
3	48.0	42.0	OTHER	80	12	0.11	0.63
3	42.0	37.0	OTHER	80	13	0.11	1.20
4	37.0	32.5	OTHER	80	23	0.20	2.10
4	32.5	30.0	OTHER	80	23	0.20	2.61



# SKIN FRICTION DESIGN

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
Control

Hole B-2  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/2/21  
Grnd. Elev. 60.00 ft  
GW Elev. N/A

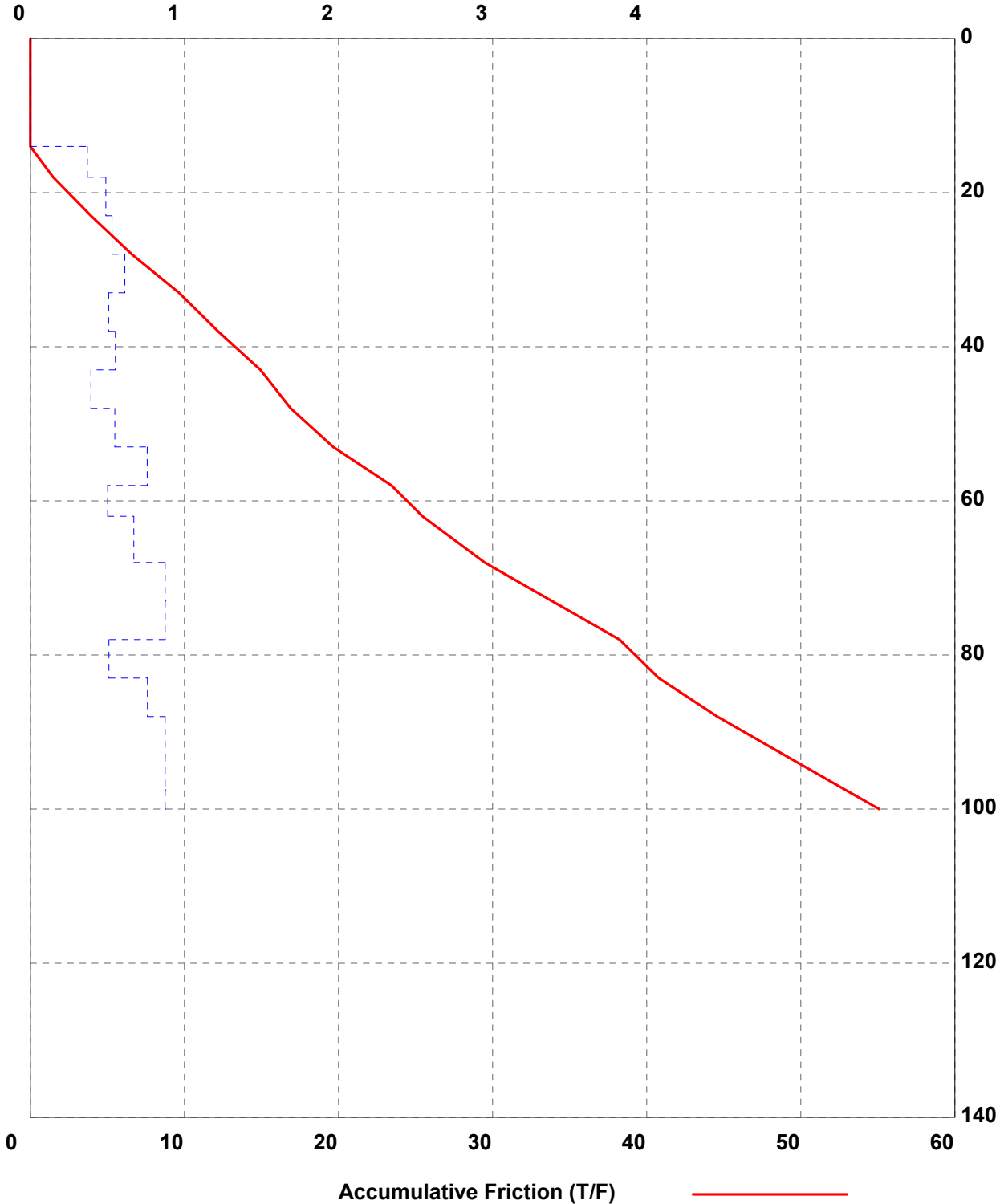
Drilled Shaft Design: Soil Reduction Factor = 0.7

TCP Friction Values Used

Skin Friction Limit = 1.3 tsf

Unit Frictional Resistance (T/SF)

-----







# SKIN FRICTION DESIGN

WinCore  
Version 3.3

County Fort Bend  
Highway Sam Houston  
Control

Hole B-3  
Structure Bridge  
Station  
Offset

District Houston  
Date 9/29/21  
Grnd. Elev. 62.00 ft  
GW Elev. N/A

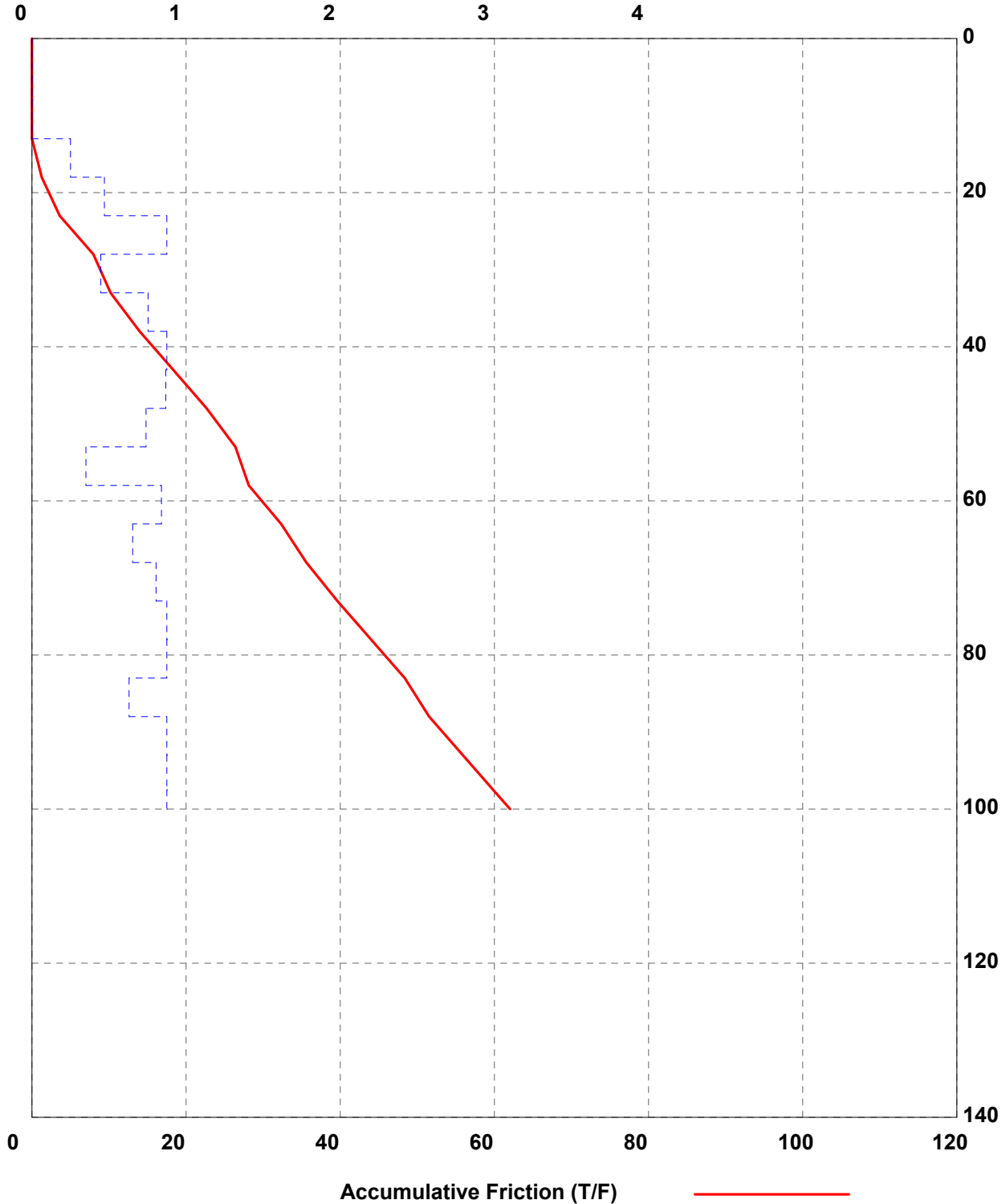
Drilled Shaft Design: Soil Reduction Factor = 0.7

TCP Friction Values Used

Skin Friction Limit = 1.3 tsf

Unit Frictional Resistance (T/SF)

-----





# POINT BEARING DESIGN

WinCore  
Version 3.3

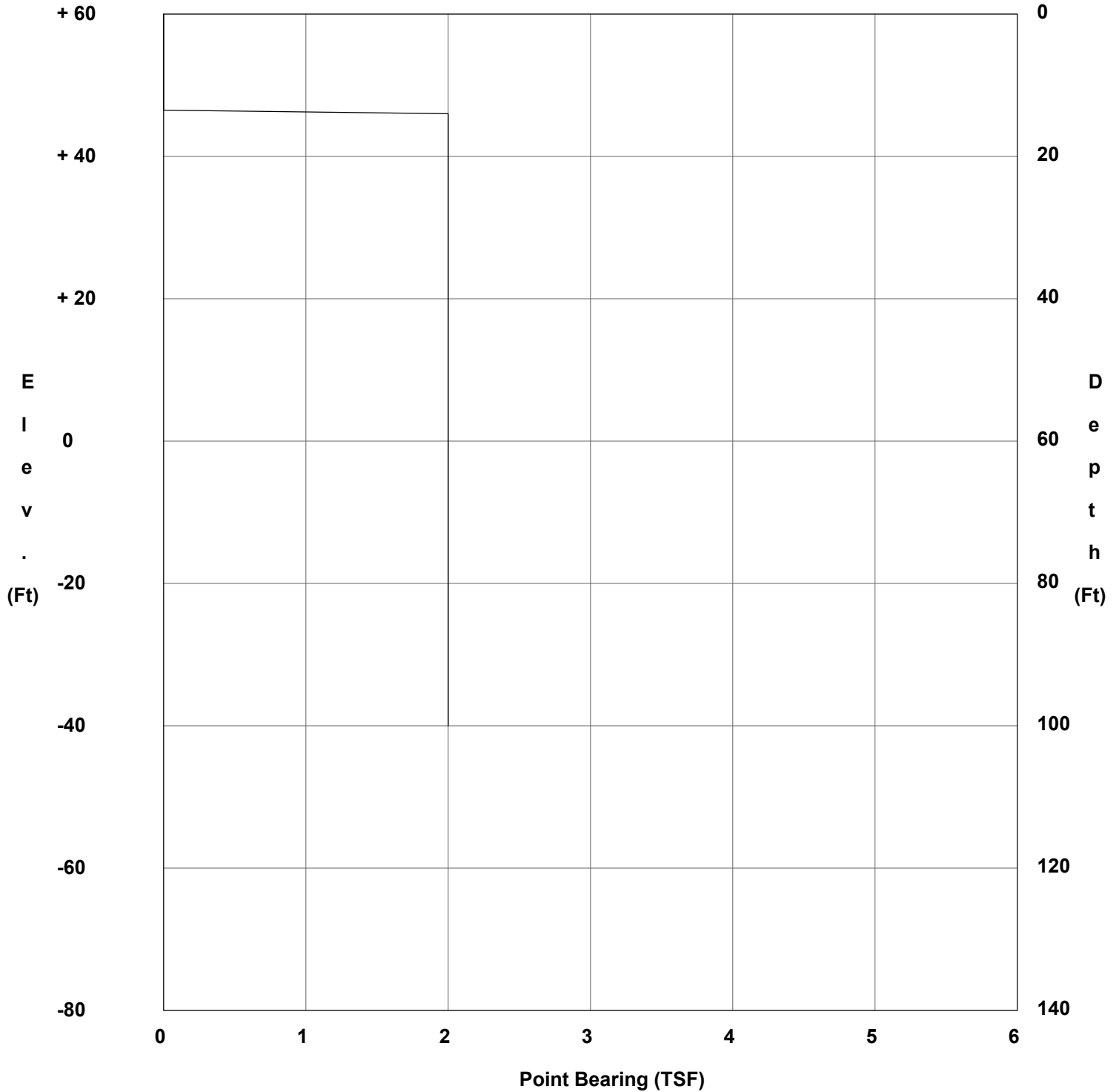
County Fort Bend  
Highway Sam Houston  
Control

Hole B-2  
Structure Bridge  
Station  
Offset

District Houston  
Date 10/2/21  
Grnd. Elev. 60.00 ft  
GW Elev. N/A

Diameters Below Tip Checked = 2

TCP Bearing Values Used





# POINT BEARING DESIGN

WinCore  
Version 3.3

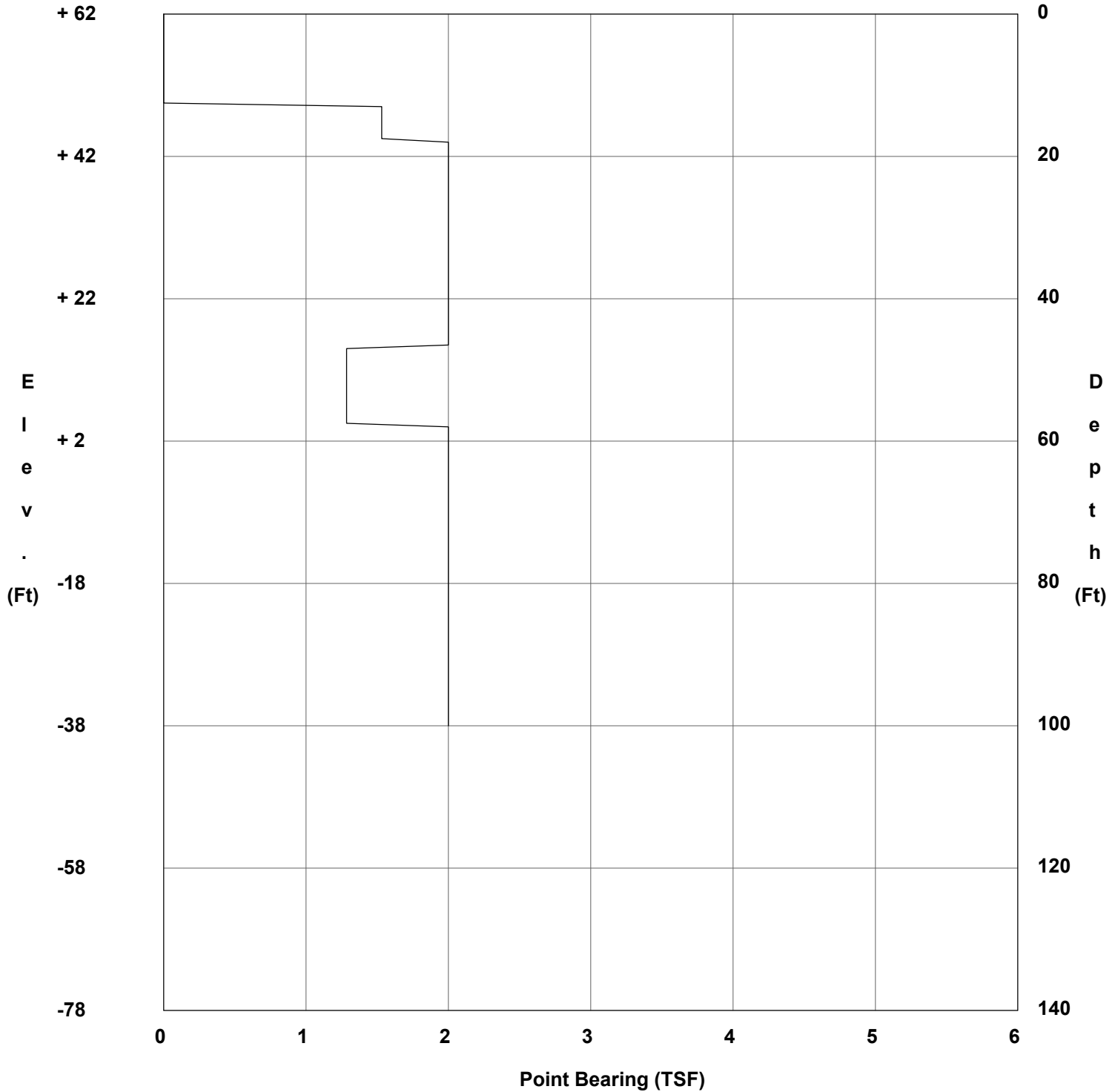
County Fort Bend  
Highway Sam Houston  
Control

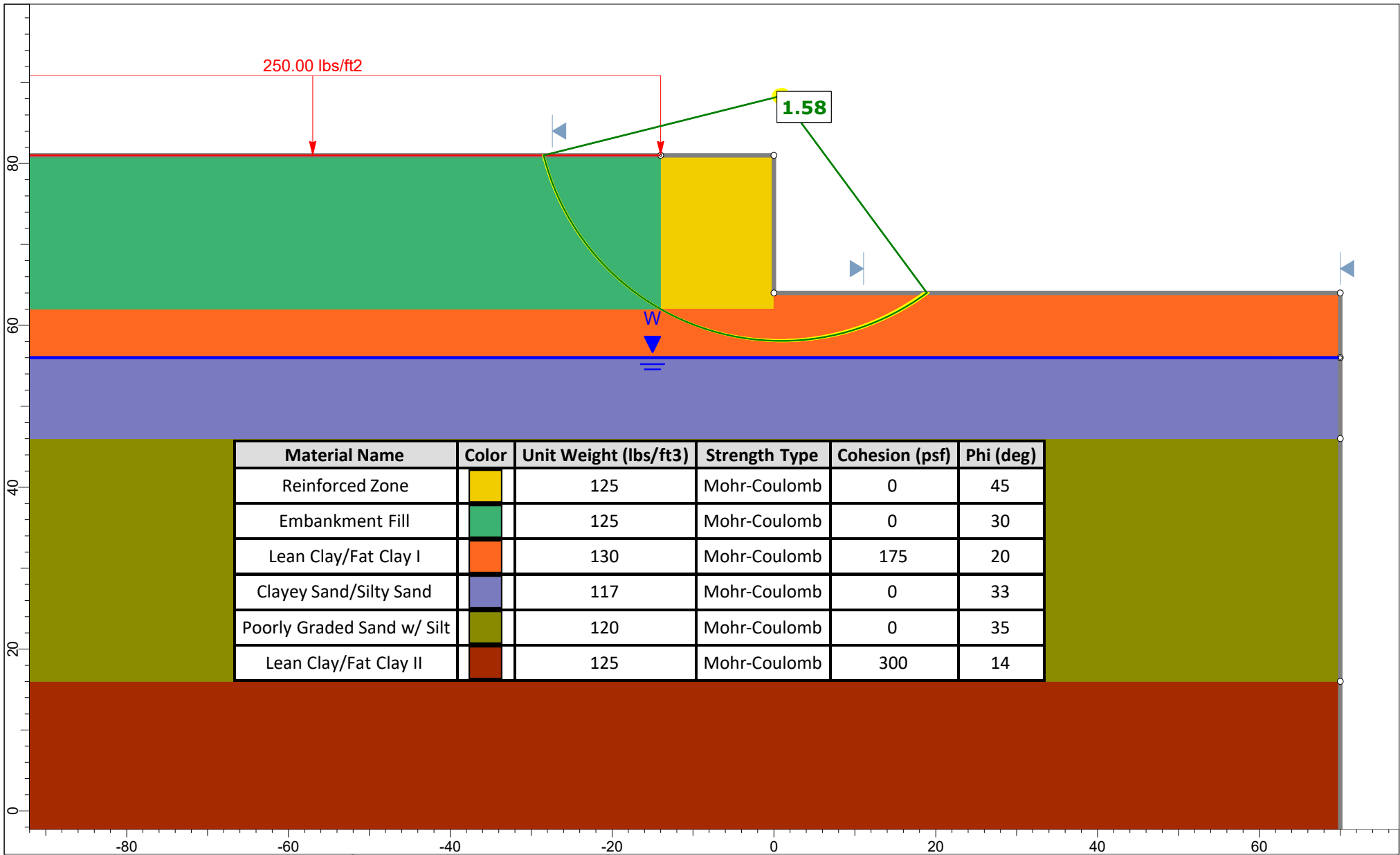
Hole B-3  
Structure Bridge  
Station  
Offset

District Houston  
Date 9/29/21  
Grnd. Elev. 62.00 ft  
GW Elev. N/A

Diameters Below Tip Checked = 2

TCP Bearing Values Used

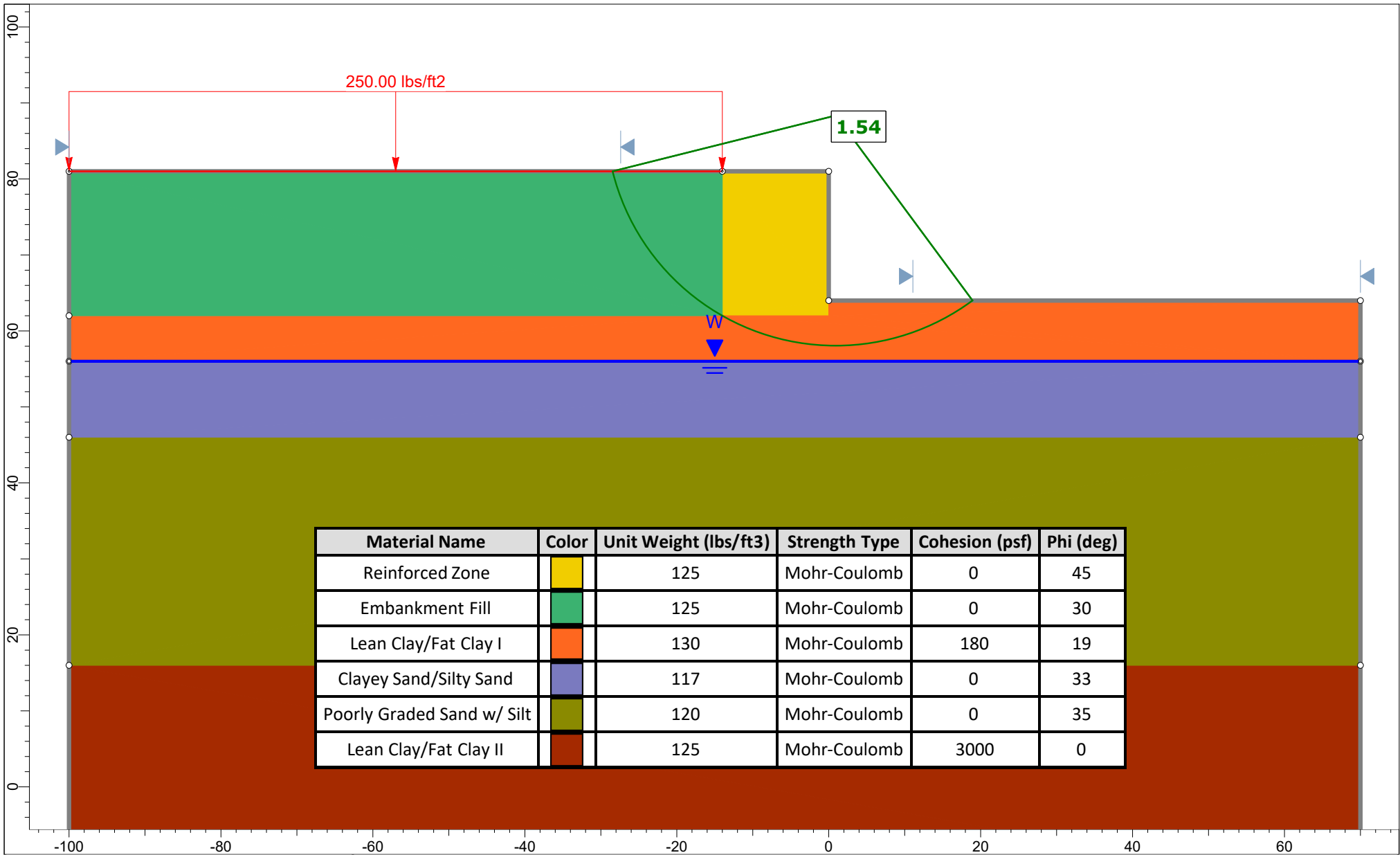




Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Reinforced Zone		125	Mohr-Coulomb	0	45
Embankment Fill		125	Mohr-Coulomb	0	30
Lean Clay/Fat Clay I		130	Mohr-Coulomb	175	20
Clayey Sand/Silty Sand		117	Mohr-Coulomb	0	33
Poorly Graded Sand w/ Silt		120	Mohr-Coulomb	0	35
Lean Clay/Fat Clay II		125	Mohr-Coulomb	300	14

	Project		Proposed FBC Ramp-Bridge Crossover	
	Group	MSE Retaining Wall South Segement_Long Term.slim	Scenario	MSE Retaining Wall South Segement_Long Term.slim
	Drawn By	Phu Thien Tran	Company	Raba Kistner, Inc.
	Date	11/2/2021, 8:32:24 PM	File Name	MSE Retaining Wall South Segement_Long Term.slim
	SLIDEINTERPRET 9.018			

Figure 5a



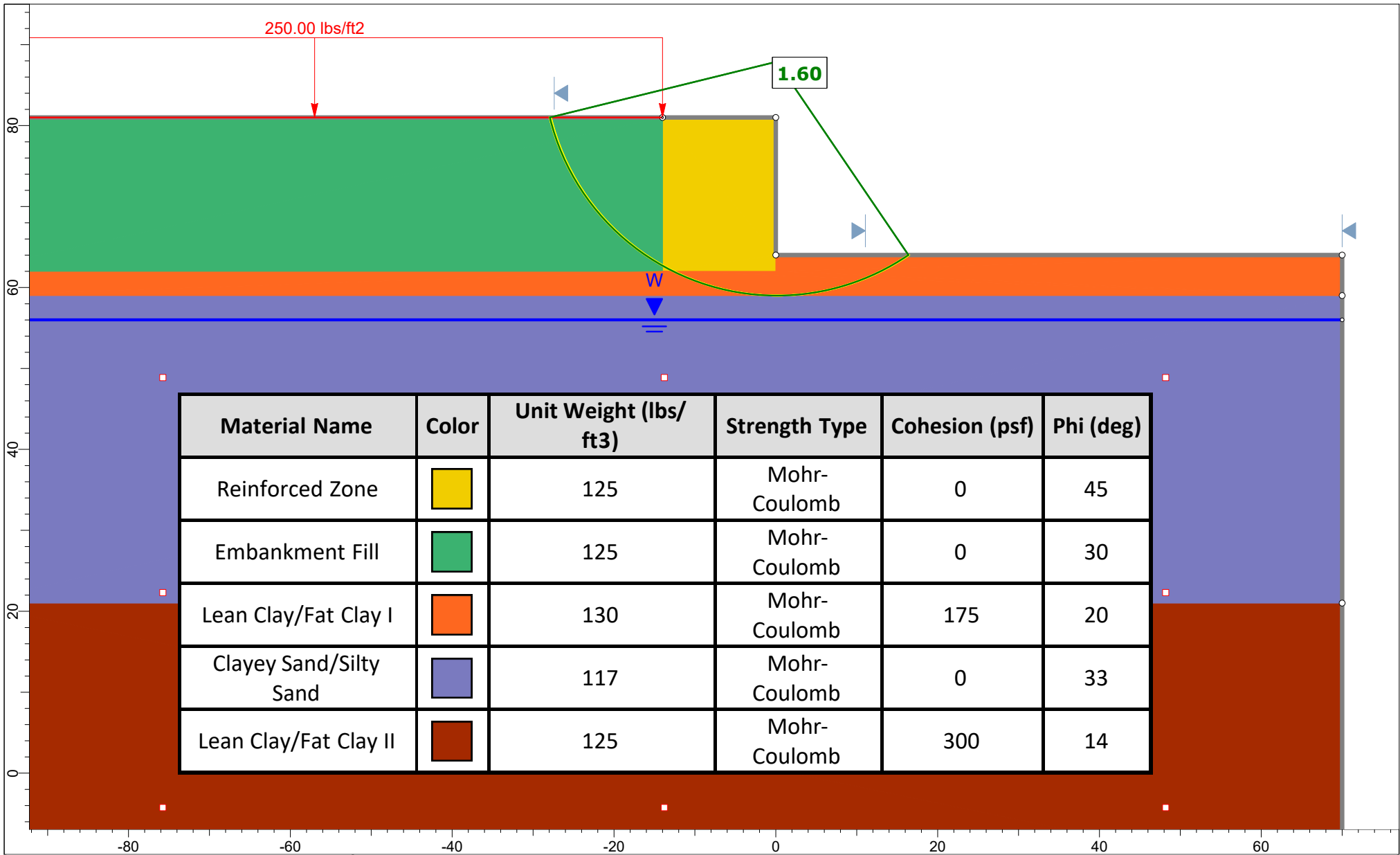
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Reinforced Zone	Yellow	125	Mohr-Coulomb	0	45
Embankment Fill	Green	125	Mohr-Coulomb	0	30
Lean Clay/Fat Clay I	Orange	130	Mohr-Coulomb	180	19
Clayey Sand/Silty Sand	Purple	117	Mohr-Coulomb	0	33
Poorly Graded Sand w/ Silt	Olive	120	Mohr-Coulomb	0	35
Lean Clay/Fat Clay II	Brown	125	Mohr-Coulomb	3000	0



SLIDEINTERPRET 9.018

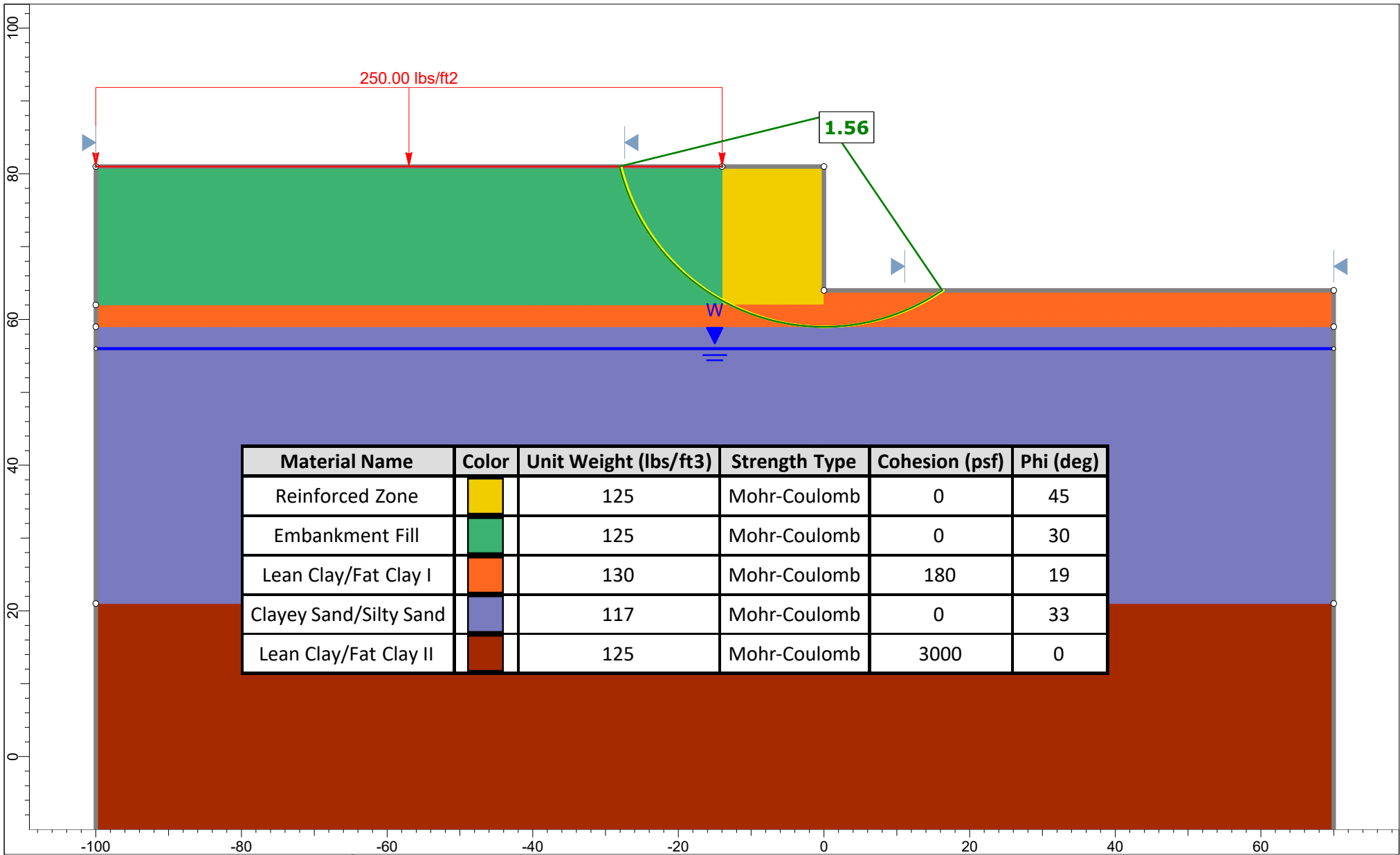
Project		Proposed FBC Ramp-Bridge Crossover	
Group	MSE Retaining Wall South Segement_Short Term.slim	Scenario	MSE Retaining Wall South Segement_Short Term.slim
Drawn By	Phu Thien Tran	Company	Raba Kistner, Inc.
Date	11/2/2021, 8:32:24 PM	File Name	MSE Retaining Wall South Segement_Short Term.slim

Figure 5b



	Project		Proposed FBC Ramp-Bridge Crossover	
	Group	MSE Retaining Wall North Segement_Long Term.slim	Scenario	MSE Retaining Wall North Segement_Long Term.slim
	Drawn By	Phu Thien Tran	Company	Raba Kistner, Inc.
	Date	11/2/2021, 8:32:24 PM	File Name	MSE Retaining Wall North Segement_Long Term.slim
	SLIDEINTERPRET 9.018			

Figure 6a



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Reinforced Zone	Yellow	125	Mohr-Coulomb	0	45
Embankment Fill	Green	125	Mohr-Coulomb	0	30
Lean Clay/Fat Clay I	Orange	130	Mohr-Coulomb	180	19
Clayey Sand/Silty Sand	Blue	117	Mohr-Coulomb	0	33
Lean Clay/Fat Clay II	Brown	125	Mohr-Coulomb	3000	0



SLIDEINTERPRET 9.018

Project			Proposed FBC Ramp-Bridge Crossover		
Group	MSE Retaining Wall North Segement_Short Term.slim	Scenario	MSE Retaining Wall North Segement_Short Term.slim		
Drawn By	Phu Thien Tran	Company	Raba Kistner, Inc.		
Date	11/2/2021, 8:32:24 PM	File Name	MSE Retaining Wall North Segement_Short Term.slim		

Figure 6b



Proposed FBC Ramp-Bridge Crossover  
Raba Kistner, Inc.  
Report Creation Date: 2021/11/05, 14:57:54



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# Settle3 Analysis Information

## Proposed FBC Ramp-Bridge Crossover

### Project Settings

---

Document Name	MSE Retaining Wall North Segment
Project Title	Proposed FBC Ramp-Bridge Crossover
Analysis	MSE Retaining Wall Structures - North Segment
Author	Phu Thien Tran
Company	Raba Kistner, Inc.
Date Created	11/2/2021
Stress Computation Method	Westergaard
Time-dependent Consolidation Analysis	
Time Units	years
Permeability Units	feet/year
Minimum settlement ratio for subgrade modulus	0.9
Use average properties to calculate layered stresses	
Improve consolidation accuracy	
Ignore negative effective stresses in settlement calculations	

## Stage Settings

---

Stage #	Name	Time [years]
1	Start	0
2	3 Months	0.25
3	6 Months	0.5
4	1 Year	1
5	2 Years	2
6	5 Years	5
7	10 Years	10
8	15 Years	15
9	25 Years	25
10	50 Years	50
11	75 Years	75

## Results

Time taken to compute: 0 seconds

### Stage: Start = 0 y

Data Type	Minimum	Maximum
Total Settlement [in]	0	3.9386
Total Consolidation Settlement [in]	0	2.60874
Virgin Consolidation Settlement [in]	0	1.04793
Recompression Consolidation Settlement [in]	0	1.56252
Immediate Settlement [in]	0	1.35174
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	-5.4964e-11	3.036
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	-5.4964e-11	8.65527
Effective Stress XX [ksf]	0	7.6636
Effective Stress YY [ksf]	0	7.6636
Total Stress ZZ [ksf]	-5.4964e-11	13.2623
Total Stress XX [ksf]	0	13.2623
Total Stress YY [ksf]	0	13.2623
Modulus of Subgrade Reaction (Total) [ksf/ft]	-5.97656e-08	9.24999
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	-8.91869e-08	28.7928
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-1.81171e-07	13.9654
Total Strain	1.17223e-07	0.108528
Pore Water Pressure [ksf]	0	6.36306
Excess Pore Water Pressure [ksf]	0	2.6035
Degree of Consolidation [%]	0	82.4078
Pre-consolidation Stress [ksf]	0.468	22.7997
Over-consolidation Ratio	1	11.9982
Void Ratio	0	0.624999
Permeability [ft/y]	0	0.504618
Coefficient of Consolidation [ft <sup>2</sup> /y]	0	30
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	-2.22045e-16	0.273207

### Stage: 3 Months = 0.25 y

<b>Data Type</b>	<b>Minimum</b>	<b>Maximum</b>
Total Settlement [in]	0	4.34152
Total Consolidation Settlement [in]	-0.000539117	3.01166
Virgin Consolidation Settlement [in]	0	1.09076
Recompression Consolidation Settlement [in]	-0.000539117	1.92531
Immediate Settlement [in]	0	1.35174
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	-5.4964e-11	3.036
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	0	8.65527
Effective Stress XX [ksf]	0	7.6636
Effective Stress YY [ksf]	0	7.6636
Total Stress ZZ [ksf]	0	13.2623
Total Stress XX [ksf]	0	13.2623
Total Stress YY [ksf]	0	13.2623
Modulus of Subgrade Reaction (Total) [ksf/ft]	-5.36083e-08	8.39153
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	-8.91869e-08	28.7928
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-1.34383e-07	12.097
Total Strain	1.17223e-07	0.108528
Pore Water Pressure [ksf]	0	6.55791
Excess Pore Water Pressure [ksf]	0	0.884124
Degree of Consolidation [%]	0	93.2759
Pre-consolidation Stress [ksf]	0.468	22.7997
Over-consolidation Ratio	1	11.9982
Void Ratio	0	0.624999
Permeability [ft/y]	0	0.504618
Coefficient of Consolidation [ft <sup>2</sup> /y]	0	30
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	-2.22045e-16	0.273207

**Stage: 6 Months = 0.5 y**

<b>Data Type</b>	<b>Minimum</b>	<b>Maximum</b>
Total Settlement [in]	0	4.39984
Total Consolidation Settlement [in]	-0.000927316	3.06997
Virgin Consolidation Settlement [in]	0	1.11896
Recompression Consolidation Settlement [in]	-0.000927316	1.95692
Immediate Settlement [in]	0	1.35174
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	-5.4964e-11	3.036
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	0	8.65527
Effective Stress XX [ksf]	0	7.6636
Effective Stress YY [ksf]	0	7.6636
Total Stress ZZ [ksf]	0	13.2623
Total Stress XX [ksf]	0	13.2623
Total Stress YY [ksf]	0	13.2623
Modulus of Subgrade Reaction (Total) [ksf/ft]	-5.20098e-08	8.28031
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	-8.91869e-08	28.7928
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-1.2477e-07	11.8672
Total Strain	1.17223e-07	0.108528
Pore Water Pressure [ksf]	0	6.56478
Excess Pore Water Pressure [ksf]	0	0.865656
Degree of Consolidation [%]	0	94.7659
Pre-consolidation Stress [ksf]	0.468	22.7997
Over-consolidation Ratio	1	11.9982
Void Ratio	0	0.624999
Permeability [ft/y]	0	0.504618
Coefficient of Consolidation [ft <sup>2</sup> /y]	0	30
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	-2.22045e-16	0.273207

**Stage: 1 Year = 1 y**

<b>Data Type</b>	<b>Minimum</b>	<b>Maximum</b>
Total Settlement [in]	0	4.43094
Total Consolidation Settlement [in]	-0.000871219	3.10108
Virgin Consolidation Settlement [in]	0	1.13128
Recompression Consolidation Settlement [in]	-0.000871219	1.97812
Immediate Settlement [in]	0	1.35174
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	-5.4964e-11	3.036
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	0	8.65527
Effective Stress XX [ksf]	0	7.6636
Effective Stress YY [ksf]	0	7.6636
Total Stress ZZ [ksf]	0	13.2623
Total Stress XX [ksf]	0	13.2623
Total Stress YY [ksf]	0	13.2623
Modulus of Subgrade Reaction (Total) [ksf/ft]	-5.04452e-08	8.22218
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	-8.91869e-08	28.7928
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-1.1613e-07	11.7482
Total Strain	1.17223e-07	0.108528
Pore Water Pressure [ksf]	0	6.57335
Excess Pore Water Pressure [ksf]	0	0.840501
Degree of Consolidation [%]	0	95.4991
Pre-consolidation Stress [ksf]	0.468	22.7997
Over-consolidation Ratio	1	11.9982
Void Ratio	0	0.624998
Permeability [ft/y]	0	0.504618
Coefficient of Consolidation [ft <sup>2</sup> /y]	0	30
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	-2.22045e-16	0.273207

**Stage: 2 Years = 2 y**

---

<b>Data Type</b>	<b>Minimum</b>	<b>Maximum</b>
Total Settlement [in]	0	4.45549
Total Consolidation Settlement [in]	-0.000453747	3.12563
Virgin Consolidation Settlement [in]	0	1.13381
Recompression Consolidation Settlement [in]	-0.000453747	2.00266
Immediate Settlement [in]	0	1.35174
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	-5.4964e-11	3.036
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	0	8.65527
Effective Stress XX [ksf]	0	7.6636
Effective Stress YY [ksf]	0	7.6636
Total Stress ZZ [ksf]	0	13.2623
Total Stress XX [ksf]	0	13.2623
Total Stress YY [ksf]	0	13.2623
Modulus of Subgrade Reaction (Total) [ksf/ft]	-4.85959e-08	8.17688
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	-8.91869e-08	28.7928
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-1.06775e-07	11.6559
Total Strain	1.17223e-07	0.108528
Pore Water Pressure [ksf]	0	6.56126
Excess Pore Water Pressure [ksf]	0	0.820456
Degree of Consolidation [%]	0	96.1003
Pre-consolidation Stress [ksf]	0.468	22.7997
Over-consolidation Ratio	1	11.9982
Void Ratio	0	0.624998
Permeability [ft/y]	0	0.504618
Coefficient of Consolidation [ft <sup>2</sup> /y]	0	30
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	-2.96043e-05	0.273207

**Stage: 5 Years = 5 y**

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<b>Data Type</b>	<b>Minimum</b>	<b>Maximum</b>
Total Settlement [in]	0	4.49758
Total Consolidation Settlement [in]	0	3.16771
Virgin Consolidation Settlement [in]	0	1.13386
Recompression Consolidation Settlement [in]	0	2.04943
Immediate Settlement [in]	0	1.35174
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	-5.4964e-11	3.036
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	0	8.65527
Effective Stress XX [ksf]	0	7.6636
Effective Stress YY [ksf]	0	7.6636
Total Stress ZZ [ksf]	0	13.2623
Total Stress XX [ksf]	0	13.2623
Total Stress YY [ksf]	0	13.2623
Modulus of Subgrade Reaction (Total) [ksf/ft]	-4.52211e-08	8.10036
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	-8.91869e-08	28.7928
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-9.17335e-08	11.501
Total Strain	1.17223e-07	0.108528
Pore Water Pressure [ksf]	0	6.39367
Excess Pore Water Pressure [ksf]	0	0.652867
Degree of Consolidation [%]	0	97.2333
Pre-consolidation Stress [ksf]	0.468	22.7997
Over-consolidation Ratio	1	11.9982
Void Ratio	0	0.624997
Permeability [ft/y]	0	0.504618
Coefficient of Consolidation [ft <sup>2</sup> /y]	0	30
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	-0.000410732	0.273207

**Stage: 10 Years = 10 y**

<b>Data Type</b>	<b>Minimum</b>	<b>Maximum</b>
Total Settlement [in]	0	4.53939
Total Consolidation Settlement [in]	0	3.20953
Virgin Consolidation Settlement [in]	0	1.13386
Recompression Consolidation Settlement [in]	0	2.09589
Immediate Settlement [in]	0	1.35174
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	-5.4964e-11	3.036
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	0	8.65527
Effective Stress XX [ksf]	0	7.6636
Effective Stress YY [ksf]	0	7.6636
Total Stress ZZ [ksf]	0	13.2623
Total Stress XX [ksf]	0	13.2623
Total Stress YY [ksf]	0	13.2623
Modulus of Subgrade Reaction (Total) [ksf/ft]	-4.21662e-08	8.02575
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	-8.91869e-08	28.7928
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-7.99793e-08	11.3512
Total Strain	1.17223e-07	0.108528
Pore Water Pressure [ksf]	0	6.13317
Excess Pore Water Pressure [ksf]	-2.02825e-38	0.392371
Degree of Consolidation [%]	0	98.3744
Pre-consolidation Stress [ksf]	0.468	22.7997
Over-consolidation Ratio	1	11.9982
Void Ratio	0	0.624996
Permeability [ft/y]	0	0.504618
Coefficient of Consolidation [ft <sup>2</sup> /y]	0	30
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.273207

**Stage: 15 Years = 15 y**

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<b>Data Type</b>	<b>Minimum</b>	<b>Maximum</b>
Total Settlement [in]	0	4.56549
Total Consolidation Settlement [in]	0	3.23356
Virgin Consolidation Settlement [in]	0	1.13386
Recompression Consolidation Settlement [in]	0	2.12252
Immediate Settlement [in]	0	1.35174
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	-5.4964e-11	3.036
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	0	8.65527
Effective Stress XX [ksf]	0	7.6636
Effective Stress YY [ksf]	0	7.6636
Total Stress ZZ [ksf]	0	13.2623
Total Stress XX [ksf]	0	13.2623
Total Stress YY [ksf]	0	13.2623
Modulus of Subgrade Reaction (Total) [ksf/ft]	-4.05486e-08	7.98348
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	-8.91869e-08	28.7928
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-7.43529e-08	11.2668
Total Strain	1.17223e-07	0.108528
Pore Water Pressure [ksf]	0	5.97401
Excess Pore Water Pressure [ksf]	-4.44401e-38	0.233213
Degree of Consolidation [%]	0	99.0388
Pre-consolidation Stress [ksf]	0.468	22.7997
Over-consolidation Ratio	1	11.9982
Void Ratio	0	0.624996
Permeability [ft/y]	0	0.504618
Coefficient of Consolidation [ft <sup>2</sup> /y]	0	30
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.273207

**Stage: 25 Years = 25 y**

<b>Data Type</b>	<b>Minimum</b>	<b>Maximum</b>
Total Settlement [in]	0	4.5902
Total Consolidation Settlement [in]	0	3.25591
Virgin Consolidation Settlement [in]	0	1.13386
Recompression Consolidation Settlement [in]	0	2.14723
Immediate Settlement [in]	0	1.35174
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	-5.4964e-11	3.036
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	0	8.65527
Effective Stress XX [ksf]	0	7.6636
Effective Stress YY [ksf]	0	7.6636
Total Stress ZZ [ksf]	0	13.2623
Total Stress XX [ksf]	0	13.2623
Total Stress YY [ksf]	0	13.2623
Modulus of Subgrade Reaction (Total) [ksf/ft]	-3.91276e-08	7.94458
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	-8.91869e-08	28.7928
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-6.97107e-08	11.1895
Total Strain	1.17223e-07	0.108528
Pore Water Pressure [ksf]	0	5.82312
Excess Pore Water Pressure [ksf]	-2.4345e-34	0.0823248
Degree of Consolidation [%]	0	99.6622
Pre-consolidation Stress [ksf]	0.468	22.7997
Over-consolidation Ratio	1	11.9982
Void Ratio	0	0.624995
Permeability [ft/y]	0	0.504618
Coefficient of Consolidation [ft <sup>2</sup> /y]	0	30
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.273207

**Stage: 50 Years = 50 y**

<b>Data Type</b>	<b>Minimum</b>	<b>Maximum</b>
Total Settlement [in]	0	4.6025
Total Consolidation Settlement [in]	0	3.26705
Virgin Consolidation Settlement [in]	0	1.13386
Recompression Consolidation Settlement [in]	0	2.15954
Immediate Settlement [in]	0	1.35174
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	-5.4964e-11	3.036
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	0	8.65527
Effective Stress XX [ksf]	0	7.6636
Effective Stress YY [ksf]	0	7.6636
Total Stress ZZ [ksf]	0	13.2623
Total Stress XX [ksf]	0	13.2623
Total Stress YY [ksf]	0	13.2623
Modulus of Subgrade Reaction (Total) [ksf/ft]	-3.84471e-08	7.92532
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	-8.91869e-08	28.7928
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-6.75798e-08	11.1514
Total Strain	1.17223e-07	0.108528
Pore Water Pressure [ksf]	0	5.74689
Excess Pore Water Pressure [ksf]	-2.06216e-35	0.0060907
Degree of Consolidation [%]	0	99.9751
Pre-consolidation Stress [ksf]	0.468	22.7997
Over-consolidation Ratio	1	11.9982
Void Ratio	0	0.624995
Permeability [ft/y]	0	0.504618
Coefficient of Consolidation [ft <sup>2</sup> /y]	0	30
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.273207

**Stage: 75 Years = 75 y**

<b>Data Type</b>	<b>Minimum</b>	<b>Maximum</b>
Total Settlement [in]	0	4.60341
Total Consolidation Settlement [in]	0	3.26787
Virgin Consolidation Settlement [in]	0	1.13386
Recompression Consolidation Settlement [in]	0	2.16044
Immediate Settlement [in]	0	1.35174
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	-5.4964e-11	3.036
Loading Stress XX [ksf]	0	0
Loading Stress YY [ksf]	0	0
Effective Stress ZZ [ksf]	0	8.65527
Effective Stress XX [ksf]	0	7.6636
Effective Stress YY [ksf]	0	7.6636
Total Stress ZZ [ksf]	0	13.2623
Total Stress XX [ksf]	0	13.2623
Total Stress YY [ksf]	0	13.2623
Modulus of Subgrade Reaction (Total) [ksf/ft]	-3.83977e-08	7.92391
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	-8.91869e-08	28.7928
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	-6.74273e-08	11.1486
Total Strain	1.17223e-07	0.108528
Pore Water Pressure [ksf]	0	5.74125
Excess Pore Water Pressure [ksf]	-1.07151e-35	0.00044975
Degree of Consolidation [%]	0	99.9982
Pre-consolidation Stress [ksf]	0.468	22.7997
Over-consolidation Ratio	1	11.9982
Void Ratio	0	0.624995
Permeability [ft/y]	0	0.504618
Coefficient of Consolidation [ft <sup>2</sup> /y]	0	30
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	0.273207

# Loads

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## **1. Rectangular Load: "MSE Retaining Wall Approach Ramp"**

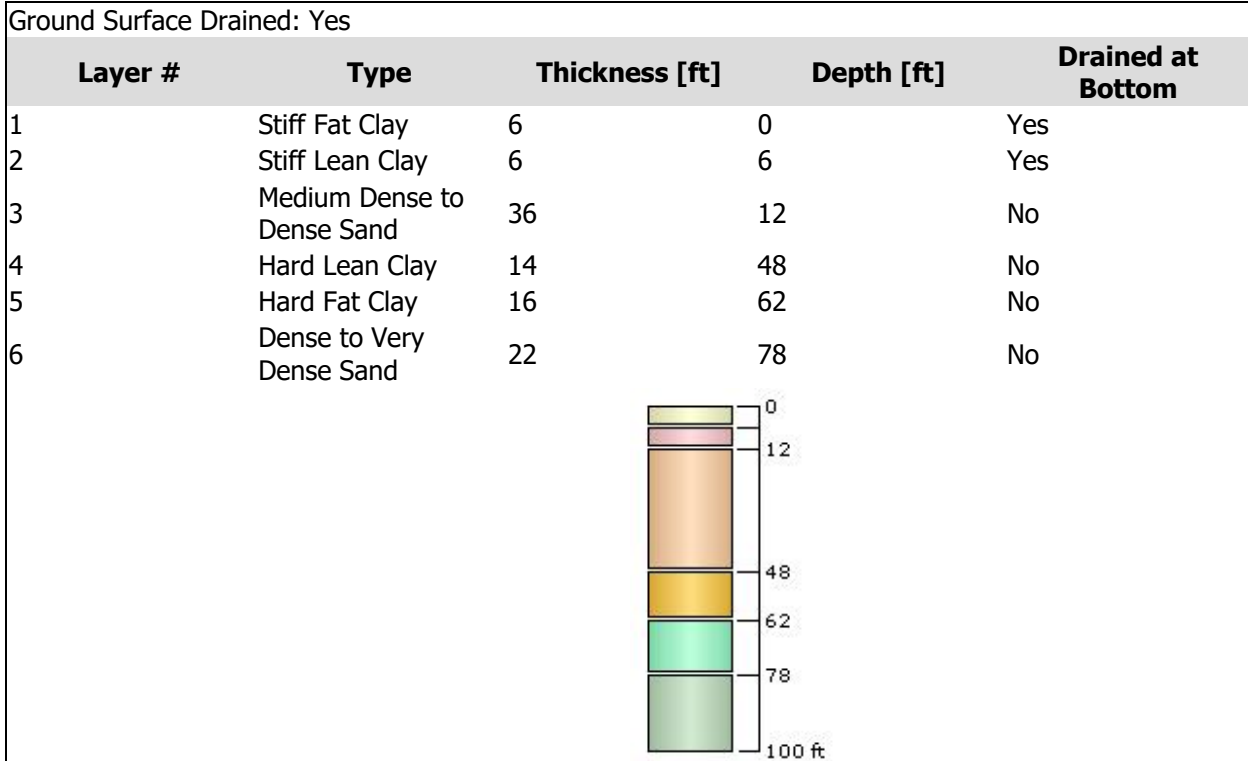
Length	420 ft
Width	30 ft
Rotation angle	0 degrees
Load Type	Flexible
Area of Load	12600 ft <sup>2</sup>
Depth	0 ft
Installation Stage	Start = 0 y

## **Coordinates and Load**

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	<b>X [ft]</b>	<b>Y [ft]</b>	<b>Load Magnitude [ksf]</b>
-210	-15		3.13
210	-15		1.25
210	15		1.25
-210	15		3.13







# Soil Layers





# Soil Properties

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Property	Stiff Fat Clay	Dense to Very Dense Sand	Medium Dense to Dense Sand	Hard Lean Clay
Color				
Unit Weight [kips/ft <sup>3</sup> ]	0.13	0.13	0.12	0.13
Saturated Unit Weight [kips/ft <sup>3</sup> ]	0.13	0.13	0.12	0.13
K0	1	1	1	1
Immediate Settlement	Enabled	Enabled	Enabled	Enabled
Es [ksf]	800	3200	2000	1600
E <sub>sur</sub> [ksf]	800	3200	2000	1600
Primary Consolidation	Enabled	Disabled	Disabled	Enabled
Material Type	Non-Linear			Non-Linear
C <sub>c</sub>	0.16	-	-	0.146
C <sub>r</sub>	0.029	-	-	0.024
e <sub>0</sub>	0.544	-	-	0.598
OCR	12	-	-	3
C <sub>v</sub> [ft <sup>2</sup> /y]	7	-	-	30
C <sub>vr</sub> [ft <sup>2</sup> /y]	7	-	-	30
B-bar	1	-	-	1
Undrained Su A [kips/ft <sup>2</sup> ]	0	0	0	0
Undrained Su S	0.2	0.2	0.2	0.2
Undrained Su m	0.8	0.8	0.8	0.8
Piezo Line ID	1	1	1	0
Property	Stiff Lean Clay		Hard Fat Clay	
Color				
Unit Weight [kips/ft <sup>3</sup> ]	0.13		0.13	
Saturated Unit Weight [kips/ft <sup>3</sup> ]	0.13		0.13	
K0	1		1	
Immediate Settlement	Enabled		Enabled	
Es [ksf]	400		1600	
E <sub>sur</sub> [ksf]	400		1600	
Primary Consolidation	Enabled		Enabled	
Material Type	Non-Linear		Non-Linear	
C <sub>c</sub>	0.112		0.176	
C <sub>r</sub>	0.024		0.03	
e <sub>0</sub>	0.623		0.625	
OCR	3		2	
C <sub>v</sub> [ft <sup>2</sup> /y]	10		10	
C <sub>vr</sub> [ft <sup>2</sup> /y]	10		10	
B-bar	1		1	
Undrained Su A [kips/ft <sup>2</sup> ]	0		0	
Undrained Su S	0.2		0.2	
Undrained Su m	0.8		0.8	
Piezo Line ID	1		1	

# Groundwater

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Groundwater method  
Water Unit Weight

Piezometric Lines  
0.0624 kips/ft<sup>3</sup>

## Piezometric Line Entities

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ID	Depth (ft)
1	8 ft

## Field Point Grid

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Number of points 116  
Expansion Factor 2

### Grid Coordinates

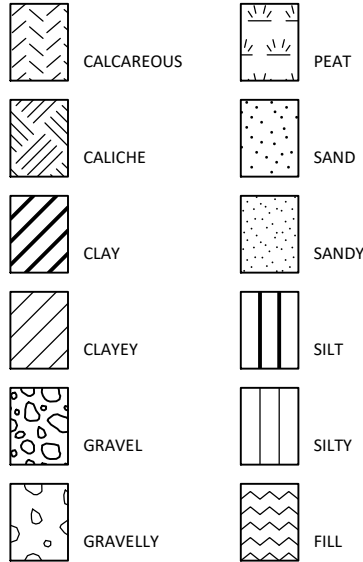
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	X [ft]	Y [ft]
420	225	
420	-225	
-420	-225	
-420	225	

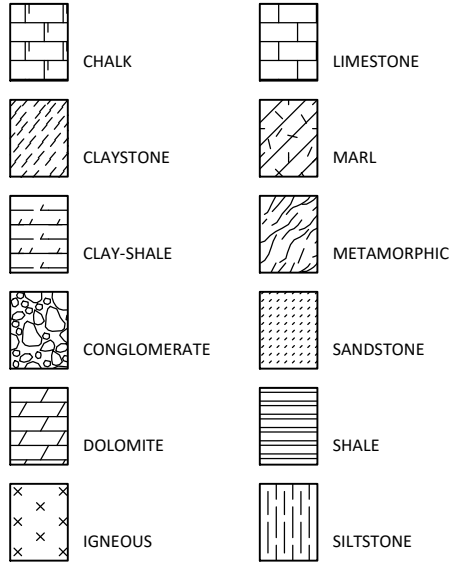
# KEY TO TERMS AND SYMBOLS

## MATERIAL TYPES

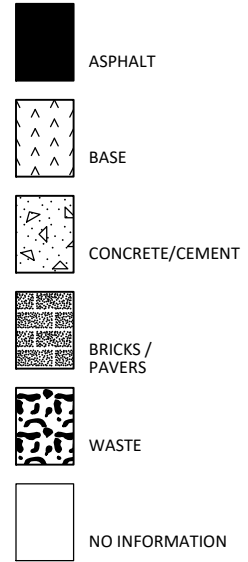
### SOIL TERMS



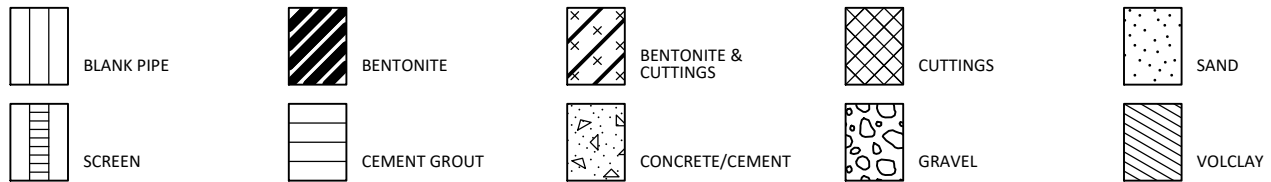
### ROCK TERMS



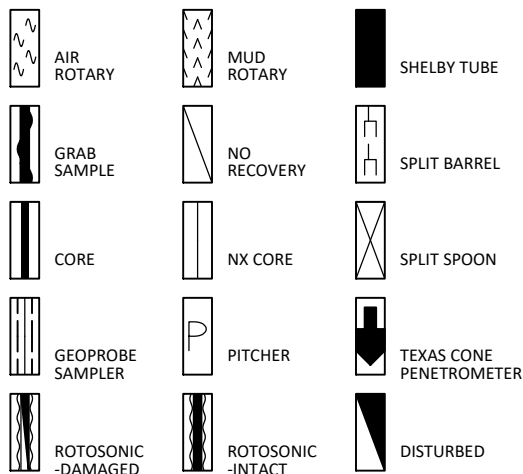
### OTHER



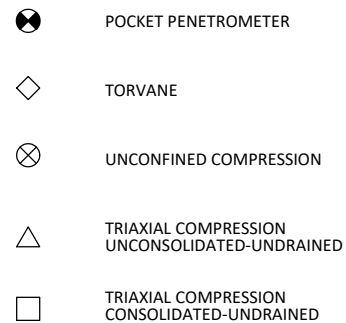
## WELL CONSTRUCTION AND PLUGGING MATERIALS



### SAMPLE TYPES



### STRENGTH TEST TYPES



NOTE: VALUES SYMBOLIZED ON BORING LOGS REPRESENT SHEAR STRENGTHS UNLESS OTHERWISE NOTED

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## KEY TO TERMS AND SYMBOLS (CONT'D)

### TERMINOLOGY

Terms used in this report to describe soils with regard to their consistency or conditions are in general accordance with the discussion presented in Article 45 of SOILS MECHANICS IN ENGINEERING PRACTICE, Terzaghi and Peck, John Wiley & Sons, Inc., 1967, using the most reliable information available from the field and laboratory investigations. Terms used for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in American Society for Testing and Materials D2487-06 and D2488-00, Volume 04.08, Soil and Rock; Dimension Stone; Geosynthetics; 2005.

The depths shown on the boring logs are not exact, and have been estimated to the nearest half-foot. Depth measurements may be presented in a manner that implies greater precision in depth measurement, i.e 6.71 meters. The reader should understand and interpret this information only within the stated half-foot tolerance on depth measurements.

#### RELATIVE DENSITY

#### COHESIVE STRENGTH

#### PLASTICITY

<u>Penetration Resistance Blows per ft</u>	<u>Relative Density</u>	<u>Resistance Blows per ft</u>	<u>Consistency</u>	<u>Cohesion TSF</u>	<u>Plasticity Index</u>	<u>Degree of Plasticity</u>
0 - 4	Very Loose	0 - 2	Very Soft	0 - 0.125	0 - 5	None
4 - 10	Loose	2 - 4	Soft	0.125 - 0.25	5 - 10	Low
10 - 30	Medium Dense	4 - 8	Firm	0.25 - 0.5	10 - 20	Moderate
30 - 50	Dense	8 - 15	Stiff	0.5 - 1.0	20 - 40	Plastic
> 50	Very Dense	15 - 30	Very Stiff	1.0 - 2.0	> 40	Highly Plastic
		> 30	Hard	> 2.0		

### ABBREVIATIONS

B = Benzene	Qam, Qas, Qal = Quaternary Alluvium	Kef = Eagle Ford Shale
T = Toluene	Qat = Low Terrace Deposits	Kbu = Buda Limestone
E = Ethylbenzene	Qbc = Beaumont Formation	Kdr = Del Rio Clay
X = Total Xylenes	Qt = Fluvial Terrace Deposits	Kft = Fort Terrett Member
BTEX = Total BTEX	Qao = Seymour Formation	Kgt = Georgetown Formation
TPH = Total Petroleum Hydrocarbons	Qle = Leona Formation	Kep = Person Formation
ND = Not Detected	Q-Tu = Uvalde Gravel	Kek = Kainer Formation
NA = Not Analyzed	Ewi = Wilcox Formation	Kes = Escondido Formation
NR = Not Recorded/No Recovery	Emi = Midway Group	Kew = Walnut Formation
OVA = Organic Vapor Analyzer	Mc = Catahoula Formation	Kgr = Glen Rose Formation
ppm = Parts Per Million	EI = Laredo Formation	Kgru = Upper Glen Rose Formation
	Kknm = Navarro Group and Marlbrook Marl	Kgrl = Lower Glen Rose Formation
	Kpg = Pecan Gap Chalk	Kh = Hensell Sand
	Kau = Austin Chalk	

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# KEY TO TERMS AND SYMBOLS (CONT'D)

## TERMINOLOGY

### SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil type.
Interlayered	Soil sample composed of alternating layers of different soil type.
Intermixed	Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of carbonate.
Carbonate	Having more than 50% carbonate content.

## SAMPLING METHODS

### RELATIVELY UNDISTURBED SAMPLING

Cohesive soil samples are to be collected using three-inch thin-walled tubes in general accordance with the Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D1587) and granular soil samples are to be collected using two-inch split-barrel samplers in general accordance with the Standard Method for Penetration Test and Split-Barrel Sampling of Soils (ASTM D1586). Cohesive soil samples may be extruded on-site when appropriate handling and storage techniques maintain sample integrity and moisture content.

### STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-in.-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

### SPLIT-BARREL SAMPLER DRIVING RECORD

<u>Blows Per Foot</u>	<u>Description</u>
25 .....	25 blows drove sampler 12 inches, after initial 6 inches of seating.
50/7" .....	50 blows drove sampler 7 inches, after initial 6 inches of seating.
Ref/3" .....	50 blows drove sampler 3 inches during initial 6-inch seating interval.

NOTE: To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.

# Important Information about This

# Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

## Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply this report for any purpose or project except the one originally contemplated.*

## Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

## Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an

assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

## Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by:* the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

## Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

## A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

## A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly



problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

### **Do Not Redraw the Engineer's Logs**

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

### **Give Constructors a Complete Report and Guidance**

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

### **Read Responsibility Provisions Closely**

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help

others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

### **Environmental Concerns Are Not Covered**

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

### **Obtain Professional Assistance To Deal with Mold**

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold-prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical-engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

### **Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance**

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your GBC-Member geotechnical engineer for more information.



8811 Colesville Road/Suite G106, Silver Spring, MD 20910

Telephone: 301/565-2733 Facsimile: 301/589-2017

e-mail: [info@geoprofessional.org](mailto:info@geoprofessional.org) [www.geoprofessional.org](http://www.geoprofessional.org)

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**ENGINEERING • ENVIRONMENTAL • INFRASTRUCTURE • PROJECT CONTROL**

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**▶ San Antonio, TX**

**Lake Worth, FL**

**Brownsville, TX**

**Houston, TX**

**Lincoln, NE**

**Dallas, TX**

**McAllen, TX**

**Salt Lake City, UT**

**Freeport, TX**

**New Braunfels, TX**

**Mexico**

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FORT BEND COUNTY ENGINEERING DEPARTMENT

FORT BEND PARKWAY ENTRANCE RAMP  
(OVERPASS AT CAREY CHASE DR.)

FROM SOUTH OF BELTWAY 8 EB FRONTAGE ROAD  
TO NORTH OF CHANNEL B-1  
LENGTH OF PROJECT: 0.6 MI

PROJECT NO. 20219x

VINCENT M. MORALES, JR.  
COMMISSIONER PRECINCT 1

GRADY PRESTAGE  
COMMISSIONER PRECINCT 2

KP GEORGE  
COUNTY JUDGE

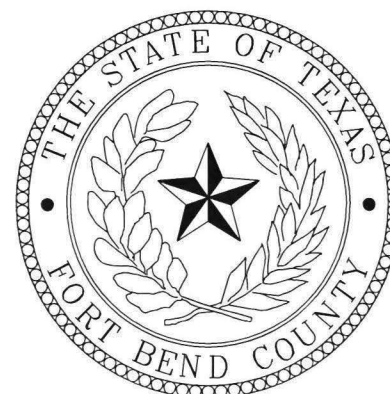
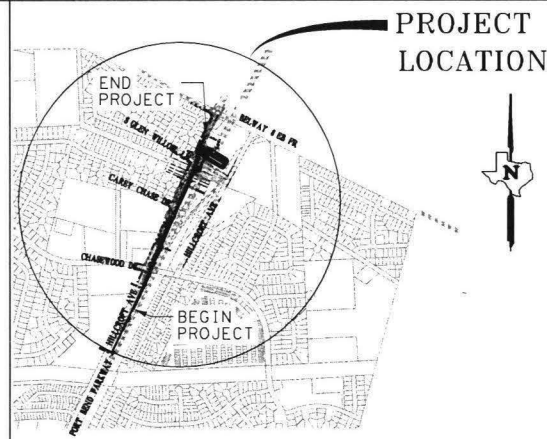
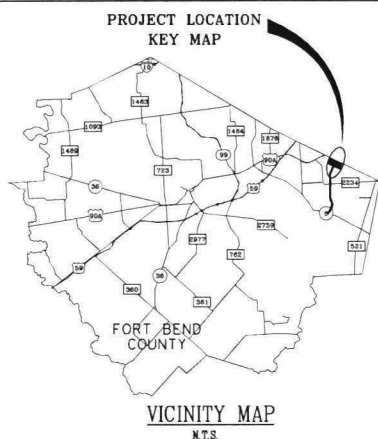
ANDY MEYERS  
COMMISSIONER PRECINCT 3

DEXTER L. McCOY  
COMMISSIONER PRECINCT 4



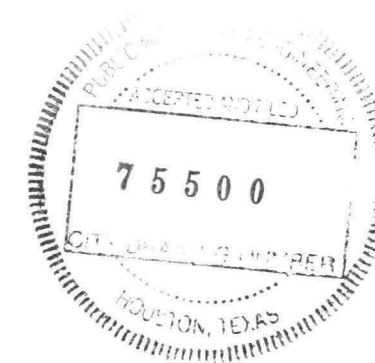
5/5/2023

FUNCTIONAL CLASSIFICATION = URBAN FREEWAY (RAMP)  
DESIGN SPEED = 45 MPH  
\* LOW-SPEED URBAN STREET DESIGN SPEED  
ALONG HILLCROFT AVE.



MAY 2023  
PRECINCT 2

Fort Bend County, Texas



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC F-20607  
**AIG Tech** 1500 S DAIRY ASHFORD  
 Advanced Infrastructure Group SUITE 445  
 HOUSTON, TX 77077

APPROVED: *[Signature]* 5/09/23  
 DIRECTOR OF HOUSTON PUBLIC WORKS DATE

APPROVED: *[Signature]* 10/12/2023  
 COUNTY ENGINEER DATE  
 STACY SLAMINSKI, P.E.

FBCED, STANDARD 01

100% SUBMITTAL

**GENERAL**

- 1 TITLE SHEET
- 2 INDEX OF SHEETS
- 3 PROJECT LAYOUT
- 4A-C TYPICAL SECTIONS
- 5A-D GENERAL NOTES
- ESTIMATE & QUANTITY
- 6-14 QUANTITY SUMMARY SHEETS

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THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH ## HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

A. REBOLLAR VELAZQUEZ, P.E. NO. 131882 10/11/2023  
SIGNATURE OF REGISTRANT DATE

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RAJESH JANARTHANAN, P.E. NO. 99487 10/11/2023  
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AHMED K. VALDEZ, P.E. NO. 110365 10/11/2023  
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MOHAMMAD IRFAN, P.E. NO. 89333 10/11/2023  
SIGNATURE OF REGISTRANT DATE

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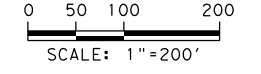
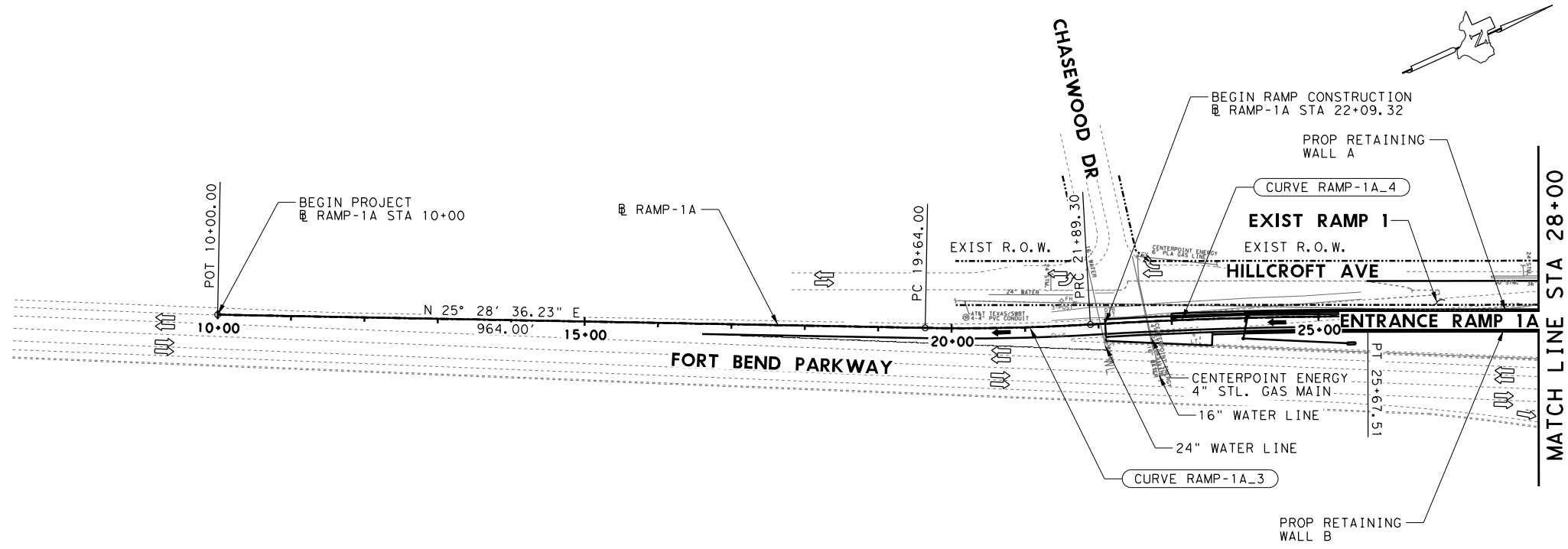
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1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

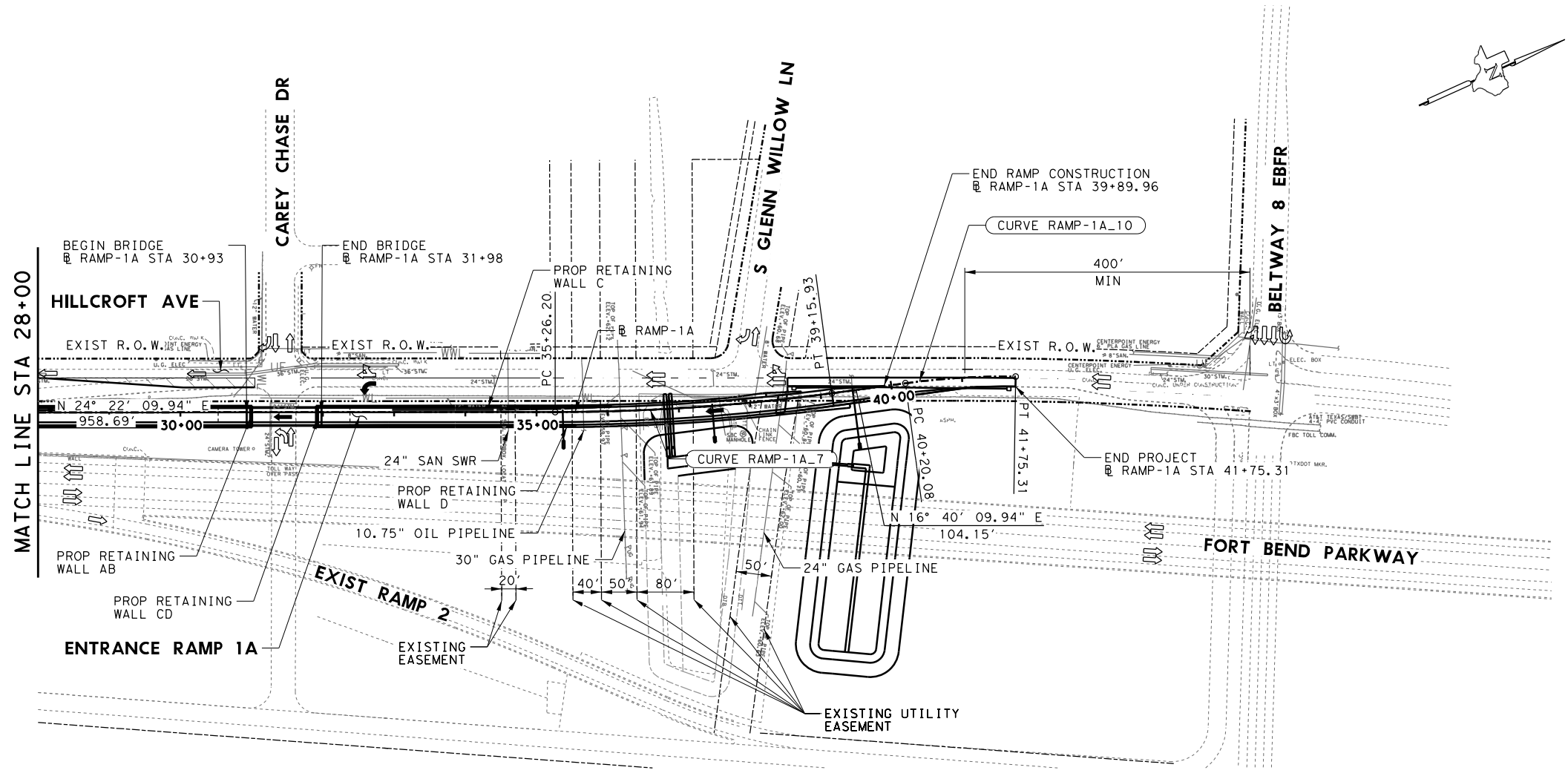
**FORT BEND PARKWAY TOLL ROAD  
INDEX OF SHEETS**

SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	10/11/2023
DESIGNED BY:		SHEET NO.:	2
CHECKED BY:			
DRAWN BY:			
CHECKED BY:			



**LEGEND**

- EXISTING RIGHT-OF-WAY (R.O.W.)
- EXISTING UTILITY EASEMENT
- ← EXIST DIRECTION OF TRAFFIC
- PROPOSED DIRECTION OF TRAFFIC
- XXXX-XX.X HORIZONTAL CURVE NUMBER



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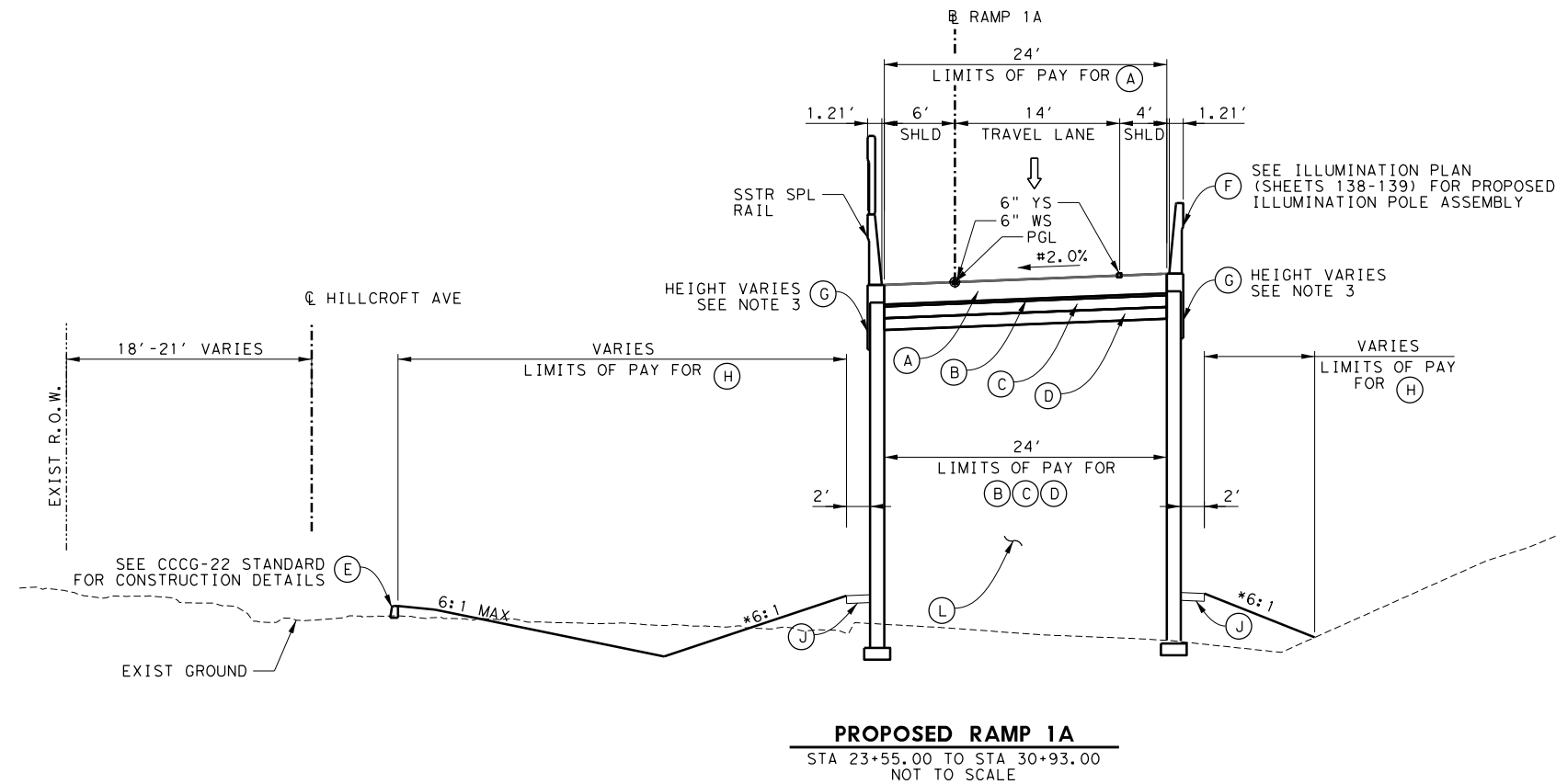
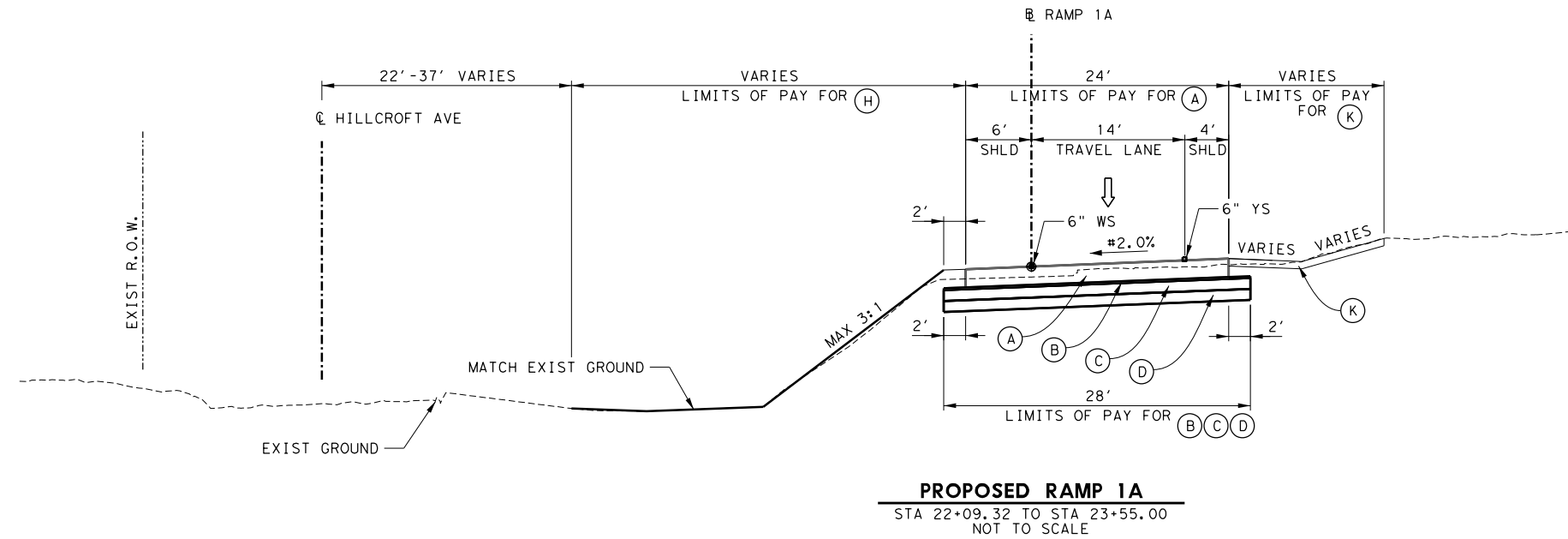
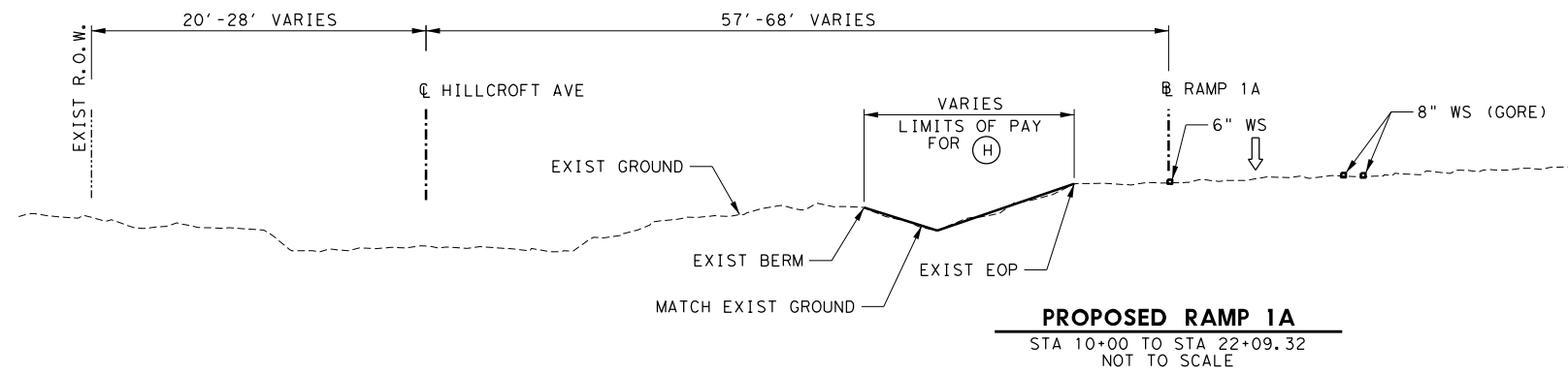
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Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
PROJECT LAYOUT  
BEGIN PROJECT TO END PROJECT**

SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	10/11/2023
DESIGNED BY:		SHEET NO.:	3
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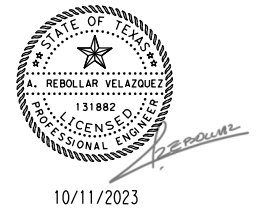
LEGEND

- (A) 12" CRCP
  - (B) 1" ASB (BOND BREAKER)
  - (C) 6" CEMENT TREATED BASE
  - (D) 6" LTS
  - (E) TY II CURB
  - (F) SSTR RAIL
  - (G) MSE RETAINING WALL
  - (H) BLOCK SOD
  - (I) SEEDING
  - (J) CONCRETE MOW STRIP
  - (K) CONCRETE RIPRAP
  - (L) CEMENT STABILIZED FILL
  - (M) 8-1/2" CONCRETE DECK
- 6" WS-REFL PAV MRK W/RET TY I (W) (6") (SLD)
  - 6" YS-REFL PAV MRK W/RET REQ TY I (Y) (6") (SLD)
  - 8" WS-REFL PAV MRK TY I (W) (8") (SLD)

NOTES:

1. STATIONS AND OFFSETS ARE BASED ON RAMP-1A ALIGNMENT UNLESS OTHERWISE NOTED.
  2. NOMINAL DIMENSIONS ARE TAKEN FROM FACE OF CURB OR FACE OF RAIL UNLESS OTHERWISE SHOWN ON PLANS.
  3. SEE RETAINING WALL LAYOUT SHEETS FOR LIMITS OF RETAINING WALL AND ADDITIONAL INFORMATION.
  4. SEE PLAN AND PROFILE SHEETS FOR LIMITS OF TYPE SSTR.
  5. SEE CONCRETE PAVEMENT JUNCTURES (CPJ) STANDARD SHEETS (TXDOT HOUSTON DISTRICT) FOR CONCRETE CONNECTION DETAILS.
  6. SEE STORM SEWER PLAN & PROFILE AND CROSS SECTION SHEETS FOR DITCH GRADING AND LIMITS OF PAY FOR (H)
- \* 6:1 TYP 3:1 MAX.  
 \*\* USUAL EMBANKMENT IN THE ABSENCE OF DITCH.  
 # SEE ROADWAY PLAN AND PROFILE SHEETS FOR CROSS-SLOPE AND SUPERELEVATION LIMIT DETAILS.

REV.	DATE	BY	DESCRIPTION



10/11/2023



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group

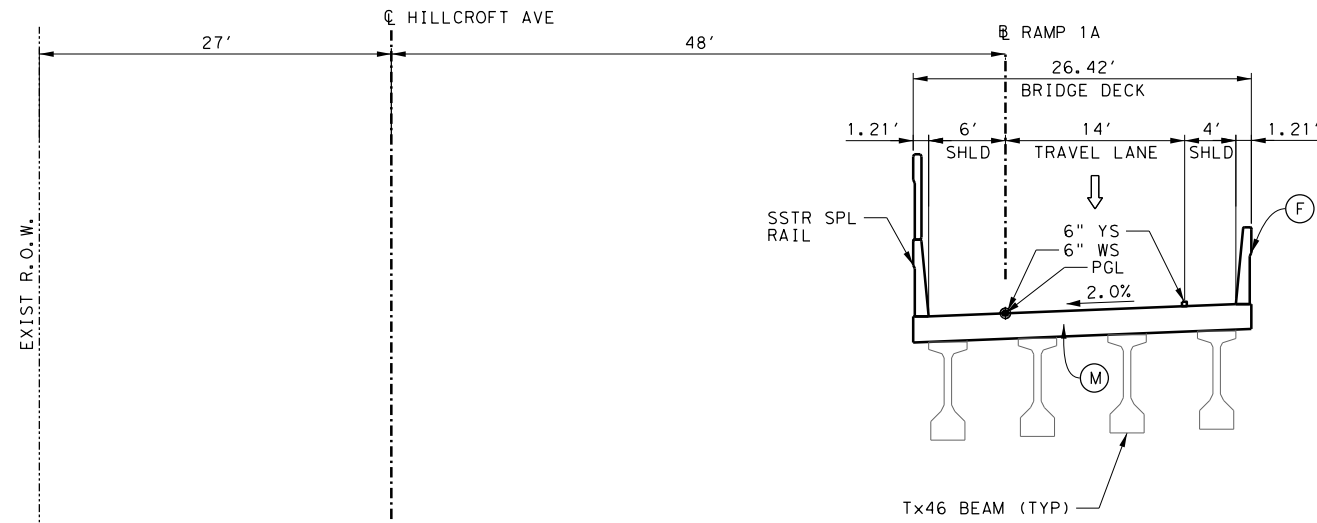
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1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD**  
**ENTRANCE RAMP 1A**  
**TYPICAL SECTIONS**

SHEET 1 OF 3			
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DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	4A
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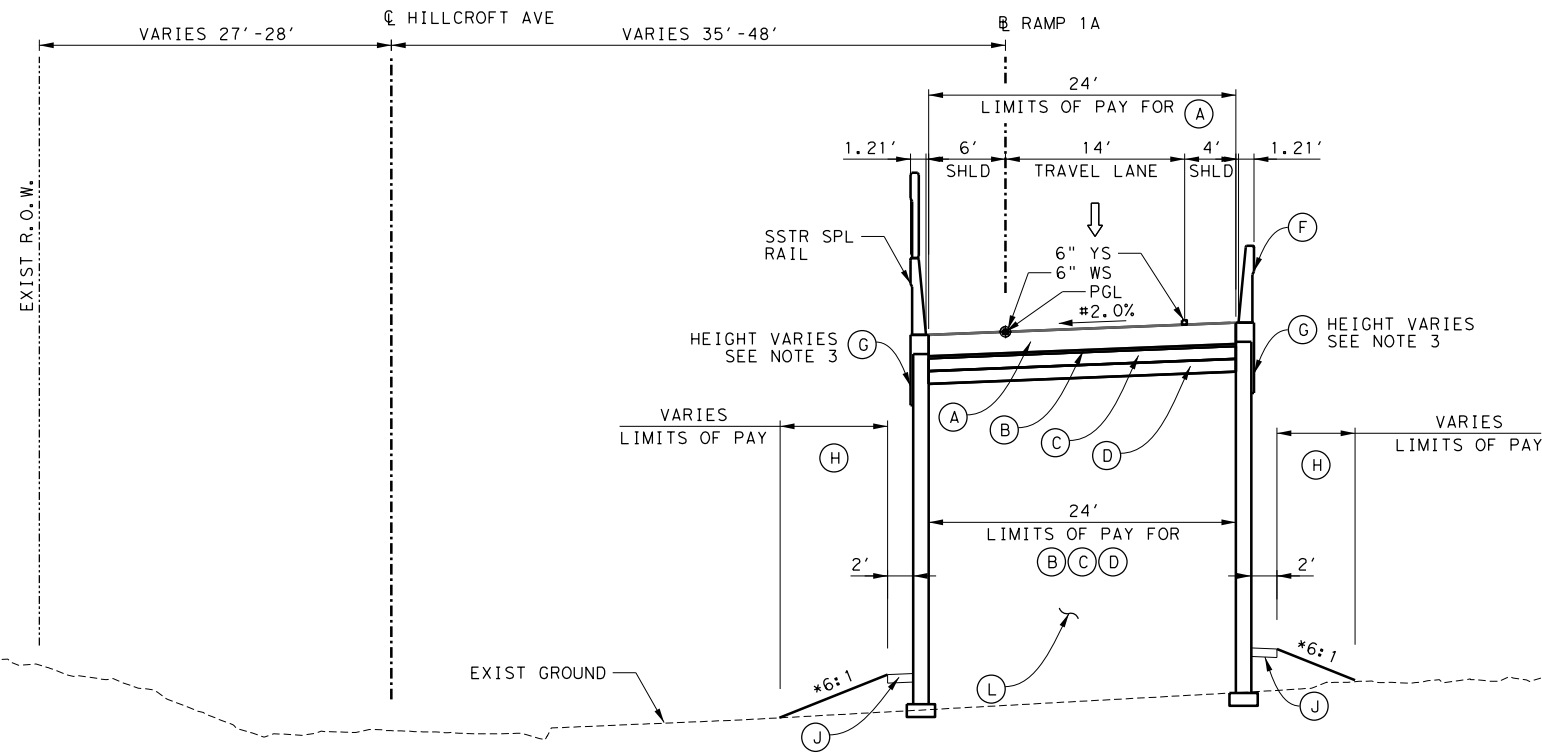
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NOTE: CONTRACTOR TO USE REMOVED CRUSHED CONCRETE AS SURFACE TREATMENT UNDER BRIDGE, ALONG EITHER SIDE OF CAREY CHASE DR. WORK TO BE PAID FOR BY ITEM 104-6009.

**PROPOSED RAMP 1A BRIDGE**  
STA 30+93.00 TO STA 31+98.00  
NOT TO SCALE



**PROPOSED RAMP 1A BRIDGE**  
STA 31+98.00 TO STA 36+05.00  
NOT TO SCALE

LEGEND

- (A) 12" CRCP
- (B) 1" ASB (BOND BREAKER)
- (C) 6" CEMENT TREATED BASE
- (D) 6" LTS
- (E) TY II CURB
- (F) SSTR RAIL
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# SEE ROADWAY PLAN AND PROFILE SHEETS FOR CROSS-SLOPE AND SUPERELEVATION LIMIT DETAILS.

REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**



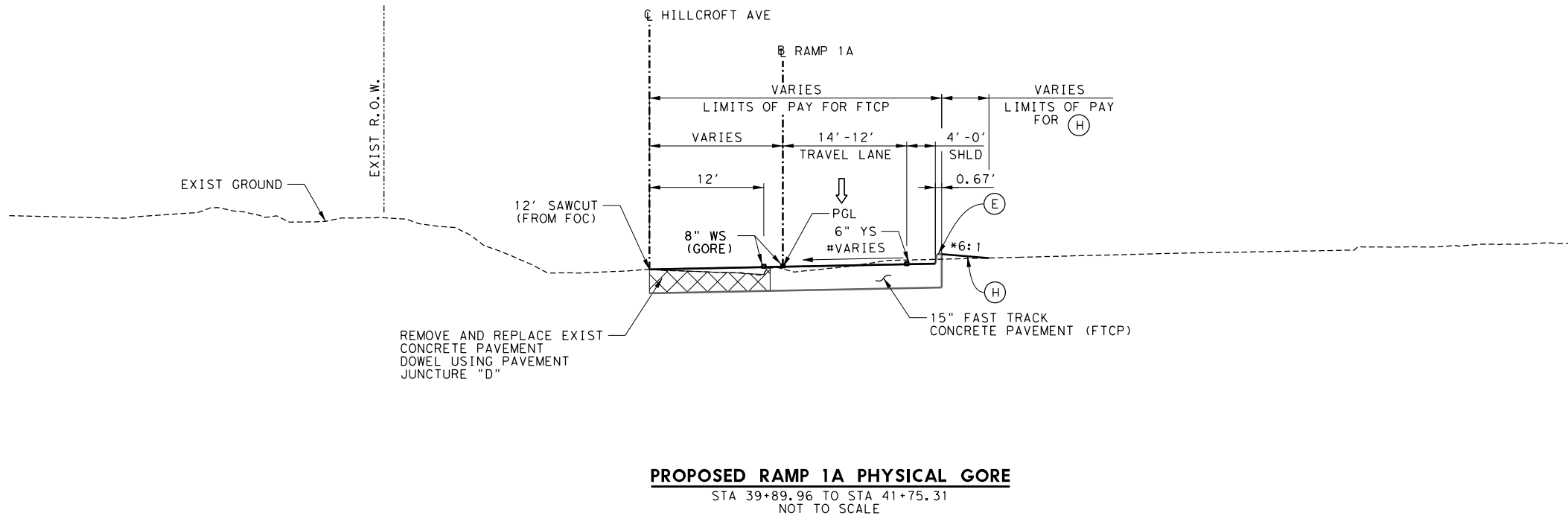
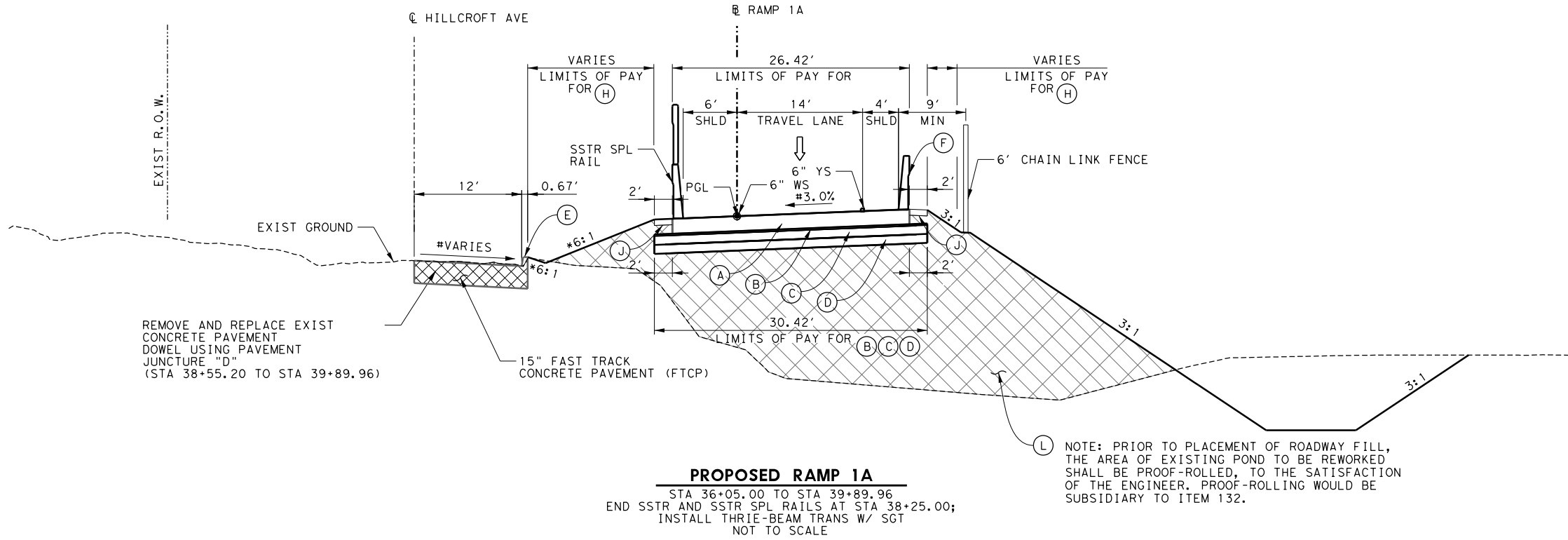
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1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
TYPICAL SECTIONS**

SHEET 2 OF 3			
PROJECT NUMBER	20219x	DATE:	10/10/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	4B
CHECKED BY:			

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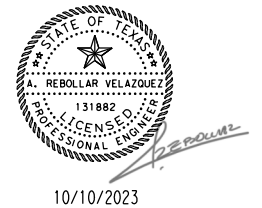
LEGEND

- (A) 12" CRCP
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- (C) 6" CEMENT TREATED BASE
- (D) 6" LTS
- (E) TY II CURB
- (F) SSTR RAIL
- (G) MSE RETAINING WALL
- (H) BLOCK SOD
- (I) SEEDING
- (J) CONCRETE MOW STRIP
- (K) CONCRETE RIPRAP
- (L) CEMENT STABILIZED FILL
- (M) 8-1/2" CONCRETE DECK
- 6" WS-REFL PAV MRK W/RET TY I (W) (6") (SLD)
- 6" YS-REFL PAV MRK W/RET REQ TY I (Y) (6") (SLD)
- 8" WS-REFL PAV MRK TY I (W) (8") (SLD)

NOTES:

1. STATIONS AND OFFSETS ARE BASED ON @ RAMP-1A ALIGNMENT UNLESS OTHERWISE NOTED.
  2. NOMINAL DIMENSIONS ARE TAKEN FROM FACE OF CURB OR FACE OF RAIL UNLESS OTHERWISE SHOWN ON PLANS.
  3. SEE RETAINING WALL LAYOUT SHEETS FOR LIMITS OF RETAINING WALL AND ADDITIONAL INFORMATION.
  4. SEE PLAN AND PROFILE SHEETS FOR LIMITS OF TYPE SSTR AND CHAIN LINK FENCE.
  5. SEE CONCRETE PAVEMENT JUNCTURES (CPJ) STANDARD SHEETS (TXDOT HOUSTON DISTRICT) FOR CONCRETE CONNECTION DETAILS.
  6. SEE STORM SEWER PLAN & PROFILE AND CROSS SECTION SHEETS FOR DITCH GRADING AND LIMITS OF PAY FOR (H)
- \* 6:1 TYP 3:1 MAX.  
 \*\* USUAL EMBANKMENT IN THE ABSENCE OF DITCH.  
 # SEE ROADWAY PLAN AND PROFILE SHEETS FOR CROSS-SLOPE AND SUPERELEVATION LIMIT DETAILS.

REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**



**AIG TECHNICAL SERVICES, LLC** F-20607  
 1500 S DAIRY ASHFORD  
 SUITE 445  
 HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
TYPICAL SECTIONS**

SHEET 3 OF 3			
PROJECT NUMBER	20219x	DATE:	10/10/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	4C
CHECKED BY:			

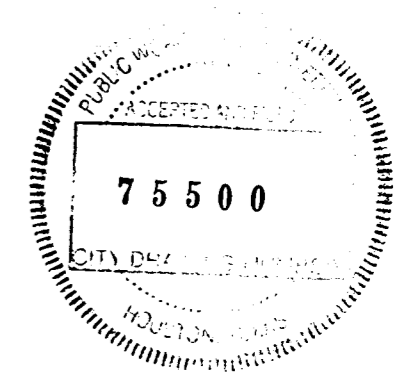


**CONSTRUCTION**

1. FORT BEND COUNTY MUST BE INVITED TO THE PRE-CONSTRUCTION MEETING.
2. CONTRACTOR SHALL NOTIFY FORT BEND COUNTY ENGINEERING DEPARTMENT 48 HOURS PRIOR TO COMMENCING CONSTRUCTION AND 48 HOUR NOTICE TO ANY CONSTRUCTION ACTIVITY WITHIN THE LIMITS OF THE PAVING AT CONSTRUCTION@FBCTX.GOV.
3. CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED FROM FORT BEND COUNTY PRIOR TO COMMENCING CONSTRUCTION OF ANY IMPROVEMENTS WITHIN COUNTY ROAD RIGHT OF WAYS.
4. ALL PAVING IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH FORT BEND COUNTY "RULES, REGULATIONS AND REQUIREMENTS" RELATING TO THE APPROVAL AND ACCEPTANCE OF IMPROVEMENTS IN SUBDIVISIONS AS CURRENTLY AMENDED.
5. ALL ROAD WIDTHS, CURB RADII AND CURB ALIGNMENT SHOWN INDICATES BACK OF CURB, UNLESS OTHERWISE NOTED IN PLANS.
6. ALL WEATHER ACCESS TO ALL EXISTING STREETS AND DRIVEWAYS SHALL BE MAINTAINED AT ALL TIMES.
7. CURB HEADERS ARE REQUIRED AT CURB CONNECTIONS TO HANDICAP RAMPS, WITH NO CONSTRUCTION JOINT WITHIN 5' OF RAMPS.
8. GUIDELINES ARE SET FORTH IN THE TEXAS "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", AS CURRENTLY AMENDED, SHALL BE OBSERVED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE FLAGMEN, SIGNING, STRIPING AND WARNING DEVICES, ETC., DURING CONSTRUCTION - BOTH DAY AND NIGHT.
9. ALL R1-1 STOP SIGNS SHALL BE A MINIMUM OF 36"x36" WITH DIAMOND GRADE SHEETING PER TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
10. A BLUE DOUBLE REFLECTORIZED BUTTON SHALL BE PLACED AT ALL FIRE HYDRANT LOCATIONS. THE BUTTON SHALL BE PLACED 12 INCHES OFF OF THE CENTERLINE OF THE STREET ON THE SAME SIDE AS THE HYDRANT.
11. THE PROJECT AND ALL PARTS THEREOF SHALL BE SUBJECT TO INSPECTION FROM TIME TO TIME BY INSPECTORS DESIGNATED BY FORT BEND COUNTY. NO SUCH INSPECTIONS SHALL RELIEVE THE CONTRACTOR OF ANY OF ITS OBLIGATIONS HEREUNDER. NEITHER FAILURE TO INSPECT NOR FAILURE TO DISCOVER OR REJECT ANY OF THE WORK AS NOT IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS, REQUIREMENTS AND SPECIFICATIONS OF FORT BEND COUNTY OR ANY PROVISION OF THIS PROJECT SHALL BE CONSTRUED TO IMPLY AN ACCEPTANCE OF SUCH WORK OR TO RELIEVE THE CONTRACTOR OF ANY OF ITS OBLIGATIONS HEREUNDER.
12. PAY ITEMS ARE BASED ON TxDOT STAND SPECIFICATION FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES (EDITION: NOVEMBER 1, 2014).

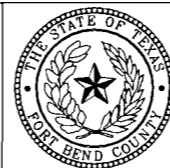
NOTE: FORT BEND COUNTY NOTES SUPERSEDE ANY CONFLICTING NOTES.

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NO.	REVISIONS	DATE	NAME
△	ORIGINAL STANDARD ISSUED	2-1-22	RJS
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FORT BEND COUNTY  
ENGINEERING DEPARTMENT



PROJECT TITLE: FORT BEND PARKWAY TOLL ROAD		FBCED STANDARD
DRAWN BY: INIT	ENTRANCE RAMP 1A	02
CR'D BY: ARV	SHEET DESCRIPTION: CONSTRUCTION GENERAL NOTES	
SCALE: NONE		SHEET NO: 5A
DATE: 2-1-22	APPROVED BY:	

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**GENERAL**

1. THE CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS BEFORE BEGINNING CONSTRUCTION.
2. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING SECURITY TO PROTECT THE PROJECT SITE, CONTRACTOR PROPERTY, EQUIPMENT, AND WORK.
3. THE CONTRACTOR IS RESPONSIBLE FOR CLEANING STREETS OF CONSTRUCTION DIRT AND DEBRIS AT CLOSE OF EACH WORK DAY.
4. THE CONDITION OF THE ROAD AND/OR RIGHT-OF-WAY, UPON COMPLETION OF THE JOB SHALL BE AS GOOD AS OR BETTER THAN PRIOR TO STARTING WORK.
5. PRIOR TO CONSTRUCTION, THE CONTRACTOR, ALONG WITH CONCURRENCE FROM THE FIELD ENGINEER, SHALL DETERMINE HIS/HER LAY-DOWN AND/OR STAGING AREA LOCATIONS.
6. THE CONTRACTOR SHALL NOTIFY ALL PROPERTY OWNERS A MINIMUM OF 24 HOURS PRIOR TO BLOCKING DRIVEWAYS OR ENTERING UTILITY EASEMENTS.
7. TRAFFIC INGRESS AND EGRESS FOR DRIVEWAYS AND PEDESTRIAN ACCESS FACILITIES SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION WITH ALL WEATHER SURFACES.
8. THE CONTRACTOR SHALL REMOVE ANY FENCES, POSTS, MAILBOXES, PLANTERS, PERMANENT TRASH CONTAINERS, CULVERTS, ETC. OR SECTIONS THEREOF, THAT ENCR OACH WITHIN THE COUNTY'S RIGHT-OF-WAY. NOTE: PRIOR TO CONSTRUCTION, THE PROPERTY OWNER WAS PAID TO RELOCATE OR REPLACE THESE ITEMS OUTSIDE OF THE COUNTY'S RIGHT-OF-WAY. IF THE OWNER HAS FAILED TO DO SO, THE CONTRACTOR WILL REPLACE THEM WITH THE MINIMUM LEVEL OF QUALITY NEEDED TO SECURE THE PROPERTY AND/OR MAINTAIN MAIL DELIVERY. IN THAT CASE, PAYMENT FOR THESE INSTALLATIONS WILL BE INCLUDED AS EXTRA WORK ITEMS OR AS OVERRUNS TO EXISTING PAY ITEMS.  
  
ANY DAMAGE CAUSED BY THE CONTRACTOR TO SUCH ITEMS LOCATED OUTSIDE OF THE COUNTY'S RIGHT-OF-WAY, SHALL BE REPLACED WITH LIKE-KIND OR BETTER AT THE CONTRACTOR'S EXPENSE.  
  
ALSO, IF THESE ITEMS ARE LOCATED WITHIN THE PROJECT RIGHT-OF-WAY AND ARE DESIGNATED TO REMAIN, ANY DAMAGE CAUSED BY THE CONTRACTOR TO SUCH ITEMS, SHALL BE REPLACED WITH LIKE-KIND OR BETTER AT THE CONTRACTOR'S EXPENSE.  
  
TREES, BUSHES, SHRUBBERY AND OTHER DAMAGED PLANTINGS DESIGNATED TO REMAIN SHALL BE REPLACED WITHIN 72 HOURS OF REMOVAL AND ARE TO BE THOROUGHLY WATERED-IN. NO SEPARATE PAY.
9. PAVED SURFACES, PAVEMENT MARKERS AND MARKINGS SHALL BE PROTECTED FROM DAMAGE BY TRACKED EQUIPMENT.
10. IRON RODS DISTURBED DURING CONSTRUCTION ARE TO BE REPLACED BY A REGISTERED PROFESSIONAL LAND SURVEYOR FOR THE ORIGINAL PROPERTY OWNER AT NO SEPARATE PAY.
11. CONSTRUCTION STAKING WILL BE PROVIDED BY THE CONTRACTOR. TWO COPIES OF STAKING NOTES TO BE PROVIDED TO THE ENGINEER PRIOR TO CONSTRUCTION.
12. THE COUNTY OR THE COUNTY'S SURVEYOR SHALL PROVIDE A BENCHMARK OR TEMPORARY BENCHMARK AND SURVEY CONTROLS.
13. THE CONTRACTOR SHALL MAINTAIN UPDATED RED-LINED RECORD DRAWINGS ON SITE FOR INSPECTION BY THE ENGINEER.
14. MOWING, MAINTENANCE, AND CLEAN-UP OF THE PROJECT SHALL MEET THE REQUIREMENT OF SPECIFICATION ITEM 560 (NO SEPARATE PAY). MOWING, MAINTENANCE, AND CLEAN-UP IS REQUIRED FOR THE PROJECT LIMITS AND DURATION, REGARDLESS OF THE CONTRACTOR'S SCOPE OF ACTIVITIES WITHIN THE PROJECT LIMITS.
15. THE REMOVAL OF ANY ABANDONED UTILITIES REQUIRED TO COMPLETE THE WORK SHALL BE INCIDENTAL AND NO SEPARATE PAYMENT SHALL BE MADE.
16. IT IS THE CONTRACTOR'S RESPONSIBILITY TO STOCKPILE NECESSARY MATERIAL ON-SITE OR AT A SECURED OFF-SITE LOCATION AT NO ADDITIONAL EXPENSE TO FORT BEND COUNTY. ANY SUITABLE EXCAVATED MATERIAL ON THE PROJECT WHICH IS AVAILABLE AT THE TIME OF NEED; WHETHER FROM STORM SEWER, ROADWAY, AND/OR CHANNEL EXCAVATION, SHALL BE USED BEFORE BORROW IS BROUGHT ON-SITE.
17. MANHOLES, JUNCTION BOXES, INLETS, AND RISERS ARE TO BE PRE-CAST OR CAST IN PLACE.
18. THE FOLLOWING DETAILS ARE MINIMUM REQUIREMENTS AND MAY BE SUPERSEDED BY GEOTECHNICAL ENGINEER RECOMMENDATIONS OR MORE STRINGENT REQUIREMENTS FROM THE CITY'S ETJ PROJECT IS WITHIN.
19. POP UP DRAINS ARE NOT ALLOWED IN FORT BEND COUNTY RIGHT OF WAY.

**TRAFFIC CONTROL**

1. THE CONTRACTOR SHALL PROVIDE AND INSTALL TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH PART VI OF THE MOST RECENT EDITION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AND THE APPROVED TRAFFIC CONTROL PLAN.
2. THE CONTRACTOR SHALL MAINTAIN AT LEAST ONE LANE OF TRAFFIC IN EACH DIRECTION DURING WORKING HOURS EXCEPT DURING FLAGGING OPERATION.
3. LANE CLOSURES SHALL BE DURING OFF-PEAK HOURS ONLY (MONDAY THROUGH FRIDAY 9 A.M. TO 4 P.M.) UNIFORMED PEACE OFFICERS OR FLAGGERS IN RADIO CONTACT ARE REQUIRED TO DIRECT TRAFFIC DURING LANE CLOSURES.
4. DETOURS REQUIRE PRIOR APPROVAL OF THE FIELD ENGINEER AND PRECINCT. DETOUR PLANS, IF ALLOWED, MUST INCLUDE APPROPRIATE DETOUR SIGNAGE, PUBLIC NOTICE VIA SIGNAGE TWO WEEKS IN ADVANCE STATING THE DATES OF THE AGREED UPON DATE OF CLOSURE AND DATE THE ROAD WILL RE-OPEN TO TRAFFIC. CONTRACTOR TO USE (WITH PRIOR APPROVAL OF THE FIELD ENGINEER) HIGH EARLY STRENGTH CONCRETE AND OTHER RELATED CONSTRUCTION METHODS TO MINIMIZE THE DURATION OF THE DETOUR AND TO ENSURE THAT THE ROADWAY IS OPEN ON, OR PRIOR TO, THE AGREED UPON DATE.
5. ONE DAY PRIOR TO THE IMPLEMENTATION OF A TRAFFIC CONTROL PLAN PHASE OR STEP, OR THE IMPLEMENTATION OF AN ADDITIONAL, REVISED, OR NEW TRAFFIC CONTROL ELEMENT, THE CONTRACTOR SHALL MEET WITH THE ENGINEER TO GIVE A DETAILED DESCRIPTION OF THE CONTRACTOR'S PLAN AND PREPARATIONS. THE CONTRACTOR SHALL OBTAIN WRITTEN CONCURRENCE FROM THE ENGINEER THAT ADEQUATE PROJECT PROGRESS HAS BEEN ACHIEVED AND THAT ADEQUATE PREPARATIONS ARE IN PLACE PRIOR TO SWITCHING TRAFFIC. IF, IN THE OPINION OF THE ENGINEER, REQUIRED PROGRESS AND ADEQUATE PREPARATIONS ARE NOT COMPLETE, THE CONTRACTOR SHALL NOT IMPLEMENT THE NEXT PHASE, STEP, OR ELEMENT OF TRAFFIC CONTROL UNTIL INCOMPLETE CONSTRUCTION ITEMS OR PREPARATIONS ARE COMPLETED. TIME EXTENSIONS WILL NOT BE GRANTED FOR DELAYS CAUSED BY THE INCOMPLETE CONSTRUCTION ITEMS OR INADEQUATE CONTRACTOR PREPARATIONS REQUIRED TO IMPLEMENT TRAFFIC CONTROL.
6. TRAFFIC CONTROL PER THE CONTRACT IS REQUIRED FOR THE ENTIRE DURATION OF THE PROJECT, INCLUDING THE PUNCHLIST PERIOD. PAYMENT FOR TRAFFIC CONTROL THAT IS PROPERLY INSTALLED FOR LESS THAN A FULL MONTH SHALL BE BASED ON A PERCENTAGE BASIS OF THE TIME INSTALLED. TRAFFIC CONTROL PAYMENTS TO THE CONTRACTOR SHALL END 10 DAYS AFTER SUBSTANTIAL COMPLETION, ALTHOUGH PROPER TRAFFIC CONTROL MUST BE MAINTAINED UNTIL PUNCHLIST COMPLETION.
7. THE PURPOSE OF THE CONSTRUCTION SEQUENCE AND TRAFFIC HANDLING OUTLINED HEREIN IS TO DOCUMENT A VIABLE TCP THAT CAN BE UTILIZED TO CONSTRUCT THE PROJECT. IT IS THE BASIS OF ESTIMATION FOR THE TRAFFIC CONTROL BID ITEMS, AND IS TO BE UTILIZED AND IMPLEMENTED, UNLESS OTHERWISE DIRECTED BY THE ENGINEER. IF THE CONTRACTOR CHOOSES TO USE A DIFFERENT TCP, HE/SHE SHALL PREPARE AND SUBMIT THE ALTERNATIVE TCP TO THE COUNTY FOR APPROVAL NO LESS THAN 10 WORKING DAYS PRIOR TO THE PROPOSED IMPLEMENTATION DATE. THE TCP SHALL BE DRAWN TO SCALE AND SIGNED & SEALED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS. UPON APPROVAL BY FORT BEND COUNTY, THE ALTERNATIVE PLAN SHALL BECOME THE BASIS FOR A "CHANGE IN CONTRACT" TO REVISE THE TRAFFIC CONTROL BID ITEMS ACCORDINGLY AND BECOME PART OF THE CONTRACT DOCUMENTS.
8. ALL TEMPORARY PAVEMENT MARKINGS ON PERMANENT PAVEMENT SHOULD BE RPMS OR TABS.
9. TRAFFIC PATTERN CHANGES REQUIRE CHANGEABLE MESSAGE BOARDS PLACED AT LEAST 2 WEEKS IN ADVANCE OF PROPOSED CHANGE. QUANTITY, PLACEMENT AND WORDING TBD BY FBC.

NO.	REVISIONS	DATE	NAME
△	ORIGINAL STANDARD ISSUED	2-1-22	RJS
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FORT BEND COUNTY  
ENGINEERING DEPARTMENT



PROJECT TITLE: FORT BEND PARKWAY TOLL ROAD		
DRAWN BY: INIT	ENTRANCE RAMP 1A	FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: PUBLIC WORKS AND SUBDIVISION	03
SCALE: NONE	GENERAL NOTES	SHEET NO:
DATE: 2-1-22	APPROVED BY:	5B

**GENERAL UTILITIES**

CONSIDER THE LOCATIONS OF UNDERGROUND UTILITIES DEPICTED IN THE PLANS AS APPROXIMATE AND EMPLOY RESPONSIBLE CARE TO AVOID DAMAGING UTILITY FACILITIES. DEPENDING UPON SCOPE AND MAGNITUDE OF PLANNED CONSTRUCTION ACTIVITIES, ADVANCED FIELD CONFIRMATION BY THE UTILITY OWNER OR OPERATOR MAY BE PRUDENT. WHERE POSSIBLE, PROTECT AND PRESERVE PERMANENT SIGNS, MARKERS, AND DESIGNATIONS OF UNDERGROUND FACILITIES.

**CITY OF HOUSTON (COH)  
INTERAGENCY- HOUSTON PUBLIC WORKS**

**CAUTION: UNDERGROUND SANITARY SEWER AND WATER LINE FACILITIES**

THE CONTRACTOR SHALL CONTACT COH (INTERAGENCY - HOUSTON PUBLIC WORKS) AT THE FOLLOWING CONTACT: JIADA HUANG, P.E. - (O) 832-395-2229, (C) 346-577-5987, OR EMAIL AT [JIADA.HUANG@HOUSTONTX.GOV](mailto:JIADA.HUANG@HOUSTONTX.GOV) A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.  
1. FOR EMERGENCIES REGARDING WATER LINES CALL 311 OR JIADA HUANG, P.E. AT 346-577-5987.  
THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

**HARRIS COUNTY TOLL ROAD AUTHORITY (HCTRA)**

- FIBER OPTIC DUCT BANKS OWNED BY TXDOT, HARRIS COUNTY, AND HCTRA MAY ALSO EXIST WITHIN THE PROJECT LIMITS. THESE FIBER DUCT BANKS ARE NOT PART OF THE TEXAS ONE CALL SYSTEM. THE CONTRACTOR SHALL CONTACT TXDOT, HARRIS COUNTY TRAFFIC AND HCTRA TO OBTAIN FIBER OPTIC DUCT BANK LOCATES AT THE FOLLOWING CONTACTS: TXDOT - 713.802.5662, HARRIS COUNTY TRAFFIC SIGNAL HOTLINE - 713.881.3210 AND HCTRA VIA E-MAIL AT [ITSMAINT@HCTRA.ORG](mailto:ITSMAINT@HCTRA.ORG).
- THE CONTRACTOR SHALL CONTACT HCTRA MAINTENANCE DEPARTMENT AT 832.590.6936 48 HOURS PRIOR TO STARTING CONSTRUCTION. THE CONTRACTOR SHALL RESTORE THE PROJECT SITE BACK TO ORIGINAL CONDITIONS OR BETTER.

**CENTERPOINT ENERGY**

**CAUTION: UNDERGROUND GAS FACILITIES**

THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 1-800-545-6005 OR 811 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.  
2. WHEN CENTERPOINT ENERGY PIPE LINE MARKINGS ARE NOT VISIBLE, CALL (713) 207-5463 OR (713)-945-8037 (7:00 A.M. TO 4:30 P.M.) FOR STATUS OF LINE LOCATION REQUEST BEFORE EXCAVATION BEGINS.  
3. WHEN EXCAVATING WITHIN EIGHTEEN INCHES (18") OF THE INDICATED LOCATION OF CENTERPOINT ENERGY FACILITIES, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.  
4. WHEN CENTERPOINT ENERGY FACILITIES ARE EXPOSED, SUFFICIENT SUPPORT MUST BE PROVIDED TO THE FACILITIES TO PREVENT EXCESSIVE STRESS ON THE PIPING.  
5. FOR EMERGENCIES REGARDING GAS LINES CALL (713) 659-3552 OR (713) 207-4200.

THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

**WARNING: OVERHEAD ELECTRICAL LINES**

OVERHEAD LINES MAY EXIST ON THE PROPERTY. THE LOCATION OF OVERHEAD LINES HAS NOT BEEN SHOWN ON THESE DRAWINGS AS THE LINES ARE CLEARLY VISIBLE, BUT YOU SHOULD LOCATE THEM PRIOR TO BEGINNING ANY CONSTRUCTION. TEXAS LAW, SECTION 752, HEALTH & SAFETY CODE FORBIDS ACTIVITIES THAT OCCUR IN CLOSE PROXIMITY TO HIGH VOLTAGE LINES, SPECIFICALLY:  
1. ANY ACTIVITY WHERE PERSON OR THINGS MAY COME WITHIN SIX (6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES; AND  
2. OPERATING A CRANE, DERRICK, POWER SHOVEL, DRILLING RIG, PILE DRIVER, HOISTING EQUIPMENT, OR SIMILAR APPARATUS WITHIN 10 FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES.

PARTIES RESPONSIBLE FOR THE WORK, INCLUDING CONTRACTORS ARE LEGALLY RESPONSIBLE FOR THE SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. THIS LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR REMOVED CALL CENTERPOINT ENERGY AT (713) 207-2222.

**ACTIVITIES ON/OR ACROSS CENTERPOINT ENERGY FEE OR EASEMENT PROPERTY**  
NO APPROVAL TO USE, CROSS OR OCCUPY CENTERPOINT FEE OR EASEMENT PROPERTY IS GIVEN. IF YOU NEED TO USE CENTERPOINT PROPERTY, PLEASE CONTACT OUR SURVEYING & RIGHT OF WAY DIVISION AT (713) 207- 6348 OR (713) 207-5769.

IF THE CONTRACTOR DAMAGES OR CAUSES DAMAGE (BREAKS, LEAKS, NICKS, DENTS, GOUGES, ETC.) TO THE UTILITY, CONTACT THE UTILITY FACILITY OWNER OR OPERATOR IMMEDIATELY.

**CenterPoint Energy Signature Block**



<p><b>NOTICE:</b> For your safety, you are required by Texas Law to call 811 at least 48 hours before you dig so that underground lines can be marked. This signature does not fulfill your obligation to call 811.</p>
<p><b>VERIFICATION OF PRIVATE UTILITY LINES</b></p>
<p>Date</p>
<p>CenterPoint Energy natural gas utilities shown. (Gas service lines are not shown). This signature not to be used for conflict verification.</p>
<p>Signature Valid for six months.</p>
<p>Date</p>
<p>CenterPoint Energy/UNDERGROUND Electrical Facilities Verification ONLY.</p>
<p>(This signature verifies existing underground facilities - not to be used for conflict verification.)</p>
<p>Signature Valid for six months.</p>

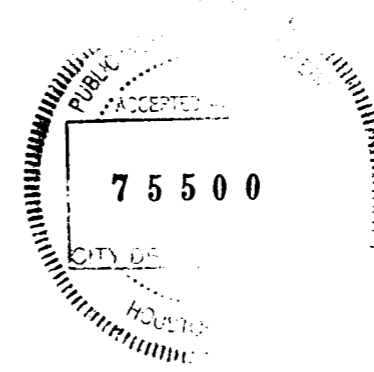
**KINDER MORGAN**

- CONTRACTORS SHALL BE ADVISED OF COMPANY'S REQUIREMENTS AND BE CONTRACTUALLY OBLIGATED TO COMPLY.
- THE CONTINUED INTEGRITY OF COMPANY'S PIPELINES AND THE SAFETY OF ALL INDIVIDUALS IN THE AREA OF PROPOSED WORK NEAR COMPANY'S FACILITIES ARE OF THE UTMOST IMPORTANCE. THEREFORE, CONTRACTOR MUST MEET WITH COMPANY REPRESENTATIVES PRIOR TO CONSTRUCTION TO PROVIDE AND RECEIVE NOTIFICATION LISTINGS FOR APPROPRIATE AREA OPERATIONS AND EMERGENCY PERSONNEL. **COMPANY'S ON-SITE REPRESENTATIVE WILL REQUIRE DISCONTINUATION OF ANY WORK THAT, IN HIS OPINION, ENDANGERS THE OPERATIONS OR SAFETY OF PERSONNEL, PIPELINES OR FACILITIES.**
- THE CONTRACTOR MUST EXPOSE ALL COMPANY TRANSMISSION AND DISTRIBUTION LINES PRIOR TO CROSSING TO DETERMINE THE EXACT ALIGNMENT AND DEPTH OF THE LINES. A COMPANY REPRESENTATIVE MUST BE PRESENT. IN THE EVENT OF PARALLEL LINES, ONLY ONE PIPELINE CAN BE EXPOSED AT A TIME
- COMPANY WILL NOT ALLOW PIPELINES TO REMAIN EXPOSED OVERNIGHT WITHOUT CONSENT OF COMPANY DESIGNATED REPRESENTATIVE. CONTRACTOR MAY BE REQUIRED TO BACKFILL PIPELINES AT THE END OF EACH DAY.
- A COMPANY REPRESENTATIVE SHALL DO ALL LINE LOCATING. A COMPANY REPRESENTATIVE SHALL BE PRESENT FOR HYDRAULIC EXCAVATION. THE USE OF PROBING RODS FOR PIPELINE LOCATING SHALL BE PERFORMED BY COMPANY REPRESENTATIVES ONLY, TO PREVENT UNNECESSARY DAMAGE TO THE PIPELINE COATING.
- NOTIFICATION SHALL BE GIVEN TO COMPANY AT LEAST 72 HOURS BEFORE START OF CONSTRUCTION. A SCHEDULE OF ACTIVITIES FOR THE DURATION OF THE PROJECT MUST BE MADE AVAILABLE AT THAT TIME TO FACILITATE THE SCHEDULING OF COMPANY'S WORK SITE REPRESENTATIVE. ANY CONTRACTOR SCHEDULE CHANGES SHALL BE PROVIDED TO COMPANY IMMEDIATELY.
- HEAVY EQUIPMENT WILL NOT BE ALLOWED TO OPERATE DIRECTLY OVER COMPANY PIPELINES OR IN COMPANY ROW UNLESS WRITTEN APPROVAL IS OBTAINED FROM COMPANY. HEAVY EQUIPMENT SHALL ONLY BE ALLOWED TO CROSS COMPANY PIPELINES AT LOCATIONS DESIGNATED BY COMPANY. CONTRACTOR SHALL COMPLY WITH ALL PRECAUTIONARY MEASURES REQUIRED BY COMPANY TO PROTECT ITS PIPELINES. WHEN INCLEMENT WEATHER EXISTS, PROVISIONS MUST BE MADE TO COMPENSATE FOR SOIL DISPLACEMENT DUE TO SUBSIDENCE OF TIRES.
- EXCAVATING OR GRADING WHICH MIGHT RESULT IN EROSION OR WHICH COULD RENDER THE COMPANY ROW INACCESSIBLE SHALL NOT BE PERMITTED UNLESS THE CONTRACTOR/DEVELOPER/OWNER AGREES TO RESTORE THE AREA TO ITS ORIGINAL CONDITION AND PROVIDE PROTECTION TO COMPANY'S FACILITY.
- A COMPANY REPRESENTATIVE SHALL BE ON-SITE TO MONITOR ANY CONSTRUCTION ACTIVITIES WITHIN 25- FEET OF A COMPANY PIPELINE OR ABOVEGROUND APPURTENANCE. THE CONTRACTOR SHALL NOT WORK WITHIN THIS DISTANCE WITHOUT A COMPANY REPRESENTATIVE BEING ON SITE. ONLY HAND EXCAVATION SHALL BE PERMITTED WITHIN A MINIMUM OF 18-INCHES (REFER TO STATE SPECIFIC RULES/REGULATIONS REGARDING ANY ADDITIONAL CLEARANCE REQUIREMENTS) OF COMPANY PIPELINES, VALVES AND FITTINGS. HOWEVER, PROCEED WITH EXTREME CAUTION WHEN WITHIN THREE (3) FEET OF THE PIPE.
- RIPPING IS ONLY ALLOWED WHEN THE POSITION OF THE PIPE IS KNOWN AND NOT WITHIN 10- FEET OF COMPANY FACILITY UNLESS COMPANY REPRESENTATIVE IS PRESENT.

- RIPPING IS ONLY ALLOWED WHEN THE POSITION OF THE PIPE IS KNOWN AND NOT WITHIN 10- FEET OF COMPANY FACILITY UNLESS COMPANY REPRESENTATIVE IS PRESENT.
- TEMPORARY SUPPORT OF ANY EXPOSED COMPANY PIPELINE BY CONTRACTOR MAY BE NECESSARY IF REQUIRED BY COMPANY'S ON-SITE REPRESENTATIVE. BACKFILL BELOW THE EXPOSED LINES AND 12-INCHES ABOVE THE LINES SHALL BE REPLACED WITH SAND OR OTHER SELECTED MATERIAL AS APPROVED BY COMPANY'S ON-SITE REPRESENTATIVE AND THOROUGHLY COMPACTED IN 12-INCHES LIFTS TO 95% OF STANDARD PROCTOR DRY DENSITY MINIMUM OR AS APPROVED BY COMPANY'S ON-SITE REPRESENTATIVE. THIS IS TO ADEQUATELY PROTECT AGAINST STRESSES THAT MAY BE CAUSED BY THE SETTLING OF THE PIPELINE.
- NO BLASTING SHALL BE ALLOWED WITHIN 1000- FEET OF COMPANY'S FACILITIES UNLESS BLASTING NOTIFICATION IS GIVEN TO COMPANY INCLUDING COMPLETE BLASTING PLAN DATA. A PRE-BLAST MEETING SHALL BE CONDUCTED BY THE ORGANIZATION RESPONSIBLE FOR BLASTING. COMPANY SHALL BE INDEMNIFIED AND HELD HARMLESS FROM ANY LOSS, COST OF LIABILITY FOR PERSONAL INJURIES RECEIVED, DEATH CAUSED OR PROPERTY DAMAGE SUFFERED OR SUSTAINED BY ANY PERSON RESULTING FROM ANY BLASTING OPERATIONS UNDERTAKEN WITHIN 500- FEET OF ITS FACILITIES. THE ORGANIZATION RESPONSIBLE FOR BLASTING SHALL BE LIABLE FOR ANY AND ALL DAMAGES CAUSED TO COMPANY'S FACILITIES AS A RESULT OF THEIR ACTIVITIES WHETHER OR NOT COMPANY REPRESENTATIVES ARE PRESENT. COMPANY SHALL HAVE A SIGNED AND EXECUTED BLASTING INDEMNIFICATION AGREEMENT BEFORE AUTHORIZED PERMISSION TO BLAST CAN BE GIVEN. NO BLASTING SHALL BE ALLOWED WITHIN 300- FEET OF COMPANY'S FACILITIES UNLESS BLASTING NOTIFICATION IS GIVEN TO COMPANY A MINIMUM OF ONE WEEK BEFORE BLASTING. (NOTE: COVERED ABOVE) COMPANY SHALL REVIEW AND ANALYZE THE BLASTING METHODS. A WRITTEN BLASTING PLAN SHALL BE PROVIDED BY THE ORGANIZATION RESPONSIBLE FOR BLASTING AND AGREED TO IN WRITING BY COMPANY IN ADDITION TO MEETING REQUIREMENTS FOR 500- FEET AND 1000- FEET BEING MET ABOVE. A WRITTEN EMERGENCY PLAN SHALL BE PROVIDED BY THE ORGANIZATION RESPONSIBLE FOR BLASTING. (NOTE: COVERED ABOVE)
- ANY CONTACT WITH ANY COMPANY FACILITY, PIPELINE, VALVE SET, ETC. SHALL BE REPORTED IMMEDIATELY TO COMPANY. IF REPAIRS TO THE PIPE ARE NECESSARY, THEY WILL BE MADE AND INSPECTED BEFORE THE SECTION IS RE- COATED AND THE LINE IS BACK- FILLED.
- COMPANY PERSONNEL SHALL INSTALL ALL TEST LEADS ON COMPANY FACILITIES.
- BURNING OF TRASH, BRUSH, ETC. IS NOT PERMITTED WITHIN THE COMPANY ROW.

4/4/2023 5:10:56 PM C:\AIG-Projectwise\AIG Technical Services LLC\2106\_FBPkwy\_BWB\_Ramp\07\_CAD\_GIS\02\_Sheets\20219x\_FBC\_AIG\_GN\_GN\_10.dgn

REV.	DATE	BY	DESCRIPTION
 4/4/2023			
 <b>FORT BEND COUNTY TOLL ROAD AUTHORITY</b>			
<b>AIG Tech</b> Advanced Infrastructure Solutions AIG TECHNICAL SERVICES, LLC F-20607 1500 S DAIRY ASHFORD SUITE 445 HOUSTON, TX 77077			
<b>FORT BEND PARKWAY TOLL ROAD</b>  <b>UTILITY GENERAL NOTES</b>			
PROJECT NUMBER	20219x	DATE:	4/4/2023
DESIGNED BY:		CHECKED BY:	
CHECKED BY:		DRAWN BY:	
DRAWN BY:		CHECKED BY:	
SHEET NO.:			5C



**ENERFIN**

1. IN ACCORDANCE WITH STATE AND FEDERAL LAWS, CONTRACTORS MUST CONTACT THE APPROPRIATE ONE CALL SYSTEM(S) AT LEAST FORTY-EIGHT (48) HOURS PRIOR TO BEGINNING ANY WORK AT THE SUBJECT SITE. PLEASE DIAL 811 TO MAKE THE ONE CALL NOTIFICATION.
2. NO WORK MAY COMMENCE IN OR AROUND ENERFIN'S RIGHT-OF-WAY UNTIL AN ENERFIN REPRESENTATIVE HAS AUTHORIZED IT TO BEGIN. NOTICE OF DESIRED WORK START DATE SHOULD BE GIVEN AT LEAST FORTY-EIGHT (48) HOURS IN ADVANCE.
3. IF IT IS DETERMINED THAT YOUR PROJECT IMPACTS ENERFIN'S FACILITIES, REQUIRING THAT INVESTIGATIVE AND/OR PROTECTIVE WORK BE PERFORMED ON ENERFIN'S PIPELINES OR APPURTENANCES, A NON-REFUNDABLE ADVANCE FEE MAY BE REQUIRED TO CONDUCT PRELIMINARY ENGINEERING DESIGN WORK. ANY WORK PERFORMED BY ENERFIN TO REMEDY SUCH IMPACTS WILL BE ENTIRELY AT THE REQUESTOR'S EXPENSE, WHICH MAY FIRST REQUIRE THE FULL EXECUTION OF OUR STANDARD REIMBURSEMENT AGREEMENT AND A DEPOSIT WITH ENERFIN OF OUR ESTIMATED COSTS FOR SUCH WORK. ANY NECESSARY INSPECTION, PROTECTION, LOWERING, ADJUSTMENT, CASING, RE-COATING, AND/OR RELOCATION OF THE PIPELINES WILL NOT BE SCHEDULED UNTIL: (A) ALL PREREQUISITE DATA ARE COMPILED; (B) THE APPROPRIATE AGREEMENTS ARE EXECUTED; AND (C) SUFFICIENT FUNDS ARE RECEIVED. IT IS ENERFIN'S MINIMUM PRACTICE TO INSPECT AND RECONDITION THE PIPELINE(S) AT PROPOSED STREET AND DRIVEWAY CROSSINGS, THE COSTS FOR WHICH WILL BE BORNE BY THE DEVELOPER OR OWNER.
4. THE EARTH COVER OVER THE PIPELINE SHALL BE MAINTAINED AND NEVER CHANGE IN ANY MANNER WITHOUT WRITTEN CONSENT FROM ENERFIN.
5. NO STORAGE AREA OR SPOIL WILL BE PLACED ON ENERFIN'S PIPELINE OR RIGHT-OF-WAY WITHOUT AUTHORIZATION FROM ENERFIN. NO ENCROACHMENTS OF ANY KIND INCLUDING BUT IN NO WAY LIMITED TO SIGNS, MONUMENTS, BUILDINGS, PARKING LOTS (UNLESS APPROVED IN ADVANCE), STRUCTURES, TREES, SHRUBS TALLER THAN FOUR (4) FEET, MANHOLES, SWIMMING POOLS, WELLS, LEACH BEDS, CESSPOOLS, SEWER SYSTEMS OR IMPOUNDMENTS SHALL BE LOCATED WITHIN THE PIPELINE RIGHT-OF-WAY. THE INTENTION OF THIS RESTRICTION IS TO MAINTAIN AN UNOBSTRUCTED RIGHT-OF-WAY. NO HOLES ARE TO BE BORED OR EXCAVATED WITHIN THE BOUNDARIES OF THE RIGHT-OF-WAY WITHOUT THE PRIOR APPROVAL OF ENERFIN.
  - a. DIRECTIONALLY DRILLED INJECTION WELLS, FOR THE PURPOSE OF GROUNDWATER CONTAMINATION REMEDIATION ACTIVITIES, WILL BE EVALUATED ON AN INDIVIDUAL BASIS UPON SUBMITTAL OF A PROPOSAL, IN WRITING, TO ENERFIN. UPON APPROVAL BY ENERFIN, THESE WELLS MAY EXTEND INTO THE SUBSURFACE BELOW THE PIPELINE ROW AS LONG AS THE WELLHEAD ASSEMBLIES DO NOT PROJECT INTO THE SURFACE WITHIN THE PIPELINE ROW, AND IN NO INSTANCE SHOULD THE WELL TRAJECTORY BE ALLOWED UNDER THE PIPELINE CORRIDOR WITHIN TEN (10) FEET OF THE SURFACE OF THE ROW. ALL SUCH WELLS ARE TO BE DIRECTIONALLY DRILLED FROM OUTSIDE OF THE SURFACE ROW.
  - b. INJECTION OF CHEMICALS INTO THESE GROUNDWATER WELLS WILL ONLY BE ALLOWED FOLLOWING APPROVAL OF A WRITTEN PROPOSAL SUBMITTED TO ENERFIN DETAILING THE PROPOSED CHEMICAL MAKEUP OF THE INJECTION STREAM AND A SATISFACTORY REVIEW OF SAID INJECTION CHEMICALS BY ENERFIN'S ENGINEERING STAFF.
6. CONSTRUCTION OF ANY ROADS, HIGHWAYS, OR STREETS WHICH REQUIRES BLASTING WITHIN THREE HUNDRED (300) FEET OF THE PIPELINE WILL REQUIRE AN APPROVED BLASTING PLAN IN ADVANCE.
7. A DRIVEWAY OR ROADWAY MAY BE ALLOWED TO CROSS THE RIGHT-OF-WAY IN AS CLOSE AS POSSIBLE TO A PERPENDICULAR ORIENTATION, SUBJECT TO WRITTEN APPROVAL.
8. ALL UNDERGROUND FACILITIES CROSSING THE RIGHT-OF-WAY MUST BE INSTALLED UNDER THE ENERFIN PIPELINES AT AN ANGLE GREATER THAN FORTY-FIVE (45) DEGREES WITH A MINIMUM VERTICAL SEPARATION OF TWENTY-FOUR (24) INCHES BETWEEN THE STRUCTURE AND ENERFIN'S PIPELINE IN A MANNER ACCEPTABLE TO ENERFIN'S ON-SITE REPRESENTATIVE.
9. VEHICULAR TRAVEL ALONG AN ENERFIN EASEMENT IS PROHIBITED EXCEPT ON ROADS, HIGHWAYS AND STREETS OR BY ENERFIN PERSONNEL AND CONTRACTORS PERFORMING PIPELINE MAINTENANCE.
10. LOGGING OPERATIONS PARALLEL TO AN ENERFIN PIPELINE MAY BE GRANTED TEMPORARY ACCESS EXCEPTIONS BY ENERFIN PERSONNEL ALLOWING DEBRIS REMOVAL FROM THE LOGGING OPERATION AREA.
11. ANY CROSSINGS OF ENERFIN'S PIPELINES WITH TRUCKS OR HEAVY EQUIPMENT SHOULD BE NOTED IN THE DRAWING AS CROSSING MAY REQUIRE RAMPING, MATTING OR AIR BRIDGING AT ENERFIN'S DISCRETION.
  - a. HEAVY EQUIPMENT WILL BE DEEMED AS ANY VEHICLE OR POWERED EQUIPMENT LARGER THAN A STANDARD PICKUP TRUCK.
  - b. LOCATIONS FOR CROSSING THE PIPELINE WITH HEAVY EQUIPMENT MAY BE GRANTED AT DESIGNATED AREAS, BUT ONLY AFTER A DEPTH SURVEY HAS BEEN PERFORMED AND VERIFICATION OF PIPELINE DEPTH HAS BEEN ESTABLISHED.
  - c. NO CROSSING OF THE PIPELINE BY HEAVY EQUIPMENT WILL BE GRANTED WITHOUT A MINIMUM DEPTH OF FIVE (5) FEET COVER ON THE PIPELINE. ENERFIN WILL DECIDE THE NECESSARY PROTECTION TO PROTECT THE PIPELINE(S). AN ENERFIN INSPECTOR MUST BE PRESENT WHEN TEMPORARY MATERIALS ARE INSTALLED AND REMOVED.
12. ANY PERMANENT STRUCTURES APPROVED FOR ENCROACHMENT UPON A RIGHT-OF-WAY SHALL BE SUBJECT TO AN AMENDMENT TO THE RIGHT-OF-WAY AGREEMENT BETWEEN THE SUBJECT PARTIES PRIOR TO CONSTRUCTION.
13. THE CONSTRUCTOR SHALL ASSUME FULL LIABILITY FOR ANY DAMAGES TO ENERFIN FACILITIES DUE TO CONSTRUCTION/EXCAVATION ACTIVITIES.
14. BE ADVISED THAT OUR PIPELINE IS CATHODICALLY PROTECTED AND SAID PROTECTION CURRENT MAY HAVE AN EFFECT ON UTILITY LINES THAT ARE MADE OF ELECTRICALLY CONDUCTIVE MATERIAL. YOU MAY WISH TO CONTACT ENERFIN CONCERNING MEASURES YOU CAN TAKE TO PROTECT YOUR METALLIC PIPE FROM THE EFFECTS OF OUR CATHODIC PROTECTION SYSTEM. IF YOUR UTILITY LINE IS MADE OF PLASTIC PIPE, IT WILL NOT BE AFFECTED BY OUR CATHODIC PROTECTION SYSTEM.
15. RESTORATION OF THE SURFACE AFTER PROJECT COMPLETION REQUIRES SEED WITH FERTILIZER AND MULCHING COVER TO RESTORE GROUND COVER AND PREVENT EROSION. SEED BLANKETS, SEED MATS AND SODDING ARE PREFERRED TO SEEDING.

**ELECTRICAL, FIBER OPTIC AND COMMUNICATION CABLE CROSSINGS**

16. WHEN APPROVED BY ENERFIN, ALL ELECTRICAL, FIBER OPTIC AND COMMUNICATION CABLES CROSSING BELOW (PREFERRED) AN ENERFIN PIPELINE SHOULD BE ENCASED IN A HIGH DENSITY POLYETHYLENE (HDPE) CASING, WHICH WILL BE LARGE ENOUGH TO ENCASE ALL COLLECTION SYSTEM HIGH VOLTAGE WIRES, EACH IN A PROTECTIVE CONDUIT, AND ANY REQUIRED FIBER OPTIC CABLES, IN THEIR INDIVIDUAL CONDUITS. THE BORE UNDER THE PIPELINE WILL BE A MINIMUM OF TWENTY-FOUR (24) INCHES FROM THE BOTTOM OF THE PIPELINE TO THE TOP OF THE HDPE CASING AND LARGE ENOUGH IN DIAMETER TO INSTALL ONE HDPE CASING PER CIRCUIT. THE CASING WILL EXTEND THE ENTIRE WIDTH OF THE RIGHT-OF-WAY.
17. WHEN APPROVED BY ENERFIN, ALL ELECTRICAL, FIBER OPTIC, AND COMMUNICATIONS CABLES CROSSING ABOVE AN ENERFIN PIPELINE SHOULD BE CASED ACROSS THE WIDTH OF ENERFIN'S RIGHT-OF-WAY AND COVERED WITH CONCRETE SIX (6) INCHES TO EIGHT (8) INCHES THICK AND A MINIMUM WIDTH OF SIX (6) INCHES ON EACH SIDE AND ABOVE THE CONDUIT.

**PIPELINE CROSSINGS**

18. PERMANENT ABOVEGROUND MARKERS IDENTIFYING THE CROSSING PIPELINE OR UTILITY SHALL BE INSTALLED AND MAINTAINED AT THE LIMITS OF ENERFIN'S RIGHT-OF-WAY AND/OR AT THE CROSSING.
19. IF IT IS IMPRACTICAL TO INSTALL AND MAINTAIN ABOVEGROUND MARKERS DUE TO THE CROSSING LOCATION, PLASTIC MARKER TAPE SHALL BE INSTALLED BELOW CULTIVATION LEVEL AND OVER ENERFIN'S PIPELINE, EXTENDING THE WIDTH OF THE RIGHT-OF-WAY.
20. AN APPROVED CROSSING ABOVE AN ENERFIN PIPELINE WILL NEED TO CLEAR ENERFIN'S PIPELINE BY TWENTY-FOUR (24) INCHES AND REQUIRE A CROSSING AGREEMENT TO BE EXECUTED BETWEEN THE PARTIES.

**BORE CROSSINGS**

21. BORED CROSSINGS WITH A CLEARANCE OF TEN (10) FEET OR LESS WILL REQUIRE THE INSTALLATION OF PEEPHOLES ON BOTH SIDES OF ENERFIN'S PIPELINE OR A WINDOW, TWO (2) FEET BELOW THE DEEPEST ENERFIN PIPELINE, AT THE POINT OF INTERSECTION SO AS TO VIEW THE DRILL STEM CLEARANCE PRIOR TO CROSSING THE ENERFIN PIPELINE.

**HYDRO-VAC EXCAVATION**

22. HYDRO-EVACUATION (HYDRO-VAC) MAY BE REQUIRED IN SOME SITUATIONS TO REDUCE THE RISK OF DAMAGE TO A PIPELINE IF SO DEEMED BY ENERFIN.
23. GROUNDING OF THE VACUUM TRUCK AND WAND IS REQUIRED AND SHOULD BE TESTED. DOWNWIND VENTING OF THE VACUUM TRUCK IS REQUIRED.
24. THE WATER WAND TIP IS TO BE AN OSCILLATION TYPE (CIRCULAR PATTERN) TO PREVENT A CONCENTRATED WATER STREAM; STREAM NOZZLES ARE NOT ALLOWED.
25. THE VACUUM WAND TIP MUST HAVE A NEOPRENE OR EQUIVALENT TIP TO PREVENT DAMAGE TO THE PIPELINE COATING AND SURROUNDING STRUCTURES.
26. IF THE EXCAVATION SITE IS SUSPECTED TO CONTAIN HYDROCARBON-IMPACTED SOIL, A PLAN MUST BE DEVELOPED UPFRONT BY THE EXCAVATOR FOR TESTING AND DISPOSAL OF SOIL/WATER SLURRY (E.G., LINED ROLL-OFF BIN).
27. OTHER AFFECTED UTILITY AND PIPELINE COMPANIES SHOULD BE INFORMED IN ADVANCE OF INTENT TO USE HYDRO-VAC TO IDENTIFY ANY LIMITATIONS.

**FENCE POST/UTILITY POLES**

28. FENCE POSTS, WHERE PERMITTED BY ENERFIN, SHALL NOT BE PLACED WITHIN FOUR (4) FEET OF THE PIPELINE(S). UTILITY POLES AND GUY WIRES SHALL NOT BE PLACED WITHIN ENERFIN'S RIGHT-OF-WAY OR WITHIN EIGHT (8) FEET OF ENERFIN'S PIPELINE(S).

**GENERAL GUIDELINES**

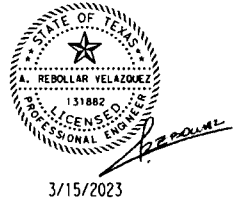

29. ALL HEAVY EQUIPMENT WILL HAVE A SPOTTER WITH IT AT ALL TIMES WHILE WORKING IN ENERFIN'S RIGHT-OF-WAY.
30. MECHANICAL EXCAVATION WILL CEASE ONCE THE EARTH HAS BEEN REMOVED TO WITHIN EIGHTEEN (18) INCHES OF ENERFIN'S PIPELINE. THE TOLERANCE ZONE WILL INCREASE TO TWENTY-FOUR (24) INCHES AT KNOWN APPURTENANCES AND AT ALL VALVE/STOPPLE SITES UNTIL THE APPURTENANCE IS EXPOSED. IF ENERFIN DEEMS IT NECESSARY, THE EXCAVATOR SHALL INSTALL A BAR ACROSS THE TEETH OF THE BUCKET DURING EXCAVATION.
31. SHOVELS WILL BE USED TO MANUALLY CLEAN THE AREA ABOVE AND BELOW THE LINE. AFTER THE LINE HAS BEEN INITIALLY LOCATED, THE LINE SHALL BE KEPT VISIBLE TO THE EQUIPMENT OPERATOR DURING THE EXCAVATION PROCESS. MECHANICAL DIGGING WILL NOT BE ALLOWED CLOSER THAN SIX (6) INCHES FROM THE SIDE AND BOTTOM OF THE PIPELINE AFTER THE LINE HAS BEEN EXPOSED PER THE ABOVE PROCEDURE.
32. EXCAVATION TO INITIALLY EXPOSE THE PIPELINE SHALL BE PARALLEL WITH THE PIPELINE UNLESS THERE ARE NO OTHER OPTIONS.
33. NO EXCAVATIONS SHALL BE MADE ON LAND ADJACENT TO THE PIPELINE THAT WILL IN ANYWAY IMPAIR OR WITHDRAW THE LATERAL SUPPORT AND CAUSE ANY SUBSIDENCE OR DAMAGE TO THE PIPELINE. SHEET PILING MAY BE REQUIRED.
34. CROSSINGS SHALL ALLOW ENERFIN'S PIPELINE(S) TO BE LOWERED IN THE FUTURE TO OBTAIN RECOMMENDED DEPTH FOR NEW CONSTRUCTION. ANY CHANGE IN THE SURFACE GRADE OR ELEVATION OVER OR ALONG THE PIPELINE(S) AND RIGHT-OF-WAY MUST BE APPROVED IN ADVANCE.
35. TEMPORARY CROSSINGS FOR LOGGING ACTIVITIES WILL BE LIMITED TO THIRTY-TWO (32) FEET IN WIDTH AND AS NEAR PERPENDICULAR AS POSSIBLE.
  - a. ORANGE TEMPORARY CONSTRUCTION FENCING ON T POSTS SHALL BE INSTALLED PARALLEL AND ADJACENT TO SAID PIPELINE TO DISCOURAGE DRIVING AROUND DESIGNATED CROSSINGS.
  - b. DESIGNATED CROSSINGS WILL BE A MINIMUM OF FIVE (5) FEET OF COVER ACROSS THE PIPELINE ROW AND WILL INCLUDE TEMPORARY FENCING.
  - c. INSTALLATION OF TEMPORARY FENCES WILL BE COORDINATED WITH ENERFIN PERSONNEL. NO FENCING SHALL BE INSTALLED UNTIL POST LOCATIONS ARE IDENTIFIED AND APPROVED BY ENERFIN.

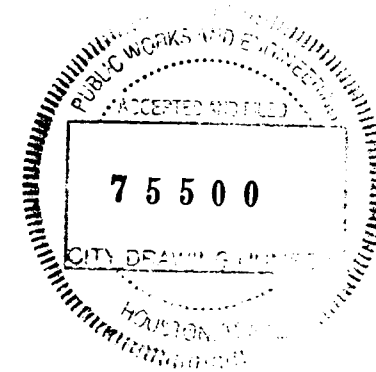
36. ALL BACKFILL ON ENERFIN'S RIGHT-OF-WAY SHALL BE MECHANICALLY COMPACTED TO THE TOP OF THE PIPELINE(S) AFTER REMOVAL OF WATER AND TRASH. GEO-GRIDS AND/OR GEO-BLANKETS ARE TO BE CONSIDERED ON FILL MATERIAL THAT WILL NOT HOLD FIRM COMPACTION.
37. IF ENERFIN'S LINE IS EXPOSED DURING THE EXCAVATION, THE EXCAVATION WILL BE MADE SAFE FOR ENTRY AND LEFT OPEN UNTIL ENERFIN INSTALLS TEST LEADS.
38. CONSTRUCTOR SHALL OPERATE EQUIPMENT THAT IS IN GOOD WORKING CONDITION, CONDUCTIVE TO A SAFE WORKING ENVIRONMENT, WHILE WORKING ON OR NEAR ENERFIN'S FACILITIES. ENERFIN'S REPRESENTATIVE SHALL HAVE THE AUTHORITY TO REJECT THE USE OF EQUIPMENT TO EXCAVATE ENERFIN'S FACILITIES IF, IN THEIR OPINION THE EQUIPMENT IS UNSUITABLE TO PERFORM THE EXCAVATION IN A SAFE AND PRUDENT MANNER.

**SUBMISSION ADDRESS**

39. NOTICES, INQUIRIES AND DETAILED CONSTRUCTION PLANS WILL BE SUBMITTED TO:

Enerfin Resources Company  
 Attn: Contract Management and Administration  
 1001 South Dairy Ashford Road, Suite 220  
 Houston, TX 77077  
 Phone: 713-888-8600  
 Fax: 713-888-8629  
 Email: [ContractManagement@enerfin.com](mailto:ContractManagement@enerfin.com)

REV.	DATE	BY	DESCRIPTION
			
 <b>FORT BEND COUNTY TOLL ROAD AUTHORITY</b>			
AIG TECHNICAL SERVICES, LLC F-20607 1500 S DAIRY ASHFORD SUITE 445 HOUSTON, TX 77077			
<b>FORT BEND PARKWAY TOLL ROAD</b>  <b>UTILITY GENERAL NOTES</b>			
PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	50
CHECKED BY:			



SUMMARY OF REMOVAL ITEMS													
LOCATION	104 6001	104 6009	104 6021	105 6008	479 6005	479 6006	496 6002	496 6007	550 6003	610 6007	644 6076	690 6021	6027 6009
	REMOVING CONC (PAV)	REMOVING CONC (RIPRAP)	REMOVING CONC (CURB)	REMOVING STAB BASE AND ASPH PAV (6")	ADJUSTING MANHOLES (WATER VALVE BOX)	ADJUSTING INLET (CAP)	REMOV STR (INLET)	REMOV STR (PIPE)	CHAIN LINK FENCE (REMOVE)	REMOVE RD IL ASM (SHOE-BAS E)	REMOVE SM RD SN SUP&AM	REMOVAL OF TIMBER POLES	GROUND BOX (ADJUST) *
	SY	SY	LF	SY	EA	EA	EA	LF	LF	EA	EA	EA	EA
SHEET 1 OF 2	2257	189	720	2257	2	1	1		60	4	5		1
SHEET 2 OF 2	446		315	446	4		1	14	439		2	1	2
PROJECT TOTALS	2703	189	1035	2703	6	1	2	14	499	4	7	1	3

\* BID ITEM 6027-6009 GROUND BOX (ADJUST) PERTAINS TO THE ADJUSTMENT OF EXISTING 4' X4' X4' COMMUNICATION (COMM) AND POWER (PWR) PULL BOX DEPICTED IN REMOVAL SHEETS. POTENTIAL NECESSARY CONDUIT LONGER THAN 1 FT TO BE SUBSIDIARY TO ITEM 6027.

REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**



**AIG TECHNICAL SERVICES, LLC** F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A**

**SUMMARY OF REMOVAL  
QUANTITIES**

SHEET 1 OF 1

PROJECT NUMBER	20219x	DATE:	10/11/2023
DESIGNED BY:		CHECKED BY:	
CHECKED BY:		DRAWN BY:	
DRAWN BY:		CHECKED BY:	
SHEET NO. :		6	

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS																			
LOCATION	* 110 6001	* 132 6006	* 292 6002	* 340 6103	403 6001	502 6001	508 6001	512 6001	512 6025	512 6049	545 6003	545 6005	545 6007	662 6060	662 6063	662 6071	662 6095	6001 6002	6185 6002
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY C)	ASPHALT STAB BASE (GR 2) (PG 64)	D-GR HMA (SQ) TY-D SAC-A PG64-22	TEMPORARY SPL SHORING	BARRICADES, SIGNS AND TRAFFIC HANDLING	CONSTRUCTING DETOURS	PORT CTB (FUR & INST) (SGL SLOPE) (TY 1)	PORT CTB (MOVE) (SGL SLP) (TY 1)	PORT CTB (REMOVE) (SGL SLP) (TY 1)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL) (L) (N) (TL3)	WK ZN PAV MRK REMOV (W) 4" (BRK)	WK ZN PAV MRK REMOV (W) 4" (SLD)	WK ZN PAV MRK REMOV (W) 8" (SLD)	WK ZN PAV MRK REMOV (Y) 4" (SLD)	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)
	CY	CY	TON	TON	SF	MO	SY	LF	LF	LF	EA	EA	EA	LF	LF	LF	LF	EA	DAY
						18													
Phase 1 Sheet 1	52	432	876	109	2062		1327	1020					2	160	910	1715	910	2	
Phase 1 Sheet 2																	722		20
Phase 2 STEP 1 Sheet 1								270	1020		2				1096	902	1006		
Phase 2 STEP 1 Sheet 2												2							
Phase 2 STEP 2 Sheet 1										1290								565	
Phase 2 STEP 2 Sheet 2																			
<b>PROJECT TOTALS</b>	<b>52</b>	<b>432</b>	<b>876</b>	<b>109</b>	<b>2062</b>	<b>18</b>	<b>1327</b>	<b>1290</b>	<b>1020</b>	<b>1290</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>160</b>	<b>2006</b>	<b>2617</b>	<b>3203</b>	<b>2</b>	<b>20</b>

\* FOR CONTRACTOR'S INFORMATION ONLY. PAID FOR BY ITEM 508-6001 CONSTRUCTING DETOURS.

REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**



**AIG TECHNICAL SERVICES, LLC F-20607**  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A**  
**SUMMARY OF TRAFFIC CONTROL  
QUANTITIES**

SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	10/10/2023
DESIGNED BY:		SHEET NO. :	7
CHECKED BY:			
DRAWN BY:			
CHECKED BY:			

SUMMARY OF ROADWAY ITEMS																					
LOCATION	100 6002	110 6001	132 6006	260 6006	260 6012	276 6224	292 6017	360 6006	360 6045	420 6043	422 6019	432 6003	432 6045	450 6023	450 6062	529 6005	529 6011	540 6006	544 6001	550 6009	3021 6001
	PREPARING ROW	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY C)	LIME TRT (EXST MATL) (6")	LIME (HYD, C OM OR QK) (SLRY) OR QK (DRY)	CEM TRT (PLNT MX) (CL N) (TY E) (GR 4) (6")	ASPHALT STAB BASE (GR 4) (PG 64)	CONC PVMT (CONT REINF - CRCP) (12")	CONC PVMT (CONT REINF) (FAST TRK) (15")	CL C CONC (FOOTING)	SLAB SPAN	RIPRAP (CONC) (6 IN)	RIPRAP (MOW STRIP) (4 IN)	RAIL (TY SSTR)	RAIL (TY SSTR) (MOD)	CONC CURB (MONO) (TY 11)	CONC CURB (DOWEL)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	CHAIN LINK FENCE (INSTALL) (6) (BARB TOP)	WIDE FLANGE PAVEMENT TERMINALS
	STA	CY	CY	SY	TON	SY	TON	SY	SY	CY	CY	CY	CY	LF	LF	LF	LF	EA	EA	LF	LF
SHEET 1 OF 3																					
SHEET 2 OF 3	10.4	693	11468	2902	39.2	2902	160	2514				34	43	145			539			60	48
SHEET 3 OF 3	12.6	1171	7146	2086	28.2	2086	115	1807	749	15.6	11.6	8	38	312	145	358		2	2	710	
PROJECT TOTALS	23	1864	18614	4988	67.4	4988	275	4321	749	15.6	11.6	42	81	457	145	358	539	2	2	770	48

REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
SUMMARY OF ROADWAY  
QUANTITIES**

SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	10/10/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO. :	8
CHECKED BY:			

100%  
SUBMITTAL

SUMMARY OF RETAINING WALL ITEMS							
LOCATION	* 132 6006	132 6035	400 6001	423 6001	450 6023	450 6062	* 556 6006
	EMBANKMENT (FINAL) (DENS CONT) (TY C)	EMBANK (FINAL) (DC) (TY E) (CSBE)	STRUCT EXCAV	RETAINING WALL (MSE)	RAIL (TY SSTR)	RAIL (TY SSTR) (MOD)	PIPE UNDERDRAINS (TY 6) (6")
	CY	CY	CY	SF	LF	LF	LF
RETAINING WALL A	3476		304	11016	543	150	724
RETAINING WALL B	3699		218	11589	693		714
RETAINING WALL C	1840		164	6176		407	413
RETAINING WALL D	1637		54	5553	357		397
RETAINING WALL AB		530		445			27
RETAINING WALL CD		481		416			27
PROJECT TOTALS	10652	1011	740	35195	1593	557	2302

\* FOR CONTRACTOR'S INFORMATION ONLY.  
SEE SHEET 8, SUMMARY OF ROADWAY QUANTITIES, FOR ITEM 132-6006 EMBANKMENT (FINAL) (DENS CONT) (TY C) COMBINED QUANTITY.  
ITEM 556-6006 PIPE UNDERDRAINS (TY 6) (6") PAID FOR BY ITEM 423-6001 RETAINING WALL (MSE).

REV.	DATE	BY	DESCRIPTION

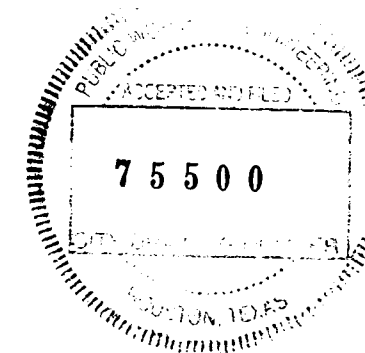


**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech** Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
SUMMARY OF RETAINING WALL  
QUANTITIES**

SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	9
CHECKED BY:			





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SUMMARY OF DRAINAGE ITEMS																	
LOCATION	110 6002	400 6001	400 6005	400 6009	402 6001	420 6009	432 6002	464 6005	464 6010	464 6019	465 6170	465 6172	465 6173	465 6176	465 6177	465 6340	465 6545
	EXCAVATION (CHANNEL)	* STRUCT EXCAV	CEM STABIL BKFL	CEMENT STAB BACKFILL (INLET OR MH)	TRENCH EXCAVATI ON PROTECTI ON	CL A CONC (COLLAR)	RIPRAP (CONC) (5 IN)	RC PIPE (CL III) (24 IN)	RC PIPE (CL III) (48 IN)	RC PIPE (CL IV) (30 IN)	INLET (COMPL) (TY AZ)	INLET (COMPL) (TY AZR2G)	MANH (COMPL) (TY A)	INLET (COMPL) (C CURB) (TY C1)	INLET (COMPL) (C TY AZ2G)	INLET (COMPL) (EXT) (TY C1)	INLET (STG II) (TY AD)
	CY	CY	CY	CY	LF	EA	CY	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA
1 OF 3																	
2 OF 3		560	410	58				665			1	5	1				1
3 OF 3		223	165	46				610				4	1	2	1	4	
LATERALS																	
LAT 2		22	16	8				33									
LAT 4																	
LAT 6																	
LAT 8		30	23	6				44			1						
LAT 10		17	14	6				47						1			
LAT 12		9	7	6				89				1					
CULVERT LAYOUT		1181	201	9	77	2	5		153								
DETENTION POND A	5242	329	97		160					160							
PROJECT TOTALS	5242	2371	933	139	237	2	5	1488	153	160	1	10	3	2	2	4	1

\* FOR CONTRACTOR INFORMATION ONLY.

SUMMARY OF DRAINAGE ITEMS					
LOCATION	467 6388	467 6394	467 6395	467 6418	467 6474
	SET (TY II) (24 IN) (RCP) (3: 1) (C)	SET (TY II) (24 IN) (RCP) (6: 1) (C)	SET (TY II) (24 IN) (RCP) (6: 1) (P)	SET (TY II) (30 IN) (RCP) (3: 1) (P)	SET (TY II) (48 IN) (RCP) (3: 1) (C)
	EA	EA	EA	EA	EA
1 OF 3					
2 OF 3			1		
3 OF 3	1	1			
LATERALS					
LAT 2					
LAT 4					
LAT 6					
LAT 8		1			
LAT 10	1				
LAT 12	1				
CULVERT LAYOUT					2
DETENTION POND A				2	
PROJECT TOTALS	3	2	1	2	2

REV.	DATE	BY	DESCRIPTION



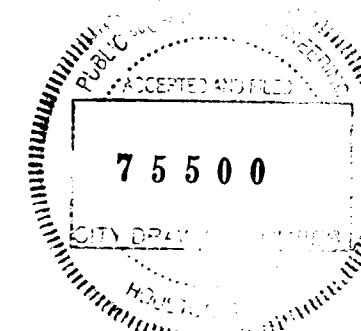
**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech** F-20607  
Advanced Infrastructure Group  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

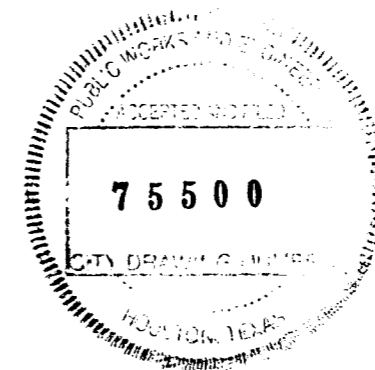
**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A**

**SUMMARY OF DRAINAGE  
QUANTITIES**

SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	10
CHECKED BY:			



SUMMARY OF ILLUMINATION ITEMS												
LOCATION	416 6029	610 6104	610 6198	610 6214	618 6046	618 6047	618 6066	618 6070	620 6007	620 6008	624 6002	628 6045
	DRILL SHAFT (RDWY ILL POLE) (30 IN)	IN RD IL (U/P) (TY 1) (150W EQ) LED	IN RD IL (TY SA) 40B-8 (250W EQ) LED	IN RD IL (TY SA) 40T-8 (250W EQ) LED	CONDT (PVC) (SCH 80) (2")	CONDT (PVC) (SCH 80) (2") (BORE)	CONDT (RM) (1 1/4")	CONDT (RM) (2")	ELEC CONDR (NO. 8) BARE	ELEC CONDR (NO. 8) INSULATED	GROUND BOX TY A (122311)W /APRON	ELC SRV TY A 240/480 060 (NS) S S (E) SP (O)
	LF	EA	EA	EA	LF	LF	LF	LF	LF	LF	EA	EA
SHEET 1 OF 2	8	1	4	1	960	55	50	45	1106	2320	1	1
SHEET 2 OF 2	16		1	2	735				735	1470		
PROJECT TOTALS	24	1	5	3	1695	55	50	45	1841	3790	1	1



REV.	DATE	BY	DESCRIPTION



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
**SUMMARY OF ILLUMINATION  
QUANTITIES**

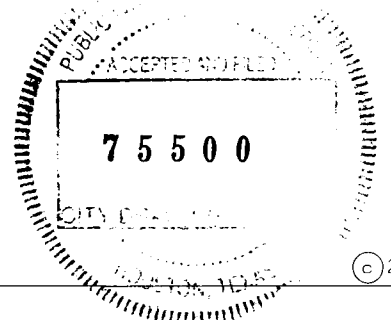
SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	5/19/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	11
CHECKED BY:			



# SUMMARY OF LARGE SIGNS

LAYOUT SHEET NO.	SIGN NO.	STATION NO.	TYPE	BACKGROUND COLOR	TEXT	SIGN DIMENSIONS (FT)	636	636	TYPE MOUNT	647				416		
							(6002)	(6003)		(6001)				DRILL SHAFT FND		
							ALUM SIGNS (TY G)	ALUM SIGNS (TY O)		*INSTALL LRSS (STRUCT STL)				(6015)	(6018)	
							SF	SF		SIZE	LENGTH (FT)			TOTAL REINF WEIGHT	(NON-REINF) (12") LF	(SIGN MTS) (24") LF
			LEFT POST	CENTER POST	RIGHT POST	LBS										
3	1A	42+87		PURPLE		12.5' x 3.0'			320	W6X9	14.5		15.8	318.4		16
				WHITE		12.5' x 4.0'										
					RELOCATE EXISTING LARGE SIGN											

\* POST LENGTHS SHOWN DO NOT INCLUDE STUB LENGTHS BUT THE TOTAL WEIGHT INCLUDES STUB POSTS, BASE CONNECTION PLATES & STIFFENERS, FRICTION FUSE P's AND ALL HIGH STRENGTH BOLTS, NUTS AND WASHERS.



## SUMMARY OF LARGE SIGNS

SHEET 1 OF 1


STATE DISTRICT	FEDERAL REGION	PROJECT NO.	SHEET
12	6		
COUNTY	CONTRACT	SECTION	JOB NUMBER
			12A

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SUMMARY OF PAVEMENT MARKING ITEMS																				
LOCATION	658 6067	658 6068	658 6069	658 6070	666 6036	666 6054	666 6078	666 6225	666 6226	666 6231	666 6232	666 6309	666 6321	668 6010	672 6010	677 6003	678 6002	678 6004	678 6009	678 6016
	INSTL DEL ASSM (D-DW) SZ 1 (BRF) GF2	INSTL DEL ASSM (D-DY) SZ 1 (BRF) GF2	INSTL DEL ASSM (D-SW) SZ (BRF) CTB (BR)	INSTL DEL ASSM (D-SY) SZ (BRF) CTB (BR)	REFL PAV MRK TY I (W) 8" (SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	PAVEMENT SEALER 6"	PAVEMENT SEALER 8"	PAVEMENT SEALER (ARROW)	PAVEMENT SEALER (WORD)	RE PM W/RET REQ TY I (W) 6" (SLD) (100MIL)	RE PM W/RET REQ TY I (Y) 6" (SLD) (100MIL)	PREFAB PAV MRK TY B (W) (6") (L BRK) CNTST	REFL PAV MRKR TY 11-C-R	ELIM EXT PAV MRK & MRKS (8")	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (8")	PAV SURF PREP FOR MRK (ARROW)	PAV SURF PREP FOR MRK (WORD)
	EA	EA	EA	EA	LF	EA	EA	LF	LF	EA	EA	LF	LF	LF	EA	LF	LF	LF	EA	EA
SHEET 1 OF 3					990			1150	990			1150			51	990	1150	990		
SHEET 2 OF 3			9	9	187	1		2740	187	1		1100	1640	0	11	187	2740	187	1	
SHEET 3 OF 3	3	3	7	7	548	1	2	1867	548	1	2	666	926	275	55	548	1867	548	1	2
PROJECT TOTALS	3	3	16	16	1725	2	2	5757	1725	2	2	2916	2566	275	117	1725	5757	1725	2	2

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REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

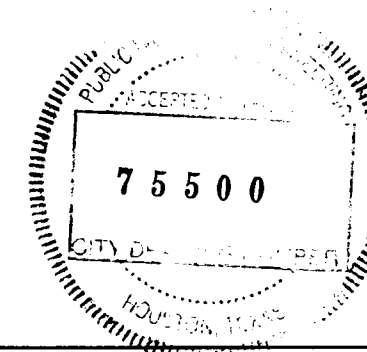
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A**

**SUMMARY OF PAVEMENT MARKING  
QUANTITIES**

SHEET 1 OF 1

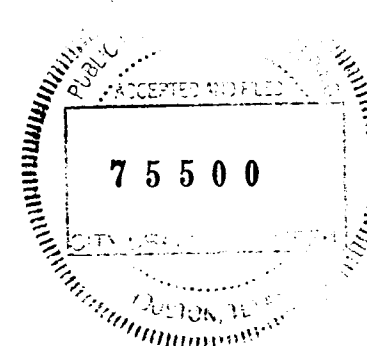
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DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	13
CHECKED BY:			




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SUBMITTAL

SUMMARY OF EROSION CONTROL ITEMS														
LOCATION	162 6002	162 6003	164 6055	164 6056	166 6001	168 6001	506 6002	506 6011	506 6020	506 6024	506 6038	506 6039	506 6041	506 6043
	BLOCK SODDING	STRAW OR HAY MULCH	BONDED FBR MTRX SEED (TEMP) (WAR M)	BONDED FBR MTRX SEED (TEMP) (CO OL)	FERTILIZER	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTR) (12")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	SY	SY	AC	MG	LF	LF	SY	SY	LF	LF	LF	LF
SHEET 1 OF 2	8200	8200	4100	4100	1.69	202.80	30	30	224	224	2160	2160	520	520
SHEET 2 OF 2	3800	3800	1900	1900	0.79	94.80			112	112	2620	2620	630	630
PROJECT TOTALS	12000	12000	6000	6000	2.48	297.6	30	30	225	225	4780	4780	1150	1150

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REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**AIG Tech**  
Advanced Infrastructure Solutions

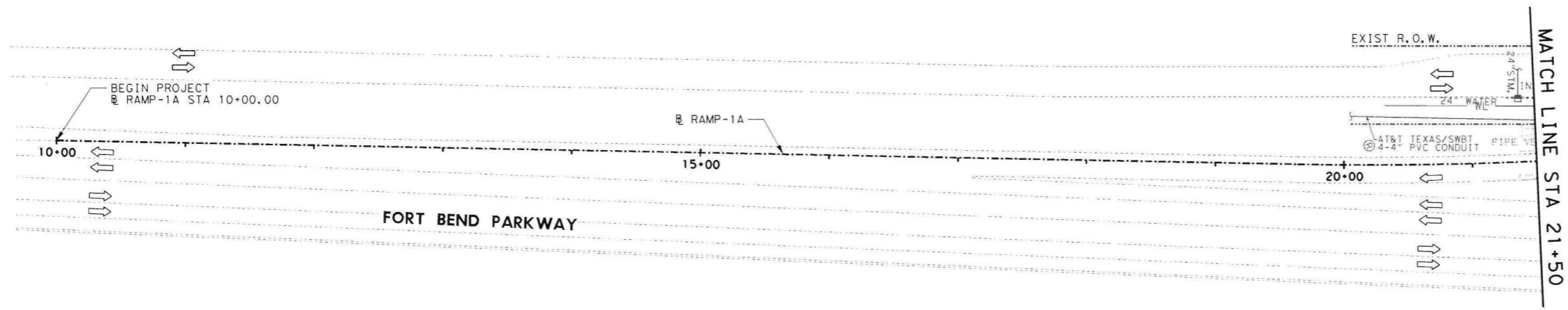
**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A**

**SUMMARY OF SW3P  
QUANTITIES**

SHEET 1 OF 1

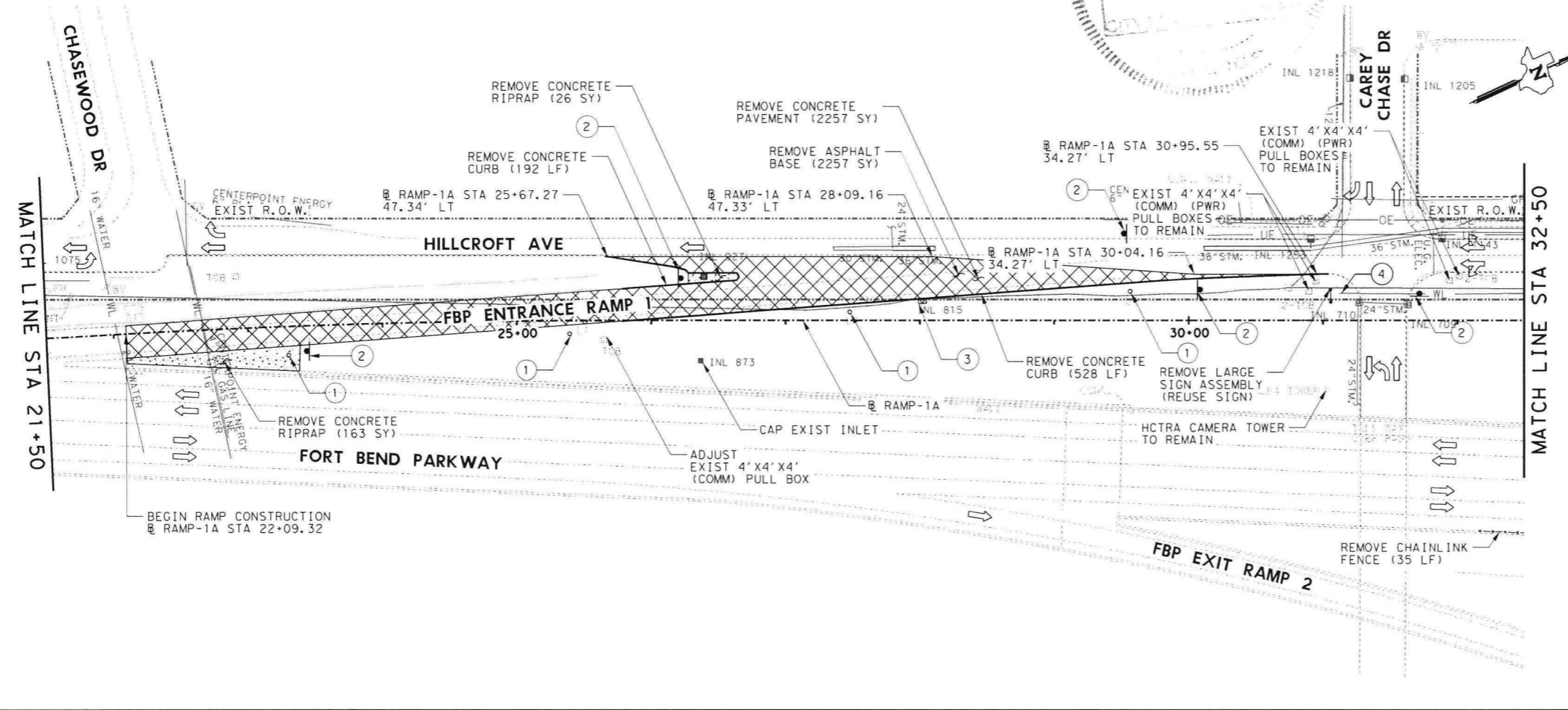
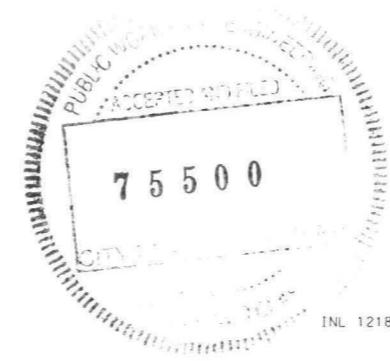
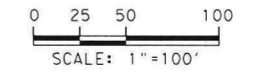
PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	14
CHECKED BY:			

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- LEGEND**
- REMOVE CONCRETE PAVEMENT AND ASPHALT BASE
  - REMOVE CONC RIPRAP
  - REMOVE CONC. CURB
  - REMOVE CHANLINK FENCE
  - REMOVE STR. (PIPE)

- KEYED NOTES**
- ① REMOVE RD IL ASM (1 EA)
  - ② REMOVE SM RD SN SUP & AM
  - ③ REMOVE STR. (INLET) (1 EA)
  - ④ APPROXIMATE LOCATION OF BURIED WATER VALVE BOXES. CONTRACTOR TO LOCATE AND ADJUST TO GRADE (6 TOTAL).



REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

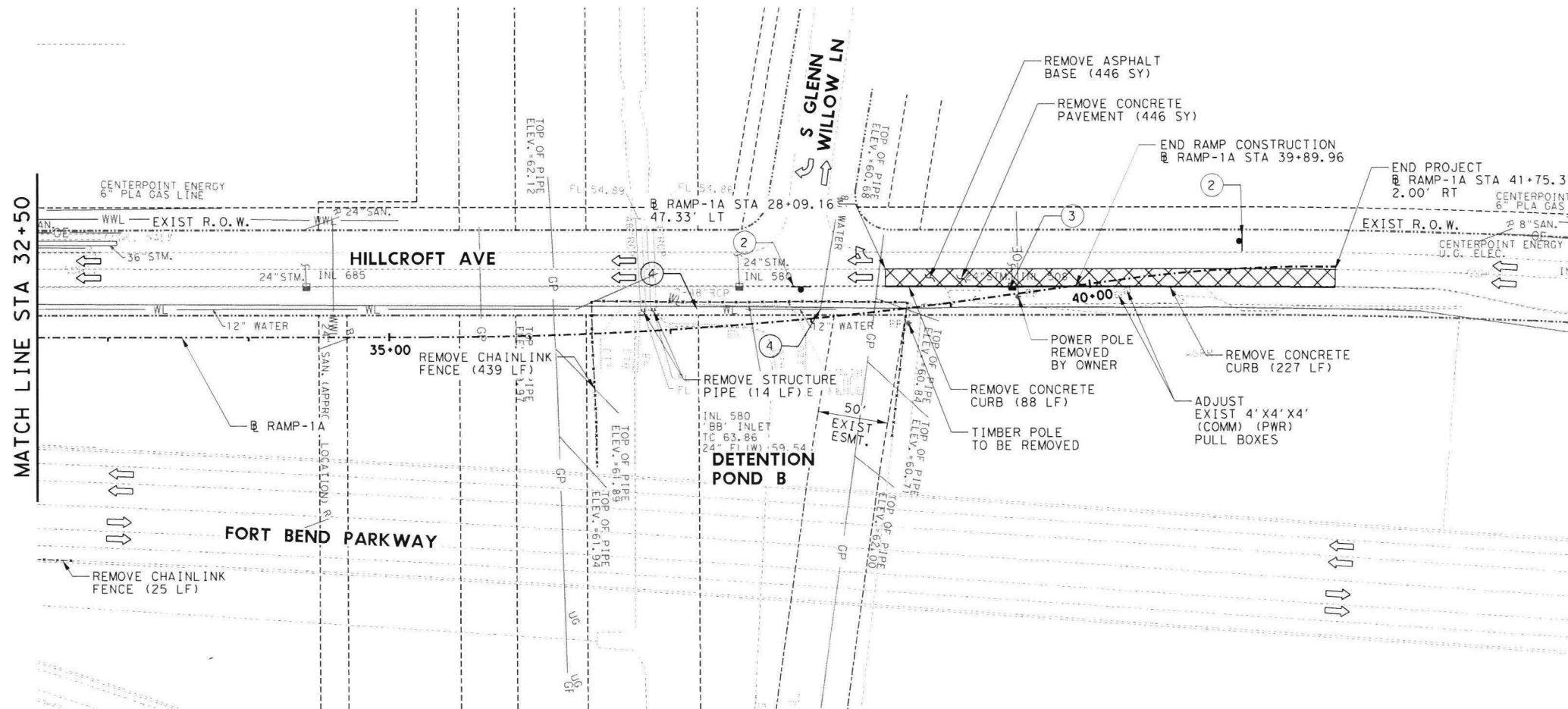
AIG Technical Services, LLC F-20607  
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SUITE 445  
HOUSTON, TX 77077






**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
DEMOLITION PLAN  
BEGIN PROJECT TO STA 32+50**

SHEET 1 OF 2			
PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	15
CHECKED BY:			

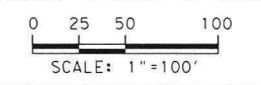
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- LEGEND**
-  REMOVE CONCRETE PAVEMENT AND ASPHALT BASE
  -  REMOVE CONC RIPRAP
  -  REMOVE CONC. CURB
  -  REMOVE CHANLINK FENCE
  -  REMOVE STR. (PIPE)

- KEYED NOTES**
- ① REMOVE RD IL ASM (1 EA)
  - ② REMOVE SM RD SN SUP & AM
  - ③ REMOVE STR. (INLET) (1 EA)
  - ④ APPROXIMATE LOCATION OF BURIED WATER VALVE BOXES. CONTRACTOR TO LOCATE AND ADJUST TO GRADE (6 TOTAL).



REV.	DATE	BY	DESCRIPTION



3/15/2023



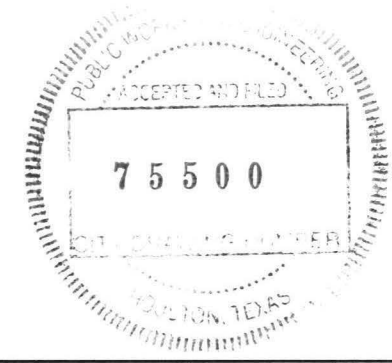
**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech** Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
DEMOLITION PLAN  
STA 32+50 TO END PROJECT**

SHEET 2 OF 2

PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	16
CHECKED BY:			



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**CONSTRUCTION GENERAL NOTES**

1. THE CONSTRUCTION TRAFFIC CONTROL SIGN, DEVICES, AND BARRICADES ON THESE DRAWINGS CONSTITUTE MINIMUM REQUIREMENTS AND ARE NOT INTENDED TO COVER SPECIAL CIRCUMSTANCES OR OTHER CONDITIONS THAT MAY ARISE DUE TO UNFORSEEN FIELD CONDITIONS. THE CONTRACTOR SHALL PLACE AND MAINTAIN SUFFICIENT ADDITIONAL SIGNS, BARRICADES, AND WARNING DEVICES TO WARN THE PUBLIC AND PROVIDE FOR THE SAFE MOVEMENT OF TRAFFIC AND THE CONSTRUCTION ZONE SAFETY WHERE PROJECT REQUIREMENTS ARE NOT FULLY SATISFIED BY THE STANDARDS SHOWN HEREON. "THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" SHALL GOVERN.
2. CONTRACTOR SHALL PROVIDE AND INSTALL ALL TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH PART VI OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (T.M.U.T.C.D.), MOST RECENT EDITION WITH REVISIONS, DURING THE ENTIRE CONSTRUCTION PERIOD.
3. ALL SIGNS, MARKINGS AND TRAFFIC CONTROL DEVICES SHALL COMPLY WITH THE REQUIREMENTS OF THE LATEST VERSION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS UNLESS SPECIFICALLY DIRECTED BY THE TRAFFIC ENGINEER OR SPECIFIED ON THE PLANS.
4. BARRICADES, SIGNS, CHANNELIZING DEVICES, AND TRAFFIC HANDLING DEVICES AS SHOWN SHALL BE ADJUSTED TO FIT FIELD CONDITIONS, AS DIRECTED BY THE ENGINEER.
5. NO LANES SHALL BE CLOSED DURING THE HOURS 7:00 AM TO 9:00 AM AND 4:00 PM TO 6:00 PM MONDAY THRU FRIDAY WITHOUT APPROVAL OF THE CITY TRAFFIC ENGINEER.
6. NO WORK SHALL BE PERFORMED IN RESIDENTIAL AREA FROM 7:00 PM TO 7:00 AM.
7. CONTRACTOR SHALL PROVIDE ACCESS TO ALL BUSINESSES ALONG THE PROJECT AT ALL TIMES DURING CONSTRUCTION UNLESS OTHERWISE AUTHORIZED SPECIFICALLY BY THE ENGINEER.
8. ALL DRAINAGE SYSTEMS SHALL BE CONSTRUCTED BEGINNING AT THE DOWNSTREAM END AND PROCEEDING UPSTREAM.
9. PROPER DRAINAGE OF EXISTING AND PROPOSED STORM SEWER SYSTEMS IS TO BE MAINTAINED THROUGHOUT CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.
10. IF THE CONTRACTOR CHOOSES TO USE A DIFFERENT METHOD OF "TRAFFIC CONTROL PLANS" DURING THE CONSTRUCTION THAN WHAT IS OUTLINED IN THE CONTRACT DRAWINGS, THE CONTRACTOR SHALL BE RESPONSIBLE TO PREPARE AND SUBMIT AN ALTERNATE SET OF TRAFFIC CONTROL PLANS TO THE COUNTY AND COORDINATE FOR APPROVAL TEN WORKING DAYS PRIOR TO IMPLEMENTATION. THESE PLANS SHALL BE DRAWN TO SCALE ON REPRODUCIBLE MYLARS AND SHALL BE SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF TEXAS. TRAFFIC OPERATIONS DIVISION REPRESENTATIVE APPROVAL IS REQUIRED TO ACCEPT THE PROPOSED CHANGES.
12. CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING NECESSARY PERMITS PRIOR TO BEGIN CONSTRUCTION.
12. CONTRACTOR SHALL BE RESPONSIBLE FOR ISSUING ALL WORK DIRECTIVES TO ALL SUB-CONTRACTORS, UTILITY COMPANIES, AND ALL OTHER ENTITIES PERFORMING CONSTRUCTION WORK ASSOCIATED WITH THE PROJECT.
13. ACCESS TO DRIVEWAYS ADJACENT TO THE CONSTRUCTION WORK ZONE SHALL BE MAINTAINED AT ALL TIMES. ADDITIONAL CONES DELINEATORS MAY BE REQUIRED TO DELINEATE THE DRIVEWAY ACCESS ROUTE THROUGH THE CONSTRUCTION WORK ZONE. A MINIMUM OF ONE TRAVEL LANE SHALL BE MAINTAINED ACROSS THE DRIVEWAYS, UNLESS PRIOR WRITTEN APPROVAL IS OBTAINED FROM THE CITY OF HOUSTON PROJECT MANAGER

**SUGGESTED SEQUENCE OF CONSTRUCTION**

SUBSIDIARY ITEMS (PAYMENT FOR THIS WORK INCLUDED IN VARIOUS BID ITEMS)

1. CONTRACTOR SHALL MAINTAIN ACCESS TO STREETS AND DRIVEWAYS AT ALL TIMES, UNLESS OTHERWISE APPROVED.
2. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE AT ALL TIMES. THIS WORK WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE SUBSIDIARY TO THE VARIOUS BID ITEMS.
3. NO TWO CONSECUTIVE INTERSECTIONS SHALL BE CLOSED TO TRAFFIC AT THE SAME TIME.
4. CONTRACTOR TO STORE BARRIER ON SITE AT LOCATIONS APPROVED BY THE ENGINEER.

INSTALL BARRICADES, SIGNS, AND TRAFFIC CONTROL DEVICES AS SHOWN FOR EACH PHASE. OR AS APPROVED BY THE ENGINEER.

THE GENERAL SEQUENCE OF CONSTRUCTION IS DEFINED AS:

PHASE 1 - STEP 1 (BEGIN TO STA 34+00 AND STA 34+00 TO END - SHEET 18 AND SHEET 19)

TRAFFIC:

1. INSTALL ADVANCED WARNING SIGNS AS SHOWN IN TCP LAYOUTS SHEET 2 OF PHASE 1.
2. PLACE CHANNELIZING, TRAFFIC CONTROL DEVICES AND TEMPORARY SIGNS AS SHOWN ON PLANS.
3. IN ADVANCE OF ANY CONSTRUCTION, PLACE EROSION CONTROL DEVICES FOR THE PROJECT AS DESCRIBED ON SEE "SW3P LAYOUTS" SHEETS.
4. BETWEEN STA 18+30 TO STA 27+90, CLOSE EXISTING FORT BEND PARKWAY SB ENTRANCE RAMP OUTSIDE SHOULDER PER LIMITS SHOWN IN PLANS.
5. BETWEEN STA 36+88 TO STA 41+75, MAINTAIN EXISTING TRAFFIC ON HILLCROFT AVE. ON MINIMUM 2'-10' LANES. SHORT-TERM INSIDE LANE CLOSURE ALLOWED ONLY DURING WEEKEND, NON-PEAK HOURS.

CONSTRUCTION:

1. BETWEEN STA 16+60 TO 26+60, CONSTRUCT EXISTING FORT BENT PARKWAY SB ENTRANCE RAMP TEMPORARY PAVEMENT WIDENING. (1 1/2" ACP TY "D" SAC-A PG 64-22 OVER 12" ASPHALT STABILIZED BASE MATERIAL)
2. BETWEEN STA 20+40 TO 25+22, CONSTRUCT TEMPORARY SPECIAL SHORING IN ACCORDANCE WITH PLAN. REFER TO SHEET NO. 18)
3. BETWEEN STA 38+55 AND STA 41+75, CONSTRUCT THE FAST TRACK PORTION OF NEW FORT BEND PARKWAY SB ENTRANCE RAMP AND HILLCROFT AVE. USING SHORT-TERM INSIDE LANE CLOSURE DURING NON-PEAK HOURS FROM 9 AM TO 3 PM. BETWEEN STA 27+47 AND STA 39+16, CONSTRUCT PORTIONS OF THE NEW FORT BEND PARKWAY SB ENTRANCE RAMP PERMANENT PAVEMENT AND CONSTRUCT MSE
4. BETWEEN STA 30+93 TO STA 31+98, CONSTRUCT CAREY CHASE BRIDGE. PLACEMENT OF BRIDGE BEAMS AND PERMANENT CONCRETE DECK SHALL BE DONE DURING WEEKEND PERIODS OF ROADWAY CLOSURES, AS APPROVED BY THE ENGINEER. THE DRAWINGS SHOW DETOUR PLAN AND TEMPORARY DETOUR SIGNS FOR THIS STEP OF WORK.
5. TEMPORARY AND PERMANENT DRAINAGE CONSTRUCTION SHALL BE CONCURRENT WITH PHASE CONSTRUCTION.

PHASE 2 - STEP 1 (BEGIN TO STA 34+00 - SHEET 20 AND SHEET 21)

TRAFFIC:

1. BETWEEN STA 36+00 TO END, MAINTAIN HILLCROFT TRAFFIC ON EXISTING TWO LANES.
2. SHIFT FORT BEND PARKWAY ENTRANCE RAMP TRAFFIC TO PREVIOUSLY CONSTRUCTED TEMPORARY RAMP AS SHOWN ON PLANS.

CONSTRUCTION:

1. COMPLETE CONSTRUCTION OF NEW RAMP BETWEEN APPROXIMATELY STA 22+00 TO STA 27+47 INCLUDING REMAINING MSE WALL CONSTRUCTION.
2. INSTALL PERMANENT SIGNING AND PAVEMENT MARKINGS.
3. TEMPORARY AND PERMANENT DRAINAGE CONSTRUCTION SHALL BE CONCURRENT WITH PHASE CONSTRUCTION.

PHASE 2 - STEP 2 (BEGIN TO STA 34+00 - SHEET 22)

TRAFFIC:

1. MAINTAIN HILLCROFT TRAFFIC ON EXISTING TWO LANES ROAD.
2. SHIFT ACCESS TO NEW RAMP ENTRANCE FROM SOUTH OF CAREY CHASE DRIVE TO NORTH OF S. GLEN WILLOW LANE, APPROXIMATELY STA 40+00.
3. PLACE CHANNELIZING AND TEMPORARY TRAFFIC CONTROL DEVICES AS SHOWN IN PLANS FOR THE CONSTRUCTION OF CURB.

CONSTRUCTION:

1. BETWEEN STA 25+60 TO 31+04, CONSTRUCT CURB.
2. REMOVE THE EXISTING PAVEMENTS ALONG HILLCROFT AVE. AS SHOWN ON PLANS.
3. INSTALL PERMANENT PAVEMENT MARKINGS.
4. REMOVE BARRICADES, TEMPORARY SIGNS, AND TRAFFIC CONTROL DEVICES FROM PROJECT.
5. PERFORM ALL REMAINING WORK AND CLEANUP OF PROJECT SITE.

REV.	DATE	BY	DESCRIPTION

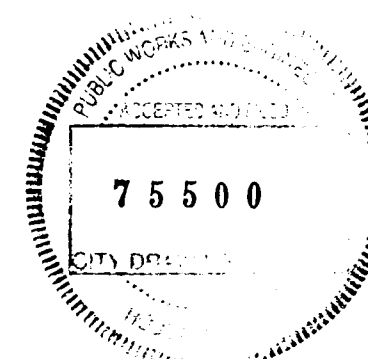


**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech**      AIG TECHNICAL SERVICES, LLC      F-20607  
Advanced Infrastructure Group      1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

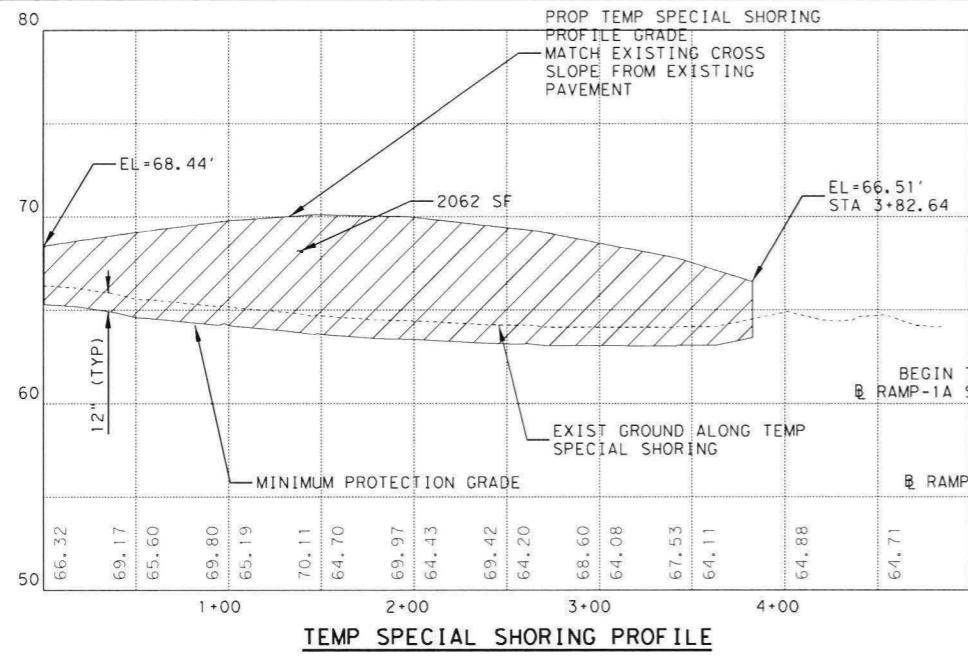
**FORT BEND PARKWAY TOLL ROAD**  
**TRAFFIC CONTROL  
SEQUENCE OF CONSTRUCTION  
AND CONSTRUCTION GENERAL NOTES**

SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	17
CHECKED BY:			



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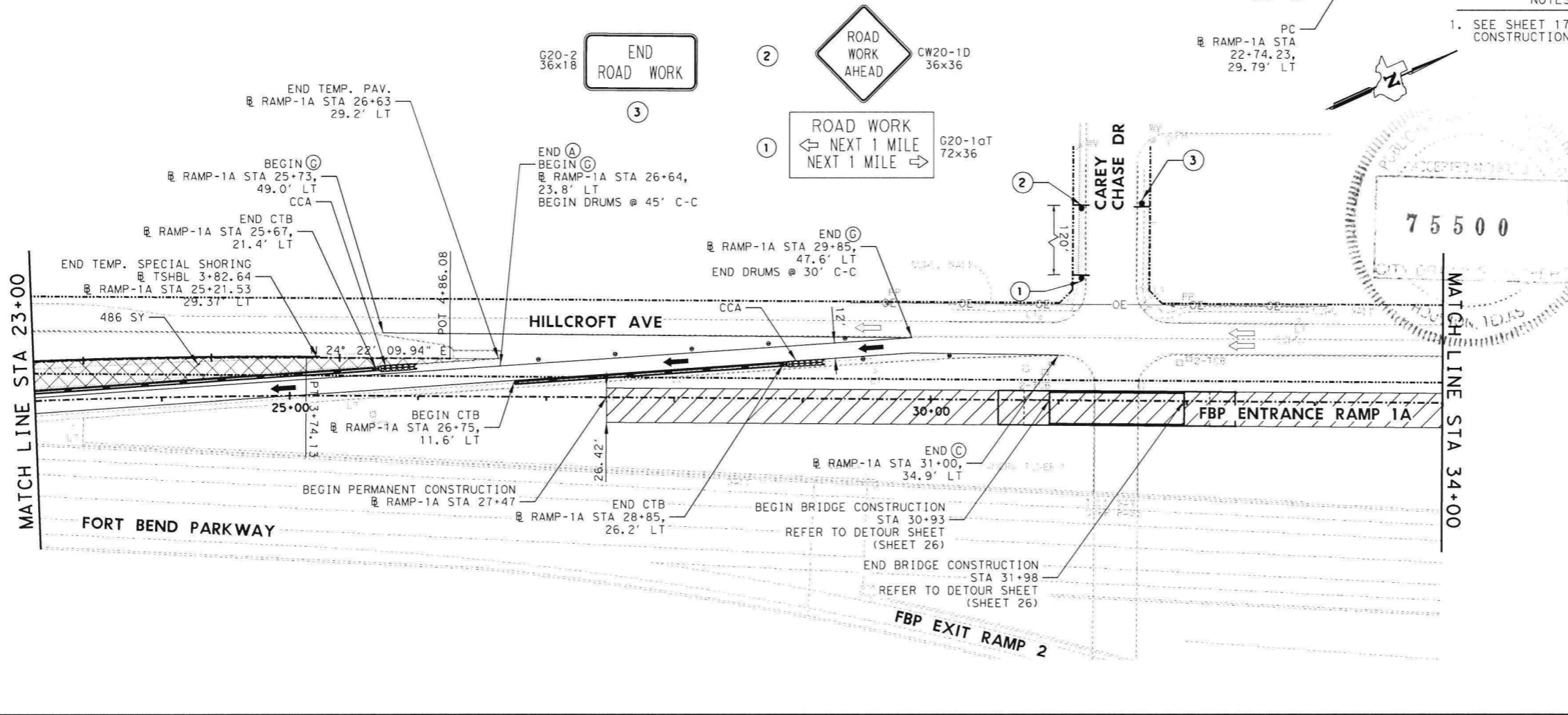
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TEMP SPECIAL SHORING PROFILE

CURVE INFO AT PC 1+34.19  
TEMP SPECIAL SHORING HORIZONTAL ALIGNMENT

PI STATION	=	2+54.19
DELTA	=	2° 54' 24.73" (RT)
DEGREE OF CURVE	=	1° 12' 41.51"
TANGENT	=	119.99
LENGTH	=	239.93
RADIUS	=	4,729.21
PC STATION	=	1+34.19
PT STATION	=	3+74.13



**LEGEND**

- PERMANENT ROADWAY AND BRIDGE CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED PAVEMENT
- TCP DEVICE (DRUMS)
- PORTABLE SIGNS/ ARROW BOARD
- TYPE III BARRICADE
- GROUND MOUNTED SIGN
- CTB W/REFLECTORS
- CRASH CUSHION ATTENUATOR (CCA)
- PROP DIRECTION OF TRAFFIC
- EXIST TRAFFIC DIRECTION
- WK ZN PAV MRK REMOV (W) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 4" (BRK)
- WK ZN PAV MRK REMOV (Y) 4" (SLD)
- WK ZN PAV MRK REMOV (Y) 4" (BRK)
- WK ZN PAV MRK REMOV (W) 4" (DOT)
- WK ZN PAV MRK REMOV (Y) 4" (DOT)
- WK ZN PAV MRK REMOV (W) 8" (SLD)
- WK ZN PAV MRK REMOV (W) 24" (SLD)
- WK ZN PAV MRK REMOV (W) (WORD)
- WK ZN PAV MRK REMOV (W) (ARROW)
- WK ZN PAV MRK REMOV (REFL) TY 11-C-R
- WK ZN PAV MRK REMOV (REFL) TY 1-C

NOTES  
1. SEE SHEET 17 FOR CONSTRUCTION GENERAL NOTES.

0 25 50 100  
SCALE: 1"=100'

REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD**  
**TRAFFIC CONTROL PLAN**  
PHASE 1  
BEGIN TO STA 34+00

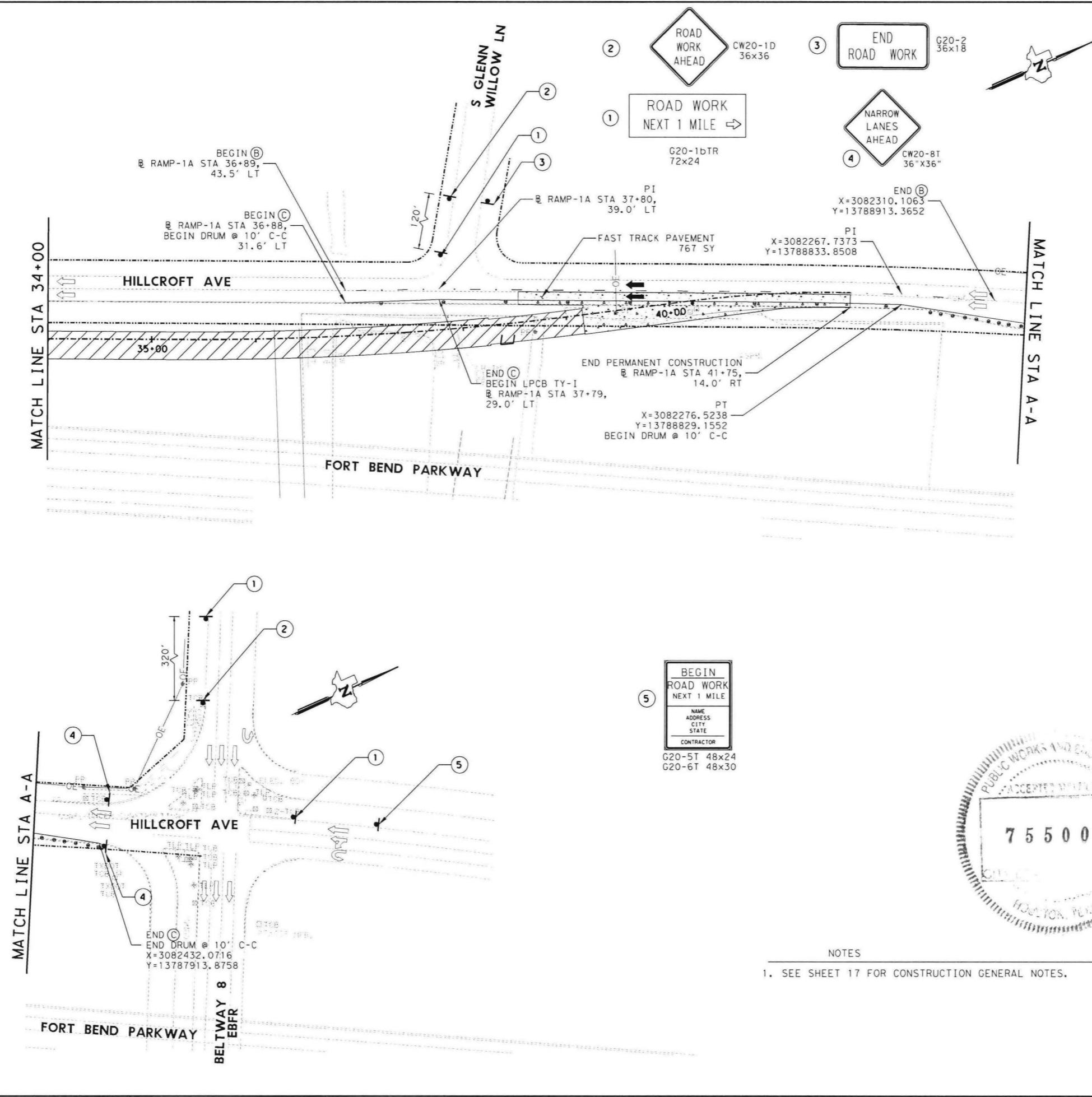
SHEET 1 OF 2

PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	18
CHECKED BY:			

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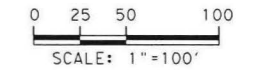
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**LEGEND**

- PERMANENT ROADWAY AND BRIDGE CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- FAST TRACK CONCRETE
- TCP DEVICE (DRUMS)
- PORTABLE SIGNS/ ARROW BOARD
- TYPE III BARRICADE
- GROUND MOUNTED SIGN
- CTB W/REFLECTORS
- CRASH CUSHION ATTENUATOR (CCA)
- PROP DIRECTION OF TRAFFIC
- EXIST TRAFFIC DIRECTION
- (A) WK ZN PAV MRK REMOV (W) 4" (SLD)
- (B) WK ZN PAV MRK REMOV (W) 4" (BRK)
- (C) WK ZN PAV MRK REMOV (Y) 4" (SLD)
- (D) WK ZN PAV MRK REMOV (Y) 4" (BRK)
- (E) WK ZN PAV MRK REMOV (W) 4" (DOT)
- (F) WK ZN PAV MRK REMOV (Y) 4" (DOT)
- (G) WK ZN PAV MRK REMOV (W) 8" (SLD)
- (H) WK ZN PAV MRK REMOV (W) 24" (SLD)
- (I) WK ZN PAV MRK REMOV (W) (WORD)
- (J) WK ZN PAV MRK REMOV (W) (ARROW)
- (K) WK ZN PAV MRK REMOV (REFL) TY II-C-R
- (L) WK ZN PAV MRK REMOV (REFL) TY I-C



REV.	DATE	BY	DESCRIPTION



3/15/2023



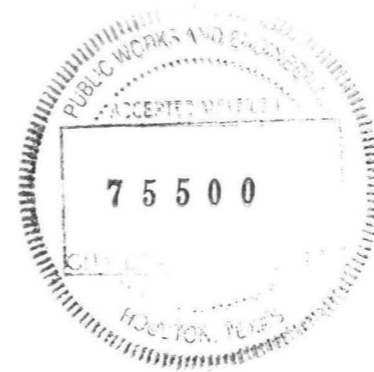
**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech** Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
TRAFFIC CONTROL PLAN  
PHASE 1  
STA 34+00 TO END**

SHEET 2 OF 2

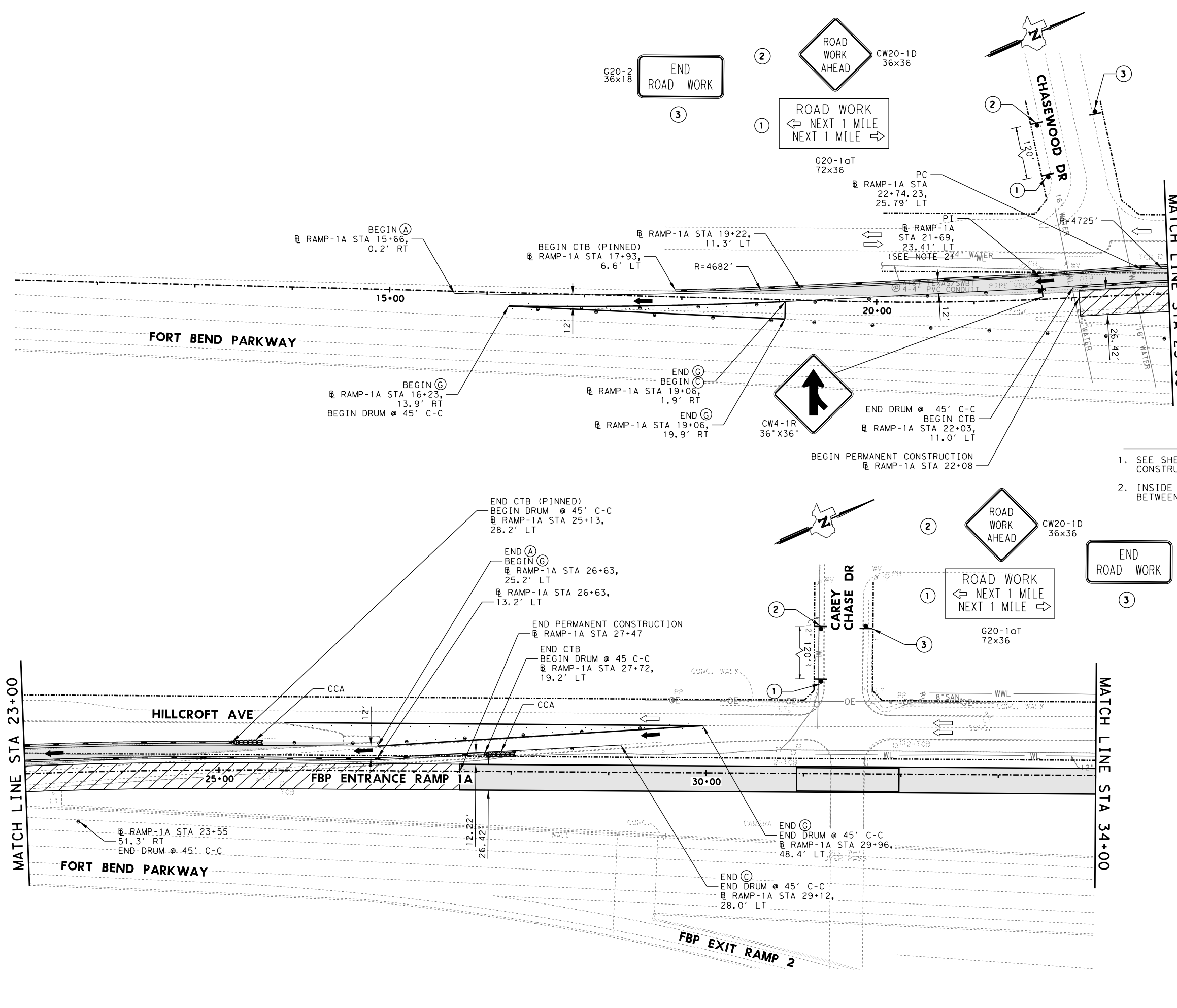
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DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	19
CHECKED BY:			



NOTES  
1. SEE SHEET 17 FOR CONSTRUCTION GENERAL NOTES.

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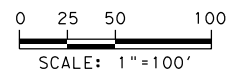
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**LEGEND**

- PERMANENT ROADWAY AND BRIDGE CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED PAVEMENT
- TCP DEVICE (DRUMS)
- PORTABLE SIGNS/ ARROW BOARD
- TYPE III BARRICADE
- GROUND MOUNTED SIGN
- CTB W/REFLECTORS
- CRASH CUSHION ATTENUATOR (CCA)
- PROP DIRECTION OF TRAFFIC
- EXIST TRAFFIC DIRECTION
- WK ZN PAV MRK REMOV (W) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 4" (BRK)
- WK ZN PAV MRK REMOV (Y) 4" (SLD)
- WK ZN PAV MRK REMOV (Y) 4" (BRK)
- WK ZN PAV MRK REMOV (W) 4" (DOT)
- WK ZN PAV MRK REMOV (Y) 4" (DOT)
- WK ZN PAV MRK REMOV (W) 8" (SLD)
- WK ZN PAV MRK REMOV (W) 24" (SLD)
- WK ZN PAV MRK REMOV (W) (WORD)
- WK ZN PAV MRK REMOV (W) (ARROW)
- WK ZN PAV MRK REMOV (REFL) TY II-C-R
- WK ZN PAV MRK REMOV (REFL) TY I-C

- NOTES**
- SEE SHEET 17 FOR CONSTRUCTION GENERAL NOTES.
  - INSIDE SHOULDER REDUCES TO 1' BETWEEN STA 19+22 TO STA 22+74.



REV.	DATE	BY	DESCRIPTION



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Advanced Infrastructure Group

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1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD**

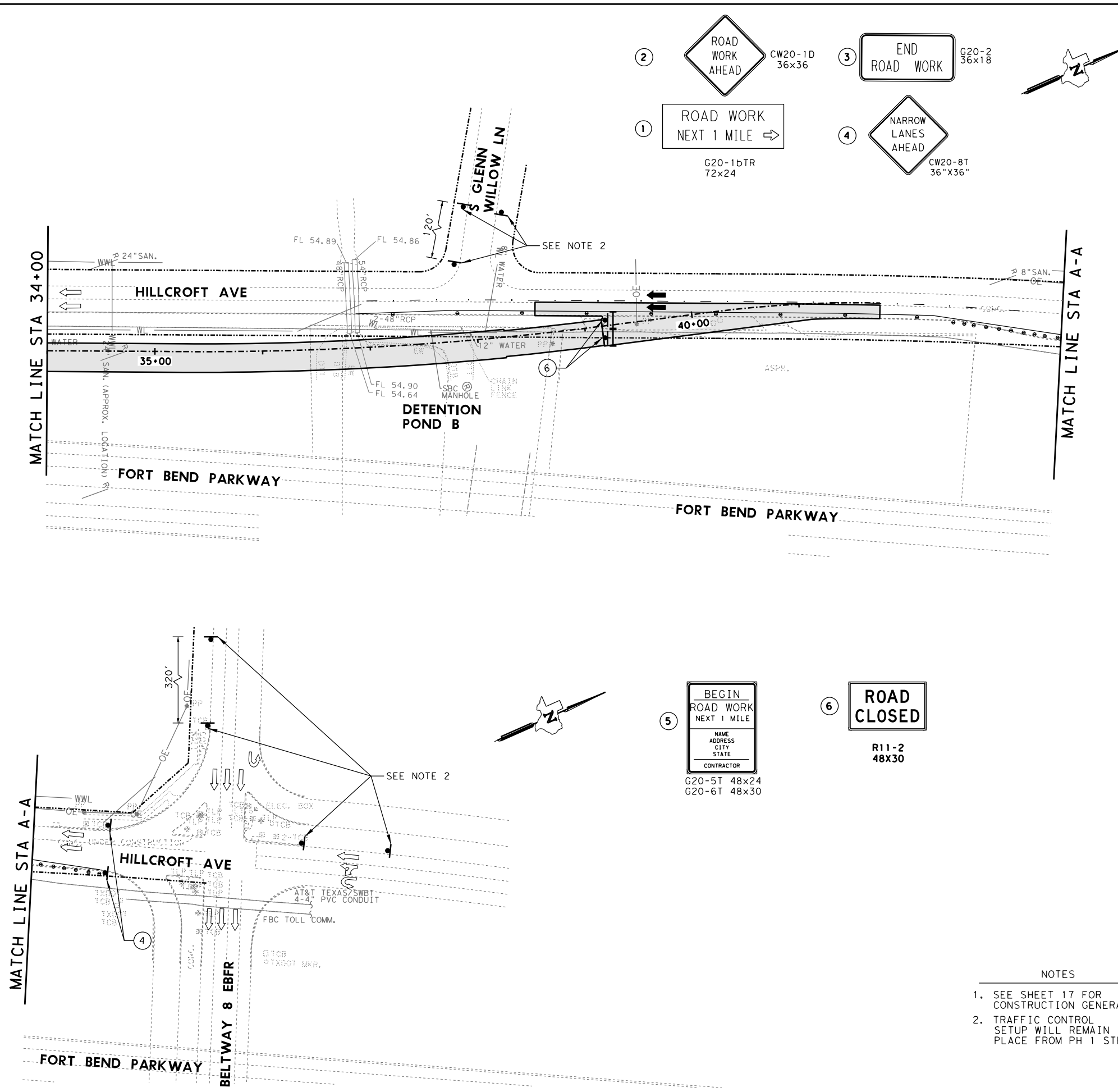
TRAFFIC CONTROL PLAN  
PHASE 2 STEP 1  
BEGIN TO STA 34+00

SHEET 1 OF 2

PROJECT NUMBER	20219x	DATE:	10/11/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	20
CHECKED BY:			

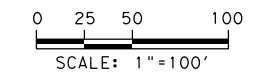
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**LEGEND**

- PERMANENT ROADWAY AND BRIDGE CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED PAVEMENT
- TCP DEVICE (DRUMS)
- PORTABLE SIGNS/ ARROW BOARD
- TYPE III BARRICADE
- GROUND MOUNTED SIGN
- CTB W/REFLECTORS
- CRASH CUSHION ATTENUATOR (CCA)
- PROP DIRECTION OF TRAFFIC
- EXIST TRAFFIC DIRECTION
- WK ZN PAV MRK REMOV (W) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 4" (BRK)
- WK ZN PAV MRK REMOV (Y) 4" (SLD)
- WK ZN PAV MRK REMOV (Y) 4" (BRK)
- WK ZN PAV MRK REMOV (W) 4" (DOT)
- WK ZN PAV MRK REMOV (Y) 4" (DOT)
- WK ZN PAV MRK REMOV (W) 8" (SLD)
- WK ZN PAV MRK REMOV (W) 24" (SLD)
- WK ZN PAV MRK REMOV (W) (WORD)
- WK ZN PAV MRK REMOV (W) (ARROW)
- WK ZN PAV MRK REMOV (REFL) TY II-C-R
- WK ZN PAV MRK REMOV (REFL) TY I-C



REV.	DATE	BY	DESCRIPTION



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1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD**

**TRAFFIC CONTROL PLAN**  
PHASE 2 STEP 1  
STA 34+00 TO END

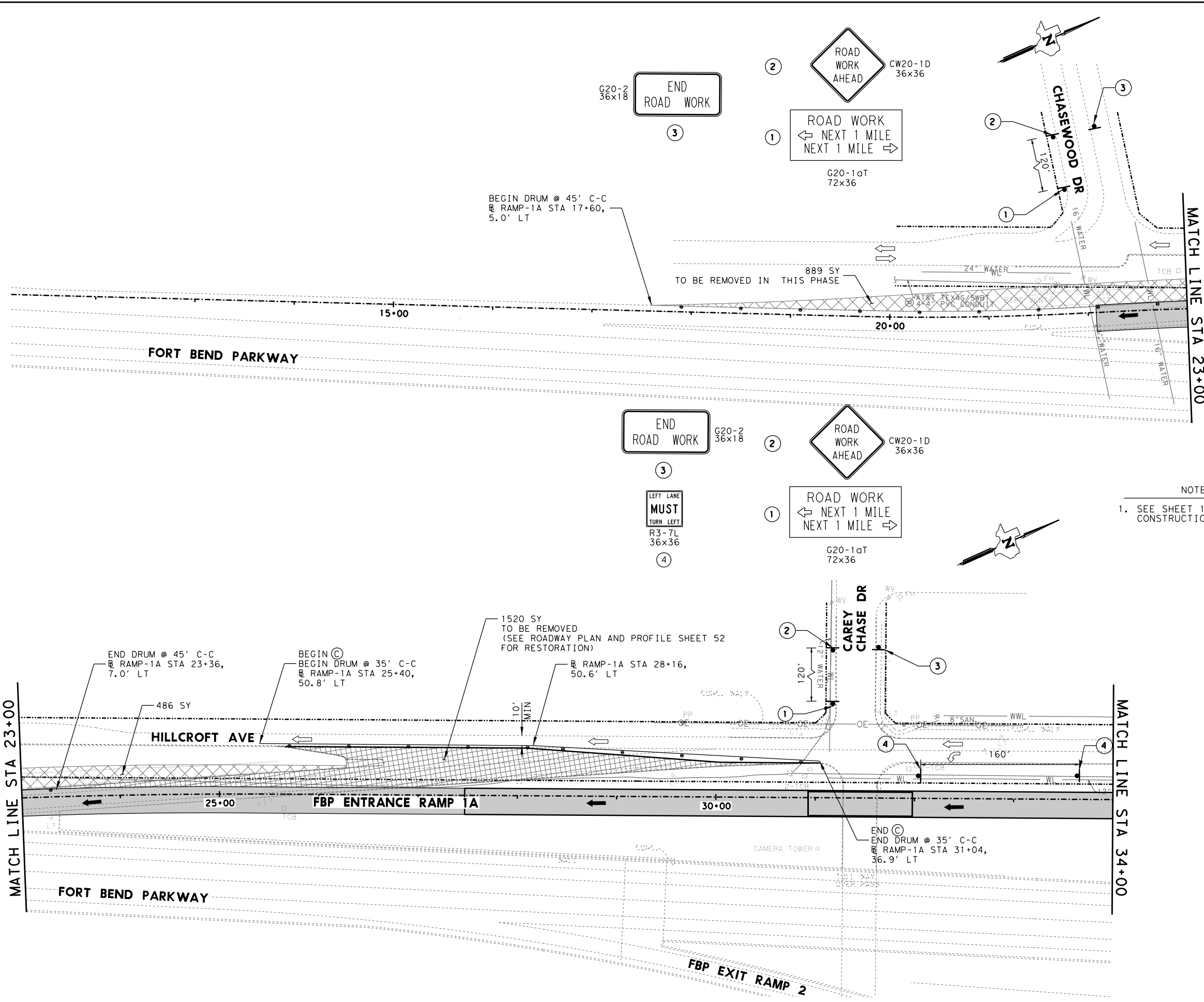
- NOTES**
- SEE SHEET 17 FOR CONSTRUCTION GENERAL NOTES.
  - TRAFFIC CONTROL SETUP WILL REMAIN IN PLACE FROM PH 1 STEP 1.

SHEET 2 OF 2

PROJECT NUMBER	20219x	DATE:	10/11/2023
DESIGNED BY:		CHECKED BY:	
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CHECKED BY:			

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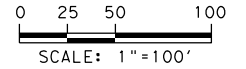


**LEGEND**

- CONC PAV TO BE REMOVED IN THIS STEP
- BUILT TEMP PAV IN PREVIOUS PHASE TO BE REMOVED IN THIS STEP
- COMPLETED PAVEMENT
- TCP DEVICE (DRUMS)
- PORTABLE SIGNS/ ARROW BOARD
- TYPE III BARRICADE
- GROUND MOUNTED SIGN
- CTB W/REFLECTORS
- CRASH CUSHION ATTENUATOR (CCA)
- PROP DIRECTION OF TRAFFIC
- EXIST TRAFFIC DIRECTION
- WK ZN PAV MRK REMOV (W) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 4" (BRK)
- WK ZN PAV MRK REMOV (Y) 4" (SLD)
- WK ZN PAV MRK REMOV (Y) 4" (BRK)
- WK ZN PAV MRK REMOV (W) 4" (DOT)
- WK ZN PAV MRK REMOV (Y) 4" (DOT)
- WK ZN PAV MRK REMOV (W) 8" (SLD)
- WK ZN PAV MRK REMOV (W) 24" (SLD)
- WK ZN PAV MRK REMOV (W) (WORD)
- WK ZN PAV MRK REMOV (W) (ARROW)
- WK ZN PAV MRK REMOV (REFL) TY II-C-R
- WK ZN PAV MRK REMOV (REFL) TY I-C

**NOTES**

1. SEE SHEET 17 FOR CONSTRUCTION GENERAL NOTES.



REV.	DATE	BY	DESCRIPTION



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Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

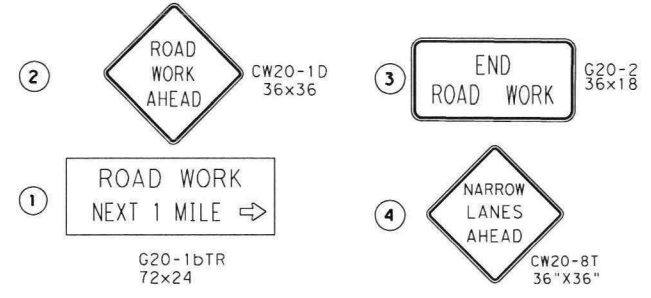
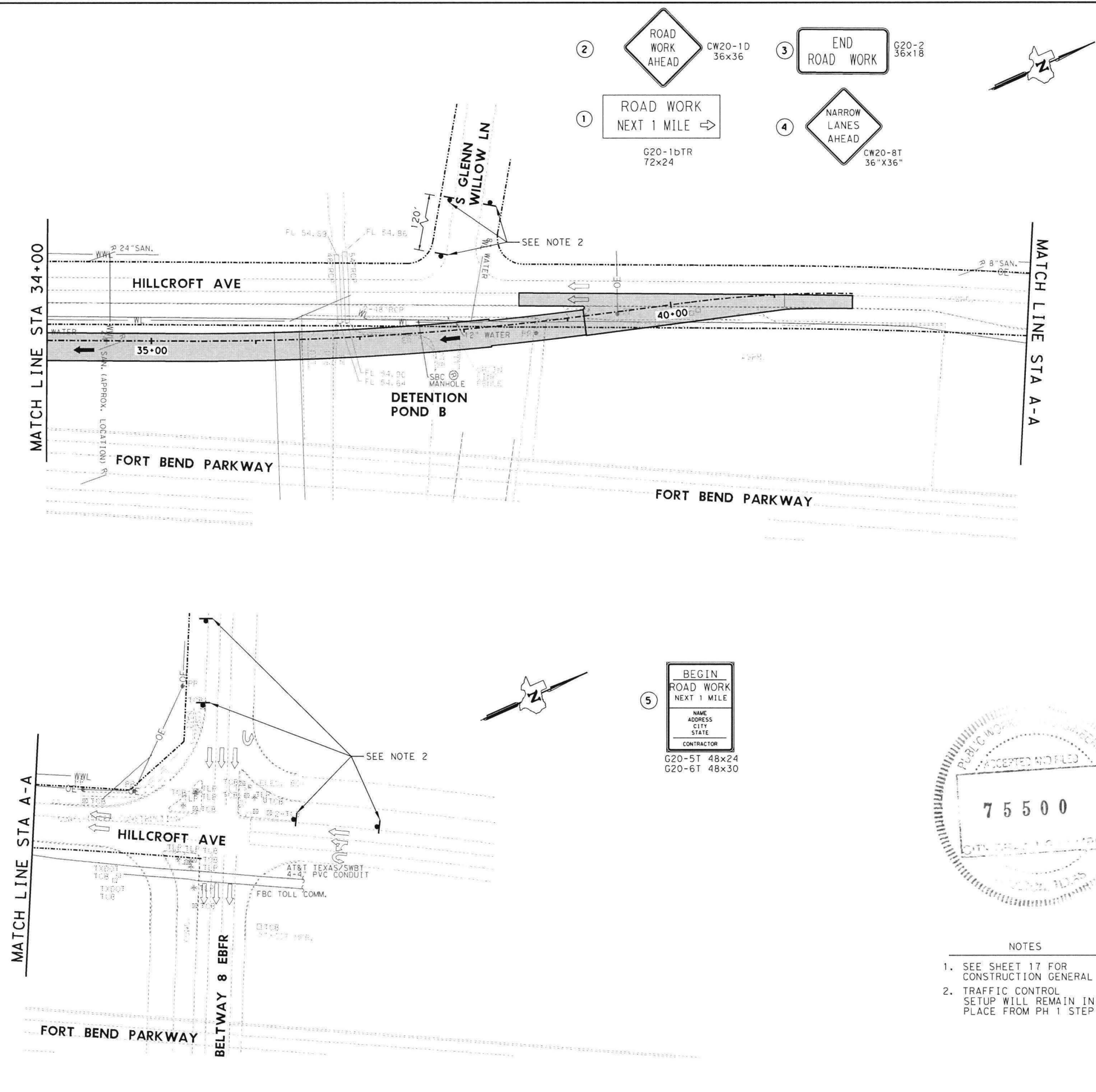
**FORT BEND PARKWAY TOLL ROAD**  
**TRAFFIC CONTROL PLAN**  
**PHASE 2 STEP 2**  
BEGIN TO STA 34+00

SHEET 3 OF 3

PROJECT NUMBER	20219x	DATE:	10/10/2023
DESIGNED BY:		CHECKED BY:	
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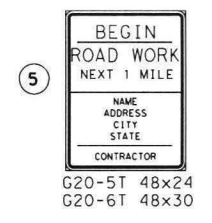
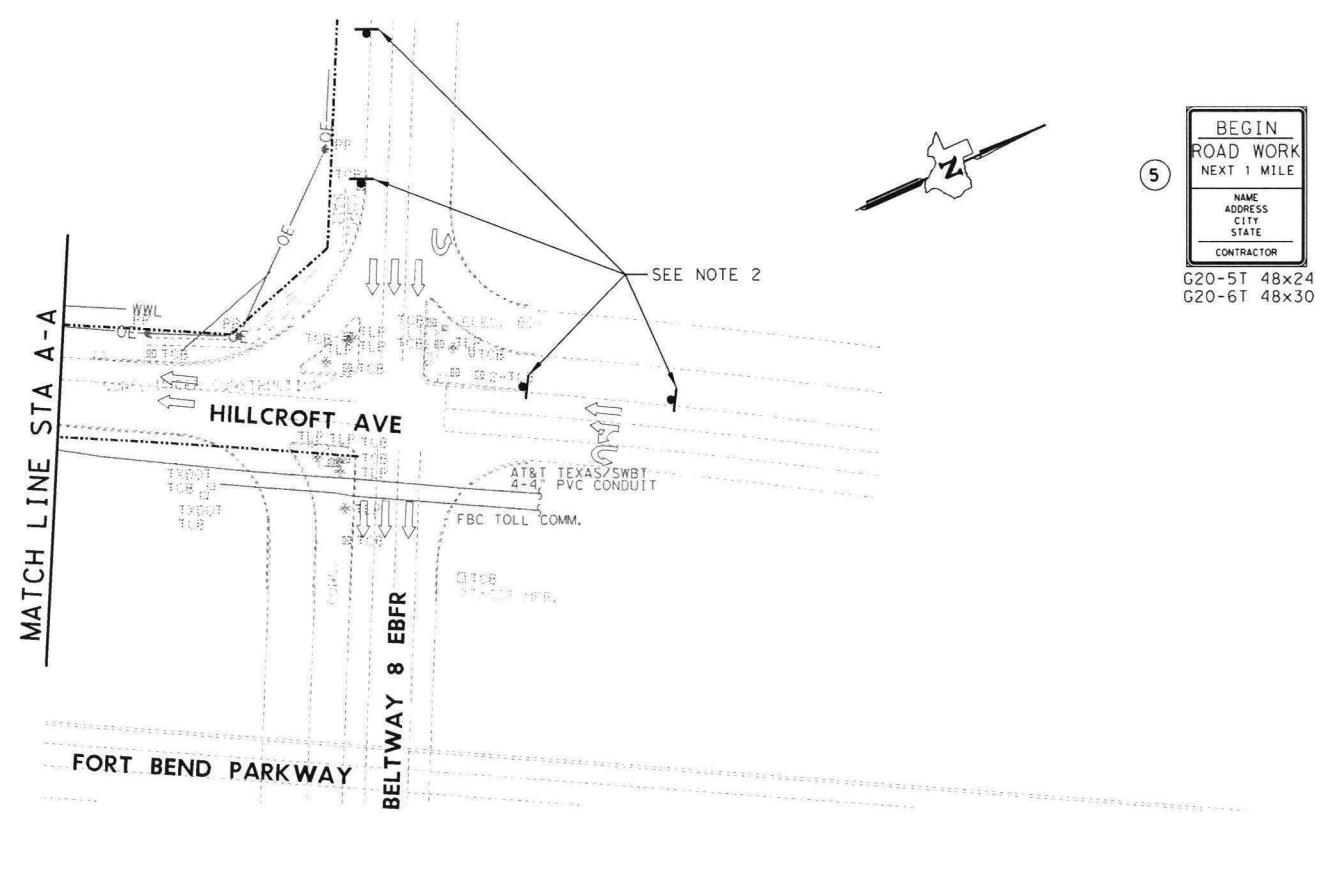
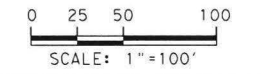
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**LEGEND**

- PERMANENT ROADWAY AND BRIDGE CONSTRUCTION THIS PHASE
- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED PAVEMENT
- TCP DEVICE (DRUMS)
- PORTABLE SIGNS/ ARROW BOARD
- TYPE III BARRICADE
- GROUND MOUNTED SIGN
- CTB W/REFLECTORS
- CRASH CUSHION ATTENUATOR (CCA)
- PROP DIRECTION OF TRAFFIC
- EXIST TRAFFIC DIRECTION
- (A) WK ZN PAV MRK REMOV (W) 4" (SLD)
- (B) WK ZN PAV MRK REMOV (W) 4" (BRK)
- (C) WK ZN PAV MRK REMOV (Y) 4" (SLD)
- (D) WK ZN PAV MRK REMOV (Y) 4" (BRK)
- (E) WK ZN PAV MRK REMOV (W) 4" (DOT)
- (F) WK ZN PAV MRK REMOV (Y) 4" (DOT)
- (G) WK ZN PAV MRK REMOV (W) 8" (SLD)
- (H) WK ZN PAV MRK REMOV (W) 24" (SLD)
- (I) WK ZN PAV MRK REMOV (W) (WORD)
- (J) WK ZN PAV MRK REMOV (W) (ARROW)
- (K) WK ZN PAV MRK REMOV (REFL) TY 11-C-R
- (L) WK ZN PAV MRK REMOV (REFL) TY 1-C



- NOTES**
- SEE SHEET 17 FOR CONSTRUCTION GENERAL NOTES.
  - TRAFFIC CONTROL SETUP WILL REMAIN IN PLACE FROM PH 1 STEP 1.

REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group

AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

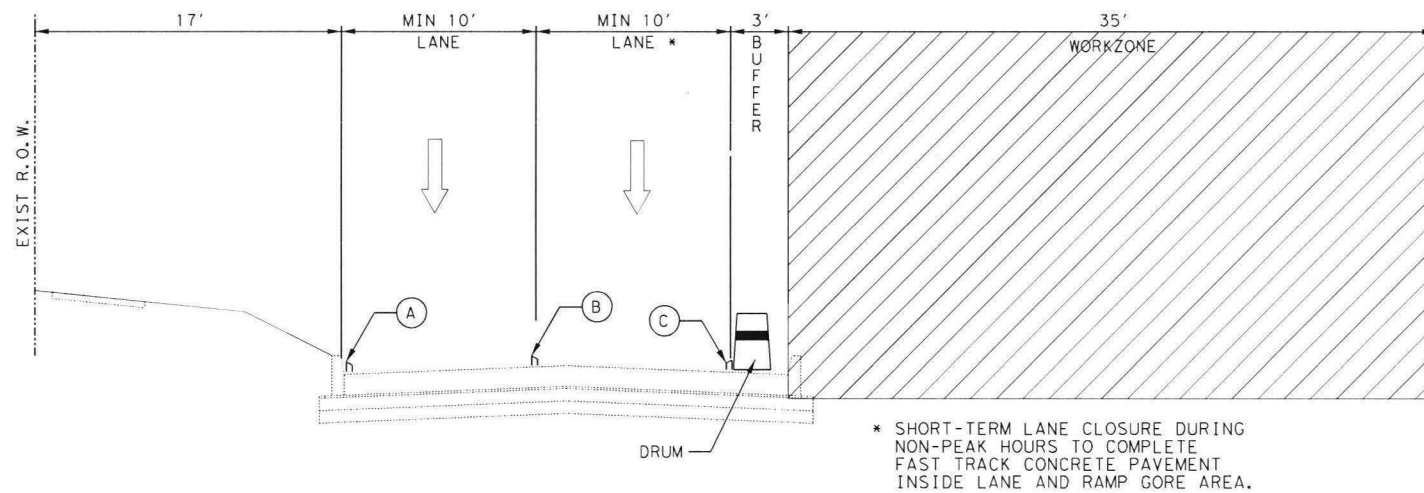
**FORT BEND PARKWAY TOLL ROAD**

**TRAFFIC CONTROL PLAN**  
PHASE 2 STEP 2  
STA 34+00 TO END

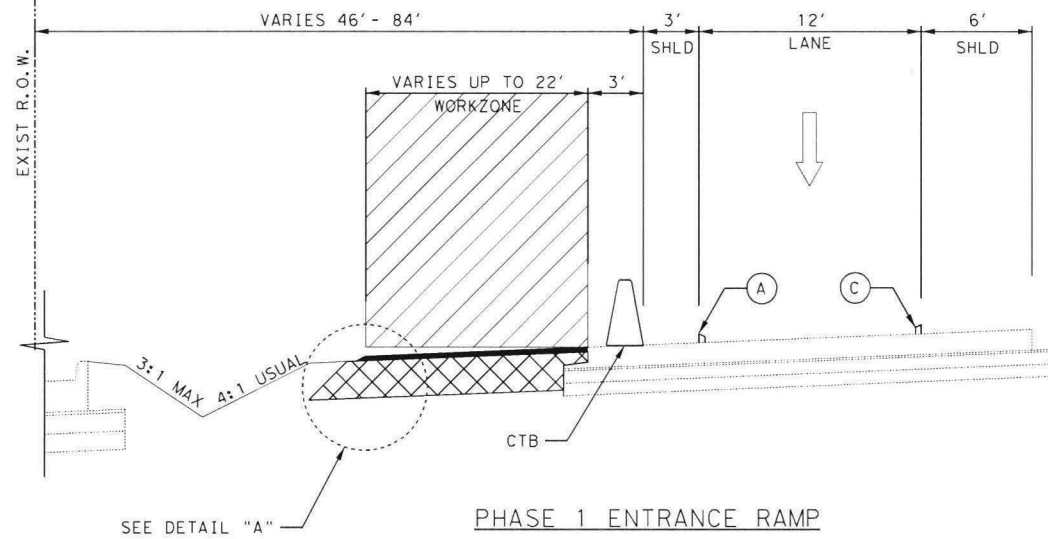
SHEET 2 OF 2

PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
CHECKED BY:		SHEET NO.:	23
DRAWN BY:			
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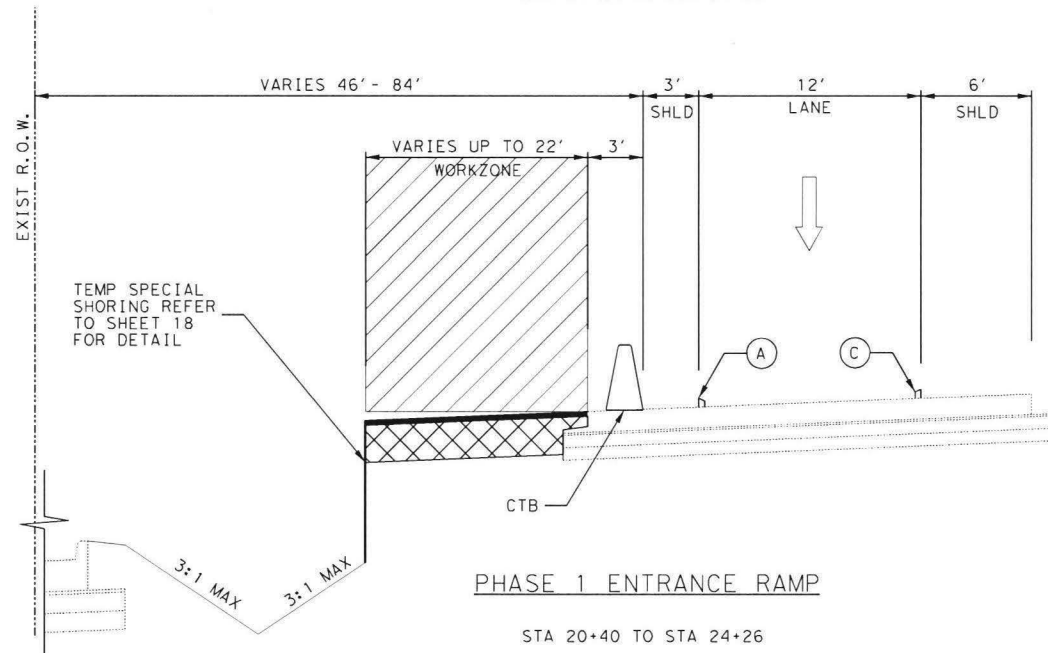
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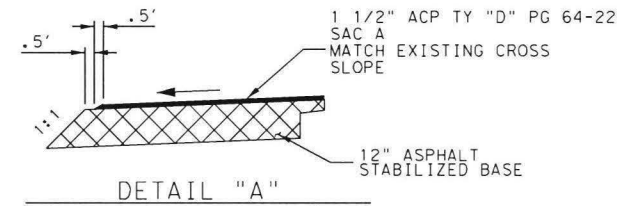
PHASE 1  
HILLCROFT AVE  
STA 38+00 TO STA 41+75



STA 17+00 TO STA 20+40  
STA 24+26 TO STA 27+00



STA 20+40 TO STA 24+26



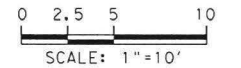
LEGEND

- TEMPORARY PAVEMENT THIS PHASE
- COMPLETED PAVEMENT FROM PREVIOUS PHASE

- (A) WK ZN PAV MRK REMOV (W) 4" (SLD)
- (B) WK ZN PAV MRK REMOV (W) 4" (BRK)
- (C) WK ZN PAV MRK REMOV (Y) 4" (SLD)

NOTES

1. SEE GENERAL NOTES FOR CONSTRUCTION NOTES.



REV.	DATE	BY	DESCRIPTION

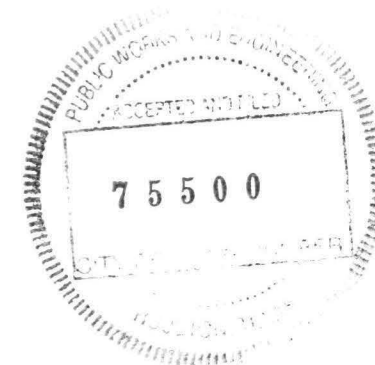


**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech** F-20607  
Advanced Infrastructure Group  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD**  
**TRAFFIC CONTROL PLAN**  
**TYPICAL SECTIONS**

SHEET 1 OF 2			
PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	24
CHECKED BY:			





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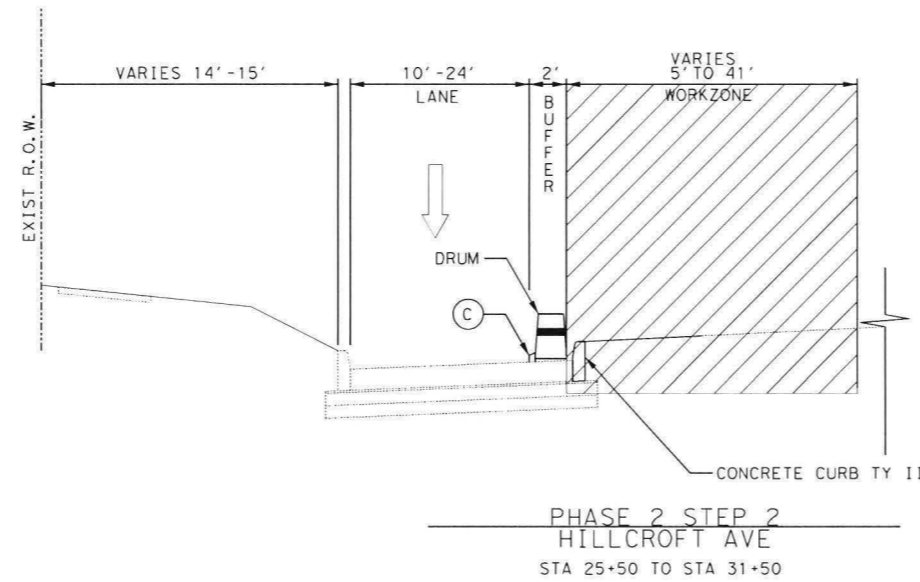
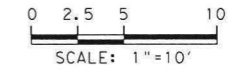
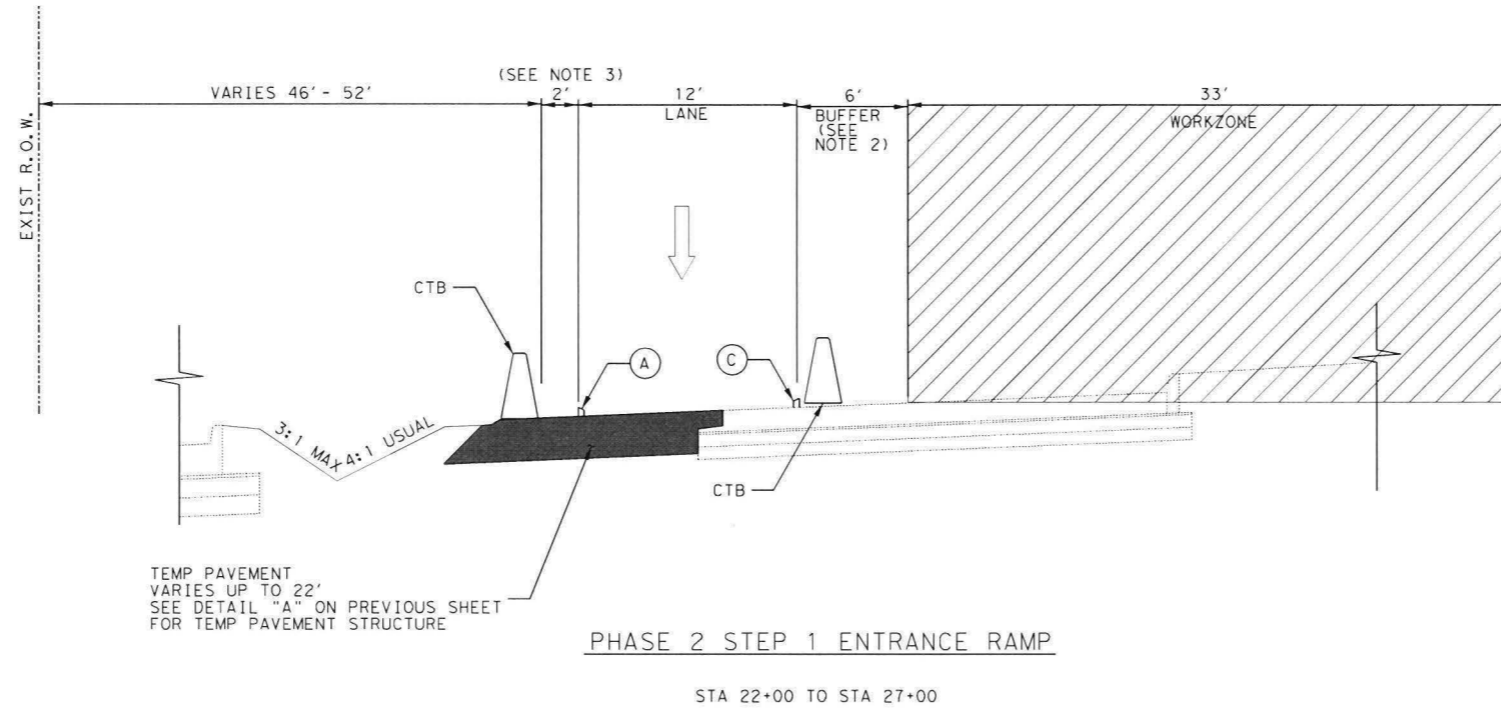
LEGEND

-  TEMPORARY PAVEMENT THIS PHASE
-  COMPLETED PAVEMENT FROM PREVIOUS PHASE


- (A) WK ZN PAV MRK REMOV (W) 4" (SLD)
- (B) WK ZN PAV MRK REMOV (W) 4" (BRK)
- (C) WK ZN PAV MRK REMOV (Y) 4" (SLD)

NOTES

1. SEE GENERAL NOTES FOR CONSTRUCTION NOTES.
2. BUFFER REDUCES TO 5' BETWEEN STA 22+08 TO STA 22+74 DUE TO REDUCED TEMP PAVEMENT WIDTH AVOIDING CONFLICT WITH EXISTING STRUCTURE WITHIN THIS LIMIT.
3. INSIDE SHOULDER REDUCES TO 1' BETWEEN STA 19+22 TO STA 22+74 DUE TO REDUCED TEMP PAVEMENT WIDTH AVOIDING CONFLICT WITH EXISTING STRUCTURE WITHIN THIS LIMIT.



REV.	DATE	BY	DESCRIPTION

**FORT BEND COUNTY TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD**

TRAFFIC CONTROL PLAN  
TYPICAL SECTIONS

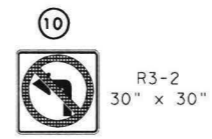
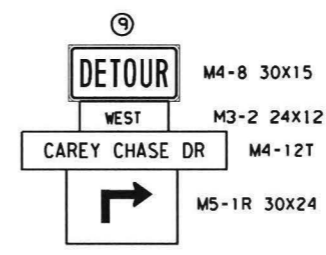
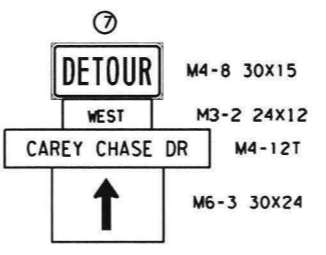
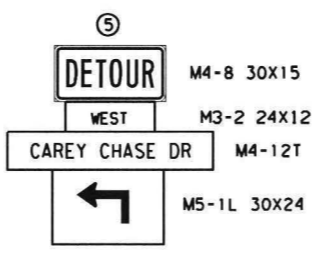
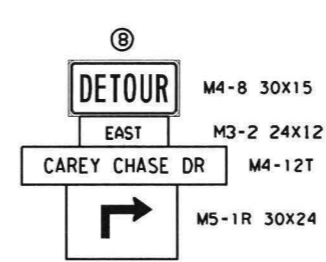
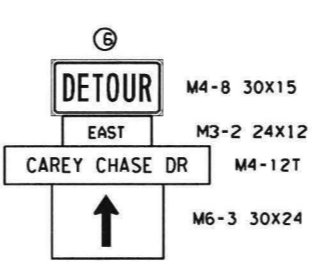
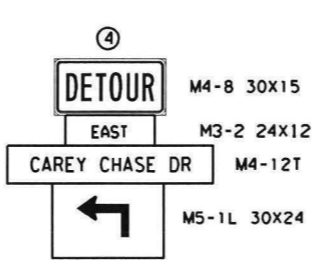
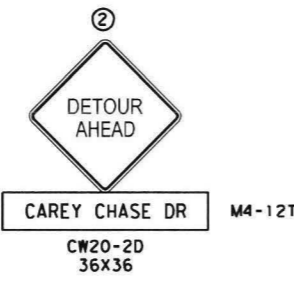
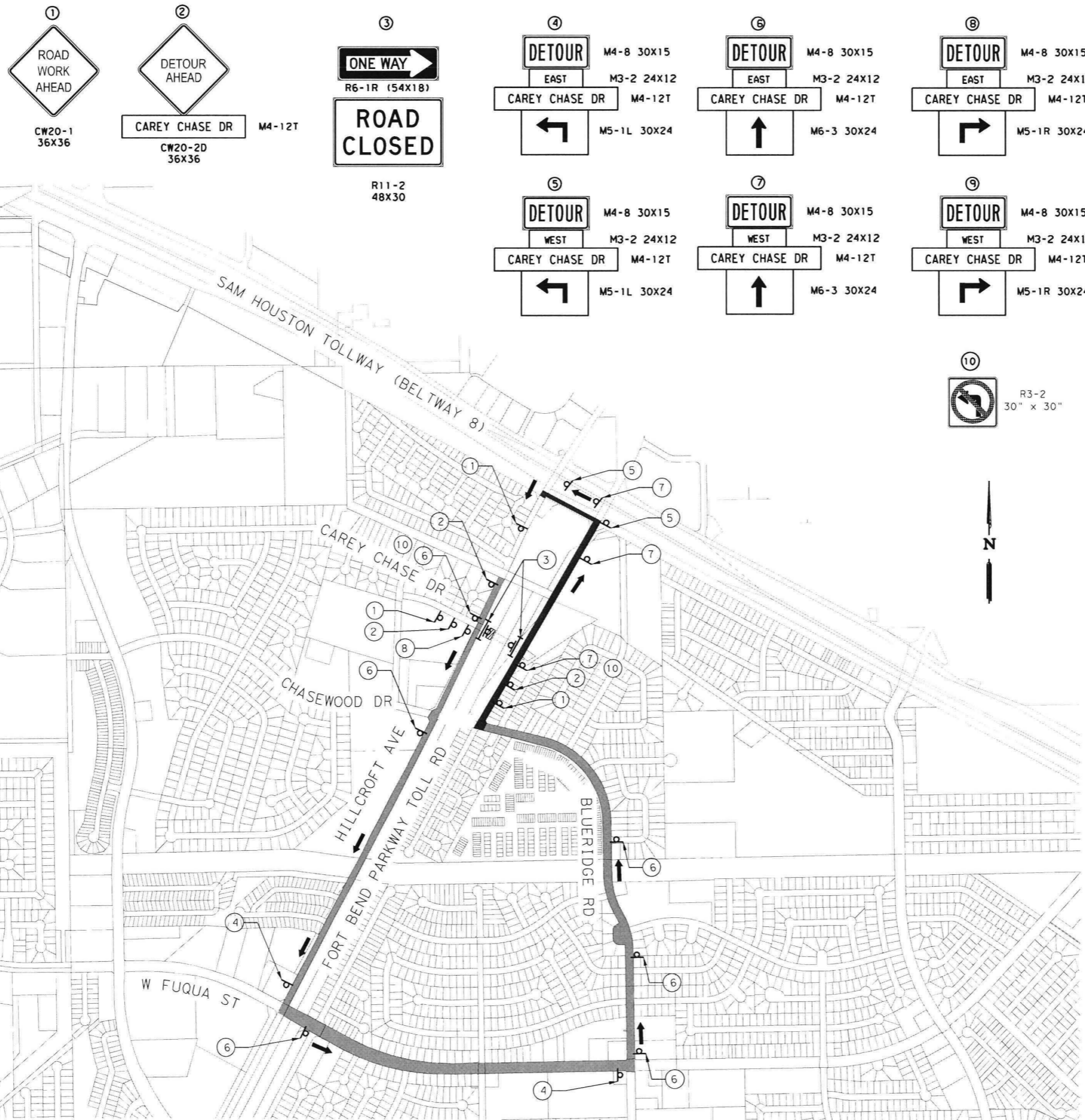
SHEET 2 OF 2

PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	25
CHECKED BY:			



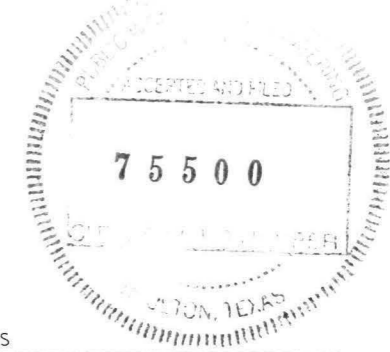
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100%  
SUBMITTAL



LEGEND

- CONSTRUCTION CLOSURE
- PROP DIRECTION OF TRAFFIC
- EXIST TRAFFIC DIRECTION
- TY-III BARRICADE
- WEST CAREY CHASE DR
- EAST CAREY CHASE DR



NOTES

1. SEE SHEET 17 FOR CONSTRUCTION GENERAL NOTES.
2. THIS DETOUR SHEET IS FOR NIGHT/WEEKEND CLOSURES TO CONSTRUCT CAREY CHASE BRIDGE.

REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**AIG Tech** Advanced Infrastructure Group  
 AIG TECHNICAL SERVICES, LLC F-20607  
 1500 S DAIRY ASHFORD  
 SUITE 445  
 HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD**  
**DETOUR FOR CAREY CHASE BRIDGE CONSTRUCTION**

SHEET 1 OF 1

PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	26

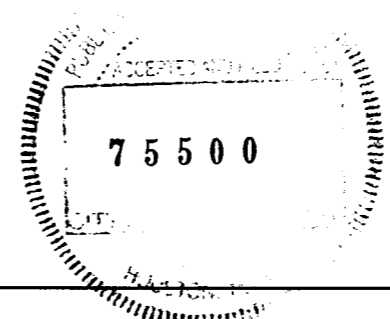
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LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION													
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE / RESET		L	L	R	R	S	S				
															MOVE/RESET	FROM LOC. #	N	W	N	W	N	W				
1	PHASE 1	18	NEW TEMP ENTRANCE RAMP	25+67		SB	N/A	N/A	N/A	N/A	N/A		1					L								
2	PHASE 1	18	NEW TEMP ENTRANCE RAMP	28+85		SB	N/A	N/A	N/A	N/A	N/A		1					L								
3	PHASE 2	20	NEW TEMP ENTRANCE RAMP	25+13		SB	N/A	N/A	N/A	N/A	N/A				1	1		L								
4	PHASE 2	20	NEW TEMP ENTRANCE RAMP	27+72		SB	N/A	N/A	N/A	N/A	N/A				1	2		L								
TOTALS												2	2	2												

LEGEND:  
 L=LOW MAINTENANCE  
 R=REUSABLE  
 S=SACRIFICIAL  
 N=NARROW  
 W=WIDE

FOR DEFINITIONS SEE THE "CRASH CUSHION CATEGORIZATION CHART.PDF" AT THE DESIGN DIVISION (ROADWAY STANDARDS) WEBSITE. USE QUICK LINKS TO ACCESS ATTENUATORS / CRASH CUSHIONS SECTION.  
<http://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/rdwylse.htm>



CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:	CK:
© TxDOT	CONT	SECT	JOB
REVISIONS			HIGHWAY
	DIST	COUNTY	
	HOU	FBC	
	FEDERAL AID PROJECT	SHEET NO.	
		27	

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DATE:  
FILE:

**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. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.
11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.
12. The Engineer has the final decision on the location of all traffic control devices.
13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

**WORKER SAFETY NOTES:**


1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.
2. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

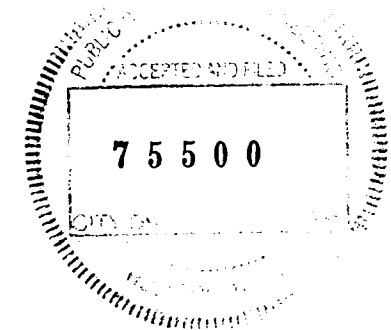
**COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES**

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.
2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT <a href="http://www.txdot.gov">http://www.txdot.gov</a>
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

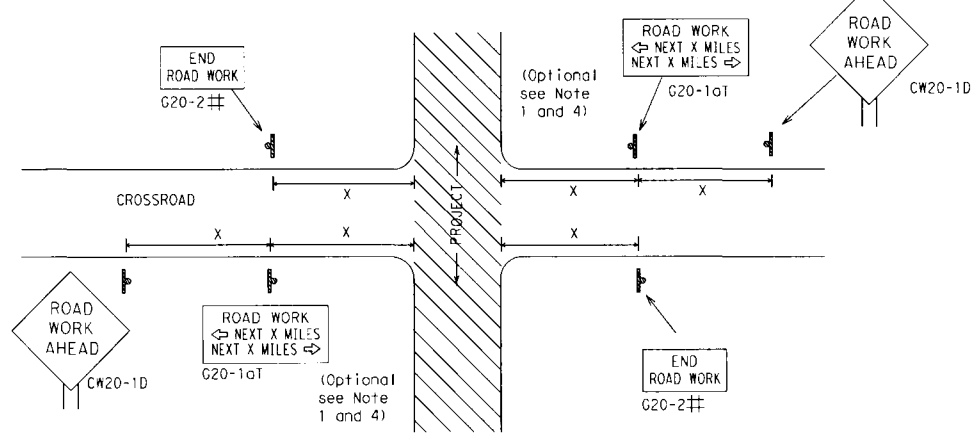
SHEET 1 OF 12

 Texas Department of Transportation		<b>Traffic Safety Division Standard</b>
<b>BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS</b>		
<b>BC (1) - 21</b>		
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT
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9-07 8-14	HIGHWAY	
5-10 5-21	DIST	COUNTY
		SHEET NO.
		28



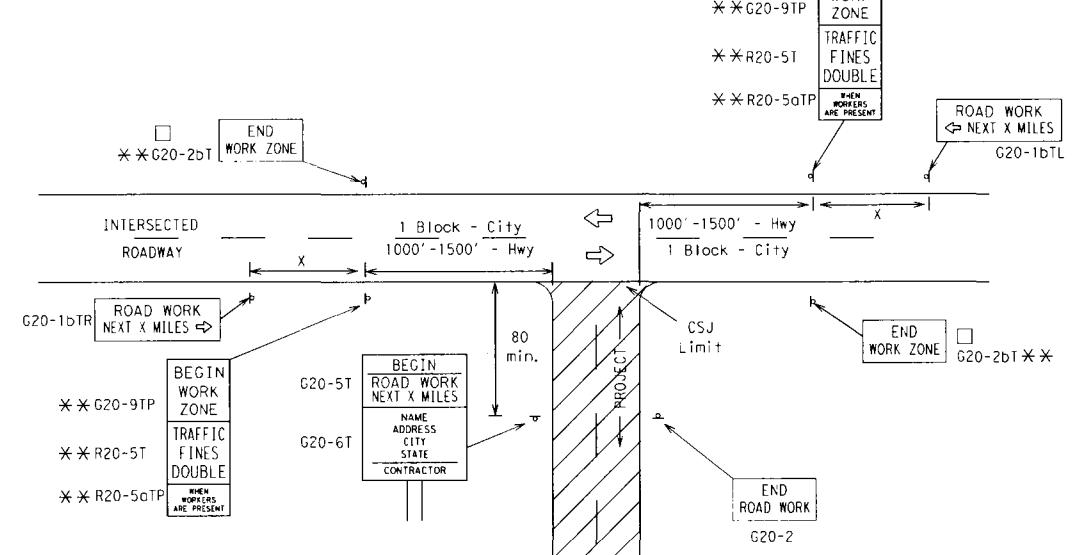
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TYPICAL LOCATION OF CROSSROAD SIGNS



- ## 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 as per TMUTCD Part 5. 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



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.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING<sup>1,5,6</sup>

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Spacing "x" (Feet (Apprx.))
CW20 <sup>4</sup>	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW25	36" x 36"	48" x 48"	50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14			55	500 <sup>2</sup>
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12			60	600 <sup>2</sup>
			65	700 <sup>2</sup>
			70	800 <sup>2</sup>
	75	900 <sup>2</sup>		
	80	1000 <sup>2</sup>		
	*	*	*	3

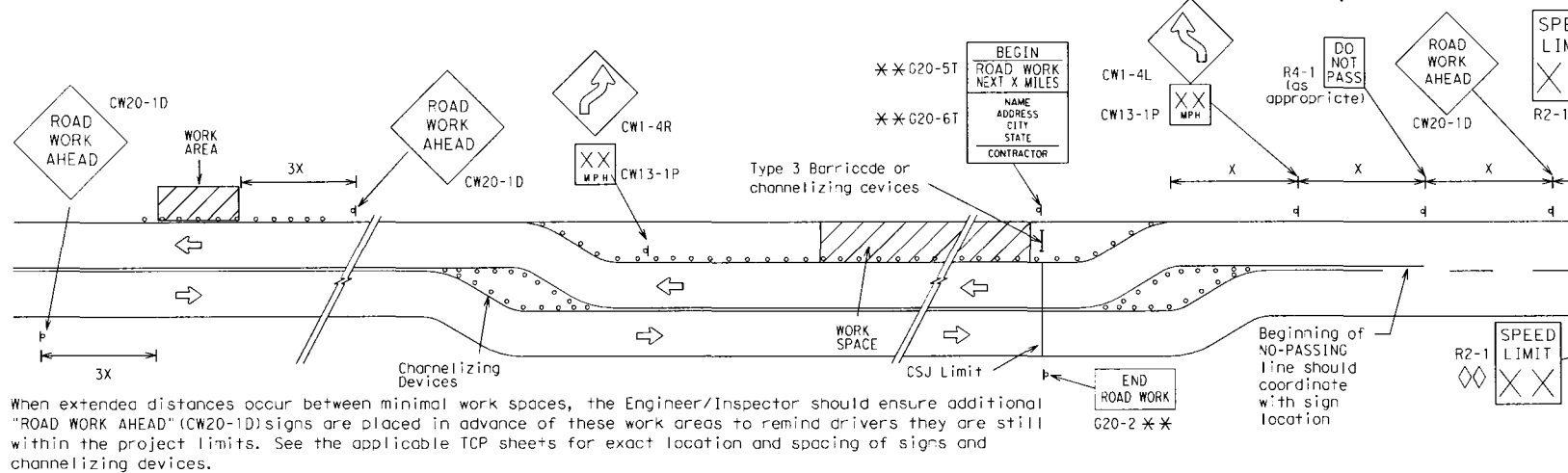
\* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

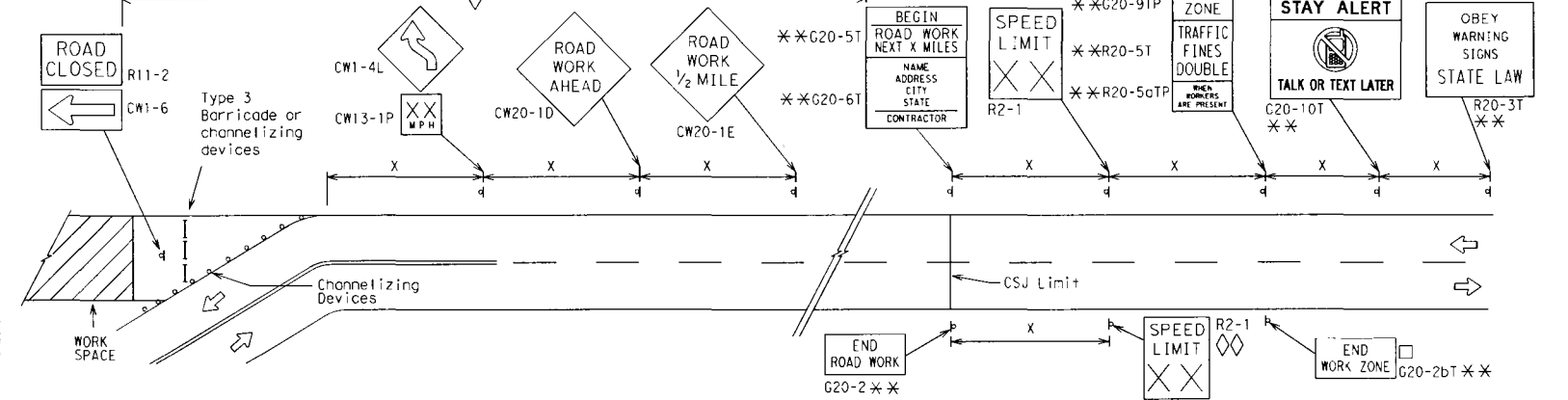
GENERAL NOTES

1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be used on low volume crossroads at the discretion of the Engineer as per TMUTCD Part 5. 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

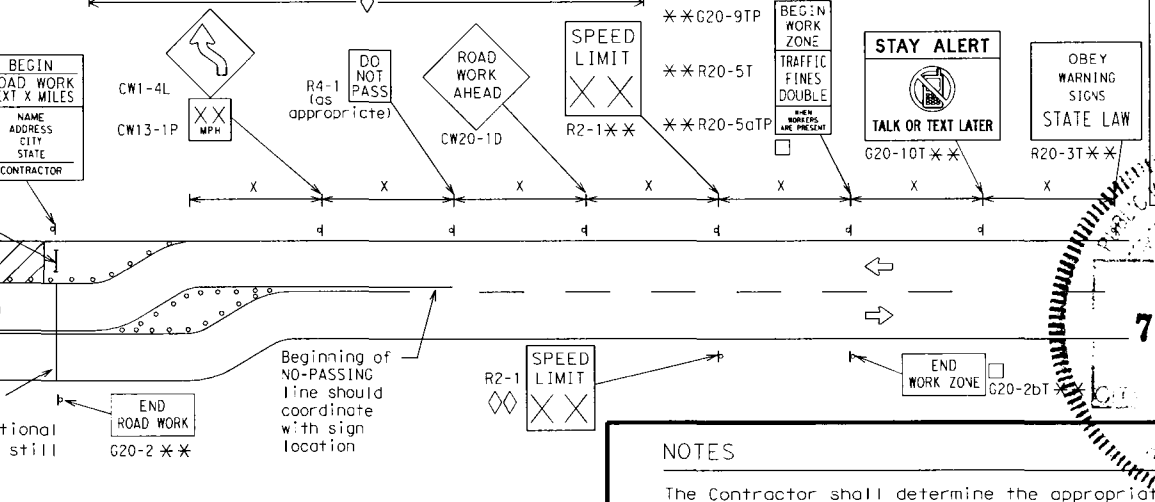


SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

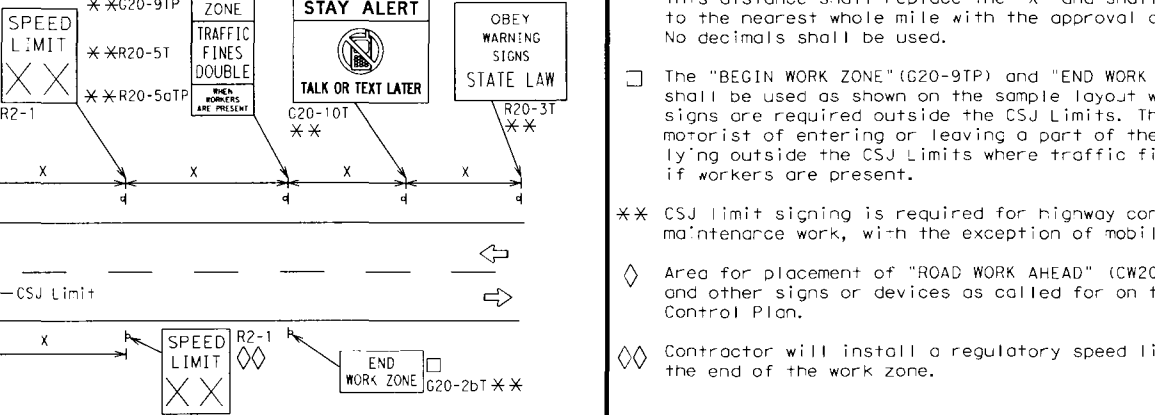


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SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



NOTES

- The Contractor shall determine the appropriate signs 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.
- 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.
  - \*\* CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.
  - ◇ Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
  - ◇◇ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

—	Type 3 Barricade
○ ○ ○	Channelizing Devices
+	Sign
x	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

SHEET 2 OF 12



Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

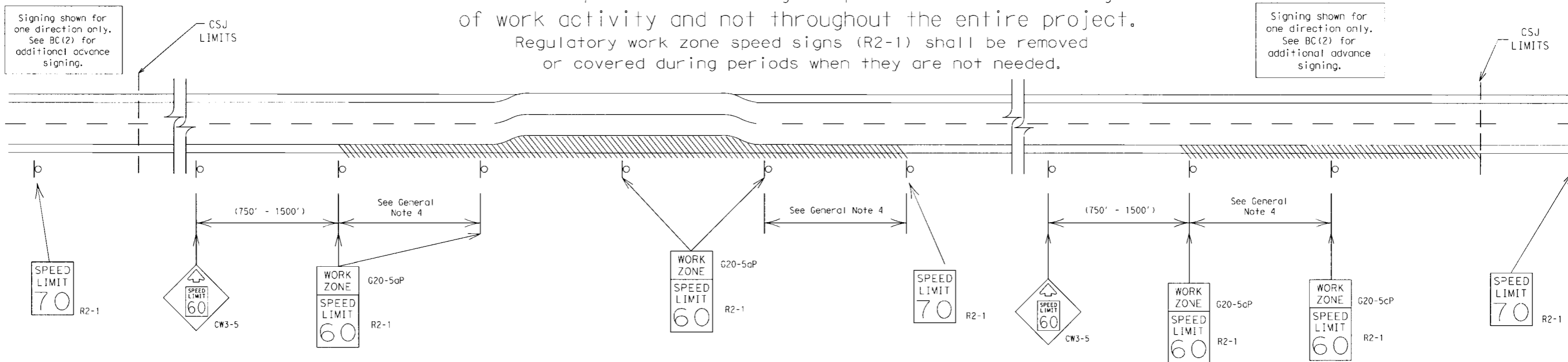
BC(2)-21

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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO.	
9-07 8-14				
7-13 5-21			29	

# TYPICAL APPLICATION OF WORK ZONE SPEED 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.



## GUIDANCE FOR USE:

### 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:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- 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.

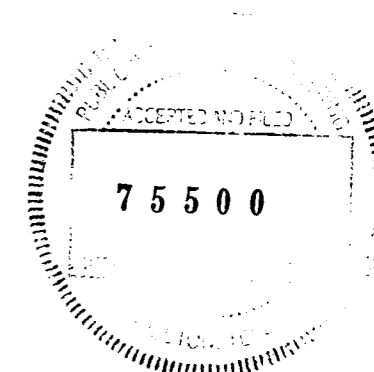
### SHORT TERM WORK ZONE SPEED LIMITS

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 traveled way.

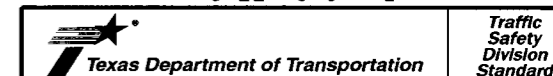
Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered. (See Removing or Covering on BC(4)).

## GENERAL NOTES

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- 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
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- Fabrication, erection and maintenance of the "ADVANCE SPEED LIMIT" (CW3-5) sign, "WORK ZONE" (G20-5aP) plaque and the "SPEED LIMIT" (R2-1) signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
- Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- Techniques that may help reduce traffic speeds include but are not limited to:
  - Law enforcement.
  - Flagger stationed next to sign.
  - Portable changeable message sign (PCMS).
  - Low-power (drone) radar transmitter.
  - Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- 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)-21

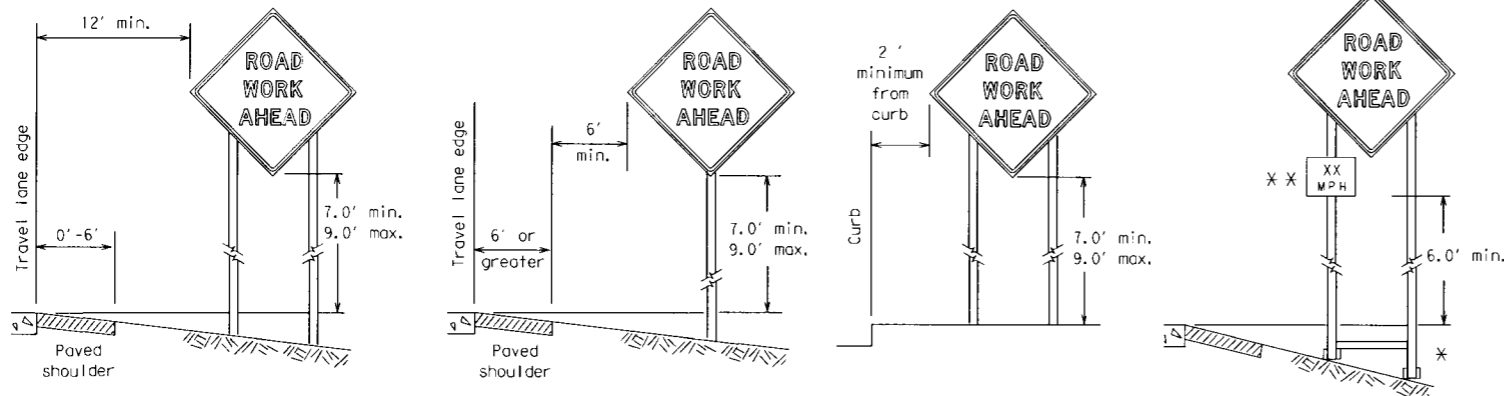
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DR: TxDOT	CR: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				
9-07 8-14				
7-13 5-21	DIST	COUNTY	SHEET NO.	
			30	

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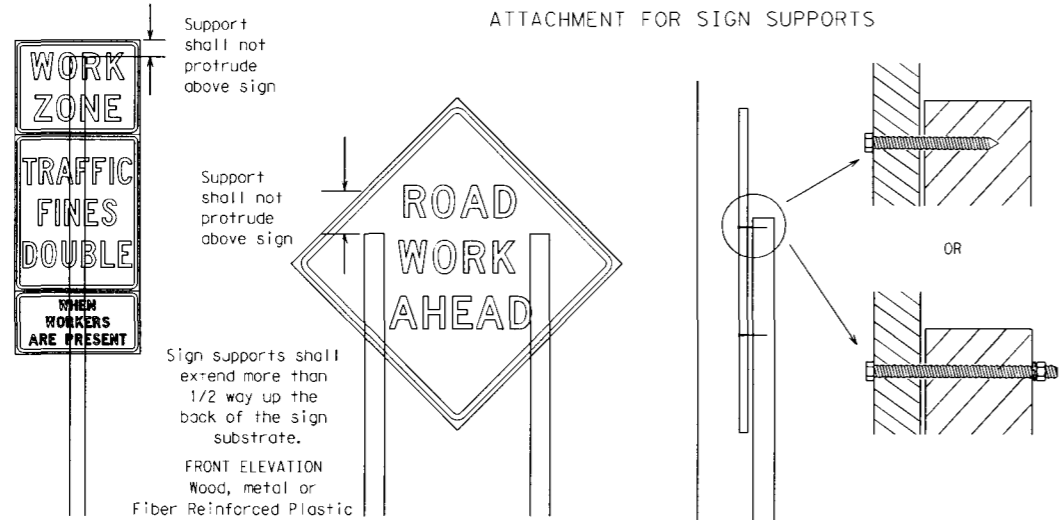
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TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



\* 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 plaques (advisory or distance) should not cover the surface of the present sign.

ATTACHMENT FOR SIGN SUPPORTS

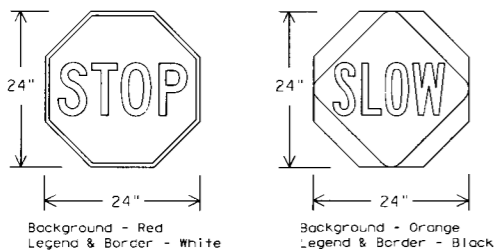


Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

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 splice 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.

STOP/SLOW PADDLES

- STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
- STOP/SLOW paddles shall be retroreflectORIZED when used at night.
- STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
- 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.



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

- 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, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
- 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. For details for covering large guide signs see the TS-CD standard.
- 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 relocating existing signs.
- If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRs standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets 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) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. 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)

- 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 night and day work 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.
- 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 ground.
- 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.
- Regulatory 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

- 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

- 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.
- 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

- 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.
- 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.
- Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
- Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
- Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

- 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

**Texas Department of Transportation**

**Traffic Safety Division Standard**

## BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

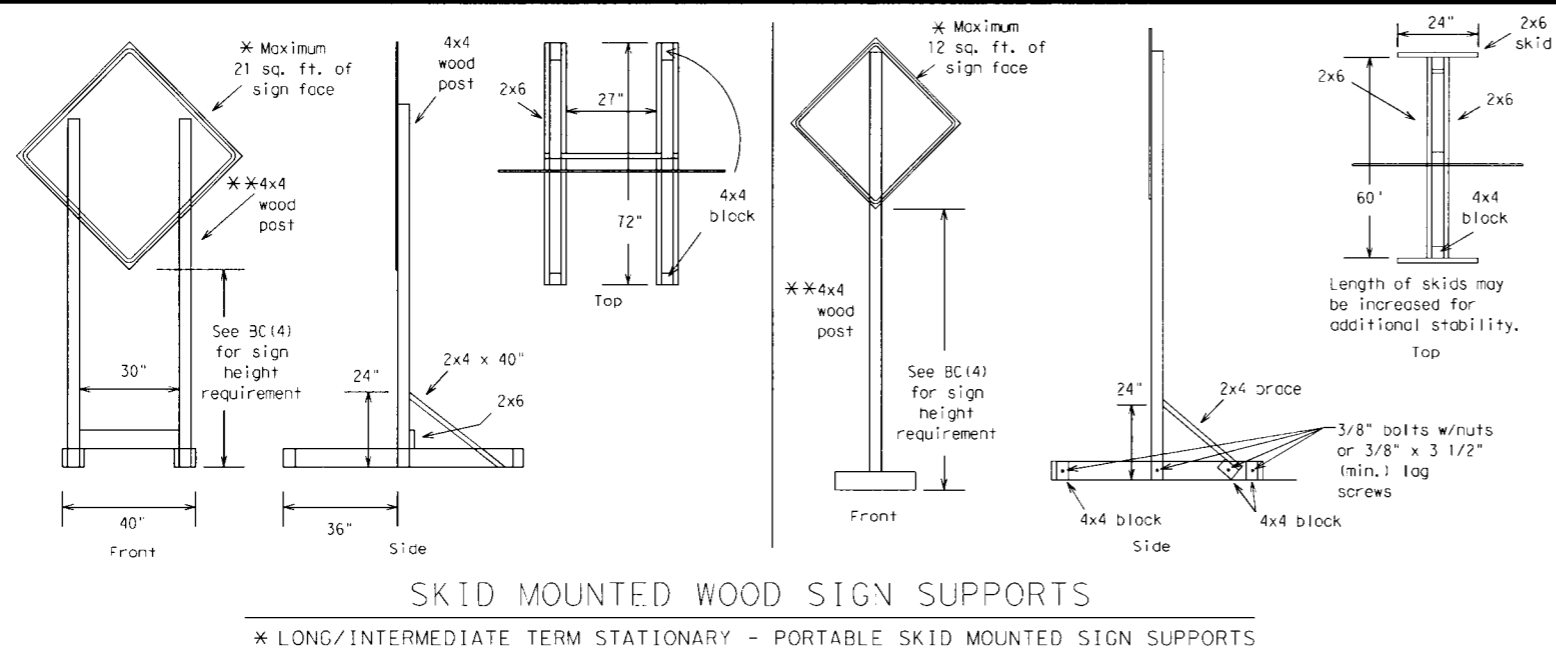
### BC (4) - 21

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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				
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7-13	5-21			
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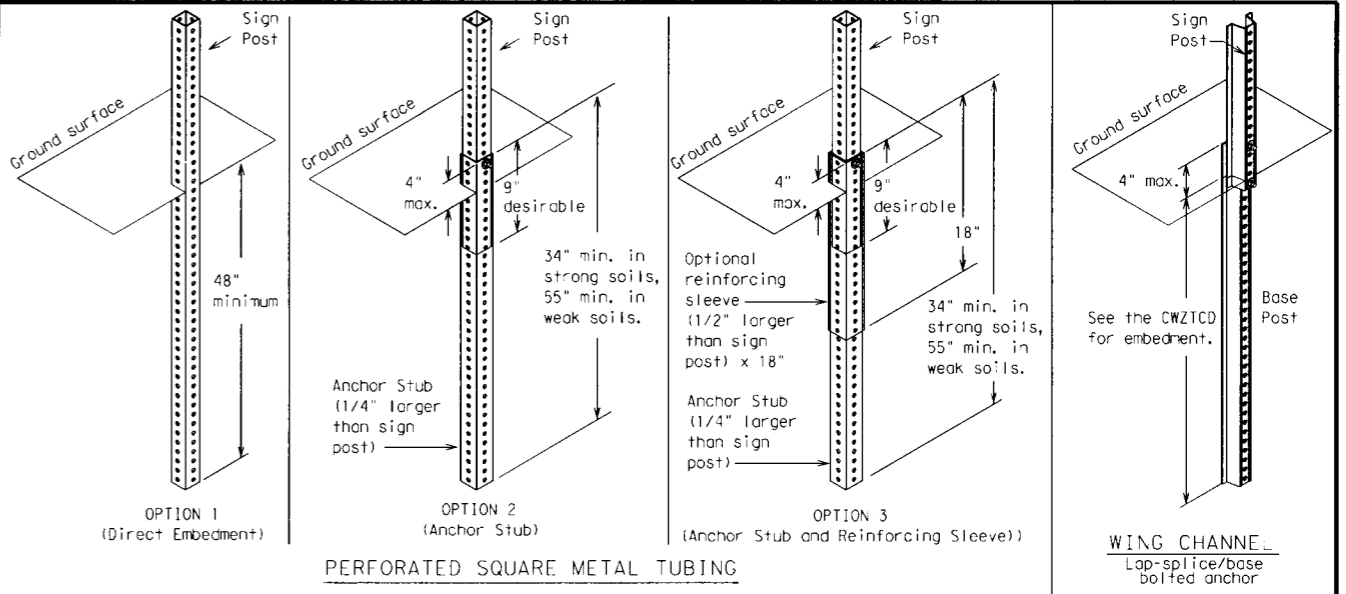
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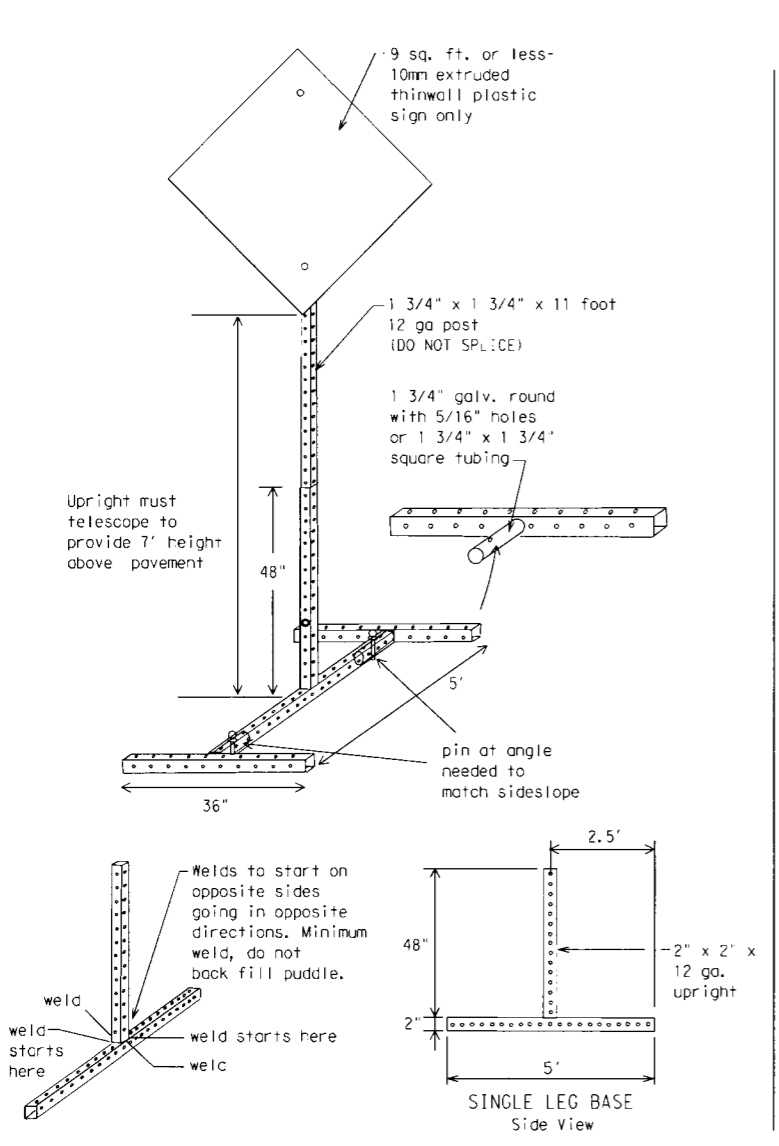
**SKID MOUNTED WOOD SIGN SUPPORTS**

\* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS



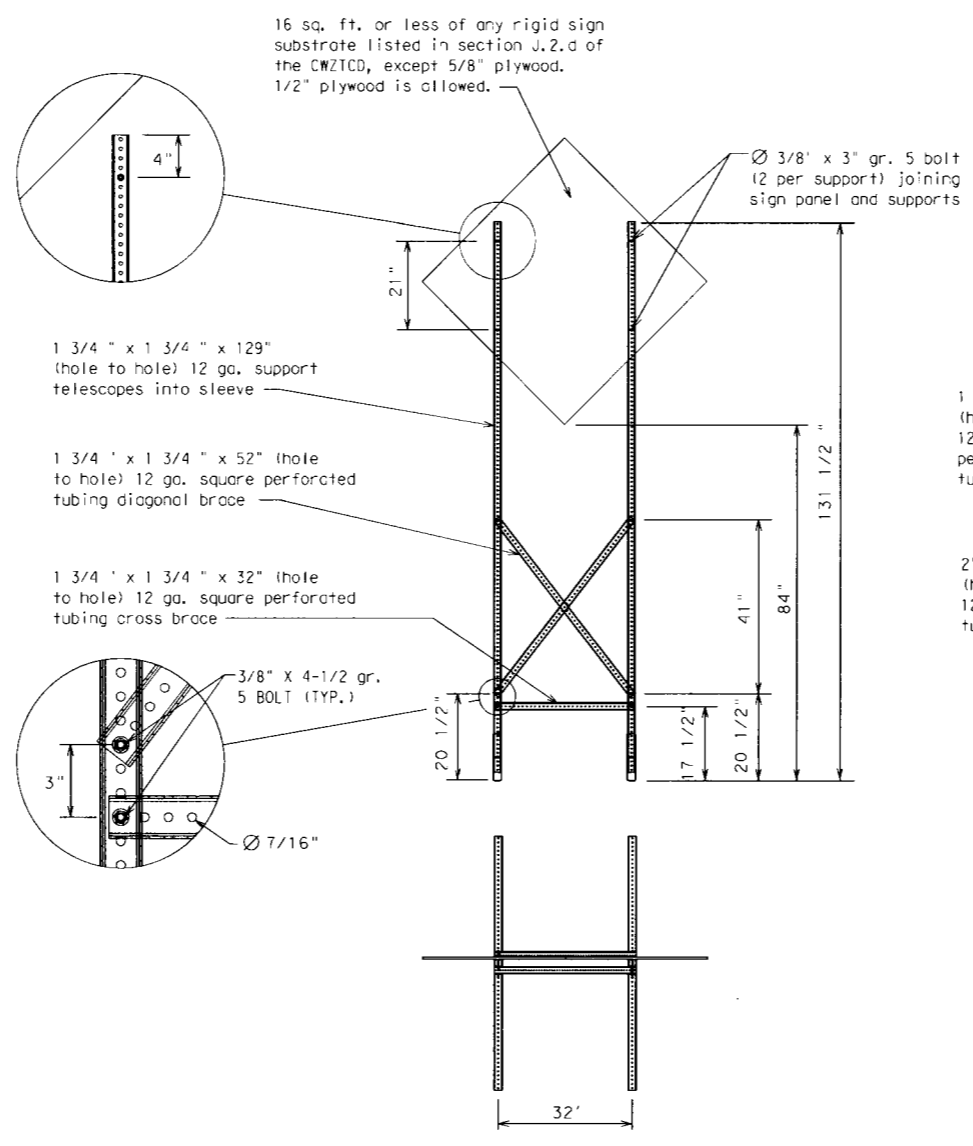
**GROUND MOUNTED SIGN SUPPORTS**

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support. The maximum sign square footage shall adhere to the manufacturer's recommendation. Two post installations can be used for larger signs.



**SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS**

\* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS



**WEDGE ANCHORS**

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

**OTHER DESIGNS**

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

**GENERAL NOTES**

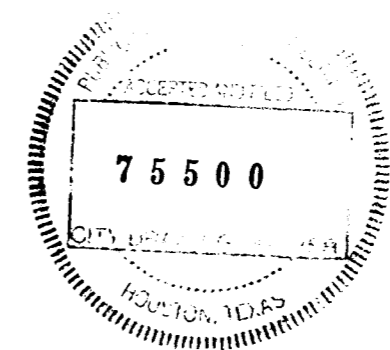
1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
  2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
  3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.
- \* See BC(4) for definition of "Work Duration."
  - \*\* Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.
  - See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

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**BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT**

BC (5) - 21



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# RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

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."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- 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.
- 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.
- 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.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- 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.
- 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.
- Each line of text should be centered on the message board rather than left or right justified.
- 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.

## Phase 1: Condition Lists

### Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT
RIGHT X LANES CLOSED	RIGHT X LANES OPEN
CENTER LANE CLOSED	DAYTIME LANE CLOSURES
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE
EXIT CLOSED	RIGHT LN TO BE CLOSED
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI
XXXXXXXXX B_VD CLOSED	

### Other Condition List

ROADWORK XXX FT	ROAD REPAIRS XXXX FT
FLAGGER XXXX FT	LANE NARROWS XXXX FT
RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
DETOUR X MILE	ROUGH ROAD XXXX FT
ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
BUMP XXXX FT	US XXX EXIT X MILES
TRAFFIC SIGNAL XXXX FT	LANES SHIFT

\* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

## Phase 2: Possible Component Lists

### Action to Take/Effect on Travel List

MERGE RIGHT	FORM X LINES RIGHT
DETOUR NEXT X EXITS	USE XXXX RD EXIT
USE EXIT XXX	USE EXIT I-XX NORTH
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N
TRUCKS USE US XXX N	WATCH FOR TRUCKS
WATCH FOR TRUCKS	EXPECT DELAYS
EXPECT DELAYS	PREPARE TO STOP
REDUCE SPEED XXX FT	END SHOULDER USE
USE OTHER ROUTES	WATCH FOR WORKERS
STAY IN LANE	

### Location List

AT FM XXXX
BEFORE RAILROAD CROSSING
NEXT X MILES
PAST US XXX EXIT
XXXXXXXXX TO XXXXXXX
US XXX TO FM XXXX

### Warning List

SPEED LIMIT XX MPH
MAXIMUM SPEED XX MPH
MINIMUM SPEED XX MPH
ADVISORY SPEED XX MPH
RIGHT LANE EXIT
USE CAUTION
DRIVE SAFELY
DRIVE WITH CARE

### \*\* Advance Notice List

TUE-FRI XX AM-XX PM
APR XX-XX X PM-X AM
BEGINS MONDAY
BEGINS MAY XX
MAY X-X XX PM - XX AM
NEXT FRI-SUN
XX AM TO XX PM
NEXT TUE AUG XX
TONIGHT XX PM-XX AM

\*\* See Application Guidelines Note 6.

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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	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLRS
High-Occupancy	HOV	Tuesday	TUES
Vehicle Highway	HWY	Time Minutes	TIME MIN
Hour(s)	HR, HRS	Upper Level	UPR LEVEL
Information	INFO	Vehicles (s)	VEH, VEHs
It Is	ITS	Warning	WARN
Junction	JCT	Wednesday	WED
Left	LFT	Weight Limit	WT LIMIT
Left Lane	LFT LN	West	W
Lane Closed	LN CLOSED	Westbound	(route) W
Lower Level	LWR LEVEL	Wet Pavement	WET PVMT
Maintenance	MAINT	Will Not	WONT

roadway designation # IH-number, US-number, SH-number, FM-number

### APPLICATION GUIDELINES

- 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.
- 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.

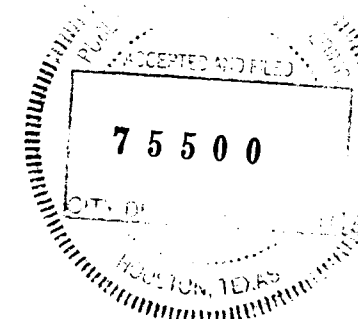
### WORDING ALTERNATIVES

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- 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

- 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.
- 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.
- 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.
- 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.



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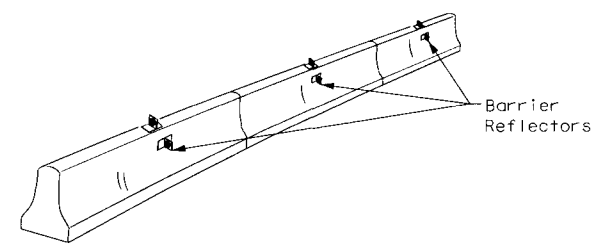
**BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)**

**BC (6) - 21**

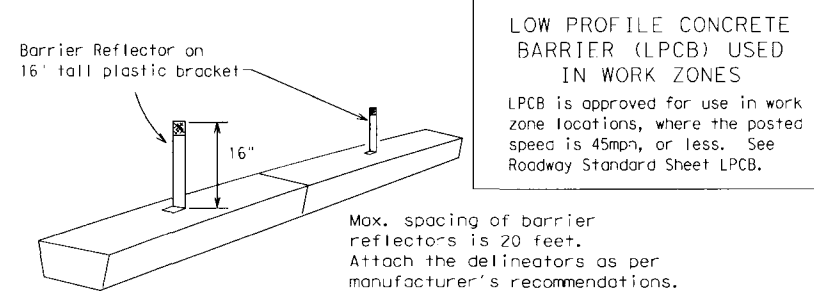
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- 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)

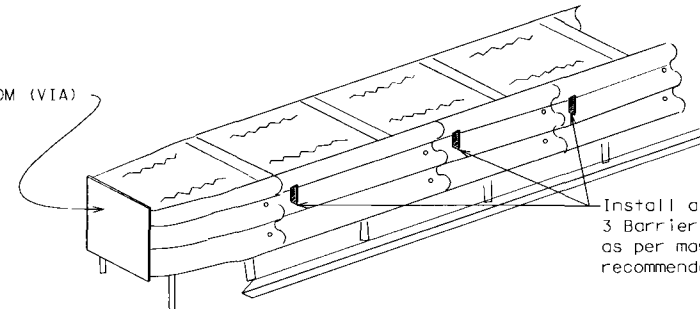


LOW PROFILE CONCRETE BARRIER (LPCB)

**LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES**

LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

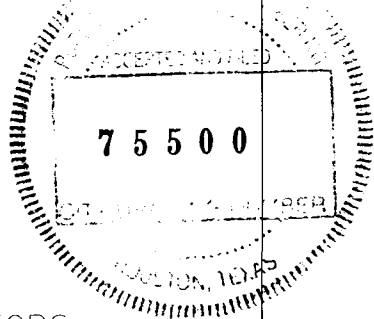
- Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. 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.
- 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.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- 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**

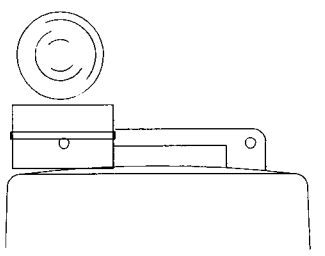
End treatments used on CTB's in work zones shall meet the appropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.



**BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS**

**WARNING LIGHTS**

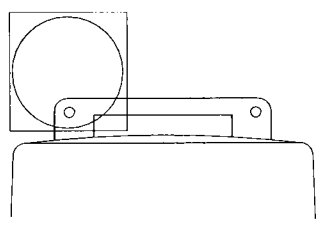
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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>PL</sub> or C<sub>FL</sub> Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
- 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".
- 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.



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- 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.
- 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.
- 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.
- The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.



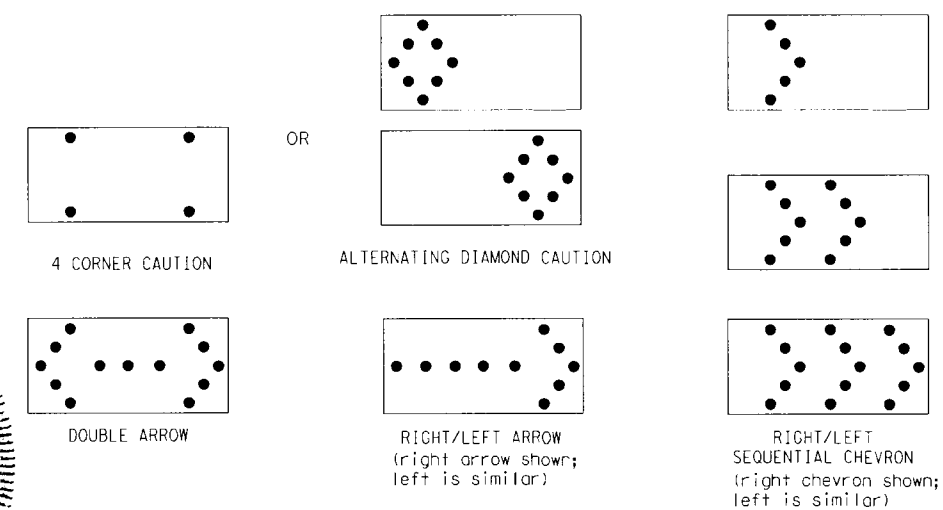
Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

**WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS**

- 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.
- 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 CWZTCD.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- 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.
- 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.

- 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.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- 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.
- 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
B	30 x 60	13	3/4 mile
C	48 x 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.

**FLASHING ARROW BOARDS**

**TRUCK-MOUNTED ATTENUATORS**

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- 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.
- 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 extended distance from the TMA.

SHEET 7 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION  
ARROW PANEL, REFLECTORS,  
WARNING LIGHTS & ATTENUATOR

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CR: TxDOT	DM: TxDOT	CK: TxDOT
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	DIST	COUNTY	SHEET NO.	
			34	

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**GENERAL NOTES**

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- 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.
- 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).
- 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:

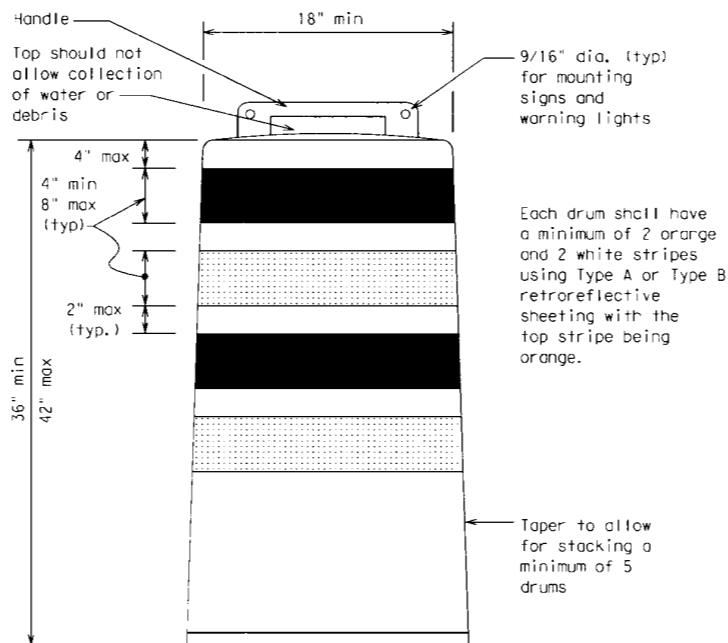
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents 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.
- 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.
- 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.
- 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.
- Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
- Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
- Drum body shall have a maximum unballasted weight of 11 lbs.
- Drum and base shall be marked with manufacturer's name and model number.

**RETROREFLECTIVE SHEETING**

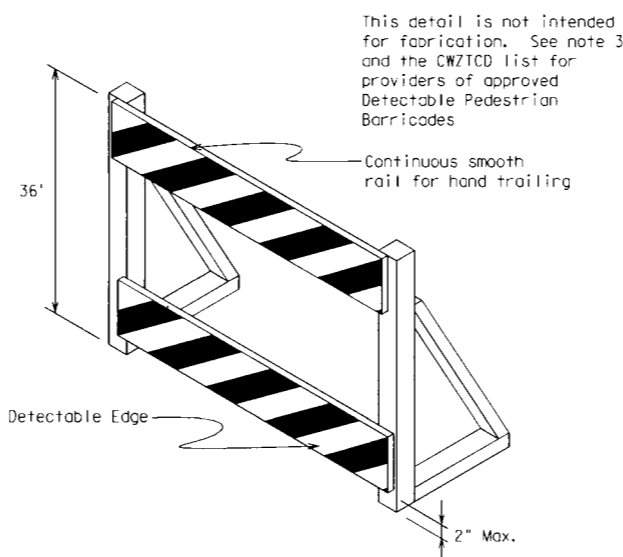
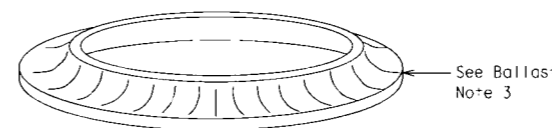
- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

**BALLAST**

- 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.
- 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.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.

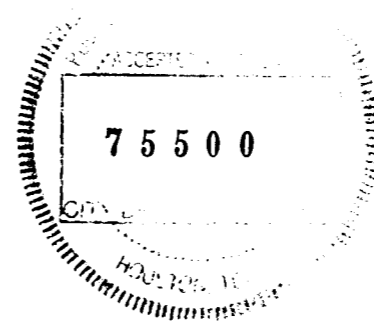


Each drum shall have a minimum of 2 orange and 2 white stripes using Type A or Type B retroreflective sheeting with the top stripe being orange.

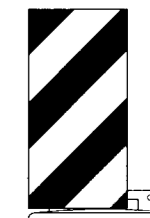


**DETECTABLE PEDESTRIAN BARRICADES**

- 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. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
- 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.
- 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 (ADAAG)" and should not be used as a control for pedestrian movements.
- Warning lights shall not be attached to detectable pedestrian barricades.
- Detectable pedestrian barricades should 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.
- Chevrons and other work zone signs with an orange background shall be manufactured with type B<sub>FL</sub> or type C<sub>FL</sub> 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 or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- 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.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- 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 an every third drum. A minimum of three (3) should be used at each location called for in the plans.
- 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



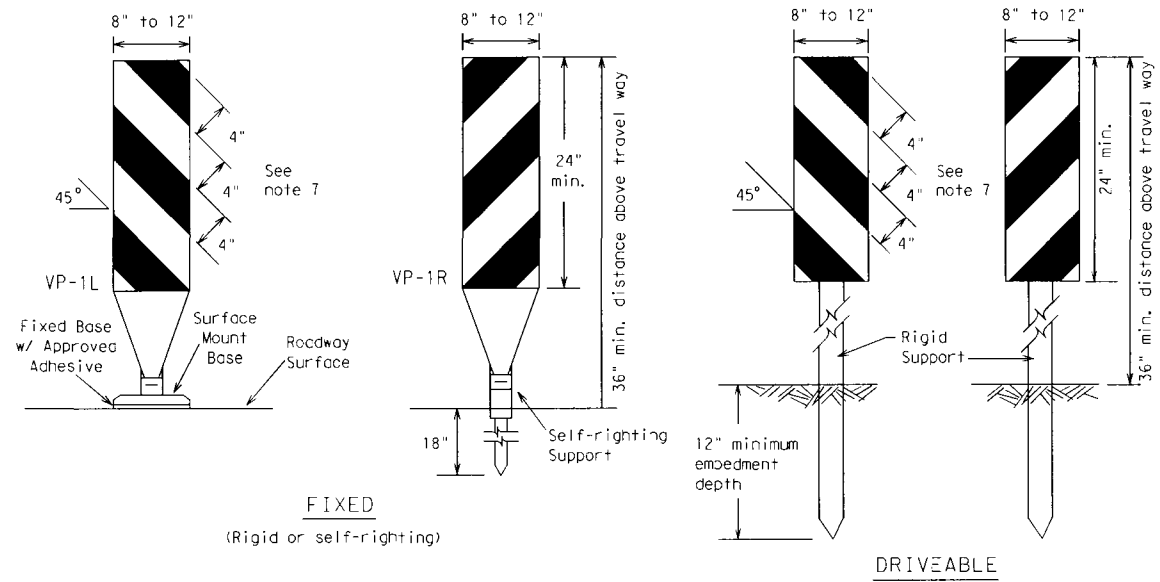
**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (8) - 21**

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9-07 5-21				
7-13				
	DIST	COUNTY	SHEET NO. 35	

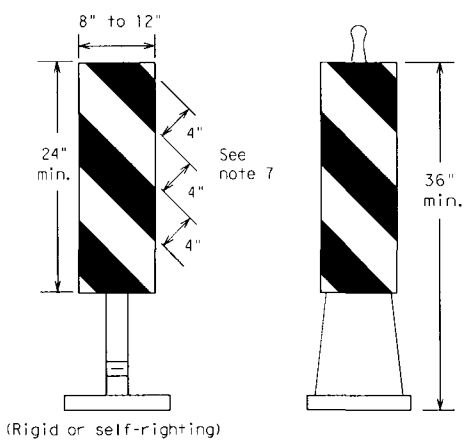
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**FIXED**  
(Rigid or self-righting)

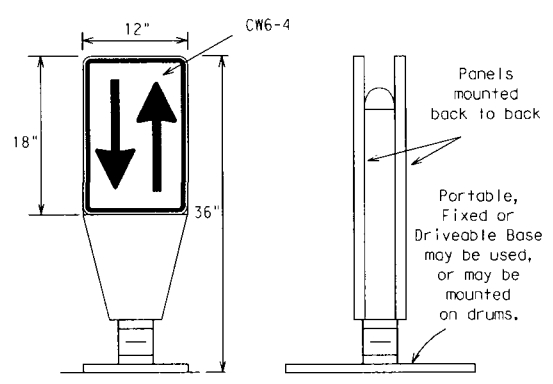
**DRIVEABLE**



**PORTABLE**

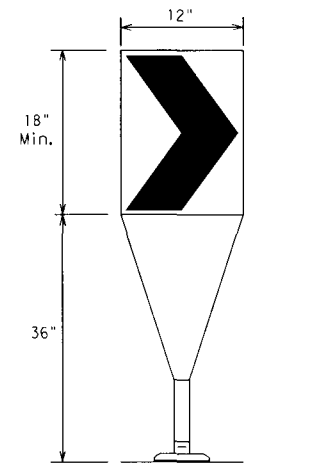
**VERTICAL PANELS (VPs)**

- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- 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 for additional requirements on the use 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.
- Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
- Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**

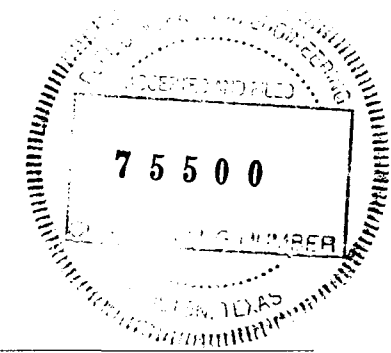
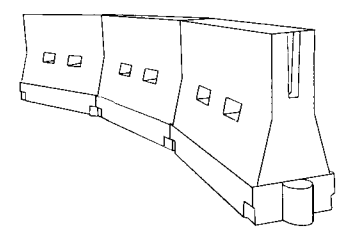
- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base 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.
- The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD 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.



Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

**CHEVRONS**

- 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.
- 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.
- To be effective, the chevron should be visible for at least 500 feet.
- 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.



**LONGITUDINAL CHANNELIZING DEVICES (LCD)**

- 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.
- LCDs may be used instead of a line of cones or drums.
- LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
- LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
- 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). Place reflective sheeting near the top of the LCD along the full length of the device.

**WATER BALLASTED SYSTEMS USED AS BARRIERS**

- 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 Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
- Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation 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.
- 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.
- 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 cones 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**

**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.
- 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).
- 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.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
- 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.
- 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.

Posted Speed	Formula	Minimum Desirable Taper Lengths X X			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		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'

\*\*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**

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**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

BC(9)-21

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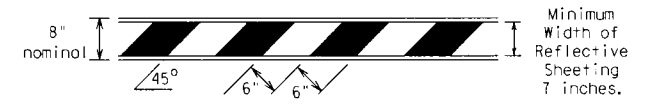
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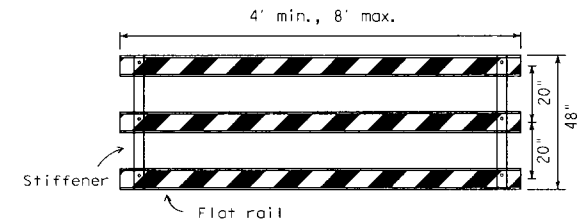
**TYPE 3 BARRICADES**

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.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the 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.
7. Warning lights shall NOT be installed on barricades.
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. Sandbags 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 sandbags. Sandbags 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 or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



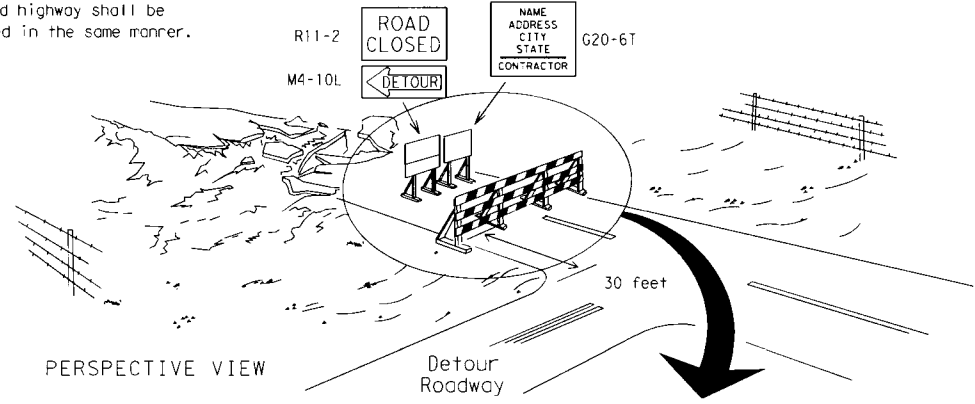
**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

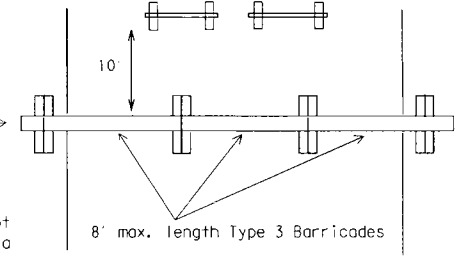
**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

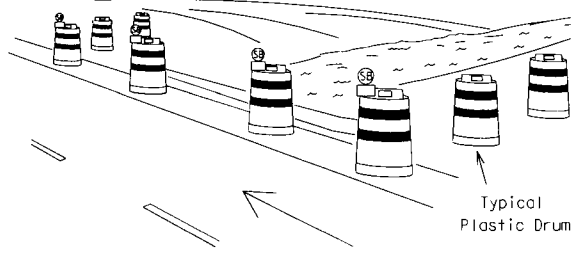
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



PLAN VIEW

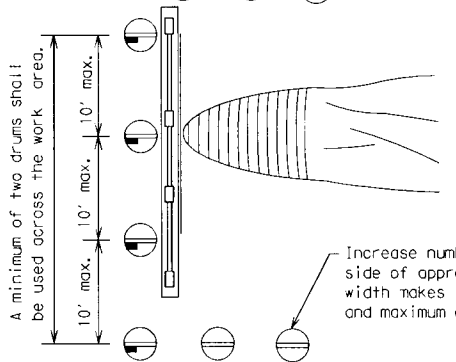
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

**TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION**



PERSPECTIVE VIEW

These drums are not required on one-way roadway

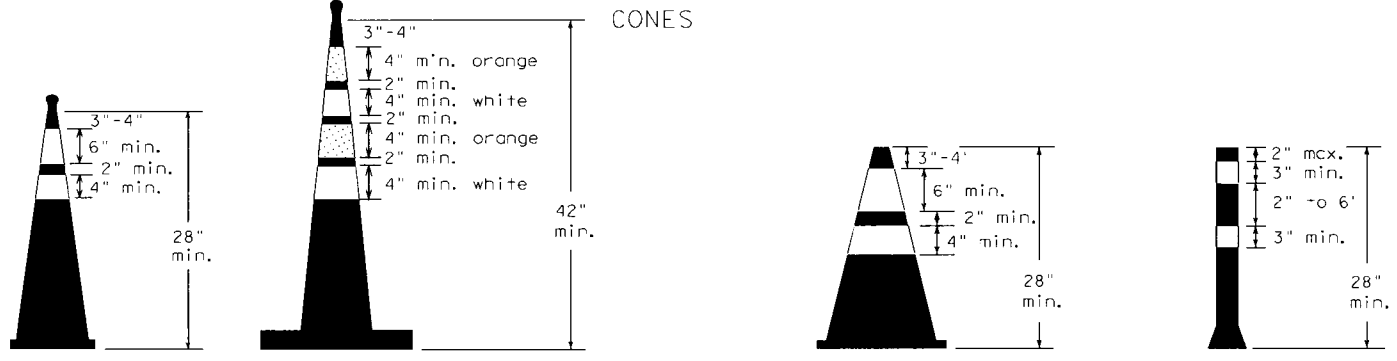


PLAN VIEW

Increase number of plastic drums on the side of approaching traffic if the crown width makes it necessary. (minimum of 2 and maximum of 4 drums)

LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
	Steady burn warning light or yellow warning reflector

**CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS**

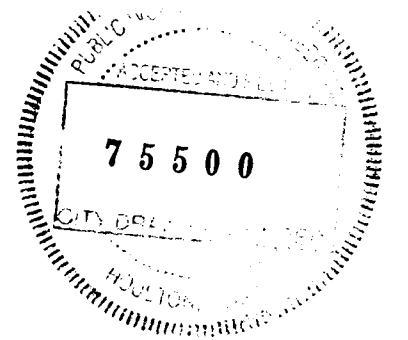


Two-Piece cones

One-Piece cones

Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.  
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.



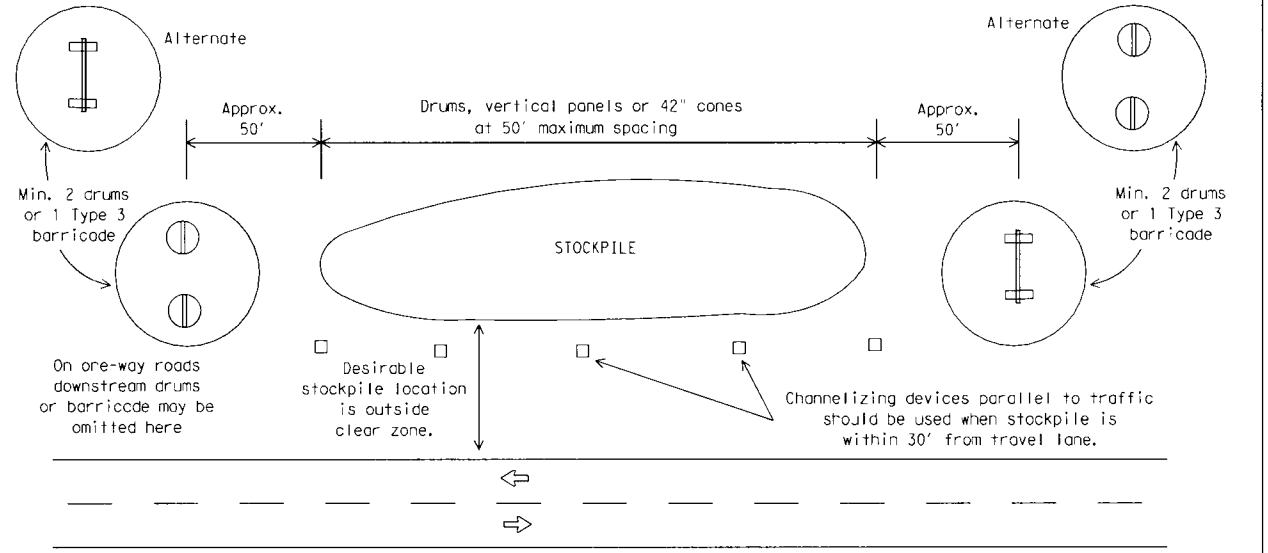
SHEET 10 OF 12

Texas Department of Transportation Traffic Safety Division Standard

**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

BC (10) - 21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DR: TxDOT	CR: TxDOT
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REVISIONS				
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21			37	



**TRAFFIC CONTROL FOR MATERIAL STOCKPILES**

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 core 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 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 or Type B.
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.

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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.
- 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.
- 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).
- 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.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

### RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- 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.

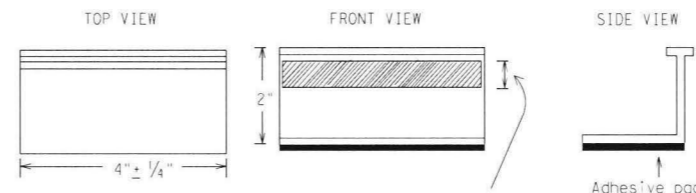
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- 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.
- 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.
- 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.
- 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".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- 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.
- 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.
  - 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.
  - 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.
- Small design variances may be noted between tab manufacturers.
- See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

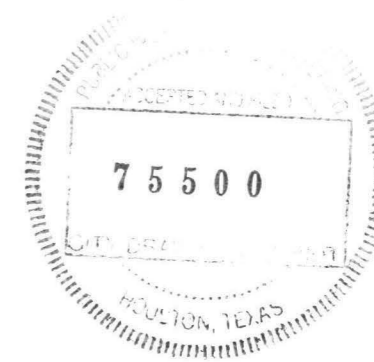
### RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

- 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.

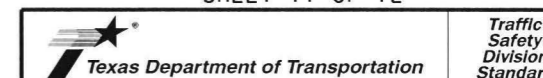
Guidemarks shall be designated as:  
 YELLOW - (two amber reflective surfaces with yellow body).  
 WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
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

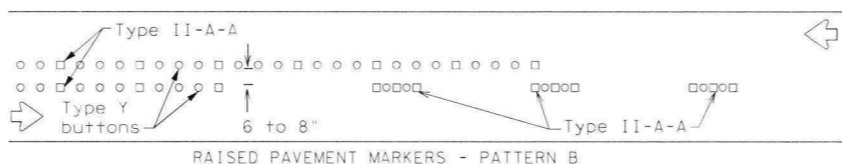
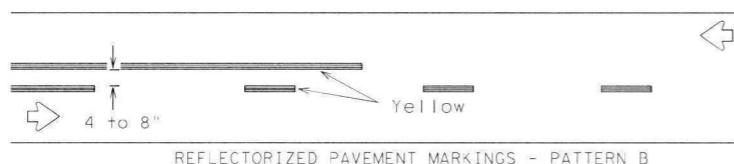
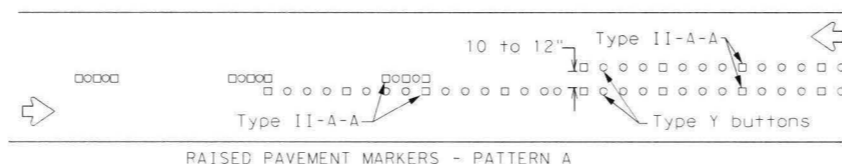
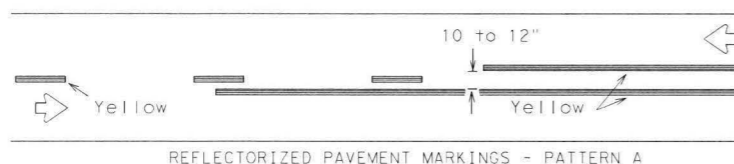
BC(11)-21

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REVISIONS				
2-98	9-07	5-21		
1-02	7-13			
11-02	8-14			
			DIST	COUNTY
				SHEET NO.
				38

DATE: FILE:

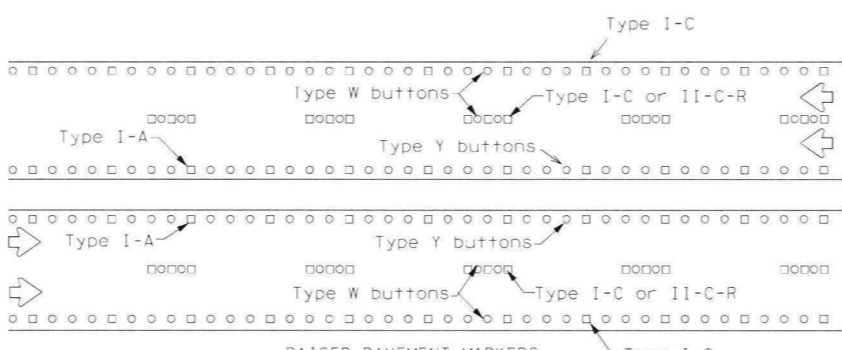
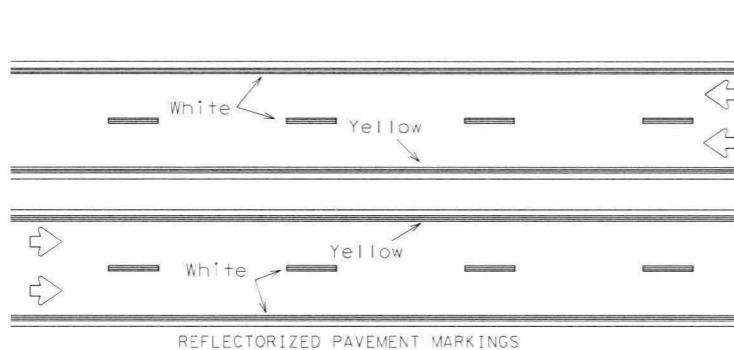
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### PAVEMENT MARKING PATTERNS



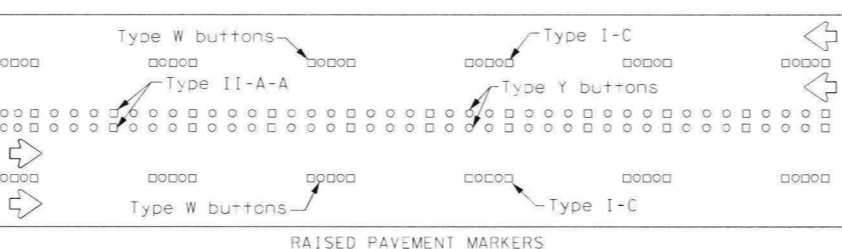
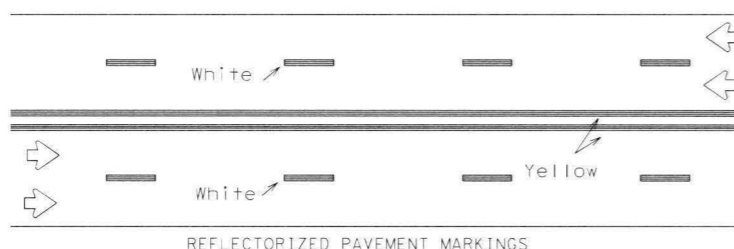
Pattern A is the TxDOT Standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectorized pavement markings.

### CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



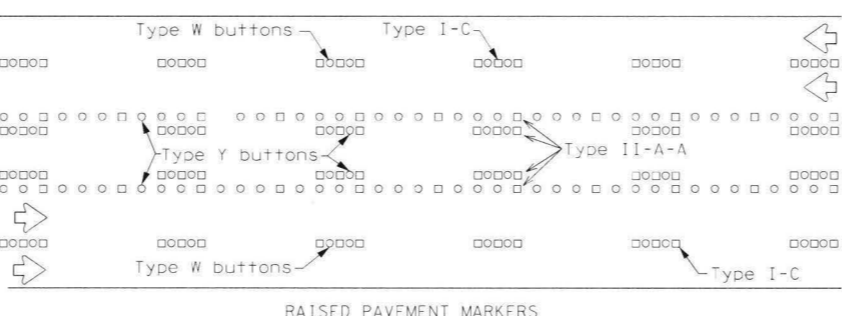
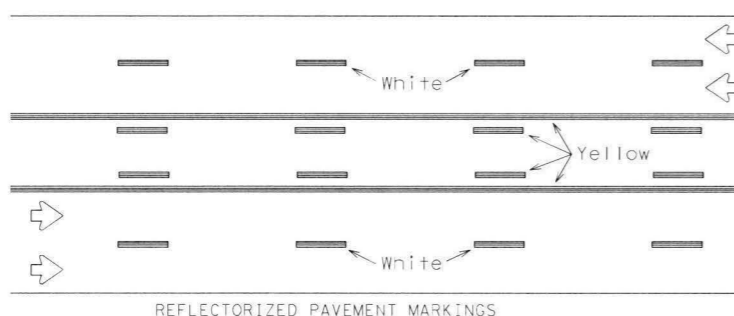
Prefabricated markings may be substituted for reflectorized pavement markings.

### EDGE & LANE LINES FOR DIVIDED HIGHWAY



Prefabricated markings may be substituted for reflectorized pavement markings.

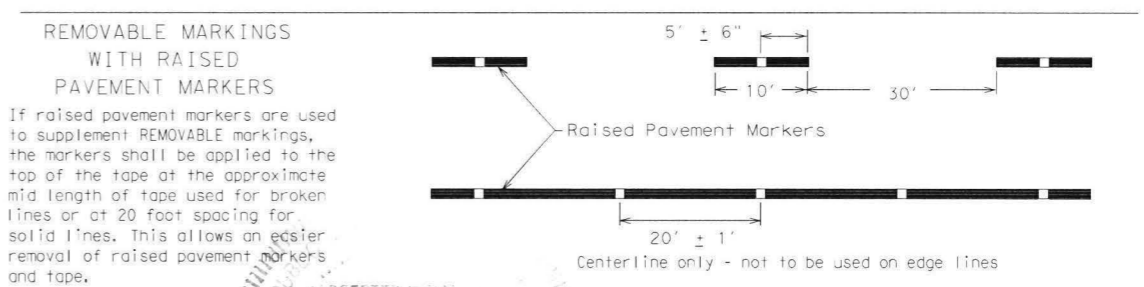
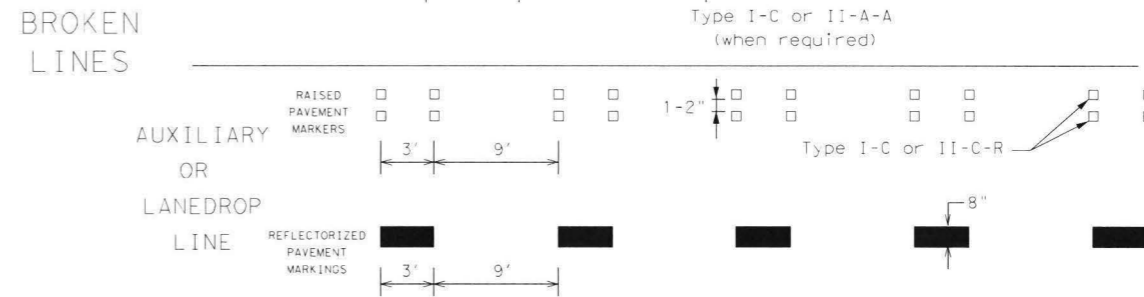
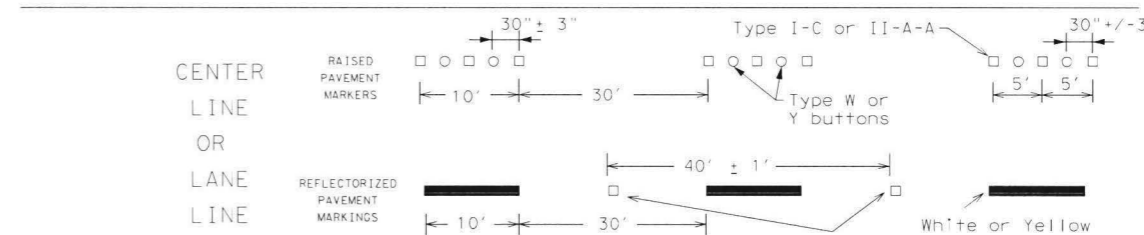
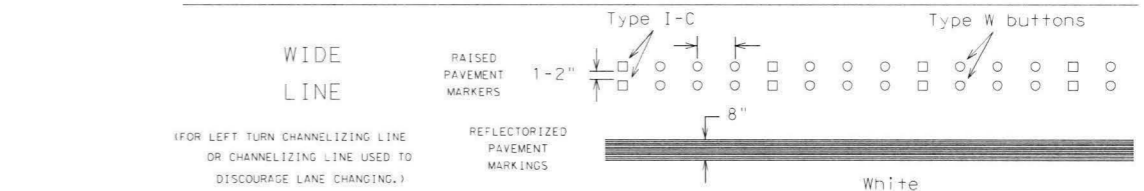
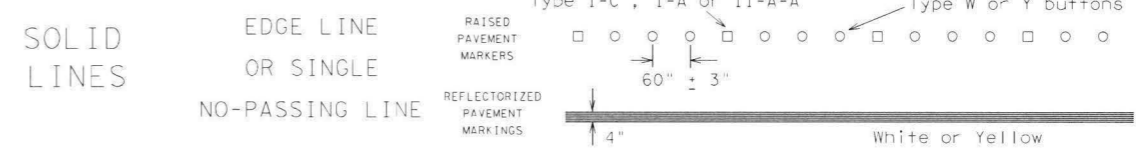
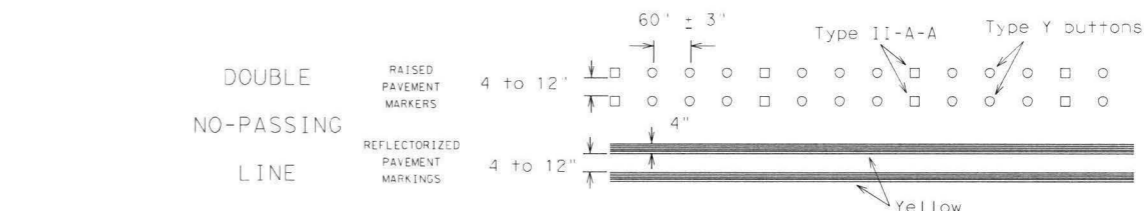
### LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



Prefabricated markings may be substituted for reflectorized pavement markings.

### TWO-WAY LEFT TURN LANE

### STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



75500

Accepted

RAISED PAVEMENT MARKERS shall be used as standard pavement markings shall be used as standard approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

SHEET 12 OF 12



### BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

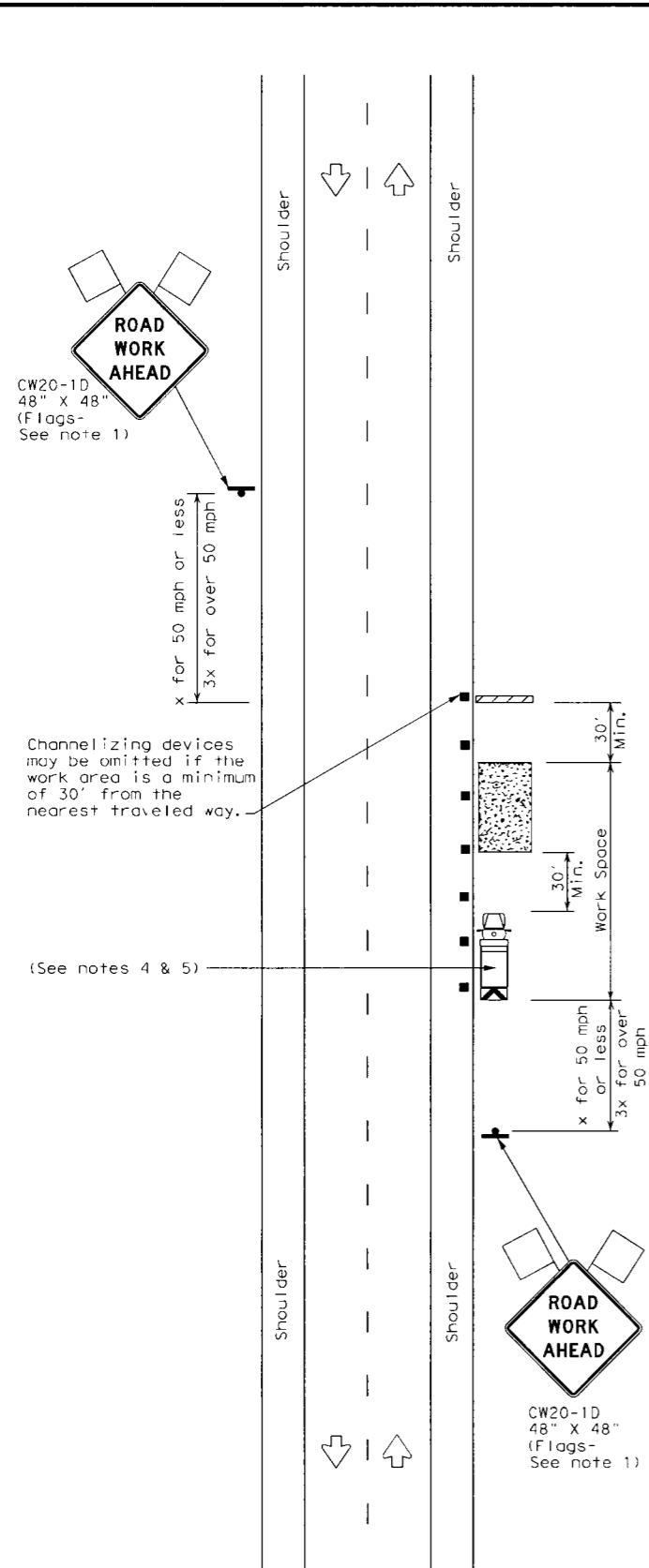
BC (12) - 21

FILE: bc-21.dgn	DW: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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2-98 7-13				
11-02 8-14				
	DIST	COUNTY	SHEET NO.	
			39	

DATE: FILE:

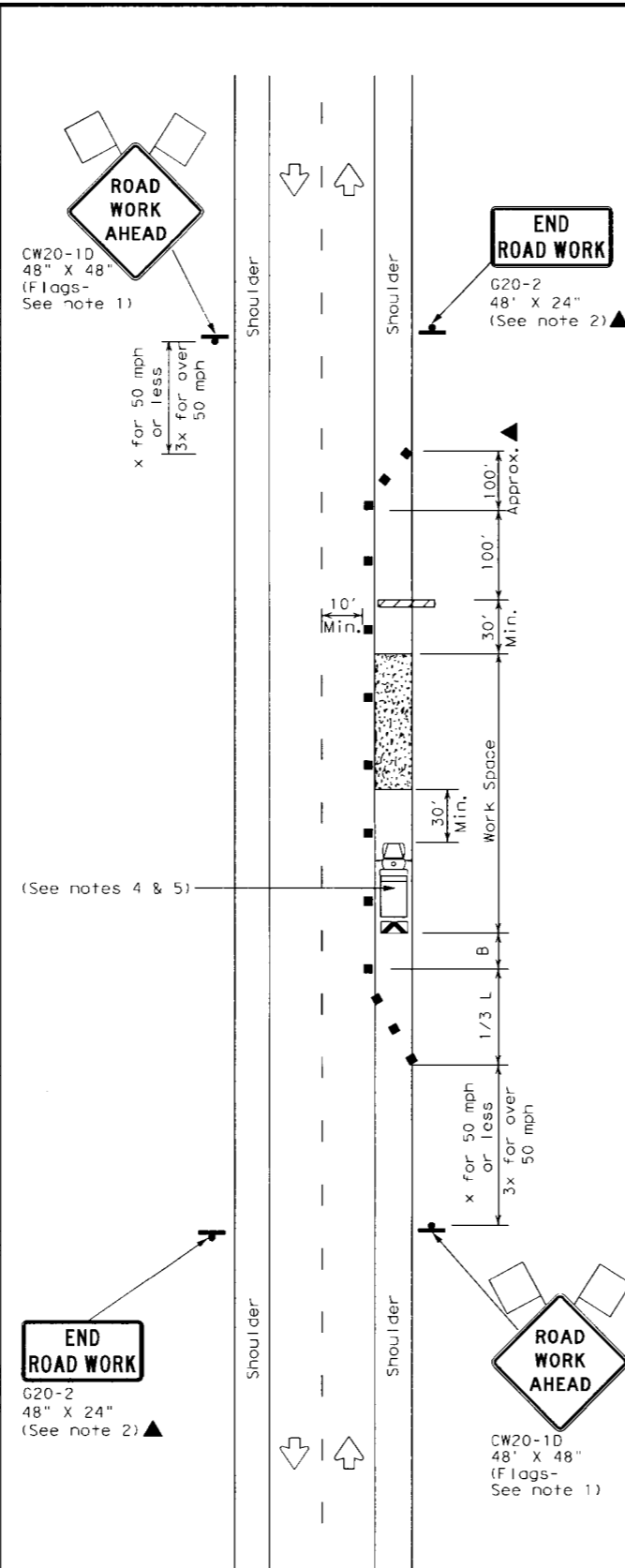
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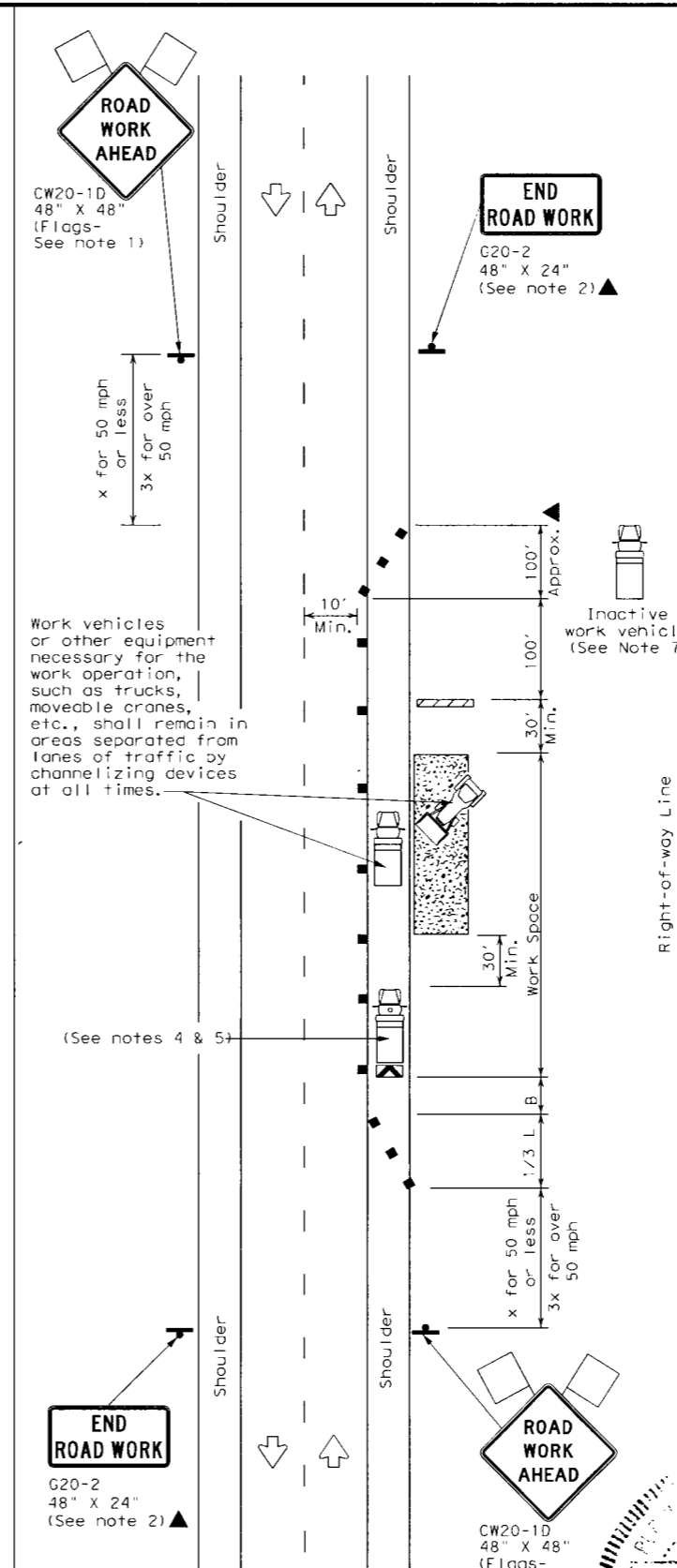
TCP (2-1a)

WORK SPACE NEAR SHOULDER  
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER  
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER  
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70	700'	770'	840'	70'	140'	800'	475'	
75	750'	825'	900'	75'	150'	900'	540'	

\* 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
	✓	✓	✓	✓

GENERAL NOTES

- 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 in the plans, or for routine maintenance work, when approved by the Engineer.
- Stackpiled material should be placed a minimum of 30 feet from nearest traveled way.
- Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. 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 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.
- Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
- See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
- Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
- CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

**Texas Department of Transportation**  
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN  
CONVENTIONAL ROAD  
SHOULDER WORK

**TCP (2-1)-18**

FILE: tcp2-1-18.dgn    DATE:    CK:    DW:    CA:

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REVISIONS

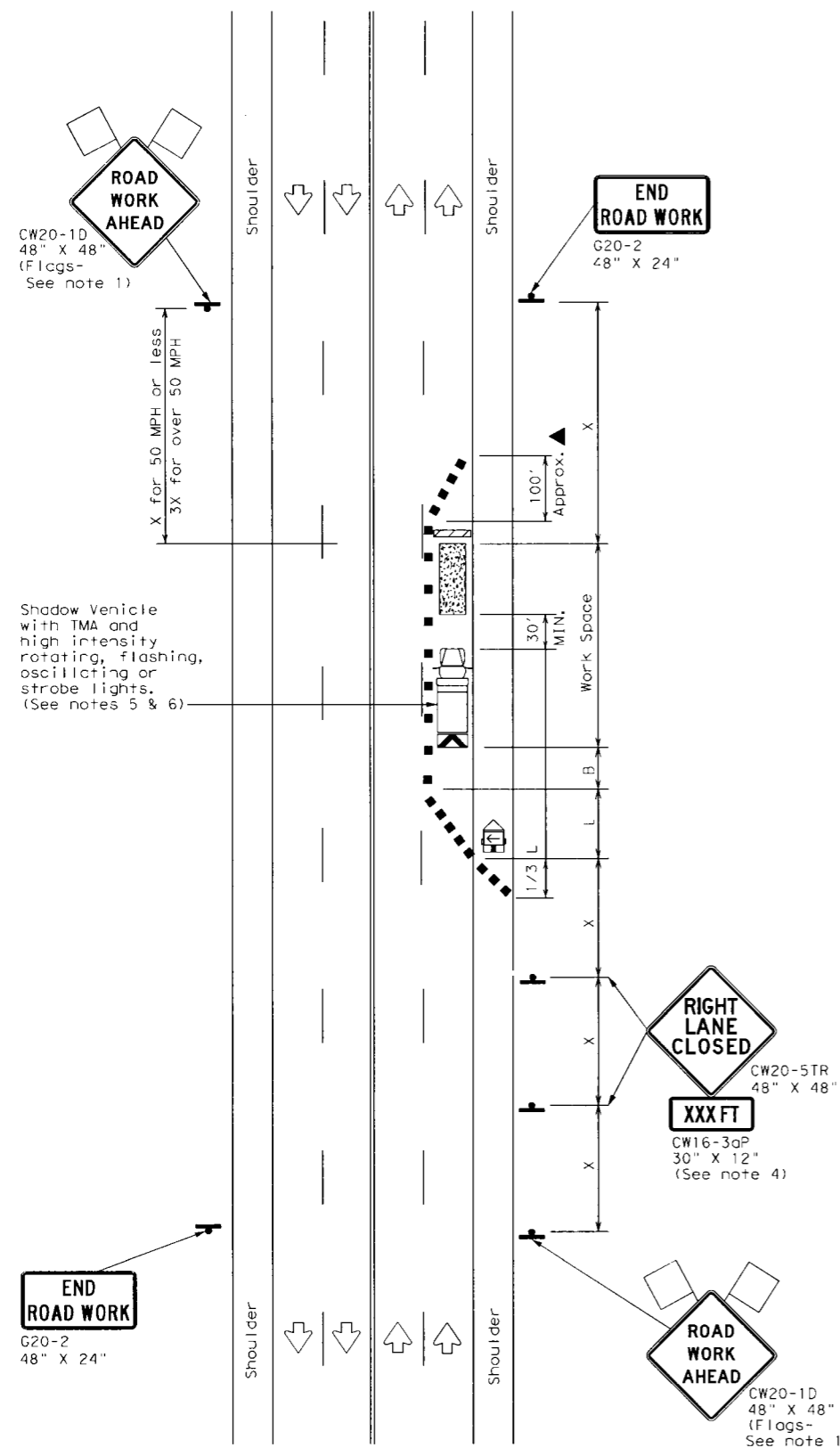
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DIST    COUNTY    SHEET NO. 40

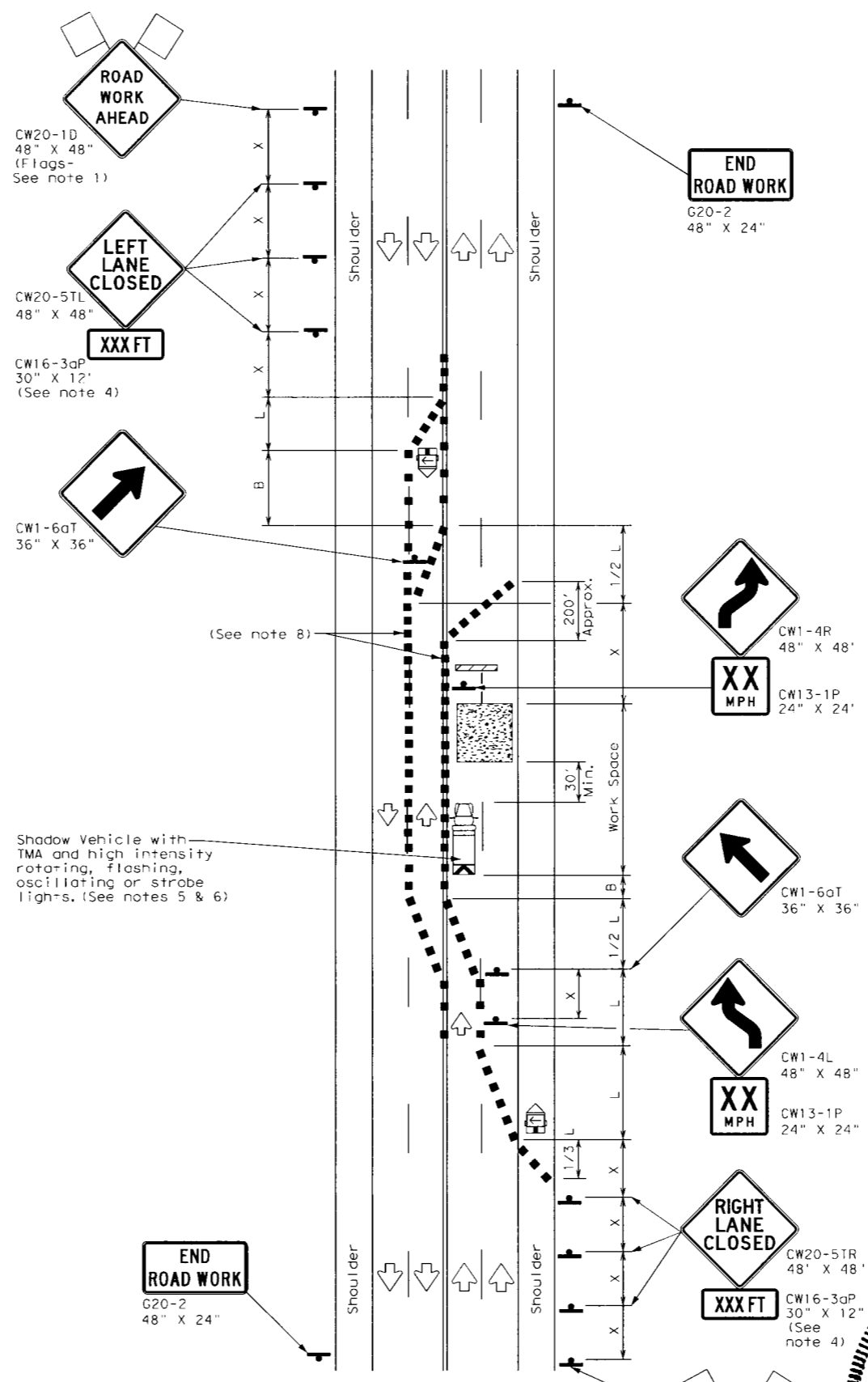


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DATE:  
FILE:



TCP (2-4a)  
ONE LANE CLOSED



TCP (2-4b)  
TWO LANES CLOSED

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	400'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

\* 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
		✓	✓	

GENERAL NOTES

- 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.
- The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
- For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
- 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.
- Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-4a)

- If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic with the arrow board placed in the closed lane near the end of the merging taper.

TCP (2-4b)

- For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter devices spacing is intended for the area of conflicting markings, not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN  
 LANE CLOSURES ON MULTILANE  
 CONVENTIONAL ROADS

TCP (2-4) - 18

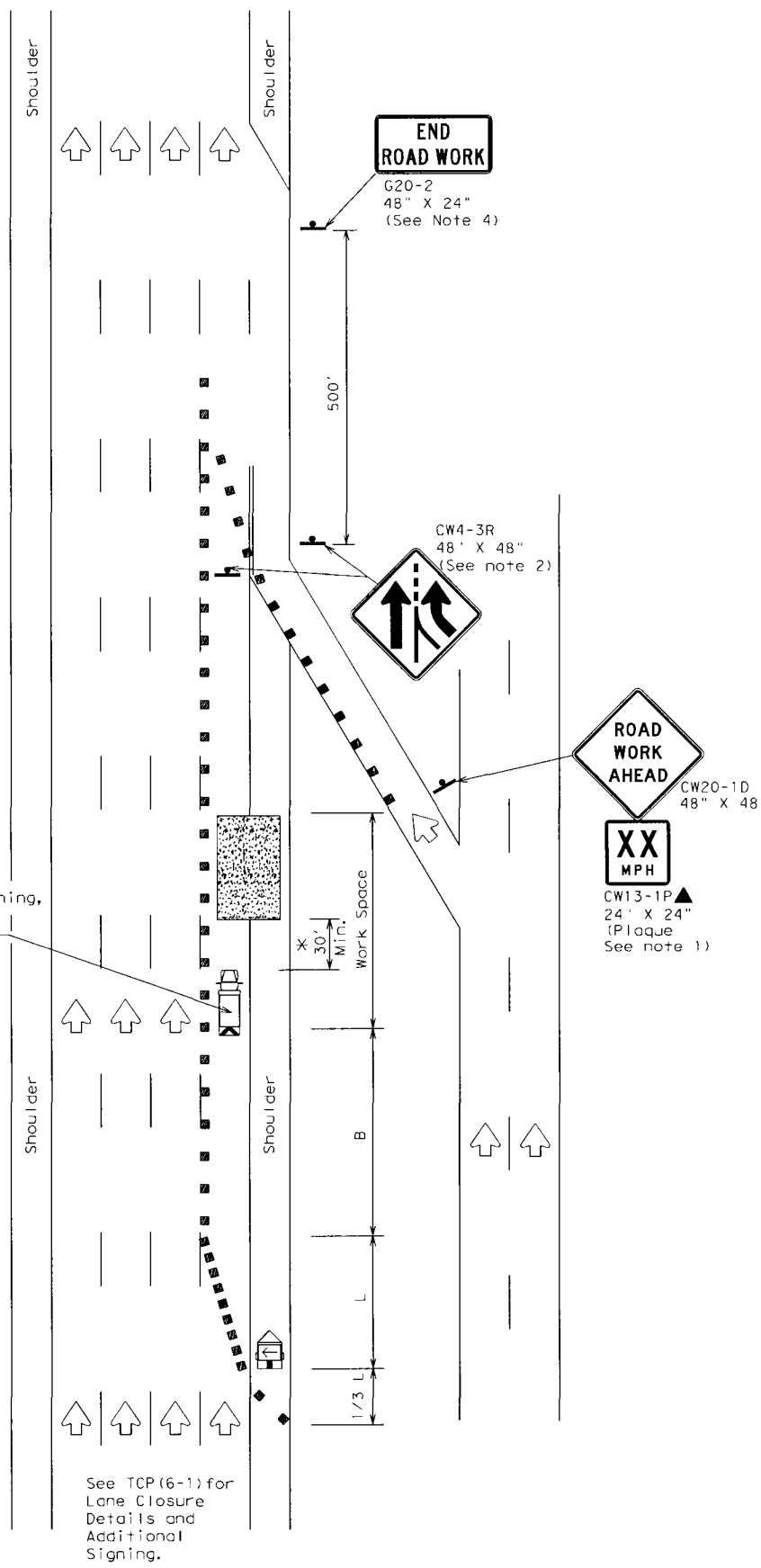
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 REVISIONS  
 8-95 3-03  
 1-97 2-12  
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 COM:    SECT:    JOB:    HIGHWAY:  
 DIST:    COUNTY:    SHEET NO.:

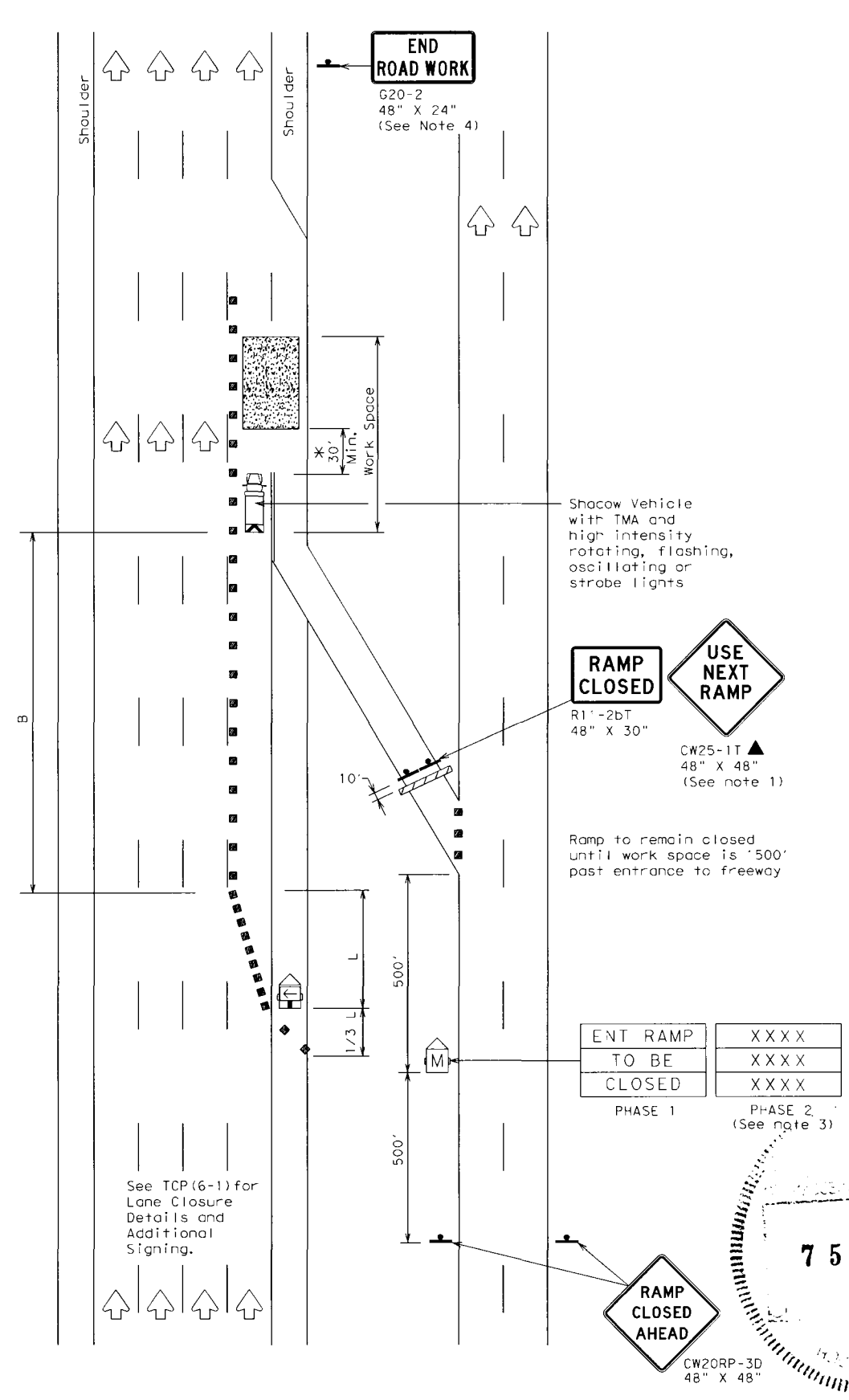
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TCP (6-2a)  
ENTRANCE RAMP OPEN  
WORK WITHIN 500' OF RAMP



TCP (6-2b)  
ENTRANCE RAMP CLOSED

LEGEND

	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed	Formula	Minimum Desirable Taper Lengths "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\*\* 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
	✓	✓	✓	

GENERAL NOTES

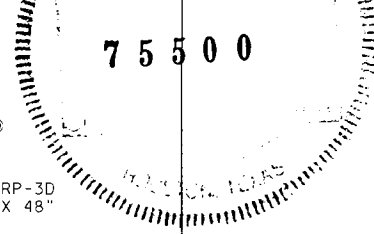
- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
- ADDED LANE Symbol (CW4-3) sign may be omitted when sign between ramp and mainline can be seen from both roadways.
- See "Advance Notice List" on BC(6) for recommended date and time formatting options for PCMS Phase 2 message.
- The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

\*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

ENT RAMP TO BE CLOSED	XXXX
PHASE 1	XXXX
PHASE 2	XXXX

(See note 3)



Texas Department of Transportation  
Traffic Operations Division Standard

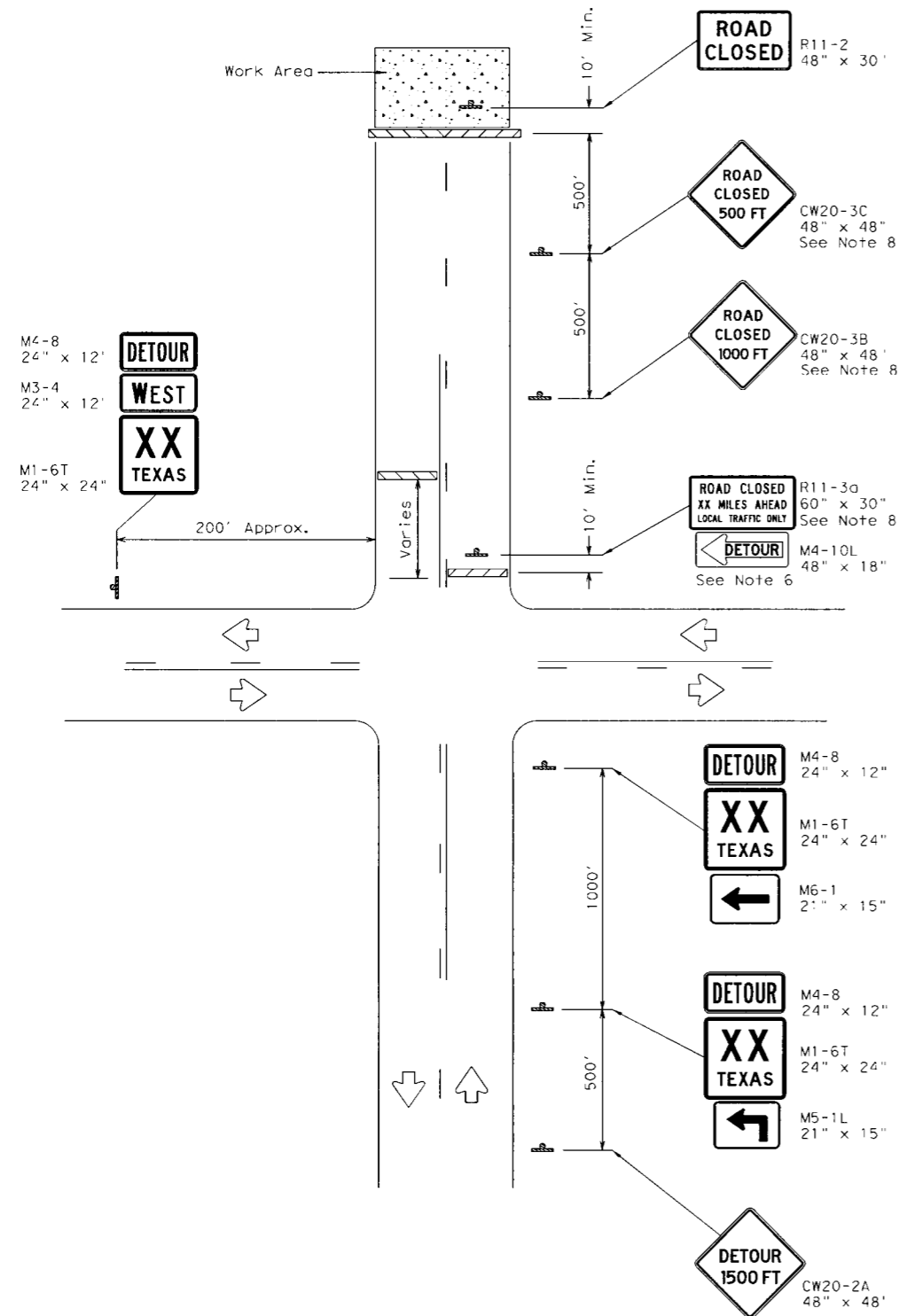
**TRAFFIC CONTROL PLAN  
WORK AREA NEAR RAMP**

**TCP (6-2) - 12**

FILE: tcp6-2.ogn	DN: TxDOT	CK: TxDOT	DM: TxDOT	CR: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISTIONS				
1-97 8-98	DIST		COUNTY	SHEET NO.
4-98 8-12				42

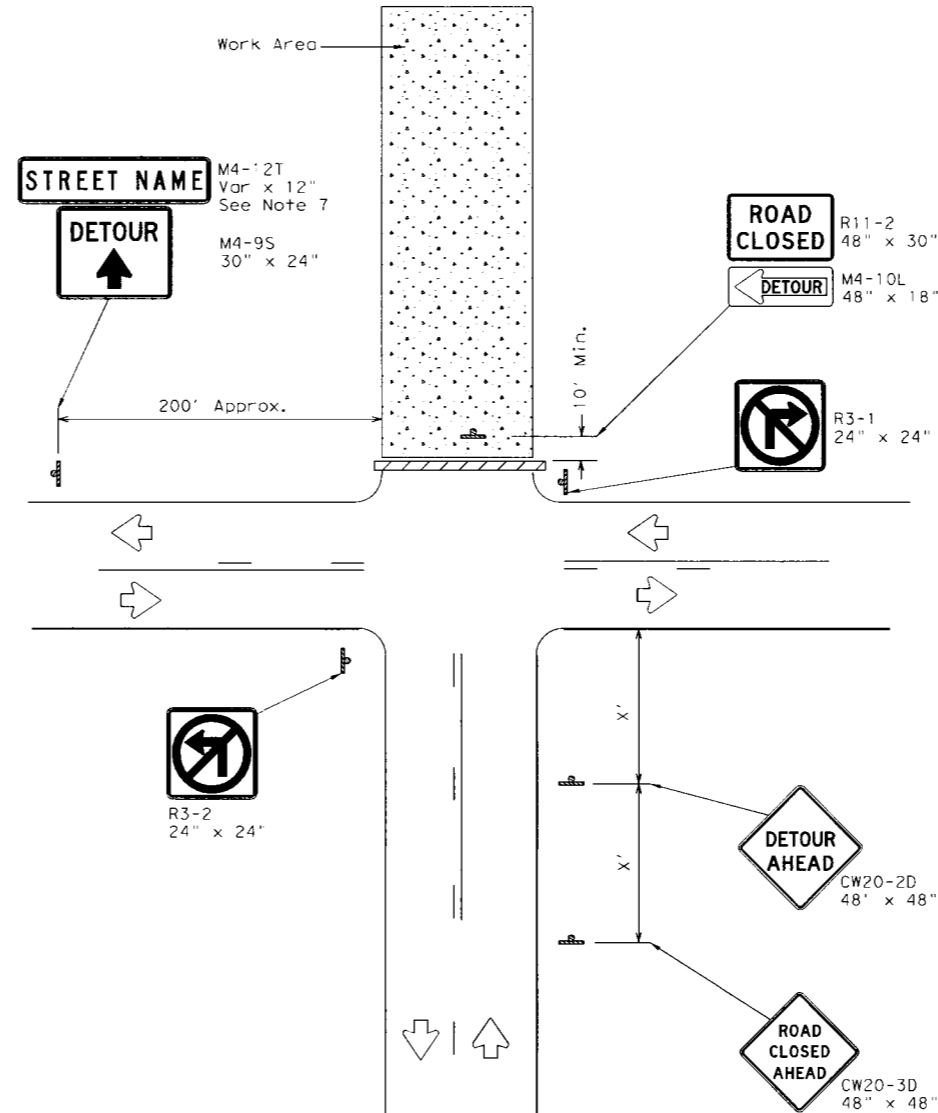
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:  
FILE:



**ROAD CLOSURE BEYOND THE INTERSECTION**

Signing for a Numbered Route with an Off-Site Detour



**ROAD CLOSURE AT THE INTERSECTION**

Signing for an Un-numbered Route with an Off-Site Detour

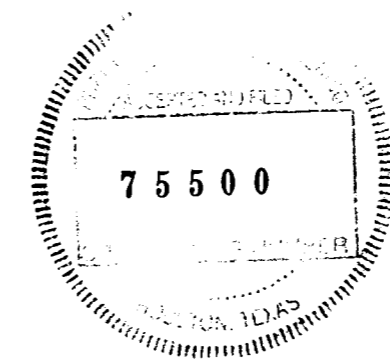
LEGEND	
	Type 3 Barricade
	Sign

Posted Speed *	Minimum Sign Spacing "X" Distance
30	120'
35	160'
40	240'
45	320'
50	400'
55	500'
60	600'
65	700'
70	800'
75	900'

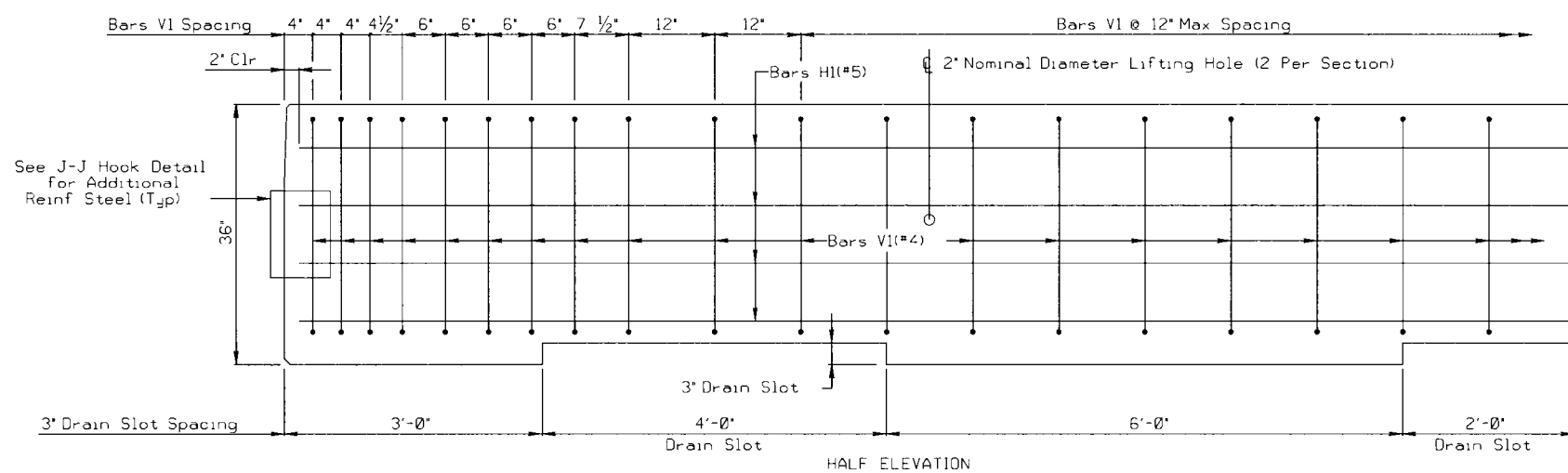
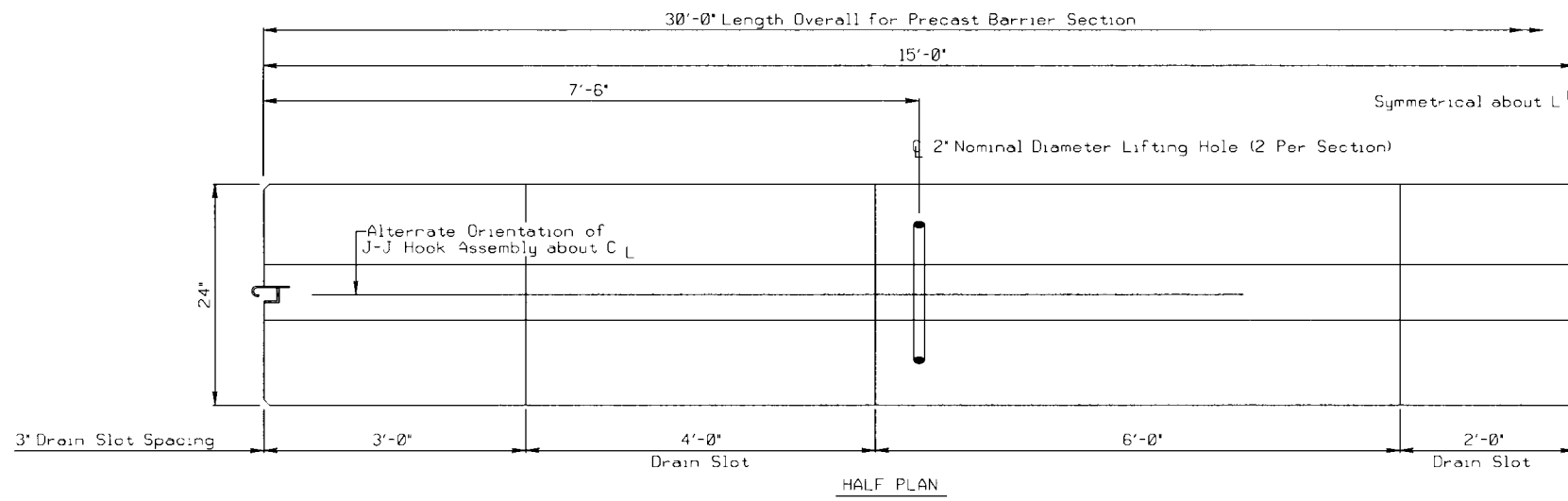
\* Conventional Roads Only

**GENERAL NOTES**

- This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&M standards.
- Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices List (CWZTCD).
- Stockpiled materials shall not be placed on the traffic side of barricades.
- Barricades at the road closure should extend from pavement edge to pavement edge.
- Detour signing shown is intended to illustrate the type of signing that is appropriate for numbered routes or un-numbered routes as labeled. It does not indicate the full extent of detour signing required. Detour routes should be signed as shown elsewhere in the plans.
- If the road is open for a significant distance beyond the intersection or there are significant origin/destination points beyond the intersection, the signs and barricades at this location should be located at the edge of the traveled way.
- The Street Name (M4-12T) sign is to be placed above the DETOUR (M4-9S) sign.
- For urban areas where there is a shorter distance between the intersection and the actual closure location, the ROAD CLOSED XX MILES AHEAD (R11-3a) sign may be replaced with a ROAD CLOSED TO THRU TRAFFIC (R11-4) sign. If adequate space does not exist between the intersection and the closure a single ROAD CLOSED AHEAD (CW20-3D) sign spaced as per the table above may replace the ROAD CLOSED 1000 FT (CW20-3B) and ROAD CLOSED 500 FT (CW20-3C) signs.
- Signs and barricades shown shall be subsidiary to Item 502. Locations where these details will be required shall be as shown elsewhere in the plans.

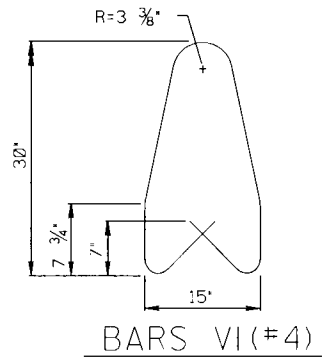
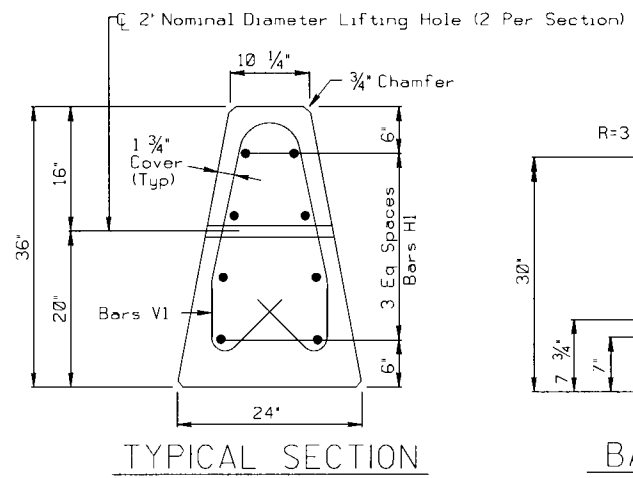


		<b>Texas Department of Transportation</b>		<b>Traffic Operations Division Standard</b>	
<p>WORK ZONE ROAD CLOSURE DETAILS</p> <p><b>WZ (RCD) - 13</b></p>					
FILE:	w2rcd-13.dgn	DN:	TxDOT	CK:	TxDOT
©	TxDOT	August 1995	CONT	SECT	JOB
REVISIONS			HIG-MAY		
1-97	4-98	7-13	DIST	COUNTY	SHEET NO.
2-98	3-03				43

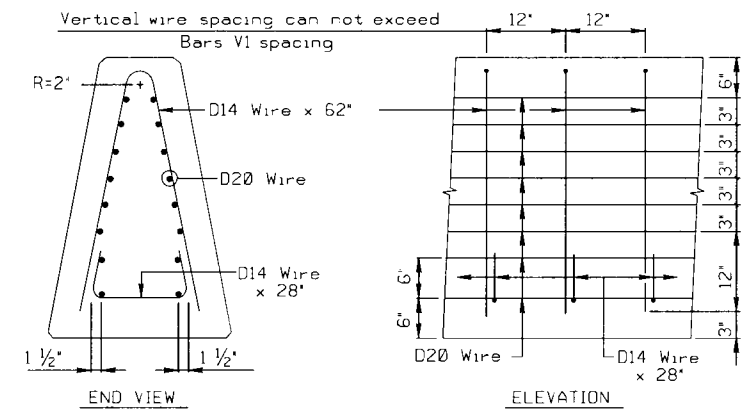


**PRECAST SINGLE SLOPE CONCRETE BARRIER**

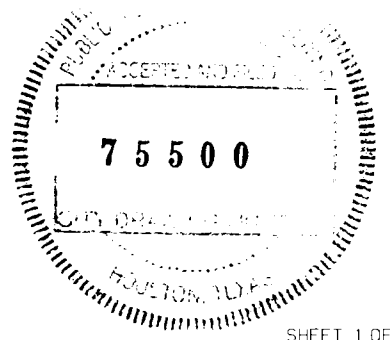
- GENERAL NOTES:**
- 1) Precast barrier length will be 30 feet (1 inch +/-) unless otherwise specified in the plans.
  - 2) All concrete will be Class C.
  - 3) All reinforcing steel will be Grade 60, unless otherwise specified. All welded rebar is ASTM A706.
  - 4) Chamfer all edges 3/4 inch.
  - 5) The minimum bar splice length is 24 times the bar diameter.
  - 6) Welded wire fabric may be used as an option to conventional reinforcement. All wire is 60 ksi yield strength.
  - 7) Transitions to barrier height, as needed, will be determined by the Engineer. Changes in barrier height should not normally exceed 2 inches per 30 feet. Vertical steel will be uniformly transitioned throughout the variation in barrier height as directed by the Engineer.
  - 8) Installation of barrier anchorage is not paid for directly. Installation is incidental to barrier bid items.



WELDED WIRE FABRIC  
36" BARRIER  
3x12-D20xD14



**WELDED WIRE FABRIC (OPTIONAL REINFORCING)**



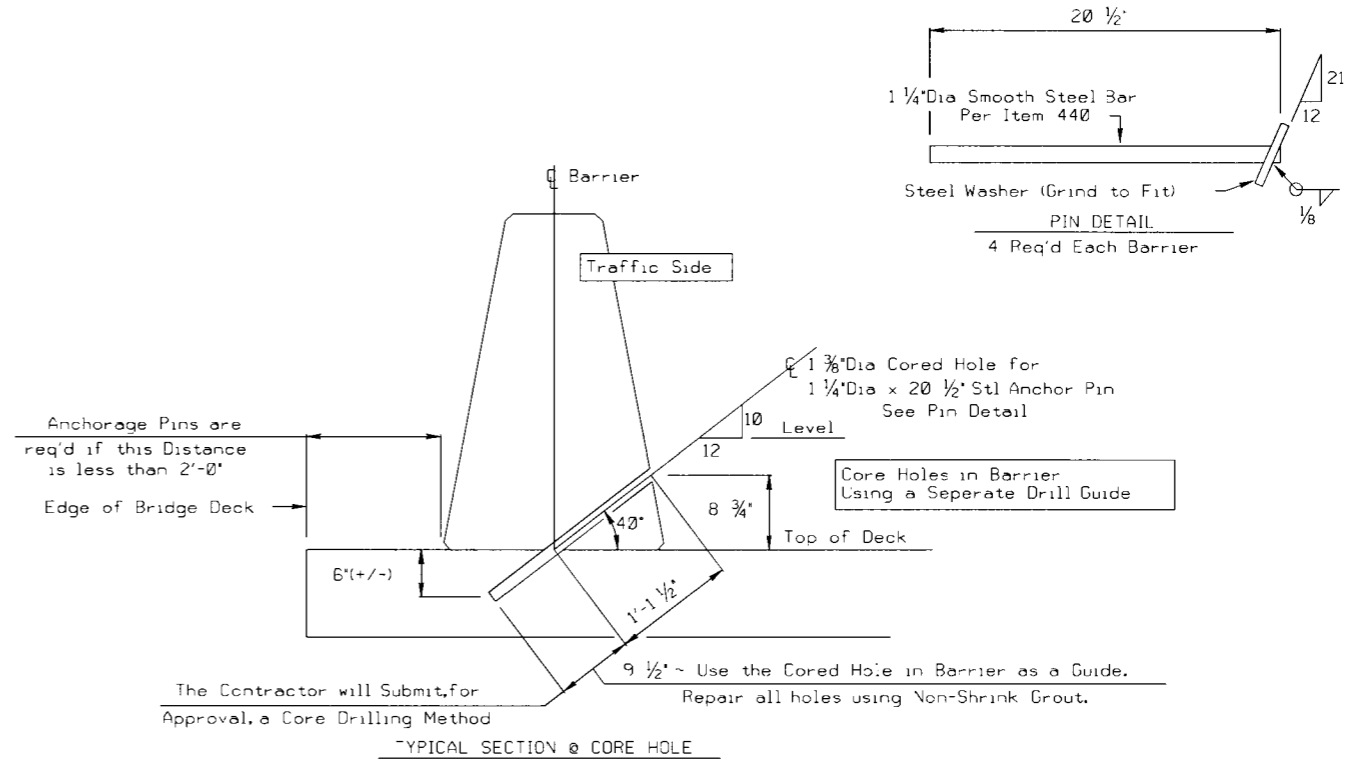
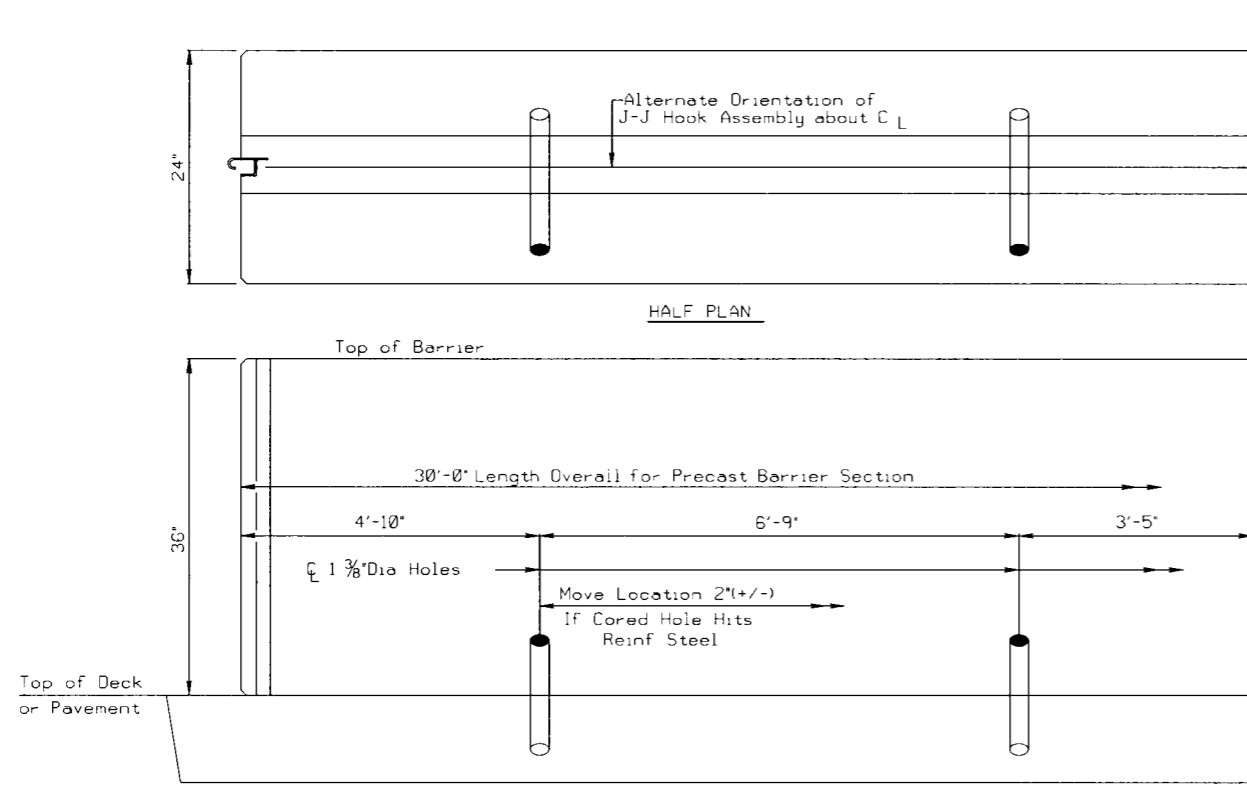
SHEET 1 OF 2

Texas Department of Transportation  
Houston District (Roadway)

**PRECAST SINGLE SLOPE  
CONCRETE BARRIER  
(J-J HOOK CONNECTION)  
PSSCB-JJ**

FILE: STDC3.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CR: TxDot
© 2005 JANUARY 2005	DIST	FED REG	PROJECT NO.	SHEET
12/2004 REVISIONS	HOUSTON	6		44
	COUNTY		CONTROL SECT	JOB HIGHWAY

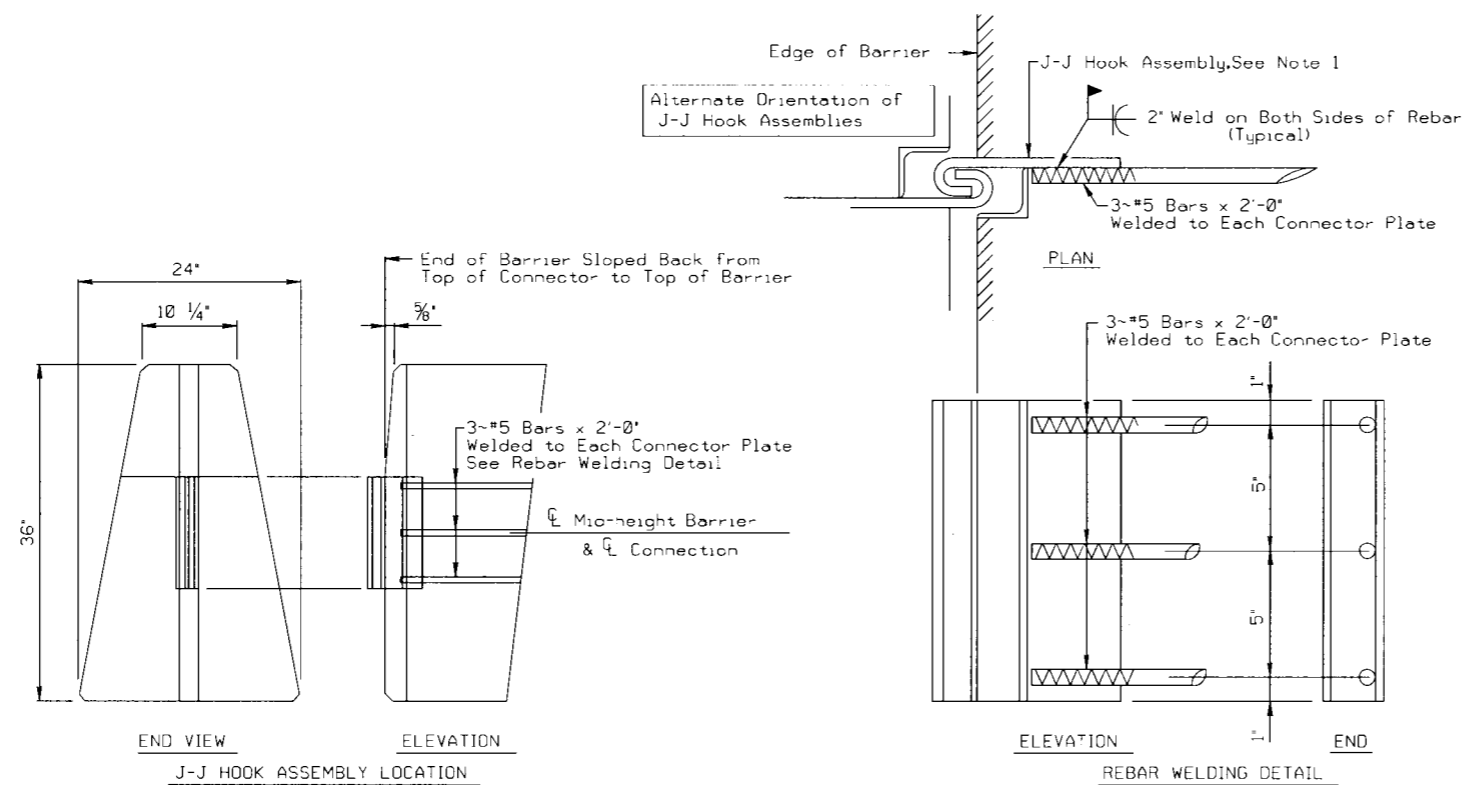
R = Radius  
Dia = Diameter



HALF ELEVATION (TRAFFIC SIDE)

**BARRIER ANCHORAGE DETAIL**

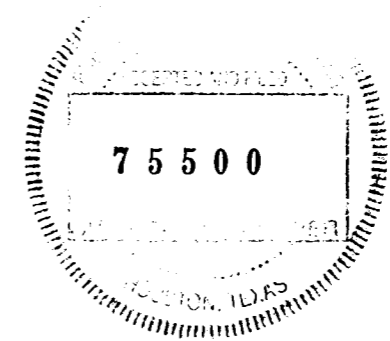
For Barrier located on Bridge Deck with less than 2' clearance or transition to dissimilar Barrier



**J-J HOOK DETAILS**

**CONNECTOR NOTES AND SPECIFICATIONS**

- 1) J-J Hooks are a patented design as manufactured by EASI-SET Industries, phone 1-800-547-4045. All steel assemblies for joint shall be galvanized after fabrication in accordance with item 445, "Galvanizing."
- 2) Reinforcing Steel: ASTM A-36 (plain).
- 3) Welding: All Welding to be in accordance with American Welding Society (AWS) Structural Welding Codes. Use weldable rebar per Item 440.
- 4) Tolerances: J-J Hook assembly tolerances as per manufacturer. Installation and fabrication tolerances as follows: Barrier length + 1/4" Connector location +/- 1/16"



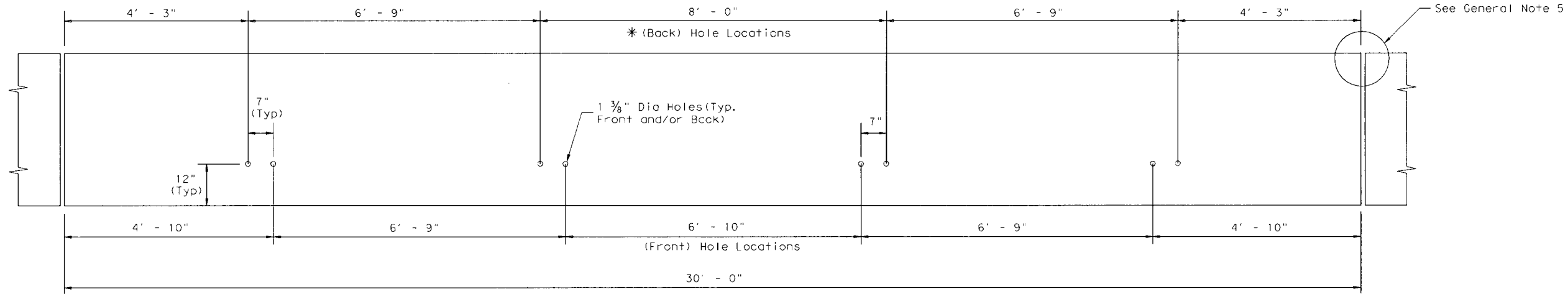
R = Radius  
Dia = Diameter

Texas Department of Transportation  
Houston District (Roadway)

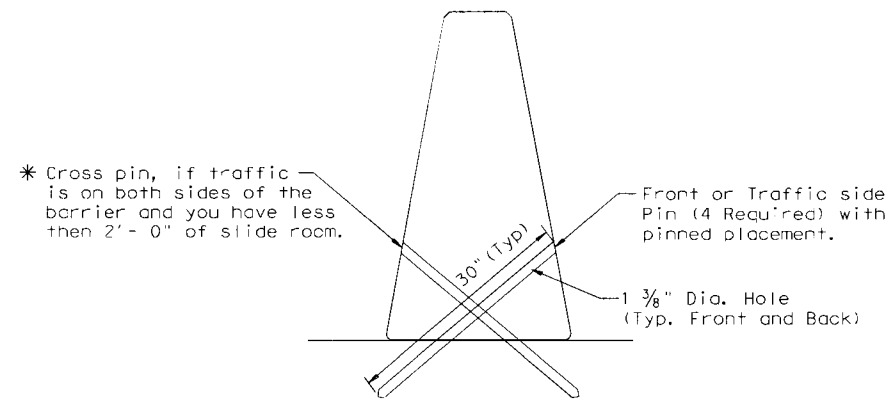
**PRECAST SINGLE SLOPE  
CONCRETE BARRIER  
(J-J HOOK CONNECTION)  
PSSCB-JJ**

FILES: STDC3.DGN	DW: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© DOT JANUARY 2005	DIST	FEE REG	PROJECT NO.	SHEET
12/2004 REVISIONS	HOUSTON	6		45
	COUNTY	CONTROL	SECT	JOB
				HIGHWAY

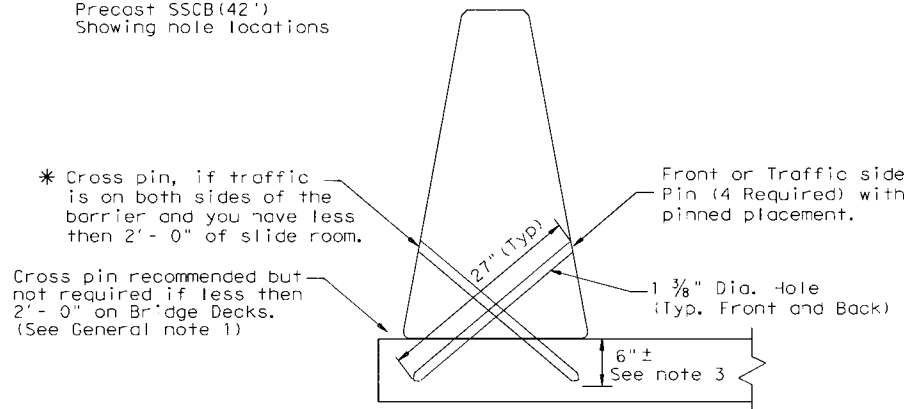
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**DETAIL 1**  
Precast SSCB (42')  
Showing hole locations



**DETAIL 2**  
Placement of (ACP)  
Asphalt Conc. Pavement  
or Treated Base Material  
(30" Pin required)

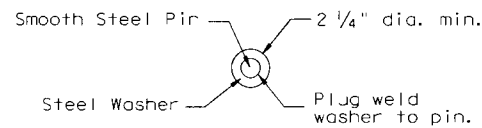


**DETAIL 3**  
Bridge Deck or CRCP  
(27" Pin required).

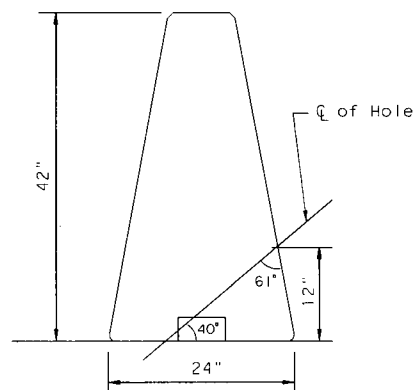
**GENERAL NOTES**

1. These details provide a method of laterally restraining precast concrete barrier to limit deflections under normally expected passenger vehicle impacts. These details are intended for use in work zones, primarily on bridge decks, or pavement where temporary barrier must be placed less than 2 ft. from the longitudinal edge of the deck or dropoff and parallel to the direction of travel. Other applications of these details are acceptable as directed by the Engineer.
2. Each precast concrete barrier section shall have a minimum of four or total of eight 1 3/8 in. ID holes formed or cored through the barrier. The center lines of the holes are shown in the hole location detail. If rebar is encountered, the entry point may be shifted 2" plus or minus longitudinally along the barrier. The eight holes are spaced along the length of the barrier as shown in Detail 1.
3. The drilling of the travel surface is accomplished by placing the pre-drilled barrier section on the travel surface in the desired position. Then the hole is drilled with the bit passing through the hole in the barrier. The bit is to be inserted into the hole in the barrier so that the travel surface is drilled to a point which is slightly more than the pin length.
4. Note that steel washers have been welded to the top of the steel pins to aid in the removal of the pins, when the barrier is removed.
5. See SSCB(2) standard sheet for reinforcement requirements and joint connection types.
6. The forming or coring of holes in the barrier, drilling of holes in bridge deck or pavement, fabrication and materials for the 1 1/4 in. pins, installation of pins, and any repair to the barrier shall be considered as subsidiary to the barrier bid items.
7. The barrier and travel surface will be repaired as directed by the Engineer in accordance with Item 429, "Concrete Structure Repair."
8. All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
9. Weight of barrier is approx. 700 lbs per foot.

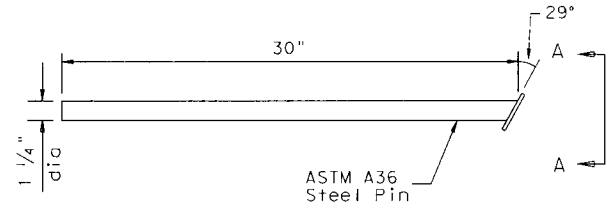
**CORE DRILLING EXISTING BARRIER**  
Core drilling existing concrete barrier is permitted. Holes shall be drilled with coring or masonry drilling type equipment. Percussion (star) drilling shall not be used. A special drill bit (to cut through existing reinforcing) will likely be required. Spalls in the concrete exceeding 1/2" shall be patched.



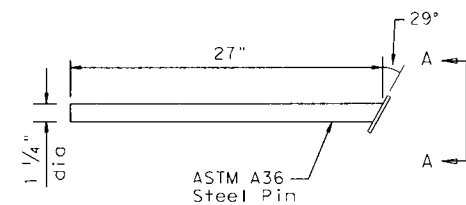
**VIEW A-A**



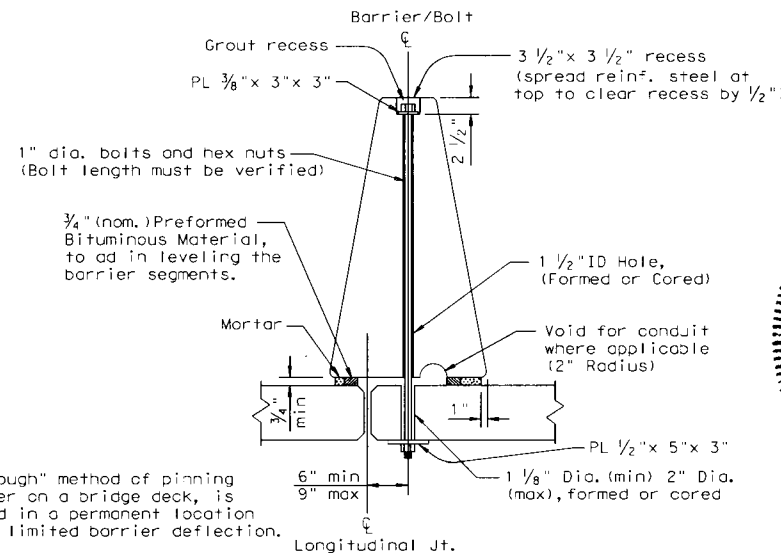
**HOLE LOCATION DETAIL**



**(30'') PIN DETAIL**  
See Detail 2



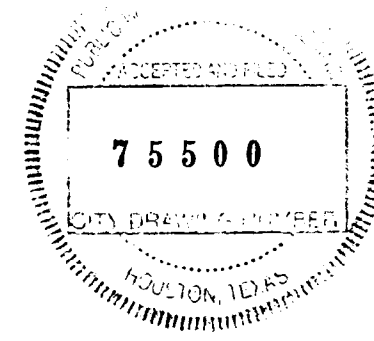
**(27'') PIN DETAIL**  
See Detail 3



Note:  
The "Bolt Through" method of pinning precast barrier on a bridge deck, is primarily used in a permanent location that requires limited barrier deflection.

**PRECAST SSCB (BOLT THROUGH) PLACEMENT OVER LONGITUDINAL EXPANSION JOINT**

For bolt through locations, use the (Front) hole locations shown on Detail 1.



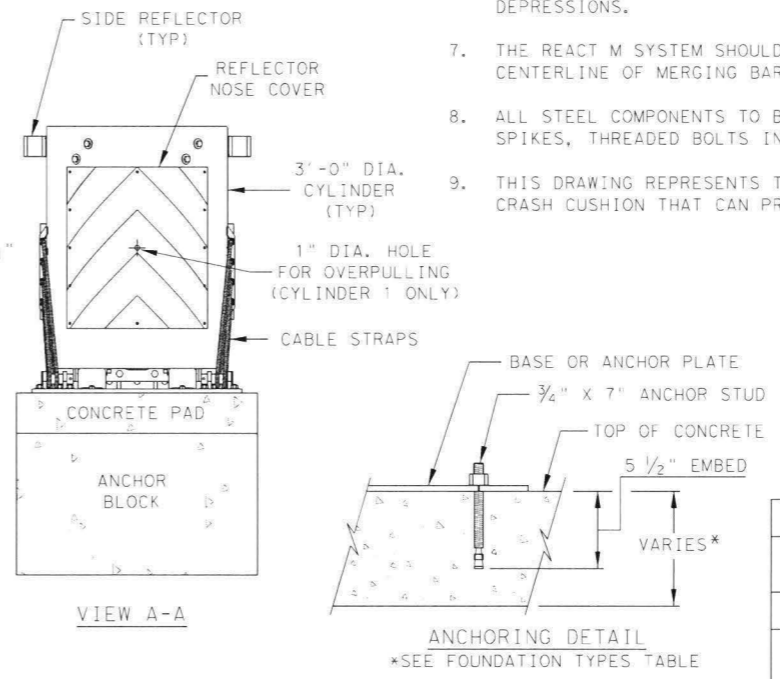
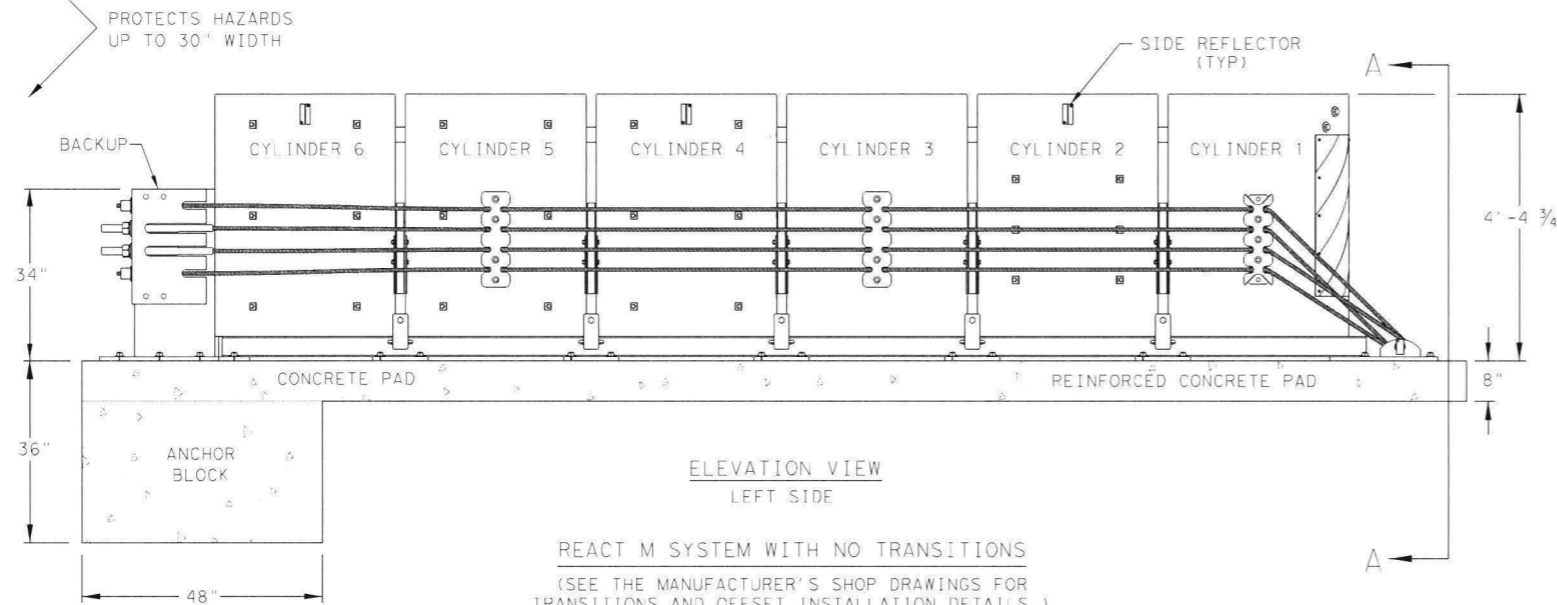
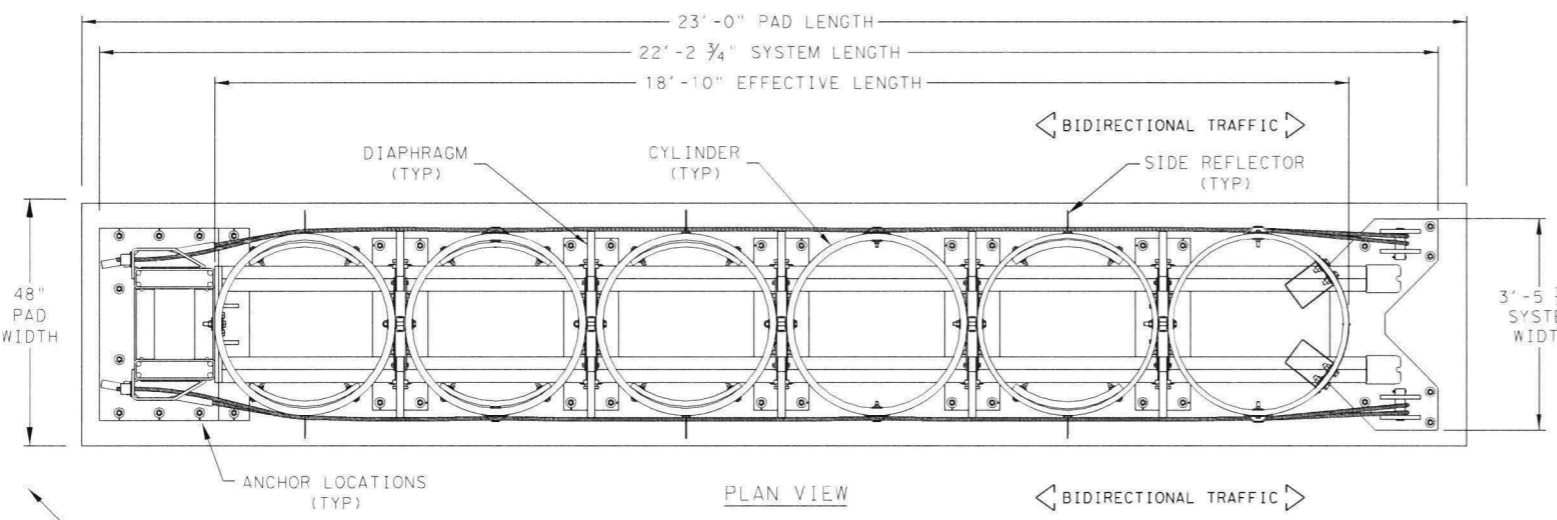
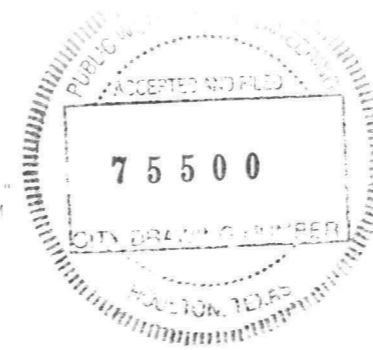
		<b>Design Division Standard</b>	
<b>SINGLE SLOPE CONCRETE BARRIER</b> <b>PRECAST BARRIER (TYPE 1)</b> <b>PINNED PLACEMENT</b> <b>SSCB (5) - 10</b>			
FILE: sscb510.dgn	DW: TxDOT	CK: AM	DR: BD
© TxDOT December 2010	CONT SECT	JOB	HIGHWAY
REVISIONS			
DIST	COUNTY	SHEET NO.	
		<b>46</b>	

DATE: FILE:

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**GENERAL NOTES**

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION AT 1(888)323-6374 OR WEBSITE: www.trinityhighway.com.
- THE NOSE OF THE REACT M SHALL BE CLAD WITH A PLASTIC WRAP WITH STANDARD DELINEATION ADHERED TO THE WRAP AND SHALL HAVE A SERIES OF SIDE MARKER REFLECTORS ON BOTH SIDES OF THE UNIT. SEE SITE PLAN VIEWS FOR MARKER AND PLASTIC WRAP COLOR ORIENTATION.
- FOR BI-DIRECTIONAL TRAFFIC, APPROPRIATE TRANSITION DETAILS WILL BE AS SHOWN ON THE MANUFACTURER'S SHOP DRAWINGS.
- DETAILS OF COMPONENTS FOR THE REACT M, BACKUPS AND REINFORCING DETAILS WILL BE SHOWN ON THE MANUFACTURER'S SHOP DRAWINGS FURNISHED TO THE ENGINEER.
- IF THE CROSS-SLOPE VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING, MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
- THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- THE REACT M SYSTEM SHOULD BE APPROXIMATELY PARALLEL WITH THE BARRIER OR CENTERLINE OF MERGING BARRIERS.
- ALL STEEL COMPONENTS TO BE HOT DIPPED GALVANIZED EXCEPT STAKES, DRIVE SPIKES, THREADED BOLTS IN BACKUP UNIT, AND WEDGE FITTINGS ON CABLES.
- THIS DRAWING REPRESENTS THE REACT M TL-3 SYSTEM, RE-DIRECTIVE, NON-GATING CRASH CUSHION THAT CAN PROTECT HAZARDS UP TO 30-INCHES IN WIDTH.



DESIGN DATA TABLE FOR REACT M

TEST NUMBER	TEST LEVEL	OVERALL LENGTH	TRANSITION LENGTH	SYSTEM WIDTH
3-30 TO 3-36	TL-3	22'-2 3/4"	-	3'-5 3/4"
3-37A	TL-3	22'-2 3/4"	9'-10 3/4"	3'-5 3/4"
3-38	TL-3	22'-2 3/4"	-	3'-5 3/4"

ANCHOR SYSTEM TYPE

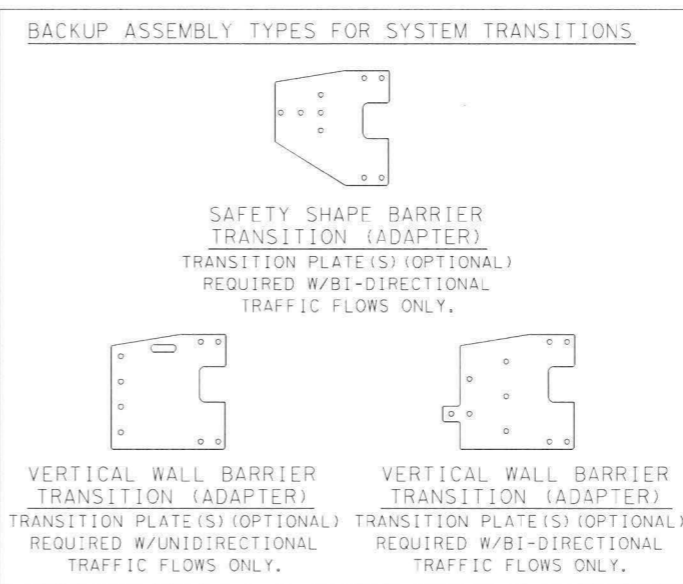
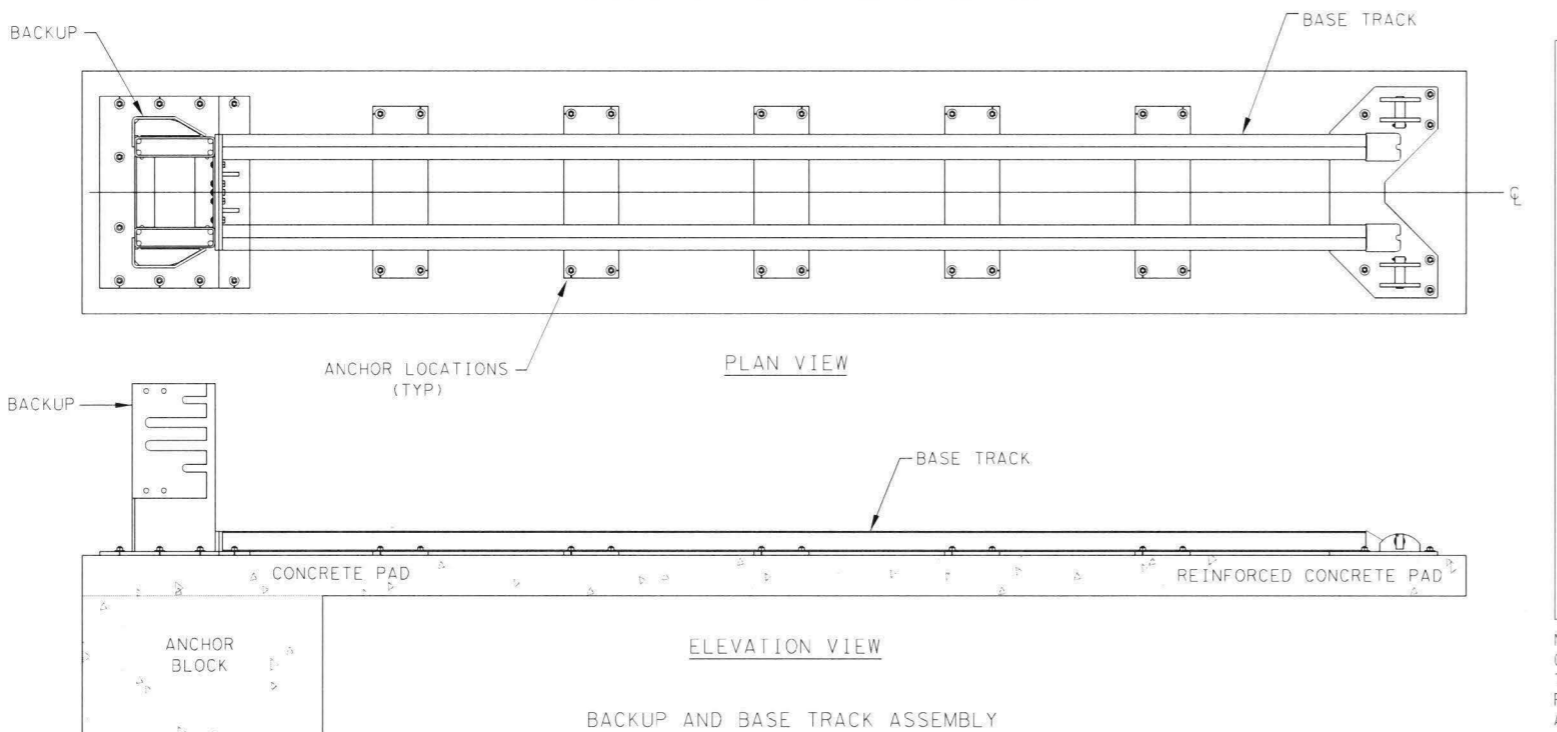
APPROVED ADHESIVE, 7" STUDS, 5.5" EMBEDMENT

FOUNDATION TYPES

MINIMUM 8" REINFORCED PORTLAND CEMENT CONCRETE PAD (REQUIRED REINFORCING STEEL FOR CONCRETE PAD SHALL BE SHOWN ON THE MANUFACTURER'S SHOP DRAWINGS.)

MINIMUM 8" NON-REINFORCED PORTLAND CEMENT CONCRETE ROADWAY MEASURING AT LEAST 12' WIDE BY 50' LONG)

MINIMUM 7" CONCRETE DECK STRUCTURE, OR MINIMUM 6" REINFORCED CONCRETE ROADWAY



NOTES:  
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR THE CORRECT BACKUP ASSEMBLY AND TRANSITION PANELS OR SIDE PANELS USED FOR STANDARD AND BI-DIRECTIONAL INSTALLATIONS: AT DIVIDED-HIGHWAY MEDIANS OR UNDIVIDED ROADWAYS WHERE THE SYSTEM IS EXPOSED TO IMPACTS FROM ONE OR TWO DIFFERENT DIRECTIONS OF TRAFFIC FLOW.

NOTE:  
THIS STANDARD IS A BASIC REPRESENTATION OF THE REACT M SYSTEM AND IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

Texas Department of Transportation  
Design Division Standard

TRINITY HIGHWAY  
ENERGY ABSORPTION  
CRASH CUSHION  
REACT M (NARROW)  
(MASH TL-3)  
REACT (M) - 21

FILE: reocctm21.dgn	DN: TxDOT	CK: KM	DW: SS	CR: CL
©TxDOT: JULY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO. 47	

LOW MAINTENANCE

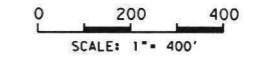
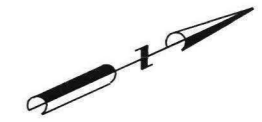
DATE: FILE:

C3  
CURVE RAMP-1A 3  
PI STATION = 20+76.71  
DELTA = 04° 27' 05" (LT)  
DEGREE OF CURVE = 01° 58' 33"  
TANGENT = 112.71  
LENGTH = 225.30  
RADIUS = 2,900.00  
PC STATION = 19+64.00  
PT STATION = 21+89.30

C4  
CURVE RAMP-1A 4  
PI STATION = 23+78.46  
DELTA = 03° 20' 39" (RT)  
DEGREE OF CURVE = 00° 53' 03"  
TANGENT = 189.16  
LENGTH = 378.20  
RADIUS = 6,480.00  
PC STATION = 21+89.30  
PT STATION = 25+67.51

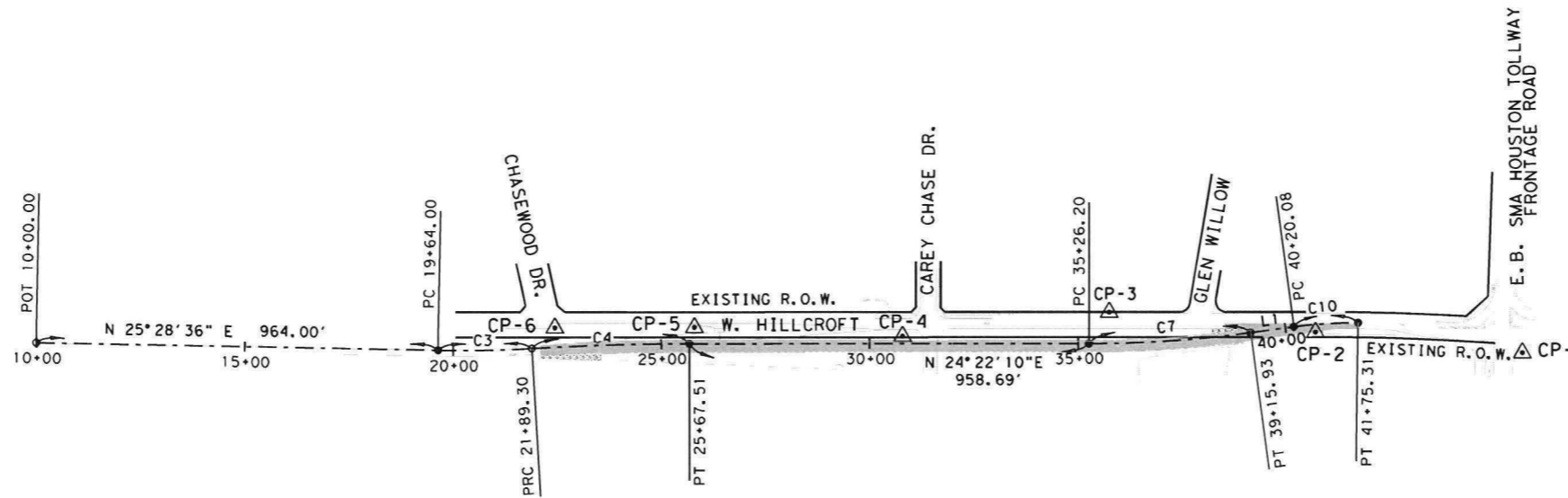
C7  
CURVE RAMP-1A 7  
PI STATION = 37+21.36  
DELTA = 7° 42' 00.00" (LT)  
DEGREE OF CURVE = 1° 58' 32.58"  
TANGENT = 195.16  
LENGTH = 389.73  
RADIUS = 2,900.00  
PC STATION = 35+26.20  
PT STATION = 39+15.93

C10  
CURVE RAMP-1A 10  
PI STATION = 40+97.84  
DELTA = 8° 33' 07.70" (RT)  
DEGREE OF CURVE = 5° 30' 33.15"  
TANGENT = 77.76  
LENGTH = 155.23  
RADIUS = 1,040.00  
PC STATION = 40+20.08  
PT STATION = 41+75.31



NOTES:

- 1, ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTH AMERICAN DATUM OF 1983 (2011 ADJ.) 2010 EPOCH.
- 2, ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED SURFACE ADJUSTMENT FACTOR OF 1.00013.
- 3, ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (CORS/2011 ADJ.) 2010 EPOCH.
- 4, VERTICAL CONTROL IS BASED ON DIGITAL LEVELING HOLDING CONTROL POINT "3" FOR REFERENCE.
- 5, FIELD SURVEYS WERE PERFORMED DURING SEPTEMBER, 2021 THROUGH OCTOBER, 2021.
- 6, ALL MEASUREMENTS SHOWN HEREON ARE IN U.S. SURVEY FEET.



CONTROL MONUMENTATION						
POINT NO.	NORTHING (Y)	EASTING (X)	ELEVATION	STATION	OFFSET	DESCRIPTION
CP-6	13,787,028.47	3,081,460.91	65.26'	22+47.17	46.02' LT	SET 3/8" I.R. W/LANDTECH CAP
CP-5	13,787,333.60	3,081,598.30	64.01'	25+79.66	38.80' LT	SET 3/8" I.R. W/LANDTECH CAP
CP-4	13,787,779.96	3,081,823.38	64.30'	30+79.13	17.95' LT	SET 3/8" I.R. W/LANDTECH CAP
CP-3	13,788,254.89	3,081,975.87	64.45'	35+75.94	74.60' LT	SET 3/8" I.R. W/LANDTECH CAP
CP-2	13,788,686.36	3,082,224.24	63.36'	40+70.98	18.95' RT	SET MAG NAIL
CP-1	13,789,119.80	3,082,474.23	64.42'	N/A	N/A	SET 3/8" I.R. W/LANDTECH CAP

LINE TABLE		
LINE	BEARING	DISTANCE
L1	N 16° 40' 10" E	104.15'

CONTROL MONUMENT INVERSE			
FROM	BEARING	DISTANCE	TO
CP-6	N 24° 14' 26" E	334.64'	CP-5
CP-5	N 26° 45' 36" E	499.90'	CP-4
CP-4	N 17° 48' 02" E	498.81'	CP-3
CP-3	N 29° 55' 34" E	497.85'	CP-2
CP-2	N 29° 58' 31" E	500.36'	CP-1

REV.	DATE	BY	DESCRIPTION

CONSULTANT:  
**LANDTECH**  
2525 North Loop West, Suite 300  
Houston, Texas 77008  
T: 713-861-7068  
F: 713-861-4131  
TBPELS Registration No. 10019100



*Russell Henderson*  
2/14/2023



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech**  
AIG Technical Services, LLC  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

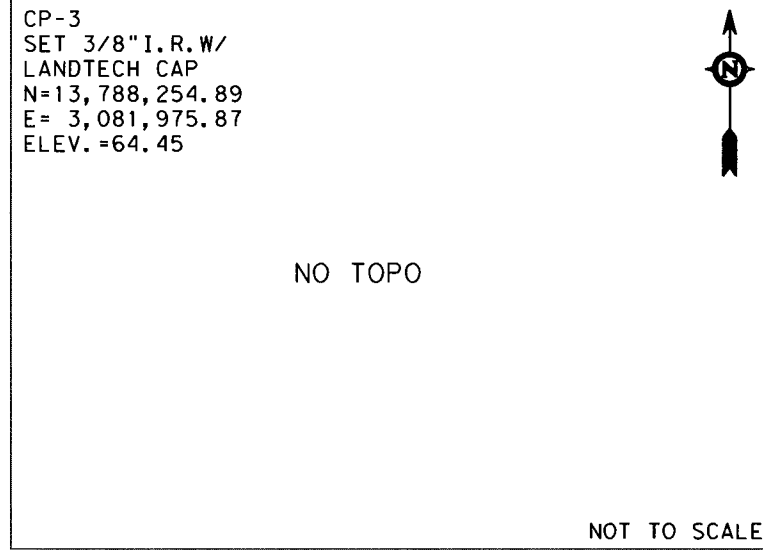
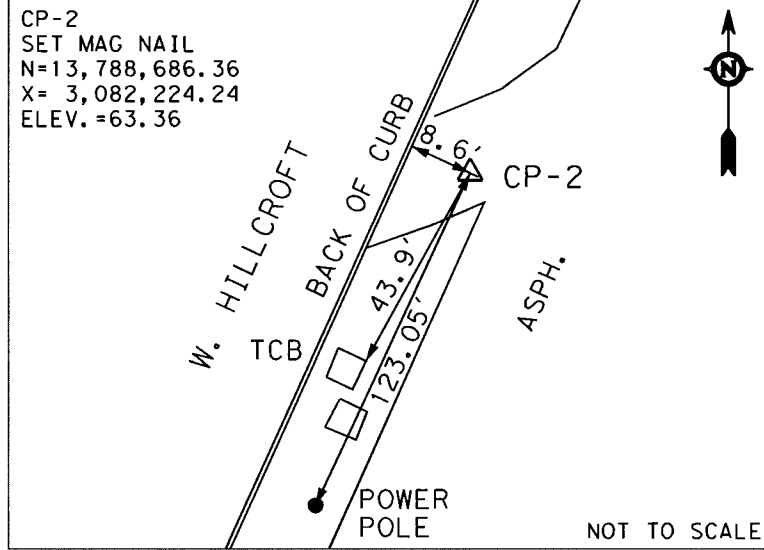
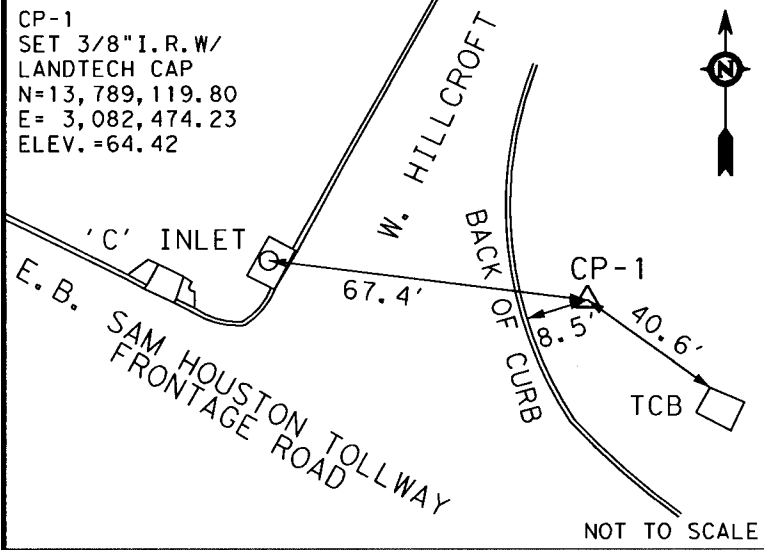
FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
SURVEY CONTROL INDEX SHEET



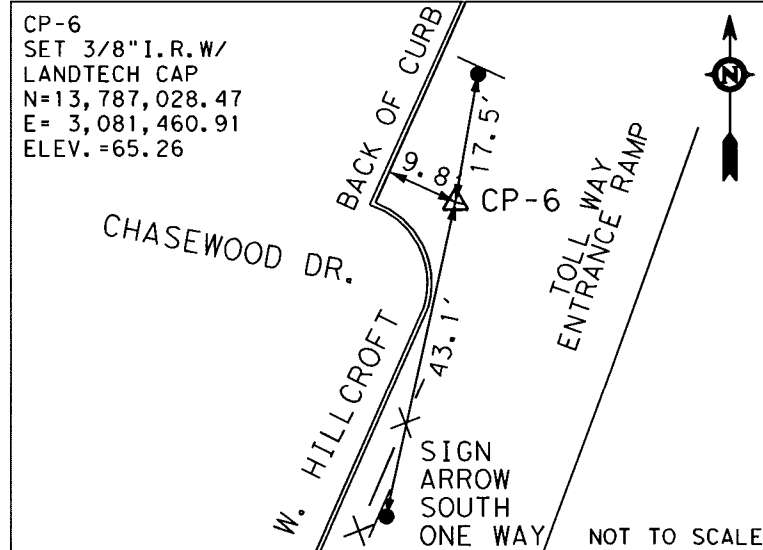
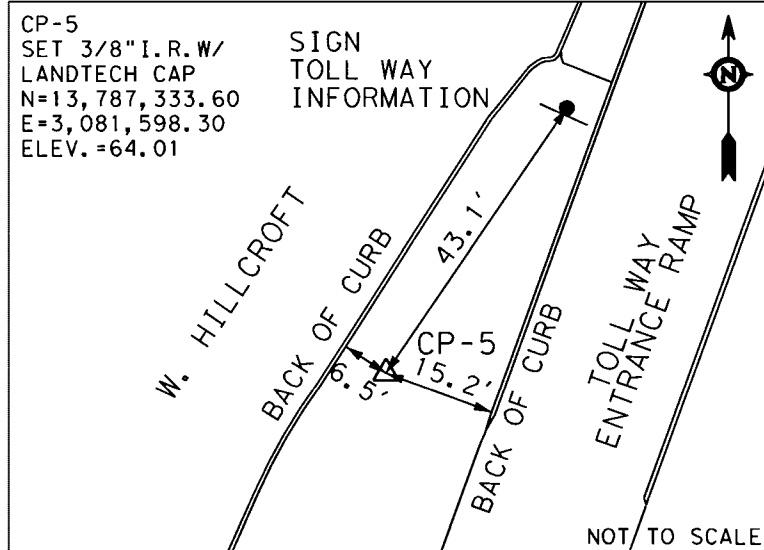
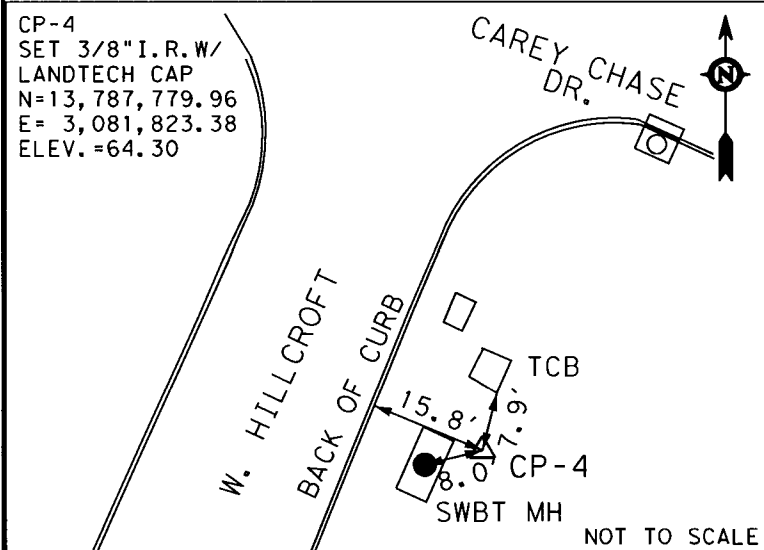
SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	2/14/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	48
CHECKED BY:			



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- NOTES:
1. ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTH AMERICAN DATUM OF 1983 (2011 ADJ.) 2010 EPOCH.
  2. ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED SURFACE ADJUSTMENT FACTOR OF 1.00013.
  3. ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (CORS/2011 ADJ.) 2010 EPOCH.
  4. VERTICAL CONTROL IS BASED ON DIGITAL LEVELING HOLDING CONTROL POINT "3" FOR REFERENCE.
  5. FIELD SURVEYS WERE PERFORMED DURING SEPTEMBER, 2021 THROUGH OCTOBER, 2021.
  6. ALL MEASUREMENTS SHOWN HEREON ARE IN U.S. SURVEY FEET.



REV.	DATE	BY	DESCRIPTION

CONSULTANT:  
**LANDTECH**  
2525 North Loop West, Suite 300  
Houston, Texas 77008  
T: 713-861-7068  
F: 713-861-4131  
TPELS Registration No. 10019100

Russell Henderson  
2/14/2023

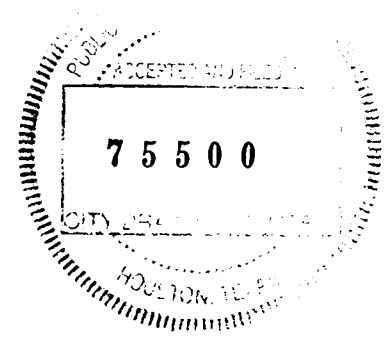
**FORT BEND COUNTY TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
HORIZONTAL & VERTICAL  
CONTROL SHEET

SHEET 1 OF 1

PROJECT NUMBER	20219x	DATE:	2/14/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	26
CHECKED BY:			49



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SUBMITTAL

**FBP ENTRANCE RAMP 1A**

Beginning chain RAMP-1A description  
Feature: Geom\_Ramp

Point 840 N 13,785,880.4430 E 3,080,979.1360 Sta 10+00.00  
Course from 840 to PC RAMP-1A\_3 N 25° 28' 36.23" E Dist 964.0000

Curve Data  
\*-----\*

Curve RAMP-1A\_3  
P.I. Station = 20+76.71 N 13,786,852.4525 E 3,081,442.2763  
Delta = 4° 27' 04.91" (LT)  
Degree = 1° 58' 32.58"  
Tangent = 112.7086  
Length = 225.3037  
Radius = 2,900.0000  
External = 2.1894  
Long Chord = 225.2471  
Mid. Ord. = 2.1877  
P.C. Station = 19+64.00 N 13,786,750.7037 E 3,081,393.7953  
P.T. Station = 21+89.30 N 13,786,957.6571 E 3,081,482.7140  
C.C. = N 13,787,998.1227 E 3,078,775.7911  
Back = N 25° 28' 36.23" E  
Ahead = N 21° 01' 31.32" E  
Chord Bear = N 23° 15' 03.77" E

Curve Data  
\*-----\*

Curve RAMP-1A\_4  
P.I. Station = 23+78.46 N 13,787,134.2192 E 3,081,550.5796  
Delta = 3° 20' 38.62" (RT)  
Degree = 0° 53' 03.10"  
Tangent = 189.1558  
Length = 378.2042  
Radius = 6,480.0000  
External = 2.7602  
Long Chord = 378.1506  
Mid. Ord. = 2.7590  
P.C. Station = 21+89.30 N 13,786,957.6571 E 3,081,482.7140  
P.T. Station = 25+67.51 N 13,787,306.5220 E 3,081,628.6287  
C.C. = N 13,784,632.7546 E 3,087,531.2864  
Back = N 21° 01' 31.32" E  
Ahead = N 24° 22' 09.94" E  
Chord Bear = N 22° 41' 50.63" E

Course from PT RAMP-1A\_4 to PC RAMP-1A\_7 N 24° 22' 09.94" E Dist 958.6914

Curve Data  
\*-----\*

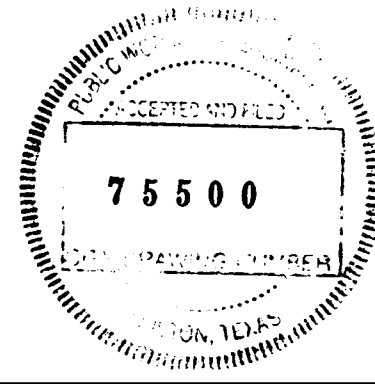
Curve RAMP-1A\_7  
P.I. Station = 37+21.36 N 13,788,357.5697 E 3,082,104.7290  
Delta = 7° 42' 00.00" (LT)  
Degree = 1° 58' 32.58"  
Tangent = 195.1598  
Length = 389.7320  
Radius = 2,900.0000  
External = 6.5594  
Long Chord = 389.4388  
Mid. Ord. = 6.5446  
P.C. Station = 35+26.20 N 13,788,179.7978 E 3,082,024.2025  
P.T. Station = 39+15.93 N 13,788,544.5280 E 3,082,160.7105  
C.C. = N 13,789,376.3912 E 3,079,382.5810  
Back = N 24° 22' 09.94" E  
Ahead = N 16° 40' 09.94" E  
Chord Bear = N 20° 31' 09.94" E

Course from PT RAMP-1A\_7 to PC RAMP-1A\_10 N 16° 40' 09.94" E Dist 104.1500

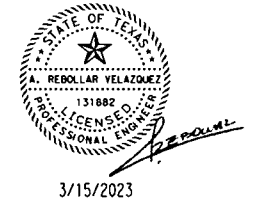
Curve Data  
\*-----\*

Curve RAMP-1A\_10  
P.I. Station = 40+97.84 N 13,788,718.7945 E 3,082,212.8916  
Delta = 8° 33' 07.70" (RT)  
Degree = 5° 30' 33.15"  
Tangent = 77.7612  
Length = 155.2335  
Radius = 1,040.0000  
External = 2.9031  
Long Chord = 155.0894  
Mid. Ord. = 2.8950  
P.C. Station = 40+20.08 N 13,788,644.3012 E 3,082,190.5858  
P.T. Station = 41+75.31 N 13,788,789.1425 E 3,082,246.0272  
C.C. = N 13,788,345.9778 E 3,083,186.8806  
Back = N 16° 40' 09.94" E  
Ahead = N 25° 13' 17.64" E  
Chord Bear = N 20° 56' 43.79" E

Ending chain RAMP-1A description



REV.	DATE	BY	DESCRIPTION



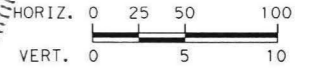
**AIG Tech** Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ROADWAY HORIZONTAL  
ALIGNMENT DATA**

SHEET 1 OF 1

PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	50
CHECKED BY:			

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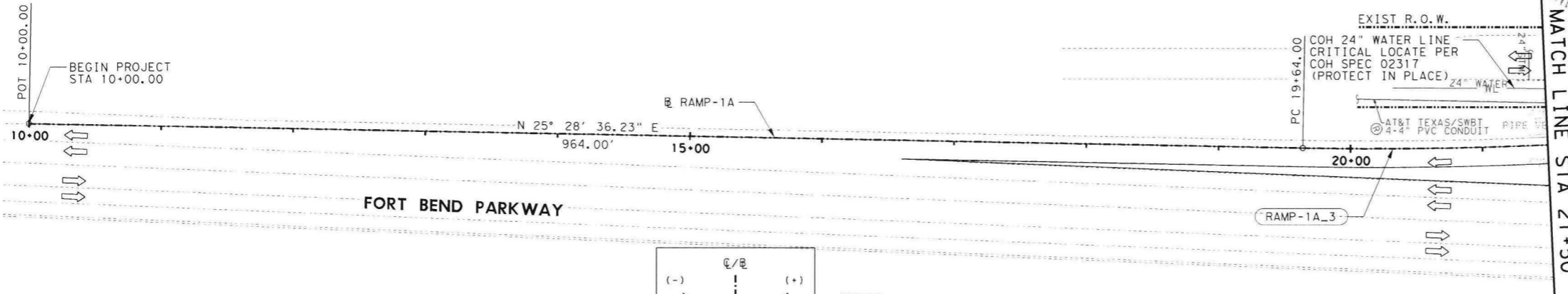
LEGEND

- PROPOSED PAVEMENT
- PROPOSED FAST TRACK CONC PVMT
- PROPOSED CONCRETE RIPRAP
- EXISTING RIGHT-OF-WAY (R.O.W.)
- PROPOSED SSTR
- RETAINING WALL
- EXIST DIRECTION OF TRAFFIC
- PROPOSED DIRECTION OF TRAFFIC
- PROPOSED ATTENUATOR
- XXXX-XX.X

NOTES:

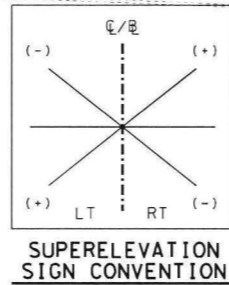
1. STATIONS AND OFFSETS ARE BASED ON RAMP-1A ALIGNMENT UNLESS OTHERWISE NOTED.
2. DIMENSIONS ARE TAKEN FROM NOMINAL FACE OF CURB OR FACE OF RAIL UNLESS OTHERWISE NOTED IN PLANS.
3. EXISTING UTILITIES ARE BASED ON BEST AVAILABLE INFORMATION, CONTRACTOR TO FIELD VERIFY LOCATIONS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL CALL THE RESPECTIVE ENTITY WHEN WORKING IN THE VICINITY OF A UTILITY LINE (PIPELINE, WATER LINE, SANITARY SEWER, FIBER OPTIC).

REV.	DATE	BY	DESCRIPTION



DESCRIPTION	ALIGNMENT	BEGIN TRANSITION		END TRANSITION		LENGTH FT
		STATION	e (LT/RT)	STATION	e (LT/RT)	
NORMAL CROWN	RAMP-1A	22+09.16	2.00	34+54.00	2.00	
TRANSITION	RAMP-1A	34+54.00	2.00	35+44.00	2.96	90.0
FULL SUPER	RAMP-1A	35+44.00	2.96	38+98.00	2.96	
TRANSITION	RAMP-1A	38+98.00	2.96	39+88.00	2.00	90.0

NOTE: DESIGN SPEED = 45 MPH; e MAX = 6%.  
\* CURVE RAMP-1A\_10 TO MATCH HILLCROFT AVE. EXISTING LOW-SPEED URBAN STREET DESIGN.

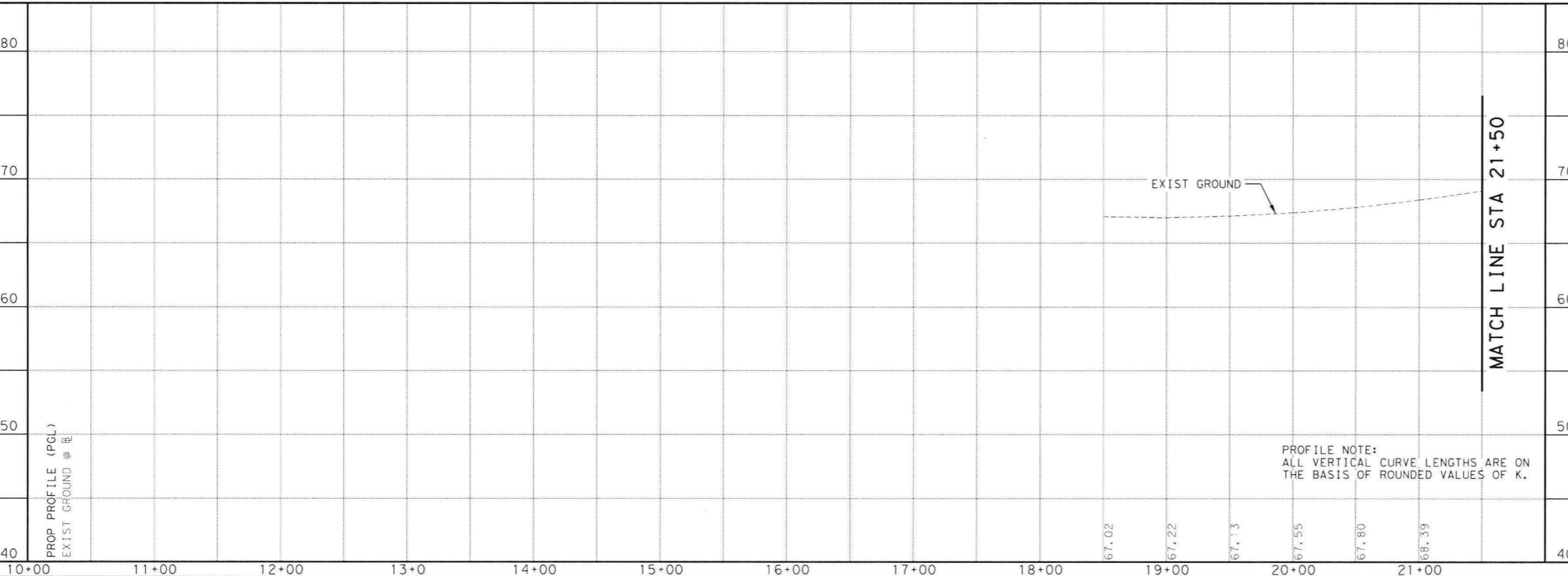


NOTES:

- A. SUPERELEVATION RATES BASED ON TxDOT'S ROADWAY DESIGN MANUAL.
- B. 6.0% MAXIMUM RATE USED BASED ON RDM Table 2-6: Minimum Radii for Design Superelevation rates, Design Speeds, and emax = 6%.
- C. AXIS OF ROTATION (AOR) LOCATED AT BASELINE, UNLESS OTHERWISE NOTED.

CURVE RAMP-1A\_3

PI STATION	= 20+76.71
DELTA	= 4° 27' 04.91" (LT)
DEGREE OF CURVE	= 1° 58' 32.58"
TANGENT	= 112.71
LENGTH	= 225.30
RADIUS	= 2,900.00
PC STATION	= 19+64.00
PT STATION	= 21+89.30



PROFILE NOTE:  
ALL VERTICAL CURVE LENGTHS ARE ON THE BASIS OF ROUNDED VALUES OF K.

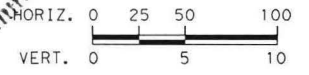
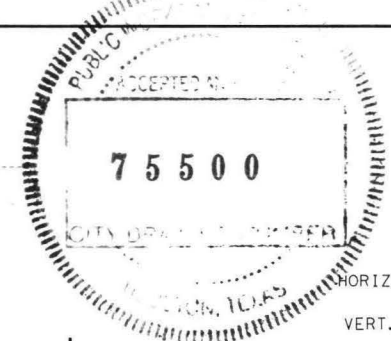
4/4/2023

**FORT BEND COUNTY TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

FORT BEND PARKWAY TOLL ROAD			
ENTRANCE RAMP 1A			
PLAN & PROFILE			
BEGIN PROJECT TO STA 21+50			
SHEET 1 OF 3			
PROJECT NUMBER	20219x	DATE:	4/4/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	51
CHECKED BY:			

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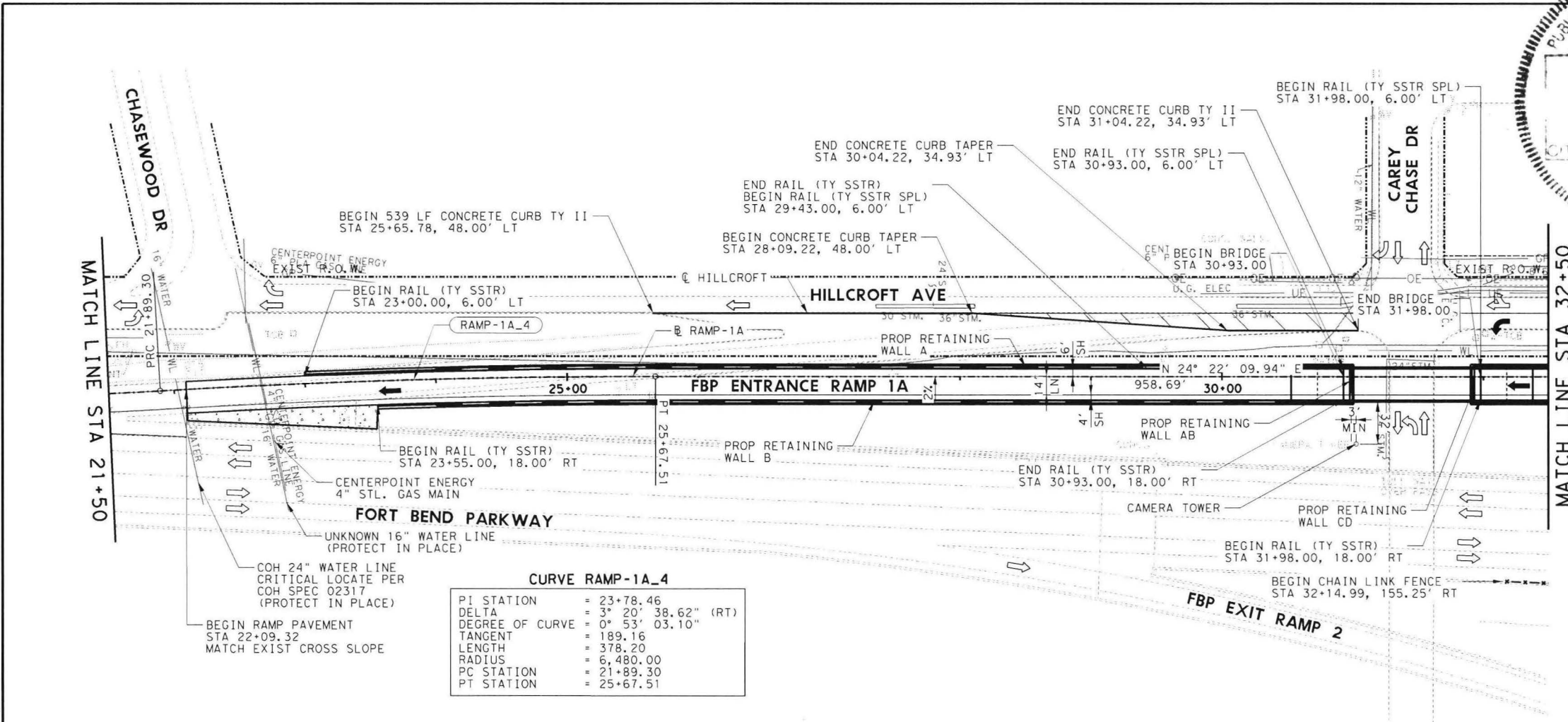
LEGEND

- PROPOSED PAVEMENT
- PROPOSED FAST TRACK CONC PVMT
- PROPOSED CONCRETE RIPRAP
- EXISTING RIGHT-OF-WAY (R.O.W.)
- PROPOSED SSTR
- RETAINING WALL
- EXIST DIRECTION OF TRAFFIC
- PROPOSED DIRECTION OF TRAFFIC
- PROPOSED ATTENUATOR
- XXXX-XX.X

NOTES:

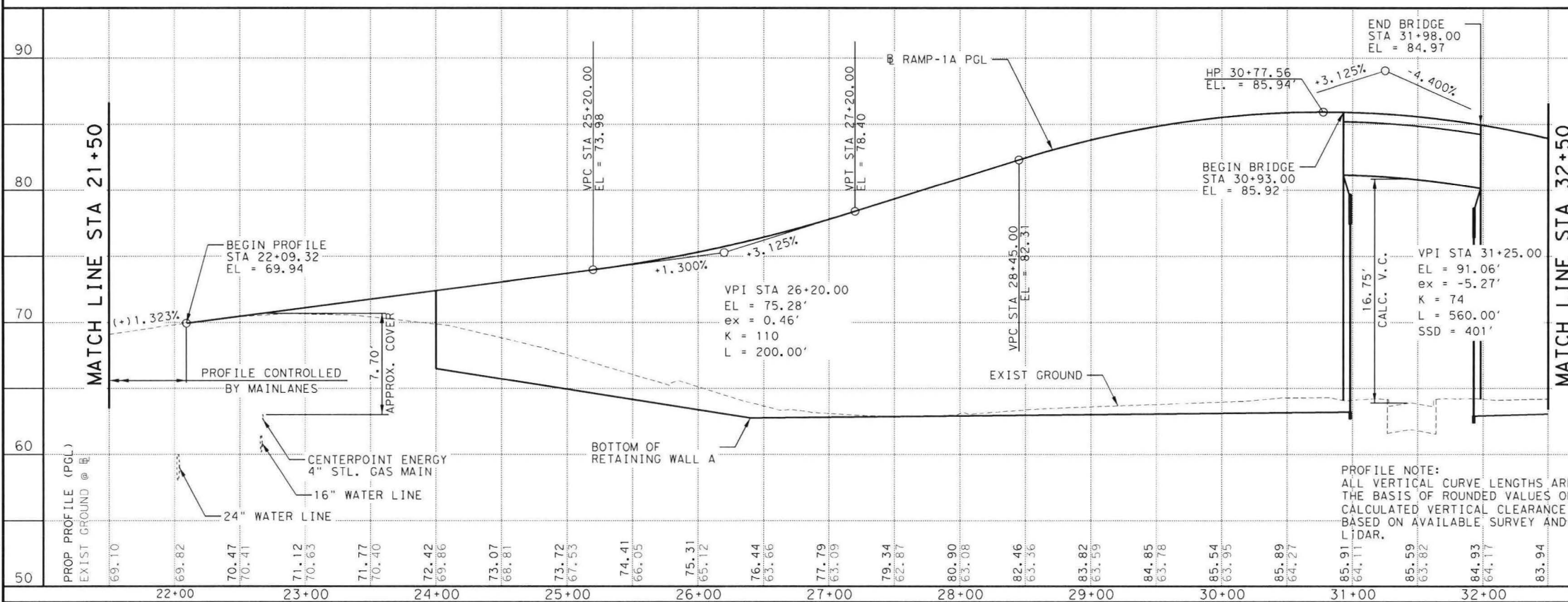
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2. DIMENSIONS ARE TAKEN FROM NOMINAL FACE OF CURB OR FACE OF RAIL UNLESS OTHERWISE NOTED IN PLANS.
3. EXISTING UTILITIES ARE BASED ON BEST AVAILABLE INFORMATION, CONTRACTOR TO FIELD VERIFY LOCATIONS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL CALL THE RESPECTIVE ENTITY WHEN WORKING IN THE VICINITY OF A UTILITY LINE (PIPELINE, WATER LINE, SANITARY SEWER, FIBER OPTIC).

REV.	DATE	BY	DESCRIPTION



**CURVE RAMP-1A\_4**

PI STATION	= 23+78.46
DELTA	= 3° 20' 38.62" (RT)
DEGREE OF CURVE	= 0° 53' 03.10"
TANGENT	= 189.16
LENGTH	= 378.20
RADIUS	= 6,480.00
PC STATION	= 21+89.30
PT STATION	= 25+67.51



STATE OF TEXAS  
A. REBOLLAR VELAZQUEZ  
131882  
LICENSED PROFESSIONAL ENGINEER  
4/4/2023

**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD**  
**ENTRANCE RAMP 1A**  
**PLAN & PROFILE**  
**STA 21+50 TO STA 32+50**

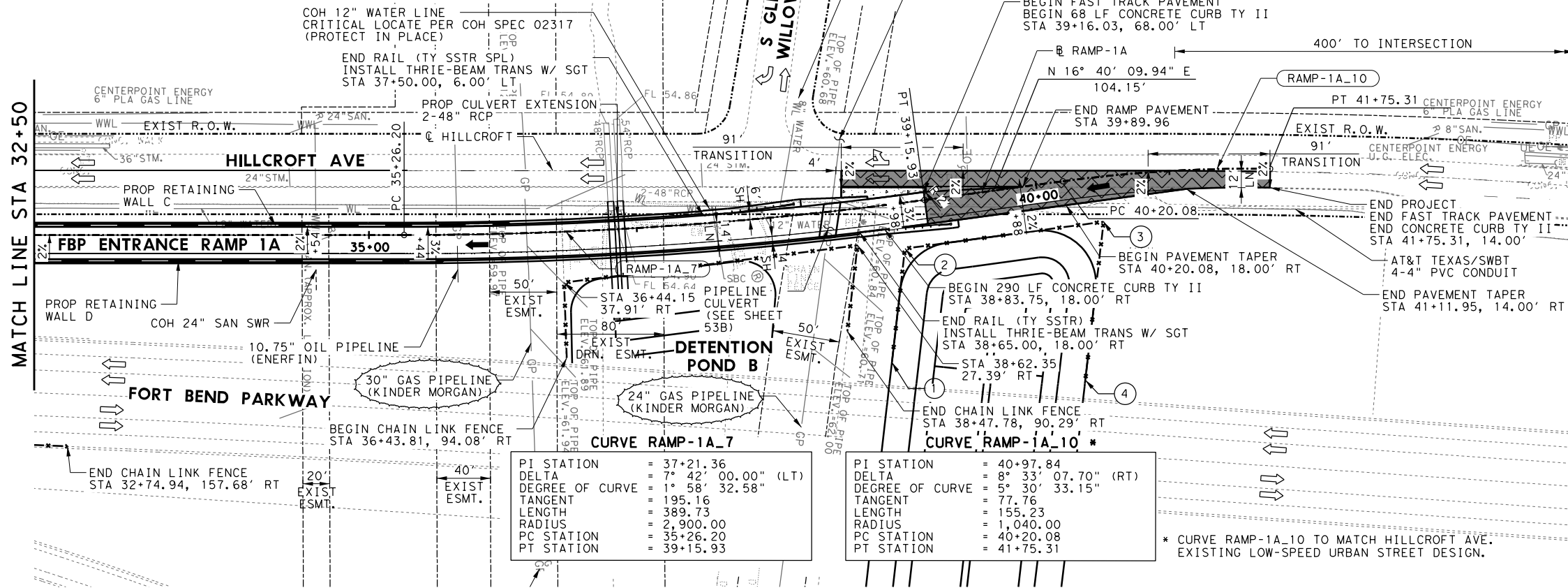
SHEET 2 OF 3

PROJECT NUMBER	20219x	DATE:	4/4/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	52
CHECKED BY:			

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DETENTION POND A CHAIN LINK FENCE DATA TABLE				
POINT	ALIGNMENT	STATION	OFFSET (LT/RT)	DESCRIPTION
1	RAMP-1A	38+77.10	117.04' RT	BEGIN CHAIN LINK FENCE
2	RAMP-1A	38+96.84	34.06' RT	CHAIN LINK PI
3	RAMP-1A	40+47.13	33.66' RT	CHAIN LINK PI
4	RAMP-1A	40+16.85	149.38' RT	END CHAIN LINK FENCE



PI STATION	= 37+21.36
DELTA	= 7° 42' 00.00" (LT)
DEGREE OF CURVE	= 1° 58' 32.58"
TANGENT	= 195.16
LENGTH	= 389.73
RADIUS	= 2,900.00
PC STATION	= 35+26.20
PT STATION	= 39+15.93

PI STATION	= 40+97.84
DELTA	= 8° 33' 07.70" (RT)
DEGREE OF CURVE	= 5° 30' 33.15"
TANGENT	= 77.76
LENGTH	= 155.23
RADIUS	= 1,040.00
PC STATION	= 40+20.08
PT STATION	= 41+75.31

\* CURVE RAMP-1A\_10 TO MATCH HILLCROFT AVE. EXISTING LOW-SPEED URBAN STREET DESIGN.



LEGEND

- PROPOSED PAVEMENT
- PROPOSED FAST TRACK CONC PAVMT
- PROPOSED CONCRETE RIPRAP
- EXISTING RIGHT-OF-WAY (R.O.W)
- PROPOSED SSTR
- RETAINING WALL
- EXIST DIRECTION OF TRAFFIC
- PROPOSED DIRECTION OF TRAFFIC
- PROPOSED ATTENUATOR
- XXXX-XX-X

NOTES:

- STATIONS AND OFFSETS ARE BASED ON RAMP-1A ALIGNMENT UNLESS OTHERWISE NOTED.
- DIMENSIONS ARE TAKEN FROM NOMINAL FACE OF CURB OR FACE OF RAIL UNLESS OTHERWISE NOTED IN PLANS.
- EXISTING UTILITIES ARE BASED ON BEST AVAILABLE INFORMATION, CONTRACTOR TO FIELD VERIFY LOCATIONS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL CALL THE RESPECTIVE ENTITY WHEN WORKING IN THE VICINITY OF A UTILITY LINE (PIPELINE, WATER LINE, SANITARY SEWER, FIBER OPTIC).

REV.	DATE	BY	DESCRIPTION



FORT BEND COUNTY  
TOLL ROAD AUTHORITY

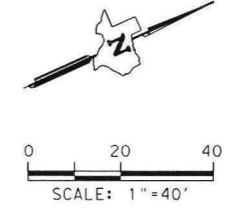
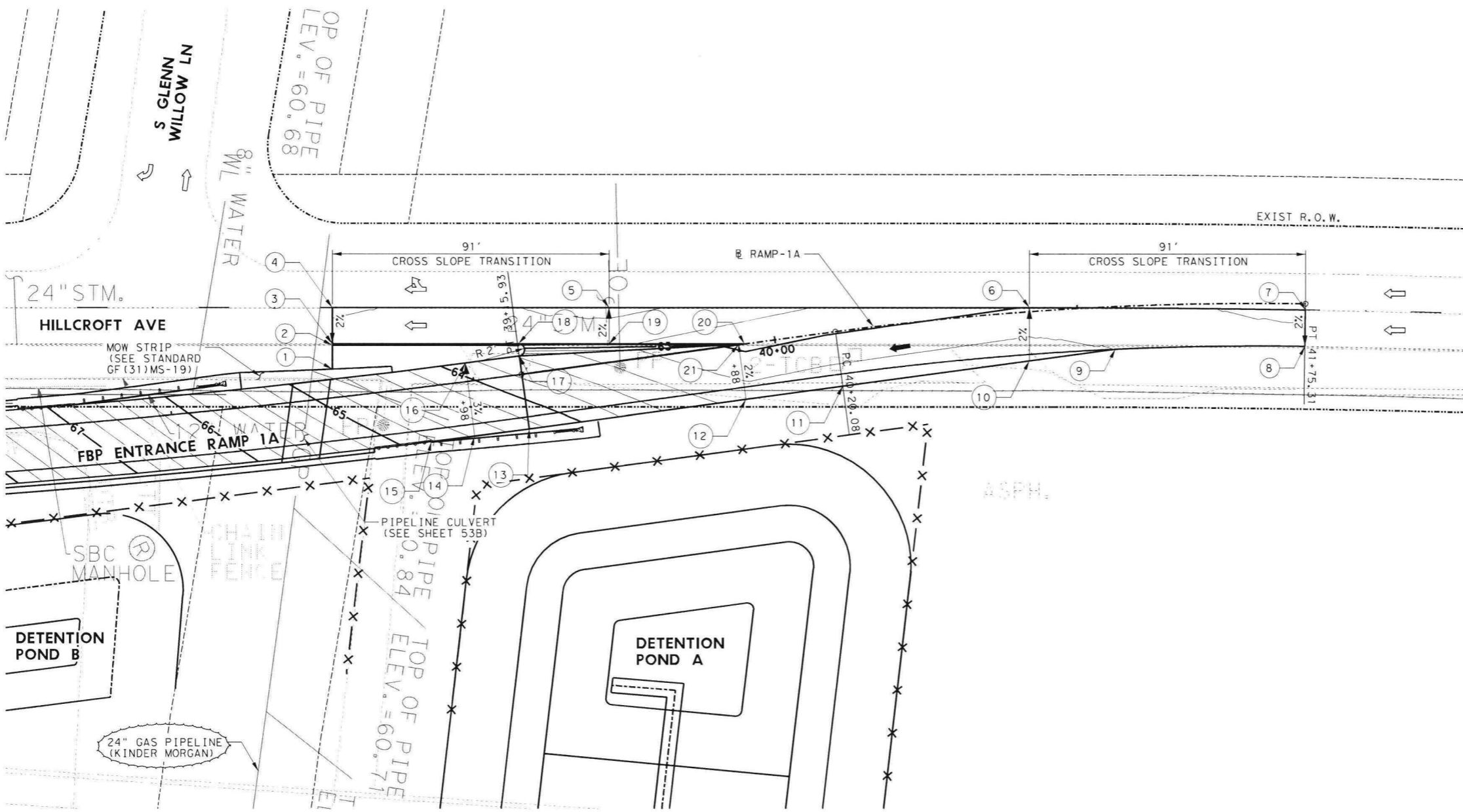
**AIG Tech**  
Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
PLAN & PROFILE  
STA 32+50 TO END PROJECT

SHEET 3 OF 3			
PROJECT NUMBER	20219x	DATE:	10/11/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	53
CHECKED BY:			

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SUBMITTAL



- NOTES:
1. OFFSETS ARE TO PAVEMENT EDGE OR FACE OF CURB UNLESS OTHERWISE NOTED.
  2. ELEVATIONS SHOWN ARE AT FACE OF CURB UNLESS OTHERWISE NOTED.
  3. SAW-CUT ALONG A NEAT HORIZONTAL LINE AND FORM A VERTICAL BUTT JOINT AS DIRECTED BY THE ENGINEER. THIS WORK SHALL BE SUBSIDIARY TO THE VARIOUS BID ITEMS.
  4. SEE "ROADWAY PLAN AND PROFILE" SHEETS FOR ADDITIONAL RAMP INFORMATION.

POINT	ALIGNMENT	STATION	OFFSET (FT) (LT/RT)	DESCRIPTION	ELEVATION (FT)
1	RAMP-1A	38+54.26	9.36 LT	BEGIN CONCRETE RIPRAP	64.92
2	RAMP-1A	38+55.14	17.07 LT	BEGIN CONCRETE RIPRAP	63.24
3	RAMP-1A	38+55.20	17.56 LT	BEGIN FAST TRACK PAVEMENT; BEGIN CURB; BEGIN SUPER TRANSITION	62.63
4	RAMP-1A	38+56.56	29.39 LT	BEGIN SAW-CUT; BEGIN FAST TRACK PAVEMENT; BEGIN SUPER TRANSITION	62.87
5	RAMP-1A	39+47.35	17.80 LT	END SUPER TRANSITION; BEGIN SINGLE SLOPE	62.53
6	RAMP-1A	40+84.31	1.26 LT	END SINGLE SLOPE; BEGIN SUPER TRANSITION	63.01
7	RAMP-1A	41+75.31	2.00 RT	END SAW-CUT; END FAST TRACK PAVEMENT; END SUPER TRANSITION	63.29
8	RAMP-1A	41+75.31	14.00 RT	END FAST TRACK PAVEMENT; END CURB; END SUPER TRANSITION	63.05
9	RAMP-1A	41+11.95	14.00 RT	END PAVEMENT TAPER	63.20
10	RAMP-1A	40+83.02	16.13 RT	END SINGLE SLOPE; BEGIN SUPER TRANSITION	63.36
11	RAMP-1A	40+20.08	18.00 RT	BEGIN PAVEMENT TAPER	63.35
12	RAMP-1A	39+88.00	18.00 RT	END SUPER TRANSITION; BEGIN SINGLE SLOPE	63.32
13	RAMP-1A	39+16.03	18.00 RT	BEGIN FAST TRACK PAVEMENT	64.28
14	RAMP-1A	38+98.00	18.00 RT	END FULL SUPER; BEGIN SUPER TRANSITION	64.57
15	RAMP-1A	38+83.75	18.00 RT	BEGIN CURB	64.82
16	RAMP-1A	38+98.00	6.00 LT	END FULL SUPER; BEGIN SUPER TRANSITION	63.86
17	RAMP-1A	39+16.03	6.00 LT	BEGIN FAST TRACK PAVEMENT; BEGIN CURB; BEGIN RADIUS	63.59
18	RAMP-1A	39+16.30	9.98 LT	END RADIUS	62.68
19	RAMP-1A	39+45.73	5.91 LT	END SUPER TRANSITION; BEGIN SINGLE SLOPE	62.77
20	RAMP-1A	39+89.96	0.00 LT	END RAMP PROFILE	62.95
21	RAMP-1A	39+88.00	0.00 LT	END SUPER TRANSITION; BEGIN SINGLE SLOPE	62.96

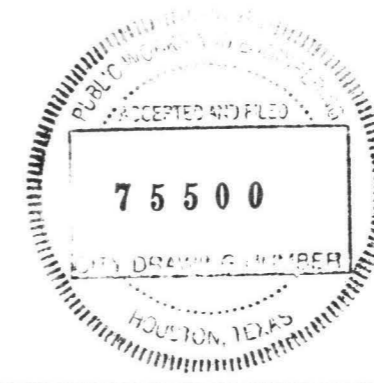
REV.	DATE	BY	DESCRIPTION



AIG TECHNICAL SERVICES, LLC F-20607  
 1500 S DAIRY ASHFORD  
 SUITE 445  
 HOUSTON, TX 77077

FORT BEND PARKWAY TOLL ROAD  
 ENTRANCE RAMP 1A  
 ROADWAY DETAILS  
 GORE LAYOUT

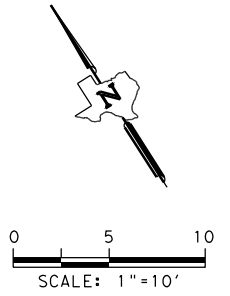
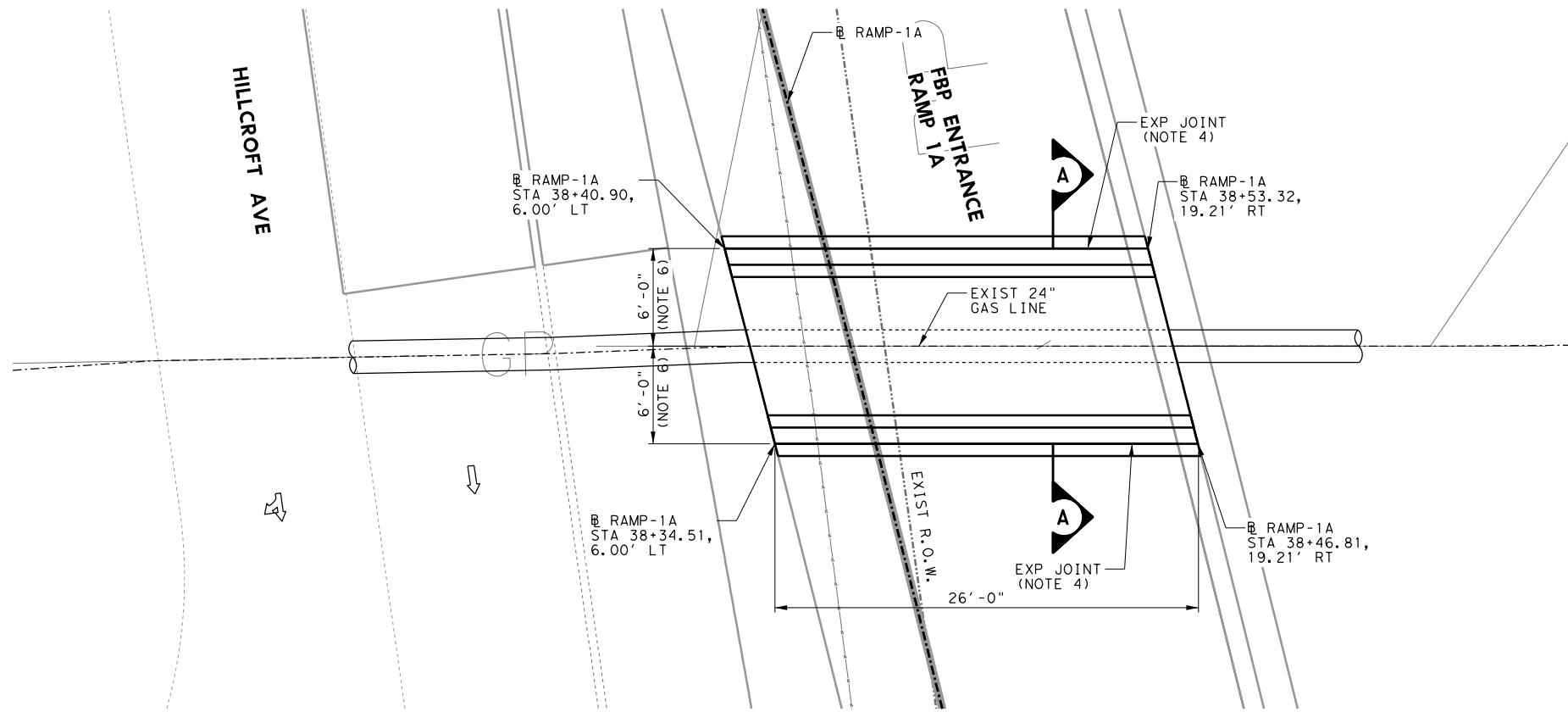
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PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	53A
CHECKED BY:			



3/15/2023 11:51:53 AM C:\AIG-Projectwise\AIG Technical Services, LLC\2106\_FBPkwy\_BW8\_Ramp\07\_CAD\_GIS\02\_Sheets\20219x\_FBC\_AIG\_RD\_ID\_01.dgn

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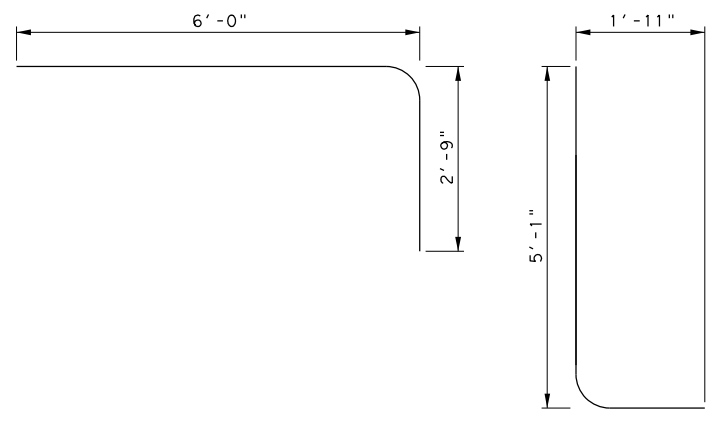
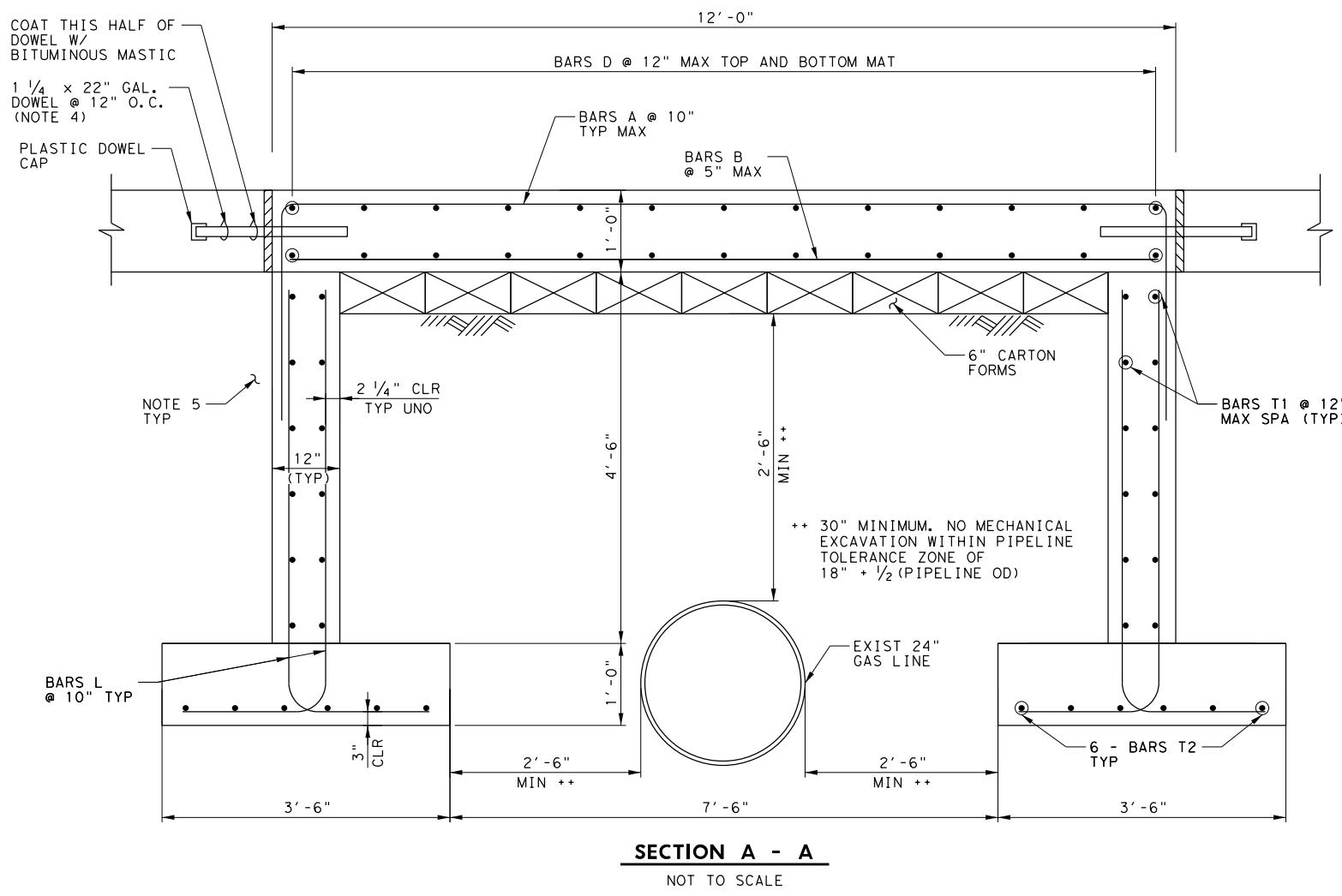
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BILL OF REINFORCING STEEL				
BAR	NO	SIZE	LENGTH	WEIGHT
A	64	#5	8'-9"	585
B	63	#6	11'-8"	1,124
D	26	#4	25'-6"	457
L	128	#5	7'-0"	935
T1	24	#4	25'-6"	422
T2	12	#5	25'-6"	320
TOTAL				3,823

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
REINFORCING STEEL	LB	3,823
CONC CL C (FOOTING)	CY	15.6
CONC CL S (SLAB SPAN)	CY	11.6

\* FOR CONTRACTOR'S INFORMATION ONLY.



**BARS A**

**BARS L**

- NOTES:
- USE CLASS C CONCRETE  $f_c' = 3,600$  psi.
  - USE CLASS S CONCRETE  $f_c' = 4,000$  psi.
  - $F_y = 60,000$  psi.
  - CARTON FORM BOXES ARE INCIDENTAL TO THE FOUNDATION. THE BOXES SHALL BE CORRUGATED FIBERBOARD CARTON FORMS CONSTRUCTED FROM WATERPROOF PAPER AND CAPABLE OF SUPPORT DEAD LOAD PLUS CONSTRUCTION LOADS. PROVIDE WATER PROOFED PROTECTIVE COVERING OVER TOP OF BOXES.
  - SEE "JOINTED REINFORCED CONCRETE PAVEMENT DETAILS" FOR EXPANSION JOINT DETAILS. EXPANSION JOINTS ARE SUBSIDIARY TO PAVEMENT.
  - BACKFILL UNDER PAVEMENT W/CEMENT STABILIZED SAND. INCIDENTAL TO FOUNDATION.
  - EDGE OF STRUCTURE SHALL BE PARALLEL TO PIPE LINE.

HL-93 LOADING			
REV.	DATE	BY	DESCRIPTION

10/10/2023

**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group

**AIG TECHNICAL SERVICES, LLC** F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

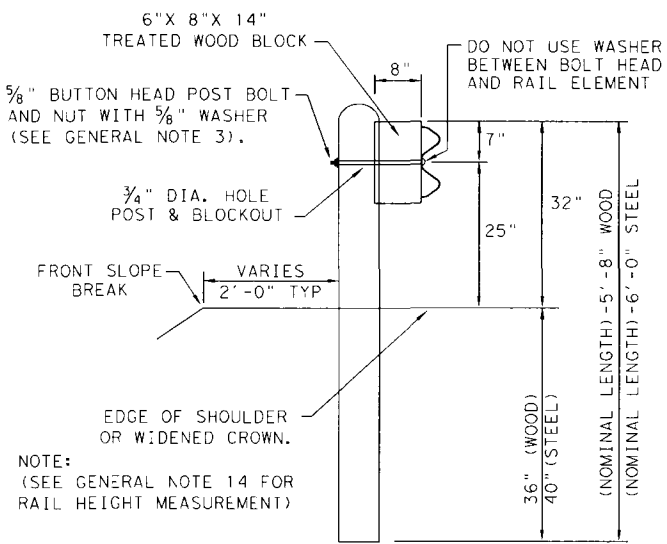
**FORT BEND PARKWAY TOLL ROAD**

**PIPE LINE CULVERT**

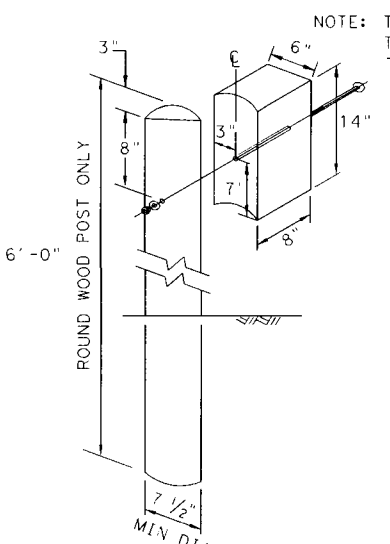
SHEET 1 OF 1

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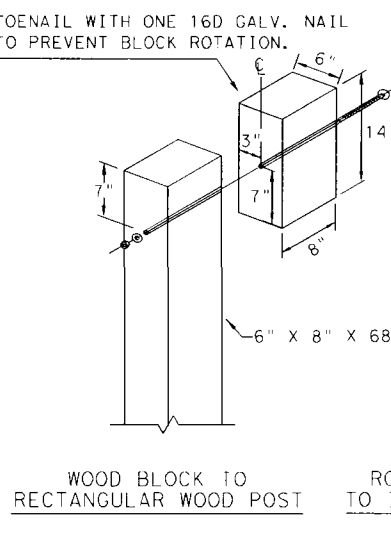
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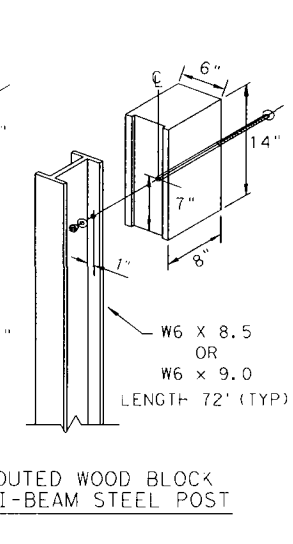
TYPICAL POST PLACEMENT



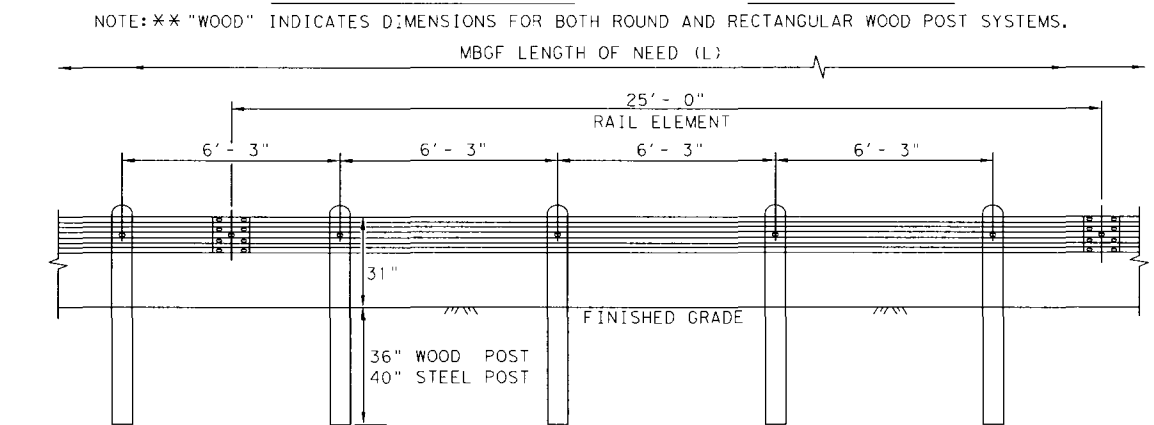
WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST

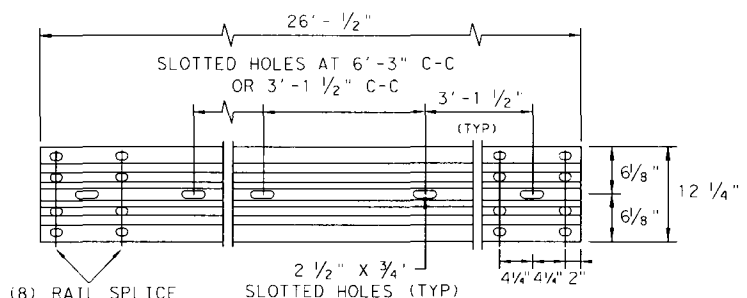


ROUTED WOOD BLOCK TO I-BEAM STEEL POST



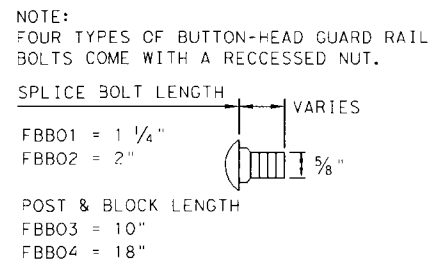
ELEVATION MID-SPAN RAIL SPLICE

SHOWING A 25' - 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



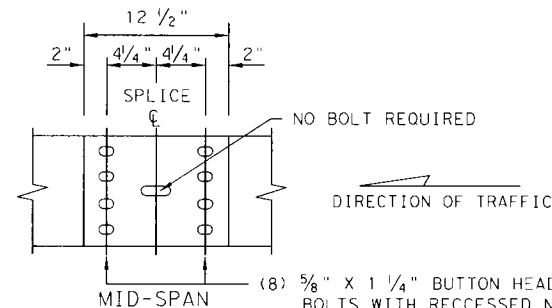
ELEVATION 25' - 0" (NOM.) W-BEAM SECTION

NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES. SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



BUTTON HEAD BOLT

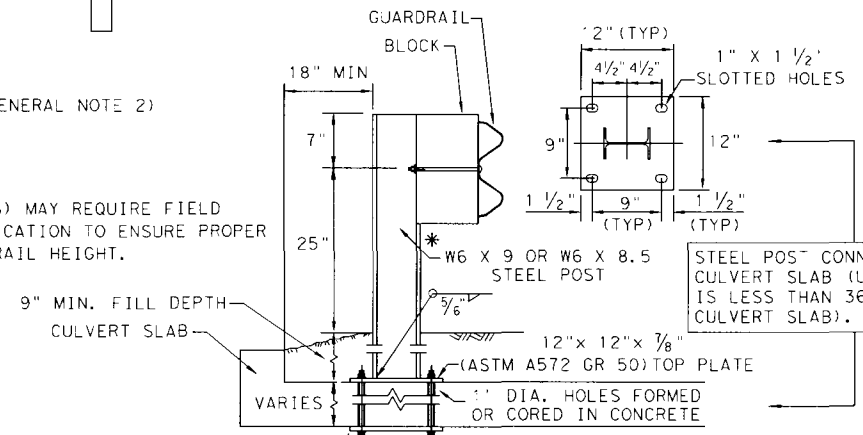
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



MID-SPAN RAIL SPLICE DETAIL

NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.

\* POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.



LOW FILL CULVERT POST

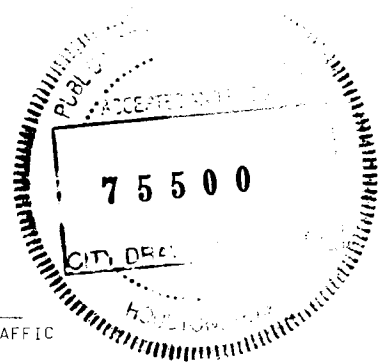
- BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.
- EPOXY ANCHOR OPTION:** THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS 1/4" MIN. BEYOND NUT.

NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.

GENERAL NOTES

- THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
- RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25' - 0", OR 12' - 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 1/2" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE "TRANSITION SECTIONS OF GUARDRAIL."
- BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 3/8" WASHER (FWC16G) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
- FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
- CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
- THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
- IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
- UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
- APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
- POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
- SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 50 FT. RADIUS.
- UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TxDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
- FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
- GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

NOTE: TRANSITIONS TO BRIDGE RAIS OR TRAFFIC BARRIERS. SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS. SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.



METAL BEAM GUARD FENCE  
TL-3 MASH COMPLIANT  
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
© TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.
				54

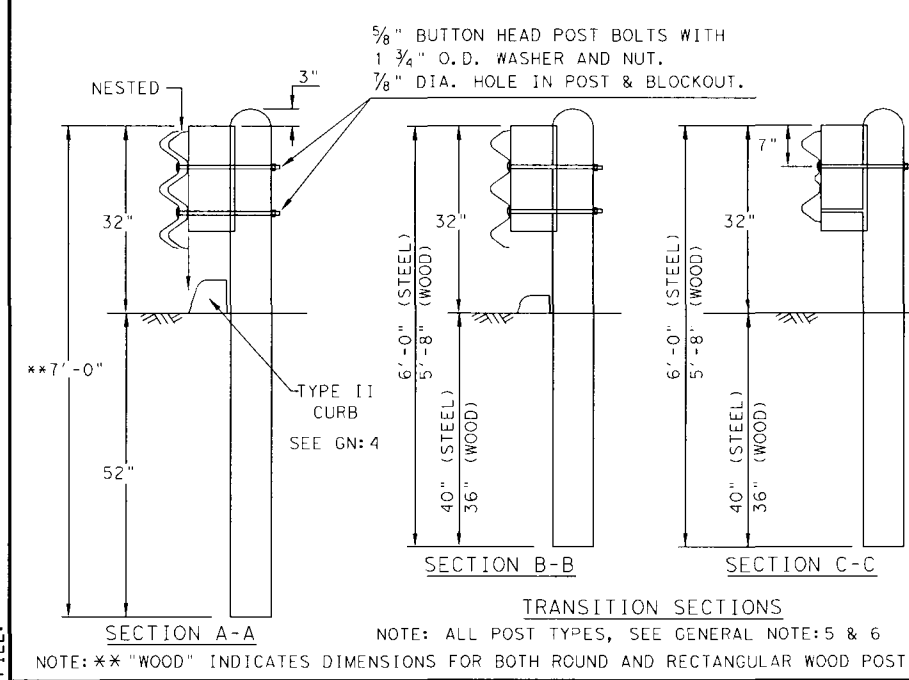
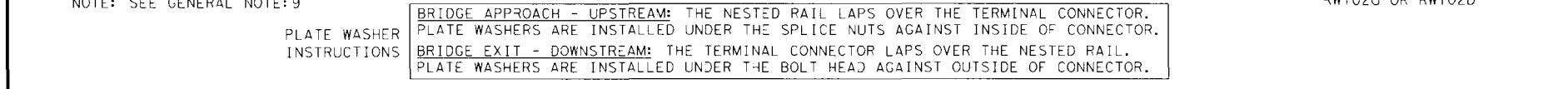
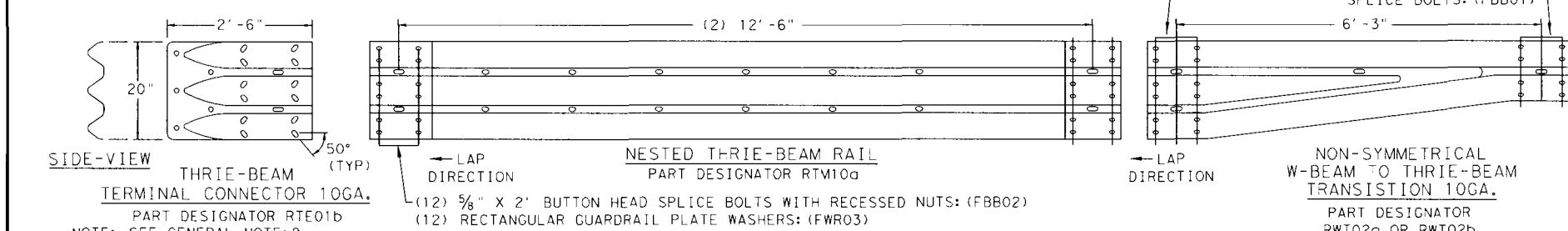
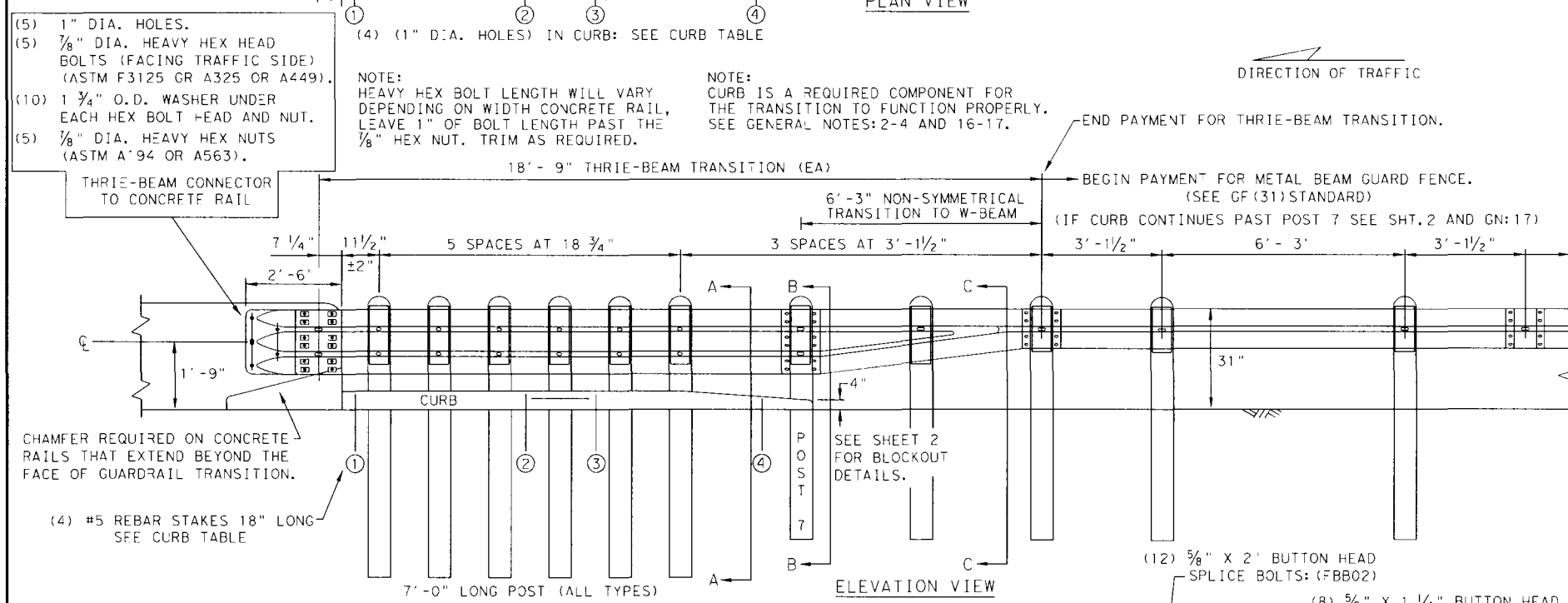
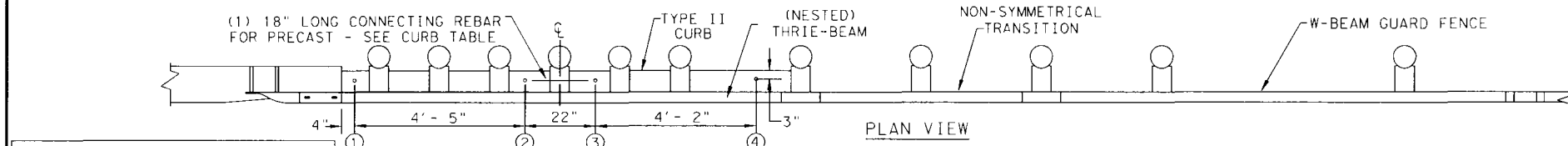
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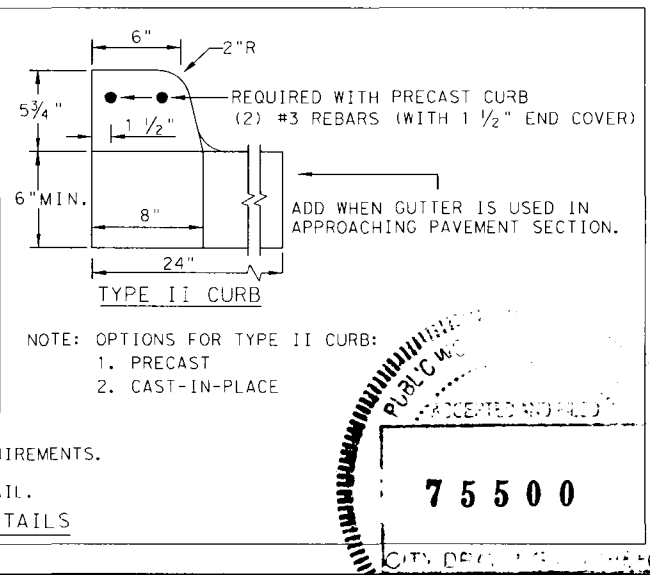
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**GENERAL NOTES**

- CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
- CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5'- $\frac{3}{4}$ " HEIGHT); SEE CURRENT CCG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE: 17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
- CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
- UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
- FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7  $\frac{1}{2}$ " DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
- THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF(31) STANDARD SHEET.
- THE POST LENGTH SHALL BE MARKED ON ALL 7'-0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST  $\frac{5}{8}$ " IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
- POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
- RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
- BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND  $\frac{5}{8}$ " WASHER (FWC160) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
- FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
- CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
- WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
- UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TxDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
- REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
- THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
- IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED) (TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED) (STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.



THRIE-BEAM TERMINAL - CURB TABLE	
PRECAST CURB FULL LENGTH EQUALS 12'-2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.	
CURB (1) LENGTH 5'-8"	CURB (2) LENGTH 6'-6"
TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7	
CONNECTING PRECAST CURB SECTIONS (1) & (2): FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB END. USE (1) #5 GR.60 REBAR 18' LONG TO CONNECT BOTH CURBS.	
SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *: FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND 1/2" BELOW TOP OF CURB. FILL HOLES WITH APPROVED GROUT MIXTURE.	
* NOTES: NOT NEEDED FOR CAST-IN-PLACE. SEE TYPE II CURB DETAIL FOR REBAR AND COVER REQUIREMENTS. PERCUSSION DRILLING IS NOT PERMITTED WITH: TYPE II CURB, BRIDGE RAIL OR CONCRETE TRAFFIC RAIL.	

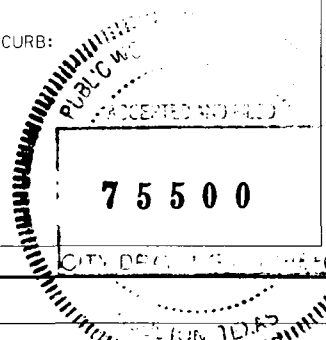


HIGH-SPEED TRANSITION  
SHEET 1 OF 2

**METAL BEAM GUARD FENCE  
THRIE-BEAM TRANSITION  
TL-3 MASH COMPLIANT**

GF(31)TR TL3-20

E: gf31tr+1320.dgn		DN: TxDOT	CK: KM	DM: VP	CK: CGL/AG
TxDOT: NOVEMBER 2020		CONT	SECT	JOB	HIGHWAY
REVISIONS					
DIST	COUNTY	SHEET NO.		55	



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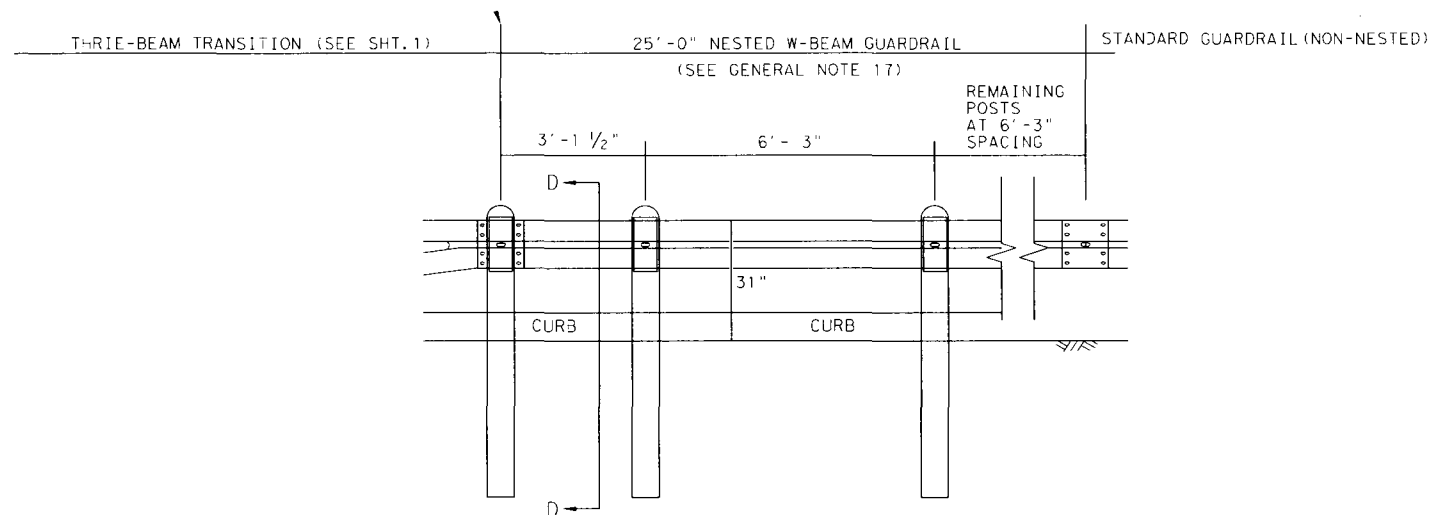
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REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)

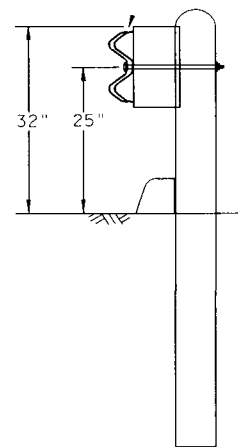
END PAYMENT FOR METAL BEAM GUARD FENCE TRANSITION. BEGIN PAYMENT FOR METAL BEAM GUARD FENCE.

(SEE GF (31) STANDARD SHEET)

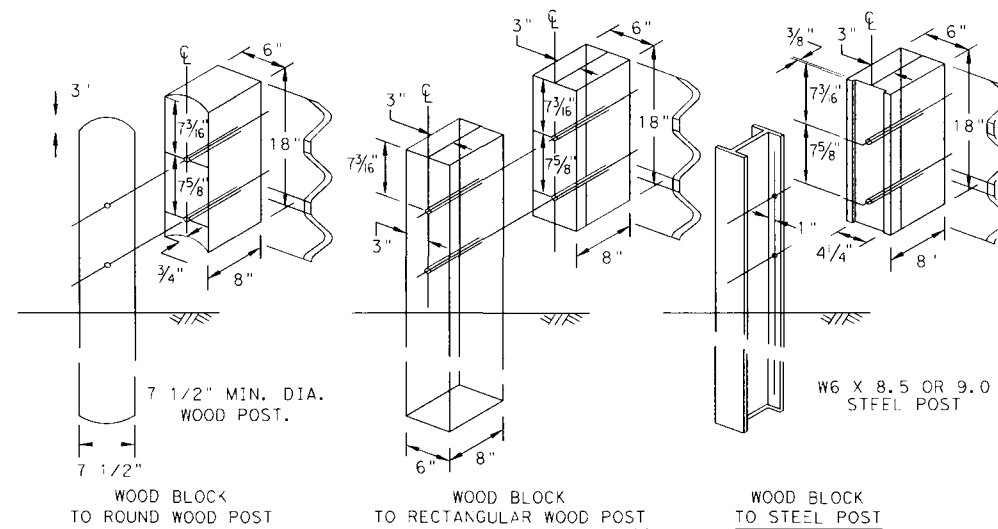


ELEVATION VIEW

NESTED



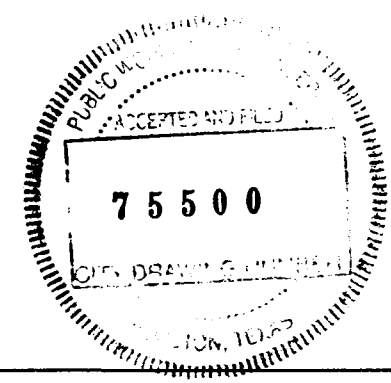
SECTION D-D



THREE BEAM TRANSITION BLOCKOUT DETAILS

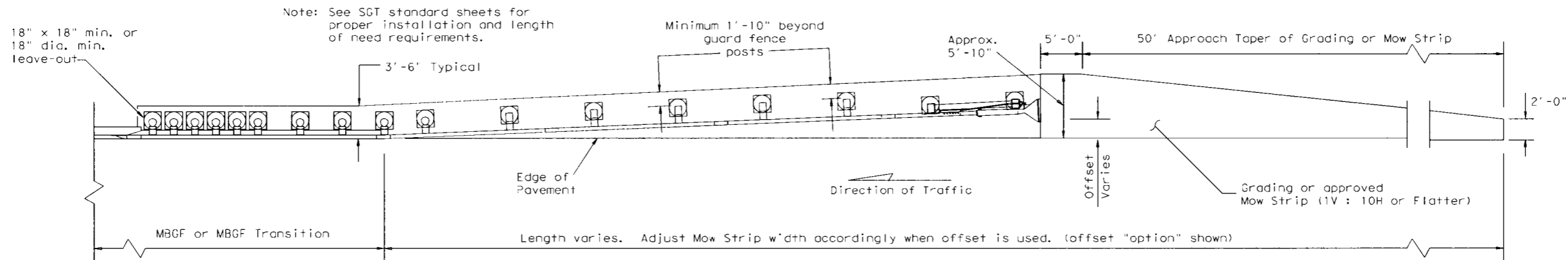
HIGH-SPEED TRANSITION

SHEET 2 OF 2



		<b>Design Division Standard</b>	
METAL BEAM GUARD FENCE THREE-BEAM TRANSITION TL-3 MASH COMPLIANT GF (31) TR TL3-20			
FILE: gf31trtl320.dgn	DN: TxDOT	CK: KM	DR: KM
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		56	

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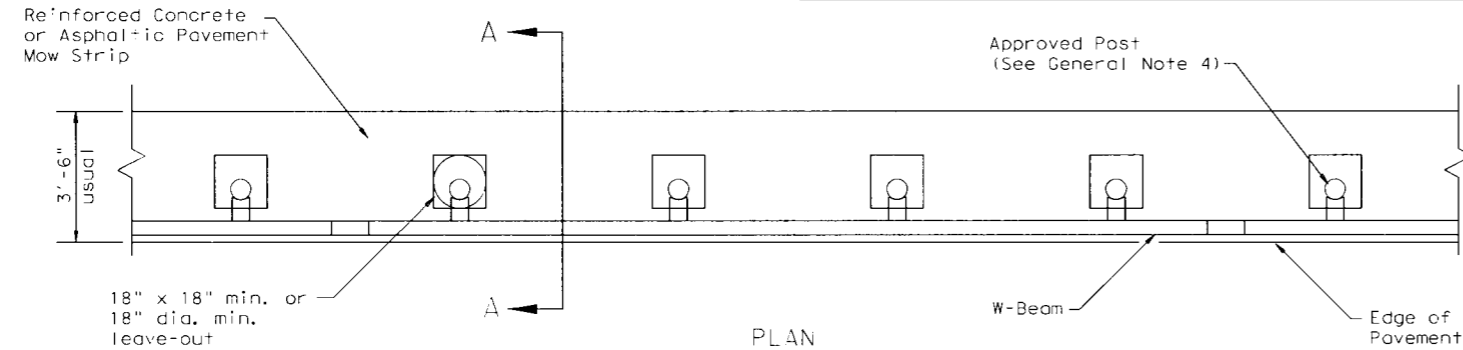


Note: See SGT standard sheets for proper installation and length of need requirements.

Note: Site Condition(s)

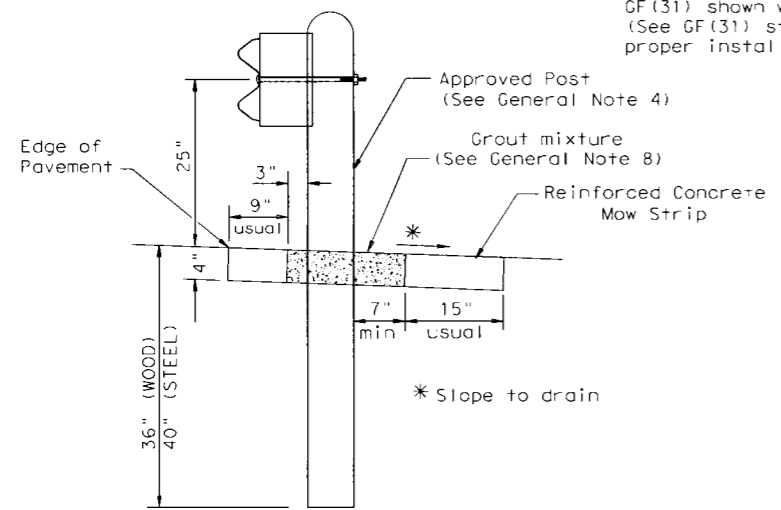
Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.  
Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.

**GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS**

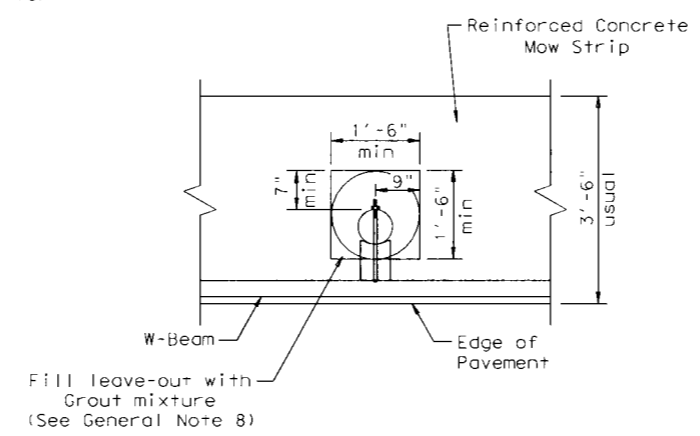


**PLAN**

GF(31) shown with Mow Strip (See GF(31) standard sheet for proper installation)



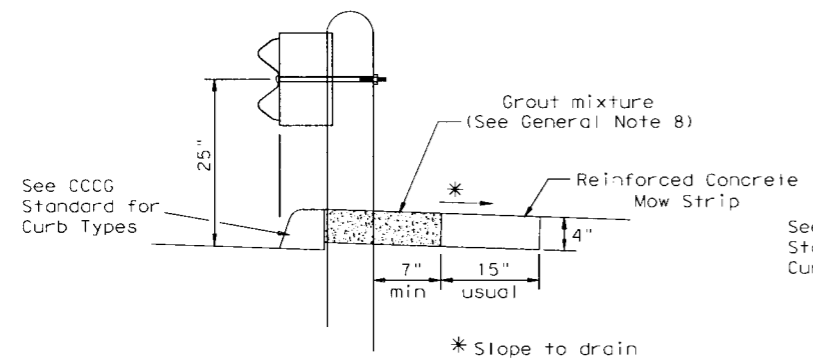
**SECTION A-A**  
Typical



**MOW STRIP DETAIL**

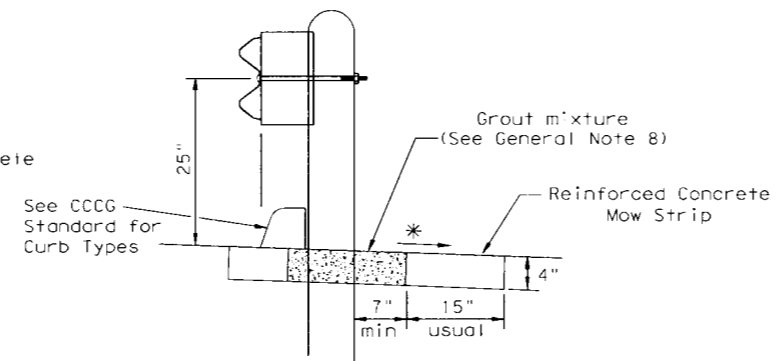
Reinforced Concrete Mow Strip with 18" x 18" Square or 18" Dia. minimum leave-out.

- GENERAL NOTES**
1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBCF or GF(31) Transition Standard sheet for additional information.
  2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
  3. The leave-out behind the post shall be a minimum of 7'.
  4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 1/2' Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
  5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
  6. Thickness of the mow strip will be 4".
  7. The limits of payment for reinforced concrete will include leave-outs for the posts.
  8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 1 or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.



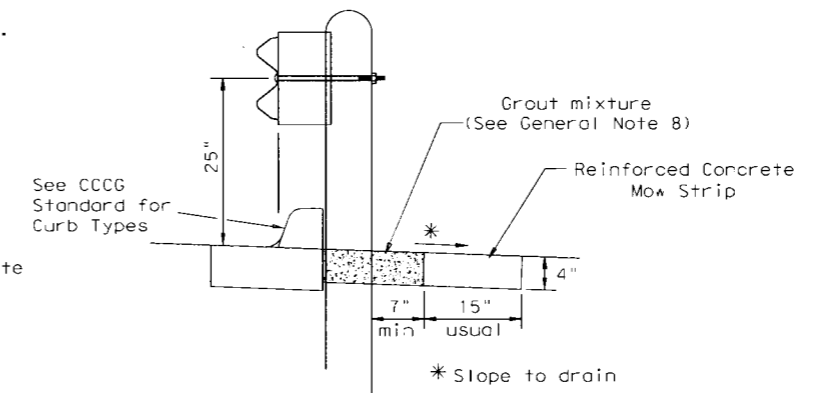
**CURB OPTION (1)**

This option will increase the post embedment throughout the system.

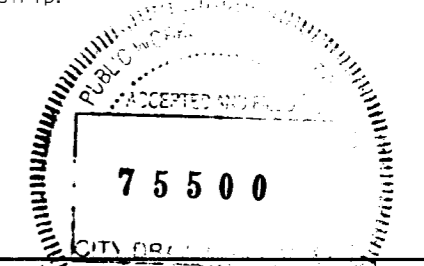


**CURB OPTION (2)**

Curb shown on top of mow strip



**CURB OPTION (3)**



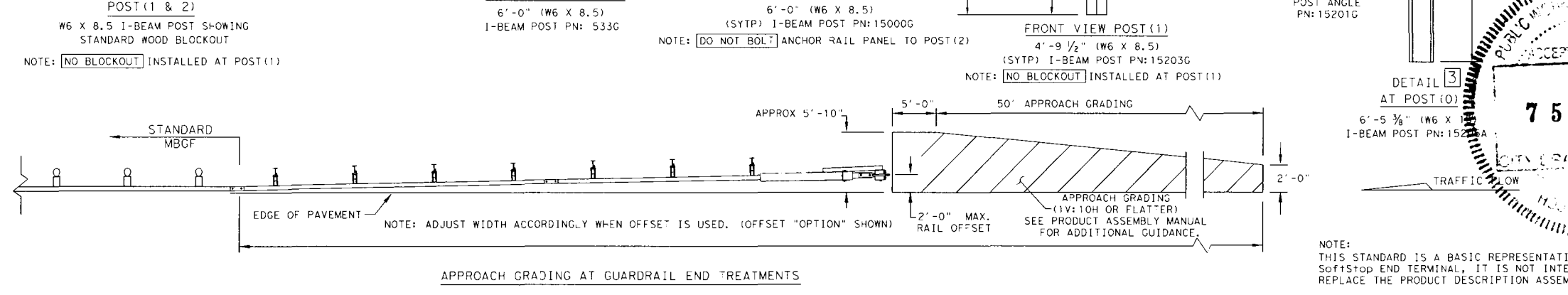
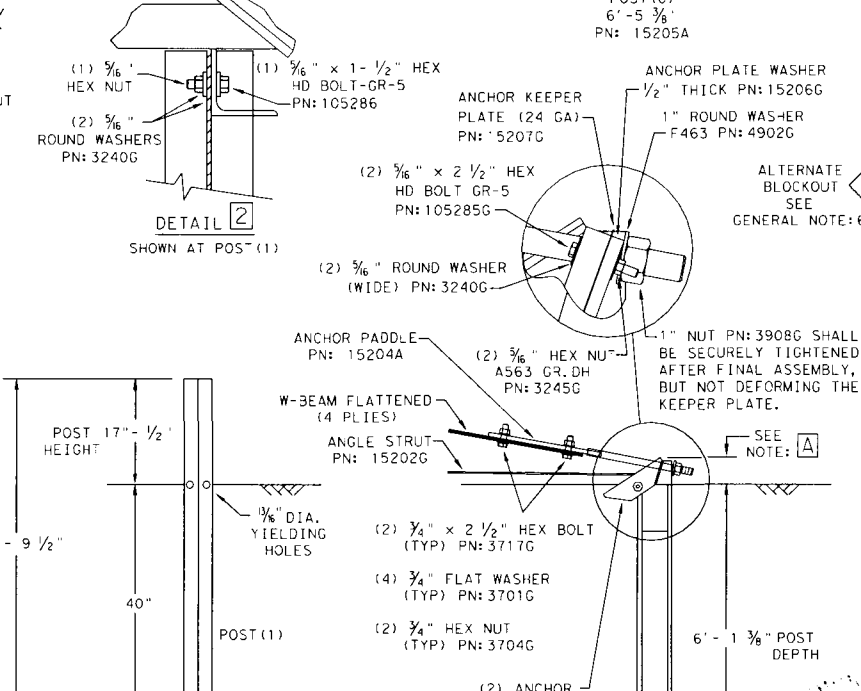
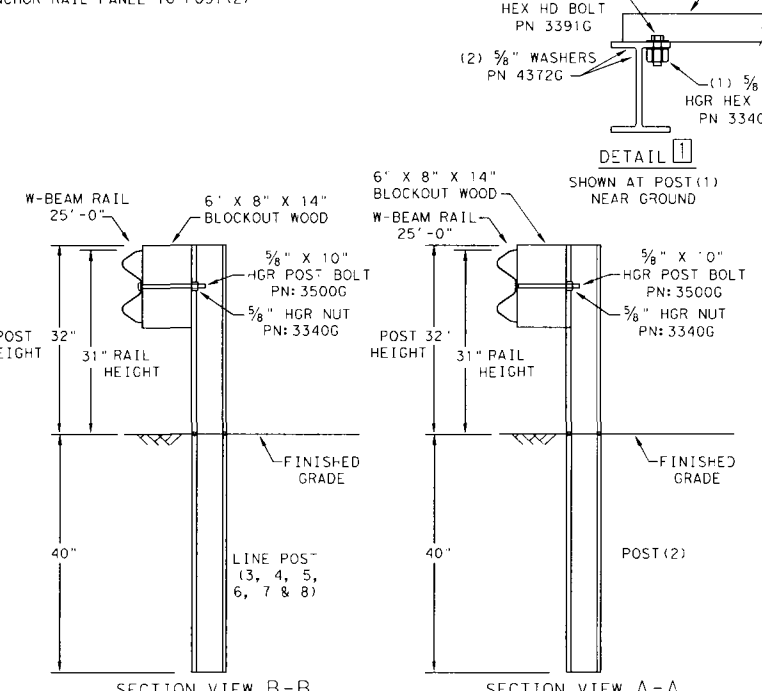
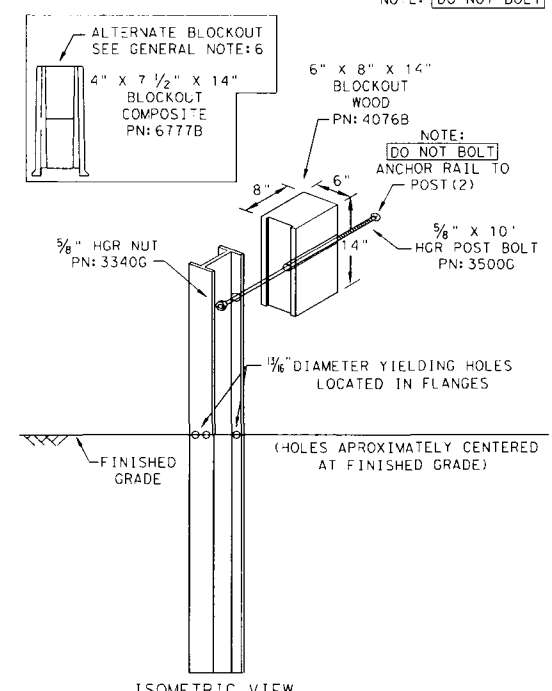
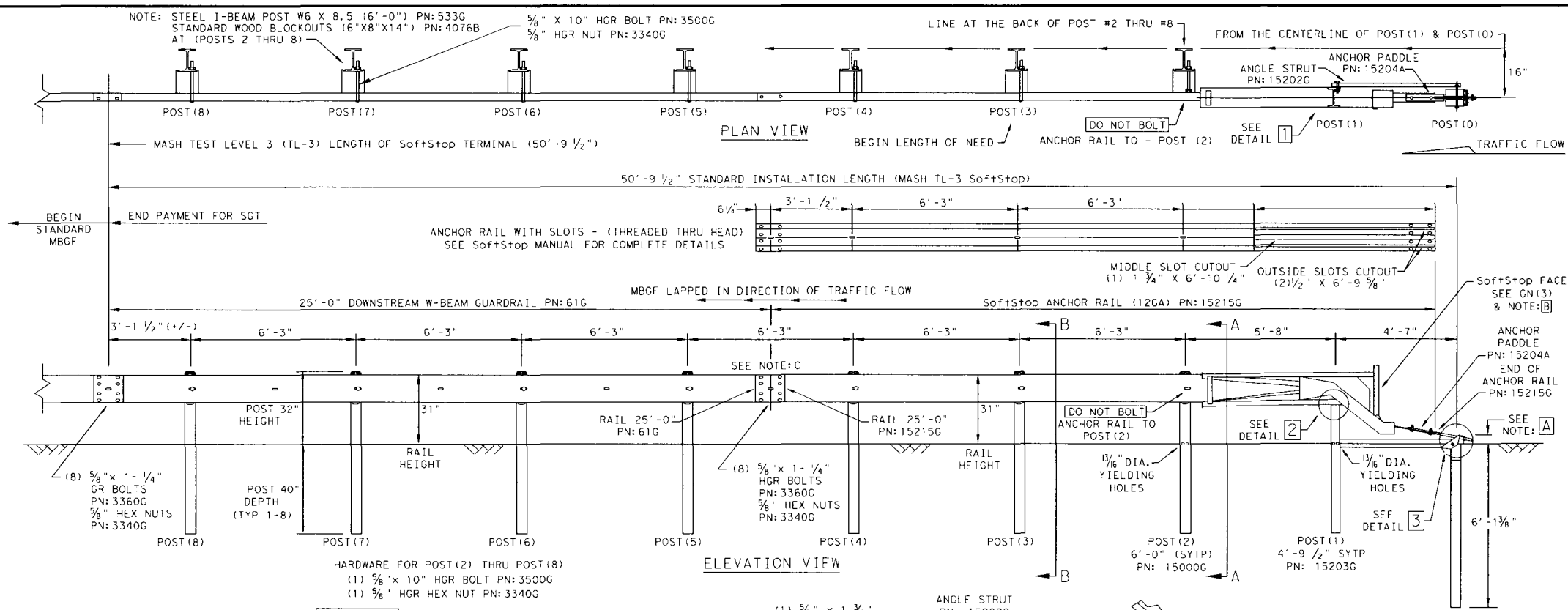
**Texas Department of Transportation**  
Design Division Standard

**METAL BEAM GUARD FENCE (MOW STRIP)**  
**TL-3 MASH COMPLIANT**  
**GF(31)MS-19**

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DR: VP	CR: CGL/AG
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REVISIONS				
DIST	COUNTY	SHEET NO.		57

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- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374, 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE: SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL, PN:620237B
  - APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - A COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
  - IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBSF STANDARD FOR INSTALLATION GUIDANCE.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
  - DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
  - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
  - A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCRoACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

NOTE: A THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3'-3/4" MIN. TO 4" MAX. ABOVE FINISHED GRADE.

NOTE: B PART PN:5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN:5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)

NOTE: C W-BEAM SPLICE LOCATED BETWEEN LINE POST(4) AND LINE POST(5) GUARDRAIL PANEL 25'-0" PN:61G ANCHOR RAIL 25'-0" PN:15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25' - 0")
15205A	1	POST #0 - ANCHOR POST (6' - 5 1/8")
15203C	1	POST #1 - (SYTP) (4' - 9 1/2")
15000G	1	POST #2 - (SYTP) (6' - 0")
533C	6	POST #3 THRU #8 - I-BEAM (W6 X 8.5) (6' - 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" X 8" X 14")
6777B	7	BLOCKOUT - COMPOSITE (4" X 7 1/2" X 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (1/2" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT

HARDWARE		
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	3/4" X 2 1/2" HEX BOLT A325
3701G	4	3/4" ROUND WASHER F436
3704G	2	3/4" HEAVY HEX NUT A563 GR.DH
3360G	16	5/8" X 1 1/4" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	5/8" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	5/8" X 10" HGR POST BOLT A307
3391G	1	5/8" X 1 3/4" HEX HD BOLT A325
4489G	1	5/8" X 9" HEX HD BOLT A325
4372G	4	3/8" WASHER F436
105285G	2	5/8" X 2 1/2" HEX HD BOLT GR-5
105286G	1	5/8" X 1 1/2" HEX HD BOLT GR-5
3240G	6	3/8" ROUND WASHER (WIDE)
3245G	3	3/8" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE: B

75500

TRINITY HIGHWAY  
SOFTSTOP END TERMINAL  
MASH - TL-3  
SGT(10S)31-16

FILE: sgt10s3116  
DN: TxDOT  
CR: KM  
DW: VP  
CR: MB/VP

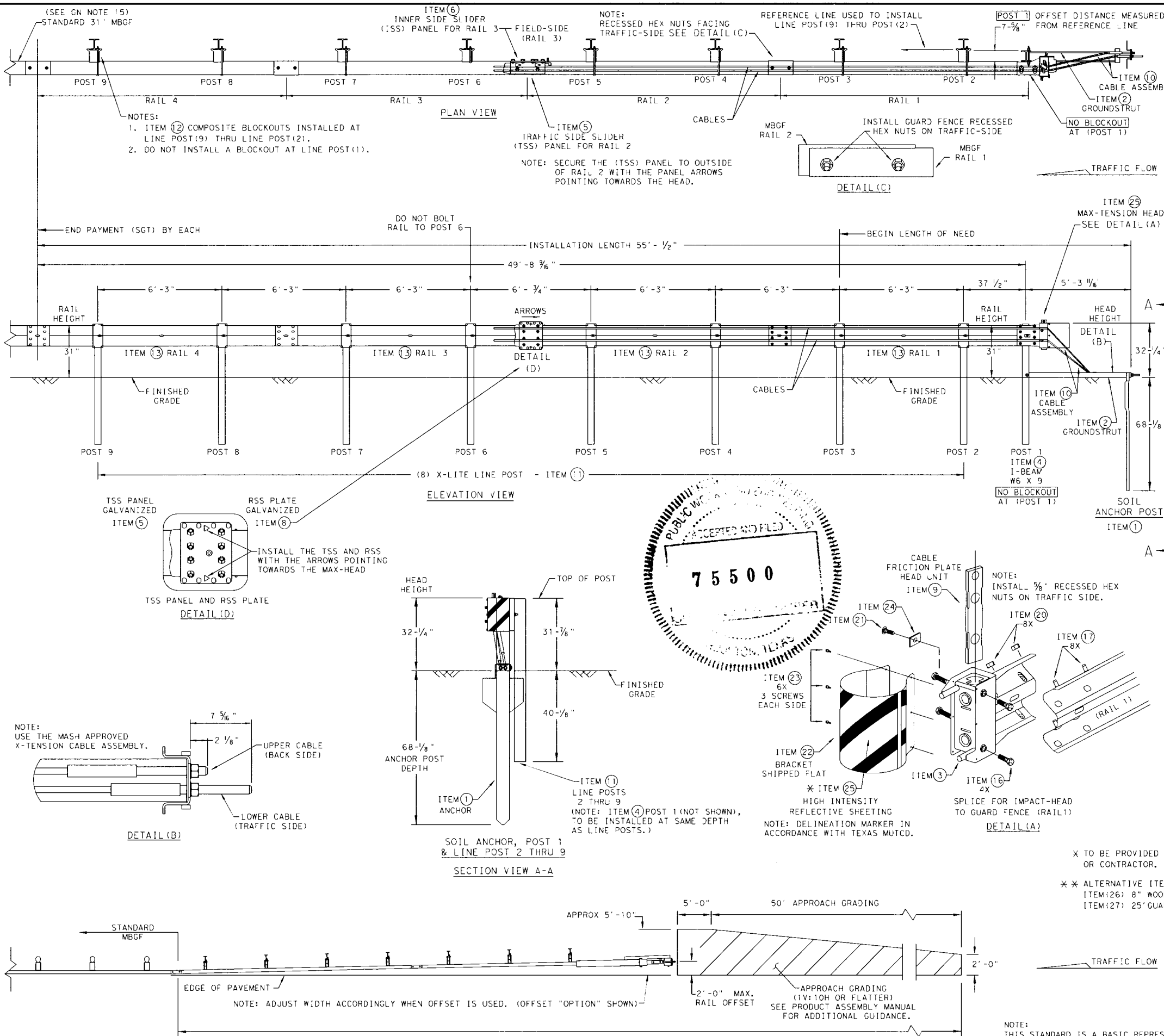
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DIST COUNTY SHEET NO. 58

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE SoftStop END TERMINAL. IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

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**GENERAL NOTES**

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800
- FOR INSTALLATION, REPAIR, & MAINTENANCE REFER TO THE MAX-TENSION INSTALLATION INSTRUCTION MANUAL. P/N MANMAX REV D (ECN 3516).
- APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
- FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
- ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
- SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
- COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) OR CERTIFIED PRODUCERS.
- REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
- IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
- POSTS SHALL NOT BE SET IN CONCRETE.
- A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POST TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST.
- MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
- IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
- THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
- A MINIMUM OF 12'-6" OF 12GA. MBGF IS REQUIRED IMMEDIATELY DOWNSTREAM OF THE MAX-TENSION SYSTEM.

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT, GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	3/8" X 7" THREAD BOLT HH (GR.5) GEOMET	1
16	BSI-2001885	1/4" X 3" ALL-THREAD BOLT HH (GR.5) GEOMET	4
17	4001115	3/8" X 1 1/4" GUARD FENCE BOLTS (GR.2) MGAL	48
18	2001840	3/8" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	3/8" WASHER F436 STRUCTURAL MGAL	2
20	4001116	3/8" RECESSED GUARD FENCE NUT (GR.2) MGAL	59
21	BSI-2001888	3/8" X 2" ALL-THREAD BOLT (GR.5) GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWRO3	1
25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL, 8-SPACE, 12GA.	2
28	MANMAX Rev-D	MAX-TENSION INSTALLATION INSTRUCTIONS	1

\* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.  
 \*\* ALTERNATIVE ITEMS NOT SHOWN.  
 ITEM(26) 8" WOOD-BLOCKOUTS  
 ITEM(27) 25' GUARD FENCE PANELS

**Texas Department of Transportation** Design Division Standard

**MAX-TENSION END TERMINAL**  
 MASH - TL-3  
 SGT(11S)31-18

FILE: sg11s3118.dgn    DN: TxDOT    CK: KM    DW: TxDOT    CK: CL  
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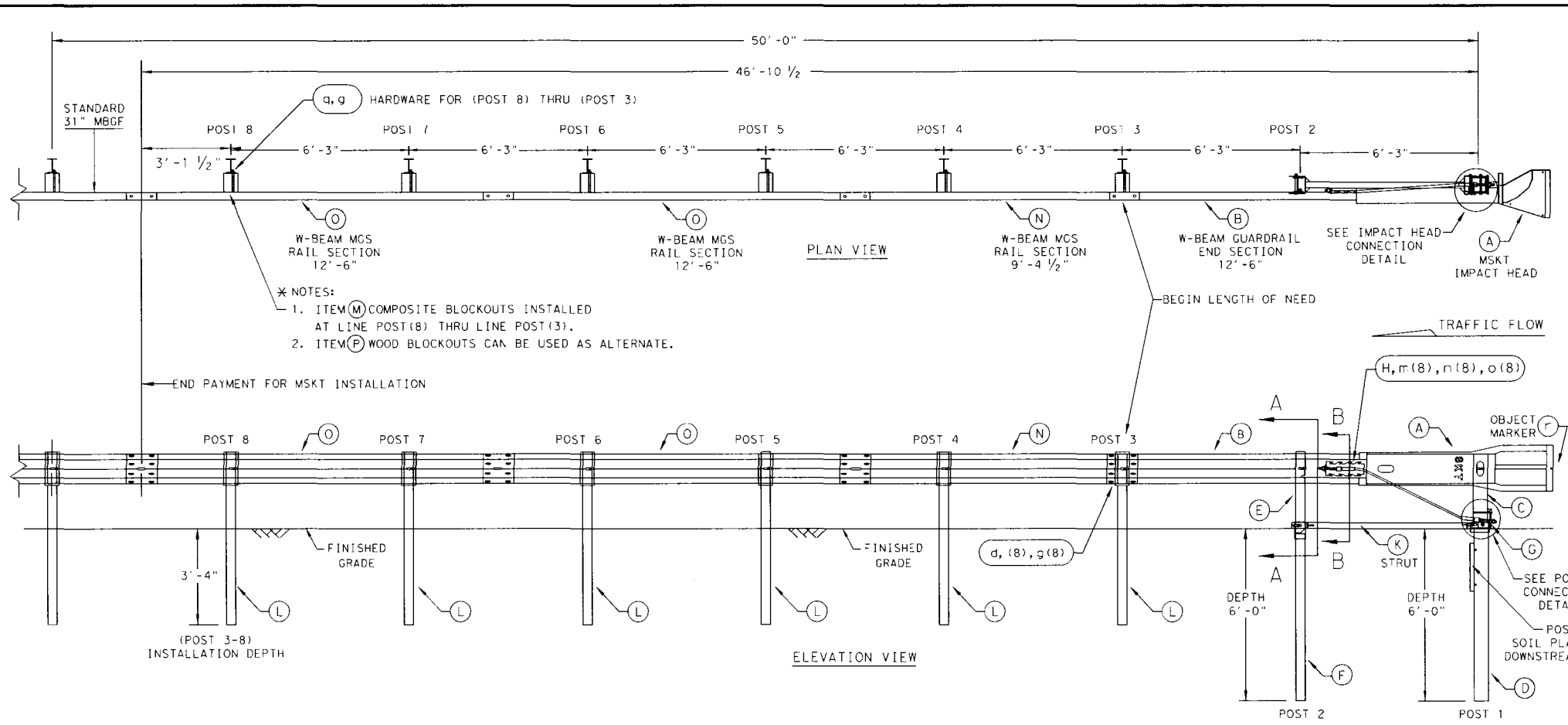
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		59

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MAX-TENSION END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

NOTE: TxDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL "ANGENT TYPE END TREATMENTS."  
 APPROACH GRADING AT GUARDRAIL END TREATMENTS

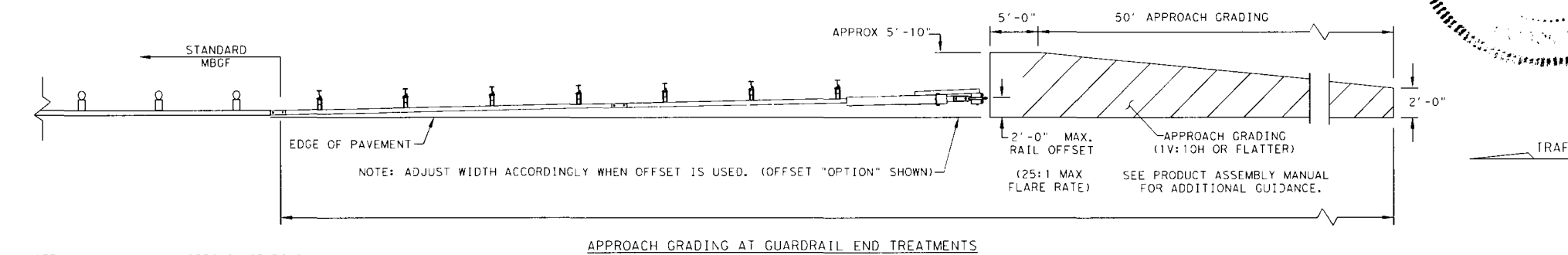
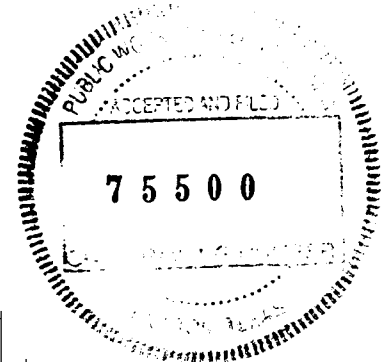
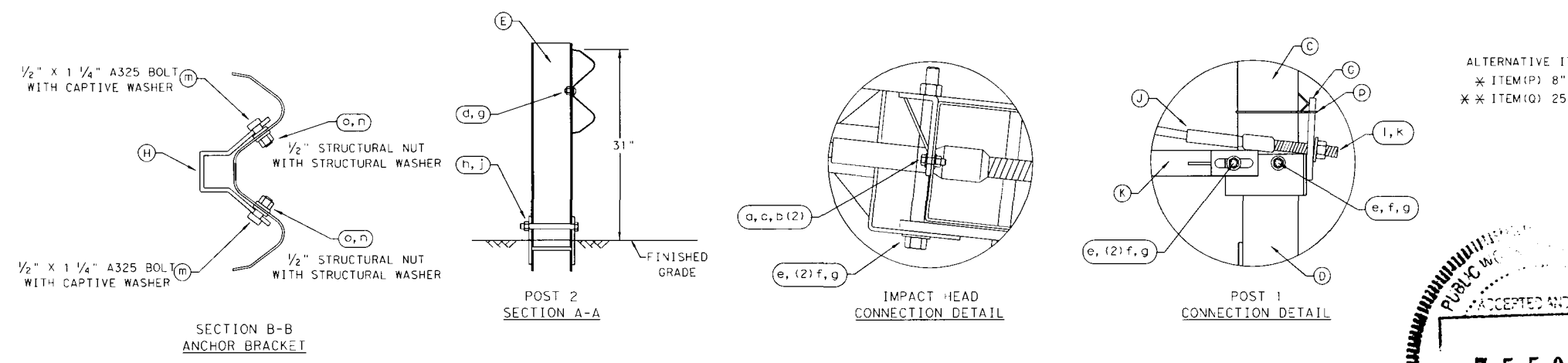
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DATE: FILE:



- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435. 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE: MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION-062717).
  - APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
  - A COMPOSITE MATERIAL BLOCKOUTS THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
  - IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - SYSTEM MUST BE ATTACHED TO STANDARD 31" MBGF.
  - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
  - A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCRANCHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
  - THE SYSTEM IS SHOWN WITH TWO 12'-6" MBGF PANELS, ONE 25'-0" MBGF PANEL IS ALSO ALLOWED IN THEIR PLACE.
  - A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POSTS 3-8 TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST. SPECIAL DRIVING CAP TO BE USED ON LOWER POSTS 1 & 2 TO PREVENT DAMAGE TO THE WELDED PLATES.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Go.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6" W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6" W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6X9 OR W6X8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
SMALL HARDWARE			
a	2	3/8" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/8" WASHER	W0516
c	2	3/8" HEX NUT	N0516
d	25	3/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	3/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	3/8" WASHER	W050
g	33	3/8" Dia. H.G.R. NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/8" O.D. x 3/8" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151



NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MSKT END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

**Texas Department of Transportation** Design Division Standard

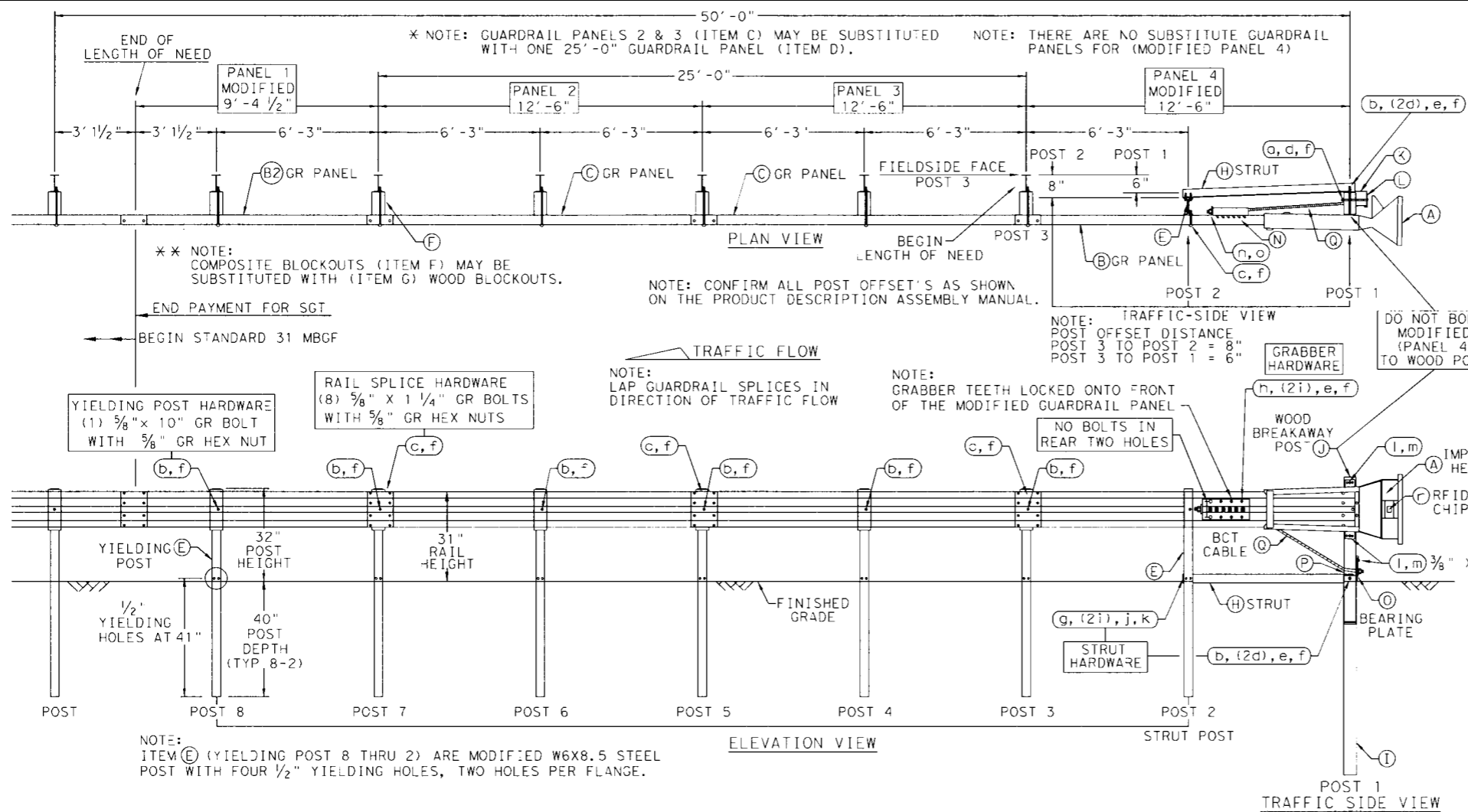
**SINGLE GUARDRAIL TERMINAL**  
MSKT-MASH-TL-3  
SGT (12S) 31-18

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REVISTONS  
DIST COLNTY SHEET NO.  
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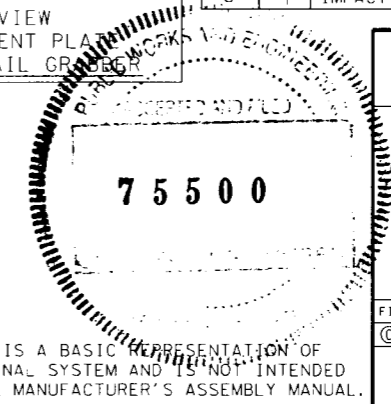
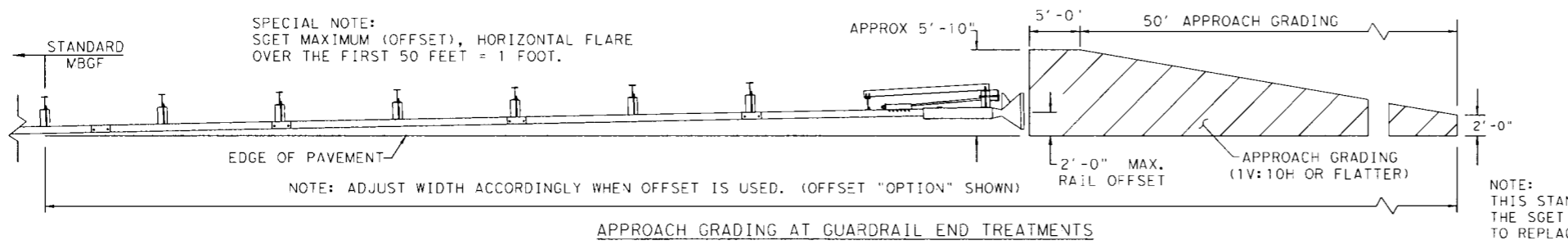
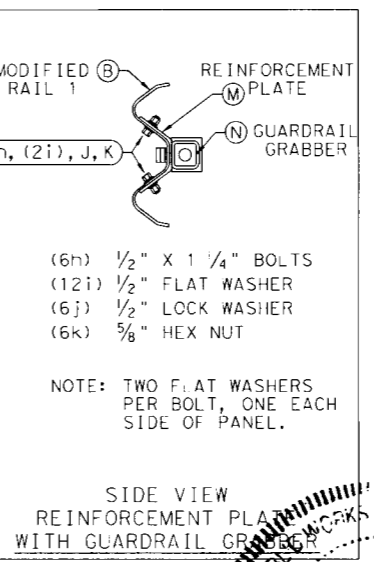
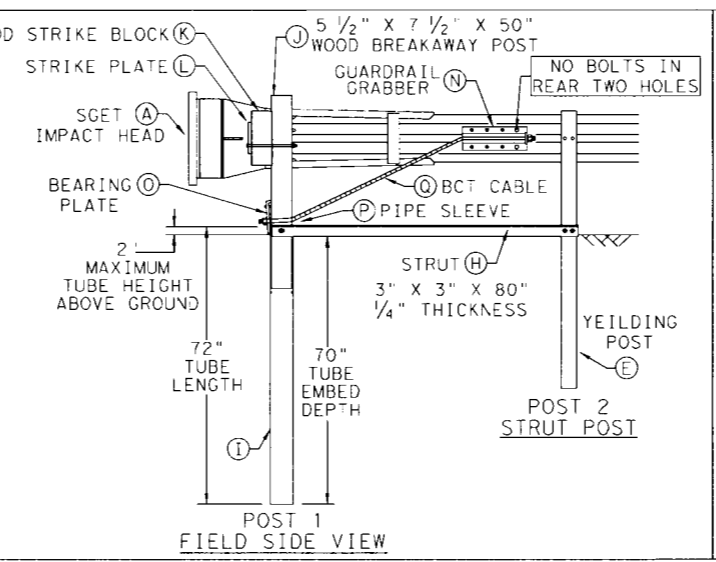
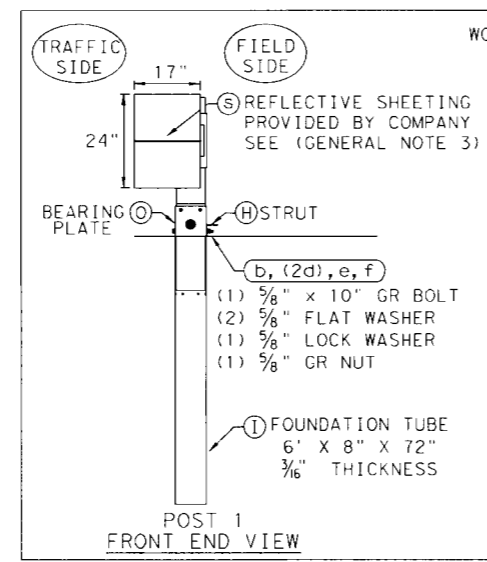
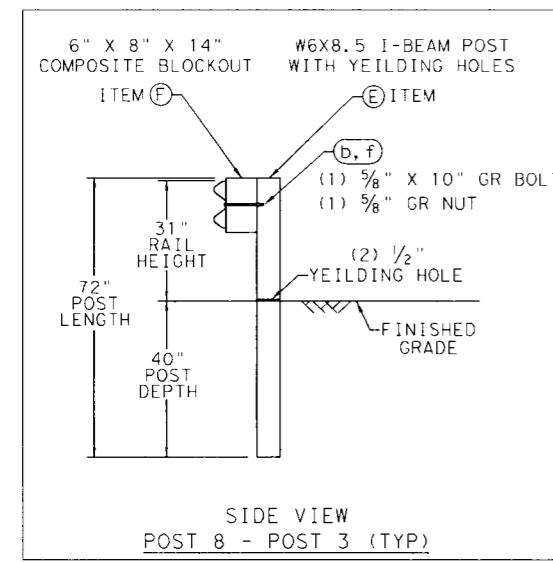
DISCLAIMER: THE USE OF THIS STANDARD IS COVERED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TxDOT FOR ANY PURPOSE WHATSOEVER. TxDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

GENERAL NOTES

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
- FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, "PRODUCT DESCRIPTION ASSEMBLY MANUAL."
- MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
- THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
- FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
- (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
- POSTS SHALL NOT BE SET IN CONCRETE.
- IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
- HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
- A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
- THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.



ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	1265PZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING 1-BEAM POST W6X8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CB08
G	6	WOOD BLOCKOUT 6" X 8" X 14"	WB08
H	1	STRUT 3" X 3" X 80" X 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" X 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" X 7 1/2" X 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 3/8" X 3/8" A36	BPLT8
P	1	PIPE SLEEVE 1 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
SMALL HARDWARE			
o	1	5/8" X 12" GUARDRAIL HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563DH HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M



**Texas Department of Transportation** Design Division Standard

**SPIG INDUSTRY, LLC**  
**SINGLE GUARDRAIL TERMINAL**  
**SGET - TL-3 - MASH**  
**SGT (15) 31-20**

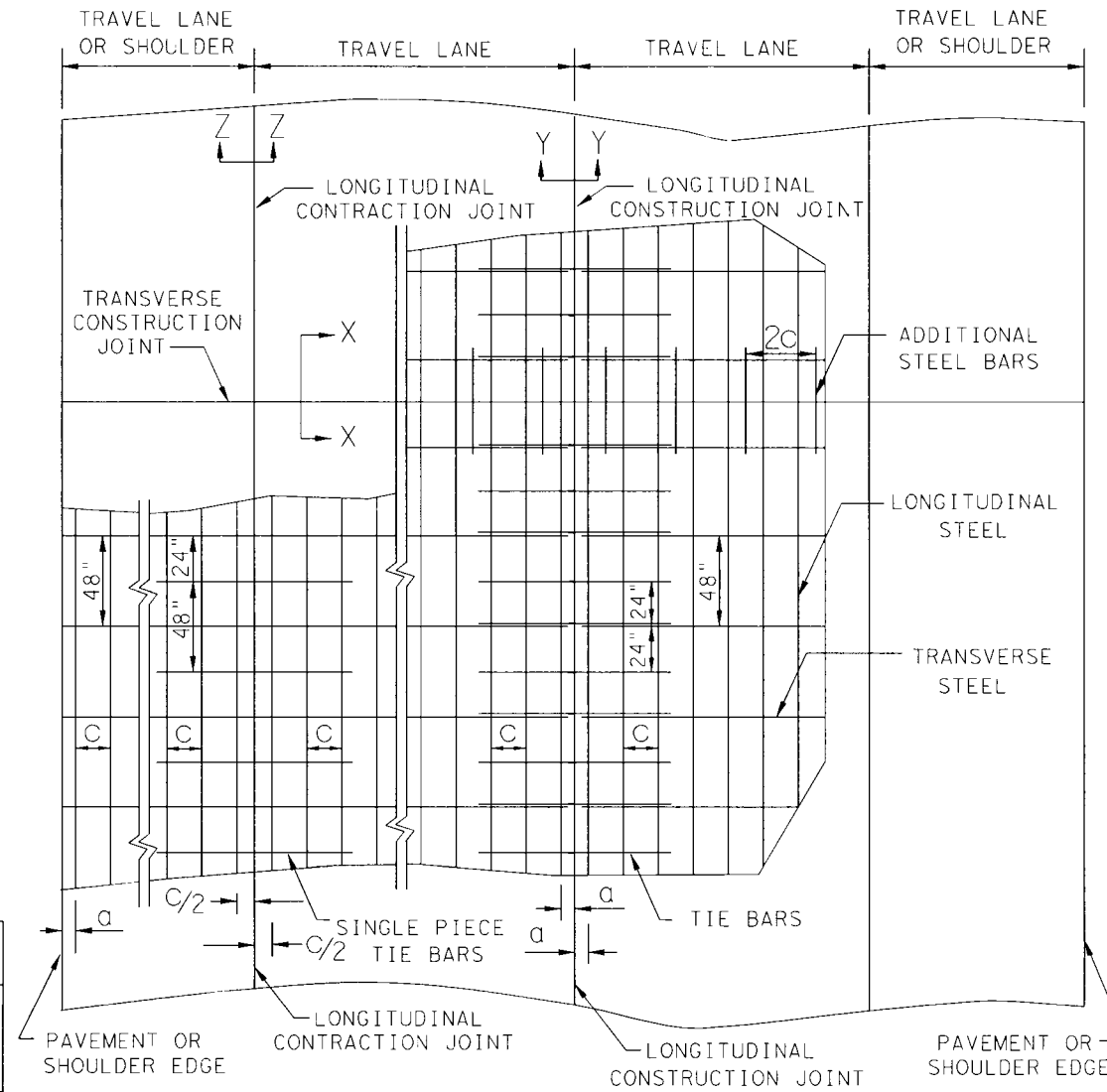
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 REVISIONS DIST COUNTY SHEET NO. **61**

DATE: FILE:

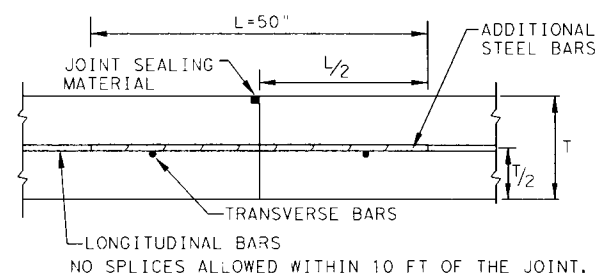
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TABLE NO.1 LONGITUDINAL STEEL					
SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING C (IN.)	SPACING a (IN.)	SPACING 2 x C (IN.)	LENGTH L (IN.)
7.0	#5	6.5	3 TO 4	13	50
7.5	#5	6.0	3 TO 4	12	50
8.0	#6	9.0	3 TO 4	18	50
8.5	#6	8.5	3 TO 4	17	50
9.0	#6	8.0	3 TO 4	16	50
9.5	#6	7.5	3 TO 4	15	50
10.0	#6	7.0	3 TO 4	14	50
10.5	#6	6.75	3 TO 4	13.5	50
11.0	#6	6.5	3 TO 4	13	50
11.5	#6	6.25	3 TO 4	12.5	50
12.0	#6	6.0	3 TO 4	12	50
12.5	#6	5.75	3 TO 4	11.5	50
13.0	#6	5.5	3 TO 4	11	50

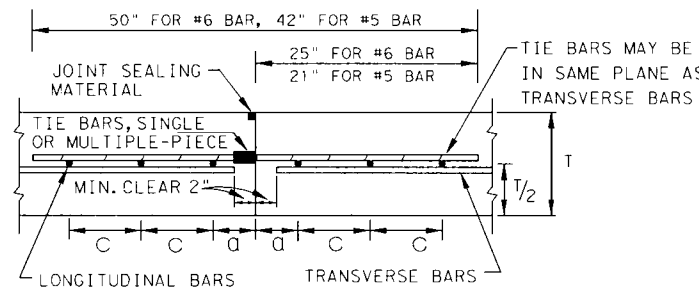
TABLE NO.2 TRANSVERSE STEEL AND TIE BARS						
SLAB THICKNESS (IN.)	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Z-Z)		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Y-Y)	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
7.0 - 7.5	#5	48	#5	48	#5	24
8.0 - 13.0	#5	48	#6	48	#6	24



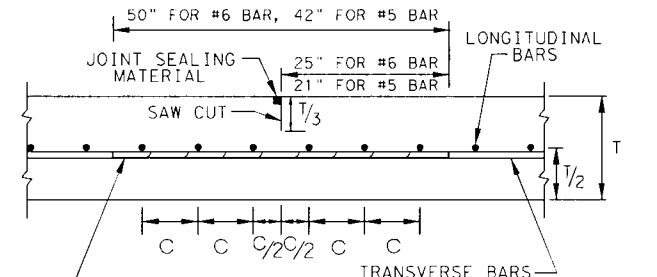
TYPICAL PAVEMENT LAYOUT  
PLAN VIEW (NOT TO SCALE)



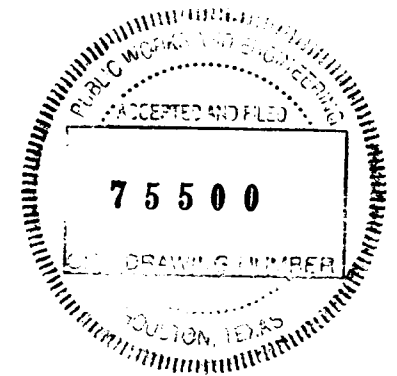
TRANSVERSE CONSTRUCTION JOINT  
SECTION X - X



LONGITUDINAL CONSTRUCTION JOINT  
SECTION Y - Y



LONGITUDINAL CONTRACTION JOINT  
SECTION Z - Z



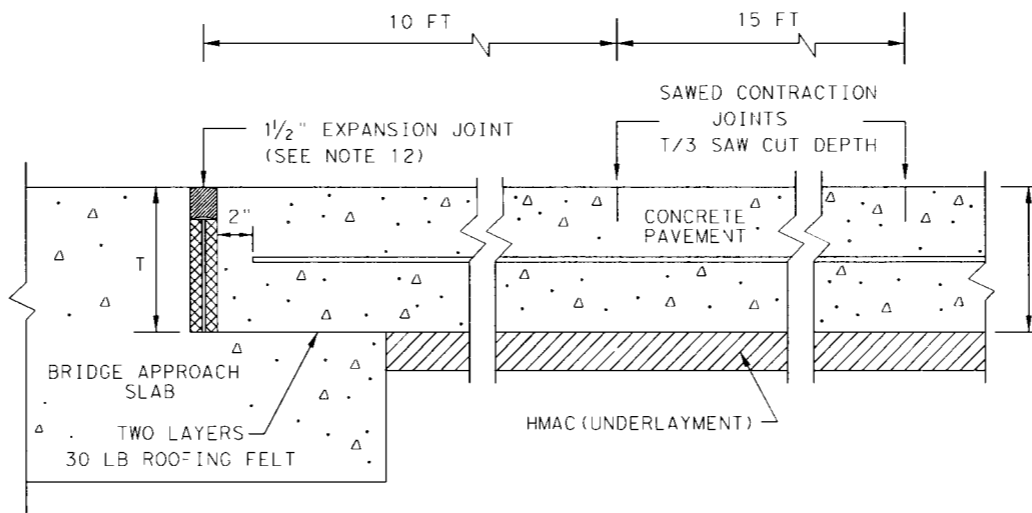
SHEET 1 OF 2

		<b>Design Division Standard</b>	
CONTINUOUSLY REINFORCED CONCRETE PAVEMENT ONE LAYER STEEL BAR PLACEMENT T - 7 TO 13 INCHES CRCP(1)-20			
FILE: crcp120.dgn	DN: TxDOT	CK: KM	DW: AN
© TxDOT: APRIL 2020	CONT	SECT	JOB
REVISIONS	DIST		COUNTY
10/10/2011 ADD GN #12			SHEET NO.
04/09/2013 REMOVE 6" AND 8.5" ADD CTE REQUIREMENTS			62
05/05/2017 COTE AS RATED 4.3			

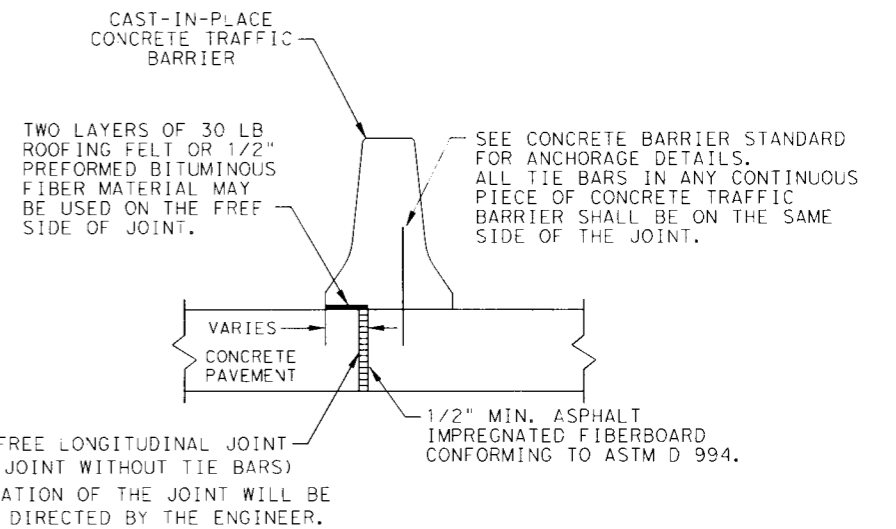
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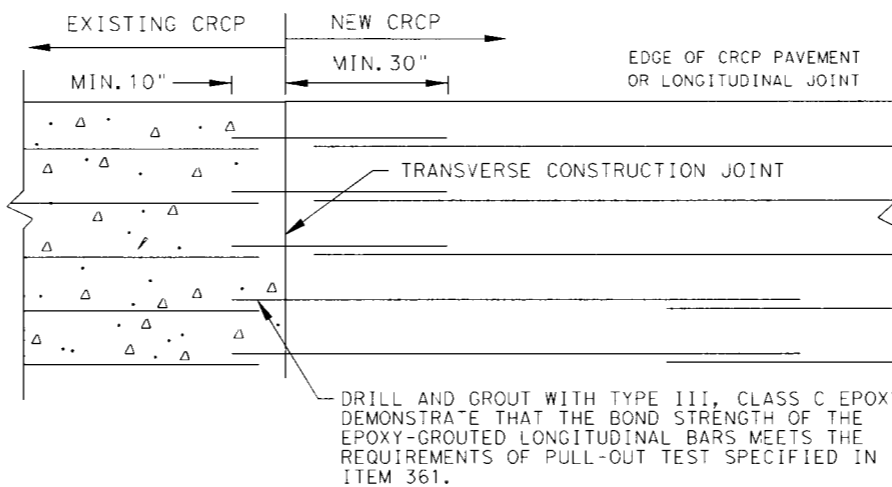
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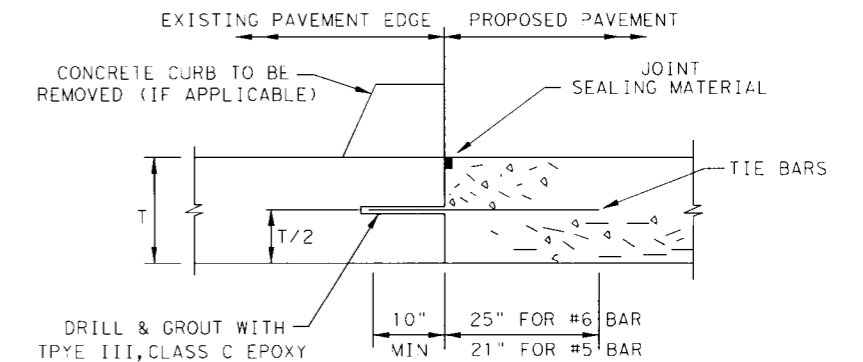
TRANSVERSE EXPANSION JOINT DETAIL  
AT BRIDGE APPROACH



FREE LONGITUDINAL JOINT DETAIL

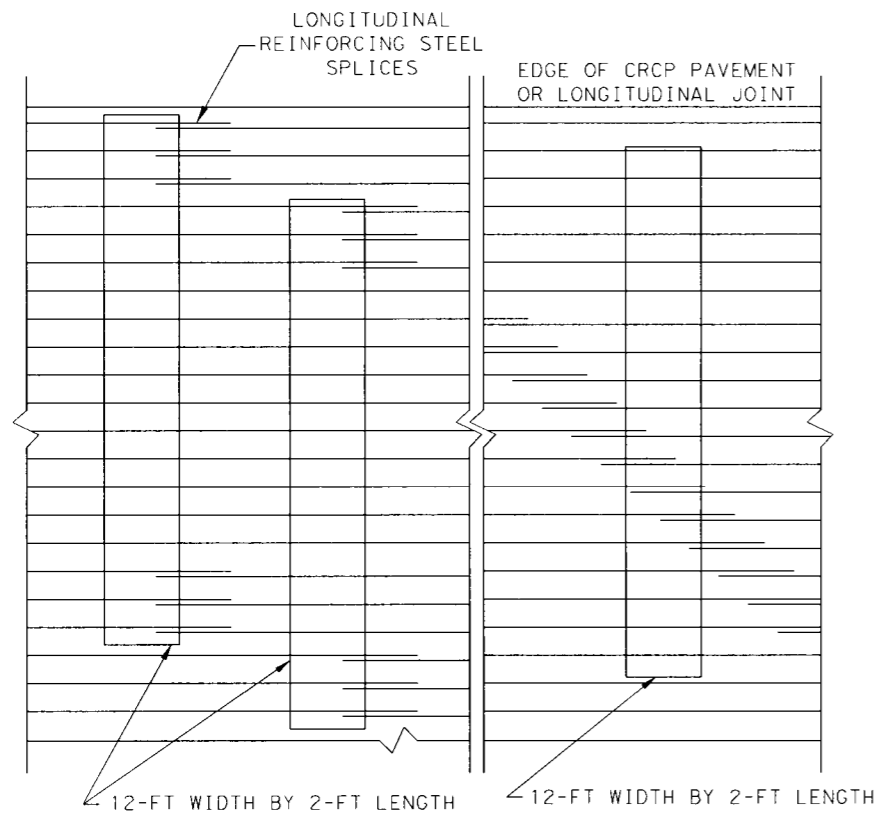


OPTION A: DRILL AND EPOXY  
PLAN VIEW (NOT TO SCALE)



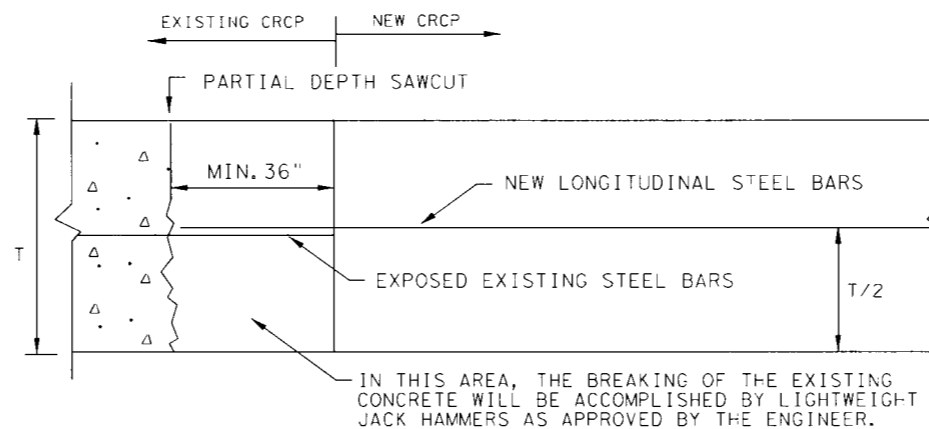
1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 TIE BARS FOR 8" AND THICKER SLABS, USE #5 TIE BARS FOR LESS THAN 8" THICK SLABS.

LONGITUDINAL WIDENING JOINT DETAIL

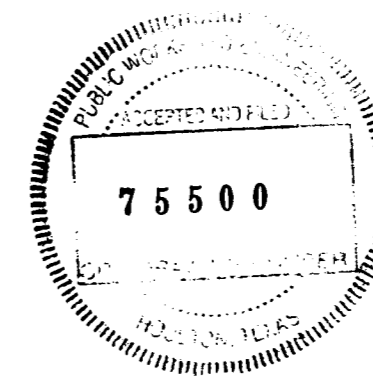


STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT. ANY OTHER LAP CONFIGURATION MEETING THIS REQUIREMENT WILL BE ALLOWED.

EXAMPLES OF LAP CONFIGURATION  
PLAN VIEW (NOT TO SCALE)



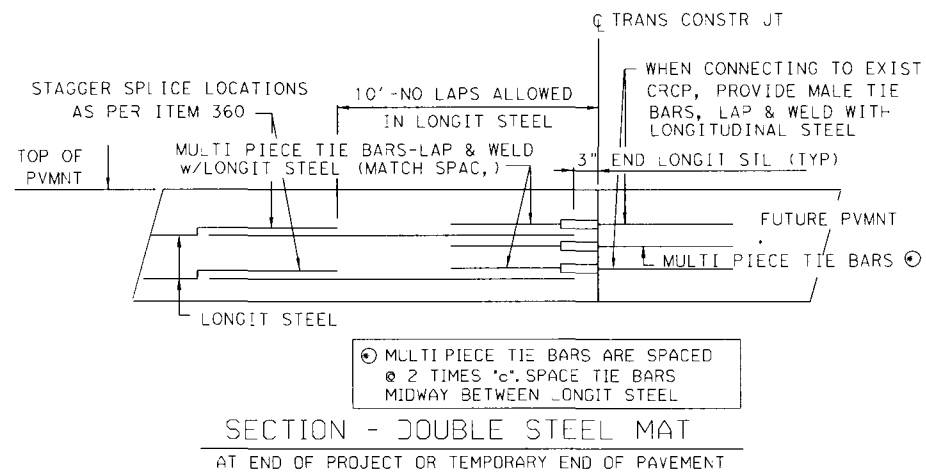
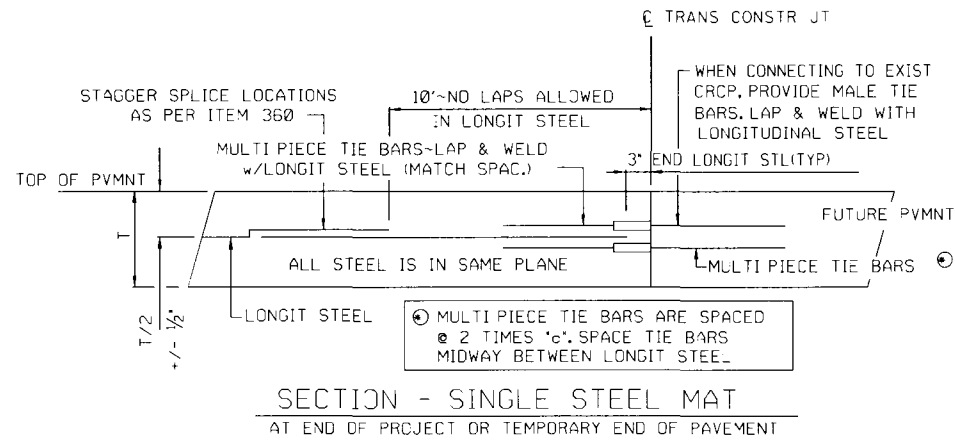
OPTION B: BREAKBACK AND LAP  
TRANSVERSE TIE JOINT DETAIL  
EXISTING CRCP TO NEW CRCP



SHEET 2 OF 2

		<b>Design Division Standard</b>	
<b>CONTINUOUSLY REINFORCED CONCRETE PAVEMENT</b> ONE LAYER STEEL BAR PLACEMENT T - 7 TO 13 INCHES CRCP(1)-20			
FILE: crcp120.dgn	DN: TxDOT	CK: KM	DR: AN
© TxDOT: APRIL 2020	CONT. SECT.	JOB	HIGHWAY
REVISIONS			
03/16/2020 REMOVED TABLE 1A	DIST	COUNTY	SHEET NO.
			<b>63</b>

DATE: FILE:

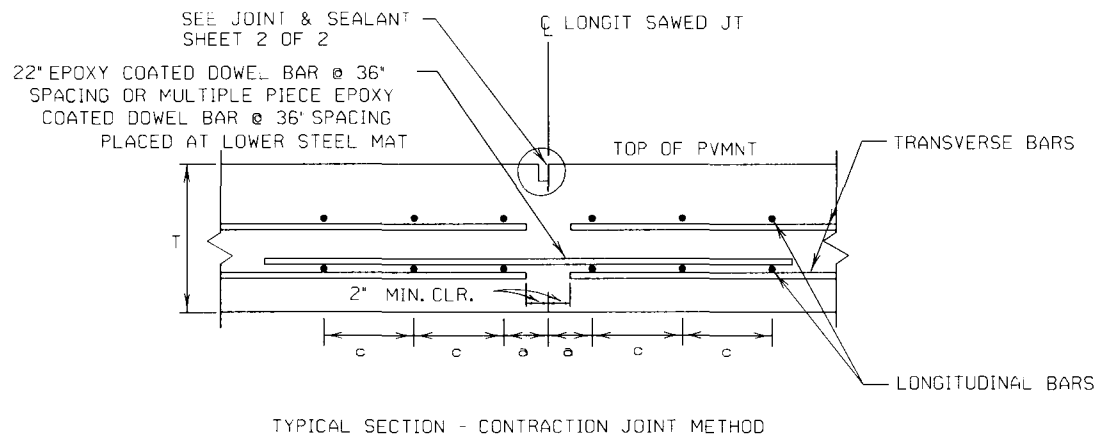
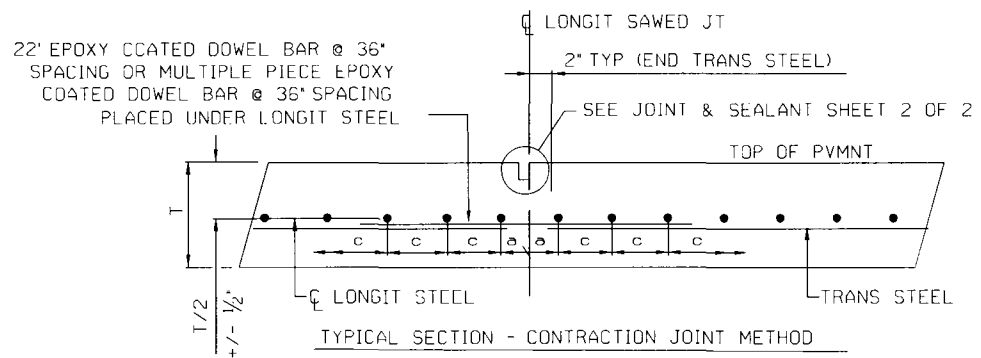
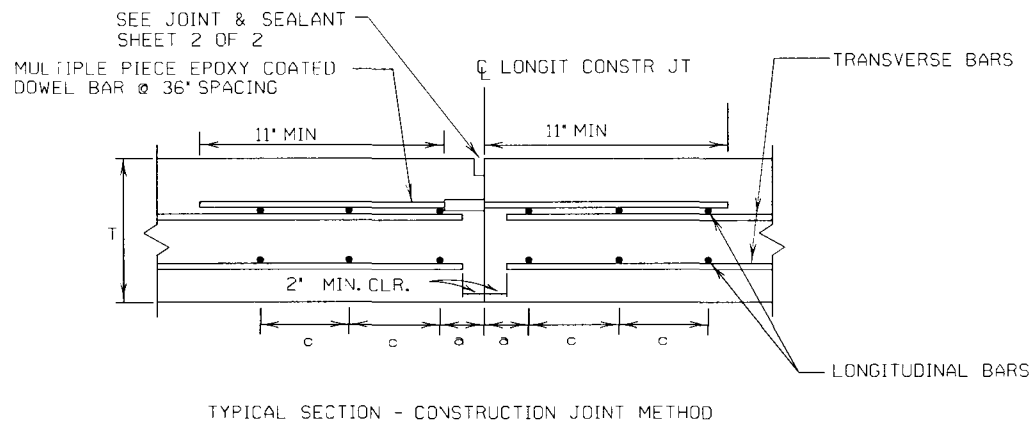
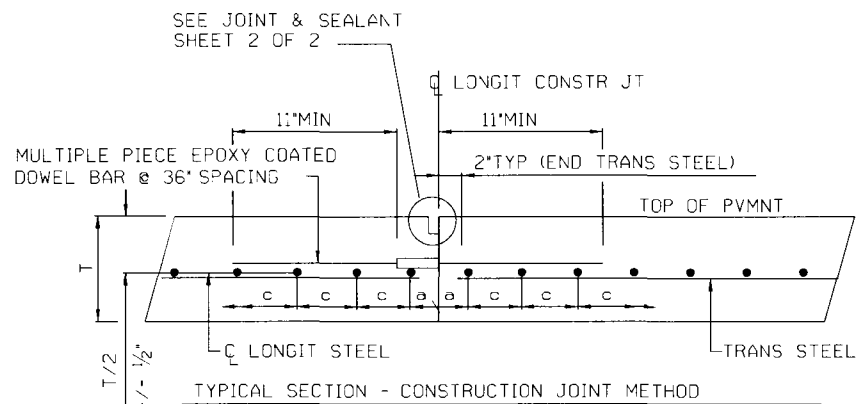


**LONGITUDINAL DOWEL JOINT DETAILS**

LOCATE WHERE SHOWN IN THE PLANS OR AS APPROVED. CONTRACTOR MAY USE EITHER METHOD

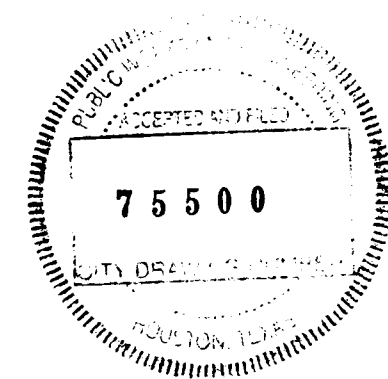
**SINGLE STEEL MAT**

**DOUBLE STEEL MAT**



**GENERAL NOTES**

1. DETAILS FOR 7.0 IN. TO 13.0 IN. THICK CONCRETE PAVEMENT ARE SHOWN ON STANDARD CRCP(1)-17. DETAILS FOR 14 IN. TO 15 IN. THICK CONCRETE PAVEMENT ARE SHOWN ON STANDARD CRCP(2)-17.
2. DOWELS AND TIE BARS - DOWELS ARE ONE INCH MINIMUM DIAMETER. ENSURE DOWELS ARE FREE OF GREASE AND ARE EPOXY COATED. DO NOT SHEAR CUT DOWELS DURING FABRICATION. PROVIDE TIE BARS PER ITEM 360. FURNISH MULTI PIECE TIE BARS AND DOWELS WITH STOP COUPLINGS AND WITH THREADS ON THE BARS.
3. USE CHAIRS OF SUFFICIENT STRUCTURAL QUALITY AND NUMBER TO SUPPORT THE MAT TO THE VERTICAL TOLERANCES. CHAIRS WILL BE APPROVED BY THE ENGINEER AND DO NOT REQUIRE GALVANIZING.
4. MECHANICALLY PLACING REINFORCING STEEL IS NOT ALLOWED. NO BARS, DOWELS OR TIE BARS MAY BE VIBRATED INTO POSITION.
5. WHERE DIFFERENT THICKNESS PAVEMENTS MEET, TRANSITION THE THINNER SECTION TO THE THICKER SECTION OVER A DISTANCE OF 20 FT. PLACE REINFORCING STEEL WITHIN THE TRANSITION THE SAME AS IN THE THICKER PAVEMENT.
6. PERFORM WELDING PER ITEM 448. FURNISH WELDABLE REBAR PER ITEM 440.

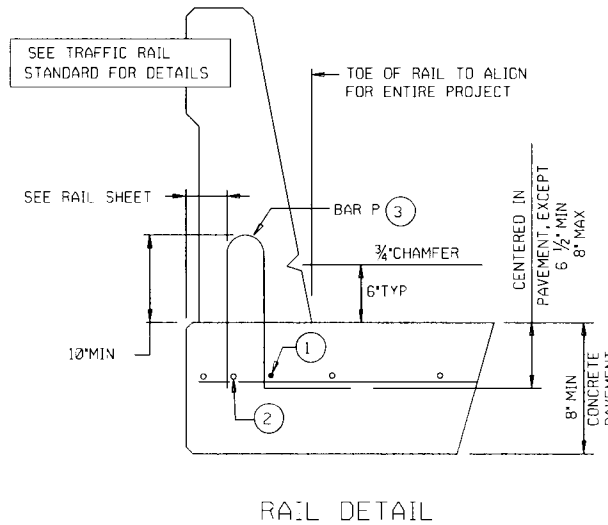
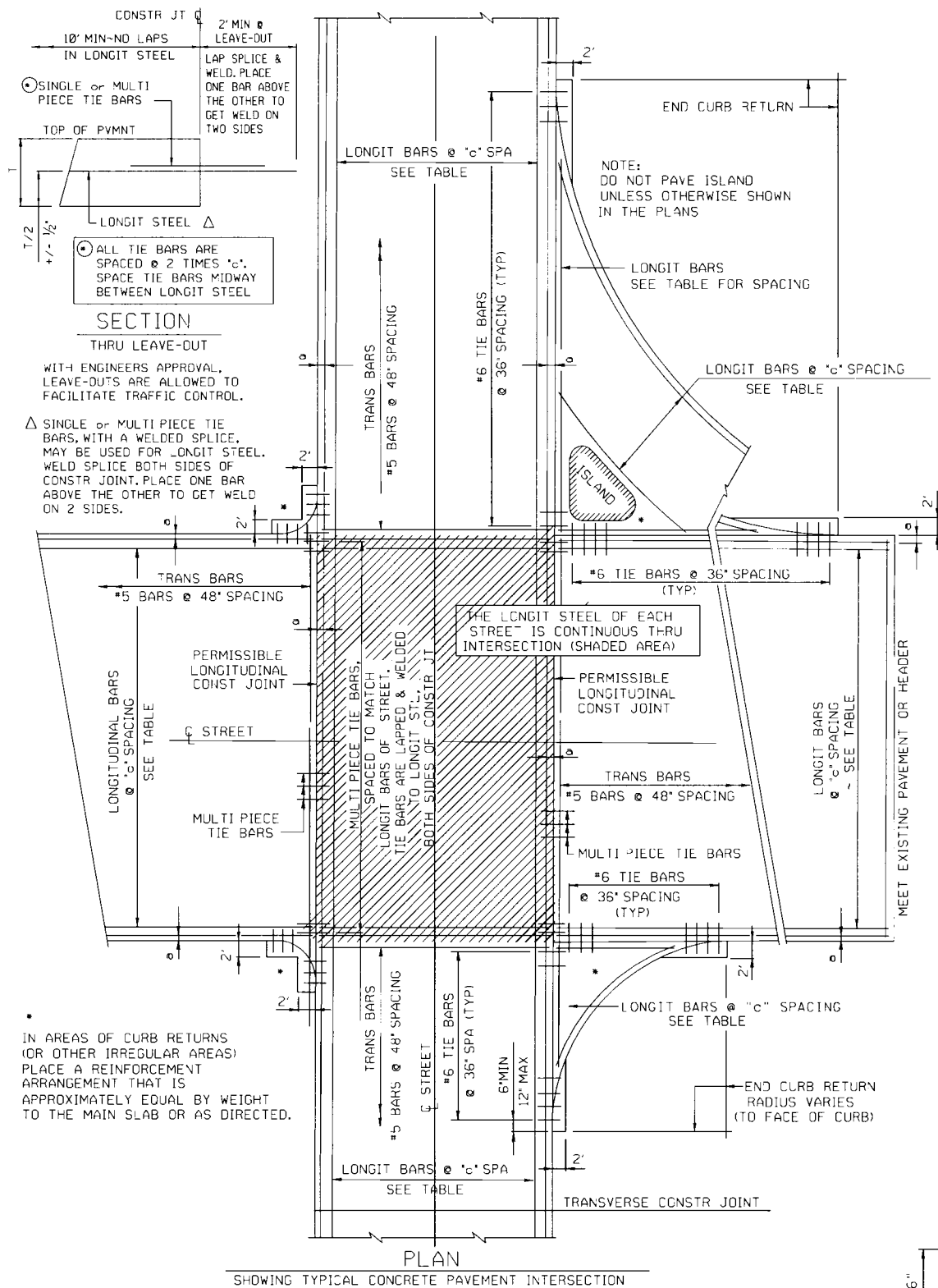


SHEET 1 OF 2

Texas Department of Transportation  
Houston District

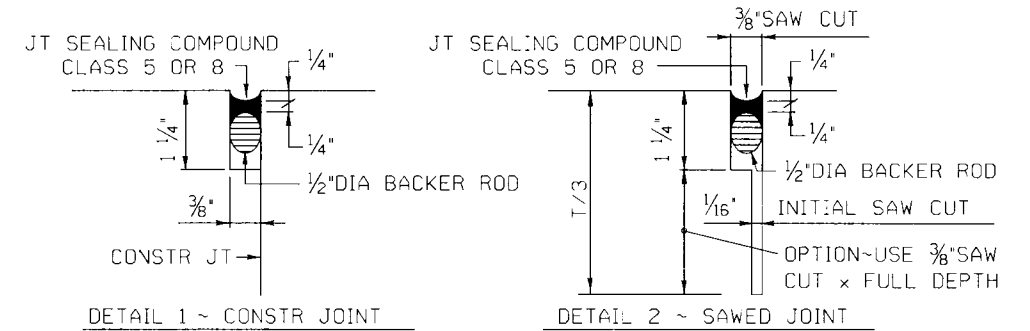
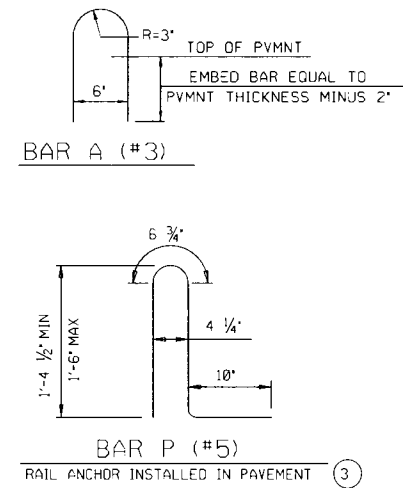
CONTINUOUSLY REINFORCED  
CONCRETE PAVEMENT  
HOUSTON SUPPLEMENT  
CRCP-HS

© TxDOT APR. 2012	DN: -	EN: -	DR: -	CR: -	
REVISIONS	DISTRICT	PROJECT NO.		HIGHWAY	
4/12 CHANGED CTE FROM 6.0 TO 5.0	HOU				
8/14 UPDATE TO REFERENCE CRCP-13 S'NO.					
2/15 REVISED GENERAL NOTES, NUMBER CORRECTIONS.					
4/17 REVISED NOTE #3 OF GENERAL NOTES, NUMBER CORRECTIONS.	COUNTY	CONTROL SECTION	JOB	SHEET	
				64	

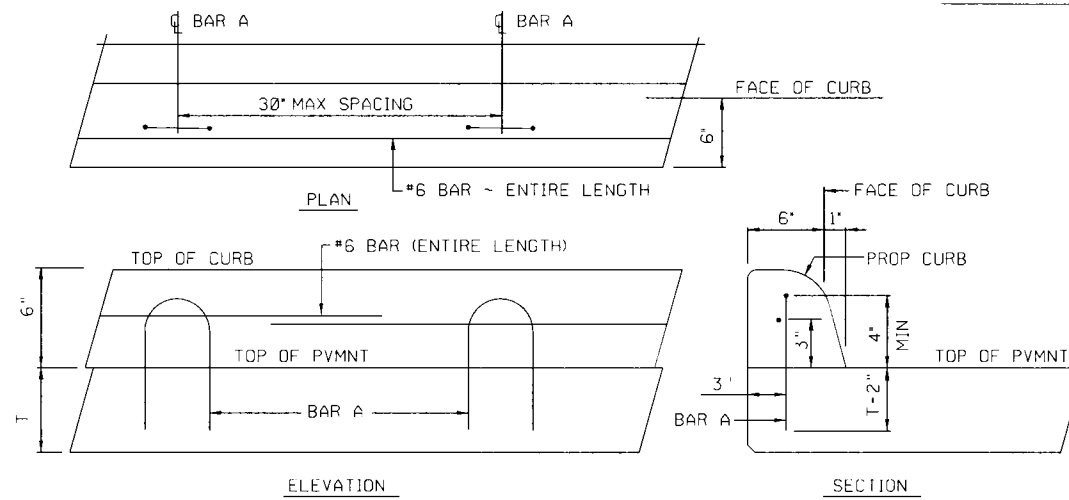


FOR ADDITIONAL DETAILS, SEE RAIL STANDARD SHEET. THE MINIMUM LENGTH OF A CONCRETE RAILING PANEL IS FIVE FEET.

- AS AN AID IN SUPPORTING REINFORCEMENT, ADDITIONAL LONGITUDINAL BARS MAY BE USED IN THE SLAB WITH THE APPROVAL OF THE ENGINEER. FURNISH SUCH BARS AT NO EXPENSE TO THE DEPARTMENT.
- LONGITUDINAL SLAB BAR MAY BE ADJUSTED LATERALLY 3" +/- TO TIE REINFORCING.
- ANCHORAGE BAR SHOWN IS FOR AN SSTR OR T551 RAIL. SEE RAILING DETAIL SHEET FOR SPACING OF BAR P. FOR OTHER RAIL TYPES SEE RAILING DETAIL SHEET.



**JOINT AND SEALANT DETAILS**



**CURB DETAIL**  
SEE CC & DID STANDARD

Texas Department of Transportation  
Houston District

CONTINUOUSLY REINFORCED  
CONCRETE PAVEMENT  
HOUSTON SUPPLEMENT  
CRCP-HS

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REVISIONS	DATE	BY	CHKD	PROJECT NO.	ROADWAY
4/12 CHANGED CTE FROM 6.0 TO 5.0 (ON SHEET 1)					
2/15 MINOR CORRECTIONS.					
	DISTRICT				
	HOU				
	COUNTY	CONTROL	SECTION	JOB	SHEET
					65

STD-B1B

1. DEFINITION OF TERMS

$T_{FS}$  - FAST TRACK CONCRETE PAVING DEPTH AT INTERSECTIONS AND LEAVE OUTS.  
 $T$  - NOMINAL CONCRETE PAVING DEPTH AS SHOWN IN THE PLANS.  
 DETERMINE FAST TRACK CONCRETE PAVING DEPTH USING TABLE 1 AND THE NOMINAL CONCRETE PAVING DEPTH "T" SHOWN IN THE PLANS.

2. AT INTERSECTIONS AND LEAVE-OUT LOCATIONS USE THE SAME LONGITUDINAL AND TRANSVERSE BAR SPACING FOR THE FAST TRACK PAVING AREA AS THAT USED FOR THE ADJACENT CONCRETE PAVING DEPTH "T" (EXCEPT BAR SIZE SHALL BE #7 ON SINGLE MAT). FOR SINGLE MAT FAST TRACK PAVING, PLACE THE LONGITUDINAL AND TRANSVERSE BARS FOR THE FAST TRACK PAVING AREA AT THE HORIZONTAL PLANE ELEVATION THAT IS TWO TIE-BAR DIAMETERS LOWER THAN THAT USED FOR THE ADJACENT CONCRETE PAVEMENT DEPTH "T", AS SHOWN IN FIGURE 1. USE SINGLE MAT STEEL IN FAST TRACK PAVING AREAS ADJACENT TO PAVEMENT SLABS WITH SINGLE MAT REINFORCING. USE DOUBLE MAT STEEL IN FAST TRACK PAVING AREAS ADJACENT TO PAVEMENT SLABS WITH DOUBLE MAT REINFORCING.

3. THE REQUIRED FAST TRACK PAVING AREAS WILL BE SHOWN ON THE PLANS. THE CONTRACTOR HAS THE OPTION TO UTILIZE FAST TRACK CONCRETE PAVING AT U-TURNS, AT INTERSECTIONS, AT MINOR STREETS, AND AT DRIVEWAYS WITH FRONTAGE ROAD LEAVE-OUT AREAS THAT ARE NOT SHOWN ON THE PLANS, WITH PRIOR WRITTEN APPROVAL FROM THE ENGINEER. TYPICAL PAVING PLANS FOR THE INTERSECTION OF A MAJOR STREET WITH THE FRONTAGE ROAD ARE SHOWN AS FIGURE 2, AND FOR THE INTERSECTION OF A MINOR STREET OR DRIVEWAY WITH THE FRONTAGE ROAD AS FIGURE 3. FAST TRACK PAVE THE FRONTAGE ROAD FOR THE FULL FRONTAGE ROAD WIDTH AND PLACE IN STAGES AS REQUIRED.

4. USE ADDITIONAL #6 REINFORCING STEEL BARS (MINIMUM 42 INCHES LONG) AND SPACE THEM MIDWAY BETWEEN ALTERNATE LONGITUDINAL BARS ALONG THE TRANSVERSE CONSTRUCTION JOINT FORMED AT THE FAST TRACK PAVING INTERFACE ( $T_{FS}$ ) WITH THE ADJACENT PAVEMENT SLAB (T).

5. SPLICE LENGTH IS A MINIMUM OF 33 TIMES THE NOMINAL STEEL DIAMETER.

6. PLACE THE CONCRETE PLACEMENT AT A UNIFORM DEPTH THROUGHOUT THE FAST TRACK CONCRETE PAVING AREA.

7. FOR CONTINUOUS SECTIONS OF ROADWAY WHERE FAST TRACK PAVING IS THE PRIMARY PAVEMENT TYPE, USE THE BAR SIZE AND SPACING FROM THE CRCP STANDARDS THAT CORRESPONDS TO THE FAST TRACK SLAB THICKNESS.

8. USE LONGITUDINAL TIE-BARS OF THE SAME SIZE DIAMETER AND SPACING AS THE LONGITUDINAL BAR. A SINGLE PIECE TIE-BAR MAY BE USED IF THE 33 TIMES DIAMETER TIE-BAR PROJECTION DOES NOT INTERFERE WITH THE SAFE HANDLING OF TRAFFIC.

9. BASE THE DEPTH OF SAW CUTS FOR SAWED JOINTS ON THE FAST TRACK CONCRETE PAVEMENT THICKNESS.

10. THIS STANDARD IS NOT INTENDED TO REPLACE OTHER STANDARDS EXCEPT WHERE SPECIFICALLY STATED HEREIN. FOR PAVING DETAILS NOT SHOWN ON THIS DRAWING, REFER TO THE STANDARD SHEETS FOR CONTINUOUSLY REINFORCED CONCRETE PAVEMENT SHOWN ELSEWHERE IN THE PLANS.

TABLE 1

EQUIVALENT PAVEMENT THICKNESS	
T* (IN.)	$T_{FS}$ ** (IN.)
<=12"	T+3"
>12'	15"

\* WITH BASE STRUCTURE OF:  
 1" ASPHALT STABILIZED BASE  
 6" PORTLAND CEMENT TREATED BASE  
 6" LIME TREATED SUBGRADE

\*\* ON AS CLT SUBGRADE

\*\*\* SEE JOINT SEALING DETAILS ON CRCP STANDARDS

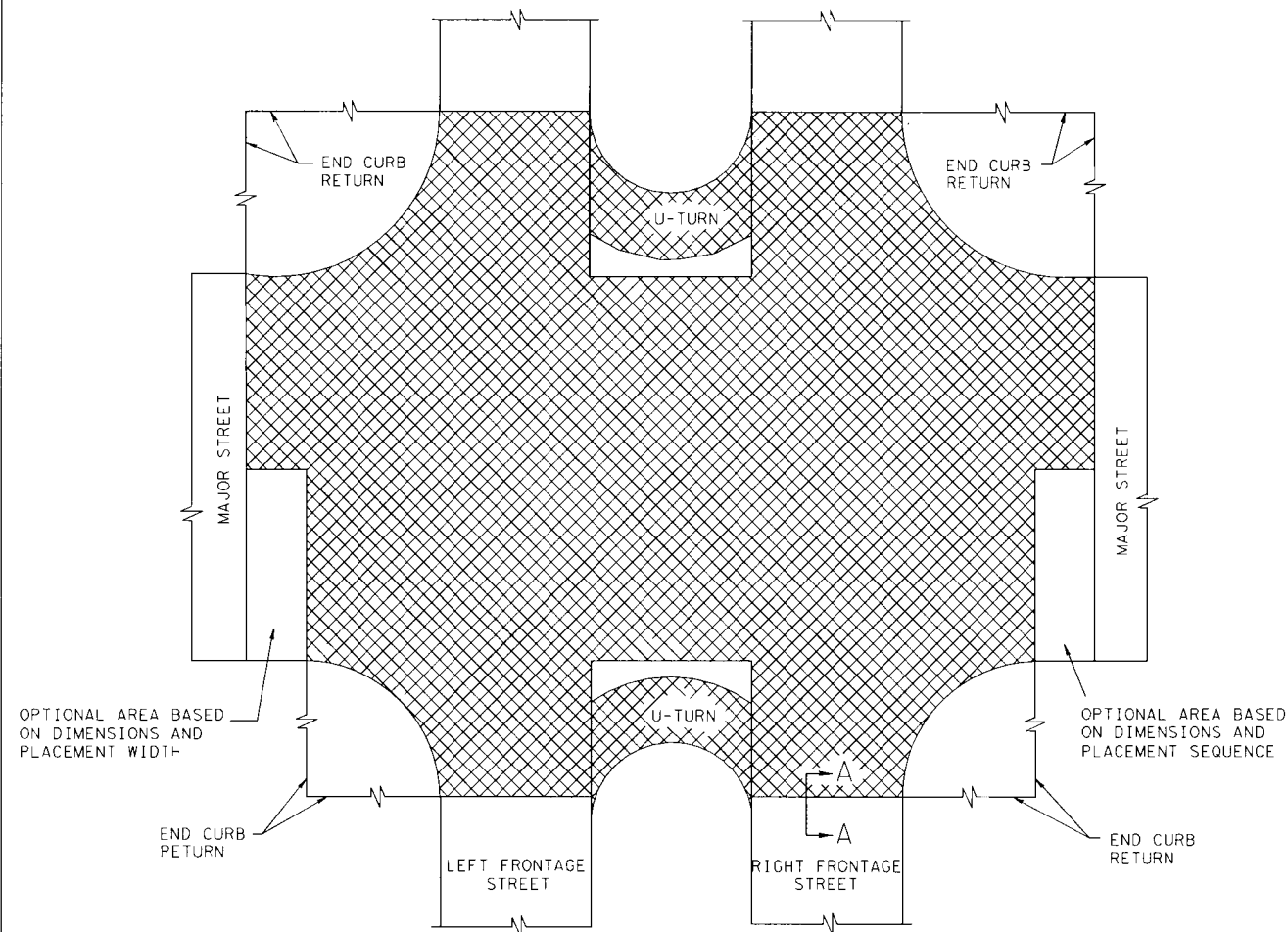


FIGURE 2

INTERSECTION OF MAJOR STREET WITH FRONTAGE STREET

FAST TRACK PAVING AREA

TYPICAL PAVING PLANS

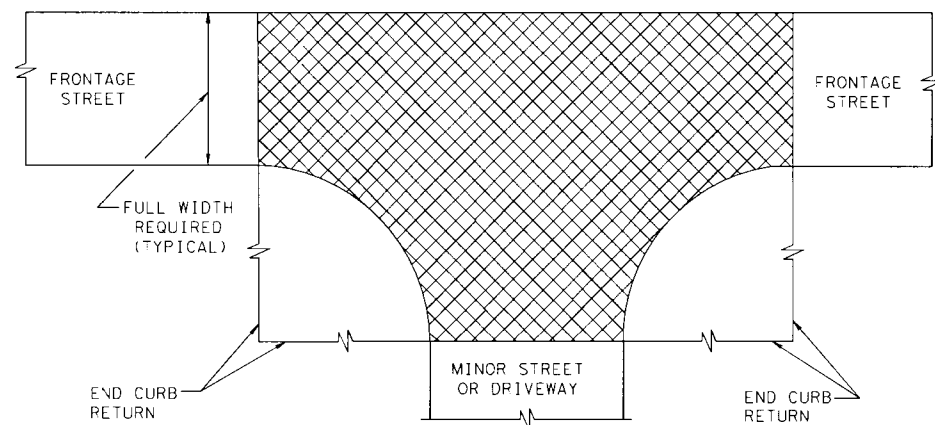
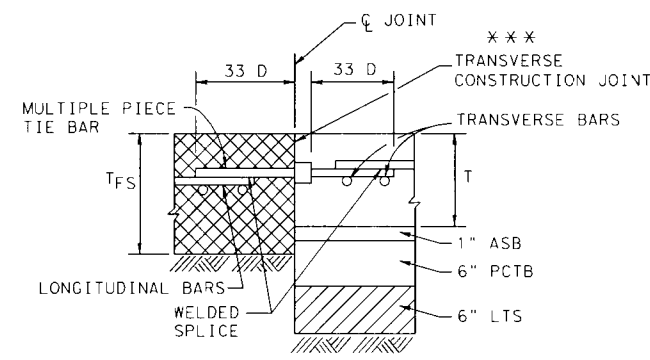


FIGURE 3

INTERSECTION OF MINOR STREET OR DRIVEWAY WITH FRONTAGE STREET



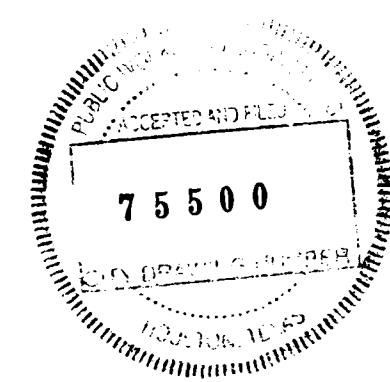
SECTION A - A

TRANSVERSE CONSTRUCTION JOINTS

FIGURE 1

LEGEND

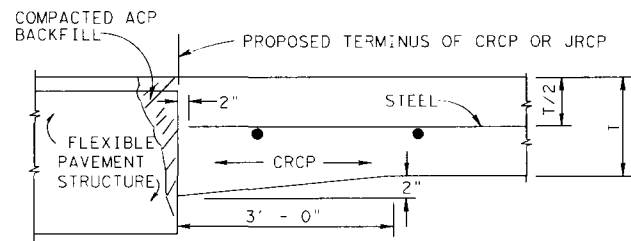
- ASB - ASPHALT STABILIZED BASE
- CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
- D - DIAMETER
- LTS - LIME TREATED SUBGRADE
- PCTB - PORTLAND CEMENT TREATED BASE



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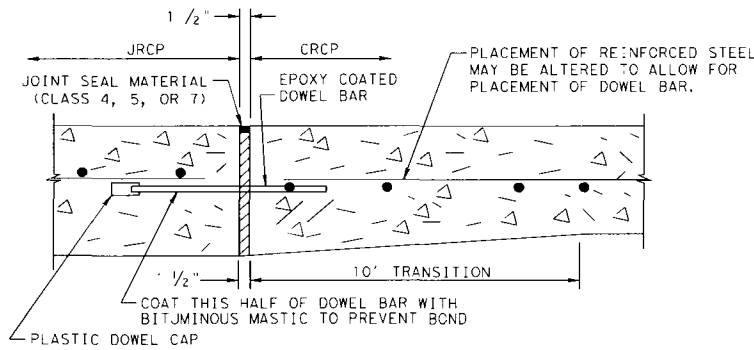
**FAST TRACK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT DETAILS**  
 CRCP-FT

FILE: STDB-4.dgn	DW:	CK:	DW:	CK:
© TXDOT DEC. 2009	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 5/05 2004 SPECS 2/15 2014 SPECS	HOU	6		66
	COUNTY	CONTROL	SECT	JOB
				HIGHWAY



NOTE:  
ADDITIONAL CONCRETE FOR THICKENED EDGE IS SUBSIDIARY TO VARIOUS BID ITEMS. BACKFILL DISTURBED MATERIAL IN THE FLEXIBLE PAVEMENT WITH ACP. THIS ACP IS SUBSIDIARY TO VARIOUS BID ITEMS.

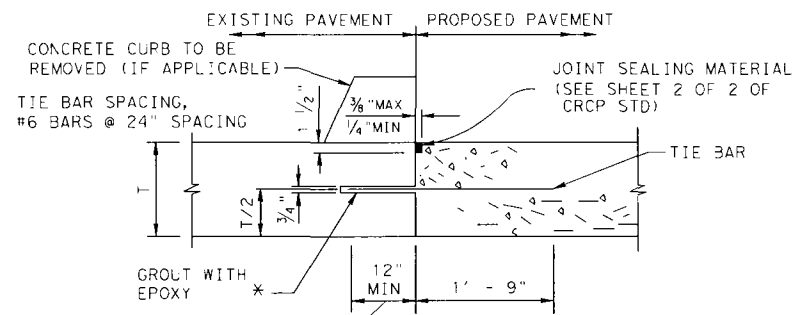
JUNCTURE A & B - CRCP OR JRCP WITH FLEXIBLE TYPE PAVEMENT STRUCTURE



FOR DETAILS NOT SHOWN, SEE TRANSVERSE EXPANSION JOINT DETAILS ELSEWHERE IN PLANS.  
DETAIL "B" - DOWEL ASSEMBLY AT EXPANSION JOINT

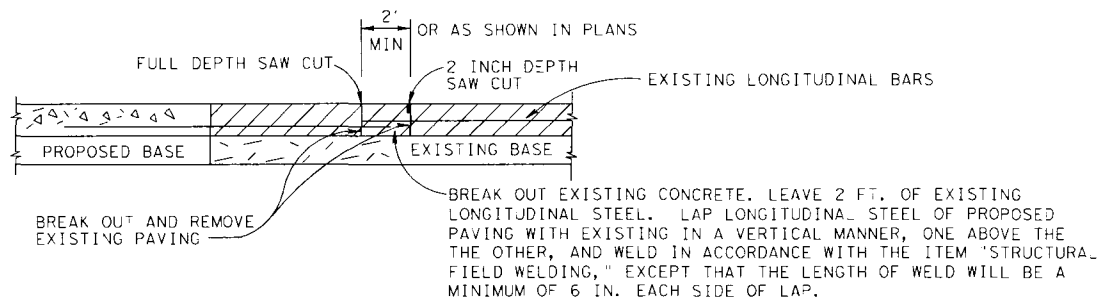
DOWEL BAR DATA			
SLAB THICKNESS (T)	6"-7.5"	8"-10"	10.5"-15"
DOWEL SIZE	1"	1 1/4"	1 1/2"
DOWEL LENGTH	18"	20"	22"
DOWEL BAR SPACING	12"	12"	12"

TABLE A - DOWEL BAR DATA



JUNCTURE D - TYPICAL CONNECTION TO EXISTING CONCRETE

\*FOR EPOXY TYPE SEE ITEM 361.



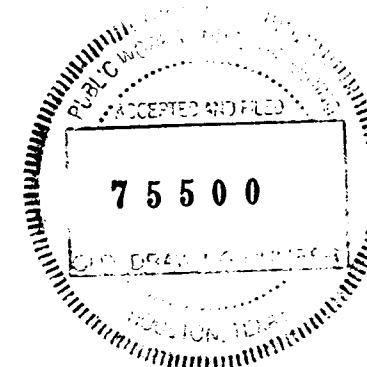
JUNCTURE F - "BREAK BACK" CONCRETE CRCP WITH CRCP OR JRCP WITH JRCP

GENERAL NOTES

- FOR FURTHER INFORMATION REGARDING PLACING CONCRETE AND REINFORCEMENT, REFER TO THE GOVERNING SPECIFICATION FOR CONCRETE PAVEMENT.
- THE DESIGN REQUIREMENTS FOR THE PAVEMENT STRUCTURE, I.E. BAR SPACING, BAR SIZE LAP REQUIREMENTS, ETC., ARE SHOWN ON THE APPROPRIATE PAVEMENT DESIGN DETAIL.
- SLEEPER SLAB AND ADDITIONAL REINFORCING REQUIRED ON THIS DRAWING ARE INCIDENTAL TO THE VARIOUS BID ITEMS.
- USE THE SIZE, SPACING, AND LENGTH OF DOWEL BARS SHOWN IN TABLE "A".
- WHERE THERE WILL BE A JUNCTURE AND ADDITIONAL JRCP PAVING WILL BE PLACED AT A FUTURE DATE, MULTIPLE PIECE DOWEL BARS WILL BE PERMITTED AT THE JUNCTURE. PROVIDE MULTIPLE PIECE DOWEL BAR ASSEMBLIES WITH A MINIMUM ULTIMATE TENSILE STRENGTH OF 60.0 KIPS AND THAT HAVE SMOOTH EPOXY COATED BARS. ENSURE THE MULTIPLE PIECE DOWEL BAR ASSEMBLIES HAVE STOP TYPE COUPLINGS AND HAVE ROLLED THREADS ON THE BARS. DISMANTLE THE BAR AND FIT THE COUPLING PORTION USED IN CONSTRUCTION, WITH A PLASTIC CAP. FURNISH THE REMAINING PORTION OF THE BAR TO THE ENGINEER.
- WHERE THE PAVING IS CRCP AND A RAMP COMPOSED OF A FLEXIBLE PAVEMENT WILL BE USED AT THE JUNCTURE UNTIL FUTURE PAVING IS CONSTRUCTED, MULTIPLE PIECE TIE BARS MAY BE USED IF PERMITTED BY THE ENGINEER. IF USED, ENSURE THE MULTIPLE PIECE TIE BAR ASSEMBLIES HAVE STOP TYPE COUPLINGS AND ROLLED THREADS ON THE BARS. FURNISH MULTIPLE PIECE TIE BAR ASSEMBLIES THAT DEVELOP A MINIMUM ULTIMATE TENSILE STRENGTH EQUAL TO 1.25 TIMES THE YIELD STRENGTH OF THE TRANSVERSE BARS BEING JOINED. FOR TIE BARS, USE DEFORMED REINFORCING BARS. TIE BAR ASSEMBLIES MADE FROM STEELS OTHER THAN ASTM GRADE 60 AND WITH DEFORMATIONS OTHER THAN ASTM STD. MAY BE USED PROVIDED THEY PROVE SATISFACTORY TO THE ENGINEER AND ARE IN EVERY RESPECT THE EQUAL TO THE ASSEMBLIES SPECIFIED. LABORATORY TESTING OF THE PROPOSED ASSEMBLIES, AT THE CONTRACTOR'S EXPENSE, MAY BE REQUIRED. LAP AND WELD ONE PORTION OF THE TIE BAR ASSEMBLY TO EACH LONGITUDINAL BAR IN ACCORDANCE WITH THE ITEM "STRUCTURAL FIELD WELDING" AND THE OTHER PORTION INTO THE COUPLING PRIOR TO PAVING. ENSURE MULTIPLE PIECE TIE BAR LENGTHS CONFORM TO THE TIE BAR LENGTHS SHOWN ELSEWHERE IN THE PLANS. ADDITIONAL "SHEAR STEEL" WILL ALSO BE REQUIRED AND MAY BE USED WITH MULTIPLE PIECE ASSEMBLIES AS PREVIOUSLY DESCRIBED. USE ADDITIONAL STEEL BARS OF EQUAL DIAMETER AT A SPACING DOUBLE THAT OF THE LONGITUDINAL STEEL AND ENSURE THE LENGTH IS 66 TIMES THE TIE BAR DIAMETER.
- DO NOT SHEAR CUT DOWEL BARS.
- ENSURE DOWEL BAR EPOXY COATING CONFORMS TO ARTICLE 440.2.7., "EPOXY COATING".
- REPLACE ANY BENT LONGITUDINAL REINFORCING. IF THERE IS NOT SUFFICIENT EXPOSED REINFORCING TO PROVIDE A MINIMUM OF A 33 TIMES BAR DIAMETER LAP, REMOVE THE EXISTING PAVEMENT AND SUFFICIENTLY EXPOSE THE EXISTING REINFORCING TO PROVIDE A 33 TIMES BAR DIAMETER LAP. REPLACE ANY SHEAR BARS THAT ARE DISTURBED, BY DRILLING AND GROUTING AS REQUIRED BY NOTE 12 BELOW. PERFORM THIS CORRECTIVE ACTION AT NO EXPENSE TO THE DEPARTMENT.
- TIE BARS AND DOWEL BARS OMITTED, LOST, OR DAMAGED SHALL BE REPAIRED BY DRILLING AND EPOXY GROUTING AT NO EXPENSE TO THE DEPARTMENT.
- JUNCTURES A & B ARE ONLY SUITABLE FOR MINOR STREETS WITH LOW TRAFFIC VOLUMES.
- FURNISH ADDITIONAL SHEAR BARS (DIAMETER "D") OF THE SAME SIZE AS LONGITUDINAL BARS AND SPACE THEM MIDWAY BETWEEN ALTERNATE LONGITUDINAL BARS ALONG THE TRANSVERSE CONSTRUCTION JOINT FORMED AT THE LEAVE-OUT.

LEGEND

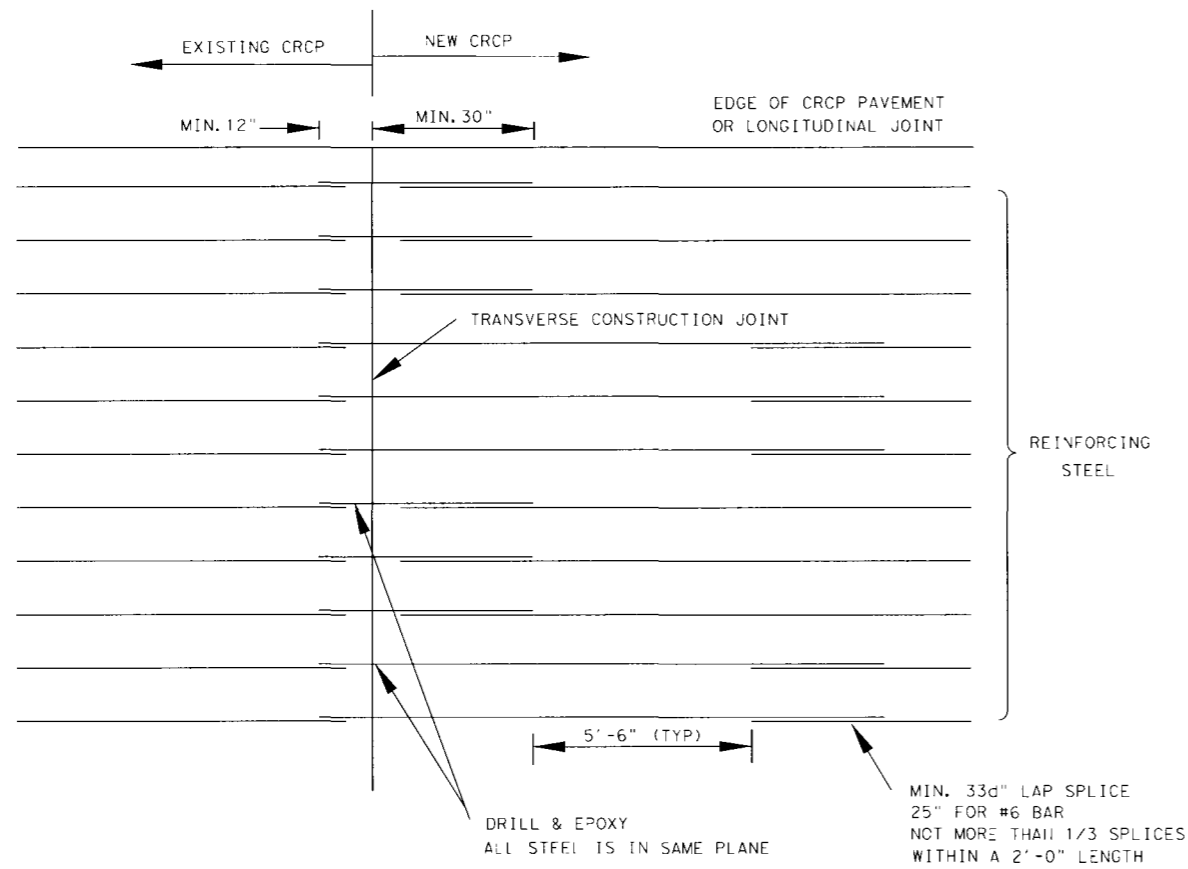
- ACP - ASPHALT CONCRETE PAVEMENT
- CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
- JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
- T - THICKNESS



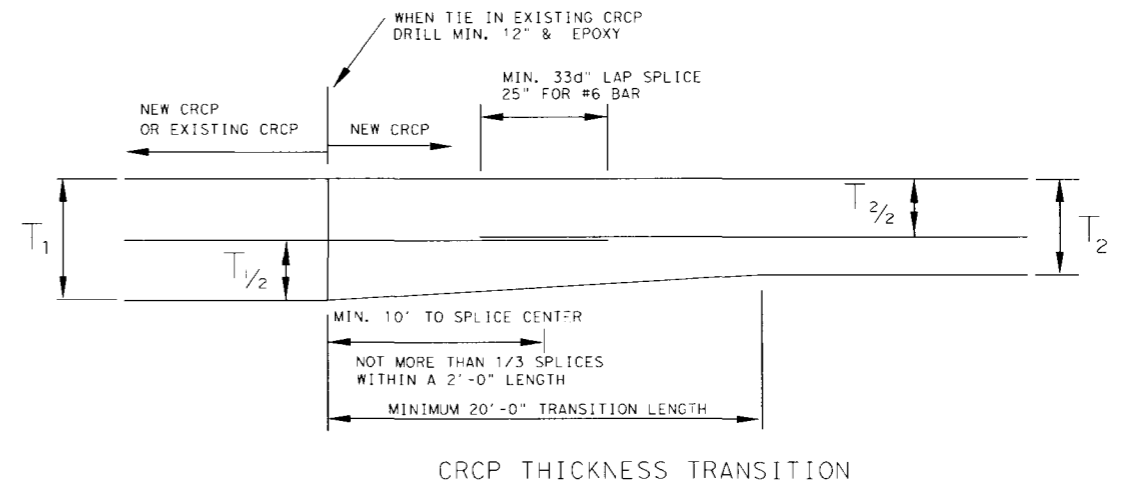
CONCRETE PAVEMENT JUNCTURES

CPJ

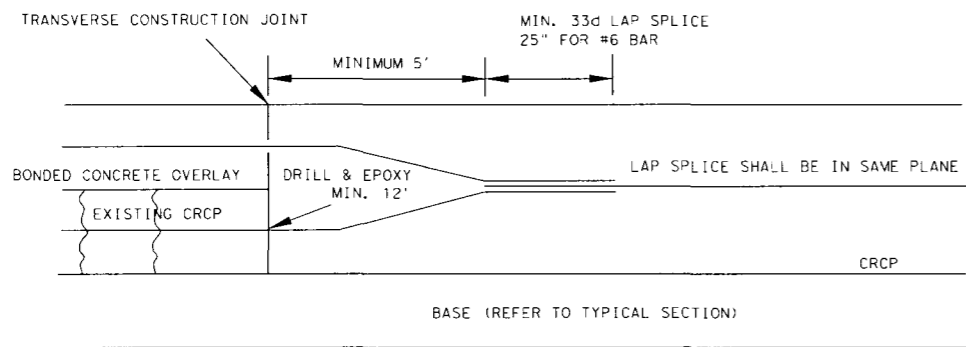
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© TxDOT DEC. 2009	DIST	FED REG	PROJECT NO.	HIGHWAY
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COUNTY	CONTROL	SECT	JOB	SHEET
				67



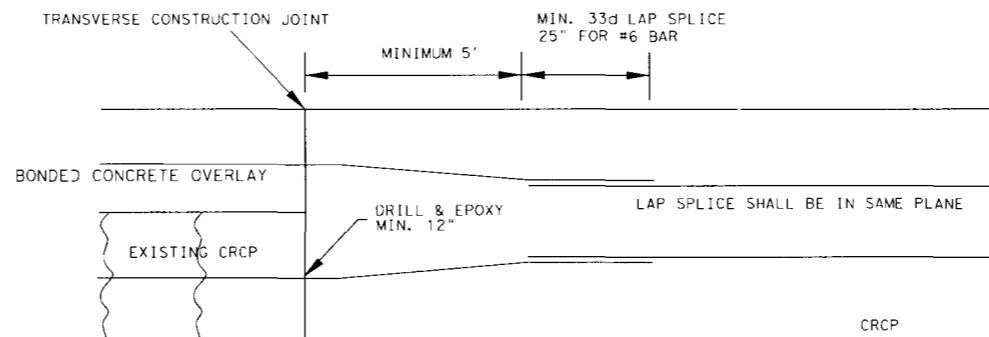
EXISTING CRCP TO NEW CRCP



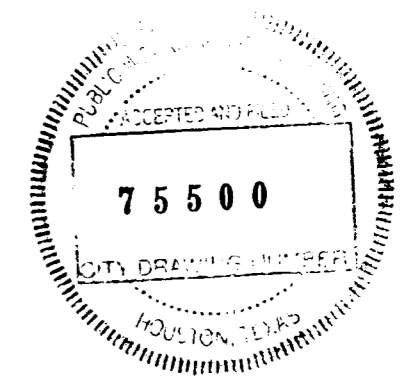
CRCP THICKNESS TRANSITION



CRCP BONDED OVERLAY TO CRCP TRANSITION  
(ONE LAYER STEEL)



CRCP BONDED OVERLAY TO CRCP TRANSITION  
(TWO LAYER STEEL)



SHEET 2 OF 2

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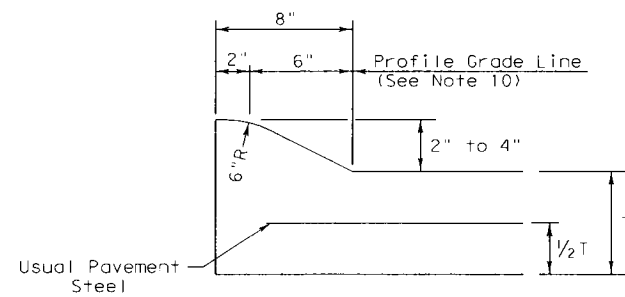
CONCRETE PAVEMENT  
JUNCTURES

CPJ

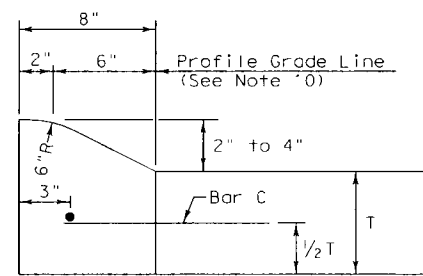
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REVISIONS	HOU	6		
5/05 2004 SPECS	COUNTY	CONTROL	SECT	JOB
REVISED 4/2008				SHEET
2/15 2014 SPECS				68

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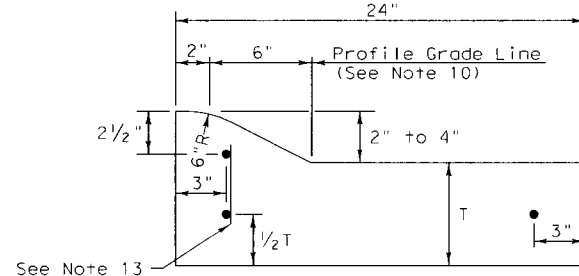
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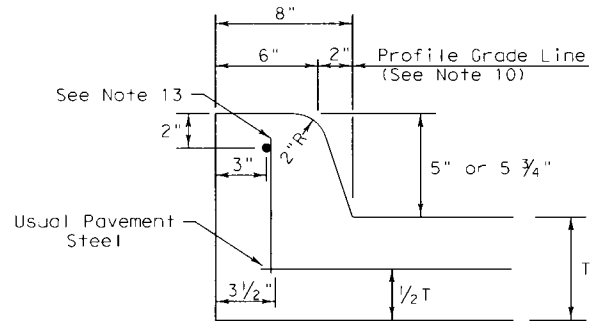
TYPE I CURB (MONOLITHIC)  
2" - 4" HEIGHT



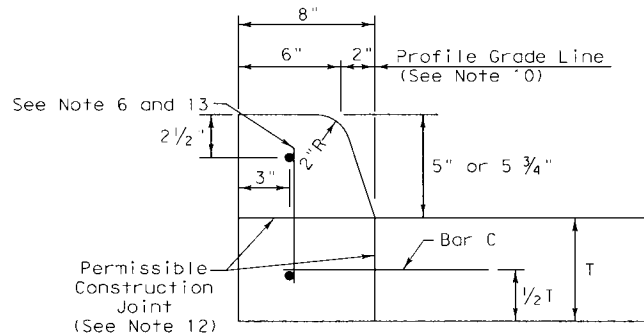
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2" - 4" HEIGHT



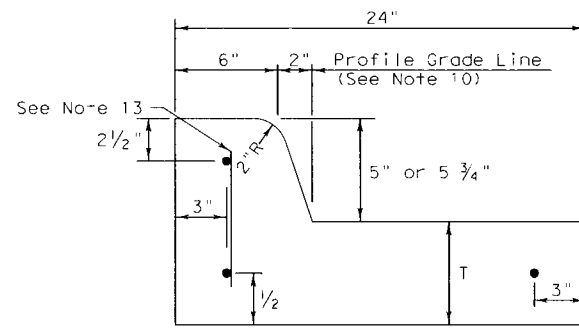
TYPE I CURB AND GUTTER  
2" - 4" HEIGHT



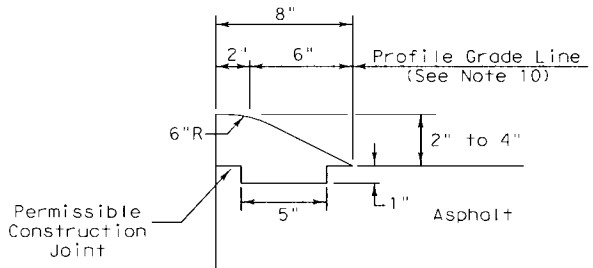
TYPE II CURB (MONOLITHIC)  
5" - 5 3/4" HEIGHT



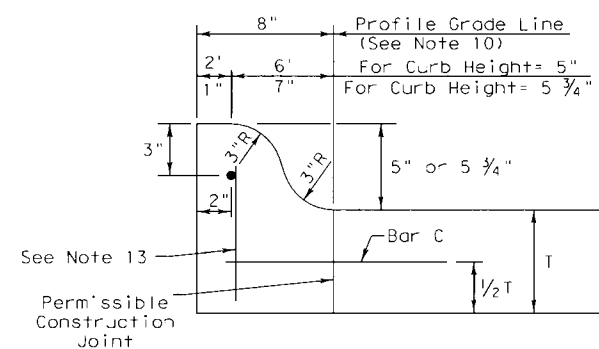
TYPE II CURB  
5" - 5 3/4" HEIGHT



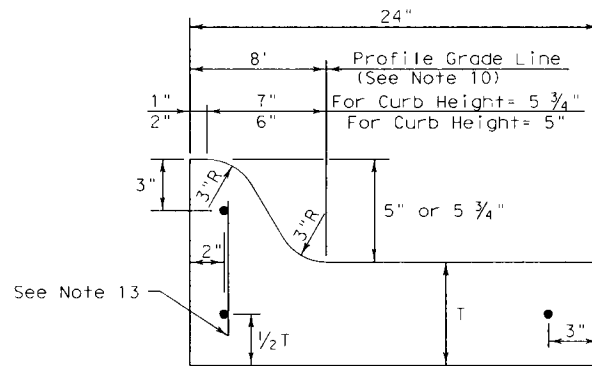
TYPE II CURB AND GUTTER  
5" - 5 3/4" HEIGHT



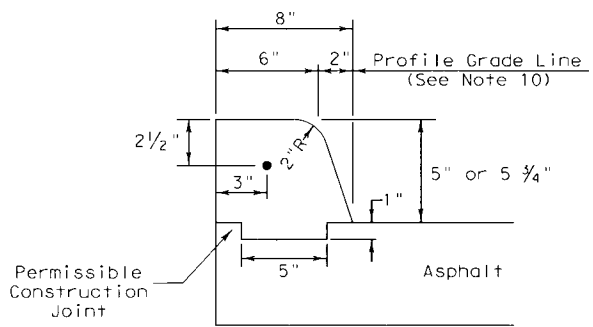
TYPE III CURB (KEYED)  
2" - 4" HEIGHT



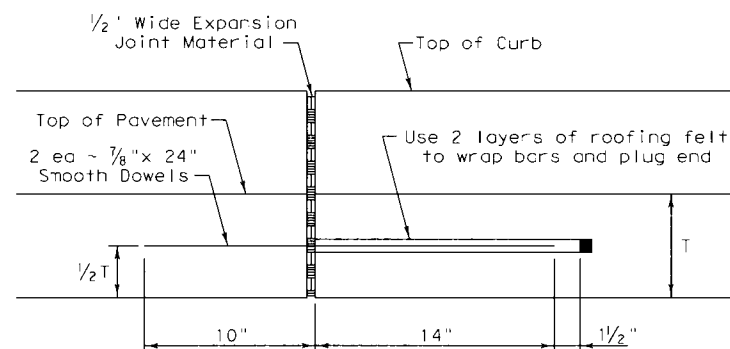
TYPE IIa CURB  
5" - 5 3/4" HEIGHT



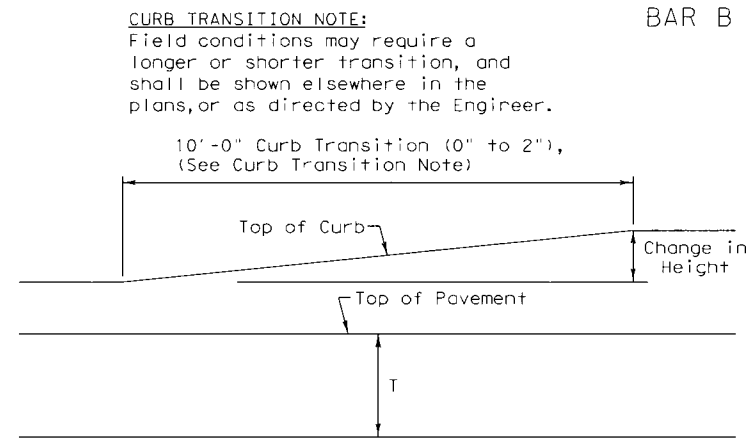
TYPE IIa CURB AND GUTTER  
5" - 5 3/4" HEIGHT



TYPE IV CURB (KEYED)  
5" - 5 3/4" HEIGHT



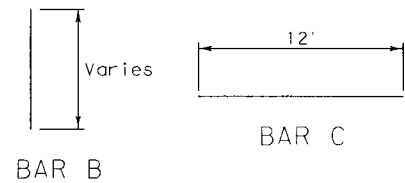
EXPANSION JOINT DETAIL



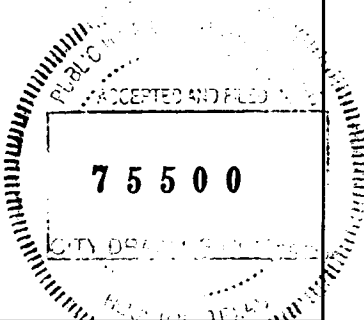
CURB TRANSITION  
Note: To be paid for as Highest Curb

GENERAL NOTES

- All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
- Concrete shall be Class A.
- When reinforcing bars are used, they shall be No. 4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
- Round exposed sharp edges with a rounding tool, to a minimum radius of 1/4 inch.
- All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
- Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and grouted in place, or may be inserted into fresh concrete.
- Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
- Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
- Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
- Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
- One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
- When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
- Bar B placement as needed (typically at four ft. C-C) to support curb reinforcing steel during concrete placement.

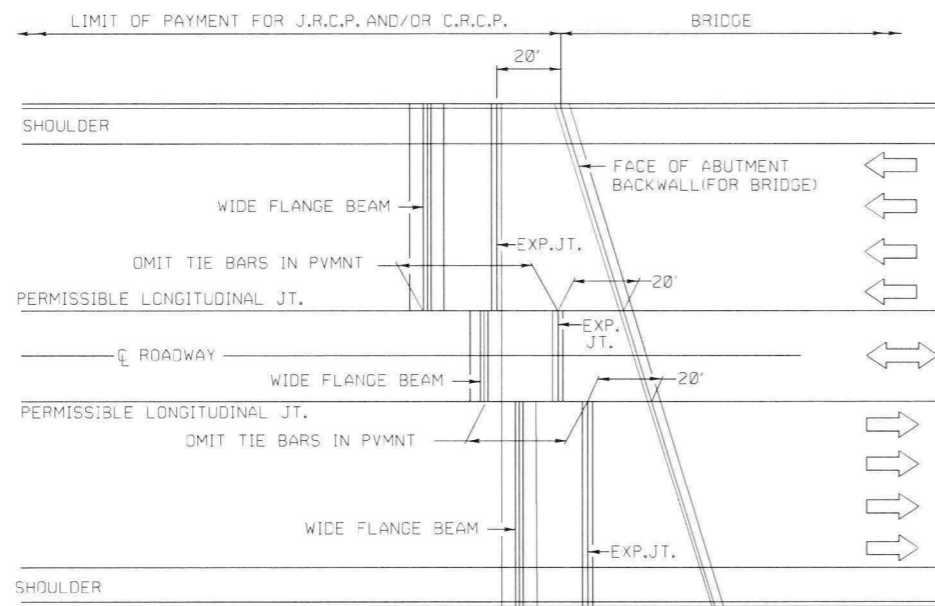


CURB TRANSITION NOTE:  
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.

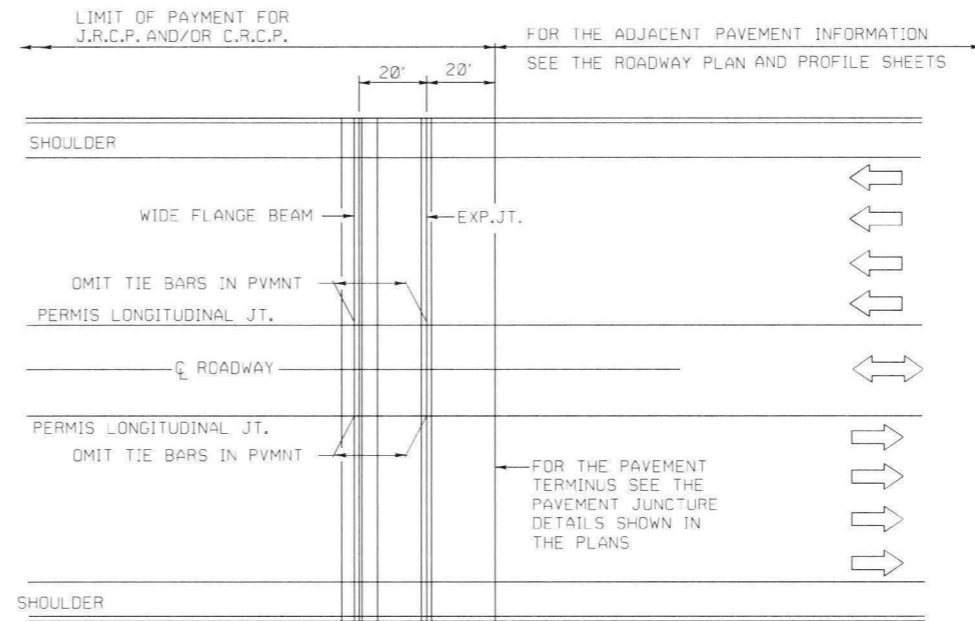


Texas Department of Transportation  
CONCRETE CURB AND GUTTER  
CCCG-22

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REVISTIONS	DIST.	COUNTY	SHEET NO.	
			69	



TYPICAL ROADWAY LAYOUT  
CONCRETE MEDIAN AND SHOULDERS  
(AT BRIDGES)

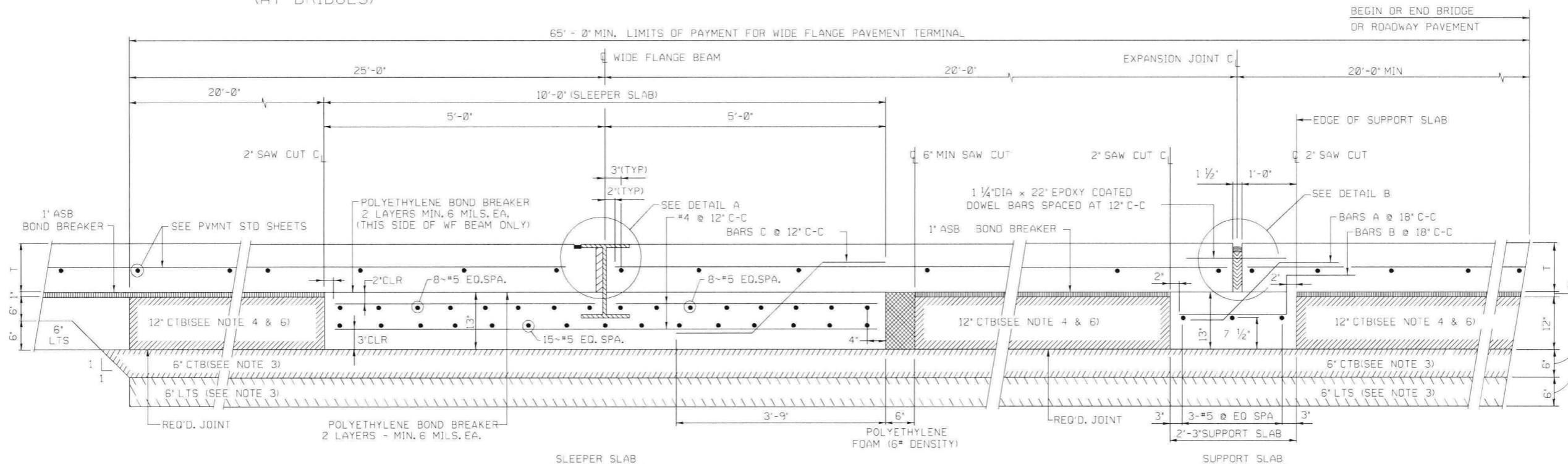


TYPICAL ROADWAY LAYOUT  
CONCRETE MEDIAN AND SHOULDERS

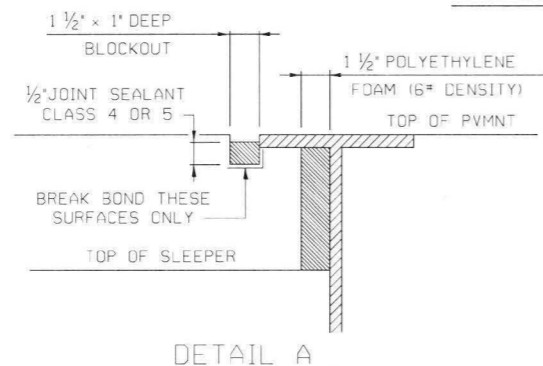
NOTES

1. BLOCK-OUT REQUIRED AT EACH END OF WIDE FLANGE BEAM ADJACENT TO 3/8" END PLATE WHERE BLOCK-OUT IS PLACED ABUTTING CONCRETE PAVEMENT, RIPRAP OR STABILIZED BASE. THE BLOCKED OUT AREA WILL BE FILLED WITH POLYETHYLENE FOAM (6 POUND DENSITY). SEE SHEET 3 OF 3 FOR BLOCK-OUT DETAIL.
2. FOR ADDITIONAL DETAILS ON REINFORCEMENT MEMBER QUANTITIES AND THE WIDE FLANGE BEAM SEE SHEET 2 OF 3.
3. REPLACE 6 INCH LIME TREATMENT AND 6 INCH CEMENT TREATMENT WITH CEMENT STABILIZED BACK-FILL AT STRUCTURES WITH CEMENT STABILIZED BACKFILL EMBANKMENT. SEE "CEMENT STABILIZED BACKFILL EMBANKMENT" STANDARD SHEET FOR DETAILS.
4. 12 INCH CEMENT STABILIZED BACKFILL MAY BE SUBSTITUTED FOR 12 INCH CTB, AT CONTRACTOR'S OPTION, ON APPLICABLE STRUCTURES WITH CEMENT STABILIZED BACKFILL EMBANKMENT.

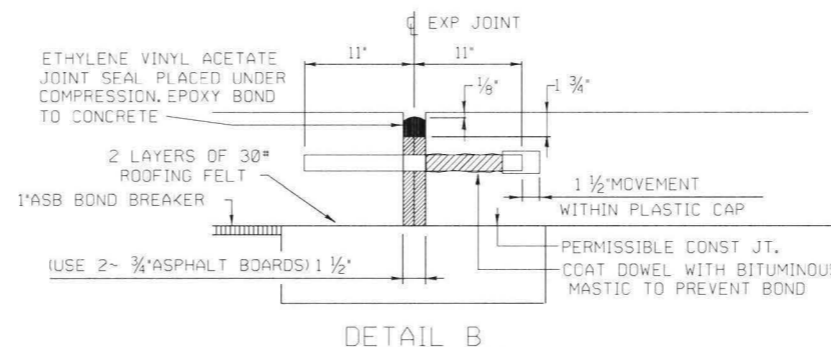
CTB - CEMENT TREATED BASE  
LTS - LIME TREATED SUBGRADE  
CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT  
JRCP - JOINTED REINFORCED CONCRETE PAVEMENT  
ASB - ASPHALT STABILIZED BASE  
T - PAVEMENT THICKNESS



TYPICAL SECTION THRU TERMINAL ANCHORAGE @ SLEEPER SLAB & SUPPORT SLAB



DETAIL A



DETAIL B



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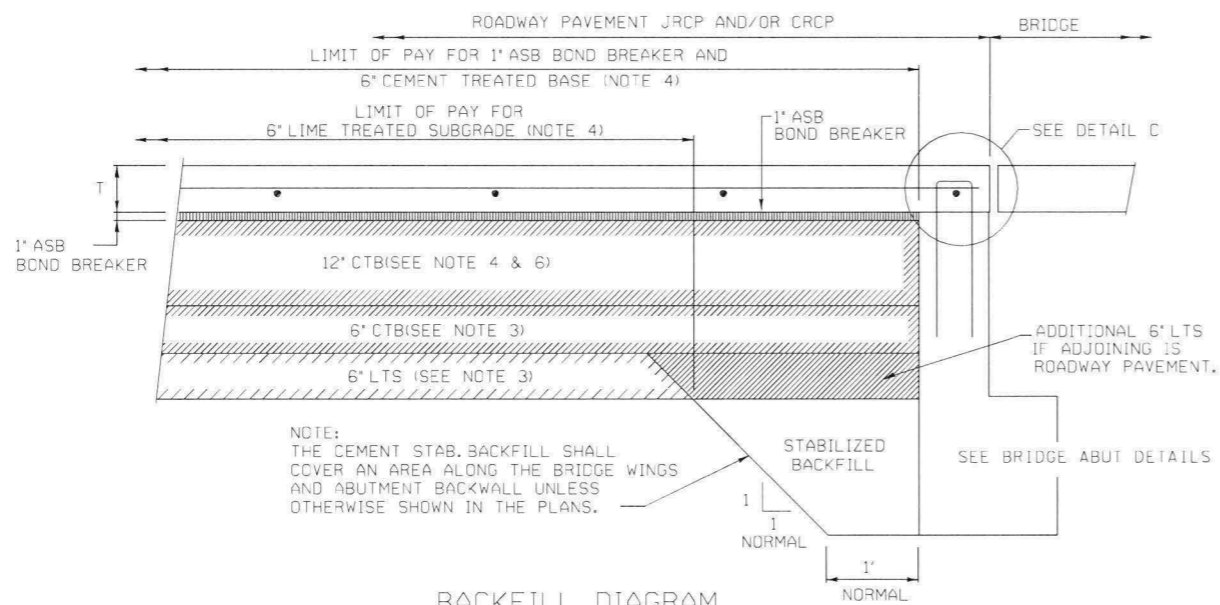
WIDE FLANGE PAVEMENT TERMINALS

FOR CONTINUOUSLY & JOINTED REINFORCED CONCRETE PAVEMENT DETAILS (FOR USE AT BRIDGE END OR PAVEMENT TERMINUS)

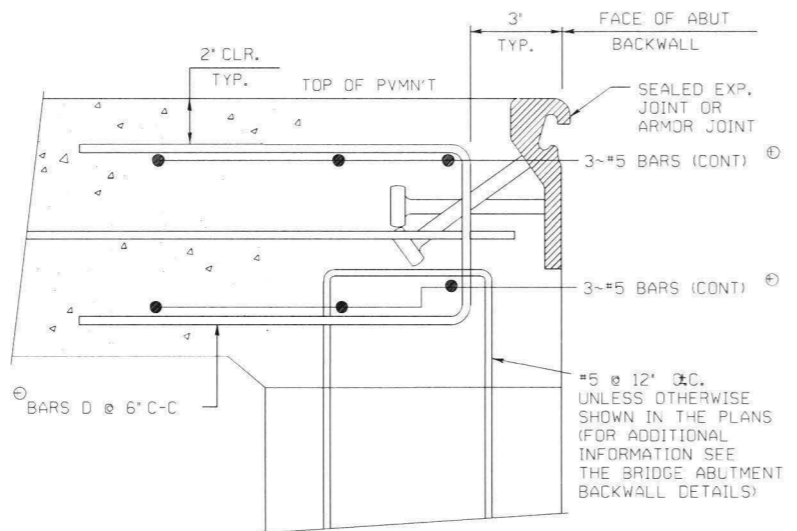
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				SHEET TO





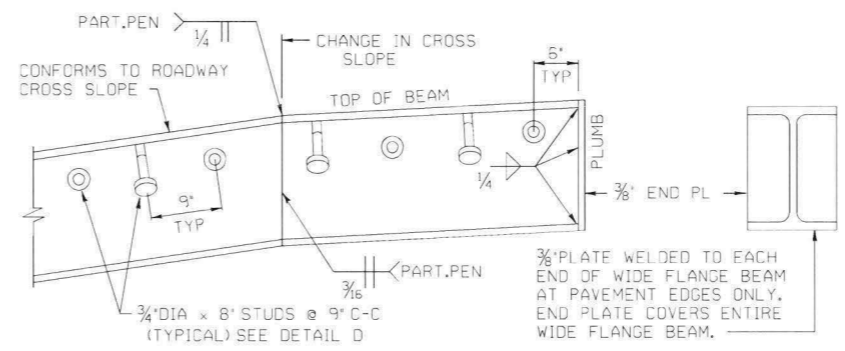
BACKFILL DIAGRAM



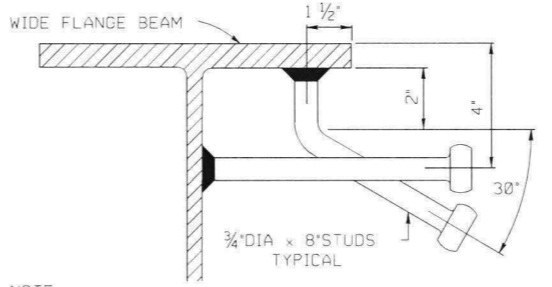
DETAIL C

(SHOWING ADDITIONAL REINFORCEMENT FOR ROADWAY PAVEMENT WITH SEALED EXPANSION JOINTS OR ARMOR JOINTS AT ABUTMENTS.)

© THE ADDITIONAL STEEL REQUIRED BY THE ABOVE DETAIL "C" SHALL NOT BE PAID FOR DIRECTLY, BUT SHALL BE CONSIDERED INCIDENTAL TO THE ITEM, "CONCRETE PAVEMENT".

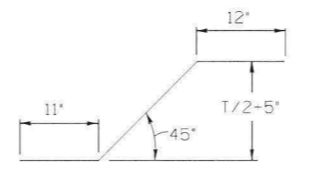


WIDE FLANGE DETAIL

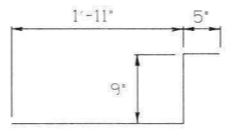


NOTE: STUDS SHALL BE ELECTRIC ARC END WELDED WITH COMPLETE FUSION. ANY STUD WHICH IS DISLODGED IN SHIPPING OR CAN BE DISLODGED BY HAMMER SHALL BE REPLACED.

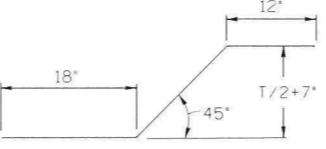
DETAIL D



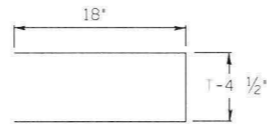
BARS A (#4)



BARS B (#4)

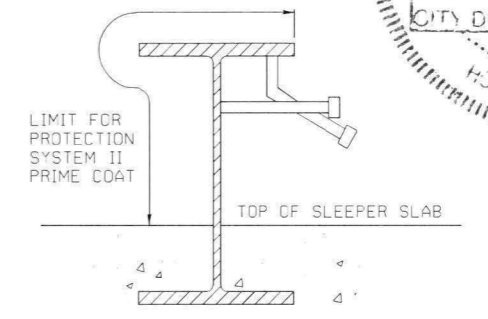


BARS C (#4)



BARS D (#5)

PAVEMENT THICKNESS	WIDE FLANGE BEAM DESIGNATION
8'-9 1/2"	W14 X 68
10'-11 1/2"	W16 X 89
12'-13"	W18 X 97
14" & 15"	W21 X111



WIDE FLANGE PAINTING DETAIL

SEE "TABLE OF BEAM SIZES"

- NOTES: (CONT)
- THIS STANDARD WILL BE USED WITH SPECIAL SPECIFICATION "CONCRETE PAVEMENT TERMINALS". THIS ITEM WILL BE MEASURED BY THE LINEAR FOOT OF WIDE FLANGE BEAM COMPLETE IN PLACE.
  - WIDE FLANGE BEAM, SUPPORT SLAB, SLEEPER SLAB, 12 INCHES OF CEMENT TREATED BASE, POLYETHYLENE BONDBREAKER AND ANY EXCAVATION NECESSARY WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO SPECIAL SPECIFICATION ITEM, "CONCRETE PAVEMENT WIDE FLANGE TERMINALS".
  - POLYETHYLENE FOAM (6 POUND DENSITY), SAW CUTS, EXPANSION JOINTS, EPOXY COATED DOWEL AND EXPANSION JOINT MATERIALS WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED INCIDENTAL TO THE ITEM 360.
  - THE CONCRETE PAVEMENT, 1 INCH ASB BONDBREAKER, 6 INCH PORTLAND CEMENT TREATED BASE AND 6 INCH LIME TREATED SUBGRADE WILL BE PAID FOR UNDER THE APPROPRIATE BID ITEMS.
  - SHEAR CUTTING OF DOWEL BARS IS PROHIBITED.
  - EPOXY COATING OF DOWEL BARS PER SPECIFICATION ITEM 440.
  - CEMENT STABILIZED BACKFILL IS REQUIRED AT ALL ABUTMENTS.
- CTB - CEMENT TREATED BASE  
 LTS - LIME TREATED SUBGRADE  
 CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT  
 JRCP - JOINTED REINFORCED CONCRETE PAVEMENT  
 ASB - ASPHALT STABILIZED BASE  
 T - PAVEMENT THICKNESS



ITEM	PAVEMENT THICKNESS					
	8" THRU 10"	10 1/2" THRU 12"	12 1/2" THRU 13"	14"	15"	
SLEEPER SLAB	CONCRETE	0.40 CY/LF	0.40 CY/LF	0.40 CY/LF	0.40 CY/LF	0.40 CY/LF
	REINFORCING STEEL	49.1 LBS/LF	49.3 LBS/LF	49.6 LBS/LF	49.7 LBS/LF	49.8 LBS/LF
SUPPORT SLAB	CONCRETE	0.09 CY/LF	0.09 CY/LF	0.09 CY/LF	0.09 CY/LF	0.09 CY/LF
	REINFORCING STEEL	6.3 LBS/LF	6.4 LBS/LF	6.5 LBS/LF	6.6 LBS/LF	6.6 LBS/LF
	12" CEMENT TREATED BASE	1.95 CY/LF (BASED ON JOINTS BEING NORMAL TO THE PAVEMENT CENTERLINE)				

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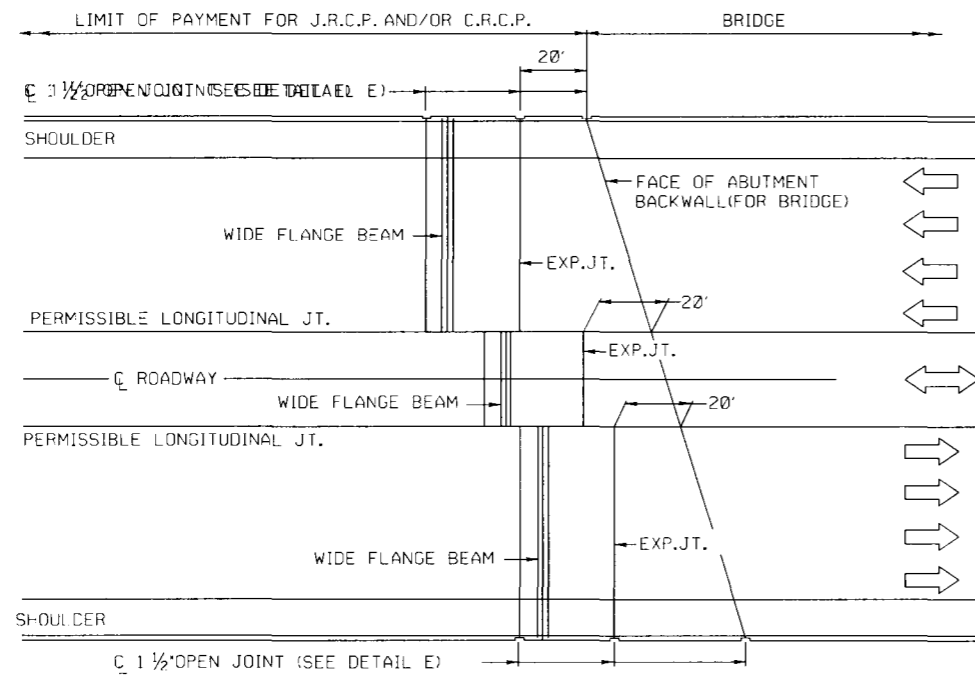
WIDE FLANGE PAVEMENT TERMINALS

FOR CONTINUOUSLY & JOINTED REINFORCED CONCRETE PAVEMENT DETAILS (FOR USE AT BRIDGE END OR PAVEMENT TERMINUS)

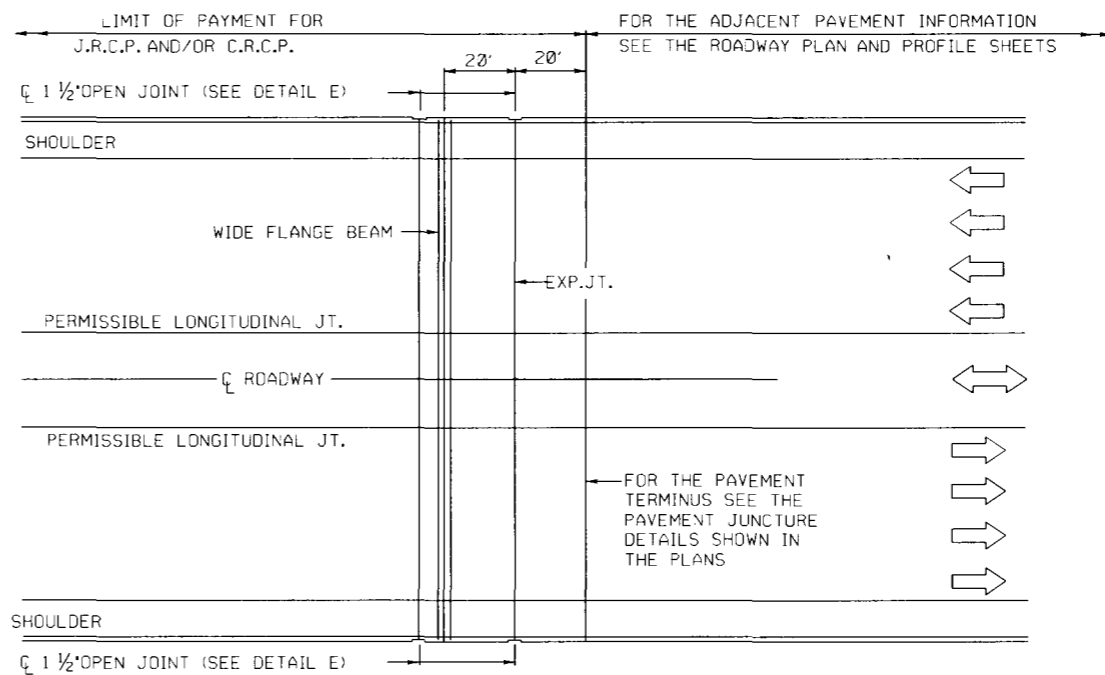
WFPT

FILE: STDB-3.DGN	DN: TXDOT	CK: TXDOT	DN: TXDOT	CK: TXDOT
© TXDOT 2014	DISTRICT	FED REG	PROJECT NO.	HIGHWAY
REVISIONS	HOU	6		
02/15 2014 SPECS	COUNTY		CONTROL SECT	JOB SHEET
				71

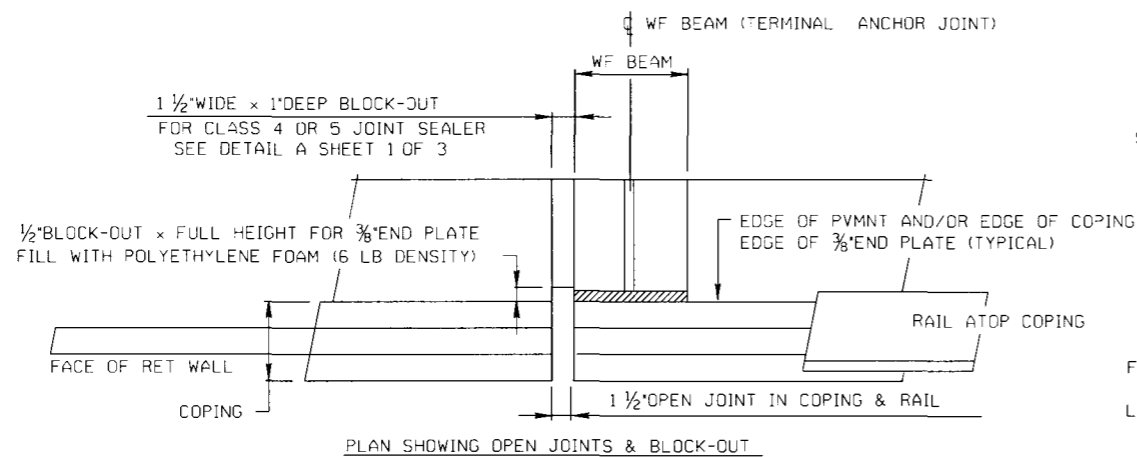
STDB-3



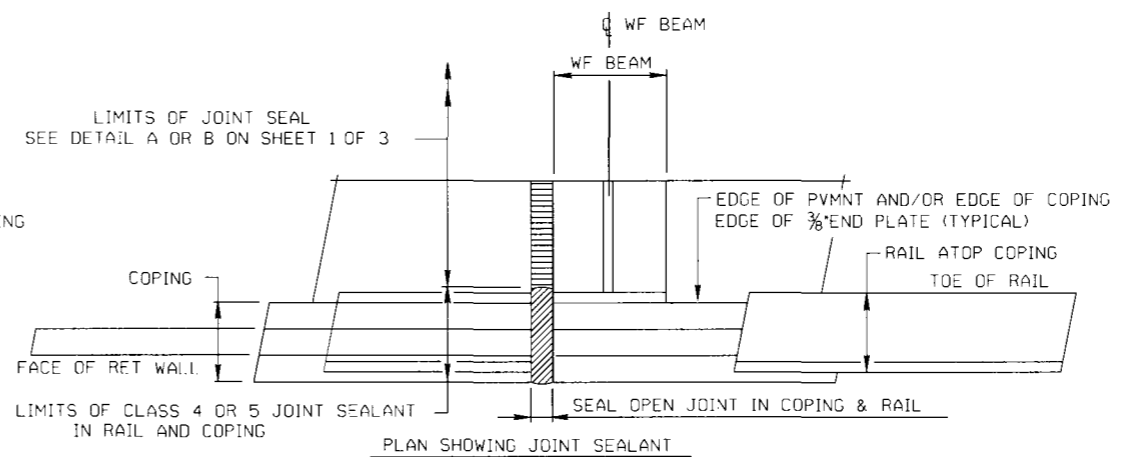
PLAN  
SHOWING OPEN JOINT LAYOUT



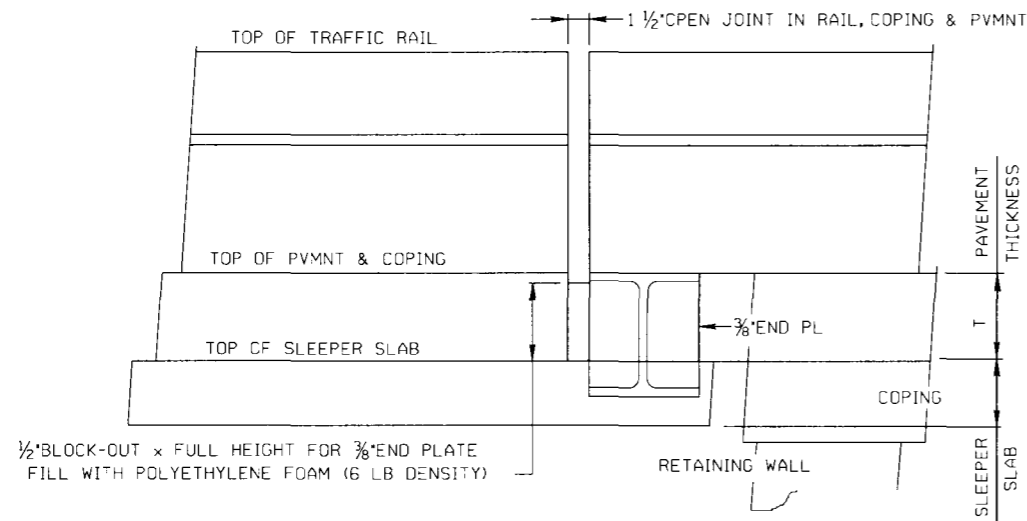
PLAN  
SHOWING OPEN JOINT LAYOUT



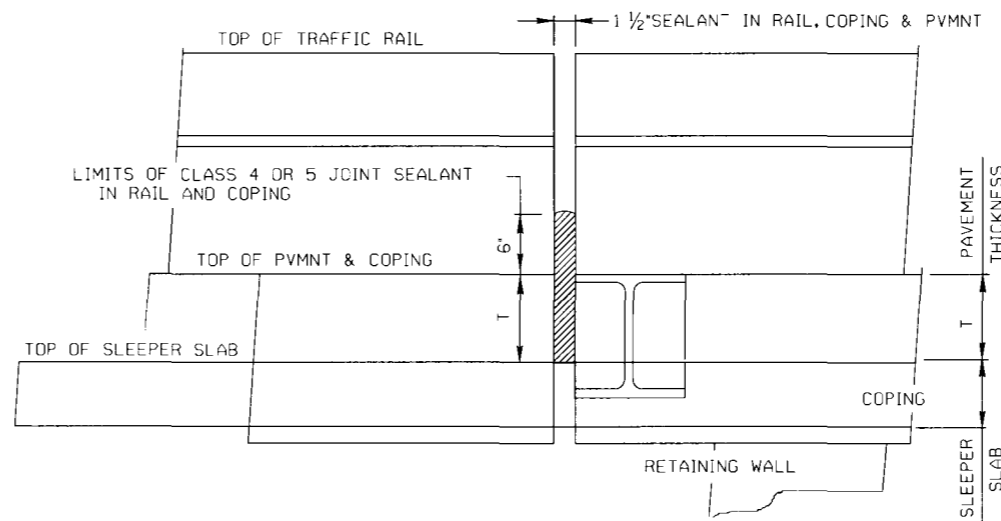
PLAN SHOWING OPEN JOINTS & BLOCK-OUT



PLAN SHOWING JOINT SEALANT



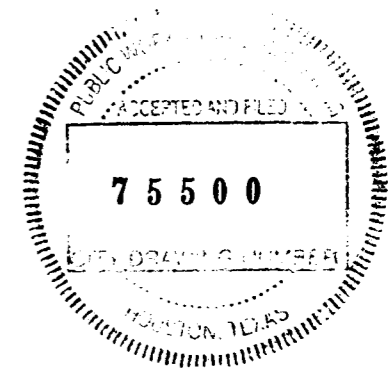
ELEVATION SHOWING OPEN JOINTS & BLOCK-OUT



ELEVATION SHOWING JOINT SEALANT

DETAIL E

SHOWN @ WIDE FLANGE - ALL OTHER JOINTS SIMILAR



SHEET 3 OF 3

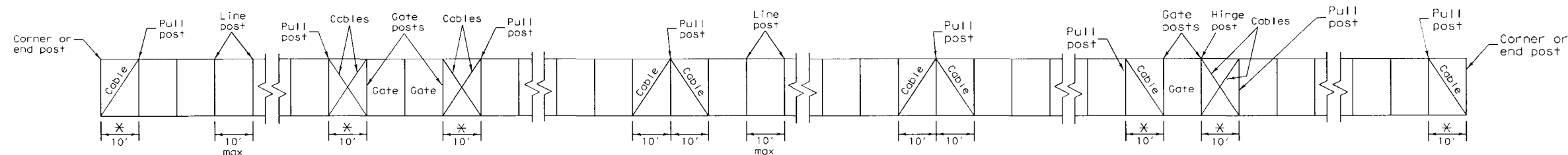
Texas Department of Transportation  
Houston District

WIDE FLANGE PAVEMENT  
TERMINALS  
FOR CONTINUOUSLY & JOINTED  
REINFORCED  
CONCRETE PAVEMENT DETAILS  
(FOR USE AT RETAINING WALLS)

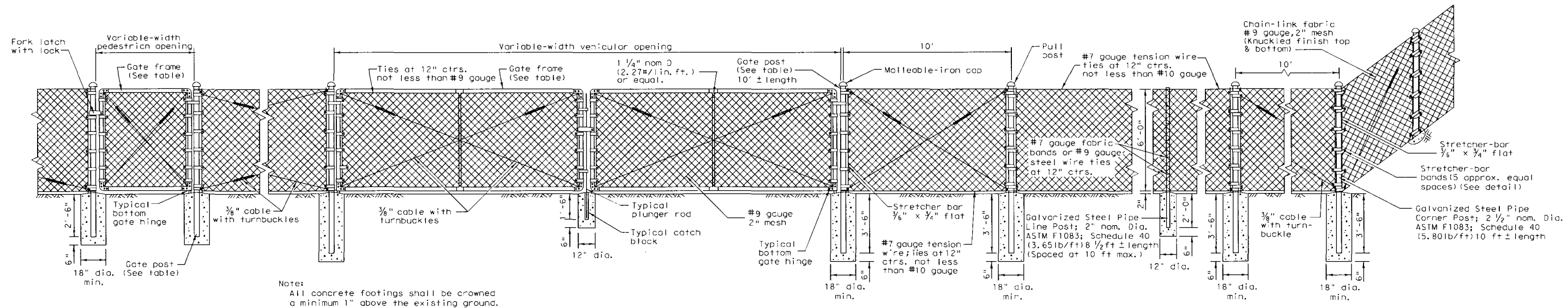
WFPT

FILES	STDB-3, DGN	DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
© TxDOT	2014	DISTRICT	FED REG	PROJECT NO.	HIGHWAY
REVISIONS	HOU	6	COUNTY	CONTROL	SECT
02/15 2014 SPECS				JOB	SHEET
					72

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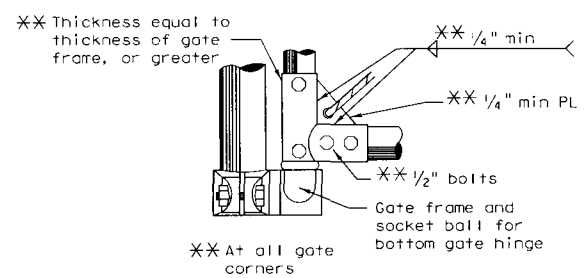
TYPICAL CABLE AND POST ARRANGEMENT



Note:  
All concrete footings shall be crowned a minimum 1" above the existing ground.

CHAIN-LINK BARRIER FENCE (6 FT.)

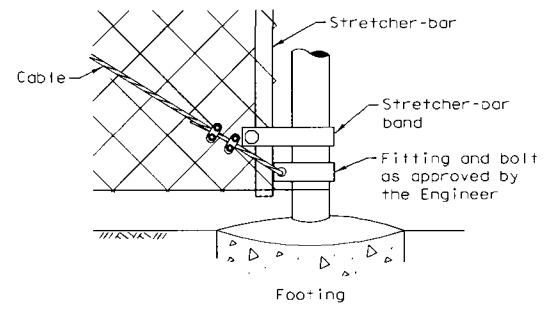
Foundation designs shown are "minimums" for a 6 ft. fence. Taller fences may require larger foundation designs.



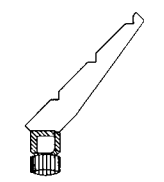
TYPICAL BOTTOM GATE HINGE



TYPICAL STRETCHER-BAR BAND

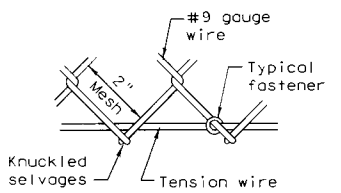


TERMINAL POST DETAIL



"OPTIONAL" 3 WIRE 45° BARBED WIRE ARM

Barbed wire arm related items shall conform to Item 550, "Chain Link Fence."



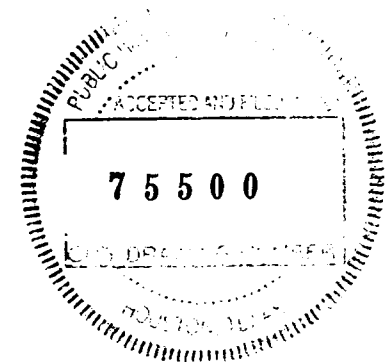
FABRIC & TENSION WIRE DETAIL, TOP & BOTTOM

GENERAL NOTES

- Items hereon shall conform to Item 550, "Chain Link Fence."
- Typical installation plan may vary as shown elsewhere on the plans or as directed by the Engineer. Location of gates shown elsewhere on plans.
- Gate-frame members shall be bolted, at frame corners, to joint fittings with four 1/2" bolts per joint.
- All cable connections are to be made with two 3/8" cable clamps.
- All pull posts and end posts and their foundations shall have the same respective dimensions as those shown for corner post.
- All pull post shall be furnished with two stretcher bars.
- One end of each turnbuckle may be attached directly to fittings with a clevis.
- Concrete footings are to be crowned at the top to shed water.

GATE (TYPES AND SIZES)	
Single Inclusive	Double Inclusive
Up to 6'	Up to 12'
Over 6' to 12'	Over 12' to 26'
Over 12' to 18'	Over 26' to 36'
Over 18'	Over 36'

GATE FRAME (WEIGHT)		GATE POST (WEIGHT)	
SIZE	WT./LIN. FT.	SIZE	WT./LIN. FT.
1 1/2" nom dia. or equal	2.72 Lbs.	2 1/2" nom dia. or equal	5.79 Lbs.
		3 1/2" nom dia. or equal	9.11 Lbs.
		6" nom dia.	18.97 Lbs.
		8" nom dia.	24.70 Lbs.



**Texas Department of Transportation**  
Design Division Standard

## CHAIN LINK FENCE

### CLF-10

FILE: clf10.dgn	DN: TxDOT	CK: AM	DR: BD	CR: VP
© TxDOT 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS		DIST	COUNTY	SHEET NO.
				73

DATE:  
FILE:

**RETAINING WALL A**

Beginning chain WALL-A description  
Feature: Struc\_WallHoriz

Curve Data  
\*-----\*

Curve WALL-A-1  
P.I. Station = 10+83.85 N 13,787,233.1153 E 3,081,587.4638  
Delta = 1° 28' 51.94" (RT)  
Degree = 0° 52' 59.56"  
Tangent = 83.8518  
Length = 167.6943  
Radius = 6,487.2083  
External = 0.5419  
Long Chord = 167.6897  
Mid. Ord. = 0.5419  
P.C. Station = 10+00.00 N 13,787,155.8656 E 3,081,554.8508  
P.T. Station = 11+67.69 N 13,787,309.4963 E 3,081,622.0626  
C.C. = N 22° 53' 17.99" E  
Back = N 24° 22' 09.94" E  
Ahead = N 23° 37' 43.96" E  
Chord Bear = N 23° 37' 43.96" E

Course from PT WALL-A-1 to 755 N 24° 22' 09.94" E Dist 531.2420

Point 755 N 13,787,793.4068 E 3,081,841.2629 Sta 16+98.94

Ending chain WALL-A description

**RETAINING WALL B**

Beginning chain WALL-B description  
Feature: Struc\_WallHoriz

Curve Data  
\*-----\*

Curve WALL-B-1  
P.I. Station = 10+83.51 N 13,787,222.5264 E 3,081,611.6678  
Delta = 1° 28' 51.94" (RT)  
Degree = 0° 53' 12.56"  
Tangent = 83.5104  
Length = 167.0115  
Radius = 6,460.7917  
External = 0.5397  
Long Chord = 167.0068  
Mid. Ord. = 0.5396  
P.C. Station = 10+00.00 N 13,787,145.5912 E 3,081,579.1875  
P.T. Station = 11+67.01 N 13,787,298.5963 E 3,081,646.1257  
C.C. = N 22° 53' 17.99" E  
Back = N 24° 22' 09.94" E  
Ahead = N 23° 37' 43.96" E  
Chord Bear = N 23° 37' 43.96" E

Course from PT WALL-B-1 to 756 N 24° 22' 09.94" E Dist 531.2420

Point 756 N 13,787,782.5068 E 3,081,865.3259 Sta 16+98.25

Ending chain WALL-B description

**RETAINING WALL AB**

Beginning chain WALL-AB description  
Feature: Struc\_WallHoriz

Point 761 N 13,787,793.4068 E 3,081,841.2629 Sta 10+00.00

Course from 761 to 762 S 65° 37' 50.06" E Dist 26.4167

Point 762 N 13,787,782.5068 E 3,081,865.3259 Sta 10+26.42

Ending chain WALL-AB description

**RETAINING WALL C**

Beginning chain WALL-C description  
Feature: Struc\_WallHoriz

Point 851 N 13,787,878.5763 E 3,081,879.8427 Sta 10+00.00  
Course from 851 to PC WALL-C 3 N 24° 22' 09.94" E Dist 333.9494

Curve Data  
\*-----\*

Curve WALL-C 3  
P.I. Station = 13+73.25 N 13,788,218.5750 E 3,082,033.8543  
Delta = 1° 33' 24.76" (LT)  
Degree = 1° 58' 50.30"  
Tangent = 39.3048  
Length = 78.6048  
Radius = 2,892.7917  
External = 0.2670  
Long Chord = 78.6023  
Mid. Ord. = 0.2670  
P.C. Station = 13+33.95 N 13,788,182.7721 E 3,082,017.6364  
P.T. Station = 14+12.55 N 13,788,254.8053 E 3,082,049.0934  
C.C. = N 24° 22' 09.94" E  
Back = N 22° 48' 45.18" E  
Ahead = N 23° 35' 27.56" E  
Chord Bear = N 23° 35' 27.56" E

Ending chain WALL-C description

**RETAINING WALL D**

Beginning chain WALL-D description  
Feature: Struc\_WallHoriz

Point 857 N 13,787,867.6763 E 3,081,903.9058 Sta 10+00.00  
Course from 857 to PC WALL-D 3 N 24° 22' 09.94" E Dist 333.9494

Curve Data  
\*-----\*

Curve WALL-D 3  
P.I. Station = 13+71.10 N 13,788,205.7092 E 3,082,057.0268  
Delta = 1° 27' 29.13" (LT)  
Degree = 1° 57' 45.78"  
Tangent = 37.1467  
Length = 74.2895  
Radius = 2,919.2083  
External = 0.2363  
Long Chord = 74.2874  
Mid. Ord. = 0.2363  
P.C. Station = 13+33.95 N 13,788,171.8721 E 3,082,041.6994  
P.T. Station = 14+08.24 N 13,788,239.9254 E 3,082,071.4883  
C.C. = N 24° 22' 09.94" E  
Back = N 22° 54' 40.81" E  
Ahead = N 23° 38' 25.37" E  
Chord Bear = N 23° 38' 25.37" E

Ending chain WALL-D description

**RETAINING WALL CD**

Beginning chain WALL-CD description  
Feature: Struc\_WallHoriz

Point 759 N 13,787,878.5763 E 3,081,879.8427 Sta 10+00.00

Course from 759 to 760 S 65° 37' 50.07" E Dist 26.4167

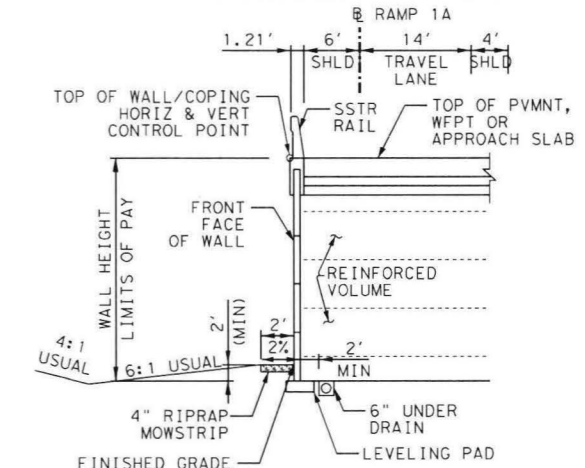
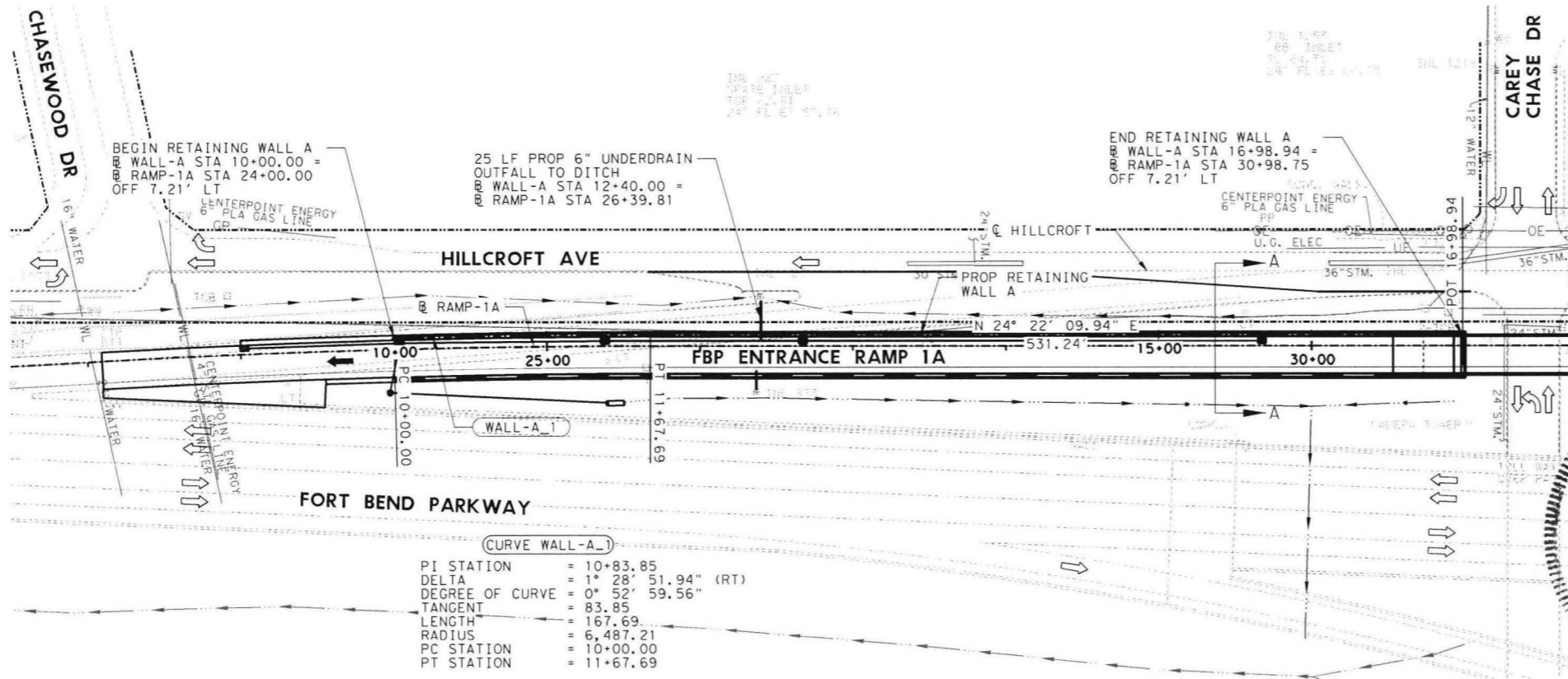
Point 760 N 13,787,867.6763 E 3,081,903.9058 Sta 10+26.42

Ending chain WALL-CD description

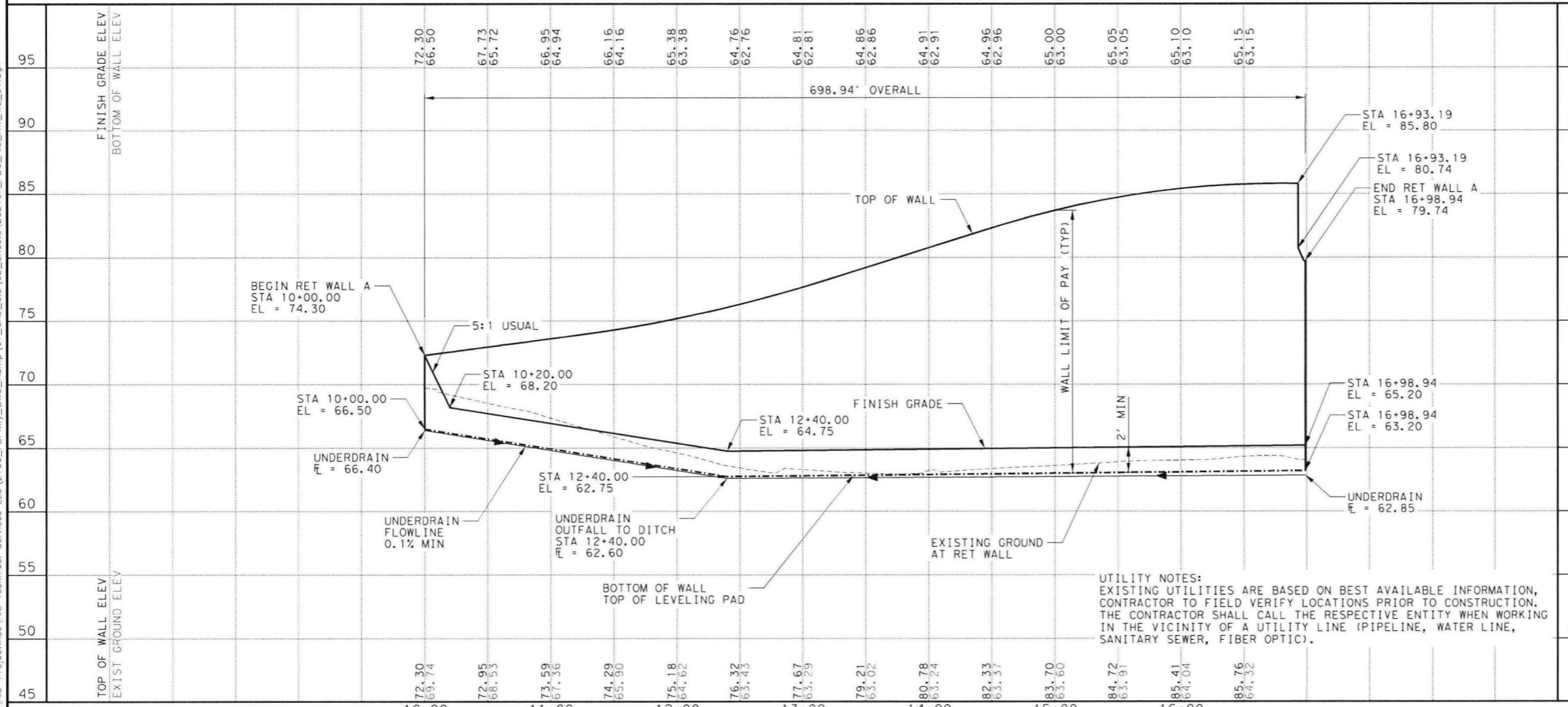


REV.	DATE	BY	DESCRIPTION
 3/15/2023			
 <b>FORT BEND COUNTY TOLL ROAD AUTHORITY</b>			
AIG TECHNICAL SERVICES, LLC F-20607 <b>AIG Tech</b> 1500 S DAIRY ASHFORD <small>Advanced Infrastructure Group</small> SUITE 445 HOUSTON, TX 77077			
<b>FORT BEND PARKWAY TOLL ROAD</b>  <b>RETAINING WALL ALIGNMENT DATA</b>			
SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	74
CHECKED BY:			

100%  
SUBMITTAL



- NOTES:
- STATIONS AND OFFSETS ARE BASED ON RETAINING WALL ALIGNMENT UNLESS OTHERWISE NOTED.
  - SEE "RETAINING WALL ALIGNMENT DATA" SHEET FOR ADDITIONAL RETAINING WALL ALIGNMENT DATA.
  - SEE MECHANICALLY STABILIZED RETAINING WALL (MSRW-CSB) AND CEMENT STABILIZED BACKFILL EMBANKMENT (CSBE-RW) STANDARD SHEETS (TXDOT HOUSTON DISTRICT) FOR DETAILS AND LIMITS OF REINFORCED VOLUME.
  - SEE RW(MSE)DD, RW(TRF), AND MSRW-CSB FOR ADDITIONAL DETAILS.
  - SEE GEOTECHNICAL REPORT PREPARED BY RABA KISTNER, INC. FOR STRUCTURAL STABILITY ANALYSIS.



REV.	DATE	BY	DESCRIPTION

STATE OF TEXAS  
RAJESH JANARTHANAN  
99487  
LICENSED PROFESSIONAL ENGINEER

4/4/2023

**FORT BEND COUNTY**  
**TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

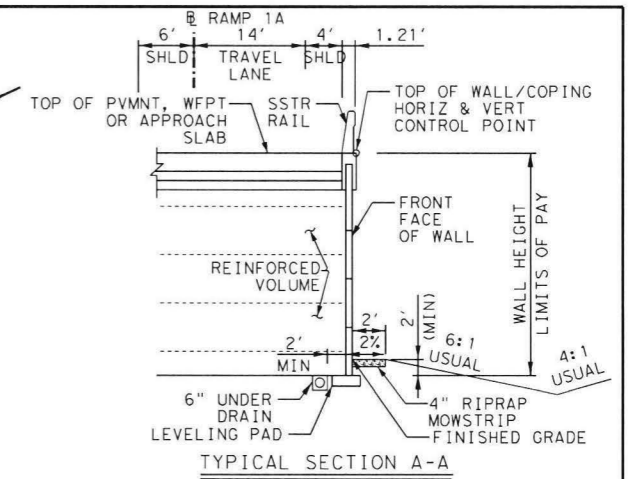
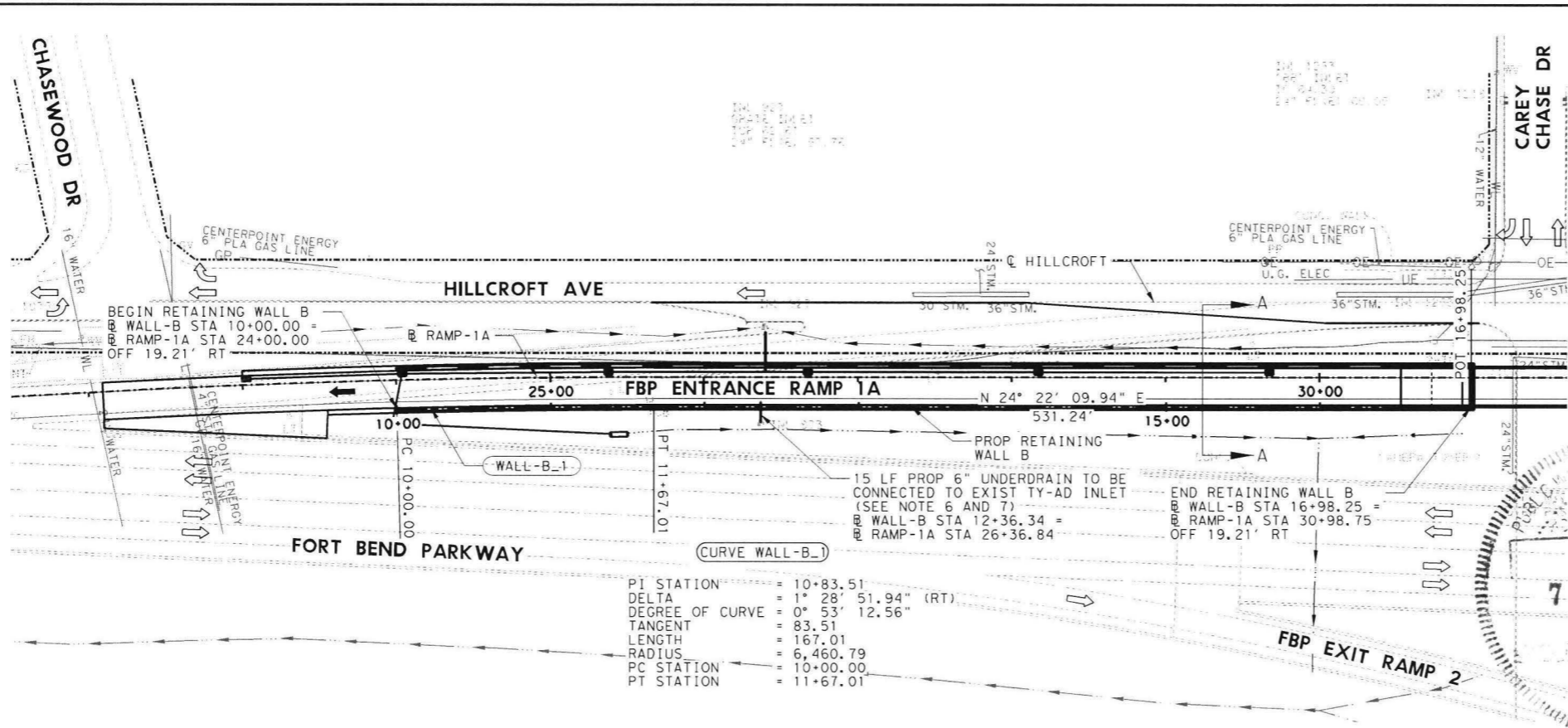
**FORT BEND PARKWAY TOLL ROAD**  
**ENTRANCE RAMP 1A**  
**RETAINING WALL A**  
**PLAN AND PROFILE**

SHEET 1 OF 5

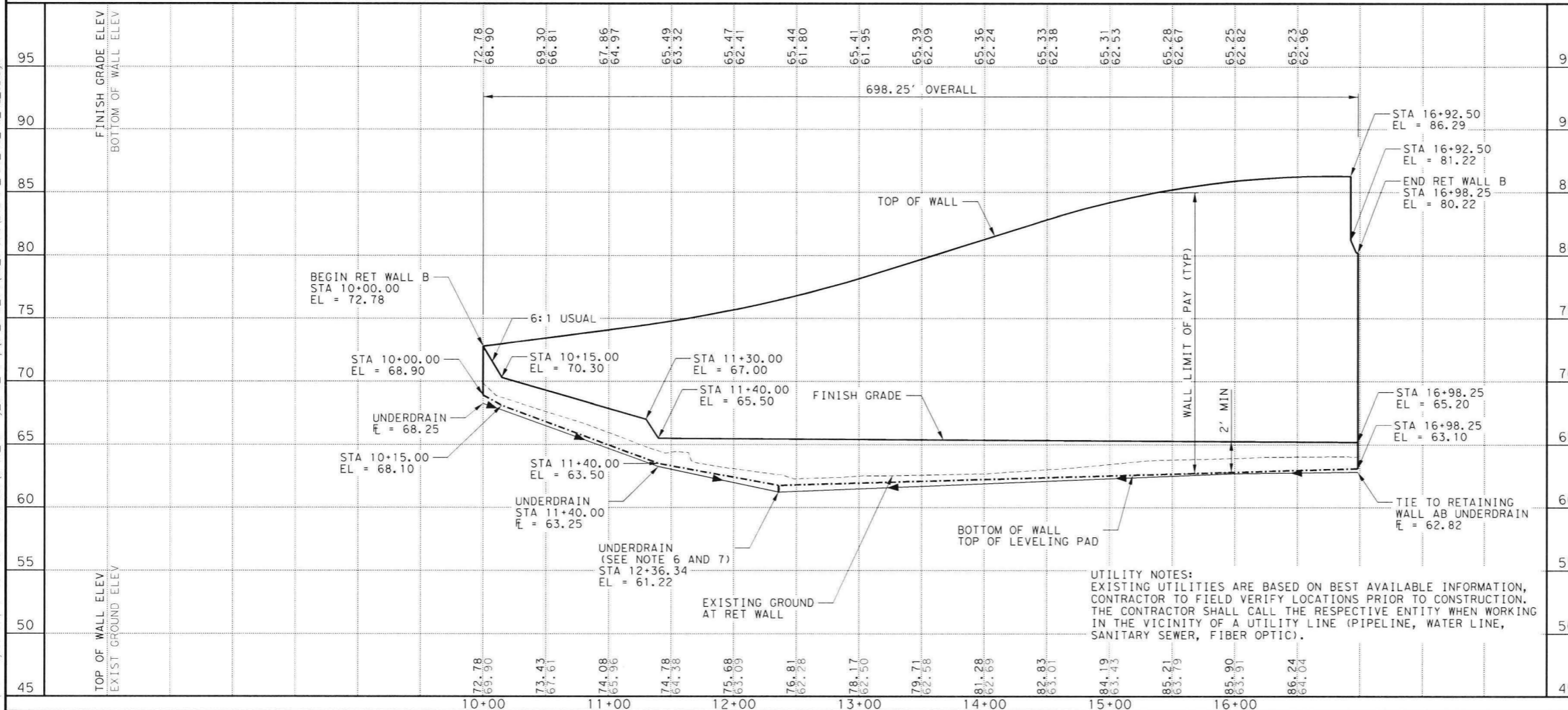
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DRAWN BY:		SHEET NO.:	75

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- NOTES:
- STATIONS AND OFFSETS ARE BASED ON RETAINING WALL ALIGNMENT UNLESS OTHERWISE NOTED.
  - SEE "RETAINING WALL ALIGNMENT DATA" SHEET FOR ADDITIONAL RETAINING WALL ALIGNMENT DATA.
  - SEE MECHANICALLY STABILIZED RETAINING WALL (MSRW-CSB) AND CEMENT STABILIZED BACKFILL EMBANKMENT (CSBE-RW) STANDARD SHEETS (TXDOT HOUSTON DISTRICT) FOR DETAILS AND LIMITS OF REINFORCED VOLUME.
  - SEE RW(MSE)DD, RW(TRF), AND MSRW-CSB FOR ADDITIONAL DETAILS.
  - SEE GEOTECHNICAL REPORT PREPARED BY RABA KISTNER, INC. FOR STRUCTURAL STABILITY ANALYSIS.
  - PROP FLOW ELEVATION OF 6" PVC UNDERDRAIN AT EXISTING TY-AD INLET TO BE AT (OR HIGHER THAN) FLOW LINE ELEVATION OF EXISTING INLET.
  - CONTRACTOR TO MAKE A HOLE ON THE SIDE OF THE EXISTING INLET TO INSERT 6" PVC TO THE INSIDE FACE OF THE WALL. CEMENT GROUT SHALL BE USED AT THE JOINT.



REV.	DATE	BY	DESCRIPTION

4/4/2023

**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group  
1500 S DAIRY ASHFORD SUITE 445 HOUSTON, TX 77077

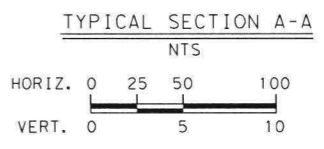
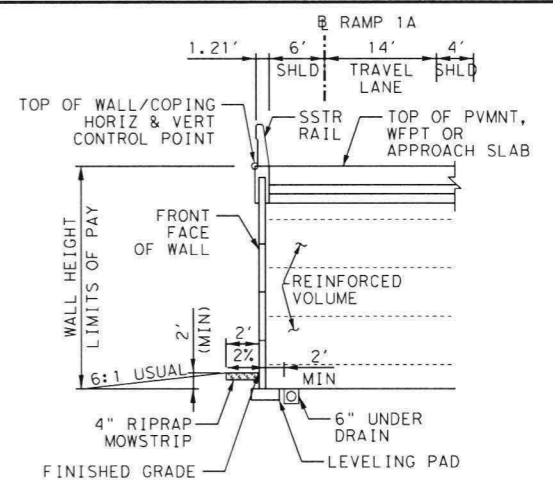
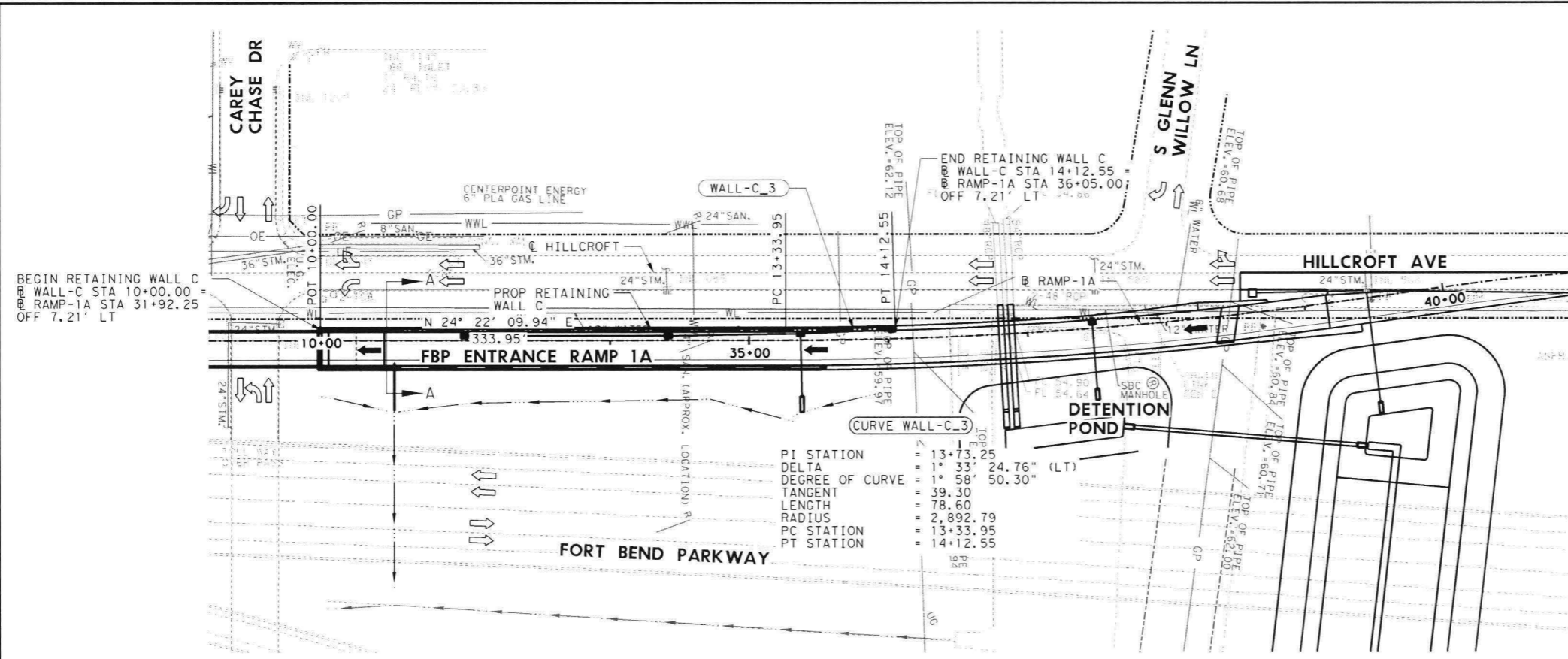
**FORT BEND PARKWAY TOLL ROAD**  
**ENTRANCE RAMP 1A**  
**RETAINING WALL B**  
**PLAN AND PROFILE**

SHEET 2 OF 5

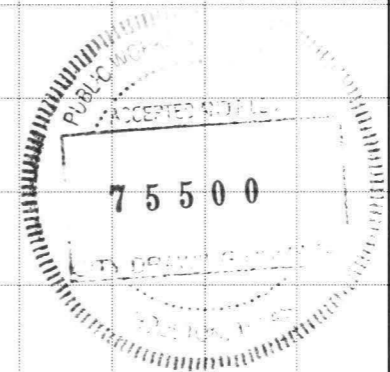
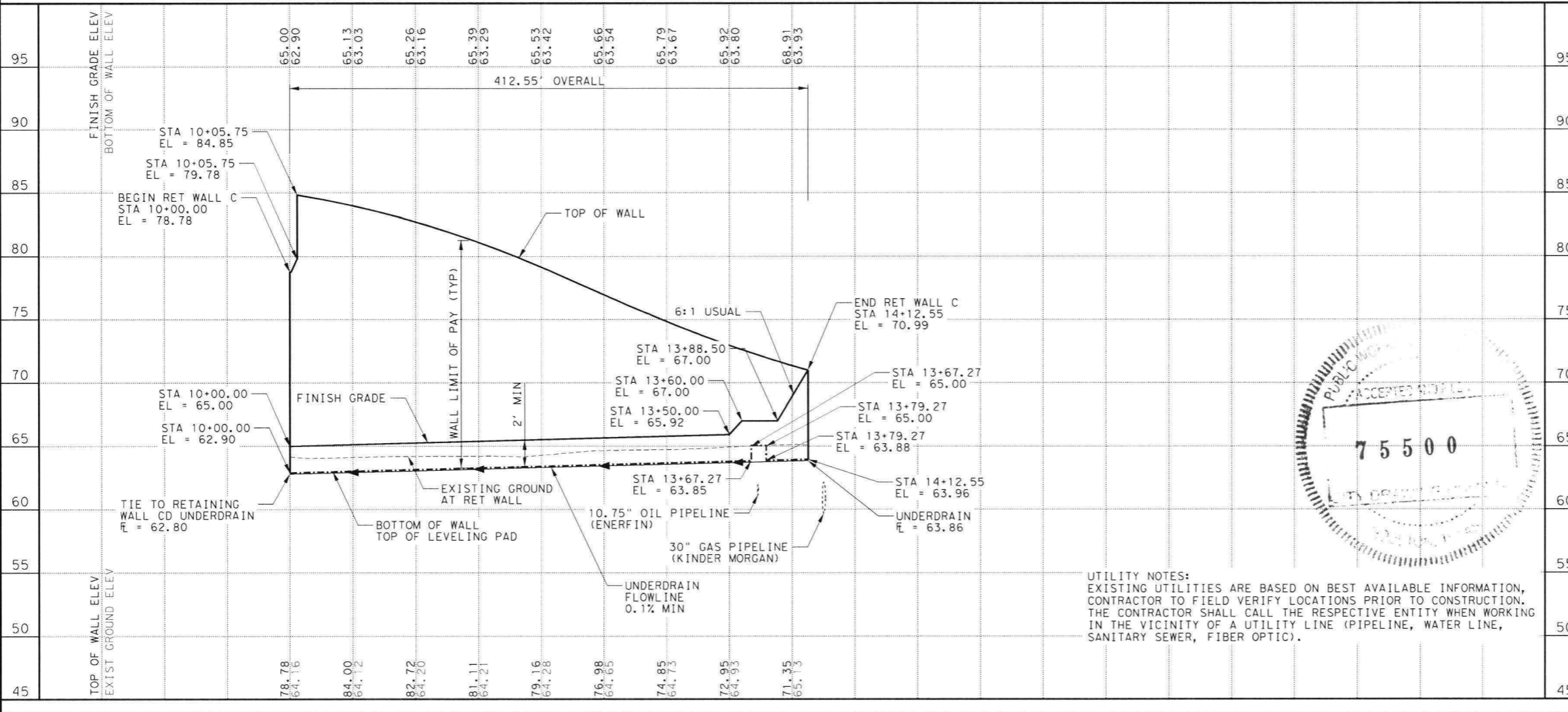
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DESIGNED BY:		CHECKED BY:	
DRAWN BY:		CHECKED BY:	
CHECKED BY:		SHEET NO.:	76

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SUBMITTAL



- NOTES:
1. STATIONS AND OFFSETS ARE BASED ON RETAINING WALL ALIGNMENT UNLESS OTHERWISE NOTED.
  2. SEE "RETAINING WALL ALIGNMENT DATA" SHEET FOR ADDITIONAL RETAINING WALL ALIGNMENT DATA.
  3. SEE MECHANICALLY STABILIZED RETAINING WALL (MSRW-CSB) AND CEMENT STABILIZED BACKFILL EMBANKMENT (CSBE-RW) STANDARD SHEETS (TXDOT HOUSTON DISTRICT) FOR DETAILS AND LIMITS OF REINFORCED VOLUME.
  4. SEE RW(MSE)DD, RW(TRF), AND MSRW-CSB FOR ADDITIONAL DETAILS.
  5. SEE GEOTECHNICAL REPORT PREPARED BY RABA KISTNER, INC. FOR STRUCTURAL STABILITY ANALYSIS.



REV.	DATE	BY	DESCRIPTION

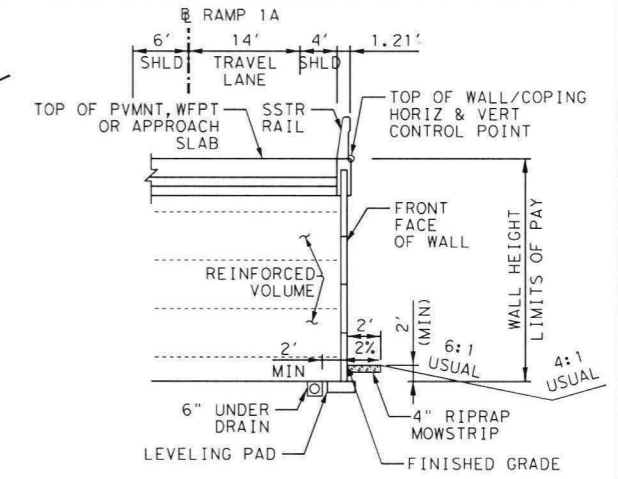
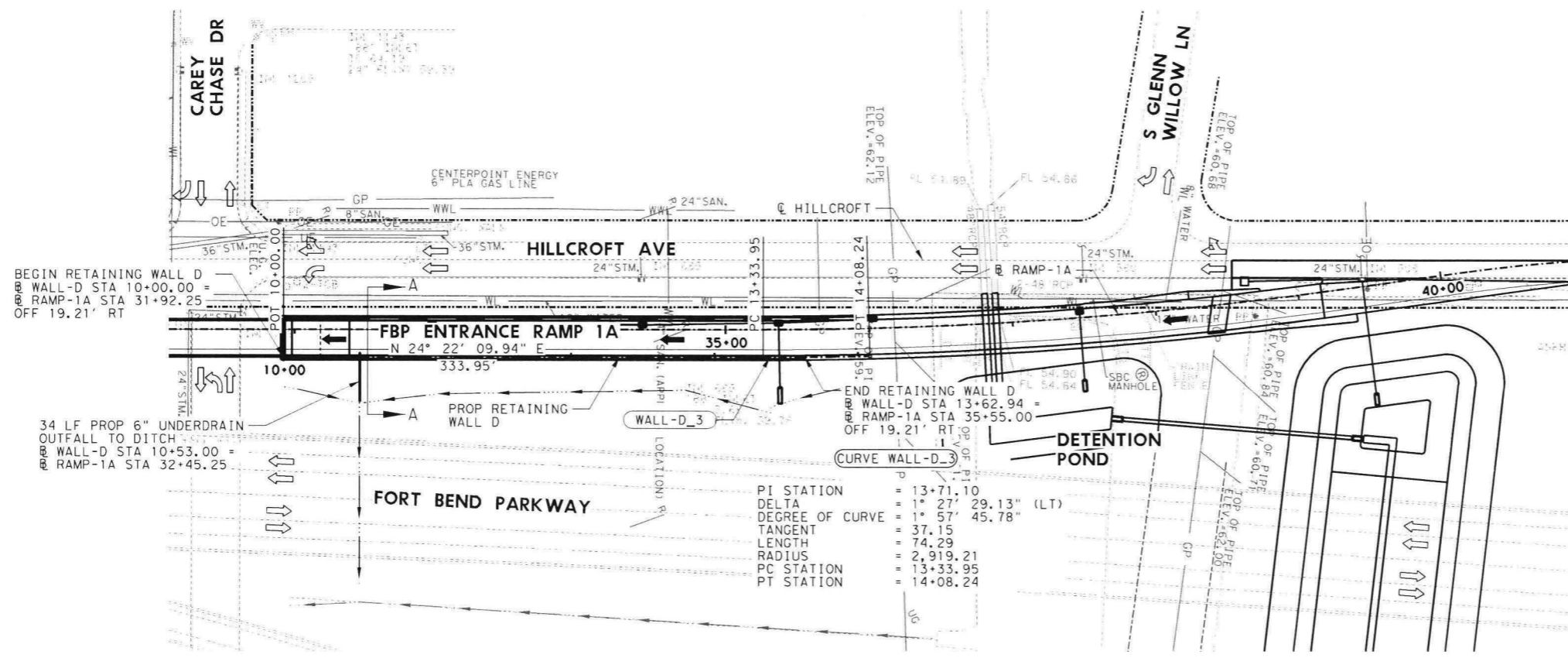
  

<p>4/4/2023</p>	
<p><b>FORT BEND COUNTY TOLL ROAD AUTHORITY</b></p>	
<p><b>AIG Tech</b> Advanced Infrastructure Group 1500 S DAIRY ASHFORD SUITE 445 HOUSTON, TX 77077</p>	
<p><b>FORT BEND PARKWAY TOLL ROAD</b></p> <p><b>ENTRANCE RAMP 1A</b> <b>RETAINING WALL C</b> <b>PLAN AND PROFILE</b></p>	
<p>SHEET 3 OF 5</p>	
PROJECT NUMBER	20219x
DESIGNED BY:	DATE: 4/4/2023
CHECKED BY:	
DRAWN BY:	SHEET NO.: 77
CHECKED BY:	

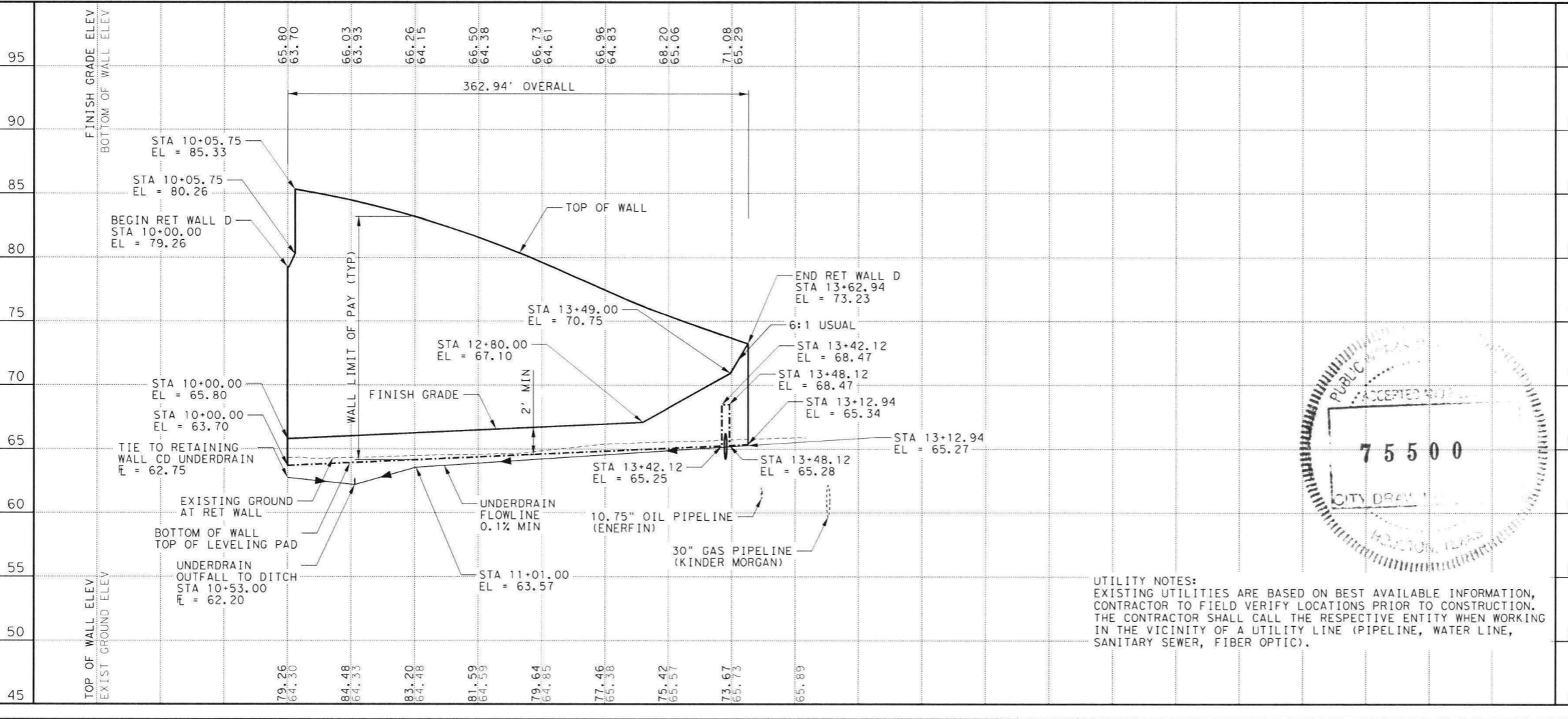
UTILITY NOTES:  
EXISTING UTILITIES ARE BASED ON BEST AVAILABLE INFORMATION, CONTRACTOR TO FIELD VERIFY LOCATIONS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL CALL THE RESPECTIVE ENTITY WHEN WORKING IN THE VICINITY OF A UTILITY LINE (PIPELINE, WATER LINE, SANITARY SEWER, FIBER OPTIC).

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- NOTES:
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  - SEE "RETAINING WALL ALIGNMENT DATA" SHEET FOR ADDITIONAL RETAINING WALL ALIGNMENT DATA.
  - SEE MECHANICALLY STABILIZED RETAINING WALL (MSRW-CSB) AND CEMENT STABILIZED BACKFILL EMBANKMENT (CSBE-RW) STANDARD SHEETS (TXDOT HOUSTON DISTRICT) FOR DETAILS AND LIMITS OF REINFORCED VOLUME.
  - SEE RW(MSE)DD, RW(TRF), AND MSRW-CSB FOR ADDITIONAL DETAILS.
  - SEE GEOTECHNICAL REPORT PREPARED BY RABA KISTNER, INC. FOR STRUCTURAL STABILITY ANALYSIS.



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

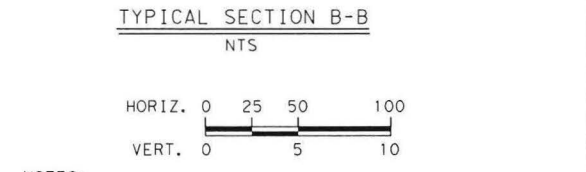
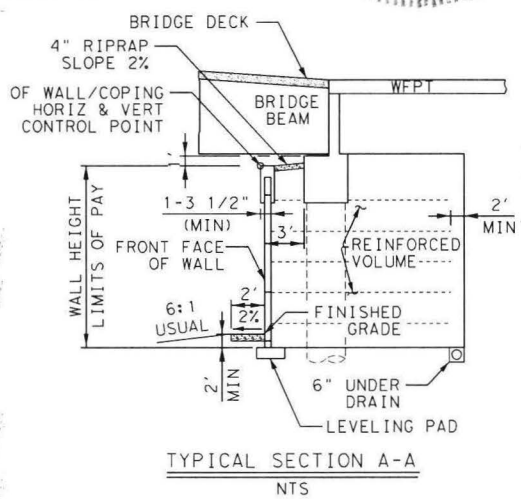
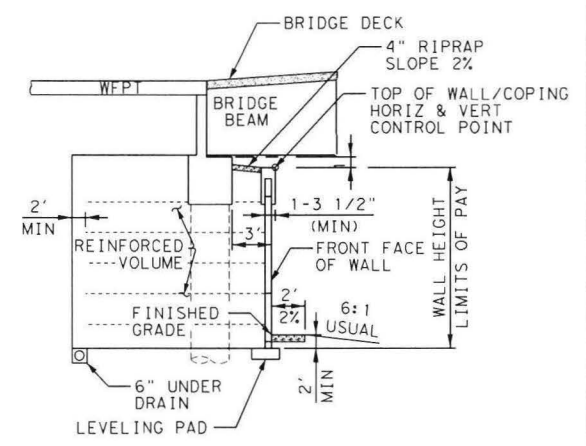
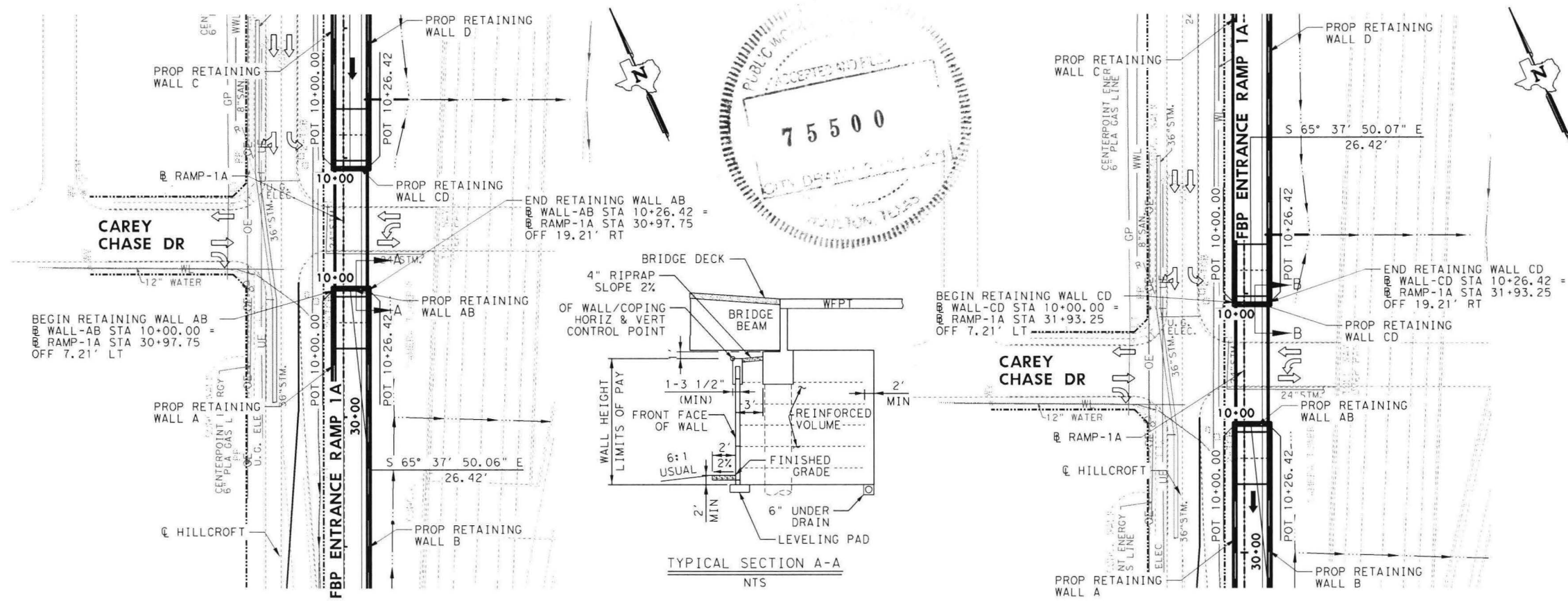
**AIG Tech**  
Advanced Infrastructure Group  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD**  
**ENTRANCE RAMP 1A**  
**RETAINING WALL D**  
**PLAN AND PROFILE**

SHEET 4 OF 5			
PROJECT NUMBER	20219x	DATE:	4/4/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	78
CHECKED BY:			



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- NOTES:
1. STATIONS AND OFFSETS ARE BASED ON RETAINING WALL ALIGNMENT UNLESS OTHERWISE NOTED.
  2. SEE "RETAINING WALL ALIGNMENT DATA" SHEET FOR ADDITIONAL RETAINING WALL ALIGNMENT DATA.
  3. SEE MECHANICALLY STABILIZED RETAINING WALL (MSRW-CSB) AND CEMENT STABILIZED BACKFILL EMBANKMENT (CSBE-RW) STANDARD SHEETS (TXDOT HOUSTON DISTRICT) FOR DETAILS AND LIMITS OF REINFORCED VOLUME.
  4. SEE RW(MSE)DD, RW(TRF), AND MSRW-CSB FOR ADDITIONAL DETAILS.
  5. SEE GEOTECHNICAL REPORT PREPARED BY RABA KISTNER, INC. FOR STRUCTURAL STABILITY ANALYSIS.

RETAINING WALL AB		RETAINING WALL CD	
95	FINISH GRADE ELEV	95	95
90	BOTTOM OF WALL ELEV	90	90
85	TOP OF WALL	85	85
80	BEGIN RET WALL AB STA 10+00.00 EL = 79.74'	BEGIN RET WALL CD STA 10+00.00 EL = 78.78	END RET WALL CD STA 10+26.42 EL = 79.26
75	END RET WALL AB STA 10+26.42 EL = 80.22	FINISH GRADE STA 10+00.00 EL = 65.00	FINISH GRADE STA 10+00.00 EL = 62.90
70	FINISH GRADE STA 10+00.00 EL = 65.20	FINISH GRADE STA 10+00.00 EL = 65.00	FINISH GRADE STA 10+00.00 EL = 62.90
65	FINISH GRADE STA 10+00.00 EL = 63.20	FINISH GRADE STA 10+00.00 EL = 65.00	FINISH GRADE STA 10+00.00 EL = 62.90
60	TIE TO RETAINING WALL A UNDERDRAIN EL = 62.85	TIE TO RETAINING WALL C UNDERDRAIN EL = 62.80	TIE TO RETAINING WALL D UNDERDRAIN EL = 62.75
55	EXISTING GROUND AT RET WALL	EXISTING GROUND AT RET WALL	EXISTING GROUND AT RET WALL
50	BOTTOM OF WALL TOP OF LEVELING PAD	BOTTOM OF WALL TOP OF LEVELING PAD	BOTTOM OF WALL TOP OF LEVELING PAD
45	TOP OF WALL ELEV	45	45

REV.	DATE	BY	DESCRIPTION

4/4/2023

**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group

AIG TECHNICAL SERVICES, LLC  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD**

**ENTRANCE RAMP 1A**

**RETAINING WALL AB & CD**

**PLAN AND PROFILE**

SHEET 5 OF 5			
PROJECT NUMBER	20219x	DATE:	4/4/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	79
CHECKED BY:			

4/4/2023 5:11:28 PM C:\AIG-Projectwise\AIG Technical Services LLC\2106\_FBPkwy\_BW8\_Ramp\07\_CAD\_GIS\02\_Sheets\20219x\_FBC\_AIG\_RW\_WL\_05.dgn

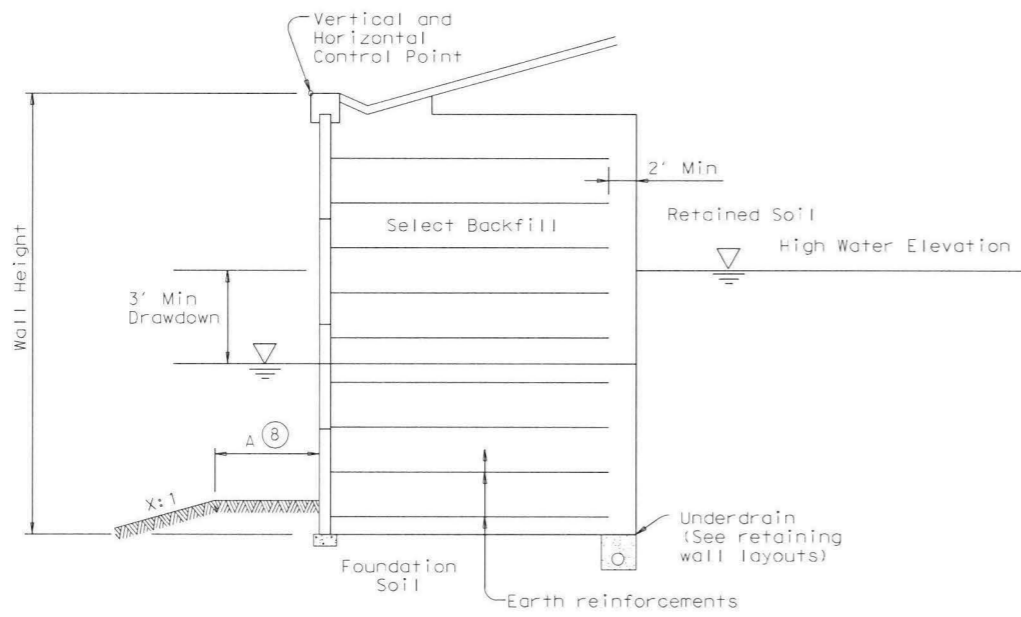
WALL SUMMARY

MSE Retaining Wall	Begin Station ①	End Station ①	Retained Soil Friction Angle ②	Foundation Soil Friction Angle ②	Ground Improvement ③	Min Earth Reinforcement Length ④	Min Wall Embedment ⑦	Underdrain Required ⑤	Drawdown Analysis ⑥	Bench Width ⑧
RETAINING WALL A	10+00.00	16+98.94	30	30	N/A	0.7H (8.0' MIN)	2 FT	YES	N/A	2 FT (TYP)
RETAINING WALL B	10+00.00	16+98.25	30	30	N/A	0.7H (8.0' MIN)	2 FT	YES	N/A	2 FT (TYP)
RETAINING WALL AB	10+00.00	10+26.42	30	30	N/A	12.5'	2 FT	YES	N/A	2 FT (TYP)
RETAINING WALL C	10+00.00	14+12.55	30	30	N/A	0.7H (8.0' MIN)	2 FT	YES	N/A	2 FT (TYP)
RETAINING WALL D	10+00.00	13+62.94	30	30	N/A	0.7H (8.0' MIN)	2 FT	YES	N/A	2 FT (TYP)
RETAINING WALL CD	10+00.00	10+26.42	30	30	N/A	11.5'	2 FT	YES	N/A	2 FT (TYP)

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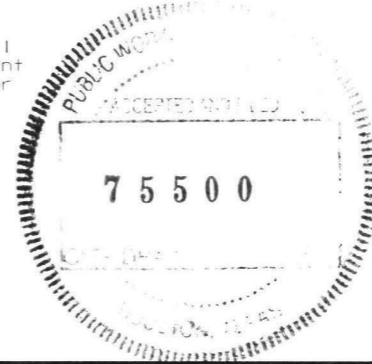
*John D. Brown*  
2/24/2023



TYPICAL SECTION  
(RAPID DRAWDOWN CONDITION)

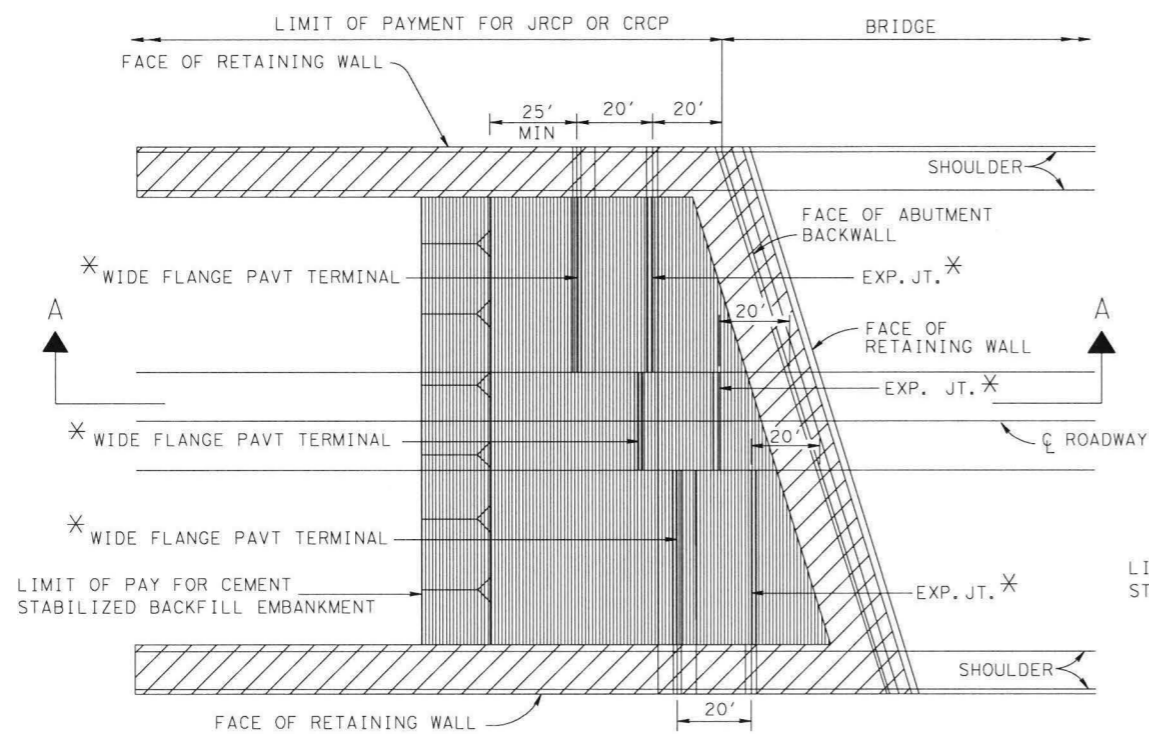
- ① Indicate limits for which the stated soil design requirements/assumptions are applicable.
- ② Retained and Foundation friction angle listed should be based on local experience or measured/correlated long term strength values.
- ③ Indicate if ground improvement is required or not required. If shown as required, refer to Ground Improvement Detail(s) for additional information.
- ④ Indicate on table minimum length and length ratio required. The minimum default length of earth reinforcements shall be either 8'-0" or 70% of the wall height, whichever is greater. Wall height and design wall height may differ depending on project geometry and loading conditions. Note: Wall height at bridge abutments is equal to the distance between the top of leveling pad and finished grade at the bridge abutment backwall.
- ⑤ Indicate if underdrain is required or not required.
- ⑥ Indicate if rapid drawdown analysis is required.
- ⑦ Guidance to wall designer of record for determination of minimum wall embedment: Unless noted elsewhere in the plans, the minimum embedment provided from the top of leveling pad to finish grade shall be 1' for level ground where there is no potential for erosion or future excavation or 2' for sloping ground (4.0H:1.0V or steeper) or where there is potential for removal of soil in front of the wall.
- ⑧ Horizontal Bench width at base of wall varies. Use the following criteria to establish base width.  
A = 2.0' Min for  $X \geq 4$ , or  
A = 4.0' Min for  $X \leq 4$ .  
Applicable to both drawdown and dry condition.

**SPECIAL NOTES:**  
This sheet is to be filled out by the wall designer of record at time of plan preparation to provide soil strength parameters for the design of the specified walls. The completed sheet shall be signed, sealed, and dated by a licensed Professional Engineer.

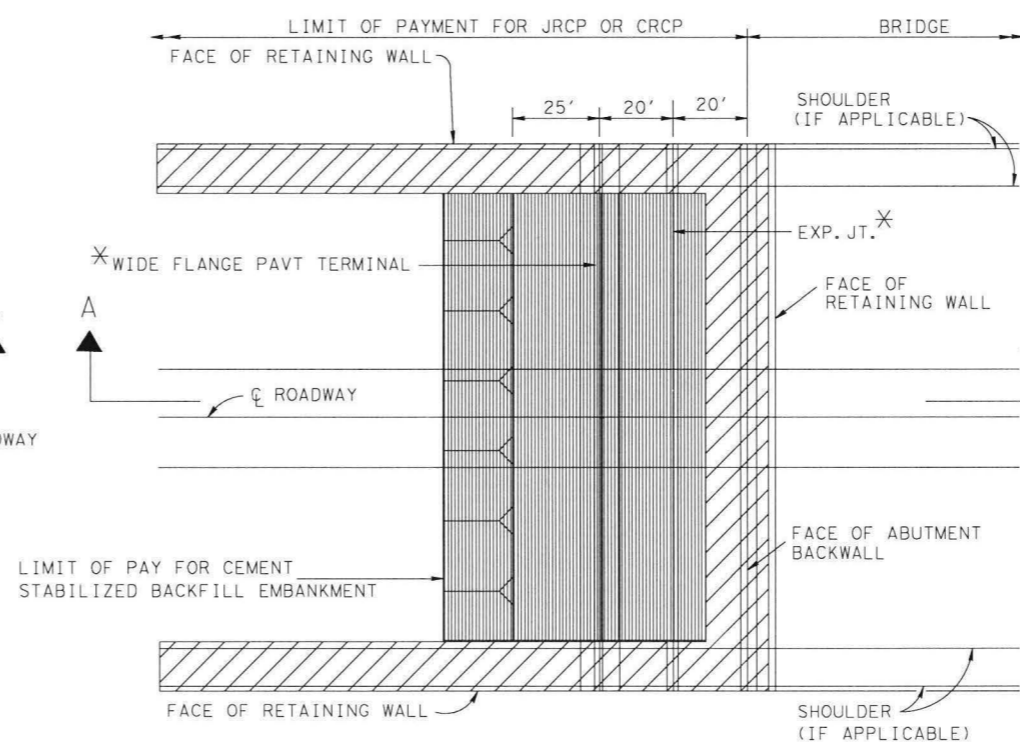


		Bridge Division Standard	
<b>MECHANICALLY STABILIZED EARTH RETAINING WALL DESIGN DATA</b>			
<b>RW(MSE)DD</b>			
FILE: rwstde16.dgn	DN: TxDOT	CK: MJG	CW: JTR
REVISIONS	CONT	SECT	JOB
HOU	COUNTY: FBC		SHEET NO: 80

DATE: FILE:



TYPICAL ROADWAY LAYOUT  
CONCRETE MEDIAN AND SHOULDERS  
(AT SKEWED BRIDGES)



TYPICAL ROADWAY LAYOUT  
CONCRETE MEDIAN AND SHOULDERS  
(AT NON-SKEWED BRIDGES)

NOTES

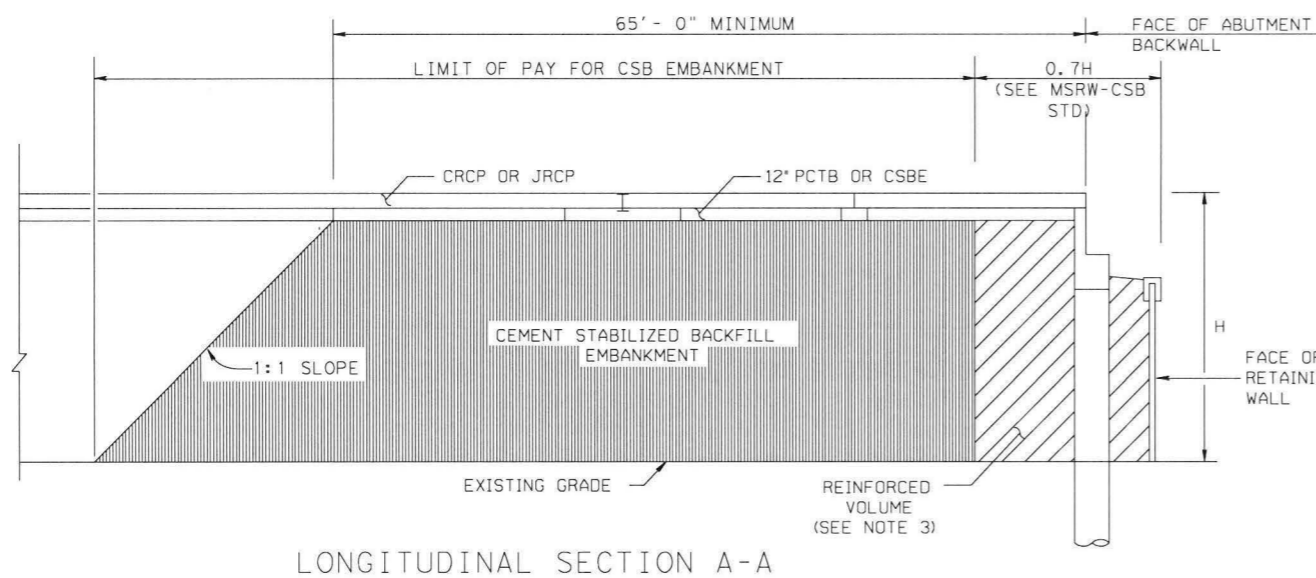
1. USE CEMENT STABILIZED BACKFILL EMBANKMENT IN ACCORDANCE WITH ITEM 132 AND HOUSTON DISTRICT-WIDE SPECIAL PROVISION (132-001).
2. FOR ADDITIONAL DETAILS ON WIDE FLANGE PAVEMENT TERMINALS SEE "WIDE FLANGE PAVEMENT TERMINALS" STANDARD SHEET.
3. FOR ADDITIONAL DETAILS ON RETAINING WALLS SEE "MECHANICALLY STABILIZED RETAINING WALL - CEMENT STABILIZED BACKFILL" MSRW-CSB STANDARD SHEET.

- CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
- CSBE - CEMENT STABILIZED BACKFILL EMBANKMENT
- EXP JT - EXPANSION JOINT
- H - HEIGHT OF RETAINING WALL
- JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
- MSRW - MECHANICALLY STABILIZED RETAINING WALL
- PCTB - PORTLAND CEMENT TREATED BASE

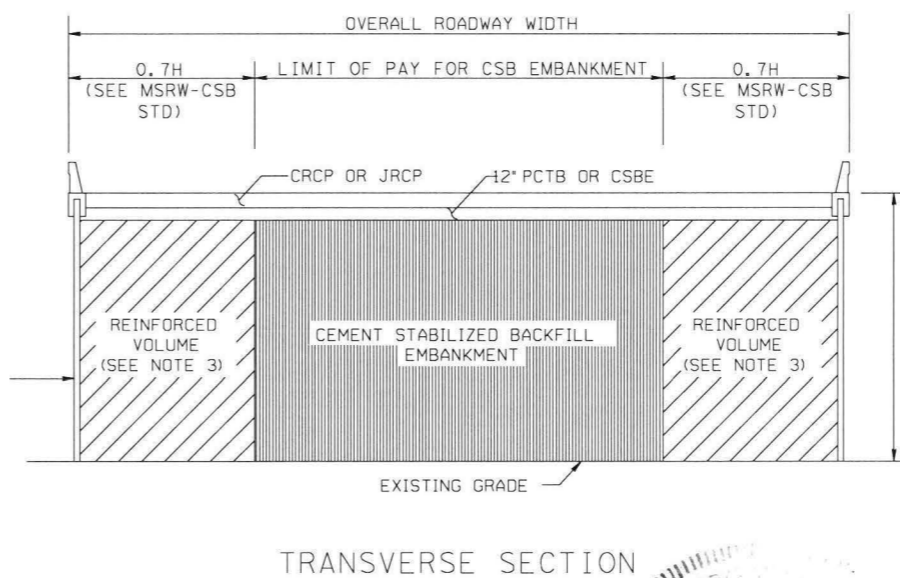
- LIMITS OF REINFORCED VOLUME (CEMENT STABILIZED BACKFILL). THIS VOLUME IS PAID UNDER ITEM 132-6006, EMBANKMENT (FINAL) (DC) (TY C).
- LIMITS OF CEMENT STABILIZED BACKFILL EMBANKMENT. THIS QUANTITY IS PAID UNDER ITEM 132-6035, EMBANKMENT (FINAL) (DENS CONT) (TY E) (CSBE).

LEGEND

\* THIS APPLIES ONLY WHEN WIDE FLANGE TERMINALS ARE USED ON APPROACHES TO BRIDGES. IF NOT USING THIS SYSTEM, SEE APPROACH SLAB DETAILS ELSEWHERE IN THE PLANS.



LONGITUDINAL SECTION A-A



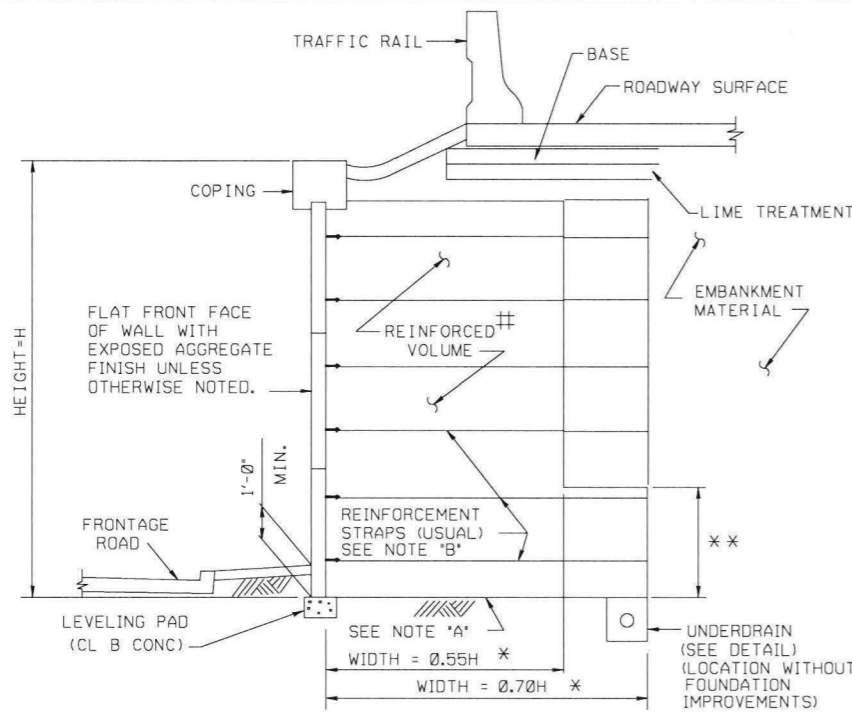
TRANSVERSE SECTION



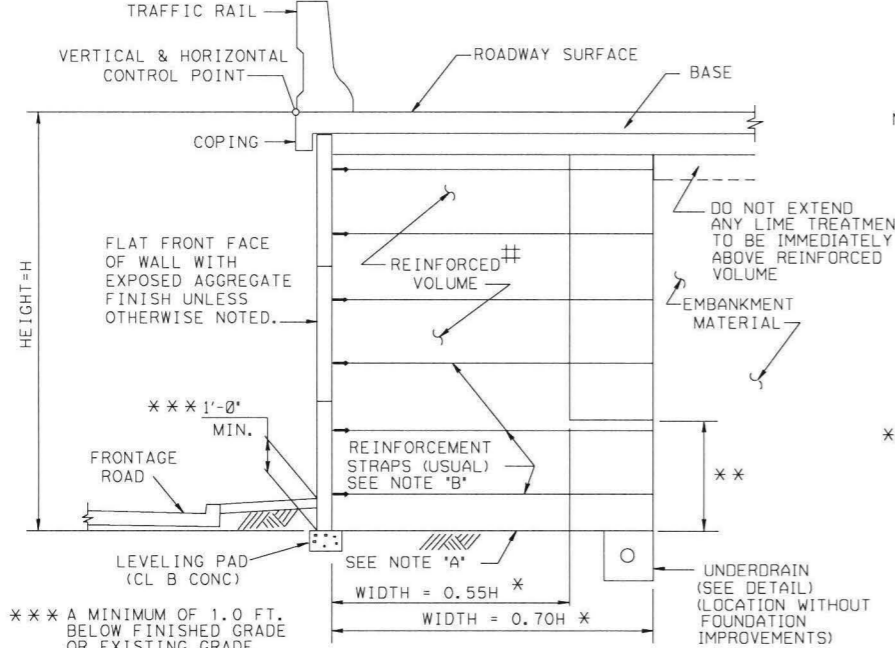
Texas Department of Transportation  
Houston District

CEMENT  
STABILIZED BACKFILL  
EMBANKMENT  
(FOR USE WITH RETAINING WALLS  
AT BRIDGE ABUTMENTS)  
CSBE-RW

FILE: STDB-6.dgn	DN:	CK:	DW:	CK:
© TXDOT 2014	DIST	FED REG	PROJECT NO.	SHEET
REVISTONS	HOU	6		81
	COUNTY	CONTROL	SECT	JOB
				HIGHWAY

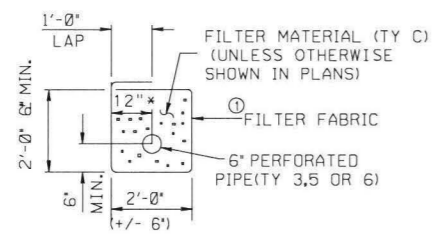


TYPICAL SECTION  
(WALL AT BOTTOM OF SLOPE)

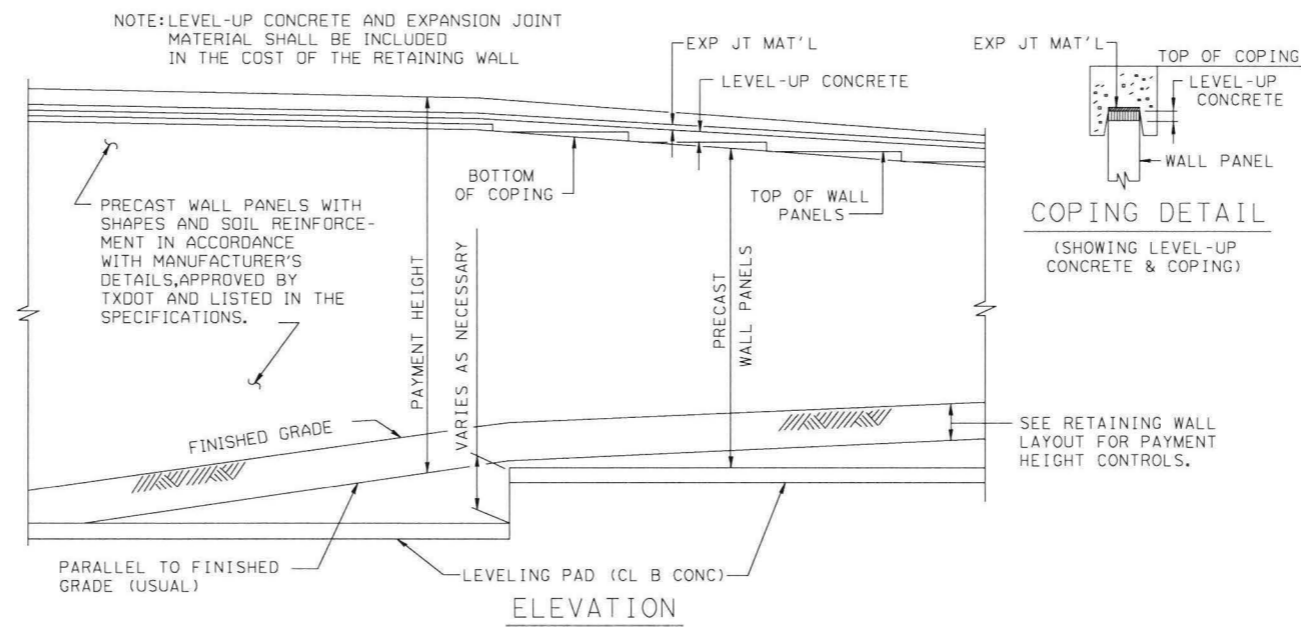


TYPICAL SECTION  
(SHOWING ROADWAY ON WALL)

① FILTER FABRIC MEETING THE REQUIREMENTS OF DMS-6200 TYPE 1.

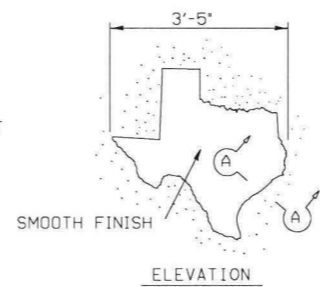


UNDERDRAIN DETAIL



ELEVATION

COPING DETAIL  
(SHOWING LEVEL-UP CONCRETE & COPING)



MAP OF TEXAS EMBLEM

(FOR NON - GREEN RIBBON PROJECTS ONLY)  
FORM MAP OF TEXAS EMBLEM INTO A WALL PANEL NEXT TO EACH BRIDGE ABUTMENT. PLACE THE EXACT LOCATION OF EACH EMBLEM AS APPROVED BY THE ENGINEER. THE COST OF FORMING THE EMBLEMS WILL NOT BE PAID FOR DIRECTLY, BUT IS CONSIDERED INCIDENTAL TO THE UNIT PRICE BID FOR 'RETAINING WALL'.

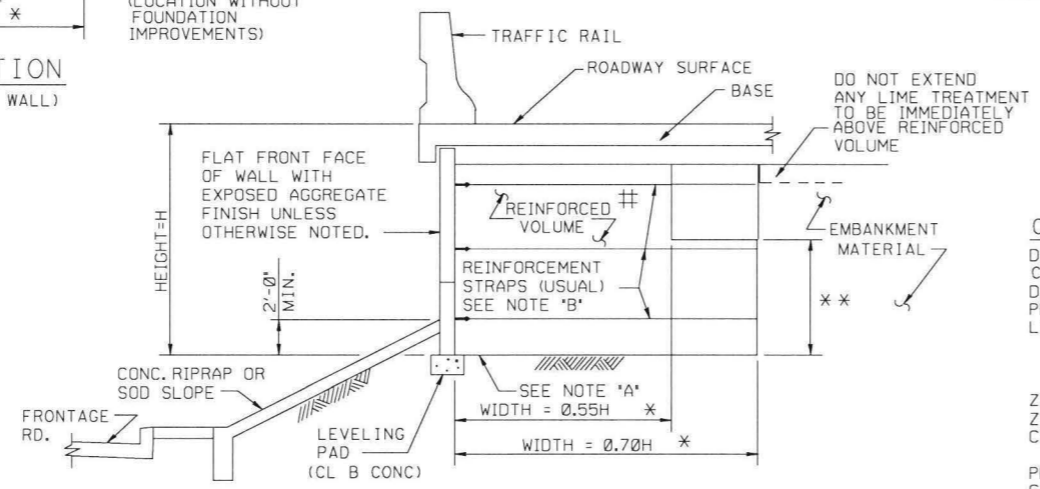
NOTE 'A': COMPACT THE SOIL UNDER THE LEVELING PAD AND THE REINFORCED VOLUME INCLUDING A MINIMUM OF TWO (2) FEET IN FRONT OF THE LEVELING PAD TO A MINIMUM OF 98% OF THE MAXIMUM DRY DENSITY, AS PRESENTED IN TEST METHOD TEX-114-E. THE DENSITY TESTING OF THE SOIL WILL BE OUTLINED IN TEST METHOD TEX-115-E. COST OF THIS COMPACTION WILL NOT BE PAID FOR DIRECTLY BUT IS INCIDENTAL TO THE UNIT PRICE BID FOR 'RETAINING WALL'.

NOTE 'B': WHEN BACKFILL DOES NOT COMPLY WITH pH AND RESISTIVITY REQUIREMENTS, USE EPOXY COATED METALLIC REINFORCEMENTS. ALSO EPOXY COATED CONNECTION HARDWARE USED WITH EPOXY COATED REINFORCEMENTS. USE EPOXY CONFORMING TO THE REQUIREMENTS OF THE ITEM, 'EPOXY.' THIS WORK WILL NOT BE PAID FOR DIRECTLY, BUT IS CONSIDERED INCIDENTAL TO THE UNIT PRICE BID FOR 'RETAINING WALL'.

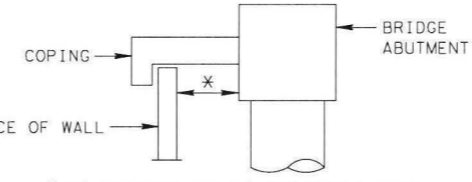
\* THE CONTRACTOR HAS THE OPTION OF PROVIDING A REINFORCED VOLUME WITH TWO DIFFERENT WIDTHS (0.55H BUT NOT LESS THAN SIX FEET AND 0.70H BUT NOT LESS THAN EIGHT FEET), OR WITH A CONSTANT WIDTH EQUAL TO 0.70H BUT NOT LESS THAN EIGHT FEET AS SHOWN.

\*\* 3 IN. MINIMUM ABOVE THE SECOND COURSE OF SOIL REINFORCEMENTS, BUT NO LESS THAN 4 FEET.

⊞ CEMENT STABILIZED BACKFILL REINFORCED VOLUME TO BE PAID AS ITEM 132-6006 EMBANKMENT (FINAL) (DENS CONT) (TY C)



TYPICAL SECTION  
(WALL AT TOP OF SLOPE)



TYPICAL SECTION  
(WALL AT ABUTMENT)

CORROSION CRITERIA

DESIGN THE EARTH REINFORCEMENT ELEMENTS TO HAVE A CORROSION RESISTANCE DURABILITY TO ENSURE A MINIMUM DESIGN LIFE OF 75 YEARS. COMPUTE THE MAXIMUM LOSS PER SIDE DUE TO CORROSION BY ASSUMING A UNIFORM LOSS MODEL BASED ON THE FOLLOWING:

ZINC CORROSION RATE (FIRST 2 YEARS) - 15 UM/YR.  
ZINC CORROSION RATE (SUBSEQUENT YEARS) - 4 UM/YR.  
CARBON STEEL CORROSION RATE - 12 UM/YR.

PERFORM STRESS AND PULLOUT CALCULATIONS ON THE CALCULATED EARTH REINFORCEMENT SECTION REMAINING AFTER 75 YEARS.

NOTES

RAILING AND ROADWAY SLAB ARE PAID FOR UNDER THE APPROPRIATE ROADWAY ITEMS. MODIFICATIONS TO THE RAIL OR ROADWAY SLAB TO FORM COPING ARE CONSIDERED INCIDENTAL TO THE SQUARE FOOT COST OF THE BID ITEM, 'RETAINING WALL'.  
PLACE THE UPPERMOST REINFORCEMENT STRAPS NO MORE THAN 3.5' BELOW THE TOP OF THE WALL. PLACE THE LOWEST LEVEL OF REINFORCEMENT STRAPS NO MORE THAN 2.0' ABOVE THE TOP OF THE LEVELING PAD.  
PROVIDE UNDERDRAINS ONLY AT LOCATIONS SHOWN ON THE PLANS. INCLUDE THE COST OF FURNISHING AND INSTALLING UNDERDRAINS IN THE UNIT PRICE BID FOR 'RETAINING WALL'.

THE REINFORCED VOLUME CONSISTS OF CEMENT STABILIZED BACKFILL IN ACCORDANCE WITH ITEM 132 AND HOUSTON DISTRICT SPECIAL PROVISION (132-001).

PAYMENT HEIGHT SHOWN IN RETAINING WALL LAYOUTS IS CONSIDERED THE MINIMUM HEIGHT TO BE FURNISHED. ADDITIONAL WALL FURNISHED BELOW PAYMENT LINE DUE TO DETAILING OR FABRICATOR DESIGN REQUIREMENTS WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED INCIDENTAL.

THE CONTRACTOR MAY USE A DIFFERENT TYPE OF TRAFFIC RAIL AND COPING ON RETAINING WALLS IF THE DESIGN AND DETAILS ARE APPROVED BY THE ENGINEER.

WHEN OBSTRUCTIONS (INLETS, DRILLED SHAFTS, PILING, ETC.) PREVENT PLACEMENT OF SOIL REINFORCEMENTS IN THEIR NORMAL LOCATIONS, PROVIDE DETAILS AND CALCULATIONS THAT ESTABLISH SUPPORT FOR THE AFFECTED PANELS. FURNISH THE SAME STEEL AREA OF SOIL REINFORCEMENTS AS THAT REQUIRED IN THE ABSENCE OF THE OBSTRUCTION. PROVIDE CALCULATIONS THAT JUSTIFY ANY ALTERATIONS MADE TO THE SOIL REINFORCEMENTS OR MODIFICATIONS TO THEIR NORMAL PLACEMENT. DO NOT USE PANELS WITHOUT ANY SOIL REINFORCEMENTS CONNECTED TO THEM UNLESS THEY ARE CONNECTED WITH GALVANIZED HARDWARE TO ADJACENT PANELS WHICH DO HAVE SUPPORTING SOIL REINFORCEMENTS ATTACHED TO THEM AND AS APPROVED BY THE ENGINEER.

DESIGN PARAMETERS

BASE RETAINING WALL DESIGN ON THE FOLLOWING DESIGN PATTERNS:

EMBANKMENT MATERIAL (BEHIN CEMENT STABILIZED BACKFILL)	UNIT WEIGHT - 125 PCF ϕ 30°C = 0 PSF KA = 0.333
CEMENT STABILIZED BACKFILL	UNIT WEIGHT = 125 PCF ϕ 45°C = 0 PSF

ALLOWABLE STRESSES IN STEEL AND CONCRETE ARE IN ACCORDANCE WITH CURRENT A.A.S.H.T.O. AND INTERIM SPECIFICATIONS.

THE MINIMUM LENGTH OF REINFORCEMENT STRAPS FOR A 0.55H STEP WALL IS SIX FEET AND FOR A 0.70H WALL IS EIGHT FEET.

EXTERNAL STABILITY CRITERIA

PROVIDE A FACTOR OF SAFETY IN SLIDING ALONG THE BASE OF THE STRUCTURE OF GREATER THAN OR EQUAL TO 1.5.  
PROVIDE A FACTOR OF SAFETY IN OVERTURNING OF GREATER THAN OR EQUAL TO 2.0.

THE MAXIMUM ALLOWABLE BEARING PRESSURE IS 1/2 THE ULTIMATE BEARING CAPACITY OF THE FOUNDATION.

THE WIDTHS SHOWN HEREIN ARE CONSIDERED MINIMUM UNLESS A LARGER WIDTH IS SPECIFIED ON THE WALL PLANS OR REQUIRED BY THE FABRICATOR'S DETAILS.

ENSURE THE BASE PRESSURE RESULTANT FALLS WITHIN THE MIDDLE THIRD OF THE RETAINING WALL.

PROVIDE A FACTOR OF SAFETY AGAINST PULLOUT OF THE EARTH REINFORCEMENTS OF GREATER THAN OR EQUAL TO 1.5 AT EACH LEVEL. DETERMINE PULLOUT RESISTANCE FROM TEST DATA EVALUATED AT 3/4 INCH STRAIN.

Texas Department of Transportation  
Houston District

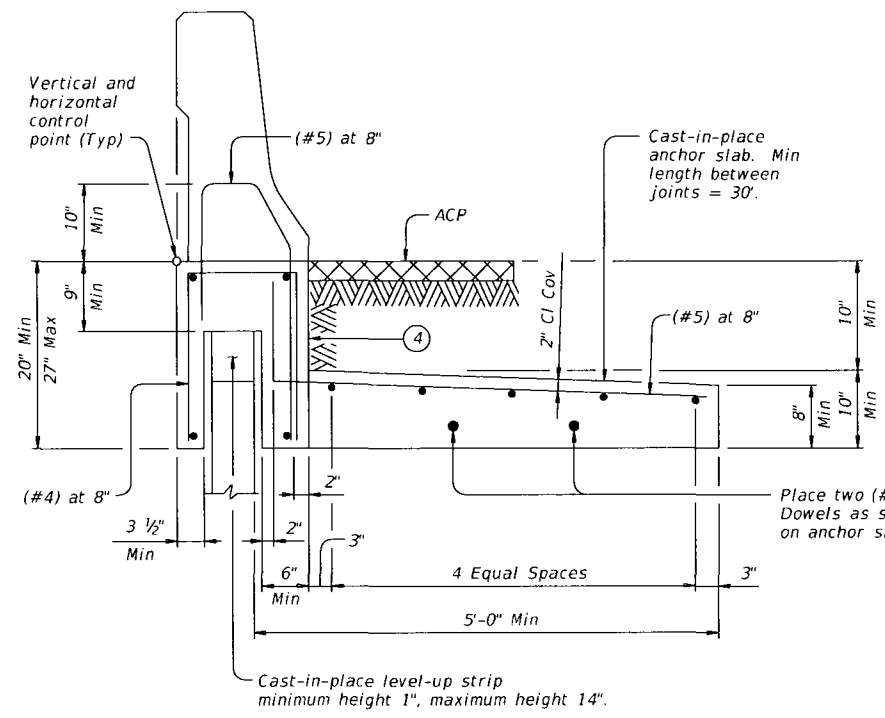
MECHANICALLY STABILIZED  
RETAINING WALL  
CEMENT STABILIZED BACKFILL

MSRW-CSB

FILE: STDJ4.DGN	DN:	CK:	DW:	CK:
© 2014	DIST	FED REG	PROJECT NO.	SHEET
MAR 2015 - 2014 SPECS	HOU	6		
	CONTROL	SECT	JOB	HIGHWAY
				82

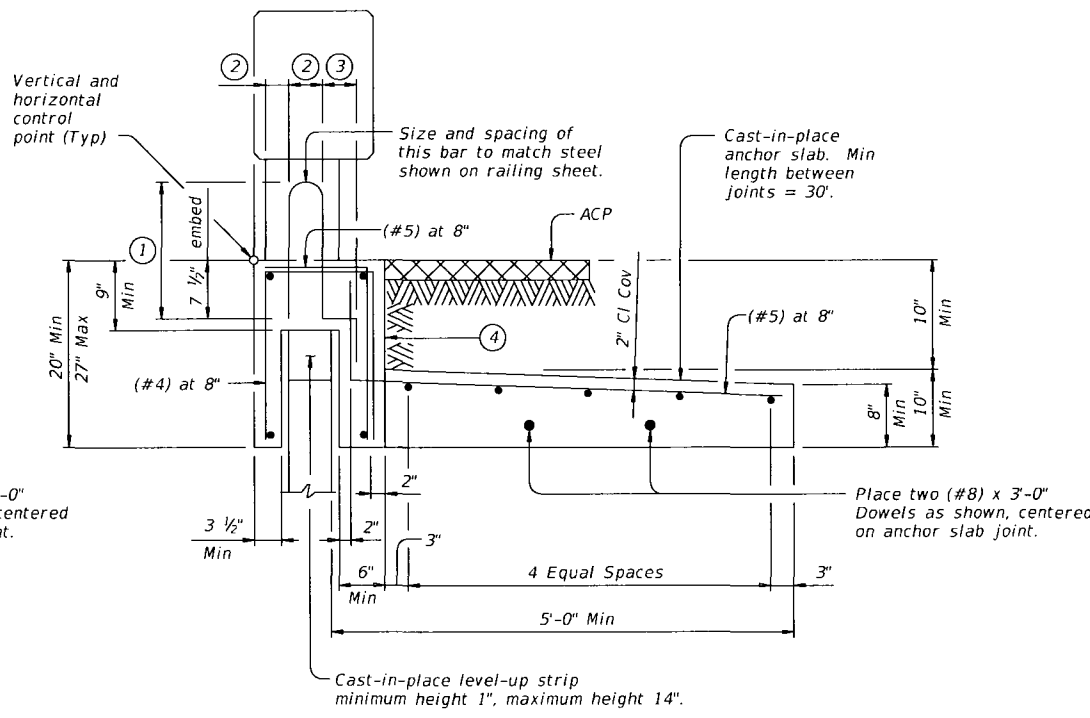


Rail Type	Detail	Precasting Rail with Coping Allowed
T1F/T1W/C1W/T2P/C2P	NARROW	NO
T221/C221/T222	NARROW	YES
T223/C223	NARROW	NO
T401/T402/C402	NARROW	NO
T411/C411	NARROW	NO
T551/T552	WIDE	YES
T66	NARROW	NO
SSTR	WIDE	YES



**"WIDE BASED" ADJACENT TO ACP**

(Showing T551 Rail, other rails listed similar)



**"NARROW BASED" ADJACENT TO ACP**

(Showing T223 Rail, other rails listed similar)

- ① Reinforcement length equal to length shown on the appropriate Rail standard plus 1".
- ② Match dimension on the appropriate Rail standard.
- ③ Match dimension on the appropriate Rail standard. Bend end of rail anchorage reinforcing as shown as required to maintain clear cover.
- ④ See "Coping Joint Sealer Details".

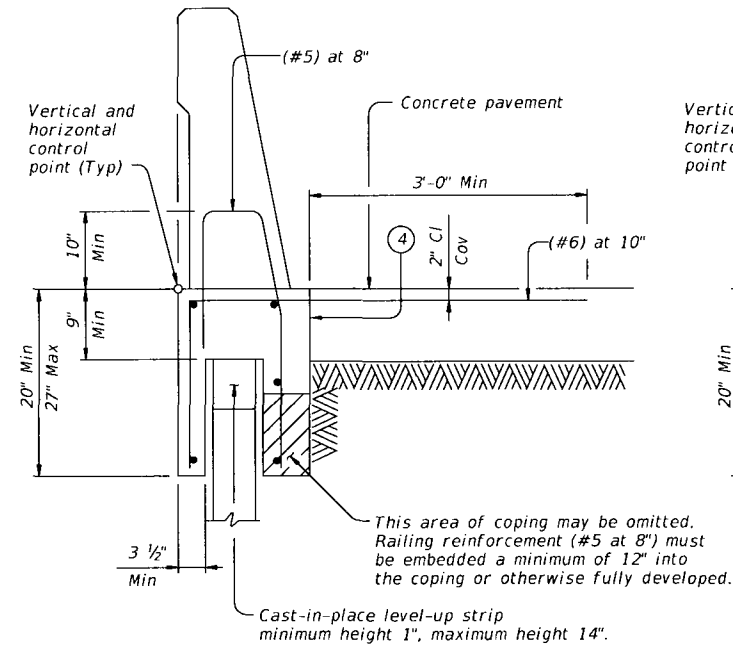
**CAST-IN-PLACE COPINGS:**  
Provide compressible material to isolate precast panel from cast-in-place coping to prevent cracking. Attach compressible material to both sides of precast panel prior to casting concrete for coping.  
When cast-in-place coping is anchored to reinforced concrete pavement, a smooth level-up strip must be provided on the top of the precast panels. The purpose of the level-up is to allow the pavement and coping to move longitudinally relative to the wall without causing damage.  
Align coping and railing joints with precast panel joints. Optional rail joints are allowed as approved by Engineer. Provide railing construction joints or expansion joints at no greater than 100' spacing.

**PRECAST COPINGS:**  
Provide a smooth level-up strip on top of the precast panels prior to installation of the coping. Shims may be used on top of the level-up strip to facilitate alignment. Total shim thickness not to exceed 1".  
Provide precast coping in 10' minimum lengths.

**JOINTED CONCRETE PAVEMENT:**  
When coping is adjacent to and anchored into jointed concrete pavement, the coping joints must coincide with the pavement joints.

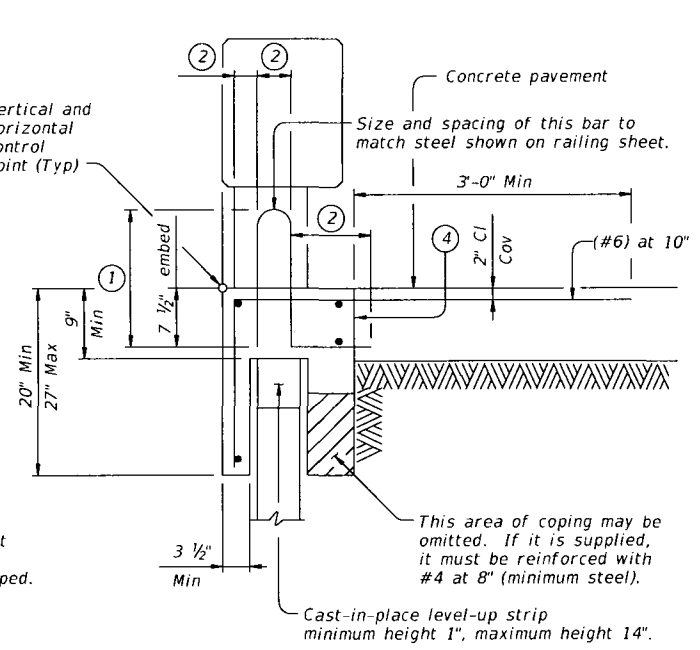
**JOINT SEALER:**  
Seal joints between coping segments in accordance with Item 438, "Cleaning and Sealing Joints". Provide Class 4 joint seal. Place sealant flush with coping surface. The purpose of the joint sealing is to reduce surface drainage infiltration into the retaining wall backfill. Sealing coping joint is considered subsidiary to other items.

**GENERAL NOTES:**  
Details on this sheet are to be used in development of specific details for mounting traffic railing on mechanically stabilized earth (MSE) walls.  
The specific details proposed must have strengths equivalent to those shown on this sheet. Areas of particular importance are the connection of the coping to the railing, the strength of the vertical coping leg connecting the railing to the anchor slab, and the connection of the coping to the anchor slab or concrete pavement.  
Submit shop drawings for the traffic railing foundations to the Engineer in accordance with Item 423 "Retaining Wall". The shop drawings must include bar bending details.  
Precasting of railing with the coping will be allowed as noted in the table on this sheet.  
The Contractor's attention is directed to the fact that various configurations of precast coping/railing combinations are covered by patent. The contractor must provide for use of these systems in accordance with Article 7.5.  
Provide Class C concrete (f'c=3,600 psi).  
Provide Grade 60 reinforcing steel.  
Provide (#4) longitudinal bars, unless otherwise shown.  
Coping and anchor slabs are considered subsidiary to Item 423 "Retaining Wall". Payment for traffic railing is per the linear foot for the appropriate railing type.



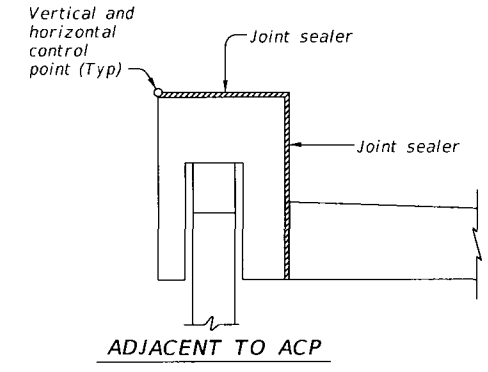
**"WIDE BASED" ADJACENT TO CONCRETE PAVEMENT**

(Showing SSTR Rail, other rails listed similar)

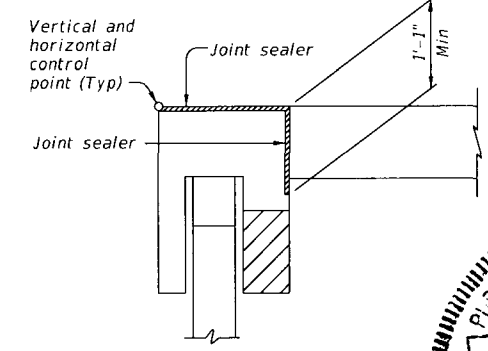


**"NARROW BASED" ADJACENT TO CONCRETE PAVEMENT**

(Showing T223 Rail, other rails listed similar)

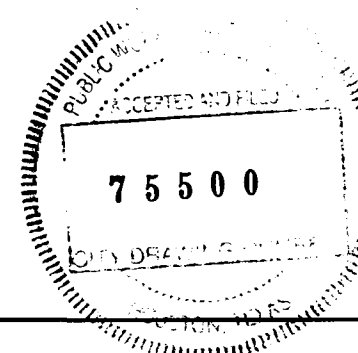


**ADJACENT TO ACP**



**ADJACENT TO CONCRETE PAVEMENT**

**COPING JOINT SEALER DETAILS**  
(Reinforcing steel not shown for clarity)



**Texas Department of Transportation** Bridge Division Standard

**RETAINING WALL TRAFFIC RAILING FOUNDATIONS**

**RW(TRF)**

FILE: rwsdte03-21.dgn DW: TxDOT CK: TxDOT DW: JTR CK: MPM  
 ©TxDOT March 2010 CONF SECT JOB HIGHWAY  
 REVISIONS  
 01-13: Precast option with Rails  
 03-18: Cast-In-Place Copings, railing construction and expansion joints  
 02-20: Note 5 added for precast rail option  
 12-21: Removed Note 5

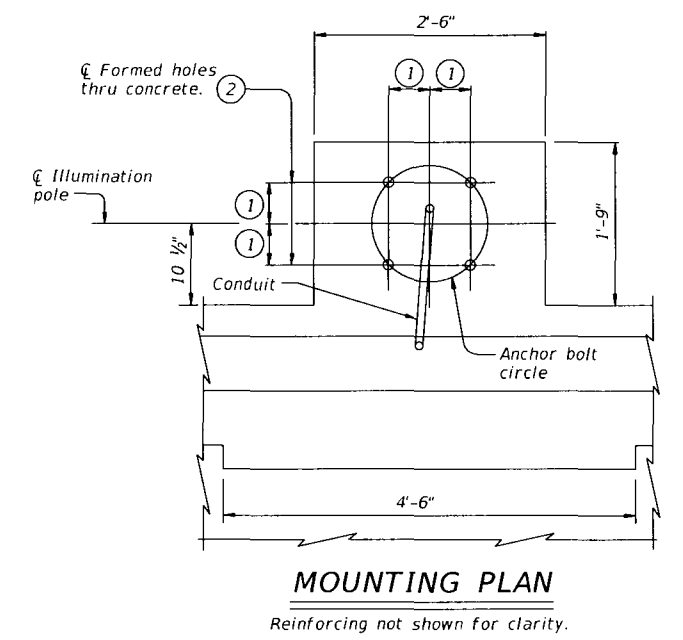
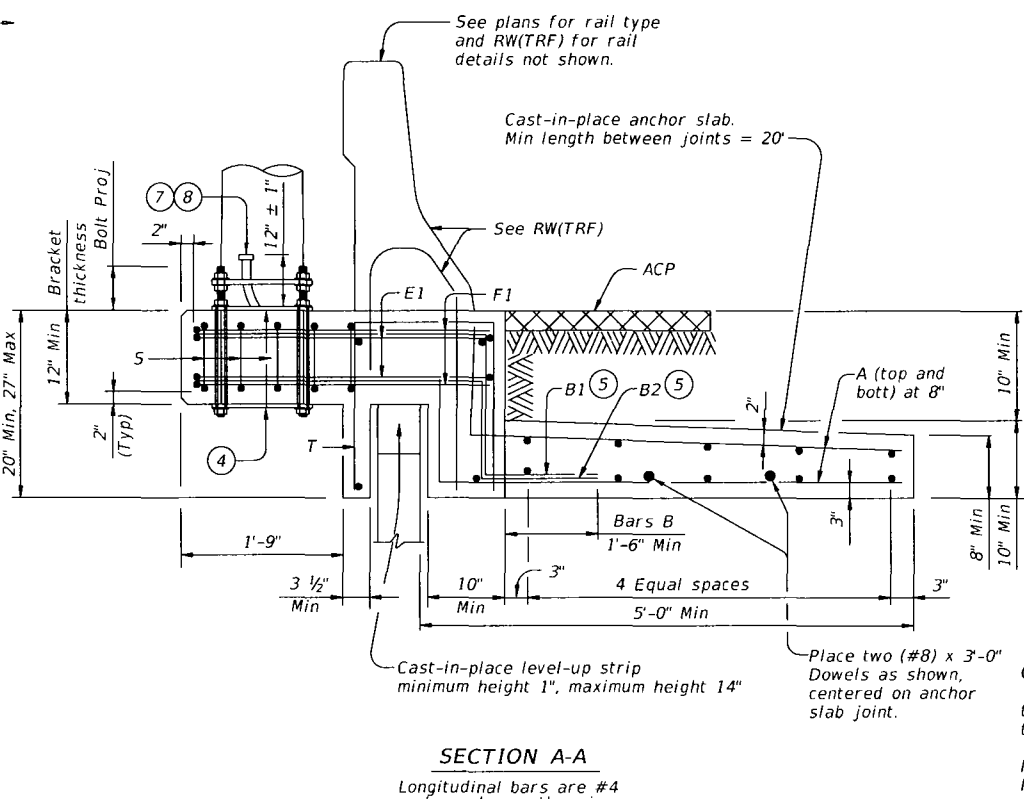
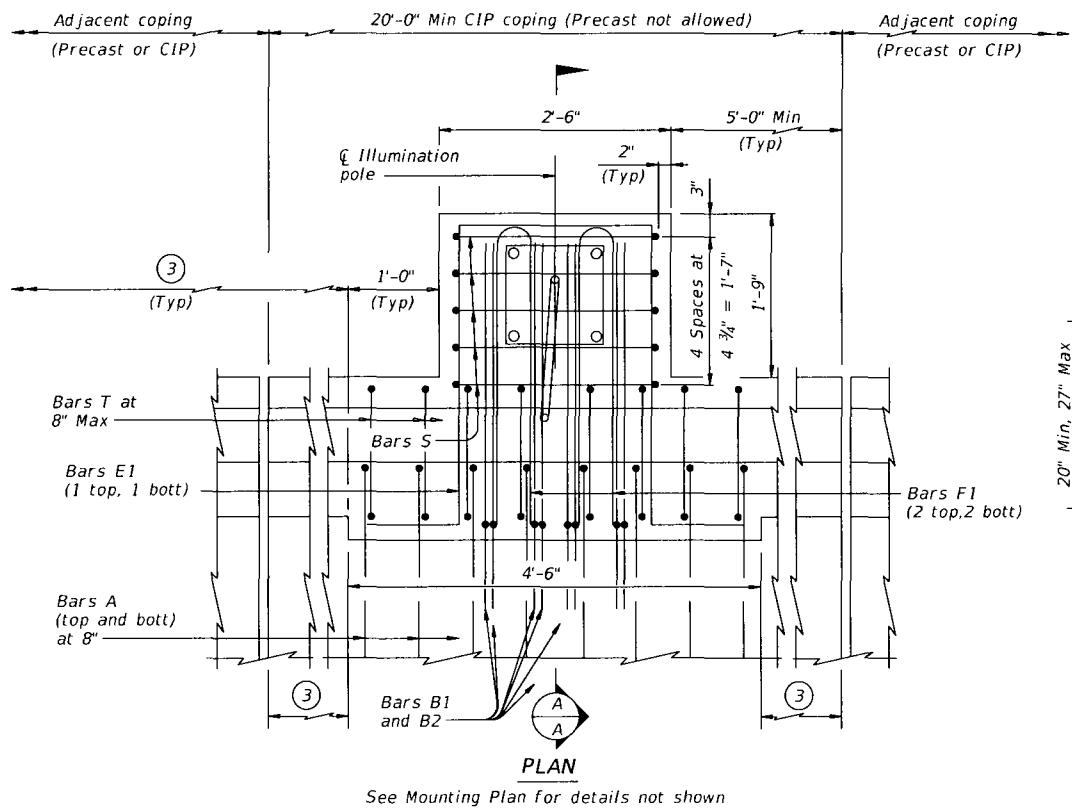
SHEET NO. **83**

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DATE: FILE:

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DATE: \$DATES  
FILE: \$FILES



**ADJACENT TO ACP**

- ① See table for anchor bolt offset dimension.
- ② See table for hole diameter size.
- ③ See RW(TRF) for coping details and reinforcing not shown.
- ④ See "Anchor Bolt Assembly", "Anchor Bolt Plate", and table for anchor bolt and anchor bolt plate information.

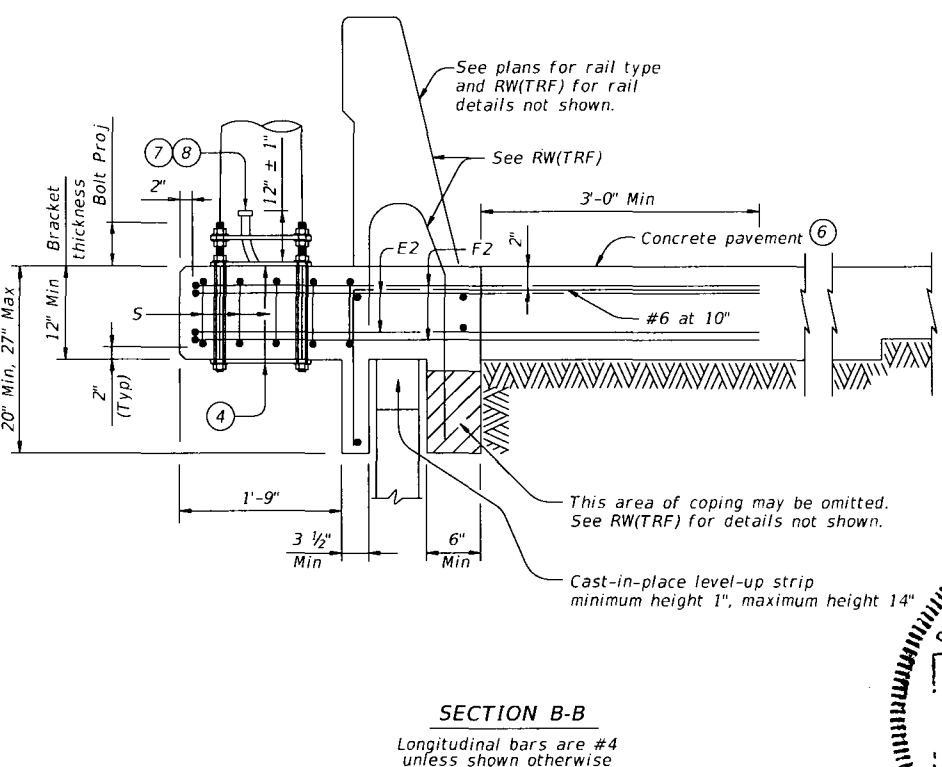
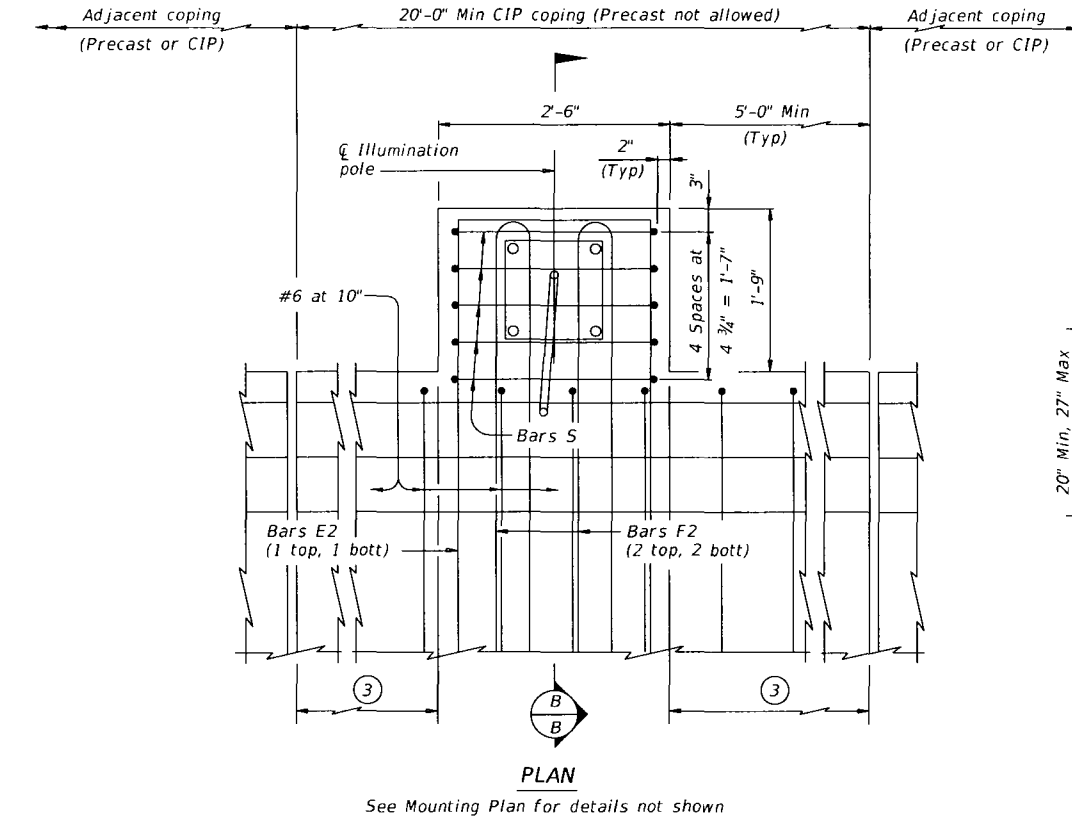
- ⑤ Lap 2'-7" Min with Bars F.
- ⑥ Concrete pavement must be at least 12" thick for a minimum 6'-0" from inside edge of coping.
- ⑦ If lighting is to be placed on future contract, extend conduit only 6" and provide water tight cap.
- ⑧ Ream burrs and install bell ends or bushings on all conduit ends.

**CAST-IN-PLACE COPINGS:**  
Provide compressible material to isolate precast panel from cast-in-place (CIP) coping to prevent cracking. Attach compressible material to both sides of precast panel prior to casting concrete for coping.  
When cast-in-place (CIP) coping is anchored to reinforced concrete pavement, a smooth level-up strip must be provided on the top of the precast panels. The purpose of the level-up is to allow the pavement and coping to move longitudinally relative to the wall without causing damage.

**JOINED CONCRETE PAVEMENT:**  
When coping is adjacent to and anchored into jointed concrete pavement, the coping joints must coincide with the pavement joints.

**MATERIAL NOTES:**  
Galvanize anchor bolts, nuts, washers, and anchor bolt plates. Repair galvanizing damage from tack welding per Item 445, "Galvanizing".  
Provide Grade 60 reinforcing steel.  
Provide Class "C" concrete (f<sub>c</sub>=3,600 psi) for Illumination Pole Bracket and CIP coping.  
Provide (#4) longitudinal bars, unless otherwise shown.  
Cast Illumination Pole Brackets monolithically with the CIP coping.

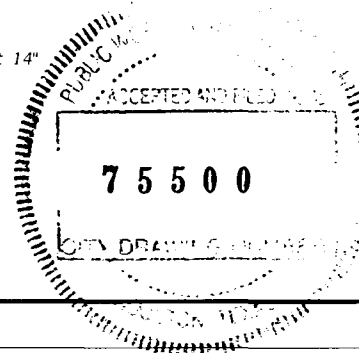
**GENERAL NOTES:**  
Designed for up to 50 ft light pole with one 12 ft arm, 60 lb luminaire with 1.6 sq ft EPA at maximum design wind speed of 110 mph (3 second gusts). A special design is required if luminaire mounting height exceeds 100 ft above average surrounding terrain.  
The type and size of conduit, the anchor bolt circle diameter, and the number and location of brackets is shown elsewhere on the plans. Brackets found to conflict with other components of the retaining wall may be relocated if necessary and as directed by the Engineer.  
These details must be used in conjunction with the MSE wall RW(TRF) standard to develop specific details for submission with the shop drawings. The steel reinforcement shown is specifically for the area of the Illumination Pole Bracket.  
Do not place Illumination Pole until after the coping and pavement have been constructed.  
See RW(TRF) standard for details and notes not shown.  
See Roadway Illumination Poles standard for details and notes not shown.  
The anchor bolts, nuts, washers, and anchor bolt plates are subsidiary to the Item "Roadway Illumination Assemblies".  
The bracket quantity is considered subsidiary to the Item "Retaining Wall".  
Coping and anchor slabs is considered subsidiary to Item 423 "Retaining Wall".  
The traffic railing will be paid for by the linear foot for the appropriate railing type.  
Cover dimensions are clear dimensions, unless noted otherwise.  
Reinforcing bar dimensions shown are out-to-out of bar.



**ADJACENT TO CONCRETE PAVEMENT**

See Mounting Plan for details not shown

SECTION B-B  
Longitudinal bars are #4 unless shown otherwise



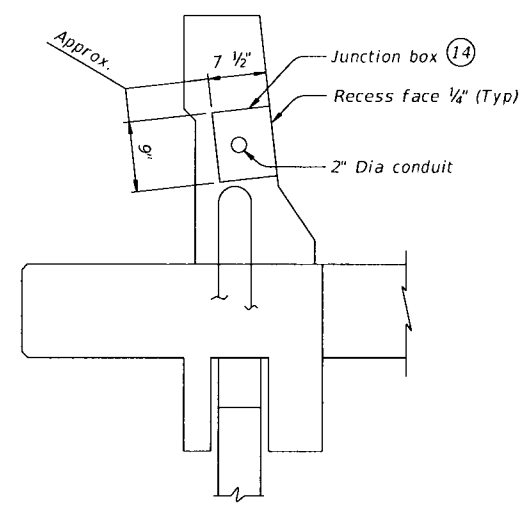
SHEET 1 OF 2

Texas Department of Transportation		Bridge Division Standard	
<b>LIGHTING BRACKET FOR MSE RETAINING WALL TRAFFIC RAIL FOUNDATION</b>			
<b>RW(LB)</b>			
FILE: rwsd14-19.dgn	DN: TxDOT	CK: TxDOT	DN: TxDOT
March 2010	CONF: SECT:	JOB:	HIGHWAY:
4-13 Tables and Junction Box Location.		FBPTR	
4-19: Assess anchor bolt information.		DIST: FBC	SHEET NO: 84

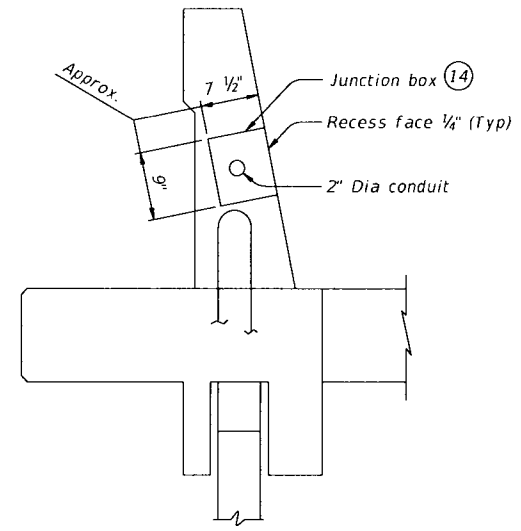
ANCHOR BOLT CIRCLE DIAMETER	ANCHOR BOLT OFFSET	ANCHOR BOLT DIAMETER	ANCHOR BOLT HOLE SIZE		TOP AND BOTTOM ANCHOR BOLT PLATE SIZE	CENTER HOLE DIAMETER IN TOP ANCHOR BOLT PLATE
			CONCRETE	STEEL		
13	4 5/8	1	1 1/4	1 1/4	PL 1/2 X 13 X 1'-1"	9 1/2
15	5 5/16	1 1/4	1 1/2	1 1/2	PL 1/2 X 15 1/2 X 1'-3 1/2"	10 1/2

ESTIMATED QUANTITIES--ONE BRACKET		
ITEM	UNIT	QUANT
CONCRETE	(11) CY	0.2
REINFORCING STEEL	(11) LB	146
STRUCTURAL STEEL	(11)(12) LB	112
CONDUIT	(13) LF	4

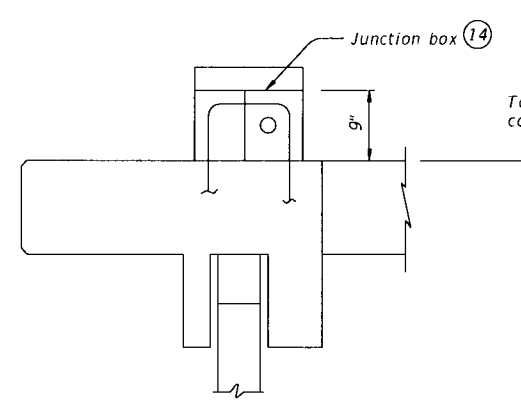
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



SHOWING T551, T552, AND T80HT



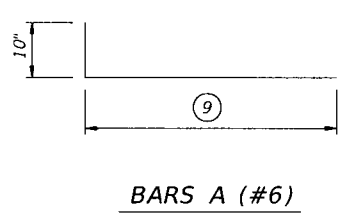
SHOWING SSTR AND T80SS



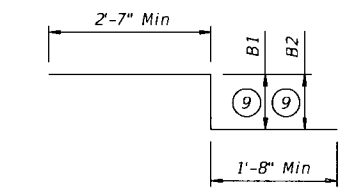
SHOWING T1F, T2P, T1W, T66, C2P, AND C1W CURB  
See Elevation View for curb modifications

**JUNCTION BOX LOCATION**

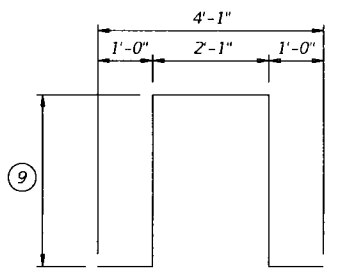
Use these details as a guide in locating junction boxes in rail types not shown.



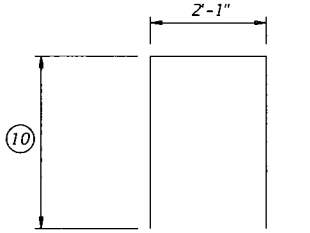
BARS A (#6)



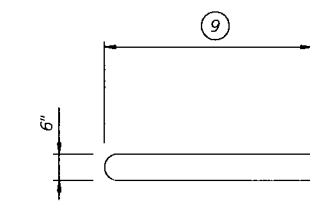
BARS B (#6)



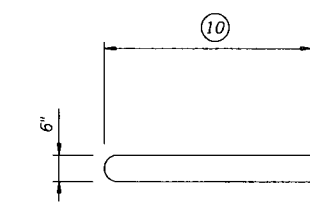
BARS E1 (#6)



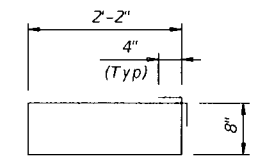
BARS E2 (#6)



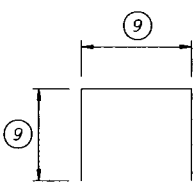
BARS F1 (#6)



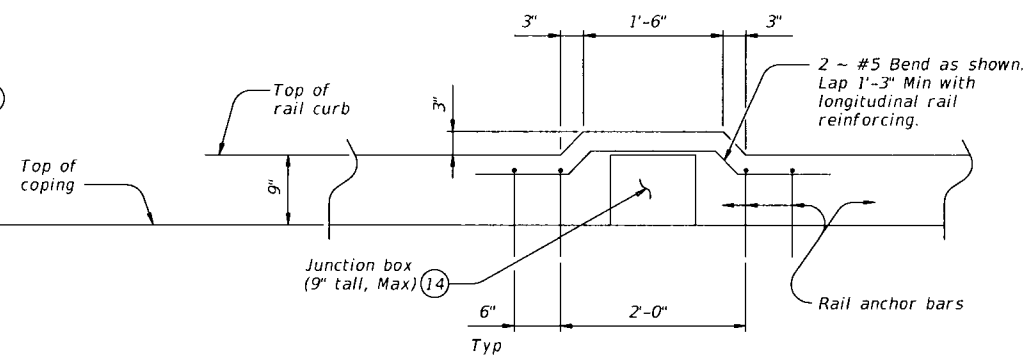
BARS F2 (#6)



BARS S (#3)

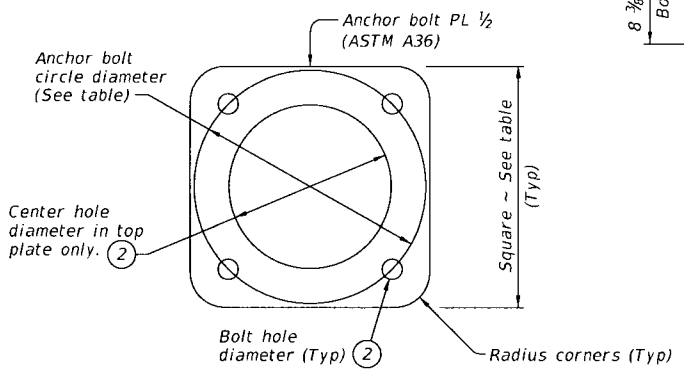


BARS T (#4)

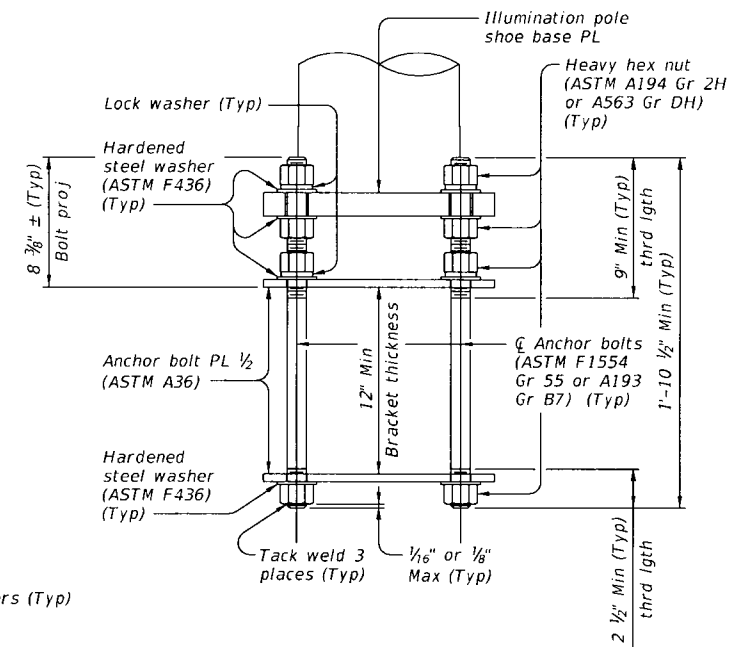


**ELEVATION VIEW**

For Rail Types T1F, T2P, T1W, T66, C2P, and C1W, center junction box between posts. Additional reinforcing and concrete required for this rail modification is considered subsidiary to the rail. Do not locate junction box in the same bay as a drain slot in rail curb.

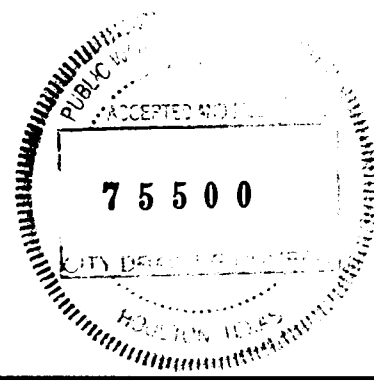


**ANCHOR BOLT PLATE**



**ANCHOR BOLT ASSEMBLY**

(See table for anchor bolt diameter)

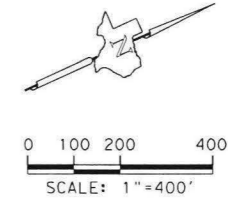


SHEET 2 OF 2

Texas Department of Transportation		Bridge Division Standard	
<b>LIGHTING BRACKET FOR MSE RETAINING WALL TRAFFIC RAIL FOUNDATION</b>			
<b>RW(LB)</b>			
FILE: rwsd14-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT March 2010	CON: SEC:	JOB:	HIGHWAY:
REVISIONS			FBPTR
4-13: Tables and Junction Box Location.			DIST:
4-19: Access anchor bolt information.			COUNTY:
			FBC
			SHEET NO: 85

DATE: \$DATE\$ \$TIME\$  
 FILE: \$FILE\$

100%  
SUBMITTAL



LEGEND

- DRAINAGE AREA BOUNDARY
- ~> EXIST SURFACE RUNOFF DIRECTION
- (X-X)  
XX.XX WATERSHED NAME  
AREA (AC)

NOTES:

1. FOR THE RATIONAL METHOD, AREA HYDROLOGY WAS CALCULATED IN GEOPAK DRAINAGE USING RATIONAL METHOD.
2. INTENSITIES WERE CALCULATED USING THE ATLAS 14 PRECIPITATION DATA FOR THE PROJECT LOCATION.
3. N1, N2, S, C DRAINAGE AREA DRAIN INTO 2-48" RCP'S CULVERTS, ULTIMATELY CHANNEL B-1.
4. N3 OUTFALL IT IS AN EXISTING INLET ADJUSTED DUE TO GRADE ELEVATION DRAINS TO EXSITING STORM SEWER SYSTEM.

REV.	DATE	BY	DESCRIPTION

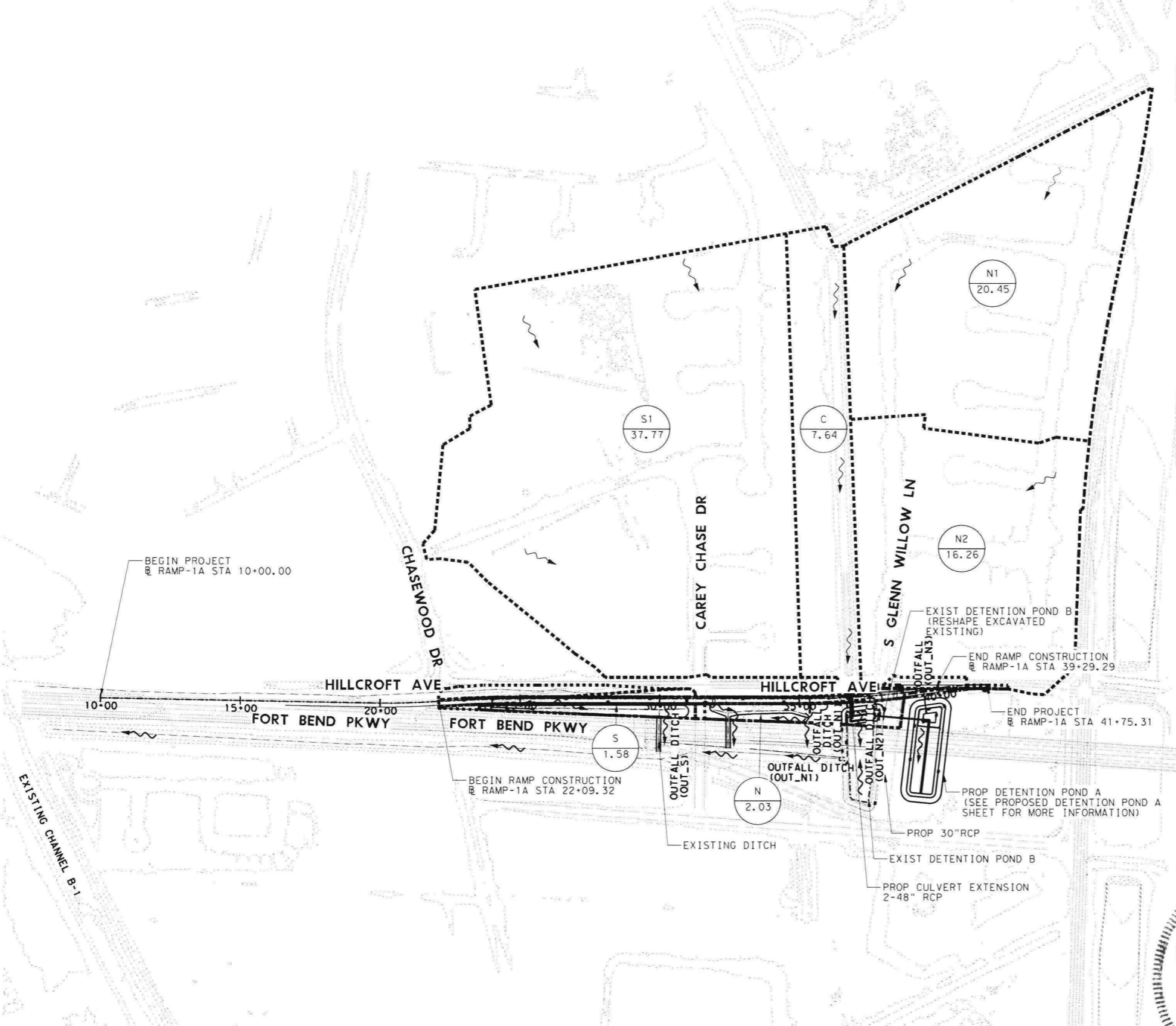
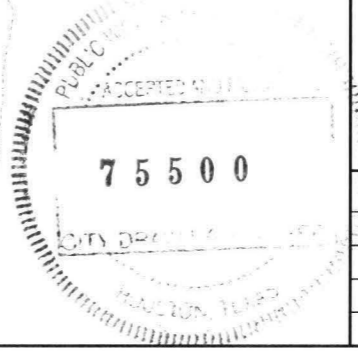


**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

FORT BEND PARKWAY TOLL ROAD  
**OVERALL DRAINAGE AREA MAP  
BEGIN PROJECT TO END PROJECT**

SHEET 1 OF 1	
PROJECT NUMBER	20219x
DESIGNED BY:	DATE: 3/15/2023
CHECKED BY:	
DRAWN BY:	SHEET NO.: 86
CHECKED BY:	



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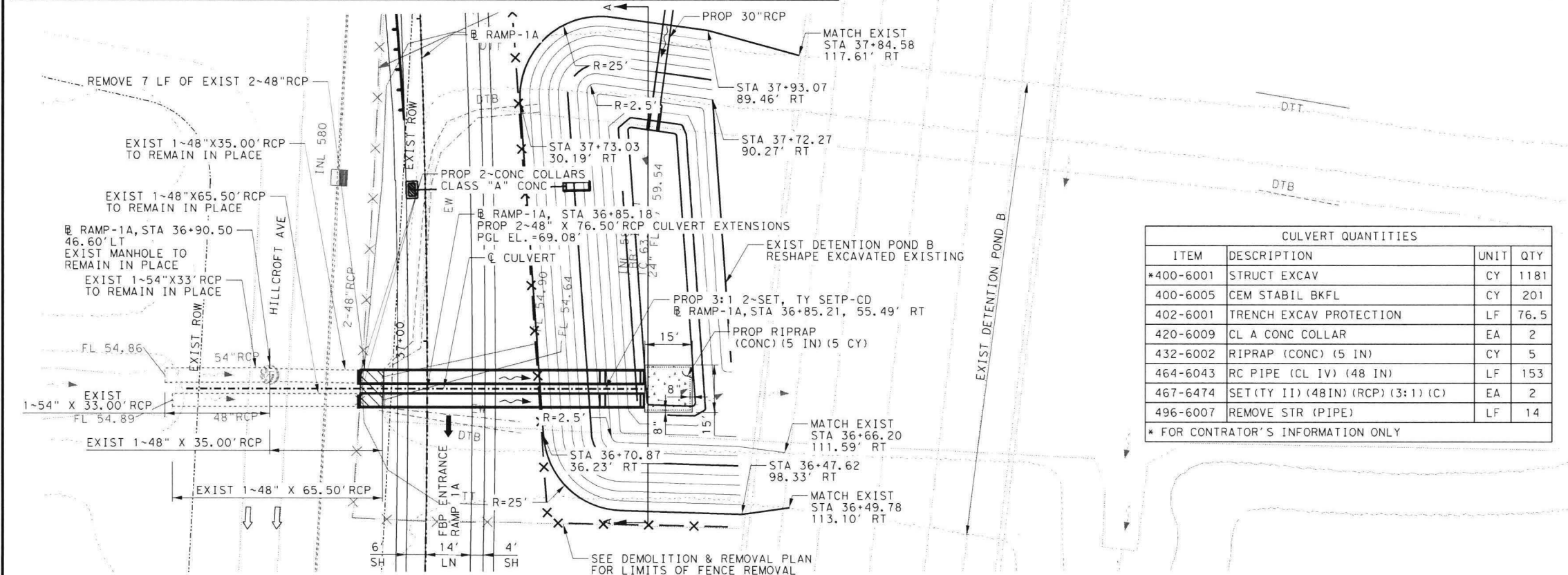


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SUBMITTAL

EXISTING CULVERT CROSSING HYDRAULIC DATA SUMMARY														
CULVERT ID	STATION	CULVERT SIZE	NUMBER OF BARRELS	CULVERT LENGTH	FLOWLINE ELEV		DRAINAGE AREA	WEIGHTED C VALUE	TC	I	10 YEAR			
					US	DS					Q	TW	HW	OUTLET VELOCITY
48"	36+85.18	4	2	65.50	54.89	54.64	82	0.54	22.00	5.67	251.07	54.64	61.500	10.62

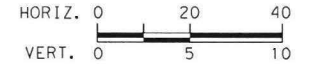
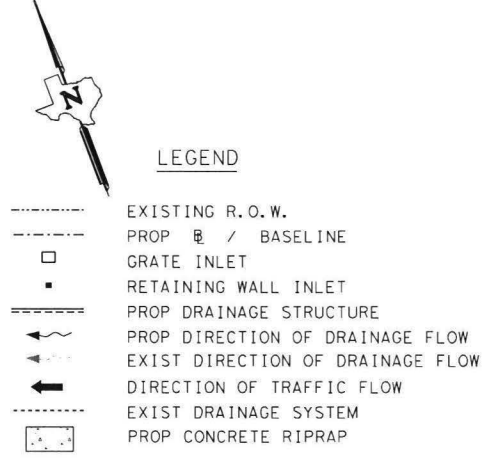
PROPOSED CULVERT CROSSING HYDRAULIC DATA SUMMARY														
CULVERT ID	STATION	CULVERT SIZE	NUMBER OF BARRELS	CULVERT LENGTH	FLOWLINE ELEV		DRAINAGE AREA	WEIGHTED C VALUE	TC	I	10 YEAR			
					US	DS					Q	TW	HW	OUTLET VELOCITY
48"	36+85.18	4	2	135.00	54.89	54.35	82	0.54	22.00	5.67	251.07	54.35	61.500	11.13



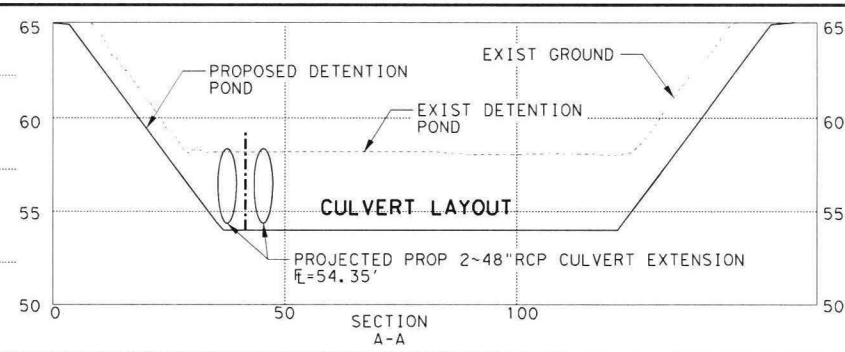
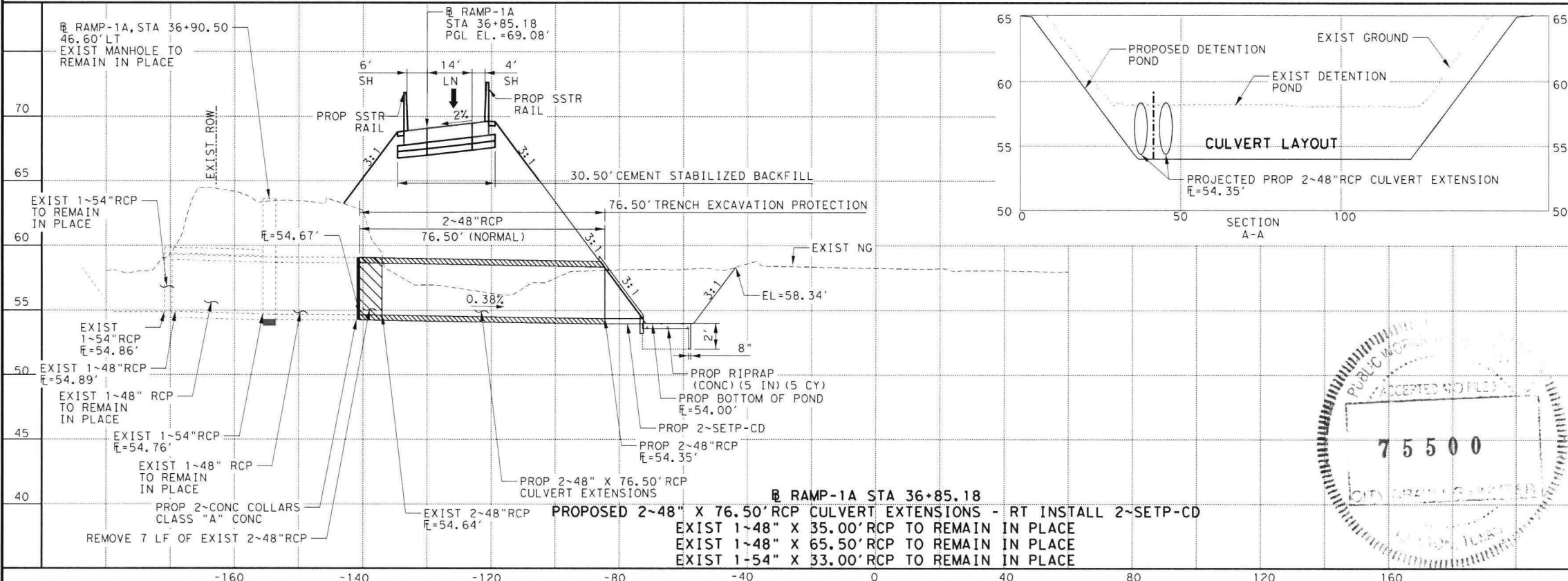
CULVERT QUANTITIES			
ITEM	DESCRIPTION	UNIT	QTY
*400-6001	STRUCT EXCAV	CY	1181
400-6005	CEM STABIL BKFL	CY	201
402-6001	TRENCH EXCAV PROTECTION	LF	76.5
420-6009	CL A CONC COLLAR	EA	2
432-6002	RIPRAP (CONC) (5 IN)	CY	5
464-6043	RC PIPE (CL IV) (48 IN)	LF	153
467-6474	SET (TY II) (48IN) (RCP) (3:1) (C)	EA	2
496-6007	REMOVE STR (PIPE)	LF	14

\* FOR CONTRATOR'S INFORMATION ONLY

- NOTES:
- SHOWN CALCULATIONS ARE REPRESENTING THE HEADWATER DIFFERENCE BETWEEN EXISTING AND PROPOSED EXTENDED CULVERT.
  - UTILITIES SHOWN ARE APPROXIMATE CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION.
  - SEE GEOMETRIC DATA SUMMARY FOR ALIGNMENT DATA.
  - ALL STATIONING IS BASED OFF OF RAMP-1A ALIGNMENT UNLESS OTHERWISE STATED.



REV.	DATE	BY	DESCRIPTION



3/15/2023

**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

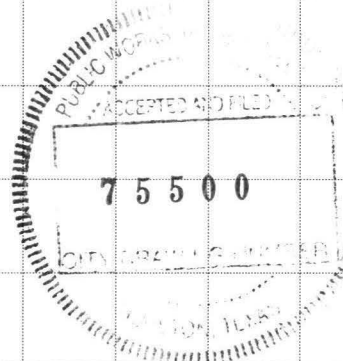
**AIG Tech**  
Advanced Infrastructure Group

**FORT BEND PARKWAY TOLL ROAD**

**ENTRANCE RAMP 1A  
CULVERT LAYOUT**

STA 36+85.07

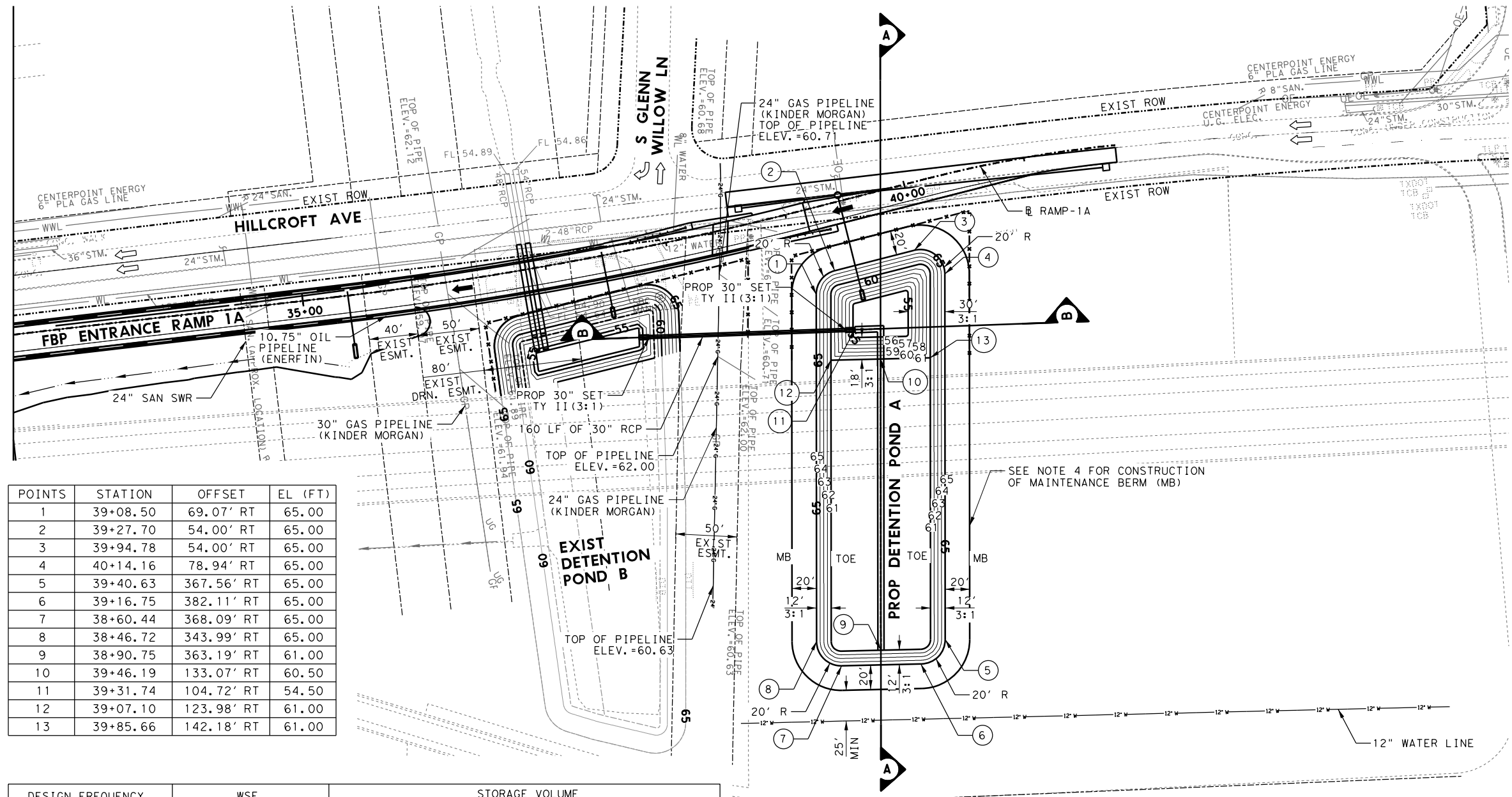
SHEET 1 OF 1	
PROJECT NUMBER	20219x
DESIGNED BY:	DATE: 3/15/2023
CHECKED BY:	
DRAWN BY:	SHEET NO.: 86A
CHECKED BY:	



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**100%  
SUBMITTAL**

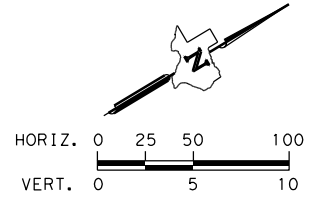
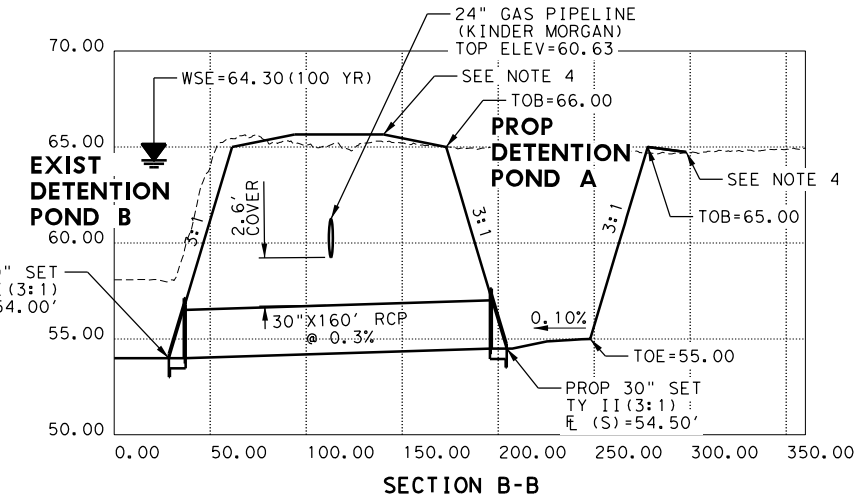
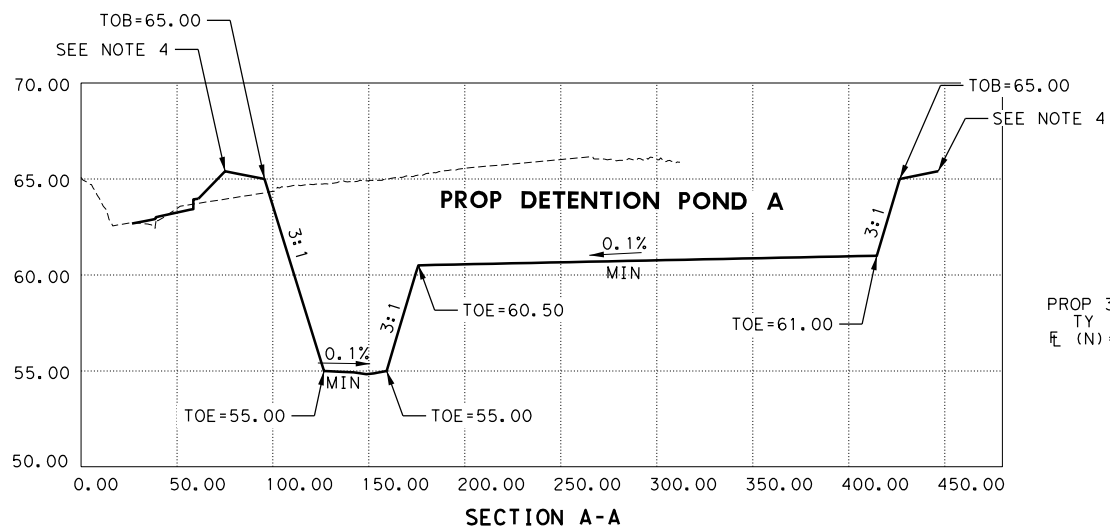
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POINTS	STATION	OFFSET	EL (FT)
1	39+08.50	69.07' RT	65.00
2	39+27.70	54.00' RT	65.00
3	39+94.78	54.00' RT	65.00
4	40+14.16	78.94' RT	65.00
5	39+40.63	367.56' RT	65.00
6	39+16.75	382.11' RT	65.00
7	38+60.44	368.09' RT	65.00
8	38+46.72	343.99' RT	65.00
9	38+90.75	363.19' RT	61.00
10	39+46.19	133.07' RT	60.50
11	39+31.74	104.72' RT	54.50
12	39+07.10	123.98' RT	61.00
13	39+85.66	142.18' RT	61.00

DESIGN FREQUENCY (YR)	WSE (FT)	STORAGE VOLUME	
		REQUIRED (AC-FT)	PROVIDED (AC-FT)
100 - YEAR	64.3	ROADWAY 0.829	PROPOSED IMPERVIOUS 0.600
TOTAL		1.429	2.461

ITEMS	DESCRIPTION	UNIT	QTY
110 6001	EXCAVATION (CHANNEL)	CY	5242
400 6005	CEM STABIL BKFL	CY	97
402 6001	TRENCH EXCAVATION PROTECTION	LF	160
464 6019	RC PIPE (CL IV) (30 IN)	LF	160
467 6418	SET (TY II) (30 IN) (RCP) (3: 1) (P)	EA	2



- LEGEND**
- SAFETY END TREATMENT (SET)
  - STORM SEWER PIPE/BOX
  - MB MAINTENANCE BERM
  - TOB TOP OF BANK
  - TOE TOE OF SLOPE

- NOTES:**
- REFER TO DRAINAGE PLAN AND PROFILE FOR ADDITIONAL INFORMATION.
  - REFER TO STORM SEWER STANDARDS FOR MISCELLANEOUS STORM SEWER DETAILS.
  - REFER TO CULVERT LAYOUT SHEET FOR EXISTING DETENTION POND B GRADING.
  - CONTRACTOR TO MATCH EXISTING ELEVATION ALONG MAINTENANCE BERM (MB).
  - EXCAVATED MATERIAL MAY BE USED FOR ROADWAY EMBANKMENT.
  - EXISTING UTILITIES ARE BASED ON BEST AVAILABLE INFORMATION. CONTRACTOR TO FIELD VERIFY ALL UTILITIES PRIOR TO STARTING CONSTRUCTION. THE CONTRACTOR SHALL CONTACT THE RESPECTIVE COMPANY WHEN WORKING IN THE VICINITY OF A PIPELINE.
  - NO EXPRESSED OR IMPLIED WARRANTIES ARE MADE BY FBCTRA FOR THE ACCURACY, COMPLETENESS, USABILITY, OR SUITABILITY OF THE UTILITY LINE DATA PROVIDED BY THE REPRESENTATIVE UTILITY COMPANY FOR USE IN THE PLANS. THIS INFORMATION IS PROVIDED SO THE CONTRACTOR IS MADE AWARE OF THEIR GENERAL PROXIMITY TO THE PROPOSED WORK. BY STATE LAW, THE CONTRACTOR IS RESPONSIBLE FOR ASCERTAINING THE LOCATION OF ALL PROJECT UTILITIES PRIOR TO CONSTRUCTION. EASEMENTS SHOWN HAVE NOT BEEN VERIFIED.

REV.	DATE	BY	DESCRIPTION



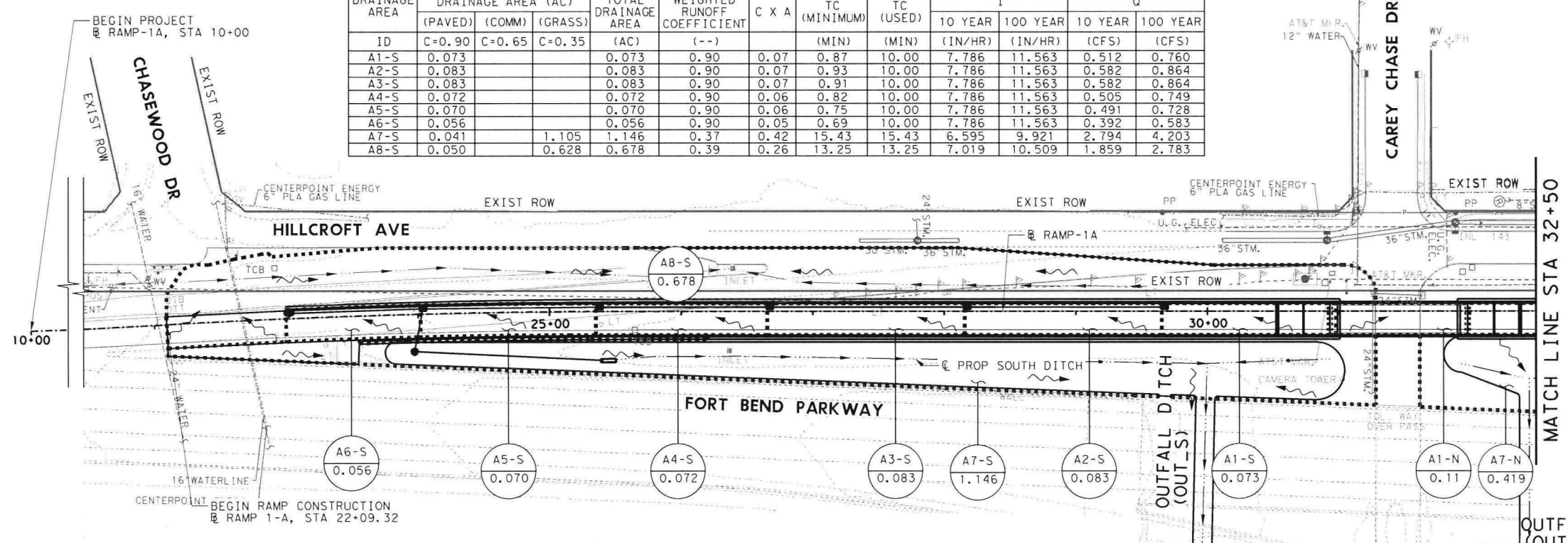
**AIG Tech**  
Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD**  
**ENTRANCE RAMP 1A**  
**DETENTION POND DETAILS**

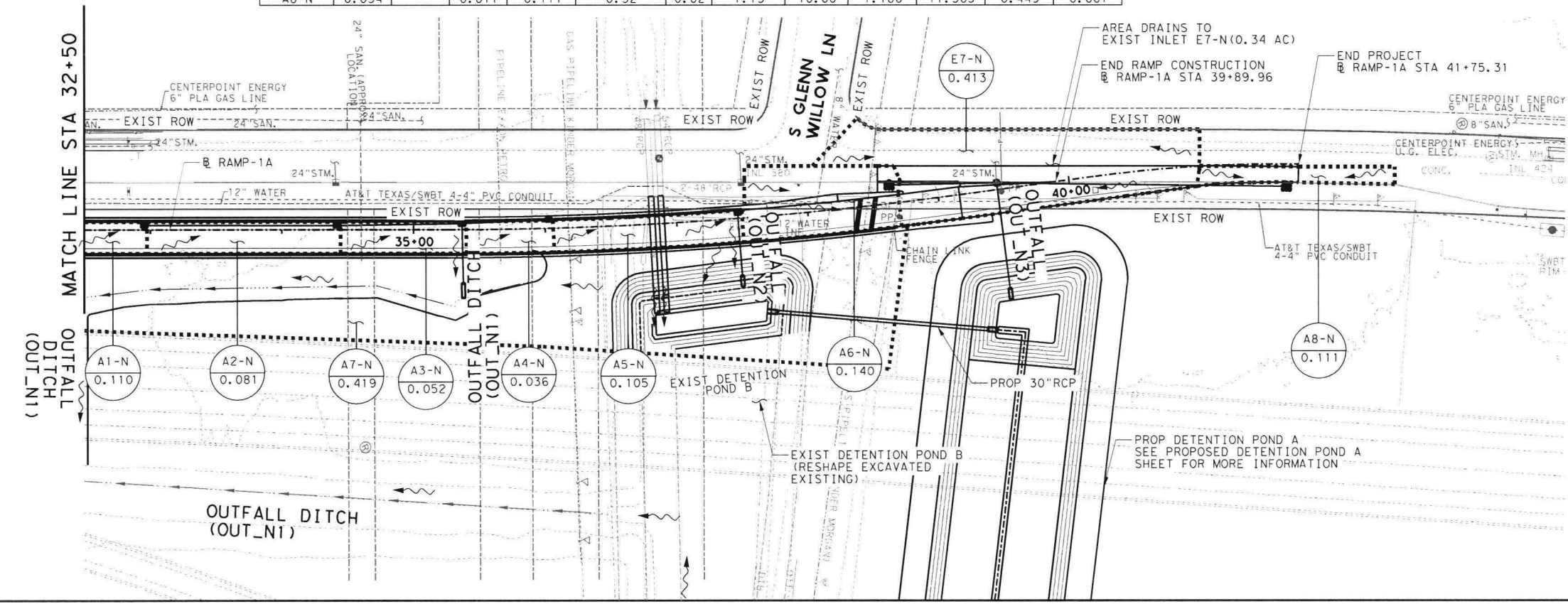
SHEET 1 OF 1		PROJECT NUMBER	20219x
DESIGNED BY:	DATE:	10/10/2023	
CHECKED BY:	SHEET NO.:	86B	
DRAWN BY:			
CHECKED BY:			

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SUBMITTAL

DRAINAGE AREA ID	DRAINAGE AREA (AC)			TOTAL DRAINAGE AREA (AC)	WEIGHTED RUNOFF COEFFICIENT	C X A	TC (MINIMUM) (MIN)	TC (USED) (MIN)	I		Q	
	(PAVED)	(COMM)	(GRASS)						(IN/HR)	(IN/HR)	(CFS)	(CFS)
A1-S	0.073			0.073	0.90	0.07	0.87	10.00	7.786	11.563	0.512	0.760
A2-S	0.083			0.083	0.90	0.07	0.93	10.00	7.786	11.563	0.582	0.864
A3-S	0.083			0.083	0.90	0.07	0.91	10.00	7.786	11.563	0.582	0.864
A4-S	0.072			0.072	0.90	0.06	0.82	10.00	7.786	11.563	0.505	0.749
A5-S	0.070			0.070	0.90	0.06	0.75	10.00	7.786	11.563	0.491	0.728
A6-S	0.056			0.056	0.90	0.05	0.69	10.00	7.786	11.563	0.392	0.583
A7-S	0.041	1.105		1.146	0.37	0.42	15.43	15.43	6.595	9.921	2.794	4.203
A8-S	0.050		0.628	0.678	0.39	0.26	13.25	13.25	7.019	10.509	1.859	2.783



DRAINAGE AREA ID	DRAINAGE AREA (AC)			TOTAL DRAINAGE AREA (AC)	WEIGHTED RUNOFF COEFFICIENT	C X A	TC (MINIMUM) (MIN)	TC (USED) (MIN)	I		Q	
	(PAVED)	(COMM)	(GRASS)						(IN/HR)	(IN/HR)	(CFS)	(CFS)
A1-N	0.110			0.110	0.90	0.10	1.27	10.00	7.786	11.563	0.771	1.145
A2-N	0.081			0.081	0.90	0.07	0.96	10.00	7.786	11.563	0.568	0.843
A3-N	0.052			0.052	0.90	0.05	0.63	10.00	7.786	11.563	0.364	0.541
A4-N	0.036			0.036	0.90	0.03	0.48	10.00	7.786	11.563	0.252	0.375
A5-N	0.105			0.105	0.90	0.09	0.94	10.00	7.786	11.563	0.736	1.093
A6-N	0.140			0.140	0.90	0.13	0.73	10.00	7.786	11.563	0.981	1.457
A7-N		0.419		0.419	0.35	0.15	11.52	11.52	7.405	11.039	1.086	1.619
A8-N	0.034	0.077		0.111	0.52	0.02	1.15	10.00	7.786	11.563	0.449	0.667



- LEGEND**
- DRAINAGE AREA BOUNDARY
  - ~~~~~ PROP SURFACE RUNOFF DIRECTION
  - X-X  
XX.XX WATERSHED NAME  
AREA (AC)
  - DITCH FLOW LINE



0 25 50 100  
SCALE: 1"=100'

REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

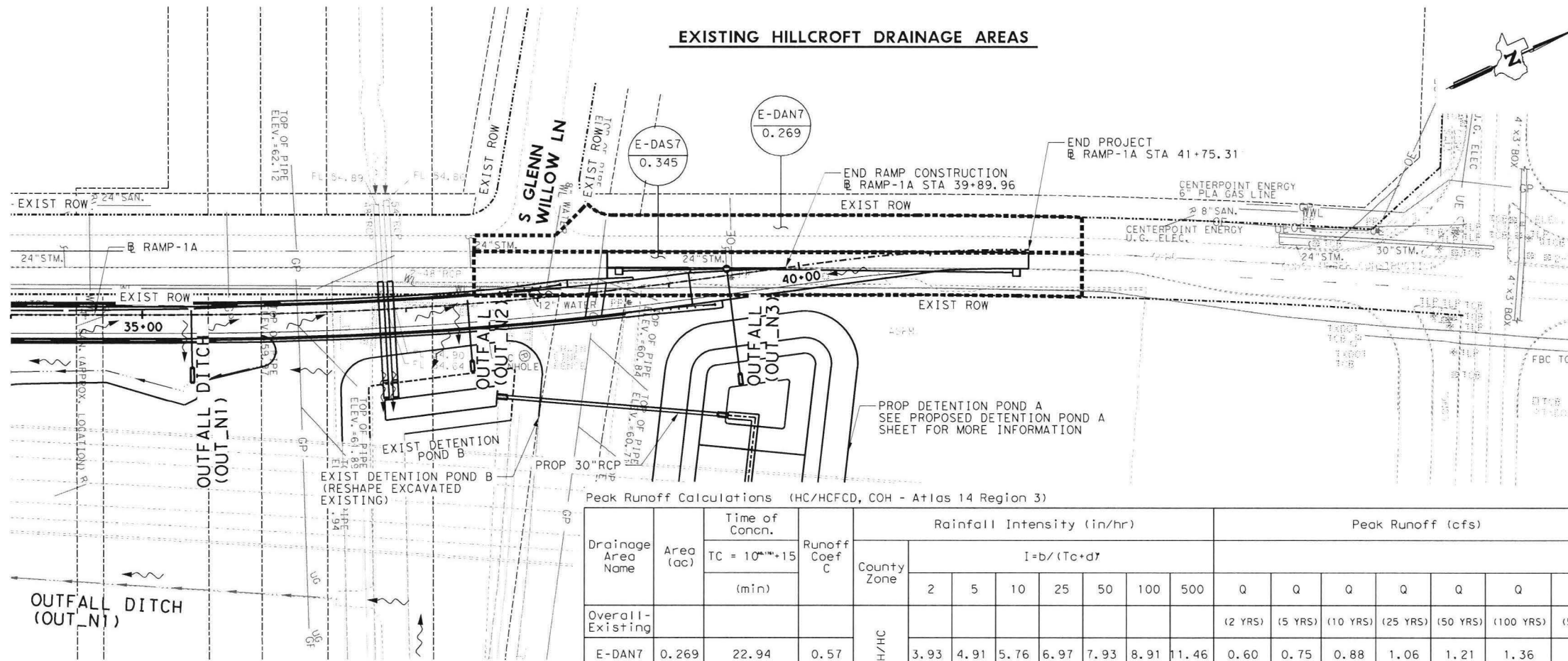
**FORT BEND PARKWAY TOLL ROAD ENTRANCE RAMP 1A DRAINAGE AREA MAP**  
BEGIN PROJECT TO STA 39+06.63

SHEET 1 OF 1	
PROJECT NUMBER	20219x
DESIGNED BY:	DATE: 3/15/2023
CHECKED BY:	
DRAWN BY:	SHEET NO.: 87
CHECKED BY:	

3/15/2023 6:46:55 PM C:\AIG-Projectwise\AIG Technical Services LLC\2106\_FBPkwy\_BW8\_Ramp\07\_CAD\_GIS\02\_Sheets\20219x\_FBC\_AIG\_DR\_DA\_01.dgn

100%  
SUBMITTAL

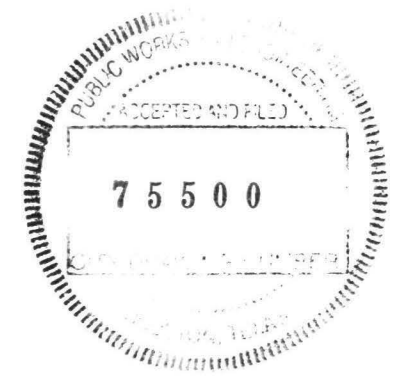
EXISTING HILLCROFT DRAINAGE AREAS



Peak Runoff Calculations (HC/HCFCD, COH - Atlas 14 Region 3)

Drainage Area Name	Area (ac)	Time of Conc. TC = 10 <sup>min</sup> +15 (min)	Runoff Coef C	County Zone	Rainfall Intensity (in/hr)								Peak Runoff (cfs)					
					I = b / (Tc + d)								Q	Q	Q	Q	Q	Q
Overall-Existing					2	5	10	25	50	100	500	(2 YRS)	(5 YRS)	(10 YRS)	(25 YRS)	(50 YRS)	(100 YRS)	(500YRS)
E-DAN7	0.269	22.94	0.57	COH/HC	3.93	4.91	5.76	6.97	7.93	8.91	11.46	0.60	0.75	0.88	1.06	1.21	1.36	1.75
E-DAS7	0.345	23.29	0.36		3.90	4.88	5.72	6.91	7.87	8.84	11.38	0.49	0.61	0.72	0.87	0.99	1.11	1.43

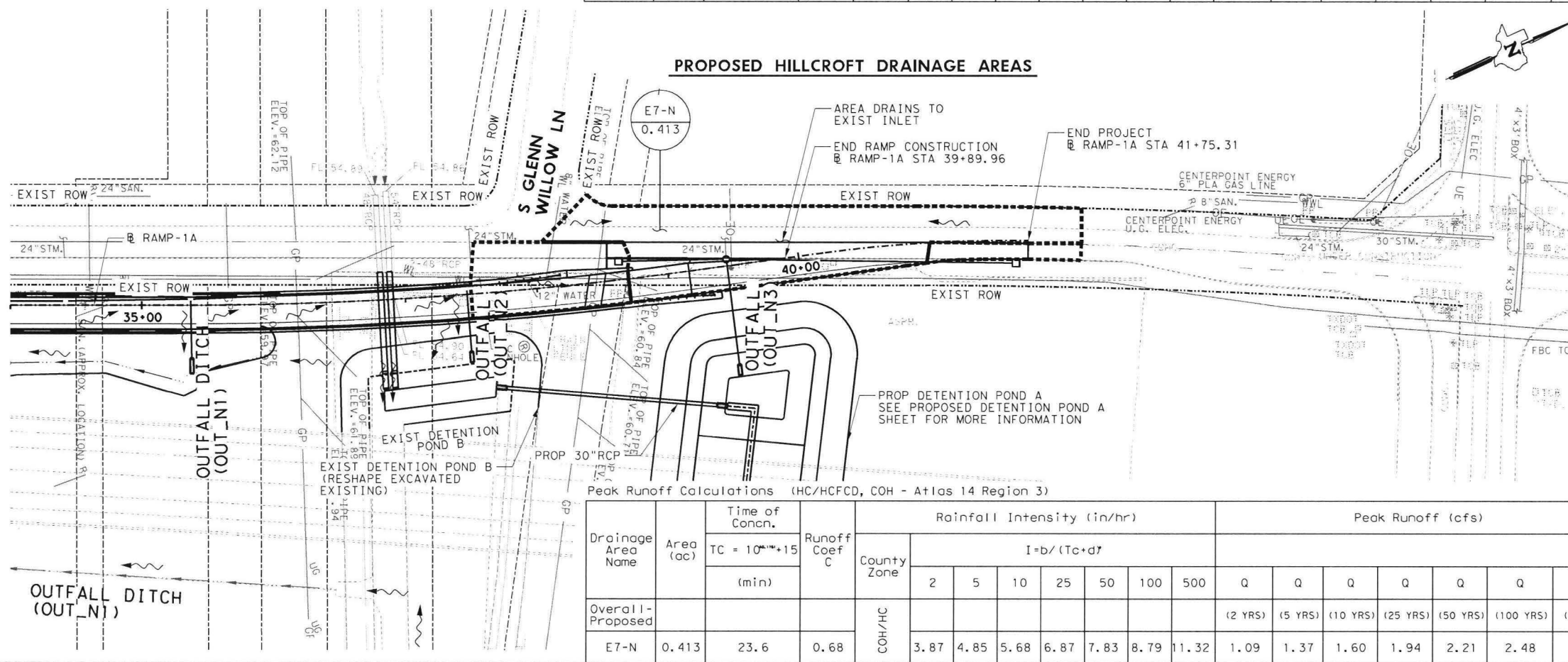
- LEGEND
- DRAINAGE AREA BOUNDARY
  - ~ PROP SURFACE RUNOFF DIRECTION
  - X-X WATERSHED NAME AREA (AC)
  - DITCH FLOW LINE



0 25 50 100  
SCALE: 1"=100'

REV.	D.USUAL SHEET TEXT SIZE-BACKGROUND

PROPOSED HILLCROFT DRAINAGE AREAS



Peak Runoff Calculations (HC/HCFCD, COH - Atlas 14 Region 3)

Drainage Area Name	Area (ac)	Time of Conc. TC = 10 <sup>min</sup> +15 (min)	Runoff Coef C	County Zone	Rainfall Intensity (in/hr)								Peak Runoff (cfs)					
					I = b / (Tc + d)								Q	Q	Q	Q	Q	Q
Overall-Proposed					2	5	10	25	50	100	500	(2 YRS)	(5 YRS)	(10 YRS)	(25 YRS)	(50 YRS)	(100 YRS)	(500YRS)
E7-N	0.413	23.6	0.68	COH/HC	3.87	4.85	5.68	6.87	7.83	8.79	11.32	1.09	1.37	1.60	1.94	2.21	2.48	3.19



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

AIG Technical Services, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
DRAINAGE AREA MAP  
HILLCROFT AVENUE

SHEET 1 OF 1	
PROJECT NUMBER	20219x
DESIGNED BY:	DATE: 3/15/2023
CHECKED BY:	SHEET NO.: 87A
DRAWN BY:	
CHECKED BY:	

100%  
SUBMITTAL

GEOPAK 2013 DRAINAGE (STORM DRAIN DESIGN)  
PROJECT NAME : FORT BEND PARKWAY ENTRANCE RAMP  
JOB NUMBER : 20219x  
PROJECT DESCRIPTION: FROM SOUTH OF BELTWAY 8 EB FRONTAGE RD TO NORTH OF CHANNEL B-1  
STORM SEWER SYSTEM: SYSTEM SOUTH  
DESIGN FREQUENCY: 10 YEARS OUT\_S  
MEASUREMENT UNITS: ENGLISH  
COUNTY: FORT BEND

OUTPUT FOR DESIGN FREQUENCY OF: 10 YEARS

RUNOFF COMPUTATION FOR DESIGN FREQUENCY

ID	C VALUE	AREA (acres)	Tc (min)	Tc USED	INTENSITY (in/hr)	TOTAL Q (cfs)
A1-S	0.90	0.073	0.87	10.00	7.786	0.512
A2-S	0.90	0.083	0.93	10.00	7.786	0.582
A3-S	0.90	0.083	0.91	10.00	7.786	0.582
A4-S	0.90	0.072	0.82	10.00	7.786	0.505
A5-S	0.90	0.070	0.75	10.00	7.786	0.491
A6-S	0.90	0.056	0.69	10.00	7.786	0.392
A7-S	0.37	1.146	15.43	15.43	6.595	2.794
A8-S	0.39	0.678	13.25	13.25	7.019	1.859

ON GRADE INLET CONFIGURATION DATA

INLET ID	INLET TYPE	INLET CURB LENGTH (ft)	GRATE INLET LENGTH (ft)	SLOPES		GUTTER		GRATE		PONDED WIDTH ALLOWED (ft)	CRITICAL ELEVATION (ft)
				LONG (%)	TRANS (%)	N (ft)	DEPR. (ft)	WIDTH (ft)	TYPE		
A1-S	Grate	n/a	5.96	1.96	2.00	0.014	n/a	2.83	Parallel	6.00	85.06
A2-S	Grate	n/a	5.96	2.82	2.00	0.014	n/a	2.83	Parallel	6.00	81.38
A3-S	Grate	n/a	5.96	2.65	2.00	0.014	n/a	2.83	Parallel	6.00	76.83
A4-S	Grate	n/a	5.96	1.46	2.00	0.014	n/a	2.83	Parallel	6.00	74.16
A5-S	Grate	n/a	5.96	1.30	2.00	0.014	n/a	2.83	Parallel	6.00	72.39
A6-S	Grate	n/a	2.96	1.30	2.00	0.014	n/a	2.83	Parallel	6.00	71.07

ON GRADE INLET COMPUTATION DATA

INLET ID	INLET TYPE	TOTAL Q (cfs)	INTERCEPT CAPACITY	Q BYPASS		TO INLET ID	REQUIRED LENGTH (ft)	ACTUAL LENGTH (ft)	PONDED WIDTH (ft)
				ALLOW (cfs)	ACTUAL (cfs)				
A1-S	Grate	0.512	0.496	0.25	0.016	A2-S	n/a	n/a	4.73
A2-S	Grate	0.598	0.576	0.25	0.022	A3-S	n/a	n/a	4.68
A3-S	Grate	0.604	0.580	0.25	0.024	A4-S	n/a	n/a	4.76
A4-S	Grate	0.529	0.508	0.25	0.021	A5-S	n/a	n/a	5.06
A5-S	Grate	0.512	0.492	0.25	0.020	A6-S	n/a	n/a	5.10
A6-S	Grate	0.412	0.374	0.25	0.038	A8-S	n/a	n/a	4.71

CUMULATIVE JUNCTION DISCHARGE COMPUTATIONS

NODE ID	NODE TYPE	WEIGHTED C-VALUE	CUMULATIVE DRAIN AREAS (acres)	CUMULATIVE Tc USED (min)	INTENSITY (in/hr)	USER SUPPLY Q (cfs)	TOTAL DISCH (cfs)
A7-S	Junction	0.517	1.582	15.430	6.595	0.000	5.390
JNT2	Other	0.902	0.436	6.084	7.786	0.000	3.064
A7-S4	Junction	0.000	0.000	0.000	0.000	0.001	0.001
MH_S2	Junction	0.902	0.436	5.535	7.786	0.000	3.064
A5-S	Grate	0.902	0.436	5.337	7.786	0.000	3.064
A4-S	Grate	0.903	0.310	4.464	7.786	0.000	2.179
A6-S	Grate	0.900	0.056	0.690	7.786	0.000	0.394
A3-S	Grate	0.903	0.238	3.542	7.786	0.000	1.675
A2-S	Grate	0.903	0.155	2.370	7.786	0.000	1.093
A1-S	Grate	0.902	0.073	0.870	7.786	0.000	0.512

CONVEYANCE CONFIGURATION DATA

LINK ID	NODE ID		FLOWLINE ELEVATION		SHAPE	# BARRELS	SPAN (ft)	RISE (ft)	LENGTH (ft)	SLOPE (%)	n VALUE
	US	DS	US (ft)	DS (ft)							
PS-22	A7-S4	A7-S	62.640	62.21	V Ditch	1	n/a	2	94.20	0.46	0.035
PS-20	A7-S	OUT_S	62.21	61.89	V Ditch	1	n/a	2	158.00	0.20	0.035
PS-18	JNT2	A7-S	63.64	62.21	V Ditch	1	n/a	2	458.80	0.31	0.035
PS-16	MH_S2	JNT2	64.59	63.64	Circular	1	n/a	2	144.55	0.66	0.013
PS-14	A5-S	MH_S2	64.65	64.58	Circular	1	n/a	2	32.95	0.20	0.013
PS-8	A4-S	A5-S	64.92	64.65	Circular	1	n/a	2	134.00	0.20	0.013
PS-10	A6-S	A5-S	64.85	64.65	Circular	1	n/a	2	101.50	0.20	0.013
PS-6	A3-S	A4-S	66.67	66.41	Circular	1	n/a	2	129.50	0.20	0.013
PS-12	A8-S	A6-S	65.01	64.85	Circular	1	n/a	2	80.50	0.20	0.013
PS-4	A2-S	A3-S	69.37	69.07	Circular	1	n/a	2	150.00	0.20	0.013
PS-2	A1-S	A2-S	73.93	73.63	Circular	1	n/a	2	150.00	0.20	0.013

CONVEYANCE HYDRAULIC COMPUTATION DATA

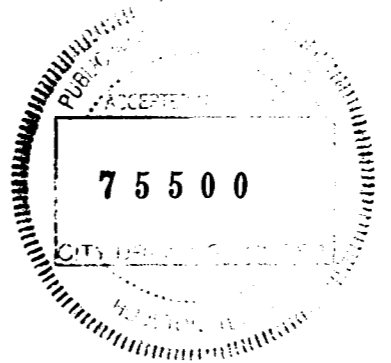
TAILWATER = 61.22

LINK ID	HYDRAULIC GRADELINE		FRICTION SLOPE (%)	DEPTH (ft)		VELOCITY (ft/s)		DISCHARGE (cfs)	CAPACITY (cfs)	JUNCTION LOSS (ft)
	UPSTREAM ELEVATION (ft)	DOWNSTREAM ELEVATION (ft)		UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)			
	PS-20	64.35		64.02	0.00%	1.05	1.80			
PS-18	64.56	64.35	0.00%	0.86	1.50	1.05	0.34	3.06	13.85	0.01
PS-22	64.35	64.35	0.00%	0.04	1.00	0.19	0.00	0.00	7.07	0.00
PS-16	65.48	64.19	1.00%	0.55	0.55	4.32	4.32	3.06	19.78	0.29
PS-14	65.78	65.48	0.00%	0.76	0.90	2.78	2.24	3.06	10.88	0.26
PS-8	65.82	65.78	0.00%	0.63	1.13	2.57	1.20	2.18	10.88	0.01
PS-10	65.78	65.78	0.00%	0.27	1.11	1.54	0.22	0.39	10.88	0.00
PS-4	69.83	69.43	0.00%	0.44	0.36	2.13	2.83	1.09	10.88	0.02
PS-2	74.28	73.88	0.00%	0.31	0.25	1.67	2.27	0.51	10.88	0.04

REV.	DATE	BY	DESCRIPTION



**AIG Tech**  
Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077



FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
HYDRAULIC  
CALCULATIONS  
SOUTH SYSTEM

SHEET 1 OF 4

PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	88

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100%  
SUBMITTAL

GEOPAK 2013 DRAINAGE (STORM DRAIN DESIGN)  
 PROJECT NAME : FORT BEND PARKWAY ENTRANCE RAMP  
 JOB NUMBER : 20219x  
 PROJECT DESCRIPTION: FROM SOUTH OF BELTWAY 8 EB FRONTAGE RD TO NORTH OF CHANNEL B-1  
 STORM SEWER SYSTEM: SYSTEM SOUTH  
 DESIGN FREQUENCY: 100 YEARS  
 MEASUREMENT UNITS: ENGLISH  
 COUNTY: FORT BEND

OUTPUT FOR ANALYSIS FREQUENCY OF: 100 YEARS  
 RUNOFF COMPUTATION FOR ANALYSIS FREQUENCY

ID	C VALUE	AREA (acres)	Tc (min)	Tc USED (min)	INTENSITY (in/hr)	TOTAL Q (cfs)
A1-S	0.90	0.073	0.87	10.00	11.563	0.760
A2-S	0.90	0.083	0.93	10.00	11.563	0.864
A3-S	0.90	0.083	0.91	10.00	11.563	0.864
A4-S	0.90	0.072	0.82	10.00	11.563	0.749
A5-S	0.90	0.070	0.75	10.00	11.563	0.728
A6-S	0.90	0.056	0.69	10.00	11.563	0.583
A7-S	0.37	1.146	15.43	15.43	9.921	4.203
A8-S	0.39	0.678	13.25	13.25	10.509	2.783

ON GRADE INLET CONFIGURATION DATA

INLET ID	INLET TYPE	INLET CURB LENGTH (ft)	GRATE INLET LENGTH (ft)	SLOPES		GUTTER		GRATE		PONDED WIDTH ALLOWED (ft)	CRITICAL ELEVATION (ft)
				LONG (%)	TRANS (%)	N	DEPR. (ft)	WIDTH (ft)	TYPE		
A1-S	Grate	n/a	5.96	1.96	2.00	0.014	n/a	2.83	Parallel	6.00	85.06
A2-S	Grate	n/a	5.96	2.82	2.00	0.014	n/a	2.83	Parallel	6.00	81.38
A3-S	Grate	n/a	5.96	2.65	2.00	0.014	n/a	2.83	Parallel	6.00	76.83
A4-S	Grate	n/a	5.96	1.46	2.00	0.014	n/a	2.83	Parallel	6.00	74.16
A5-S	Grate	n/a	5.96	1.30	2.00	0.014	n/a	2.83	Parallel	6.00	72.39
A6-S	Grate	n/a	5.00	1.30	2.00	0.014	n/a	2.50	Parallel	6.00	71.07

ON GRADE INLET COMPUTATION DATA

INLET ID	INLET TYPE	TOTAL Q (cfs)	INTERCEPT CAPACITY	Q BYPASS		TO INLET ID	REQUIRED LENGTH (ft)	ACTUAL LENGTH (ft)	PONDED WIDTH (ft)
				ALLOW (cfs)	ACTUAL (cfs)				
A1-S	Grate	0.760	0.716	0.25	0.044	A2-S	n/a	n/a	5.48
A2-S	Grate	0.908	0.845	0.25	0.063	A3-S	n/a	n/a	5.47
A3-S	Grate	0.927	0.860	0.25	0.067	A4-S	n/a	n/a	5.58
A4-S	Grate	0.816	0.763	0.25	0.053	A5-S	n/a	n/a	5.94
A5-S	Grate	0.781	0.730	0.25	0.051	A6-S	n/a	n/a	5.96
A6-S	Grate	0.634	0.545	0.25	0.089	A8-S	n/a	n/a	5.52

CUMULATIVE JUNCTION DISCHARGE COMPUTATIONS

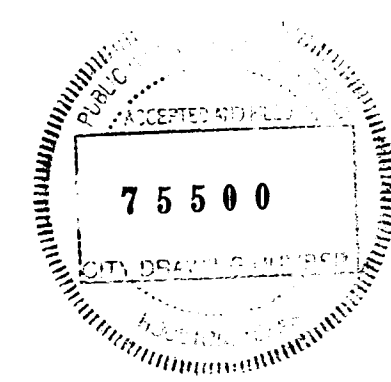
NODE ID	NODE TYPE	WEIGHTED C-VALUE	CUMULATIVE DRAIN AREAS (acres)	CUMULATIVE Tc USED (min)	CUMULATIVE INTENSITY (in/hr)	USER SUPPLY Q (cfs)	TOTAL DISCH (cfs)
OUT_S	Outlet	0.517	1.582	17.901	0.000	0.000	0.000
A7-S	Junction	0.517	1.582	15.430	6.595	0.000	5.390
JNT2	Other	0.902	0.436	6.084	7.786	0.000	3.064
A7-S4	Junction	0.000	0.000	0.000	0.000	0.001	0.001
MH_S2	Junction	0.902	0.436	5.535	7.786	0.000	3.064
A5-S	Grate	0.902	0.436	5.337	7.786	0.000	3.064
A4-S	Grate	0.903	0.310	4.464	7.786	0.000	2.179
A6-S	Grate	0.900	0.056	0.690	7.786	0.000	0.394
A3-S	Grate	0.903	0.238	3.542	7.786	0.000	1.675
A2-S	Grate	0.903	0.155	2.370	7.786	0.000	1.093
A1-S	Grate	0.902	0.073	0.870	7.786	0.000	0.512

CONVEYANCE CONFIGURATION DATA

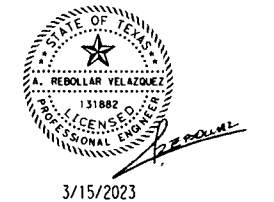
LINK ID	NODE ID		FLOWLINE ELEVATION		SHAPE	# BARRELS	SPAN (ft)	RISE (ft)	LENGTH (ft)	SLOPE (%)	n VALUE
	US	DS	US (ft)	DS (ft)							
PS-20	A7-S	OUT_S	62.72	62.41	V Ditch	1	n/a	2	154.50	0.20	0.035
PS-18	JNT2	A7-S	63.64	62.72	V Ditch	1	4	2	458.50	0.20	0.035
PS-16	MH_S2	JNT2	64.59	63.64	Circular	1	n/a	2	144.55	0.66	0.013
PS-14	A5-S	MH_S2	64.65	64.58	Circular	1	n/a	2	32.95	0.20	0.013
PS-8	A4-S	A5-S	64.92	64.65	Circular	1	n/a	2	134.00	0.20	0.013
PS-10	A6-S	A5-S	64.85	64.65	Circular	1	n/a	2	101.50	0.20	0.013
PS-6	A3-S	A4-S	66.67	66.41	Circular	1	n/a	2	129.50	0.20	0.013
PS-12	A8-S	A6-S	65.01	64.85	Circular	1	n/a	2	80.50	0.20	0.013
PS-4	A2-S	A3-S	69.37	69.07	Circular	1	n/a	2	150.00	0.20	0.013
PS-2	A1-S	A2-S	73.93	73.630	Circular	1	n/a	2	150.00	0.20	0.013

CONVEYANCE HYDRAULIC COMPUTATION DATA TAILWATER = 61.22

LINK	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE (cfs)	CAPACITY (cfs)	JUNCTION LOSS (ft)
	UPSTREAM	DOWNSTREAM		UNIFORM	ACTUAL	UNIFORM	ACTUAL			
	ELEVATION (ft)	ELEVATION (ft)	SLOPE (%)	(ft)	(ft)	(ft/s)	(ft/s)			
PS-20	64.35	64.02	0.00%	1.05	1.80	1.21	0.42	5.39	22.48	0.30
PS-18	64.56	64.35	0.00%	0.86	1.50	1.05	0.34	3.06	13.85	0.01
PS-22	64.35	64.35	0.00%	0.04	1.00	0.19	0.00	0.00	7.07	0.00
PS-16	65.48	64.19	1.00%	0.55	0.55	4.32	4.32	3.06	19.78	0.29
PS-14	65.78	65.48	0.00%	0.76	0.90	2.78	2.24	3.06	10.88	0.26
PS-8	65.82	65.78	0.00%	0.63	1.13	2.57	1.20	2.18	10.88	0.01
PS-10	65.78	65.78	0.00%	0.27	1.11	1.54	0.22	0.39	10.88	0.00
PS-4	69.83	69.43	0.00%	0.44	0.36	2.13	2.83	1.09	10.88	0.02
PS-2	74.28	73.88	0.00%	0.31	0.25	1.67	2.27	0.51	10.88	0.04



REV.	DATE	BY	DESCRIPTION



3/15/2023



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech** F-20607  
 Advanced Infrastructure Solutions  
 1500 S DAIRY ASHFORD SUITE 445  
 HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
HYDRAULIC  
CALCULATIONS  
SOUTH SYSTEM**

SHEET 2 OF 4

PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	89
CHECKED BY:			

100%  
SUBMITTAL

GEOPAK 2013 DRAINAGE (STORM DRAIN DESIGN)  
PROJECT NAME: FORT BEND PARKWAY ENTRANCE RAMP  
JOB NUMBER: 20219x  
PROJECT DESCRIPTION: FROM SOUTH OF BELTWAY 8 EB FRONTAGE RD TO NORTH OF CHANNEL B-I  
STORM SEWER SYSTEM: SYSTEM NORTH  
DESIGN FREQUENCY: 10 YEARS   OUTFALL\_N1  
MEASUREMENT UNITS: ENGLISH  
COUNTY: FORT BEND

OUTPUT FOR DESIGN FREQUENCY: 10 YEARS  
RUNOFF COMPUTATION FOR DESIGN FREQUENCY

Table with 7 columns: ID, C VALUE, AREA (acres), Tc (min), Tc USED (min), INTENSITY (in/hr), TOTAL Q (cfs). Rows include A1-N through A7-N.

ON GRADE INLET CONFIGURATION DATA table with columns for INLET ID, INLET TYPE, INLET CURB LENGTH, GRATE INLET LENGTH, SLOPES (LONG, TRANS), GUTTER (N, DEPR.), GRATE (WIDTH, TYPE), PONDED WIDTH ALLOWED, CRITICAL ELEVATION.

ON GRADE INLET COMPUTATION DATA table with columns for INLET ID, INLET TYPE, TOTAL Q (cfs), INTERCEPT CAPACITY (cfs), Q BYPASS (ALLOW, ACTUAL), TO INLET ID, REQUIRED LENGTH (ft), ACTUAL LENGTH (ft), PONDED WIDTH (ft).

CUMULATIVE JUNCTION DISCHARGE COMPUTATIONS table with columns for NODE ID, NODE TYPE, WEIGHTED C-VALUE, CUMULATIVE DRAIN AREAS, CUMULATIVE Tc USED, INTENSITY, USER SUPPLY Q, TOTAL DISCH.

CONVEYANCE CONFIGURATION DATA table with columns for LINK ID, NODE ID (US, DS), FLOWLINE ELEVATION (US, DS), SHAPE, # BARRELS, SPAN, RISE, LENGTH, SLOPE, n VALUE.

CONVEYANCE HYDRAULIC COMPUTATION DATA table with columns for LINK ID, HYDRAULIC GRADELINE (UPSTREAM, DOWNSTREAM), FRICTION, DEPTH, VELOCITY, DISCHARGE, CAPACITY, JUNCTION LOSS.

DESIGN FREQUENCY: 10 YEARS   OUTFALL\_N2  
MEASUREMENT UNITS: ENGLISH  
COUNTY: FORT BEND

OUTPUT FOR DESIGN FREQUENCY: 10 YEARS  
RUNOFF COMPUTATION FOR DESIGN FREQUENCY

Table with 7 columns: ID, C VALUE, AREA (acres), Tc (min), Tc USED (min), INTENSITY (in/hr), TOTAL Q (cfs). Row includes A5-N.

OUTFALL-N2 CONT ON GRADE INLET CONFIGURATION DATA table with columns for INLET ID, INLET TYPE, INLET CURB LENGTH, GRATE INLET LENGTH, SLOPES (LONG, TRANS), GUTTER (N, DEPR.), GRATE (WIDTH, TYPE), PONDED WIDTH ALLOWED, CRITICAL ELEVATION.

ON GRADE INLET COMPUTATION DATA table with columns for INLET ID, INLET TYPE, TOTAL Q (cfs), INTERCEPT CAPACITY (cfs), Q BYPASS (ALLOW, ACTUAL), TO INLET ID, REQUIRED LENGTH (ft), ACTUAL LENGTH (ft), PONDED WIDTH (ft).

CUMULATIVE JUNCTION DISCHARGE COMPUTATIONS table with columns for NODE ID, NODE TYPE, WEIGHTED C-VALUE, CUMULATIVE DRAIN AREAS, CUMULATIVE Tc USED, INTENSITY, USER SUPPLY Q, TOTAL DISCH.

CONVEYANCE CONFIGURATION DATA table with columns for LINK ID, NODE ID (US, DS), FLOWLINE ELEVATION (US, DS), SHAPE, # BARRELS, SPAN, RISE, LENGTH, SLOPE, n VALUE.

CONVEYANCE HYDRAULIC COMPUTATION DATA table with columns for LINK ID, HYDRAULIC GRADELINE (UPSTREAM, DOWNSTREAM), FRICTION, DEPTH, VELOCITY, DISCHARGE, CAPACITY, JUNCTION LOSS.

DESIGN FREQUENCY: 10 YEARS   OUTFALL\_N3  
MEASUREMENT UNITS: ENGLISH  
COUNTY: FORT BEND

OUTPUT FOR DESIGN FREQUENCY: 10 YEARS  
RUNOFF COMPUTATION FOR DESIGN FREQUENCY

Table with 7 columns: ID, C VALUE, AREA (acres), Tc (min), Tc USED (min), INTENSITY (in/hr), TOTAL Q (cfs). Rows include A6-N through A8-N.

SAG INLET CONFIGURATION DATA table with columns for INLET ID, INLET TYPE, CURB LENGTH, PERIMETER, AREA, LEFT-SLOPE (LONG, TRANS), RIGHT-SLOPE (LONG, TRANS), GUTTER (N, DEPR.), DEPTH ALLOWED, CRITICAL ELEVATION.

SAG INLET COMPUTATION DATA table with columns for INLET ID, INLET TYPE, INLET LENGTH, GRATE (PERIM, AREA), TOTAL Q, INLET CAPACITY, TOTAL HEAD, PONDED WIDTH (LEFT, RIGHT).

CUMULATIVE JUNCTION DISCHARGE COMPUTATIONS table with columns for NODE ID, NODE TYPE, WEIGHTED C-VALUE, CUMULATIVE DRAIN AREAS, CUMULATIVE Tc USED, INTENSITY, USER SUPPLY Q, TOTAL DISCH.

CONVEYANCE CONFIGURATION DATA table with columns for LINK ID, NODE ID (US, DS), FLOWLINE ELEVATION (US, DS), SHAPE, # BARRELS, SPAN, RISE, LENGTH, SLOPE, n VALUE.

CONVEYANCE HYDRAULIC COMPUTATION DATA table with columns for LINK ID, HYDRAULIC GRADELINE (UPSTREAM, DOWNSTREAM), FRICTION, DEPTH, VELOCITY, DISCHARGE, CAPACITY, JUNCTION LOSS.

NOTE:  
\* E7-N: EXIST INLET. TC CALCULATION BASED ON COH CRITERIA ATLAS 14 REGION 3



Table with columns: REV., DATE, BY, DESCRIPTION.



FORT BEND COUNTY TOLL ROAD AUTHORITY

AIG Technical Services, LLC F-20607  
1500 S DAIRY ASHFORD SUITE 445 HOUSTON, TX 77077

FORT BEND PARKWAY TOLL ROAD ENTRANCE RAMP 1A  
HYDRAULIC CALCULATIONS NORTH SYSTEM

Table with columns: SHEET 3 OF 4, PROJECT NUMBER (20219x), DESIGNED BY, DATE (3/15/2023), CHECKED BY, SHEET NO. (90).

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100% SUBMITTAL

GEOPAK 2013 DRAINAGE (STORM DRAIN DESIGN)
PROJECT NAME: FORT BEND PARKWAY ENTRANCE RAMP
JOB NUMBER: 20219x
PROJECT DESCRIPTION: FROM SOUTH OF BELTWAY 8 EB FRONTAGE RD TO NORTH OF CHANNEL B-1
STORM SEWER SYSTEM: SYSTEM NORTH
ANALYSIS FREQUENCY: 100 YEARS OUTFALL\_N1
MEASUREMENT UNITS: ENGLISH
COUNTY: FORT BEND

Table with 6 columns: ID, C VALUE, AREA (acres), Tc (min), INTENSITY (in/hr), TOTAL Q (cfs). Rows include A1-N through A7-N.

Table with 10 columns: INLET ID, INLET TYPE, INLET CURB LENGTH, GRATE INLET LENGTH, SLOPES (LONG, TRANS), GUTTER (N, DEPR.), GRATE (WIDTH, TYPE), PONDED WIDTH ALLOWED, CRITICAL ELEVATION. Rows include A1-N through A4-N.

Table with 10 columns: INLET ID, INLET TYPE, TOTAL Q (cfs), INTERCEPT CAPACITY, Q BYPASS (ALLOW, ACTUAL), TO INLET ID, REQUIRED LENGTH (ft), ACTUAL LENGTH (ft), PONDED WIDTH (ft). Rows include A1-N through A4-N.

Table with 8 columns: NODE ID, NODE TYPE, WEIGHTED C-VALUE, CUMULATIVE DRAIN AREAS (acres), CUMULATIVE Tc USED (min), INTENSITY (in/hr), USER SUPPLY (cfs), TOTAL DISCH (cfs). Rows include OUT\_N1 through A1-N.

Table with 11 columns: LINK ID, NODE ID (US, DS), FLOWLINE ELEVATION (US, DS), SHAPE, # BARRELS, SPAN (ft), RISE (ft), LENGTH (ft), SLOPE (%), n VALUE. Rows include PN-9 through PN-2.

Table with 10 columns: LINK ID, UPSTREAM ELEVATION, DOWNSTREAM ELEVATION, FRICTION SLOPE, DEPTH (UNIFORM, ACTUAL), VELOCITY (UNIFORM, ACTUAL), DISCHARGE (cfs), CAPACITY (cfs), JUNCTION LOSS (ft). Rows include PN-9 through PN-2.

Table with 6 columns: ID, C VALUE, AREA (acres), Tc (min), INTENSITY (in/hr), TOTAL Q (cfs). Rows include A5-N.

Table with 10 columns: INLET ID, INLET TYPE, INLET CURB LENGTH, GRATE INLET LENGTH, SLOPES (LONG, TRANS), GUTTER (N, DEPR.), GRATE (WIDTH, TYPE), PONDED WIDTH ALLOWED, CRITICAL ELEVATION. Rows include A5-N.

Table with 10 columns: INLET ID, INLET TYPE, TOTAL Q (cfs), INTERCEPT CAPACITY, Q BYPASS (ALLOW, ACTUAL), TO INLET ID, REQUIRED LENGTH (ft), ACTUAL LENGTH (ft), PONDED WIDTH (ft). Rows include A5-N.

Table with 8 columns: NODE ID, NODE TYPE, WEIGHTED C-VALUE, CUMULATIVE DRAIN AREAS (acres), CUMULATIVE Tc USED (min), INTENSITY (in/hr), USER SUPPLY (cfs), TOTAL DISCH (cfs). Rows include OUT\_N2 through A5-N.

Table with 11 columns: LINK ID, NODE ID (US, DS), FLOWLINE ELEVATION (US, DS), SHAPE, # BARRELS, SPAN (ft), RISE (ft), LENGTH (ft), SLOPE (%), n VALUE. Rows include PN-14 through PN-12.

Table with 10 columns: LINK ID, UPSTREAM ELEVATION, DOWNSTREAM ELEVATION, FRICTION SLOPE, DEPTH (UNIFORM, ACTUAL), VELOCITY (UNIFORM, ACTUAL), DISCHARGE (cfs), CAPACITY (cfs), JUNCTION LOSS (ft). Rows include PN-14 through PN-12.

ANALYSIS FREQUENCY: 100 YEARS OUTFALL\_N3
MEASUREMENT UNITS: ENGLISH
COUNTY: FORT BEND

Table with 6 columns: ID, C VALUE, AREA (acres), Tc (min), INTENSITY (in/hr), TOTAL Q (cfs). Rows include A6-N through A8-N.

Table with 11 columns: INLET ID, INLET TYPE, CURB LENGTH, PERIMETER (ft), AREA (sf), LEFT-SLOPE (LONG, TRANS), RIGHT-SLOPE (LONG, TRANS), GUTTER (N, DEPR.), DEPTH ALLOWED (ft), CRITICAL ELEVATION (ft). Rows include A6-N through A8-N.

Table with 10 columns: INLET ID, INLET TYPE, INLET LENGTH (ft), GRATE (PERIM, AREA), TOTAL Q (cfs), INLET CAPACITY (cfs), TOTAL HEAD (ft), PONDED WIDTH (LEFT, RIGHT) (ft). Rows include A6-N through A8-N.

Table with 8 columns: NODE ID, NODE TYPE, WEIGHTED C-VALUE, CUMULATIVE DRAIN AREAS (acres), CUMULATIVE Tc USED (min), INTENSITY (in/hr), USER SUPPLY (cfs), TOTAL DISCH (cfs). Rows include OUT\_N3 through A8-N.

Table with 11 columns: LINK ID, NODE ID (US, DS), FLOWLINE ELEVATION (US, DS), SHAPE, # BARRELS, SPAN (ft), RISE (ft), LENGTH (ft), SLOPE (%), n VALUE. Rows include PN-1 through PN-4.

Table with 10 columns: LINK ID, UPSTREAM ELEVATION, DOWNSTREAM ELEVATION, FRICTION SLOPE, DEPTH (UNIFORM, ACTUAL), VELOCITY (UNIFORM, ACTUAL), DISCHARGE (cfs), CAPACITY (cfs), JUNCTION LOSS (ft). Rows include PN-1 through PN-4.

NOTE:
\*E7-N: EXIST INLET. TC CALCULATION
BASED ON COH CRITERIA ATLAS 14 REGION 3

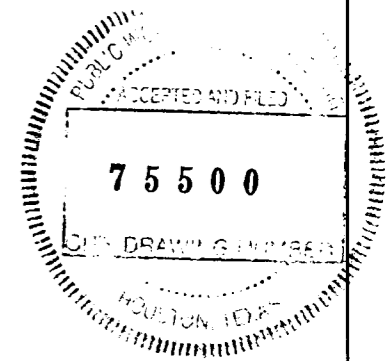
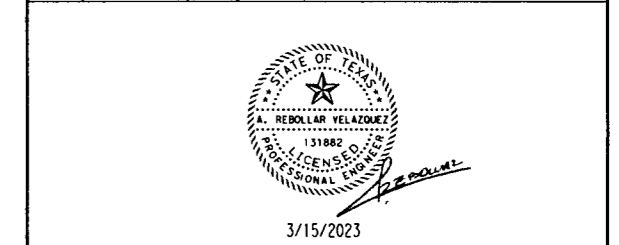


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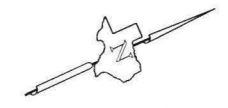


FORT BEND COUNTY TOLL ROAD AUTHORITY
AIG Tech
Advanced Infrastructure Group
1500 S DAIRY ASHFORD SUITE 445 HOUSTON, TX 77077

FORT BEND PARKWAY TOLL ROAD ENTRANCE RAMP 1A HYDRAULIC CALCULATIONS NORTH SYSTEM
SHEET 4 OF 4
PROJECT NUMBER: 20219x
DESIGNED BY: DATE: 3/15/2023
CHECKED BY: SHEET NO.: 91



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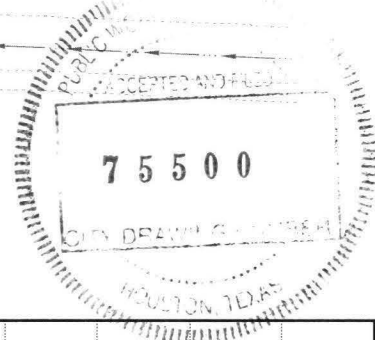
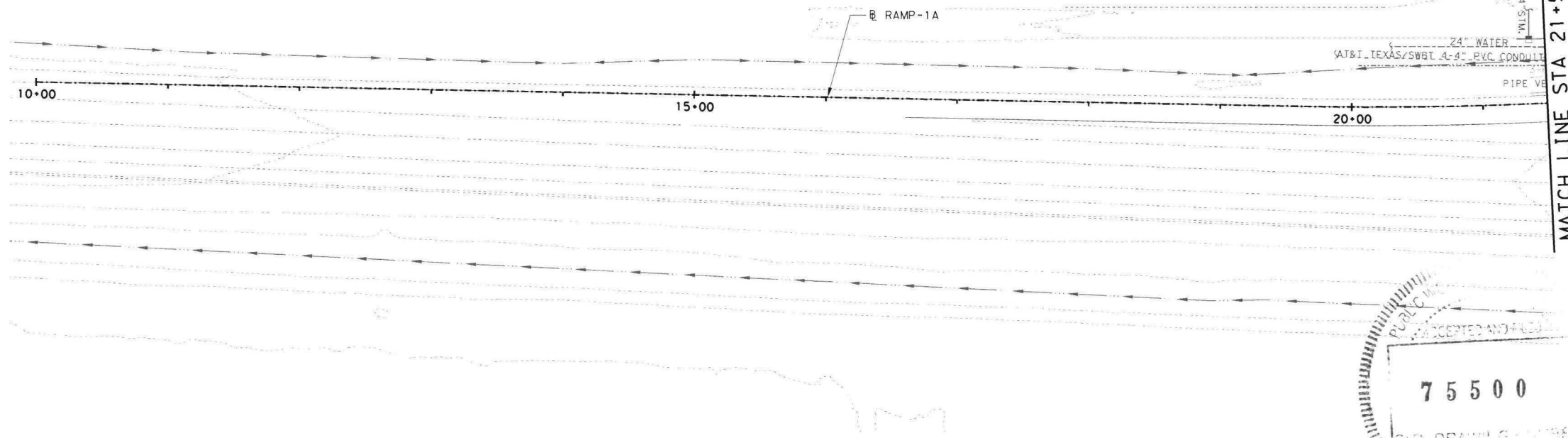
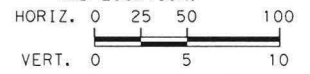
LEGEND

- MANHOLE
- GRATE INLET
- ▣ CURB INLET
- ▭ SAFETY END TREATMENT (SET)

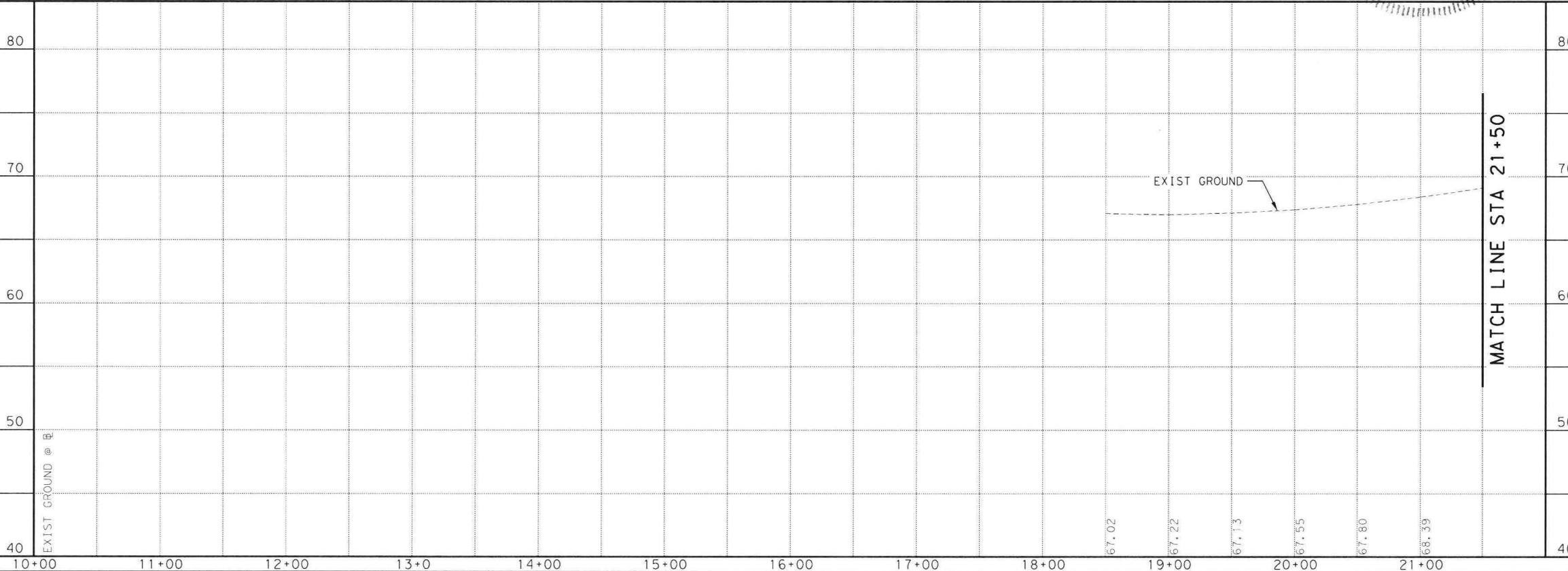
- PROPOSED STORM SEWER
- & PROPOSED DITCH
- DIRECTION OF FLOW

NOTES

1. THE HORIZONTAL CONTROL POINT FOR ALL CURB INLETS IS AT THE CENTER FACE OF CURB, FOR GRATE INLETS AND MANHOLES, THE HORIZONTAL CONTROL POINT IS AT THE CENTER OF INLET OR MANHOLE.
2. HORIZONTAL CONTROL IS BASED ON RAMP-1A PGL ALIGNMENT.
3. STORM SEWER LENGTH SHOWN IS CENTER TO CENTER OF STRUCTURE WHICH DIFFERS FROM PAY LENGTH IN QUANTITY SHEET.
4. SEE STORM SEWER LATERAL SHEETS FOR MORE INFORMATION.
5. ALL DITCHES ARE V-SHAPED UNLESS OTHERWISE NOTED.
6. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE WITHIN THE PROJECT LIMITS TO CONVEY ALL STORMWATER RUNOFF TO IDENTIFIED OUTFALL POINTS.
7. UTILITIES SHOWN ARE APPROXIMATE CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION.



REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
STORM SEWER  
PLAN & PROFILE  
BEGIN PROJECT TO STA 21+50**

SHEET 1 OF 3	
PROJECT NUMBER	20219x
DESIGNED BY:	DATE: 3/15/2023
CHECKED BY:	SHEET NO.: 92
DRAWN BY:	
CHECKED BY:	

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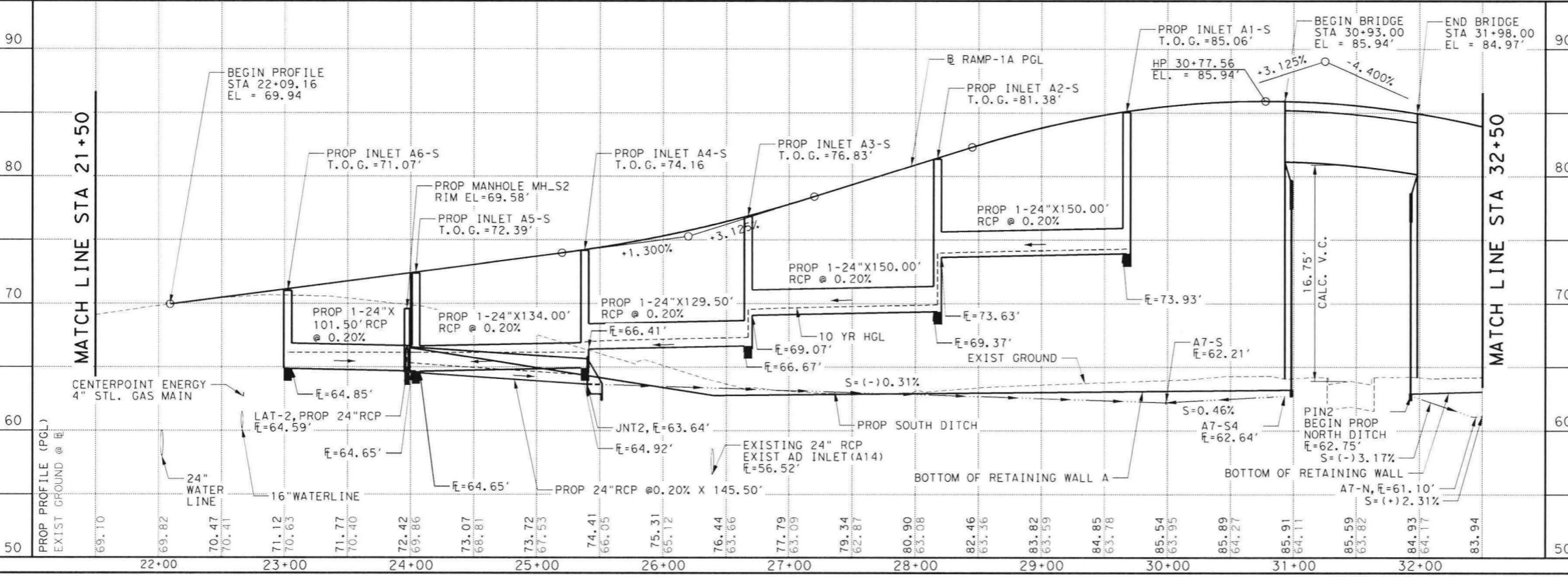
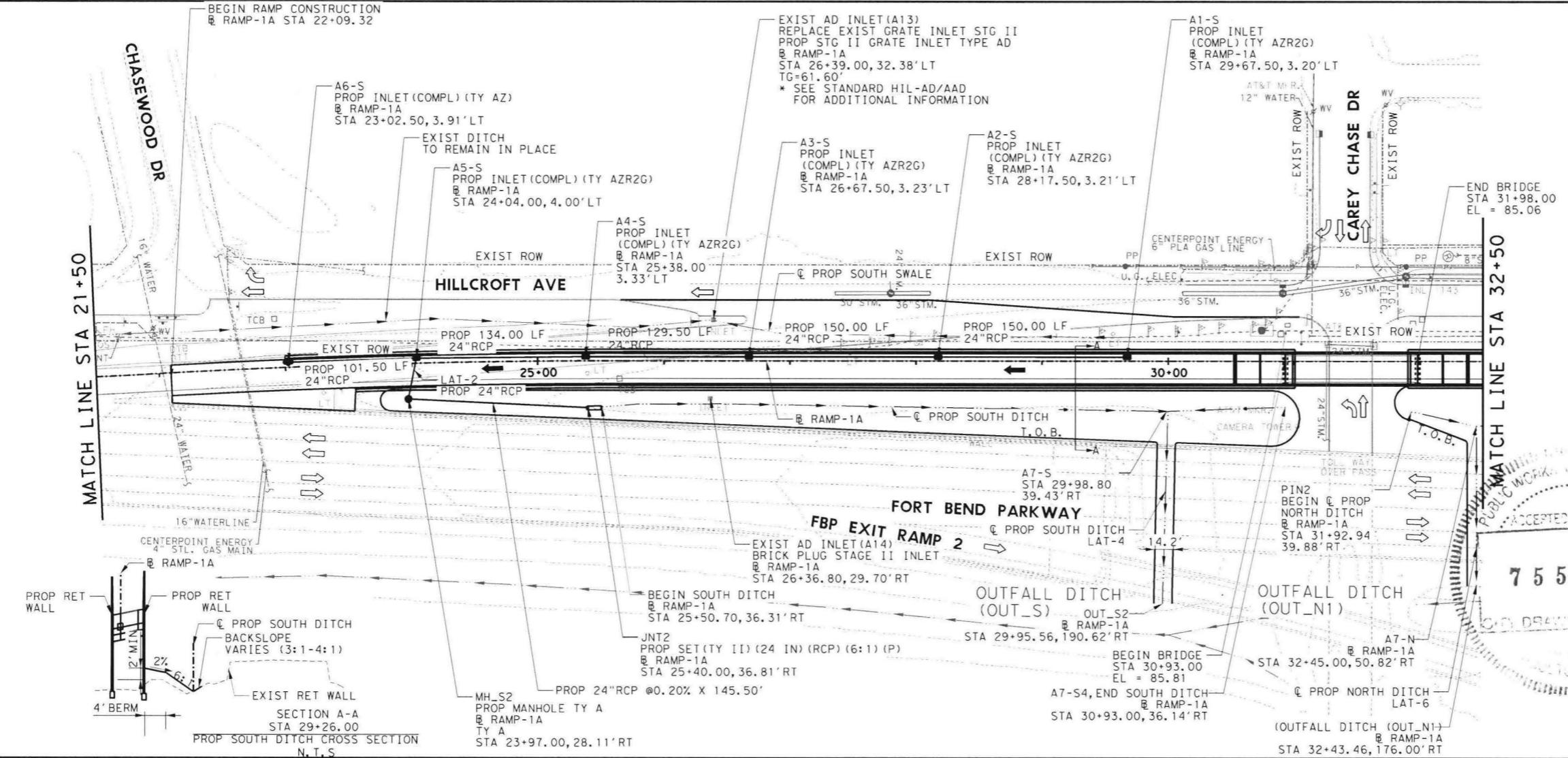
**LEGEND**

- MANHOLE
- GRATE INLET
- ▣ CURB INLET
- ▭ SAFETY END TREATMENT (SET)
- PROPOSED STORM SEWER
- ⊕ PROPOSED DITCH
- DIRECTION OF FLOW

- NOTES**
1. THE HORIZONTAL CONTROL POINT FOR ALL CURB INLETS IS AT THE CENTER FACE OF CURB, FOR GRATE INLETS AND MANHOLES, THE HORIZONTAL CONTROL POINT IS AT THE CENTER OF INLET OR MANHOLE.
  2. HORIZONTAL CONTROL IS BASED ON RAMP-1A PGL ALIGNMENT.
  3. STORM SEWER LENGTH SHOWN IS CENTER TO CENTER OF STRUCTURE WHICH DIFFERS FROM PAY LENGTH IN QUANTITY SHEET.
  4. SEE STORM SEWER LATERAL SHEETS FOR MORE INFORMATION.
  5. ALL DITCHES ARE V-SHAPED UNLESS OTHERWISE NOTED.
  6. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE WITHIN THE PROJECT LIMITS TO CONVEY ALL STORMWATER RUNOFF TO IDENTIFIED OUTFALL POINTS.
  7. UTILITIES SHOWN ARE APPROXIMATE CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION.

HORIZ. 0 25 50 100  
VERT. 0 5 10

REV.	DATE	BY	DESCRIPTION



STATE OF TEXAS  
A. REBOLLAR VELAZQUEZ  
131882  
LICENSED PROFESSIONAL ENGINEER

3/15/2023

**FORT BEND COUNTY TOLL ROAD AUTHORITY**

AIG Technical Services, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD ENTRANCE RAMP 1A STORM SEWER PLAN & PROFILE STA 21+50 TO STA 32+50**

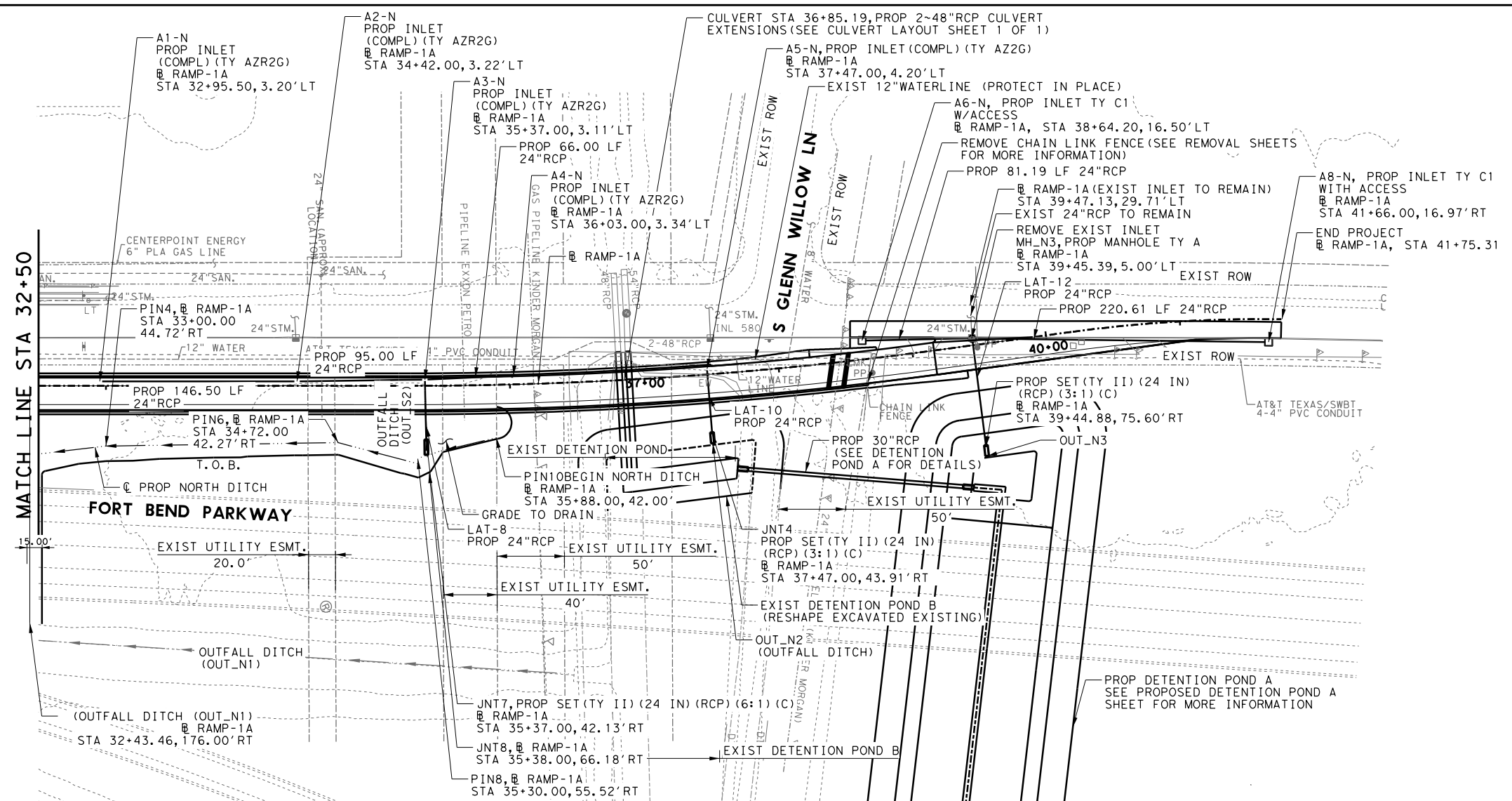
SHEET 2 OF 3

PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	93

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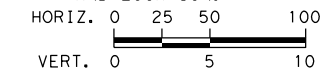


**LEGEND**

- MANHOLE
- GRATE INLET
- CURB INLET
- ▭ SAFETY END TREATMENT (SET)
- PROPOSED STORM SEWER
- ⊕ PROPOSED DITCH
- DIRECTION OF FLOW

**NOTES**

1. THE HORIZONTAL CONTROL POINT FOR ALL CURB INLETS IS AT THE CENTER FACE OF CURB, FOR GRATE INLETS AND MANHOLES, THE HORIZONTAL CONTROL POINT IS AT THE CENTER OF INLET OR MANHOLE.
2. HORIZONTAL CONTROL IS BASED ON RAMP-1A PGL ALIGNMENT.
3. STORM SEWER LENGTH SHOWN IS CENTER TO CENTER OF STRUCTURE WHICH DIFFERS FROM PAY LENGTH IN QUANTITY SHEET.
4. SEE STORM SEWER LATERAL SHEETS FOR MORE INFORMATION.
5. ALL DITCHES ARE V-SHAPED UNLESS OTHERWISE NOTED.
6. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE WITHIN THE PROJECT LIMITS TO CONVEY ALL STORMWATER RUNOFF TO IDENTIFIED OUTFALL POINTS.
7. UTILITIES SHOWN ARE APPROXIMATE CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION.



REV.	DATE	BY	DESCRIPTION



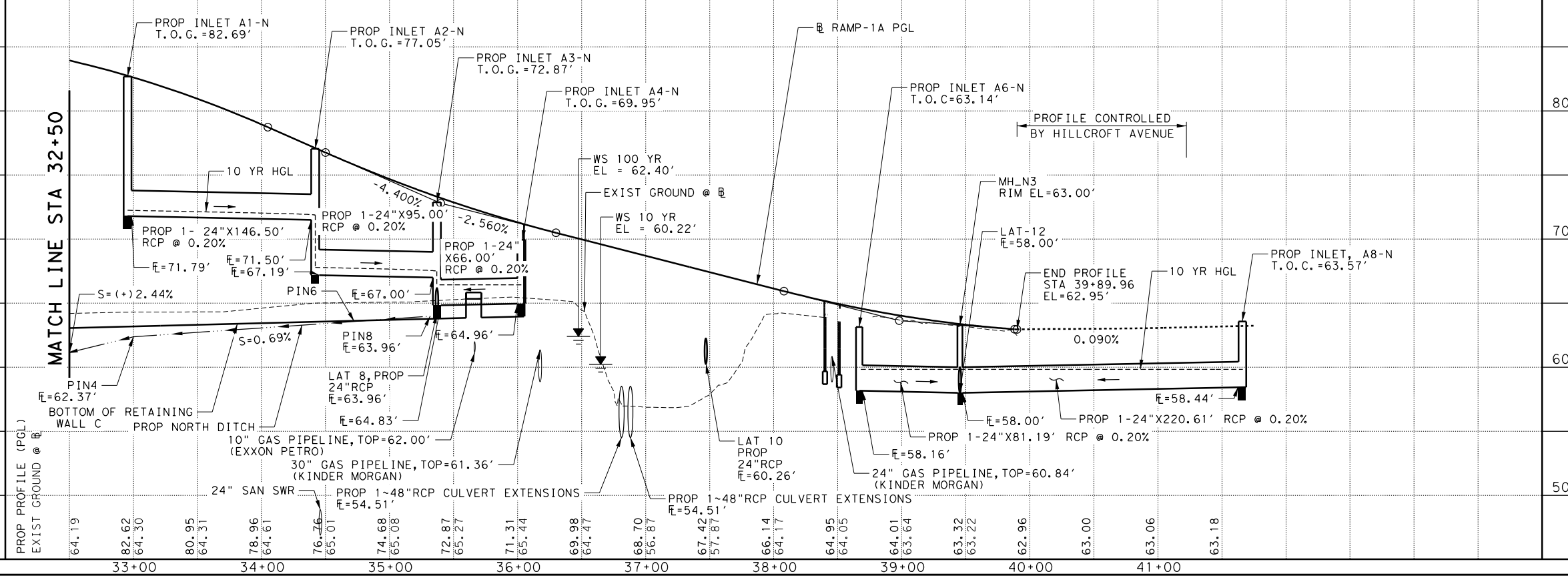
10/11/2023



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

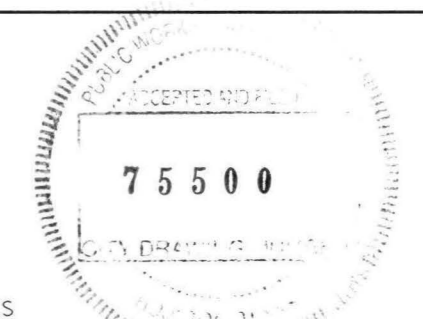
**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
STORM SEWER  
PLAN & PROFILE  
STA 32+50 TO END PROJECT**



SHEET 3 OF 3

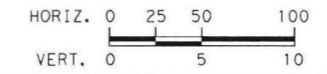
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DESIGNED BY:		DATE:	
CHECKED BY:		SHEET NO.:	94
DRAWN BY:			
CHECKED BY:			

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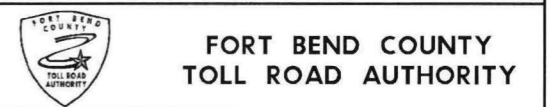


NOTES

1. THE HORIZONTAL CONTROL POINT FOR ALL CURB INLETS IS AT THE CENTER FACE OF CURB, FOR GRATE INLETS AND MANHOLES, THE HORIZONTAL CONTROL POINT IS AT THE CENTER OF INLET OR MANHOLE.
2. HORIZONTAL CONTROL IS BASED ON RAMP-1A PGL ALIGNMENT.
3. STORM SEWER LENGTH SHOWN IS CENTER TO CENTER OF STRUCTURE WHICH DIFFERS FROM PAY LENGTH IN QUANTITY SHEET.
4. ALL DITCHES ARE V-SHAPED UNLESS OTHERWISE NOTED.
5. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE WITHIN THE PROJECT LIMITS ENSURING ALL STORMWATER RUNOFF IS CONVEYED TO IDENTIFIED OUTFALL POINTS.



REV.	DATE	BY	DESCRIPTION



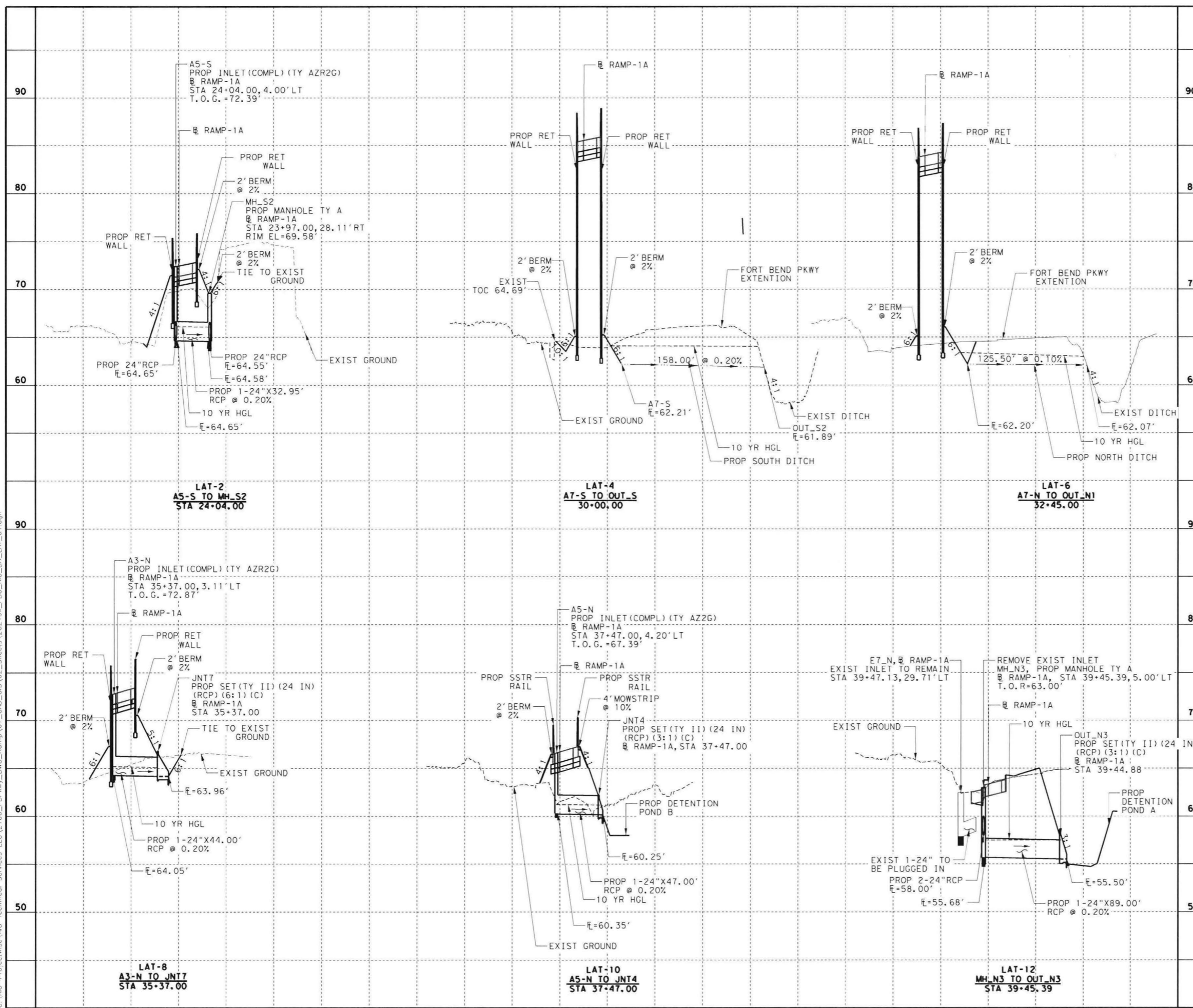
**AIG Tech**  
Advanced Infrastructure Group  
F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

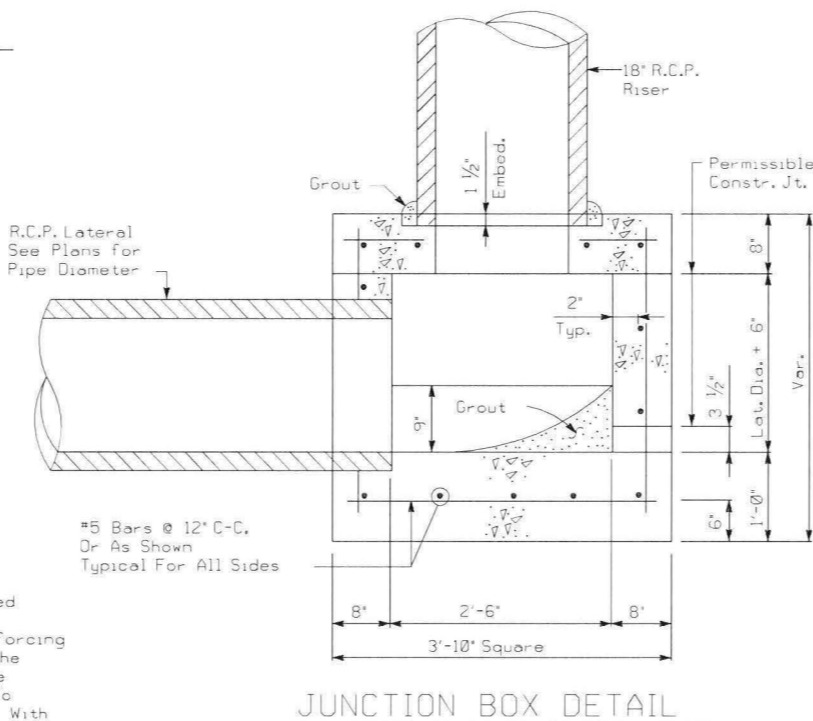
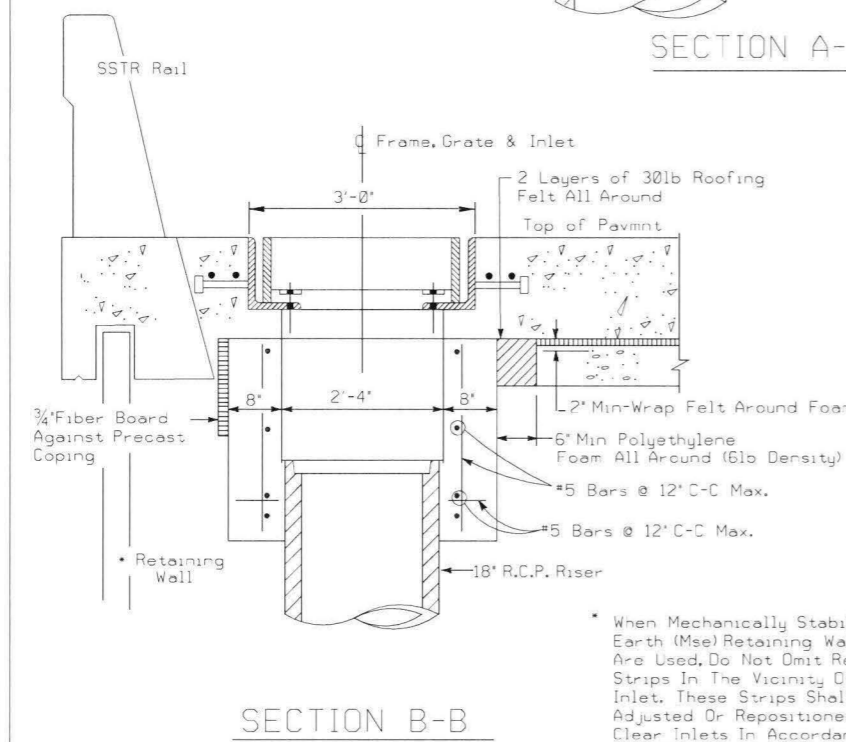
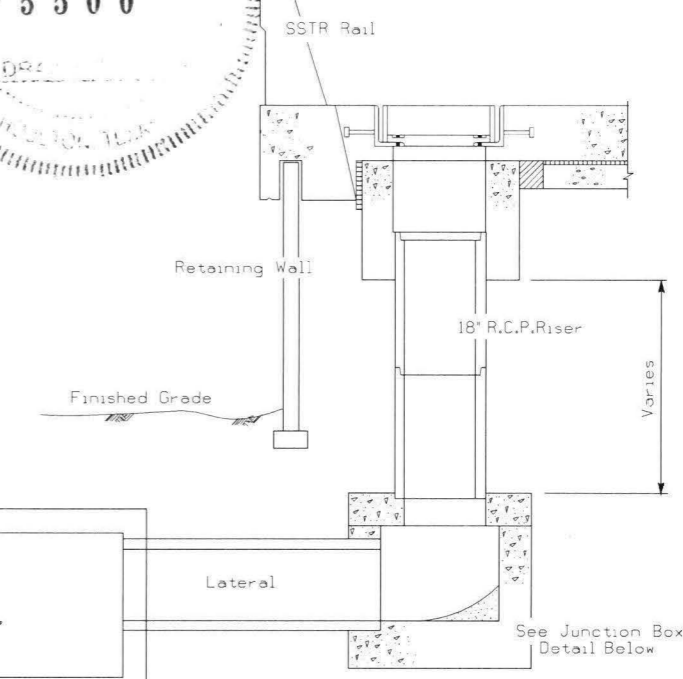
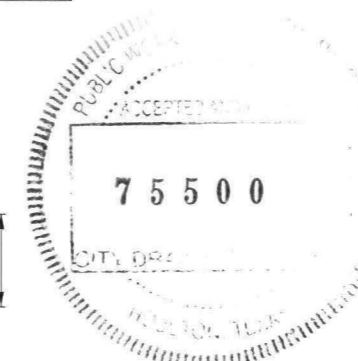
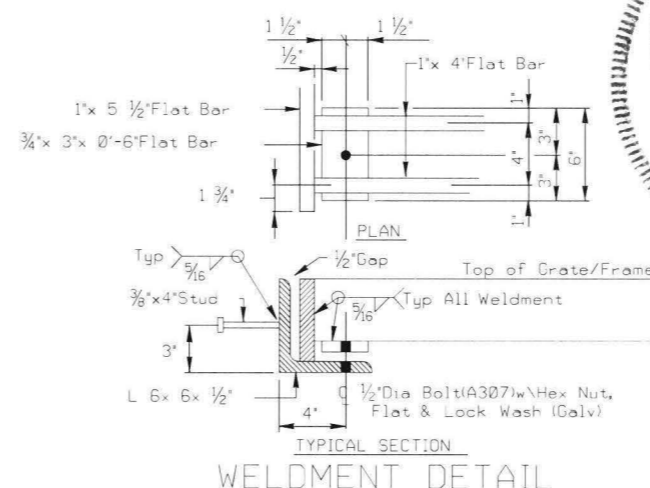
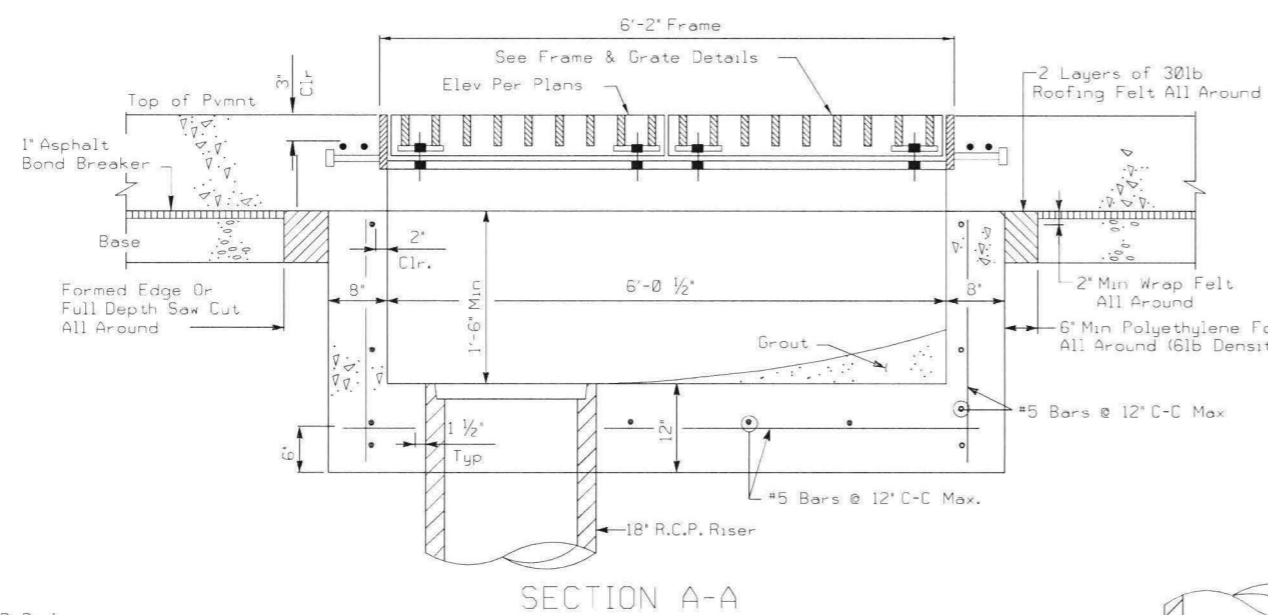
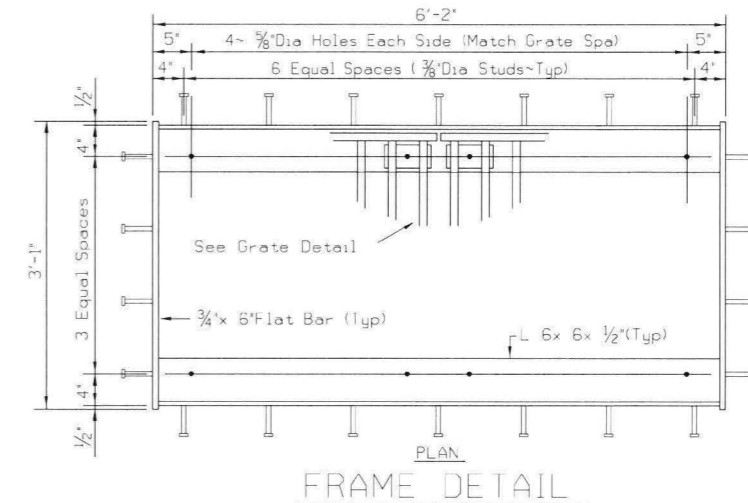
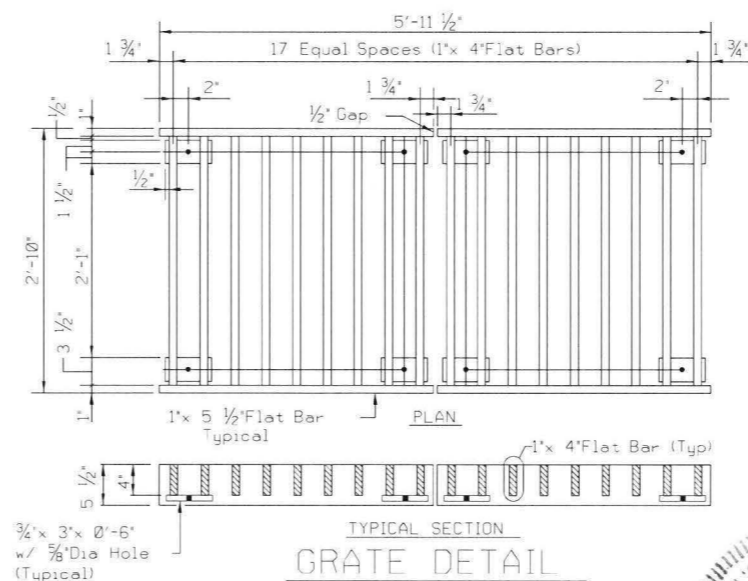
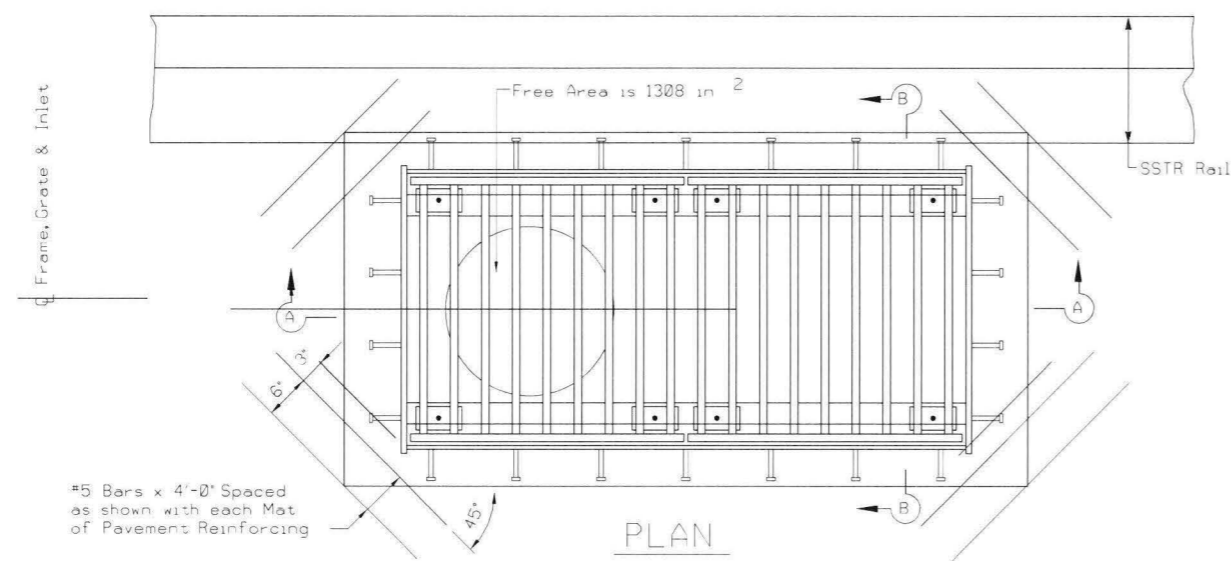
**FORT BEND PARKWAY TOLL ROAD**  
**ENTRANCE RAMP 1A**  
**STORM SEWER**  
**LATERALS**

SHEET 1 OF 1

PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	95
CHECKED BY:			

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GENERAL NOTES:

All steel is ASTM-A36 and shall be galvanized after fabrication. Cost of Furnishing And Installing Frames, Grates, Additional Pavement Reinforcing, Roofing Felt, Polyethylene Foam, Vertical Riser and Junction Box Shall Be Included In The Unit Price Bid For The Type Of Inlet Selected.

All Concrete Shall Be Class C.

Shop Drawings Will Be Required For Precast Construction Of Inlets.

FOR TRAFFIC LOADS

Texas Department of Transportation  
Houston District

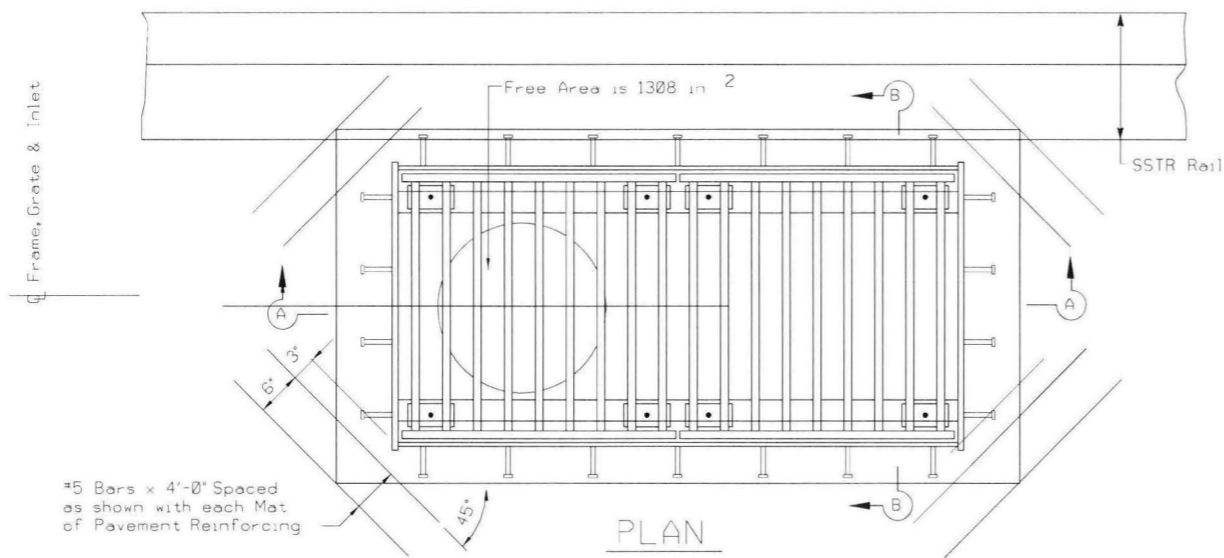
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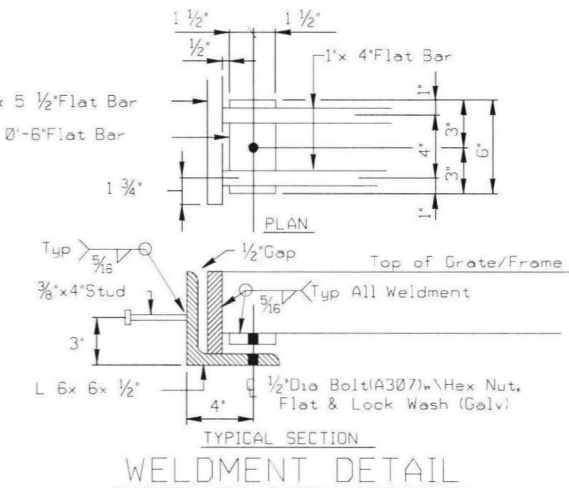
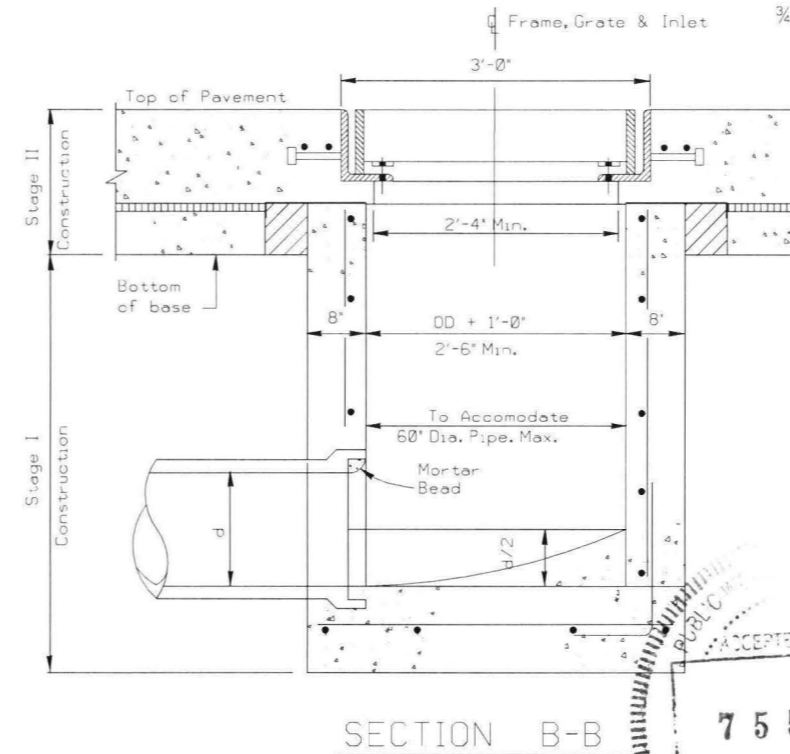
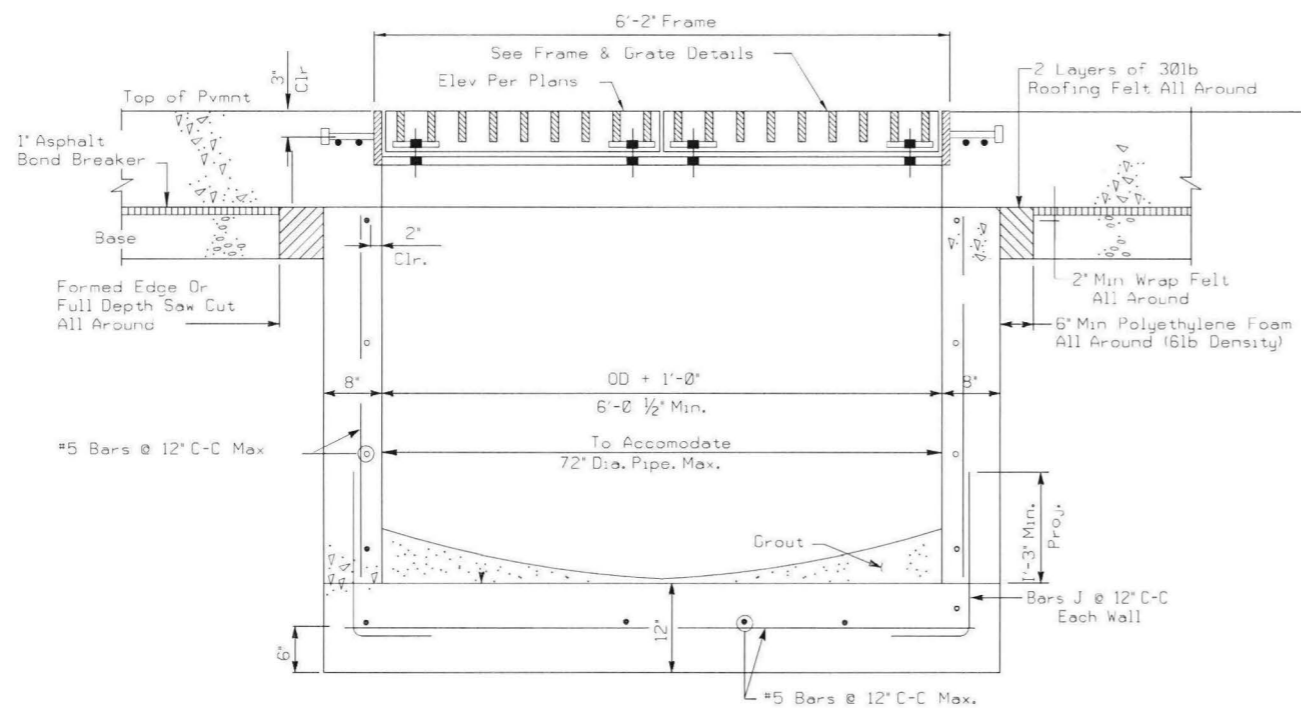
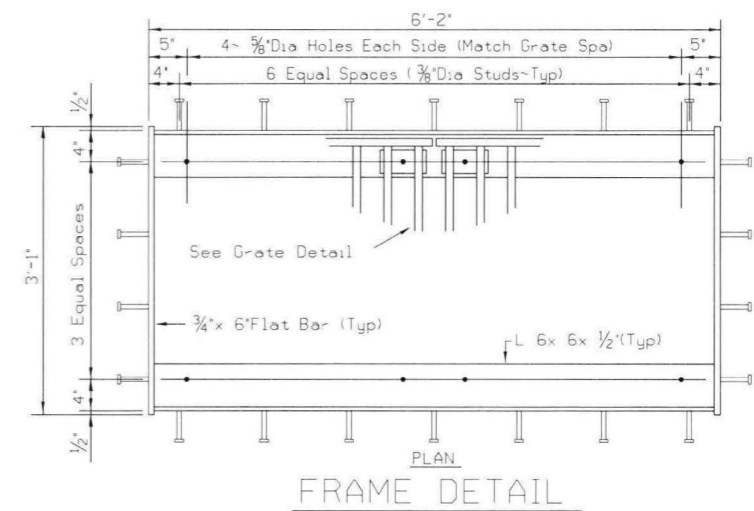
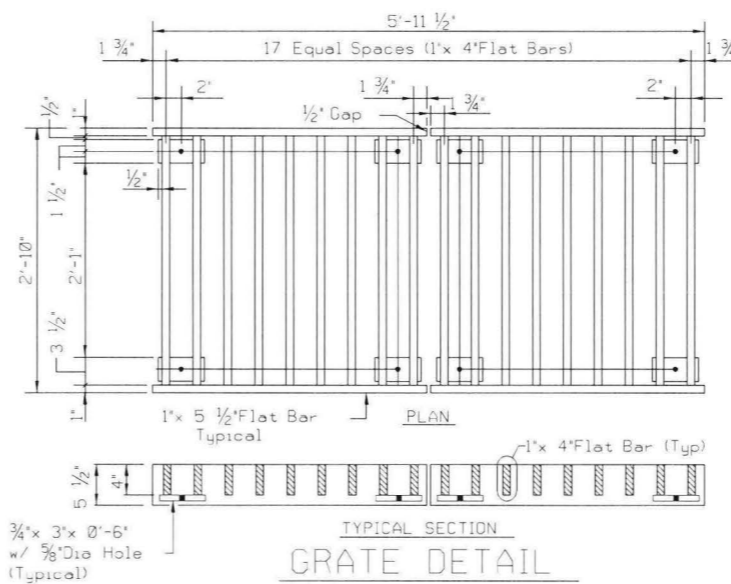
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© TxDOT	Feb 2010	DIST	FED REG	PROJECT NO.	SHEET	
REVISIONS	HOUS	6	COUNTY	CONTROL	SECT	JOB
			FORT BEND			HIGHWAY

d = Diameter

STDD9.DGN



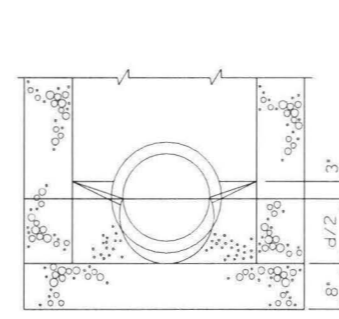
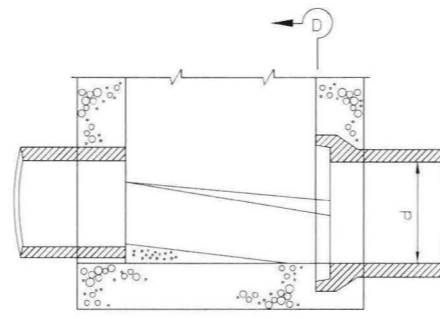
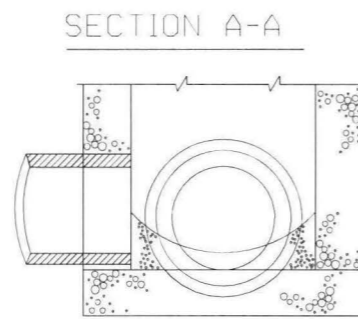
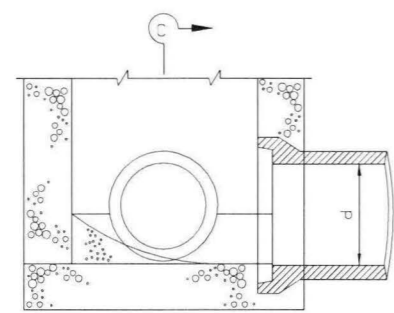
#5 Bars x 4'-0" Spaced as shown with each Mat of Pavement Reinforcing



GENERAL NOTES:

All steel is ASTM-A36 and shall be galvanized after fabrication.  
 Cost Of Furnishing And Installing Frames, Grates, Additional Pavement Reinforcing, Roofing Felt And Polyethylene Foam Shall Be Included In The Unit Price Bid For The Type Of Inlet Selected.

All Concrete Shall Be Class C.  
 Shop Drawings Will Be Required For Precast Construction Of Inlets.



BARS J (#5)

75500  
 CITY DRAWING

FOR TRAFFIC LOADS

Texas Department of Transportation  
 Houston District

INLET TYPE AZ2G

HIL-AZ2G

FILE: STDD7.DGN	DN: TXDOT	CK: TXDOT	DN: TXDOT	CK: TXDOT	STD:
© TXDOT Feb 2010	DIST	FED REG	PROJECT NO.	SHEET	
REVISIONS	HQUS	6	COUNTY	CONTROL SECT	JOB HIGHWAY
			FORT BEND		

d = Diameter

GENERAL NOTES:

Type AD Inlet contains a single frame with grate.  
 Type AAD Inlet contains a double frame and double grate with an I-beam.  
 Frame and Grates may be gray cast iron.  
 The Furnishing And Installation Of Cast Iron I-Beams Shall Be Considered Incidental To Inlet (Comp) (Ty AAD) Or Inlet (Stage II) (Ty AAD) As The Case May Be.

Where Size Of Pipes Passing Thru Inlet Exceeds 30", Increase Inside Width To Diameter Of Pipe Plus 1'-0" (OD + 1'-0")

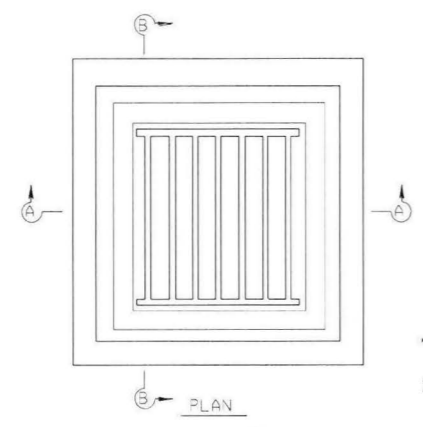
Cast Iron Manhole Steps (See Manhole Details) Spaced At 16' Centers And Located On Wall Specified By The Engineer Shall Be Provided And Installed Where 'D' Exceeds 5'-0".

See Standard or Detail Sheet For Excavation and Backfill Diagrams.

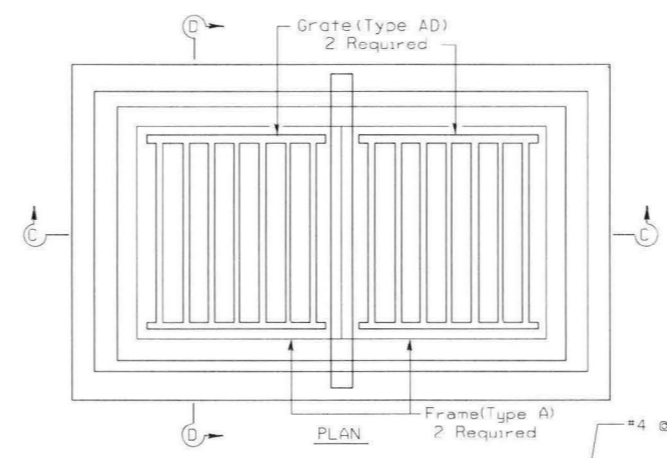
Type AD & AAD Inlets Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

Shop Drawings Will Be Required For Precast Construction Of Inlets.

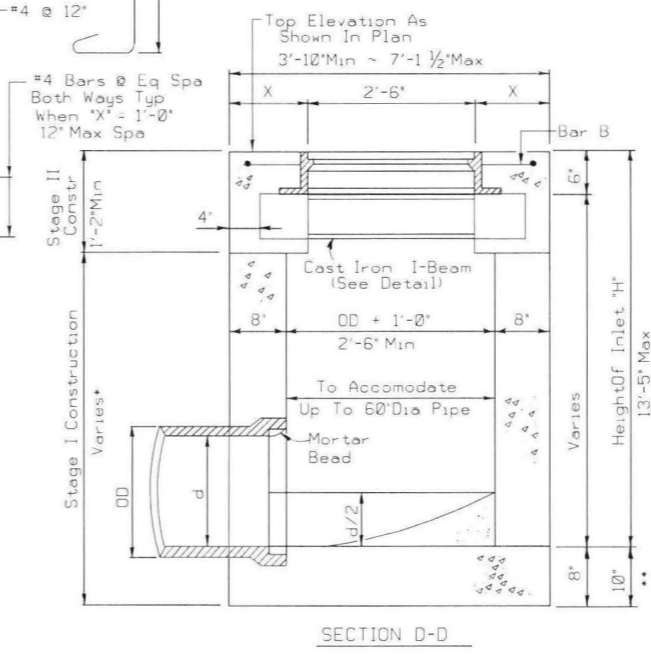
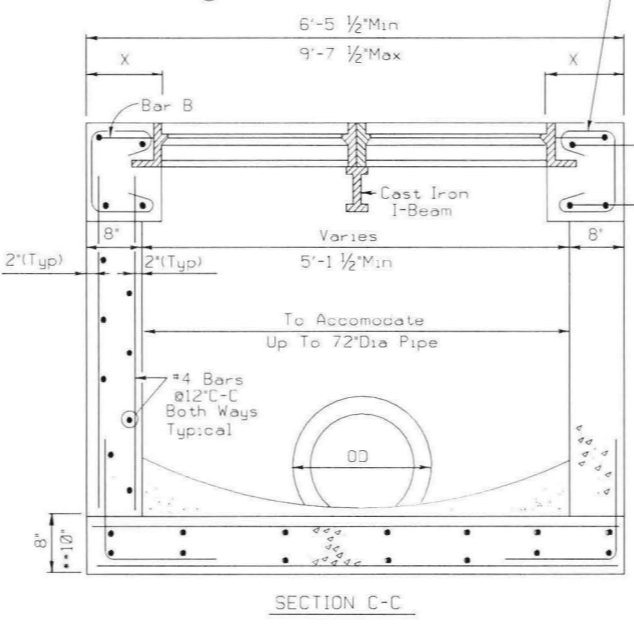
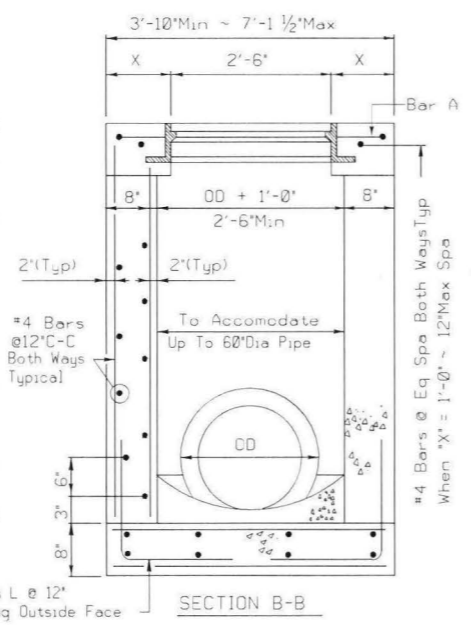
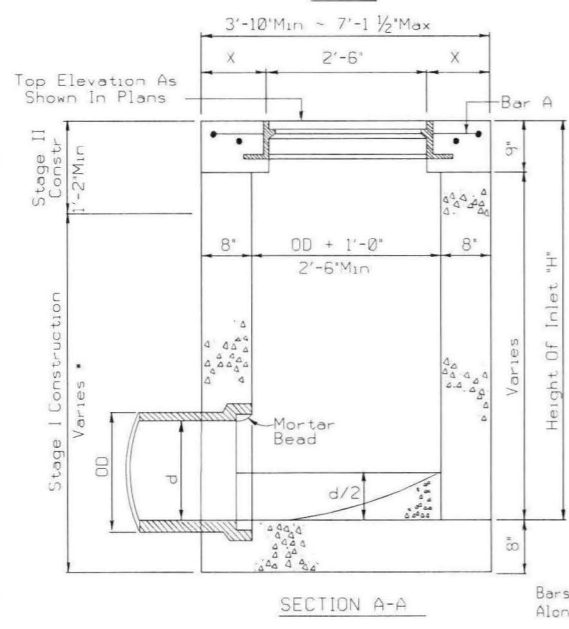
Upon installation of the grates the threads of the bolts shall be coated with thread lock type adhesive (Lockite or equal). Reapply thread lock adhesive each time grates are removed. Bolted grates and frames are a matched set, do not unbolt without 'Match Marking' so that grates and frames are re-installed as originally built.



• But Not Less Than Six Inches Over Highest Entering Pipe.  
 X = 8' Min to 3'-9' Max

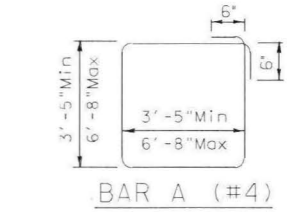


• But Not Less Than Six Inches Over Highest Entering Pipe.  
 •• For Pipe Diameters 66" And Greater

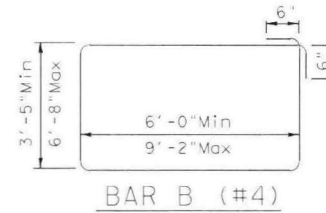


INLET TYPE AD

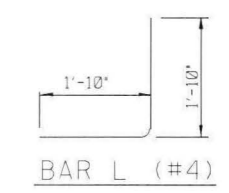
INLET TYPE AAD



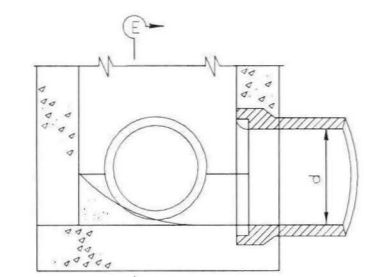
BAR A (#4)



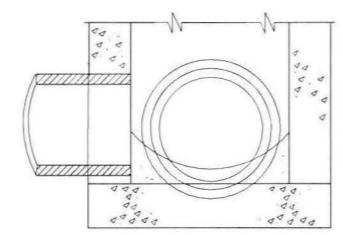
BAR B (#4)



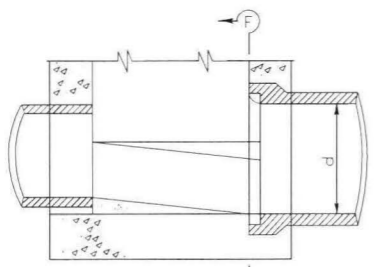
BAR L (#4)



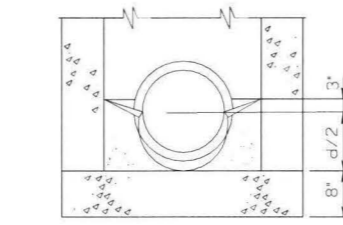
PART SECTION AT INVERT Showing Shaping Of Invert, Pipe Entering From Adjacent Sides



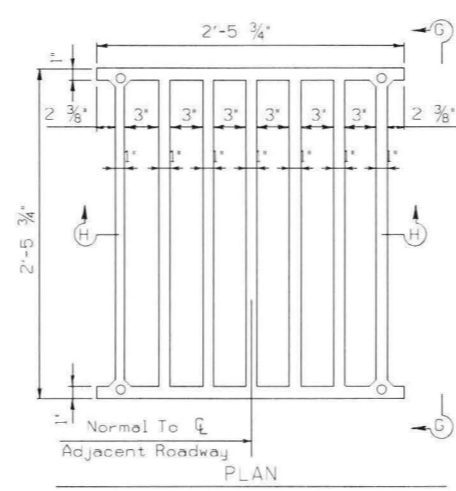
SECTION E-E



PART SECTION AT INVERT Showing Shaping Of Invert, Pipe Entering From Opposite Sides

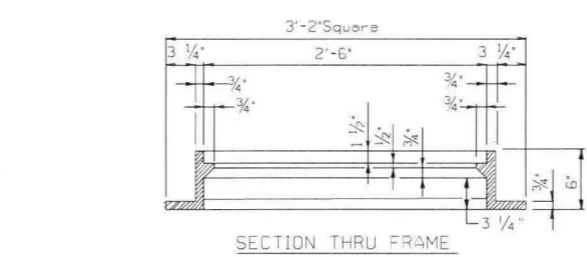


SECTION F-F

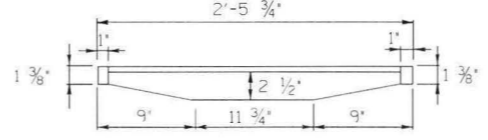


FRAME AND GRATE

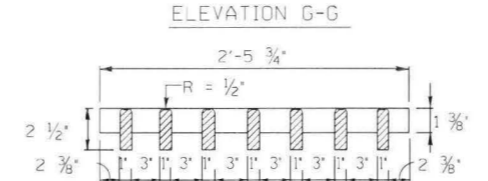
Type AD ~ Neenah No.3418 or EJIW No.V-4880-2  
 Type AAD ~ Neenah No.3418-2 or EJIW No.V-4881-2



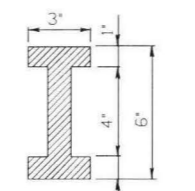
SECTION THRU FRAME



ELEVATION G-G



SECTION H-H



SECTION OF CAST IRON I-BEAM



NOT FOR TRAFFIC LOADS



INLETS TYPE AD & AAD

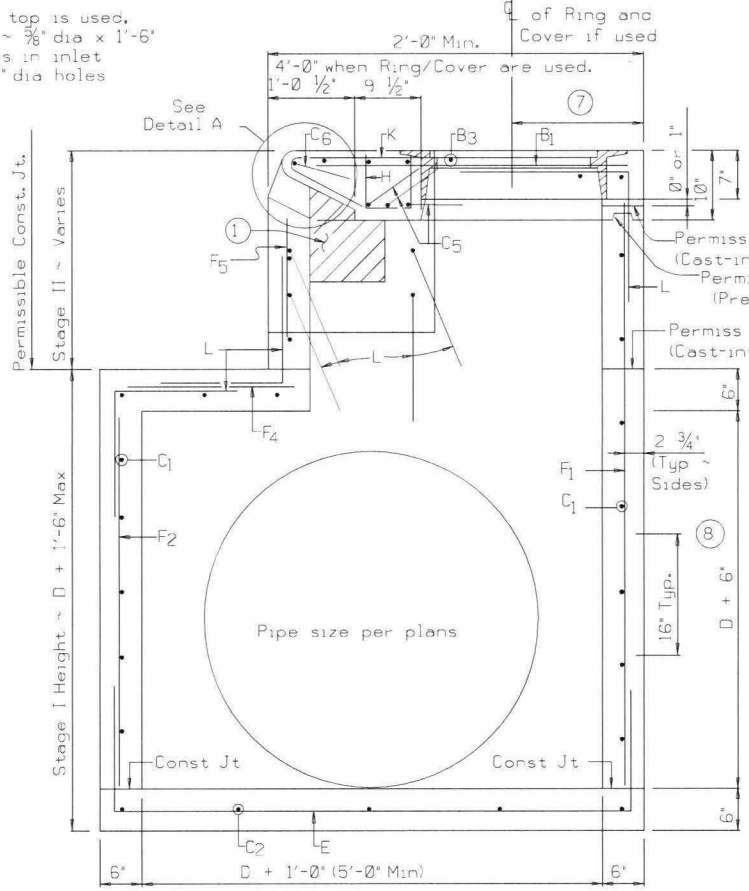
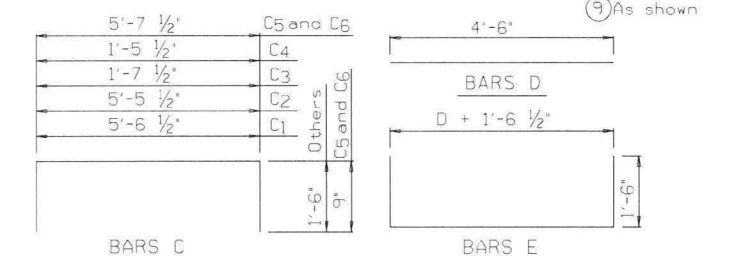
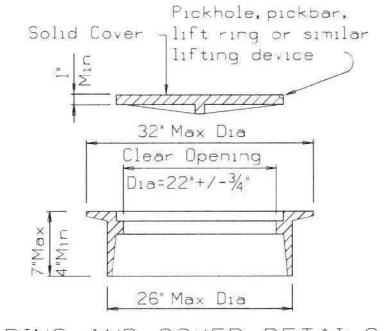
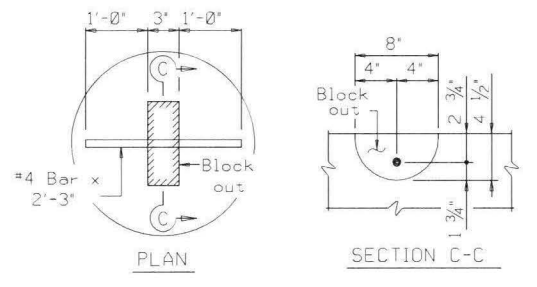
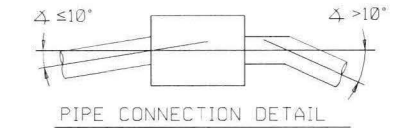
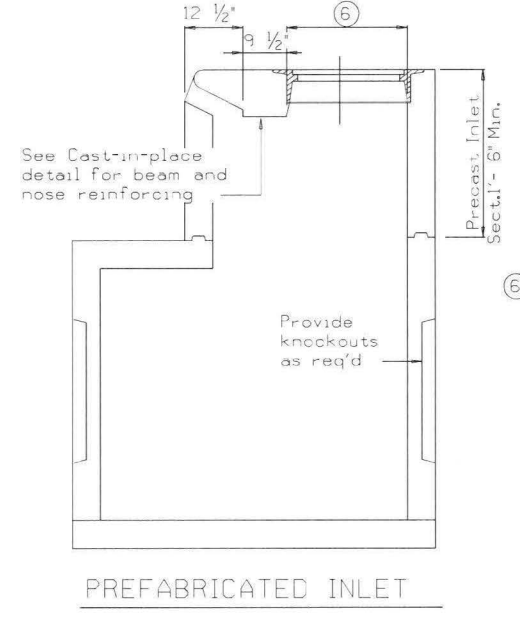
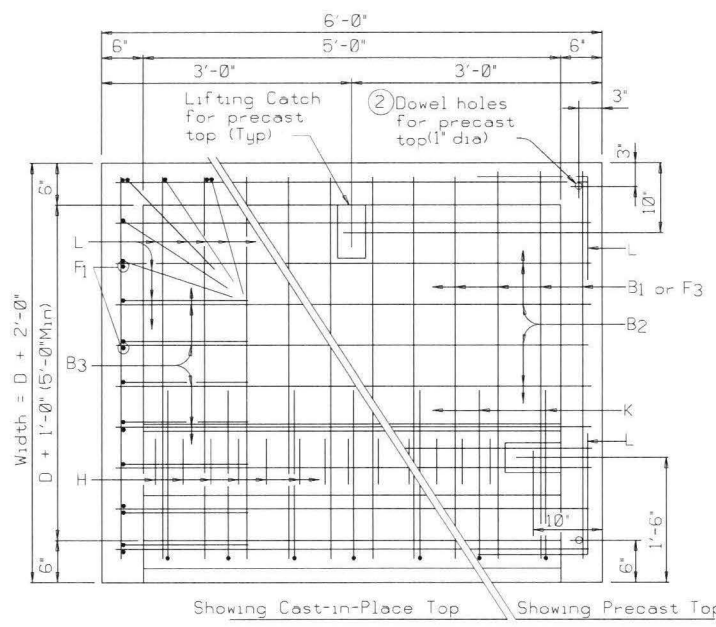
HIL-AD/AAD

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© TXDOT 2014	DIST	FED REG	PROJECT NO.	SHEET 97A	
REVISIONS		HOUS	6	COUNTY	CONTROL SECT JOB HIGHWAY
		FORT BEND			

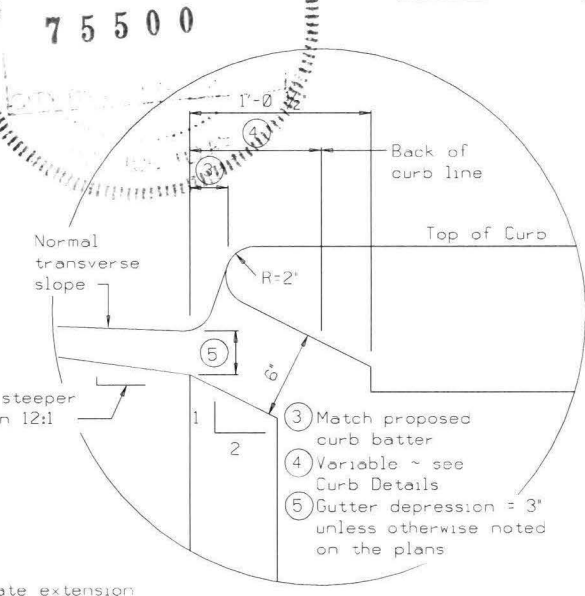
STDD5.DGN

d = Diameter  
 R = Radius

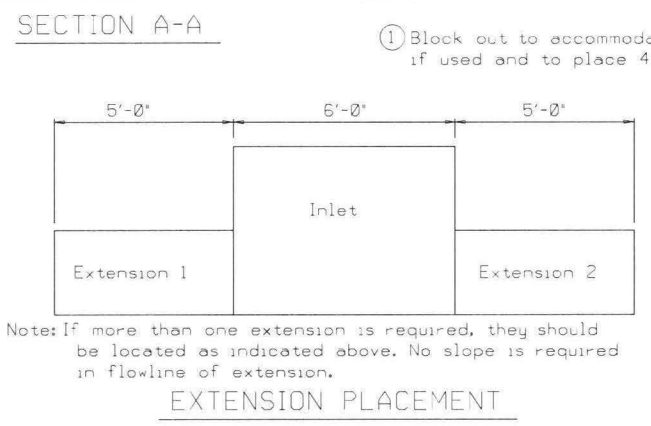
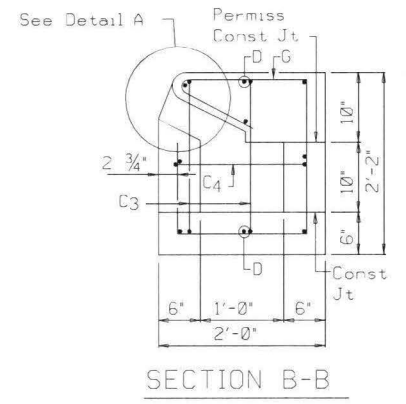
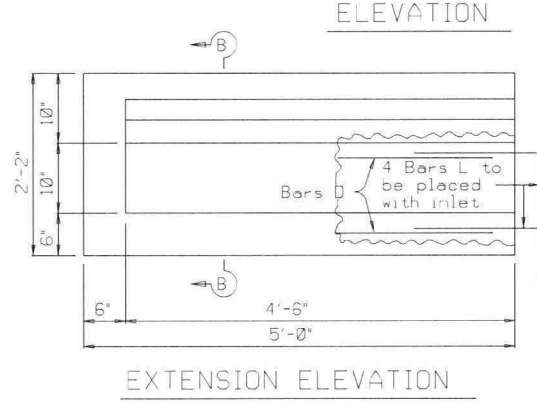
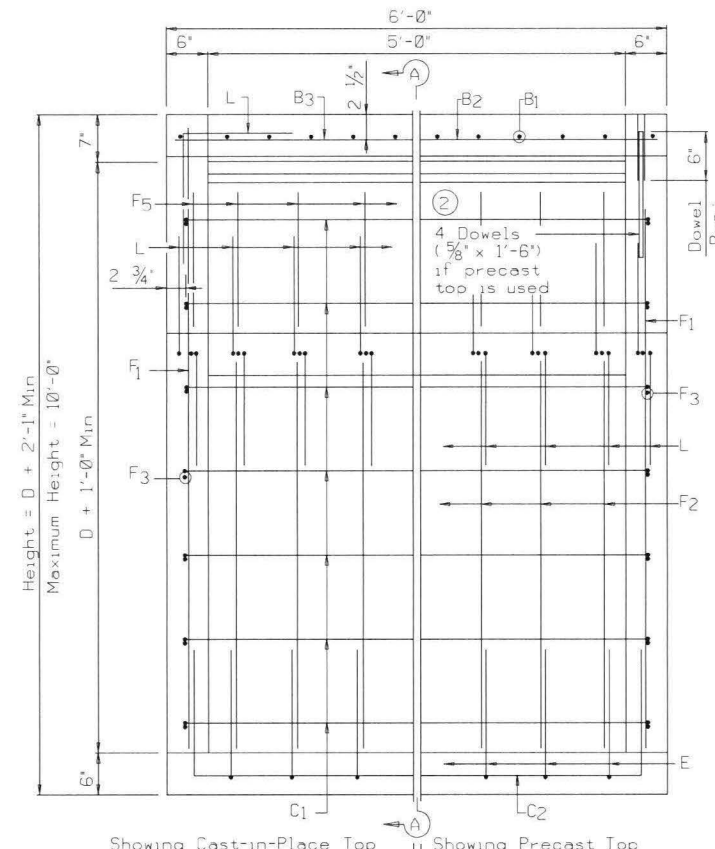
REINF STEEL		
Bar	Size	Spacing
B1	#4	6"
B2	#5	6"
B3	#4	6"
C1-2	#4	12"
C3-4	#4	(9)
C5	#6	(9)
C6	#4	(9)
D	#4	(9)
E	#4	12"
F1-5	#4	12"
G	#4	6"
H	#3	4"
K	#4	9"
L	#4	6"



⑦ 1'-7" Usual. Adjust placement of Ring and Cover as necessary to avoid conflict with Bars H.



**GENERAL NOTES:**  
 No alternate designs nor alternate details shall be permitted for precast or cast in place inlets.  
 Quantities shown herein are for Contractor's information only. Unless otherwise shown in the plans, payment will be made for each inlet of the type specified and for each extension. Each five foot curb opening of extension is considered "one extension" regardless of whether placed monolithically or precast. Extension length shall be in multiples of 5 feet.  
 Engineer has the option of specifying cast-in-place top with ring and cover or removable precast top as specified elsewhere in plans.  
 Shop drawings will be required for precast construction of inlets.  
 In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.  
 Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.



INSTALL A 3 FT.(HORIZ.) x 6 IN.(VERT.) OPENING ON THE BACK OF THE INLET WHEN SPECIFIED ELSEWHERE ON THE PLANS. MOVE STEPS AS NEEDED. NO REINFORCING ON OPENING/ON 2 IN. ADJACENT TO OPENING.  
 DESIGNERS: CLARIFY FLOWLINE OF OPENING AND INCLUDE OPENING IN HYDRAULIC CALCULATIONS.

D = Diameter  
 R = Radius

Texas Department of Transportation  
 Houston District

**CURB INLET TYPE C1 (WITH OR WITHOUT EXTENSION)**

HIL-C1

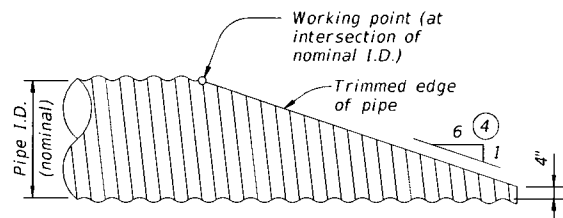
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© TXDOT Feb 2010	DIST	FED REG	PROJECT NO.	SHEET	
2/2010 Note for alternate design and comment on the back of inlet.	HOUS	6		98	
10/2016 Removed ladder rung and wordings.	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	FORT BEND				

STDD2.DGN



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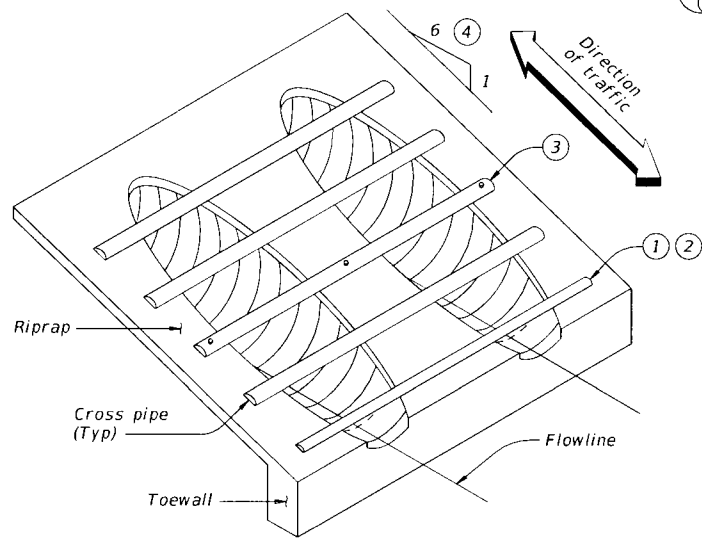
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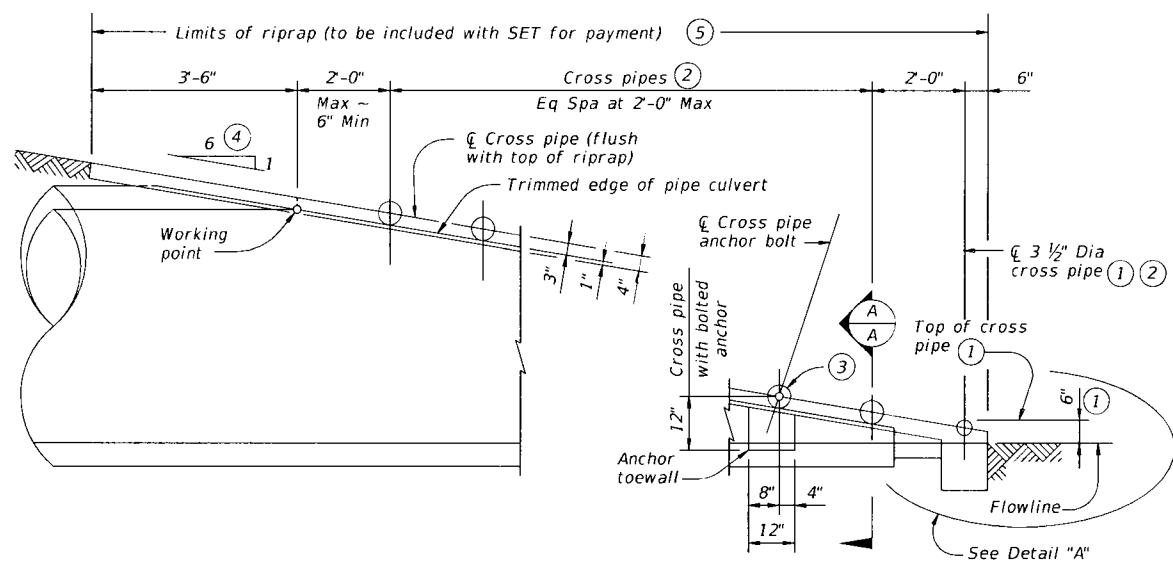
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

### SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert. Details at reinforced concrete pipe (RCP) culvert are similar.)

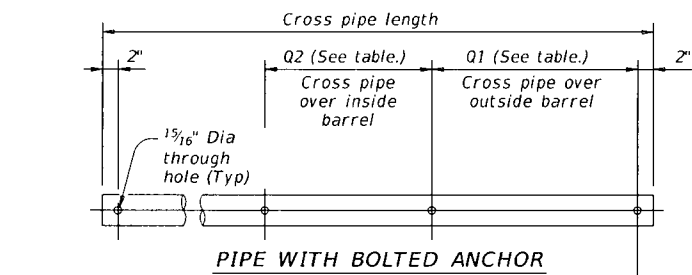


### ISOMETRIC VIEW OF TYPICAL INSTALLATION

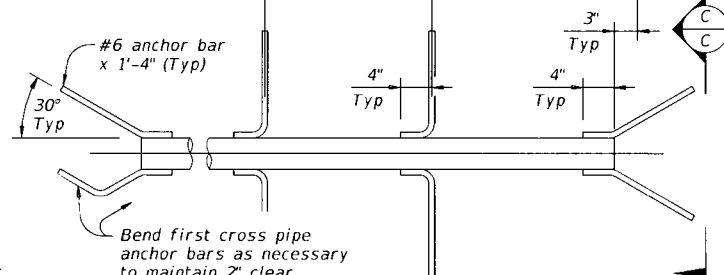


### SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

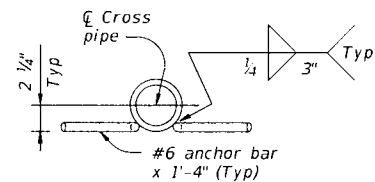
(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



### PIPE WITH BOLTED ANCHOR

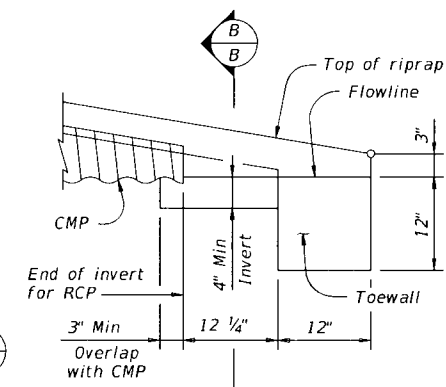


### PIPE WITH ANCHOR BARS



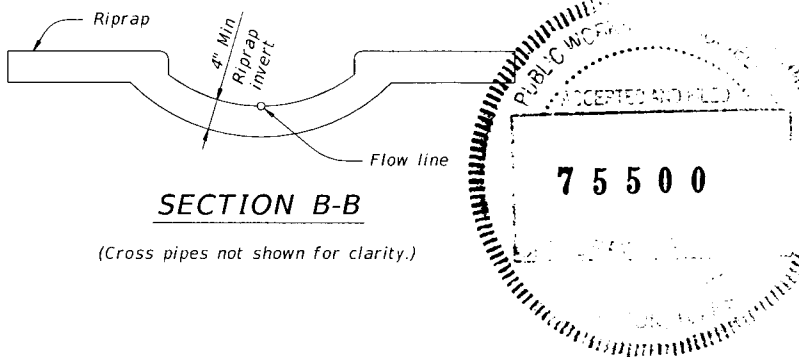
### SECTION C-C

### CROSS PIPE DETAILS



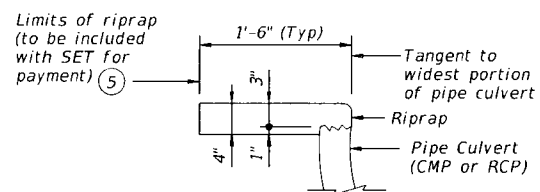
### DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)

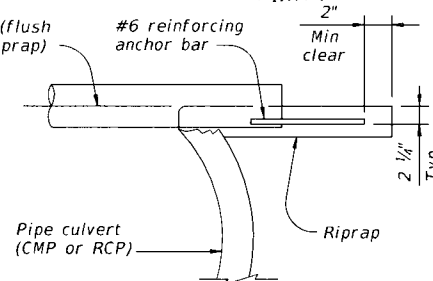


### SECTION B-B

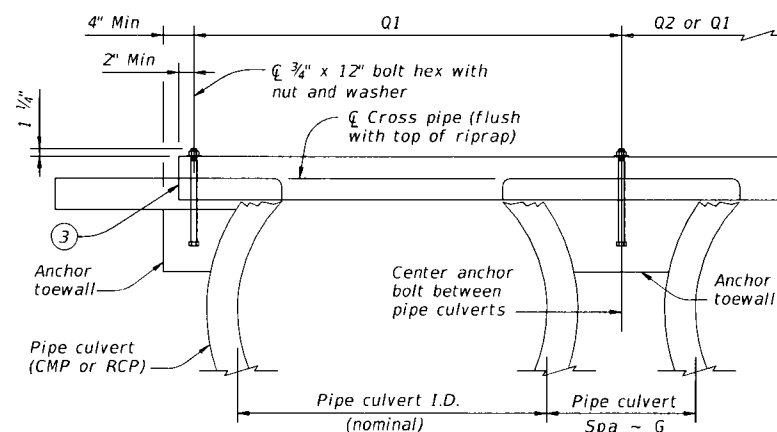
(Cross pipes not shown for clarity.)



### SHOWING TYPICAL PIPE CULVERT AND RIPRAP



### SHOWING CROSS PIPE WITH ANCHOR BAR



### SHOWING CROSS PIPE WITH BOLTED ANCHOR

### SECTION A-A

## CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"	3 or more pipe culverts	3 1/2" Std (4.000" O.D.)
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"		
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	3 1/2" Std (4.000" O.D.)
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"		
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

- The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flowline.
- Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1/2" standard pipe (4" O.D.) for the first bottom pipe.
- Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.
- Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.
- Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".
- Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

#### MATERIAL NOTES:

- Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
- Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.
- Provide ASTM A307 bolts and nuts.
- Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

#### GENERAL NOTES:

- Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.
- Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.
- Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".
- Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

**Texas Department of Transportation** **Bridge Division Standard**

## SAFETY END TREATMENT

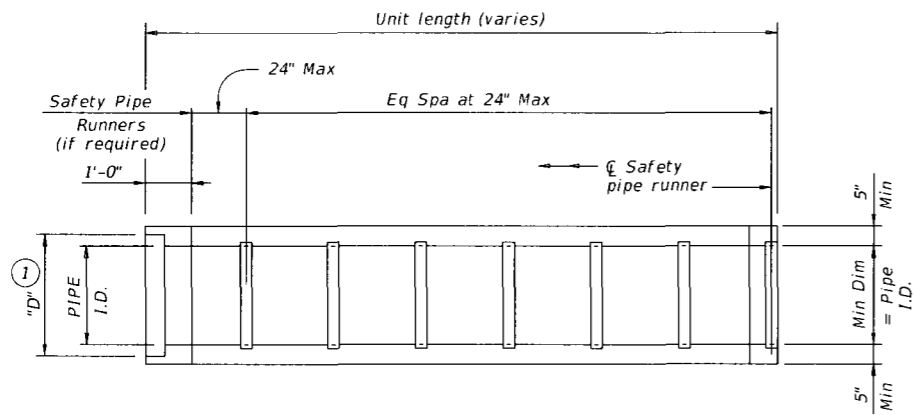
FOR 12" DIA TO 72" DIA  
PIPE CULVERTS  
TYPE II ~ PARALLEL DRAINAGE

### SETP-PD

FILE: setpdse-20.dgn	DW: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONTRACT	SECTION	JOB	HIGHWAY
REVISIONS			DIST	COUNTY
			HOU	FORT BEND
			SHEET NO. <b>99</b>	

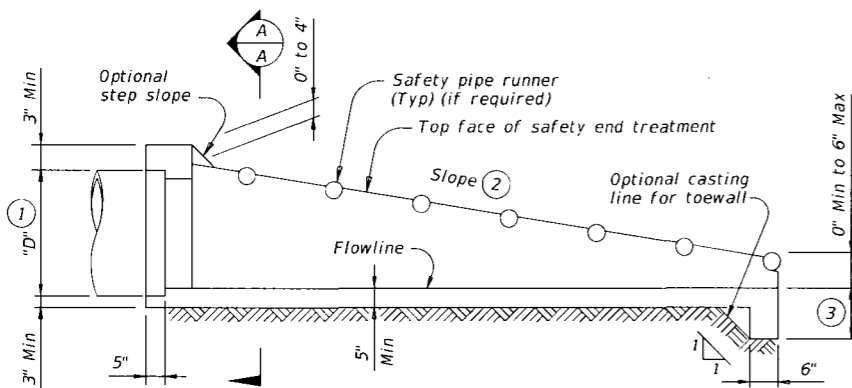
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DATE: FILE:



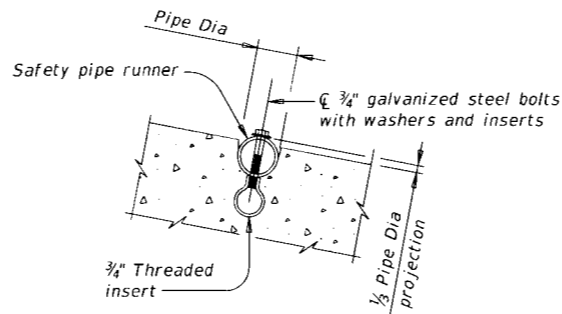
**PLAN**

(Showing bell end connection.)



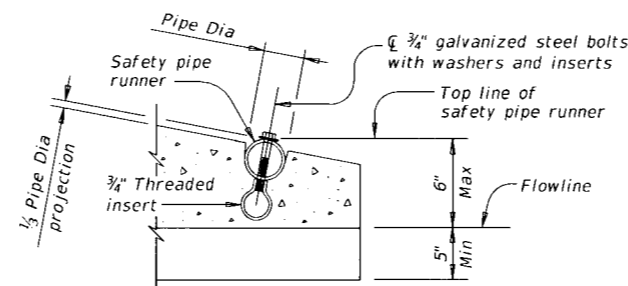
**LONGITUDINAL ELEVATION**

(Showing bell end connection.)

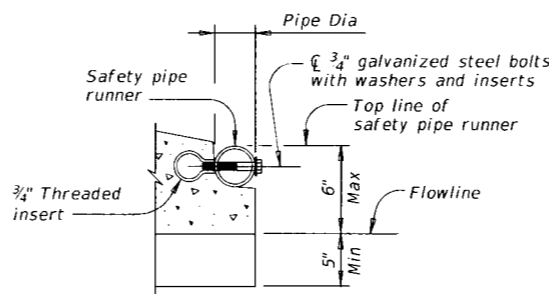


**INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS**

(If required)



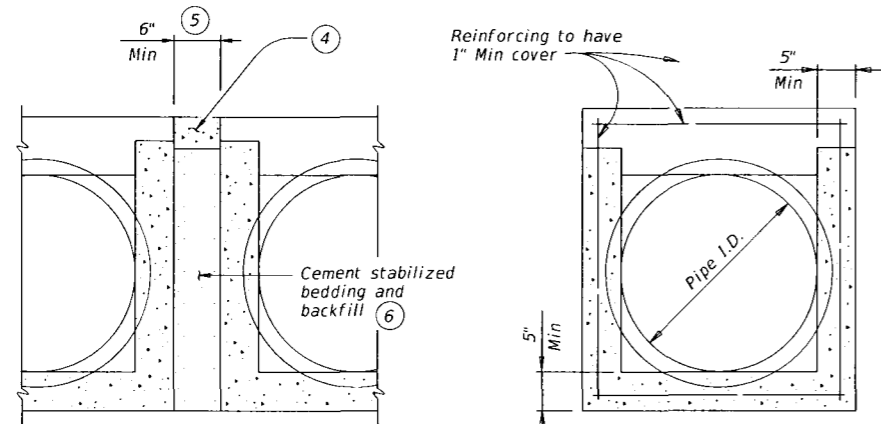
**OPTION A**



**OPTION B**

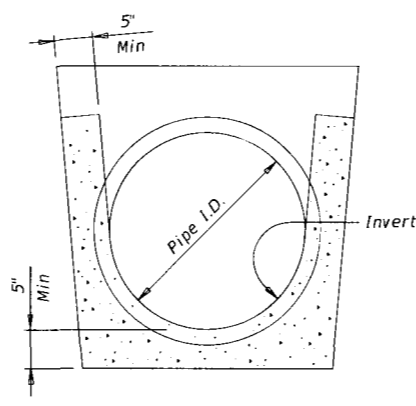
**END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS**

(If required)

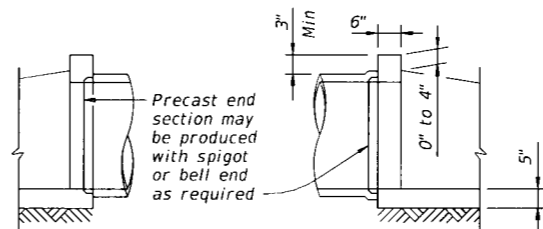


**OPTION WITH SQUARE BOTTOM**

**SECTION A-A**



**OPTION WITH INVERT BOTTOM**



**OPTIONAL JOINT FOR RCP**

(Showing joint between RCP and precast safety end treatment.)

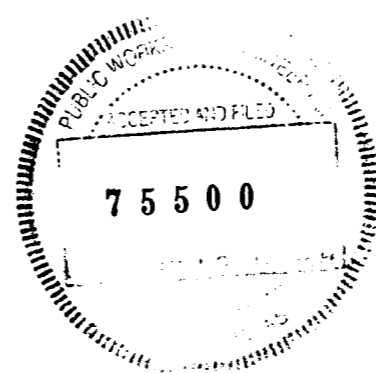
**REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS**

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness ⑦	"D"	Slope	Min Length	Pipe Runners Required		Required Pipe Runner Size		
						Single Pipe	Multiple Pipe	Nominal Dia.	O.D.	I.D.
12"	2"	1.15"	17.00"	6:1	4' - 9"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
15"	2 1/4"	1.30"	20.50"	6:1	6' - 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 1/2"	1.60"	24.00"	6:1	8' - 0"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31.00"	6:1	11' - 3"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
30"	3 1/2"	2.65"	38.50"	6:1	14' - 8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17' - 11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 1/2"	2.7"	52.50"	6:1	21' - 2"	Yes	Yes	4" STD	4.500"	4.026"

- ① Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.
- ② Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.
- ③ Toewall to be used only when dimension is shown elsewhere in the plans.
- ④ Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".
- ⑤ Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.
- ⑥ Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.
- ⑦ Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

**GENERAL NOTES:**

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".  
When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.  
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.  
Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below:  
A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).  
B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).  
At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.  
Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.  
Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.  
Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.  
Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464, "Reinforced Concrete Pipe". Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.



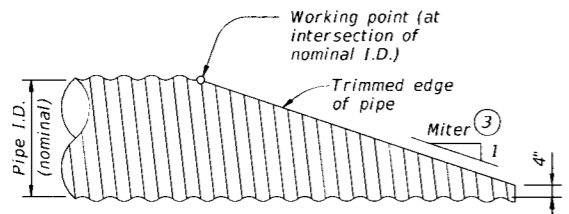
**Texas Department of Transportation** Bridge Division Standard

**PRECAST SAFETY END TREATMENT TYPE II ~ PARALLEL DRAINAGE**

**PSET-SP**

FILE: psetsps-21.dgn	DN: RLW	CK: KLR	DW: JTR	CC: GAF
© TxDOT February 2020	CONT: SEC7	JOB:	HIGHWAY:	
REVISIONS 12-21, Assoc 42 TP	DIST:	COUNTY:	SHEET NO:	
	HOU:	FORT BEND	99A	

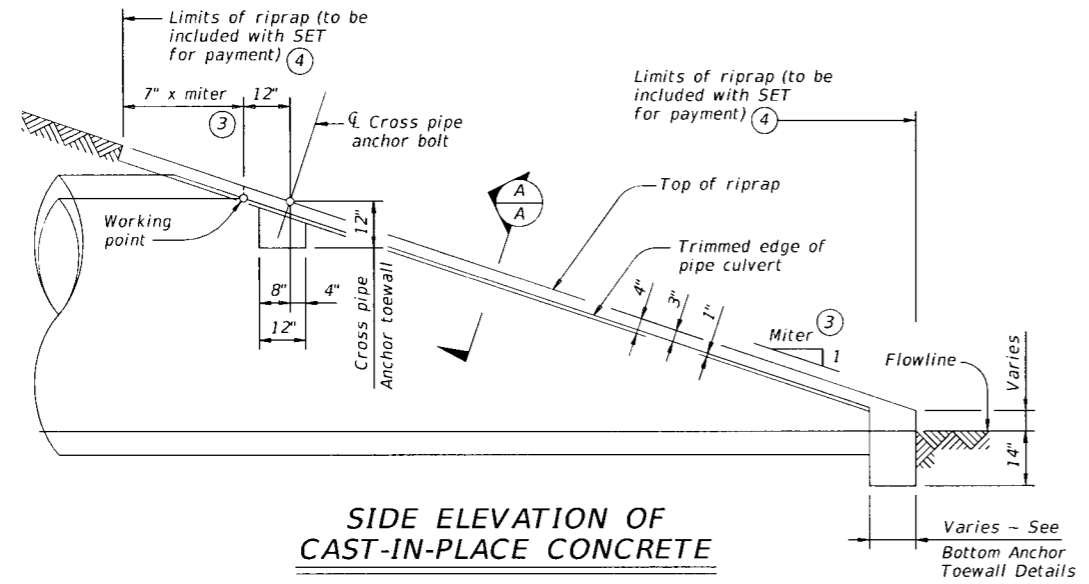
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NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

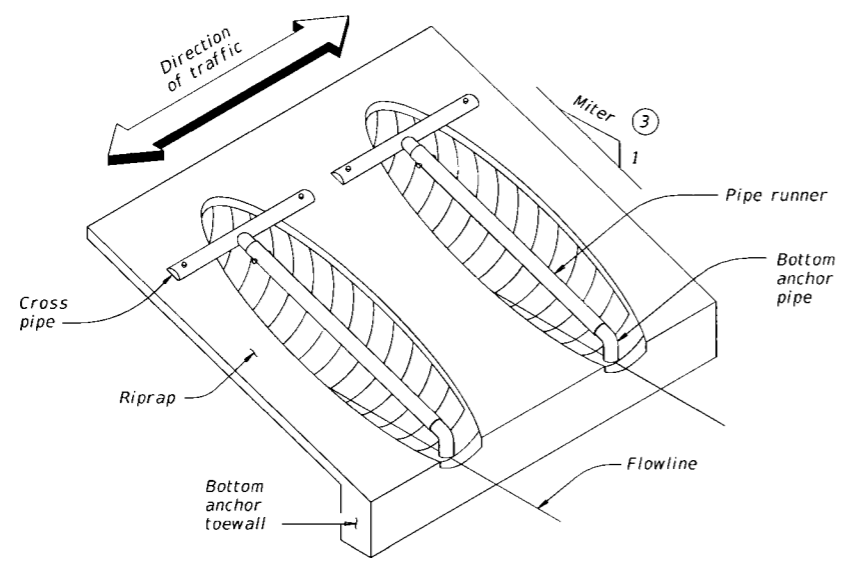
**SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER**

(Showing corrugated metal pipe (CMP) culvert. Details of reinforced concrete pipe (RCP) culvert are similar.)



**SIDE ELEVATION OF CAST-IN-PLACE CONCRETE**

(Showing reinforced concrete pipe (RCP) culvert. Details of corrugated metal pipe (CMP) culvert are similar. Pipe runners not shown for clarity)



**ISOMETRIC VIEW OF TYPICAL INSTALLATION**

(Showing installation with no skew.)

**CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS ① ②**

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length												
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope				
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	
24"	1' - 7"	3' - 5"	N/A	N/A	N/A	5' - 10"	N/A	N/A	N/A	8' - 1"	N/A	N/A	N/A	12' - 9"	
27"	1' - 8"	3' - 8"	N/A	N/A	5' - 5"	6' - 11"	N/A	N/A	N/A	7' - 7"	9' - 7"	N/A	N/A	11' - 11"	14' - 11"
30"	1' - 10"	3' - 11"	N/A	N/A	6' - 4"	8' - 0"	N/A	N/A	N/A	8' - 9"	11' - 0"	N/A	N/A	13' - 8"	17' - 0"
33"	1' - 11"	4' - 2"	6' - 2"	6' - 5"	7' - 3"	9' - 1"	8' - 6"	8' - 10"	10' - 0"	12' - 5"	13' - 3"	13' - 9"	15' - 5"	19' - 2"	
36"	2' - 1"	4' - 5"	6' - 11"	7' - 3"	8' - 2"	10' - 2"	9' - 6"	9' - 11"	11' - 2"	13' - 10"	14' - 9"	15' - 3"	17' - 2"	21' - 3"	
42"	2' - 4"	4' - 11"	8' - 6"	8' - 10"	9' - 11"	12' - 4"	11' - 7"	12' - 0"	13' - 6"	16' - 8"	17' - 9"	18' - 5"	20' - 8"	25' - 7"	
48"	2' - 7"	5' - 5"	10' - 1"	10' - 5"	11' - 9"	N/A	13' - 7"	14' - 2"	15' - 10"	N/A	20' - 9"	21' - 6"	24' - 2"	N/A	
54"	3' - 0"	5' - 11"	11' - 8"	12' - 1"	N/A	N/A	15' - 8"	16' - 3"	N/A	N/A	23' - 10"	24' - 8"	N/A	N/A	
60"	3' - 3"	6' - 5"	13' - 3"	N/A	N/A	N/A	17' - 9"	N/A	N/A	N/A	26' - 10"	N/A	N/A	N/A	

**TYPICAL PIPE CULVERT MITERS ③**

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

**CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED ②**

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always required	Always required

**STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS ①**

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10' - 0"
4" STD	4.500"	4.026"	19' - 8"
5" STD	5.563"	5.047"	34' - 2"

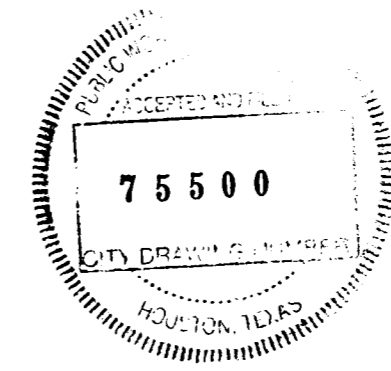
**ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) ⑤**

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

- Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.
- This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:  
 For 60" culvert pipes, the skew must not exceed 0°.  
 For 54" culvert pipes, the skew must not exceed 15°.  
 For 48" culvert pipes, the skew must not exceed 30°.  
 For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT Roadway Design Manual.

- Miter = slope of mitered end of pipe culvert.
- Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".
- Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.



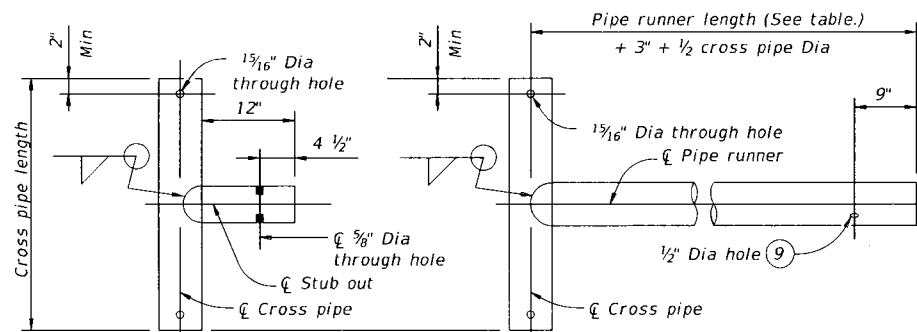
Texas Department of Transportation Bridge Division Standard

**SAFETY END TREATMENT FOR 12" DIA TO 60" DIA PIPE CULVERTS TYPE II ~ CROSS DRAINAGE**

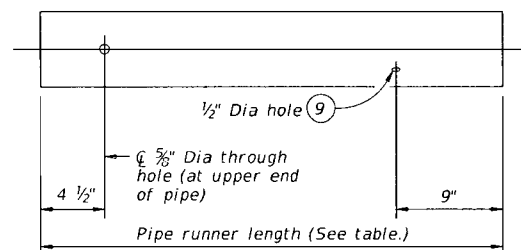
SETP-CD

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©TxDOT February 2020	COUNTY: HOU	SECTION: FORT BEND	JOB: 100	HIGHWAY:
REVISIONS:	DIST:	COUNTY:	SHEET NO:	

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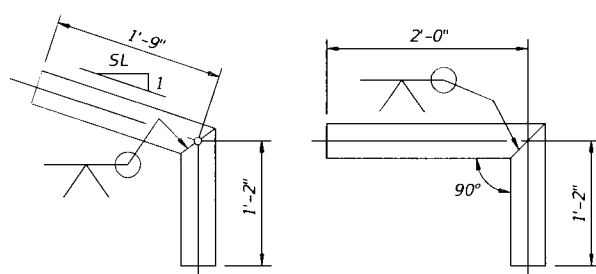


OPTION A1  
OPTION A2  
**CROSS PIPE AND CONNECTIONS DETAILS**

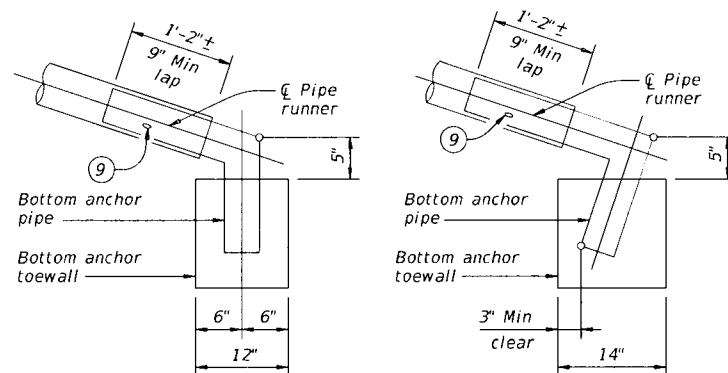


NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

**PIPE RUNNER DETAILS**



OPTION B1  
OPTION B2  
**BOTTOM ANCHOR PIPE DETAILS** ⑩



OPTION B1  
OPTION B2  
**BOTTOM ANCHOR TOEWALL DETAILS**

(Culvert and riprap not shown for clarity.)

**MATERIAL NOTES:**

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts. Galvanize all steel components, except concrete reinforcing, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the specifications.

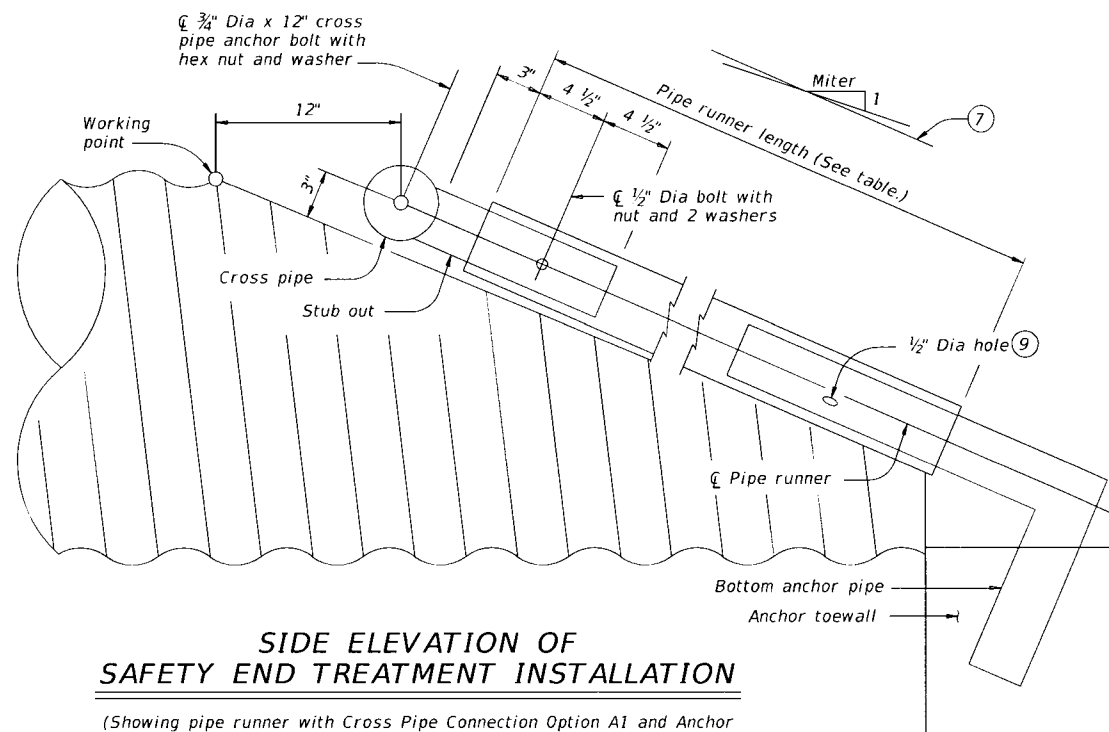
**GENERAL NOTES:**

Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.

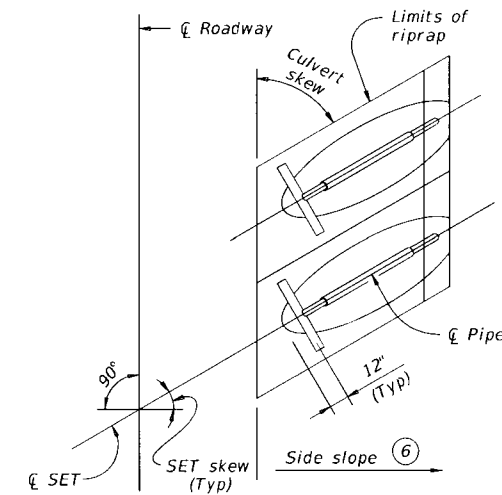
Payment for riprap and toewall is included in the price bid for each safety end treatment.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

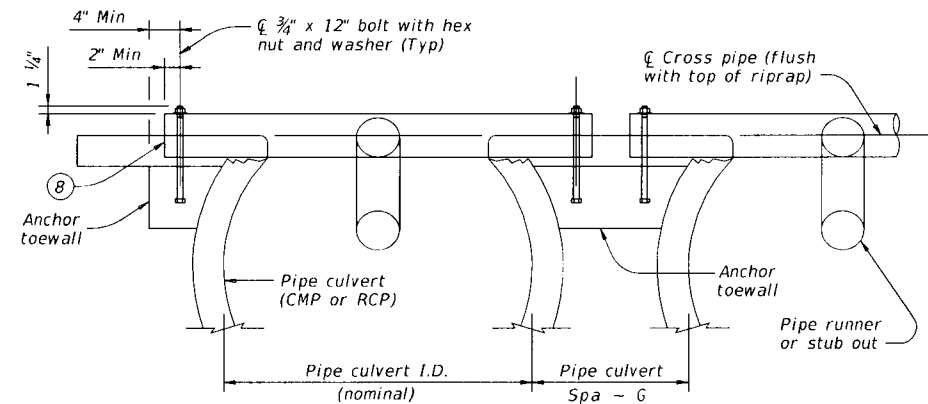


**SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION**

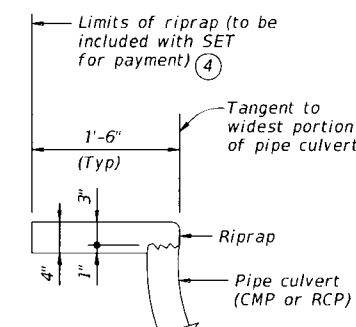
(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)



**PLAN OF SKEWED INSTALLATION**



**SHOWING CROSS PIPE AND ANCHOR TOEWALL**



**SHOWING TYPICAL PIPE CULVERT AND RIPRAP**

**SECTION A-A**

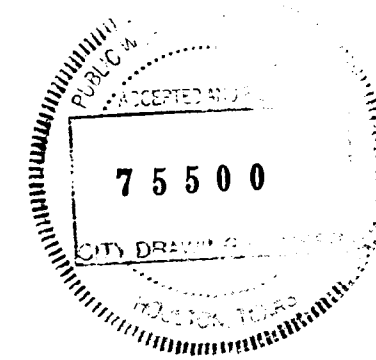
SHEET 2 OF 2



**SAFETY END TREATMENT FOR 12" DIA TO 60" DIA PIPE CULVERTS TYPE II ~ CROSS DRAINAGE**

**SETP-CD**

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©TxDOT February 2020	CONTRACT	SECTION	JOB	HIGHWAY
REVISIONS				
DIST	COUNTY	SHEET NO.		
HOU	FORT BEND	101		



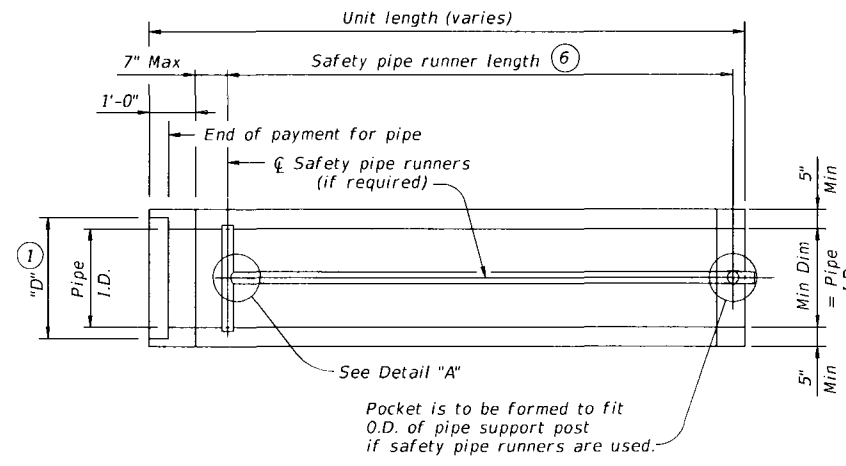
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# REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe		Multiple Pipes	
						Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' - 11"	≤ 45°	No	≤ 45°	No
				4:1	3' - 6"				
				6:1	4' - 9"				
15"	2 1/4"	1.30"	20.50"	3:1	3' - 8"	≤ 45°	No	≤ 45°	No
				4:1	4' - 7"				
				6:1	6' - 5"				
18"	2 1/2"	1.60"	24.00"	3:1	4' - 6"	≤ 45°	No	≤ 45°	No
				4:1	5' - 8"				
				6:1	8' - 0"				
24"	3"	1.95"	31.00"	3:1	6' - 2"	≤ 45°	No	= 30°	No
				4:1	7' - 10"				
				6:1	11' - 3"				
30"	3 1/2"	2.65"	38.50"	3:1	7' - 10"	= 15°	No	= 15°	No
				4:1	10' - 1"				
				6:1	14' - 8"				
36"	4"	2.75"	45.50"	3:1	9' - 5"	= 0°	No	≥ 0°	Yes
				4:1	12' - 3"				
				6:1	17' - 11"				
42"	4 1/2"	2.7"	52.50"	3:1	11' - 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' - 5"				
				6:1	21' - 2"				

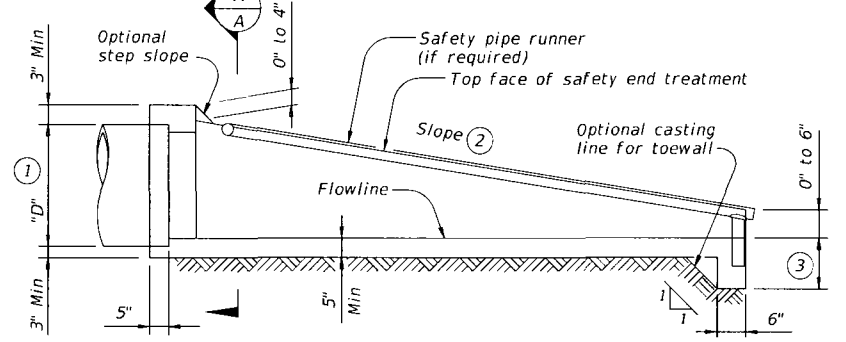
## SAFETY PIPE RUNNER DIMENSIONS

Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 1/2" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"



### PLAN

(Showing bell end connection.)



### LONGITUDINAL ELEVATION

(Showing bell end connection.)

- ① Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.
- ② Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.
- ③ Toewall to be used only when dimension is shown elsewhere in the plans.
- ④ Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".
- ⑤ Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.
- ⑥ Measured along slope.
- ⑦ Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.
- ⑧ Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

#### GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below:

- A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).
- B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

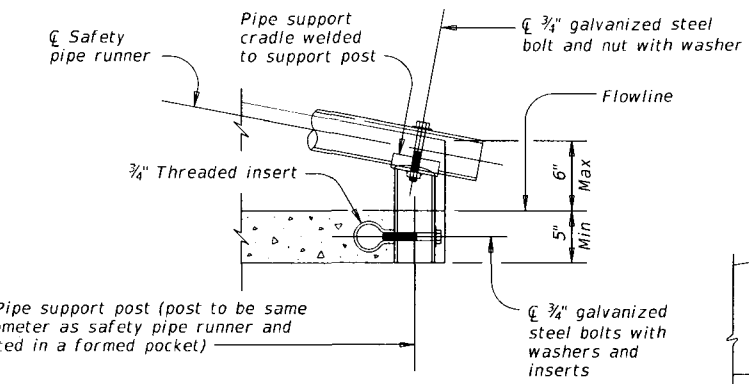
At the option and expense of the Contractor, the next larger size of safety end treatment may be furnished as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

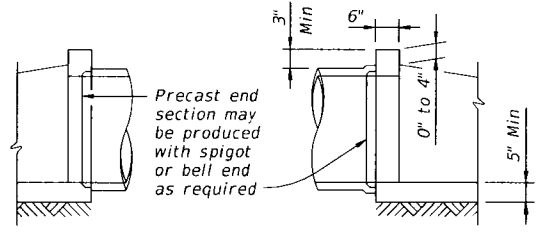
Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.



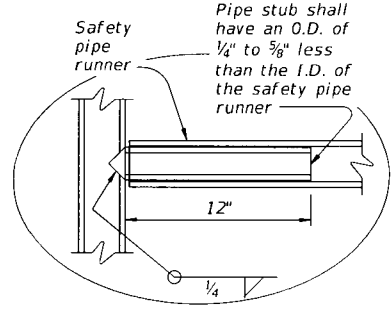
### END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



### OPTIONAL JOINT FOR RCP

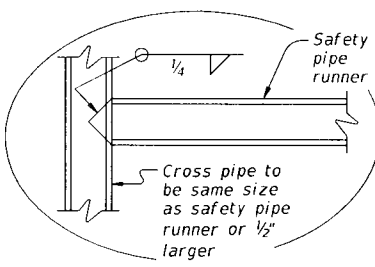
(Showing joint between RCP and precast safety end treatment)



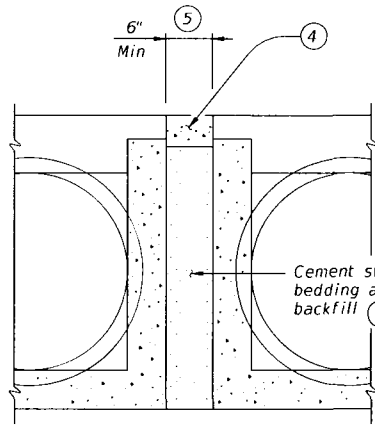
### OPTION A

### DETAIL A

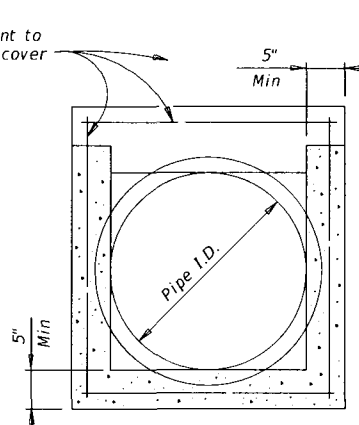
(If required)



### OPTION B

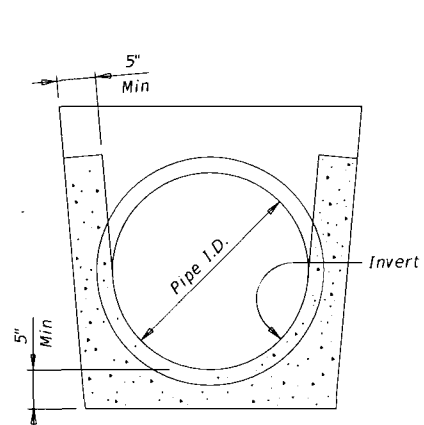


### MULTIPLE PIPE INSTALLATION

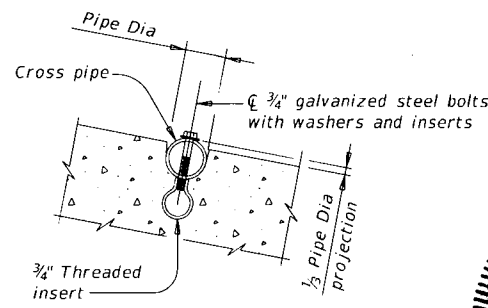


### OPTION WITH SQUARE BOTTOM

### SECTION A-A

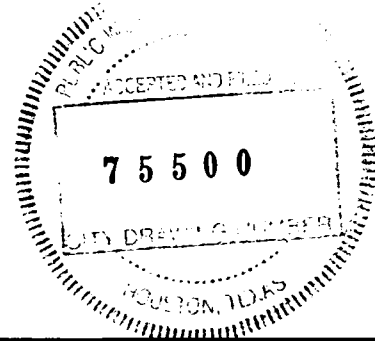


### OPTION WITH INVERT BOTTOM



### INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



**Texas Department of Transportation** Bridge Division Standard

## PRECAST SAFETY END TREATMENT

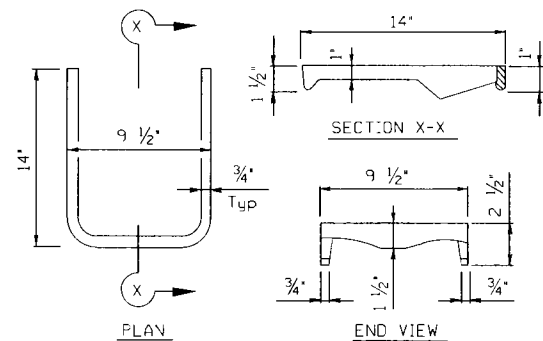
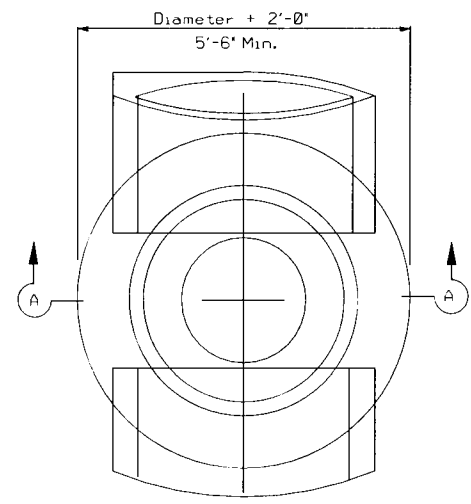
### TYPE II ~ CROSS DRAINAGE

### PSET-SC

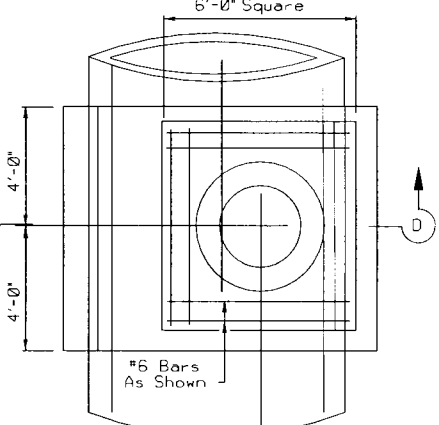
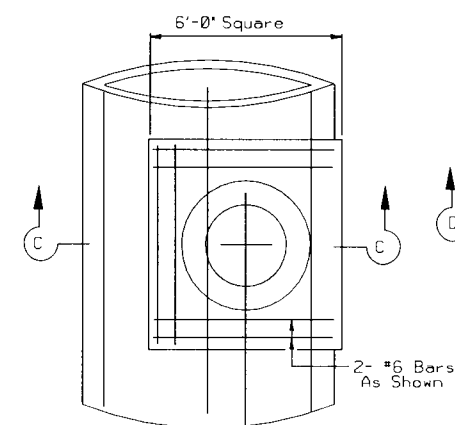
FILE: psetscss-21.dgn	DW: RLW	CK: KLR	DW: JTR	CK: GAF
© TxDOT February 2020	CONY	SECT	JOB	HIGHWAY
REVISIONS	DIST		COUNTY	SHEET NO
12-21, Addec 42 TP	HOU		FORT BEND	101A

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: FILE:



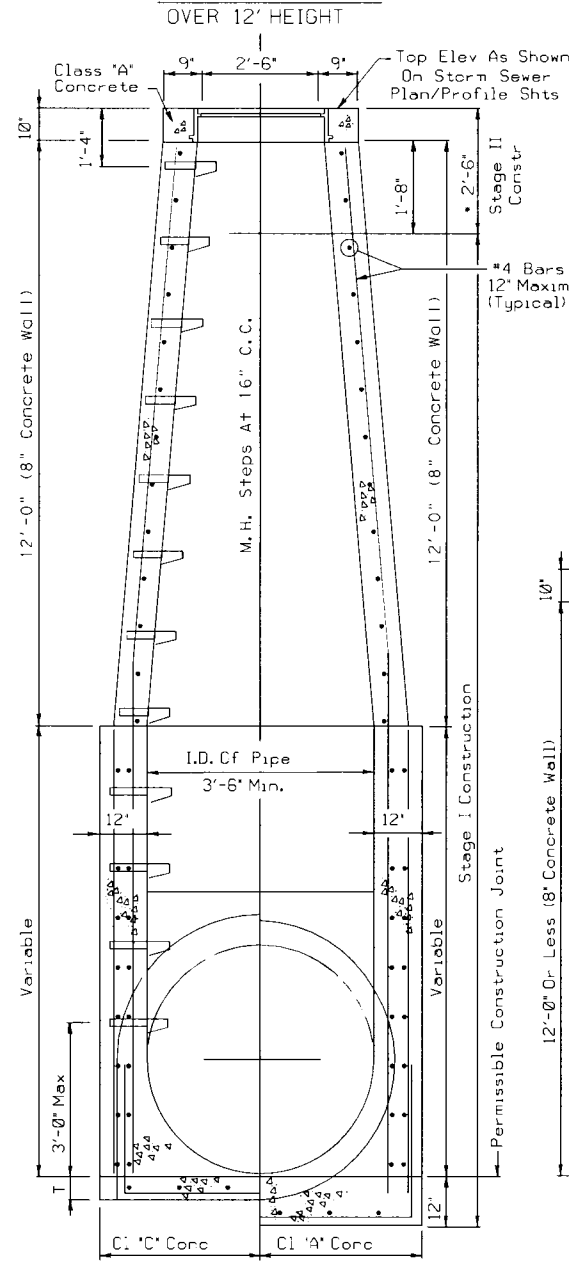
CAST IRON MANHOLE STEPS  
(In Stock Locally)



MONOLITHIC SEWERS

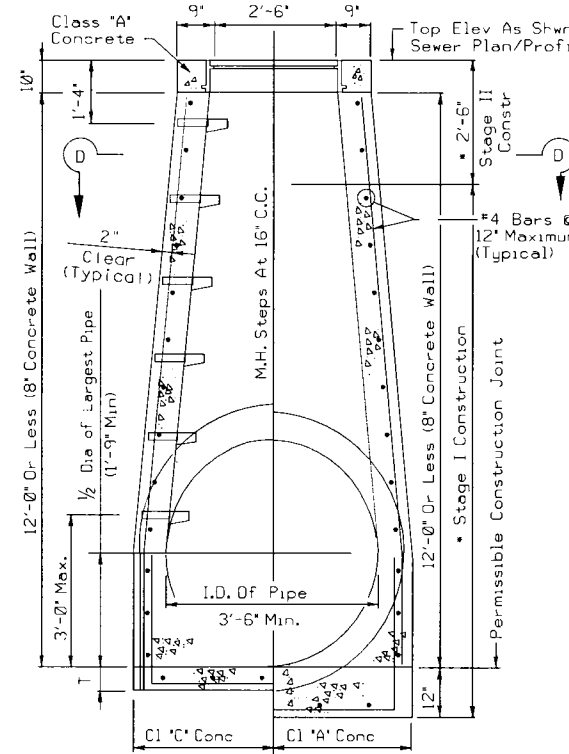
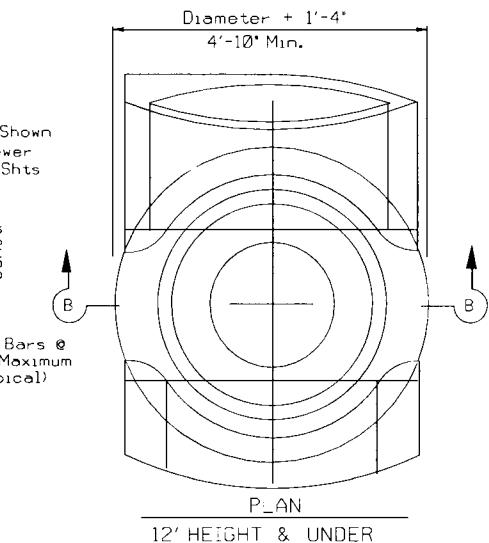
PRECAST PIPE SEWERS

GENERAL NOTES:  
See Standard or Detail Sheet For Excavation And Backfill Diagrams.  
All Manholes In Grades Areas Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.  
• But Not Less Than 6 Inches Above Highest Pipe.  
\*T Thickness Of Shell Equals That Of Larger Diameter Pipe.  
Optional Monolithic Or Precast Designs Permitted. Optional Designs Shall Be Signed & Sealed By A Registered Professional Engineer.

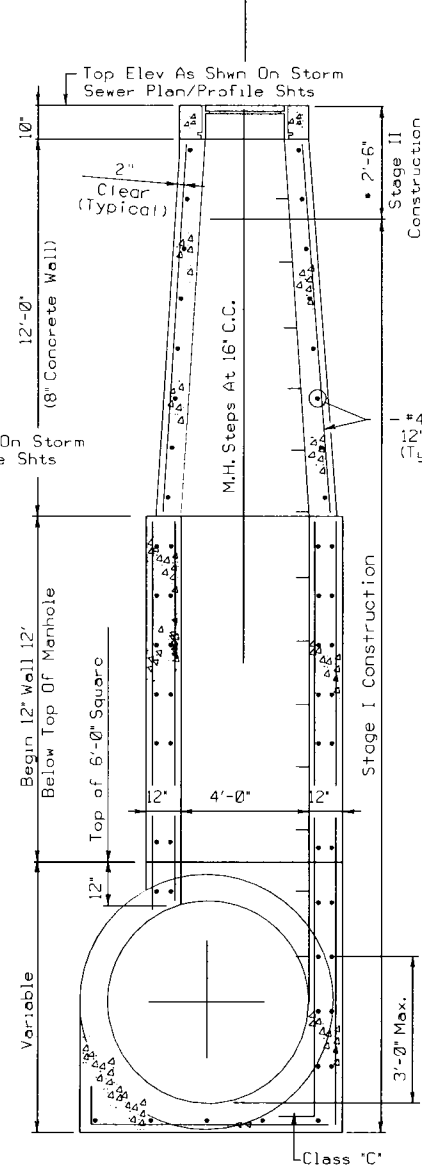


MONOLITHIC SEWERS PRECAST PIPE SEWERS  
SECTION A-A

MANHOLE - TYPE A  
FOR PIPES 54" AND SMALLER

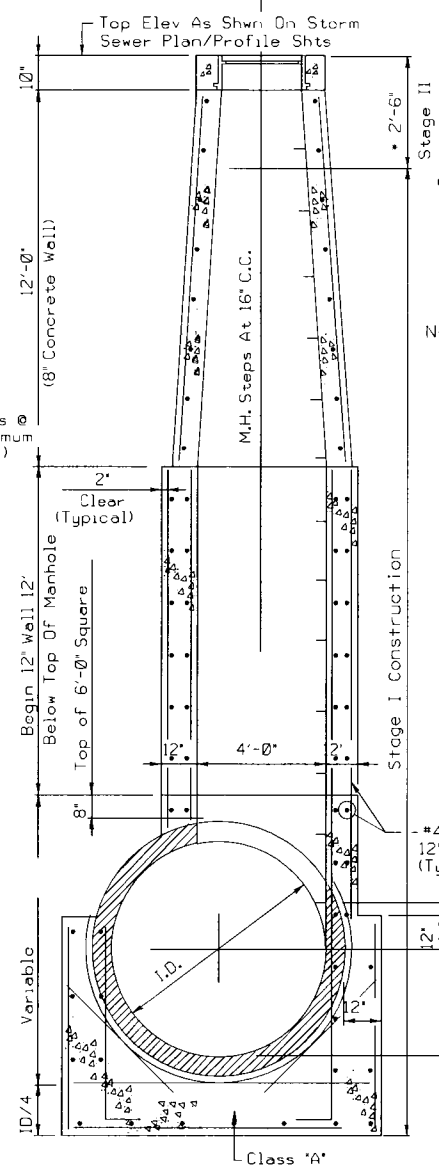


MONOLITHIC SEWERS PRECAST PIPE SEWERS  
SECTION B-B

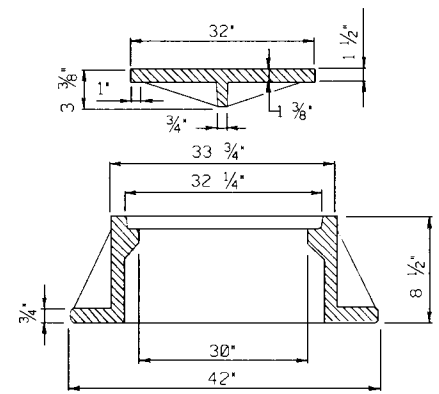


SECTION C-C

MANHOLE - TYPE B  
FOR PIPES 60" AND LARGER

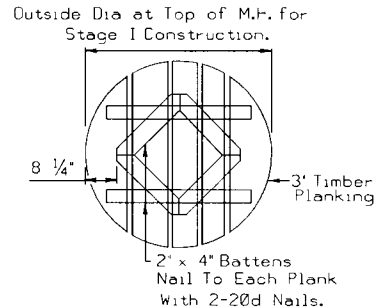


SECTION D-D



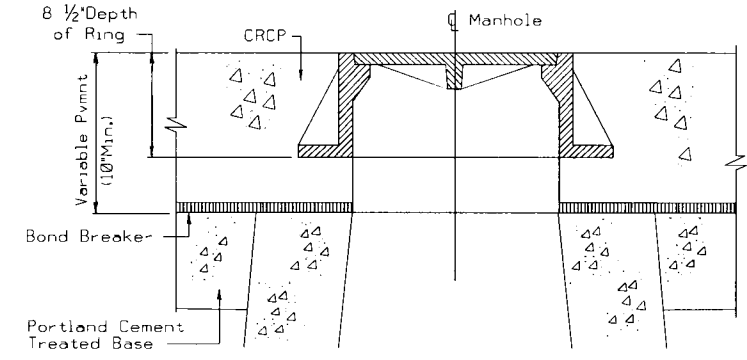
Heavy Duty 30" ID Ring as Required, Vulcan No. V-1419 w/ribbed cover, Neenah No. R1740-BTX

RING AND COVER



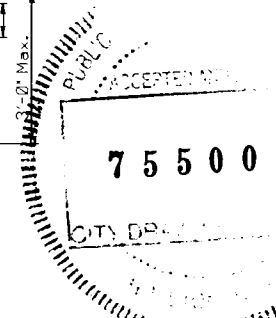
2" x 4" Battens Nail To Each Plank With 2-20d Nails.

TEMPORARY TIMBER COVER



RING AND COVER CAST MONOLITHICALLY WITH PAVEMENT

FOR DIRECT TRAFFIC



Texas Department of Transportation  
Houston District

MANHOLES  
TYPE A & B

MH-A/B

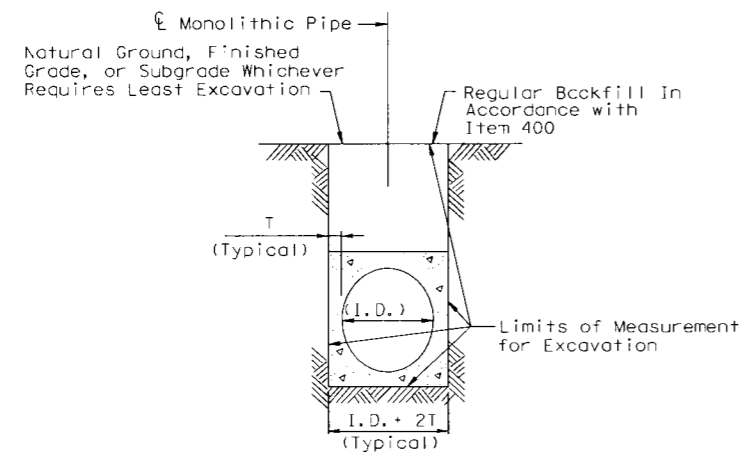
FILE: STDD10.DGN	DN: TXDOT	CA: TXDOT	DR: TXDOT	CR: TXDOT	STD:
© TXDOT December 2006	DIST	FED REG	PROJECT NO.	SHEET	
REVISIONS		HOJ	6	102	
3/15 MINOR CORRECTIONS		COUNTY	CONTROL	SECT	JOB
FORT BEND					HIGHWAY

d = Diameter  
R = Radius

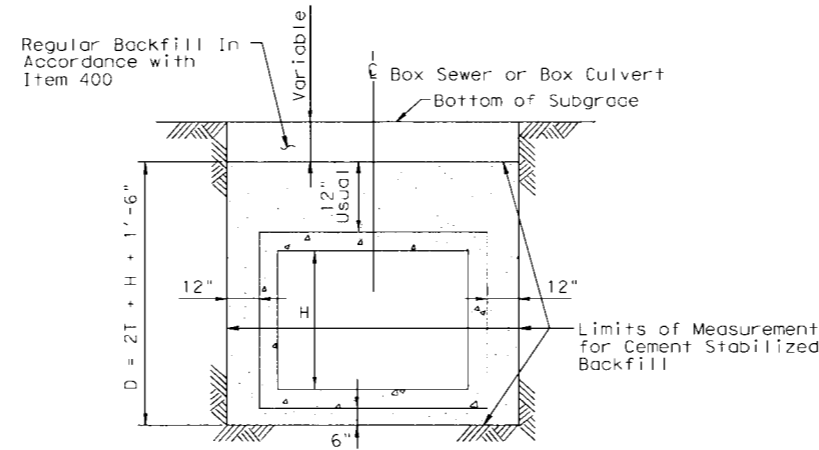
REINFORCED CONCRETE PIPE

EXCAVATION AND BACKFILL QUANTITIES

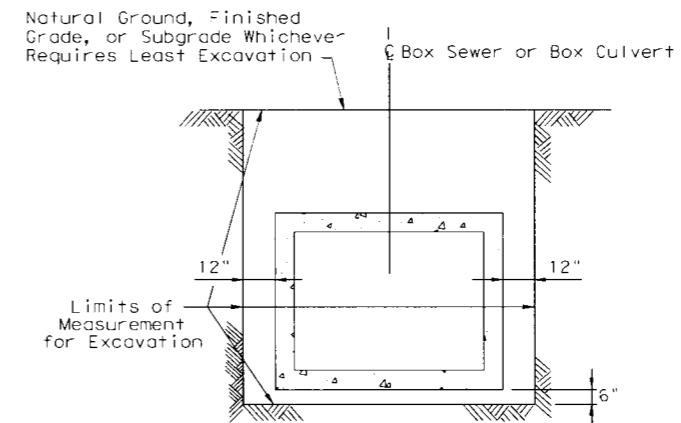
PIPE DIA. IN.	T FT.	CULVERT OR SEWER EXCAVATION IN A PAVED OR GRADED AREA	CEMENT STABILIZED BACKFILL IN A PAVED OR GRADED AREA
		C.Y. PER L.F. PER FT. OF DEPTH	C.Y. PER L.F. OF PIPE
18	0.19	0.144	0.383
24	0.23	0.165	0.478
30	0.29	0.188	0.586
36	0.33	0.210	0.692
42	0.38	0.231	0.808
48	0.42	0.327	1.394
54	0.46	0.349	1.560
60	0.50	0.370	1.731
66	0.54	0.392	1.907
72	0.58	0.414	2.088
78	0.62	0.435	2.275
84	0.67	0.457	2.474



EXCAVATION DETAIL  
MONOLITHIC PIPE  
IN A PAVED OR GRADED AREA



BACKFILL DETAIL  
BOX CULVERTS  
IN A GRADED OR PAVED AREA  
INCLUDING DETOURS \*

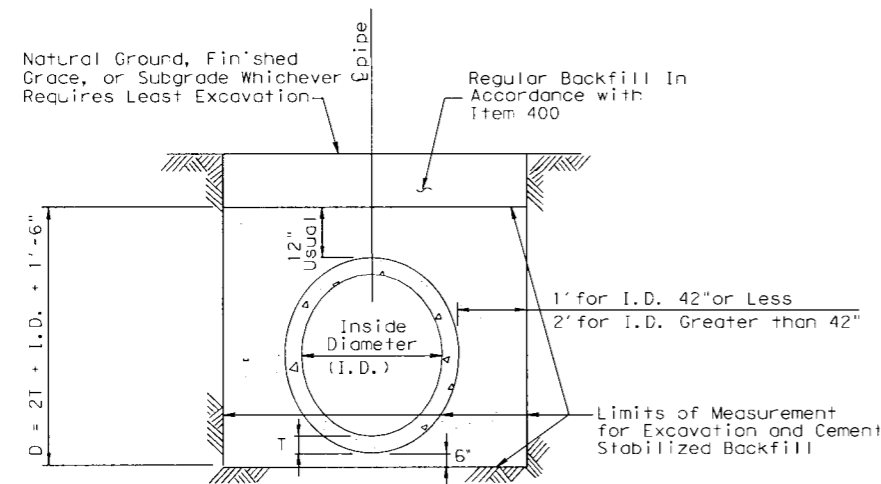


EXCAVATION DETAIL  
BOX CULVERTS  
IN A GRADED AREA

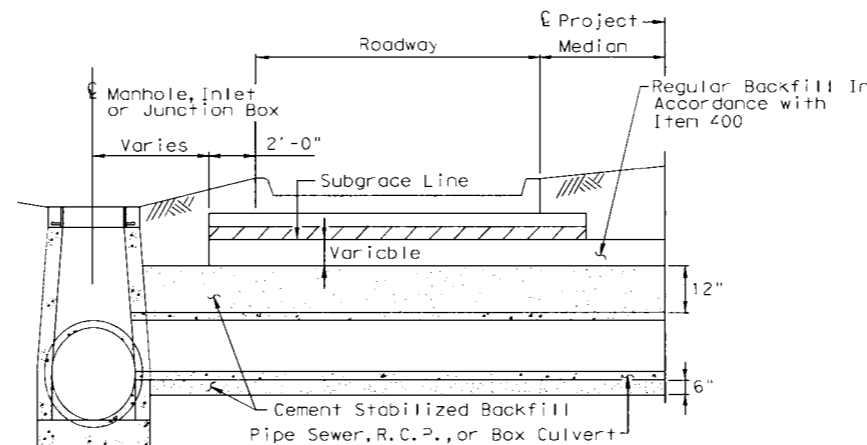
MONOLITHIC PIPE

EXCAVATION QUANTITIES

PIPE DIA. IN.	T FT.	EXCAVATION
		C.Y. PER L.F. PER FT. OF DEPTH
36	0.417	0.142
42	0.458	0.164
48	0.458	0.182
54	0.500	0.204
60	0.583	0.228
66	0.583	0.247
72	0.625	0.269
78	0.625	0.287
84	0.625	0.306



EXCAVATION & BACKFILL DETAIL  
REINFORCED CONCRETE PIPE  
IN A GRADED OR PAVED AREA  
INCLUDING DETOURS



BACKFILL DETAIL  
AT MANHOLE, INLET OR JUNCTION BOX

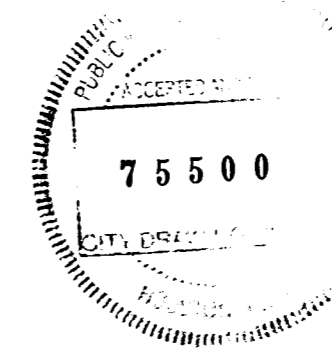
NOTE:

Cement stabilized backfill may be omitted in private driveways as indicated elsewhere in the plans.

Rubber gaskets shall be required for all joints on proposed cross drainage, pipe culverts and proposed storm sewer systems, unless otherwise shown in the plans.

\* Backfill with cement stabilized material will be required for all structures under detours unless noted otherwise in the General Notes.

SHEET 1 OF 2



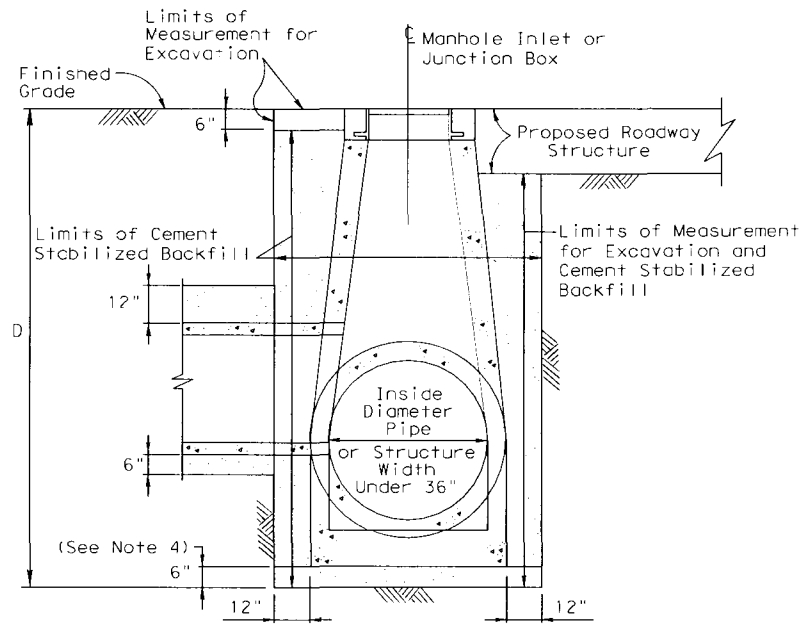
Texas Department of Transportation  
Houston District

EXCAVATION AND BACKFILL  
DIAGRAMS

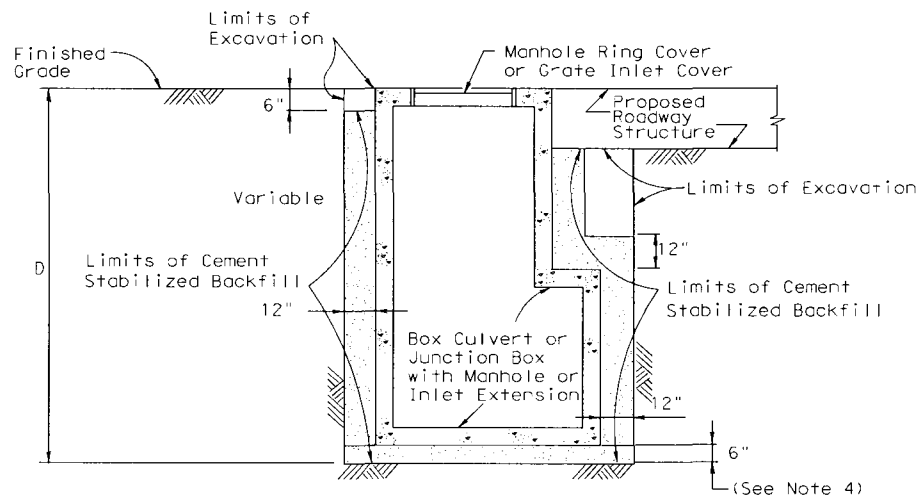
E&BD

FILE: ST021.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CR: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISED 11/05	HOUSTON	E		103
REVISED 2/2010 Added note to Table 1, Sht 2 of 2.	COUNTY	CONTROL	SECT	JOB
REVISED 6/12	FORT BEND			HIGHWAY
REVISED 9/14				

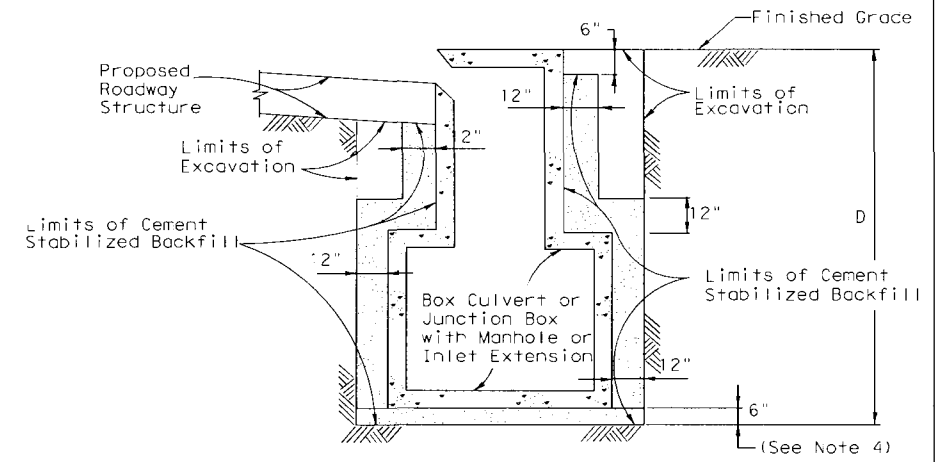
D = Depth  
H = Height  
T = Thickness  
R = Radius  
D'a = Diameter



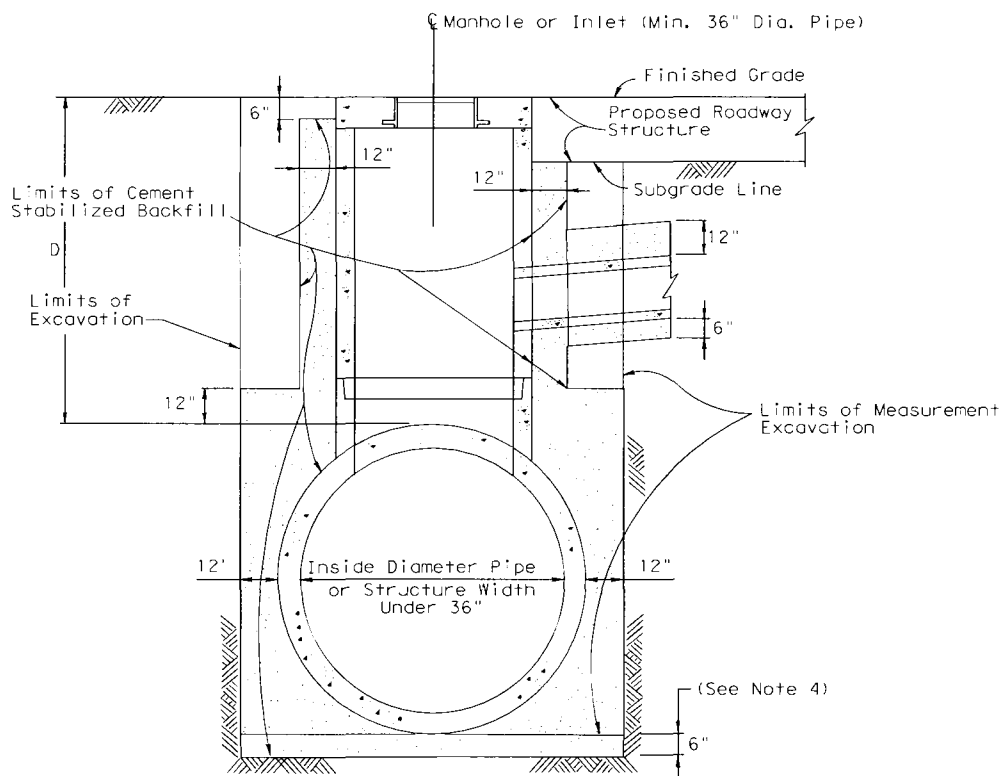
EXCAVATION AND BACKFILL DETAIL  
MANHOLES SMALLER THAN 36 IN.  
IN A PAVED OR GRADED AREAS  
N. T. S.



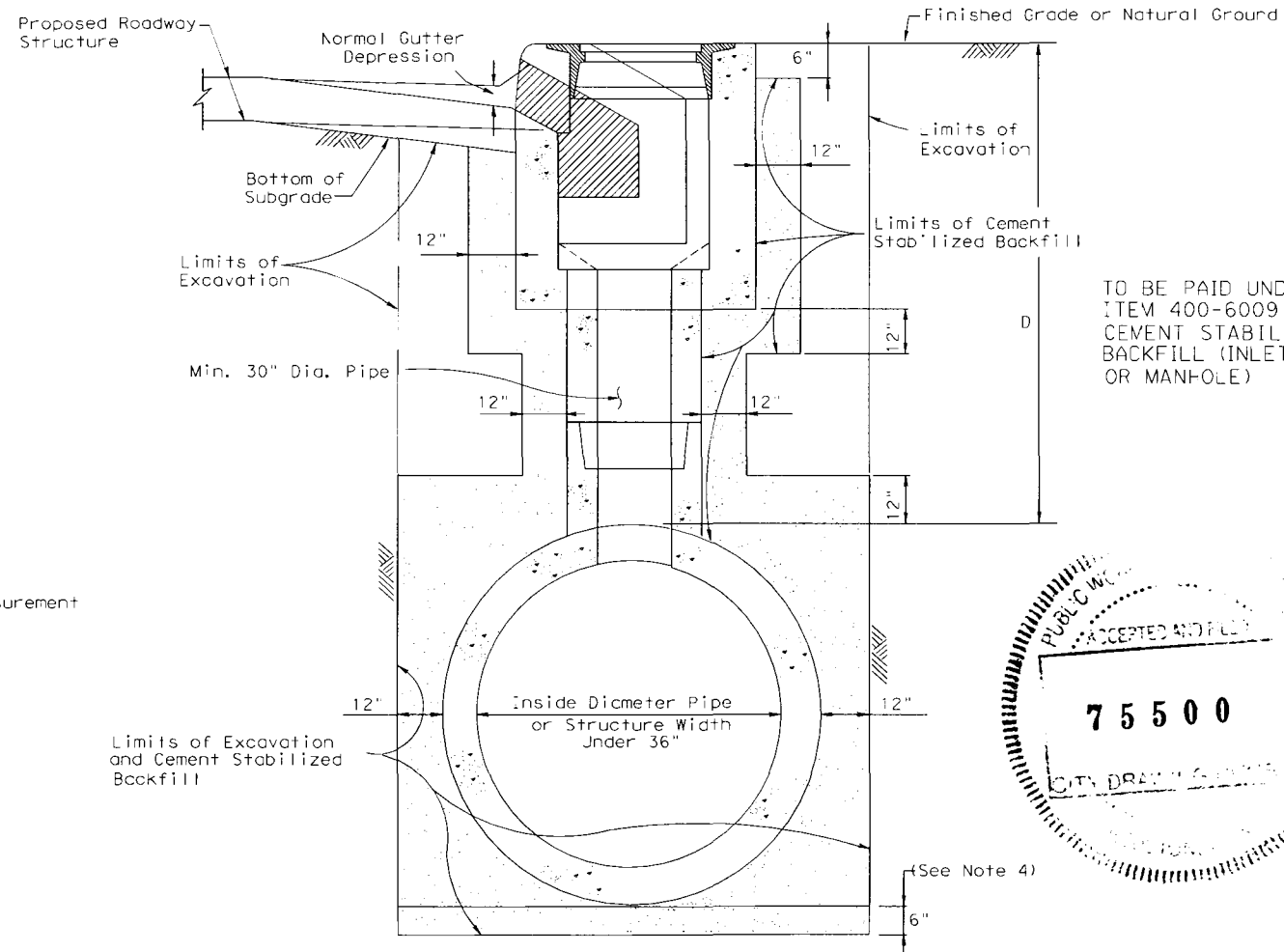
EXCAVATION AND BACKFILL DETAIL  
JUNCTION BOXES IN A  
PAVED OR GRADED AREA  
N. T. S.



EXCAVATION AND BACKFILL DETAIL  
INLET EXTENSIONS ON A BOX CULVERT  
IN A PAVED OR GRADED AREA  
N. T. S.



EXCAVATION AND BACKFILL DETAIL  
MANHOLES 36 IN. AND GREATER  
IN A PAVED OR GRADED AREA  
N. T. S.



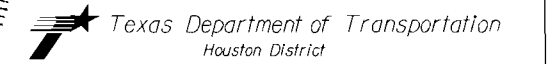
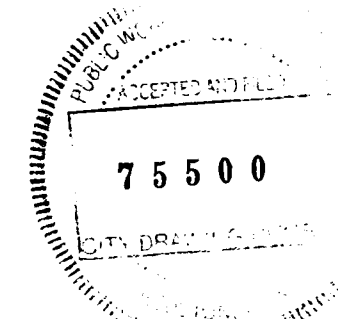
EXCAVATION AND BACKFILL DETAIL  
CURB INLETS IN A PAVED OR GRADED AREA  
N. T. S.

TABLE 1 SCHEDULE FOR PAY QUANTITIES OF CEMENT STABILIZED BACKFILL (SEE NOTE 1)	
MANHOLE OR INLET DEPTH (D) IN FEET	CEMENT STABILIZED BACKFILL IN CUBIC YARDS
0 through 5	5.75
> 5 through 10	8.25
greater than 10	12.75

TO BE PAID UNDER  
ITEM 400-6009  
CEMENT STABILIZED  
BACKFILL (INLET  
OR MANHOLE)

- NOTES:
- The Contractor is paid a fixed estimated amount for cement stabilized backfill based on depth (D) and Table 1.
  - Proposed roadway structure includes pavement, base and any subgrade.
  - For backfill of intersecting pipes and box culverts, see "Excavation and Backfill Diagram for Pipes and Box Culverts."
  - 6" cement stabilized backfill will be required only for precast units.

SHEET 2 OF 2



EXCAVATION AND BACKFILL  
DIAGRAMS

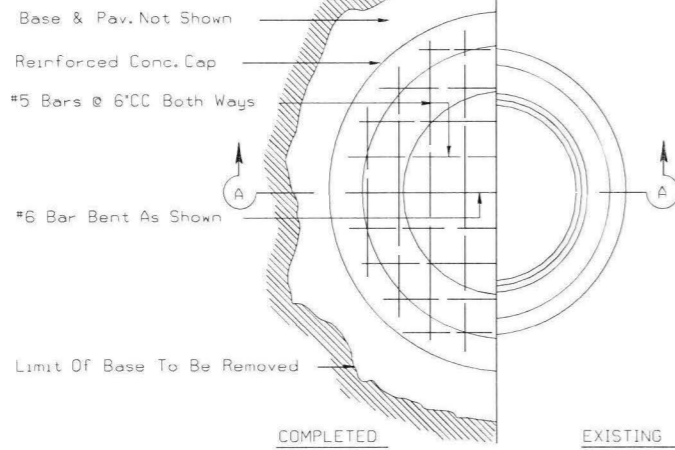
E&BD

FILE: STDE1.DGN	DN: TxDot	CR: TxDot	DM: TxDot	CK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS Table 1	HOUSTON	6		104
REVISED 2/2010 Added note to Table 1.	COUNTY	CONTROL	SECT	JOB
REVISED 6/12				
REVISED 9/12				
REVISED 3/15	FORT BEND			

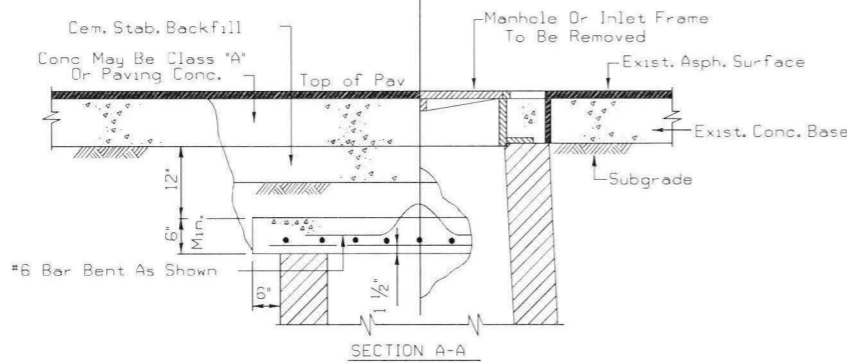
D = Depth  
H = Height  
T = Thickness  
R = Radius  
Dia = Diameter



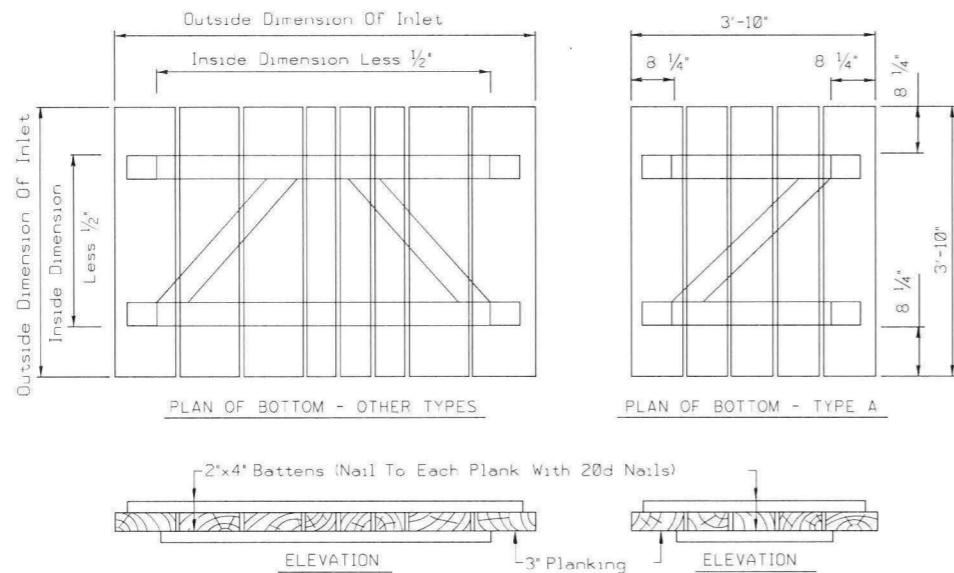
Note: No Conc Or Cem Stab Bkfl Required In Graded Areas.



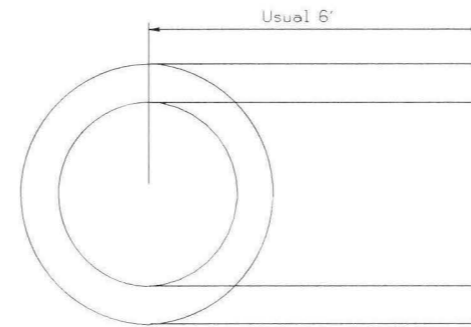
Note: Reinforced Conc. Cap Shall Be Precasted & Properly Cured Before Placing in Position.



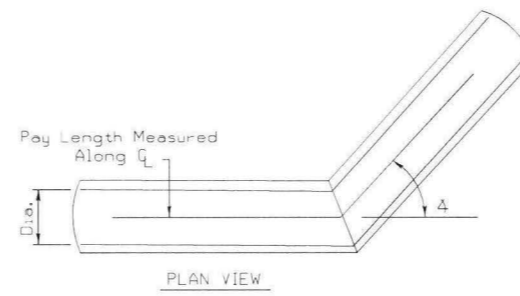
DETAIL SHOWING METHOD OF CAPPING ABANDONED MANHOLES OR INLETS (GRADED OR PAVED AREAS)



TEMPORARY COVERS FOR ALL TYPES OF INLETS

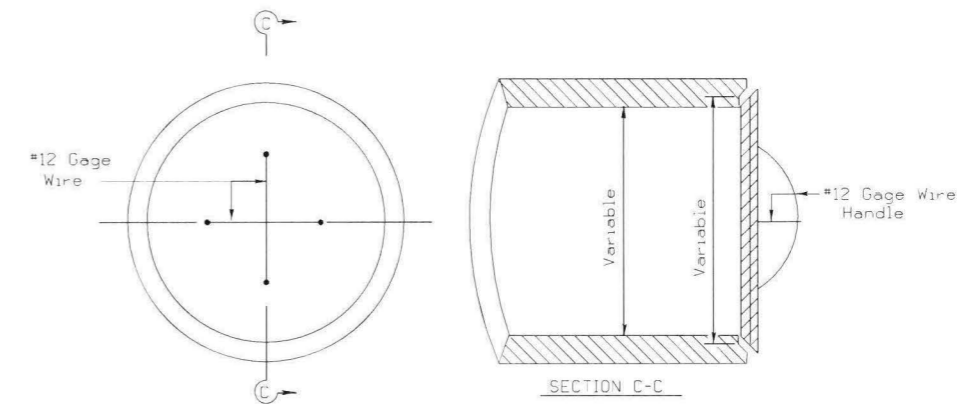


PRECAST STORM SEWER TEE



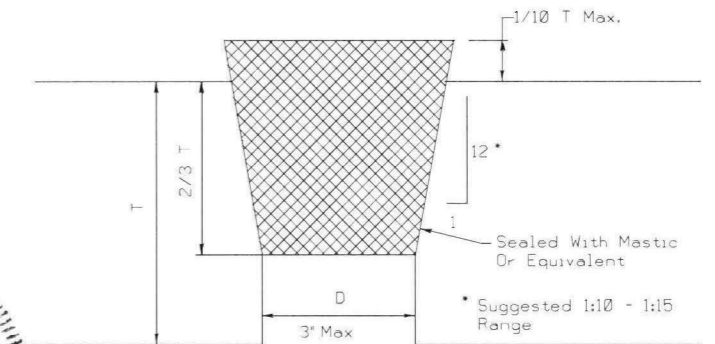
BENDING DETAIL

Note: Bending Of Proposed Pipe Sewer Or RCP In A Vertical & /Or Horizontal Plane Shall Be Accomplished By The Use Of A "Pipe Collar" Or A "Precast Elbow", As Approved By The Engineer. Price Of "Pipe Collar" Or "Precast Elbow" Shall Be Subsidiary To The Unit Prices Bid For Item Reinforced Concrete Pipe. Pay Length Measurement To Be Along Horizontal C & Horizontal Plane Of Pipes.



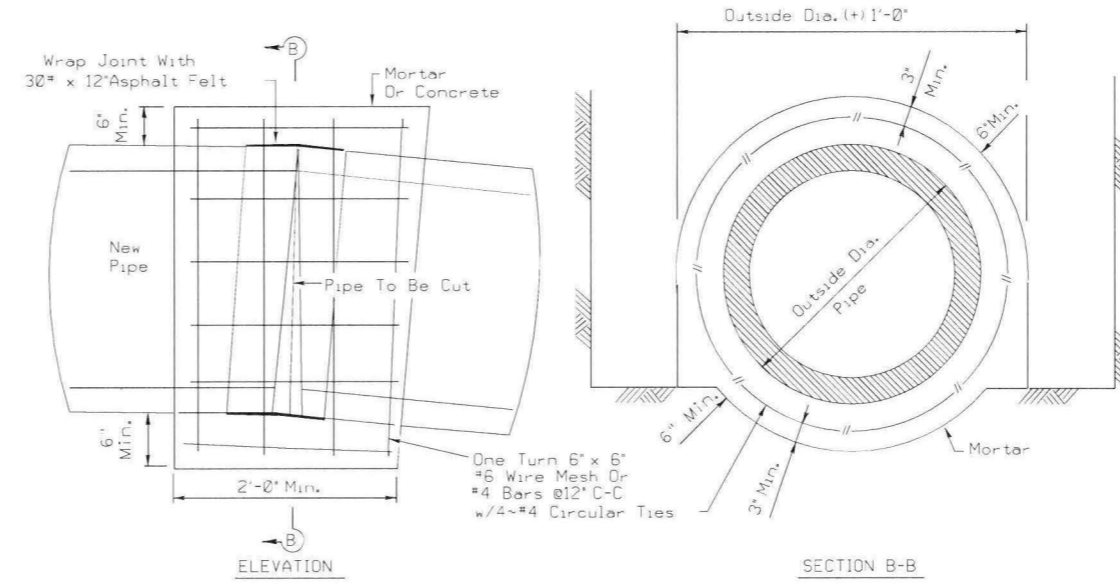
Concrete Plug For End Of Pipe Culvert Or Sewer

CONCRETE PLUG FOR PIPE



T = Wall Thickness On Top Of Box Or Pipe  
D = Diameter Of Lifting Hole  
Minimum Length Of Plug Is 2/3 T +/-  
Minimum Diameter At Bottom Of Plug = D - 1/8"  
Maximum 1/10 T Of Plug Not Seated In Lifting Hole  
Note: The Plug Shall Be Cast With The Same Taper As The Lifting Hole.

DETAIL OF PLUG FOR LIFTING HOLES IN RCB AND RCP



PIPE COLLAR DETAIL For Horizontal Or Vertical Placement

d = Diameter  
R = Radius

Texas Department of Transportation  
Houston District (Bridge)

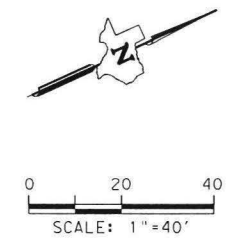
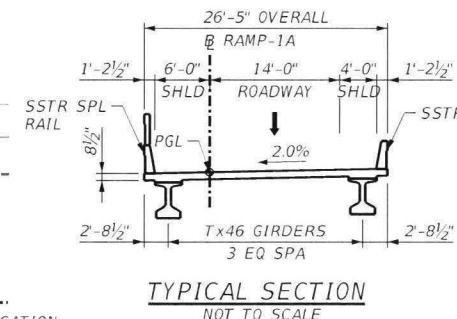
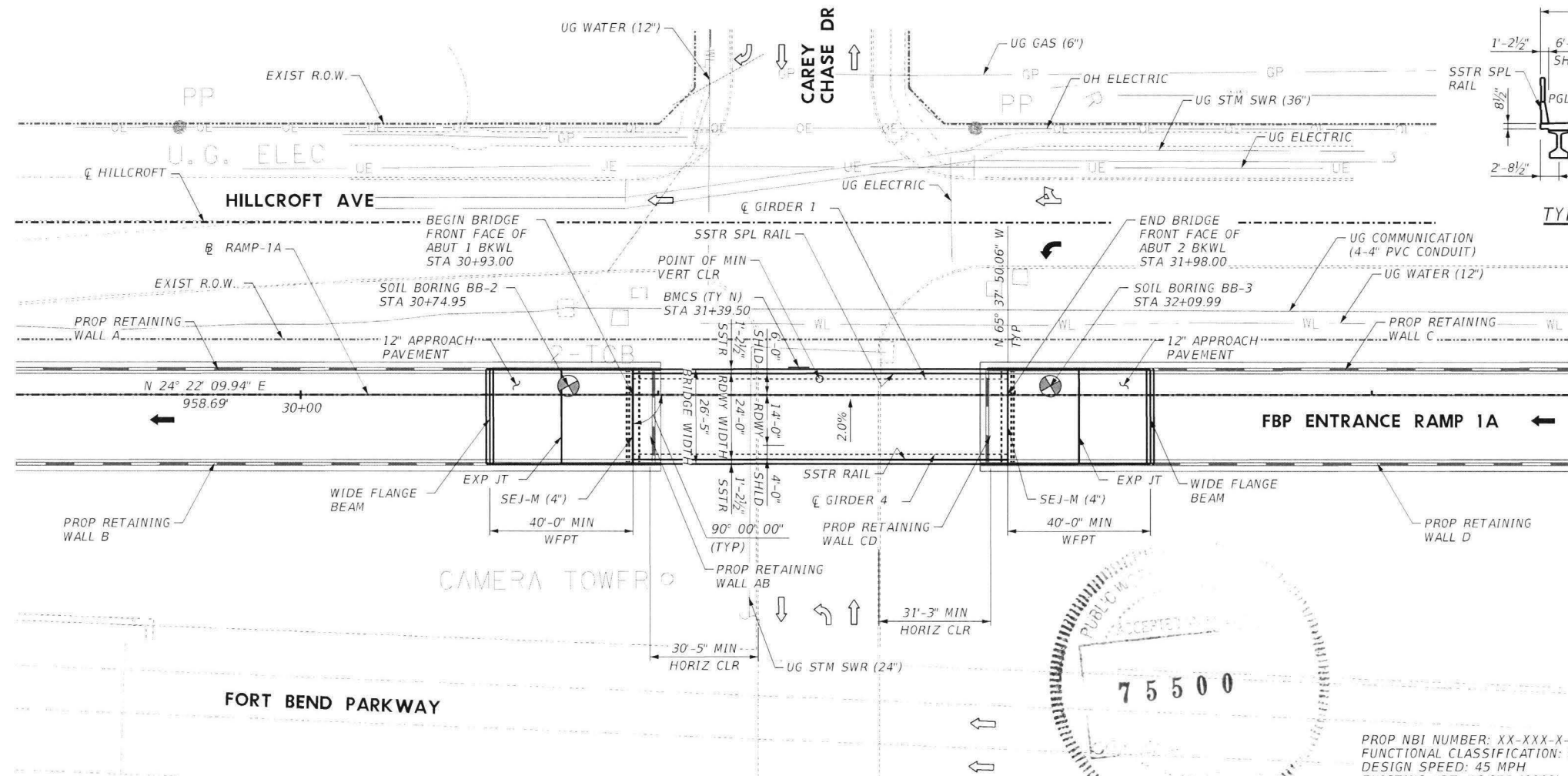
MISCELLANEOUS SEWER DETAILS

MSD

FILE: STDD11.DGN	DN: TXDOT	CK: TXDOT	DN: TXDOT	CK:
© TXDOT Mar 2004	DISTRICT FED REG	PROJECT NO.		SHEET
REVISIONS	HDU	6	105	
3/2015 2014 Specs	COUNTY	CONTROL	SECT	JOB HIGHWAY
FORT BEND				

STDD11.DGN

100%  
SUBMITTAL

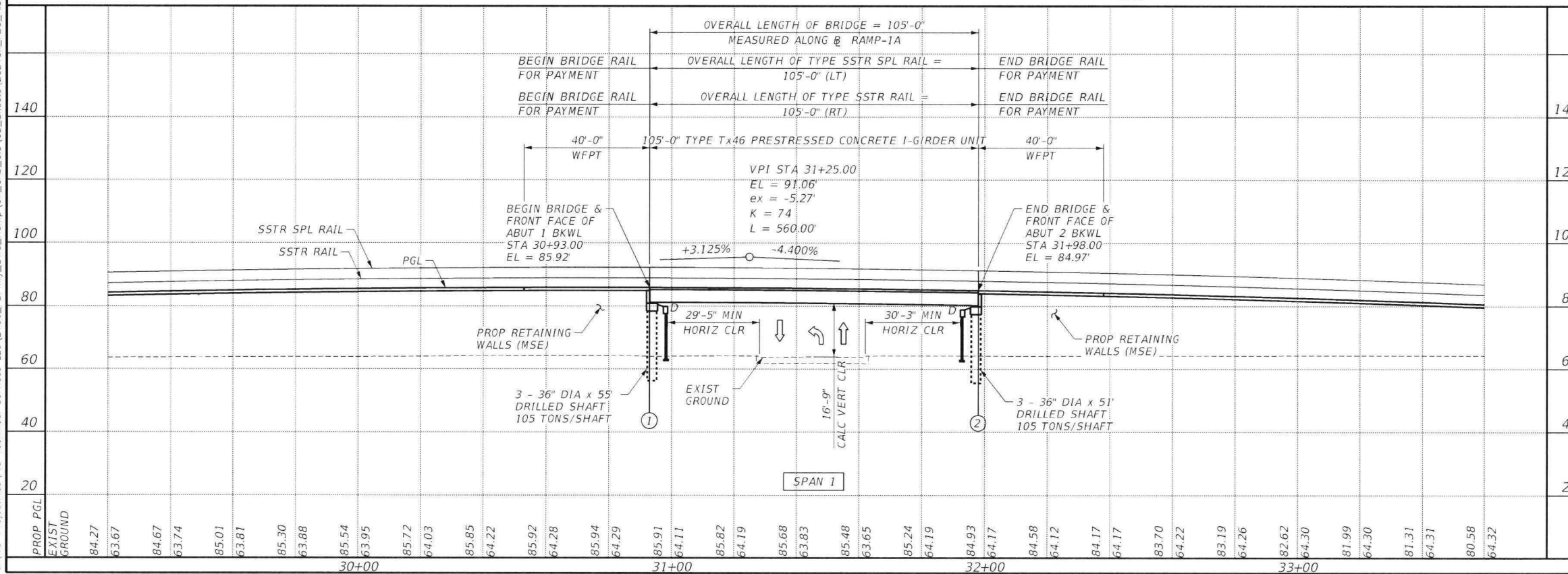


- GENERAL NOTES:**
- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (HL-93 LOADING) (8TH EDITION) AND MODIFIED BY THE TXDOT LRFD BRIDGE DESIGN MANUAL AND DETAILING GUIDE.
  - ALL BENTS ARE NORMAL, UNLESS OTHERWISE NOTED.
  - BORING LOG LOCATIONS ARE APPROXIMATE.
  - SEE CSBE-RW STANDARD FOR CEMENT STABILIZED BACKFILL BEHIND ABUTMENTS.
  - THE CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING THE LOCATION OF ALL UTILITIES PRIOR TO ORDERING MATERIALS AND EXCAVATION.
  - THE "D" DENOTES SLOTTED HOLE AT GIRDER END. SEE ABUTMENT DETAILS FOR LOCATION OF DOWELS D.
  - VPC DENOTES POINT OF MINIMUM VERTICAL CLEARANCE.

PROP NBI NUMBER: XX-XXX-X-XXXX-XX-XXX  
FUNCTIONAL CLASSIFICATION: URBAN FREEWAY  
DESIGN SPEED: 45 MPH  
EXISTING ADT: 13,075 (2020)

**HL-93 LOADING**

REV.	DATE	BY	DESCRIPTION



Professional Engineer Seal for Ahmed K. Valdez, State of Texas, License No. 110365. Date: 2/16/23.

**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**AIG Tech**  
Advanced Infrastructure Group  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
BRIDGE LAYOUT**

SHEET 1 OF 1

PROJECT NUMBER	20219x	DATE:	2/16/2023
DESIGNED BY:	BG	CHECKED BY:	AV
DRAWN BY:	AR	SHEET NO.:	106
CHECKED BY:	AV		

2/16/2023 11:27:39 AM C:\AIG-Projectwise\AIG Technical Services LLC\2106\_FBPkwy\_BWB\_Ramp\07\_CAD\_GIS\02\_Sheets\20219x\_FBC\_AIG\_BR\_BL\_01.dgn



**DRILLING LOG**

1 of 2

WinCore Version 3.3  
 County Fort Bend  
 Highway Sam Houston  
 CSJ  
 Hole B-1  
 Structure Bridge  
 Station  
 Offset  
 District Houston  
 Date 10/2/21  
 Grnd. Elev. 0.00 ft  
 GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
			CLAY, soft, dark gray, with roots, sandy (CL)			20				
						18	46	28		-%200 = 68
						15				
5		4 (6) 7 (6)				21				
						21	0	0		-%200 = 17
-8			SAND, loose to slightly compact, light brown, silty (SM)			21				
10		8 (6) 9 (6)				22				
						22				
15		10 (6) 13 (6)				22				
						22				-%200 = 5
-18			SAND, compact, light brown, poorly graded w/ silt (SP-SM)			25				
20		21 (6) 25 (6)				25				
						23				
25		24 (6) 29 (6)				25				
						25				-%200 = 4
-33			SAND, dense, light brown, poorly graded (SP)			22				
35		39 (6) 46 (6)				22				
						22				
40		50 (6) 50 (4)								

Remarks: Free-water was encountered at a depth of about 9.6 ft and rose to a depth of about 7.5 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal      Logger: Mustafa Salloom      Organization: Raba-Kistner, Inc.



**DRILLING LOG**

2 of 2

WinCore Version 3.3  
 County Fort Bend  
 Highway Sam Houston  
 CSJ  
 Hole B-1  
 Structure Bridge  
 Station  
 Offset  
 District Houston  
 Date 10/2/21  
 Grnd. Elev. 0.00 ft  
 GW Elev. N/A

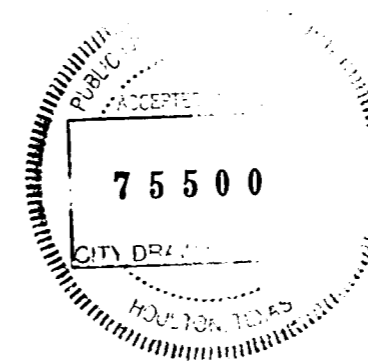
Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
			SAND, dense, light brown, poorly graded (SP)							
-43						25	26	10		-%200 = 43
45		27 (6) 16 (6)	SAND, compact, multicolored, clayey (SC)							
						22				
-48			CLAY, very stiff, light gray (CH)							
50		12 (6) 14 (6)								
55										
60										
65										
70										
75										
80										

Remarks: Free-water was encountered at a depth of about 9.6 ft and rose to a depth of about 7.5 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal      Logger: Mustafa Salloom      Organization: Raba-Kistner, Inc.

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REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC F-20607  
 1500 S DAIRY ASHFORD  
**AIG Tech** SUITE 445  
 Advanced Infrastructure Group HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD BORING LOGS**

SHEET 1 OF 6			
PROJECT NUMBER	20219x	DATE:	6/30/2022
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	107A
CHECKED BY:			



### DRILLING LOG

1 of 3

WinCore Version 3.3  
 County Fort Bend  
 Highway Sam Houston  
 Station CSJ  
 Hole B-2  
 Structure Bridge  
 District Houston  
 Date 10/2/21  
 Grnd. Elev. 0.00 ft  
 Offset N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
5		5 (6) 6 (6)	CLAY, soft, multicolored, with roots, w/ sand (CH)	0	28	20	51	32		-%200 = 78
							18	54	36	
8			CLAY, soft, multicolored, with calcareous nodules and sand seams (CL)	0	9	27				
10		6 (6) 7 (6)					28	34	17	
15		13 (6) 24 (6)	SAND, slightly compact to compact, light brown, clayey (SC)			23				-%200 = 24
20		21 (6) 28 (6)					24			
25		25 (6) 28 (6)	SAND, compact, light brown, poorly graded w/ silt (SP-SM)			24				
28							26			
30		31 (6) 39 (6)				22				
35		26 (6) 32 (6)				26				
40		27 (6) 36 (6)								

Remarks: Free-water was encountered at a depth of about 11.5 ft and rose to a depth of about 8.7 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal      Logger: Mustafa Salloom      Organization: Raba-Kistner, Inc.



### DRILLING LOG

2 of 3

WinCore Version 3.3  
 County Fort Bend  
 Highway Sam Houston  
 Station CSJ  
 Hole B-2  
 Structure Bridge  
 District Houston  
 Date 10/2/21  
 Grnd. Elev. 0.00 ft  
 Offset N/A

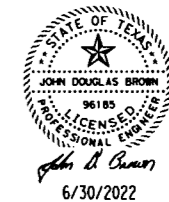
Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
45		19 (6) 26 (6)	SAND, compact, light brown, poorly graded w/ silt (SP-SM)			22				
48							22	35	16	
50		22 (6) 25 (6)	CLAY, very stiff, light green, with sand layers (CL)			24				
53							24			
55		35 (6) 30 (6)	CLAY, very stiff, multicolored (CH)			24				
60		18 (6) 25 (6)					53	42	21	52
65		20 (6) 28 (6)	SAND, compact, light tan, clayey (SC)			29				
70		31 (6) 34 (6)					23			
75		35 (6) 39 (6)				24				-%200 = 30
78										
80		28 (6) 23 (6)								

Remarks: Free-water was encountered at a depth of about 11.5 ft and rose to a depth of about 8.7 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal      Logger: Mustafa Salloom      Organization: Raba-Kistner, Inc.

REV.	DATE	BY	DESCRIPTION

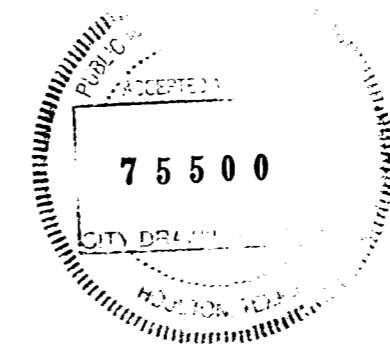


**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC F-20607  
 1500 S DAIRY ASHFORD  
 SUITE 445  
 HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
BORING LOGS**

SHEET 2 OF 6			
PROJECT NUMBER	20219x	DATE:	6/30/2022
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	107B
CHECKED BY:			





**DRILLING LOG**

3 of 3

WinCore Version 3.3  
 County Fort Bend  
 Highway Sam Houston  
 Station CSJ  
 Hole B-2  
 Structure Bridge  
 District Houston  
 Date 10/2/21  
 Grnd. Elev. 0.00 ft  
 Offset N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
			SAND, compact, light tan, clayey (SC)							
						21				
85		35 (6) 41 (6)								
-88			SAND, dense, light tan, some clayey sand, silty (SM)			19				-%200 = 15
90		50 (6) 50 (3)								
						21				
95		45 (6) 50 (4)								
						21				
-100		50 (5) 50 (3)								
100										
105										
110										
115										
120										

Remarks: Free-water was encountered at a depth of about 11.5 ft and rose to a depth of about 8.7 ft after 15 minutes.  
 The ground water elevation was not determined during the course of this boring.

Driller: Universal      Logger: Mustafa Salloom      Organization: Raba-Kistner, Inc.



**DRILLING LOG**

1 of 3

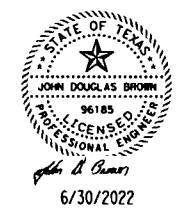
WinCore Version 3.3  
 County Fort Bend  
 Highway Sam Houston  
 Station CSJ  
 Hole B-3  
 Structure Bridge  
 District Houston  
 Date 9/29/21  
 Grnd. Elev. 0.00 ft  
 Offset N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
			CLAY, soft, dark gray, with roots to 2-ft and calcareous and ferrous nodules, w/ sand (CH) (CH)							
						22				
						21	53	35		-%200 = 82
						18				
-5		6 (6) 6 (6)								
5			SAND, loose to compact, dark gray, clayey (SC)							
						19	38	21		-%200 = 44
						25				
10		5 (6) 9 (6)								
						23				
						21				
15		11 (6) 14 (6)								
						24				
						25				
20		19 (6) 28 (6)								
						24	0	0		-%200 = 16
-23			SAND, dense, light brown, silty (SM)							
26		31 (6) 50 (3)								
						25				
30		21 (6) 30 (6)								
						23				
35		40 (6) 46 (6)								
						21				
40		47 (6) 50 (3)								

Remarks: Free-water was encountered at a depth of about 9.5 ft and rose to a depth of about 9.0 ft after 15 minutes.  
 The ground water elevation was not determined during the course of this boring.

Driller: Universal      Logger: Mustafa Salloom      Organization: Raba-Kistner, Inc.

REV.	DATE	BY	DESCRIPTION



6/30/2022

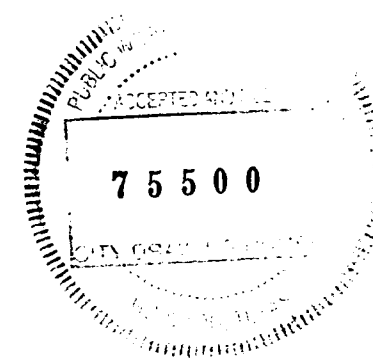


**FORT BEND COUNTY TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC F-20607  
 1500 S DAIRY ASHFORD  
 SUITE 445  
 HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD BORING LOGS**

SHEET 3 OF 6			
PROJECT NUMBER	20219x	DATE:	6/30/2022
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	107C
CHECKED BY:			



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### DRILLING LOG

2 of 3

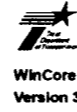
County Fort Bend  
 Highway Sam Houston  
 CSJ  
 Hole B-3  
 Structure Bridge  
 Station  
 Offset  
 District Houston  
 Date 9/29/21  
 Grnd. Elev. 0.00 ft  
 GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
-43			SAND, dense, light brown, silty (SM)	37	9	29	54	27		
-45		28 (6) 34 (6)	CLAY, very stiff, light green, with clayey sand (CH)							
-48			SAND, compact, light green, clayey (SC) (SC)			24				-%200 = 25
-50		35 (6) 39 (6)								
-53			CLAY, stiff, light green, with calcareous nodules, w/ sand (CH)			19				
-55		9 (6) 16 (6)								
-58			CLAY, very stiff, light green, sandy silty (CL-ML)			21	24	8		
-60		27 (6) 45 (6)								
-63			CLAY, very stiff, light green, with sand seams, sandy (CL)			23				-%200 = 65
-65		26 (6) 30 (6)								
-70		32 (6) 37 (6)								
-75		34 (6) 45 (6)				28				
-78			SAND, dense, multicolored, silty (SM)			20				-%200 = 13
-80		50 (3) 50 (2)								

Remarks: Free-water was encountered at a depth of about 9.5 ft and rose to a depth of about 9.0 ft after 15 minutes.

The ground water elevation was not determined during the course of this boring.

Driller: Universal      Logger: Mustafa Salloom      Organization: Raba-Kistner, Inc.



### DRILLING LOG

3 of 3

County Fort Bend  
 Highway Sam Houston  
 CSJ  
 Hole B-3  
 Structure Bridge  
 Station  
 Offset  
 District Houston  
 Date 9/29/21  
 Grnd. Elev. 0.00 ft  
 GW Elev. N/A

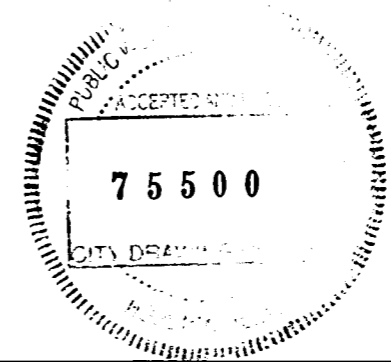
Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
-85		35 (6) 37 (6)	SAND, dense, multicolored, silty (SM)							27
-90		39 (6) 50 (4)								25
-95		48 (6) 50 (3)								22
-100		40 (6) 50 (5)								21

Remarks: Free-water was encountered at a depth of about 9.5 ft and rose to a depth of about 9.0 ft after 15 minutes.

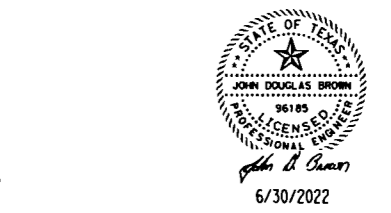
The ground water elevation was not determined during the course of this boring.

Driller: Universal      Logger: Mustafa Salloom      Organization: Raba-Kistner, Inc.

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REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC F-20607  
 1500 S DAIRY ASHFORD  
 SUITE 445  
 HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD BORING LOGS**

SHEET 4 OF 6			
PROJECT NUMBER	20219x	DATE:	6/30/2022
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	107D
CHECKED BY:			



**DRILLING LOG**

1 of 2

WinCore Version 3.3  
 County Fort Bend  
 Highway Sam Houston  
 CSJ  
 Hole B-4  
 Structure Bridge  
 Station  
 Offset  
 District Houston  
 Date 10/4/21  
 Grnd. Elev. 0.00 ft  
 GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
5		9 (6) 11 (6)	CLAY, stiff to soft, dark gray, sandy (CL)			17	40	24		-%200 = 61
						12				
						14				
						14	40	24		-%200 = 53
						15				
10		8 (6) 8 (6)								
-12			SAND, loose, multicolored, clayey (SC)	0	22	18				-%200 = 29
						23				
15		7 (6) 8 (6)								
						24				-%200 = 18
-18			SAND, slightly compact, multicolored, silty (SM)							
20		10 (6) 13 (6)								
						25				
25		11 (6) 12 (6)								
						23				
30		15 (6) 18 (6)								
						21				-%200 = 11
-33			SAND, slightly compact to compact, multicolored, poorly graded w/ silt (SP-SM)							
35		17 (6) 22 (6)								
						21				
40		22 (6) 29 (6)								

Remarks: Free-water was encountered at a depth of about 14.5 ft and rose to a depth of about 10.5 ft after 15 minutes.  
 The ground water elevation was not determined during the course of this boring.

Driller: Universal      Logger: Mustafa Salloom      Organization: Raba-Kistner, Inc.



**DRILLING LOG**

2 of 2

WinCore Version 3.3  
 County Fort Bend  
 Highway Sam Houston  
 CSJ  
 Hole B-4  
 Structure Bridge  
 Station  
 Offset  
 District Houston  
 Date 10/4/21  
 Grnd. Elev. 0.00 ft  
 GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
45		26 (6) 29 (6)	SAND, slightly compact to compact, multicolored, poorly graded w/ silt (SP-SM)							
						22				
						22				
-50		27 (6) 35 (6)								
55										
60										
65										
70										
75										
80										

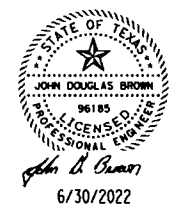
Remarks: Free-water was encountered at a depth of about 14.5 ft and rose to a depth of about 10.5 ft after 15 minutes.  
 The ground water elevation was not determined during the course of this boring.

Driller: Universal      Logger: Mustafa Salloom      Organization: Raba-Kistner, Inc.

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REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC F-20607  
 1500 S DAIRY ASHFORD  
**AIG Tech** SUITE 445  
 Advanced Infrastructure Group HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD BORING LOGS**

SHEET 5 OF 6			
PROJECT NUMBER	20219x	DATE:	6/30/2022
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	107E
CHECKED BY:			



WinCore  
Version 3.3

# DRILLING LOG

1 of 1

County	Fort Bend	Hole	B-5	District	Houston
Highway	Sam Houston	Structure	Bridge	Date	10/4/21
CSJ		Station		Grnd. Elev.	0.00 ft
		Offset		GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
-4			CLAY, soft, gray, sandy (CL) (CL)			20	47	29		-%200 = 64
				0	28	24				
5		5 (8) 7 (8)	CLAY, soft, multicolored, sandy (CH) (CH)			19	58	38		-%200 = 66
						16				
						19				
10		9 (8) 10 (8)								
-12			SAND, loose, gray, silty (SM)			20				-%200 = 15
						22				
15		4 (8) 8 (8)				25				
						21				
20		6 (8) 7 (8)								
						23				-%200 = 5
-23			SAND, slightly compact, gray, poorly graded w/ silt (SC-SM)							
25		10 (8) 13 (8)								
						24				
30		9 (8) 14 (8)								
35										
40										

Remarks: Free-water was encountered at a depth of about 14.7 ft and rose to a depth of about 10.3 ft after 15 minutes.  
The ground water elevation was not determined during the course of this boring.

Driller: Universal      Logger: Mustafa Salloom      Organization: Raba-Kistner, Inc.

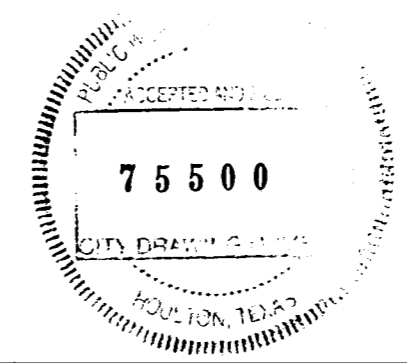
REV.	DATE	BY	DESCRIPTION



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

FORT BEND PARKWAY TOLL ROAD  
BORING LOGS

SHEET 6 OF 6	
PROJECT NUMBER	20219x
DESIGNED BY:	DATE: 6/30/2022
CHECKED BY:	
DRAWN BY:	SHEET NO.: 107F
CHECKED BY:	



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SUMMARY OF ESTIMATED QUANTITIES

ITEM NUMBER	416	420	422	425	450	450	454
DESCRIPTION CODE	6004	6013	6001	6038	6023	XXXX	6018
BRIDGE ELEMENT	DRILL SHAFT	CL C CONC	REINF CONC SLAB	PRESTR CONC GIRDER	RAIL	RAIL	SEALED EXPANSION JOINT
	(36 IN)	(ABUT)		(TX46)	(TY SSTR)	(TY SSTR)	(4 IN) (SEJ-M)
	LF	CY	SF	LF	LF	LF	LF
2 - ABUTMENTS	318	23.4					
1 - 105.00' PRESTR CONC I-GIRDER UNIT			2,774	418.00	105.0	105.0	50
TOTAL	318	23.4	2,774	418.00	105.0	105.0	50

BEARING SEAT ELEVATIONS

BENT 1	(FWD)	GIRDER 1 80.897	GIRDER 2 81.037	GIRDER 3 81.177	GIRDER 4 81.317
BENT 2	(BK)	GIRDER 1 79.957	GIRDER 2 80.097	GIRDER 3 80.237	GIRDER 4 80.377

REV.	DATE	BY	DESCRIPTION



5/27/2022

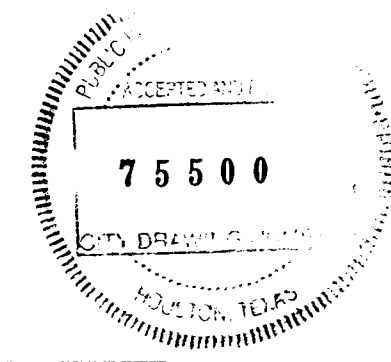


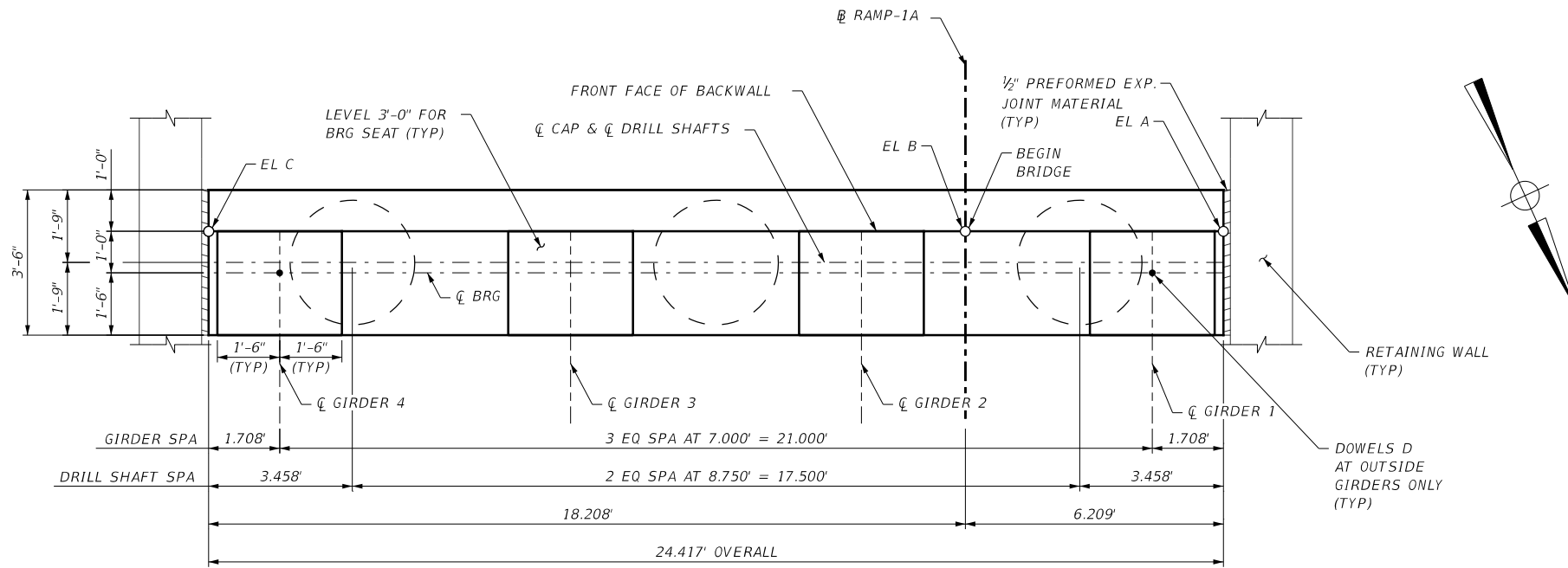
**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech** F-20607  
Advanced Infrastructure Group  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
ESTIMATED QUANTITIES  
AND BEARING SEAT ELEVATIONS**

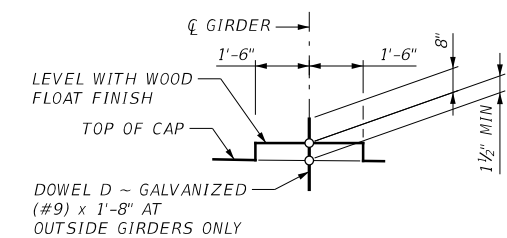
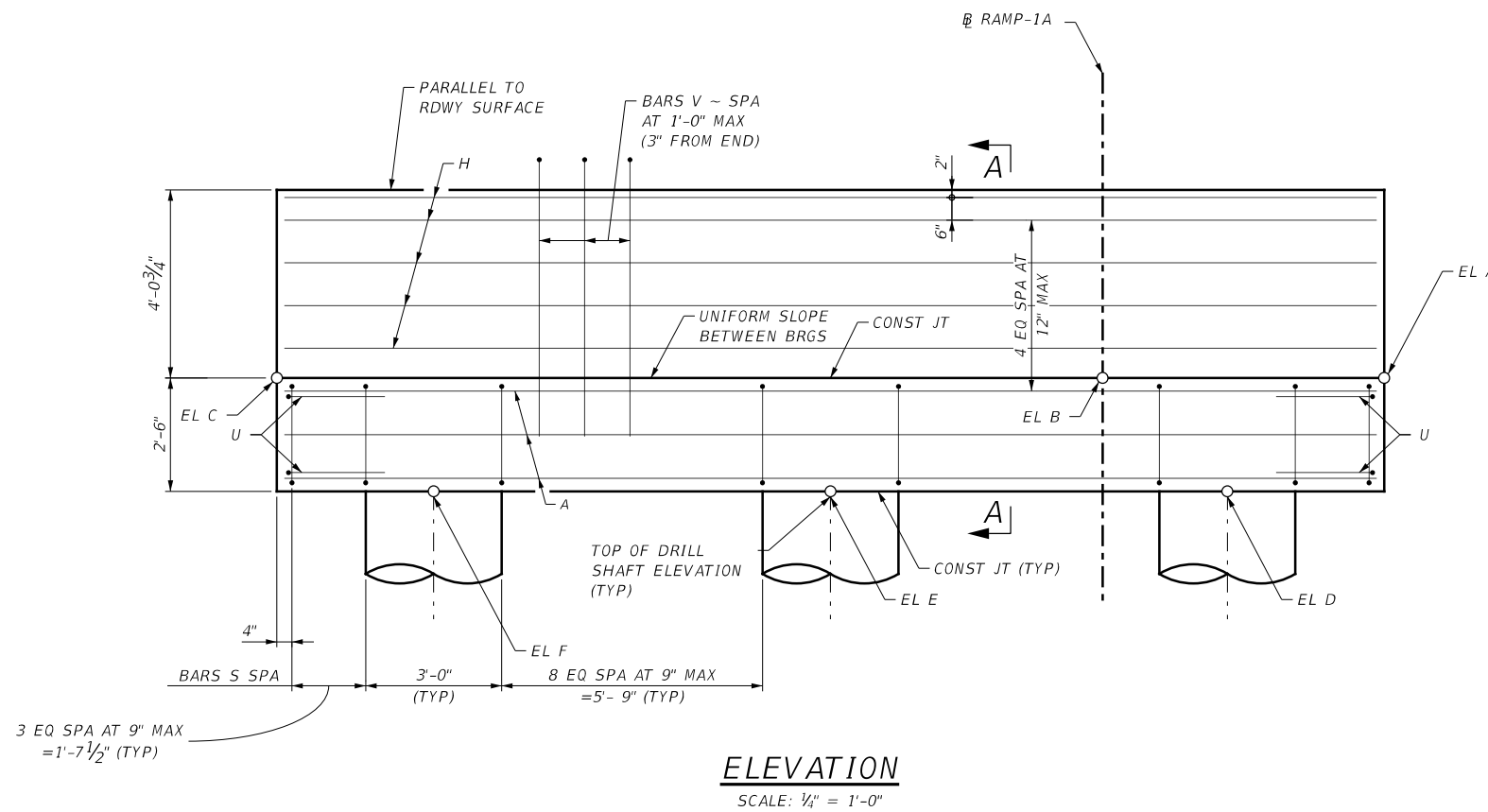
SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	4/20/2022
DESIGNED BY:	BG	CHECKED BY:	AV
CHECKED BY:	AV	DRAWN BY:	BG
DRAWN BY:	BG	CHECKED BY:	AV
CHECKED BY:	AV	SHEET NO.:	108





NOTES:

- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (HL93 LOADING) (8TH EDITION) AND MODIFIED BY THE TXDOT LRFD BRIDGE DESIGN MANUAL AND DETAILING GUIDE.
- SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE AND LENGTH.
- PROVIDE CLASS C CONCRETE ( $f'_c = 3,600$  psi).
- PROVIDE GRADE 60 REINFORCING STEEL.
- CALCULATED FOUNDATION LOAD = 105 TONS/ SHAFT.



CONTROL ELEVATIONS					
EL A	EL B	EL C	EL D	EL E	EL F
80.73	80.86	81.22	78.30	78.48	78.65

HL 93 LOADING

REV.	DATE	BY	DESCRIPTION



5/27/2022



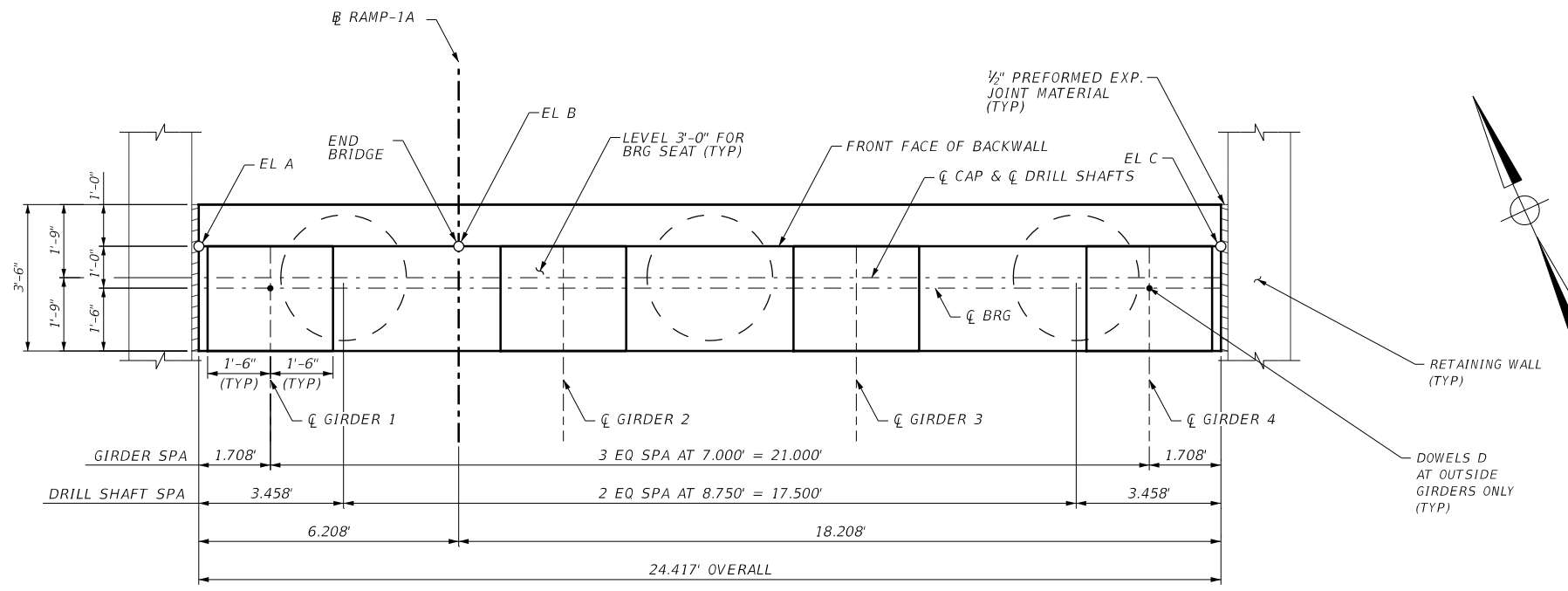
FORT BEND COUNTY  
TOLL ROAD AUTHORITY



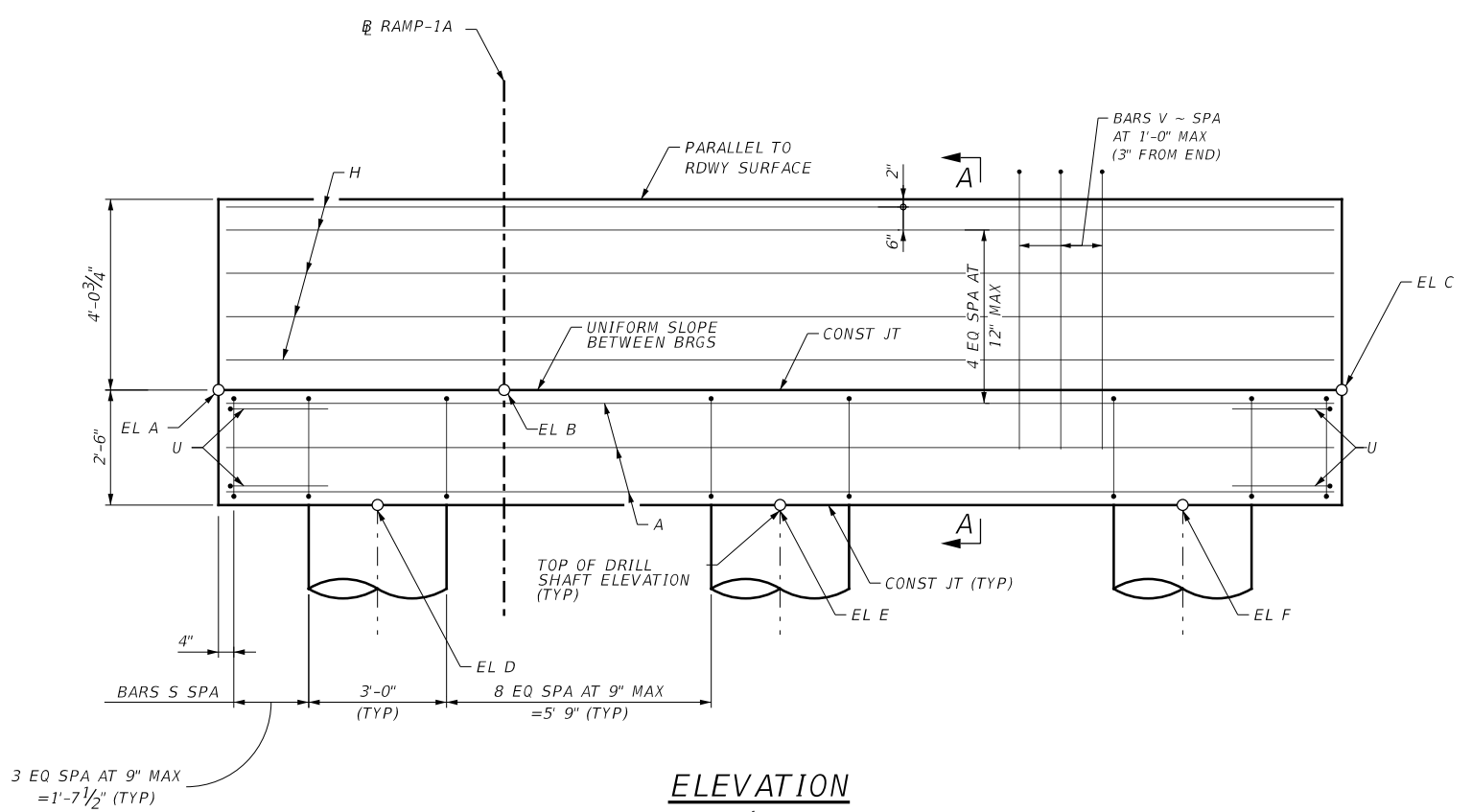
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
ABUTMENT 1  
PLAN AND ELEVATION

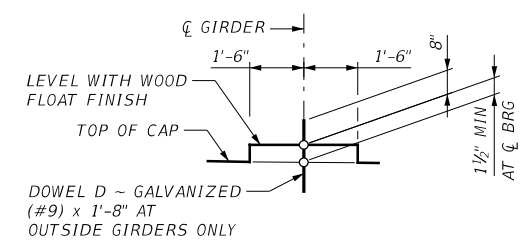
SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	4/20/2022
DESIGNED BY:	BG	CHECKED BY:	AV
CHECKED BY:	AV	DRAWN BY:	BG
DRAWN BY:	BG	CHECKED BY:	AV
SHEET NO.:		109	



**PLAN**  
SCALE: 1/4" = 1'-0"



**ELEVATION**  
SCALE: 1/4" = 1'-0"



**BEARING SEAT DETAIL**  
(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)

CONTROL ELEVATIONS					
EL A	EL B	EL C	EL D	EL E	EL F
79.79	79.92	80.28	77.36	77.54	77.71

**NOTES:**

- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (HL93 LOADING) (8TH EDITION) AND MODIFIED BY THE TXDOT LRFD BRIDGE DESIGN MANUAL AND DETAILING GUIDE.
- SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE AND LENGTH.
- PROVIDE CLASS C CONCRETE ( $f'_c = 3,600$  psi).
- PROVIDE GRADE 60 REINFORCING STEEL.
- CALCULATED FOUNDATION LOAD = 105 TONS/ SHAFT.

**HL 93 LOADING**

REV.	DATE	BY	DESCRIPTION



8/19/2022



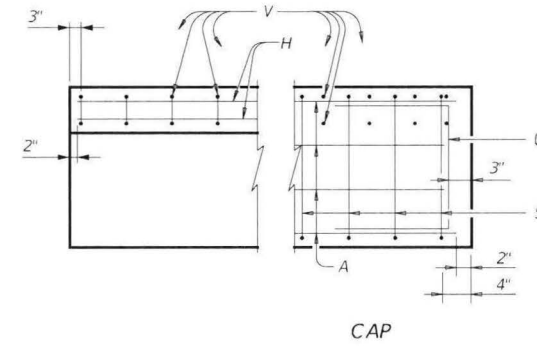
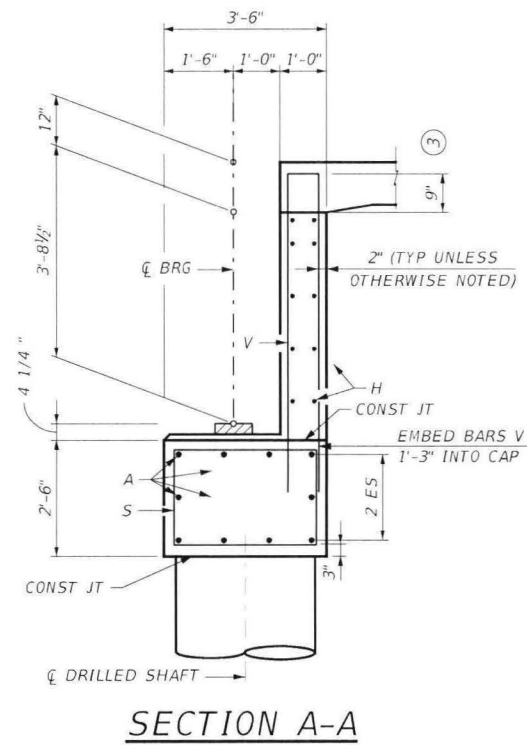
**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**



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1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

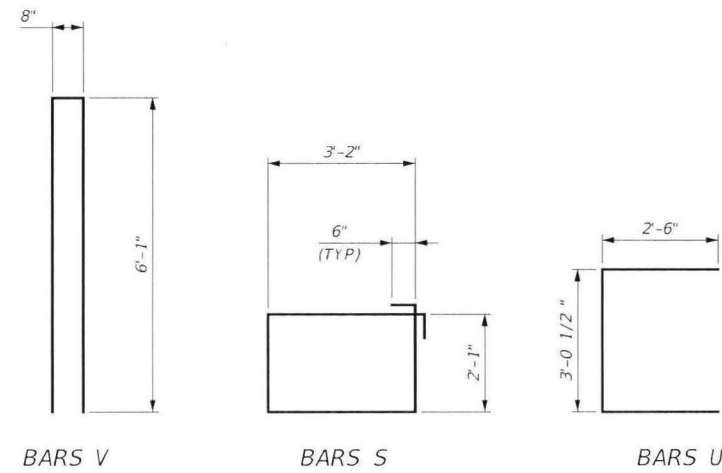
**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
ABUTMENT 2  
PLAN AND ELEVATION**

SHEET 1 OF 1			
PROJECT NUMBER	20219x	DATE:	8/19/2022
DESIGNED BY:	BG	CHECKED BY:	AV
CHECKED BY:	AV	DRAWN BY:	BG
DRAWN BY:	BG	SHEET NO.:	110
CHECKED BY:	AV		



**CORNER DETAILS**

N.T.S



**TABLE OF ESTIMATED QUANTITIES**

BAR	NO.	SIZE	LENGTH	WEIGHT
A	10	#11	24'-1"	1,280
D	2	#9	1'-8"	11
H	10	#6	24'-1"	362
S	26	#5	11'-6"	312
U	4	#6	8'-1"	49
V	25	#5	14'-4"	374
REINFORCING STEEL			LB	2,388
CL "C" CONC (ABUT)			CY	11.7

- ① QUANTITIES SHOWN ARE FOR ONE ABUTMENT ONLY.
- ② FOR CONTRACTOR'S INFORMATION ONLY.
- ③ INCREASE AS REQUIRED TO MAINTAIN 3" FROM FINISHED GRADE.
- ④ INCLUDE IN PRICE BID FOR DRILLED SHAFT.

COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.  
REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.

- 1. PROVIDE CLASS C CONCRETE ( $f_c = 3,600$  PSI)
- 2. PROVIDE GRADE 60 REINFORCEMENT STEEL
- 3. FOR DRILLED SHAFT REINFORCEMENT SEE STANDARD BRIDGE DRILLED SHAFT DETAILS HOUSTON DISTRICT

**HL 93 LOADING**

REV.	DATE	BY	DESCRIPTION



8/19/2022



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

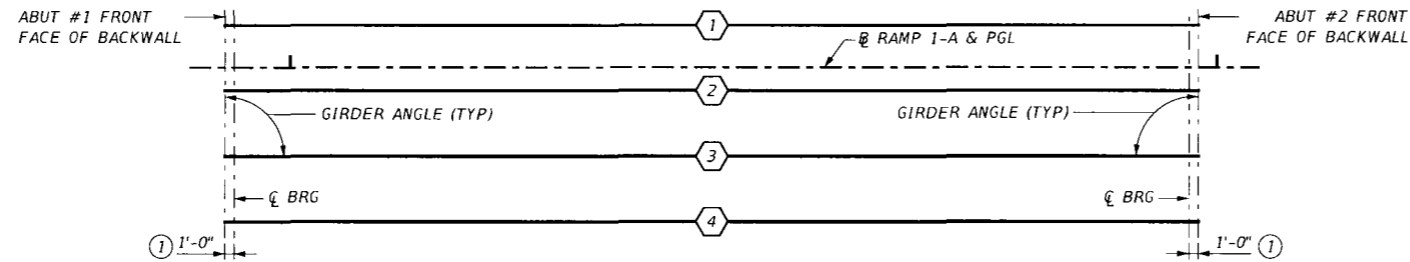
**AIG Tech** F-20607  
Advanced Infrastructure Group  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
ABUTMENT DETAILS**



SHEET 1 OF 1

PROJECT NUMBER	20219x	DATE:	8/19/2022
DESIGNED BY:	BG	CHECKED BY:	AV
CHECKED BY:	AV	DRAWN BY:	BG
DRAWN BY:	BG	CHECKED BY:	AV
SHEET NO.:		111	



**SPAN 1**  
(T x 46 GIRDERS)  
**FRAMING PLAN**

**BENT REPORT**

BENT NO. 1 (S 65 35 22.61 E)  
DISTANCE BETWEEN STATION LINE AND GIRDER 1, 4.500 L

SPAN	GIRDER	GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE		
			D	M	S
1	GIRDER 1	0.000	90	00	00
	GIRDER 2	7.000	90	00	00
	GIRDER 3	7.000	90	00	00
	GIRDER 4	7.000	90	00	00
	TOTAL	21.000			

BENT NO. 2 (S 65 35 22.61 E)  
DISTANCE BETWEEN STATION LINE AND GIRDER 1, 4.500 L

SPAN	GIRDER	GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE		
			D	M	S
1	GIRDER 1	0.000	90	00	00
	GIRDER 2	7.000	90	00	00
	GIRDER 3	7.000	90	00	00
	GIRDER 4	7.000	90	00	00
	TOTAL	21.000			

**GIRDER REPORT**

GIRDER REPORT, SPAN 1

GIRDER	HORIZONTAL DISTANCE	TRUE DISTANCE	GIRDER SLOPE
	C-C BENT	C-C BRG. BOT. GDR. FLG.	
GIRDER 1	105.000	103.000	-0.0091
GIRDER 2	105.000	103.000	-0.0091
GIRDER 3	105.000	103.000	-0.0091
GIRDER 4	105.000	103.000	-0.0091

- ① SEE ELASTOMERIC BEARING & GIRDER END DETAILS (IGEB) STANDARD SHEET FOR ORIENTATION OF DIMENSIONS.
- ② GIRDER LENGTHS SHOWN ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE.

**HL 93 LOADING**

REV.	DATE	BY	DESCRIPTION



5/27/2022



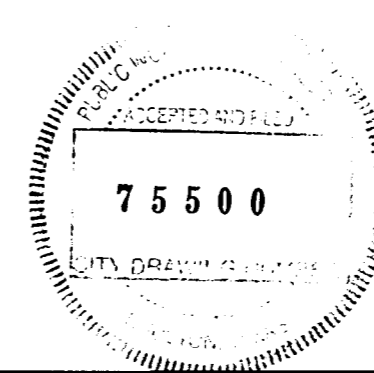
**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

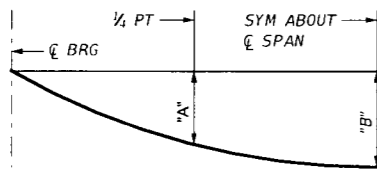
**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
FRAMING PLAN**

SHEET 1 OF 1

PROJECT NUMBER	20219x	DATE:	4/20/2022
DESIGNED BY:	BG	CHECKED BY:	AV
DRAWN BY:	BG	SHEET NO.:	112
CHECKED BY:	AV		



SPAN	GIRDER	"A"	"B"
		(FT)	(FT)
1	1 & 4	0.099	0.141
1	2 & 3	0.111	0.158



**DEAD LOAD DEFLECTION DIAGRAM**

CALCULATED DEFLECTIONS SHOWN ARE DUE TO THE CONCRETE SLAB ONLY ( $E_c = 5000$  ksi). ADJUST VALUES AS REQUIRED IF OPTIONAL SLAB FORMING IS USED. THESE VALUES ARE THEORETICAL AND MAY REQUIRE FIELD VERIFICATION.

**TABLE OF SECTION DEPTHS**

SPAN	GIRDER	"X" AT	"Y" AT	"Z" AT
		CL BRG	CL BRG	CL SPAN
1	1	10 1/2"	4' - 8 1/2"	10 1/2"
1	2 & 3	10 1/2"	4' - 8 1/2"	10 3/4"
1	4	10 1/2"	4' - 8 1/2"	10 3/8"

① THEORETICAL DIMENSION

**TABLE OF ESTIMATED QUANTITIES**

SPAN	REINF CONC SLAB (CL S)	PRESTRESSED CONC GIRDERS	REINFORCING STEEL
		(TY T x 46)	(LB)
NO.	(SF)	(LF)	(LB)
1	2,774	418.00	6,380
TOTAL	2,774	418.00	6,380

② REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 LBS/SF OF SLAB, FOR CONTRACTOR'S INFORMATION ONLY. NO DIRECT PAYMENT.

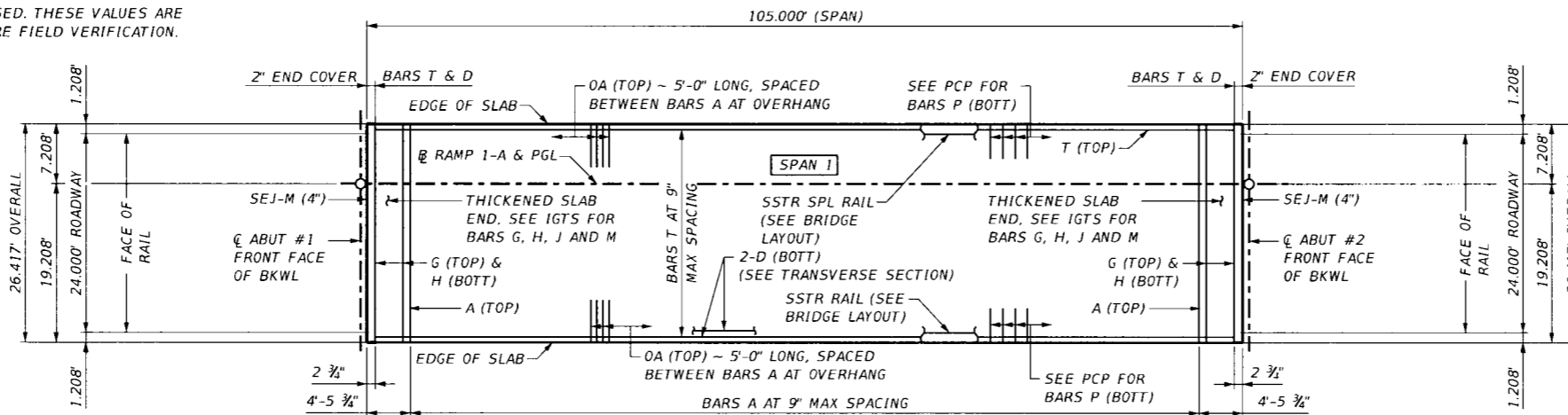
**NOTES:**

- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (HL93 LOADING) (8TH EDITION) AND MODIFIED BY THE TXDOT LRFD BRIDGE DESIGN MANUAL AND DETAILING GUIDE.
- SEE PRESTRESSED CONCRETE PANELS (PCP) AND PRESTRESSED CONCRETE PANEL FABRICATION DETAILS (PCP-FAB) STANDARD SHEETS FOR PANEL DETAILS NOT SHOWN.
- SEE THICKENED SLAB END DETAILS (IGTS) STANDARD SHEET FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.
- SEE MISCELLANEOUS SLAB DETAILS (IGMS) STANDARD SHEET FOR MISCELLANEOUS DETAILS.
- SEE RAILING STANDARDS SHEETS FOR RAIL ANCHORAGE IN SLAB.
- PROVIDE CLASS 5 CONCRETE ( $f'_c = 4,000$  psi).
- PROVIDE GRADE 60 REINFORCEMENT STEEL.
- PROVIDE BAR LAPS, WHERE REQUIRED, AS FOLLOWS:  
UNCOATED ~ #4 = 1'-7"

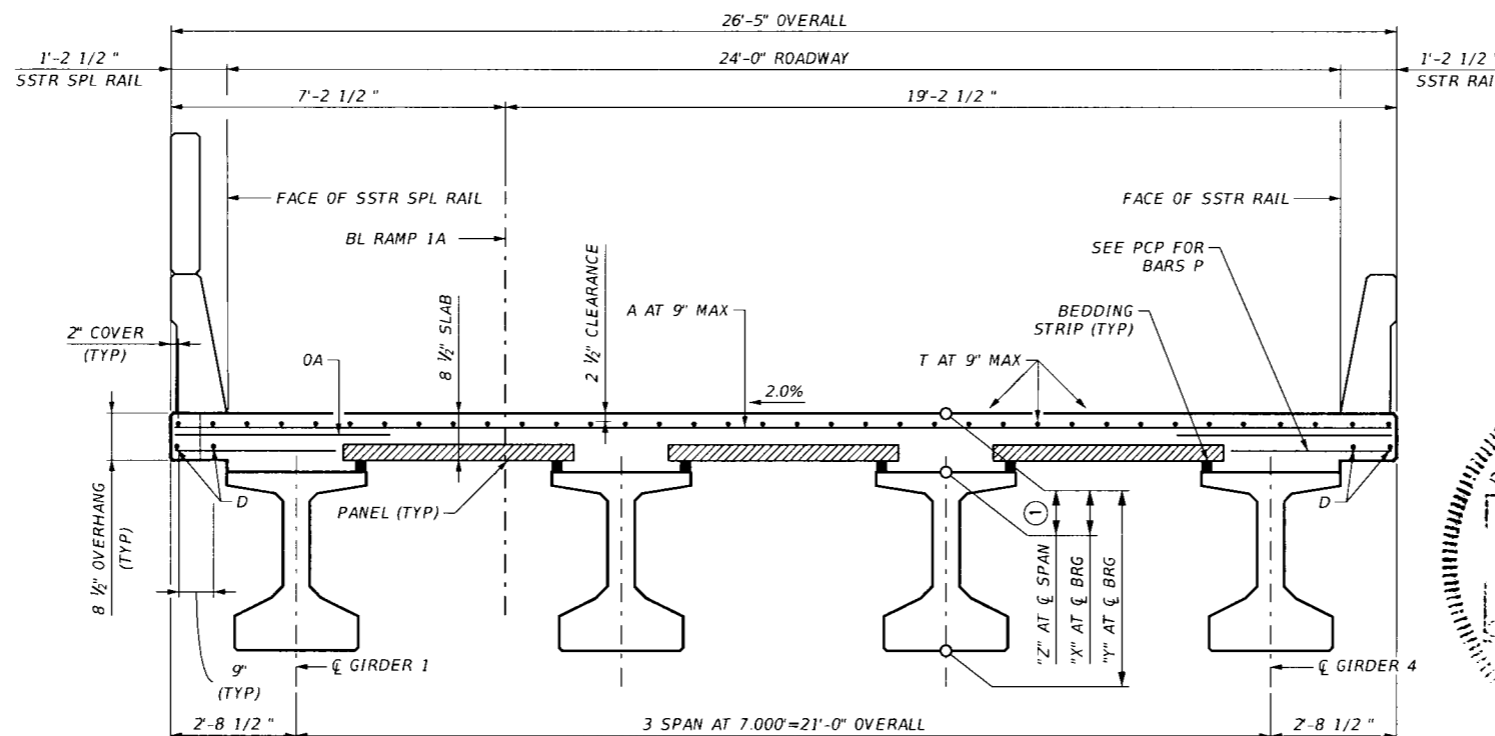
COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.

**BAR TABLE**

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4



**PLAN (T x 46 GIRDERS)**



**TYPICAL TRANSVERSE SECTION (T x 46 GIRDERS)**

**HL 93 LOADING**

REV.	DATE	BY	DESCRIPTION

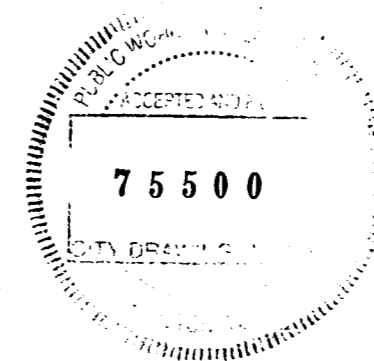


5/27/2022



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

AIG TECHNICAL SERVICES, LLC F-20607  
**AIG Tech**  
 Advanced Infrastructure Group  
 1500 S DAIRY ASHFORD SUITE 445  
 HOUSTON, TX 77077



**FORT BEND PARKWAY TOLL ROAD ENTRANCE RAMP 1A SLAB DETAILS**

SHEET 1 OF 1

PROJECT NUMBER	20219x	DATE:	5/26/2022
DESIGNED BY:	BG	CHECKED BY:	AV
CHECKED BY:	AV	DRAWN BY:	BG
DRAWN BY:	BG	CHECKED BY:	AV
SHEET NO.:		113	

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DATE: FILE:

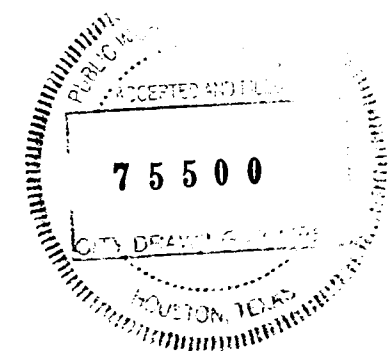
STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN				
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					NO.	TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP (€)) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOT (€)) (SERVICE III) fct(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" (in)								"e" END (in)	Moment	Shear
RAMP 1A	1	1-4	Tx46		38	0.6	270	15.81	10.13	6	42.5	5.300	6.200	4.098	-4.036	6121	0.569	0.743

NON-STANDARD STRAND PATTERNS	
PATTERN	STRAND ARRANGEMENT AT € OF GIRDER

- (1) Based on the following allowable stresses (ksi):  
 Compression = 0.65 f'ci  
 Tension = 0.24 √f'ci  
 Optional designs must likewise conform.
- (2) Portion of full HL93.

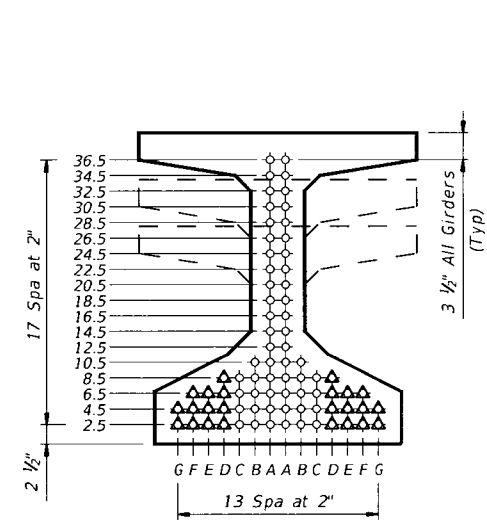
**DESIGN NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.  
 Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

**FABRICATION NOTES:**  
 Provide Class H concrete.  
 Provide Grade 60 reinforcing steel bars.  
 Use low relaxation strands, each pretensioned to 75 percent of fpu.  
 Strand debonding must comply with Item 424.4.2.2.4. Full-length debonded strands are only permitted in positions marked Δ. Double wrap full-length debonded strands in outer most position of each row.  
 When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas. Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

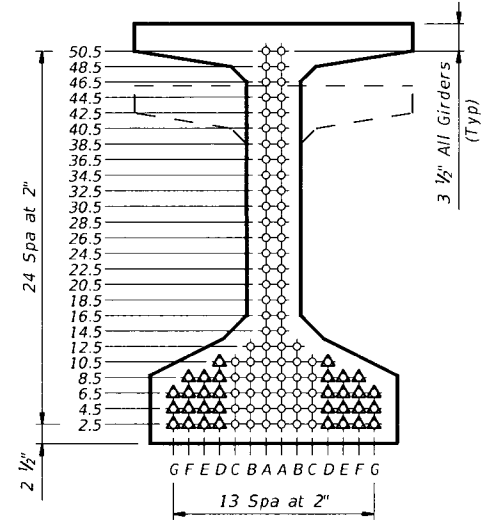


**DEPRESSED STRAND DESIGNS:**  
 Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.

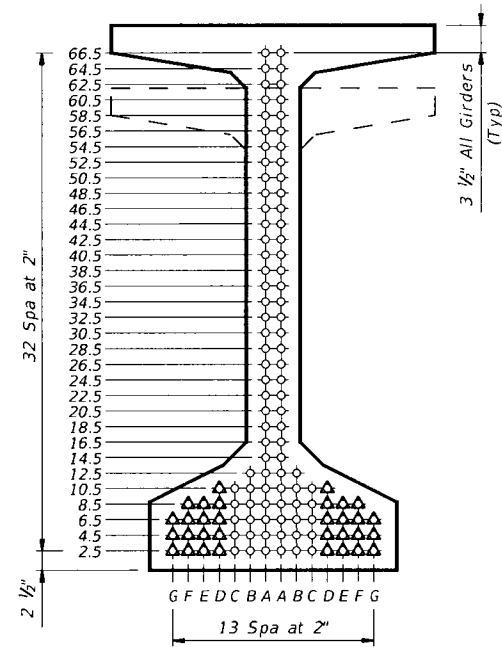
To complete this sheet input the girder designs in the table and the relative humidity under Design Notes. In all cases, remove this block. This sheet must be signed, sealed, and dated by a registered Professional Engineer.



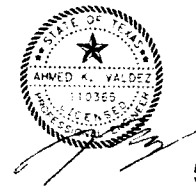
TYPE Tx28, Tx34 & Tx40



TYPE Tx46 & Tx54



TYPE Tx62 & Tx70



5/27/2022

AIG TECHNICAL SERVICES, LLC F-20607  
 1500 S DAIRY ASHWOOD  
 SUITE 445  
 HOUSTON, TX 77077

HL93 LOADING

Texas Department of Transportation Bridge Division Standard

**PRESTRESSED CONCRETE I-GIRDER DESIGNS (NON-STANDARD SPANS)**

IGND

FILE: 08\_2019X\_FBC\_igndstst1-19.dgn DW: TxDOT CK: TxDOT DW: EFC CK: TAR

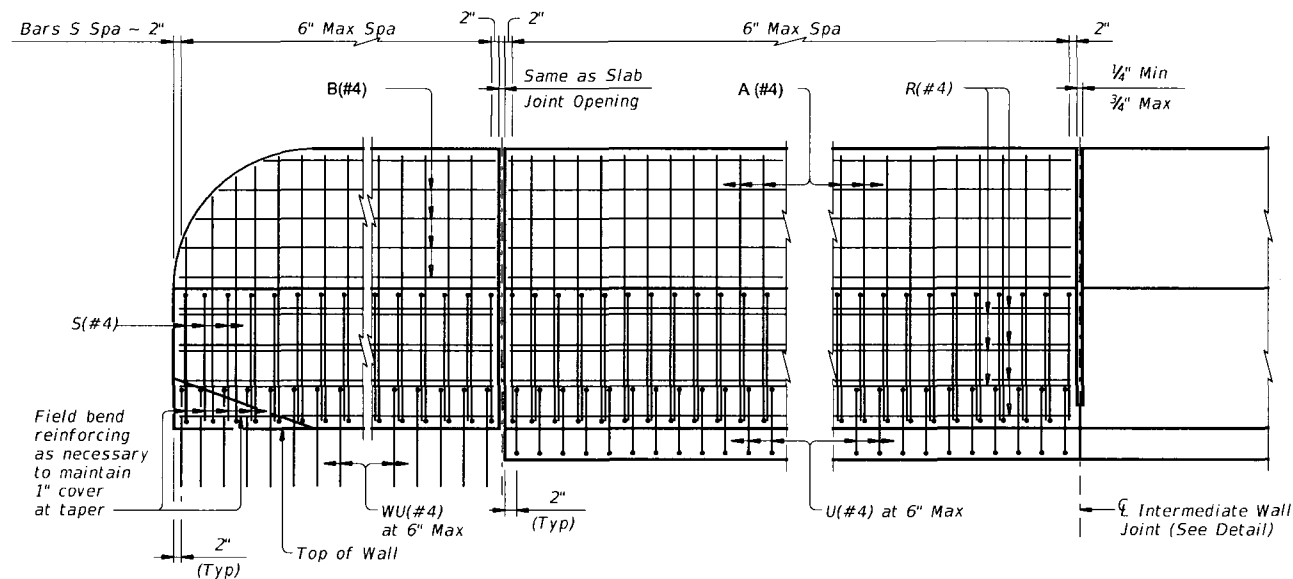
REVISIONS: AUGUST 2017

10-19 Modified for depressed strands only.

SHEET NO. 114

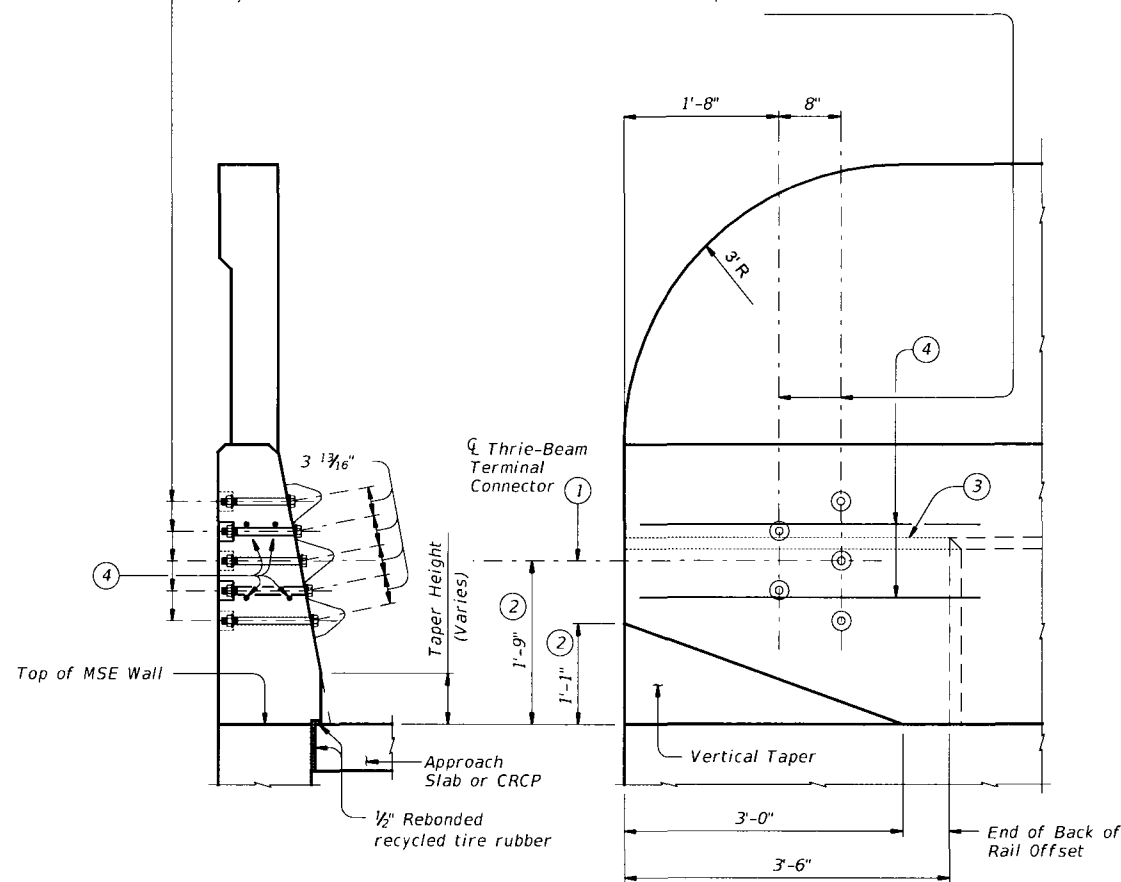
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DATE: FILE:

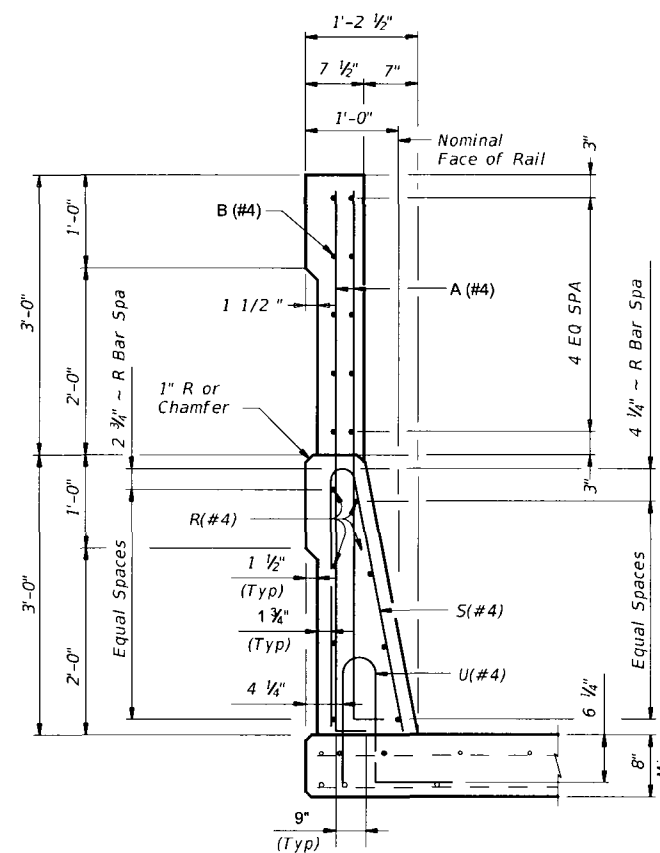


**ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT**

5 - 1" Dia holes and 2 1/2" Dia x 2" deep recesses. Form or core holes and recesses. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes and recesses. Tighten the 5 Terminal Connection Bolts in a well distributed pattern so to prevent damage or distortion of the Thrie-Beam Connection and the MBGF Transition. Cut bolts off after installation so as to extend no more than 3/4" beyond nut. Paint ends of cut-off bolts with Zinc-rich paint.

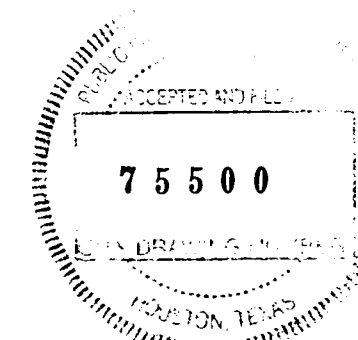


**SECTION ELEVATION**  
**TERMINAL CONNECTION DETAILS**



**SECTIONS THRU RAIL**

For connection details to MSE wall see SSTR standard



- 1 Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- 2 Increase 2" for structures with Overlay.
- 3 Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
- 4 Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required.

For additional material, general, and construction notes, refer to SSTR standard.

SHEET 1 OF 1

Texas Department of Transportation		Bridge Division Standard	
<b>TRAFFIC RAIL SINGLE SLOPE</b>			
<b>SPECIAL TYPE SSTR</b>			
FILE: r1std014-19.dgn	DN: TxDOT	CK: TxDOT	DR: JTR
©TxDOT September 2019	CONF SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO.
			<b>115</b>

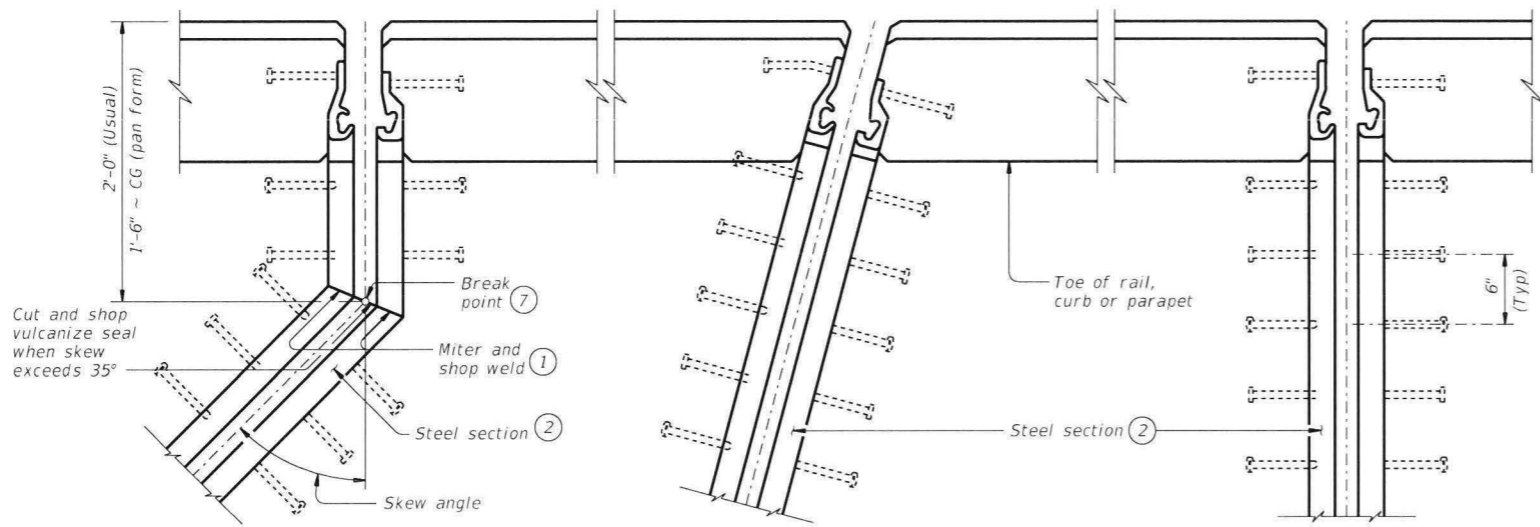


**AIG Tech**  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHWOOD  
SUITE 445  
HOUSTON, TX 77077

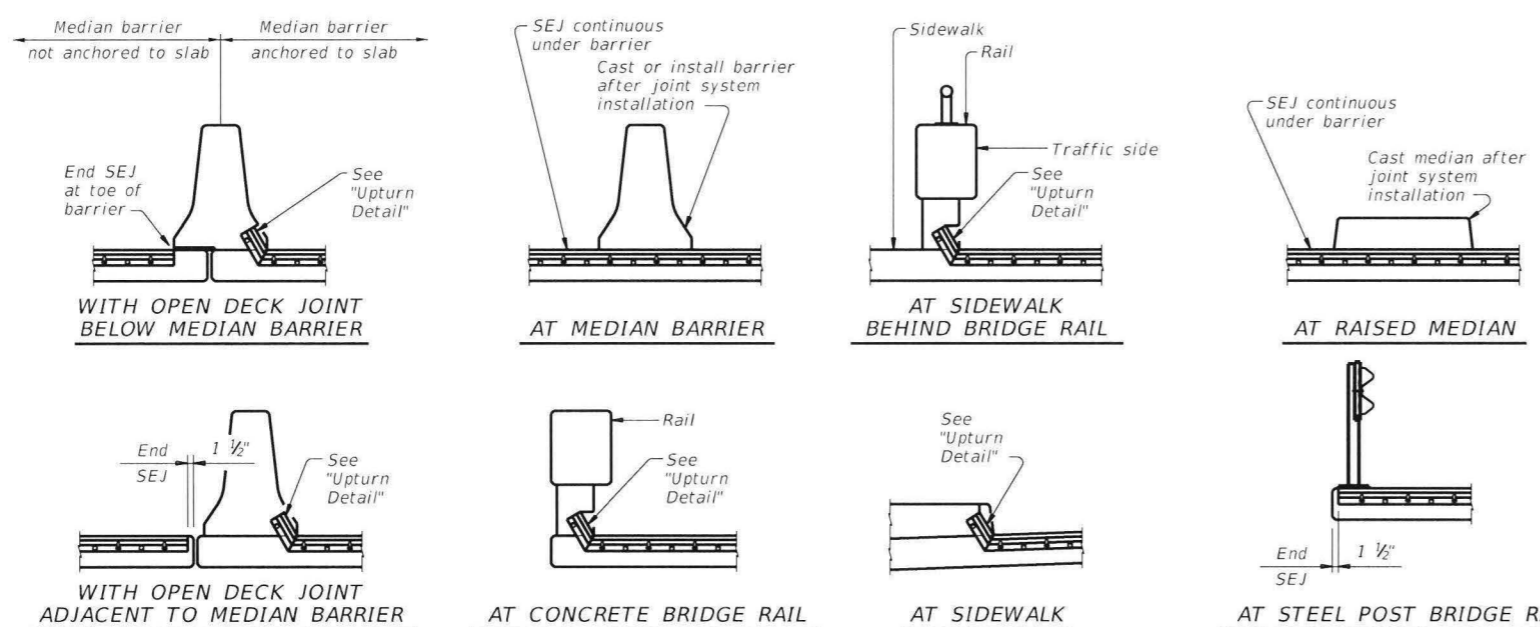


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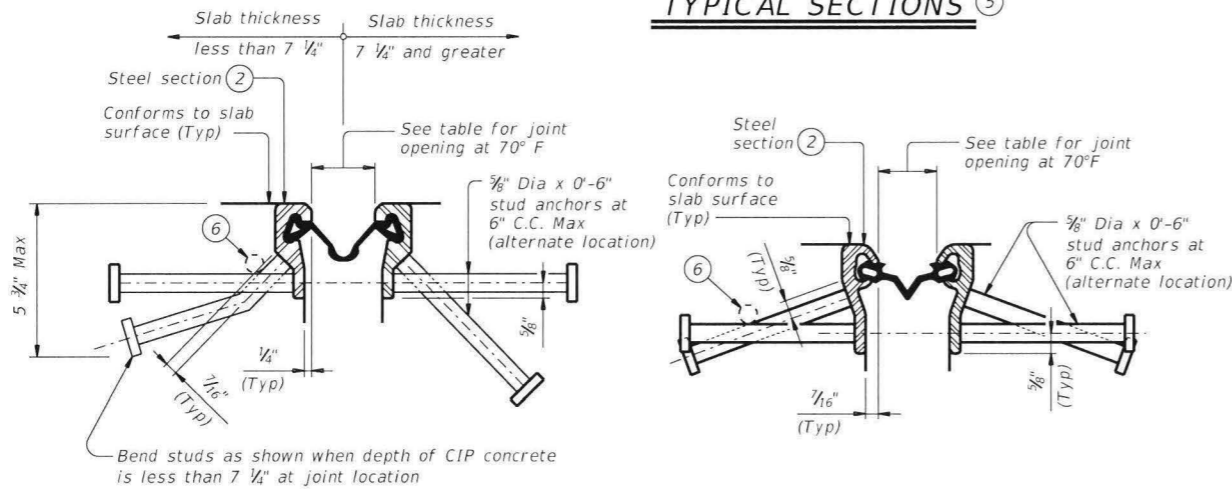
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**PLANS OF END CONDITIONS**

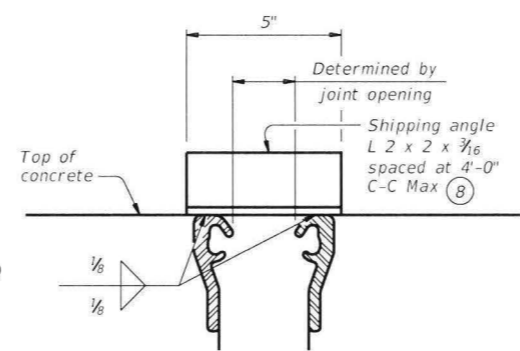


**TYPICAL SECTIONS**



**SECTION THRU WATSON BOWMAN ACME (SE-400 OR SE-500) JOINTS**

**SECTION THRU D.S. BROWN (A2R-400 OR A2R-XTRA) JOINTS**



**SHOWING D.S. BROWN (Ty SSCM2)**  
(All joints are similar.) (Studs are not shown for clarity.)

**SHIPPING ANGLE**

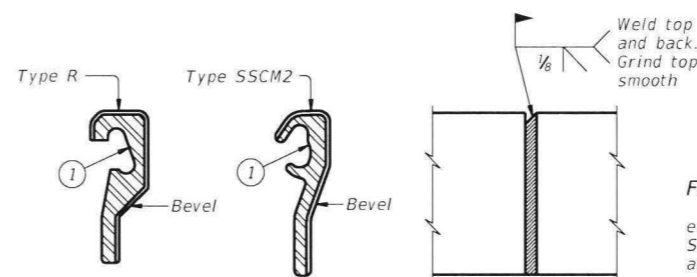
An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

TABLE OF SEALED EXPANSION JOINT INFORMATION					
MANUFACTURER	STEEL SECTION ②	STRIP SEAL			
		4" JOINT		5" JOINT	
		Seal Type	Joint Opening ③	Seal Type	Joint Opening ③
D.S. Brown	Type SSCM2	A2R-400	1 3/4"	A2R-XTRA	2"
Watson Bowman Acme	Type R	SE-400	1 3/4"	SE-500	2"

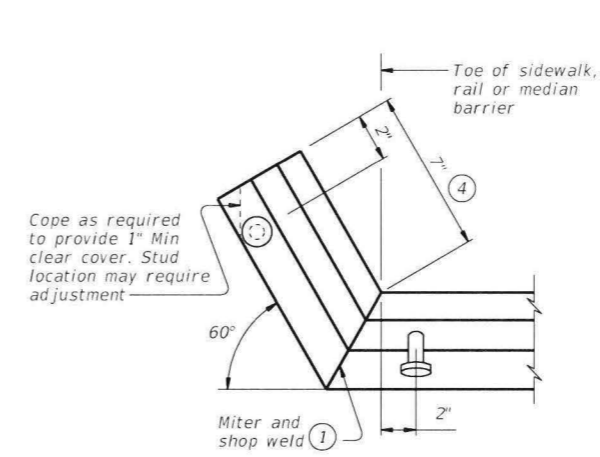
SKEW (deg)	JOINT SIZE	
	4"	5"
0	4.0"	5.0"
15	4.0"	5.0"
30	3.5"	4.3"
45	2.8"	3.5"

**DESIGN NOTES:**  
Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations. For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).

- Remove all burrs which will be in contact with seal prior to making splice.
- Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.
- These openings are also the recommended minimum installation openings.
- Reduce for sidewalk or parapet heights less than 6".
- Other conditions affecting the joint profile should be noted elsewhere.
- Move transverse bars that are in conflict with SEJ studs, in either the bridge slab or approach slab, to rest at the junction of the studs.
- See Span details for location of break point.
- Align shipping angle perpendicular to joint.



**FIELD SPLICE DETAIL**



**UPTURN DETAIL**

**FABRICATION NOTES:**

Temporarily shop assemble corresponding sections of sealed expansion joints (SEJ), check for fit, and match mark for shipment. Secure corresponding sections together for shipment with shipping angle. Do not use erection bolts.  
The seal must be continuous and included in the price bid for sealed expansion joint.  
Ship steel sections in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for staged construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.  
Weld studs in accordance with AWS D1.1.  
Butt weld all shop and field splices and grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.  
Paint the entire steel section with System II or IV primer in accordance with Item 446, "Feild Cleaning and Painting Steel", unless required to galvanize when shown in the plans. Provide galvanizing in accordance with Item 445, "Galvanizing". Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Item 446.4.7.3 and 446.4.7.4.  
Shop drawings for the fabrication of sealed expansion joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

**CONSTRUCTION NOTES:**

Secure the sealed expansion joint in position and place to the proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for sealed expansion joint.  
Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.  
Clean and prepare seal cavity for seal installation as per the Manufacturer's installation procedures.

**GENERAL NOTES:**

Provide sealed expansion joints in the size and at locations shown on the plans.  
Minimum slab and overhang thickness required for the use of SEJ-M is 6 1/2".



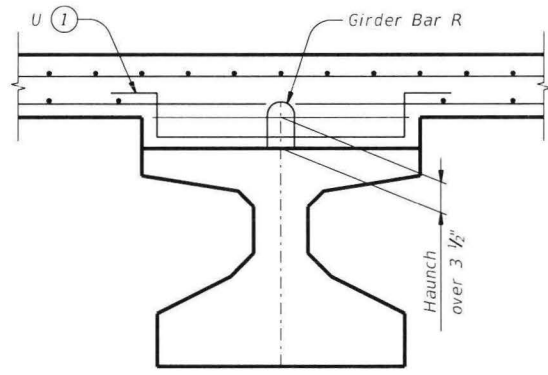
**Texas Department of Transportation** Bridge Division Standard

**SEALED EXPANSION JOINT TYPE M WITHOUT OVERLAY**

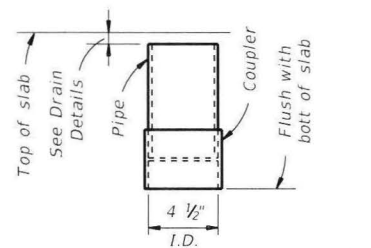
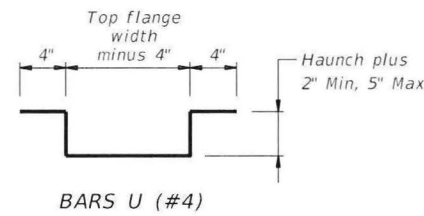
**SEJ-M**

FILE: sejmstel-19.dgn	DN: TxDOT	CK: TxDOT	DR: JTR	CR: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS				
DIST	COUNTY	SHEET NO.		
HOU	FORT BEND	116		

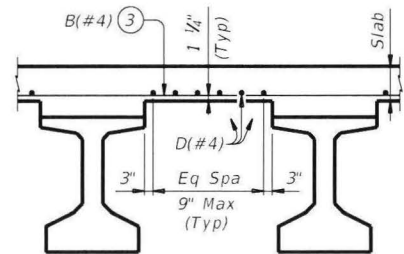
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**HAUNCH REINFORCING DETAIL**

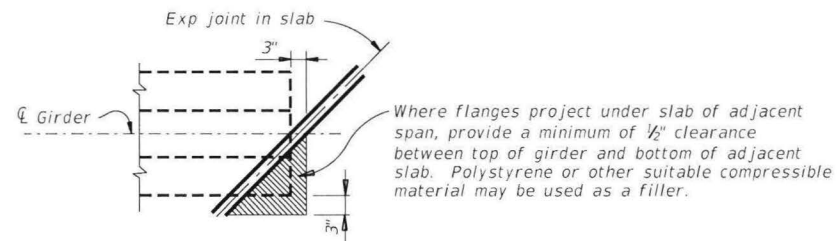


**C-I-P DRAIN DETAIL (2)**

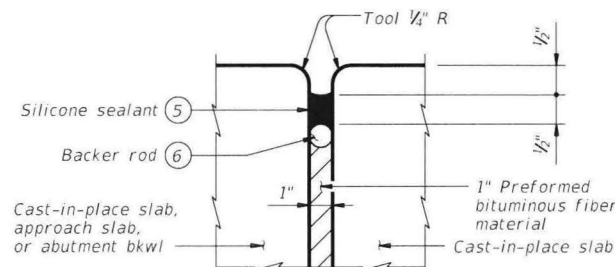


**TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP (4)**

Top reinforcing steel not shown for clarity.

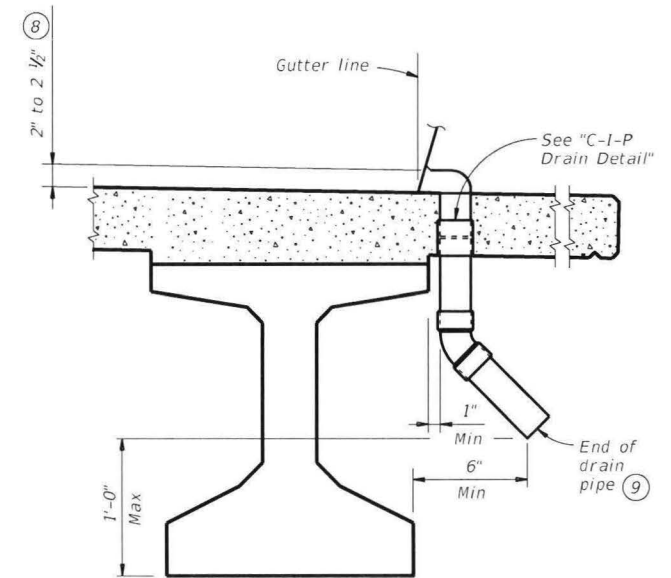


**TREATMENT AT GIRDER END FOR SKEWED SPANS**



**TYPE A JOINT DETAIL (7)**

- (1) Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 1/2".
- (2) Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.
- (3) Bars B(#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#4) at centerline outside girder.
- (4) Provide Grade 60 reinforcing steel. Provide bar laps, where required, as follows:  
Uncoated - #4 = 1'-7"  
Epoxy coated - #4 = 2'-5"
- (5) Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.
- (6) 1 1/4" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.
- (7) The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.
- (8) Drain entrance formed in rail or sidewalk.
- (9) Water may not be discharged onto girders.
- (10) All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railways, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.



**DRAIN DETAIL (10)**

**GENERAL NOTES:**  
Designed according to AASHTO LRFD Bridge Design Specifications.  
Payment for Type A joint will be as per Item 454, "Bridge Expansion Joints."  
All other items (reinforcing steel, drains, etc.) shown on this sheet are subsidiary to other bid items.

Cover dimensions are clear dimensions, unless noted otherwise.  
Reinforcing bar dimensions shown are out-to-out of bar.

**DECK FORMWORK NOTES:**  
Overhang bracket hangers are limited to a safe working load of 3,600 lbs, applied to and along the axis of a coil rod at 45 degrees from vertical, regardless of higher loads permitted by hanger manufacturers. Do not place a hanger less than 12" from girder end. Space hangers accordingly.

SHEET 1 OF 2

Texas Department of Transportation  
Bridge Division Standard

MISCELLANEOUS  
SLAB DETAILS  
PRESTR CONCRETE I-GIRDERS

IGMS

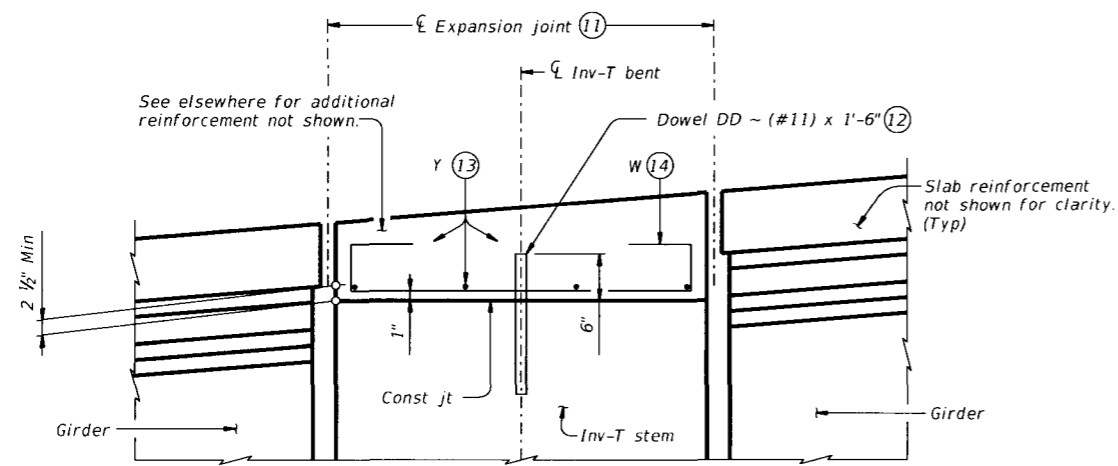
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August 2017	CONF	SECT	JOB	HIGHWAY
10-19: Modified Note 7, Type A now a pay item.	DIST	COUNTY	SHEET NO:	
	HOU	FORT BEND	117	



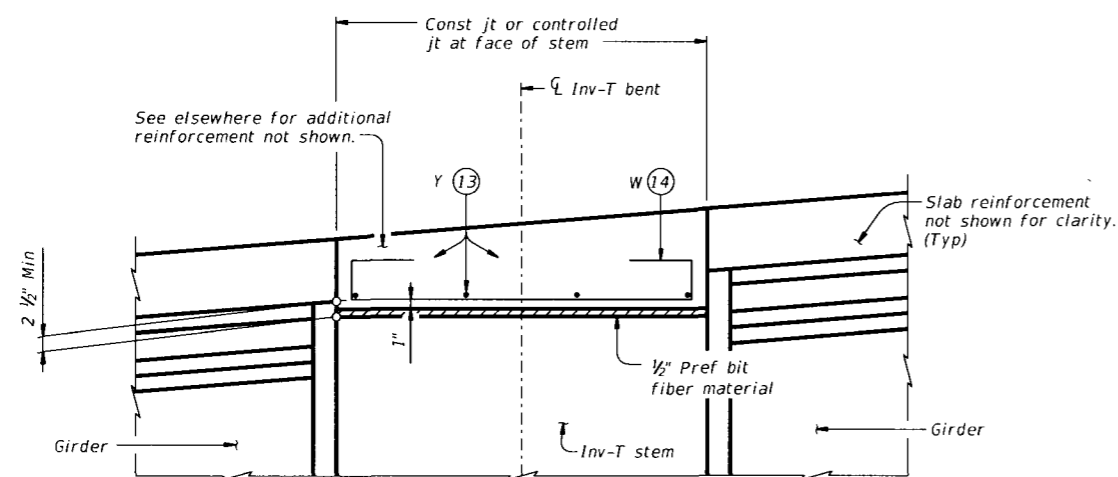
DATE:  
FILE:

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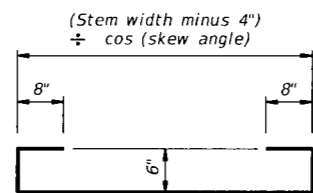
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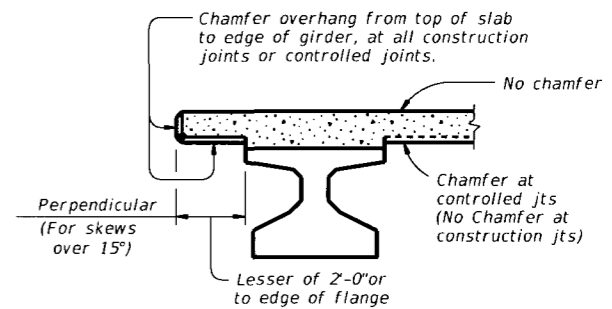
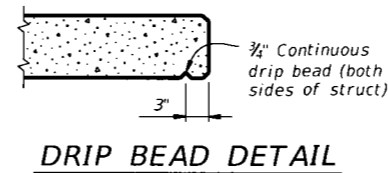
**SHOWING EXPANSION JOINTS**



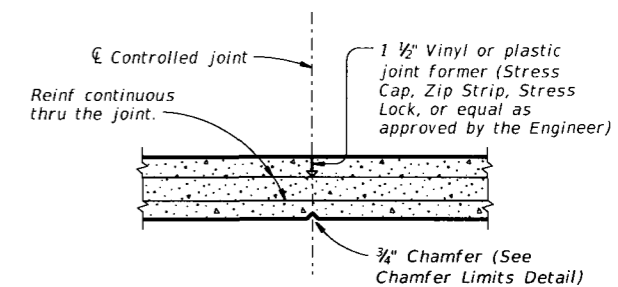
**SHOWING CONST JTS OR CONTROLLED JTS  
REINFORCEMENT OVER INV-T BENTS**



**BARS W (#4)**

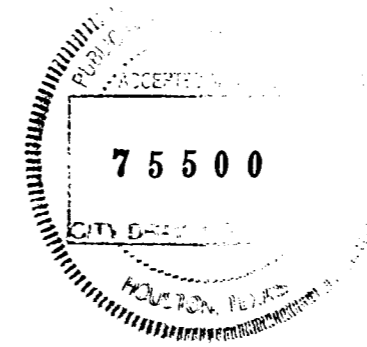


**CHAMFER LIMITS DETAIL (15)**



**CONTROLLED JOINT DETAIL  
(Saw-cutting is not allowed)**

- (11) See Layout for joint type.
- (12) Dowels DD (#11) spaced at 5 Ft Max. See Inv-T bents for quantity and location.
- (13) Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.
- (14) Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.
- (15) See Span details for type of joint and joint locations.

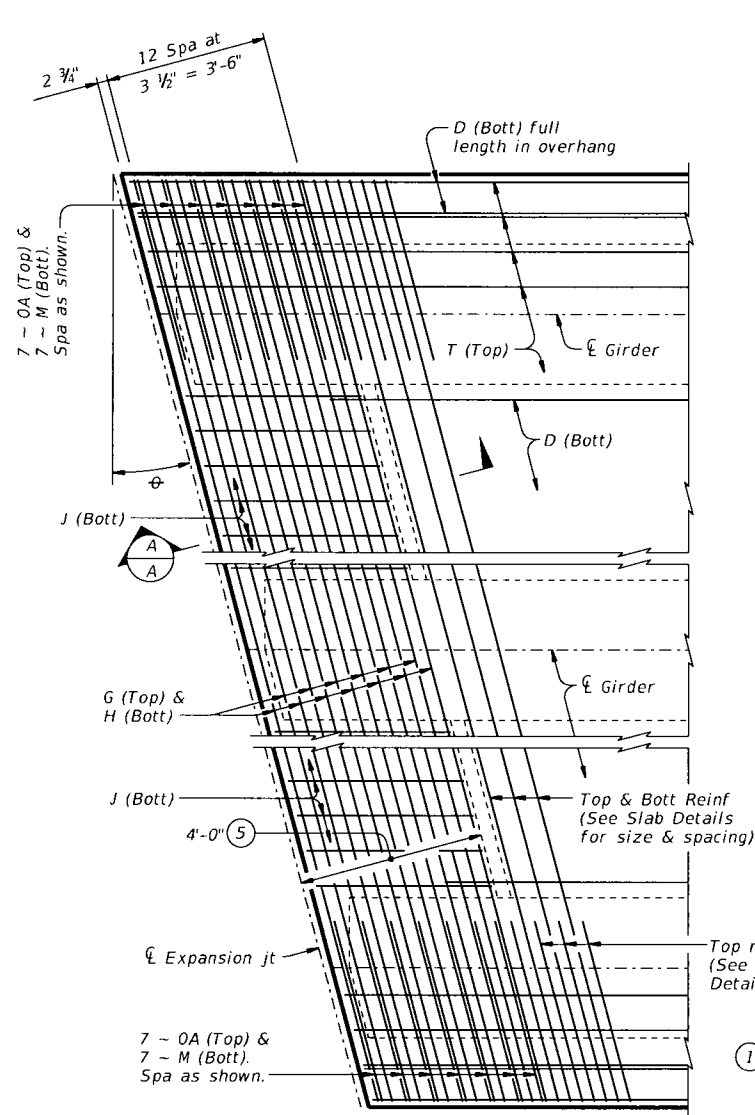


SHEET 2 OF 2

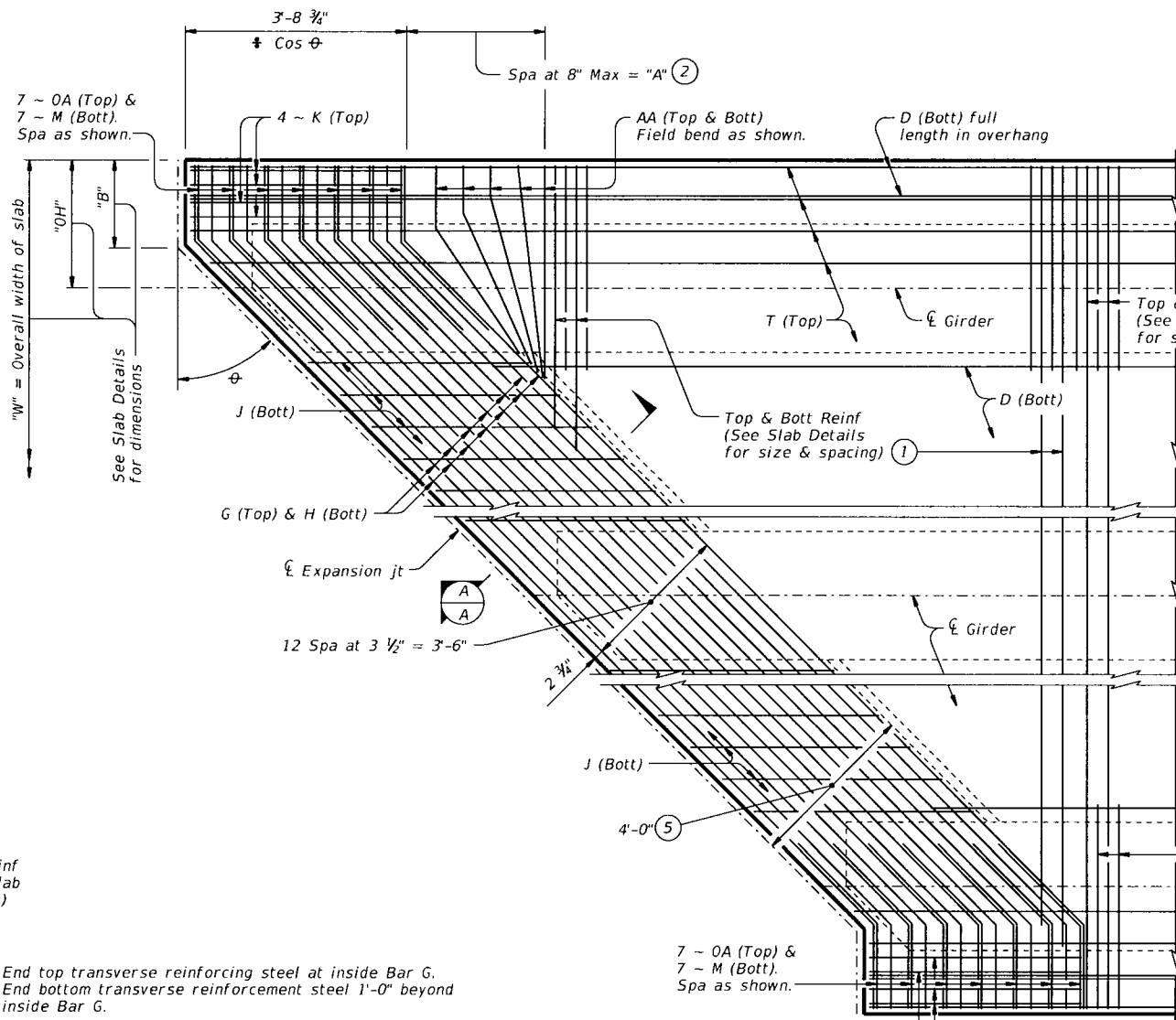
		Bridge Division Standard	
<b>MISCELLANEOUS SLAB DETAILS PRESTR CONCRETE I-GIRDERS</b>			
<b>IGMS</b>			
FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT August 2017	CONT	SECT	JOB HIGHWAY
REVISIONS			
10-19: Modified Note 7, Type A now a pay item.	DIST	COUNTY	SHEET NO
HOU	FORT BEND		118

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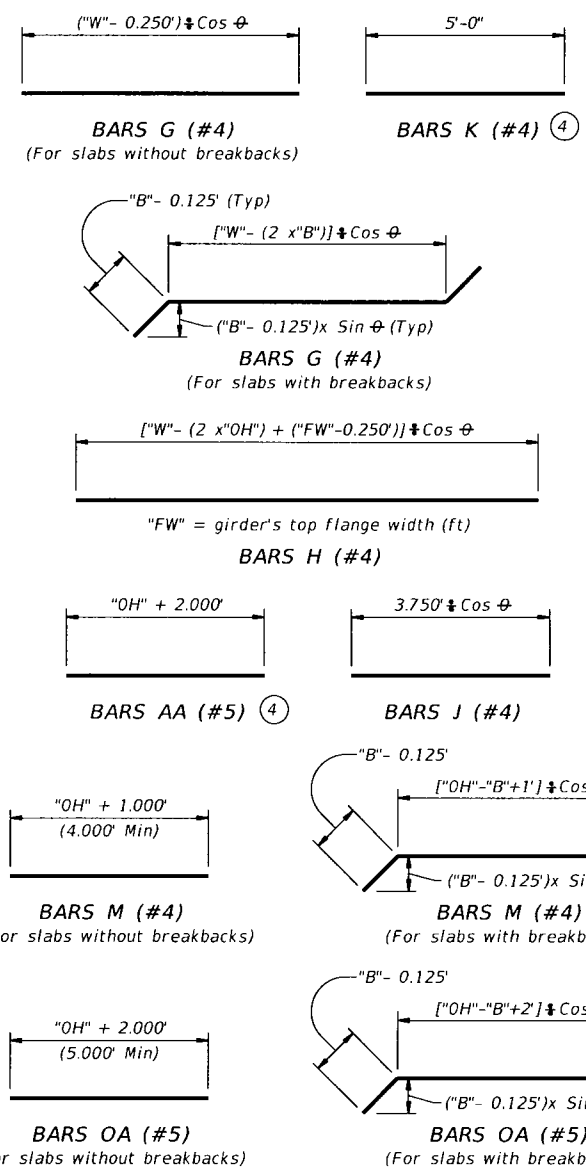
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**PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK**



**PARTIAL PLAN FOR SLABS WITH BREAKBACK**

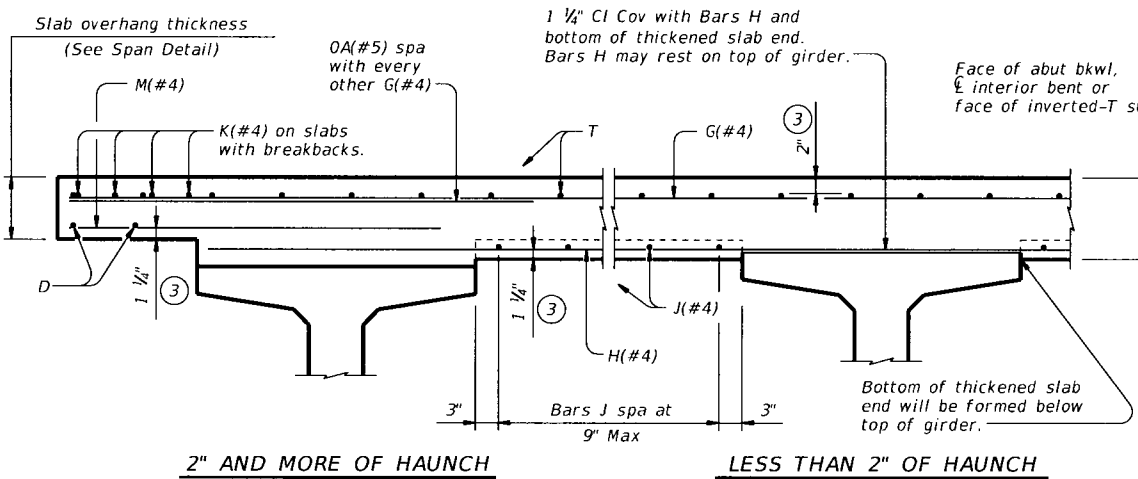


- ① End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
- ② "A" = ("OH" + 2.333 "B") x Tan phi
- ③ Provide clear cover as indicated unless otherwise shown on Span Details.
- ④ Only required on slabs with breakbacks.
- ⑤ Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.

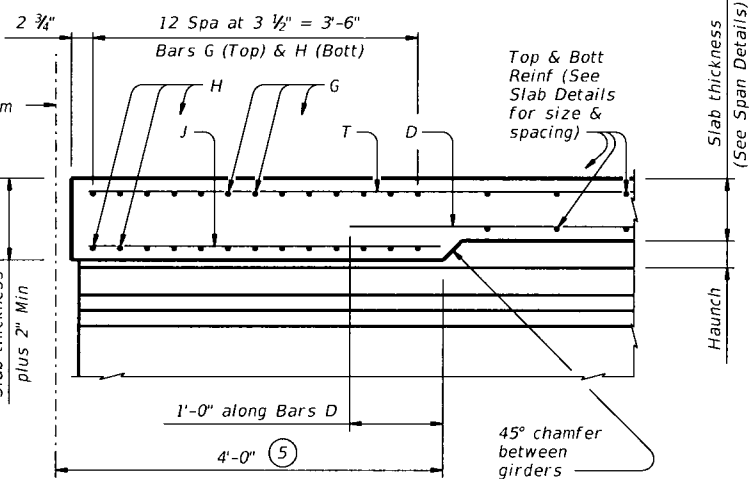
**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. These details are restricted to Prestressed Concrete I-Girder Spans. These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used). When Option 2 from PCP standard is used, provide Bars AA, G, K and OA in the slab.

**MATERIAL NOTES:**  
 Provide Grade 60 reinforcing steel. If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and OA must be epoxy coated. Provide bar laps, where required, as follows:  
 Uncoated - #4 = 1'-7"  
 Epoxy Coated - #4 = 2'-5"

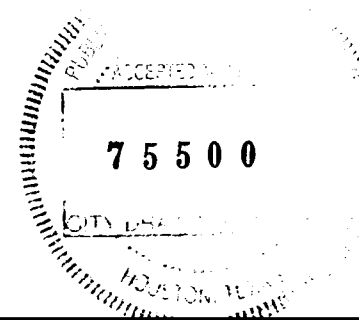
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



**TYPICAL TRANSVERSE SECTION**  
 (Showing Prestressed Conc I-Girders at C Brg)



**SECTION A-A**  
 (Showing with 2" and more of haunch)



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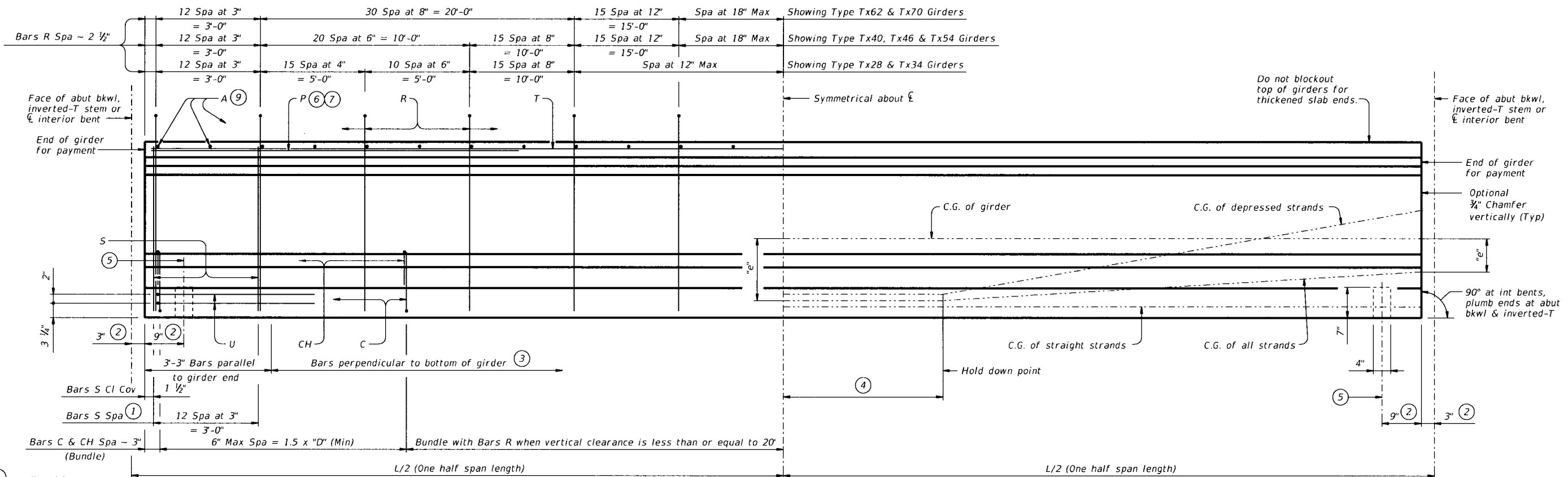
**THICKENED SLAB END DETAILS**  
 PRESTRESSED CONCRETE I-GIRDER SPANS

IGTS

FILE: igtstsl-17.dgn	DN: TxDOT	CK: TxDOT	OW: JTR	CK: TxDOT
©TxDOT August 2017	CONT SECT	JOB	HIGHWAY	
REVISIONS	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	119	

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DATE: FILE:



- ① Bundle with Bars R.
- ② Measured along  $\bar{C}$  Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.
- ③ The average of the top and bottom spacing of Bars R cannot exceed the required spacing.
- ④ L/20, but not less than 5'-0" (-0,+2").

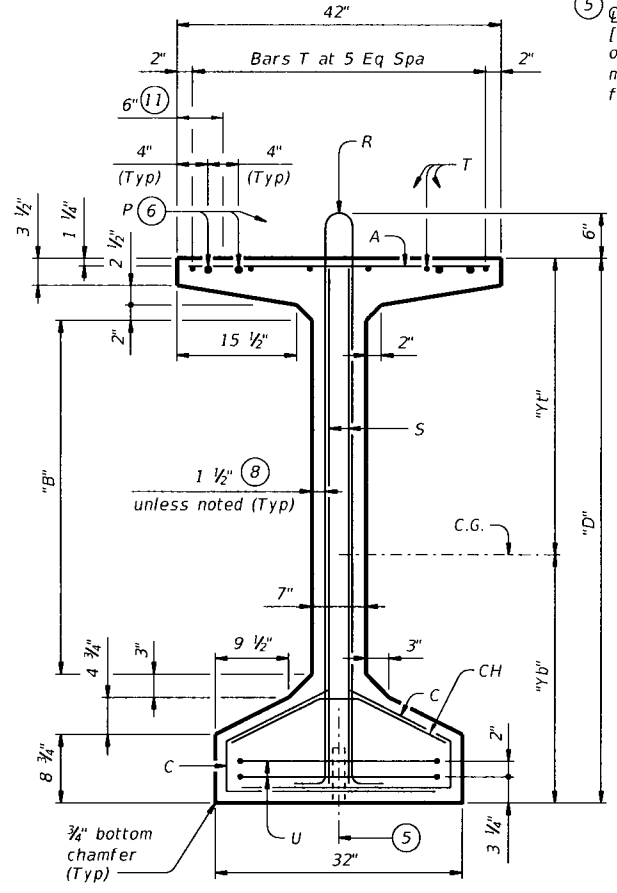
**GIRDER ELEVATION**

- ⑥ Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.
- ⑦ Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.
- ⑧ 1 3/8" Clear Cover to Bars S.
- ⑨ Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".
- ⑩ Based on 155 pcf total weight of concrete and reinforcing steel.
- ⑪ Smooth trowel finish on the slab overhang side of exterior girder.

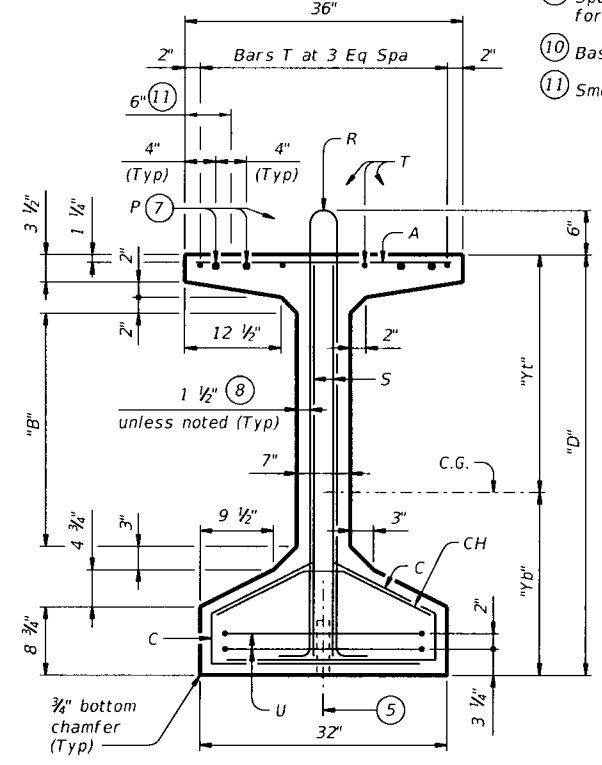
**GIRDER DIMENSIONS AND SECTION PROPERTIES**

Girder Type	"D" (in.)	"B" (in.)	"yt" (in.)	"yb" (in.)	Area (in. <sup>2</sup> )	"Ix" (in. <sup>4</sup> )	"Iy" (in. <sup>4</sup> )	Weight (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 1/2	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 1/2	38.09	31.91	966	628,747	57,579	1,040

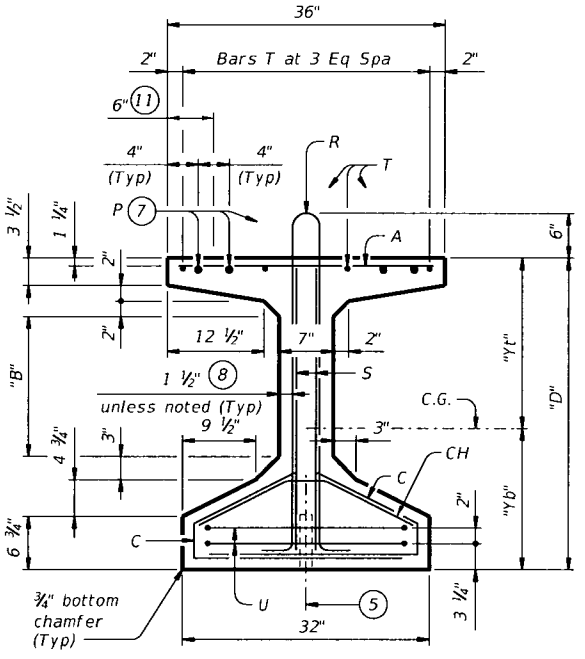
**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. Provide Class H concrete. Provide Grade 60 reinforcing steel. An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A1064) may be substituted for Bars A, C, R or T unless otherwise noted. It is permissible for bars or strands to come in contact with materials used in forming anchor holes. Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



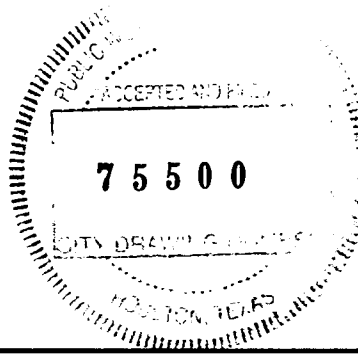
**TYPE Tx62 & Tx70**



**TYPE Tx46 & Tx54**



**TYPE Tx28, Tx34 & Tx40**



HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation Bridge Division Standard

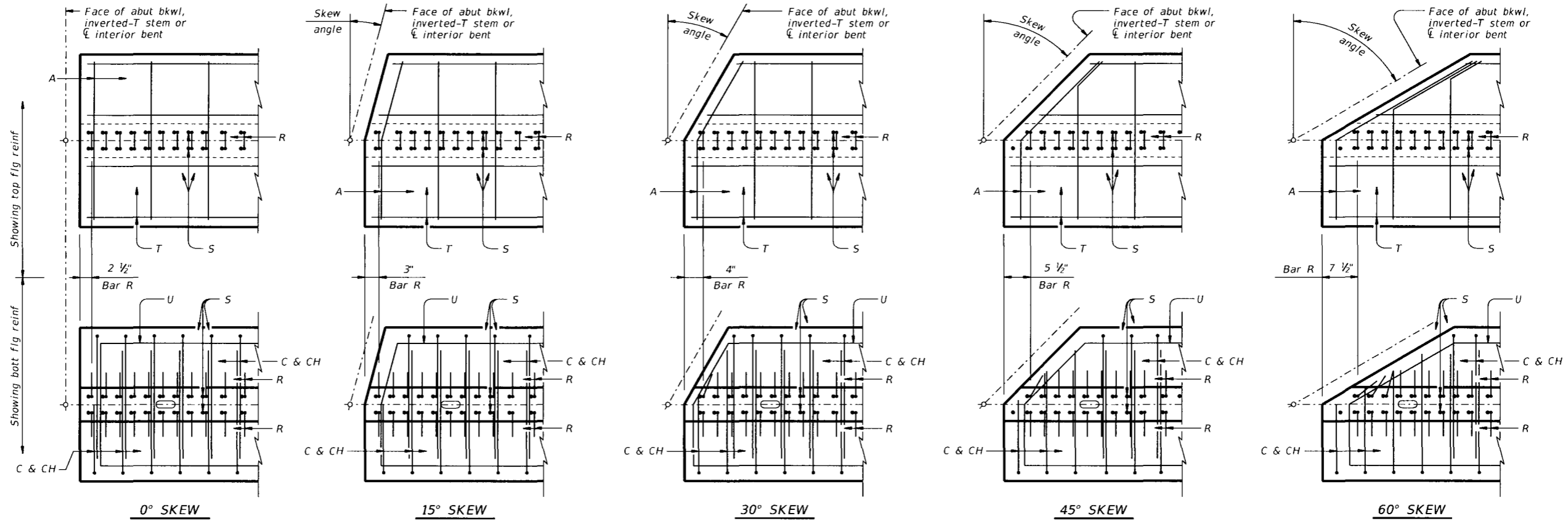
**PRESTRESSED CONCRETE I-GIRDER DETAILS**

IGD

FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT SECT	JOB	HIGHWAY	
REVISIONS				
10-19: Added Bars C and CH full length for VC <= 20	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	120	

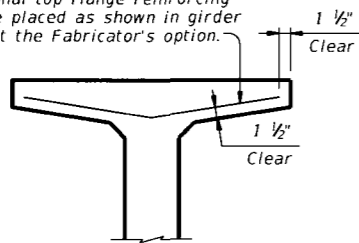
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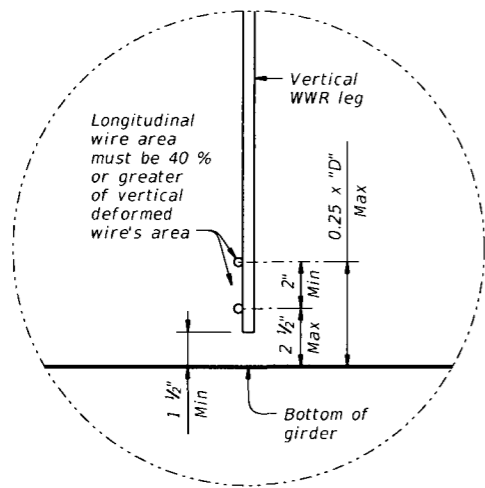


**PLAN OF GIRDER ENDS (12)**

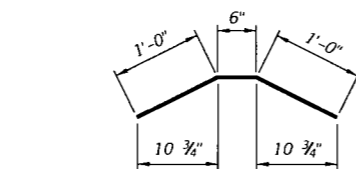
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



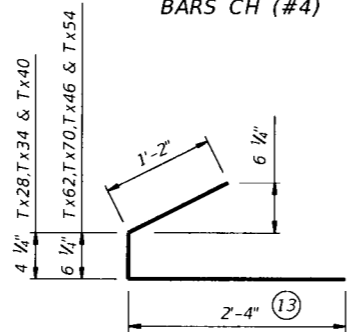
**OPTIONAL TOP FLANGE REINFORCING DETAIL**



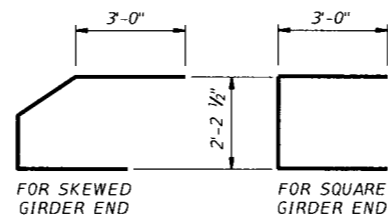
**OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL**



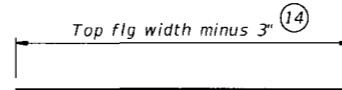
BARS CH (#4)



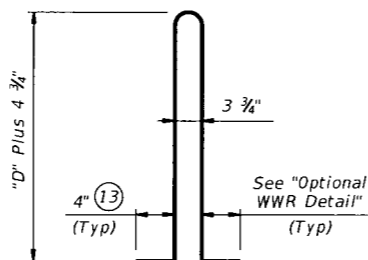
BARS C (#4)



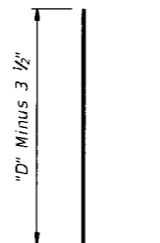
BARS U (#5)



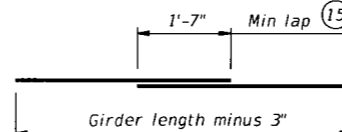
BARS A (#3)



BARS R (#4) (16)

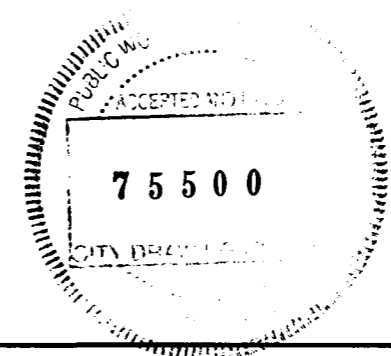


BARS S (#6)



BARS T (#4)

- (12) Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.
- (13) Bars may be cut or bent at skewed end as required.
- (14) Increase as necessary for bars at skewed end.
- (15) No portion of bar less than 10 ft.
- (16) For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.



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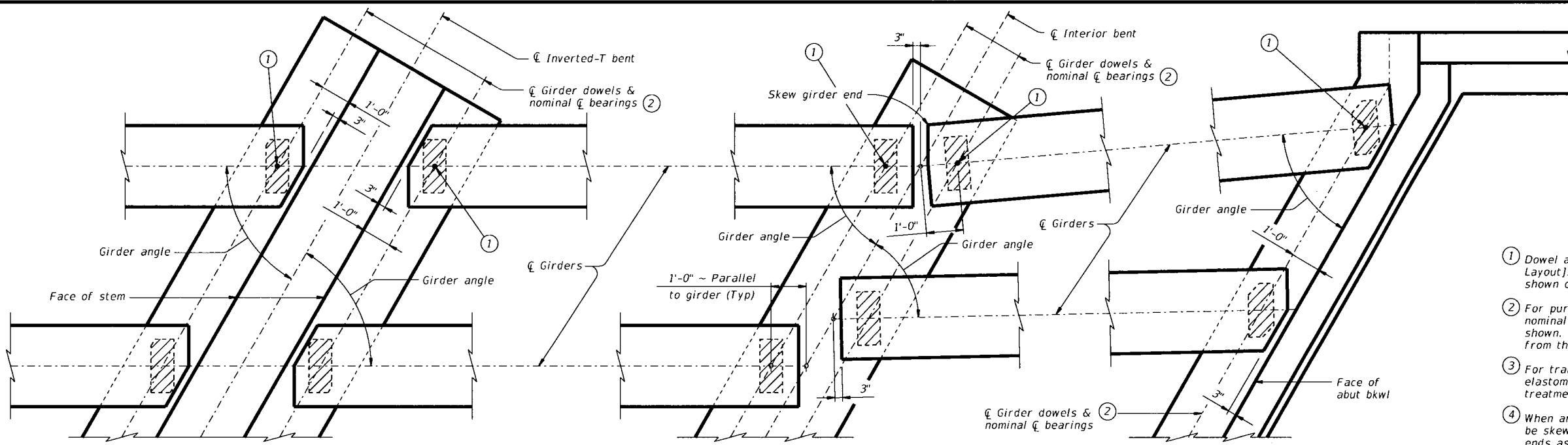
**PRESTRESSED CONCRETE I-GIRDER DETAILS**

IGD

FILE: igdstds1-19.dgn	DW: TxDOT	CK: JMH	DW: JTR	CK: TAR
August 2017	CONT	SECT	JOB	HIGHWAY
10-19: Added Bars C and CH full length for VC <= 20'		DIST	COUNTY	SHEET NO.
HOU		FORT BEND		121

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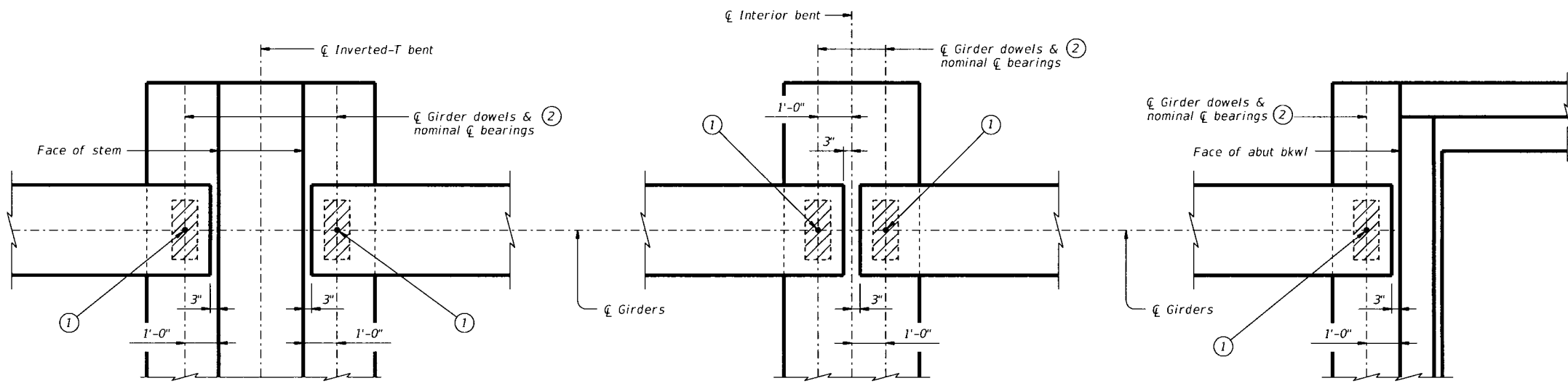


AT INVERTED-T BENT W/SKEW

AT CONVENTIONAL INTERIOR BENT W/SKEW

AT ABUTMENT W/SKEW

- ① Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.
- ② For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.
- ③ For transition bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for abutments.
- ④ When angle exceeds 0°, one or both girders ends must be skewed to maintain the clearance between girder ends as shown in view.
- ⑤ See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.



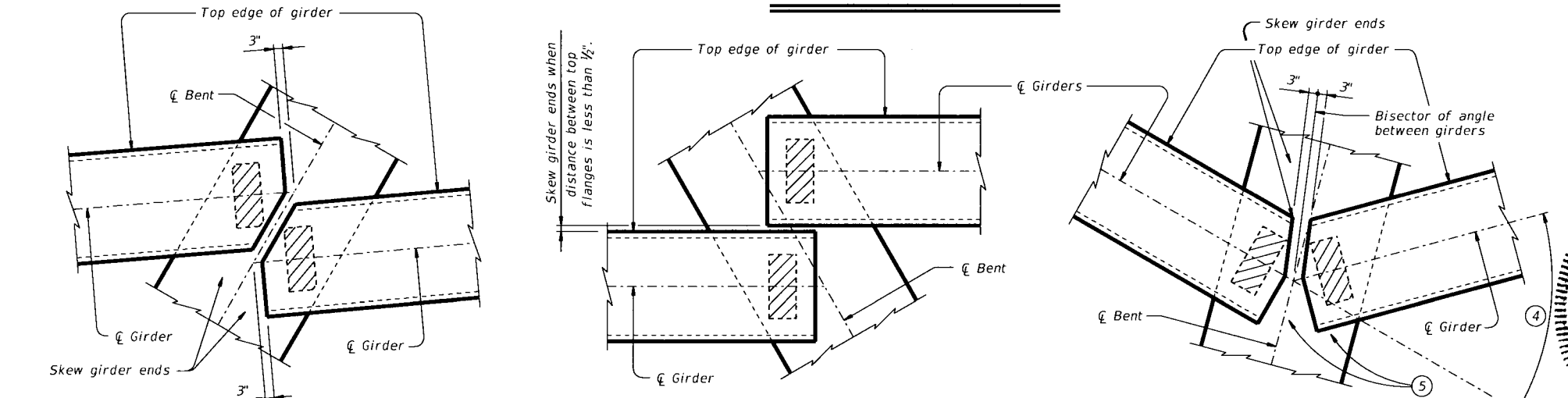
AT INVERTED-T BENT

AT CONVENTIONAL INTERIOR BENT

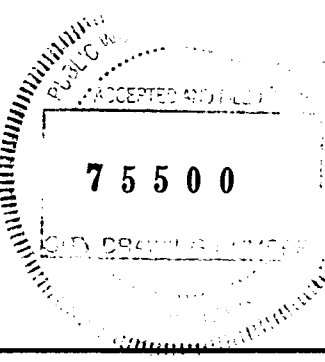
AT ABUTMENT

**GIRDER END DETAILS**

**GENERAL NOTES:**  
 These details accommodate skew angles up to 60°. Shop drawings for approval are required. A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer. Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".



**GIRDER CONFLICT DETAILS**



Texas Department of Transportation  
 Bridge Division Standard

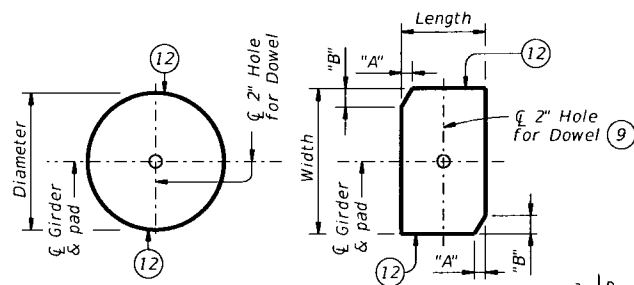
**ELASTOMERIC BEARING AND GIRDER END DETAILS  
 PRESTR CONCRETE I-GIRDERS**

**IGEB**

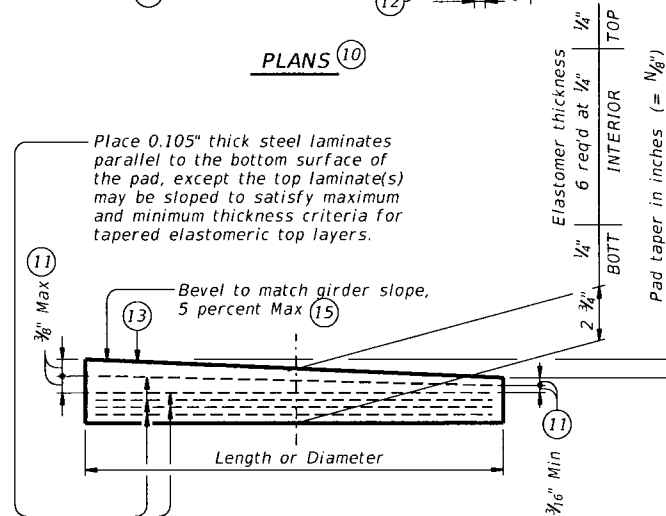
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REVISIONS	CONT	SECT	JOB	HIGHWAY
DIST	COUNTY	SHEET NO.		
HOU	FORT BEND	122		

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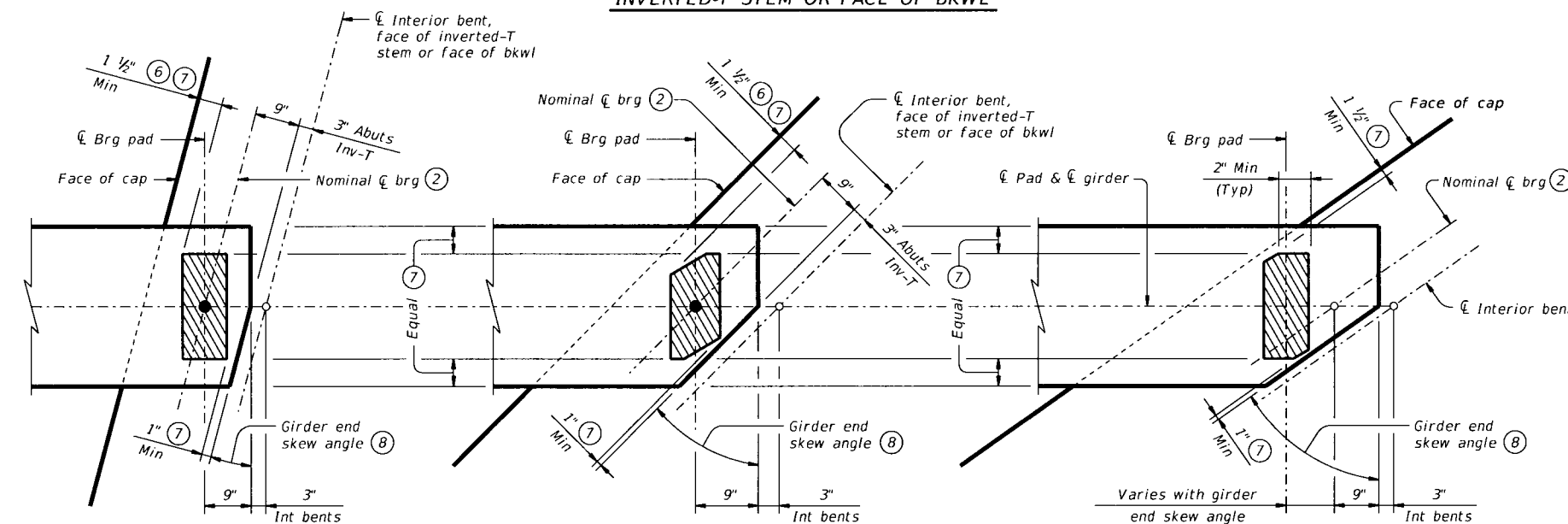
PLANS (10)



ELEVATION

**LAMINATED ELASTOMERIC BEARING PAD**

(50 DUROMETER)



SKewed GIRDER ENDS AT INT BENTS, FACE OF INVERTED-T STEM OR FACE OF BKWL

SKewed GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (NO GIRDER DOWELS)

**BEARING PAD PLACEMENT DIAGRAMS**

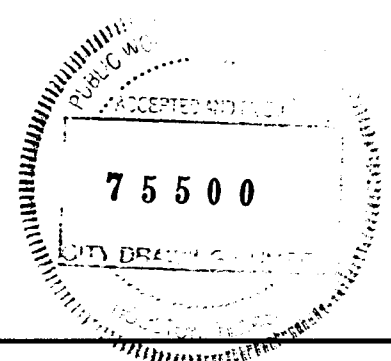
TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)

Girder Type	Abutments	Int Bents	Inv-T Bents
	Face of Bkwl to Face of Cap	Overall Cap Width	Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 1/2"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 1/2"

TABLE OF BEARING PAD DIMENSIONS

Bent Type	Girder Type	Bearing Type (13)	Girder End Skew Angle Range	Pad Size Lgth x Wdth	Pad Clip Dimensions	
					"A"	"B"
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28, Tx34, Tx40, Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---
		G-2-"N"	21°+ thru 30°	8" x 21"	1 1/2"	2 1/2"
		G-3-"N"	30°+ thru 45°	9" x 21"	4 1/2"	4 1/2"
		G-4-"N"	45°+ thru 60°	15" Dia	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---
		G-6-"N"	21°+ thru 30°	9" x 21"	1 1/2"	2 1/2"
		G-7-"N"	30°+ thru 45°	10" x 21"	4 1/2"	4 1/2"
		G-8-"N"	45°+ thru 60°	10" x 21"	7 1/4"	4 1/4"
CONVENTIONAL INTERIOR BENTS	Tx28, Tx34, Tx40, Tx46 & Tx54	---	---	---	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 60°	9" x 21"	---	---
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS)	Tx28, Tx34, Tx40, Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---
		G-2-"N"	18°+ thru 30°	8" x 21"	1 1/2"	2 1/2"
		G-9-"N"	30°+ thru 45°	8" x 21"	3"	3"
		G-10-"N"	45°+ thru 60°	9" x 21"	6"	3 1/2"
	Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
		G-11-"N"	18°+ thru 30°	9" x 21"	---	---
G-12-"N"	30°+ thru 45°	9" x 21"	1 1/2"	1 1/2"		
G-12-"N"	45°+ thru 60°	9" x 21"	3"	1 3/4"		

- (2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.
- (6) 3" for inverted-T.
- (7) Place centerline pad as near nominal centerline bearing as possible between limits shown.
- (8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.
- (9) Provide 2" dia hole only at locations required. See Substructure details for location.
- (10) See Table of Bearing Pad Dimensions for dimensions.
- (11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.
- (12) Locate Permanent Mark here.
- (13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in 1/8" increments) in this mark.  
Examples: N=0, (for 0° taper)  
N=1, (for 1/8" taper)  
N=2, (for 1/4" taper)  
(etc.)  
Fabricated pad top surface slope must not vary from plan girder slope by more than (0.0625" / Length or Dia) IN/IN.
- (14) Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.
- (15) See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.
- (16) If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.



**Texas Department of Transportation** Bridge Division Standard

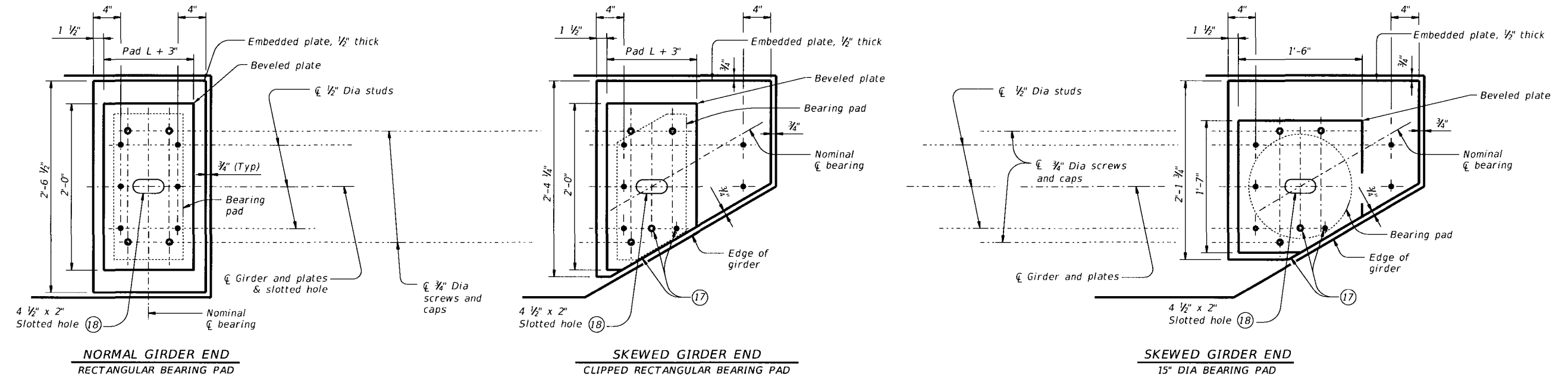
**ELASTOMERIC BEARING AND GIRDER END DETAILS PRESTR CONCRETE I-GIRDERS**

**IGEB**

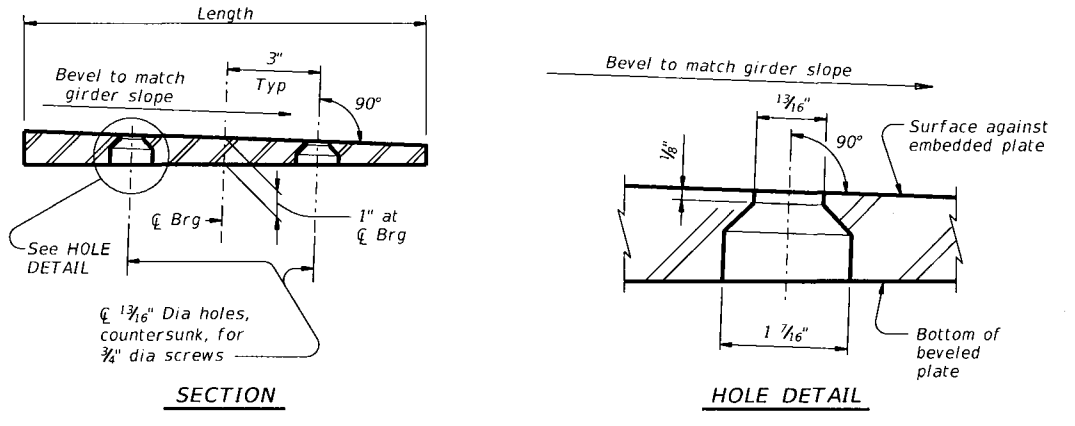
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TxDOT August 2017	CONV SECT	JOB	HIGHWAY	
REVISIONS				
DIST	COUNTY	SHEET NO		
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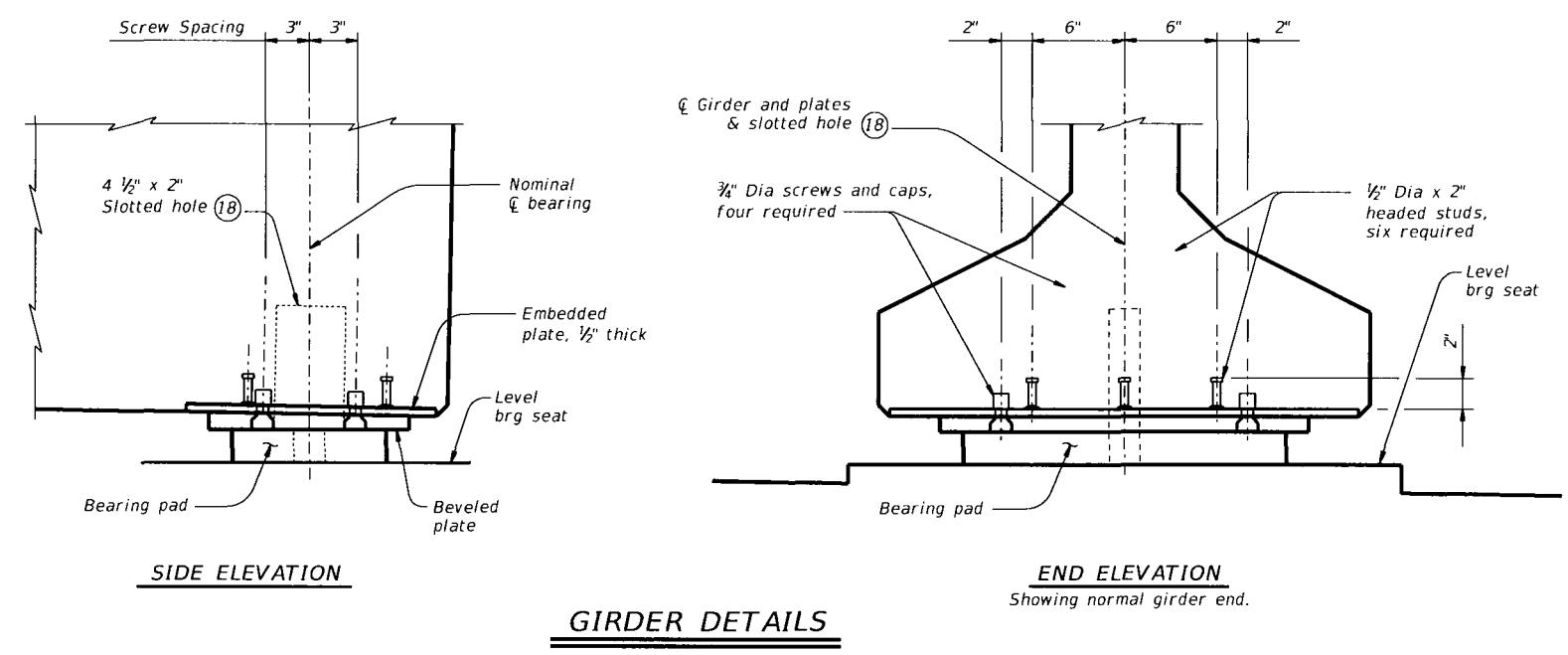
**PLAN VIEW OF SOLE PLATE DETAILS**



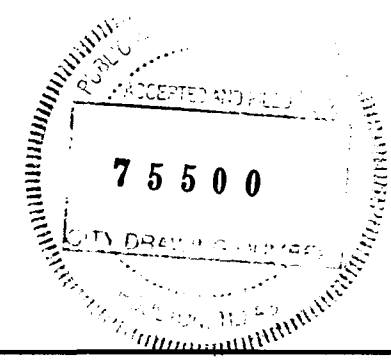
**BEVELED PLATE DETAILS**

- (17) Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.
- (18) Slotted hole is required at doweled girder end locations.

**SOLE PLATE NOTES:**  
 Provide constant thickness elastomeric bearings with beveled and embedded steel sole plates in accordance with these details when the girder slope exceeds 5 percent or if otherwise required in the plans. Provide for all girders in the span.  
 On the shop drawings, dimension sole plates to the nearest 1/16" based on required thickness at centerline of bearing and slope of girder. Thickness tolerance variation from the approved shop drawings is 1/16" +/-, except variation from a plane parallel to the theoretical top surface can not exceed 1/16" total. Bearing surface tolerances listed in Item 424 apply to embedded and beveled plates.  
 Steel plate must conform to ASTM A36, A572 Gr 50, or A709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.  
 When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".  
 Tap threads in the embedded plate only. Drill and tap prior to galvanizing.  
 3/4" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a 3/4" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than 1/2" deep or deeper than 1".  
 Install beveled sole plates prior to shipping girders. Installed screw heads must not protrude below the bottom of the beveled plate.



**GIRDER DETAILS**

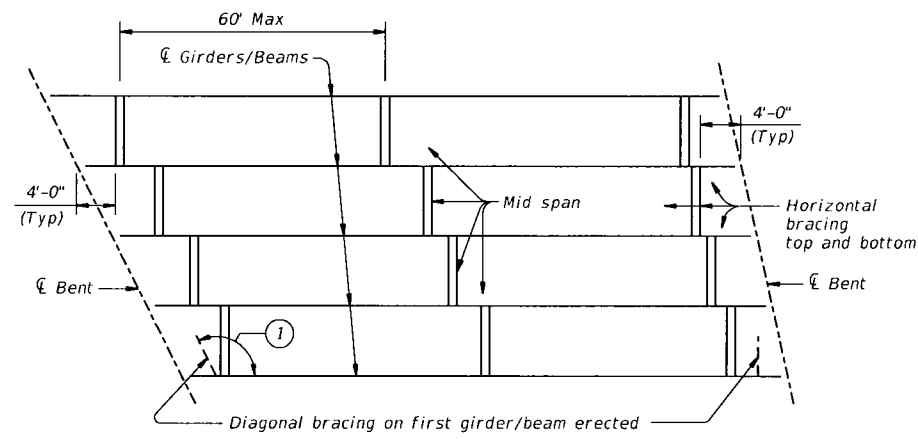


HL93 LOADING		SHEET 3 OF 3	
Texas Department of Transportation		Bridge Division Standard	
<b>ELASTOMERIC BEARING AND GIRDER END DETAILS</b>			
<b>PRESTR CONCRETE I-GIRDERS</b>			
<b>IGEB</b>			
FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	OW: JTR
REVISIONS: August 2017	CONT SECT	JOB	HIGHWAY
DIST	COUNTY	SHEET NO.	
HOU	FORT BEND	124	

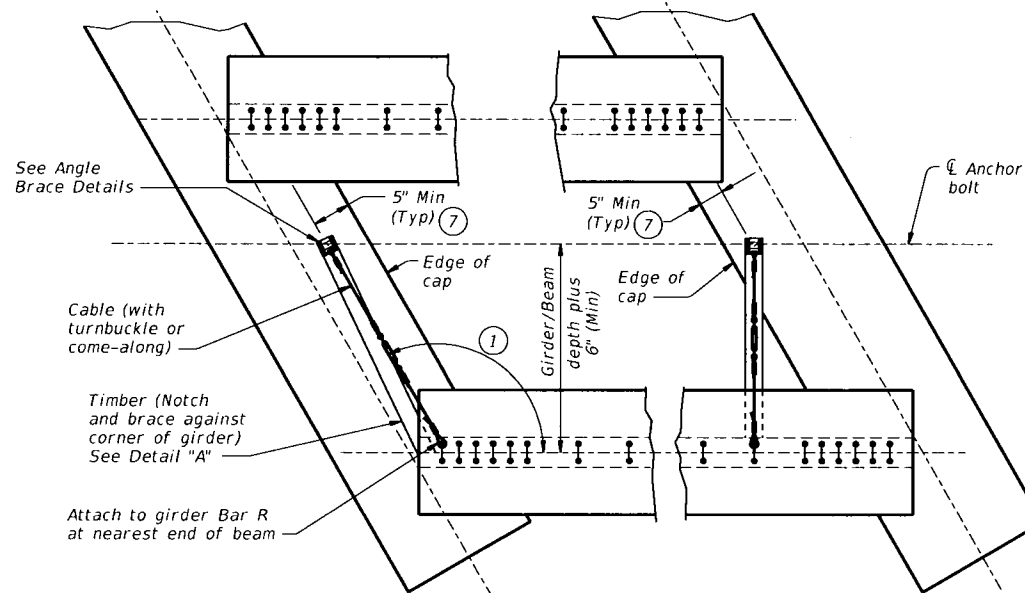
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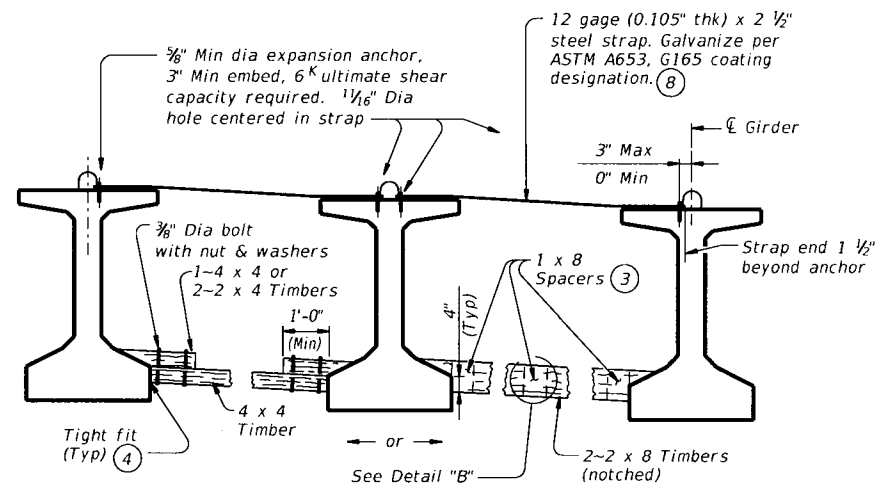
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**ERECTION BRACING**

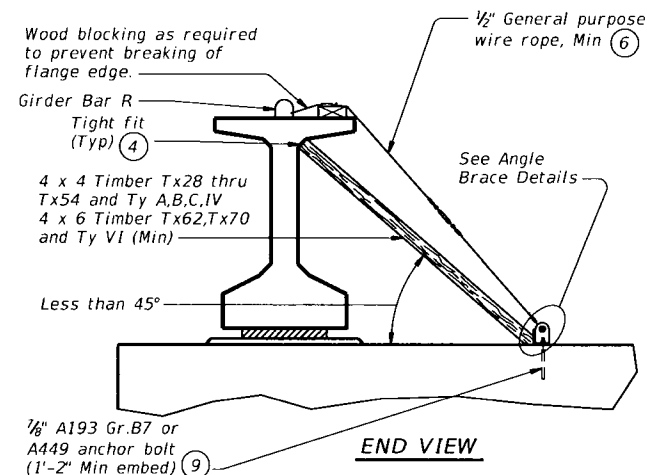


**PLAN**



**FOR ERECTION BRACING, OPTION 1**

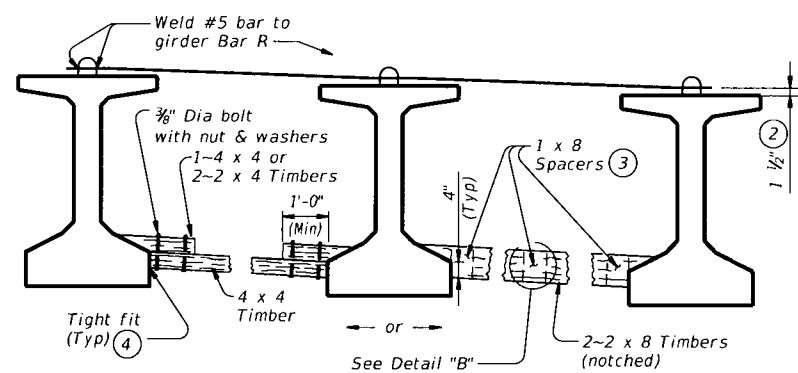
(This option is not allowed when slab is formed with PMDF or plywood.)



**END VIEW**

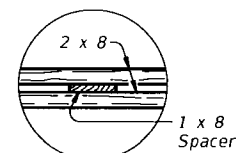
**DIAGONAL BRACING DETAILS**

(To be used on both ends of the first girder/beam erected in the span in each phase.)



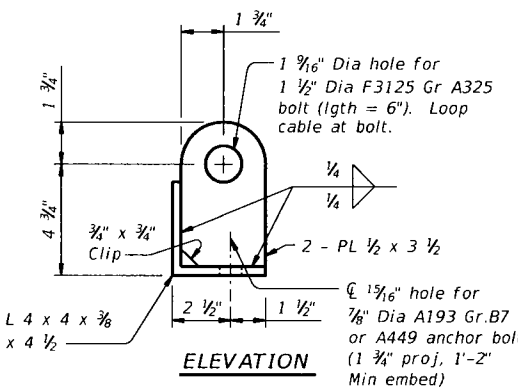
**FOR ERECTION BRACING, OPTION 2**

**HORIZONTAL BRACING DETAILS**

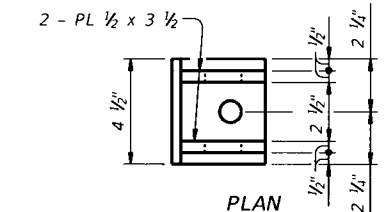


**PLAN**

**DETAIL "B"**



**ELEVATION**



**PLAN**

**ANGLE BRACE DETAILS**

**HAULING & ERECTION:**

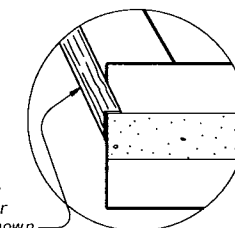
The Contractor's attention is directed to the possible lateral instability of prestressed concrete girders and beams over 130' long, especially during hauling and erection. The use of the following methods to improve stability is encouraged: Locate lifting devices at the maximum practical distance from girder ends; use external lateral stiffening devices during hauling and erection; lift with vertical lines using two machines; and take care in handling to minimize inertial and impact forces.

**ERECTION BRACING:**

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425. Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

**PHASED CONSTRUCTION:**

Place erection and slab placement bracing for all girders in a phase as shown in these details. For phases after first, also place erection and slab placement bracing between outer girder of completed phase and adjacent girder of current phase. When the phase construction joint is between girders, top bracing can be omitted.

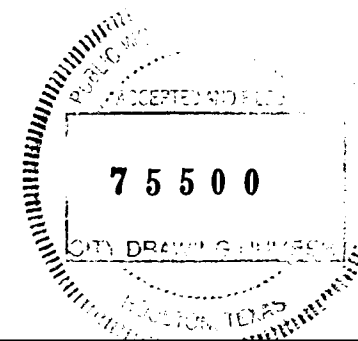


**DETAIL "A"**

- 1 If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.
- 2 Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R (See Sheet 2 of 2).
- 3 Clear distance between spacers must not exceed 3'. Nail together with 16d nails.
- 4 Use wedges as necessary to obtain tight fit. Nail wedges to timbers.
- 5 Pressure treated landscape timbers can not be used.
- 6 All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing against the dead end.
- 7 It is acceptable to tie anchor bolts to cap reinforcement.
- 8 Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.
- 9 Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

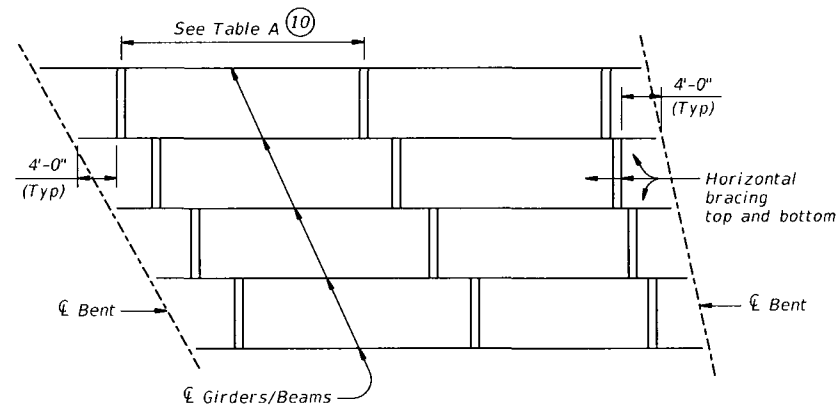
SHEET 1 OF 2

		<b>Bridge Division Standard</b>	
<b>MINIMUM ERECTION AND BRACING REQUIREMENTS PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS</b>			
<b>MEBR(C)</b>			
FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
TXDOT August 2017	CON: SECT	JOB	HIGHWAY
DIST		COUNTY	SHEET NO.
HOU		FORT BEND	125



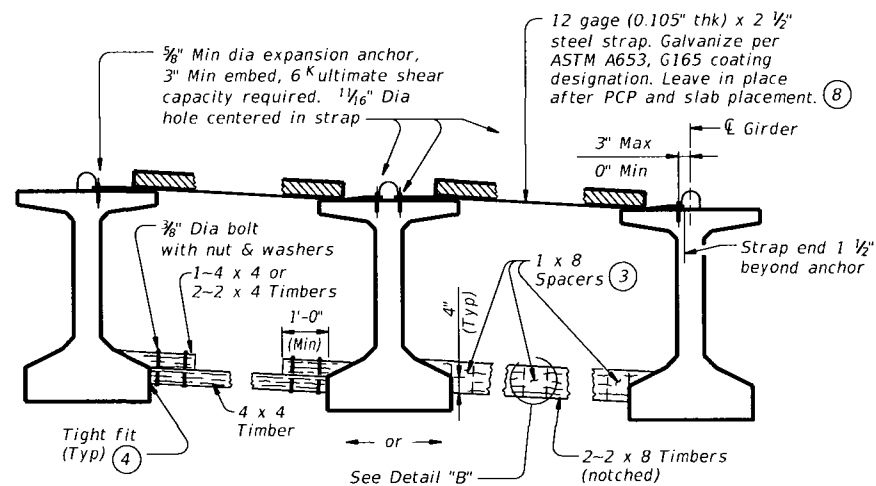
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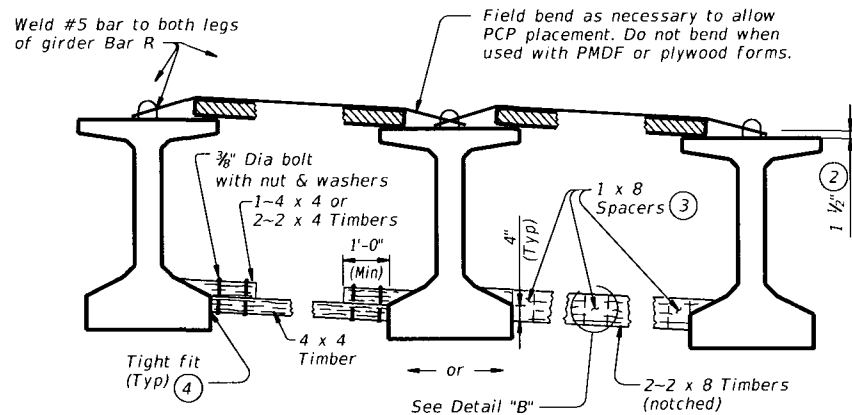
**SLAB PLACEMENT BRACING**

OPTION 1-RIGID BRACING (STEEL STRAP)			OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)		
Girder or Beam Type	Maximum Bracing Spacing		Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)		Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	1/4 points	1/4 points	Tx28	1/4 points	1/6 points
Tx34	1/4 points	1/4 points	Tx34	1/4 points	1/6 points
Tx40	1/4 points	1/6 points	Tx40	1/4 points	1/6 points
Tx46	1/4 points	1/6 points	Tx46	1/4 points	1/6 points
Tx54	1/4 points	1/6 points	Tx54	1/4 points	1/6 points
Tx62	1/4 points	1/6 points	Tx62	1/4 points	1/6 points
Tx70	1/4 points	1/6 points	Tx70	1/4 points	1/6 points
A	1/6 points	1/6 points	A	2.0 ft	1.5 ft
B	1/6 points	1/6 points	B	3.0 ft	2.0 ft
C	1/6 points	1/6 points	C	4.5 ft	2.0 ft
IV	1/4 points	1/6 points	IV	1/4 points	4.0 ft
VI	1/4 points	1/6 points	VI	1/4 points	4.0 ft



**FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID**

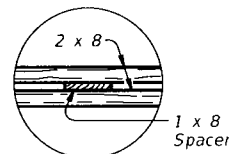
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



**FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE**

(Showing slab formed with PCP.)

**HORIZONTAL BRACING DETAILS (5)**



**PLAN  
DETAIL "B"**

- (2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.
- (3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.
- (4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.
- (5) Pressure treated landscape timbers can not be used.
- (8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.
- (10) Bracing spacing (1/4 and 1/6 points) measured between first and last typical brace location.
- (11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

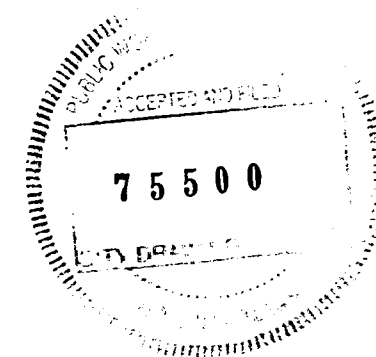
**SLAB PLACEMENT BRACING:**

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425. Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

**GENERAL NOTES:**

Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection. Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection. Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure. Removal of bracing for short periods of time to align girders and beams is permissible. All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown. Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

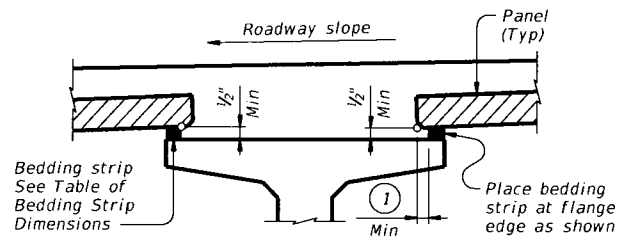
SHEET 2 OF 2



Texas Department of Transportation		Bridge Division Standard	
<b>MINIMUM ERECTION AND BRACING REQUIREMENTS PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS</b>			
<b>MEBR(C)</b>			
FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
CON: August 2017	SECT:	JOB:	HIGHWAY:
REVISIONS			
DIST: HOU	COUNTY: FORT BEND	SHEET NO: 126	

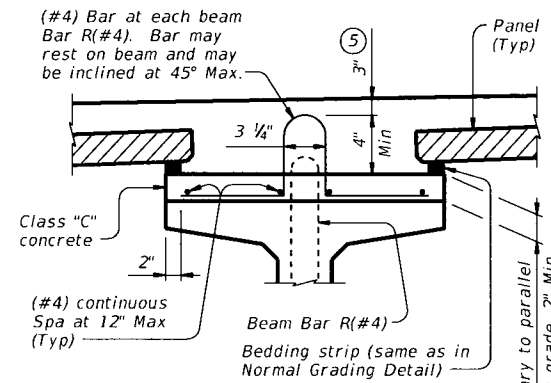
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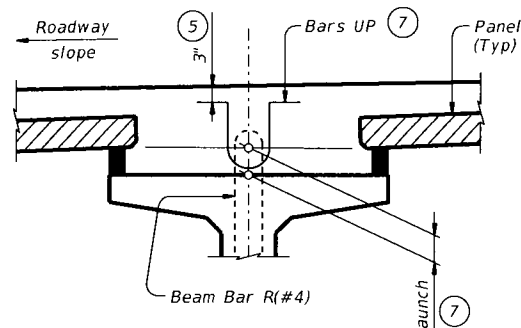
**NORMAL GRADING DETAIL**

Showing prestressed concrete I-girders. (Other beam types similar)



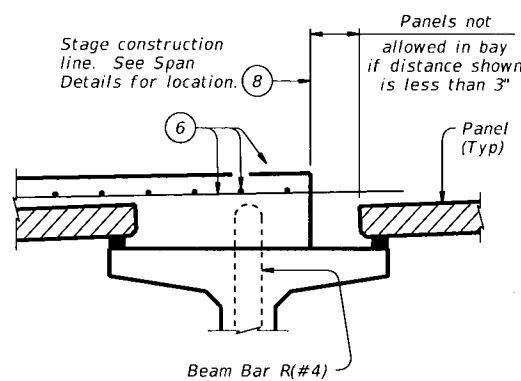
**SPECIAL GRADING DETAIL FOR CONCRETE BEAMS**

Showing prestressed concrete I-girders. (Other beam types similar)



**HAUNCH REINFORCING DETAIL**

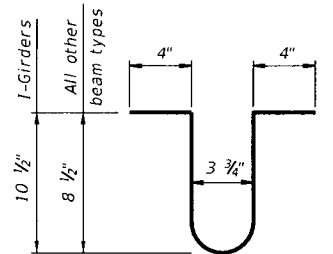
Showing prestressed concrete I-girders. (Other beam types similar)



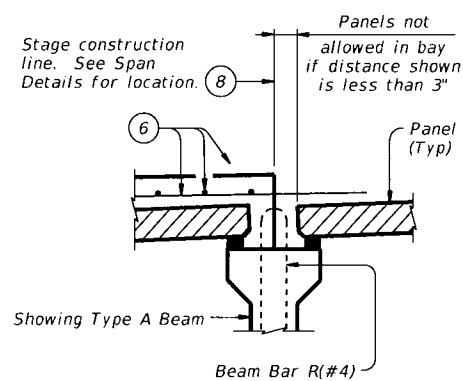
**PRESTR CONC I-GIRDERS**

**TABLE OF BEDDING STRIP DIMENSIONS**

WIDTH	HEIGHT (4)	
	Min	Max
1" (Min)	1/2"	2"
1 1/4"	1/2"	2 1/2"
1 1/2"	1/2"	3"
1 3/4"	1/2"	3 1/2"
2"	1/2"	4"
2 1/4"	1/2"	4 1/2"
2 1/2"	1/2"	5"
2 3/4"	1/2"	5 1/2"
3" (Max)	1/2"	6"



**BARS UP (#4)**



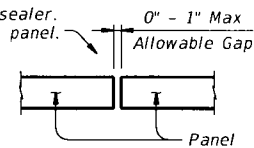
**PRESTR CONC I-BEAMS**

**STAGE CONSTRUCTION LIMITATIONS**

(Other beam types similar)

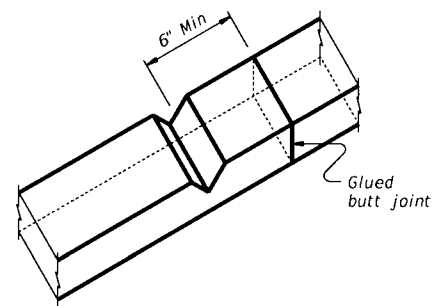
- 2" Min for I-girders, 1 1/2" Min for all other beam types.
- Allowed for I-girders, not allowed on other beam types.
- To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in 1/4" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is 1/4". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.
- Height must not exceed twice the width.
- Provide clear cover as indicated unless otherwise shown on Span Details.
- See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 1/2" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.
- Do not locate construction joints on top of a panel.
- Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8' o.c..

Seal joint between panels when gap exceeds 1/4" with polyurethane sealant or expanding foam sealer. Make seal flush with top of panel.



**PANEL JOINTS**

(Panel reinforcing not shown for clarity. The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



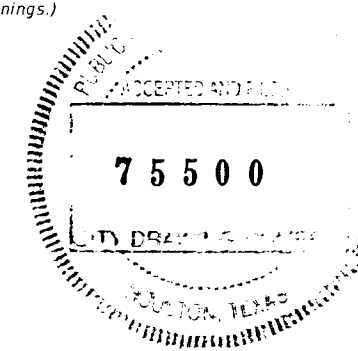
**BEDDING STRIP DETAIL**

**CONSTRUCTION NOTES:**  
 Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges. Placing panels to minimize joint openings is recommended. If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction.  
 Bars U, shown on PCP-FAB, may be bent over or cut off if necessary.  
 Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 1/2" under the panels as the slab concrete is placed.  
 To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least 1/2". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required.  
 For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

**MATERIAL NOTES:**  
 Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.  
 If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated.  
 Provide bar Laps, where required, as follows:  
 Uncoated ~ #4 = 1'-7"  
 Epoxy Coated ~ #4 = 2'-5"

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees.  
 Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use.  
 These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.  
 When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer.  
 Any additional reinforcement or concrete required on this standard is considered subsidiary to the bid item "Reinforced Concrete Slab".

Cover dimensions are clear dimensions, unless noted otherwise.  
 Reinforcing bar dimensions shown are out-to-out of bar.



HL93 LOADING SHEET 1 OF 4

Texas Department of Transportation Bridge Division Standard

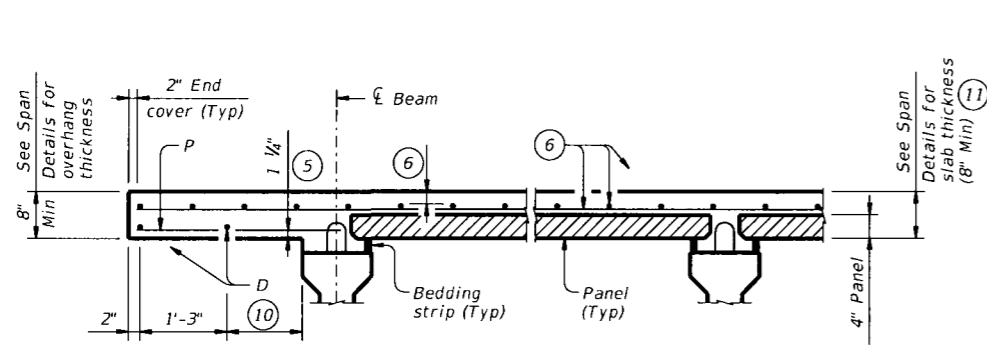
**PRESTRESSED CONCRETE PANELS DECK DETAILS**

PCP

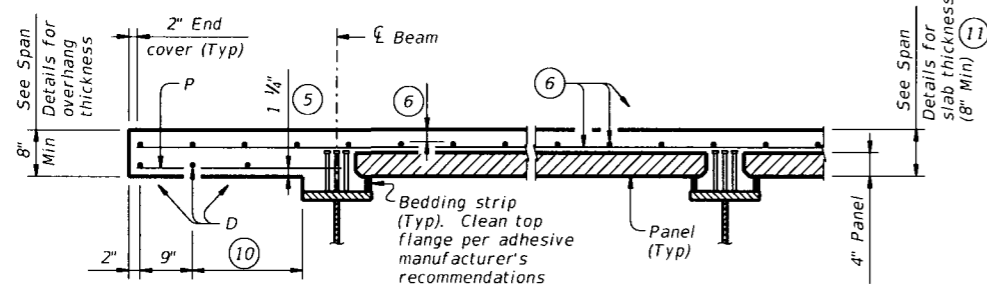
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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS		DIST	COUNTY	SHEET NO.
		HOU	FORT BEND	127

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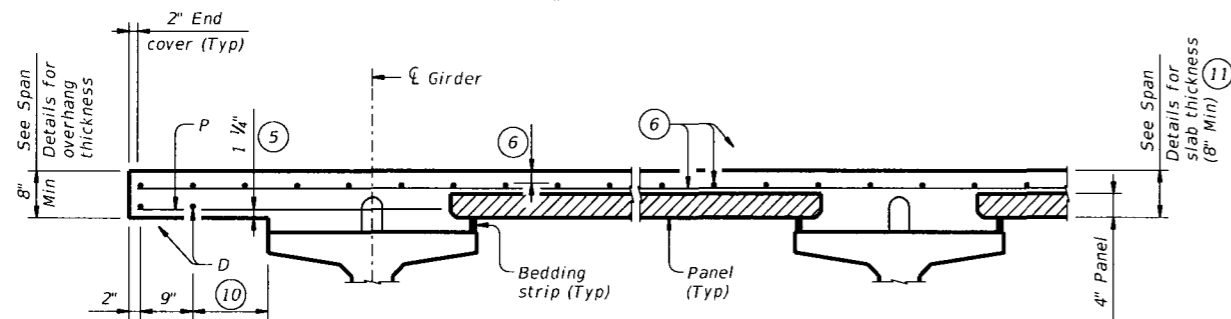
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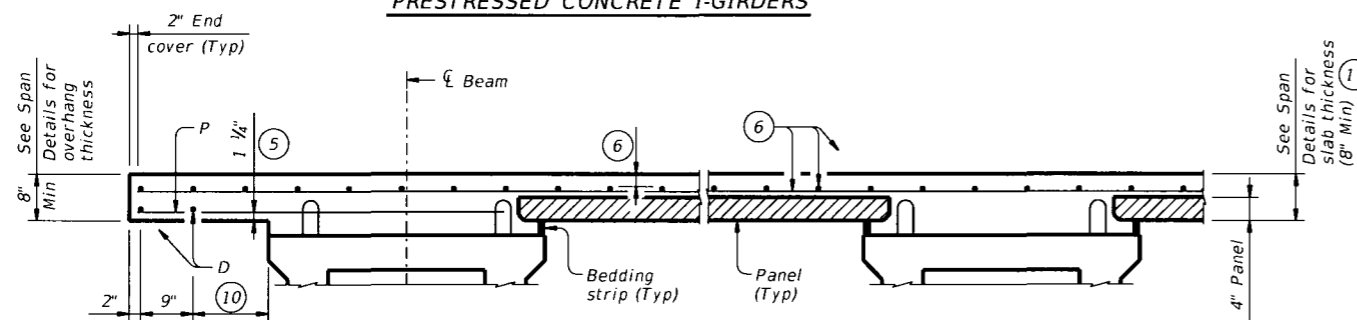
**PRESTRESSED CONCRETE I-BEAMS**



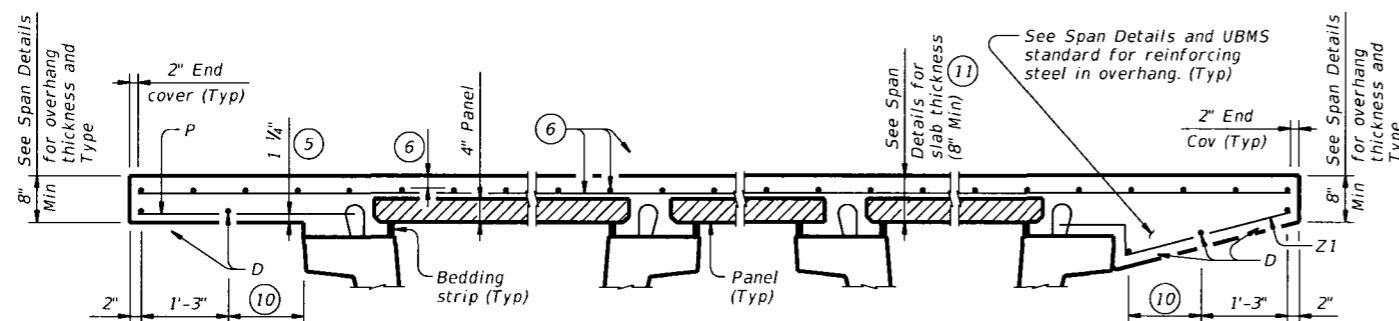
**STEEL BEAMS**



**PRESTRESSED CONCRETE I-GIRDERS**



**PRESTRESSED CONCRETE X-BEAMS**



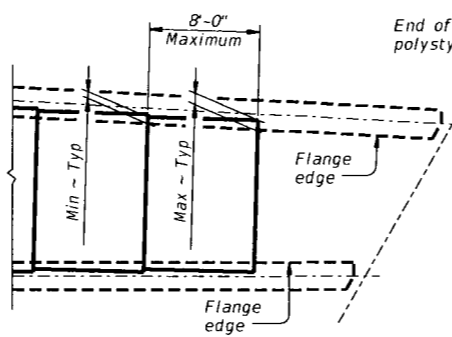
**NORMAL OVERHANG WITH PRESTR CONC U-BEAMS**

**TYPICAL PART TRANSVERSE SECTIONS**

**SLOPED OVERHANG WITH PRESTR CONC U-BEAMS**

**AT FLARED BEAMS OR GIRDERS**

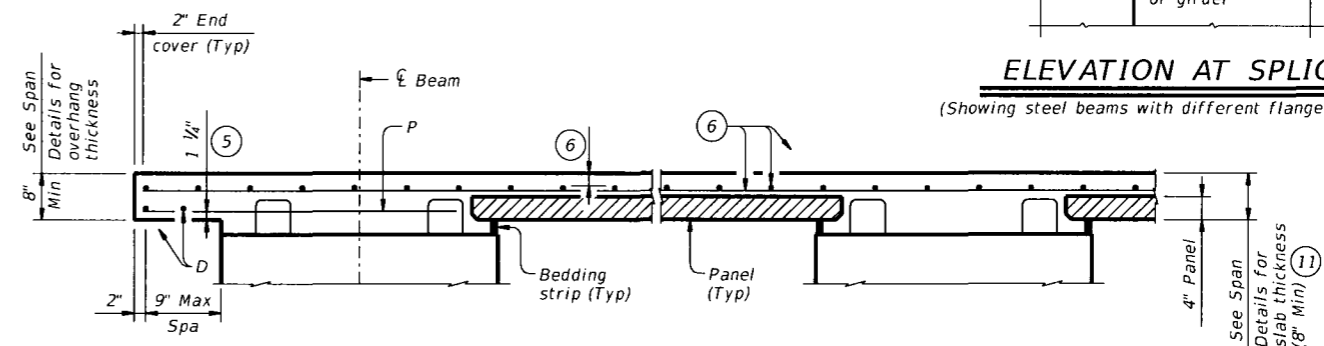
See PCP-FAB standard for Min and Max dimensions based on beam/girder type.



**OVER CONC U-BEAMS**

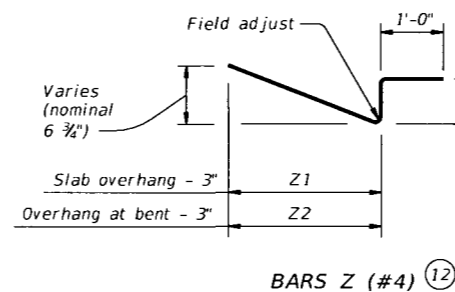
**PART PLANS OF PANEL PLACEMENT**

- 5 Provide clear cover as indicated unless otherwise shown on Span Details.
- 6 See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- 9 Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8" o.c..
- 10 Equally space additional bar if more than 1'-3" Max.
- 11 The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.
- 12 Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.
- 13 Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.

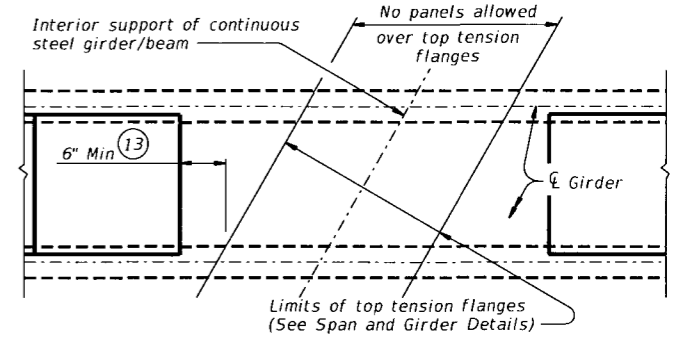


**PRESTRESSED CONCRETE SPREAD SLAB BEAMS**

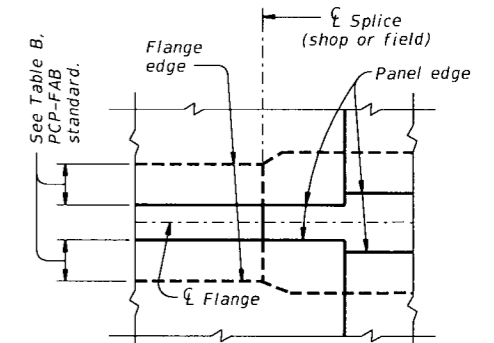
Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



**BARS Z (#4)**



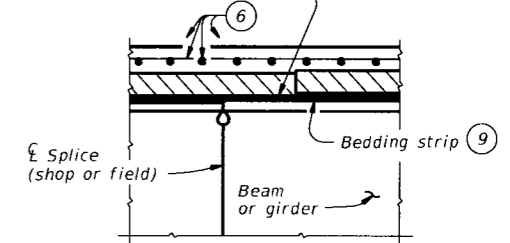
**AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS**



**PLAN AT SPLICE**

(Showing steel beams with flange width transition)

Cut bedding strip to adjust for difference in flange thickness.



**ELEVATION AT SPLICE**

(Showing steel beams with different flange thickness)

HL93 LOADING

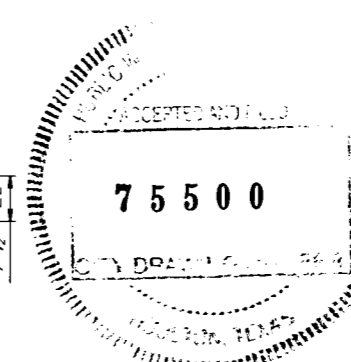
SHEET 2 OF 4



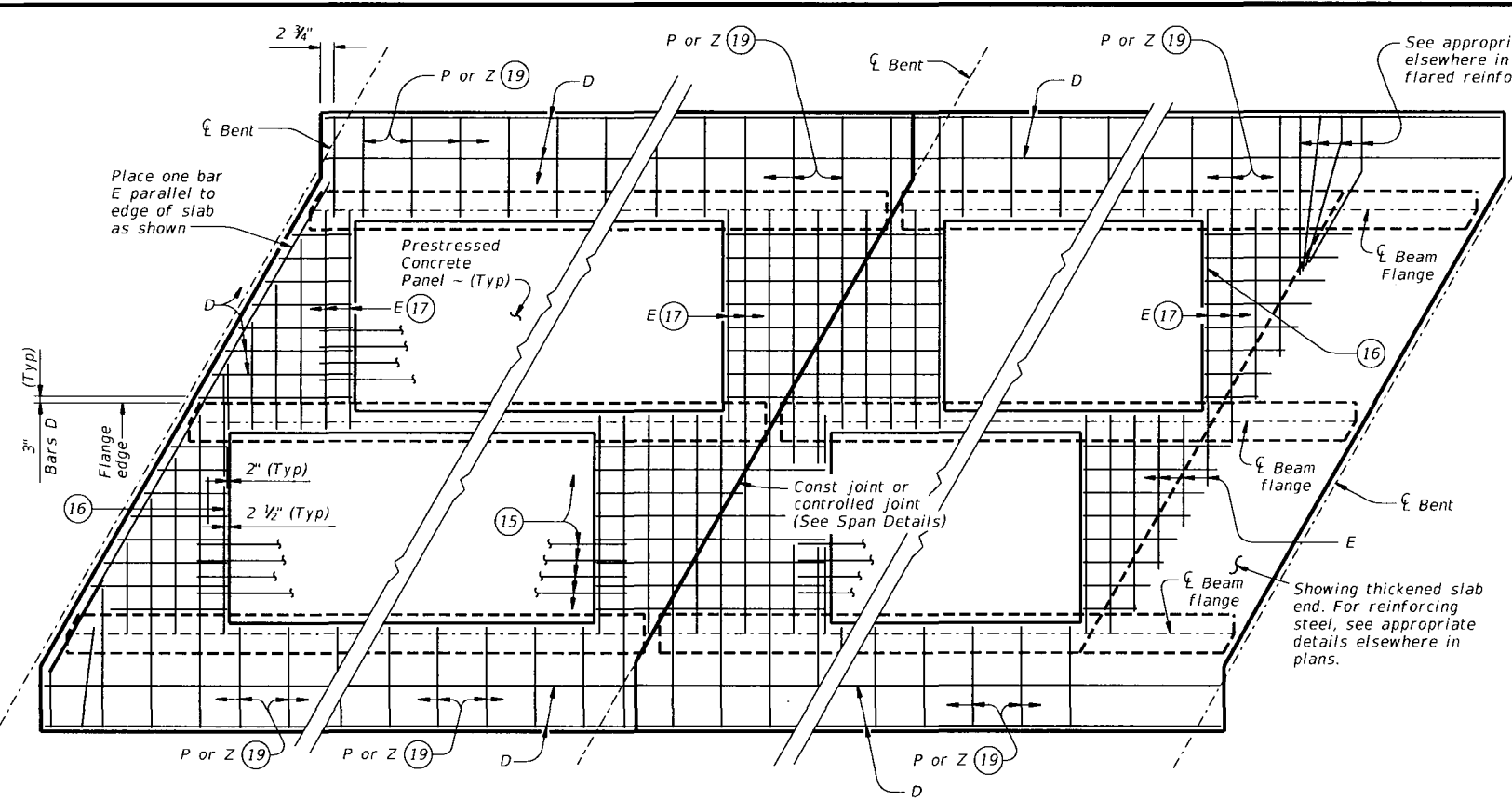
**PRESTRESSED CONCRETE PANELS DECK DETAILS**

PCP

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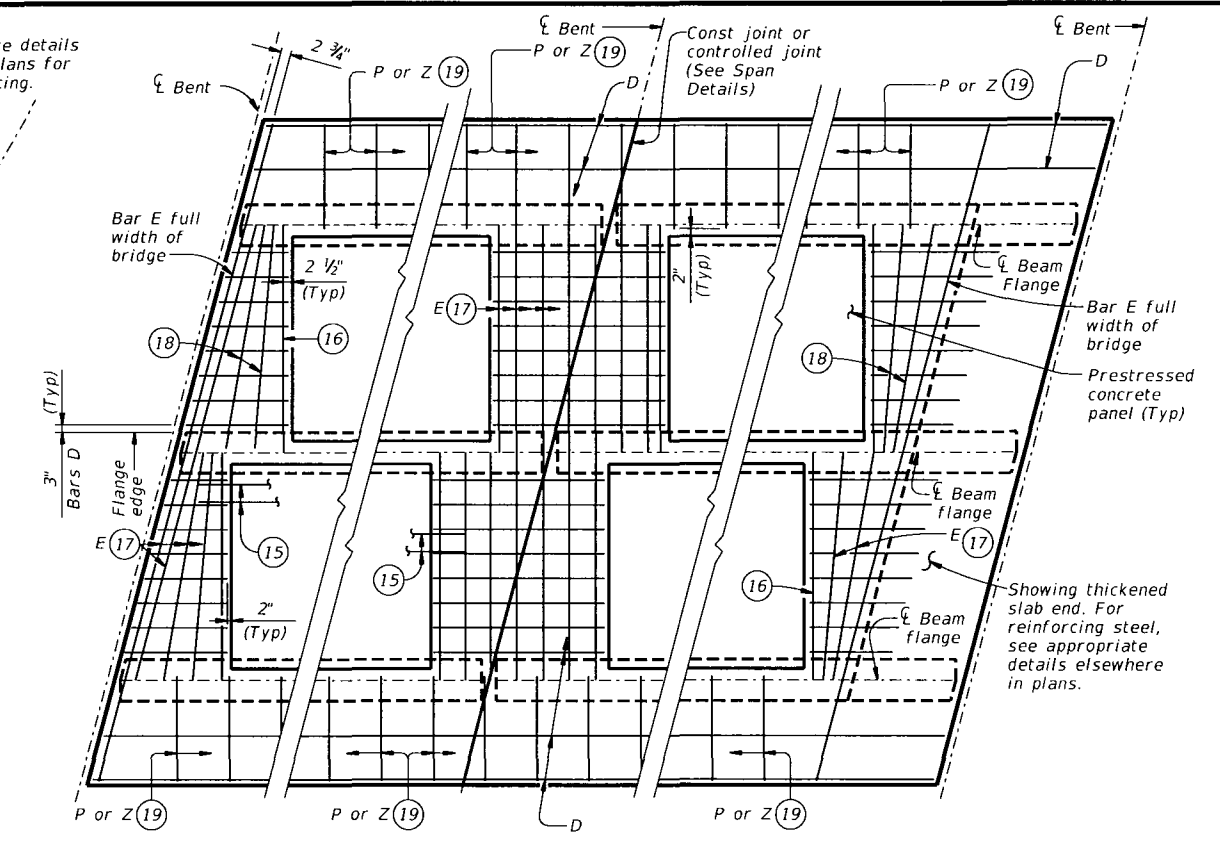


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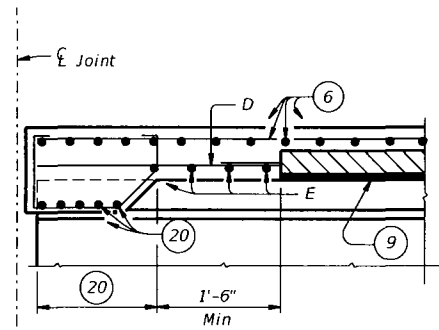
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE      AT INTERIOR BENTS      AT THICKENED END SLABS

**OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT**

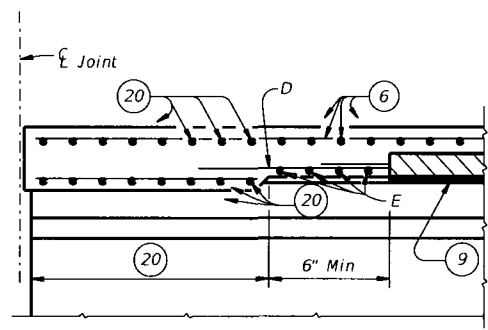


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE      AT INTERIOR BENTS      AT THICKENED END SLABS

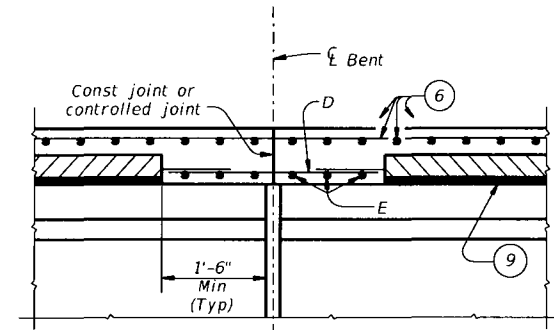
**OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT**



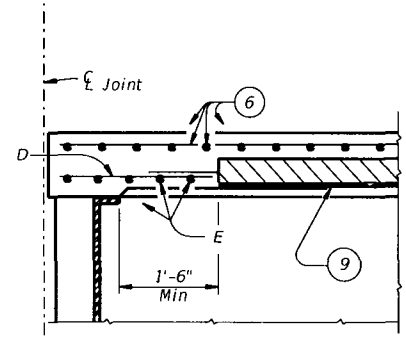
AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS



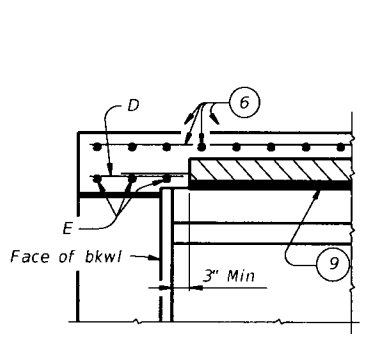
AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS



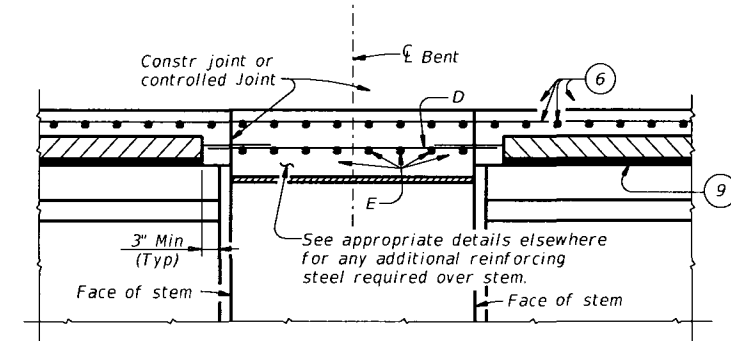
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS



AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS

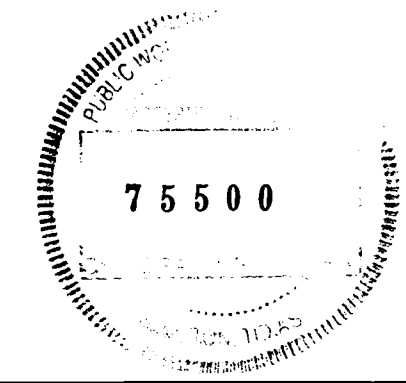


AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

**OPTION 1 ~ ELEVATIONS AT BEAM ENDS**

- 6 See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- 9 Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8' o.c.
- 14 Max Spacing as listed unless otherwise shown.
- 15 At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.
- 16 Maintain one Bar E(#4) parallel to panel ends (Typ).
- 17 Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.
- 18 Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.
- 19 Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.
- 20 See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



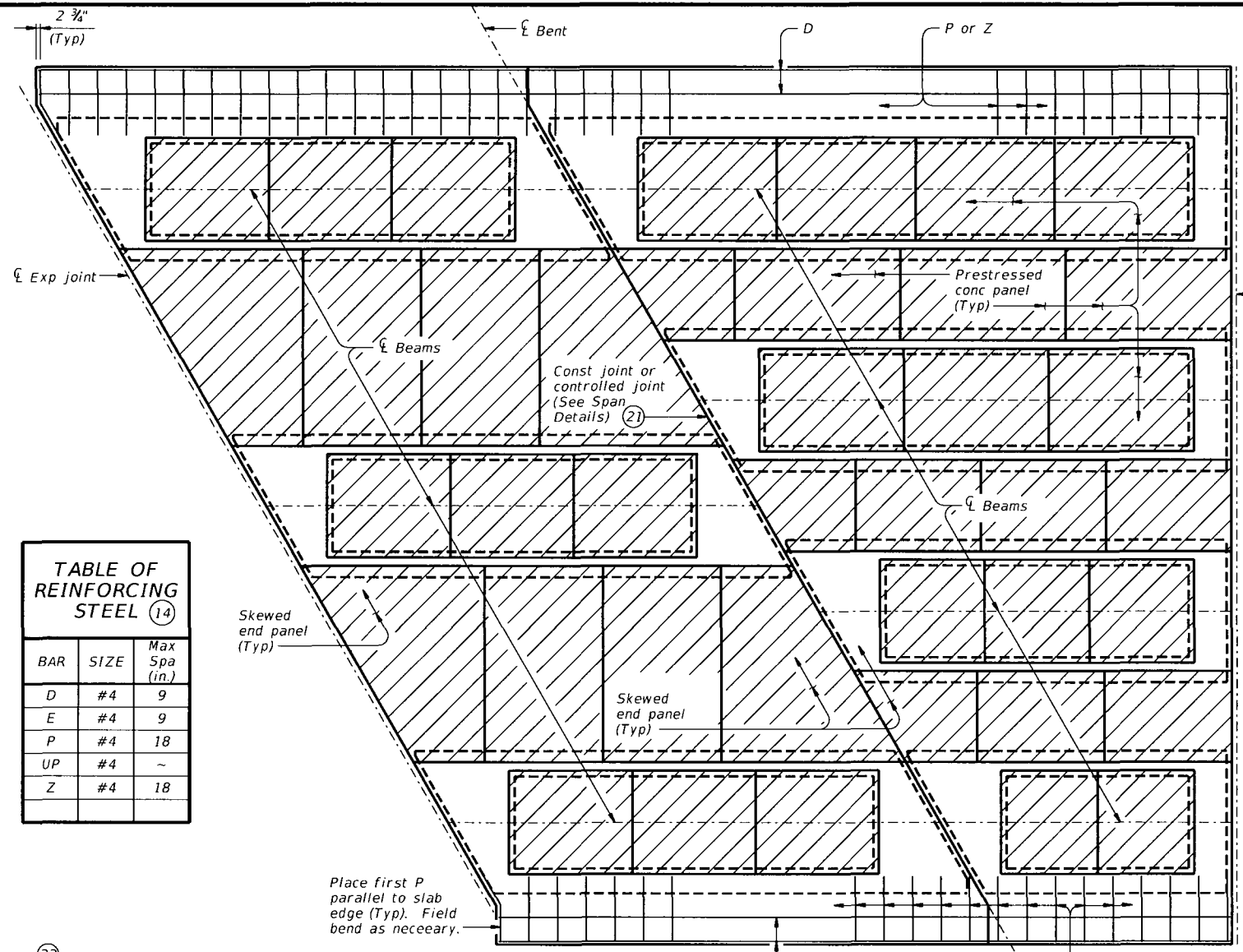
Texas Department of Transportation  
**PRESTRESSED CONCRETE PANELS DECK DETAILS**  
 Bridge Division Standard

PCP

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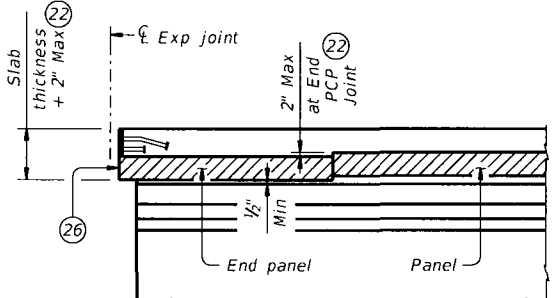
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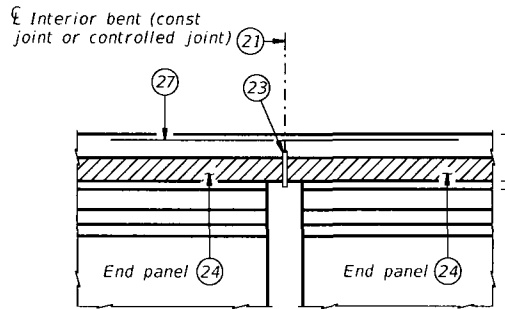


**TABLE OF REINFORCING STEEL (14)**

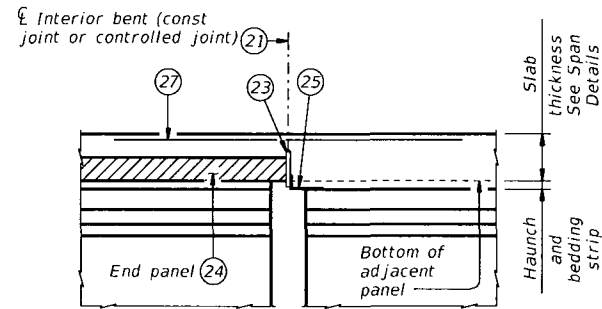
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



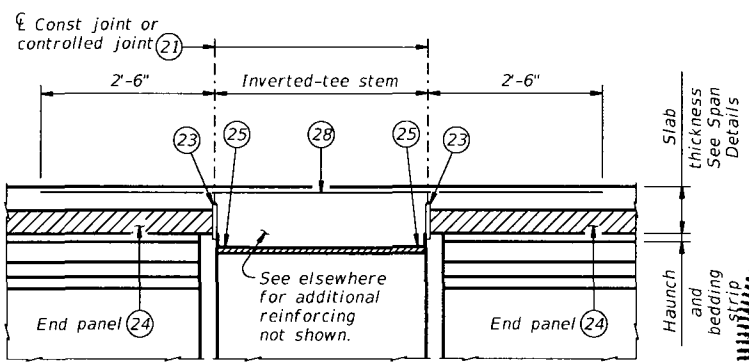
**JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)**  
For SEJ-A, SEJ-S(0), AJ, and Type A expansion joints only.



**CONVENTIONAL INTERIOR BENT**  
Panel against panel between beams/girders.



**CONVENTIONAL INTERIOR BENT**  
Panel against beam/girder end in adjacent span.



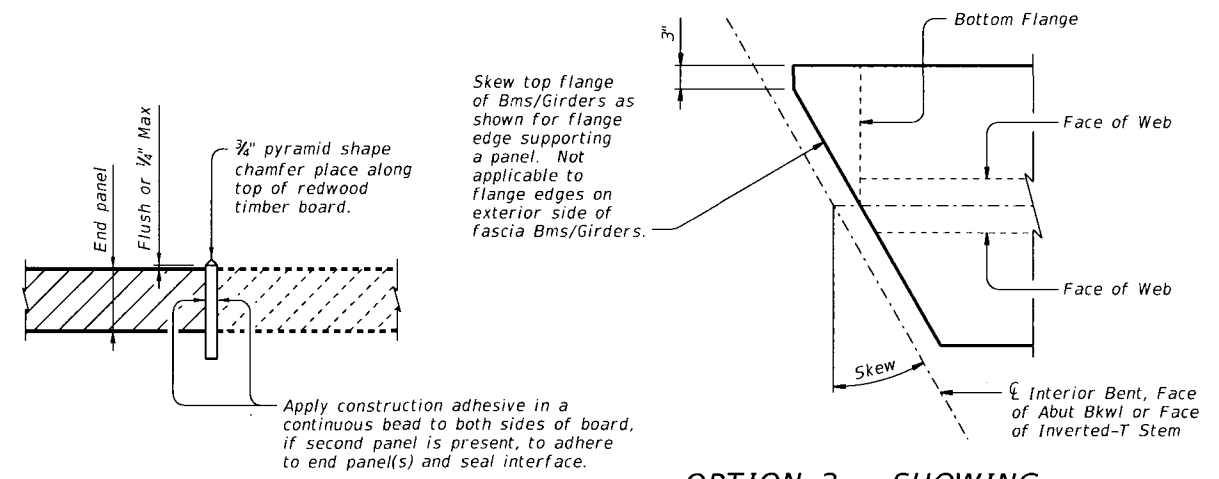
**INVERTED-T BENT**  
Panels against inverted-tee stem

**OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)**

**ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)**

See "Option 2 ~ Elevation At Beam Ends".

- (6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- (14) Max Spacing as listed unless otherwise shown.
- (21) 1 1/2" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)
- (22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than 1/2" thick.
- (23) 3/4" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within 1/4" Max above panel. Place 3/4" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within 1/4" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.
- (24) Place panel within 1/2" of 3/4" thick board.
- (25) Permanent galvanized steel sheet form. Removable formwork is acceptable.
- (26) Place end panel within 1/2" of expansion joint opening. End panel cannot encroach on required expansion joint opening.
- (27) Place additional (#4) bar 5'-0" in length between every slab bars T. Center (#4) bar on joint.
- (28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.



**OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°**

Showing I-Bm/I-Girder, U-Bms and Steel Bms similar.

**SPECIAL OPTION 2 CONSTRUCTION NOTES:**

When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 1/2".

Do not extend the longitudinal panel reinforcement into the cast-in-place slab.

Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.

Bending of anchor studs of expansion joints shown on standards AJ, SEJ-A and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and OA from standard IGTS in the slab.



**PRESTRESSED CONCRETE PANELS DECK DETAILS**

PCP

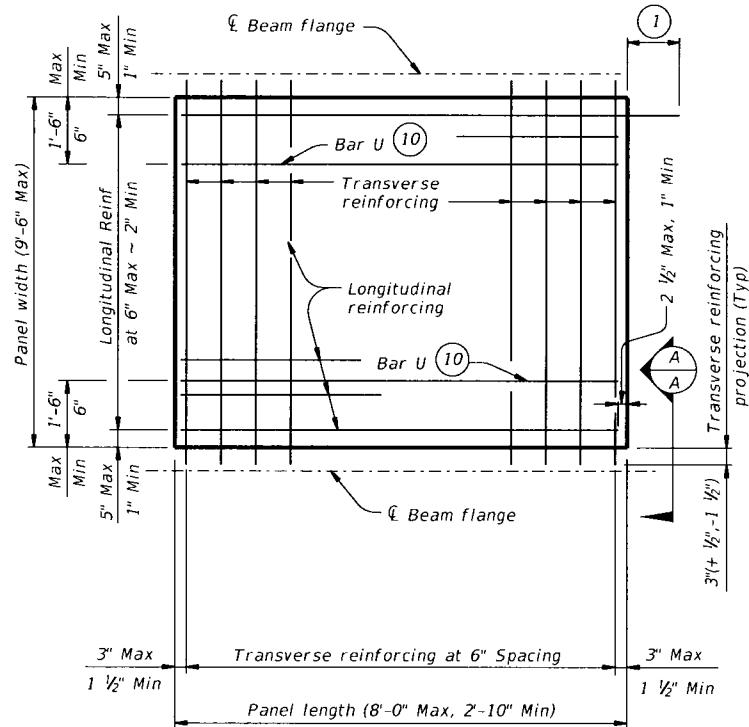
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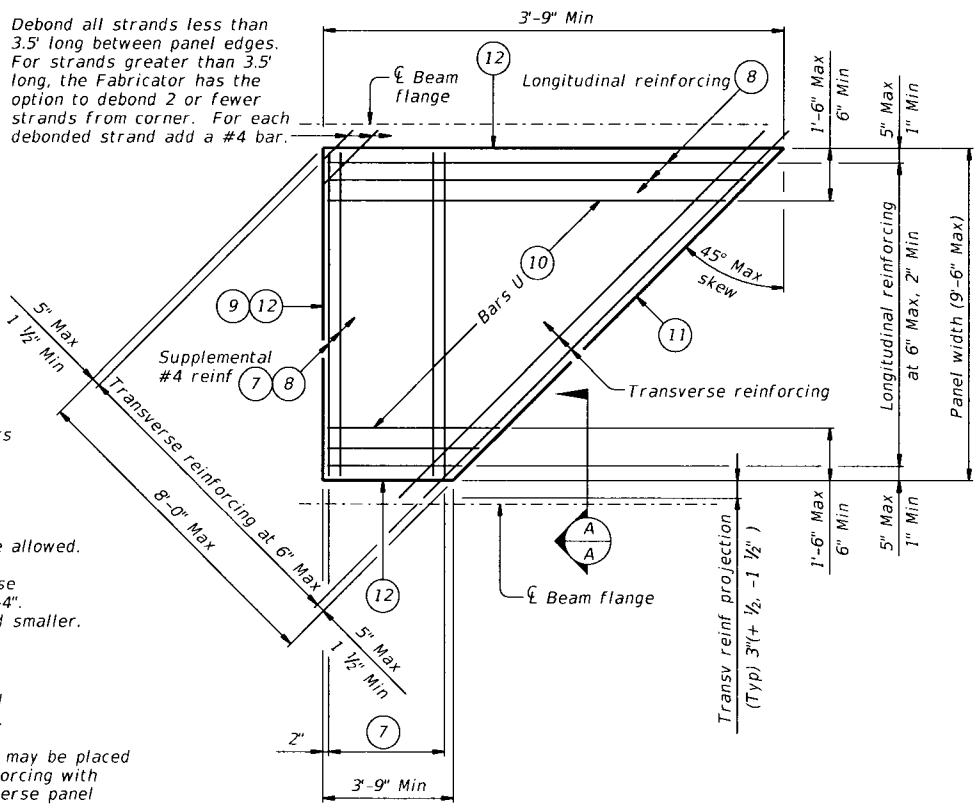
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**TYPICAL NON-SKEWED PANEL PLAN**



**TYPICAL SKEWED END PANEL PLAN**  
(Only to be used with details shown elsewhere in the plans.)

- 1 At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2", -0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
- 2 Four loops required per panel.
- 3 Four loops required per panel. 3/8" or 1/2" strands may be used.
- 4 Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
- 5 See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
- 6 One Splice allowed per panel. No more than two sheets of WWR are allowed.
- 7 Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
- 8 End Cover 2 1/2" Max, 1" Min.
- 9 Recess strands on indicated panel edge in accordance with Item 424.
- 10 At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
- 11 Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
- 12 Timber form work permissible this edge.

TABLE A			TABLE B				
Beam Type	Normal (In.)	Min (In.)	Max (In.)	Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
A	3	2 1/2	3 1/2	11" to 12"	2 3/4	2 1/2	2 3/4
B	3	2 1/2	3 1/2	Over 12" to 15"	3 1/4	3	3 1/4
C	4	3	4 1/2	Over 15" to 18"	4	3	4 3/4
IV	6	4	7 1/2	Over 18"	5	3 1/2	6 1/4
VI	6 1/2	4 1/2	8 1/2				
U40 - 54	5 1/2	5 1/2	7				
Tx28-70	6	5	7 1/2				
XB20 - 40	4	3	4 1/2				
XSB12 - 15	4	3	4 1/2				

**GENERAL NOTES:**

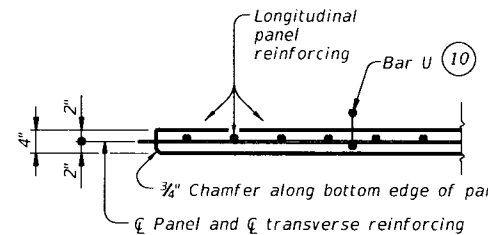
Provide Class H concrete for panels. Release strength  $f'ci=3,500$  psi. Minimum 28 day strength  $f'c=5,000$  psi.  
 Provide 3/4" chamfer along bottom edge of panel on beam side. Do not use epoxy-coated reinforcing steel bar or strand in panels. Remove laitance from top panel surface.  
 Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).  
 Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.  
 A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

**TRANSVERSE PANEL REINFORCEMENT:**

For panel widths over 5', use 3/8" or 1/2" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.  
 For panel widths over 3'-6" up to and including 5', use 3/8" or 1/2" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.  
 For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).  
 Place transverse panel reinforcement at panel centroid and space at 6" Max.

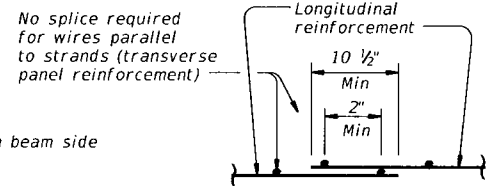
**LONGITUDINAL PANEL REINFORCEMENT:**

Any of the following options may be used for longitudinal panel reinforcement:  
 1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.  
 2. 3/8" Dia prestressing strands at 4 1/2" Max Spacing (unstressed). No splices allowed.  
 3. 1/2" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.  
 4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.  
 No combination of longitudinal reinforcement options in a panel is allowed. Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.

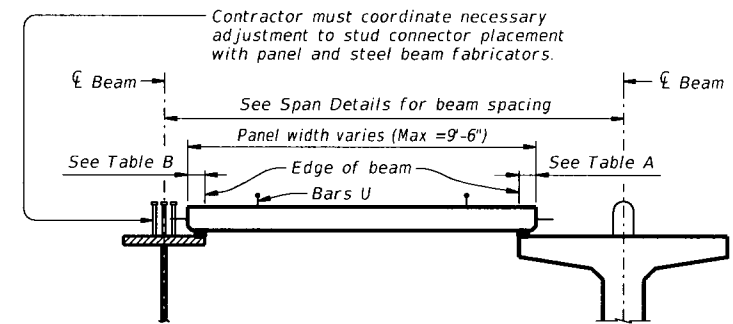


**SECTION A-A**

(Not showing supplemental #4 bars for skewed end panels.)



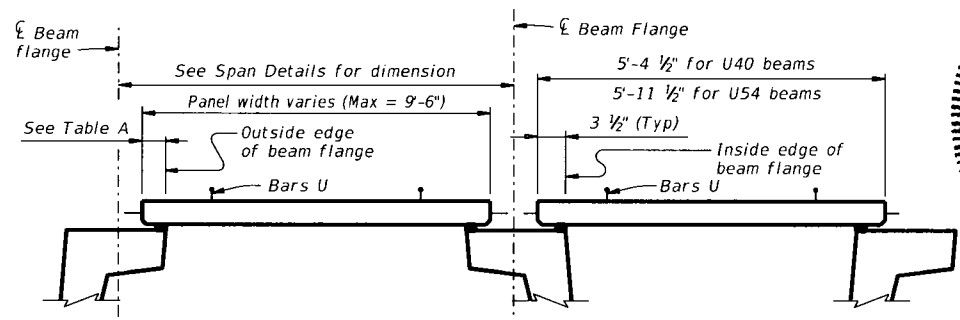
**WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL**



**STEEL BEAMS**

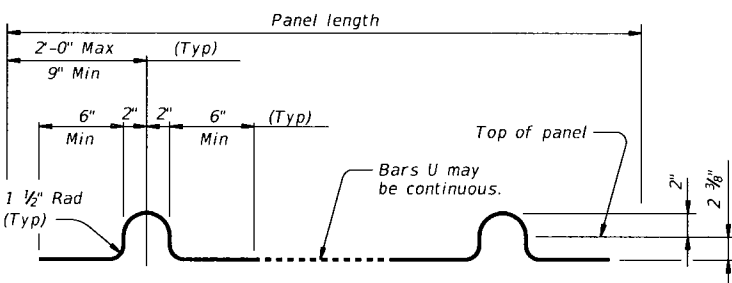
**PRESTRESSED CONCRETE BEAMS OR GIRDERS**

Typ unless noted otherwise

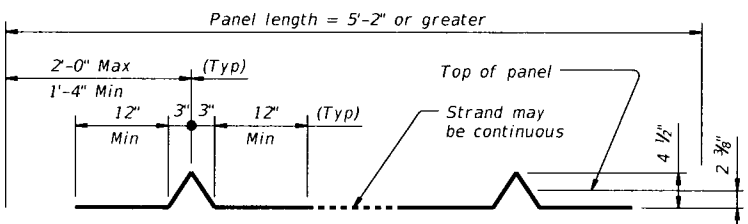


**PRESTRESSED CONCRETE U-BEAMS**

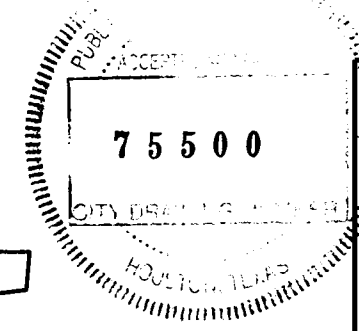
**TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH**



**BARS U (#3)**



**OPTIONAL STRAND FOR BARS U**



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Texas Department of Transportation  
 Bridge Division Standard

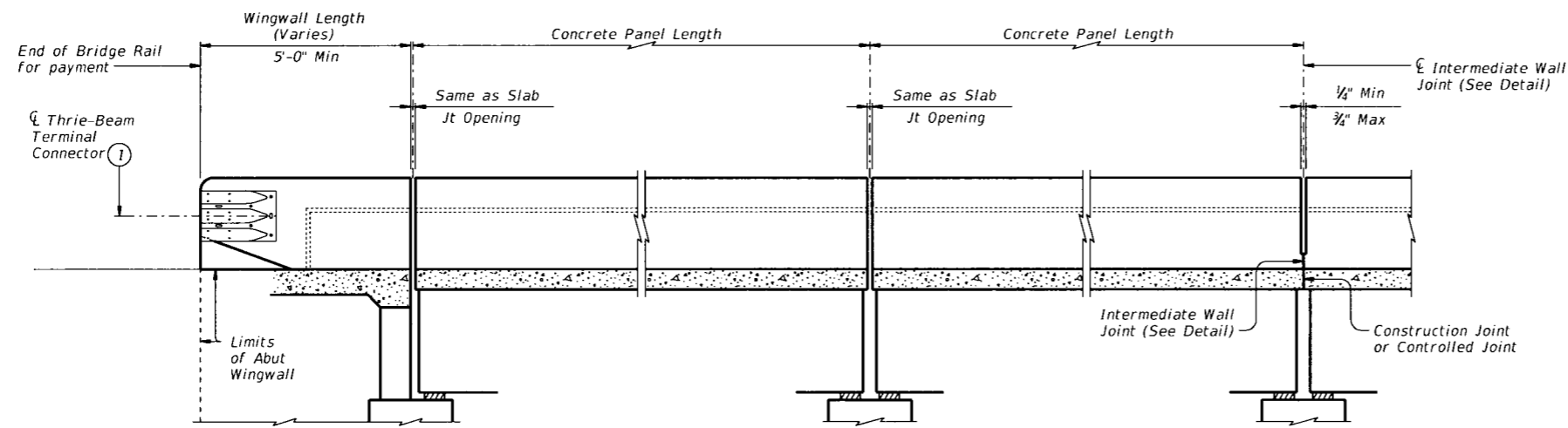
**PRESTRESSED CONCRETE PANEL FABRICATION DETAILS**

PCP-FAB

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DIST	COUNTY	SHEET NO.		
HOU	FORT BEND	131		



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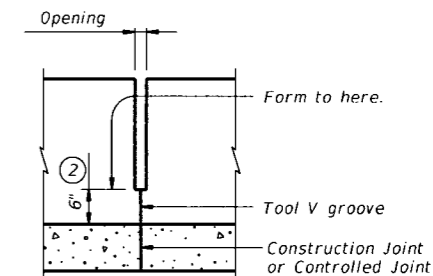


AT ABUTMENTS

AT BENTS WITH SLAB EXP JOINTS

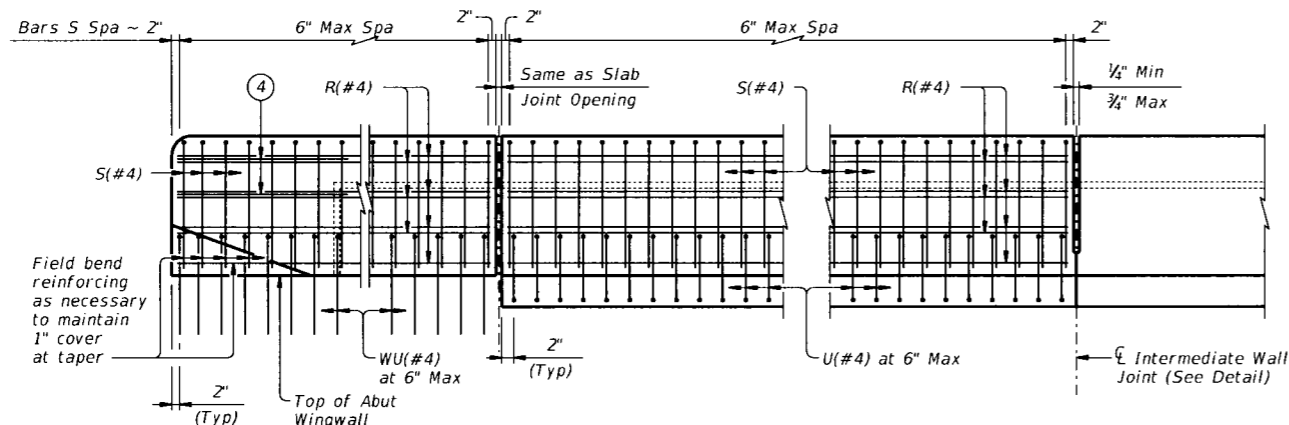
AT BENTS WITHOUT SLAB EXP JOINTS

**ROADWAY ELEVATION OF RAIL**

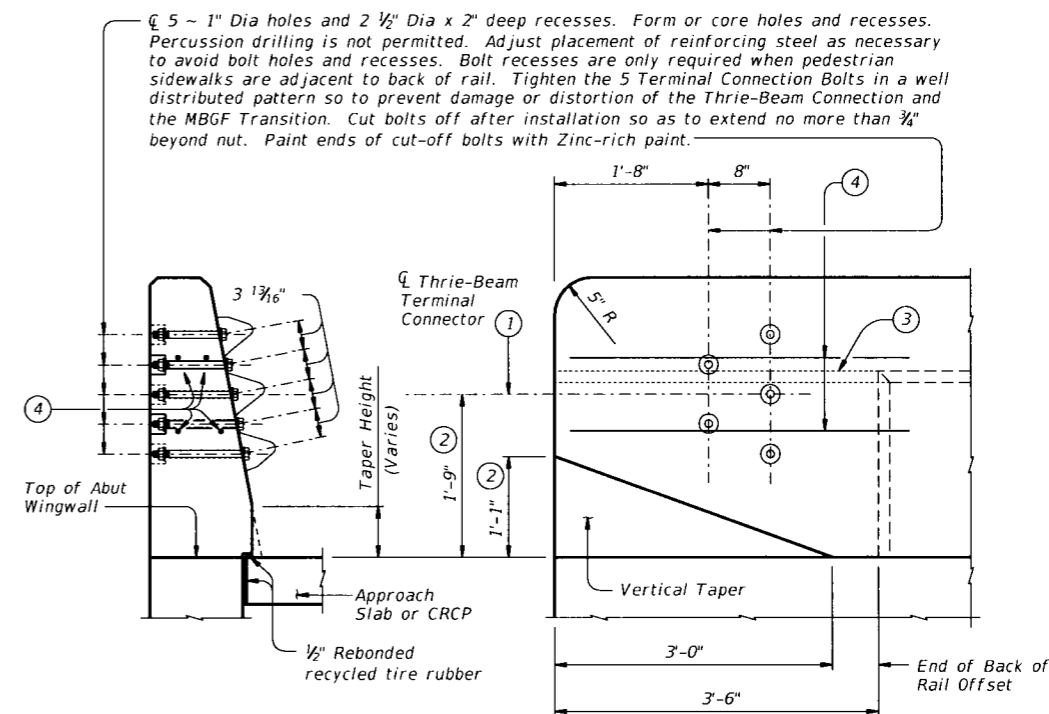


**INTERMEDIATE WALL JOINT DETAIL**

Provide at all interior bents without slab expansion joints.



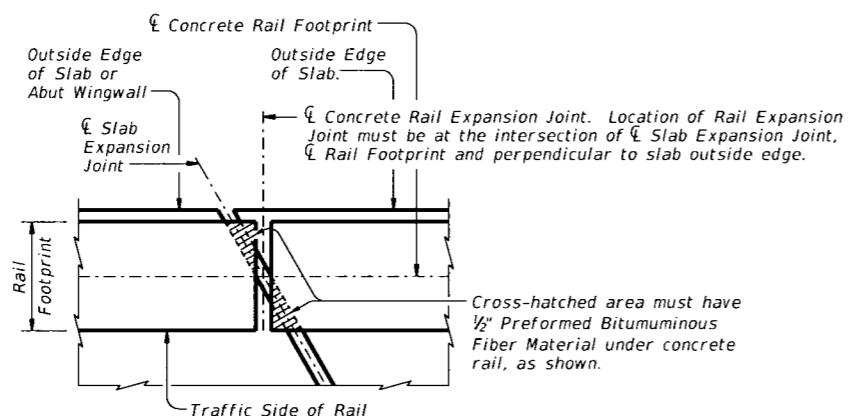
**ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT**



SECTION

ELEVATION

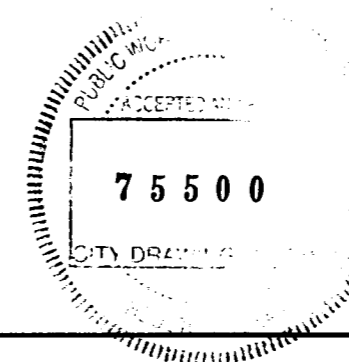
**TERMINAL CONNECTION DETAILS**



**PLAN OF RAIL AT EXPANSION JOINTS**

Example showing Slab Expansion Joints without breakbacks.

- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Increase 2" for structures with Overlay.
- ③ Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
- ④ Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required.



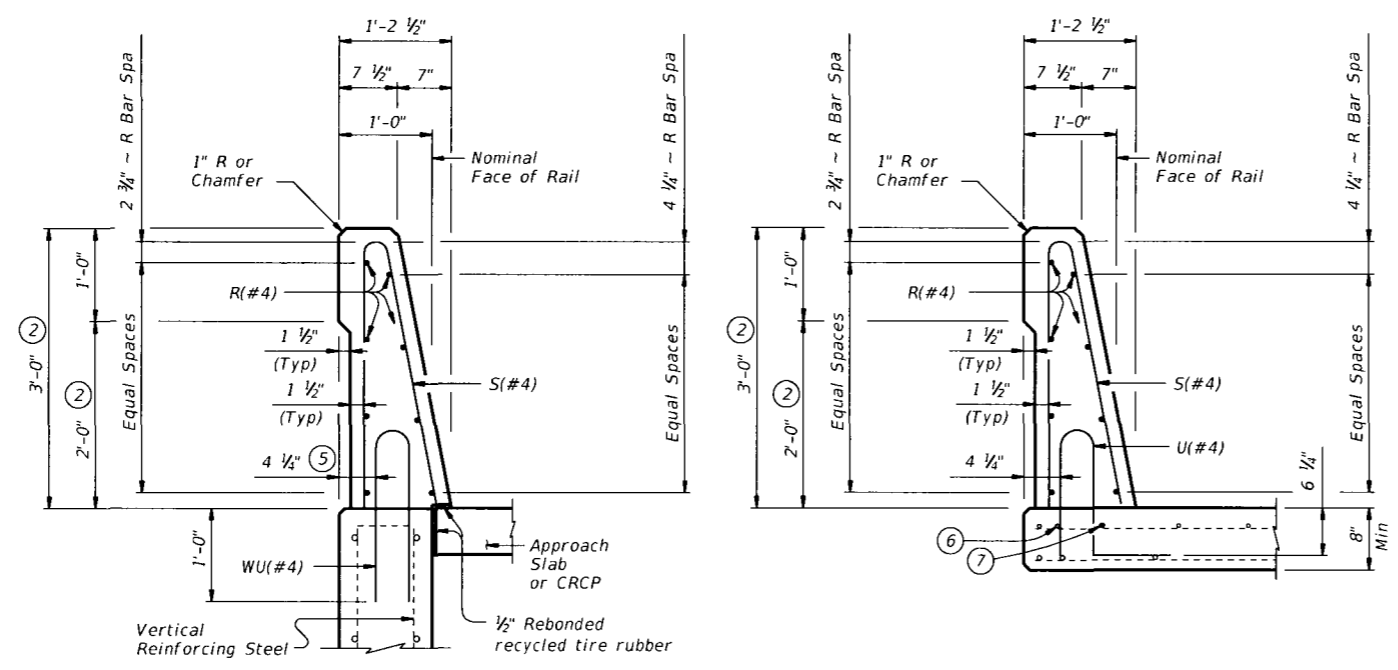
SHEET 1 OF 2

		<b>Bridge Division Standard</b>	
<b>TRAFFIC RAIL SINGLE SLOPE</b>			
<b>TYPE SSTR</b>			
FILE: r1stc014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
REVISIONS: TxDOT September 2019	CONT	SECT	JOB HIGHWAY
DIST	COUNTY	SHEET NO.	
HOU	FORT BEND	132	

DATE: FILE:

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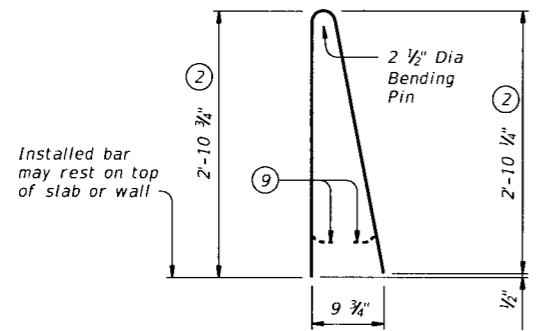
DATE: FILE:



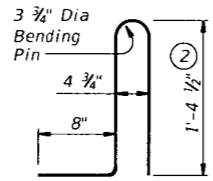
ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS

ON BRIDGE SLAB

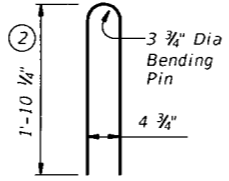
**SECTIONS THRU RAIL**



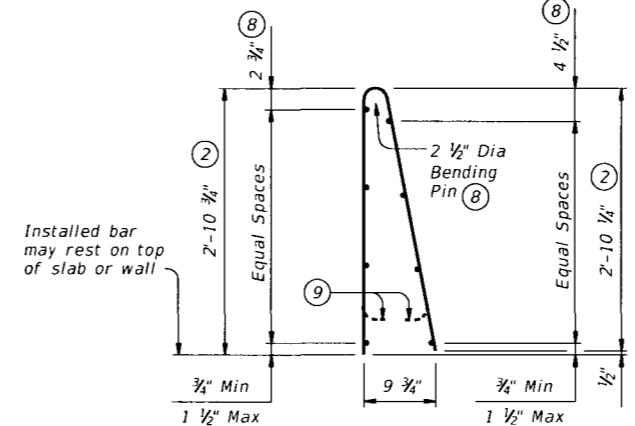
BARS S (#4)



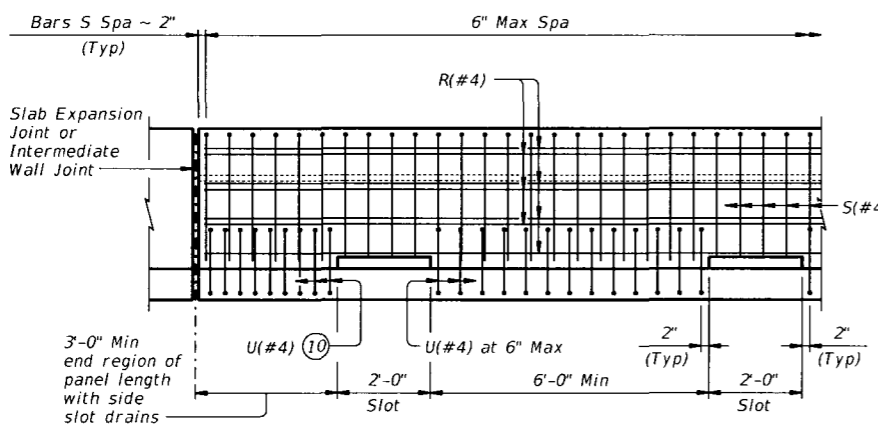
BARS U (#4)



BARS WU (#4)

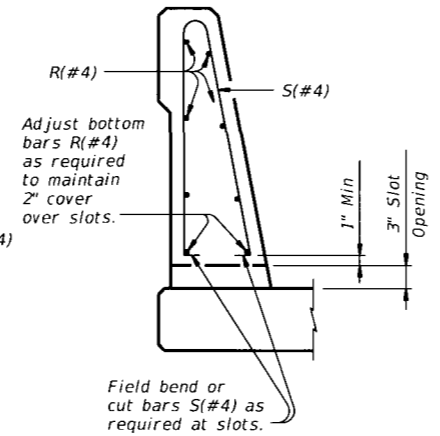


OPTIONAL WELDED WIRE REINFORCEMENT (WWR)



**OPTIONAL SIDE SLOT DRAIN DETAIL**

Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



**SECTION THRU OPTIONAL SIDE SLOT DRAIN**

DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
Minimum	No. of Wires	Spacing
Maximum	8	4"
Maximum Wire Size Differential	10	8"
	The smaller wire must have an area of 40% or more of the larger wire.	

- ② Increase 2" for structures with Overlay.
- ⑤ 5/4" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑥ As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars must be furnished at the Contractor's expense.
- ⑦ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑧ No longitudinal wires may be within upper bend.
- ⑨ Bend or cut as required to clear drain slots.
- ⑩ Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

**CONSTRUCTION NOTES:**

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".  
If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a 3/8" width x 1/4" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.  
The back of railing must be vertical unless otherwise shown in the plans or approved by the Engineer.

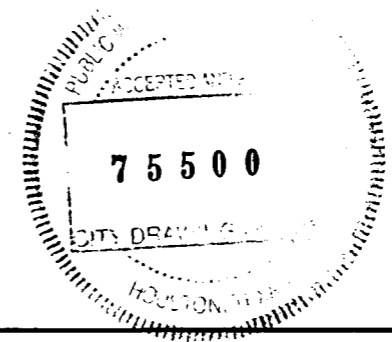
**MATERIAL NOTES:**

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.  
Provide Grade 60 reinforcing steel.  
Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.  
Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM A1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.  
Provide bar laps, where required, as follows:  
Uncoated or galvanized - #4 = 1'-7"  
Epoxy coated - #4 = 2'-5"

**GENERAL NOTES:**

This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.  
Do not use this railing on bridges with expansion joints providing more than 5" movement.  
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.  
Shop drawings will not be required for this rail.  
Average weight of railing with no overlay is 376 plf.

Cover dimensions are clear dimensions, unless noted otherwise.  
Reinforcing bar dimensions shown are out-to-out of bar.



**Texas Department of Transportation** Bridge Division Standard

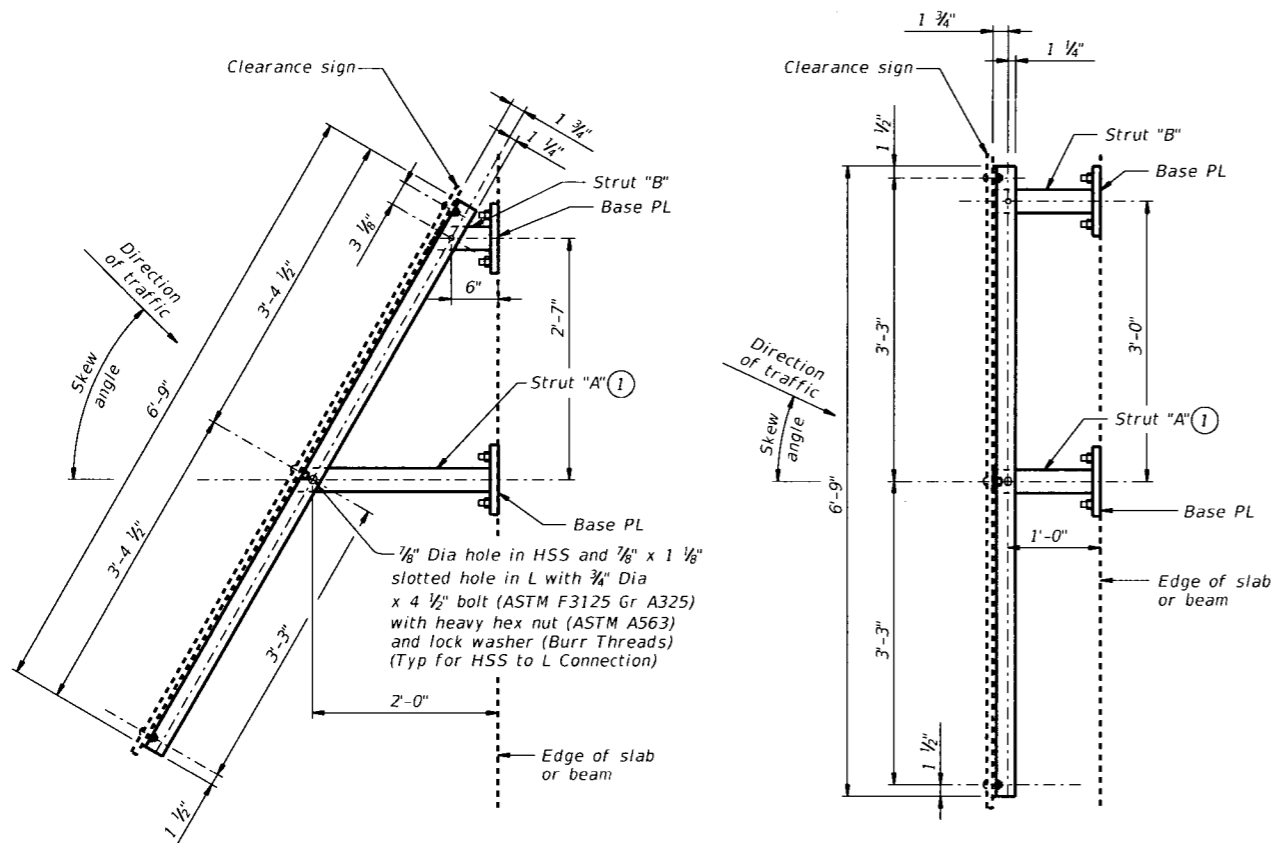
**TRAFFIC RAIL SINGLE SLOPE**

**TYPE SSTR**

FILE: r1std014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS				
DIST	COUNTY	SHEET NO.		
HOU	FORT BEND	133		

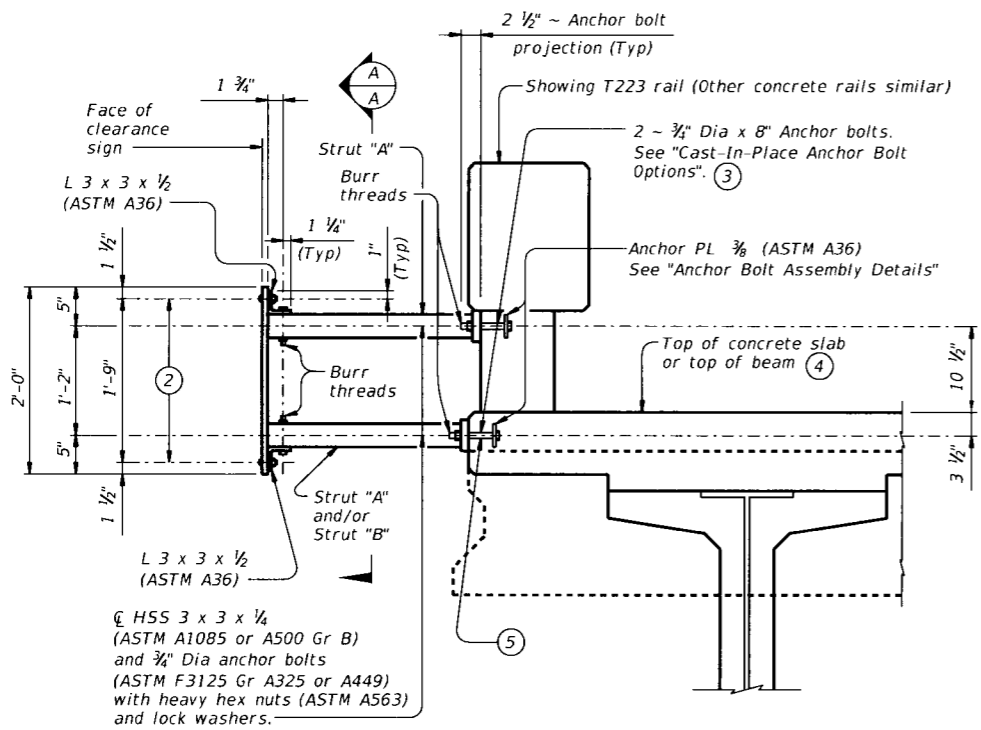
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DATE: FILE:

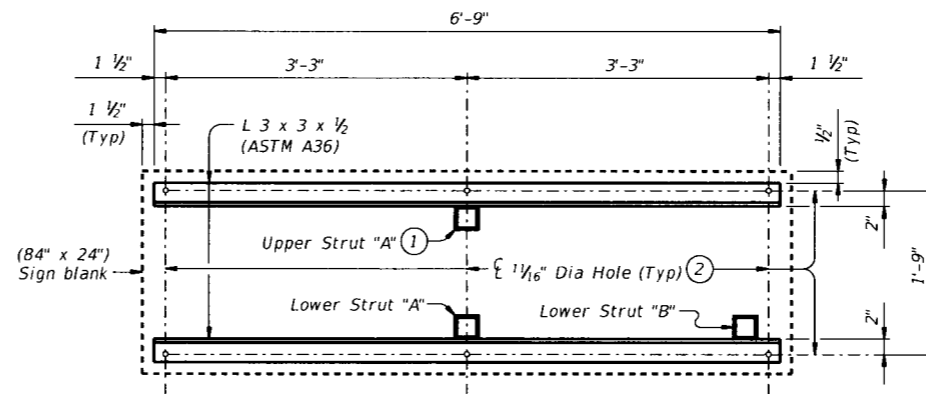


**PLAN OF TYPE S MOUNT**  
(Used for skews over 30°)

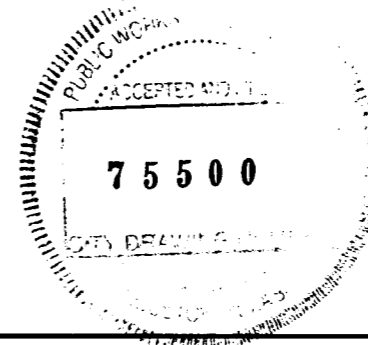
**PLAN OF TYPE N MOUNT**  
(Used for 0° to 30° skews)



**SECTION**



**SECTION A-A**



- ① Locate centerline of Strut A no closer than 12" from a vertical concrete edge.
- ② 5/16" Dia x 2" Hexagon socket button head cap screws (ASTM A574) with hex nuts. Attach hex nuts to L 3 x 3 x 1/2 by tack welding in two places. Threads must have Class 3A fit tolerance in accordance ASME B1.1. Six screws required.
- ③ At the Contractor's option fully threaded adhesive anchors may be used instead of cast-in-place anchor bolts. Expansion anchors are not allowed. Provide adhesive anchors that are 3/4" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). Embed fully threaded rods using a Type III, Class C, D, E, or F anchor adhesive. Adhesive anchor embedment depth is 8". Anchor adhesive chosen must be able to achieve a factored bond strength in tension of 2.2 kips per anchor (edge distance and spacing must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".
- ④ For decked slab beams topped with a 2 course surface treatment and ACP overlay.
- ⑤ Anchor bolts to be cast into decked slab beams topped with a 2 course surface treatment or ACP overlay. Anchor bolts with heavy hex nuts, regular lock washers, hardened washers and anchor plate that is embedded in the beam will be provided by the beam Fabricator.

**CONSTRUCTION NOTES:**

Install the vertical face of clearance sign plumb unless otherwise approved by the Engineer.  
Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 1 anchor per bridge mounted clearance sign installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

**MATERIAL NOTES:**

Galvanize all steel components after fabrication unless otherwise noted.

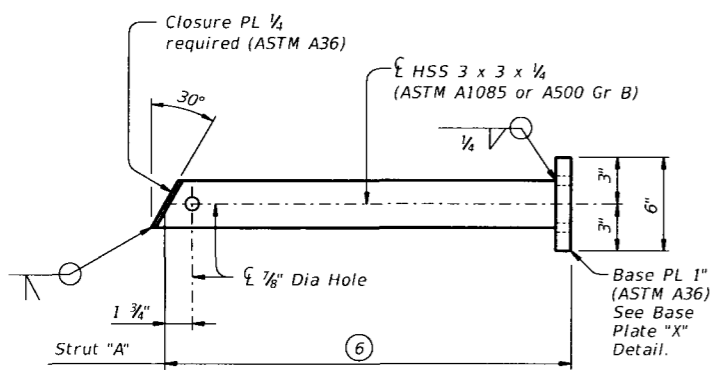
**GENERAL NOTES:**

This standard provides details to mount a vertical clearance sign (84" x 24") to bridges. Rail Types T631, T631LS, PR11, PR22 and PR3 are not accommodated.  
The Engineer will furnish the clearance to be shown on the sign.  
See Bridge Layout for sign location and mounting type (Type N or S).  
Cost of furnishing, installing, relocating or removing a clearance sign, including structural steel for sign mount, is included in unit price bid for Item 644, "Small Roadside Sign Assemblies".  
One Sign Blank (84" x 24") is 14 SF.  
Average steel weight for one complete Type N Mount is 219 Lb.  
Average steel weight for one complete Type S Mount is 233 Lb.

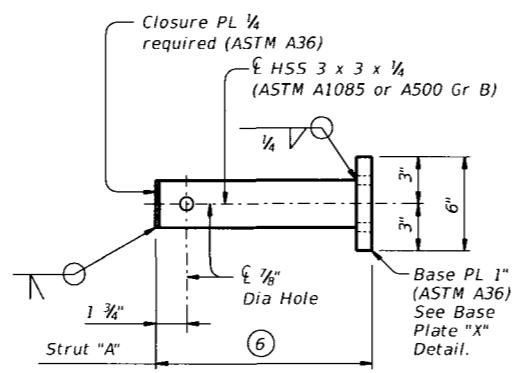
SHEET 1 OF 3

		Bridge Division Standard	
<b>BRIDGE MOUNTED CLEARANCE SIGN ASSEMBLY</b>			
<b>BMCS</b>			
FILE: bmcsteel-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
REVISIONS	CONTRACT	SECTION	JOB
	DISTRICT	COUNTY	SHEET NO.
	HOU	FORT BEND	134

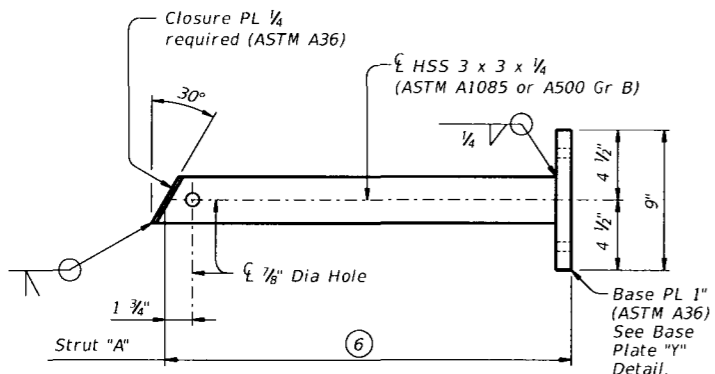
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FOR T411 AND C411 RAIL TYPES



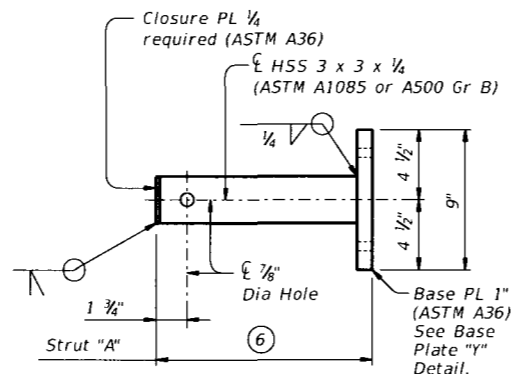
FOR T411 AND C411 RAIL TYPES



FOR T221, C221, T222, T223, C223, T401, T402, C402, T551, T552, T80HT, T80SS AND SSTR RAIL TYPES

UPPER STRUT DETAIL FOR (TYPE S MOUNT)

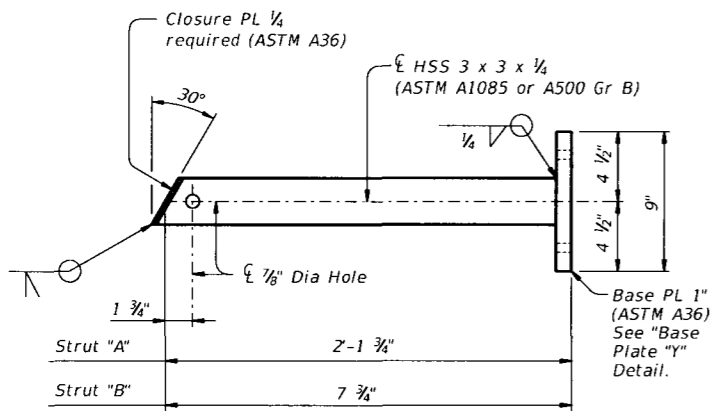
(Used for skews over 30°)



FOR T221, C221, T222, T223, C223, T401, T402, C402, T551, T552, T80HT, T80SS AND SSTR RAIL TYPES

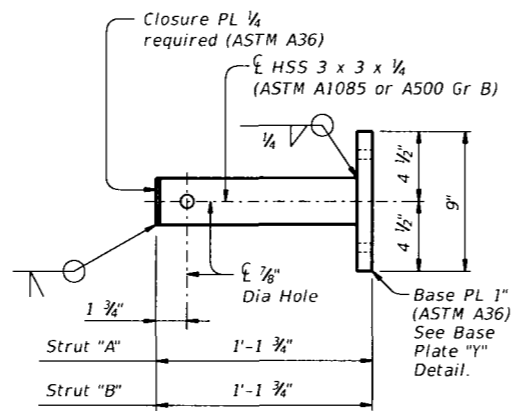
UPPER STRUT DETAIL FOR (TYPE N MOUNT)

(Used for 0° to 30° skews)



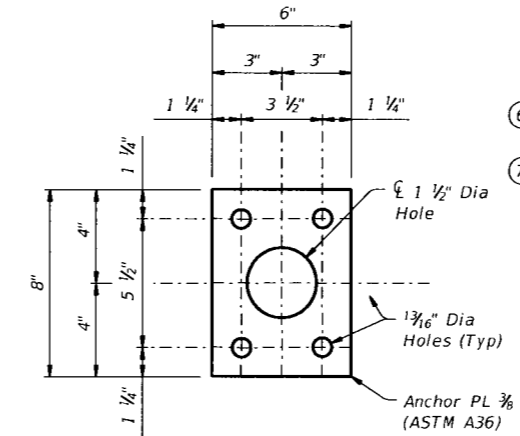
LOWER STRUT DETAILS FOR (TYPE S MOUNT)

(Used for skews over 30°)

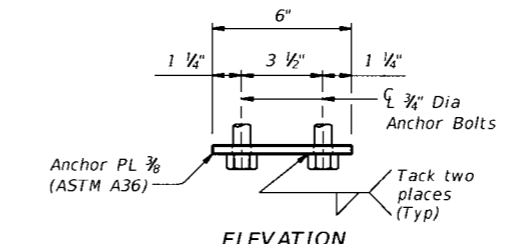


LOWER STRUT DETAILS FOR (TYPE N MOUNT)

(Used for 0° to 30° skews)



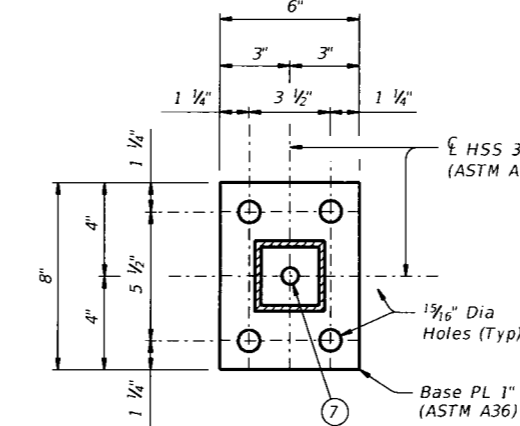
PLAN OF ANCHOR PLATE



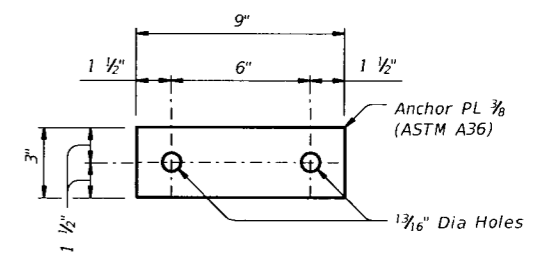
ELEVATION

ANCHOR BOLT ASSEMBLY DETAILS ③

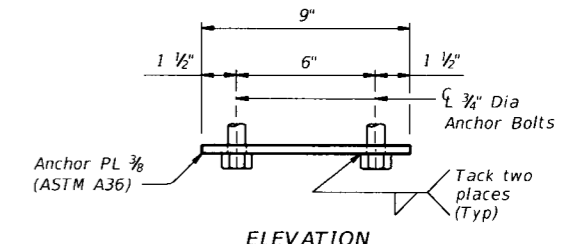
(Used on Base Plate "X" with T411 and C411 rail types.)



BASE PLATE "X" DETAIL



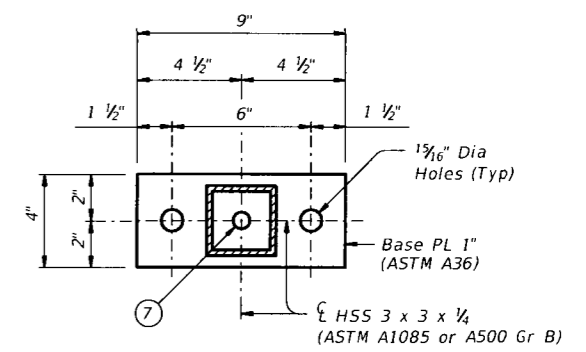
PLAN OF ANCHOR PLATE



ELEVATION

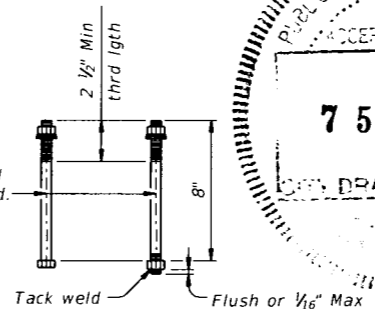
ANCHOR BOLT ASSEMBLY DETAILS ③

(Used on Base Plate "Y" and with T1F, T2P, C2P, T1W, C1W, T66 and C66 rail types.)

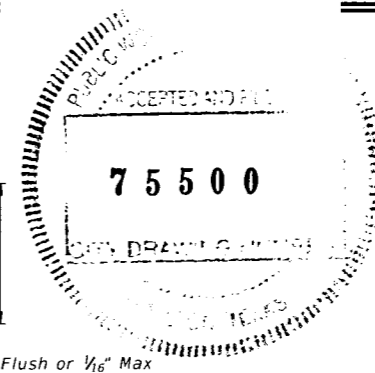


BASE PLATE "Y" DETAIL

③ 3/4" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ASTM A193 Gr B7 or F1554 Gr 105) with one hardened washer and one regular lock washer placed under heavy hex nut (ASTM A563). Furnish one additional heavy hex nut for each threaded rod.



CAST-IN-PLACE ANCHOR BOLT OPTIONS ③



SHEET 2 OF 3

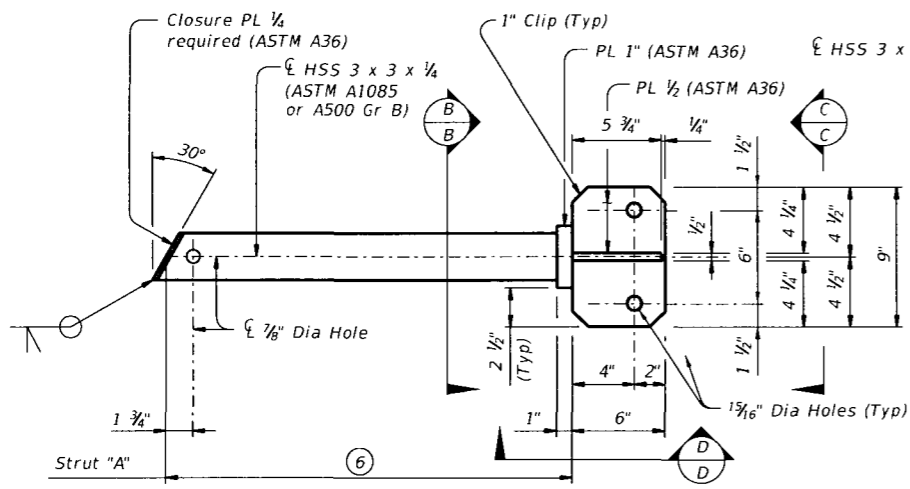
**Texas Department of Transportation**  
**BRIDGE MOUNTED CLEARANCE SIGN ASSEMBLY**  
**BMCS**

FILE: bmcstel-19.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO	
	HOU	FORT BEND	135	

DATE: FILE:

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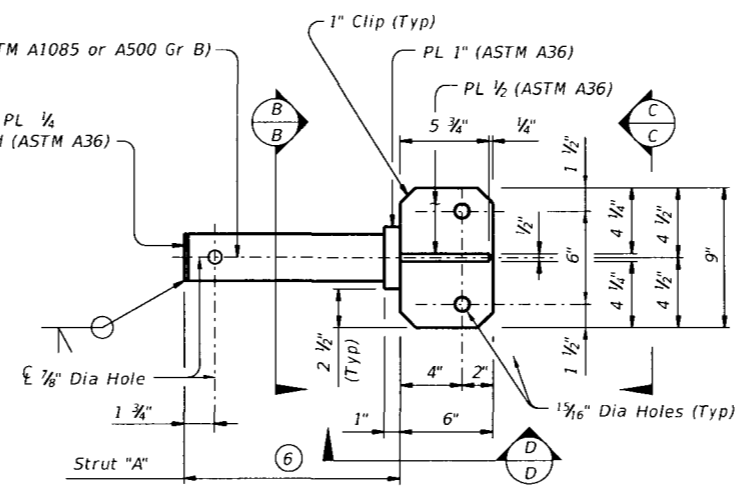
DATE: FILE:



FOR T1F, T2P, C2P, T1W, C1W, T66 AND C66 RAIL TYPES

**UPPER STRUT DETAIL FOR (TYPE S MOUNT)**  
(Used for skews over 30°)

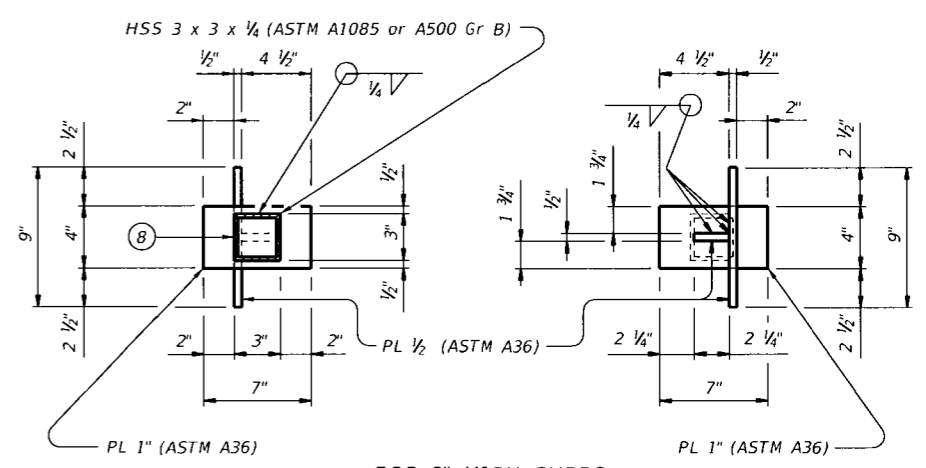
- ② 1/8" Dia x 2" Hexagon socket button head cap screws (ASTM A574) with hex nuts. Attach hex nuts to L 3 x 3 x 1/2 by tack welding in two places. Threads must have Class 3A fit tolerance in accordance ASME B1.1. Six screws required.
- ③ At the Contractor's option fully threaded adhesive anchors may be use instead of cast-in-place anchor bolts. Expansion anchors are not allowed. Provide adhesive anchors that are 3/4" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). Embed fully threaded rods using a Type III, Class C, D, E, or F anchor adhesive. Adhesive anchor embedment depth is 8". Anchor adhesive chosen must be able to achieve a factored bond strength in tension of 2.2 kips per anchor (edge distance and spacing must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".



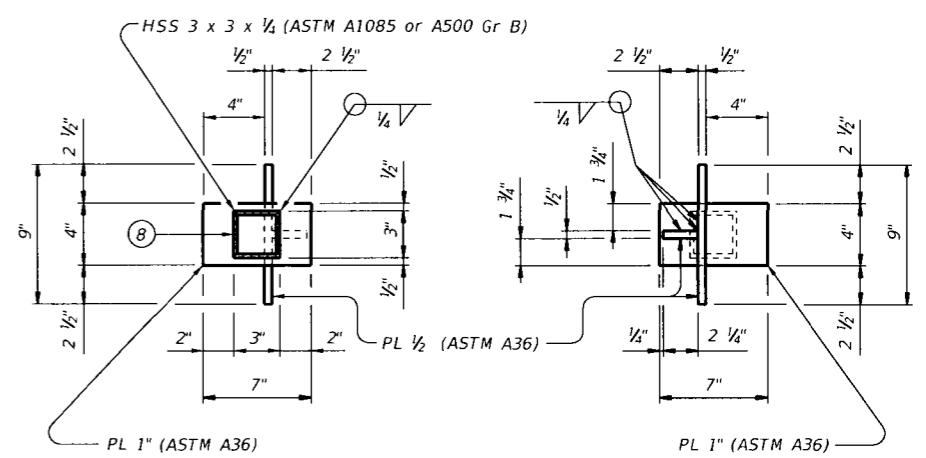
FOR T1F, T2P, C2P, T1W, C1W, T66 AND C66 RAIL TYPES

**UPPER STRUT DETAIL FOR (TYPE N MOUNT)**  
(Used for 0° to 30° skews)

- ④ For decked slab beams topped with a 2 course surface treatment and ACP overlay.
- ⑥ Adjust length to accommodate edge of slab to back of rail for specific project conditions and to help plumb the vertical face of clearance sign.
- ⑧ Hole required in bottom of HSS to drain zinc during galvanizing.
- ⑨ 11" curb is for structures with 2" ACP overlay.



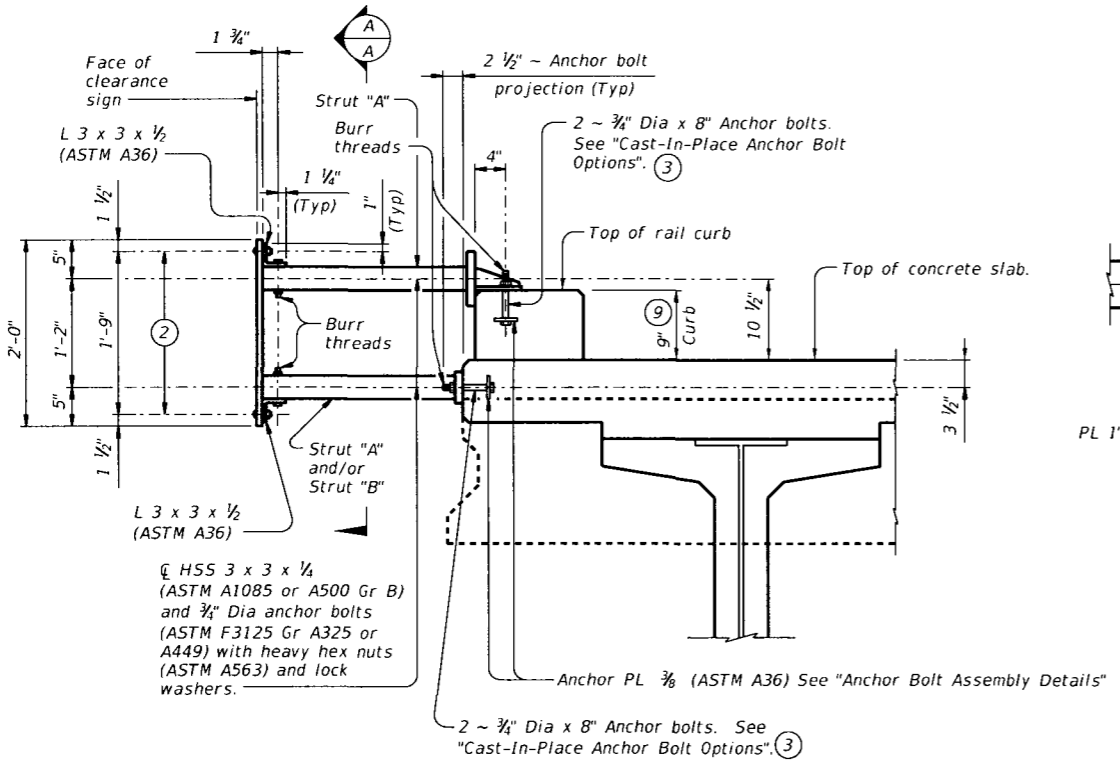
FOR 9" HIGH CURBS



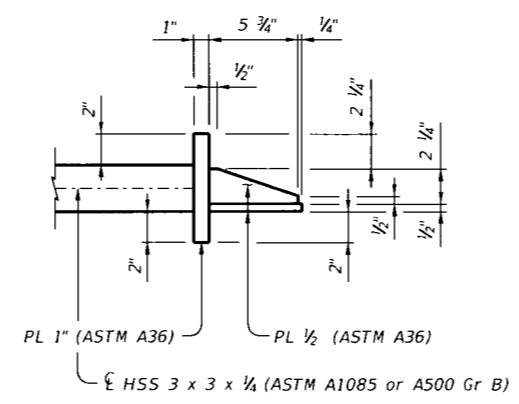
FOR 11" HIGH CURBS

**SECTION B-B**

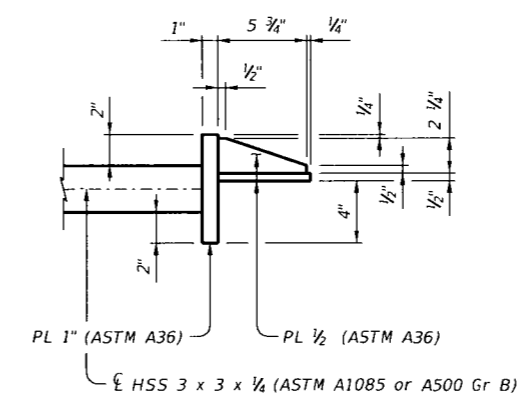
**VIEW C-C**



**SECTION THRU T1F, T2P, C2P, T1W, C1W, T66 AND C66 RAIL CURB**  
Showing sign mount on a 9" high curb, 11" high curb similar.



FOR 9" HIGH CURBS



FOR 11" HIGH CURBS

**VIEW D-D**

SHEET 3 OF 3

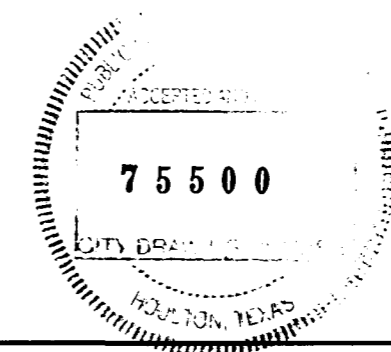
**Texas Department of Transportation**  
Bridge Division Standard

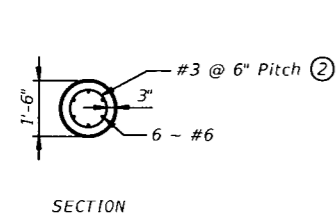
**BRIDGE MOUNTED CLEARANCE SIGN ASSEMBLY**

**BMCS**

FILE: bmcstel-19.dgn    DW: TxDOT    CK: TxDOT    DW: TxDOT    CK: TxDOT  
 TxDOT April 2019    CONV    SECT    JOB    HIGHWAY  
 REVISIONS

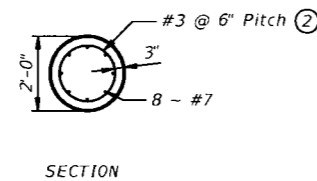
DIST: COUNTY: SHEET NO:  
 HOU: FORT BEND: 136





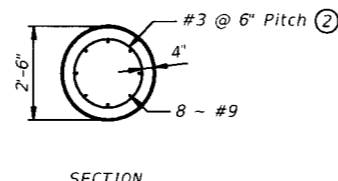
**18" DRILLED SHAFT**

Located at bridge abutment wingwalls.



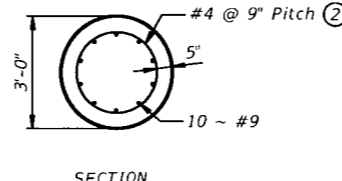
**24" DRILLED SHAFT**

Located at prestressed concrete slab beam bridges.



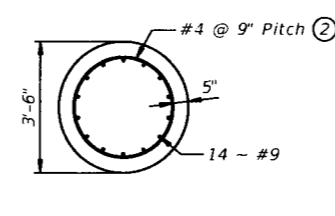
**30" DRILLED SHAFT**

Located at bridge abutments or prestressed concrete slab beam bridges.



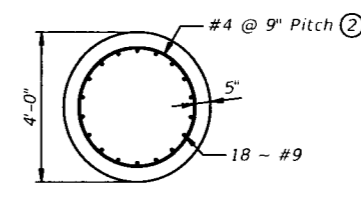
**36" DRILLED SHAFT**

Located at bridge abutments and select bridge bents.



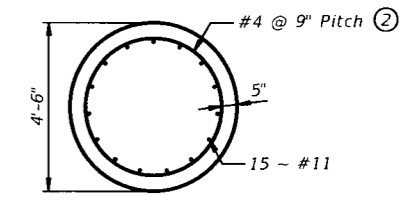
**42" DRILLED SHAFT**

Located at bridge bents.



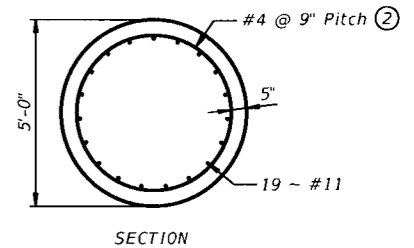
**48" DRILLED SHAFT**

Located at bridge bents.



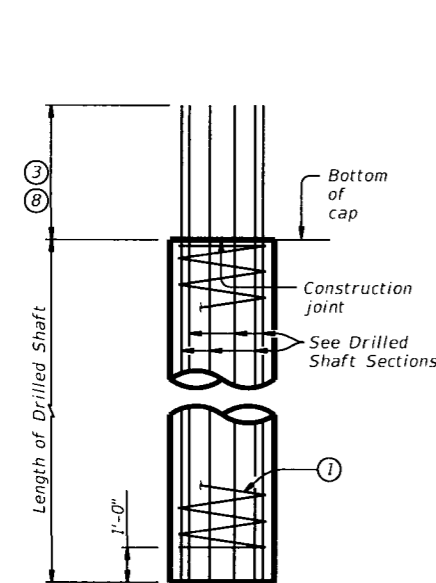
**54" DRILLED SHAFT**

Located at bridge bents.

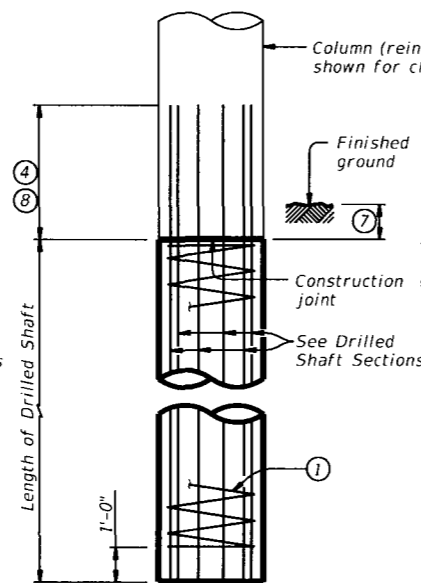


**60" DRILLED SHAFT**

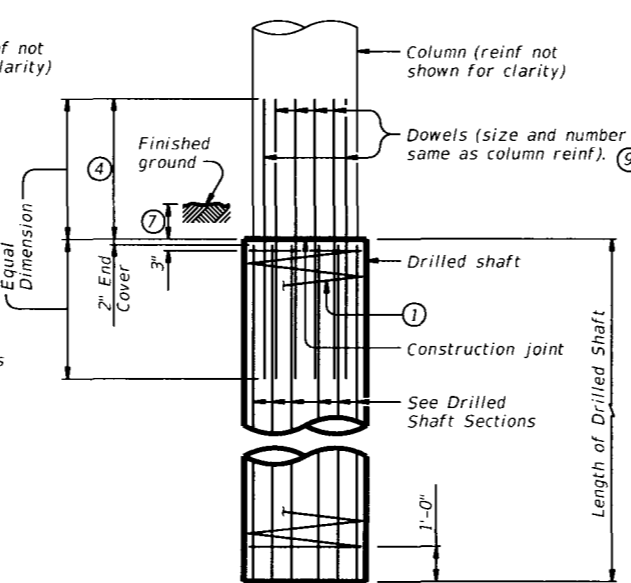
Located at bridge bents.



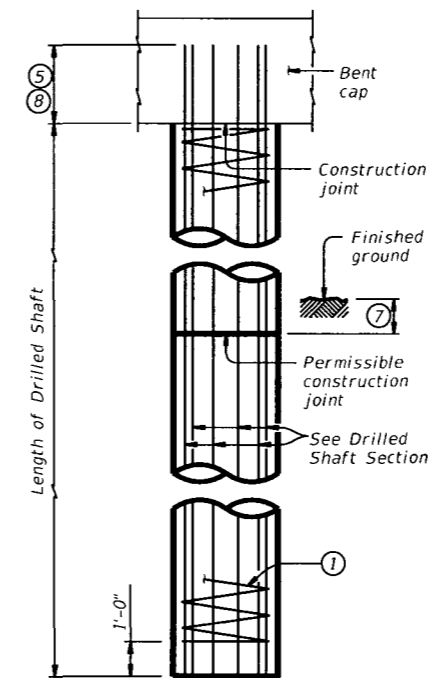
**ABUTMENTS & WINGWALLS**



**INTERIOR BENTS  
DRILLED SHAFT DIA  
EQUAL TO COLUMN DIA**



**INTERIOR BENTS  
DRILLED SHAFT DIA  
GREATER THAN COLUMN DIA**



**SHORT INTERIOR BENT  
DRILLED SHAFT DETAIL**

**DRILLED SHAFT ELEVATION DETAILS**

**CONSTRUCTION NOTES:**

See Bridge Layout and "Foundation Notes" or "Table of Foundation Quantities", if provided, for drilled shaft size, design load, and length required.

Use these drilled shaft details unless shown otherwise on bridge plans.

Refer to bridge details for anticipated locations of drilled shaft casing.

**GENERAL NOTES:**

Designed according to AASHTO LRFD Bridge Design Specifications.

These details have been modified for the Houston District to facilitate slurry displacement method of drilled shaft installation.

The details shown on this sheet are only applicable for multi-column or multi-drilled shaft bridge abutments and bents. These details are not applicable for retaining walls, sound walls, and sign structures. Drilled shaft details shown on this sheet may be referenced by engineer for footings on drilled shafts. Refer elsewhere in plans for footing details.

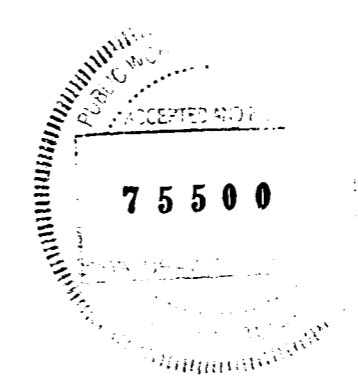
Drilled shaft details for drilled shafts exceeding 60" diameter are shown elsewhere in plans. Drilled shafts exceeding 30" diameter shall have a minimum of 5" clear cover and 1% minimum vertical reinforcing steel.

**MATERIAL NOTES:**

Provide Class SS Concrete ( $f'c = 3,600$  psi), unless shown otherwise.  
 Provide Grade 60 reinforcing steel, unless shown otherwise.  
 Galvanize reinforcing if shown elsewhere in the plans.  
 Provide bar laps for drilled shaft reinforcing, where required, as follows:  
 Uncoated or galvanized (#6) ~ 2'-10"  
 Uncoated or galvanized (#7) ~ 3'-3"  
 Uncoated or galvanized (#9) ~ 4'-3"  
 Uncoated or galvanized (#11) ~ 5'-3"

Cover dimensions are clear dimensions, unless noted otherwise.  
 Reinforcing bar dimensions shown are out-to-out of bar.

- ① Refer to drilled shaft section for spiral size and pitch.
- ② Provide one and half flat turns top and bottom.
- ③ Min extensions into support element  
 #6 Bars = 1'-11"  
 #7 Bars = 2'-0"  
 #9 Bars = 2'-3"
- ④ Min lap with column reinforcement  
 #7 Bars = 3'-3"  
 #9 Bars = 4'-3"  
 #11 Bars = 5'-3"
- ⑤ Min extensions into support element  
 #6 Bars = 1'-11"  
 #7 Bars = 2'-3"  
 #9 Bars = 2'-9"
- ⑥ Refer to bridge details for applicable locations. Drilled shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved. This option can only be used when the drilled shaft diameter equals the column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.
- ⑦ 1'-0" Min, unless shown otherwise on plans.  
 2'-0" Min at water crossings, unless shown otherwise on plans.
- ⑧ Projecting reinforcing is to be included in unit price bid for drilled shafts.
- ⑨ Dowels are to be included in unit price bid for drilled shafts.



HL93 LOADING

SHEET 1 OF 1

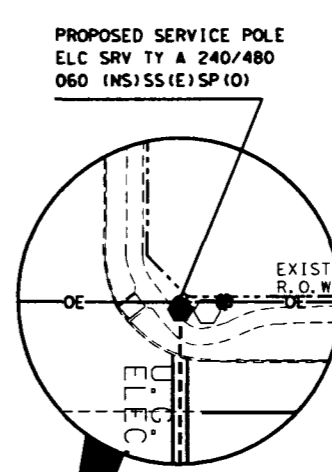
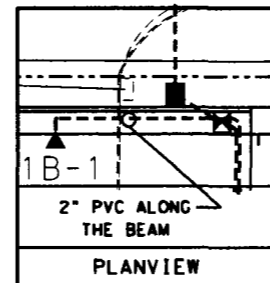
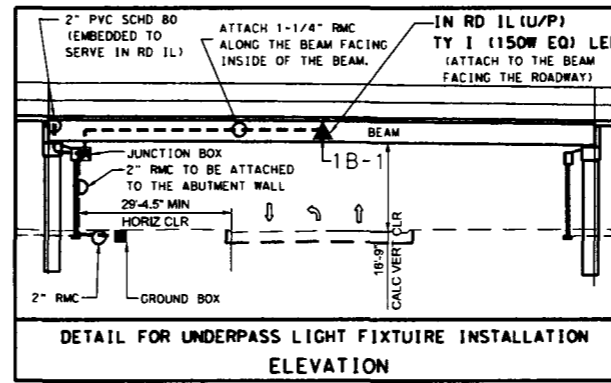
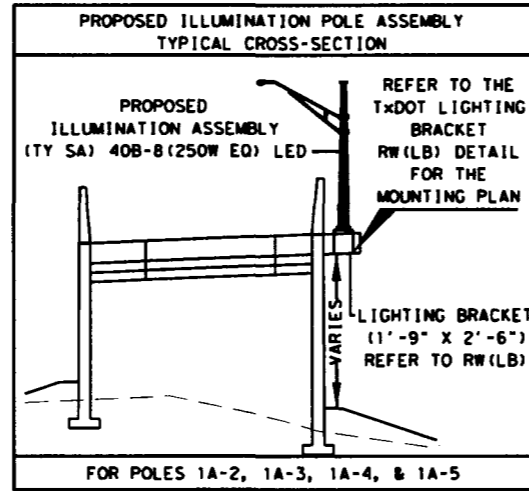
Texas Department of Transportation		Houston District (Bridge)	
<b>STANDARD BRIDGE DRILLED SHAFT DETAILS HOUSTON DISTRICT</b>			
HOU-BDS-22			
FILE: STDJ14.dgn	DN: MEC	CK: YL	DW: MEC
DATE: JAN. 27, 2022	CON: SECT	JOB:	HIGHWAY:
REVISIONS		DIST:	COUNTY:
		SHEET NO. 137	

DATE:  
FILE:

100%  
SUBMITTAL

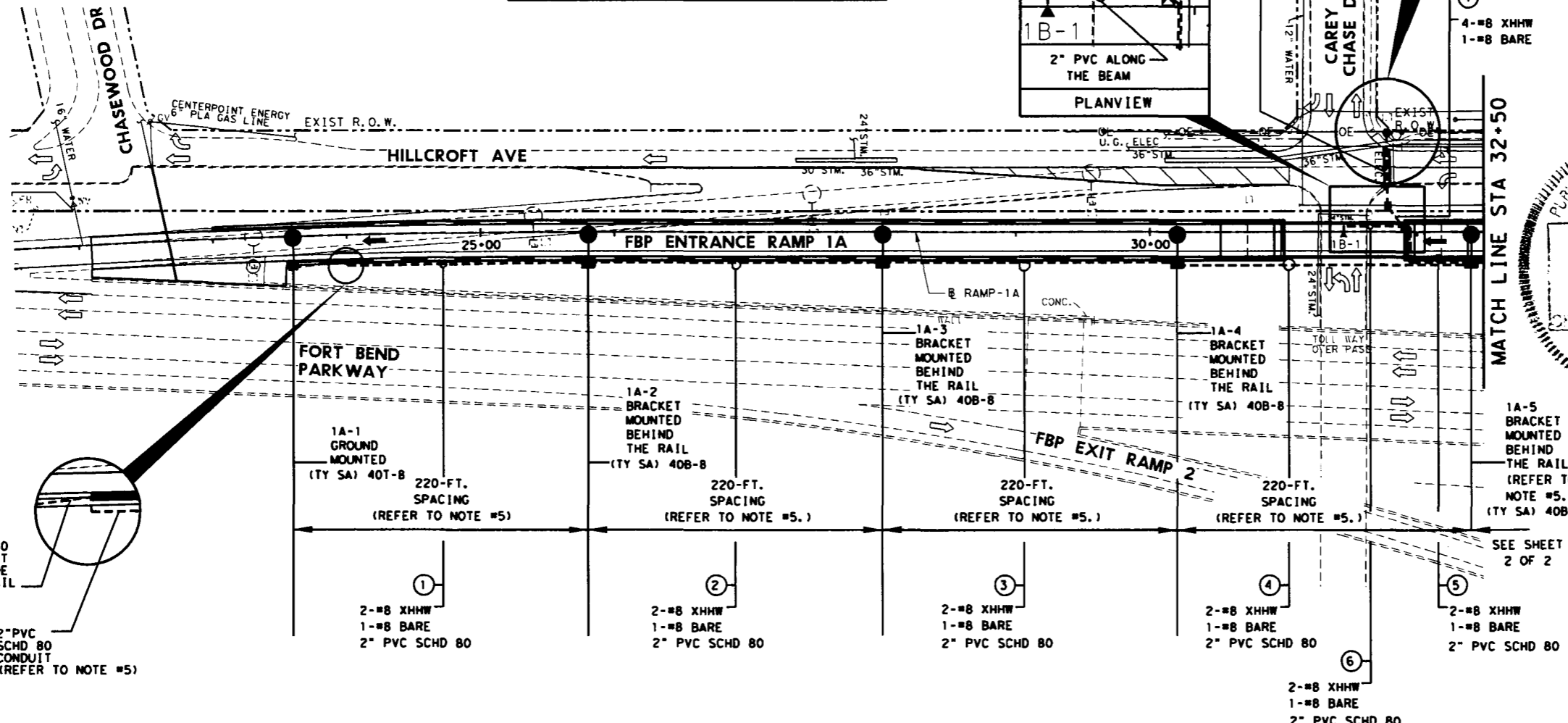
**GENERAL NOTES:**

1. CONTRACTOR SHALL MAKE SURE THAT THE INSTALLATION OF SAFETY LIGHT POLES ARE IN COMPLIANCE WITH THE CURRENT NATIONAL ELECTRICAL CODE (NEC) AND TxDOT STANDARDS.
2. CONTRACTOR SHALL GROUND ALL THE PROPOSED SAFETY LIGHT POLES IN ACCORDANCE WITH THE CURRENT NATIONAL ELECTRICAL CODE (NEC) AND TxDOT REQUIREMENTS.
3. CONTRACTOR SHALL CONFORM TO ALL PERTINENT OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION) REGULATIONS.
4. LOCATIONS OF UTILITIES SHOWN ARE APPROXIMATE. IT IS CONTRACTOR'S RESPONSIBILITY TO VERIFY AND LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING CONSTRUCTION.
5. PROPOSED CONDUITS ARE SHOWN OUTSIDE THE RAIL FOR CLARITY. HOWEVER, THE ELECTRICAL CONDUCTOR AND BARE WIRE ARE SUPPOSED TO BE EMBEDDED INSIDE THE RAIL IN 2-INCH CONDUIT.



**LEGEND**

- PROPOSED ILLUMINATION ASSEMBLY
- PROPOSED GROUND BOX TY A (W/APRON, 122311)
- ▬ PROPOSED CONDUIT (BORE, PVC SCHD 80)
- ▬ PROPOSED CONDUIT (TRENCH/EMBEDDED, PVC SCHD 80)
- ▬ PROPOSED CONDUIT (RMC)
- 1A-3 PROPOSED ILLUMINATION LIGHT
- ⊕ PROPOSED ELECTRICAL RUN NUMBER
- PROPOSED ELECTRICAL SERVICE
- EXISTING ELECTRICAL SERVICE
- ⊗ EXISTING GROUND BOX
- ⊠ PROPOSED JUNCTION BOX
- ▲ PROPOSED RD IL AM (U/P) TY I (150W EQ) LED
- ↑ POLE DESIGNATION
- POLE
- CIRCUI
- SERVICE



75500  
ACCEPTED  
SCALE: 1"=100'

REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**Progressive** Traffic & Transportation  
16360 Park Ten Place, Ste. 106, Houston, Texas, 77084  
281-206-7495  
281-206-7494 FX  
#F-9492

**ILLUMINATION ASSEMBLY LOCATIONS (THIS SHEET ONLY)**

NUMBER	STATION @ RAMP-1A	OFFSET @ RAMP-1A	LOCATION	TYPE
1A-1	23+59.87	21.58' RT	SB FBP ENT. RAMP	(TY SA) 40T-8 (250W EQ) LED
1A-2	25+80.65	22.40' RT	SB FBP ENT. RAMP	(TY SA) 40B-8 (250W EQ) LED
1A-3	28+00.65	22.46' RT	SB FBP ENT. RAMP	(TY SA) 40B-8 (250W EQ) LED
1A-4	30+20.65	22.46' RT	SB FBP ENT. RAMP	(TY SA) 40B-8 (250W EQ) LED
1A-5	32+40.65	22.48' RT	SB FBP ENT. RAMP	(TY SA) 40B-8 (250W EQ) LED
1B-1	31+45.13	02.29' RT	SB FBP ENT. RAMP	(U/P) TY I (150W EQ) LED

• APPROXIMATE OFFSET.

**ESTIMATED CONDUIT AND CONDUCTOR RUNS (THIS SHEET ONLY)**

CIRCUIT	RUN NUMBER	GRD WIRE & COND NUMBER & LENGTH (FEET)		CONDUIT LENGTH (FEET)			
		NO. 8 BARE	NO. 8 INSUL	2" PVC SCHD 80	2" PVC (BORE) SCHD 80	1-1/4" RM	2" RM
A	1	220	440	220			
A	2	220	440	220			
A	3	220	440	220			
A	4	220	440	220			
A	5	80	160	80			
B	6	50	100			50	
A & B	7	45	180				45
A & B	8	55	220		55		

**TOTAL ESTIMATED QUANTITIES (THIS SHEET ONLY)**

ITEM-CODE	DESCRIPTION	UNIT	SHEET TOTAL
610-6104	IN RD IL (U/P) TY I (150W EQ) LED	EA	1
610-6198	IN RD IL (TY SA) 40B-8 (250W EQ) LED	EA	4
610-6214	IN RD IL (TY SA) 40T-8 (250W EQ) LED	EA	1
618-6046	COND. (PVC) SCHD 80 (2")	LF	960
618-6047	COND. (PVC) SCHD 80 (2") (BORED)	LF	55
618-6066	COND. (RMC) (1-1/4")	LF	50
618-6070	COND. (RMC) (2")	LF	45
620-6007	ELE COND (NO. 8) BARE	LF	1,110
620-6008	ELE COND (NO. 8) INSULATED	LF	2,420
624-6002	GROUND BOX TY A (122311) W/ APRON	EA	1
628-6045	ELC SRV TY A 240/480 060 (NS)SS(E)SP(O)	EA	1

**FORT BEND PARKWAY TOLL ROAD**

**ENTRANCE RAMP 1A ILLUMINATION PLAN**

STA 21+50 TO STA 32+50

SHEET 1 OF 2

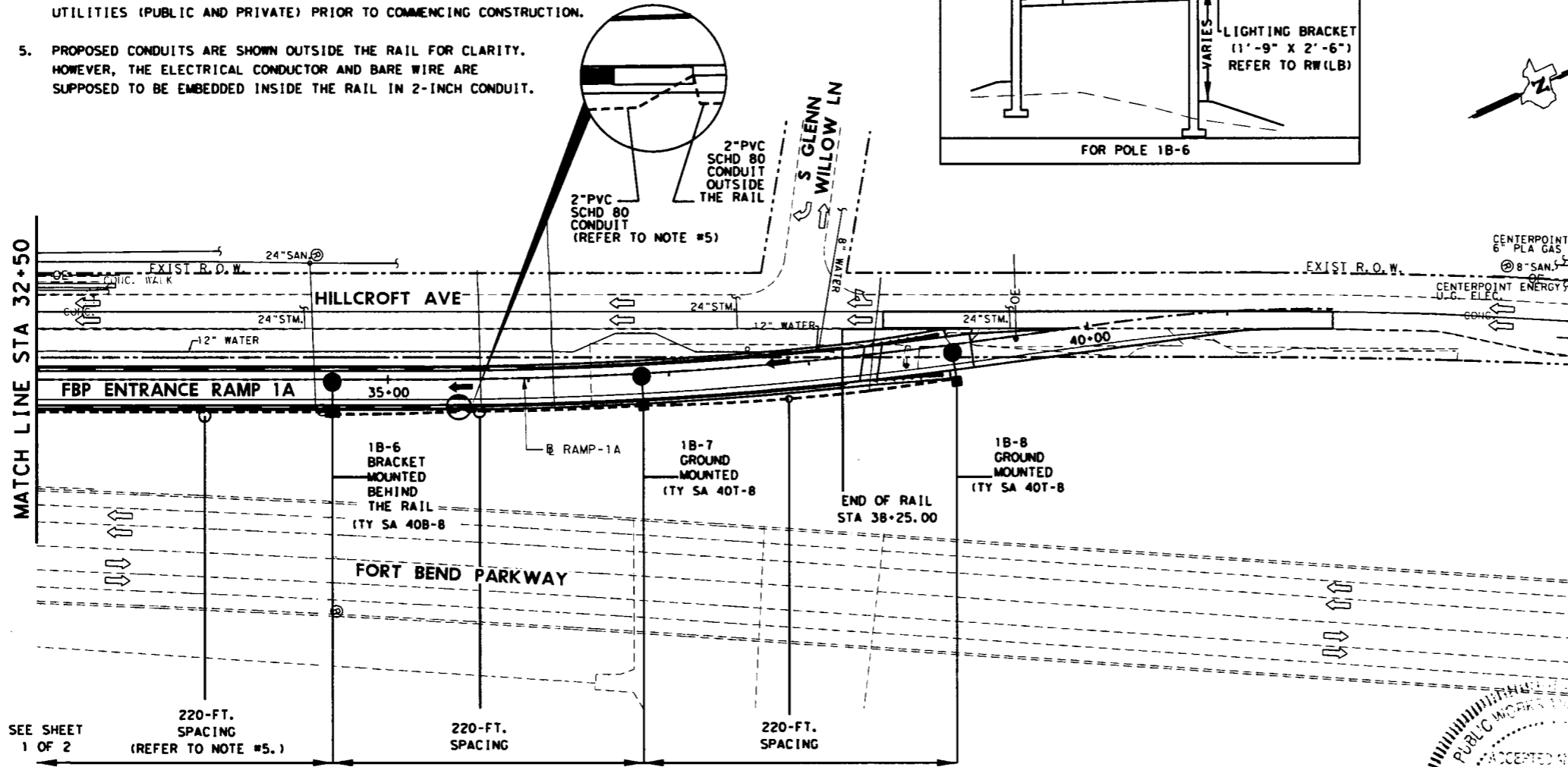
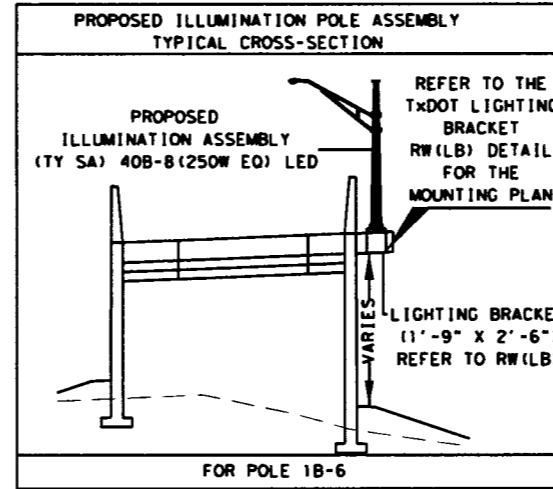
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CHECKED BY: MI	DRAWN BY: HAA	SHEET NO.:	138
CHECKED BY: MI			

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SUBMITTAL

**GENERAL NOTES:**

- CONTRACTOR SHALL MAKE SURE THAT THE INSTALLATION OF SAFETY LIGHT POLES ARE IN COMPLIANCE WITH THE CURRENT NATIONAL ELECTRICAL CODE (NEC) AND TxDOT STANDARDS.
- CONTRACTOR SHALL GROUND ALL THE PROPOSED SAFETY LIGHT POLES IN ACCORDANCE WITH THE CURRENT NATIONAL ELECTRICAL CODE (NEC) AND TxDOT REQUIREMENTS.
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- LOCATIONS OF UTILITIES SHOWN ARE APPROXIMATE. IT IS CONTRACTOR'S RESPONSIBILITY TO VERIFY AND LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING CONSTRUCTION.
- PROPOSED CONDUITS ARE SHOWN OUTSIDE THE RAIL FOR CLARITY. HOWEVER, THE ELECTRICAL CONDUCTOR AND BARE WIRE ARE SUPPOSED TO BE EMBEDDED INSIDE THE RAIL IN 2-INCH CONDUIT.



SEE SHEET 1 OF 2

220-FT. SPACING (REFER TO NOTE #5.)

220-FT. SPACING

220-FT. SPACING

9  
2-#8 XHHW  
1-#8 BARE

10  
2-#8 XHHW  
1-#8 BARE

11  
2-#8 XHHW  
1-#8 BARE

ILLUMINATION ASSEMBLY LOCATIONS (THIS SHEET ONLY)				
NUMBER	STATION	OFFSET #	LOCATION	TYPE
1B-6	34+60.65	22.45' RT	SB FBP ENT. RAMP	(TY SA) 40B-8 (250W EQ) LED
1B-7	36+80.98	22.47' RT	SB FBP ENT. RAMP	(TY SA) 40T-8 (250W EQ) LED
1B-8	39+02.70	26.20' RT	SB FBP ENT. RAMP	(TY SA) 40T-8 (250W EQ) LED

\* APPROXIMATE OFFSET.

ESTIMATED CONDUIT AND CONDUCTOR RUNS (THIS SHEET ONLY)				
CIRCUIT	RUN NUMBER	GRD WIRE & COND NUMBER & LENGTH (FEET)		CONDUIT LENGTH (FEET)
		NO. 8 BARE	NO. 8 INSULT	
B	9	295	590	295
B	10	220	440	220
B	11	220	440	220

TOTAL ESTIMATED QUANTITIES (THIS SHEET ONLY)				
ITEM-CODE	DESCRIPTION	UNIT	SHEET TOTAL	
610-6198	IN RD IL (TY SA) 40B-8 (250W EQ) LED	EA	1	
610-6214	IN RD IL (TY SA) 40T-8 (250W EQ) LED	EA	2	
618-6046	CONDUIT PVC SCHD 80 (2")	LF	735	
620-6007	ELE COND (NO. 8) BARE	LF	735	
620-6008	ELE COND (NO. 8) INSULATED	LF	1470	

**LEGEND**

- PROP RDWY ILLUMINATION ASSEMBLY
- PROP GROUND BOX TY A (W/APRON, 122311)
- PROP CONDUIT (BORE, PVC SCHD 80)
- PROP CONDUIT (TRENCH/EMBEDDED, PVC SCHD 80)
- PROP CONDUIT (RMC)
- 1A-3 PROP ILLUMINATION LIGHT
- PROP ELECTRICAL RUN NUMBER
- PROP ELECTRICAL SERVICE
- EXIST ELECTRICAL SERVICE
- EXIST GROUND BOX
- PROP JUNCTION BOX
- PROP RD IL AM (U/P) TY 1 (150W EQ) LED
- 1A-1 POLE DESIGNATION
- POLE
- CIRCUIT
- SERVICE

0 25 50 100  
SCALE: 1"=100'

REV.	DATE	BY	DESCRIPTION



M. Irfan  
5-19-23



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**Progressive** 16360 Park Ten Place,  
Traffic & Transportation Ste. 106  
Houston, Texas, 77084  
281-206-7495  
281-206-7494 FX  
Engineers, Planners & Managers

TBPE FIRM REGISTRATION #F-9492

FORT BEND PARKWAY TOLL ROAD

**ENTRANCE RAMP 1A  
ILLUMINATION PLAN  
STA 32+50 TO END PROJECT**

SHEET 2 OF 2

PROJECT NUMBER		DATE:	5/19/2023
DESIGNED BY:	HAA	CHECKED BY:	MI
DRAWN BY:	HAA	SHEET NO.:	139
CHECKED BY:	MI		

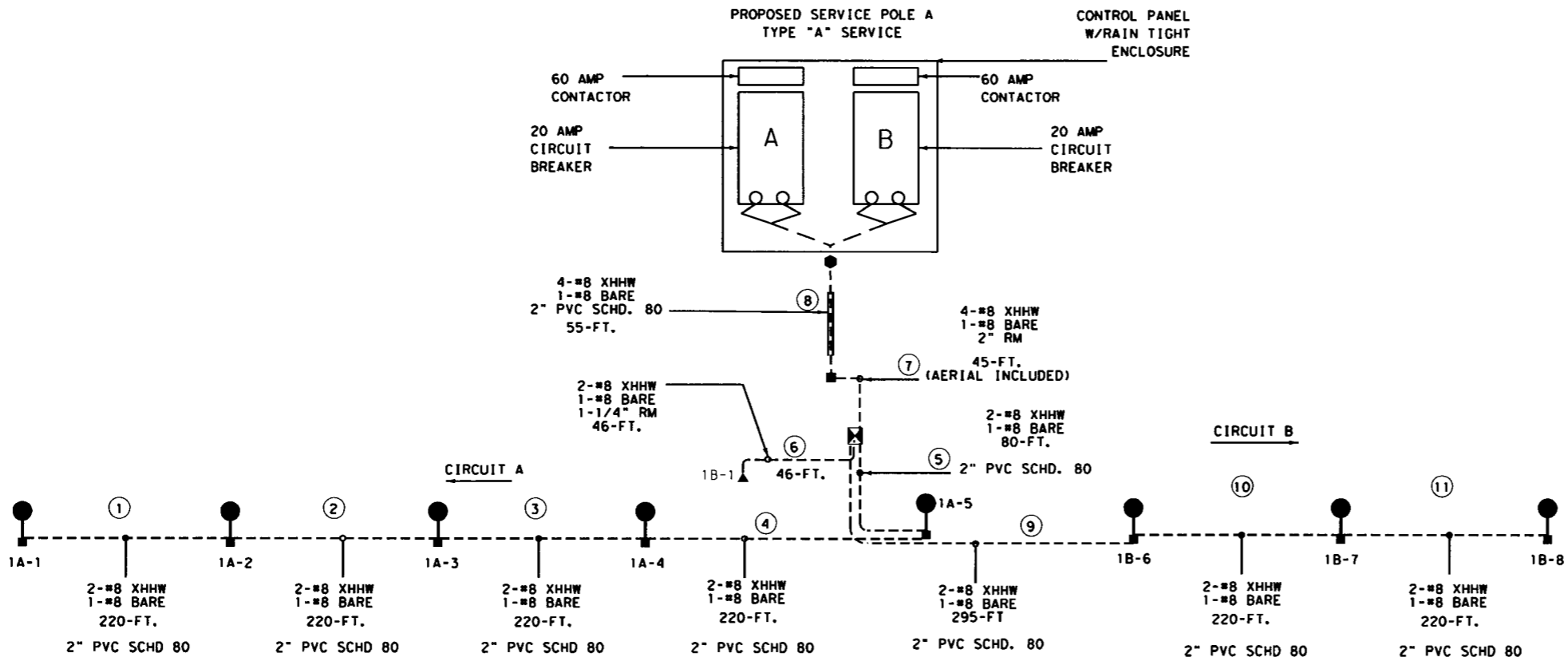


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SUBMITTAL

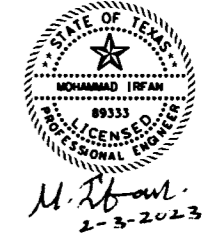
LEGEND

- PROP RDWY ILLUMINATION ASSEMBLY
  - PROP GROUND BOX TY A (W/APRON, 122311)
  - ▬▬▬ PROP CONDUIT (BORE, PVC SCHD 80)
  - PROP CONDUIT (TRENCH/EMBEDDED, PVC SCHD 80)
  - PROP CONDUIT (RMC)
  - 1A-3 PROP ILLUMINATION LIGHT
  - ⊕ PROP ELECTRICAL RUN NUMBER
  - PROP ELECTRICAL SERVICE
  - EXIST ELECTRICAL SERVICE
  - ⊠ EXIST GROUND BOX
  - ⊠ PROP JUNCTION BOX
  - ▲ PROP RD IL AM (U/P) TY 1 (150W EQ) LED
- 1A-1 POLE DESIGNATION  
 POLE #  
 CIRCUIT #  
 SERVICE #

SCALE: N. T. S.



REV.	DATE	BY	DESCRIPTION



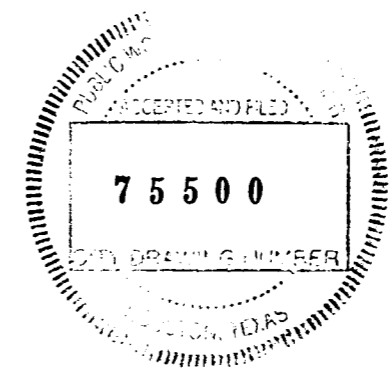
FORT BEND COUNTY  
TOLL ROAD AUTHORITY

**Progressive** 16360 Park Ten Place,  
Houston, Texas, 77084  
281-206-7495  
281-206-7494 FX  
TBPE FIRM REGISTRATION #F-9492

FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A ILLUMINATION  
CIRCUIT DIAGRAM

SHEET 1 OF 1

PROJECT NUMBER		DATE:	2/24/2023
DESIGNED BY:	HAA	CHECKED BY:	MI
DRAWN BY:	HAA	SHEET NO.:	140
CHECKED BY:	MI		



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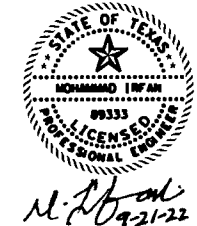
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SUBMITTAL

**NOTES:**

- 1) BORE PIT SHALL BE NO CLOSER THAN 5.0 FEET FROM THE EDGE OF PAVING OR RAD BASE. THE CONTRACTOR SHALL NOT LEAVE ANY BORE PIT HOLES OPEN OVERNIGHT.
- 2) ANY WIRE USED IN POLE FOUNDATION OR POLE BASE TO MAKE CONNECTION SHALL BE CONSIDERED INCIDENTAL TO ELECTRICAL CONDUCTORS.
- 3) LINEAR MEASUREMENT OF CONDUCTORS FOR PAYMENT SHALL BE SURFACE DISTANCE BETWEEN LOCATIONS.
- 4) THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL UNDERGROUND UTILITIES OR OTHER INSTALLATIONS AND PROVIDE ADEQUATE PROTECTION FOR THEM. ANY DAMAGE BY CONTRACTOR SHALL BE PAID FOR BY CONTRACTOR.
- 5) ALL STUB-OUTS IN FOUNDATION AND CONCRETE STRUCTURES ARE TO BE RIGID METAL CONDUIT (RMC).
- 6) ANY AND ALL COST ASSOCIATED WITH THE INSTALLATION AND CONNECTION OF SERVICE POLE TO THE ELECTRICAL UTILITY COMPANY WILL BE CONSIDERED INCIDENTAL TO THE SERVICE POLE. THIS INCLUDES CONDUIT, CONDUIT FITTINGS AND ELECTRICAL CONDUCTORS.
- 7) ALL EXPOSED CONDUIT SHALL BE RIGID METAL CONDUIT (RMC).
- 8) CONDUIT PLACED UNDER PAVED AREAS SHALL BE BY BORING. IF PLACED PRIOR TO PAVING, MAY BE TRENCHED.
- 9) THE CONTRACTOR SHALL COORDINATE AND VERIFY SERVICE POLE LOCATION WITH CENTERPOINT ENERGY.
- 10) PULLING CONDUCTORS IN PVC CONDUIT SHALL BE ACCOMPLISHED WITH NON-METALLIC PULL ROPE.
- 11) CONDUIT INSTALLED ON BRIDGE SHALL HAVE EXPANSION DEVICE AT ALL EXPANSION JOINTS AND ABUTMENTS.
- 12) IF CASING IS REQUIRED TO PLACE BORED CONDUIT, CASING SHALL BE INCIDENTAL TO CONDUIT.
- 13) ALL CONDUIT PLACED UNDER RIPRAP SHALL BE PLACED PRIOR TO PLACEMENT OF THE RIPRAP.
- 14) ALL WORK SHALL BE DONE ACCORDING TO THE NATIONAL ELECTRICAL CODE AND TEXAS DEPARTMENT OF TRANSPORTATION STANDARD SHEETS.
- 15) THE CONTRACTOR SHALL SUPPLY TWO (2) POWER DRIVE UNITS FOR THIS PROJECT.

ELECTRICAL SERVICE DATA												
SERVICE POLE NO.	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED (4) (5)-14)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT		TWO-POLE CONTRACTOR AMPS	PANEL BD. / LOAD CENTER AMP RATING (MIN)	CIRCUIT NO.	FEEDER CKT. BRK. POLE/AMPS	KVA LOAD
							CKT. BRK. POLE/AMP					
A	1 OF 2	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	1 1/4"	3-#6 XHHW	N/A		2P/60 A	2P/60	N/A	A	2P/20 A	1.5
										B	2P/20 A	

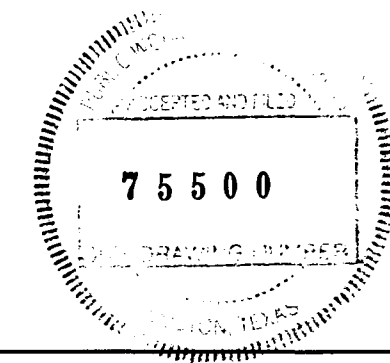
REV.	DATE	BY	DESCRIPTION



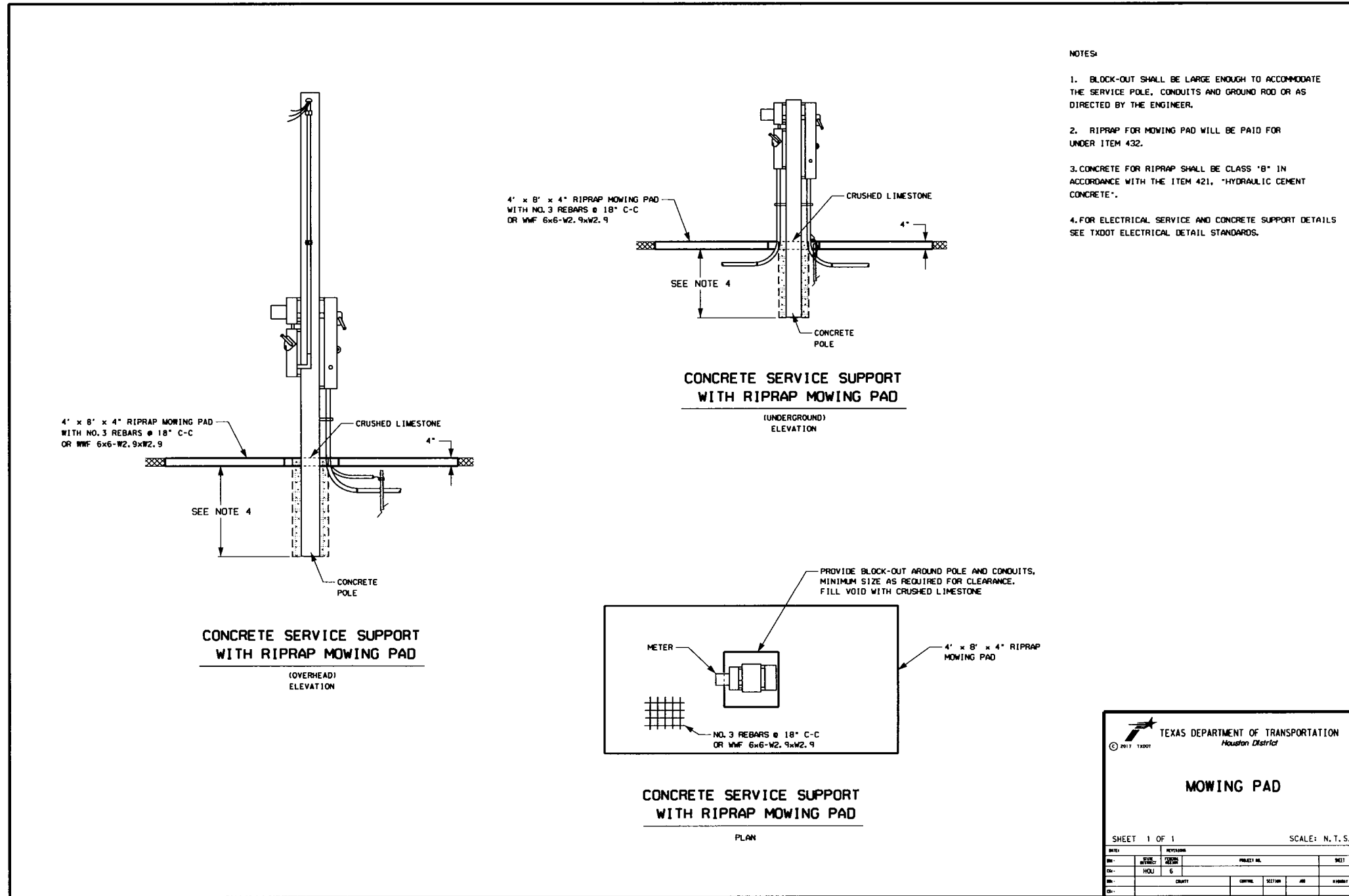
**Progressive** 16360 Park Ten Place, Ste. 106  
Houston, Texas, 77084  
Traffic & Transportation  
281-206-7495  
281-206-7494 FX  
Engineers, Planners & Managers  
TBE FIRM REGISTRATION #F-9492

FORT BEND PARKWAY TOLL ROAD  
**ENTRANCE RAMP 1A  
ELECTRICAL DATA  
SUMMARY**

SHEET 1 OF 1			
PROJECT NUMBER		DATE:	9/21/2022
DESIGNED BY:	HAA		
CHECKED BY:	MI		
DRAWN BY:	HAA	SHEET NO.:	141
CHECKED BY:	MI		



9/21/2022 3:59:32 PM  
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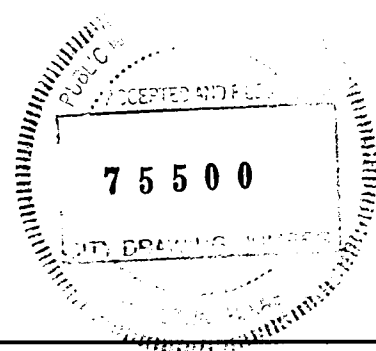
- NOTES:
1. BLOCK-OUT SHALL BE LARGE ENOUGH TO ACCOMMODATE THE SERVICE POLE, CONDUITS AND GROUND ROD OR AS DIRECTED BY THE ENGINEER.
  2. RIPRAP FOR MOWING PAD WILL BE PAID FOR UNDER ITEM 432.
  3. CONCRETE FOR RIPRAP SHALL BE CLASS 'B' IN ACCORDANCE WITH THE ITEM 421, "HYDRAULIC CEMENT CONCRETE".
  4. FOR ELECTRICAL SERVICE AND CONCRETE SUPPORT DETAILS SEE TXDOT ELECTRICAL DETAIL STANDARDS.

TEXAS DEPARTMENT OF TRANSPORTATION  
Houston District

**MOWING PAD**

SHEET 1 OF 1 SCALE: N.T.S.

DATE	BY	REVISION



REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**Progressive Traffic & Transportation**  
16360 Park Ten Place, Ste. 106  
Houston, Texas, 77084  
281-206-7495  
281-206-7494 FX  
Engineers, Planners & Managers  
TBPCE FIRM REGISTRATION #F-9492

**FORT BEND PARKWAY TOLL ROAD**

**FORT BEND COUNTY TOLL ROAD MOWING PAD DETAILS**

SHEET 1 OF 1

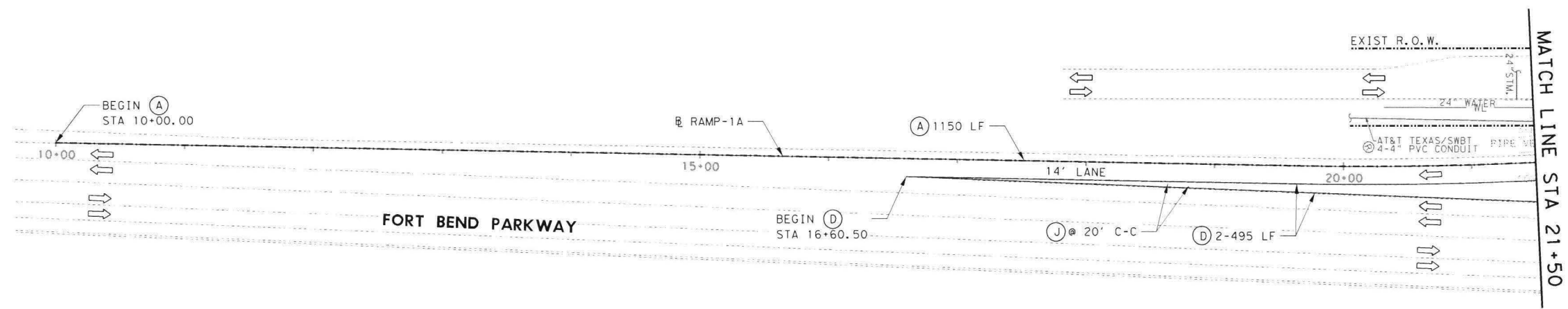
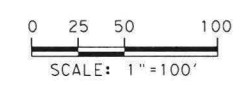
PROJECT NUMBER		DATE:	9/21/2022
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	142
CHECKED BY:			

100%  
SUBMITTAL



**LEGEND:**

- (A) REFL PAV MRK W/RET TY I (W) (6") (SLD)
- (B) PREFAB PAV MRK W/WNTY TY B (W) 6" (BRK) CNTST
- (C) REFL PAV MRK W/RET REQ TY I (Y) (6") (SLD)
- (D) REFL PAV MRK TY I (W) (8") (SLD)
- (E) REFL PAV MRK TY I (W) (12") (SLD)
- (F) REFL PAV MRK TY I (W) (24") (SLD)
- (G) REFL PAV MRK TY I (W) (ARROW)
- (H) REFL PAV MRK TY I (W) (WORD)
- (I) REFL PAV MRK TY I (W) 36" (YLD TRI)
- (J) REFL PAV MRK TYPE II-C-R
- (K) (D-SG)SZ (BRF)CTB (GREEN)
- (L) REMOVE EXISTING SIGN
- (#) PROPOSED SMALL SIGN NUMBER
- [#] PROPOSED LARGE SIGN NUMBER
- ← TRAFFIC FLOW DIRECTION



REV.	DATE	BY	DESCRIPTION



3/15/2023

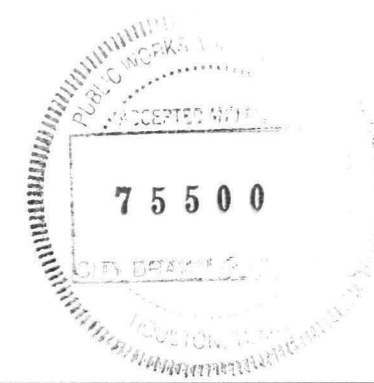


**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech** Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

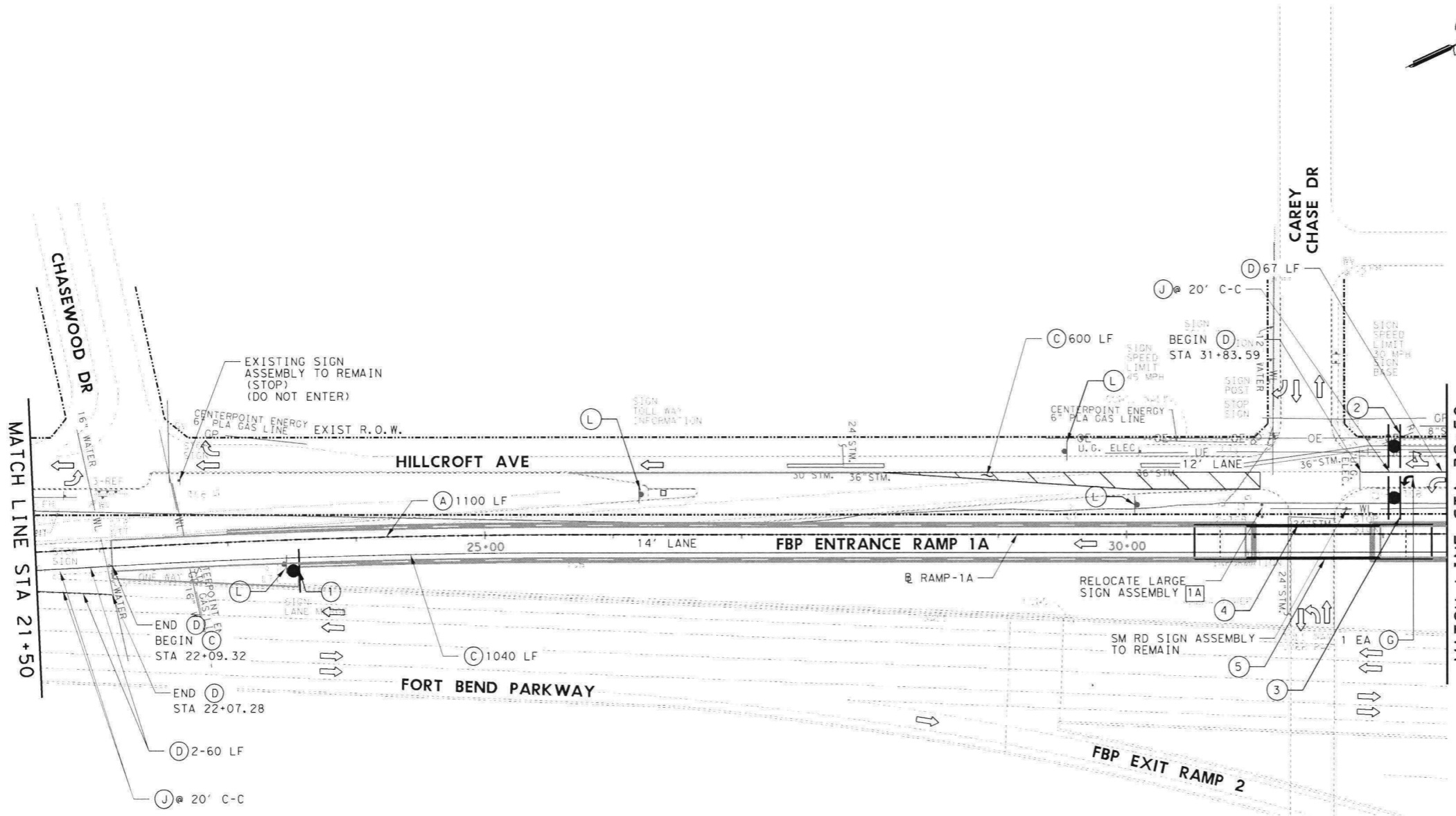
**FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
SIGNING & PAVEMENT MARKING PLAN  
BEGIN PROJECT TO STA 21+50**

PROJECT NUMBER		20219x	DATE:	3/15/2023
DESIGNED BY:				
CHECKED BY:				
DRAWN BY:			SHEET NO.:	143
CHECKED BY:				

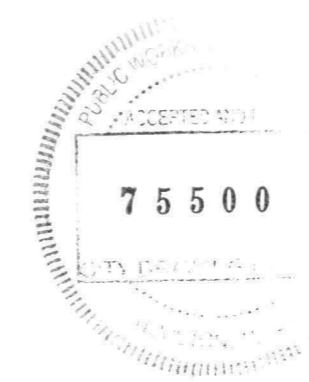
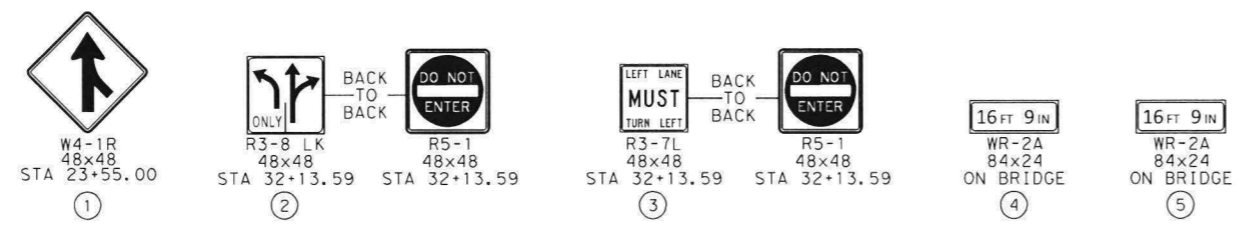
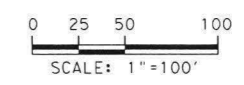


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- LEGEND:**
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  - (B) PREFAB PAV MRK W/WNTY TY B (W) 6" (BRK) CNTST
  - (C) REFL PAV MRK W/RET REQ TY I (Y) (6") (SLD)
  - (D) REFL PAV MRK TY I (W) (8") (SLD)
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  - (J) REFL PAV MRK TYPE II-C-R
  - (K) (D-SG)SZ (BRF)CTB (GREEN)
  - (L) REMOVE EXISTING SIGN
  - (#) PROPOSED SMALL SIGN NUMBER
  - (#) PROPOSED LARGE SIGN NUMBER
  - ← TRAFFIC FLOW DIRECTION



REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

**AIG Tech** F-20607  
Advanced Infrastructure Group  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

**FORT BEND PARKWAY TOLL ROAD**  
**ENTRANCE RAMP 1A**  
**SIGNING & PAVEMENT MARKING PLAN**  
STA 21+50 TO STA 32+50  
SHEET 2 OF 3

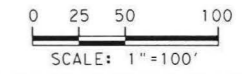
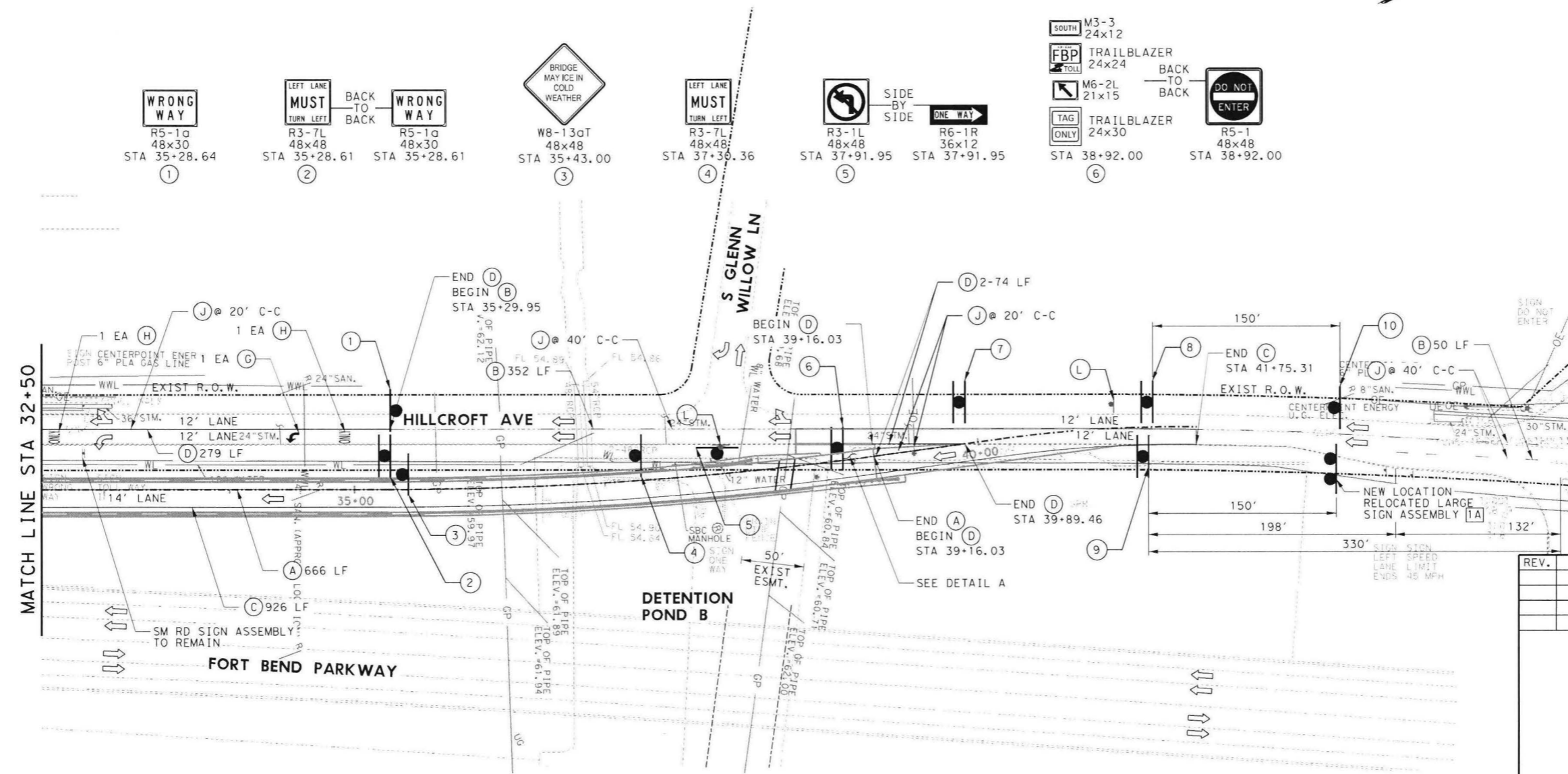
PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	144
CHECKED BY:			

100%  
SUBMITTAL



LEGEND:

- (A) REFL PAV MRK W/RET TY I (W) (6") (SLD)
- (B) PREFAB PAV MRK W/WNTY TY B (W) 6" (BRK) CNTST
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- (K) (D-SG)SZ (BRF) CTB (GREEN)
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- (#) PROPOSED LARGE SIGN NUMBER
- ← TRAFFIC FLOW DIRECTION



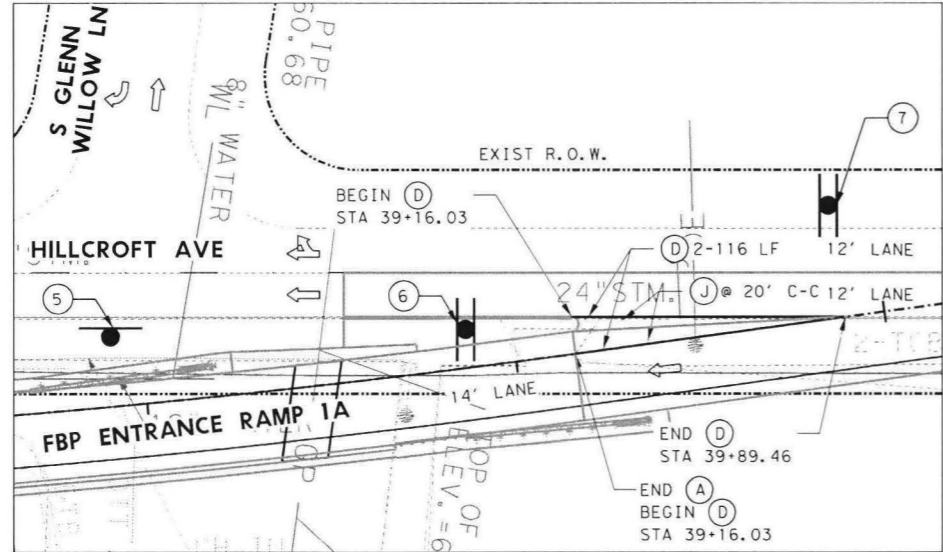
REV.	DATE	BY	DESCRIPTION



**AIG Tech**  
Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

FORT BEND PARKWAY TOLL ROAD  
**ENTRANCE RAMP 1A**  
SIGNING & PAVEMENT MARKING PLAN  
STA 32+50 TO END PROJECT

SHEET 3 OF 3		PROJECT NUMBER	20219x
DESIGNED BY:	DATE:	3/15/2023	
CHECKED BY:	SHEET NO.:	145	
DRAWN BY:			
CHECKED BY:			



DETAIL A  
NOT TO SCALE

SOUTH M3-3 24x12  
 FBPTOLL TRAILBLAZER 24x24  
 M6-2L 21x15 BACK TO BACK  
 TAG ONLY TRAILBLAZER 24x30  
 STA 39+93.90 STA 39+93.90  
 R5-1 48x48 DO NOT ENTER  
 STA 39+93.90  
 SPEED LIMIT 45 BACK TO BACK  
 R2-1 48x60 WRONG WAY  
 STA 41+40.52 STA 41+40.52  
 PEDESTRIANS AND BICYCLES PROHIBITED BACK TO BACK  
 R5-10b 30x18 WRONG WAY  
 STA 41+36.34 STA 41+36.34  
 SOUTH M3-3 24x12  
 FBPTOLL TRAILBLAZER 24x24  
 M6-3 21x15  
 TAG ONLY TRAILBLAZER 24x30  
 STA 39+93.90 STA 39+89.46  
 END BEGIN (A) STA 39+16.03  
 END BEGIN (D) STA 39+89.46

T EZTAG ONLY  
 NO CASH  
 NO PAY BY MAIL  
 1A

PUBLIC WORKS  
 ACCEPTED AND  
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**GENERAL NOTES FOR ALL ELECTRICAL WORK**

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.
2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.
3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is 1/2 in. or less in diameter.
4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.
5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.
6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

**CONDUIT**

**A. MATERIALS**

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.
2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.
3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.
5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.
6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.
7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

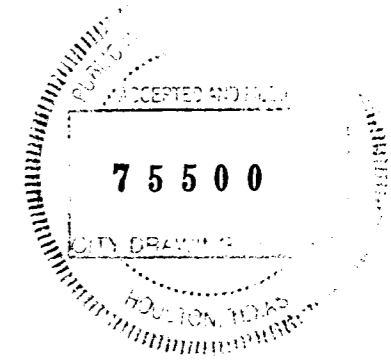
8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.
9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.
10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

**B. CONSTRUCTION METHODS**

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.
2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.
3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.
4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.
5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."
6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.
7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.
8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.
9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.
10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.
11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.
12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).
13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.
14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

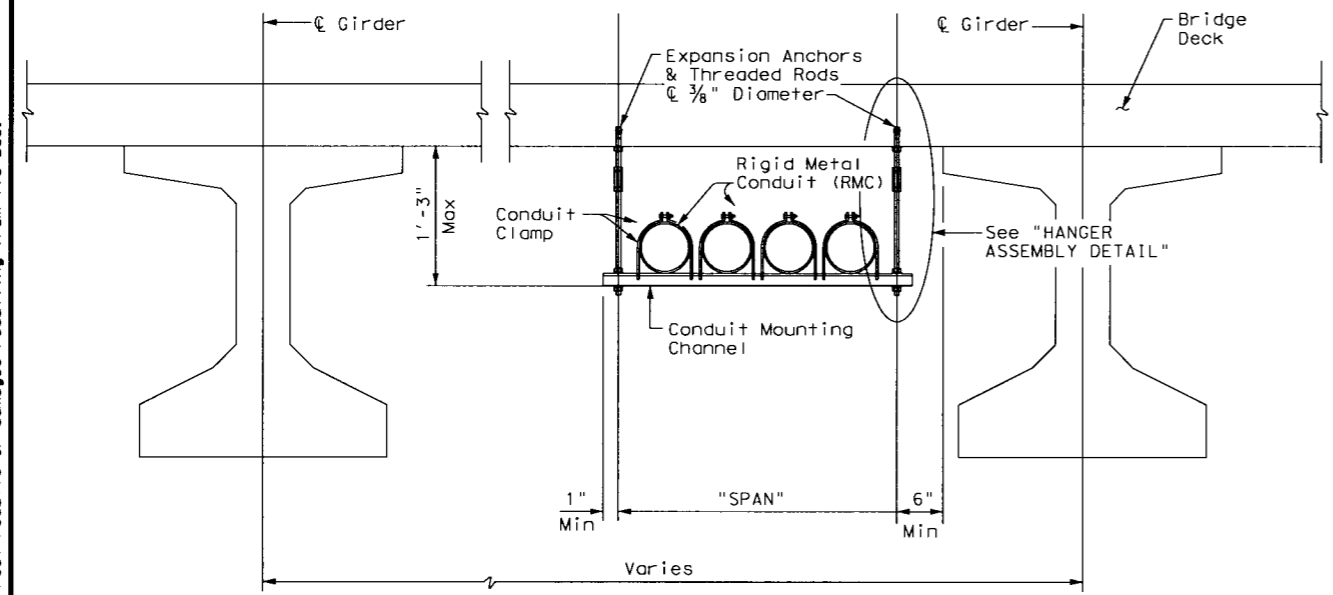
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DATE: FILE:



		<b>Traffic Operations Division Standard</b>	
<h2>ELECTRICAL DETAILS CONDUITS &amp; NOTES</h2> <h3>ED(1) - 14</h3>			
FILE#	ed1-14.dgn	DN#	CK#
© TxDOT	October 2014	CONT	SECT
REVISIONS		JOB	
		HIGHWAY	
		FBPTR	
	DIST	COUNTY	SHEET NO.
	HOU	FT BEND	146

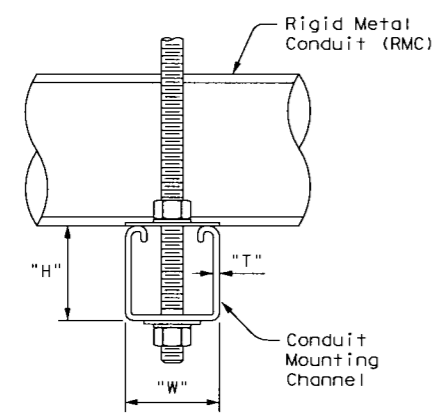
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CONDUIT HANGING DETAIL

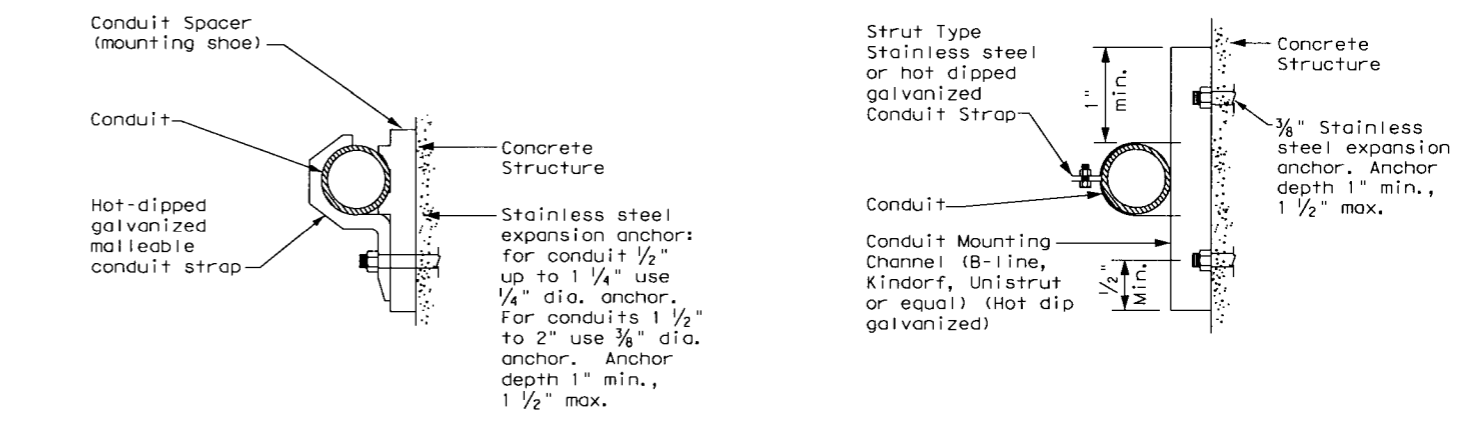
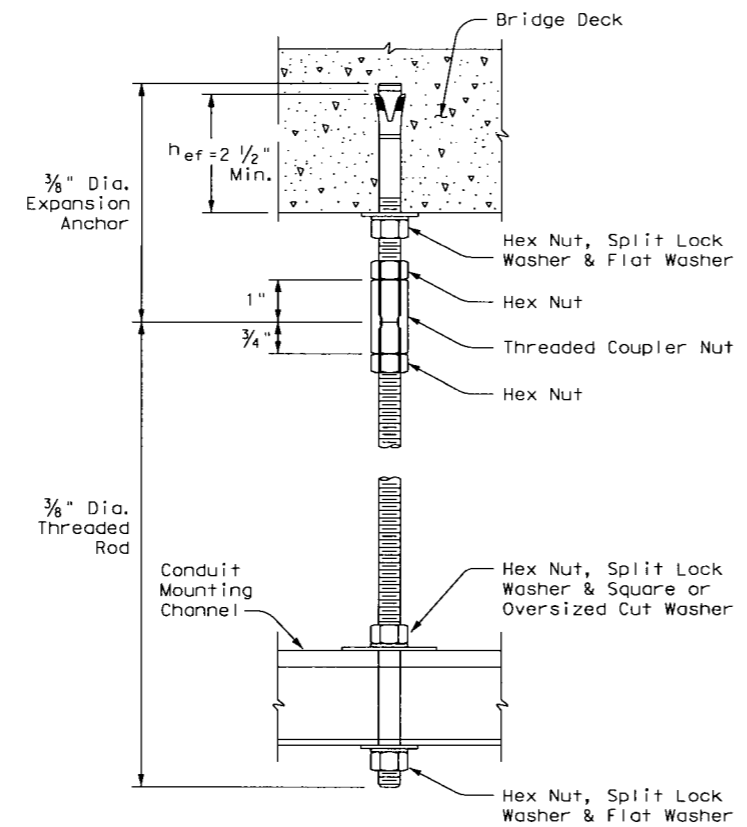
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/16"	12 Ga.

Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.



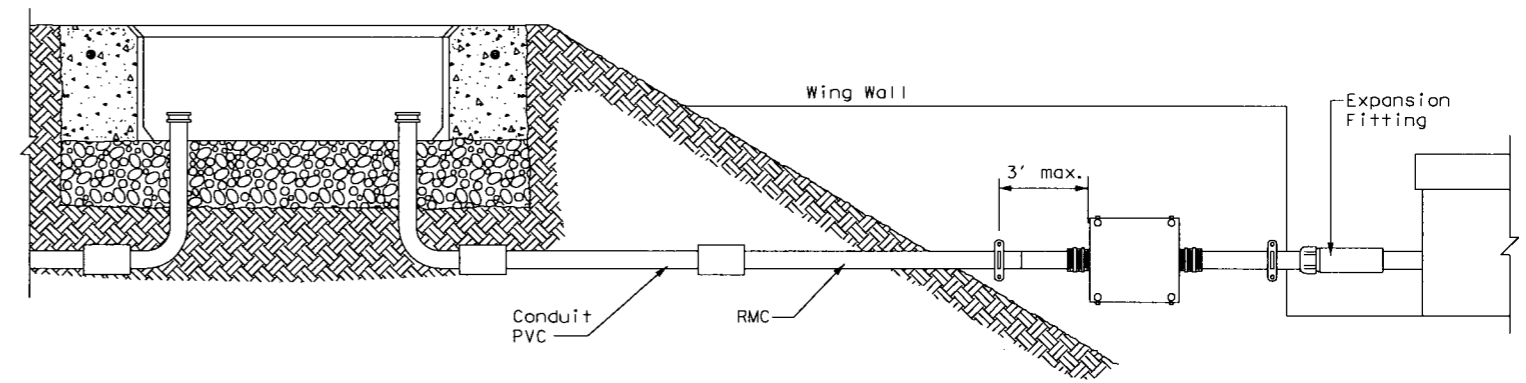
HANGER ASSEMBLY DETAIL

ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT



CONDUIT MOUNTING OPTIONS

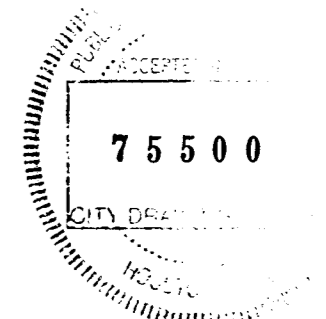
Attachment to concrete surfaces  
See ED(1)B.2



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.
2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.
3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.
4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.
5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, ( $h_{ef}$ ), as shown. Increase ( $h_{ef}$ ) as needed to ensure sufficient thread length for proper torquing and tightening of anchors.
6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth ( $h_{ef}$ ). No lateral loads shall be introduced after conduit installation.



Texas Department of Transportation  
Traffic Operations Division Standard

## ELECTRICAL DETAILS CONDUIT SUPPORTS

### ED(2) - 14

FILE: ed2-14.dgn	DN: TxDOT	CK: TxDOT	DR: TxDOT	CR: TxDOT
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REVISIONS				FBPTR
	DIST	COUNTY	SHEET NO.	
	HOU	FT BEND	147	

DATE:  
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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS) 11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.
2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.
3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.
4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.
11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.
4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.
5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

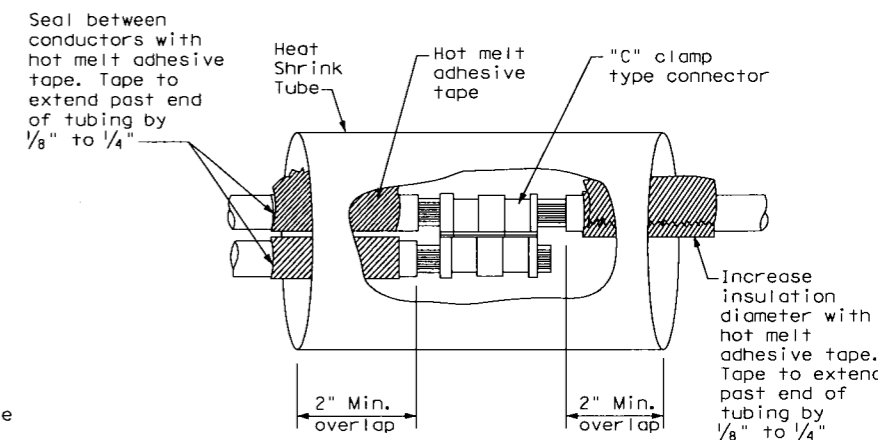
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

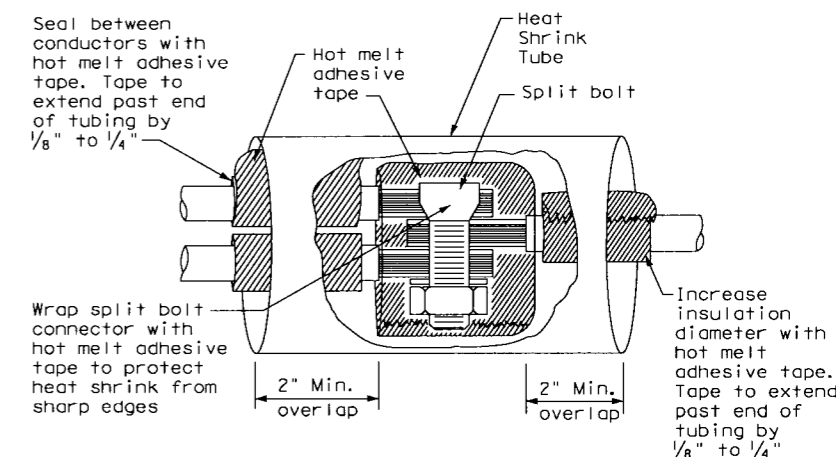
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

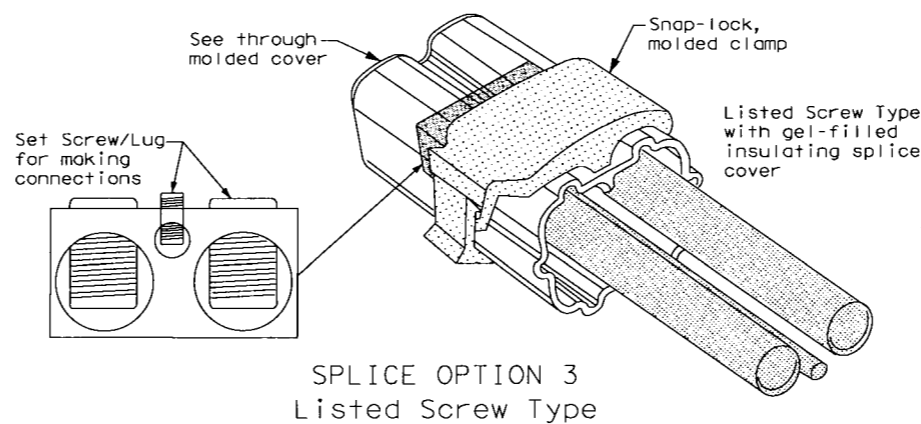
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
2. Do not place ground rods in the same drilled hole as a timber pole.
3. Install ground rods so the imprinted part number is at the upper end of the rod.
4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1  
Compression Type



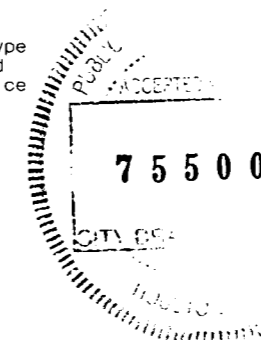
SPLICE OPTION 2  
Split Bolt Type



SPLICE OPTION 3  
Listed Screw Type

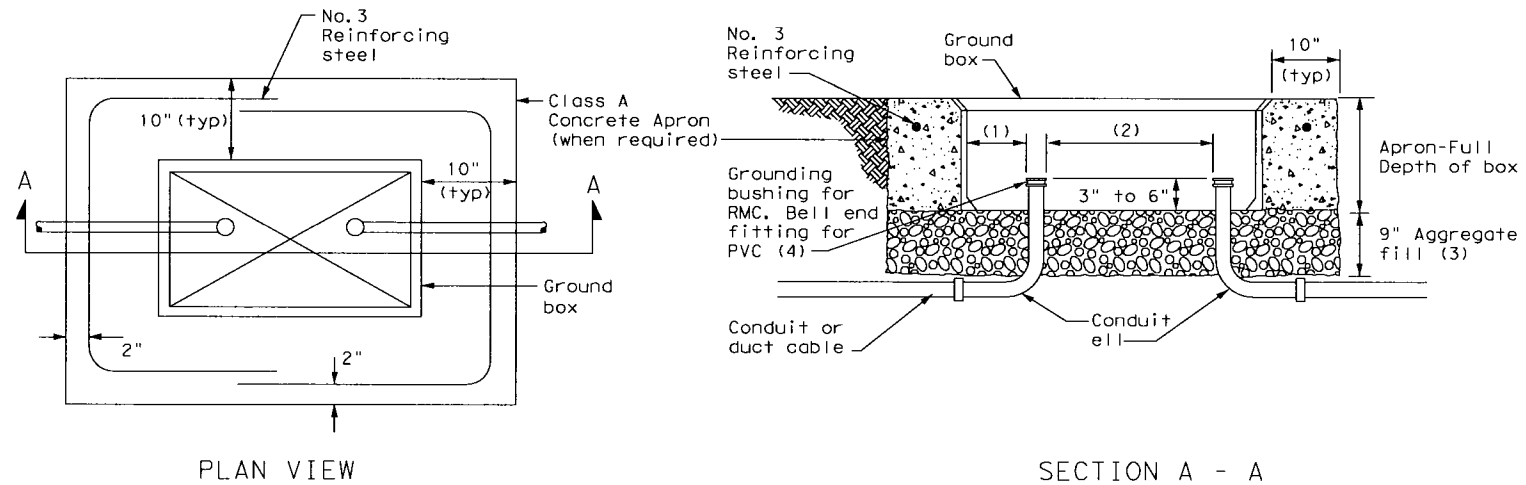
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		<b>Traffic Operations Division Standard</b>	
<h2>ELECTRICAL DETAILS CONDUCTORS</h2> <h3>ED(3) - 14</h3>			
FILES: ed3-14.dgn	DN: TxDOT	CK: TxDOT	DR: TxDOT
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	DIST	COUNTY	SHEET NO.
	HOU	FT BEND	148

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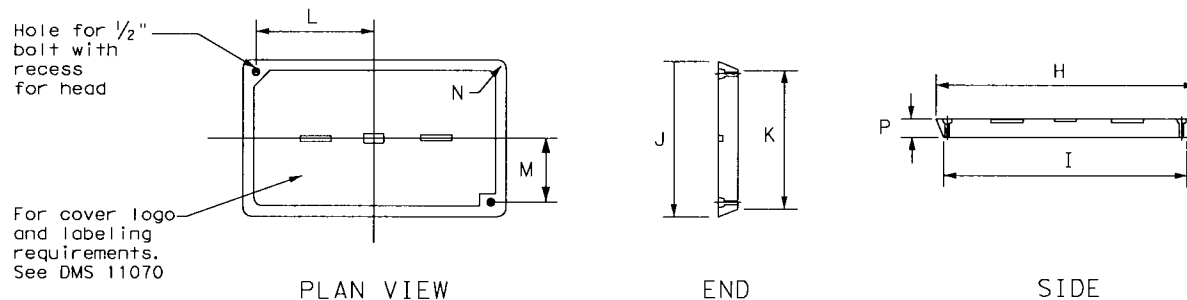


APRON FOR GROUND BOX

- (1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.
- (2) Maintain sufficient space between conduits to allow for proper installation of bushing.
- (3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.
- (4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



GROUND BOX COVER

GROUND BOXES

A. MATERIALS

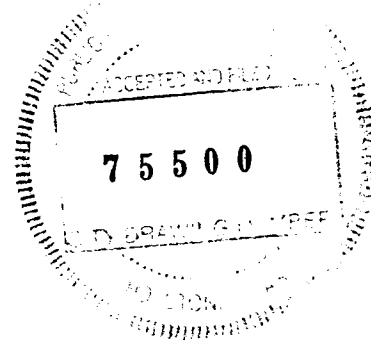
1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."
2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.
2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.
3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.
4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.
5. Temporarily seal all conduits in the ground box until conductors are installed.
6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.
7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.
8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.
9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.
10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.
11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.



		Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS</h2> <h3>GROUND BOXES</h3> <h4>ED(4) - 14</h4>			
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			149

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**ELECTRICAL SERVICES NOTES**

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.
2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services," DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.
3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.
4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.
5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.
6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.
7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.
8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.
9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.
10. Provide rigid metal conduit (RMC) for all conduits on service, except for the 1/2 in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.
11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.
12. Ensure all mounting hardware and installation details of services conform to utility company specifications.
13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 1/2 in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.
14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 1/2 in. x 11 in. before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.
15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

**SERVICE ASSEMBLY ENCLOSURE**

1. Provide threaded hub for all conduit entries into the top of enclosure.
2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.
3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.
4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

**MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS**

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.
2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

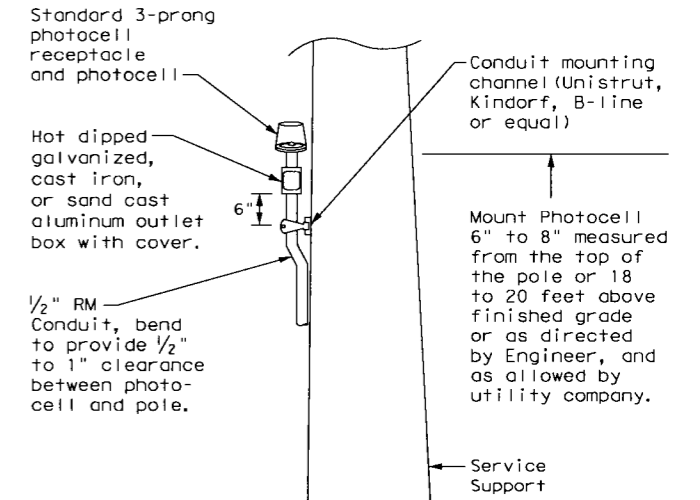
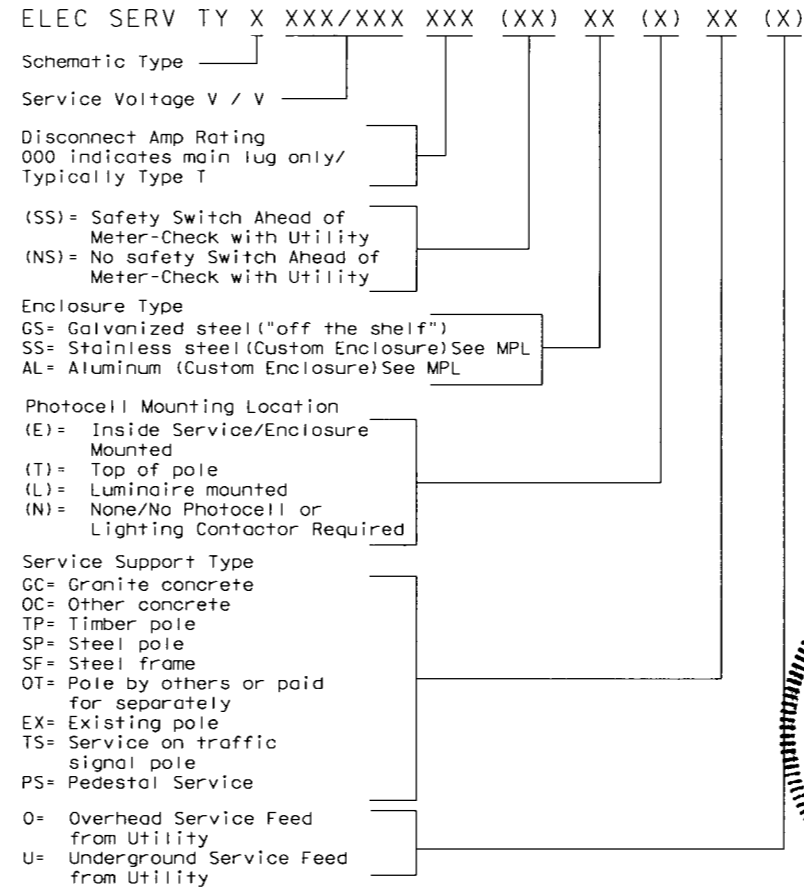
**PHOTOELECTRIC CONTROL**

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA												
Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Pole/Amps	Two-Pole Contractor Amps	Panelbd/Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 1/4"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 1/4"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

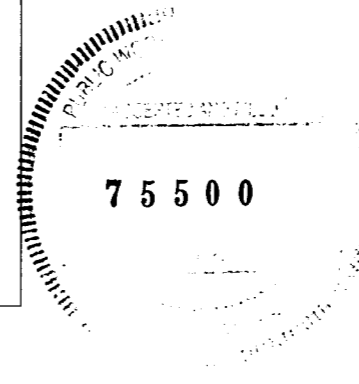
\* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.  
 \*\* Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National Electrical Code.

**EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE**



**TOP MOUNTED PHOTOCELL**

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

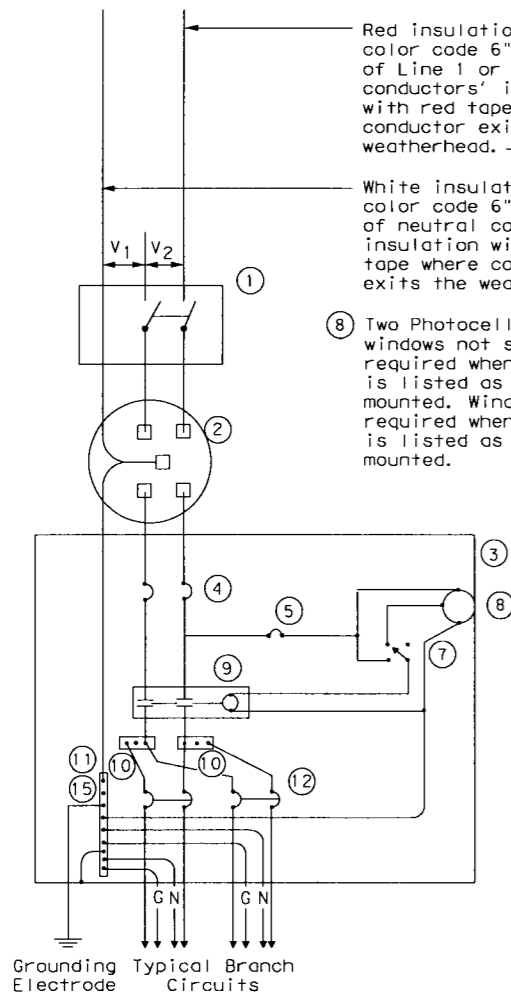


Texas Department of Transportation		Traffic Operations Division Standard	
<b>ELECTRICAL DETAILS SERVICE NOTES &amp; DATA</b>			
<b>ED(5) - 14</b>			
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		150	

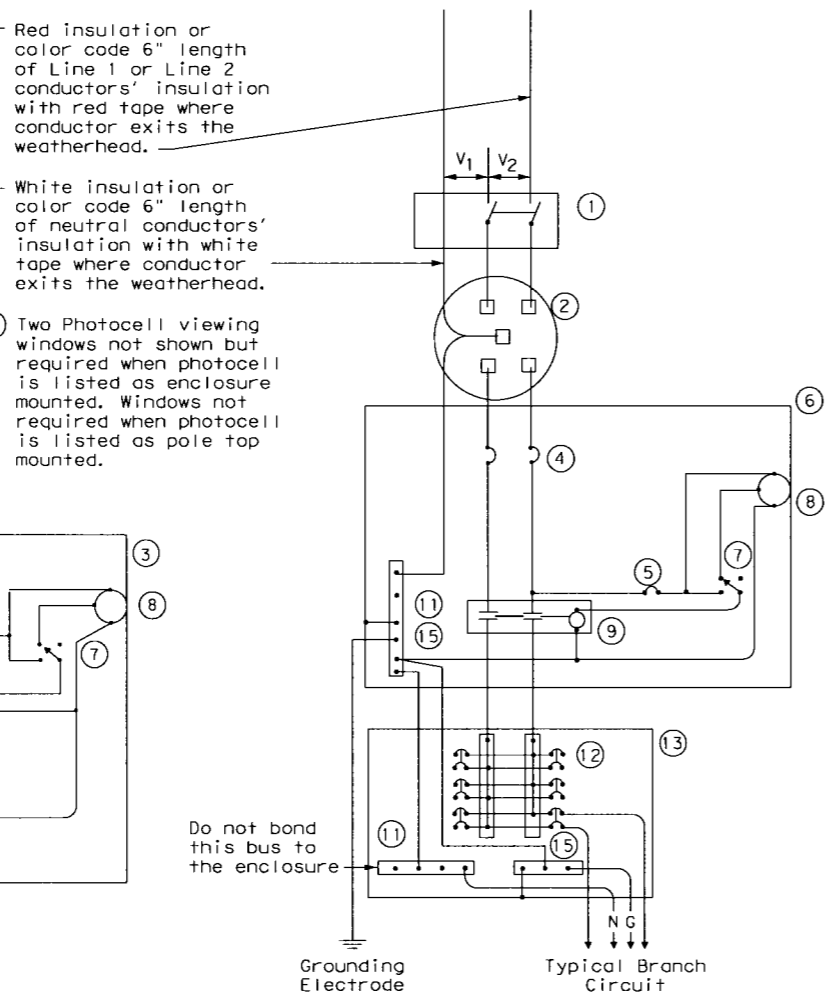
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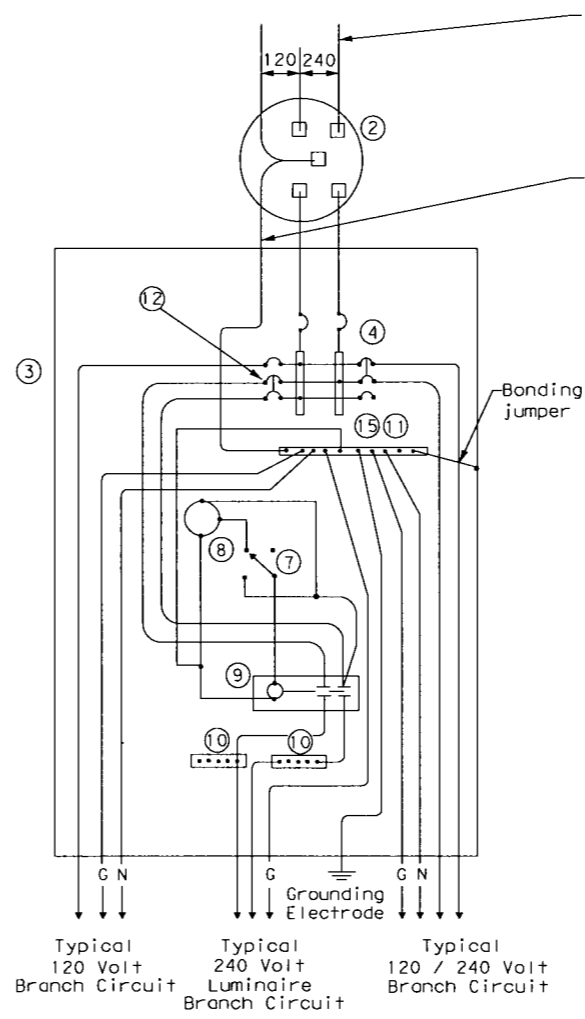
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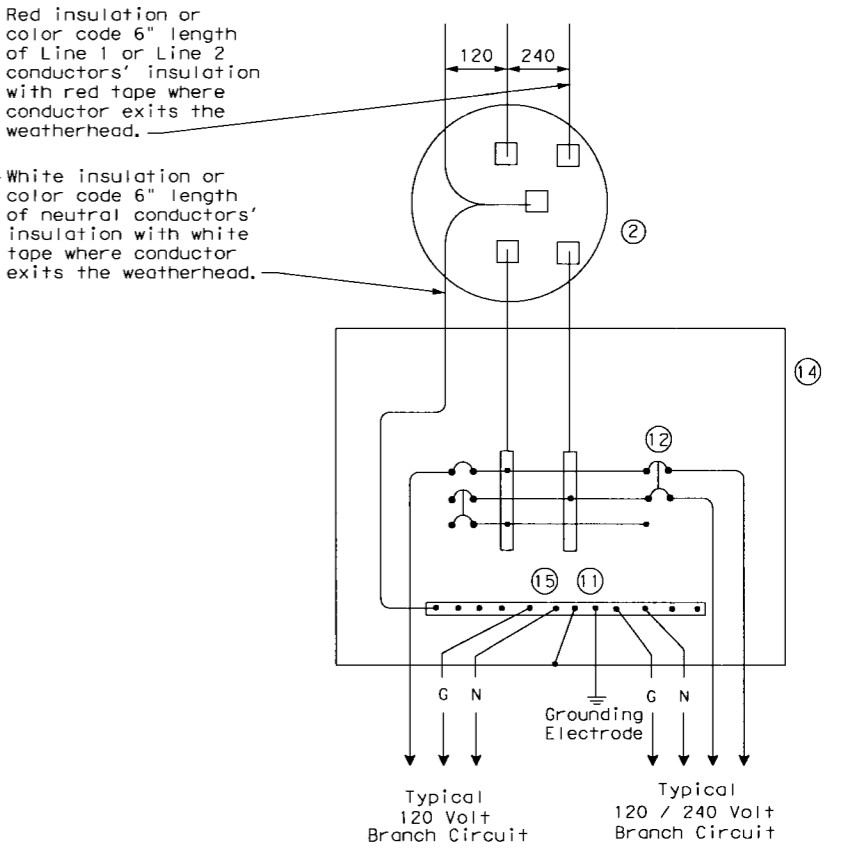
SCHMATIC TYPE A  
THREE WIRE



SCHMATIC TYPE C  
THREE WIRE



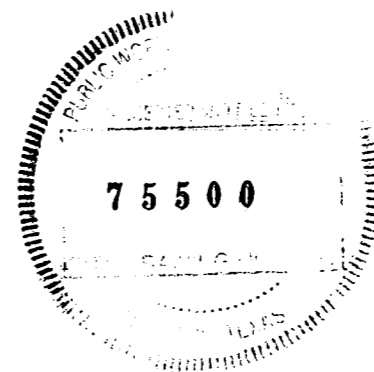
SCHMATIC TYPE D - CUSTOM  
120/240 VOLTS - THREE WIRE



SCHMATIC TYPE T  
120/240 VOLTS - THREE WIRE  
Galvanized steel - "Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
—	Power Wiring
—	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

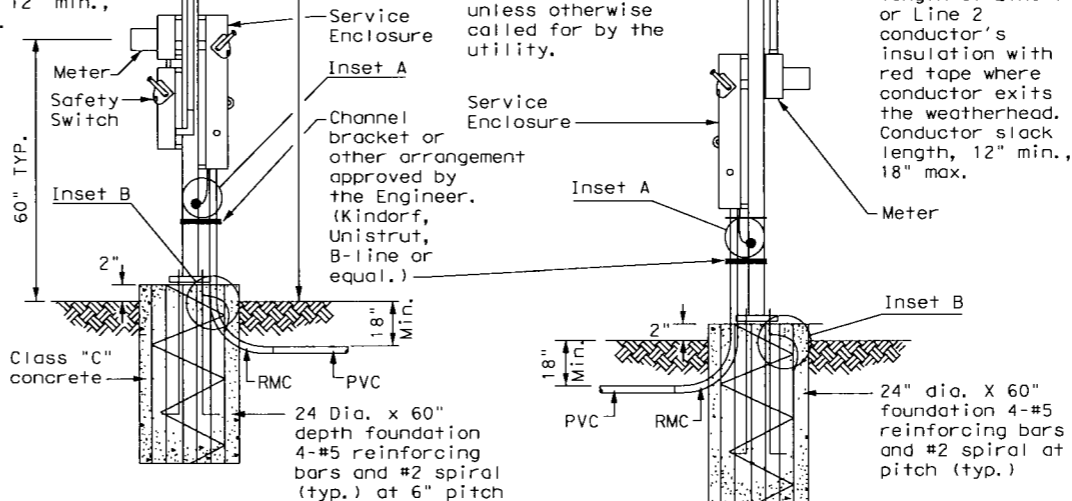


		Traffic Operations Division Standard	
<b>ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES</b>			
<b>ED(6) - 14</b>			
FILE: ed6-14.dgn	DN: TxDOT	CK: TxDOT	DR: TxDOT
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	DIST	COUNTY	SHEET NO.
	HOU	FT BEND	151

**SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)**

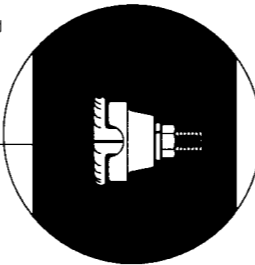
1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS) 11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 1/2 in. or 1 3/8 in. wide by 1 in. up to 3 3/4 in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.
2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.
3. Provide and install galvanized 3/4 in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized 3/4 in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 1/4 in. to 3 1/2 in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.
4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.
5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.
6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.
7. Drill and tap steel poles and frames for 1/2 in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.
8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.
9. Provide 1/4" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.
10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.
11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

White insulation or color code 6" of neutral conductor's insulation with white tape where conductor exits weatherhead.  
 Red insulation or color code 6" length of Line 1 or Line 2 conductor's insulation with red tape where conductor exits the weatherhead. Conductor slack length, 12" min., 18" max.

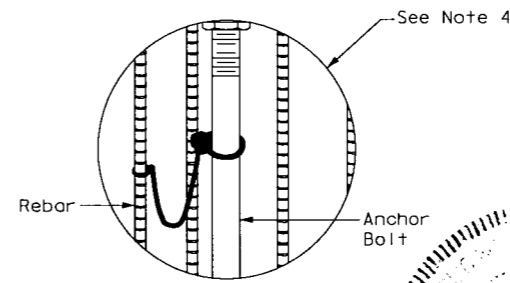


WITH SAFETY SWITCH  
 WITHOUT SAFETY SWITCH  
 SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE

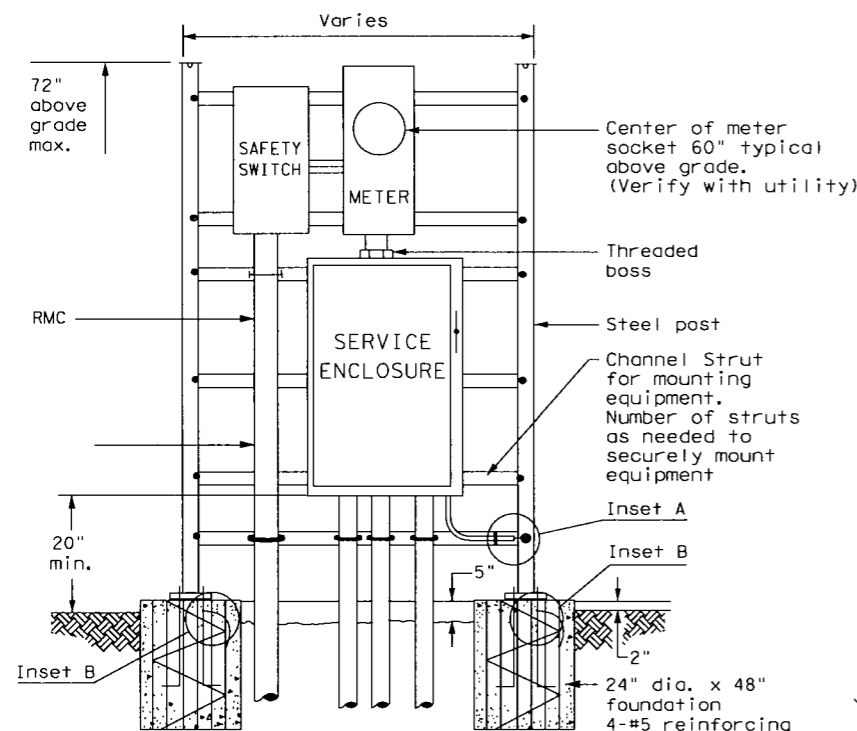
Drill, top, and thread 1/2" X 13 UNC. Install tank ground fitting, connect electrical service grounding electrode conductor. See Note 7.



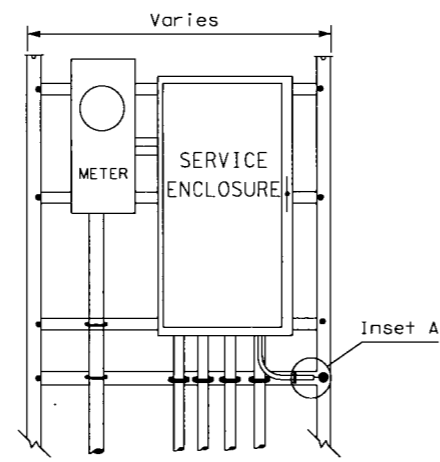
FRONT VIEW  
 INSET A



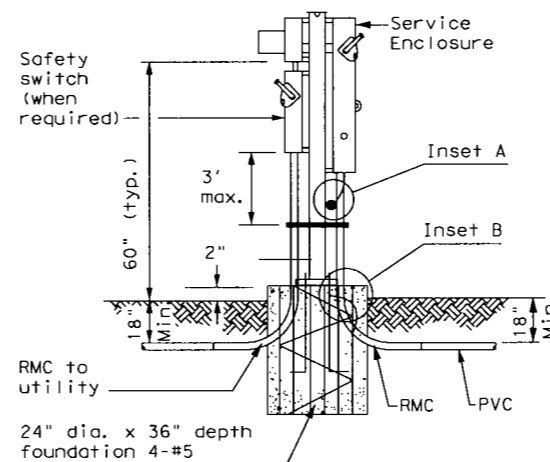
INSET B



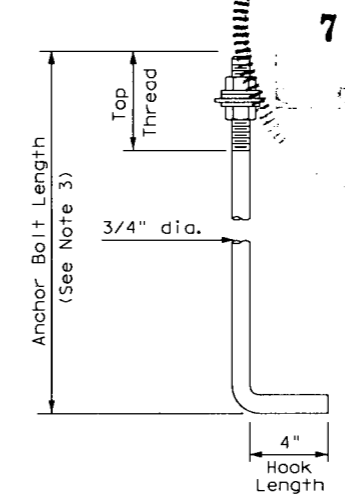
WITH SAFETY SWITCH  
 FRONT VIEW  
 SERVICE SUPPORT TYPE SF (U) - UNDERGROUND SERVICE



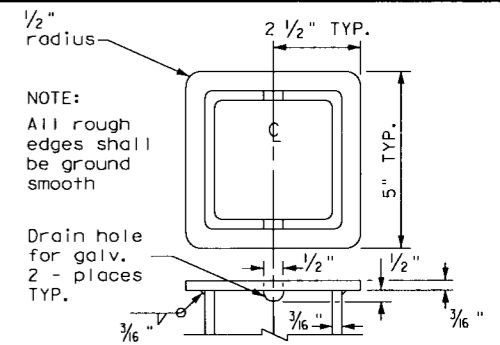
WITHOUT SAFETY SWITCH  
 FRONT VIEW



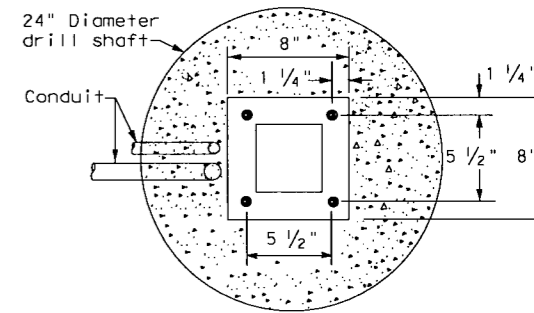
WITH SAFETY SWITCH  
 HOOKED ANCHOR DETAIL  
 SERVICE SUPPORT TYPE SP (U) - UNDERGROUND SERVICE



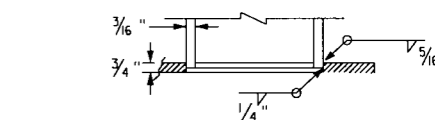
HOOKED ANCHOR DETAIL



POLE TOP PLATE

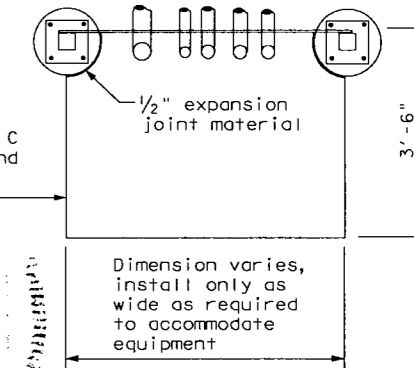


BASE PLATE DETAIL



BOTTOM OF POLE

**SERVICE SUPPORT TYPE SF & SP**



TOP VIEW

**SERVICE SUPPORT TYPE SF (O) & SF (U)**



**ELECTRICAL DETAILS  
 SERVICE SUPPORT  
 TYPES SF & SP  
 ED(7)-14**

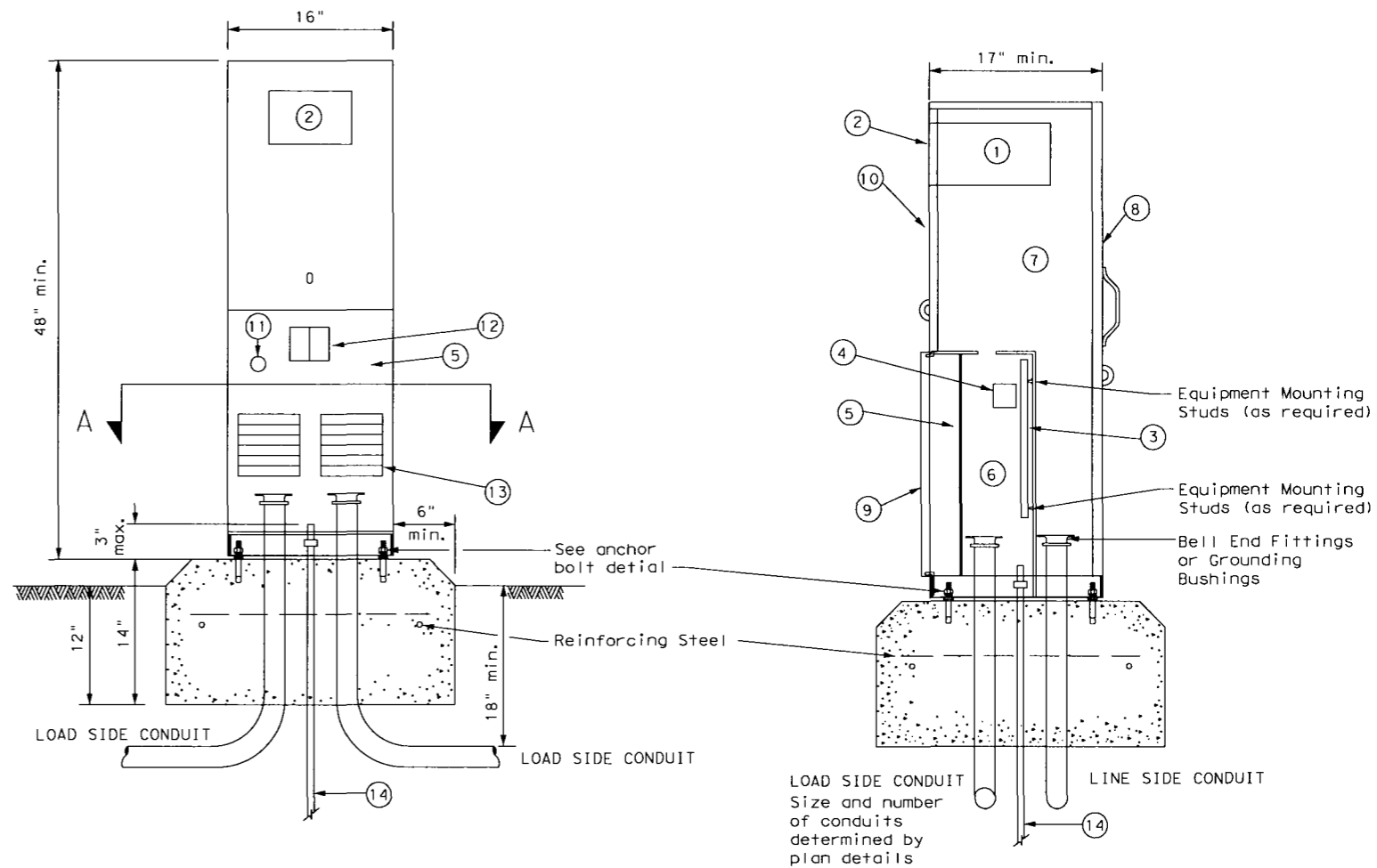
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PEDESTAL SERVICE NOTES

1. Manufacture pedestal electrical services in accordance with Departmental Material Specifications (DMS) 11080 "Electrical Services", 11085 "Electrical Services-Pedestal (PS)" and Item 628 "Electrical Services." Provide pedestal electrical services as listed on the Material Producers list (MPL) on the Department's web site under "Roadway Illumination and Electrical Supplies," Item 628. Ensure all mounting hardware and installation details of services meet utility company specifications. Contact the local utility company for approval of pedestal details prior to installing the electrical pedestal service. Submit any changes required by the utility company prior to manufacturing the pedestal enclosure.
2. When a meter socket is required, provide a socket with a minimum 100 amp rating that complies with local utility requirements.
3. Provide Class A or C concrete for pedestal service foundations in accordance with Item 420, "Concrete Substructures," except that concrete will not be paid for directly but is considered subsidiary to Item 628.
4. Provide #4 reinforcing steel for foundations in accordance with Item 440, "Reinforcement for Concrete."
5. Install 1/2 in. X 2 1/16 in. minimum length concrete single expansion type anchors for mounting pedestal enclosure to foundation. Anchor location to match mounting holes in each corner of enclosure. Secure each of the four corners of the pedestal enclosure to the anchors in the foundation with a 1/2 in. galvanized or stainless steel machine thread bolt, a properly sized locknut and a flat washer.
6. Finish top of concrete foundation in a neat and workmanlike manner. If leveling washers are used, ensure no more than 1/8 in. gap at any corner. Do not exceed a maximum dip or rise in the foundation of 1/8 in. per foot. When properly installed, ensure the top of the service enclosure is level front to back and side to side within 1/4 in. Repair rocking or movement of the service enclosure at no additional cost to the department.
7. Do not use liquidtight flexible metal conduit (LFMC) on pedestal type services.
8. Ensure all elbows in the foundation are sized as per utility provider's conduit requirements for underground conduit and feeders. PVC extensions may be installed provided the ends of the rigid metal conduits are more than 2 in. below the top of the concrete foundation. Where extension conduits are metal, grounding bushings must be installed with a bonding jumper properly terminated.

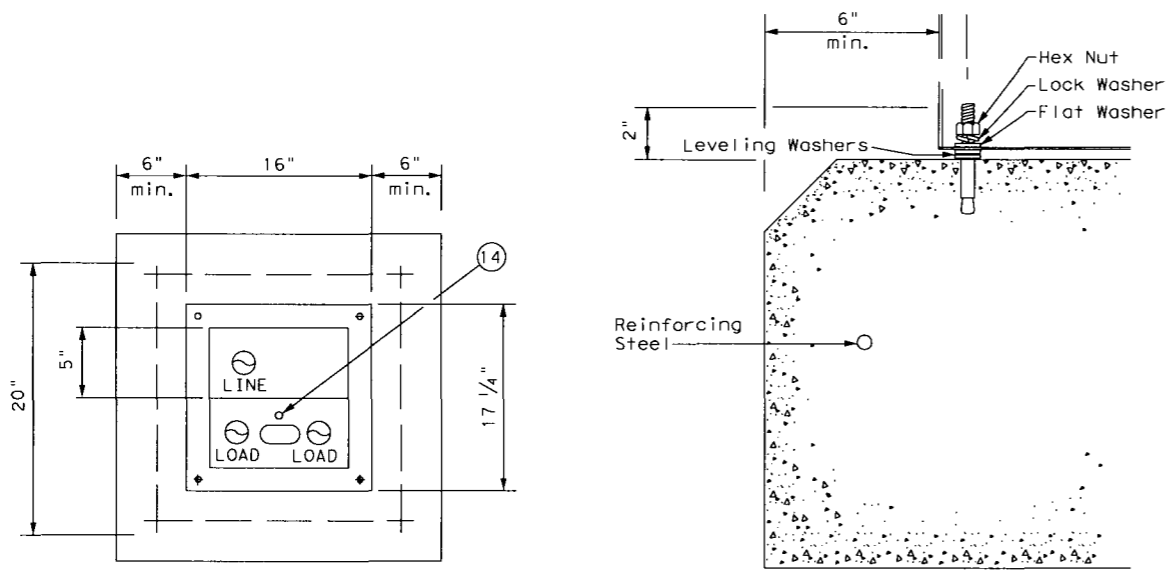


FRONT VIEW

SIDE VIEW

TYPE C shown, TYPE A similar except that TYPE A shall have individual circuit breakers (CB) mounted on an equipment mounting panel. CB Handles shall protrude through hinged deadfront trim.

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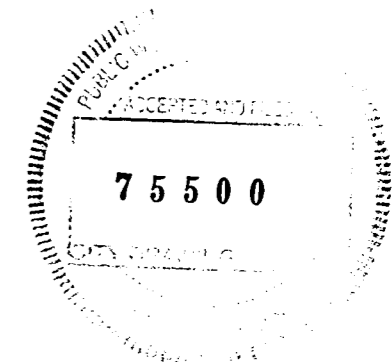


SECTION A-A

ANCHOR BOLT DETAIL

LEGEND

1	Meter Socket, (when required)
2	Meter Socket Window, (when required)
3	Equipment Mounting Panel
4	Photo Electric Control Window, (When required)
5	Hinged Deadfront Trim
6	Load Side Conduit Trim
7	Line Side Conduit Area
8	Utility Access Door, with handle
9	Pedestal Door
10	Hinged Meter Access
11	Control Station (H-O-A Switch)
12	Main Disconnect
13	Branch Circuit Breakers
14	Copper Clad Ground Rod - 5/8" X 10'



**Texas Department of Transportation** Traffic Operations Division Standard

**ELECTRICAL DETAILS  
ELECTRICAL SERVICE SUPPORT  
PEDESTAL SERVICE TYPE PS**

**ED(9)-14**

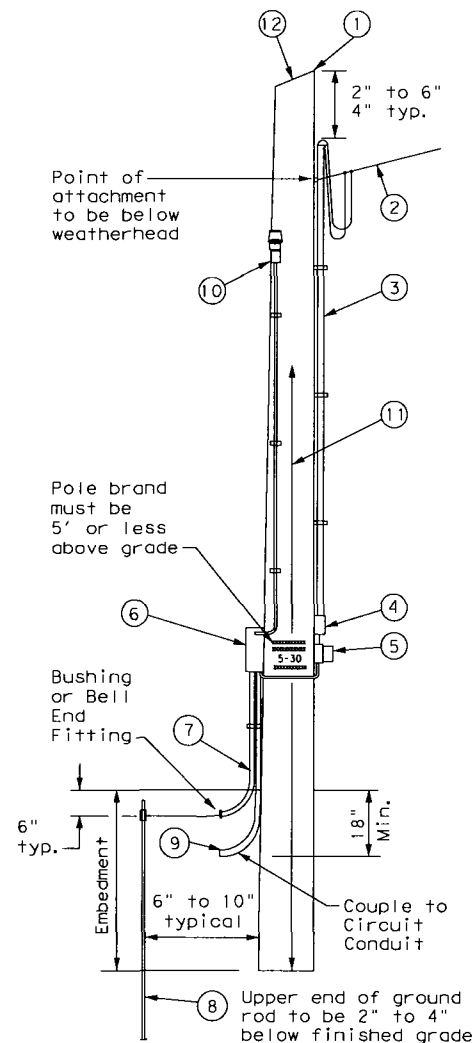
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**TIMBER POLE (TP) SERVICE SUPPORT NOTES**

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrical service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to 5/8 in. max. depth and 1 7/8 in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 3/4 in. maximum depth, and 1/2 in. to 1 3/8 in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, 1/4 in. minimum diameter by 1/2 in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

- 1 Class 5 pole, height as required
- 2 Service drop from utility company (attached below weatherhead)
- 3 Service conduit (RMC) and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)
- 4 Safety switch (when required)
- 5 Meter (when required)
- 6 Service enclosure
- 7 6 AWG bare grounding electrode conductor in 1/2 in. PVC to ground rod - extend 1/2 in. PVC 6 in. underground.
- 8 5/8 in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.
- 9 RMC same size as branch circuit conduit.
- 10 See pole-top mounted photocell detail on ED(5).
- 11 When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.
- 12 When required by utility, cut top of pole at an angle to enhance rain run off.

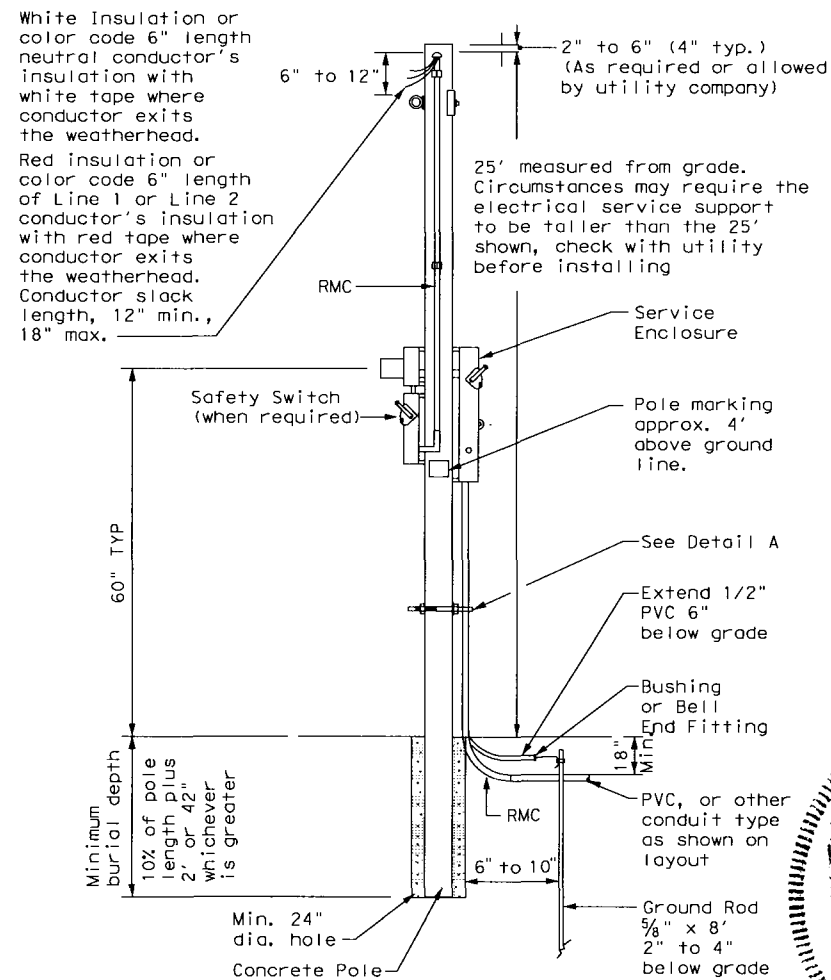


**SERVICE SUPPORT TYPE TP (O)**

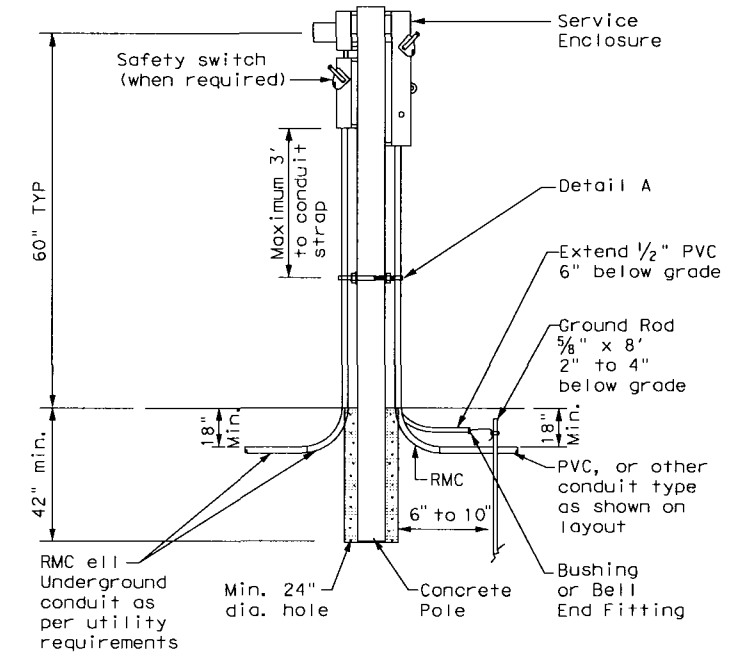
**GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES**

Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

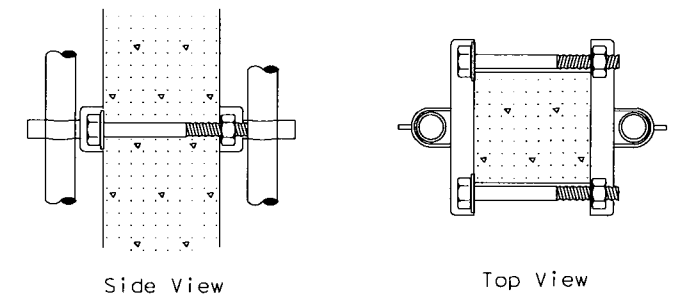
1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
7. Furnish and install galvanized or stainless steel channel strut 1 1/2 in. or 1 5/8 in. wide by 1 in. up to 3 3/4 in. deep (Unistrut, Kindorf, B-line or equal). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
8. Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



**CONCRETE SERVICE SUPPORT Overhead (O)**

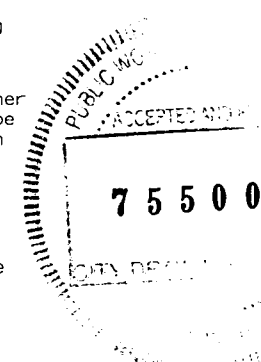


**CONCRETE SERVICE SUPPORT Underground (U)**



**DETAIL A**

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.

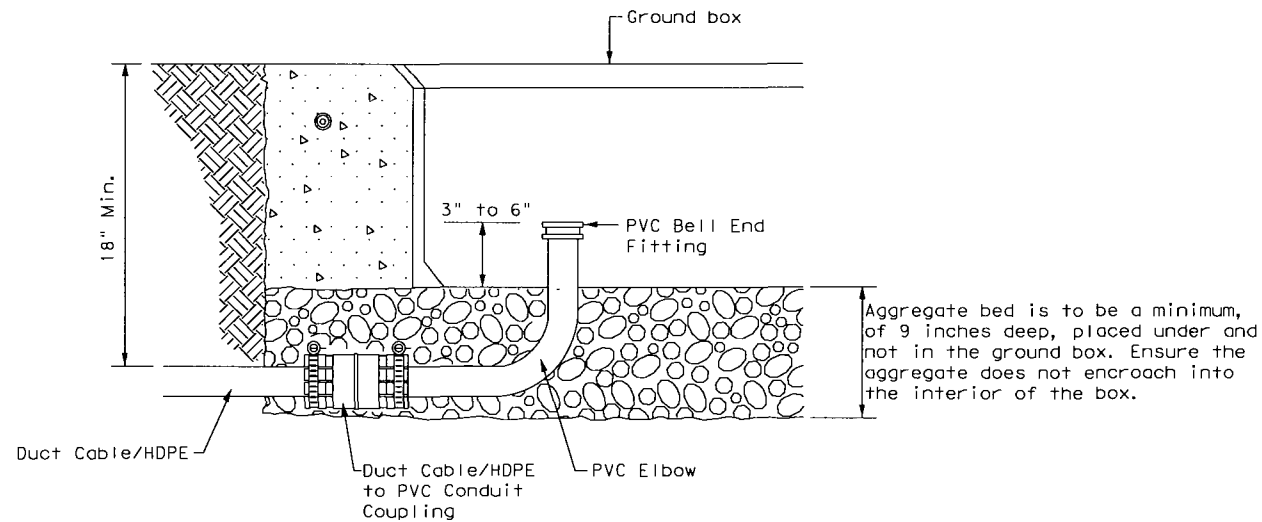


		<b>Texas Department of Transportation</b>		<b>Traffic Operations Division Standard</b>	
<b>ELECTRICAL DETAILS</b> <b>SERVICE SUPPORT</b> <b>TYPES GC, OC, &amp; TP</b> <b>ED(10)-14</b>					
FILE: ed10-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT	
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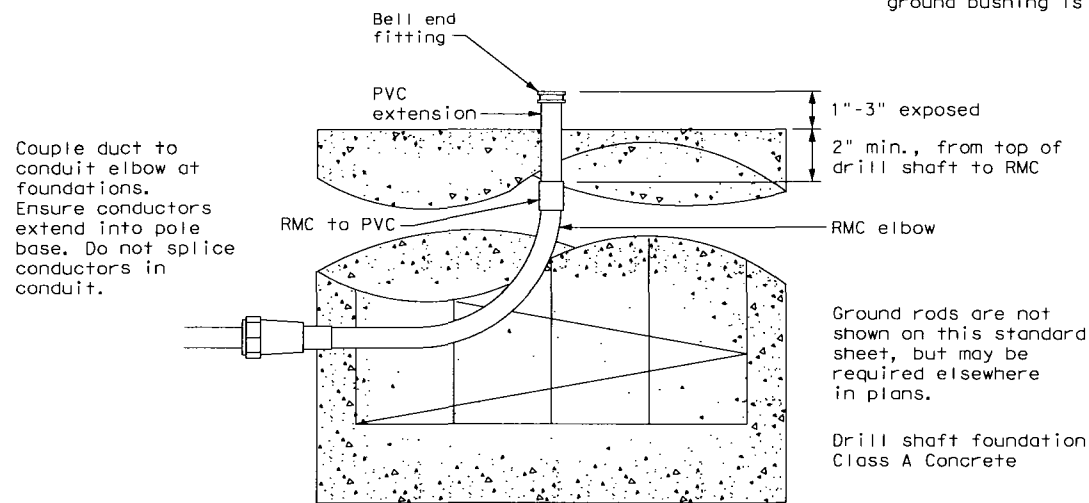
DUCT CABLE & HDPE CONDUIT NOTES

1. Provide duct cable in accordance with Departmental Material Specification (DMS) 11060 "Duct Cable" and Item 622 "Duct Cable." Provide duct cable as listed on the Material Producer List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 622.
2. Provide High-Density Polyethylene (HDPE) conduit in accordance with DMS 11060 and Item 618, "Conduit." Provide HDPE as listed on the MPL on the Department web site under "Roadway Illumination and Electrical Supplies," Item 618.
3. Supply duct cable with a minimum 2 in. diameter, unless otherwise shown in the plans. Provide duct cable and HDPE conduit as shown by descriptive code or on the plans. Bend duct cable and HDPE conduit as recommended by the manufacturer, with a minimum bending radius of 26 in. for 2 in. duct. Follow manufacturers' recommendations when handling duct cable and HDPE conduit reels and during installation of duct cable and HDPE conduit.
4. Do not splice conductors within duct cable or HDPE conduit. Couple duct cable and HDPE entering a ground box or foundation to a PVC elbow. When galvanized steel RMC elbows are called for in the plans and any portion of the RMC elbow is buried less than 18" from possible contact, ground the RMC elbow.
5. Furnish and install duct cable with factory installed conductors, sized as shown in the plans and as required by the National Electrical Code (NEC). The NEC contains specific requirements for duct cable in Article, "Nonmetallic Underground Conduit with Conductors: Type NUCC."
6. When conduit casing is called for in the plans, extend duct cable or HDPE conduit through the conduit casing in one continuous length without connection to the casing.
7. Seal the ends of duct cable or HDPE conduit with duct seal, expandable foam, or other approved method after completing the pull tests required by Item 622.
8. Provide minimum cover of 24 in. under roadways, 18 in. in other locations, or as shown on the plans.
9. Furnish and install listed fittings to couple duct cable or HDPE conduit to other types of conduit. Duct cable and HDPE conduit may be field-threaded and spliced with PVC or RMC threaded couplings; connected with listed tie-wrap fittings; connected using listed coupling made of HDPE with stainless steel external bonding clamps and locking rings; connected with approved electrofusion conduit couplings; or connected using an approved chemical fusion method using an epoxy or adhesive specifically designed for HDPE couplings and connectors all installed in accordance with their manufacturer's instructions. Do not use PVC glue on HDPE. Do not use water pipe fittings, or connect conduit with heat shrink tubing.

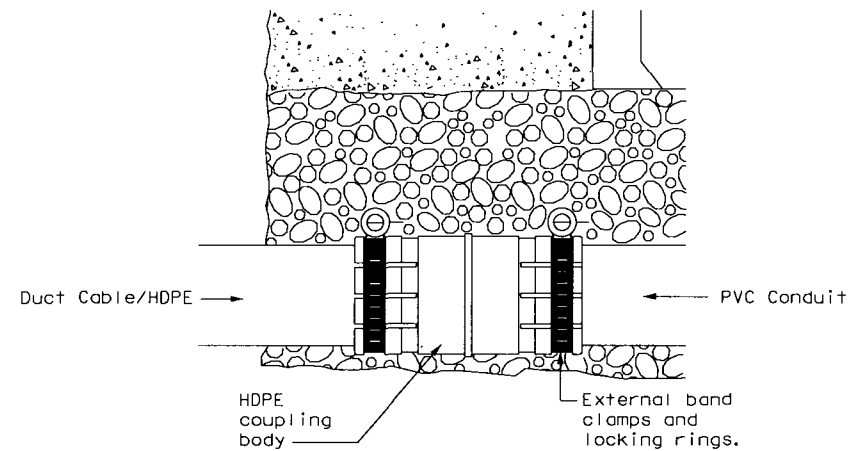


DUCT CABLE/HDPE AT GROUND BOX

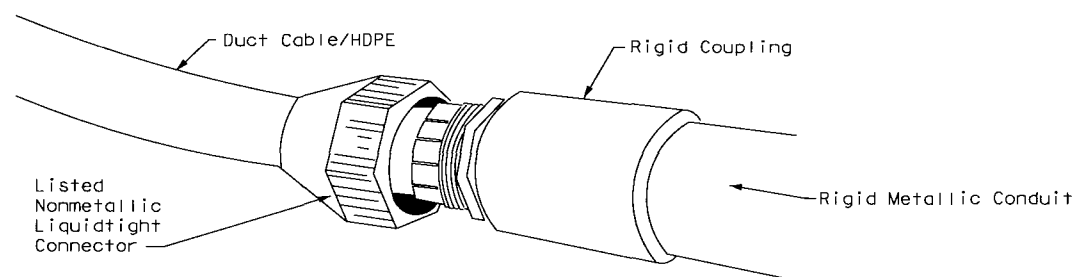
When the upper end of an RMC Ell does not enter the ground box, it may be extended with a SCH-40 PVC conduit nipple and bell end, provided there is a minimum of 18" of cover over all parts of the elbow. If not, a rigid extension and ground bushing is required.



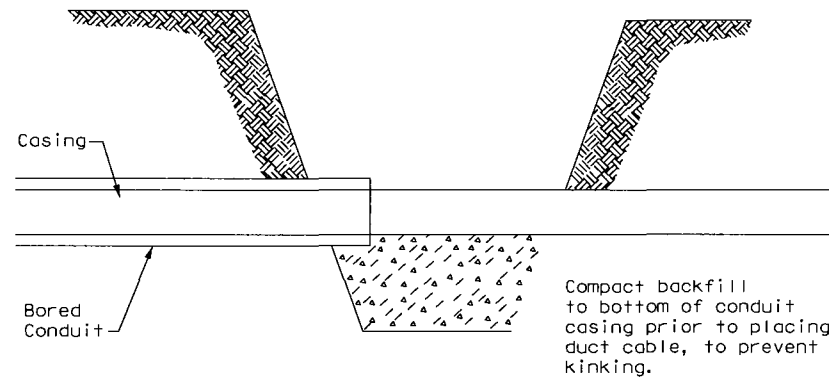
DUCT CABLE / HDPE AT FOUNDATION



DUCT CABLE/HDPE TO PVC



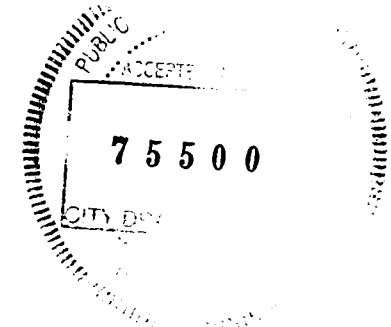
DUCT CABLE/HDPE TO RMC



BORE PIT DETAIL

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		Traffic Operations Division Standard	
<b>ELECTRICAL DETAILS</b> <b>DUCT CABLE / HDPE CONDUIT</b> <b>ED(11)-14</b>			
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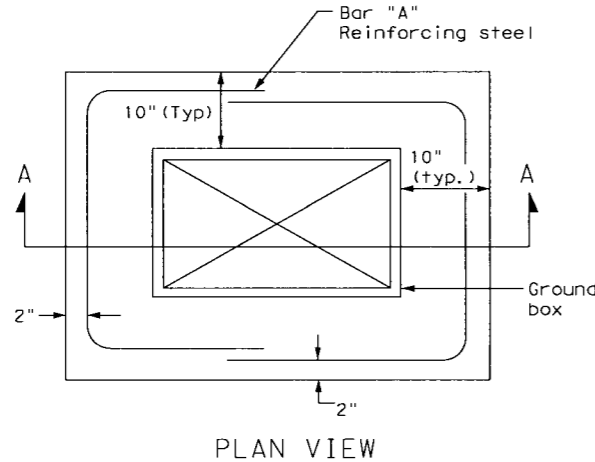
**BATTERY BOX GROUND BOXES NOTES**

**A. MATERIALS**

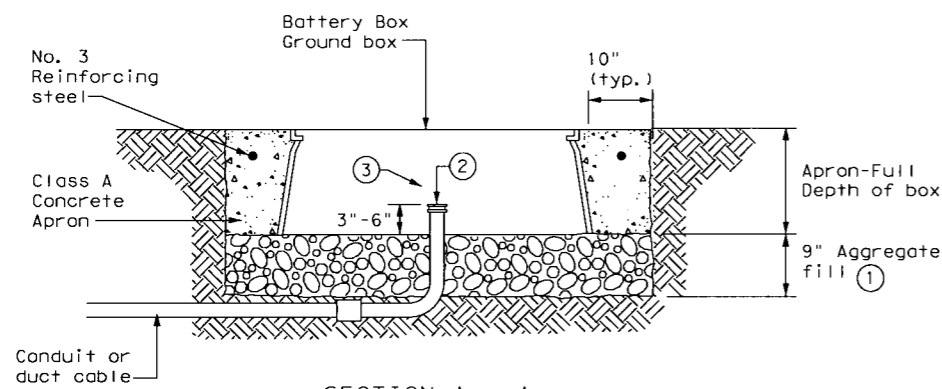
1. Provide polymer concrete or fiberglass reinforced plastic (FRP) battery box ground box and cover in accordance with Departmental Material Specification (DMS) 11071 "Battery Box Ground Boxes." Battery box will accommodate up to 4 batteries, each measuring 8 in. x 13.5 in. x 10 in. (W x L x D). Label battery box ground box cover in accordance with DMS 11071.
2. Supply a marine grade batteries with covers. Secure the marine grade batteries with covers to the stainless steel rack in the bottom of the ground box with tie down straps.

**B. CONSTRUCTION METHODS**

1. Ensure conduit entry will not interfere with placement of the batteries in the battery box ground box.
2. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting battery box ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure the aggregate bed is in place and is a minimum of 9 in. deep prior to setting the box. Install battery box ground box on top of aggregate.
3. Cast battery box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Battery box ground box aprons, including concrete and reinforcing steel, are subsidiary to battery box ground boxes when called for by descriptive code.
4. Bolt covers down when not working in battery box ground boxes. Keep bolt holes in the box clear of dirt.



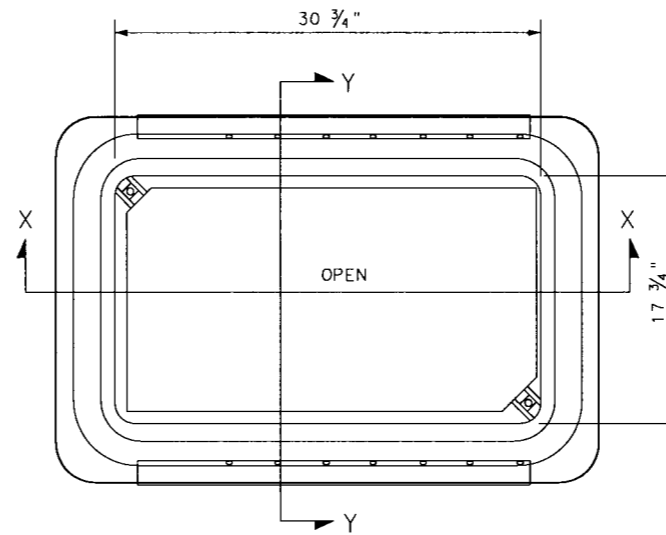
PLAN VIEW



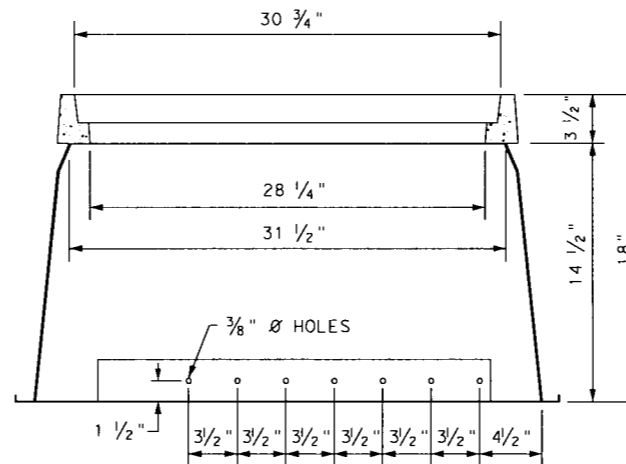
SECTION A - A

**APRON FOR BATTERY BOX GROUND BOXES**

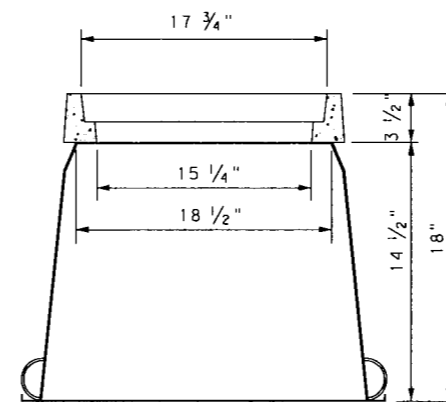
- ① Place aggregate under the box and not in the box. Aggregate should not encroach on the interior volume of the box.
- ② Install bushing or bell end fitting on the upper end of all ells.
- ③ Install all conduits in a neat and workmanlike manner.



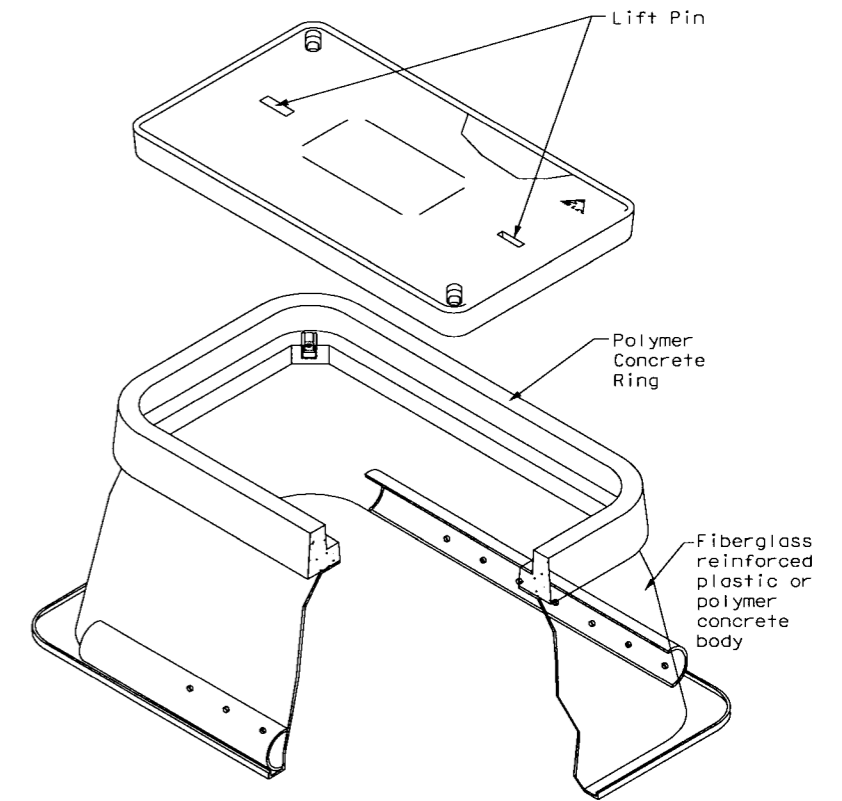
BATTERY BOX TOP VIEW



SECTION X-X



SECTION Y-Y



		Traffic Operations Division Standard	
<b>ELECTRICAL DETAILS BATTERY BOX GROUND BOXES</b>			
<b>ED(12)-14</b>			
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# ROADWAY ILLUMINATION ASSEMBLY NOTES

1. Details apply to roadway lighting installations bid or referenced under Item 610, "Roadway Illumination Assemblies." Provide, furnish, and install all other materials not shown on the plans which may be necessary for complete and proper construction. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the State such warranties or guarantees.
2. The locations of poles and fixtures may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.
3. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.
4. Provide Roadway Illumination Light Fixtures as per TxDOT Departmental Material Specification (DMS) 11010, Item 610, and as shown on the Material Producers List (MPL) for Roadway Illumination and Electrical Supplies.
5. Fabricate steel roadway illumination poles in accordance with Roadway Illumination Poles (RIP) standards and Item 610. Poles fabricated according to RIP standards do not require shop drawing submittals.
  - a. Alternate designs to RIP standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" on the TxDOT web site.
  - b. Limitations on use of the RIP standard: The RIP standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25' above the elevation of the surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 6th Edition (2013) of the AASHTO Design Specifications. For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25' above the surrounding terrain, provide poles meeting the following requirements:
    - i. Submittals. Following the electronic shop drawing submittal process (see Guide to Electronic Shop Drawing Submittal on the TxDOT web site), submit to the Engineer for approval fabrication drawings and calculations for the poles, sealed by a Texas licensed professional engineer (P.E.).
    - ii. Luminaire Structural Support Requirements. Provide light poles, arms, and anchor bolt assemblies with a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the 6th edition (2013) of the AASHTO Design Specifications. For transformer base poles, include transformer base and connecting hardware in calculations and shop drawing submittals. Structurally test all transformer bases to resist the theoretical plastic moment capacity of the pole. Submit certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished with the shop drawings. Show breakaway base model number, manufacturer's name, and logo on shop drawings. Include on manufacturer's shop drawings the ASTM designations for all materials to be used.
6. For both transformer and shoe-base type illumination poles, provide and install double-pole breakaway fuse holders as specified by DMS-11040. Breakaway fuse holders are listed on the MPL for Roadway Illumination and Electrical Supplies under Items 610 & 620. Provide 10 amp time delay fuses for breakaway connectors in light poles, or inside the light fixture for underpass luminaires. In each pole, connect luminaires to the breakaway connector with continuous stranded 12 AWG copper conductors as listed on the MPL. Bond all equipment grounding conductors together and to the ground lug in the transformer base or hand hole.
7. Tighten anchor bolts for shoe base, concrete traffic barrier base, and bridge mount roadway illumination poles, in accordance with Item 449.
8. Install T-Base with following procedure:
  - a. Anchor Bolt Tightening.
    - i. Coat the threads of the anchor bolts with electrically conductive lubricant.
    - ii. Place the T-base over the anchor bolts. Foundation must be level and flat. The maximum permissible gap under any one corner of the t-base is 1/8" before nuts are tightened.
    - iii. Coat the bearing surfaces of the nuts and washers with electrically conductive lubricant. Install (1) 1/2" hold down washer, (1) lock washer, and (1) nut on each anchor bolt. Turn the nuts onto the bolts so that each is hand-tight against the washer.
    - iv. Using a torque wrench, tighten each nut to 150 ft-lb. Uniform contact is required between the foundation and the T-base in the corner regions of the T-base, and all corner gaps must be closed after applying torque. If a gap still exists after torquing to 150 ft-lbs, continue torquing each bolt incrementally until gap is closed or maximum allowable torque of 250 ft. pound is reached, whichever comes first. If 250 ft-lbs is not enough to close the gap the foundation must be leveled. Gaps along the straight sides of the T-bases and the foundation are permissible. Ensure that no high point of contact occurs between the straight sides of the T-base and the foundation.
    - v. Check top of T-base for level. If not level then foundation must be leveled.
  - b. Top Bolt Procedure
    - i. Erect pole over T-base with crane. Coat bolts, nuts, washers, and lock washers with electrically conductive lubricant.

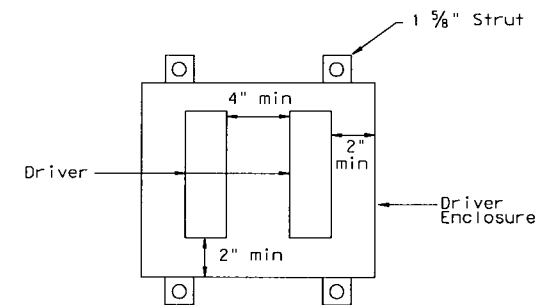
- ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."
- iii. Tighten each nut to 150 ft-lb. using a torque wrench.
- c. Level and Plumb
  - i. Ensure pole is plumb and mast arm is perpendicular to the roadway according to plans to within 5 degrees.
9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).
10. Provide and install underpass luminaires in accordance with Item 610, DMS-11010, and TxDOT standard sheet RID(3). Typical luminaire size for underpass luminaires is 150W HPS or 150W EQ LED.
11. Mount luminaires on arms level as shown by the luminaire level indicator.
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

## Wiring Diagram Notes:

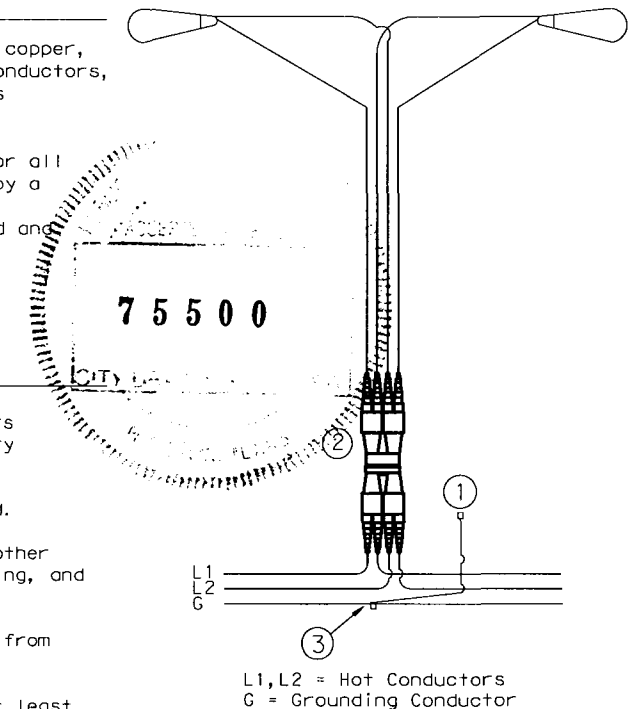
- ① Use 1/2 in.-13 UNC threaded, copper or tin-plated copper, pole bonding connector, sized appropriately for conductors, bonded to T-base, or use ground lug in handhole as available.
- ② Use pre-qualified two-pole breakaway connectors for all luminaire pole installations. For luminaires fed by a circuit with a neutral conductor, use double pole breakaway connectors with the neutral side unfused and marked white.
- ③ Split Bolt or other connector.

## Decorative LED Lighting Notes:

1. LED Drivers in Remote Outdoor enclosures (for drivers that do not include an enclosure as part of a factory assembly):
  - a. Provide NEMA 3R outdoor enclosure or as approved.
  - b. Install enclosure at least 12" above ground or other horizontal surface. Mount vertically or on ceiling, and avoid direct sun where possible.
  - c. Install drivers with at least 2 inches of space from enclosure walls.
  - d. For multiple drivers in an enclosure, provide at least 4 inches side to side and 1 inch end to end from other drivers or electronic equipment
  - e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.
  - f. Provide remote drivers with a maximum of 100 watts
  - g. Provide drivers with documentation of 100,000 hr lifetime at Tcase of 65C or higher.



Driver Spacing in Remote Enclosure



## TYPICAL WIRING DIAGRAM

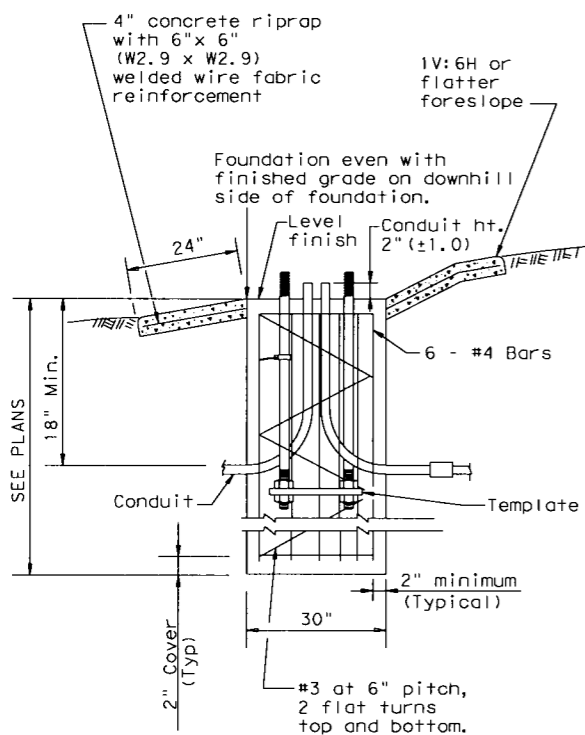
LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.

				<b>Traffic Safety Division Standard</b>	
<h3>ROADWAY ILLUMINATION DETAILS</h3> <h3>RID(1)-20</h3>					
FILE#	rid1-20.dgn	DN#	CK#	DW#	CK#
© TxDOT	January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS				FBPTR	
7-17		DIST	COUNTY	SHEET NO.	
12-20		HOU	FT BEND	157	
72A					

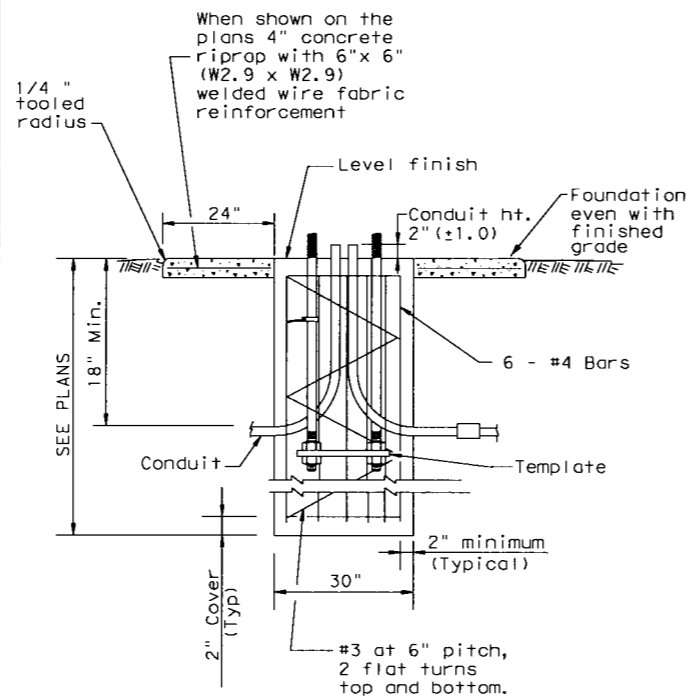
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**SECTION A-A**  
SHOWING SLOPED GRADE



**SECTION A-A**  
SHOWING CONSTANT GRADE

**TABLE 1**

ANCHOR BOLTS

POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1 in. x 30 in.
40-50 ft.	15 in.	17 1/4 in.	1 1/4 in. x 30 in.

**TABLE 2**

RECOMMENDED FOUNDATION LENGTHS  
(See note 1)

MOUNTING HEIGHT	TEXAS CONE PENETROMETER N Blows/ft		
	10	15	40
≤20 ft.	6'	6'	6'
>20 ft. to 30 ft.	8'	6'	6'
>30 ft. to 40 ft.	8'	8'	6'
>40 ft. to 50 ft.	10'	8'	6'

**TABLE 3**

PAY QUANTITY OF RIPRAP PER FOUNDATION  
(Install only when shown on the plans)

Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

**GENERAL NOTES:**

- "Recommended Foundation Lengths" table is for information purposes only. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations," unless otherwise shown on the plans.
- Erect roadway illumination assembly poles plumb and true. Form and level the top 6" of the foundation so the pole will be plumb. Use leveling nuts to plumb shoe base poles. Do not use shims or leveling nuts under transformer bases. Do not grout between baseplate and the foundation.
- Ensure Class 2A and 2B fit for anchor bolts and nuts. Tap and chase nuts after galvanizing. Anchor bolt body with rolled threads need not be full size.
- Use appropriate class of concrete as specified in Items 416 and 432. Concrete for riprap may be upgraded to Class C at no extra cost to the Department.
- Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
- Locate breakaway roadway illumination assemblies as shown in the placement table, unless otherwise dimensioned on the plans. Protect non-breakaway illumination assemblies from vehicular impact (i.e. 2.5 ft. behind guard rail or mounted on traffic barrier), or located outside the clear zone, except that 2.5 ft. from curb face is minimum desired for light poles on city streets, 45 mph or less. See Roadway Design Manual for further information.
- Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
- Install a minimum of 2 conduits in each foundation. See lighting layout sheets for locations of foundations with more than 2 conduits. Cap unused conduits in foundations on both ends.
- Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
- Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. The bonded steel in the foundation creates a concrete encased grounding electrode which replaces the ground rod.
- Grade earthwork around T-base foundations even with the finished grade as shown in Section A-A to ensure proper function of the breakaway device. Use riprap on T-base foundations that are located on sloped grades, and as shown on the plans for level grades.

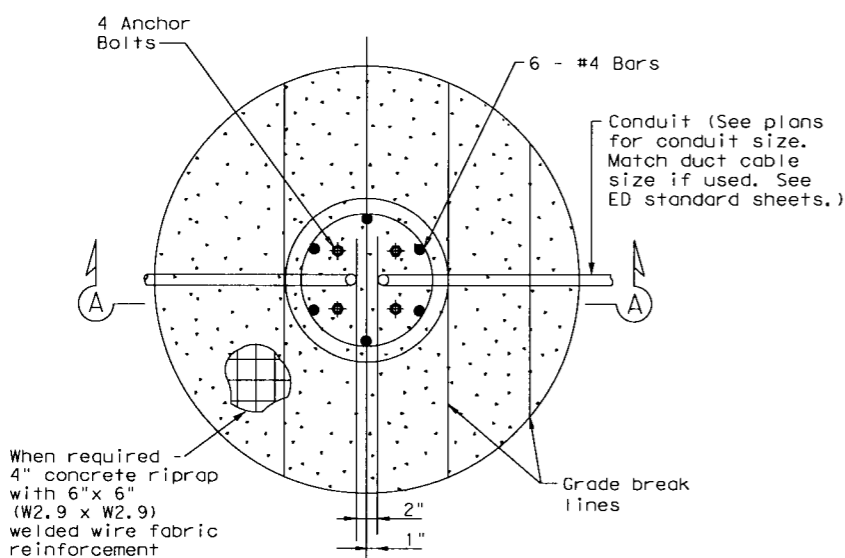
**TABLE 4**

BREAKAWAY POLE PLACEMENT (See note 6)

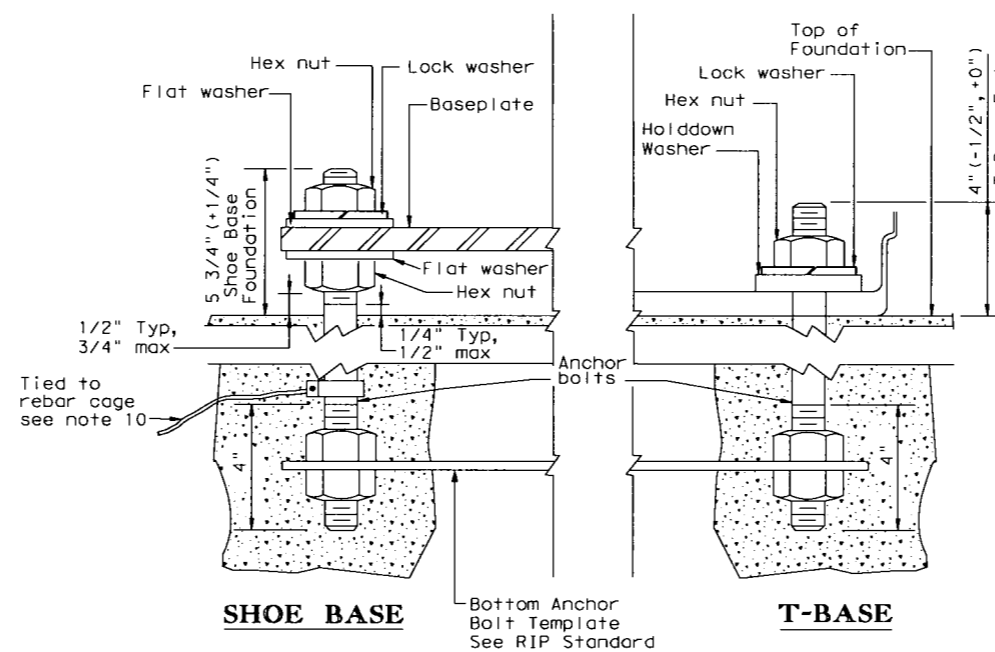
ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 ft. desirable) from lane edge

\* or as close to ROW line as is practical

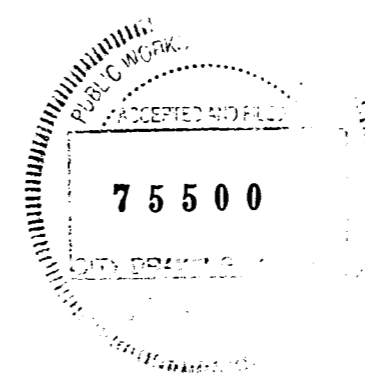
\*\* provide 2/5 of the luminaire mounting height behind the pole for "falling area" to prevent encroachment on the other travel lanes. See design guidelines.



**FOUNDATION DETAIL**



**ANCHOR BOLT DETAIL**

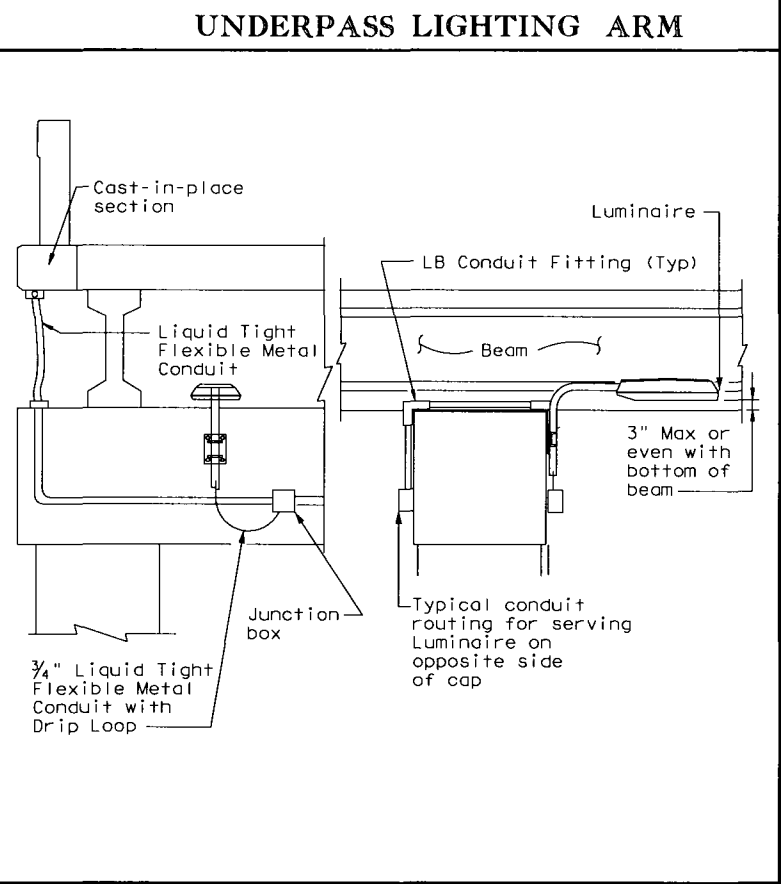
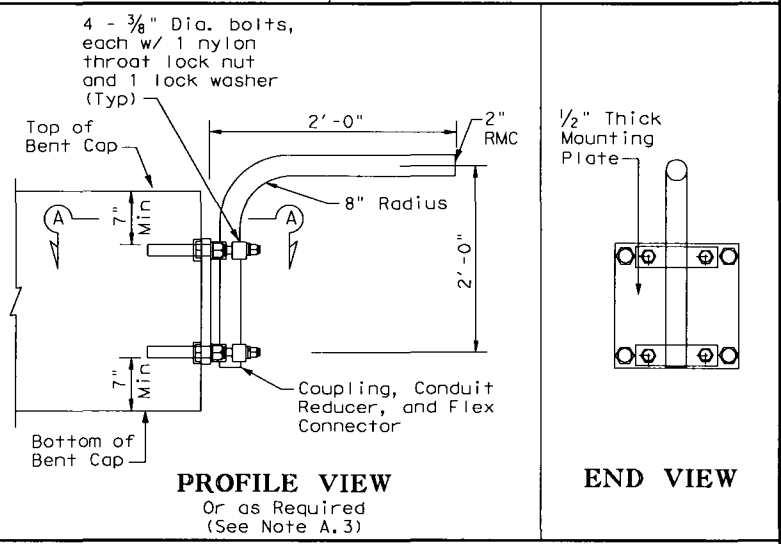
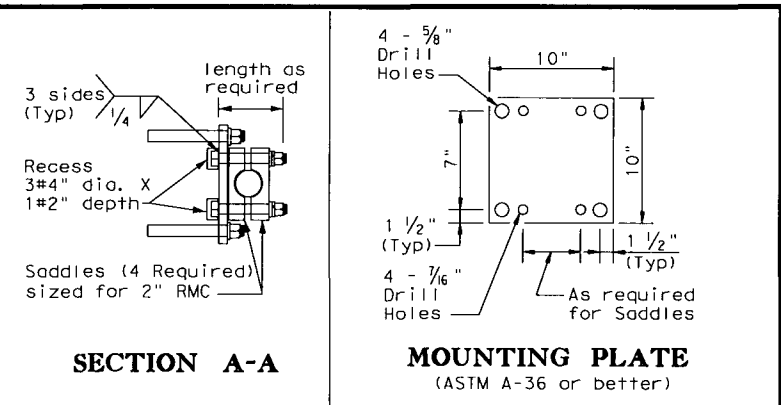


**ROADWAY ILLUMINATION DETAILS  
(RDWY ILLUM FOUNDATIONS)  
RID(2)-20**

FILE: rid2-20.dgn	DN: [ ]	CK: [ ]	DW: [ ]	CK: [ ]
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1-11	REVISIONS			FBPTR
7-17	DIST	COUNTY	SHEET NO.	
12-20	HOU	FT BEND	158	

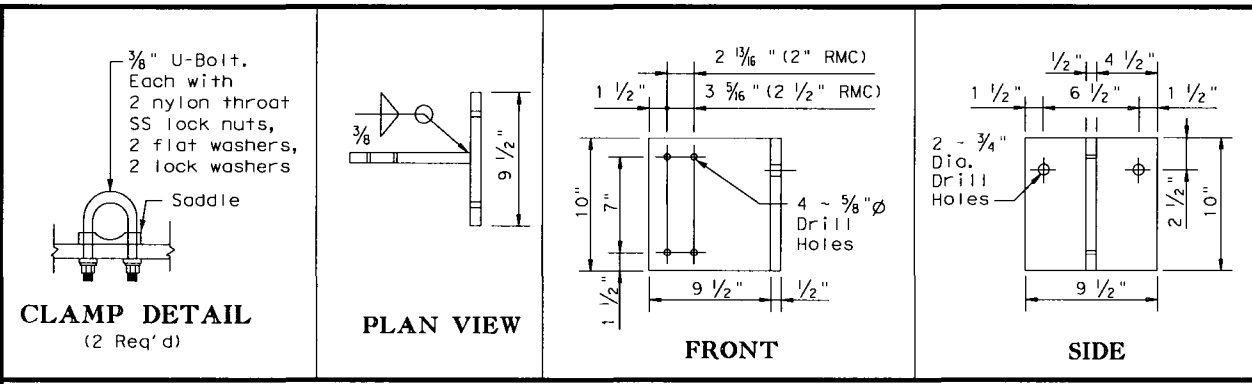
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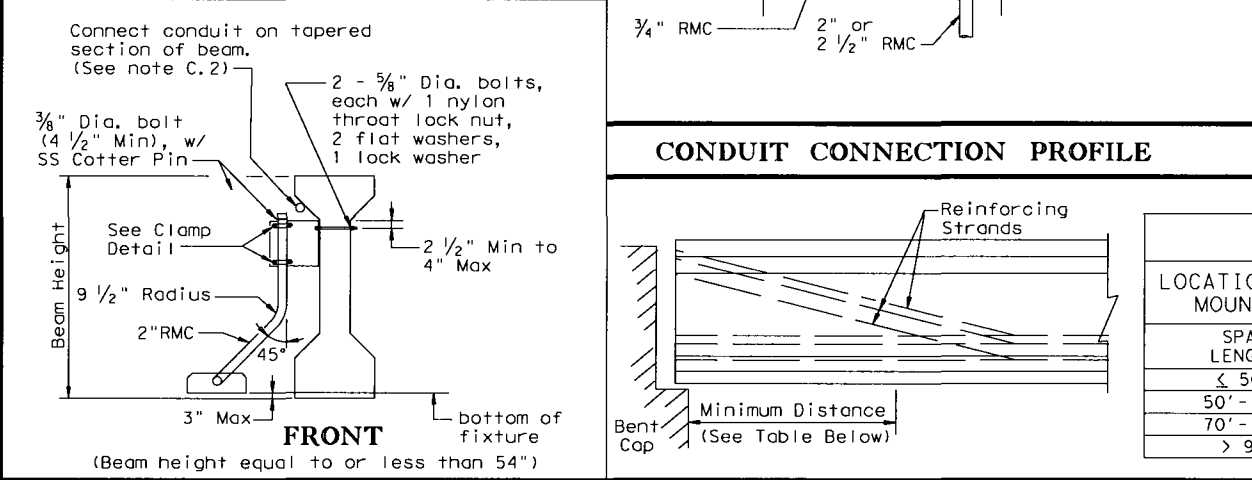
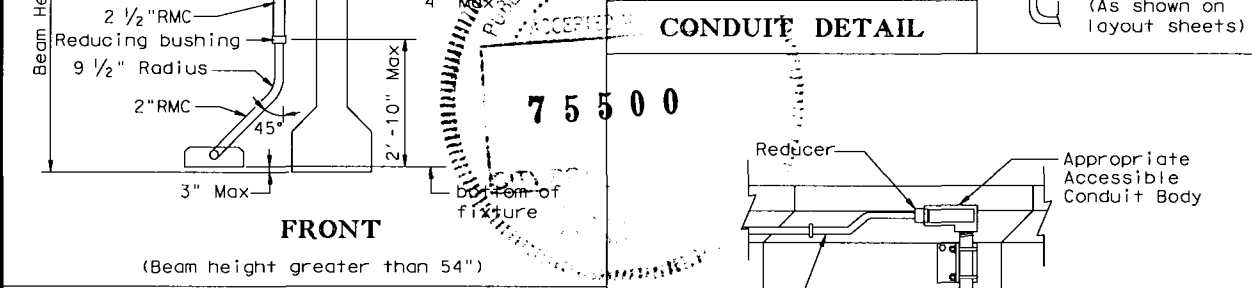
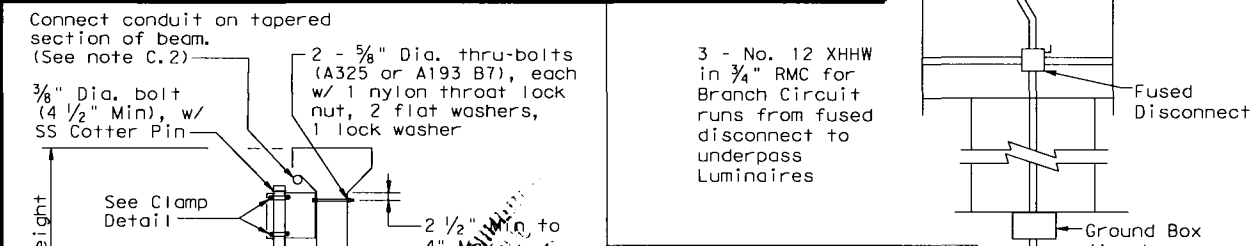
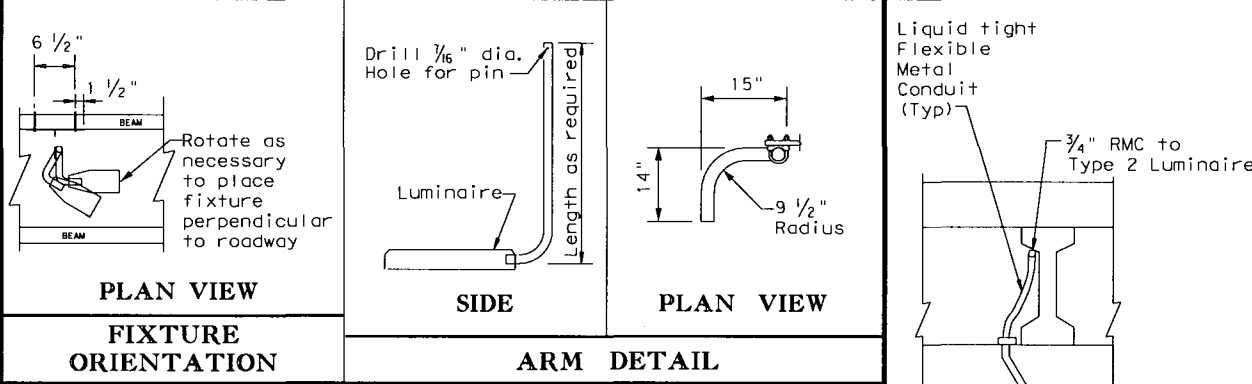


**IN RD IL AM (U/P) (TY 1)**  
If bridge has pre-cast panels under deck, run circuit under deck.

**UNDERPASS LIGHTING TYPE 1**



**BRACKET DETAIL**  
Make from 1/2" plate (ASTM A-36 or better)



**IN RD IL AM (U/P) (TY 2)**

**UNDERPASS LIGHTING TYPE 2**

- GENERAL NOTES:**
- A. ALL 150 watt HPS and 150 watt equivalent LED Luminaires**
- Luminaire locations, conduit and conductor sizes and routing are typical and diagrammatic only. See project layout sheets for specific details.
  - Conduit will be paid for under Item 618, "Conduit" and conductors will be paid for under Item 620, "Electrical Conductors," unless otherwise shown on the plans.
  - Adjust conduit in saddles to place fixture height and orientation as required. See fixture orientation detail and plans. Where practicable, place luminaires so the bottom of luminaire is above the bottom of the beam, maximum of 3 in. (See detail UNDERPASS LIGHTING ARM TYPE 2)
  - Except as noted, galvanize all structural steel and exposed bolts, nuts, and washers in accordance with Item 445 "Galvanizing".
  - Fabrication of brackets and support arms will not be paid for directly but is subsidiary to Item 610, "Roadway Illumination Assemblies."
  - Install a heavy duty NEMA 3R fused disconnect or breaker enclosure rated at 30 amps and 480 volts to switch underpass luminaires as shown on plans, with at least one per bridge circuit. Install 20 amp time-delay fuses or inverse-time circuit breakers. Mount disconnect or breaker enclosure 10 ft. (min) above grade on columns or bent caps as approved by the Department. Modify disconnect to allow padlocking in the "ON" and "OFF" positions. Padlocks and disconnect switches or circuit breakers for underpass fixtures will not be paid for directly but are subsidiary to the various bid items of the contract.
  - Conduit on columns, caps, and slab is shown surface mounted. For new columns and caps, embed PVC conduit in concrete. Bond and ground metal junction boxes and conduit.

- B. TYPE 1**
- Provide 2 in. rigid metal conduit (2.375" O.D., 0.146" wall) for Type 1 arm shaft.
  - Use 3/8 in. stainless steel bolt or stud non-epoxy type expansion anchors for concrete for Type 1 mounting. Except as noted, provide an allowable 2650 lbs minimum pull-out force (after consideration of adjustment factors for edge distance and bolt spacing) for each anchor. Install each anchor to the embedment depth recommended by the manufacturer.
  - Attach conduit to plate with 4 saddles, four - 3/8 in. diameter bolts, nylon throat lock nuts, and lock washers.

- C. TYPE 2**
- Provide 2 in. rigid metal conduit (2.375" O.D., 0.146" wall) or provide a combination of 2 1/2 in. (2.875" O.D., 0.193" wall) and 2 in. (2.375" O.D., 0.146" wall) rigid metal conduits with a reducing bushing as beam height stipulated for Type 2 arm shaft. Field cutting and threading will be permitted. Paint cut and threaded areas with zinc rich paint after conduit is connected to adjacent fitting.
  - Connecting conduit may be strapped to tapered section only of precast beams as shown. Anchor as approved by the Engineer. Maximum anchor depth is 1 in.
  - Indiscriminate drilling into precast concrete beams may result in reduced beam strength. Use drilling location and method as directed by the Engineer. See Location of Underpass Lighting Mounting Bracket detail. The locations shown in the table are such that reinforcing strands will not be damaged.

**TABLE 5**  
LOCATION OF UNDERPASS LIGHT MOUNTING BRACKET

SPAN LENGTH	MINIMUM DISTANCE
≤ 50'	10'-0"
50' - 70'	15'-0"
70' - 90'	20'-0"
> 90'	25'-0"

**ROADWAY ILLUMINATION DETAILS (UNDERPASS LIGHT FIXTURES)**  
RID(3)-20

FILE: rid3-20.dgn	DN: TxDOT	CK: TxDOT	DR: TxDOT	CR: TxDOT
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2-14				FBPTR
7-17	DIST	COUNTY		SHEET NO.
12-20	HOU	FT BEND		159
72C				



SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

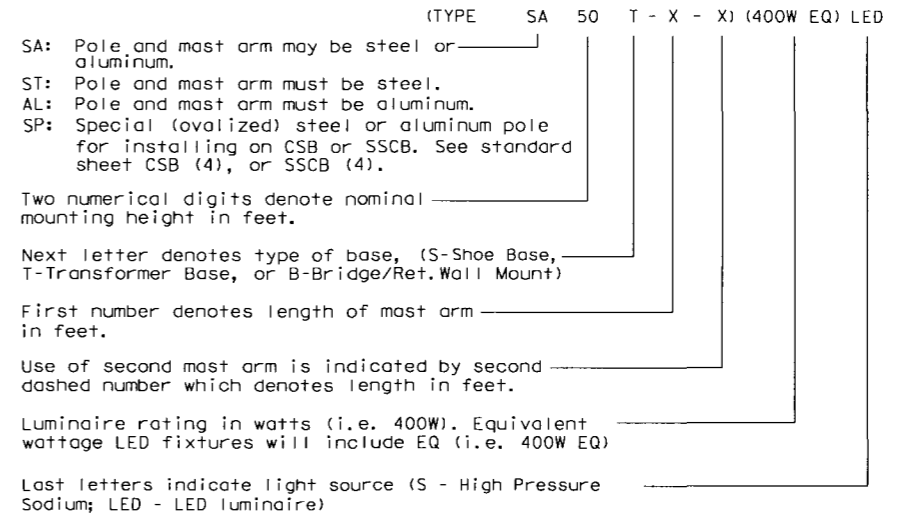
Nominal Mounting Ht. (ft)	Shoe Base					T-Base					CSB/SSCB Mounted							
	Designation					Quantity	Designation					Quantity	Designation					Quantity
	Pole	A1	A2	Luminaire	Pole		A1	A2	Luminaire	Pole	A1		A2	Luminaire				
20	(Type SA 20 S - 4)			(150W EQ) LED		(Type SA 20 T - 4)			(150W EQ) LED									
	(Type SA 20 S - 4 - 4)			(150W EQ) LED		(Type SA 20 T - 4 - 4)			(150W EQ) LED									
30	(Type SA 30 S - 4)			(250W EQ) LED		(Type SA 30 T - 4)			(250W EQ) LED		(Type SP 28 S - 4)			(250W EQ) LED				
	(Type SA 30 S - 4 - 4)			(250W EQ) LED		(Type SA 30 T - 4 - 4)			(250W EQ) LED		(Type SP 28 S - 4 - 4)					(250W EQ) LED		
40	(Type SA 30 S - 8)			(250W EQ) LED		(Type SA 30 T - 8)			(250W EQ) LED		(Type SP 28 S - 8)			(250W EQ) LED				
	(Type SA 30 S - 8 - 8)			(250W EQ) LED		(Type SA 30 T - 8 - 8)			(250W EQ) LED		(Type SP 28 S - 8 - 8)					(250W EQ) LED		
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	(Type SA 40 S - 10)			(250W EQ) LED		(Type SA 40 T - 10)			(250W EQ) LED		(Type SP 38 S - 10)					(250W EQ) LED		
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50	(Type SA 40 S - 12)			(250W EQ) LED		(Type SA 40 T - 12)			(250W EQ) LED		(Type SP 38 S - 12)			(250W EQ) LED				
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	(Type SA 50 S - 8 - 8)			(400W EQ) LED		(Type SA 50 T - 8 - 8)			(400W EQ) LED		(Type SP 48 S - 8 - 8)					(400W EQ) LED		
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(Type SA 50 S - 12 - 12)			(400W EQ) LED	(Type SA 50 T - 12 - 12)			(400W EQ) LED	(Type SP 48 S - 12 - 12)				(400W EQ) LED						

OTHER				
Designation				Quantity
Pole	A1	A2	Luminaire	

GENERAL NOTES:

- All work, materials and services not shown on the plans which may be necessary for complete and proper construction shall be performed, furnished and installed by the Contractor. Faulty fabrication or poor workmanship in any material, equipment or installation will be considered justification for rejection. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the Department such warranties or guarantees.
- The location of poles and fixtures are diagrammatic only and may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.
- Standard Steel Pole Designs. Steel poles fabricated in accordance with the details and dimensions shown herein, shall be considered standard designs. Submission of shop drawings and design calculations for standard designs is not required.
- Optional Steel Pole Designs. Multi-sided steel poles may be allowed as optional designs, if steel poles are permitted or required, pending approval by the Department as outlined below.
  - Shop Drawings. Optional designs require submission of shop drawings and design calculations bearing the seal of an engineer licensed in the State of Texas, in accordance with Item 441, "Steel Structures." The Department may elect to pre-approve some shop drawings for optionally designed poles. Submission of shop drawings and design calculations is not required for structures fabricated in accordance with the details of shop drawings on the pre-approved list maintained by the TxDOT Traffic Operations Division. Any deviation from the pre-approved shop drawings will require submission of shop drawings of the complete assembly and design calculations as described above.
  - Structural Support Design for Luminaires. Lighting support structures shall be designed for a 25 year design life in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. All poles shall be designed for 110 mph 3-second gust wind speeds. The Gust Factor, G, and Wind Importance Factor, Ir, shall be applied as per the AASHTO Specifications assuming a 25-year design life. The design wind pressure for hurricane wind velocities greater than 100 mph shall not be less than the design wind pressure using 100 mph with the non-hurricane Wind Importance Factor, Ir, value. For transformer base poles, fabricator shall include transformer base and connecting hardware in design calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.
  - Mast Arm Attachments. All poles and attachments shall be structurally designed to support two 12-foot mast arms and luminaires. Poles shall be supplied with mast arm combinations as shown in the plans. All mast arms shall be designed for a 60-pound luminaire having an effective projected area of 1.6 square feet.
  - Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.
- Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.
  - Meet all of the requirements stated above for optional steel pole designs and the following:
    - Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
    - Aluminum pole designs shall use the same anchor bolt assembly and be subject to the same geometric restraints and other requirements for steel poles specified herein.
    - Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
    - Pole components shall be constructed using the following material:
      - Shaft: ASTM B221 or B241 Alloy 6063-T6, ASTM B209 Alloy 5086-H34, ASTM B221 Alloy 6005-T5.
      - Base Flange: ASTM B26 Alloy 356.0-T6 or ASTM B108 Alloy 356.0-T6 (Yield strength test required).
      - Mast Arm Fitting: ASTM B209 Alloy 6061-T6 or ASTM B221 Alloy 6005-T5.
      - Mast Arms: ASTM B241 Alloy 6061-T6 or Alloy 6063-T6.
      - Pole Cap: ASTM B209 Alloy 5086-H32 or ASTM B108 or B26 Alloy 356.0-T6.
      - Bolts: Stainless Steel AISI 300 series. Bolts threading into aluminum threads shall be treated with anti-seize compound, Never-Seez Compound, Permatex 133K or equal.
- Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.
- Luminaire Mounting Height. Actual luminaire mounting height shall be the nominal mounting height given on RIP(2) for all pole-arm combinations except for poles with 4 ft. luminaire arms, which shall be 3'-0" lower than the nominal height, unless otherwise shown or directed.

EXPLANATION OF ROADWAY ILLUMINATION ASSEMBLY DESIGNATIONS



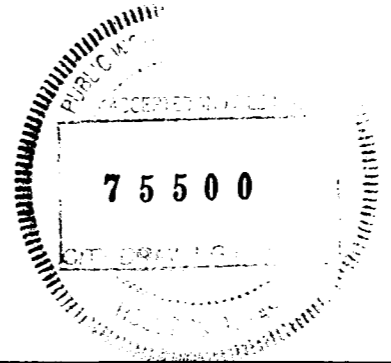
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SHEET 1 OF 4



Texas Department of Transportation  
Traffic Safety Division Standard

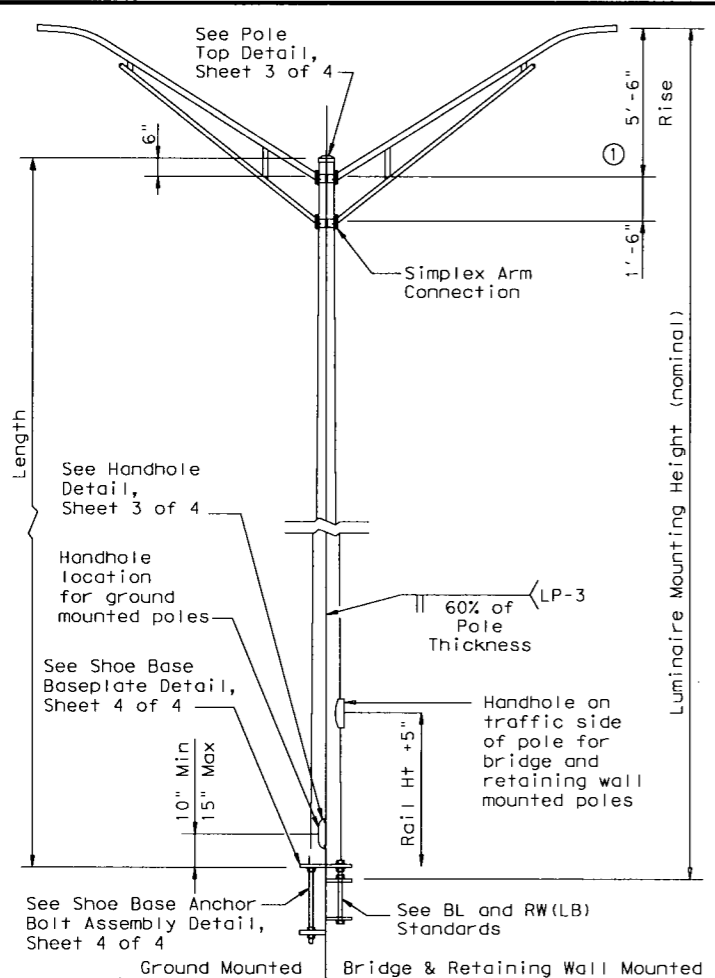
ROADWAY ILLUMINATION POLES  
RIP(1)-19



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7-17	DIST: [ ]	COUNTY: [ ]	SHEET NO. 160	
12-19	73A			

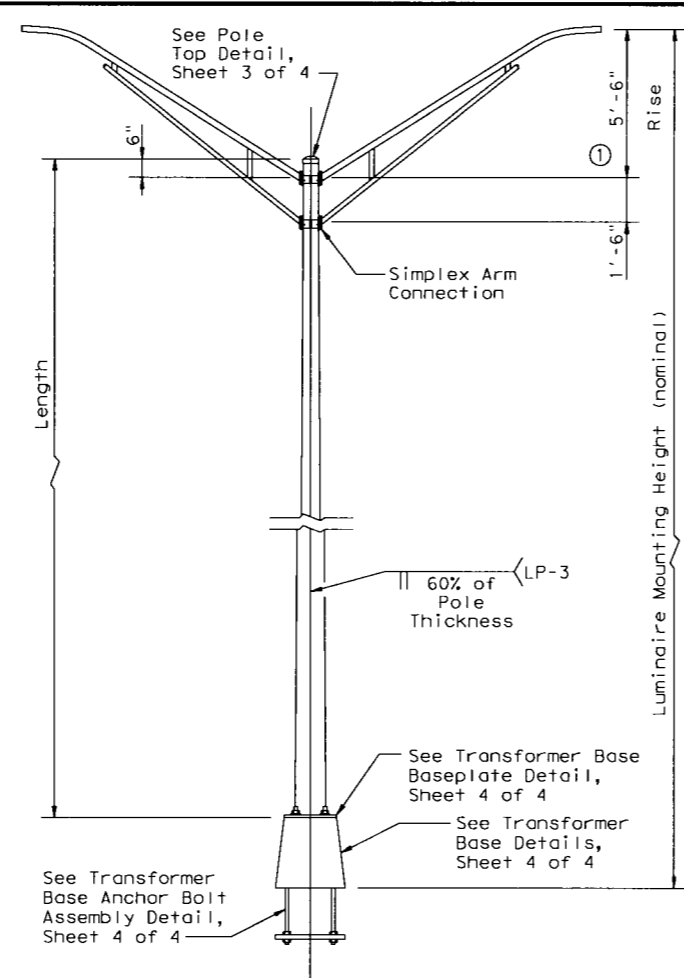
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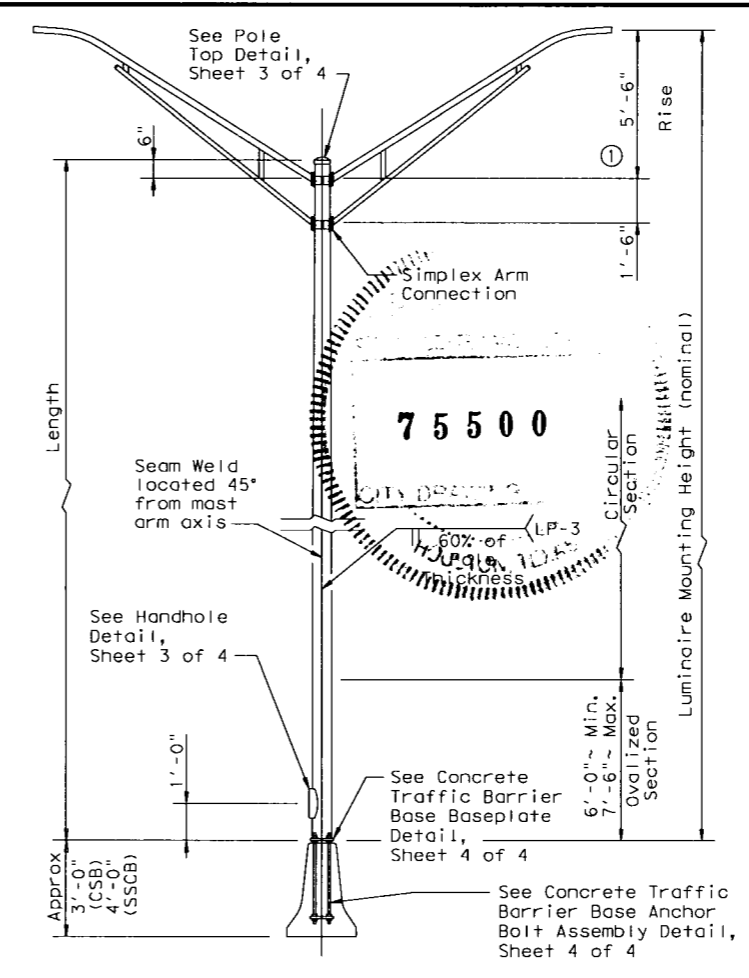
**SHOE BASE POLE**

SHOE BASE POLE					
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	4.90	15.00	0.1196	7.1
30.00	7.50	4.00	25.00	0.1196	13.2
31.00-39.00	8.00	4.36-3.24	26.00-34.00	0.1196	20.7
40.00	8.50	3.60	35.00	0.1196	20.7
50.00	10.50	4.20	45.00	0.1196	30.3



**TRANSFORMER BASE POLE**

TRANSFORMER BASE POLE					
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	5.11	13.50	0.1196	7.1
30.00	7.50	4.21	23.50	0.1196	13.2
31.00-39.00	8.00	4.57-3.45	24.50-32.50	0.1196	20.7
40.00	8.50	3.81	33.50	0.1196	20.7
50.00	10.00	3.91	43.50	0.1196	30.3



**CONCRETE TRAFFIC BARRIER BASE POLE**

CONCRETE TRAFFIC BARRIER BASE POLE (CSB/SSCB)						
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)	
					About C of Rail	Perp. to Rail
28.00	9.00	5.78	23.00	0.1196	10.3	13.2
38.00	9.00	4.38	33.00	0.1196	16.6	20.8
48.00	10.50	4.48	43.00	0.1345	25.1	30.5

**GENERAL NOTES:**

- Designs conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. Design 3-Second Gust Wind Speed equals 110 mph with a 1.14 gust factor. A wind importance factor of 0.80 is applied to adjust the wind speed to a 25 year recurrence interval. Design moments listed in tables assume base of pole is 25' above natural ground level.
- Structures are designed to support two 12' luminaire mast arms and luminaires. Mast arms are designed to support a 60-pound luminaire having an effective projected area of 1.6 square feet.
- Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Do not submit shop drawings for roadway illumination pole assemblies fabricated in accordance with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of these sheets and the Specifications. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
- For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.
- Unless otherwise noted, all steel parts shall be galvanized in accordance with Item 445, "Galvanizing."
- Steel poles shall be fabricated in accordance with Item 441, "Steel Structures." Longitudinal seam welds for pole sections shall have 60% minimum penetration. All welding shall be in accordance with AWS D1.1, Structural Welding Code-Steel.
- Two-section poles joined by circumferential welds will not be permitted, unless otherwise shown on the plans. Poles may be fabricated in two sections and field-assembled by the lap-joint method. The two sections shall telescope together with a lap length of not less than 1-1/2 times the shaft diameter at the lap joint.
- Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.
- Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."
- All poles, except Transformer Base Poles, shall have hand holes with reinforcing frames and covers. For ground mounted shoe base poles, hand holes shall be placed 90 degrees to mast arm unless otherwise noted on the plans. For poles mounted on a concrete traffic barrier with one luminaire arm, hand holes shall be located 180 degrees from luminaire arm. For poles mounted on a concrete traffic barrier with two luminaire arms, all hand holes shall be on the same side of the barrier. For poles mounted on a bridge lighting bracket or a retaining wall lighting bracket, hand hole shall be on traffic side of the pole, at a height that will clear the barrier.
- The finished pole shall have a smooth, uniform finish free of pits, blisters, or other defects. Scratched, chipped, and other damaged galvanized areas on poles and mast arms shall be repaired in accordance with Item 445, "Galvanizing."
- Pole length is based on a 5'-6" luminaire arm rise. 4 ft. luminaire arms have a 2'-6" rise. A pole with 4 ft. luminaire arms will have an actual mounting height 3'-0" less than the nominal mounting height. Increasing the pole length to meet the nominal mounting height is allowed, but unnecessary unless otherwise directed by the engineer.
- Erect transformer base poles in accordance with sheet RID(1).

**MATERIAL DATA**

COMPONENT	ASTM DESIGNATION	MIN. YIELD (ksi)
Pole Shaft (0.14"/ft. Taper)	A572 Gr 50, A595 Gr A, A1011 HSLAS Gr 50 Cl 2 ③, or A1008 HSLAS Gr 50 Cl 2	50
Base Plate and Handhole Frame	A572 Gr. 50, or A36	36
T-Base Connecting Bolts	F3125 Gr A325	92
Anchor Bolts	F1554 Gr 55, A193-B7 or A321	55 105
Anchor Bolt Templates	A36	36
Heavy Hex (H.H.) Nuts	A194 Gr 2H, or A563 Gr DH	
Flat Washers	F436	

**NOTES:**

- 2'-6" rise for 4 ft. luminaire arms.
- Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.
- A1011 SS Gr 50 may be used instead of HSLAS, provided the material meets the elongation requirements for HSLAS.

**POLE ASSEMBLY FABRICATION TOLERANCES TABLE**

DIMENSION	TOLERANCE
Shaft length	+1"
I.D. of outside piece of slip fitting pieces	+1/8", -1/16"
O.D. of inside piece of slip fitting pieces	+1/32", -1/8"
Shaft diameter: other	+3/16"
Out of "round"	1/4"
Straightness of shaft	±1/4" in 10 ft
Twist in multi-sided shaft	4° in 50 ft
Perpendicular to baseplate	1/8" in 24"
Pole centered on baseplate	±1/4"
Location of Attachments	±1/4"
Bolt hole spacing	±1/16"

SHEET 2 OF 4

Texas Department of Transportation  
Traffic Safety Division Standard

**ROADWAY ILLUMINATION POLES**

**RIP(2)-19**

FILE: rip-19.dgn  
DNI: CK: DW: CK:

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REVISIONS

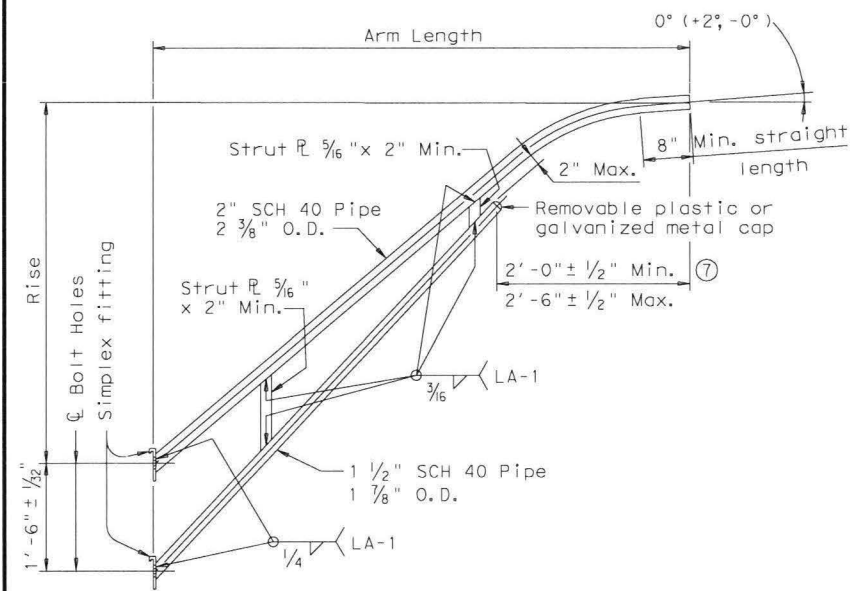
7-17  
12-19

DIST COUNTY SHEET NO.  
161

73B

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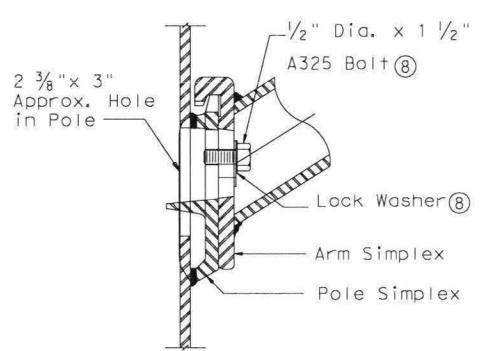
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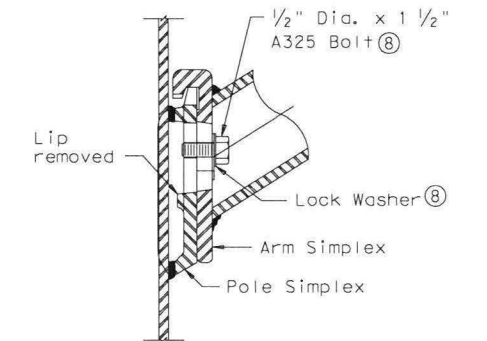
**LUMINAIRE ARM**

LUMINAIRE ARM DIMENSIONS		
Nominal Arm Length	Arm Length	Rise
4'-0"	3'-6"	2'-6"
6'-0"	5'-6"	5'-6"
8'-0"	7'-6"	5'-6"
10'-0"	9'-6"	5'-6"
12'-0"	11'-6"	5'-6"

ARM ASSEMBLY FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Arm Length	±1"
Arm Rise	±1"
Deviation from flat	1/8" in 12"
Spacing between holes	±1/32"

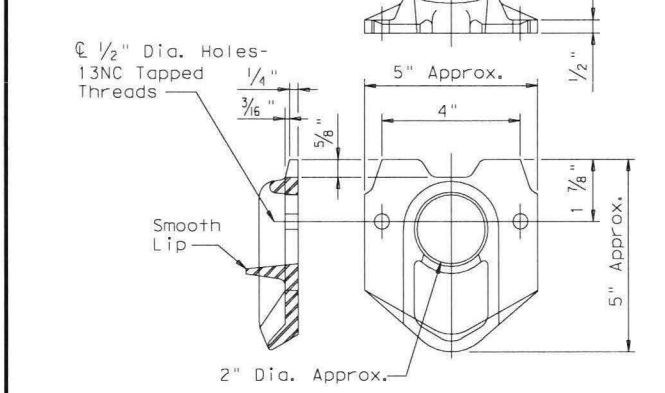


**UPPER SIMPLEX FITTING**  
(Gusset not shown for clarity)

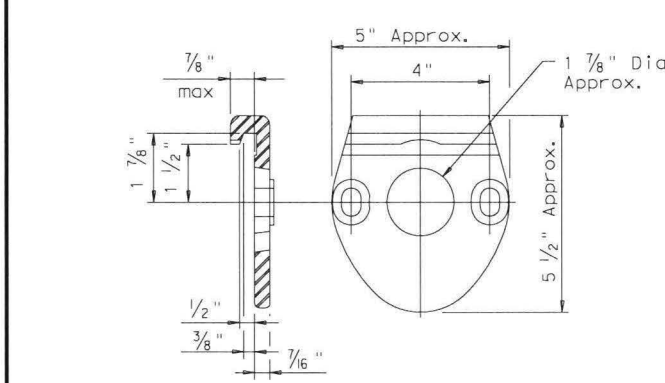


**LOWER SIMPLEX FITTING**  
(Gusset not shown for clarity)

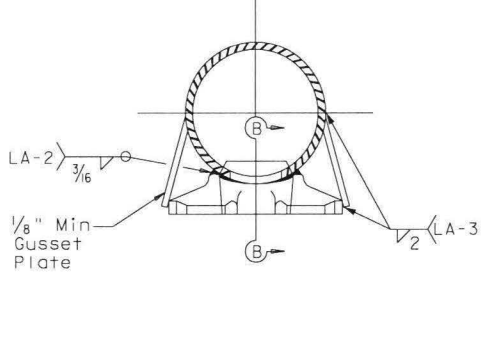
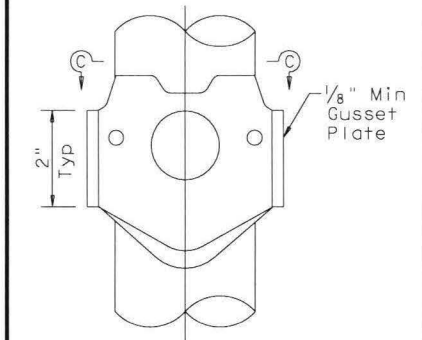
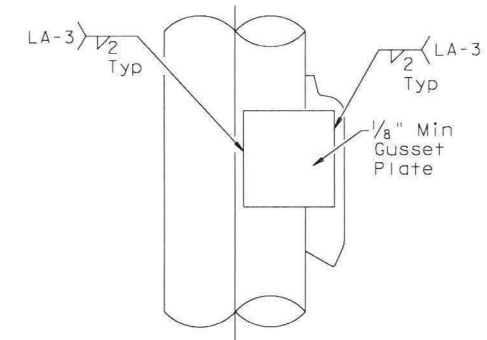
**SECTION B-B**



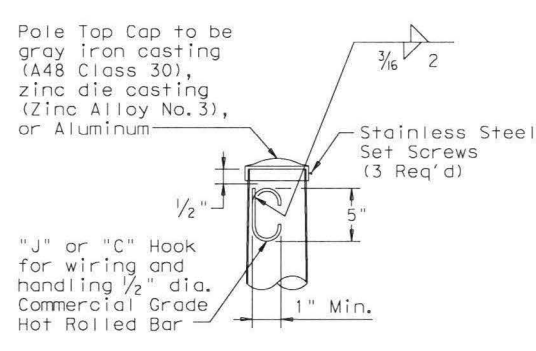
**POLE SIMPLEX DETAIL ⑨**



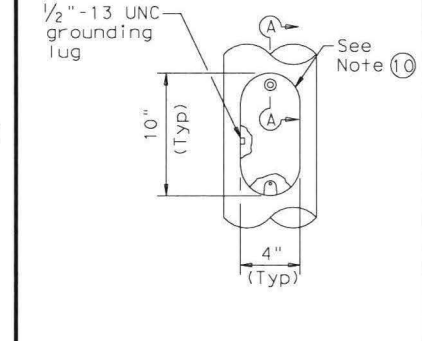
**ARM SIMPLEX DETAIL ⑨**



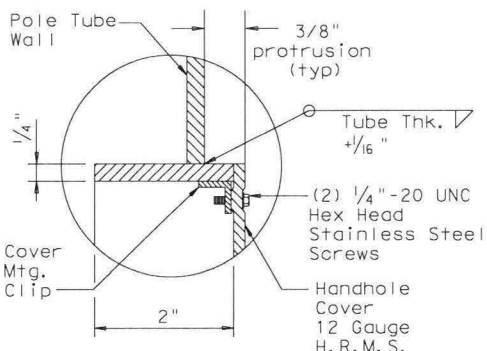
**SIMPLEX ATTACHMENT DETAIL**



**POLE TOP**



**ELEVATION**



**SECTION A-A**

**HANDHOLE**

- NOTES:**
- ④ Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
  - ⑤ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.
  - ⑥ A572, A1008 HSLAS-F, and A1011 HSLAS-F materials may have higher yield strengths but shall not have less elongation than the grade indicated.
  - ⑦ Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.
  - ⑧ Each pole simplex fitting shall be supplied with 2 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans.
  - ⑨ Proposed deviations in arm simplex dimensions or materials must be submitted to the Department for approval.
  - ⑩ A welded handhole frame is permissible. Maximum of two (2) CJP weld splices is allowed.

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr 65-35 or Gr 70-36, A148 Gr 80-50, A576 Gr 1021 ⑤, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr A or B, A500 Gr B, A501, A 1008 HSLAS-F Gr 50 ⑥, or A1011 HSLAS-F Gr 50 ⑥
Arm Struts and Gusset Plates ④	ASTM A36, A572 Gr 50 ⑥, or A588
Misc.	ASTM designations as noted



SHEET 3 OF 4

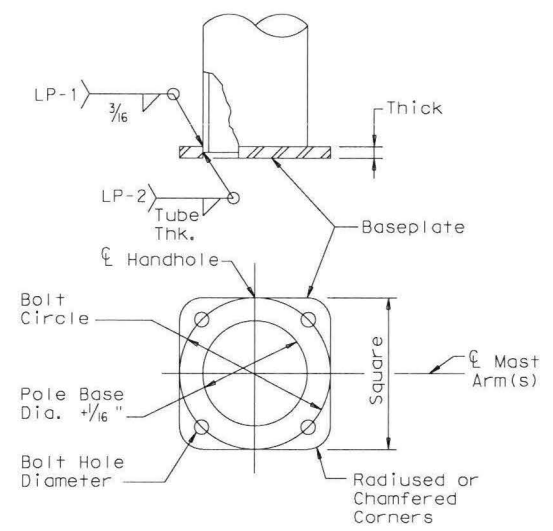


**ROADWAY ILLUMINATION POLES**  
**RIP (3) - 19**

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
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7-17	DIST	COUNTY	SHEET NO.	
12-19			162	

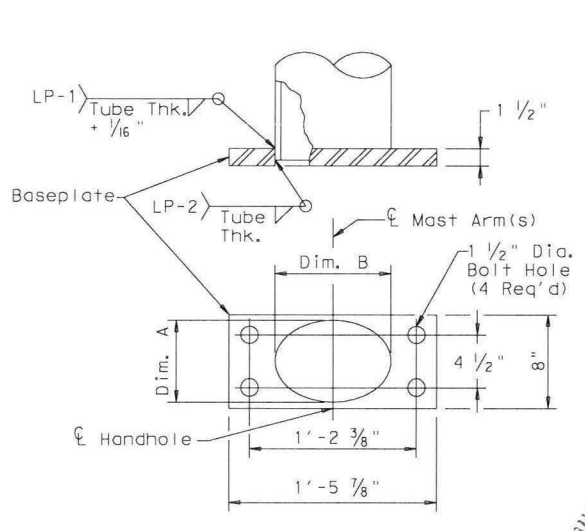
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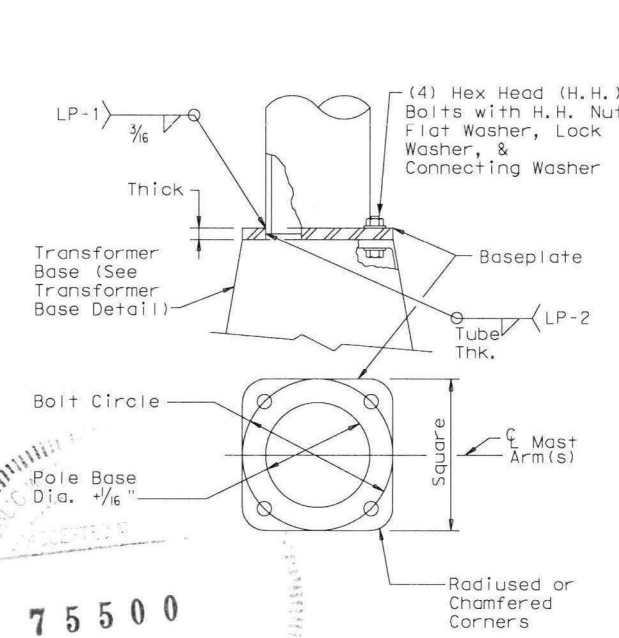
**SHOE BASE BASEPLATE**

SHOE BASE BASEPLATE TABLE				
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	BOLT HOLE DIAMETER
20' - 39'	13"	13"	1 1/4"	1 1/4"
40'	15"	15"	1 1/4"	1 1/2"
50'	15"	15"	1 1/2"	1 1/2"



**CONCRETE TRAFFIC BARRIER BASEPLATE**

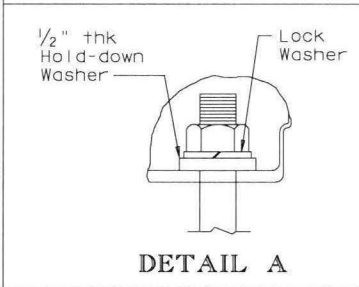
CONCRETE TRAFFIC BARRIER BASEPLATE TABLE			
MOUNTING HEIGHTS (nominal)	POLE DIA. (1)	DIM. A	DIM. B
28' - 38'	9"	7" ± 1/4"	10" ± 1/4"
48'	10 1/2"	7" ± 1/4"	13" ± 1/4"



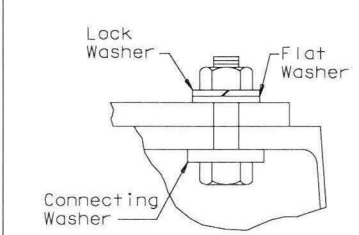
**TRANSFORMER BASE BASEPLATE**

TRANSFORMER BASE BASEPLATE TABLE						
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	CONNECTING BOLT DIA.	BOLT HOLE DIAMETER	TRANSFORMER BASE TYPE
20' - 39'	13"	13"	1 1/4"	1"	1 1/4"	A
40'	15"	15"	1 1/4"	1 1/4"	1 1/2"	B
50'	15"	15"	1 1/2"	1 1/4"	1 1/2"	B

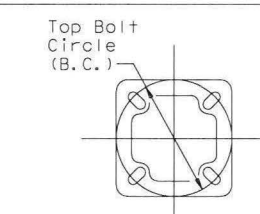
TRANSFORMER BASE TABLE		
TYPE	TOP B. C.	BTM. B. C.
A	13"	14"
B	15"	17 1/4"



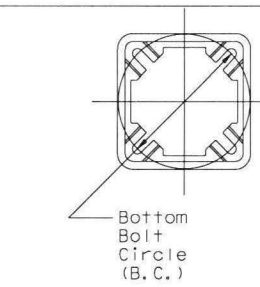
**DETAIL A**



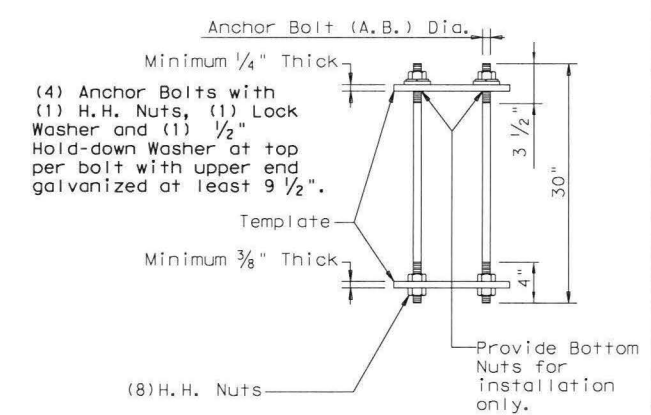
**DETAIL B**



**TOP PLAN**



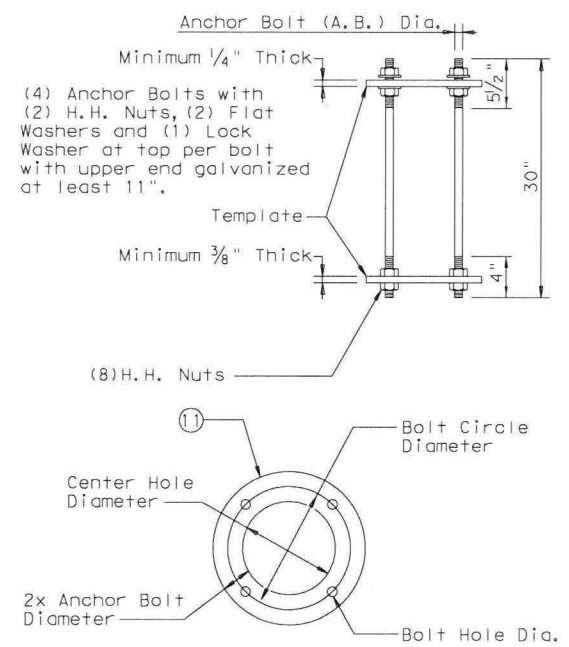
**BOTTOM PLAN**



**TRANSFORMER BASE ANCHOR BOLT ASSEMBLY**

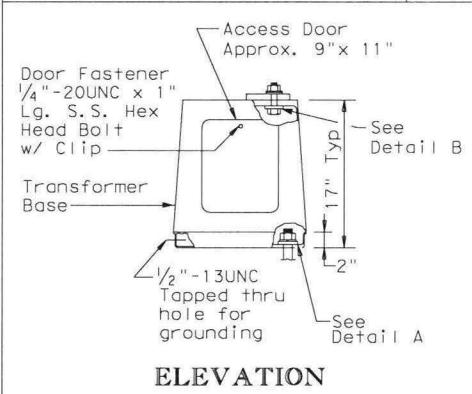
**CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY**

TRANSFORMER BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A. B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20' - 39'	1"	14"	12"	1 1/16"
40' - 50'	1 1/4"	17 1/4"	14 3/4"	1 5/16"



**SHOE BASE ANCHOR BOLT ASSEMBLY**

SHOE BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A. B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20' - 39'	1"	13"	11"	1 1/16"
40' - 50'	1 1/4"	15"	12 1/2"	1 5/16"



**ELEVATION**

**TRANSFORMER BASE DETAILS**

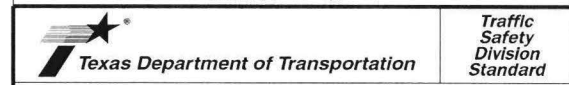
**GENERAL NOTES:**

- For mounting heights between those shown in the table, use the values in the table for the larger mounting height.
- All breakaway bases shall meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto, and shall have been tested by FHWA-approved methods. All bases shall have been structurally tested to resist 150% of the design moment.
- Transformer bases shall be cast from aluminum, ASTM B108 or B26 Alloy 356.0-T6, or other material approved by the Engineer. Four Hex Head (H.H.) bolts with four H.H. nuts, four lock washers, four flat washers, and connecting and hold-down washers as recommended by the manufacturer, galvanized to ASTM A153 Class C or D, or B695 Class 50, shall be provided with each transformer base for connecting the pole. Bolts shall be ASTM A325 or approved equal. Nuts shall be ASTM A563 grade DH galvanized.
- Bases shall be stamped, incised or by other approved permanent means, marked to show fabricator's name or logo, and model number. Such information shall be placed in a readily seen location, inside or outside the base, but shall not be placed on the door.
- Doors for transformer bases shall be made of plastic, fiberglass or other non-metallic material approved by the Engineer and shall be attached with stainless steel screws or bolts. Transformer bases shall be cleaned by grit blast cleaning after heat treatment. Certification by the manufacturer of heat treatment shall be furnished with transformer bases. The certification shall show the metal alloy and temper and that the base meets those requirements, chemical and physical. The certification shall also show the material ASTM specification. Transformer bases shall be cast with a removable tab bar for material testing. Some bars may have been removed by the manufacturer for testing.

**NOTES:**

- Anchor Bolt Templates do not need to be galvanized.
- Pole diameter before ovalized.

ANCHOR BOLT FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Length	± 1/2"
Threaded length	± 1/2"
Galvanized length (if required)	- 1/4"



**ROADWAY ILLUMINATION POLES**

**RIP(4)-19**

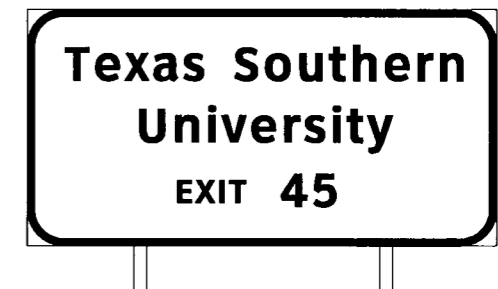
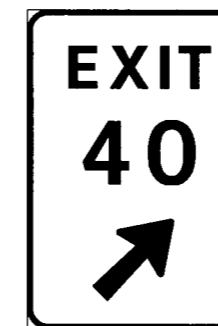
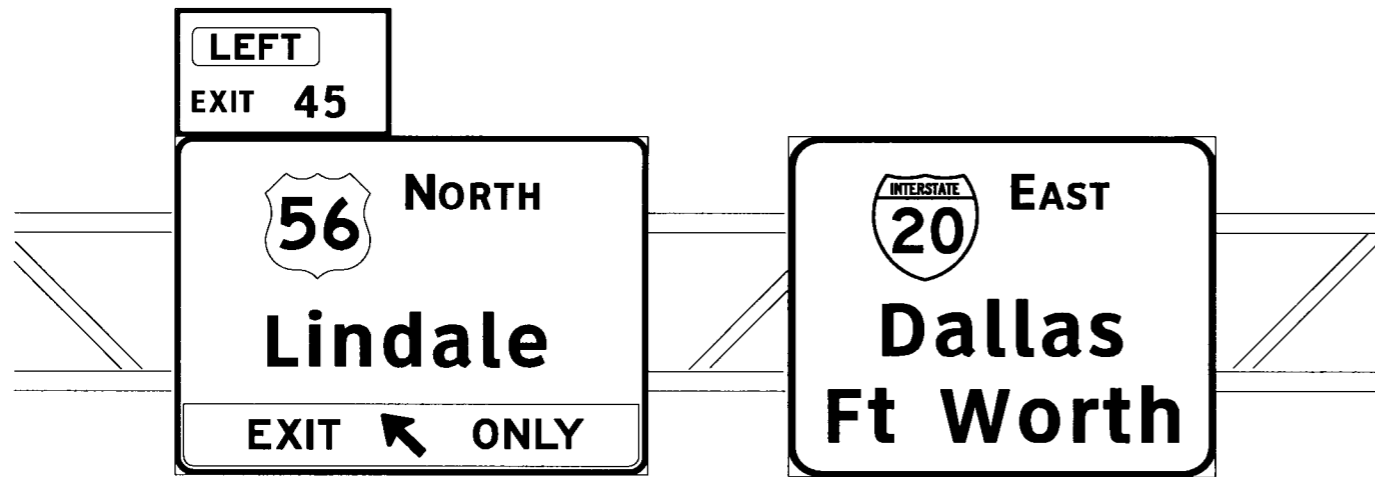
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©TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
7-17	DIST	COUNTY	SHEET NO.	
12-19			163	

DATE: FILE:



REQUIREMENTS FOR OVERHEAD AND LARGE GROUND-MOUNTED SIGNS

TYPICAL EXAMPLES



GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign summary sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Black legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod, or F). White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white FHWA lettering, when not specified in the SHSD or in the plans.

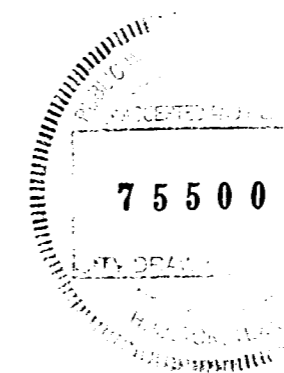
B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be cut-out white sheeting applied to colored background sheeting.
6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius need not be trimmed or rounded if fabricated from an extruded material.
7. Sign substrate for ground-mounted signs shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative. Sign substrate for overhead signs shall be any material that meets DMS-7110. Exit Number Panels attached above the parent sign shall be made with the same substrate and sheeting as the parent sign.
8. Mounting details of attachments to parent sign face are shown on Standard Plan Sheet TSR(5). Mounting details of exit number panels above parent sign are shown in the "SMD series" Standard Plan Sheets.
9. Background sheeting shall be applied to the substrate per sheeting manufacturer's recommendations. Sheeting will not be allowed to bridge the horizontal gap between panels.
10. Cut all legend, symbols, borders, and direct applied sign attachments at panel joints.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:  
<http://www.txdot.gov/>

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE B OR C SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM



		Traffic Operations Division Standard	
<h2>TYPICAL SIGN REQUIREMENTS</h2> <h3>TSR(1)-13</h3>			
FILE: tsr1-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT October 2003	CONT	SECT	JOB
12-03 7-13	DIST	COUNTY	SHEET NO.
9-08			164

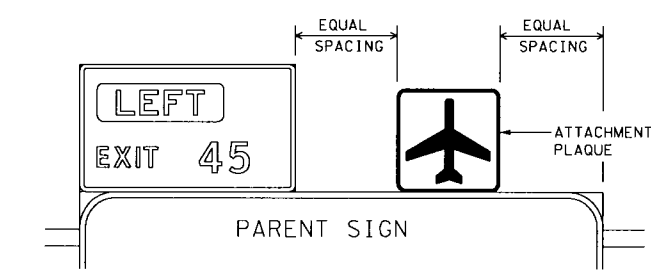
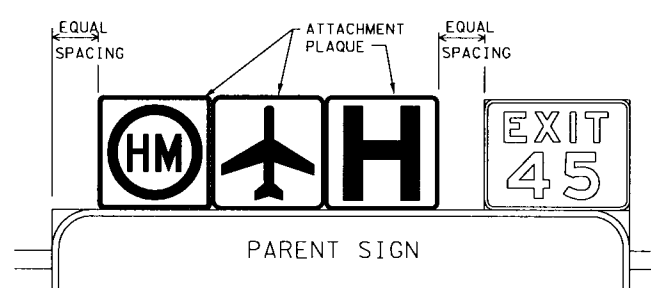
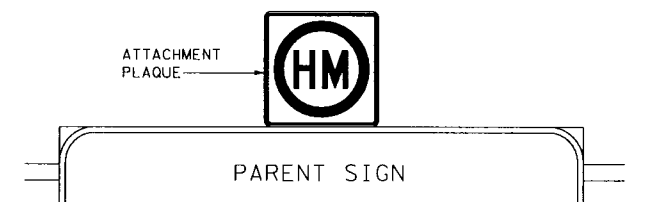
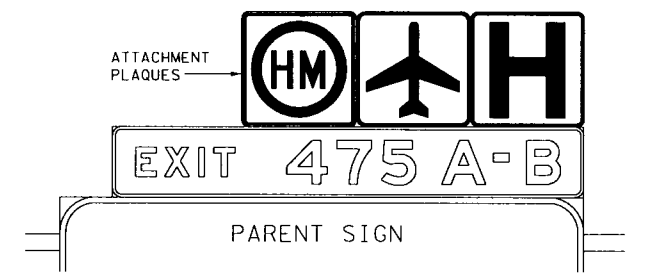
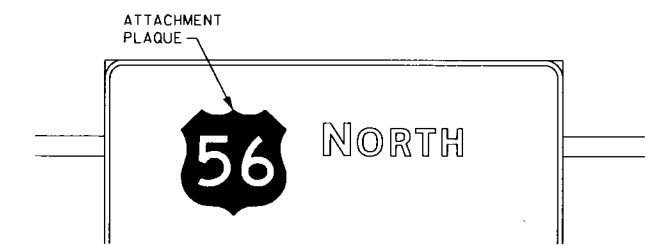
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REQUIREMENTS FOR ATTACHMENTS TO OVERHEAD AND LARGE GROUND MOUNTED SIGNS

REQUIREMENTS FOR EXIT ONLY AND LEFT EXIT PANELS

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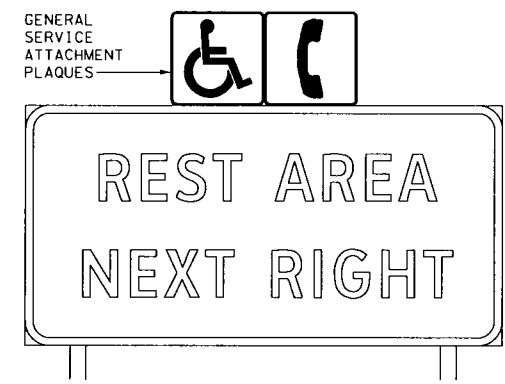
DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B OR C SHEETING

GENERAL NOTES

- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
- Route Marker legends (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod, or F).
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
- White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
- Colored legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to white background sheeting, or combination thereof.
- Route markers and other attachments within the parent sign shall be direct applied unless otherwise specified in the plans. Attachments not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
- General Service Plaques shall be 0.080 inch thick and Routing Plaques shall be 0.100 inch thick.
- The priority for Routing Plaques shall be (left to right) Hazardous Material, Airport then Hospital. See examples for mounting location.
- Mounting details of attachments to parent signs face are shown on Standard Plan Sheet TSR(5). Mounting details of sign plaque attachments above and below parent sign are shown in the "SMD series" Standard Plan Sheets.
- Plaques shall be horizontally centered at the top of the parent sign. If an exit number panel exists, the plaque shall be centered between the edge of the parent sign and the edge of the exit number panel. The plaque may be placed above the exit number panel when there is insufficient space.

TYPICAL EXAMPLES



DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

SHEETING REQUIREMENTS FOR OVERHEAD EXIT PANELS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLUORESCENT YELLOW	TYPE B <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND	BLACK	ACRYLIC NON-REFLECTIVE FILM

GENERAL NOTES

- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD). Individual panel sizes shown in the plans may be adjusted to fit actual parent sign sizes if necessary.
- Exit Panel legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets E Series.
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Black legend shall be applied by screening process or cut-out acrylic non-reflective black film to yellow background sheeting, or combination thereof.
- Exit Only and Left Exit panels within the parent sign face shall be direct applied unless otherwise specified in the plans. Panels not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
- Mounting details of Exit Only and Left Exit panel attachments to parent signs face are shown on Standard Plan Sheet TSR(5).



TYPICAL EXAMPLES

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:  
<http://www.txdot.gov/>

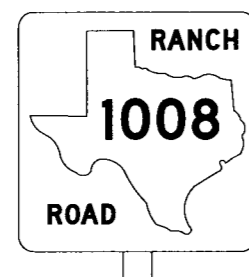
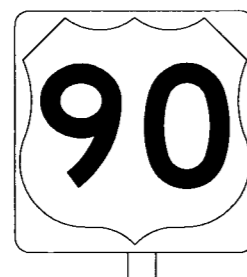
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		Traffic Operations Division Standard	
<h2>TYPICAL SIGN REQUIREMENTS</h2>			
<h3>TSR(2) - 13</h3>			
FILE: tsr2-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT October 2003	CONT SECT	JOB	HIGHWAY
REVISIONS			
12-03 7-13	DIST	COUNTY	SHEET NO.
9-08			165
2			

## REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

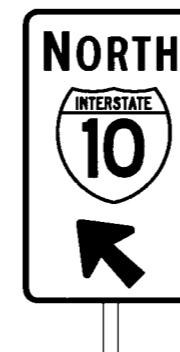
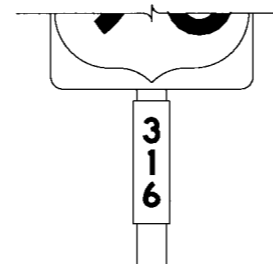
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

## REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

## GENERAL NOTES

- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
- White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

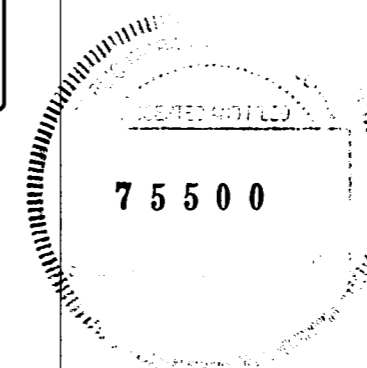
- Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.
- Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

<http://www.txdot.gov/>



		<b>Traffic Operations Division Standard</b>	
<h3>TYPICAL SIGN REQUIREMENTS</h3>			
<h4>TSR(3) - 13</h4>			
FILE:	tsr3-13.dgn	DW:	TxDOT
© TxDOT	October 2003	CK:	TxDOT
REVISIONS		DW:	TxDOT
12-03	7-13	CK:	TxDOT
9-08			
DIST		COUNTY	SHEET NO.
			166

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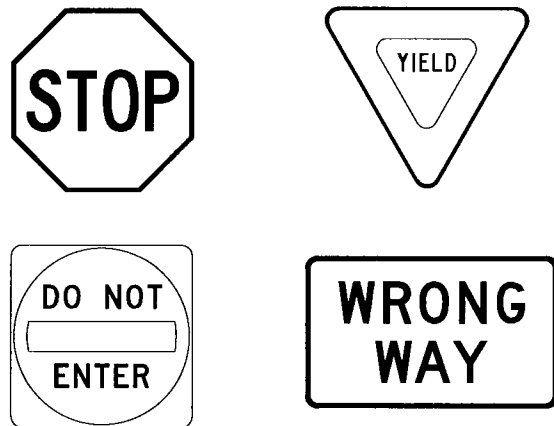
DATE:  
FILE:

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DATE: FILE:

### REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

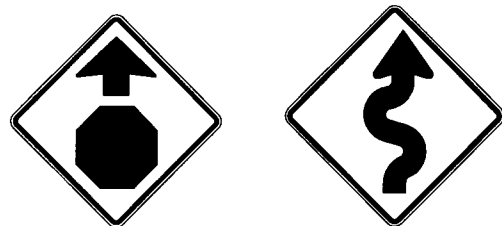
(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



#### REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

### REQUIREMENTS FOR WARNING SIGNS



#### TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

### REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



#### TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

### REQUIREMENTS FOR SCHOOL SIGNS



#### TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

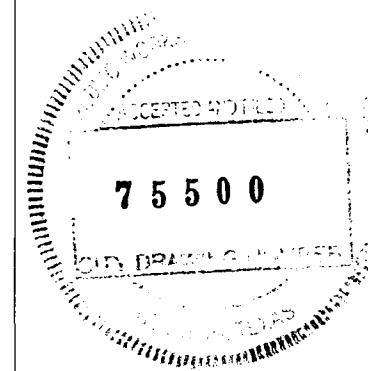
### GENERAL NOTES

- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
- Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
- White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
- Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:  
<http://www.txdot.gov/>

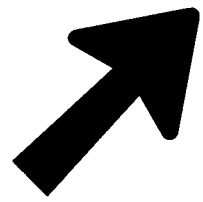


		<b>Traffic Operations Division Standard</b>	
<h2>TYPICAL SIGN REQUIREMENTS</h2>			
<h3>TSR(4)-13</h3>			
FILE: tsr4-13.dgn	DW: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT October 2003	CONT SECT	JOB	HIGHWAY
REVISIONS			
12-03 7-13	DIST	COUNTY	SHEET NO.
9-08			167

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### ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



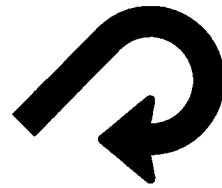
Type A



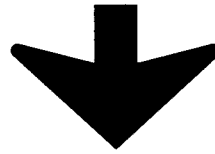
Type B



E-3



E-4



Down Arrow

TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

**NOTE**

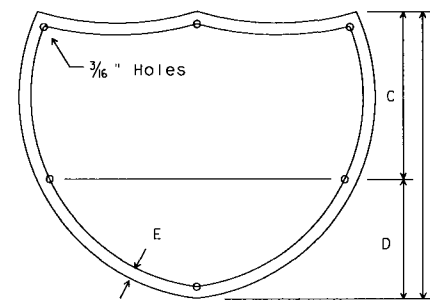
Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

<http://www.txdot.gov/>

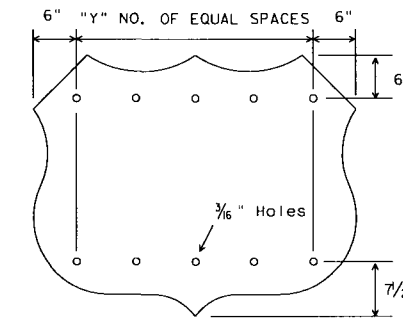
### SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED

TO BE TYPE A ALUMINUM SIGNS  
(FOR MOUNTING TO GUIDE SIGN FACE)



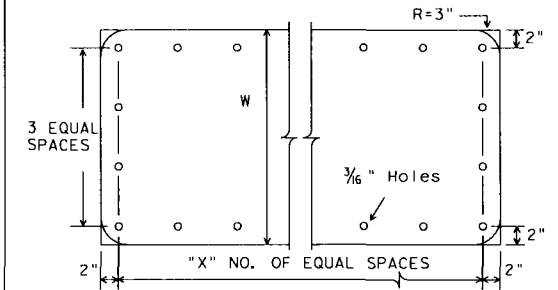
INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4



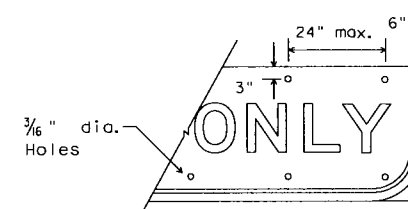
U. S. ROUTE MARKERS

Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



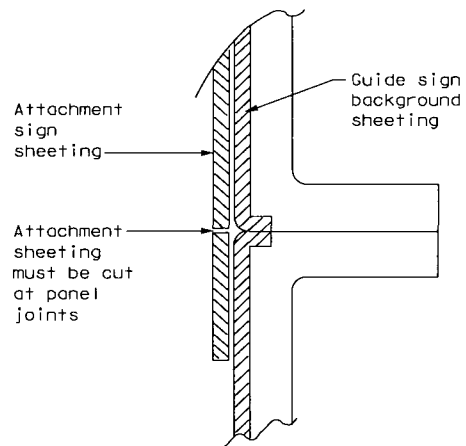
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5



EXIT ONLY PANEL

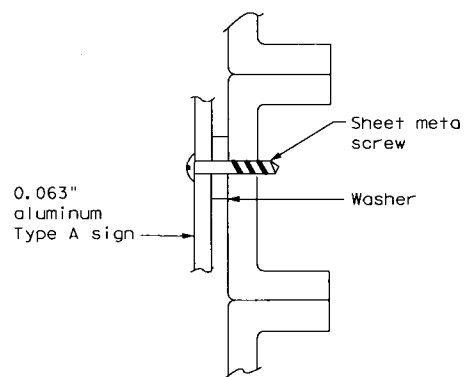
### MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ( "EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS )



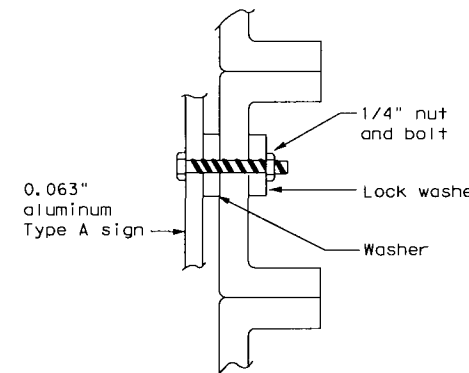
DIRECT APPLIED ATTACHMENT

**NOTE:**

- Sheeting for legend, symbols, and borders must be cut at panel joints.
- Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



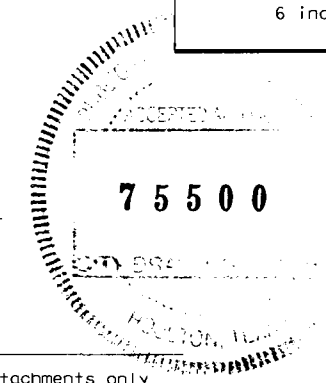
SCREW ATTACHMENT



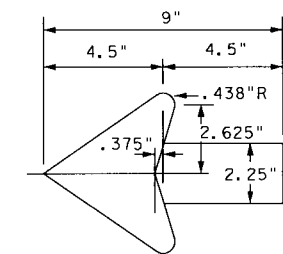
NUT/BOLT ATTACHMENT

**NOTE:**

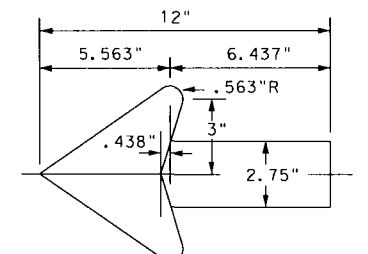
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".



### ARROW DETAILS for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.



### TYPICAL SIGN REQUIREMENTS

#### TSR (5) - 13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
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REVISIONS				
12-03 7-13	DIST	COUNTY	SHEET NO.	
9-08			168	

DATE:  
FILE:

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**REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS**

DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4

SHEETING Yellow, White or Red Type B or C reflective sheeting

NOTE  
 1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx).  
 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.

**DELINEATORS**

DEVICE	SINGLE		DOUBLE	
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units

SHEETING Yellow, White or Red Type B or C Reflective Sheeting

POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

**D & OM DESCRIPTIVE CODES**

INSTL DEL ASSM (D-XX) SZ X (XXXX)XXX (XX)  
 NUMBER OF REFLECTORS  
 S = Single  
 D = Double  
 COLOR OF REFLECTORS  
 W = White  
 Y = Yellow  
 R = Red  
 REFLECTOR UNIT SIZE  
 1 or 2  
 TYPE OF POST OR DELINEATOR  
 WC = Wing Channel Post  
 YFLX = Yellow Flexible Post  
 WFLX = White Flexible Post  
 BRF = Barrier Reflector  
 TYPE OF MOUNT  
 GND = Embedded (drivable or set in concrete)  
 CTB = Concrete Barrier Mount  
 GF1 or GF2 = Guard Fence Attachment  
 SRF = Surface Mount

DIRECTION  
 If Required  
 BI = Bi-Directional  
 BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX (XX)

TYPE OF OBJECT MARKER  
 1, 2, 3, or 4  
 NUMBER OF REFLECTORS OR DIRECTION  
 X = 3-Size 2 reflector units (Type 2 only)  
 Y = 1-Size 3 reflector unit (Type 2 only)  
 Z = 3-Size 1 or 1-Size 4 reflector units (Type 2 only)  
 L = Left Side (Type 3 Object Marker only)  
 R = Right Side (Type 3 Object Marker only)  
 C = Center (Type 3 Object Marker only)  
 TYPE OF POST  
 WC = Wing Channel Post  
 WFLX = White Flexible Post  
 TWT = Thin Walled Tubing  
 TYPE OF MOUNT  
 GND = Embedded (drivable)  
 SRF = Surface Mount  
 WAS = Wedge Anchor Steel  
 WAP = Wedge Anchor Plastic  
 DIRECTION  
 If Required  
 BI = Bi-Directional

**OBJECT MARKERS**

DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroreflective yellow - Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting			Red -Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

DEPARTMENTAL MATERIAL SPECIFICATIONS	
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

**BARRIER REFLECTORS (BRF)**

DEVICE	GF1	GF2	CTB
SHEETING	Yellow, White, Red		
NOTE	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		

**CHEVRONS**

DEVICE	W1-8			
SIZE (W x L)	18" x 24" (Conventional)	24" x 30" (Conventional Oversize)	30" x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"			

**ONE DIRECTION LARGE ARROW**

DEVICE	W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0" Only	

NOTE  
 1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).  
 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

NOTE:  
 Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

**Texas Department of Transportation** Traffic Safety Division Standard

**DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION**  
**D & OM(1)-20**

75500

FILE: daml-20.dgn	DN: TXDOT	CK: TXDOT	DR: TXDOT	CR: TXDOT
TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20			169	

20A

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**POST TYPE AND SUPPORT FOUNDATION DETAILS**

**TYPE OF BARRIER MOUNTS**

**WING CHANNEL (WC)**

**FLEXIBLE POSTS (YFLX, WFLX)**

**WEDGE ANCHOR SYSTEMS**

**GUARD FENCE ATTACHMENT**

GND

GND

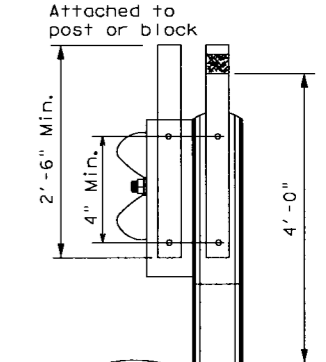
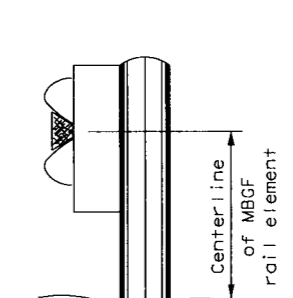
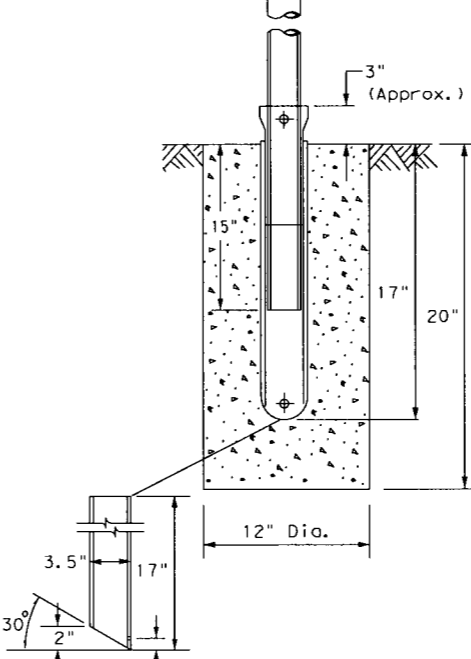
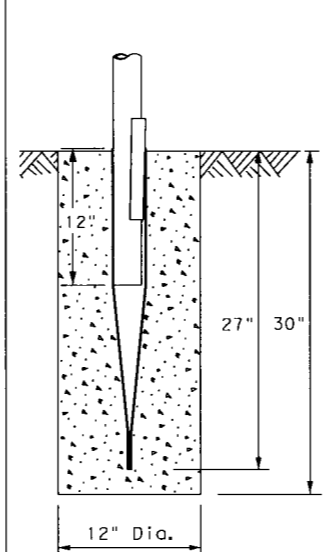
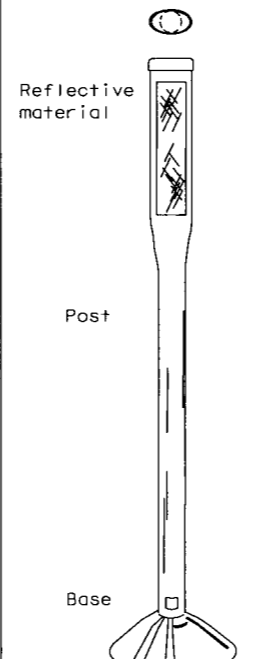
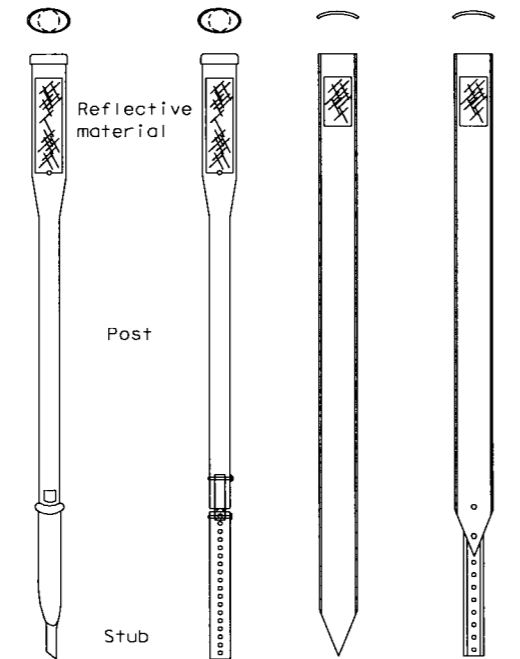
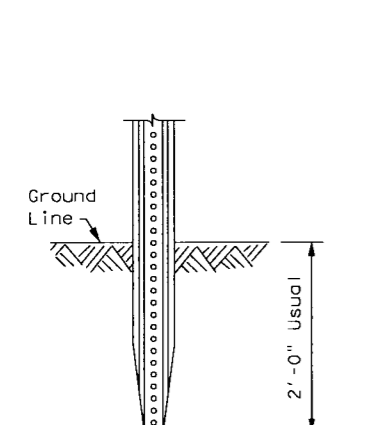
SRF

WAS

WAP

GF1

GF2

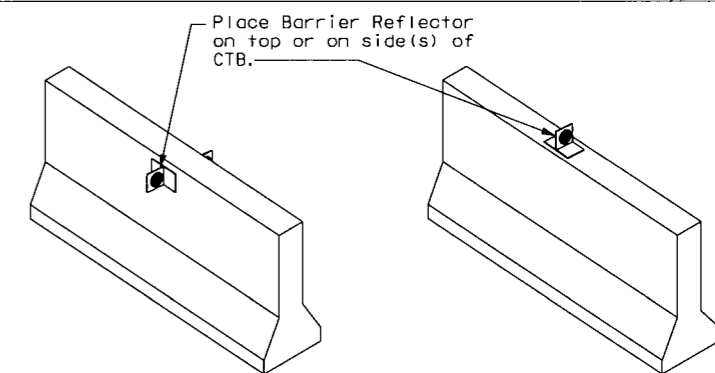


- NOTES**
1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
  2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

- NOTES**
1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
  2. Install per manufacturer's recommendations.
  3. Post length may vary to meet field conditions.
  4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

- NOTE**
1. Install per manufacturer's recommendations.

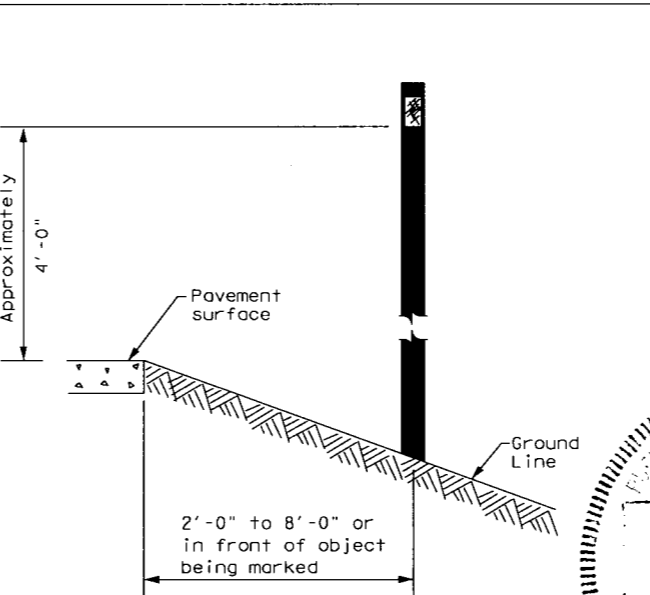
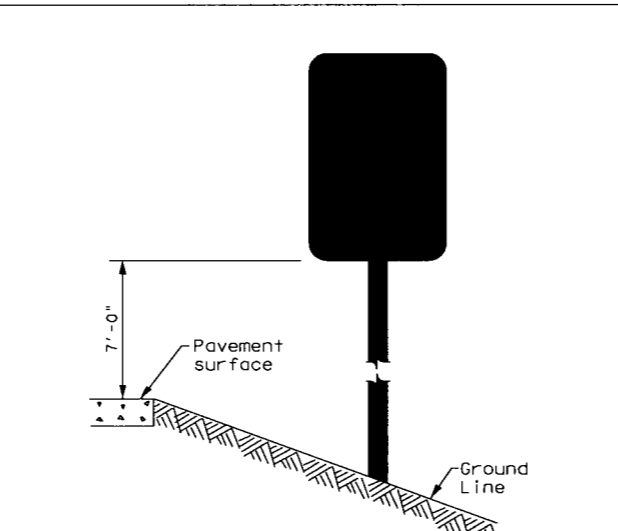
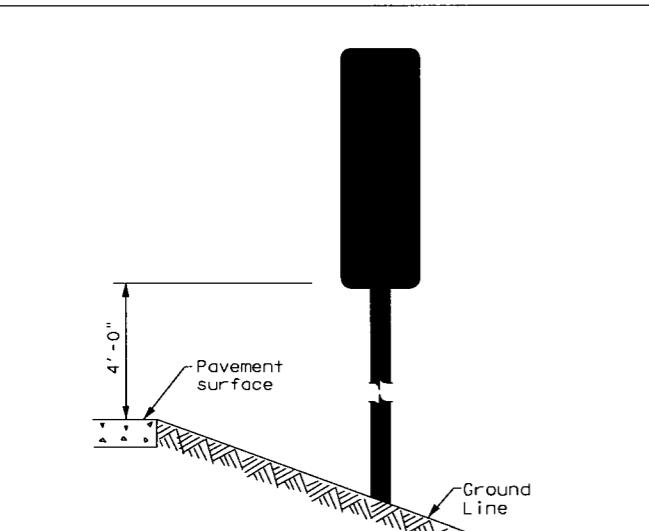
**CONCRETE TRAFFIC BARRIER (CTB)**



**TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS**

**CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN**

**DELINEATORS AND TYPE 2 OBJECT MARKERS**



- NOTE**
- Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

- NOTE**
- Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

See general notes 1, 2 and 3.

- GENERAL NOTES**
1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
  2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
  3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
  4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
  5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
  6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

**Texas Department of Transportation**

**Traffic Safety Division Standard**

**DELINEATOR & OBJECT MARKER INSTALLATION**

**D & OM(2)-20**

**75500**

FILE: dam2-20.dgn	DW: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS				
10-09 3-15				
4-10 7-20				
	DIST	COUNTY	SHEET NO.	
			170	

ZOB

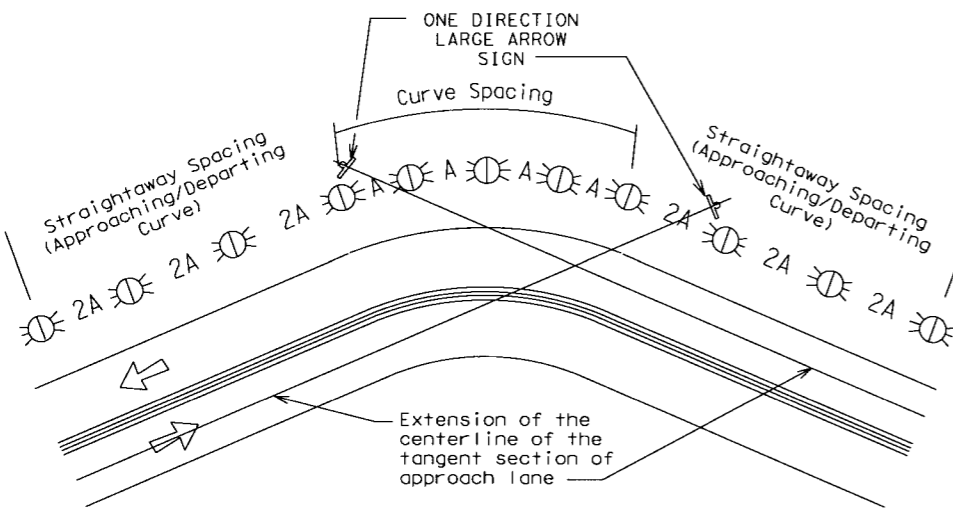
DATE: FILE:

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### MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

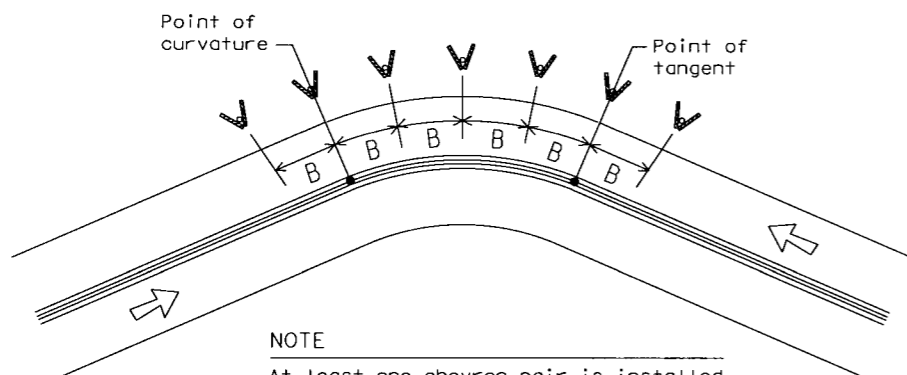
### SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



**NOTE**

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

### SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



**NOTE**

At least one chevron pair is installed beyond the point of tangent in tangent section.

### DELINEATOR AND CHEVRON SPACING

Degree of Curve	WHEN DEGREE OF CURVE OR RADIUS IS KNOWN			
	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	---
2	2865	160	320	---
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

### DELINEATOR AND CHEVRON SPACING

Advisory Speed (MPH)	WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN		
	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

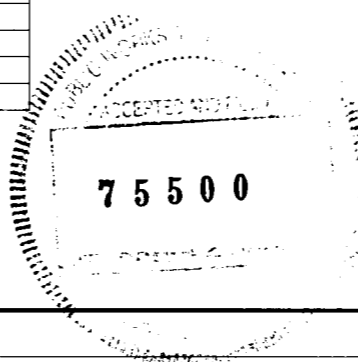
### DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy./Exp. Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete) and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100' max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100' max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

**NOTES**

- Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
- Barrier reflectors may be used to replace required delineators.
- Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign



**Texas Department of Transportation**  
Traffic Safety Division Standard

## DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

### D & OM(3) - 20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	OW: TXDOT	CK: TXDOT
© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS				
3-15 8-15				
8-15 7-20				
			COUNTY	SHEET NO.
				171

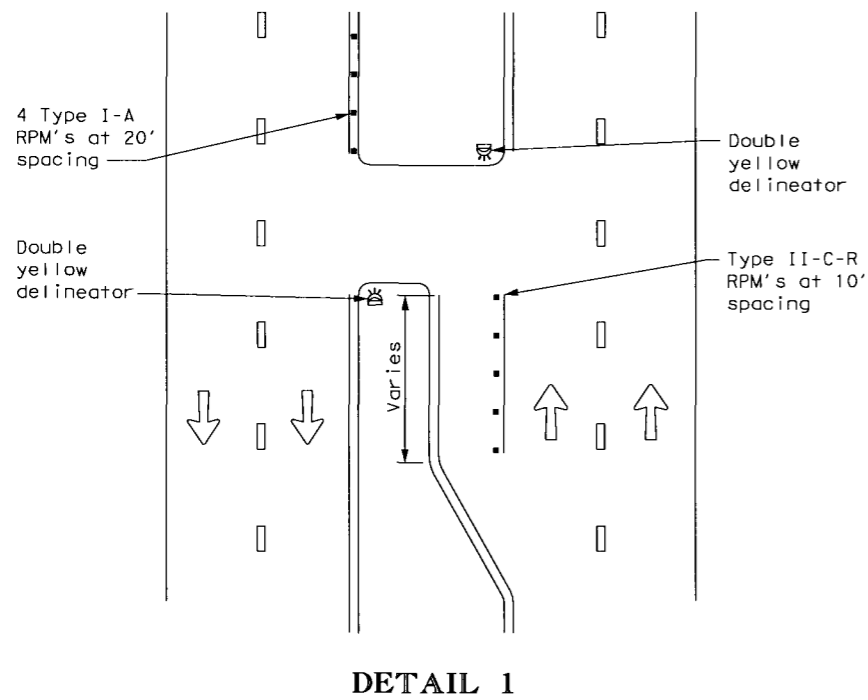
20C

DATE:  
FILE:

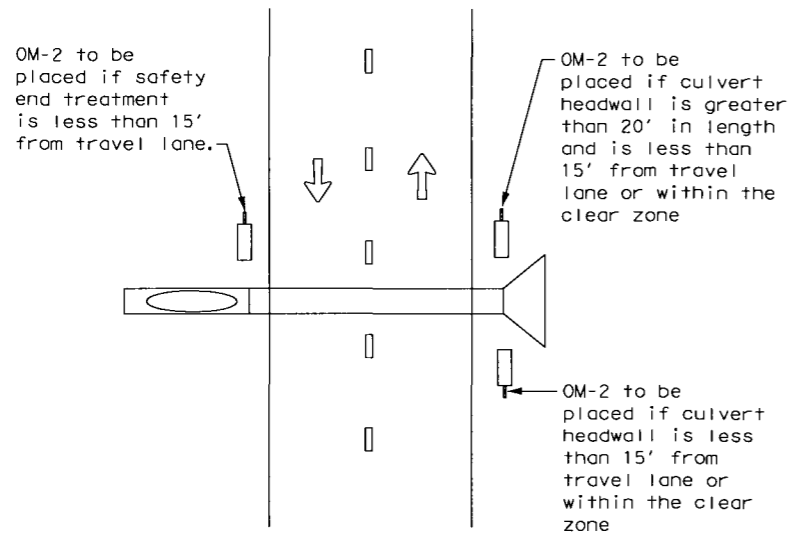


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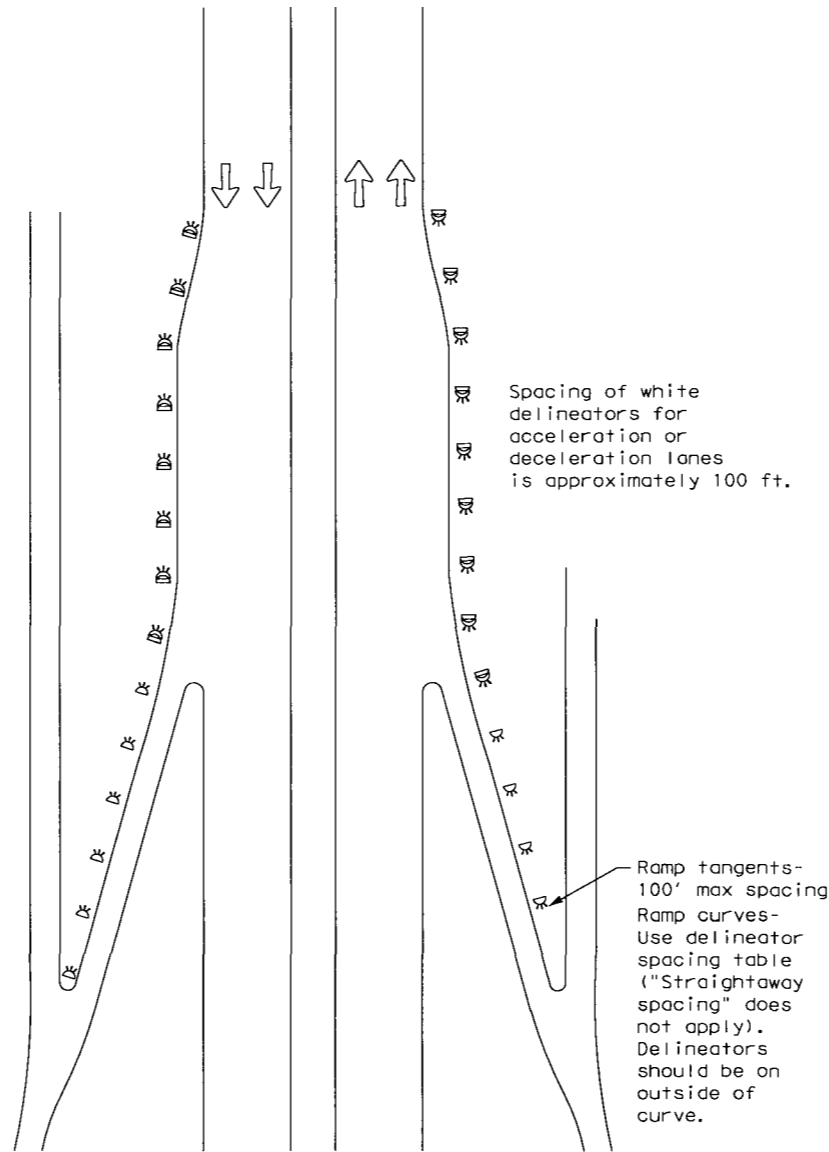
**CROSSOVERS**



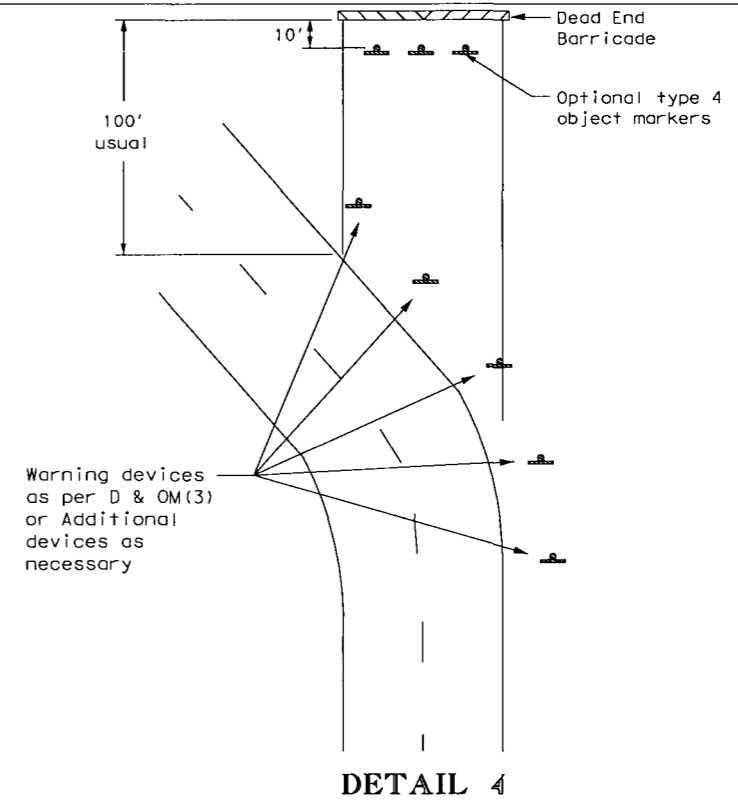
**FOR CULVERTS WITHOUT MGBF**



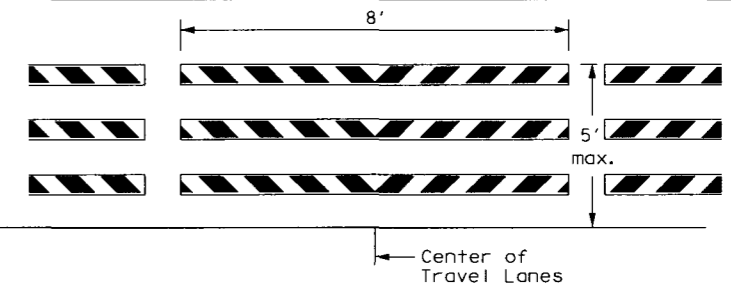
**FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES**



**TYPICAL APPLICATION OF DEAD END BARRICADE**



**TYPICAL DEAD END BARRICADE INSTALLATION**



**NOTES**

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

**DETAIL 5**

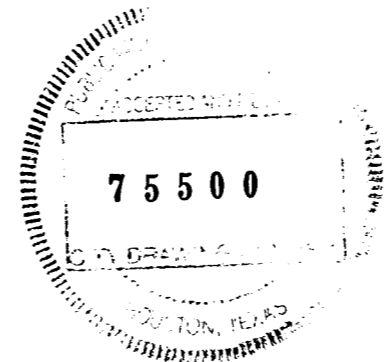
LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator



**DELINEATOR & OBJECT MARKER PLACEMENT DETAILS**

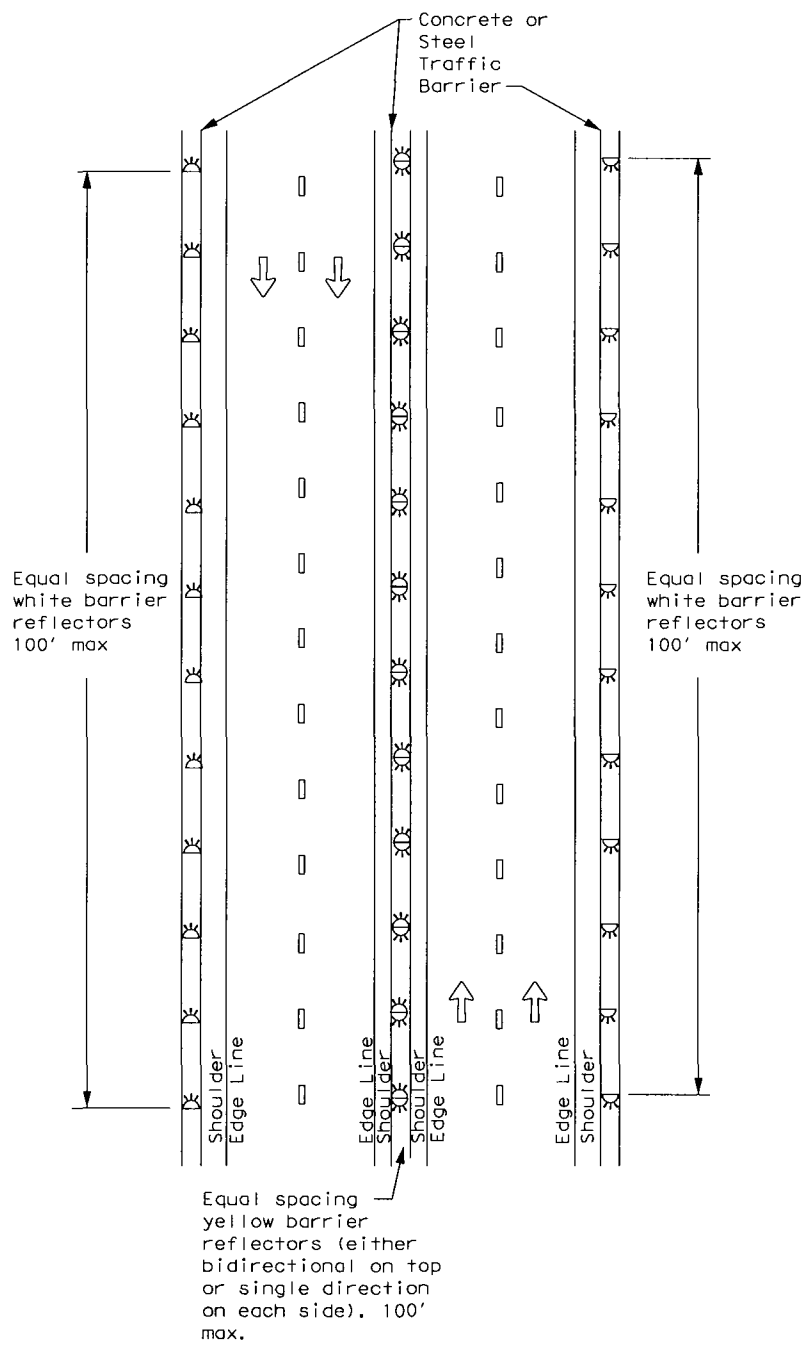
D & OM(4) -20

FILE: dam4-20.dgn	DW: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
3-15	REVISIONS		DIST	COUNTY
7-20				SHEET NO.
				172

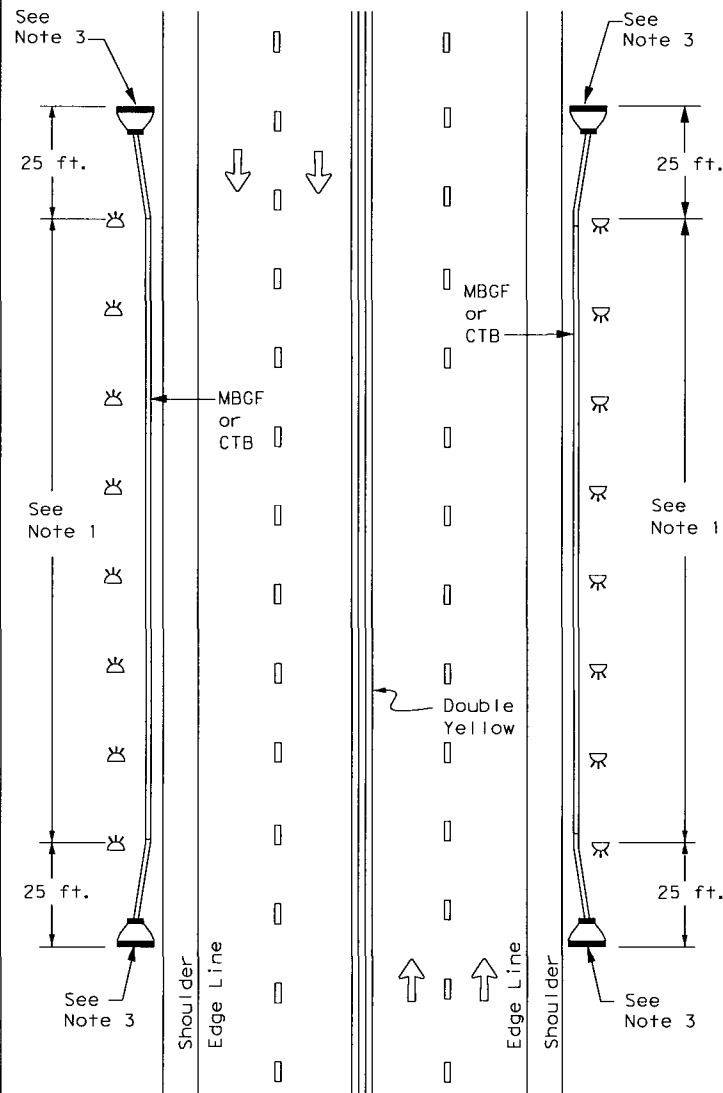


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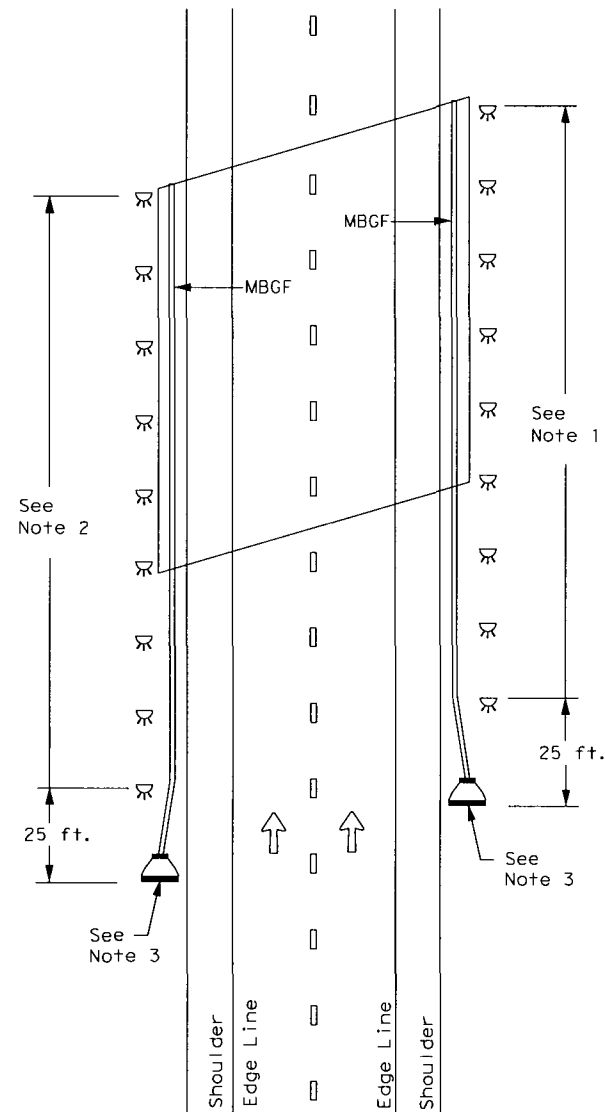
**CONTINUOUS CONCRETE OR STEEL BARRIER**



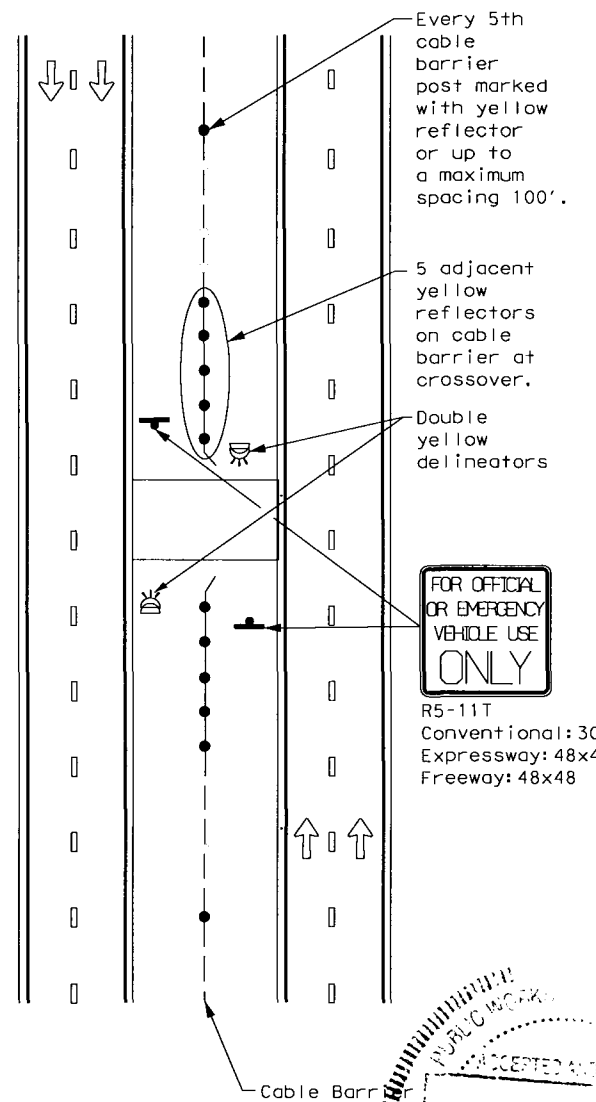
**MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)**



**DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)**

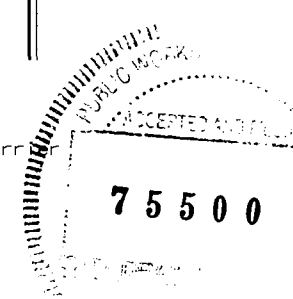


**EMERGENCY CROSSOVER**



FOR OFFICIAL OR EMERGENCY VEHICLE USE ONLY

R5-11T  
Conventional: 30x30  
Expressway: 48x48  
Freeway: 48x48



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DATE:  
FILE:

**NOTES**

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuous Barrier, equal spacing (100' max.)
2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

**LEGEND**

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

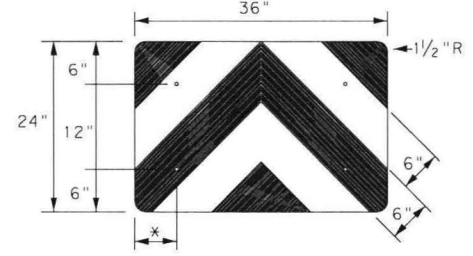
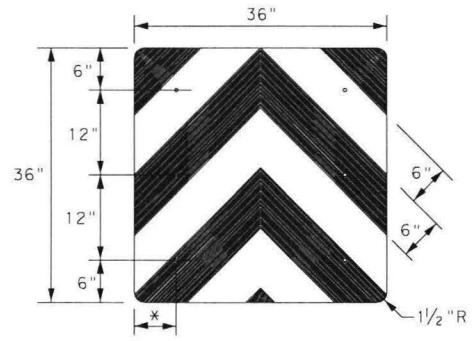
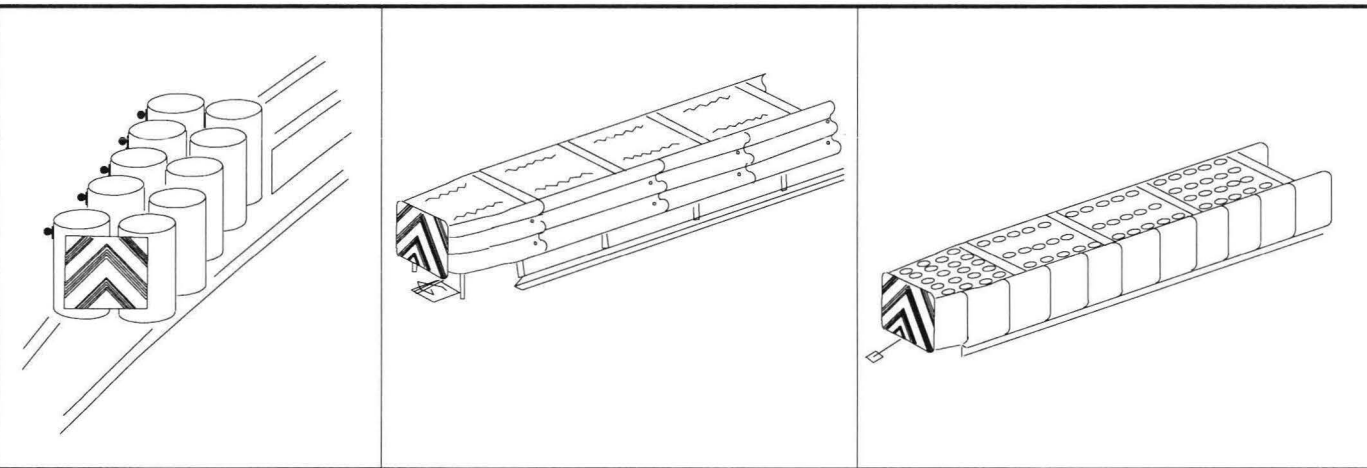
Texas Department of Transportation  
Traffic Safety Division Standard

**DELINEATOR & OBJECT MARKER PLACEMENT DETAILS**

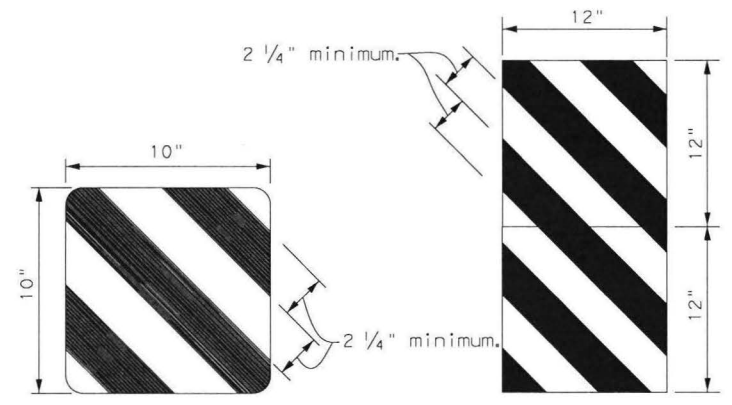
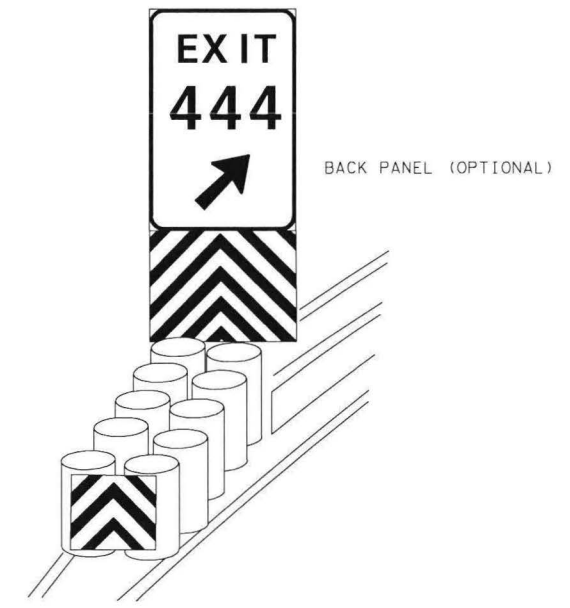
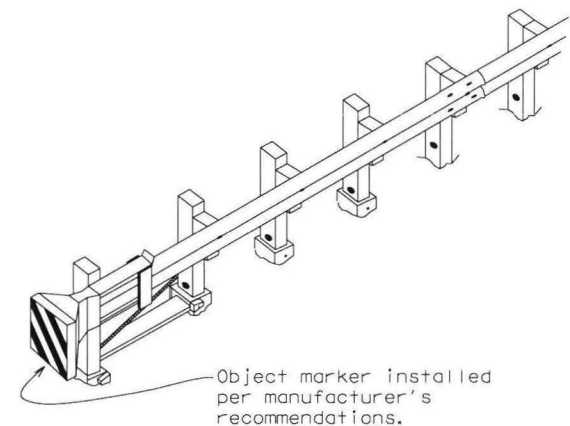
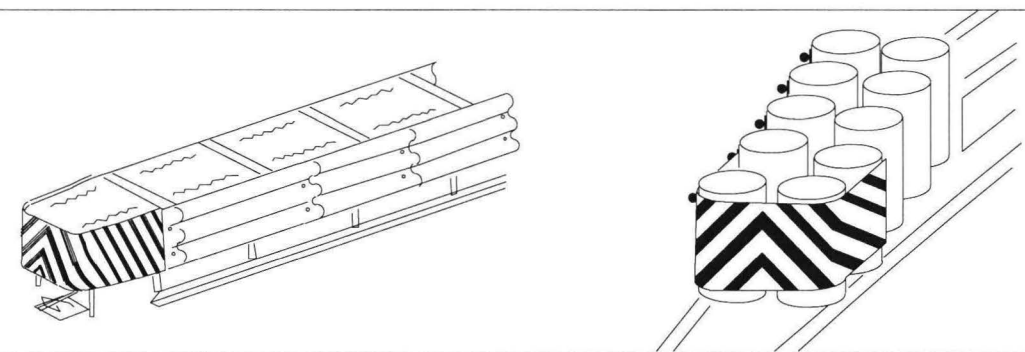
**D & OM(6) - 20**

FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DR: TxDOT	CR: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
7-20	REVISIONS		DIST	COUNTY
				SHEET NO. 173

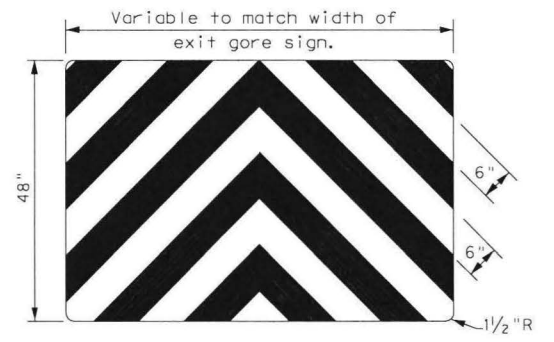
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\* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer



OBJECT MARKERS SMALLER THAN 3 FT<sup>2</sup>

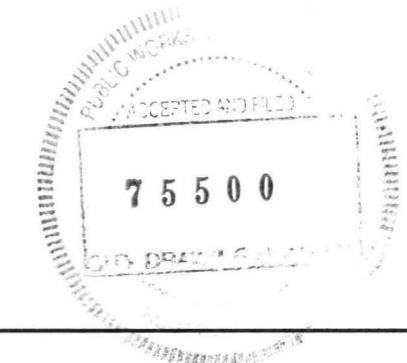
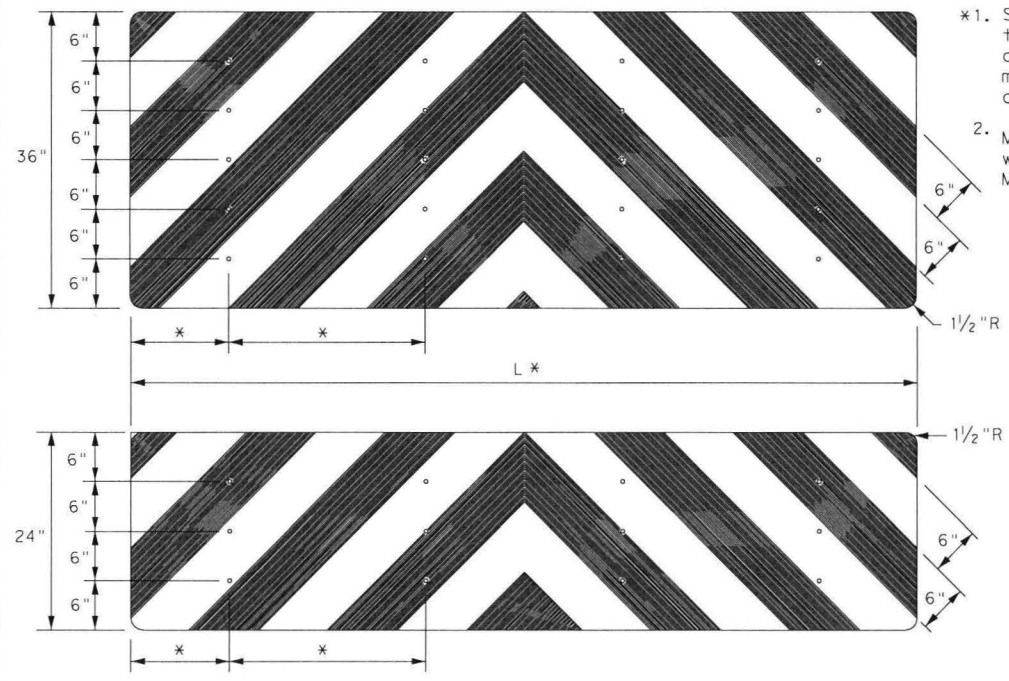


NOTES

- Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.
- Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.
- Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 1/4".
- Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.
- Object Marker at nose of attenuator is subsidiary to the attenuator.
- See D & OM (1-4) for required barrier reflectors.

NOTES

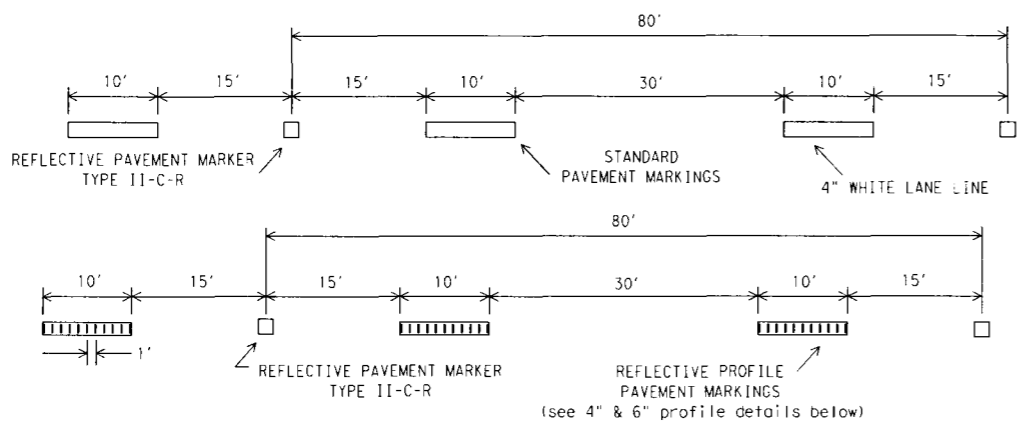
- Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturer's recommendation, or as directed by the Engineer.
- Mounting should be flush with top of attenuator. Minimum size 96" x 24".



		<b>Traffic Safety Division Standard</b>	
<b>DELINEATOR &amp; OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS</b> <b>D &amp; OM(VIA) -20</b>			
FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT
© TXDOT December 1989	CONT	SECT	JOB
REVISIONS			
4-92 8-04			
8-95 3-15			
4-98 7-20			
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			174
206			

DATE:  
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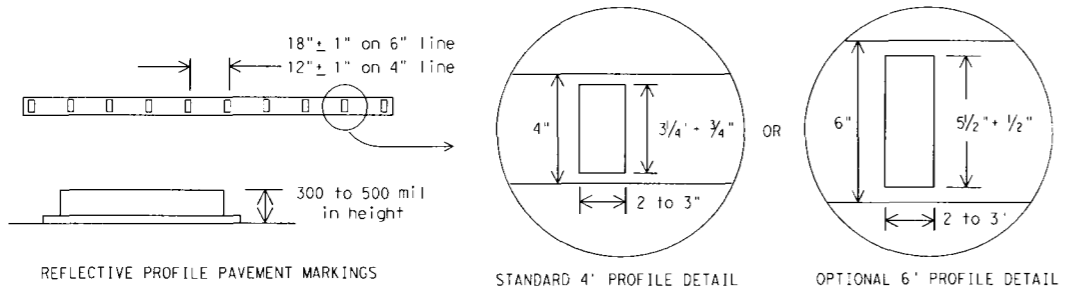
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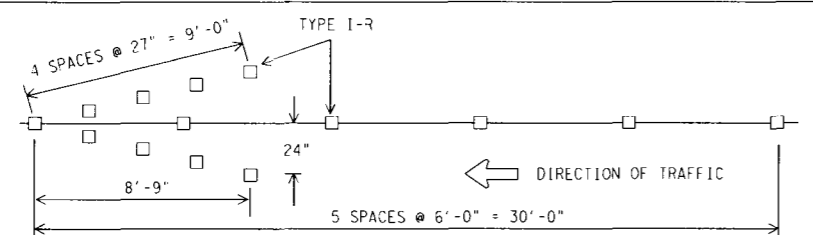
PAVEMENT MARKERS (REFL) TYPE II-C-R SHALL BE SPACED ON 80' CENTERS WITH THE CLEAR FACE TOWARD NORMAL TRAFFIC AND THE RED FACE TOWARD WRONG WAY TRAFFIC.

TRAFFIC LANE LINES PAVEMENT MARKING DETAILS

EDGELINES SHOULD TYPICALLY BE 4" WIDE AND THE MATERIALS SHALL BE AS SPECIFIED IN THE PLANS. IF RAISED PROFILE PAVEMENT MARKINGS ARE USED SEE DETAILS BELOW.

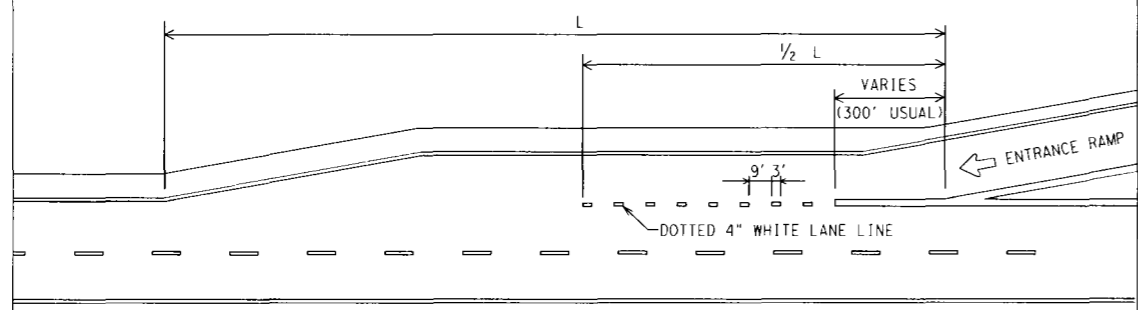


EDGELINE PAVEMENT MARKINGS

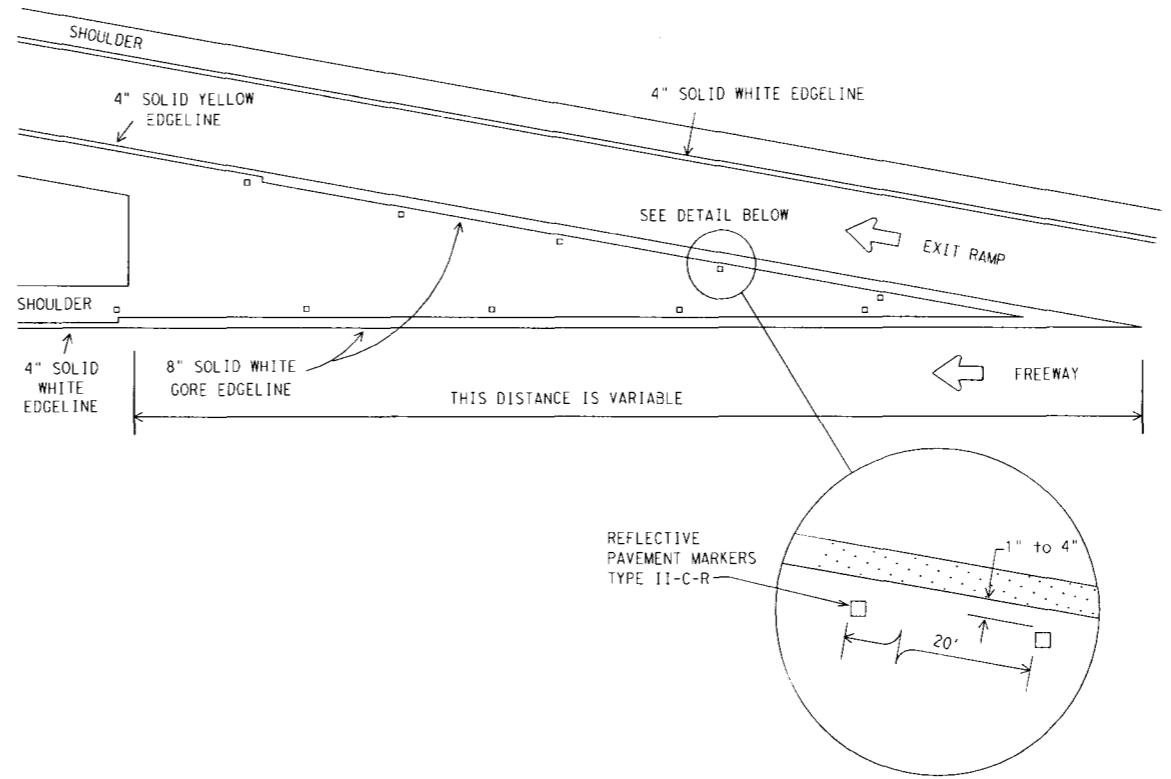


ALL RAISED MARKERS IN THE WRONG WAY ARROW SHALL BE TYPE I-R REFLECTORIZED PAVEMENT MARKERS WITH THE REFLECTORIZED SURFACE FACING THE WRONG WAY TRAFFIC. TYPE II-C-R SHALL NOT BE USED. REFLECTORIZED WRONG WAY ARROWS, NOT TO EXCEED TWO, MAY BE PLACED ON EXIT RAMP. LOCATION OF THE ARROWS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER.

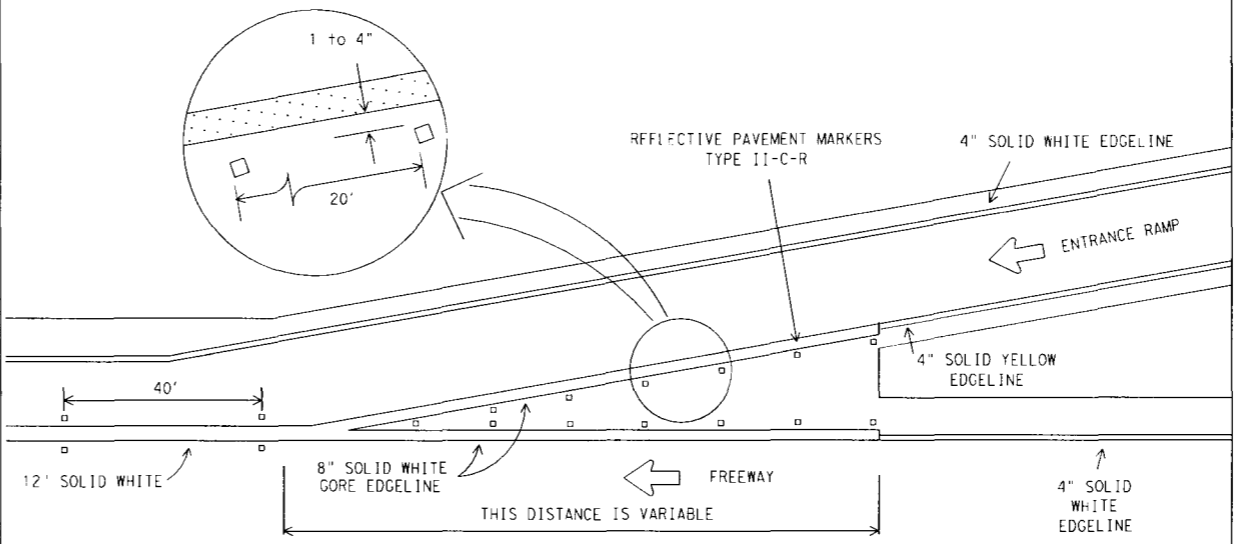
WRONG WAY ARROW DETAIL



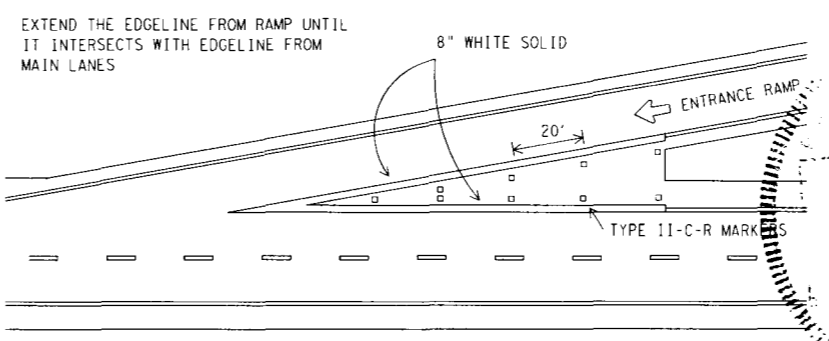
PARALLEL ACCELERATION LANE



TYPICAL EXIT RAMP GORE MARKING



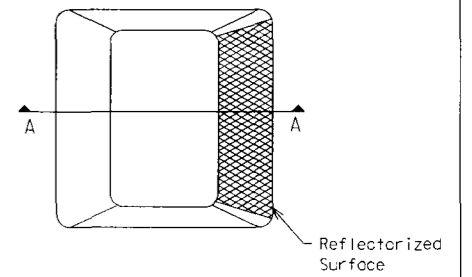
TYPICAL ENTRANCE RAMP GORE MARKING



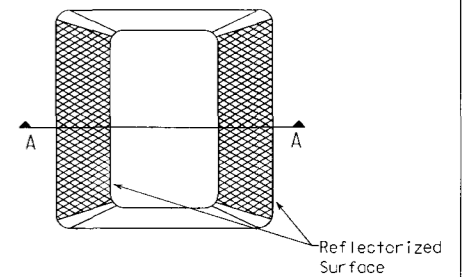
TAPERED ACCELERATION LANE

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

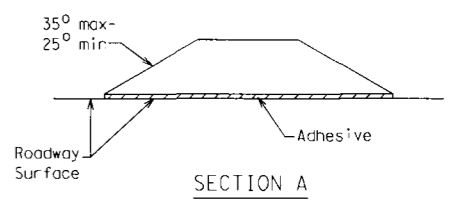
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation  
Traffic Operations Division

TYPICAL STANDARD  
FREEWAY PAVEMENT MARKINGS  
WITH RAISED  
PAVEMENT MARKERS

FPM(1)-12

75500

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REVISIONS		CONT	SECT	JOB	HIGHWAY
4-92	2-10				
5-00	2-12				
8-00					
2-08					
DIST		COUNTY		SHEET NO.	
				175	

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### SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

#### Post Type

- FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
- TWT = Thin-Walled Tubing (see SMD(TWT))
- 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
- S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

#### Number of Posts (1 or 2)

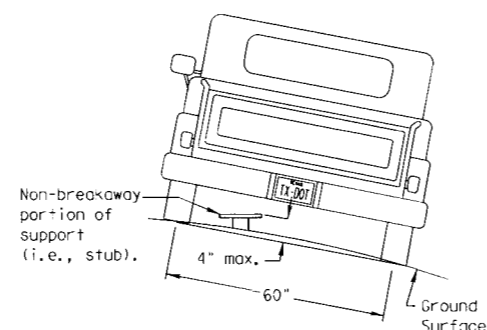
#### Anchor Type

- UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
- UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
- WS = Wedge Anchor Steel - (see SMD(TWT))
- WP = Wedge Anchor Plastic (see SMD(TWT))
- SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
- SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

#### Sign Mounting Designation

- P = Prefab. 'Plain' (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
- T = Prefab. 'T' (see SMD(SLIP-1) to (SLIP-3), (TWT))
- U = Prefab. 'U' (see SMD(SLIP-1) to (SLIP-3))
- IF REQUIRED
- 1EXT or 2EXT - Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
- BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
- WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
- EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

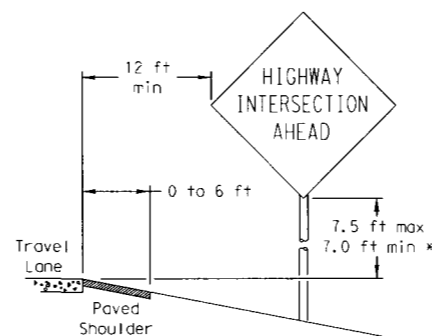
### REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

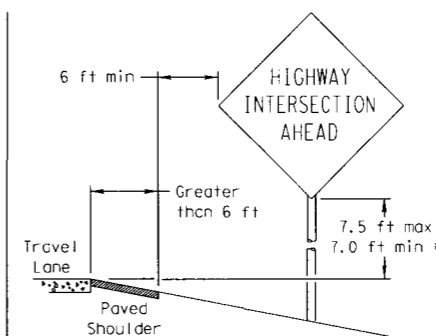
### SIGN LOCATION

#### PAVED SHOULDERS



LESS THAN 6 FT. WIDE

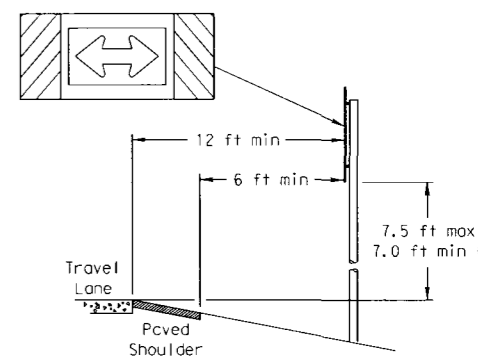
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



GREATER THAN 6 FT. WIDE

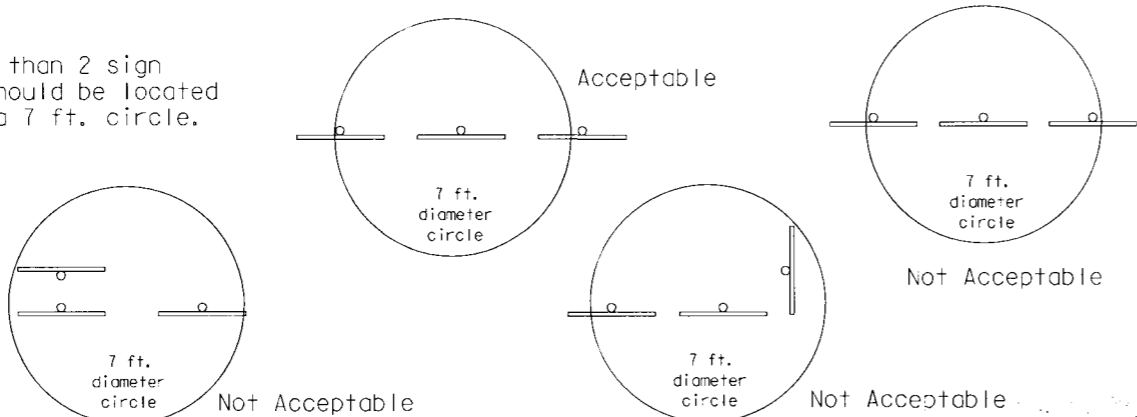
When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

#### T-INTERSECTION

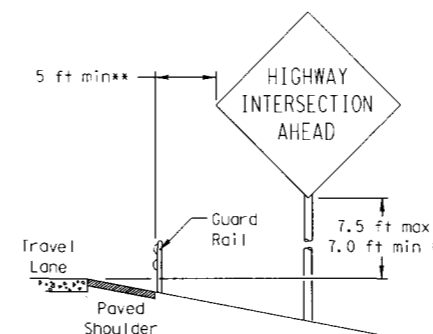


When this sign is needed at the end of a two-lane, two-way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

No more than 2 sign posts should be located within a 7 ft. circle.

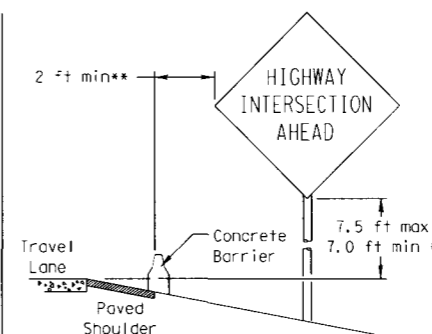


#### BEHIND BARRIER



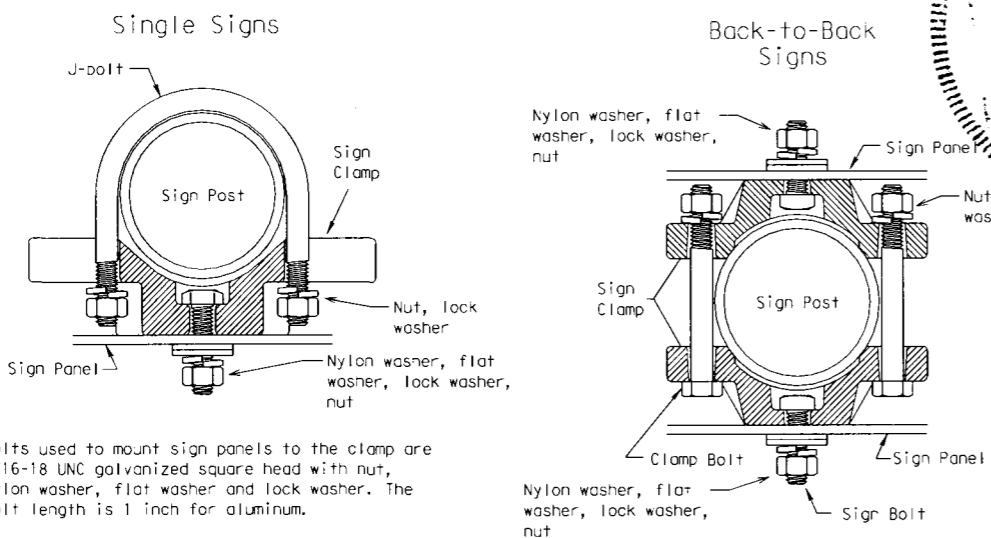
BEHIND GUARDRAIL

\*\*Sign clearance based on distance required for proper guard rail or concrete barrier performance.



BEHIND CONCRETE BARRIER

### TYPICAL SIGN ATTACHMENT DETAIL



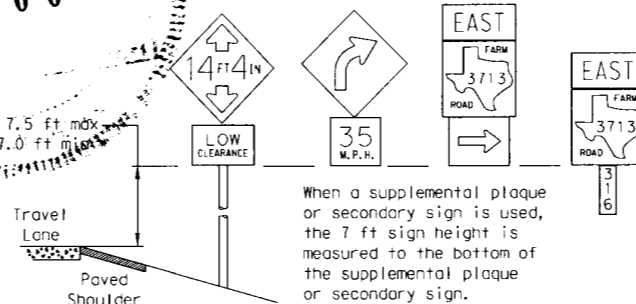
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

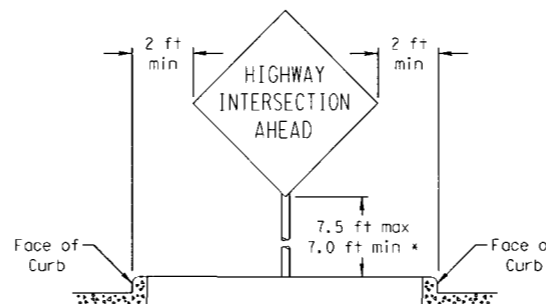
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

#### SIGNS WITH PLAQUES

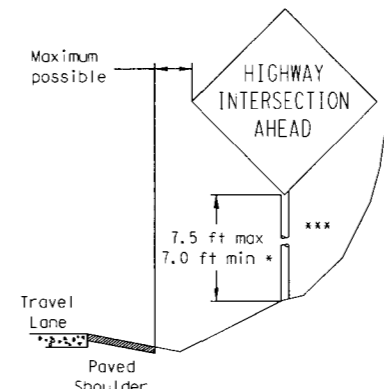


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

#### CURB & GUTTER OR RAISED ISLAND



#### RESTRICTED RIGHT-OF-WAY (When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

\*\*\* Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

\* Signs shall be mounted using the following condition that results in the greatest sign elevation:

- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:  
<http://www.txdot.gov/publications/traffic.htm>



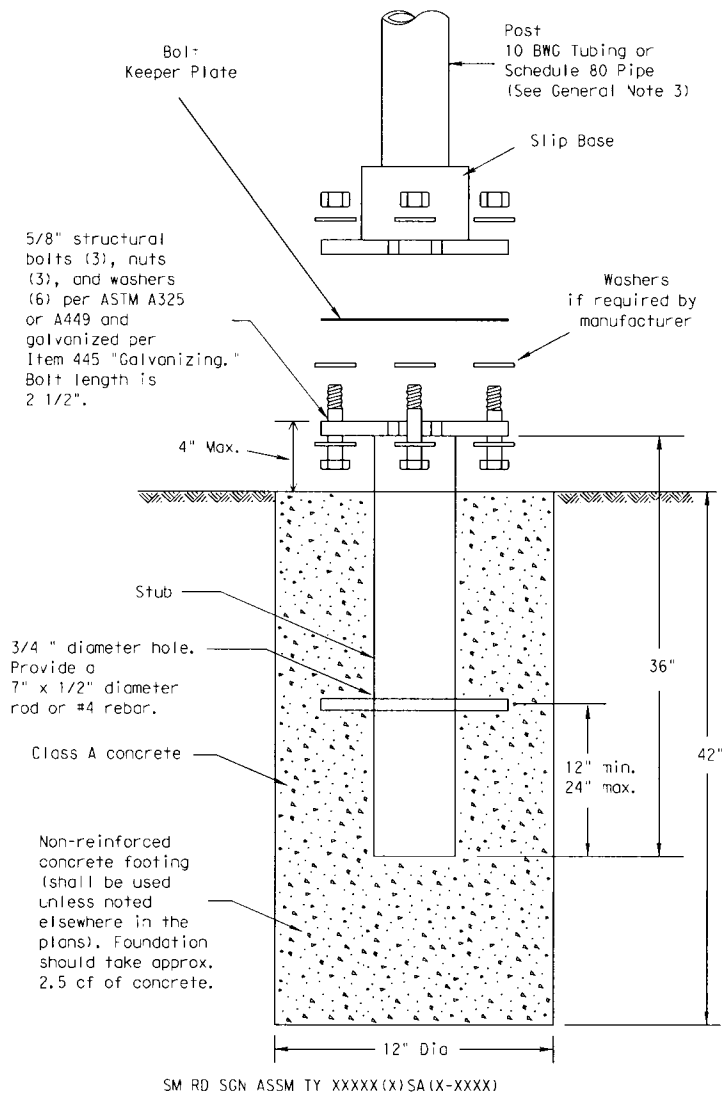
## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD (GEN) -08

© TxDOT July 2002	DN: TxDOT	CK: TxDOT	DR: TxDOT	CR: TxDOT
9-08	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY	SHEET NO.	
		FBC	176	

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## TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



### NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. [http://www.txdot.gov/business/producer\\_list.htm](http://www.txdot.gov/business/producer_list.htm) The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

### GENERAL NOTES:

- Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
- Material used as post with this system shall conform to the following specifications:
  - 10 BWC Tubing (2.875" outside diameter)
    - 0.134" nominal wall thickness
    - Seamless or electric-resistance welded steel tubing or pipe
    - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
    - Other steels may be used if they meet the following:
      - 55,000 PSI minimum yield strength
      - 70,000 PSI minimum tensile strength
      - 20% minimum elongation in 2"
    - Wall thickness (uncoated) shall be within the range of 0.122" to 0.136"
    - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
    - Galvanization per ASTM A123 or ASTM A653 G210. For pre-coated steel tubing (ASTM A653), recast tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
  - Schedule 80 Pipe (2.875" outside diameter)
    - 0.276" nominal wall thickness
    - Steel tubing per ASTM A500 Gr C
    - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
      - 46,000 PSI minimum yield strength
      - 62,000 PSI minimum tensile strength
      - 21% minimum elongation in 2"
    - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
    - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
    - Galvanization per ASTM A123
- See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

### ASSEMBLY PROCEDURE

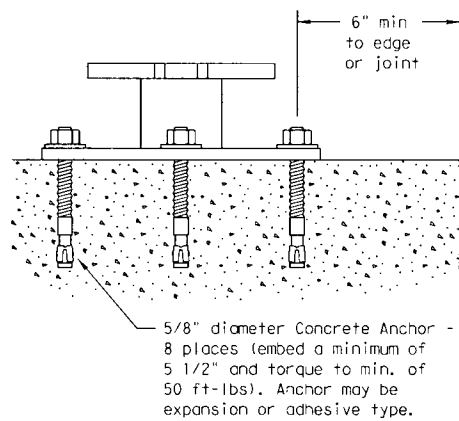
#### Foundation

- Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
- The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
- Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
- Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
- The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

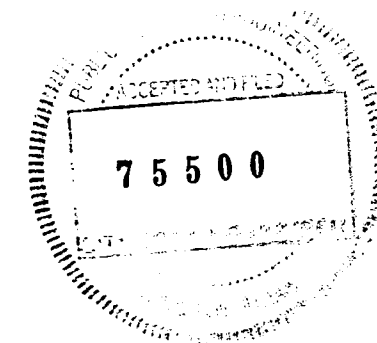
#### Support

- Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
- Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

### CONCRETE ANCHOR



Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxyes and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.



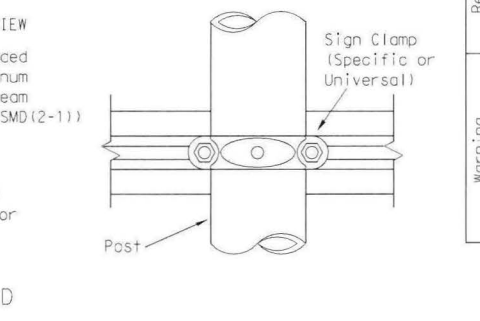
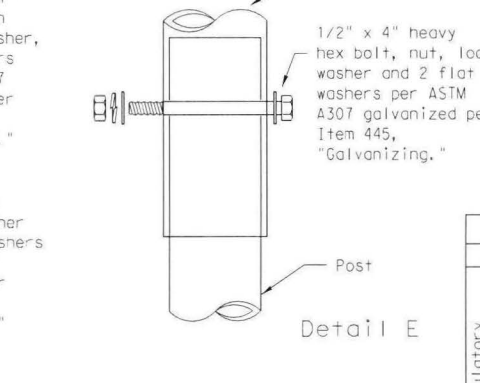
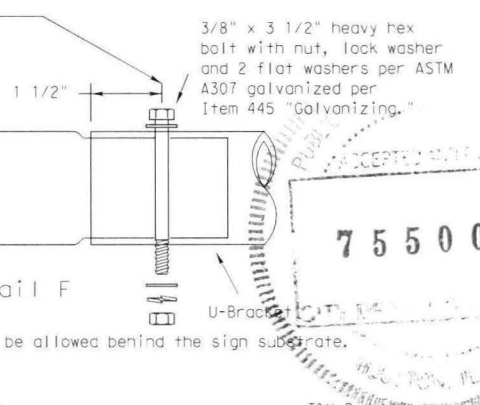
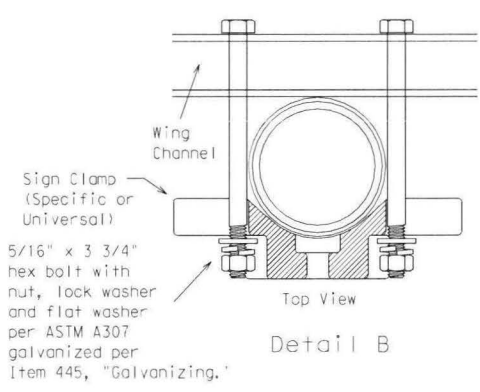
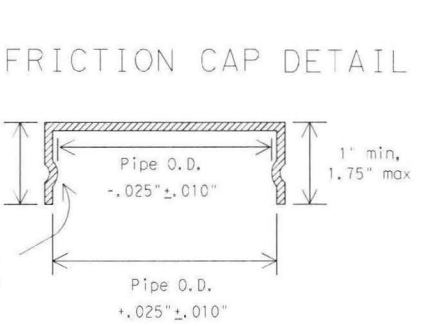
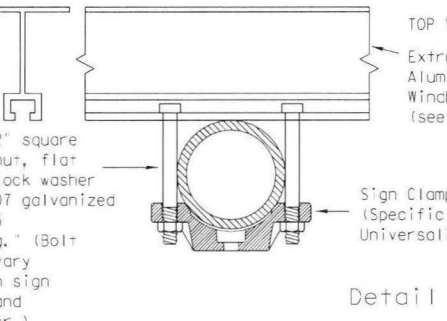
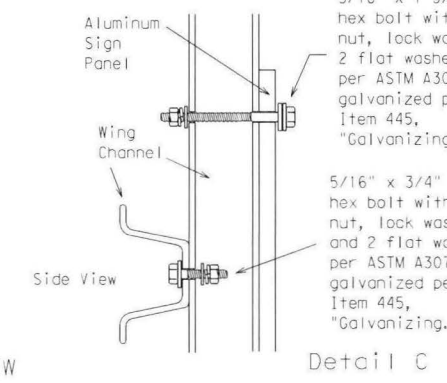
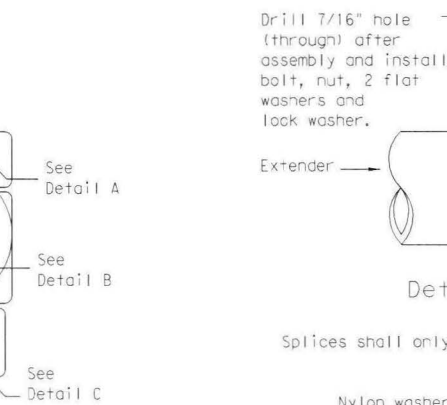
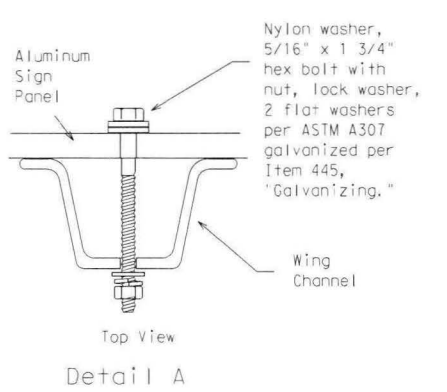
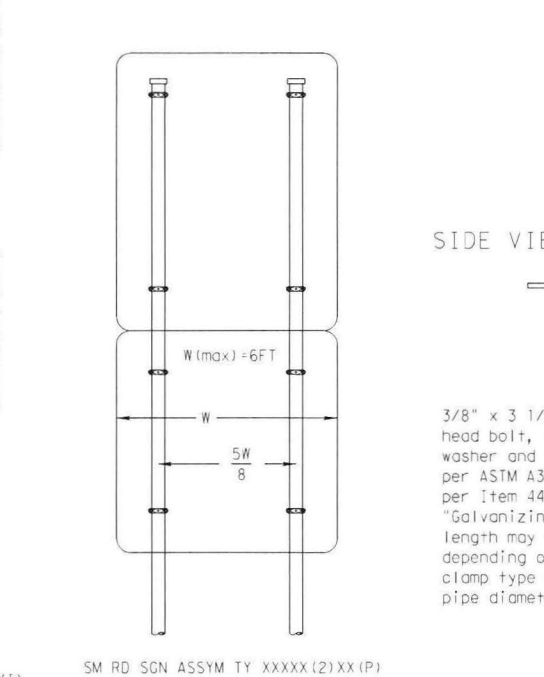
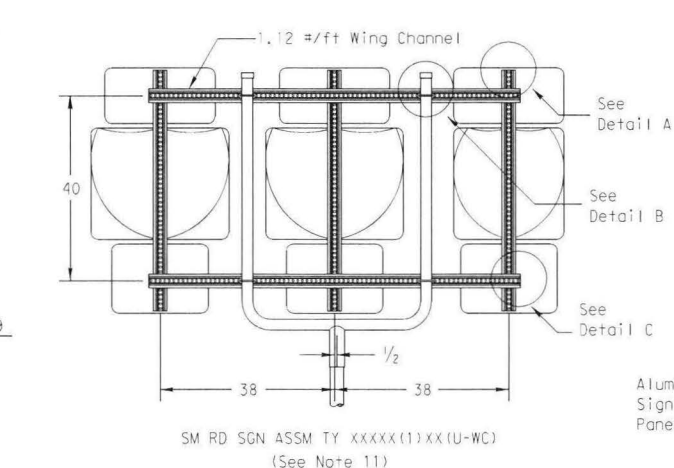
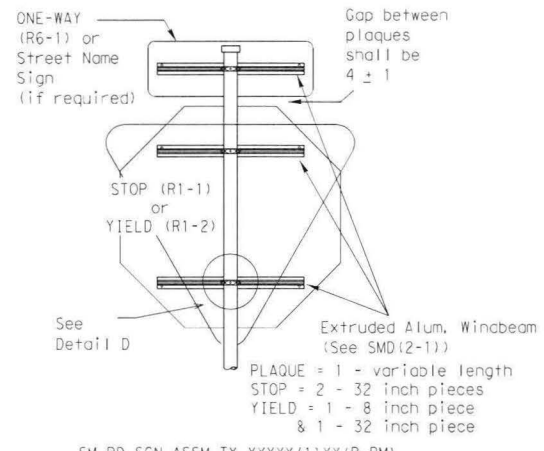
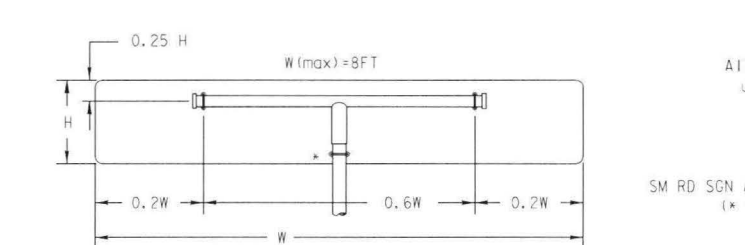
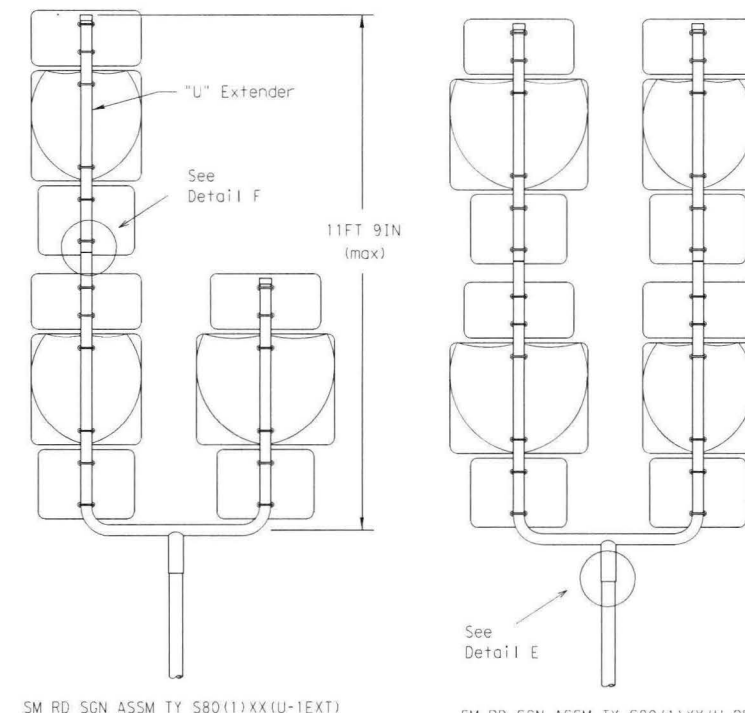
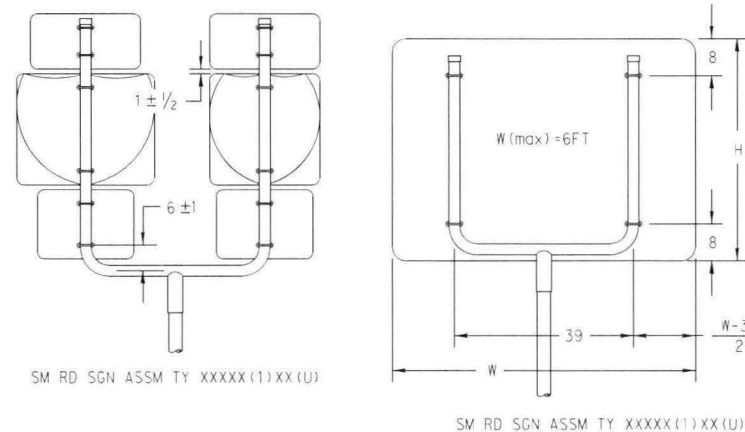
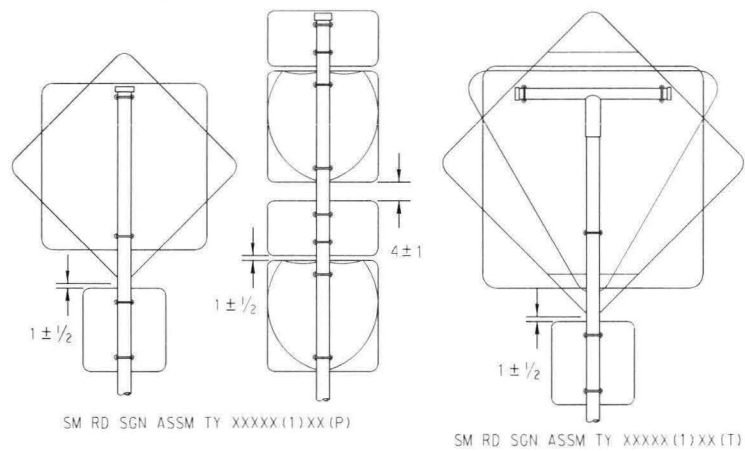
**Texas Department of Transportation**  
Traffic Operations Division

## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
		DIST	COUNTY	SHEET NO.	
			FBC	177	

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GENERAL NOTES:

- | SIGN SUPPORT | # OF POSTS | MAX. SIGN AREA |
|--------------|------------|----------------|
| 10 BWG       | 1          | 16 SF          |
| 10 BWG       | 2          | 32 SF          |
| Sch 80       | 1          | 32 SF          |
| Sch 80       | 2          | 64 SF          |
- The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
- When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
- Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
- Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
- Post open ends shall be fitted with Friction Caps.
- Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT		
SIGN DESCRIPTION	SUPPORT	
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
Warning	48x60-inch signs	TY S80(1)XX(T)
	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)	

Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes. The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture. Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

Texas Department of Transportation  
Traffic Operations Division

SIGN MOUNTING DETAILS  
SMALL ROADSIDE SIGNS  
TRIANGULAR SLIPBASE SYSTEM  
SMD (SLIP-2) - 08

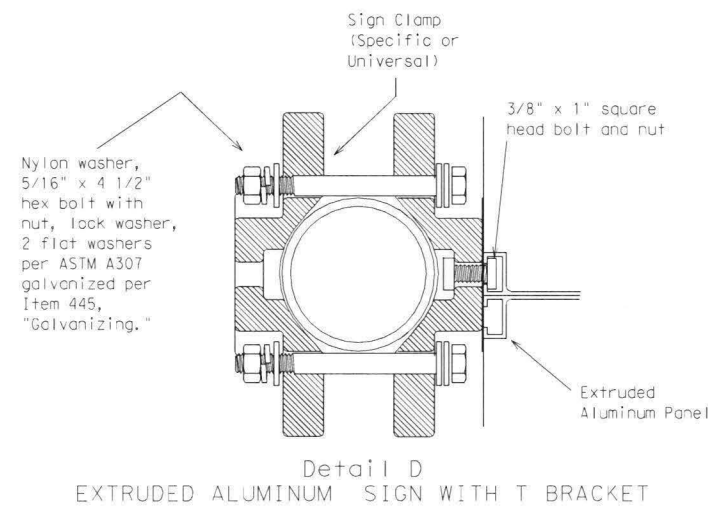
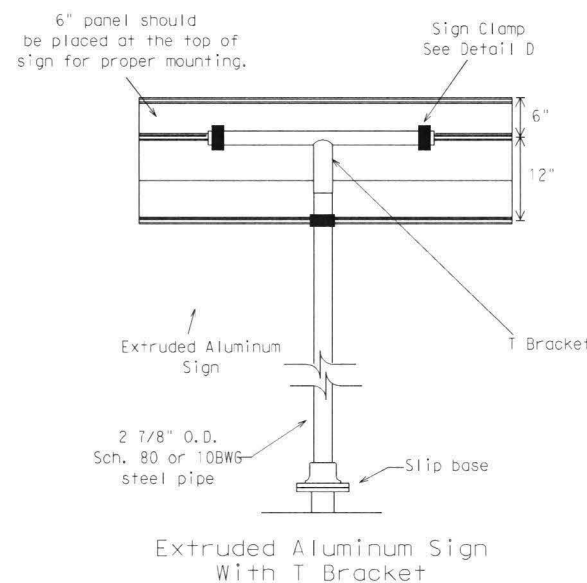
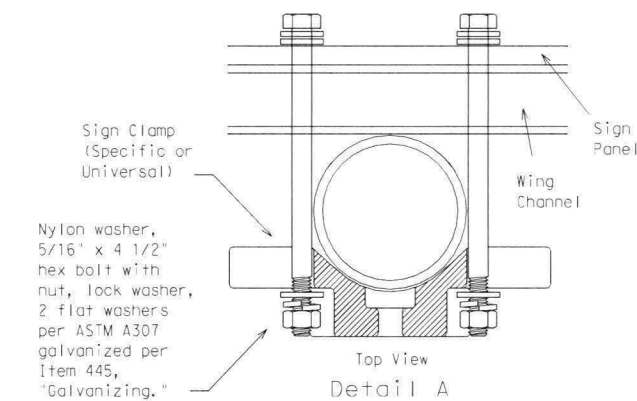
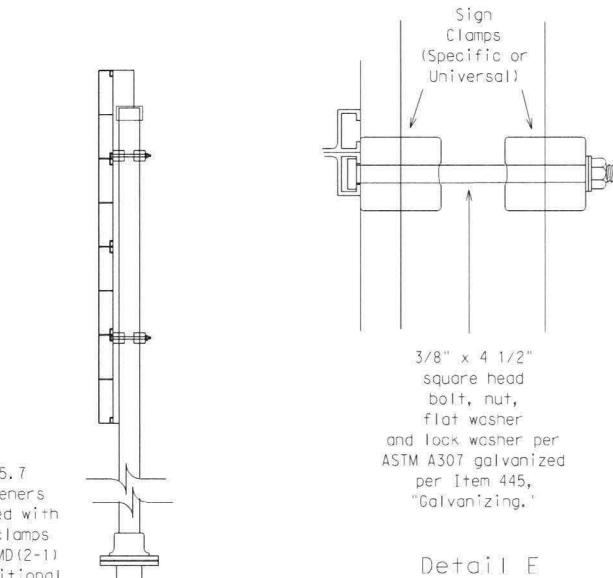
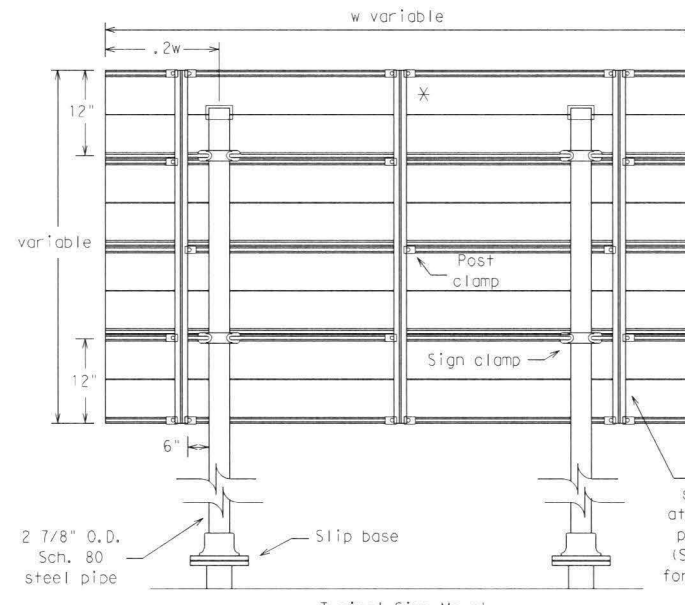
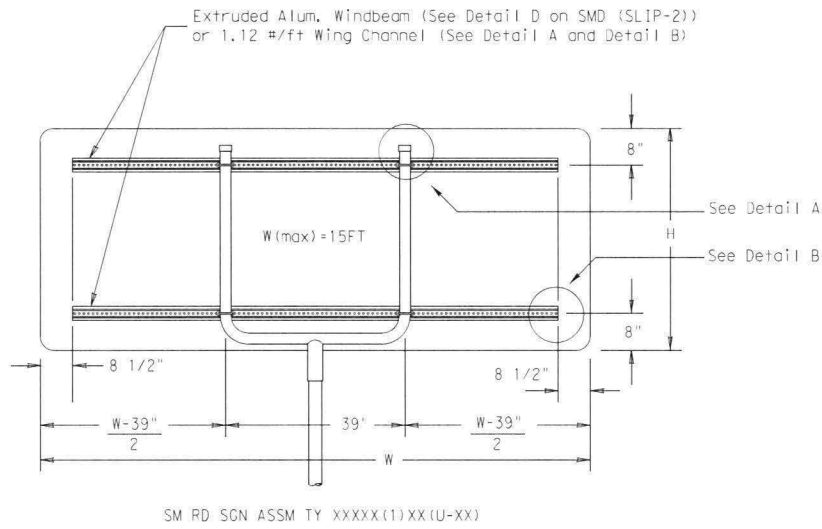
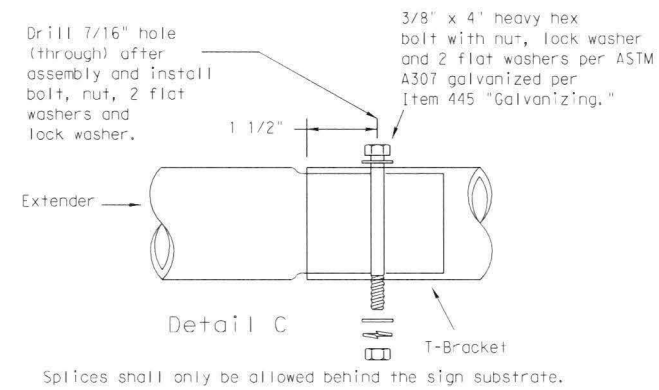
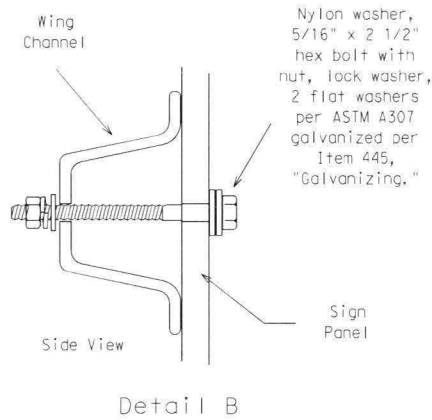
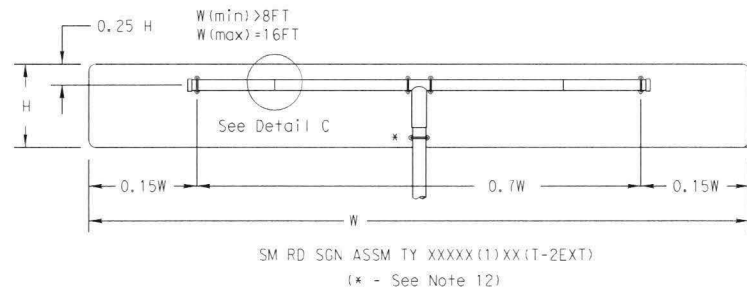
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9-08	REVISIONS	CONTRACT	SECTION	JOB	HIGHWAY
		DIST	COUNTY	SHEET NO.	
			FBC	178	

26C

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DATE: FILE:



GENERAL NOTES:

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|--------------|------------|----------------|
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| 10 BWG       | 2          | 32 SF          |
| Sch 80       | 1          | 32 SF          |
| Sch 80       | 2          | 64 SF          |
- The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
- When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
- Sign blanks shall be the sizes and shapes shown on the plans.
- Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
- Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
SIGN DESCRIPTION	SUPPORT	
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)	



Texas Department of Transportation  
Traffic Operations Division

SIGN MOUNTING DETAILS  
SMALL ROADSIDE SIGNS  
TRIANGULAR SLIPBASE SYSTEM

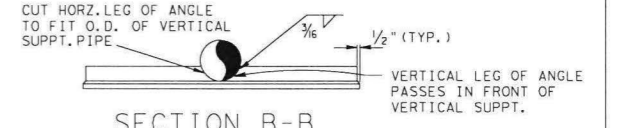
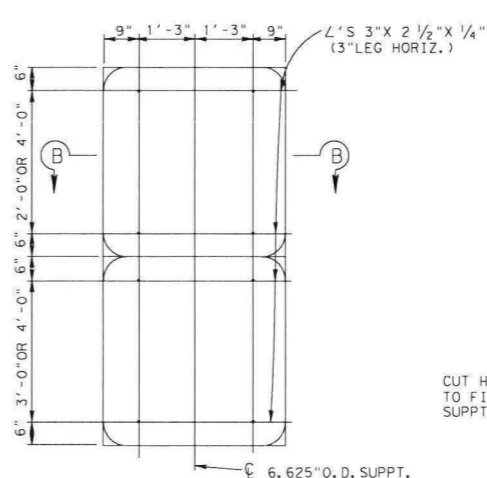
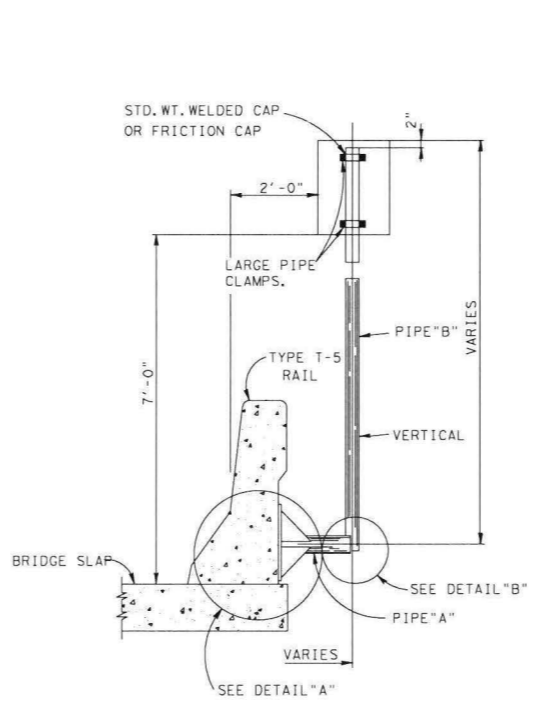
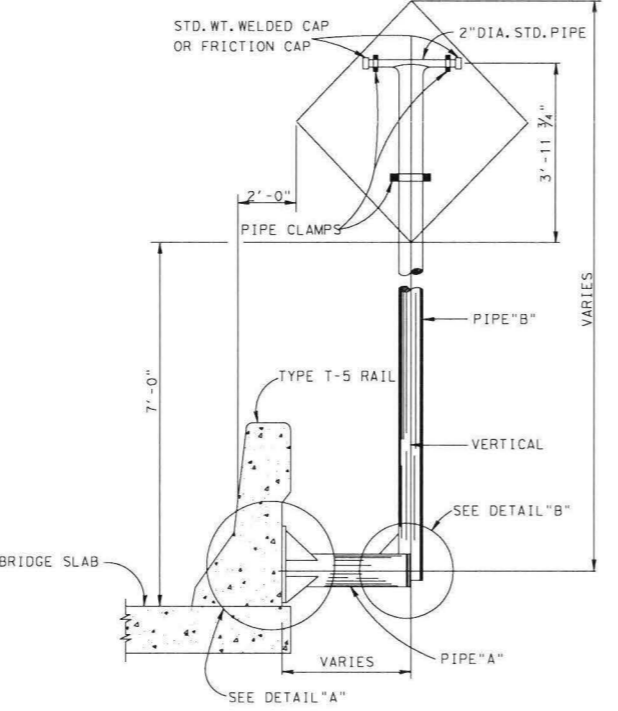
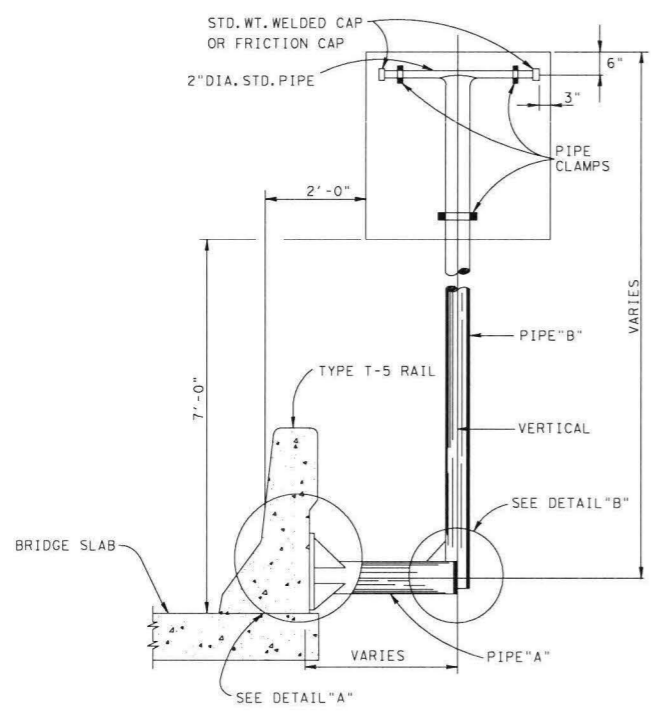
SMD(SLIP-3)-08

© TxDOT July 2002	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY	SHEET NO.	
		FBC	179	

26D

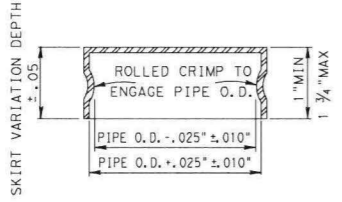


TABLE OF PIPE SIZES			
SIGN AREA S.F.	PIPE A SIZE	PIPE B SIZE	CORRESPONDING TYPE GROUND MOUNT
1-10	4.500" O.D. X 0.337" W.T.	3.500" O.D. X 0.300" W.T.	10 BWG (1) SA (P)
10-16	8.625" O.D. X 0.332" W.T.	4.500" O.D. X 0.337" W.T.	10 BWG (1) SA (T)
16-32	8.625" O.D. X 0.332" W.T.	6.625" O.D. X 0.280" W.T.	S80 (1) SA (T) S80 (1) SA (U) S80 (1) SA (U-1EXT)
32-40	8.625" O.D. X 0.332" W.T.	6.625" O.D. X 0.432" W.T.	S80 (2) SA (P) S80 (1) SA (U-2EXT)



R2-1 (48x60) & R2-4 (48x60)  
R5-1a (48x36) & R5-1 (48x48)

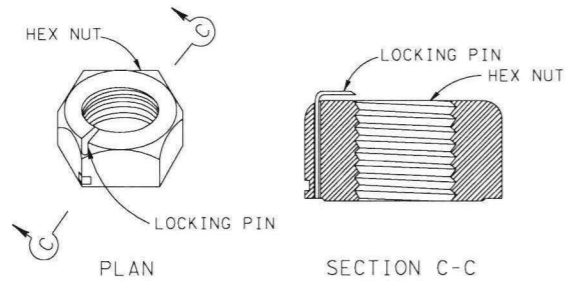
BRIDGE MOUNTED SIGNS



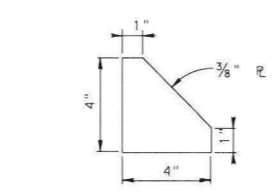
FRICTION CAP

NOTES:

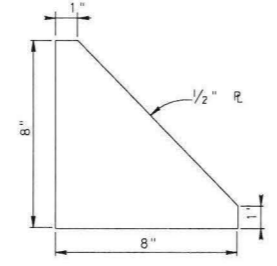
FRICTION CAPS-MANUFACTURED FROM HOT OR COLD ROLLED STEEL SHEETS, SIZED FOR DRIVE FRICTION FIT, AND SO FORMED AS TO HAVE NO TENDENCY TO ROCK WHEN SEATED. THEY SHALL BE FREE OF SHARP INDENTATIONS AND EVIDENCE OF METAL FRACTURE, WITH RIMS REASONABLY STRAIGHT AND SMOOTH.



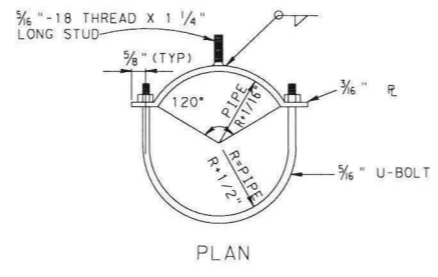
LOCK NUT DETAIL



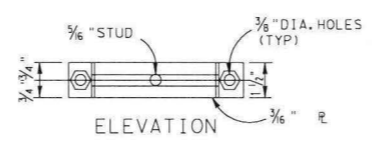
3/8" R STIFFENER



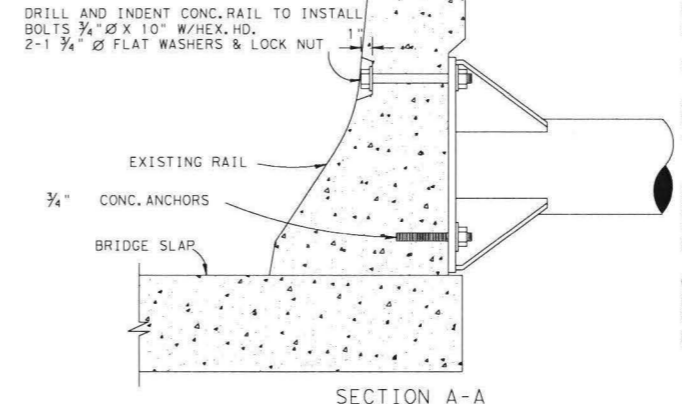
1/2" R STIFFENER



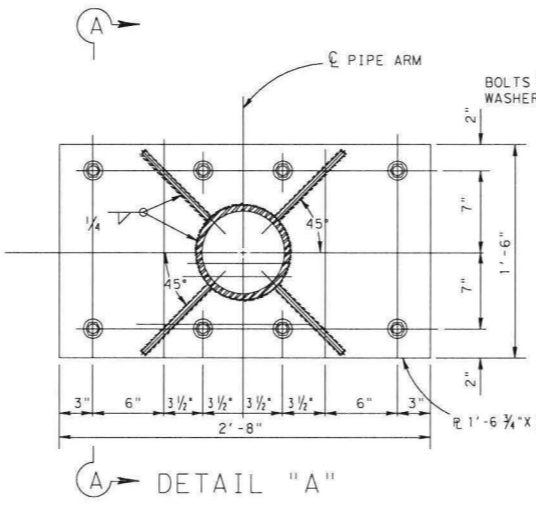
PLAN



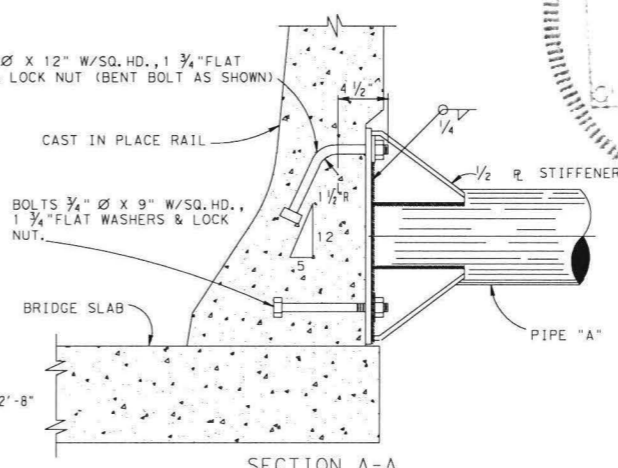
ELEVATION  
LARGE PIPE CLAMP



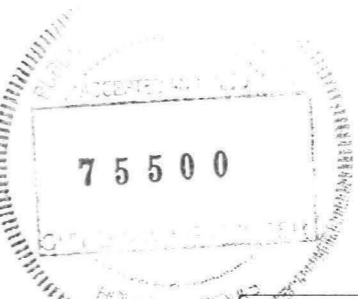
SECTION A-A  
(SHOWING EXISTING RAILING)



DETAIL "A"



SECTION A-A  
(SHOWING CAST IN PLACE RAIL)

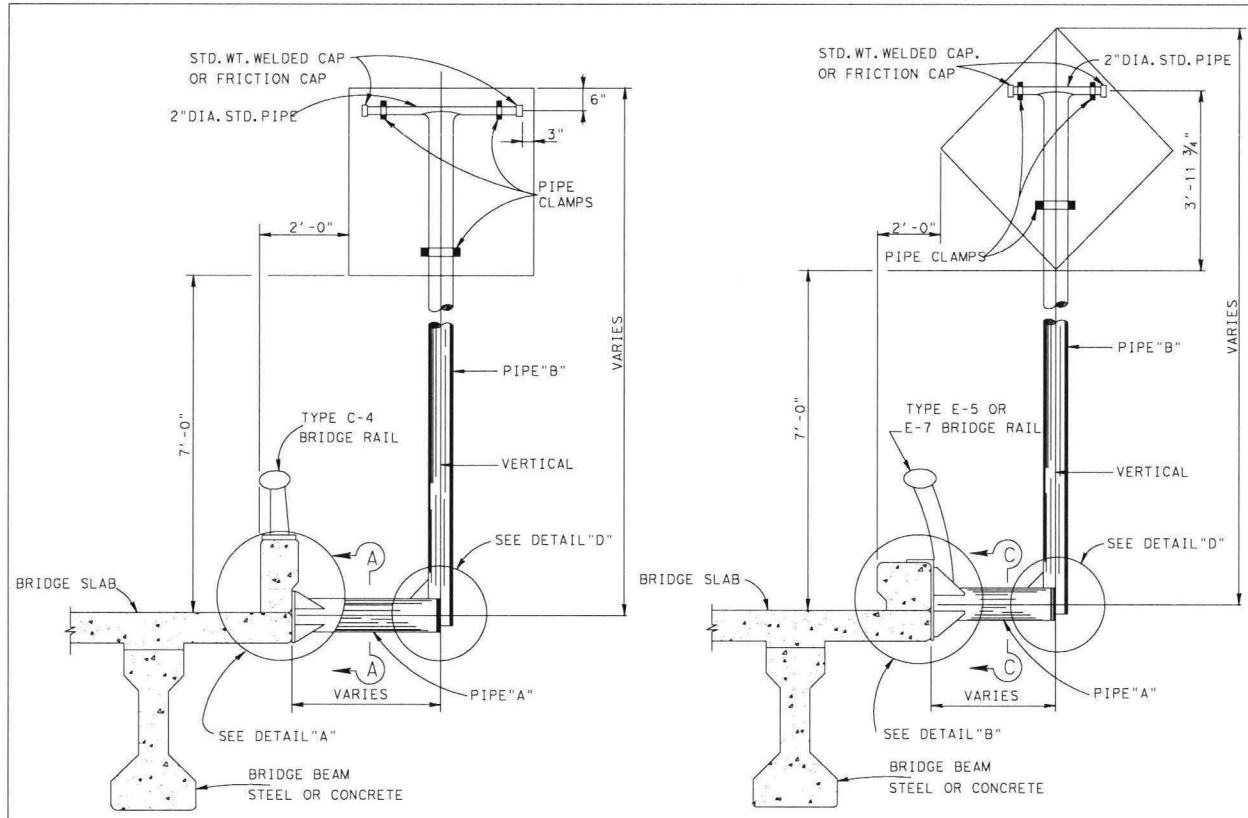


Texas Department of Transportation  
Houston District

BRIDGE MOUNTING DETAILS  
(FOR SMALL ROADSIDE SIGNS)

SMD (BM-1) - 04

FILE:	DN:	CK:	DW:	CK:
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REVISIONS	HOU	6		180
	COUNTY	CONTROL	SECT	JOB
	FBC			HIGHWAY



NOTES:  
 FRICTION CAPS-MANUFACTURED FROM HOT OR COLD ROLLED STEEL SHEETS, SIZED FOR DRIVE FRICTION FIT, AND SO FORMED AS TO HAVE NO TENDENCY TO ROCK WHEN SEATED. THEY SHALL BE FREE OF SHARP INDENTATIONS AND EVIDENCE OF METAL FRACTURE, WITH RIMS REASONABLY STRAIGHT AND SMOOTH.

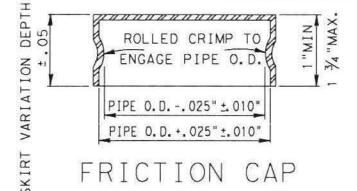
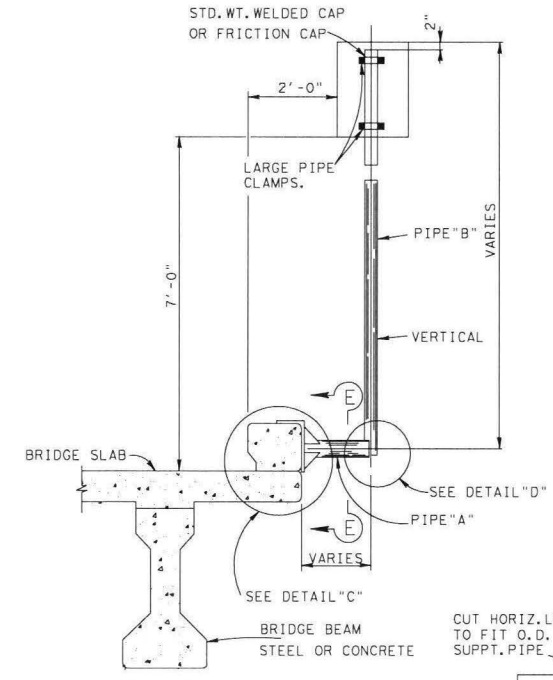
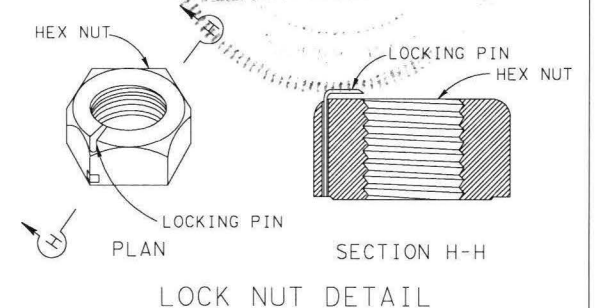
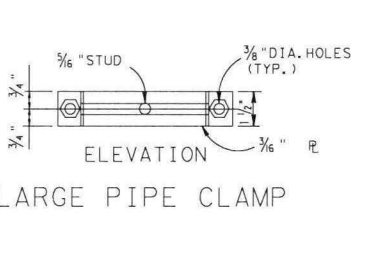
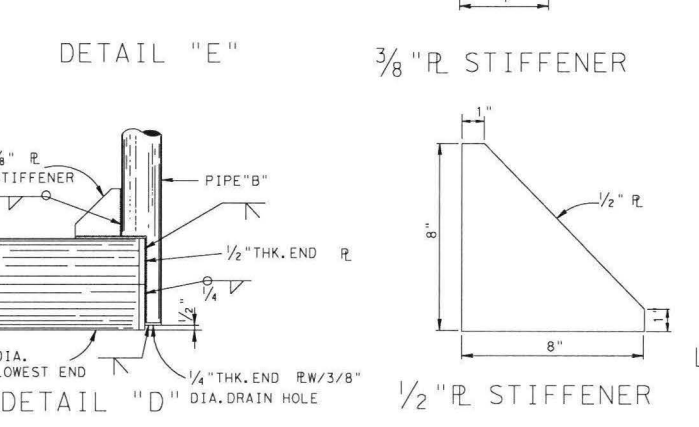
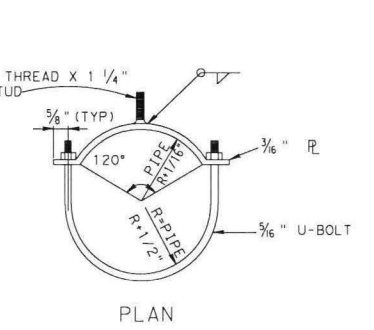
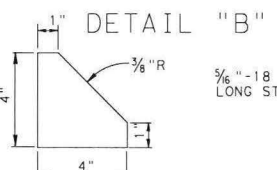
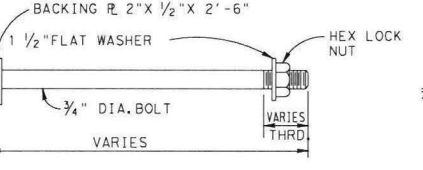
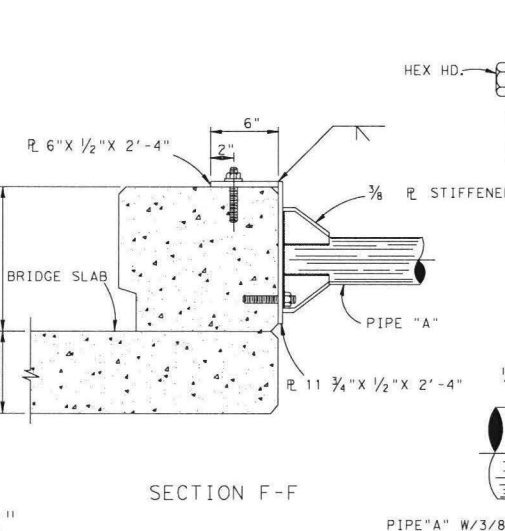
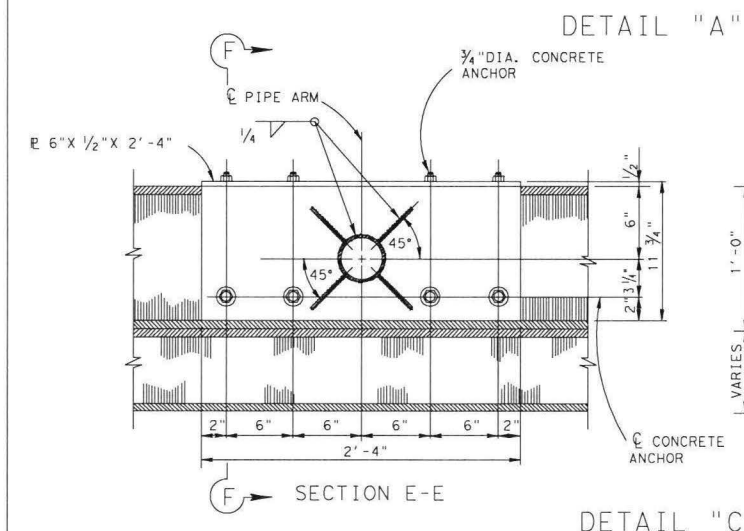
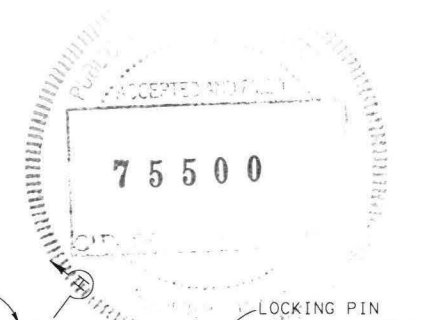
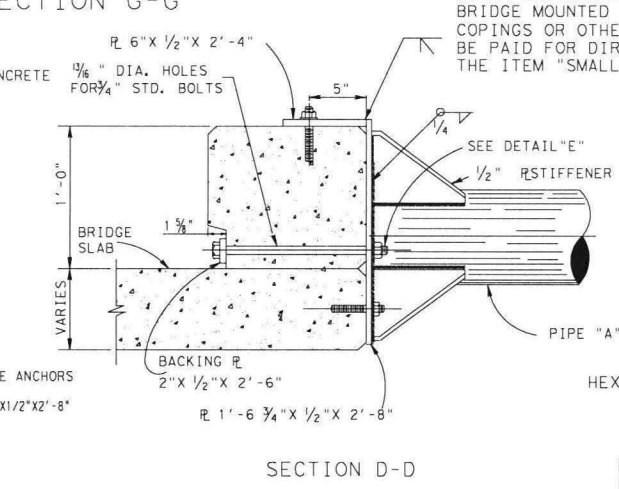
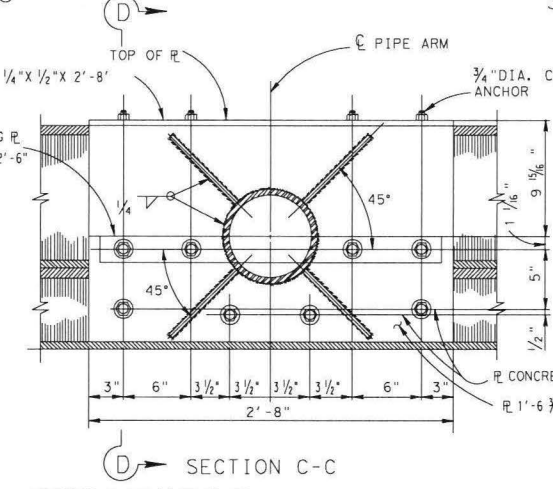
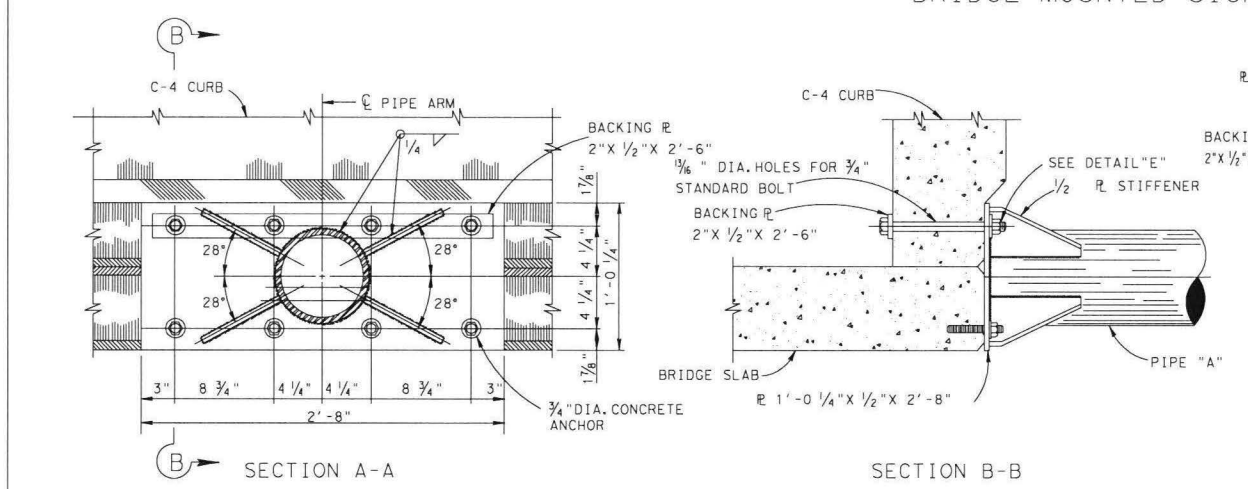


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32-40	8.625" O.D. X 0.332" W.T.	6.625" O.D. X 0.432" W.T.	S80 (2) SA (P) S80 (1) SA (U-2EXT)

NOTES:  
 CONTRACTOR SHALL CHECK CROSS SLOPE ON BRIDGES AND THEN FABRICATE SIGN MOUNTS SO SIGN SUPPORT PIPE IS VERTICAL.  
 ADDITIONAL "U" OR "T" EXTENSION PIPE OF THE SIZE AND LENGTHS SHOWN ON STANDARD PLAN SHEETS SHALL BE PROVIDED AND ATTACHED (WELDED OR AS DIRECTED BY THE ENGINEER) TO PIPE "B" AS REQUIRED.  
 SIGN PANELS SHALL BE ATTACHED TO THE 3" DIA. OR SMALLER PIPE ARMS AS SHOWN IN THE STANDARD PLAN SHEETS. ATTACHMENT TO 4" OR 6" PIPES SHALL BE AS SHOWN ON THIS SHEET OR AS SHOWN IN STANDARD PLAN SHEETS EXCEPT FOR R2-1 AND R2-4 OR R5-1A AND R5-1 SIGN COMBINATIONS WHICH SHALL BE MOUNTED AS SHOWN ON THIS SHEET.  
 LOCK NUTS WITH NONREVERSIBLE HIGH TENSILE STRENGTH STAINLESS STEEL LOCKING PINS SHALL BE USED ON BOLTS.  
 CONCRETE ANCHORS SHALL BE STANDARD 3 UNIT CONCRETE ANCHORS. RAWL, PARABOLT, KWIKBOLT OR EQUAL, WITH LOCK NUT, FLAT WASHER & LOCK WASHER. ANCHORS SHALL NOT BE LESS THAN 4 1/2" IN LENGTH.  
 SIGN SUPPORTS SHALL BE GALVANIZED AFTER FABRICATION. SIGN SUPPORT BRACKETS AS DETAILED ON THIS SHEET ARE FOR SIGNS MOUNTED ON RIGHT SIDE OF ROADWAY. LEFT HAND BRACKETS SHALL BE OPPOSITE TO THOSE SHOWN. SEE SIGN LAYOUT SHEETS TO DETERMINE WHETHER RIGHT OR LEFT HAND BRACKET IS REQUIRED.  
 ANY CHIPPING, GOUGING, OR OTHER WORK, TOOLS OR ANY OTHER INCIDENTALS NECESSARY TO EFFECT THE INSTALLATION OF BRIDGE MOUNTED SIGN BRACKETS ON CURBS, PARAPET WALLS, COPINGS OR OTHER LOCATIONS AS CALLED FOR IN PLANS WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED SUBSIDIARY TO THE ITEM "SMALL ROADSIDE SIGN SUPPORTS AND ASSEMBLIES".

BRIDGE MOUNTED SIGNS

SECTION G-G



Texas Department of Transportation  
 Houston District

BRIDGE MOUNTING DETAILS  
 (FOR SMALL ROADSIDE SIGNS)

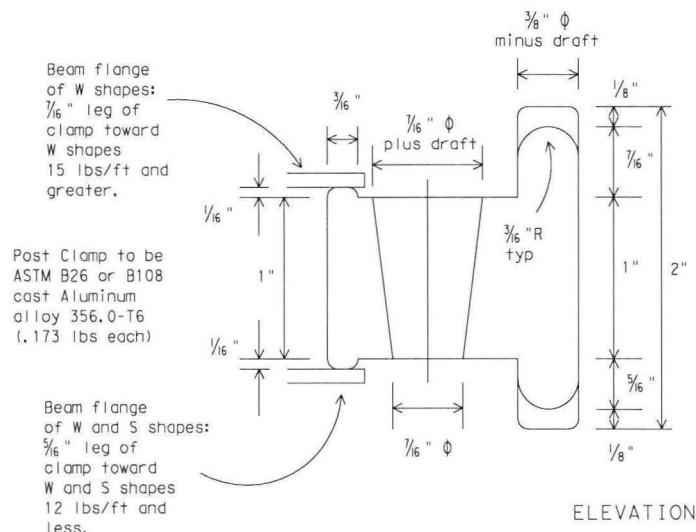
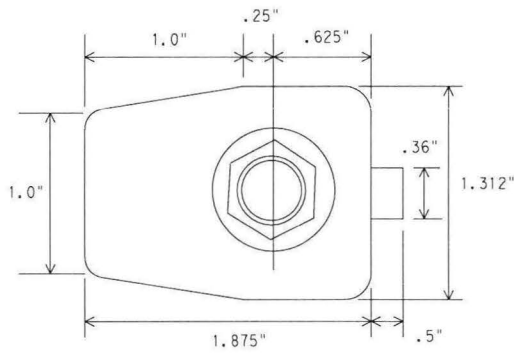
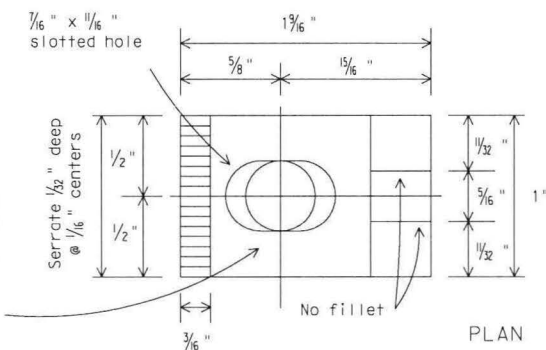
SMD (BM-2) -04

FILE:	DN:	CK:	DN:	CK:
© TxDOT 1998	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		181
	COUNTY	CONTROL	SECT	JOB
	FBC			HIGHWAY

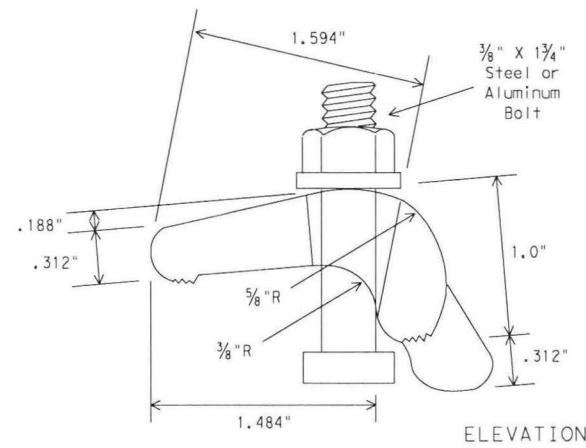
STD N-8

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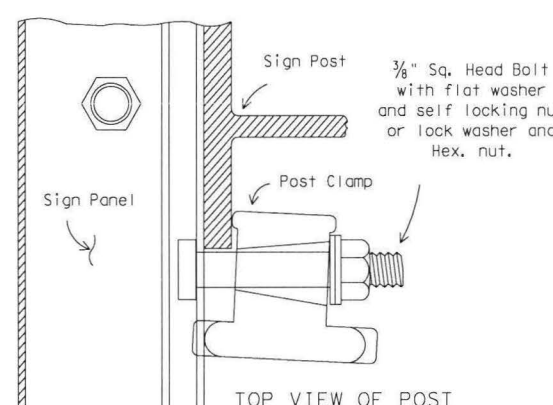
NOTE: centerline of hole for 3/8" diameter squarehead bolt x 2 1/4" long with a flat washer and self-locking nut, or lock washer and hex. nut. Bolt head dimensions shall be in accordance with ANSI B 18.2.1 as referred to in the AISC Manual of steel construction. Bolt assembly shall be galvanized.



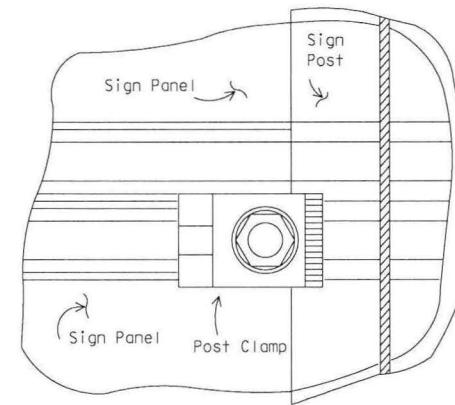
POST CLAMP DETAIL



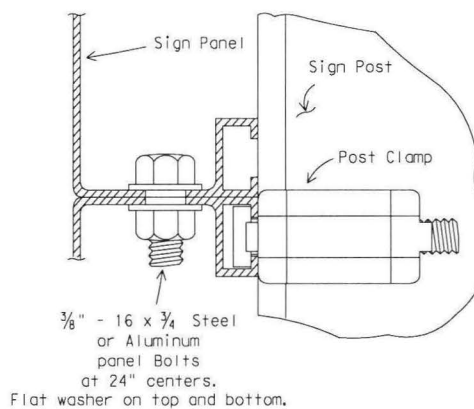
ALTERNATE POST CLAMP DETAIL



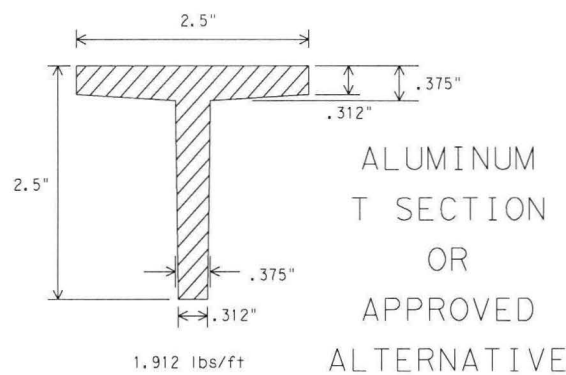
TOP VIEW OF POST



TOP VIEW OF CLAMP



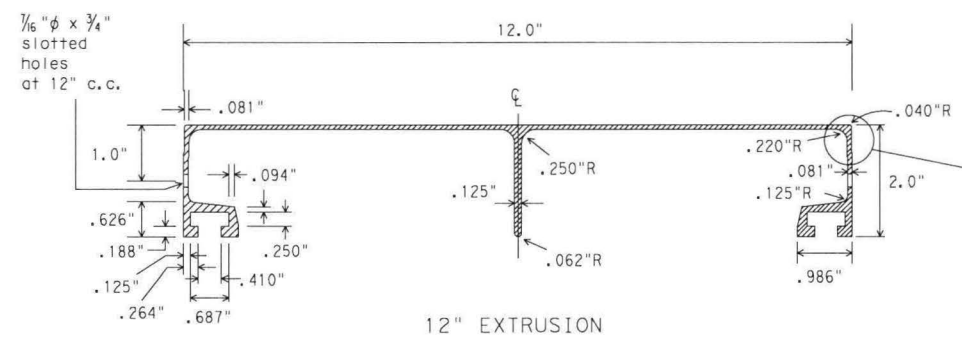
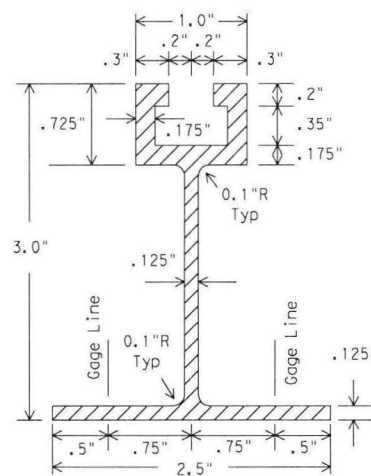
SIDE VIEW OF PANELS CONNECTION DETAILS



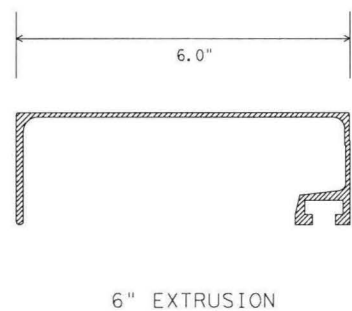
ALUMINUM T SECTION OR APPROVED ALTERNATIVE

WINDBEAM CROSS SECTION

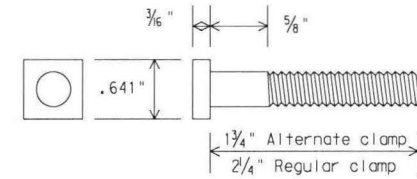
Windbeam to be extruded aluminum (1.175 lbs/ft) or approved alternative



ALUMINUM SIGN PANEL EXTRUSION DETAILS



6" EXTRUSION



POST CLAMP BOLT DETAIL

DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN HARDWARE	DMS-7120

- GENERAL NOTES:
- Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
  - Materials and fabrication shall conform to the requirements of the Department material specifications.
  - Structural steel shall be "low-alloy steel" for non-bridge structures per Item 442, "Metal For Structures."
  - For fiberglass substrate connection details, see manufacturer's recommendations.



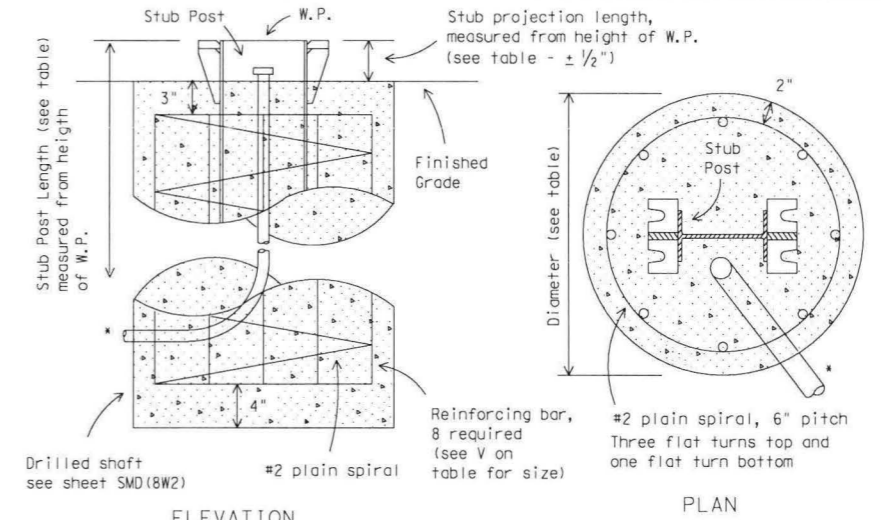
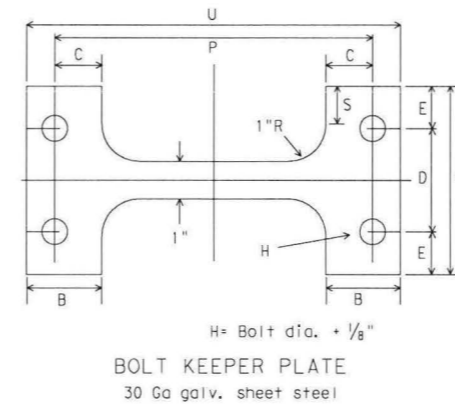
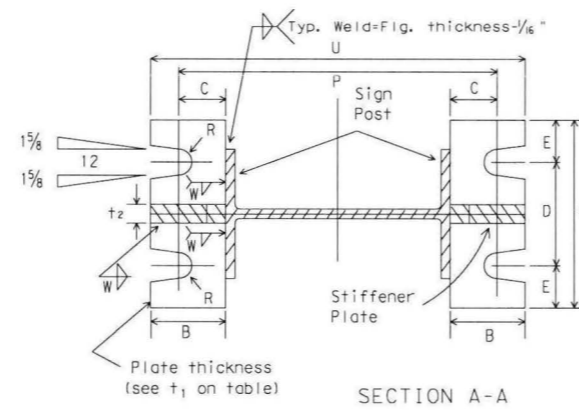
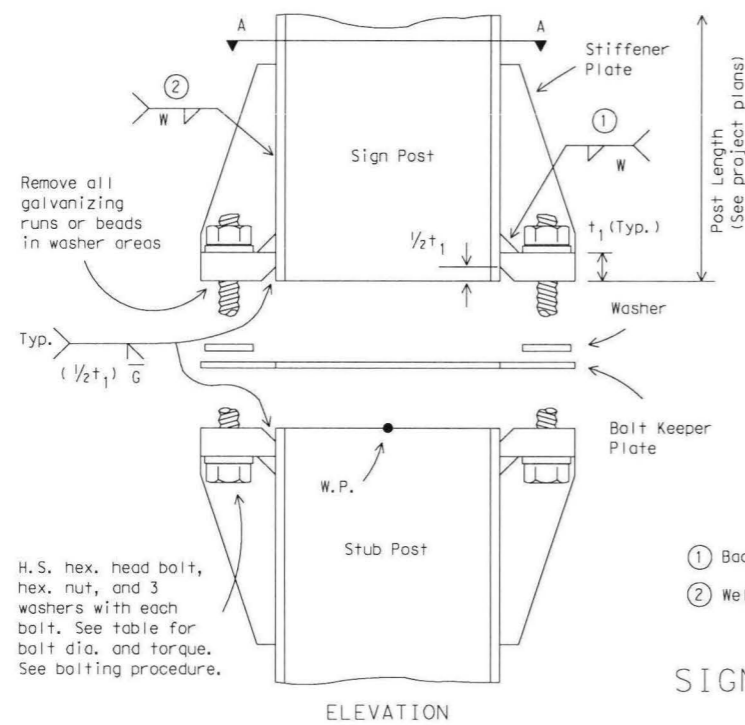
Texas Department of Transportation  
Traffic Operations Division

SIGN MOUNTING DETAILS-  
EXTRUDED ALUMINUM  
SIGN PANELS & HARDWARE  
SMD(2-1)-08

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
		DIST	COUNTY	SHEET NO.	
			FBC	182	

DATE:  
FILE:

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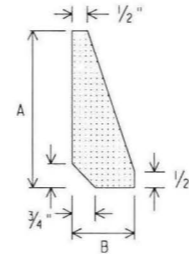


- ① Back up weld to be made before installing stiffener plate
- ② Weld W may be continued across clips to seal joint

SIGN POST AND STUB POST  
(For W Shapes)

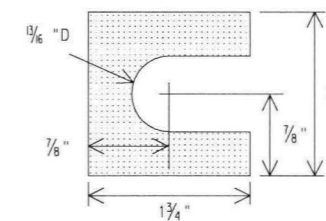
STIFFENER PLATE  
DETAIL

Steel Plate (thickness =  $t_2$ )  
(See table for dimensions)



FOUNDATION DETAIL

\*Note: For signs with electrical apparatus, see ED(10) for conduit required in foundation.



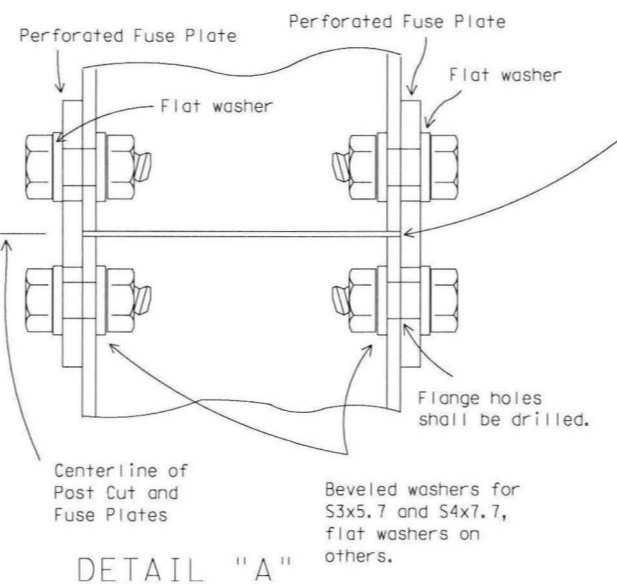
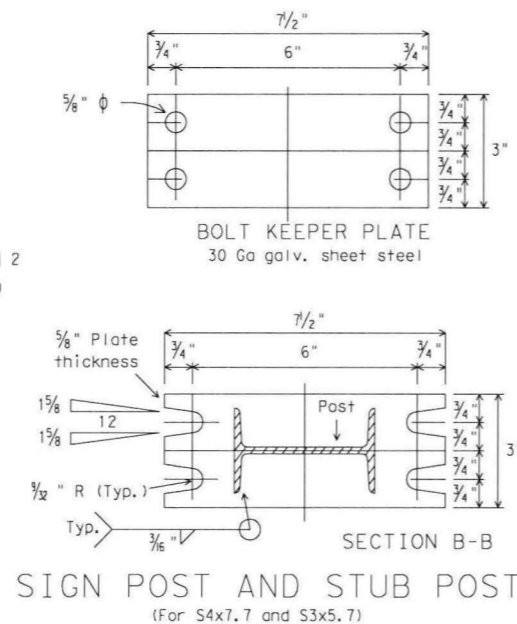
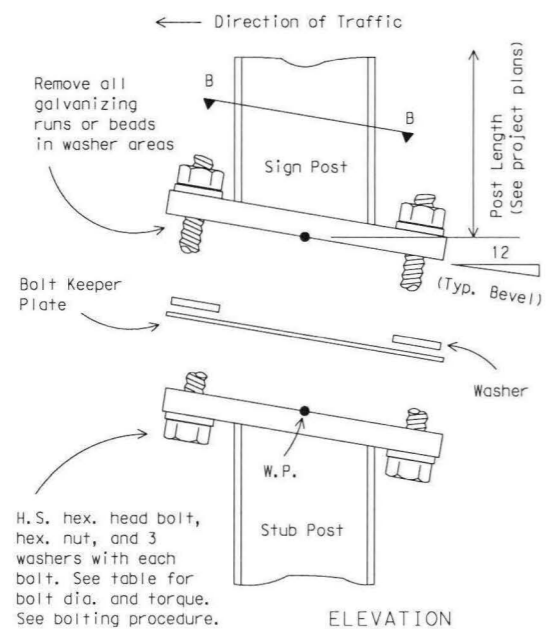
SHIM DETAIL

Furnish two .012" thick and two .032" thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.

BOLTING PROCEDURE FOR ASSEMBLY OF BASE CONNECTION:

1. Assemble sign post, BOLT KEEPER PLATE and stub post with bolts and three flat washers per bolt as shown.
2. Shim as required to plumb post.
3. Tighten all bolts the maximum possible with a 12 to 15 inch wrench to clean bolt threads and to bed washers and shims.
4. Loosen each bolt in sequence and retighten bolts in a systematic order to the prescribed torque. Do not over-tighten.
5. To prevent nut loosening, burr threads of bolt at junction with nut using a center punch.

Dimensions Post Size	Base Connection Data Table										Perforated Fuse Plate Data Table								Bolt Keeper Data			Foundation Data							
	Bolt Size & Torque	A	B	C	D	E	$t_1$	$t_2$	W	R	F	G	J	K	M	$d_1$	$d_2$	$t_3$	Bolt Dia. (eq.) (lbs.)	Bolt length	P	S	U	Stub length	Stub projection	Dr. Shaft diameter	Bar V Size		
W6x9	$\frac{5}{8}$ " $\phi$ x $2\frac{3}{4}$ "										$4\frac{1}{4}$ "	2"	4"	$2\frac{1}{4}$ "	1"	$\frac{9}{16}$ "	$\frac{3}{4}$ "	$\frac{1}{4}$ "	$\frac{1}{2}$ "	1.01	$1\frac{1}{2}$ "	$8\frac{3}{8}$ "		$9\frac{7}{8}$ "	2'-0"	3"		#5	
W6x12	440-450 inch pounds 36-38 foot pounds	5"	2"	$1\frac{1}{4}$ "	$2\frac{3}{4}$ "	$1\frac{1}{8}$ "	$\frac{3}{4}$ "	$\frac{1}{2}$ "	$\frac{1}{4}$ "	$\frac{11}{32}$ "	5"	$2\frac{1}{2}$ "	6"	$3\frac{1}{2}$ "	$1\frac{1}{2}$ "	$\frac{11}{16}$ "	$1\frac{1}{4}$ "	$\frac{3}{8}$ "	$\frac{5}{8}$ "	2.51	$2\frac{1}{4}$ "	$8\frac{1}{2}$ "	1"	10"	2'-0"	3"		#5	
W6x15											5"	$2\frac{1}{2}$ "	5"	$2\frac{3}{4}$ "	$1\frac{1}{4}$ "	$\frac{11}{16}$ "	$1\frac{1}{16}$ "	$\frac{3}{8}$ "	$\frac{5}{8}$ "	2.26	$2\frac{1}{4}$ "	$10\frac{5}{8}$ "		10"	2'-6"	3"		#6	
W8x18											5"	$2\frac{1}{2}$ "	$5\frac{1}{4}$ "	$2\frac{3}{4}$ "	$1\frac{1}{4}$ "	$\frac{11}{16}$ "	$1\frac{1}{16}$ "	$\frac{3}{8}$ "	$\frac{5}{8}$ "	2.26	$2\frac{1}{4}$ "	$10\frac{5}{8}$ "		$12\frac{1}{8}$ "	2'-6"	3"		#7	
W8x21	$\frac{3}{4}$ " $\phi$ x $3\frac{1}{2}$ "										$5\frac{1}{2}$ "	$2\frac{1}{2}$ "	$5\frac{1}{4}$ "	$2\frac{3}{4}$ "	$1\frac{1}{4}$ "	$\frac{13}{16}$ "	1"	$\frac{1}{2}$ "	$\frac{3}{4}$ "	3.35	$2\frac{1}{4}$ "	11"		$12\frac{3}{4}$ "	3'-0"	$2\frac{1}{2}$ "		#8	
W10x22											6"	3"	$5\frac{3}{4}$ "	$2\frac{3}{4}$ "	$1\frac{3}{8}$ "	$\frac{13}{16}$ "	$1\frac{1}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	4.03	$2\frac{1}{4}$ "	$12\frac{7}{8}$ "	$1\frac{1}{2}$ "	$14\frac{5}{8}$ "	3'-0"	$2\frac{1}{2}$ "		#9	
W10x26	740-750 inch pounds 62-63 foot pounds	6"	$2\frac{1}{4}$ "	$1\frac{3}{8}$ "	$3\frac{1}{2}$ "	$1\frac{1}{4}$ "	1"	$\frac{3}{4}$ "	$\frac{5}{16}$ "	$\frac{13}{32}$ "	6"	3"	$6\frac{1}{2}$ "	$3\frac{1}{2}$ "	$1\frac{5}{8}$ "	$\frac{13}{16}$ "	$1\frac{1}{2}$ "	$\frac{3}{4}$ "	$\frac{1}{2}$ "	4.47	$2\frac{1}{4}$ "	$13\frac{3}{8}$ "		$14\frac{7}{8}$ "	3'-0"	$2\frac{1}{2}$ "		#10	
W12x26											6"	3"	$6\frac{1}{2}$ "	$3\frac{1}{2}$ "	$1\frac{5}{8}$ "	$\frac{13}{16}$ "	$1\frac{1}{2}$ "	$\frac{3}{4}$ "	$\frac{1}{2}$ "	4.47	$2\frac{1}{4}$ "	15"		$16\frac{3}{4}$ "	3'-0"	$2\frac{1}{2}$ "		#11	
S3x5.7	$\frac{1}{2}$ " $\phi$ x $2\frac{1}{2}$ "	See Detail Below										$3\frac{3}{4}$ "	$1\frac{1}{2}$ "	$2\frac{5}{8}$ "	$1\frac{1}{2}$ "	$\frac{5}{8}$ "	$\frac{9}{16}$ "	$\frac{3}{8}$ "	$\frac{1}{4}$ "	$\frac{1}{2}$ "	0.60	$1\frac{1}{2}$ "	See Detail Below			3'-3 $\frac{1}{2}$ "	$3\frac{1}{2}$ "	12"	Non-reinforced ③
S4x7.7	440-450 inch pounds 36-38 foot pounds	See Detail Below										$3\frac{3}{4}$ "	$1\frac{1}{2}$ "	$2\frac{5}{8}$ "	$1\frac{1}{2}$ "	$\frac{5}{8}$ "	$\frac{9}{16}$ "	$\frac{3}{8}$ "	$\frac{1}{4}$ "	$\frac{1}{2}$ "	0.60	$1\frac{1}{2}$ "	See Detail Below			3'-3 $\frac{1}{2}$ "	$3\frac{1}{2}$ "	12"	Non-reinforced ③



③ Foundation design shall be Type G Mount, see SMD (TY G).

Parts shall be saw cut either before galvanizing and the galvanized cut cleaned of zinc build-up, or saw cut after galvanizing and the cut surface repaired per Item 445, "Galvanizing."

PERFORATED FUSE PLATE DETAIL

Use H.S. hex head bolts, hex head nut and bevel or flat washer (where req'd) under nut. All holes shall be drilled, sub-punched and reamed. All plate cuts shall preferably be saw cuts. However, flame cutting will be permitted provided all edges are ground. Metal projecting beyond the plane of the plate face will not be permitted. Steel fuse plates shall conform to the requirements of ASTM A36. ASTM A572 Grade 50 or ASTM A588 may be substituted for A36 at the option of the fabricator. Mill test reports shall be submitted for Fuse Plates. Steel used shall have an ultimate tensile strength not to exceed 80 KSI. For alternative Fuse Plate contact Traffic Operations Division.



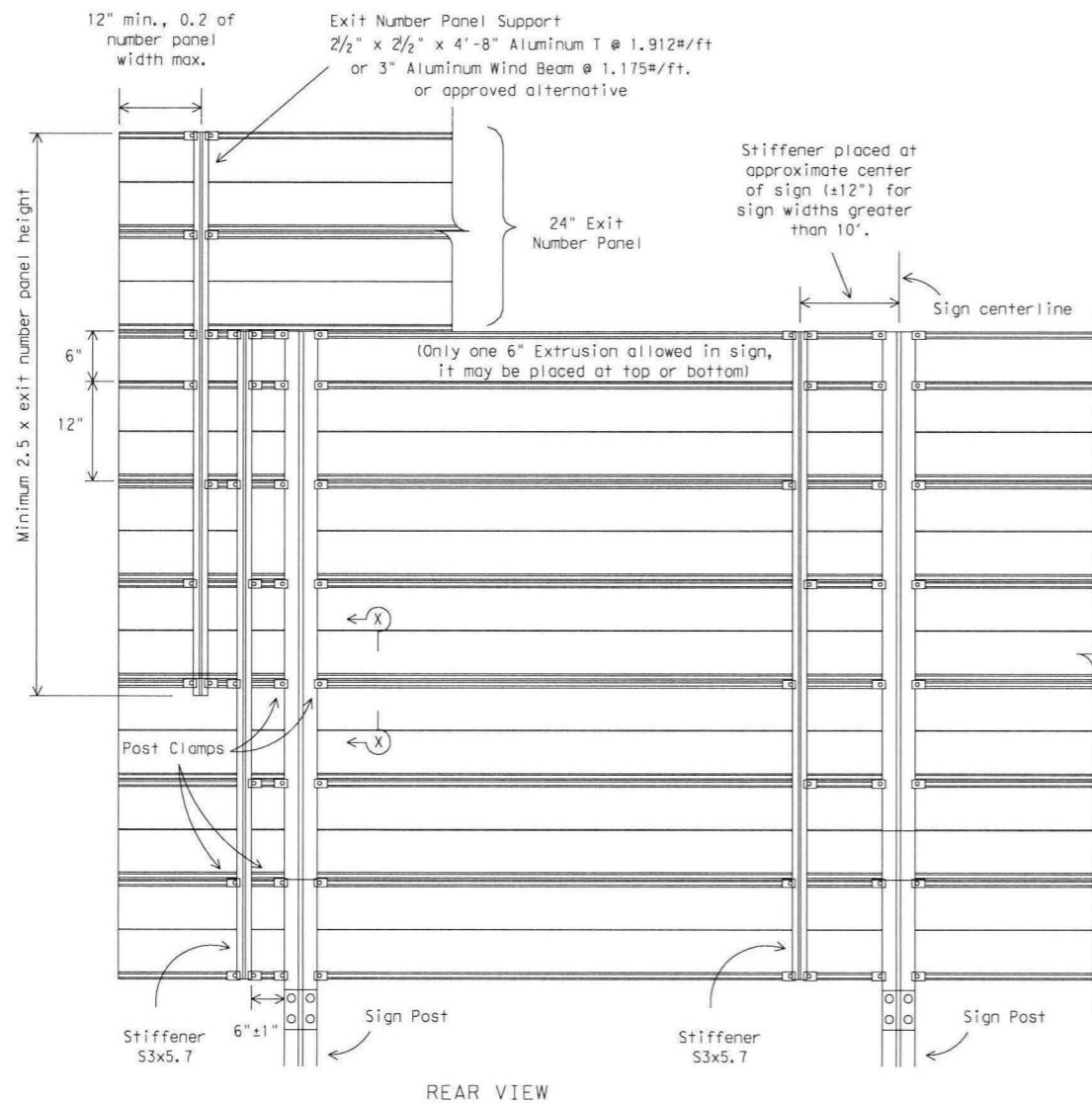
Texas Department of Transportation  
Traffic Operations Division

SIGN MOUNTING DETAILS-  
LARGE ROADSIDE SIGNS  
FOUNDATION & STUB

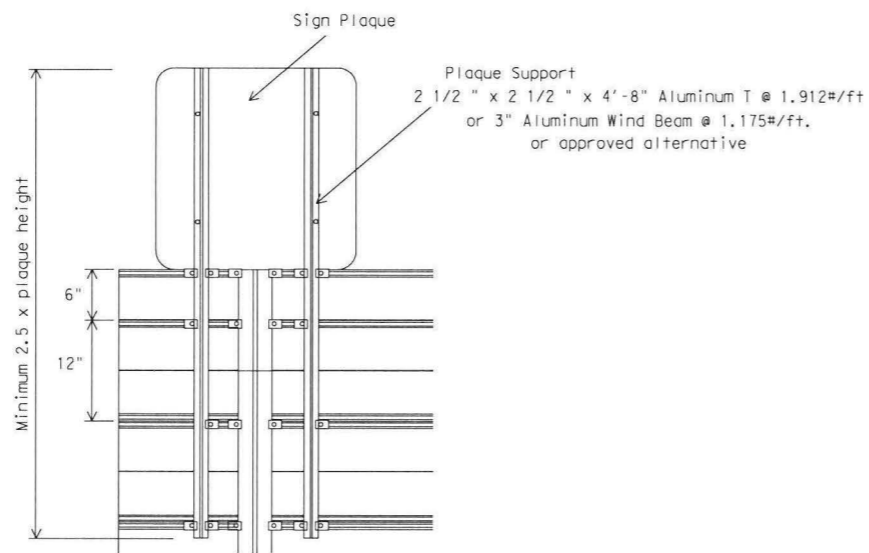
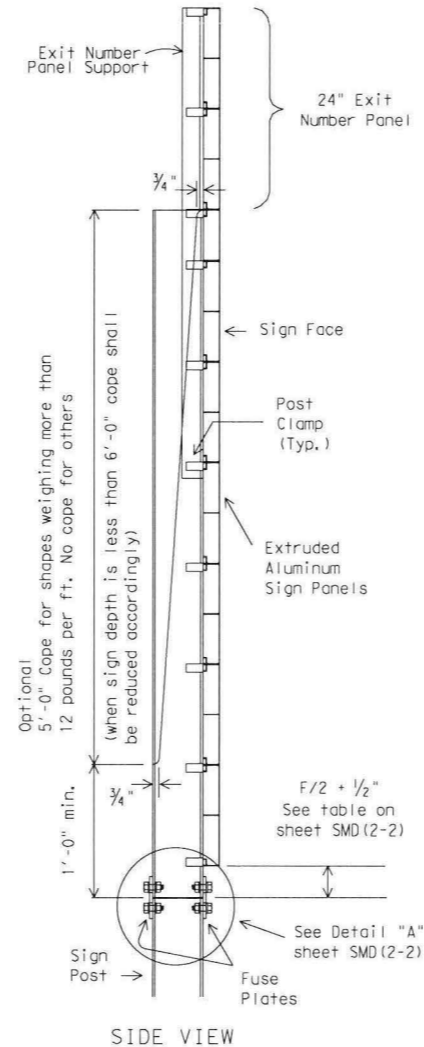
SMD(2-2)-08

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4-98	REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08		DIST		COUNTY	SHEET NO.
				FBC	183

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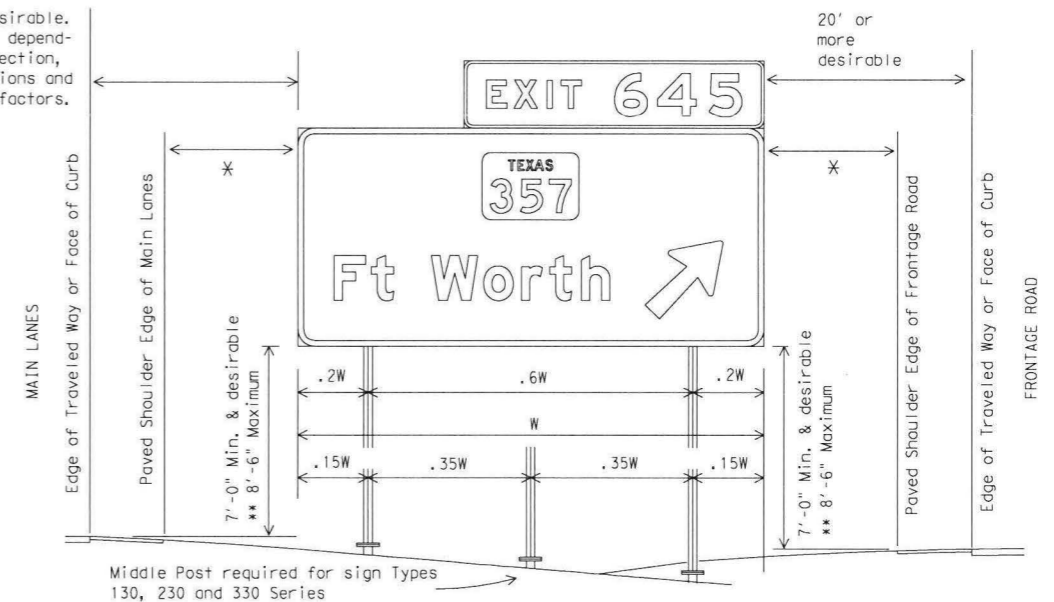


ALUMINUM PARENT SIGN & EXIT NUMBER PANEL MOUNTING DETAILS



SIGN PLAQUE MOUNTING DETAIL TO ALUMINUM PARENT SIGN

30' or more desirable. May be reduced depending on cross section, viewing conditions and other related factors.



TYPICAL SIGN INSTALLATION AND LOCATION

LATERAL CLEARANCE NOTES:

Lateral clearances of signs mounted on median side of main lanes are the same as shown above where space will permit.

Where a sign is to be located behind guardrail, an allowable minimum clearance of five feet may be used, measured from the face of the guardrail to the near edge of sign.

\* - 6' minimum and desirable may be used only in areas of limited lateral clearance and when approved by the Engineer.

POST SPACING NOTES:

Post spacing on a two post sign may vary a maximum of plus or minus 10% of total sign width to fit field conditions.

Post spacing on a three post sign may vary a maximum of plus or minus 5% of total sign width to fit field conditions.

SIGN HEIGHT NOTES:

\*\* The 8' 6" maximum may be exceeded when placing signs on extreme slopes. In these conditions, a 7' minimum from natural ground to bottom of sign must be maintained.

DEPARTMENTAL MATERIAL SPECIFICATIONS

ALUMINUM SIGN BLANKS	DMS-7110
SIGN HARDWARE	DMS-7120

GENERAL NOTES:

- Exit number panel shall be mounted to the right hand side of the parent sign for right exits and to the left hand side for left exits. The number panel shall be mounted with two uprights so its right edge is even with the right edge of the parent sign or vice-versa for left hand exits.
- Exit number panel support shall be symmetrical about number panel centerline.
- Exit number panel support shall be ASTM A36 structural steel galvanized after fabrication, or ASTM B221 aluminum alloy 6061-T6 or approved alternative.
- All bolts, nuts and washers shall be galvanized per ASTM Designation: B695 Class 50, or A153 Class C or D.
- Posts, parent sign panels, and exit number panels shall comply with notes on sheets SMD(2-1) and SMD(2-2).
- Signs (such as exit number panels) attached above a parent sign shall be made of the same type material as the parent sign. General Service and Routing signs may be fabricated from flat sheet aluminum.
- Exit number panel support and other connection hardware required to fasten exit number panel to parent sign shall be subsidiary to "Aluminum Signs" or "Fiberglass Signs."
- For fiberglass sign installation details, see manufacturer's recommendations.



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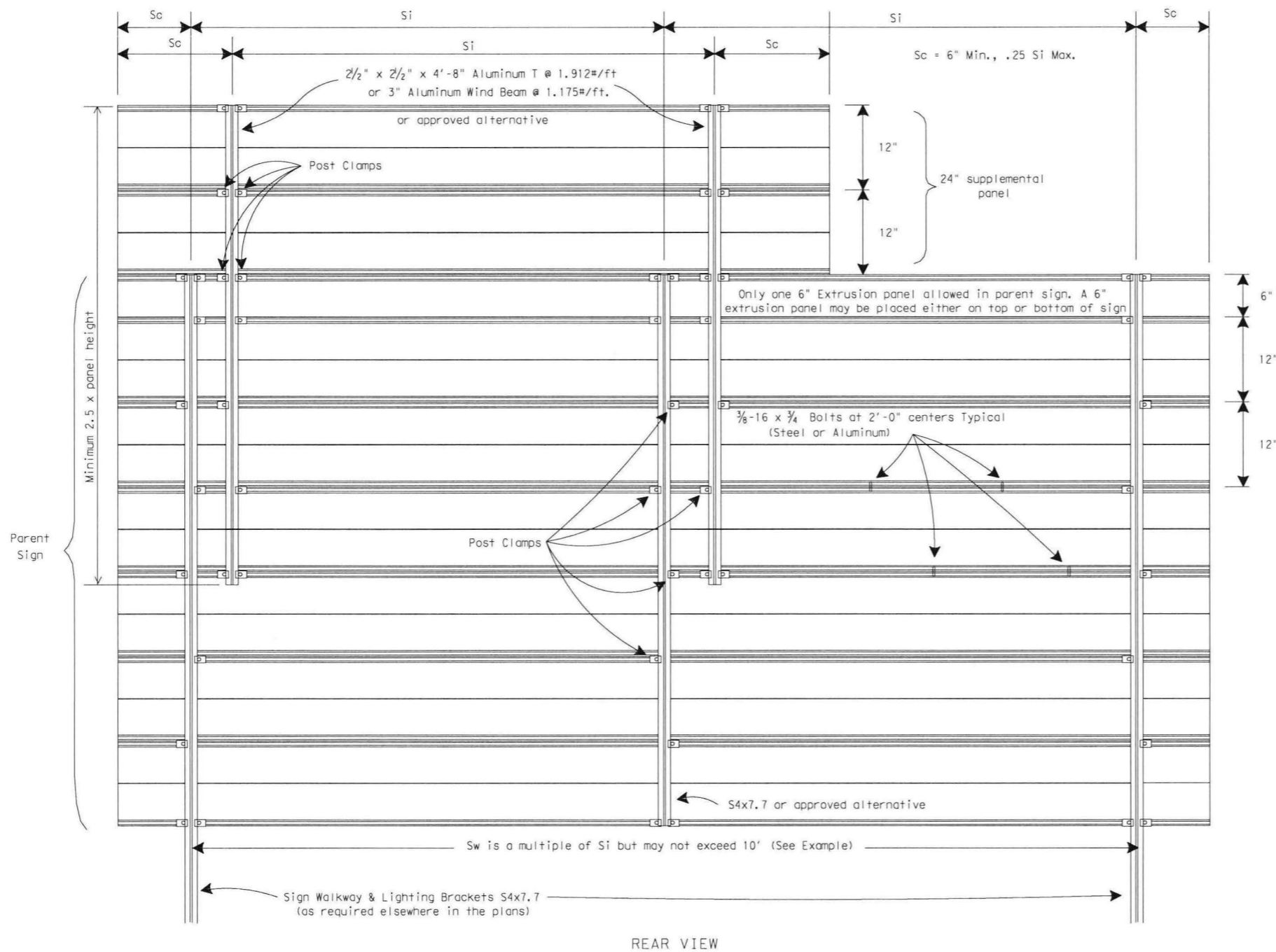
SIGN MOUNTING DETAILS-  
LARGE ROADSIDE SIGNS

SMD(2-3)-08

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9-08	REVISIONS	CONT	SECT	JOB
		DIST	COUNTY	SHEET NO.
			FBC	184

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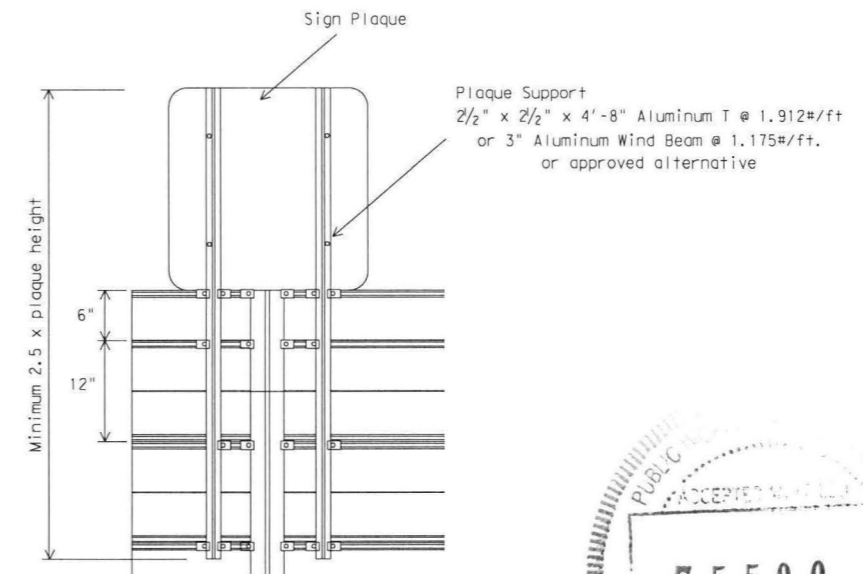
DATE:  
FILE:



EXAMPLES (FOR DETERMINING Si and Sw)

NO.	ZONE	"d"	EXIT PANEL	WALKWAY	Si	Sw	COMMENT
1	1	15.0	YES	YES	4.5	9.0	Sw=2x(Si)
2	2	14.0	YES	NO	7.5	7.5	Sw = Si
3	1	15.0	NO	NO	8.5	8.5	Sw = Si
4	3	14.0	NO	YES	10.0	10.0	Sw = Si

Values shown for Si are maximum values. Si may be varied for different sign lengths and Truss mounting conditions. Sw should not exceed two times Si(Max.) or 10 feet.



"d" Deepest Sign in Group (Ft.)	MAXIMUM SIGN SUPPORT SPACING "Si" (FEET)															
	EXTRUDED ALUMINUM SIGN PANELS															
	WITH EXIT NUMBER PANELS								WITHOUT EXIT NUMBER PANELS							
	WITH WALKWAYS				WITHOUT WALKWAYS				WITH WALKWAYS				WITHOUT WALKWAYS			
WIND ZONE				WIND ZONE				WIND ZONE				WIND ZONE				
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
15	4.5	7	8	10	5	7	8	10	7	8	9	10	8.5	10	10	10
14	6	7.5	9.5	10	6	7.5	9.5	10	8	9	10	10	10	10	10	10
13	7.5	9	10	10	7.5	9	10	10	9	10	10	10	10	10	10	10
12	8.5	10	10	10	8.5	10	10	10	10	10	10	10	10	10	10	10
11 or less	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

For fiberglass sign installations, see manufacturer's recommendations.

Texas Department of Transportation  
Traffic Operations Division

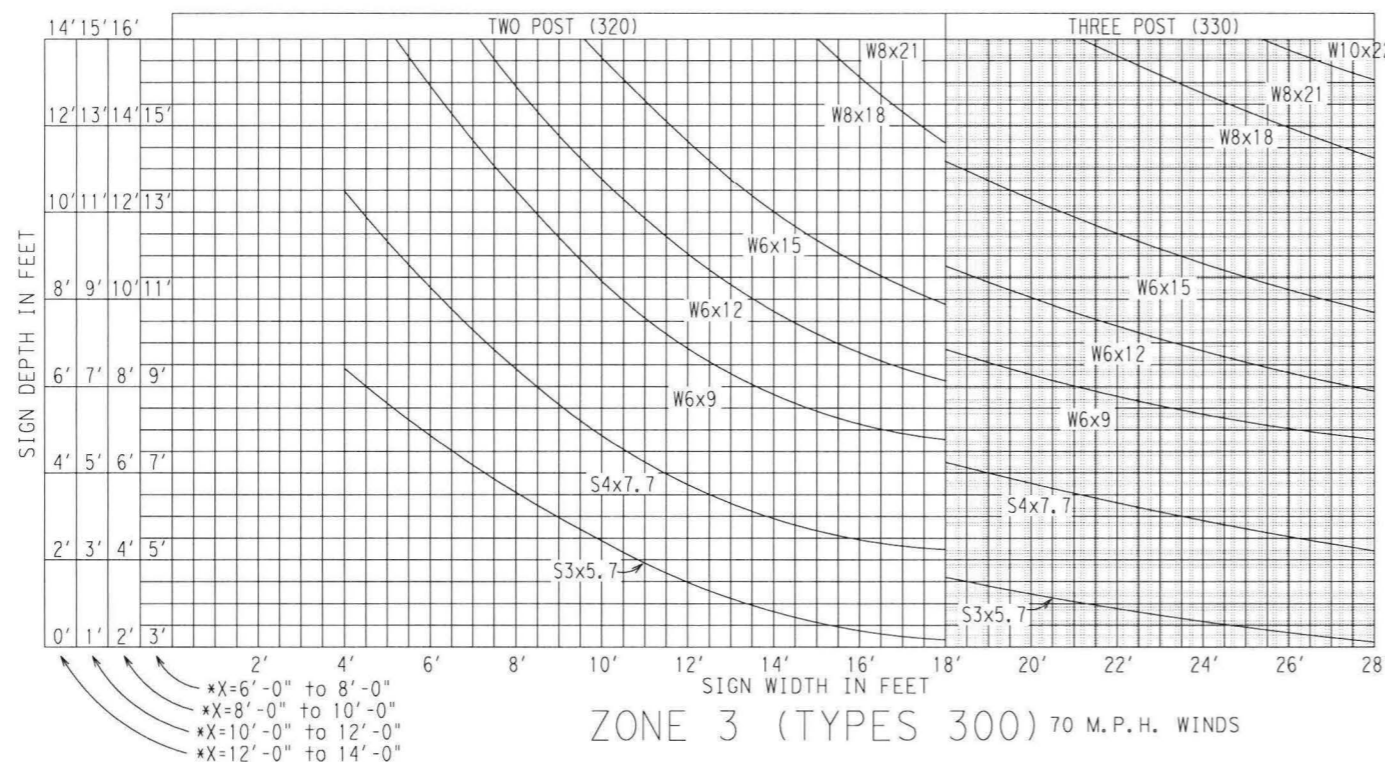
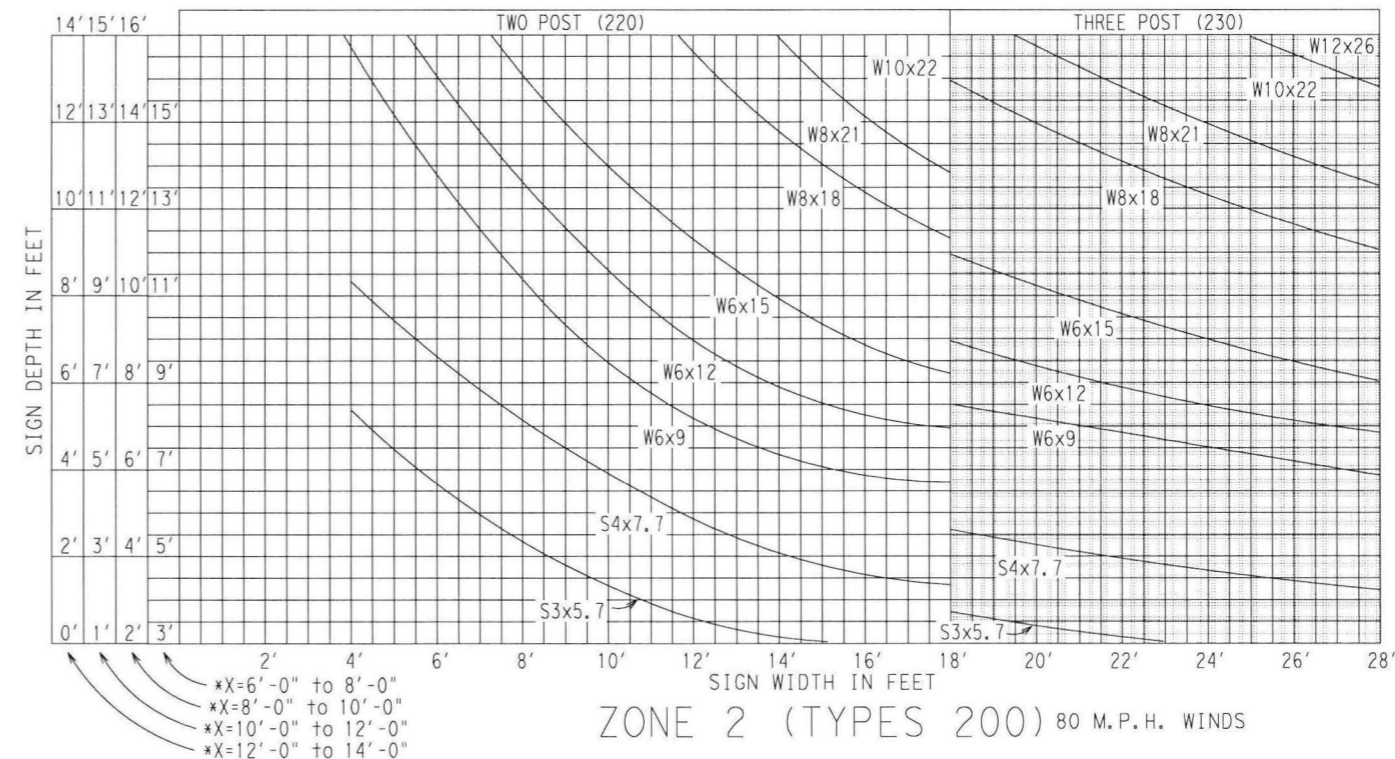
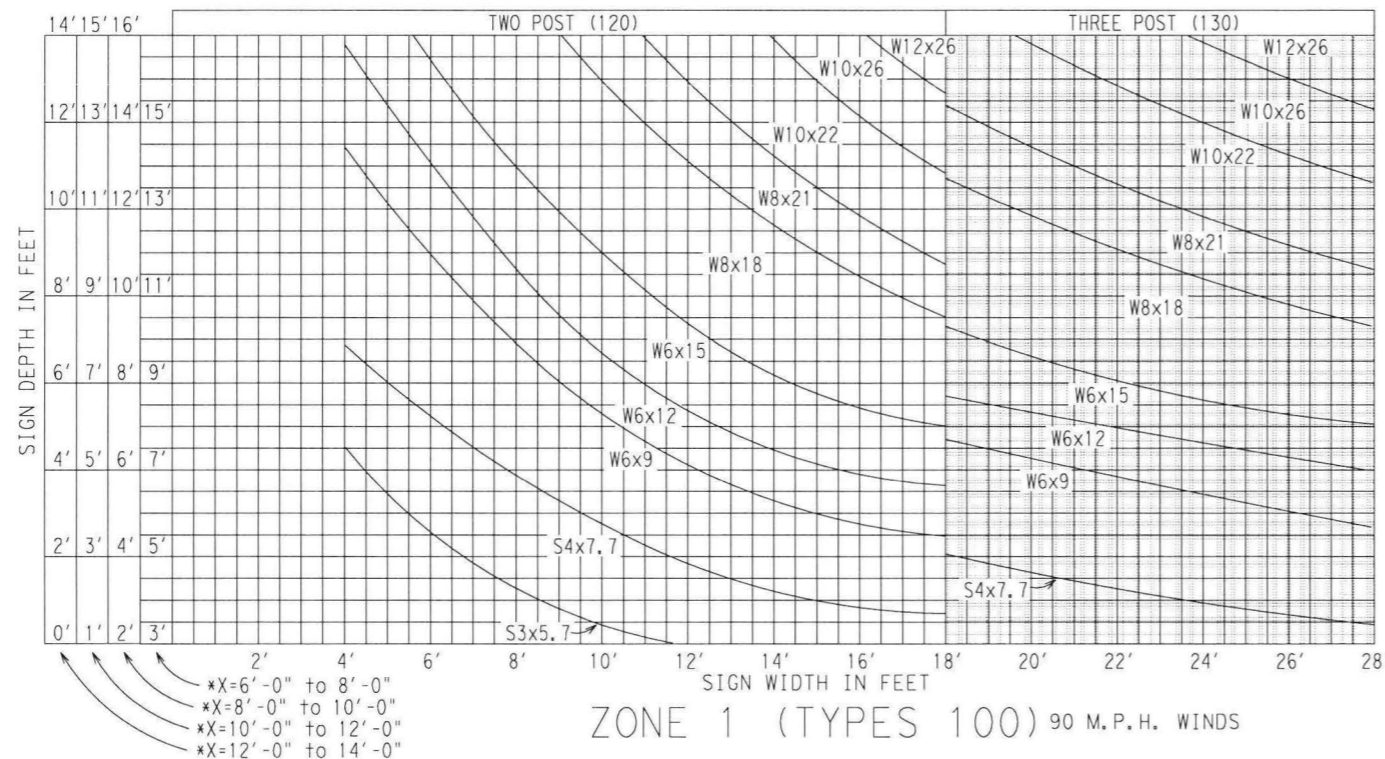
SIGN MOUNTING DETAILS-  
OVERHEAD SIGNS  
EXTRUDED ALUMINUM  
SMD(2-4)-08

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
		DIST	COUNTY	SHEET NO.	
			FBC	185	

27D

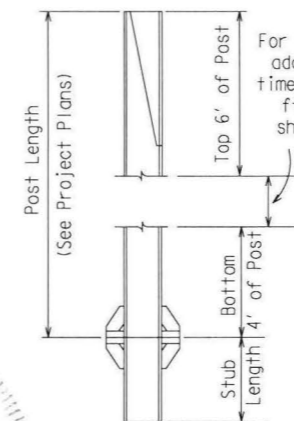
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DATE: FILE:



\* NOTE: "X" EQUALS THE AVERAGE HEIGHT FROM THE GROUND LINE TO THE BOTTOM EDGE OF THE SIGN.

SHADED AREA DENOTES 3 POST SUPPORTS



For total post wt. add this length times post wt. per ft. to weight shown in table

**POST WEIGHT DATA**

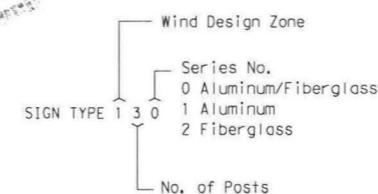
POST SIZE	WEIGHT OF ONE POST (#)	WEIGHT OF TWO POSTS (#)	WEIGHT OF THREE POSTS (#)
W6x9*	123.2	246.4	369.6
W6x12*	160.3	320.6	480.9
W6x15*	167.8	335.6	503.4
W8x18*	201.8	403.6	605.4
W8x21*	254.7	509.4	764.1
W10x22*	266.0	532.0	798.0
W10x26*	308.0	616.0	924.0
W12x26*	308.6	617.2	925.8
S3x5.7*	85.9	171.8	257.7
S4x7.7*	112.2	224.4	336.6

\*LAST FIGURES=POST WT. PER FT.

Weight Data is the weight of items shown for one, two or three posts - (includes top 6' of post, bottom 4' of post, post foundation stub, related base connection plates and stiffeners, friction fuse plate and all high strength bolts, nuts and washers).



**SIGN TYPE**



Note: Footings for S3x5.7 and S4x7.7 post sizes shall be non-reinforced with Class A concrete, while footing for all other post sizes shall be reinforced with Class C concrete.

Texas Department of Transportation  
 Traffic Operations Division

**LARGE ROADSIDE SIGN SUPPORTS  
 POST SELECTION  
 WORKSHEET**

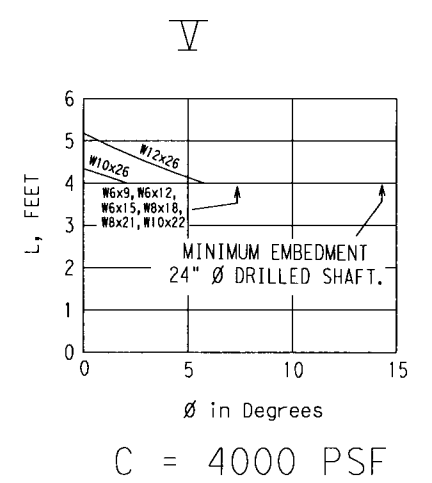
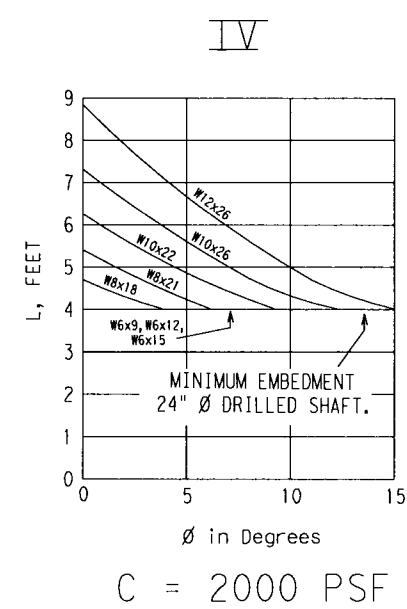
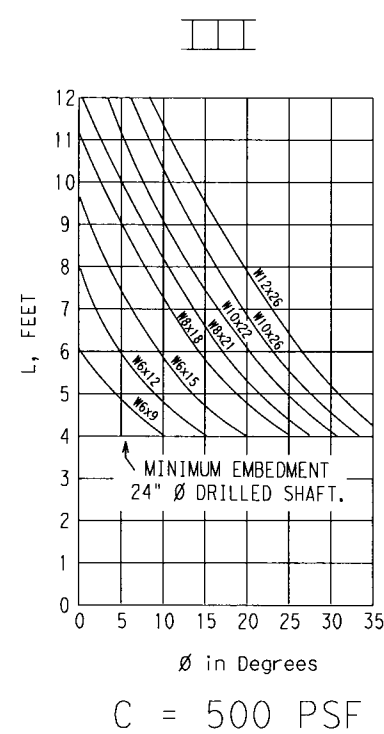
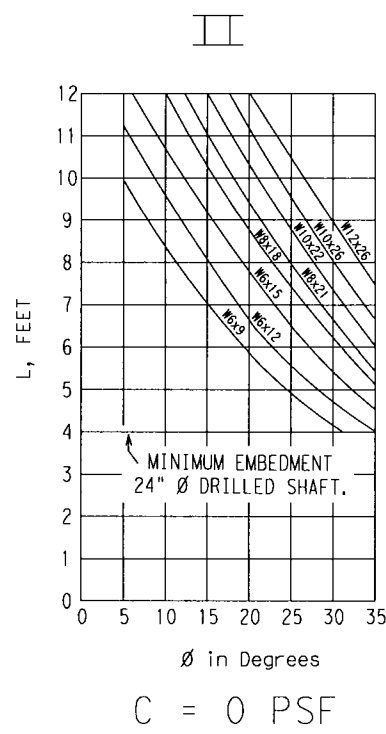
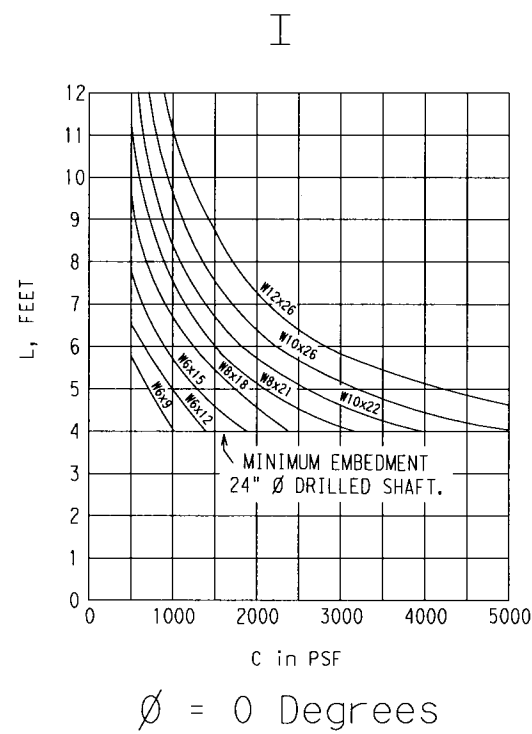
SMD (8W1) -08

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1-82	REVISIONS	CONT	SECT	JOB	HIGHWAY
5-01					FBPTR
9-08		DIST	COUNTY	SHEET NO.	
			FBC		186

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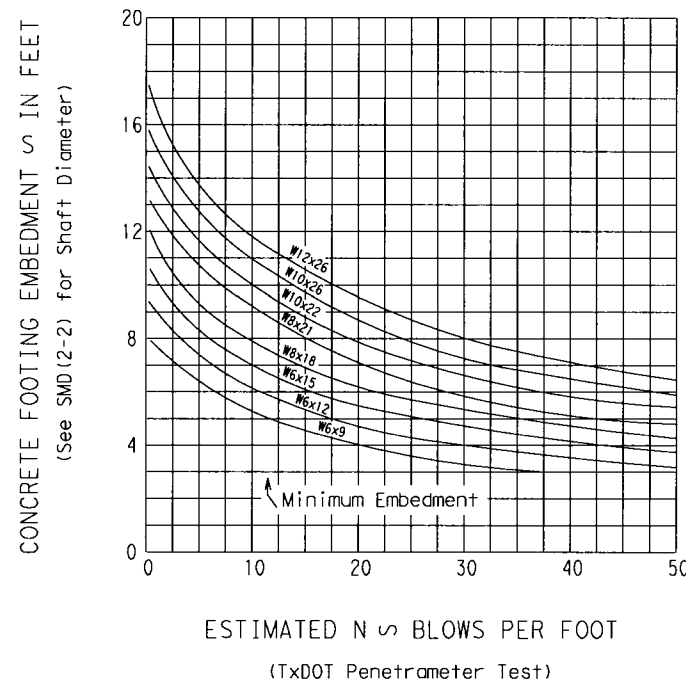
### DRILLED CONCRETE FOOTING DEPTH CHART (COHFRIC DESIGN)

NOTE: THESE CHARTS MAY BE USED AS AN ALTERNATE TO THE CHART BELOW, PROVIDED THAT SOIL COHESION AND INTERNAL FRICTION (COHFRIC) DATA ARE AVAILABLE.

**LEGEND:**

L = Required embedment of concrete drilled shaft, in feet  
 C = Cohesive shear strength of soil, in psf  
 $\phi$  = Angle of internal friction of soil, in degrees

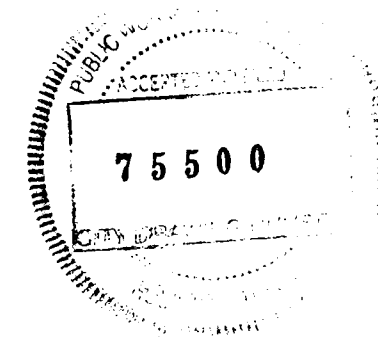
For values of C and  $\phi$  which are intermediate to those on the charts, embedments may be determined by straight-line interpolation.




### DRILLED CONCRETE FOOTING DEPTH CHART (TxDOT PENETROMETER DESIGN)

NOTE: ESTIMATED N SHOULD BE BASED AT APPROXIMATELY THE UPPER ONE-THIRD POINT OF THE DRILLED CONCRETE FOOTING BELOW THE GROUND LINE

Note:  
1. Curves shown on this sheet are applicable for reinforced concrete footings only.




 Texas Department of Transportation  
 Traffic Operations Division

**LARGE ROADSIDE SIGN SUPPORTS  
 FOUNDATION  
 WORKSHEET**  
 SMD (8W2) -08

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5-74	REVISIONS	CONT	SECT	JOB	HIGHWAY
4-78					FBPTR
9-08		DIST	COUNTY	SHEET NO.	
		FBC		<b>187</b>	

298



**SITE DESCRIPTION**

PROJECT LIMITS: SEE TITLE SHEET

PROJECT DESCRIPTION: SEE TITLE SHEET

MAJOR SOIL DISTURBING ACTIVITIES: GRADING, EMBANKMENT, DRAINAGE, RETAINING WALL, AND BRIDGE CONSTRUCTION

TOTAL PROJECT AREA: 19.79 AC

TOTAL AREA TO BE DISTURBED: 5.83 AC

WEIGHTED RUNOFF COEFFICIENT: 0.90  
(AFTER CONSTRUCTION):

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER: EXISTING SOIL CONSISTS PRIMARILY OF CLAY MATERIAL WELL STABILIZED WITH VEGETATION (APPROX. 90%-95%).

NAME OF RECEIVING WATERS: Drainage will flow toward ditch B-1. Ditch B-1 is a tributary of Sims Bayou (Segments 1007A, 1007J, and 1007) which drains into the Houston Ship Channel (Segment 1006), and eventually the Gulf of Mexico.

**EROSION AND SEDIMENT CONTROLS**

**SOIL STABILIZATION PRACTICES:**

- TEMPORARY SEEDING
- PERMANENT PLANTING, SODDING, OR SEEDING
- MULCHING
- SOIL RETENTION BLANKET
- BUFFER ZONES
- PRESERVATION OF NATURAL RESOURCES

OTHER: \_\_\_\_\_

**STRUCTURAL PRACTICES:**

- SILT FENCES
- HAY BALES
- ROCK BERMS
- DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- DIVERSION DIKE AND SWALE COMBINATIONS
- PIPE SLOPE DRAINS
- PAVED FLUMES
- ROCK BEDDING AT CONSTRUCTION EXIT
- TIMBER MATTING AT CONSTRUCTION EXIT
- CHANNEL LINERS
- SEDIMENT TRAPS
- SEDIMENT BASINS
- STORM INLET SEDIMENT TRAP
- STONE OUTLET STRUCTURES
- CURBS AND GUTTERS
- STORM SEWERS
- VELOCITY CONTROL DEVICES
- EROSION CONTROL LOGS

OTHER: \_\_\_\_\_

**NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:**

The order of activities will be as follows:

1. Install structural practices as indicated above in ditches at structure locations.
2. Existing topsoil will be bladed and windrowed.
3. Construction activities begin.
4. Windrowed topsoil will be bladed back onto completed front slope. Then seed all disturbed areas.
5. Removal all temporary controls and reseed any areas disturbed by their removal.

STORM WATER MANAGEMENT: Storm water will be conveyed using storm sewers and roadside ditches to designated outfall channels.

**OTHER EROSION AND SEDIMENT CONTROLS:**

MAINTENANCE: All erosion and sediment controls will be maintained in good working order. If a repair is necessary it will be done at the earliest date possible, but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. The area adjacent to creeks and drainageways shall have priority followed by devices protecting storm sewer inlets.

INSPECTION: All inspections will be performed by a TxDOT inspector per one of the options below as directed by the Area Engineer  
 1. At least every 7 calendar days  
 2. At least every 14 days or after 0.5 inches or more of rainfall  
An inspection and maintenance report should be made for each inspection. Based on the inspection results, the controls shall be revised according to the inspection report.

WASTE MATERIALS: The dumpster used to store all waste material will meet all state and local city solid waste management regulations. All trash and construction debris will be deposited in the dumpster. The dumpster will be emptied as necessary or as required by local regulation and the trash will be hauled to a local dump. No construction waste material will be buried on site.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): In the event of a spill which may be considered hazardous, the Houston District Safety Office shall be contacted immediately at 713-802-5962.

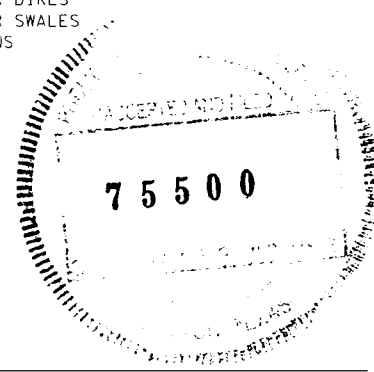
SANITARY WASTE: All Sanitary Waste will be collected from the portable units as necessary or as required by local regulations by a licensed sanitary waste management contractor.

**OFFSITE VEHICLE TRACKING:**

- HAUL ROADS DAMPENED FOR DUST CONTROL
- LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- EXCESS DIRT ON ROAD REMOVED DAILY
- STABILIZED CONSTRUCTION ENTRANCE

OTHER: \_\_\_\_\_

REMARKS: Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the sediment that may enter receiving waterways. Disposal areas shall not be located in any waterway, waterbody or streambed. Construction staging areas and vehicle maintenance areas shall be constructed by the contractor in a manner which minimizes the runoff of all pollutants. All waterways shall be cleared as soon as practical of temporary embankments, temporary bridges, matting, falsework, piling, debris, and other obstructions placed during construction operations that are not part of the finished work.



Texas Department of Transportation  
Houston District

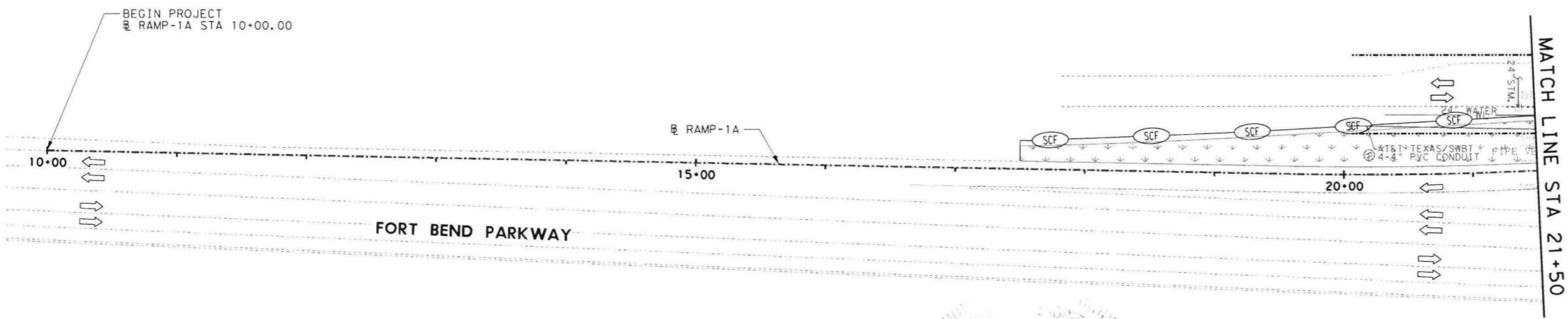
**TxDOT STORM WATER POLLUTION PREVENTION PLAN**

SWP3

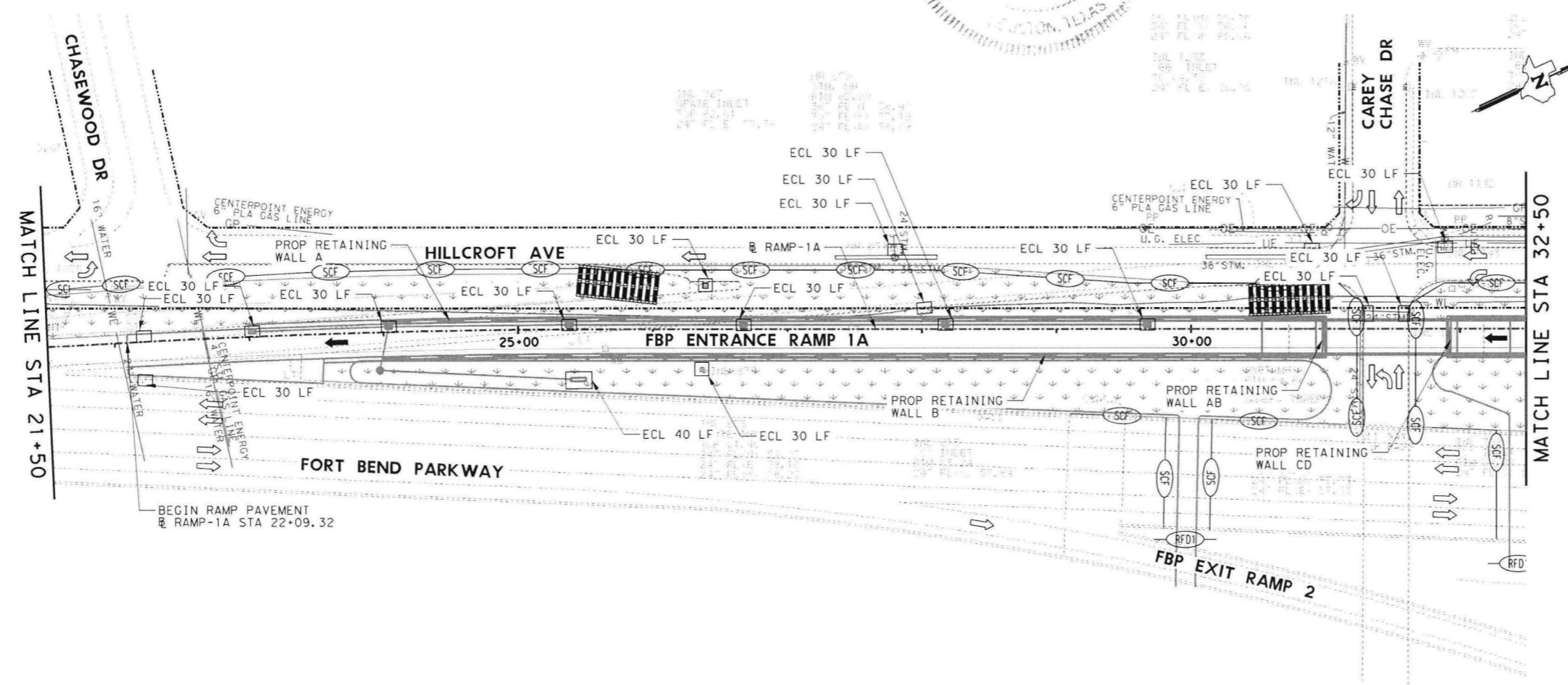
FILE: STDG1.DGN	DN: TxDOT	CR: TxDOT	DR: TxDOT	CK: TxDOT
© TxDOT JANUARY 2007	DIST	FED REC	PROJECT NO.	SHEET
	HOU	5		188
	COUNTY	CONTROL	SECT	JOB
				HIGHWAY

REVISIONS  
 9/2010 INSPECTION NOTE  
 9/2013 INSPECTION NOTE  
 11/2013 SWP TO SWP3  
 03/2015 2014 SPECS

100%  
SUBMITTAL



- LEGEND:**
- SCF SEDIMENT CONTROL FENCE AROUND INLET
  - ECL EROSION CONTROL LOG (INLET PROTECTION)
  - SEDIMENT CONTROL FENCE
  - ROCK FILTER DAM (TY-1)
  - PROP INLET
  - SODDING
  - PROP CONSTRUCTION EXIT (TY 1)



REV.	DATE	BY	DESCRIPTION



**FORT BEND COUNTY TOLL ROAD AUTHORITY**

AIG Technical Services, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

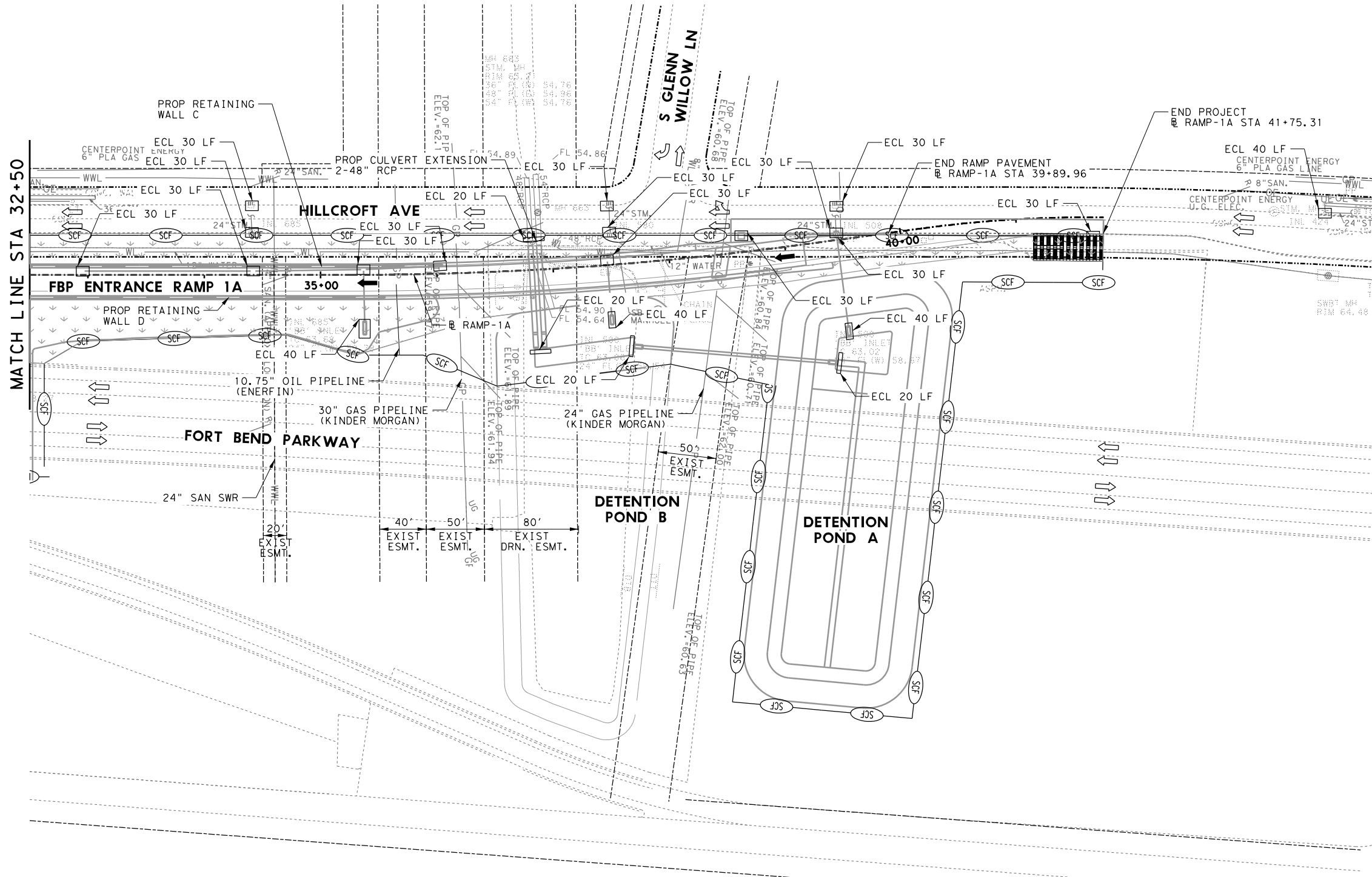
FORT BEND PARKWAY TOLL ROAD  
**ENTRANCE RAMP 1A**  
SW3P PLAN  
BEGIN PROJECT TO STA 32+50

SHEET 1 OF 2			
PROJECT NUMBER	20219x	DATE:	3/15/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		SHEET NO.:	189
CHECKED BY:			

3/15/2023 7:01:20 PM C:\AIG-Projectwise\AIG Technical Services LLC\2106\_FBPkwy\_BWB\_Ramp\07\_CAD\_GIS\02\_Sheets\20219x\_FBC\_AIG\_SW3P\_PL\_11.dgn

**100%**  
SUBMITTAL

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0 25 50 100  
SCALE: 1"=100'

**LEGEND:**

- SCF SEDIMENT CONTROL FENCE AROUND INLET
- ECL EROSION CONTROL LOG (INLET PROTECTION)
- SCF SEDIMENT CONTROL FENCE
- RFD ROCK FILTER DAM (TY-1)
- PROP INLET
- SODDING
- PROP CONSTRUCTION EXIT (TY 1)

REV.	DATE	BY	DESCRIPTION



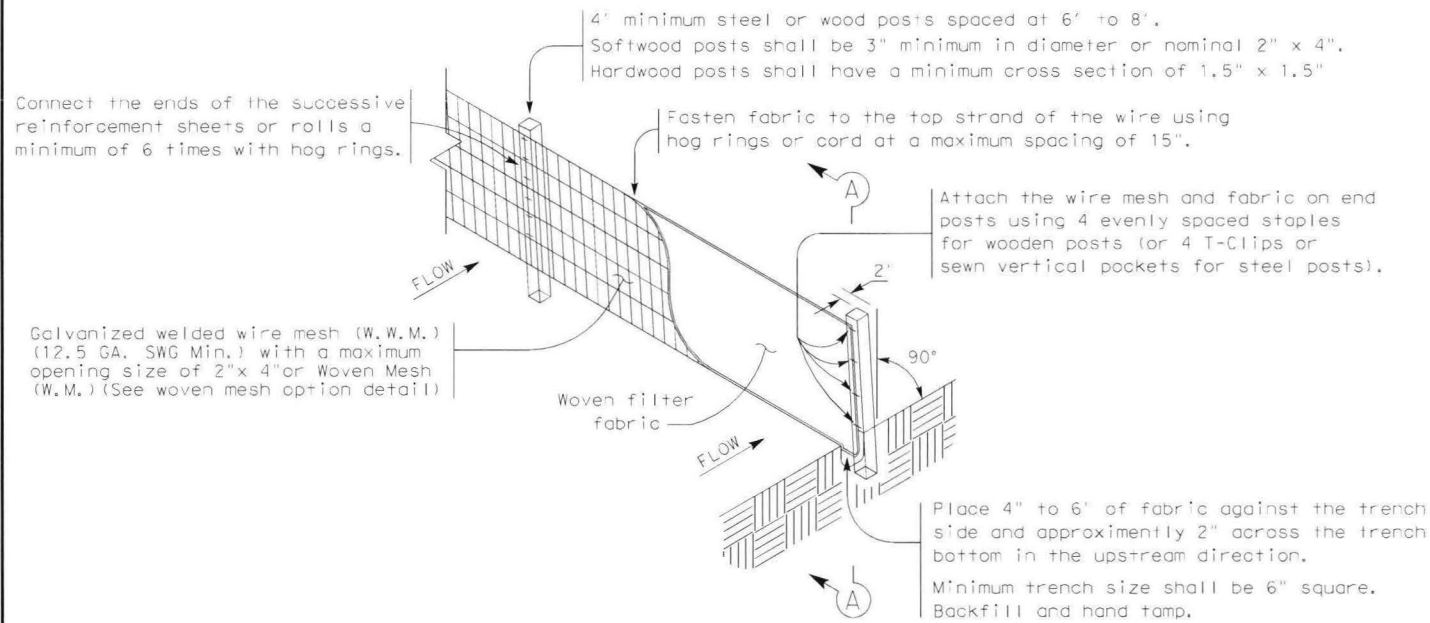
**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

**AIG Tech** Advanced Infrastructure Group  
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

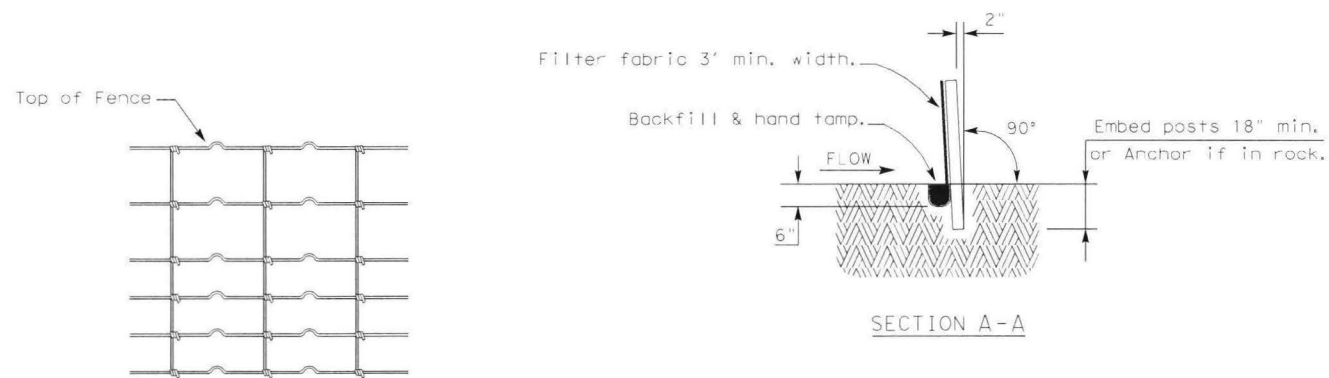
FORT BEND PARKWAY TOLL ROAD  
**ENTRANCE RAMP 1A  
SW3P PLAN  
STA 32+50 TO END PROJECT**

SHEET 2 OF 2			
PROJECT NUMBER	20219x	DATE:	10/10/2023
DESIGNED BY:		SHEET NO.:	190
CHECKED BY:			
DRAWN BY:			
CHECKED BY:			

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TEMPORARY SEDIMENT CONTROL FENCE



HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA. SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

**SEDIMENT CONTROL FENCE USAGE GUIDELINES**

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT<sup>2</sup>. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

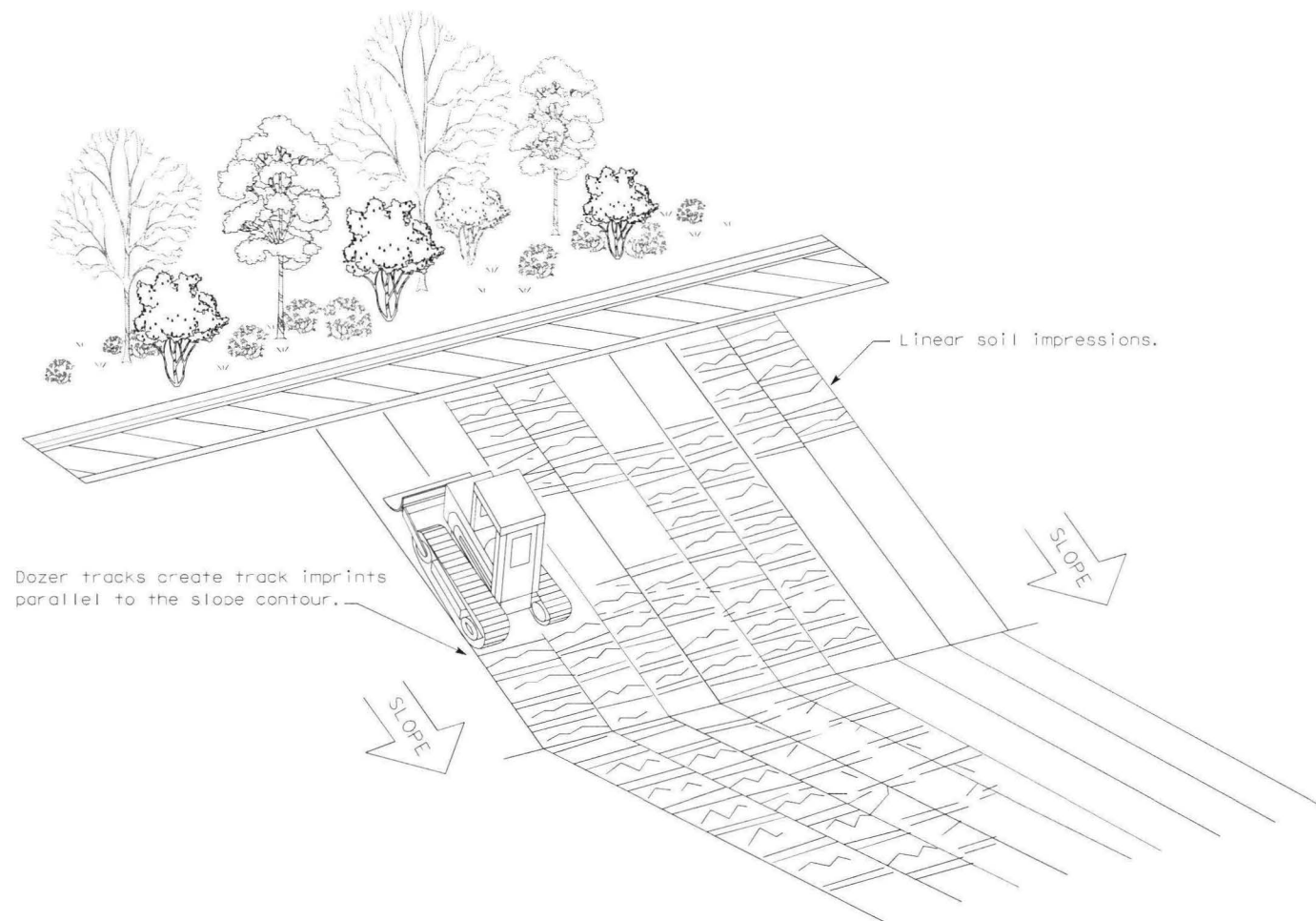
**LEGEND**

Sediment Control Fence

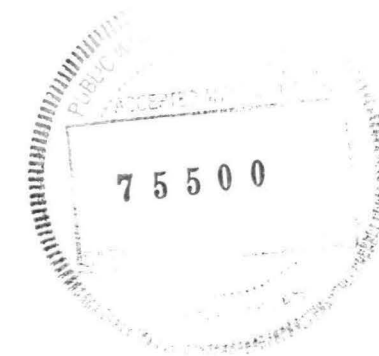


**GENERAL NOTES**

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING



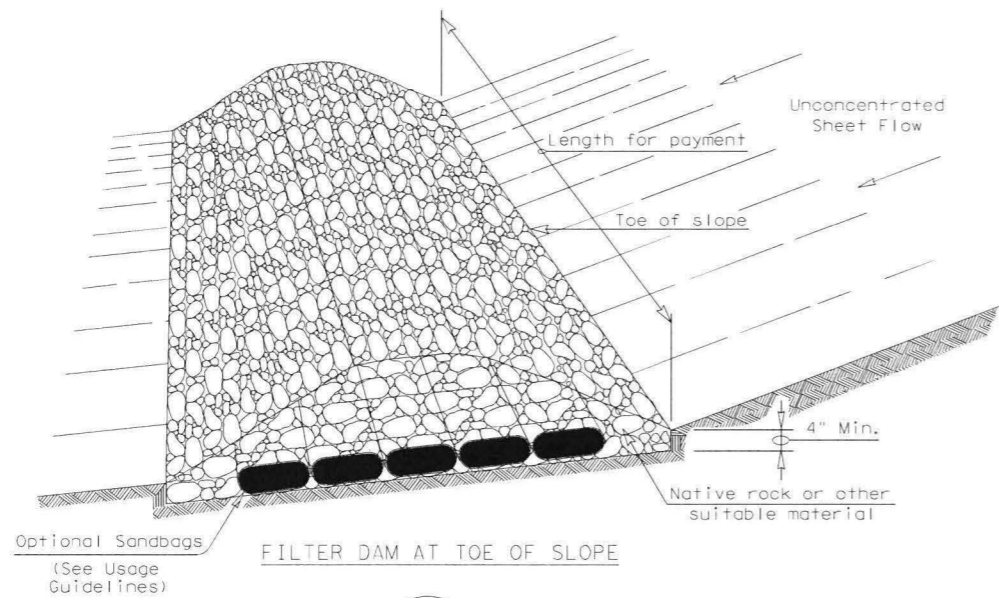
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & VERTICAL TRACKING  
**EC(1)-16**

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO.	
			191	

DATE  
FILE

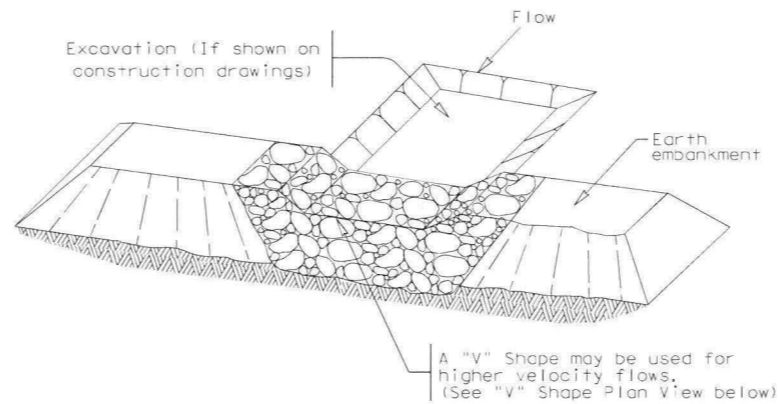
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:  
FILE:



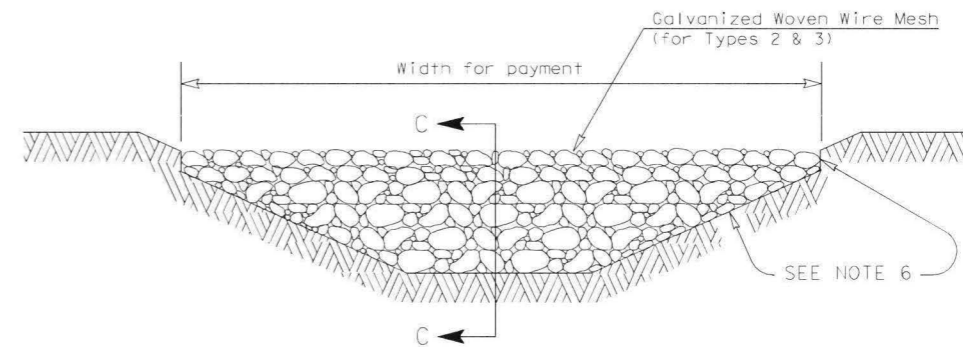
FILTER DAM AT TOE OF SLOPE

(RFD1)



FILTER DAM AT SEDIMENT TRAP

(RFD1) OR (RFD2)

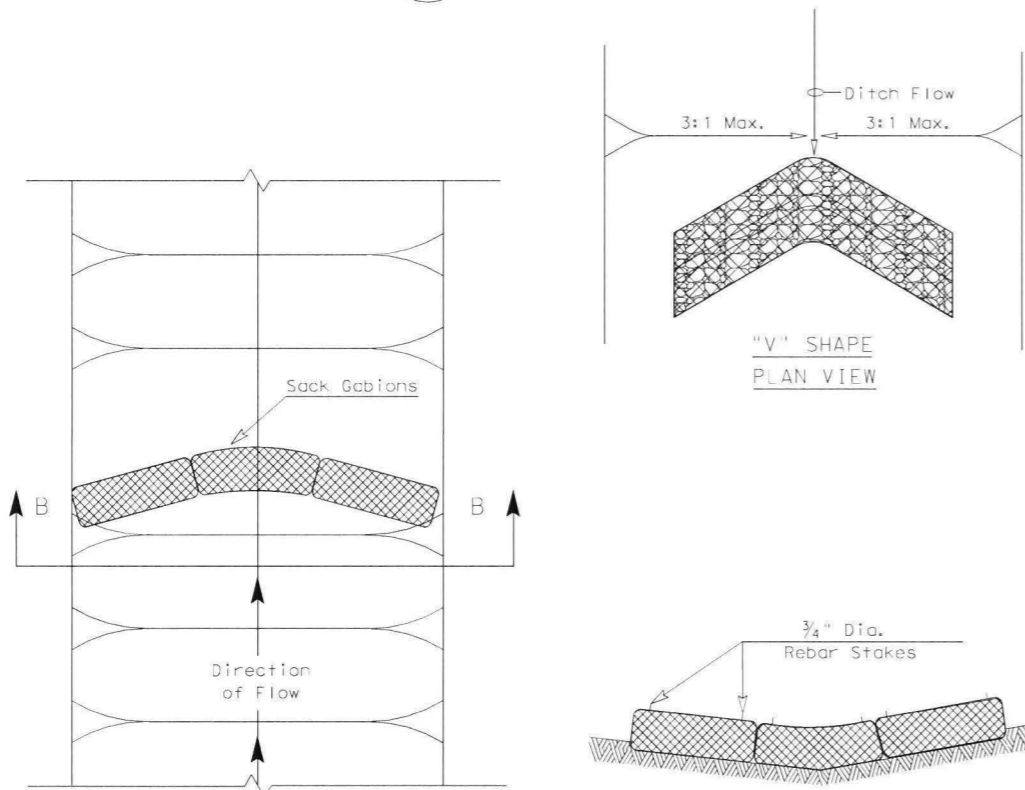


FILTER DAM AT CHANNEL SECTIONS

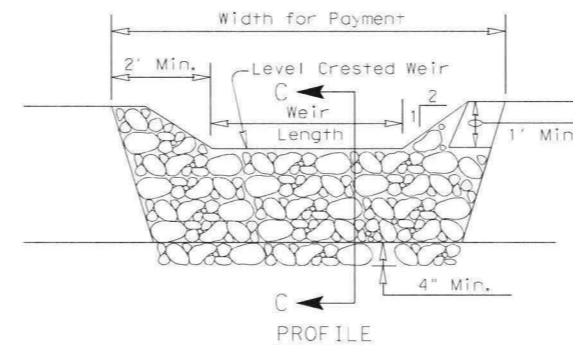
(RFD1) OR (RFD2) OR (RFD3)

GENERAL NOTES

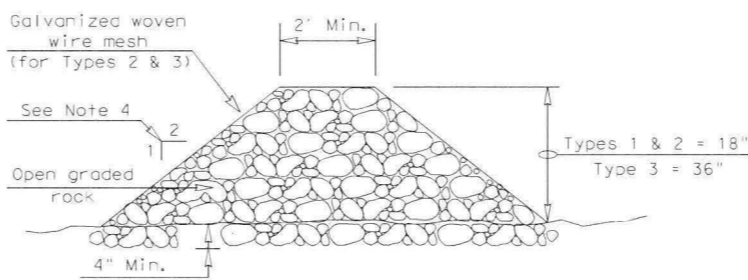
1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall 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.



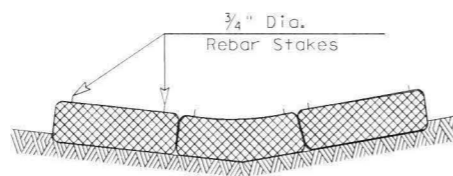
"V" SHAPE PLAN VIEW



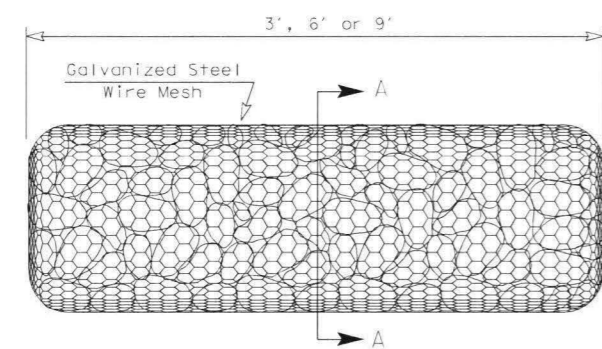
PROFILE



SECTION C-C

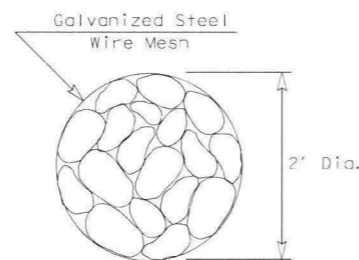


SECTION B-B



TYPE 4 (SACK GABIONS)

(RFD4)



SECTION A-A

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 GPM/FT<sup>2</sup> 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 (approximately 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.

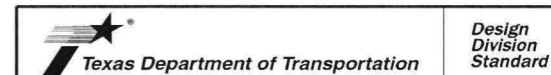
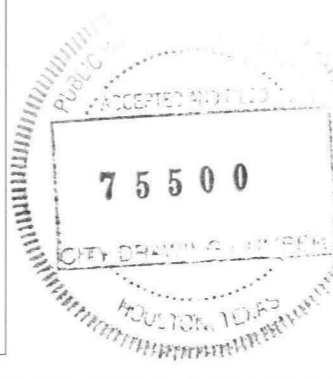
**Type 3** (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

**Type 4** (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

**Type 5:** Provide rock filter dams as shown on plans.

PLAN SHEET LEGEND

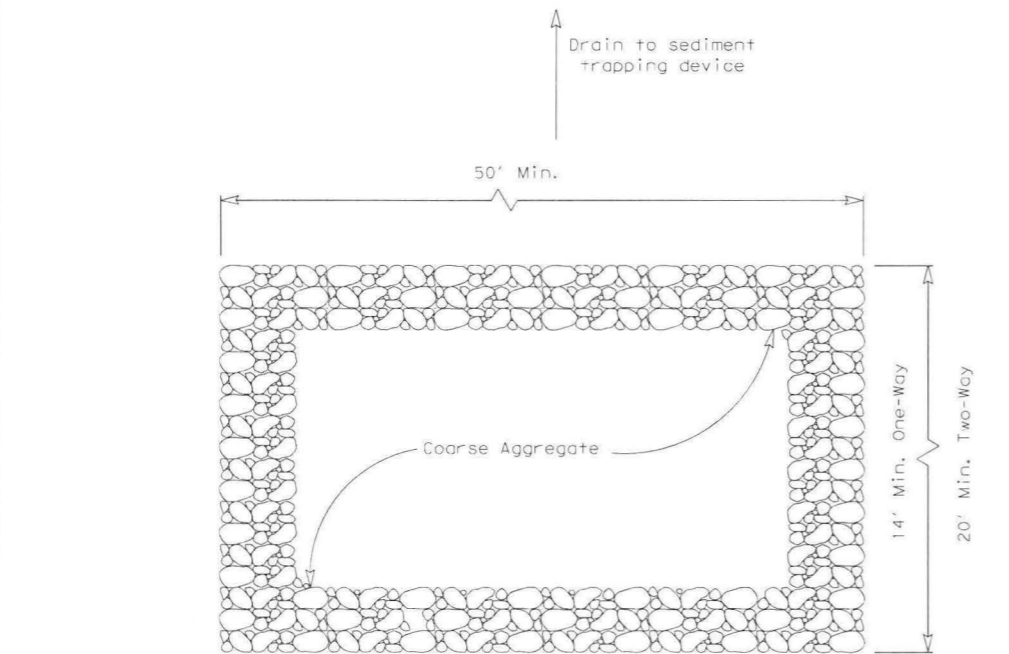
- Type 1 Rock Filter Dam (RFD1)
- Type 2 Rock Filter Dam (RFD2)
- Type 3 Rock Filter Dam (RFD3)
- Type 4 Rock Filter Dam (RFD4)



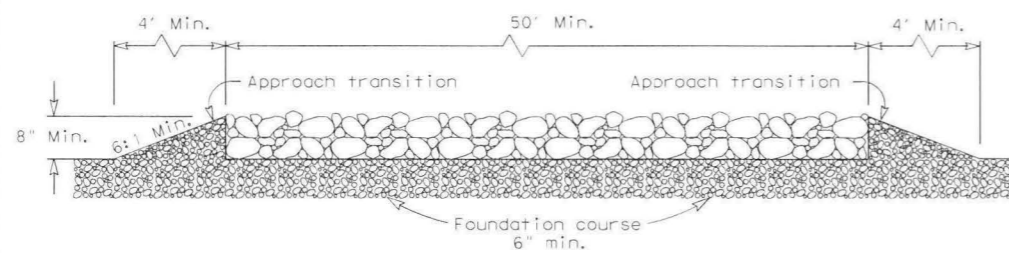
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES  
ROCK FILTER DAMS  
EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DR: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO.	
			192	

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PLAN VIEW

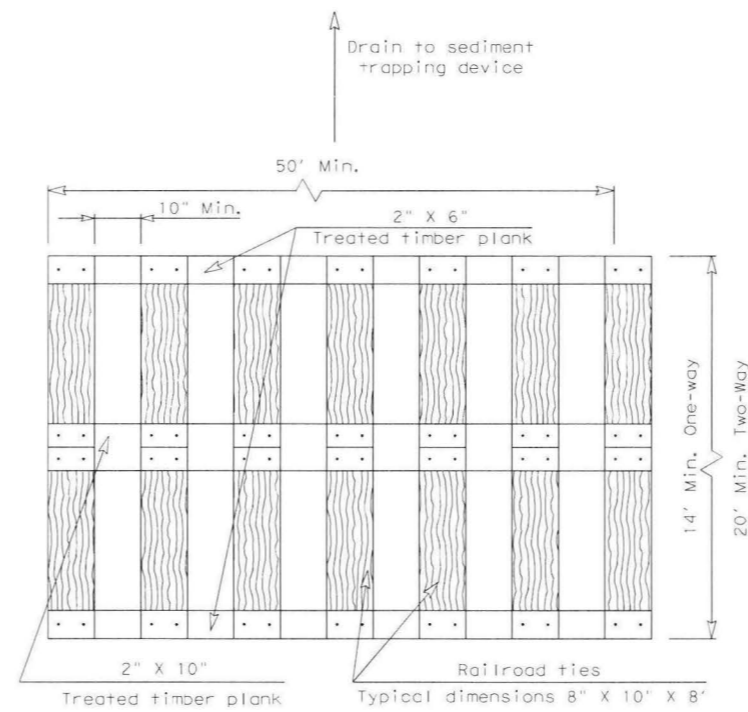


ELEVATION VIEW

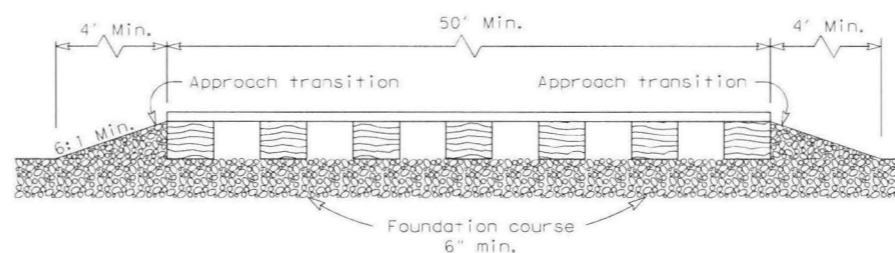
CONSTRUCTION EXIT (TYPE 1)  
ROCK CONSTRUCTION (LONG TERM)

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 materials 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 by the Engineer.
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

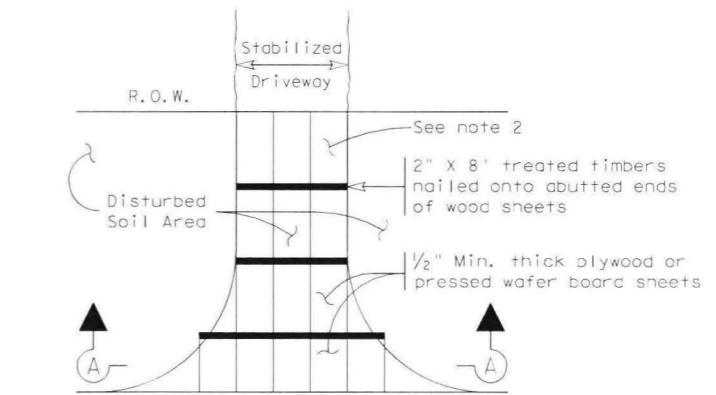


ELEVATION VIEW

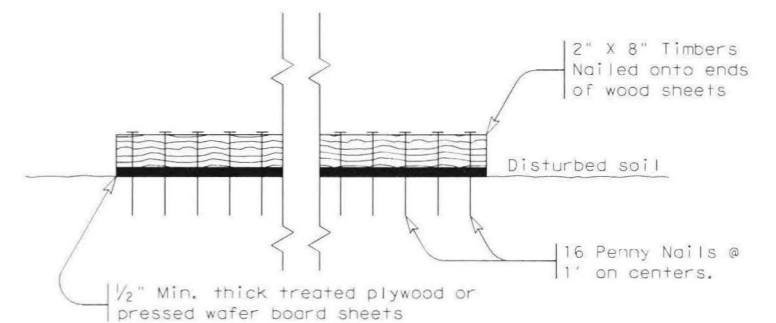
CONSTRUCTION EXIT (TYPE 2)  
TIMBER CONSTRUCTION (LONG TERM)

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'.
2. 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.

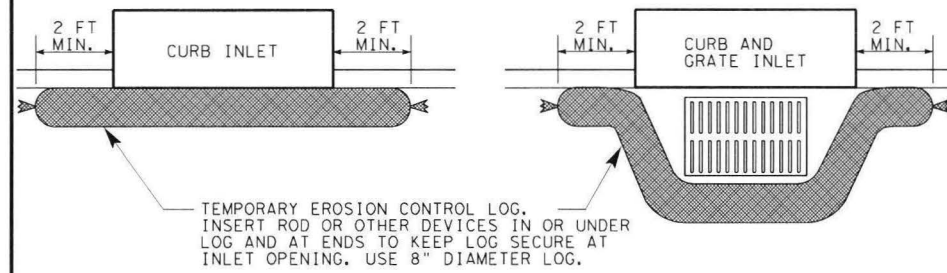


		<b>Design Division Standard</b>	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES CONSTRUCTION EXITS EC(3)-16			
FILE# ec316	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO.
			193

DATE:  
FILE:

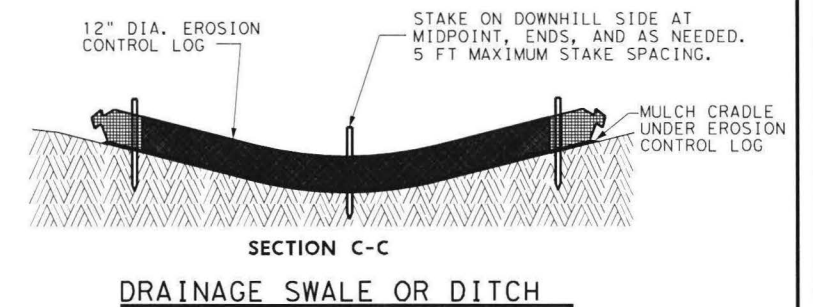
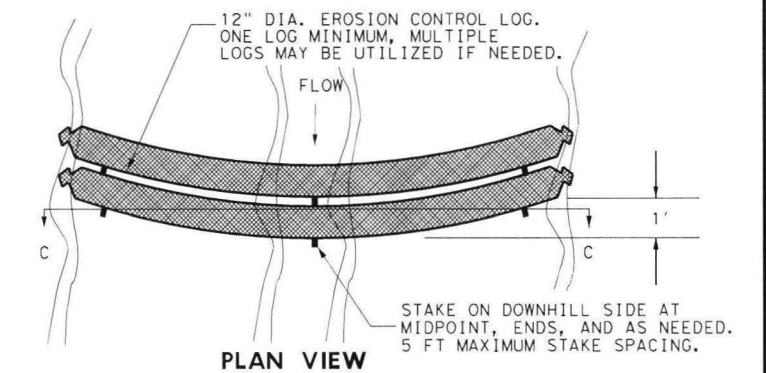
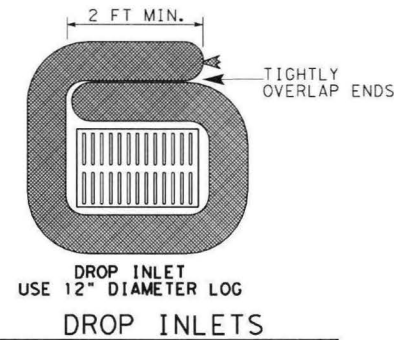
## CURB INLETS 8" DIAMETER LOGS

ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8")



## DROP INLETS AND OTHER LOCATIONS 12" DIAMETER LOGS

ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12")



### MATERIAL REQUIREMENTS

#### FILL:

Use 100% shredded mulch or other non-compost biodegradable material as fill for logs. No compost or fines.

DO NOT USE MATERIAL WHICH PROHIBITS WATER INFILTRATION.

#### LOG MESH:

Use mesh with 1/4" openings or larger. Mesh must allow water infiltration but also hold fill material in place.

### SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment trap (erosion control log) may be used to filter 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).

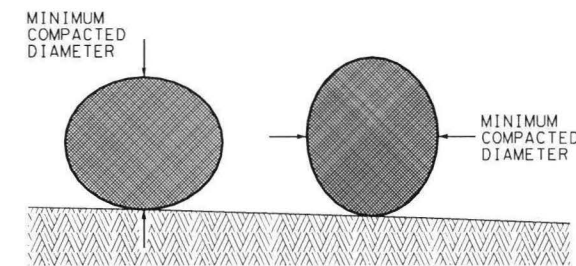
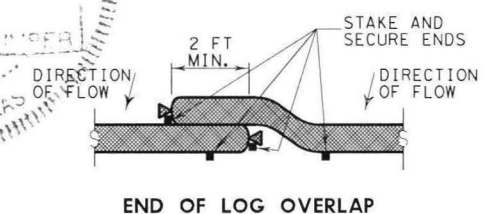
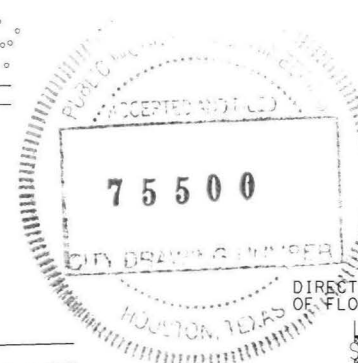
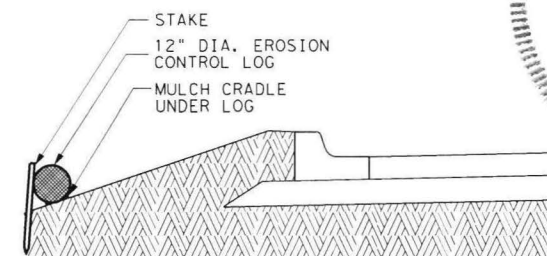
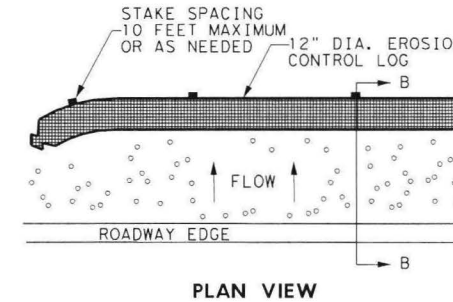
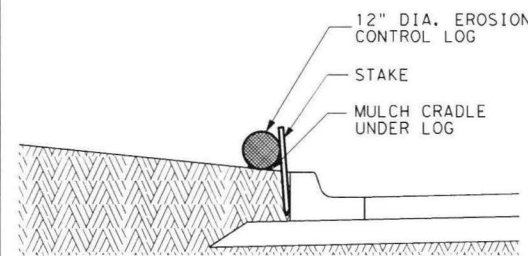
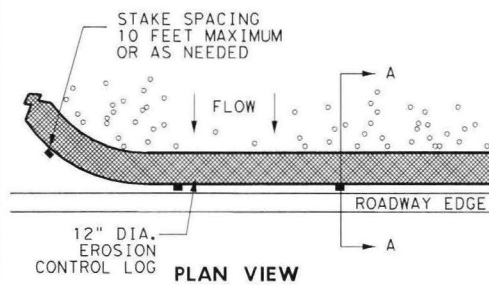
Sediment traps should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way

The trap should be cleaned when the capacity has been reduced by 1/2 or the sediment has accumulated to a depth of 1', whichever is less.

#### REQUIRED ITEMS:

- ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8") LF
- ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12") LF
- ITEM 506-6043 BIODEG EROSN CONT LOGS (REMOVE) LF



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation  
Houston District

## EROSION CONTROL LOG

ECL-12

FILE: SID04a.DGN	DN: TxDot	CK: TxDot	DN: TxDot	CK: TxDot
© TxDOT 2014	DISTRICT	FED REG	PROJECT NUMBER	SHEET
3/15 MINOR CORRECTIONS	HOU	5		194
	COUNTY	CONTROL SECT	JOB	HIGHWAY

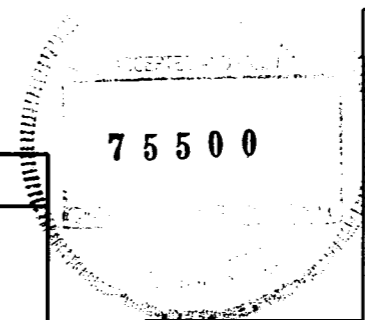
TYPE OF WORK

ITEMS AND REQUIREMENTS FOR EACH TYPE OF WORK

SODDING	PERMANENT SEEDING	TEMPORARY SEEDING	Reference Item 161, 162, 164, 166, 168 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown. Use latest Houston District, Special Provisions for those items indicated.		
	✓		161-6017 COMPOST MANUF TOPSOIL (BIP) (4") SY	APPLICATION RATE Item 161.2.1. Compost Manufactured Topsoil (CMT)	Item 161.2. Materials. Submit quality control (QC) documentation to the Engineer. Compost producer's STA certification must be dated to meet STA requirements (certification must be within 30 or 90 days per STA requirements). Lab analysis performed by an STA-certified lab must be dated within 30 days before delivery of the compost.
✓			162-6002 BLOCK SODDING SY	GRASS SPECIES Item 162.2. Materials. Common Bermuda (Cynodon Dactylon)	Item 162.2.1. Block Sod. Use block palletized or roll type sod. REMOVE PLASTIC BACKING FROM ROLL TYPE SOD. Place sod within 48 hours of delivery to site. No exceptions. Place sod with joints alternating on each row to prevent continuous joint lines. Peg sod as needed with wood pegs to hold sod in place. Pegging sod is subsidiary to Item 162.
	✓		164-6066 DRILL SEEDING (PERM) (WARM OR COOL) SY Item 164.1. Description. Provide and install seeding as shown on District Standard	PLANTING MONTH SEED MIX March, April, May, June, July, August, September, October Hulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre	PLS (Pure Live Seed) Provide documentation of PLS requirements per Item 164.2.1. CONSTRUCTION. Cultivate the area to a depth of 4 inches before placing the seed unless otherwise directed. When performing permanent seeding after an established temporary seeding, cultivate the seedbed to a depth of 4 inches or mow the area before placement of the permanent seed. Plant the seed and place the straw or hay mulch after the area has been completed to lines and grades as shown on the plans.
	✓		164-6052 BROADCAST SEED (PERM) (SPECIAL MIX) SY Item 164.1. Description. Provide and install seeding as shown on District Standard	PLANTING MONTH SEED MIX November, December, January, February Unhulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre Oats (Avena sativa) - 72.0 lbs PLS/acre Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre	Drill Seeding. Plant seed or seed mixture uniformly over the area shown on the plans at a depth of 1/4 to 1/3 inch using a cultipacker (turfgrass) type seeder. Plant seed along the contour of the slopes.
		✓	164-6051 DRILL SEED (TEMP) (WARM OR COOL) SY Item 164.1. Description. Provide and install seeding as shown on District Standard	PLANTING MONTH SEED MIX March, April, May, June, July, August, September, October Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre	Use broadcast seeding method where site conditions prevent drill seeding method.
		✓	164-6009 BROADCAST SEED (TEMP) (WARM) SY Item 164.1. Description. Provide and install seeding as shown on District Standard	PLANTING MONTH SEED MIX November, December, January, February Oats (Avena sativa) - 72.0 lbs PLS/acre	Broadcast Seeding. Distribute the dry seed or dry seed mixture uniformly over the areas shown on the plans using hand or mechanical distribution on top of soil.
	✓	✓	162-6003 STRAW OR HAY MULCH SY	APPLICATION RATE Immediately after planting the seed or seed mixture, apply straw or hay mulch uniformly over the seeded area. Apply straw or hay mulch at 2 tons per acre. Use tacking agent with straw or hay mulch as described on this sheet.	Use straw or hay mulch in conformance with Article 162.2.5, "Mulch." Use biodegradable tacking agents only applied at a rate in accordance with manufacturer's recommendations. Use the following products or an approved equal (see note this sheet): Conweb/Contac Guar Gum, Profile Products Corporation, (307) 655-9565, Ramtec/Procol/Viscol Guar Gum, Ramtec Corporation, (800) 366-1180
✓	✓	✓	166-6001 FERTILIZER AC Item 166.2. Materials. Use fertilizer as shown on District Standard	APPLICATION RATE Deliver and evenly distribute fertilizer at a rate of 4000 lbs/acre.	Use a NON-CHEMICAL fertilizer which meets all the following criteria: (1) BRAND NAME must be registered with the Texas State Chemist as a commercial fertilizer. (2) Meets USEPA guidelines for unrestricted use. (3) Derived from biological sources such as, but not limited to: sewage sludge, manures, vegetation, etc. (4) In granular form and essentially dust free. Submit proof of registration and nutrient source to Engineer. Use the following products or an approved equal (see note this sheet): Sigma, SIGMA AgriScience, 281-851-6749 Sustanite-standard grade, Automation Nation, Inc., 713-675-4999 Milorganite, MMSD, 800-287-9645 Agricultural Organic P/L, Ag Org, INC., 713-523-4396
✓	✓	✓	168-6001 VEGETATIVE WATERING MG	APPLICATION RATE Item 168.3 Construction. 6000 gallons/acre x 20 consecutive working days = 120,000 gallons total/acre per working day	Begin watering immediately after installation of seed or sod. Replace, fertilize, and water any seed or sod in poor condition due to the failure to apply the specified amount of water within the time allowed at no expense to the Department.

SEQUENCE OF WORK

BLOCK SOD	PERMANENT SEEDING	TEMPORARY SEEDING
1. FERTILIZER 2. CULTIVATE SOIL (ITEM 162.3) 3. SOD 4. VEGETATIVE WATERING	1. FERTILIZER 2. COMPOST MANUFACTURED TOPSOIL 3. CULTIVATE SOIL (ITEMS 164.3 AND 161.3.1) 4. PERMANENT SEEDING 5. STRAW OR HAY MULCH 6. VEGETATIVE WATERING	1. FERTILIZER 2. CULTIVATE SOIL (PER ITEM 164.3) 3. TEMPORARY SEEDING 4. STRAW OR HAY MULCH 5. VEGETATIVE WATERING



Texas Department of Transportation  
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HOUSTON DISTRICT

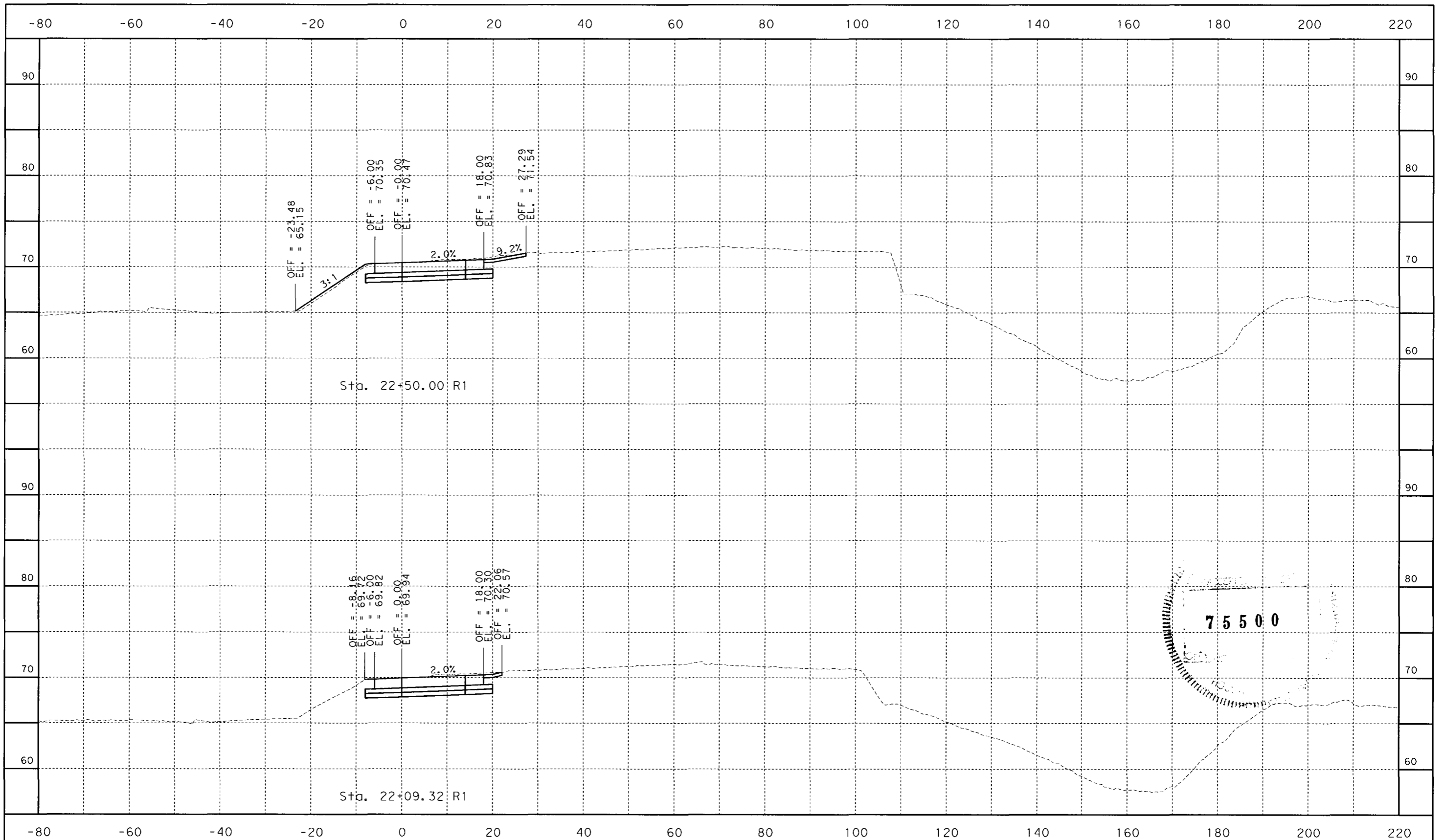
FERTILIZER, SEED, SOD,  
STRAW, COMPOST, AND WATER

SHEET 1 OF 1

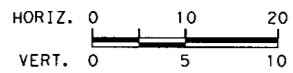
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10/2014 UPDATED TO 2014 SPECIFICATIONS 3/2015 MINOR CORRECTIONS	OCT 2014	TEXAS		
ORIGINAL	DIST	COUNTY	CONTROL	SECT
	12			
				JOB
				HIGHWAY
				195



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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
TOLL ROAD AUTHORITY



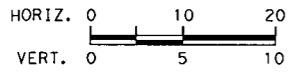
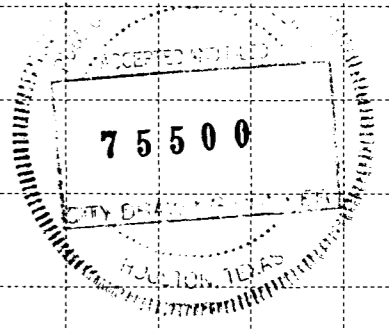
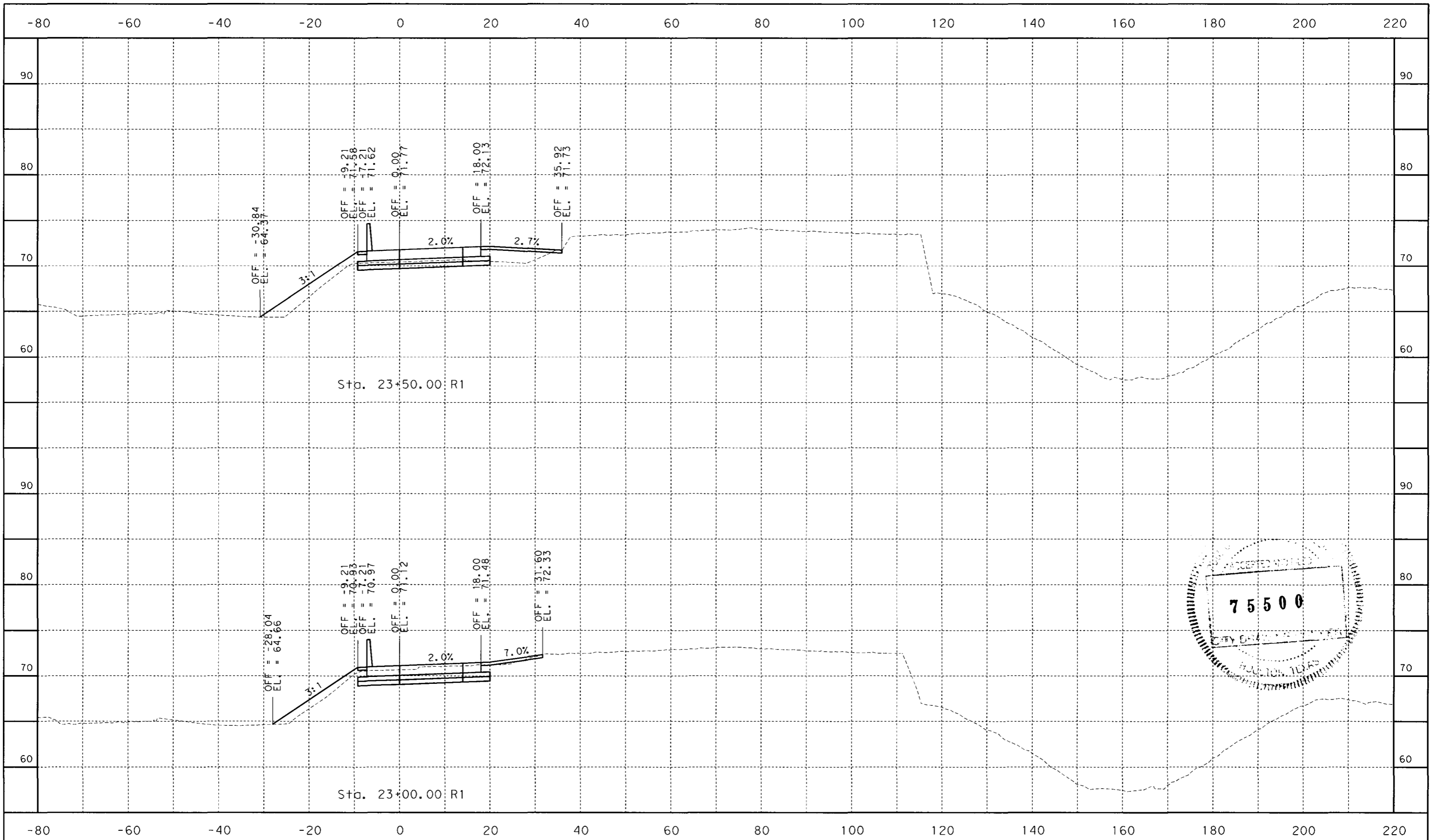
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

PROJECT NUMBER	20219x	DATE:	2/19/2023
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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
TOLL ROAD AUTHORITY

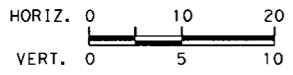
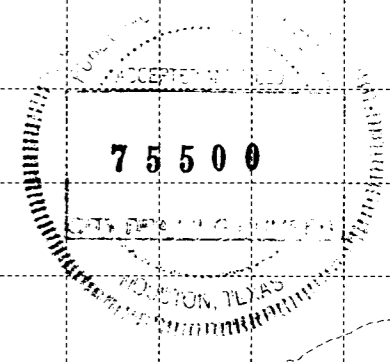
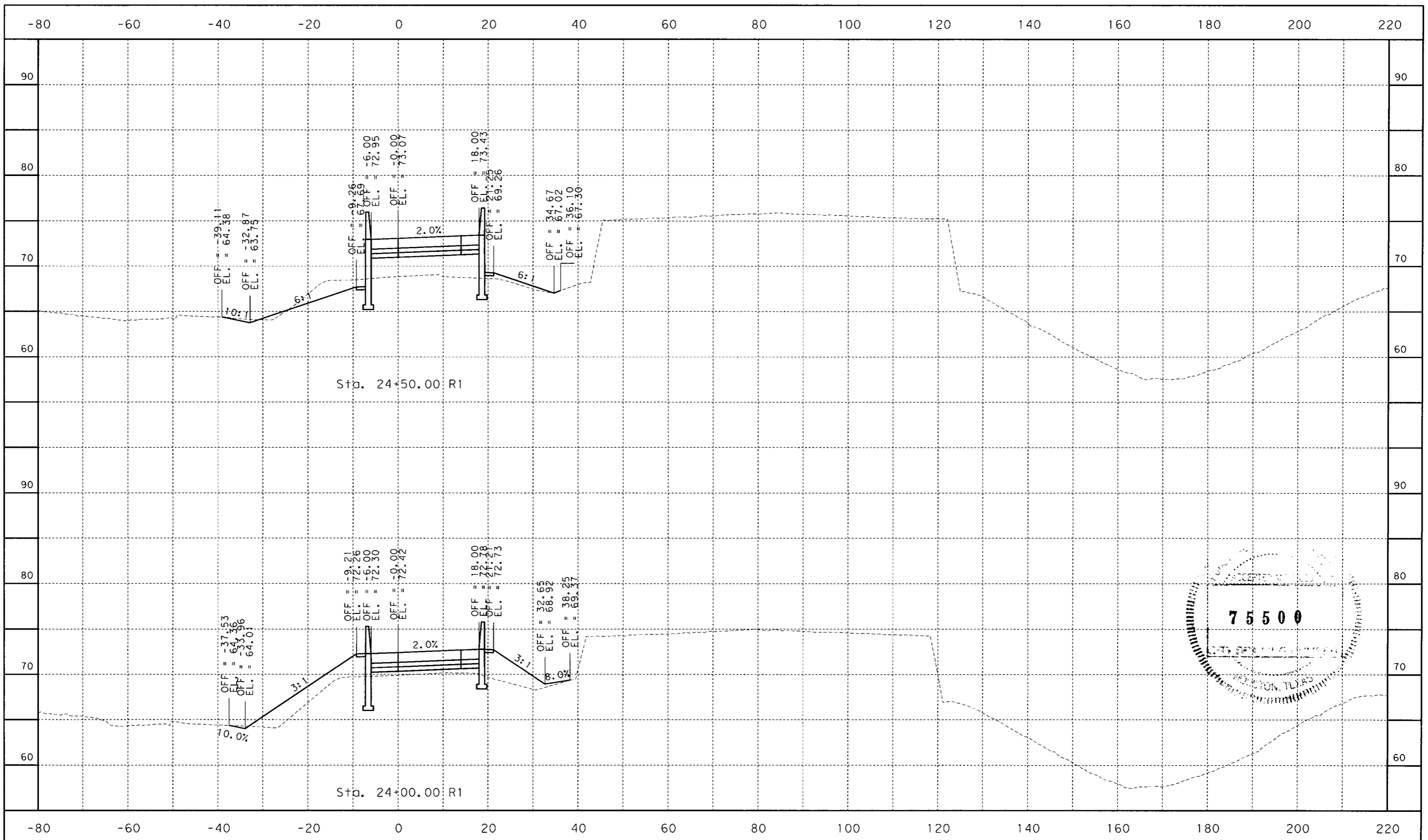


AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
TOLL ROAD AUTHORITY

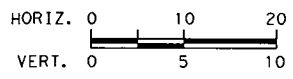
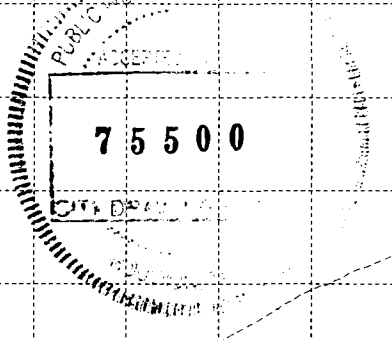
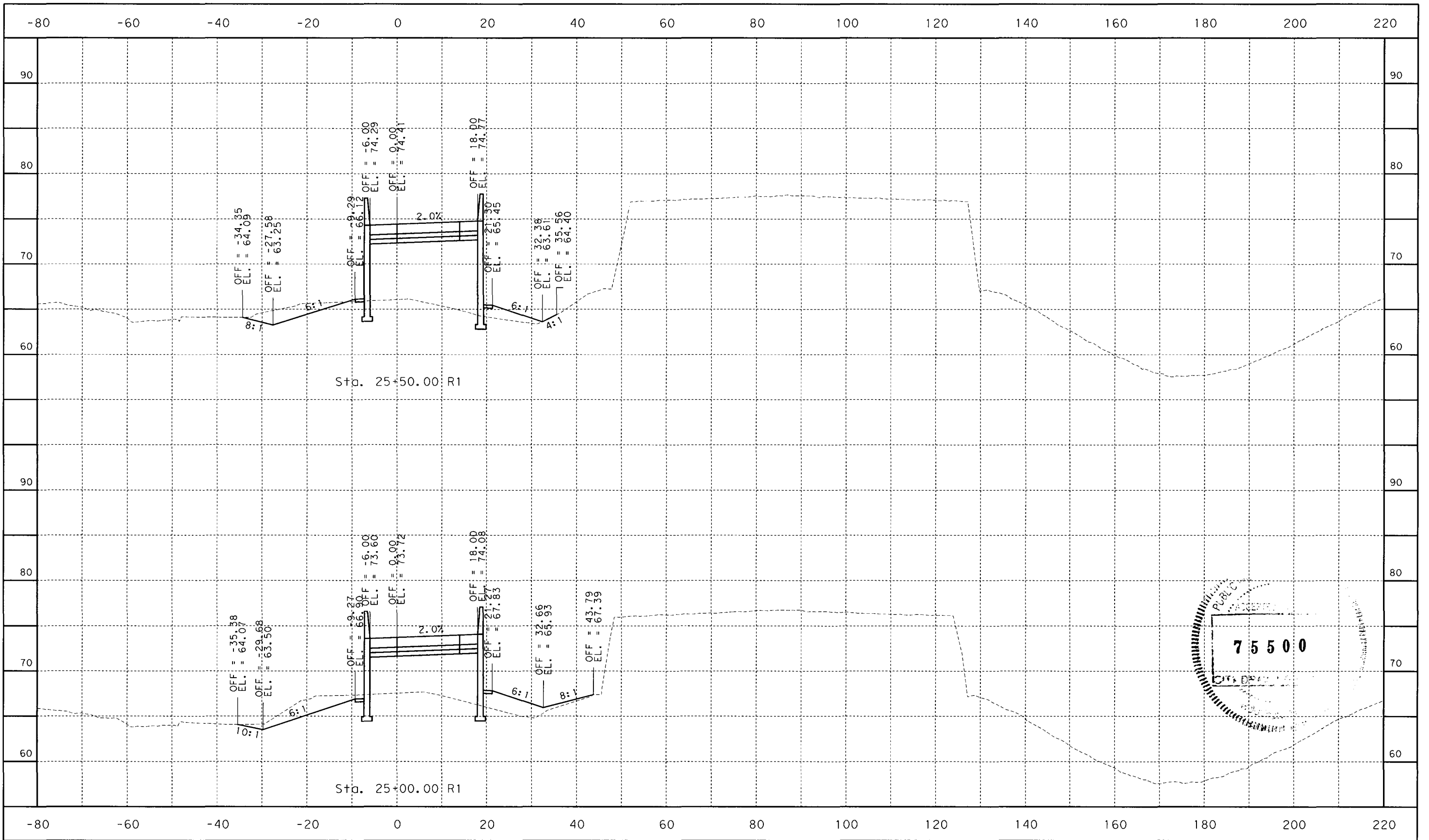


AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
TOLL ROAD AUTHORITY



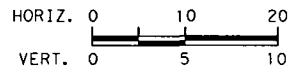
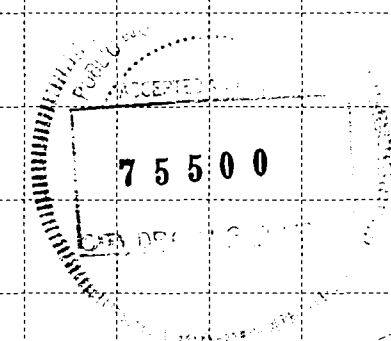
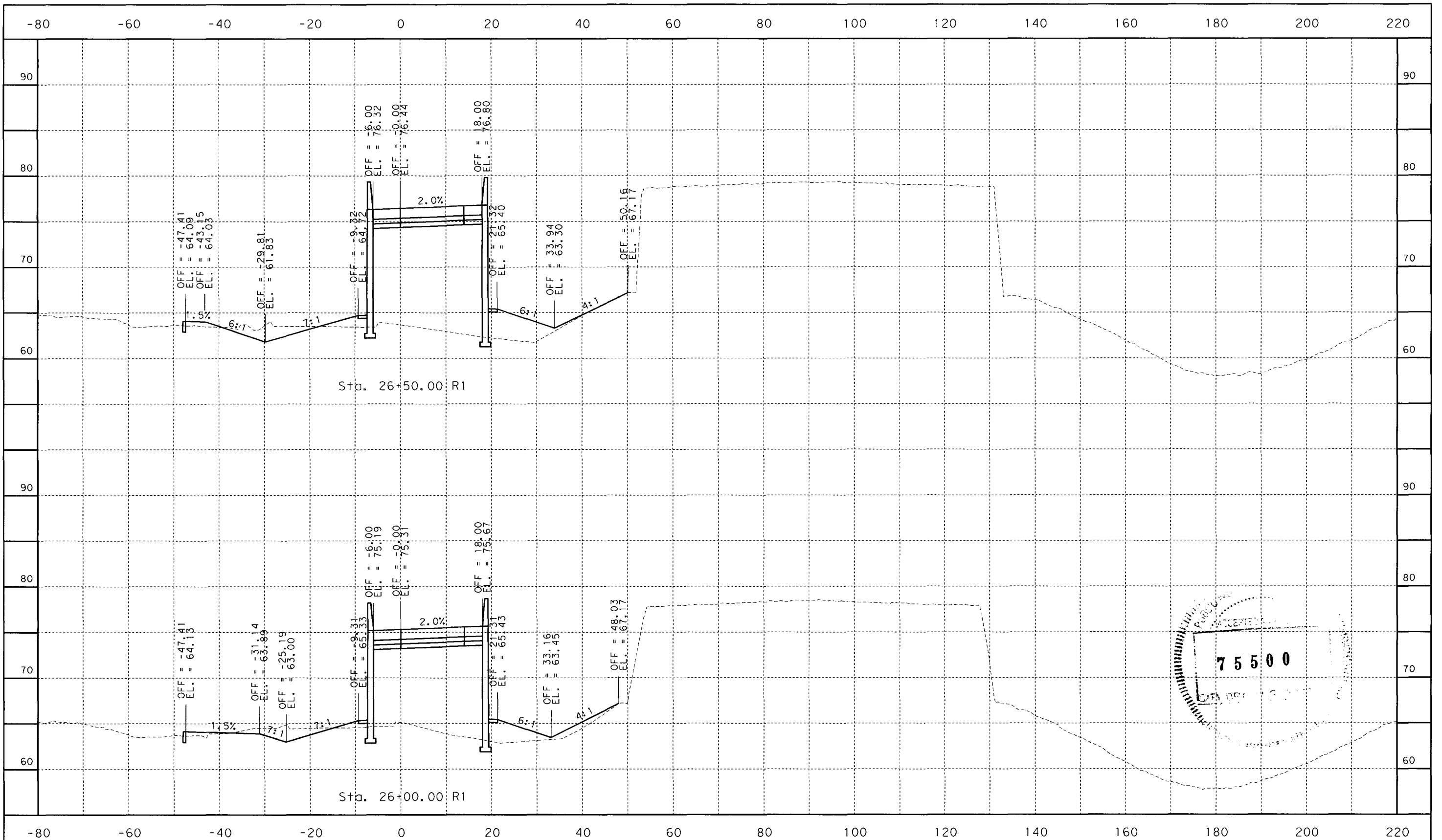
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1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



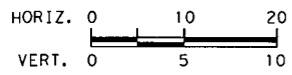
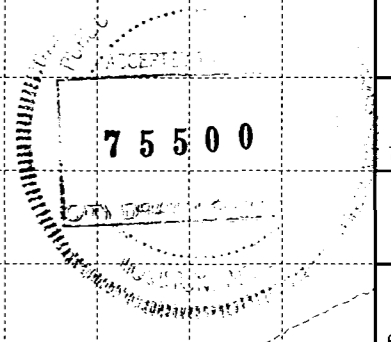
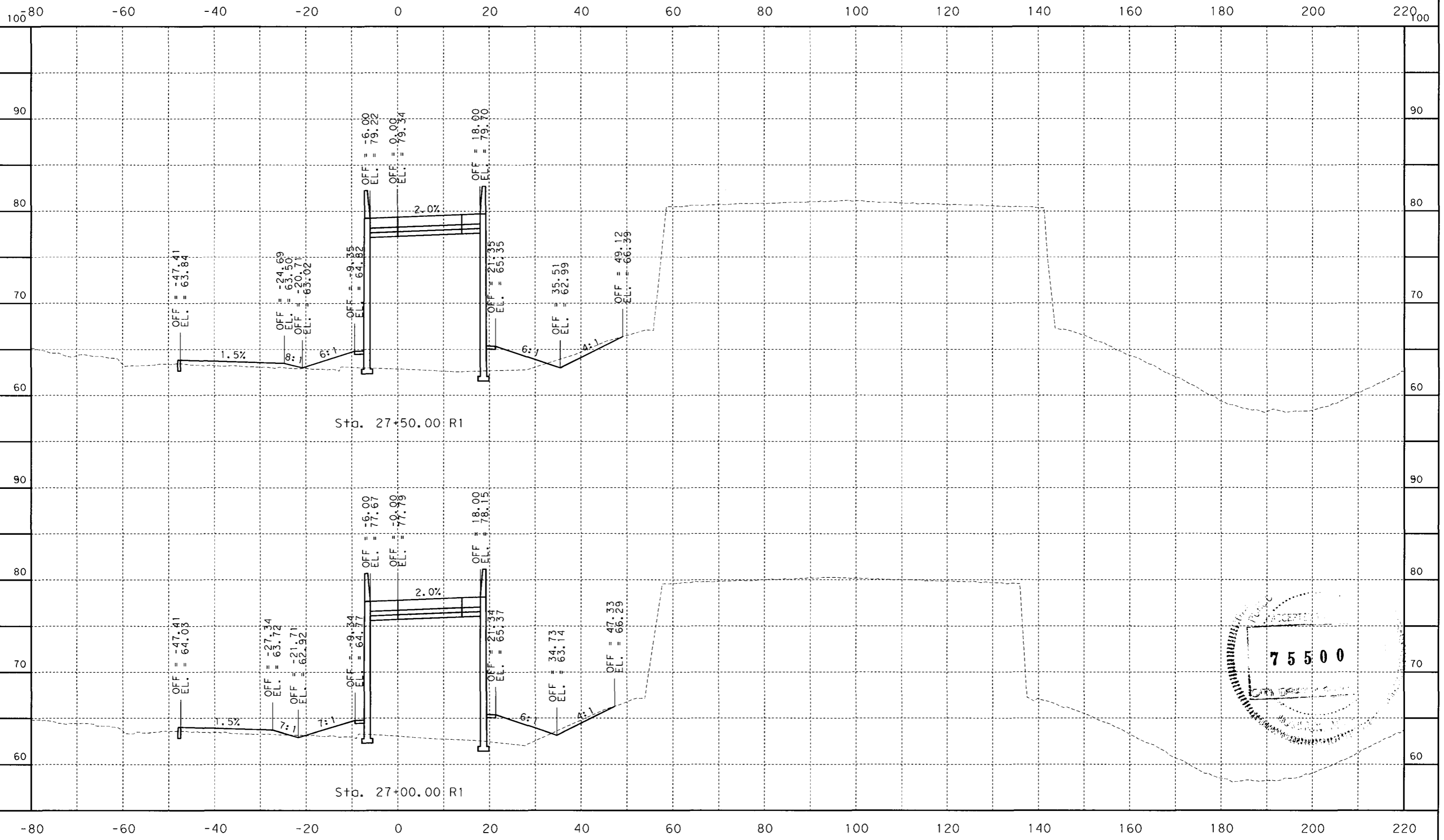
FORT BEND COUNTY  
TOLL ROAD AUTHORITY



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

PROJECT NUMBER	20219x	DATE:	2/19/2023
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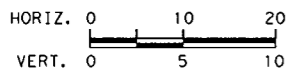
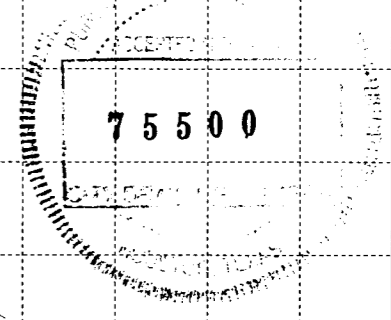
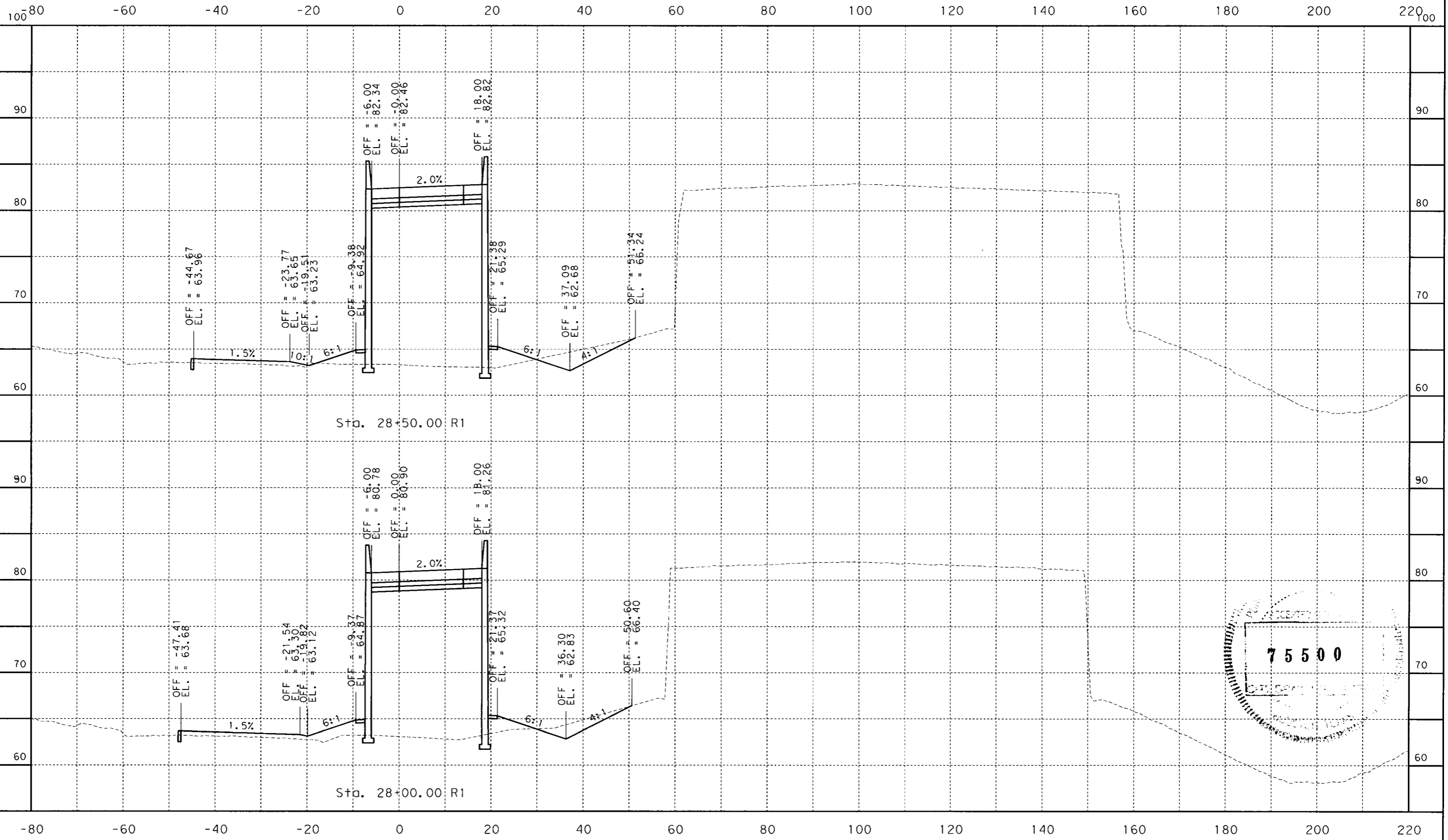
FORT BEND COUNTY  
TOLL ROAD AUTHORITY



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1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
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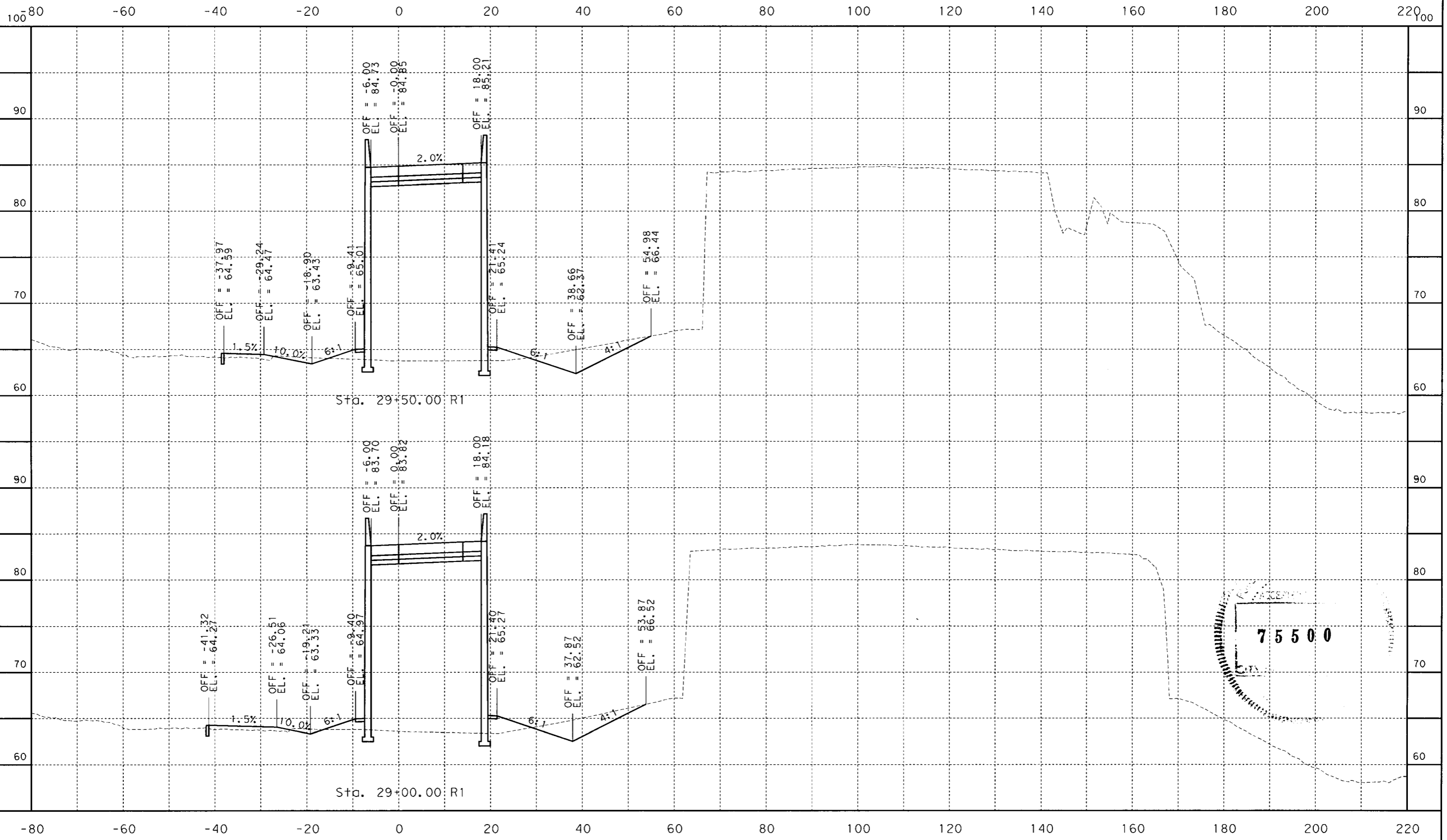
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1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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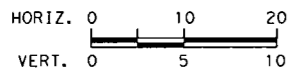
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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
TOLL ROAD AUTHORITY

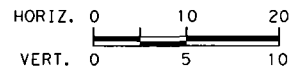
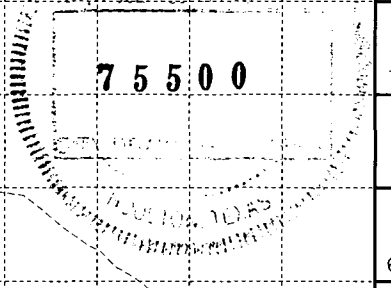
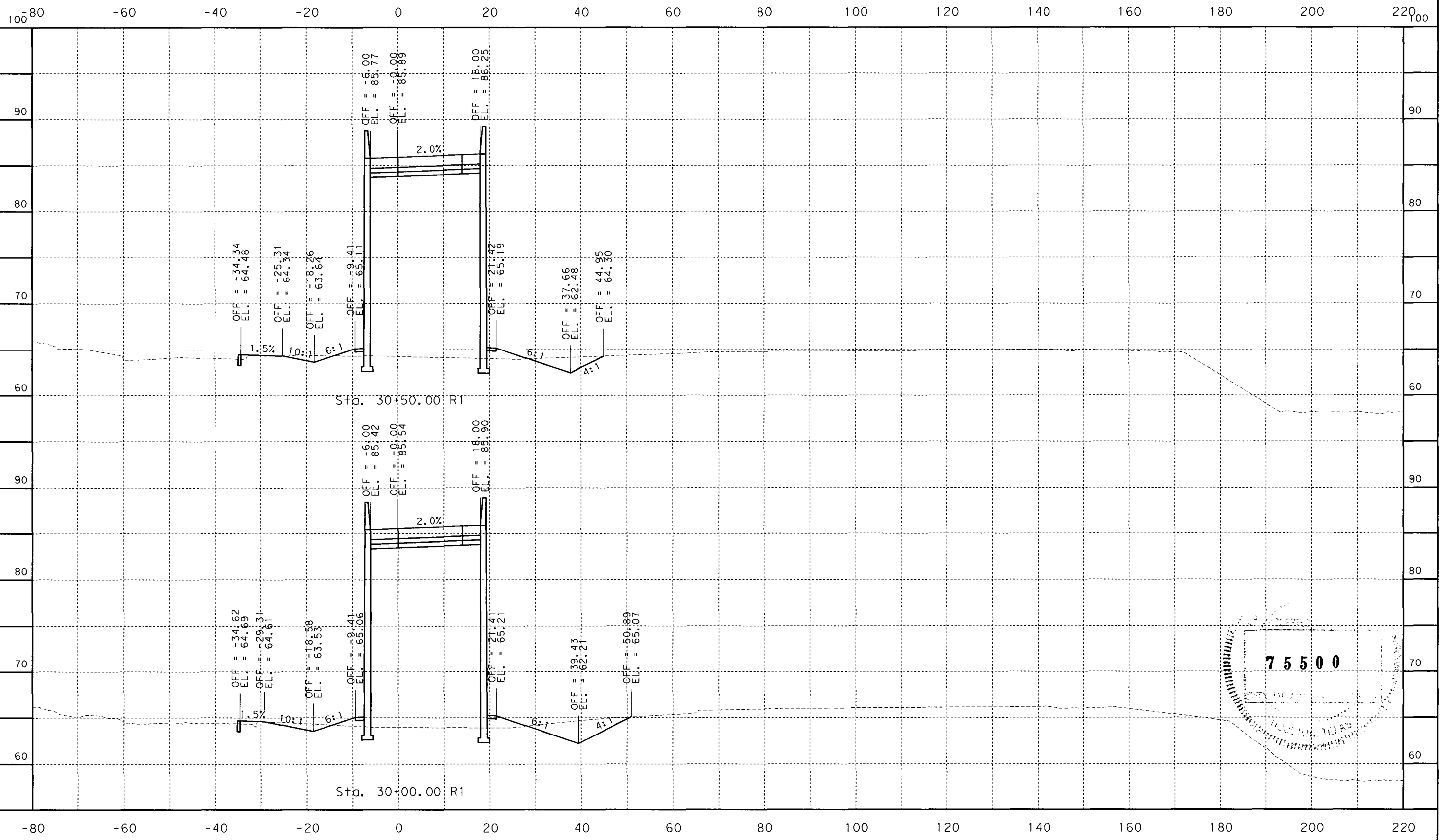


AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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FORT BEND PARKWAY TOLL ROAD  
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CROSS SECTIONS



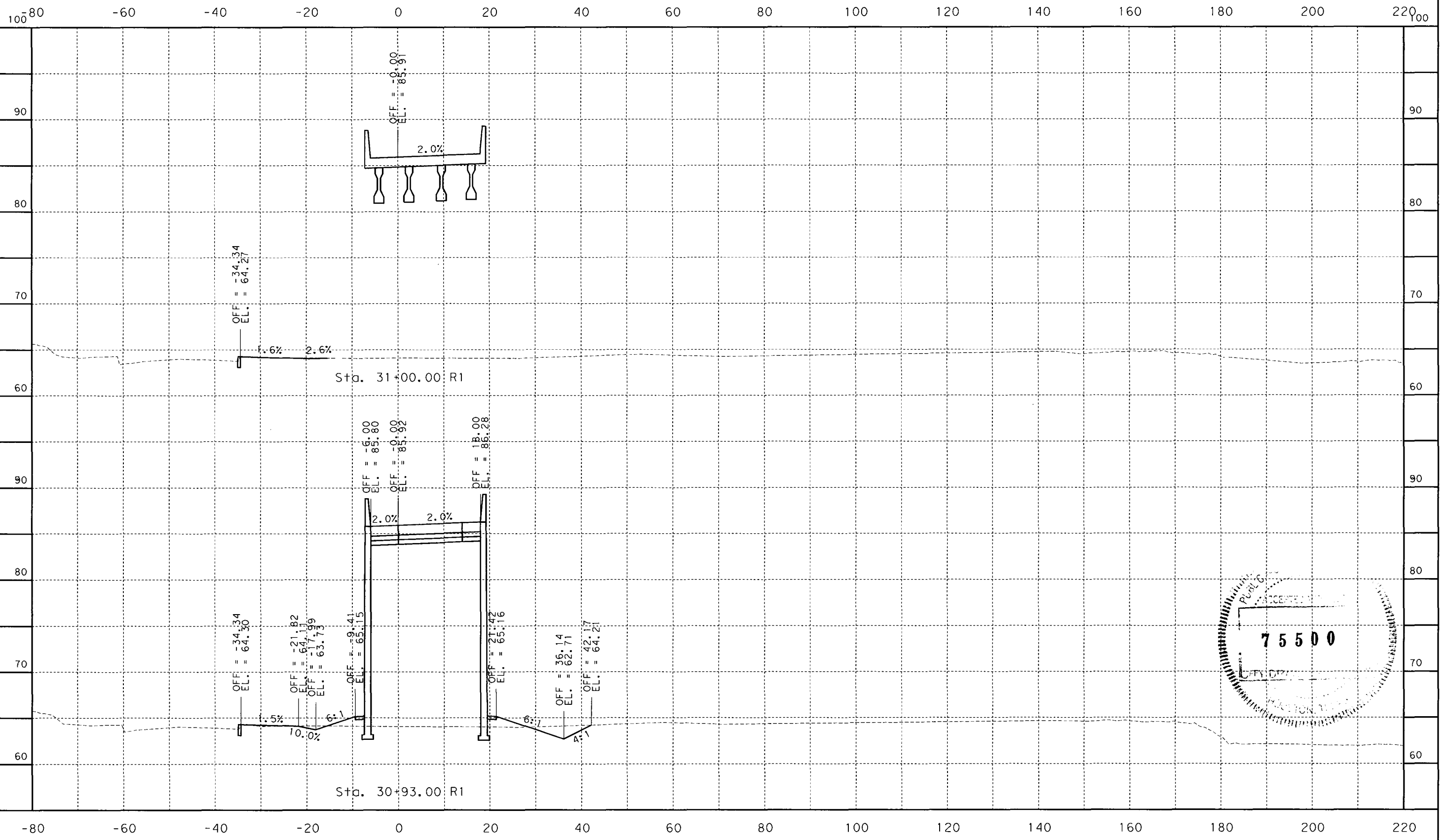
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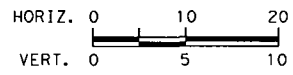
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1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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FORT BEND PARKWAY TOLL ROAD  
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CROSS SECTIONS



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**

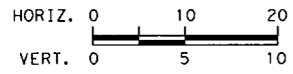
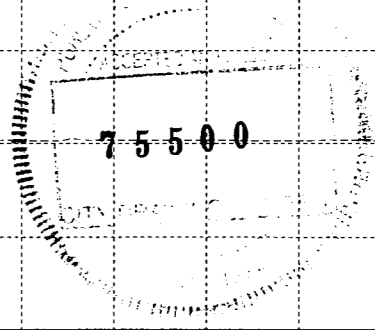
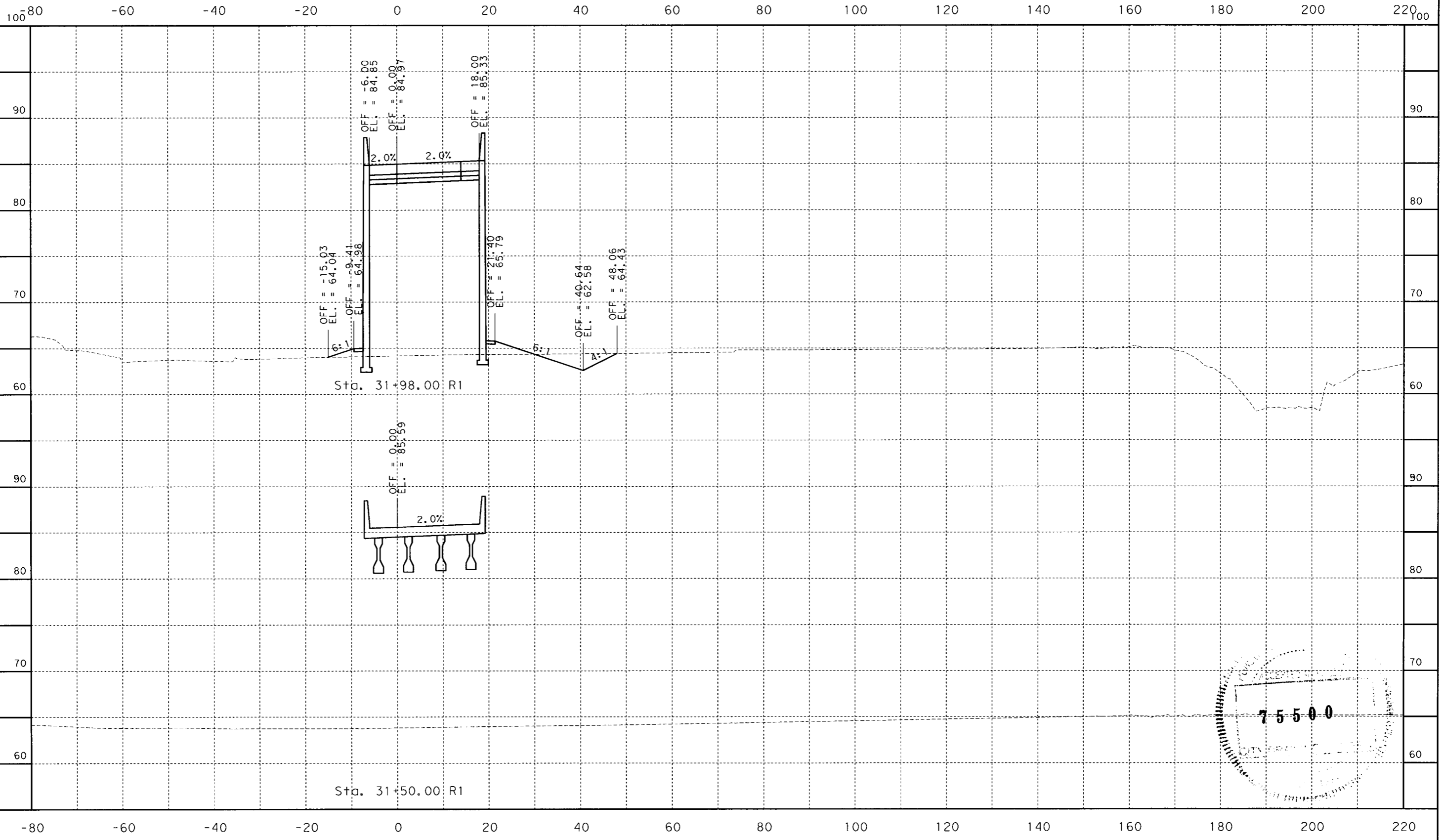


AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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FORT BEND PARKWAY TOLL ROAD  
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CROSS SECTIONS



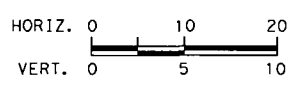
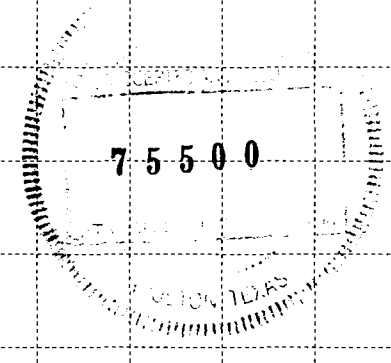
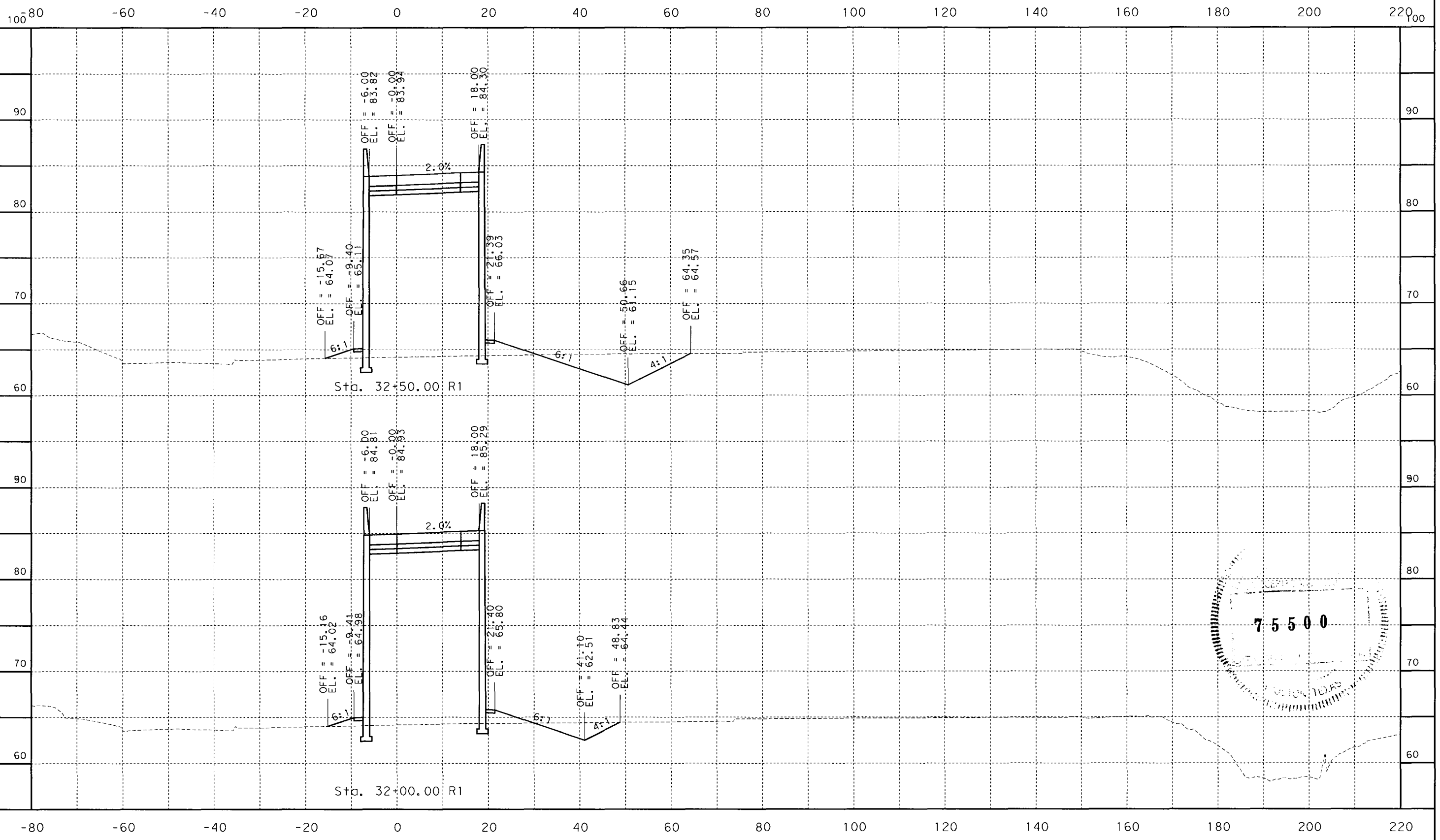
FORT BEND COUNTY  
TOLL ROAD AUTHORITY



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

PROJECT NUMBER	20219x	DATE:	2/19/2023
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FORT BEND PARKWAY TOLL ROAD  
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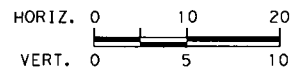
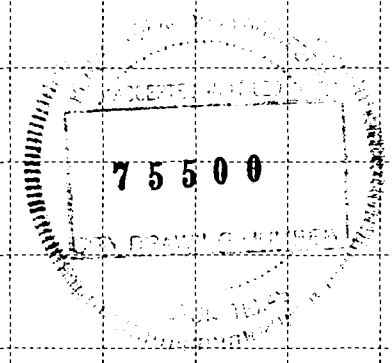
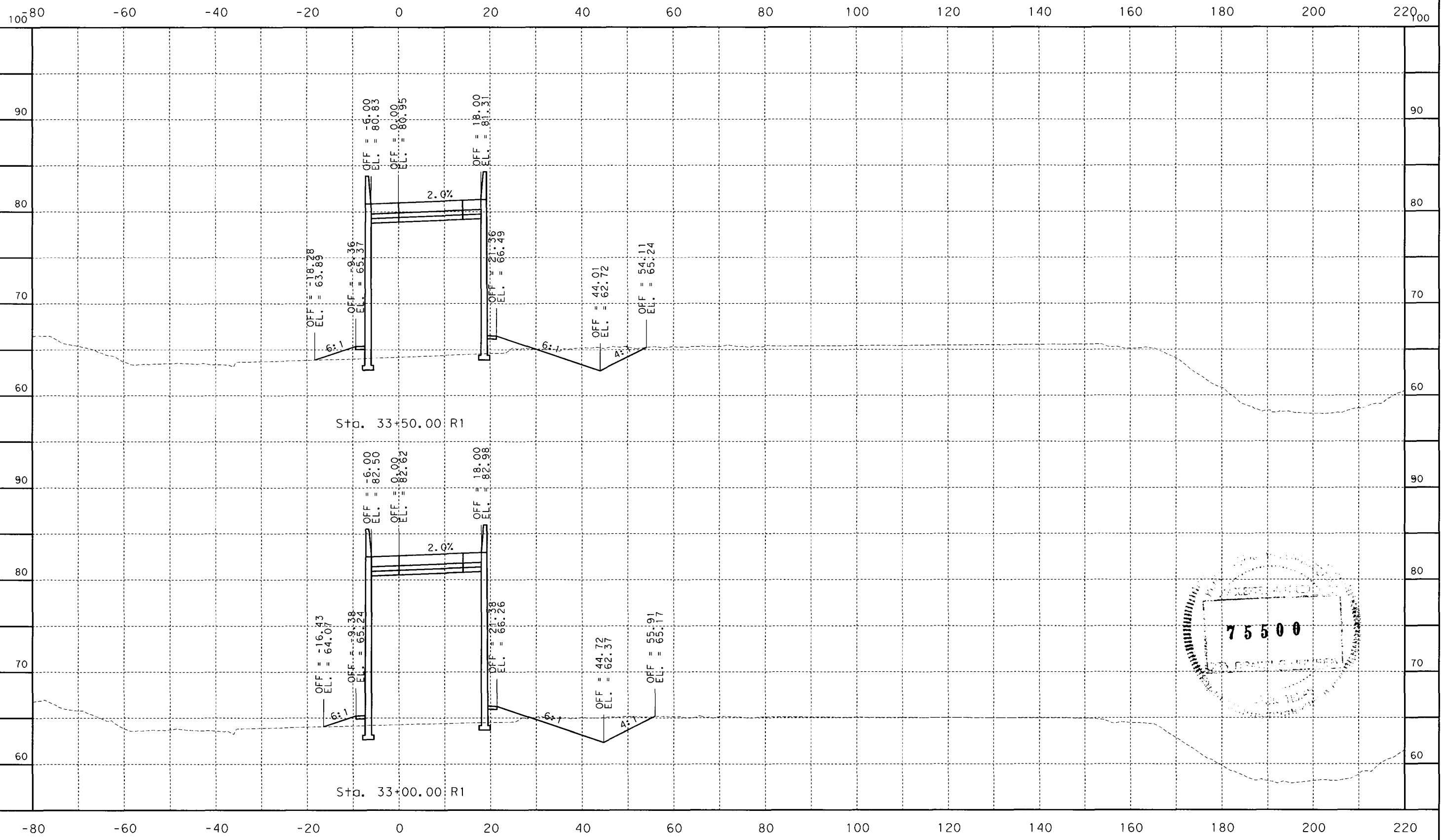
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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FORT BEND PARKWAY TOLL ROAD  
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CROSS SECTIONS



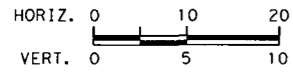
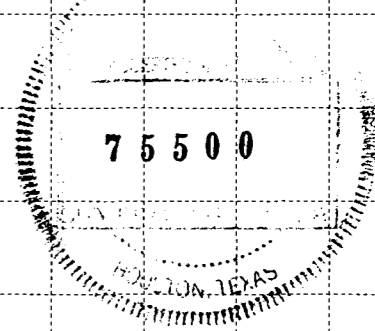
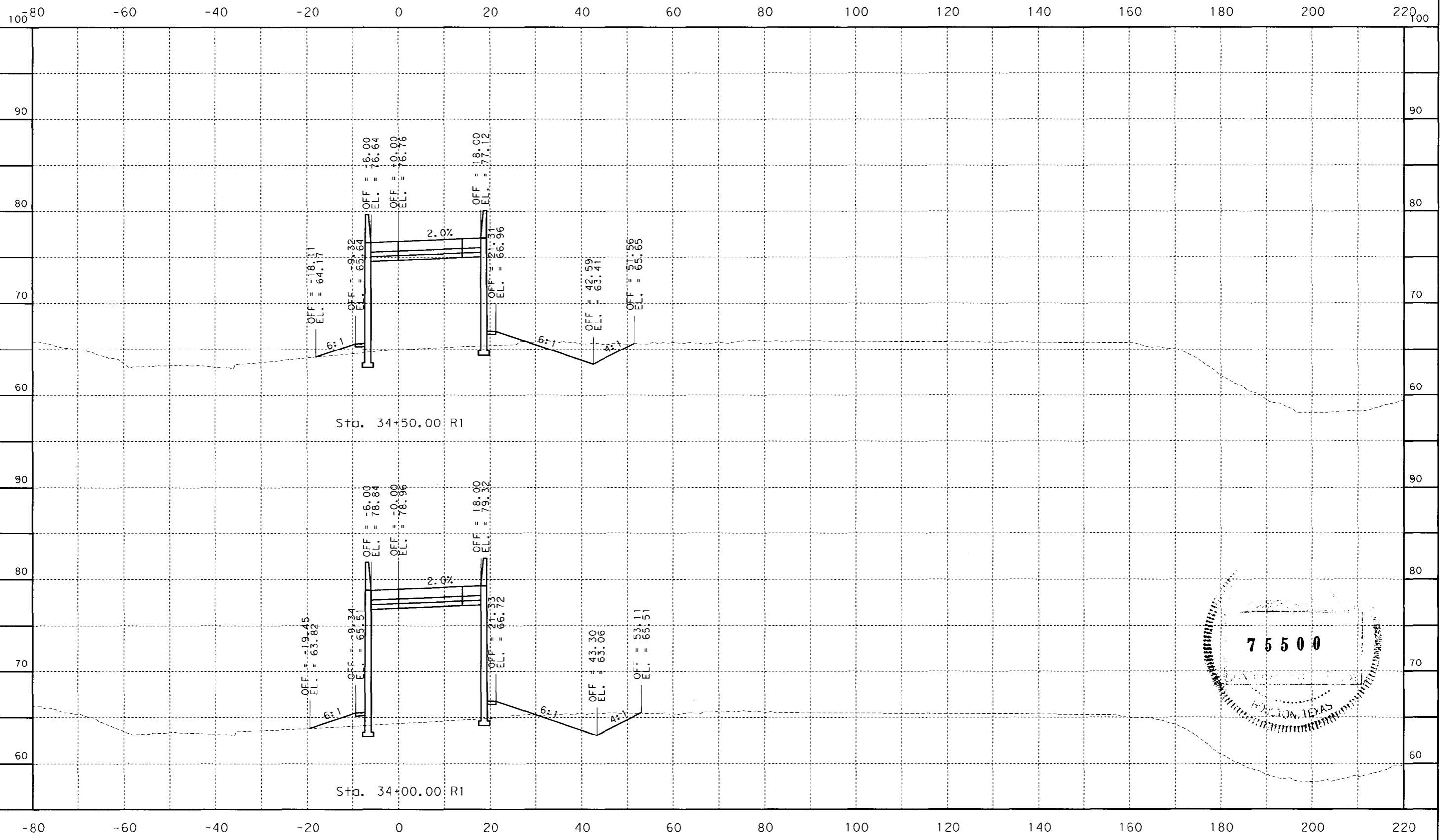
FORT BEND COUNTY  
TOLL ROAD AUTHORITY



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
TOLL ROAD AUTHORITY



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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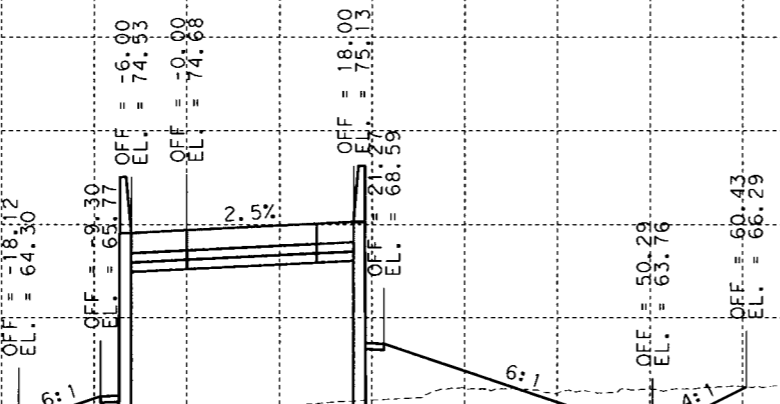
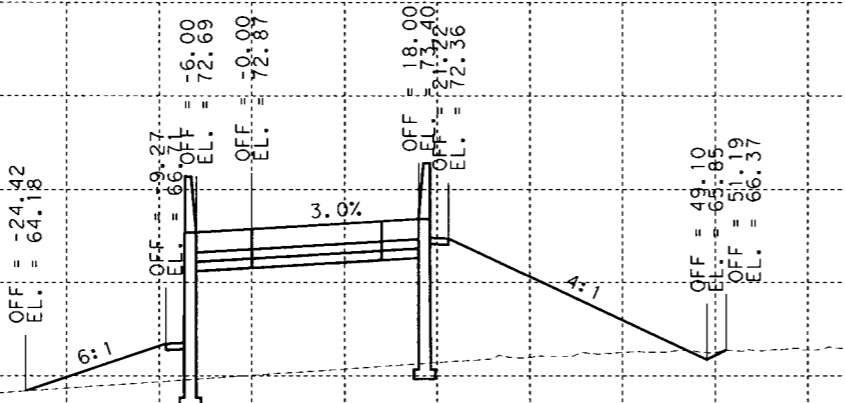
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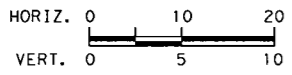
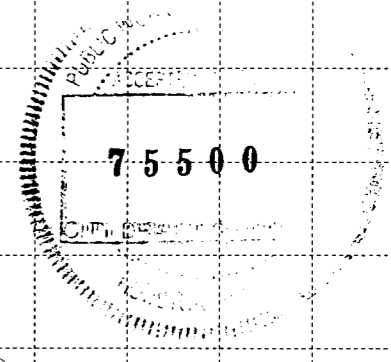
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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
TOLL ROAD AUTHORITY



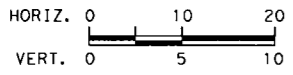
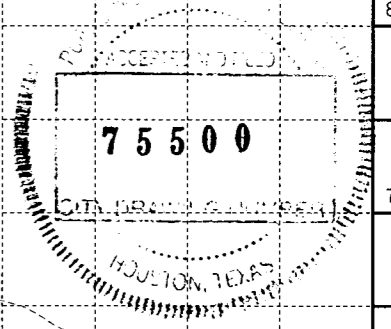
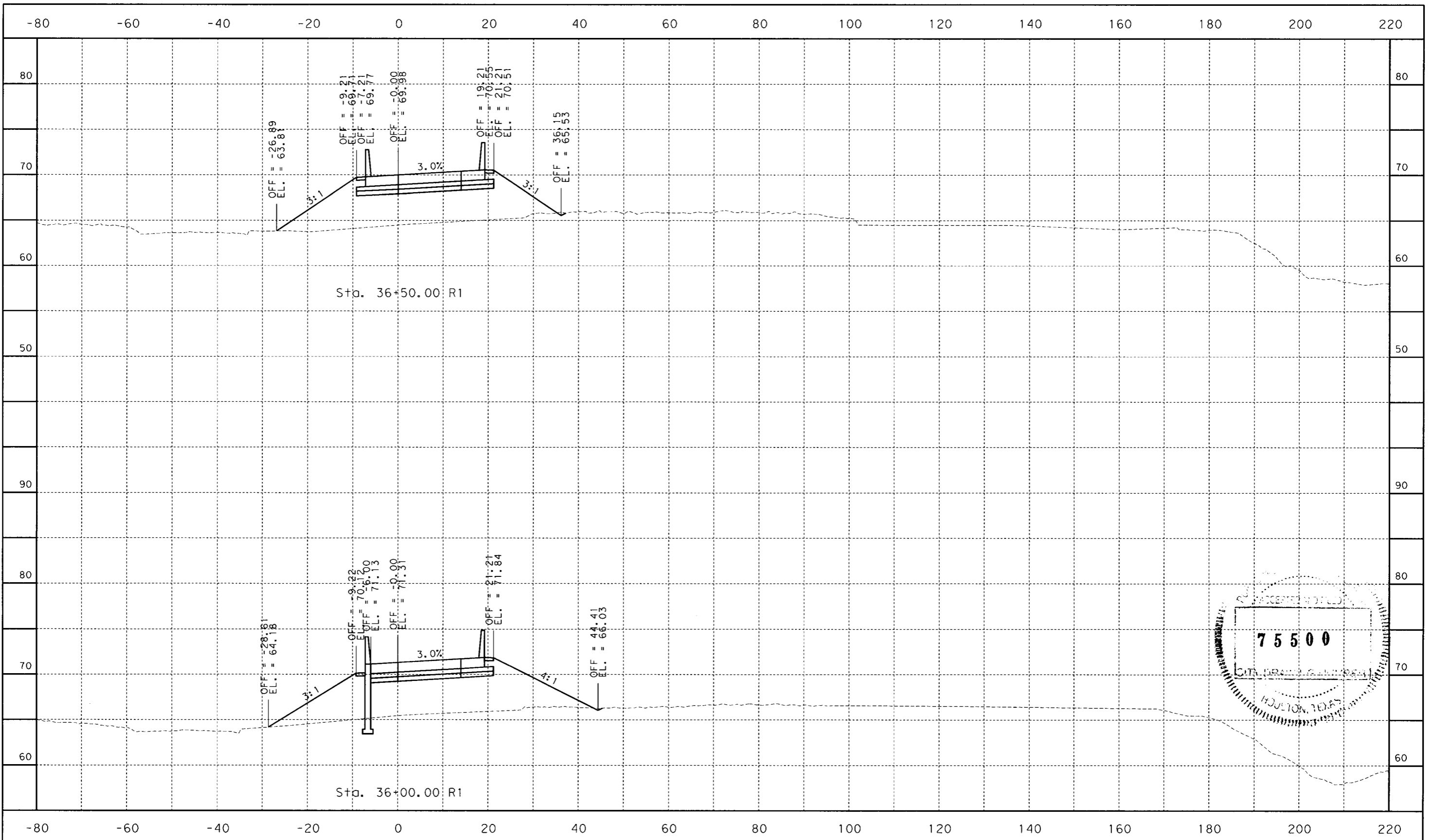
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
TOLL ROAD AUTHORITY



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

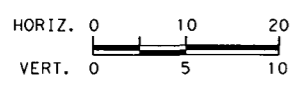
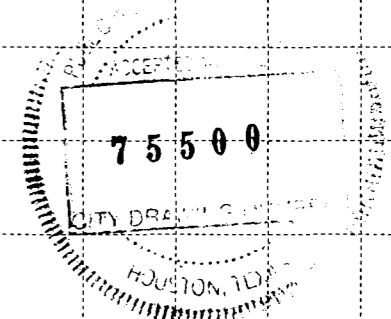
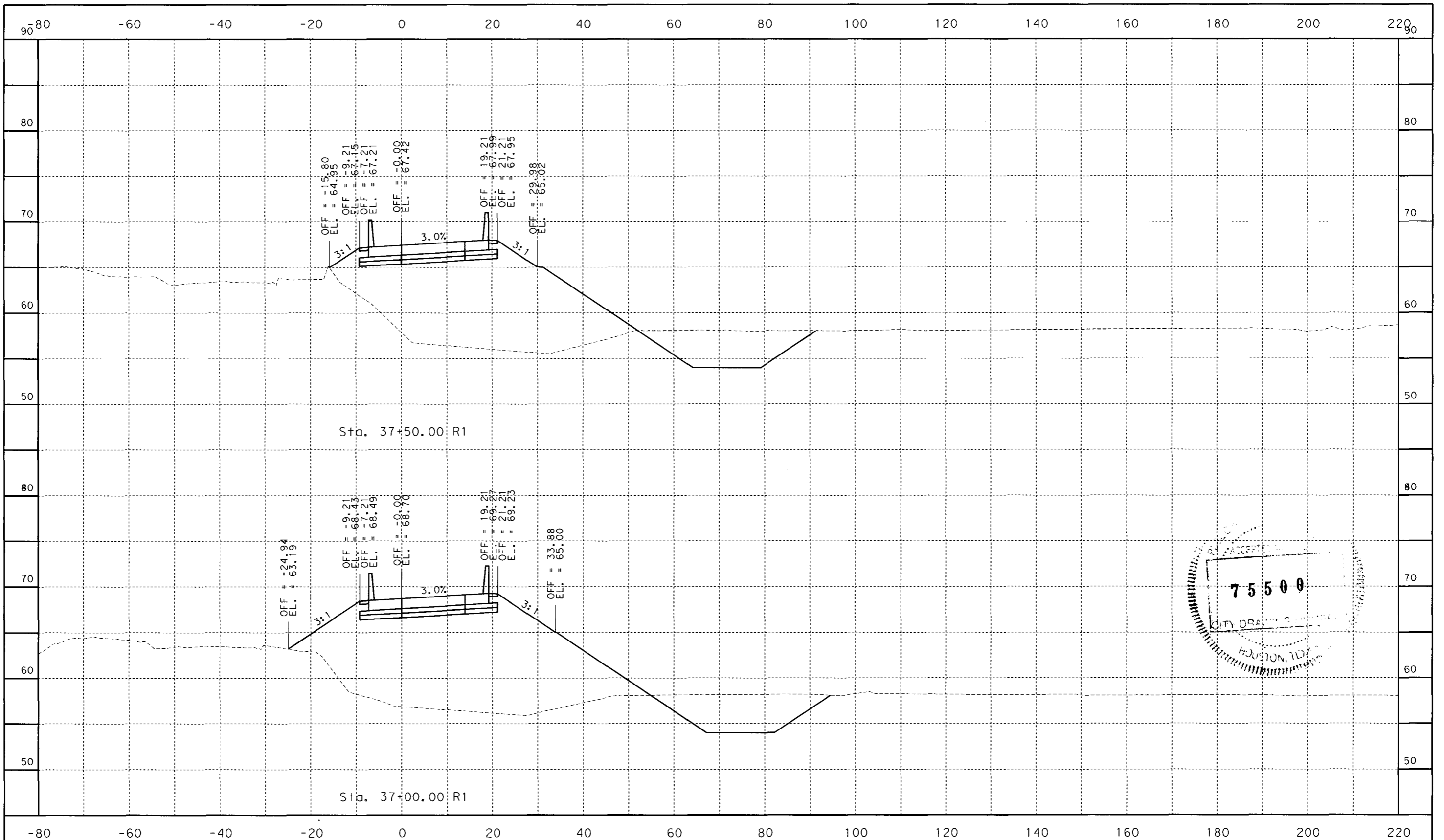
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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

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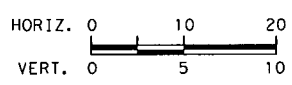
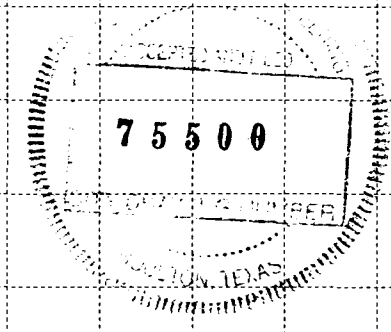
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Sta. 38+00.00: R1

-80 -60 -40 -20 0 20 40 60 80 100 120 140 160 180 200 220



FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



**FORT BEND COUNTY  
TOLL ROAD AUTHORITY**



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

PROJECT NUMBER	20219x	DATE:	2/19/2023
DESIGNED BY:			
CHECKED BY:		SHEET NO.:	18
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CHECKED BY:			

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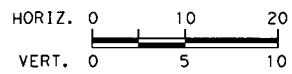
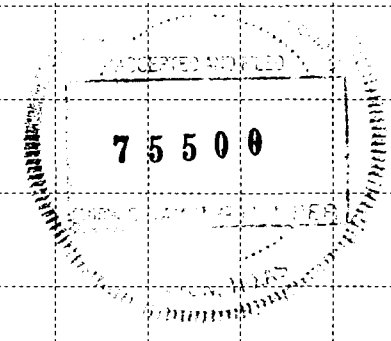
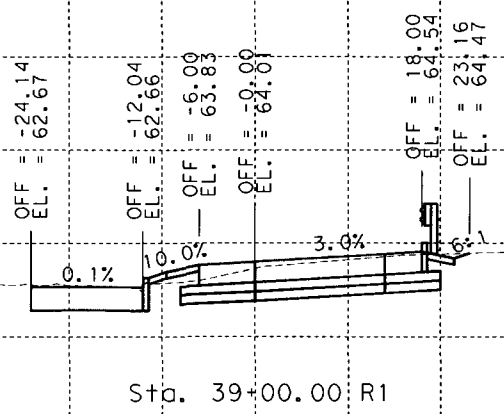
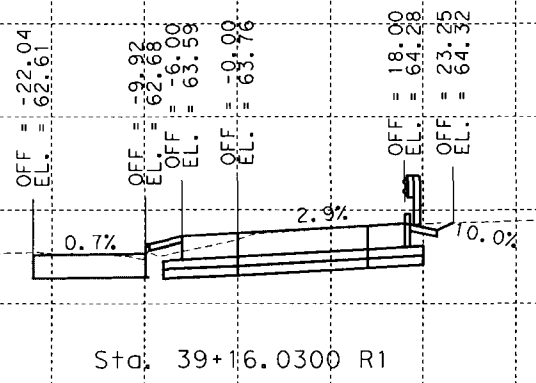
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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
TOLL ROAD AUTHORITY



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

PROJECT NUMBER	20219x	DATE:	2/19/2023
DESIGNED BY:		CHECKED BY:	
DRAWN BY:		CHECKED BY:	
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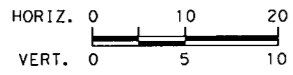
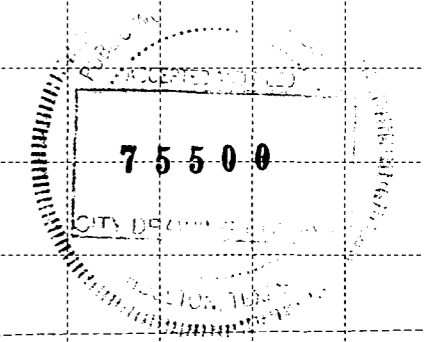
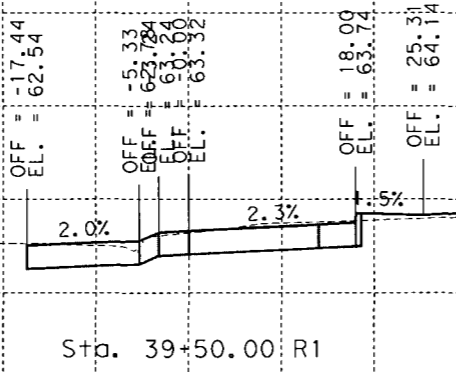
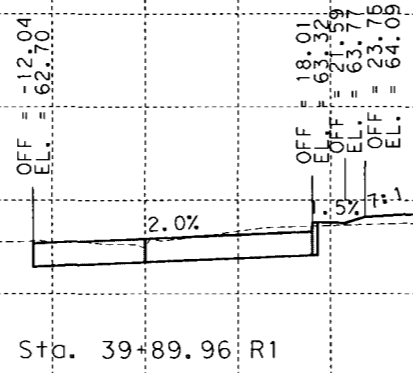
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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
TOLL ROAD AUTHORITY



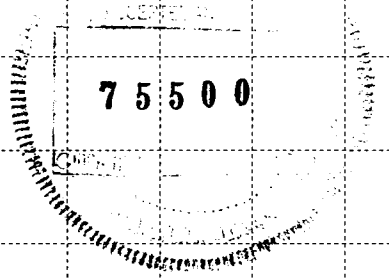
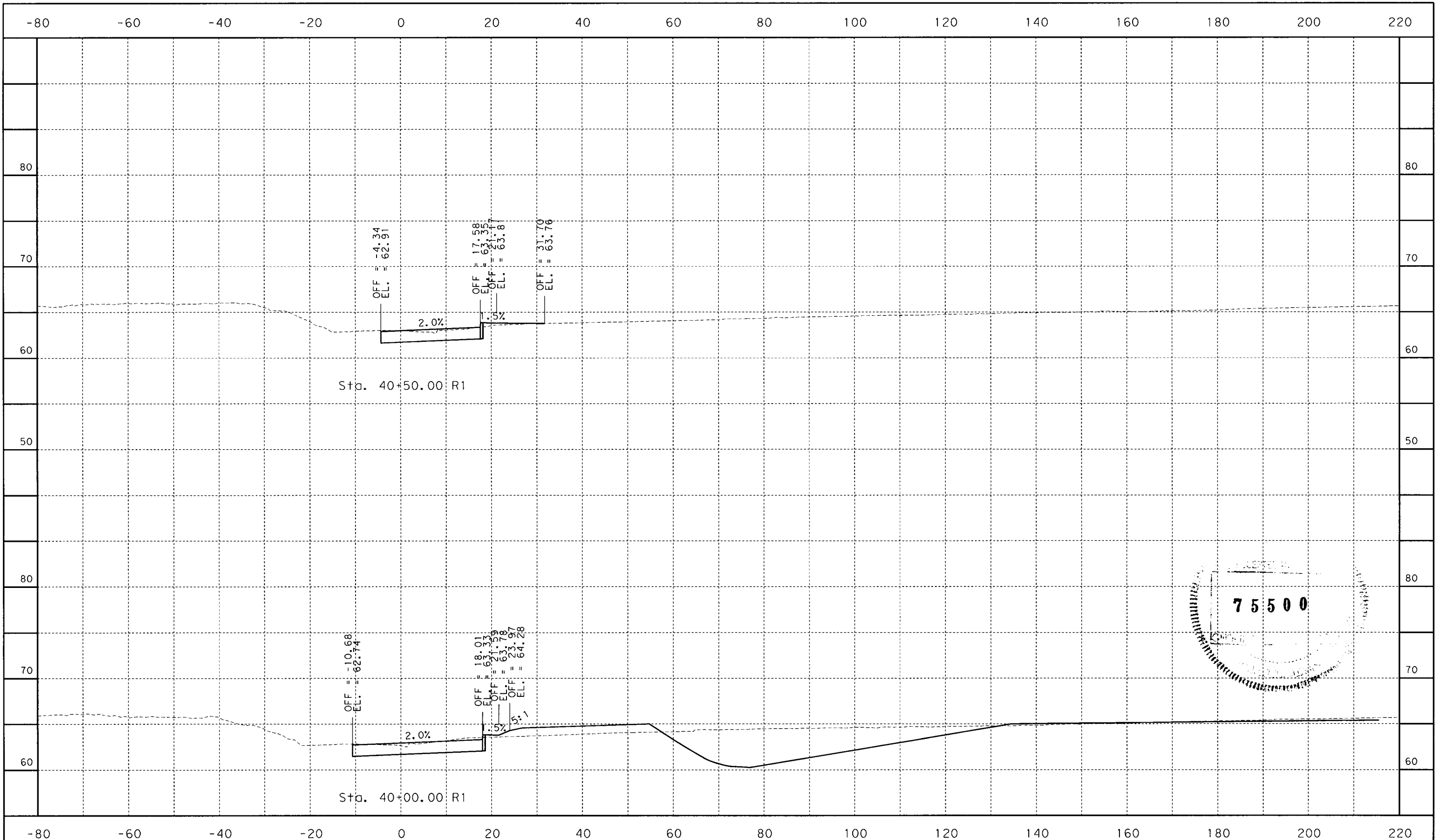
AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

PROJECT NUMBER	20219x	DATE:	2/19/2023
DESIGNED BY:			
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DRAWN BY:			
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SUBMITTAL



FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
TOLL ROAD AUTHORITY



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

PROJECT NUMBER	20219x	DATE:	2/19/2023
DESIGNED BY:			
CHECKED BY:		SHEET NO.:	21
DRAWN BY:			
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SUBMITTAL

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Sta. 41+50.00 R1

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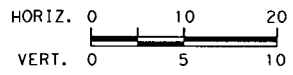
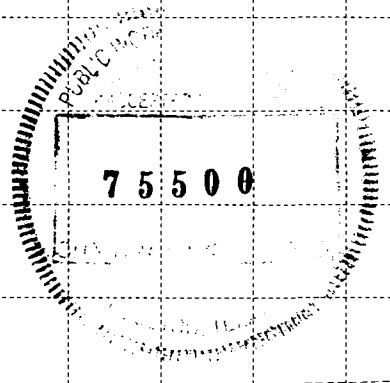
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Sta. 41+00.00 R1

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FORT BEND PARKWAY TOLL ROAD  
ENTRANCE RAMP 1A  
CROSS SECTIONS



FORT BEND COUNTY  
TOLL ROAD AUTHORITY



AIG TECHNICAL SERVICES, LLC F-20607  
1500 S DAIRY ASHFORD  
SUITE 445  
HOUSTON, TX 77077

PROJECT NUMBER	20219x	DATE:	2/19/2023
DESIGNED BY:			
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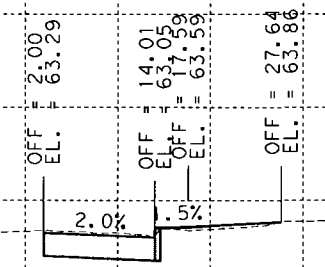
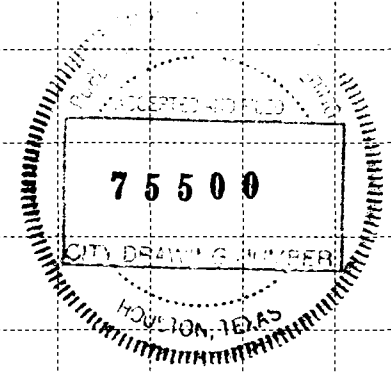
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Sta. 41+75.31 R1



FORT BEND PARKWAY TOLL ROAD  
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PROJECT NUMBER	20219x	DATE:	2/19/2023
DESIGNED BY:		SHEET NO.:	23
CHECKED BY:			
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