Fort Bend County, Texas
Invitation for Bid

Construction of Voss Road Roundabout and Cullinan Park at SH 6 Left Turn Lane for Fort Bend County Mobility Bond Project Nos. 17413 and 20407
BID 23-036

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, April 4, 2023
2:00 PM (Central)

LABEL ENVELOPE:

BID 23-036
Voss Road & Cullinan Park

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@fortbendcountytx.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.

Prepared: 03/08/23
Issued: 03/12/23

COUNTY PURCHASING AGENT

Fort Bend County, Texas

Vendor Information

Jaime Kovar
Purchasing Agent

Office (281-341-8640

Legal Company Name (top line of W9)			
Business Name (if different from legal name)			
Federal ID # or S.S. #		DUNS #	
Type of Business	___ Corporation/LLC ___ Partnership ___ Sole Proprietor/Individual ___ Tax Exempt Organization		Age in Business?
Publicly Traded Business	___ No ___ 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 ☐ SBE-Small Business Enterprise ☐ HUB-Texas Historically Underutilized Business ☐ WBE-Women's Business Enterprise ☐	**Certification #** _____ **Certification #** _____ **Certification #** _____ **Certification #** _____	Cert Date _____ _____ _____ _____
Company's gross annual receipts	<$500,000 _____	$500,000-$4,999,999 _____	Exp Date _____ _____ _____ _____
	$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@fortbendcountytx.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, March 28, 2023 at 10:00AM (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.

Initials of Bidder: _____

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 the Construction of Voss Road Roundabout and Cullinan Park at SH 6 Left Turn Lane, hereinafter referred to as the "Project," as specified herein.

3.0 PRE-BID CONFERENCE:

A pre-bid conference will be conducted on **Tuesday, March 21, 2023 at 9:30 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

Initials of Bidder: _____

Contractor agree that as liquidated damages for delay (but not as a penalty) the Contractor shall 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

Initials of Bidder: _____

location agreed upon in writing), less retainage of ten percent (10%).

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

Initials of Bidder: _____

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 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.

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 <u>current</u> 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

Initials of Bidder: _____

provide replacement certificates, policies and/or endorsements for any such insurance expiring prior to completion of Services. Contractor shall obtain such 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

Initials of Bidder: _____

liability of the Contractor.

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.

Initials of Bidder: _____

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 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.

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.

Initials of Bidder: _____

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.

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 **	

Initials of Bidder: _____

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.

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

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.

Initials of Bidder: _____

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:

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.

Initials of Bidder: _____

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 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.

Initials of Bidder: _____

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-

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.

Initials of Bidder: _____

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.

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 270 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: B23-036.

34.2.3 Description is the title of the solicitation: Voss Road Roundabout and Cullinan Park-SH 6 Turn Lane.

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 23-036

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 Voss Road Roundabout and Cullinan Park at SH 6 Left Turn Lane for Fort Bend County Mobility Bond Project Nos. 17413 and 20407** 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

Form **W-9**
(Rev. December 2014)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

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

Print or type
See **Specific Instructions** on page 2.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.

2 Business name/disregarded entity name, if different from above

3 Check appropriate box for federal tax classification; check only **one** of the following seven boxes:

☐ Individual/sole proprietor or single-member LLC ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶ _____

Note. 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.

☐ Other (see instructions) ▶

4 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) _____

(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.)

Requester's name and address (optional)

6 City, state, and ZIP code

7 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.

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.

Social security number

			–		–				

or

Employer identification number

		–							

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.

Sign Here	**Signature of U.S. person ▶**	**Date ▶**

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*.

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[1]	Generally, exempt payees 1 through 5[2]
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

[1] See Form 1099-MISC, Miscellaneous Income, and its instructions.

[2] 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*. 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* 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 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[1]
3. Custodian account of a minor (Uniform Gift to Minors Act)	The minor[2]
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[1] The actual owner[1]
5. Sole proprietorship or disregarded entity owned by an individual	The owner[3]
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[4]
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

[1] 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.

[2] Circle the minor's name and furnish the minor's SSN.

[3] 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.

[4] 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.* 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* or contact them at *www.ftc.gov/idtheft* or 1-877-IDTHEFT (1-877-438-4338).

Visit 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.)

Fort Bend County Tax Acct. No.*	Property address or location**
_____	_____
_____	_____
_____	_____
_____	_____

** 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
[Company Name]
§2252.001.

I certify that _____ is a Nonresident Bidder as defined in Government Code
[Company Name]
§2252.001 and our principal place of business is _____.
[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

LIST OF HARRIS COUNTY SPECIFICATIONS

Project: **FORT BEND COUNTY - 17413 VOSS RD AT OLD RICHMOND RD PROPOSED ROUNDABOUT**

Engineer: **BGE, INC**

ITEM NO.	SPEC NO.	SPECIFICATION SECTION
1	102	Clearing and Grubbing
2	104	Removing Old Concrete
3	110	Roadway Excavation
4	130	Borrow
5	162	Sodding for Erosion Control and Stabilization
6	250	Hot Mix Asphaltic Concrete Base Course (Black Base)
7	309	Milling Existing Pavement
8	360	Concrete Pavement
9	429	Trench Safety System
10	433	Cement Stabilized Sand Bedding and Backfill Material
11	460	Reinforced Concrete Pipe
12	463	Safety End Treatment
13	464	PVC Pipe
14	465	Remove and Dispose of Existing Concrete or Metal Pipe
15	471	Precast Concrete Manholes and Junction Boxes
16	472	Inlets
17	473	Adjusting Manholes and Inlets
18	491	Reinforced Concrete Slope Paving
19	495	Removing Old Structure
20	500	Remove and Relocate or Dispose of Traffic Signs, Mail Boxes and Roadway Signs
21	530	Concrete Curb, Concrete Curb and Gutter, Sidewalks and Driveways
22	540	Removing and Disposing of Existing Asphaltic Surface and Base Material
23	550	Existing Fencing and Gates
24	556	Four Strand Barbed Wire Fence
25	561	Video Recording Construction
26	624	Aluminum Signs
27	660	Reflectorized Pavement Markings
28	663	Traffic Buttons and Pavement Markers
29	665	Work Zone Pavement Markings
30	671	Traffic Control
31	672	Work Zone Pavement Markings
32	673	Constructing Detours for Maintaining Two-Way Traffic
33	674	Removing Pavement Striping and Markings
34	696	Low Profile Concrete Barrier
35	713	Reinforced Filter Fabric Barrier
36	719	Inlet Protection Barriers
37	724	Stabilized Construction Access
38	741	Inlet Protection Barrier (for Stage II Inlets, Gravel Bags)
39	750	Rock Filter Dams
40	751	SWPPP Inspecion and Maintenance

LIST OF TxDOT SPECIFICATIONS

Project: **FORT BEND COUNTY - 17413 VOSS RD AT OLD RICHMOND RD PROPOSED ROUNDABOUT**

Engineer: **BGE, INC**

ITEM NO.	SPEC NO.	SPECIFICATION SECTION
1	400	Cut & Restoring Pav
2	416	Drilled Shaft Foundations
3	528	Colored Textured Concrete and Landscape Pavers
4	529	Concrete Curb, Gutter, and Combined Curb and Gutter
5	536	Concrete Medians and Directional Islands
6	610	Roadway Illumination Assemblies
7	618	Conduit
8	620	Electrical Conductors
9	624	Ground Boxes
10	628	Electrical Services

Proposed Dedicated Northbound Left-Turn Lane Along SH-6 at Cullinan Park.
for Fort Bend County Bid 23-036

INDEX OF TECHNICAL SPECIFICATIONS

Texas Department of Transportation Standard Specifications
Reference Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges (2014 revision) where applicable when identified in the Bid Form specification reference as "TxDOT"

Item No.	Specification Title
100	Preparing Right of Way
104	Removing Concrete
105	Removing Treated and Untreated Base and Asphalt Pavement
110	Excavation
354	Planing and Texturing
502	Barricades, Signs, and Traffic Handling
506	Temporary Erosion, Sedimentation, and Environmental Controls
512	Portable Concrete Traffic Barrier
545	Crash Cushion Attenuators
529	Concrete Curb, Gutter, and Combined Curb and Gutter
536	Concrete Medians and Directional Islands
644	Small Roadside Sign Assemblies
666	Retroreflectorized Pavement Markings
672	Raised Pavement Markers
678	Pavement Surface Preparation for Markings
3076	Dense-Graded Hot-Mix Asphalt

Reference Harris County Standard Engineering Design Specifications (2017 revision) where applicable.

Fort Bend County Specifications

Item No.	Specification Title
561	Video Recording Construction
671	Fort Bend Project Sign
672	Off-Duty Uniformed Peace Officers – As Directed By Engineer
700	Notice of Intent
751	SWPPP Inspection and Maintenance

Storm Water Pollution Prevention Plan (included herein)

Geotechnical Investigation (included herein) - no Geotech on this project

Summary of Work – Voss Road at Old Richmond Rd

The scope of work for the above project includes removal of existing asphalt pavement, removal of existing concrete pavement, existing curb & gutter, existing pedestrian ramps, existing signs and pavement markings.

The scope includes proposing a 1 lane roundabout at the intersection of Voss Road & Old Richmond Road. The approaches along Old Richmond Rd will include 2" mill and overlay HMA. The approach along Voss Rd and the proposed roundabout will include 8" concrete pavement on top of a 8" black base. Within the roundabout will be a truck apron that includes 12" stamped concrete on top of 10" black base.

The scope includes the installation of 24" reinforced concrete pipe culvert with safety end treatments, manholes and inlets Type C. The driveway culvert shall be 6:1 slope.

The scope also includes the installation of pedestrian ramps, barbed wire fence, gates, irrigation sleeves and proposed ditches within County ROW. A ditch with Duhascek Park will also need to be regraded towards County ROW.

Traffic Control, Permanent Signing and Striping, Illumination and Storm Water Pollution Prevention is also included as part of the scope for this project.

Contractor to ensure he or she is familiar with the Utility Summary Package included In the Project Manual. The Utility Summary Package includes information on contact personnel regarding various utilities to be remain.

Summary of Work – SH 6 Northbound Approaching Cullinan Park Left Turn Lane

The scope of work for the above project includes removal of existing concrete pavement, curb, roadway signs and pavement markings.

The scope includes proposing a 12' dedicated northbound left-turn lane along SH 6 approaching Cullinan Park, with a length of approximately 332 LF. The project limits are from 284-ft south of Cullinan Park to 48-ft north of Cullinan Park. The left-turn ingress for the northbound direction will consist of a 100 LF storage length, 167 LF deceleration length and 137 LF taper length. The median opening for northbound turning movements is designed at 55 LF with a 35-FT radius to allow cars up to a WB-62 class vehicle to make the turn into Cullinan Park. This analysis was done using AutoTURN. The proposed roadway section is composed of 1.5" TY D surface, 1.5" TY D Level-up and 12" HMA Base.

The addition of the left-turn lane along SH 6 at Cullinan Park will require the removal of concrete curb and lane closures to complete the proposed work. Construction of this project will be accomplished using TxDOT standards for traffic control plan lane closures on multilane conventional roads (TCP (1-4) - 18 and TCP (1-5) – 18).

Voss Rd @ Old Richmond Rd – Proposed Roundabout

FBC 17413

Utility Adjustment Summary

1. **AT&T**: AT&T has approximately 10 underground lines, 1 buried cable marker, 1 pedestal and 1 handhole that will be relocated. The relocation has been completed.

2. **CenterPoint Electric**: CenterPoint Electric will relocate their power pole to avoid conflict with the proposed construction. The relocation has been completed.

3. **CenterPoint Gas:** CenterPoint Gas has redesigned their proposed 4" IP gas line to avoid conflict with the proposed drainage system. The proposed 4" IP gas line has been installed.

4. **Ardurra Group**: Fort Bend County has received a LONO from Ardurra Group for Fort Bend County Mud #25 12" PVC water line.

5. **Consolidated Communications**: Fort Bend County has received a LONO from Consolidated Communications. Consolidated does not have utilities in the location of the proposed construction.

6. **Crown Castle**: Fort Bend County has received a LONO from Crown Castle. Crown Castle does not have utilities in the location of the proposed construction.

7. **Comcast**: Comcast aerial line is attached to CenterPoint power poles. The relocation has been completed.

8. **Windstream**: Fort Bend County has received a LONO from Windstream. Windstream does not have utilities in the location of the proposed construction.

9. **Grande Communications**: Fort Bend County has received a LONO from Grande Communications. Grande Communications does not have utilities in the location of the proposed construction.

Utility Conflict List
FBC-Intersection Improvements (Voss Rd at Old Richmond Rd)

Owner	Title	Utility Description	Email	Direct Number	Office Number	Mailing Address	Status	Note
Othneil McLean	Project Engineer	AT&T Fiber Optic	OMcLean@Cobbfendley.com		713-462-3242	13430 Northwest Freeway, Suite 1100 Houston, TX 77040	No conflict. Relocation completed on 09/23/2022.	
Michael Brower Centerpoint Energy	Engineer Support Representative		michael.brower@centerpointenergy.com					Sent utility exhibit plan set on 6/29/2020
Cynthia Martinez Centerpoint Electric (CNP Job # JU-M-20-065)	Asset Optimization Coordinator	Electric/ Power Poles	cindy.martinez@centerpointenergy.com	713-207-6555			No conflict. Relocation completed on 08/26/2021.	
William F. Wilcox, Jr Centerpoint Electric (CNP Job # JU-M-20-065)	Staff Service Consultant	Electric/ Power Poles	William.WilcoxJr@centerpointenergy.com	281-341-4918				
David Fuentes Centerpoint Gas (CNP ID # 1405041777)	Engineer	Gas Line	jose.fuentes@centerpointenergy.com	832-529-5506			No conflict	CenterPoint 4" IP Gas line has been installed.
Stephanie E Money Centerpoint	Associate Service Consultant		stephanie.money@centerpointenergy.com	281-561-3249				Stephanie is responsible to get power for the private light
Shirley J. Hale Energy Transfer	Sr. Encroachments Analyst	Natural Gas, Transmission	Shirley.Hale@energyTransfer.com	713-989-2860			No conflict	No utilities found in the area according to Texas RailRoad Commison Map
John Stevenson Energy Transfer	Project Manager	Natural Gas, Transmission	john.stevenson@energytransfer.com	713-292-8949	713-989-2833	1300 Main Street Houston, Texas 77002		
Robert W. Dazey Jones & Carter	District Engineer	Water Line		713-777-5337		6330 West Loop S STE 150 Bellaire, TX 77401-1112		
Kaci Schlachter Jones & Carter	E.I.T	Water Line	kschlachter@jonescarter.com					
Chris Canonico Ardurra Group	District Engineer	Water Line	canonico@ardurra.com	713-540-5512		2032 Buffalo Terrace Houston, Texas 77019-2408	No conflict	Received a no conflict letter on 6/16/2020
David Minks Consolidated	Engineer	Communication line	david.minks@consolidated.com	281-960-1477	281-396-5071		No conflict	David said there aren't any utilities within our project limit. 01/12/2021
Robert Rychlik Consolidated	Manager	Communication line	robert.rychlik@consolidated.com	281-960-0824	281-396-5074			
Nick Belinsky Crown Castle	Utility Coordinator	Fiber Optic	Nicholas.Belinsky@crowncastle.com		1-888-632-0931 (Option 2)	1500 Corporate Dr. l Canonsburg, PA 15317	No conflict	Nick said there aren't any utilites within our project limit. 7/16/2020
William Leopard Comcast		Fiber Optic	William_Leopard@comcast.com					
Manuel Santiago Comcast		Fiber Optic	manuel_santiago@comcast.com				Relocation completed on 08/02/2022.	Comcast line is on the same pole as CenterPoint. Inform Comcast whenever CenterPoint relocates their power pole.
Cody Hicks Comcast		Fiber	Cody_Hicks@comcast.com	281-500-3108				
Shawn Amin Windstream			Shawn.Amin@windstream.com	832-317-5768			No conflict	Shawn said there aren't any utilities within our project limit. 7/15/2020
Chris Langston Grande Communications			chris.langston@mygrande.com	214-618-6198		500 Tittle Dr. Suite 400 Lewisville, Texas 75056	No conflict	Chris said there aren't any utilities within our project limit. 7/15/2020

GEOSCIENCE
ENGINEERING & TESTING, INC.
405 E. 20th Street
Houston, Texas 77008
713.861.9700
713.861.4477 Fax
HOUSTON THE WOODLANDS

June 10, 2020

BGE, Inc
10777 Westheimer Road, Suite 400
Houston, Texas 77042

Attention: Mr. Jason Ellison, P.E

Reference: **Geotechnical Investigation**
Proposed Geotechnical Investigation
Voss Road at Old Richmond Road
Voss Road at SH 6
Fort Bend County, Texas
GETI NO: 19G7659/B Supplemental Letter

Dear Ms. Ellison:

As per your request, Geoscience Engineering and Testing, Inc. (GETI) is pleased to submit this supplemental report providing **Revised Pavement Design Parameters** for the Old Richmond Road at Voss Road.

GETI prepared a geotechnical report (GETI PROJECT No. 19G7659), dated September 12, 2019, for the proposed 1000-feet long Voss Road traffic roundabout (1-lane) at Old Richmond Road, and a 600-ft long right turn lane along Voss Road at SH 6. The report provided both flexible and rigid pavement recommendations and utility recommendations based on the borings B-1 through B-5 drilled on July 22, 2019. GETI also previously released the revised report 19G7659/A *(dated on 10/24/2019)* based on revised Annual Average daily Traffic (AADT) data.

GETI was recently provided with new reduced AADT data by BGE on 06/01/2020 for Old Richmond Road at Voss Road. Based on the information, GETI is providing this supplemental letter to redefine the pavement design parameters for Old Richmond Road at Voss Road.

1.1 Old Richmond Road at Voss Road

1.1.1 Flexible (Asphalt) Pavement

Two-Way AADT (Current) = 12,204 (Revised data provided by BGE, Inc on 06/01/2020)
Two-Way AADT (2030) =14,934 (Revised data provided by BGE, Inc on 06/01/2020)
Two-Way AADT (2040) = 17,671 (Revised data provided by BGE, Inc on 06/01/2020)

The 18-kip single axle loads (ESALS) for flexible pavement is calculated as **2.60×10^6** for the design year 2040 (design life 20 years) and **1.20×10^6** for the design year 2030.

1993 AASHTO Empirical Equation for Flexible Pavement - The serviceability loss due to traffic is computed from an empirical relationship derived from AASHTO Road Test Data. It relates the number of cumulative Equivalent 18-kip Single-Axle Loads (ESAL) passes to the corresponding change in pavement serviceability. It is expressed in the following format (Imperial Units):

$$\log_{10}(W_{18}) = Z_R \times S_o + 9.36 \times \log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left(\frac{\Delta PSI}{4.2-1.5}\right)}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32 \times \log_{10}(M_R) - 8.07$$

Where,

Z_R is the Standard Normal Deviate that is function of Reliability. With the Reliability defined as 95% the corresponding Z_R = -1.645.

S_o = 0.4, the Combined Standard Error in predicting pavement serviceability.

W18 is the number of Equivalent 18-kip Single Axle Loads ESALs that will result in a change in serviceability of ΔPSI, Design ESALs for 20 years (W_{18}) = 2.5 x 10^6

ΔPSI = Initial Serviceability Index – Final Serviceability Index = 4.4 – 2.5 = 1.9

SN is the structural number, defined by SN= a1D1 + a2D2m2 + a3D3m3

a1, a2, a3 are structural layer coefficients for asphalt/concrete, base & sub-base, respectively

D1, D2, and D3 are the layer thicknesses of the asphalt/concrete, base & sub-base, respectively

m2 and m3 are the drainage coefficients for the base and the sub-base, respectively

MR is the resilient modulus of the subgrade, defined by $M_r = \frac{\Delta(\sigma_1 - \sigma_3)}{\varepsilon_{1,r}}$

σ1 and σ3 are major and minor principal stress, respectively

ε1, r is major principal resilient strain

Applying the above equation and using representative structural layer coefficients reported by Yoder and Witczak and representative resilient modulus, the Design Structural Number (SN) are estimated based 1993 AASHTO Empirical Equation for Flexible Pavement.

Soil underling stabilized soil defined as pavement subgrade material with M_R = 6,000 psi, estimated based on CBR = 4

Stabilized soil defined as lime stabilized subgrade with M_R = 15,000 psi.

Crushed Limestone as the base material for the AASHTO Empirical Equation with M_R = 40,000 psi, and a structural layer coefficient, a2, defined as 0.17, and m2 = 1.0, and depth D2. Crushed limestone base material criteria as defined by Harris County Public Infrastructure Department Standard Engineering Design Specifications for Construction and Maintenance of Roads and Bridges, Item 230 Crushed Aggregate Base. The crushed aggregate base shall be compacted to at least 95 percent of modified proctor density (ASTM D1557) at a moisture content ranging from optimum to +/- 3 percent above optimum.

Hot Mix Hot Laid Asphaltic Concrete Asphalt, considered as pavement surface course material for the AASHTO Empirical Equation, with a1 = 0.44, m1 = 1.0, and depth D1. Hot Mix Asphaltic Concrete Surface Course should be plant mixed, hot laid Type "D": (Dense Graded Surface Course) and meet the requirements TxDOT Item 340 Hot Mixed-Hot Laid Asphaltic Concrete.

TxDOT Item 210 defined rollers compacting subgrade, base, subbase and surface course.

The following table shows estimated W_{18} as a function of a, m, M_R with D1, D2 and D3 for major thoroughfare roadway according to 2014 Harris County Public Infrastructure Department Standard Engineering Design Specifications.

Option 1: Pavement thickness for 20-year design Period (2040)

Pavement System Component (New Pavement)	a	m	M_R, (psi)	W18 ESALs for ΔPSI	Design Structural Number (SN)	SN based on Design layer Depths	Recommended Design Pavement Thickness (inches)
Surface Hot-Mix Asphaltic Concrete (TxDOT Item 340, Type D)	0.44	1.0	N/A	2.60×10^6	4.51	4.56	**4.50**
Flexible Base Crushed Limestone (Harris County Item 230)	0.17	1.0	40,000				**10.0**
Subbase Stabilized compacted Subgrade (Harris County Item 223)	0.11	1.0	15,000				**8.0**
Subgrade	N/A	N/A	6,000				N/A

Option 2: Pavement thickness for 10-year design Period (2030)

Pavement System Component (New Pavement)	a	m	M_R, (psi)	W18 ESALs for ΔPSI	Design Structural Number (SN)	SN based on Design layer Depths	Recommended Design Pavement Thickness (inches)
Surface Hot-Mix Asphaltic Concrete (TxDOT Item 340, Type D)	0.44	1.0	N/A	1.20×10^6	4.0	4.0	**4.0**
Flexible Base Crushed Limestone (Harris County Item 230)	0.17	1.0	40,000				**8.0**
Subbase Stabilized compacted Subgrade (Harris County Item 223)	0.11	1.0	15,000				**8.0**
Subgrade	N/A	N/A	6,000				N/A

Please note **widening of the pavement** is similar to the design of the new pavement as described in this section.

Pavement Coatings

Seal Coat: Seal coat is a thin surface treatment used to waterproof the surface and to provide skid resistance. *Harris County specification Item No 324 defines the application of Seal coat.*

Tack Coat: Tack coat is a very light application of asphalt, usually asphalt emulsion diluted with water. It provides proper bonding between two layers of binder course and must be thin, uniformly cover the entire surface, and set very fast. *Harris County specification Item No 310 defines the application of Tack coat.*

Prime Coat: Prime coat is an application of low viscous cutback bitumen to an absorbent surface like granular bases on which binder layer is placed. It provides bonding between two layers. Unlike tack coat, prime coat penetrates into the layer below, plugs the voids, and forms a water-tight surface. *Harris County specification Item No 310 defines the application of Prime coat.*

1.1.2 Rigid Pavement Design for Old Richmond Road at Voss road

1993 AASHTO Empirical Equation for Ridge Pavement -- The serviceability loss due to traffic is computed from an empirical relationship derived from AASTHO Road Test data. It relates the number of cumulative Equivalent 18-kip Single-Axle Loads (ESAL) passes to the corresponding change in pavement serviceability. It is expressed in the following format (Imperial Units)[1]:

$$\log(W_{18}) = Z_R S_0 + 7.35\log(D+1) - 0.06 + \frac{\log\left[\frac{\Delta PSI}{4.2-1.5}\right]}{1+\frac{1.624 \times 10^7}{(D+1)^{8.46}}} + (4.22 - 0.32P_t)\log\left[\frac{Sc'C_d(D^{0.75}-1.132)}{215.63J\left(D^{0.75} - \frac{18.42}{\left(E_c/k\right)^{0.25}}\right)}\right]$$

Where,

Z_R is the Standard Normal Deviate that is function of Reliability. With the Reliability defined as 95% the corresponding Z_R = -1.645.

S_o = 0.4, the Combined Standard Error in predicting pavement serviceability.

ΔPSI = Initial Serviceability Index – Final Serviceability Index = 4.5 – 2.5 = 2.0

W_{18} is the number of Equivalent 18-kip Single Axle Loads ESALs that will result in a change in serviceability of ΔPSI. GETI was provided with the AADT data and we have calculated ESALS (W_{18}) based on the provided information.

The parameters used for calculations are as follows:

D is the Portland cement concrete pavement thickness

S'_c is the modulus of rupture of Portland cement concrete, psi, based on third point loading.

C_d is a drainage coefficient that characterizes drainage quality and percent of time pavement structure is saturated.

J is a load transfer coefficient that is a function of the pavement type (jointed plain, jointed dowel-reinforced, or continuously reinforced), shoulder material (asphalt or concrete), and load transfer reinforcement across joints or pavement.

E_c is Modulus of elasticity of Portland cement concrete

k is Modulus of subgrade reaction (estimated for stabilized soil)

[1] Pavement Design and Materials, Papagiannakis, A.T. & Masad, E.A. (2007), John Wiley & Sons, Inc. publications

18-kip ESAL Calculation for Rigid Pavement

Two-Way AADT (Current) = 12,204 (Revised data provided by BGE, Inc on 06/01/2020)
Two-Way AADT (2030) =14,934 (Revised data provided by BGE, Inc on 06/01/2020)
Two-Way AADT (2040) = 17,671 (Revised data provided by BGE, Inc on 06/01/2020)

The 18-kip single axle loads (ESALS) for rigid pavement is calculated as **3.65×10^6** for Old Richmond and Voss Road for the design year 2040 (design life 20 years) & as **1.65×10^6** for Old Richmond and Voss Road for the design year 2030.

The following table shows estimated 18-kip Single-Axle Loads (W_{18}) as a function of D.

Pavement Thickness, inches	**8.0**	**9.0**	**10.0**
W_{18} ESALs for ΔPSI	1.20×10^6	2.50×10^6	5×10^6
Req. 28 Day Compressive Strength, f'_c, psi	4,000	4,000	4,000
Concrete Elastic Modulus, E_c, psi	4.0×10^6	4.0×10^6	4.0×10^6
Req. 28 Day Flexural Strength S'_c, psi	600	600	600
Drainage Factor, C_d	1	1	1
Load Transfer Coefficient, J	3.2	3.2	3.2
Stabilized Subgrade Thickness, in.	8	8	8
Mod. of Subgrade Reaction, k, pci	150	150	150

Note: Fort Bend County Regulations of Subdivision Section 5 defines minimum depth for concrete pavement is 8-inch for major arterial.

Based on the available AADT information, the estimated ESALS for design year 2040 is approximately **3.65×10^6**, whereas, the estimated ESALS for design year 2030 is approximately **1.65×10^6**. Hence, GETI recommends the proposed pavement should be designed with design thickness of **8.5-inches** for a **design life of 10 years;** and **9.5-inches** with a **design life of 20-years**, for a concrete flexural strength of 600 psi or a concrete compressive strength f'_c ~ 4,000 psi. An 8-inch thick lime stabilized subgrade should be placed and compacted as per ASTM D698, below the concrete pavement.

Note: **8-inch** thick Concrete pavement will have a design life of 8-years.

GETI recommends widening of the pavement should be designed in a similar manner as of new pavement design section described above.

Recommended Rigid Pavement Reinforcement, Load Transfer, and Joints

Minimum Reinforcing Steel:	• For 8 & 8.5-inch pavement, Grade 60 #4 bars spaced at 24-inches on center in both directions. • For 9 & 9.5-inch pavement, Grade 60 #5 bars spaced at 24-inches on center in both directions. • For 10-inch pavement, Grade 60 #5 bars spaced at 18-inches on center in both directions.
Minimum Dowel Size:	• For 8 & 8.5-inch pavement, #8 bars, 24-inch in length spaced at 18-inches on center. • For 9 & 9.5-inch pavement, #9 bars, 24-inch in length spaced at 24-inches on center. • For 10-inch pavement, #9 bars, 30-inches in length spaced at 24-inches on center.
Control Joint Spacing:	Maximum of 15 feet. If sawcut, control joints should be cut as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually within 4 to 24 hours of concrete placement.
Isolation / Expansion Joints:	Expansion joints should be used in areas adjacent to structures. The maximum spacing should not exceed 60 feet.

1.1.3 Overlay on Existing Pavement (Old Richmond Road at Voss Road)

GETI observed the existing old Richmond Road at Voss road has minor cracks and distress. The thickness of the existing pavement in the borings B-1 & B-2 was found to be 5 to 11-inch of asphalt including base and 6-inches of base /subbase material.

Based on FPS 21 design software, for a design life of 20 years, a total of **5-inch of asphalt overlay** can be constructed over the existing asphalt pavement, provided that the all areas of the existing pavement consist of at least 2-inches of asphalt & 10-inches of base material. The asphalt overlay can also be placed with 2-inches in the first year and 3-inches in the 8th year as well.

For a design life of 10-years, **an asphalt overlay of 3-inch** will be satisfactory over the existing pavement.

Note: Our recommendation is based on a few borings drilled near to the proposed roundabouts. GETI recommends an existing pavement should be evaluated again before constructing the overlay. Full depth repairs are required only where structural integrity is lost at the isolated spots.

General Construction Considerations

The site preparation, preparation of subgrade, select fill requirements, compaction and surface drainage appear on GETI PROJECT No. 19G7659/A, dated October 24, 2019.

****

We appreciate the opportunity to work with you on this phase of the project. If you have any question concerning this, report or require additional information, please contact us.

With Kindest Regards,
GeoScience Engineering & Testing, Inc.,

Kishor Rawal, MSCE, PE
Senior Project Engineer

Telfryn L. John, PE
Senior Vice President

F-4802

Copies Submitted: (1)

GEOTECHNICAL INVESTIGATION
Proposed Geotechnical Investigation
Voss Road Roundabout at Old Richmond Road
Voss Right Turn Lane at SH 6
Fort Bend County, Texas

Reported to:
BGE, Inc
Houston, Texas

Prepared by:
Geoscience Engineering and Testing, Inc.
Houston, Texas

PROJECT NO: 19G7659/A (Revised Report)

October 2019

GEOSCIENCE
ENGINEERING & TESTING, INC.

405 E. 20th Street
Houston, Texas 77008
713.861.9700
713.861.4477 Fax

HOUSTON THE WOODLANDS

October 24, 2019

BGE, Inc
10777 Westheimer Road, Suite 400
Houston, Texas 77042

Attention: Mr. Jason Ellison, P.E

Reference: **Geotechnical Investigation**
Proposed Geotechnical Investigation
Voss Road Roundabout at Old Richmond Road
Voss Right Turn Lane at SH 6
Fort Bend County, Texas
GETI NO: 19G7659/A *(Revised Report)*

Dear Mr. Ellison:

GEOSCIENCE ENGINEERING & TESTING, INC. (GETI) is pleased to submit this report for the above referenced project. This study was authorized through an Exhibit A attachment B, subcontract between BGE, Inc and Geoscience Engineering & Testing, Inc on June 4, 2019. This report describes the procedures employed in our investigation and presents the conclusions and recommendations of our studies.

We appreciate the opportunity to work with you on this phase of the project. If you have any question concerning this report or require additional information, please contact us.

With Kindest Regards,
Geoscience Engineering & Testing, Inc.

Kishor Rawal, MSCE, P.E
Project Engineer

Telfryn L. John, PE
Senior Vice President

F-4802

Copies Submitted: (1)

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This Geotechnical Report for the Voss Road improvements was prepared based on the geotechnical exploration obtained from 5-corings and 5-soil borings for the 1000-feet long Voss Road traffic roundabout (1-lane) at Old Richmond Road, and a 600-feet long Voss Road right turn lane along Voss Road at SH 6.

Summary of the Findings the Study:

- GETI observed an existing 5 to 11-inch thick asphalt pavement along the Old Richmond Road, 8 to 8.5-inch thick concrete pavement at Voss Road immediately east of Old Richmond Road; and 8 to 8.5-inch thick concrete pavement along Voss Road immediately west of SH 6.
- Lean clays and fat clays were predominantly encountered below the existing pavement to a depth of 15 to 20-feet; except boring B-2 which shows clayey sand below 8-feet from the ground surface.

Summary of the Recommendations and Conclusions of the Study:

- For the Voss Road roundabout at old Richmond Road, utilizing the 1993 AASTHO Empirical Equation for flexible pavement, a 5-inch thick Hot Mix asphalt surface course, 10-inch thick crushed limestone and an 8-inch thick lime stabilized subgrade is satisfactory for a design life of 20 years. However, for a design life of 10-years, a 4.5-inch thick Hot Mix asphalt surface course, 8-inch thick crushed limestone and 8-inch thick lime stabilized subgrade is required.
- For the Voss Road roundabout at old Richmond Road, utilizing the 1993 AASTHO Empirical Equation for rigid pavement, a 10-inch thick concrete pavement can also be constructed over an 8-inch thick lime stabilized subgrade for a design life of 20 years. However, for a design life of 10-years, an 9-inch thick concrete pavement can be constructed over an 8-inch thick lime stabilized subgrade
- For the Voss Road Right Turn Lane at SH 6, utilizing the 1993 AASTHO Empirical Equation for flexible pavement, a 4-inch thick Hot Mix asphalt surface course, 8-inch thick crushed limestone and 8-inch thick lime stabilized subgrade is satisfactory for a design life of 20 years. However, for a design life of 10-years, a 3-inch thick Hot Mix asphalt surface course, 8-inch thick crushed limestone and 8-inch thick lime stabilized subgrade is required.
- For the Voss Road Right Turn Lane at SH 6, utilizing 1993 AASTHO Empirical Equation for rigid pavement, an 8-inch thick concrete pavement can also be constructed over an 8-inch thick lime stabilized subgrade for a design life of 20 years
- Alternatively, a 7-inch thick asphalt overlay can be constructed at Voss Road roundabout at Old Richmond Road and a 2-inch bonded concrete overlay can also be constructed over the existing pavement at the Voss right turn lane at SH 6. Design of widening of pavement is similar to the design of new pavements.
- Groundwater control program is required, if water seepage is observed in trenches. For dewatering, sumps and pumps can be utilized in most of the areas where low seepage cohesive soils are present.
- Bedding and backfilling of the utilities and storm sewer should be conducted in general accordance with the specifications of Fort Bend County requirements. The Harris County, Standard Engineering Design Specifications for Construction and Maintenance of Roads and Bridges contains bedding and backfill Items that should be satisfactory to Fort Bend County Building Officials.
- Fort Bend County Engineering Department drawing FBC-050, FBC-051, and FBC-052 defines bedding for pipe sewer, special sections for pipe sewer and wet sand construction for pipe sewers respectively. FBC-057 & FBC-058 defines the standard manhole for concrete pipe storm sewers.

I. INTRODUCTION AND PROJECT INFORMATION

Geoscience Engineering and Testing, Inc. (GETI) is pleased to submit our report of geotechnical investigation of subsurface conditions at the site of the proposed Voss Road improvement at Old Richmond Road and SH 6 in Fort Bend County, Texas. GETI's investigation was authorized by Mr. Matthew Brannan, PE through a subcontract between Geoscience Engineering & Testing, Inc and BGE, Inc.

The purpose of the geotechnical investigation was to determine the subsurface soil conditions at the site of the proposed roadway with particular reference to the pavement recommendation for 600-feet long right turn lane at Voss Road immediately west of SH 6, and 1000-feet long 1-Lane roundabout at the intersection of Old Richmond and Voss Road along with storm water drainage improvements.

II. SUBSURFACE EXPLORATION

1. General / Scope of Work

Scope of this investigation included a reconnaissance of the immediate site, geologic desktop review, subsurface exploration, pavement cores, field and laboratory testing, with an engineering analysis for pavement design. The purpose of this subsurface exploration and analysis was to determine soil profile components, the engineering characteristics of the subsurface materials and to provide criteria for use by design engineers and contractors in preparing the new pavement design, drainage improvements and existing signal modification.

The exploration and analysis of the subsurface conditions reported herein are considered in sufficient detail and scope to form a reasonable basis for the recommendations. These recommendations are based on available soil information and preliminary design details furnished by Mr. Jason Ellison, PE with BGE Inc. Any revision in plans for the proposed pavement from those enumerated in this report should be brought to the attention of the soil engineer so that he may determine if changes in the recommendations are required. If deviations from the noted subsurface conditions are encountered during construction, they should also be brought to the attention of the soil engineer.

The report addresses:

- ✓ Existing soil and groundwater condition
- ✓ Evaluation of existing pavement.
- ✓ New asphalt and concrete pavement design recommendations
- ✓ Storm water drainage recommendations
- ✓ Materials and compaction requirements.
- ✓ Construction considerations, if any

2. Description of the Site / Geology

The site has relatively level. GETI observed an existing asphalt pavement along the Old Richmond Road, a concrete pavement at Voss Road immediately east of old Richmond road; and a concrete pavement along Voss road immediately west of SH 6. During drilling operation, GETI observed minor distresses along Old Richmond Road and Voss Road. No major potholes were observed at the time of drilling operation.

The soils underlying the existing pavement system were primarily lean clay and fat clay at the time of our drilling operation. Please refer to the boring logs for details. The site is generally in the geographic area which corresponds to the outcrop area of the Beaumont Formation, Quaternary Period, and Holocene, Pleistocene Epoch or Series[1].

3. Field Investigation

The field investigation was completed on July 22, 2019, with the intent to explore and determine the engineering characteristics of the subsurface materials. This included a reconnaissance of the project site, drilling the exploratory borings, and recovering the representative soil samples.

Subsurface soil conditions were explored by advancing five soil borings. Borings B-1 through B-3 were drilled to a depth of 20-feet below the existing ground surface, whereas, boring B-4 through B-5 were drilled to a depth of 15-feet. Please note boring B-3 was stopped at 6-feet due to encountered old utility pipe debris. The approximate soil boring locations are shown on the Soil Boring Plan, Plate No. 1.

Sample depth and description of soil classification (based on the Unified Soil Classification System) are presented on the Soil Boring Logs, Plate Nos. 2 through 6. Keys to Terms and Symbols used on the Soil Boring Logs are shown on Plate No. 7. Photographs appear on Plate No. 8.

The soil borings were of 3-inch nominal diameter. All relatively undisturbed and disturbed soil samples were obtained at 2-feet intervals continuously to a depth of 10-feet. The soil borings were performed with a drilling rig equipped with rotary head conventional solid-stem augers used to advance the holes. Representative disturbed or undisturbed soil samples were obtained employing thin-walled sampling procedures in accordance with ASTM D1587.

Soil samples were identified according to the boring number and depth and wrapped in aluminum foil and polyethylene plastic wrapping bags to prevent moisture loss and disturbance. All of the samples were transported to our geotechnical laboratory for examination, testing and analysis. All borings were backfilled with the soil cuttings accumulated during the drilling operation, after final water readings were obtained, then cold patch asphalt was used to restore the pavement surface.

3.1 Field Strength Tests

During the field boring operation, samples of cohesive soil from the thin-walled tube were frequently tested in compression by use of a calibrated soil penetrometer to provide a measure of shear strength to aid in characterizing the soil consistency.

3.2 Water Level Measurement

The information in this report summarizes conditions as found on the date the borings were drilled. Ground water was encountered in boring B-2 and B-5 at a depth of 15-feet and 13-feet respectively, during the drilling operation. After 30-minutes, water at boring B-2 and B-5 rose to a depth of 10-feet and 9-feet respectively. Long-term monitoring of the ground water level was beyond the scope of this study. It should be noted that the ground water table may be expected to fluctuate with environmental variations such as frequency and magnitude of rainfall and the time of the year when construction begins.

[1] Note: USGS, TNRIS, UTBEG, GEOLOGIC ATLAS OF TEXAS

4. Asphalt & Concrete Core Data

Asphalt and concrete cores were cored at the respective boring location in order to evaluate the existing surface course and base materials. The nominal concrete core diameter was 5.75-inches. Core samples were acquired and tested in general accordance with ASTM C42, "Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete". Asphalt and concrete core thickness measurements are summarized in the following table.

Table 1 – Thickness of Cores

Coring Number	Asphalt Thickness (Inches)	Concrete Thickness (Inches)	Base Thickness (Inches)
C-1	11.0	-	6.0
C-2	5.0	-	8.0
C-3	-	8.5	10.0
C-4	-	8.5	-
C-5	-	8.5	-

5. Surface Fault

Fault assessment was conducted based on current guidelines for Geological Fault Studies contained in the March 1985 Houston Geological Society (HFS) Bulletin. We have reviewed several available published literatures on faulting in the area, USGS fault maps and site reconnaissance. According to the "Principal Faults in Houston, Texas, Metropolitan Area" by Sachin D. Shah and Jennifer Lanning-Ruch, no faults were documented nearby the proposed site location.

6. Laboratory Testing

Complementing the field investigation, a supplemental laboratory investigation was conducted to ascertain additional pertinent engineering characteristics of the subsurface materials necessary in analyzing their behavior under the proposed loading conditions. During the laboratory investigation, all field soil samples from the boring were examined and classified by a soil engineer. Laboratory tests were then performed on selected soil samples to evaluate and determine the physical and engineering properties of the soils in accordance with prescribed ASTM standards and methods.

The following laboratory tests were performed:

LABORATORY TEST	TEST STANDARD
Moisture Content of Soils	ASTM D2216
Moisture Content and In Situ Dry Density of Soils	ASTM D2937
Unconfined Compressive Strength of Cohesive Soils	ASTM D2166
Liquid Limit, Plastic Limit, and Plasticity Index of Soils	ASTM D4318

Strength properties of the soils were determined by means of unconfined compression tests performed on undisturbed samples.

The type and number of laboratory tests performed for this investigation are:

DESCRIPTIONS	No. of Test	DESCRIPTIONS	No. of Test
Hand Penetrometer Test	28	Dry Density Test	1
Moisture Content Test	33	Unconfined Compressive Test	1
Atterberg Limits	7		

Laboratory Test Data is shown on the Soil Boring Logs presented on Plate Nos. 2 through 6.

III. GENERAL DESCRIPTION OF SUBSURFACE MATERIALS

The specific subsurface stratigraphy as determined by the field exploration at individual boring locations is shown in detail on the soil boring logs herein. However, the stratigraphy can be generalized as follows:

STRATUM NUMBER	RANGE OF DEPTH, Ft.	BORING NUMBER	SOIL DESCRIPTION (Below Asphalt Pavement or Concrete pavement)
I	0' – 8'	B-1 & B-2	Stiff to very stiff; dark gray and gray LEAN CLAY (CL)*
	4' – 6'	B-3	
II	0 – 4'	B-3	Soft to very Stiff; dark gray and gray; brown and gray FAT CLAY (CH)*
	0 – 15'	B-4 & B-5	
	8' – 20'	B-1	
III	8' – 20'	B-2	Medium dense, brown CLAYEY SAND (SC)*

* Classification is in accordance with the Unified Soil Classification System

Laboratory tests results for the soils indicate that the Liquid Limits range from LL = 25 to 80 percent, the Plastic Limits range from PL = 15 to 30 percent and the Plasticity Indices range from PI = 10 to 50. Soil moisture content ranged from 14 to 33 percent.

1. Swell Potential

Based on plasticity index results, the lean clay, clayey sand and fat clay are characterized as having low to high shrink/swell potential. The fat clay has high shrink/swell potential.

When the moisture content of clay soil increases, the volume increases; conversely, when the moisture content of this type of soils decreases, the soil volume decreases. The volume changes can result in foundation movement and stresses.

2. Potential Vertical Rise (PVR)

The magnitude of the moisture induced vertical movement, potential vertical rise, was calculated using the Texas Department of Transportation Method Tex-124-E in conjunction with our evaluation of the current moisture profile.

The potential vertical rise (PVR) at the boring B-1 through B-3 (Voss Road at Old Richmond) of the test borings drilled is estimated to be approximately 1¾-inches at their existing moisture condition. The potential vertical rise (PVR) at the boring B-4 and B-5 (Voss Road at SH 6) of the test borings drilled is estimated to be approximately 4-inches at their existing moisture condition.

More movement may occur in areas where the soil dries and water subsequently ponds, during or after construction. Site grading may also influence the potential for movement.

IV. PAVEMENT RECOMMENDATIONS

1. Evaluation of Existing Pavement and Materials

GETI cored 5 core samples along the Old Richmond Road and Voss Road in order to evaluate the existing pavement thickness, existing base layers and evaluate the suitability for the new pavement.

At the time of drilling operation, the existing pavement along Old Richmond Road west of Voss Road is covered with 5 to 11-inches of asphalt pavement which shows a minor sign of distress. Also, the 8.5-inch thick concrete pavement on the right turn lane along Voss Road immediately west of SH 6 also shows minor signs of distress. No major potholes were observed at the time of drilling operation. The details of the core samples were presented in section II Table 1.

2. Subgrade

Based on our field investigation and test results in the drilled borings, surficial soils were primarily lean clay and fat clay. Therefore, these surface soils can be easily handled, retain compaction, and minimize or eliminate rutting if stabilized.

GETI recommends the upper 8 inches of the exposed clay final subgrade be stabilized by the addition of 7% lime at the following rate of treatment based on a soil dry weight of 100 pcf.

Item	Percent	Range Per Square Yard
Lime	7 %	40-45 lbs.

The actual stabilization requirements may vary in the field depending on conditions at the time of construction and should be established by running tests on the exposed subgrade soils. The required quantity of lime for use in stabilization as provided above is an estimated value only. The actual quantity should be based on tests performed on the soils used at the time of construction.

The stabilized subgrade should be compacted to a minimum 95% of the Standard Proctor maximum dry density (ASTM D 698). Texas Department of Transportation 2014 Standard Specification, Item 260 and 264, should be used as a procedural guide for lime treatment of the subgrade soils.

The required quantity of lime for use in stabilization as provided above is an estimated value only. The actual quantity of lime should be based on tests performed on the soils used at the time of construction.

The lime is applied and initially mixed. After mellowing a minimum of 48-hours, the treated soil should be pulverized where 100, 85 and 60 percent pass the 1-3/4 inch, ¾-inch, and No. 4 sieve, respectively. Resume mixing until a homogeneous, friable mixture is obtained.

3. Proposed Pavement Systems

Traffic volume information and loads were provided to GETI by BGE, Inc. Revised traffic volume estimates may require increased thickness. However, we have developed pavement thickness recommendations, based on the serviceability of the existing pavement and generally recommended traffic counts for a major thoroughfare.

We have evaluated both Hot Mix asphaltic concrete pavement comprising surface course, crushed limestone base and stabilized subgrade; and concrete pavement which comprises concrete surface course, and stabilized subgrade. Please contact us for alternative thickness recommendations as applicable to any adjustments in our assumptions.

3.1 Old Richmond Road at Voss Road

3.1.1 Flexible (Asphalt) Pavement

Two-Way Average Daily Traffic (AADT) (Current) = 17,262 (Provided by BGE, Inc)
Two-Way Average Daily Traffic (AADT) (2030) =21,605 (Provided by BGE Inc)
Two-Way Average Daily Traffic (AADT) (2040) = 25,361(Provided by BGE, Inc)

The 18-kip single axle loads (ESALS) for flexible pavement is calculated as **3.20×10^6** for Old Richmond and Voss Road for the design year 2040 (design life 20 years) & as **1.50×10^6** for Old Richmond and Voss Road for the design year 2030.

1993 AASHTO Empirical Equation for Flexible Pavement - The serviceability loss due to traffic is computed from an empirical relationship derived from AASHTO Road Test Data. It relates the number of cumulative Equivalent 18-kip Single-Axle Loads (ESAL) passes to the corresponding change in pavement serviceability. It is expressed in the following format (Imperial Units):

$$\log_{10}(W_{18}) = Z_R \times S_o + 9.36 \times \log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left(\frac{\Delta PSI}{4.2-1.5}\right)}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32 \times \log_{10}(M_R) - 8.07$$

Where,

Z_R is the Standard Normal Deviate that is function of Reliability. With the Reliability defined as 95% the corresponding Z_R = -1.645.

S_o = 0.4, the Combined Standard Error in predicting pavement serviceability.

W18 is the number of Equivalent 18-kip Single Axle Loads ESALs that will result in a change in serviceability of ΔPSI, Design ESALs for 20 years (W_{18}) = 2.5 x 10^6

ΔPSI = Initial Serviceability Index – Final Serviceability Index = 4.4 – 2.5 = 1.9

SN is the structural number, defined by SN= a1D1 + a2D2m2 + a3D3m3

a1, a2, a3 are structural layer coefficients for asphalt/concrete, base & sub-base, respectively

D1, D2, and D3 are the layer thicknesses of the asphalt/concrete, base & sub-base, respectively

m2 and m3 are the drainage coefficients for the base and the sub-base, respectively

MR is the resilient modulus of the subgrade, defined by $M_r = \frac{\Delta(\sigma_1 - \sigma_3)}{\varepsilon_{1,r}}$

σ1 and σ3 are major and minor principal stress, respectively

ε1, r is major principal resilient strain

Applying the above equation and using representative structural layer coefficients reported by Yoder and Witczak and representative resilient modulus, the Design Structural Number (SN) are estimated based 1993 AASHTO Empirical Equation for Flexible Pavement.

Soil underling stabilized soil defined as pavement subgrade material with M_R = 6,000 psi, estimated based on CBR = 4

Stabilized soil defined as lime stabilized subgrade with M_R = 15,000 psi.

Crushed Limestone as the base material for the AASHTO Empirical Equation with M_R = 40,000 psi, and a structural layer coefficient, a2, defined as 0.17, and m2 = 1.0, and depth D2. Crushed limestone base material criteria as defined by Harris County Public Infrastructure Department Standard Engineering Design Specifications for Construction and Maintenance of Roads and Bridges, Item 230 Crushed Aggregate Base. The crushed aggregate base shall be compacted to at least 95 percent of modified proctor density (ASTM D1557) at a moisture content ranging from optimum to +/- 3 percent above optimum.

Hot Mix Hot Laid Asphaltic Concrete Asphalt, considered as pavement surface course material for the AASHTO Empirical Equation, with a1 = 0.44, m1 = 1.0, and depth D1. Hot Mix Asphaltic Concrete Surface Course should be plant mixed, hot laid Type "D": (Dense Graded Surface Course) and meet the requirements TxDOT Item 340 Hot Mixed-Hot Laid Asphaltic Concrete.

TxDOT Item 210 defined rollers compacting subgrade, base, subbase and surface course.

The following table shows estimated W_{18} as a function of a, m, M_R with D1, D2 and D3 for major thoroughfare roadway according to 2014 Harris County Public Infrastructure Department Standard Engineering Design Specifications.

Option 1: Pavement thickness for 20-year design Period (2040)

Pavement System Component (New Pavement)	a	m	M_R, (psi)	W18 ESALs for ΔPSI	Design Structural Number (SN)	SN based on Design layer Depths	Recommended Design Pavement Thickness (inches)
Surface Hot-Mix Asphaltic Concrete (TxDOT Item 340, Type D)	0.44	1.0	N/A	3.20×10^6	4.64	4.78	**5.0**
Flexible Base Crushed Limestone (Harris County Item 230)	0.17	1.0	40,000				**10.0**
Subbase Stabilized compacted Subgrade (Harris County Item 223)	0.11	1.0	15,000				**8.0**
Subgrade	N/A	N/A	6,000				N/A

Option 2: Pavement thickness for 10-year design Period (2030)

Pavement System Component (New Pavement)	a	m	M_R, (psi)	W18 ESALs for ΔPSI	Design Structural Number (SN)	SN based on Design layer Depths	Recommended Design Pavement Thickness (inches)
Surface Hot-Mix Asphaltic Concrete (TxDOT Item 340, Type D)	0.44	1.0	N/A	1.50×10^6	4.16	4.22	**4.5**
Flexible Base Crushed Limestone (Harris County Item 230)	0.17	1.0	40,000				**8.0**
Subbase Stabilized compacted Subgrade (Harris County Item 223)	0.11	1.0	15,000				**8.0**
Subgrade	N/A	N/A	6,000				N/A

Please note **widening of the pavement** is similar to the design of the new pavement as described in this section.

Pavement Coatings

Seal Coat: Seal coat is a thin surface treatment used to water-proof the surface and to provide skid resistance. *Harris County specification Item No 324 defines the application of Seal coat.*

Tack Coat: Tack coat is a very light application of asphalt, usually asphalt emulsion diluted with water. It provides proper bonding between two layers of binder course and must be thin, uniformly cover the entire surface, and set very fast. *Harris County specification Item No 310 defines the application of Tack coat.*

Prime Coat: Prime coat is an application of low viscous cutback bitumen to an absorbent surface like granular bases on which binder layer is placed. It provides bonding between two layers. Unlike tack coat, prime coat penetrates into the layer below, plugs the voids, and forms a water-tight surface. *Harris County specification Item No 310 defines the application of Prime coat.*

3.1.2 Rigid Pavement Design for Old Richmond Road at Voss road

1993 AASHTO Empirical Equation for Ridge Pavement -- The serviceability loss due to traffic is computed from an empirical relationship derived from AASTHO Road Test data. It relates the number of cumulative Equivalent 18-kip Single-Axle Loads (ESAL) passes to the corresponding change in pavement serviceability. It is expressed in the following format (Imperial Units)[2]:

$$\log(W_{18}) = Z_R S_0 + 7.35\log(D+1) - 0.06 + \frac{\log\left[\frac{\Delta PSI}{4.2-1.5}\right]}{1+\frac{1.624 \times 10^7}{(D+1)^{8.46}}} + (4.22 - 0.32P_t)\log\left[\frac{Sc'C_d(D^{0.75}-1.132)}{215.63J\left(D^{0.75}-\frac{18.42}{\left(E_c/k\right)^{0.25}}\right)}\right]$$

Where,

Z_R is the Standard Normal Deviate that is function of Reliability. With the Reliability defined as 95% the corresponding Z_R = -1.645.

S_o = 0.4, the Combined Standard Error in predicting pavement serviceability.

ΔPSI = Initial Serviceability Index – Final Serviceability Index = 4.5 – 2.5 = 2.0

W_{18} is the number of Equivalent 18-kip Single Axle Loads ESALs that will result in a change in serviceability of ΔPSI. GETI was provided with the AADT data and we have calculated ESALS (W_{18}) based on the provided information.

The parameters used for calculations are as follows:

D is the Portland cement concrete pavement thickness

S'_c is the modulus of rupture of Portland cement concrete, psi, based on third point loading.

C_d is a drainage coefficient that characterizes drainage quality and percent of time pavement structure is saturated.

J is a load transfer coefficient that is a function of the pavement type (jointed plain, jointed dowel-reinforced, or continuously reinforced), shoulder material (asphalt or concrete), and load transfer reinforcement across joints or pavement.

E_c is Modulus of elasticity of Portland cement concrete

k is Modulus of subgrade reaction (estimated for stabilized soil)

[2] Pavement Design and Materials, Papagiannakis, A.T. & Masad, E.A. (2007), John Wiley & Sons, Inc. publications

18-kip ESAL Calculation for Rigid Pavement

Two-Way Average Daily Traffic (AADT) (Current) = 17,262 (Provided by BGE, Inc)
Two-Way Average Daily Traffic (AADT) (2030) =21,605 (Provided by BGE Inc)
Two-Way Average Daily Traffic (AADT) (2040) = 25,361(Provided by BGE, Inc)

The 18-kip single axle loads (ESALS) for rigid pavement is calculated as **4.5×10^6** for Old Richmond and Voss Road for the design year 2040 (design life 20 years) & as **2.0×10^6** for Old Richmond and Voss Road for the design year 2030.

The following table shows estimated 18-kip Single-Axle Loads (W_{18}) as a function of D.

Pavement Thickness, inches	**8.0**	**9.0**	**10.0**
W_{18} ESALs for ΔPSI	1.20×10^6	2.50×10^6	5×10^6
Req. 28 Day Compressive Strength, f'_c, psi	4,000	4,000	4,000
Concrete Elastic Modulus, E_c, psi	4.0×10^6	4.0×10^6	4.0×10^6
Req. 28 Day Flexural Strength S'_c, psi	600	600	600
Drainage Factor, C_d	1	1	1
Load Transfer Coefficient, J	3.2	3.2	3.2
Stabilized Subgrade Thickness, in.	8	8	8
Mod. of Subgrade Reaction, k, pci	150	150	150

Note: Fort Bend County Regulations of Subdivision Section 5 defines minimum depth for concrete pavement is 8-inch for major arterial.

Based on the available AADT information, the estimated ESALS for design year 2040 is approximately **4.5×10^6**, whereas, the estimated ESALS for design year 2030 is approximately **2.0×10^6**. Hence, GETI recommends the proposed pavement should be designed with design thickness of **9-inches** for a **design life of 10 years;** and **10-inches** with a **design life of 20-years**, for a concrete flexural strength of 600 psi or a concrete compressive strength f'_c ~ 4,000 psi. An 8-inch thick lime stabilized subgrade should be placed and compacted as per ASTM D698, below the concrete pavement.

Note: **8-inch** thickness of concrete pavement has a design life of only 6-years.

GETI recommends widening of the pavement should be designed in a similar manner as of new pavement design section described above.

Recommended Rigid Pavement Reinforcement, Load Transfer, and Joints

Minimum Reinforcing Steel:	• For 8-inch pavement, Grade 60 #4 bars spaced at 24-inches on center in both directions. • For 9-inch pavement, Grade 60 #5 bars spaced at 24-inches on center in both directions. • For 10-inch pavement, Grade 60 #5 bars spaced at 18-inches on center in both directions.
Minimum Dowel Size:	• For 8-inch pavement, #8 bars, 24-inch in length spaced at 18-inches on center. • For 9-inch pavement, #9 bars, 24-inch in length spaced at 24-inches on center. • For 10-inch pavement, #9 bars, 30-inches in length spaced at 24-inches on center.
Control Joint Spacing:	Maximum of 15 feet. If sawcut, control joints should be cut as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually within 4 to 24 hours of concrete placement.
Isolation / Expansion Joints:	Expansion joints should be used in areas adjacent to structures. The maximum spacing should not exceed 60 feet.

3.1.3 Overlay on Existing Pavement (Old Richmond Road at Voss Road)

GETI observed the existing old Richmond Road at Voss road has minor cracks and distress. The thickness of the existing pavement in the borings B-1 & B-2 was found to be 5 to 11-inch of asphalt including base and 6-inches of base /subbase material.

Based on FPS 21 design software, for a design life of 20 years, a total of **7-inch of asphalt overlay** can be constructed over the existing asphalt pavement, provided that the all areas of the existing pavement consist of at least 2-inches of asphalt & 10-inches of base material. The overlays can be done 4-inches in the first year and 3-inches in the 9th year as well.

For a design life of 10-years, **an asphalt overlay of 4.5-inch** will be satisfactory over the existing pavement.

Note: Our recommendation is based on a few borings drilled near to the proposed roundabouts. GETI recommends an existing pavement should be evaluated again before constructing the overlay. Full depth repairs are required only where structural integrity is lost at the isolated spots.

3.2 Voss Right Turn Lane at SH 6

3.2.1 Flexible (Asphalt) Pavement

Two-Way Average Daily Traffic (AADT) (Current) = 4,150 (Provided by BGE, Inc)
Two-Way Average Daily Traffic (AADT) (2030) =5,200 (Provided by BGE Inc)
Two-Way Average Daily Traffic (AADT) (2040) = 6,100 (Provided by BGE, Inc)

The 18-kip single axle loads (ESALS) for flexible pavement is calculated as **1×10^6** for Old Richmond and Voss Road for the design year 2040 (design life 20 years) & as **4×10^5** for Old Richmond and Voss Road for the design year 2030.

The following table shows estimated W_{18} as a function of a, m, M_R with D1, D2 and D3 for major thoroughfare roadway according to 2014 Harris County Public Infrastructure Department Standard Engineering Design Specifications.

Option 1: Pavement thickness for 20-year design Period (2040)

Pavement System Component (New Pavement)	a	m	M_R, (psi)	W18 ESALs for ΔPSI	Design Structural Number (SN)	SN based on Design layer Depths	Recommended Design Pavement Thickness (inches)
Surface Hot-Mix Asphaltic Concrete (TxDOT Item 340, Type D)	0.44	1.0	N/A	1.0×10^6	3.91	4.00	**4.0**
Flexible Base Crushed Limestone (Harris County Item 230)	0.17	1.0	40,000				**8.0**
Subbase Stabilized compacted Subgrade (Harris County Item 223)	0.11	1.0	15,000				**8.0**
Subgrade	N/A	N/A	6,000				N/A

Option 2: Pavement thickness for 10-year design Period (2030)

Pavement System Component (New Pavement)	a	m	M_R, (psi)	W18 ESALs for ΔPSI	Design Structural Number (SN)	SN based on Design layer Depths	Recommended Design Pavement Thickness (inches)
Surface Hot-Mix Asphaltic Concrete (TxDOT Item 340, Type D)	0.44	1.0	N/A	4.0×10^5	3.60	4.0	**3.0**
Flexible Base Crushed Limestone (Harris County Item 230)	0.17	1.0	40,000				**8.0**
Subbase Stabilized compacted Subgrade (Harris County Item 223)	0.11	1.0	15,000				**8.0**
Subgrade	N/A	N/A	6,000				N/A

Please note **widening of the pavement** is similar to the design of the new pavement as described in this section.

Pavement Coatings

Seal Coat: Seal coat is a thin surface treatment used to water-proof the surface and to provide skid resistance. *Harris County specification Item No 324 defines the application of Seal coat.*

Tack Coat: Tack coat is a very light application of asphalt, usually asphalt emulsion diluted with water. It provides proper bonding between two layers of binder course and must be thin, uniformly cover the entire surface, and set very fast. *Harris County specification Item No 310 defines the application of Tack coat.*

Prime Coat: Prime coat is an application of low viscous cutback bitumen to an absorbent surface like granular bases on which binder layer is placed. It provides bonding between two layers. Unlike tack coat, prime coat penetrates into the layer below, plugs the voids, and forms a water-tight surface. *Harris County specification Item No 310 defines the application of Prime coat.*

3.2.2 Rigid Pavement Design for Voss Right Turn Lane at SH 6

Two-Way Average Daily Traffic (AADT) (Current) = 4,150 (Provided by BGE, Inc)
Two-Way Average Daily Traffic (AADT) (2030) =5,200 (Provided by BGE Inc)
Two-Way Average Daily Traffic (AADT) (2040) = 6,100 (Provided by BGE, Inc)

The 18-kip single axle loads (ESALS) for rigid pavement is calculated as **1.15×10^6** for Old Richmond and Voss Road for the design year 2040 (design life 20 years) & as **5.0×10^5** for Old Richmond and Voss Road for the design year 2030.

The following table shows estimated W_{18} as a function of a, m, M_R with D1, D2 and D3 for major thoroughfare roadway according to 2014 Harris County Public Infrastructure Department Standard Engineering Design Specifications.

The following table shows estimated 18-kip Single-Axle Loads (W_{18}) as a function of D.

Pavement Thickness, inches	**7.0**	**8.0**
W_{18} ESALs for ΔPSI	6.0×10^5	1.20×10^6
Req. 28 Day Compressive Strength, f'$_c$, psi	4,000	4,000
Concrete Elastic Modulus, E_c, psi	4.0×10^6	4.0×10^6
Req. 28 Day Flexural Strength S'$_c$, psi	600	600
Drainage Factor, C_d	1	1
Load Transfer Coefficient, J	3.2	3.2
Stabilized Subgrade Thickness, in.	8	8
Mod. of Subgrade Reaction, k, pci	150	150

Note: Fort Bend County Regulations of Subdivision Section 5 defines minimum depth for concrete pavement is 8-inch for major arterial.

Based on the available AADT information and estimated ESALS for design year 2040 is approximately **1.15×10^6**, so, we recommend the proposed pavement should be designed with design thickness of **8-inches** for a concrete flexural strength of 600 psi or a concrete compressive strength f'$_c$ ~ 4,000 psi. An 8-inch thick lime stabilized subgrade should be placed and compacted as per ASTM D698, below the concrete pavement.

GETI recommends widening of the pavement should be designed in a similar manner as of new pavement design section described above.

Recommended Rigid Pavement Reinforcement, Load Transfer, and Joints

Minimum Reinforcing Steel:	• For 8-inch pavement, Grade 60 #4 bars spaced at 18-inches on center in both directions.
Minimum Dowel Size:	• For 8-inch pavement, #8 bars, 24-inch in length spaced at 18-inches on center.
Control Joint Spacing:	Maximum of 15 feet. If sawcut, control joints should be cut as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually within 4 to 24 hours of concrete placement.
Isolation / Expansion Joints:	Expansion joints should be used in areas adjacent to structures. The maximum spacing should not exceed 60 feet.

3.2.3 Overlay on Existing Pavement (Voss Right Turn Lane at SH6)

GETI observed the Voss right turn lane has minor cracks. The thickness of the existing pavement in the borings B-4 & B-5 shows 8 to 8.5-inch of concrete.

For a design life of 20 years, a **2-inch** bonded concrete overlay can also be constructed over the existing pavement. If a good bond is provided, the new slab consisting of old and new concrete layers will behave monolithically and increased slab thickness will reduce the wheel load stress at the bottom of the slab substantially, thus prolonging the pavement life. On the other hand, if a sufficient bond is not provided, the wheel load stress level in the new concrete layer will be high and the pavement performance will be compromised.

Note: Our recommendation is based on few boring drilled near to proposed Voss right turn lane at SH 6. GETI recommends an existing pavement should be evaluated again before constructing the overlay. Full depth repairs are required only where structural integrity is lost at the isolated spots.

V. UTILITY TRENCHES

1. Lateral Earth Pressure for Trenches

Excavating is recognized as one of the most hazardous construction operations. The condition of adjacent structures should be assessed prior to excavation and monitored during the excavation. When vertical cut excavations exceed 5 feet depth, trench boxes or shoring and bracing are needed to prevent caving of the soil into the excavation. The apparent lateral earth pressure exerted on braced trenches is a function of soil shear strength and applied surcharge loads.

Soil shear strength is defined using the angle of internal friction (ϕ), and cohesion (c_u). The following illustration, Fig. 1, defines the apparent lateral earth pressure distribution on vertical sheeting based on "Lateral Supports in Open Cuts" by Terzaghi, Peck and Mesri[3], and "Lateral Pressure for Designing Bracing" described and illustrated by McCarthy[4].

Should a trench box be used without providing backfill from top to bottom on each side of the box, the lateral earth pressure defined above should be increased by a factor of 2 to account for sides caving in on box. Clay heaving of the trench bottom is likely to be small when $\gamma H/c_u < 6$; whereas, clay heaving is significant when $\gamma H/c_u > 8$.[2]

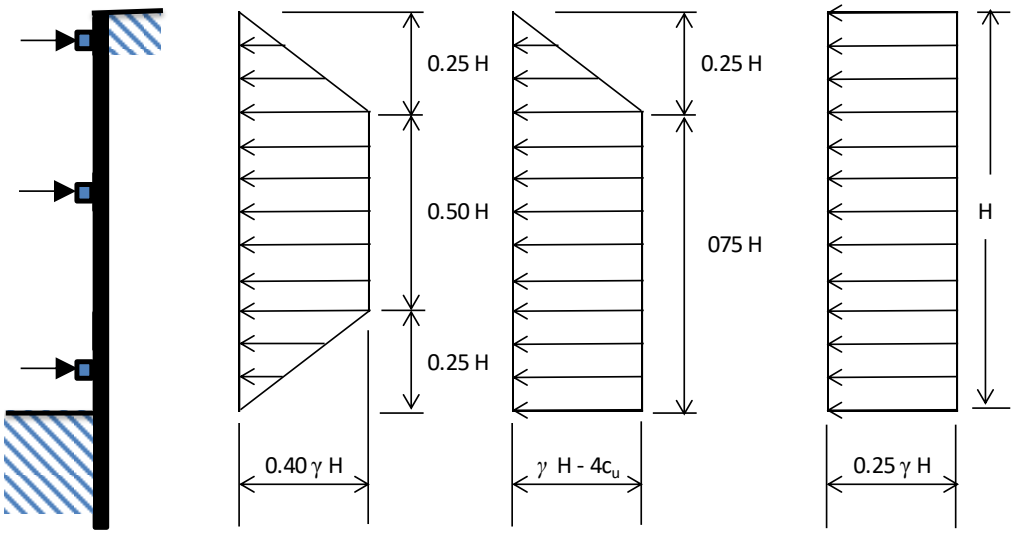

Fig. 1 – Apparent Lateral Pressure on Excavations [2, 3]

[2] Karl Terzaghi, Ralph B. Peck and Gholamreza Mesri, *Soil Mechanics in Engineering Practice*, III edition, John Wiley and Sons, Inc., 1996.
[3] David F. McCarthy, *Essentials of Soil Mechanics and Foundations*, VII edition, Pearson Prentice Hall, 2007.

The lateral pressure on the trench due a uniform surcharge load should be added to the earth pressure loads. A uniform surcharge pressure of 250 psf or greater should be considered to account for vehicle loads. The lateral pressure exerted on the trench due a uniform surcharge load can be estimated by using earth pressure coefficient value of 1.0 (conservative for sands and characteristic of clay). In this case, the lateral pressure equals the vertical surcharge pressure.

Any additional lateral loads due to surcharge and live loads should also be included in the design. GETI should be contacted to assess the earth pressures, if any structures are located within the proximity of the excavation.

2. Control of Groundwater

As previously discussed, groundwater was encountered in Boring B-2 at a depth of 15-feet and in boring B-5 at a depth of 13-feet, respectively, below the existing ground surface at the time of the time of drilling operation. But, seasonal variations in the ground water elevation can occur. The trench instability due to hydrostatic pressure can result due to the presence of clayey sand or when the lean clay and fat clay soil layers contain sand/gravel pockets and seams of calcareous/ferrous nodules that facilitate water seepage. Site drainage can contribute to surface water seepage into the soil.

Groundwater control program is required, if water seepage is observed in trenches. Sumps and pumps are generally used if water bearing cohesive soils with low seepage rates are encountered; whereas, well point systems should be used where water bearing cohesion less soils or granular soils having higher seepage rates, are encountered.

3. Pipe Bedding and Backfill (Storm Sewer)

GETI recommends that bedding and backfilling materials should be conducted in general accordance with the specifications of Fort Bend County requirements. The Harris County, Standard Engineering Design Specifications for Construction and Maintenance of Roads and Bridges contains bedding and backfill Items that should be satisfactory to Fort Bend County Building Officials.

- Specification Item 402 entitled, “Bank Sand Backfill”, addresses furnishing, placing, manipulation, compacting and completing in-place, Bank Sand as a bedding and backfill material for water and sewer lines.
- Specification Item 430 entitled, “Construction of Underground Utilities”, addresses embedment and backfill around completed sewers to the level of the original ground. This item governs the furnishing and placing of cement stabilized backfill.

- Specification Item 433 entitled “Cement Stabilized Sand Bedding and Backfill Material” defines requirements for cement stabilized sand used as bedding and backfill in trenches.

Certain materials are unsuitable for pipe bedding and backfill, and these are materials that correspond to ASTM D 2487 classification of ML, CL-ML, MH, PT, OH, and OL; containing aggregates, clods, or stones greater than 4 inches, debris, vegetation, waste; or any deleterious materials; that cannot be compacted to required density; or contaminated with hydrocarbons or chemicals.

Fort Bend County Engineering Department drawing FBC-050, FBC-051, and FBC-052 defines bedding for pipe sewer, special sections for pipe sewer and wet sand construction for pipe sewers respectively. FBC-057 & FBC-058 defines the standard manhole for concrete pipe storm sewers.

4. OSHA Trench Safety Recommendations

Excavating is recognized by the Occupational Safety and Health Administration (OSHA) as one of the most hazardous construction operations. Appropriate construction practices and equipment selection is the Contractor's responsibility. Texas Health & Safety Code - Section 756.022. Trench Excavation are the Occupational Safety and Health Administration standards for trench safety that will be in effect during the period of construction of the project. OSHA has defined requirements for shored, benched or sloped excavations that assure worker and public safety, and property protection. Code of Federal Regulations (Standards - 29 CFR) PART 1926 Safety and Health Regulations for Construction Subpart P – Excavations addresses the following:

1926.650 - Scope, application, and definitions applicable to this Subpart P;
1926.651 - Specific Excavation Requirements;
1926.652 - Requirements for protective systems;
1926 Subpart P App A - Soil Classification ;
1926 Subpart P App B - Sloping and Benching;
1926 Subpart P App C - Timber Shoring for Trenches;
1926 Subpart P App D - Aluminum Hydraulic Shoring for Trenches;
1926 Subpart P App E - Alternatives to Timber Shoring;
1926 Subpart P App F - Selection of Protective Systems.

The OSHA Technical Manual (OTM), Section V: Construction Operations, Chapter 2. entitled, "Excavations: Hazard Recognition in Trenching and Shoring" provides definitions, overview of soil mechanics, determination of soil type, test equipment and methods for evaluating soil type, types of shoring and shielding, sloping and benching, spoil, and health and safety considerations.

Summary of OSHA Soil Classification for upper 20-feet of Drilled Borings:

BORING NUMBER	DEPTH (FT)							
	0'-2'	2'-4'	4'-6'	6'-8'	8' -10'	10'-12'	13'-15'	18'-20'
B-1	A	A	A	A	A	A	A	A
B-2	A	A	A	A	C	C	C	C
B-3	A	B	C	-	-	-	-	-
B-4	A	A	B	A	A	A	A	-
B-5	C	C	B	A	A	A	A	-

OSHA 1926 Subpart P App A "Soil Classification" is defined in a hierarchy of Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the characteristics of the deposits and the environmental conditions of exposure. (See OSHA 1926 Subpart P App A for additional information.)

- Type A" means cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if: (i) The soil is fissured; or (ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or (iii) The soil has been previously disturbed; or (iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or (v) The material is subject to other factors that would require it to be classified as a less stable material.

- Type B means: (i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf; or (ii) Granular cohesion less soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam; (iii) Previously disturbed soils except those which would otherwise be classed as Type C soil; (iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or (v) Dry rock that is not stable; or (vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified Type B.

- Type C means: (i) Cohesive soil with an unconfined compressive strength of 0.5 tsf or less; or (ii) Granular soils including gravel, sand, and loamy sand; or (iii) Submerged soil or soil from which water is freely seeping; or (iv) Submerged rock that is not stable, or (v) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper

VI. OPEN DRAINAGE DITCHES

1. **Ditch Slope -** Should sufficient ROW remain to handle increased drainage flows and volumes, GETI recommends an exposed slope that does not exceed 3.5(H):1(V) should be satisfactory based on Texas Department of Transportation, December 2012, Geotechnical Manual. The slope criteria appear in Table 7-1 of the Manual; and the table is entitled, “Plasticity Index Range for Exposed Side Slopes Required” for FS=1.3 for the Long Term or Drained Condition.

VII. GENERAL CONSTRUCTION CONSIDERATIONS

1. Site Preparation

Our recommendations for site preparations are summarized below:

1.1 Any on-site fill soils, encountered in the paved areas during construction, must have records of successful compaction tests signed by a registered professional engineer that confirms the use of the fill and record of construction and earthwork testing. These tests must have been performed on all the lifts for the entire thickness of the fill. If no compaction test results are available, the fill soil must be removed, processed and re-compacted in accordance with our recommendations of "Structural Fill and Subgrade Preparation".

1.2 The subgrade areas should be proof-rolled with a tandem axle, fully-loaded truck, 15-ton roller, or other equivalent suitable equipment as approved by the engineer. The proof-rolling serves to compact surficial soils and to detect any soft or loose zones. Any soils deflecting excessively under moving loads should be undercut to firm soils and re-compacted. The proof-rolling operations should be observed by an experienced geotechnician.

2. Structural Fill and Subgrade Preparation

It is recommended that the subgrade and fill be prepared as follow:

2.1 The site should be stripped to suitable depth to remove all existing pavement and miscellaneous fill material. The exposed subgrade surface should then be proof-rolled and scarified to a minimum depth of 6-inches and recompacted to the previously mentioned density tests at the time of construction. All soft or loose soils should be removed and replaced with select fill materials.

2.2 The natural subgrade should be scarified to a minimum depth of 6-inches. The scarified soils should then be recompacted to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor Density Test (ASTM D698). The moisture content should range +1% to +3% of optimum moisture.

2.3 Structural Select Fill should consist of a clean Sandy Clay with Liquid Limit, LL < 35 percent and a Plasticity Index, PI ~ 10-20. Specifications should require a uniform thickness throughout the paved area.

3. Surface Drainage

It is recommended that site drainage be well developed. Surface water should be directed away from the pavement subgrade soils. No ponding of surface water should be allowed.

VIII. DISCLAIMER

The information and recommendation contained in the report summarized conditions found at the site of the proposed Voss Road improvement for Voss road traffic roundabout (1-lane) at Old Richmond road, and right turn lane along Voss road at SH 6, in Fort Bend County Texas specified and on the date the field exploration was completed. The attached soil boring logs are a true representation of the soils encountered at the stratigraphy as found during the field exploration and drilling of the subject site.

Reasonable variations from the subsurface information presented in this report are assumed. If conditions encountered during construction are significantly different than those presented in this report, GETI should be notified immediately.

The report was prepared for the sole and exclusive use by our client, based on specific and limited objectives. GETI assumes no responsibility or obligation for the unauthorized use of this report beyond the stated project objectives and work limitations.

In addition, the construction process may itself alter site soil conditions. Therefore, experienced geotechnical personnel should observe and document the construction procedures and all conditions encountered. We recommend that the owner retain Geoscience Engineering and Testing, Inc. to provide this service as well as the construction material and testing and inspection required during the construction phase of the project.

The standard of care for all professional engineering and related services performed by Geoscience Engineering & Testing, Inc. (GETI) corresponds to other geotechnical firms under similar circumstances in the project locality. GETI makes no warranties, express or implied, under this agreement or about any services performed or furnished by us.

We would welcome the opportunity to discuss our recommendation with you and hope we may have the opportunity to provide any additional studies or service to complete this project.

The following illustrations are attached and complete this report:

ILLUSTRATIONS	PLATE NUMBERS
Boring & Coring Location Plan	1
Boring Logs	2-6
Symbols and Terms used on Boring Logs	7
Site Pictures	8

N

Approximate Boring & Coring Location

LOCATION

Proposed Geotechnical Investigation
Voss Road Roundabout at Old Richmond Road
Voss Right Turn Lane at SH 6
Fort Bend County, Texas
GETI NO.: 19G7659/A

NOT TO SCALE

PLATE NO.: 1

PROJECT: **Proposed Geotechnical Investigation**
Voss Road at SH 6
Voss Road at Old Richmond Road
Sugar Land, Texas

CLIENT: **BGE, Inc.**
Houston, Texas

BORING NO.: **B-1** DEPTH: **20'**
PROJECT NO. 19G7659A DATE: July 22, 2019
Drilling Crew: GXP
Drilling Type: Truck/Trailer Mounted Rig w/ 3-inch Sampler

Water was not encountered during drilling operation

FIELD DATA | LABORATORY DATA | DRILLING METHOD (S)

Continuous Flight Auger & Intermittent Sampling

Legend

Fat Clay | Lean Clay / Silty Clay | Silty Sand / Sandy Silt
Fill | Clayey Sand | Silty Clayey Sand

DEPTH (FEET)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT	T: INCHES/100 BLOWS	P: TONS/SQ FT	RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU. FT	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS NO. 200 SIEVE (%)	SHEAR STRENGTH (TSF)	DESCRIPTION OF STRATUM (Below 11-inch Asphalt & 6-inch Base)
0			P=2.75				21		41	18	23			Dark gray and gray LEAN CLAY (CL) - very stiff from 0' to 6'
			P=2.25				23							
5			P=1.75				23							- stiff from 4' to 8'
			P=1.75				23							
			P=2.25				24		61	25	37			Brown and gray FAT CLAY (CH) - very stiff from 8' to 10'
10			P=1.50				21							- stiff from 10' to 12'
			P=4.0+				26	100					1.30	- very stiff to hard from 13' to 15'
15														
			P=3.25				25							- very stiff from 18' to 20'
20														
25														
30														

N- STANDARD PENETRATION TEST RESISTANCE
T- TXDOT CONE PENETRATION RESISTANCE
P- POCKET PENETROMETER RESISTANCE
R- PERCENTAGE OF ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

GEOSCIENCE ENGINEERING & TESTING, INC

PLATE NO. 2

PROJECT: **Proposed Geotechnical Investigation**
Voss Road at SH 6
Voss Road at Old Richmond Road
Sugar Land, Texas

CLIENT: **BGE, Inc.**
Houston, Texas

BORING NO.: **B-2** DEPTH: **20'**
PROJECT NO. 19G7659A DATE: July 22, 2019
Drilling Crew: GXP
Drilling Type: Truck/Trailer Mounted Rig w/ 3-inch Sampler

Water was encountered during drilling operation

Water level measured after 30-minutes

FIELD DATA | LABORATORY DATA | DRILLING METHOD (S)

Continuous Flight Auger & Intermittent Sampling

Legend

Fat Clay | Lean Clay / Silty Clay | Silty Sand / Sandy Silt
Fill | Clayey Sand | Silty Clayey Sand

DEPTH (FEET)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT	T: INCHES/100 BLOWS	P: TONS/SQ FT	RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU. FT	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS NO. 200 SIEVE (%)	SHEAR STRENGTH (TSF)	DESCRIPTION OF STRATUM (Below 5-inch Asphalt & 8-inch Base)
			P=1.75				27							Dark gray and gray LEAN CLAY (CL)
			P=2.25				24							- stiff from 0' to 2'
5			P=2.5				21							- very stiff from 2' to 8'
			P=2.75				21							
			N=18				15							Medium dense, brown CLAYEY SAND (SC)
10			N=16				14		25	15	10			- water level at 10' after 30 min
			N=21				24							
15														- free water below 15'
														- cave in at 17'
			N=19				25							
20														
25														
30														

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GEOSCIENCE ENGINEERING
&
TESTING, INC

PLATE NO. 3

PROJECT: **Proposed Geotechnical Investigation**
Voss Road at SH 6
Voss Road at Old Richmond Road

CLIENT: **BGE, Inc.**
Houston, Texas

BORING NO.: **B-3** DEPTH: **6'**
PROJECT NO. 19G7659A DATE: July 22, 2019
Drilling Crew: GXP
Drilling Type: Truck/Trailer Mounted Rig w/ 3-inch Sampler

Water was not encountered during drilling operation

FIELD DATA | LABORATORY DATA | DRILLING METHOD (S)

Continuous Flight Auger & Intermittent Sampling

Legend

Fat Clay | Lean Clay / Silty Clay | Silty Sand / Sandy Silt
Fill | Clayey Sand | Silty Clayey Sand

DEPTH (FEET)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT	T: INCHES/100 BLOWS	P: TONS/SQ FT	RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU. FT	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS NO. 200 SIEVE (%)	SHEAR STRENGTH (TSF)	DESCRIPTION OF STRATUM (Below 8.5-inch Concrete & 10-inch Base)
			P=1.5				24		52	22	30			Brown and gray FAT CLAY (CH) - stiff from 0' to 2' - firm to stiff from 2' to 4'
			P=1.0				24							
5			B				21		43	18	25			Gray LEAN CLAY (CL)
10														Note: Refusal of drilling at 6-feet due to old utility debris
15														
20														
25														
30														

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GEOSCIENCE ENGINEERING & TESTING, INC

PLATE NO. 4

PROJECT: **Proposed Geotechnical Investigation**
Voss Road at SH 6
Voss Road at Old Richmond Road

CLIENT: **BGE, Inc.**
Houston, Texas

BORING NO.: **B-4** DEPTH: **6'**
PROJECT NO. 19G7659A DATE: July 22, 2019
Drilling Crew: GXP
Drilling Type: Truck/Trailer Mounted Rig w/ 3-inch Sampler

Water was not encountered during drilling operation

FIELD DATA | LABORATORY DATA | DRILLING METHOD (S)

Continuous Flight Auger & Intermittent Sampling

Legend

Fat Clay | Lean Clay / Silty Clay | Silty Sand / Sandy Silt
Fill | Clayey Sand | Silty Clayey Sand

DEPTH (FEET)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT	T: INCHES/100 BLOWS	P: TONS/SQ FT	RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU. FT	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS NO. 200 SIEVE (%)	SHEAR STRENGTH (TSF)	DESCRIPTION OF STRATUM (Below 8.5-inch Concrete)
			P=1.75				29							Stiff, dark gray and gray FAT CLAY (CH)
			P=1.75				30							
5			P=1.25				31		80	30	50			
			P=1.75				29							
			P=2.5				26							Very stiff, brown and gray FAT CLAY (CH)
10			P=2.5				26							
			P=3.75				27							
15														
20														
25														
30														

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GEOSCIENCE ENGINEERING & TESTING, INC

PLATE NO. 5

PROJECT: **Proposed Geotechnical Investigation**
Voss Road at SH 6
Voss Road at Old Richmond Road

CLIENT: **BGE, Inc.**
Houston, Texas

BORING NO.: **B-5** DEPTH: **6'**
PROJECT NO. 19G7659A DATE: July 22, 2019
Drilling Crew: GXP
Drilling Type: Truck/Trailer Mounted Rig w/ 3-inch Sampler

Water was encountered during drilling operation

Water level measured after 30-minutes

FIELD DATA | LABORATORY DATA | DRILLING METHOD (S)

Continuous Flight Auger & Intermittent Sampling

Legend

Fat Clay | Lean Clay / Silty Clay | Silty Sand / Sandy Silt
Fill | Clayey Sand | Silty Clayey Sand

DEPTH (FEET)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT	T: INCHES/100 BLOWS	P: TONS/SQ FT	RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU. FT	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS NO. 200 SIEVE (%)	SHEAR STRENGTH (TSF)	DESCRIPTION OF STRATUM (Below 8.5-inch Concrete)
			P=0.5				33							Dark gray and gray FAT CLAY (CH) - soft to firm from 0' to 4'
			P=0.5				30							
5			P=1.25				29							- stiff from 4' to 6'
			P=2.25				23		72	27	45			- very stiff from 6' to 8'
			P=3.75				19							Very stiff, brown and gray FAT CLAY (CH) - water level at 9' after 30 min
10			P=4.0				19							
			P=4.0				20							- free water below 13'
15														
20														
25														
30														

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T- TXDOT CONE PENETRATION RESISTANCE
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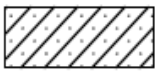
GEOSCIENCE ENGINEERING & TESTING, INC

PLATE NO. 6

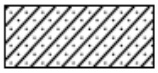
KEY TO SOIL CLASSIFICATION AND SYMBOLS

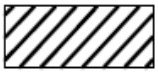

Gravel (GW, GP, GM, GC)


Clayey Sand (SC)

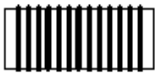

Sandy Silt (ML)


Sand (SW, SP)


Clayey Silt (ML)


Silty or Sandy Clay (CL)


Silty Sand (SM)


Silt (ML)


Clay (CH)

CONSISTENCY OF COHESIVE SOILS

Description	Shear Strength KSF	Penetration Resistance Blows/ Ft
Very Soft	Less than 0.25	0 - 2
Soft	0.25 - 0.5	2 - 4
Firm	0.5 - 1.00	4 - 8
Stiff	1.00 - 2.00	8 - 15
VeryStiff	2.00 - 4.00	15 - 30
Hard	Greater than 4.00	>30

RELATIVE DENSITY OF COHESIONLESS SOILS

Description	Penetration Resistance Blows / Ft	Relative Density %
Very Loose	0 - 4	0 - 15
Loose	4 - 10	15 - 35
Medium dense	10 - 30	35 - 65
Dense	30 - 50	65 - 85
Very Dense	>50	85 - 100

Soil Structure

CALCAREOUS NODULES	-- Nodules of Calcium Carbonate
FERROUS NODULES	-- Nodules of Ferrous Material
SLICKENSIDED	-- Having inclined planes of weakness that are slick and glossy
BLOCKY	-- Having inclined planes of weakness that are frequent and rectangular in pattern
LAMINATED	-- Composed of thin layers of varying soil type and texture
FISSURERD	-- Containing shrinkage cracks frequently filled with fine sand
INTERBEDDED	-- Composed of alternate layers of different soil types


Shelby Tube Sample


Standard Penetration Test


Auger or Wash Sample


No Recovery

GROUNDWATER


(24 hOurs) - Water Level after drilling (time increment after drilling)


- Free Water observed during drilling

FAILURE DESCRIPTION (COMPRESSION TEST)

B - Bulge
S - Shear
M/S - Multiple Shear

SLS - Failure surface occuring along slickensided plane
SAS - Failure surface occuring along or in sand seam
SS - Failure surface occuring in or along other secondary structure such as calcareous pockets

PLATE NO. 7

Project No.: 19G7659/A
PLATE NO.: 8

12/19/2022 6:16:21 PM

100% SUBMITTAL

FORT BEND COUNTY ENGINEERING DEPARTMENT

VOSS ROAD AT OLD RICHMOND ROAD
PROPOSED ROUNDABOUT

PROJECT NO. 17413

VINCENT M. MORALES, JR.
COMMISSIONER — PRECINCT 1

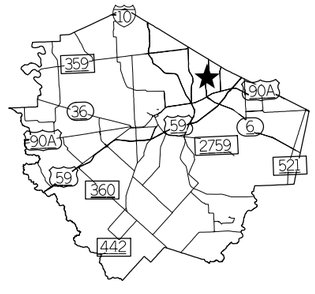
KP GEORGE
COUNTY JUDGE

ANDY MEYERS
COMMISSIONER — PRECINCT 3

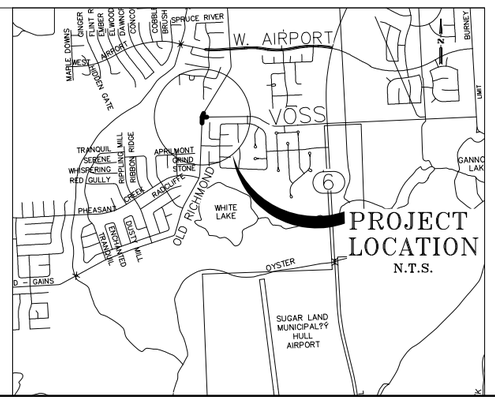
GRADY PRESTAGE
COMMISSIONER — PRECINCT 2

DEXTER L. McCOY
COMMISSIONER — PRECINCT 4

PROJECT LOCATION
KEY MAPS # 567C & 567G



VICINITY MAP
N.T.S.



JANUARY 2023
PRECINCT 3
Fort Bend County, Texas

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

1/1/2023

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

APPROVED: _____ 02/14/2023
COUNTY ENGINEER — DATE
J. STACY SLAWINSKI, P.E.

FBCED, STANDARD 01

G:\TXH\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\6974-00_CVR_RDBT.dgn

INDEX OF SHEETS

LEGEND

HC = HARRIS COUNTY
TX = TxDOT STATEWIDE
TH = TxDOT HOUSTON DISTRICT
FB = FORT BEND COUNTY

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

INDEX OF SHEETS

SHEET 1 OF 1

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	2

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2/7/2022 9:34:42 AM

FORT BEND COUNTY GENERAL CONSTRUCTION NOTES

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.

6. A CONTINUOUS LONGITUDINAL REINFORCING BAR SHALL BE USED IN THE CURBS.

7. ALL CONCRETE PAVEMENT SHALL BE 5½ SACK CEMENT WITH A MINIMUM COMPRESSIVE STRENGTH OF 3500 PSI AT 28 DAYS. TRANSVERSE EXPANSION JOINTS SHALL BE INSTALLED AT EACH CURB RETURN AND AT A MAXIMUM SPACING OF 60 FEET.

8. ALL WEATHER ACCESS TO ALL EXISTING STREETS AND DRIVEWAYS SHALL BE MAINTAINED AT ALL TIMES.

9. CURB HEADERS ARE REQUIRED AT CURB CONNECTIONS TO HANDICAP RAMPS, WITH NO CONSTRUCTION JOINT WITHIN 5' OF RAMPS.

10. GUIDELINES SET FORTH IN THE TEXAS "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", AS CURRENTLY AMENDED, SHALL BE OBSERVED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING FLAGMEN, SIGNING, STRIPING AND OTHER TRAFFIC CONTROL WARNING DEVICES, AS REQUIRED BY THE TMUTCD AND TCP STANDARDS DURING CONSTRUCTION - BOTH DAY AND NIGHT.

11. ALL R1-1 STOP SIGNS SHALL BE A MINIMUM OF 30"X30" WITH DIAMOND GRADE SHEETING PER TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

12. STREET NAME SIGNAGE SHALL BE ON A 9" HIGH SIGN FLAT BLADE W/REFLECTIVE GREEN BACKGROUND. STREET NAMES SHALL BE UPPER AND LOWERCASE LETTERING WITH UPPERCASE LETTERS OF 6" MINIMUM AND LOWERCASE LETTERS OF 4.5" MINIMUM. THE LETTERS SHALL BE REFLECTIVE WHITE. STREET NAME SIGNS SHALL BE MOUNTED ON STOP SIGN POST.

13. THE PROJECT AND ALL PARTS THEREOF SHALL BE SUBJECT TO PERIODIC INSPECTION 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.

NOTE: FORT BEND COUNTY NOTES SUPERSEDE ANY CONFLICTING NOTES

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

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BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

GENERAL CONSTRUCTION NOTES

SHEET 1 OF 1

DESIGNED BY:	
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DATE:	
SHEET NO:	3

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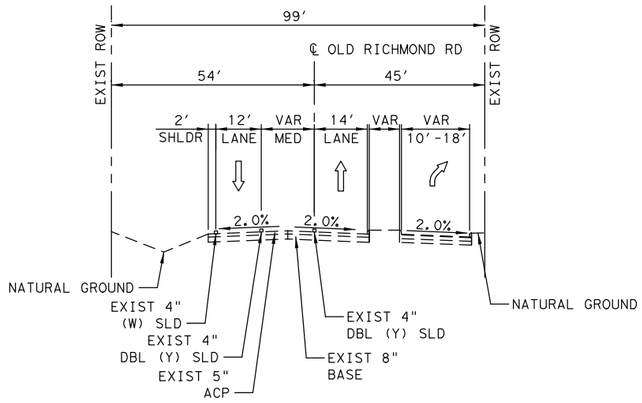

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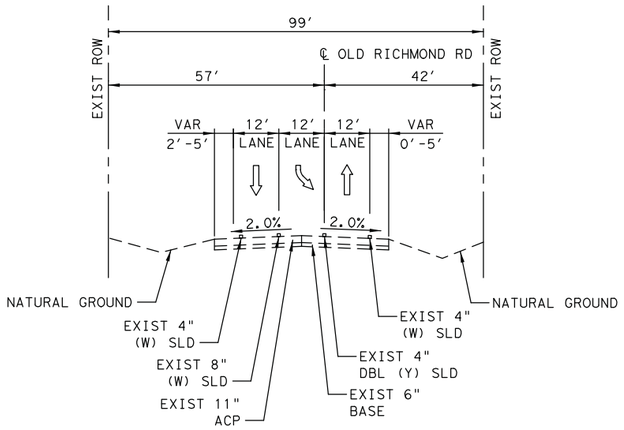

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OLD RICHMOND RD
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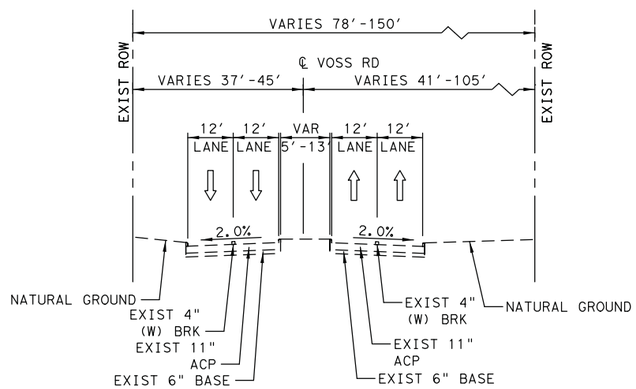

EXIST TYPICAL SECTION

VOSS RD
STA 11+79.24 TO STA 13+23.50

H: 0 20 40

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
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2/7/2022

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TBPE Registration No. F-1046

OLD RICHMOND RD
TYPICAL SECTIONS

SHEET 1 OF 3

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DATE:	
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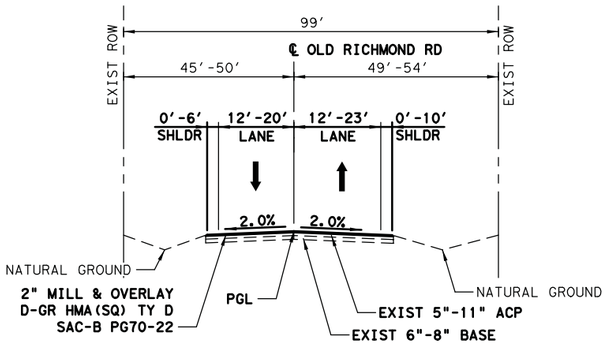
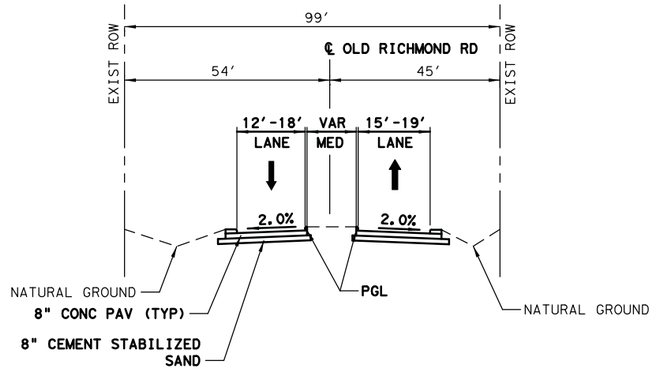


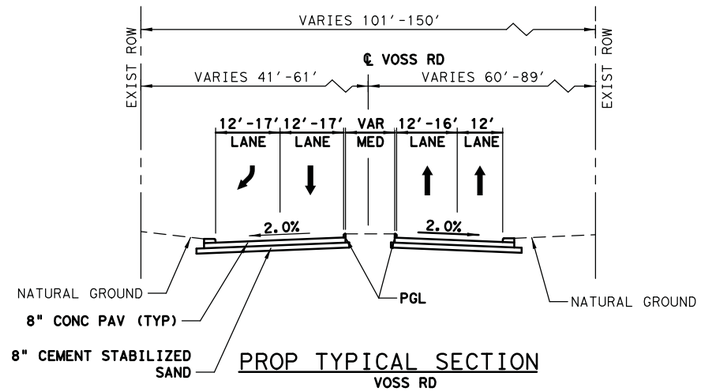
PROP TYPICAL SECTION

OLD RICHMOND RD
STA 10+00 TO STA 13+40
STA 16+88 TO STA 19+52.01



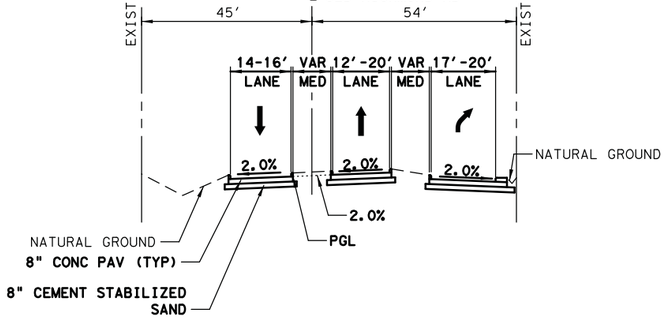
PROP TYPICAL SECTION

OLD RICHMOND RD
STA 16+20 TO STA 16+88



PROP TYPICAL SECTION

VOSS RD
STA 11+73.72 TO STA 13+23.05



PROP TYPICAL SECTION

OLD RICHMOND RD
STA 13+40 TO STA 14+72.73

NOTE:

1. PGL LOCATED AT GUTTER EL OF BOC UNLESS OTHERWISE NOTED.

H: 0 20 40

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/21/2023

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
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OLD RICHMOND RD
TYPICAL SECTIONS

SHEET 2 OF 3

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DRAWN BY:	
DATE:	
SHEET NO:	5

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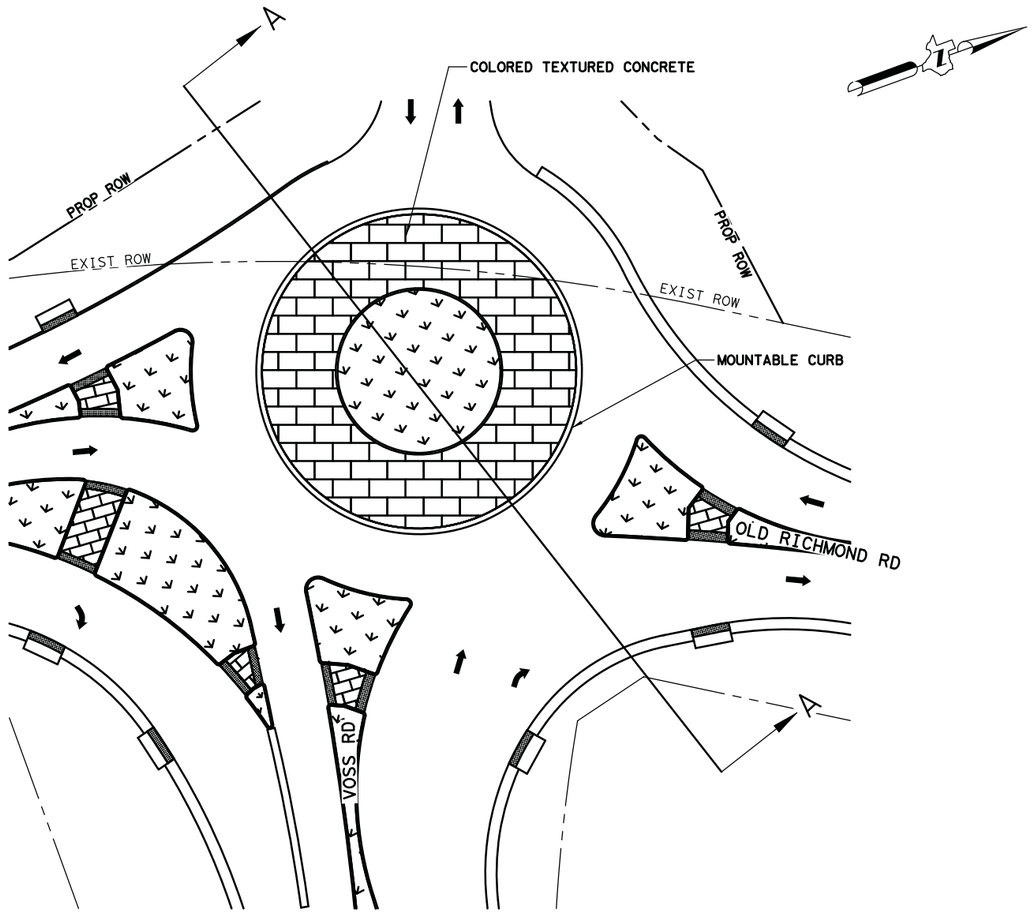
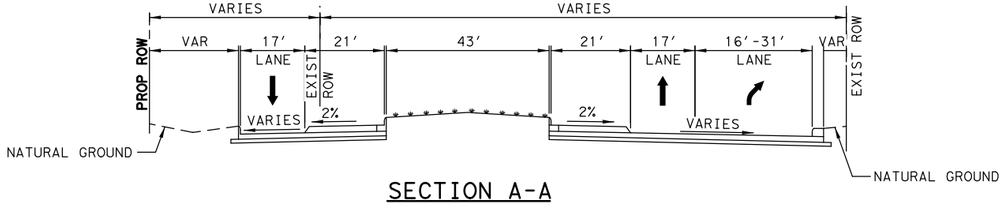
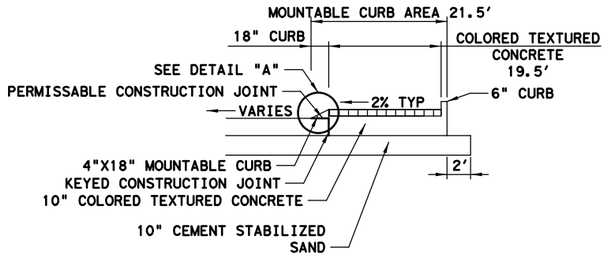




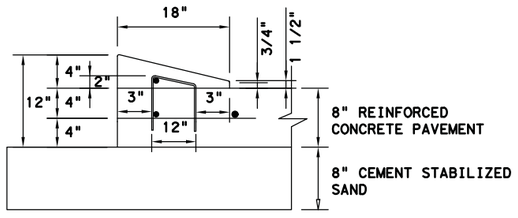
SECTION A-A

PROPOSED ROUNDABOUT
***SEE TRUCK APRON DETAIL**
N. T. S.



TRUCK APRON DETAIL

N. T. S.



4"x18" MOUNTABLE CURB DETAIL "A"

N. T. S.

NOTES:

1. 1.0 LBS. OF APPROVED NON- METALLIC FIBER MESH PER C/Y ON 4"X18" CURBS.
2. #4 RE-BAR STIRRUPS TO BE PLACED AT INTERVALS OF 2' (FT) C-C.
3. #4 RE-BAR LONGITUDINAL SHALL BE TIED TO EACH STIRRUP.

H: 0 20 40

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/21/2023

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TYPICAL SECTIONS

SHEET 3 OF 3

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	6

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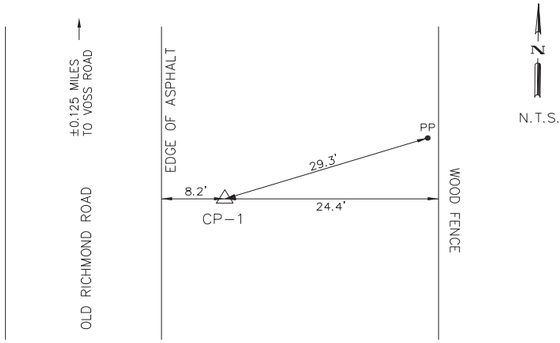
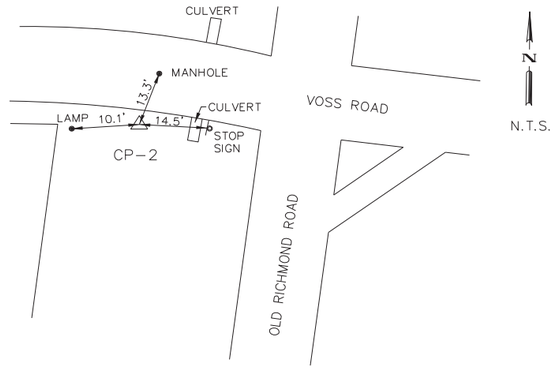


NOTE: ALL UNITS ARE IN US SURVEY FEET

CP 1
N= 13,798,493.88
E= 3,028,992.05
ELEV= 82.96

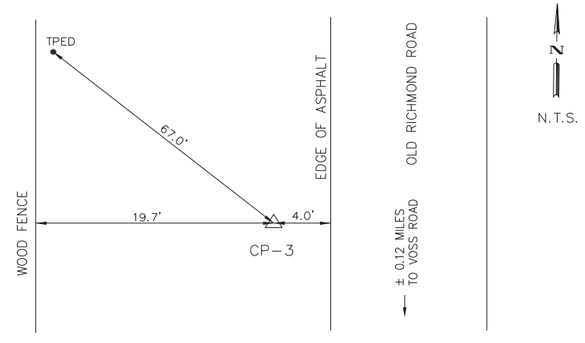
SET 1/2-INCH IRON ROD WITH "BGE TRAV" CAP ON THE EAST SIDE OF OLD RICHMOND ROAD ABOUT 0.125 MILES SOUTH OF VOSS ROAD AND BEING APPROXIMATELY 8.2 FEET EAST OF THE EDGE OF ASPHALT, 29.3 FEET SOUTHWEST OF A POWER POLE, AND 24.4 FEET WEST OF A WOODEN FENCE.



NOTE: ALL UNITS ARE IN US SURVEY FEET

CP 2
N= 13,799,145.28
E= 3,028,982.38
ELEV= 84.50

SET 1/2-INCH IRON ROD WITH "BGE TRAV" CAP ON THE WEST SIDE OF OLD RICHMOND ROAD AT THE INTERSECTION OF VOSS ROAD SOUTH OF THE ENTRANCE TO DUHACSEK PARK AND APPROXIMATELY 13.3 FEET SOUTHWEST OF A STORM MANHOLE, 10.1 FEET EAST OF A LAMP, AND 14.5 FEET WEST OF A STOP SIGN.



NOTE: ALL UNITS ARE IN US SURVEY FEET

CP 3
N= 13,799,687.66
E= 3,029,329.20
ELEV= 84.62

SET 1/2-INCH IRON ROD WITH "BGE TRAV" CAP ON THE WEST SIDE OF OLD RICHMOND ROAD ABOUT 0.12 MILES NORTH OF VOSS ROAD AND APPROXIMATELY 4.04 FEET WEST OF THE EDGE OF ASPHALT, 67.0 FEET SOUTHEAST OF A TELEPHONE PEDESTAL, AND 19.7 FEET EAST OF A WOODEN FENCE.

NOTE:

ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, SOUTH CENTRAL ZONE (4204), NAD83 (2011 ADJ, EPOCH 2010) AND ARE REFERENCED TO THE TXDOT VRS GPS NETWORK.

ALL DISTANCES AND COORDINATES ARE EXPRESSED IN U.S. SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00013.

ALL ELEVATIONS WERE ESTABLISHED WITH GPS AND ARE REFERENCED TO THE TXDOT VRS GPS NETWORK, NAVD88, GEOID12A.

ALL CAPS ARE STAMPED BGE TRAV

0 200 400 600
1" = 100' (22" X 34")
1" = 200' (11" X 17")

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
REGISTERED
CHRIS JORDAN
6750
PROFESSIONAL
LAND SURVEYOR

5/24/2021

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD
SURVEY HORIZONTAL & VERTICAL CONTROL INDEX SHEET

SHEET 1 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	7

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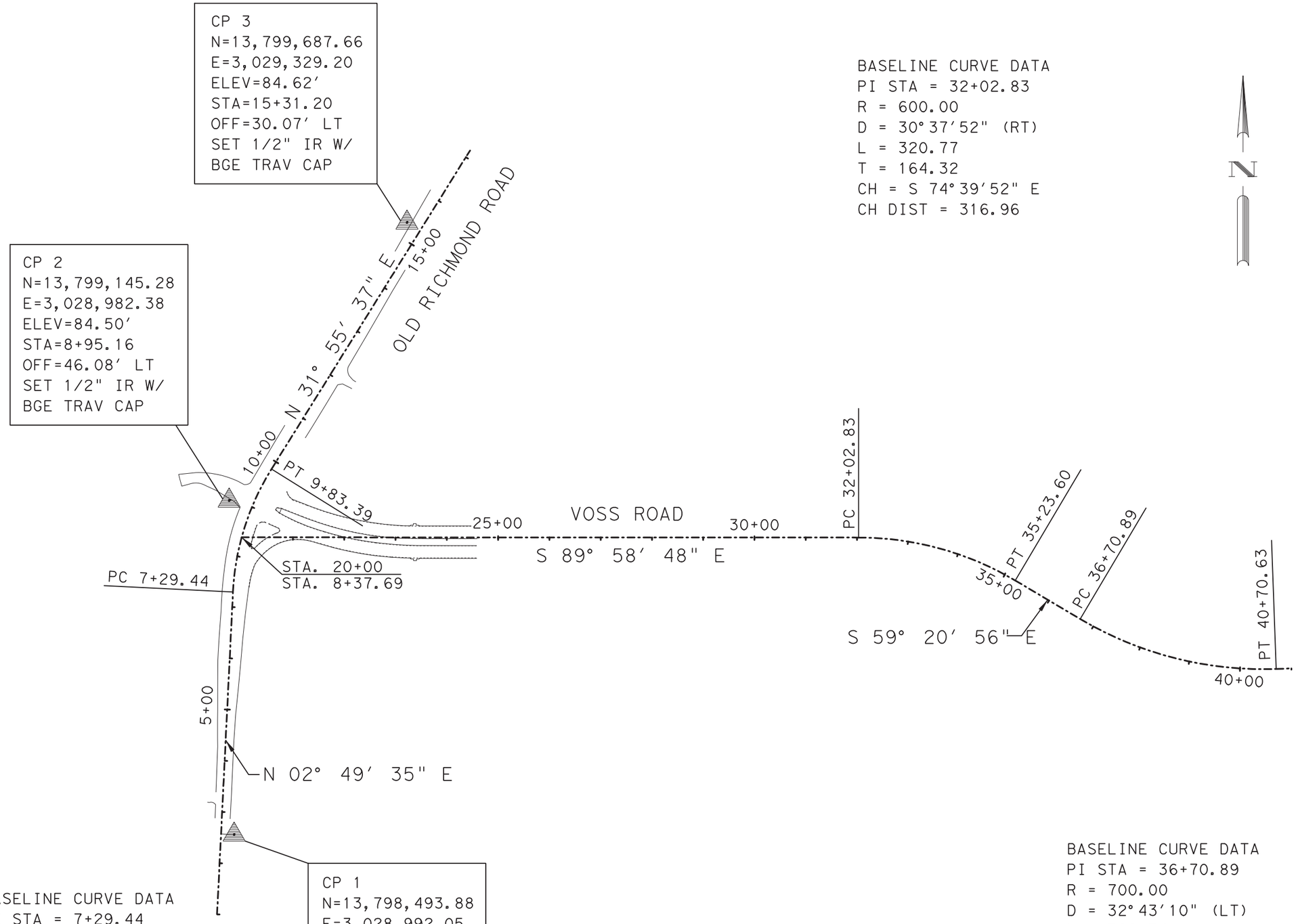

BASELINE CURVE DATA
PI STA = 32+02.83
R = 600.00
D = 30° 37' 52" (RT)
L = 320.77
T = 164.32
CH = S 74° 39' 52" E
CH DIST = 316.96

BASELINE CURVE DATA
PI STA = 7+29.44
R = 500.00
D = 29° 06' 02" (RT)
L = 253.95
T = 129.78
CH = N 17° 22' 36" E
CH DIST = 251.23

BASELINE CURVE DATA
PI STA = 36+70.89
R = 700.00
D = 32° 43' 10" (LT)
L = 399.74
T = 205.49
CH = S 75° 42' 31" E
CH DIST = 394.33

N

NOTE:

ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, SOUTH CENTRAL ZONE (4204), NAD83 (2011 ADJ, EPOCH 2010) AND ARE REFERENCED TO THE TXDOT VRS GPS NETWORK.

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ALL ELEVATIONS WERE ESTABLISHED WITH GPS AND ARE REFERENCED TO THE TXDOT VRS GPS NETWORK, NAVD88, GEOID12A.

ALL CAPS ARE STAMPED BGE TRAV

0 200 400 600
1" = 100' (22" X 34")
1" = 200' (11" X 17")

5/24/2021

REV	DATE	BY	DESCRIPTION

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CHRIS JORDAN
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5/24/2021

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OLD RICHMOND RD
SURVEY HORIZONTAL & VERTICAL CONTROL INDEX SHEET

SHEET 2 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	8

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℄ OLD RICHMOND RD

Chain P_ORR contains:
ORR101 CUR P_ORR1 CUR P_ORR2 CUR P_ORR3 CUR P_ORR4 CUR P_ORR5 CUR P_ORR6 CUR P-
_ORR7 ORR102

Beginning chain P_ORR description

Point ORR101 N 13,798,627.7381 E 3,028,974.8393 Sta 10+00.00

Course from ORR101 to PC P_ORR1 N 3° 11′ 59.85" E Dist 206.2809

Curve Data

Curve P_ORR1					
P.I. Station	12+51.59	N	13,798,878.9315	E	3,028,988.8830
Delta =	5° 11′ 16.81"	(LT)			
Degree =	5° 43′ 46.48"				
Tangent =	45.3048				
Length =	90.5477				
Radius =	1,000.0000				
External =	1.0257				
Long Chord =	90.5168				
Mid. Ord. =	1.0247				
P.C. Station	12+06.28	N	13,798,833.6973	E	3,028,986.3541
P.T. Station	12+96.83	N	13,798,924.2091	E	3,028,987.3114
C.C.		N	13,798,889.5181	E	3,027,987.9133
Back = N	3° 11′ 59.85" E				
Ahead = N	1° 59′ 16.97" W				
Chord Bear = N	0° 36′ 21.44" E				

Curve Data

Curve P_ORR2					
P.I. Station	13+85.02	N	13,799,012.3428	E	3,028,984.2521
Delta =	8° 02′ 20.20"	(RT)			
Degree =	4° 33′ 55.44"				
Tangent =	88.1868				
Length =	176.0841				
Radius =	1,255.0000				
External =	3.0946				
Long Chord =	175.9397				
Mid. Ord. =	3.0869				
P.C. Station	12+96.83	N	13,798,924.2091	E	3,028,987.3114
P.T. Station	14+72.91	N	13,799,100.0382	E	3,028,993.5480
C.C.		N	13,798,967.7463	E	3,030,241.5560
Back = N	1° 59′ 16.97" W				
Ahead = N	6° 03′ 03.24" E				
Chord Bear = N	2° 01′ 53.13" E				

Curve Data

Curve P_ORR3					
P.I. Station	15+09.20	N	13,799,136.1236	E	3,028,997.3732
Delta =	43° 28′ 50.38"	(RT)			
Degree =	62° 57′ 44.62"				
Tangent =	36.2875				
Length =	69.0581				
Radius =	91.0000				
External =	6.9683				
Long Chord =	67.4129				
Mid. Ord. =	6.4726				
P.C. Station	14+72.91	N	13,799,100.0382	E	3,028,993.5480
P.T. Station	15+41.97	N	13,799,159.6752	E	3,029,024.9794
C.C.		N	13,799,090.4457	E	3,029,084.0410
Back = N	6° 03′ 03.24" E				
Ahead = N	49° 31′ 53.62" E				
Chord Bear = N	27° 47′ 28.43" E				

Curve Data

Curve P_ORR4					
P.I. Station	16+03.28	N	13,799,199.4652	E	3,029,071.6195
Delta =	22° 39′ 30.10"	(LT)			
Degree =	18° 43′ 26.80"				
Tangent =	61.3069				
Length =	121.0117				
Radius =	306.0000				
External =	6.0810				
Long Chord =	120.2247				
Mid. Ord. =	5.9625				
P.C. Station	15+41.97	N	13,799,159.6752	E	3,029,024.9794
P.T. Station	16+62.98	N	13,799,254.1515	E	3,029,099.3313
C.C.		N	13,799,392.4689	E	3,028,826.3765
Back = N	49° 31′ 53.62" E				
Ahead = N	26° 52′ 23.52" E				
Chord Bear = N	38° 12′ 08.57" E				

℄ OLD RICHMOND RD (CON'T)

Curve Data

Curve P_ORR5					
P.I. Station	16+74.57	N	13,799,264.4864	E	3,029,104.5683
Delta =	4° 25′ 24.01"	(RT)			
Degree =	19° 05′ 54.93"				
Tangent =	11.5860				
Length =	23.1605				
Radius =	300.0000				
External =	0.2236				
Long Chord =	23.1548				
Mid. Ord. =	0.2235				
P.C. Station	16+62.98	N	13,799,254.1515	E	3,029,099.3313
P.T. Station	16+86.14	N	13,799,274.3865	E	3,029,110.5869
C.C.		N	13,799,118.5463	E	3,029,366.9340
Back = N	26° 52′ 23.52" E				
Ahead = N	31° 17′ 47.53" E				
Chord Bear = N	29° 05′ 05.52" E				

Course from PT P_ORR5 to PC P_ORR6 N 31° 17′ 47.53" E Dist 97.1419

Curve Data

Curve P_ORR6					
P.I. Station	18+05.58	N	13,799,376.4460	E	3,029,172.6316
Delta =	5° 00′ 24.29"	(RT)			
Degree =	11° 14′ 04.08"				
Tangent =	22.2972				
Length =	44.5659				
Radius =	510.0000				
External =	0.4872				
Long Chord =	44.5518				
Mid. Ord. =	0.4867				
P.C. Station	17+83.29	N	13,799,357.3933	E	3,029,161.0490
P.T. Station	18+27.85	N	13,799,394.4152	E	3,029,185.8329
C.C.		N	13,799,092.4649	E	3,029,596.8390
Back = N	31° 17′ 47.53" E				
Ahead = N	36° 18′ 11.81" E				
Chord Bear = N	33° 47′ 59.67" E				

Curve Data

Curve P_ORR7					
P.I. Station	18+55.39	N	13,799,416.6094	E	3,029,202.1381
Delta =	6° 10′ 54.82"	(LT)			
Degree =	11° 14′ 04.08"				
Tangent =	27.5398				
Length =	55.0261				
Radius =	510.0000				
External =	0.7430				
Long Chord =	54.9995				
Mid. Ord. =	0.7419				
P.C. Station	18+27.85	N	13,799,394.4152	E	3,029,185.8329
P.T. Station	18+82.88	N	13,799,440.4303	E	3,029,215.9584
C.C.		N	13,799,696.3655	E	3,028,774.8267
Back = N	36° 18′ 11.81" E				
Ahead = N	30° 07′ 16.99" E				
Chord Bear = N	33° 12′ 44.40" E				

Course from PT P_ORR7 to ORR102 N 30° 07′ 16.99" E Dist 89.0111

Point ORR102 N 13,799,517.4217 E 3,029,260.6272 Sta 19+71.89

Ending chain P_ORR description

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
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2/7/2022

FORT BEND COUNTY
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OLD RICHMOND RD

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 3

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	9

℄ VOSS RD

Chain P_VOSS_R contains:
 VOSSR101 CUR P_VOSS_R1 CUR P_VOSS_R2 CUR P_VOSS_R3 CUR P_VOSS_R4

Beginning chain P_VOSS_R description
Description: Proposed Voss at ORR Alignment - Working

Point VOSSR101 N 13,799,187.7661 E 3,028,905.4007 Sta 10+00.00

Course from VOSSR101 to PC P_VOSS_R1 N 83° 13′ 31.22" E Dist 13.1588

Curve P_VOSS_R1	Curve Data				
P.I. Station	10+34.15	N	13,799,191.7948	E	3,028,939.3134
Delta =	36° 51′ 26.30" (RT)				
Degree =	90° 56′ 44.45"				
Tangent =	20.9923				
Length =	40.5267				
Radius =	63.0000				
External =	3.4054				
Long Chord =	39.8316				
Mid. Ord. =	3.2308				
P.C. Station	10+13.16	N	13,799,189.3184	E	3,028,918.4677
P.T. Station	10+53.69	N	13,799,181.2724	E	3,028,957.4781
C.C.		N	13,799,126.7583	E	3,028,925.8995
Back = N 83° 13′ 31.23" E					
Ahead = S 59° 55′ 02.47" E					
Chord Bear = S 78° 20′ 45.62" E					

Course from PT P_VOSS_R1 to PC P_VOSS_R2 S 59° 55′ 02.47" E Dist 123.3532

Curve P_VOSS_R2	Curve Data				
P.I. Station	12+11.17	N	13,799,102.3322	E	3,029,093.7523
Delta =	21° 21′ 33.96" (LT)				
Degree =	31° 39′ 18.46"				
Tangent =	34.1339				
Length =	67.4754				
Radius =	181.0000				
External =	3.1905				
Long Chord =	67.0854				
Mid. Ord. =	3.1352				
P.C. Station	11+77.04	N	13,799,119.4418	E	3,029,064.2160
P.T. Station	12+44.51	N	13,799,097.1554	E	3,029,127.4914
C.C.		N	13,799,276.0617	E	3,029,154.9420
Back = S 59° 55′ 02.47" E					
Ahead = S 81° 16′ 36.43" E					
Chord Bear = S 70° 35′ 49.45" E					

Curve P_VOSS_R3	Curve Data				
P.I. Station	12+83.81	N	13,799,091.1963	E	3,029,166.3286
Delta =	5° 06′ 47.11" (RT)				
Degree =	6° 30′ 39.18"				
Tangent =	39.2918				
Length =	78.5314				
Radius =	880.0000				
External =	0.8767				
Long Chord =	78.5053				
Mid. Ord. =	0.8759				
P.C. Station	12+44.51	N	13,799,097.1554	E	3,029,127.4914
P.T. Station	13+23.05	N	13,799,081.7998	E	3,029,204.4802
C.C.		N	13,798,227.3348	E	3,028,994.0294
Back = S 81° 16′ 36.43" E					
Ahead = S 76° 09′ 49.32" E					
Chord Bear = S 78° 43′ 12.88" E					

℄ VOSS RD (CON'T)

Curve P_VOSS_R4	Curve Data				
P.I. Station	13+96.45	N	13,799,064.2445	E	3,029,275.7577
Delta =	13° 50′ 10.68" (LT)				
Degree =	9° 28′ 13.36"				
Tangent =	73.4075				
Length =	146.1008				
Radius =	605.0000				
External =	4.4372				
Long Chord =	145.7461				
Mid. Ord. =	4.4049				
P.C. Station	13+23.05	N	13,799,081.7998	E	3,029,204.4802
P.T. Station	14+69.15	N	13,799,064.2445	E	3,029,349.1652
C.C.		N	13,799,669.2445	E	3,029,349.1652
Back = S 76° 09′ 49.32" E					
Ahead = Due East					
Chord Bear = S 83° 04′ 54.66" E					

Ending chain P_VOSS_R description

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
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OLD RICHMOND RD

HORIZONTAL ALIGNMENT DATA

SHEET 2 OF 3

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	10

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2/7/2022 9:34:48 AM

℄ SB OLD RICHMOND RD

Chain P_CLSBORR contains:
CUR P_CLSBORR1 CUR P_CLSBORR2 CUR P_CLSBORR3 CUR P_CLSBORR4

Beginning chain P_CLSBORR description

			Curve Data				
Curve P_CLSBORR1							
P.I. Station			10+70.71	N	13,799,037.6600	E	3,028,984.3036
Delta	=	17° 35′ 29.21"	(LT)				
Degree	=	12° 32′ 14.53"					
Tangent	=		70.7124				
Length	=		140.3121				
Radius	=		457.0000				
External	=		5.4384				
Long Chord	=		139.7616				
Mid. Ord.	=		5.3744				
P.C. Station			10+00.00	N	13,798,967.3687	E	3,028,976.5976
P.T. Station			11+40.31	N	13,799,106.9931	E	3,028,970.4052
C.C.				N	13,799,017.1707	E	3,028,522.3193
Back	= N	6° 15′ 22.61"	E				
Ahead	= N	11° 20′ 06.60"	W				
Chord Bear	= N	2° 32′ 22.00"	W				

Course from PT P_CLSBORR1 to PC P_CLSBORR2 N 11° 20′ 06.60" W Dist 40.2895

			Curve Data				
Curve P_CLSBORR2							
P.I. Station			12+31.73	N	13,799,196.6290	E	3,028,952.4369
Delta	=	89° 35′ 11.07"	(RT)				
Degree	=	111° 15′ 14.19"					
Tangent	=		51.1296				
Length	=		80.5243				
Radius	=		51.5000				
External	=		21.0705				
Long Chord	=		72.5687				
Mid. Ord.	=		14.9528				
P.C. Station			11+80.60	N	13,799,146.4968	E	3,028,962.4864
P.T. Station			12+61.13	N	13,799,207.0400	E	3,029,002.4953
C.C.				N	13,799,156.6190	E	3,029,012.9818
Back	= N	11° 20′ 06.60"	W				
Ahead	= N	78° 15′ 04.47"	E				
Chord Bear	= N	33° 27′ 28.93"	E				

Course from PT P_CLSBORR2 to PC P_CLSBORR3 N 78° 15′ 04.47" E Dist 27.2718

			Curve Data				
Curve P_CLSBORR3							
P.I. Station			13+33.50	N	13,799,221.7763	E	3,029,073.3503
Delta	=	50° 19′ 36.80"	(LT)				
Degree	=	59° 40′ 59.17"					
Tangent	=		45.0994				
Length	=		84.3235				
Radius	=		96.0000				
External	=		10.0658				
Long Chord	=		81.6388				
Mid. Ord.	=		9.1105				
P.C. Station			12+88.40	N	13,799,212.5931	E	3,029,029.1958
P.T. Station			13+72.72	N	13,799,261.6246	E	3,029,094.4706
C.C.				N	13,799,306.5819	E	3,029,009.6482
Back	= N	78° 15′ 04.47"	E				
Ahead	= N	27° 55′ 27.67"	E				
Chord Bear	= N	53° 05′ 16.07"	E				

			Curve Data				
Curve P_CLSBORR4							
P.I. Station			13+83.32	N	13,799,270.9912	E	3,029,099.4351
Delta	=	2° 11′ 04.51"	(LT)				
Degree	=	10° 18′ 17.99"					
Tangent	=		10.6009				
Length	=		21.1993				
Radius	=		556.0000				
External	=		0.1011				
Long Chord	=		21.1980				
Mid. Ord.	=		0.1010				
P.C. Station			13+72.72	N	13,799,261.6246	E	3,029,094.4706
P.T. Station			13+93.92	N	13,799,280.5403	E	3,029,104.0389
C.C.				N	13,799,522.0024	E	3,028,603.2075
Back	= N	27° 55′ 27.67"	E				
Ahead	= N	25° 44′ 23.15"	E				
Chord Bear	= N	26° 49′ 55.41"	E				

Ending chain P_CLSBORR description

℄ NB OLD RICHMOND RD

Chain P_CLNBORR contains:
NBORR01 CUR P_CLNBORR1 CUR P_CLNBORR2 CUR P_CLNBORR3 NBORR02

Beginning chain P_CLNBORR description

Point NBORR01 N 13,798,967.3739 E 3,028,993.8236 Sta 10+00.00

Course from NBORR01 to PC P_CLNBORR1 N 2° 17′ 40.32" E Dist 65.8809

			Curve Data				
Curve P_CLNBORR1							
P.I. Station			11+05.91	N	13,799,073.1982	E	3,028,998.0638
Delta	=	45° 16′ 07.07"	(RT)				
Degree	=	59° 40′ 59.17"					
Tangent	=		40.0284				
Length	=		75.8483				
Radius	=		96.0000				
External	=		8.0109				
Long Chord	=		73.8909				
Mid. Ord.	=		7.3939				
P.C. Station			10+65.88	N	13,799,033.2019	E	3,028,996.4612
P.T. Station			11+41.73	N	13,799,100.2085	E	3,029,027.6057
C.C.				N	13,799,029.3584	E	3,029,092.3842
Back	= N	2° 17′ 40.32"	E				
Ahead	= N	47° 33′ 47.39"	E				
Chord Bear	= N	24° 55′ 43.86"	E				

Course from PT P_CLNBORR1 to PC P_CLNBORR2 N 47° 33′ 47.39" E Dist 27.2718

			Curve Data				
Curve P_CLNBORR2							
P.I. Station			11+84.36	N	13,799,128.9721	E	3,029,059.0652
Delta	=	33° 12′ 16.83"	(LT)				
Degree	=	111° 15′ 14.19"					
Tangent	=		15.3551				
Length	=		29.8458				
Radius	=		51.5000				
External	=		2.2404				
Long Chord	=		29.4299				
Mid. Ord.	=		2.1470				
P.C. Station			11+69.00	N	13,799,118.6109	E	3,029,047.7328
P.T. Station			11+98.85	N	13,799,143.8476	E	3,029,062.8731
C.C.				N	13,799,156.6190	E	3,029,012.9818
Back	= N	47° 33′ 47.39"	E				
Ahead	= N	14° 21′ 30.56"	E				
Chord Bear	= N	30° 57′ 38.98"	E				

			Curve Data				
Curve P_CLNBORR3							
P.I. Station			12+44.30	N	13,799,187.8782	E	3,029,074.1442
Delta	=	17° 13′ 47.00"	(RT)				
Degree	=	19° 05′ 54.94"					
Tangent	=		45.4503				
Length	=		90.2146				
Radius	=		300.0000				
External	=		3.4234				
Long Chord	=		89.8751				
Mid. Ord.	=		3.3847				
P.C. Station			11+98.85	N	13,799,143.8476	E	3,029,062.8731
P.T. Station			12+89.06	N	13,799,226.5944	E	3,029,097.9516
C.C.				N	13,799,069.4512	E	3,029,353.5020
Back	= N	14° 21′ 30.56"	E				
Ahead	= N	31° 35′ 17.57"	E				
Chord Bear	= N	22° 58′ 24.06"	E				

Course from PT P_CLNBORR3 to NBORR02 N 31° 35′ 17.57" E Dist 49.2591

Point NBORR02 N 13,799,268.5550 E 3,029,123.7540 Sta 13+38.32

Ending chain P_CLNBORR description

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
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PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
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TBPE Registration No. F-1046

OLD RICHMOND RD

HORIZONTAL ALIGNMENT DATA

SHEET 3 OF 3

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	11

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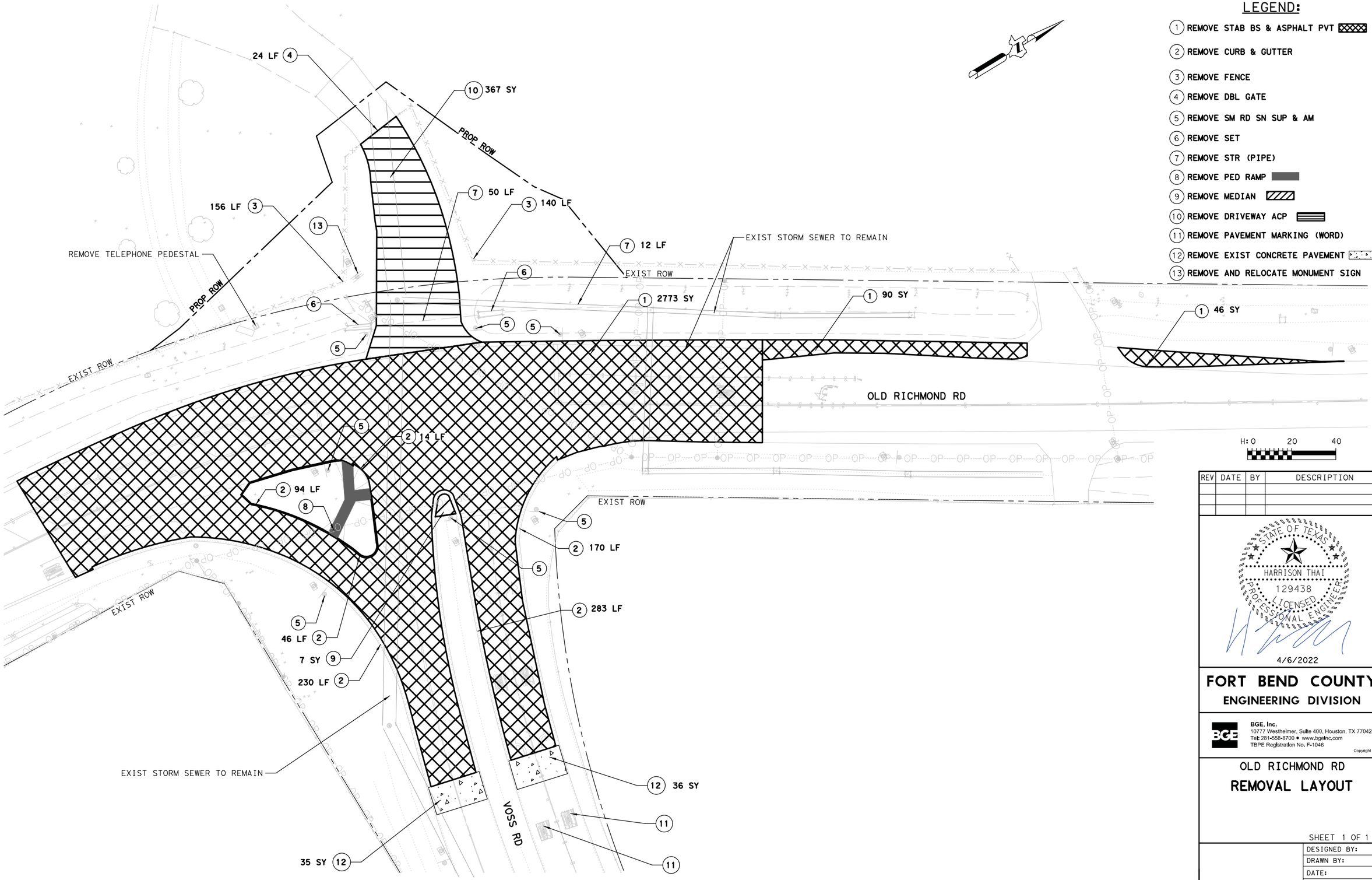
2/7/2022 9:34:49 AM



LEGEND:

1. REMOVE STAB BS & ASPHALT PVT
2. REMOVE CURB & GUTTER
3. REMOVE FENCE
4. REMOVE DBL GATE
5. REMOVE SM RD SN SUP & AM
6. REMOVE SET
7. REMOVE STR (PIPE)
8. REMOVE PED RAMP
9. REMOVE MEDIAN
10. REMOVE DRIVEWAY ACP
11. REMOVE PAVEMENT MARKING (WORD)
12. REMOVE EXIST CONCRETE PAVEMENT
13. REMOVE AND RELOCATE MONUMENT SIGN

H: 0 20 40

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
4/6/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
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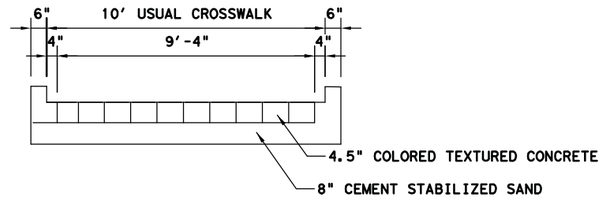
TBPE Registration No. F-1046

OLD RICHMOND RD
REMOVAL LAYOUT

SHEET 1 OF 1

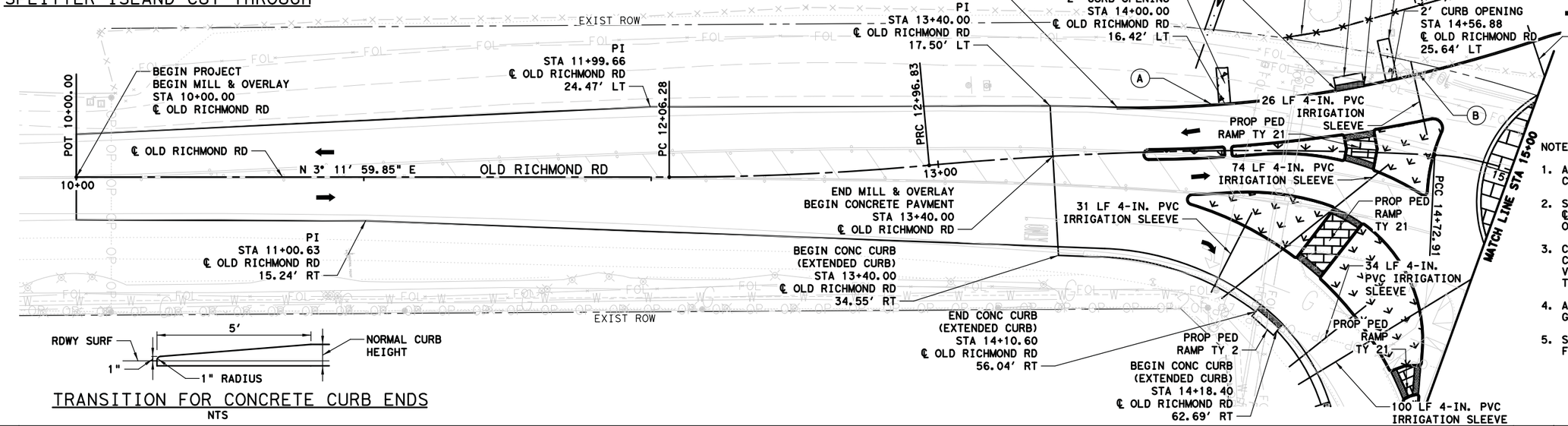
DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	12



TYPICAL SECTION
SPLITTER ISLAND CUT THROUGH

Ⓐ END CURB (DOWEL)
BEGIN CURB
STA 13+95.48
℄ OLD RICHMOND RD
16.14' LT

Ⓑ END CURB
BEGIN CURB (DOWEL)
STA 14+65.94
℄ OLD RICHMOND RD
28.11' LT



TRANSITION FOR CONCRETE CURB ENDS
NTS

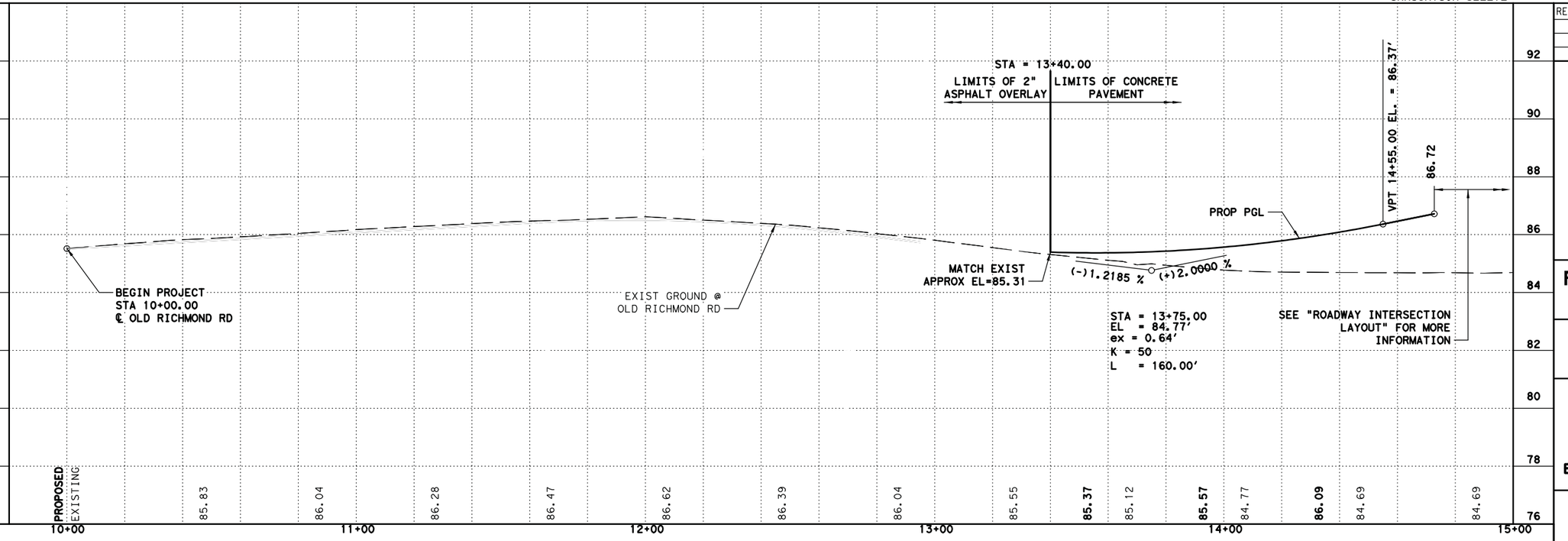
LEGEND:

- (#) DRIVEWAY NUMBER
- LANDSCAPING AREA
- STAMPED CONCRETE
- BARBED WIRE FENCE
- EXIST ROW
- PROP ROW
- EXIST DIRECTION OF TRAFFIC
- PROPOSED DIRECTION OF TRAFFIC

NOTES:

1. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.
2. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
3. CONTRACTOR RESPONSIBLE FOR CONTACTING UTILITY COMPANIES AND VERIFYING UTILITY LOCATIONS PRIOR TO EXCAVATION.
4. ALL ELEVATIONS ARE AT THE GUTTER LINE.
5. SEE "HOU-U-CURB" STANDARD SHEET FOR MORE DETAILS ON EXTENDED CURB.

H: 0 20 40
V: 0 2 4



REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/21/2023

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
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OLD RICHMOND RD

ROADWAY PLAN AND PROFILE OLD RICHMOND RD
BEGIN PROJECT TO STA 15+00
SHEET 1 OF 3

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	13

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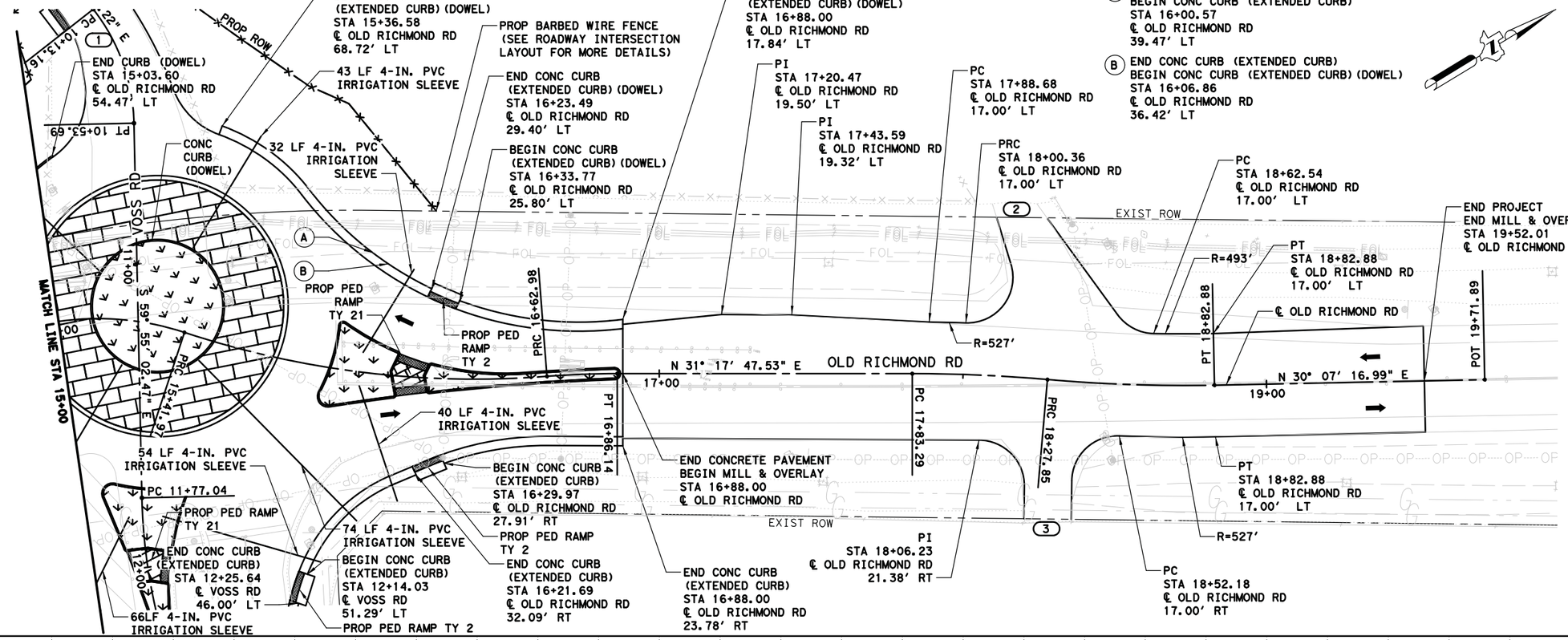

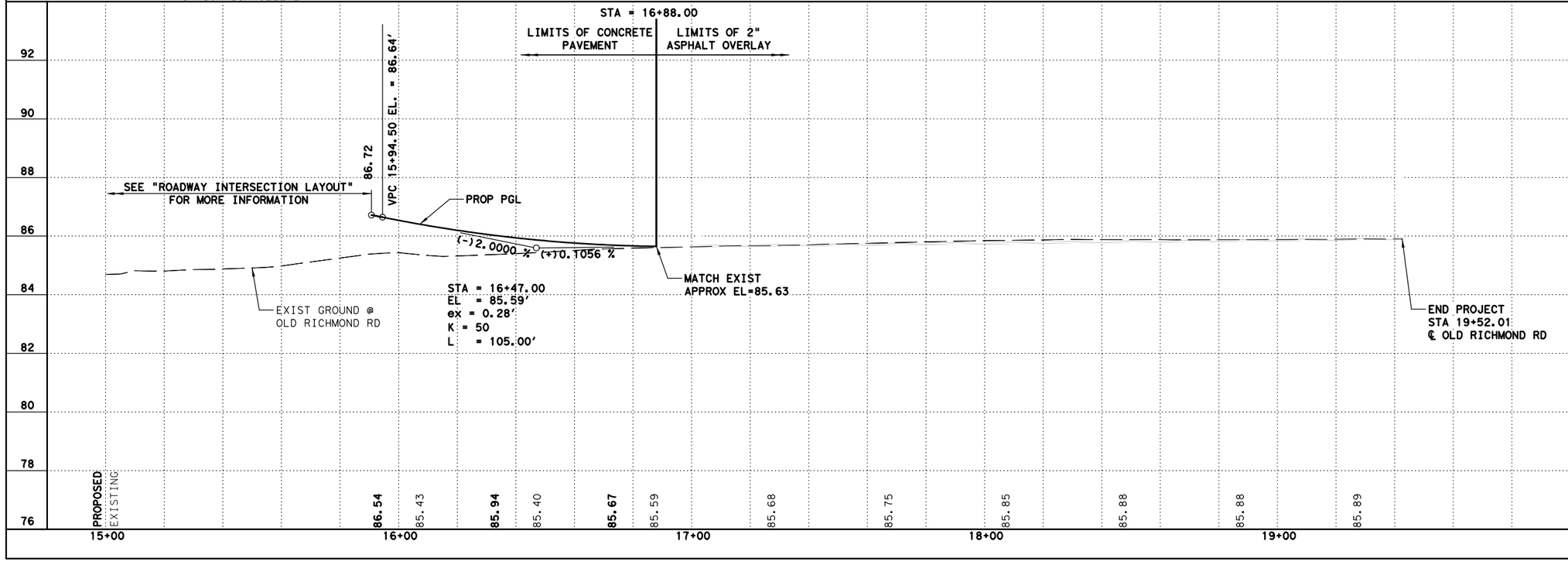

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
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4/6/2022

FORT BEND COUNTY
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TBPE Registration No. F-1046

OLD RICHMOND RD

ROADWAY PLAN AND PROFILE OLD RICHMOND RD

STA 15+00 TO END PROJECT

SHEET 2 OF 3

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	14

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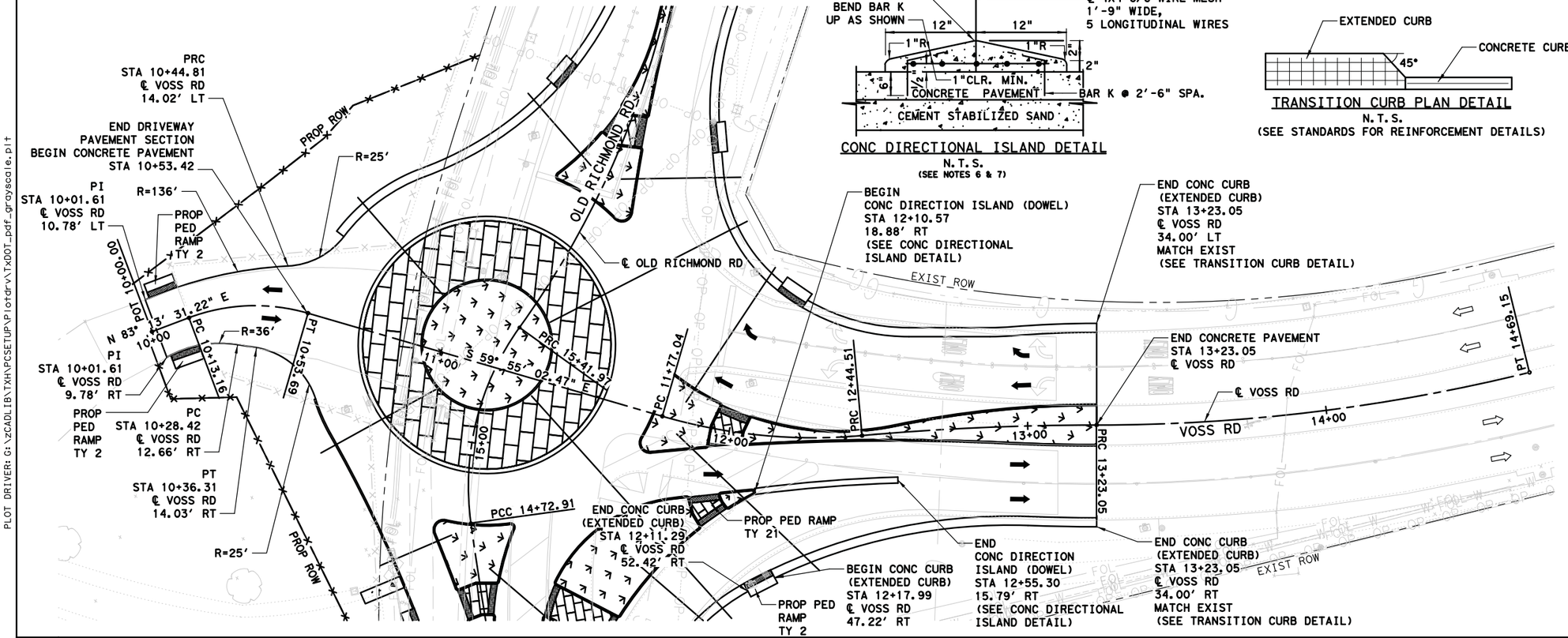

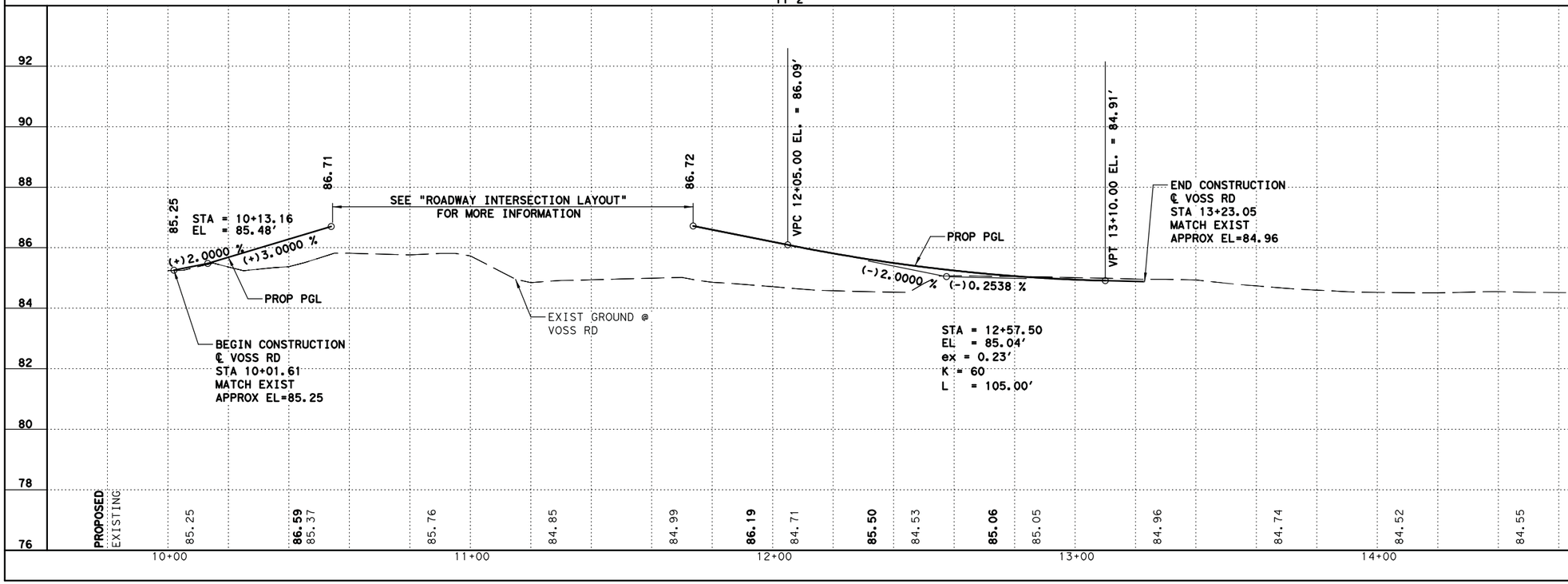

REV	DATE	BY	DESCRIPTION

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2/21/2023

FORT BEND COUNTY
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OLD RICHMOND RD

ROADWAY PLAN AND PROFILE VOSS RD

BEGIN PROJECT TO END

SHEET 3 OF 3

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	15

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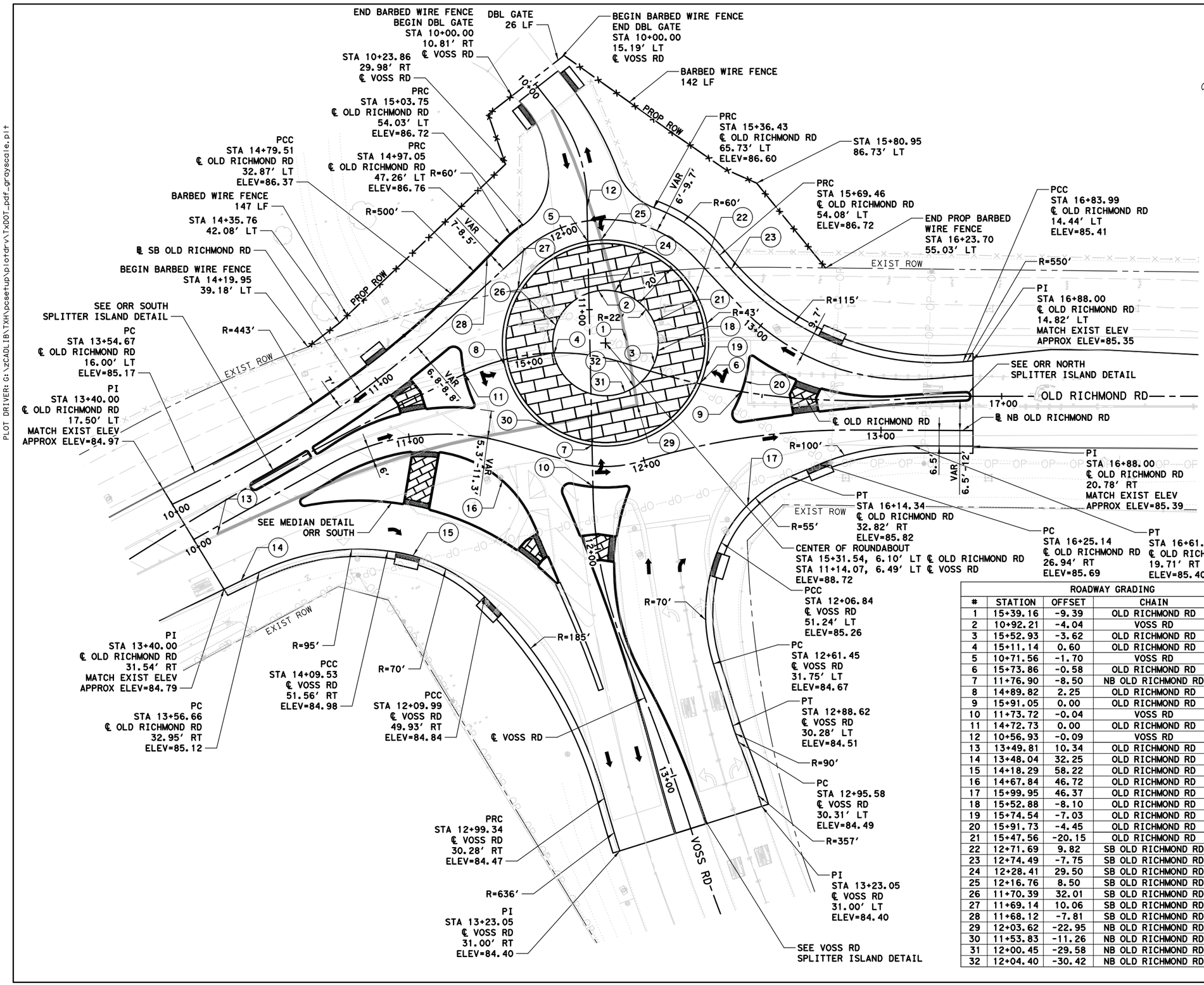

LEGEND:

WATERSHED BOUNDARY
(SEE DRAINAGE AREA MAP
SHEET 2 OF 2)

NOTES:

1. ALL DIMENSIONS ARE TO FACE OF CURB UNLESS NOTED OTHERWISE.
2. CONTRACTOR RESPONSIBLE FOR CONTACTING UTILITY COMPANIES AND VERIFYING UTILITY LOCATIONS PRIOR TO EXCAVATION.
3. ALL ELEVATIONS ARE AT THE GUTTER LINE.

H: 0 20 40

ROADWAY GRADING

#	STATION	OFFSET	CHAIN	ELEV
1	15+39.16	-9.39	OLD RICHMOND RD	88.90
2	10+92.21	-4.04	VOSS RD	87.79
3	15+52.93	-3.62	OLD RICHMOND RD	87.79
4	15+11.14	0.60	OLD RICHMOND RD	87.79
5	10+71.56	-1.70	VOSS RD	87.06
6	15+73.86	-0.58	OLD RICHMOND RD	87.06
7	11+76.90	-8.50	NB OLD RICHMOND RD	87.06
8	14+89.82	2.25	OLD RICHMOND RD	87.06
9	15+91.05	0.00	OLD RICHMOND RD	86.72
10	11+73.72	-0.04	VOSS RD	86.72
11	14+72.73	0.00	OLD RICHMOND RD	86.72
12	10+56.93	-0.09	VOSS RD	86.72
13	13+49.81	10.34	OLD RICHMOND RD	85.58
14	13+48.04	32.25	OLD RICHMOND RD	85.18
15	14+18.29	58.22	OLD RICHMOND RD	84.79
16	14+67.84	46.72	OLD RICHMOND RD	86.49
17	15+99.95	46.37	OLD RICHMOND RD	85.94
18	15+52.88	-8.10	OLD RICHMOND RD	87.89
19	15+74.54	-7.03	OLD RICHMOND RD	87.15
20	15+91.73	-4.45	OLD RICHMOND RD	86.81
21	15+47.56	-20.15	OLD RICHMOND RD	87.89
22	12+71.69	9.82	SB OLD RICHMOND RD	87.15
23	12+74.49	-7.75	SB OLD RICHMOND RD	86.81
24	12+28.41	29.50	SB OLD RICHMOND RD	87.90
25	12+16.76	8.50	SB OLD RICHMOND RD	87.14
26	11+70.39	32.01	SB OLD RICHMOND RD	87.90
27	11+69.14	10.06	SB OLD RICHMOND RD	87.15
28	11+68.12	-7.81	SB OLD RICHMOND RD	86.79
29	12+03.62	-22.95	NB OLD RICHMOND RD	87.99
30	11+53.83	-11.26	NB OLD RICHMOND RD	87.54
31	12+00.45	-29.58	NB OLD RICHMOND RD	88.12
32	12+04.40	-30.42	NB OLD RICHMOND RD	88.12

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
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OLD RICHMOND RD

ROADWAY INTERSECTION LAYOUT

SHEET 1 OF 1

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	16

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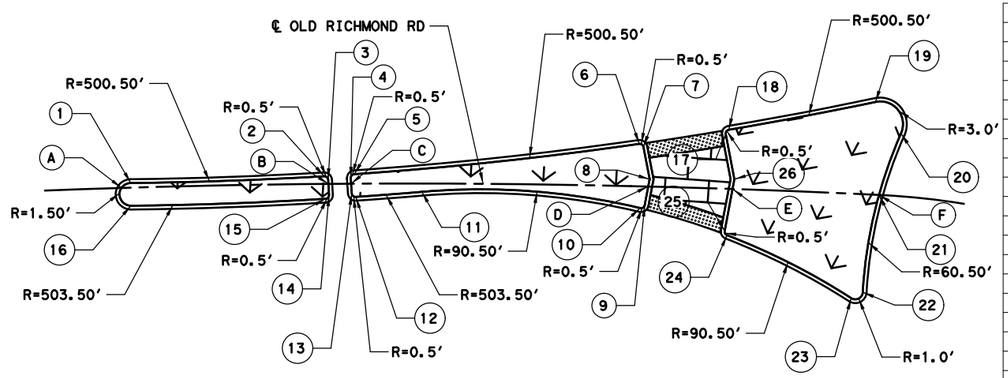


SPLITTER ISLAND DETAIL (ORR SOUTH)

SPLITTER ISLAND ORR SOUTH					
	STATION	OFFSET	CHAIN	DESCRIPTION	ELEVATION
1	13+73.42	0.63′ LT	OLD RICHMOND RD	PC	85.40
2	13+98.95	1.02′ LT	OLD RICHMOND RD	PRC	85.56
3	13+99.47	0.57′ LT	OLD RICHMOND RD	PT	85.56
4	14+02.46	0.72′ LT	OLD RICHMOND RD	PC	85.59
5	14+02.93	1.25′ LT	OLD RICHMOND RD	PRC	85.60
6	14+40.40	5.59′ LT	OLD RICHMOND RD	PRC	86.60
7	14+40.97	5.20′ LT	OLD RICHMOND RD	PT	86.10
8	14+41.89	0.95′ LT	OLD RICHMOND RD	PI	86.12
9	14+41.33	2.48′ RT	OLD RICHMOND RD	PC	86.10
10	14+40.73	2.88′ RT	OLD RICHMOND RD	PRC	86.10
11	14+11.85	1.09′ RT	OLD RICHMOND RD	PCC	85.69
12	14+03.11	1.75′ RT	OLD RICHMOND RD	PRC	85.60
13	14+02.58	1.28′ RT	OLD RICHMOND RD	PT	85.59
14	13+99.58	1.45′ RT	OLD RICHMOND RD	PC	85.57
15	13+99.10	1.97′ RT	OLD RICHMOND RD	PCC	85.56
16	13+73.36	2.37′ RT	OLD RICHMOND RD	PCC	85.40
17	14+51.75	7.19′ LT	OLD RICHMOND RD	PC	86.30
18	14+52.13	7.79′ LT	OLD RICHMOND RD	PRC	86.31
19	14+71.18	12.26′ LT	OLD RICHMOND RD	PRC	86.69
20	14+74.58	8.30′ LT	OLD RICHMOND RD	PRC	86.69
21	14+72.22	0	OLD RICHMOND RD		86.72
22	14+70.71	12.91′ RT	OLD RICHMOND RD	PRC	86.77
23	14+69.19	13.77′ RT	OLD RICHMOND RD	PRC	86.75
24	14+52.34	6.12′ RT	OLD RICHMOND RD	PRC	86.30
25	14+52.01	5.57′ RT	OLD RICHMOND RD	PT	86.31
26	14+53.07	1.29′ LT	OLD RICHMOND RD	PI	86.33

(A) BEGIN CONC CURB (DOWEL)
STA 13+72.17
℄ OLD RICHMOND RD

(B) END CONC CURB (DOWEL)
STA 13+99.50
℄ OLD RICHMOND RD

(C) BEGIN CONC CURB (DOWEL)
STA 14+02.50
℄ OLD RICHMOND RD

(D) END CONC CURB (DOWEL)
STA 14+41.74
℄ OLD RICHMOND RD

(E) BEGIN CONC CURB (DOWEL)
STA 14+52.88
℄ OLD RICHMOND RD

(F) END CONC CURB (DOWEL)
STA 14+72.72
℄ OLD RICHMOND RD

(G) BEGIN CONC CURB (DOWEL)
STA 15+91.56
℄ OLD RICHMOND RD

(H) END CONC CURB (DOWEL)
STA 16+11.55
℄ OLD RICHMOND RD

(I) BEGIN CONC CURB
STA 16+22.91
℄ OLD RICHMOND RD

(J) END CONC CURB
STA 16+86.69
℄ OLD RICHMOND RD

(K) BEGIN CONC CURB
STA 13+23.05
6.50′ RT
℄ VOSS RD

(L) END CONC CURB
BEGIN CONC CURB (DOWEL)
STA 12+98.17
5.91′ LT
℄ VOSS RD

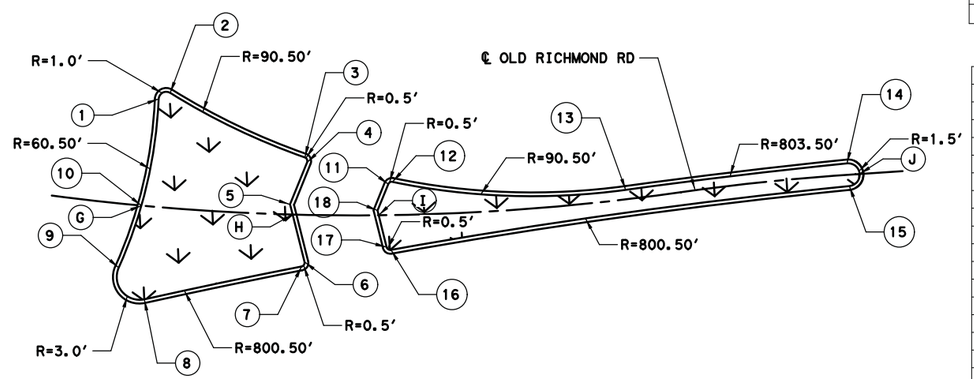
(M) END CONC CURB (DOWEL)
STA 13+23.05
6.50′ LT
℄ VOSS RD

(N) BEGIN CONC CURB (DOWEL)
STA 11+93.53
℄ VOSS RD

(O) END CONC CURB (DOWEL)
STA 11+74.22
℄ VOSS RD

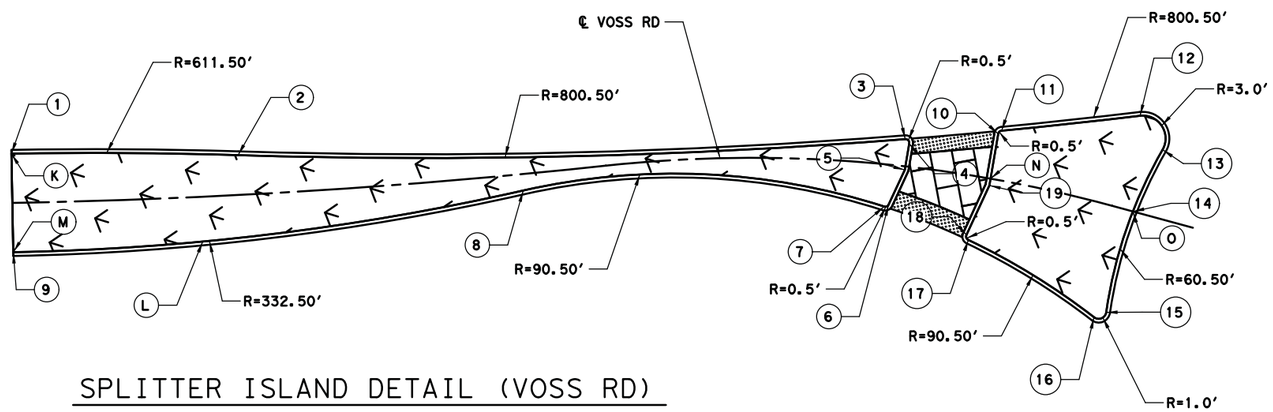
NOTES:

1. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.
2. ALL ELEVATIONS ARE AT THE GUTTER LINE.



SPLITTER ISLAND DETAIL (ORR NORTH)

SPLITTER ISLAND ORR NORTH					
	STATION	OFFSET	CHAIN	DESCRIPTION	ELEVATION
1	15+92.58	14.21′ LT	OLD RICHMOND RD	PC	86.58
2	15+94.10	15.15′ LT	OLD RICHMOND RD	PRC	86.56
3	16+13.00	7.58′ LT	OLD RICHMOND RD	PRC	86.31
4	16+13.32	6.92′ LT	OLD RICHMOND RD	PT	86.30
5	16+11.18	1.32′ LT	OLD RICHMOND RD	PI	86.34
6	16+13.25	6.22′ RT	OLD RICHMOND RD	PC	86.30
7	16+12.88	6.84′ RT	OLD RICHMOND RD	PRC	86.31
8	15+93.02	12.28′ RT	OLD RICHMOND RD	PRC	86.74
9	15+89.39	8.46′ RT	OLD RICHMOND RD	PRC	86.81
10	15+91.56	0	OLD RICHMOND RD		86.72
11	16+25.24	4.06′ LT	OLD RICHMOND RD	PC	86.12
12	16+24.81	4.38′ LT	OLD RICHMOND RD	PRC	86.13
13	16+55.76	1.26′ LT	OLD RICHMOND RD	PRC	85.80
14	16+85.14	1.50′ LT	OLD RICHMOND RD	PRC	85.66
15	16+85.24	1.50′ RT	OLD RICHMOND RD	PRC	86.66
16	16+24.47	4.60′ RT	OLD RICHMOND RD	PRC	86.14
17	16+23.91	4.22′ RT	OLD RICHMOND RD	PT	86.14
18	16+22.77	0.62′ LT	OLD RICHMOND RD	PI	86.16



SPLITTER ISLAND DETAIL (VOSS RD)

SPLITTER ISLAND VOSS RD					
	STATION	OFFSET	CHAIN	DESCRIPTION	ELEVATION
1	13+23.05	6.50′ RT	VOSS RD	PC	84.88
2	12+92.94	5.26′ RT	VOSS RD	PRC	84.98
3	12+05.29	3.58′ RT	VOSS RD	PRC	86.09
4	12+04.71	3.06′ RT	VOSS RD	PT	86.09
5	12+04.91	0.46′ LT	VOSS RD	PI	86.11
6	12+06.55	5.25′ LT	VOSS RD	PC	86.06
7	12+07.15	5.57′ LT	VOSS RD	PRC	86.05
8	12+55.68	2.17′ LT	VOSS RD	PRC	85.29
9	13+23.05	6.50′ LT	VOSS RD	PC	84.88
10	11+93.55	6.00′ RT	VOSS RD	PC	86.29
11	11+93.20	6.49′ RT	VOSS RD	PRC	86.33
12	11+76.61	12.44′ RT	VOSS RD	PRC	86.56
13	11+72.58	8.90′ RT	VOSS RD	PRC	86.58
14	11+73.72	0	VOSS RD		86.72
15	11+74.13	13.77′ LT	VOSS RD	PRC	86.58
16	11+75.51	14.82′ LT	VOSS RD	PRC	86.56
17	11+95.08	8.47′ LT	VOSS RD	PRC	86.29
18	11+95.44	7.86′ LT	VOSS RD	PT	86.29
19	11+93.52	0.90′ LT	VOSS RD	PI	86.32

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
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OLD RICHMOND RD

SPLITTER ISLAND/ MEDIAN DETAIL

SHEET 1 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	17

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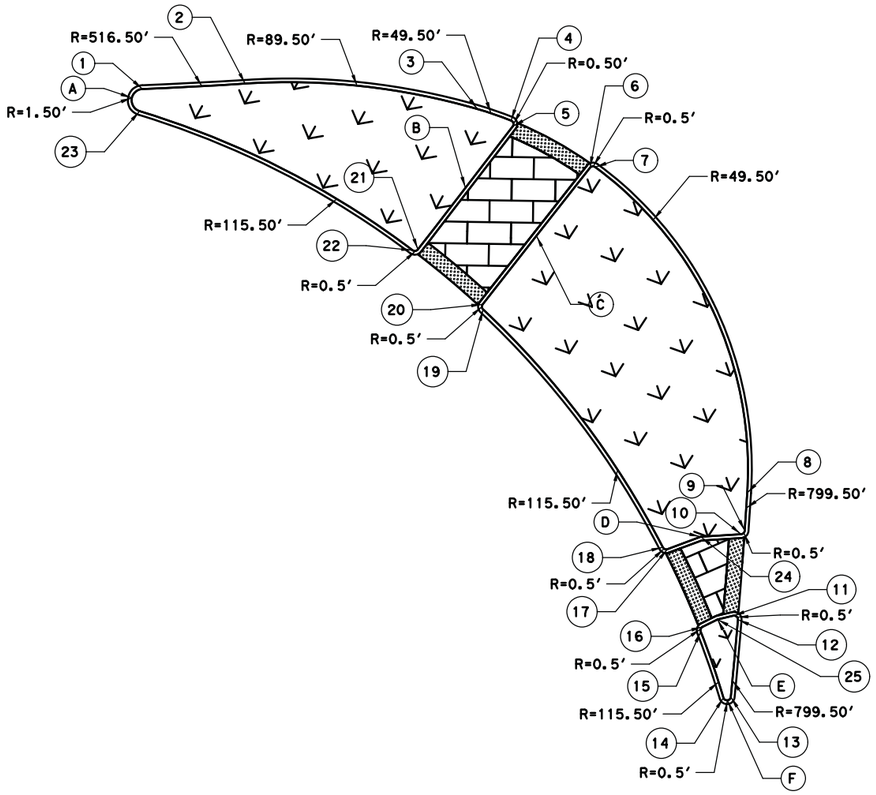

MEDIAN DETAIL (ORR SOUTH)

MEDIAN ORR SOUTH					
	STATION	OFFSET	CHAIN	DESCRIPTION	ELEVATION
1	13+88.24	15.37′ RT	OLD RICHMOND RD	PC	85.73
2	14+01.96	14.84′ RT	OLD RICHMOND RD	PRC	85.89
3	14+33.04	18.00′ RT	OLD RICHMOND RD	PCC	86.33
4	14+37.60	19.44′ RT	OLD RICHMOND RD	PRC	86.44
5	14+37.83	20.21′ RT	OLD RICHMOND RD	PT	86.43
6	14+48.36	25.41′ RT	OLD RICHMOND RD	PC	86.52
7	14+49.06	25.30′ RT	OLD RICHMOND RD	PCC	86.56
8	11+86.39	26.08′ RT	VOSS RD	PCC	86.10
9	11+90.52	24.42′ RT	VOSS RD	PCC	86.05
10	11+91.05	24.67′ RT	VOSS RD	PT	86.03
11	12+00.30	21.80′ RT	VOSS RD	PT	85.87
12	12+00.56	21.04′ RT	VOSS RD	PC	85.87
13	12+09.55	18.77′ RT	VOSS RD	PRC	85.69
14	12+09.89	19.68′ RT	VOSS RD	PRC	85.09
15	12+03.29	25.17′ RT	VOSS RD	PRC	85.31
16	12+02.69	25.14′ RT	VOSS RD	PT	85.89
17	11+95.74	32.98′ RT	VOSS RD	PRC	86.05
18	11+95.74	33.65′ RT	VOSS RD	PRC	85.31
19	14+34.32	44.46′ RT	OLD RICHMOND RD	PRC	85.34
20	14+34.26	43.79′ RT	OLD RICHMOND RD	PT	85.37
21	14+25.31	36.68′ RT	OLD RICHMOND RD	PC	85.41
22	14+24.60	36.78′ RT	OLD RICHMOND RD	PRC	85.38
23	13+87.81	18.30′ RT	OLD RICHMOND RD	PRC	85.44
24	11+93.08	29.50′ RT	VOSS RD	PI	86.19
25	12+01.31	23.58′ RT	VOSS RD	PI	85.97

(A) BEGIN CONC CURB (DOWEL)
STA 13+86.77
16.65′ RT
℄ OLD RICHMOND RD

(B) END CONC CURB (DOWEL)
STA 14+31.61
28.46′ RT
℄ OLD RICHMOND RD

(C) BEGIN CONC CURB (DOWEL)
STA 14+41.36
34.62′ RT
℄ OLD RICHMOND RD

(D) END CONC CURB (DOWEL)
STA 11+93.08
29.50′ RT
℄ VOSS RD

(E) BEGIN CONC CURB (DOWEL)
STA 12+01.30
23.58′ RT
℄ VOSS RD

(F) END CONC CURB (DOWEL)
STA 12+01.31
23.58′ RT
℄ VOSS RD

NOTES:

1. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.
2. ALL ELEVATIONS ARE AT THE GUTTER LINE.

REV	DATE	BY	DESCRIPTION

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OLD RICHMOND RD

SPLITTER ISLAND/ MEDIAN DETAIL

SHEET 2 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	18

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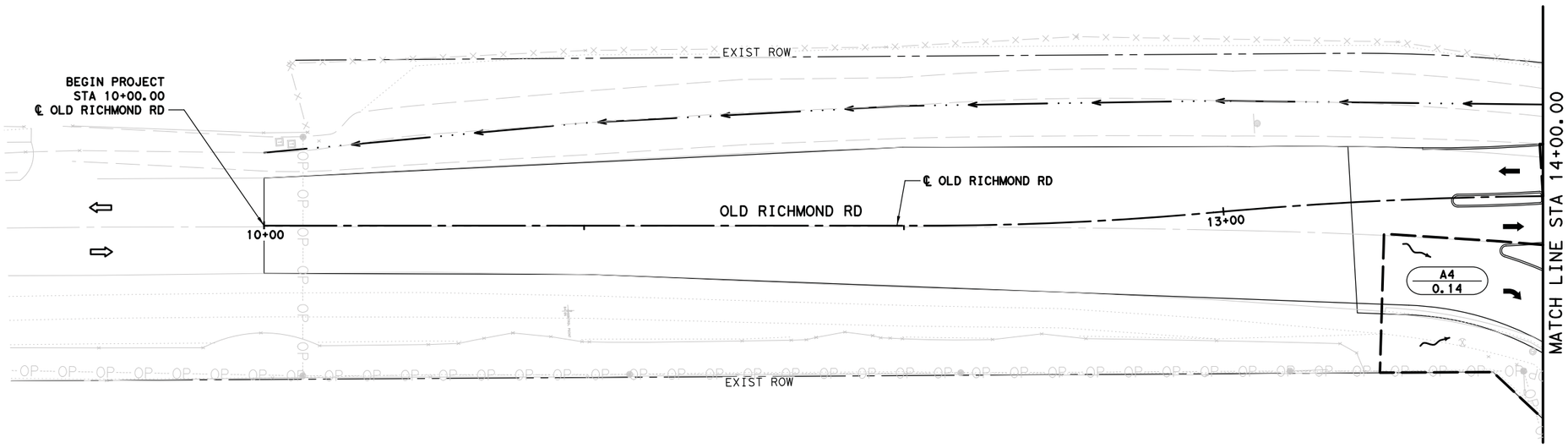

LEGEND:

- X-X / XX.XX — DRAINAGE AREA NO / AREA IN ACRES
- DRAINAGE BOUNDARY
- WATERSHED BOUNDARY (SEE NOTE 1)
- DIRECTION OF FLOW
- EXIST DIRECTION OF TRAFFIC
- PROPOSED DIRECTION OF TRAFFIC

H: 0 20 40

REV	DATE	BY	DESCRIPTION

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OLD RICHMOND RD

DRAINAGE AREA MAP

SHEET 1 OF 2

DESIGNED BY:	
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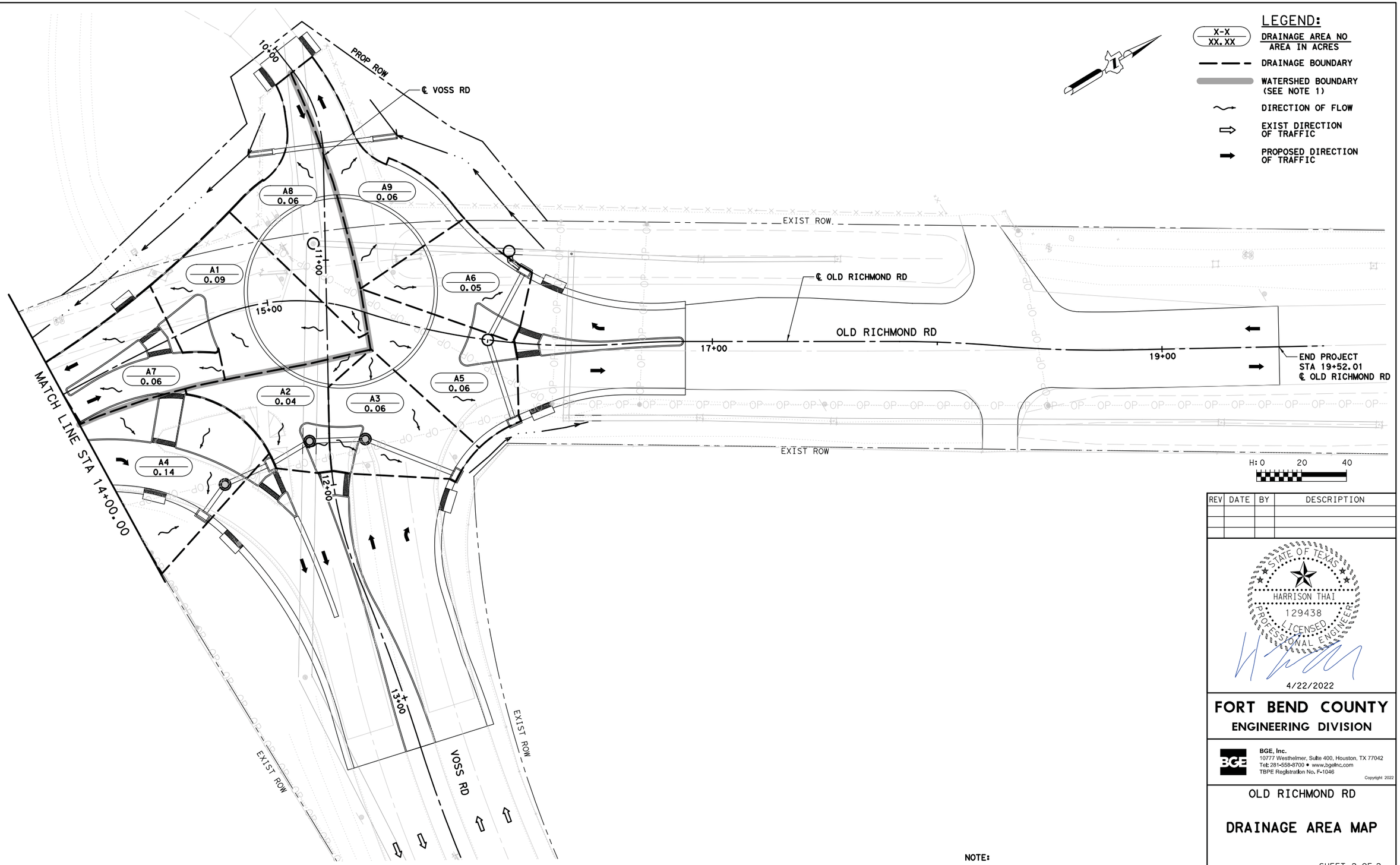
DATE:	
SHEET NO:	19



NOTE:

1. SEE "FBC 17404 & 17413 - INTERSECTION IMPROVEMENTS DRAINAGE IMPACT STUDY" FOR MORE INFORMATION.

REV	DATE	BY	DESCRIPTION

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OLD RICHMOND RD

DRAINAGE AREA MAP

SHEET 2 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	20

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4/22/2022 3:39:40 PM

RUNOFF COMPUTATIONS (3 YR)

AREA ID	AREA (ACRES)	COMPOSITE C	Tc MIN (MIN)	Tc USED (MIN)	3 YR INTENSITY (IN/HR)	3 YR DISCHARGE (CFS)	REMARKS
A1	0.08	0.90	10.00	10.00	6.24	0.47	
A2	0.04	0.90	10.00	10.00	6.24	0.25	
A3	0.06	0.90	10.00	10.00	6.24	0.32	
A4	0.14	0.72	10.00	10.00	6.24	0.61	
A5	0.06	0.90	10.00	10.00	6.24	0.34	
A6	0.05	0.89	10.00	10.00	6.24	0.28	
A7	0.06	0.90	10.00	10.00	6.24	0.33	
A8	0.06	0.91	10.00	10.00	6.24	0.36	
A9	0.06	0.90	10.00	10.00	6.24	0.35	

INLET COMPUTATIONS (3 YR)

INLET ID	INLET TYPE		LENGTH (FT)	WIDTH (FT)	TOTAL DISCHARGE (CFS)	CAPACITY (CFS)	BY PASS FLOW (CFS)	BY PASS NODE	PONDED WIDTH (FT)	PONDED DEPTH (FT)	PONDED WIDTH ALLOW (FT)	PONDED DEPTH ALLOW (FT)	REMARKS
A1	Curb Opening	On Grade	2	n/a	0.47	0.25	0.22	A7	4.67	0.09	12	0.5	
A2	Curb	On Grade	5	n/a	0.25	0.25		EXIST INLET	3.67	0.07	12	0.5	
A3	Curb	On Grade	5	n/a	0.32	0.30	0.02	EXIST INLET	6.24	0.06	12	0.5	
A4	Curb	On Grade	5	n/a	0.61	0.55	0.07	EXIST INLET	5.49	0.11	12	0.5	
A5	Curb	On Grade	5	n/a	0.34	0.34		DITCH	4.32	0.09	12	0.5	
A6	Curb	On Grade	5	n/a	0.28	0.28		DITCH	3.97	0.08	12	0.5	
A7	Curb Opening	On Grade	2	n/a	0.55	0.32	0.23	DITCH	5.74	0.11	12	0.5	

LINK COMPUTATIONS (3 YR)

LINK ID	U.S. NODE	D.S. NODE	U.S. INVERT (FT)	D.S. INVERT (FT)	ACTUAL LENGTH (FT)	HYDRAULIC LENGTH (FT)	SLOPE (%)	NO. OF BARRELS	SHAPE	DIMENSION SPAN FT	DIMENSION RISE FT	MANNING'S "n" VALUE	JUNCTION LOSS (CFS)	DISCHARGE (CFS)	CAPACITY (CFS)	U.S. HGL (FT)	D.S. HGL (FT)	DEPTH (FT)	FULL FLOW VELOCITY (FPS)
A2	A2	MH1	80.37	80.31	16.67	20.17	0.3	1	Circular	n/a	2	0.01	0	0.85	12.39	80.71	80.62	0.35	3.94
A3	A3	B3	80.50	80.38	39.98	43.48	0.3	1	Circular	n/a	2	0.01	0	0.32	12.39	80.76	80.59	0.22	3.94
A4	A4	B1	80.47	80.43	13.56	17.06	0.3	1	Circular	n/a	2	0.01	0	0.61	12.39	80.8	80.74	0.3	3.94
A5	A5	MH2	81.44	81.33	34.6	38.1	0.3	1	Circular	n/a	2	0.01	0	0.34	12.39	81.7	81.57	0.23	3.94
A6	A6	B2	81.23	81.20	5.28	7.78	0.3	1	Circular	n/a	2	0.01	0	0.6	12.39	81.52	81.49	0.3	3.94
B1	B1	A2	80.43	80.37	18.62	22.12	0.3	1	Circular	n/a	2	0.01	0	0.61	12.39	80.74	80.71	0.3	3.94
B2	B2	MH3	81.20	81.19	2.22	4.22	0.3	1	Circular	n/a	2	0.01	0	0.6	12.39	81.49	81.45	0.3	3.94
B3	B3	MH1	80.38	80.31	20.85	24.85	0.3	1	Circular	n/a	2	0.01	0	0.32	12.39	80.59	80.49	0.22	3.94
J2	J2	MH3	75.43	75.3	25.76	27.76	0.46	1	Circular	n/a	2.5	0.01	0	10	27.82	79.48	79.46	1.04	5.67
MH1	MH1	EMH1	71.73	71.49	83.86	87.86	0.27	1	Circular	n/a	6	0.01	0	1.15	221.34	79.41	79.41	0.31	7.78
MH2	MH2	A6	81.33	81.23	31.27	34.77	0.3	1	Circular	n/a	2	0.01	0	0.34	12.39	81.57	81.52	0.23	3.94
MH3	MH3	EMH1	75.3	74.9	83.08	87.08	0.46	1	Circular	n/a	2.5	0.01	0	10.6	27.87	79.46	79.41	1.06	5.67
EMH1	EMH1	OUTFALL	71.44	71.41	26.47	28.47	0.12	1	Circular	n/a	8	0.01	0	11.71	315.95	79.41	79.41	1.06	6.29

RUNOFF COMPUTATIONS (100 YR)

AREA ID	AREA (ACRES)	COMPOSITE C	Tc MIN (MIN)	Tc USED (MIN)	100 YR INTENSITY (IN/HR)	100 YR DISCHARGE (CFS)	REMARKS
A1	0.08	0.90	10.00	10.00	12.09	0.91	
A2	0.04	0.90	10.00	10.00	12.09	0.48	
A3	0.06	0.90	10.00	10.00	12.09	0.62	
A4	0.14	0.72	10.00	10.00	12.09	1.19	
A5	0.06	0.90	10.00	10.00	12.09	0.66	
A6	0.05	0.89	10.00	10.00	12.09	0.53	
A7	0.06	0.90	10.00	10.00	12.09	0.63	
A8	0.06	0.91	10.00	10.00	12.09	0.70	
A9	0.06	0.90	10.00	10.00	12.09	0.67	

LINK COMPUTATIONS (100 YR)

LINK ID	U.S. NODE	D.S. NODE	U.S. INVERT (FT)	D.S. INVERT (FT)	ACTUAL LENGTH (FT)	HYDRAULIC LENGTH (FT)	SLOPE (%)	NO. OF BARRELS	SHAPE	DIMENSION SPAN FT	DIMENSION RISE FT	MANNING'S "n" VALUE	JUNCTION LOSS (CFS)	DISCHARGE (CFS)	CAPACITY (CFS)	U.S. HGL (FT)	D.S. HGL (FT)	DEPTH (FT)	FULL FLOW VELOCITY (FPS)
A2	A2	MH1	80.37	80.31	16.67	20.17	0.3	1	Circular	n/a	2	0.01	0	1.65	12.39	80.85	80.74	0.49	3.94
A3	A3	B3	80.50	80.38	39.98	43.48	0.3	1	Circular	n/a	2	0.01	0	0.62	12.39	80.83	80.68	0.3	3.94
A4	A4	B1	80.47	80.43	13.56	17.06	0.3	1	Circular	n/a	2	0.01	0	1.19	12.39	80.93	80.87	0.42	3.94
A5	A5	MH2	81.44	81.33	34.6	38.1	0.3	1	Circular	n/a	2	0.01	0	0.66	12.39	81.78	81.67	0.32	3.94
A6	A6	B2	81.23	81.20	5.28	7.78	0.3	1	Circular	n/a	2	0.01	0	1.17	12.39	81.63	81.6	0.41	3.94
B1	B1	A2	80.43	80.37	18.62	22.12	0.3	1	Circular	n/a	2	0.01	0	1.19	12.39	80.87	80.85	0.42	3.94
B2	B2	MH3	81.20	81.19	2.22	4.22	0.3	1	Circular	n/a	2	0.01	0	1.17	12.39	81.6	81.56	0.41	3.94
B3	B3	MH1	80.38	80.31	20.85	24.85	0.3	1	Circular	n/a	2	0.01	0	0.62	12.39	80.68	80.56	0.3	3.94
J2	J2	MH3	75.43	75.3	25.76	27.76	0.46	1	Circular	n/a	2.5	0.01	0	10	27.82	79.49	79.47	1.04	5.67
MH1	MH1	EMH1	71.73	71.49	83.86	87.86	0.27	1	Circular	n/a	6	0.01	0	2.23	221.34	79.41	79.41	0.42	7.78
MH2	MH2	A6	81.33	81.23	31.27	34.77	0.3	1	Circular	n/a	2	0.01	0	0.66	12.39	81.67	81.63	0.32	3.94
MH3	MH3	EMH1	75.3	74.9	83.08	87.08	0.46	1	Circular	n/a	2.5	0.01	0	11.16	27.87	79.47	79.41	1.1	5.67
EMH1	EMH1	OUTFALL	71.44	71.41	26.47	28.47	0.12	1	Circular	n/a	8	0.01	0	13.31	315.95	79.41	79.41	1.11	6.29

NOTES:

1. 3-YEAR FREQUENCY STORM EVENT USED FOR STORM SEWER DESIGN.
2. RATIONAL METHOD USED FOR HYDROLOGIC ANALYSIS.
3. GEOPAK DRAINAGE VERSION 08.11.09.845 (SELECT SERIES 4) USED FOR HYDRAULIC ANALYSIS.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

4/22/2022

FORT BEND COUNTY
ENGINEERING DIVISION

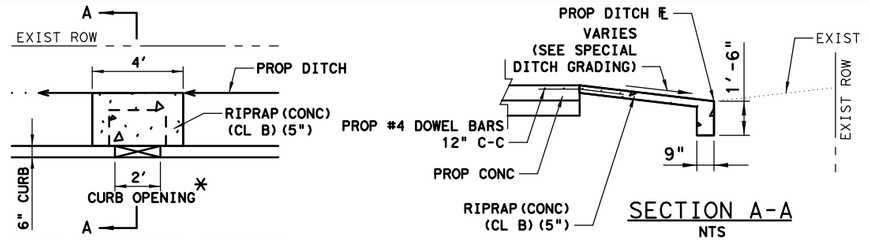
BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

DRAINAGE CALCULATIONS

SHEET 1 OF 1

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	21

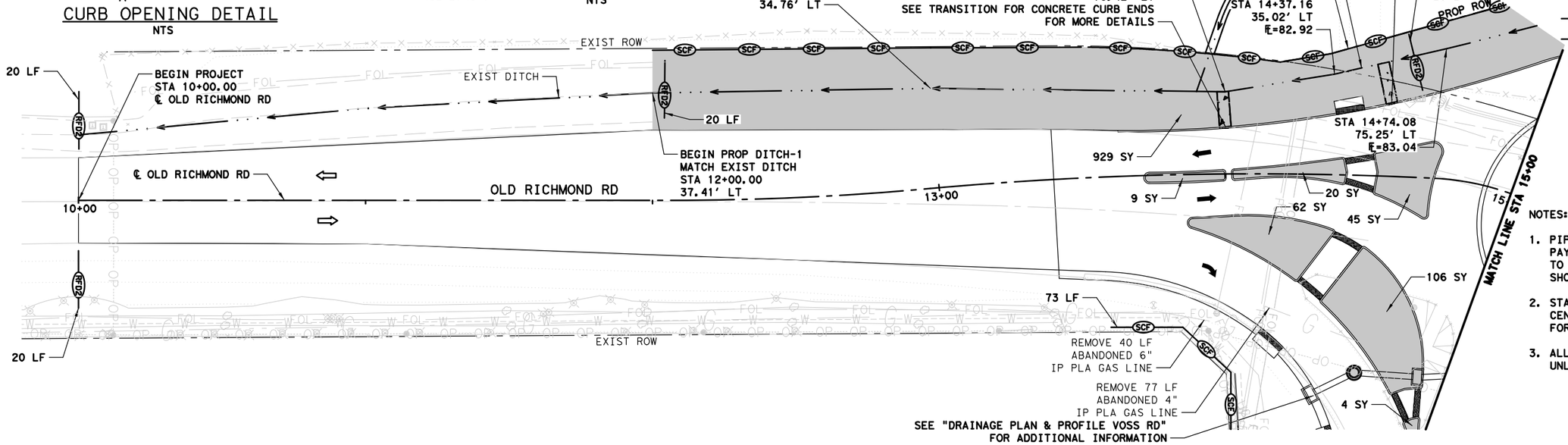


CURB OPENING DETAIL
NTS

SECTION A-A
NTS

* SEE "DRAINAGE STANDARDS" SHEET 1 OF 5 FOR GUTTER DEPRESSION DETAILS

SEE "DUHASEK PARK DITCH PLAN & PROFILE" FOR MORE DETAILS



LEGEND:

- MANHOLE
- CURB INLET
- PROP STORM SEWER
- IPB — INLET PROTECTION BARRIER FOR STAGE I INLETS (TEMPORARY)
- IPB-II — INLET PROTECTION BARRIER FOR STAGE II INLETS (TEMPORARY)
- RFD2 — TYPE II ROCK FILTER DAM
- SCF — SEDIMENT CONTROL FENCE
- BLOCK SOD
- EXIST DIRECTION OF TRAFFIC
- PROPOSED DIRECTION OF TRAFFIC

NOTES:

1. PIPE LENGTHS SHOWN IN PROFILE ARE PAY LENGTHS. CENTER OF STRUCTURE TO CENTER OF STRUCTURE LENGTHS ARE SHOWN IN HYDRAULIC CALCULATIONS.
2. STATION AND OFFSET ARE MEASURED TO CENTER OF INLET AT BACK OF CURB FOR ALL CURB INLETS AND MANHOLES.
3. ALL STATIONING IS ℄ OLD RICHMOND RD UNLESS OTHERWISE NOTED.

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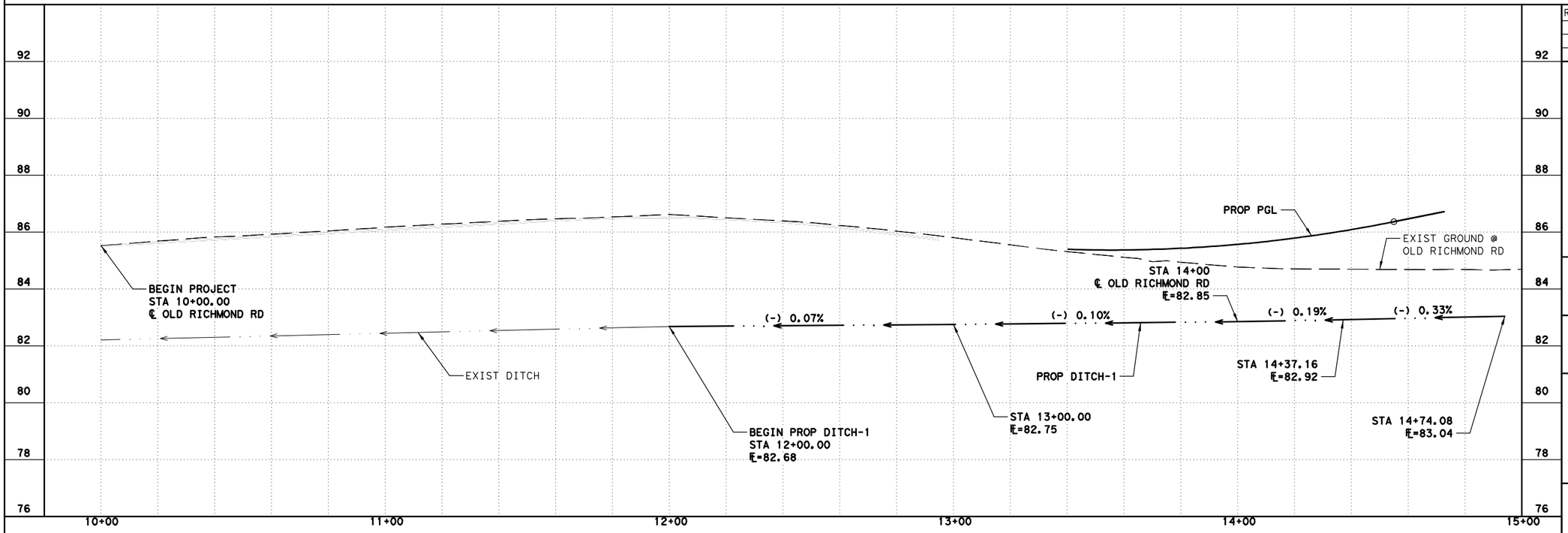
V: 0 2 4



REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
PROFESSIONAL ENGINEER
LICENSED
4/27/2022

FORT BEND COUNTY
ENGINEERING DIVISION

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OLD RICHMOND RD

DRAINAGE/SW3P
PLAN & PROFILE
OLD RICHMOND RD
BEGIN PROJECT TO STA 15+00

SHEET 1 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	22

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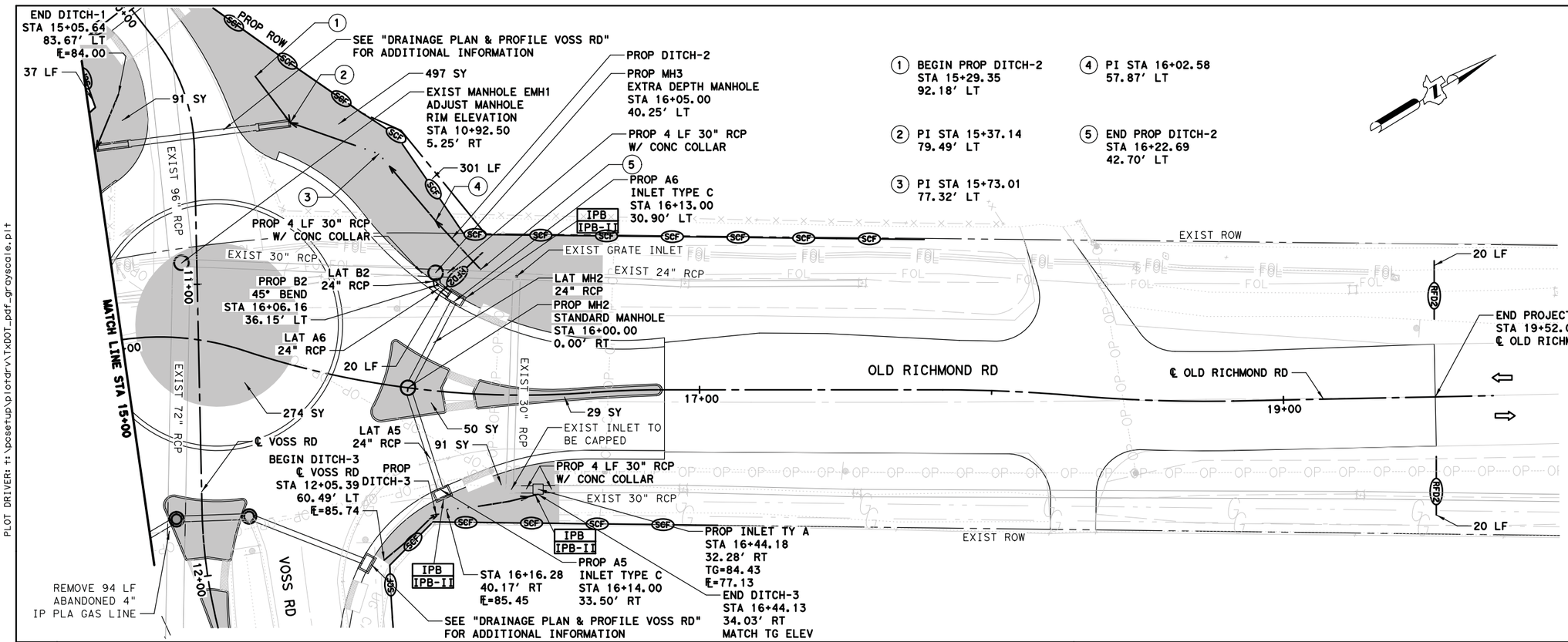

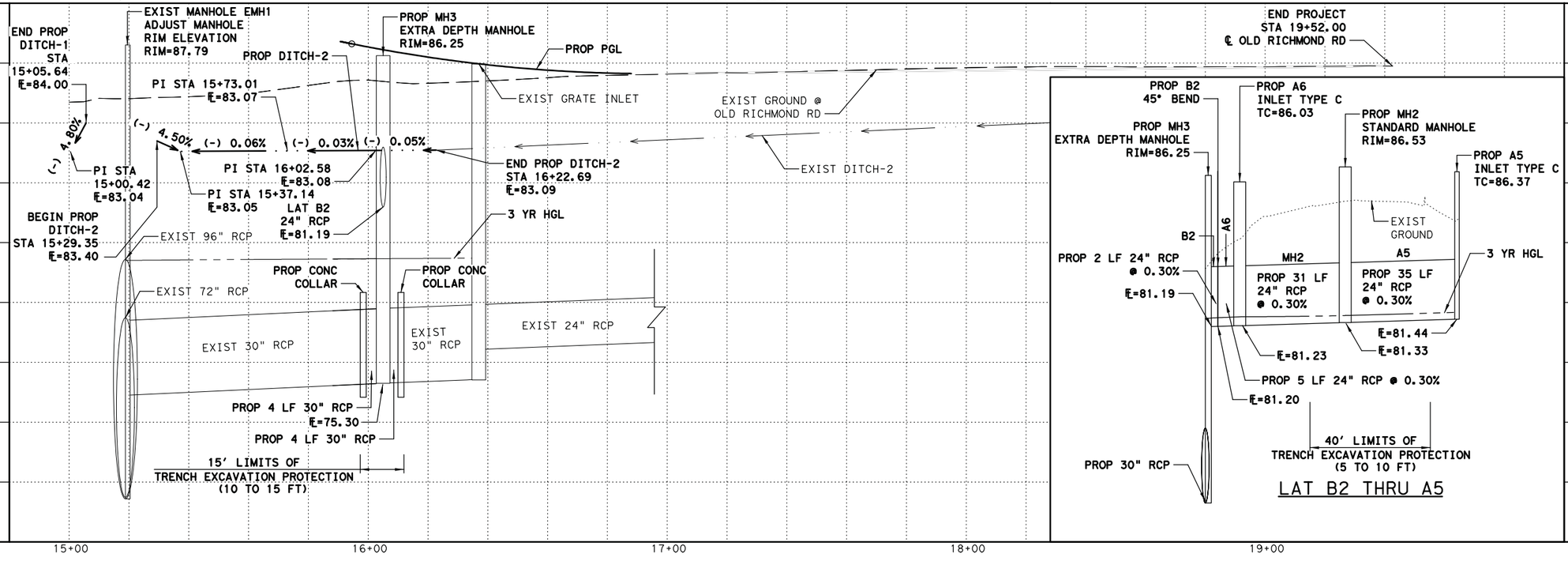

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
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PROFESSIONAL ENGINEER
5/31/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
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TBPE Registration No. F-1046

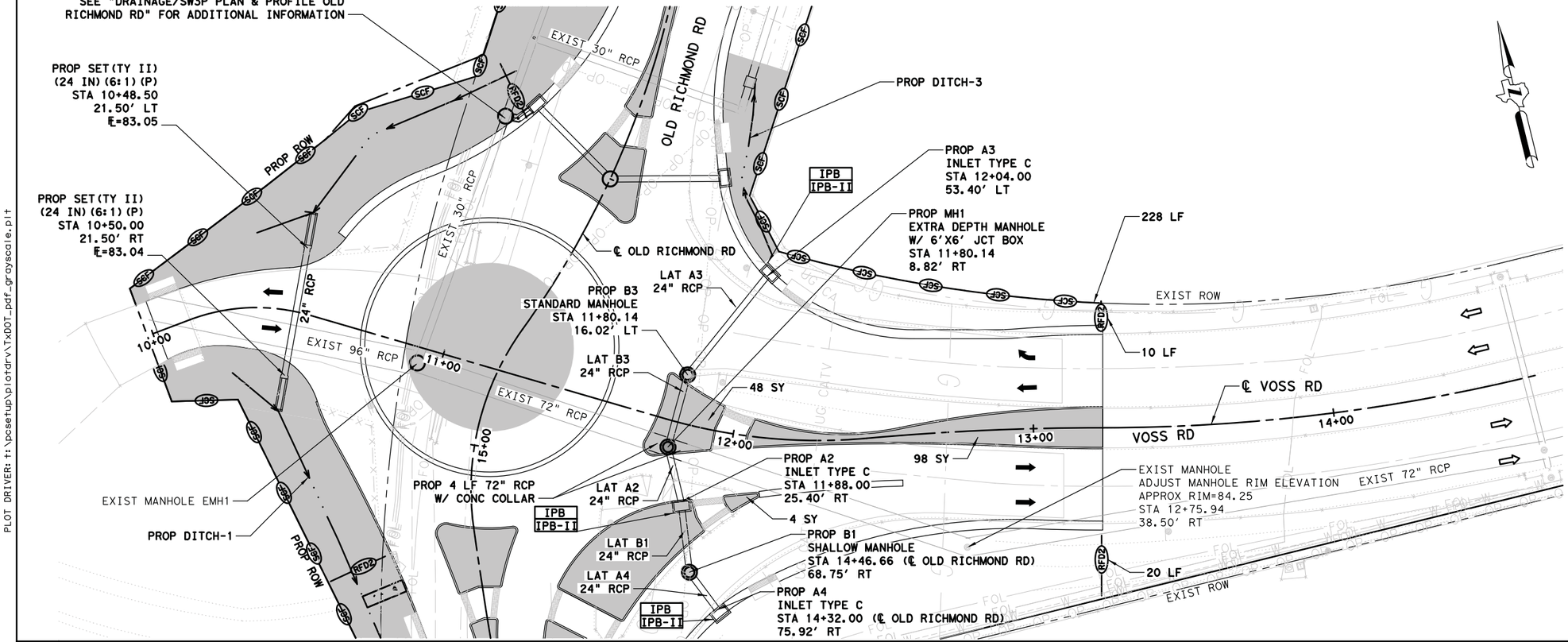
OLD RICHMOND RD

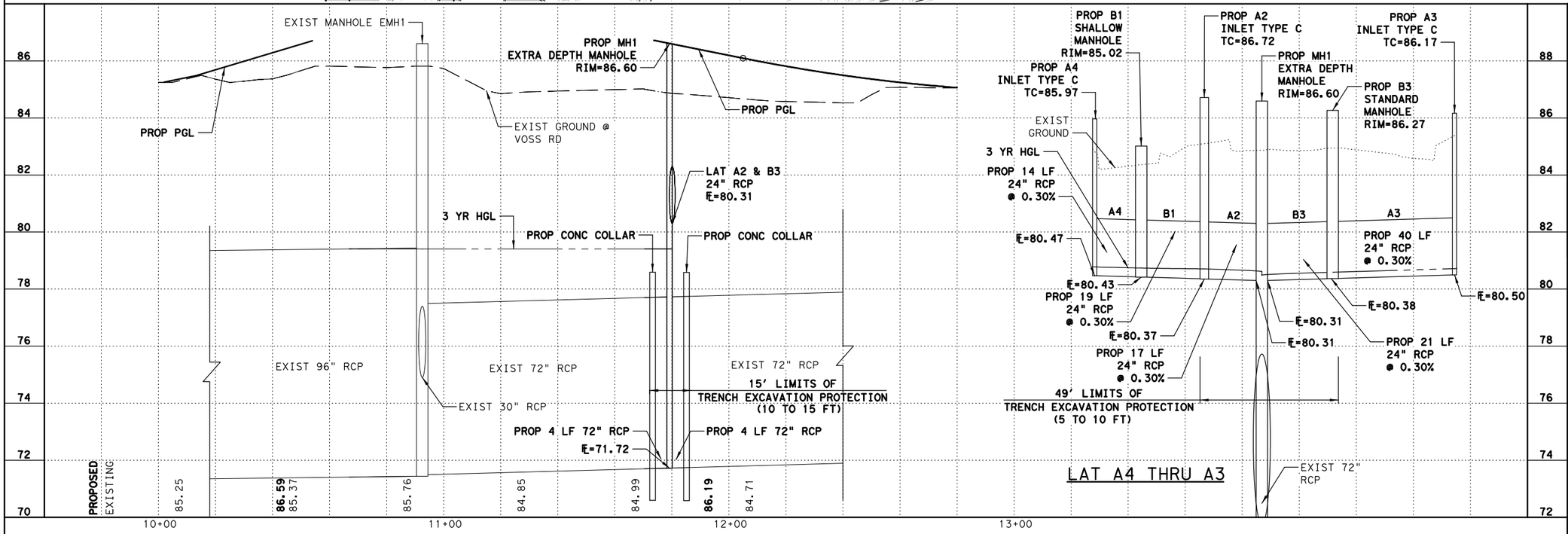
DRAINAGE/SW3P PLAN & PROFILE OLD RICHMOND RD

STA 15+00 TO END PROJECT

SHEET 2 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	23





REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
5/31/2022

FORT BEND COUNTY
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OLD RICHMOND RD

DRAINAGE/SW3P PLAN & PROFILE VOSS RD

BEGIN PROJECT TO END

SHEET 1 OF 1

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	24

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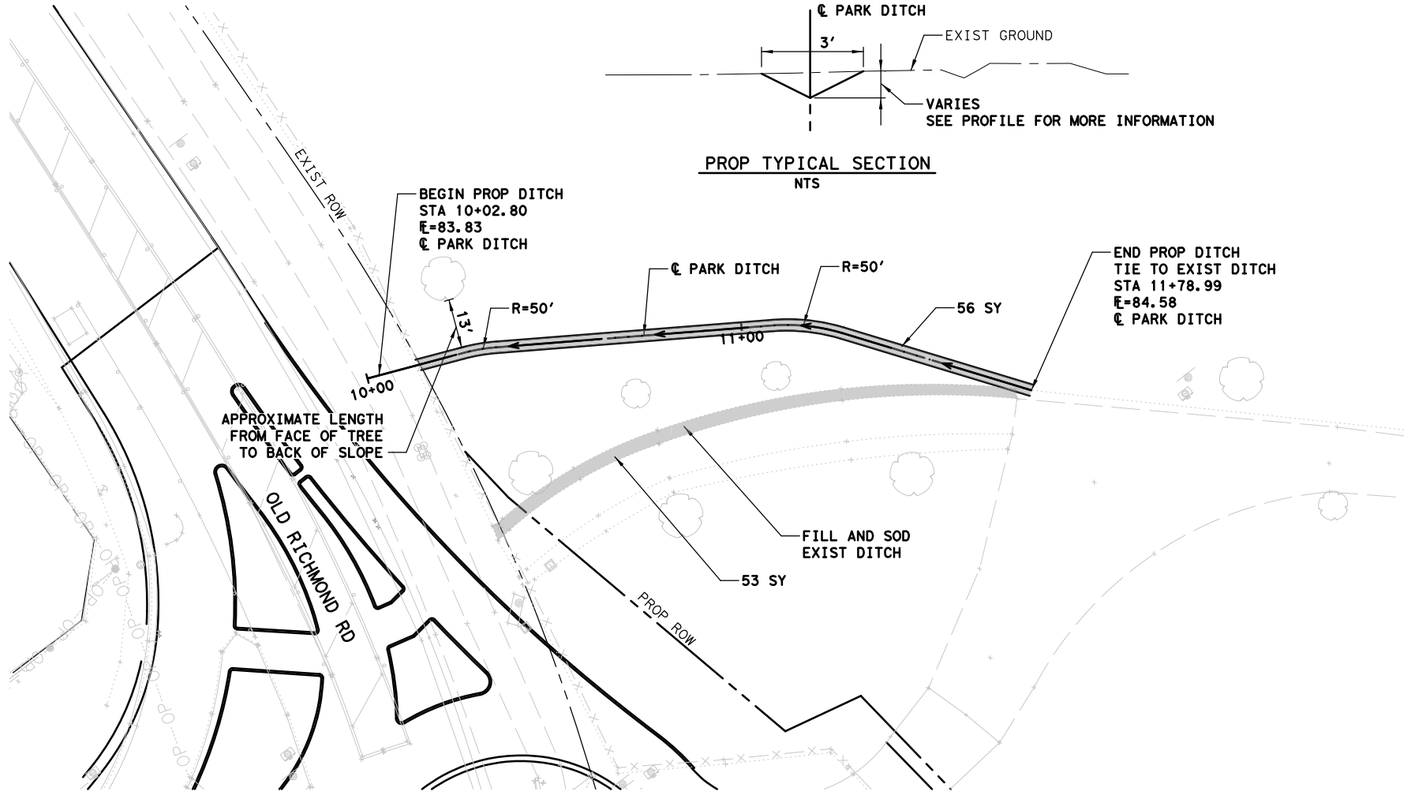


LEGEND:

- FLOW DIRECTION
- PROP DITCH BOUNDARIES
- EXIST ROW
- PROP ROW
- BLOCK SOD

℄ PARK DITCH

Chain PARKDITCH_CL contains:
PD01 CUR PARKDITCH_CL1 CUR PARKDITCH_CL2 PD0

Beginning chain PARKDITCH_CL description

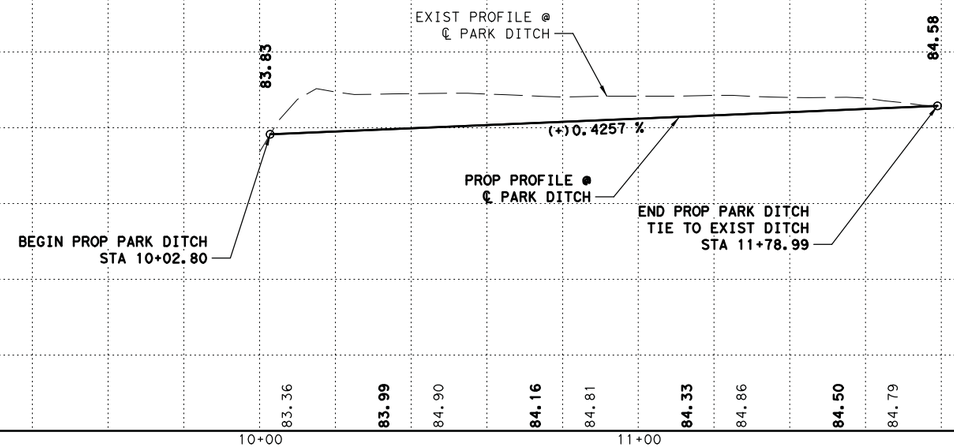
Point PD01 N 13,799,018.7269 E 3,028,958.7605 Sta 10+00.00

Course from PD01 to PC PARKDITCH_CL1 N 67° 37' 33.80" W Dist 25.9400

Curve Data						
Curve PARKDITCH_CL1						
P.I. Station		10+30.53	N	13,799,030.3488	E	3,028,930.5273
Delta	=	10° 29' 38.75" (RT)				
Degree	=	114° 35' 29.61"				
Tangent	=	4.5918				
Length	=	9.1578				
Radius	=	50.0000				
External	=	0.2104				
Long Chord	=	9.1450				
Mid. Ord.	=	0.2095				
P.C. Station		10+25.94	N	13,799,028.6009	E	3,028,934.7734
P.T. Station		10+35.10	N	13,799,032.8408	E	3,028,926.6705
C.C.			N	13,799,074.8369	E	3,028,953.8058
Back	= N 67° 37' 33.80" W					
Ahead	= N 57° 07' 55.05" W					
Chord Bear	= N 62° 22' 44.43" W					

Course from PT PARKDITCH_CL1 to PC PARKDITCH_CL2 N 57° 07' 55.05" W Dist 73.0991

H: 0 20 40
V: 0 2 4



Curve Data						
Curve PARKDITCH_CL2						
P.I. Station		11+17.61	N	13,799,077.6219	E	3,028,857.3647
Delta	=	21° 19' 43.94" (RT)				
Degree	=	114° 35' 29.61"				
Tangent	=	9.4155				
Length	=	18.6130				
Radius	=	50.0000				
External	=	0.8788				
Long Chord	=	18.5057				
Mid. Ord.	=	0.8636				
P.C. Station		11+08.20	N	13,799,072.5121	E	3,028,865.2730
P.T. Station		11+26.81	N	13,799,085.2581	E	3,028,851.8566
C.C.			N	13,799,114.5082	E	3,028,892.4083
Back	= N 57° 07' 55.05" W					
Ahead	= N 35° 48' 11.11" W					
Chord Bear	= N 46° 28' 03.08" W					

Course from PT PARKDITCH_CL2 to PD02 N 35° 48' 11.11" W Dist 52.1753

Point PD02 N 13,799,127.5740 E 3,028,821.3340 Sta 11+78.99

Ending chain PARKDITCH_CL description

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
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PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

DUHACSEK PARK DITCH PLAN & PROFILE

SHEET 1 OF 1

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	25

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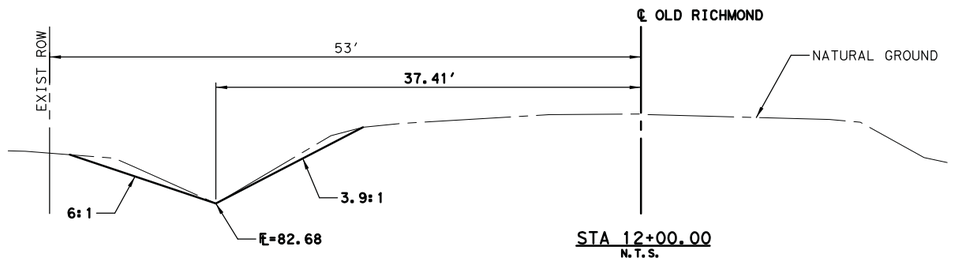

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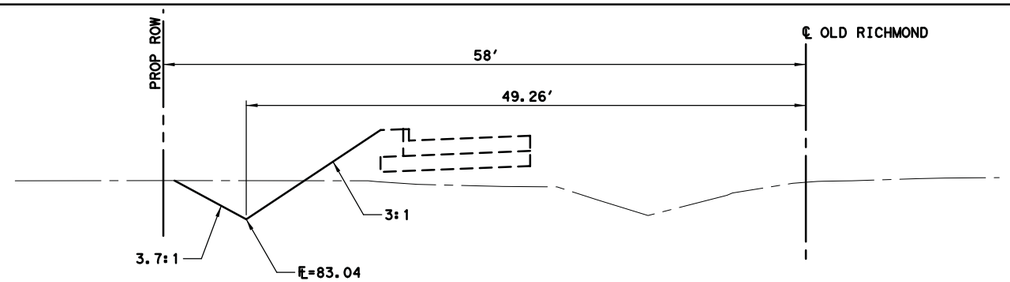

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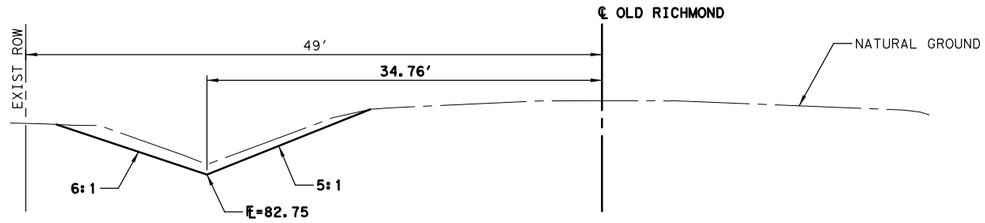

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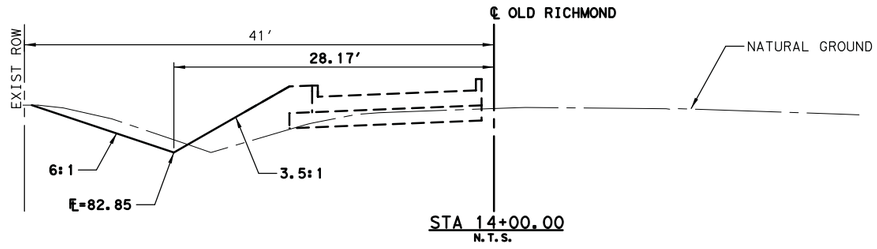

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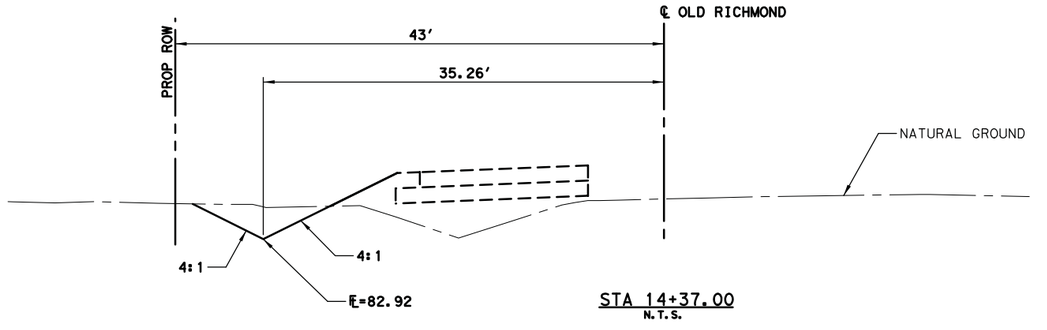

STA 14+37.00
N.T.S.

NOTE:

1. SPECIAL DITCH GRADING IS REQUIRED AS SHOWN ON THIS SHEET TO PROVIDE STORM RUNOFF DETENTION WITHIN DITCH.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

SPECIAL DITCH SECTIONS

SHEET 1 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	26

FILENAME: G:\TXH\Projects\Fort Bend County\6974-00 FBC Intersections\03_CADD\6974-00_DRN SPECIAL DITCH01_RDBT.dgn
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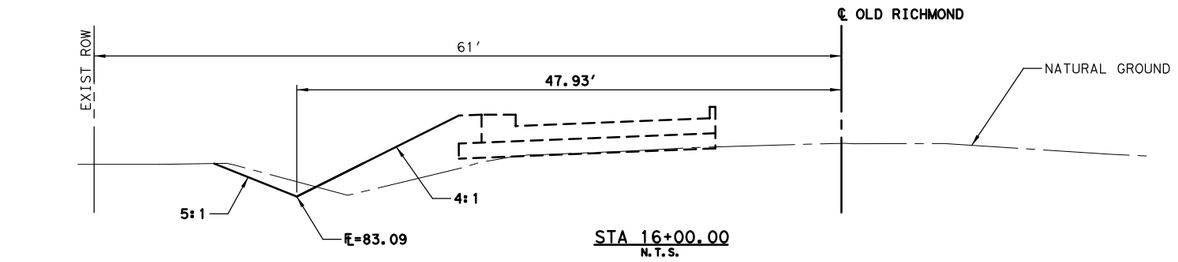

STA 16+00.00
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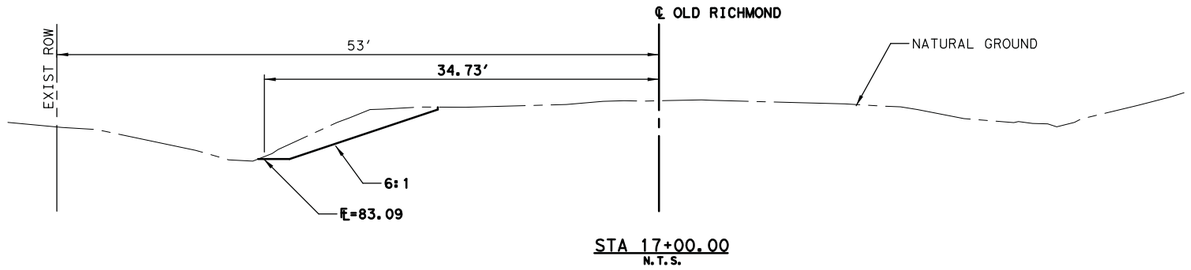
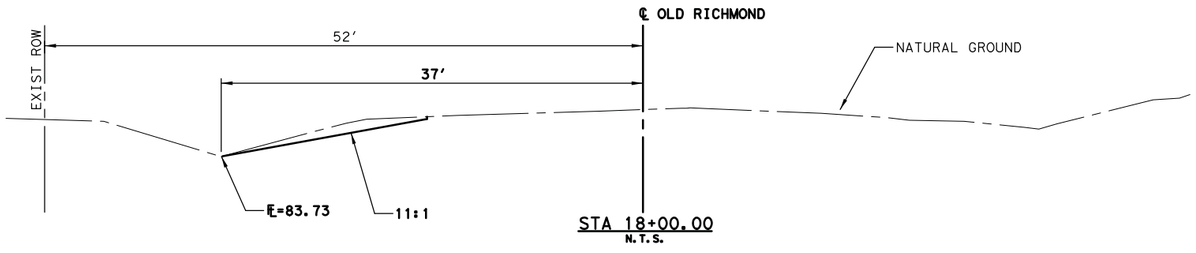


STA 17+00.00
N.T.S.



STA 18+00.00
N.T.S.

NOTE:

1. SPECIAL DITCH GRADING IS REQUIRED AS SHOWN ON THIS SHEET TO PROVIDE STORM RUNOFF DETENTION WITHIN DITCH.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

SPECIAL DITCH SECTIONS

SHEET 2 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	27

FILENAME: G:\TXH\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\6974-00_DRN SPECIAL DITCH02_RDBT.dgn
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PLOT DRIVER: T:\pcsetup\plotdrv\TxDOT_pdf_grayscale.plt
2/7/2022 9:35:03 AM

TCP CONSTRUCTION NARRATIVE

TCP GENERAL NOTES

1. THIS TRAFFIC CONTROL CONSTRUCTION NARRATIVE REPRESENTS MINIMUM REQUIREMENTS. CONTRACTOR IS RESPONSIBLE FOR CHANGES REQUIRED BY EXISTING FIELD CONDITIONS.

2. THE CONTRACTOR MAY PROPOSE MODIFICATIONS TO THE SEQUENCE OF WORK FOR CONSIDERATION BY THE ENGINEER. ANY RECOMMENDATIONS RESULTING IN MAJOR MODIFICATIONS TO THE SEQUENCE OF WORK BY THE CONTRACTOR SHALL INCLUDE ANY CHANGES TO THE VARIOUS PAY ITEMS, IMPACT TO TRAFFIC, AND AFFECT ON OVERALL PROJECT TIME, COST, ETC. DO NOT PROCEED WITH ANY CONSTRUCTION OPERATIONS BASED ON A REVISED SEQUENCE OF WORK WITHOUT WRITTEN APPROVAL FROM THE ENGINEER.

3. LANE CLOSURES SHALL BE DURING OFF PEAK HOURS ONLY MON-FRI 9AM-4PM.

4. ADVANCE SIGNING SHALL BE PLACED A MINIMUM OF TWO WEEKS IN ADVANCE TO INFORM OF POSSIBLE DELAY. CONTRACTOR SHALL NOTIFY THE FORT BEND COUNTY ENGINEERING DEPARTMENT AT LEAST TWO WEEKS PRIOR TO CONSTRUCTION. PLACE WORK ZONE SIGNING AS SHOWN ON TCP STANDARDS, PLAN SHEETS, AND IN ACCORDANCE WITH THE TMUTCD.

5. TRAFFIC HANDLING FOR THE DURATION OF THE PROJECT SHALL BE IN ACCORDANCE WITH PERTINENT STANDARDS.

6. ACCESS TO EXISTING BUSINESSES SHALL BE MAINTAINED AT ALL TIMES.

7. POSITIVE DRAINAGE AND SWP3 DEVICES MUST BE MAINTAINED AT ALL TIMES DURING CONSTRUCTION.

8. ALL ADVANCED WARNINGS SIGNS ARE TO BE SET PRIOR TO CONSTRUCTION ACTIVITIES, KEPT CLEAN, AND TO REMAIN IN PLACE UNTIL ALL CONSTRUCTION ACTIVITIES ARE COMPLETE AND ACCEPTED BY FORT BEND COUNTY. COORDINATE WITH FORT BEND COUNTY PUBLIC INFRASTRUCTURE DEPARTMENT, ENGINEERING DIVISION IN ESTABLISHING TRAFFIC ROUTES AND LOCATIONS OF SIGNS. EROSION CONTROL AND SWP3 ITEMS MUST BE IN PLACE PRIOR TO COMMENCENT OF CONSTRUCTION ACTIVITIES.

CONSTRUCTION SEQUENCE

PHASE 1 STEP 1

1. PLACE ALL ADVANCED WARNING SIGNS AND BARRICADES WITH TMUTCD AND BC STANDARDS.

2. PLACE EROSION CONTROL MEASURES IN ACCORDANCE WITH SWP3.

3. REMOVE PORTION OF EXIST ISLAND AND INSTALL TEMPORARY PAVEMENT AS SHOWN.

4. CUT AND RESTORE PAVEMENT TO CONSTRUCT MH2 AND LATERAL AS SHOWN.

PHASE 1 STEP 2

1. ELIMINATE EXIST STRIPING AND SIGNING IN CONFLICT WITH PHASE 1 STEP 2 AND INSTALL TEMPORARY MARKINGS AND SIGNING AS SHOWN, SHIFT TRAFFIC TO EAST OLD RICHMOND RD.

2. INSTALL DRIVEWAY CULVERT, SET, PIPES, MANHOLES, AND SWALES AS SHOWN ON DRAINAGE SHEETS IN AREAS CORRESPONDING TO PROPOSED PAVEMENT CONSTRUCTION IN THIS STEP.

3. CONSTRUCT PERMANENT PAVEMENT AND TEMPORARY PAVEMENT ALONG WEST OLD RICHMOND RD.

4. CONSTRUCT PORTION OF CENTRAL ISLAND AS SHOWN ON THE PLANS.

PHASE 1 STEP 3

1. PLACE TEMPORARY ASPHALT TRANSITION TO PERMANENT PAVEMENT CONSTRUCTED IN PHASE 1 UTILIZING FLAGGING OPERATION.

PHASE 2 STEP 1

1. ELIMINATE TEMPORARY PAVEMENT MARKING AND SIGNING FROM PHASE 1 AND INSTALL TEMPORARY MARKINGS AND SIGNING AS SHOWN ALONG OLD RICHMOND RD. SHIFT TRAFFIC ON OLD RICHMOND RD TO PERMANENT AND TEMPORARY PAVEMENT CONSTRUCTED IN PHASE 1.

2. ALONG VOSS RD, ELIMINATE EXISTING STRIPING AND PAVEMENT MARKINGS IN CONFLICT WITH PHASE 2 AND INSTALL TEMPORARY MARKINGS AND SIGNING AS SHOWN. SHIFT ALL TRAFFIC TO WESTBOUND VOSS RD USING "BOULEVARD CLOSURES (TCPTC 3050-96)."

3. CONSTRUCT INLETS, PIPES, AND MANHOLE IN AREAS CORRESPONDING TO PROPOSED PAVEMENT CONSTRUCTION IN THIS STEP.

4. CONSTRUCT PERMANENT PAVEMENT AS SHOWN ON PLANS.

5. CONSTRUCT SPLITTER ISLAND/MEDIAN ON VOSS RD.

PHASE 2 STEP 2

1. OPEN NORTHBOUND RIGHT TURN LANE ON OLD RICHMOND RD. REMOVE TEMPORARY PAVEMENT AND CONSTRUCT PERMANENT PAVEMENT AS SHOWN.

2. UTILIZE "BOULEVARD CLOSURES (TCPTC 3050-96)" TO MERGE TRAFFIC ALONG EASTBOUND VOSS TO SAME SIDE.

PHASE 3

1. ELIMINATE TEMPORARY PAVEMENT MARKING AND SIGNING IN CONFLICT WITH PHASE 3 AND INSTALL TEMPORARY MARKINGS AND SIGNING AS SHOWN ALONG OLD RICHMOND RD. MAINTAIN TRAFFIC ON PERMANENT AND TEMPORARY PAVEMENT CONSTRUCTED IN PREVIOUS STEPS.

2. ALONG VOSS RD, ELIMINATE EXISTING STRIPING AND PAVEMENT MARKINGS IN CONFLICT WITH PHASE 3 AND INSTALL TEMPORARY MARKINGS AND SIGNING AS SHOWN. SHIFT ALL TRAFFIC TO EASTBOUND VOSS RD USING "BOULEVARD CLOSURES (TCPTC 3050-96)."

3. CONSTRUCT REMAINING INLETS, PIPES, AND MANHOLE IN IN AREAS CORRESPONDING TO PROPOSED PAVEMENT CONSTRUCTION IN THIS STEP.

4. CONSTRUCT PERMANENT PAVEMENT AS SHOWN ON PLANS.

PHASE 4

1. CONSTRUCT REMAINING CENTRAL ISLAND, MEDIANS, AND REMAINING CURB INLETS.

2. CONSTRUCT ILLUMINATION.

3. PLACE PERMANENT MARKINGS AND SIGNING.

PHASE 4A

1. UTILIZING TCP(1-1)-18, TCP(1-2)-17 OR TCP(1-3)-18, PLACE FULL-WIDTH 2" OVERLAY AND WORK ZONE SHORT TERM PAVEMENT MARKINGS ALONG OLD RICHMOND RD ASPHALT SECTIONS.

2. UTILIZING TCP(3-1)-13, TCP(3-3)-14, AND TCP(3-4)-13. PLACE PAVEMENT MARKINGS IN ACCORDANCE WITH SIGNING AND PAVEMENT MARKING LAYOUT.

3. REMOVE TEMPORARY PAVEMENT CONSTRUCTED IN PREVIOUS STEPS. GRADE FINAL DITCHES AND PLACE BLOCK SOD. REMOVE EROSION CONTROL DEVICES AS DIRECTED.

4. PERFORM FINAL CLEANUP AND REMOVE PROJECT LIMIT AND WORK ZONE SIGNING.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TCP CONSTRUCTION NARRATIVE

SHEET 1 OF 1

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	28

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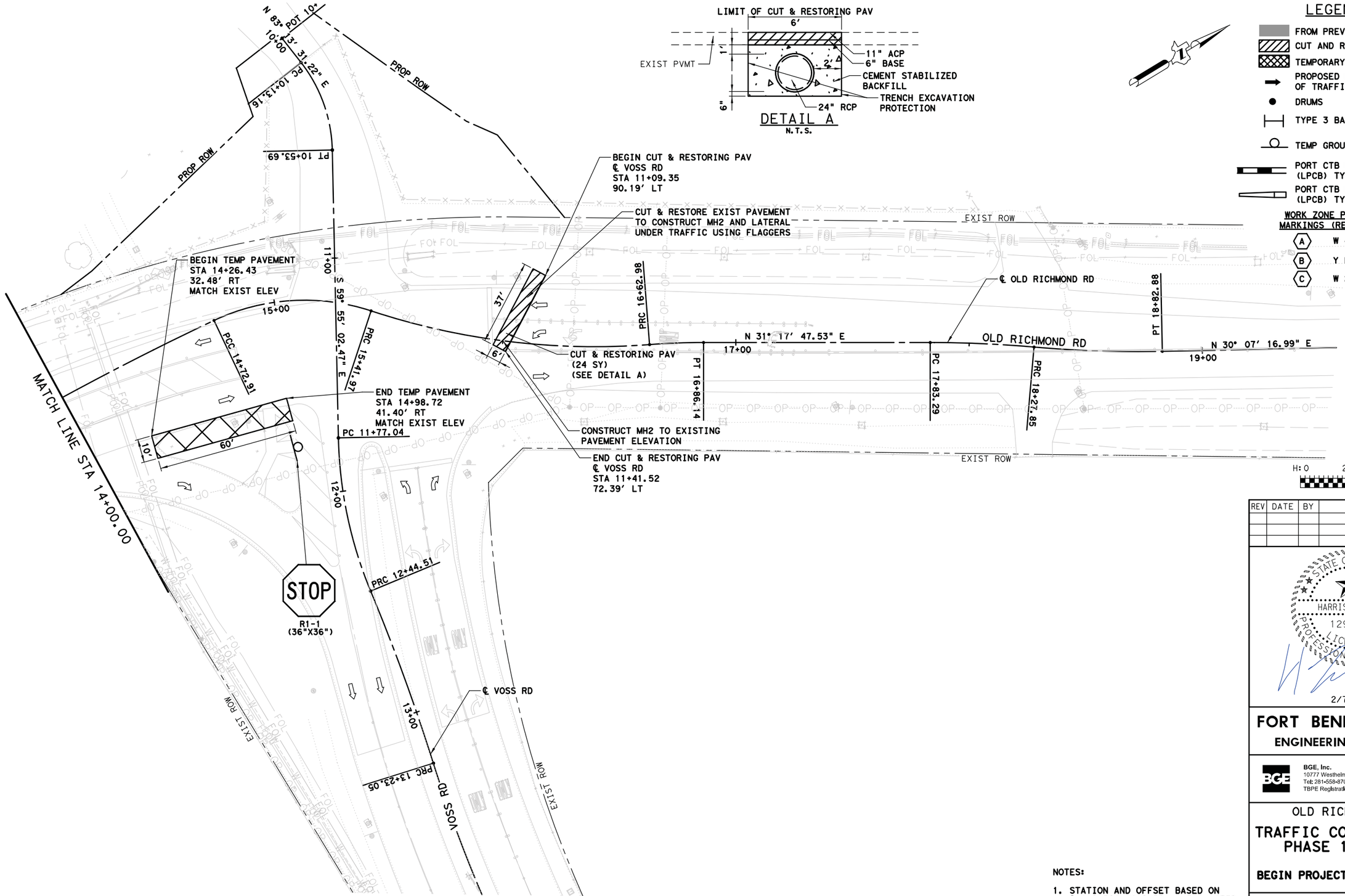

NOTES:

1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
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TBPE Registration No. F-1046

OLD RICHMOND RD

TRAFFIC CONTROL PLAN PHASE 1 STEP 1

BEGIN PROJECT TO STA 14+00

SHEET 1 OF 1

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	29

FILENAME: G:\TXN\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\6974-00_TCP PHASE 1S1_ROBT.dgn
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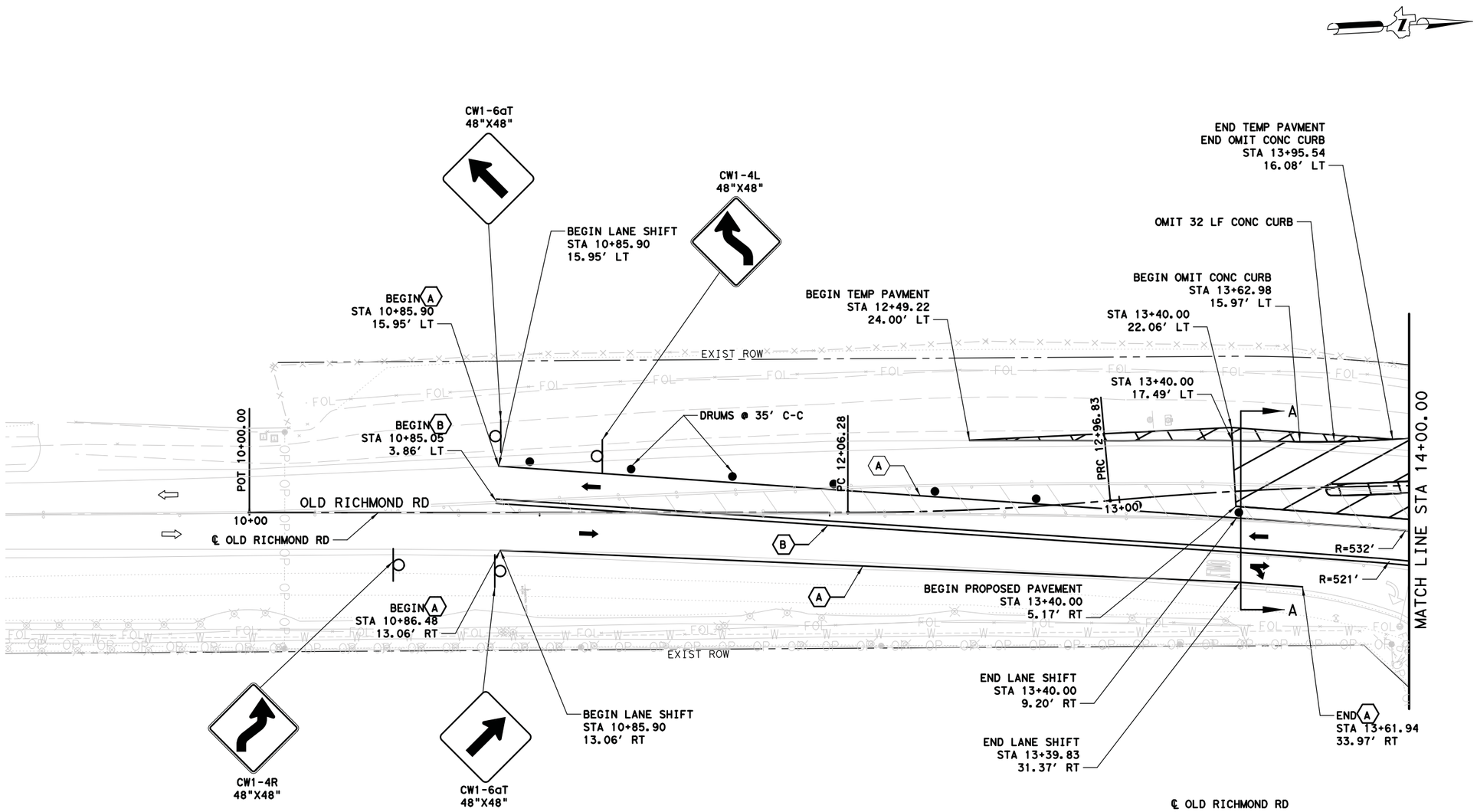

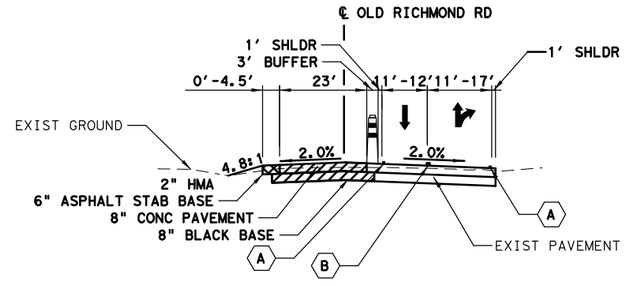

TYPICAL SECTION A-A

NOT TO SCALE

NOTES:

1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.

LEGEND:

- FROM PREVIOUS STEP
- PROPOSED CONSTRUCTION
- TEMPORARY PAVEMENT
- PROPOSED DIRECTION OF TRAFFIC
- DRUMS
- TYPE 3 BARRICADES
- TEMP GROUND MOUNTED SIGN
- PORT CTB LOW PROFILE (LPCB) TY 1
- PORT CTB LOW PROFILE (LPCB) TY 2

WORK ZONE PAVEMENT MARKINGS (REMOVABLE)

- (A) W 4" SLD
- (B) Y DBL 4" SLD
- (C) W 24" SLD

H: 0 20 40

REV	DATE	BY	DESCRIPTION

HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

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OLD RICHMOND RD

TRAFFIC CONTROL PLAN PHASE 1 STEP 2

BEGIN PROJECT TO STA 14+00

SHEET 1 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	30

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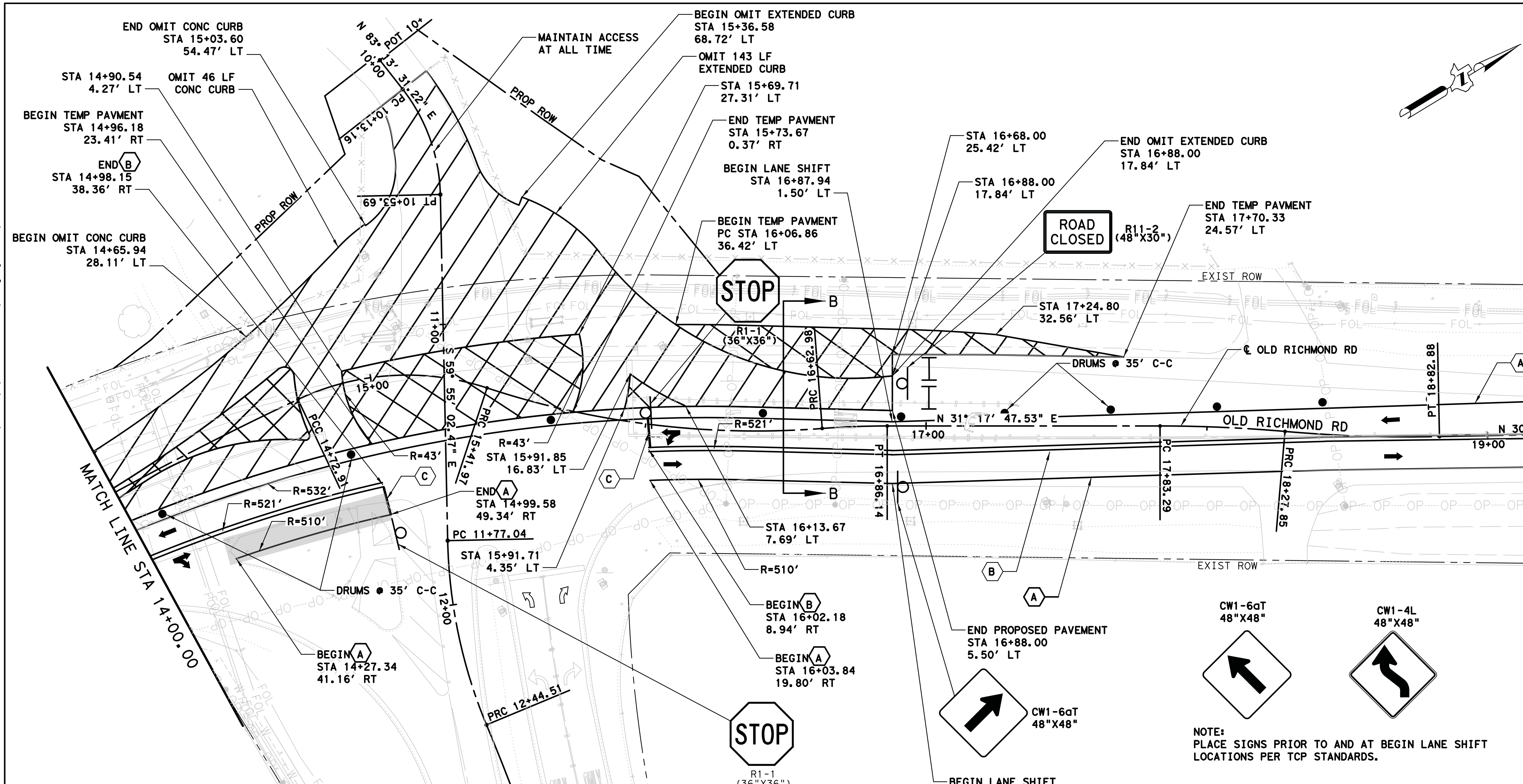


END OMIT CONC CURB
STA 15+03.60
54.47' LT
STA 14+90.54
4.27' LT
OMIT 46 LF
CONC CURB
BEGIN TEMP PAVMENT
STA 14+96.18
23.41' RT
END (B)
STA 14+98.15
38.36' RT
BEGIN OMIT CONC CURB
STA 14+65.94
28.11' LT
MAINTAIN ACCESS
AT ALL TIME
BEGIN OMIT EXTENDED CURB
STA 15+36.58
68.72' LT
OMIT 143 LF
EXTENDED CURB
STA 15+69.71
27.31' LT
END TEMP PAVMENT
STA 15+73.67
0.37' RT
BEGIN LANE SHIFT
STA 16+87.94
1.50' LT
BEGIN TEMP PAVMENT
PC STA 16+06.86
36.42' LT
STA 16+68.00
25.42' LT
STA 16+88.00
17.84' LT
ROAD CLOSED
R11-2
(48"X30")
END OMIT EXTENDED CURB
STA 16+88.00
17.84' LT
END TEMP PAVMENT
STA 17+70.33
24.57' LT
STA 17+24.80
32.56' LT
STOP
R1-1
(36"X36")
PROP ROW
EXIST ROW
DRUMS ● 35' C-C
℄ OLD RICHMOND RD
OLD RICHMOND RD
N 31° 17' 47.53" E
N 30° 07' 16.99" E
END (A)
END LANE SHIFT
STA 19+52.02
12.25' LT
END (B)
STA 19+52.02
0.81' RT
END (A)
END LANE SHIFT
STA 19+52.02
11.81' RT
MATCH LINE STA 14+00.00
R=43'
STA 15+91.85
16.83' LT
END (A)
STA 14+99.58
49.34' RT
PC 11+77.04
STA 15+91.71
4.35' LT
STA 16+13.67
7.69' LT
R=510'
BEGIN (B)
STA 16+02.18
8.94' RT
BEGIN (A)
STA 16+03.84
19.80' RT
END PROPOSED PAVEMENT
STA 16+88.00
5.50' LT
BEGIN (A)
STA 14+27.34
41.16' RT
DRUMS ● 35' C-C
CW1-6aT
48"X48"
CW1-4L
48"X48"
CW1-6aT
48"X48"
R1-1
(36"X36")
EXIST SIGN
FROM PREVIOUS PHASE
BEGIN LANE SHIFT
STA 16+88.00
20.50' RT
℄ VOSS RD
VOSS RD
PRC 12+44.51
PRC 13+23.05
H: 0 20 40

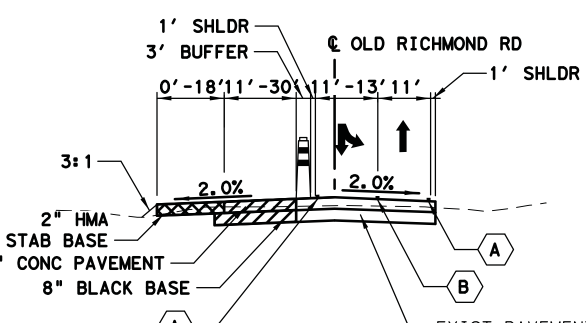
LEGEND:

- FROM PREVIOUS STEP
- PROPOSED CONSTRUCTION
- TEMPORARY PAVEMENT
- PROPOSED DIRECTION OF TRAFFIC
- DRUMS
- TYPE 3 BARRICADES
- TEMP GROUND MOUNTED SIGN
- PORT CTB LOW PROFILE (LPCB) TY 1
- PORT CTB LOW PROFILE (LPCB) TY 2

WORK ZONE PAVEMENT MARKINGS (REMOVABLE)

- (A) W 4" SLD
- (B) Y DBL 4" SLD
- (C) W 24" SLD

NOTE:
PLACE SIGNS PRIOR TO AND AT BEGIN LANE SHIFT LOCATIONS PER TCP STANDARDS.



TYPICAL SECTION B-B
NOT TO SCALE

NOTES:
1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD
TRAFFIC CONTROL PLAN
PHASE 1 STEP 2
STA 14+00 TO END PROJECT
SHEET 2 OF 2

DESIGNED BY:
DRAWN BY:
DATE:
SHEET NO: 31

FILENAME: G:\TXH\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\6974-00_TCP PHASE 1S2.2_RDBT.dgn
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2/7/2022 9:35:06 AM
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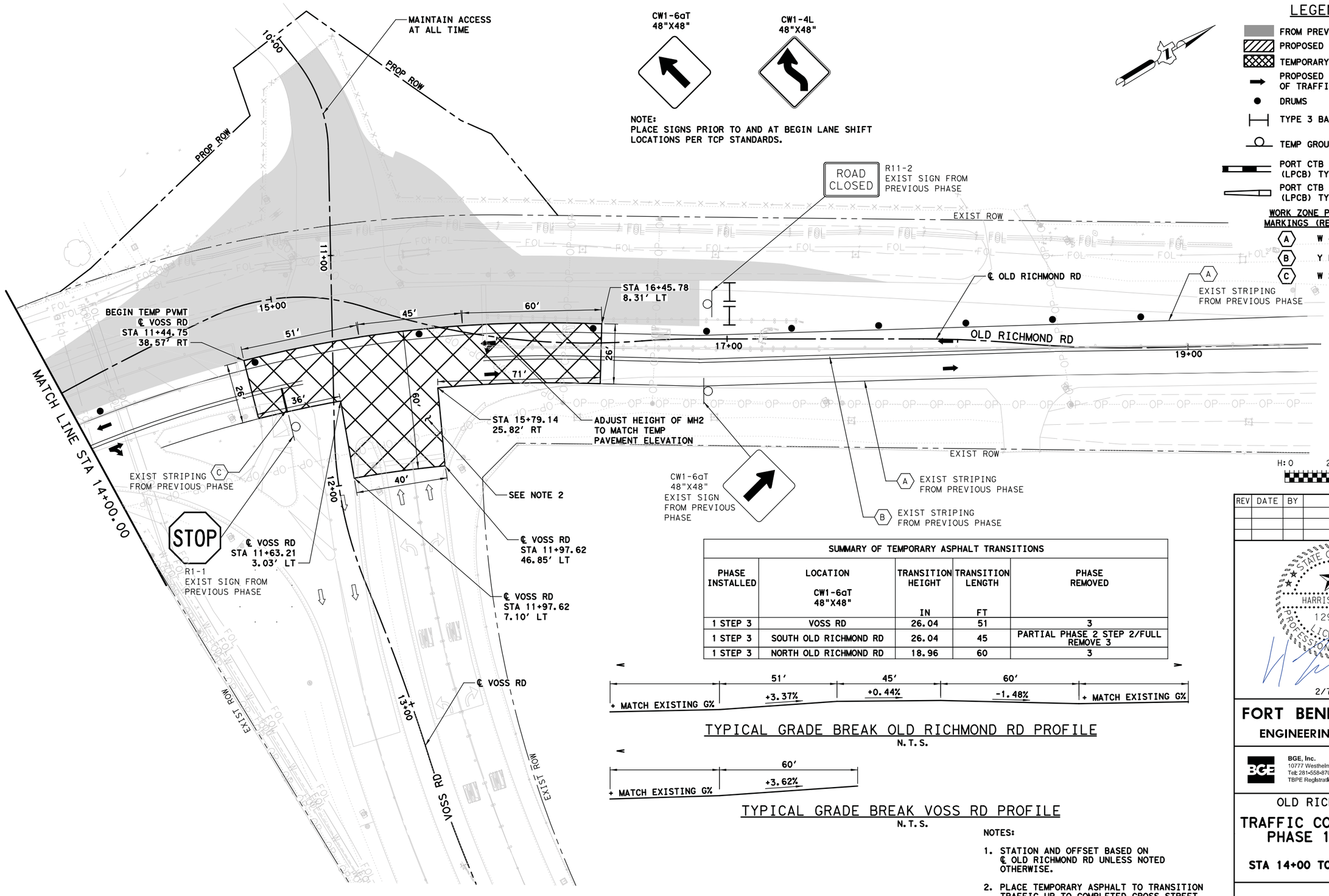

SUMMARY OF TEMPORARY ASPHALT TRANSITIONS				
PHASE INSTALLED	LOCATION CW1-6aT 48"X48"	TRANSITION HEIGHT IN	TRANSITION LENGTH FT	PHASE REMOVED
1 STEP 3	VOSS RD	26.04	51	3
1 STEP 3	SOUTH OLD RICHMOND RD	26.04	45	PARTIAL PHASE 2 STEP 2/FULL REMOVE 3
1 STEP 3	NORTH OLD RICHMOND RD	18.96	60	3

TYPICAL GRADE BREAK OLD RICHMOND RD PROFILE
N.T.S.

TYPICAL GRADE BREAK VOSS RD PROFILE
N.T.S.

NOTES:

1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
2. PLACE TEMPORARY ASPHALT TO TRANSITION TRAFFIC UP TO COMPLETED CROSS STREET PAVEMENT. CONSTRUCT TEMPORARY PAVEMENT USING FLAGGERS.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

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TBPE Registration No. F-1046

OLD RICHMOND RD

TRAFFIC CONTROL PLAN PHASE 1 STEP 3

STA 14+00 TO END PROJECT

SHEET 1 OF 1

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	32

FILENAME: G:\TXH\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\6974-00_TCP PHASE 1S3_RDBT.dgn
MODEL NAME: TCP PHASE 1 STEP 3 2/7/2022 9:35:07 AM
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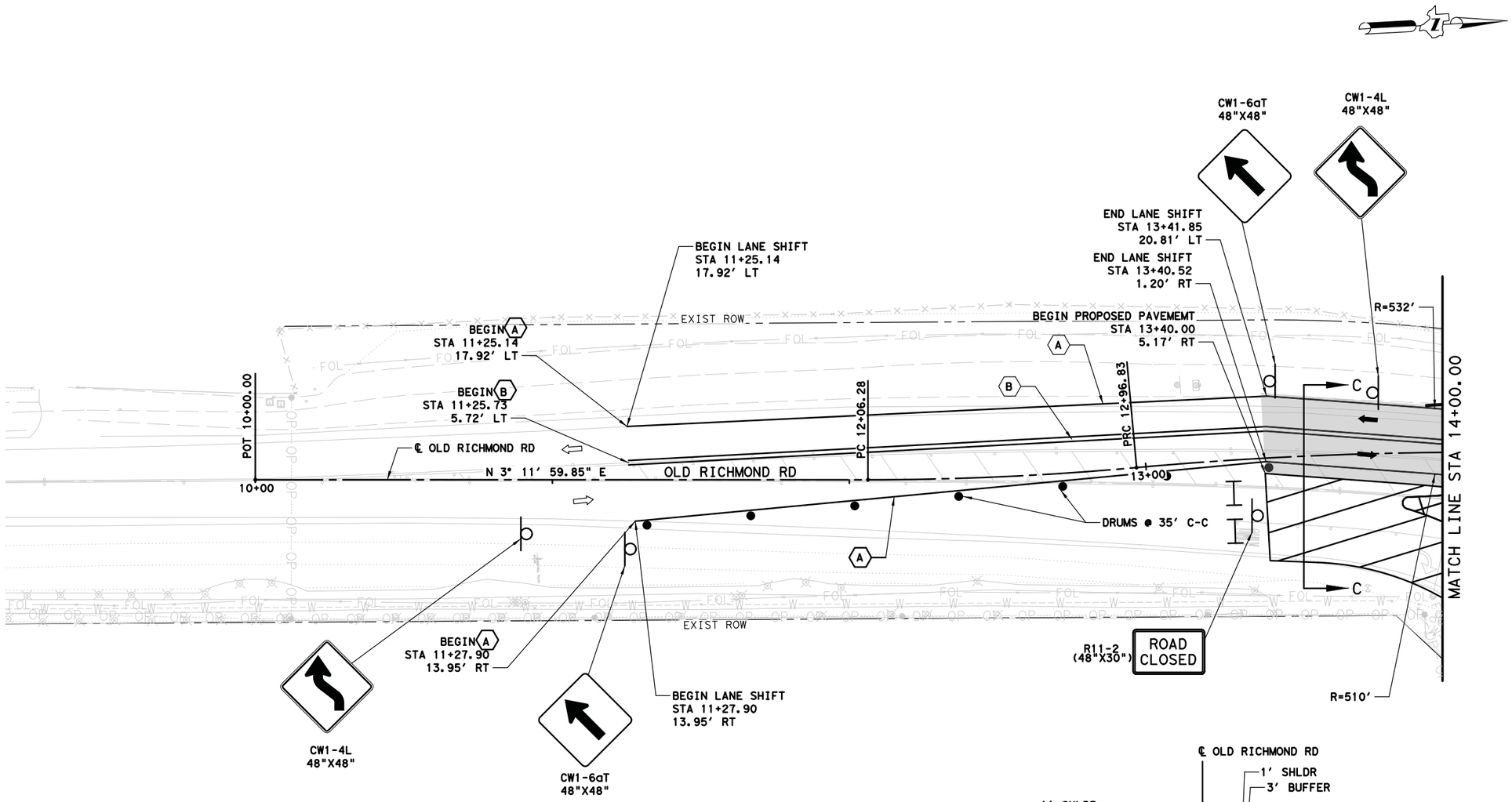

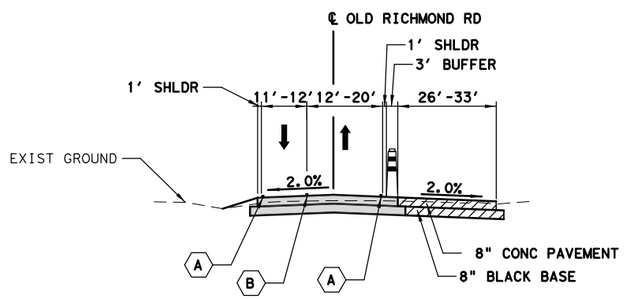

TYPICAL SECTION C-C
NOT TO SCALE

NOTES:

1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.

LEGEND:

- FROM PREVIOUS STEP
- PROPOSED CONSTRUCTION
- TEMPORARY PAVEMENT
- PROPOSED DIRECTION OF TRAFFIC
- DRUMS
- TYPE 3 BARRICADES
- TEMP GROUND MOUNTED SIGN
- PORT CTB LOW PROFILE (LPCB) TY 1
- PORT CTB LOW PROFILE (LPCB) TY 2

WORK ZONE PAVEMENT MARKINGS (REMOVABLE)

- (A) W 4" SLD
- (B) Y DBL 4" SLD
- (C) W 24" SLD

H: 0 20 40

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

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Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TRAFFIC CONTROL PLAN PHASE 2 STEP 1

BEGIN PROJECT TO STA 14+00

SHEET 1 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	33

FILENAME: G:\TXH\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\6974-00_TCP PHASE 2S1.1_RDBT.dgn
MODEL NAME: TCP PHASE 2 STEP 1 2/7/2022 9:35:08 AM
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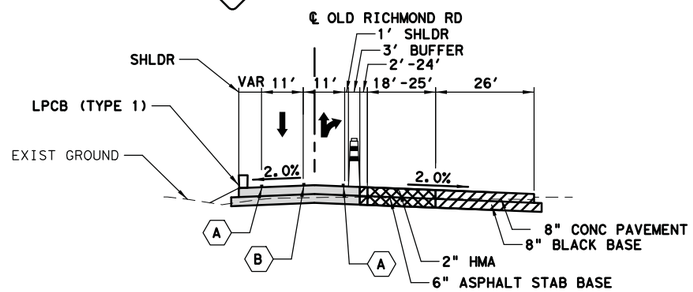
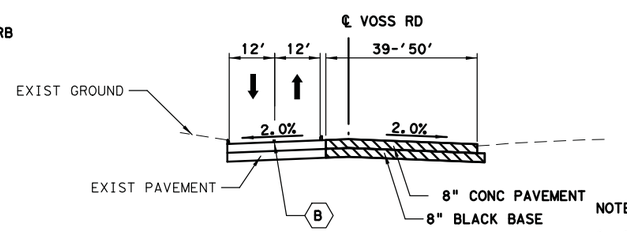
PLEASE REFER TO TCPTC 3050-96



TYPICAL SECTION D-D
NOT TO SCALE



TYPICAL SECTION E-E
NOT TO SCALE

NOTES:
1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/16/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281•558•6700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TRAFFIC CONTROL PLAN PHASE 2 STEP 1

STA 14+00 TO END PROJECT

SHEET 2 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	34

FILENAME= G:\TXHX\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\6974-00_TCP PHASE 2S1.2_RDBT.dgn
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2/16/2022 10:06:16 AM
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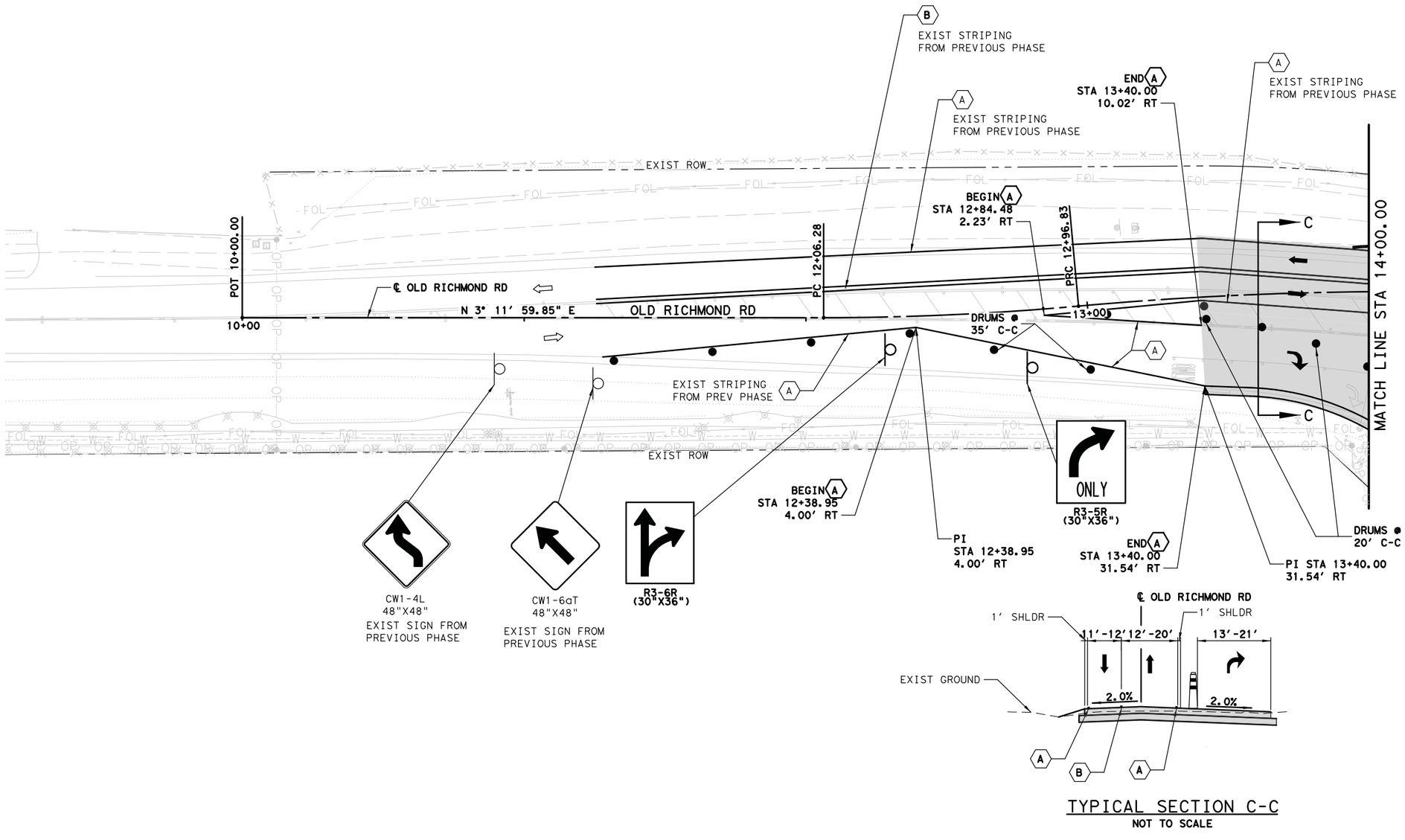

TYPICAL SECTION C-C
NOT TO SCALE

NOTES:

1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.

LEGEND:

- FROM PREVIOUS STEP
- PROPOSED CONSTRUCTION
- TEMPORARY PAVEMENT
- PROPOSED DIRECTION OF TRAFFIC
- DRUMS
- TYPE 3 BARRICADES
- TEMP GROUND MOUNTED SIGN
- PORT CTB LOW PROFILE (LPCB) TY 1
- PORT CTB LOW PROFILE (LPCB) TY 2

WORK ZONE PAVEMENT MARKINGS (REMOVABLE)

- A — W 4" SLD
- B — Y DBL 4" SLD
- C — W 24" SLD

H: 0 20 40

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TRAFFIC CONTROL PLAN PHASE 2 STEP 2

BEGIN PROJECT TO STA 14+00

SHEET 1 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	35

FILENAME: G:\TXH\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\6974-00_TCP PHASE 2S2.1_RDBT.dgn
MODEL NAME: TCP PHASE 2 STEP 2
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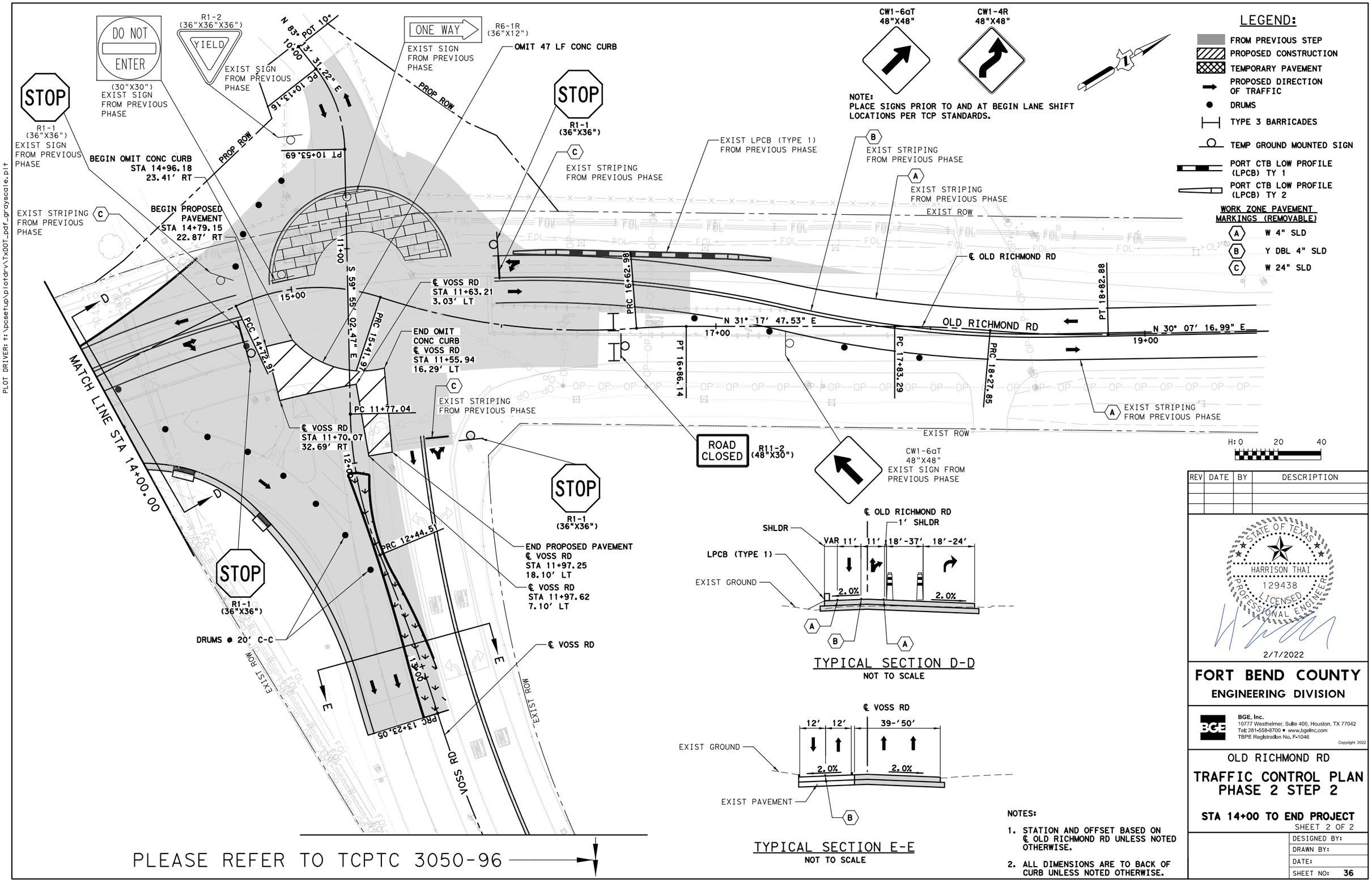
2/7/2022 9:35:10 AM



PLEASE REFER TO TCPTC 3050-96

TYPICAL SECTION D-D
NOT TO SCALE

TYPICAL SECTION E-E
NOT TO SCALE

NOTES:

1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

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TBPE Registration No. F-1046

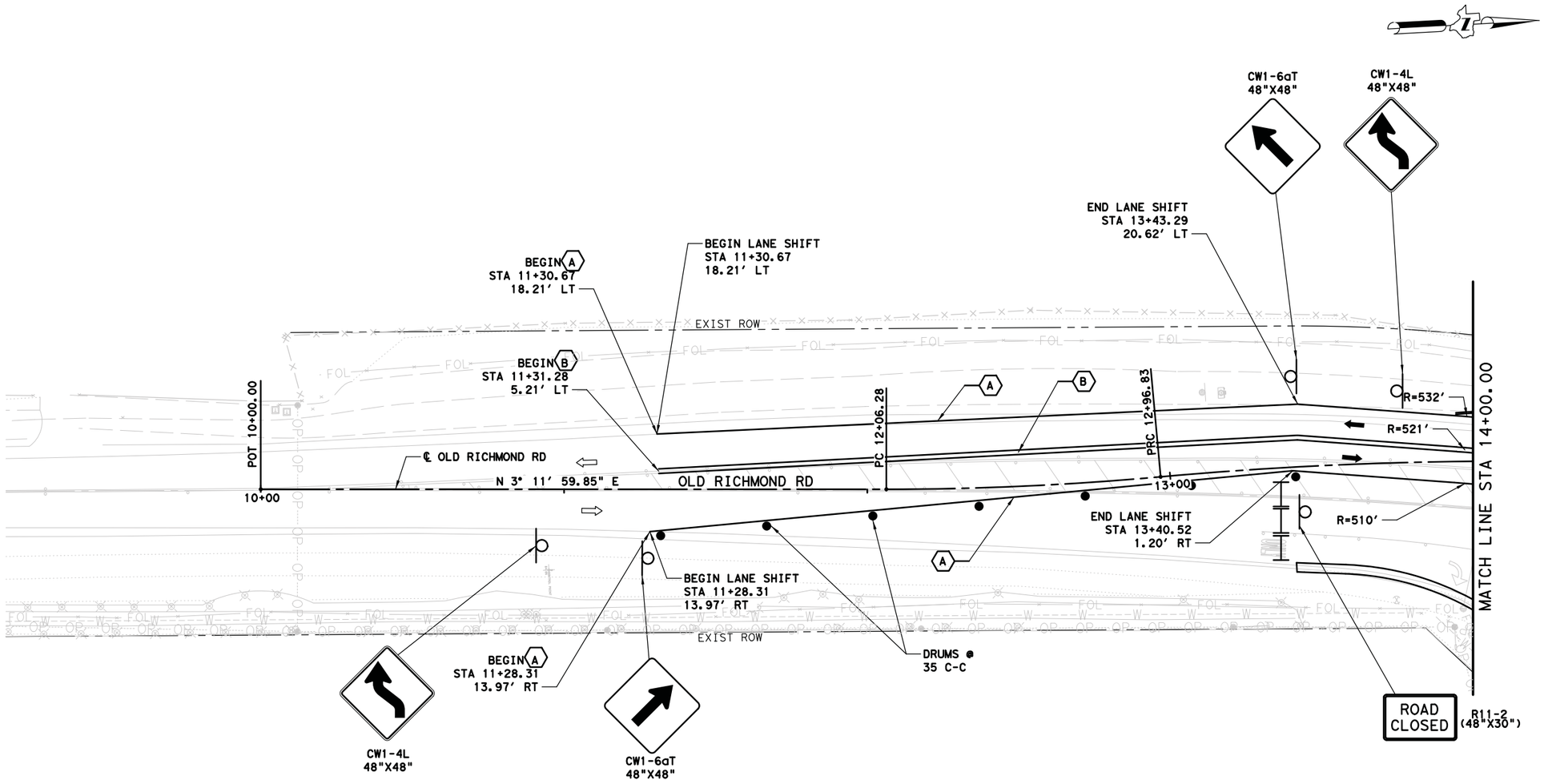
OLD RICHMOND RD

TRAFFIC CONTROL PLAN PHASE 2 STEP 2

STA 14+00 TO END PROJECT

SHEET 2 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	36



LEGEND:

- FROM PREVIOUS STEP
- PROPOSED CONSTRUCTION
- TEMPORARY PAVEMENT
- PROPOSED DIRECTION OF TRAFFIC
- DRUMS
- TYPE 3 BARRICADES
- TEMP GROUND MOUNTED SIGN
- PORT CTB LOW PROFILE (LPCB) TY 1
- PORT CTB LOW PROFILE (LPCB) TY 2

WORK ZONE PAVEMENT MARKINGS (REMOVABLE)

- (A) W 4" SLD
- (B) Y DBL 4" SLD
- (C) W 24" SLD

H: 0 20 40

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TRAFFIC CONTROL PLAN PHASE 3

BEGIN PROJECT TO STA 14+00

SHEET 1 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	37

NOTES:

1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.

FILENAME: G:\TXH\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\6974-00_TCP PHASE 301_RDBT.dgn
MODEL NAME: TCP PHASE 3
2/7/2022 9:35:11 AM
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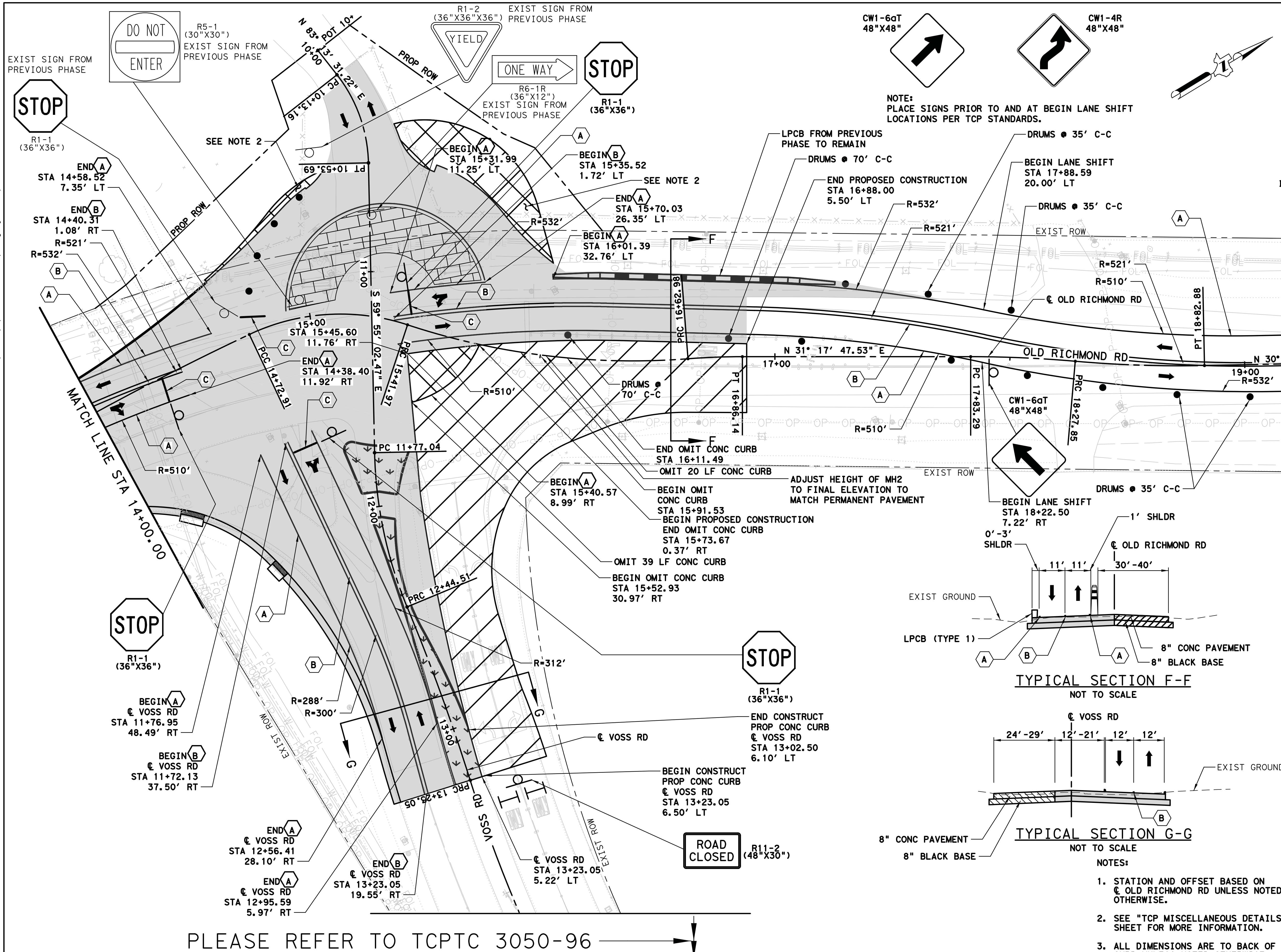

EXIST SIGN FROM PREVIOUS PHASE
STOP
R1-1 (36"X36")
DO NOT ENTER
R5-1 (30"X30")
EXIST SIGN FROM PREVIOUS PHASE
R1-2 (36"X36"X36")
YIELD
EXIST SIGN FROM PREVIOUS PHASE
ONE WAY
R6-1R (36"X12")
EXIST SIGN FROM PREVIOUS PHASE
STOP
R1-1 (36"X36")
CW1-6aT 48"X48"
CW1-4R 48"X48"
NOTE: PLACE SIGNS PRIOR TO AND AT BEGIN LANE SHIFT LOCATIONS PER TCP STANDARDS.
N 83° POT 10+00 13' 31.22" E
PC 10+13.16
PT 10+53.69
PROP ROW
SEE NOTE 2
END A STA 14+58.52 7.35' LT
END B STA 14+40.31 1.08' RT
R=521'
R=532'
BEGIN A STA 15+31.99 11.25' LT
BEGIN B STA 15+35.52 1.72' LT
SEE NOTE 2
END A STA 15+70.03 26.35' LT
R=532'
BEGIN A STA 16+01.39 32.76' LT
LPCB FROM PREVIOUS PHASE TO REMAIN
DRUMS @ 70' C-C
END PROPOSED CONSTRUCTION STA 16+88.00 5.50' LT
R=532'
R=521'
DRUMS @ 35' C-C
BEGIN LANE SHIFT STA 17+88.59 20.00' LT
DRUMS @ 35' C-C
EXIST ROW
R=521'
R=510'
℄ OLD RICHMOND RD
PT 18+82.88
END A END LANE SHIFT STA 19+52.02 12.25' LT
11+00
S 59° 55' 02.47" E
15+00 STA 15+45.60 11.76' RT
PCC 14+72.91
END A STA 14+38.40 11.92' RT
PRC 15+41.97
PRC 16+62.98
N 31° 17' 47.53" E
17+00
OLD RICHMOND RD
N 30° 07' 16.99" E
19+00
R=532'
END B STA 19+52.01
END A END LANE SHIFT STA 19+52.01 11.81' RT
R=510'
DRUMS 70' C-C
PT 16+86.14
PC 17+83.29
CW1-6aT 48"X48"
PRC 18+27.85
R=510'
EXIST ROW
MATCH LINE STA 14+00.00
R=510'
PC 11+77.04
12+00
END OMIT CONC CURB STA 16+11.49
OMIT 20 LF CONC CURB
ADJUST HEIGHT OF MH2 TO FINAL ELEVATION TO MATCH PERMANENT PAVEMENT
BEGIN A STA 15+40.57 8.99' RT
BEGIN OMIT CONC CURB STA 15+91.53
BEGIN PROPOSED CONSTRUCTION END OMIT CONC CURB STA 15+73.67 0.37' RT
OMIT 39 LF CONC CURB
BEGIN OMIT CONC CURB STA 15+52.93 30.97' RT
BEGIN LANE SHIFT STA 18+22.50 7.22' RT
DRUMS @ 35' C-C
H: 0 20 40
PRC 12+44.51
STOP
R1-1 (36"X36")
R=312'
STOP
R1-1 (36"X36")
BEGIN A ℄ VOSS RD STA 11+76.95 48.49' RT
R=288'
R=300'
BEGIN B ℄ VOSS RD STA 11+72.13 37.50' RT
EXIST ROW
13+00
PRC 13+25.05
VOSS RD
END CONSTRUCT PROP CONC CURB ℄ VOSS RD STA 13+02.50 6.10' LT
℄ VOSS RD
BEGIN CONSTRUCT PROP CONC CURB ℄ VOSS RD STA 13+23.05 6.50' LT
EXIST ROW
ROAD CLOSED
R11-2 (48"X30")
END A ℄ VOSS RD STA 12+56.41 28.10' RT
END A ℄ VOSS RD STA 12+95.59 5.97' RT
END B ℄ VOSS RD STA 13+23.05 19.55' RT
℄ VOSS RD STA 13+23.05 5.22' LT
PLEASE REFER TO TCPTC 3050-96

LEGEND:

- FROM PREVIOUS STEP
- PROPOSED CONSTRUCTION
- TEMPORARY PAVEMENT
- PROPOSED DIRECTION OF TRAFFIC
- DRUMS
- TYPE 3 BARRICADES
- TEMP GROUND MOUNTED SIGN
- PORT CTB LOW PROFILE (LPCB) TY 1
- PORT CTB LOW PROFILE (LPCB) TY 2

WORK ZONE PAVEMENT MARKINGS (REMOVABLE)

- A W 4" SLD
- B Y DBL 4" SLD
- C W 24" SLD

1' SHLDR
0'-3' SHLDR
℄ OLD RICHMOND RD
11' 11'
30'-40'
EXIST GROUND
LPCB (TYPE 1)
8" CONC PAVEMENT
8" BLACK BASE

TYPICAL SECTION F-F

NOT TO SCALE

℄ VOSS RD
24'-29'
12'-21'
12'
12'
EXIST GROUND
8" CONC PAVEMENT
8" BLACK BASE

TYPICAL SECTION G-G

NOT TO SCALE

NOTES:

1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
2. SEE "TCP MISCELLANEOUS DETAILS" SHEET FOR MORE INFORMATION.
3. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED PROFESSIONAL ENGINEER
2/16/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TRAFFIC CONTROL PLAN PHASE 3

STA 14+00 TO END PROJECT

SHEET 2 OF 2

DESIGNED BY:
DRAWN BY:
DATE:
SHEET NO: 38

PEN TABLE: T:\PCSETUP\Tables\TXDOT.TBL
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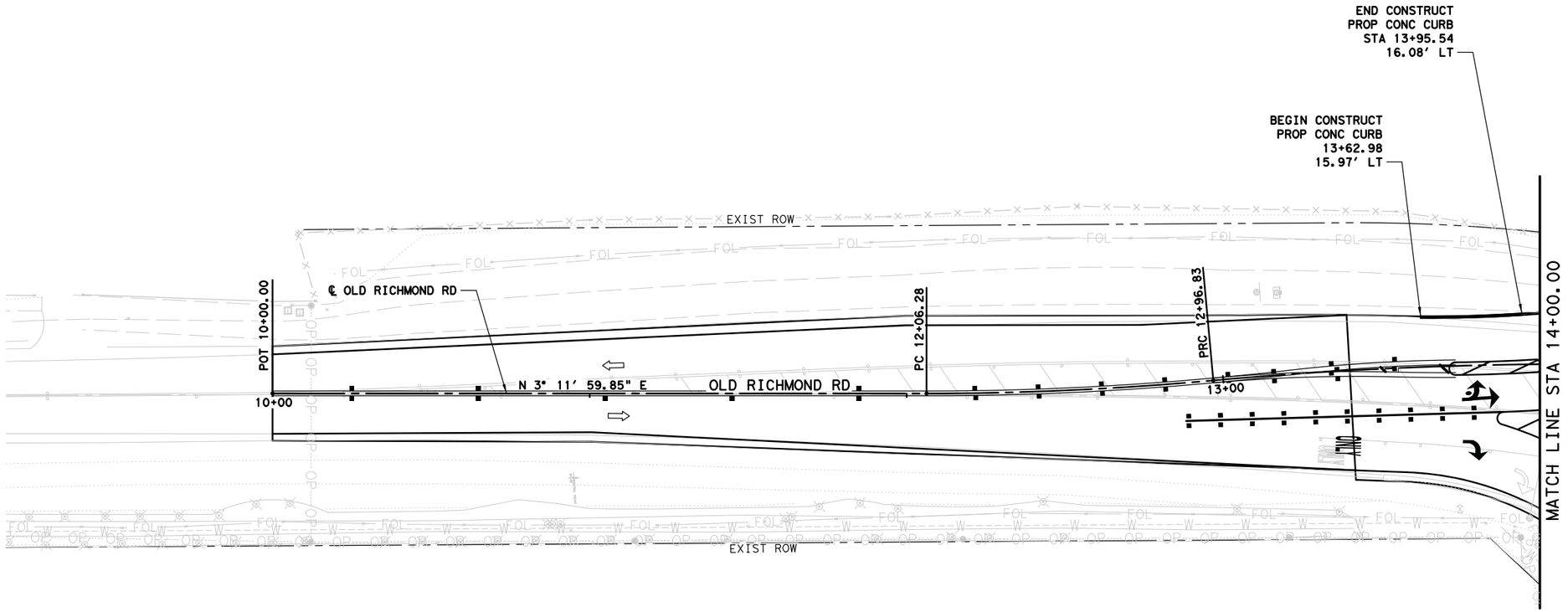

LEGEND:

- FROM PREVIOUS STEP
- PROPOSED CONSTRUCTION
- TEMPORARY PAVEMENT
- PROPOSED DIRECTION OF TRAFFIC
- DRUMS
- TYPE 3 BARRICADES
- TEMP GROUND MOUNTED SIGN
- PORT CTB LOW PROFILE (LPCB) TY 1
- PORT CTB LOW PROFILE (LPCB) TY 2

WORK ZONE PAVEMENT MARKINGS (REMOVABLE)

- (A) W 4" SLD
- (B) Y DBL 4" SLD
- (C) W 24" SLD

H: 0 20 40

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

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10777 Westheimer, Suite 400, Houston, TX 77042
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TBPE Registration No. F-1046

OLD RICHMOND RD

TRAFFIC CONTROL PLAN PHASE 4

BEGIN PROJECT TO STA 14+00

SHEET 1 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	39

NOTES:

1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.

FILENAME: G:\TXH\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\6974-00_TCP PHASE 401_ROBT.dgn
MODEL NAME: TCP PHASE 4
2/7/2022 9:35:13 AM
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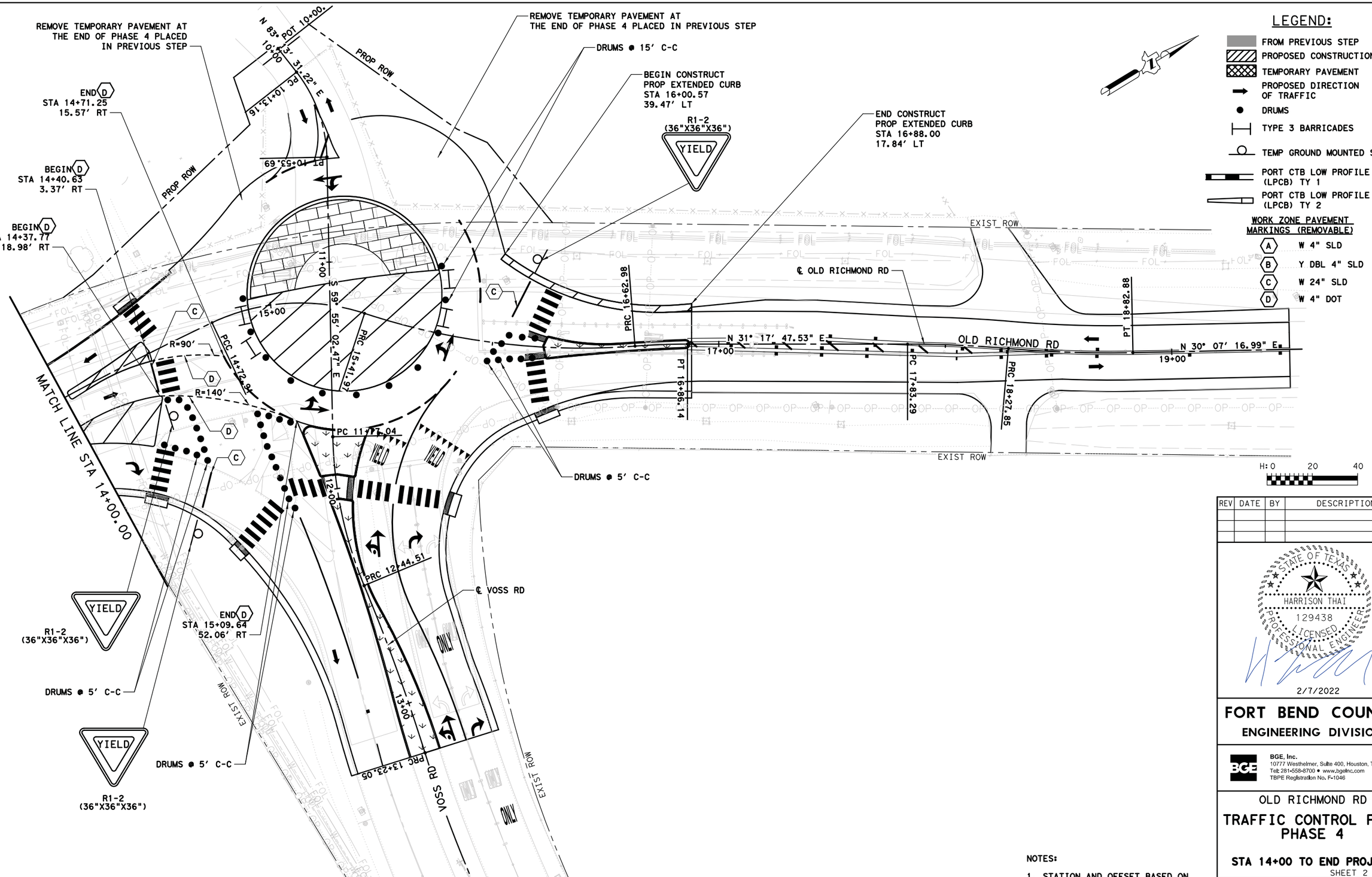

NOTES:

1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS NOTED OTHERWISE.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281•558•8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TRAFFIC CONTROL PLAN PHASE 4

STA 14+00 TO END PROJECT

SHEET 2 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	40

FILENAME: G:\TXH\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\6974-00_TCP PHASE 402_RDBT.dgn
MODEL NAME: TCP PHASE 4
2/7/2022 9:35:14 AM
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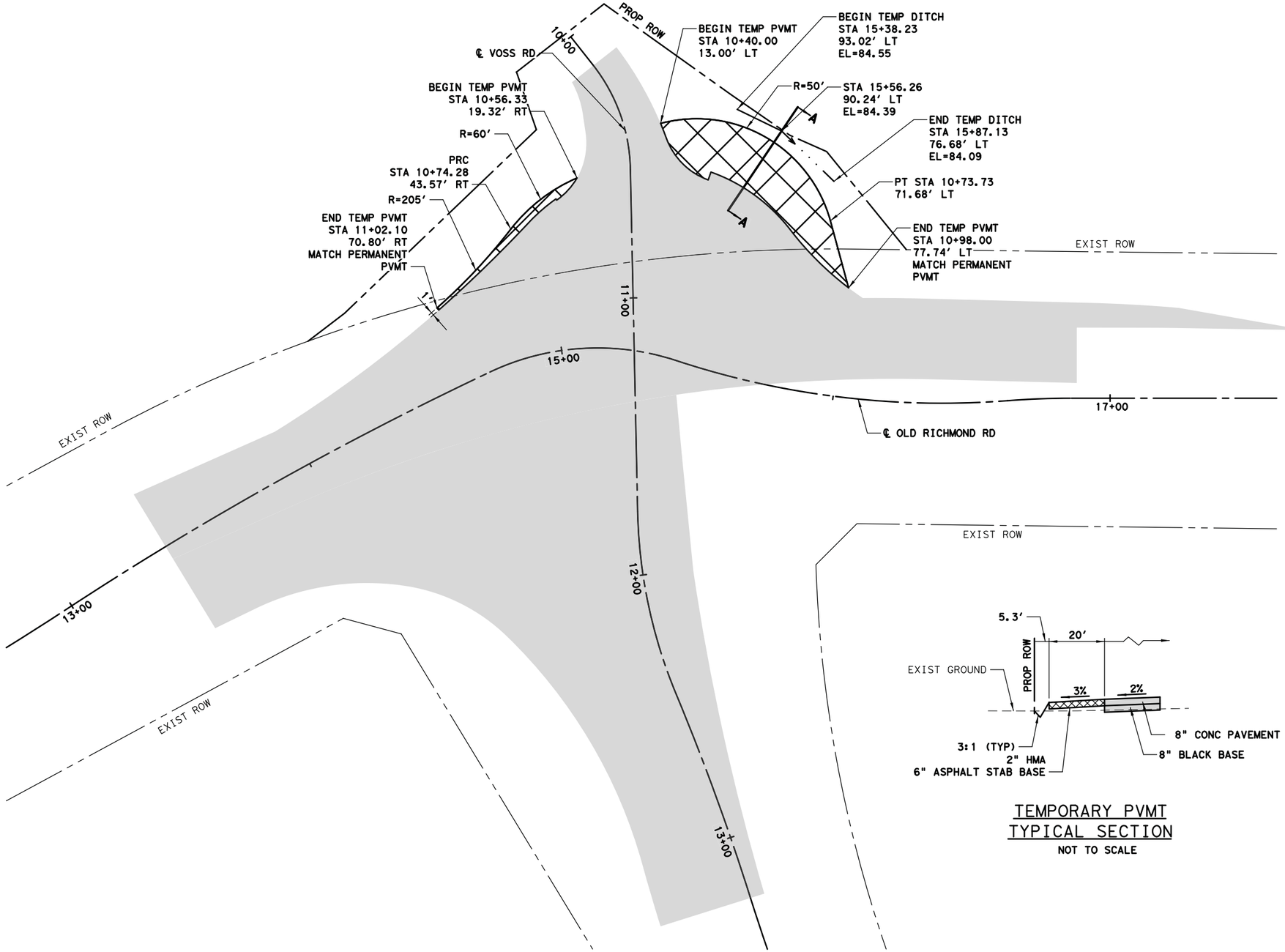

PHASE 3 TEMPORARY PVMT DETAILS

TEMPORARY PVMT TYPICAL SECTION

NOT TO SCALE

LEGEND

- BUILT IN PREVIOUS PHASE
- TEMPORARY PAVEMENT
- TEMPORARY DITCH

NOTE:

1. STATION AND OFFSET BASED OFF ℄ VOSS RD UNLESS OTHERWISE NOTED.

H: 0 20 40

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TRAFFIC CONTROL PLAN MISCELLANEOUS DETAILS

SHEET 1 OF 1

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	41

PEN TABLE: T:\PCSETUP\Tables\TXDOT.TBL
PLOT DRIVER: t:\pcsetup\plotdrv\TxDOT_pdf_grayscale.plt
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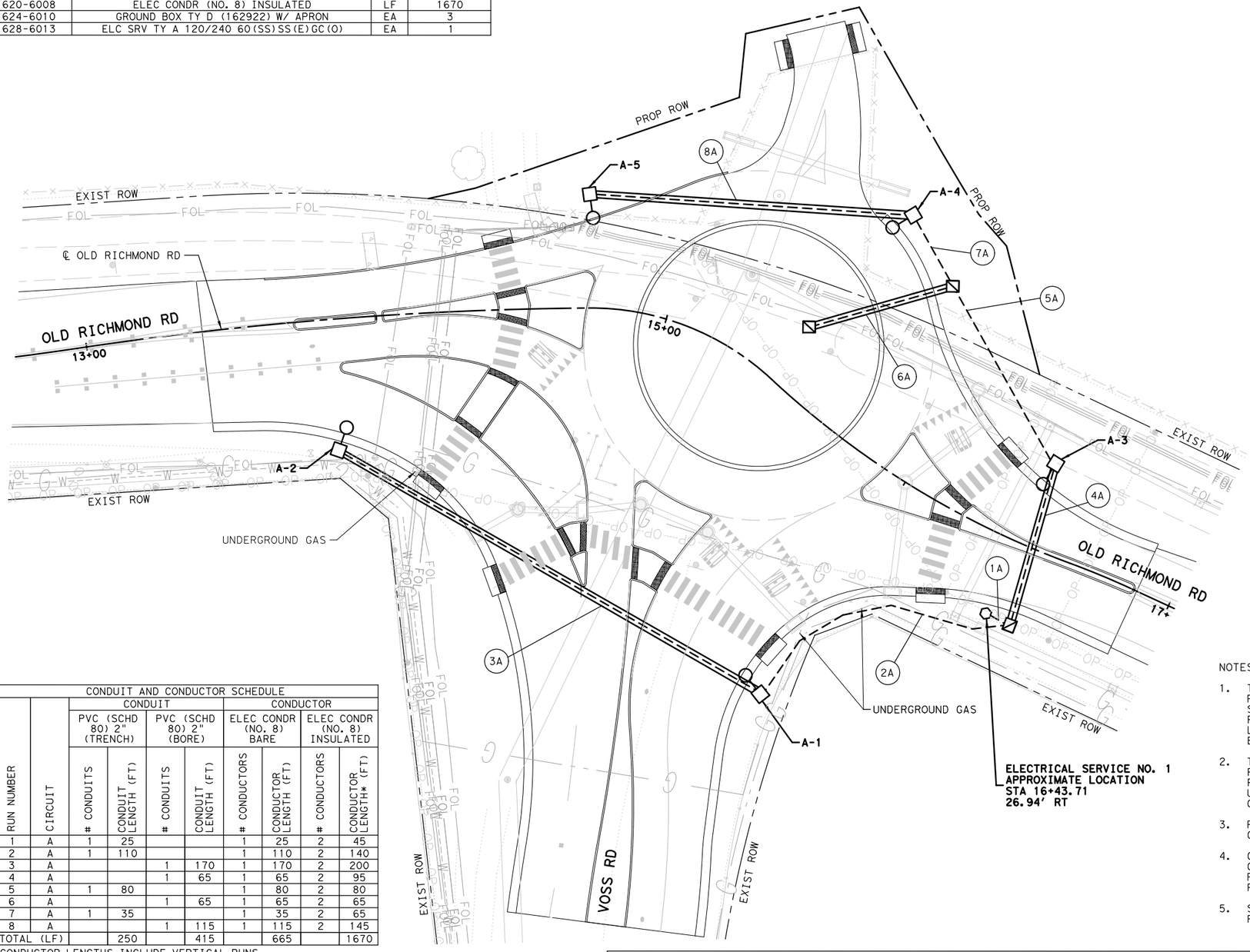
MODEL NAME: TCP MISC DETAIL
2/7/2022 9:35:14 AM

ILLUMINATION QUANTITIES			
TXDOT ITEM-CODE	DESCRIPTION	UNIT	SHEET TOTAL
416-6003	DRILL SHAFT (RDWY ILL) (30 IN)	LF	40
610-6162	IN RD IL AM (TY SA)30T-8(250W EQ)LED	EA	5
618-6046	CONDT (PVC) (SCH 80) (2")	LF	250
618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	415
620-6007	ELEC CONDR (NO. 8) BARE	LF	665
620-6008	ELEC CONDR (NO. 8) INSULATED	LF	1670
624-6010	GROUND BOX TY D (162922) W/ APRON	EA	3
628-6013	ELC SRV TY A 120/240 60(SS)SS(E)GC(O)	EA	1

ILLUMINATION ASSEMBLY SUMMARY							
POLE NO.	LOCATION			EQ WATTS	TYPE	STANDARD TYPE
	CL	STATION	OFFSET			
A-1	ORR	15+95.72	87.40' RT	250	LED	(TYSA)30T-8(.25KW EQ)LED
A-2	ORR	13+84.32	43.24' RT	250	LED	(TYSA)30T-8(.25KW EQ)LED
A-3	ORR	16+44.57	27.63' LT	250	LED	(TYSA)30T-8(.25KW EQ)LED
A-4	ORR	15+40.06	72.25' LT	250	LED	(TYSA)30T-8(.25KW EQ)LED
A-5	ORR	14+73.68	36.87' LT	250	LED	(TYSA)30T-8(.25KW EQ)LED

LEGEND:

- RDWY ILL ASSEM (250W EQ) LED
- GROUND BOX TY D (162922) W/ APRON
- PROP ELECTRICAL SERVICE POLE
- 2" CONDT (PVC) SCHD 80
- 2" CONDT (PVC) SCHD 80 (BORE)
- (X) CONDUIT RUN NUMBER
- X-X RDWY ILL ASSEM ID (X = POLE NO., X = CIRCUIT NO.)



CONDUIT AND CONDUCTOR SCHEDULE									
RUN NUMBER	CIRCUIT	CONDUIT				CONDUCTOR			
		PVC (SCHD 80) 2" (TRENCH)		PVC (SCHD 80) 2" (BORE)		ELEC CONDR (NO. 8) BARE		ELEC CONDR (NO. 8) INSULATED	
		# CONDUITS	CONDUIT LENGTH (FT)	# CONDUITS	CONDUIT LENGTH (FT)	# CONDUCTORS	CONDUCTOR LENGTH (FT)	# CONDUCTORS	CONDUCTOR LENGTH* (FT)
1	A	1	25			1	25	2	45
2	A	1	110			1	110	2	140
3	A			1	170	1	170	2	200
4	A			1	65	1	65	2	95
5	A	1	80			1	80	2	80
6	A			1	65	1	65	2	65
7	A	1	35			1	35	2	65
8	A			1	115	1	115	2	145
TOTAL (LF)			250		415		665		1670

*CONDUCTOR LENGTHS INCLUDE VERTICAL RUNS.

NOTES:

1. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING.
2. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.
3. POWER SOURCE IS TO BE DETERMINED DURING CONSTRUCTION BY OTHERS.
4. CONTRACTOR RESPONSIBLE FOR BORING CONDUIT IF ROADWAY CONSTRUCTION OCCURS PRIOR TO INSTALLATION OF CONDUIT UNDER ROADWAY.
5. STATION AND OFFSET BASED ON ℄ OLD RICHMOND ROAD UNLESS OTHERWISE NOTED.

ELECTRICAL SERVICE DATA										
SERVICE NO.	ELECTRICAL SERVICE DESCRIPTION (SEE TXDOT ED-14 STANDARDS)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO/SIZE	SAFETY SWITCH AMPS	MAIN CKT BREAKER POLE/AMP	TWO-POLE CONTRACTOR AMPS	CIRCUIT	BRANCH CKT. BKR. POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
1	ELC SRV TY A 120/240 60 (SS) SS (E) GC (O)	1 1/2"	3/#6	60	2P/60	60	A-LIGHTING	2P/20	4	1.000

H: 0 20 40

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED
PROFESSIONAL ENGINEER
4/27/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

ILLUMINATION LAYOUT

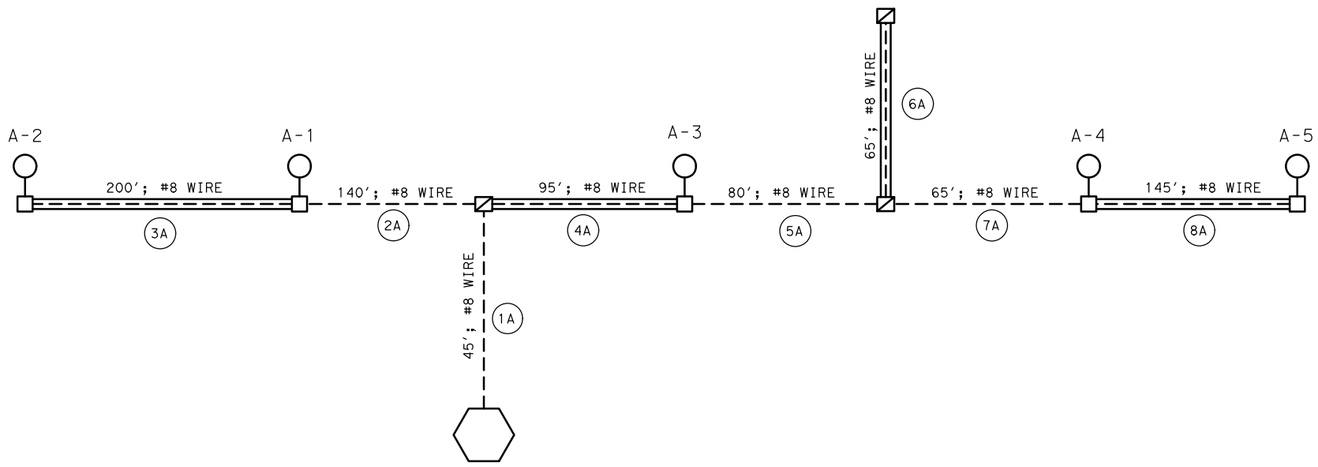
SHEET 1 OF 1

DESIGNED BY:	DCD
DRAWN BY:	DCD
DATE:	
SHEET NO:	42

FILENAME: G:\TXH\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\10-ILLUM\6974-00_ILLUM_PROP_01.dgn
MODEL NAME: ILLUMINATION LAYOUT
PEN TABLE: G:\ZCADLIB\TXH\PCSETUP\TABLES\TXDOT.TBL
PLOT DRIVER: G:\ZCADLIB\TXH\psetup\plotdrv\TxDOT_pdf_grayscale.plt
4/27/2022 10:21:55 AM

LEGEND:

- RDWY ILL ASSEM (250W EQ) LED
- GROUND BOX TY D (162922) W/ APRON
- PROP ELECTRICAL SERVICE POLE
- 2" CONDT (PVC) SCHD 80
- 2" CONDT (PVC) SCHD 80 (BORE)
- (X) CONDUIT RUN NUMBER
- X-X RDWY ILL ASSEM ID (X = POLE NO., X = CIRCUIT NO.)



ELECTRICAL SERVICE NO. 1

ELC SRV TY A 120/240 60(SS)SS(E)GC(O)

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED
PROFESSIONAL ENGINEER

P.E.

4/8/2022

FORT BEND COUNTY
ENGINEERING DIVISION

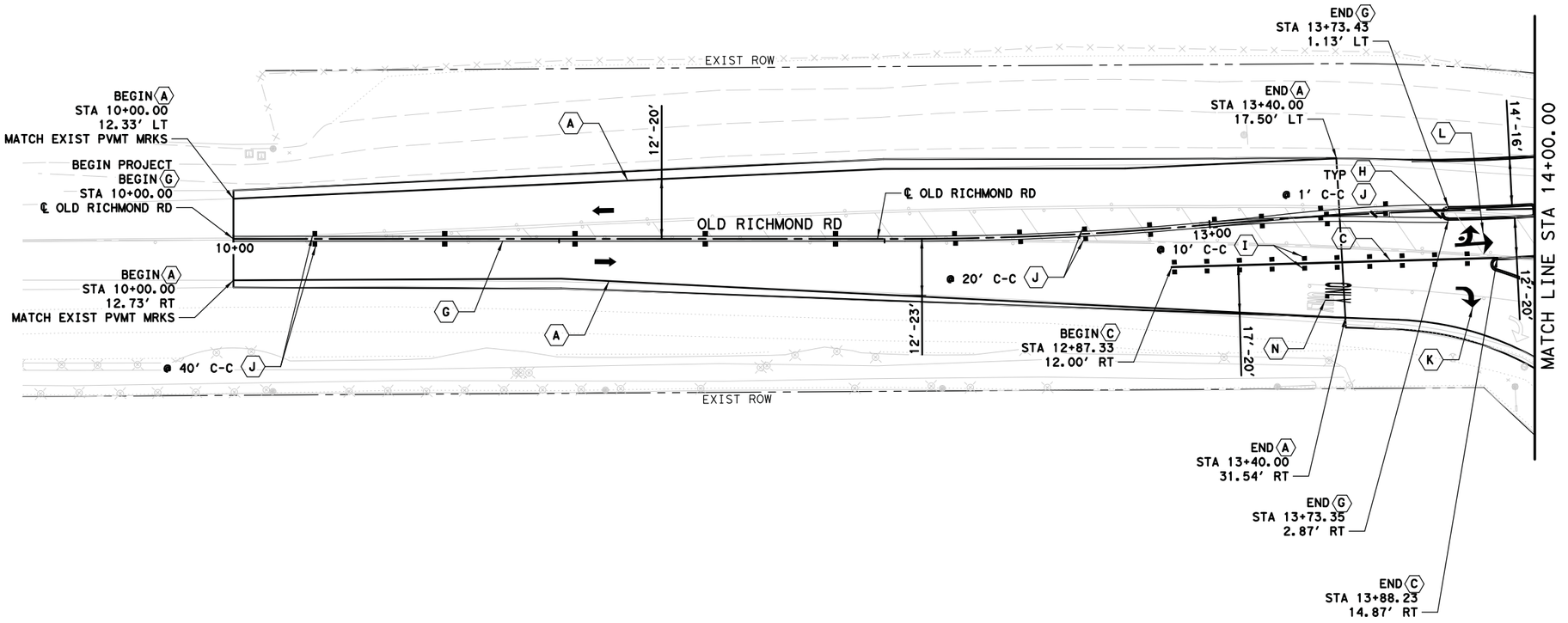
BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

ONE LINE DIAGRAM

SHEET 1 OF 1

DESIGNED BY:	DCD
DRAWN BY:	DCD
DATE:	
SHEET NO:	43



LEGEND:

- (A) W 4" SLD
- (B) W 4" BRK
- (C) W 8" SLD
- (D) W 24" SLD
- (E) W 24" BRK (3' DASH 2' GAP)
- (F) Y 4" SLD
- (G) Y DBL 4" SLD
- (H) Y 24" SLD
- (I) TYPE I-C
- (J) TYPE II A-A
- (K) ARROW
- (L) DBL ARROW
- (M) YIELD TRIANGLES (18")
- (N) WORD
- (#) DRIVEWAY NUMBER
- ➡ PROPOSED DIRECTION OF TRAFFIC

H: 0 20 40

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

PAVEMENT MARKINGS LAYOUT

SHEET 1 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	44

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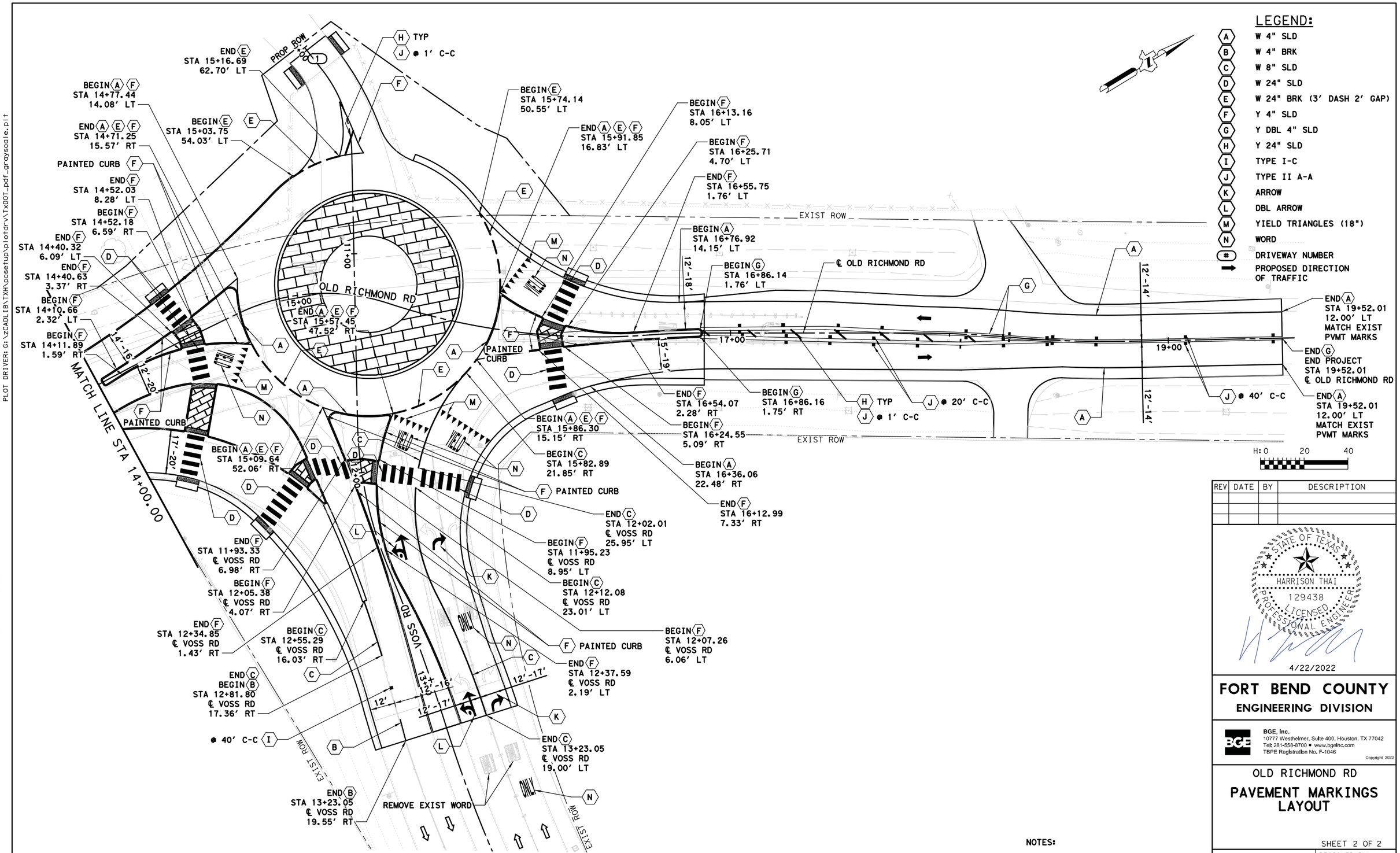

NOTES:

1. STATION AND OFFSET BASED ON ℄ OLD RICHMOND RD UNLESS NOTED OTHERWISE.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
4/22/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

PAVEMENT MARKINGS LAYOUT

SHEET 2 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	45

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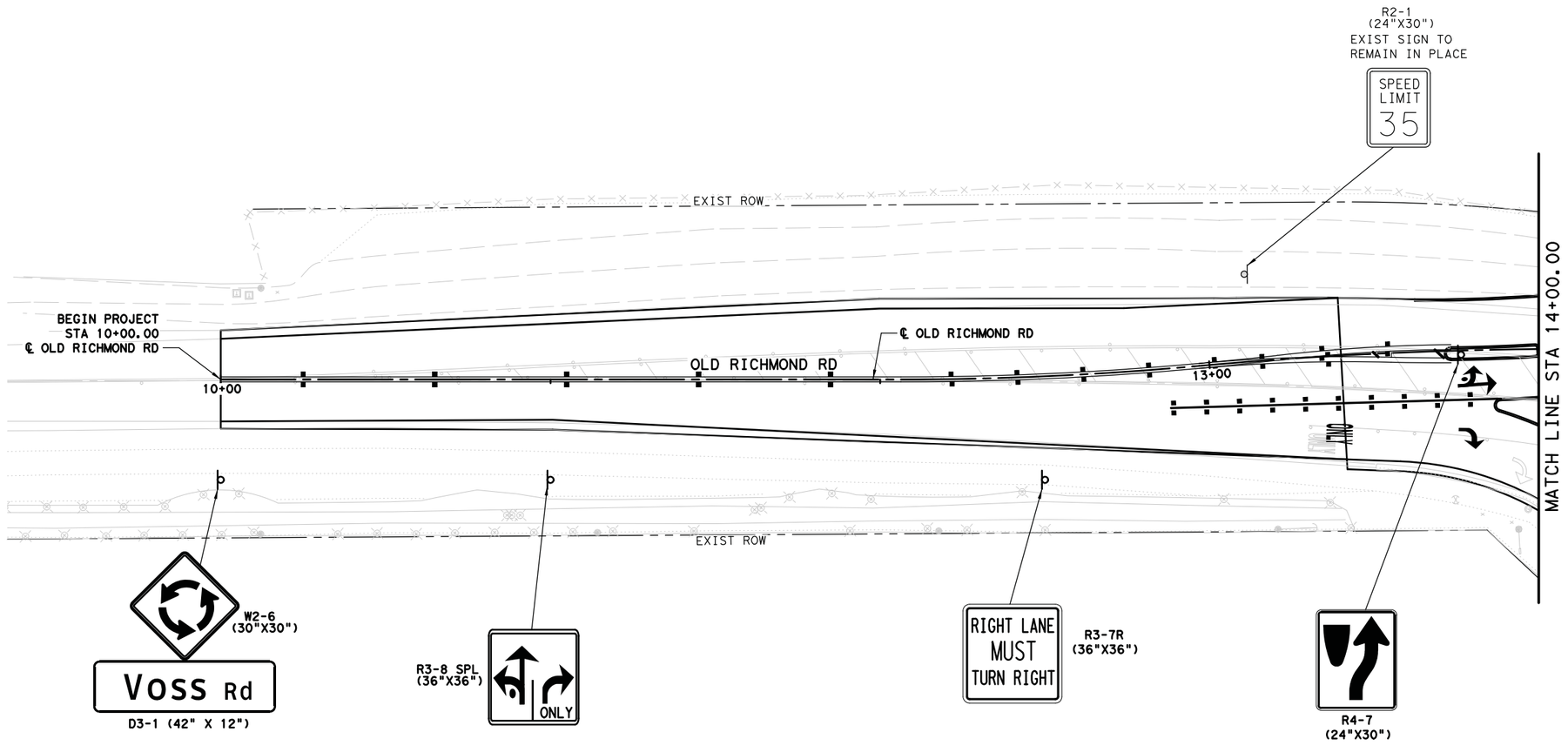
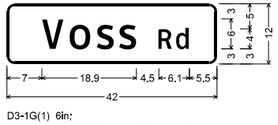
LEGEND:

PROPOSED SIGN SYMBOL





D3-1G(1) 6in:
1.5" Radius, 0.5" Border, White on, Green;
"Voss", ClearviewHwy-3-W;
"Rd", ClearviewHwy-3-W;

H: 0 20 40

REV	DATE	BY	DESCRIPTION

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OLD RICHMOND RD

SIGNING LAYOUT

SHEET 1 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	46

R1-2 (36"X36"X36") YIELD

PROP ROW

R6-4A (48"X24") MOUNT AT 4' ABOVE ROADWAY MOUNT AT 3' ABOVE TRUCK APRON

REMOVE AND RELOCATE MONUMENT SIGN

REMOVE EXIST SIGN

W11-2 (30"X30")

W16-7pl (24"X12")

EXIST ROW

℄ OLD RICHMOND RD

OLD RICHMOND RD

END PROJECT STA 19+52.01 ℄ OLD RICHMOND RD

MATCH LINE STA 14+00.00

W4-3R (36"X36")

VOSS RD

ONLY

EXIST ROW

R3-8 SPL (36"X36")

W2-6 (30"X30")

Old Richmond Rd

D3-1 (84" X 12")

W4-3R (36"X36")

A Old Richmond Rd

D1-2 (90 X 30")

B Voss Rd

D1-1 (78" X 18")

D3-1 (42" X 12") Voss Rd

R4-7 (24"X30")

SPEED LIMIT 35

R2-1 (24"X30") EXIST SIGN TO REMAIN IN PLACE

H: 0 20 40

LEGEND:

PROPOSED SIGN SYMBOL

Voss Rd

D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on, Green;
"Voss", ClearviewHwy-3-W;
"Rd", ClearviewHwy-3-W;

Voss Rd

D1-1 8in 45 RT;
1.5" Radius, 0.5" Border, White on, Green;
"Voss Rd", ClearviewHwy-3-W; Standard Arrow Custom 12.7" 45°;

Old Richmond Rd

D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on, Green;
"Old Richmond", ClearviewHwy-3-W; "Rd", ClearviewHwy-3-W;

Old Richmond Rd

D1-2 8in 45 RT;
1.9" Radius, 0.8" Border, White on, Green;
"Old Richmond", ClearviewHwy-3-W;
1.9" Radius, 0.8" Border, White on, Green;
"Rd", ClearviewHwy-3-W; Standard Arrow Custom 12.7" X 7.1" 45°;

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
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PROFESSIONAL ENGINEER

4/27/2022

FORT BEND COUNTY
ENGINEERING DIVISION

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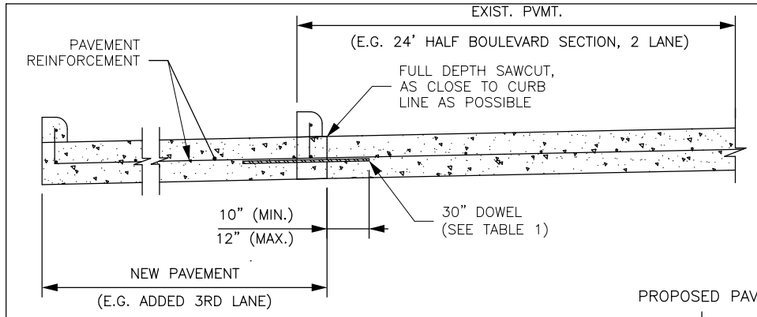
TBPE Registration No. F-1046

OLD RICHMOND RD
SIGNING LAYOUT

SHEET 2 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	47



TYPICAL CONCRETE ROADWAY WIDENING DETAIL

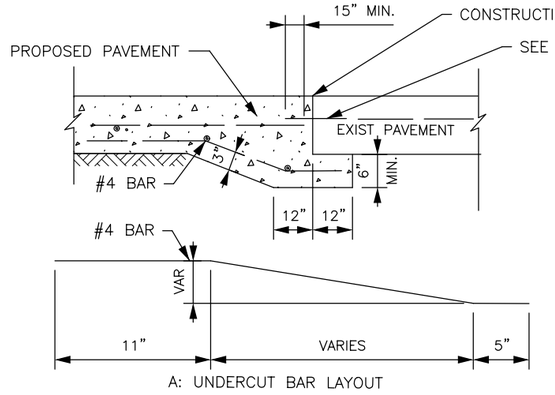
SCALE: 1" = 1'–6"

TABLE 1
(CONSTRUCTION JOINT DOWELS)

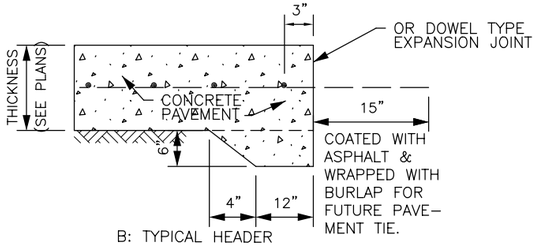
DOWEL SIZE	PAVEMENT DEPTH
#4 BAR	< 6"
#5 BAR	6" ≤ D < 9"
#6 BAR	≥ 9"
DOWEL SHALL BE DRILLED INTO EXISTING PAVEMENT (MIN. 10", MAX. 12") AND EPOXIED. (SEE ITEM 361.3).	

EXPANSION JOINT DOWELS 12" O.C.

PAVEMENT THICKNESS (D)	DOWEL DIA.
6"	3/4"
7"	1"
8"	1"
9" & 10"	1 1/4"



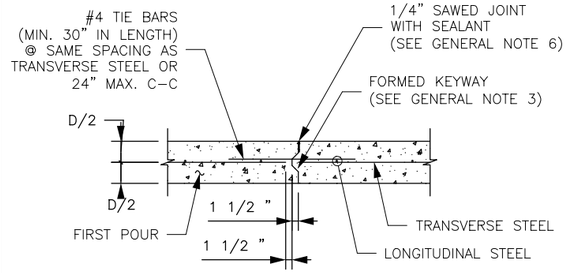
A: UNDERCUT BAR LAYOUT



B: TYPICAL HEADER

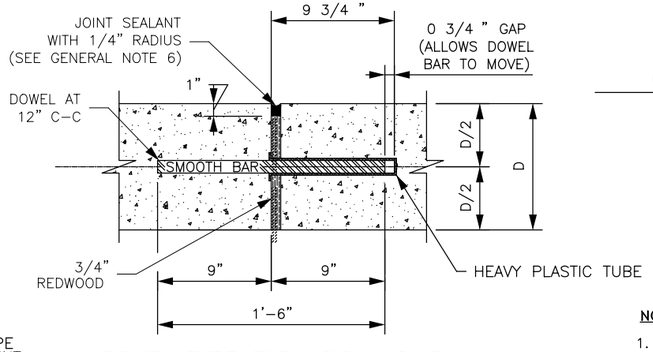
PAVEMENT HEADER/ UNDERCUT

N.T.S



LONGITUDINAL CONSTRUCTION JOINT

SCALE: 1" = 1'–6"

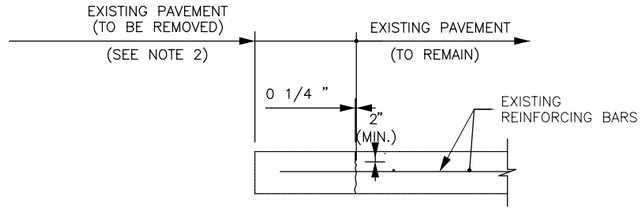


DOWEL TYPE EXPANSION JOINT

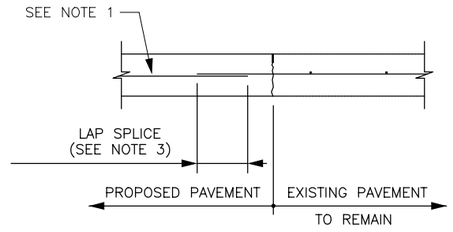
SCALE: 1" = 6"

NOTES FOR DOWEL EXPANSION JOINT:

1. EXPANSION JOINT SHALL BE PLACED AT THE END OF EACH CURB RADIUS AND SPACED AT A MAXIMUM DISTANCE OF 60 FEET.
2. CENTER DOWEL HORIZONTALLY ON JOINT.
3. EXPANSION JOINT BARS SHALL BE HELD PARALLEL TO THE FINISHED CONCRETE SURFACE.



STEP 1 DEMOLITION OF EXISTING PAVEMENT



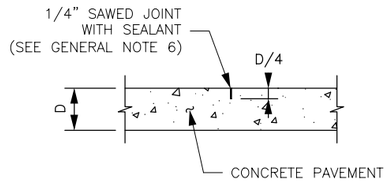
STEP 2 CONSTRUCTION OF NEW PAVEMENT

CONCRETE TO CONCRETE STANDARD PAVEMENT TIE–IN

SCALE: 1" = 1'–6"

NOTES FOR STANDARD PAVEMENT TIE–IN:

1. REINFORCING CENTERED IN PROPOSED PAVEMENT, 3" CLEAR AT EDGES.
2. ONLY FULL DEPTH SAWCUTS WILL BE ALLOWED
3. USE FULL DEPTH SAWCUT WITH DRILLED IN DOWELS (AS SHOWN IN THE "TYPICAL CONCRETE ROADWAY WIDENING DETAIL" ON THIS SHEET. THE SAWCUTTING AND DOWELS WILL BE AT CONTRACTOR'S EXPENSE.
4. ALL PAVEMENT CONCRETE SHALL BE 5½ SACK PER CY, 3500, PSI AT 28 DAYS
5. SIZE OF DOWEL BARS SHALL CONFORM TO TABLE 1. DOWELS SHALL BE PLACED 24" CENTER TO CENTER OR MATCH EXISTING, IF CLOSER

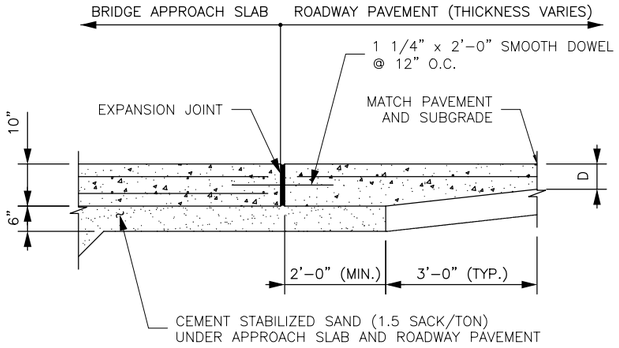


CONTRACTION JOINT (SAWED)

SCALE: 1" = 1'–6"

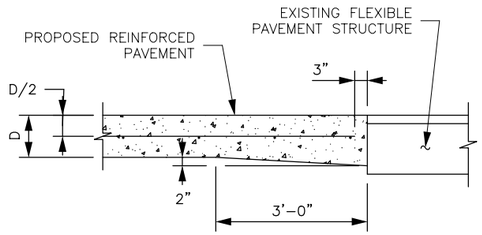
NOTE FOR CONTRACTION JOINT:

1. 20'–0" MAXIMUM SPACING BETWEEN JOINTS.



TYPICAL SECTION PAVING TIE–IN TO BRIDGE APPROACH SLAB

SCALE: 1" = 1'–6"



TYPICAL PAVING HEADER

SCALE: 1" = 1'–6"

NOTES FOR PAVING HEADER:

1. ADDITIONAL CONCRETE FOR PAVING HEADER SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAVING BID ITEMS.
2. DISTURBED MATERIAL IN THE FLEXIBLE PAVEMENT WILL BE BACKFILLED WITH ASPHALT CONCRETE PAVEMENT (ACP). THE ACP WILL BE CONSIDERED INCIDENTAL TO VARIOUS PAVING BID ITEMS.

GENERAL NOTES:

1. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND REINFORCING, REFER TO ITEM 360 HARRIS COUNTY SPECIFICATIONS
2. THE CHAIRS USED TO SUPPORT THE BAR MATS SHALL BE OF SUFFICIENT STRUCTURAL QUALITY AND NUMBER TO HOLD THE MAT WITHIN THE PLACEMENT HEIGHT, AND SHALL BE OF A TYPE APPROVED BY THE ENGINEER. SPACING OF BAR SUPPORT CHAIRS SHALL BE 3'–0" MAXIMUM.
3. SAWED CONTRACTION JOINTS SHALL BE USED FOR LONGITUDINAL JOINTS WHEREVER MORE THAN ONE LANE WIDTH IS PLACED IN A SINGLE POUR. KEYED CONSTRUCTION JOINTS SHALL BE USED AT ALL OTHER JOINTS.
4. ALL SAW CUTTING SHOWN ON THIS DETAIL SHALL BE INCIDENTAL TO ITEM 360 "CONCRETE PAVEMENT".
5. D = THICKNESS OF CONCRETE PAVEMENT.
   - FOR DEVELOPMENT PROJECTS SEE REGULATIONS OF FORT BEND COUNTY, TEXAS FOR THE APPROVAL AND ACCEPTANCE OF INFRASTRUCTURE.
6. ALL CONSTRUCTION JOINTS SHALL BE SEALED. JOINT SEALANT SHALL CONFORM TO THE REQUIREMENTS OF ITEM 360
7. NO TRAFFIC ON CONCRETE PAVEMENT UNTIL 7 DAYS CURE TIME AND 3,500 PSI HAS BEEN REACHED.

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2–1–22	RJS

FORT BEND COUNTY
ENGINEERING DEPARTMENT

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

PROJECT TITLE:	
DRAWN BY: INIT	
CK'D BY: INIT	SHEET DESCRIPTION: CONCRETE PAVEMENT DETAILS
SCALE: AS NOTED	SHEET 1 OF 3
DATE: 2–1–22	APPROVED BY:
FBCED STANDARD	05
SHEET NO:	48

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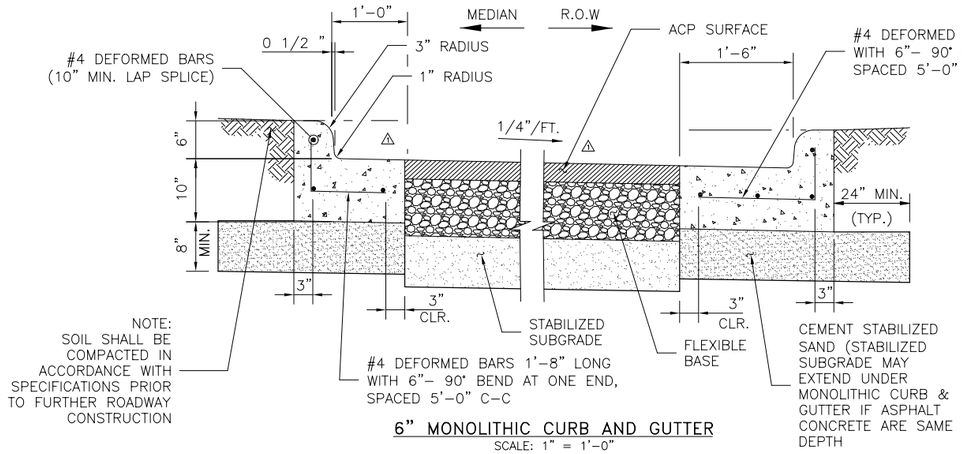
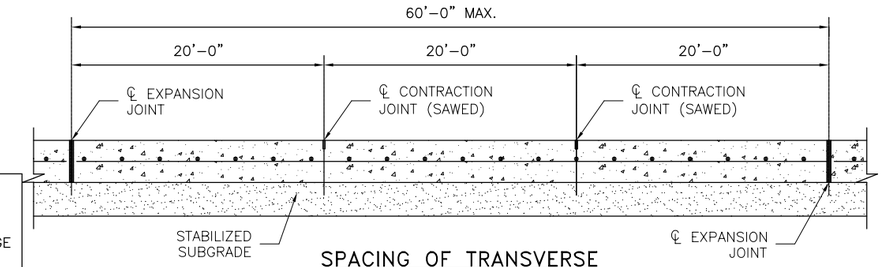


6" MONOLITHIC CURB AND GUTTER

SCALE: 1" = 1'-0"

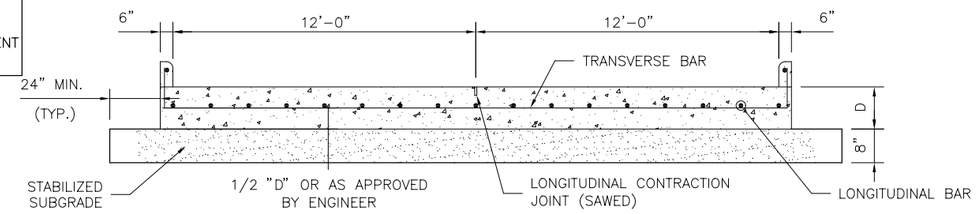
SLAB AND REBAR NOTES:

1. TYPICAL SLAB THICKNESS D=8"
2. TYPICAL REBAR SIZE AND SPACING ARE:
   a. #4 BAR @ 18" C-C LONGITUDINAL
   b. #4 BAR @ 18" C-C TRANSVERSE
3. REBAR SIZE FOR PAVEMENT LESS THAN 8" THICK
   a. #4 BAR @ 24" C-C LONGITUDINAL
   b. #4 BAR @ 24" C-C TRANSVERSE
4. REBAR SHALL NOT BE PLACED WITHIN 3" FROM THE EDGE OF PAVEMENT.
5. TYPICAL STABILIZED SUBGRADE THICKNESS IS 8 INCHES.
6. FOR HEAVY INDUSTRIAL TRAFFIC, SLAB THICKNESS AND REBAR SIZE AND SPACING WILL BE AS PER GEOTECHNICAL RECOMMENDATION.
7. ALL BENT BARS SHALL BE GRADE 40 STEEL, ALL OTHER SHALL BE GRADE 60.
8. MINIMUM LAP SPLICE 16".
9. LAP SPLICES SHOULD BE ON ALTERNATING BARS, ADJACENT LAP SPLICES ARE NOT ACCEPTABLE.



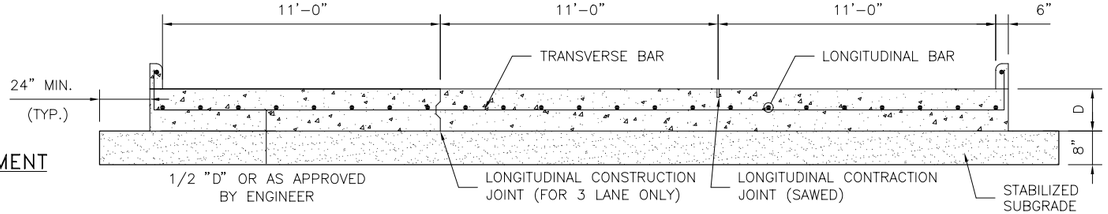
SPACING OF TRANSVERSE EXPANSION AND CONTRACTION JOINTS

HORIZONTAL SCALE: 1" = 6'-0"
VERTICAL SCALE: 1" = 1'-6"



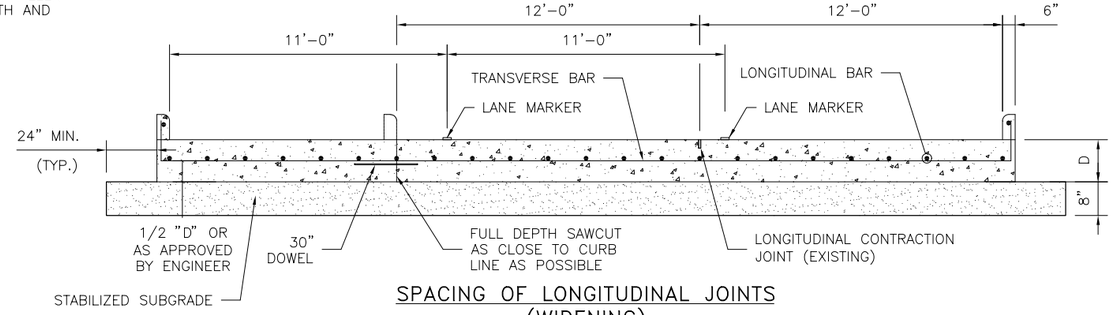
TYPICAL STEEL REBAR REPLACEMENT AND SPACING OF LONGITUDINAL JOINTS (NEW CONSTRUCTION FOR A 4 LANE HALF BOULEVARD)

HORIZONTAL SCALE: 1" = 3'-0"
VERTICAL SCALE: 1" = 1'-6"



TYPICAL STEEL REBAR REPLACEMENT AND SPACING OF LONGITUDINAL JOINTS (NEW CONSTRUCTION FOR A 6 LANE HALF BOULEVARD)

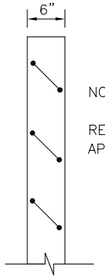
HORIZONTAL SCALE: 1" = 3'-0"
VERTICAL SCALE: 1" = 1'-6"



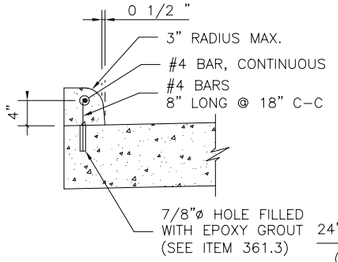
SPACING OF LONGITUDINAL JOINTS (WIDENING)

HORIZONTAL SCALE: 1" = 3'-0"
VERTICAL SCALE: 1" = 1'-6"

TYPICAL CONCRETE CURB REINFORCEMENT PLAN VIEW

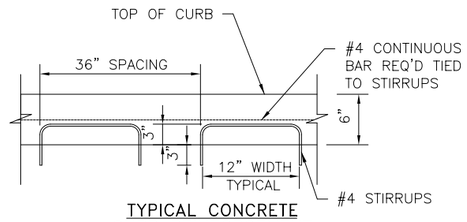


4" X 12" CURB PLAN VIEW



CONCRETE DOWELED ON CURB FOR CONCRETE OR ASPHALT PAVEMENT

SCALE: 1" = 1'-0"

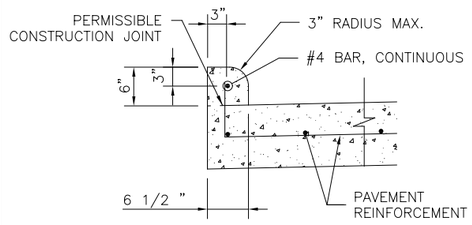


TYPICAL CONCRETE CURB REINFORCEMENT

NTS

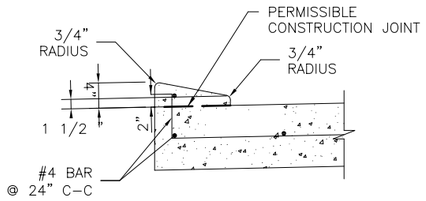
NOTES FOR CURB:

1. AT EACH PAVEMENT CONTRACTION JOINT, PROVIDE A 1/4" THICK PRE-MOLDED EXPANSION JOINT AT THE FULL WIDTH AND HEIGHT OF THE CURB.
2. FOR EACH PAVEMENT EXPANSION JOINT, THE PRE-MOLDED EXPANSION JOINT FILLER MATERIAL SHALL BE THE FULL WIDTH AND HEIGHT OF THE CURB.



TYPICAL CONCRETE CURB REINFORCING DETAILS

SCALE: 1" = 1'-0"



4" X 12" CURB (MONOLITHIC OR DOWEL)

SCALE: 1" = 1'-0"

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

FORT BEND COUNTY ENGINEERING DEPARTMENT

THE STATE OF TEXAS · FORT BEND COUNTY ·

BGE, Inc.
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TBPE Registration No. F-1046

PROJECT TITLE:		
DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: CONCRETE PAVEMENT DETAILS	06
SCALE: AS NOTED	SHEET 2 OF 3	SHEET NO:
DATE: 2-1-22	APPROVED BY:	49

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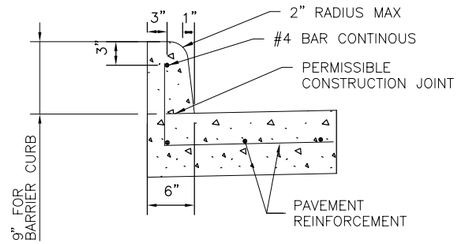
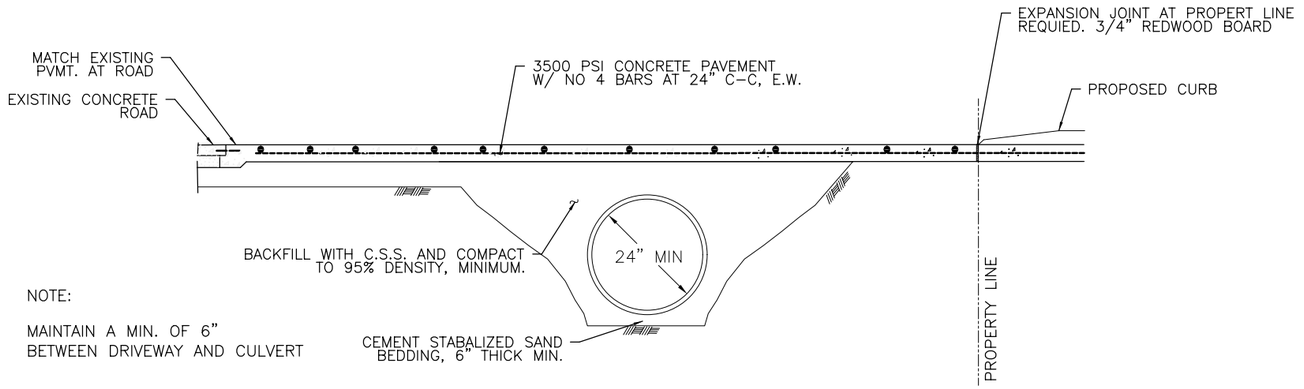


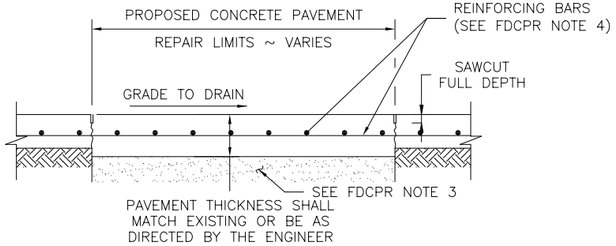
9" BARRIER CURB



NOTE:

MAINTAIN A MIN. OF 6"
BETWEEN DRIVEWAY AND CULVERT

CONCRETE APRON DETAIL – DRIVEWAY PROFILE
FOR CULVERT DRAINAGE



FULL DEPTH CONCRETE PAVEMENT REPAIR

HORIZONTAL SCALE: 1" = 3'-0"
VERTICAL SCALE: 1" = 1'-6"

FULL DEPTH CONCRETE PAVEMENT REPAIR (FDCPR) NOTES:

1. ONLY FULL DEPTH SAWCUTS WILL BE ALLOWED
2. EXISTING CONCRETE VERTICAL FACES SHALL BE CLEANED OF ALL DELETERIOUS LOOSE MATERIAL PRIOR TO CONCRETE PLACEMENT.
3. FOR REPAIR/REPLACE AREAS, A 8" DEPTH BASE SHALL BE REMOVED AND REPLACED WITH CEMENT STABILIZED SAND PER ITEM 433 HARRIS COUNTY SPECIFICATIONS.
4. REINFORCEMENT OF 9"–10" THICK CONCRETE PAVEMENT SHALL BE NO. 5 BARS AT 18" SPACING IN EACH DIRECTION. REFER TO TABLE ON CONCRETE PAVEMENT SHEET 2 OF 2
5. REFER TO FBC STREET ACCEPTANCE GUIDELINES

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

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BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

PROJECT TITLE:

DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: CONCRETE PAVEMENT DETAILS	07
SCALE: AS NOTED	SHEET 3 OF 3	SHEET NO:
DATE: 2-1-22	APPROVED BY:	50

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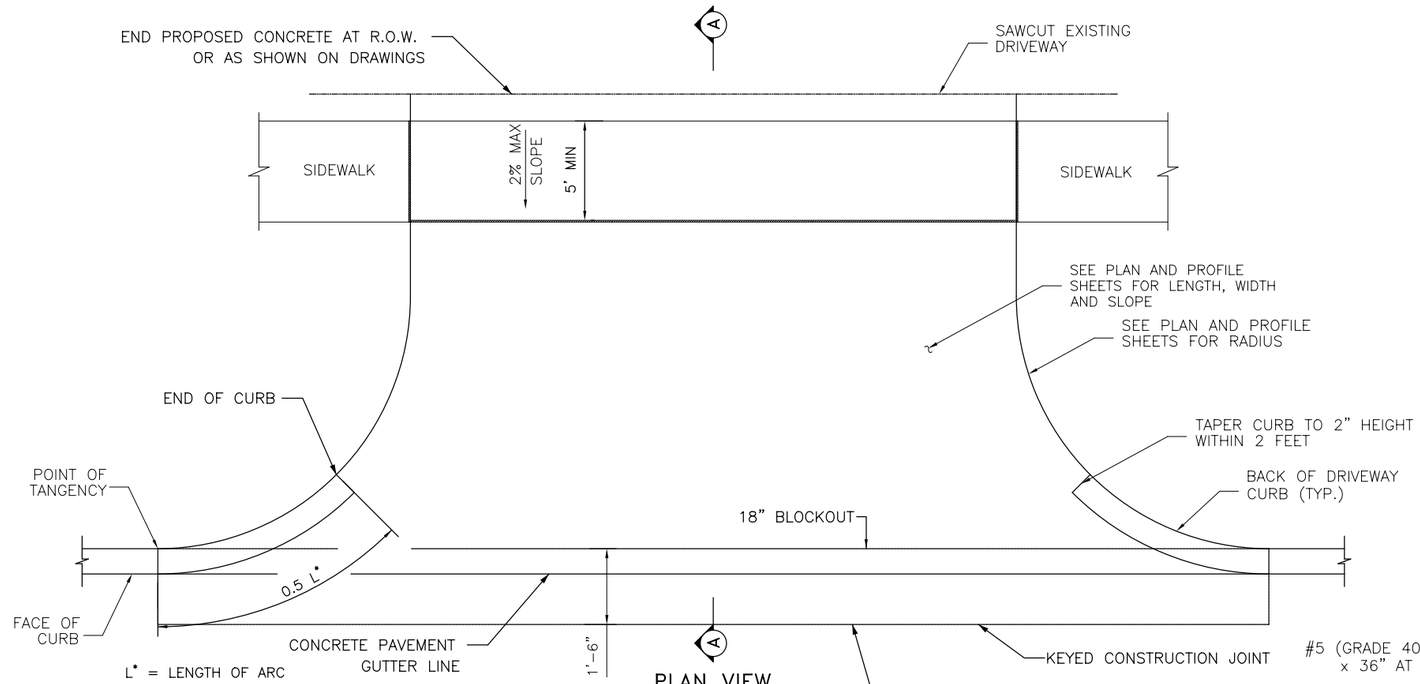
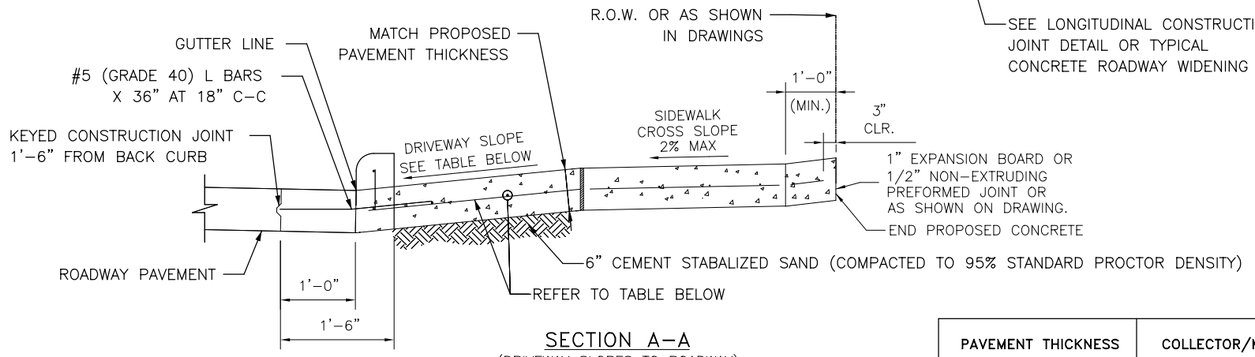
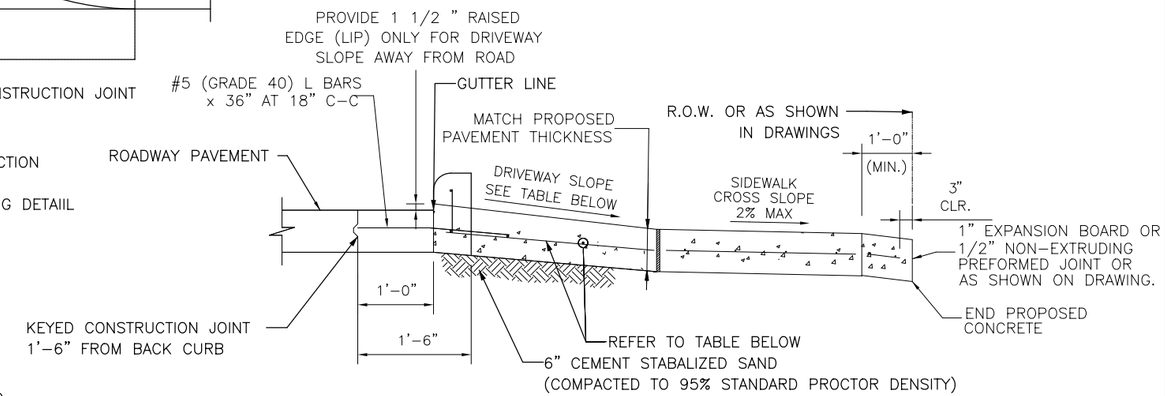


PLAN VIEW



SECTION A-A

(DRIVEWAY SLOPES TO ROADWAY)



SECTION A-A

(DRIVEWAY SLOPES AWAY FROM ROADWAY)

NOTES:

1. SAWCUT EXISTING DRIVEWAY AT R.O.W. LINE OR AS SHOWN ON DRAWING AND REMOVE EXISTING DRIVEWAY TO SAWCUT LINE.
2. IF THERE IS EXISTING CURB ON DRIVEWAY, CONNECT PROPOSED CURB TO EXISTING CURB; OTHERWISE TAPER CURB HEIGHT AS SHOWN.
3. SEE PAVEMENT DETAIL SHEET FOR CONCRETE CURB REINFORCEMENT.
4. THIS DRIVEWAY INSTALLATION IS GOVERNED BY HARRIS COUNTY ITEM 360.
5. DRIVEWAY WIDTHS ARE MEASURED AT THE ROW LINE

MINIMUM RADII REQUIREMENTS – DRIVEWAYS

	LOCAL	COLLECTOR	MAJOR
RESIDENTIAL	5'	5'	–
COMMERCIAL	10'	10'	25'

DRIVEWAY WIDTHS

	MINIMUM	MAXIMUM
RESIDENTIAL	10'	25'
COMMERCIAL	20'	40'

	PAVEMENT THICKNESS	COLLECTOR/MAJOR	RESIDENTIAL (MAJOR THOROUGHFARE)	RESIDENTIAL (COLLECTORS AND LOCAL STREETS)
REINFORCEMENT	6"	#4 @ 24" O.C.E.W.	N/A	#4 @ 24" O.C.E.W.
	7"	#4 @ 24" O.C.E.W.	#4 @ 24" O.C.E.W.	#4 @ 24" O.C.E.W.
	8"	#4 @ 18" O.C.E.W.	#4 @ 18" O.C.E.W.	#4 @ 18" O.C.E.W.
	9"–10"	#5 @ 18" O.C.E.W.	#5 @ 18" O.C.E.W.	#5 @ 18" O.C.E.W.
EXPANSION DOWEL JOINT	6"	3/4" DIA. SMOOTH BAR	3/4" DIA. SMOOTH BAR	3/4" DIA. SMOOTH BAR
	7"	1" DIA. SMOOTH BAR	1" DIA. SMOOTH BAR	1" DIA. SMOOTH BAR
	8"	1" DIA. SMOOTH BAR	1" DIA. SMOOTH BAR	1" DIA. SMOOTH BAR
	9"–10"	1¼" DIA. SMOOTH BAR	1¼" DIA. SMOOTH BAR	1¼" DIA. SMOOTH BAR
CONSTRUCTION JOINT DOWEL	ALL	#5 REBAR	#5 REBAR	#5 REBAR
SUBGRADE	ALL	6" CEMENT–STABALIZED SAND	2" BANK SAND	2" BANK SAND
DRIVEWAY SLOPE	ALL	2% TO 4%	2% TO 6%	2% TO 10%*

*10% ALLOWABLE ON PRIVATELY CONSTRUCTED PROJECTS
6% MAX ON PUBLIC PROJECTS

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	3-1-22	RJS

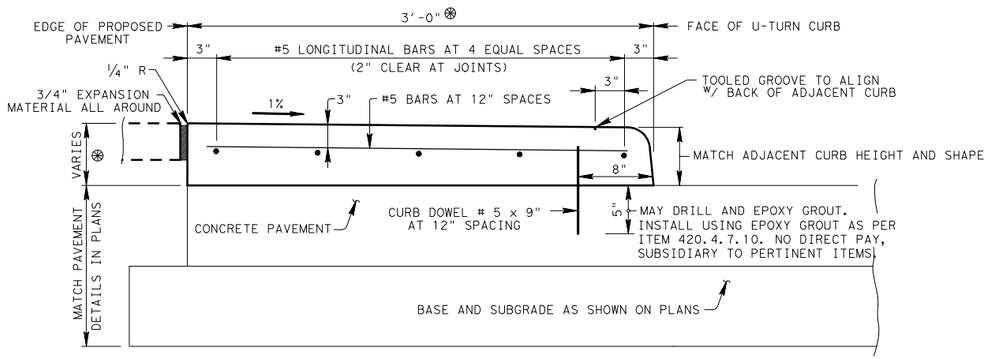
FORT BEND COUNTY ENGINEERING DEPARTMENT

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

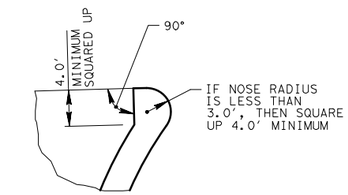
PROJECT TITLE:

DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: DRIVEWAY DETAILS FOR	10
SCALE: 1"=1'-6"	MAJOR ROADWAY CONSTRUCTION	SHEET NO:
DATE: 3-1-22	APPROVED BY:	51

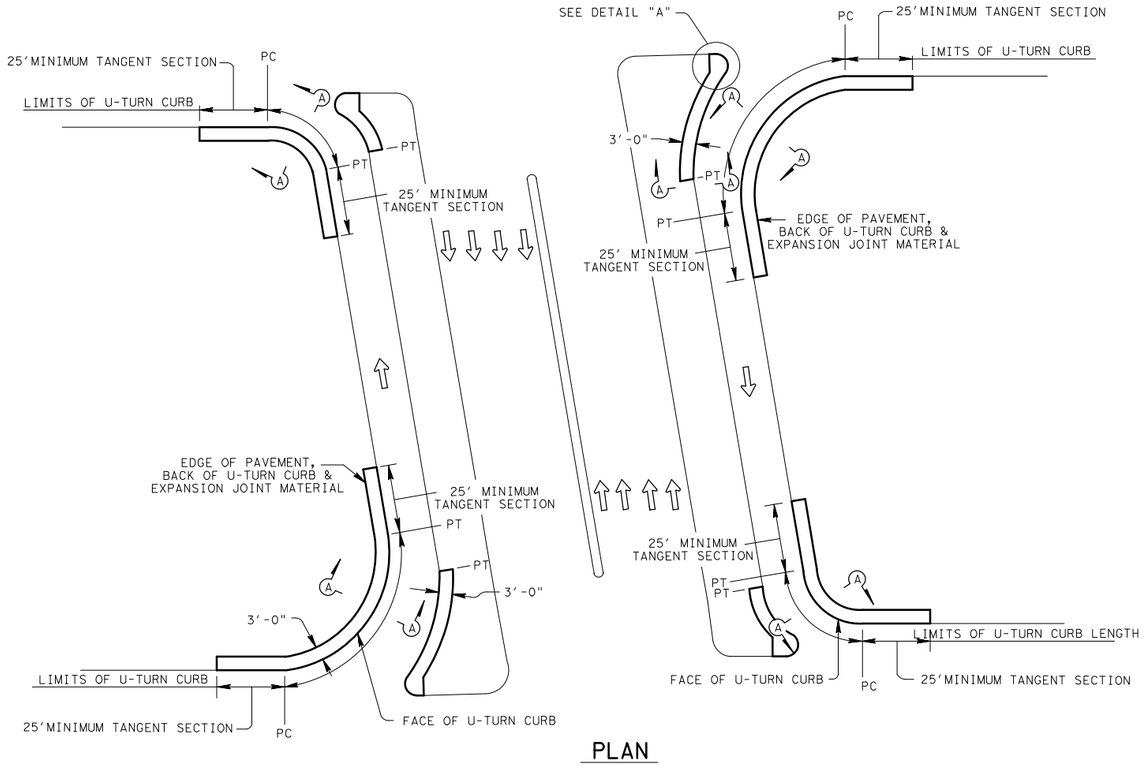
J:\1704\1601\Fort Bend County Standards\Fort Bend County STD\DONE\FBC DRIVEWAY DETAILS FOR MAJOR ROADWAY CONSTRUCTION\DRIVEWAY_DETAILS_FOR_MAJOR_ROADWAY_CONSTRUCTION.dwg



SECTION A-A
NEW CONSTRUCTION
ITEM 529 - CONC CURB (U-TURN)



DETAIL "A"



PLAN

NOTE:

1. U-TURN CURB MEASURED BY THE FOOT ALONG THE FACE OF THE CURB.

LEGEND:

R = RADIUS
⊛ = LIMITS OF PAY FOR U-TURN CURB WIDTH

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

Texas Department of Transportation
Houston District

U-TURN CURB DETAIL
NEW CONSTRUCTION
HOU-U-CURB

FILE: UCURBNEW.DGN	DN:TxDOT	CK:TxDOT	DW:TxDOT	CK:TxDOT
©TxDOT 2014	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		
	COUNTY		CONTROL SECT JOB	HIGHWAY

STD B11

FORT BEND COUNTY
ENGINEERING DIVISION

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10777 Westheimer, Suite 400, Houston, TX 77042
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TBPE Registration No. F-1046

OLD RICHMOND RD

ROADWAY STANDARDS

SHEET 5 OF 10

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	52

PEN TABLE: T:\PCSETUP\Tables\TXDOT.TBL
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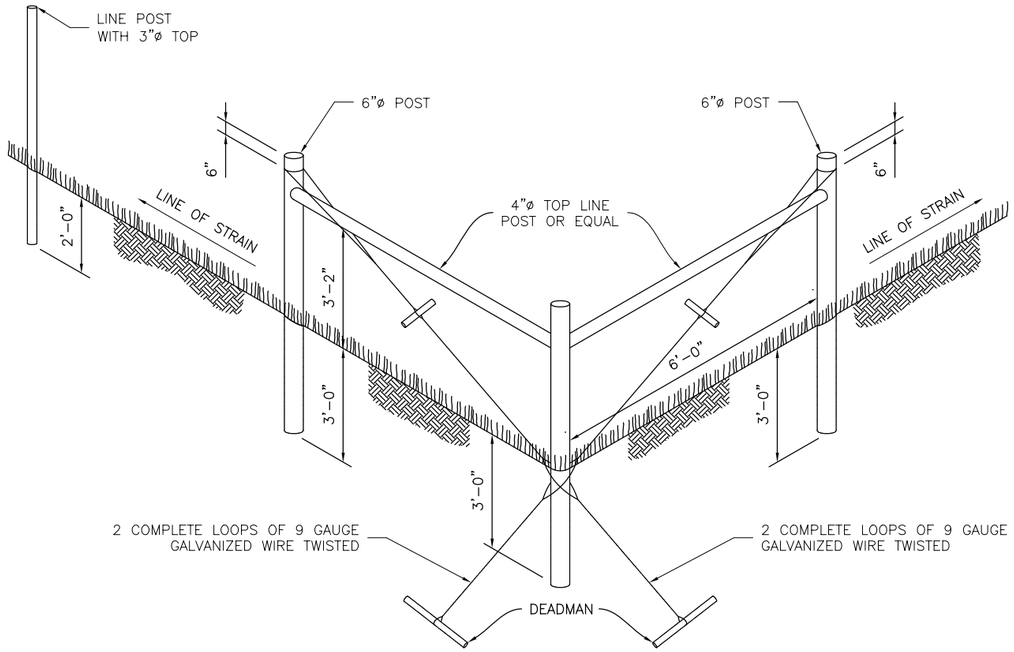
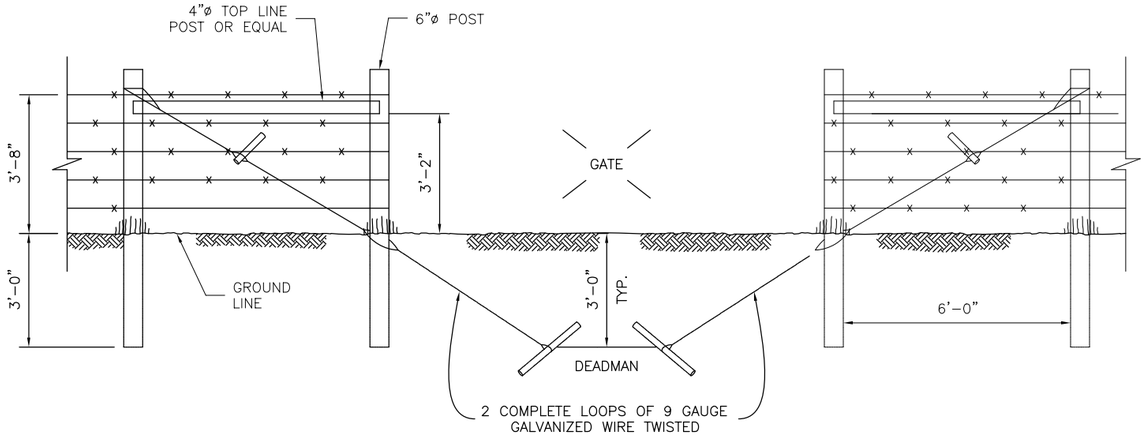
MODEL NAME: CURB DETAIL
2/7/2022 9:35:24 AM



ISOMETRIC VIEW
AT CORNER ELEVATION

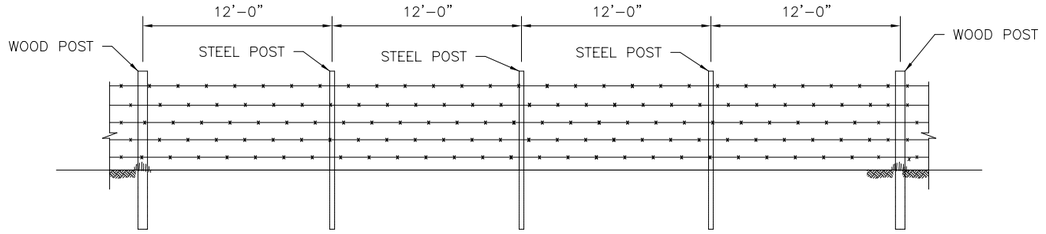
NOTE: ALL DIMENSIONS ARE MINIMUM



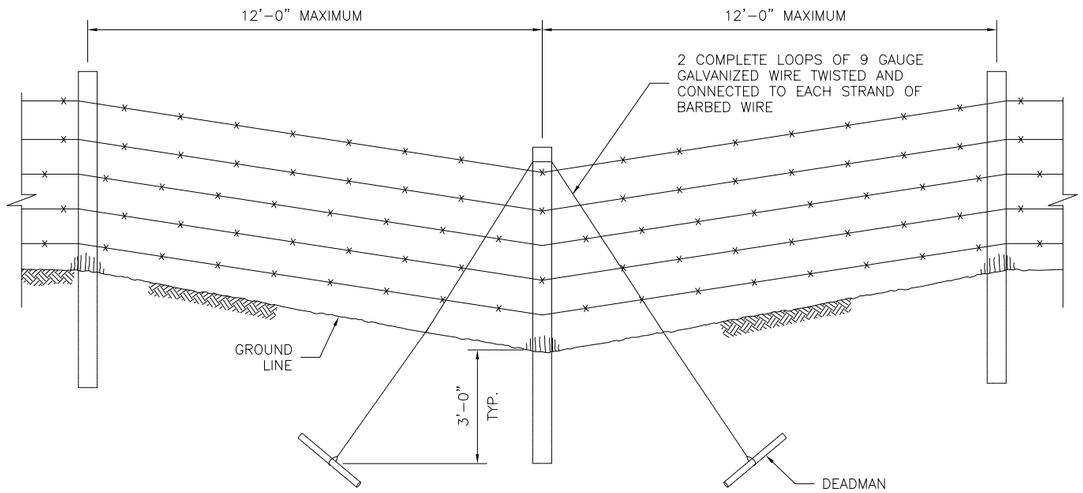
SPLICES SHALL BE
"WESTERN UNION SPLICES"

ELEVATION AT GATE OPENING

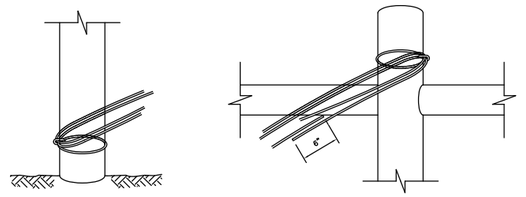
NOTE: ALL DIMENSIONS ARE MINIMUM



TYPICAL FENCE ELEVATION



GRADE DEPRESSION DETAIL



FASTENING DETAILS

FOR WIRE BRACE, TIE IN WOOD CORNER,
OR END POST ASSEMBLY

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

FORT BEND COUNTY
ENGINEERING DEPARTMENT

THE STATE OF TEXAS · FORT BEND COUNTY

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-6700 • www.bgeinc.com
TBPE Registration No. F-1046

PROJECT TITLE:		
DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: BARBED WIRE FENCING DETAILS	41
SCALE: NONE		SHEET NO:
DATE: 2-1-22	APPROVED BY:	53

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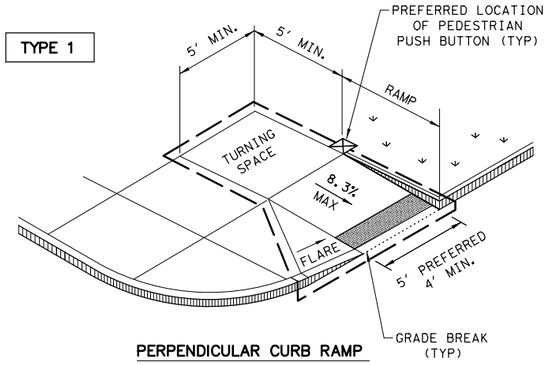
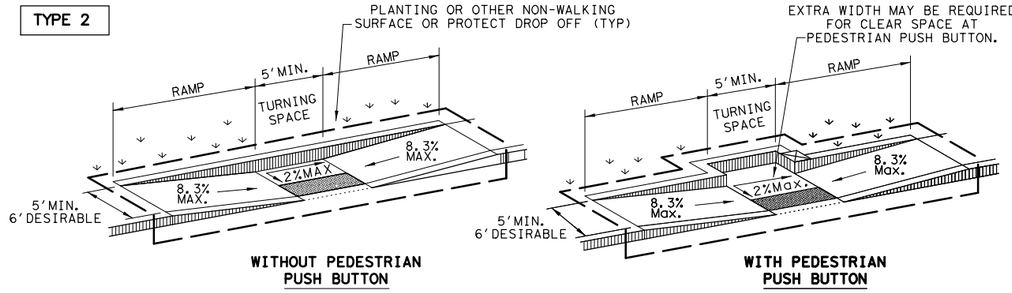


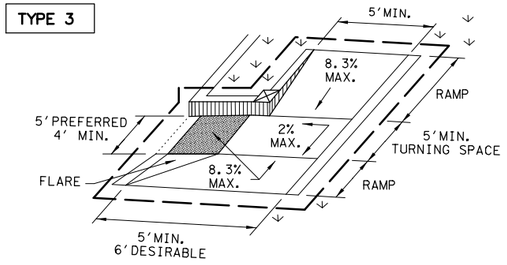
PERPENDICULAR CURB RAMP

TYPE 2

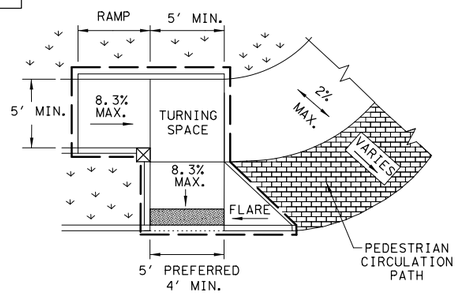


PARALLEL CURB RAMP

TYPE 3

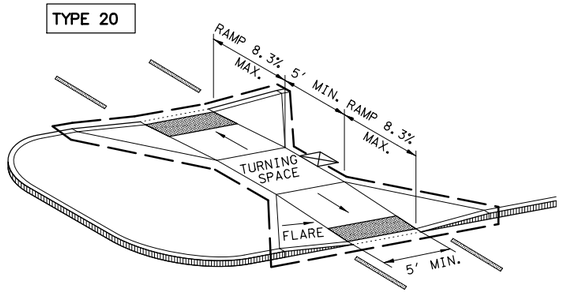


TYPE 6



COMBINATION CURB RAMPS

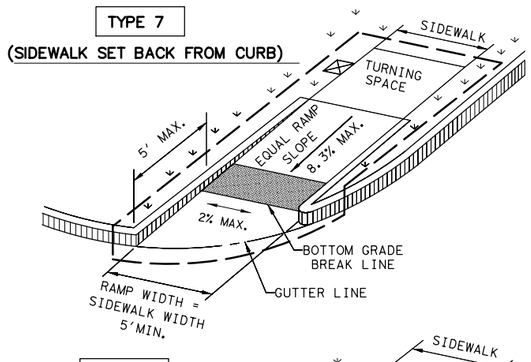
TYPE 20

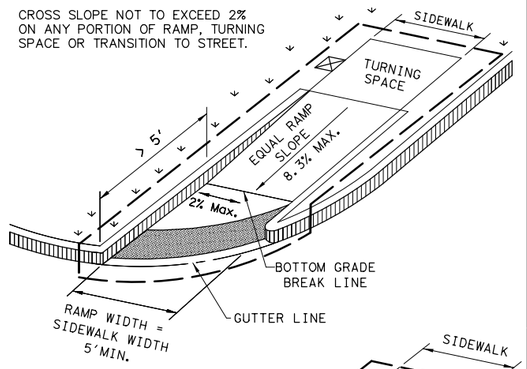


CURB RAMPS AT MEDIAN ISLANDS

TYPE 7

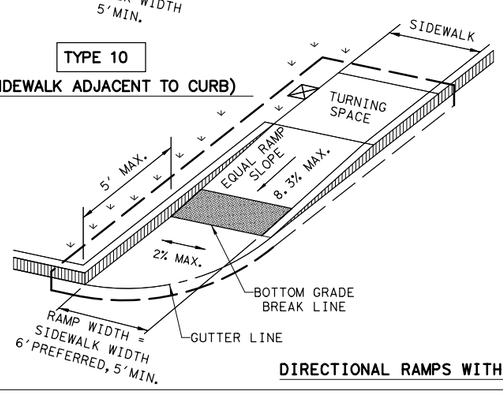
(SIDEWALK SET BACK FROM CURB)

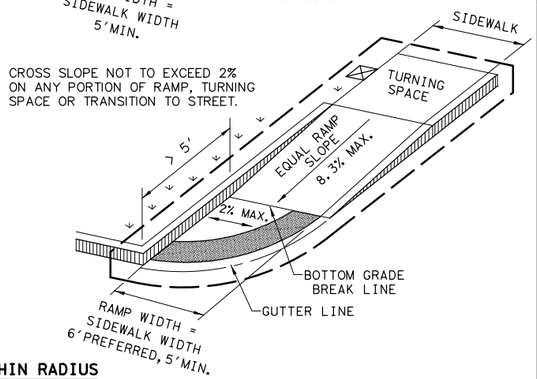




TYPE 10

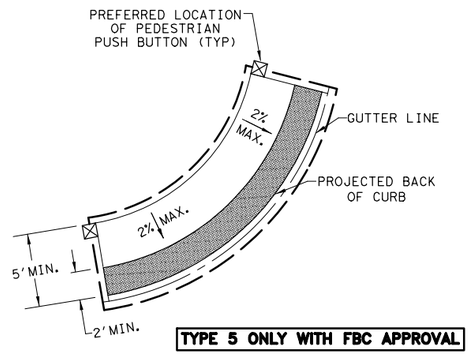
(SIDEWALK ADJACENT TO CURB)





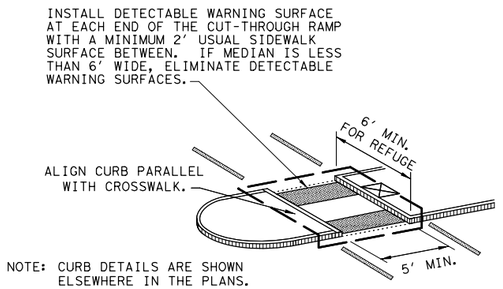
DIRECTIONAL RAMPS WITHIN RADIUS

TYPE 5



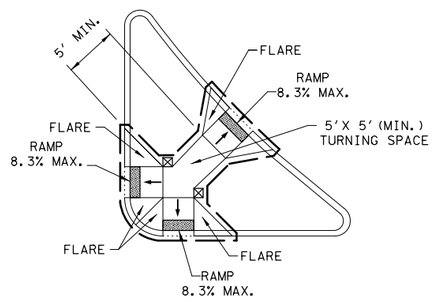
TYPE 5 ONLY WITH FBC APPROVAL

TYPE 21

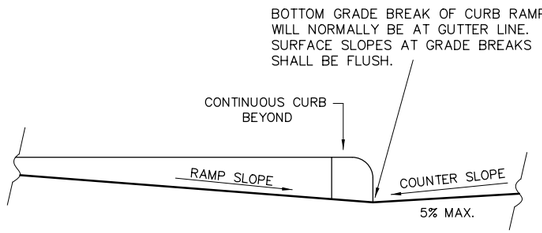


NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

NOTES / LEGEND:

SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DETECTABLE WARNING SURFACE

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	1-1-22	RJS

FORT BEND COUNTY
ENGINEERING DEPARTMENT

THE STATE OF TEXAS FORT BEND COUNTY

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

PROJECT TITLE:

DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: PED-18 RAMP DETAILS	14
SCALE: 1" = 1'	SHEET 1 OF 4	SHEET NO:
DATE: 2-1-22	APPROVED BY:	54

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GENERAL NOTES

CURB RAMPS

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5'x 5' passing areas at intervals not to exceed 200' are required.
5. Turning Spaces shall be 5'x 5' minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4'x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5'x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicalble standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

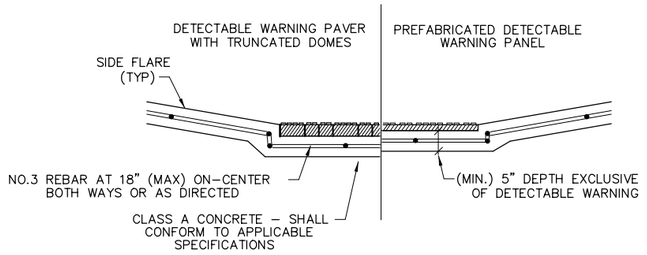
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

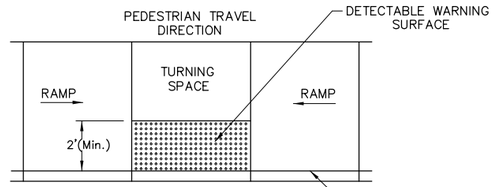
SIDEWALKS

27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.

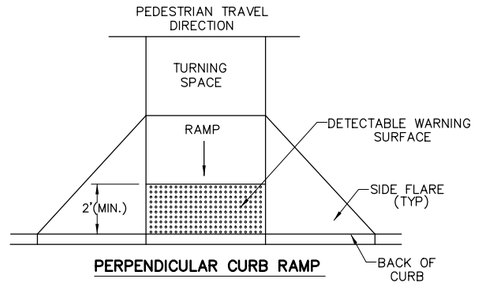


SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

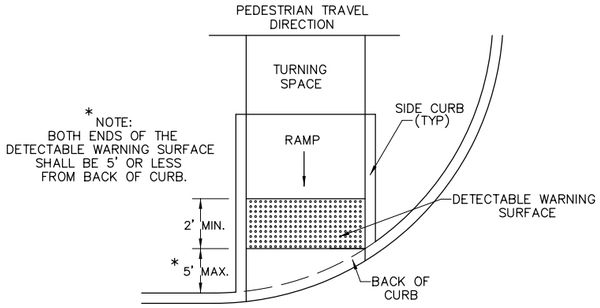
DETECTABLE WARNING SURFACE DETAILS



PARALLEL CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.



PERPENDICULAR CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



DIRECTIONAL CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

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NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

FORT BEND COUNTY
ENGINEERING DEPARTMENT

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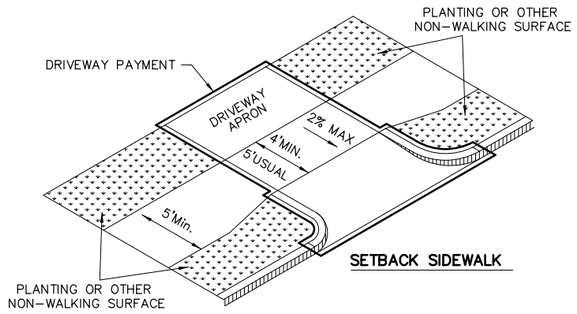
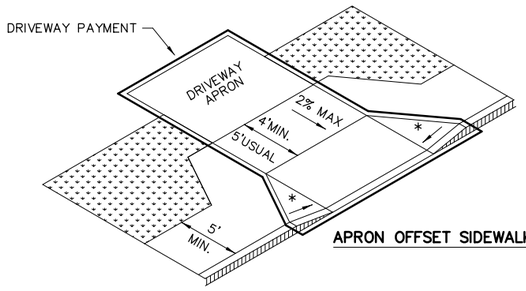
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

PROJECT TITLE:			
DRAWN BY: INIT			FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: PED-18 RAMP DETAILS		15
SCALE: 1" = 1'	SHEET 2 OF 4		SHEET NO:
DATE: 2-1-22	APPROVED BY:		55

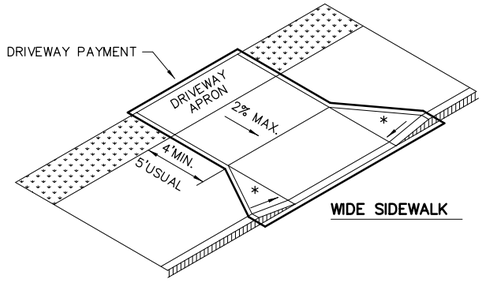
SIDEWALK TREATMENT AT DRIVEWAYS



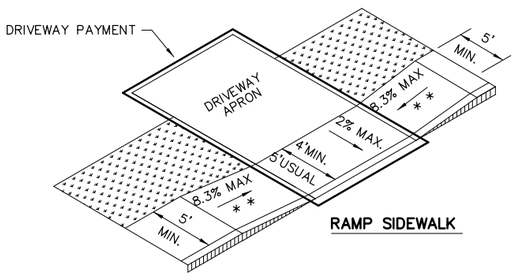
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

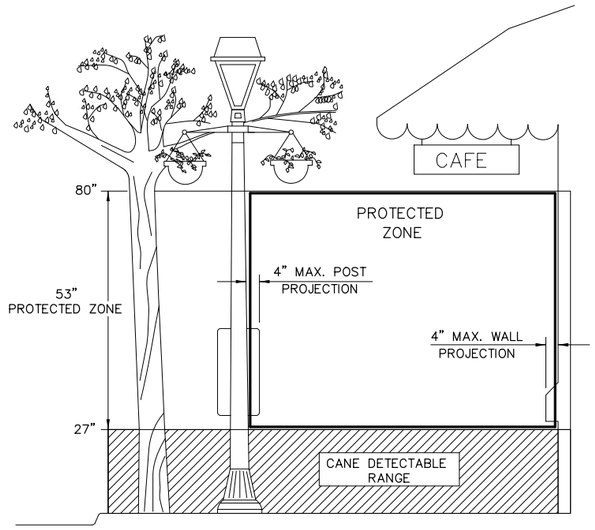


RAMP SIDEWALK

NOTES:

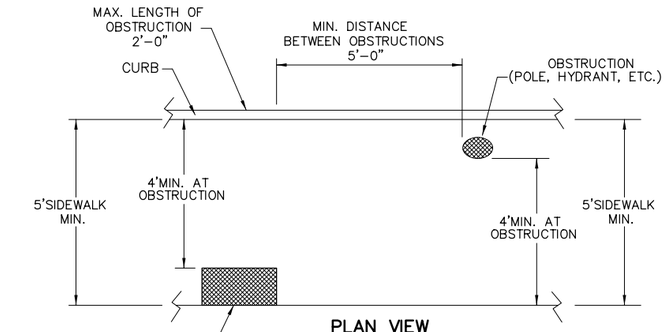
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5% HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.



PROTECTED ZONE

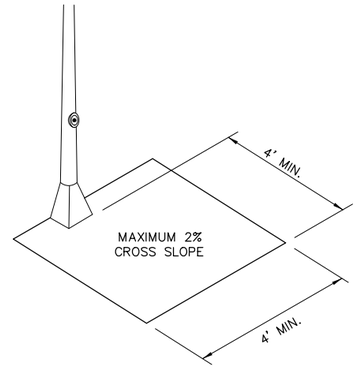
NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



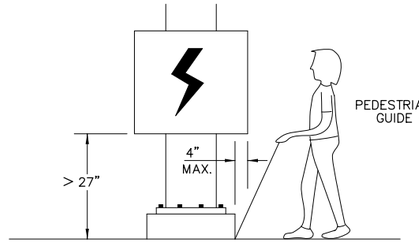
PLAN VIEW

PLACEMENT OF STREET FIXTURES

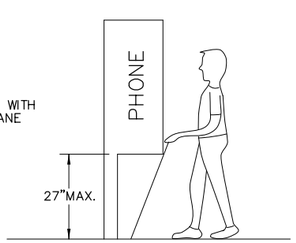
NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



WHEN AN OBSTRUCTION OF A HEIGHT GREATER THAN 27" FROM THE SURFACE WOULD CREATE A PROTRUSION OF MORE THAN 4" INTO THE PEDESTRIAN CIRCULATION AREA, CONSTRUCT ADDITIONAL CURB OR FOUNDATION AT THE BOTTOM TO PROVIDE A MAXIMUM 4" OVERHANG.



PROTRUDING OBJECTS OF A HEIGHT 27" ARE DETECTABLE BY CANE AND DO NOT REQUIRE ADDITIONAL TREATMENT.

DETECTION BARRIER FOR VERTICAL CLEARANCE <80"

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

FORT BEND COUNTY ENGINEERING DEPARTMENT

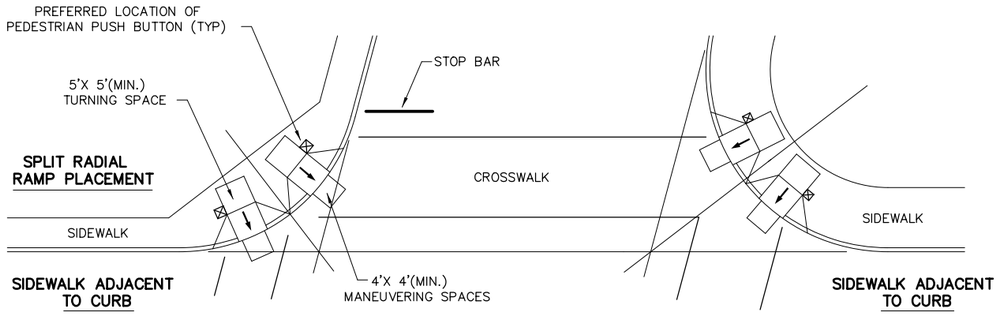
BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

PROJECT TITLE:	
DRAWN BY: INIT	FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: PED-18 RAMP DETAILS — 16
SCALE: 1" = 1'	SHEET 3 OF 4 — SHEET NO: 56
DATE: 2-1-22	APPROVED BY:

J:\1704\1703\Standard Sheets\07 FBC PED-18 RAMP DETAILS\PED-18_RAMP_DETAILS.dwg

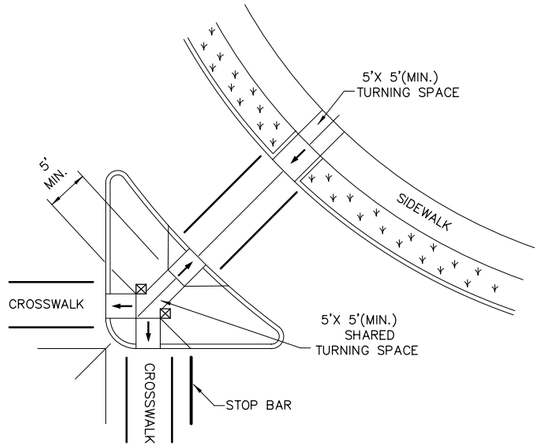
TYPICAL CROSSING LAYOUTS

SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS

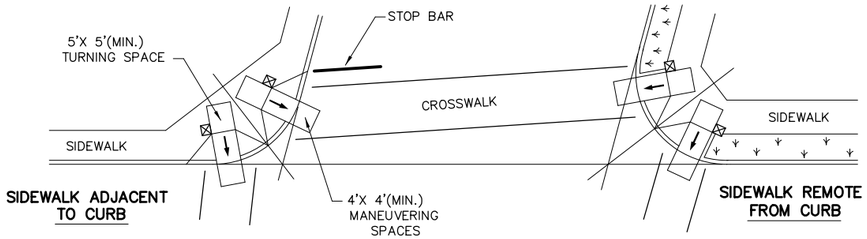


SKEWED INTERSECTION WITH "LARGE" RADIUS

REQUIRES FBC APPROVAL

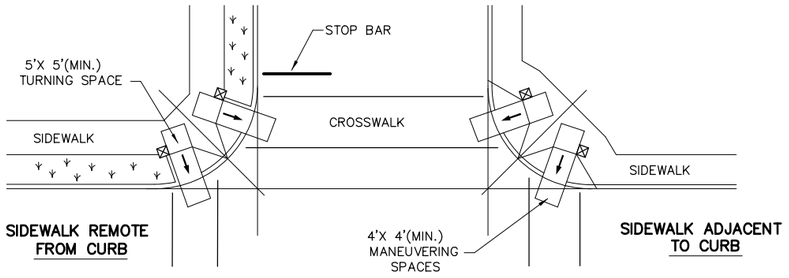


AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



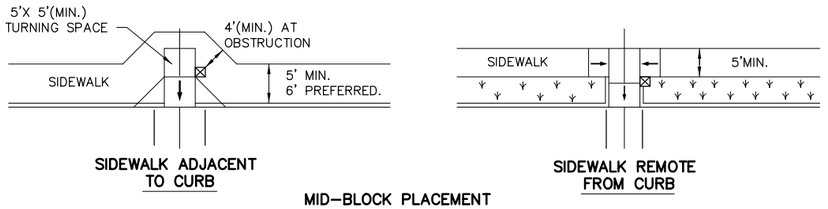
SKEWED INTERSECTION WITH "SMALL" RADIUS

REQUIRES FBC APPROVAL



NORMAL INTERSECTION WITH "SMALL" RADIUS

REQUIRES FBC APPROVAL



MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ☒

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

FORT BEND COUNTY
ENGINEERING DEPARTMENT

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

PROJECT TITLE:

DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: PED-18 RAMP DETAILS	17
SCALE: 1" = 1'	SHEET 4 OF 4	SHEET NO:
DATE: 2-1-22	APPROVED BY:	57

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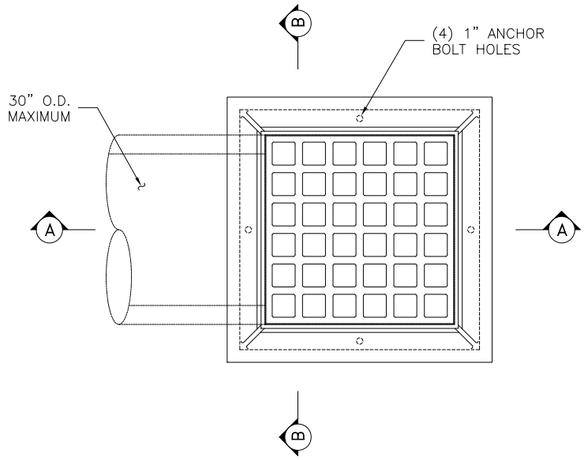
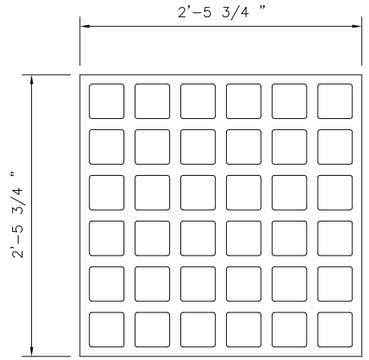
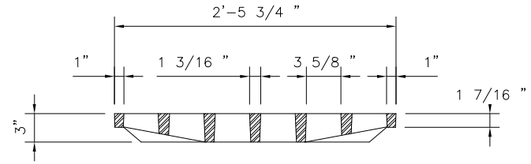


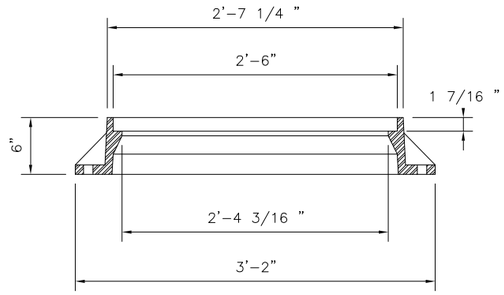
PLAN VIEW



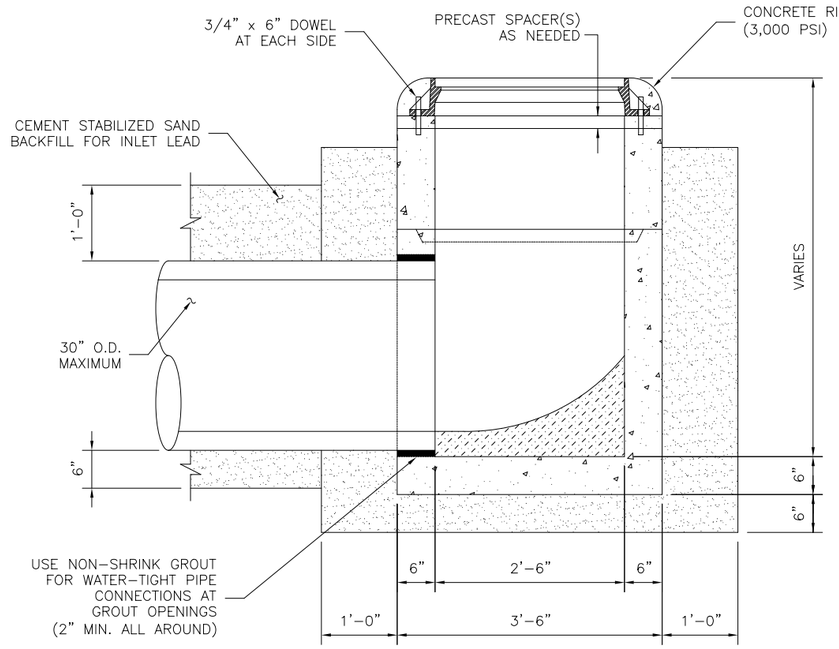
GRATE PLAN VIEW



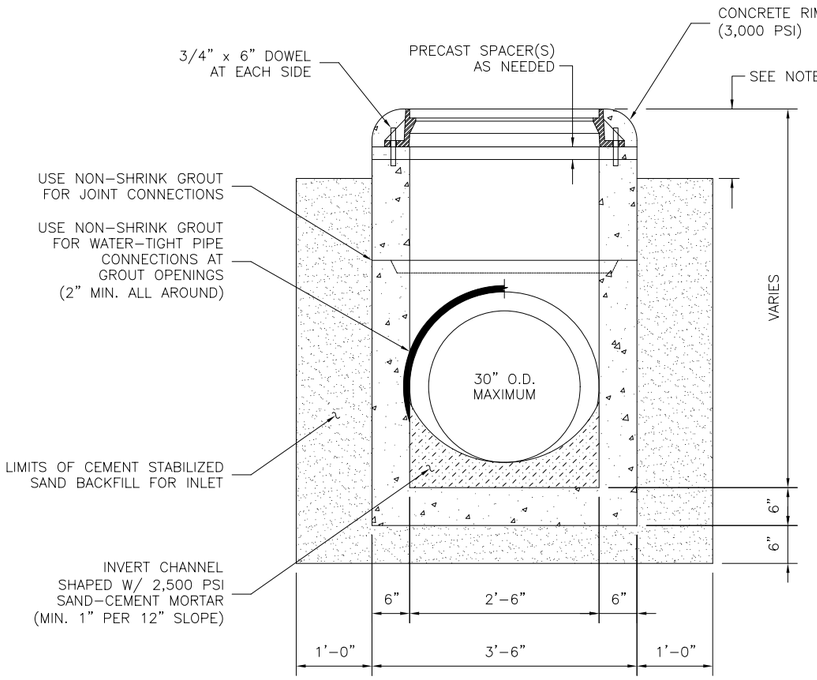
GRATE SECTION A-A



FRAME SECTION A-A



SECTION A-A



SECTION B-B

GENERAL NOTES:

1. CONSTRUCTION AND MATERIALS SHALL MEET REQUIREMENTS OF ITEM 472 "INLETS".
2. CONCRETE FOR INLET: MINIMUM 4,000 PSI IN 28 DAYS
3. PRECAST STRUCTURE TO MEET ASTM C913
4. FRAME AND GRATE SHALL BE EAST JORDAN IRON WORKS MODEL V-4880-1 (OPEN AREA 473 SQ. IN.) OR APPROVED EQUAL.
5. IF THE ENGINEER OF RECORD SPECIFIES A CAST-IN-PLACE INLET, HE/SHE SHALL INCORPORATE A DETAILED DRAWING INTO THE CONTRACT DOCUMENTS. HOWEVER, IF THE CONTRACTOR ELECTS TO CONSTRUCT A CAST-IN-PLACE INLET, THE CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING A DETAILED DRAWING, SIGNED AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS.
6. SHOP DRAWINGS SHALL BE REQUIRED FOR PRECAST CONSTRUCTION OF INLET.
7. KNOCK-OUTS ARE NOT PERMISSIBLE FOR PRECAST CONSTRUCTION OF INLET.
8. CEMENT STABILIZED SAND SHALL EXTEND TO THE BOTTOM OF PAVEMENT OR SLOPE PAVING, OR 12 INCHES BELOW THE SURFACE IF INLET IS LOCATED IN AN UNPAVED AREA.

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

FORT BEND COUNTY ENGINEERING DEPARTMENT

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

PROJECT TITLE:

DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: TYPE "A" INLET DETAILS	22
SCALE: 1"=1'-0"	FOR MAXIMUM 30" O.D. PIPE	SHEET NO:
DATE: 2-1-22	APPROVED BY:	58

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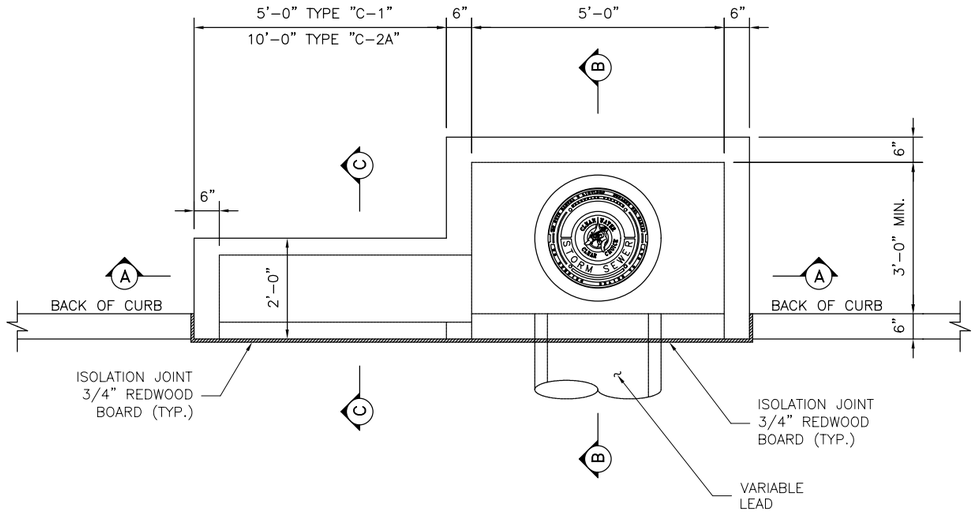
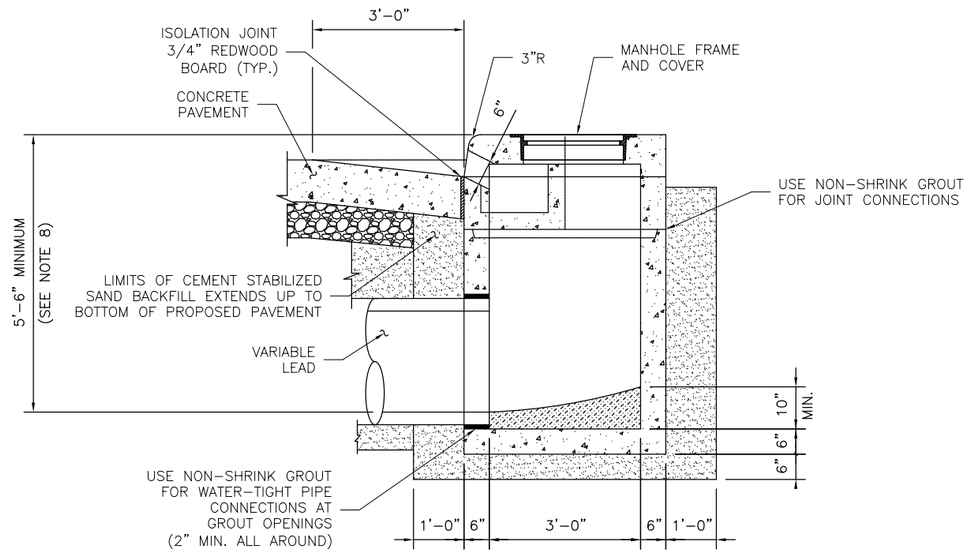
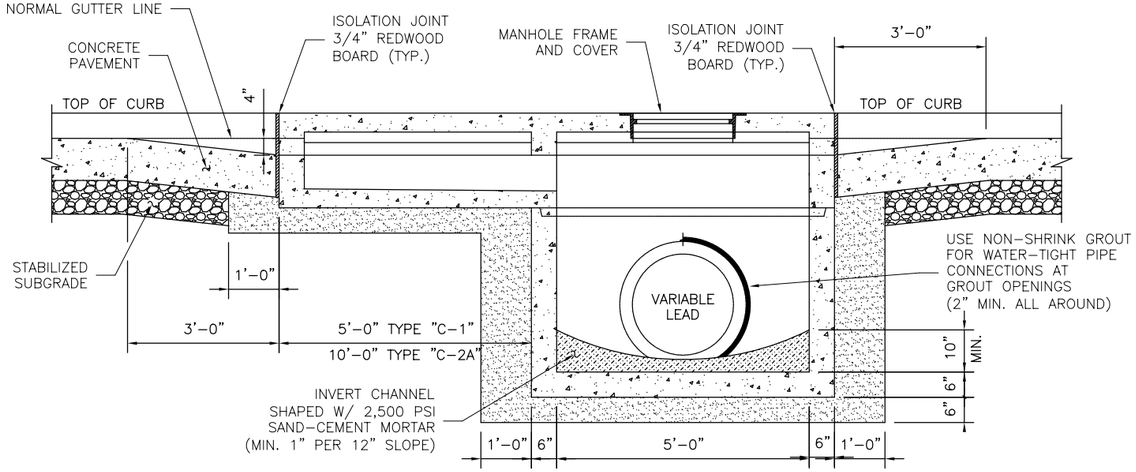


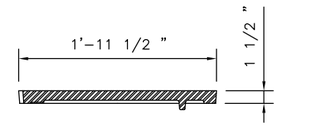
PLAN VIEW



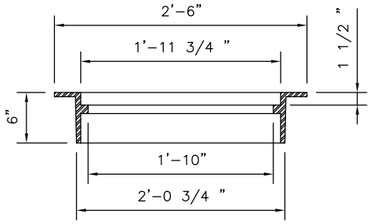
SECTION B-B



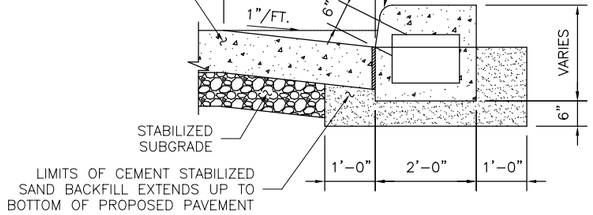
SECTION A-A INLET



COVER SECTION A-A



FRAME SECTION A-A



SECTION C-C

INLET NOTES:

TYPE "C": INLET ONLY – NO EXTENSION
TYPE "C-1": INLET WITH ONE EXTENSION (5'-0" LONG)
TYPE "C-2": INLET WITH ONE EXTENSION (5'-0" LONG) ON EACH SIDE
TYPE "C-2A": INLET WITH ONE DOUBLE EXTENSION (10'-0" LONG) ON ONE SIDE
* FOR TYPE "C-2A" INLETS, PROVIDE A CENTER 6"x6" COLUMN IN THE CURB LINE BETWEEN ALL EXTENSIONS.

GENERAL NOTES:

1. CONSTRUCTION AND MATERIALS SHALL MEET REQUIREMENTS OF ITEM 472 "INLETS".
2. CONCRETE FOR INLET: MINIMUM 4,000 PSI IN 28 DAYS
3. PRECAST STRUCTURE TO MEET ASTM C913.
4. FRAME AND COVER SHALL BE EAST JORDAN IRON WORKS MODEL V-1814 FRAME AND V-1418 COVER OR APPROVED EQUAL.
5. IF THE ENGINEER OF RECORD SPECIFIES A CAST-IN-PLACE INLET, HE/SHE SHALL INCORPORATE A DETAILED DRAWING INTO THE CONTRACT DOCUMENTS. HOWEVER, IF THE CONTRACTOR ELECTS TO CONSTRUCT A CAST-IN-PLACE INLET, THE CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING A DETAILED DRAWING, SIGNED AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS.
6. SHOP DRAWINGS WILL BE REQUIRED FOR THE PRECAST SECTION OF INLET.
7. KNOCK-OUTS ARE NOT PERMISSIBLE FOR THE PRECAST SECTION OF INLET.
8. 5'-6" MINIMUM OR AS SPECIFIED BY THE ENGINEER OF RECORD.

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

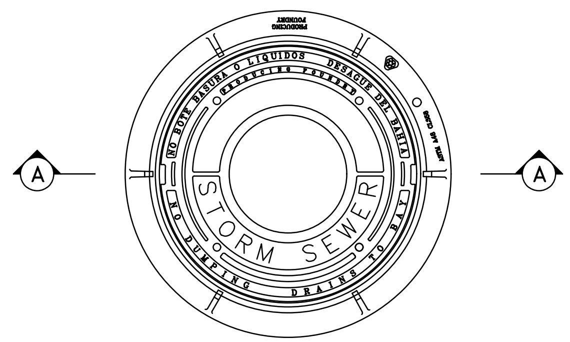
FORT BEND COUNTY ENGINEERING DEPARTMENT

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

PROJECT TITLE:

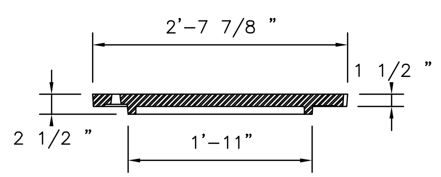
DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: TYPE "C", "C-1", "C-2"	27
SCALE: 1"=1'-6"	AND "C-2A" INLET DETAILS	SHEET NO:
DATE: 2-1-22	APPROVED BY:	59

J:\1704\1601\Fort Bend County Standards\Fort Bend County STD\DONE\FBC MONOLITHIC TYPE C INLET DETAILS\MONOLITHIC_TYPE_C_INLET_DETAILS.dwg

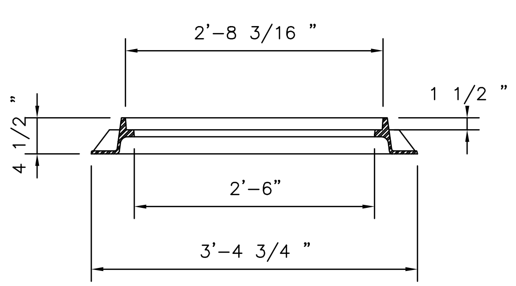


PLAN VIEW
FRAME AND COVER
SCALE: 1" = 1'-0"

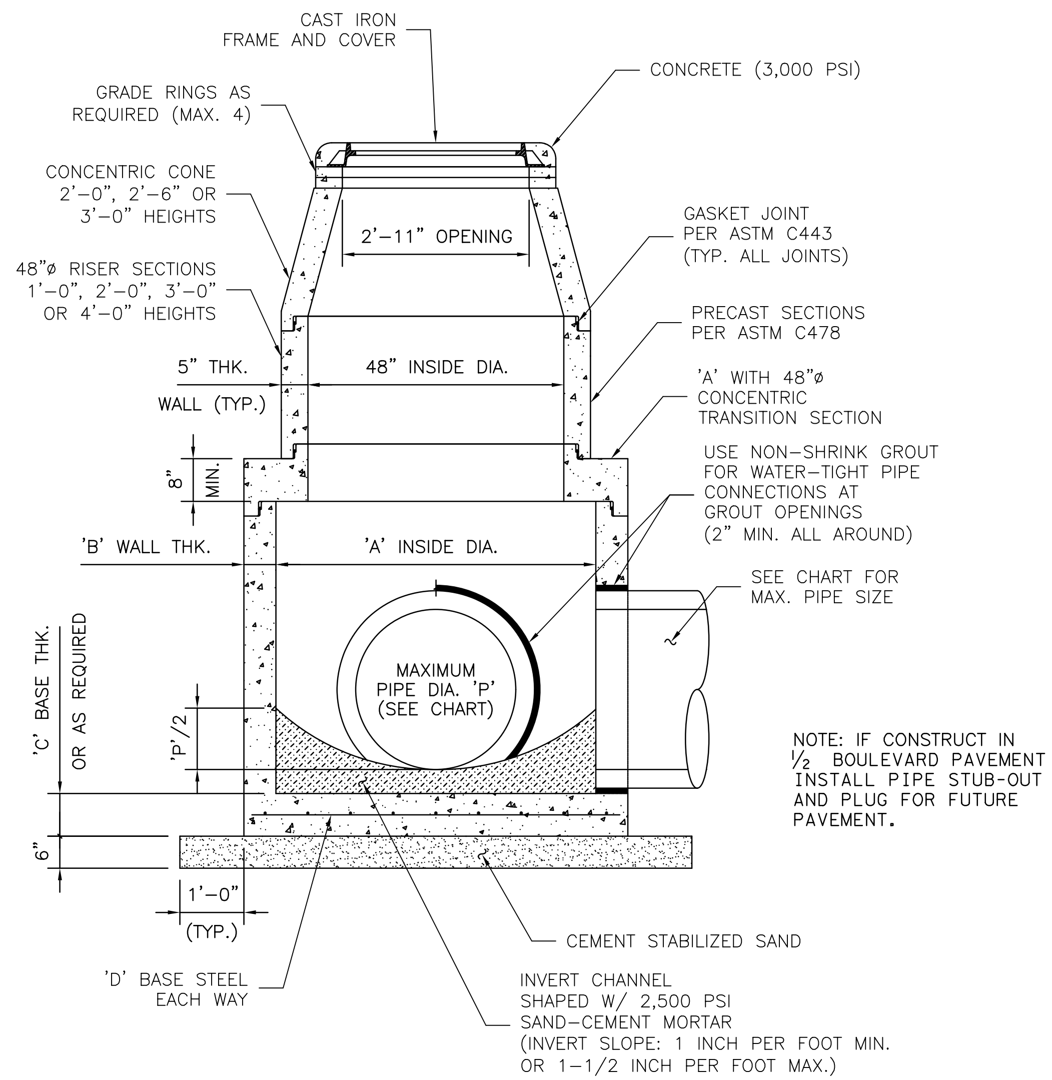
NOTE: IF PROJECT IS WITHIN A CITY ETJ OR CITY LIMITS, USE CITY'S STD MANHOLE COVER



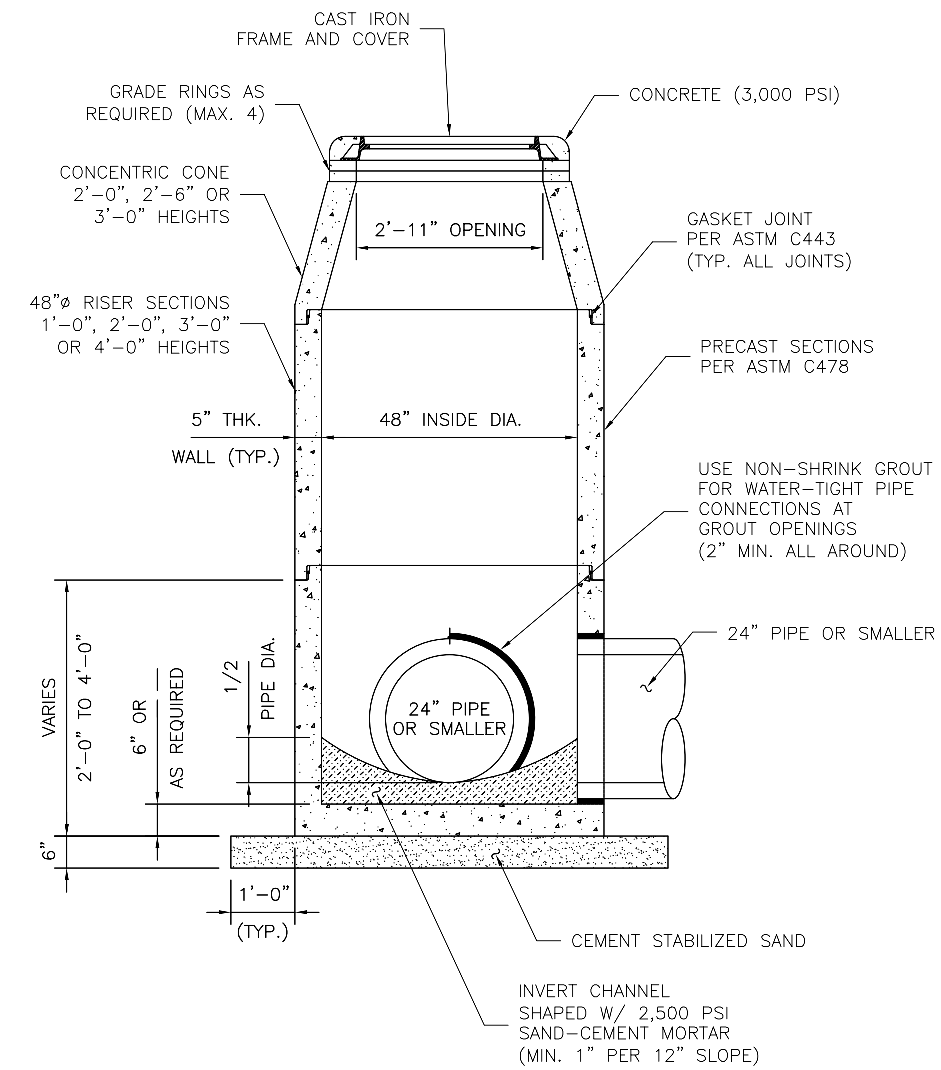
COVER SECTION A-A
SCALE: 1" = 1'-0"



FRAME SECTION A-A
SCALE: 1" = 1'-0"



PRECAST CONCENTRIC MANHOLE
FOR PIPE SIZES GREATER THAN 24"
SCALE: 1" = 1'-6"



48"ø PRECAST CONCENTRIC MANHOLE
FOR PIPE SIZES 24" OR SMALLER
SCALE: 1" = 1'-6"

MAXIMUM PIPE DIA. 'P'	INSIDE DIA. 'A'	WALL THICKNESS 'B'	BASE THICKNESS 'C'	BASE STEEL 'D'
30"	5'-0"	6"	8"	#5 @ 8"
42"	6'-0"	7"	8"	#5 @ 8"
54"	7'-0"	8"	10"	#6 @ 12" (2 LAYERS)
60"	8'-0"	9"	10"	#6 @ 12" (2 LAYERS)

GENERAL NOTES:

1. CONSTRUCTION AND MATERIALS SHALL MEET REQUIREMENTS OF ITEM 471 "PRECAST CONCRETE MANHOLES".
2. CONCRETE FOR MANHOLE: MINIMUM 4,000 PSI IN 28 DAYS
3. HS-20 LOADING; MANHOLE DESIGN SHALL MEET OR EXCEED ASTM C478 REQUIREMENTS.
4. GASKET JOINT: PER ASTM C443
5. FRAME AND COVER SHALL BE EAST JORDAN IRON WORKS MODEL V-1420 OR APPROVED EQUAL.
6. SHOP DRAWINGS WITH MANUFACTURER'S CERTIFICATION SHALL BE SUBMITTED FOR ENGINEER'S APPROVAL.

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

FORT BEND COUNTY
ENGINEERING DEPARTMENT

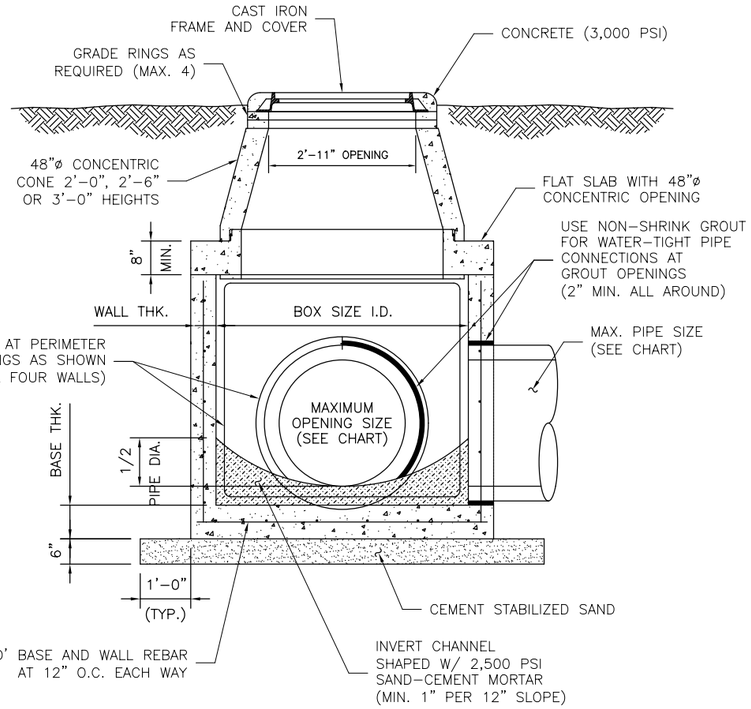
THE STATE OF TEXAS — FORT BEND COUNTY

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

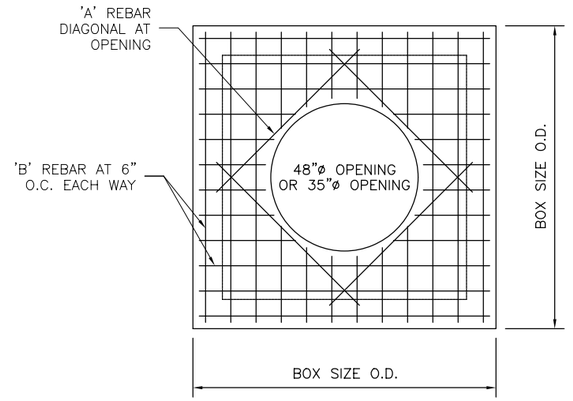
PROJECT TITLE:
DRAWN BY: INIT
CK'D BY: INIT
SHEET DESCRIPTION: PRECAST CONCRETE STORM SEWER MANHOLE DETAILS
SCALE: AS NOTED
DATE: 2-1-22
APPROVED BY:
FBCED STANDARD 20
SHEET NO: 60

BOX SIZE I.D.	MAX. OPENING SIZE	FLAT SLAB THK.	WALL THK.	BASE THK.	BAR 'A'	BAR 'B'	BAR 'C'	*BAR 'D'
4'X4'	48"	8"	6"	6"	#4	#4	#4	#4
5'X5'	60"	10"	6"	8"	#5	#5	#4	#4
6'X6'	72"	10"	8"	8"	#5	#5	#5	#5
7'X7'	84"	10"	8"	8"	#5	#5	#5	#5
8'X8'	96"	10"	8"	8"	#5	#5	#5	#5

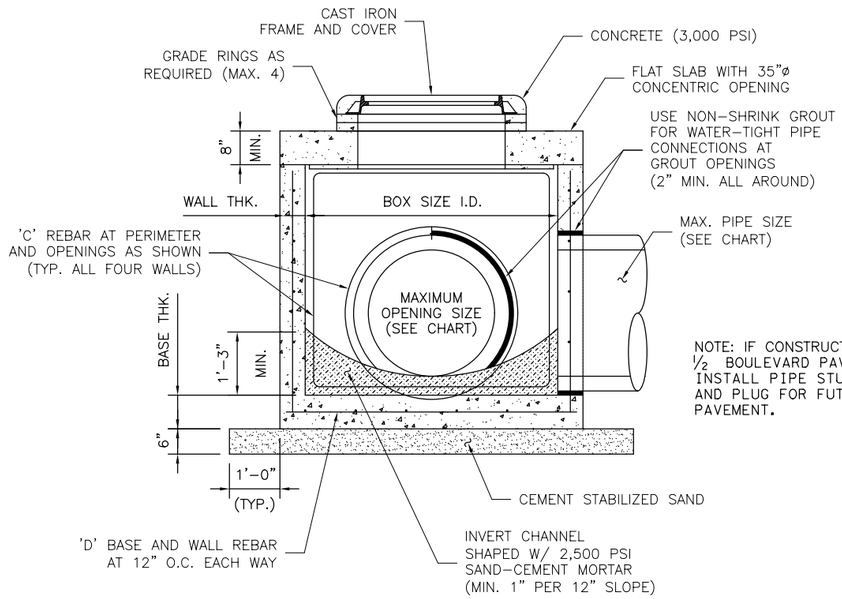
* FOR 7'X7' AND 8'X8' BOX SIZE: TWO LAYERS OF STEEL REQUIRED. (FOR DEPTHS GREATER THAN 15')



JUNCTION BOX/MANHOLE
WITH CONCENTRIC CONE
SCALE: 1"=1'-6"

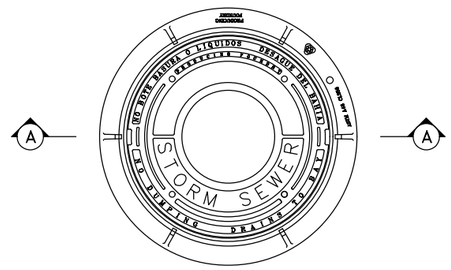


PLAN VIEW
FLAT SLAB WITH OPENING
SCALE: 1"=1'-6"



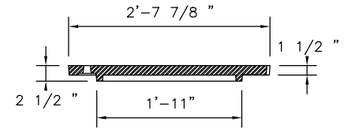
NOTE: IF CONSTRUCT IN ½ BOULEVARD PAVEMENT INSTALL PIPE STUB-OUT AND PLUG FOR FUTURE PAVEMENT.

JUNCTION BOX/MANHOLE
WITH FLAT SLAB
SCALE: 1"=1'-6"

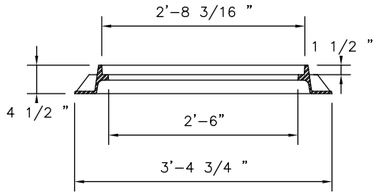


PLAN VIEW
FRAME AND COVER
SCALE: 1"=1'-0"

NOTE: IF PROJECT IS WITHIN A CITY ETJ USE CITY'S STD MANHOLE COVER



COVER SECTION A-A
SCALE: 1"=1'-0"



FRAME SECTION A-A
SCALE: 1"=1'-0"

GENERAL NOTES:

1. CONSTRUCTION AND MATERIALS SHALL MEET REQUIREMENTS OF ITEM 471 "PRECAST CONCRETE MANHOLES".
2. CONCRETE FOR JUNCTION BOX: MINIMUM 4,000 PSI IN 28 DAYS
3. HS-20 LOADING; MANHOLE DESIGN SHALL MEET OR EXCEED ASTM C478 AND ASTM C913 REQUIREMENTS.
4. JOINT SEALANT: RAM-NEK GASKET MATERIAL
5. FRAME AND COVER SHALL BE EAST JORDAN IRON WORKS MODEL V-1420 OR APPROVED EQUAL.
6. SHOP DRAWINGS WITH MANUFACTURER'S CERTIFICATION SHALL BE SUBMITTED FOR ENGINEER'S APPROVAL.

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

FORT BEND COUNTY ENGINEERING DEPARTMENT

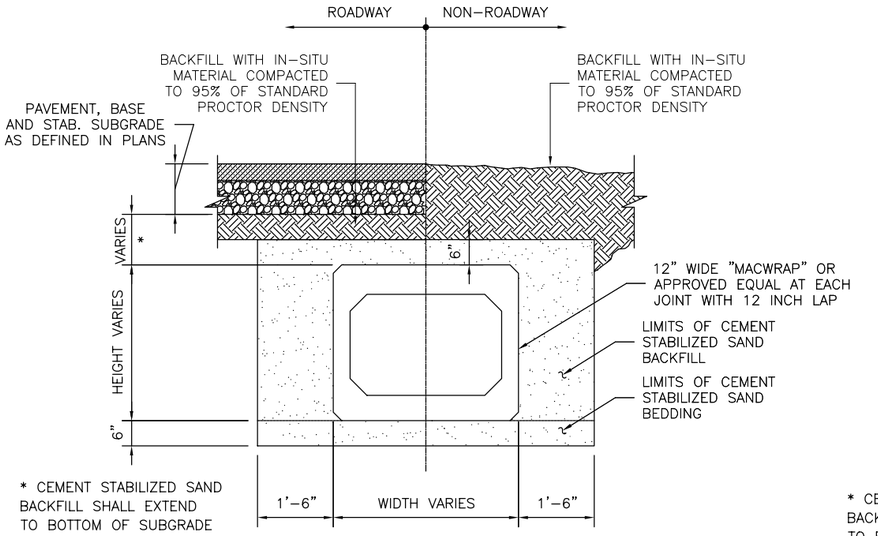
BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

PROJECT TITLE:

DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: JUNCTION BOX/ MANHOLE	21
SCALE: AS NOTED	DETAILS	SHEET NO:
DATE: 2-1-22	APPROVED BY:	61

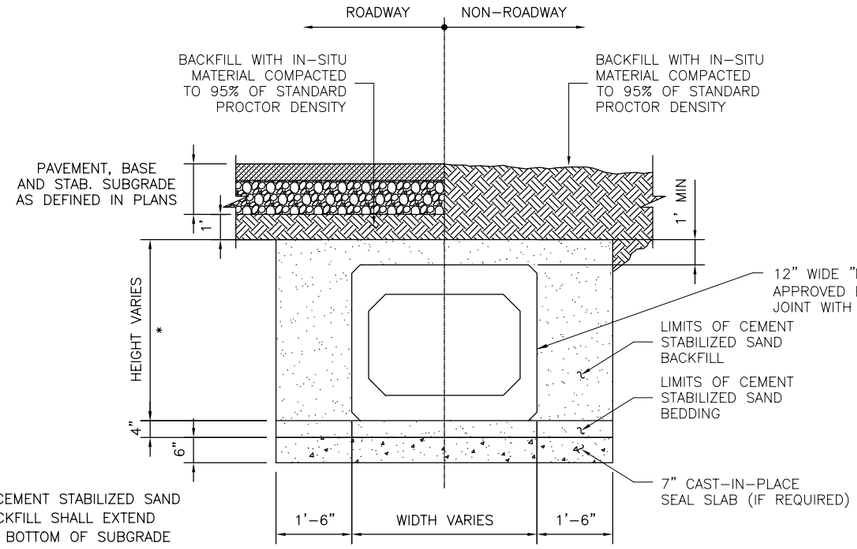
J:\1704\601\Fort Bend County Standards\Fort Bend County STD\DONE\FBC PRECAST CONCRETE JUNCTION BOX_MANHOLE_DETAILS.dwg

JUNCTION BOX MANHOLE DETAIL\PRECAST_CONCRETE_JUNCTION_BOX_MANHOLE_DETAILS.dwg



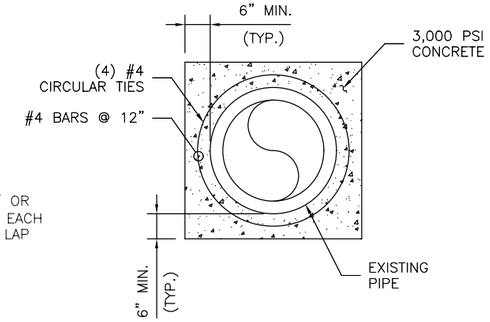
* CEMENT STABILIZED SAND BACKFILL SHALL EXTEND TO BOTTOM OF SUBGRADE ON ALL PIPE OR BOXES UNDERNEATH PAVEMENT OR WITHIN 2' BACK OF CURB.

PRECAST REINFORCED CONCRETE BOX

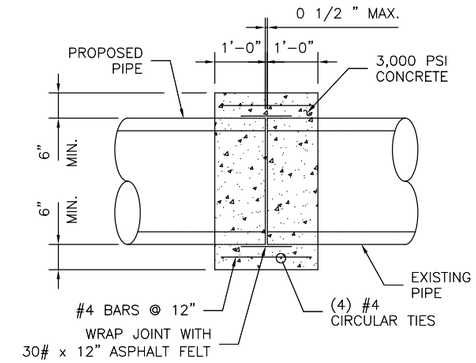


* CEMENT STABILIZED SAND BACKFILL SHALL EXTEND TO BOTTOM OF SUBGRADE ON ALL PIPE OR BOXES UNDERNEATH PAVEMENT OR WITHIN 2' BACK OF CURB.

PRECAST REINFORCED CONCRETE BOX WITH SEAL SLAB

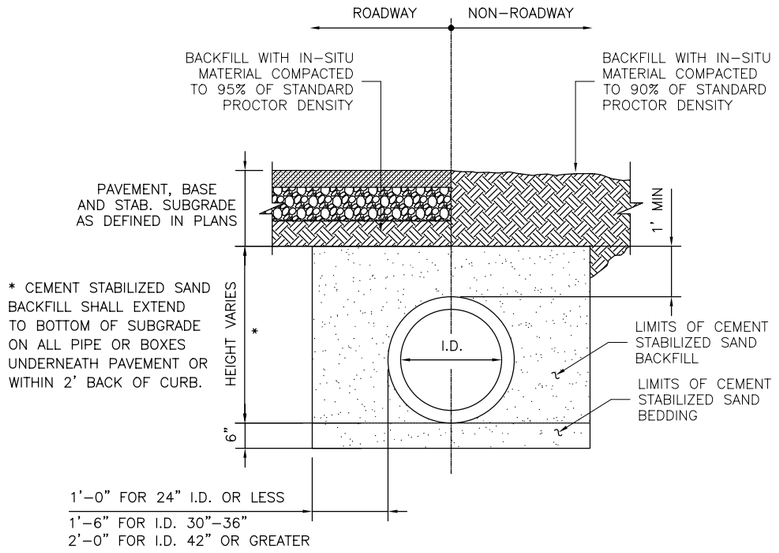


SECTION VIEW

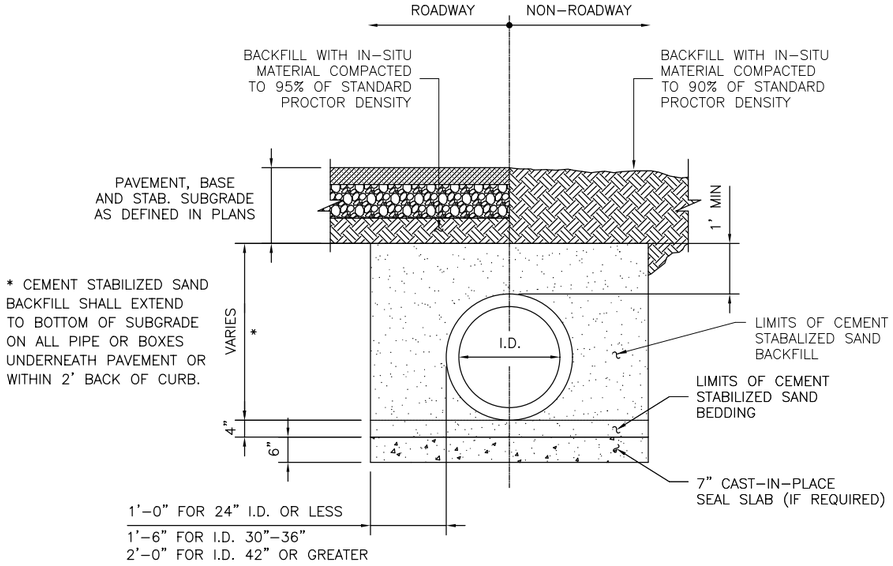


ELEVATION VIEW

TYPICAL CONCRETE COLLAR FOR 36" & SMALLER RCP



REINFORCED CONCRETE PIPE



REINFORCED CONCRETE PIPE WITH SEAL SLAB

GENERAL NOTES:

1. FOR RCP LARGER THAN 36" DIAMETER, CONCRETE COLLARS MUST BE DESIGNED BY THE ENGINEER OF RECORD.
2. ALL TRENCHES IN ROW SHALL BE BACKFILLED WITH 1.5 SACK CEMENT STABILIZED SAND TO WITHIN 1' OF SUBGRADE. COMPACTED TO 95% STANDARD PROCTOR DENSITY

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2–1–22	RJS

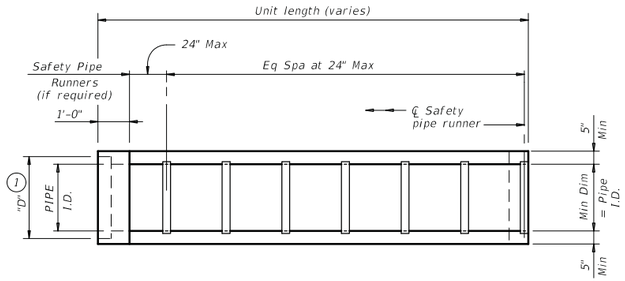
FORT BEND COUNTY ENGINEERING DEPARTMENT

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

PROJECT TITLE:

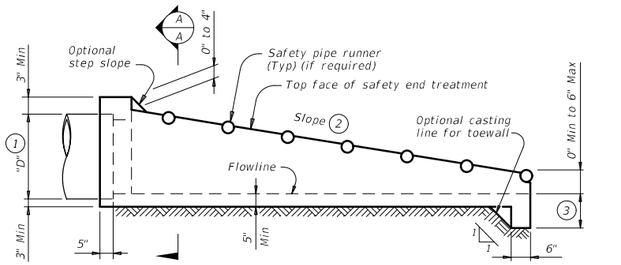
DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: STORM SEWER CONSTRUCTION	18
SCALE: 1"=1'–6"	DETAILS	SHEET NO:
DATE: 2–1–22	APPROVED BY:	62

J:\1704\1601\Fort Bend County Standards\Fort Bend County STD\DONE\FBC STORM SEWER CONSTRUCTION DETAILS\STORM_SEWER_CONSTRUCTION_DETAILS.dwg



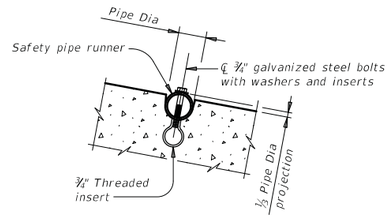
PLAN

(Showing bell end connection.)



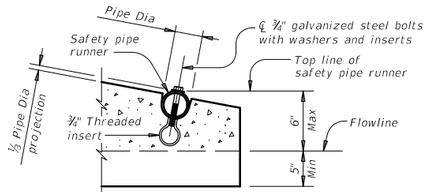
LONGITUDINAL ELEVATION

(Showing bell end connection.)

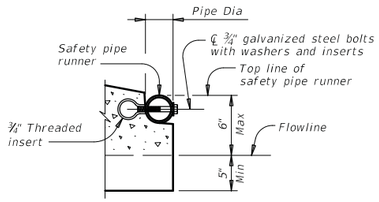


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



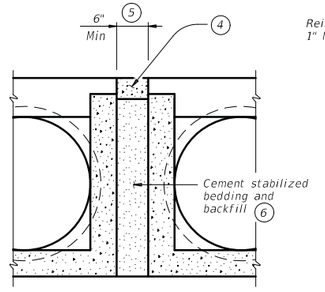
OPTION A



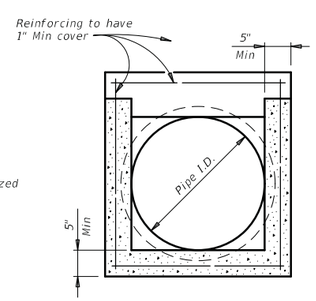
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

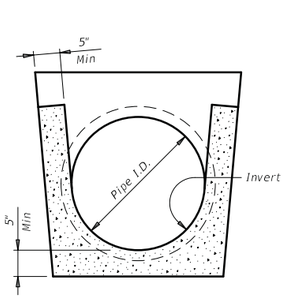
(If required)



MULTIPLE PIPE INSTALLATION

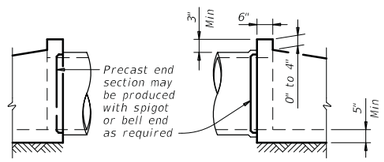


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



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" (1)	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 ¼"	1.30"	20.50"	6:1	6' - 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	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 ½"	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 ½"	N/A	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 PBGC standard for grouted connections with TP and precast safety end treatment.

REV	DATE	BY	DESCRIPTION

HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

DRAINAGE STANDARDS

SHEET 6 OF 7

Texas Department of Transportation — Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

FILE: psetspss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	63

FILENAME: G:\TXH\Projects\Fort_Bend_County\69740-00 FBC Intersections\03_CADD\06-DRNG\PSET-SP_RDBT.dgn
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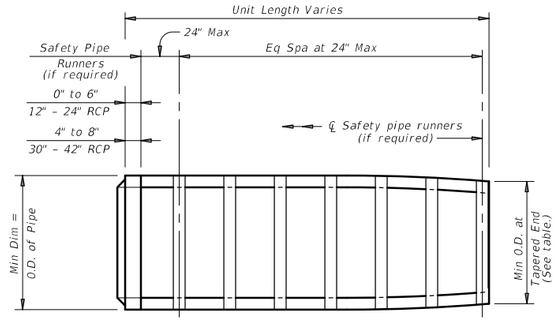
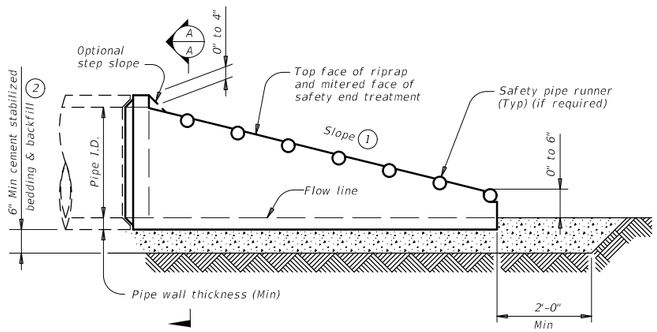


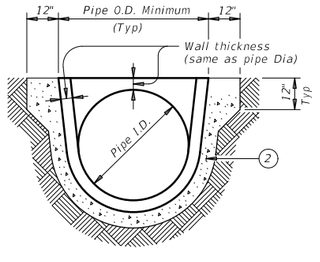
PLAN VIEW - 12" THRU 24"

(Showing spigot end connection.)

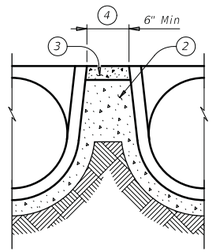


LONGITUDINAL ELEVATION - 12" THRU 24"

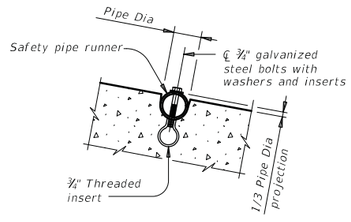
(Showing spigot end connection.)



SECTION A-A

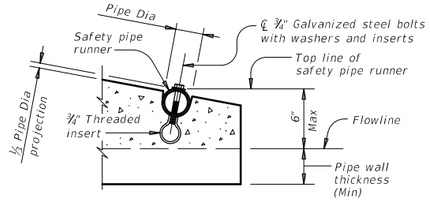


MULTIPLE PIPE INSTALLATION

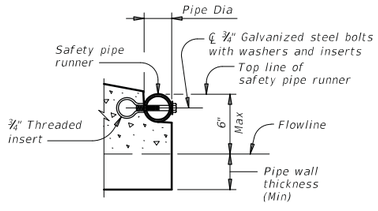


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



OPTION A



OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

(1) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

Provide cement stabilized bedding and backfill in accordance with the Item, "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.

(3) 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".

(4) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(5) Safety pipe runners are required for multiple pipe culverts with more than two pipes.

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. per ft. of Pipe)	Max Slope	Min Length of Unit	Pipe Runner Requirements		Required Pipe Runner Sizes		
							Single Pipe	Multiple Pipe	Nominal Dia	O.D.	I.D.
12"	2"	16"	16"	0.07 Circ.	6:1	4' - 0"	No	(5)	3" STD	3.500"	3.068"
15"	2 ¼"	19 ½"	19"	0.07 Circ.	6:1	5' - 8"	No	(5)	3" STD	3.500"	3.068"
18"	2 ½"	23"	21 ½"	0.07 Circ.	6:1	7' - 3"	No	(5)	3" STD	3.500"	3.068"
24"	3"	30"	27"	0.07 Circ.	6:1	10' - 6"	No	(5)	3" STD	3.500"	3.068"
30"	3 ½"	37"	31"	0.18 Circ.	6:1	12' - 1"	No	Yes	4" STD	4.500"	4.026"
36"	4"	44"	36"	0.19 Ellip.	6:1	15' - 4"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	51"	41 ½"	0.23 Ellip.	6:1	18' - 7"	Yes	Yes	4" STD	4.500"	4.026"

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 meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Galvanize steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP) may be used for TYPE II end treatment as specified in Item 467, "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.

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading and installation.

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.

DATE:
FILE:

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/7/2022

Texas Department of Transportation | Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-RP

FILE: psetrpss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY		SHEET NO.

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

DRAINAGE STANDARDS

SHEET 7 OF 7

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	64

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 http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

SHEET 1 OF 12

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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4-03 7-13	DIST	COUNTY		SHEET NO.
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5-10 5-21				

95

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS — HARRISON THAI — 129438 — LICENSED PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
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OLD RICHMOND RD

TCP STANDARDS

SHEET 1 OF 19

DESIGNED BY:	
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DATE:	
SHEET NO:	65

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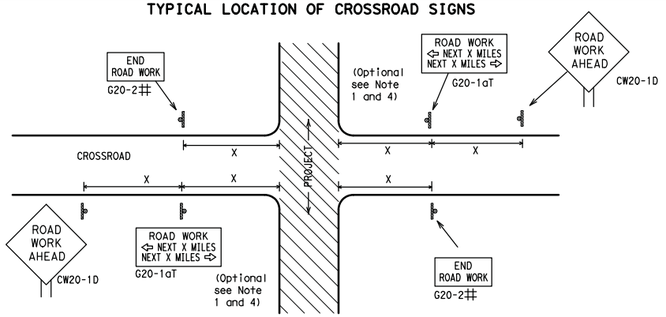
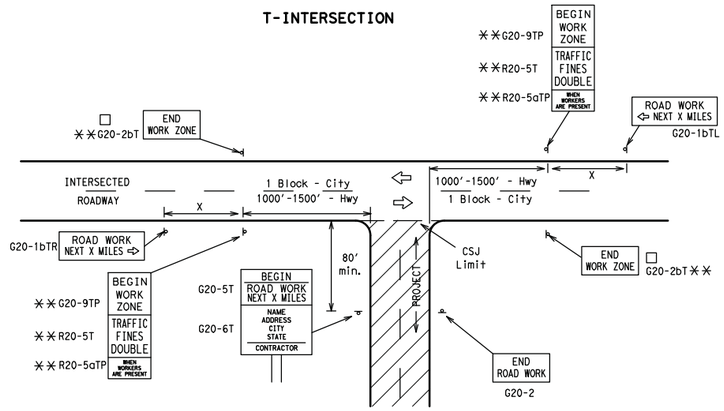
TYPICAL LOCATION OF CROSSROAD SIGNS



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[1,5,6]

SIZE

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4], CW21, CW22, CW23, CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign △ Spacing "X"
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
✳	✳[3]

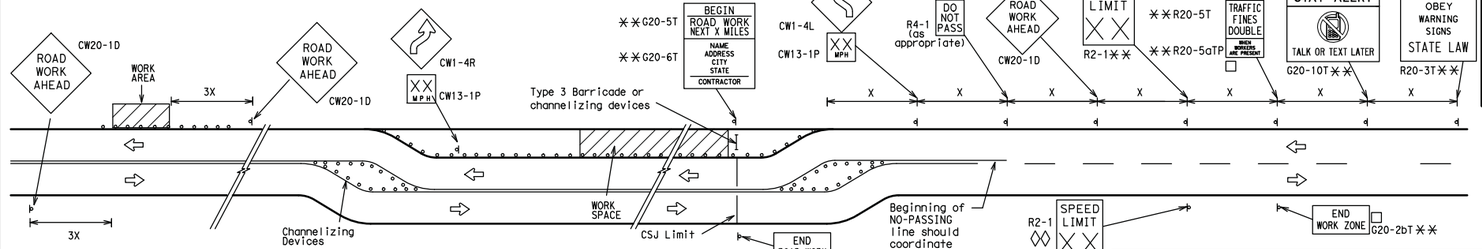
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

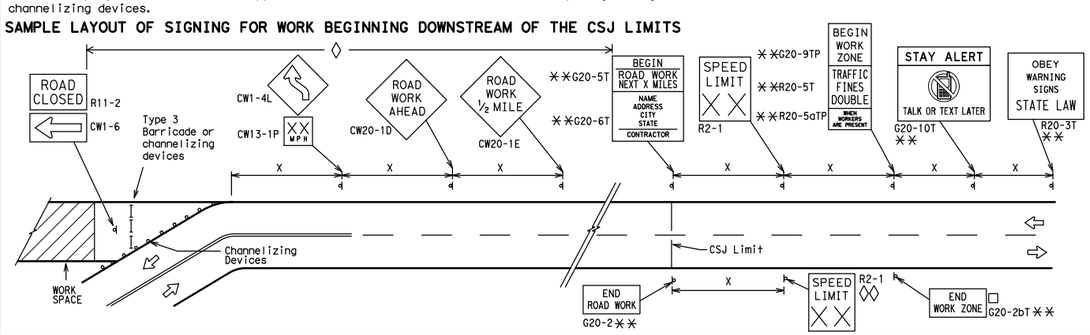
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may 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



When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

☐ 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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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STATE OF TEXAS — HARRISON THAI — 129438 — LICENSED PROFESSIONAL ENGINEER
2/7/2022

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TCP STANDARDS

SHEET 2 OF 19

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SHEET NO:	66

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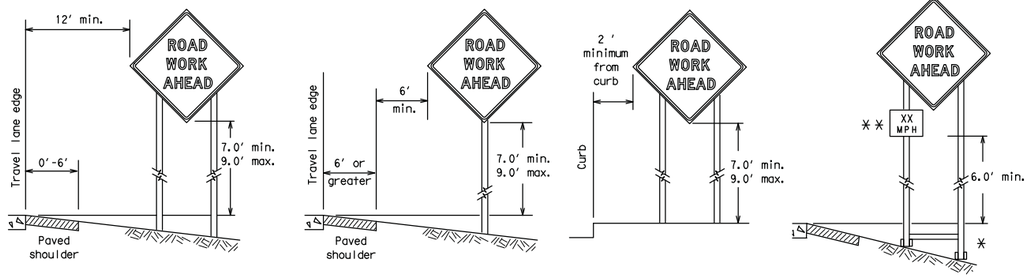
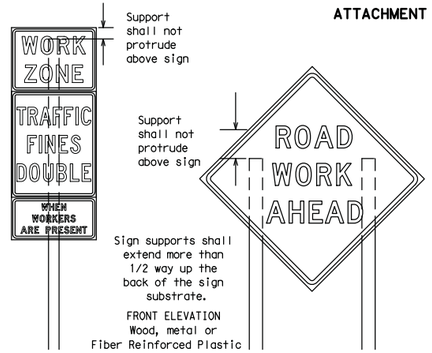
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



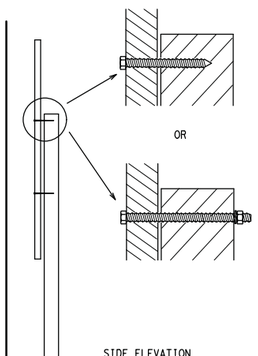
⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ 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 parent sign.

ATTACHMENT FOR SIGN SUPPORTS



Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

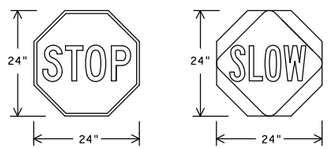


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
2. STOP/SLOW paddles shall be retroreflectorized when used at night.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} 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

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, 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.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. 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.
5. 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.
6. 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

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs 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.
6. 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.
7. 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.
8. 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.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. 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.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. 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.
3. 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.
4. 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.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. 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.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

SHEET 4 OF 12

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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STATE OF TEXAS
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129438
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TCP STANDARDS

SHEET 3 OF 19

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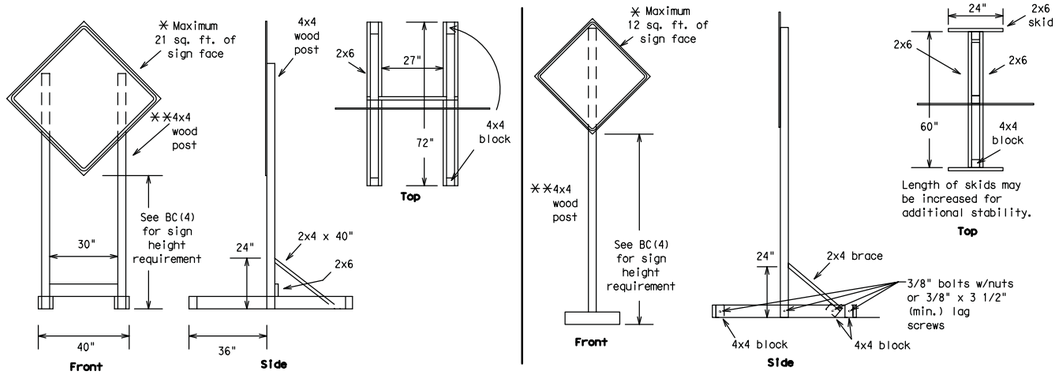
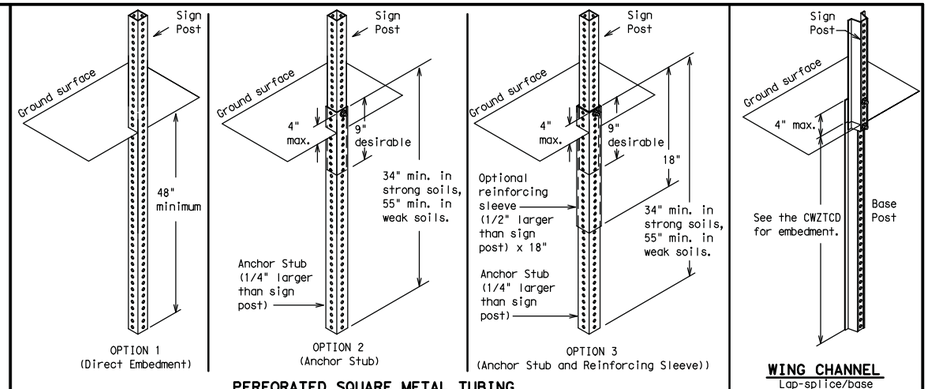


SKID MOUNTED WOOD SIGN SUPPORTS

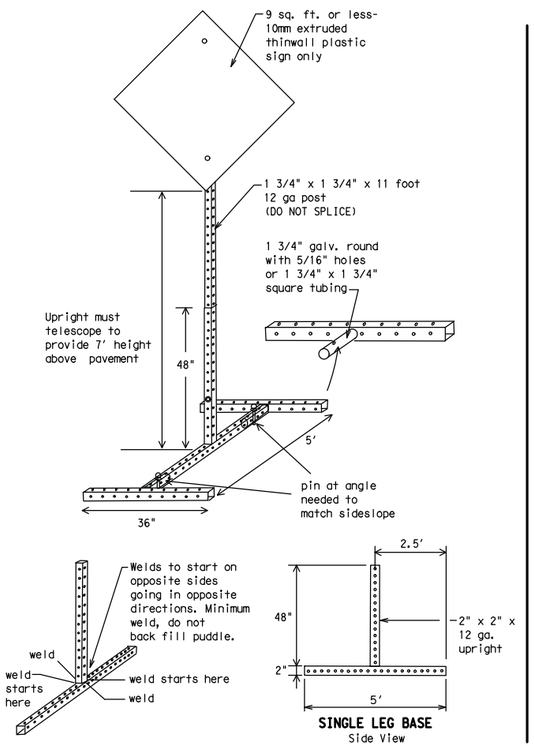
*** LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS**

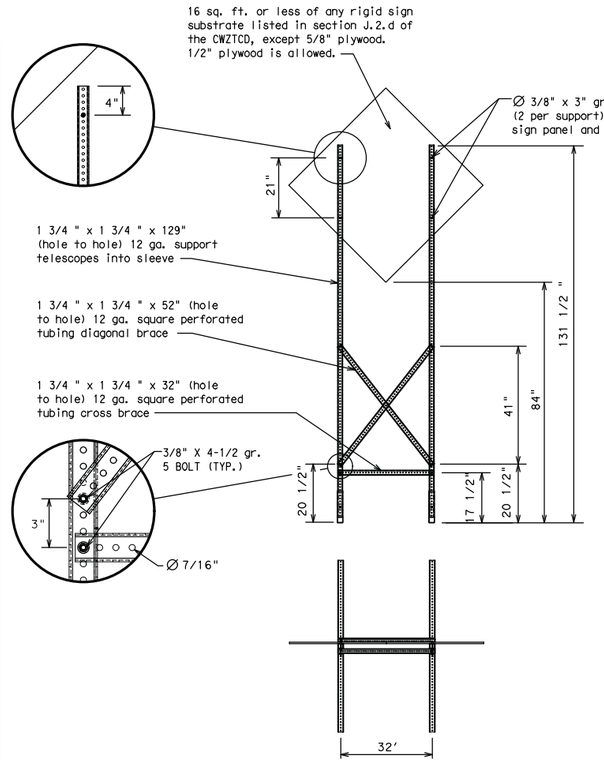


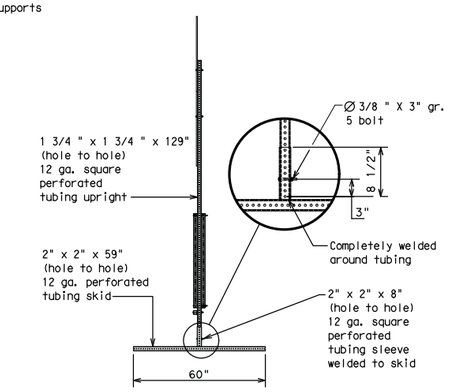
PERFORATED SQUARE METAL TUBING

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.

SHEET 5 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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99

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STATE OF TEXAS
HARRISON THAI
129438
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PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
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Tel: 281-558-8700 • www.bgeinc.com
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OLD RICHMOND RD

TCP STANDARDS

SHEET 4 OF 19

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	68

GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. 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:

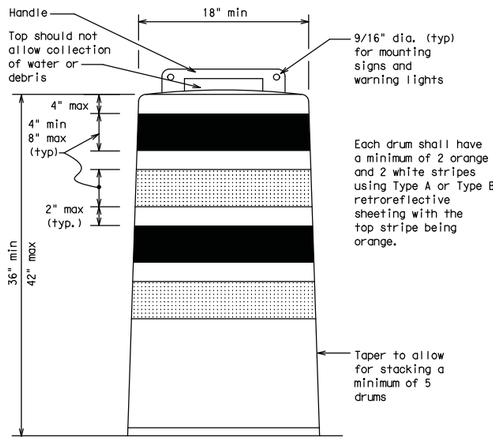
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

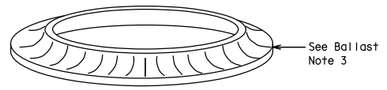
RETROREFLECTIVE SHEETING

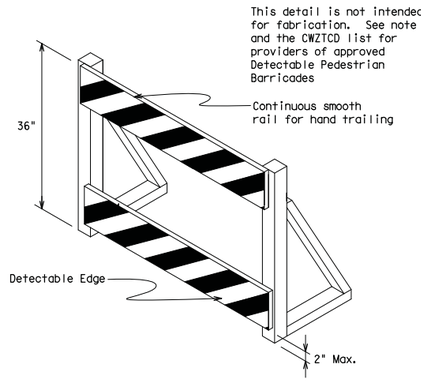
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
2. 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.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.

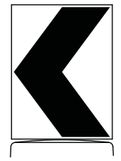




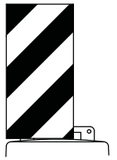


DETECTABLE PEDESTRIAN BARRICADES

1. 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.
2. 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.
3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades 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

1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
3. 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.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

SHEET 8 OF 12

Texas Department of Transportation | *Traffic Safety Division Standard*

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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REVISIONS				
4-03 8-14	DIST	COUNTY		SHEET NO.
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STATE OF TEXAS
HARRISON THAI
129438
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OLD RICHMOND RD

TCP STANDARDS

SHEET 5 OF 19

DESIGNED BY:	
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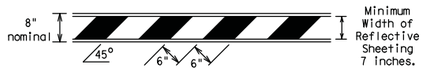
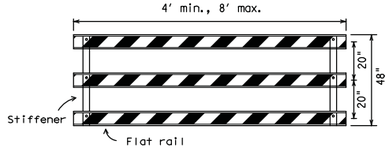
TYPE 3 BARRICADES

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. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for 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.

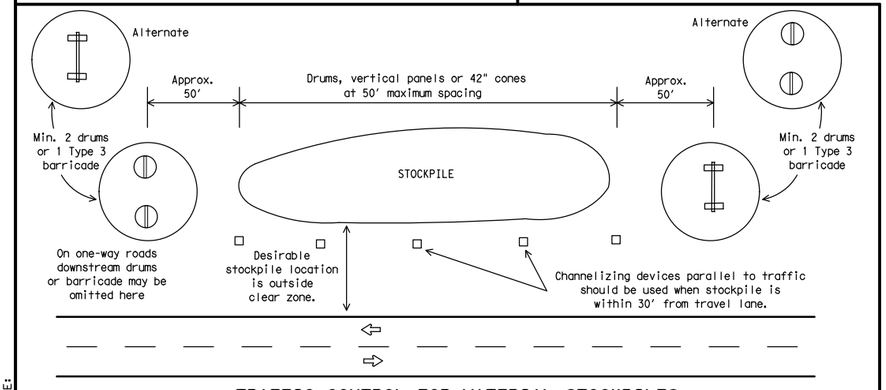


TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



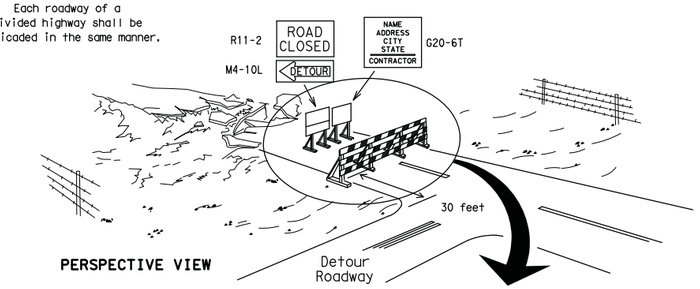
Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



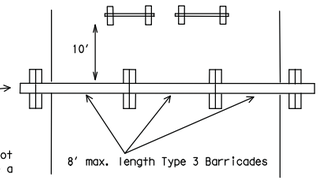
TRAFFIC CONTROL FOR MATERIAL STOCKPILES

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

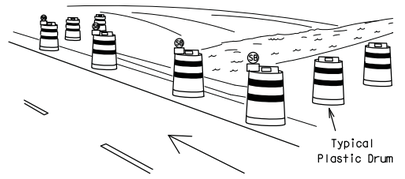
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



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.

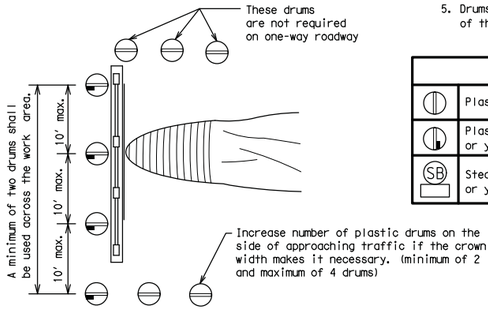
PLAN VIEW

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

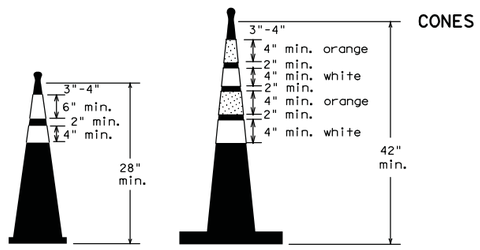
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

PLAN VIEW

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.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers 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.

Texas Department of Transportation | *Traffic Safety Division Standard*

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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STATE OF TEXAS
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2/7/2022

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TCP STANDARDS

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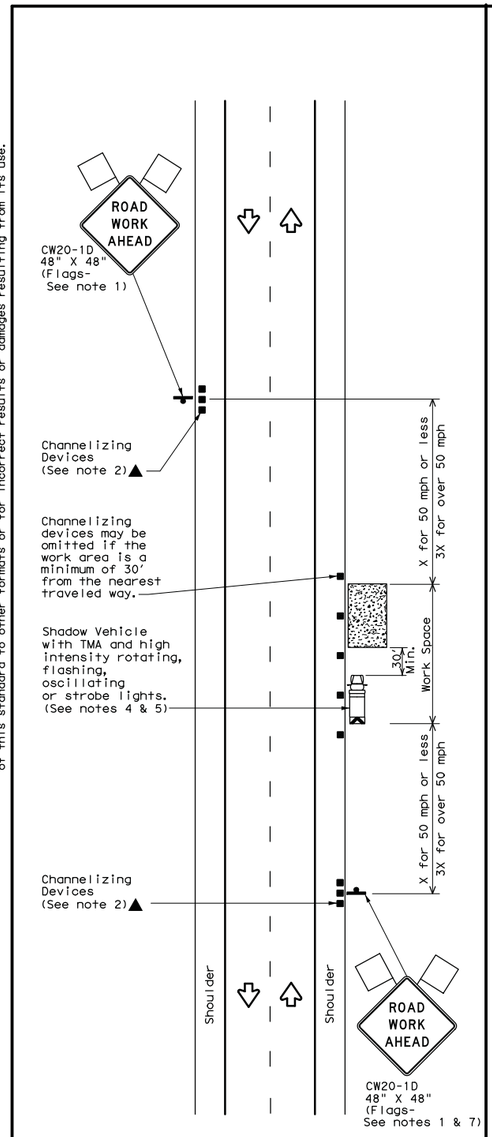
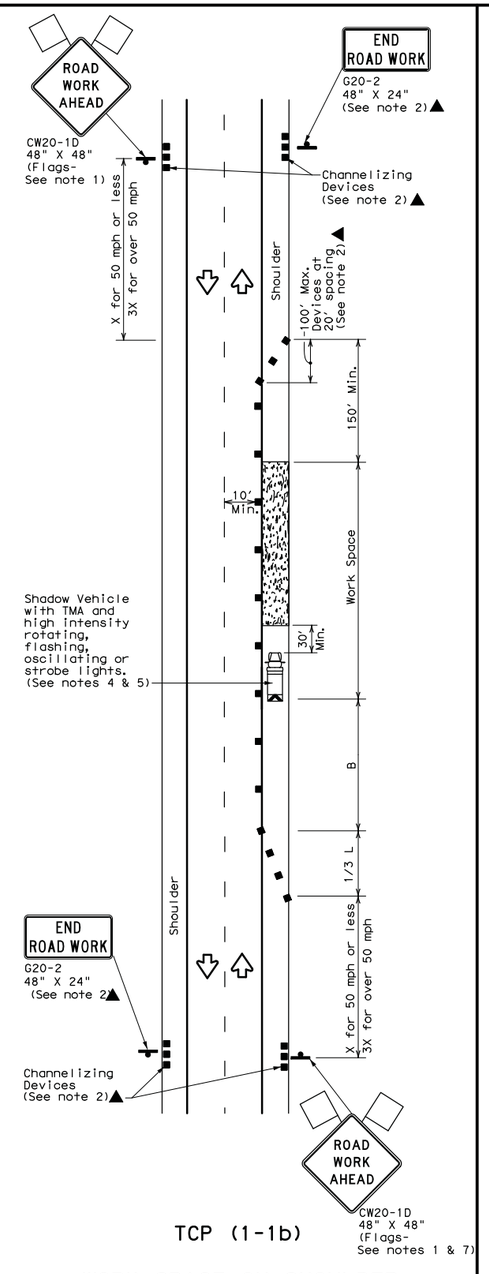


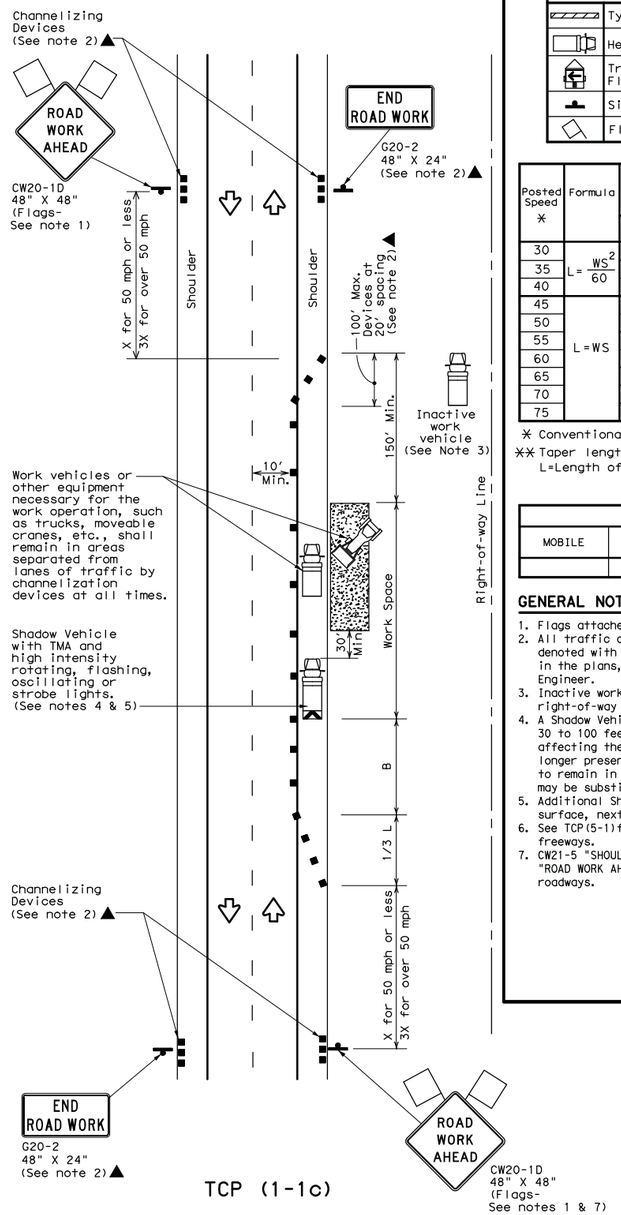
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	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

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. 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.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. See TCP(5-1)for shoulder work on divided highways, expressways and freeways.
7. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
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2/7/2022

FORT BEND COUNTY
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BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
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OLD RICHMOND RD

TCP STANDARDS

SHEET 7 OF 19

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

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8-95 2-12				
1-97 2-18				

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DRAWN BY:	
DATE:	
SHEET NO:	71

DATE:
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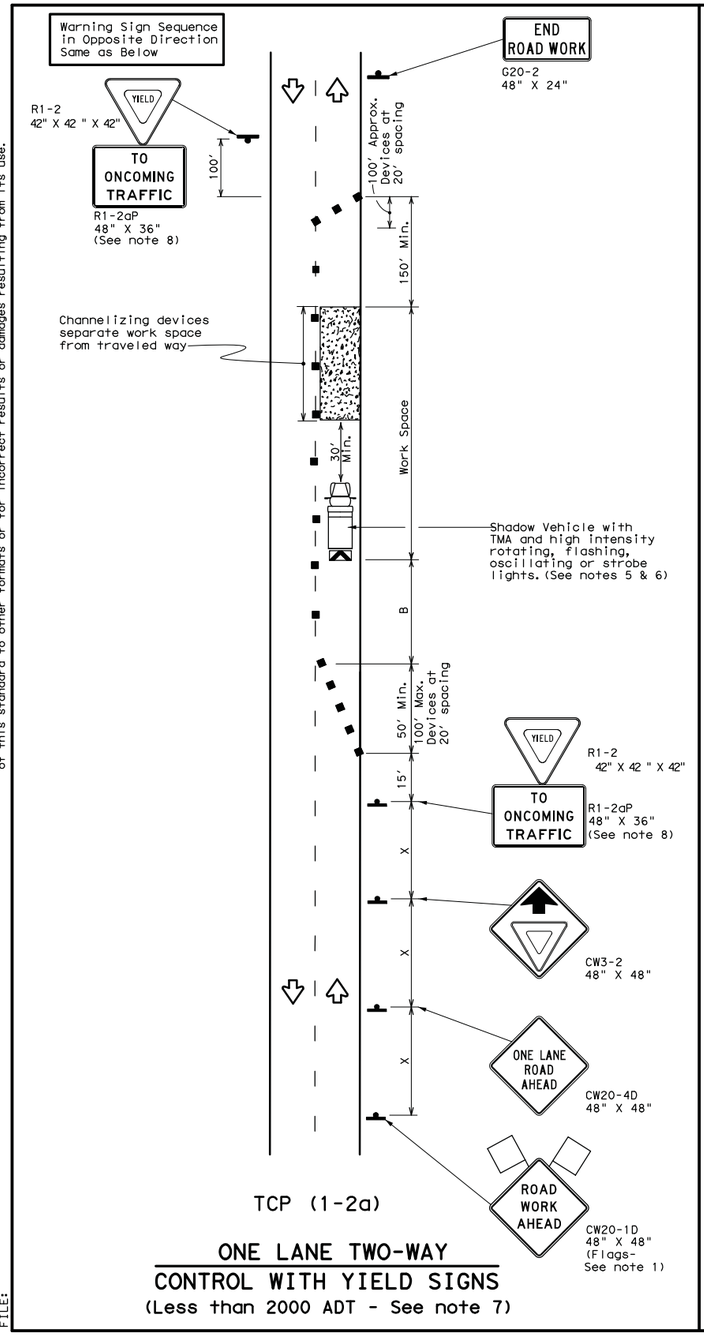
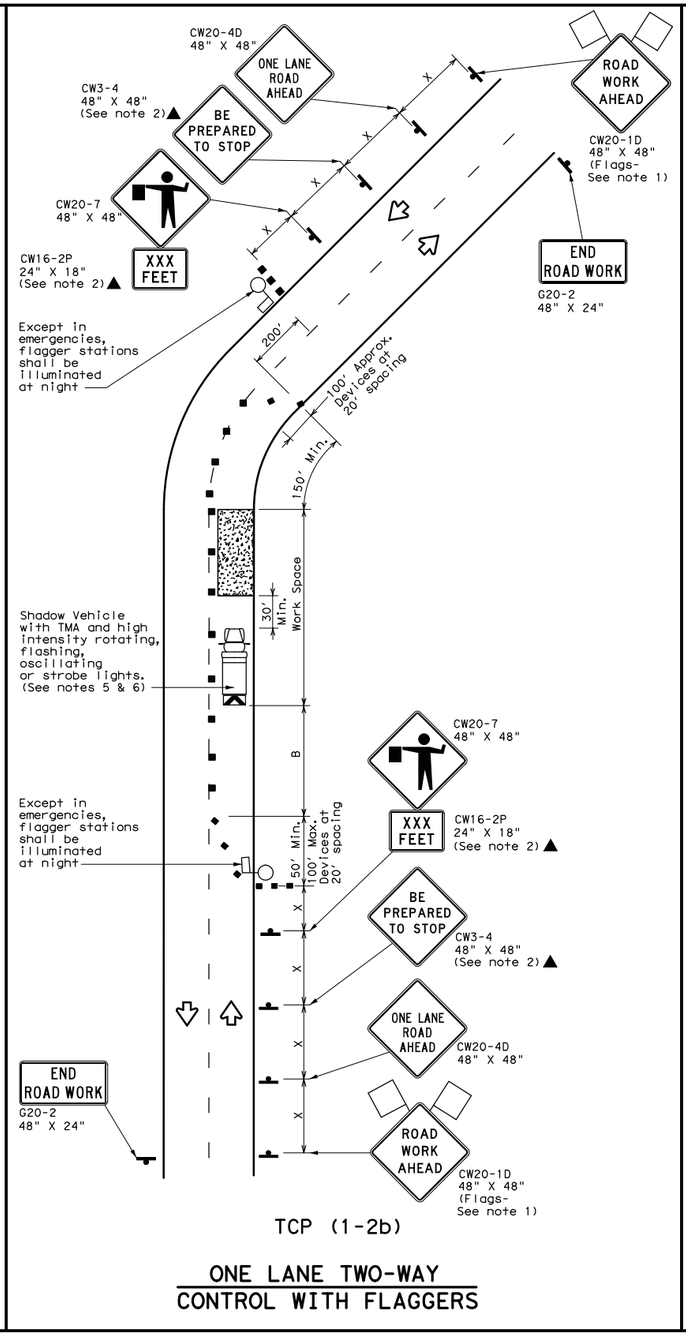


TCP (1-2a)

ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

LEGEND

	Type 3 Barricade	■ ■	Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L=WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* Conventional Roads Only
** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
4. Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
5. 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.
6. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-2a)

7. R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
8. R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.

TCP (1-2b)

9. Flaggers should use two-way radios or other methods of communication to control traffic.
10. Length of work space should be based on the ability of flaggers to communicate.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
12. Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
13. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Texas Department of Transportation | Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS				
4-90 4-98	DIST	COUNTY		SHEET NO.
2-94 2-12				
1-97 2-18				

152

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TCP STANDARDS

SHEET 8 OF 19

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	72

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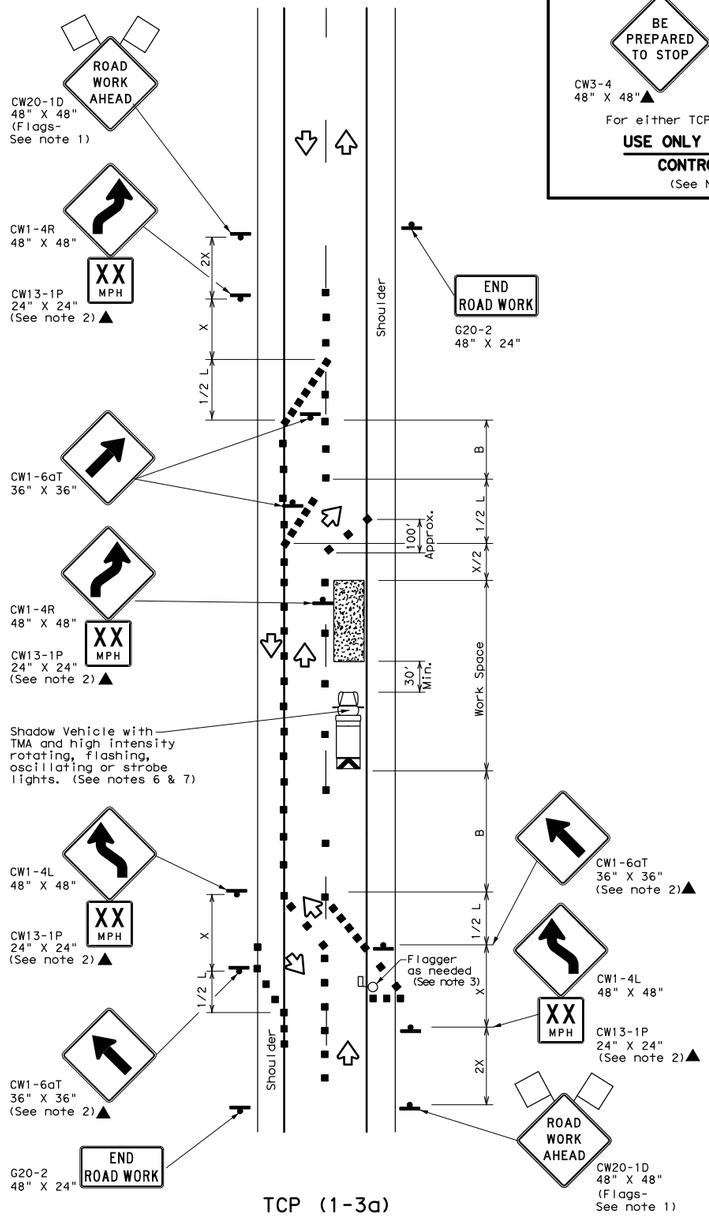
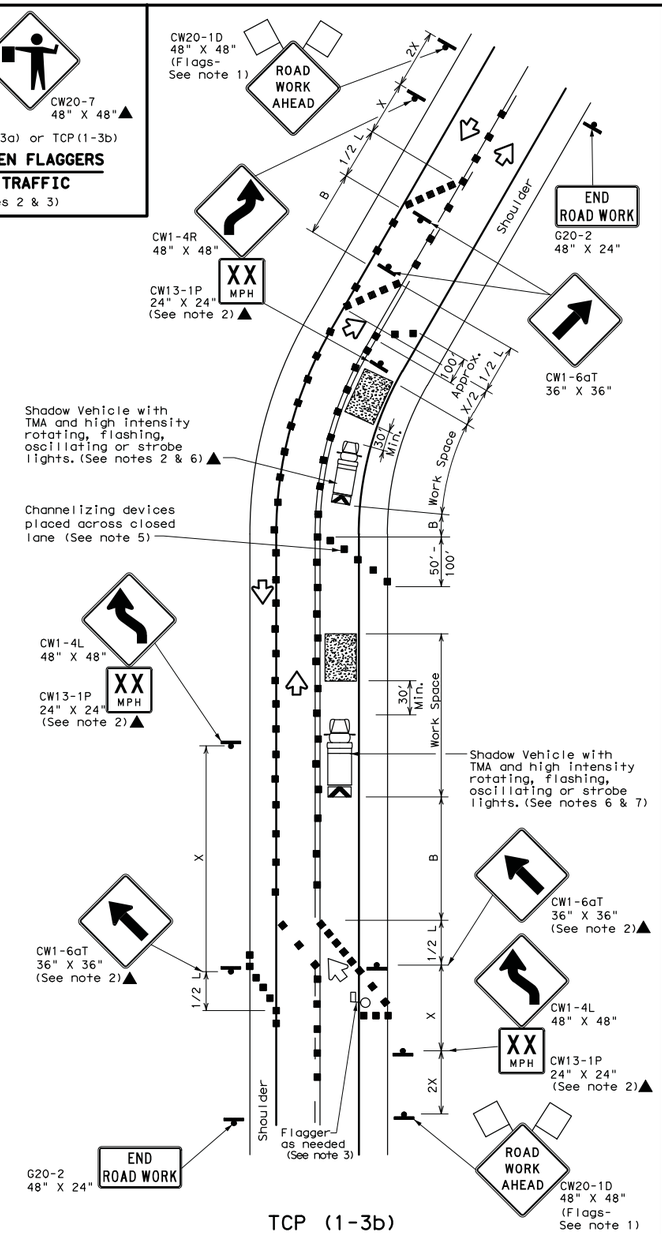


TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW

BE PREPARED TO STOP
CW3-4 48" X 48"
CW20-7 48" X 48"
For either TCP(1-3a) or TCP(1-3b)

USE ONLY WHEN FLAGGERS
CONTROL TRAFFIC
(See Notes 2 & 3)



TCP (1-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	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

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
8. 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 speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device 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 TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12				
1-97 2-18				

153

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TCP STANDARDS

SHEET 9 OF 19

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	73

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2/7/2022 9:35:39 AM

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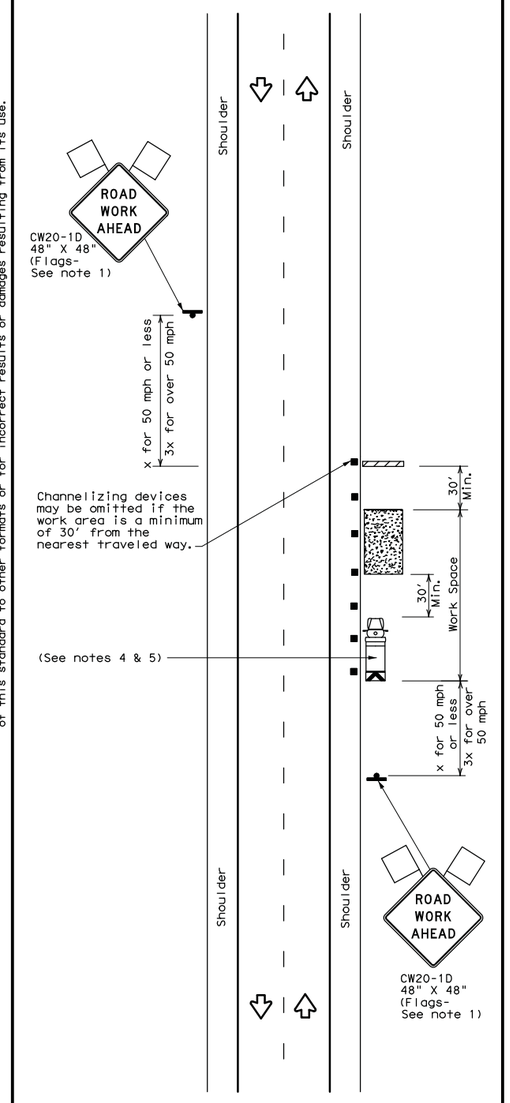
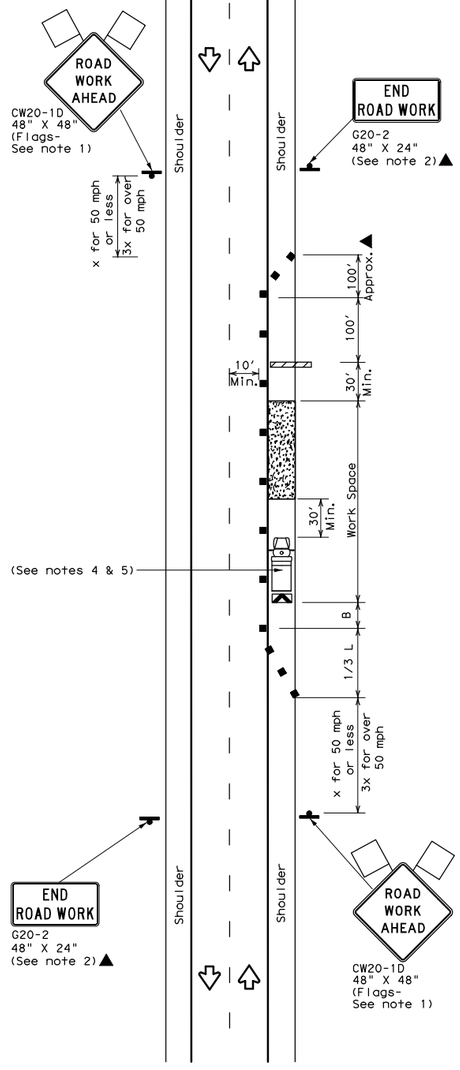


TCP (2-1a)

WORK SPACE NEAR SHOULDER

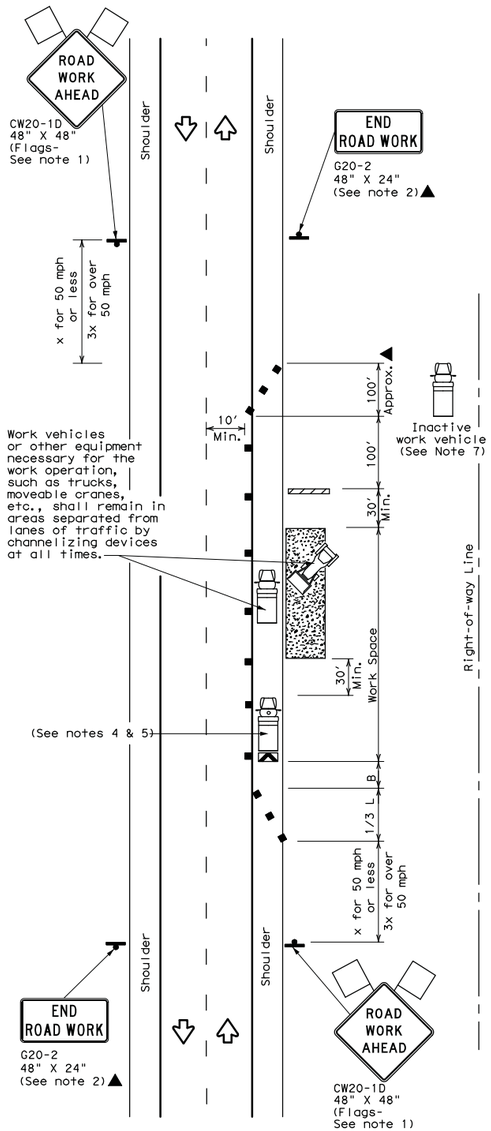
Conventional Roads



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	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	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

1. Flags attached to signs where shown, are REQUIRED.
2. 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.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. 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 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.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. 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

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12				
1-97 2-18				

161

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TCP STANDARDS

SHEET 10 OF 19

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	74

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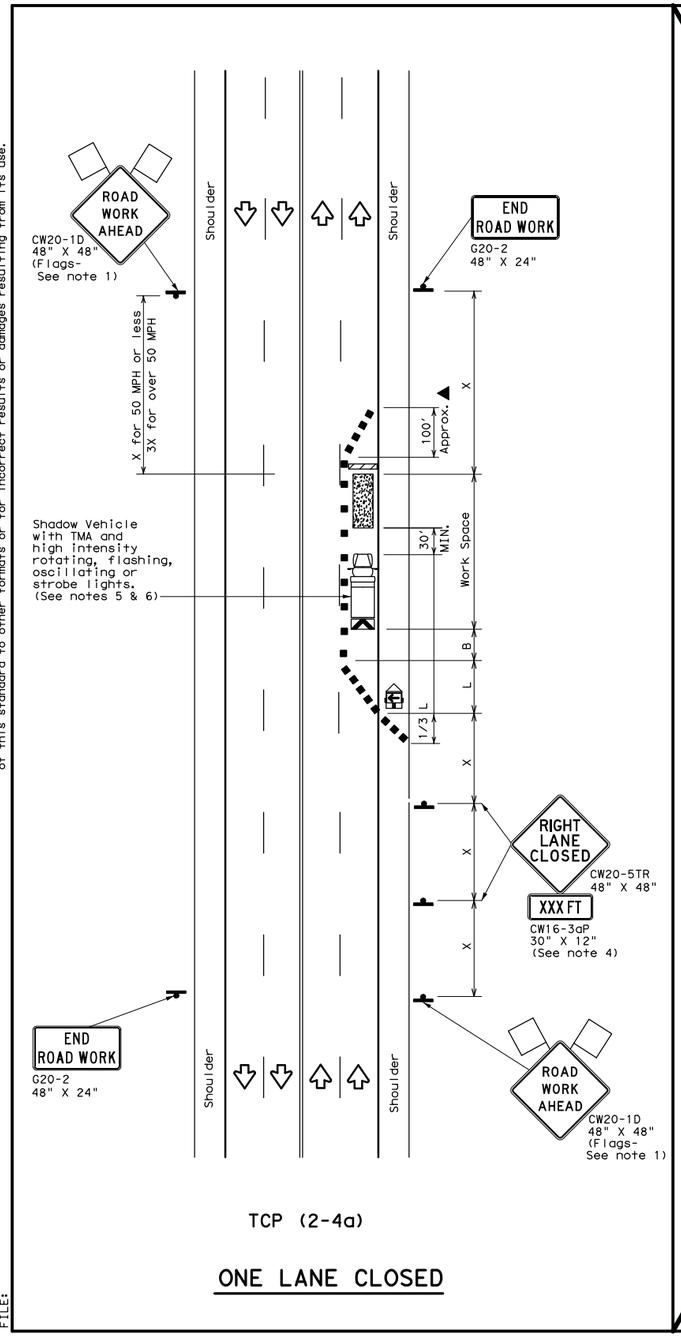
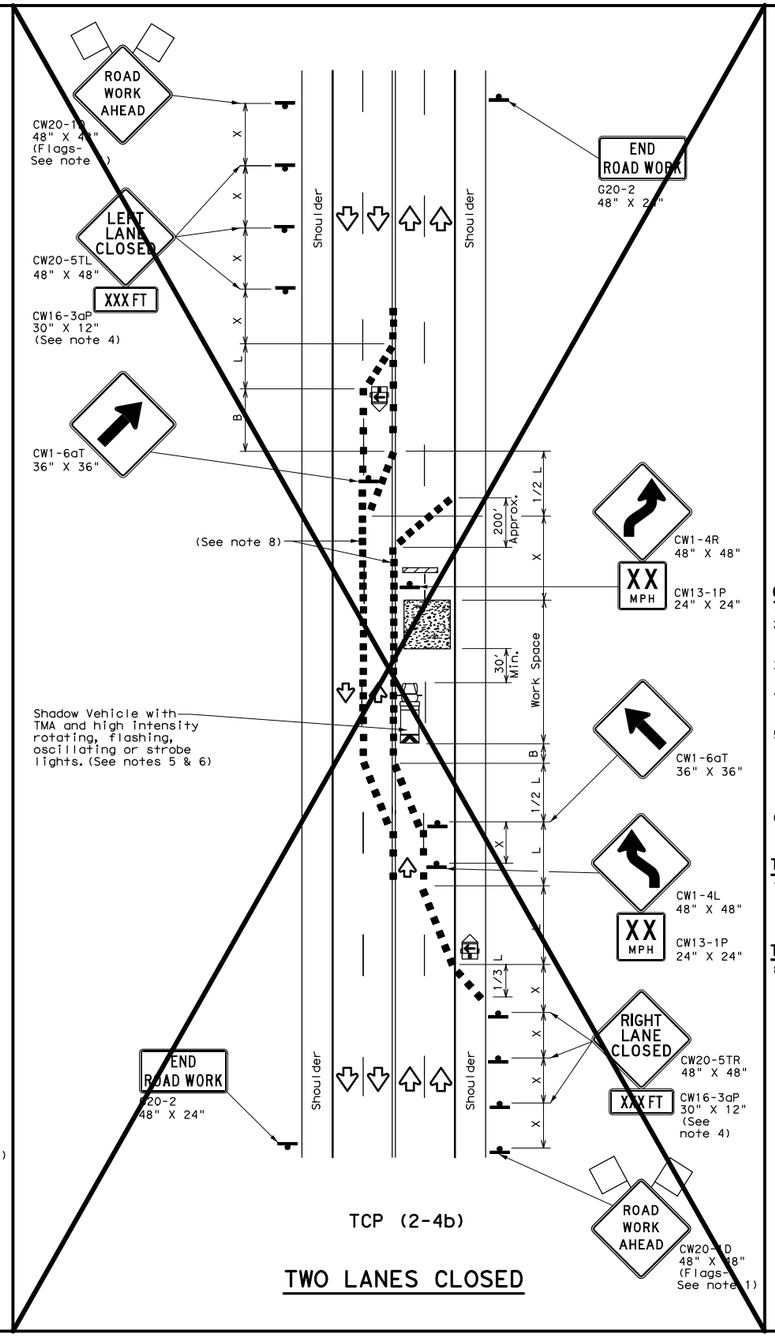


TCP (2-4a)

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	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	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

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
4. 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.
5. 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.
6. 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)

7. 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)

8. 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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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS				
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12				
4-98 2-18				

164

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS — HARRISON THAI — 129438 — LICENSED PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

TCP STANDARDS

SHEET 11 OF 19

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	75

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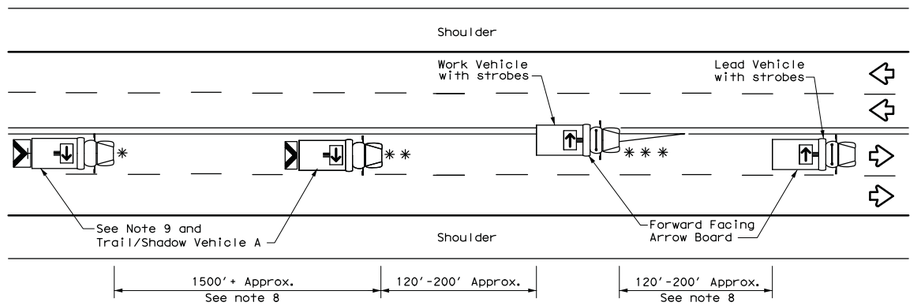
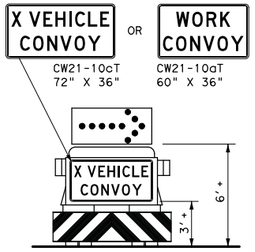


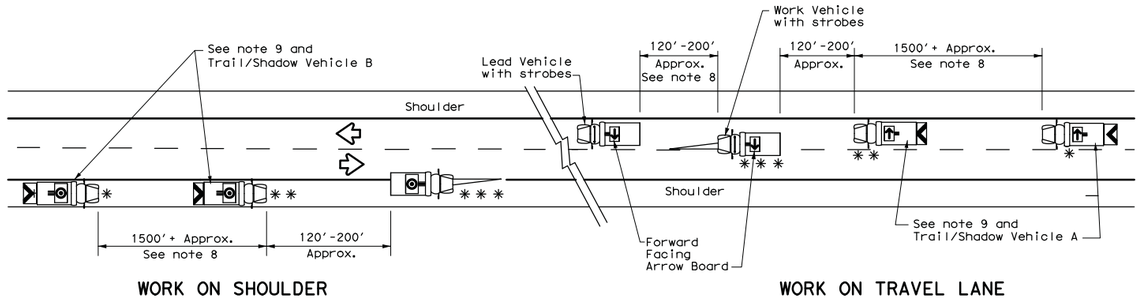
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



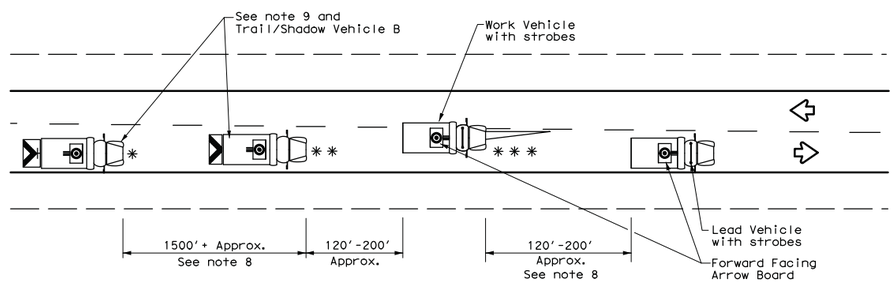
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board



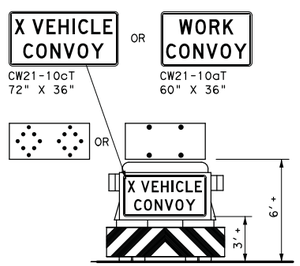
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

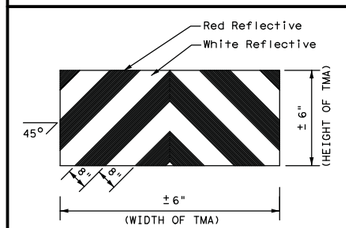
with Flashing Arrow Board in CAUTION display

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	DIST	COUNTY		SHEET NO.

175

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS — HARRISON THAI — 129438 — LICENSED PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
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Tel: 281-558-8700 • www.bgeinc.com
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OLD RICHMOND RD

TCP STANDARDS

SHEET 12 OF 19

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	76

DATE:
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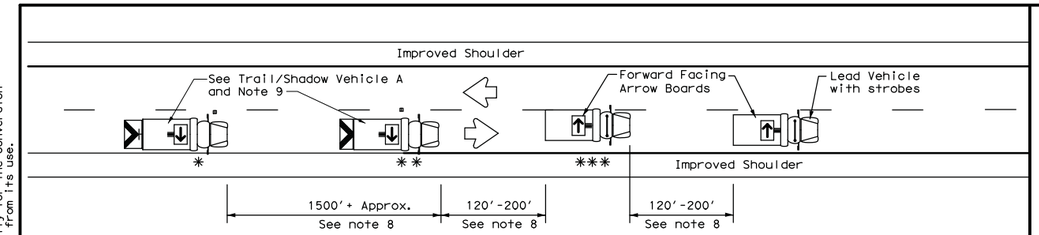
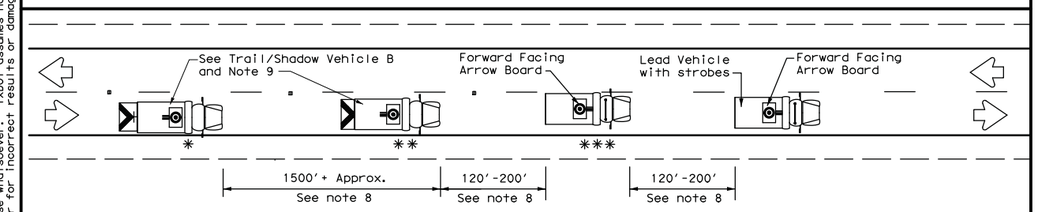


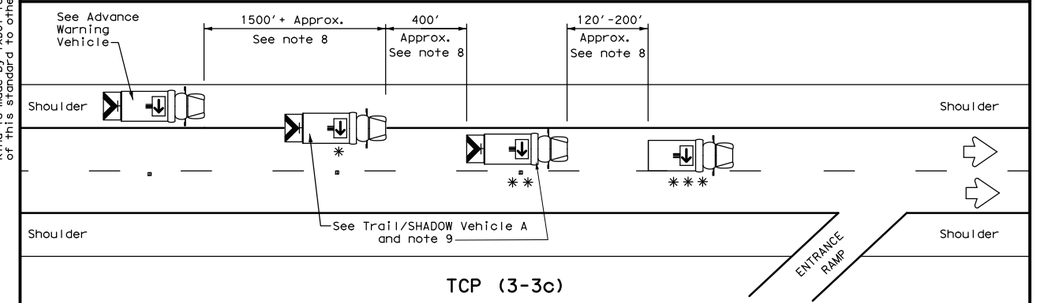
TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS (WORK ON TRAVEL LANE)



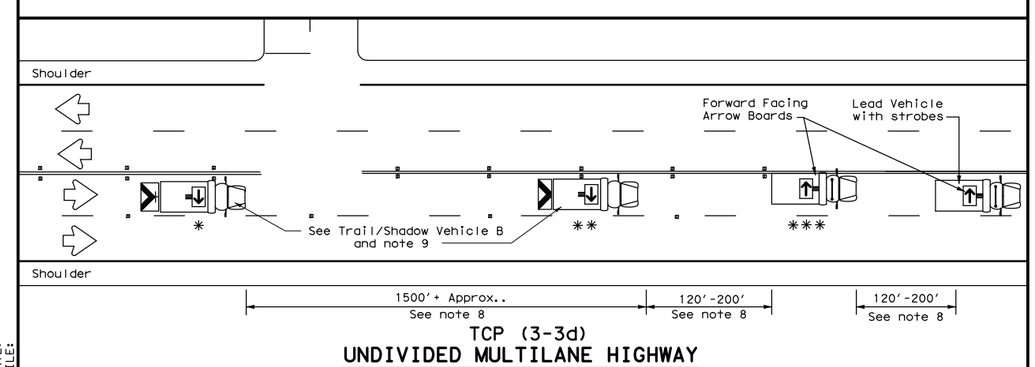
TCP (3-3b)

TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS (WORK ON TRAVEL LANE)



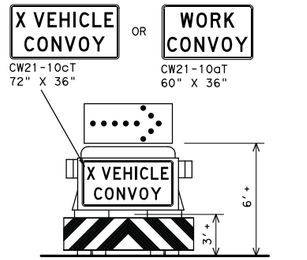
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



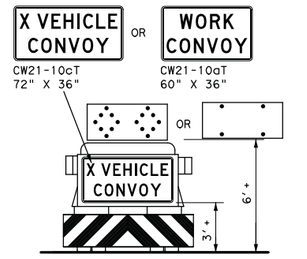
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



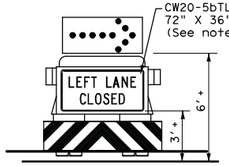
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

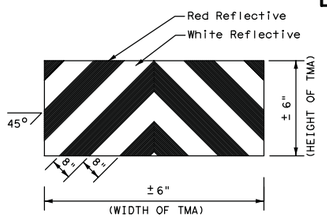


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer will determine if the LEAD vehicle and/or TRAIL vehicle are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating, or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. X VEHICLE CONVOY (CW21-10cT) or WORK CONVOY (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" x 48" diamond shaped WORK CONVOY (CW21-10T) or X VEHICLE CONVOY (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The X VEHICLE CONVOY sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. For divided highways with two or three lanes in one direction, the appropriate LEFT LANE CLOSED (CW20-5bTL), RIGHT LANE CLOSED (CW20-5bTR), or CENTER LANE CLOSED (CW20-5dT) sign should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board may be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
12. For divided highways with three or four lanes in each direction, use TCP(3-2).
13. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
14. The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
15. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL TCP(3-3)-14

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©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13				
1-97 7-14				

177

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

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OLD RICHMOND RD

TCP STANDARDS

SHEET 13 OF 19

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	77

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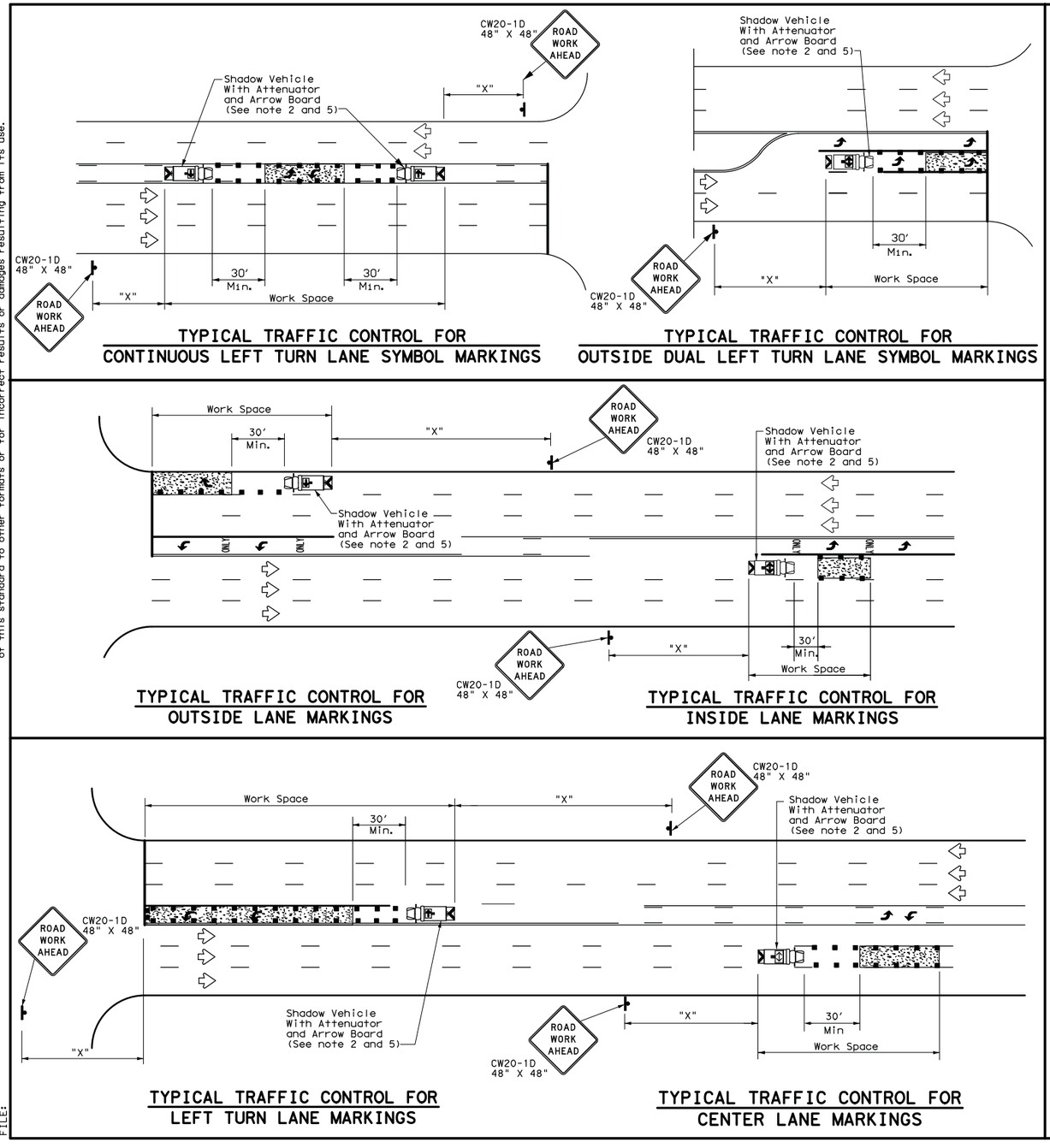


LEGEND			
✳	Trail Vehicle	ARROW BOARD DISPLAY	
✳✳	Shadow Vehicle		
✳✳✳	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow	■ ■ ■	Channelizing Devices

Posted Speed ✳	Formula	Minimum Desirable Taper Lengths ✳✳ 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	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'

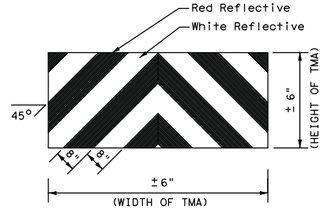
✳ Conventional Roads Only

✳✳ 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

1. This traffic control plan is for use on conventional roads posted at 45 mph or less and is intended for mobile operations that move continuously or intermittently (stopping up to approximately 15 minutes) such as short-line striping and in-lane rumble strips. When activities are anticipated to take longer amounts of time or traffic conditions warrant, a short duration or short-term stationary traffic control plan should be used.
2. A Truck Mounted Attenuator shall be used on Shadow Vehicle. Striping on the back panel of all truck mounted attenuators shall be 8" red and white reflective sheeting placed in an inverted "V" design. Reflective sheeting shall meet or exceed the reflectivity and color requirements of departmental material specification DMS-8300, Type A.
3. All traffic control devices shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), latest edition.
4. The use of yellow rotating beacons or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the drivers side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
5. Flashing arrow board shall be used on Shadow Vehicle. Flashing arrow board shall be Type B or Type C as per BC Standards. The arrow board operation shall be controlled from inside the truck.



STRIPING FOR TMA

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS FOR ISOLATED WORK AREAS UNDIVIDED HIGHWAYS TCP(3-4)-13

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©TxDOT July, 2013	CONT	SECT	JOB	HIGHWAY
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178

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS — HARRISON THAI — 129438 — LICENSED PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
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TBPE Registration No. F-1046

OLD RICHMOND RD

TCP STANDARDS

SHEET 14 OF 19

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DRAWN BY:	
DATE:	
SHEET NO:	78

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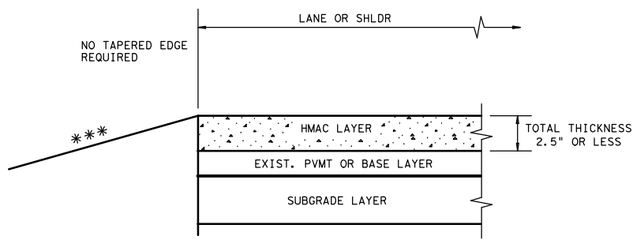
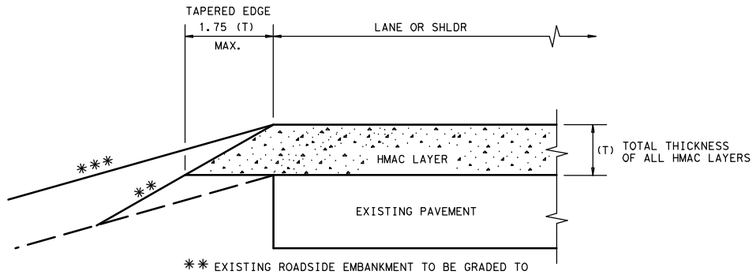


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

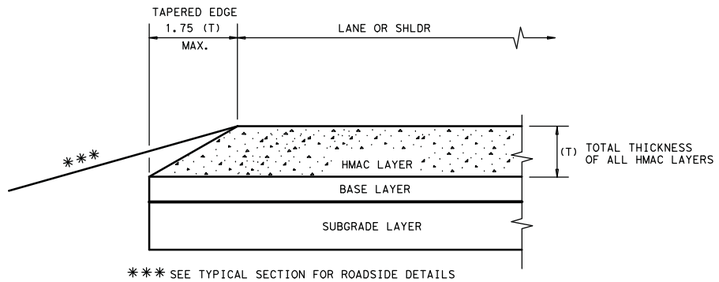
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



** EXISTING ROADSIDE EMBANKMENT TO BE GRADED TO PRODUCE A SMOOTH LEVEL SURFACE FOR PLACEMENT OF TAPERED EDGE. THIS WORK IS SUBSIDIARY TO THE VARIOUS BID ITEMS.

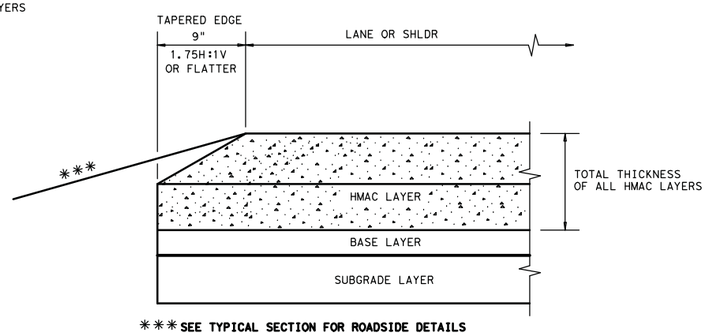
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 2
OVERLAY OF EXISTING PAVEMENT HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 3
NEW OR RECONSTRUCTED PAVEMENT HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 4
NEW OR RECONSTRUCTED PAVEMENT HMAC THICKNESS 5" OR GREATER

(NOT TO SCALE)

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
3. PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
4. THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
5. THE TAPERED EDGE SHALL BE PRODUCED BY USE OF A SCREED ATTACHMENT CAPABLE OF PRODUCING A SMOOTH COMPACTED SURFACE. ADDITIONAL COMPACTING EFFORT BEHIND THE SCREED IS NOT REQUIRED.

REV	DATE	BY	DESCRIPTION

2/7/2022

Texas Department of Transportation — Design Division Standard

TAPERED EDGE DETAILS HMAC PAVEMENT

TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
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TCP STANDARDS

SHEET 15 OF 19

DESIGNED BY:
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DATE:
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DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet

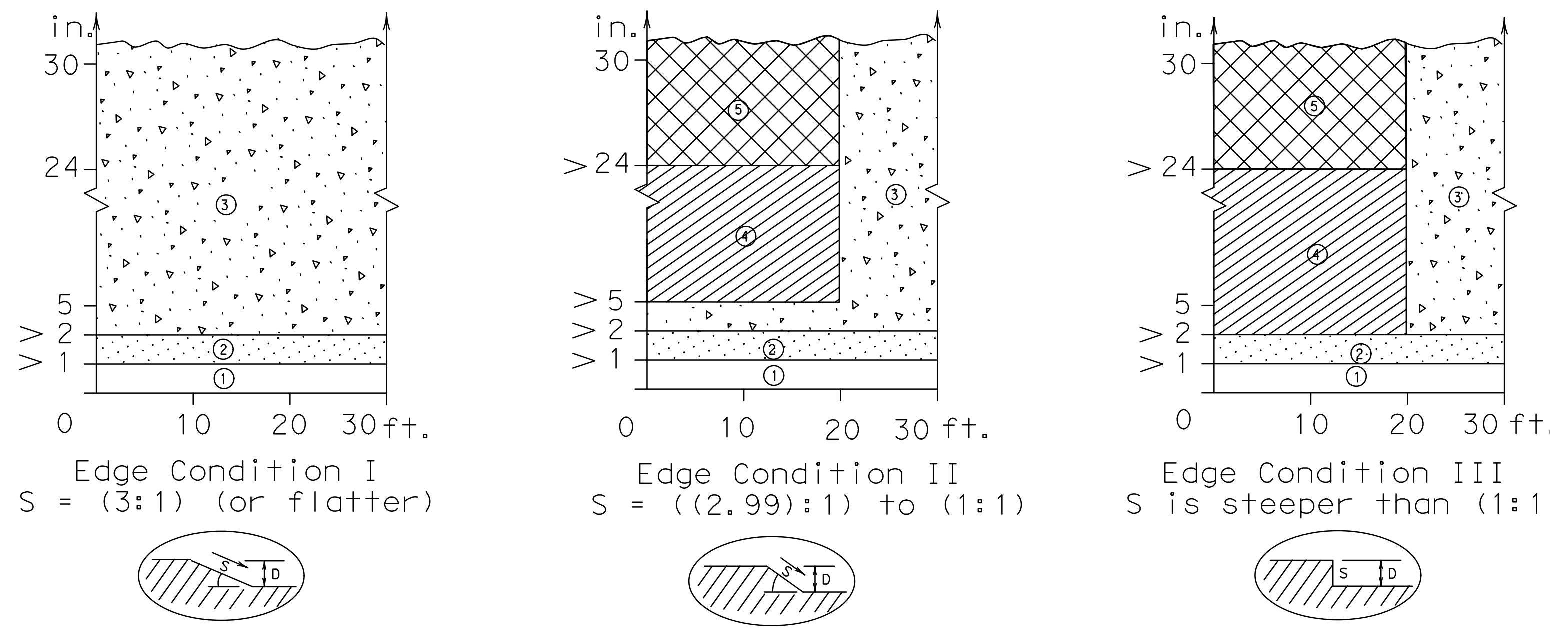
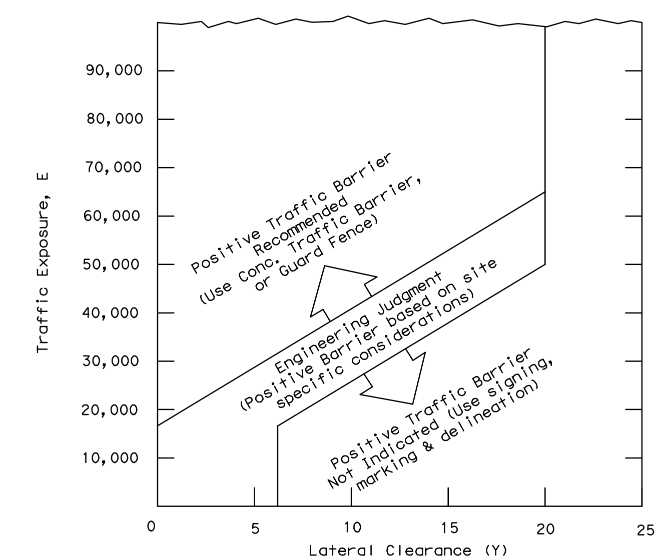


FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5

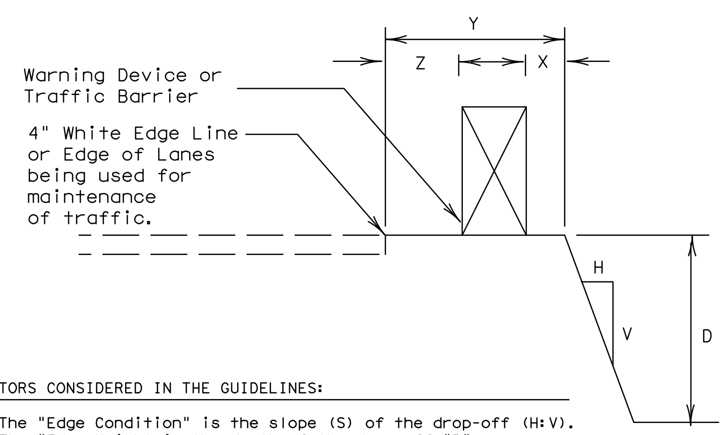


1 E = ADT x T
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.

2 Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.

3 An approved end treatment should be provided for any positive barrier end located within a lateral offset of 20 feet from the edge of the travel lane.

These guidelines apply to temporary traffic control areas or work zones where continuous pavement edges or drop-offs exists parallel and adjacent to a lane used by traffic. The edge conditions may be present between shoulders and travel lanes, between adjacent or opposing travel lanes, or at intermediate points across the width of the paved surface. Due to the variability in construction operations, tolerances in the variables may be allowed by the engineer. These guidelines do not apply to short term operations. These guidelines do not constitute a rigid standard or policy; rather, they are guidance to be used in conjunction with engineering judgement. These guidelines may be updated on the Design Division's on-line manuals.



Zone	Treatment Types Guidelines:
①	No treatment.
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a "Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	CW 8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge fill may be provided to change the edge slope to that of the preferable Edge Condition I.
⑤	Check indications (Figure-1) for positive barrier. Where positive barrier is not indicated, the treatment shown above for Zone- 4 may be used after consideration of other applicable factors.

FACTORS CONSIDERED IN THE GUIDELINES:

1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height is the depth of the drop-off "D".
2. Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.
3. In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.
4. The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.
5. If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

Edge Condition Notes:

1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.
2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exeeds 24 inches, the possibility for rollover is greater in most vehicles.
3. Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularily those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.
4. Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

Engineer's Seal

Date ____________

Texas Department of Transportation
Traffic Operations Division

TREATMENT FOR VARIOUS EDGE CONDITIONS

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03-01 08-01 correct typos	DIST	COUNTY		SHEET NO.

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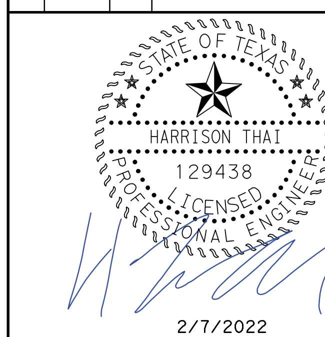

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OLD RICHMOND RD

TCP STANDARDS

SHEET 16 OF 19

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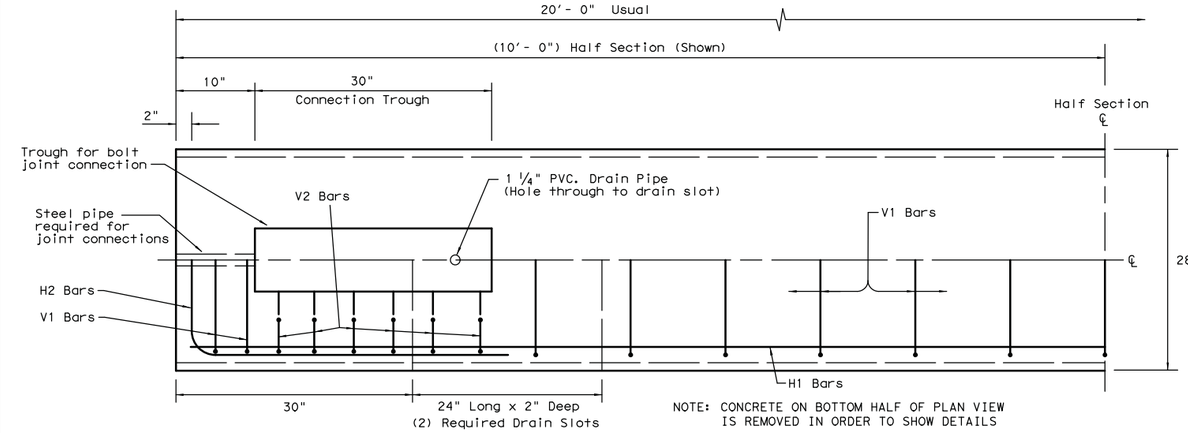
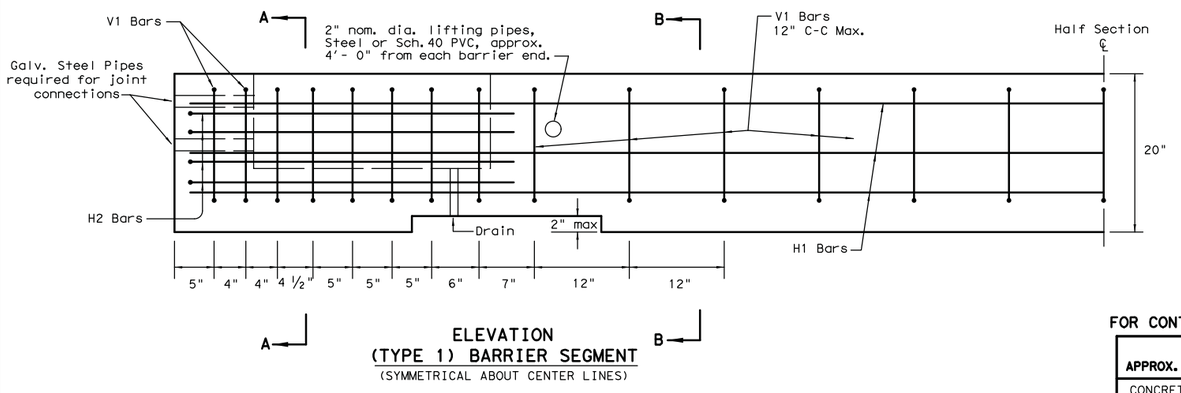
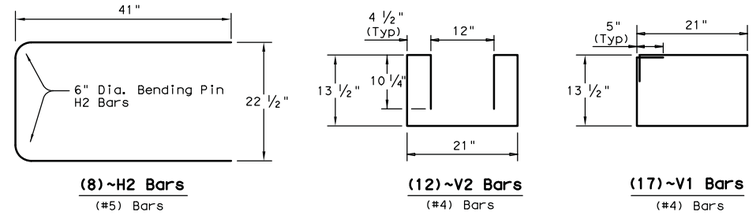


NOTE: CONCRETE ON BOTTOM HALF OF PLAN VIEW IS REMOVED IN ORDER TO SHOW DETAILS

PLAN
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)



ELEVATION
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)



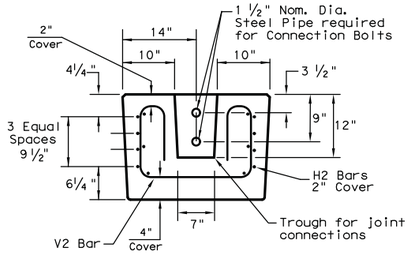
(8)~H2 Bars (#5) Bars

(12)~V2 Bars (#4) Bars

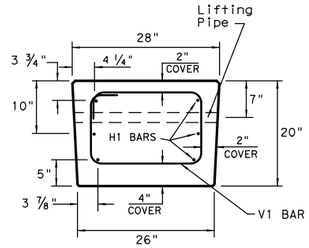
(17)~V1 Bars (#4) Bars

REINFORCING STEEL DETAILS
TYPE 1 - BARRIER SEGMENT

Note: Use 2" Dia. Bending Pin, unless otherwise shown



SECTION A-A



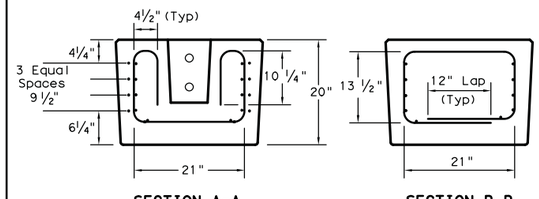
SECTION B-B

GENERAL NOTES

1. Low Profile Concrete Barrier (LPCB), is approved for use in temporary work zone locations, where the posted speed is 45 mph, or less.
2. Concrete shall be Class H for precast barrier with a minimum compressive strength of 3,600 psi.
3. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
4. Precast LPCB barrier length shall be 20 ft.
5. All barrier edges shall have ¾" chamfer or a tooled radius.
6. Joint connection hardware shall be in accordance with Item 449, "Anchor Bolts." and is considered subsidiary.
7. Steel pipe required for joint connection bolts shall be galvanized in accordance with Item 445, "Galvanizing."
8. Welded wire reinforcement (WWR) may be used in lieu of conventional reinforcement for Type 1 barrier, and shall meet the requirements shown.

FOR CONTRACTORS INFORMATION ONLY

(TYPE 1) APPROX. QUANTITIES 20 FT. SECTION		
CONCRETE	CY	2.6
REINFORCING STEEL	LBS	330
TOTAL BARRIER WT.	LBS	11000



SECTION A-A **SECTION B-B**

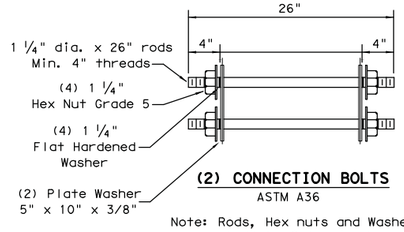
(WWR) GENERAL NOTES

1. Deformed Welded Wire Reinforcement shall conform to ASTM A497.
2. Welded wire cage may be cut or bent, if necessary, but must be approved by the Engineer.
3. Combinations of reinforcing steel and WWR are permitted, as directed by the Engineer. The dimensions from the end of the barrier section to the first wire shall not exceed 3".

REQUIRED (WWR) WIRE DESIGN

8 ~ (D31) Horizontal Wires (Equally spaced)
10 ~ (D20) Horizontal Wires (Equally spaced)
29 ~ (D20) Vertical Wires (Spaced as shown in Elevation View)

WELDED WIRE REINFORCEMENT (WWR)- OPTIONAL REINFORCING



(2) CONNECTION BOLTS ASTM A36

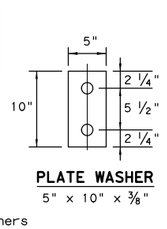


PLATE WASHER 5" x 10" x ⅜"

Note: Rods, Hex nuts and Washers shall be Galvanized.

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

LOW PROFILE CONCRETE BARRIER
PRECAST BARRIER (TYPE 1)
LPCB-13

FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
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OLD RICHMOND RD

TCP STANDARDS

SHEET 17 OF 19

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SHEET NO:	80

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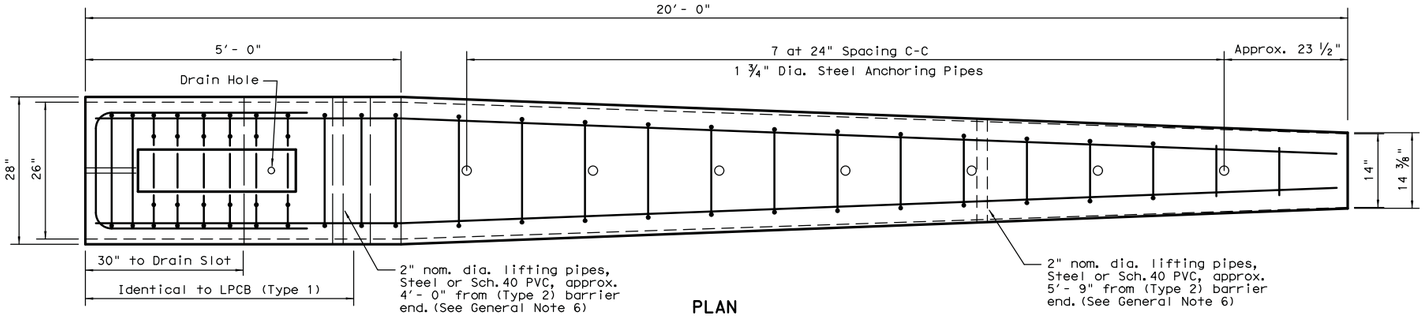
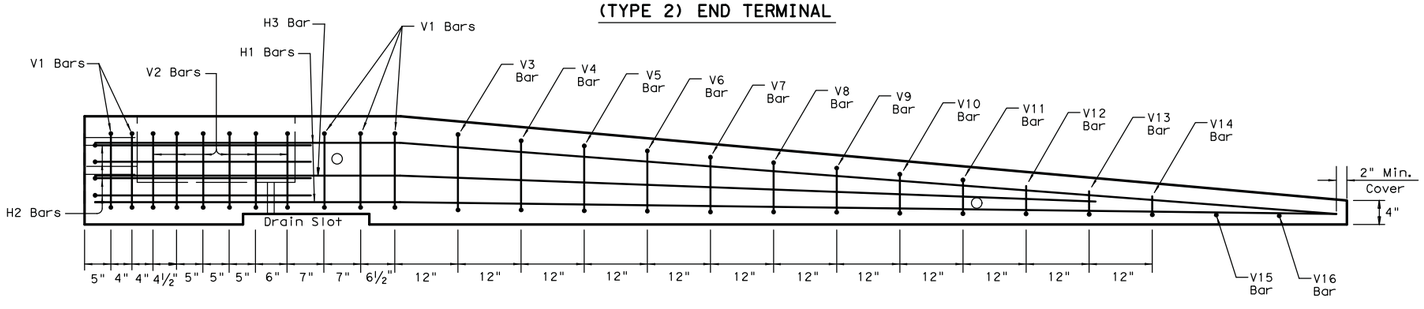
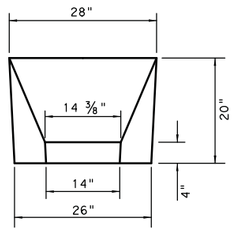


PLAN
(TYPE 2) END TERMINAL



ELEVATION
(TYPE 2) END TERMINAL

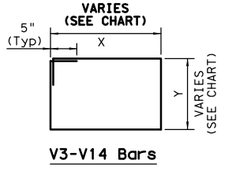
Note:
Anchoring pipes not shown in Elevation View



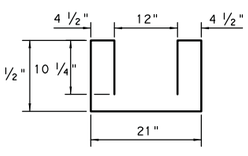
APPROACH VIEW

TYPE 2 - NOTES

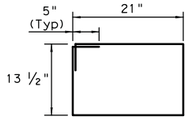
1. Welded wire reinforcment (WWR) is "not" an option for Type 2 Barrier.
2. Type 2 Barrier shall be used as an end treatment for the Type 1 barrier segments, when applicable.
3. The end treatment can be used without the anchor pins in locations that can accommodate approximately 4 ft. of lateral displacement of the end treatment. The use of non-pinned end treatment does not affect the performance or the deflection of the Low-Profile barrier system.
4. The anchor pins are all the same length and are to be driven flush with the top of the (Type 2) barrier surface.
5. The bends in the H3 and H1 bars are slight, no formal bend is necessary.
6. The Type 2 barrier segment must be lifted from the rear first, to prevent cracking of sloped section.
7. See LPCB sheet 1 for additional information.



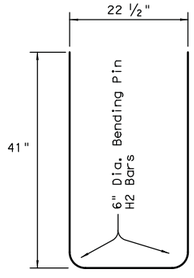
V3-V14 Bars



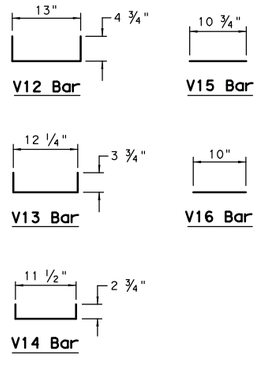
(6)~V2 Bars



(5)~V1 Bars



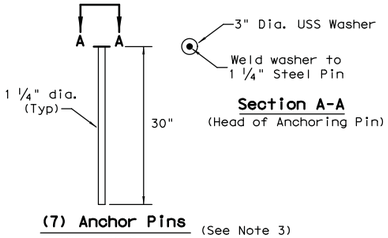
(4)~H2 Bars
(#5) Bars



Note: All V Bars are (#4)

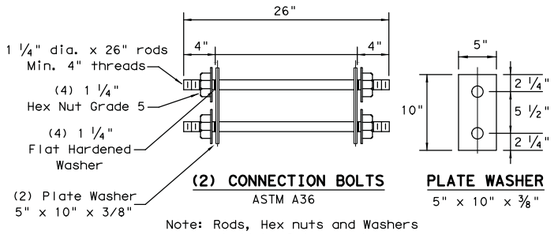
BAR (#4)	X (IN.)	Y (IN.)
V3 BAR	20 ¼	14 ½
V4 BAR	19 ½	13 ½
V5 BAR	18 ½	12 ¼
V6 BAR	17 ½	11 ¼
V7 BAR	17	10 ¼
V8 BAR	16 ¼	9
V9 BAR	15 ½	8
V10 BAR	14 ½	7
V11 BAR	13 ¾	6

REINFORCING STEEL DETAILS
TYPE 2 - END TERMINAL



Section A-A
(Head of Anchoring Pin)

(7) Anchor Pins (See Note 3)
ASTM A36 Steel

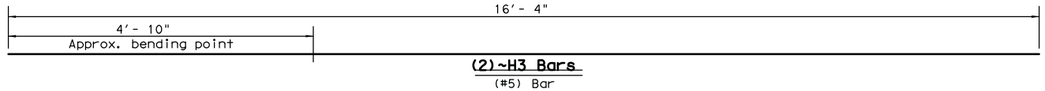


(2) CONNECTION BOLTS
ASTM A36

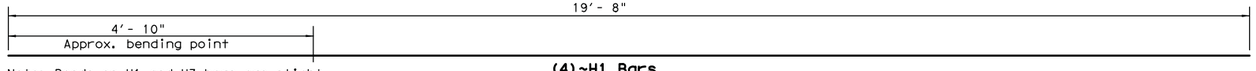
PLATE WASHER
5" x 10" x ⅜"

Note: Rods, Hex nuts and Washers shall be Galvanized.

Note: Use 2" Dia. Bending Pin, unless otherwise shown



(2)~H3 Bars
(#5) Bar



Note: Bends on H1 and H3 bars are slight and do not require formal bends.

(4)~H1 Bars
(#5) Bar

FOR CONTRACTORS INFORMATION ONLY

(TYPE 2) APPROX. QUANTITIES	20 FT. SECTION	
CONCRETE	CY	1.65
REINFORCING STEEL	LBS	240
TOTAL BARRIER WT.	LBS	7000

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

LOW PROFILE CONCRETE BARRIER
PRECAST BARRIER (TYPE 2)
LPCB-13

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OLD RICHMOND RD

TCP STANDARDS

SHEET 18 OF 19

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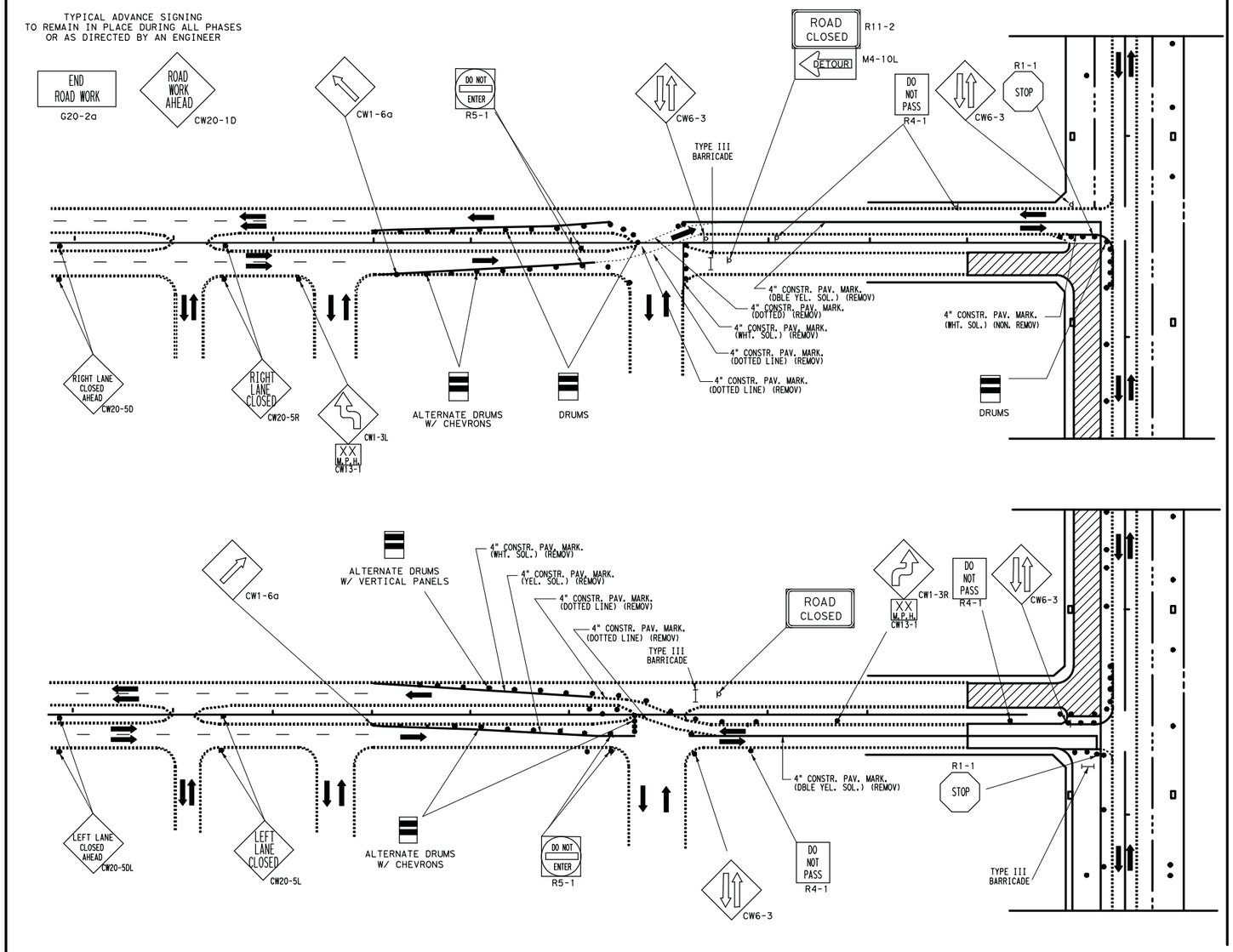

TYPICAL TRANSITION LENGTHS
AND
SUGGESTED MAXIMUM SPACING OF DEVICES

POSTED SPEED	FORMULA	MINIMUM DESIRABLE TAPER LENGTHS Ⓚ Ⓚ Ⓚ 10′ OFFSET	11′ OFFSET	12′ OFFSET	SUGGESTED MAX. SPAC. OF DEVICE ON A TAPER	ON A TANGENT	MINIMUM SIGN SPACING × DISTANCE
30	$L=\frac{WS^2}{60}$	150′	165′	180′	30′	60′-75′	120′
35		205′	225′	245′	35′	70′-90′	160′
40		265′	295′	320′	40′	80′-100′	240′
45	L=WS	450′	495′	540′	45′	90′-110′	320′
50		500′	550′	600′	50′	100′-125′	400′
55		550′	605′	660′	55′	110′-140′	500′
60		600′	660′	720′	60′	120′-150′	Ⓚ 600′
65		650′	715′	780′	65′	130′-165′	Ⓚ 700′
70		700′	770′	840′	70′	140′-175′	Ⓚ 800′

Ⓚ CONVENTIONAL ROADS ONLY

Ⓚ Ⓚ TAPER LENGTHS HAVE BEEN ROUNDED OFF.

CONSTRUCTION WARNING
SIGN SPACING

POSTED SPEED (MPH)	"X" SIGN SPACINGS (FEET)
30 OR LESS	120
35	120
40	240
45	320
50	400
55	500
60	600
65	700
70	800

LEGEND

CONSTRUCTION AREA

OPEN TO TRAFFIC

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

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TCP STANDARDS

SHEET 19 OF 19

Texas Department of Transportation
Houston District

BOULEVARD CLOSURES

TCPTC 3050-96

FILE:	DN:	CK:	DW:	CK:
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REVISIONS REV. 5/2006	HOU	6		
	COUNTY	CONTROL	SECT	JOB	HIGHWAY

STD H-15

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DRAWN BY:
DATE:
SHEET NO: 83

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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 ½ 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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STATE OF TEXAS
DREW C. DAVIS
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2/7/2022

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 1 OF 18

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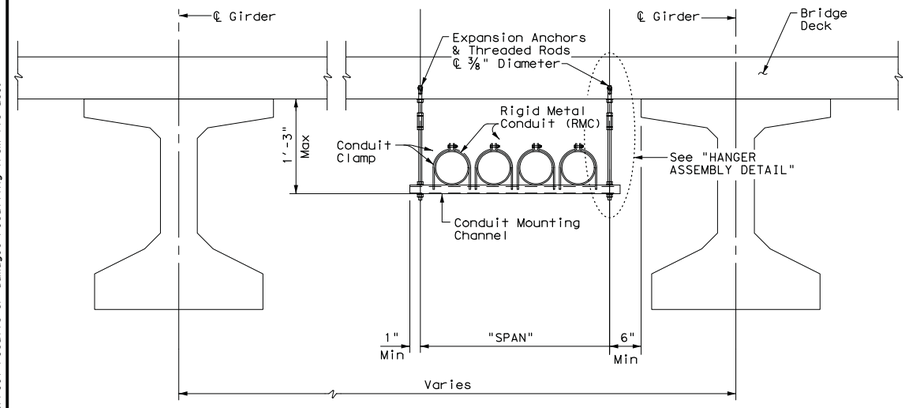
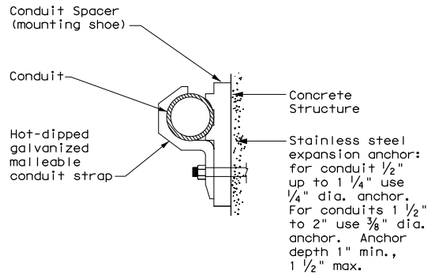
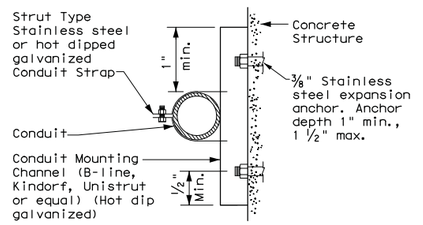


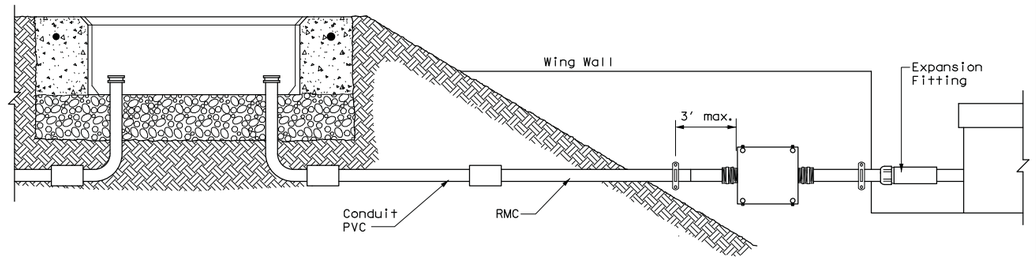
CONDUIT HANGING DETAIL





CONDUIT MOUNTING OPTIONS

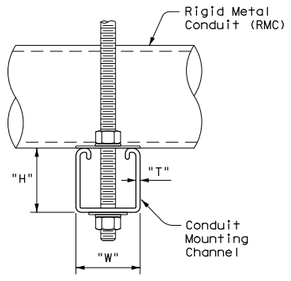
Attachment to concrete surfaces
See ED(1)B.2

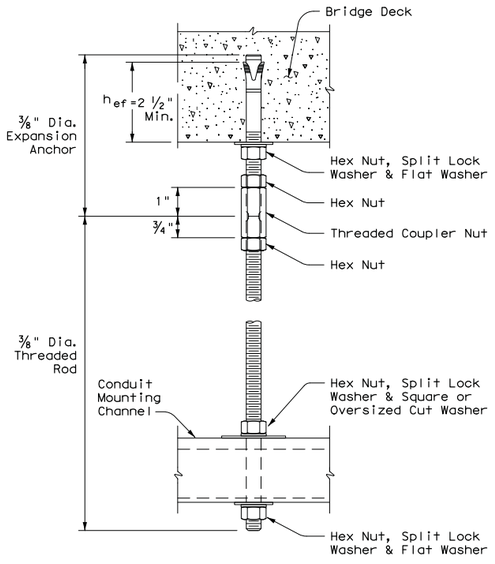


TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

CONDUIT MOUNTING CHANNEL		
"SPAN"	"W" x "H"	"T"
less than 2'	1 ⅝" x 1 ⅜"	12 Ga.
2'-0" to 2'-6"	1 ⅝" x 1 ⅝"	12 Ga.
>2'-6" to 3'-0"	1 ⅝" 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

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 torqueing 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

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10777 Westheimer, Suite 400, Houston, TX 77042
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OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 2 OF 18

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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.

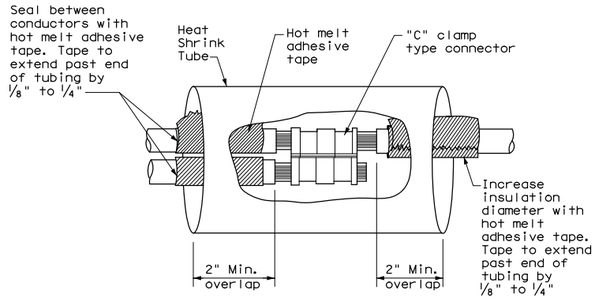
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

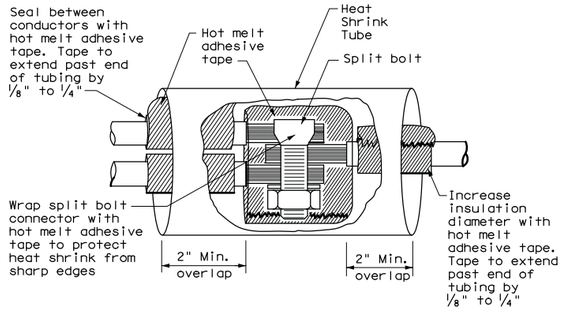
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

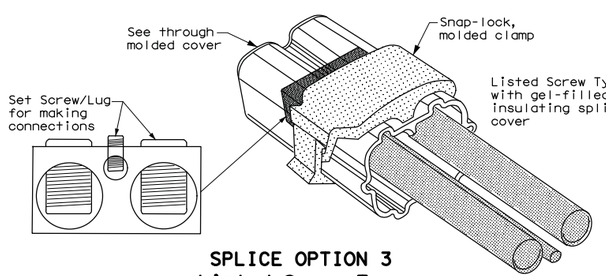
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, 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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Texas Department of Transportation — Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

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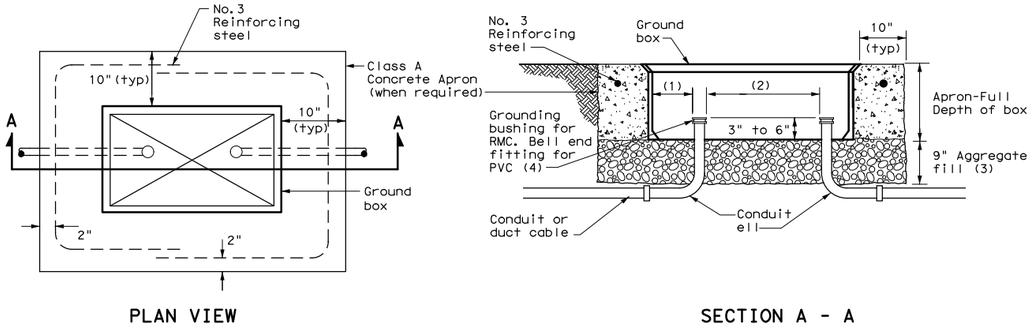


PLAN VIEW

SECTION A - A

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.

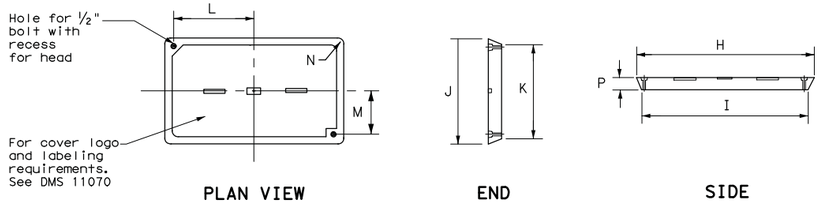
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(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



PLAN VIEW

END

SIDE

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.

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STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED
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2/7/2022

Texas Department of Transportation | Traffic Operations Division Standard

ELECTRICAL DETAILS GROUND BOXES

ED(4)-14

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OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 4 OF 18

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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 ½ 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 ½ 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 ½ 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. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. 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 ¼"	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 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

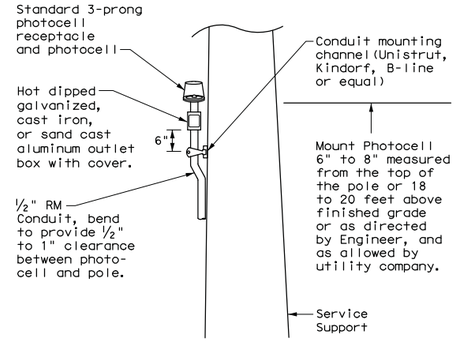
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** 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

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

- Schematic Type
- Service Voltage V / V
- Disconnect Amp Rating
  000 indicates main lug only/
  Typically Type T
- (SS)= Safety Switch Ahead of Meter-Check with Utility
  (NS)= No safety Switch Ahead of Meter-Check with Utility
- Enclosure Type
  GS= Galvanized steel("off the shelf")
  SS= Stainless steel(Custom Enclosure)See MPL
  AL= Aluminum (Custom Enclosure)See MPL
- Photocell Mounting Location
  (E)= Inside Service/Enclosure Mounted
  (T)= Top of pole
  (L)= Luminaire mounted
  (N)= None/No Photocell or Lighting Contactor Required
- Service Support Type
  GC= Granite concrete
  OC= Other concrete
  TP= Timber pole
  SP= Steel pole
  SF= Steel frame
  OT= Pole by others or paid for separately
  EX= Existing pole
  TS= Service on traffic signal pole
  PS= Pedestal Service
- O= Overhead Service Feed from Utility
  U= Underground Service Feed from Utility



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

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

FILE: ed5-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REV	DATE	BY	DESCRIPTION

STATE OF TEXAS — DREW C. DAVIS — 136156 — LICENSED PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 5 OF 18

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	88

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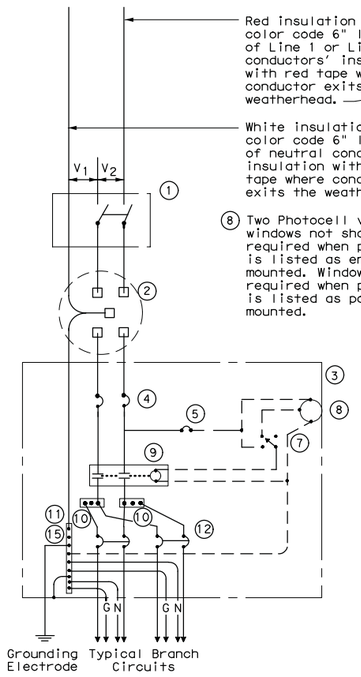
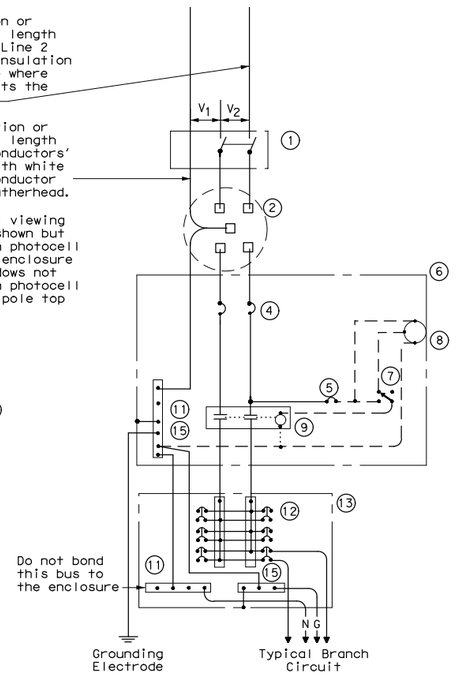
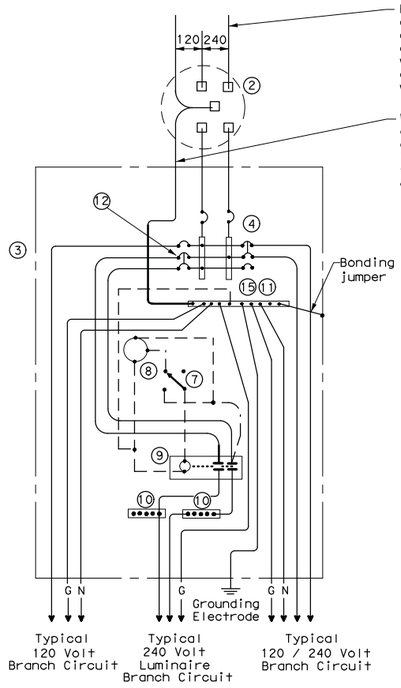


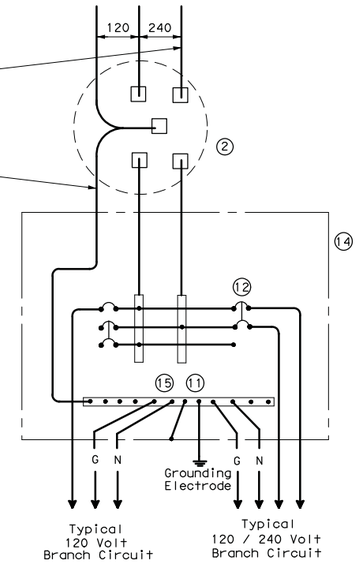
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC 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

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED
PROFESSIONAL ENGINEER
P.E.
2/7/2022

Texas Department of Transportation
Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

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FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
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OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 6 OF 18

DESIGNED BY:	
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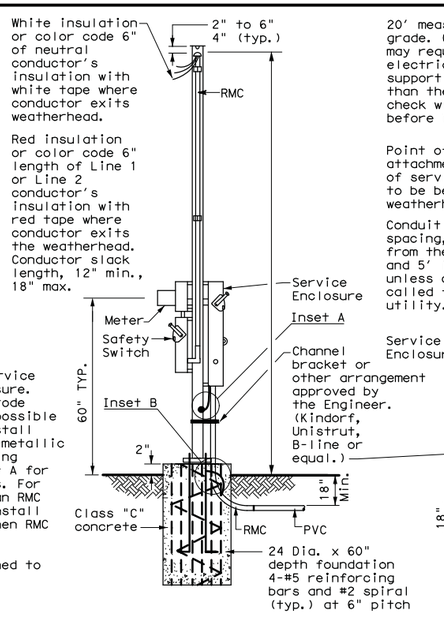
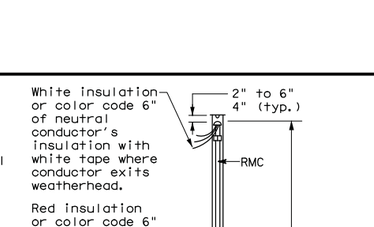
DATE:
FILE:

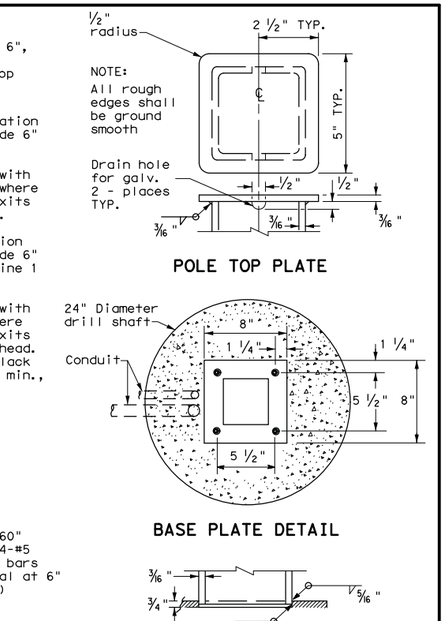
SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

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 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ 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 ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ 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 ½ 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 ¼" - 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.

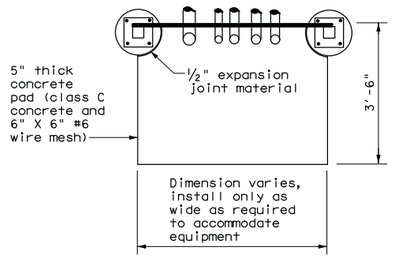


SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE

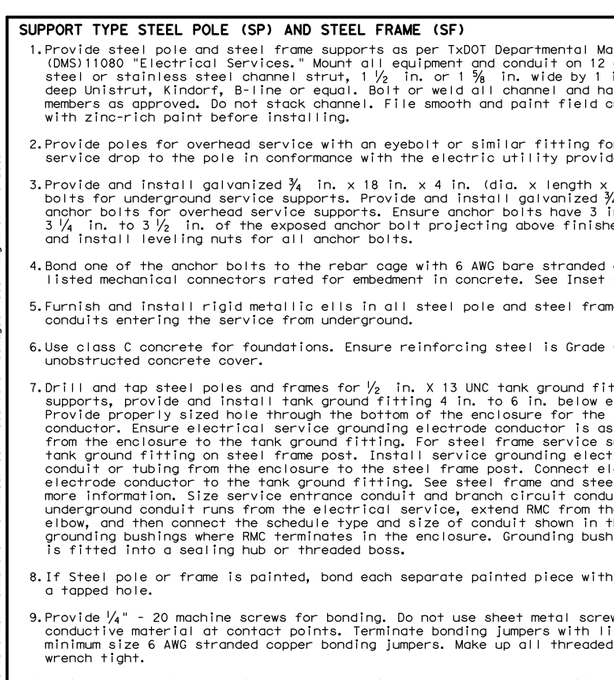


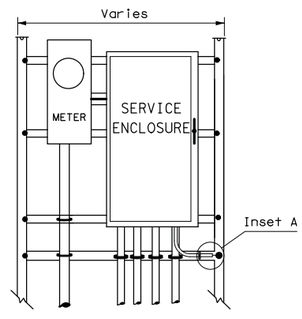


SERVICE SUPPORT TYPE SF & SP

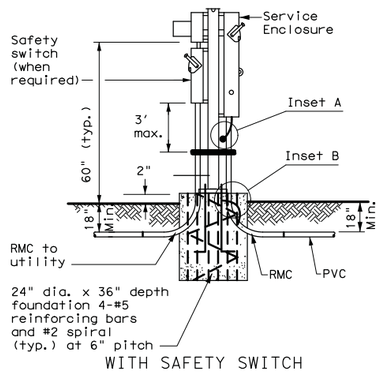


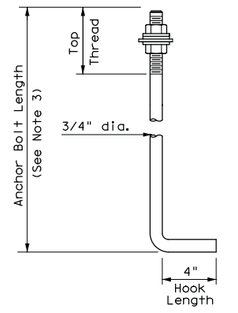
SERVICE SUPPORT TY SF (O) & SF (U)





SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE





SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

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STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED
PROFESSIONAL ENGINEER

Drew C. Davis P.E.
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
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OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 7 OF 18

Texas Department of Transportation — Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

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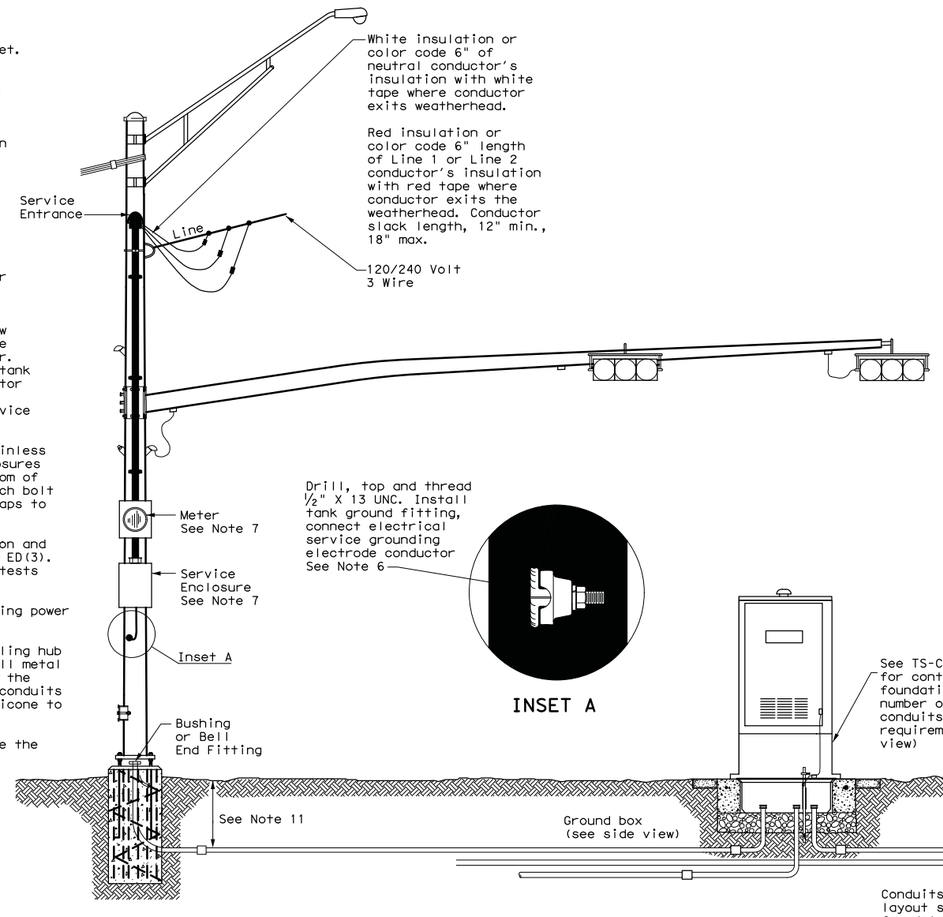
71G

TRAFFIC SIGNAL NOTES

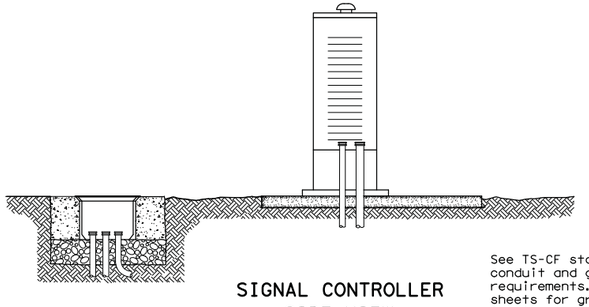
1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material and construction sections of Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test installed roadway luminaires for proper operation as a part of the associated traffic signal system test.
4. If internally illuminated street name signs are approved for use, ground the fixture to the pole with a 12 AWG green XHHW conductor.
5. Bond anchor bolts to rebar cage in two locations using #3 bars or 6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TXDOT standard TS-FD for further details.
6. Drill and tap signal poles for ½ in. X 13 UNC tank ground fitting. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Connect the electrical service grounding electrode conductor to the tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole with stainless steel bands. Ensure bands are a minimum width of ¾ in. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole for attaching conduit.
8. Conduct pull tests and insulation resistance tests on all illumination and power conductors as required in Item 620 "Electrical Conductors" and ED(3). To prevent electronics damage, do not conduct insulation resistance tests on traffic signal cables after termination.
9. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
10. Terminate conduits entering the top of enclosures with a conduit-sealing hub or threaded boss such as meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Bond the grounding bushing to the ground bus with a bonding jumper. Seal all conduits entering enclosures with duct seal or expanding foam. Do not use silicone to seal conduit ends.
11. For all conduits, ensure the burial depth is a minimum of 18". Ensure the minimum burial depth for conduit placed under a roadway is 24".



SIGNAL POLE WITH SERVICE

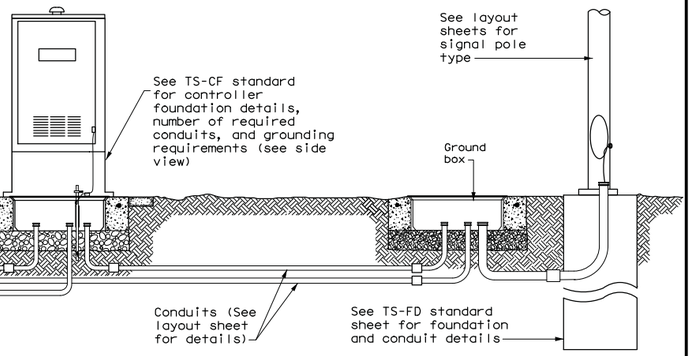
Type T electrical service mounted on signal pole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

INSET A



SIGNAL CONTROLLER SIDE VIEW

See TS-CF standard for conduit and grounding requirements. See layout sheets for ground box locations and any additional conduits that are required.



SIGNAL CONTROLLER FRONT VIEW

SIGNAL POLE

Texas Department of Transportation — Traffic Operations Division Standard

ELECTRICAL DETAILS TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(8)-14

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STATE OF TEXAS — DREW C. DAVIS — 136156 — LICENSED PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
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OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 8 OF 18

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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.

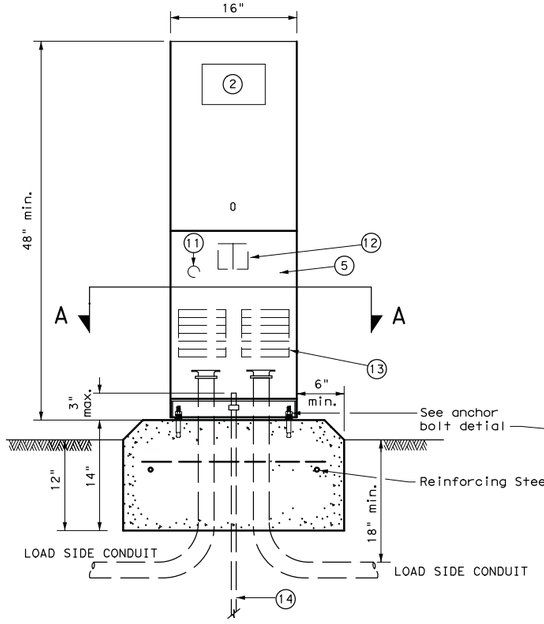
4. Provide #4 reinforcing steel for foundations in accordance with Item 440, "Reinforcement for Concrete."

5. Install ½ in. X 2 ⅛ 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 ½ in. galvanized or stainless steel machine thread bolt, a properly sized locknut and a flat washer.

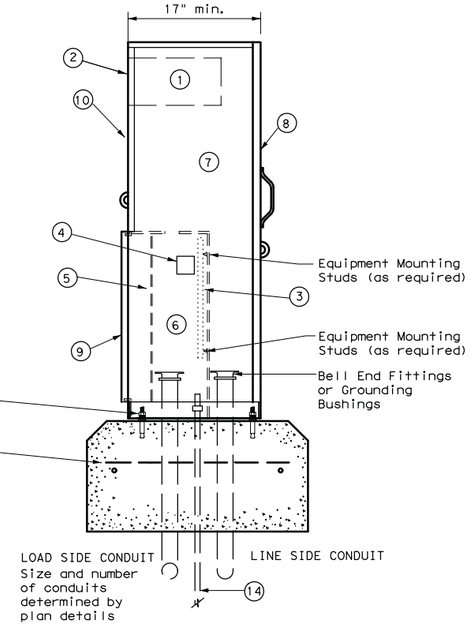
6. Finish top of concrete foundation in a neat and workmanlike manner. If leveling washers are used, ensure no more than ⅛ in. gap at any corner. Do not exceed a maximum dip or rise in the foundation of ⅛ in. per foot. When properly installed, ensure the top of the service enclosure is level front to back and side to side within ¼ 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.

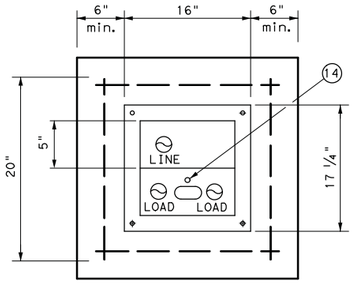


FRONT VIEW

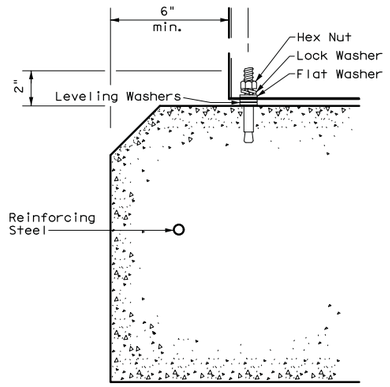


SIDE VIEW

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.



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'

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED
PROFESSIONAL ENGINEER
P.E.
2/7/2022

Texas Department of Transportation — Traffic Operations Division Standard

ELECTRICAL DETAILS
ELECTRICAL SERVICE SUPPORT
PEDESTAL SERVICE TYPE PS

ED(9)-14

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OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 9 OF 18

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SHEET NO:	92

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FILENAME: G:\TXH\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\10-ILLUM\Standards\ed9-14.dgn
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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 ⅝ in. max. depth and 1 ⅞ 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 ¾ in. maximum depth, and 1½ in. to 1⅝ 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, ¼ in. minimum diameter by 1½ 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 ½ in. PVC to ground rod - extend ½ in. PVC 6 in. underground.

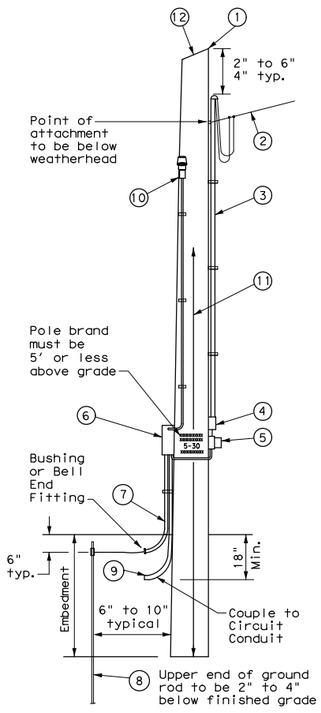
(8) ⅝ in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.

(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.

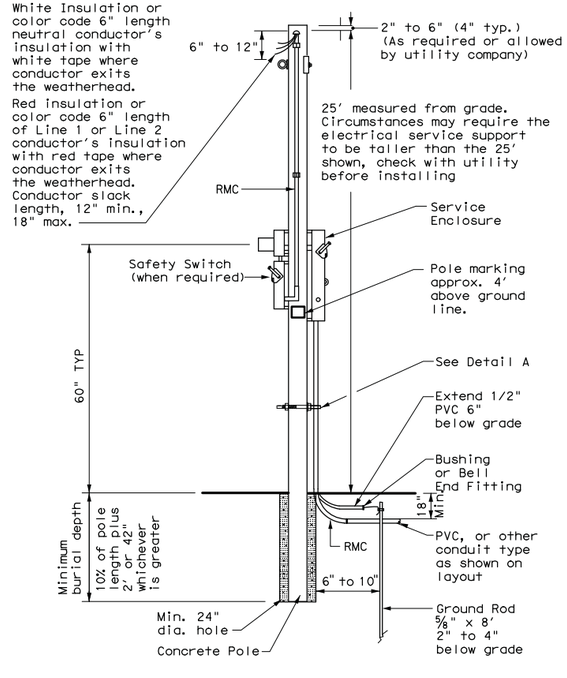


SERVICE SUPPORT TYPE TP (O)

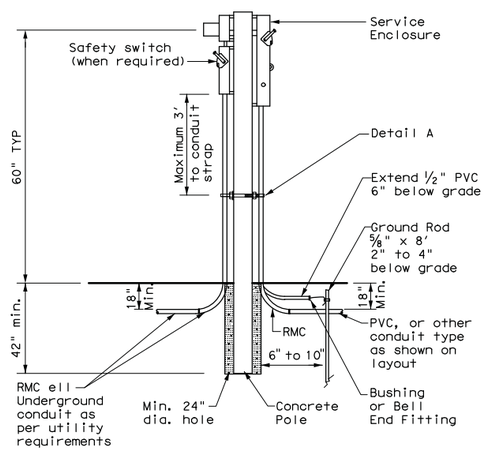
GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

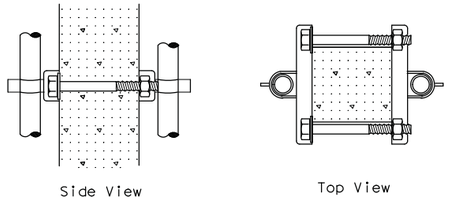
1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' 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 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ 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.

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED
PROFESSIONAL ENGINEER
P.E.
2/7/2022

Texas Department of Transportation — Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

ED(10)-14

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OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 10 OF 18

DESIGNED BY:	
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SHEET NO:	93

DATE: 2/7/2022
FILE: ed11-14.dgn

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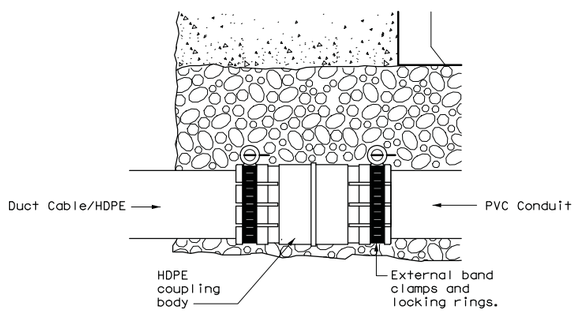
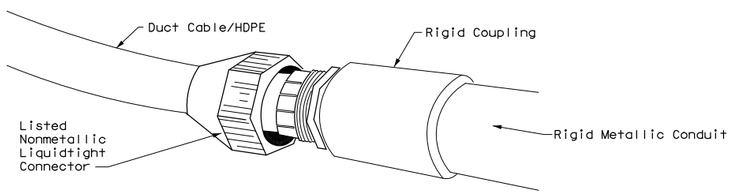
DUCT CABLE & HDPE CONDUIT NOTES

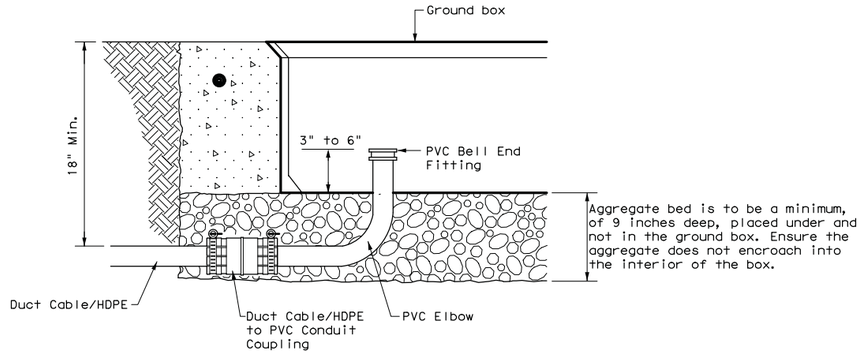
1. Provide duct cable in accordance with Departmental Material Specification (DMS) 11060 "Duct Cable" and Item 622 "Duct Cable." Provide duct cable as listed on the Material Producer List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 622.
2. Provide High-Density 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 banding 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 TO PVC

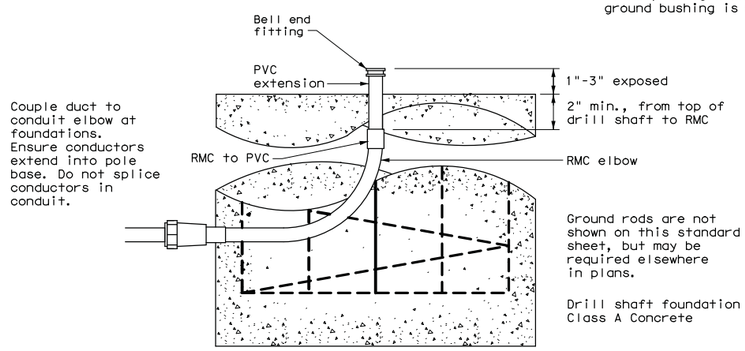


DUCT CABLE/HDPE TO RMC

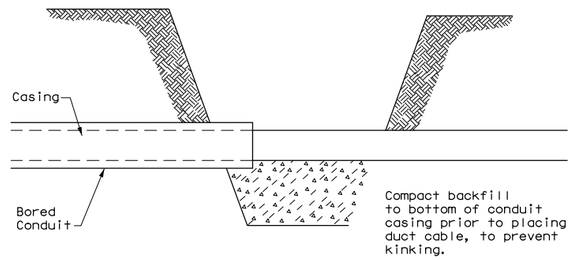


DUCT CABLE/HDPE AT GROUND BOX

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



BORE PIT DETAIL

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED PROFESSIONAL ENGINEER
P.E.
2/7/2022

Texas Department of Transportation
Traffic Operations Division Standard

ELECTRICAL DETAILS DUCT CABLE/ HDPE CONDUIT

ED(11)-14

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OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 11 OF 18

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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.

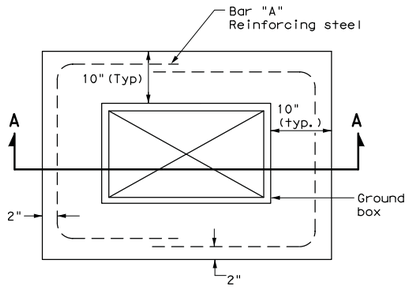
B. CONSTRUCTION METHODS

1. Ensure conduit entry will not interfere with placement of the batteries in the battery box ground box.

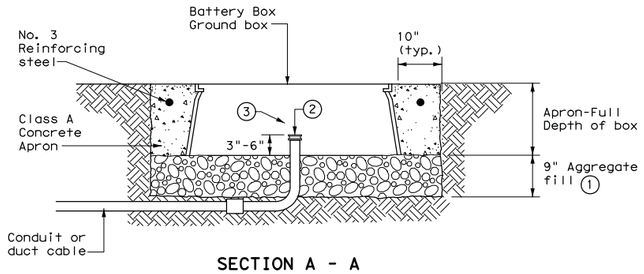
2. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting battery box ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure the aggregate bed is in place and is a minimum of 9 in. deep prior 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.



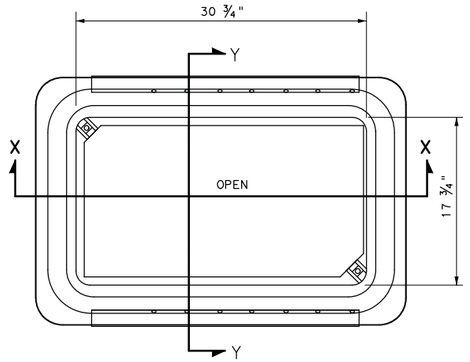
PLAN VIEW



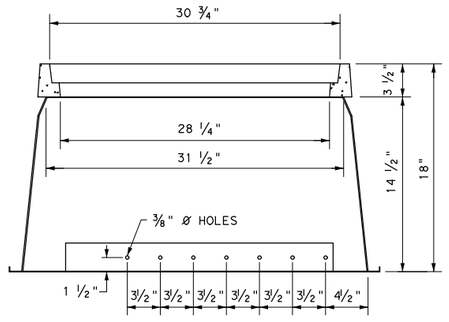
SECTION A - A

APRON FOR BATTERY BOX GROUND BOXES

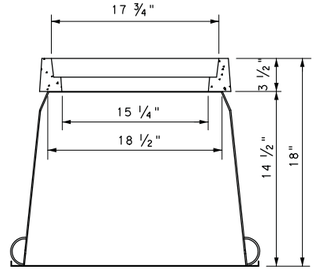
1. Place aggregate under the box and not in the box. Aggregate should not encroach on the interior volume of the box.
2. Install bushing or bell end fitting on the upper end of all ells.
3. Install all conduits in a neat and workmanlike manner.



BATTERY BOX TOP VIEW



SECTION X-X



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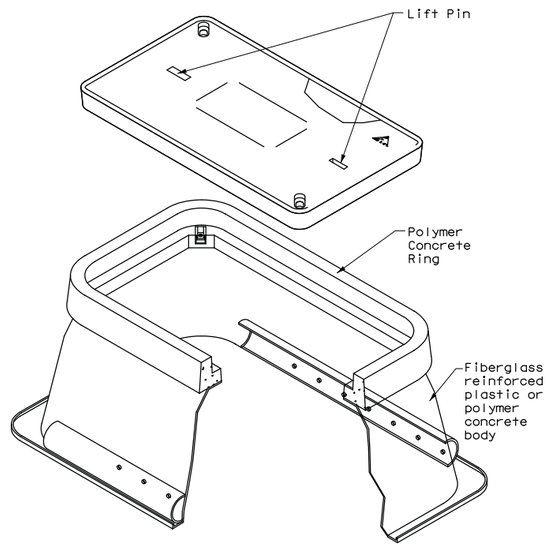

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED
PROFESSIONAL ENGINEER
P.E.
2/7/2022

Texas Department of Transportation | Traffic Operations Division Standard

ELECTRICAL DETAILS BATTERY BOX GROUND BOXES

ED(12)-14

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OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 12 OF 18

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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.

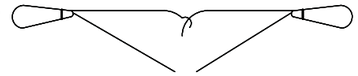
9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).

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.

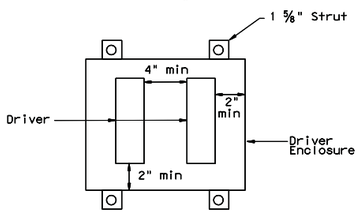
   c. Install drivers with at least 2 inches of space from enclosure walls.

   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

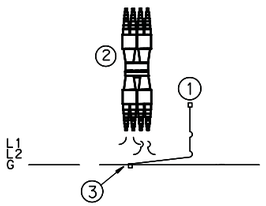
   e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.

   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



L1,L2 = Hot Conductors
G = Grounding Conductor

TYPICAL WIRING DIAGRAM

LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.

Texas Department of Transportation — Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS

RID(1)-20

FILE:	ridl-20.dgn	DN:	CK:	DW	CK:
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12-20					
72A					

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 13 OF 18

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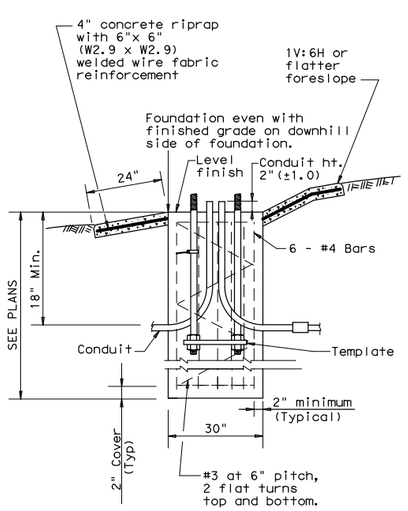
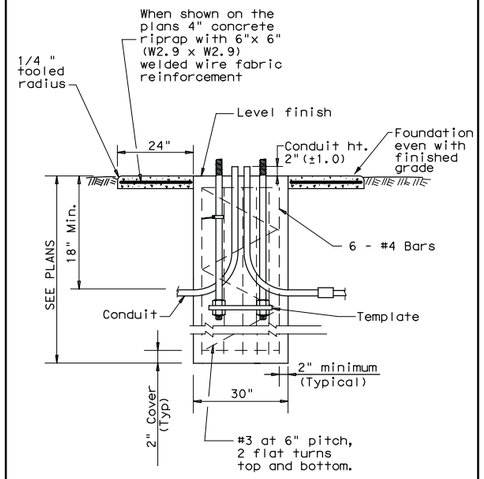
DATE:	
SHEET NO:	96



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.	1in.x 30in.
40-50 ft.	15 in.	17 ¼in.	1 ¼in. x 30in.

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:

1. "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.
2. 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.
3. 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.
4. 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.
5. Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
6. 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.
7. Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
8. 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.
9. Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
10. 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.
11. 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.

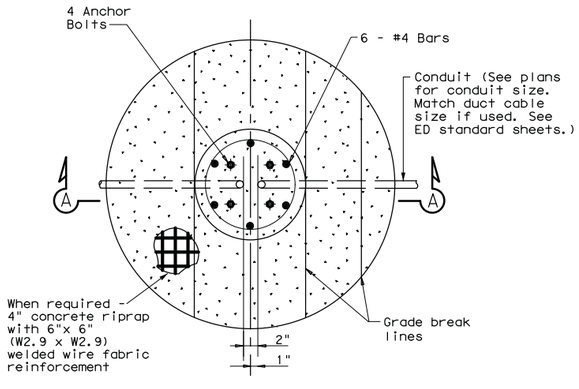
TABLE 4

BREAKAWAY POLE PLACEMENT (See note 6)

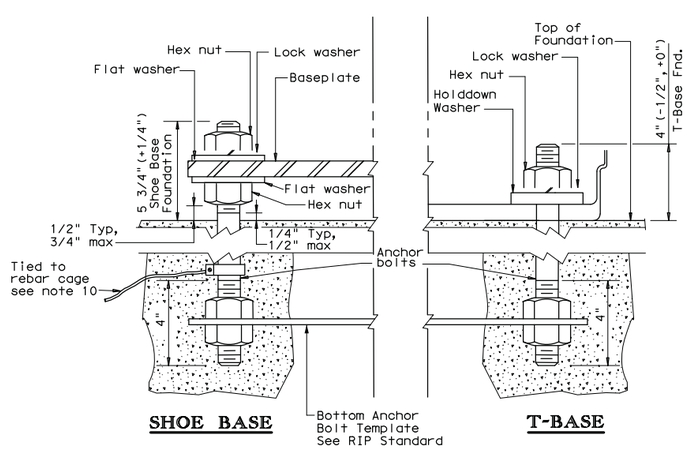
ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 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

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED
PROFESSIONAL ENGINEER

Drew Davis P.E.

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
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Texas Department of Transportation — Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS (RDWY ILLUM FOUNDATIONS)

RID(2)-20

FILE: rid2-20.dgn	DN:	CK:	DW:	CK:
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72B				

OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 14 OF 18

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	97

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SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

Nominal Mounting Ht. (ft)	Shoe Base Designation Pole	A1	A2	Luminaire	Quantity	T-Base Designation Pole	A1	A2	Luminaire	Quantity	CSB/SSCB Mounted Designation Pole	A1	A2	Luminaire	Quantity
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	
	(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	
40	(Type SA 40 S - 4)			(250W EQ) LED		(Type SA 40 T - 4)			(250W EQ) LED		(Type SP 38 S - 4)			(250W EQ) LED	
	(Type SA 40 S - 4 - 4)			(250W EQ) LED		(Type SA 40 T - 4 - 4)			(250W EQ) LED		(Type SP 38 S - 4 - 4)			(250W EQ) LED	
	(Type SA 40 S - 8)			(250W EQ) LED		(Type SA 40 T - 8)			(250W EQ) LED		(Type SP 38 S - 8)			(250W EQ) LED	
	(Type SA 40 S - 8 - 8)			(250W EQ) LED		(Type SA 40 T - 8 - 8)			(250W EQ) LED		(Type SP 38 S - 8 - 8)			(250W EQ) LED	
	(Type SA 40 S - 10)			(250W EQ) LED		(Type SA 40 T - 10)			(250W EQ) LED		(Type SP 38 S - 10)			(250W EQ) LED	
	(Type SA 40 S - 10 - 10)			(250W EQ) LED		(Type SA 40 T - 10 - 10)			(250W EQ) LED		(Type SP 38 S - 10 - 10)			(250W EQ) LED	
	(Type SA 40 S - 12)			(250W EQ) LED		(Type SA 40 T - 12)			(250W EQ) LED		(Type SP 38 S - 12)			(250W EQ) LED	
	(Type SA 40 S - 12 - 12)			(250W EQ) LED		(Type SA 40 T - 12 - 12)			(250W EQ) LED		(Type SP 38 S - 12 - 12)			(250W EQ) LED	
50	(Type SA 50 S - 4)			(400W EQ) LED		(Type SA 50 T - 4)			(400W EQ) LED		(Type SP 48 S - 4)			(400W EQ) LED	
	(Type SA 50 S - 4 - 4)			(400W EQ) LED		(Type SA 50 T - 4 - 4)			(400W EQ) LED		(Type SP 48 S - 4 - 4)			(400W EQ) LED	
	(Type SA 50 S - 8)			(400W EQ) LED		(Type SA 50 T - 8)			(400W EQ) LED		(Type SP 48 S - 8)			(400W EQ) LED	
	(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	
	(Type SA 50 S - 10)			(400W EQ) LED		(Type SA 50 T - 10)			(400W EQ) LED		(Type SP 48 S - 10)			(400W EQ) LED	
	(Type SA 50 S - 10 - 10)			(400W EQ) LED		(Type SA 50 T - 10 - 10)			(400W EQ) LED		(Type SP 48 S - 10 - 10)			(400W EQ) LED	
	(Type SA 50 S - 12)			(400W EQ) LED		(Type SA 50 T - 12)			(400W EQ) LED		(Type SP 48 S - 12)			(400W EQ) LED	
	(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 Pole	A1	A2	Luminaire	Quantity

GENERAL NOTES:

1. 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.

2. 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.

3. 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.

4. 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.

   a. 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.
   b. 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.
   c. 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.
   d. Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.

5. Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.

   a. Meet all of the requirements stated above for optional steel pole designs and the following:
      1. Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
      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.
      3. Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
      4. 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.

6. Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.

7. 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

(TYPE SA 50 T - X - X) (400W EQ) LED

- SA: Pole and mast arm may be steel or aluminum.
- ST: Pole and mast arm must be steel.
- AL: Pole and mast arm must be aluminum.
- SP: Special (ovalized) steel or aluminum pole for installing on CSB or SSCB. See standard sheet CSB (4), or SSCB (4).

Two numerical digits denote nominal mounting height in feet.

Next letter denotes type of base, (S-Shoe Base, T-Transformer Base, or B-Bridge/Ret.Wall Mount)

First number denotes length of mast arm in feet.

Use of second mast arm is indicated by second dashed number which denotes length in feet.

Luminaire rating in watts (i.e. 400W). Equivalent wattage LED fixtures will include EQ (i.e. 400W EQ)

Last letters indicate light source (S - High Pressure Sodium; LED - LED luminaire)

SHEET 1 OF 4

Texas Department of Transportation | Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(1)-19

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ILLUMINATION STANDARDS

SHEET 15 OF 18

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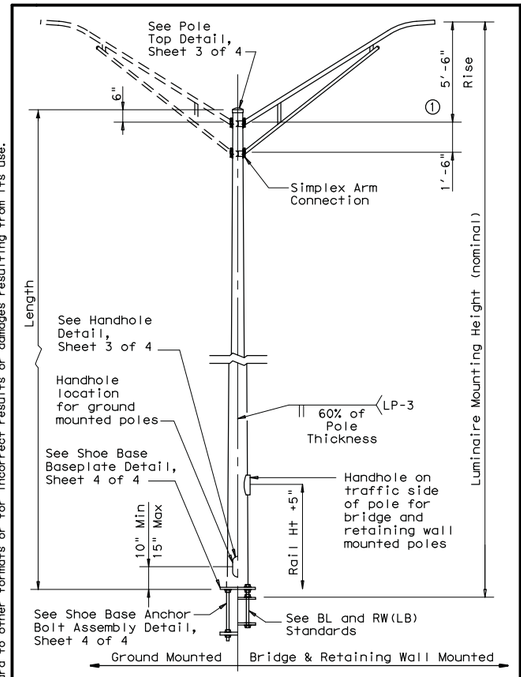
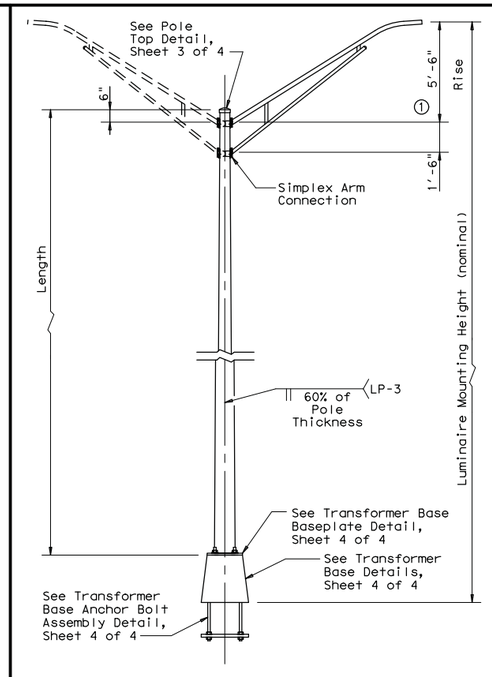


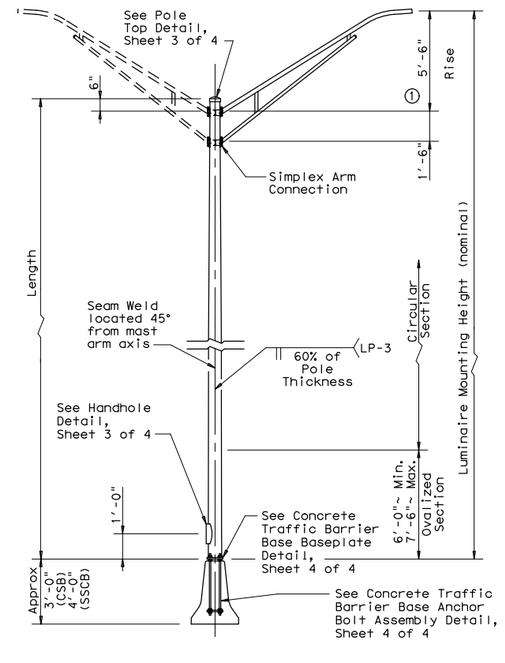
SHOE BASE POLE

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)	Base② Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)	
					About ℄ 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:

1. 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.
2. 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.
3. 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.
4. For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.
5. Unless otherwise noted, all steel parts shall be galvanized in accordance with Item 445, "Galvanizing."
6. 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.
7. 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.
8. Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.
9. Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."
10. 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.
11. 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."
12. 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.
13. 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 2③, 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		
Anchor Bolt Templates	A36	36
Heavy Hex (H.H.) Nuts	A194 Gr 2H,or A563 Gr DH	
Flat Washers	F436	

NOTES:

① 2'-6" rise for 4 ft. luminaire arms.

② Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.

③ 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	DN:	CK:	DW:	CK:
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7-17	DIST	COUNTY		SHEET NO.
12-19				

73B

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS — DREW C. DAVIS — 136156 — LICENSED PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 16 OF 18

DESIGNED BY:
DRAWN BY:
DATE:
SHEET NO: 99

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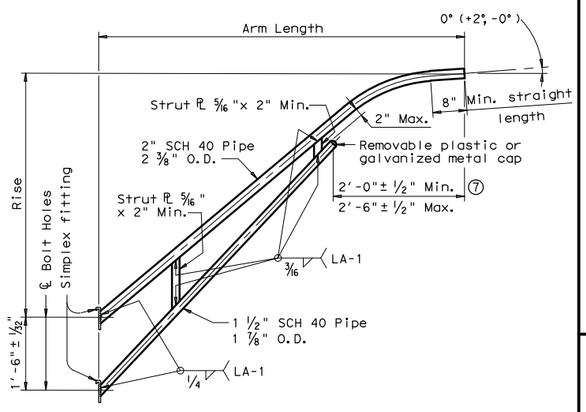
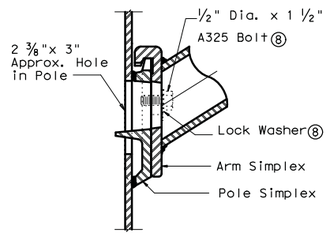


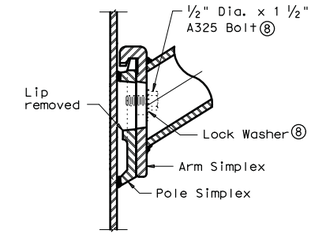
LUMINAIRE ARM

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
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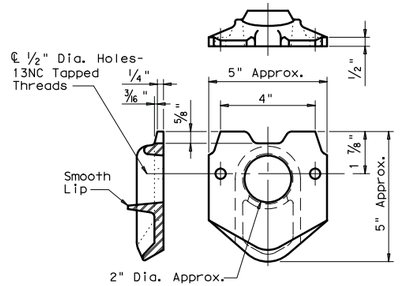
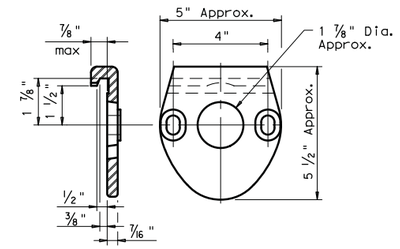
SECTION B-B



POLE SIMPLEX DETAIL ⑨



ARM SIMPLEX DETAIL ⑨

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.

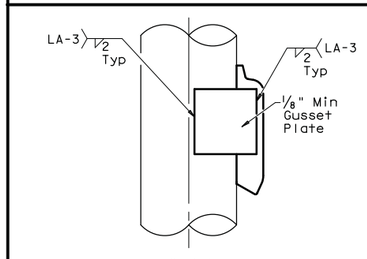
⑦ Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

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



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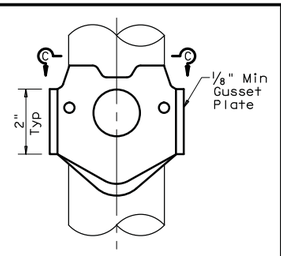
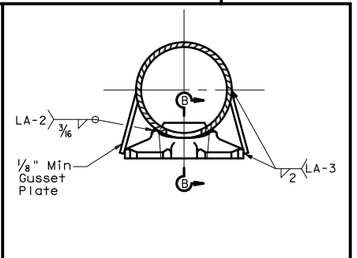
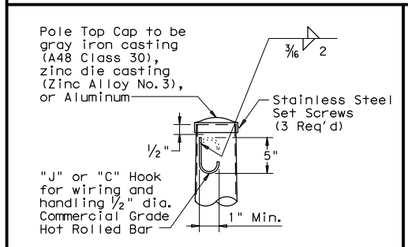


ELEVATION

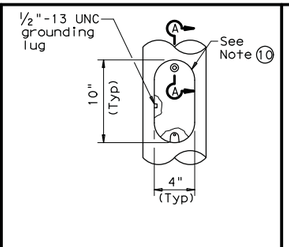


SECTION C-C

SIMPLEX ATTACHMENT DETAIL



POLE TOP



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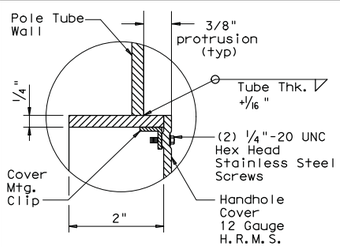

SECTION A-A

HANDHOLE

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED
PROFESSIONAL ENGINEER

P.E.
2/7/2022

SHEET 3 OF 4

Texas Department of Transportation — Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(3)-19

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TBPE Registration No. F-1046

OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 17 OF 18

DESIGNED BY:	
DRAWN BY:	
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SHEET NO:	100

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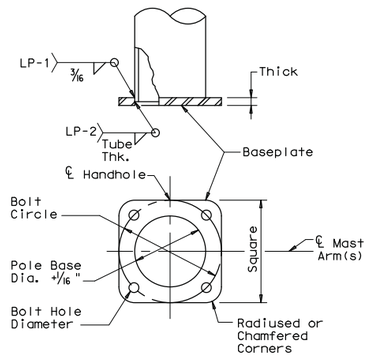
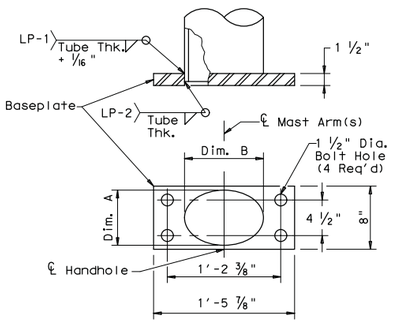


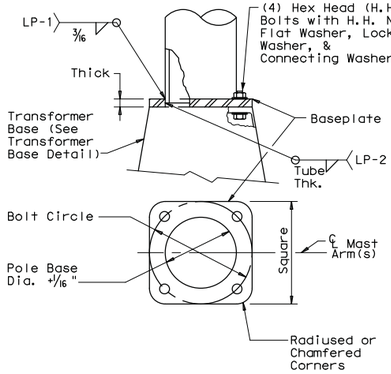
SHOE BASE BASEPLATE

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 BASE BASEPLATE

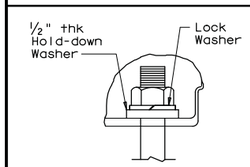
CONCRETE TRAFFIC BARRIER BASE BASEPLATE TABLE			
MOUNTING HEIGHTS (nominal)	POLE DIA.(12)	DIM. A	DIM. B
28′ - 38′	9"	7" ± 1/4"	10" ± 1/4"
48′	10 1/2"	7" ± 1/4"	13" ± 1/4"



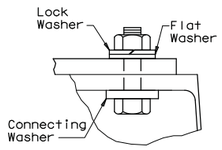
TRANSFORMER BASE BASEPLATE

TRANSFORMER BASE BASEPLATE TABLE						
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	CONNECTING BOLT DIA.	BOLT HOLE DIAMETER	TRANSFOMER 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

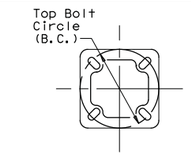
TRANSFORMER BASE TABLE		
TYPE	TOP B.C.	BTM. B.C.
A	13"	14"
B	15"	17 1/4"



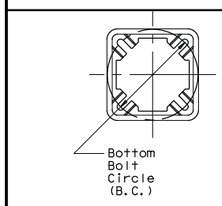
DETAIL A



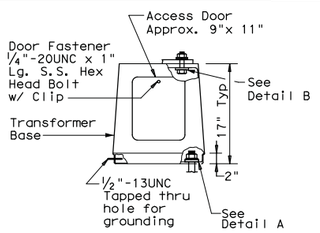
DETAIL B



TOP PLAN



BOTTOM PLAN



ELEVATION

TRANSFORMER BASE DETAILS

GENERAL NOTES:

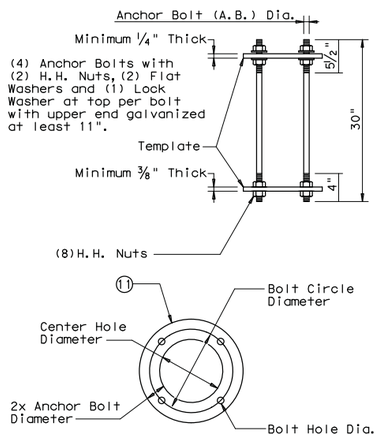
1. For mounting heights between those shown in the table, use the values in the table for the larger mounting height.
2. All breakaway bases shall meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (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.
3. 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.
4. 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.
5. 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:

(11) Anchor Bolt Templates do not need to be galvanized.

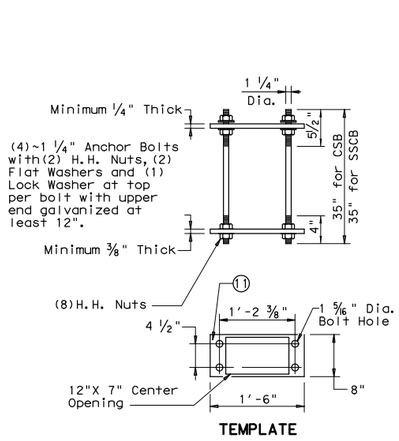
(12) Pole diameter before ovalized.

ANCHOR BOLT FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Length	± 1/2"
Threaded length	± 1/2"
Galvanized length (if required)	- 1/4"



SHOE BASE ANCHOR BOLT ASSEMBLY

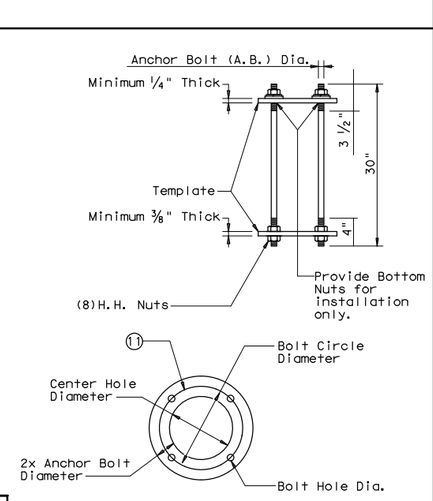
SHOE BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20′-39′	1"	13"	11"	1 1/16"
40′-50′	1 1/4"	15"	12 1/2"	1 5/16"



TEMPLATE

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"



TRANSFORMER BASE ANCHOR BOLT ASSEMBLY

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
DREW C. DAVIS
136156
LICENSED
PROFESSIONAL ENGINEER

P.E.

2/7/2022

SHEET 4 OF 4

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(4)-19

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OLD RICHMOND RD

ILLUMINATION STANDARDS

SHEET 18 OF 18

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SHEET NO:	101

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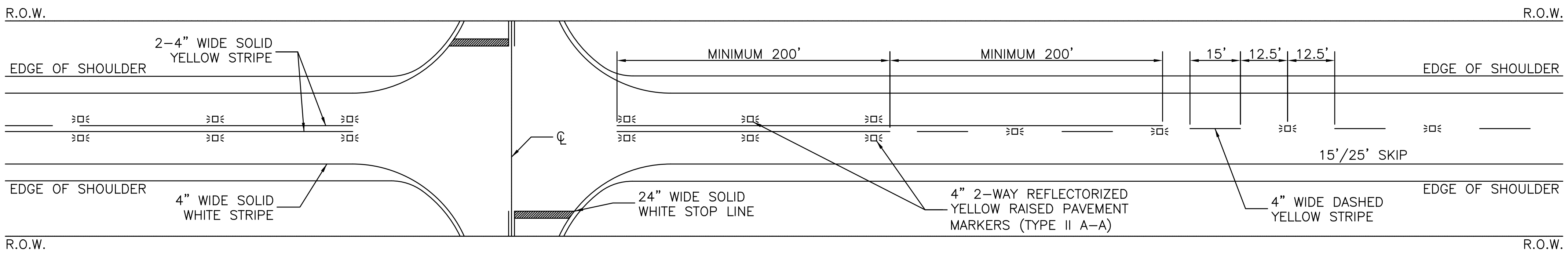
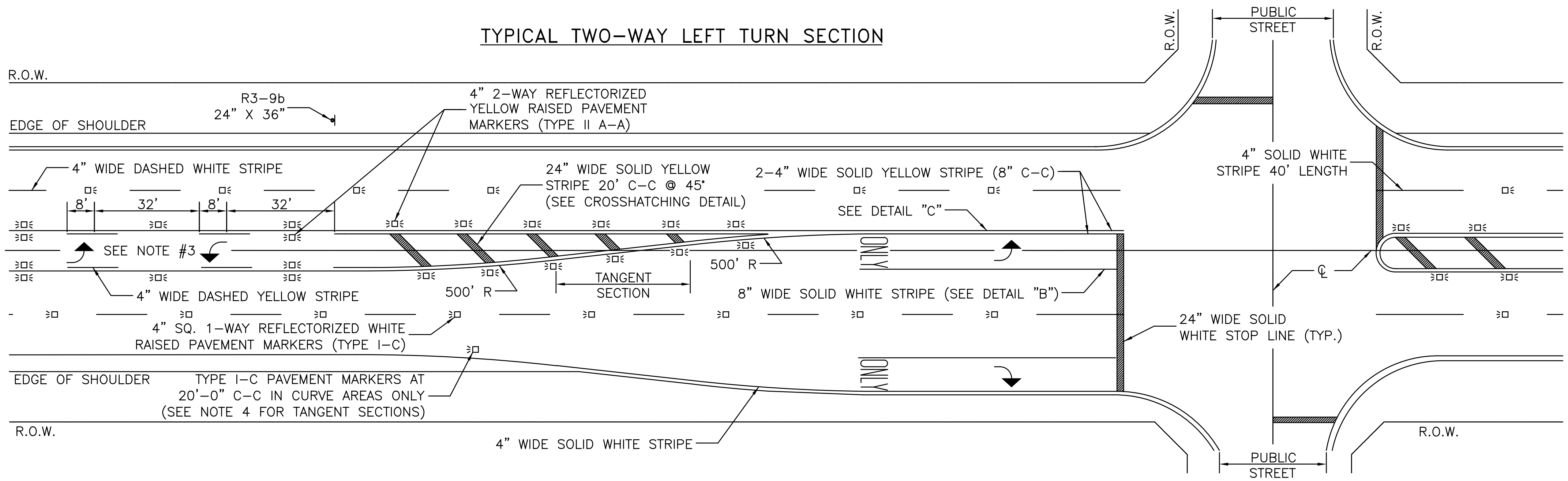
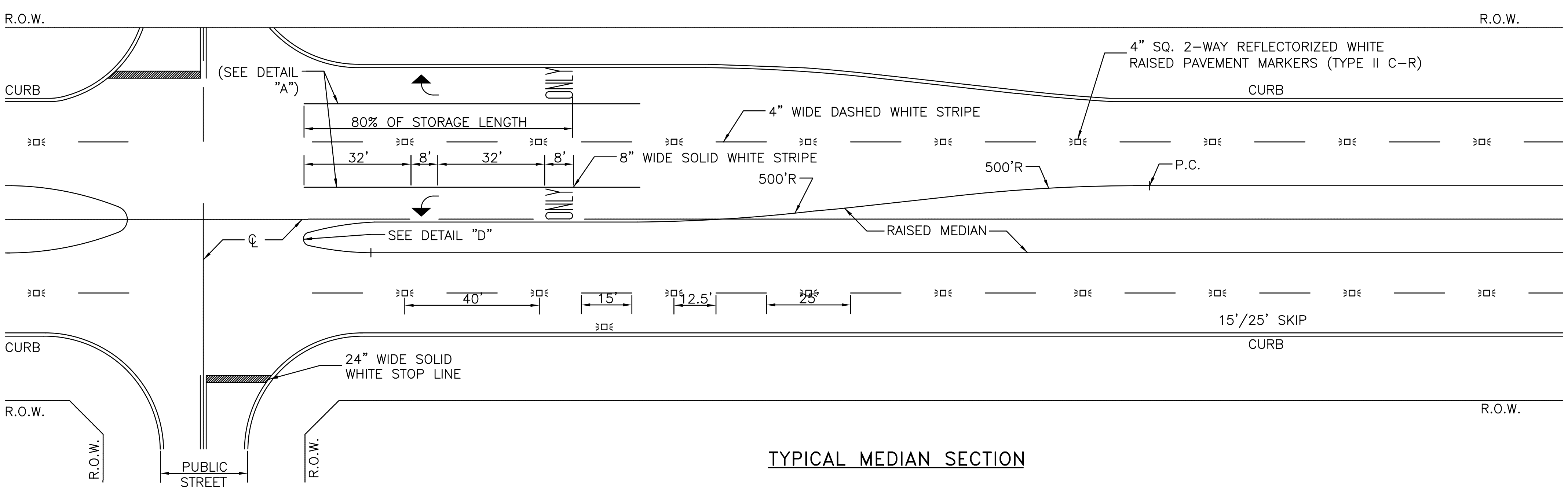


TYPICAL TWO LANE TWO-WAY ROAD

TYPICAL TWO-WAY LEFT TURN SECTION



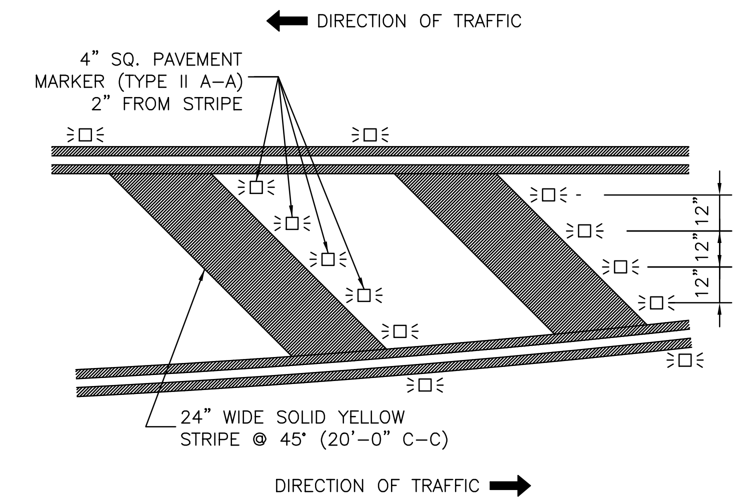


TYPICAL MEDIAN SECTION

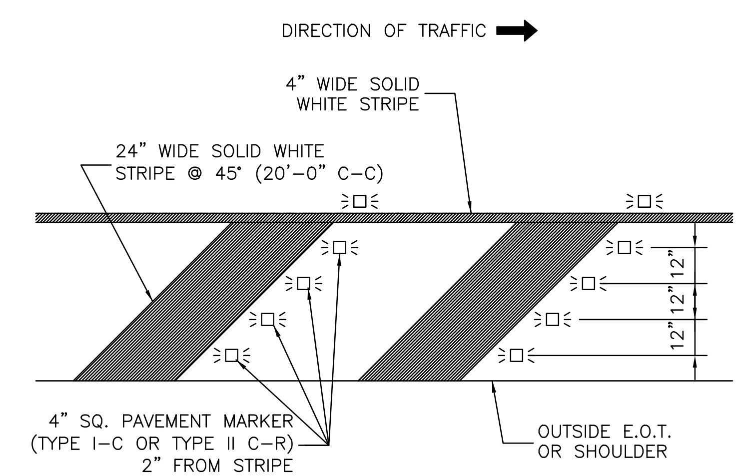
NOTES:

1. ALL PAVEMENT MARKINGS SHALL CONFORM TO THE LATEST EDITION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS (TMUTCD).
2. ALL TRAFFIC BUTTONS AND MARKERS SHALL BE INSTALLED ADJACENT TO STRIPES (APPROXIMATELY 2").
3. REPEAT ARROWS AT APPROXIMATELY 1000' INTERVALS WITHIN TWO-WAY LEFT TURN SECTION.
4. WITHIN A TANGENT SECTION THE TYPE I-C PAVEMENT MARKERS SHALL BE PLACED AT 40' C-C ON ROADWAYS WITHOUT CURB AND GUTTERS.
5. WHEN PAVEMENT MARKINGS EXTEND INTO OR CONTINUE THROUGH AN INTERSECTION AREA, THEY SHALL BE THE SAME COLOR AND AT LEAST THE SAME WIDTH AS THE LINE MARKINGS THEY EXTEND.
6. WHEN CROSSWALK MARKINGS ARE USED WITHIN AN ESTABLISHED SCHOOL ZONE, MID-BLOCK, OR AT UNCONTROLLED INTERSECTIONS, CROSSWALK SHALL BE CONTINENTAL STYLE.
7. ADDITIONAL SET OF "WORD" AND "ARROW" PAVEMENT MARKINGS SHALL BE USED WHEN TURN LANE STORAGE LENGTH IS 160 FEET OR GREATER.

CROSSHATCHING DETAIL



OUTSIDE EDGE CROSSHATCHING DETAIL



NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2–1–22	RJS

FORT BEND COUNTY
ENGINEERING DEPARTMENT

BGE, Inc.
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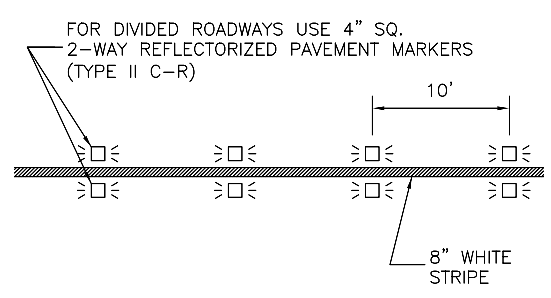
PROJECT TITLE:

DRAWN BY: INIT
CK'D BY: INIT
SCALE: NONE
DATE: 2–1–22

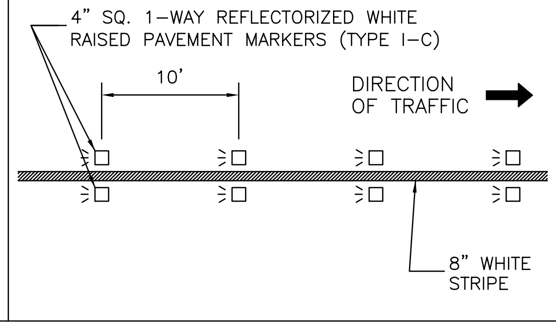
SHEET DESCRIPTION: PAVEMENT MARKING DETAILS
SHEET 1 OF 2
APPROVED BY:

FBCED STANDARD 46
SHEET NO: 102

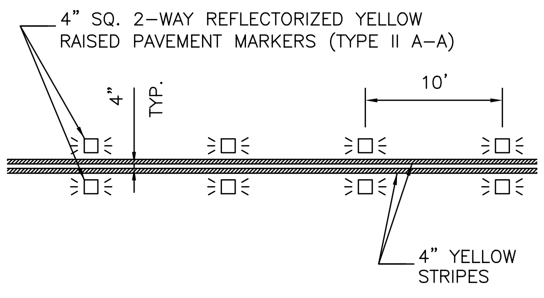
DETAIL "A"
(FOR DIVIDED ROADWAYS)



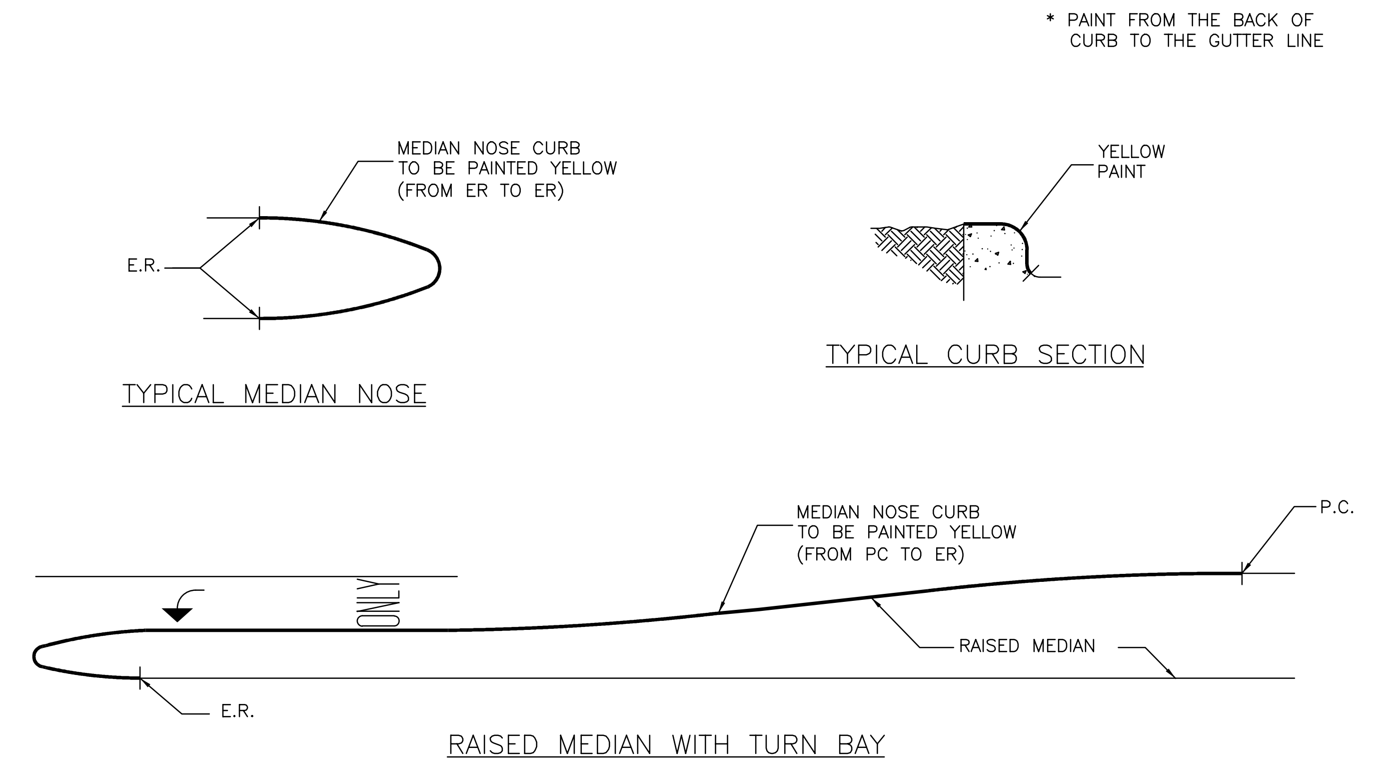
DETAIL "B"
(FOR UNDIVIDED ROADWAYS)



DETAIL "C"



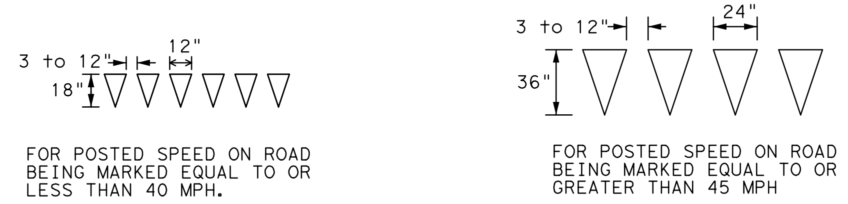
DETAIL "D"



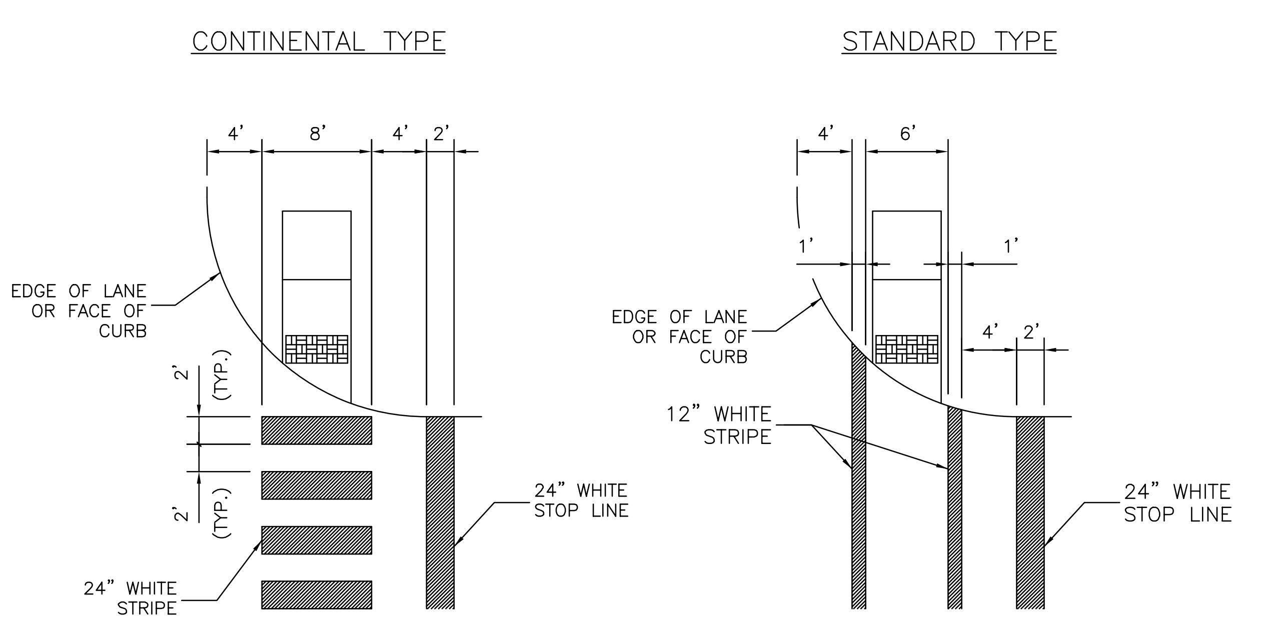
PAVEMENT MARKER LEGEND

SYMBOL	DESCRIPTION
⋸□⋹	4" x 4" REFLECTORIZED RAISED PAVEMENT MARKER
□⋹	INDICATED DIRECTION OF TRAFFIC FLOW

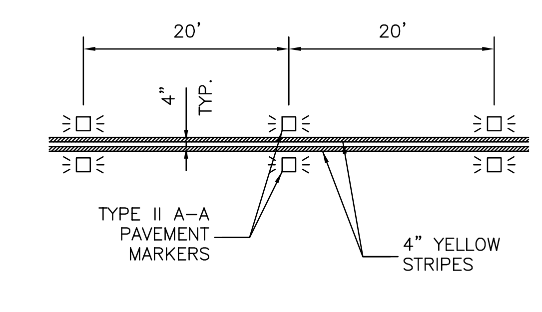
YIELD LINE DETAILS



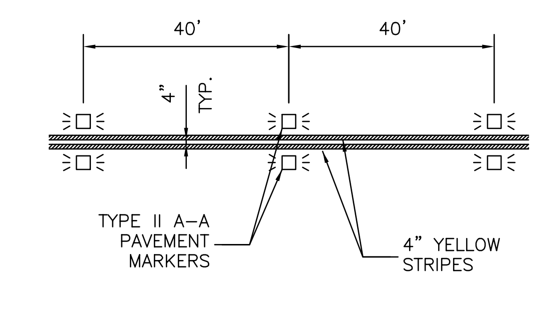
TYPICAL CROSSWALK PLACEMENT



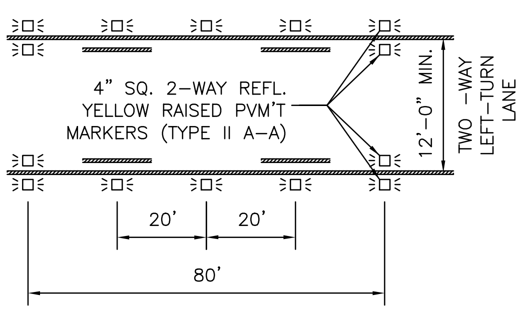
CENTER LINE DETAIL CURVE SECTION



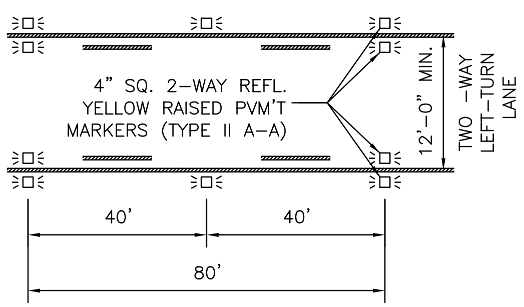
CENTER LINE DETAIL TANGENT SECTION



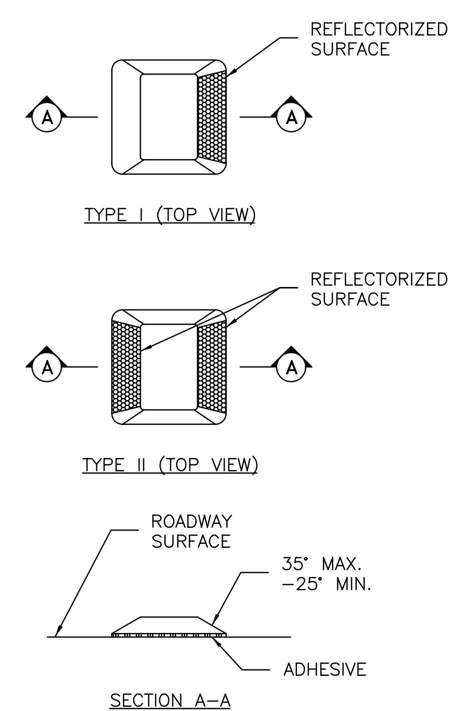
TWO-WAY LEFT TURN CURVE SECTION



TWO-WAY LEFT TURN TANGENT SECTION



RAISED PAVEMENT MARKERS



NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

FORT BEND COUNTY
ENGINEERING DEPARTMENT

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

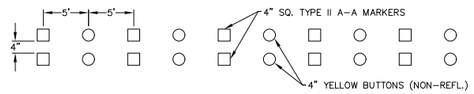
PROJECT TITLE:
DRAWN BY: INIT
CK'D BY: INIT
SCALE: NONE
DATE: 2-1-22
SHEET DESCRIPTION: PAVEMENT MARKING DETAILS
SHEET 2 OF 2
APPROVED BY:
FBCED STANDARD 47
SHEET NO: 103

PAVEMENT_MARKING_DETAILS-2of2.dwg

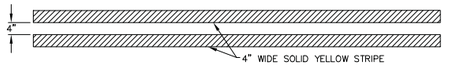
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

DOUBLE NO-PASSING LINE

RAISED PAVEMENT DETAILS (REMOVABLE)

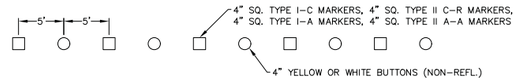


REFLECTORIZED PAVEMENT DETAILS (NON-REMOVABLE)

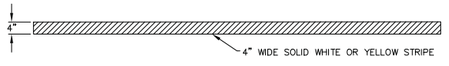


EDGE LINE OR SINGLE NO-PASSING LINE

RAISED PAVEMENT DETAILS (REMOVABLE)

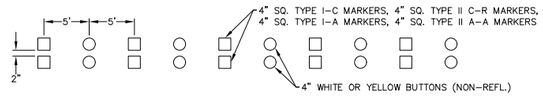


REFLECTORIZED PAVEMENT DETAILS (NON-REMOVABLE)

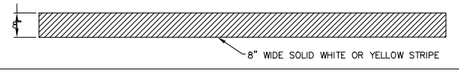


WIDE LINE (LEFT TURN LANE CHANNELIZING)

RAISED PAVEMENT DETAILS (REMOVABLE)

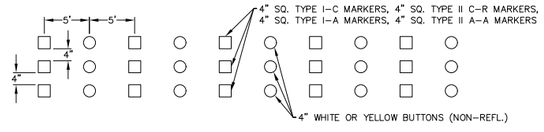


REFLECTORIZED PAVEMENT DETAILS (NON-REMOVABLE)

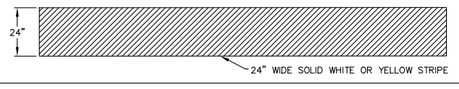


WIDE LINE (CROSS HATCHING)

RAISED PAVEMENT DETAILS (REMOVABLE)

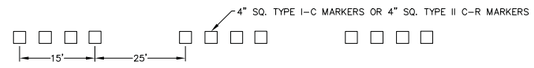


REFLECTORIZED PAVEMENT DETAILS (NON-REMOVABLE)

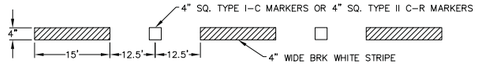


BROKEN LINES

RAISED PAVEMENT DETAILS (REMOVABLE)

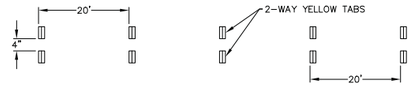


REFLECTORIZED PAVEMENT DETAILS (NON-REMOVABLE)

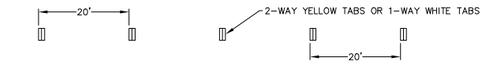


SHORT TERM WORK ZONE PAVEMENT MARKINGS DETAILS ASPHALT SURFACE TREATMENTS (ONLY)

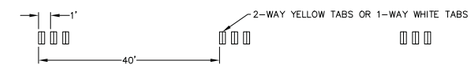
DOUBLE NO-PASSING LINE



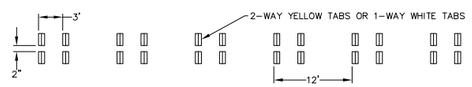
EDGE LINE OR SINGLE NO-PASSING LINE



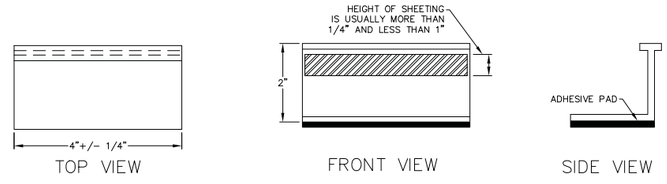
BROKEN LINE



WIDE LINE (WIDTH 8" OR GREATER)



TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTORIZED ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
5			

HARRIS COUNTY ENGINEERING DEPARTMENT

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

FOR INTERIM REVIEW ONLY
DOCUMENT INCOMPLETE: NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES
ENGINEER: NAME
P.E. SERIAL No. NUMBER
DATE: / /

PROJECT TITLE:
SHEET DESCRIPTION: TEMPORARY PAVEMENT MARKING DETAILS
TRAFFIC STANDARD: PM-T
DRAWN BY:
DATE:
CK'D BY:
SCALE: NONE
SHEET NO: /

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
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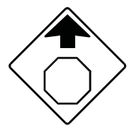
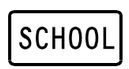
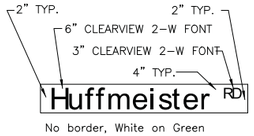
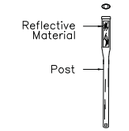
OLD RICHMOND RD

SIGNING & PAVEMENT MARKING STANDARDS

SHEET 3 OF 12

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	104

	 * MINIMUM SIZE OF 36X36 SHALL BE USED FOR STOP SIGNS THAT FACE MULTI-LANE APPROACHES										
TMUTCD/SHSD ID	R1-1	R1-2	R1-3P	R2-1	R3-4	R3-5R (L)	R3-7L (R)	R3-8	R4-7	R6-1R, R6-1L	R6-2R (L)
LOCAL	30x30*	30x30	18X6	24x30	24x24	30x36	30x30	Varies x 30	24x30	36x12	24x30
COLLECTOR	36x36	36x36	18X6	24x30	30x30	30x36	36x36	Varies x 30	24x30	36x12	30x36
THOROUGHFARE	36x36	36x36	18X6	24x30	30x30	30x36	36x36	Varies x 36	24x30	36x12	30x36
				 * SIGNALIZED LOCATIONS ONLY WHERE APPROVED BY HCED							
TMUTCD/SHSD ID	NO PARKING (ALL TYPES)	R8-8	R10-6R (L)	R10-17T	W1-1R (L)	W1-2R (L)	W1-3R (L)	W1-4R (L)	W1-6R (L), W1-7	W1-7T	W1-8R (L)
LOCAL	18x24	24x30	24x36	30x30	30x30	30x30	30x30	30x30	48x24	48x24	18x24
COLLECTOR	18X24	24x30	24x36	30X30	36x36	36x36	36x36	36x36	48x24	48x24	18x24
THOROUGHFARE	18X24	24x30	24x36	30X30	36x36	36x36	36x36	36x36	48x24	48x24	30x36
											
TMUTCD/SHSD ID	W2-1	W2-2R (L)	W3-1	W3-3	W4-2R (L)	W6-2	W6-3	W8-13aT	W9-1R (L)	W9-2R (L)	W10-1
LOCAL	30x30	30x30	30x30	30x30	36x36	36x36	36x36	36x36	36x36	36x36	30 dia.
COLLECTOR	30x30	30x30	30x30	30x30	36x36	36x36	36x36	36x36	36x36	36x36	30 dia.
THOROUGHFARE	36x36	36x36	36x36	36x36	36x36	36x36	36x36	36x36	36x36	36x36	30 dia.
											
TMUTCD/SHSD ID	W11-1 through W11-12	W13-1P	W14-1	W14-2	W16-2aP	W16-7PL (PR)	W16-9	S1-1	S4-3P		I-3
LOCAL	30x30	18x18	30x30	24x24	24x12	30x18	24x12	36x36	24x8	24x36	VARIES X 18
COLLECTOR	36x36	18x18	36x36	24x24	24x12	30X18	24x12	36x36	24x8	24x36	VARIES X 18
THOROUGHFARE	36x36	18x18	36x36	N/A	24X12	30x18	24X12	36x36	24x8	24x36	VARIES X 30
											
TMUTCD/SHSD ID	OM-3R, OM-3L	GROUND MOUNTED STREET NAME SIGN		TYPES D-DY, D-DW							
LOCAL	12X36	VARIES X 8		36" TALL							
COLLECTOR	12X36	VARIES X 8		36" TALL							
THOROUGHFARE	12X36	VARIES X 8		36" TALL							

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
5			

HARRIS COUNTY
ENGINEERING DEPARTMENT

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10777 Westheimer, Suite 400, Houston, TX 77042
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TBPE Registration No. F-1046

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DOCUMENT INCOMPLETE:
NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES

ENGINEER: NAME
P.E. SERIAL No. NUMBER
DATE: / /

PROJECT TITLE:

SHEET DESCRIPTION: SMALL SIGN DETAILS

TRAFFIC STANDARD: SSD

DRAWN BY:

DATE:

CK'D BY:

SCALE: NONE

SHEET NO:

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER
2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

SIGNING & PAVEMENT MARKING STANDARDS

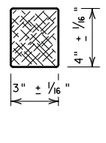
SHEET 4 OF 12

DESIGNED BY:
DRAWN BY:
DATE:
SHEET NO: 105

PEN TABLE: T:\PCSETUP\Tables\TXDOT.TBL
PLOT DRIVER: t:\pcsetup\plotdrv\TxDOT_pdf_grayscale.plt
FILENAME: G:\TXH\Projects\Fort_Bend_County\6974-00 FBC Intersections\03_CADD\08-SPMD\SSD_RDBT.dgn
MODEL NAME: SSD
2/7/2022 9:36:10 AM

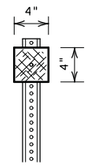
DATE:
FILE:

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
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

	SINGLE		DOUBLE	
DEVICE				
	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

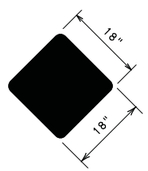
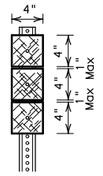
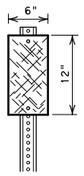
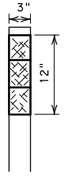
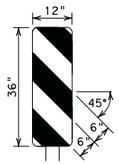
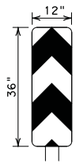
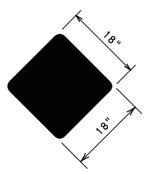
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

	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
DEVICE								
		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_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

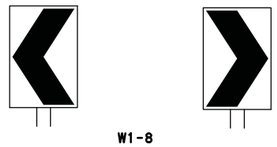
BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			

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.

SHEETING	Yellow, White, Red
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.

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"		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).

ONE DIRECTION LARGE ARROW

DEVICE  W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

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

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

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS				
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20				

20A

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS — HARRISON THAI — 129438 — LICENSED PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

SIGNING & PAVEMENT MARKING STANDARDS

SHEET 5 OF 12

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	106

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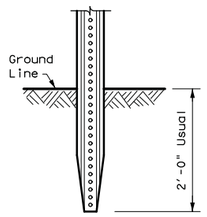
2/7/2022 9:36:11 AM

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND



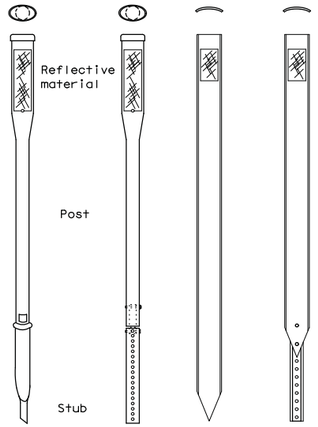
NOTES

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.

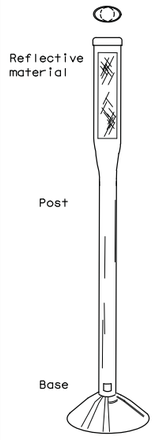
EMBEDDED

FLEXIBLE POSTS (YFLX, WFLX)

GND



SRF



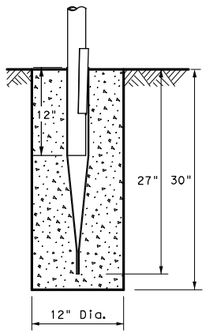
SURFACE MOUNT

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.

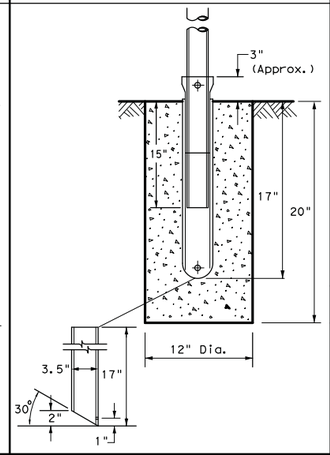
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

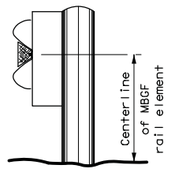
NOTE

1. Install per manufacturer's recommendations.

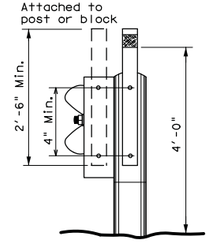
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

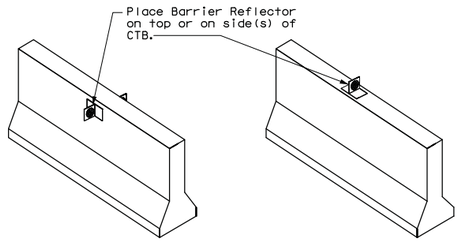
GF1



GF2



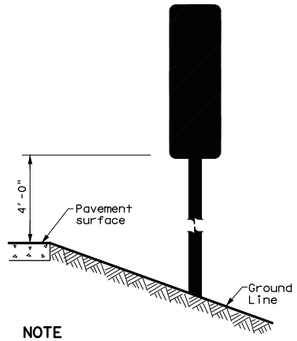
CONCRETE TRAFFIC BARRIER (CTB)



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.

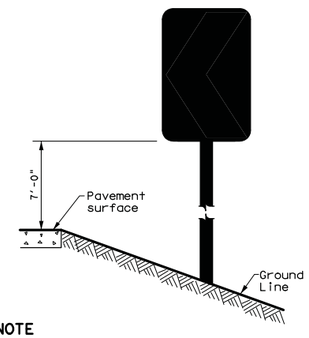
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

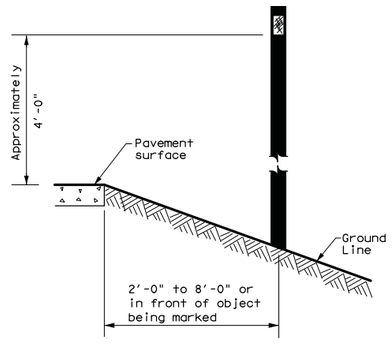
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS				
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20				
20B				

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

SIGNING & PAVEMENT MARKING STANDARDS

SHEET 6 OF 12

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	107

DATE:
FILE:

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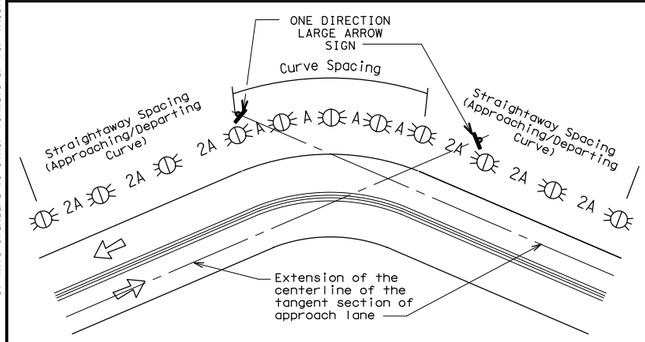
MODEL NAME: DOM2-20
2/7/2022 9:36:11 AM

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

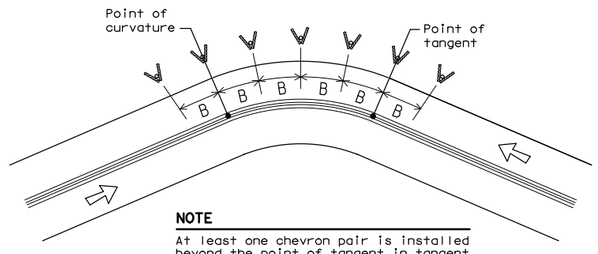
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



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

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	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

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	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

1. 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.
2. Barrier reflectors may be used to replace required delineators.
3. 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	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS				
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20				
20C				

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

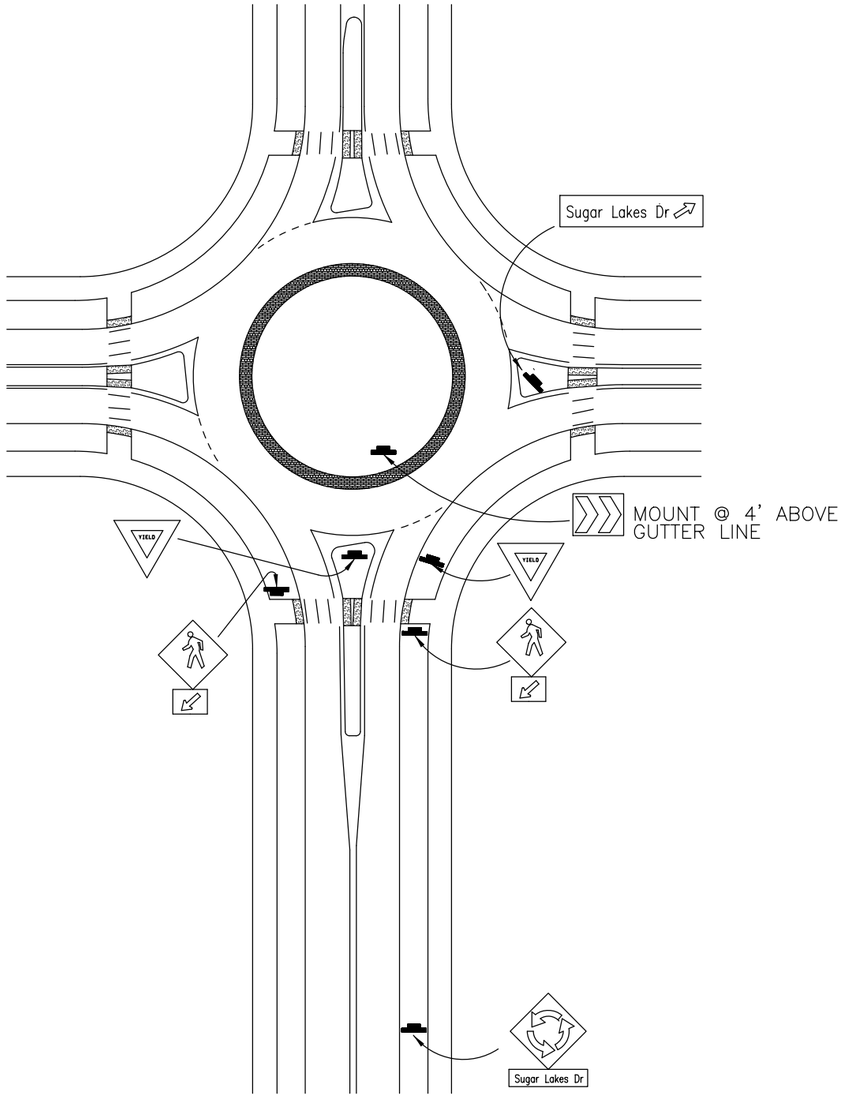
OLD RICHMOND RD

SIGNING & PAVEMENT MARKING STANDARDS

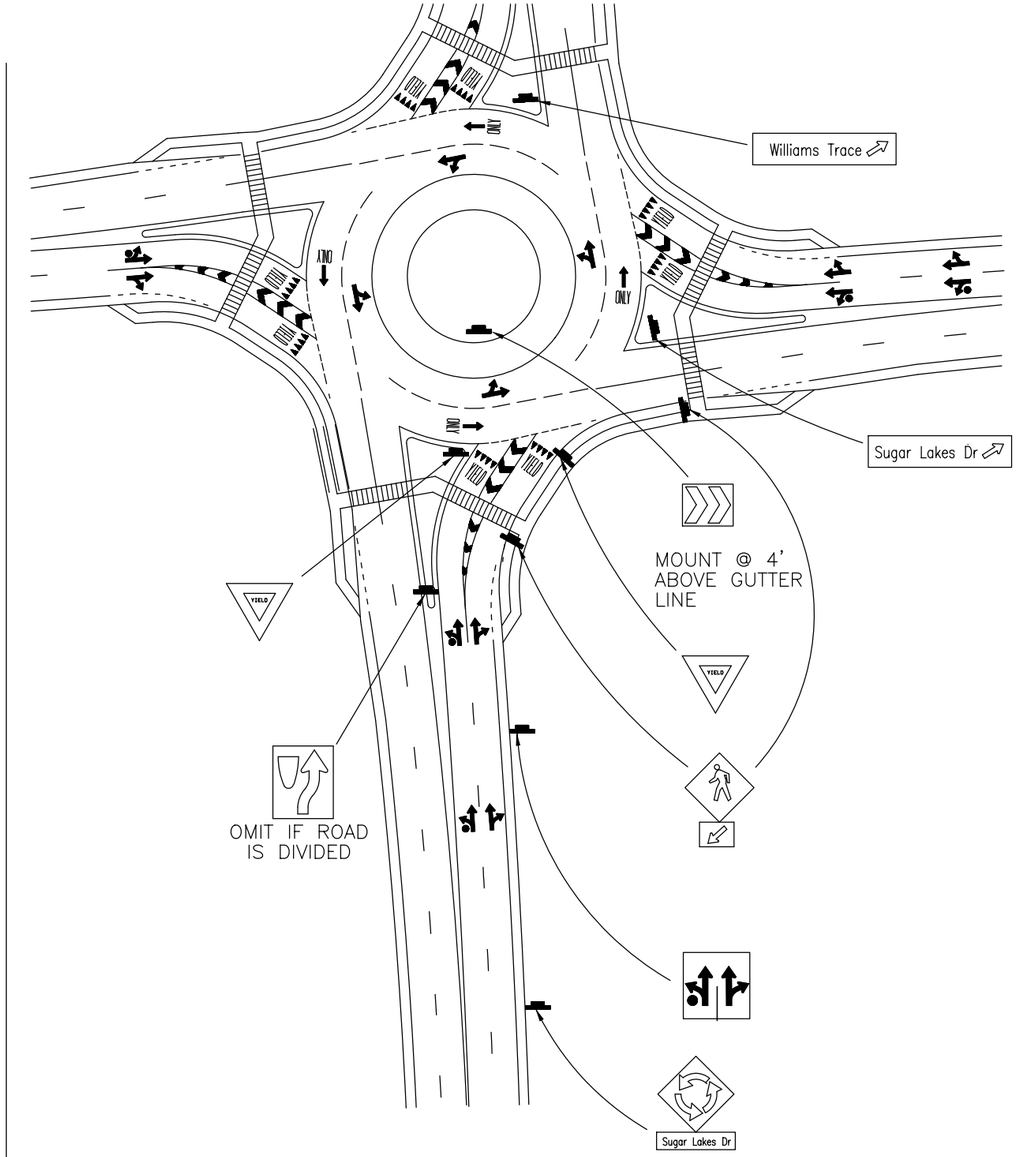
SHEET 7 OF 12

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	108

DATE:
FILE:



SIGNAGE FOR SINGLE LANE ROUNDABOUT
N.T.S.



SIGNAGE FOR 2–LANE ROUNDABOUT
N.T.S.

NOTES: SIGNS ARE SHOWN FOR ONE APPROACH ONLY

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2–1–22	RJS

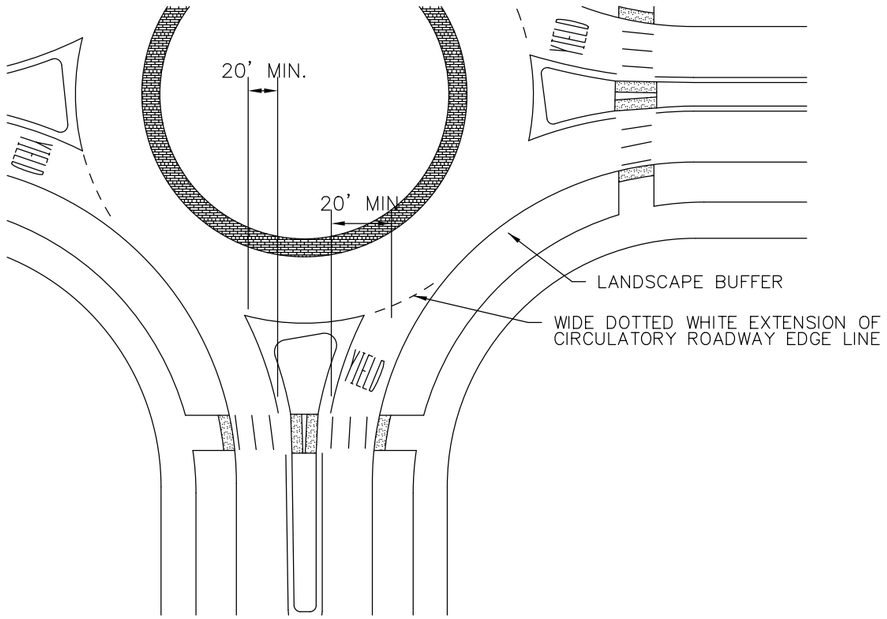
FORT BEND COUNTY
ENGINEERING DEPARTMENT

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

PROJECT TITLE:

DRAWN BY: INIT		FBCED STANDARD 43
CK'D BY: INIT	SHEET DESCRIPTION: ROUNDABOUT CONSTRUCTION DET II	
SCALE: AS NOTED	SHEET 2 OF 3	SHEET NO: 109
DATE: 2–1–22	APPROVED BY:	

J:\1704\1601\Fort Bend County Standards\Fort Bend County STD\DONE\FBC CONCRETE PAVEMENT DETAILS\CONCRETE_PAVEMENT_DETAILS-1of2.dwg



PAVEMENT MARKINGS FOR
SINGLE LANE ROUNDABOUT
N.T.S.

NOTES

1. USE STANDARD (NON FISHHOOK) ARROWS ON ROUNDABOUT APPROACHES AND IN CIRCULATORY ROADWAY.

2. PLACE "SHARKS'S TEETH" YIELD MARKINGS PERPENDICULAR TO LEFT LANE LINE OR CURB FOR EACH LANE.

3. CROSSWALK OMITTED FROM TWO–LANE DETAIL FOR CLARITY. MINIMUM CROSSWALK DIMENSIONS FOR SINGLE –LANE ROUNDABOUT ALSO APPLY TO MULTI –LANE.

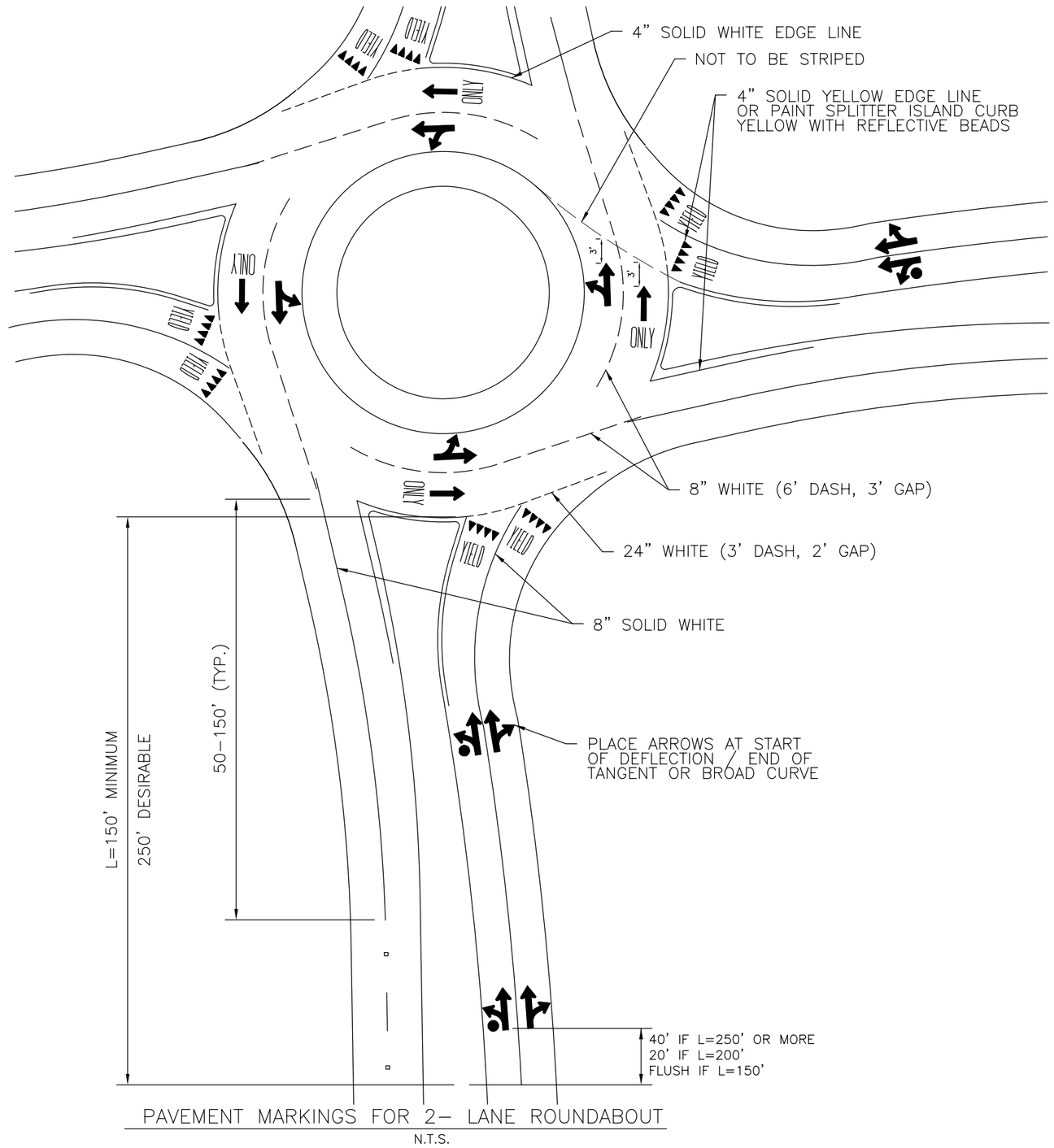
4. PAVEMENT MARKING MUST BE SHOWN ON THE APPROVED CONSTRUCTION PLANS.

5. PAVEMENT SURFACE AREAS PRIOR TO PLACEMENT OF PAVEMENT MARKINGS AND/OR RAISED PAVEMENT MARKERS SHALL BE CLEANING IN ACCORDANCE WITH COUNTY STANDARDS. CONCRETE SURFACES SHALL BE CLEANED BY ABRASIVE BLASTING MEDIUM. ASPHALT PAVEMENT SURFACE SHALL BE CLEANED BY BRUSHING WASHING, COMPRESSED AIR, AND/OR HIGH –PRESSURE WATER. AREAS MUST BE FREE OF CURING MEMBRANCE, DIRT, GREASE, LOOSE AND/OR FLAKING EXISTING MARKERS, AND FORMS OF DEBRIS.

6. ALL STREET CROSSING SHALL COMPLY WITH T.A.S. AND A.D.A. SEE HANDICAP CROSS DETAIL.

7. ALL PAVEMENT MARKING AND/OR RAISED PAVEMENT MARKERS SHALL COMPLY WITH THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, A.D.A, T.A.S., AMD COUNTY STANDARDS AND ALL REVISIONS THEREOF.

8. PAVEMENT MAKINGS PLACED THAT ARE NOT IN ALIGNMENT OR SEQUENCE AS SHOWN ON THE PLANS OR STATED IN THE PROJECT SPECIFICATIONS SHALL BE REMOVED AND REPLACED AT THE CONTRACTOR'S EXPENSE.



PAVEMENT MARKINGS FOR 2– LANE ROUNDABOUT
N.T.S.

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2–1–22	RJS

FORT BEND COUNTY
ENGINEERING DEPARTMENT

BGE, Inc.
10777 Westhelmer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Reglstration No. F-1046

PROJECT TITLE:	
DRAWN BY: INIT	FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: ROUNDABOUT CONSTRUCTION DET III — 44
SCALE: AS NOTED	SHEET 3 OF 3
DATE: 2–1–22	APPROVED BY: — SHEET NO: 110

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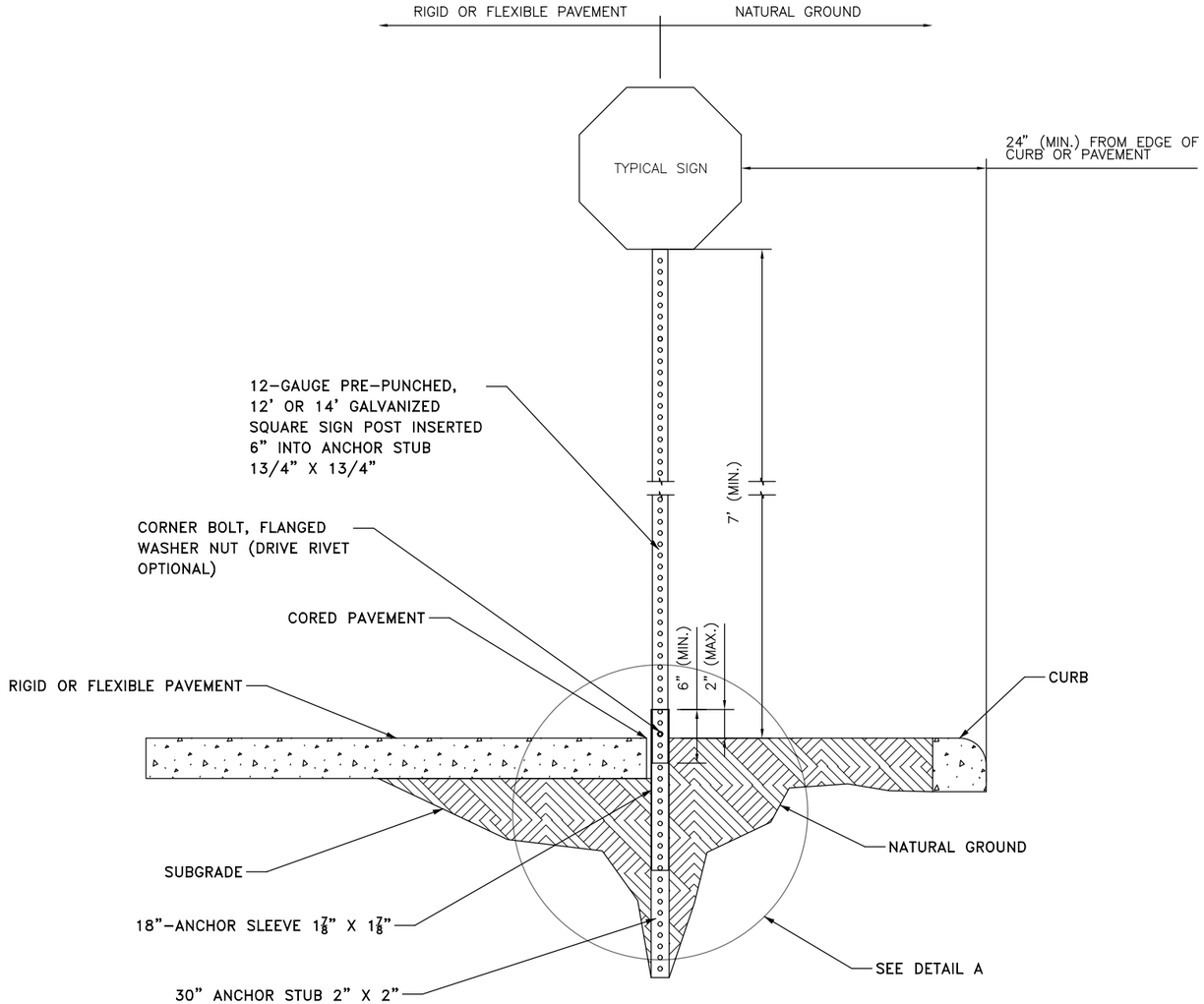

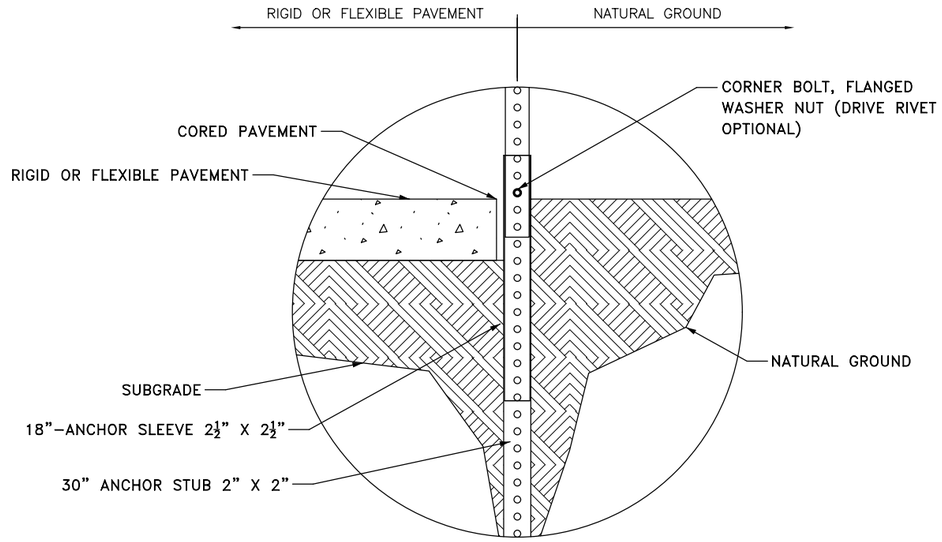

TYPICAL GROUND SIGN INSTALLATION
DETAIL A

NOTES:

1. THE CROSS SECTION OF ALL MEMBERS SHALL BE SQUARE TUBE FORMED OF 12 GAUGE AND MANUFACTURED FROM HOT-GALVANIZED STEEL
2. THE TELESCOPE BREAKAWAY SYSTEM OR "SYSTEM" IS DEFINED AS FOLLOW:
   - A MINIMUM 30" ANCHOR STUB;
   - 18" ANCHOR SLEEVE.
3. DRIVE THE SYSTEM TOGETHER MAKING SURE THE HOLES ARE ALIGNED.
4. THE SYSTEM IS TO BE DRIVEN INTO NATURAL GROUND EXPOSED SUBGRADE UNTIL ONLY 1 TO 2 INCHES ARE LEFT EXPOSED.
5. ATTACH THE SIGN TO AN 1 3/4" SQUARE POST AT THE DESIRED HEIGHT, SUCH THAT IT MEETS THE MINIMUM VERTICAL CLEARANCE.
6. SIGNS ARE FASTENED TO THE POST BY USING DRIVE RIVETS OR BOLTS.
7. INSERT THE SIGN POST APPROXIMATELY 6 TO 8 INCHES INTO THE ANCHOR BASE.
8. BOLT THE SIGN POST TO THE ANCHOR ASSEMBLY WITH A CORNER BOLT.
9. WHEN INSTALLING IN RIGID OR FLEXIBLE PAVEMENT, USE A CORING MACHINE TO EXPOSE THE SUBGRADE MATERIAL AND INSTALL THE SYSTEM.

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NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

FORT BEND COUNTY
ENGINEERING DEPARTMENT

THE STATE OF TEXAS · FORT BEND COUNTY ·

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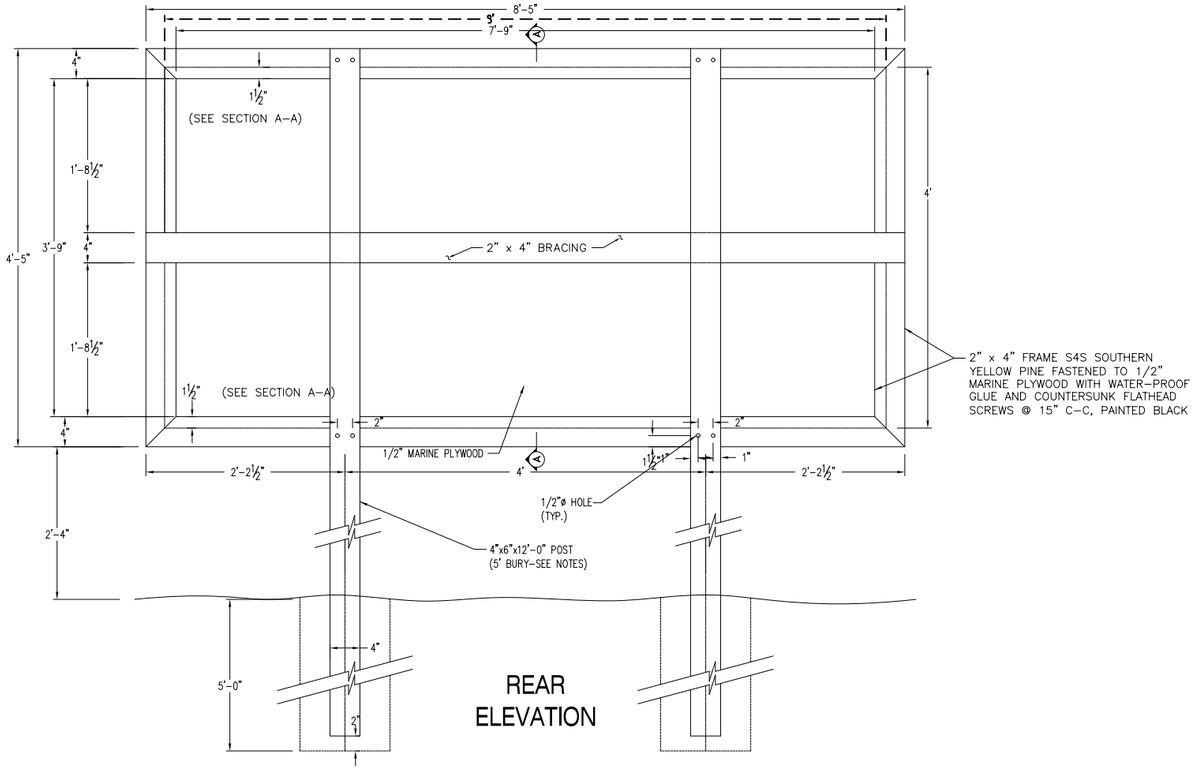
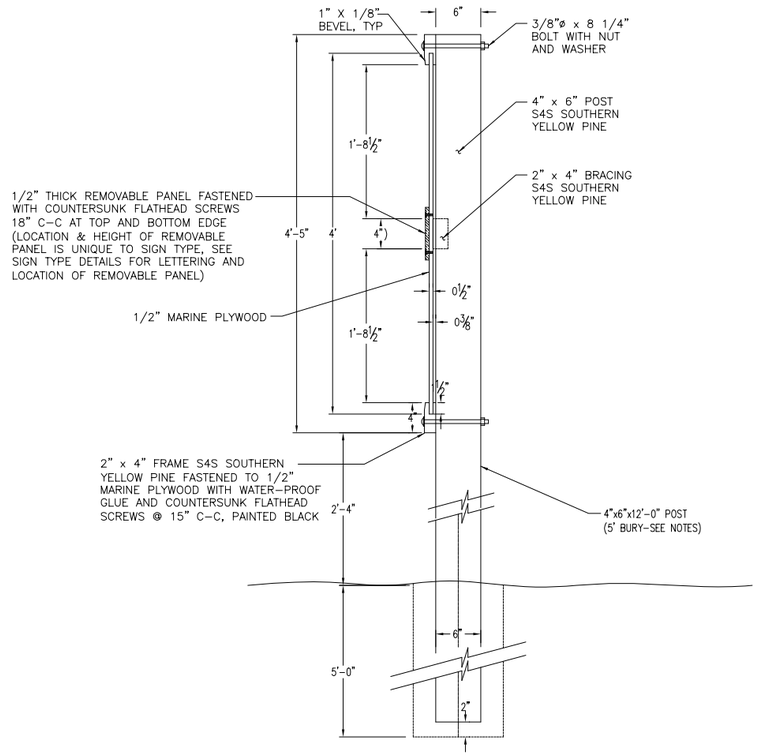
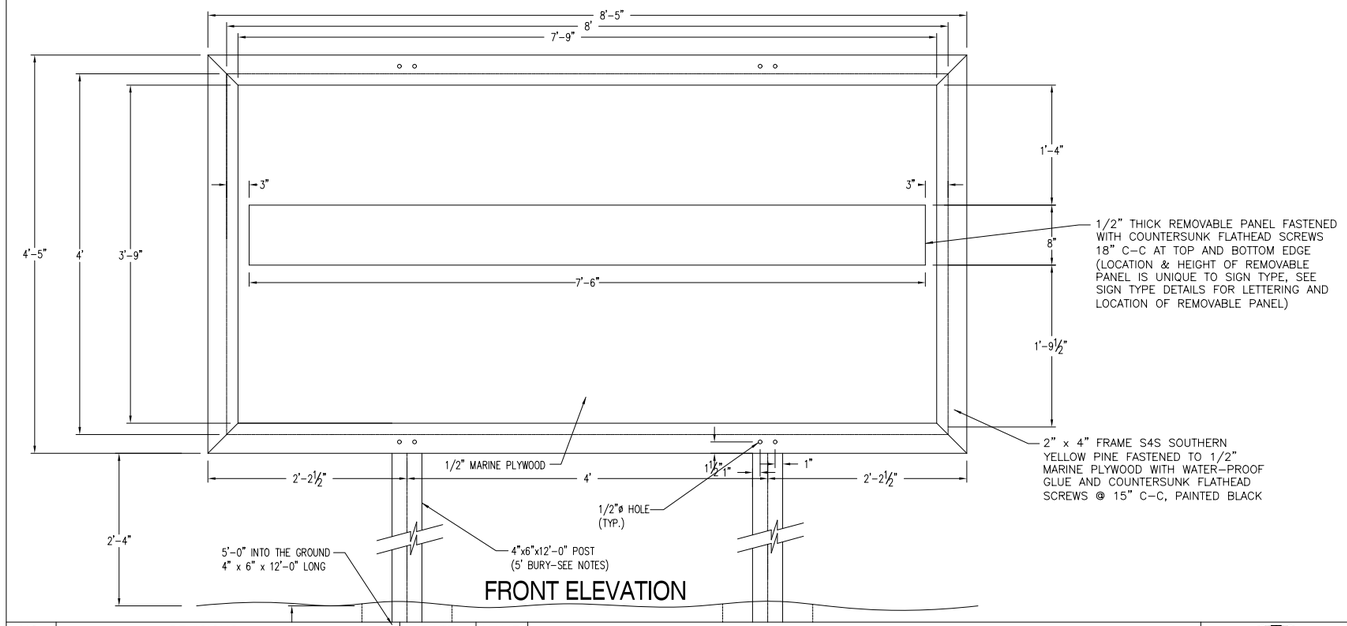
PROJECT TITLE:		
DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: TYPICAL GROUND SIGN INSTALLATION	52
SCALE: AS NOTED		SHEET NO:
DATE: 2-1-22	APPROVED BY:	111



REAR ELEVATION



SECTION A-A



FRONT ELEVATION

GENERAL NOTES:

1. THE SIGN SHALL HAVE BLACK LETTERS WITH WHITE BACKGROUND.
2. ALL LETTERING SHALL BE EITHER AERIAL FONT OR HELVETICA FONT.
3. SIGN SHALL BE MOUNTED ON 4" x 6" POSTS AND LOCATED BY THE ENGINEER.
4. REMOVABLE PANEL SHALL BE 1/2" MARINE PLYWOOD.
5. ALL BOLTS, SCREWS, NAILS, NUTS AND WASHERS SHALL BE GALVANIZED OR CADMIUM PLATED.
6. 4" x 6" POST SHALL BE WOLMANIZED OR PENTACHLOROPHENOL TREATED.
7. ALL WOOD SURFACES SHALL HAVE PRIME COAT AND TWO (2) COATS OF SHERWIN-WILLIAMS KEM-LUSTRA ENAMEL OR EQUAL.

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

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PROJECT TITLE:

DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: PROJECT SIGN DETAILS	35
SCALE: NONE	SHEET 1 OF 4	SHEET NO: 112
DATE: 2-1-22	APPROVED BY:	

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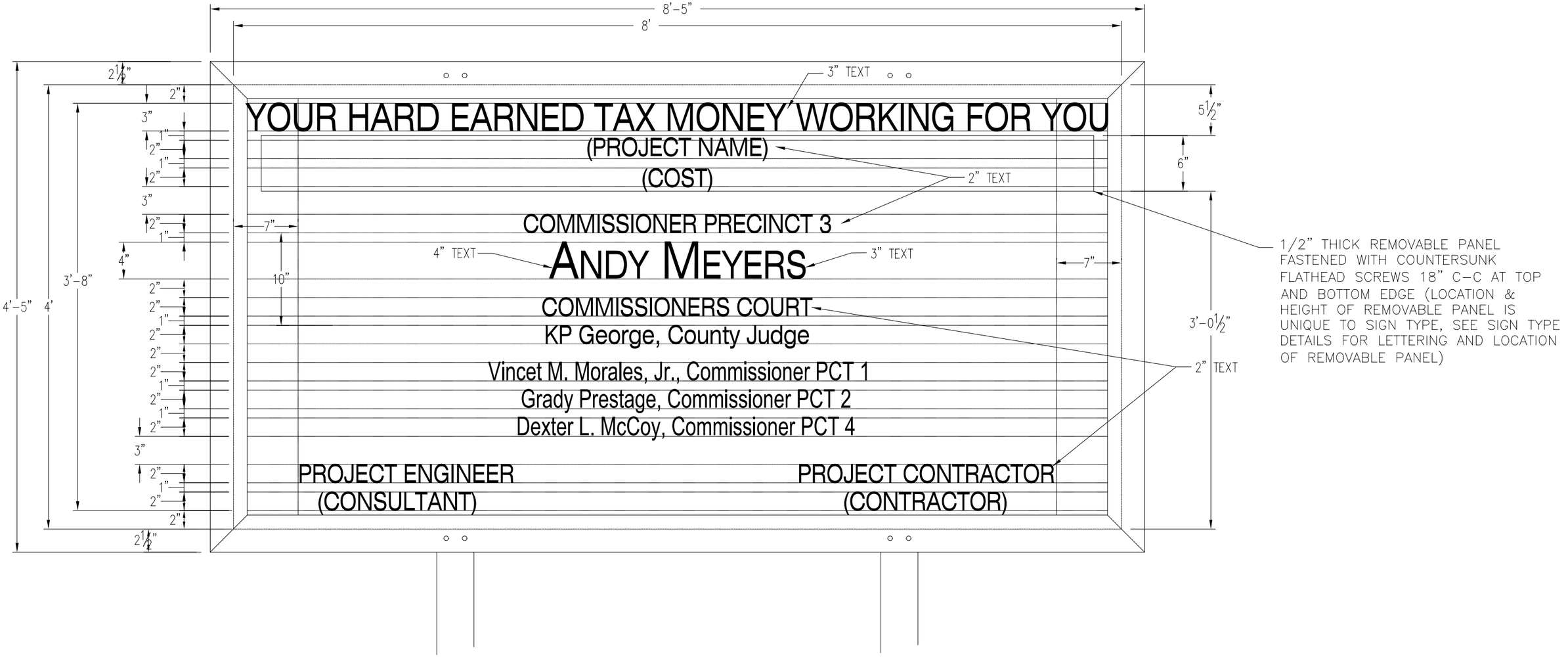

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GENERAL NOTES:

1. THE SIGN SHALL HAVE BLACK LETTERS WITH WHITE BACKGROUND.
2. ALL LETTERING SHALL BE EITHER AERIAL FONT OR HELVETICA FONT.
3. SIGN SHALL BE MOUNTED ON 4" x 6" POSTS AND LOCATED BY THE ENGINEER.
4. REMOVABLE PANEL SHALL BE 1/2" MARINE PLYWOOD.
5. ALL BOLTS, SCREWS, NAILS, NUTS AND WASHERS SHALL BE GALVANIZED OR CADMIUM PLATED.
6. 4" x 6" POST SHALL BE WOLMANIZED OR PENTACHLOROPHENOL TREATED.
7. ALL WOOD SURFACES SHALL HAVE PRIME COAT AND TWO (2) COATS OF SHERWIN-WILLIAMS KEM-LUSTRA ENAMEL OR EQUAL.

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	3-1-22	RJS
2	UPDATED PCT. 4 COMMISSIONER	1-1-23	RJS

FORT BEND COUNTY
ENGINEERING DEPARTMENT

THE STATE OF TEXAS · FORT BEND COUNTY ·

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10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
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PROJECT TITLE:

DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: COUNTY FUNDED PROJECT SIGN	37
SCALE: NONE	(FOR PCNT. 3) SHEET 3 OF 4	SHEET NO:
DATE: 1-1-23	APPROVED BY:	113

STORM WATER POLLUTION PREVENTION PLAN

PROJECT NAME: Project 17413 Voss Rd at Old Richmond Rd proposed roundabout.

LOCATION & LIMITS: Intersection of Voss Rd and Old Richmond Rd. Limits include: 531' south of intersection, 418' north, and 192' east.

See plan cover sheet for vicinity map.

PROJECT SCOPE:

Activity (check all that apply)	
Roadway Expansion	
Roadway New Construction	✓
Underground Storm Sewer	✓
Detention Pond	
Bridge Expansion	
Bridge New Construction	

TOTAL PROJECT AREA: 2.78 Acres 1,133 Linear Feet

TOTAL AREA DISTURBED: 1.96 Acres

EXISTING CONDITIONS OF SOIL, VEGETATION, AND DRAINAGE:

Site generally covered with grass and existing pavement.

PHASED CONSTRUCTION ACTIVITIES:

Construction activities include clearing of the right-of-way;
Installation of underground storm sewer pipe, manholes, and inlets;
Construction of curbed roadway and asphalt overlay
Installation of signing and pavement marking;
And final project cleanup and acceptance.

DESCRIPTION OF DRAINAGE AREAS AND OUTFALLS:

Drainage pathways are shown on Plan
Sheets stored with other attachments to this SWPPP.

TCEQ 303(d) listed water ☐

RECEIVING WATERS/CONVEYANCE:

The drainage of Voss Rd and Old Richmond Road outfalls will drain into existing storm sewer w/ conc collar.

MAJOR SOIL DISTURBING ACTIVITIES:

ACTIVITY (CHECK ALL THAT APPLY)	
SPEC 102 – Clearing & Grubbing	✓
SPEC 104/110/400 – Excavating	✓
SPEC 400 – Fill	✓
Leveling/Grading	✓

NOTES:

SOIL STABILIZATION AND SEDIMENT CONTROL MEASURE:

MEASURES	TEMPORARY	PERMANENT
SPEC 164 – Seeding		
SPEC 162 – Sodding		✓
SPEC 165 – Hydro-mulch		✓
SPEC 164 – Soil Retention Blanket		
SPEC 713 – Reinforced Filter Fabric Barrier	✓	
SPEC 719 – Inlet Protection Barrier	✓	
SPEC 724 – Stabilized Construction Access	✓	
SPEC 730 – Concrete Truck Washout Structures	✓	
SPEC 741 – Inlet Protection Barrier	✓	
SPEC 750 – Rock Filter Dam	✓	
SPEC 725 – Watering for Dust Control		

NOTES:

If sediment escapes off site, these accumulations will be removed to minimize impact. Rock filter dams will be cleared before the reach 1/3 the height of the dam, other control measures will be cleared before their capacity has been reduced by 50%. As required in CGP TXR 150000, soil stabilization measures will be initiated in portions of the site where activities have ceased for a period exceeding 14 days. This stabilization will commence no later than the day following completion of work in these areas. If prompt repair or replacement is not feasible, the reason will be documented in the SWPPP. Records of dates for major grading activities, and initiation of stabilization measures will be maintained in the SWPPP. Daily work logs related to this section will be kept in CAPTRAC. The Harris County SWPPP detail sheet will be used when implementing BMP's and included with this document.

Current construction specification documents can be found at:
http://www.eng.hctx.net/Consultants/Standards-Specifications/Standard-Engineering-Design-Specifications

INSPECTION & MAINTENANCE:

Inspection and Maintenance will be performed according to SPEC 751. Inspections will be conducted at least every 7 calendar days. Inspection forms will be filed with SWPPP supporting documents. If repair or replacement of stabilization or erosion control features is necessary, it must be completed at the earliest date possible. Amendments will be tracked on the SWPPP Amendment Log. Daily work logs related to this section will be kept in CAPTRAC.

POTENTIAL POLLUTION SOURCES:

Concrete	✓	Cleaning Solvents	
Fertilizer	✓	Curing Compounds	
Pesticides		Hydraulic Fluid	
Asphalt	✓	Motor Oil	
Paint	✓		
Gasoline	✓		
Diesel Fuel	✓		
Sanitary Toilets			

POLLUTION PREVENTION BMPS

Whenever possible all materials will be stored in their original containers in secure areas where spillage is protected from runoff. Stockpiles and work areas will be constructed in such a way to minimize the amount of sediment that enters receiving waters and wetlands. Spill prevention and control measures are included on attached site maps. Records of spills will be maintained with SWPPP supporting documents. Additional required BMPs can be found in SPEC 725. Temporary materials and structures will be removed from waterways as soon as feasible once they are no longer required.

WASTE MATERIAL:

All solid waste materials will be collected and stored in secure metal dumpsters, then transported to appropriate disposal facilities. Collection will be completed often enough to ensure that no waste materials will be lost due to overfilling of collection containers. Liquid wastes will be stored in sealed containers in designated areas and disposed of according to all applicable regulations. All wasted containers should meet all state and local requirements.

RESPONSIBLE PARTY/CONTRACTOR

Name	
Title	
Company	
Signature	

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
5			

HARRIS COUNTY ENGINEERING DEPARTMENT

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

FOR INTERIM REVIEW ONLY

DOCUMENT INCOMPLETE:
NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES

ENGINEER: NAME
P.E. SERIAL No. NUMBER
DATE: / /

PROJECT TITLE:

SHEET DESCRIPTION: STORM WATER POLLUTION PREVENTION PLAN NOTES

CIVIL STANDARD

DRAWN BY: DATE:

CK'D BY: SCALE: NONE SHEET NO:

REV	DATE	BY	DESCRIPTION

STATE OF TEXAS
HARRISON THAI
129438
LICENSED
PROFESSIONAL ENGINEER

2/7/2022

FORT BEND COUNTY
ENGINEERING DIVISION

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Registration No. F-1046

OLD RICHMOND RD

ENVIRONMENTAL STANDARDS

SHEET 1 OF 2

DESIGNED BY:	
DRAWN BY:	
DATE:	
SHEET NO:	114

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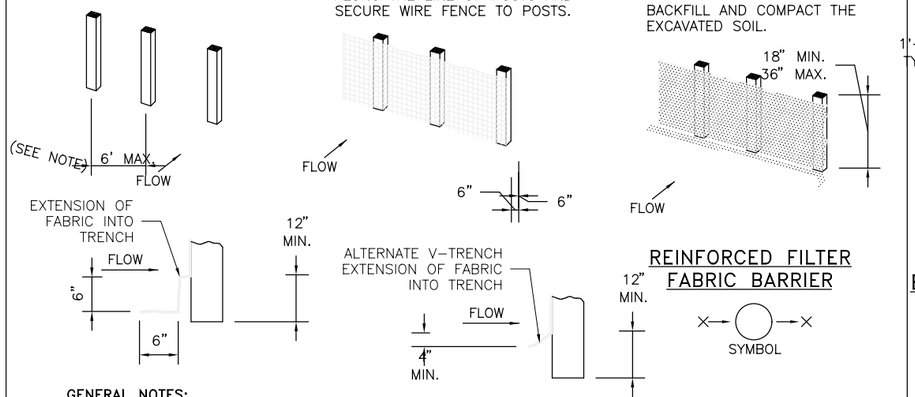
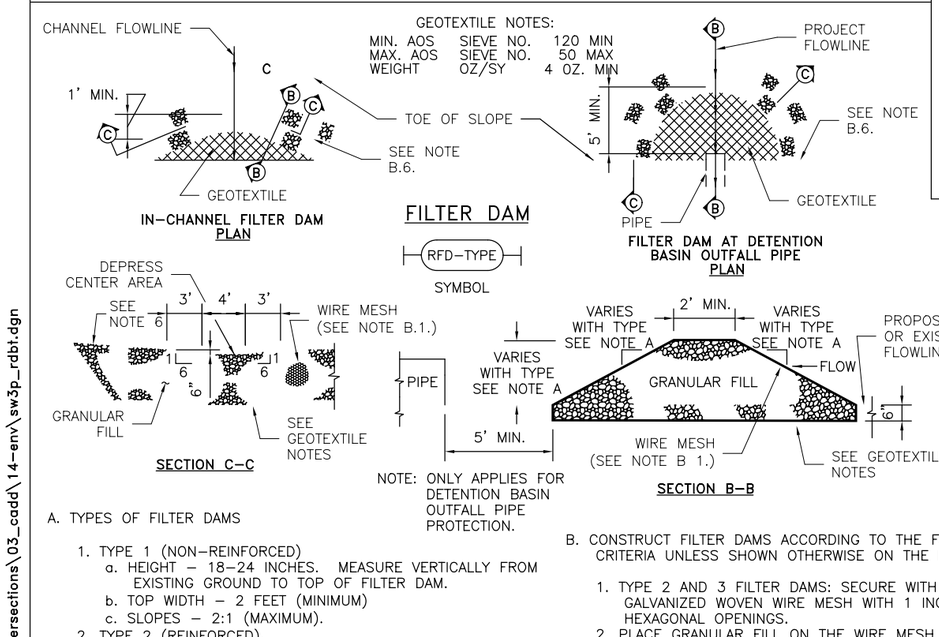


REINFORCED FILTER FABRIC BARRIER

GENERAL NOTES:

1. SECURELY FASTEN MESH FENCING TO POSTS WITH STAPLES OR TIE WIRES.
2. SECURELY FASTEN FILTER FABRIC TO MESH FENCING.
3. WHEN TWO SECTIONS OF FILTER FABRIC ADJOIN EACH OTHER, OVERLAP 6 INCHES AT A POST, FOLD TOGETHER, AND ATTACH TO A POST.
4. REMOVE SEDIMENT DEPOSITS WHEN SILT REACHES ONE-THIRD OF THE HEIGHT OF THE FENCE IN DEPTH.
5. SILT FENCE MINIMUM 2' BEHIND CURB.



IN-CHANNEL FILTER DAM PLAN

FILTER DAM

RFD-TYPE

SYMBOL

FILTER DAM AT DETENTION BASIN OUTFALL PIPE PLAN

SECTION C-C

SECTION B-B

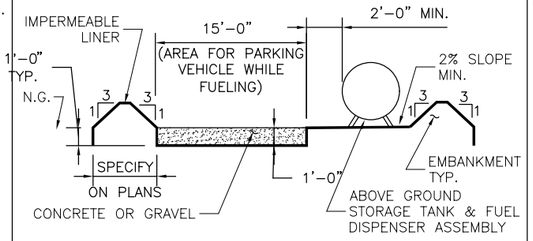
NOTE: ONLY APPLIES FOR DETENTION BASIN OUTFALL PIPE PROTECTION.

A. TYPES OF FILTER DAMS

1. TYPE 1 (NON-REINFORCED)
   a. HEIGHT – 18-24 INCHES. MEASURE VERTICALLY FROM EXISTING GROUND TO TOP OF FILTER DAM.
   b. TOP WIDTH – 2 FEET (MINIMUM)
   c. SLOPES – 2:1 (MAXIMUM).
2. TYPE 2 (REINFORCED).
   a. HEIGHT – 18-36 INCHES. MEASURE VERTICALLY FROM EXISTING GROUND TO TOP OF FILTER DAM.
   b. TOP WIDTH – 2 FEET (MINIMUM).
   c. SLOPES – 2:1 (MAXIMUM).
3. TYPE 3 (REINFORCED)
   a. HEIGHT – 36-48 INCHES. MEASURE VERTICALLY FROM EXISTING GROUND TO TOP OF FILTER DAM.
   b. TOP WIDTH – 2 FEET (MINIMUM).
   c. SLOPES – 3:1 (MAXIMUM).
4. TYPE 4 (GABION)
   a. HEIGHT – 30 INCHES (MINIMUM). MEASURE VERTICALLY FROM EXISTING GROUND TO TOP OF FILTER DAM.
   b. TOP WIDTH – 2 FEET (MINIMUM).
5. TYPE 5. AS SHOWN ON THE PLANS.

B. CONSTRUCT FILTER DAMS ACCORDING TO THE FOLLOWING CRITERIA UNLESS SHOWN OTHERWISE ON THE PLANS.

1. TYPE 2 AND 3 FILTER DAMS: SECURE WITH 20 GAUGE GALVANIZED WOVEN WIRE MESH WITH 1 INCH DIAMETER HEXAGONAL OPENINGS.
2. PLACE GRANULAR FILL ON THE WIRE MESH TO HEIGHT AND SLOPES SHOWN ON PLANS OR AS SPECIFIED BY THE ENGINEER.
   a. 3-5 INCHES FOR ROCK FILTER DAM TYPES 1, 2 AND 4.
   b. 4-8 INCHES FOR ROCK FILTER DAM TYPE REFER TO GRANULAR FILL IN SPECIFICATION SECTION No. 02378 RIPRAP AND GRANULAR FILL.
3. FOLD WIRE MESH AT UPSTREAM SIDE OVER GRANULAR FILL AND TIGHTLY SECURED TO ITSELF ON THE DOWNSTREAM SIDE USING WIRE TIES OR HOG RINGS.
4. IN STREAMS: SECURE OR STAKE MESH TO STREAM BED PRIOR TO AGGREGATE PLACEMENT.
5. SEE HCFCD SPECIFICATION SECTION NO. 02364-FILTER DAMS.
6. EMBED ONE FOOT MINIMUM INTO SLOPE AND RAISE ONE FOOT HIGHER THAN CENTER OF DEPRESSED AREA AT SLOPE.



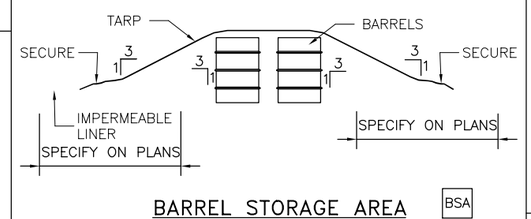
ABOVE GROUND TEMP. VEHICLE & EQUIPMENT FUELING AREA WITH TANK

TFA

SYMBOL

GENERAL NOTES:

1. THE SIZE OF TANK FOUNDATION AREA DEPENDS ON THE SIZE OF ABOVE GROUND STORAGE TANK AND DISPENSER ASSEMBLY.
2. PROVIDE A MINIMUM SLOPE OF 2 % TOWARD THE SUMP PIT.
3. INSTALL IMPERMEABLE LINER AS PER MANUFACTURER'S RECOMMENDATIONS.



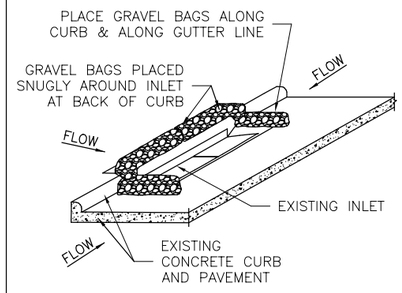
BARREL STORAGE AREA

BSA

SYMBOL

GENERAL NOTES:

1. ALTERNATIVELY, STORE BARRELS IN AN ENCLOSED BUILDING OR SHED.
2. INSTALL IMPERMEABLE LINER AS PER MANUFACTURER'S RECOMMENDATIONS. 60 mil MINIMUM.
3. CONSTRUCT BERMED AREA WITH VOLUME GREATER THAN OR EQUAL TO 110% VOLUME OF BARRELS.



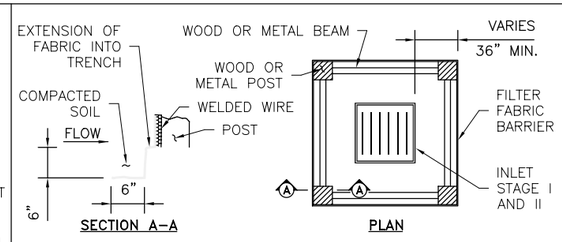
INLET PROTECTION BARRIERS FOR STAGE II INLETS

IPB-II

SYMBOL

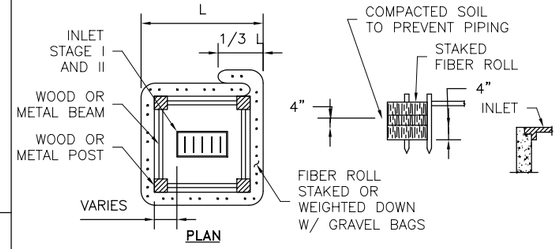
GENERAL NOTES:

1. REMOVE SEDIMENT DEPOSIT WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-THIRD THE HEIGHT OF THE BARRIER.
2. GRAVEL BAGS SHALL NOT BLOCK THROAT OF INLET UNLESS DIRECTED BY ENGINEER.



SECTION A-A **PLAN**

INLET PROTECTION BARRIER WITH REINFORCED FILTER FABRIC



PLAN

INLET PROTECTION BARRIER WITH FILTER ROLLS

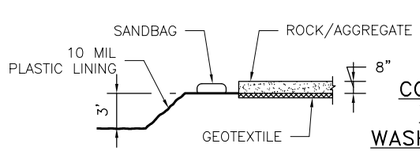
GENERAL NOTES:

1. FIBER ROLLS WILL BE UTILIZED ONLY WHEN SITE CONDITIONS DO NOT PERMIT THE USE OF FILTER FABRIC BARRIER, AND AS APPROVED BY THE ENGINEER.

INLET PROTECTION BARRIERS FOR STAGE I INLETS

IPB

SYMBOL

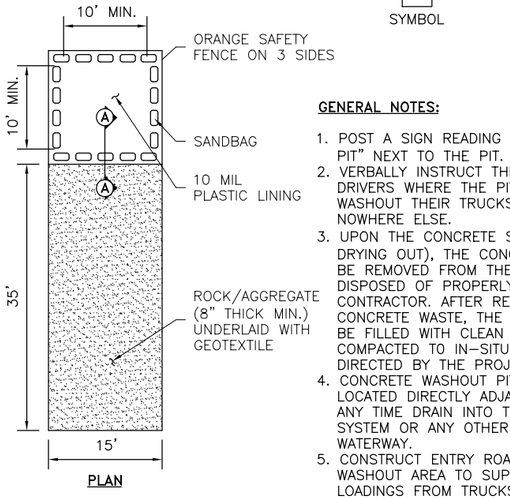


SECTION A-A

CONCRETE TRUCK WASHOUT AREA

CTW

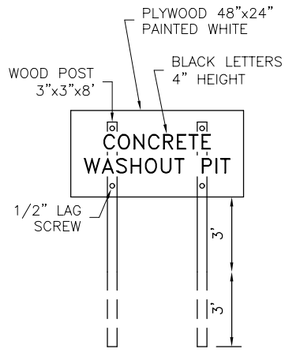
SYMBOL



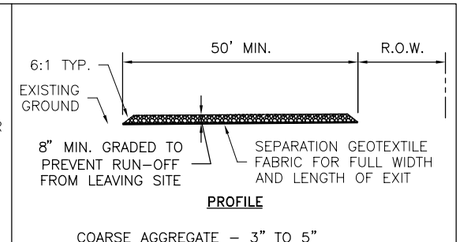
PLAN

GENERAL NOTES:

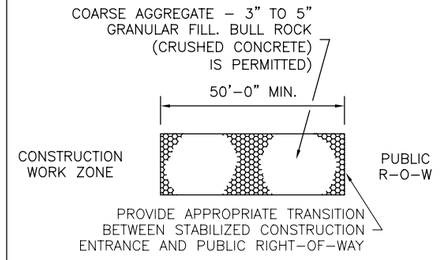
1. POST A SIGN READING "CONCRETE WASHOUT PIT" NEXT TO THE PIT.
2. VERBALLY INSTRUCT THE CONCRETE TRUCK DRIVERS WHERE THE PIT IS AND TO WASHOUT THEIR TRUCKS IN THE PIT AND NOWHERE ELSE.
3. UPON THE CONCRETE SETTING UP (CURING, DRYING OUT), THE CONCRETE WASTE SHALL BE REMOVED FROM THE PROJECT SITE AND DISPOSED OF PROPERLY BY THE CONTRACTOR. AFTER REMOVAL OF THE CONCRETE WASTE, THE WASHOUT PIT SHALL BE FILLED WITH CLEAN FILL MATERIAL AND COMPACTED TO IN-SITU CONDITIONS, OR AS DIRECTED BY THE PROJECT SPECIFICATIONS.
4. CONCRETE WASHOUT PITS SHALL NOT BE LOCATED DIRECTLY ADJACENT TO, NOR AT ANY TIME DRAIN INTO THE STORM SEWER SYSTEM OR ANY OTHER SWALE, DITCH, OR WATERWAY.
5. CONSTRUCT ENTRY ROAD AND BOTTOM OF WASHOUT AREA TO SUPPORT EXPECTED LOADINGS FROM TRUCKS EQUIPMENT.



SIGN DETAIL (OR EQUIVALENT)



PROFILE



PLAN

STABILIZED CONSTRUCTION ACCESS

SC-1

SYMBOL

GENERAL NOTES:

1. MINIMUM LENGTH IS AS SHOWN ON CONSTRUCTION DRAWINGS OR 50 FEET, WHICHEVER IS MORE.
2. CONSTRUCT AND MAINTAIN CONSTRUCTION EXIT WITH CONSTANT WIDTH ACROSS ITS LENGTH, INCLUDING ALL POINTS OF INGRESS OR EGRESS.
3. UNLESS SHOWN ON THE CONSTRUCTION DRAWINGS, STABILIZATION FOR OTHER AREAS WILL HAVE THE SAME AGGREGATE THICKNESS AND WIDTH REQUIREMENTS AS THE STABILIZED CONSTRUCTION EXIT.
4. WHEN SHOWN ON THE CONSTRUCTION DRAWINGS, WIDEN OR LENGTHEN STABILIZED AREA TO ACCOMMODATE A TRUCK WASHING AREA. PROVIDE OUTLET SEDIMENT TRAP FOR THE TRUCK WASHING AREA.
5. PROVIDE PERIODIC TOP DRESSING WITH ADDITIONAL COARSE AGGREGATE TO MAINTAIN THE REQUIRED DEPTH OR WHEN SURFACE BECOMES PACKED WITH MUD.
6. PERIODICALLY TURN AGGREGATE TO EXPOSE A CLEAN DRIVING SURFACE.
7. MINIMUM 14' WIDTH FOR ONE WAY TRAFFIC AND 20' WIDTH FOR TWO WAY TRAFFIC.

NO.	REVISIONS	DATE	NAME
1	ORIGINAL STANDARD ISSUED	2-1-22	RJS

FORT BEND COUNTY ENGINEERING DEPARTMENT

BGE, Inc.
10777 Westheimer, Suite 400, Houston, TX 77042
Tel: 281-558-8700 • www.bgeinc.com
TBPE Reglstratlon No, F-1046

PROJECT TITLE:

DRAWN BY: INIT		FBCED STANDARD
CK'D BY: INIT	SHEET DESCRIPTION: STORM WATER POLLUTION	54
SCALE: NONE	PREVENTION PLAN DETAILS	SHEET NO:
DATE: 2-1-22	APPROVED BY:	115

G:\txh\projects\fort_bend_county\6974-00 fbc intersections\03_cadd\14-env\sw3p_rdbt.dgn

FORT BEND COUNTY ENGINEERING DEPARTMENT

PROPOSED LEFT-TURN LANE ALONG SH 6 NORTHBOUND TRAFFIC LANES APPROACHING CULLINAN PARK

PROJECT NO. 20407

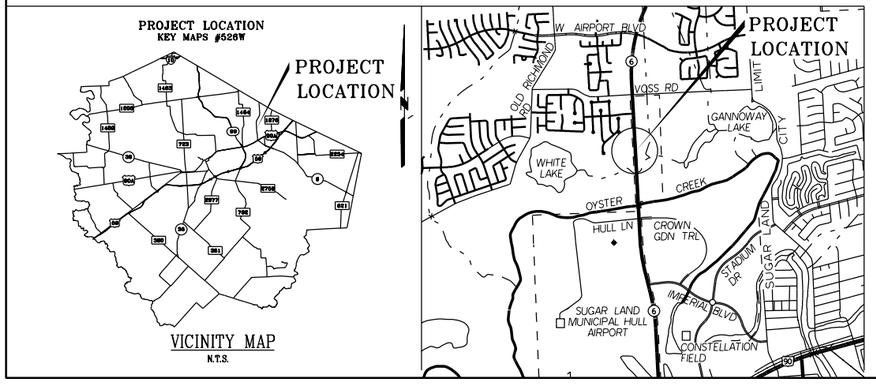
VINCENT M. MORALES, JR.
COMMISSIONER PRECINCT 1

GRADY PRESTAGE
COMMISSIONER PRECINCT 2

KP GEORGE
COUNTY JUDGE

ANDY MEYERS
COMMISSIONER PRECINCT 3

DEXTER L. McCOY
COMMISSIONER PRECINCT 4



THE STATE OF TEXAS
FORT BEND COUNTY

JANUARY 2023
PRECINCT #3

Fort Bend County, Texas

STATE OF TEXAS
AARON C. LEGG
142513
LICENSED PROFESSIONAL ENGINEER

01/02/2023

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
13430 Northwest Freeway, Suite 1100
Houston, Texas 77040
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

APPROVED: _____ 02/14/2023
COUNTY ENGINEER DATE
J. STACY SLAWINSKI, P.E.

FBCED, STANDARD 01

SHEET NO.	DESCRIPTION
	GENERAL
1	TITLE SHEET
2	INDEX OF SHEETS
3	CONSTRUCTION GENERAL NOTES (FBC)
4	PUBLIC WORKS AND SUBDIVISION GENERAL NOTES (FBC)
5	QUANTITY SUMMARY SHEET
6	EXISTING TYPICAL SECTIONS
7	DEMOLITION TYPICAL SECTIONS
8	PROPOSED TYPICAL SECTIONS
9	SURVEY CONTROL INDEX SHEET
10	SURVEY CONTROL DATA PANELS
11	DEMOLITION PLAN LAYOUT
	PAVING AND DRAINAGE
12	HORIZONTAL DATA SHEET
13	ROADWAY PLAN LAYOUT
14	OVERALL DRAINAGE AREA MAP
15	CONCRETE CURB AND DIRECTIONAL ISLAND DETAILS - CC & DID (HOU DIST)
	TRAFFIC CONTROL PLAN
16	TRAFFIC CONTROL PLAN LAYOUT
17 - 28	BARRICADE AND CONSTRUCTION STANDARDS - BC (1)-21 THRU BC (12)-21
29	TRAFFIC CONTROL PLAN - LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS - TCP (1-4)-18
30	TRAFFIC CONTROL PLAN - LANE CLOSURES FOR DIVIDED HIGHWAYS - TCP (1-5)-18
31 - 32	SINGLE SLOPE CONCRETE BARRIER PRECAST BARRIER (TYPE 1) - SSCB(2)-10
33	VEHICLE IMPACT ATTENUATOR SAND FILLED PLASTIC MODULES MASH TL-3 & TL-2 - VIA (SFPM)-19
	SIGNING AND PAVEMENT MARKING
34	SIGNING AND PAVEMENT MARKING LAYOUT
35	TYPICAL STANDARD PAVEMENT MARKINGS - PM(1)-20
36	POSITION GUIDANCE USING RAISED MARKERS - REFLECTORIZED PROFILE MARKINGS - PM(2)-20
37	TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION - PAVEMENT MARKINGS - PM(3)-20
38	SIGN MOUNTING DETAILS - SMALL ROADSIED SIGNS - GENERAL NOTES & DETAILS - SMD(SLIP-1)-08
39	SIGN MOUNTING DETAILS - SMALL ROADSIED SIGNS - TRIANGULAR SLIPBASE SYSTEM - SMD(SLIP-1)-08
40	SIGN MOUNTING DETAILS - SMALL ROADSIED SIGNS - TRIANGULAR SLIPBASE SYSTEM - SMD(SLIP-2)-09
41	SIGN MOUNTING DETAILS - SMALL ROADSIED SIGNS - TRIANGULAR SLIPBASE SYSTEM - SMD(SLIP-3)-10
	STORM WATER POLLUTION PREVENTION PLAN (SW3P)
42	STORM WATER POLLUTION PREVENTION PLAN LAYOUT
43	TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & VERTICAL TRACKING - EC(1)-16
	CROSS SECTIONS
44 - 45	CROSS SECTION SHEETS
	MISCELLANEOUS DETAILS
46 - 47	PROJECT SIGN DETAILS (FBC)

STATE OF TEXAS
AARON C. LEGG
142513
LICENSED PROFESSIONAL ENGINEER

11/1/2022

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

INDEX OF SHEETS

SUBMITTED:	DESIGNED BY:
SCALE: N/A	CC'D BY:
DATE: 11/1/2022	SHEET NO 2 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

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.

6. A CONTINUOUS LONGITUDINAL REINFORCING BAR SHALL BE USED IN THE CURBS.

7. ALL CONCRETE PAVEMENT SHALL BE 5½ SACK CEMENT WITH A MINIMUM COMPRESSIVE STRENGTH OF 3500 PSI AT 28 DAYS. TRANSVERSE EXPANSION JOINTS SHALL BE INSTALLED AT EACH CURB RETURN AND AT A MAXIMUM SPACING OF 60 FEET.

8. ALL WEATHER ACCESS TO ALL EXISTING STREETS AND DRIVEWAYS SHALL BE MAINTAINED AT ALL TIMES.

9. 4" X 12" REINFORCED CONCRETE CURB SHALL BE PLACED IN FRONT OF SINGLE FAMILY LOTS ONLY. ALL OTHER AREAS SHALL BE 6" REINFORCED CONCRETE CURB.

10. CURB HEADERS ARE REQUIRED AT CURB CONNECTIONS TO HANDICAP RAMPS, WITH NO CONSTRUCTION JOINT WITHIN 5' OF RAMPS.

11. 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.

12. ALL R1-1 STOP SIGNS SHALL BE A MINIMUM OF 36"X36" WITH DIAMOND GRADE SHEETING PER TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

13. STREET NAME SIGNAGE SHALL BE ON A 9" HIGH SIGN FLAT BLADE W/REFLECTIVE GREEN BACKGROUND. STREET NAMES SHALL BE UPPER AND LOWERCASE LETTERING WITH UPPERCASE LETTERS OF 6" MINIMUM AND LOWERCASE LETTERS OF 4.5" MINIMUM. THE LETTERS SHALL BE REFLECTIVE WHITE. STREET NAME SIGNS SHALL BE MOUNTED ON STOP SIGN POST.

14. 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.

15. 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.

16. STABILIZED SUBGRADE: DETERMINE THE THICKNESS OF THE STABILIZED SUBGRADE AFTER CURING AND COMPACTION. IF THE SUBGRADE DEPTH IS GREATER THAN THE PROPOSED THICKNESS BY 20% OR MORE, THE CMT LAB MUST PROVIDE VERIFICATION THE PERCENTAGE OF MATERIAL BEING USED TO STABILIZE THE SUBGRADE MEETS OR EXCEEDS PROJECT REQUIREMENTS. TEST RESULTS REQUIRED.

NOTE: FORT BEND COUNTY NOTES SUPERSEDE ANY CONFLICTING NOTES.

STATE OF TEXAS
AARON C. LEGG
142513
LICENSED
PROFESSIONAL ENGINEER

11/1/2022

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

CONSTRUCTION GENERAL NOTES

SUBMITTED:	DESIGNED BY:
SCALE: N/A	CC'D BY:
DATE: 11/1/2022	SHEET NO 3 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

1:52:52 PM
11/1/2022
D:\Projects\2021\11009*FBC*SH6*at*Cullinan*Park\400*CAD\411*Trans\02-Sheets\01-General\2111-009-01*GN01.dgn

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 ENCROACH 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 SIGNAL

1. ALL ITEMS RELATING TO THE CONSTRUCTION OF TRAFFIC SIGNAL INSTALLATIONS, EXCEPT FOR PUNCHLIST ITEMS, SHALL BE COMPLETED PRIOR TO THE ACTIVATION OF THE SIGNAL SYSTEM(S), UNLESS OTHERWISE REQUIRED BY THE CONTRACT.

2. THE CONTRACTOR SHALL MEET WITH THE FORT BEND COUNTY TRAFFIC SIGNAL MAINTENANCE GROUPS FIELD INSPECTOR, HEREAFTER REFERRED TO AS THE TRAFFIC INSPECTOR, ONE-WEEK PRIOR TO THE DESIRED ACTIVATION OF ANY NEW TRAFFIC SIGNALS. THE CONTRACTOR SHALL OBTAIN VERBAL CONCURRENCE FROM THE TRAFFIC INSPECTOR THAT ADEQUATE PROGRESS HAS BEEN ACHIEVED AND THAT ADEQUATE PREPARATIONS ARE IN PLACE TO SCHEDULE A PRE-"TURN ON" WALK-THROUGH INSPECTION MEETING. IF IN THE OPINION OF THE TRAFFIC INSPECTOR, REQUIRED PROGRESS AND ADEQUATE PREPARATIONS ARE NOT COMPLETE, THE PRE-"TURN ON" WALK-THROUGH INSPECTION MEETING WILL BE POSTPONED TO ALLOW ADEQUATE TIME FOR INCOMPLETE CONSTRUCTION ITEMS AND PREPARATIONS TO BE COMPLETED. AFTER THE CONTRACTOR HAS COMPLETED ALL INCOMPLETE ITEMS AND PREPARATIONS, THE CONTRACTOR SHALL REQUEST THE TRAFFIC INSPECTOR REVIEW AND APPROVE ITEMS PREVIOUSLY IDENTIFIED. IF, IN THE OPINION OF THE TRAFFIC INSPECTOR, ALL ITEMS HAVE BEEN ADDRESSED SATISFACTORILY, THE DATE OF THE PRE-"TURN ON" WALK-THROUGH INSPECTION SHALL BE ESTABLISHED. TIME EXTENSIONS TO THE CONTRACT TIME WILL NOT BE GRANTED FOR DELAYS CAUSED BY INCOMPLETE CONSTRUCTION OR INADEQUATE CONTRACTOR PREPARATIONS REQUIRED TO COMPLETE TRAFFIC SIGNAL SYSTEM WITHIN THE TIMEFRAME SET FORTH IN THE CONTRACT.

3. PRIOR TO ACTIVATING A NEW TRAFFIC SIGNAL, THE CONTRACTOR SHALL REQUEST A PRE-TURN ON WALK-THROUGH INSPECTION MEETING, IN ACCORDANCE WITH ITEM 2. THE PURPOSE OF THE MEETING WILL BE TO ESTABLISH THAT THE TRAFFIC SIGNAL SYSTEM HAS BEEN CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT, AND IN A MANNER THAT DOES NOT ADVERSELY IMPACT PUBLIC SAFETY. THIS MEETING SHALL BE ATTENDED BY THE TRAFFIC INSPECTOR, THE ENGINEER OF RECORD, AND THE CONTRACTOR. AS A MINIMUM, ANY DEFICIENCIES THAT ADVERSELY IMPACT PUBLIC SAFETY WILL BE IDENTIFIED FOR CORRECTION PRIOR TO ESTABLISHING THE "TURN ON" DATE FOR THE TRAFFIC SIGNAL SYSTEM. ITEMS THAT HAVE AN IMPACT ON PUBLIC SAFETY INCLUDE, BUT ARE NOT LIMITED TO: PAVEMENT MARKINGS AND SIGNAGE, PROPER AND ACCEPTABLE BONDING OF EARTH GROUNDS, PROPERLY ALIGNED TRAFFIC SIGNALS, FULLY OPERATIONAL VEHICULAR AND PEDESTRIAN DETECTION, COMPLETED CABINET-TO-FIELD WIRING, AND PROPERLY TERMINATED ELECTRICAL SERVICE CONDUCTORS. FAILURE TO ADDRESS THE PUNCHLIST ITEMS IDENTIFIED AS BEING CRITICAL TO PUBLIC SAFETY PRIOR TO THE PRE-TURN ON WALK-THROUGH MEETING WILL RESULT IN THE "TURN ON" BEING POSTPONED TO ALLOW ADEQUATE TIME FOR THE INCOMPLETE ITEMS TO BE COMPLETED. AT SUCH TIME AS MEETING ATTENDEES AGREE THAT THE TRAFFIC SIGNAL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT, AND THAT THE TRAFFIC SIGNAL, AS IT EXISTS, IS NOT A THREAT TO PUBLIC SAFETY, A "TURN ON" DATE WILL BE ESTABLISHED.

4. THE CONTRACTOR SHALL HAVE 10 DAYS FROM THE DATE THE TRAFFIC SIGNAL SYSTEM IS TURNED ON TO COMPLETE ANY PUNCHLIST ITEMS IDENTIFIED AT THE PRE-"TURN ON" WALK-THROUGH MEETING OR AT THE TIME THE SIGNAL SYSTEM IS ACTIVATED THAT ARE NOT OTHERWISE ADDRESSED PRIOR TO ACTIVATION OF THE TRAFFIC SIGNAL SYSTEM.

5. THE CONTRACTOR'S ATTENTION IS DIRECTED TO STANDARD SPECIFICATION ITEM 1000, TRAFFIC SIGNAL INSTALLATION AND MODIFICATION, WHICH INCLUDES PROCEDURES AND REQUIREMENTS REGARDING ACTIVATION OF TRAFFIC SIGNAL CONTROL SYSTEMS. THE PROJECT MANUAL MAY INCLUDE SPECIAL SPECIFICATIONS AND/OR SPECIAL PROVISIONS RELATED TO PROPOSED TRAFFIC CONTROL SIGNAL SYSTEM INSTALLATION(S) AND MODIFICATION(S) REQUIRING THE CONTRACTOR'S ADHERENCE TO DEFINED CHECKLISTS, PROCEDURES AND/OR REPORTS AT NO ADDITIONAL COST TO THE COUNTY BEYOND THE ESTABLISHED BID ITEMS OF THE CONTRACT.

6. ALL SIGNAL ALTERATIONS MUST BE APPROVED AND COORDINATED THROUGH FBC ENGINEERING AND ROAD & BRIDGE.

TRAFFIC CONTROL

1. THE CONTRACTOR SHALL PROVIDE AND INSTALL TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH PART VI OF THE MOST RECENT EDITION OF THE 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.

STATE OF TEXAS
AARON C. LEGG
142513
LICENSED
PROFESSIONAL ENGINEER

11/1/2022

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

PUBLIC WORKS AND SUBDIVISION GENERAL NOTES

SUBMITTED:	DESIGNED BY:
SCALE: N/A	CC'D BY:
DATE: 11/1/2022	SHEET NO 4 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

11:52:55 PM
11/1/2022
D:\Projects\2021\11009*FBC*SH*6*at*Cullinan*Park\400*CAD\411*Trans\02-Sheets\01-General\2111-009-01*GN02.dgn

SUMMARY OF SITE PREPERATION AND EARTHWORK QUANTATIES

ITEM NO.			100	104		105	110	354
DESC. CODE			6002	6011	6021	6020	6001	6048
DESCRIPTION	BEGIN STATION	END STATION	PREPARING ROW	REMOVING CONC (MEDIAN)	REMOVING CONC (CURB)	REMOVING STAB BASE & ASPH PAV (12")	EXCAVATION (ROADWAY)	PLANE ASPH CONC PAVE (3")
UNIT			STA	SY	LF	SY	CY	SY
LOCATION								
SHEET 1 OF 1	BEGIN PROJECT	END PROJECT	4	63	436	142	167	98
PROJECT TOTALS			4	63	436	142	167	98

SUMMARY OF ROADWAY QUANTITIES

ITEM NO.			529	536		3076		
DESC. CODE			6011	6002	6004	6001	6050	6051
DESCRIPTION	BEGIN STATIONS	END STATIONS	CONC CURB (DOWEL)	CONC MEDIAN	CONC DIRECTIONAL ISLAND	D-GR HMA TY-B PG64-22	D-GR HMA TY-D SAC-B PG76-22	D-GR HMA TY-D PG76-22 LEVEL-UP
UNIT			LF	SY	SY	TON	TON	TON
LOCATION								
SHEET 1 OF 1	BEGIN PROJECT	END PROJECT	27	16	59	248	40	40
PROJECT TOTALS			27	16	59	248	40	40

SUMMARY OF TRAFFIC CONTROL QUANTITIES

ITEM NO.			502	* 512	* 545	FBC 561	FBC 671	
DESC. CODE			6001	6001	6019			
DESCRIPTION	BEGIN STATIONS	END STATIONS	BARRICADES, SIGNS, & TRAFFIC CONTROL	PORT CTB (FUR & INST) (SGL SLOPE) (TY 1)	CRASH CUSH ATTEN (INSTL) (S) (N) (TL3)	VIDEO RECORDING CONSTRUCTION	FORT BEND PROJECT SIGN	OFF-DUTY UNIFORMED PEACE OFFICERS - AS DIRECTED BY ENGINEER
UNIT			MO	LF	EA	LS	EA	HR
LOCATION								
SHEET 1 OF 1	BEGIN PROJECT	END PROJECT	2	672	2	1	2	16
PROJECT TOTALS			2	672	2	1	2	16

SUMMARY OF SIGNING AND PAVEMENT MARKING QUANTITIES

ITEM NO.			644	666							672	678		
DESC. CODE			6068	6036	6054	6078	6226	6231	6232	6439	6440	6010	6004	6009	6016
DESCRIPTION	BEGIN STATIONS	END STATIONS	RELOCATE SM RD SN SUP&AM TY 10BWG	REFL PAV MRK TY I (W) (8 IN) SLD (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	PAVEMENT SEALER (8 IN)	PAVEMENT SEALER (ARROW)	PAVEMENT SEALER (WORD)	REFL PAV MRK TY II (W) (CURB)	REFL PAV MRK TY II (Y) (CURB)	REFL PAV MRKR TY II (C-R)	PAV SURF PREP FOR MRK (8 IN)	PAV SURF PREP FOR MRK (ARROW)	PAV SURF PREP FOR MRK (WORD)
UNIT			EA	LF	EA	EA	LF	EA	EA	LF	LF	EA	LF	EA	EA
LOCATION															
SHEET 1 OF 1	BEGIN PROJECT	END PROJECT	1	130	1	1	130	1	1	62	276	7	130	1	1
PROJECT TOTALS			1	130	1	1	130	1	1	62	276	7	130	1	1

SUMMARY OF STORM WATER POLUTION PREVENTION PLAN QUANTITIES

ITEM NO.			506	506	FBC 700	FBC 751
DESC. CODE			6038	6039		
DESCRIPTION	BEGIN STATIONS	END STATIONS	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	TPDES GENERAL PERMIT	SWPPP INSPECTION & MAINTENANCE
UNIT			LF	LF	EA	MONTH
LOCATION						
SHEET 1 OF 1	BEGIN PROJECT	END PROJECT	150	150	1	2
PROJECT TOTALS			150	150	1	2

* AT THE COUNTY OR ENGINEER'S DISCRETION, A QUANTITY FOR PORTABLE CTB AND CRASH CUSHION ATTENUATORS IS PROVIDED FOR CONTRACTOR'S USE. REFER TO SSCB(2)-10 AND VIA(SFPM)-19 FOR ADDITIONAL DETAILS.

STATE OF TEXAS
AARON C. LEGG
142513
LICENSED
PROFESSIONAL ENGINEER
11/1/2022

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

QUANTITIY SUMMARY SHEET

SUBMITTED:	DESIGNED BY:
SCALE: N/A	CC'D BY:
DATE: 11/1/2022	SHEET NO 5 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

1:52:57 PM
11/1/2022
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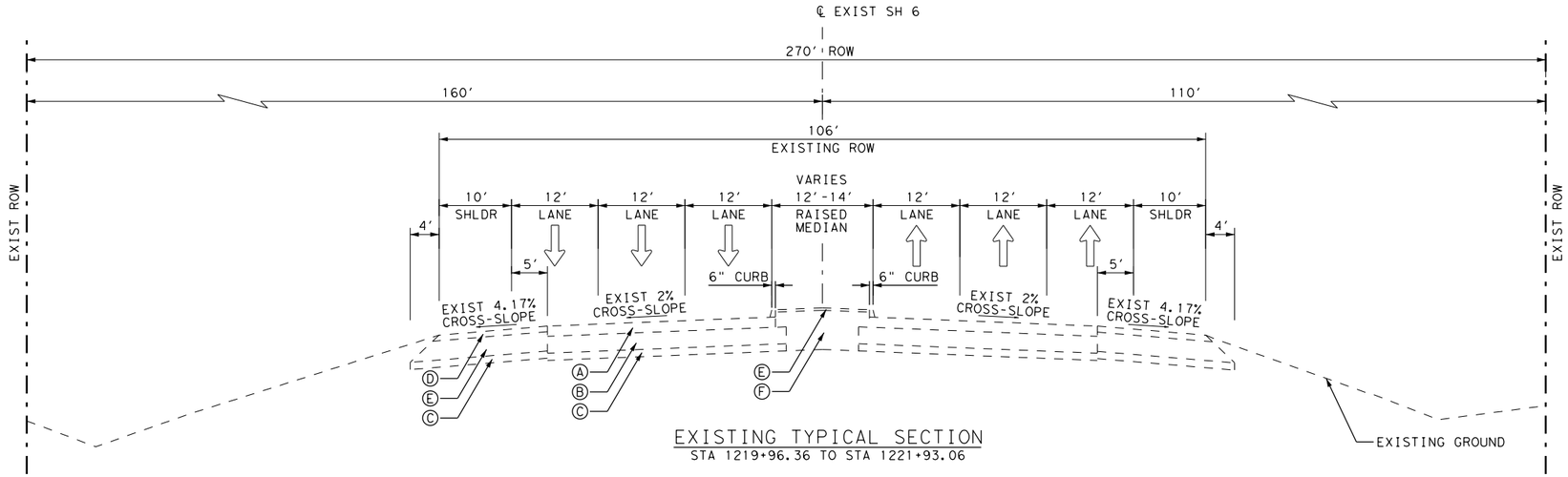
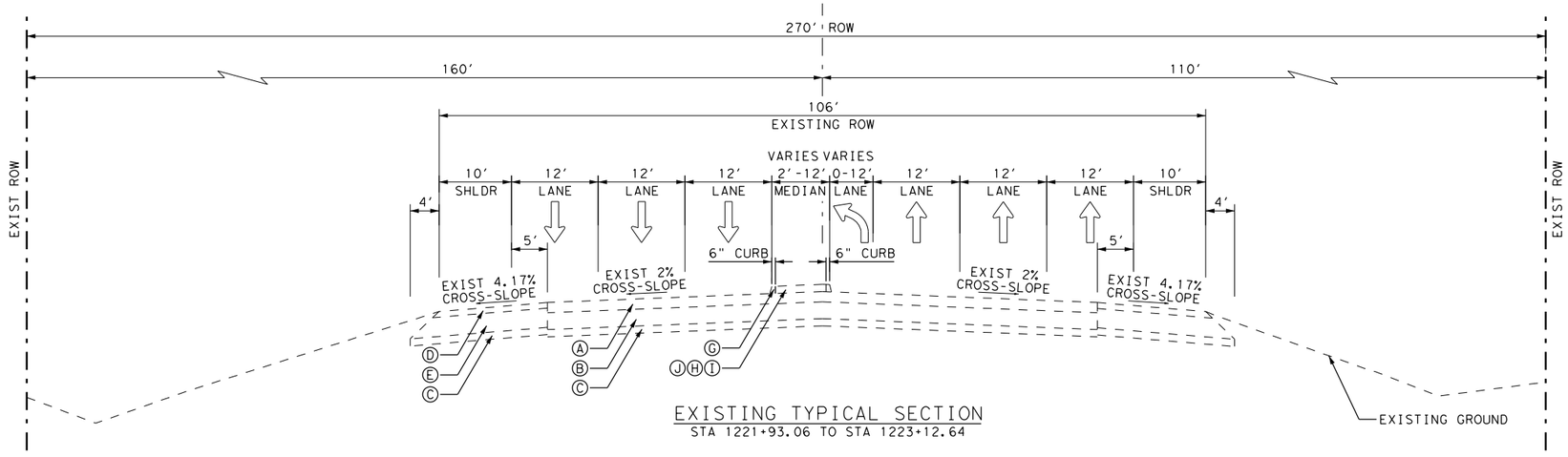


EXISTING TYPICAL SECTION
STA 1219+96.36 TO STA 1221+93.06



EXISTING TYPICAL SECTION
STA 1221+93.06 TO STA 1223+12.64

LEGEND

- Ⓐ - 8.5" ACP
- Ⓑ - 14" CSB
- Ⓒ - 6" LTS
- Ⓓ - 5" ACP
- Ⓔ - BLOCK SOD
- Ⓕ - 32" TOPSOIL
- Ⓖ - 6" CONC CURB (DOWEL)(TY II)
- Ⓗ - 1" BEDDING SAND/2 5/8" PCTB
- Ⓘ - ANTIQUE RED BRICK PAVER
- Ⓙ - CONC RIPRAP
- EXIST TRAFFIC ARROW
- PROP TRAFFIC ARROW

NOTES:

1. ALL STATIONS AND OFFSETS ARE FROM SH 6 CENTERLINE, UNLESS OTHERWISE NOTED.
2. FOR LIMITS AND GEOMETRY, REFER TO ROADWAY PLAN LAYOUT.
3. SEE DEMOLITION TYPICAL SECTIONS AND PROPOSED TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
4. SAWCUT IS SUBSIDIARY TO REMOVAL OF EXISTING PAVEMENT.
5. THE CONTRACTOR WILL BE REQUIRED TO PROOF ROLL SUBGRADE PRIOR TO PLACEMENT OF ASPHALT BASE. IF UNSTABLE AREAS ARE ENCOUNTERED, THEY WILL BE CORRECTED PRIOR TO PLACEMENT OF THE ASPHALT BASE. EQUIPMENT AND METHODS USED TO CORRECT UNSTABLE AREAS WILL BE APPROVED BY THE ENGINEER. THIS WORK WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS.

STATE OF TEXAS
AARON C. LEGG
142513
LICENSED
PROFESSIONAL ENGINEER
11/1/2022

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

EXISTING
TYPICAL SECTIONS

SUBMITTED:	DESIGNED BY:
SCALE: N/A	CC'D BY:
DATE: 11/1/2022	SHEET NO 6 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

1:53:10 PM
11/1/2022
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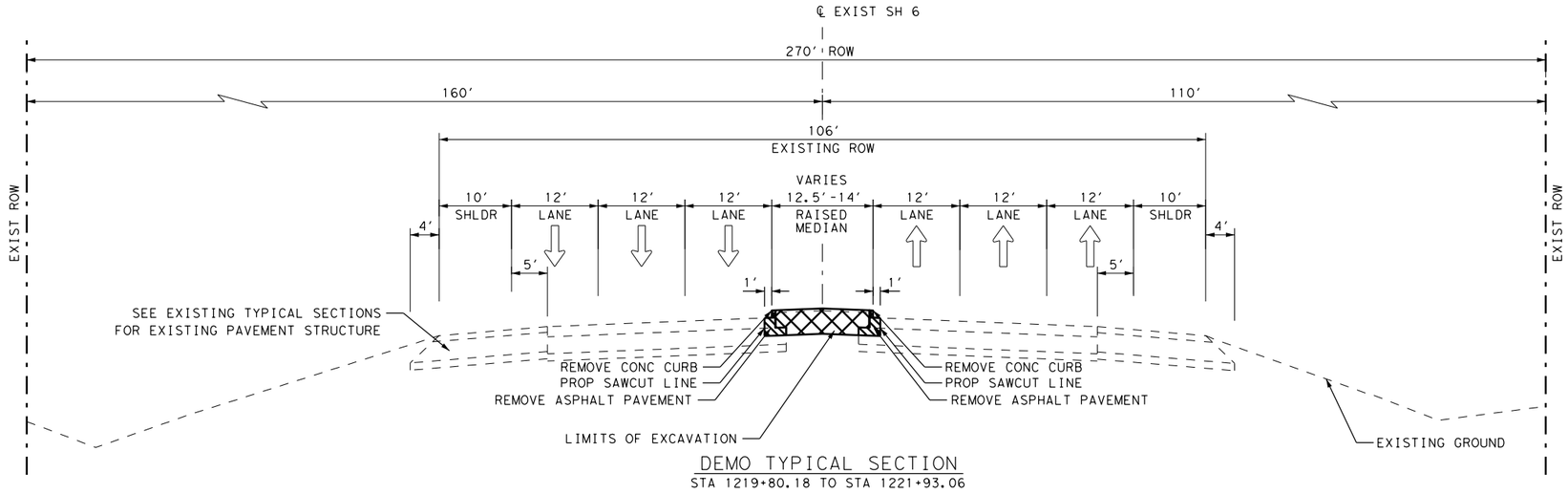
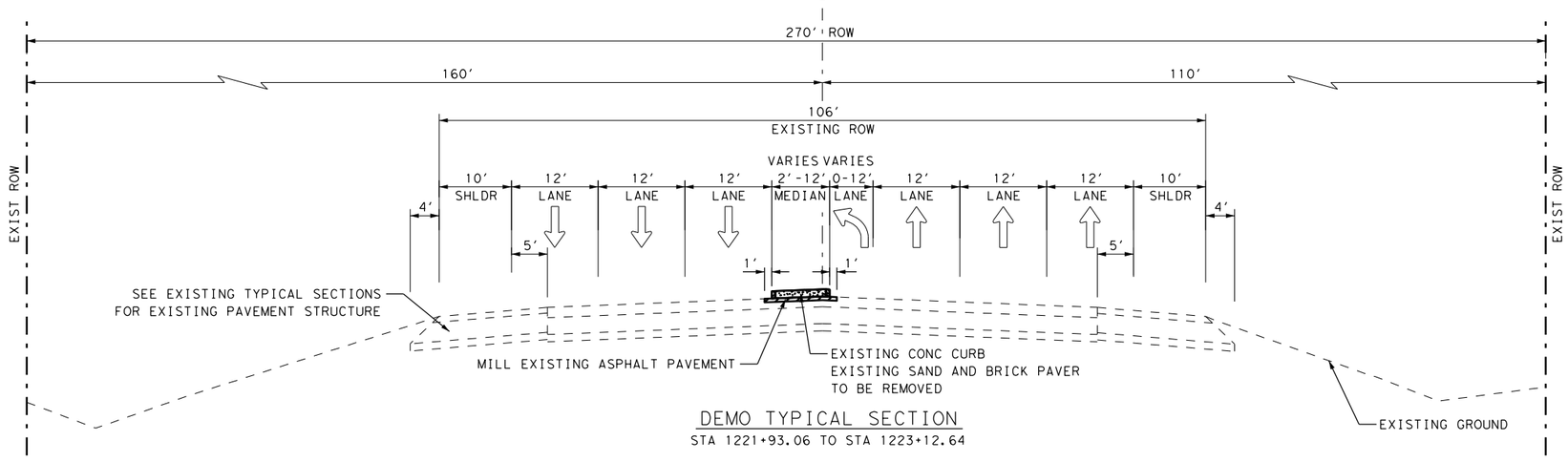


DEMO TYPICAL SECTION
STA 1219+80.18 TO STA 1221+93.06



DEMO TYPICAL SECTION
STA 1221+93.06 TO STA 1223+12.64

LEGEND

- EXIST TRAFFIC ARROW
- PROP TRAFFIC ARROW
- LIMITS OF PAY ITEM 104
- LIMITS OF PAY ITEM 105
- LIMITS OF PAY ITEM 110
- LIMITS OF PAY ITEM 354

NOTES:

1. ALL STATIONS AND OFFSETS ARE FROM SH 6 CENTERLINE, UNLESS OTHERWISE NOTED.
2. FOR LIMITS AND GEOMETRY, REFER TO ROADWAY PLAN LAYOUT.
3. SAWCUT IS SUBSIDIARY TO REMOVAL OF EXISTING PAVEMENT.
4. THE CONTRACTOR WILL BE REQUIRED TO PROOF ROLL SUBGRADE PRIOR TO PLACEMENT OF ASPHALT BASE. IF UNSTABLE AREAS ARE ENCOUNTERED, THEY WILL BE CORRECTED PRIOR TO PLACEMENT OF THE ASPHALT BASE. EQUIPMENT AND METHODS USED TO CORRECT UNSTABLE AREAS WILL BE APPROVED BY THE ENGINEER. THIS WORK WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS.

STATE OF TEXAS
AARON C. LEGG
142513
LICENSED PROFESSIONAL ENGINEER
11/1/2022

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
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22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

DEMOLITION
TYPICAL SECTIONS

SUBMITTED:	DESIGNED BY:
SCALE: N/A	CC'D BY:
DATE: 11/1/2022	SHEET NO 7 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

1:53:15 PM
11/1/2022
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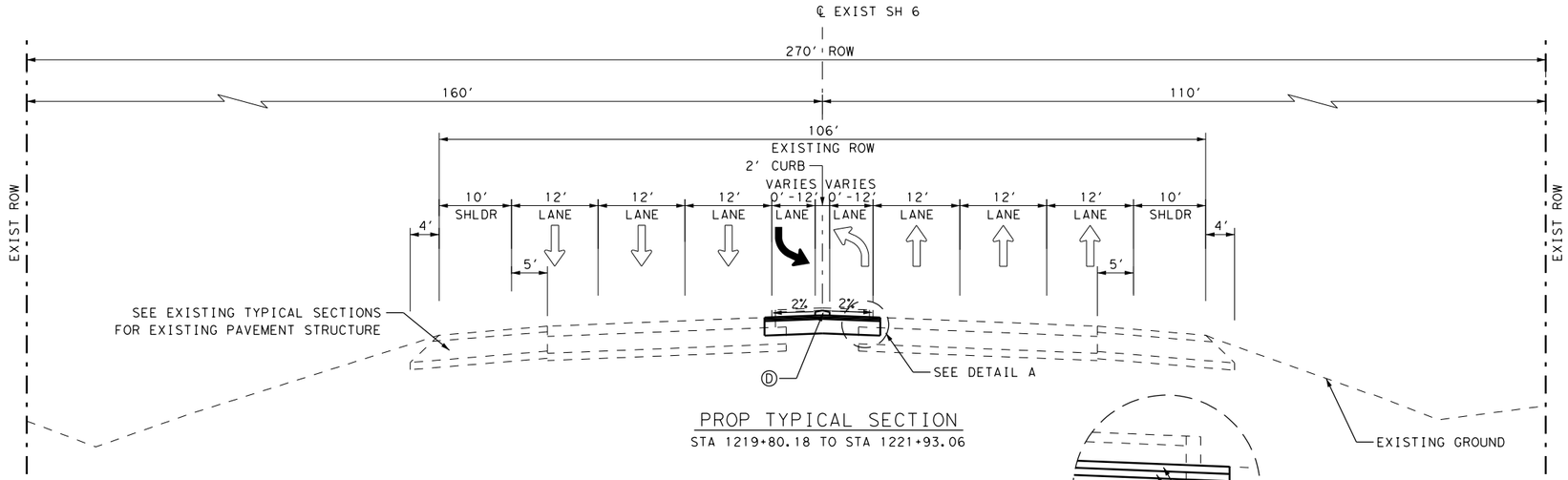
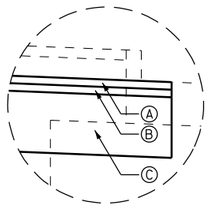
LEGEND

- (A) - 1.5" TY D SURFACE
- (B) - 1.5" TY D LEVEL-UP
- (C) - 12" HMA BASE
- (D) - CONC DIRECTIONAL ISLAND
- (E) - 6" CONC CURB (DOWEL)(TY II)
- (F) - RIPRAP (CONC)
- ⇨ - EXIST TRAFFIC ARROW
- ➡ - PROP TRAFFIC ARROW

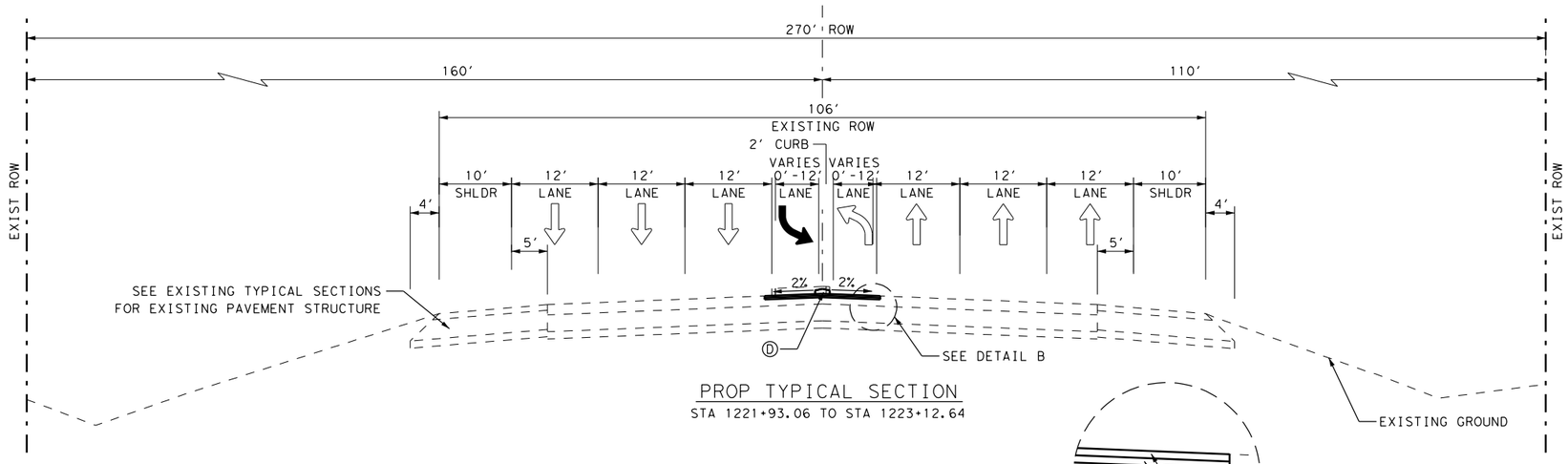


PROP TYPICAL SECTION

STA 1219+80.18 TO STA 1221+93.06

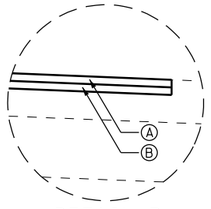


DETAIL A



PROP TYPICAL SECTION

STA 1221+93.06 TO STA 1223+12.64



DETAIL B

NOTES:

1. ALL STATIONS AND OFFSETS ARE FROM SH 6 CENTERLINE, UNLESS OTHERWISE NOTED.
2. FOR LIMITS AND GEOMETRY, REFER TO ROADWAY PLAN LAYOUT.
3. SAWCUT IS SUBSIDIARY TO REMOVAL OF EXISTING PAVEMENT.
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STATE OF TEXAS
AARON C. LEGG
142513
LICENSED PROFESSIONAL ENGINEER

11/1/2022

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

PROPOSED
TYPICAL SECTIONS

SUBMITTED:	DESIGNED BY:
SCALE: N/A	CC'D BY:
DATE: 11/1/2022	SHEET NO 8 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

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11/1/2022
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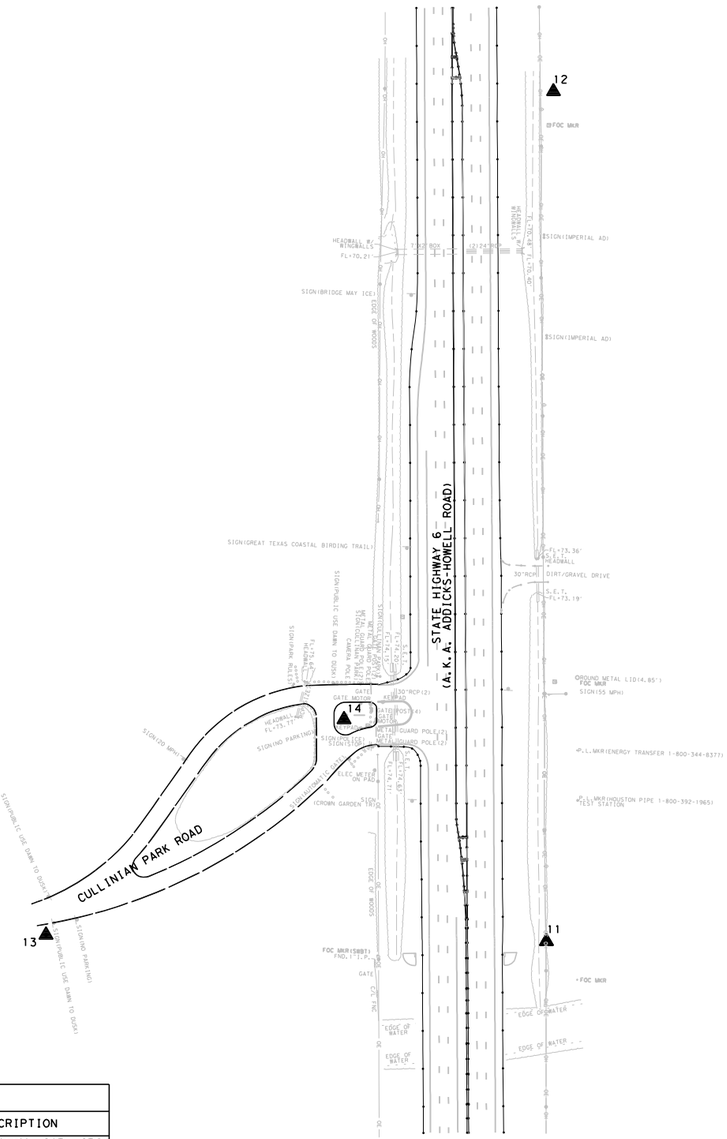


SURVEY CONTROL TABLE				
MONUMENT	NORTHING	EASTING	ELEVATION	MONUMENT DESCRIPTION
11	13,795,359.99	3,032,589.11	74.88	SET 5/8" I.R. W/TxDOT ALUM. CAP -GPS
12	13,796,481.53	3,032,559.24	73.23	SET 5/8" I.R. W/TxDOT ALUM. CAP -GPS
13	13,795,345.32	3,031,928.66	79.20	SET 5/8" I.R. W/ CFA CAP
14	13,795,643.34	3,032,311.92	80.75	SET 5/8" I.R. W/ CFA CAP

U.S. SURVEY FEET

200 100 0 200

SCALE: 1" = 100' (22"X34" SHEET)
SCALE: 1" = 200' (11"X17" SHEET)

N

NOTES:

1. ALL BEARINGS AND COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTH AMERICAN DATUM OF 1983 (NAD83), 2011 ADJUSTMENT, EPOCH 2010.00

2. COORDINATES AND DISTANCES ARE IN U.S. SURVEY FEET, DISPLAYED IN SURFACE VALUES AND MAY BE CONVERTED TO GRID VALUES BY APPLYING THE TXDOT SURFACE ADJUSTMENT FACTOR (SAF), SAF =1.00013, USING THE FORMULA: SURFACE /SAF=GRID.

3. ALL ELEVATIONS SHOWN HEREON ARE ORTHOMETRIC VALUES REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, (NAVD 88),REALIZED USING GEOID 12B.

4. FIELD INFORMATION SHOWN HEREON IS BASED ON AN "ON-THE-GROUND" SURVEY PERFORMED BY COBB, FENDLEY & ASSOCIATES, INC. IN FEBRUARY, 2022.

STATE OF TEXAS REGISTERED CHRISTOPHER B. WELLS 6615 PROFESSIONAL LAND SURVEYOR

SURVEYOR CERTIFICATION

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

CHRISTOPHER B. WELLS
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6615
DATE:

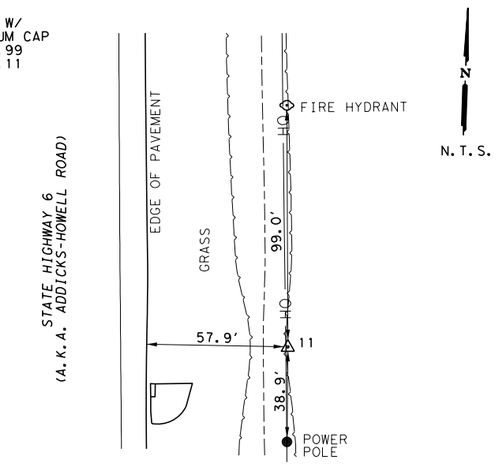
CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
13430 Northwest Freeway, Suite 1100
Houston, Texas 77040
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

CULLINAN PARK @ STATE HIGHWAY 6
SURVEY CONTROL INDEX SHEET

FORT BEND COUNTY, TEXAS

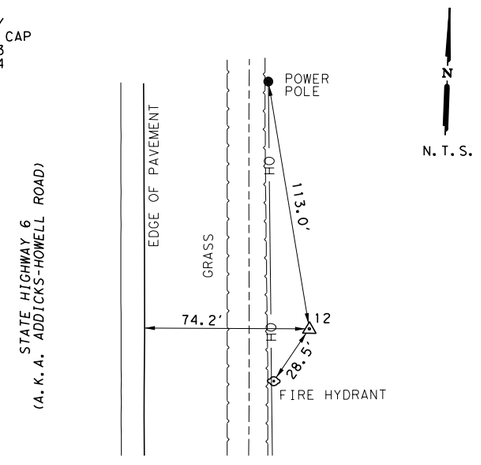
FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
6	TEXAS				6
STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
12	FORT BEND	1685	06	01	9

11
SET 5/8"I.R. W/
TxDOT ALUMINUM CAP
N: 13,795,359.99
E: 3,032,589.11
ELEV: 74.88'



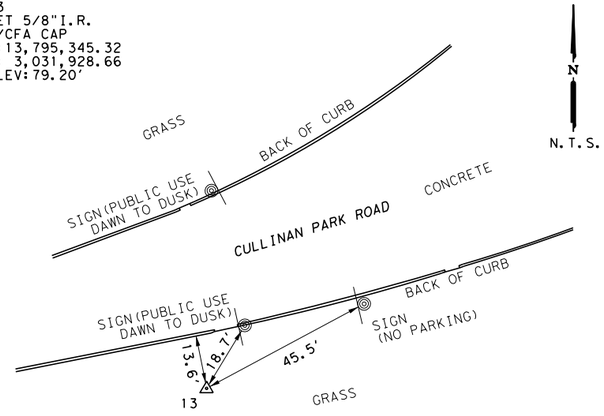
SET 5/8" IRON ROD W/TxDOT ALUMINUM CAP EAST OF HWY 6, APPROX. 345' SOUTH OF THE INTERSECTION OF CULLINAN PARK ROAD & STATE HIGHWAY 6.

12
SET 5/8"I.R. W/
TxDOT ALUMINUM CAP
N: 13,796,481.53
E: 3,032,559.24
ELEV: 73.23'



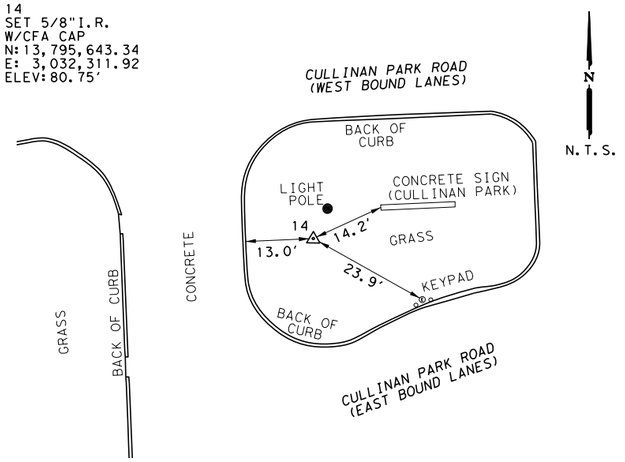
SET 5/8" IRON ROD W/TxDOT ALUMINUM CAP EAST OF HWY 6, APPROX. 837' NORTH OF THE INTERSECTION OF CULLINAN PARK ROAD & STATE HIGHWAY 6.

13
SET 5/8"I.R.
W/CFA CAP
N: 13,795,345.32
E: 3,031,928.66
ELEV: 79.20'



SET 5/8" IRON ROD W/CFA CAP SOUTH OF CULLINAN PARK ROAD, APPROX. 583' WEST OF THE INTERSECTION OF CULLINAN PARK ROAD & STATE HIGHWAY 6.

14
SET 5/8"I.R.
W/CFA CAP
N: 13,795,643.34
E: 3,032,311.92
ELEV: 80.75'



SET 5/8" IRON ROD W/CFA CAP APPROX. 112' WEST OF THE INTERSECTION OF CULLINAN PARK ROAD & STATE HIGHWAY 6.

NOTES:

1. ALL BEARINGS AND COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTH AMERICAN DATUM OF 1983 (NAD83), 2011 ADJUSTMENT, EPOCH 2010.00

2. COORDINATES AND DISTANCES ARE IN U.S. SURVEY FEET, DISPLAYED IN SURFACE VALUES AND MAY BE CONVERTED TO GRID VALUES BY APPLYING THE TXDOT SURFACE ADJUSTMENT FACTOR (SAF), SAF =1.00013, USING THE FORMULA: SURFACE /SAF=GRID.

3. ALL ELEVATIONS SHOWN HEREON ARE ORTHOMETRIC VALUES REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, (NAVD 88),REALIZED USING GEOID 12B.

4. FIELD INFORMATION SHOWN HEREON IS BASED ON AN "ON-THE-GROUND" SURVEY PERFORMED BY COBB, FENDLEY & ASSOCIATES, INC. IN FEBRUARY, 2022.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

CHRISTOPHER B. WELLS
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6615

DATE: 10/3/22

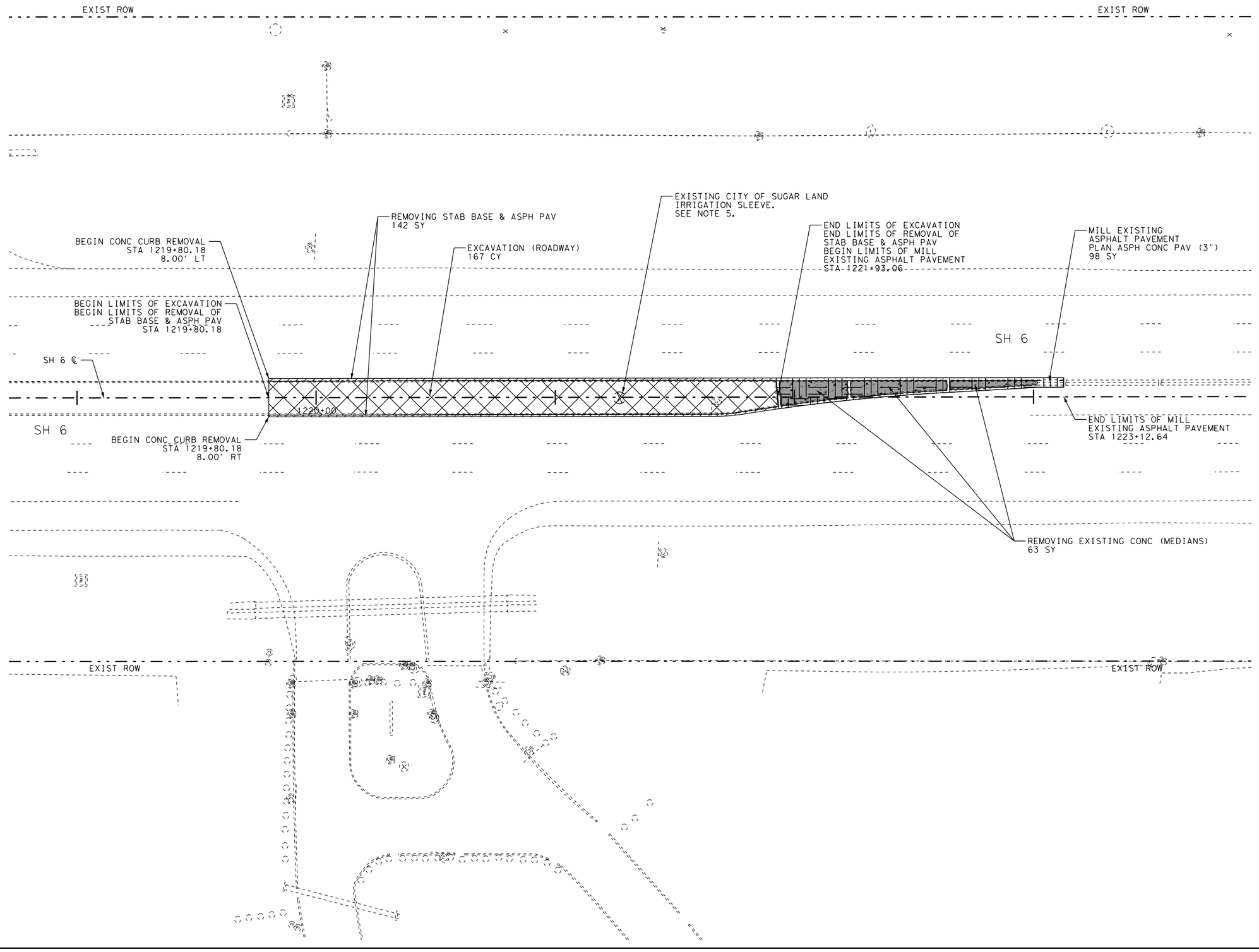
CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
13430 Northwest Freeway, Suite 1100
Houston, Texas 77040
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

CULLINAN PARK & STATE HIGHWAY 6

SURVEY CONTROL
DATA PANELS

FORT BEND COUNTY, TEXAS

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
6	TEXAS				6
STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
12	FORT BEND	1685	06	01	10



LEGEND

- EXIST TRAFFIC ARROW
- PROP TRAFFIC ARROW
- LIMITS OF PAY ITEM 104
- LIMITS OF PAY ITEM 105
- LIMITS OF PAY ITEM 110
- LIMITS OF PAY ITEM 354

0 10 20 40

NOTES:

1. ALL STATIONS AND OFFSETS ARE FROM SH 6 CENTERLINE, UNLESS OTHERWISE NOTED.
2. FOR ADDITIONAL DETAILS ON LIMITS OF REMOVAL, SEE DEMOLITION TYPICAL SECTIONS.
3. SAWCUT IS SUBSIDIARY TO REMOVAL OF EXISTING PAVEMENT.
4. THE CONTRACTOR WILL BE REQUIRED TO PROOF ROLL SUBGRADE PRIOR TO PLACEMENT OF ASPHALT BASE. IF UNSTABLE AREAS ARE ENCOUNTERED, THEY WILL BE CORRECTED PRIOR TO PLACEMENT OF THE ASPHALT BASE. EQUIPMENT AND METHODS USED TO CORRECT UNSTABLE AREAS WILL BE APPROVED BY THE ENGINEER. THIS WORK WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS.
5. CITY OF SUGAR LAND IRRIGATION SLEEVE TO BE TO BE CUT, PLUGGED, AND ABANDONED, AS APPROVED BY THE ENGINEER. THIS WORK IS SUBSIDIARY TO PAYMENT OF ITEM 100 PREPARING ROW

STATE OF TEXAS
R. MATTHEW ADAMS
105842
LICENSED
PROFESSIONAL ENGINEER

2/20/2023

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

DEMOLITION
PLAN LAYOUT

SUBMITTED:	DESIGNED BY:
SCALE: 1"=40'	CC'D BY:
DATE: 2/20/2023	SHEET NO 11 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

3:47:03 PM
2/20/2023
D:\Projects\2021\11009\FBC*SH*6*at*Cullinan*Park\400*CAD\411*Trans\02-Sheets\03-Removal\SH6*DEMO*01.dgn

℄ CR SH 6 ALIGNMENT

Chain SH6_CL contains:
1200 1201

Beginning chain SH6 CL description

Point 1200	N	13,797,684.60	E	3,032,382.82	Sta 1200+00.00
Course from 1200 to 1201 S 2° 20′ 43.00" E Dist 3,500.00					
Point 1201	N	13,794,187.53	E	3,032,526.05	Sta 1235+00.00

Ending chain SH6 CL description

11/1/2022

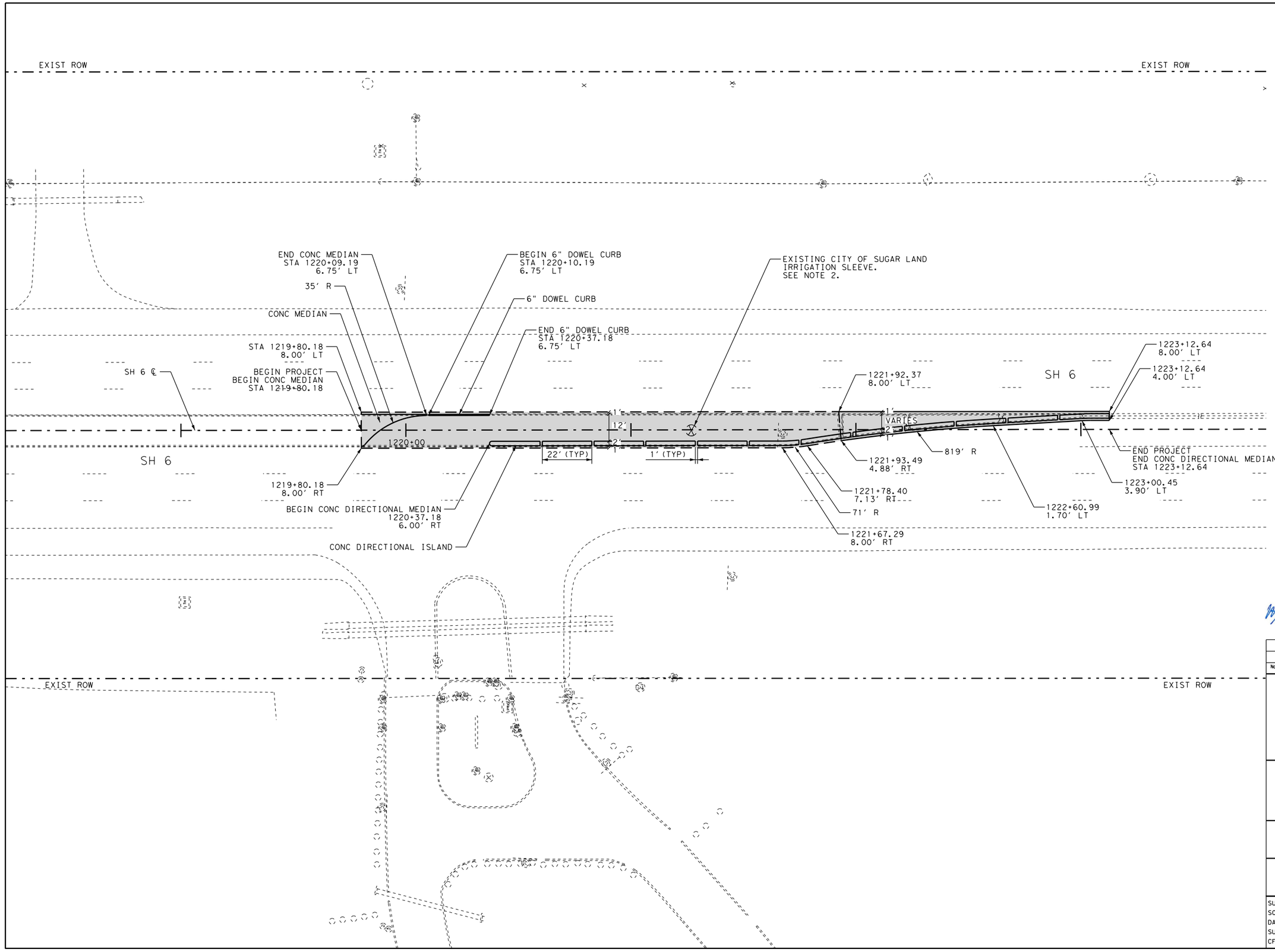
No.	Date	Revisions	App.

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

HORIZONTAL
DATA SHEET

SUBMITTED:	DESIGNED BY:
SCALE: N/A	CC'D BY:
DATE: 11/1/2022	SHEET NO 12 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	



LEGEND

- EXISTING ROW
- SAWCUT
- PROP PAVEMENT

0 10 20 40

NOTES:

1. SEE DEMOLITION TYPICAL SECTIONS AND DEMOLITION PLAN LANYOUT FOR REMOVAL LIMITS OF EXISTING MATERIALS.
2. CITY OF SUGAR LAND IRRIGATION SLEEVE TO BE CUT, PLUGGED, AND ABANDONED, AS APPROVED BY THE ENGINEER. THIS WORK IS SUBSIDIARY TO PAYMENT OF ITEM 100 PREPARING ROW.

STATE OF TEXAS
W. MATTHEW ADAMS
105842
LICENSED
PROFESSIONAL ENGINEER

2/20/2023

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

ROADWAY
PLAN LAYOUT

SUBMITTED:	DESIGNED BY:
SCALE: 1"=40'	CC'D BY:
DATE: 2/20/2023	SHEET NO 13 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

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2/20/2023
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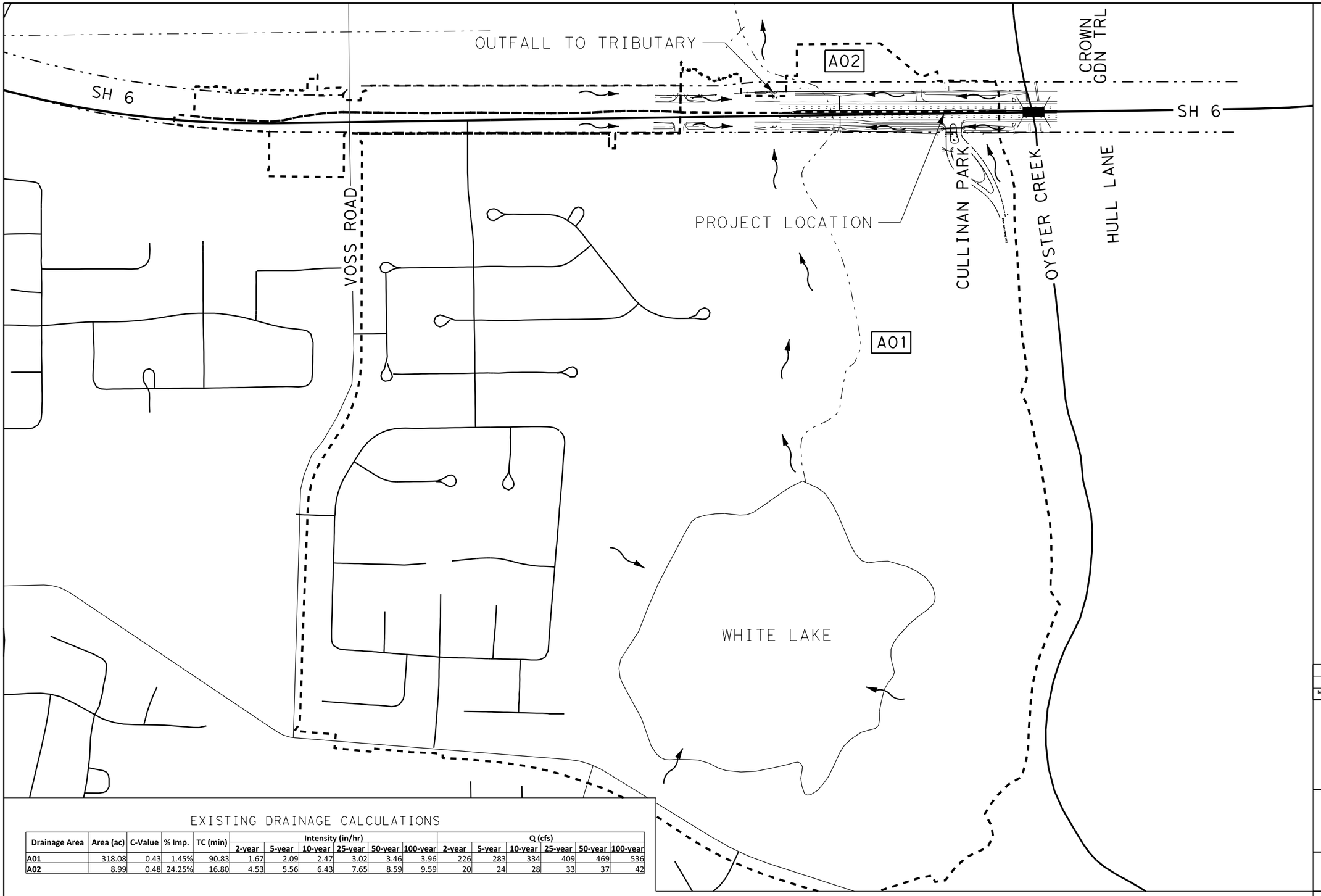

LEGEND

- EXISTING ROW
- DRAINAGE BOUNDARY
- OVERLAND SHEET FLOW DIRECTION

0 250 500

EXISTING DRAINAGE CALCULATIONS

Drainage Area	Area (ac)	C-Value	% Imp.	TC (min)	Intensity (in/hr)						Q (cfs)					
					2-year	5-year	10-year	25-year	50-year	100-year	2-year	5-year	10-year	25-year	50-year	100-year
A01	318.08	0.43	1.45%	90.83	1.67	2.09	2.47	3.02	3.46	3.96	226	283	334	409	469	536
A02	8.99	0.48	24.25%	16.80	4.53	5.56	6.43	7.65	8.59	9.59	20	24	28	33	37	42

PROPOSED DRAINAGE CALCULATIONS

Drainage Area	Area (ac)	C-Value	% Imp.	TC (min)	Intensity (in/hr)						Q (cfs)					
					2-year	5-year	10-year	25-year	50-year	100-year	2-year	5-year	10-year	25-year	50-year	100-year
A01	318.08	0.43	1.46%	90.83	1.67	2.09	2.47	3.02	3.46	3.96	226	283	334	409	469	536
A02	8.99	0.48	24.47%	16.80	4.53	5.56	6.43	7.65	8.59	9.59	20	24	28	33	37	42

EFFECTS OF CHANGE

	INCREASE IN PEAK FLOWS, Q (cfs)						INCREASE IN IMPERVIOUSE AREA	INCREASE IN DETENTION VOLUME
DRAINAGE AREA	2-year	5-year	10-year	25-year	50-year	100-year	%	AC-FT
A01	0.00	0.00	0.00	0.00	0.00	0.00	0.01%	0
A02	0.00	0.00	0.00	0.00	0.00	0.00	0.22%	0

STATE OF TEXAS
AARON C. LEGG
142513
LICENSED PROFESSIONAL ENGINEER
11/1/2022

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

OVERALL DRAINAGE AREA MAP

SUBMITTED:	DESIGNED BY:
SCALE: 1"=500'	CC'D BY:
DATE: 11/1/2022	SHEET NO 14 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

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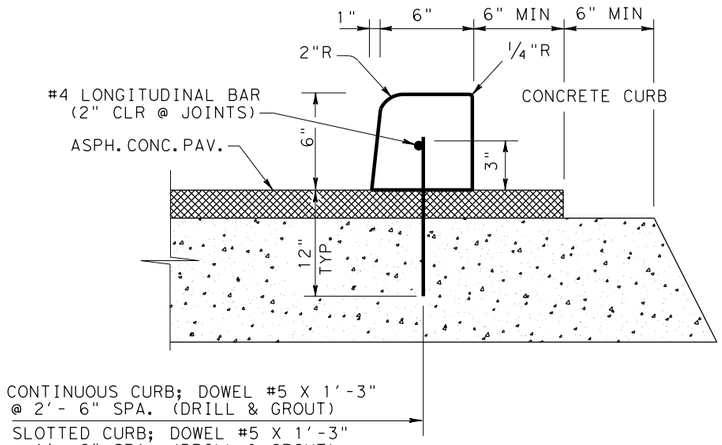
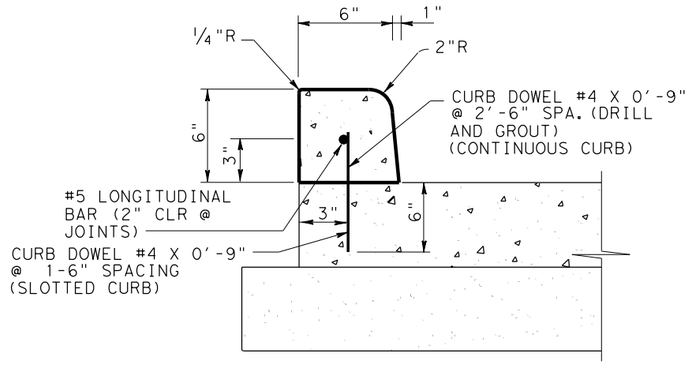


SHOWN ON EXISTING OR PROPOSED ACP PAVEMENT

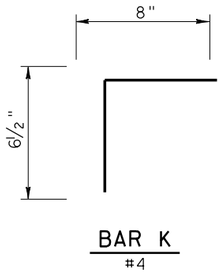
(PAY ITEM 529-6011) - FOR CONTINUOUS



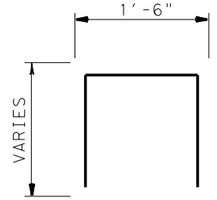
SHOWN ON EXISTING OR PROPOSED CONCRETE PAVEMENT

(PAY ITEM 529-6011) - FOR CONTINUOUS

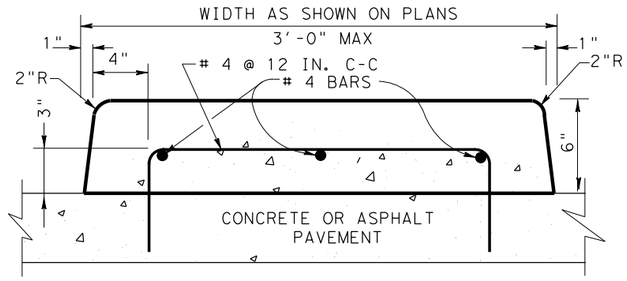
CONCRETE CURB (DOWEL) (6 IN.)



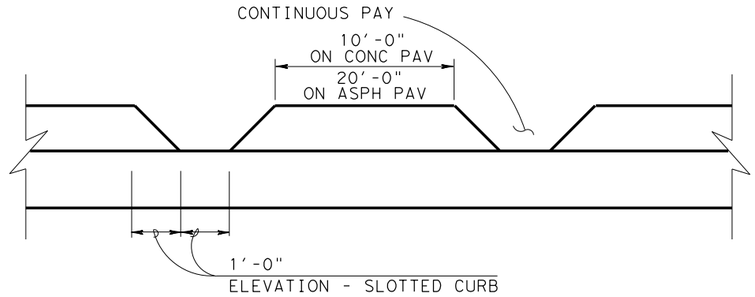
BAR K
#4



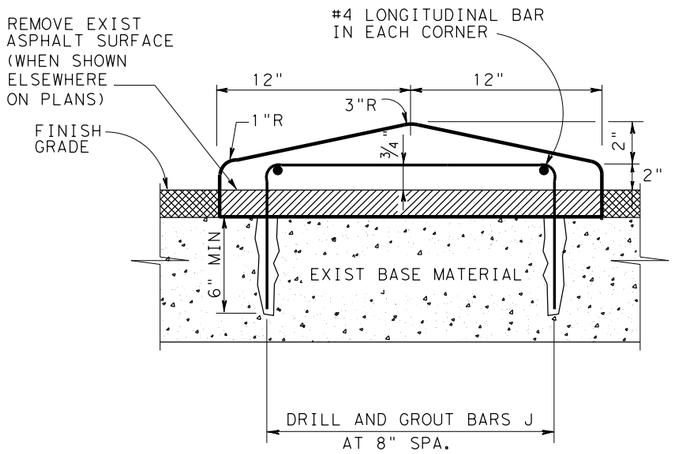
BAR J
#4



ITEM 536-6001 CONCRETE MEDIAN
SEE NOTE 2

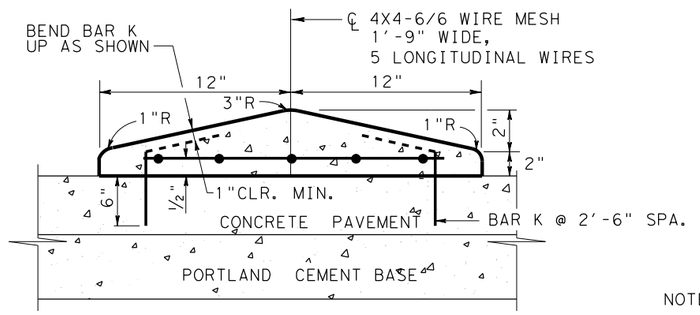


ITEM 529-6012 CONCRETE CURB (SLOTTED) - ON CONC.
ITEM 529-6009 CONC CURB (DOWEL)(SLOTTED) - ON ASPH.



SHOWN ON EXISTING ACP PAVEMENT

SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND



SHOWN ON EXISTING OR PROPOSED CONCRETE PAVEMENT

SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND

CONCRETE DIRECTIONAL ISLAND

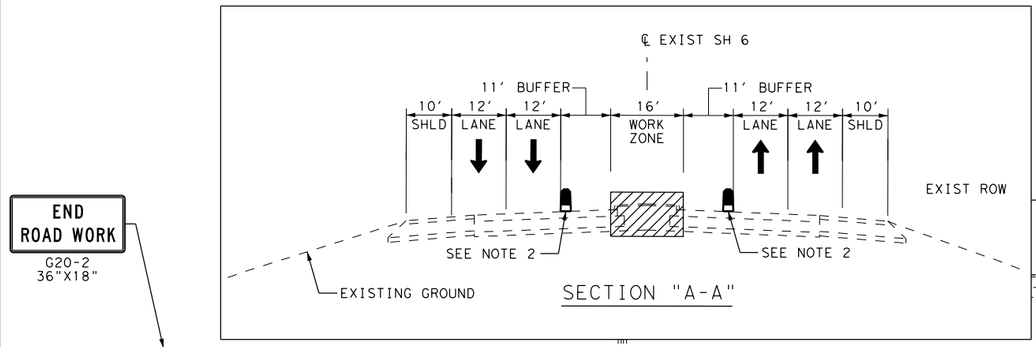
NOTES:

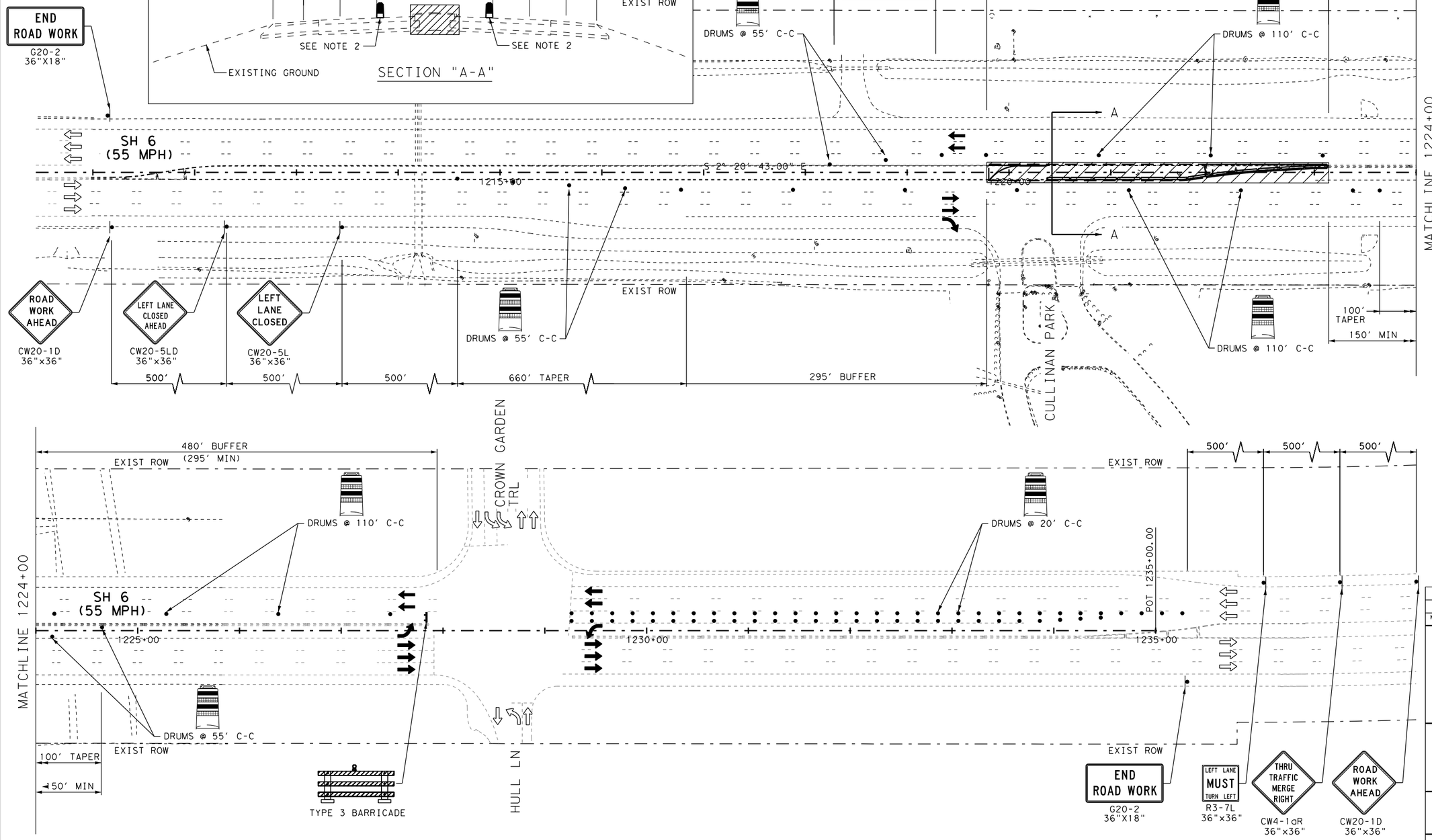
1. DRILL AND GROUT BARS SHOWN AS PER ITEM 420.4.7.10, 6" EMBEDMENT, MINIMUM ON CONC.
2. INSTALL A 2 INCH DRAINAGE OPENING AT 10 FT C-C WHEN CURB/ISLAND IS NOT ON TOP OF CROSS SECTION. (LOCATED ON A 2 OR 3 PERCENT TRANSVERSE GRADE, OR SUPERELEVATION.)

Texas Department of Transportation
Houston District

CONCRETE CURB AND DIRECTIONAL ISLAND DETAILS CC & DID

FILE: STDB-9.dgn	DN:	CK:	DW:	CK:	
©TxDOT 2014	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS	HOU	6			15
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	FORT BEND					SH 6





LEGEND

- WORK ZONE
- DRUMS
- DIRECTION OF TRAFFIC (EXISTING)
- DIRECTION OF TRAFFIC (PROPOSED)

0 25 50 100

NOTES:

1. REFER TO TCP (1-4)-18 AND TCP (1-5)-18 FOR ADDTIONAL TRAFFIC CONTROL DETAILS
2. AT THE COUNTY OR ENGINEER'S DISCRETION, A QUANTITY FOR PORTABLE CTB AND CRASH CUSHION ATTENUATORS IS PROVIDED FOR CONTRACTOR'S USE. REFER TO SSCB(2)-10 AND VIA(SFPM)-19 FOR ADDITIONAL DETAILS.

STATE OF TEXAS
AARON C. LEGG
142513
LICENSED PROFESSIONAL ENGINEER
11/1/2022

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

TRAFFIC CONTROL PLAN

SUBMITTED:	DESIGNED BY:
SCALE: 1"=100'	CC'D BY:
DATE: 11/1/2022	SHEET NO 16 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

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DATE:
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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 http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

Texas Department of Transportation

Traffic Safety Division Standard

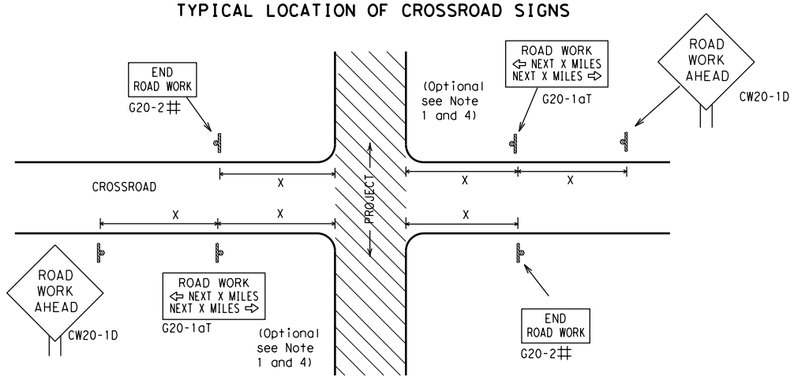
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13				SH 6
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21	HOU	FORT BEND		17

DATE:
FILE:

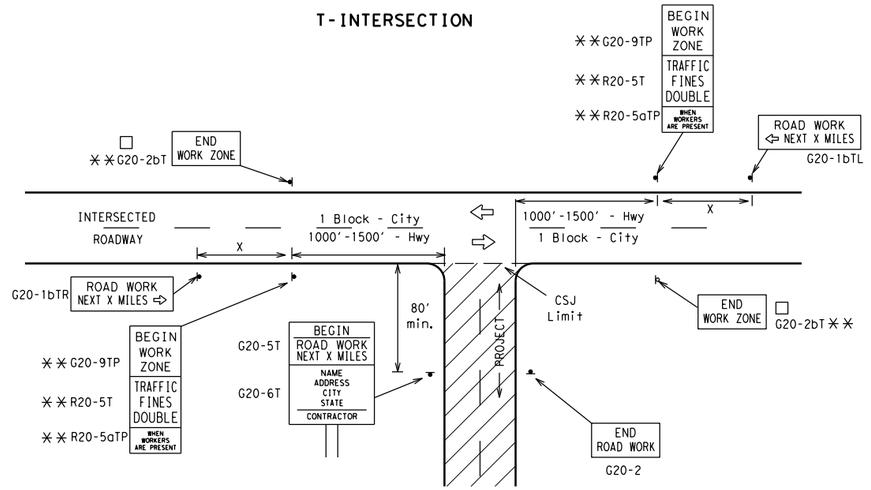
TYPICAL LOCATION OF CROSSROAD SIGNS



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[1,5,6]

SIZE

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign △ Spacing "X"
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
✳	✳[3]

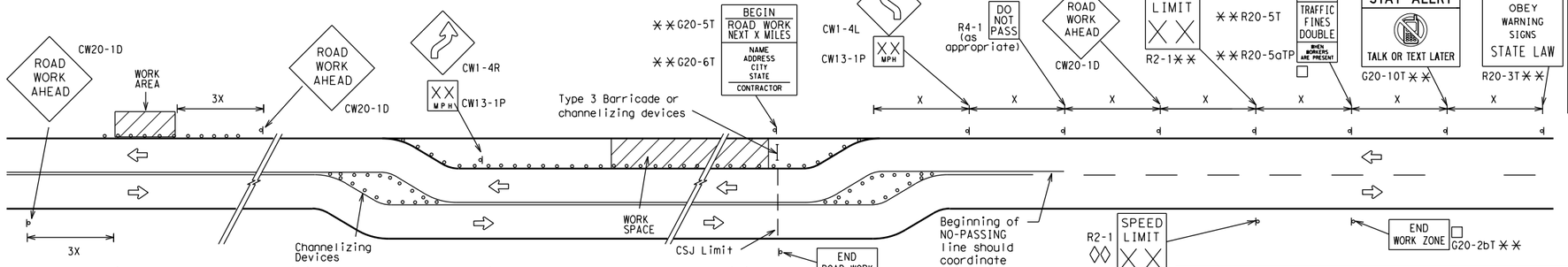
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

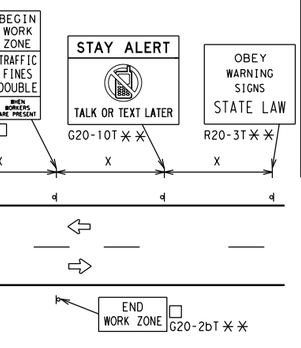
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may 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

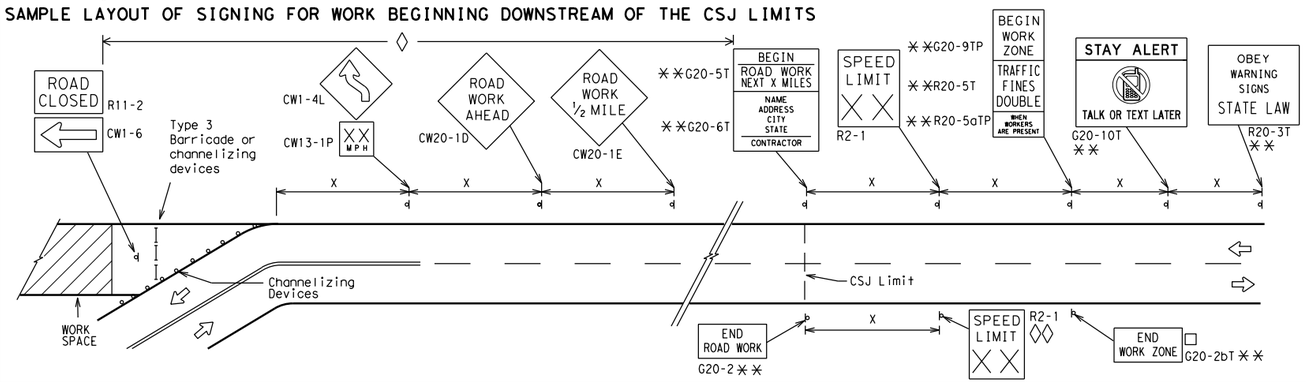


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

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 distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

□ 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.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				SH 6
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	FORT BEND		18

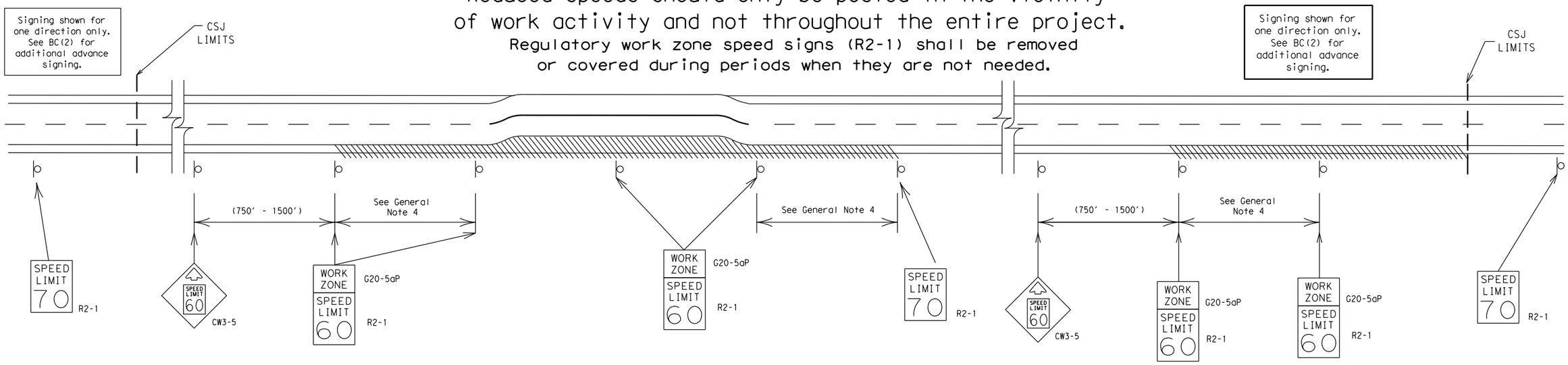
DATE:
FILE:

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:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the 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

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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DATE:
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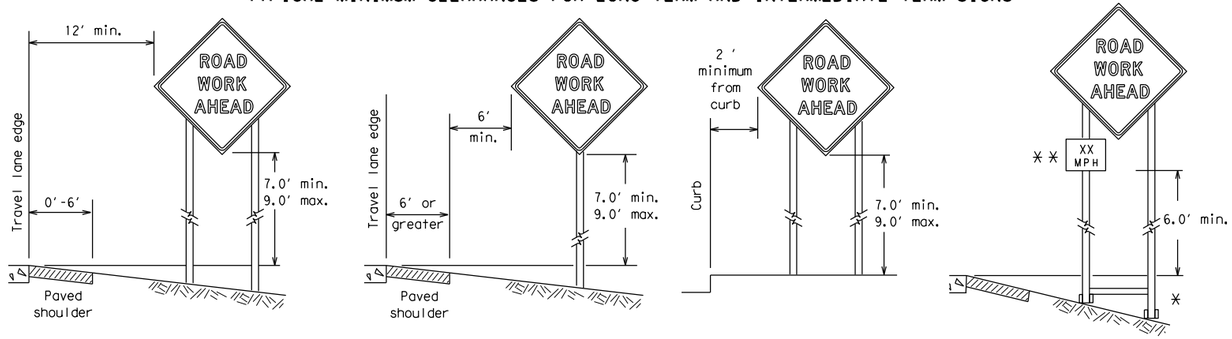
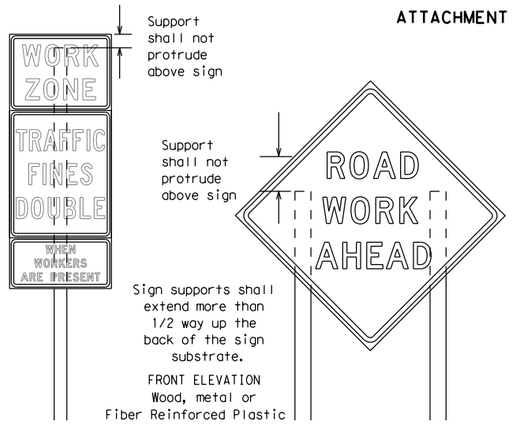
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



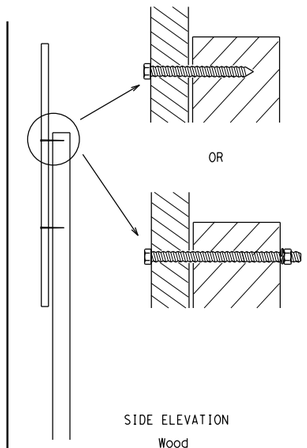
⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ 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 parent sign.

ATTACHMENT FOR SIGN SUPPORTS



FRONT ELEVATION
Wood, metal or
Fiber Reinforced Plastic



SIDE ELEVATION
Wood

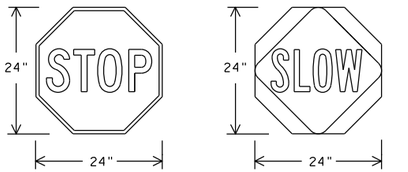
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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 spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
2. STOP/SLOW paddles shall be retroreflectorized when used at night.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} 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

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, 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.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. 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.
5. 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.
6. 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

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs 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.
6. 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.
7. 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.
8. 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.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. 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.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. 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.
3. 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.
4. 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.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. 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.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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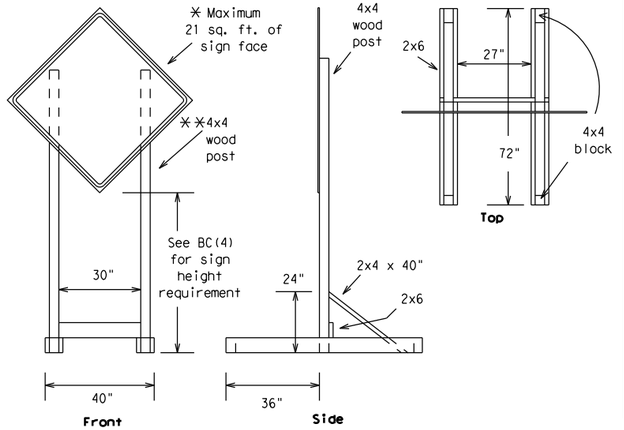
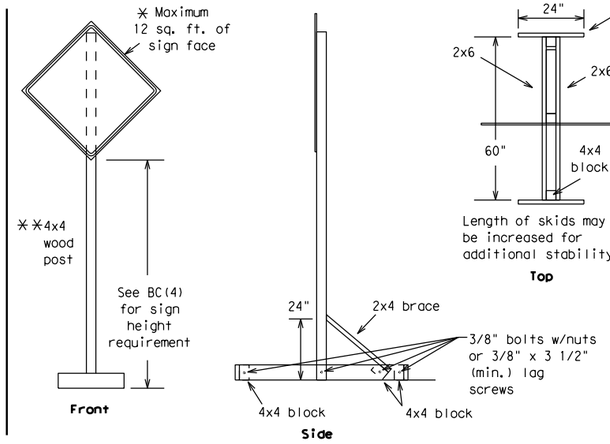
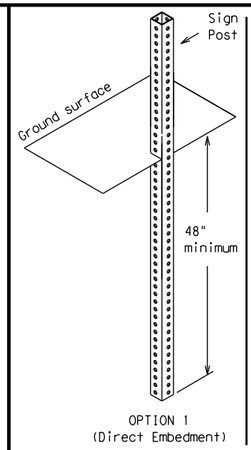
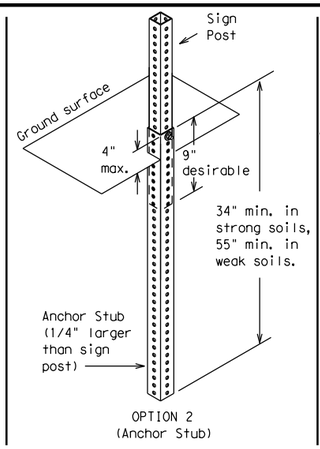


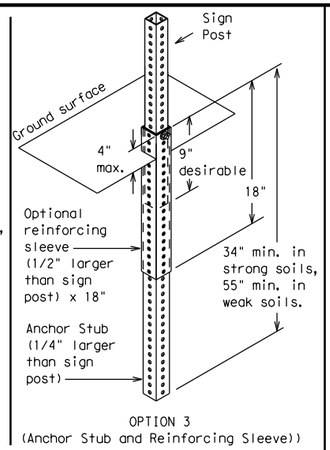


SKID MOUNTED WOOD SIGN SUPPORTS

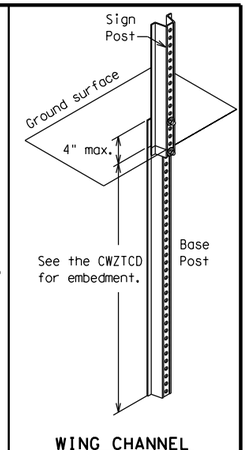
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







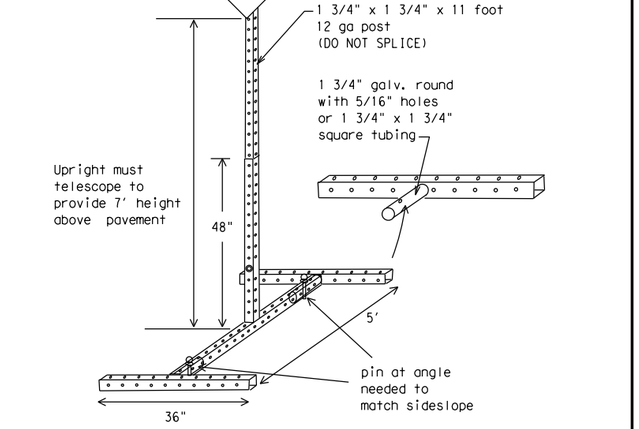
PERFORATED SQUARE METAL TUBING

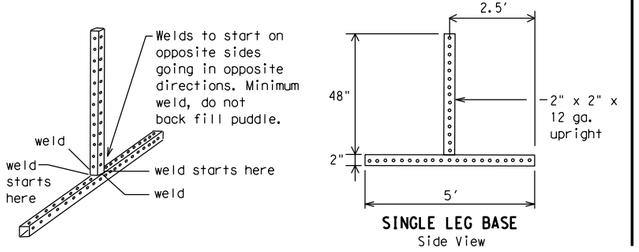


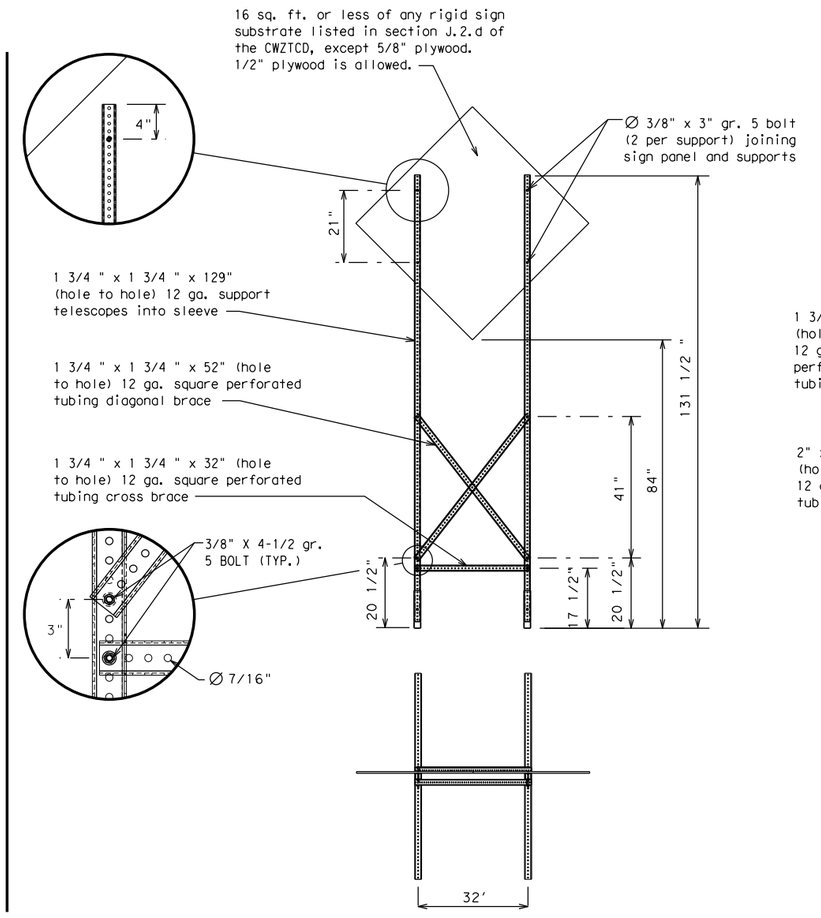
WING CHANNEL
Lap-splice/base bolted anchor

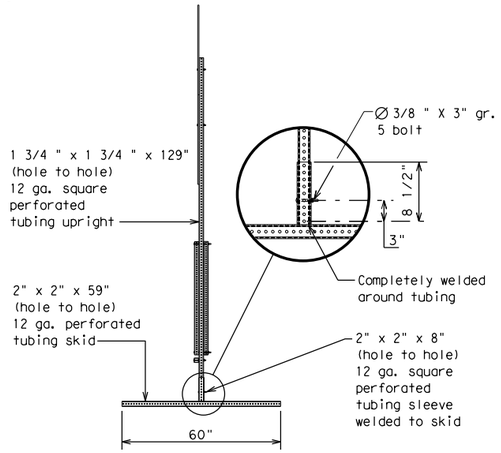
GROUND MOUNTED SIGN SUPPORTS

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.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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DATE:
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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. 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.
3. 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.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

Roadway designation ≠ IH-number, US-number, SH-number, FM-number

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

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
- XXXXXXXX BLVD 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 XXXXX 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
- XXXXXXX 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- X 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

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation

Traffic Safety Division Standard

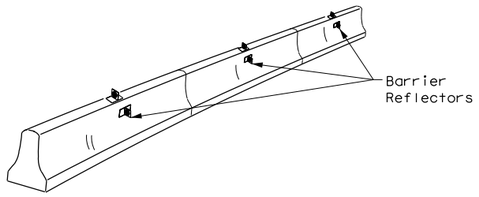
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				SH 6
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	FORT BEND		22

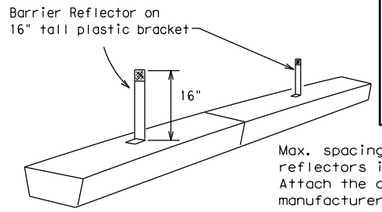
DATE:
FILE:

1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



CONCRETE TRAFFIC BARRIER (CTB)

3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without 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.
4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional)while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.

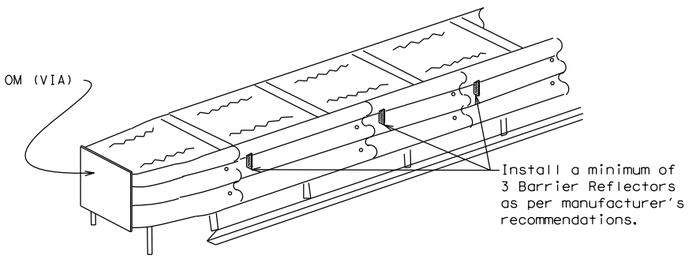


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

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.



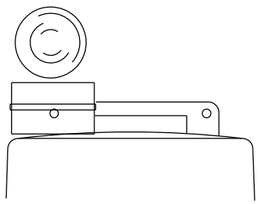
DELINEATION OF END TREATMENTS

END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate 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

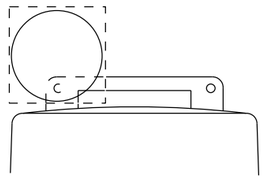


Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. 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.
7. 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.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.



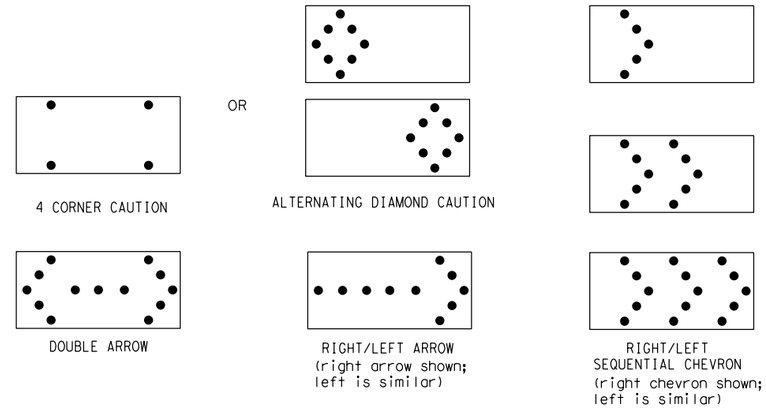
Warning reflector may be round or square.Must have a yellow reflective surface area of at least 30 square inches

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. 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.
6. 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.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
2. 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.
3. 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.
4. The Flashing Arrow Board should be able to display the following symbols:



5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. 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.
8. 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.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
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

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

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	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				SH 6
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	FORT BEND		23

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DATE:
FILE:

GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. 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:

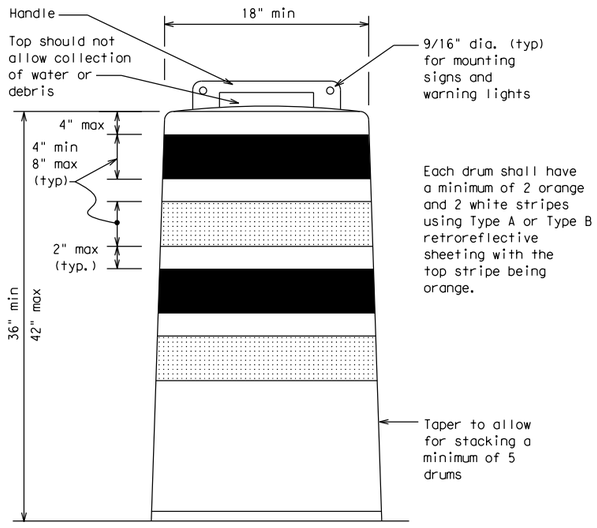
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

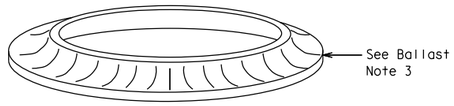
RETROREFLECTIVE SHEETING

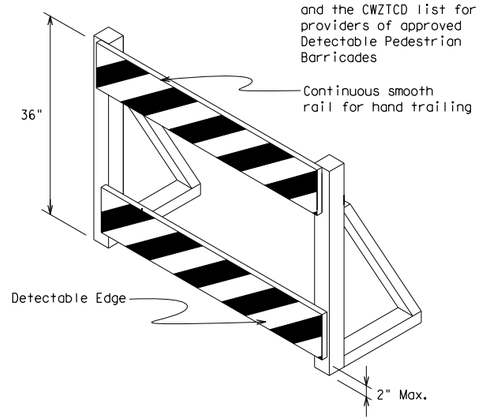
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
2. 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.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.

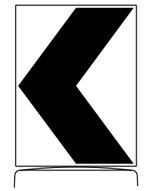




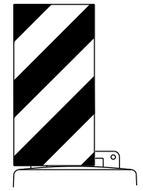


DETECTABLE PEDESTRIAN BARRICADES

1. 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.
2. 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.
3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades 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

1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
3. 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.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				SH 6
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	HOU	FORT BEND		24
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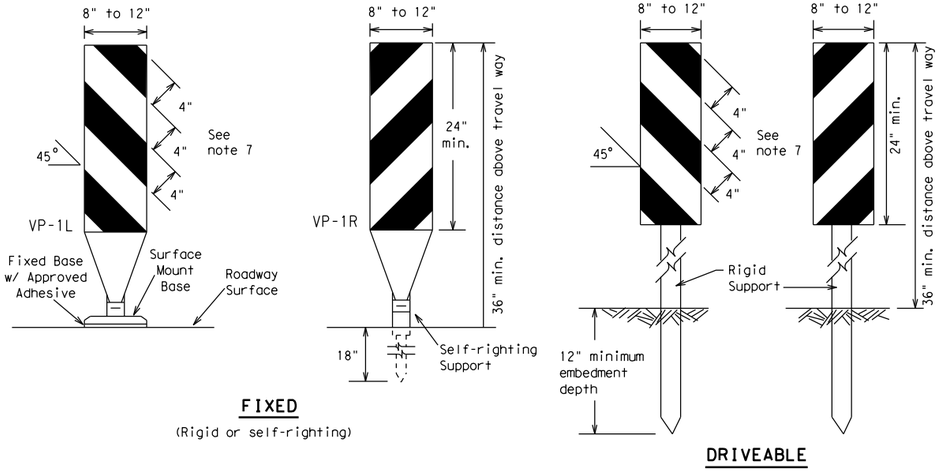
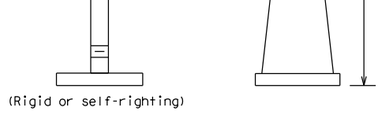


FIXED
(Rigid or self-righting)

DRIVEABLE

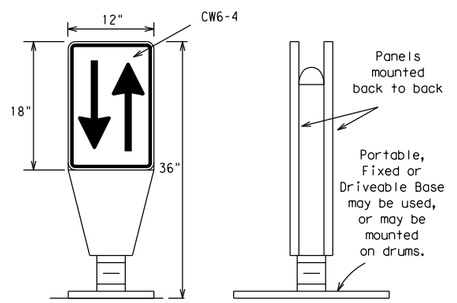


(Rigid or self-righting)

PORTABLE

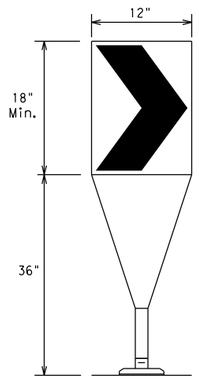
VERTICAL PANELS (VPs)

1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use VP's for drop-offs.
3. 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.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



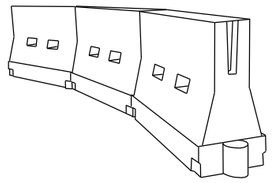
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways, self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. 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).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
2. 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.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	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

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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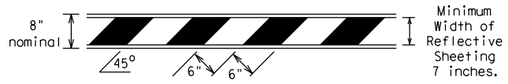
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	FORT BEND		25

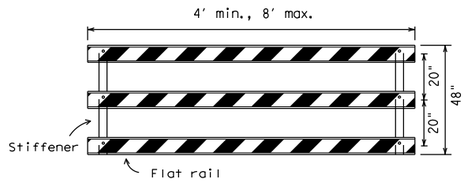
TYPE 3 BARRICADES

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. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for 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.



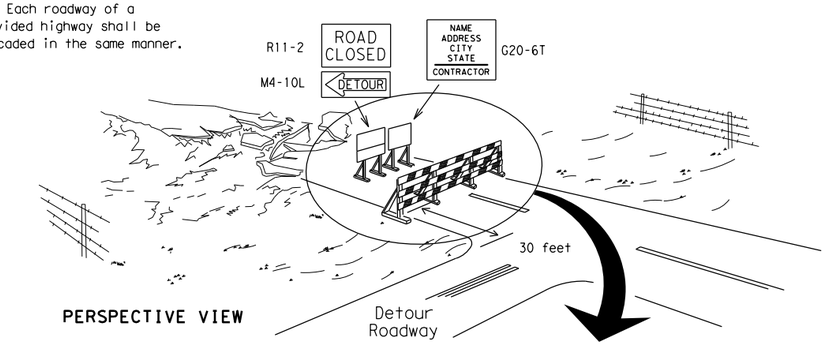
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

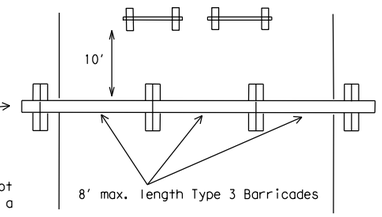
Each roadway of a divided highway shall be barricaded in the same manner.



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.

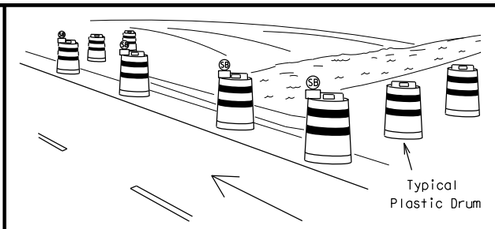
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

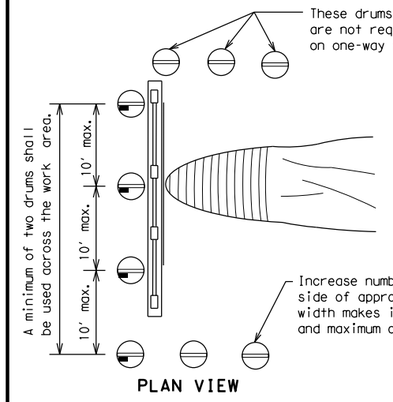
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

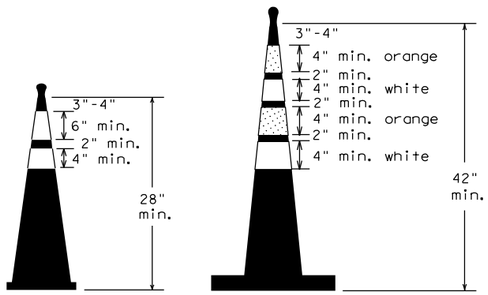
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



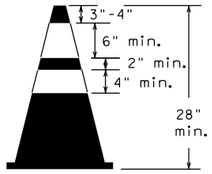
PLAN VIEW

LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

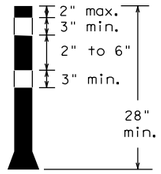
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

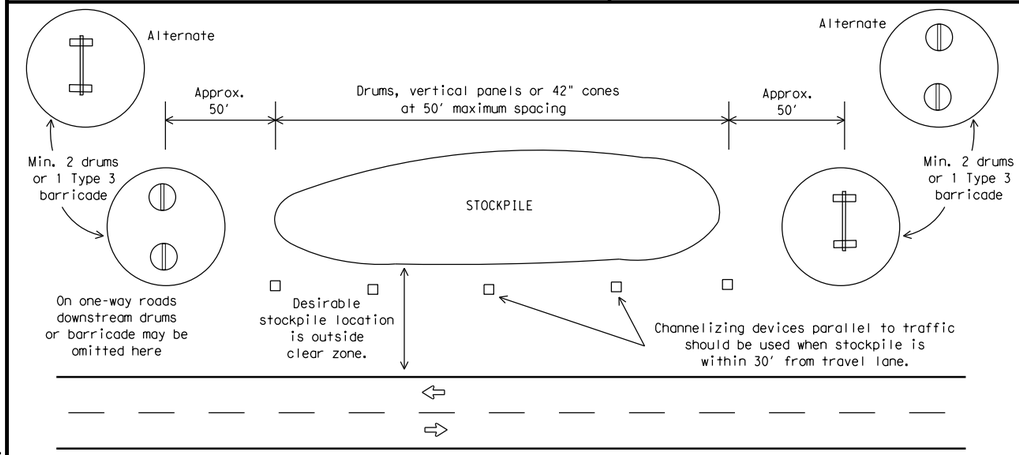


Tubular Marker

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.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers 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.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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7-13 5-21	HOU	FORT BEND		26

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WORK ZONE PAVEMENT MARKINGS

GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(12).
2. 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

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

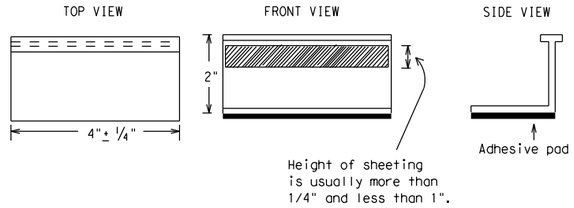
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

1. 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.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. 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).

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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11-02 8-14	HOU	FORT BEND		27

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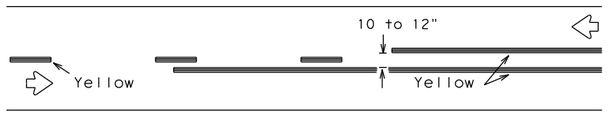
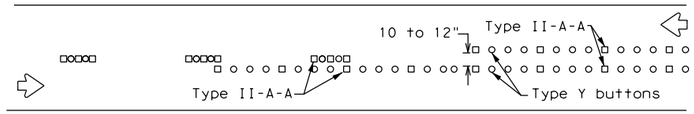
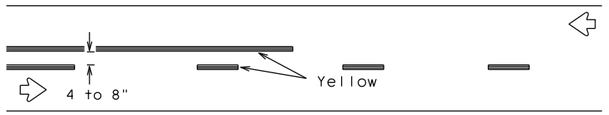
PAVEMENT MARKING PATTERNS



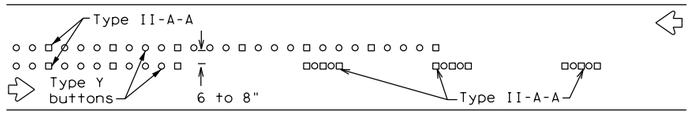
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



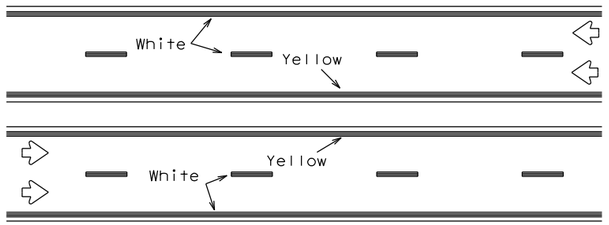
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



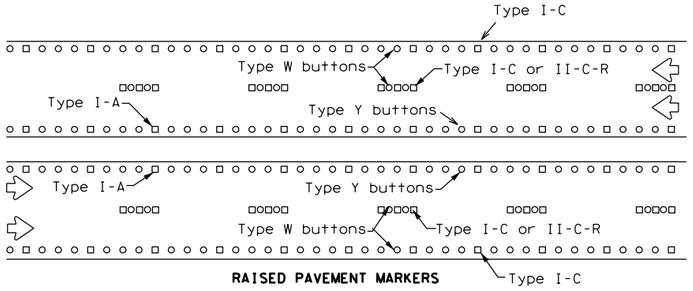
RAISED PAVEMENT MARKERS - PATTERN B

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



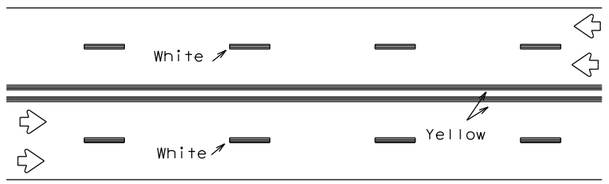
REFLECTORIZED PAVEMENT MARKINGS



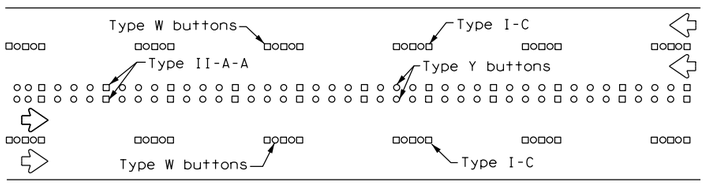
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



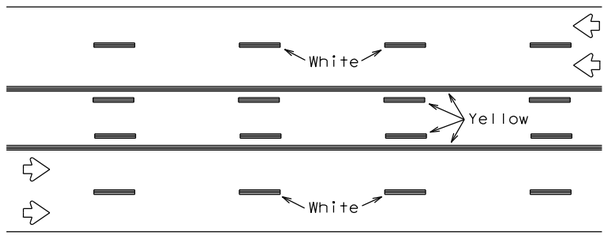
REFLECTORIZED PAVEMENT MARKINGS



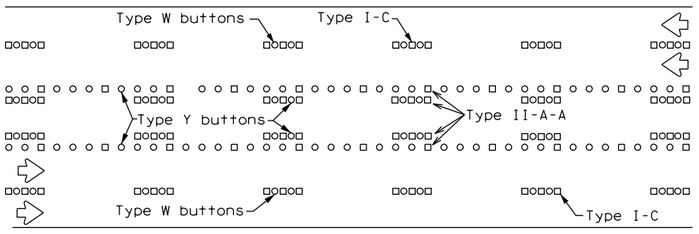
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

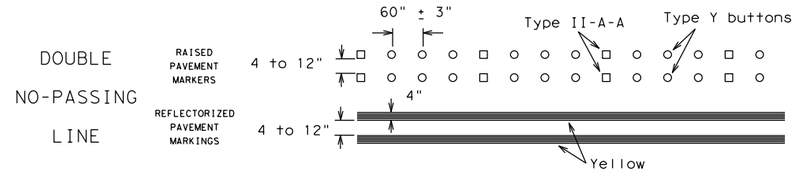
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

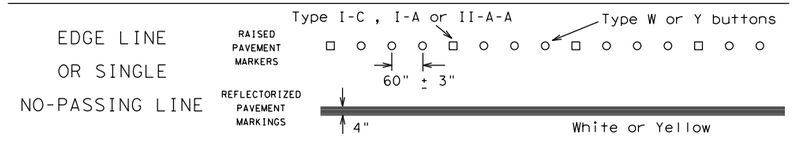
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

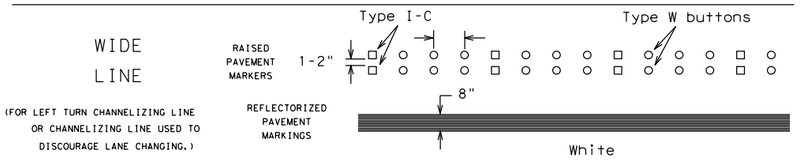


EDGE LINE OR SINGLE NO-PASSING LINE



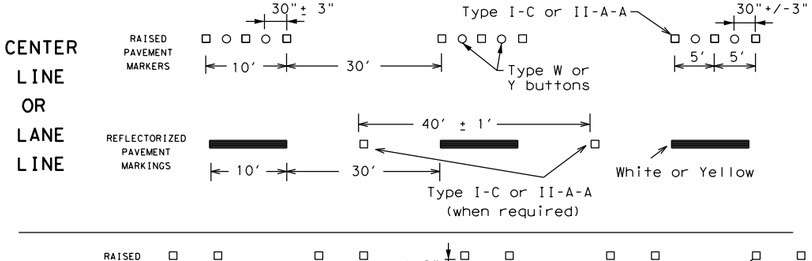
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

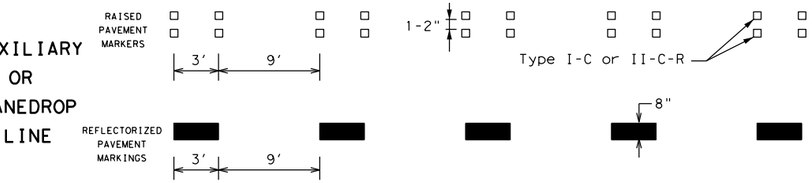


BROKEN LINES

CENTER LINE OR LANE LINE

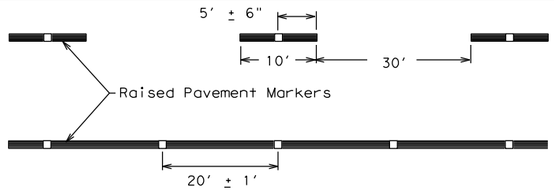


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

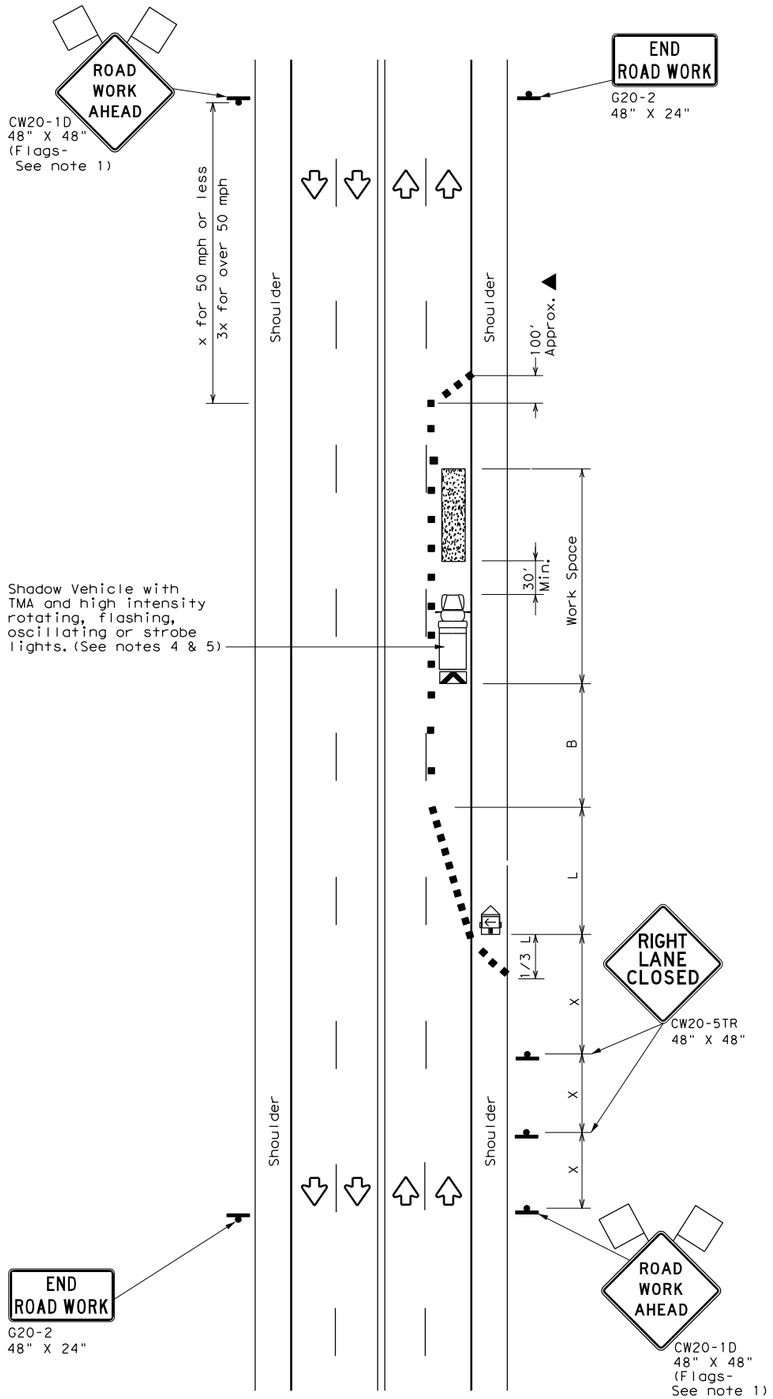
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

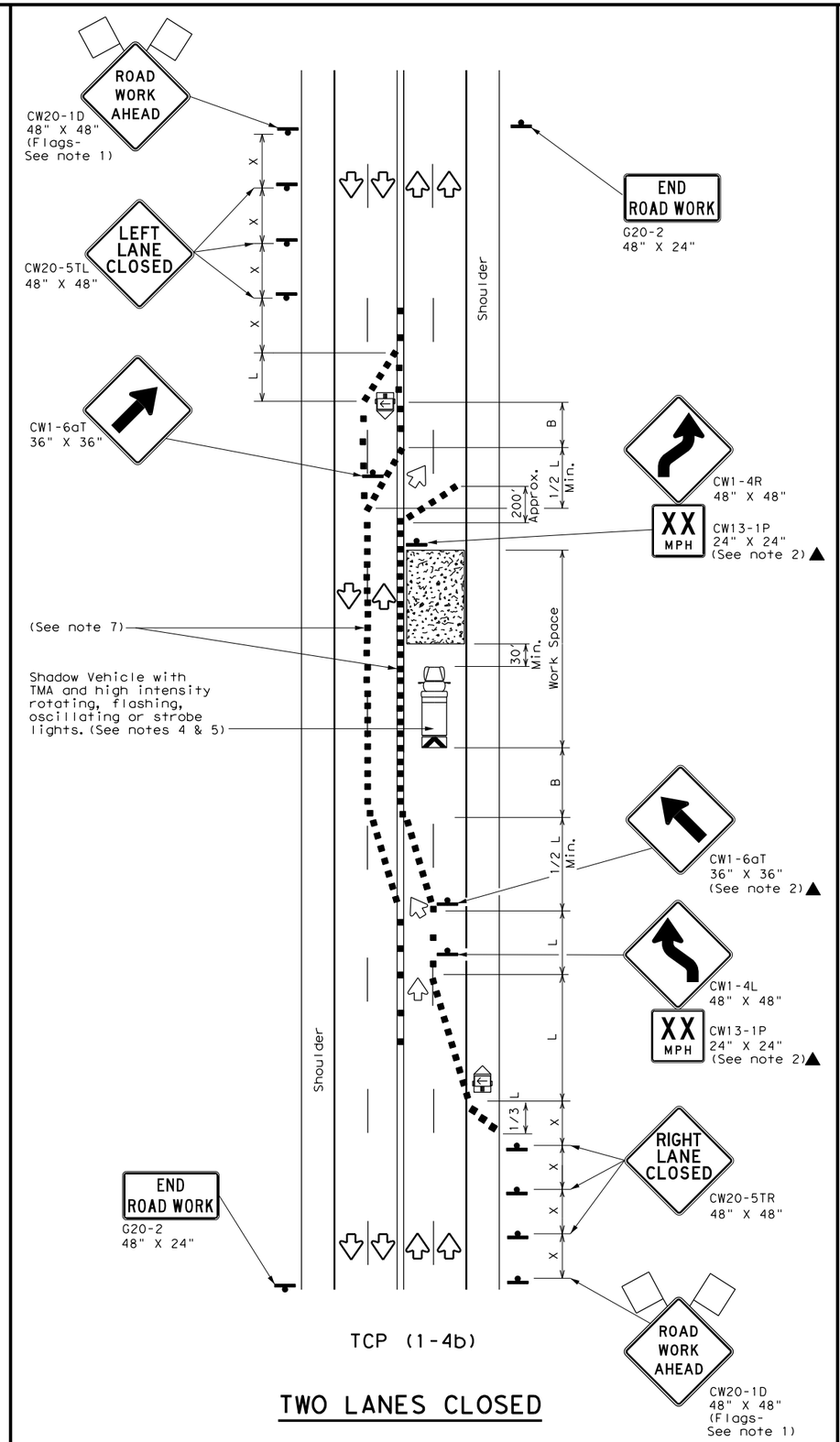
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14				SH 6
	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND		28

DATE:
FILE:



TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	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

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
4. 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.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-4a)

6. 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 where needed to protect the work space from opposing traffic with the arrow panel placed in the closed lane near the end of the merging taper.

TCP (1-4b)

7. 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 1/2S where S is the speed in mph. This tighter device spacing is intended for the areas 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(1-4)-18

FILE: tcp1-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS				SH 6
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	FORT BEND		29
1-97 2-18				

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DATE:
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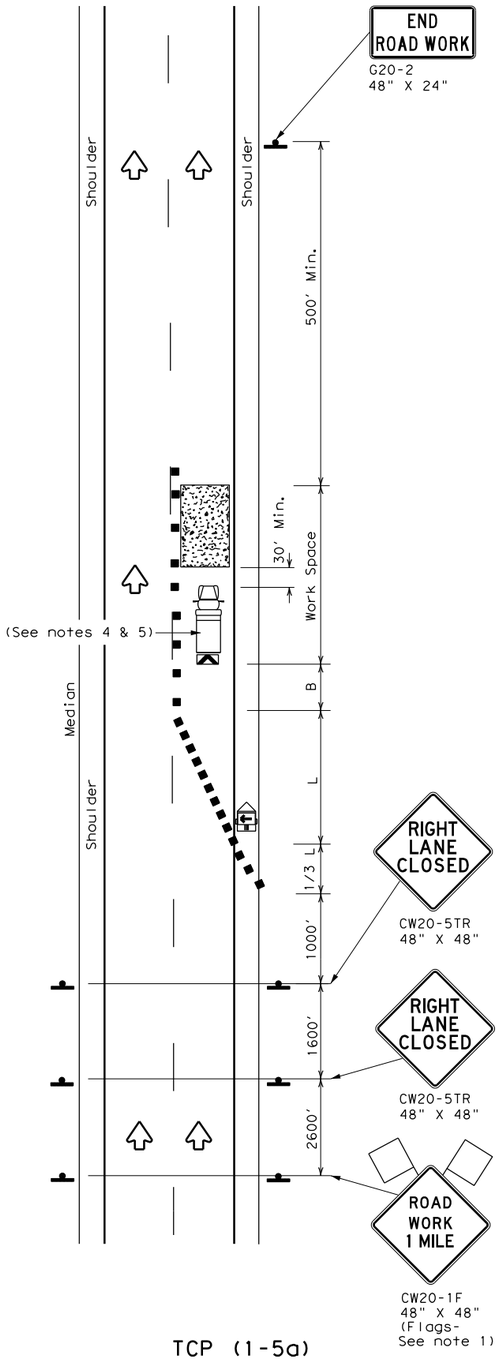
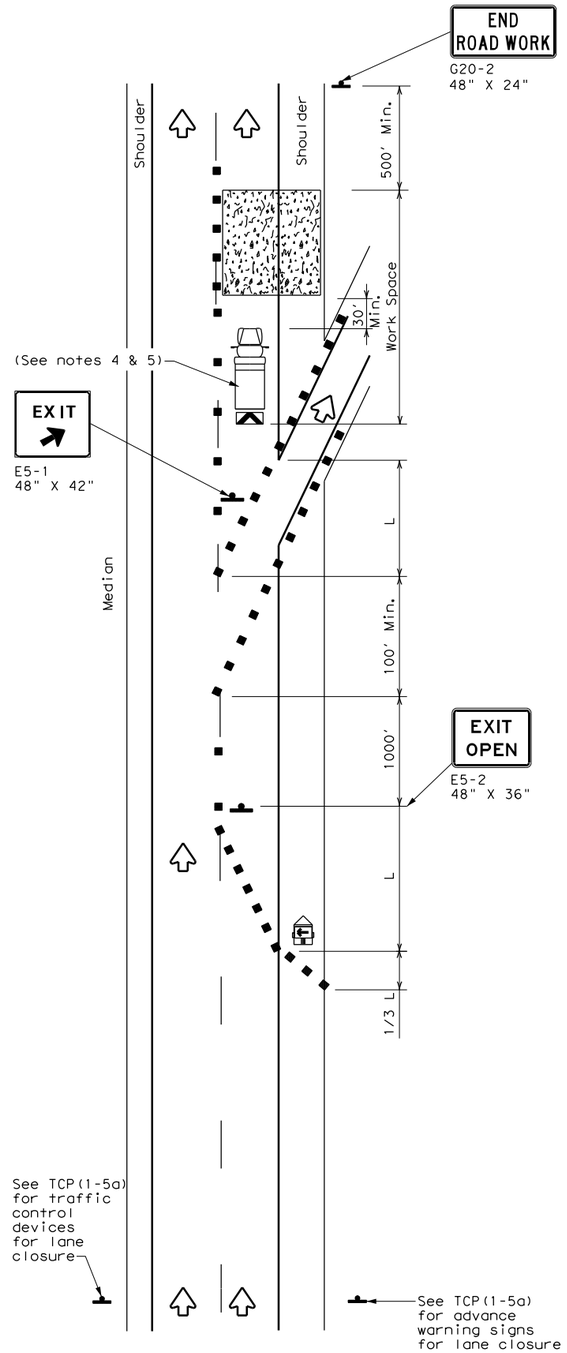


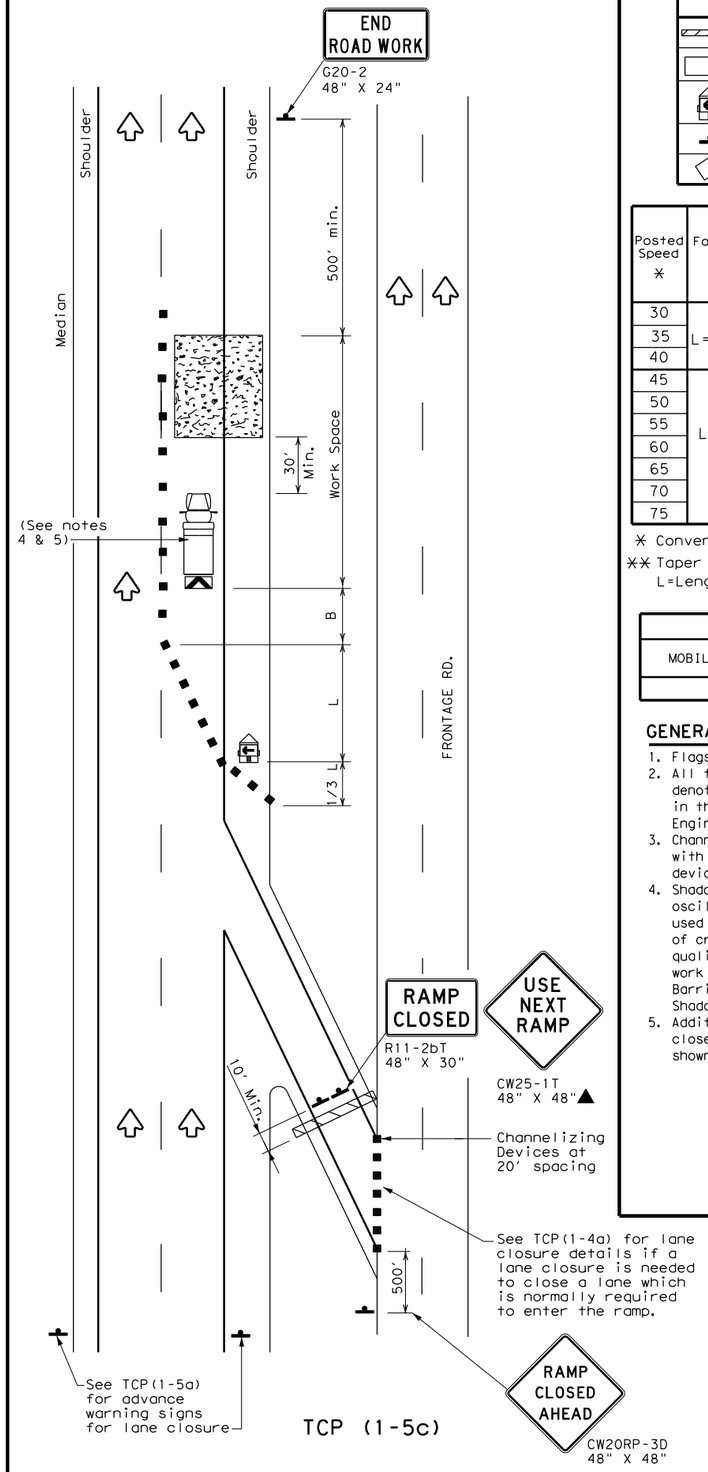
TCP (1-5a)

ONE LANE CLOSURE



TCP (1-5b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (1-5c)

LANE CLOSURE NEAR ENTRANCE RAMPS

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	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

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. 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 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.
5. 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.

Texas Department of Transportation

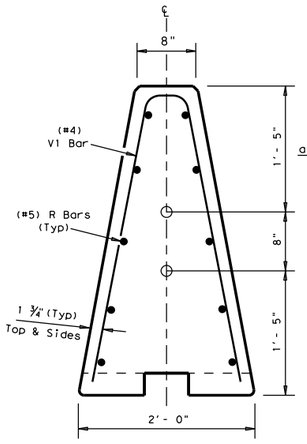
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

TCP(1-5)-18

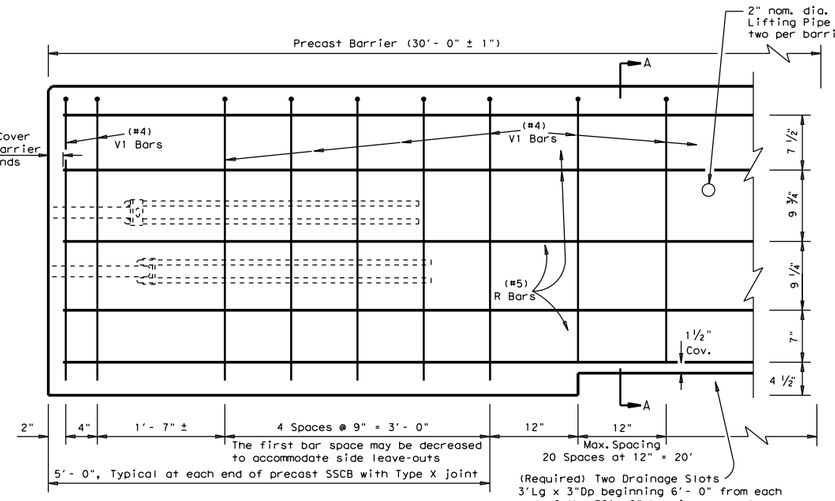
FILE: tcp1-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-18				SH 6
	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND		30

DATE:
FILE:



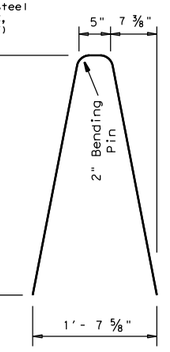
End View Precast Barrier

Pipe locations for Joint Type X connection



Reinforcement for Precast (SSCB) Single Slope Concrete Barrier (Type 1)

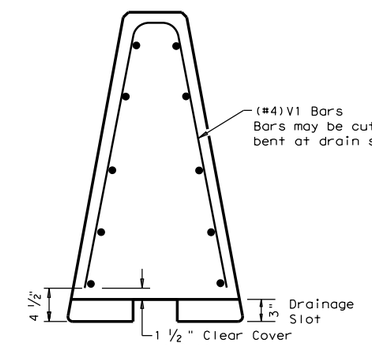
Showing reinforcement for Joint Connection (Type X)



V1 Bar

#4 Rebar

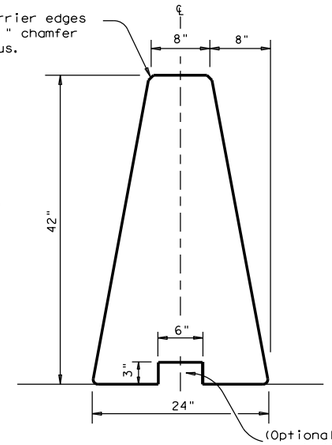
Note:
V1 Bars above the drainage slots may bent to accomadate 1 ½" clear cover as directed by the Engineer.



Section A-A

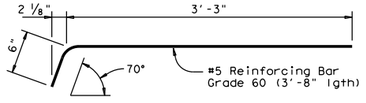
Steel Placement at (Required) Drainage Slots

All precast barrier edges shall have a ¾" chamfer or tooled radius.



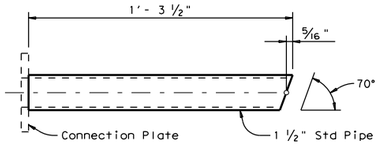
Single Slope Concrete Traffic Barrier

Precast SSCB barrier may be connected to cast-in-place SSBC. The joint connection "Types" may be used in the cast-in-place barrier, to match the precast barrier connection.



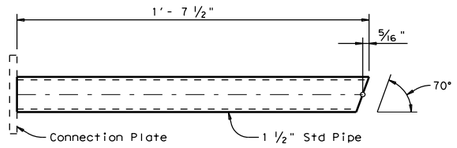
DEFORMED BAR ANCHOR DETAILS

Two (2) Bars required per assembly.
Eight (8) required per Joint.



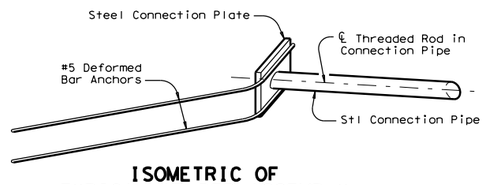
UPPER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Upper Assembly.
Two (2) required per Joint.



LOWER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Lower Assembly.
Two (2) required per Joint.

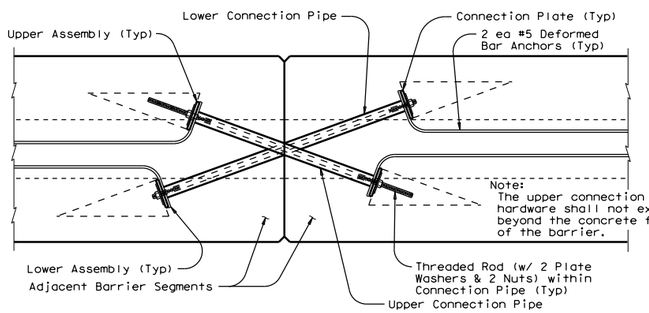


ISOMETRIC OF TYPICAL WELDED ASSEMBLY

Four (4) [2 Upper & 2 Lower] Assemblies required per Joint.

General Notes

1. Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
4. All precast barrier edges shall have a ¾" chamfer or a tooled radius.
5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
6. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.
7. Regardless of the method of handling, barrier lifting points shall be approx. 7.5 feet from the ends of the barrier. Lifting devices and attachments to barrier sections shall be approved by the Engineer.
8. Surface finishing and grouting (where required) shall be two parts sand one part cement with enough water to make the mixture plastic. Grouting shall be done in a manner that will assure a smooth surface. Surface finishing shall be considered subsidiary to the various bid items.
9. All steel assemblies shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."



TYPE X JOINT INSTALLATION DETAIL

Barrier reinforcing and Type X Joint Leave-Out dimensions not shown for clarity.

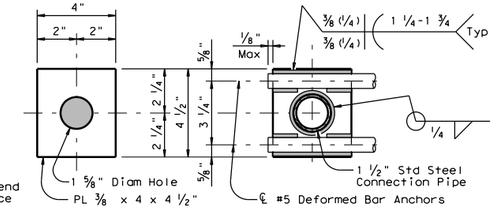
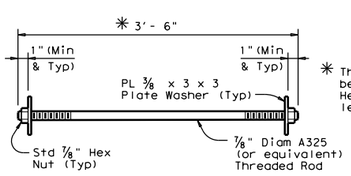


PLATE DIMENSIONS | WELDING DETAILS

CONNECTION PLATE DETAILS

One (1) Plate required per assembly.
Four (4) required per Joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.

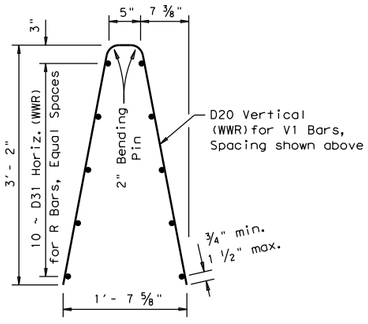


✳ The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.

CONNECTION BOLT OR THREADED ROD DETAIL

Two (2) Threaded Rods (Or Equivalent Hex Hd. Bolts) (w/ Two (2) PL ⅜ x 3 x 3 Plate Washers & Two (2) Std Hex Nuts) required per Joint.

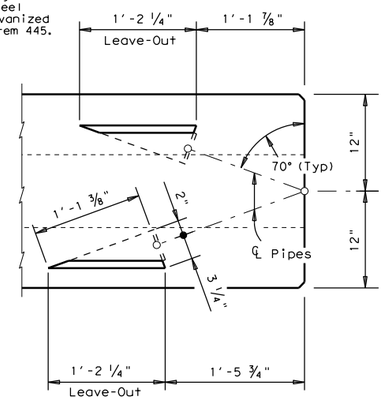
Weight of one precast 30 ft. (SSCB) segment = Approx. 10.5 Tons or 717 lbs per ft.



Welded Wire Reinforcement (WWR) Option for Bars R and V1

(WWR) General Notes

1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



BARRIER PLAN AT JOINT

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1)

SSCB(2)-10

FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				SH 6
	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND		31

DATE:
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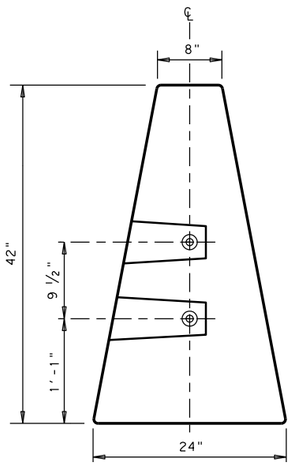
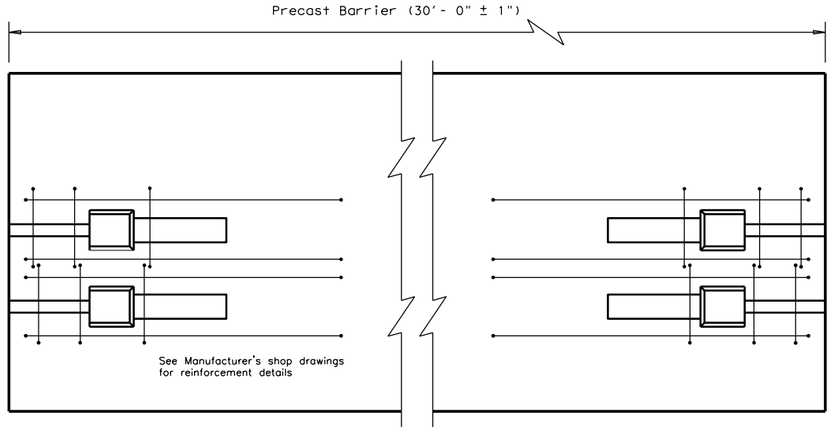
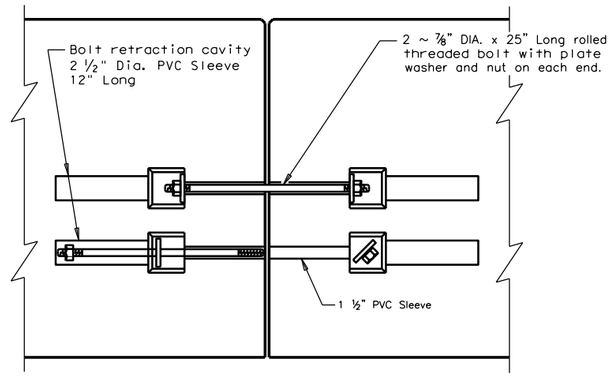


END VIEW
"QUICK-BOLT" POCKET LOCATIONS

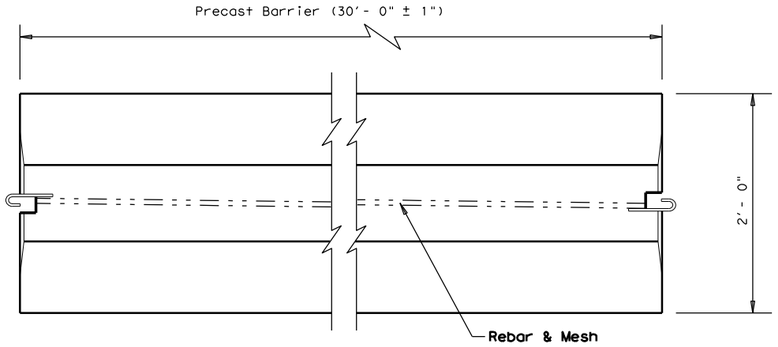


ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details

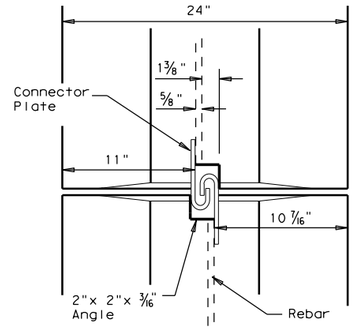


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

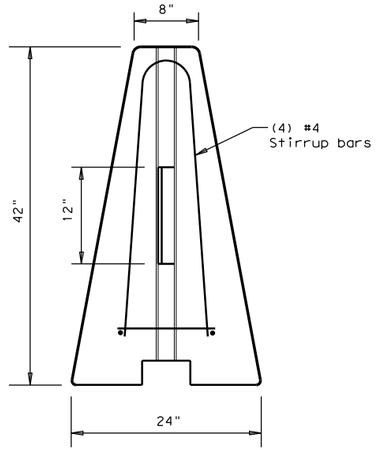
Joint Connection (Type Q)



TOP VIEW
PRECAST (SSCB) WITH J-J HOOKS
See Manufacturer's shop drawing for additional details



VIEW FROM ABOVE
J-J HOOK CONNECTION



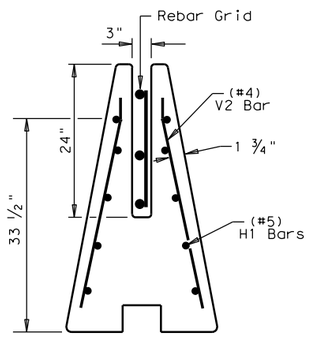
END VIEW

Proprietary Joint Connections (SSCB)

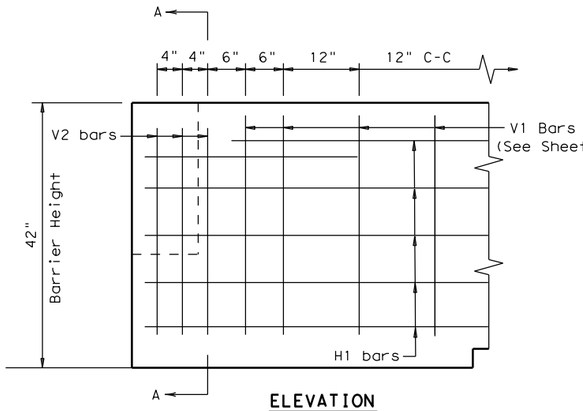
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

J-J Hooks by Easi-Set Industries, (800)547-4045
Quick-Bolt by Bexar Concrete, (210)497-3773

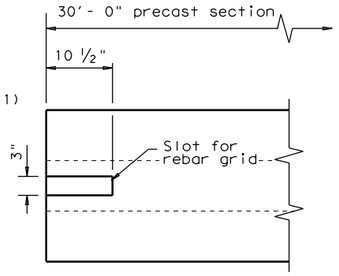
If one of the connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



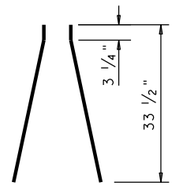
SECTION A-A
Showing (Type R) Rebar Grid



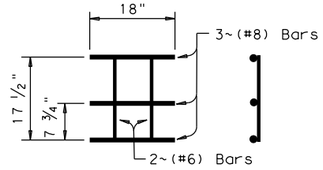
ELEVATION
V1 Bars (See Sheet 1)



TOP VIEW
JOINT CONNECTION
Typical at both ends of barrier segment



(#4) V2 BARS
6 ~ two piece bars per barrier segment



WELDED REBAR GRID

Joint Connection (Type R)

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

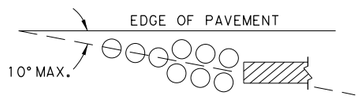
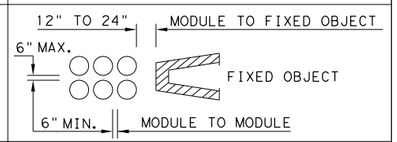
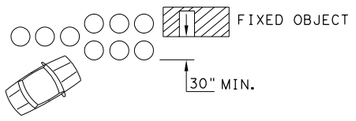
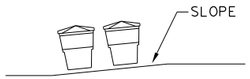
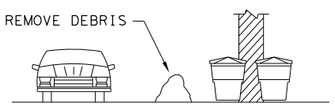
PRECAST BARRIER (TYPE 1)

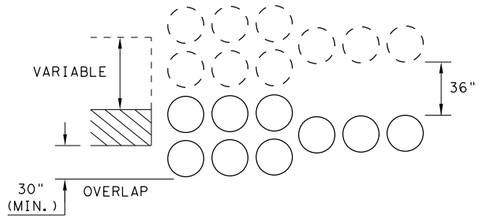
SSCB(2)-10

FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				SH 6
	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND		32

DATE:
FILE:

SITE CONDITIONS AND PLACEMENT GUIDELINES

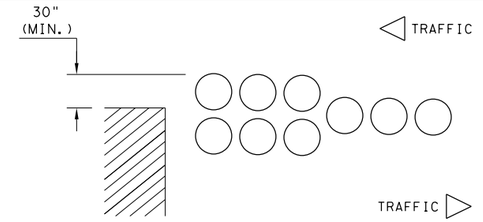
CONDITION	RECOMMENDATION	ILLUSTRATION
1. ANGLE OF ARRAY IN RELATION TO CENTER LINE OF OBSTACLE	NOT RECOMMENDED FOR MORE THAN 10°	
2. MODULE SPACING: MODULE TO FIXED OBJECT MODULE TO MODULE	 12" TO 24" SEE DIAGRAM	
3. BI-DIRECTIONAL TRAFFIC	OFFSET ARRAY TO AVOID REAR CORNER MODULE SNAGGING, POTENTIAL BY TRAFFIC IN THE UPSTREAM DIRECTION OF FLOW.	SEE (DETAIL B) SHOWING BI-DIRECTIONAL TRAFFIC
4. "COFFIN" CORNER	SHIELD 30" MINIMUM OUTSIDE OF FIXED OBJECT	
5. SLOPING SITES: LATERAL AND LONGITUDINAL FOR MORE INFORMATION READ GENERAL NOTE: 7	1:10 MAXIMUM (V: H:)	
6. CURB: RAISED ISLAND:	NO MORE THAN 4" HIGH (REMOVE IF POSSIBLE)	
7. FOUNDATION PADS:	FLAT SURFACE: CONCRETE OR ASPHALT	
8. MAINTENANCE:	KEEP SITE CLEAR OF TRASH, ROAD DEBRIS, ETC	
9. SAND DENSITIES	100 LBS / CF	
10. VANDALISM	CHECK PERIODICALLY FOR DAMAGES, GRAFFITI.	



MODULE PLACEMENT FOR FIXED OBJECT OF VARIABLE WIDTH

DETAIL A

SEE GENERAL NOTE 2



MODULE PLACEMENT FOR BI-DIRECTIONAL TRAFFIC

DETAIL B

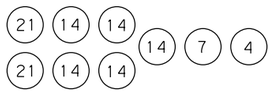
SEE GENERAL NOTE 2

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE AVAILABLE MASH COMPLIANT SYSTEMS, CONTACT: TrafFix DEVICES, INC. AT (949) 361-5663 OR PSS INNOVATIONS, INC. AT (800) 662-6338.
2. REAR MODULES SHOULD OVERLAP THE HAZARDOUS FIXED OBJECT IN WIDTH ON EACH SIDE BY A MINIMUM OF 30 INCHES. SEE DETAILS A, B.
3. BARRIERS CAN BE INSTALLED AT ANY DISTANCE FROM THE SHOULDER, AT ROADSIDE AND MEDIAN LOCATIONS FROM ZERO FT UP TO 30 FT, DEPENDING UPON THE LOCATION OF THE HAZARDOUS FIXED OBJECT.
4. ANGLING THE BARRIER TOWARDS ON-COMING TRAFFIC IS SUGGESTED, 3-DEGREES UP TO 10-DEGREES DEPENDING ON SPACE AVAILABLE.
5. WHENEVER POSSIBLE, CURBS 4 INCHES AND HIGHER SHOULD BE REMOVED FROM THE HAZARDOUS SITES. HOWEVER, WHEN REMOVAL IS NOT POSSIBLE, MODULES CAN BE SEPARATED ALONG THE BARRIER AXIS TO FIT THE SITUATION.
6. LONGITUDINAL SPACING OF MODULES MAY BE INCREASED WHERE SPACE PERMITS, E.G., 2 FT UP TO 3 FT SPACING OF SELECTED MODULES MAY PERMIT THE DESIGNER TO USE ALL THE SPACE ALLOCATED FOR AN ENERGY-ABSORBING BARRIER.
7. THE ENTIRE AREA OF THE CRASH CUSHION INSTALLATION AND APPROACHES SHALL BE GRADED SO THAT THE MAXIMUM SLOPE DOES NOT EXCEED 1V:10H VERTICALLY OR HORIZONTALLY IN ANY DIRECTION.
8. WHERE REQUIRED, SUPPORT PADS, CONCRETE, ASPHALT, ETC, WILL BE MEASURED AND PAID FOR IN ACCORDANCE WITH PERTINENT BID ITEMS.
9. TrafFIX DEVICES AND PSS INNOVATIONS SAND BARREL SYSTEMS HAVE BEEN ASSESSED AS MASH COMPLIANT.

TYPICAL MODULE ARRAYS WITH CORRESPONDING DESIGN SPEED AND SAND WEIGHT (X 100 LB) SHOWN IN CIRCLES.

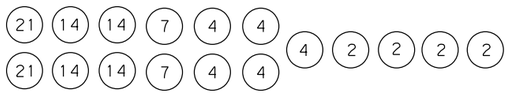
CONFIGURATION = 12,300 LB



TL-2

TL-2 = 45 MPH OR LOWER

CONFIGURATION = 14,000 LB



TL-3

TL-3 = 50 MPH OR GREATER

TYPICAL MODULE ARRAY

NOTE: MODULE ARRAYS SHOWN ARE THE MINIMUM DESIGNS REQUIRED. SITE SPECIFIC VARIATIONS OF THESE DESIGNS WILL REQUIRE ADDITIONAL DETAILS WITH AN ENGINEER'S SEAL.

SACRIFICIAL

Texas Department of Transportation

Design Division Standard

VEHICLE IMPACT ATTENUATOR SAND FILLED PLASTIC MODULES MASH TL-3 & TL-2

VIA(SFPM)-19

FILE: viasfpm19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
©TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS				SH 6
	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND		33

LEGEND

EXIST TRAFFIC ARROW

PROP TRAFFIC ARROW

0 10 20 40

EXIST ROW

EXIST ROW

SPEED LIMIT 55

R3-7L 36"X36"

LEFT LANE MUST TURN LEFT

EXISTING SIGN TO REMAIN

PROP REFL PAV MRK TY I (W)(8")(SLD) 62 LF

PROP REFL PAV MRK TY I (W)(8")(SLD) 130 LF

PROP RAISE PAVEMENT MARKER TY II C-R 7 EA

SIGN AND POST TO BE REMOVED AND RELOCATED TO APPROXIMATLY STA 1219+50

SH 6 ℄

SH 6

SH 6

1220+00

ONLY

PROP REFL PAV MRK TY II (Y)(CURB) 276 LF

PROP REFL PAVE MRK TY I (W) (WORD) 1 EA

PROP REFL PAVE MRK TY I (W) (ARROW) 1 EA

APPROXIMATE NEW LOCATION OF RELOCATED SIGN R3-7L. STA 1219+50

EXISTING SIGN TO REMAIN

EXIST ROW

EXIST ROW

← CROWN GARDEN TR

HULL LN →

NEXT SIGNAL

STOP

EXISTING SIGN TO REMAIN

STATE OF TEXAS
AARON C. LEGG
142513
LICENSED
PROFESSIONAL ENGINEER

11/1/2022

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

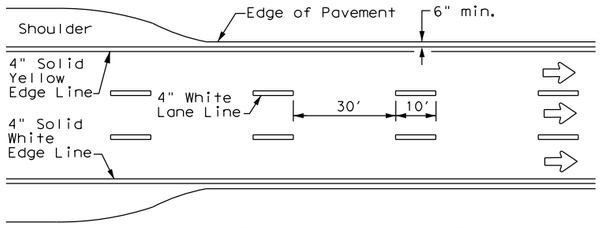
CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

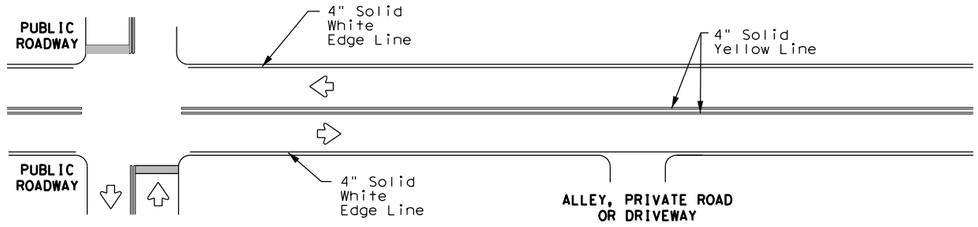
SINGING AND PAVEMENT MARKING LAYOUT

SUBMITTED:	DESIGNED BY:
SCALE: 1"=40'	CC'D BY:
DATE: 11/1/2022	SHEET NO 34 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

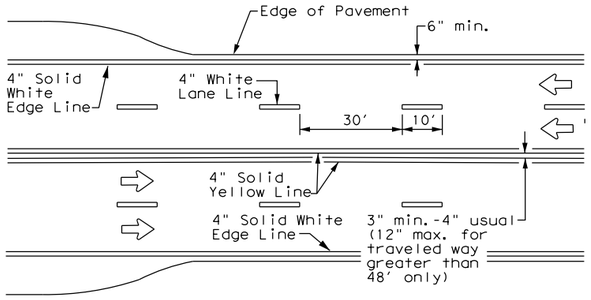
1:55:06 PM
11/1/2022
D:\Projects\2021\11009*FBC*SH*6*at*Cullinan*Park\400*CAD\41*Trans\02-Sheets\08-SPM\SH6*SPM01.dgn



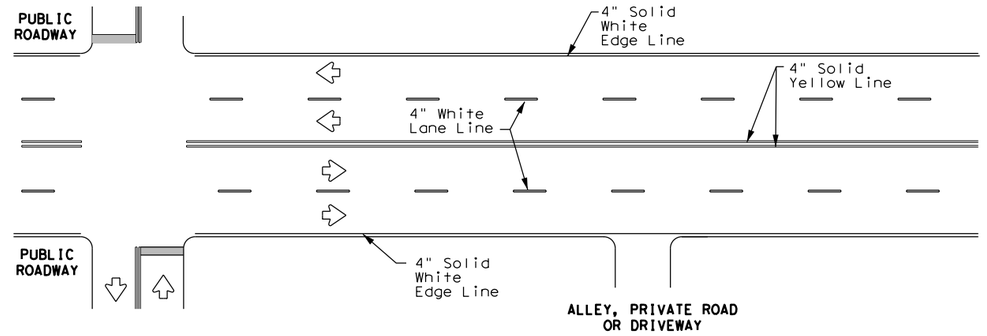
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



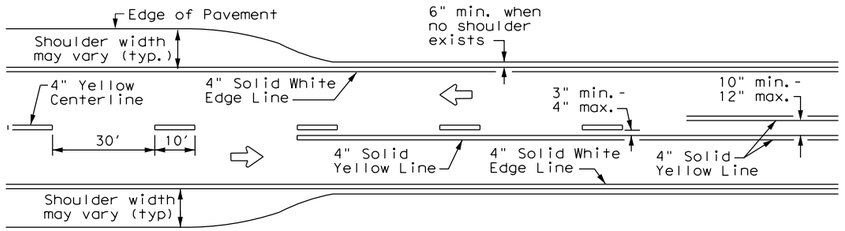
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



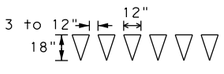
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



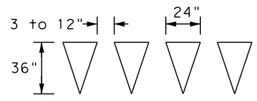
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

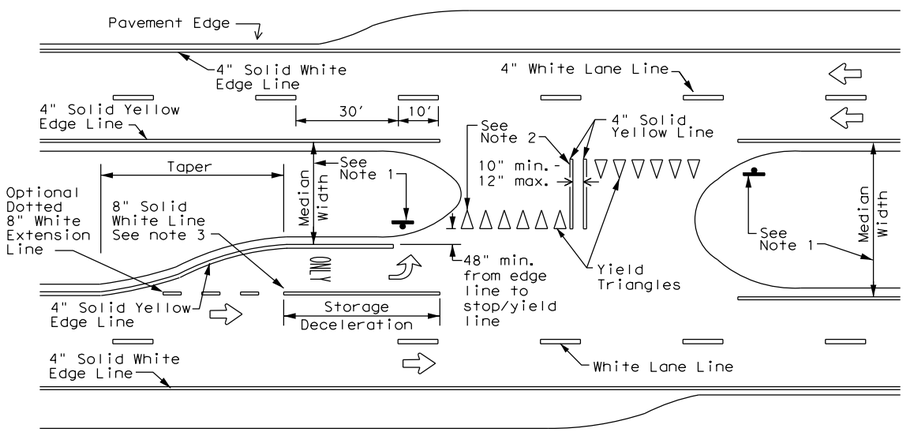


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

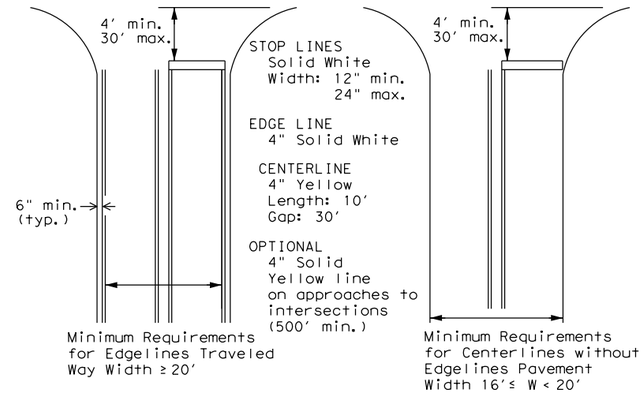
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

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.



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

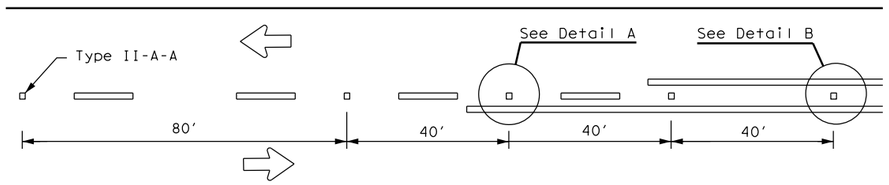
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03				SH 6
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	HOU	FORT BEND		35

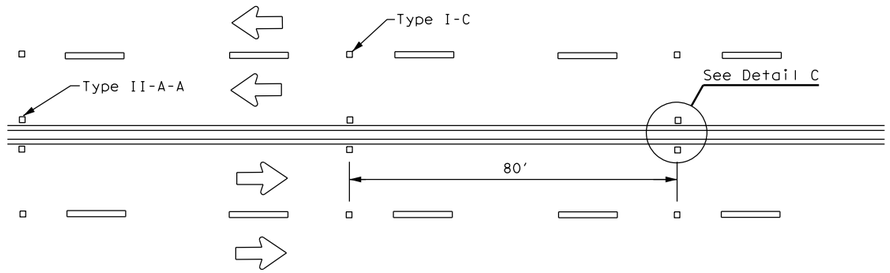
22A

DATE:
FILE:

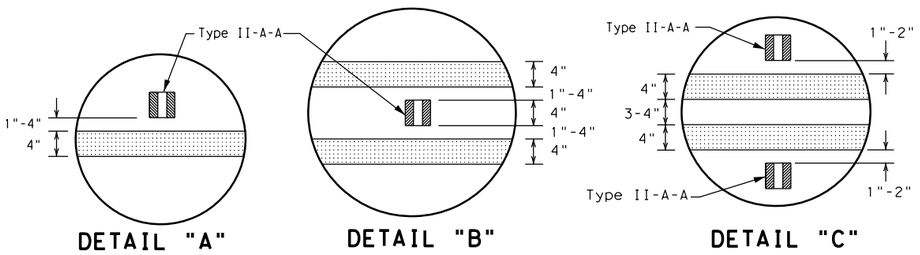
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



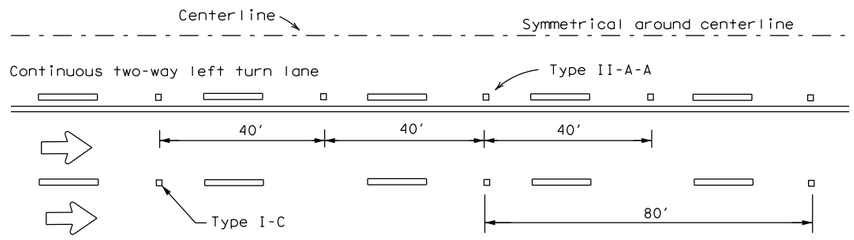
CENTERLINE FOR ALL TWO LANE ROADWAYS



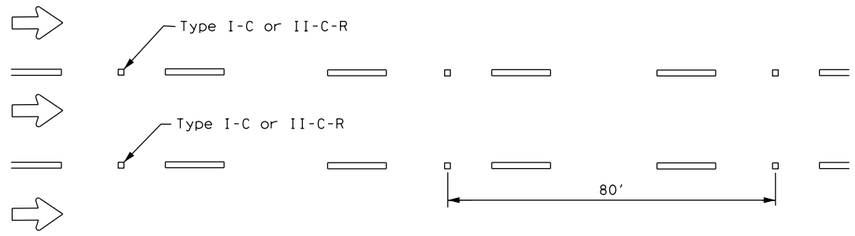
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

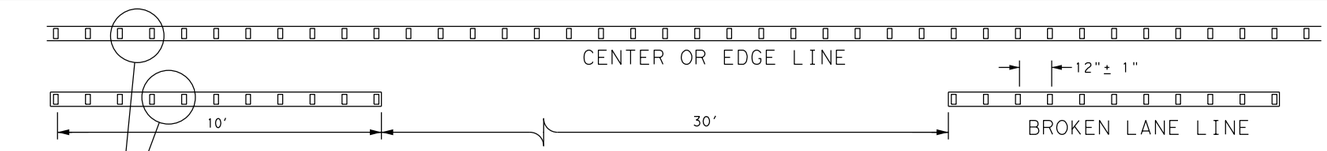


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



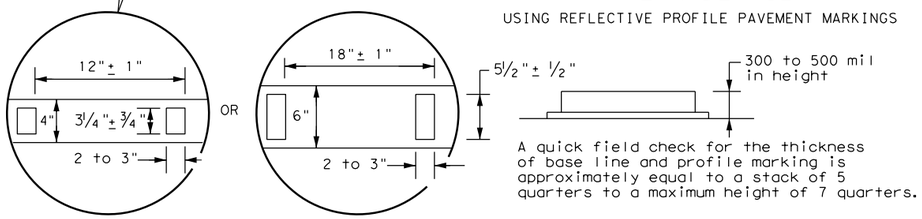
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE

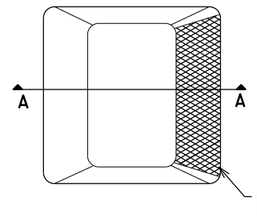
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

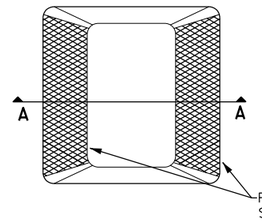
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

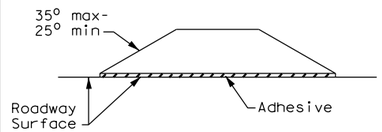
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

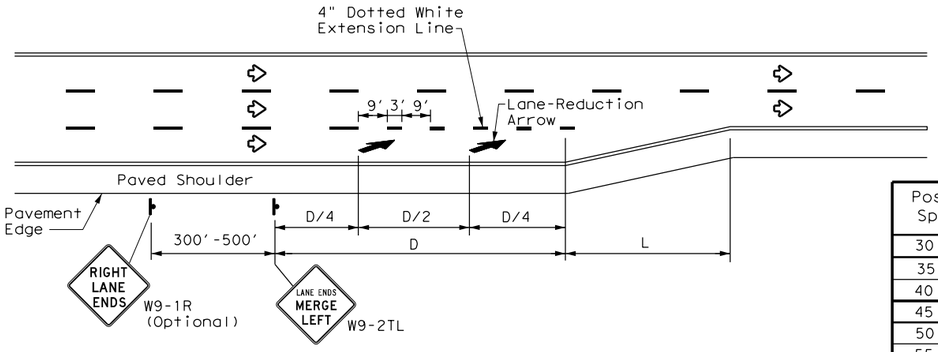
Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10				SH 6
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	HOU	FORT BEND		36

22B

DATE:
FILE:

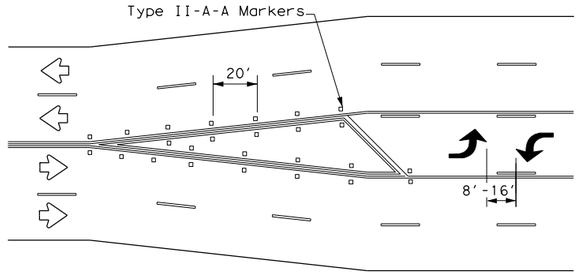


LANE REDUCTION

Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.



A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

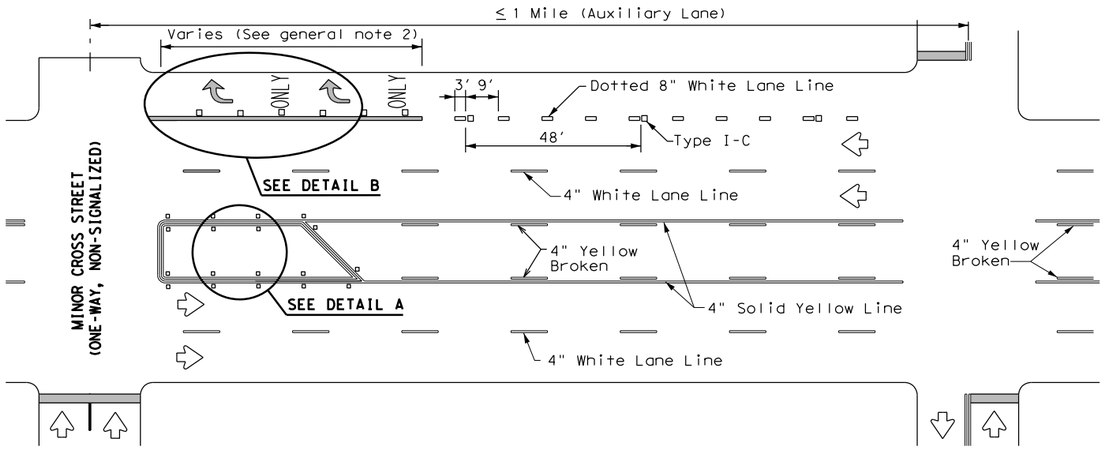
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

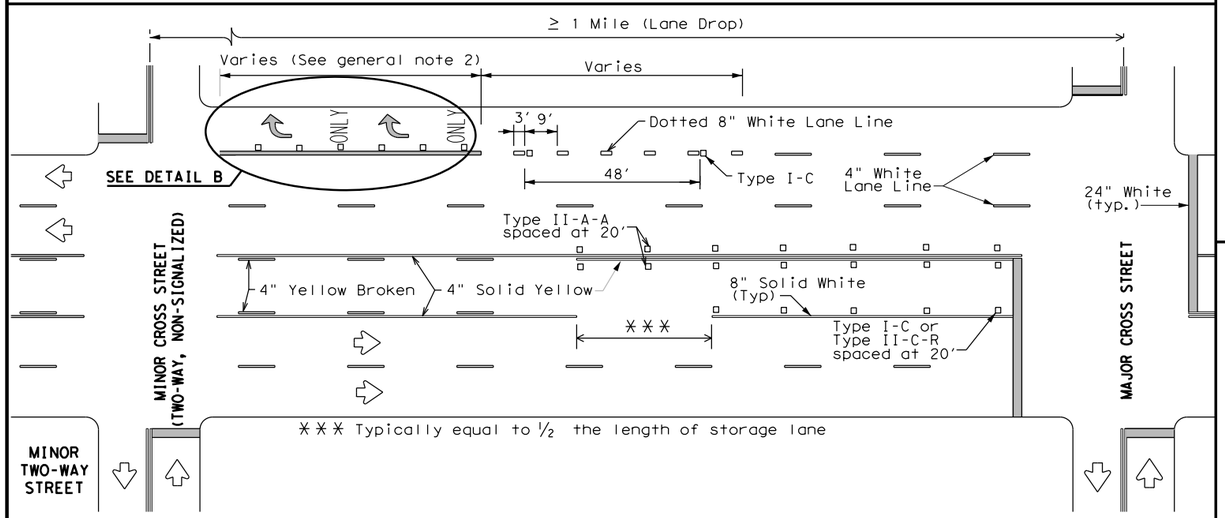
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

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

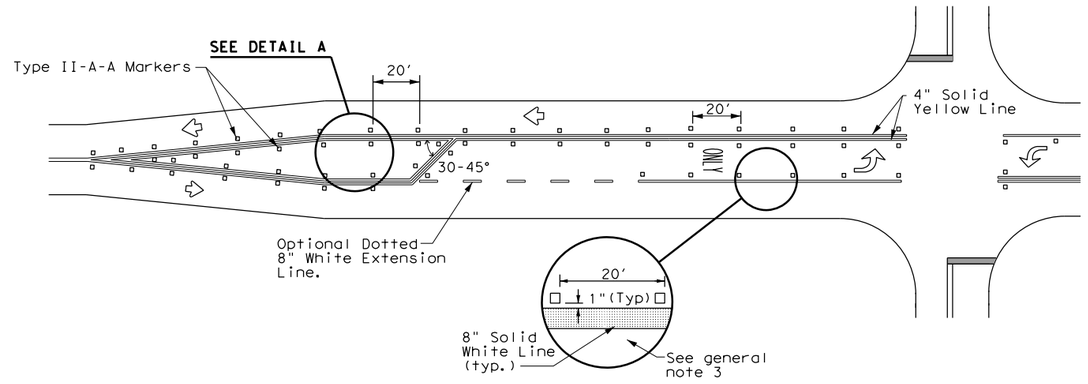
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



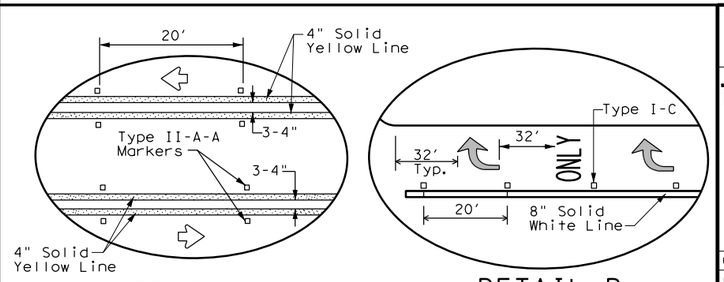
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-20

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS				SH 6
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	HOU	FORT BEND		37
3-03 6-20				

22C

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.

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)

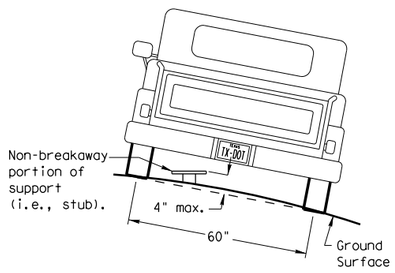
Anchor Type

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

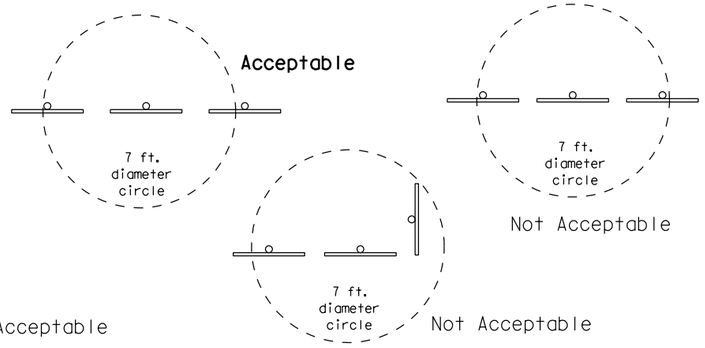
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



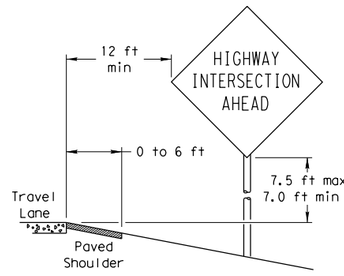
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



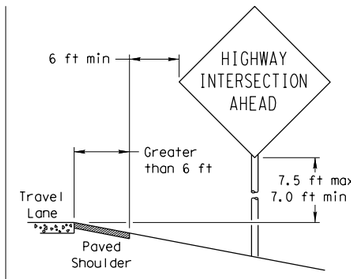
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

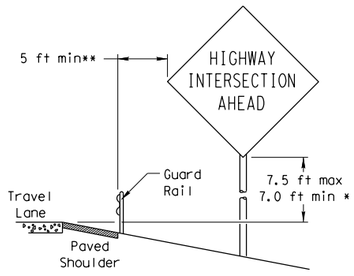
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



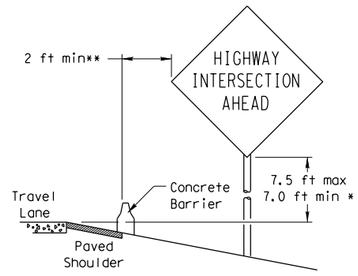
GREATER THAN 6 FT. WIDE

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.

BEHIND BARRIER



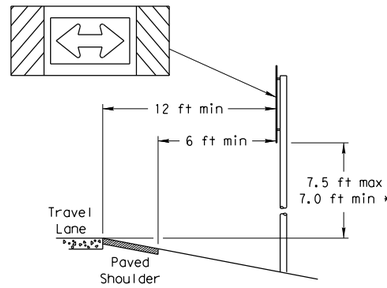
BEHIND GUARDRAIL



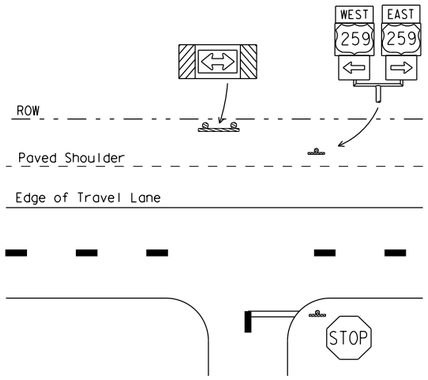
BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

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.



* 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.

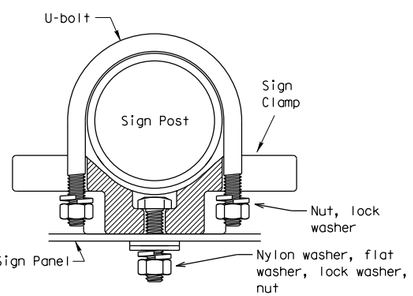
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

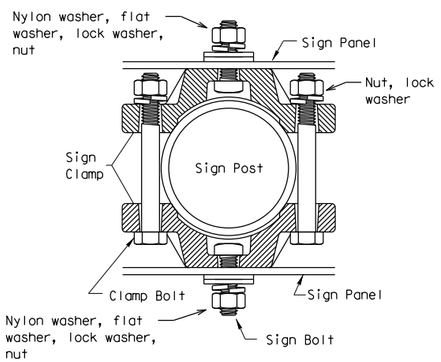
The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



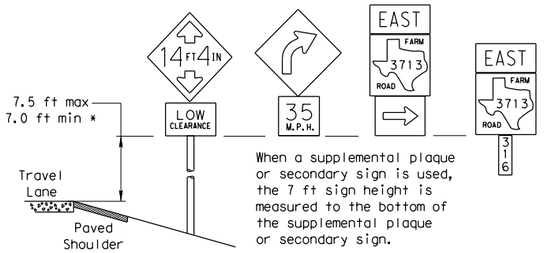
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

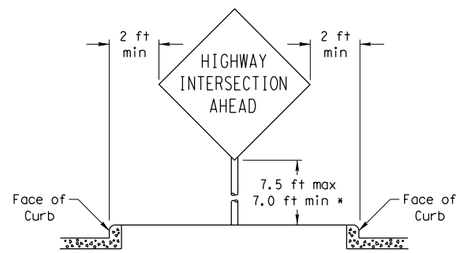
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



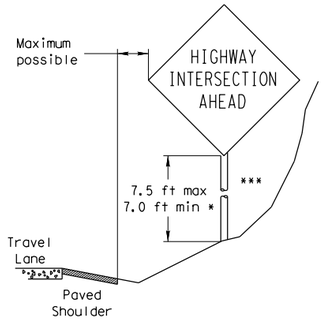
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

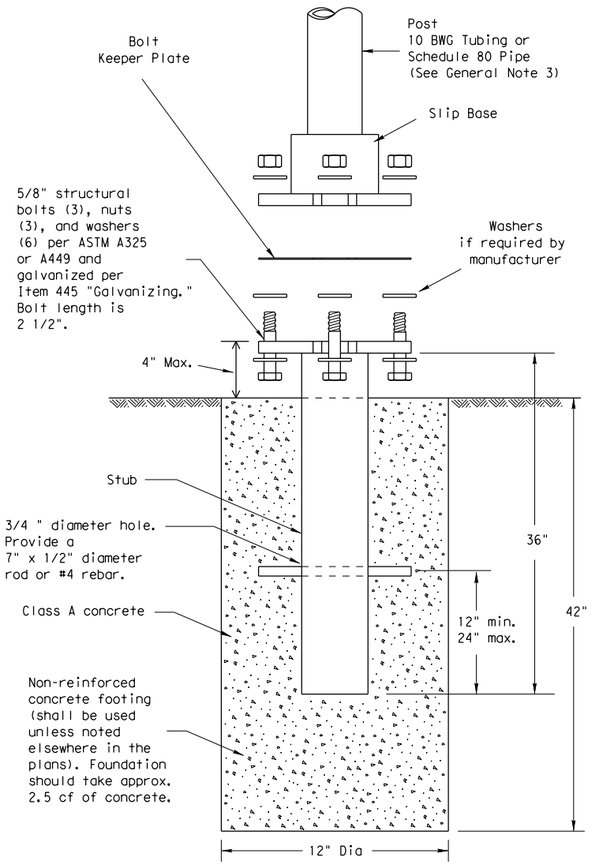
SMD(GEN)-08

9-08 REVISIONS

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
			SH 6
DIST	COUNTY		SHEET NO.
HOU	FORT BEND		38

DATE:
FILE:

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

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 The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. 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.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG 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 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

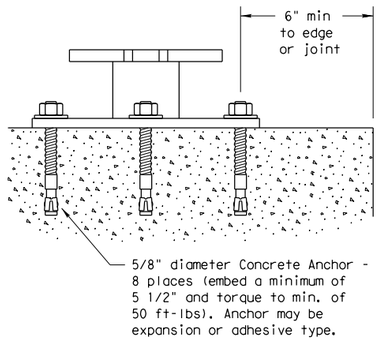
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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
3. 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
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. 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.
2. 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.
3. 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.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. 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.
2. 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



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

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, "Epoxies 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

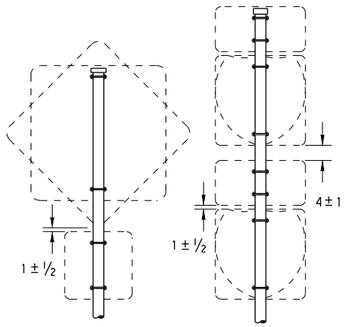
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

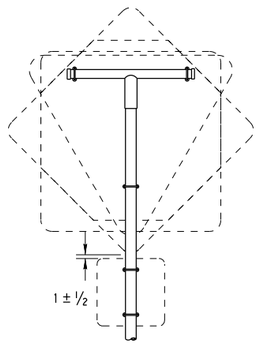
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
			SH 6
DIST	COUNTY		SHEET NO.
HOU	FORT BEND		39

REVISIONS
9-08

DATE:
FILE:



SM RD SGN ASSM TY XXXXX(1)XX(P)



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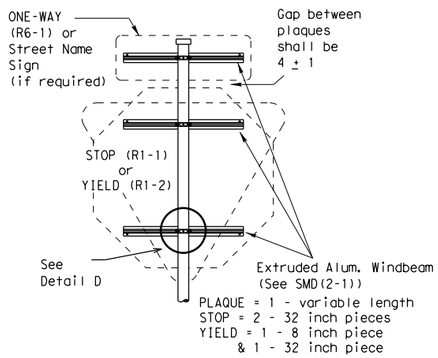

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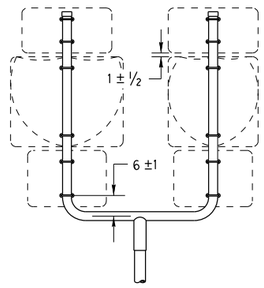
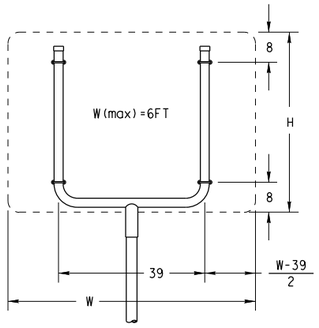


SM RD SGN ASSM TY XXXXX(1)XX(U)



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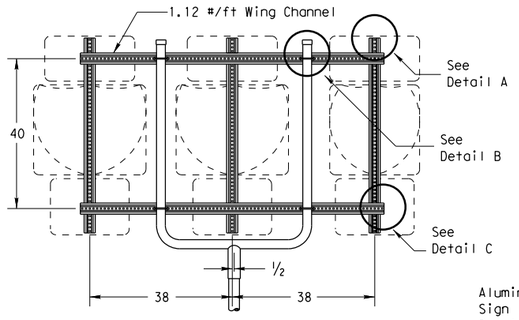
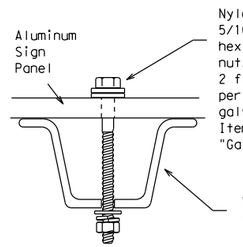
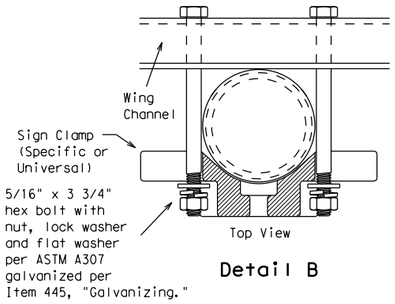


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)



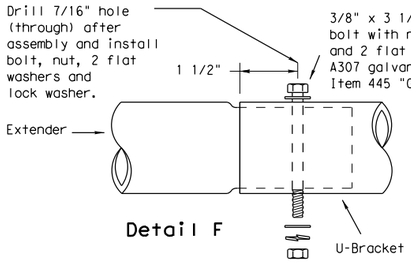
Top View

Detail A



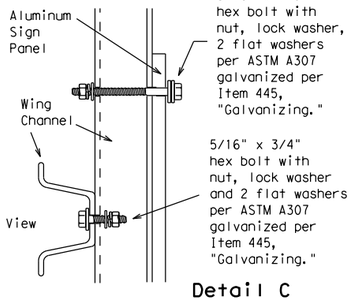
Top View

Detail B

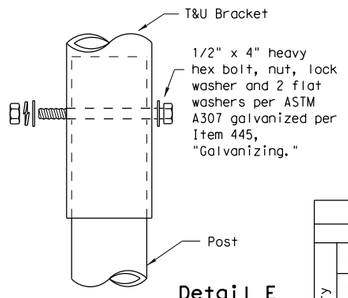


Detail F

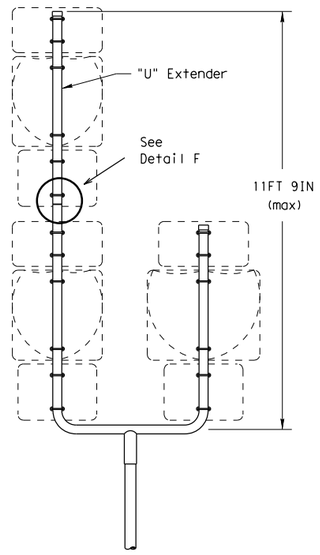
Splices shall only be allowed behind the sign substrate.



Detail C



Detail E



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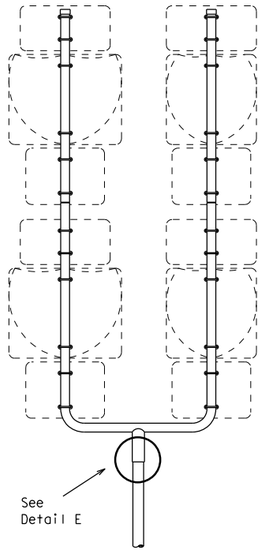

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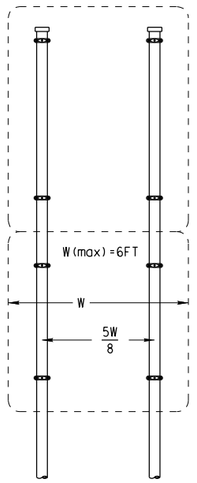
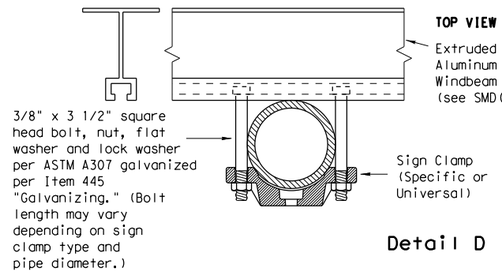


SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



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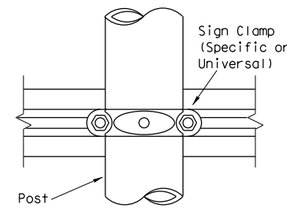
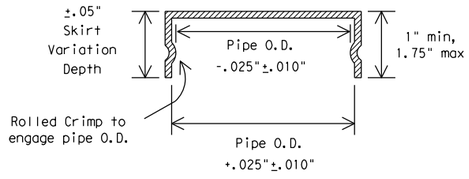


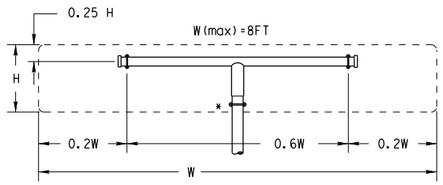
FRICTION CAP DETAIL



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.



SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

GENERAL NOTES:

1.

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

2. 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.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. 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.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. 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.
7. 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.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. 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."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. 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.
12. Post open ends shall be fitted with Friction Caps.
13. 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)
	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

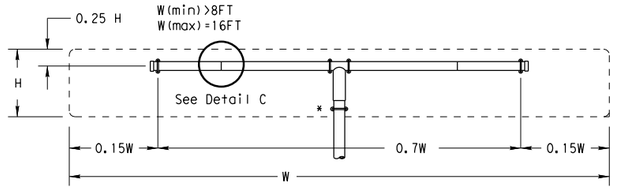
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
			SH 6
DIST	COUNTY		SHEET NO.
HOU	FORT BEND		40

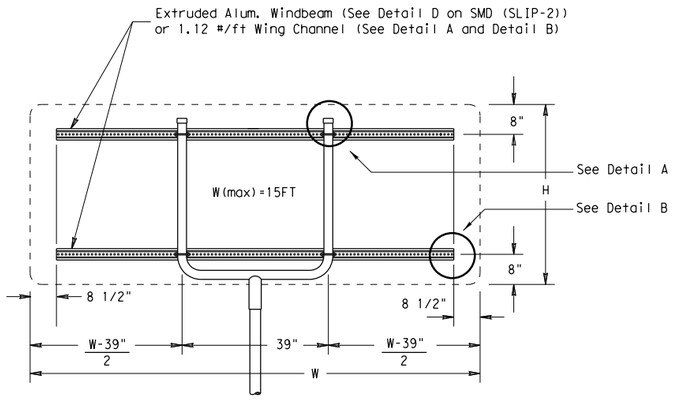
9-08 REVISIONS

DATE:
FILE:

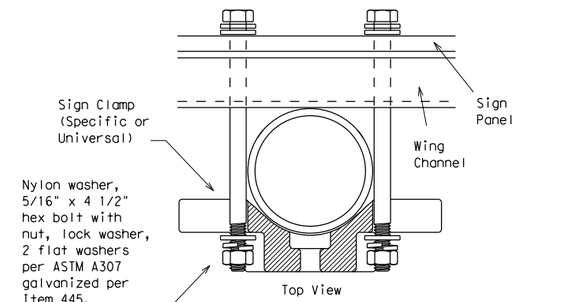


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

(* - See Note 12)



SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



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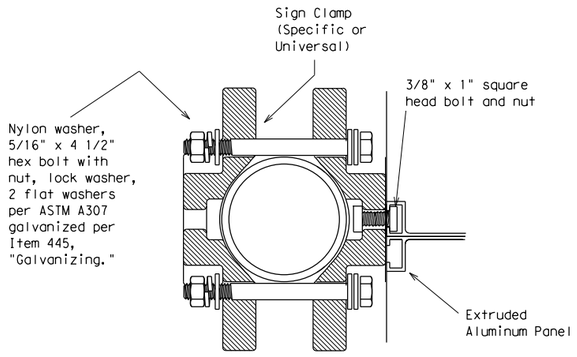
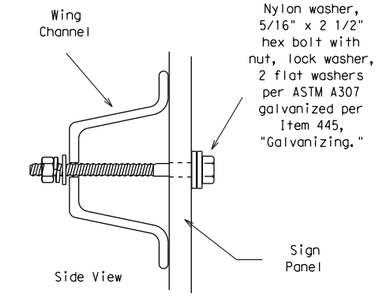


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET



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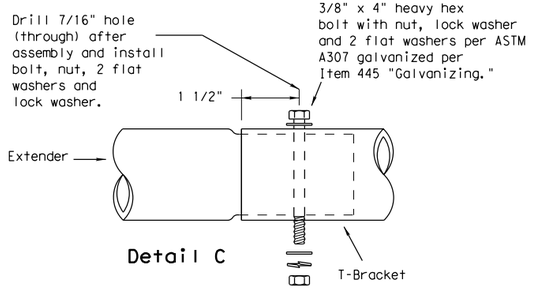
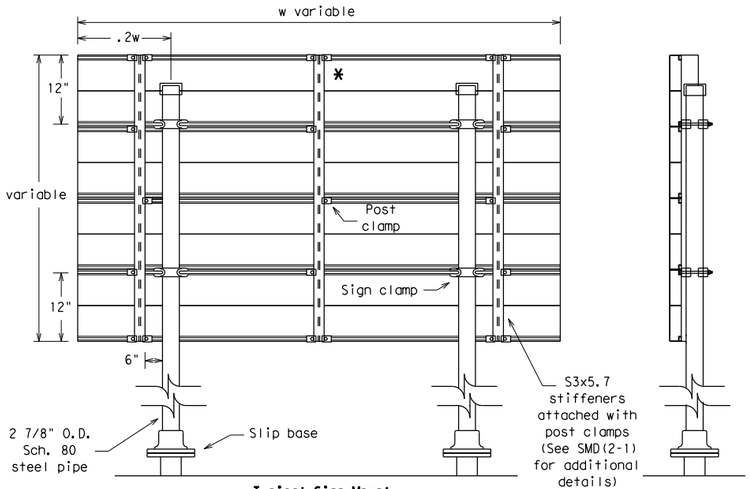


Detail C

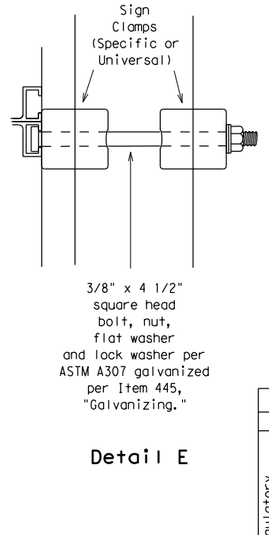
Splices shall only be allowed behind the sign substrate.



Typical Sign Mount

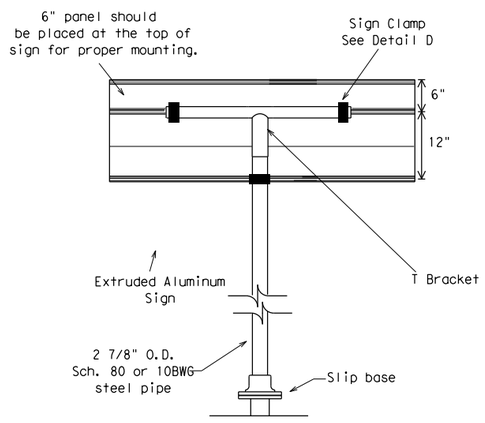
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

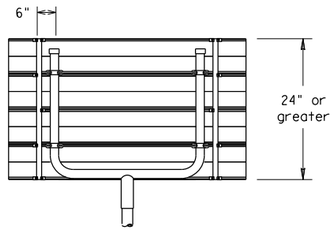


Detail E

See Detail E
for clamp installation



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

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

1. 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.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. 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.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. 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.
6. 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.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. 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."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. 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.
11. 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)
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Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
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	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

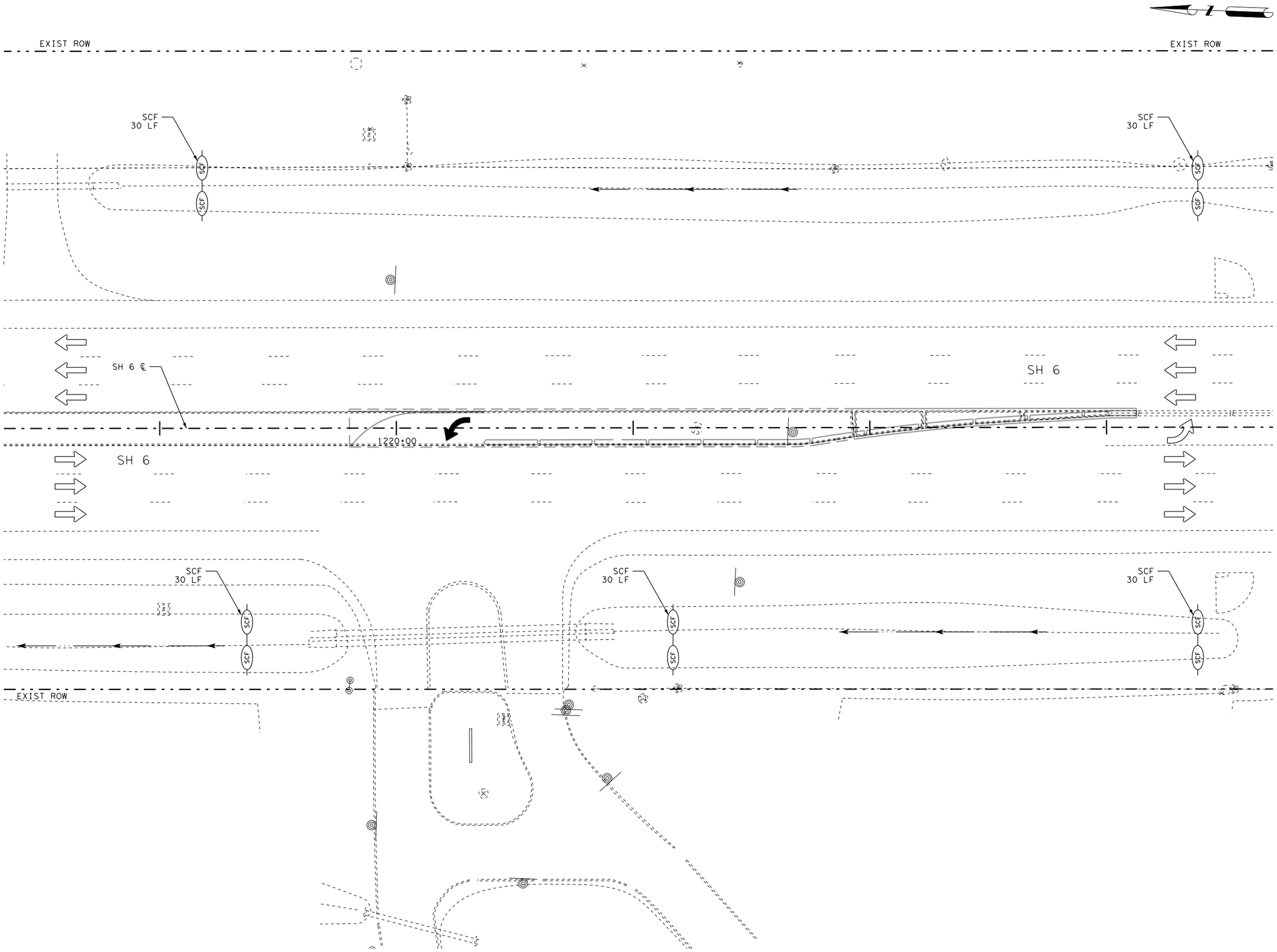
SMD(SLIP-3)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS 9-08

CONT	SECT	JOB	HIGHWAY
			SH 6
DIST	COUNTY		SHEET NO.
HOU	FORT BEND		41

DATE:
FILE:



LEGEND

- EXIST TRAFFIC ARROW
- PROP TRAFFIC ARROW
- FLOW DIRECTION
- SCF — SEDIMENT CONTROL FENCE

0 10 20 40

NOTES:

1. THE LOCATION OF CONSTRUCTION SUPPORT ACTIVITIES INCLUDING MATERIALS, WASTE, BORROW, FILL AND EQUIPMENT STORAGE AREA WILL BE SHOWN ON THE PLAN SHEETS ONCE ESTABLISHED BY CONTRACTOR. THESE SITES WILL BE INCLUDED IN THE INSPECTION REPORT.

2. THE FOLLOWING RECORDS WILL BE MAINTAINED BY THE CONTRACTOR AND WILL BE MADE READILY AVAILABLE UPON REQUEST TO PARTIES LISTED IN PART III. D.1 OF THE TPDES GENERAL PERMIT TXR150000:

   I. DATES WHEN MAJOR GRADING ACTIVITIES OCCUR;

   II. ALL DATES WHEN CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON A PORTION OF THE SITE; AND

   III. THE DATES WHEN STABILIZATION (BOTH TEMPORARY AND/OR PERMANENT) MEASURE ARE INITIATED.

   IV. CHECK LIST TO BE ON ALL SWPPP SHEETS.

STATE OF TEXAS
AARON C. LEGG
142513
LICENSED
PROFESSIONAL ENGINEER

11/1/2022

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

STORM WATER POLLUTION PREVENTION PLAN LAYOUT

SUBMITTED:	DESIGNED BY:
SCALE: 1"=40'	CC'D BY:
DATE: 11/1/2022	SHEET NO 42 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

1:55:39 PM
11/1/2022
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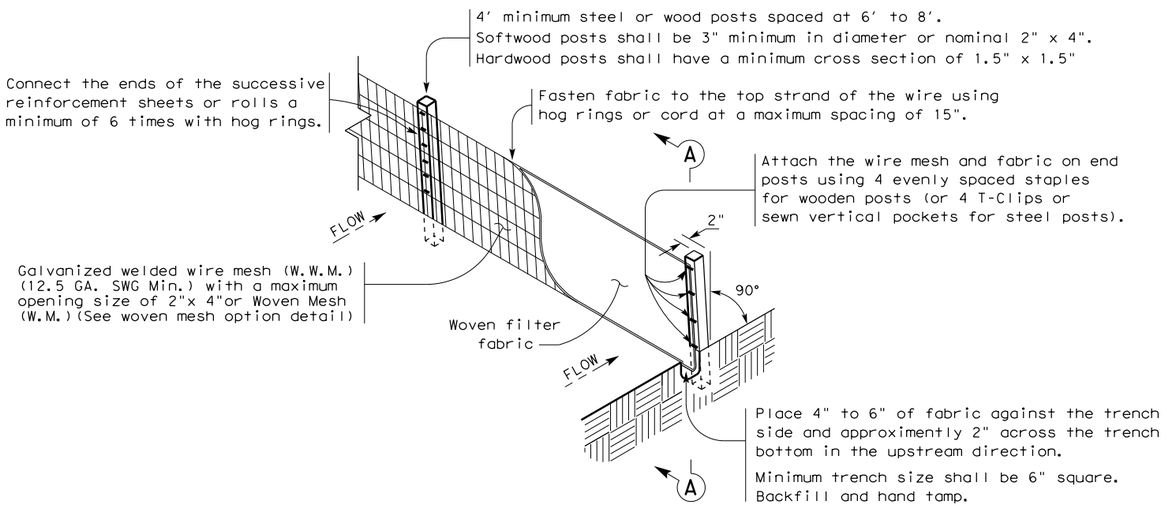
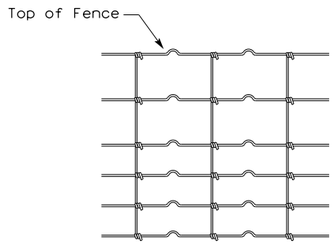
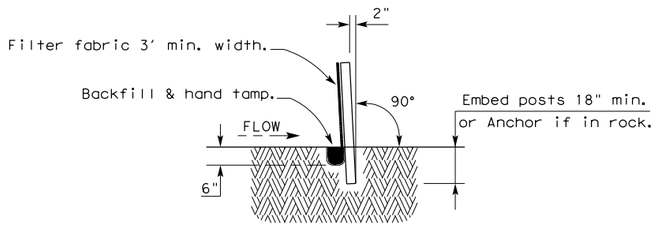


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

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^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

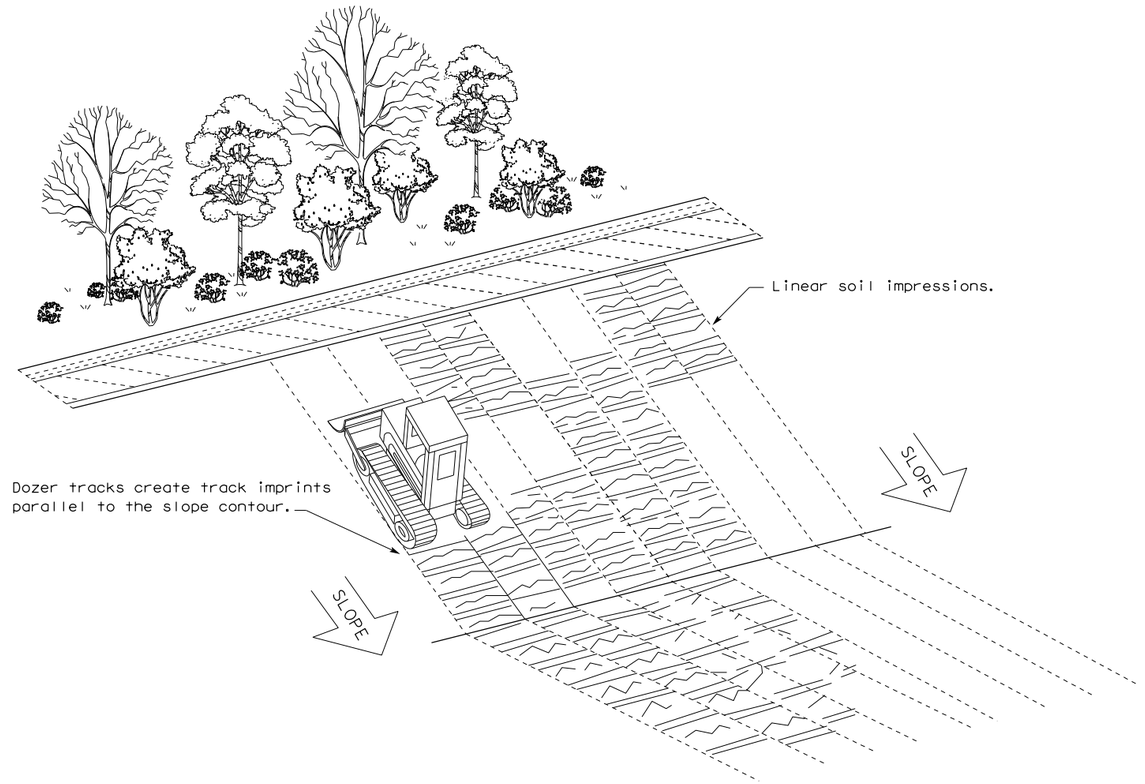
LEGEND

Sediment Control Fence

SCF

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 continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

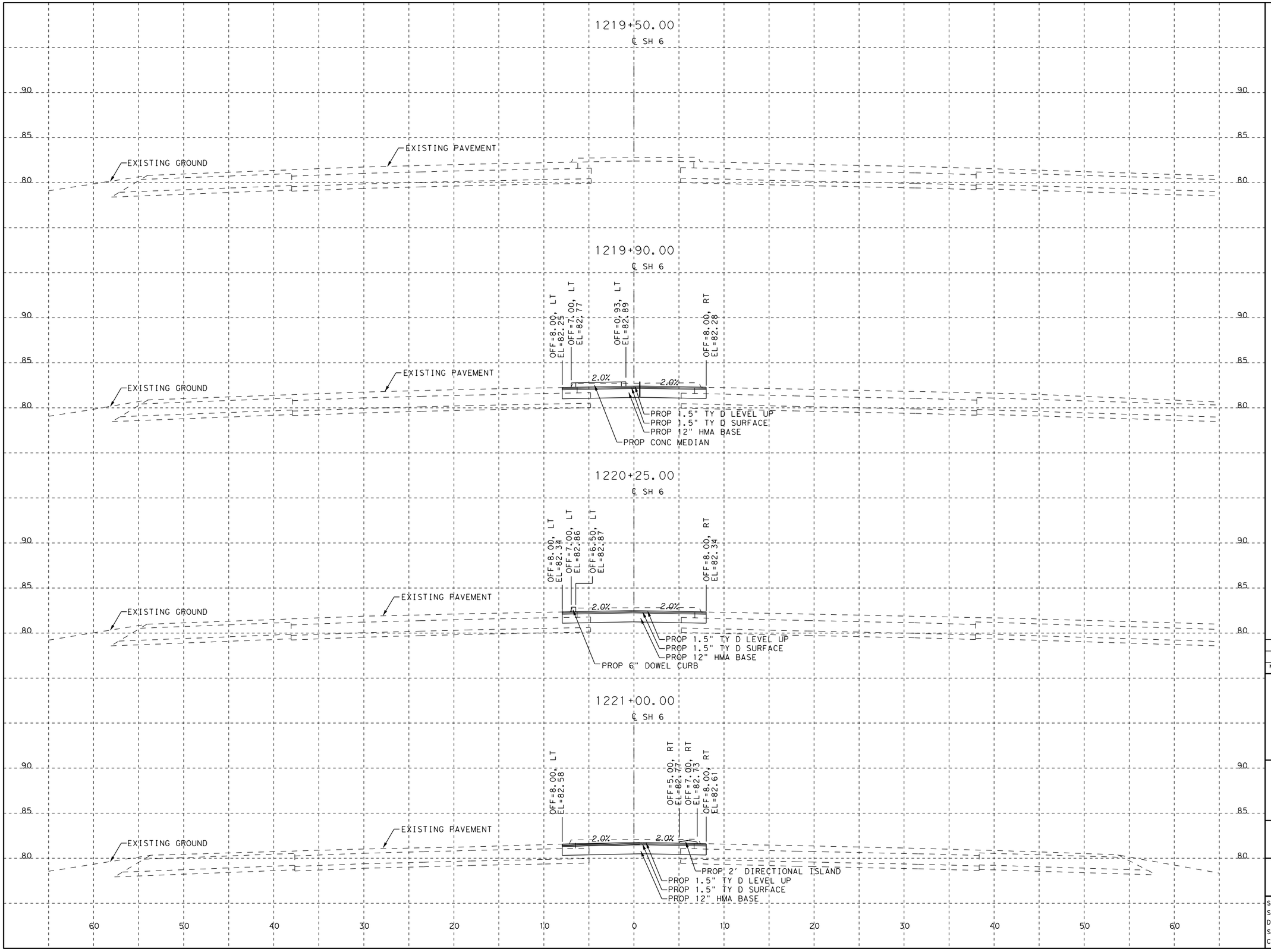
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

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				SH 6	
	DIST	COUNTY		SHEET NO.	
		FORT BEND		43	

DATE
FILE



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STATE OF TEXAS
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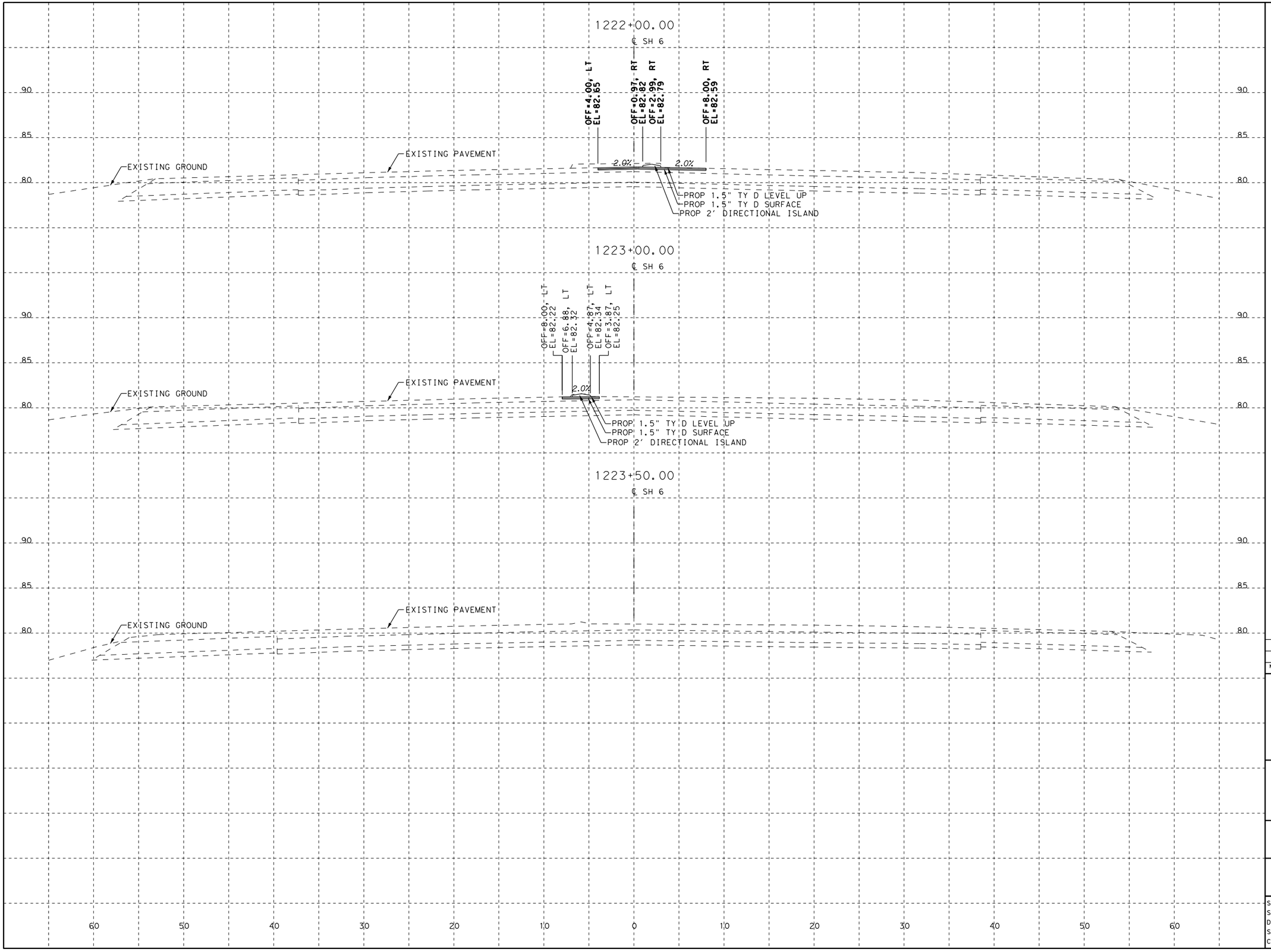
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

CROSS SECTIONS
SHEET 1 OF 2

SUBMITTED:	DESIGNED BY:
SCALE: 1"=5'	CC'D BY:
DATE: 11/1/2022	SHEET NO 44 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	



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AARON C. LEGG
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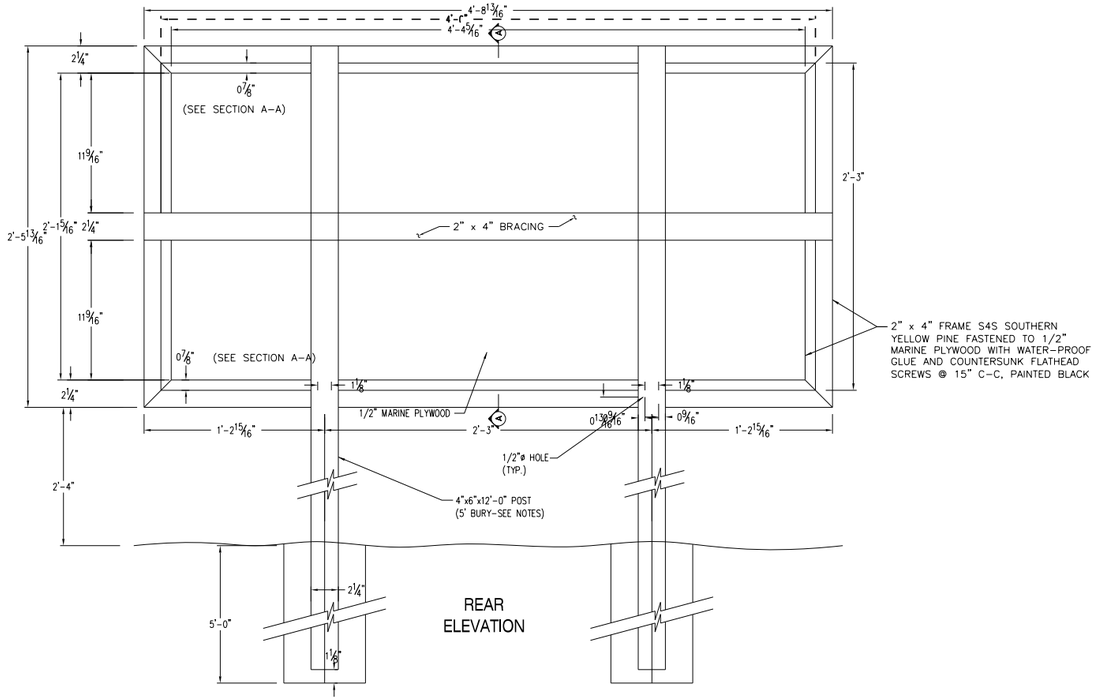
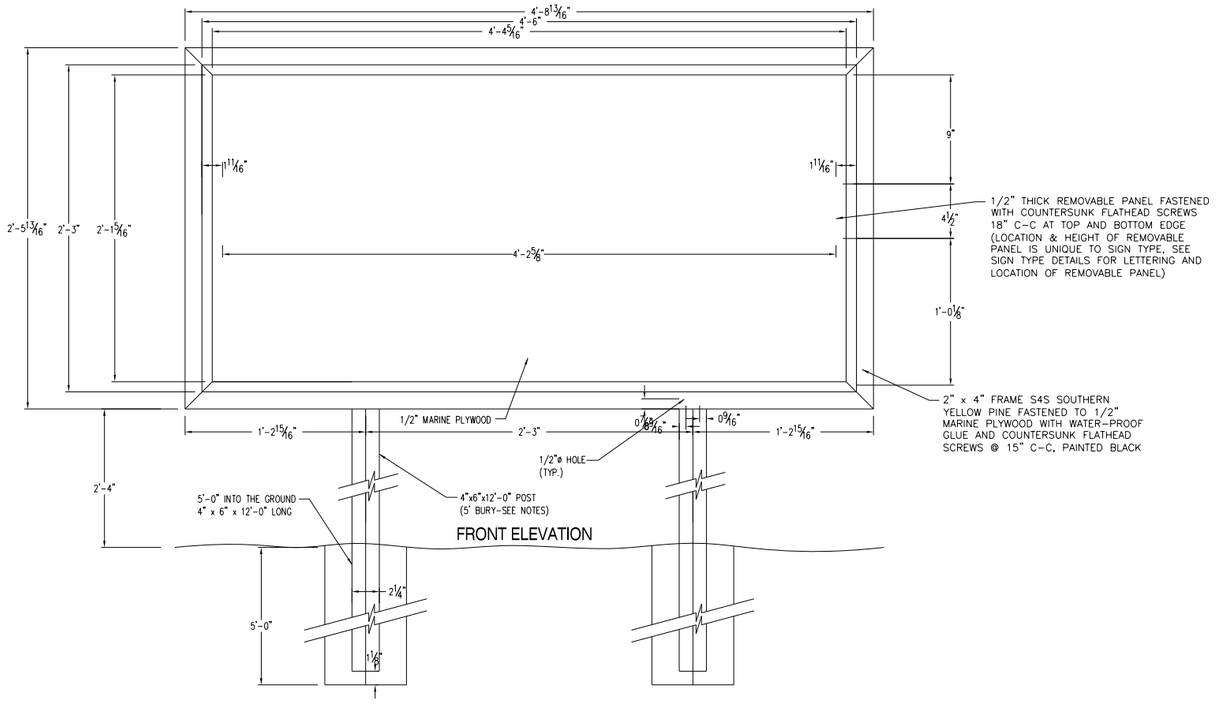
SH 6 AT CULLINAN PARK

CROSS SECTIONS
SHEET 2 OF 2

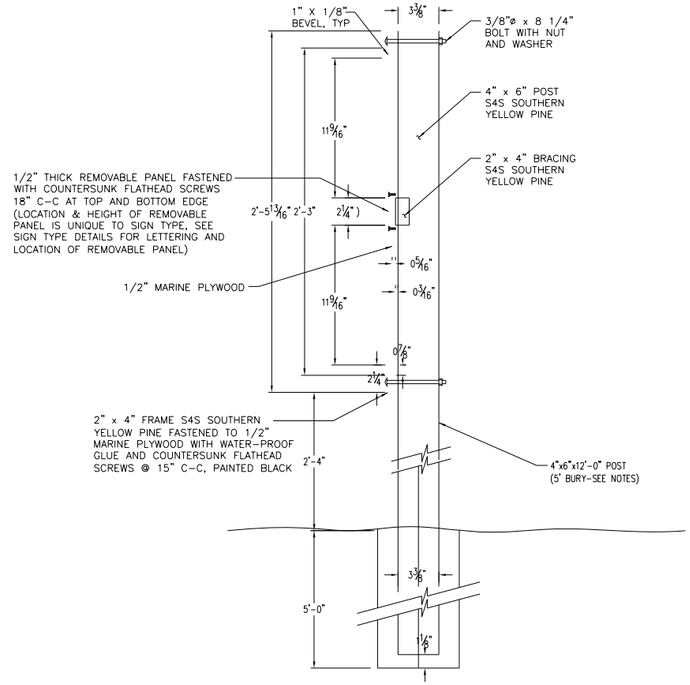
SUBMITTED:	DESIGNED BY:
SCALE: 1"=5'	CC'D BY:
DATE: 11/1/2022	SHEET NO 45 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	



REAR ELEVATION



FRONT ELEVATION



SECTION A-A

GENERAL NOTES:

1. THE SIGN SHALL HAVE BLACK LETTERS WITH WHITE BACKGROUND.
2. ALL LETTERING SHALL BE EITHER AERIAL FONT OR HELVETICA FONT.
3. SIGN SHALL BE MOUNTED ON 4" x 6" POSTS AND LOCATED BY THE ENGINEER.
4. REMOVABLE PANEL SHALL BE 1/2" MARINE PLYWOOD.
5. ALL BOLTS, SCREWS, NAILS, NUTS AND WASHERS SHALL BE GALVANIZED OR CADMIUM PLATED.
6. 4" x 6" POST SHALL BE WOLMANIZED OR PENTACHLOROPHENOL TREATED.
7. ALL WOOD SURFACES SHALL HAVE PRIME COAT AND TWO (2) COATS OF SHERWIN-WILLIAMS KEM-LUSTRA ENAMEL OR EQUAL.

STATE OF TEXAS
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11/1/2022

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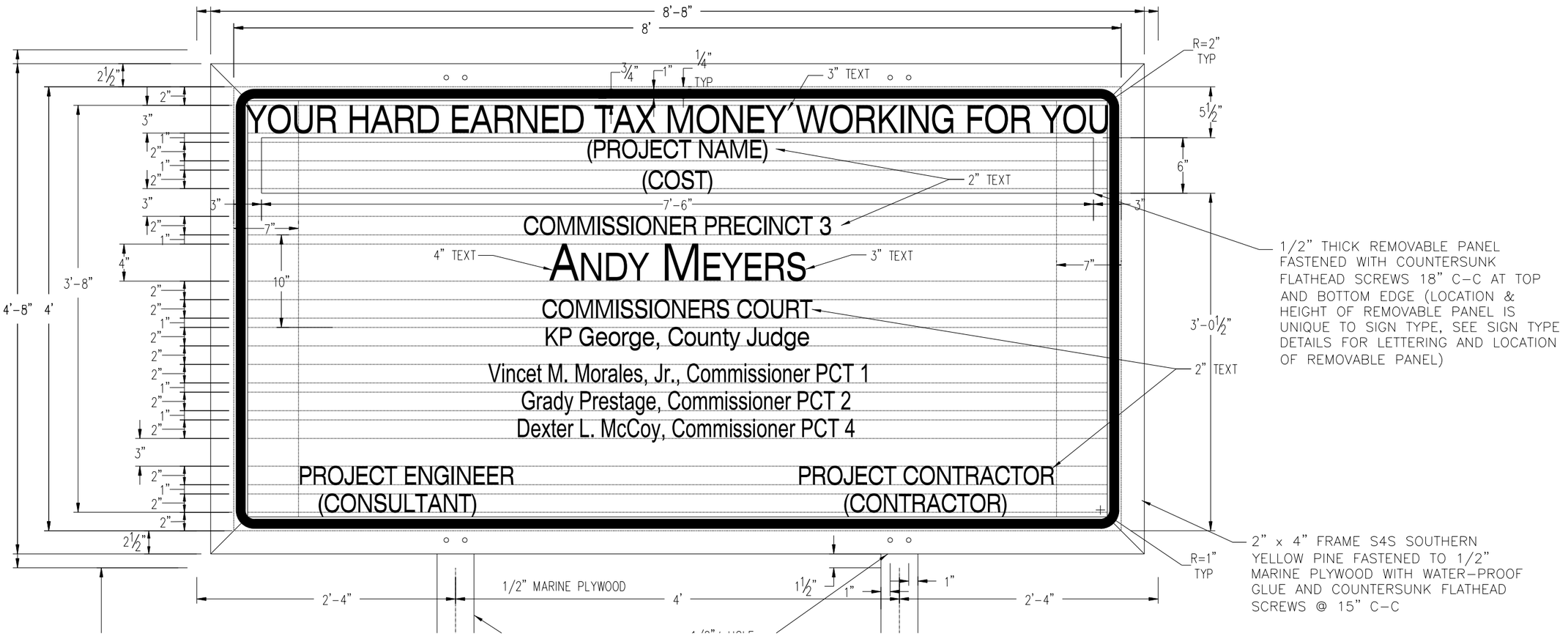
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

PROJECT SIGN DETAILS
SHEET 1 OF 2

SUBMITTED:	DESIGNED BY:
SCALE: N/A	CC'D BY:
DATE: 11/1/2022	SHEET NO 46 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

1:56:34 PM
11/1/2022
D:\Projects\2021\11009*FBC*SH*6*at*Cullinan*Park\400*CADD\411*Trans\02-Sheets\11-MISCSH6*PROJSIGNDET01.dgn



GENERAL NOTES:

1. THE SIGN SHALL HAVE BLACK LETTERS WITH WHITE BACKGROUND.
2. ALL LETTERING SHALL BE EITHER AERIAL FONT OR HELVETICA FONT.
3. SIGN SHALL BE MOUNTED ON 4" x 6" POSTS AND LOCATED BY THE ENGINEER.
4. REMOVABLE PANEL SHALL BE 1/2" MARINE PLYWOOD.
5. ALL BOLTS, SCREWS, NAILS, NUTS AND WASHERS SHALL BE GALVANIZED OR CADMIUM PLATED.
6. 4" x 6" POST SHALL BE WOLMANIZED OR PENTACHLOROPHENOL TREATED.
7. ALL WOOD SURFACES SHALL HAVE PRIME COAT AND TWO (2) COATS OF SHERWIN-WILLIAMS KEM-LUSTRA ENAMEL OR EQUAL.

STATE OF TEXAS
AARON C. LEGG
142513
LICENSED
PROFESSIONAL ENGINEER

01/02/2023

No.	Date	Revisions	App.

THE STATE OF TEXAS
FORT BEND COUNTY

CobbFendley
TBPE Firm Registration No. 274
TBPLS Firm Registration No. 100467
22316 Grand Corner Drive, Suite 100
Katy, Texas 77494
713.462.3242 | fax 713.462.3262
www.cobbfendley.com

SH 6 AT CULLINAN PARK

PROJECT SIGN DETAILS
SHEET 2 OF 2

SUBMITTED:	DESIGNED BY:
SCALE: N/A	CC'D BY:
DATE: 12/21/2022	SHEET NO 47 OF 47 SHEETS
SURVEY: COBBFENDLEY	
CF JOB NO: 2111-009	

8:17:41 AM
12/21/2022
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