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0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		1

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STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT
PROJECT NO. BR 2023(296)
CSJ: 0916-25-019

BEE COUNTY
CR 1187 (CR 421)

NET LENGTH OF ROADWAY =	225.00	FT.=	0.043	MI.
NET LENGTH OF BRIDGE =	70.00	FT.=	0.013	MI.
NET LENGTH OF PROJECT =	295.00	FT.=	0.056	MI.

DESIGN SPEED = MEETS OR IMPROVES EXISTING CONDITION
GUIDELINES: RDM (JULY 2020) CH 6, SEC 1
FUNCTIONAL CLASS: LOCAL ROAD
AREA OF DISTURBED SOIL = TBD
ADT: 54 (2021) 54 (2041)

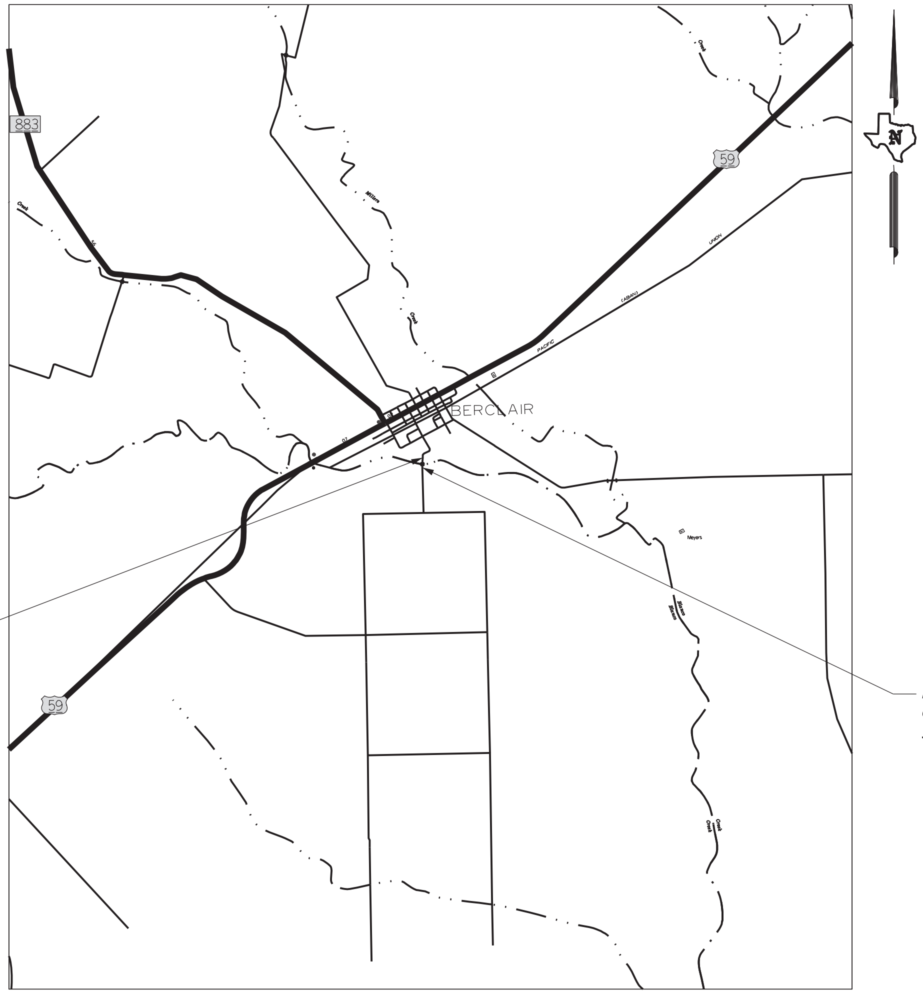
NO RAS REVIEW REQUIRED

LIMITS: AT BLANCO CREEK

FOR THE CONSTRUCTION OF: BRIDGE REPLACEMENT

CONSISTING OF: REPLACE BRIDGE AND APPROACHES

BEGIN PROJECT
CSJ: 0916-25-019
STA: 101+65.00



END PROJECT
CSJ: 0916-25-019
STA: 104+60.00

SCALE : NOT TO SCALE

EXCEPTIONS: NONE
EQUATIONS: NONE
R.R. CROSSINGS: NONE

FINAL PLANS

LETTING DATE: ____________

DATE CONTRACTOR BEGAN WORK: ____________

DATE WORK WAS COMPLETED & ACCEPTED: ____________

FINAL CONTRACT COST: $ ____________

CONTRACTOR : ____________

FINAL PLANS STATEMENT:

THE CONSTRUCTION WORK WAS PERFORMED
IN ACCORDANCE WITH THE PLANS.

______________ P.E. ______________

AREA ENGINEER DATE

TEXAS DEPARTMENT OF TRANSPORTATION

Jacobs
1999 BRYAN ST, SUITE 1200
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

RECOMMENDED FOR LETTING: 3/6/2023

DocuSigned by:
Paula Sales-Evans, P.E.
597546A18C0C435...

DISTRICT DIRECTOR OF TRANSPORTATION
PLANNING & DEVELOPMENT

APPROVED FOR LETTING: 3/6/2023

DocuSigned by:
Valente Olivarez
303F64E8A9B44E0...

DISTRICT ENGINEER

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, JULY 2022)

DATE: $DATE$ $TIME$
FILE: $FILE$ DOCUMENT NAME

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Jacobs Engineering Group
STATE OF TEXAS
JUSTIN D BEAIRD
95588
LICENSED
PROFESSIONAL ENGINEER
F-2966

03/28/23

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Firm Registration: F-2966

Texas Department of Transportation

CR 421

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CK: CW
DW: BDG
CK: JB
DW: BDG

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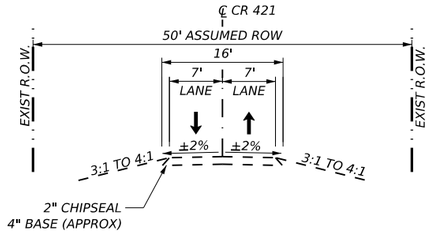
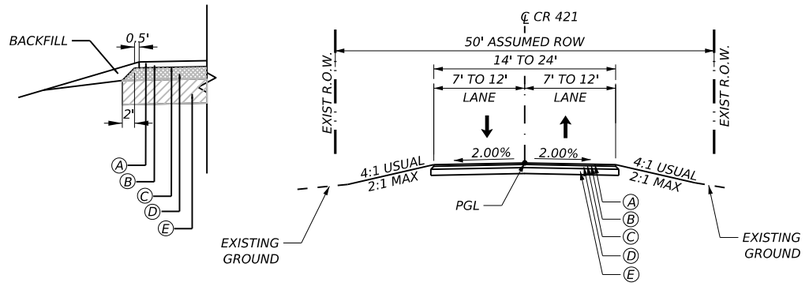


CR 421 - EXISTING TYPICAL SECTION

STA 101+65 TO STA 102+76.53
STA 103+33.53 TO STA 104+60



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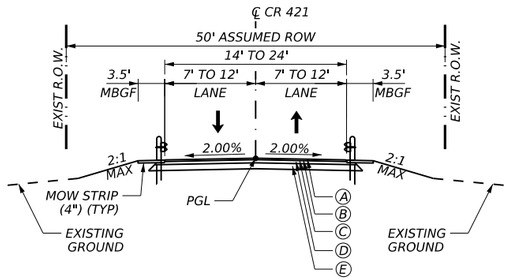
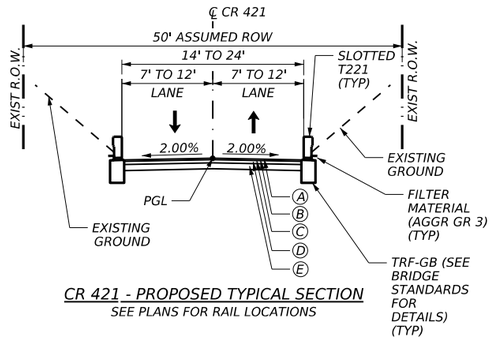
STA 101+65 TO STA 102+62
STA 103+72 TO STA 104+60



CR 421 - PROPOSED TYPICAL SECTION

SEE PLANS FOR MBGF LOCATIONS



CR 421 - PROPOSED TYPICAL SECTION

SEE PLANS FOR RAIL LOCATIONS

LEGEND

- (A) TOP COURSE SURFACE TREATMENT
  ASPH (AC-15P, HFRS-2P, OR CRS-2P)
  APPL RATE: 0.32 GAL/SY
  AGGR (TY-PB GR-4 SAC B)
  APPL RATE: 110 SY/CY
- (B) BOTTOM COURSE SURFACE TREATMENT
  ASPH (AC-10, CR-2, OR HFRS-2)
  APPL RATE: 0.39 GAL/SY
  AGGR (TY-PB GR-3 SAC B)
  APPL RATE: 85 SY/CY
- (C) PRIME COAT (MC-30)
  APPL RATE: 0.20 GAL/SY
- (D) 4" FLEXBASE TY A GR 1-2
- (E) 8" LIME TREATED SUBGRADE

NOTES:

1. SEE PLAN AND PROFILE SHEET FOR TRANSITIONS.
2. SEE BRIDGE LAYOUT FOR BRIDGE STATION LIMITS.
3. SEE BRIDGE LAYOUT AND STANDARDS FOR DETAILS OF T221 RAIL SHOWN.

Jacobs Engineering Group
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03/28/2023

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Firm Registration: F-2966

Texas Department of Transportation

CR 421

TYPICAL SECTIONS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 421
DIST	COUNTY		SHEET NO.
CRP	BEE		3

DATE: 3/2/2023 2:09 PM
FILE: c:\pw_work\dirl\txdot\dms58538\CR421 RTS01.dgn

GENERAL NOTES:

Find, for your information and convenience, tools such as forms, software, materials, and various other information provided by the Department at https://www.txdot.gov/business.html. Please note that these tools are updated periodically and your attention is directed to the latest edition.

In the event of a called evacuation, emergencies, impending adverse weather or as directed, do not perform any work without written authorization. The District reserves the right to suspend all work in support of evacuations or emergencies occurring from other parts of the state. Any work performed, other than work directed by the Department, is unauthorized work in accordance with Item 5.

Sweep, clean and remove any construction waste, surplus materials or debris from the roadway and right of way at the end of each day unless otherwise approved. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Asphalt application season will be established in accordance with Item 316.4.4 Adverse Weather Conditions or as directed by the Engineer.

Cut existing pavement using a saw or other approved method to ensure a neat transverse and/or longitudinal line to assure a smooth tie-in with new pavement. Cut to a minimum depth of the final lift thickness. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Promptly pick up and properly dispose of paper and other materials used for pavement joints.

Stencil the National Bridge Inventory (NBI) number on each bridge and bridge class culvert. Use 3" letters or numbers. Use stain and color as approved. Paint will not be permitted. Locate the NBI number on the outside beam immediately adjacent to the abutment on the downstream end, on the outside headwall upper right-hand corner, or as directed. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

All pavement markings shall be in accordance with the latest edition of Texas MUTCD.

Contractor questions on this project are to be addressed to the following individual(s):

Nick Novosad, P.E.	nick.novosad@txdot.gov
Roberto Jimenez, P.E.	mailto:roberto.a.jimenez@txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individuals.

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address:
https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors

County: Bee **Control: 0916-25-019**

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All contractor questions will be reviewed by the Engineer. All questions and any corresponding responses that are generated will be posted through the same Letting Pre-Bid Q&A web page.

The Letting Pre-Bid Q&A web page for each project can be accessed by using the dashboard to navigate to the project you are interested in by scrolling or filtering the dashboard using the controls on the left. Hover over the blue hyperlink for the project you want to view the Q&A for and click on the link in the window that pops up.

ITEM 2

It is recommended that prospective bidders examine the specified work locations with the Engineer to view the nature of the work, the need for close coordination with the various utilities, traffic control considerations, and other factors influencing the prosecution of the work.

ITEM 5

Field verify all dimensions and notify Engineer prior to initiating any work.

Verify the locations of utilities, underground or overhead, shown within the limits of the right-of-way. Adhere to OSHA Standards when working within the vicinity of overhead power lines. Coordinate with the utility companies and notify the Engineer of any possible conflicts. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Overhead power may need de-energizing during portions of the project. Notify AEP Texas, Alan Gomez, adgomez@aep.com, 361-881-5532, to coordinate the outages.

The 811 call services for a utility location does not include TxDOT facilities. Provide notification to the District Traffic Signal Shop by email at CRP_Utility_Locate@txdot.gov or call 361-739-6044 when planning, drilling, or excavating in areas where existing TxDOT underground utilities exist. Visual evidence of TxDOT underground utilities in the area include illumination poles, ground boxes, flashing beacons, traffic signals, etc. This notification must be provided 48 hours in advance of performing the work, but no earlier than 72 business hours before the work will commence. Drilled shaft locations or excavation areas must be staked prior to the notification so that the underground utilities can be located in relationship to the proposed work.

Notify the Engineer immediately of utility conflicts in accordance with Item 5.6. Refer to Item 4.5 for consideration of differing site conditions.

The responsibility for the construction surveying on this contract will be in accordance with Item 5.9.1, "Method A".

This project was developed using 3D design software and tools. A proposed 3D model of the project In Extensible Markup Language (XML) and 3d PDF format is available upon request. These models are specifically intended to aid the contractor in preparing bids and in the use of automated machine guidance equipment for the project construction. If discrepancies are found, numerical dimensions in the cross-sections and plan sheets govern over the 3D model.

When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design. Acceptance or denial of an alternate is at the sole discretion of the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor.

ITEM 6

Inspection at Precast Concrete Fabrication Plants is as follows: TxDOT's Materials and Pavements Section will inspect any precast units at commercial fabrication yards and staging areas. The Area Engineer will inspect all other precast units.

For Department-furnished material, contact the Engineer or his designated representative to request material a minimum of one workday prior to pick up. Load material with contract personnel. Materials are to be stored in a safe location outside TXDOT property or right-of-way, unless otherwise approved. Use material furnished by the Department only on the project(s) intended. Return any unused material as soon as possible.

To comply with the latest provisions of Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, the contractor must submit a notarized original of the TxDOT Construction Material Buy America Certification Form for all items classified as construction materials. This form is not required for materials classified as a manufactured product.

Refer to the Buy America Material Classification Sheet for clarification on material categorization.

The Buy America Material Classification Sheet is located at the below link. https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html for clarification on material categorization.

ITEM 7

The work performed for Item 7.2.4, "Public Safety and Convenience" will not be measured or paid for directly, but will be subsidiary to pertinent Items.

County: Bee **Control: 0916-25-019**

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The total disturbed area for this project is 0.24 acres. The disturbed area in this project, all project locations in the Contract, and Contractor project specific locations (PSLs), within 1 mile of the project limits, for the Contract will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain any required authorization from the TCEQ for any Contractor PSLs for construction support activities on or off ROW. When the total area disturbed for all projects in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer.

Establish uniform perennial vegetative coverage with a density of at least 70% of the native background vegetative cover to achieve final stabilization.

Comply with the Texas Aggregate Quarry and Pit Safety Act for waste areas or material source areas resulting from this project.

No significant traffic generator events identified.

ITEM 8

Prepare the progress schedule using the Critical Path Method (CPM). Submit (2) two 11" x 17" hard copies and an electronic file of the original or updated progress schedule. Submit the original progress schedule seven (7) days before the Preconstruction Conference.

Submit an updated progress schedule as directed to show proposed major changes, changes affecting compliance with the contract requirements, or changes affecting the critical path/controlling item of work.

Working days will be computed and charge in accordance with Article 8.3.1.4, "Standard Workweek".

Work above traffic is not allowed.

Notify the Engineer at least 48 hours in advance of weekend or nighttime work.

ITEM 9

Monthly progress payments will be made for items of work completed by the 28th day of each month. Any work completed after the 28th will be included for payment in the subsequent monthly progress estimate.

Submit signed request for compensation of material-on-hand (MOH), including any requests from subcontractors, suppliers, or fabricators for MOH, at least two (2) working days prior to the end of the month on the Departments approved forms.

ITEM 100

Coordinate all right of way preparation activities with the project's Storm Water Pollution Prevention Plan (SWP3) and Environmental Permit Issues, and Commitments Sheet (EPIC) or as approved.

Prune trees and shrubs as directed. Use accepted pruning practices in accordance with Item 192 and as defined by the National Arborist Association. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

ITEM 110

For earth cuts, manipulate and compact subgrade in accordance with Item 132.3.4.2, "Compaction Methods, Density Control".

ITEM 132

Use embankment material with a plasticity index (PI) ranging from 10 to 25. Blend or treat approved materials to achieve the desired PI and pulverize the material so that 100% passes the 3 inch sieve. Retest materials as borrow sources change or when the material changes significantly. Notify the Engineer of the proposed material sources and of changes to material sources. The Engineer may sample and test project materials at any time before compaction throughout the duration of the project to assure specification compliance. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Obtain approval to incorporate existing salvaged asphaltic surface and flexible base materials in the surface layer. If approved, incorporate existing materials no larger than 2 inches in the surface layer. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

The estimated quantities for embankments adjacent to culverts and bridges were calculated using the average-end-area method.

County: Bee **Control: 0916-25-019**

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ITEM 164

Restore and seed areas not shown in the plans disturbed by the Contractor's operations. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Notify the Engineer of the unavailability of any seed mix. Make changes to the seed mix as approved.

Use a tacking agent of 50% SS-1 and 50% water and apply the agent at a rate of 0.10 gal/sy or as directed. A biodegradable tacking agent may be used in lieu of the SS-1 tacking agent in accordance with the manufacturer's recommendations when approved. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

ITEM 168

Distribute water to only those areas shown in the plans or as directed. Excessive overspray will not be permitted.

Water all areas of the project to be seeded or sodded every two (2) days for 90 days or as directed. Apply water in a manner to ensure adequate moisture but not to erode the soil in-place. During periods of adequate moisture, mechanical watering may not be required as approved. Upon final stabilization, the Engineer may require to continue watering as specified for a period not to exceed 30 days.

The Basis of Estimate below establishes the approximate quantity of water required to complete the 90-day watering cycle:

Rate	Water (Gal/Acre/Day)	Area (Acre)	Total Gallons (Min)
0.25 inch/week	1961	1	88,245

ITEM 247

For Table 1, "Material Requirements" a minimum plasticity index (PI) of 4 is required for Ty A Gr 1-2 Flex Base.

When requested, stake with blue tops, at 100-foot intervals, the lines and grade shown in the plans.

ITEM 260

Provide Hydrated Lime Slurry and apply lime by slurry placement method.

ITEM 302

Provide aggregates with a minimum surface aggregate classification (SAC) of “B” unless otherwise shown. The SAC for sources on the Department’s Aggregate Quality Monitoring Program (AQMP) is listed in the Department’s Bituminous Rated Source Quality Catalogue (BRSQC). SAC requirements apply to aggregates used on all final roadway surfaces, including shoulders.

For precoated aggregate Type PB crushed gravel will not be used.

ITEM 310

Use MC-30 at a rate of 0.20 gallons per square yard or as directed.

A minimum prime coat curing period shall be determined by the Engineer during (option: “prior to”) the preconstruction meeting. This curing period may be revised by the Engineer throughout the duration of the project pending weather and observed performance.

ITEM 316

Do not place surface treatment on exposed concrete structures unless directed.

Furnish a distributor equipped with a working hand hose.

Material rates shown are for estimating purposes only. Adjust actual rates based on the material used, the existing condition and type of roadway surface, and as approved.

When using asphalt emulsion, a minimum 24-hour curing period is required before placing any subsequent asphalt courses.

Remove vegetation and blade pavement edges prior to surfacing operations. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Broom and clean sealed sections of roadway and all adjacent paved surfaces, including the gutter line, of any surplus aggregate before opening to traffic or as directed.

A vacuum sweeper will be required for this project. This shall be considered subsidiary to Item 316. Vacuum sweeper must perform a test strip before use.

ITEM 400

Compact each layer to meet the density and consolidation of the adjacent undisturbed material.

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ITEM 420

Set a Department-furnished brass disk on all bridge abutments and culvert headwalls as directed. The work performed will not be measured or paid directly, but will be subsidiary to pertinent Items.

Bent concrete will be a plans quantity item.

Place longitudinal construction joints at the lane line for bridge approach slabs. These construction joints will be subsidiary to Item
420.

ITEM 421

The Engineer will provide strength-testing equipment for acceptance testing.

Furnish on-site curing facilities. The curing facility should include an adequate water supply and be able to adequately maintain a water temperature of 69.8 to 77 degrees Fahrenheit.

Furnish test molds for cylindrical concrete specimens measuring four (4") inches in diameter by eight (8") inches in length.

ITEM 422

Power-wash the surface of the precast panels before placement of concrete deck concrete to the satisfaction of the Engineer.

ITEM 427

Provide a rub finish for Surface Area II unless otherwise directed.

ITEM 432

Saw cut the existing riprap to ensure a neat transverse and/or longitudinal line to assure a smooth tie-in with new riprap. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items. Use Cap Option A for the joint between the face of the abutment and riprap as shown on the standard sheet “Stone Riprap (SRR)".

ITEM 496

Contractor shall provide a demolition plan to engineer for approval.

The structure(s) to be removed have surface coatings which may contain hazardous materials. Provide for the safety and health of employees and abide by all OSHA Standards and Regulations.

Coordinate and identify the locations where the structure(s) will be cut at least 30 days prior to the demolition of the structure(s). If the surface coatings contain hazardous materials, the Department will arrange by separate Contract for the removal of a 4 inch wide strip around bearing attachments, at the anchor bolts, and as approved. Provide traffic control for the paint removal operations. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Notify the Engineer no later than 30 calendar days prior to the demolition of the structure(s) for coordination with the Texas Department of State Health Services.

Provide for approval a method of removal to prevent any materials from falling into water or traffic. The method used and work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

ITEM 500

"Materials on Hand" payments are not considered when determining partial payments.

ITEM 502

Furnish additional barricades, signs, and traffic handling as directed. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Attach stop/slow paddle to a staff with a minimum length of 6 feet to the bottom of the sign.

The Contractor Force Account “Safety Contingency” that has been established for this project is intended to be utilized for work zone enhancements, to improve the effectiveness of the Traffic Control Plan, that could not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the Engineer and the Contractor’s Responsible Person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

All items marked as optional on all traffic control standards shall be required unless otherwise approved by an Engineer.

County: Bee **Control: 0916-25-019**

Highway: CR 1187 (CR 421)

ITEM 504

No field office will be required for this project.

ITEM 506

Designate in writing a Contractor Responsible Person (CRP) for implementing, maintaining, and reviewing environmental requirements.

ITEM 540

Mixing of wood post types and shapes will not be permitted at the same location.

Type II Galvanization coatings will be used.

Backfill area behind concrete mow strip using existing soil to the slope shown in the plans and cross-sections. Payment for backfilling is part of Item 132 Embankment.

ITEM 644

All slip bases and hardware including but not limited to nuts, bolts, screws and washers will be galvanized. All signs and housing components will be galvanized. Slip bases shall be clamp-style.

Any abandoned slip base footings, in the vicinity of the existing sign, shall be removed and will be subsidiary to ITEM 644-6076.

ITEM 658

Furnish round delineators and object markers except when wing channel posts are shown in the plans.

County: Bee **Control: 0916-25-019**

Highway: CR 1187 (CR 421)

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SPECIFICATION DATA

UNIT WEIGHT ESTIMATES

ITEM 247: FL BS (CMP IN PLC)(TYA GR1-2)(FNAL POS) ---------- 135 LBS/CF

BASIS OF ESTIMATE

ITEM 60: LIME TREAT (SUBGRADE) (8") ---------- 42 LBS/SY
ITEM 310: PRIME COAT ---------- 0.20 GAL/SY

COMPACTION REQUIREMENTS FOR BASE COURSE

ITEM 247: FL BS (CMP IN PLC)(TYA GR1-2)(FNAL POS)
DENSITY ---------- 100% MIN.
LIFTS ---------- ALL

SURFACE TREATMENT DATA

TWO COURSE SURFACE TREATMENT (MULTI-OPTION)

FIRST COURSE

ASPHALT TYPE ---------- AC-10, CRS-2, OR HFRS-2
AVEREAGE ASPHALT RATE ---------- 0.39 GAL/SY
AGGREGATE RATE ---------- 1 CY/90 SY
AGGREGATE TYPE ---------- PB
AGGREGATE GRADE ---------- 3, SAC-B

SECOND COURSE

ASPHALT TYPE ---------- AC-15P, CRS-2P, OR HFRS-2P
AVEREAGE ASPHALT RATE ---------- 0.32 GAL/SY
AGGREGATE RATE ---------- 1 CY/115 SY
AGGREGATE TYPE ---------- PB
AGGREGATE GRADE ---------- 4, SAC-B

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0916-25-019 **DISTRICT** Corpus Christi **COUNTY** Bee
HIGHWAY CR 1187

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0916-25-019**			
		PROJECT ID		**A00135995**			
		COUNTY		**Bee**			
		HIGHWAY		**CR 1187**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	2.250		2.250	
	110-6001	EXCAVATION (ROADWAY)	CY	68.520		68.520	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	210.890		210.890	
	164-6001	BROADCAST SEED (PERM) (RURAL) (SANDY)	SY	620.000		620.000	
	168-6001	VEGETATIVE WATERING	MG	12.000		12.000	
	247-6041	FL BS (CMP IN PLC)(TYA GR1-2)(FNAL POS)	CY	64.000		64.000	
	260-6002	LIME (HYDRATED LIME (SLURRY))	TON	15.000		15.000	
	260-6073	LIME TRT (SUBGRADE)(8")	SY	640.000		640.000	
	310-6009	PRIME COAT (MC-30)	GAL	113.000		113.000	
	316-6001	ASPH (MULTI OPTION)	GAL	220.000		220.000	
	316-6222	AGGR(TY-PB GR-3 SAC-B)	CY	7.000		7.000	
	316-6224	AGGR(TY-PB GR-4 SAC-B)	CY	5.000		5.000	
	316-6413	ASPH(AC-15P, HFRS-2P OR CRS-2P)	GAL	181.000		181.000	
	400-6005	CEM STABIL BKFL	CY	76.000		76.000	
	416-6004	DRILL SHAFT (36 IN)	LF	180.000		180.000	
	420-6013	CL C CONC (ABUT)	CY	33.000		33.000	
	420-6066	CL C CONC (RAIL FOUNDATION)	CY	17.000		17.000	
	422-6001	REINF CONC SLAB	SF	1,820.000		1,820.000	
	425-6035	PRESTR CONC GIRDER (TX28)	LF	278.000		278.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	31.000		31.000	
	432-6035	RIPRAP (STONE PROTECTION)(24 IN)	CY	91.000		91.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	8.000		8.000	
	450-6004	RAIL (TY T221)	LF	292.000		292.000	
	454-6004	ARMOR JOINT (SEALED)	LF	51.000		51.000	
	496-6009	REMOV STR (BRIDGE 0 - 99 FT LENGTH)	EA	1.000		1.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	6.000		6.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	60.000		60.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	60.000		60.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	50.000		50.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	2.000		2.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	50.000		50.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	2.000		2.000	
	545-6028	CRASH CUSH ATTEN (INSTL) (S) (TL3)	EA	2.000		2.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)	EA	2.000		2.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	3.000		3.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	6.000		6.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0916-25-019 **DISTRICT** Corpus Christi **COUNTY** Bee
HIGHWAY CR 1187

		CONTROL SECTION JOB		**0916-25-019**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00135995**			
		COUNTY		**Bee**			
		HIGHWAY		**CR 1187**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	4.000		4.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

CW CK | BDG DW | JB CK | BDG DW

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	502 6001
	BARRICADES, SIGNS AND TRAFFIC HANDLING
	MO
CR421	6
PROJECT TOTALS	6

SUMMARY OF REMOVAL ITEMS

LOCATION	496 6009	542 6001	644 6076
	REMOV STR (BRIDGE 0 - 99 FT LENGTH)	REMOVE METAL BEAM GUARD FENCE	REMOVE SM RD SN SUP&AM
	EA	LF	EA
CR421	1	50	3
PROJECT TOTALS	1	50	3

SUMMARY OF ROADWAY ITEMS

LOCATION	100 6002	247 6041	260 6002	260 6073	310 6009	316 6001	316 6413	316 6222	316 6224	432 6045	420 6066	450 6004	540 6001	540 6006	544 6001	545 6028
	PREPARING ROW	FL BS (CMP IN PLC)(TYA GR1-2)(FNAL POS)	LIME (HYDRATED LIME (SLURRY))	LIME TRT (SUBGRADE)(8")	PRIME COAT (MC-30)	ASPH (MULTI OPTION)	ASPH(AC-15P, HFRS-2P OR CRS-2P)	AGGR(TY-PB GR-3 SAC-B)	AGGR(TY-PB GR-4 SAC-B)	RIPRAP (MOW STRIP)(4 IN)	CL C CONC (RAIL FOUNDATION)	RAIL (TY T221)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	CRASH CUSH ATTEN (INSTL) (S) (TL3)
	STA	CY	TON	SY	GAL	GAL	GAL	CY	CY	CY	CY	LF	LF	EA	EA	EA
CR421	2.25	64	15	640	113	220	181	7	5	8	17	120	50	2	2	2
PROJECT TOTALS	2.25	64	15	640	113	220	181	7	5	8	17	120	50	2	2	2

SUMMARY OF EARTHWORK ITEMS

LOCATION	110 6001	132 6006
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)
	CY	CY
CR421	68.52	210.89
PROJECT TOTALS	68.52	210.89

FOR CONTRACTOR'S INFORMATION ONLY

STATION	EXCAVATION	EMBANKMENT
	CY	CY
101+65	0.00	0.00
101+70	2.62	0.29
101+80	5.80	0.56
101+90	6.05	0.45
102+00	5.54	0.30
102+10	4.15	0.28
102+20	2.04	1.21
102+30	0.48	4.74
102+40	0.03	11.48
102+50	0.00	0.95
102+60	0.00	4.14
102+70	0.00	12.29
102+80	0.00	25.92
102+82	0.30	36.01
BRIDGE STA 102+82 TO 103+52		
103+52	0.00	31.33
103+60	0.00	31.93
103+70	0.02	23.93
103+80	0.21	14.34
103+90	0.80	7.12
104+00	2.24	2.07
104+10	4.77	0.14
104+20	6.83	0.07
104+30	7.24	0.10
104+40	6.97	0.19
104+50	6.63	0.52
104+60	5.81	0.53
TOTAL	68.52	210.89

BRIDGE # 1

SUMMARY OF BRIDGE # 1 ITEMS NBI: 16-013-0-AA11-87-001

LOCATION	400 6005	416 6004	420 6013	422 6001	425 6035	432 6002	432 6035	450 6004	454 6004
	CEM STABIL BKFL	DRILL SHAFT (36 IN)	CL C CONC (ABUT)	REINF CONC SLAB	PRESTR CONC GIRDER (TX28)	RIPRAP (CONC) (5 IN)	RIPRAP (STONE PROTECTION) (24 IN)	RAIL (TY T221)	ARMOR JOINT (SEALED)
	CY	LF	CY	SF	LF	CY	CY	LF	LF
2 - ABUTMENTS	76	180	33.0			31	91	32.0	
1 - 70.00' PRESTR CONC I-GIRDER SPAN (Tx28)				1,820	278.00			140.0	51
PROJECT TOTALS	76	180	33.0	1,820	278.00	31	91	172.0	51

SUMMARY OF SIGNING ITEMS

LOCATION	644 6030	658 6014	658 6062
	IN SM RD SN SUP&AM TYS80(1)SA(T)	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
	EA	EA	EA
CR421	2	6	4
PROJECT TOTALS	2	6	4

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	164 6001	168 6001	506 6002	506 6011
	BROADCAST SEED (PERM) (RURAL) (SANDY)	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)
	SY	MG	LF	LF
CR 421	620	12	60	60
PROJECT TOTALS	620	12	60	60

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Texas Department of Transportation

CR 421

QUANTITY SUMMARIES

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 421
DIST	COUNTY		SHEET NO.
CRP	BEE		6

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DATE:
FILE:

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
87	1	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 X 36	X		S80	1	SA	T		
87	2	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 X 36	X		S80	1	SA	T		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

STATE OF TEXAS
ERIC HERNANDEZ
114309
LICENSED PROFESSIONAL ENGINEER
3/2/2023

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0916	25	019	CR 422
4-16		DIST	COUNTY		SHEET NO.
8-16		CRP	BEE		7

18

DN:	KP
CK:	KM
DW:	KP
CK:	KM

GENERAL

1. THE CONTRACTOR SHALL PLACE AND MAINTAIN ALL SIGNS, BARRICADES, PAVEMENT MARKINGS AND OTHER WORKING DEVICES AS SHOWN IN THESE PLANS IN ACCORDANCE WITH THE "TEXAS MANUAL ON UNIFORM CONTROL DEVICES" AND ALL APPLICABLE STANDARDS. THE SIGNS, BARRICADES AND WARNINGS SHOWN SHALL BE CONSIDERED A MINIMUM AND ADDITIONAL SIGNS, BARRICADES OR WARNING DEVICES DEEM NECESSARY BY THE ENGINEER OR DICTATED BY FIELD CONDITIONS SHALL BE PROVIDED IN ACCORDANCE WITH ALL APPLICABLE STANDARDS AND "THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES." ADDITIONAL SIGNS OR BARRICADES WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE SUBSIDIARY TO THE BID ITEM "BARRICADES, SIGNS AND TRAFFIC HANDLING."

2. MAINTENANCE OF THE SIGNS, BARRICADES AND TRAFFIC CONTROL DEVICES SHALL BE DONE ON A REGULAR BASIS AND IS THE RESPONSIBILITY OF THE CONTRACTOR.

3. THE CONTRACTOR SHALL PROVIDE FOR SAFE AND CONVENIENT INGRESS AND EGRESS TO ABUTTING PROPERTY HIGHWAYS, PUBLIC ROADS AND STREET CROSSINGS IN A SAFE AND PASSABLE CONDITION.

4. SIGNS, PAVEMENT MARKINGS, CHANNELIZING DEVICES AND OTHER TRAFFIC CONTROL DEVICES THAT ARE INCONSISTENT WITH INTENDED TRAVEL PATHS THROUGH THE PROJECT AREA SHALL BE REMOVED IMMEDIATELY.

5. UPON COMPLETION OF THE WORK AND BEFORE FINAL ACCEPTANCE AND FINAL PAYMENT ARE MADE, THE CONTRACTOR SHALL CLEAR AND REMOVE FROM THE SITE ALL SURPLUS AND DISCARDED MATERIALS AND DEBRIS OF EVERY KIND AND LEAVE THE PROJECT IN A SMOOTH, CLEAN, NEAT AND SIGHTLY CONDITION.

6. THE CONTRACTOR MAY SUBMIT AN ALTERNATE TRAFFIC CONTROL PLAN, IN ADVANCE AND IN WRITING, SUBJECT TO THE APPROVAL OF THE ENGINEER.

TRAFFIC CONTROL NARRATIVE

1. INSTALL PROJECT ADVANCE WARNING SIGNS AND PROJECT SIGNS IN ACCORDANCE WITH THE TEXAS MUTCD AND BARRICADE AND CONSTRUCTION STANDARDS AS DIRECTED.

2. PLACE APPLICABLE SIGNS AND CLOSE COUNTY ROAD 421, APPROACHING THE BRIDGE, IN ACCORDANCE WITH WZ (RCD)- 13 STANDARD SHEET.

3. PLACE SW3P EROSION CONTROL MEASURES IN ACCORDANCE WITH THE SW3P LAYOUT AND APPLICABLE STANDARDS.

4. DEMOLISH EXISTING BRIDGE AND CONSTRUCT NEW BRIDGE.

5. COMPLETE ROADWAY, SIGNING, AND DELINEATOR AND EROSION CONTROL ITEMS WITHIN THE CLOSED SECTION.

6. OPEN BRIDGE TO TRAFFIC.

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03/28/2023

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Texas Department of Transportation

CR 421

TRAFFIC CONTROL NARRATIVE

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 421
DIST	COUNTY		SHEET NO.
CRP	BEE		8

DATE: 3/28/2023 10:25 AM
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KM CK: KM
KP DW: KP
KM CK: KM
KP DW: KP

0 1000 2000
SCALE IN FEET

LEGEND

- TYPE III BARRICADE
- TCP SIGN
- TRAFFIC DIRECTION
- DETOUR

CW20-2D DETOUR AHEAD

US 59

LAZY F RD

FM 883

NEW PORT ST

NORTH ST

FRONT ST

TEMPLE ST

MISSION AVE

PETTUS ST

LUCAS RD

CITY OF BERCLAIR

PROJECT LOCATION (BRIDGE CLOSED)

R11-2 ROAD CLOSED

NAME
ADDRESS
CITY
STATE
CONTRACTOR

CR421

CR420

CR419

CR416

CR417

CR 421/ S WILSON AVE M4-12T DETOUR M4-9S

CR 421/ S WILSON AVE M4-12T DETOUR M4-9L

CR 421/ S WILSON AVE M4-12T DETOUR M4-9R

CR 421/ S WILSON AVE M4-12T ROAD CLOSED LOCAL TRAFFIC ONLY DETOUR M4-9S

CR 421/ S WILSON AVE M4-12T ROAD CLOSED LOCAL TRAFFIC ONLY DETOUR M4-9L

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CR 421

TRAFFIC CONTROL DETOUR PLAN

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 421
DIST	COUNTY		SHEET NO.
CRP	BEE		9

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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

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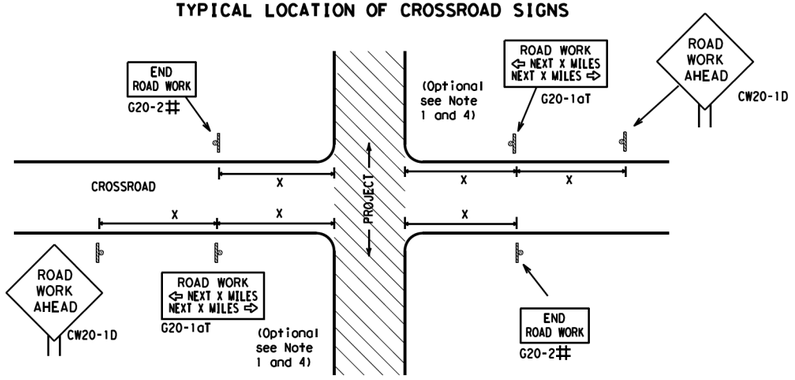
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21	0916	25	019	CR 421
	DIST	COUNTY		SHEET NO.
	CRP	BEE		10

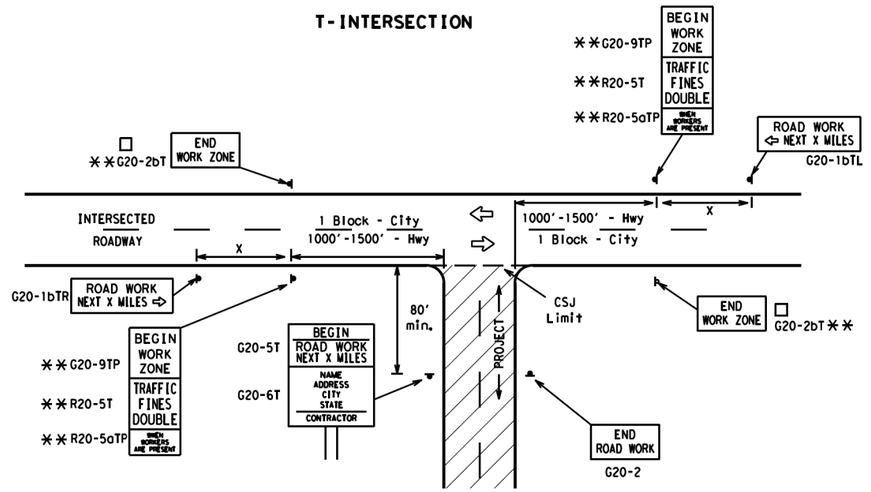
TYPICAL LOCATION OF CROSSROAD SIGNS



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]

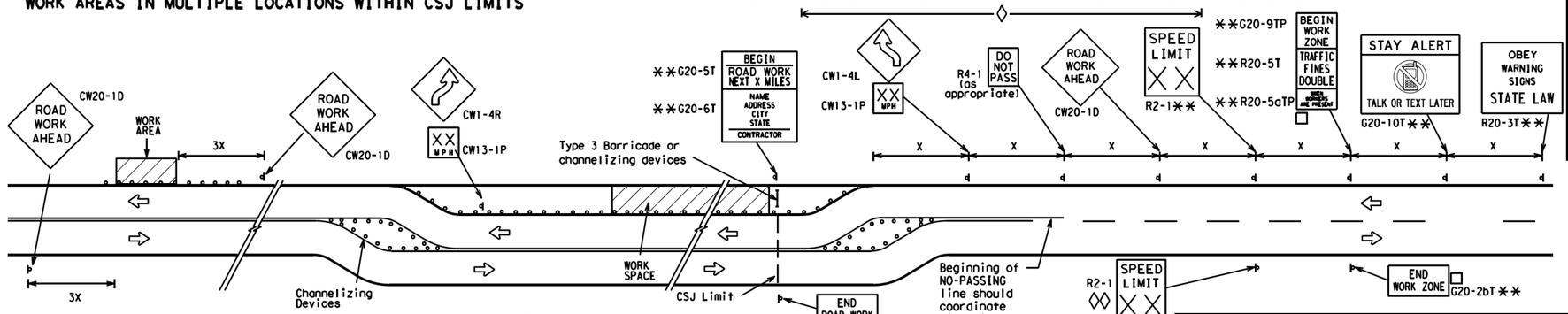
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

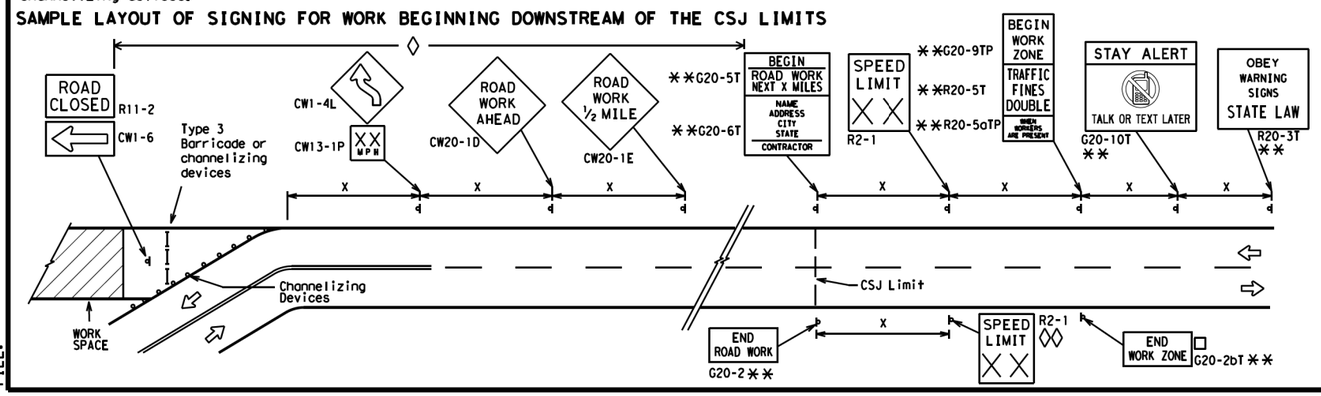
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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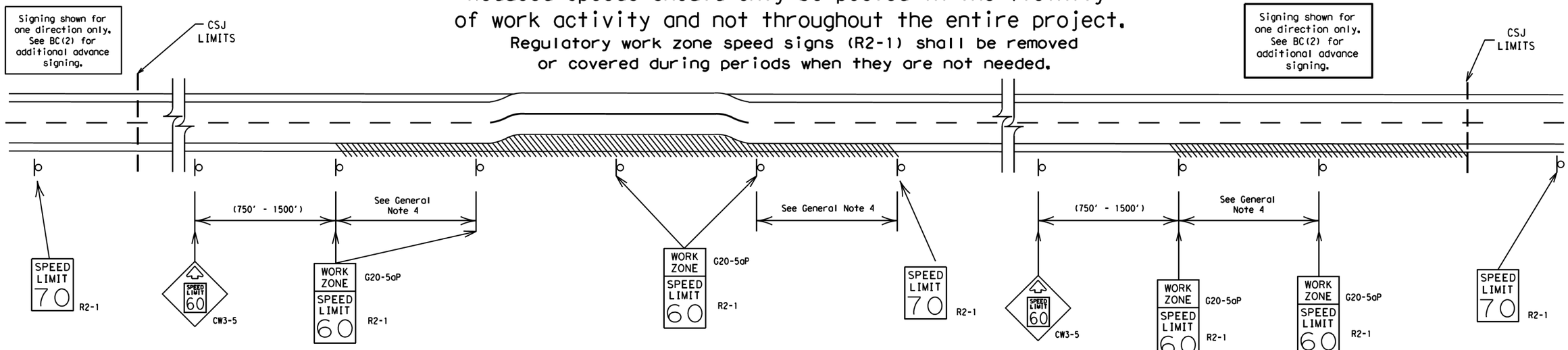
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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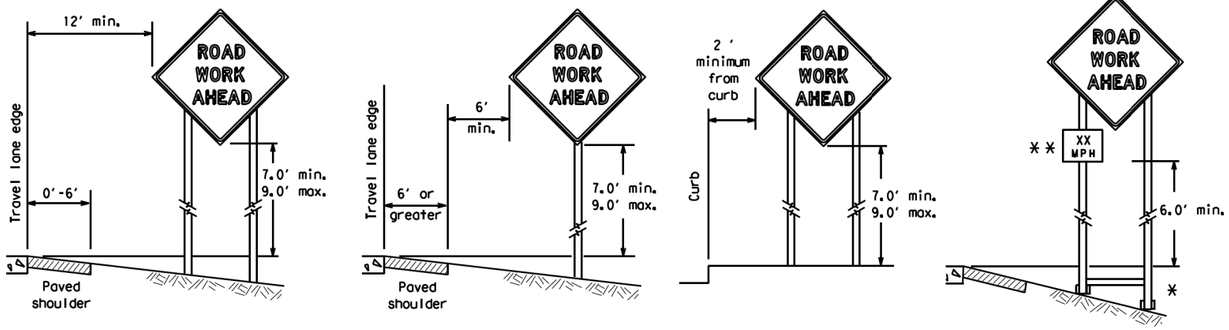
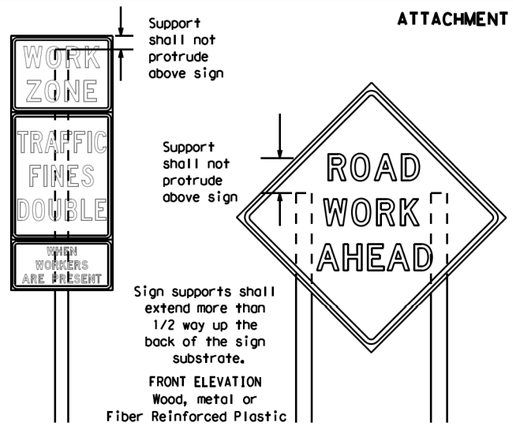
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

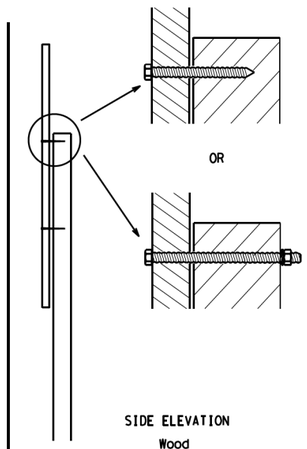


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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





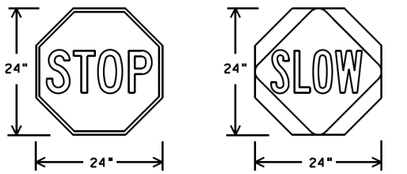
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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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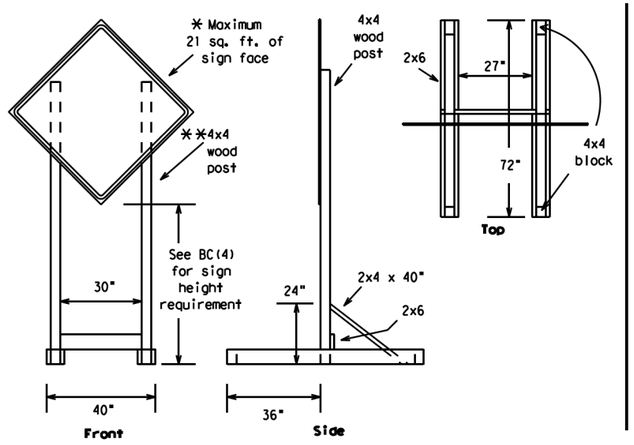
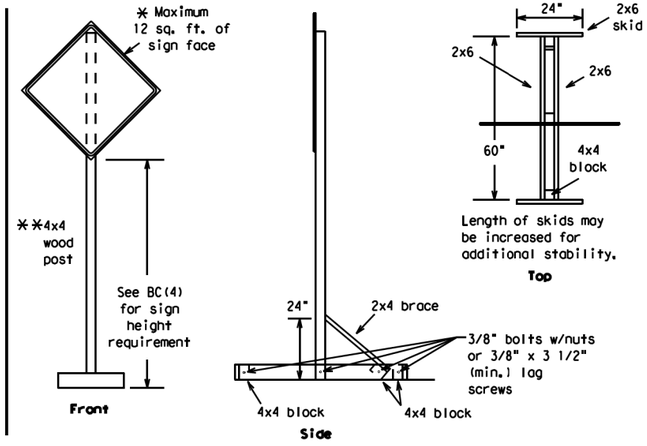
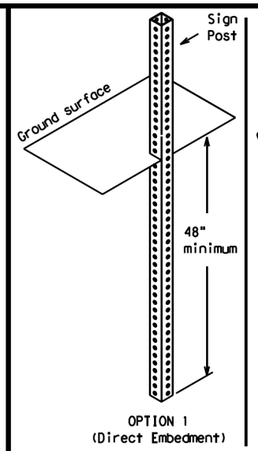
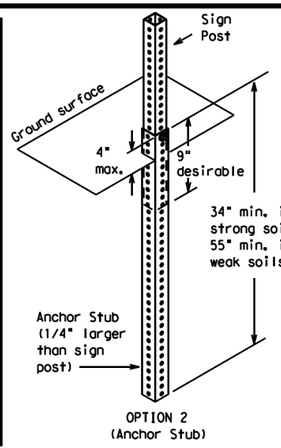


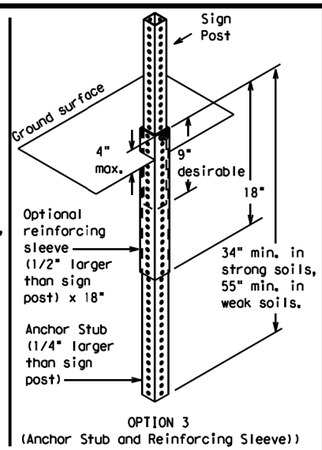


SKID MOUNTED WOOD SIGN SUPPORTS

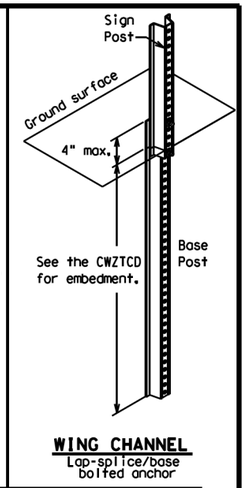
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







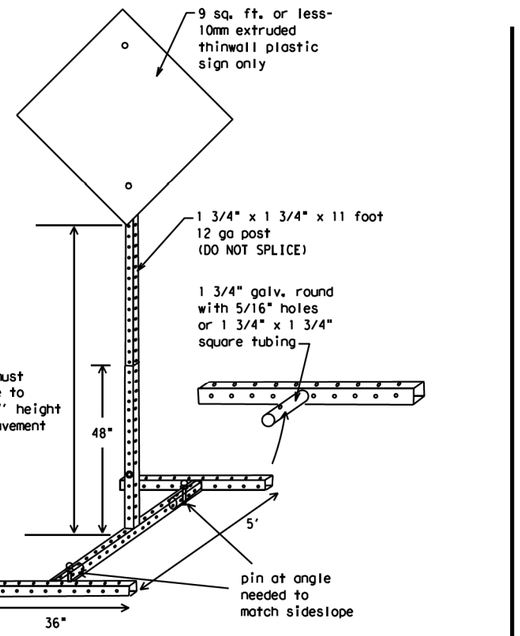
PERFORATED SQUARE METAL TUBING

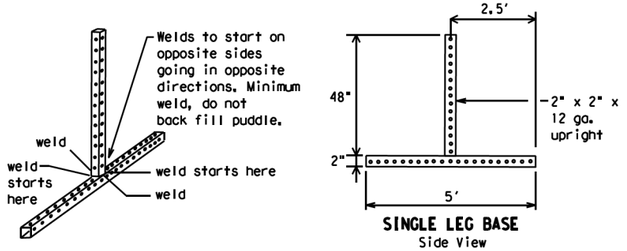


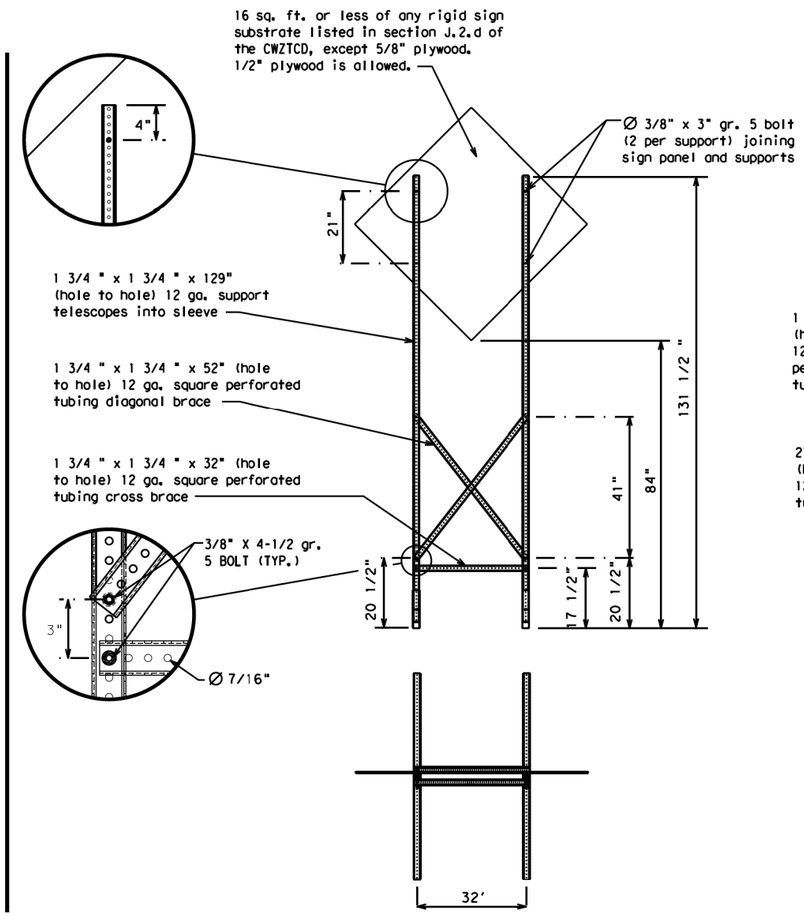
WING CHANNEL
Lap-splice/base bolted anchor

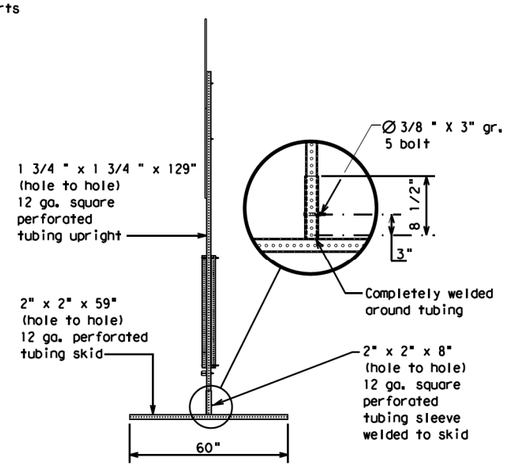
GROUND MOUNTED SIGN SUPPORTS

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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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

* 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

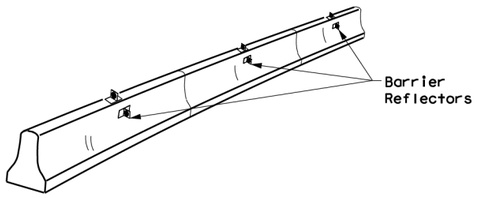
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

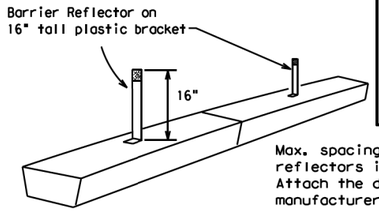
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 421
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	CRP	BEE		15

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.

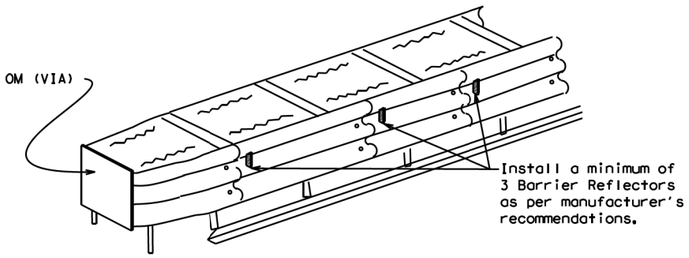


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) 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.

LOW PROFILE CONCRETE BARRIER (LPCB)

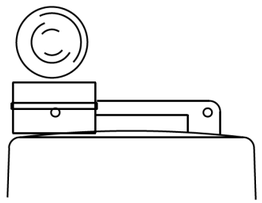


DELINEATION OF END TREATMENTS

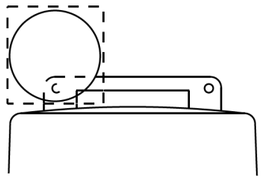
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

WARNING LIGHTS

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{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

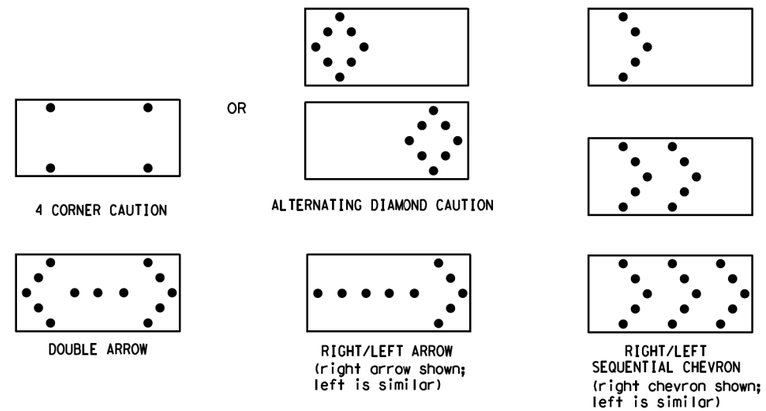
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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 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	0916	25	019	CR 421
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	CRP	BEE		16

DATE:
FILE:

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:

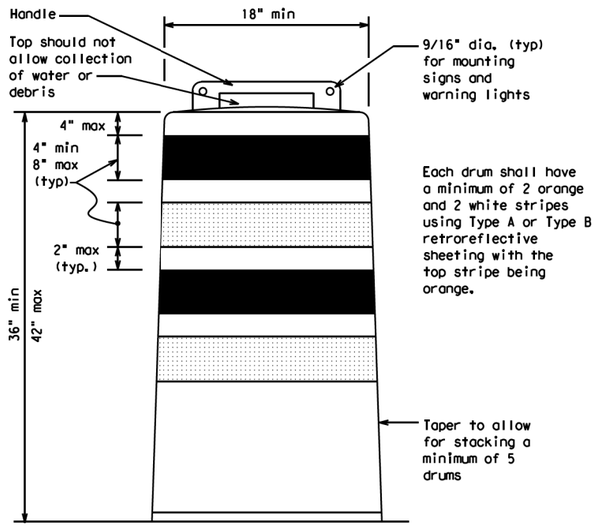
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents 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.

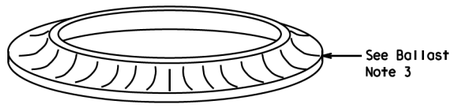
RETROREFLECTIVE SHEETING

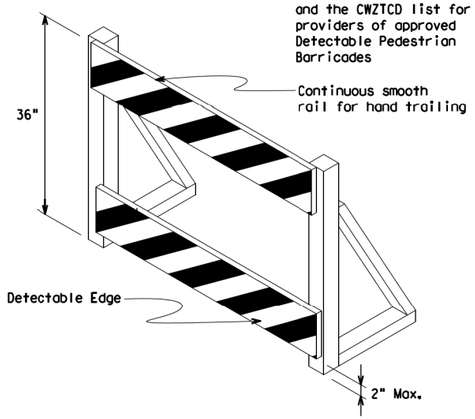
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall 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.

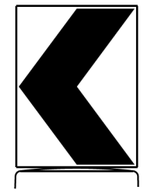




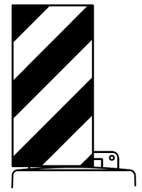


DETECTABLE PEDESTRIAN BARRICADES

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

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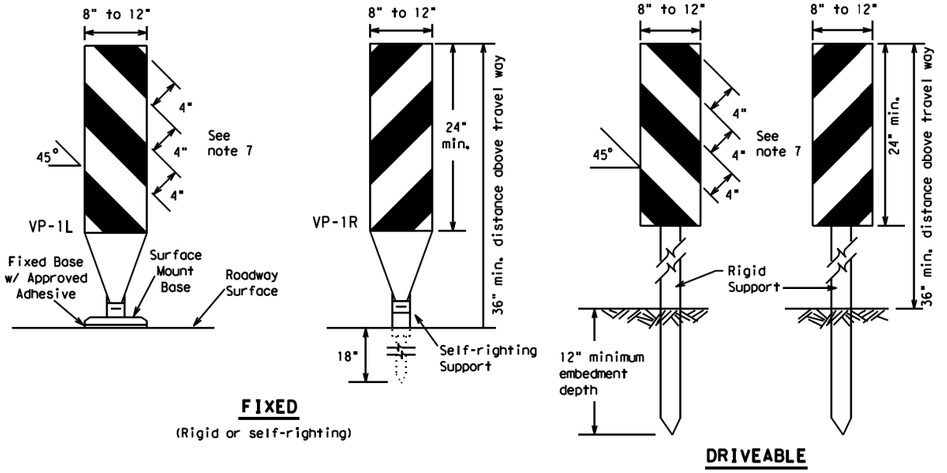
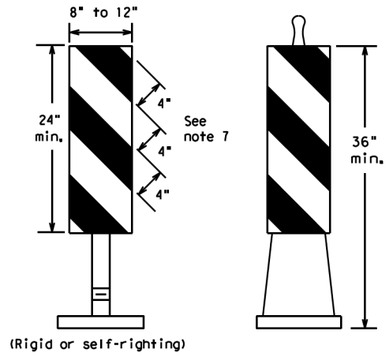


FIXED
(Rigid or self-righting)

DRIVEABLE

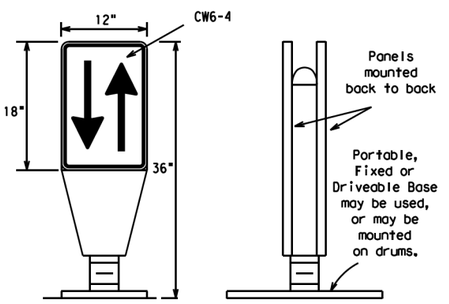


(Rigid or self-righting)

PORTABLE

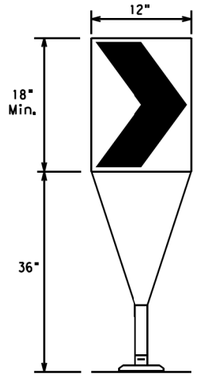
VERTICAL PANELS (VPs)

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)



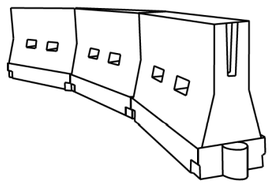
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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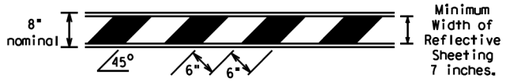
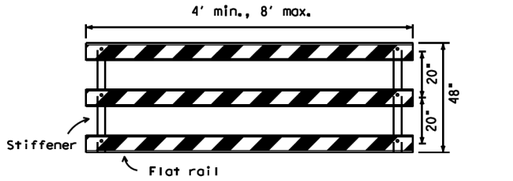
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road, striping should slope downward in both directions toward the center of roadway.
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.



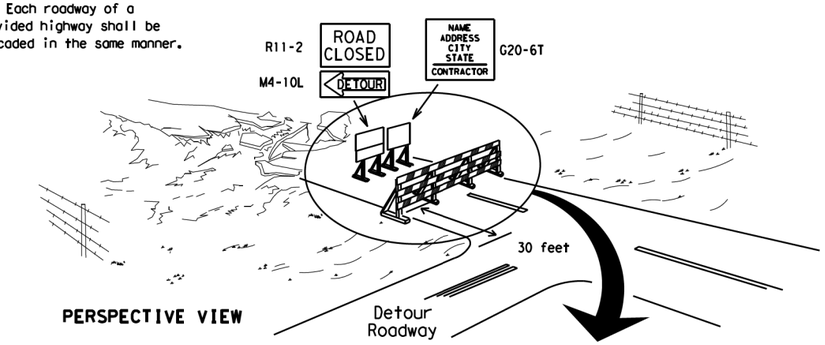
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

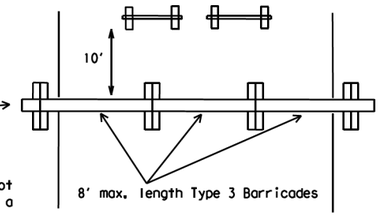
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

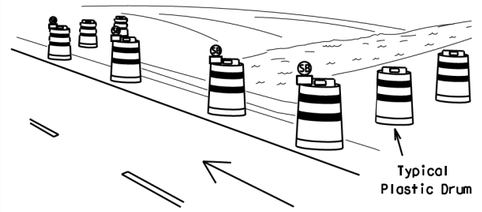
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

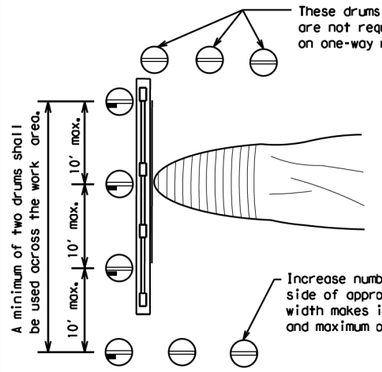
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

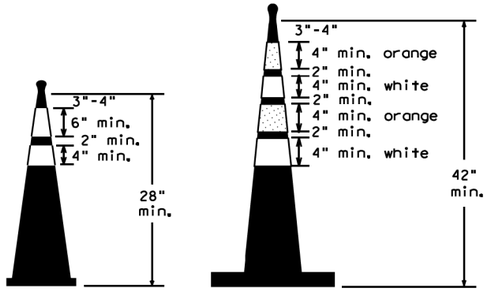
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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.



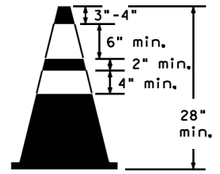
LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

PLAN VIEW

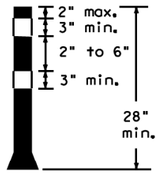
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



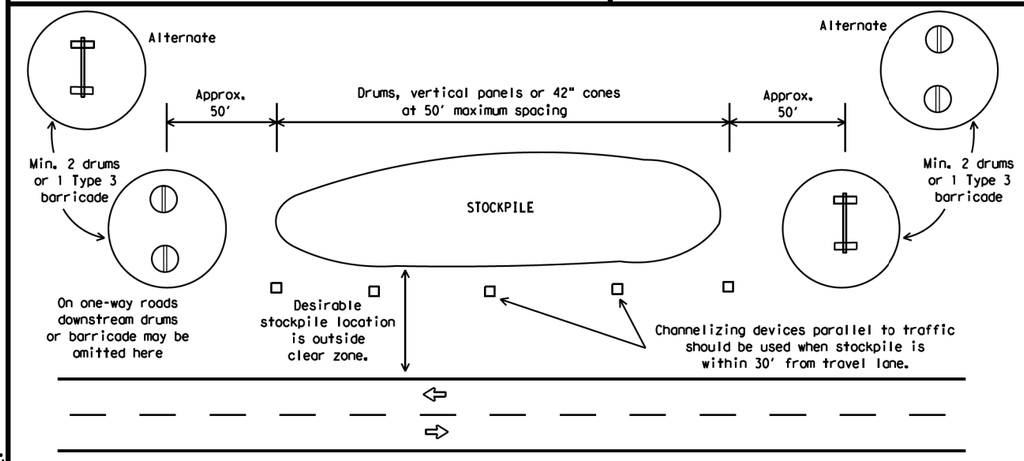
One-Piece cones



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.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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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.

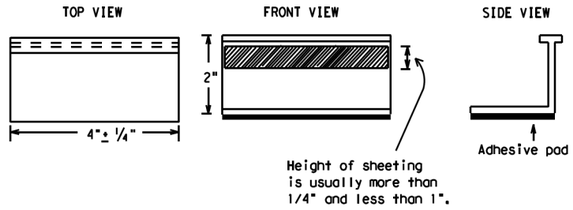
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

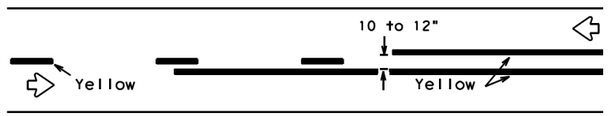
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 421
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	CRP	BEE		20
11-02 8-14				

DATE:
FILE:

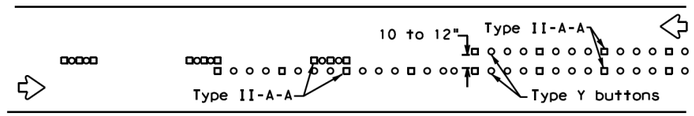
105

DATE:
FILE:

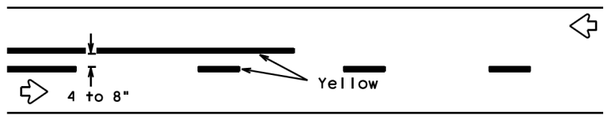
PAVEMENT MARKING PATTERNS



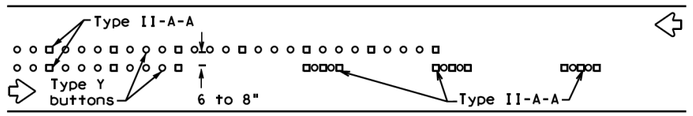
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



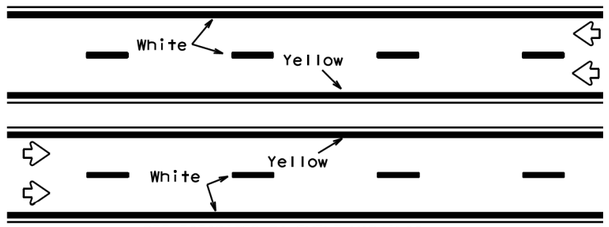
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



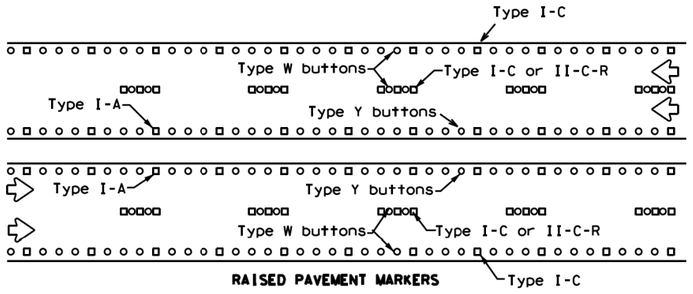
RAISED PAVEMENT MARKERS - PATTERN B

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



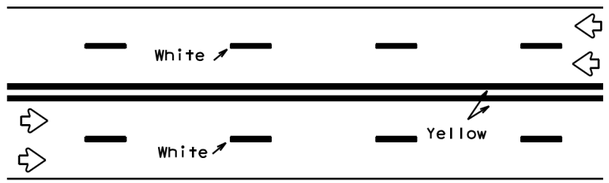
REFLECTORIZED PAVEMENT MARKINGS



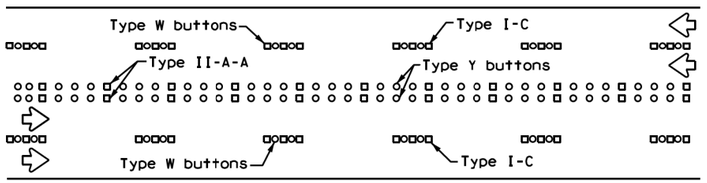
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



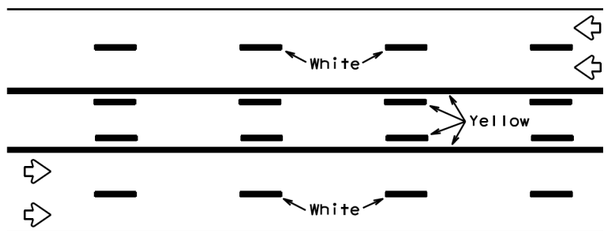
REFLECTORIZED PAVEMENT MARKINGS



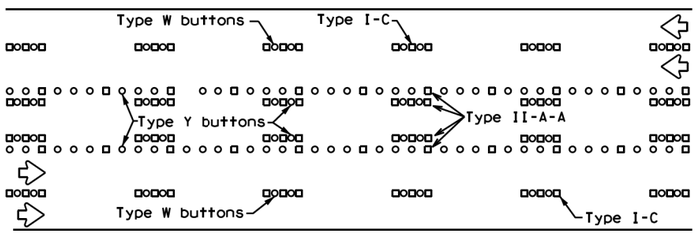
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

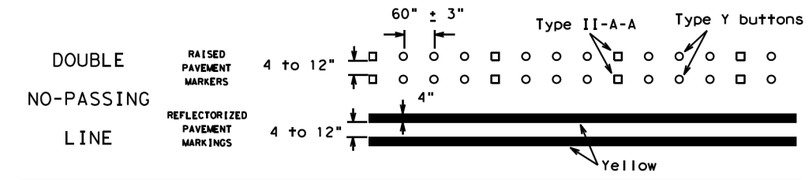
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

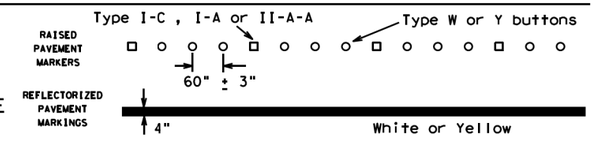
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

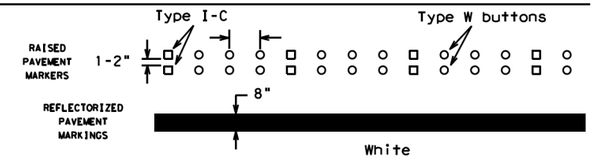


EDGE LINE OR SINGLE NO-PASSING LINE



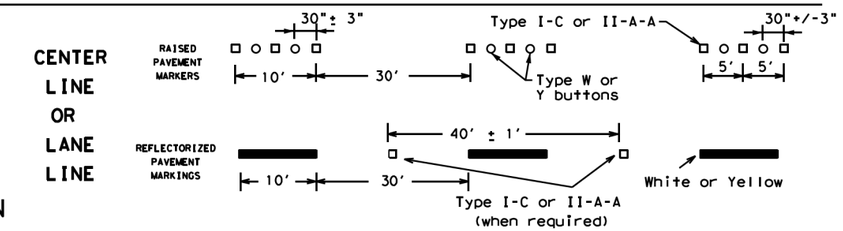
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

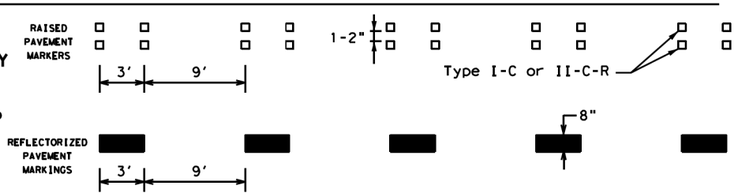


BROKEN LINES

CENTER LINE OR LANE LINE

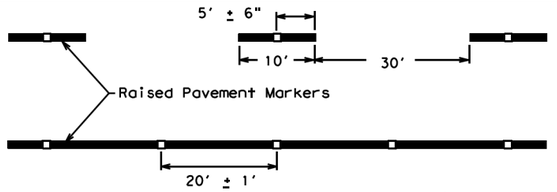


AUXILIARY OR LANEDROP LINE



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

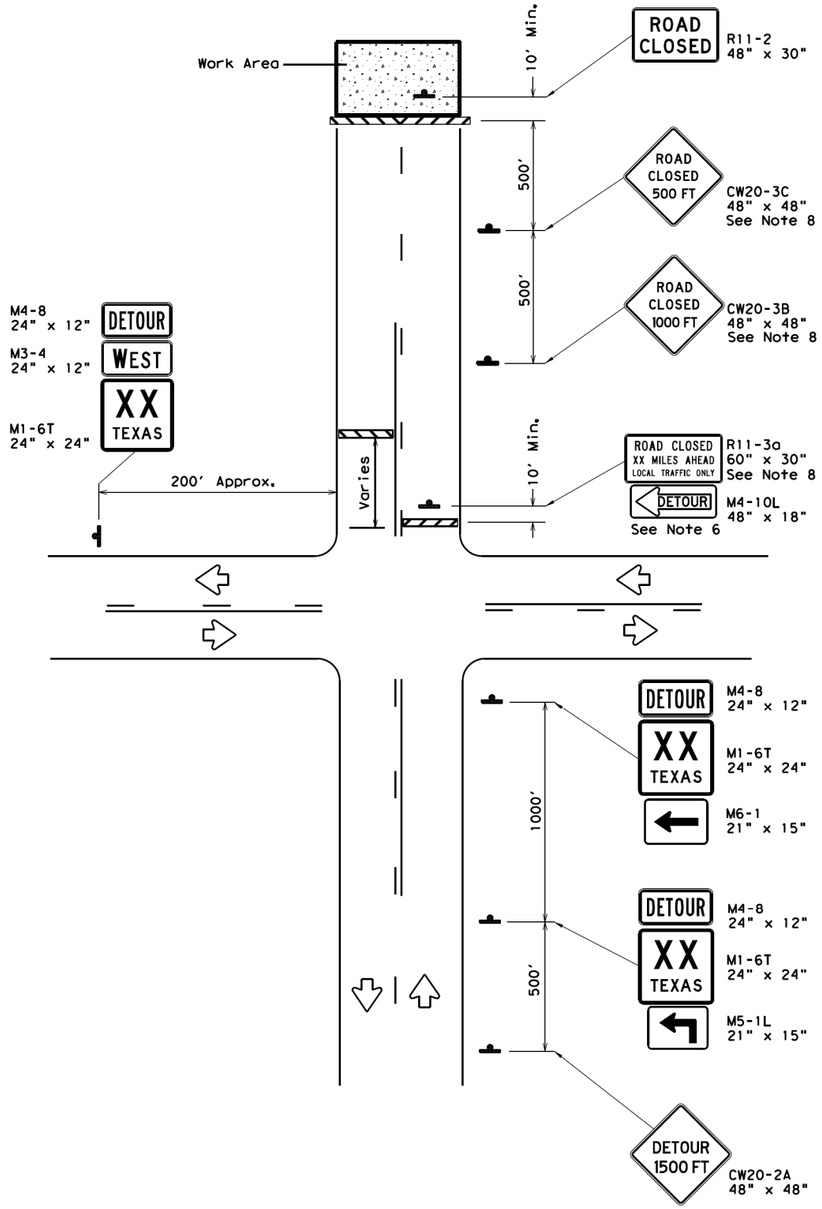
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

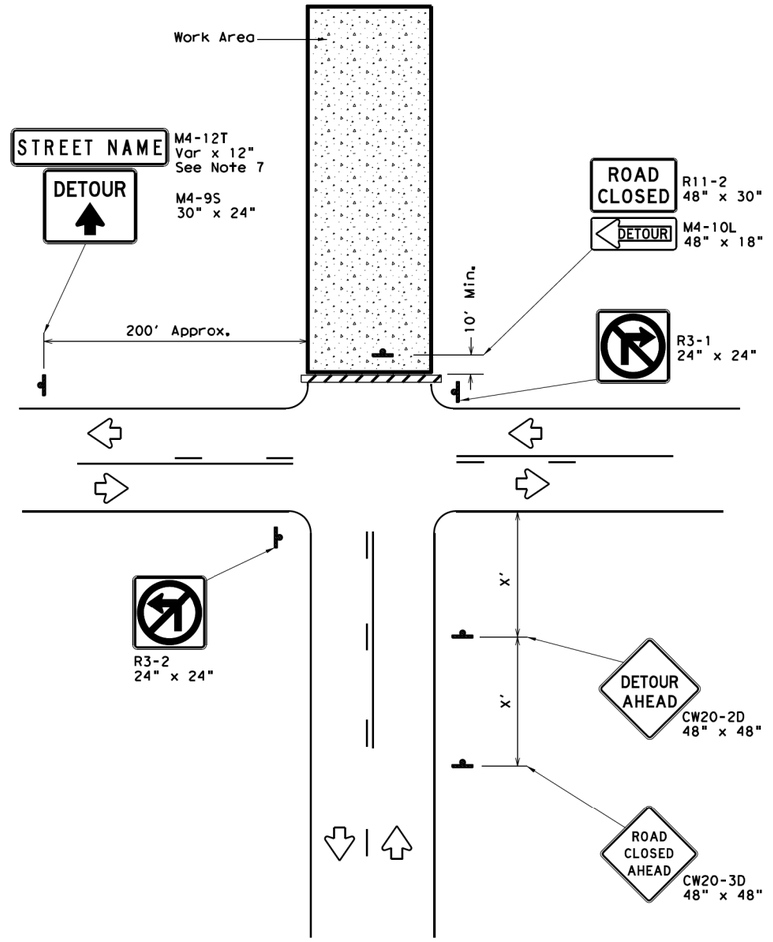
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0916	25	019	CR 421
	DIST	COUNTY		SHEET NO.
	CRP	BEE		21

DATE:
FILE:



ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

Posted Speed *	Minimum Sign Spacing "X" Distance
30	120'
35	160'
40	240'
45	320'
50	400'
55	500'
60	600'
65	700'
70	800'
75	900'

* Conventional Roads Only

GENERAL NOTES

1. This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&OM standards.
2. Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices list (CWZTCD).
3. Stockpiled materials shall not be placed on the traffic side of barricades.
4. Barricades at the road closure should extend from pavement edge to pavement edge.
5. Detour signing shown is intended to illustrate the type of signing that is appropriate for numbered routes or un-numbered routes as labeled. It does not indicate the full extent of detour signing required. Detour routes should be signed as shown elsewhere in the plans.
6. If the road is open for a significant distance beyond the intersection or there are significant origin/destination points beyond the intersection, the signs and barricades at this location should be located at the edge of the traveled way.
7. The Street Name (M4-12T) sign is to be placed above the DETOUR (M4-9S) sign.
8. For urban areas where there is a shorter distance between the intersection and the actual closure location, the ROAD CLOSED XX MILES AHEAD (R11-3a) sign may be replaced with a ROAD CLOSED TO THRU TRAFFIC (R11-4) sign. If adequate space does not exist between the intersection and the closure a single ROAD CLOSED AHEAD (CW20-3D) sign spaced as per the table above may replace the ROAD CLOSED 1000 FT (CW20-3B) and ROAD CLOSED 500 FT (CW20-3C) signs.
9. Signs and barricades shown shall be subsidiary to Item 502. Locations where these details will be required shall be as shown elsewhere in the plans.

Texas Department of Transportation

Traffic Operations Division Standard

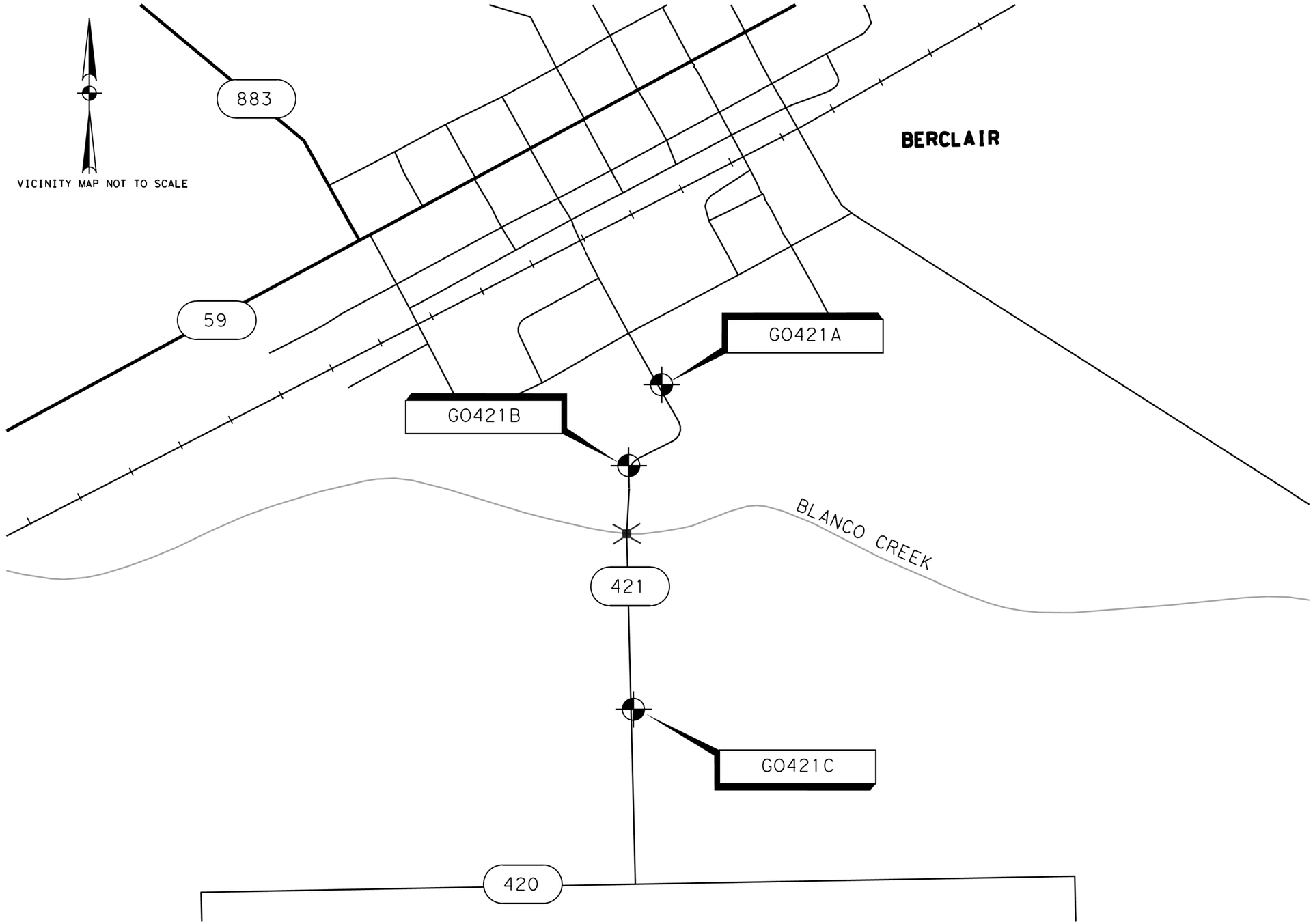
WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 421
1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03	CRP	BEE		22

113

MK MK MK MK



Point ID	Latitude (Global)	Longitude (Global)	Northing (Grid)	Easting (Grid)	Northing (Surface)	Easting (Surface)	Elevation	Ellipsoid Height (Global)	Feature Code
GO421A	28°31'34.90344"	-97°35'23.29413"	13,378,059.355	2,421,324.169	13,378,995.819	2,421,493.662	176.091	87.039	3 1/2-INCH ALUMINUM DISK TXDOT CONTROL MARK
GO421B	28°31'30.09437"	-97°35'25.57854"	13,377,571.225	2,421,126.272	13,378,507.655	2,421,295.751	172.724	83.673	3 1/2-INCH ALUMINUM DISK TXDOT CONTROL MARK
GO421C	28°31'15.52117"	-97°35'25.46270"	13,376,099.586	2,421,154.344	13,377,035.913	2,421,323.825	178.088	89.032	3 1/2-INCH ALUMINUM DISK TXDOT CONTROL MARK

NOTES:
BEARING BASIS BEING GRID NORTH, TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NAD83 (NAD83 (2011 ADJUSTMENT) EPOCH 2010), DETERMINED BY GPS OBSERVATIONS, CALCULATED FROM THEIR TXDOT REAL TIME NETWORK (RTN) STATION BEEVILLE (TXBE). ALL COORDINATES AND DISTANCES SHOWN ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY THE TXDOT COUNTY WIDE SCALE FACTOR OF 1.00007. ALL ELEVATIONS SHOWN HEREIN ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AS DETERMINED BY THE TXDOT REAL TIME NETWORK (RTN) GEOID 18.

PROJECT BENCHMARK: D 1526

LOCATED ON THE WEST RIGHT-OF-WAY OF SOUTHBOUND STATE HIGHWAY 181, 104.7 FEET SOUTHEAST OF A SIGN POST, 54.1 FEET NORTHEAST OF THE EAST EDGE OF THE FRONTAGE ROAD, 38.1 FEET SOUTHWEST OF THE WEST EDGE OF STATE HIGHWAY 181, 10.5 FEET SOUTH-SOUTHEAST OF A WITNESS POST, 1.3 FEET BELOW THE LEVEL OF THE HIGHWAY AND IS SET IN THE TOP OF A 22-INCH ROUND CONCRETE POST.

SURFACE
NORTHING: 13,333,441.663 (MEASURED)
EASTING: 2,378,420.562 (MEASURED)
ELEV: 202.598' (PUBLISHED)

GRID
NORTHING: 13,332,508.41' (PUBLISHED)
EASTING: 2,378,254.09' (PUBLISHED)
ELEV: 202.598' (PUBLISHED)

STATE OF TEXAS REGISTERED MARK E. KEETON 6790 PROFESSIONAL LAND SURVEYOR

10/28/2022
MARK E KEETON DATE
RPLS NO. 6790

NO.	REVISIONS	BY	DATE

Jacobs
1999 BRYAN ST., SUITE 3500
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

CR 421

ROADWAY
SURVEY CONTROL

SHEET 1 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
			23
STATE	DISTRICT	COUNTY	
TEXAS	CRP	BEE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0916	25	019	CR 421

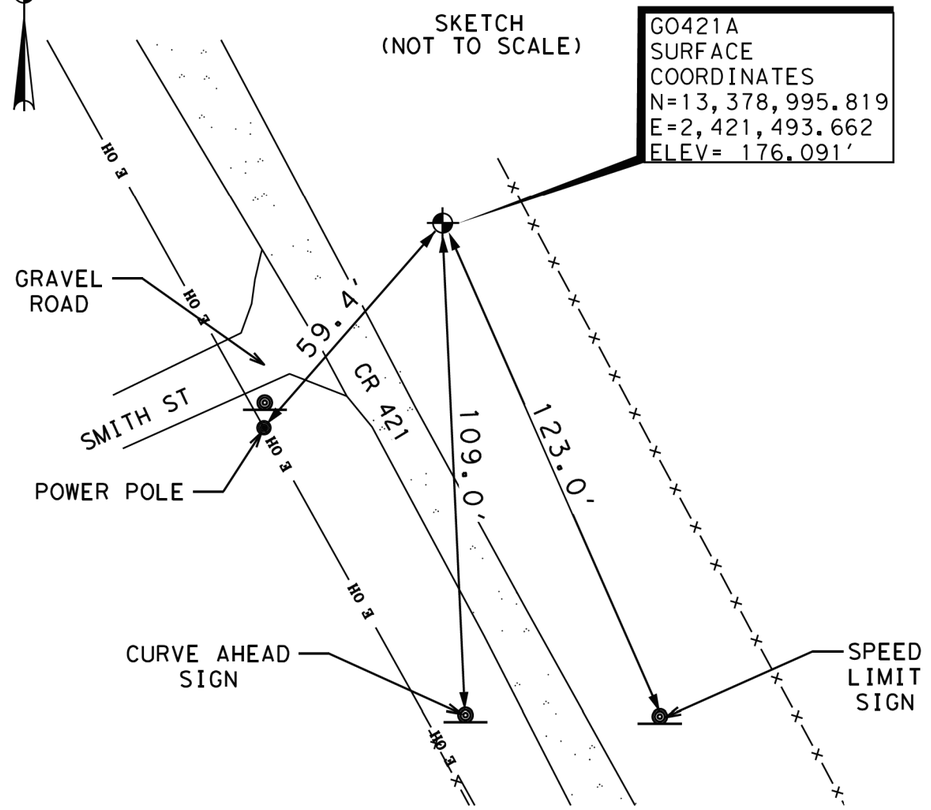
10/28/2022 2:28:33 PM RETANAP
J:\JOB\WFX08701-36-01DP5087 W&E\ TxDOT FTW District Off System Bridges\700 CADD\713 Survey\713.4 Control Surveys\CONTROL\WALNUT CREEK\WFX08701WCCTRL.dgn

MK
MK
MK
MK

CONTROL MONUMENT DESCRIPTION:

A 3-1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "G0421A".

SKETCH
(NOT TO SCALE)



G0421A

APPROXIMATE LOCATION:

A 3-1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "G0421A" LOCATED IN THE EAST RIGHT-OF-WAY OF COUNTY ROAD 421, APPROXIMATELY 30 FEET NORTHEAST OF THE CENTERLINE INTERSECTION OF SMITH ST AND CR 421, APPROXIMATELY 59.4 FEET NORTHEAST OF A WOOD POWER POLE, APPROXIMATELY 109.0 FEET NORTH OF A "CURVE AHEAD" SIGN, AND APPROXIMATELY 123.0 FEET NORTHWEST OF A SPEED LIMIT SIGN.

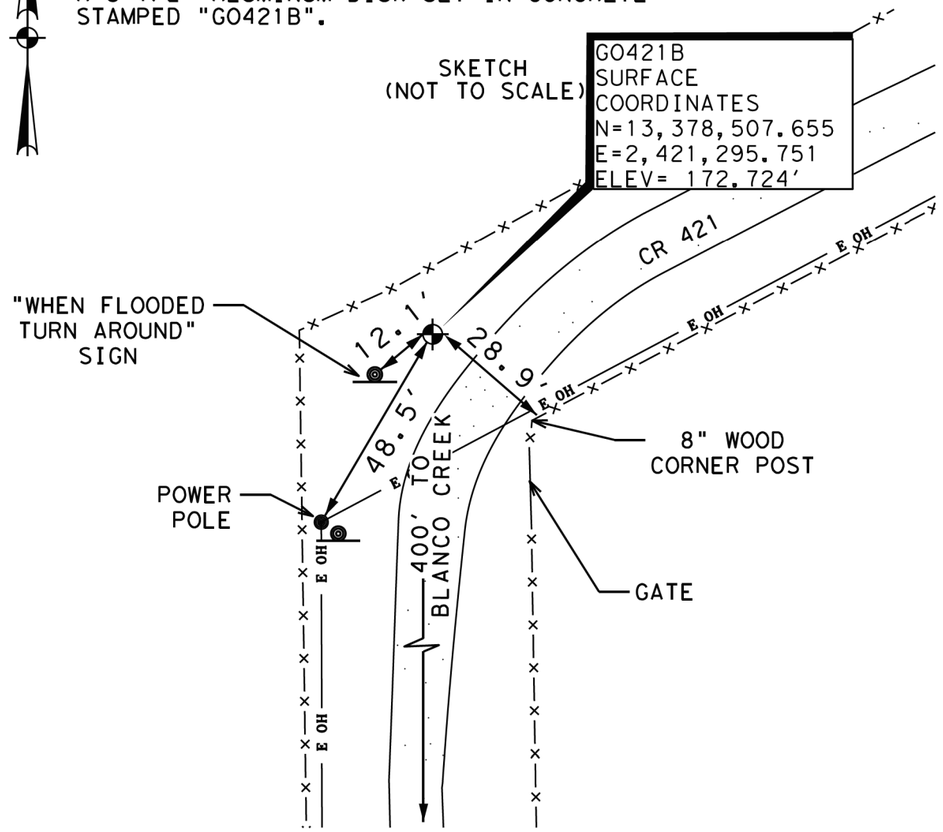
US SURVEY FEET
TEXAS SOUTH CENTRAL ZONE 4204
NORTH AMERICAN DATUM OF 1983 (NAD83)
GEOID 18 MODEL
DATE SET: OCTOBER 3, 2022
TXDOT SURFACE ADJUSTMENT FACTOR: 1.00007

GRID NORTHING:	13,378,059.355
GRID EASTING:	2,421,324.169
SURFACE NORTHING:	13,378,995.819
SURFACE EASTING:	2,421,493.662
NAVD88 ELEVATION:	176.091'

CONTROL MONUMENT DESCRIPTION:

A 3-1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "G0421B".

SKETCH
(NOT TO SCALE)



G0421B

APPROXIMATE LOCATION:

A 3-1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "G0421B" LOCATED IN THE WEST RIGHT-OF-WAY OF COUNTY ROAD 421, APPROXIMATELY 400 FEET NORTH OF THE APPARENT CENTERLINE OF BLANCO CREEK, APPROXIMATELY 12.1 FEET NORTHEAST OF A "WHEN FLOODED TURN AROUND" SIGN, APPROXIMATELY 48.5 FEET NORTHEAST OF A WOOD POWER POLE, AND APPROXIMATELY 28.9 FEET NORTHWEST OF A 8-INCH WOOD CORNER POST.

US SURVEY FEET
TEXAS SOUTH CENTRAL ZONE 4204
NORTH AMERICAN DATUM OF 1983 (NAD83)
GEOID 18 MODEL
DATE SET: OCTOBER 3, 2022
TXDOT SURFACE ADJUSTMENT FACTOR: 1.00007

GRID NORTHING:	13,377,571.225
GRID EASTING:	2,421,126.272
SURFACE NORTHING:	13,378,507.655
SURFACE EASTING:	2,421,295.751
NAVD88 ELEVATION:	172.724'

NOTES:
BEARING BASIS BEING GRID NORTH, TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NAD83 (NAD83 (2011 ADJUSTMENT) EPOCH 2010), DETERMINED BY GPS OBSERVATIONS, CALCULATED FROM THEIR TXDOT REAL TIME NETWORK (RTN) STATION BEEVILLE (TXBE). ALL COORDINATES AND DISTANCES SHOWN ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY THE TXDOT COUNTY WIDE SCALE FACTOR OF 1.00007. ALL ELEVATIONS SHOWN HEREIN ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AS DETERMINED BY THE TXDOT REAL TIME NETWORK (RTN) GEOID 18.

PROJECT BENCHMARK: D 1526

LOCATED ON THE WEST RIGHT-OF-WAY OF SOUTHBOUND STATE HIGHWAY 181, 104.7 FEET SOUTHEAST OF A SIGN POST, 54.1 FEET NORTHEAST OF THE EAST EDGE OF THE FRONTAGE ROAD, 38.1 FEET SOUTHWEST OF THE WEST EDGE OF STATE HIGHWAY 181, 10.5 FEET SOUTH-SOUTHEAST OF A WITNESS POST, 1.3 FEET BELOW THE LEVEL OF THE HIGHWAY AND IS SET IN THE TOP OF A 22-INCH ROUND CONCRETE POST.

SURFACE		
NORTHING:	13,333,441.663	(MEASURED)
EASTING:	2,378,420.562	(MEASURED)
ELEV:	202.598'	(PUBLISHED)

GRID		
NORTHING:	13,332,508.41'	(PUBLISHED)
EASTING:	2,378,254.09'	(PUBLISHED)
ELEV:	202.598'	(PUBLISHED)

STATE OF TEXAS
REGISTERED
MARK E. KEETON
6790
PROFESSIONAL
LAND SURVEYOR

10/28/2022

MARK E KEETON
RPLS NO. 6790

DATE

REVISIONS	BY	DATE

Jacobs
1999 BRYAN ST., SUITE 3500
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration # F-2966

Texas Department of Transportation

CR 421

ROADWAY
SURVEY CONTROL

SHEET 2 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
			24
STATE	DISTRICT	COUNTY	
TEXAS	CRP	BEE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0916	25	019	CR 421

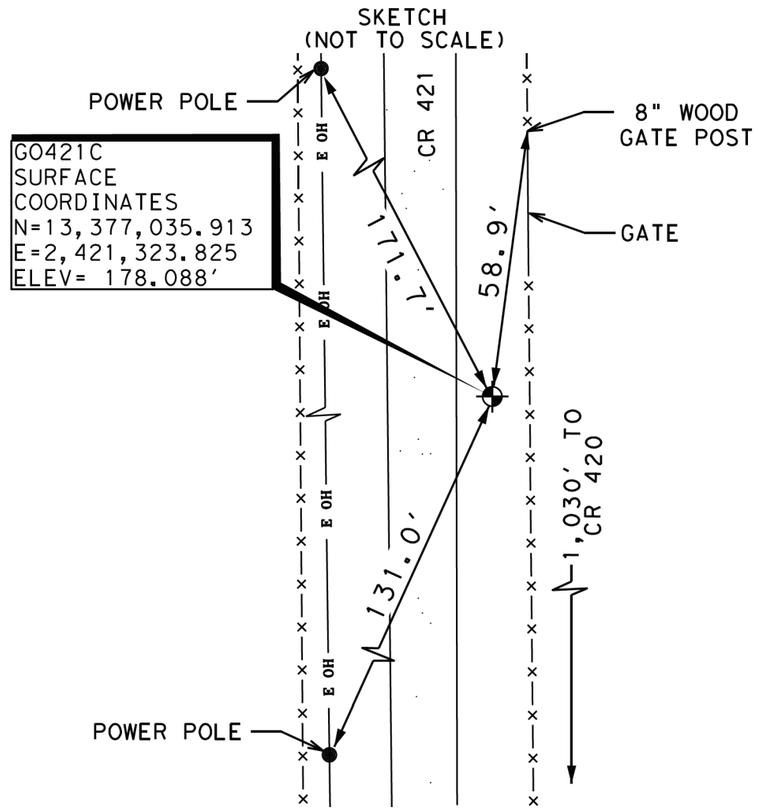
10/28/2022 2:27:19 PM RETANAP
J:\JOB\WJXN5202-36-91DP5090 WA#2 TxDOT Corpus District Bridges\700 CADD\713 Survey\713.4 Control Surveys\GOLIAD\WJXN5202 CONTROL.dgn

MK MK MK MK MK

CONTROL MONUMENT DESCRIPTION:

A 3-1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "G0421C".

SKETCH
(NOT TO SCALE)



G0421C

APPROXIMATE LOCATION:

A 3-1/2" ALUMINUM DISK SET IN CONCRETE STAMPED "G0421C" LOCATED IN THE EAST RIGHT-OF-WAY OF CR 421, APPROXIMATELY 1,030 FEET NORTH OF THE CENTERLINE INTERSECTION OF COUNTY ROAD 420 AND COUNTY ROAD 421, APPROXIMATELY 131.0 FEET NORTHEAST OF A WOOD POWER POLE, APPROXIMATELY 58.9 FEET SOUTHWEST OF A 8-INCH WOOD POST AT THE NORTH END OF A GATE, AND APPROXIMATELY 171.7 FEET SOUTHEAST OF A WOOD POWER POLE.

US SURVEY FEET
TEXAS SOUTH CENTRAL ZONE 4204
NORTH AMERICAN DATUM OF 1983 (NAD83)
GEOID 18 MODEL
DATE SET: OCTOBER 3, 2022
TXDOT SURFACE ADJUSTMENT FACTOR: 1.00007

GRID NORTHING:	13,376,099.586
GRID EASTING:	2,421,154.344
SURFACE NORTHING:	13,377,035.913
SURFACE EASTING:	2,421,323.825
NAVD88 ELEVATION:	178.088'

NOTES:
BEARING BASIS BEING GRID NORTH, TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NAD83 (NAD83 (2011 ADJUSTMENT) EPOCH 2010), DETERMINED BY GPS OBSERVATIONS, CALCULATED FROM THEIR TXDOT REAL TIME NETWORK (RTN) STATION BEEVILLE (TXBE). ALL COORDINATES AND DISTANCES SHOWN ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY THE TXDOT COUNTY WIDE SCALE FACTOR OF 1.00007. ALL ELEVATIONS SHOWN HEREIN ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AS DETERMINED BY THE TXDOT REAL TIME NETWORK (RTN) GEOID 18.

PROJECT BENCHMARK: D 1526

LOCATED ON THE WEST RIGHT-OF-WAY OF SOUTHBOUND STATE HIGHWAY 181, 104.7 FEET SOUTHEAST OF A SIGN POST, 54.1 FEET NORTHEAST OF THE EAST EDGE OF THE FRONTAGE ROAD, 38.1 FEET SOUTHWEST OF THE WEST EDGE OF STATE HIGHWAY 181, 10.5 FEET SOUTH-SOUTHEAST OF A WITNESS POST, 1.3 FEET BELOW THE LEVEL OF THE HIGHWAY AND IS SET IN THE TOP OF A 22-INCH ROUND CONCRETE POST.

SURFACE

NORTHING:	13,333,441.663	(MEASURED)
EASTING:	2,378,420.562	(MEASURED)
ELEV:	202.598'	(PUBLISHED)

GRID

NORTHING:	13,332,508.41'	(PUBLISHED)
EASTING:	2,378,254.09'	(PUBLISHED)
ELEV:	202.598'	(PUBLISHED)

STATE OF TEXAS
REGISTERED
MARK E. KEETON
6790
PROFESSIONAL
LAND SURVEYOR

10/28/2022

MARK E KEETON
RPLS NO. 6790

DATE

REVISIONS	BY	DATE

Jacobs
1999 BRYAN ST, SUITE 3500
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

CR 421

ROADWAY
SURVEY CONTROL

SHEET 3 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
			25
STATE	DISTRICT	COUNTY	
TEXAS	CRP	BEE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0916	25	019	CR 421

10/28/2022 2:25:34 PM RETANAP
J:\JOB\WJXN5202-36-91DP5090 WA#2 TxDOT Corpus District Bridges\700 CADD\713 Survey\713.4 Control Surveys\GOLIAD\WJXN5202 CONTROL.dgn

Alignment Name:	*CR421*		
Alignment Description:			
	Station	*Easting*	*Northing*
POT	*100+80.0000 R1*	*2421295.1941*	*13378327.4964*
PI	*102+40.0000 R1*	*2421296.6574*	*13378167.5031*
Tangential Direction:	*S00°31'26.534"E*		
Tangential Length:	*160*		
PI	*102+40.0000 R1*	*2421296.6574*	*13378167.5031*
PI	*103+65.0000 R1*	*2421295.3068*	*13378042.5104*
Tangential Direction:	*S00°37'08.773"W*		
Tangential Length:	*125*		
PI	*103+65.0000 R1*	*2421295.3068*	*13378042.5104*
POT	*104+81.7652 R1*	*2421295.2584*	*13377925.7452*
Tangential Direction:	*S00°01'25.536"W*		
Tangential Length:	*116.77*		

DW: KP CK: KM DW: KP CK: KM

DATE: 3/28/2023 7:27 AM
FILE: c:\pw_workdir\txdot\dms58533\CR421HAD01.dgn

Jacobs Engineering Group
STATE OF TEXAS
KIRANKUMAR PATIL
129587
LICENSED
PROFESSIONAL ENGINEER
F-2966

03/28/2023

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Firm Registration: F-2966

Texas Department of Transportation

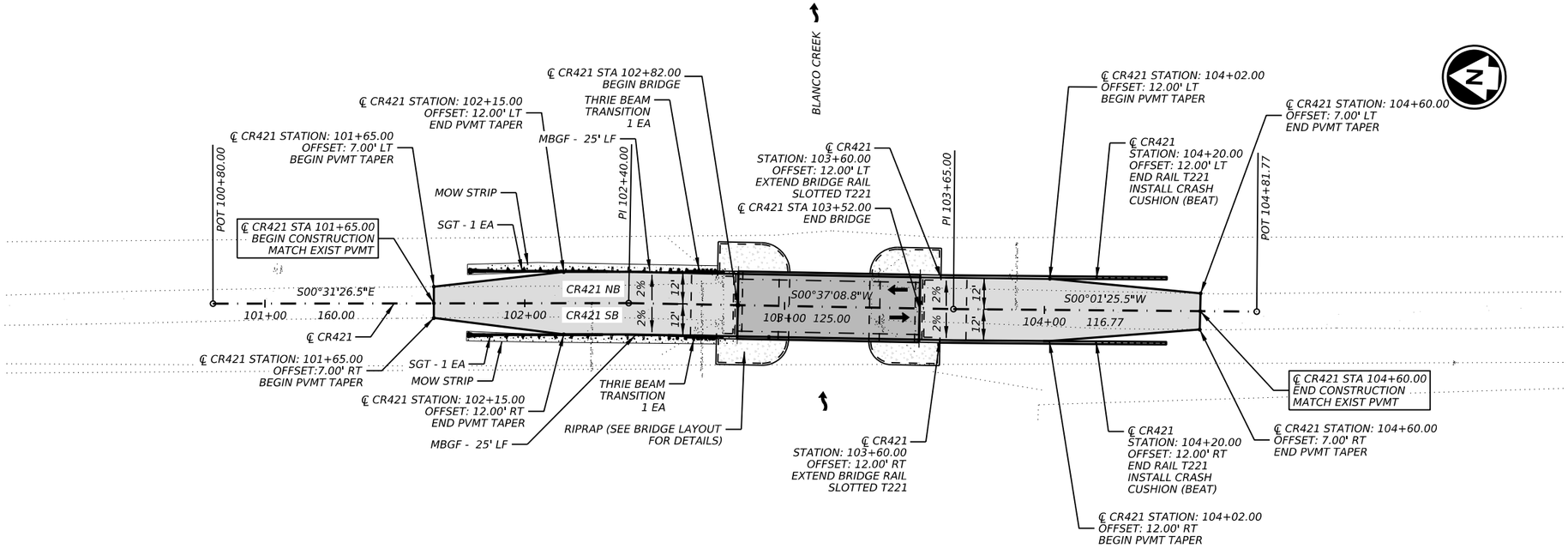
CR 421

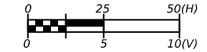
ROADWAY HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 421
DIST	COUNTY		SHEET NO.
CRP	BEE		26

DW: KP CK: KM
DW: KP CK: KM



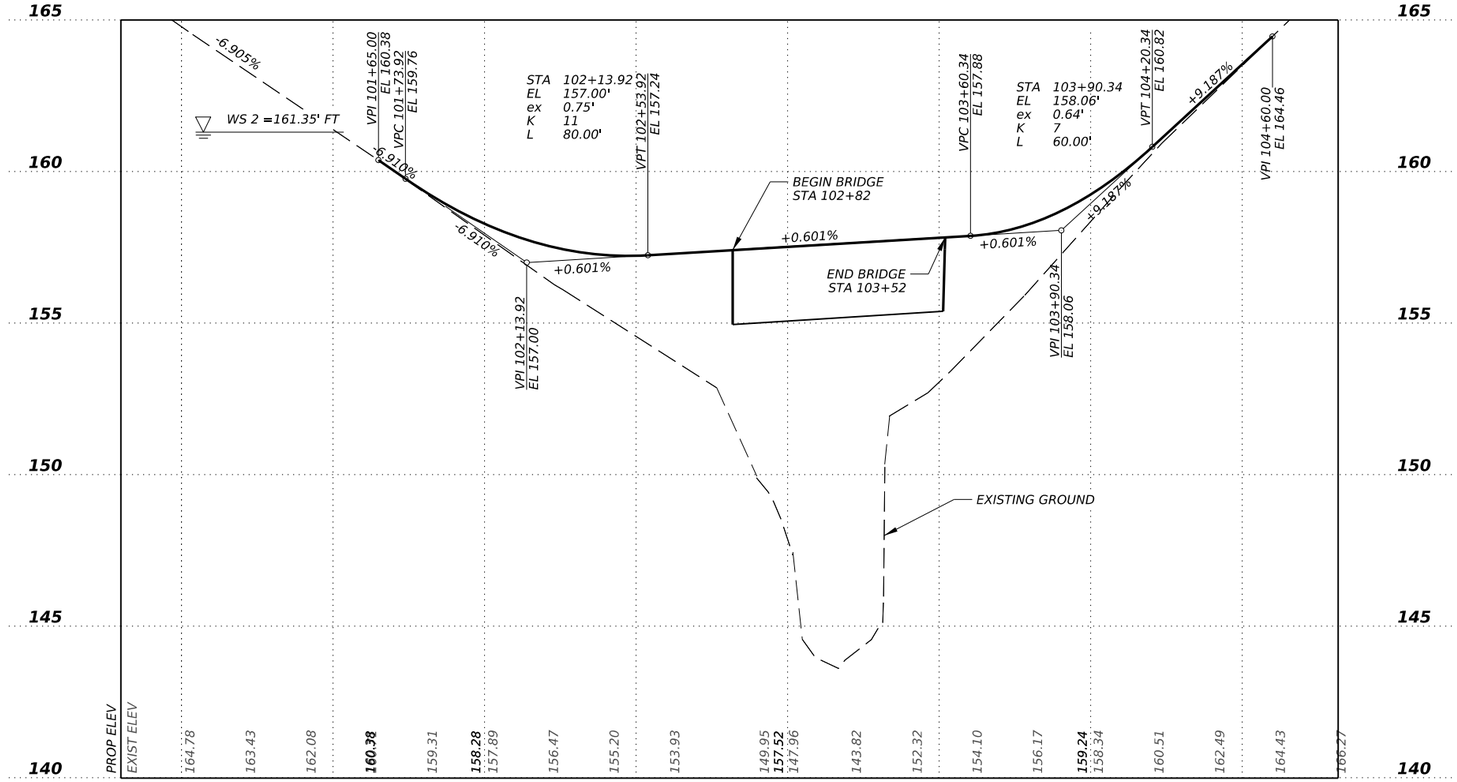


LEGEND

- PROPOSED CENTERLINE
- ASPHALT PAVEMENT
- PROPOSED BRIDGE
- PROPOSED TRAFFIC FLOW

NOTES:

1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR ADDITIONAL INFORMATION REGARDING HORIZONTAL ALIGNMENTS.
2. SEE TYPICAL SECTIONS FOR MORE INFORMATION REGARDING PAVING SECTION.



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03/28/2023

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Texas Department of Transportation

CR 421

ROADWAY PLAN & PROFILE

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 421
DIST	COUNTY		SHEET NO.
CRP	BEE		27

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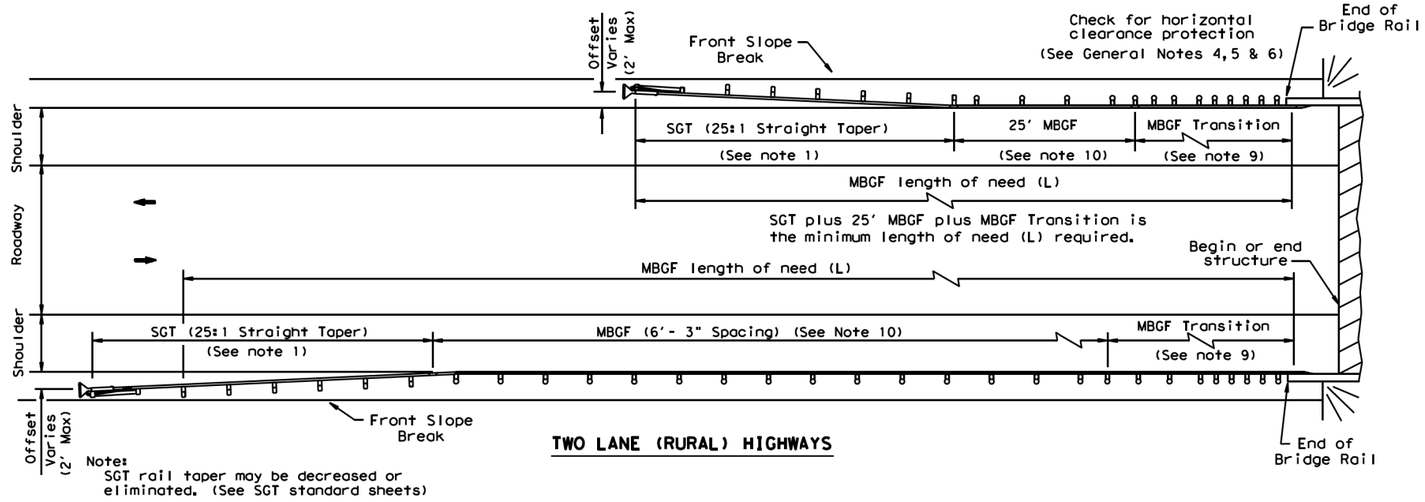
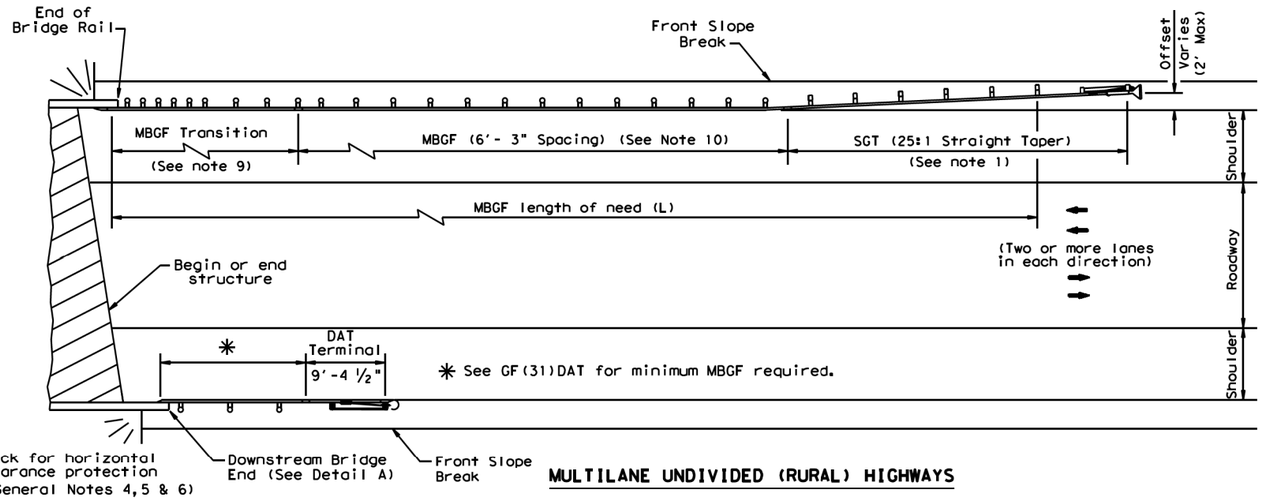
DATE:
FILE:

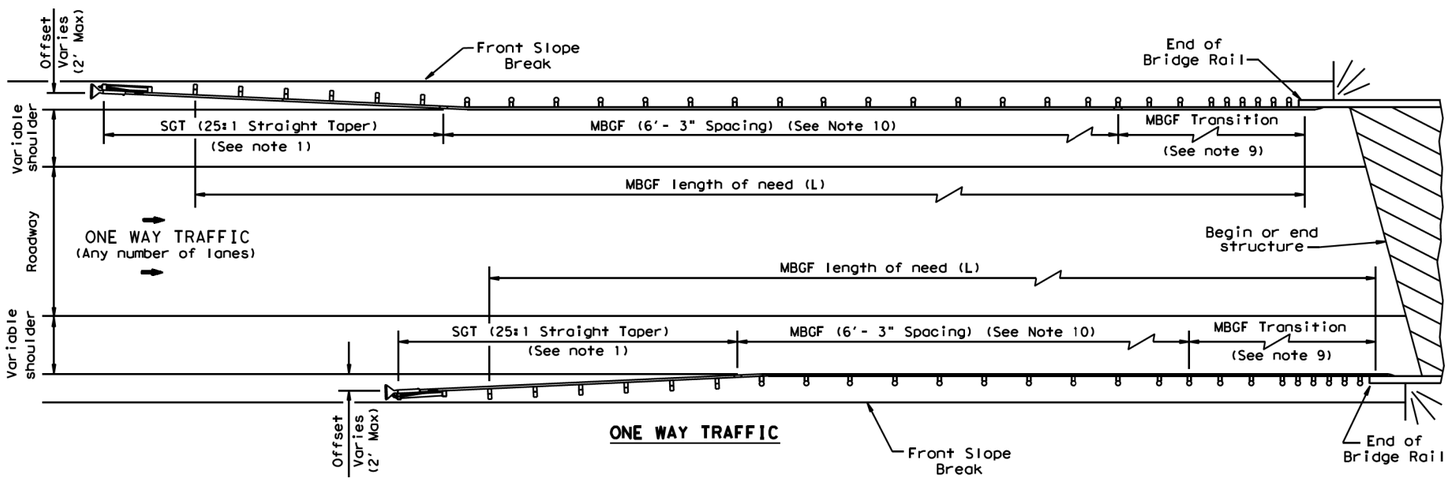


TWO LANE (RURAL) HIGHWAYS

Note:
SGT rail taper may be decreased or eliminated. (See SGT standard sheets)



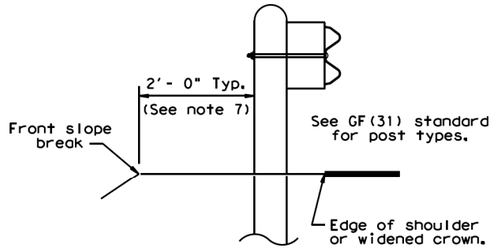
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



ONE WAY TRAFFIC

GENERAL NOTES

1. For more detail: See GF(31), SGT( )31, GF(31)TR, and GF(31)TL2 standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are as shown in the plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF to concrete rails are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (This requires a minimum of three standard line posts plus the DAT terminal, See Detail A)
7. The crown shall be widened to accommodate MBGF. Typically the "front slope" break should be 2'- 0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
8. <u>For restrictive bridge widths:</u> The MBGF should be properly transitioned from the existing bridge rail to the adjoining MBGF (See MBGF Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft. "maximum" offset from the shoulder edge in the approach direction.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
10. A minimum 25' length of MBGF will be required.



TYPICAL CROSS SECTION AT MBGF

Note:
All rail elements shall be lapped in the direction of adjacent traffic.

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

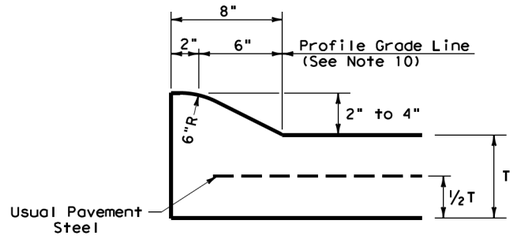
BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

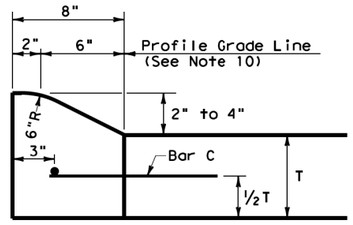
BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY		SHEET NO.
	CRP	BEE		28

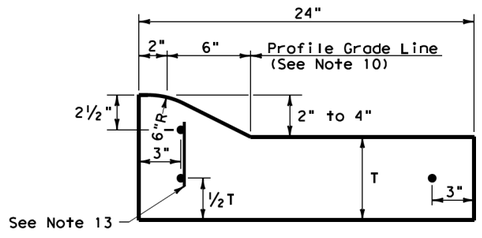
DATE:
FILE:



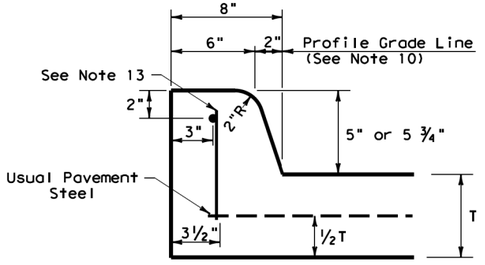
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



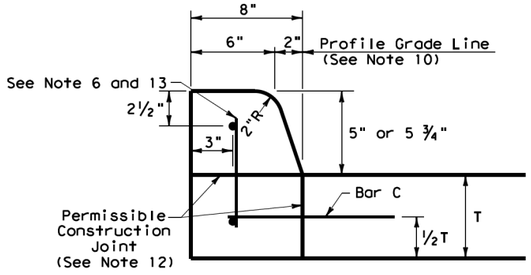
TYPE I CURB
2" - 4" HEIGHT



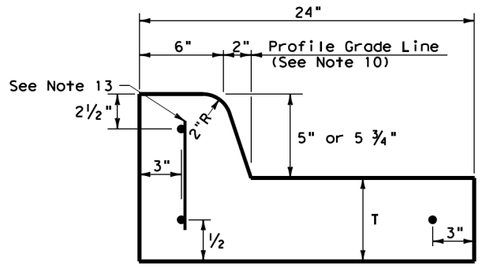
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



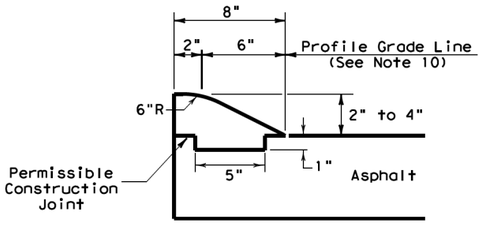
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



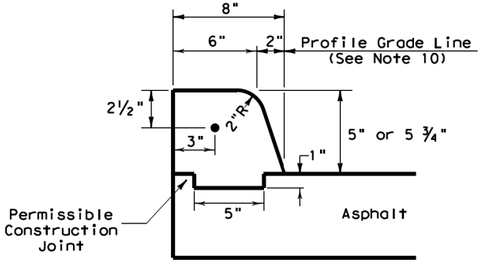
TYPE II CURB
5" - 5 ¾" HEIGHT



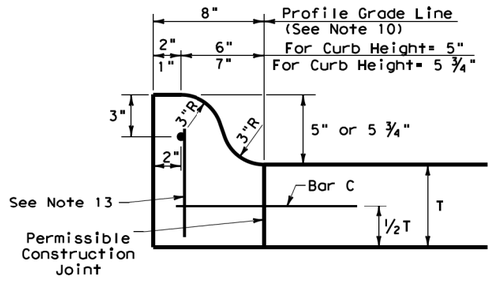
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



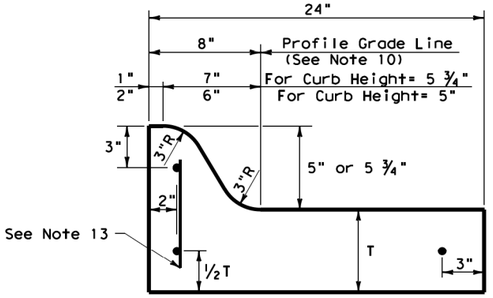
TYPE III CURB (KEYED)
2" - 4" HEIGHT



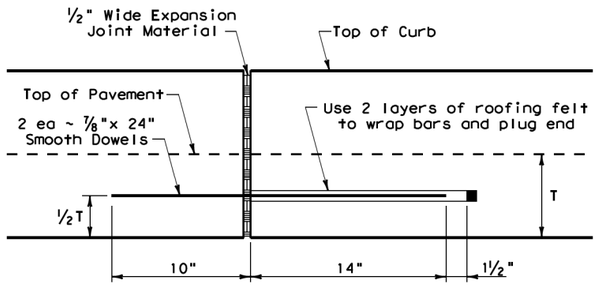
TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



TYPE IIa CURB
5" - 5 ¾" HEIGHT

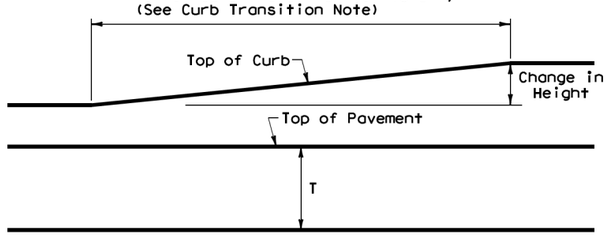


TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.

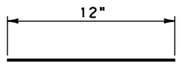


CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No. 4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and grouted in place, or may be inserted into fresh concrete.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C~C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B placement as needed (typically at four ft. C-C) to support curb reinforcing steel during concrete placement.

BAR B



BAR C

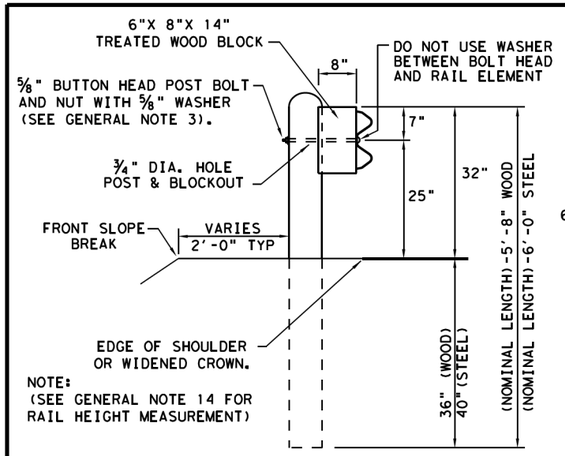
Texas Department of Transportation

Design Division Standard

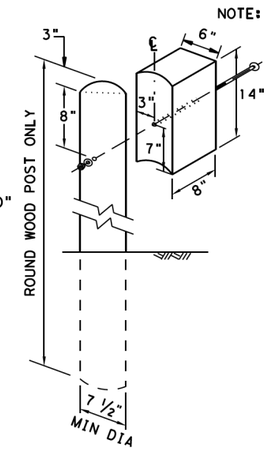
CONCRETE CURB AND CURB AND GUTTER

CCCG-22

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: CS	CK: KM
© TxDOT: JUNE 2022 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0447	04	018	CR 1188
	DIST	COUNTY		SHEET NO.
	CRP	BEE		29

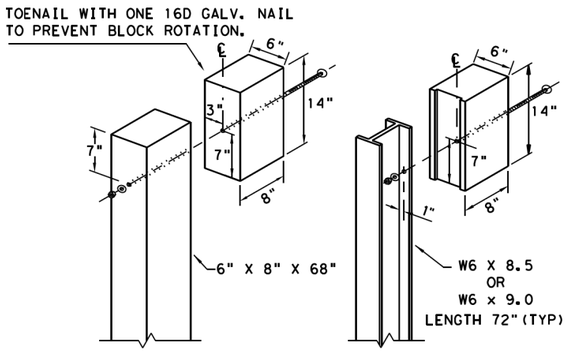


TYPICAL POST PLACEMENT



WOOD BLOCK TO ROUND WOOD POST

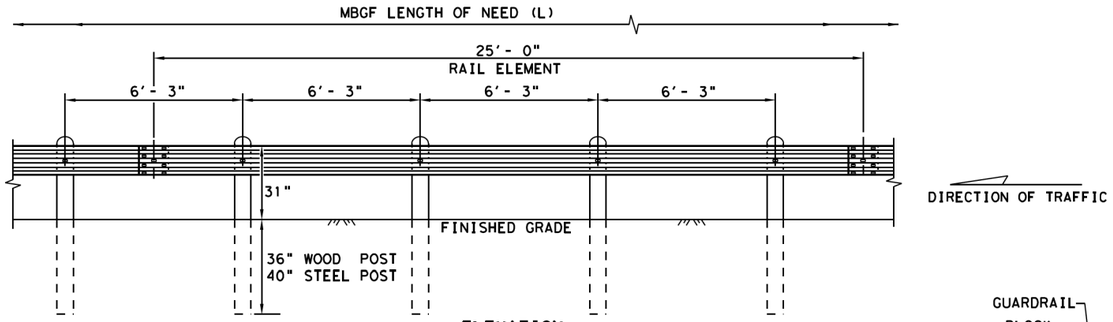
NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.



WOOD BLOCK TO RECTANGULAR WOOD POST

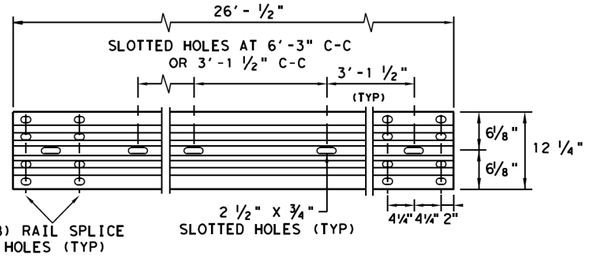
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



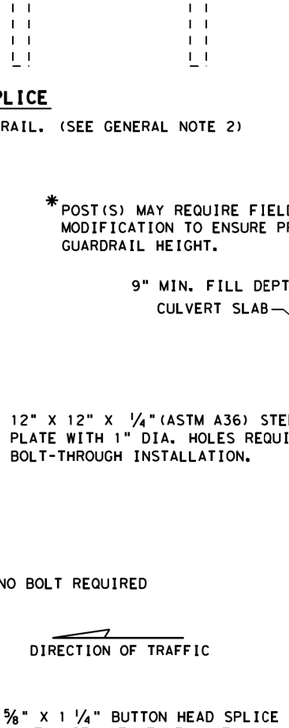
ELEVATION MID-SPAN RAIL SPLICE

SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)

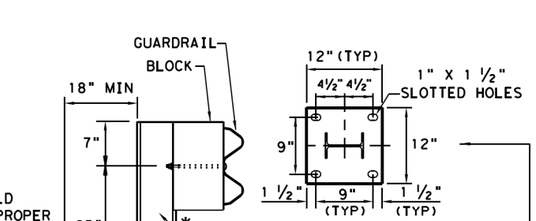


ELEVATION 25'- 0" (NOM.) W-BEAM SECTION

NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



* POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.



STEEL POST CONNECTION TO CULVERT SLAB (USE WHEN THERE IS LESS THAN 36" COVER OVER CULVERT SLAB).

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. ⅞" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
   NOTE: BOLT LENGTH = SLAB PLUS 2 ¼" MIN.

2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE ⅞" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS ¼" MIN. BEYOND NUT.

NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.

NOTE: TRANSISTIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS.
SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS.
SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.

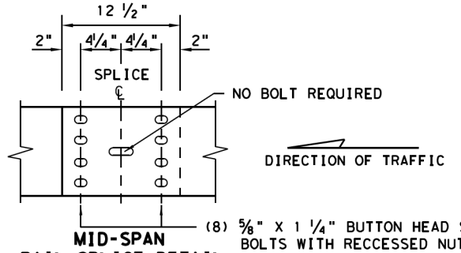
NOTE:
FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECCESSED NUT.

SPLICE BOLT LENGTH — VARIES
FBB01 = 1 ¼"
FBB02 = 2"
⅝"

POST & BLOCK LENGTH
FBB03 = 10"
FBB04 = 18"

BUTTON HEAD BOLT

NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



MID-SPAN RAIL SPLICE DETAIL

NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 ½" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

Texas Department of Transportation — Design Division Standard

METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0916	25	019	CR 1187	
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	CRP	BEE		30	

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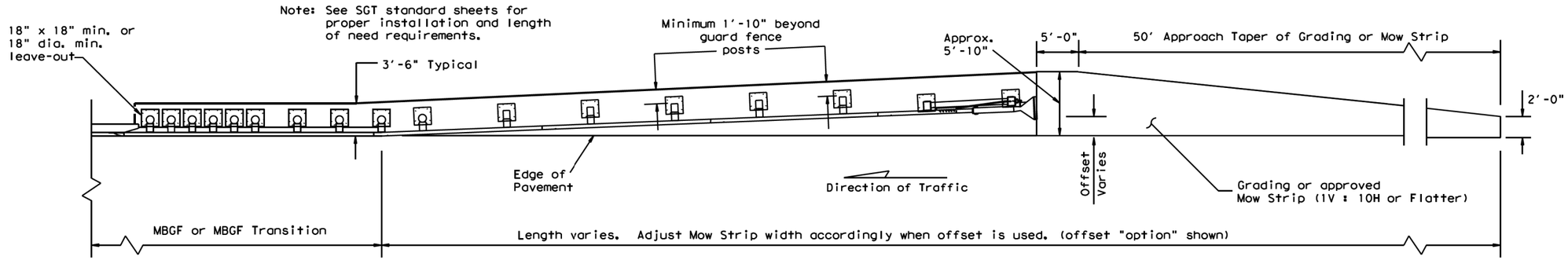
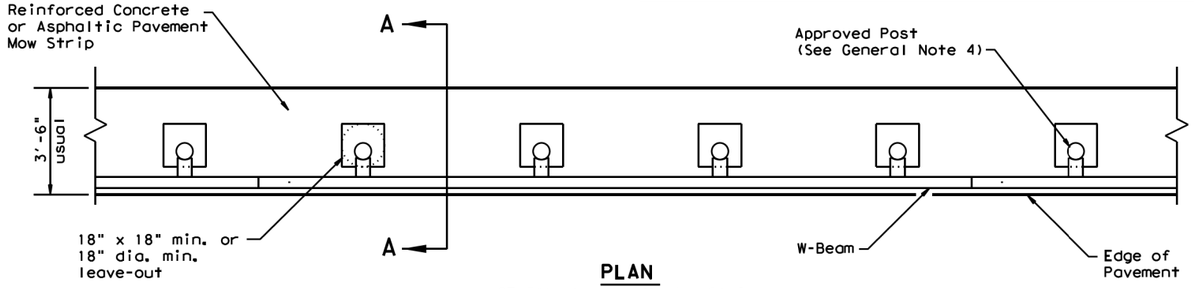
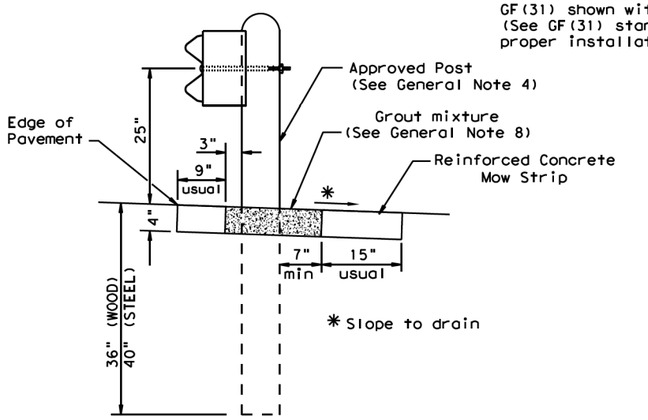


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



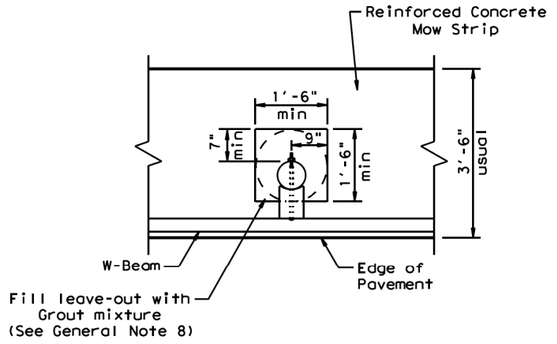
PLAN

GF(31) shown with Mow Strip
(See GF(31) standard sheet for proper installation)



SECTION A-A

Typical



MOW STRIP DETAIL

Reinforced Concrete Mow Strip with 18" x 18" Square or 18" Dia. minimum leave-out.

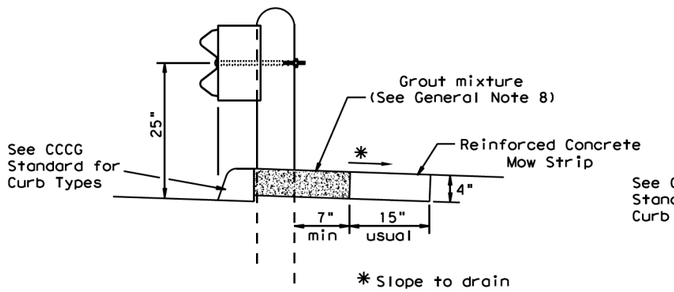
Note: Site Condition(s)

Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.

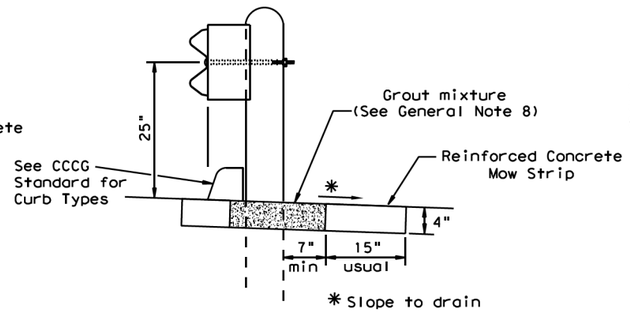
GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leave-out behind the post shall be a minimum of 7".
4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 ½" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 1 or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.



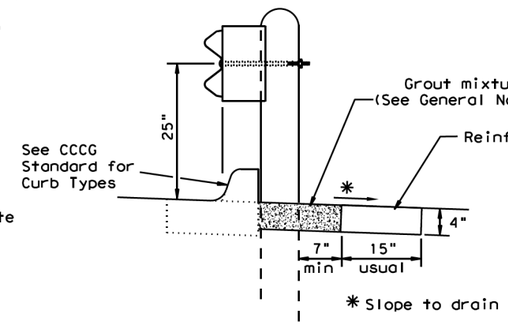
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT

GF(31)MS-19

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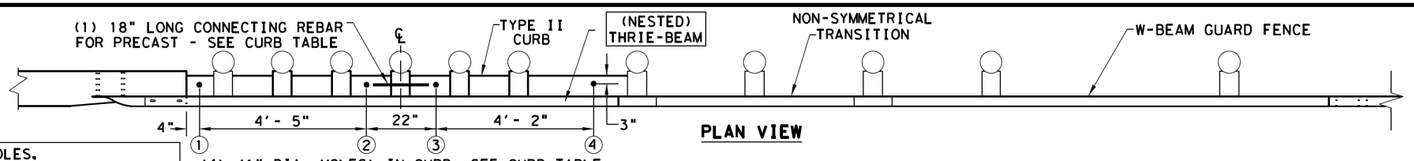


PLAN VIEW

(4) (1" DIA. HOLES) IN CURB: SEE CURB TABLE

(5) 1" DIA. HOLES.
(5) ⅞" DIA. HEAVY HEX HEAD BOLTS (FACING TRAFFIC SIDE) (ASTM F3125 GR A325 OR A449).
(10) 1 ¾" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
(5) ⅞" DIA. HEAVY HEX NUTS (ASTM A194 OR A563).

NOTE:
HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL, LEAVE 1" OF BOLT LENGTH PAST THE ⅞" HEX NUT. TRIM AS REQUIRED.

NOTE:
CURB IS A REQUIRED COMPONENT FOR THE TRANSITION TO FUNCTION PROPERLY. SEE GENERAL NOTES: 2-4 AND 16-17.

DIRECTION OF TRAFFIC

END PAYMENT FOR THRIE-BEAM TRANSITION.

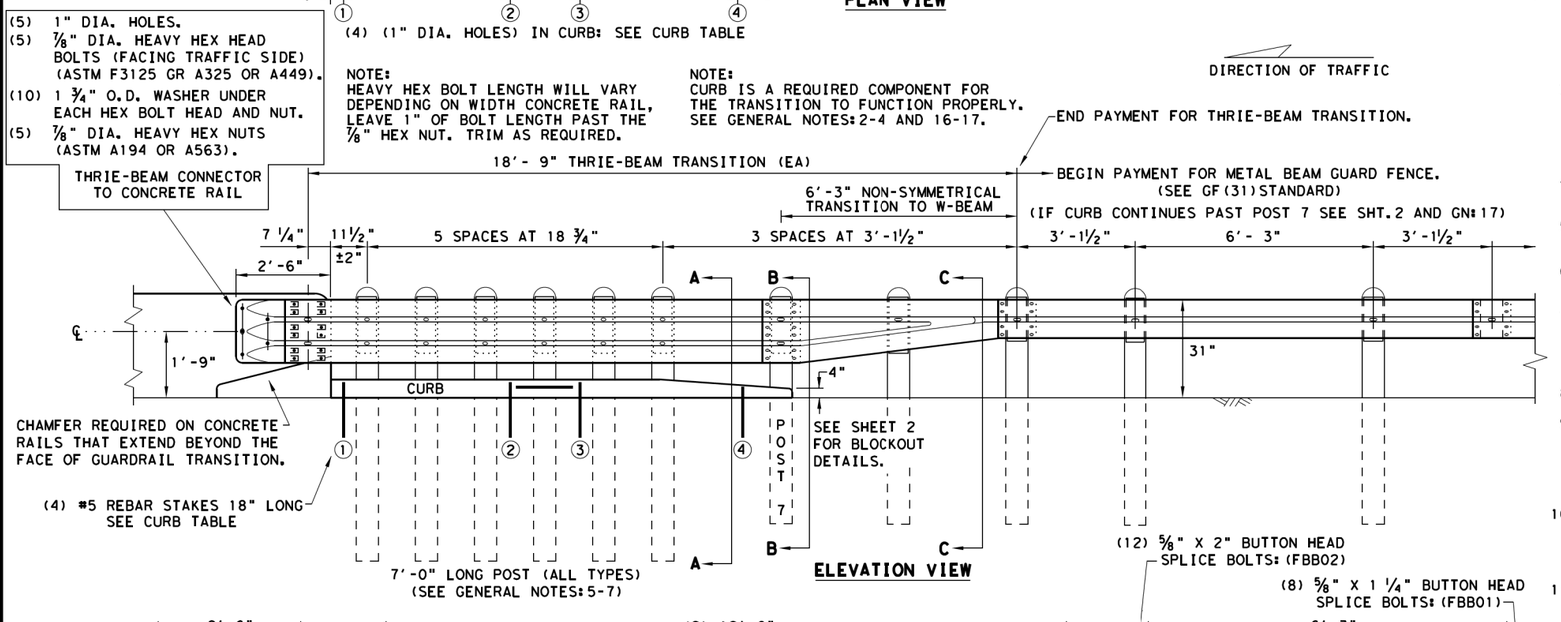
18'- 9" THRIE-BEAM TRANSITION (EA)

BEGIN PAYMENT FOR METAL BEAM GUARD FENCE. (SEE GF(31)STANDARD)

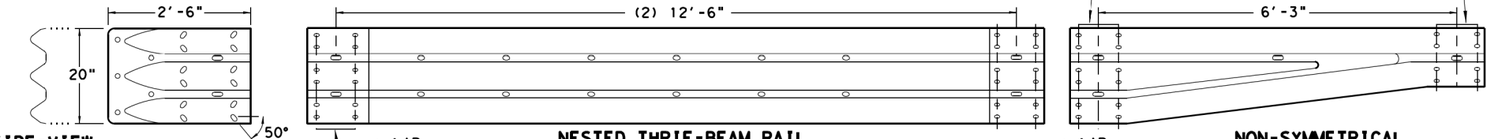
6'-3" NON-SYMMETRICAL TRANSITION TO W-BEAM

(IF CURB CONTINUES PAST POST 7 SEE SHT.2 AND GN:17)

THRIE-BEAM CONNECTOR TO CONCRETE RAIL



ELEVATION VIEW



SIDE-VIEW

THRIE-BEAM TERMINAL CONNECTOR 10GA.
PART DESIGNATOR RTE01b
NOTE: SEE GENERAL NOTE: 9

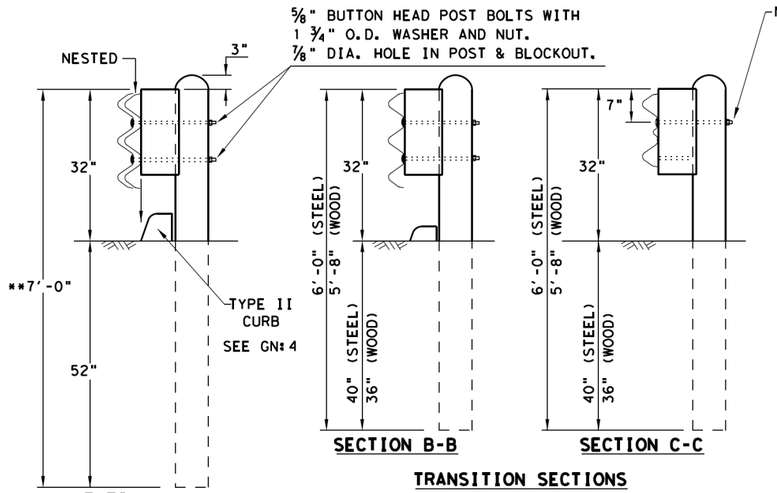
NESTED THRIE-BEAM RAIL
PART DESIGNATOR RTM10a

NON-SYMMETRICAL W-BEAM TO THRIE-BEAM TRANSITION 10GA.
PART DESIGNATOR RWT02a OR RWT02b

(12) ⅝" X 2" BUTTON HEAD SPLICE BOLTS WITH RECESSED NUTS: (FBB02)
(12) RECTANGULAR GUARDRAIL PLATE WASHERS: (FWR03)

PLATE WASHER INSTRUCTIONS

BRIDGE APPROACH - UPSTREAM: THE NESTED RAIL LAPS OVER THE TERMINAL CONNECTOR. PLATE WASHERS ARE INSTALLED UNDER THE SPLICE NUTS AGAINST INSIDE OF CONNECTOR.
BRIDGE EXIT - DOWNSTREAM: THE TERMINAL CONNECTOR LAPS OVER THE NESTED RAIL. PLATE WASHERS ARE INSTALLED UNDER THE BOLT HEAD AGAINST OUTSIDE OF CONNECTOR.



SECTION A-A

SECTION B-B

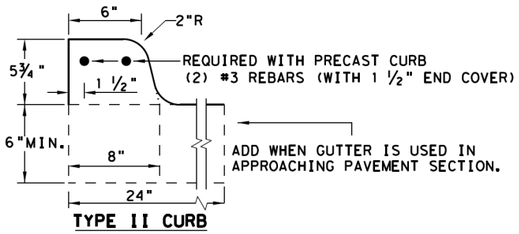
SECTION C-C

TRANSITION SECTIONS

NOTE: ALL POST TYPES, SEE GENERAL NOTE: 5 & 6

NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.

THRIE-BEAM TERMINAL - CURB TABLE
PRECAST CURB FULL LENGTH EQUALS 12'- 2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.
CURB (1) LENGTH 5'- 8" CURB (2) LENGTH 6'- 6" TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7
CONNECTING PRECAST CURB SECTIONS (1) & (2): FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB END. USE (1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS.
SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *: FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND ½" BELOW TOP OF CURB. FILL HOLES WITH APPROVED GROUT MIXTURE.



TYPE II CURB

NOTE: OPTIONS FOR TYPE II CURB:
1. PRECAST
2. CAST-IN-PLACE

* NOTES: NOT NEEDED FOR CAST-IN-PLACE.
SEE TYPE II CURB DETAIL FOR REBAR AND COVER REQUIREMENTS.
PERCUSSION DRILLING IS NOT PERMITTED WITH:
TYPE II CURB, BRIDGE RAIL OR CONCRETE TRAFFIC RAIL.

TYPE II CURB DETAILS

GENERAL NOTES

1. CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
2. CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5- ¾" HEIGHT); SEE CURRENT CCCG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE: 17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
3. CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
4. UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
5. FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 ½" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
6. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF(31) STANDARD SHEET.
7. THE POST LENGTH SHALL BE MARKED ON ALL 7'- 0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST ⅝" IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
8. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
9. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT SHALL NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
10. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16g) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED)(TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED)(STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-20

FILE: gf31tr-tl320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
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	CRP	BEE		32

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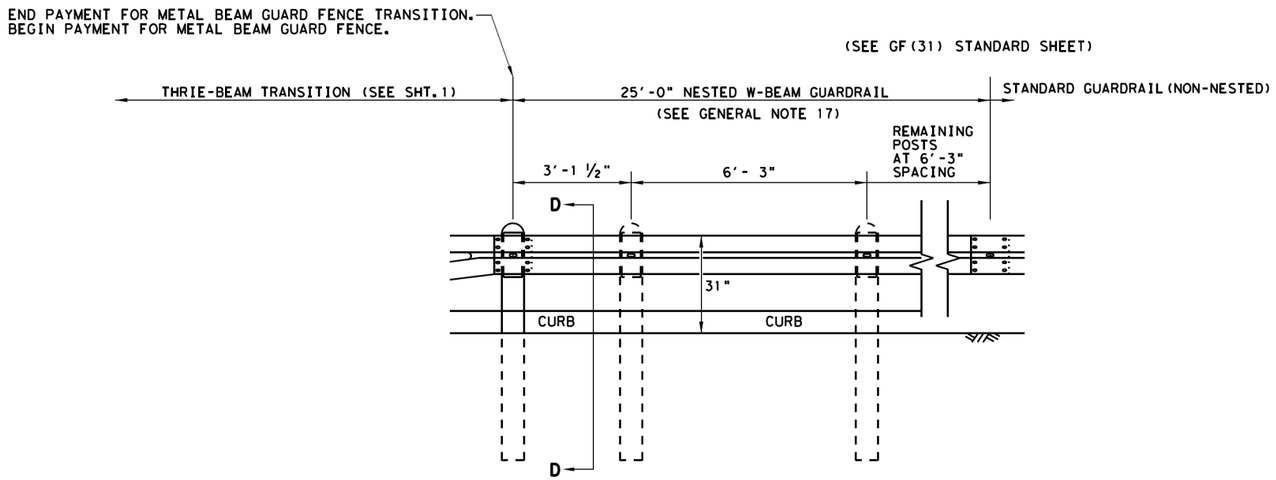
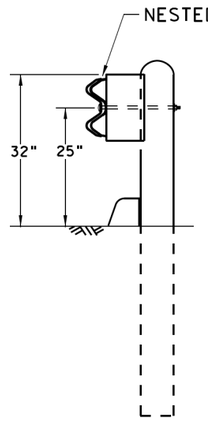
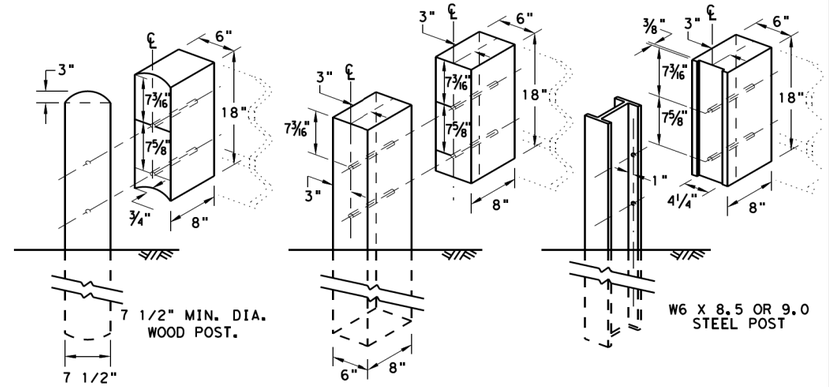
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-20

FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG	
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REVISIONS	0916	25	019	CR 1187	
	DIST	COUNTY		SHEET NO.	
	CRP	BEE		33	

NOTE: STEEL I-BEAM POST W6 X 8.5 (6'-0") PN: 533G
STANDARD WOOD BLOCKOUTS (6"X8"X14") PN: 4076B
AT (POSTS 2 THRU 8)

⅝" X 10" HGR BOLT PN: 3500G
⅝" HGR NUT PN: 3340G

LINE AT THE BACK OF POST #2 THRU #8

FROM THE CENTERLINE OF POST(1) & POST(0)

ANCHOR PADDLE PN: 15204A

ANGLE STRUT PN: 15202G

16"

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(1) POST(0)

DO NOT BOLT ANCHOR RAIL TO - POST (2)

SEE DETAIL 1

BEGIN LENGTH OF NEED

TRAFFIC FLOW

PLAN VIEW

MASH TEST LEVEL 3 (TL-3) LENGTH OF SoftStop TERMINAL (50'-9 ½")

50'-9 ½" STANDARD INSTALLATION LENGTH (MASH TL-3 SoftStop)

BEGIN STANDARD MBGF

END PAYMENT FOR SGT

6¼" 3'-1 ½" 6'-3" 6'-3"

ANCHOR RAIL WITH SLOTS - (THREADED THRU HEAD)
SEE SoftStop MANUAL FOR COMPLETE DETAILS

MIDDLE SLOT CUTOUT (1) 1 ¾" X 6'-10 ¼"

OUTSIDE SLOTS CUTOUT (2) 1½" X 6'-9 ⅜"

SoftStop FACE SEE GN(3) & NOTE: B

MBGF LAPPED IN DIRECTION OF TRAFFIC FLOW

25'-0" DOWNSTREAM W-BEAM GUARDRAIL PN: 61G

SoftStop ANCHOR RAIL (12GA) PN: 15215G

3'-1 ½" (+/-) 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 5'-8" 4'-7"

B B A A

SEE NOTE: C

ANCHOR PADDLE PN: 15204A

END OF ANCHOR RAIL PN: 15215G

SEE NOTE: A

POST 32" HEIGHT

31"

RAIL HEIGHT

RAIL 25'-0" PN: 61G

RAIL 25'-0" PN: 15215G

DO NOT BOLT ANCHOR RAIL TO POST(2)

SEE DETAIL 2

13/16" DIA. YIELDING HOLES

SEE DETAIL 3

6'-1⅜"

(8) ⅝"x 1-¼" GR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

POST 40" DEPTH (TYP 1-8)

(8) ⅝"x 1-¼" HGR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(2) 6'-0" (SYTP) PN: 15000G POST(1) 4'-9 ½" SYTP PN: 15203G POST(0) 6'-5 ⅜" PN: 15205A

ELEVATION VIEW

HARDWARE FOR POST(2) THRU POST(8)
(1) ⅝"x 10" HGR BOLT PN: 3500G
(1) ⅝" HGR HEX NUT PN: 3340G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

4" X 7 ½" X 14" BLOCKOUT COMPOSITE PN: 6777B

6" X 8" X 14" BLOCKOUT WOOD PN: 4076B

NOTE: DO NOT BOLT ANCHOR RAIL TO POST(2)

8" 6" 14"

⅝" HGR NUT PN: 3340G

⅝" X 10" HGR POST BOLT PN: 3500G

1⅜"DIAMETER YIELDING HOLES LOCATED IN FLANGES

FINISHED GRADE

(HOLES APROXIMATELY CENTERED AT FINISHED GRADE)

ISOMETRIC VIEW POST(1 & 2)

W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

(1) ⅝" x 1 ¾" HEX HD BOLT PN 3391G

ANGLE STRUT PN: 15202G

(2) ⅝" WASHERS PN 4372G

(1) ⅝" HGR HEX NUT PN 3340G

DETAIL 1

SHOWN AT POST(1) NEAR GROUND

(1) ⅝" HEX NUT

(1) ⅝" x 1-½" HEX HD BOLT-GR-5 PN: 105286

(2) ⅝" ROUND WASHERS PN: 3240G

DETAIL 2

SHOWN AT POST(1)

ANCHOR KEEPER PLATE (24 GA) PN: 15207G

ANCHOR PLATE WASHER ½" THICK PN: 15206G

1" ROUND WASHER F463 PN: 4902G

(2) ⅝" x 2 ½" HEX HD BOLT GR-5 PN: 105285G

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

(2) ⅝" ROUND WASHER (WIDE) PN: 3240G

1" NUT PN: 3908G SHALL BE SECURELY TIGHTENED AFTER FINAL ASSEMBLY, BUT NOT DEFORMING THE KEEPER PLATE.

ANCHOR PADDLE PN: 15204A

(2) ⅝" HEX NUT A563 GR.DH PN: 3245G

W-BEAM FLATTENED (4 PLIES)

ANGLE STRUT PN: 15202G

SEE NOTE: A

(2) ¾" x 2 ½" HEX BOLT (TYP) PN: 3717G

(4) ¾" FLAT WASHER (TYP) PN: 3701G

(2) ¾" HEX NUT (TYP) PN: 3704G

6'-1 ⅜" POST DEPTH

(2) ANCHOR POST ANGLE PN: 15201G

DETAIL 3 AT POST(0)

6'-5 ⅜" (W6 X 15) I-BEAM POST PN: 15205A

TRAFFIC FLOW

W-BEAM RAIL 25'-0"

6" X 8" X 14" BLOCKOUT WOOD

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

LINE POST (3, 4, 5, 6, 7 & 8)

FINISHED GRADE

SECTION VIEW B-B

6'-0" (W6 X 8.5) I-BEAM POST PN: 533G

POST(2)

SECTION VIEW A-A

6'-0" (W6 X 8.5) (SYTP) I-BEAM POST PN: 15000G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

POST 17"- ½" HEIGHT

4'- 9 ½"

1⅜"DIA. YIELDING HOLES

40"

POST(1)

FRONT VIEW POST(1)

4'-9 ½" (W6 X 8.5) (SYTP) I-BEAM POST PN: 15203G

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

2'-0"

STANDARD MBGF

EDGE OF PAVEMENT

NOTE: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)

2'-0" MAX. RAIL OFFSET

APPROACH GRADING (1V:10H OR FLATTER) SEE PRODUCT ASSEMBLY MANUAL FOR ADDITIONAL GUIDANCE.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374. 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN: 620237B
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
7. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
8. POSTS SHALL NOT BE SET IN CONCRETE.
9. IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
10. DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

NOTE: A	THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-¾" MIN. TO 4" MAX. ABOVE FINISHED GRADE.
NOTE: B	PART PN: 5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN: 5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)
NOTE: C	W-BEAM SPLICE LOCATED BETWEEN LINE POST(4) AND LINE POST(5) GUARDRAIL PANEL 25'-0" PN: 61G ANCHOR RAIL 25'-0" PN: 15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'- 0")
15205A	1	POST #0 - ANCHOR POST (6'- 5 ⅜")
15203G	1	POST #1 - (SYTP) (4'- 9 ½")
15000G	1	POST #2 - (SYTP) (6'- 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 x 8.5) (6'- 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (4" x 7 ½" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (½" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT
		HARDWARE
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	¾" x 2 ½" HEX BOLT A325
3701G	4	¾" ROUND WASHER F436
3704G	2	¾" HEAVY HEX NUT A563 GR.DH
3360G	16	⅝" x 1 ¼" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	⅝" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	⅝" x 10" HGR POST BOLT A307
3391G	1	⅝" x 1 ¾" HEX HD BOLT A325
4489G	1	⅝" x 9" HEX HD BOLT A325
4372G	4	⅝" WASHER F436
105285G	2	⅝" x 2 ½" HEX HD BOLT GR-5
105286G	1	⅝" x 1 ½" HEX HD BOLT GR-5
3240G	6	⅝" ROUND WASHER (WIDE)
3245G	3	⅝" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE: B

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SoftStop END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

Texas Department of Transportation

Design Division Standard

TRINITY HIGHWAY
SOFTSTOP END TERMINAL
MASH - TL-3
SGT(10S)31-16

FILE: sgt10s3116		DN: TxDOT	CK: KM	DW: VP	CK: MB/VP		
©TxDOT: JULY 2016		CONT	SECT	JOB	HIGHWAY		
REVISIONS		0916	25	019	CR 1187		
		DIST	COUNTY		SHEET NO.		
		CRP	BEE		34		

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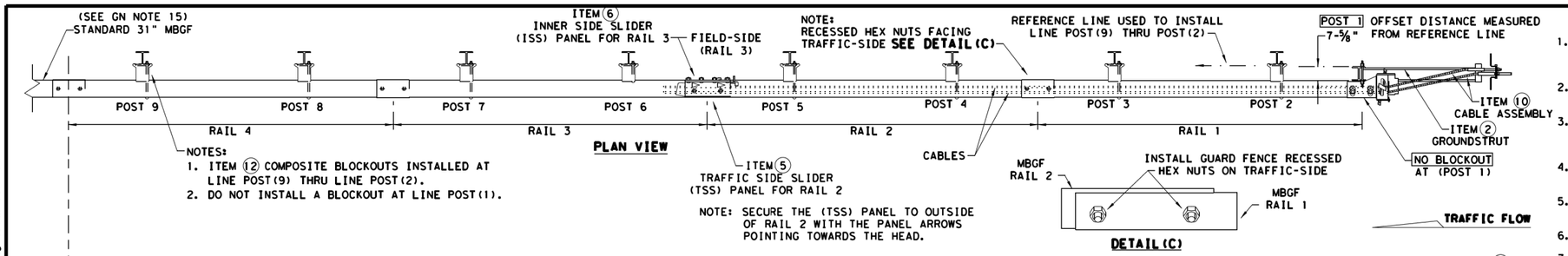

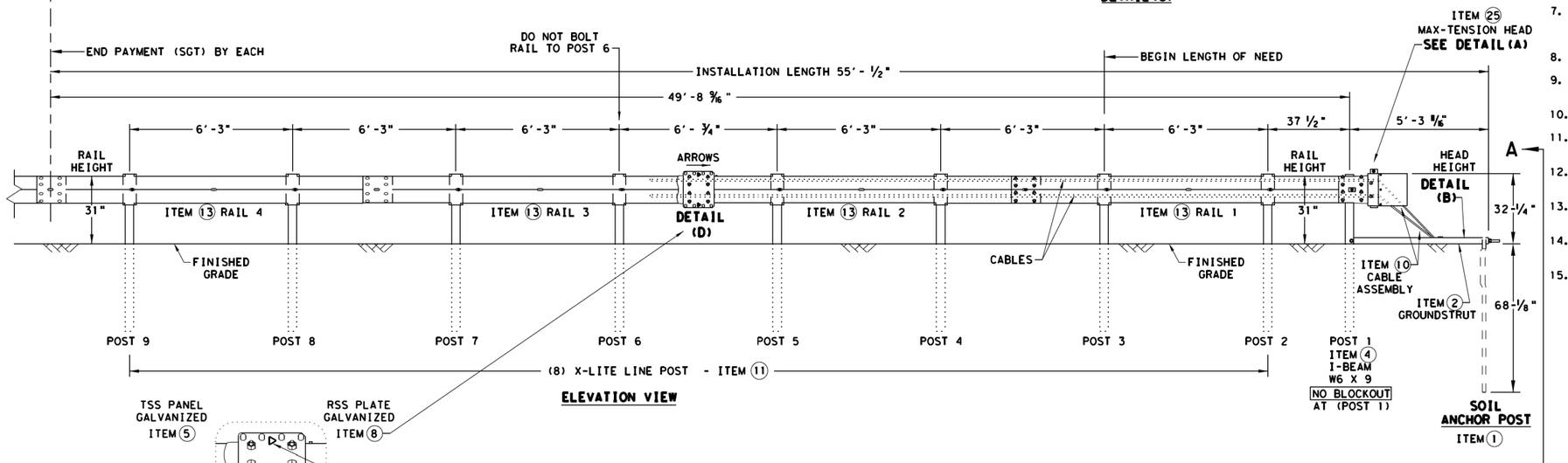

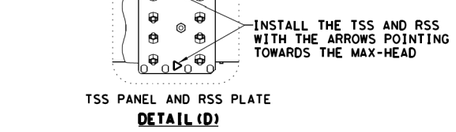

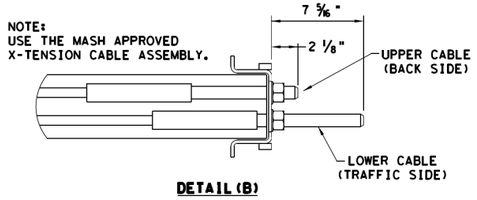

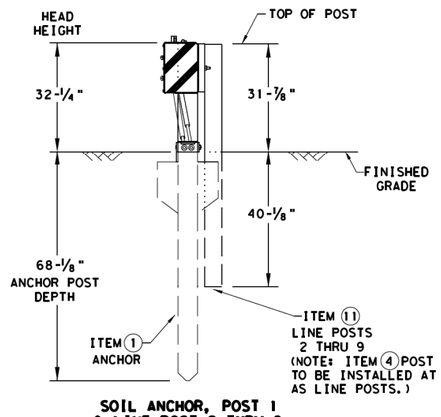

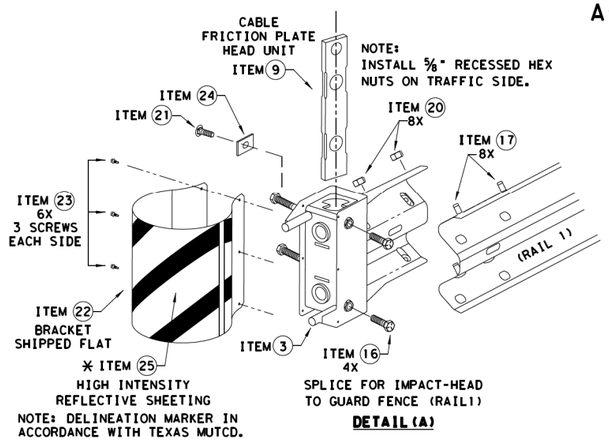

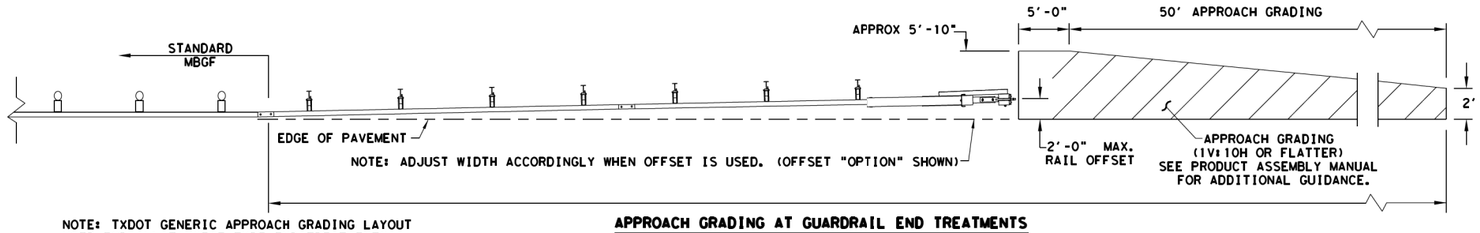

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800
2. FOR INSTALLATION, REPAIR, & MAINTENANCE REFER TO THE; MAX-TENSION INSTALLATION INSTRUCTION MANUAL. P/N MANMAX REV D (ECN 3516).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURE'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
7. COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
8. REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
9. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
10. POSTS SHALL NOT BE SET IN CONCRETE.
11. A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POST TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST.
12. MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
13. IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
14. THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
15. A MINIMUM OF 12'-6" OF 12GA. MBGF IS REQUIRED IMMEDIATELY DOWNSTREAM OF THE MAX-TENSION SYSTEM.

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	5/8" X 7" THREAD BOLT HH (GR.5) GEOMET	1
16	BSI-2001885	3/4" X 3" ALL-THREAD BOLT HH (GR.5) GEOMET	4
17	4001115	5/8" X 1 1/4" GUARD FENCE BOLTS (GR.2) MGAL	48
18	2001840	5/8" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	5/8" WASHER F436 STRUCTURAL MGAL	2
20	4001116	5/8" RECESSED GUARD FENCE NUT (GR.2) MGAL	59
21	BSI-2001888	5/8" X 2" ALL THREAD BOLT (GR.5) GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
* 25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
** 26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
** 27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL, 8-SPACE, 12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

** ALTERNATIVE ITEMS NOT SHOWN.
ITEM(26) 8" WOOD-BLOCKOUTS
ITEM(27) 25'GUARD FENCE PANELS

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE MAX-TENSION END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

Texas Department of Transportation

Design Division Standard

MAX-TENSION END TERMINAL
MASH - TL-3
SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL	
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0916	25	019	CR 1187	
	DIST	COUNTY		SHEET NO.	
	CRP	BEE		35	

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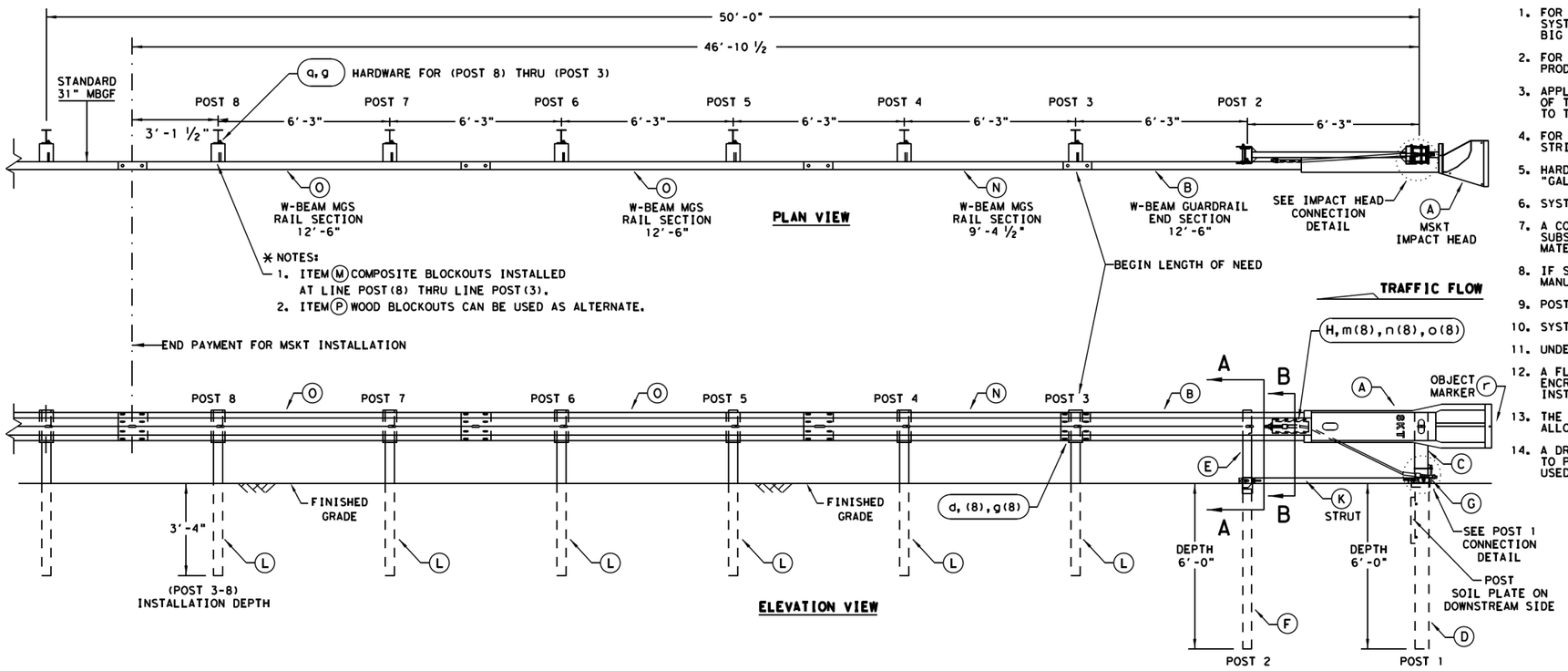
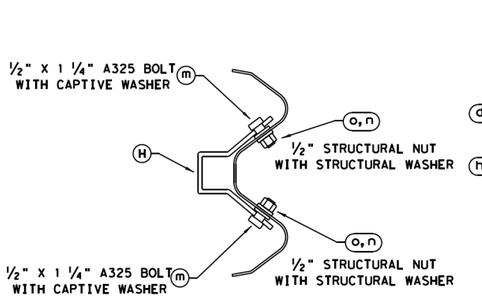
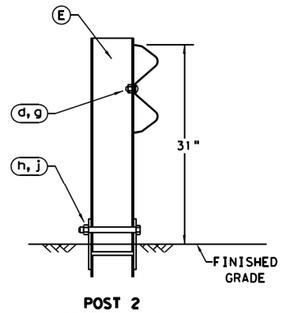
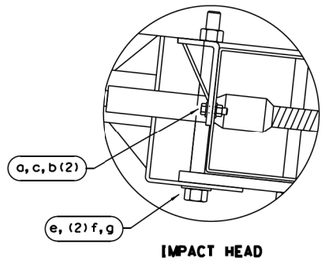
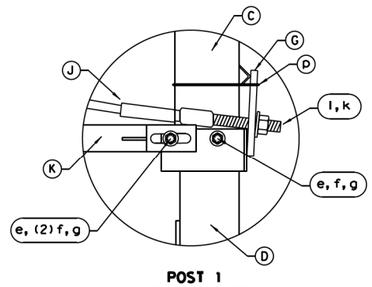


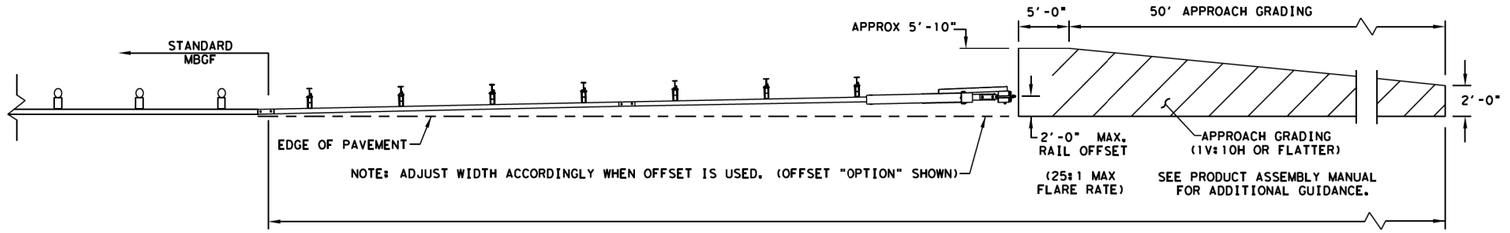
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.











APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MSKT END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435. 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION~062717).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
7. A COMPOSITE MATERIAL BLOCKOUTS THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
8. IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. SYSTEM MUST BE ATTACHED TO STANDARD 31" MBGF.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
13. THE SYSTEM IS SHOWN WITH TWO 12'-6" MBGF PANELS, ONE 25'-0" MBGF PANEL IS ALSO ALLOWED IN THEIR PLACE.
14. A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POSTS 3-8 TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST. SPECIAL DRIVING CAP TO BE USED ON LOWER POSTS 1 & 2 TO PREVENT DAMAGE TO THE WELDED PLATES.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X ⅛" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 ½")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	⅝" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	⅝" WASHER	W0516
c	2	⅝" HEX NUT	N0516
d	25	⅝" Dia. x 1 ¼" SPLICE BOLT (POST 2)	B580122
e	2	⅝" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	⅝" WASHER	W050
g	33	⅝" Dia. H.G.R NUT	N050
h	1	¾" Dia. x 8 ½" HEX BOLT (GRD A449)	B340854A
j	1	¾" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	½" x 1 ¼" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	½" STRUCTURAL NUTS	N012A
o	8	1 ⅛" O.D. x ⅜" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	⅝" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

ALTERNATIVE ITEMS NOT SHOWN. * *
* ITEM(P) 8" WOOD-BLOCKOUT
* * ITEM(Q) 25'GUARD FENCE PANEL

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT(12S)31-18

FILE: sgt12s3118.dgn	DN:TxDOT	CK:KM	DW:VP	CK:CL
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	CRP	BEE		36

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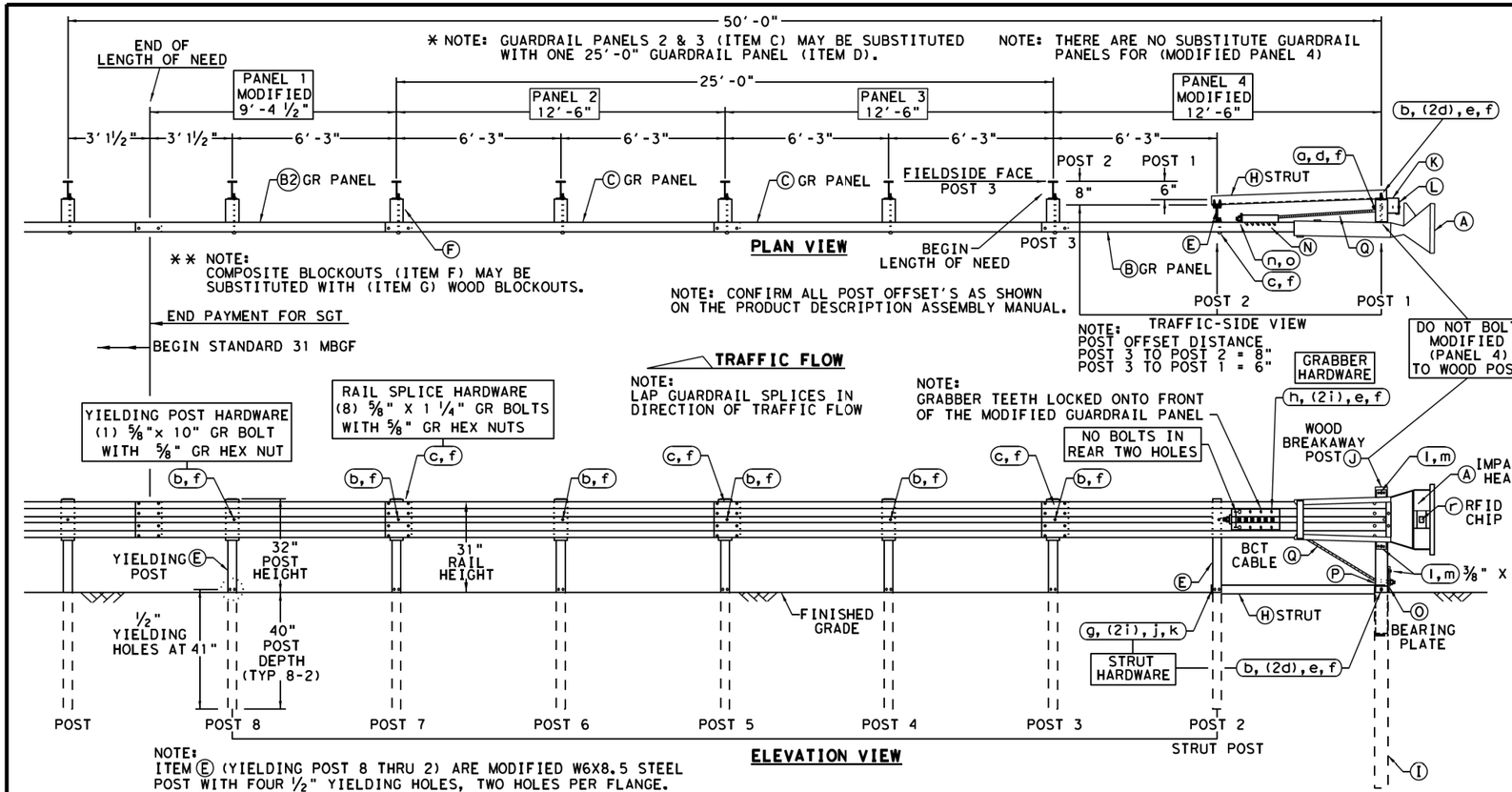
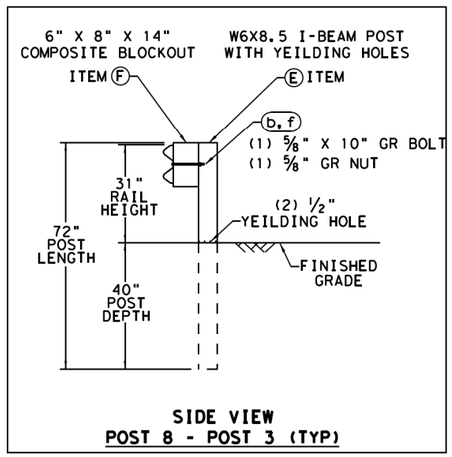


GENERAL NOTES

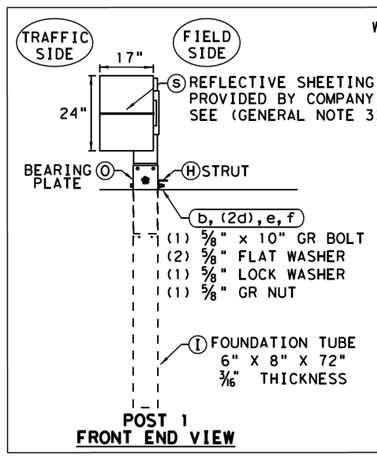
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
3. MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
5. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
6. (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
9. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
10. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
11. THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" x 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" x 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" x 7 1/2" x 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
		SMALL HARDWARE	
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563DH HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M

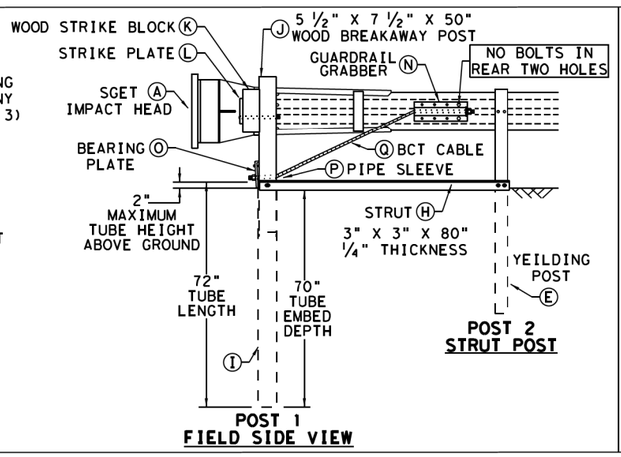
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



SIDE VIEW
POST 8 - POST 3 (TYP)

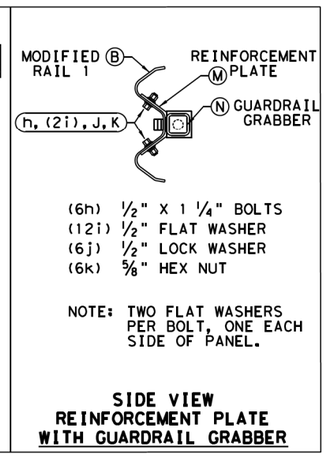


POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW

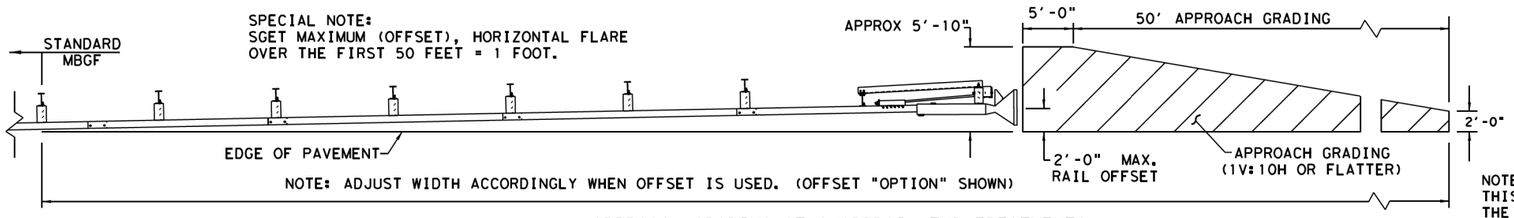
POST 2
STRUT POST



(6h) 1/2" X 1 1/4" BOLTS
(12i) 1/2" FLAT WASHER
(6j) 1/2" LOCK WASHER
(6k) 5/8" HEX NUT

NOTE: TWO FLAT WASHERS PER BOLT, ONE EACH SIDE OF PANEL.

SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

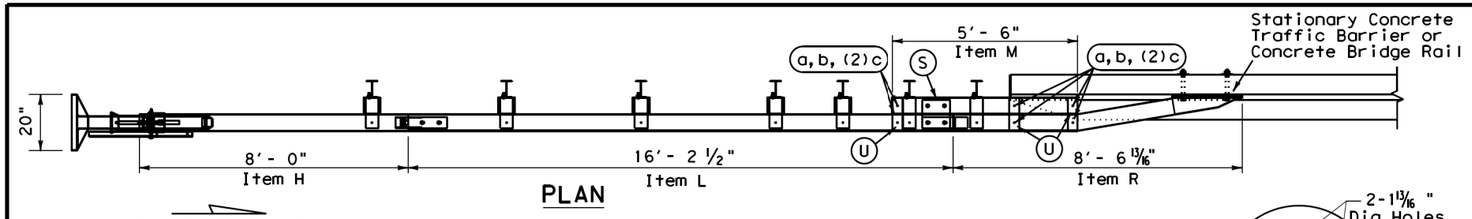
Texas Department of Transportation

Design Division Standard

SPIG INDUSTRY, LLC
SINGLE GUARDRAIL TERMINAL
SGET - TL-3 - MASH
SGT(15)31-20

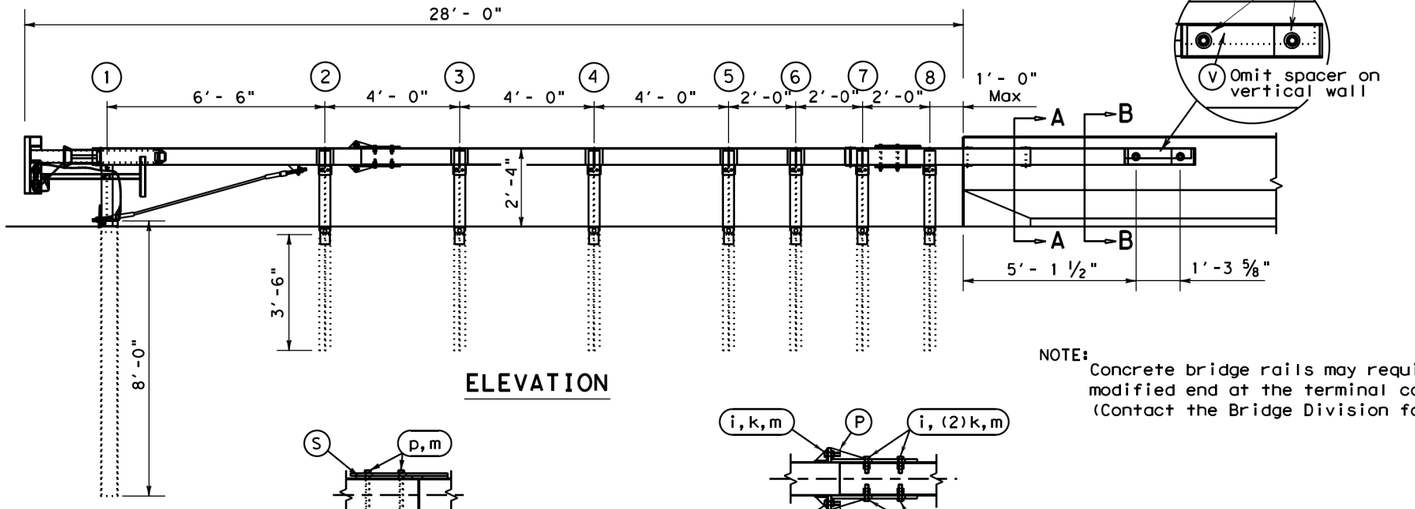
FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
	DIST	COUNTY		SHEET NO.
	CRP	BEE		37

DATE:
FILE:

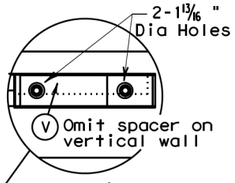


PLAN

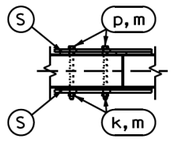
Direction of Traffic



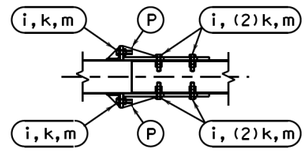
ELEVATION



NOTE:
Concrete bridge rails may require a modified end at the terminal connection. (Contact the Bridge Division for details.)



SPLICE PLATE DETAIL

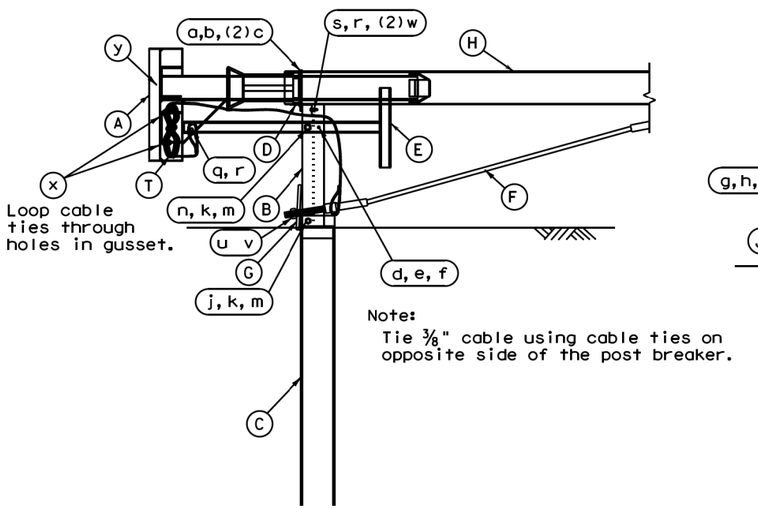


END SPLICE PLATE DETAIL

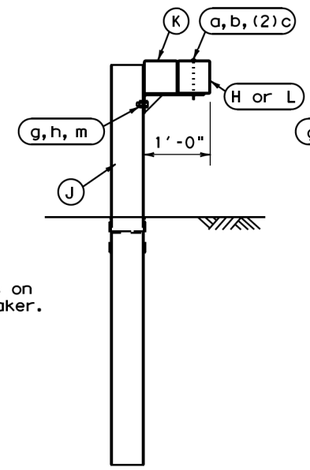
GENERAL NOTES

1. For specific information regarding installation and technical guidance of the system, contact: Road Systems, Inc., at (330)346-0721. 3616 Old Howard County Airport. Big Springs, TX 79720
2. Due to the Single-Sided design, the BEAT-SSCC is not appropriate for use at locations where backside hits towards the rigid concrete barrier are possible, e.g. In gore areas, or in narrow median locations where backside opposite direction hits are likely.
3. All bolts, nuts, cable assemblies, cable anchors, bearing plate, tubing, post, impact heads, and other steel components shall be galvanized, unless otherwise noted.
4. The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
5. When site conditions permit, posts may be driven. The lower section of post #1 should not be driven with the upper post section attached. If posts are placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
6. If rock excavation is encountered, see manufacturer's installation booklet for installation recommendations.
7. Post shall not be set full depth in concrete.
8. The appropriate connection of the SSCC to the stationary rigid structure is a critical component to insure proper performance of the system. The length of the 1" bolts used to attach the system to the rigid structure will vary with the wall thickness and will need to be determined in the field.
9. The approach area in front of the SSCC and the area within the system itself shall be free of fixed obstacles greater than 4 inches in height and have a fill slope or a cut slope of 1V:10H or flatter.
10. Unless otherwise shown in the plans, SSCC rail placed in the vicinity of curbs shall be blocked out so that the face of curb is located directly below the face of rail. The steel posts shall be installed at the proper ground elevation above the gutter pan or roadway surface. Curbs located along or in front of the SSCC system shall not be greater than 4 inches in height.
11. An object marker shall be installed on the front of the impact head as detailed on D & OM(VIA).

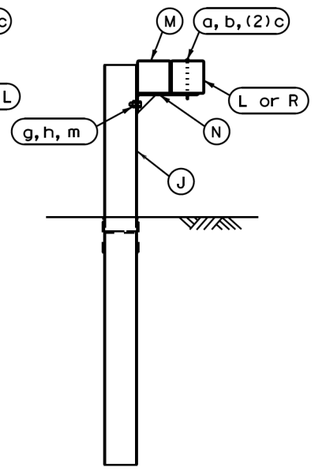
ITEM	QTY	DESCRIPTION
A	1	Box-Beam Impact Head
B	1	Upper End Post (A1) W6 x 9 x 1'-9 1/2" LG.
C	1	Lower End Post (A4) W6 x 15 x 8'-0" LG.
D	1	Support Bracket (B1) L4 x 2 x 4" LG.
E	1	Post Breaker (A2) Welded TS2 x 2 x 1/4"
F	1	Cable Anchor Assembly
G	1	Cable Anchor Bearing Plate
H	1	End Tube Rail (A5) x 8'-0" LG.
J	7	Steel Breakaway Post W6 x 9 x 6'-0" LG.
K	5	Support Bracket w/ Blockout (A9) TS6 x 6 w/ Bent PL.
L	1	Second Rail (A11) x 16'-2 1/2" LG.
M	1	Transition Blockout (A6) x 5'-6" LG.
N	2	Trans. Support Bracket (A10) 3/16" Bent PL. w/ Gusset
P	2	End Section Splice Plate (A3) - Detail Below
Q	2	1" Square Washer (B10) PL 4 x 4 x 1/4"
R	1	Anchor Rail (A13) x 8'-6 15/16 "LG.
S	2	Splice Plate (A12) PL 10 x 10 x 3/8" Detail Below
T	1	3/8" GALV. Cable x 20'-0" (A14)
U	6	Tie Plate (C10) PL 11 1/2" x 3 1/2"x 3/16"
V	1	Spacer (D10) (OMIT ON VERTICAL WALL)
		HARDWARE
a	14	5/16" x 7 1/2" Hex Bolt (A449)
b	14	5/16" Hex Nut
c	28	5/16" Washer
d	1	1/4" x 3" Hex Bolt (A449)
e	1	1/4" Hex Nut
f	1	1/4" Washer
g	7	5/8" x 1 1/2" Bolt (A307)
h	7	5/8" Recess Nut
j	8	5/8" x 2" Hex Bolt (A325 or A449)
j	1	5/8" x 8" Hex Bolt (A325 or A449)
k	18	5/8" Hex Nut
m	25	5/8" Washer
n	1	5/8" x 3" Hex Bolt (A325 or A449)
p	4	5/8" x 9" Hex Bolt (A325 or A449)
q	1	1/2" x 5" Hex Bolt (A325 or A449)
r	2	1/2" Hex Nut
s	1	1/2" x 2" Hex Bolt (A307, A325 or A449)
t	2	1" x 10"Hex Bolt(A325 or A449)(Length Varies w/Wall Sect)
u	4	1" Hex Nut (2H Heavy Hex Nut)
v	4	1" Washer Structural Washer
w	2	1/2" Washer
x	2	Cable Tie
y	1	Object Marker



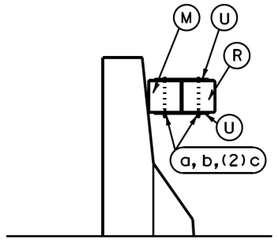
POSTS 1
IMPACT HEAD DETAIL



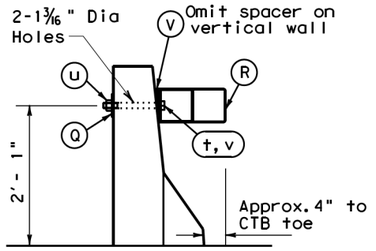
POSTS 2 THRU 6



POSTS 7 & 8



SECTION A-A



SECTION B-B

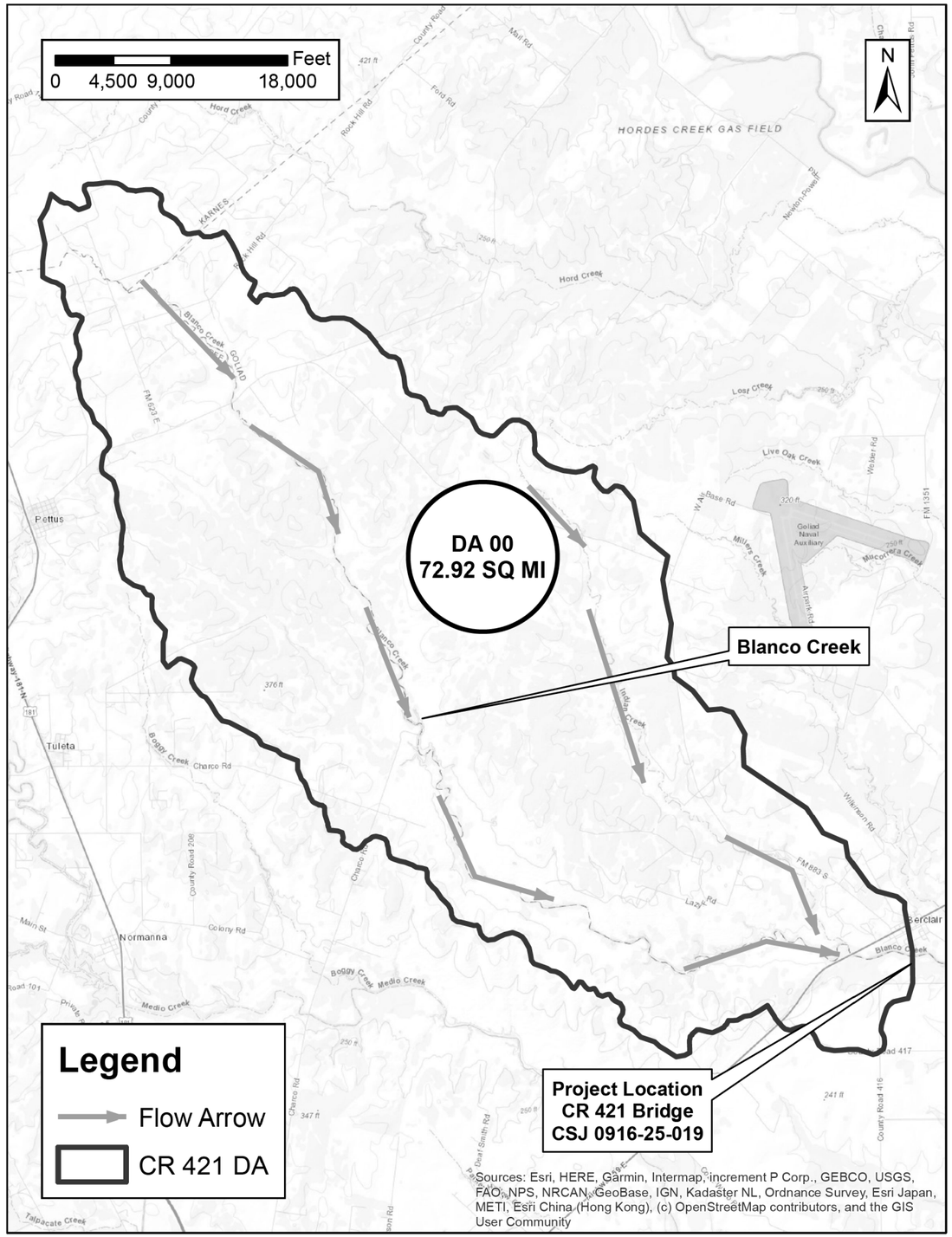
Texas Department of Transportation

Design Division Standard

ROAD SYSTEMS INC CRASH CUSHION (BEAT)

SSCC-16

FILE: ssscc16.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP	
© TxDOT April 2003	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0916	25	019	CR 1187	
REVISED 03,2016 (VP)	DIST	COUNTY		SHEET NO.	
	CRP	BEE		38	



DRAINAGE AREA MAP

NOTES:

1. THIS PROJECT IS LOCATED IN FEMA DESIGNATED ZONE "A". FIRM PANELS 48175C0375B EFFECTIVE DATE OCTOBER 19, 2010 FOR GOLIAD COUNTY, AND 48025C0225C EFFECTIVE DATE MAY 20, 2010 FOR BEE COUNTY.
2. COORDINATION WAS MADE WITH THE FLOODPLAIN ADMINISTRATORS FOR GOLIAD AND BEE COUNTIES, MR. MIKE BENNETT AND MR. JOHNNY CARABAJAL, RESPECTIVELY, ON NOVEMBER 28, 2022 EXPLAINING THE PROJECT. THIS COORDINATION IS DOCUMENTED IN THE CR 421 BRIDGE REPLACEMENT DRAINAGE REPORT. JACOBS WILL PROVIDE FINAL REPORT PRESENTING THE CHANGE IN WATER SURFACE ANTICIPATED BASED ON THE ANALYSIS AND OFFERING THE TECHNICAL DATA FROM THE ANALYSIS.

REFERENCES:

1. TXDOT HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCES (TNRIS SOUTH TEXAS 2018 & SURVEY SITE DATA)

Jacobs Engineering Group
STATE OF TEXAS
GRANT R. DICKEY
143922
LICENSED
PROFESSIONAL ENGINEER
F-2966
03/28/23

Jacobs
1999 BRYAN ST, SUITE 3500
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

CR 421

DRAINAGE AREA MAP

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		39

DATE: 2/16/2023 10:15 AM
FILE: c:\pw_workdir\txdot\dms58455\CR421DAM01.dgn

GD | cx: GD | dw: GD | GD | cx: GD | dw: GD

OMEGA EM REGRESSION CALCULATIONS:

Parameters Table

PARAMETERS	INPUT	UNIT
Drainage Area =	72.92	sq.mi.
Main Channel Slope=	0.0022	ft/ft
P =	32	in
Ω =	0.197	-

Regression Flows Summary Table

PEAK FLOW	RESULT	UNIT
Q_{2} =	2857	cfs
Q_{5} =	6403	cfs
Q_{10} =	9301	cfs
Q_{25} =	13990	cfs
Q_{50} =	18176	cfs
Q_{100} =	23128	cfs
Q_{500} =	37512	cfs

CURVE NUMBER CALCULATIONS:

SOIL GROUP	SUB-AREA (ac.)	LAND USE	CN_{pred}	CN_{dev}	CN_{obs}
B	0.0	Open Water	100	0	100
C	5.1	Open Water	100	0	100
D	2.0	Open Water	100	0	100
A	4.4	Developed, Open Space	49	0	49
B	158.6	Developed, Open Space	69	0	69
C	185.9	Developed, Open Space	79	0	79
D	124.2	Developed, Open Space	84	0	84
A	2.2	Developed, Low Intensity	77	0	77
B	75.4	Developed, Low Intensity	86	0	86
C	72.9	Developed, Low Intensity	91	0	91
D	71.1	Developed, Low Intensity	94	0	94
A	0.3	Developed, Medium Intensity	89	0	89
B	22.9	Developed, Medium Intensity	92	0	92
C	14.2	Developed, Medium Intensity	94	0	94
D	23.6	Developed, Medium Intensity	95	0	95
B	1.9	Developed, High Intensity	98	0	98
C	1.6	Developed, High Intensity	98	0	98
D	5.1	Developed, High Intensity	98	0	98
B	31.2	Barren Land (Rock/Sand/Clay)	86	0	86
C	4.2	Barren Land (Rock/Sand/Clay)	91	0	91
D	89.9	Barren Land (Rock/Sand/Clay)	94	0	94
A	358.0	Deciduous Forest	32	0	32
B	1,749.6	Deciduous Forest	48	0	48
C	1,696.5	Deciduous Forest	57	0	57
D	2,507.2	Deciduous Forest	63	0	63
B	14.9	Evergreen Forest	58	0	58
C	7.3	Evergreen Forest	73	0	73
D	16.5	Evergreen Forest	80	0	80
A	85.6	Mixed Forest	46	0	46
B	1,145.1	Mixed Forest	60	0	60
C	1,186.3	Mixed Forest	68	0	68
D	1,764.4	Mixed Forest	74	0	74
A	145.0	Shrub/Scrub	49	0	49
B	10,304.6	Shrub/Scrub	68	0	68
C	7,614.7	Shrub/Scrub	79	0	79
D	7,431.6	Shrub/Scrub	84	0	84
A	0.5	Grassland/Herbaceous	64	0	64
B	23.2	Grassland/Herbaceous	71	0	71
C	21.3	Grassland/Herbaceous	81	0	81
D	42.3	Grassland/Herbaceous	89	0	89
A	43.1	Pasture/Hay	49	0	49
B	3,382.8	Pasture/Hay	69	0	69
C	3,218.0	Pasture/Hay	79	0	79
D	1,539.9	Pasture/Hay	84	0	84
B	195.3	Cultivated Crops	80	0	80
C	154.8	Cultivated Crops	87	0	87
D	127.9	Cultivated Crops	90	0	90
A	17.6	Woody Wetlands	88	0	88
B	47.3	Woody Wetlands	89	0	89
C	263.2	Woody Wetlands	90	0	90
D	610.6	Woody Wetlands	91	0	91
A	0.0	Emergent Herbaceous Wetlands	89	0	89
B	3.9	Emergent Herbaceous Wetlands	90	0	90
C	37.0	Emergent Herbaceous Wetlands	91	0	91
D	14.5	Emergent Herbaceous Wetlands	92	0	92

Weighted CN_{pred}	**73**	"Governs"
Weighted CN_{obs}	**73**	
Adjusted $CN_{H\&M}$	**62**	

RAINFALL DATA:

Rainfall Data - Goliad County, TX:

STORM FREQUENCY (YR)	24 HOUR DURATION** P_d (IN)
2	4.09
5	5.43
10	6.71
25	8.65
50	10.30
100	12.30
500	17.60

NOTES:

1. *RUNOFF COMPUTATIONS PERFORMED USING HEC-HMS V4.10 AND COMPARED TO TXDOT OMEGA EM REGRESSION METHOD.*
2. *WEIGHTED CURVE NUMBER AND TIME OF CONCENTRATION PARAMETERS DETERMINED USING ARCGIS WATERSHED MODEL.*
3. *THE RAINFALL DEPTHS IN INCHES WERE TAKEN FROM THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION'S (NOAA) NATIONAL WEATHER SERVICE HYDROMETEOROLOGICAL DESIGN STUDIES CENTER PRECIPITATION FREQUENCY DATA SERVER (PFDS) NOAA ATLAS 14, VOLUME 11, VERSION 2, POINT PRECIPITATION FREQUENCY ESTIMATES FOR TEXAS, OCTOBER 24, 2022.*
4. *RAINFALL WAS MODELED USING HEC-HMS V4.10 FREQUENCY STORMS WITH MAXIMUM DEPTHS PROVIDED FOR 15-MINUTE TO 24-HOUR EVENT DURATIONS. TP-40 AREA REDUCTION WAS APPLIED TO PREVENT OVER ESTIMATION OF LARGE DRAINAGE AREA.*
5. *RUNOFF VOLUME WAS COMPUTED USING THE SCS CURVE NUMBER LOSS MODEL.*
6. *TIME OF CONCENTRATION (TC) WAS COMPUTED USING THE KERBY-KIRPICH METHOD. LAG TIME = .06*TC*
7. *THE SCS UNIT HYDROGRAPH METHOD WAS USED TO DEVELOP THE DISCHARGE HYDROGRAPH.*
8. *PS&E CALCULATED FLOWS WERE USED FOR THE DESIGN ANALYSIS OF THE 2-YR, 5-YR, 10-YR, 25-YR, 50-YR, 100-YR, AND 500-YR STORM FREQUENCIES. SEE HYDRAULIC REPORT FOR ADDITIONAL DETAIL.*

REFERENCES:

1. *TXDOT HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)*
2. *TOPOGRAPHIC DATA SOURCES (TNRIS SOUTH TEXAS 2018 & SURVEY SITE DATA)*

Jacobs Engineering Group
STATE OF TEXAS
GRANT R. DICKEY
143922
LICENSED
PROFESSIONAL ENGINEER
F-2966

Grant Dickey
03/28/23

TIME OF CONCENTRATION (KIRBY-KIRPICH) CALCULATIONS:

WATERSHED NAME	AREA (Sq. Mi.)	OVERLAND FLOW COMPONENT					CHANNEL FLOW COMPONENT				KERBY-KIRPICH Tc (min)	KERBY-KIRPICH Tc (hrs)	Tc Check Hoc Method[1]
		N	K	L (ft)	S (ft/ft)	t_{ov} (min)	K	L (ft)	S (ft/ft)	t_{ch} (min)			
DA 00	72.92	0.40	0.828	1200	0.017	38.73	0.0078	125500	0.0022	690.04	728.8	12.15	8.54

PEAK DISCHARGE COMPARISON:

WATERSHED NAME	SOURCE	SCS UNIT HYDROGRAPH PARAMETERS				COMPUTED PEAK FLOWS						
		AREA (Sq. Mi.)	Tc (min)	LAG TIME (min)	CN	Q2 (cfs)	Q5 (cfs)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q100 (cfs)	Q500 (cfs)
DA 00	Jacobs HMS Calculated Flows	72.92	728.8	437.3	64	5,476	9,138	12,868	18,752	23,852	29,782	46,334
	Omega Regression Flows					2,857	6,403	9,301	13,990	18,176	23,128	37,512

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Texas Department of Transportation

CR 421

DRAINAGE HYDROLOGIC DATA

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		40

DATE: 2/16/2023 11:54 AM
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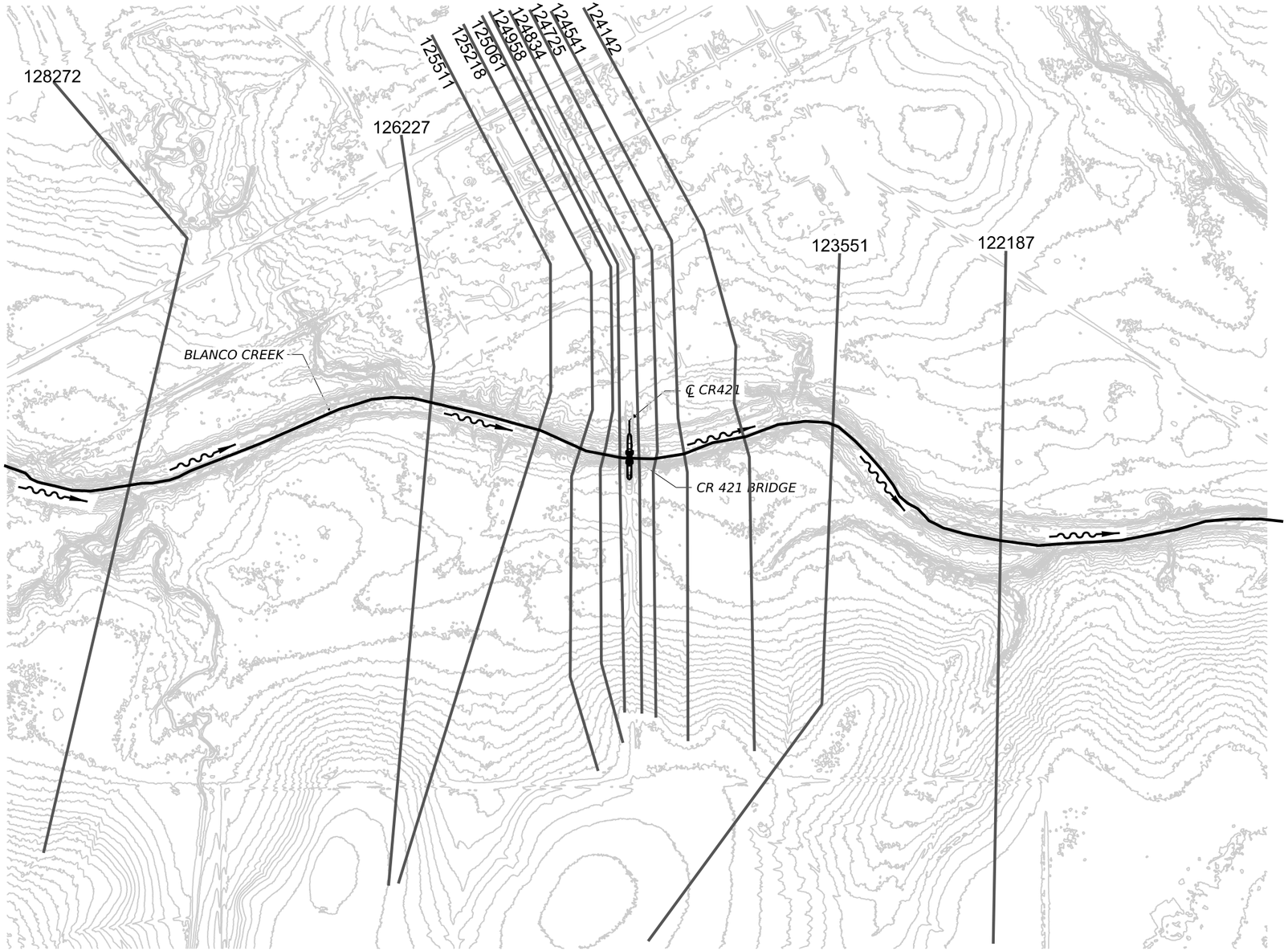
GD CK GD DW GD CK GD DW

GD | CK | GD | DW | GD | CK | GD | DW

CROSS SECTION AND STREAM LAYOUT

N.T.S.



NOTES:

1. THIS PROJECT IS LOCATED IN FEMA DESIGNATED ZONE "A". FIRM PANELS 48175C0375B EFFECTIVE DATE OCTOBER 19, 2010 FOR GOLIAD COUNTY, AND 48025C0225C EFFECTIVE DATE MAY 20, 2010 FOR BEE COUNTY.
2. COORDINATION WAS MADE WITH THE FLOODPLAIN ADMINISTRATOR AS A LETTER EXPLAINING THE PROJECT, PRESENTING THE AMOUNT OF RISE ANTICIPATED BASED ON THE ANALYSIS AND OFFERING THE TECHNICAL DATA FROM THE ANALYSIS.
3. UNITED STATES ARMY CORPS OF ENGINEERS (USACE) HEC-RAS VERSION 6.3.1 UTILIZED FOR THE ANALYSIS.
4. SAN ANTONIO RIVER AUTHORITY'S (SARA) BLANCO CREEK MODEL USED AS BEST AVAILABLE EXISTING CONDITION.
5. ADDITIONAL CROSS SECTIONS WERE DEVELOPED FROM SITE SURVEY WITH ADDITIONAL ELEVATIONS TAKEN FROM USGS TOPOGRAPHIC DATA (SOUTH TEXAS LIDAR 2018). SITE SURVEY BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204) NAD 83 WITH A SURFACE ADJUSTMENT FACTOR OF 1.00000. ALL ELEVATIONS BASED ON NAVD88 VERTICAL DATUM.
6. PS&E CALCULATED FLOWS WERE USED OF THE DESIGN ANALYSIS OF THE 2-YR, 5-YR, 10-YR, 25-YR, 50-YR, 100-YR, AND 500-YR STORM FREQUENCIES. SEE HYDRAULIC REPORT FOR MORE DETAIL.

REFERENCES:

1. TXDOT HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCES (TNRIS SOUTH TEXAS 2018 & SURVEY SITE DATA)

Jacobs Engineering Group
STATE OF TEXAS
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03/28/23

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Texas Department of Transportation

CR 421

DRAINAGE HYDRAULIC DATA

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		41

DATE: 2/16/2023 2:38 PM
FILE: c:\pw_workdir\jacobs-amer-transpldms58458\CR421DHD03.dgn

EXISTING CONDITIONS HEC-RAS RESULTS:

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	134700	2-YR	5476	164.5	173.3		174.71	0.010698	9.52	575.05	121.75	0.77
1	134700	5-YR	9138	164.5	176.6		177.75	0.006115	8.61	1061.68	172.24	0.61
1	134700	10-YR	12868	164.5	179.06		180.16	0.004619	8.41	1529.41	208.15	0.55
1	134700	25-YR	18752	164.5	182.16		183.25	0.003067	8.4	2351.73	364.73	0.47
1	134700	50-YR	23852	164.5	183.65		184.89	0.002973	9.08	2979.22	477.33	0.47
1	134700	100-YR	29782	164.5	185.07		186.46	0.002931	9.74	3733.81	586.35	0.48
1	134700	500-YR	46334	164.5	188.55		190.02	0.002521	10.59	6274.18	851.56	0.46
1	133075	2-YR	5476	154.5	171.8		172	0.000543	3.58	1552.76	178.3	0.2
1	133075	5-YR	9138	154.5	174.95		175.26	0.000594	4.48	2206.5	237.25	0.22
1	133075	10-YR	12868	154.5	177.33		177.73	0.000648	5.21	2823.59	282.73	0.23
1	133075	25-YR	18752	154.5	180.31		180.9	0.000763	6.34	4008.03	1195	0.26
1	133075	50-YR	23852	154.5	182.03		182.59	0.000727	6.56	6133.08	1270.67	0.26
1	133075	100-YR	29782	154.5	183.72		184.23	0.00067	6.64	8341.69	1341.78	0.25
1	133075	500-YR	46334	154.5	187.68		188.1	0.000543	6.67	14041.67	1535.53	0.23
1	129782	2-YR	5476	154.5	166.53		167.68	0.005954	8.59	637.31	99.79	0.6
1	129782	5-YR	9138	154.5	168.79		170.46	0.006861	10.37	889.14	137.01	0.66
1	129782	10-YR	12868	154.5	170.77		172.71	0.00643	11.26	1220.95	189.46	0.66
1	129782	25-YR	18752	154.5	173.45		175.59	0.005247	12.09	1784.06	230.56	0.62
1	129782	50-YR	23852	154.5	175.16		177.56	0.005061	13	2200.15	257.93	0.62
1	129782	100-YR	29782	154.5	176.92		179.56	0.004879	13.85	2678.26	285.16	0.63
1	129782	500-YR	46334	154.5	181.76	177.83	184.4	0.003761	14.62	5762.91	1416.99	0.58
1	128272	2-YR	5476	154.5	164.48		164.6	0.000863	3.3	2105.94	362.22	0.23
1	128272	5-YR	9138	154.5	167.37		167.52	0.000708	3.62	3231.04	415.3	0.22
1	128272	10-YR	12868	154.5	169.73		169.9	0.000643	3.88	4259.96	456.7	0.21
1	128272	25-YR	18752	154.5	172.73		172.93	0.000608	4.46	6129.94	689.31	0.22
1	128272	50-YR	23852	154.5	174.81		175.02	0.00054	4.63	7636.33	762.29	0.21
1	128272	100-YR	29782	154.5	176.84		177.06	0.000504	4.86	9271.28	854.3	0.21
1	128272	500-YR	46334	154.5	181.55		181.87	0.000581	6.13	16112.37	2514.1	0.23
1	126227	2-YR	5476	149	162.7		162.97	0.000738	4.19	1327.84	145.1	0.23
1	126227	5-YR	9138	149	165.38		165.84	0.000931	5.49	1743.6	165.06	0.27
1	126227	10-YR	12868	149	167.53		168.18	0.00108	6.55	2116.8	181.93	0.3
1	126227	25-YR	18752	149	170.16		171.11	0.0013	7.99	2622.91	208.62	0.33
1	126227	50-YR	23852	149	171.96		173.2	0.0015	9.15	3065.71	282.7	0.36
1	126227	100-YR	29782	149	173.7		175.22	0.001688	10.27	3619.04	356.71	0.39
1	126227	500-YR	46334	149	177.6		179.7	0.002	12.51	5483.84	618.39	0.44
1	125511	2-YR	5476	148.04	161.6		162.09	0.00223	5.66	982.89	148.01	0.37
1	125511	5-YR	9138	148.04	164.1		164.83	0.002265	6.89	1377.1	168.31	0.39
1	125511	10-YR	12868	148.04	166.1		167.06	0.002332	7.94	1740.31	202.59	0.41
1	125511	25-YR	18752	148.04	168.56		169.83	0.002456	9.27	2384.23	320.85	0.44
1	125511	50-YR	23852	148.04	170.45		171.85	0.002375	9.92	3076.94	413.29	0.44
1	125511	100-YR	29782	148.04	172.34		173.81	0.002269	10.45	3913.33	475.77	0.44
1	125511	500-YR	46334	148.04	176.57		178.09	0.002022	11.38	7809.38	1484.69	0.43
1	125218	2-YR	5476	145.56	160.94		161.43	0.002305	5.64	981.87	151.67	0.38
1	125218	5-YR	9138	145.56	163.46		164.15	0.002277	6.76	1423.53	194.83	0.39
1	125218	10-YR	12868	145.56	165.49		166.36	0.002235	7.65	1864.72	240.6	0.4
1	125218	25-YR	18752	145.56	167.99		169.1	0.002248	8.77	2530.39	294.49	0.42
1	125218	50-YR	23852	145.56	169.89		171.14	0.002196	9.45	3134.6	338.4	0.42
1	125218	100-YR	29782	145.56	171.71		173.14	0.002243	10.27	3816.52	541.66	0.43
1	125218	500-YR	46334	145.56	176.12		177.48	0.001842	10.81	7850.56	1468.76	0.41
1	125061	2-YR	5476	144.61	160.6		161.07	0.00223	5.52	991.97	145.05	0.37
1	125061	5-YR	9138	144.61	163.1		163.8	0.0022	6.74	1380.52	166.67	0.39
1	125061	10-YR	12868	144.61	165.08		166	0.002264	7.76	1732.99	189.05	0.41
1	125061	25-YR	18752	144.61	167.43		168.71	0.002487	9.22	2222.75	229.51	0.44
1	125061	50-YR	23852	144.61	169.21		170.74	0.002574	10.17	2662.14	259.84	0.46
1	125061	100-YR	29782	144.61	170.88		172.72	0.002739	11.23	3144.1	326.43	0.48
1	125061	500-YR	46334	144.61	175.23	169.01	177.1	0.002362	12.12	6428.09	1181.18	0.46

EXISTING CONDITIONS HEC-RAS RESULTS:

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	124958	2-YR	5476	143.99	160.4	155.38	160.84	0.001897	5.29	1036.24	143.46	0.34
1	124958	5-YR	9138	143.99	162.9	157.53	163.57	0.001985	6.57	1411.17	158.4	0.37
1	124958	10-YR	12868	143.99	164.86	159.31	165.77	0.002119	7.66	1740.57	176.88	0.39
1	124958	25-YR	18752	143.99	167.16	161.19	168.45	0.002427	9.23	2170.96	198.45	0.43
1	124958	50-YR	23852	143.99	168.83	162.68	170.45	0.002644	10.38	2517.13	218.4	0.46
1	124958	100-YR	29782	143.99	170.34	164.36	172.38	0.002961	11.67	2876.86	281.77	0.49
1	124958	500-YR	46334	143.99	173.45	168.35	176.41	0.003724	14.61	4636.46	890.38	0.57
1	124893		Bridge									
1	124834	2-YR	5476	143.25	160.4		160.73	0.001296	4.6	1199.81	160.96	0.29
1	124834	5-YR	9138	143.25	162.94		163.45	0.001398	5.75	1638.32	183.45	0.31
1	124834	10-YR	12868	143.25	164.95		165.64	0.001506	6.72	2024.85	201.21	0.34
1	124834	25-YR	18752	143.25	167.35		168.32	0.001719	8.07	2542.6	231.25	0.37
1	124834	50-YR	23852	143.25	169.11		170.31	0.001852	9.03	2967.26	249.88	0.39
1	124834	100-YR	29782	143.25	170.75		172.24	0.002047	10.1	3420.07	347.21	0.42
1	124834	500-YR	46334	143.25	174.25	167.09	176.29	0.002394	12.28	6139.08	1467.08	0.46
1	124725	2-YR	5476	145.57	160.17		160.55	0.001756	4.93	1117.58	173.19	0.33
1	124725	5-YR	9138	145.57	162.73		163.28	0.001671	5.94	1590.82	196.46	0.34
1	124725	10-YR	12868	145.57	164.76		165.46	0.001692	6.8	2019.09	227.58	0.35
1	124725	25-YR	18752	145.57	167.17		168.12	0.001811	7.99	2609.95	257.82	0.38
1	124725	50-YR	23852	145.57	168.93		170.07	0.001887	8.84	3080.96	275.38	0.39
1	124725	100-YR	29782	145.57	170.57		171.97	0.002061	9.86	3585.11	398.36	0.42
1	124725	500-YR	46334	145.57	174.22		175.84	0.002076	11.25	7333.15	1608.78	0.43
1	124541	2-YR	5476	144.49	159.63		160.13	0.002925	5.63	972.31	166.11	0.41
1	124541	5-YR	9138	144.49	162.26		162.9	0.002429	6.42	1433.26	186.14	0.39
1	124541	10-YR	12868	144.49	164.3		165.09	0.002305	7.17	1856.64	220.64	0.4
1	124541	25-YR	18752	144.49	166.69		167.73	0.00238	8.29	2407.88	239.05	0.42
1	124541	50-YR	23852	144.49	168.44		169.68	0.002425	9.09	2835.58	252.04	0.43
1	124541	100-YR	29782	144.49	170.07		171.55	0.002536	10.01	3328.09	376.12	0.45
1	124541	500-YR	46334	144.49	173.9		175.42	0.00223	10.86	7140.41	1536.12	0.43
1	124142	2-YR	5476	143.95	158.21	154.73	158.84	0.003484	6.38	858.98	138.88	0.45
1	124142	5-YR	9138	143.95	161.01	157.06	161.81	0.003022	7.14	1285.71	193	0.44
1	124142	10-YR	12868	143.95	163.14	158.48	164.09	0.002679	7.85	1738.71	268.04	0.43
1	124142	25-YR	18752	143.95	165.5	160.51	166.71	0.002674	9	2323.44	316.46	0.45
1	124142	50-YR	23852	143.95	167.24	162.11	168.64	0.002682	9.83	2787.3	374.28	0.46
1	124142	100-YR	29782	143.95	169.15	163.68	170.54	0.002396	10.09	3917.16	485.64	0.44
1	124142	500-YR	46334	143.95	173.15	167.01	174.53	0.002043	10.79	7593.94	1551.32	0.42
1	123551	2-YR	5476	143	157.35		157.64	0.001155	4.32	1266.4	164.88	0.28
1	123551	5-YR	9138	143	160.16		160.58	0.001288	5.16	1771.62	195.5	0.3
1	123551	10-YR	12868	143	162.41		162.93	0.001227	5.82	2264.09	244.12	0.3
1	123551	25-YR	18752	143	164.73		165.47	0.001365	6.94	2891.17	294.65	0.33
1	123551	50-YR	23852	143	166.46		167.35	0.001441	7.72	3432.17	332.11	0.35
1	123551	100-YR	29782	143	168.29		169.34	0.001483	8.43	4077.49	372.24	0.36
1	123551	500-YR	46334	143	172.09		173.46	0.001595	9.98	7291.57	1363.63	0.38
1	122187	2-YR	5476	141	156.47	150.32	156.56	0.00053	2.77	2374.37	355.77	0.18
1	122187	5-YR	9138	141	159.31	151.66	159.43	0.00053	3.11	3481.8	424.43	0.19
1	122187	10-YR	12868	141	161.63	152.69	161.78	0.00053	3.57	4659.08	568.79	0.2
1	122187	25-YR	18752	141	164.03	154.05	164.22	0.00053	4.1	6143.64	679.91	0.2
1	122187	50-YR	23852	141	165.82	155.1	166.05	0.00053	4.48	7473.94	803.59	0.21
1	122187	100-YR	29782	141	167.73	156.07	167.98	0.00053	4.86	9190.26	1042.4	0.21
1	122187	500-YR	46334	141	171.69	158.55	171.99	0.00053	5.62	15443.47	2260.2	0.22

NOTES:

1. *THIS PROJECT IS LOCATED IN FEMA DESIGNATED ZONE "A". FIRM PANELS 48175C0375B EFFECTIVE DATE OCTOBER 19, 2010 FOR GOLIAD COUNTY, AND 48025C0225C EFFECTIVE DATE MAY 20, 2010 FOR BEE COUNTY.*
2. *COORDINATION WAS MADE WITH THE FLOODPLAIN ADMINISTRATOR AS A LETTER EXPLAINING THE PROJECT, PRESENTING THE AMOUNT OF RISE ANTICIPATED BASED ON THE ANALYSIS AND OFFERING THE TECHNICAL DATA FROM THE ANALYSIS.*
3. *UNITED STATES ARMY CORPS OF ENGINEERS (USACE) HEC-RAS VERSION 6.3.1 UTILIZED FOR THE ANALYSIS.*
4. *SAN ANTONIO RIVER AUTHORITY'S (SARA) BLANCO CREEK MODEL USED AS BEST AVAILABLE EXISTING CONDITION.*
5. *ADDITIONAL CROSS SECTIONS WERE DEVELOPED FROM SITE SURVEY WITH ADDITIONAL ELEVATIONS TAKEN FROM USGS TOPOGRAPHIC DATA (SOUTH TEXAS LIDAR 2018). SITE SURVEY BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204) NAD 83 WITH A SURFACE ADJUSTMENT FACTOR OF 1.00000. ALL ELEVATIONS BASED ON NAVD88 VERTICAL DATUM.*
6. *PS&E CALCULATED FLOWS WERE USED OF THE DESIGN ANALYSIS OF THE 2-YR, 5-YR, 10-YR, 25-YR, 50-YR, 100-YR, AND 500-YR STORM FREQUENCIES. SEE HYDRAULIC REPORT FOR MORE DETAIL.*

REFERENCES:

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Texas Department of Transportation

CR 421

DRAINAGE HYDRAULIC DATA

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		42

DATE: 3/1/2023 11:49 AM
FILE: c:\pw_work\dirtxdot\dms58458\CR421DHD04.dgn

GD CK GD DW GD CK GD DW

PROPOSED CONDITIONS HEC-RAS RESULTS:

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	134700	2-YR	5476	164.5	173.3		174.71	0.010703	9.52	574.96	121.73	0.77
1	134700	5-YR	9138	164.5	176.6		177.76	0.006111	8.61	1061.89	172.26	0.61
1	134700	10-YR	12868	164.5	179.06		180.16	0.00462	8.41	1529.37	208.14	0.55
1	134700	25-YR	18752	164.5	182.16		183.25	0.003067	8.4	2351.73	364.73	0.47
1	134700	50-YR	23852	164.5	183.65		184.89	0.002973	9.08	2979.25	477.34	0.47
1	134700	100-YR	29782	164.5	185.07		186.46	0.002931	9.74	3733.89	586.36	0.48
1	134700	500-YR	46334	164.5	188.55		190.02	0.002521	10.59	6274.22	851.56	0.46
1	133075	2-YR	5476	154.5	171.8		171.99	0.000544	3.58	1552.45	178.27	0.2
1	133075	5-YR	9138	154.5	174.96		175.26	0.000594	4.48	2207.05	237.3	0.22
1	133075	10-YR	12868	154.5	177.33		177.73	0.000648	5.21	2823.49	282.72	0.23
1	133075	25-YR	18752	154.5	180.31		180.9	0.000763	6.34	4008.05	1195	0.26
1	133075	50-YR	23852	154.5	182.03		182.59	0.000727	6.56	6133.29	1270.67	0.26
1	133075	100-YR	29782	154.5	183.72		184.23	0.00067	6.64	8342.02	1341.79	0.25
1	133075	500-YR	46334	154.5	187.68		188.1	0.000543	6.67	14041.81	1535.54	0.23
1	129782	2-YR	5476	154.5	166.54		167.68	0.005945	8.59	637.67	99.81	0.6
1	129782	5-YR	9138	154.5	168.83		170.48	0.006771	10.32	894.15	138.24	0.66
1	129782	10-YR	12868	154.5	170.78		172.71	0.0064	11.24	1223.23	189.64	0.66
1	129782	25-YR	18752	154.5	173.46		175.59	0.005238	12.08	1785.33	230.65	0.62
1	129782	50-YR	23852	154.5	175.16		177.56	0.005053	12.99	2201.64	258.03	0.62
1	129782	100-YR	29782	154.5	176.92		179.57	0.004874	13.84	2679.35	285.21	0.63
1	129782	500-YR	46334	154.5	181.76	177.83	184.4	0.003762	14.62	5762.86	1417.04	0.58
1	128272	2-YR	5476	154.5	164.69		164.8	0.00078	3.19	2180.46	366	0.22
1	128272	5-YR	9138	154.5	167.48		167.62	0.000681	3.57	3275.84	417.25	0.21
1	128272	10-YR	12868	154.5	169.76		169.92	0.000639	3.87	4270.28	457.1	0.21
1	128272	25-YR	18752	154.5	172.74		172.94	0.000607	4.46	6136.41	689.64	0.22
1	128272	50-YR	23852	154.5	174.81		175.03	0.000539	4.63	7642.22	762.56	0.21
1	128272	100-YR	29782	154.5	176.84		177.07	0.000503	4.86	9275.08	854.48	0.21
1	128272	500-YR	46334	154.5	181.55		181.87	0.000581	6.13	16112.37	2514.1	0.23
1	126227	2-YR	5476	149	163.09		163.34	0.00065	4.03	1385.22	147.93	0.22
1	126227	5-YR	9138	149	165.57		166.02	0.000885	5.41	1775.2	166.55	0.26
1	126227	10-YR	12868	149	167.57		168.22	0.001071	6.53	2123.88	182.23	0.3
1	126227	25-YR	18752	149	170.18		171.12	0.001296	7.98	2626.2	209.27	0.33
1	126227	50-YR	23852	149	171.98		173.21	0.001496	9.15	3069.59	283.26	0.36
1	126227	100-YR	29782	149	173.7		175.23	0.001685	10.27	3622	357.07	0.39
1	126227	500-YR	46334	149	177.6		179.7	0.002	12.51	5483.84	618.39	0.44
1	125511	2-YR	5476	148.04	162.19		162.61	0.001737	5.21	1070.96	152.11	0.33
1	125511	5-YR	9138	148.04	164.39		165.07	0.002039	6.67	1426.99	171.13	0.38
1	125511	10-YR	12868	148.04	166.16		167.1	0.002291	7.9	1752.58	204.41	0.41
1	125511	25-YR	18752	148.04	168.59		169.85	0.002435	9.25	2393.52	321.51	0.44
1	125511	50-YR	23852	148.04	170.48		171.87	0.002358	9.9	3087.61	414.04	0.44
1	125511	100-YR	29782	148.04	172.35		173.82	0.002262	10.44	3919.37	476.38	0.44
1	125511	500-YR	46334	148.04	176.57		178.09	0.002022	11.38	7809.38	1484.69	0.43
1	125218	2-YR	5476	145.56	161.71		162.1	0.001659	5.07	1105.25	168.57	0.32
1	125218	5-YR	9138	145.56	163.84		164.48	0.001979	6.48	1498.81	202.34	0.37
1	125218	10-YR	12868	145.56	165.57		166.43	0.00218	7.59	1883.36	242.12	0.4
1	125218	25-YR	18752	145.56	168.02		169.13	0.002227	8.74	2540.65	295.39	0.41
1	125218	50-YR	23852	145.56	169.92		171.16	0.00218	9.42	3144.82	339.04	0.42
1	125218	100-YR	29782	145.56	171.72		173.16	0.002236	10.26	3824.37	547.16	0.43
1	125218	500-YR	46334	145.56	176.12		177.48	0.001842	10.81	7850.56	1468.76	0.41
1	125061	2-YR	5476	144.61	161.48		161.85	0.001494	4.9	1122.89	152.13	0.31
1	125061	5-YR	9138	144.61	163.53		164.17	0.001888	6.43	1453.59	171.55	0.36
1	125061	10-YR	12868	144.61	165.17		166.08	0.002205	7.7	1749.5	190.03	0.4
1	125061	25-YR	18752	144.61	167.47		168.74	0.002462	9.19	2231.8	230.78	0.44
1	125061	50-YR	23852	144.61	169.24		170.76	0.002555	10.15	2670.79	261.32	0.45
1	125061	100-YR	29782	144.61	170.9		172.73	0.002728	11.22	3150.1	330.72	0.48
1	125061	500-YR	46334	144.61	175.23	168.99	177.1	0.002362	12.12	6428.09	1181.18	0.46

PROPOSED CONDITIONS HEC-RAS RESULTS:

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	124958	2-YR	5476	143.99	161.35	155.38	161.7	0.001266	4.68	1174.54	148.44	0.29
1	124958	5-YR	9138	143.99	163.36	157.53	163.97	0.001701	6.27	1485.27	162.74	0.34
1	124958	10-YR	12868	143.99	164.96	159.31	165.85	0.002063	7.6	1757.06	177.75	0.39
1	124958	25-YR	18752	143.99	167.2	161.19	168.49	0.002401	9.2	2179.49	198.85	0.43
1	124958	50-YR	23852	143.99	168.86	162.68	170.47	0.002623	10.35	2525.17	219.31	0.46
1	124958	100-YR	29782	143.99	170.36	164.36	172.39	0.002948	11.66	2882.66	289.04	0.49
1	124958	500-YR	46334	143.99	173.45	168.35	176.41	0.003724	14.61	4636.46	890.38	0.57
1	124893		Bridge									
1	124834	2-YR	5476	143.25	160.4		160.73	0.001296	4.6	1199.81	160.96	0.29
1	124834	5-YR	9138	143.25	162.94		163.45	0.001398	5.75	1638.32	183.45	0.31
1	124834	10-YR	12868	143.25	164.95		165.64	0.001506	6.72	2024.85	201.21	0.34
1	124834	25-YR	18752	143.25	167.35		168.32	0.001719	8.07	2542.6	231.25	0.37
1	124834	50-YR	23852	143.25	169.11		170.31	0.001852	9.03	2967.24	249.88	0.39
1	124834	100-YR	29782	143.25	170.75		172.24	0.002047	10.1	3420.09	347.22	0.42
1	124834	500-YR	46334	143.25	174.25	167.09	176.29	0.002394	12.28	6139.08	1467.08	0.46
1	124725	2-YR	5476	145.57	160.17		160.55	0.001756	4.93	1117.58	173.19	0.33
1	124725	5-YR	9138	145.57	162.73		163.28	0.001671	5.94	1590.82	196.46	0.34
1	124725	10-YR	12868	145.57	164.76		165.46	0.001692	6.8	2019.08	227.58	0.35
1	124725	25-YR	18752	145.57	167.17		168.12	0.001811	7.99	2609.95	257.82	0.38
1	124725	50-YR	23852	145.57	168.93		170.07	0.001887	8.84	3080.94	275.38	0.39
1	124725	100-YR	29782	145.57	170.57		171.97	0.002061	9.86	3585.13	398.36	0.42
1	124725	500-YR	46334	145.57	174.22		175.84	0.002076	11.25	7333.15	1608.78	0.43
1	124541	2-YR	5476	144.49	159.63		160.13	0.002925	5.63	972.31	166.11	0.41
1	124541	5-YR	9138	144.49	162.26		162.9	0.002429	6.42	1433.26	186.14	0.39
1	124541	10-YR	12868	144.49	164.3		165.09	0.002305	7.17	1856.63	220.64	0.4
1	124541	25-YR	18752	144.49	166.69		167.73	0.00238	8.29	2407.88	239.05	0.42
1	124541	50-YR	23852	144.49	168.44		169.68	0.002425	9.09	2835.56	252.03	0.43
1	124541	100-YR	29782	144.49	170.07		171.55	0.002536	10.01	3328.11	376.13	0.45
1	124541	500-YR	46334	144.49	173.9		175.42	0.00223	10.86	7140.41	1536.12	0.43
1	124142	2-YR	5476	143.95	158.21	154.73	158.84	0.003484	6.38	858.98	138.88	0.45
1	124142	5-YR	9138	143.95	161.01	157.06	161.81	0.003022	7.14	1285.7	193	0.44
1	124142	10-YR	12868	143.95	163.14	158.48	164.09	0.002679	7.85	1738.71	268.04	0.43
1	124142	25-YR	18752	143.95	165.5	160.51	166.71	0.002674	9	2323.44	316.46	0.45
1	124142	50-YR	23852	143.95	167.24	162.11	168.64	0.002683	9.83	2787.27	374.27	0.46
1	124142	100-YR	29782	143.95	169.15	163.68	170.54	0.002396	10.09	3917.21	485.65	0.44
1	124142	500-YR	46334	143.95	173.15	167.01	174.53	0.002043	10.79	7593.94	1551.32	0.42
1	123551	2-YR	5476	143	157.35		157.64	0.001155	4.32	1266.4	164.88	0.28
1	123551	5-YR	9138	143	160.16		160.58	0.001288	5.16	1771.62	195.5	0.3
1	123551	10-YR	12868	143	162.4		162.93	0.001227	5.82	2264.09	244.12	0.3
1	123551	25-YR	18752	143	164.73		165.47	0.001365	6.94	2891.17	294.65	0.33
1	123551	50-YR	23852	143	166.46		167.35	0.001441	7.72	3432.13	332.11	0.35
1	123551	100-YR	29782	143	168.29		169.34	0.001483	8.43	4077.55	372.25	0.36
1	123551	500-YR	46334	143	172.09		173.46	0.001595	9.98	7291.57	1363.63	0.38
1	122187	2-YR	5476	141	156.47	150.32	156.56	0.00053	2.77	2374.37	355.77	0.18
1	122187	5-YR	9138	141	159.31	151.64	159.43	0.000531	3.11	3481.8	424.43	0.19
1	122187	10-YR	12868	141	161.63	152.71	161.78	0.00053	3.57	4659.04	568.75	0.2
1	122187	25-YR	18752	141	164.03	154.08	164.22	0.00053	4.1	6143.55	679.91	0.2
1	122187	50-YR	23852	141	165.82	155.03	166.05	0.00053	4.48	7473.74	803.58	0.21
1	122187	100-YR	29782	141	167.73	156.09	167.98	0.00053	4.86	9190.33	1042.42	0.21
1	122187	500-YR	46334	141	171.69	158.5	171.99	0.00053	5.62	15443.36	2260.2	0.22

NOTES:

1. *THIS PROJECT IS LOCATED IN FEMA DESIGNATED ZONE "A". FIRM PANELS 48175C0375B EFFECTIVE DATE OCTOBER 19, 2010 FOR GOLIAD COUNTY, AND 48025C0225C EFFECTIVE DATE MAY 20, 2010 FOR BEE COUNTY.*
2. *COORDINATION WAS MADE WITH THE FLOODPLAIN ADMINISTRATOR AS A LETTER EXPLAINING THE PROJECT, PRESENTING THE AMOUNT OF RISE ANTICIPATED BASED ON THE ANALYSIS AND OFFERING THE TECHNICAL DATA FROM THE ANALYSIS.*
3. *UNITED STATES ARMY CORPS OF ENGINEERS (USACE) HEC-RAS VERSION 6.3.1 UTILIZED FOR THE ANALYSIS.*
4. *SAN ANTONIO RIVER AUTHORITY'S (SARA) BLANCO CREEK MODEL USED AS BEST AVAILABLE EXISTING CONDITION.*
5. *ADDITIONAL CROSS SECTIONS WERE DEVELOPED FROM SITE SURVEY WITH ADDITIONAL ELEVATIONS TAKEN FROM USGS TOPOGRAPHIC DATA (SOUTH TEXAS LIDAR 2018). SITE SURVEY BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204) NAD 83 WITH A SURFACE ADJUSTMENT FACTOR OF 1.00000. ALL ELEVATIONS BASED ON NAVD88 VERTICAL DATUM.*
6. *PS&E CALCULATED FLOWS WERE USED OF THE DESIGN ANALYSIS OF THE 2-YR, 5-YR, 10-YR, 25-YR, 50-YR, 100-YR, AND 500-YR STORM FREQUENCIES. SEE HYDRAULIC REPORT FOR MORE DETAIL.*

REFERENCES:

1. *TXDOT HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)*
2. *TOPOGRAPHIC DATA SOURCES (TNRIS SOUTH TEXAS 2018 & SURVEY SITE DATA)*

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STATE OF TEXAS
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143922
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Texas Department of Transportation

CR 421

DRAINAGE
HYDRAULIC DATA

SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		43

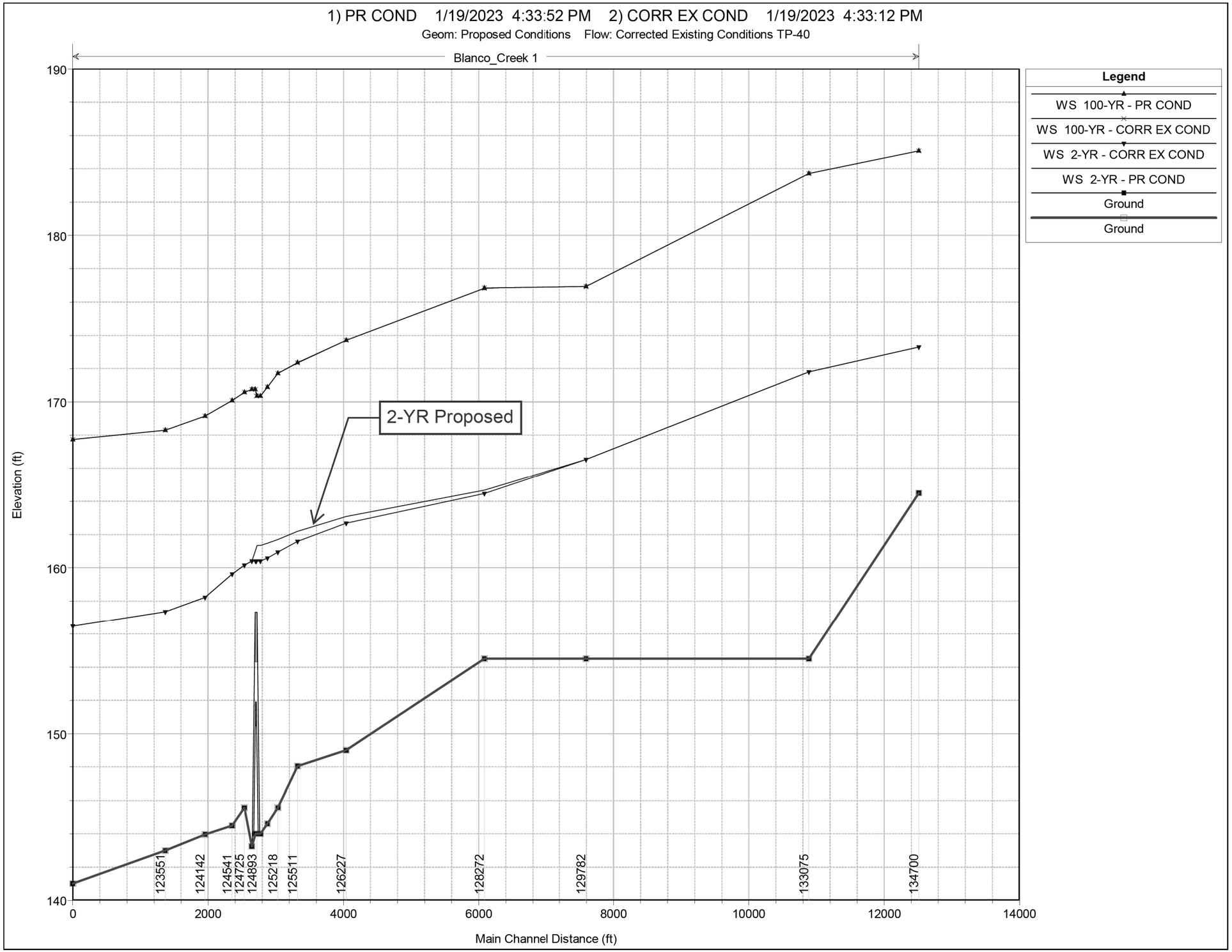
DATE: 3/28/2023 7:26 AM
FILE: c:\pw_work\dirltxdot\dms58458\CR421DHD04a.dgn

GD CK GD DW GD CK GD DW

TIME: $TIME$
DATE: $DATE$
DW GD DATE CK GD

1) PR COND 1/19/2023 4:33:52 PM 2) CORR EX COND 1/19/2023 4:33:12 PM

Geom: Proposed Conditions Flow: Corrected Existing Conditions TP-40



Legend

- WS 100-YR - PR COND
- WS 100-YR - CORR EX COND
- WS 2-YR - CORR EX COND
- WS 2-YR - PR COND
- Ground
- Ground

NOTES:

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4. *SAN ANTONIO RIVER AUTHORITY'S (SARA) BLANCO CREEK MODEL USED AS BEST AVAILABLE EXISTING CONDITION.*
5. *ADDITIONAL CROSS SECTIONS WERE DEVELOPED FROM SITE SURVEY WITH ADDITIONAL ELEVATIONS TAKEN FROM USGS TOPOGRAPHIC DATA (SOUTH TEXAS LIDAR 2018). SITE SURVEY BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204) NAD 83 WITH A SURFACE ADJUSTMENT FACTOR OF 1.00000. ALL ELEVATIONS BASED ON NAVD88 VERTICAL DATUM.*
6. *PS&E CALCULATED FLOWS WERE USED OF THE DESIGN ANALYSIS OF THE 2-YR, 5-YR, 10-YR, 25-YR, 50-YR, 100-YR, AND 500-YR STORM FREQUENCIES. SEE HYDRAULIC REPORT FOR MORE DETAIL.*

REFERENCES:

1. *TXDOT HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)*
2. *TOPOGRAPHIC DATA SOURCES (TNRIS SOUTH TEXAS 2018 & SURVEY SITE DATA)*

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Texas Department of Transportation

CR 421

DRAINAGE CROSS SECTION LAYOUT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		44

DATE: 2/16/2023 12:16 PM
FILE: $FILE$ w:\work\in\jacobs-amer-trans\pl\dms58458\CR421DHD05.dgn

DW: GD | CK: GD | DW: GD | CK: GD

2 YR UPPER SOIL LAYER *5 YR UPPER SOIL LAYER* *10 YR UPPER SOIL LAYER* *25 YR UPPER SOIL LAYER* *50 YR UPPER SOIL LAYER*

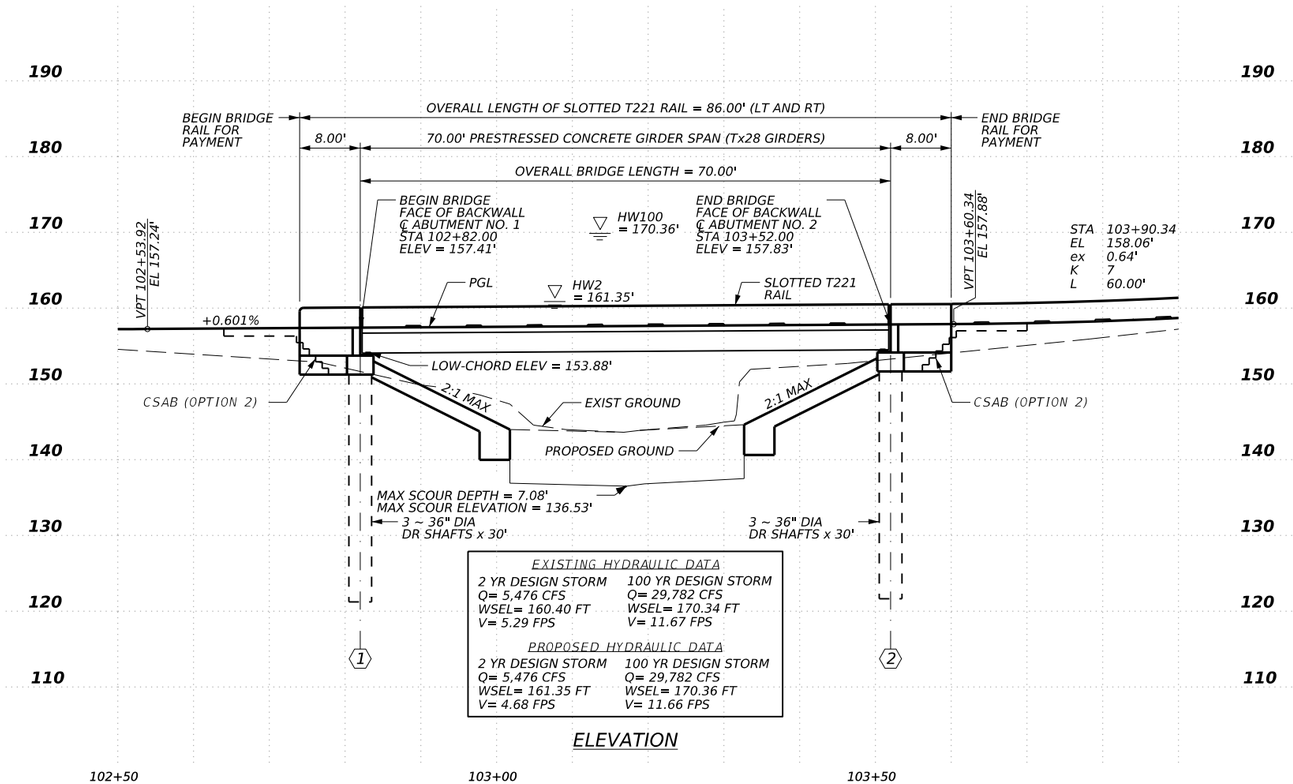
CR 421 at BLANCO CREEK - UPPER SANDY LAYER					
2-YEAR SCOUR DESIGN FLOOD FREQUENCY					
Pier Shape	NA	k_{sh}	NA	$t_{e(P)}$ (hr)	137.3
α (degrees)	0	k_{sp}	NA	τ_c (Pa)	0.21
a (m)	0	k_w	NA	$\tau_{i(C)}$ (Pa)	77.2
a' (m)	0	K_W	1.00	$\tau_{i(P)}$ (Pa)	NA
A_1 (m^2)	102.7	K_{SH}	1.00	ν (m^2/s)	0.000001
B_1 (m)	51.4	K_{SP}	1.00	V_1 (m/s)	1.51
B_2 (m)	21.3	L_c (m)	7.92	V_2 (m/s)	2.23
γ (kg/m^3)	9810	L_p (m)	0	V_c (m/s)	0.23
g (m/s^2)	9.81	n	0.042	$\dot{z}_{i(C)}$ (mm/hr)	724.07
θ (degrees)	8.6	n_b	0	$\dot{z}_{i(P)}$ (mm/hr)	NA
H_1 (m)	2	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	1.78
H_2 (m)	1.90	P (m)	53.2	$Z_C(\Delta t)$ (m)	1.77
$H_{2\Delta}$ (m)	1.90	R_e	0	$Z_{max(P)}$ (m)	0.00
k_α	NA	R_h (m)	2	$Z_P(\Delta t)$ (m)	0.00
k_θ	1.03	S (m)	0	**$Z_C(\Delta t)$ (ft)**	**5.80**
k_{Lc}	0.99	Δt (yr)	100	**$Z_P(\Delta t)$ (ft)**	**0.00**
k_r	2.40	$t_{e(C)}$ (hr)	317.2	**$Z_{tot}(\Delta t)$ (ft)**	**5.80**

CR 421 at BLANCO CREEK - UPPER SANDY LAYER					
5-YEAR SCOUR DESIGN FLOOD FREQUENCY					
Pier Shape	NA	k_{sh}	NA	$t_{e(P)}$ (hr)	100.3
α (degrees)	0	k_{sp}	NA	τ_c (Pa)	0.21
a (m)	0	k_w	NA	$\tau_{i(C)}$ (Pa)	134.6
a' (m)	0	K_W	1.00	$\tau_{i(P)}$ (Pa)	NA
A_1 (m^2)	139.2	K_{SH}	1.00	ν (m^2/s)	0.000001
B_1 (m)	61.7	K_{SP}	1.00	V_1 (m/s)	1.86
B_2 (m)	21.3	L_c (m)	7.92	V_2 (m/s)	1.98
γ (kg/m^3)	9810	L_p (m)	0	V_c (m/s)	0.23
g (m/s^2)	9.81	n	0.041	$\dot{z}_{i(C)}$ (mm/hr)	1262.82
θ (degrees)	11.5	n_b	0	$\dot{z}_{i(P)}$ (mm/hr)	NA
H_1 (m)	2.26	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	1.67
H_2 (m)	1.90	P (m)	63.6	$Z_C(\Delta t)$ (m)	1.66
$H_{2\Delta}$ (m)	1.90	R_e	0	$Z_{max(P)}$ (m)	0.00
k_α	NA	R_h (m)	2	$Z_P(\Delta t)$ (m)	0.00
k_θ	1.04	S (m)	0	**$Z_C(\Delta t)$ (ft)**	**5.43**
k_{Lc}	0.96	Δt (yr)	100	**$Z_P(\Delta t)$ (ft)**	**0.00**
k_r	3.06	$t_{e(C)}$ (hr)	186.2	**$Z_{tot}(\Delta t)$ (ft)**	**5.43**

CR 421 at BLANCO CREEK - UPPER SANDY LAYER					
10-YEAR SCOUR DESIGN FLOOD FREQUENCY					
Pier Shape	NA	k_{sh}	NA	$t_{e(P)}$ (hr)	83.3
α (degrees)	0	k_{sp}	NA	τ_c (Pa)	0.21
a (m)	0	k_w	NA	$\tau_{i(C)}$ (Pa)	190.8
a' (m)	0	K_W	1.00	$\tau_{i(P)}$ (Pa)	NA
A_1 (m^2)	175	K_{SH}	1.00	ν (m^2/s)	0.000001
B_1 (m)	73.8	K_{SP}	1.00	V_1 (m/s)	2.08
B_2 (m)	21.3	L_c (m)	7.92	V_2 (m/s)	1.85
γ (kg/m^3)	9810	L_p (m)	0	V_c (m/s)	0.23
g (m/s^2)	9.81	n	0.039	$\dot{z}_{i(C)}$ (mm/hr)	1790.30
θ (degrees)	14.8	n_b	0	$\dot{z}_{i(P)}$ (mm/hr)	NA
H_1 (m)	2.37	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	1.58
H_2 (m)	1.90	P (m)	75.7	$Z_C(\Delta t)$ (m)	1.57
$H_{2\Delta}$ (m)	1.90	R_e	0	$Z_{max(P)}$ (m)	0.00
k_α	NA	R_h (m)	2	$Z_P(\Delta t)$ (m)	0.00
k_θ	1.06	S (m)	0	**$Z_C(\Delta t)$ (ft)**	**5.16**
k_{Lc}	0.93	Δt (yr)	100	**$Z_P(\Delta t)$ (ft)**	**0.00**
k_r	3.96	$t_{e(C)}$ (hr)	134.8	**$Z_{tot}(\Delta t)$ (ft)**	**5.16**

CR 421 at BLANCO CREEK - UPPER SANDY LAYER					
25-YEAR SCOUR DESIGN FLOOD FREQUENCY					
Pier Shape	NA	k_{sh}	NA	$t_{e(P)}$ (hr)	95.1
α (degrees)	0	k_{sp}	NA	τ_c (Pa)	0.21
a (m)	0	k_w	NA	$\tau_{i(C)}$ (Pa)	289.4
a' (m)	0	K_W	1.00	$\tau_{i(P)}$ (Pa)	NA
A_1 (m^2)	236	K_{SH}	1.00	ν (m^2/s)	0.000001
B_1 (m)	90	K_{SP}	1.00	V_1 (m/s)	2.25
B_2 (m)	21.3	L_c (m)	7.92	V_2 (m/s)	2.1
γ (kg/m^3)	9810	L_p (m)	0	V_c (m/s)	0.23
g (m/s^2)	9.81	n	0.039	$\dot{z}_{i(C)}$ (mm/hr)	2715.74
θ (degrees)	19.1	n_b	0	$\dot{z}_{i(P)}$ (mm/hr)	NA
H_1 (m)	2.62	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	1.90
H_2 (m)	1.90	P (m)	92.1	$Z_C(\Delta t)$ (m)	1.89
$H_{2\Delta}$ (m)	1.90	R_e	0	$Z_{max(P)}$ (m)	0.00
k_α	NA	R_h (m)	3	$Z_P(\Delta t)$ (m)	0.00
k_θ	1.09	S (m)	0	**$Z_C(\Delta t)$ (ft)**	**6.21**
k_{Lc}	0.90	Δt (yr)	100	**$Z_P(\Delta t)$ (ft)**	**0.00**
k_r	5.35	$t_{e(C)}$ (hr)	129.1	**$Z_{tot}(\Delta t)$ (ft)**	**6.21**

CR 421 at BLANCO CREEK - UPPER SANDY LAYER					
50-YEAR SCOUR CHECK FLOOD FREQUENCY					
Pier Shape	NA	k_{sh}	NA	$t_{e(P)}$ (hr)	103.9
α (degrees)	0	k_{sp}	NA	τ_c (Pa)	0.21
a (m)	0	k_w	NA	$\tau_{i(C)}$ (Pa)	389.0
a' (m)	0	K_W	1.00	$\tau_{i(P)}$ (Pa)	NA
A_1 (m^2)	292.2	K_{SH}	1.00	ν (m^2/s)	0.000001
B_1 (m)	103.3	K_{SP}	1.00	V_1 (m/s)	2.31
B_2 (m)	21.3	L_c (m)	7.92	V_2 (m/s)	2.29
γ (kg/m^3)	9810	L_p (m)	0	V_c (m/s)	0.23
g (m/s^2)	9.81	n	0.04	$\dot{z}_{i(C)}$ (mm/hr)	3650.57
θ (degrees)	22.5	n_b	0	$\dot{z}_{i(P)}$ (mm/hr)	NA
H_1 (m)	2.83	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	2.17
H_2 (m)	1.90	P (m)	105.4	$Z_C(\Delta t)$ (m)	2.19
$H_{2\Delta}$ (m)	1.90	R_e	0	$Z_{max(P)}$ (m)	0.00
k_α	NA	R_h (m)	3	$Z_P(\Delta t)$ (m)	0.00
k_θ	1.11	S (m)	0	**$Z_C(\Delta t)$ (ft)**	**7.08**
k_{Lc}	0.88	Δt (yr)	100	**$Z_P(\Delta t)$ (ft)**	**0.00**
k_r	6.64	$t_{e(C)}$ (hr)	124.5	**$Z_{tot}(\Delta t)$ (ft)**	**7.08**



EXISTING HYDRAULIC DATA	
2 YR DESIGN STORM	100 YR DESIGN STORM
Q= 5,476 CFS	Q= 29,782 CFS
WSEL= 160.40 FT	WSEL= 170.34 FT
V= 5.29 FPS	V= 11.67 FPS
PROPOSED HYDRAULIC DATA	
2 YR DESIGN STORM	100 YR DESIGN STORM
Q= 5,476 CFS	Q= 29,782 CFS
WSEL= 161.35 FT	WSEL= 170.36 FT
V= 4.68 FPS	V= 11.66 FPS

ELEVATION

NOTES:

1. *SEE CSAB (OPTION 2) STANDARD FOR CEMENT STABILIZED ABUTMENT BACKFILL DETAILS, SSR FOR STONE RIPRAP DETAILS, AND CRR FOR CONCRETE RIPRAP DETAILS.*
2. *SEE BRIDGE PLANS FOR RIPRAP LIMITS.*
3. *TXDOT'S SCRICOS METHOD USED FOR SCOUR EVALUATION.*

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Texas Department of Transportation

CR 421

DRAINAGE SCOUR DATA SHEET BLANCO CREEK BRIDGE

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		45

DATE: 3/28/2023 3:01 PM
FILE: c:\pw_workdir\jacobs-amer-transp\dms58458\CR421DHD06.dgn

DW: GD CK: GD DW: GD CK: GD

2 YR LOWER SOIL LAYER *5 YR LOWER SOIL LAYER* *10 YR LOWER SOIL LAYER* *25 YR LOWER SOIL LAYER* *50 YR LOWER SOIL LAYER*

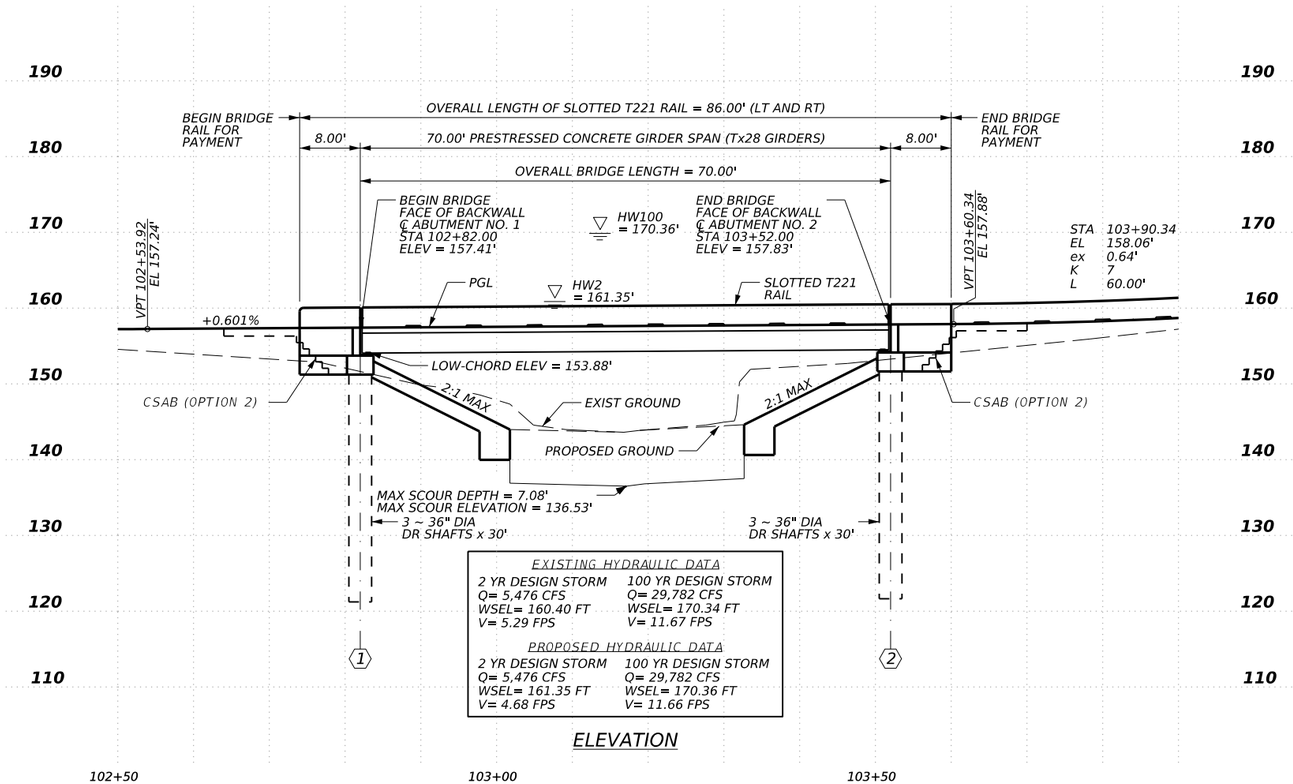
CR 421 at BLANCO CREEK - LOWER CLAY LAYER					
2-YEAR SCOUR DESIGN FLOOD FREQUENCY					
Pier Shape	NA	k_{sh}	NA	$t_{e(P)}$ (hr)	289.6
α (degrees)	0	k_{sp}	NA	τ_c (Pa)	1.63
a (m)	0	k_w	NA	$\tau_{i(C)}$ (Pa)	84.8
a' (m)	0	K_W	1.00	$\tau_{i(P)}$ (Pa)	NA
A_1 (m^2)	100.1	K_{SH}	1.00	ν (m^2/s)	0.000001
B_1 (m)	50.7	K_{SP}	1.00	V_1 (m/s)	1.55
B_2 (m)	21.3	L_c (m)	7.92	V_2 (m/s)	2
γ (kg/m^3)	9810	L_p (m)	0	V_c (m/s)	0.60
g (m/s^2)	9.81	n	0.042	$\dot{z}_{i(C)}$(mm/hr)	6.84
θ (degrees)	18.4	n_b	0	$\dot{z}_{i(P)}$ (mm/hr)	NA
H_1 (m)	1.97	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	1.44
H_2 (m)	2.29	P (m)	52.5	$Z_C(\Delta t)$ (m)	1.37
$H_{2\Delta}$ (m)	2.29	R_e	0	$Z_{max(P)}$ (m)	0.00
k_α	NA	R_h (m)	2	$Z_P(\Delta t)$ (m)	0.00
k_θ	1.08	S (m)	0	**$Z_C(\Delta t)$ (ft)**	**4.51**
k_{Lc}	0.99	Δt (yr)	100	**$Z_P(\Delta t)$ (ft)**	**0.00**
k_r	2.35	$t_{e(C)}$(hr)	4450.3	**$Z_{tot}(\Delta t)$ (ft)**	**4.51**

CR 421 at BLANCO CREEK - LOWER CLAY LAYER					
5-YEAR SCOUR DESIGN FLOOD FREQUENCY					
Pier Shape	NA	k_{sh}	NA	$t_{e(P)}$ (hr)	236.0
α (degrees)	0	k_{sp}	NA	τ_c (Pa)	1.63
a (m)	0	k_w	NA	$\tau_{i(C)}$ (Pa)	138.8
a' (m)	0	K_W	1.00	$\tau_{i(P)}$ (Pa)	NA
A_1 (m^2)	138	K_{SH}	1.00	ν (m^2/s)	0.000001
B_1 (m)	61.2	K_{SP}	1.00	V_1 (m/s)	1.87
B_2 (m)	21.3	L_c (m)	7.92	V_2 (m/s)	1.8
γ (kg/m^3)	9810	L_p (m)	0	V_c (m/s)	0.60
g (m/s^2)	9.81	n	0.04	$\dot{z}_{i(C)}$(mm/hr)	7.75
θ (degrees)	24.3	n_b	0	$\dot{z}_{i(P)}$ (mm/hr)	NA
H_1 (m)	2.26	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	1.35
H_2 (m)	2.29	P (m)	63.1	$Z_C(\Delta t)$ (m)	1.28
$H_{2\Delta}$ (m)	2.29	R_e	0	$Z_{max(P)}$ (m)	0.00
k_α	NA	R_h (m)	2	$Z_P(\Delta t)$ (m)	0.00
k_θ	1.13	S (m)	0	**$Z_C(\Delta t)$ (ft)**	**4.21**
k_{Lc}	0.96	Δt (yr)	100	**$Z_P(\Delta t)$ (ft)**	**0.00**
k_r	3.03	$t_{e(C)}$(hr)	3468.7	**$Z_{tot}(\Delta t)$ (ft)**	**4.21**

CR 421 at BLANCO CREEK - LOWER CLAY LAYER					
10-YEAR SCOUR DESIGN FLOOD FREQUENCY					
Pier Shape	NA	k_{sh}	NA	$t_{e(P)}$ (hr)	216.4
α (degrees)	0	k_{sp}	NA	τ_c (Pa)	1.63
a (m)	0	k_w	NA	$\tau_{i(C)}$ (Pa)	211.1
a' (m)	0	K_W	1.00	$\tau_{i(P)}$ (Pa)	NA
A_1 (m^2)	175.7	K_{SH}	1.00	ν (m^2/s)	0.000001
B_1 (m)	74	K_{SP}	1.00	V_1 (m/s)	2.07
B_2 (m)	21.3	L_c (m)	7.92	V_2 (m/s)	1.73
γ (kg/m^3)	9810	L_p (m)	0	V_c (m/s)	0.60
g (m/s^2)	9.81	n	0.039	$\dot{z}_{i(C)}$(mm/hr)	8.53
θ (degrees)	30.8	n_b	0	$\dot{z}_{i(P)}$ (mm/hr)	NA
H_1 (m)	2.37	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	1.31
H_2 (m)	2.29	P (m)	76	$Z_C(\Delta t)$ (m)	1.24
$H_{2\Delta}$ (m)	2.29	R_e	0	$Z_{max(P)}$ (m)	0.00
k_α	NA	R_h (m)	2	$Z_P(\Delta t)$ (m)	0.00
k_θ	1.18	S (m)	0	**$Z_C(\Delta t)$ (ft)**	**4.08**
k_{Lc}	0.93	Δt (yr)	100	**$Z_P(\Delta t)$ (ft)**	**0.00**
k_r	3.98	$t_{e(C)}$(hr)	3066.0	**$Z_{tot}(\Delta t)$ (ft)**	**4.08**

CR 421 at BLANCO CREEK - LOWER CLAY LAYER					
25-YEAR SCOUR DESIGN FLOOD FREQUENCY					
Pier Shape	NA	k_{sh}	NA	$t_{e(P)}$ (hr)	265.1
α (degrees)	0	k_{sp}	NA	τ_c (Pa)	1.63
a (m)	0	k_w	NA	$\tau_{i(C)}$ (Pa)	330.2
a' (m)	0	K_W	1.00	$\tau_{i(P)}$ (Pa)	NA
A_1 (m^2)	237.1	K_{SH}	1.00	ν (m^2/s)	0.000001
B_1 (m)	90.3	K_{SP}	1.00	V_1 (m/s)	2.24
B_2 (m)	21.3	L_c (m)	7.92	V_2 (m/s)	1.97
γ (kg/m^3)	9810	L_p (m)	0	V_c (m/s)	0.60
g (m/s^2)	9.81	n	0.039	$\dot{z}_{i(C)}$(mm/hr)	9.36
θ (degrees)	38	n_b	0	$\dot{z}_{i(P)}$ (mm/hr)	NA
H_1 (m)	2.62	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	1.60
H_2 (m)	2.29	P (m)	92.4	$Z_C(\Delta t)$ (m)	1.53
$H_{2\Delta}$ (m)	2.29	R_e	0	$Z_{max(P)}$ (m)	0.00
k_α	NA	R_h (m)	3	$Z_P(\Delta t)$ (m)	0.00
k_θ	1.25	S (m)	0	**$Z_C(\Delta t)$ (ft)**	**5.00**
k_{Lc}	0.90	Δt (yr)	100	**$Z_P(\Delta t)$ (ft)**	**0.00**
k_r	5.38	$t_{e(C)}$(hr)	3590.5	**$Z_{tot}(\Delta t)$ (ft)**	**5.00**

CR 421 at BLANCO CREEK - LOWER CLAY LAYER					
50-YEAR SCOUR CHECK FLOOD FREQUENCY					
Pier Shape	NA	k_{sh}	NA	$t_{e(P)}$ (hr)	261.8
α (degrees)	0	k_{sp}	NA	τ_c (Pa)	1.63
a (m)	0	k_w	NA	$\tau_{i(C)}$ (Pa)	458.8
a' (m)	0	K_W	1.00	$\tau_{i(P)}$ (Pa)	NA
A_1 (m^2)	290.7	K_{SH}	1.00	ν (m^2/s)	0.000001
B_1 (m)	103	K_{SP}	1.00	V_1 (m/s)	2.33
B_2 (m)	21.3	L_c (m)	7.92	V_2 (m/s)	1.97
γ (kg/m^3)	9810	L_p (m)	0	V_c (m/s)	0.60
g (m/s^2)	9.81	n	0.04	$\dot{z}_{i(C)}$(mm/hr)	9.96
θ (degrees)	42.7	n_b	0	$\dot{z}_{i(P)}$ (mm/hr)	NA
H_1 (m)	2.82	ρ (kg/m^3)	1000	$Z_{max(C)}$ (m)	1.66
H_2 (m)	2.29	P (m)	105.1	$Z_C(\Delta t)$ (m)	1.58
$H_{2\Delta}$ (m)	2.29	R_e	0	$Z_{max(P)}$ (m)	0.00
k_α	NA	R_h (m)	3	$Z_P(\Delta t)$ (m)	0.00
k_θ	1.29	S (m)	0	**$Z_C(\Delta t)$ (ft)**	**5.20**
k_{Lc}	0.88	Δt (yr)	100	**$Z_P(\Delta t)$ (ft)**	**0.00**
k_r	6.61	$t_{e(C)}$(hr)	3458.1	**$Z_{tot}(\Delta t)$ (ft)**	**5.20**



EXISTING HYDRAULIC DATA

2 YR DESIGN STORM	100 YR DESIGN STORM
Q= 5,476 CFS	Q= 29,782 CFS
WSEL= 160.40 FT	WSEL= 170.34 FT
V= 5.29 FPS	V= 11.67 FPS

PROPOSED HYDRAULIC DATA

2 YR DESIGN STORM	100 YR DESIGN STORM
Q= 5,476 CFS	Q= 29,782 CFS
WSEL= 161.35 FT	WSEL= 170.36 FT
V= 4.68 FPS	V= 11.66 FPS

ELEVATION

NOTES:

1. *SEE CSAB (OPTION 2) STANDARD FOR CEMENT STABILIZED ABUTMENT BACKFILL DETAILS, SSR FOR STONE RIPRAP DETAILS, AND CRR FOR CONCRETE RIPRAP DETAILS.*
2. *SEE BRIDGE PLANS FOR RIPRAP LIMITS.*
3. *TXDOT'S SCRICOS METHOD USED FOR SCOUR EVALUATION.*

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Grant Dickey 03/28/23

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Texas Department of Transportation

CR 421

DRAINAGE SCOUR DATA SHEET BLANCO CREEK BRIDGE

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		46

DATE: 3/28/2023 3:06 PM
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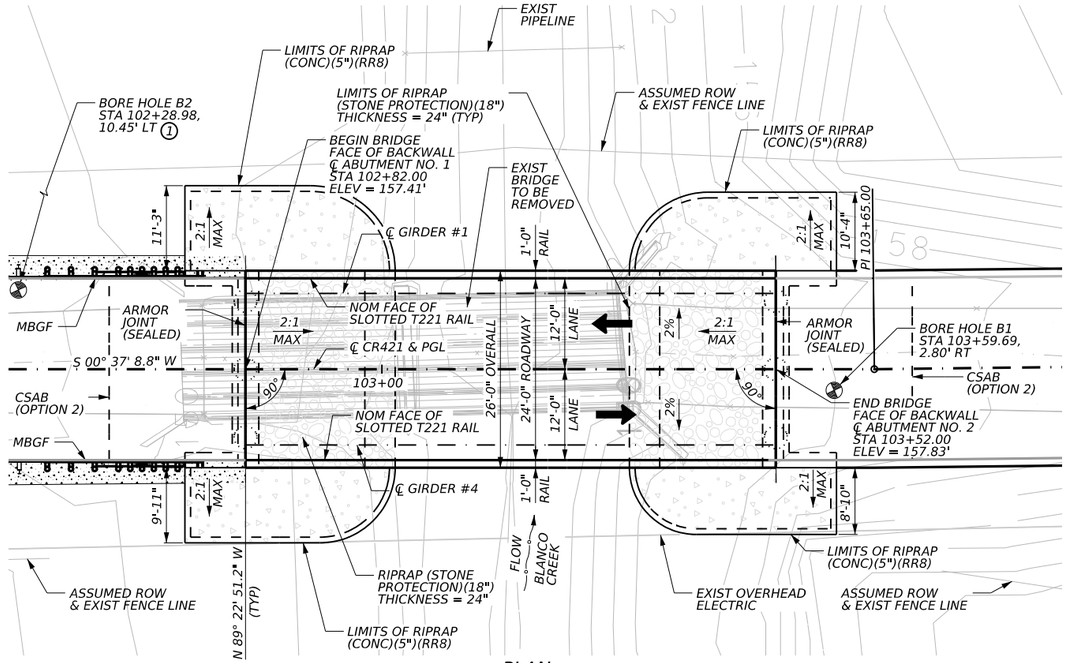
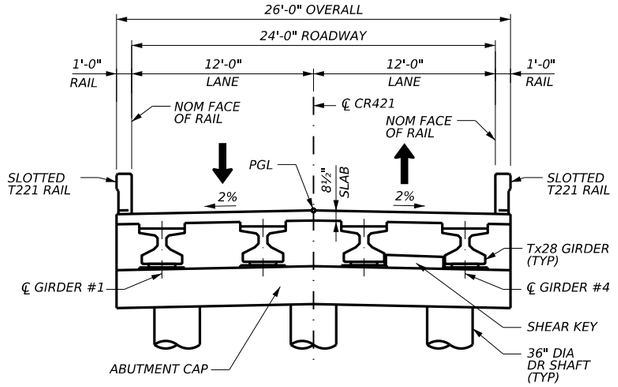
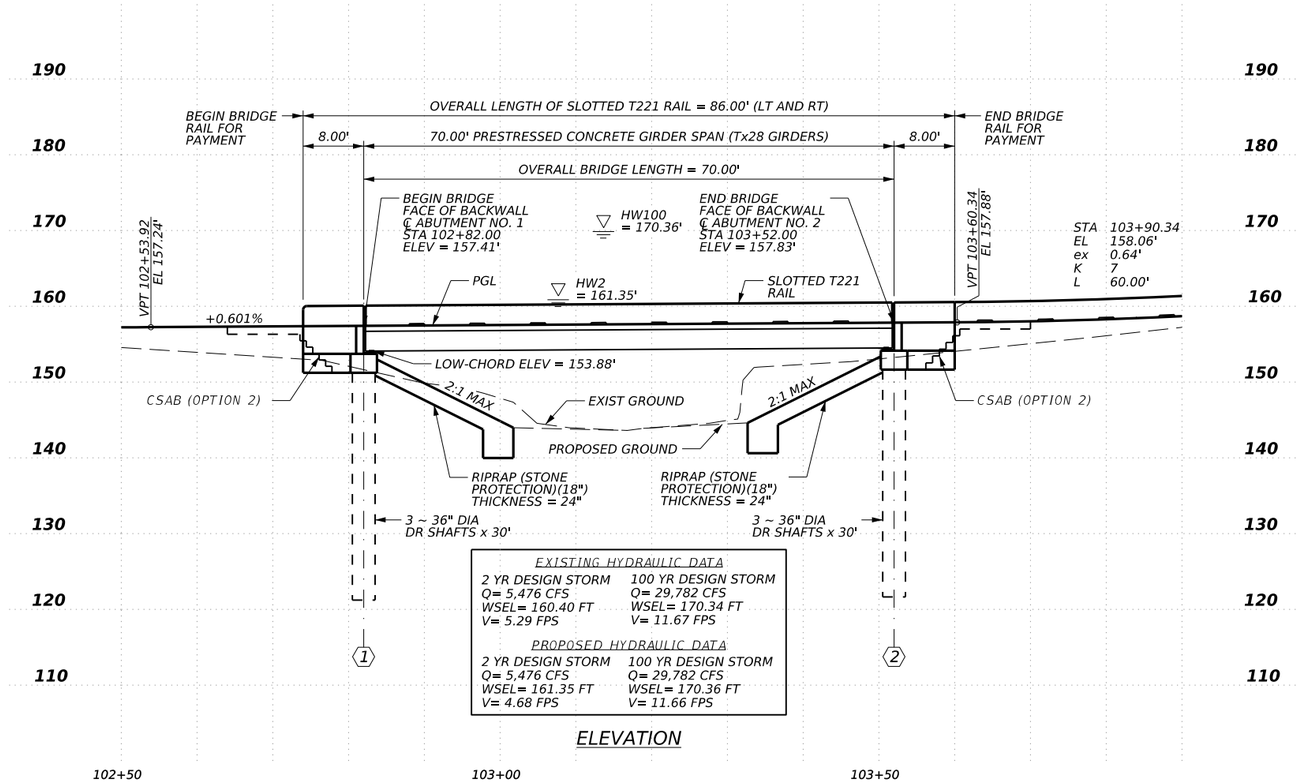


PLAN



TYPICAL SECTION
SCALE: N.T.S.
(ABUTMENT 2 SHOWN; ABUTMENT 1 SIMILAR)



ELEVATION

EXISTING HYDRAULIC DATA	
2 YR DESIGN STORM	100 YR DESIGN STORM
Q= 5,476 CFS	Q= 29,782 CFS
WSEL= 160.40 FT	WSEL= 170.34 FT
V= 5.29 FPS	V= 11.67 FPS

PROPOSED HYDRAULIC DATA	
2 YR DESIGN STORM	100 YR DESIGN STORM
Q= 5,476 CFS	Q= 29,782 CFS
WSEL= 161.35 FT	WSEL= 170.36 FT
V= 4.68 FPS	V= 11.66 FPS

0 10 20
SCALE IN FEET

NOTES:

1. DESIGNED IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATION 9TH EDITION (2020), AS MODIFIED BY THE TxDOT BRIDGE DESIGN MANUAL (2021) AND THE TxDOT BRIDGE DETAILING GUIDE (2022).
2. ALL DIMENSIONS ARE EITHER HORIZONTAL OR VERTICAL AND MUST BE CORRECTED FOR GRADE OR CROSS-SLOPE WHERE APPROPRIATE.
3. SAW-CUT GROOVING OF BRIDGE DECK IS NOT REQUIRED.
4. CONTRACTOR SHALL FIELD VERIFY LOCATIONS OF ALL STRUCTURES, UTILITIES, ELEVATIONS, AND DIMENSIONS PRIOR TO ORDERING MATERIALS OR PERFORMING ANY CONSTRUCTION WORK AND NOTIFY ENGINEER IN WRITING OF ANY CONFLICTS OR DISCREPANCIES.
5. DESCRIPTION OF EXISTING STRUCTURE TO BE REMOVED: CONCRETE ENCASED STEEL STRINGER BRIDGE ON CONCRETE BENTS, APPROXIMATELY 16.0' WIDE x 60.0' LONG, 2 SPANS.
6. FOR BORINGS, SEE BORE LOGS SHEET.
7. SEE CSAB (OPTION 2) STANDARD FOR CEMENT STABILIZED ABUTMENT BACKFILL DETAILS.

(1) TEST HOLE NOT SHOWN IN TRUE LOCATION

NBI NO. (NEW): 16-013-0-AA11-87-001
NBI NO. (EXIST): 16-013-0-AA03-80-001
DESIGN SPEED: MEETS OR EXCEEDS EXIST CONDITIONS
FUNCTIONAL CLASSIFICATION: LOCAL ROAD
ADT : 54 (2021)
ADT : 54 (2041)

FOUNDATION NOTES:

1. DRILLED SHAFT HOLE STABILITY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
2. SEE BORE LOGS SHEET FOR BORE LOG INFORMATION.
3. THE CONTRACTOR'S ATTENTION IS DRAWN TO THE PRESENCE OF SAND, WHICH MAY BE WATER BEARING. THE USE OF DRILLING SLURRY MAY BE NECESSARY TO INSTALL THE DRILLED SHAFTS TO THE REQUIRED PENETRATION DEPTHS. REFER TO GEOTECHNICAL REPORT SECTION 5.3.2 FOR ADDITIONAL INFORMATION.

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HL93 LOADING

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Texas Department of Transportation

CR 421

BLANCO CREEK BRIDGE
BRIDGE LAYOUT
NBI NO. 16-013-0-AA11-87-001

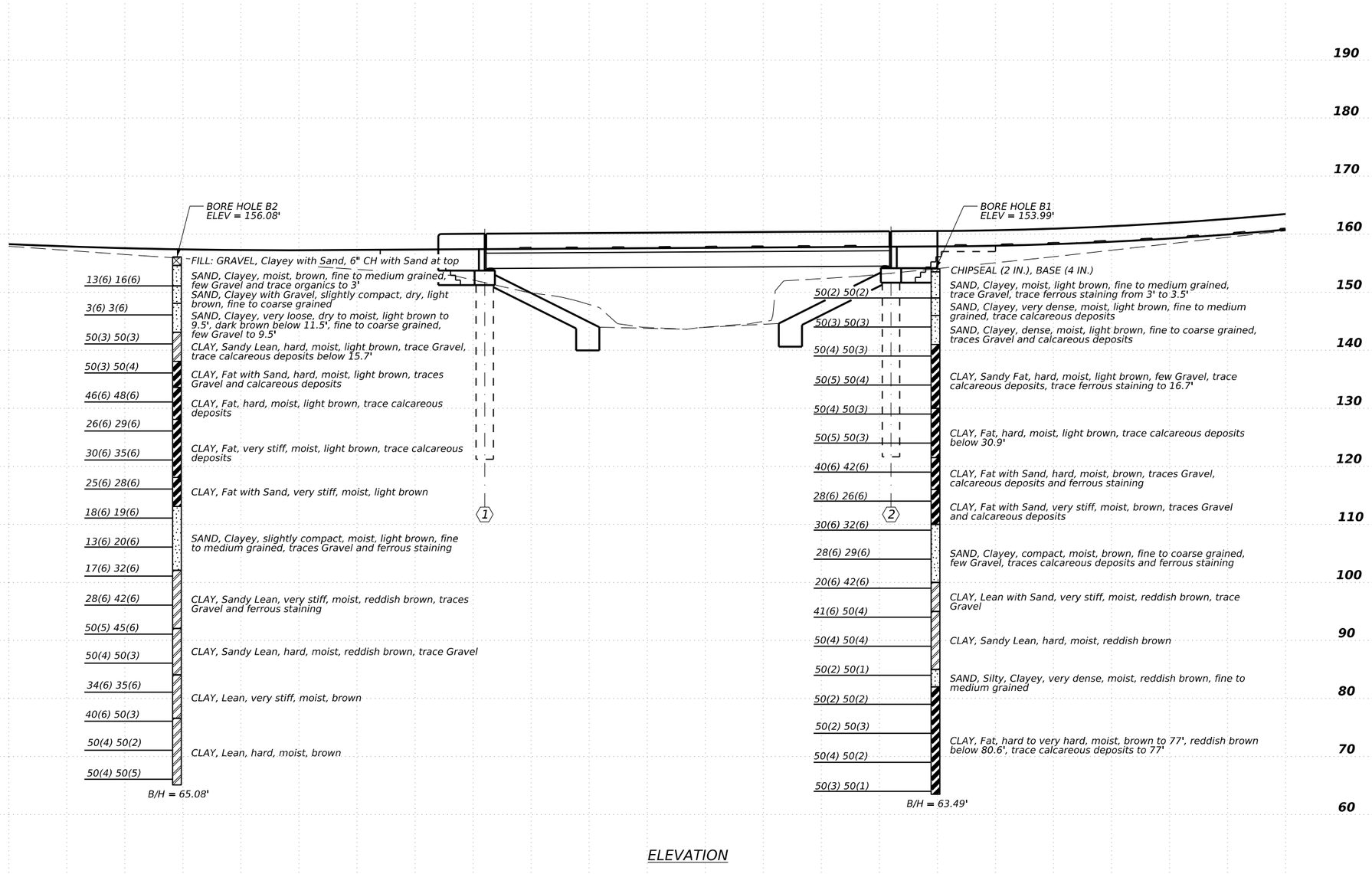
SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		47

DATE: 3/28/2023 3:00 PM
FILE: c:\pw_workdir\jacobs-amer-transpldms\58444\CR421 SBL01.dgn

CW
CK:
VH
DW:
CW
CK:
VH
DN:

0 10 20
SCALE IN FEET



ELEVATION

HL93 LOADING

NOTES:

1. BORE LOGS ARE SHOWN FOR INFORMATION ONLY.
2. BORING B1 WAS TAKEN 10/08/2022
   BORING B2 WAS TAKEN 10/07/2022
3. THE GEOTECHNICAL DATA PRESENTED HERE WAS PROVIDED BY CORSAIR CONSULTING, LLC.
4. FINAL GEOTECHNICAL REPORT DATED 02/10/2023.
5. GROUNDWATER WAS NOT ENCOUNTERED IN BORINGS B1 OR B2 PRIOR TO INTRODUCING DRILLING FLUID AT THE TIME OF THE FIELD EXPLORATION.

FOUNDATION NOTES:

1. DRILLED SHAFT HOLE STABILITY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
2. THE CONTRACTOR'S ATTENTION IS DRAWN TO THE PRESENCE OF SAND, WHICH MAY BE WATER BEARING. THE USE OF DRILLING SLURRY MAY BE NECESSARY TO INSTALL THE DRILLED SHAFTS TO THE REQUIRED PENETRATION DEPTHS. REFER TO GEOTECHNICAL REPORT SECTION 5.3.2 FOR ADDITIONAL INFORMATION.

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Texas Department of Transportation

CR 421

BLANCO CREEK BRIDGE
BORE LOGS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		48

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SUMMARY OF ESTIMATED QUANTITIES

BID CODES / BRIDGE ELEMENT \ BID ITEM DESCRIPTION	0400 6005 CEM STABIL BKFL	0416 6004 DRILL SHAFT (36 IN) (1)	0420 6013 CL C CONC (ABUT) (2)	0422 6001 REINF CONC SLAB	0425 6035 PRESTR CONC GIRDER (TX28)	0432 6002 RIPRAP (CONC) (5 IN)	0432 6035 RIPRAP (STONE PROTECTION) (24 IN)	0450 6004 RAIL (TY T221)	0454 6004 ARMOR JOINT (SEALED)
	CY	LF	CY	SF	LF	CY	CY	LF	LF
2 - ABUTMENTS	76	180	33.0			31	91	32.0	
1 - 70.00' PRESTR CONC I-GIRDER SPAN (Tx28)				1,820	278.00			140.0	51
TOTAL	76	180	33.0	1,820	278.00	31	91	172.0	51

(1) CONTRACTOR SHALL USE SULPHATE RESISTANCE CONCRETE FOR DRILLED SHAFTS.

(2) QUANTITY INCLUDES 0.4 CY FOR SHEAR KEYS. SEE TYPICAL SECTION AND SHEAR KEY DETAILS FOR I-GIRDERS (IGSK) STANDARD SHEET FOR SHEAR KEY LOCATION, DETAIL, AND NOTES.

BEARING SEAT ELEVATIONS

	BEAM 1	BEAM 2	BEAM 3	BEAM 4
BENT 1 (FWD)	153.652	153.786	153.786	153.652
	BEAM 1	BEAM 2	BEAM 3	BEAM 4
BENT 2 (BK)	154.061	154.195	154.195	154.061

SIGNING AND SEALING ONLY FOR BEARING SEAT ELEVATIONS

Jacobs Engineering Group
STATE OF TEXAS
COREY M. WIRKMAN
135191
LICENSED
PROFESSIONAL ENGINEER
Corey M. Wirkman
03/28/2023
F-2966

HL93 LOADING

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Firm Registration: F-2966

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CR 421

BLANCO CREEK BRIDGE ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
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CRP	BEE		49

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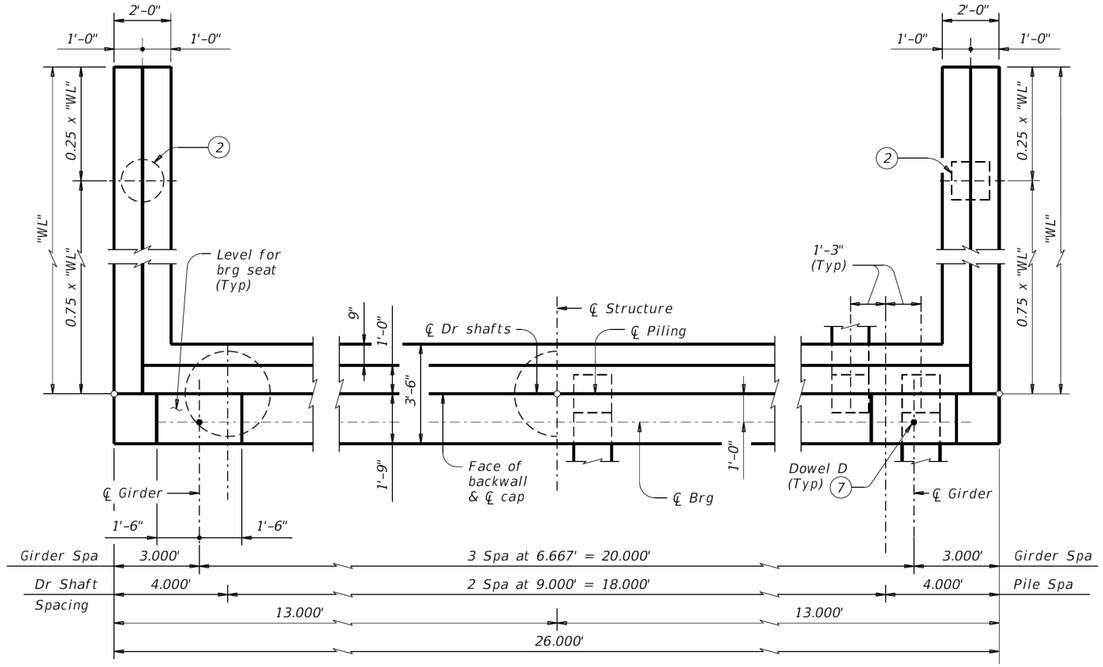
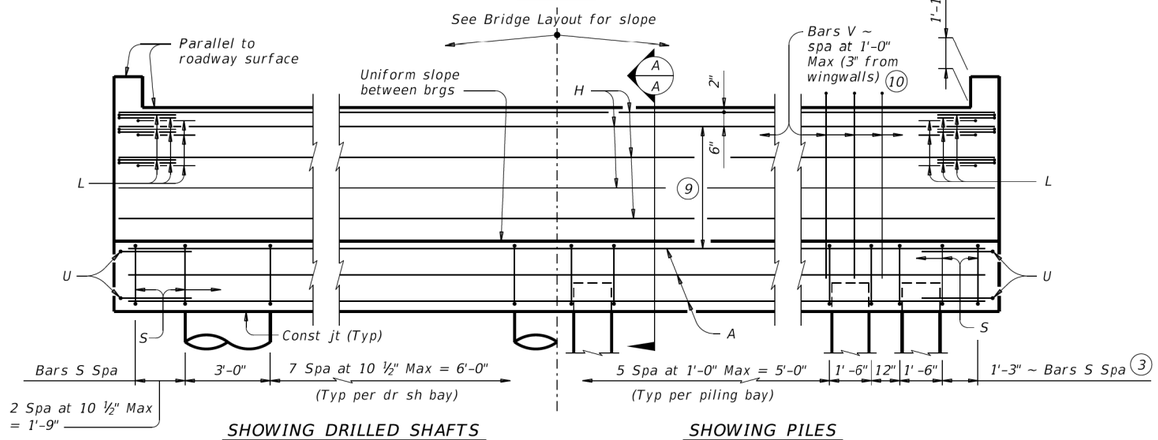


SHOWING DRILLED SHAFTS — SHOWING PILES

PLAN (1)

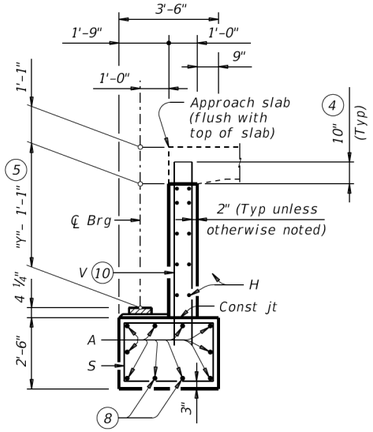


SHOWING DRILLED SHAFTS — SHOWING PILES

ELEVATION

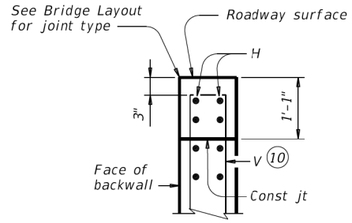
TABLE A

Header Slope	Girder Type	Wingwall Type	Wingwall Lgth "WL"
2:1	Tx28	Cantilevered	8.000'
	Tx34	Cantilevered	9.000'
	Tx40	Cantilevered	10.000'
	Tx46	Cantilevered	11.000'
	Tx54	Cantilevered	12.000'
3:1	Tx28	Cantilevered	12.000'
	Tx34	Founded	13.000'
	Tx40	Founded	15.000'
	Tx46	Founded	16.000'
	Tx54	Founded	18.000'



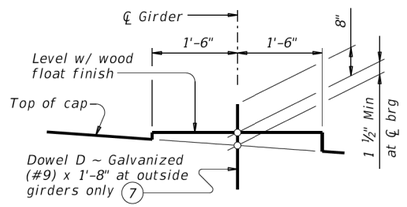
SECTION A-A

(With approach slab) (6)



BACKWALL DETAIL

(Without approach slab) (6)



BEARING SEAT DETAIL

(Bearing surface must be clean and free of all loose material before placing bearing pad.)

(1) See Table A for variable dimensions based on header slope and girder type.

(2) See Table A to determine if wingwall foundations are required.

(3) For piling larger than 16" adjust Bars S spacing as required to avoid piling.

(4) Increase as required to maintain 3" from finished grade.

(5) See Span details for "Y" value.

(6) See Bridge Layout to determine if approach slab is present.

(7) Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.

(8) With pile foundations, move Bars A shown to clear piles.

(9) Spacing based on girder type:
Tx28 ~ 3 spaces at 1'-0" Max
Tx34 ~ 3 spaces at 1'-0" Max
Tx40 ~ 4 spaces at 1'-0" Max
Tx46 ~ 4 spaces at 1'-0" Max
Tx54 ~ 5 spaces at 1'-0" Max

(10) Field bend as needed to clear piles.

TABLE OF FOUNDATION LOADS

Span Length	All Girder Types	
Ft	Tons/Shaft	Tons/Pile
40	64	54
45	69	56
50	73	59
55	77	61
60	81	63
65	85	65
70	88	67
75	92	69
80	96	71
85	100	73
90	104	75
95	108	77
100	111	79
105	115	80
110	119	82
115	123	84
120	126	86
125	130	88

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Bridge Layout for header slope and foundation type, size and length.

See Common Foundation Details (FD) standard sheet for all foundation details and notes.

See Concrete Riprap (CRR) standard sheet or Stone Riprap (SRR) standard sheet for riprap attachment details, if applicable.

See applicable rail details for rail anchorage in wingwalls.

These abutment details may be used with standard SIG-24 only.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

MATERIAL NOTES:

Provide Class C concrete (f'c = 3,600 psi).
Provide Class C (HPC) concrete if shown elsewhere in the plans.
Provide Grade 60 reinforcing steel.
Galvanize dowel bars D.

HL93 LOADING — SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

ABUTMENTS
TYPE TX28 THRU TX54 PRESTR CONC I-GIRDERS 24' ROADWAY

AIG-24

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	CRP	BEE		50

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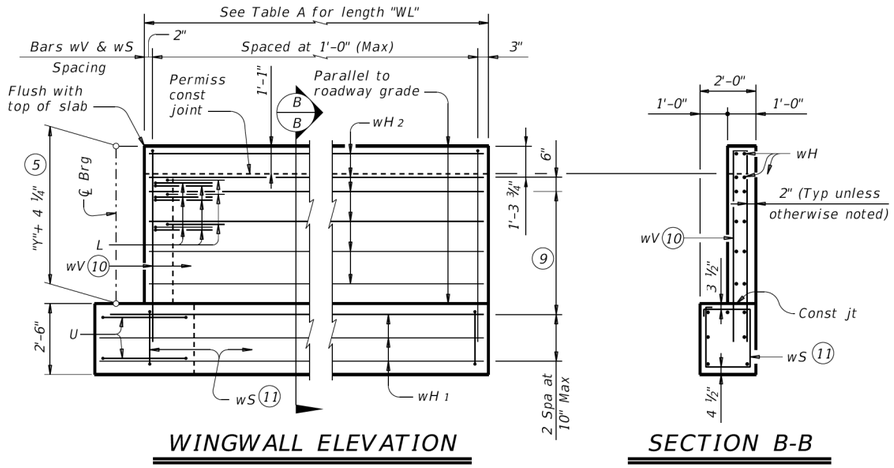
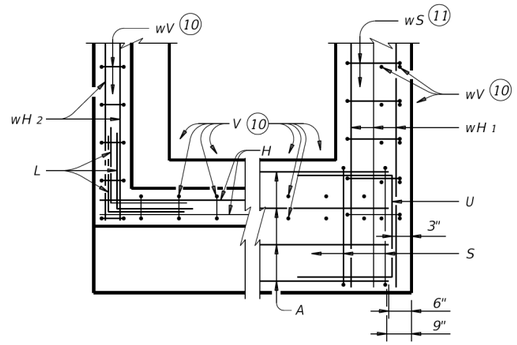


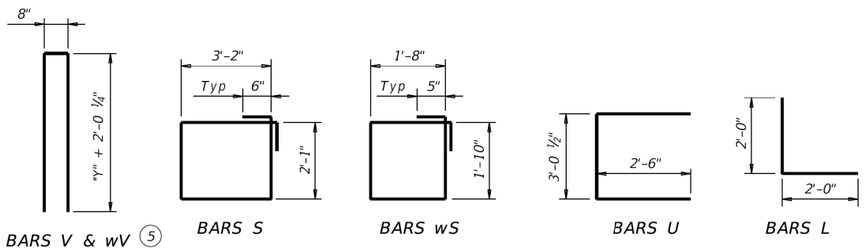
WINGWALL ELEVATION

SECTION B-B



BACKWALL CAP

CORNER DETAILS



BARS V & wV (5) BARS S BARS wS BARS U BARS L

(5) See Span details for "Y" value.

(9) Spacing based on girder type:
Tx28 ~ 3 spaces at 1'-0" Max
Tx34 ~ 3 spaces at 1'-0" Max
Tx40 ~ 4 spaces at 1'-0" Max
Tx46 ~ 4 spaces at 1'-0" Max
Tx54 ~ 5 spaces at 1'-0" Max

(10) Field bend as needed to clear piles.

(11) Adjust as required to avoid piling.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation | Bridge Division Standard

ABUTMENTS
TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
24' ROADWAY

AIG-24

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REVISIONS	0916	25	019	CR 1187
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	CRP	BEE		51

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TABLES OF ESTIMATED QUANTITIES WITH 2:1 HEADER SLOPE (12)

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	25'-0"	1,328
D(7)	2	#9	1'-8"	11
H	8	#6	25'-8"	308
L	18	#6	4'-0"	108
S	22	#5	11'-6"	264
U	4	#6	8'-1"	49
V	25	#5	11'-4"	296
wH1	14	#6	9'-5"	198
wH2	20	#6	7'-8"	230
wS	18	#4	7'-10"	94
wV	18	#5	11'-4"	213
Reinforcing Steel		Lb		3,099
Class "C" Concrete		CY		15.2

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	25'-0"	1,328
D(7)	2	#9	1'-8"	11
H	8	#6	25'-8"	308
L	18	#6	4'-0"	108
S	22	#5	11'-6"	264
U	4	#6	8'-1"	49
V	25	#5	12'-4"	322
wH1	14	#6	10'-5"	219
wH2	20	#6	8'-8"	260
wS	20	#4	7'-10"	105
wV	20	#5	12'-4"	257
Reinforcing Steel		Lb		3,231
Class "C" Concrete		CY		16.6

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	25'-0"	1,328
D(7)	2	#9	1'-8"	11
H	10	#6	25'-8"	386
L	18	#6	4'-0"	108
S	22	#5	11'-6"	264
U	4	#6	8'-1"	49
V	25	#5	13'-4"	348
wH1	14	#6	11'-5"	240
wH2	24	#6	9'-8"	348
wS	22	#4	7'-10"	115
wV	22	#5	13'-4"	306
Reinforcing Steel		Lb		3,503
Class "C" Concrete		CY		18.1

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	25'-0"	1,328
D(7)	2	#9	1'-8"	11
H	10	#6	25'-8"	386
L	18	#6	4'-0"	108
S	22	#5	11'-6"	264
U	4	#6	8'-1"	49
V	25	#5	14'-4"	374
wH1	14	#6	12'-5"	261
wH2	24	#6	10'-8"	385
wS	24	#4	7'-10"	126
wV	24	#5	14'-4"	359
Reinforcing Steel		Lb		3,651
Class "C" Concrete		CY		19.7

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	25'-0"	1,328
D(7)	2	#9	1'-8"	11
H	12	#6	25'-8"	463
L	18	#6	4'-0"	108
S	22	#5	11'-6"	264
U	4	#6	8'-1"	49
V	25	#5	15'-8"	409
wH1	14	#6	13'-5"	282
wH2	28	#6	11'-8"	491
wS	26	#4	7'-10"	136
wV	26	#5	15'-8"	425
Reinforcing Steel		Lb		3,966
Class "C" Concrete		CY		21.6

TABLES OF ESTIMATED QUANTITIES WITH 3:1 HEADER SLOPE (12)

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	25'-0"	1,328
D(7)	2	#9	1'-8"	11
H	8	#6	25'-8"	308
L	18	#6	4'-0"	108
S	22	#5	11'-6"	264
U	4	#6	8'-1"	49
V	25	#5	11'-4"	296
wH1	14	#6	13'-5"	282
wH2	20	#6	11'-8"	350
wS	26	#4	7'-10"	136
wV	26	#5	11'-4"	307
Reinforcing Steel		Lb		3,439
Class "C" Concrete		CY		17.8

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	25'-0"	1,328
D(7)	2	#9	1'-8"	11
H	8	#6	25'-8"	308
L	18	#6	4'-0"	108
S	22	#5	11'-6"	264
U	4	#6	8'-1"	49
V	25	#5	12'-4"	322
wH1	14	#6	14'-5"	303
wH2	20	#6	12'-8"	381
wS	28	#4	7'-10"	147
wV	28	#5	12'-4"	360
Reinforcing Steel		Lb		3,581
Class "C" Concrete		CY		19.3

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	25'-0"	1,328
D(7)	2	#9	1'-8"	11
H	10	#6	25'-8"	386
L	18	#6	4'-0"	108
S	22	#5	11'-6"	264
U	4	#6	8'-1"	49
V	25	#5	13'-4"	348
wH1	14	#6	16'-5"	345
wH2	24	#6	14'-8"	529
wS	32	#4	7'-10"	167
wV	32	#5	13'-4"	445
Reinforcing Steel		Lb		3,980
Class "C" Concrete		CY		21.7

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	25'-0"	1,328
D(7)	2	#9	1'-8"	11
H	10	#6	25'-8"	386
L	18	#6	4'-0"	108
S	22	#5	11'-6"	264
U	4	#6	8'-1"	49
V	25	#5	14'-4"	374
wH1	14	#6	17'-5"	366
wH2	24	#6	15'-8"	565
wS	34	#4	7'-10"	178
wV	34	#5	14'-4"	508
Reinforcing Steel		Lb		4,137
Class "C" Concrete		CY		23.4

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	25'-0"	1,328
D(7)	2	#9	1'-8"	11
H	12	#6	25'-8"	463
L	18	#6	4'-0"	108
S	22	#5	11'-6"	264
U	4	#6	8'-1"	49
V	25	#5	15'-8"	409
wH1	14	#6	19'-5"	408
wH2	28	#6	17'-8"	743
wS	38	#4	7'-10"	199
wV	38	#5	15'-8"	621
Reinforcing Steel		Lb		4,603
Class "C" Concrete		CY		26.4

(7) Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.

(12) Quantities shown are for one abutment only (with approach slab). With no approach slab, add 1.0 CY Class "C" concrete and 154 lbs reinforcing steel for 4 additional Bars H.

HL93 LOADING

SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

ABUTMENTS
TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
24' ROADWAY

AIG-24

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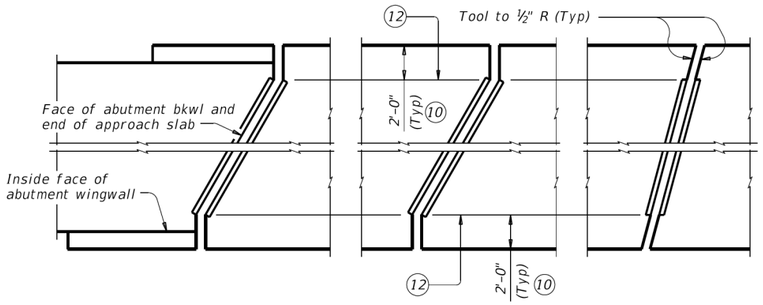
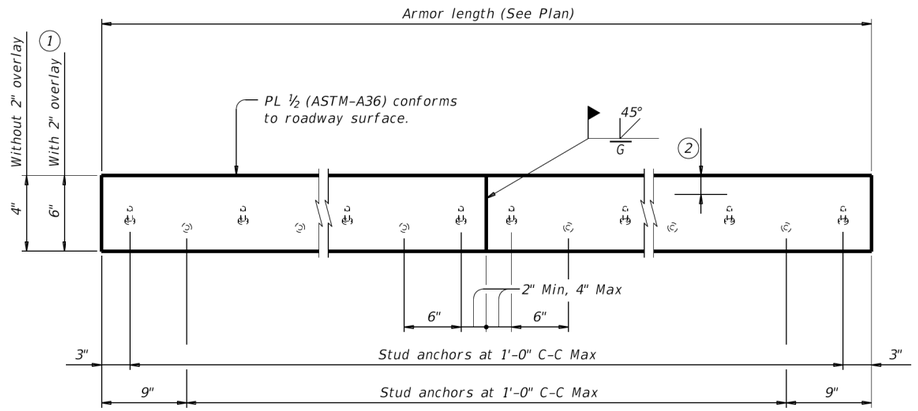


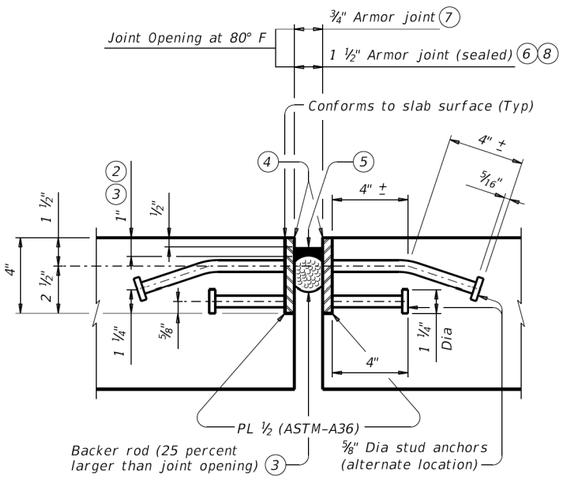
JOINTS AT ABUTMENTS | SKEWS OVER 15° | SKEWS THRU 15°

PLANS OF ARMOR PLATES

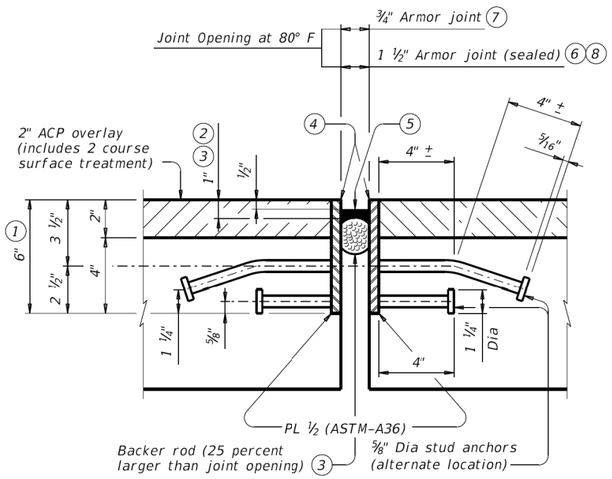


ELEVATION OF BASIC ARMOR PLATE

1. Adjust 6" plate height for overlay thicknesses other than the 2" shown. Adjust weight by 1.70 plf for each ½" variation in thickness.
2. Do not paint top 1 ½" of plate if using sealed armor joint.
3. Set top of backer rod 1" below top of armor plate. Backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.
4. Blast clean entire contact area between sealant and plate (SSPC-SP10) before installing sealant. Light brush blast and thoroughly clean all dust and debris from concrete surfaces in contact with joint sealant before application of silicone seal.
5. Use Class 7 joint sealant that conforms to DMS-6310.
6. Place sealant while ambient temperature is between 55°F and 80°F and is rising.
7. Armor joint does not include joint sealant or backer rod.
8. Armor joint (sealed) includes Class 7 joint sealant and backer rod.
9. Form vertical leg of seal as per the Manufacturer's recommendations. Use Class 4 joint sealant if Class 7 cannot be installed correctly. Install according to Manufacturer's recommendations.
10. Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.
11. See "Plans of Armor Plates".
12. At Fabricator's option, armor plate may extend up to 6" beyond this point for skews through 15°.
13. Align shipping angle perpendicular to joint.



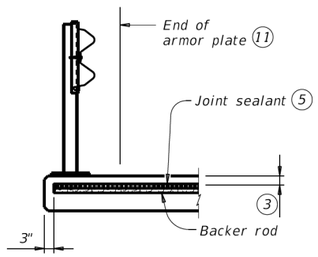
SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION



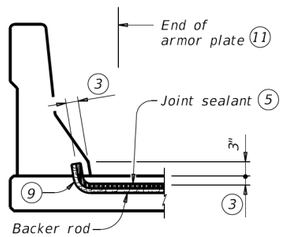
SHOWN WITH 2" OVERLAY AT JOINT LOCATION 1

ARMOR JOINT SECTIONS

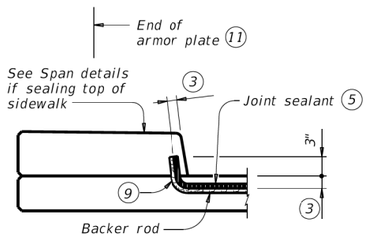
Showing Armor Joint (Sealed)



AT STEEL POST BRIDGE RAIL



AT CONCRETE BRIDGE RAIL



AT SIDEWALK

JOINT SEALANT TERMINATION DETAILS

Armor joint (sealed) only. Armor plate is not shown for clarity.

FABRICATION NOTES:

Match mark corresponding plate sections and secure together for shipment with shipping angle. Do not use erection bolts.

Ship armor joints in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for stage construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.

Weld studs in accordance with AWS D1.1.

Use groove welds for all shop and field butt splices. Grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section, except as stated in Note 2, with System II or IV primer in accordance with Item 446 "Field Cleaning and Painting Steel." Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Items 446.4.7.3 and 446.4.7.4.

Shop drawings for the fabrication of armor joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

CONSTRUCTION NOTES:

Secure armor joints in position and place to proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for Armor Joint.

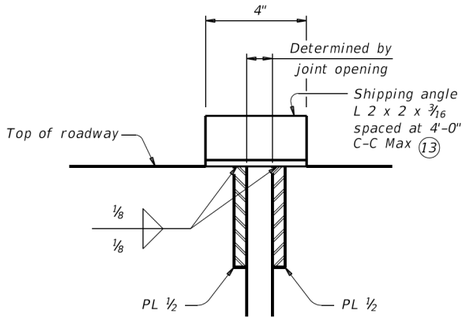
Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

GENERAL NOTES:

Provide armor joints at locations shown on the plans. Provide the seal when "Armor Joint (Sealed)" is noted on the plans.

These joint details accommodate a joint movement range of 1 ⅜" (¾" opening movement and ⅝" closure movement).

Payment for armor joint, with or without seal, is based on length of armor plate.



SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION

With overlay similar

SHIPPING ANGLE

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

WEIGHTS FOR ONE ARMOR JOINT (2 PLATES)	
WITHOUT OVERLAY	16.10 plf
WITH 2" OVERLAY 1	22.90 plf

Texas Department of Transportation

Bridge Division Standard

ARMOR JOINT DETAILS

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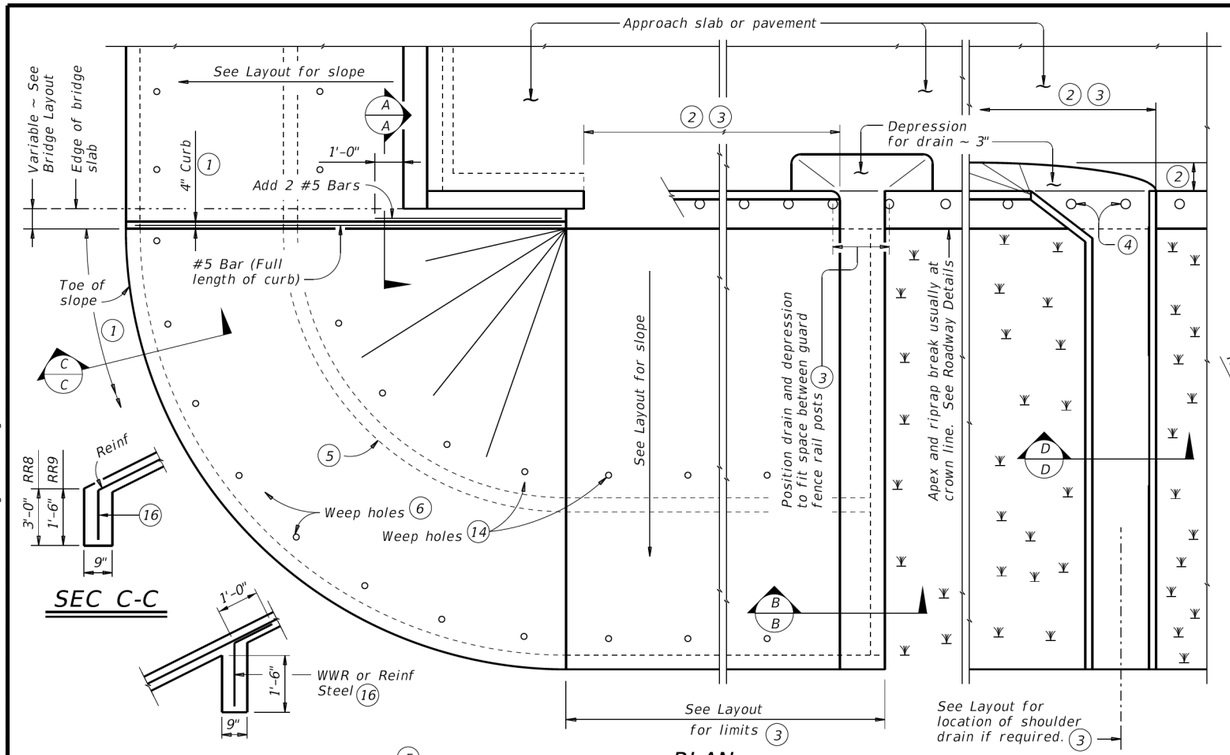
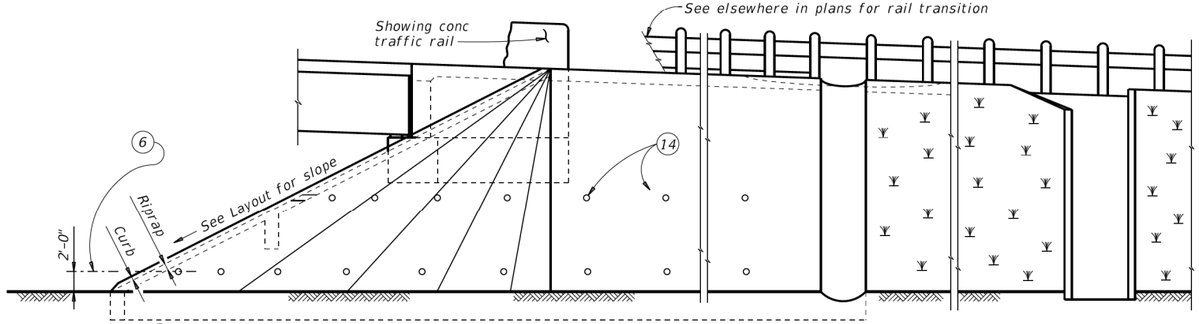
DATE:
FILE:



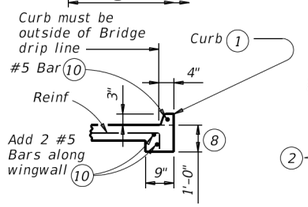
PLAN

SEC C-C

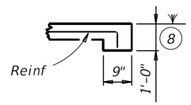
INTERMEDIATE TOEWALL



ELEVATION

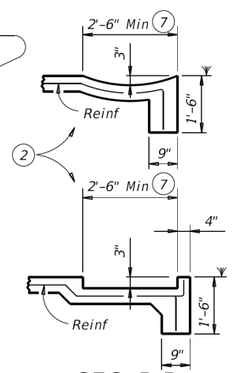


SEC A-A



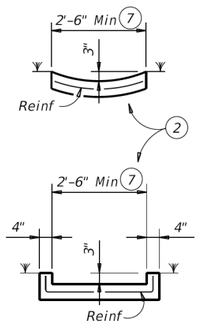
SEC B-B

(No drain)



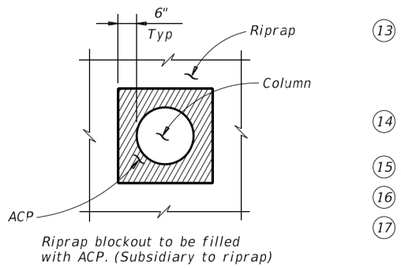
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

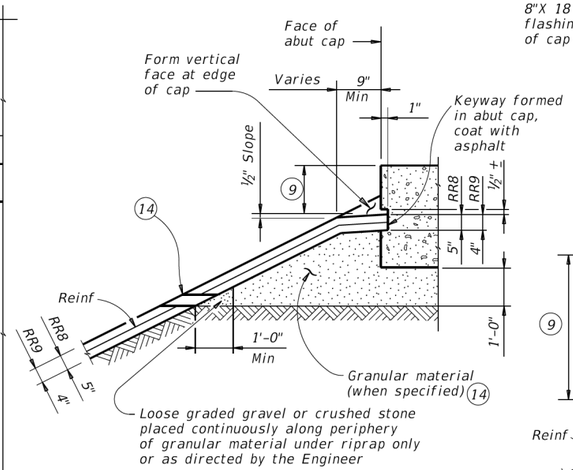
(Shoulder drain)



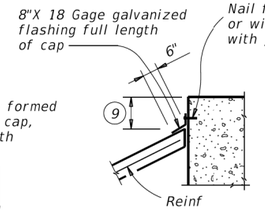
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

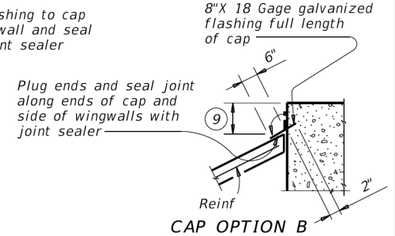
(As directed by the Engineer)



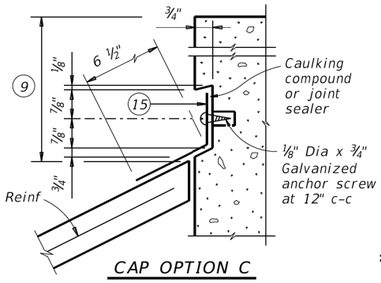
SHOWING KEYWAY OPTION



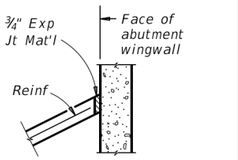
CAP OPTION A



CAP OPTION B



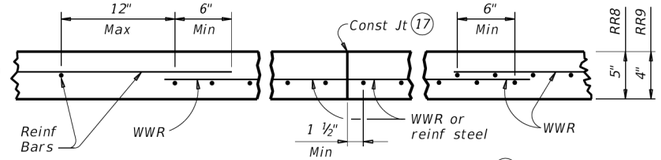
CAP OPTION C



SECT THRU RIPRAP AT WINGWALL (12)

SECTIONS THRU RIPRAP AT CAP (11)

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.
17. WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

GENERAL NOTES:

Provide Class "B" concrete (f'c = 2,000 psi) unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.

Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.

Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.

Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

Texas Department of Transportation

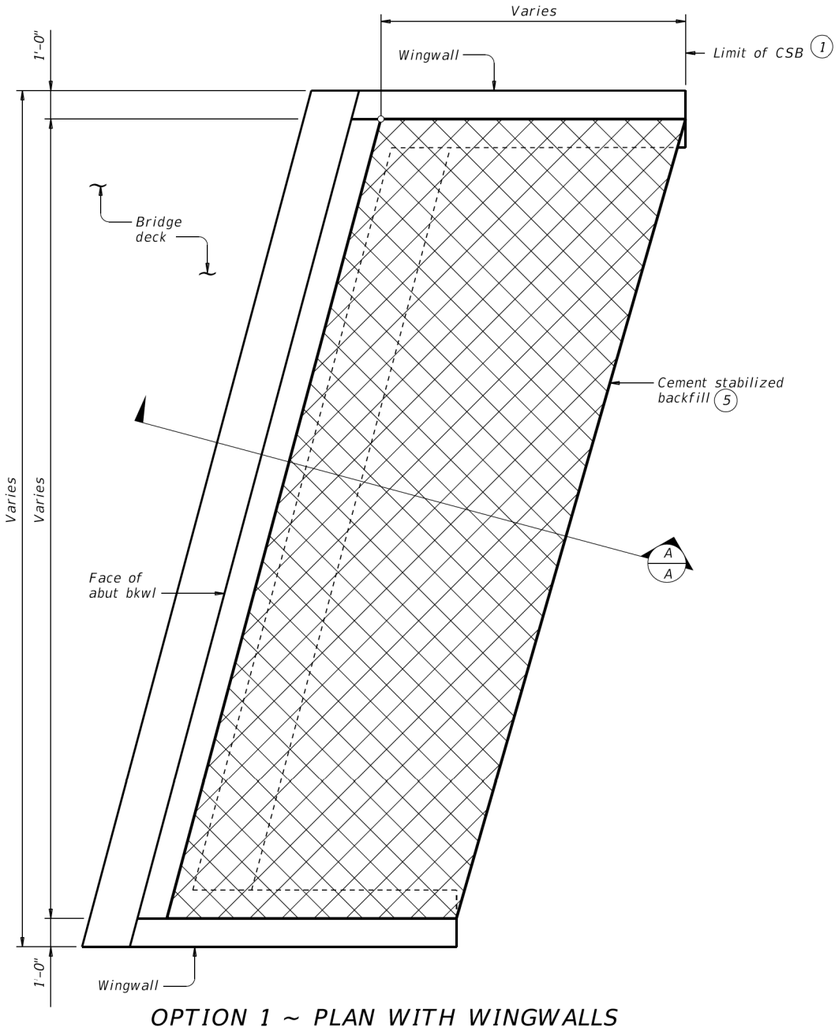
Bridge Division Standard

CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

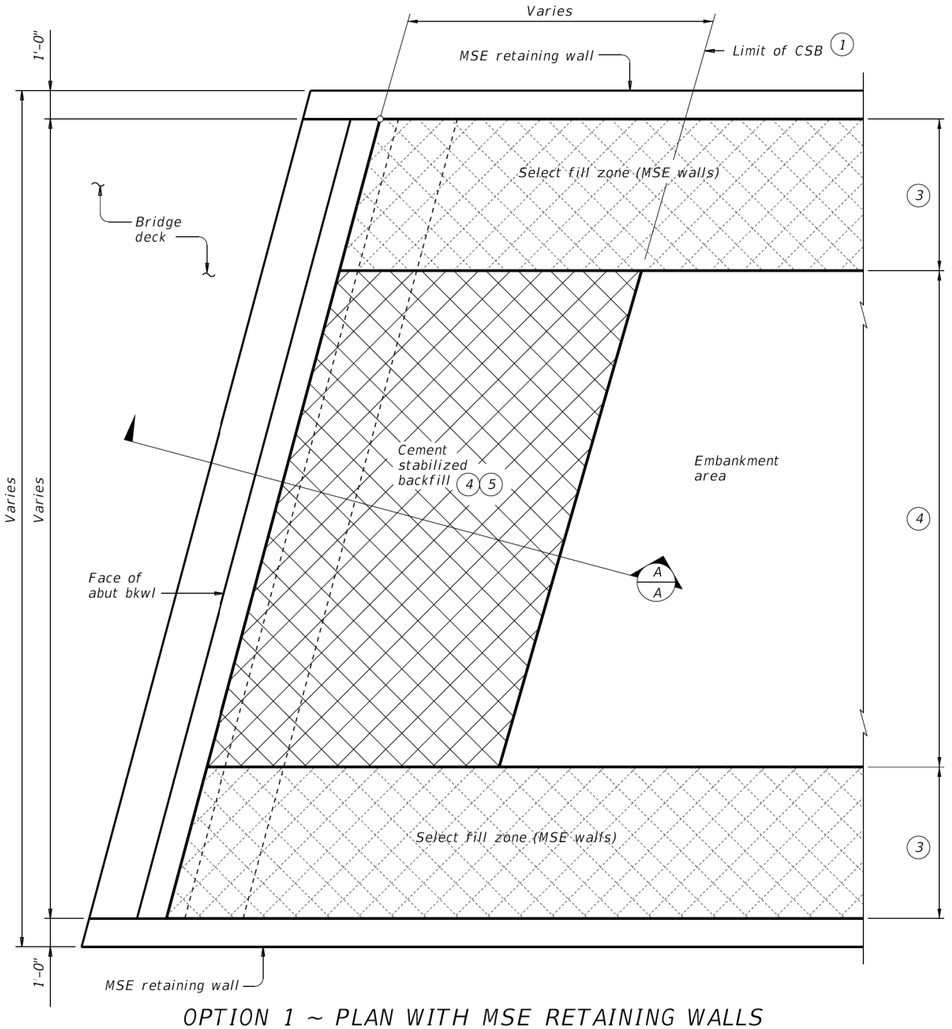
FILE: crrstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
	DIST	COUNTY		SHEET NO.
	CRP	BEE		54

DATE:
FILE:

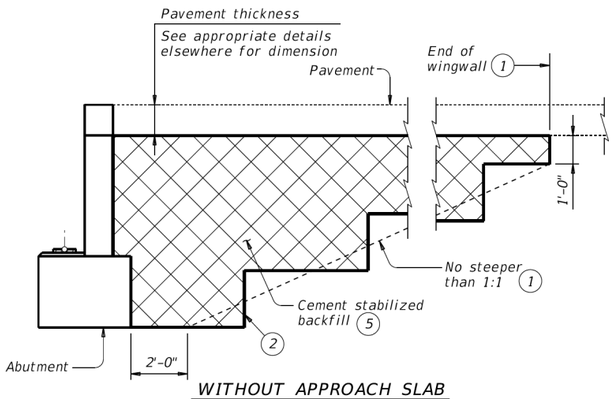


OPTION 1 ~ PLAN WITH WINGWALLS

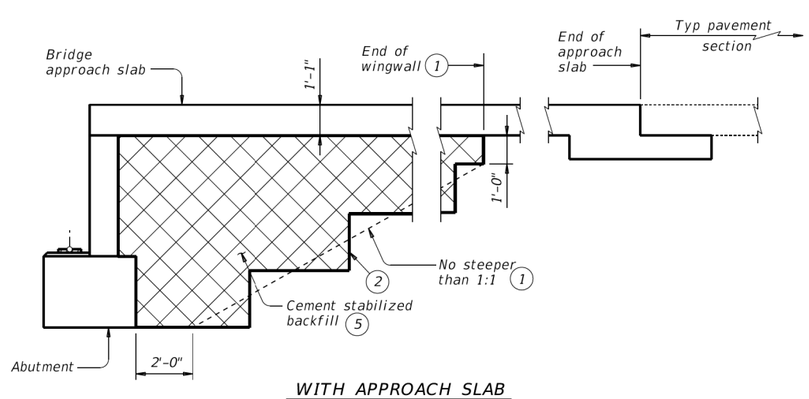
Cast-in-place retaining walls similar.



OPTION 1 ~ PLAN WITH MSE RETAINING WALLS



WITHOUT APPROACH SLAB



WITH APPROACH SLAB

(Showing BAS-C, BAS-A similar.)

SECTION A-A

(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

(2) Bench backfill as shown with 12" (approximate) bench depths.

(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(5) If shown in the plans flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
a). If flowable backfill is to be placed over MSE backfill then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
b). Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

GENERAL NOTES:

See the Bridge Layout for selected Option. Option 2 is intended for new construction requiring high plasticity embankment fill with a plasticity index (PI) greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays. Option 1 is intended for construction only requiring PI controlled embankment fill or excavation in competent soils/rocks in order to construct the abutment.

Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.

If required elsewhere in the plans, provide Flowable Backfill meeting the requirements of Item 401, "Flowable Backfill", to the limits shown at bridge abutments.

Details are drawn showing left forward skew. See Bridge Layout for actual skew direction.

These details do not apply when Concrete Block retaining walls are used in lieu of wingwalls.

Texas Department of Transportation

Bridge Division Standard

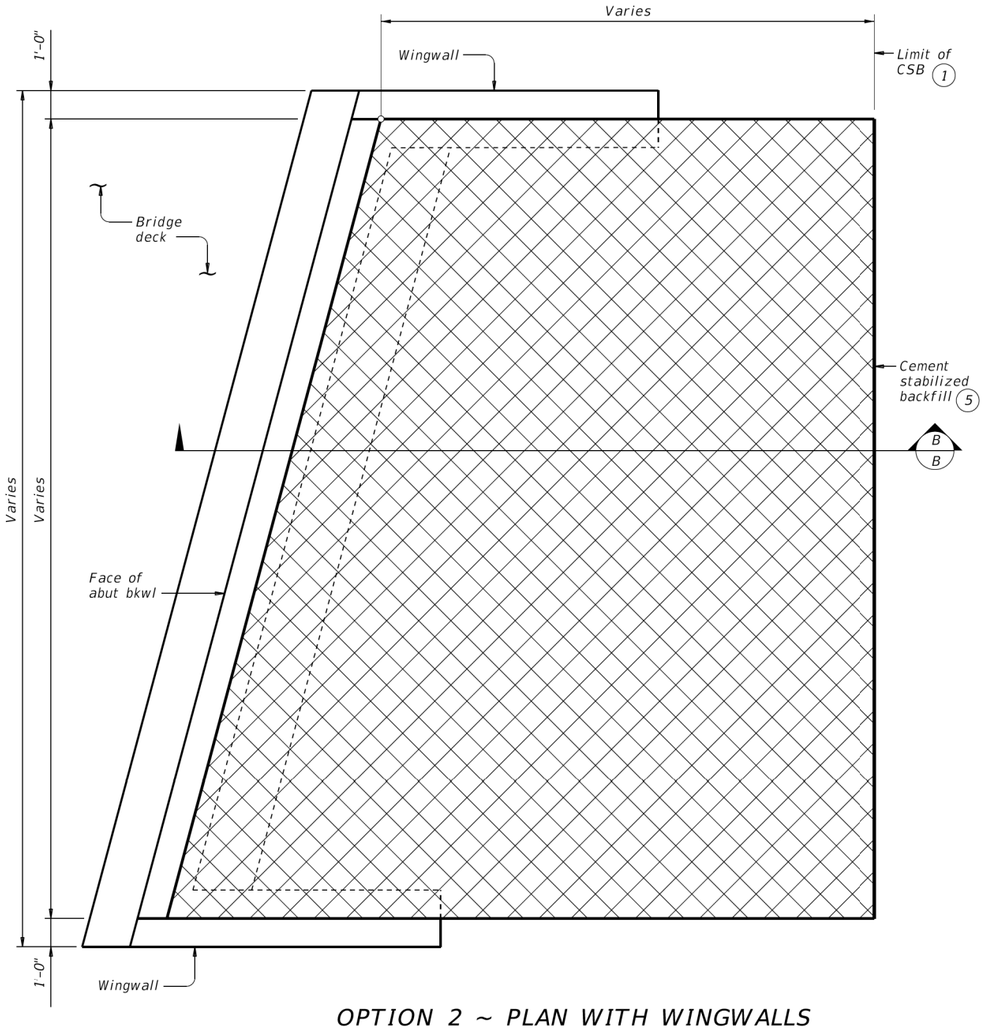
CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

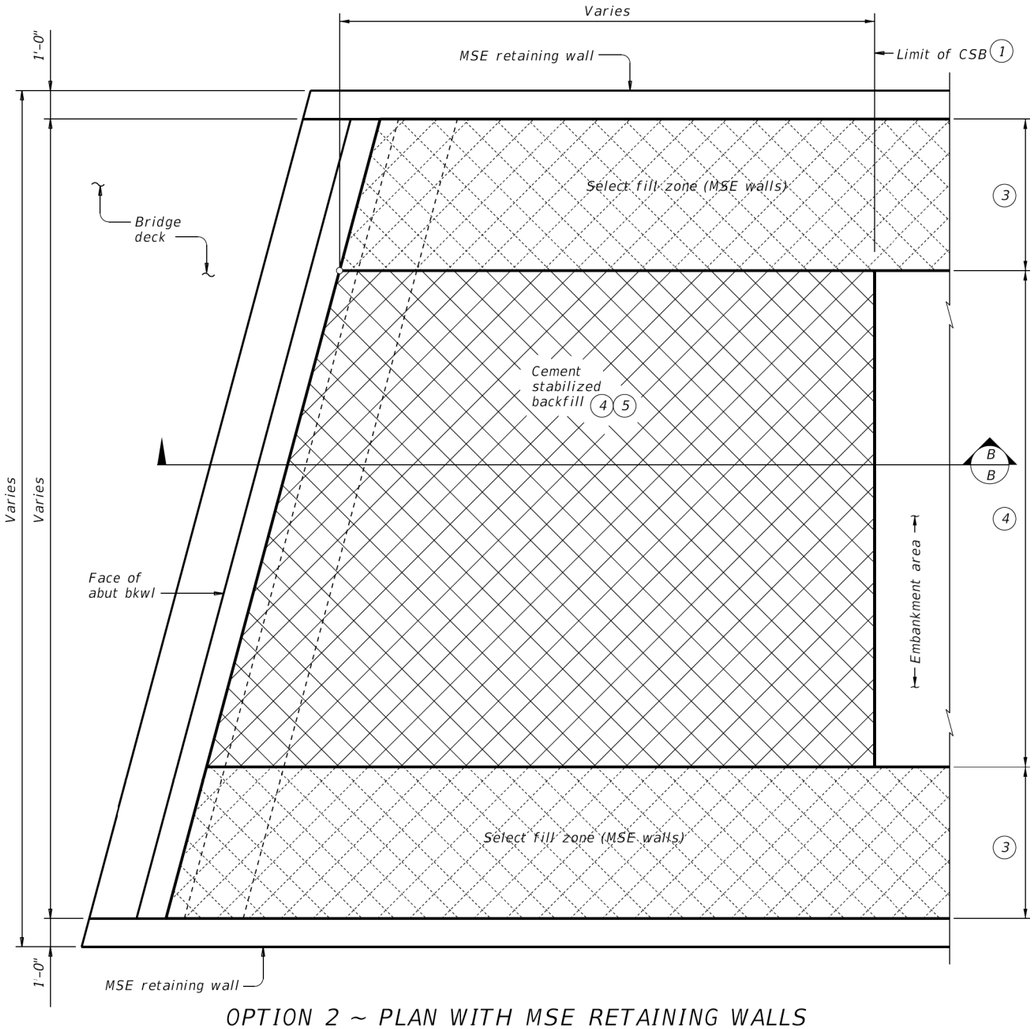
FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
02-20: Added Option 2.	DIST	COUNTY		SHEET NO.
	CRP	BEE		55

DATE:
FILE:



OPTION 2 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 2 ~ PLAN WITH MSE RETAINING WALLS

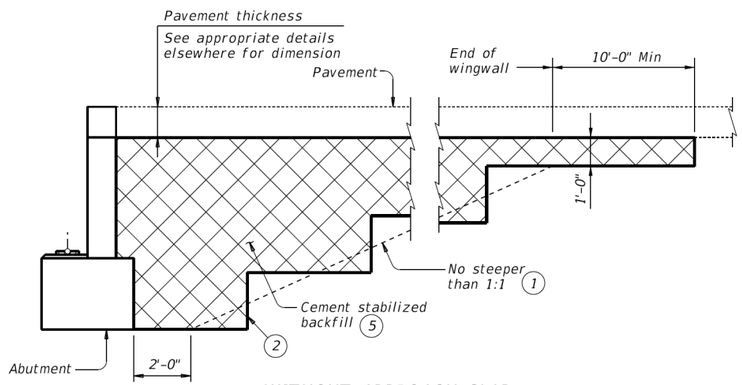
(1) *Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.*

(2) *Bench backfill as shown with 12" (approximate) bench depths.*

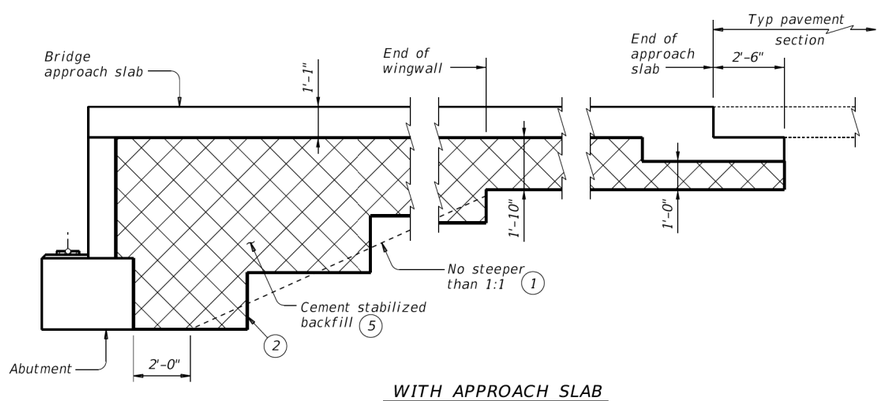
(3) *Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.*

(4) *When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.*

(5) *If shown in the plans flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:*
a). If flowable backfill is to be placed over MSE backfill then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
b). Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).



WITHOUT APPROACH SLAB



WITH APPROACH SLAB
(Showing BAS-C, BAS-A similar.)

SECTION B-B

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
02-20: Added Option 2.	DIST	COUNTY		SHEET NO.
	CRP	BEE		56

DATE:
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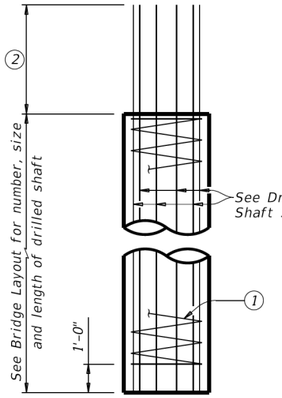
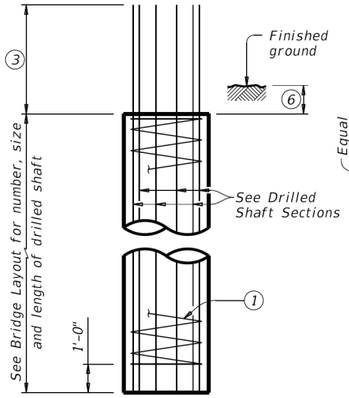
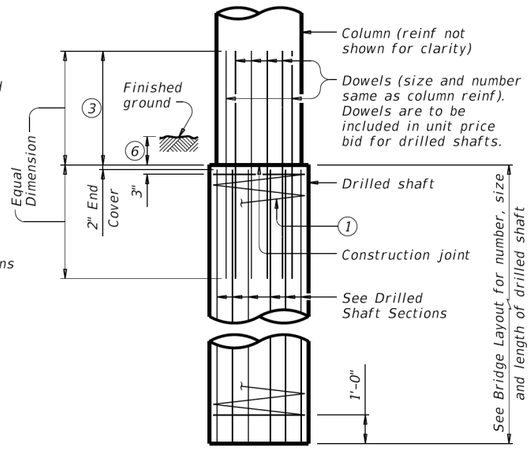


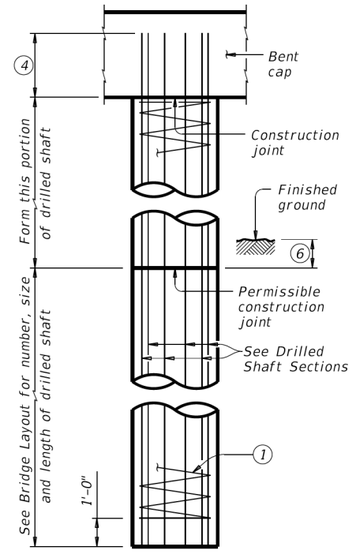
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



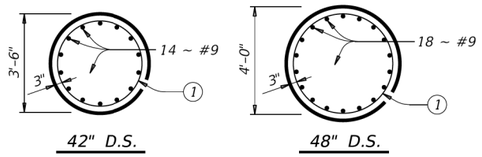
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL (5)

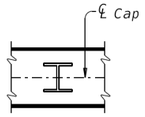


DRILLED SHAFT SECTIONS

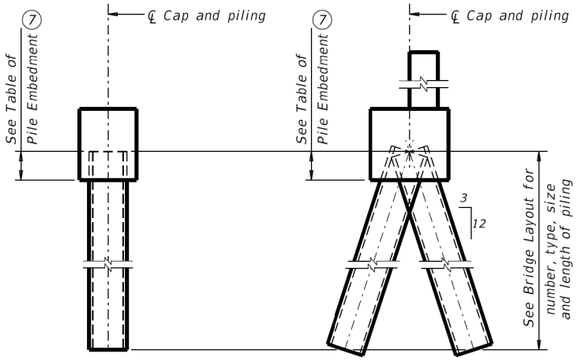
DRILLED SHAFT DETAILS

TABLE OF PILE EMBEDMENT	
Pile Type	Embedment Depth (Ft)
16" Sq Concrete 18" Sq Concrete HP14 Steel HP16 Steel	1'-0"
20" Sq Concrete 24" Sq Concrete HP18 Steel	1'-6"

See Prestressed Concrete Piling (CP) standard for additional details on concrete pile embedment.

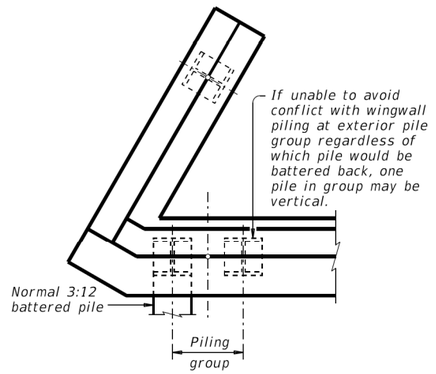


ORIENTATION OF STEEL H-PILING

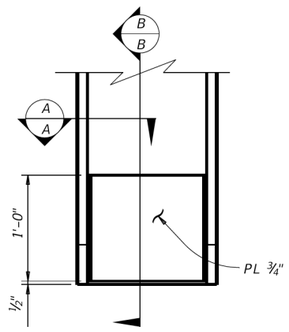


VERTICAL PILE BATTERED PILE

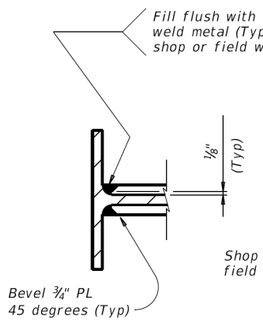
PILING DETAILS
(Concrete or steel H)



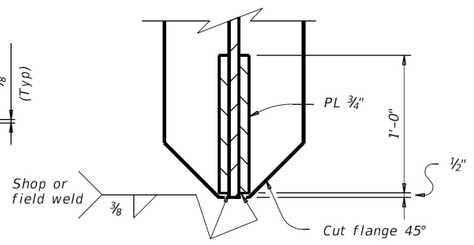
DETAIL "A"
(Showing plan view of a 30° skewed abutment)



ELEVATION

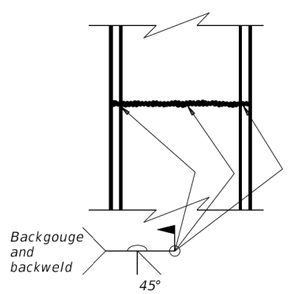


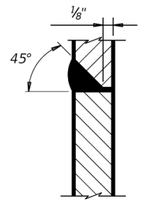
SECTION A-A



SECTION B-B

STEEL H-PILE TIP REINFORCEMENT
See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.





SECTION THRU FLANGE OR WEB

STEEL H-PILE SPLICE DETAIL
Use when required.

(1) #3 spiral at 6" pitch (one and a half flat turns top and bottom).

(2) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-0"
#9 Bars = 2'-3"

(3) Min lap with column reinf:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(4) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-3"
#9 Bars = 2'-9"

(5) Drilled shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved. This option can only be used when the drilled shaft diameter equals the column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

Texas Department of Transportation

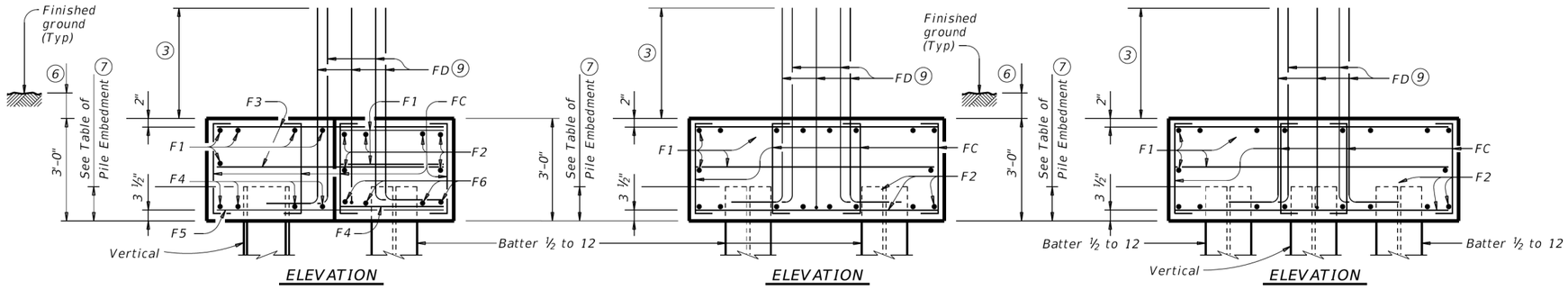
Bridge Division Standard

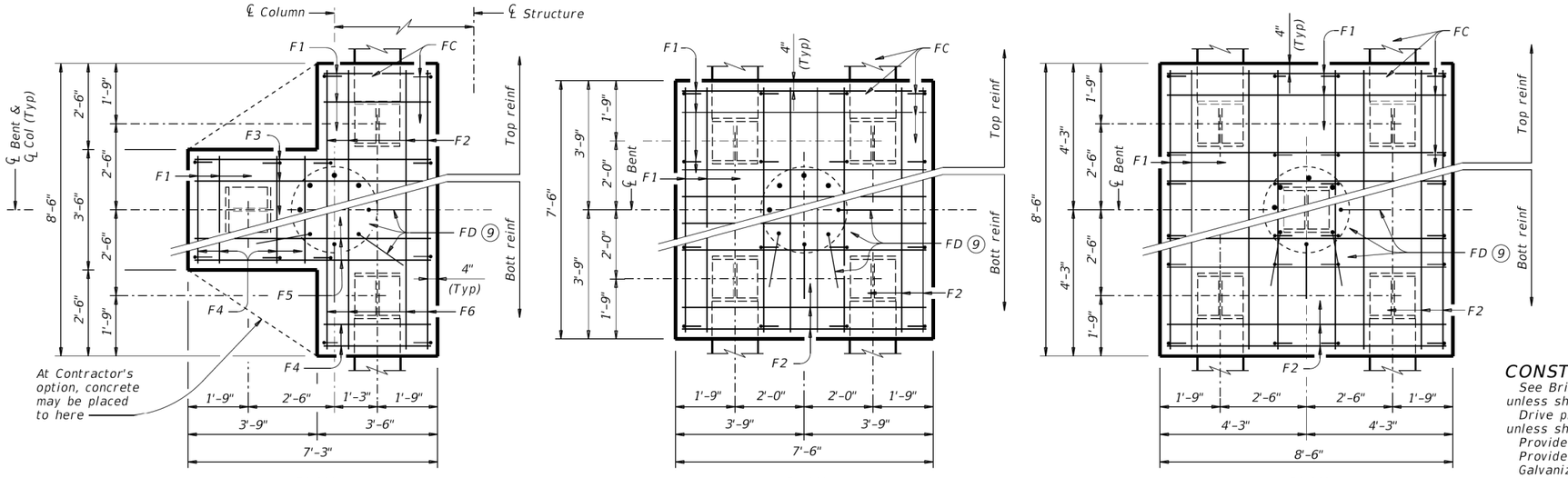
COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	CRP	BEE		57

DATE:
FILE:





THREE PILE FOOTING (8)

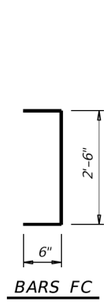
For 36" Dia and smaller columns.

FOUR PILE FOOTING (8)

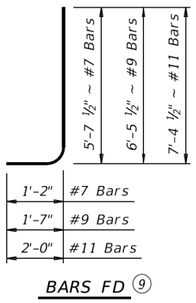
For 42" Dia and smaller columns.

FIVE PILE FOOTING (8)

For 42" Dia and smaller columns.



BARS FC



BARS FD (9)

(3) Min lap with column reinforcing:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

(8) See Bridge Layout for type, size and length of piling.

(9) Number and size of FD bars must match column reinforcing. Tie FD bars to the top of the bottom reinforcing mat.

(10) Adjust FD quantity, size and weight as needed to match column reinforcing.

TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS

ONE 3 PILE FOOTING

Bar	No.	Size	Length	Weight
F1	11	#4	3'- 2"	23
F2	6	#4	8'- 2"	33
F3	6	#4	6'- 11"	28
F4	8	#9	3'- 2"	86
F5	4	#9	6'- 11"	94
F6	4	#9	8'- 2"	111
FC	12	#4	3'- 6"	28
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	623
Class "C" Concrete			CY	4.8

ONE 4 PILE FOOTING

Bar	No.	Size	Length	Weight
F1	20	#4	7'- 2"	96
F2	16	#8	7'- 2"	306
FC	16	#4	3'- 6"	37
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	659
Class "C" Concrete			CY	6.3

ONE 5 PILE FOOTING

Bar	No.	Size	Length	Weight
F1	20	#4	8'- 2"	109
F2	16	#9	8'- 2"	444
FC	24	#4	3'- 6"	56
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	829
Class "C" Concrete			CY	8.0

CONSTRUCTION NOTES:

See Bridge Layout for foundation type required. Use these foundation details unless shown otherwise.

Drive piling under abutment wingwalls to a minimum resistance of 10 Tons/Pile unless shown otherwise.

Provide Class C Concrete (f'c = 3,600 psi), unless shown otherwise.

Provide Grade 60 reinforcing steel.

Galvanize reinforcing if shown elsewhere in the plans.

Provide bar laps for drilled shaft reinforcing, where required, as follows:

Uncoated or galvanized (#6) ~ 2'-6"
Uncoated or galvanized (#7) ~ 2'-11"
Uncoated or galvanized (#9) ~ 3'-9"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

DESIGNER NOTES:

Do not use the drilled shaft details shown on this standard for retaining wall, noise wall, barrier, or sign foundations without structural evaluation.

Do not use the footings shown on this standard in direct contact with salt water or exposed to salt water spray.

Maximum allowable pile loads for the footings shown are:

72 Tons/Pile with 24" Dia Columns
80 Tons/Pile with 30" Dia Columns
100 Tons/Pile with 36" Dia Columns
120 Tons/Pile with 42" Dia Columns

Texas Department of Transportation

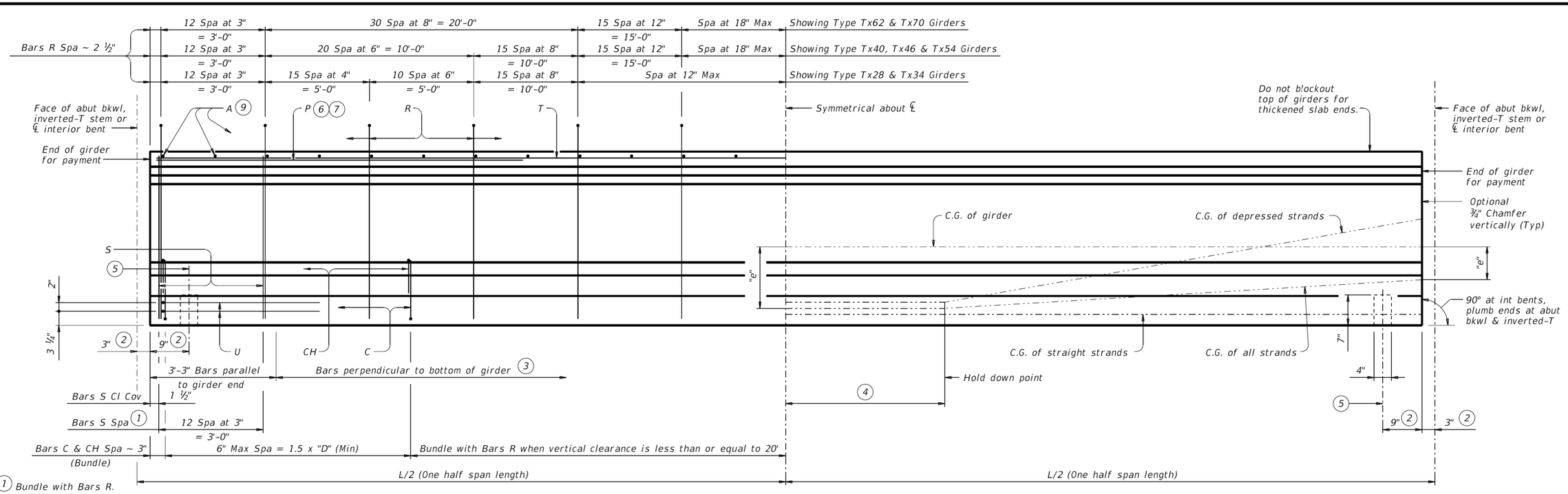
Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	CRP	BEE		58

DATE:
FILE:



(1) Bundle with Bars R.

(2) Measured along ℄ Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.

(3) The average of the top and bottom spacing of Bars R cannot exceed the required spacing.

(4) L/20, but not less than 5'-0" (-0,+2').

(5) ℄ 4" x 1 ½" Vertical Slotted Hole at doweled girder end [labeled (D) on Bridge Layout]. Required for outsiae girder only or as shown on substructure details. Anchorage holes may be tapered (4 ¾" x 1 ⅝") at base. If holes are formed with sheet metal, forms may be left in place.

GIRDER ELEVATION

(6) Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

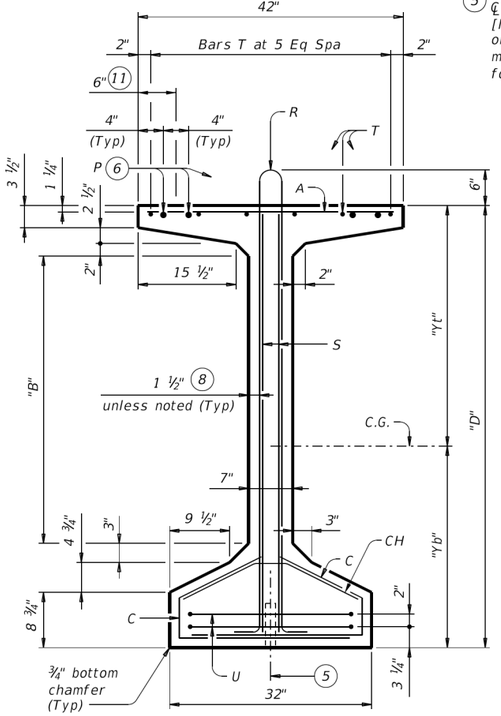
(7) Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

(8) 1 ⅜" Clear Cover to Bars S.

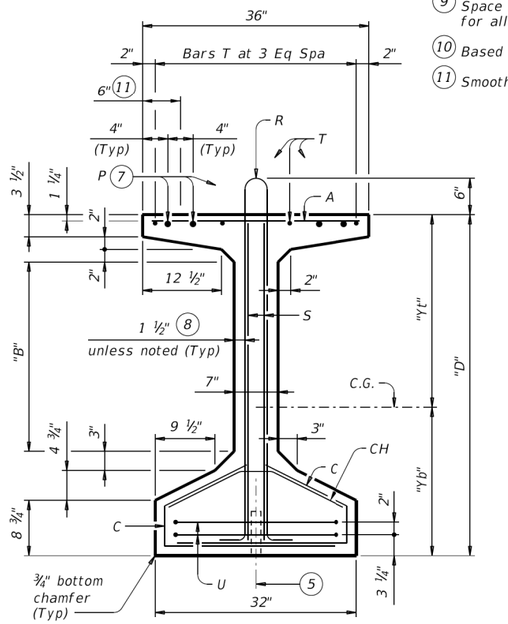
(9) Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".

(10) Based on 155 pcf total weight of concrete and reinforcing steel.

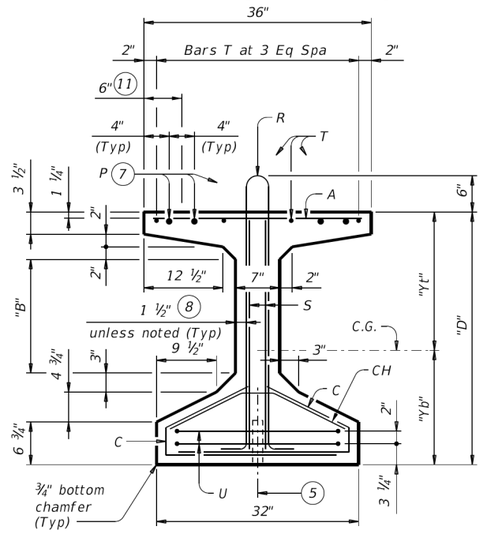
(11) Smooth trowel finish on the slab overhang side of exterior girder.



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40

GIRDER DIMENSIONS AND SECTION PROPERTIES

Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in.²)	"Ix" (in.⁴)	"Iy" (in.⁴)	Weight (10) (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 ½"	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 ½"	38.09	31.91	966	628,747	57,579	1,040

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Provide Class H concrete.
Provide Grade 60 reinforcing steel.
An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A1064) may be substituted for Bars A, C, R or T unless otherwise noted.
It is permissible for bars or strands to come in contact with materials used in forming anchor holes.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING

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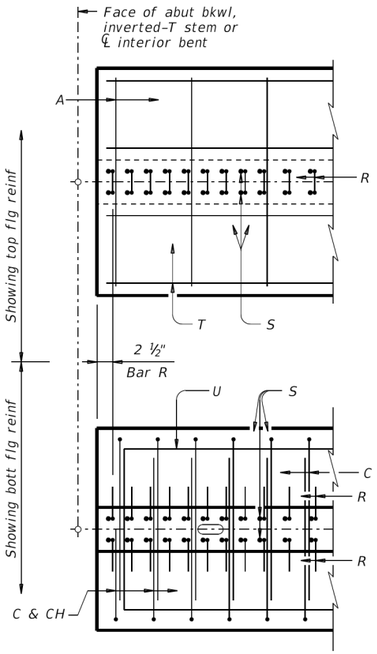
Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

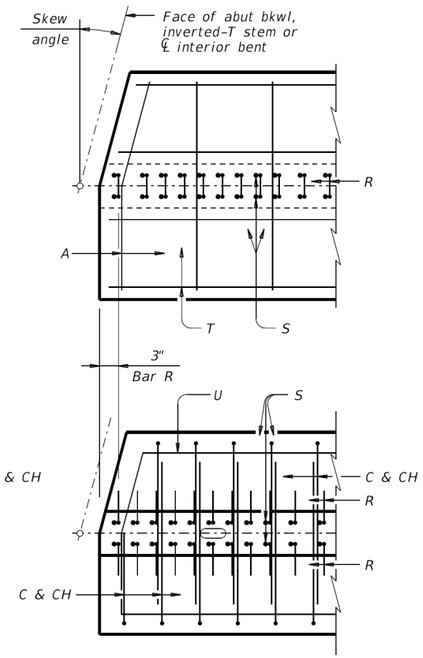
IGD

FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
10-19: Added Bars C and CH full length for VC<= 20'	DIST	COUNTY		SHEET NO.
	CRP	BEE		59

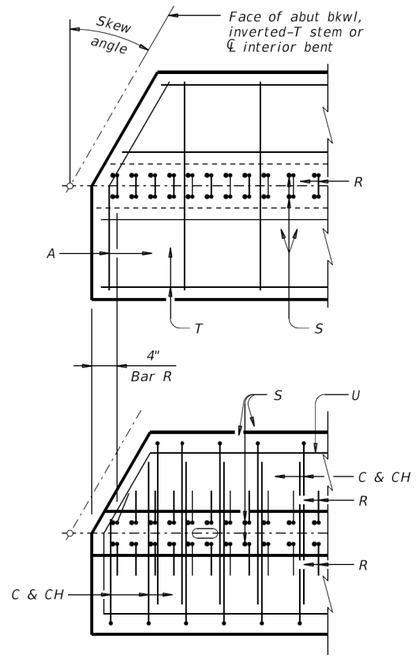
DATE:
FILE:



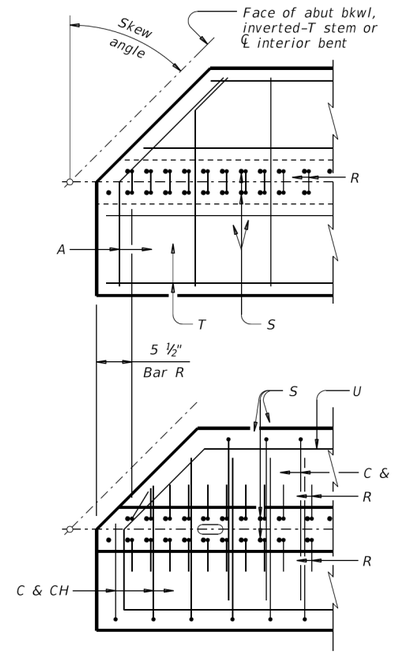
0° SKEW



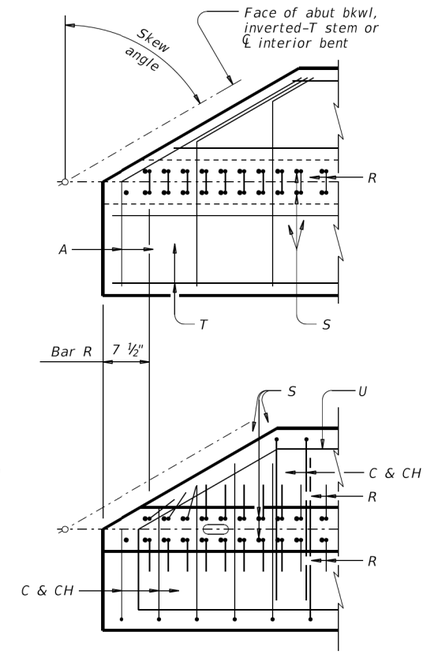
15° SKEW



30° SKEW



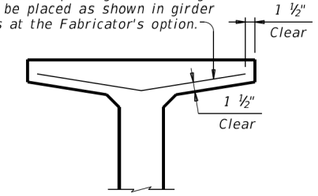
45° SKEW



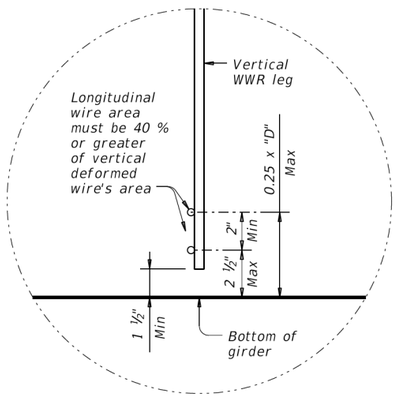
60° SKEW

PLAN OF GIRDER ENDS (12)

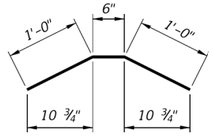
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



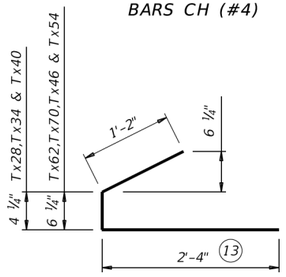
OPTIONAL TOP FLANGE REINFORCING DETAIL



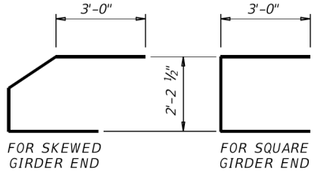
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



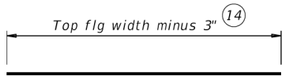
BARS CH (#4)



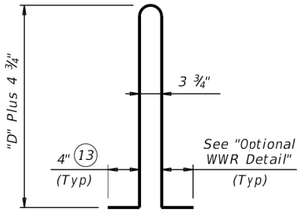
BARS C (#4)



BARS U (#5)

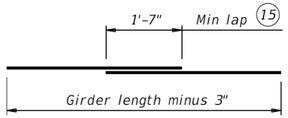


BARS A (#3)



BARS R (#4) (16)

BARS S (#6)



BARS T (#4)

(12) Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.

(13) Bars may be cut or bent at skewed end as required.

(14) Increase as necessary for bars at skewed end.

(15) No portion of bar less than 10 ft.

(16) For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.

HL93 LOADING SHEET 2 OF 2

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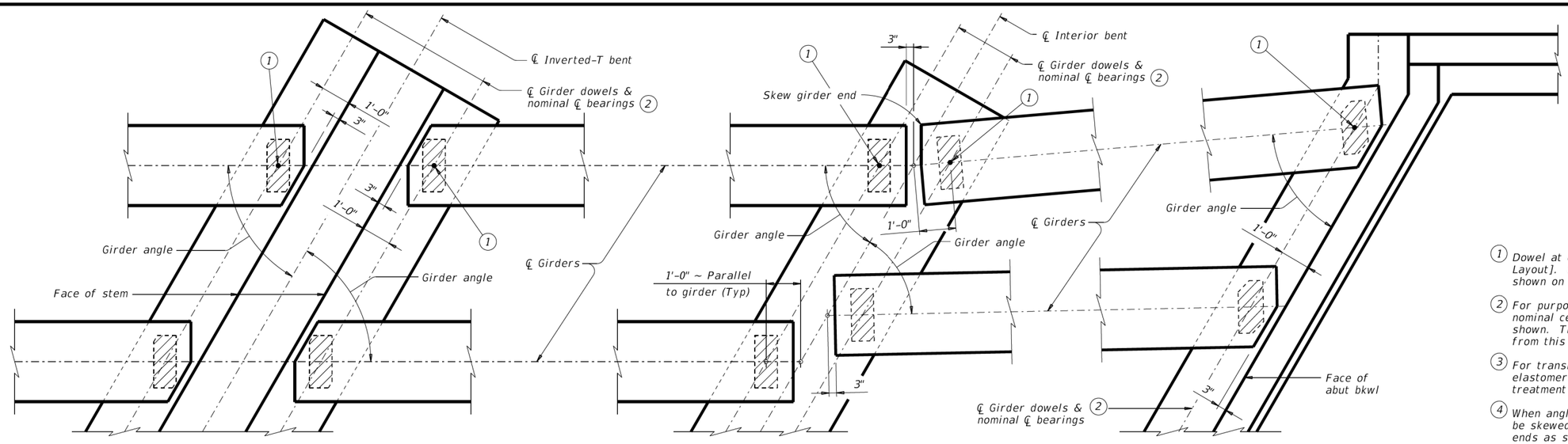
Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
10-19: Added Bars C and CH full length for VC<= 20'	DIST	COUNTY		SHEET NO.
	CRP	BEE		60

DATE:
FILE:



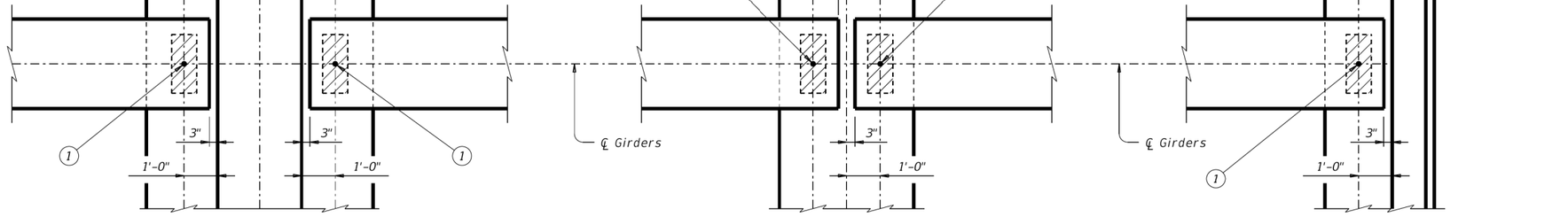
(1) Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(3) For transition bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for abutments.

(4) When angle exceeds 0°, one or both girders ends must be skewed to maintain the clearance between girder ends as shown in view.

(5) See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.



GENERAL NOTES:

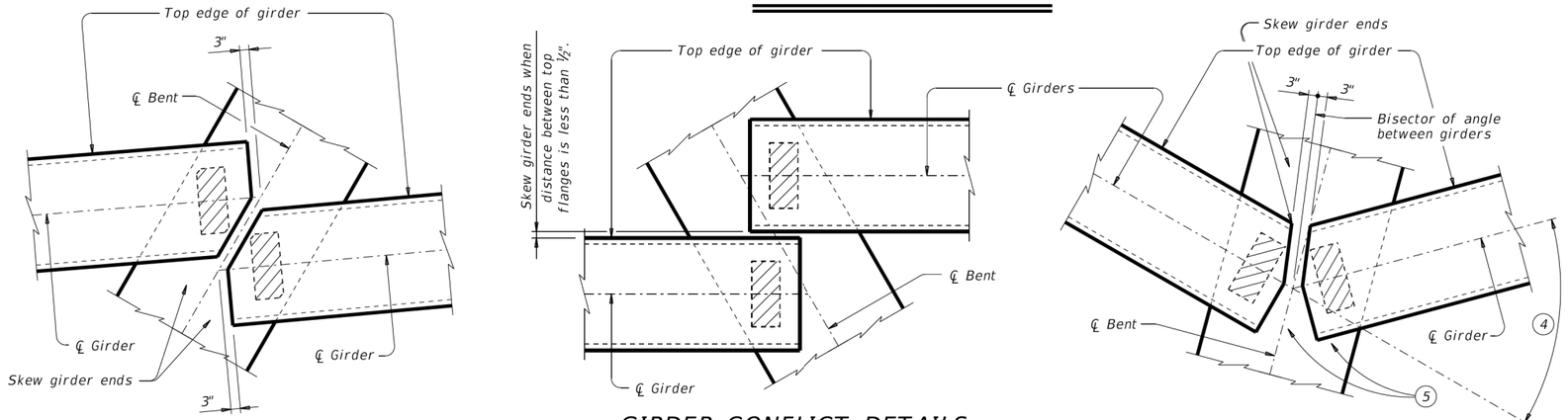
These details accommodate skew angles up to 60°.

Shop drawings for approval are required.

A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer.

Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".

GIRDER END DETAILS



GIRDER CONFLICT DETAILS

HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
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	CRP	BEE		61

DATE:
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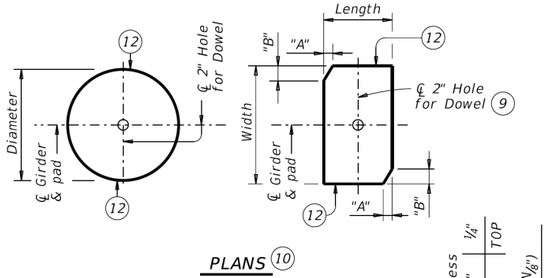
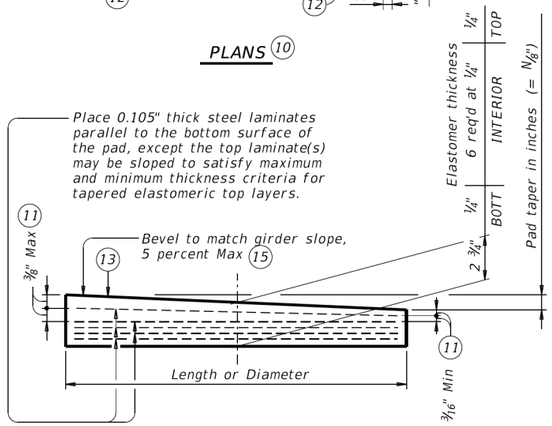


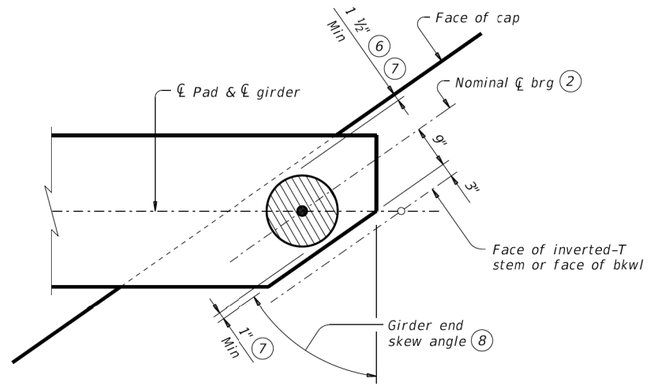
PLANS (10)



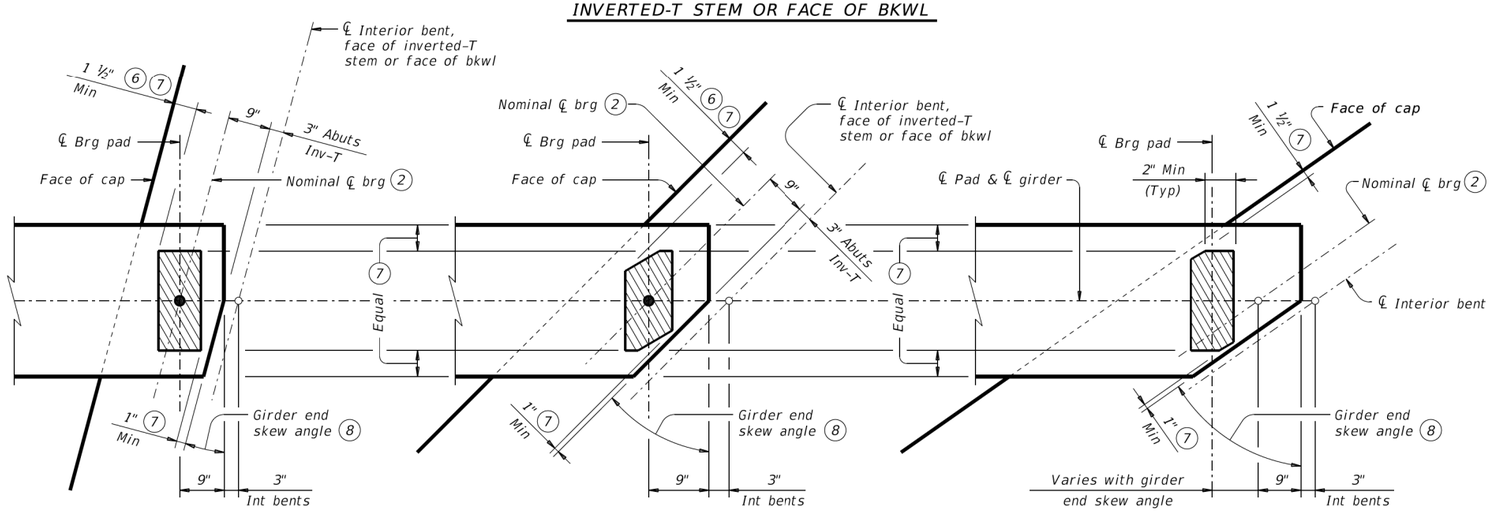
ELEVATION

LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)



ROUND BEARINGS FOR SKEWED GIRDER ENDS AT FACE OF INVERTED-T STEM OR FACE OF BKWL



SKEWED GIRDER ENDS AT INT BENTS, FACE OF INVERTED-T STEM OR FACE OF BKWL

SKEWED GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (16)

(NO GIRDER DOWELS)

BEARING PAD PLACEMENT DIAGRAMS

TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)

Girder Type	Abutments: Face of Bkwl to Face of Cap	Int Bents: Overall Cap Width	Inv-T Bents: Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 ½"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 ½"

TABLE OF BEARING PAD DIMENSIONS

Bent Type	Girder Type	Bearing Type (13)	Girder End Skew Angle Range	Pad Size Lgth x Wdth	Pad Clip Dimensions "A"	Pad Clip Dimensions "B"
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---
		G-2-"N"	21°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-3-"N"	30°+ thru 45°	9" x 21"	4 ½"	4 ½"
		G-4-"N"	45°+ thru 60°	15" Dia	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---
		G-6-"N"	21°+ thru 30°	9" x 21"	1 ½"	2 ½"
		G-7-"N"	30°+ thru 45°	10" x 21"	4 ½"	4 ½"
		G-8-"N"	45°+ thru 60°	10" x 21"	7 ¼"	4 ¼"
CONVENTIONAL INTERIOR BENTS	Tx28,Tx34, Tx40,Tx46 & Tx54	---	---	---	---	---
		---	---	---	---	---
		G-1-"N"	0° thru 60°	8" x 21"	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 60°	9" x 21"	---	---
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS) (16)	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---
		G-2-"N"	18°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-9-"N"	30°+ thru 45°	8" x 21"	3"	3"
		G-10-"N"	45°+ thru 60°	9" x 21"	6"	3 ½"
	Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
		G-5-"N"	18°+ thru 30°	9" x 21"	---	---
		G-11-"N"	30°+ thru 45°	9" x 21"	1 ½"	1 ½"
		G-12-"N"	45°+ thru 60°	9" x 21"	3"	1 ¾"

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(6) 3" for inverted-T.

(7) Place centerline pad as near nominal centerline bearing as possible between limits shown.

(8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.

(9) Provide 2" dia hole only at locations required. See Substructure details for location.

(10) See Table of Bearing Pad Dimensions for dimensions.

(11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

(12) Locate Permanent Mark here.

(13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in ⅛" increments) in this mark.
Examples: N=0, (for 0" taper)
N=1, (for ⅛" taper)
N=2, (for ¼" taper)
(etc.)
Fabricated pad top surface slope must not vary from plan girder slope by more than $\left(\frac{0.0625"}{\text{Length or Dia}}\right)$ IN/IN.

(14) Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.

(15) See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.

(16) If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

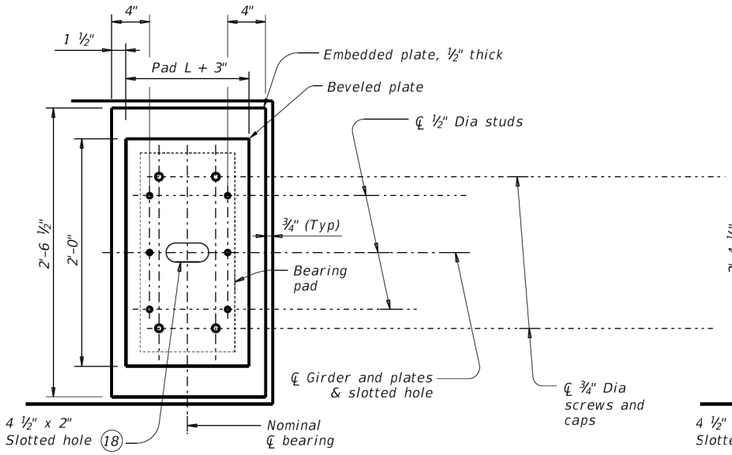
ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

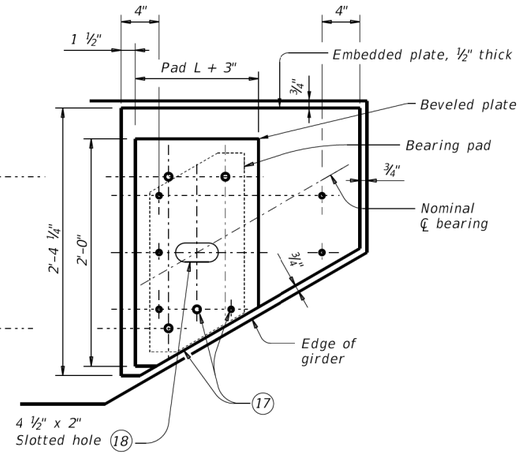
IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0916	25	019	CR 1187
	DIST	COUNTY		SHEET NO.
	CRP	BEE		62

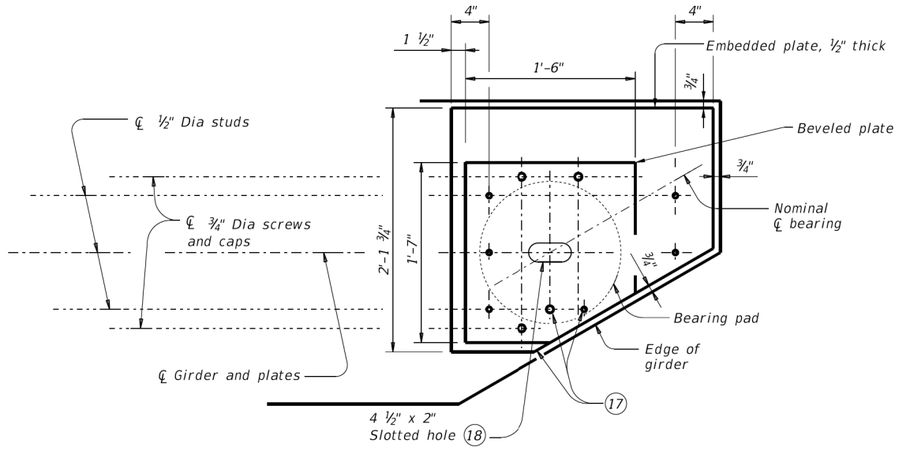
DATE:
FILE:



NORMAL GIRDER END
RECTANGULAR BEARING PAD

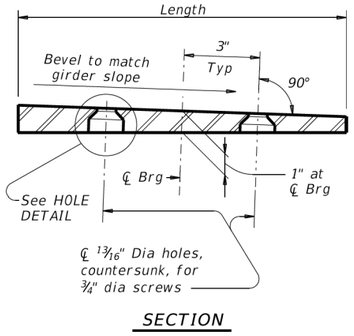


SKEWED GIRDER END
CLIPPED RECTANGULAR BEARING PAD

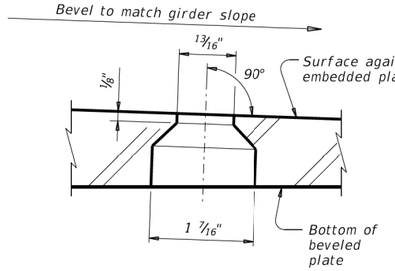


SKEWED GIRDER END
15" DIA BEARING PAD

PLAN VIEW OF SOLE PLATE DETAILS



SECTION



HOLE DETAIL

(17) Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.

(18) Slotted hole is required at doweled girder end locations.

SOLE PLATE NOTES:

Provide constant thickness elastomeric bearings with beveled and embedded steel sole plates in accordance with these details when the girder slope exceeds 5 percent or if otherwise required in the plans. Provide for all girders in the span.

On the shop drawings, dimension sole plates to the nearest 1⁄16" based on required thickness at centerline of bearing and slope of girder. Thickness tolerance variation from the approved shop drawings is 1⁄16"+/-, except variation from a plane parallel to the theoretical top surface can not exceed 1⁄16" total. Bearing surface tolerances listed in Item 424 apply to embedded and beveled plates.

Steel plate must conform to ASTM A36, A572 Gr 50, or A709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

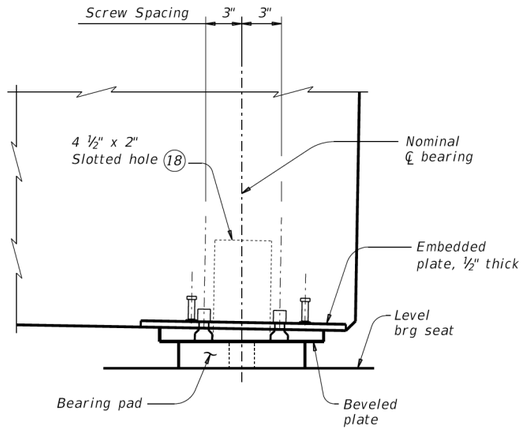
When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".

Tap threads in the embedded plate only. Drill and tap prior to galvanizing.

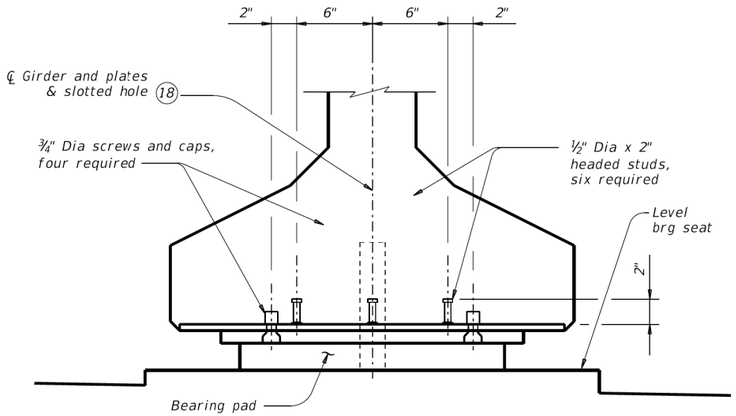
¾" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a ¾" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than ½" deep or deeper than 1".

Install beveled sole plates prior to shipping girders. Installed screw heads must not protrude below the bottom of the beveled plate.

BEVELED PLATE DETAILS



SIDE ELEVATION



END ELEVATION
Showing normal girder end.

GIRDER DETAILS

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation | Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
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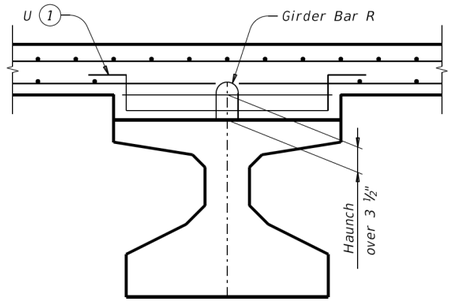
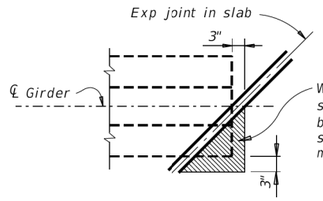
	0916	25	019	CR 1187
	DIST	COUNTY		SHEET NO.
	CRP	BEE		63

DATE:
FILE:

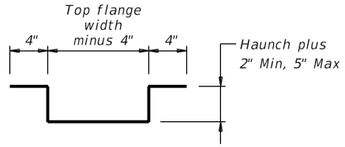


HAUNCH REINFORCING DETAIL

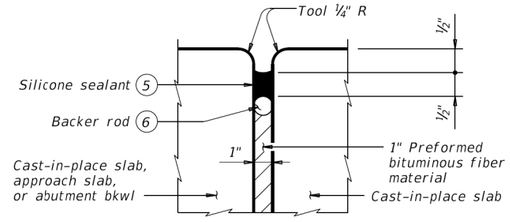


Where flanges project under slab of adjacent span, provide a minimum of ½" clearance between top of girder and bottom of adjacent slab. Polystyrene or other suitable compressible material may be used as a filler.

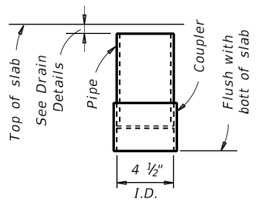
TREATMENT AT GIRDER END FOR SKEWED SPANS



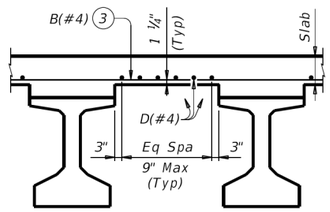
BARS U (#4)



TYPE A JOINT DETAIL (7)

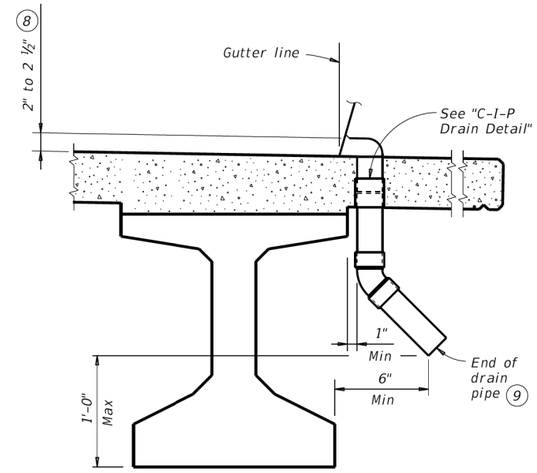


C-I-P DRAIN DETAIL (2)



TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP (4)

Top reinforcing steel not shown for clarity.



DRAIN DETAIL (10)

(1) Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 ½".

(2) Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.

(3) Bars B(#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#4) at centerline outside girder.

(4) Provide Grade 60 reinforcing steel. Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

(5) Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.

(6) 1 ¼" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

(7) The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.

(8) Drain entrance formed in rail or sidewalk.

(9) Water may not be discharged onto girders.

(10) All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railways, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Payment for Type A joint will be as per Item 454, "Bridge Expansion Joints."

All other items (reinforcing steel, drains, etc.) shown on this sheet are subsidiary to other bid items.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

DECK FORMWORK NOTES:

Overhang bracket hangers are limited to a safe working load of 3,600 lbs, applied to and along the axis of a coil rod at 45 degrees from vertical, regardless of higher loads permitted by hanger manufacturers. Do not place a hanger less than 12" from girder end. Space hangers accordingly.

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE I-GIRDERS

IGMS

FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
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REVISIONS	0916	25	019	CR 1187
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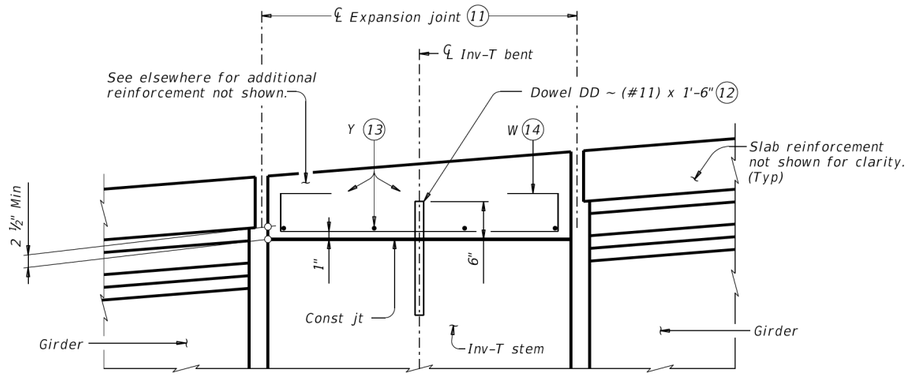
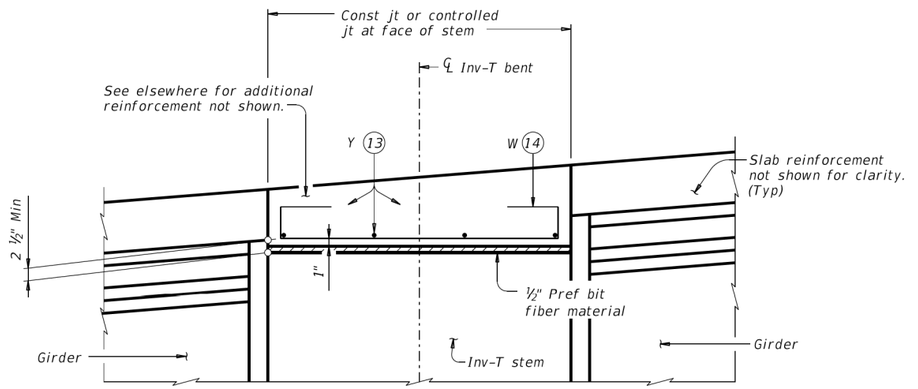
	CRP	BEE		64

DATE:
FILE:

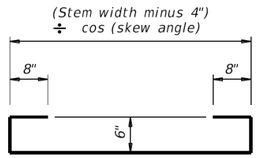


SHOWING EXPANSION JOINTS

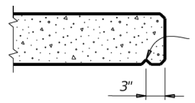


SHOWING CONST JTS OR CONTROLLED JTS

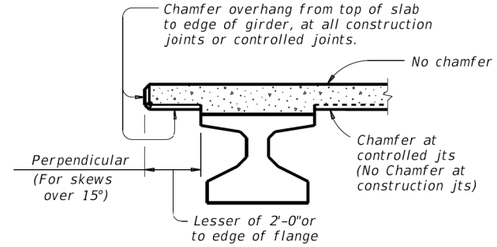
REINFORCEMENT OVER INV-T BENTS



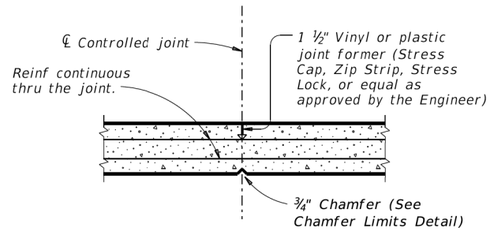
BARS W (#4)



DRIP BEAD DETAIL



CHAMFER LIMITS DETAIL (15)



CONTROLLED JOINT DETAIL

(Saw-cutting is not allowed)

(11) See Layout for joint type.

(12) Dowels DD (#11) spaced at 5 Ft Max. See Inv-T bents for quantity and location.

(13) Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.

(14) Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.

(15) See Span details for type of joint and joint locations.

Texas Department of Transportation

Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE I-GIRDERS

IGMS

FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
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	CRP	BEE		65

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STRUCTURE	DESIGNED GIRDERS								DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS		
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS: NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)	NO.	TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2) Moment	LIVE LOAD DISTRIBUTION FACTOR (2) Shear	STRENGTH I Inv	STRENGTH I Opr	SERVICE III Inv
Type Tx28 Girders 24' Roadway 8.5" Slab	40	ALL	Tx28		10	0.6	270	10.48	10.48			4.000	5.000	1.055	-1.423	1382	0.670	0.850	1.56	2.02	1.98
	45	ALL	Tx28		12	0.6	270	10.48	10.48			4.500	5.000	1.332	-1.744	1525	0.650	0.850	1.58	2.05	1.79
	50	ALL	Tx28		12	0.6	270	10.48	10.48			4.200	5.000	1.645	-2.113	1657	0.630	0.860	1.25	1.62	1.25
	55	ALL	Tx28		14	0.6	270	10.48	9.62	2	8.5	4.000	5.000	1.969	-2.490	1919	0.610	0.860	1.27	1.64	1.11
	60	ALL	Tx28		18	0.6	270	10.04	7.81	4	14.5	4.000	5.600	2.320	-2.901	2206	0.600	0.870	1.43	1.86	1.14
	65	ALL	Tx28		22	0.6	270	9.75	6.12	4	24.5	4.300	5.900	2.716	-3.337	2486	0.580	0.870	1.55	2.00	1.14
	70	ALL	Tx28		26	0.6	270	9.56	6.48	4	24.5	5.200	6.300	3.131	-3.802	2793	0.570	0.870	1.26	1.89	1.01
	75	ALL	Tx28		28	0.6	270	9.48	6.62	4	24.5	5.600	7.800	3.572	-4.291	3110	0.560	0.880	1.38	1.81	1.08
Type Tx34 Girders 24' Roadway 8.5" Slab	40	ALL	Tx34		10	0.6	270	13.01	13.01			4.000	5.000	0.835	-1.089	1605	0.690	0.830	1.85	2.40	2.60
	45	ALL	Tx34		10	0.6	270	13.01	13.01			4.500	5.500	1.050	-1.332	1750	0.670	0.840	1.90	2.46	2.42
	50	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	1.294	-1.612	1868	0.650	0.840	1.53	1.98	1.81
	55	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	1.553	-1.904	1981	0.630	0.840	1.24	1.61	1.33
	60	ALL	Tx34		14	0.6	270	13.01	12.44	2	6.5	4.000	5.000	1.845	-2.231	2287	0.620	0.850	1.27	1.64	1.22
	65	ALL	Tx34		16	0.6	270	12.76	11.76	4	8.5	4.000	5.000	2.161	-2.579	2605	0.610	0.850	1.25	1.62	1.06
	70	ALL	Tx34		20	0.6	270	12.41	9.61	4	18.5	4.000	5.100	2.461	-2.902	2888	0.590	0.850	1.46	1.89	1.13
	75	ALL	Tx34		24	0.6	270	12.18	7.84	4	30.5	4.300	5.400	2.818	-3.283	3223	0.580	0.860	1.57	2.04	1.15
	80	ALL	Tx34		26	0.6	270	12.09	8.09	4	30.5	4.700	5.700	3.168	-3.660	3554	0.570	0.860	1.39	1.96	1.04
	85	ALL	Tx34		30	0.6	270	11.81	7.81	6	26.5	5.400	6.100	3.567	-4.078	3909	0.560	0.860	1.46	2.00	1.04
Type Tx40 Girders 24' Roadway 8.5" Slab	40	ALL	Tx40		10	0.6	270	15.60	15.60			4.000	5.000	0.697	-0.889	1671	0.720	0.820	2.10	2.73	3.15
	45	ALL	Tx40		10	0.6	270	15.60	15.60			4.000	5.000	0.873	-1.080	1972	0.690	0.820	1.74	2.26	2.50
	50	ALL	Tx40		12	0.6	270	15.60	15.60			4.000	5.000	1.065	-1.299	2276	0.670	0.830	1.78	2.31	2.33
	55	ALL	Tx40		12	0.6	270	15.60	15.60			4.000	5.000	1.283	-1.538	2237	0.650	0.830	1.46	1.90	1.80
	60	ALL	Tx40		14	0.6	270	15.60	15.60			4.200	5.000	1.522	-1.801	2434	0.640	0.830	1.49	1.93	1.66
	65	ALL	Tx40		14	0.6	270	15.60	15.60			4.000	5.000	1.780	-2.081	2688	0.630	0.840	1.24	1.60	1.25
	70	ALL	Tx40		16	0.6	270	15.35	14.85	4	6.5	4.000	5.000	2.035	-2.349	2989	0.610	0.840	1.28	1.65	1.17
	75	ALL	Tx40		18	0.6	270	15.16	14.27	4	8.5	4.000	5.000	2.328	-2.657	3337	0.600	0.840	1.28	1.66	1.05
	80	ALL	Tx40		22	0.6	270	14.87	11.24	4	24.5	4.000	5.000	2.616	-2.961	3681	0.590	0.850	1.47	1.90	1.11
	85	ALL	Tx40		26	0.6	270	14.68	9.76	4	36.5	4.400	5.100	2.930	-3.287	4041	0.580	0.850	1.60	2.08	1.22
	90	ALL	Tx40		28	0.6	270	14.60	10.03	4	36.5	4.800	5.500	3.259	-3.626	4410	0.570	0.850	1.55	2.01	1.07
	95	ALL	Tx40		32	0.6	270	14.23	8.60	6	36.5	5.100	5.800	3.620	-3.991	4799	0.560	0.850	1.62	2.10	1.06
	100	ALL	Tx40		36	0.6	270	13.93	8.93	6	36.5	5.800	6.600	4.006	-4.393	5245	0.560	0.850	1.47	1.94	1.06
Type Tx46 Girders 24' Roadway 8.5" Slab	40	ALL	Tx46		10	0.6	270	17.60	17.60			4.000	5.000	0.613	-0.708	1732	0.740	0.810	2.35	3.05	3.78
	45	ALL	Tx46		10	0.6	270	17.60	17.60			4.000	5.000	0.768	-0.865	2066	0.720	0.810	1.93	2.50	3.01
	50	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	0.937	-1.042	2452	0.700	0.820	1.97	2.55	2.81
	55	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	1.127	-1.235	2726	0.680	0.820	1.63	2.11	2.22
	60	ALL	Tx46		14	0.6	270	17.60	17.60			4.000	5.000	1.332	-1.438	2951	0.660	0.820	1.68	2.18	2.10
	65	ALL	Tx46		14	0.6	270	17.60	17.60			4.000	5.000	1.557	-1.662	2905	0.650	0.820	1.41	1.82	1.64
	70	ALL	Tx46		14	0.6	270	17.60	17.60			4.000	5.000	1.798	-1.898	3157	0.640	0.830	1.18	1.52	1.25
	75	ALL	Tx46		16	0.6	270	17.35	16.85	4	6.5	4.000	5.000	2.050	-2.137	3495	0.620	0.830	1.23	1.59	1.17
	80	ALL	Tx46		18	0.6	270	17.16	16.27	4	8.5	4.000	5.000	2.304	-2.384	3859	0.610	0.830	1.25	1.63	1.09
	85	ALL	Tx46		22	0.6	270	16.88	15.06	4	14.5	4.000	5.000	2.591	-2.656	4249	0.600	0.830	1.46	1.89	1.30
	90	ALL	Tx46		24	0.6	270	16.77	14.10	4	20.5	4.000	5.000	2.870	-2.923	4631	0.590	0.840	1.45	1.88	1.06
	95	ALL	Tx46		28	0.6	270	16.60	11.46	4	40.5	4.200	5.000	3.192	-3.234	5087	0.590	0.840	1.57	2.03	1.08
	100	ALL	Tx46		32	0.6	270	16.23	9.48	6	42.5	4.400	5.000	3.524	-3.542	5513	0.580	0.840	1.65	2.14	1.07
	105	ALL	Tx46		36	0.6	270	15.94	9.94	6	42.5	5.000	5.800	3.856	-3.851	5937	0.570	0.840	1.72	2.23	1.17
	110	ALL	Tx46		38	0.6	270	15.81	10.45	6	40.5	5.400	6.300	4.200	-4.169	6370	0.560	0.840	1.67	2.16	1.04
	115	ALL	Tx46		42	0.6	270	15.60	10.75	6	40.5	6.000	7.000	4.584	-4.532	6886	0.560	0.840	1.46	1.96	1.05

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER

(1) Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

Tension = $0.24\sqrt{f'ci}$

Optional designs must likewise conform.

(2) Portion of full HL93.

DESIGN NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications. Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation.

Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.

Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

Use low relaxation strands, each pretensioned to 75 percent of fpu.

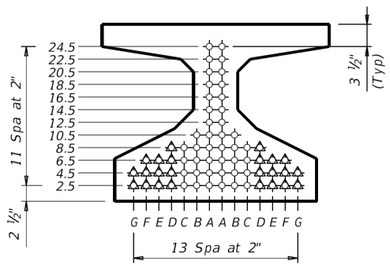
Strand debonding must comply with Item 424.4.2.2.2.4. Full-length debonded strands are only permitted in positions marked △. Double wrap full-length debonded strands in outer most position of each row.

When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

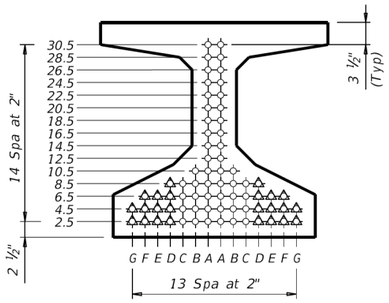
Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

DEPRESSED STRAND DESIGNS:

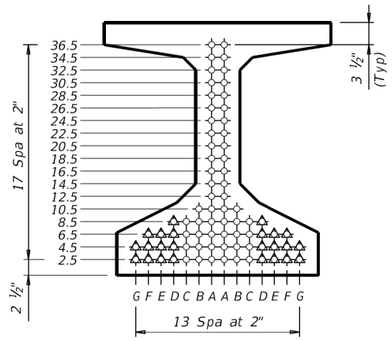
Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.



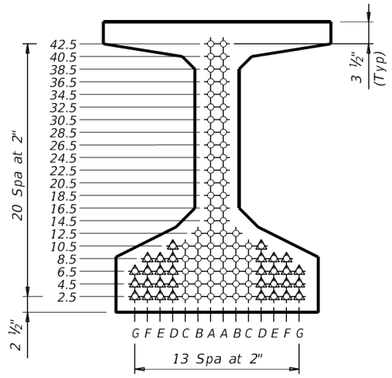
TYPE Tx28



TYPE Tx34



TYPE Tx40



TYPE Tx46

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

24' ROADWAY

IGSD-24

FILE: ig01stds-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Redesigned girders. 1-21: Added load rating.	0916	25	019	CR 1187
	DIST	COUNTY		SHEET NO.
	CRP	BEE		66

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS		
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS						NO.	TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)								Moment	Shear	Inv	Opr	Inv
Type Tx54 Girders 24' Roadway 8.5" Slab	40	ALL	Tx54		8	0.6	270	21.01	21.01			4.000	5.000	0.511	-0.578	1798	0.770	0.800	2.05	2.66	3.76
	45	ALL	Tx54		10	0.6	270	21.01	21.01			4.000	5.000	0.636	-0.703	2126	0.740	0.800	2.24	2.90	3.69
	50	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.781	-0.850	2533	0.720	0.810	1.81	2.35	2.91
	55	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.938	-1.007	2951	0.700	0.810	1.90	2.46	2.79
	60	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	1.108	-1.173	3271	0.680	0.810	1.60	2.07	2.25
	65	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	1.285	-1.348	3547	0.670	0.810	1.66	2.16	2.16
	70	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	1.482	-1.540	3502	0.660	0.820	1.41	1.82	1.73
	75	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.689	-1.733	3745	0.640	0.820	1.47	1.91	1.66
	80	ALL	Tx54		16	0.6	270	20.76	20.76			4.000	5.000	1.912	-1.944	4001	0.630	0.820	1.26	1.63	1.30
	85	ALL	Tx54		18	0.6	270	20.56	19.67	4	8.5	4.000	5.000	2.148	-2.166	4406	0.620	0.820	1.07	1.39	1.00
	90	ALL	Tx54		20	0.6	270	20.41	19.21	4	10.5	4.000	5.000	2.379	-2.384	4806	0.610	0.820	1.33	1.73	1.16
	95	ALL	Tx54		22	0.6	270	20.28	18.46	4	14.5	4.000	5.000	2.639	-2.624	5234	0.600	0.820	1.35	1.75	1.07
	100	ALL	Tx54		26	0.6	270	20.08	16.39	4	28.5	4.000	5.000	2.896	-2.871	5699	0.600	0.830	1.52	1.97	1.14
	105	ALL	Tx54		30	0.6	270	19.81	12.21	6	44.5	4.000	5.000	3.180	-3.130	6153	0.590	0.830	1.51	1.96	1.02
	110	ALL	Tx54		32	0.6	270	19.63	11.38	6	50.5	4.100	5.000	3.477	-3.400	6619	0.580	0.830	1.63	2.12	1.03
	115	ALL	Tx54		36	0.6	270	19.34	12.01	6	50.5	4.700	5.500	3.786	-3.679	7096	0.570	0.830	1.60	2.07	1.00
	120	ALL	Tx54		38	0.6	270	19.22	13.22	6	44.5	5.200	6.100	4.116	-3.985	7646	0.570	0.830	1.65	2.14	1.01
	125	ALL	Tx54		42	0.6	270	19.01	12.72	6	50.5	5.600	6.600	4.415	-4.257	8113	0.560	0.830	1.71	2.24	1.09
Type Tx62 Girders 24' Roadway 8.5" Slab	60	ALL	Tx62		12	0.6	270	25.78	25.78			4.000	5.000	0.878	-0.986	3525	0.700	0.800	1.81	2.35	2.73
	65	ALL	Tx62		12	0.6	270	25.78	25.78			4.000	5.000	1.016	-1.133	3847	0.690	0.800	1.89	2.45	2.64
	70	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	1.171	-1.293	4173	0.680	0.810	1.61	2.08	2.16
	75	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	1.332	-1.455	4132	0.660	0.810	1.68	2.18	2.10
	80	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.506	-1.633	4429	0.650	0.810	1.45	1.88	1.72
	85	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.691	-1.819	4610	0.640	0.810	1.24	1.61	1.37
	90	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.885	-2.013	5051	0.630	0.810	1.29	1.68	1.31
	95	ALL	Tx62		20	0.6	270	25.18	24.78	4	6.5	4.000	5.000	2.081	-2.209	5493	0.620	0.820	1.11	1.44	1.02
	100	ALL	Tx62		22	0.6	270	25.05	23.96	4	10.5	4.000	5.000	2.295	-2.420	5959	0.610	0.820	1.16	1.50	1.01
	105	ALL	Tx62		24	0.6	270	24.94	23.28	4	14.5	4.000	5.000	2.514	-2.642	6475	0.610	0.820	1.37	1.78	1.10
	110	ALL	Tx62		26	0.6	270	24.85	22.70	4	18.5	4.000	5.000	2.723	-2.850	6936	0.600	0.820	1.39	1.80	1.03
	115	ALL	Tx62		30	0.6	270	24.58	17.78	6	40.5	4.000	5.000	2.963	-3.083	7440	0.590	0.820	1.56	2.02	1.09
	120	ALL	Tx62		34	0.6	270	24.25	15.07	6	58.5	4.200	5.000	3.213	-3.325	7957	0.580	0.820	1.55	2.01	1.00
	125	ALL	Tx62		36	0.6	270	24.11	17.11	6	48.5	4.700	5.600	3.480	-3.591	8551	0.580	0.820	1.64	2.13	1.04
	130	ALL	Tx62		40	0.6	270	23.88	16.68	6	54.5	5.100	6.100	3.733	-3.836	9072	0.570	0.820	1.52	2.09	1.02
	135	ALL	Tx62		42	0.6	270	23.78	16.35	6	58.5	5.300	6.300	4.002	-4.104	9676	0.570	0.830	1.61	2.18	1.05

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER

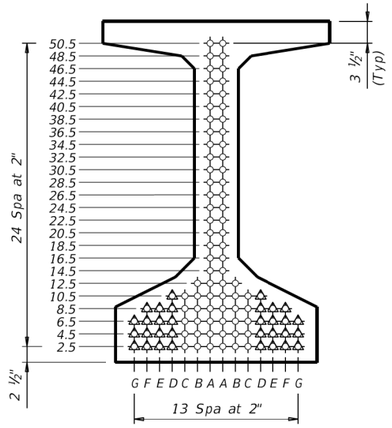
(1) Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

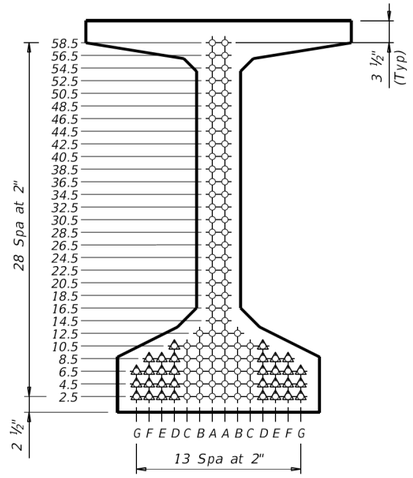
Tension = $0.24\sqrt{f'ci}$

Optional designs must likewise conform.

(2) Portion of full HL93.



TYPE Tx54



TYPE Tx62

HL93 LOADING

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

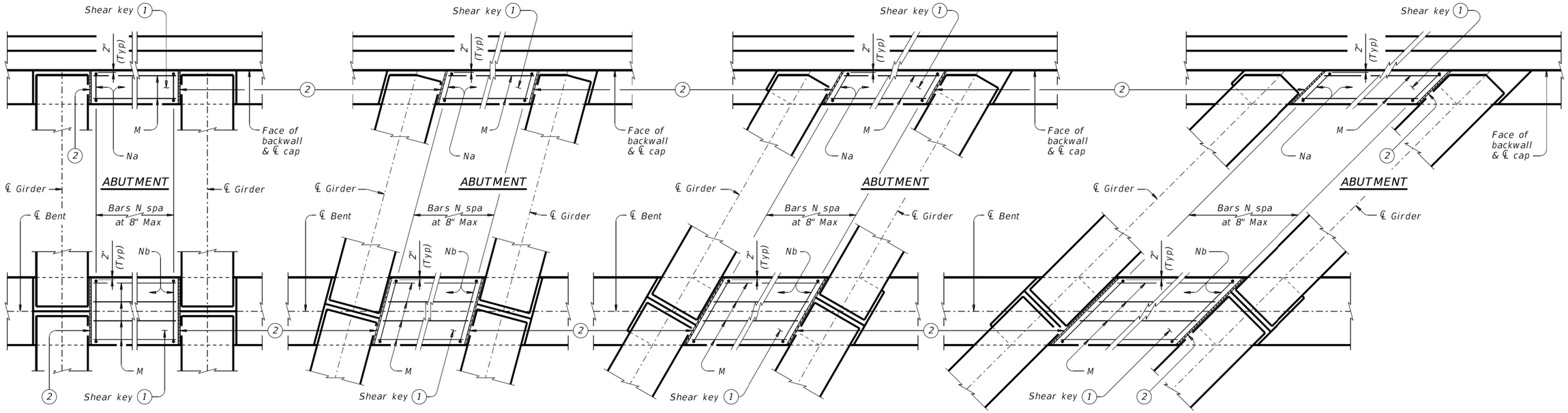
PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

24' ROADWAY

IGSD-24

FILE: ig01stds-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Redesigned girders. 1-21: Added load rating.	0916	25	019	CR 1187
	DIST	COUNTY		SHEET NO.
	CRP	BEE		67

DATE:
FILE:



PARTIAL PLANS WITH NO SKEW

Showing shear keys on 3'–6" wide caps. 4'–0" caps similar.

PARTIAL PLANS WITH 15° SKEW

Showing shear keys on 3'–6" wide caps. 4'–0" caps similar.

PARTIAL PLANS WITH 30° SKEW

Showing shear keys on 3'–6" wide caps. 4'–0" caps similar.

PARTIAL PLANS WITH 45° SKEW

Showing shear keys on 3'–6" wide caps. 4'–0" caps similar.

(1) Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.

(2) UHMW polyethylene wear pad. (Typ)

(3) Leave a ¼" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. Care must be taken to keep concrete from flowing under girder. Slope top of shear keys in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces."

(4) Measure at higher bearing seat elevation forward or back. Dimension based on typical bearing pad and bearing seat. Increase as necessary to maintain 5" overlap.

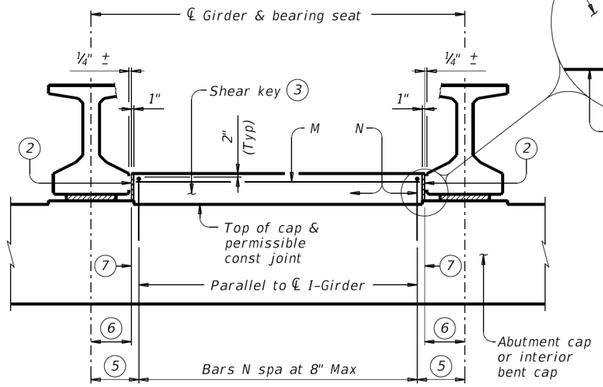
(5) With No Skew = 1'–8 ¼", measured along ℄ cap.
With Skew = 1'–8 ¼" ✚ Cos Skew, measured along ℄ cap.

(6) With No Skew = 1'–4 ¼", measured along ℄ cap.
With Skew = 1'–4 ¼" ✚ Cos Skew, measured along ℄ cap.

(7) Face of UHMW polyethylene wear pad. Smooth side of pad facing girder.

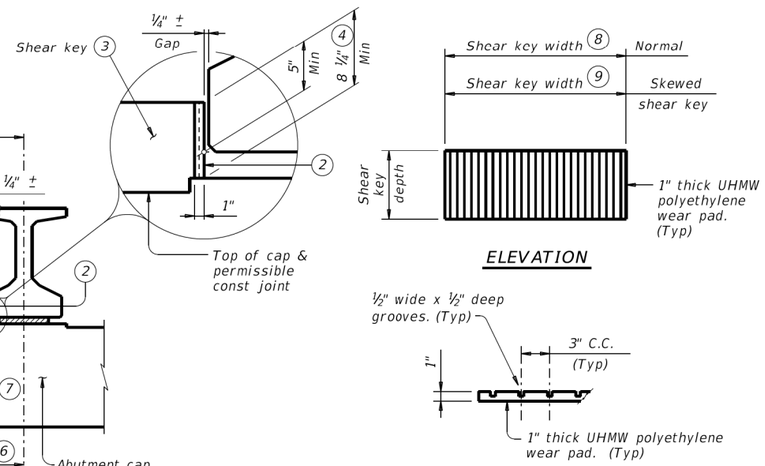
(8) Abutments = ½ Cap width.
Interior bents = Cap width.

(9) Abutments = ½ Cap width ✚ Cos Skew.
Interior bents = Cap width ✚ Cos Skew.

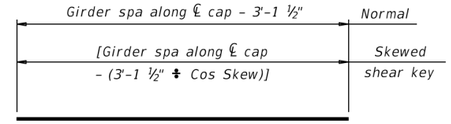


PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

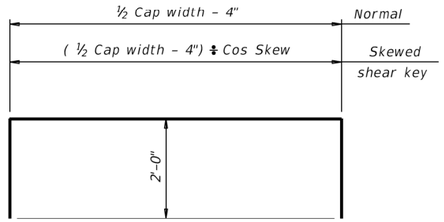
Showing shear key with girder Type Tx46. Other I–Girder types similar.



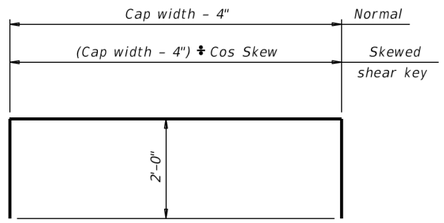
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



BARS M (#5)



BARS Na (#5)
(For abutments)



BARS Nb (#5)
(For interior bents)

CONSTRUCTION NOTES:

Provide Class "C" concrete (f'c = 3,600 psi). Provide Class "C" (HPC) if shown elsewhere on the plans.
Provide Grade 60 reinforcing steel.
Provide epoxy coated reinforcing steel for shear key if abutment or interior bent reinforcing steel is epoxy coated.
Provide Ultra High Molecular Weight (UHMW) polyethylene wear pads in accordance with ASTM D6712.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Details showing skew are drawn showing right forward skew. See Bridge Layout for actual skew direction.
These details are limited to bridges skewed 45 degrees and less.
This standard is only applicable for I–Girders.
Modify details for bearing conditions, and girder spacing not shown on this standard. Details do not account for sole plate or pedestal bearing seat.
Include shear key concrete in abutment or bent concrete for payment.
UHMW polyethylene wear pads are subsidiary to Class "C" concrete.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out–to–out of bar.

Texas Department of Transportation

Bridge Division Standard

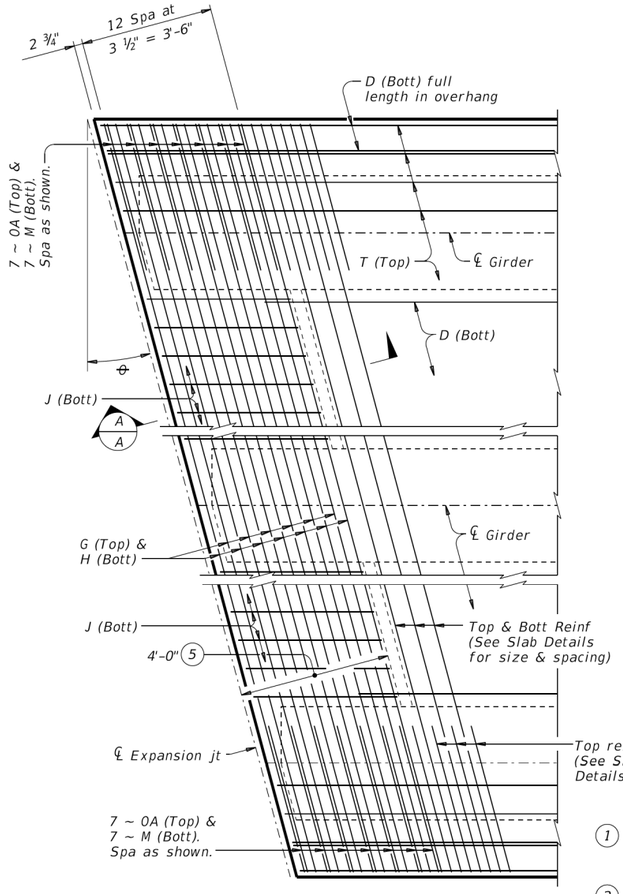
SHEAR KEY DETAILS
PRESTR CONCRETE I-GIRDERS

IGSK

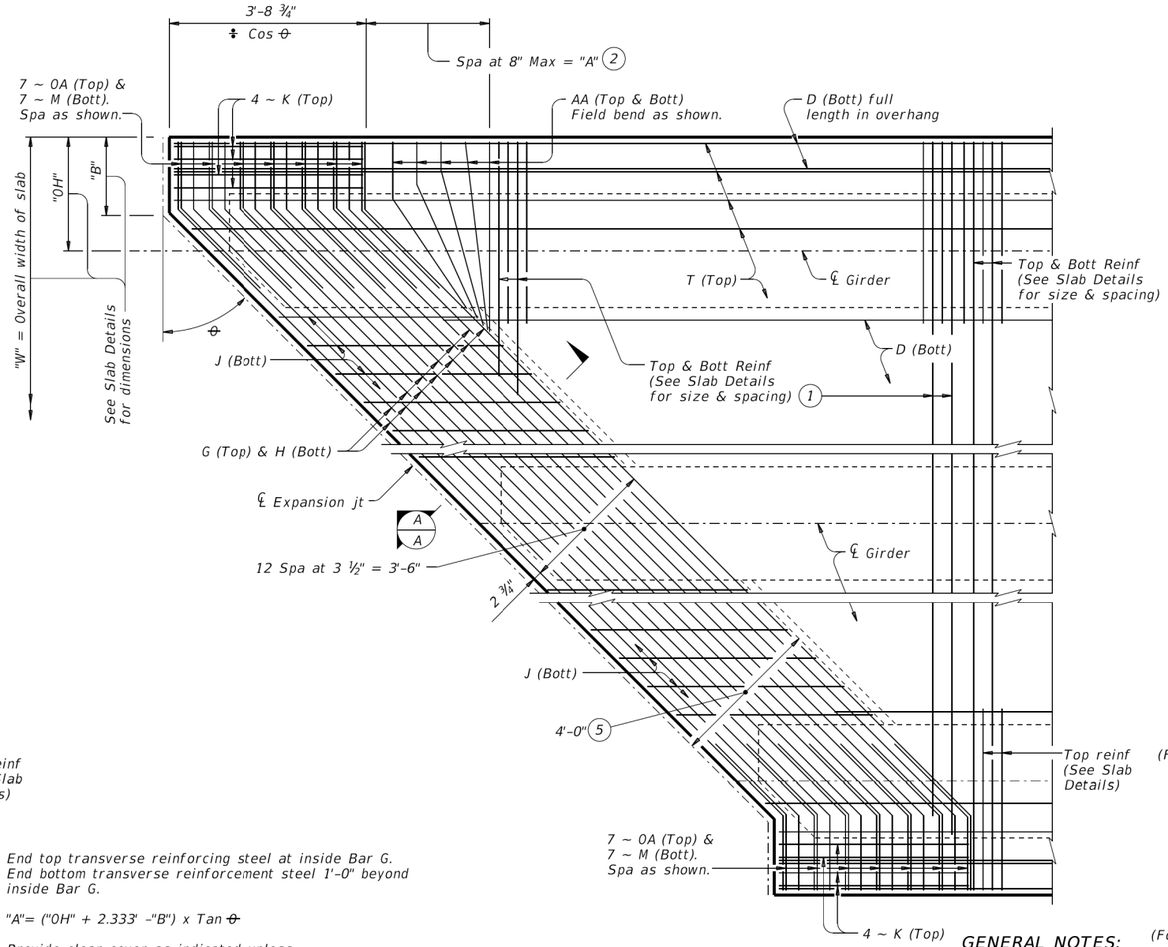
FILE: igskstds-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
	DIST	COUNTY		SHEET NO.
	CRP	BEE		68

DATE:
FILE:

DATE:
FILE:

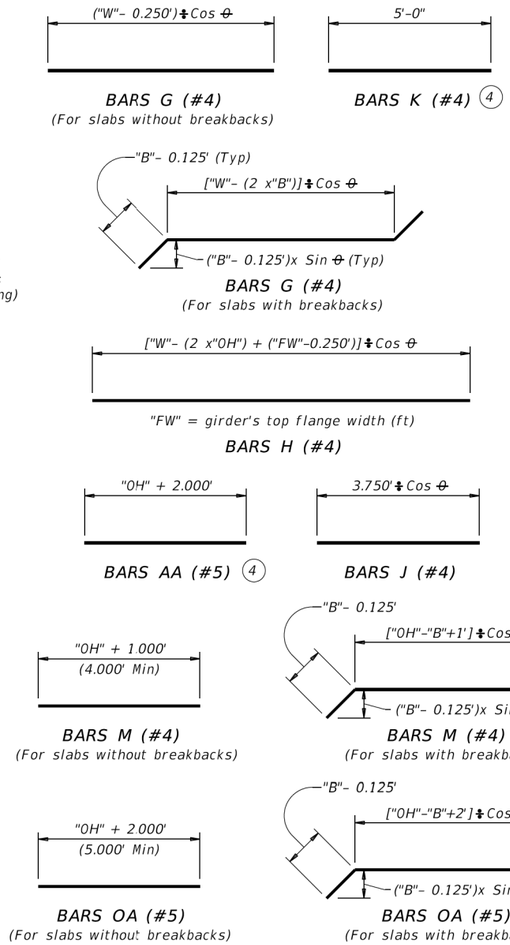


PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



PARTIAL PLAN FOR SLABS WITH BREAKBACK

1. End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
2. "A"= ("0H" + 2.333' -"B") x Tan θ
3. Provide clear cover as indicated unless otherwise shown on Span Details.
4. Only required on slabs with breakbacks.
5. Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.



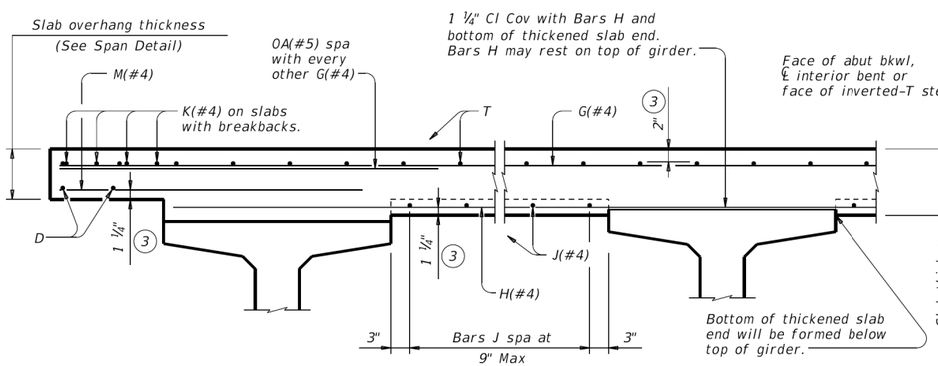
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
These details are restricted to Prestressed Concrete I-Girder Spans.
These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used).
When Option 2 from PCP standard is used, provide Bars AA, G, K and OA in the slab.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and OA must be epoxy coated.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

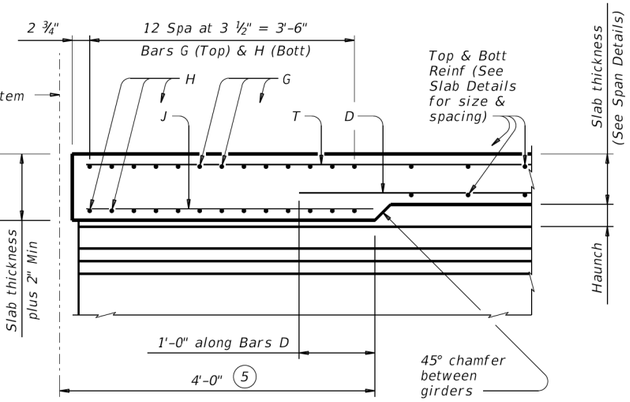
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



2" AND MORE OF HAUNCH — LESS THAN 2" OF HAUNCH

TYPICAL TRANSVERSE SECTION

(Showing Prestressed Conc I-Girders at ℄ Brg)



SECTION A-A

(Showing with 2" and more of haunch)

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

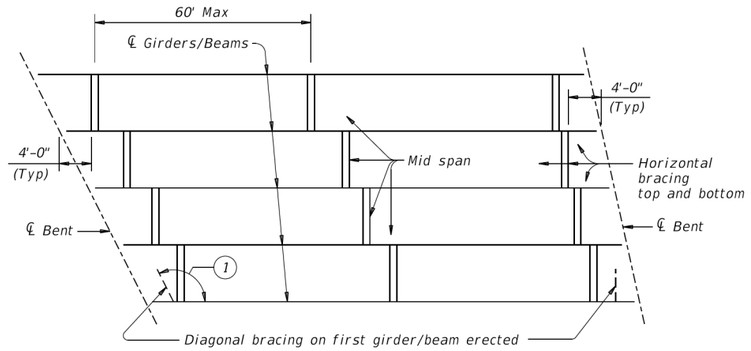
THICKENED SLAB END DETAILS

PRESTRESSED CONCRETE I-GIRDER SPANS

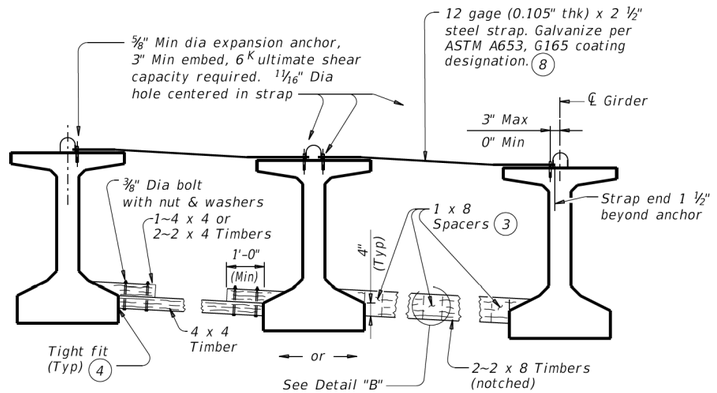
IGTS

FILE: igtssts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
	DIST	COUNTY		SHEET NO.
	CRP	BEE		69

DATE:
FILE:

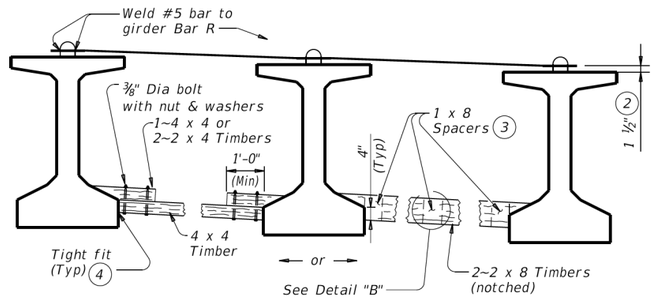


ERECTION BRACING



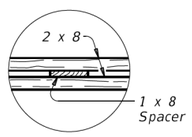
FOR ERECTION BRACING, OPTION 1

(This option is not allowed when slab is formed with PMDF or plywood.)



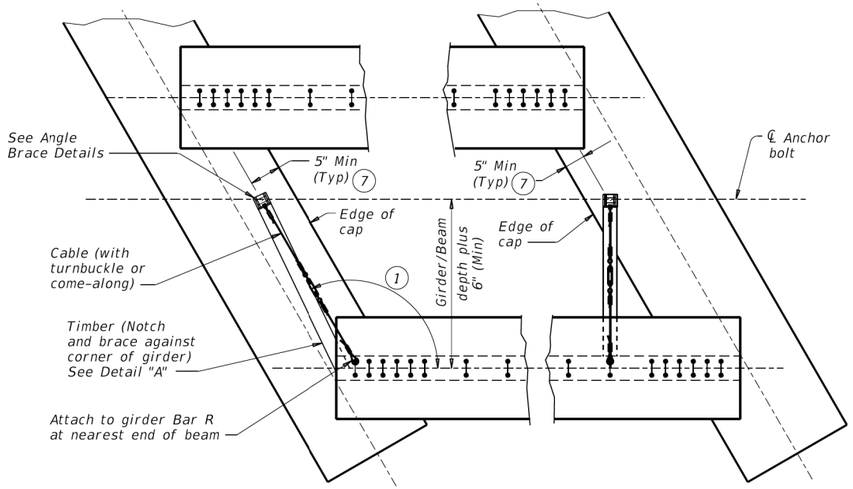
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS 5

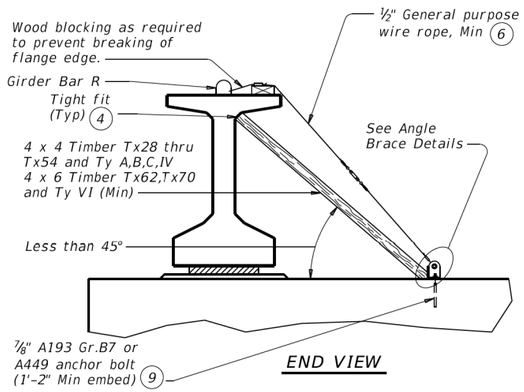


PLAN

DETAIL "B"



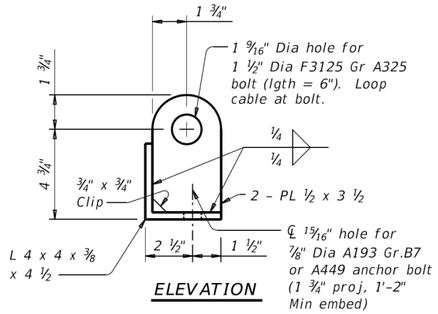
PLAN



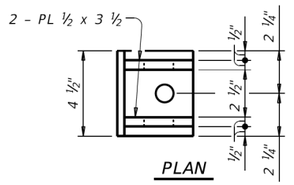
END VIEW

DIAGONAL BRACING DETAILS 5

(To be used on both ends of the first girder/beam erected in the span in each phase.)



ELEVATION



PLAN

ANGLE BRACE DETAILS

HAULING & ERECTION:

The Contractor's attention is directed to the possible lateral instability of prestressed concrete girders and beams over 130' long, especially during hauling and erection. The use of the following methods to improve stability is encouraged: Locate lifting devices at the maximum practical distance from girder ends; use external lateral stiffening devices during hauling and erection; lift with vertical lines using two machines; and take care in handling to minimize inertial and impact forces.

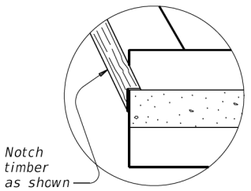
ERECTION BRACING:

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425.

Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

PHASED CONSTRUCTION:

Place erection and slab placement bracing for all girders in a phase as shown in these details. For phases after first, also place erection and slab placement bracing between outer girder of completed phase and adjacent girder of current phase. When the phase construction joint is between girders, top bracing can be omitted.



DETAIL "A"

(1) If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R (See Sheet 2 of 2).

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(6) All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing aginst the dead end.

(7) It is acceptable to tie anchor bolts to cap reinforcement.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(9) Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS
PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2017 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	CRP	BEE		70

DATE:
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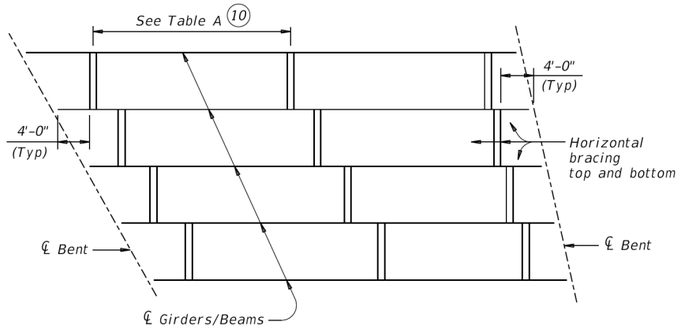


SLAB PLACEMENT BRACING

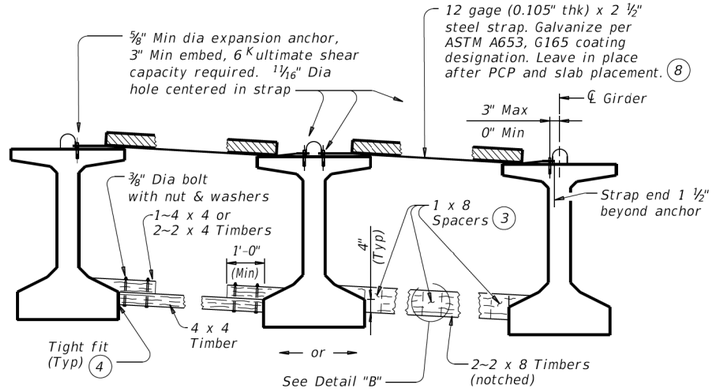
TABLE A

OPTION 1-RIGID BRACING (STEEL STRAP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	¼ points
Tx34	¼ points	¼ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	⅛ points	⅛ points
B	⅛ points	⅛ points
C	⅛ points	⅛ points
IV	¼ points	⅛ points
VI	¼ points	⅛ points

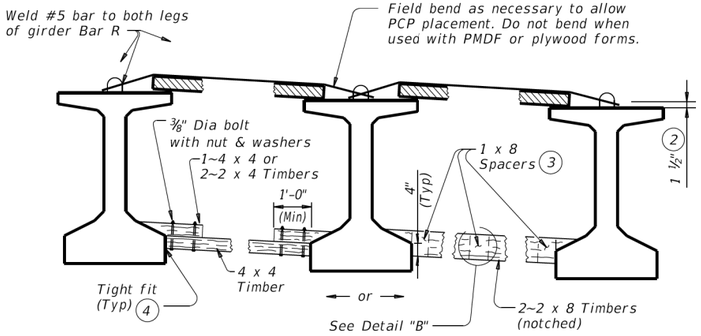
OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	⅛ points
Tx34	¼ points	⅛ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	2.0 ft	1.5 ft
B	3.0 ft	2.0 ft
C	4.5 ft	2.0 ft
IV	¼ points	4.0 ft
VI	¼ points	4.0 ft



FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID

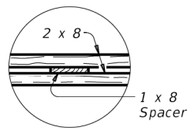
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE

(Showing slab formed with PCP.)

HORIZONTAL BRACING DETAILS (5)



PLAN

DETAIL "B"

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(10) Bracing spacing (¼ and ⅛ points) measured between first and last typical brace location.

(11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

SLAB PLACEMENT BRACING:

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425.

Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

GENERAL NOTES:

Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection.

Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection.

Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

Removal of bracing for short periods of time to align girders and beams is permissible.

All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown.

Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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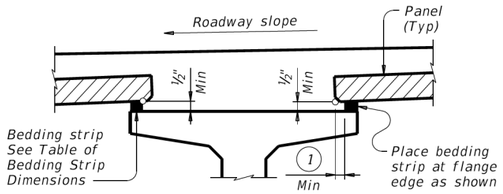
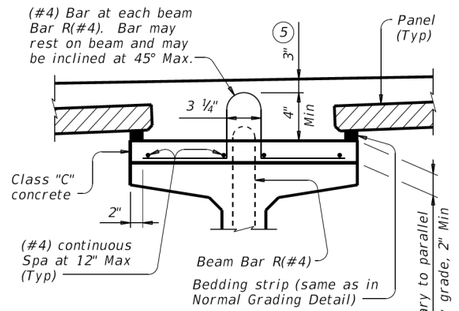


NORMAL GRADING DETAIL (3)

Showing prestressed concrete I-girders.
(Other beam types similar)



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

Showing prestressed concrete I-girders.
(Other beam types similar)

TABLE OF BEDDING STRIP DIMENSIONS		
WIDTH	HEIGHT (4)	
	Min	Max
1" (Min)	½"	2"
1 ¼"	½"	2 ½"
1 ½"	½"	3"
1 ¾"	½"	3 ½"
2"	½"	4"
2 ¼"	½"	4 ½" (2)
2 ½"	½"	5" (2)
2 ¾"	½"	5 ½" (2)
3" (Max)	½"	6" (2)

(1) 2" Min for I-giders, 1 ½" Min for all other beam types.

(2) Allowed for I-girders, not allowed on other beam types.

(3) To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in ¼" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is ¼". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.

(4) Height must not exceed twice the width.

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(7) Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 ½" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.

(8) Do not locate construction joints on top of a panel.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

CONSTRUCTION NOTES:

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges.

Placing panels to minimize joint openings is recommended.

If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction.

Bars U, shown on PCP-FAB, may be bent over or cut off if necessary.

Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 ½" under the panels as the slab concrete is placed.

To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least ½". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required.

For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated.

Provide bar Laps, where required, as follows:

Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees.

Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use.

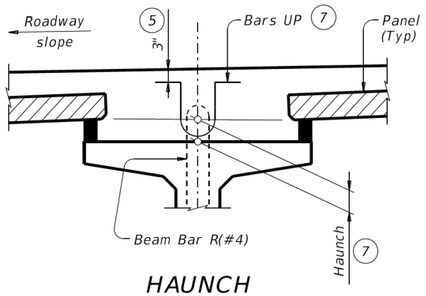
These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.

When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer.

Any additional reinforcement or concrete required on this standard is considered subsidiary to the bid Item "Reinforced Concrete Slab".

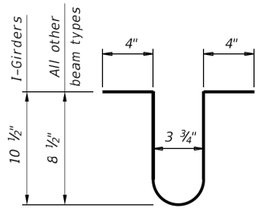
Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

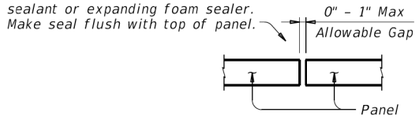


HAUNCH REINFORCING DETAIL

Showing prestressed concrete I-girders.
(Other beam types similar)

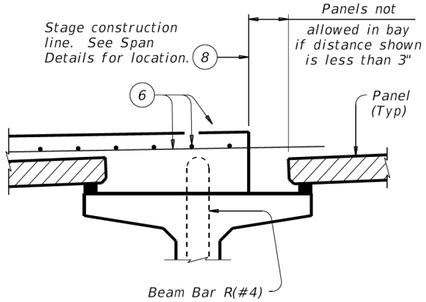


BARS UP (#4) (7)

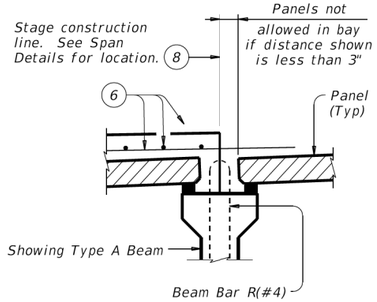


PANEL JOINTS

(Panel reinforcing not shown for clarity.
The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



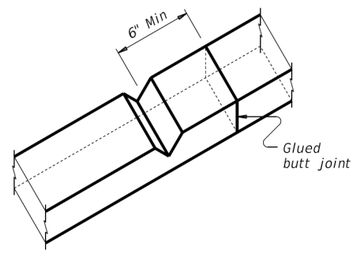
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)



BEDDING STRIP DETAIL (9)

HL93 LOADING SHEET 1 OF 4

Texas Department of Transportation | Bridge Division Standard

PRESTRESSED CONCRETE PANELS DECK DETAILS

PCP

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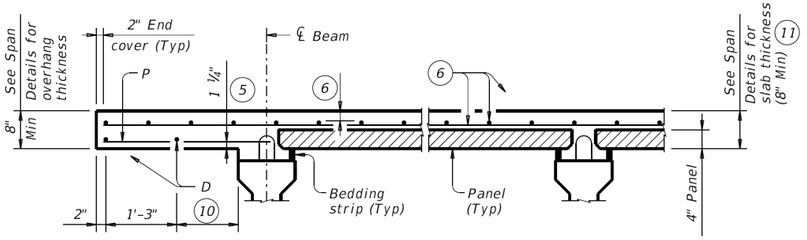
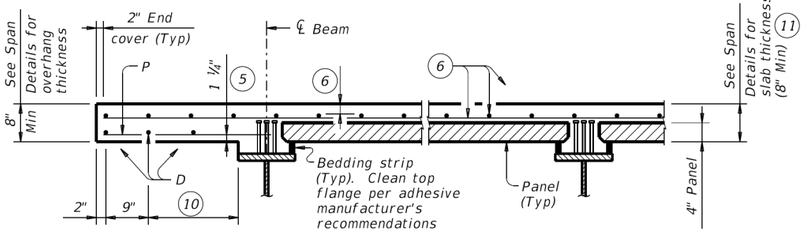
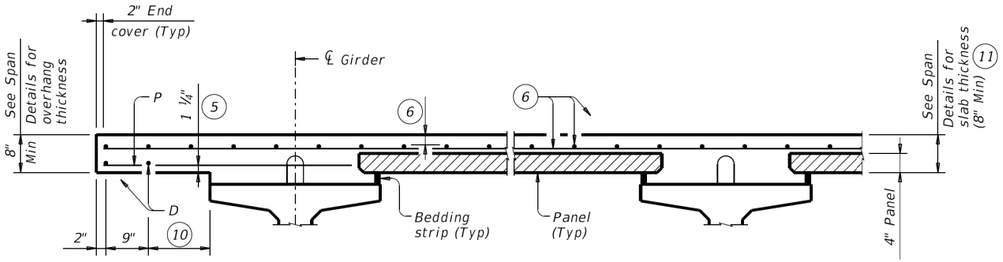


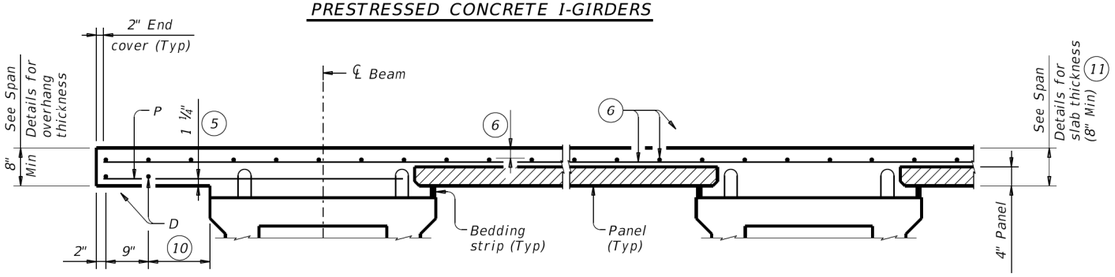
PRESTRESSED CONCRETE I-BEAMS



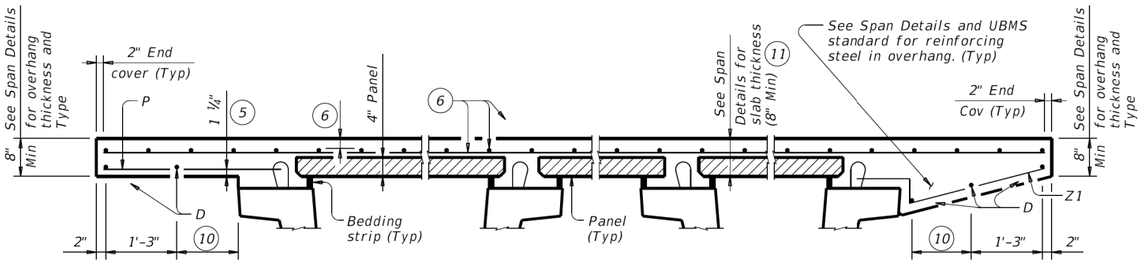
STEEL BEAMS



PRESTRESSED CONCRETE I-GIRDERS



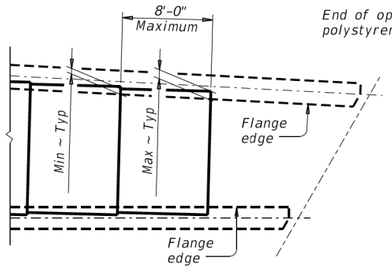
PRESTRESSED CONCRETE X-BEAMS



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

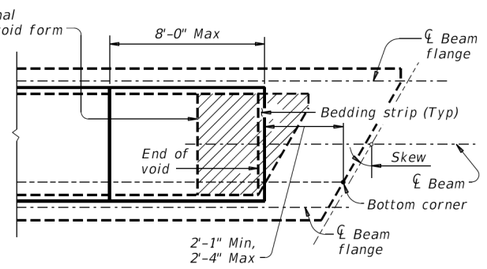
SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

TYPICAL PART TRANSVERSE SECTIONS

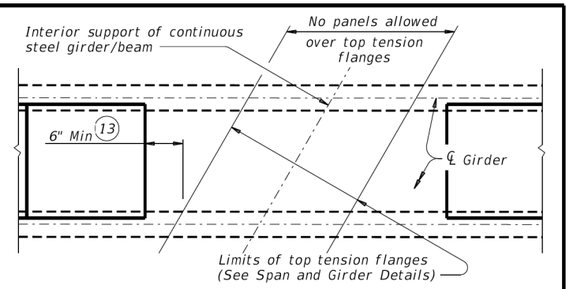


AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on beam/girder type.



OVER CONC U-BEAMS



AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS

PART PLANS OF PANEL PLACEMENT

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

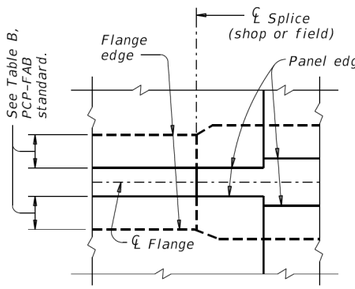
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(10) Equally space additional bar if more than 1'-3" Max.

(11) The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.

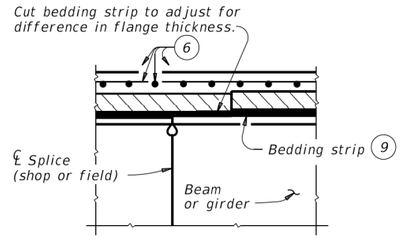
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



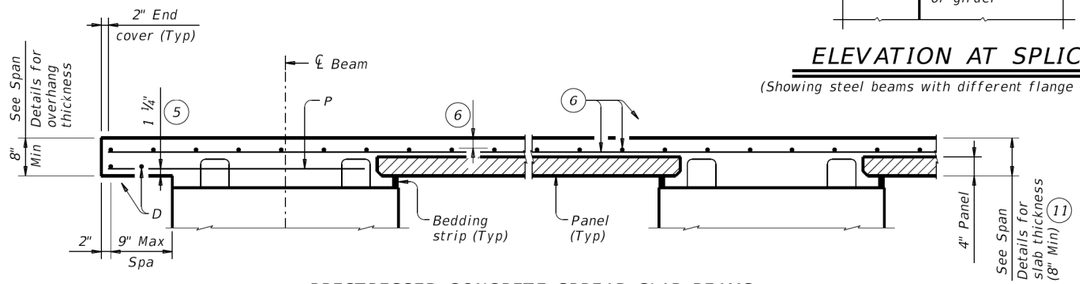
PLAN AT SPLICE

(Showing steel beams with flange width transition)



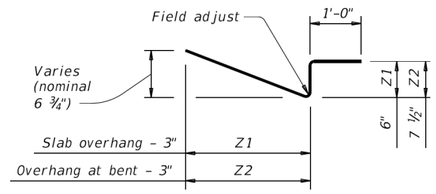
ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



PRESTRESSED CONCRETE SPREAD SLAB BEAMS

Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



BARS Z (#4) (12)

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Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

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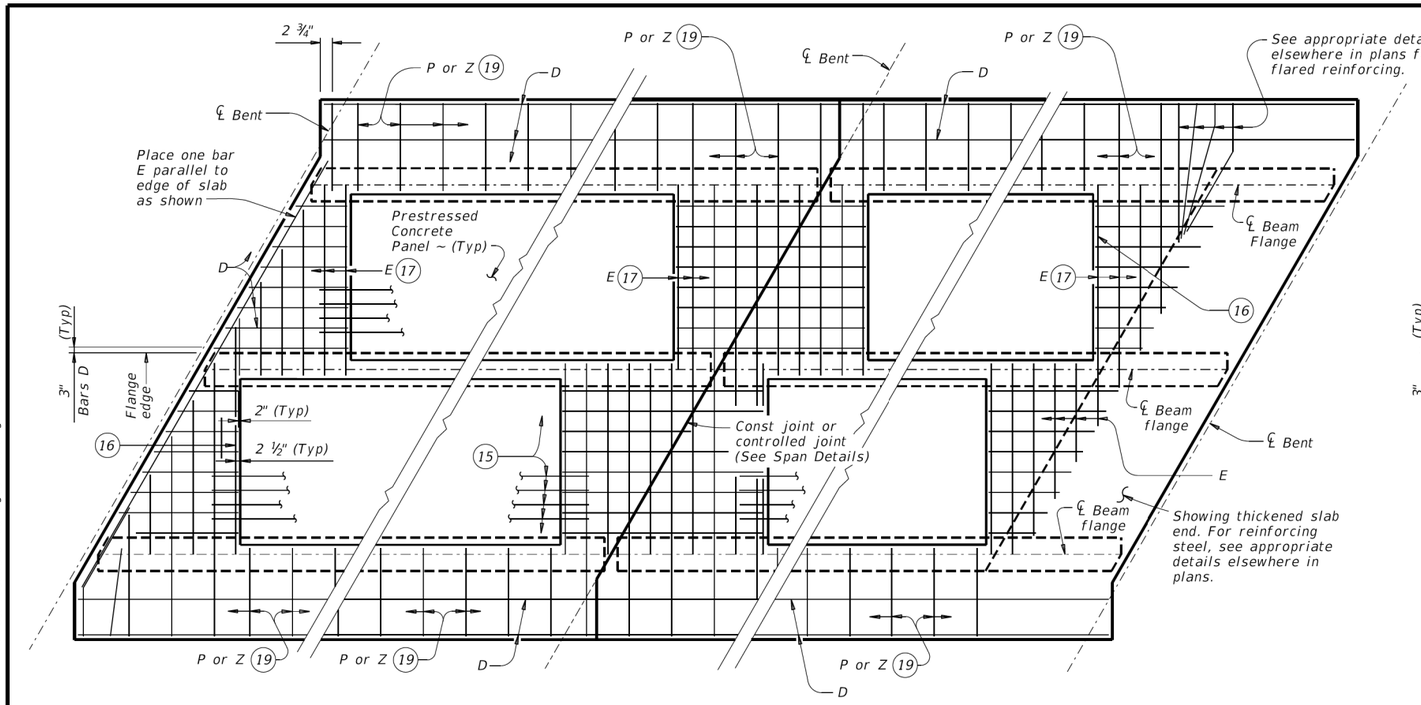
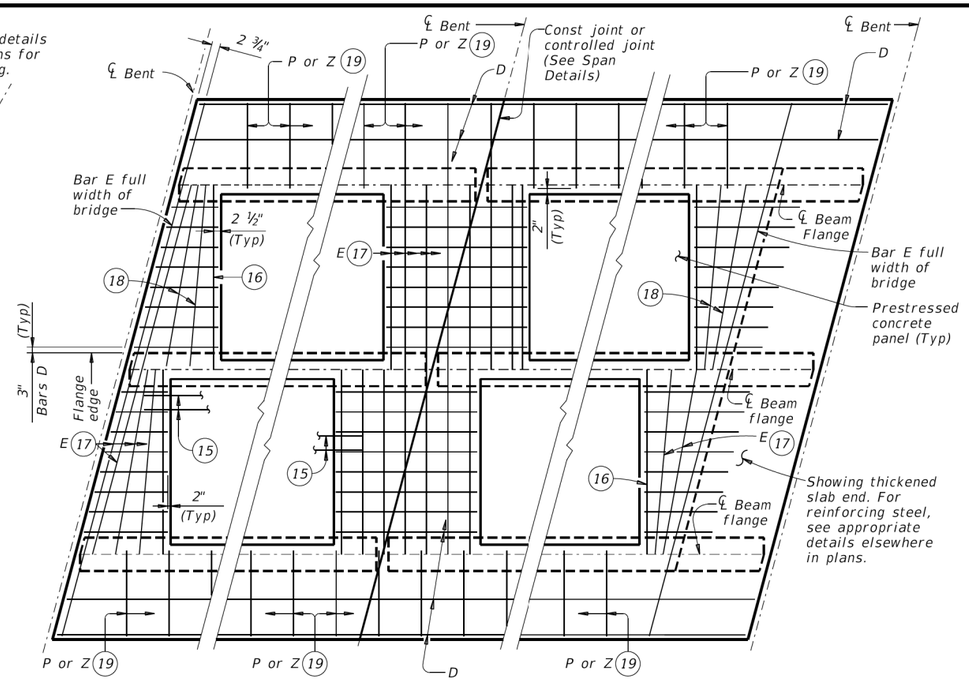


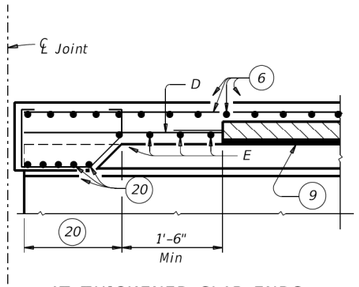
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

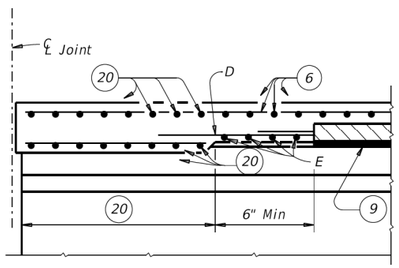


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

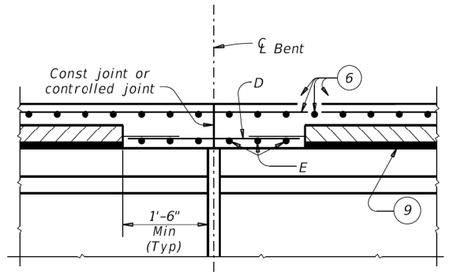
OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



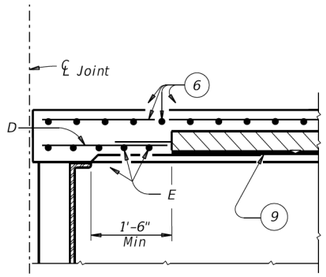
AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS



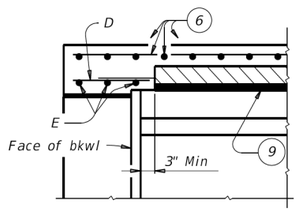
AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS



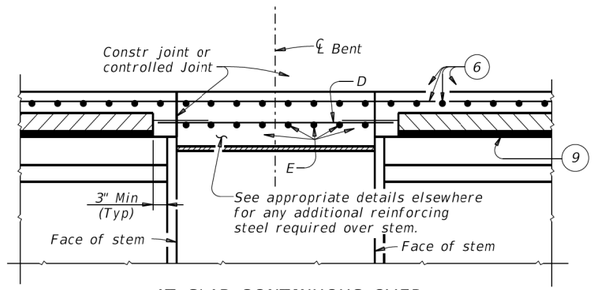
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS



AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS



AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

OPTION 1 ~ ELEVATIONS AT BEAM ENDS

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c.

(14) Max Spacing as listed unless otherwise shown.

(15) At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.

(16) Maintain one Bar E(#4) parallel to panel ends (Typ).

(17) Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.

(18) Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.

(19) Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.

(20) See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

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PRESTRESSED CONCRETE PANELS DECK DETAILS

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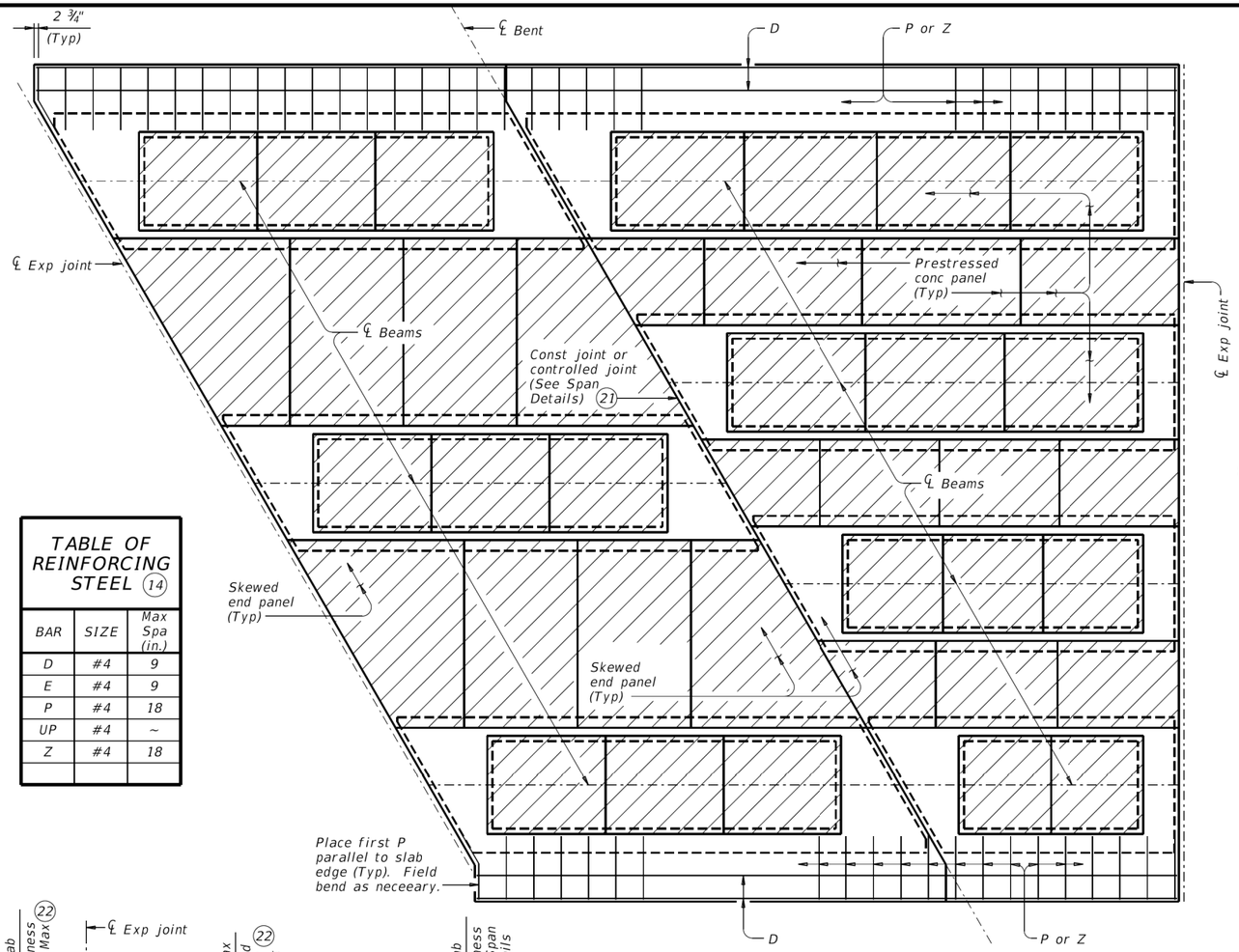
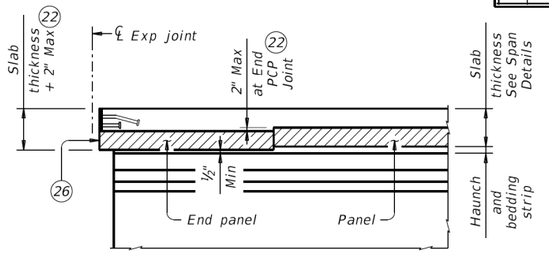


TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

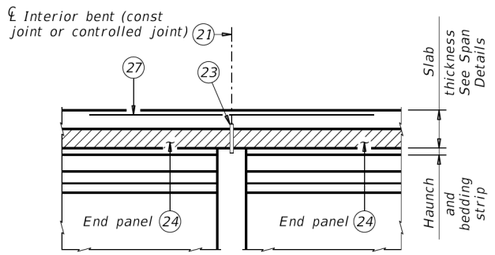
OPTION 2 ~ PLAN OF SLAB

(Showing U-Beams; other beams similar)



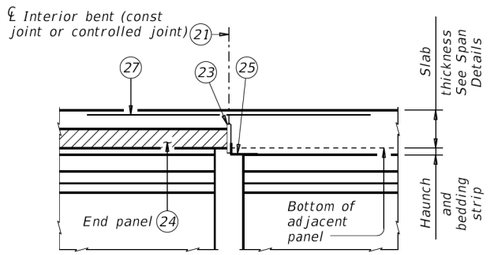
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-B, SEJ-M, SEJ-S(0), AJ, and Type A expansion joints only.



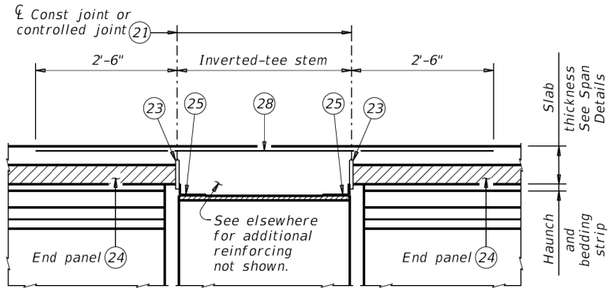
CONVENTIONAL INTERIOR BENT

Panel against panel between beams/girders.



CONVENTIONAL INTERIOR BENT

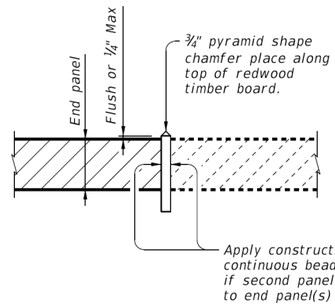
Panel against beam/girder end in adacent span.



INVERTED-T BENT

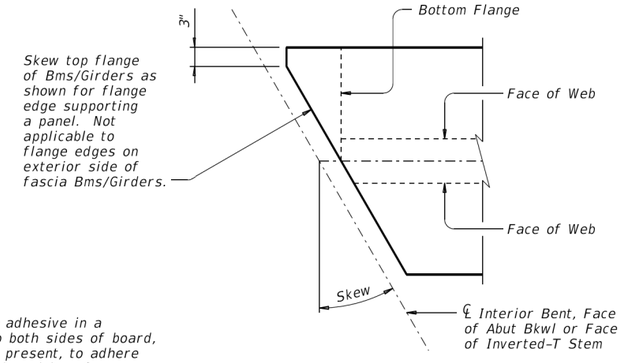
Panels against inverted-tee stem

OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)



ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)

See "Option 2 ~ Elevation At Beam Ends".



OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°

Showing I-Bm/I-Girder, U-Bms and Steel Bms similar.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(14) Max Spacing as listed unless otherwise shown.

(21) 1 ½" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

(22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than ½" thick.

(23) ¾" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within ¼" Max above panel. Place ¾" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within ¼" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.

(24) Place panel within ½" of ¾" thick board.

(25) Permanent galvanized steel sheet form. Removable formwork is acceptable.

(26) Place end panel within ½" of expansion joint opening. End panel cannot encroach on required expansion joint opening.

(27) Place additional (#4) bar 5'-0" in length between every slab bars T. Center (#4) bar on Joint.

(28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.

SPECIAL OPTION 2 CONSTRUCTION NOTES:

When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 ½".

Do not extend the longitudinal panel reinforcement into the cast-in-place slab.

Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.

Bending of anchor studs of expansion joints shown on standards AJ, SEJ-B, SEJ-M, and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and 0A from standard IGTS in the slab.

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PRESTRESSED CONCRETE PANELS
DECK DETAILS

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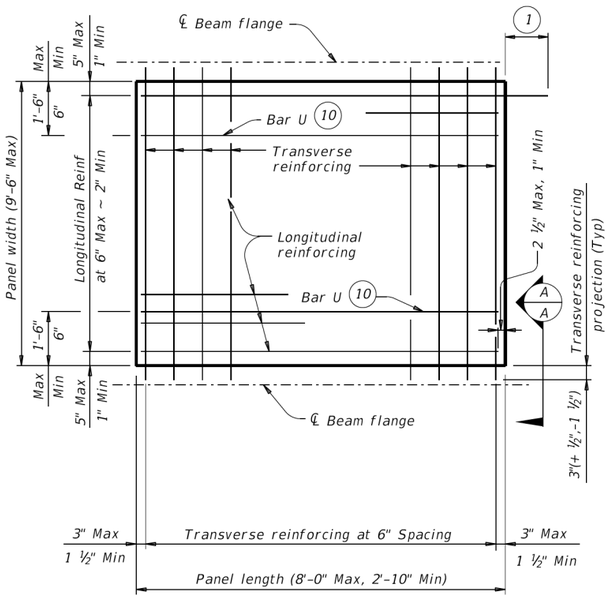
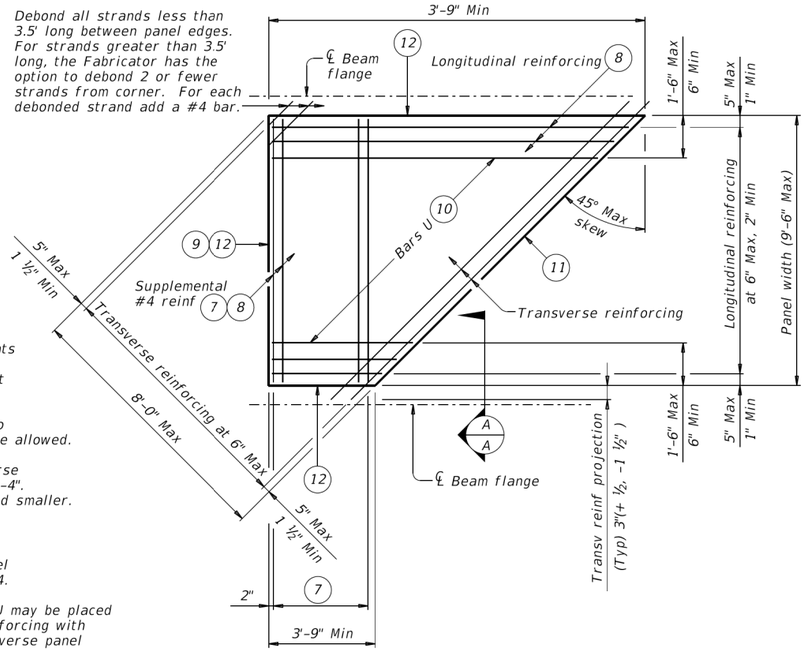


TYPICAL NON-SKEWED PANEL PLAN



TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

1. At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2",-0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
2. Four loops required per panel.
3. Four loops required per panel. ⅜" or ½" strands may be used.
4. Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
5. See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
6. One Splice allowed per panel. No more than two sheets of WWR are allowed.
7. Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
8. End Cover 2 ½" Max, 1" Min.
9. Recess strands on indicated panel edge in accordance with Item 424.
10. At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
11. Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
12. Timber form work permissible this edge.

Debond all strands less than 3.5' long between panel edges. For strands greater than 3.5' long, the Fabricator has the option to debond 2 or fewer strands from corner. For each debonded strand add a #4 bar.

TABLE A (4) (5)

Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3	4 ½
IV	6	4	7 ½
VI	6 ½	4 ½"	8 ½
U40 – 54	5 ½	5 ½	7
Tx28-70	6	5	7 ½
XB20 – 40	4	3	4 ½
XSB12 – 15	4	3	4 ½

TABLE B (4) (5)

Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 ¾	2 ½	2 ¾
Over 12" to 15"	3 ¼	3	3 ¼
Over 15" to 18"	4	3	4 ¾
Over 18"	5	3 ½	6 ¼

GENERAL NOTES:

Provide Class H concrete for panels. Release strength f'ci=3,500 psi. Minimum 28 day strength f'c=5,000 psi.

Provide ¾" chamfer along bottom edge of panel on beam side.

Do not use epoxy-coated reinforcing steel bar or strand in panels.

Remove laitance from top panel surface.

Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:

For panel widths over 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.

For panel widths over 3'-6" up to and including 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.

For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).

Place transverse panel reinforcement at panel centroid and space at 6" Max.

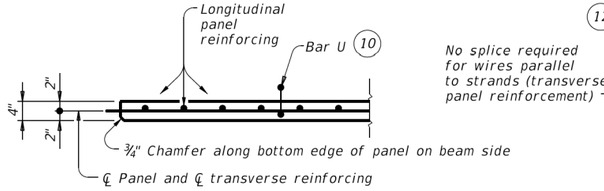
LONGITUDINAL PANEL REINFORCEMENT:

Any of the following options may be used for longitudinal panel reinforcement:

1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
2. ⅜" Dia prestressing strands at 4 ½" Max Spacing (unstressed). No splices allowed.
3. ½" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.

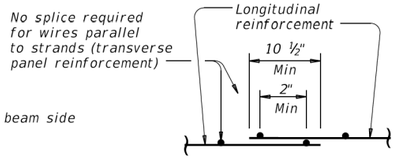
No combination of longitudinal reinforcement options in a panel is allowed.

Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.

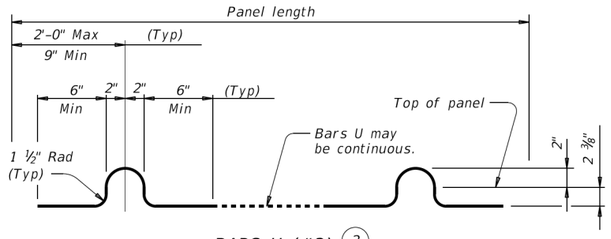


SECTION A-A

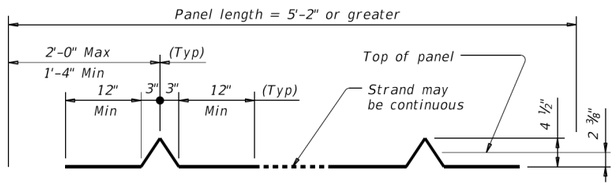
(Not showing supplemental #4 bars for skewed end panels.)



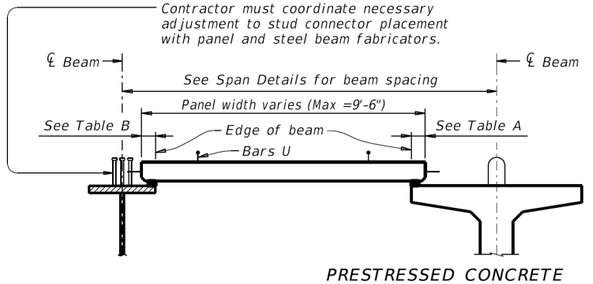
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)



BARS U (#3) (2)



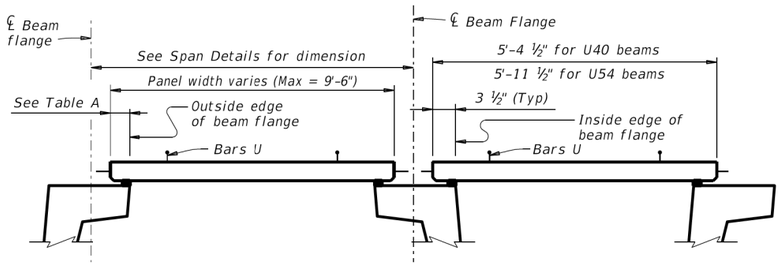
OPTIONAL STRAND FOR BARS U (3)



STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

Typ unless noted otherwise



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANEL FABRICATION DETAILS

PCP-FAB

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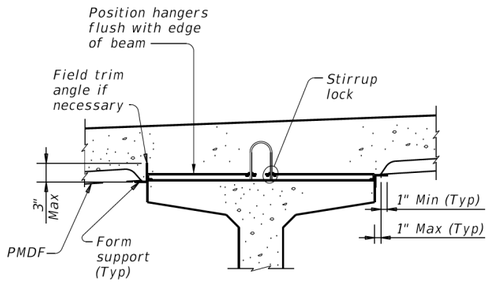
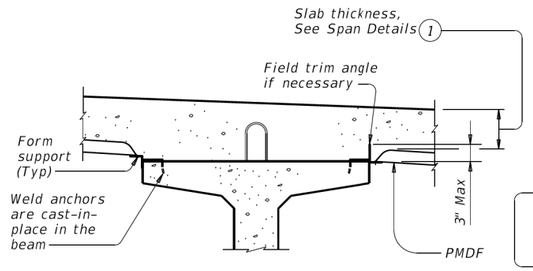
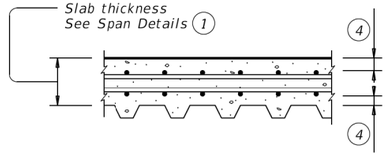


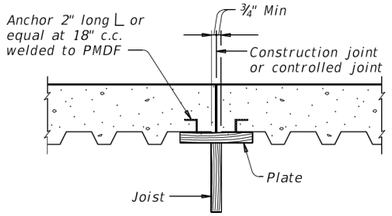
PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS



PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS

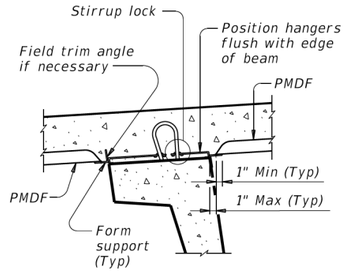


TYP LONGITUDINAL SLAB SECTION

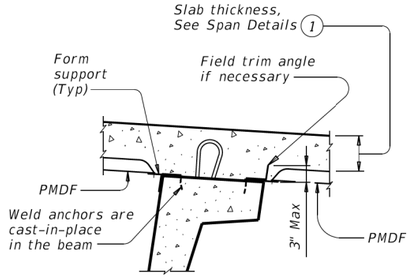


Note: In spans where PMD forms are used, timber forms must be used at construction joints. Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

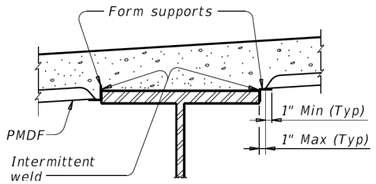
SECTION THRU CONSTRUCTION JOINT



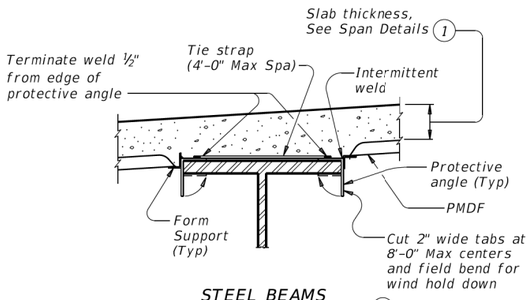
U-BEAMS WITH STIRRUP LOCKS



U-BEAMS WITH WELD ANCHORS

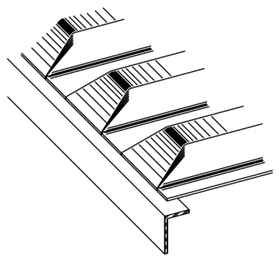


STEEL BEAMS AT COMPRESSION FLANGES

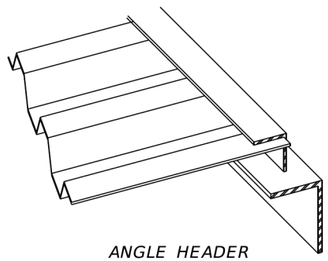


STEEL BEAMS AT TENSION FLANGES (2)

TYPICAL TRANSVERSE SECTIONS



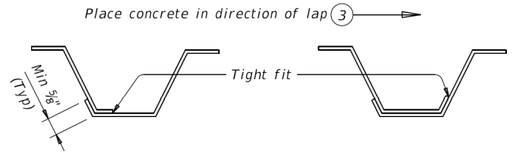
PRECLOSED



ANGLE HEADER

NOTE: This type is to be used for skewed ends only.

TYPES OF END CLOSURES



SIDE LAP DETAILS

(1) Slab thickness minus 5/8" if corrugations match reinforcing bars.

(2) Welding of form supports to tension flanges will not be permitted. Other methods of providing wind hold down resistance for PMDF in tension flange zones will be considered. At least one layer of sheet metal must be provided between the flange and the weld joint.

(3) The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.

(4) See Span details for cover requirements.

FOR PRESTR CONC U-BEAM AND STEEL GIRDER BRIDGES:
Unless shown elsewhere in the plans, size, spacing, and orientation of bottom mat of slab reinforcement must match the top mat of reinforcing shown on the span details except all bottom mat bars are to be #5. Bottom mat reinforcement and additional concrete is subsidiary to Item 422 "Concrete Superstructures."

FOR PRESTR CONC TX-GIRDER BRIDGES:
See Miscellaneous Slab Details, Prestr Concrete I-Girders (IGMS) standard sheet for bottom mat reinforcing.

GENERAL NOTES:

Steel for Permanent Metal Deck Forms (PMDF) and support angles shall conform to ASTM A653, structural steel (SS), with coating designation G165. Steel must have a minimum yield strength of 33 ksi. Minimum thickness of PMDF is 20 gage and that of support angles and protective angles is 12 gage.

Submit two copies of forming plans for PMDF to the Engineer. These plans must show all essential details of proposed form sheets, closures, fasteners, supports, connectors, special conditions and size and location of welds. These plans must clearly show areas of tension flanges for steel beams and provisions for protecting the tension flanges from welding notch effects by inclusion of separating sheet metal or other positive method. These plans must be designed, signed, and sealed by a licensed professional engineer. Department approval of these plans is not required, but the Department reserves the right to require modifications to the plans. The Contractor is responsible for the adequacy of these plans.

The details and notes shown on this standard are to be used as a guide in preparation of the forming plans.

All material, labor, tools and incidentals necessary to form a bridge deck with Permanent Metal Deck Forms is considered subsidiary to Item 422, "Concrete Superstructures".

DESIGN NOTES:

As a minimum, PMDF and support angles must be designed for the dead load of the form, reinforcement and concrete plus 50 psf for construction loads. Flexural stresses due to these design loads must not exceed 75 percent of the yield strength of the steel. Allowable stress for weld metal must be 12,400 psi.

Maximum deflection under the weight of forms, reinforcement and concrete or 120 psf, whichever is greater, shall not exceed the following:

1/180 of the form design span, but not more than 0.50", for design spans of 10' or less.

1/240 of the form design span, but not more than 0.75", for design spans greater than 10'.

1/240 of the form design span, but not more than 0.75", for all design spans of railroad overpass bridge spans fully or partially over railroad right-of-way, and for all bridge spans of railroad underpass structures.

The form design span must not be less than the clear distance between beam flanges, measured parallel to the form flutes, minus 2".

CONSTRUCTION NOTES:

Form sheets must not be permitted to rest directly on the top of beam flanges. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam flanges.

All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads.

Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.

All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up.

Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.

Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab.

A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.

Texas Department of Transportation

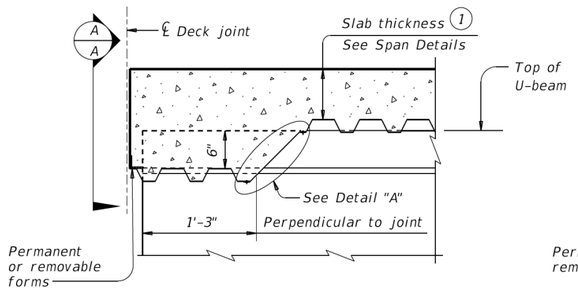
Bridge Division Standard

PERMANENT METAL DECK FORMS

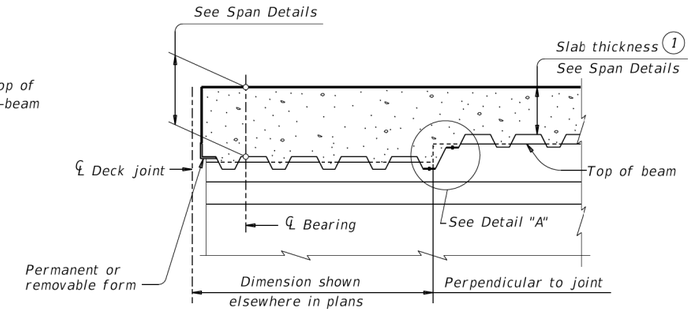
PMDF

FILE: pmdfste1-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
12-21: Updated max deflection for RR.	CRP	BEE		77

DATE:
FILE:

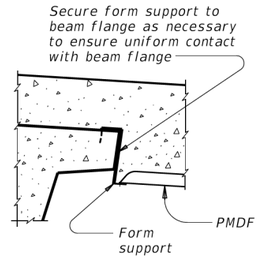


AT THICKENED SLAB END FOR U-BEAMS

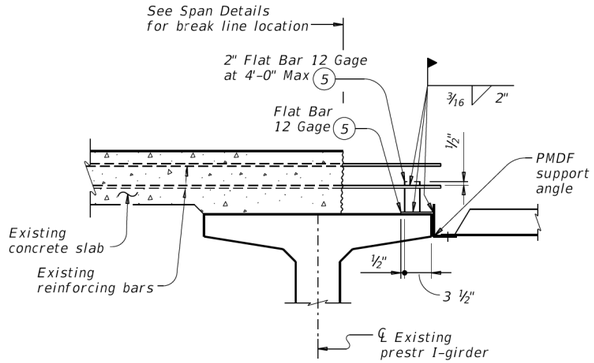


AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS

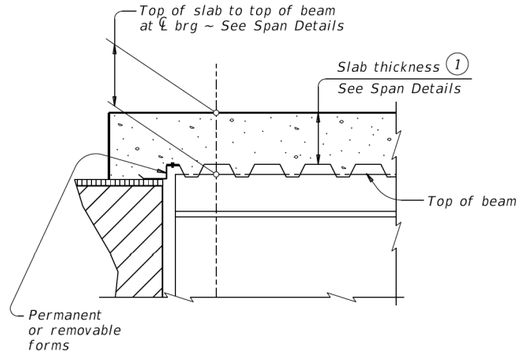
Showing 1-beam block-out. No block-out for I-girders or steel beams.



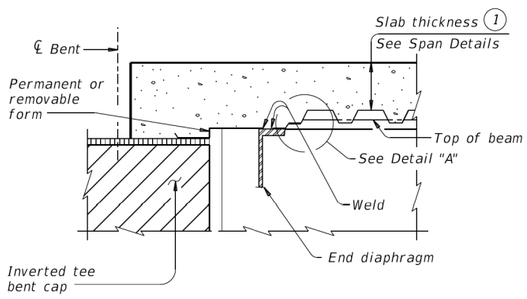
SECTION A-A



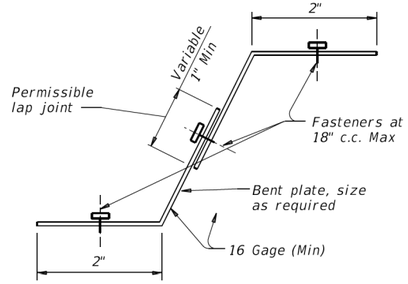
SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS



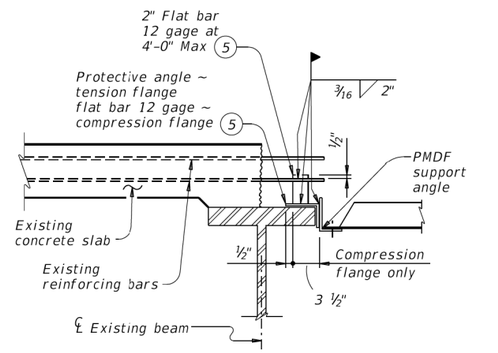
AT SLAB OVER ABUT BKWL OR INV TEE STEM FOR CONC BEAMS WITHOUT THICKENED SLAB END



AT SLAB OVER INV TEE STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END

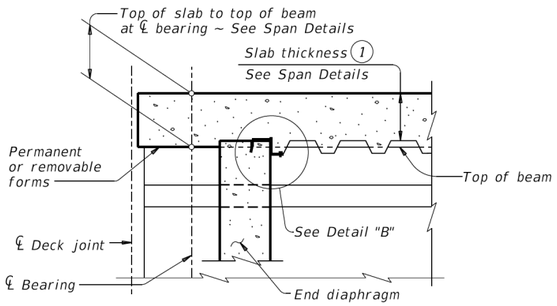


DETAIL "A"

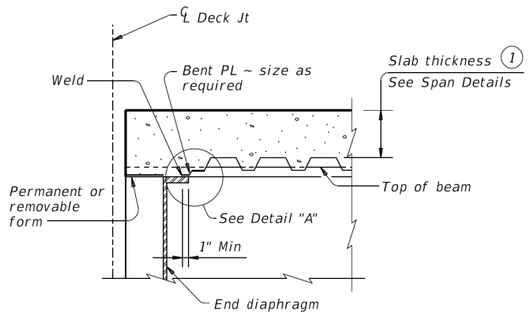


SHOWING STEEL BEAMS

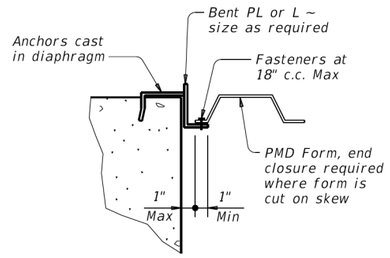
WIDENING DETAILS



AT CONC END DIAPHRAGM FOR PRESTRESSED I-BEAMS AND STEEL BEAMS



AT END DIAPHRAGM FOR STEEL BEAMS WITHOUT THICKENED SLAB END



DETAIL "B"

(1) Slab thickness minus 5/8" if corrugations match reinforcing bars

(5) Minimum yield stress of 12 gage bars shall be 40 ksi

DETAILS AT ENDS OF BEAMS

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
12-21: Updated max deflection for RR.	CRP	BEE		78

DATE:
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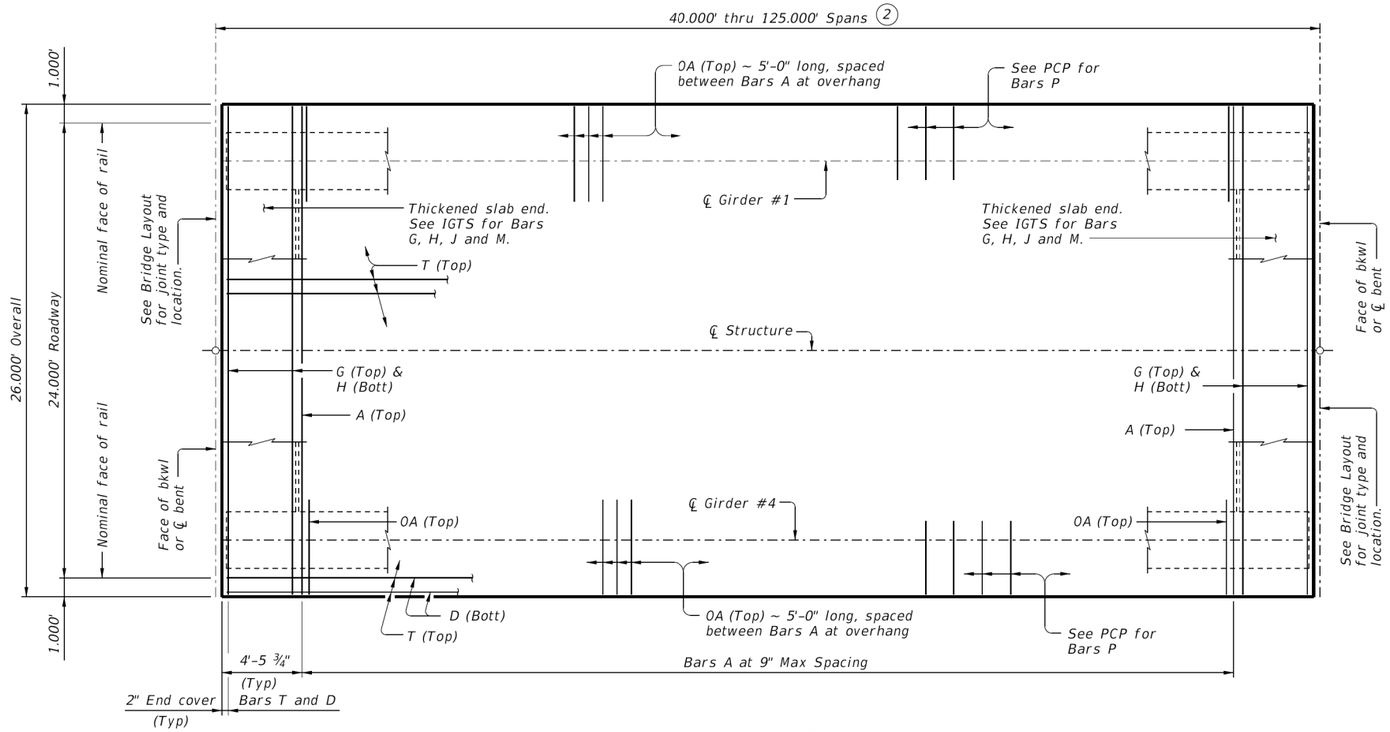


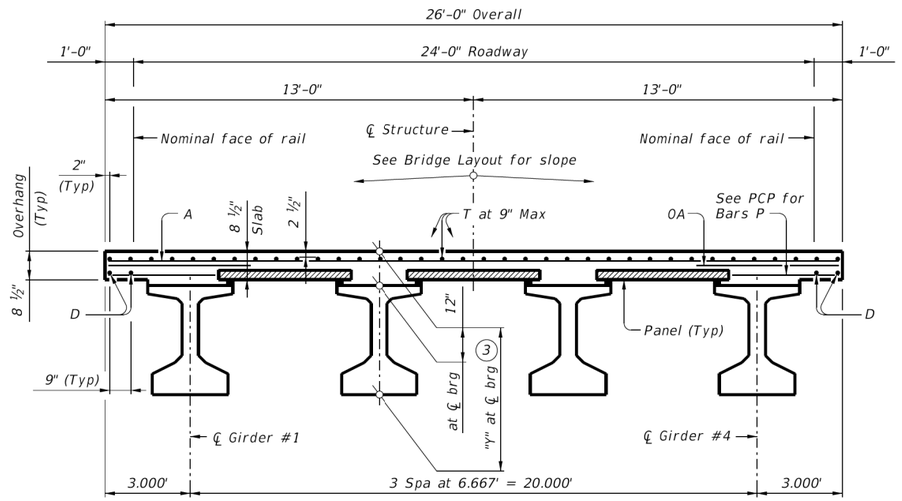
PLAN (1)

BAR TABLE	
BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
0A	#5
P	#4
T	#4

(1) If multi-span units (with slab continuous over interior bents) are indicated on the Bridge Layout, see standard IGCS for adjustment to slab reinforcement and quantities.

(2) Span lengths for Prestressed Concrete I-Girder type:
Type Tx28 for spans lengths 40.000' thru 75.000'.
Type Tx34 for spans lengths 40.000' thru 85.000'.
Type Tx40 for spans lengths 40.000' thru 100.000'.
Type Tx46 for spans lengths 40.000' thru 115.000'.
Type Tx54 for spans lengths 40.000' thru 125.000'.

(3) "Y" value shown is based on theoretical girder camber, dead load deflection from an 8 ½" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve.



TYPICAL TRANSVERSE SECTION

(Showing girder type Tx46)

TABLE OF SECTION DEPTHS	
GIRDER TYPE	"Y" AT ℄ BRG (3)
	Ft/In
Tx28	3'-4"
Tx34	3'-10"
Tx40	4'-4"
Tx46	4'-10"
Tx54	5'-6"

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54)

24' ROADWAY

SIG-24

FILE: IG-SIG2400-23.dgn	DN: JMH	CK: NRN	DW: JTR	CK: TAR
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REVISIONS	0916	25	019	CR 1187
10-19: Increased "X" and "Y" Values. 01-23: Removed PCP(0) reference.	DIST	COUNTY		SHEET NO.
	CRP	BEE		79

DATE:
FILE:

TABLE OF DEAD LOAD DEFLECTIONS

TYPE Tx28 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.007	0.010
45	0.012	0.017
50	0.019	0.027
55	0.028	0.040
60	0.041	0.057
65	0.056	0.079
70	0.077	0.108
75	0.102	0.143

TYPE Tx34 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.004	0.006
45	0.007	0.010
50	0.011	0.016
55	0.017	0.024
60	0.024	0.034
65	0.033	0.047
70	0.046	0.064
75	0.061	0.085
80	0.079	0.111
85	0.102	0.143

TYPE Tx40 GIRDERS

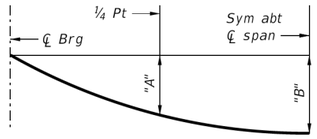
SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.003	0.004
45	0.005	0.007
50	0.007	0.010
55	0.011	0.016
60	0.016	0.022
65	0.022	0.031
70	0.030	0.042
75	0.040	0.056
80	0.052	0.073
85	0.066	0.093
90	0.084	0.118
95	0.105	0.147
100	0.130	0.182

TYPE Tx46 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.002	0.003
45	0.004	0.005
50	0.005	0.007
55	0.008	0.011
60	0.011	0.015
65	0.015	0.021
70	0.021	0.029
75	0.027	0.038
80	0.036	0.050
85	0.046	0.064
90	0.057	0.080
95	0.071	0.100
100	0.088	0.124
105	0.108	0.151
110	0.130	0.182
115	0.156	0.219

TYPE Tx54 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.001	0.002
45	0.002	0.003
50	0.004	0.005
55	0.005	0.007
60	0.007	0.010
65	0.010	0.014
70	0.014	0.019
75	0.018	0.025
80	0.024	0.033
85	0.030	0.042
90	0.038	0.053
95	0.047	0.066
100	0.058	0.082
105	0.071	0.100
110	0.086	0.121
115	0.103	0.144
120	0.123	0.172
125	0.145	0.203



DEAD LOAD DEFLECTION DIAGRAM

Calculated deflections shown are due to the concrete slab on interior girders only (Ec = 5000 ksi). Adjust values as required for exterior girders and if optional slab forming is used. These values may require field verification.

TABLE OF ESTIMATED QUANTITIES

SPAN LENGTH	REINF CONCRETE SLAB	Prestressed Concrete Girders			TOTAL REINF STEEL (5)
		ABUT TO INT BT (4)	INT BT TO INT BT (4)	ABUT TO ABUT (4)	
Ft	SF	LF	LF	LF	Lb
40	1,040	158.00	158.00	158.00	2,392
45	1,170	178.00	178.00	178.00	2,691
50	1,300	198.00	198.00	198.00	2,990
55	1,430	218.00	218.00	218.00	3,289
60	1,560	238.00	238.00	238.00	3,588
65	1,690	258.00	258.00	258.00	3,887
70	1,820	278.00	278.00	278.00	4,186
75	1,950	298.00	298.00	298.00	4,485
80	2,080	318.00	318.00	318.00	4,784
85	2,210	338.00	338.00	338.00	5,083
90	2,340	358.00	358.00	358.00	5,382
95	2,470	378.00	378.00	378.00	5,681
100	2,600	398.00	398.00	398.00	5,980
105	2,730	418.00	418.00	418.00	6,279
110	2,860	438.00	438.00	438.00	6,578
115	2,990	458.00	458.00	458.00	6,877
120	3,120	478.00	478.00	478.00	7,176
125	3,250	498.00	498.00	498.00	7,475

(4) Fabricator will adjust lengths for girder slopes as required.

(5) Reinforcing steel weight is calculated using an approximate factor of 2.3 lbs/SF.

MATERIAL NOTES:

Provide Class S concrete (f'c = 4,000 psi).
Provide Class S (HPC) concrete if shown elsewhere in the plans.
Provide Grade 60 reinforcing steel.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"
Deformed welded wire reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars A, D, 0A, P or T unless noted otherwise.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Multi-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet and the I-Girder Continuous Slab Detail (IGCS) standard.
See I-Girder Thickened Slab End Details (IGTS) standard for details and quantity adjustments.
See Prestressed Concrete Panels (PCP) standard and Prestressed Concrete Panel Fabrication Details (PCP-FAB) standard for panel details not shown.
See I-Girder Miscellaneous Slab Details (IGMS) standard for miscellaneous details.
See applicable rail details for rail anchorage in slab.
See Permanent Metal Deck Forms (PMDF) standard for details and quantity adjustments if this option is used.
This standard does not support the use of transition bents.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54)

24' ROADWAY

SIG-24

FILE: IG-SIG2400-23.dgn	DN: JMH	CK: NRN	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
10-19: Increased "X" and "Y" Values. 01-23: Removed PCP(O) reference.	DIST	COUNTY		SHEET NO.
	CRP	BEE		80

DATE:
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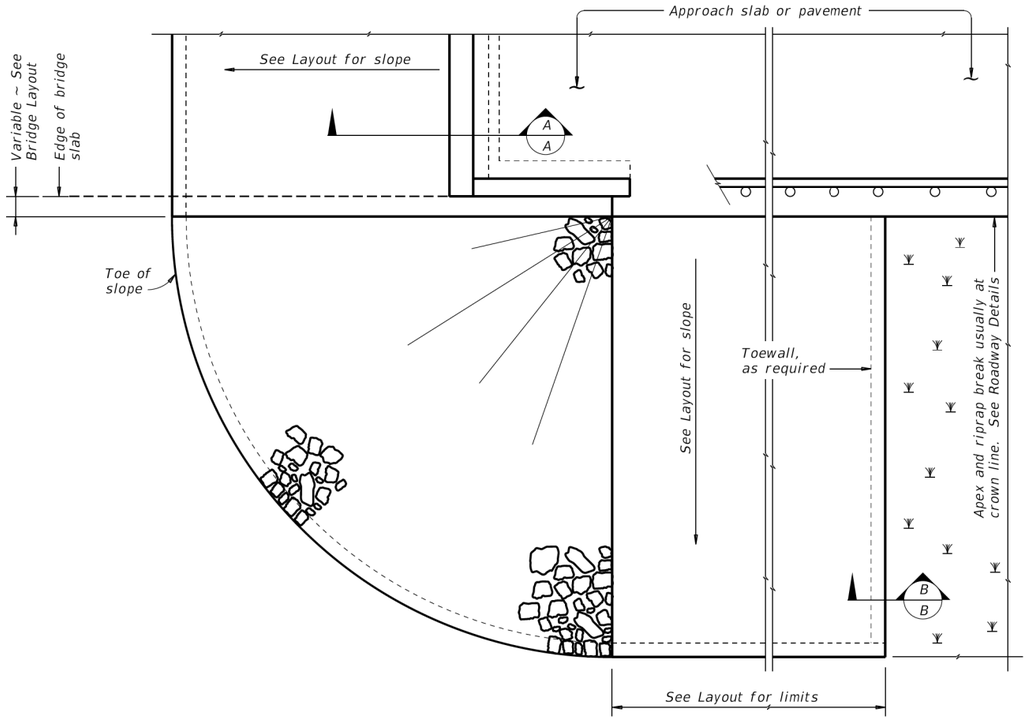
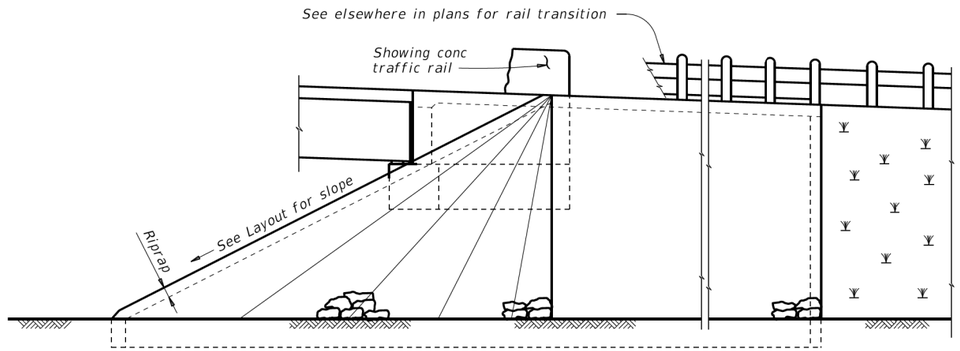
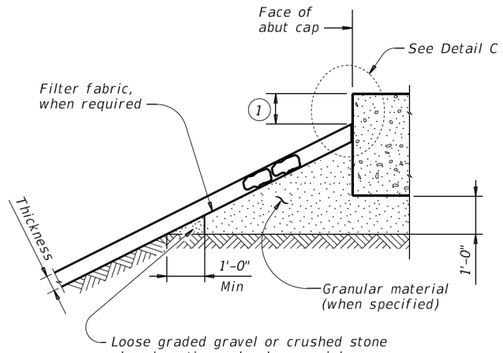


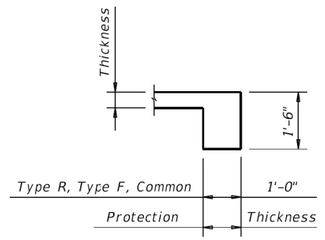
PLAN



ELEVATION

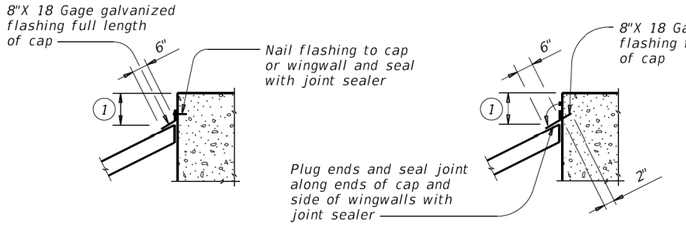


SECTION A-A AT CAP



SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A

CAP OPTION B

DETAIL C

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
See elsewhere in plans for locations and details of shoulder drains.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES		CK: JGD	DW: BWH		CK: AES	
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REVISIONS	0916	25	019		CR 1187		
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	CRP	BEE				81	

DATE:
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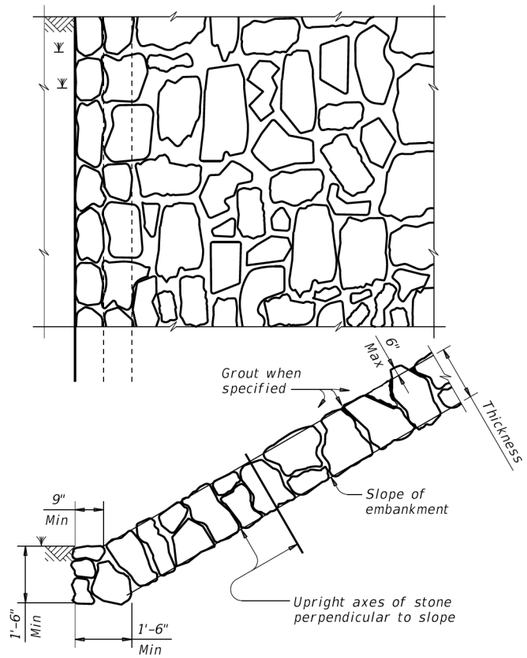


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

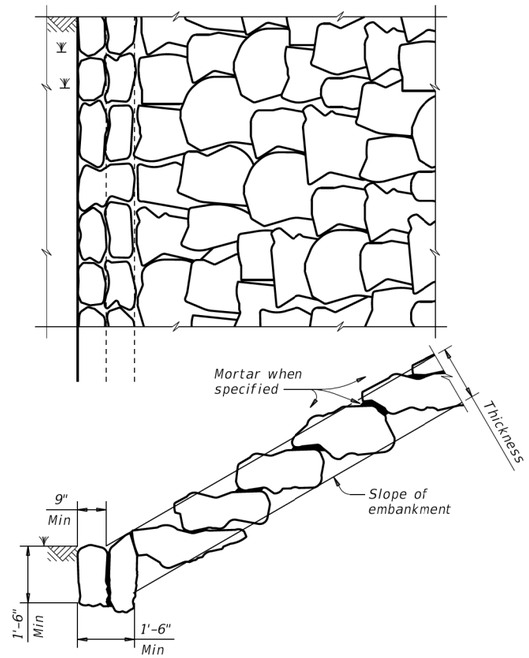


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

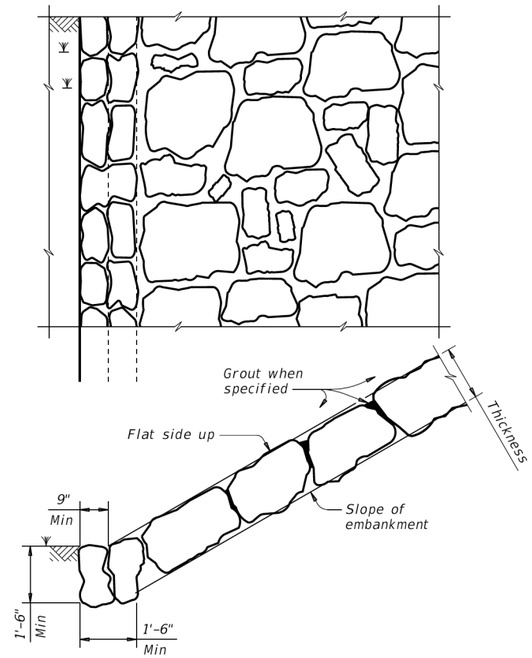


FIGURE 3 ~ TYPE F STONE RIPRAP

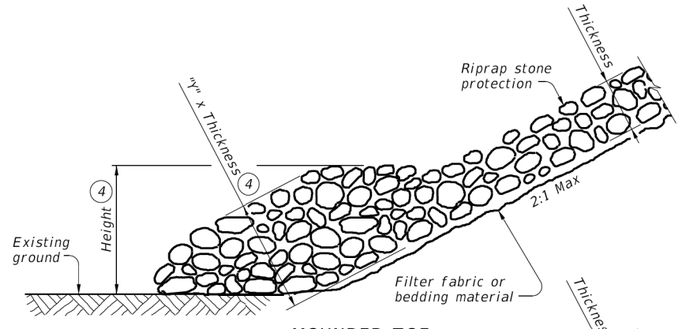
grouted

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

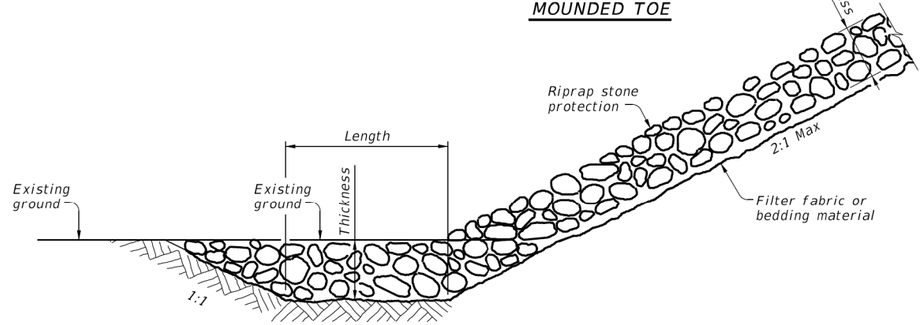
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(4) "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.

(5) List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)

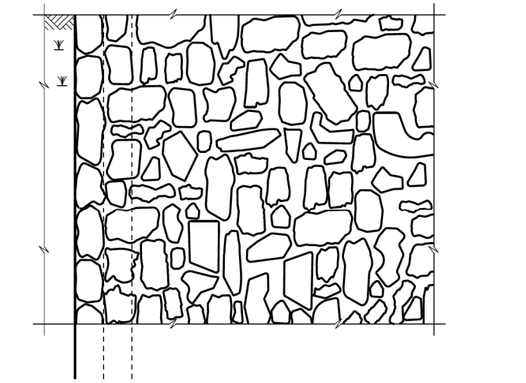


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

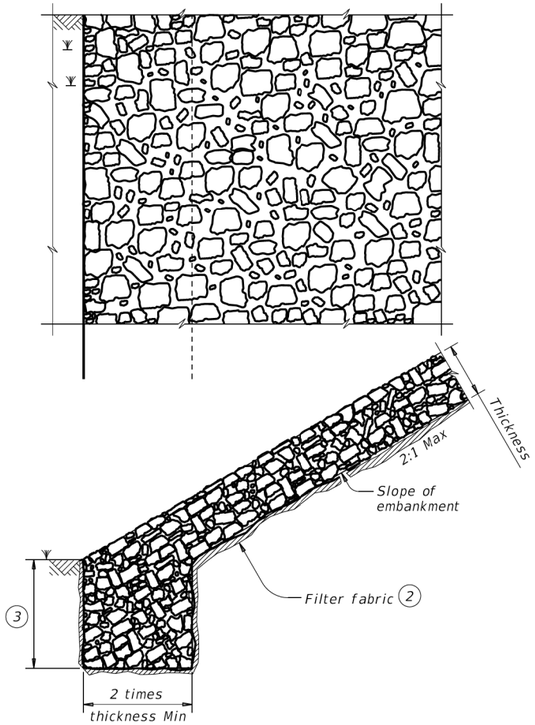


FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

SHEET 2 OF 2

Texas Department of Transportation

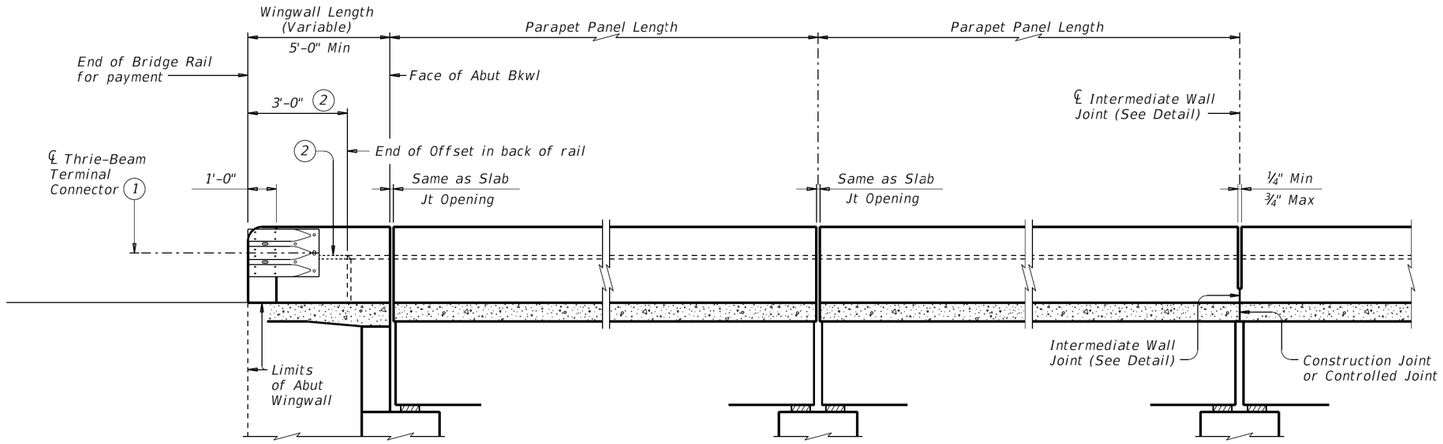
Bridge Division Standard

STONE RIPRAP

SRR

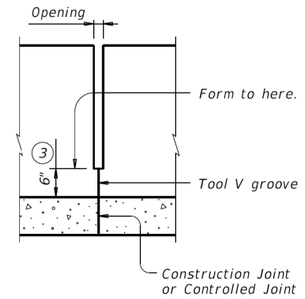
FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
	DIST	COUNTY		SHEET NO.
	CRP	BEE		82

DATE:
FILE:



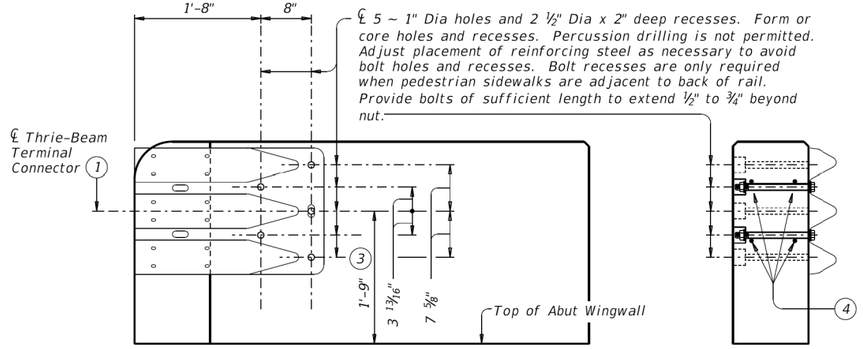
AT ABUTMENTS | AT BENTS WITH SLAB EXP JOINTS | AT BENTS WITHOUT SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL



INTERMEDIATE WALL JOINT DETAIL

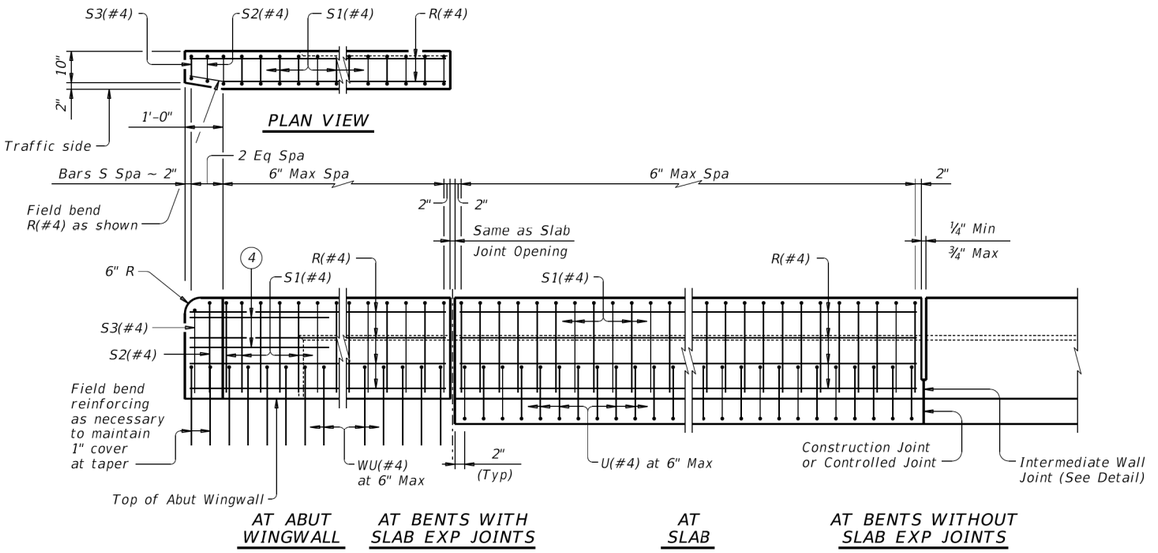
Provide at all interior bents without slab expansion joints.



ELEVATION | SECTION

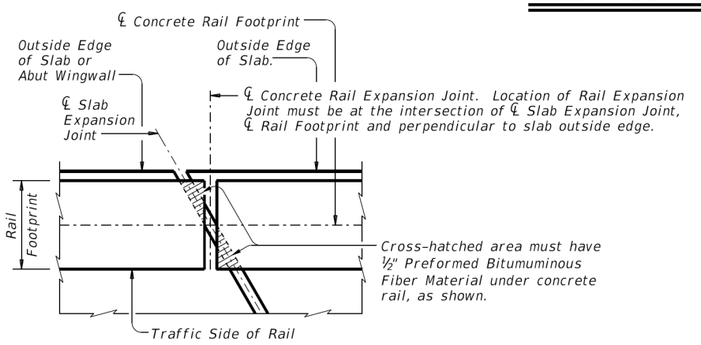
TERMINAL CONNECTION DETAILS

1. Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
2. Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
3. Increase 2" for structures with overlay.
4. Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required. Field bend as needed.



AT ABUT WINGWALL | AT BENTS WITH SLAB EXP JOINTS | AT SLAB | AT BENTS WITHOUT SLAB EXP JOINTS

ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

SHEET 1 OF 2

Texas Department of Transportation

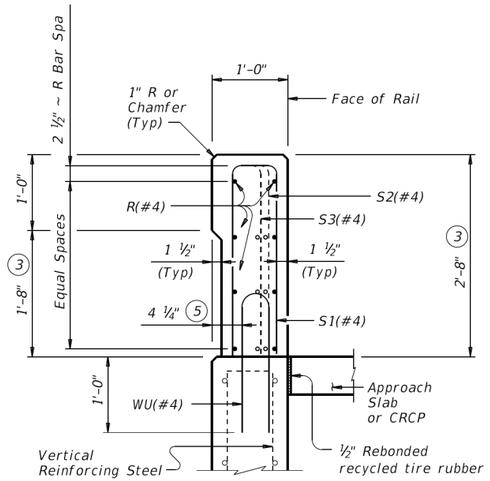
Bridge Division Standard

TRAFFIC RAIL

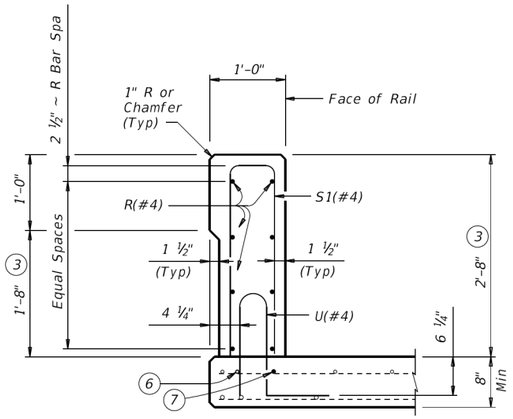
TYPE T221

FILE: rlstd004-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
	DIST	COUNTY		SHEET NO.
	CRP	BEE		83

DATE:
FILE:



ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB

SECTIONS THRU RAIL

(3) Increase 2" for structures with overlay.

(5) 5 ¼" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.

(6) As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars will be furnished at the Contractors expense.

(7) Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.

(8) Bend or cut as required to clear drain slots.

(9) No longitudinal wires may be in top center of cage.

(10) Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".

If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a ⅜" width x ¼" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.

Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.

Chamfer all exposed concrete corners.

MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM 1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other that shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #4 = 1'-7"

Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:

This rail has been evaluated and accepted to be of equal strength to railings with like geometry, which have been crash tested to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

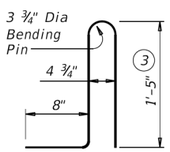
Do not use this railing on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

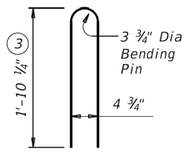
Shop drawings are not required for this rail.

Average weight of railing with no overlay is 370 plf.

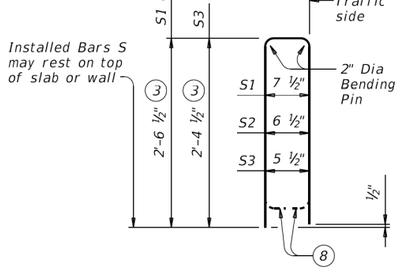
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



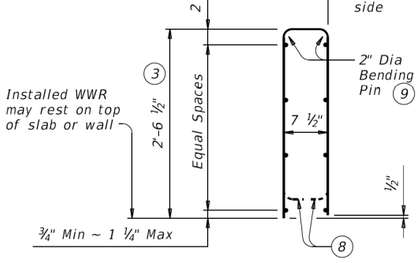
BARS U (#4)



BARS WU (#4)

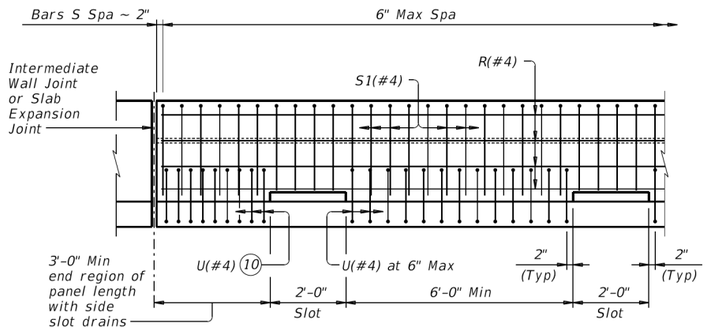


BARS S (#4)



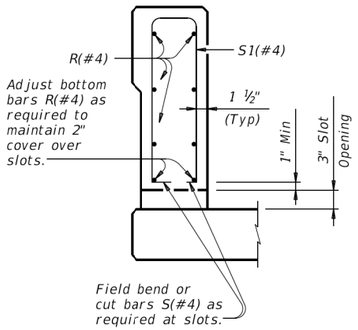
OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
	No. of Wires	Spacing
Minimum	8	4"
Maximum	10	8"
Maximum Wire Size Differential	The smaller wire must have an area of 40% or more of the larger wire.	



OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



SECTION THRU OPTIONAL SIDE SLOT DRAIN

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T221

FILE: rlstd004-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
	DIST	COUNTY		SHEET NO.
	CRP	BEE		84

DATE:
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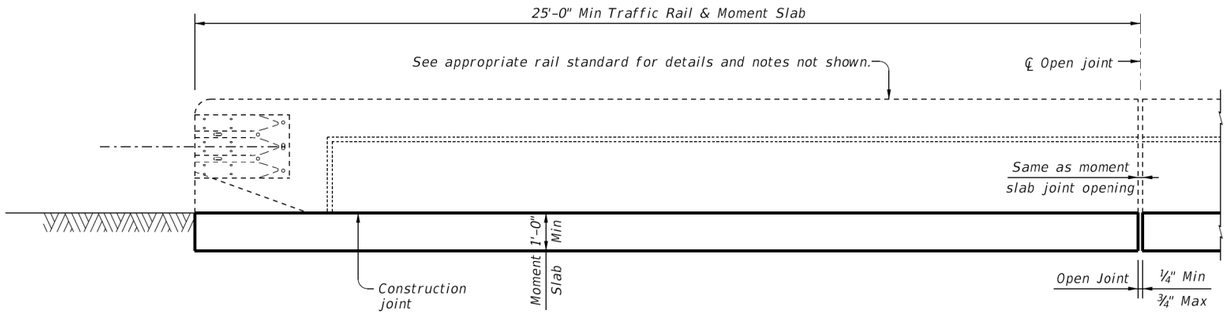
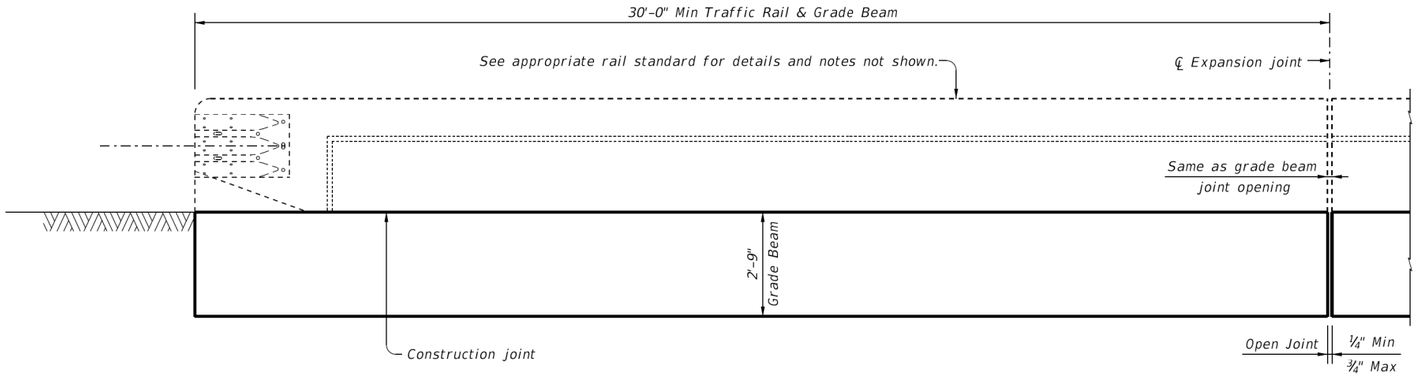


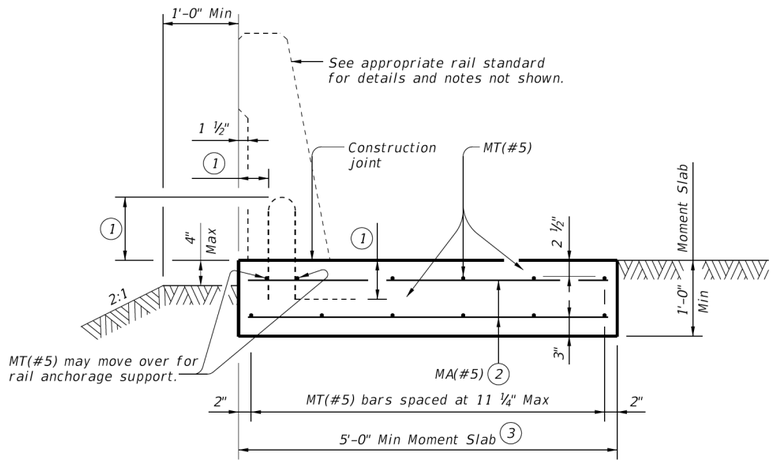
ROADWAY ELEVATION OF TRAFFIC RAIL ON MOMENT SLAB (TRF-MS)

(Showing SSTR rail other rails are similar. Reinforcing not shown for clarity.)



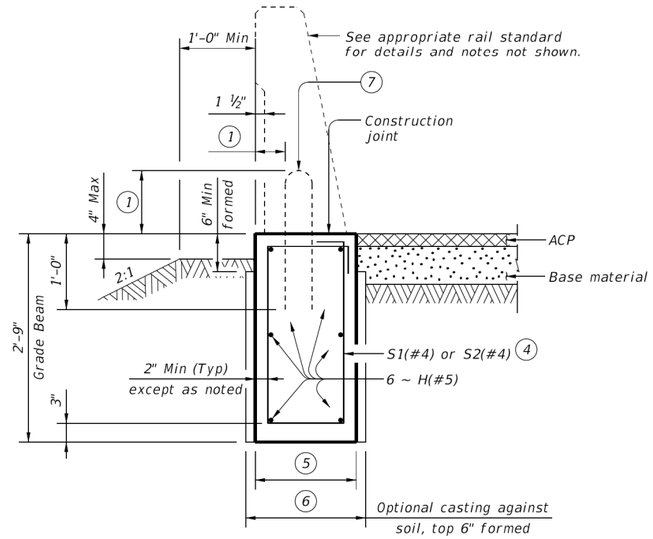
ROADWAY ELEVATION OF TRAFFIC RAIL ON GRADE BEAM (TRF-GB)

(Showing SSTR rail other rails are similar. Reinforcing not shown for clarity.)



SECTION OF TRAFFIC RAIL ON MOMENT SLAB (TRF-MS)

(Showing SSTR rail other rails are similar.)



SECTION OF TRAFFIC RAIL ON GRADE BEAM (TRF-GB)

(Showing SSTR rail other rails are similar.)

1 See applicable bridge rail standard.

2 MA(#5) space longitudinally along moment slab at 12" Max.
(Spaced 2 ½" longitudinally from outside edge of moment slab).

3 Approximate moment slab concrete = 0.19 CY/LF and reinforcement = 22.4 LB/LF.

4 S1(#4) or S2(#4) spaced longitudinally along grade beam at 8" Max.
(Spaced 2 ½" longitudinally from outside edge of grade beam).

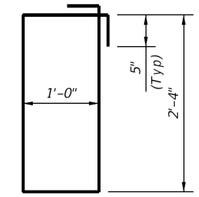
5 Use bar S1(#4) with 1'-4" grade beam width and bridge rail types: All rails except for T224, C412, T66, C66, T80HT and T80SS.
Approximate grade beam concrete = 0.14 CY/LF and reinforcement = 13.8 LB/LF.

Use bar S2(#4) with 1'-7" grade beam width and bridge rail types: T66 and C66.
Approximate grade beam concrete = 0.16 CY/LF and reinforcement = 14.2 LB/LF.

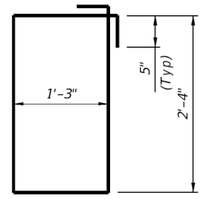
6 1'-6" for bridge rail types: All rails except for T224, C412, T66, C66, T80HT and T80SS.

1'-9" bridge rail types: T66 and C66.

7 Modify reinforcing on standard bridge rail anchorage if necessary by extending rail anchorage 12" Min, vertically into traffic rail



BARS S1(#4)



BARS S2(#4)

CONSTRUCTION NOTES:

Align moment slab (TRF-MS) or grade beam (TRF-GB) open joints with rail open joints maintaining no less than minimum rail length. Provide moment slab (TRF-MS) or grade beam (TRF-GB) with open joints at no greater than 100' spacing unless otherwise shown on the plans or approved by the Engineer.

MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if required elsewhere.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for bars S1(#4), S2(#4) and H(#5) unless noted otherwise. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:
Uncoated or galvanized ~ #5 = 2'-4"
Epoxy coated ~ #5 = 3'-6"

GENERAL NOTES:

Use of these details will result in a moment slab (TRF-MS) or grade beam (TRF-GB) foundation that is acceptable for traffic rails which are MASH TL-2, TL-3, or TL-4 compliant.

See elsewhere in the plans for selected options between moment slab (TRF-MS) and/or grade beam (TRF-GB).

The foundation design resistance is based on the current AASHTO bridge railing requirements with the assumption of fair to good soil support conditions. Poor soil conditions will require suitably deeper and/or wider foundations.

See appropriate rail standard for details and notes not shown.

This detail is intended for use as a guide to unusual railing anchorage situations but may be included in the plans, modified as necessary to apply to specific installations required on the project.

Payment for moment slab (TRF-MS) and/or grade beam (TRF-GB) will be by Class "C" concrete or Class "C" (HPC) concrete for rail foundations.

The associated bridge railing will be paid for by the linear foot which includes the concrete and reinforcement.

Excavation will be subsidiary to other Items.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

Texas Department of Transportation

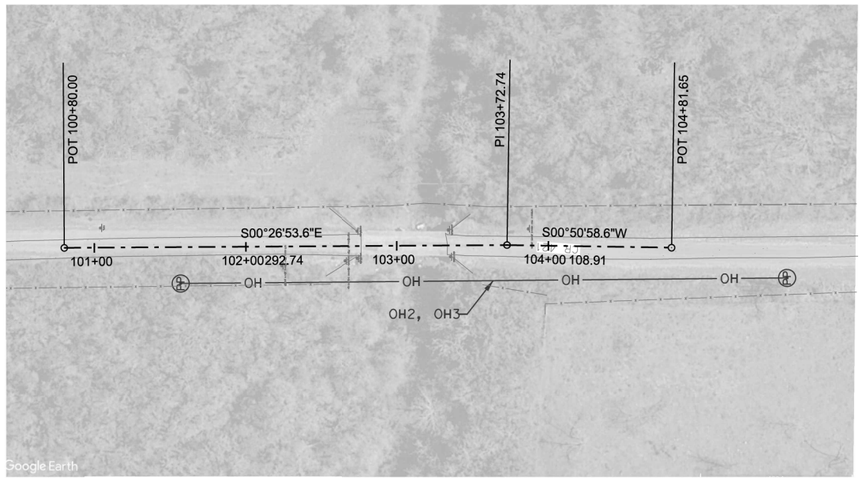
Bridge Division Standard

TRAFFIC RAIL FOUNDATIONS
FOR MASH TL-2, TL-3 & TL-4 BRIDGE RAILS

TRF

FILE: rlstd027-20.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
07-20: Added moment slab with rail foundation lengths.	DIST	COUNTY		SHEET NO.
	CRP	BEE		85

DN: TRG | CK: TRG | DW: TRG | CK: TRG | DW: TRG



SPECIAL NOTES

1. ALL PIPE SIZES WERE TAKEN FROM UTILITY RECORDS WHERE POSSIBLE. THE UTILITIES DEPICTED WERE INVESTIGATED BY THE RIOS GROUP,INC.. ALL OTHER PLAN INFORMATION, NOTABLY THE BACKGROUND INFORMATION, WAS PROVIDED BY OTHERS AND THE RIOS GROUP, INC. DISCLAIMS RESPONSIBILITY FOR ITS ACCURACY.

2. EXISTING SUBSURFACE UTILITY INVESTIGATIONS WERE COMPLETED ON 09/14/2022. THE RIOS GROUP, INC. EXPRESSLY DISCLAIMS ANY AND ALL RESPONSIBILITY FOR NEW UTILITY INSTALLATIONS, MODIFICATIONS, AND/OR ADJUSTMENTS TO EXISTING UTILITIES AFTER THE COMPLETION DATE.

3. UTILITY LOCATIONS ON THESE DRAWINGS ARE INTENDED FOR DESIGN PURPOSES AND NOT CONSTRUCTION. THEY REFLECT SUBSURFACE UTILITIES AT THE TIME OF FIELD INVESTIGATION. CALL TEXAS ONE CALL SYSTEM (800)245-4545 FOR UTILITY LOCATIONS 48 HOURS PRIOR TO ANY WORK.

4. WHERE POSSIBLE, WATER, GAS, AND COMMUNICATION SERVICE LINES WERE DESIGNATED. HOWEVER, SOME SERVICE LINES ARE CONSTRUCTED OF NON-CONDUCTIVE MATERIAL AND UTILITY COMPANY DRAWINGS MAY NOT SHOW SERVICE LINE LOCATIONS. THEREFORE ALL SERVICE LINES MAY NOT BE SHOWN.

QUALITY LEVELS

Quality Level "D" - Information derived from existing records and/or oral collection.

Quality Level "C" - Information obtained by surveying and plotting visible above ground utility features and by using professional judgment in correlating information to Quality Level "D" information.

Quality Level "B" - Designate: Two-dimensional horizontal mapping. This information is obtained through the application and interpretation of appropriate non-destructive surface geophysical methods. Utility indications are referenced to established survey control. Incorporates Quality Levels "C" and "D" information to produce Quality Level "B" information.

Quality Level "A" - Locate: Precise horizontal and vertical location of utilities obtained by the actual exposure and subsequent measurement of subsurface utilities at a specific point. Diameters shown are verified visually and may not be exact.

0 50′ 100′

SCALE: 1" = 100′

LEGEND OF UTILITY TYPES

QUALITY LEVELS

- QUALITY LEVEL "B" — X# —
- QUALITY LEVEL "C" ------- X#(C) -------
- QUALITY LEVEL "D" ------- X#(D) -------
- ABANDONED UTILITY —X—X—X—X—
- PROPOSED UTILITY ———————
- UNKNOWN UTILITY — — — — —

COMMUNICATIONS

- ATT (TELE) — T1 —
- TIME WARNER (FO/DUCT) — FOC1 —

OVERHEAD UTILITY

- SAN PATRICIO ELECTRIC — OH1 —
- AMERICAN ELECTRIC POWER — OH 2 —
- LUMEN — OH 3 —

LEGEND OF UTILITY SYMBOLS

- END CAP
- QUALITY LEVEL CHANGE
- TEST HOLE
- UTILITY CONTINUATION
- FIBER HANDHOLE
- TELEPHONE PEDESTAL
- ELECTRIC POLE (POWER)

The Rios Group, Inc.
TBPE Firm # F-14595

STATE OF TEXAS
TRAVIS S. ISAACSON
100094
LICENSED
PROFESSIONAL ENGINEER

02-08-2023

THE RIOS GROUP
SUBSURFACE UTILITY ENGINEERING
UTILITY COORDINATION
1740 Universal City Blvd.
Suite 200
Universal City, Texas 78148

Texas Department of Transportation

CR 421

S.U.E PLAN SHEET

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0916	25	019	CR 1187
CRP	BEE		86

DATE: 10/4/2022 10:58 AM
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RG CK RG DW RG CK RG DW

0 10 20
SCALE IN FEET

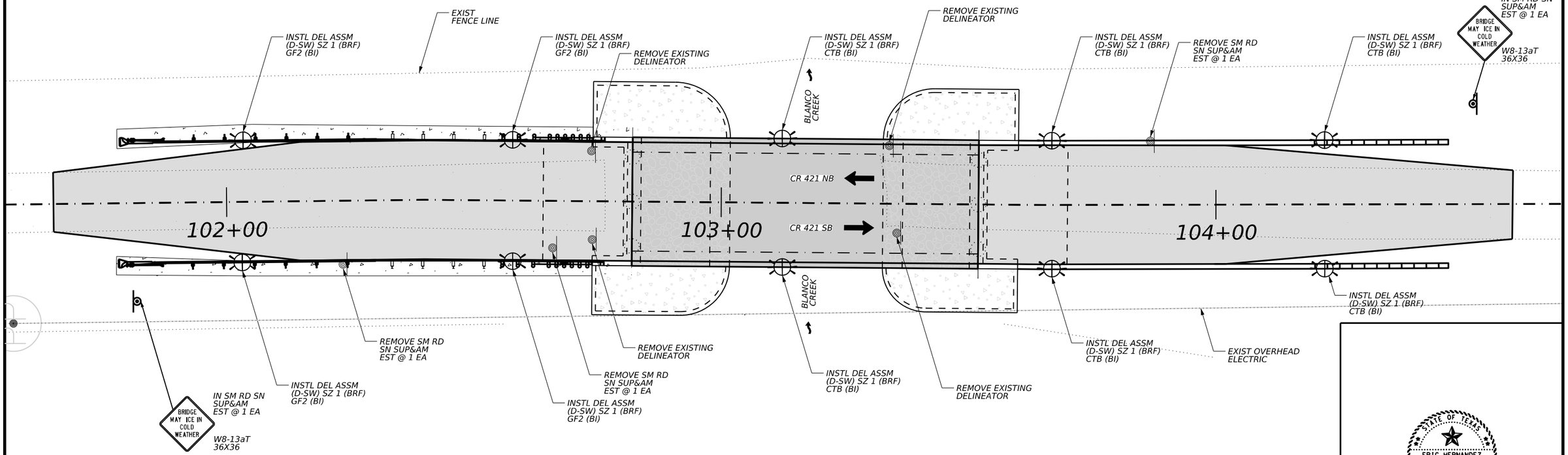
LEGEND

BIDIRECTIONAL DELINEATOR

TRAFFIC FLOW ARROW

EXISTING SIGN/DELINEATOR

PROPOSED SIGN



STATE OF TEXAS
ERIC HERNANDEZ
114309
LICENSED PROFESSIONAL ENGINEER

3/2/2023

LEGACY ENGINEERING GROUP

Legacy Engineering Group, PLLC
7800 W Interstate 10, Ste. 830, San Antonio, Texas 78230, 210.493.3700
TBPE Firm Registration No. 20623

Texas Department of Transportation

CR 421

TRAFFIC ITEMS SIGNING & DELINEATION LAYOUT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		87

DATE: 10/4/2022 10:58 AM
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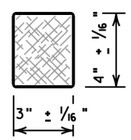
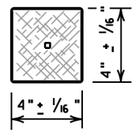
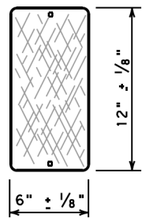
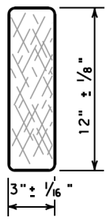
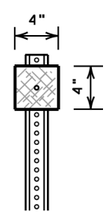
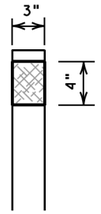
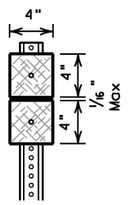
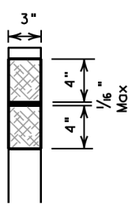
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

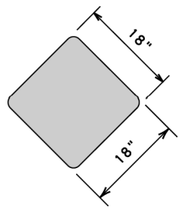
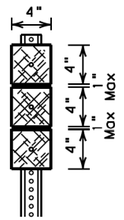
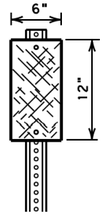
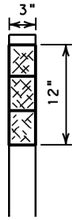
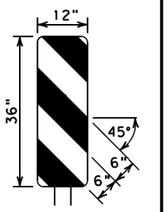
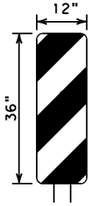
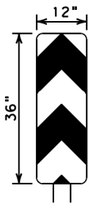
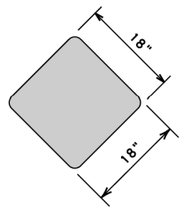
	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			

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

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

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

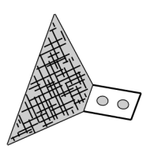
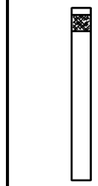
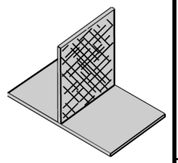
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

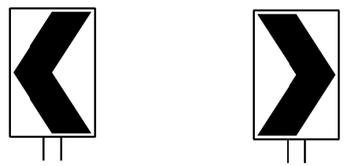
	GF1	GF2	CTB
DEVICE			

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.

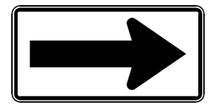
CHEVRONS

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"	

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	0916	25	019	CR 1187
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	CRP	BEE		88

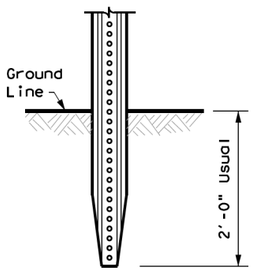
DATE:
FILE:

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

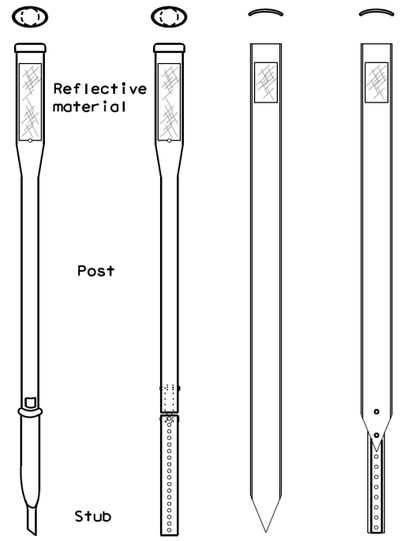


NOTES

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.

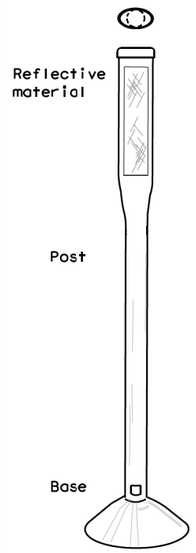
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



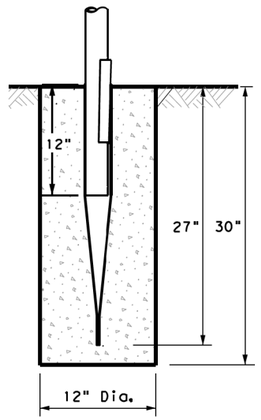
SURFACE MOUNT

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.

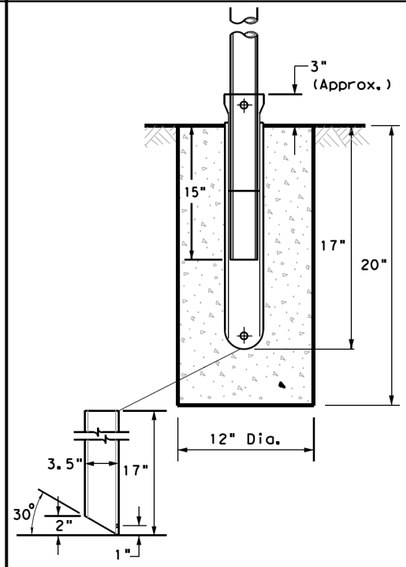
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

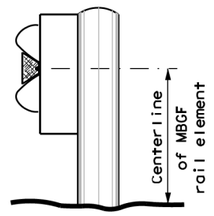
NOTE

1. Install per manufacturer's recommendations.

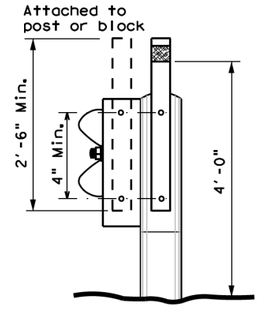
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

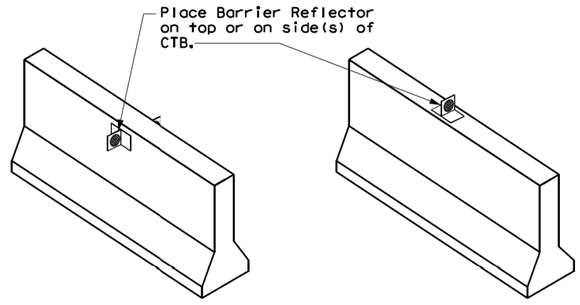
GF1



GF2



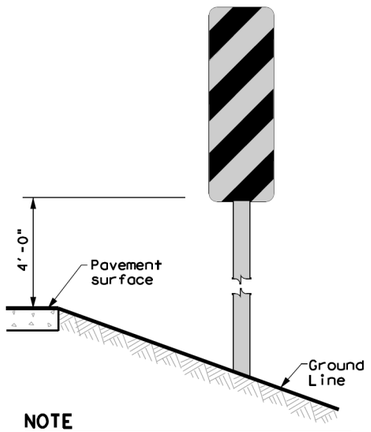
CONCRETE TRAFFIC BARRIER (CTB)



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.

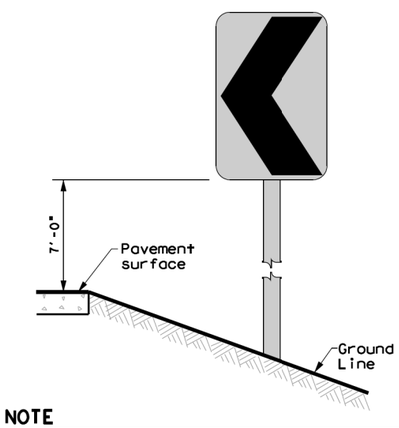
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

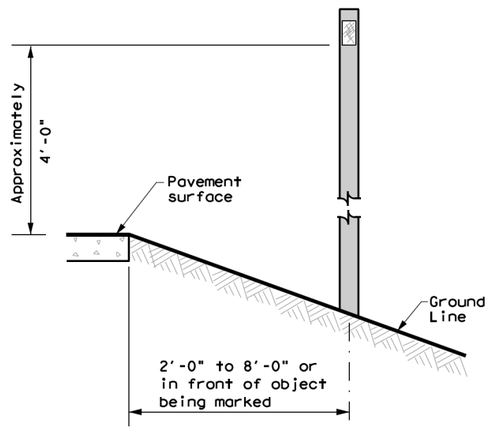
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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	0916	25	019	CR 1187
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	CRP	BEE		89

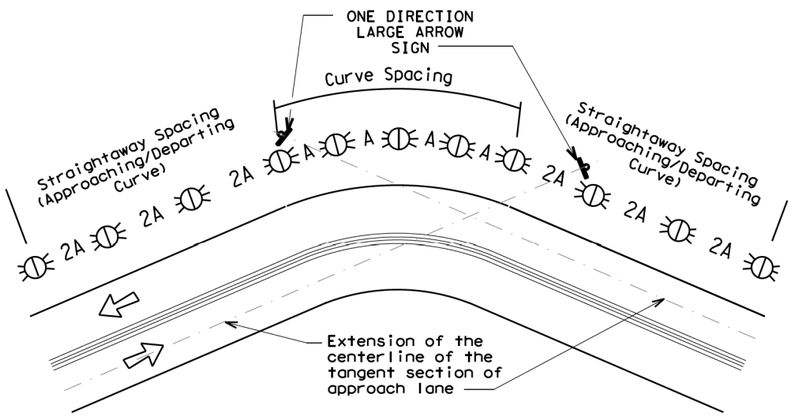
20B

DATE: $DATE$ $TIME$
FILE: $FILE$

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

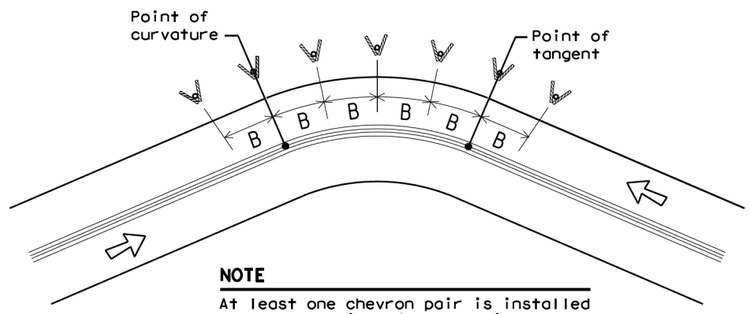
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



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	0916	25	019	CR 1187
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	CRP	BEE		90

DATE:
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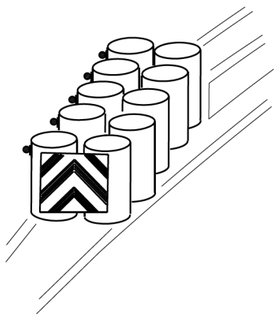
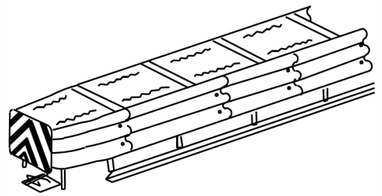
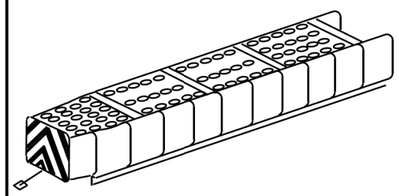
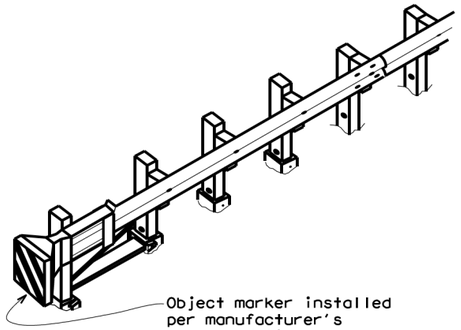
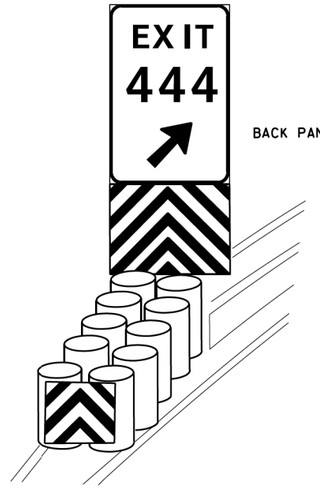
20C

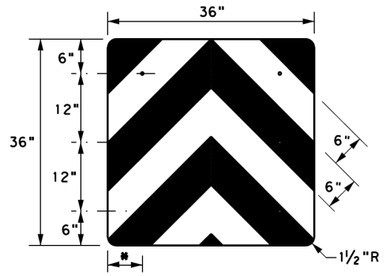


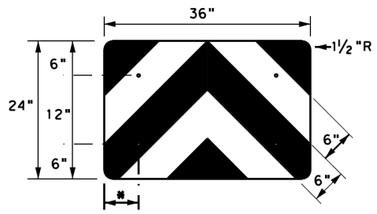




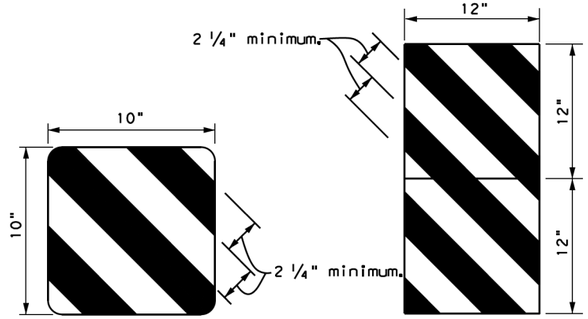




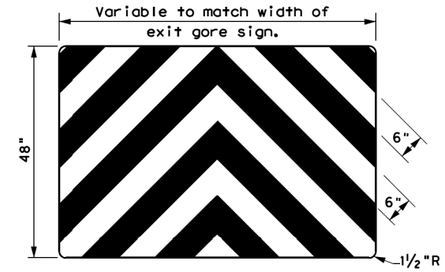


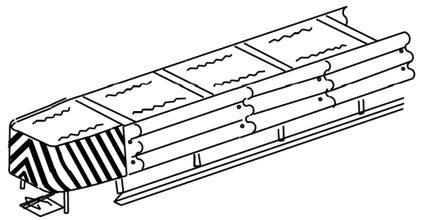


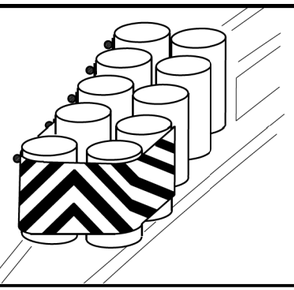
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

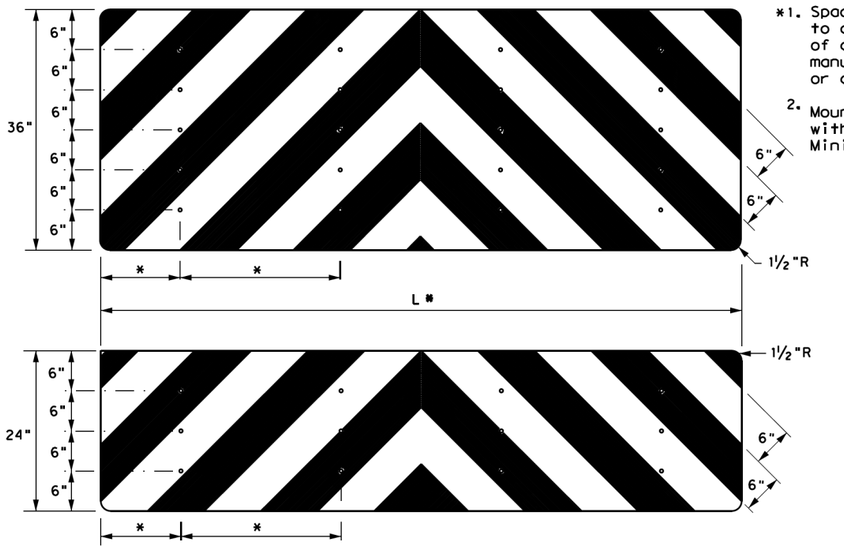


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	CRP	BEE		91
4-98 7-20				

20G

DATE:
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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

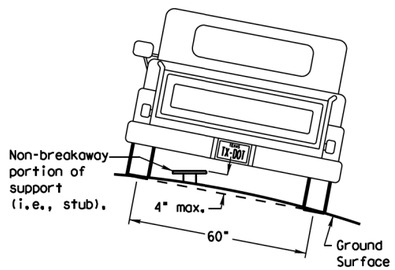
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1) to (SLIP-3))

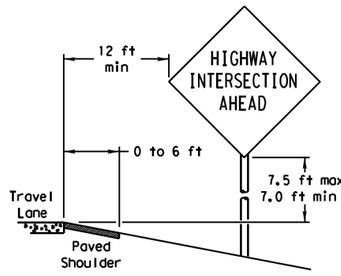
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercorriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

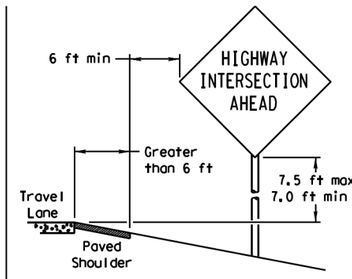
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

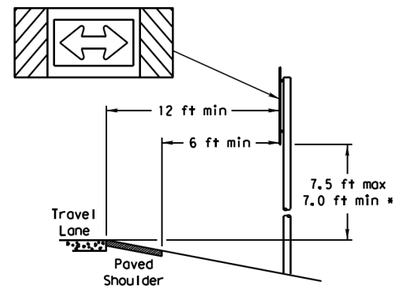
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



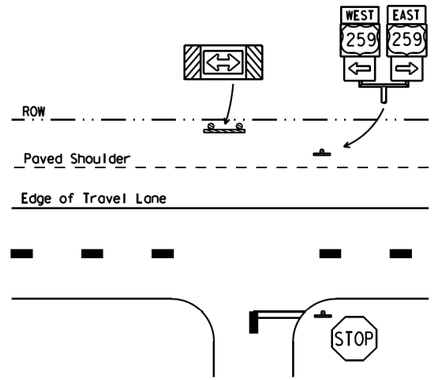
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

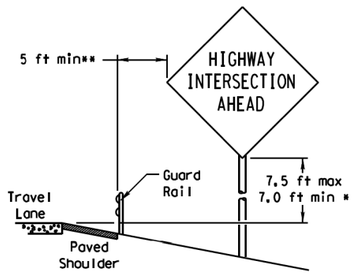
T-INTERSECTION



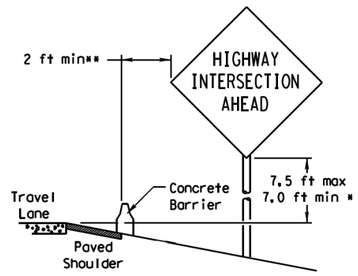
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

* 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

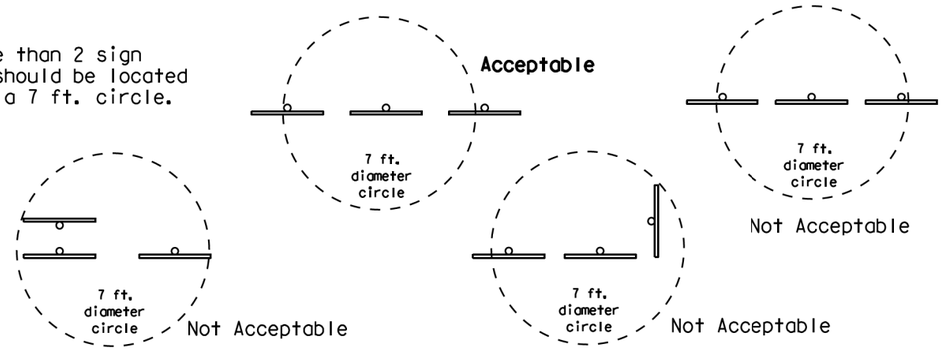
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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.

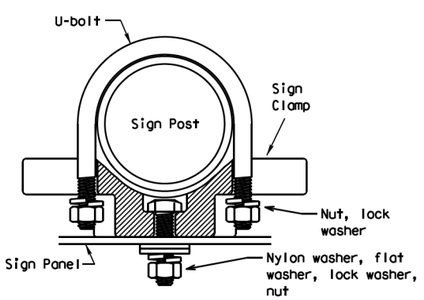
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

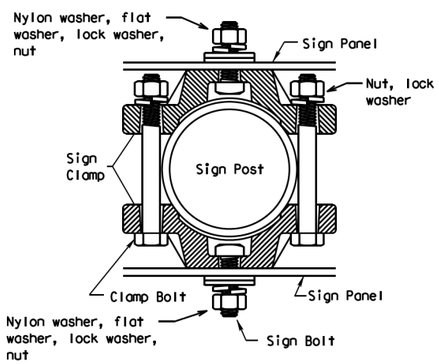


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

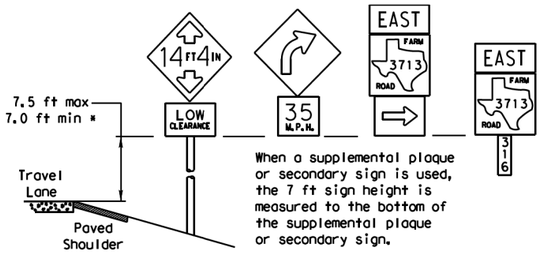
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



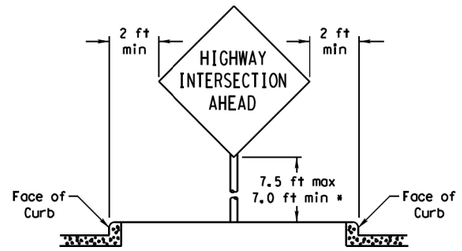
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



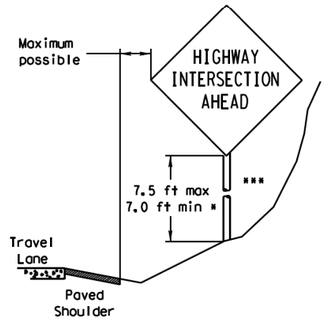
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS 9-08

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		92

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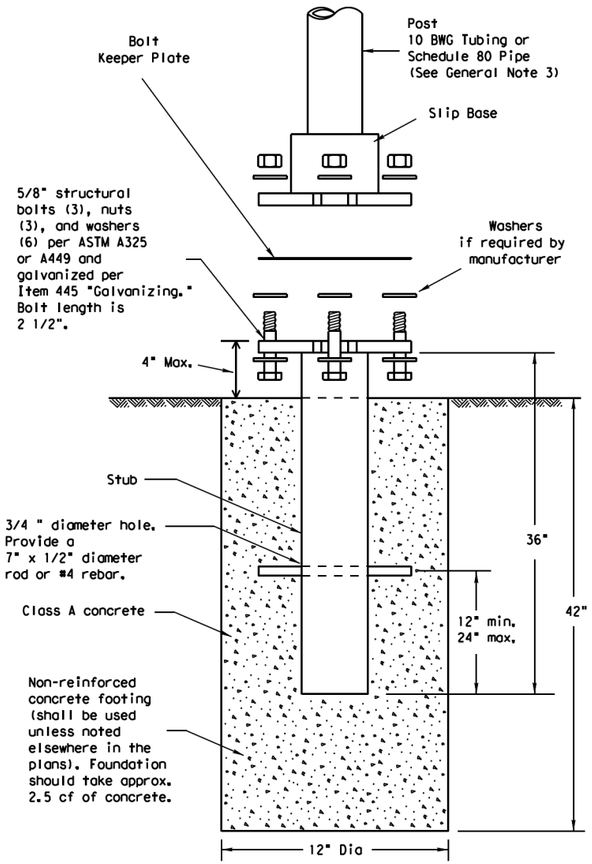
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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:

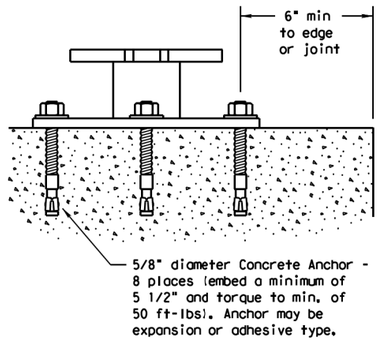
1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   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

REVISIONS

9-08

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CRP	BEE		93

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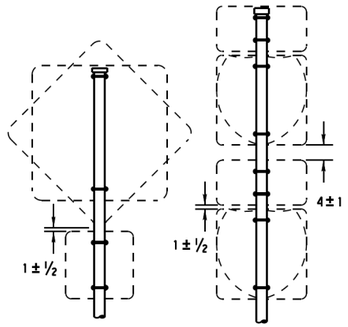
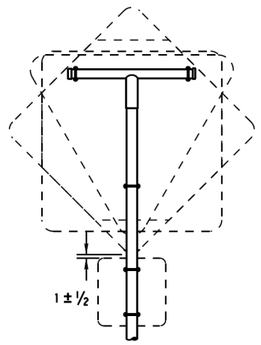
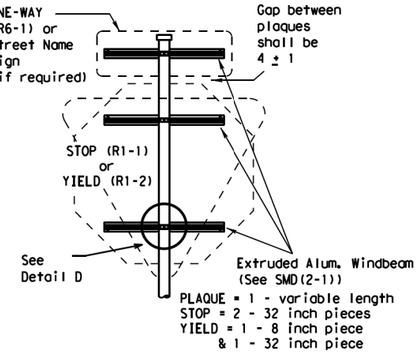


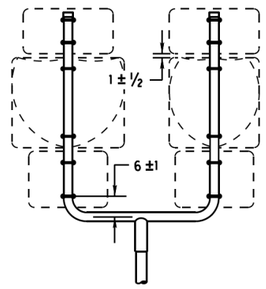
SM RD SGN ASSM TY XXXXX(1)XX(P)



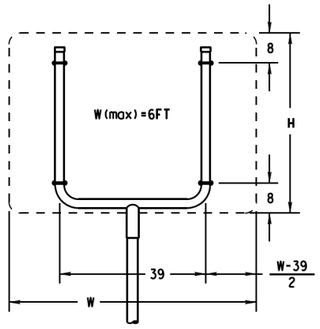
SM RD SGN ASSM TY XXXXX(1)XX(T)



SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



SM RD SGN ASSM TY XXXXX(1)XX(U)



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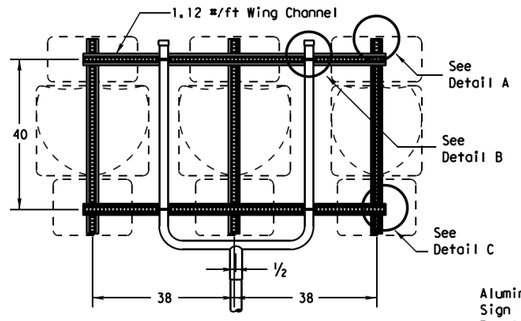
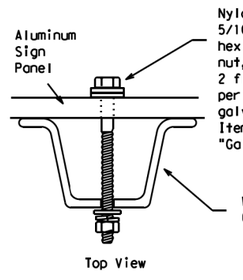
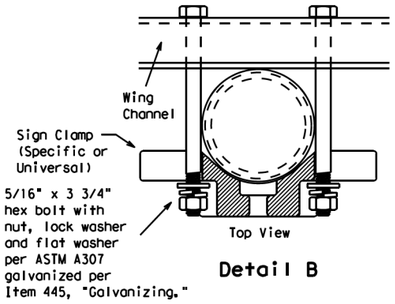


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)



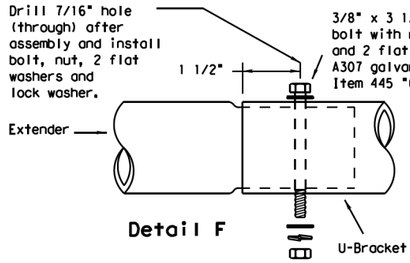
Top View

Detail A



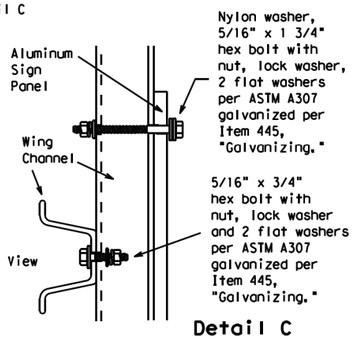
Top View

Detail B

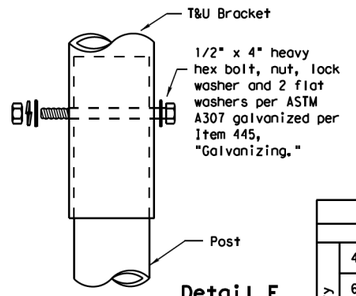


Detail F

Splices shall only be allowed behind the sign substrate.



Detail C

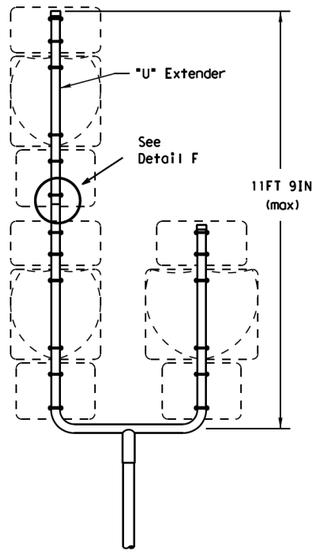


Detail E

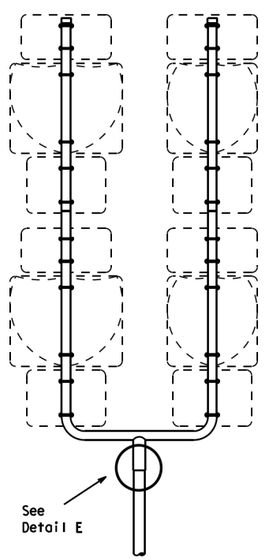
GENERAL NOTES:

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

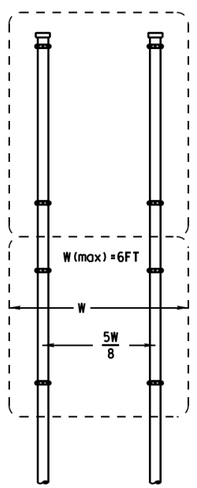
1.
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material 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.



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

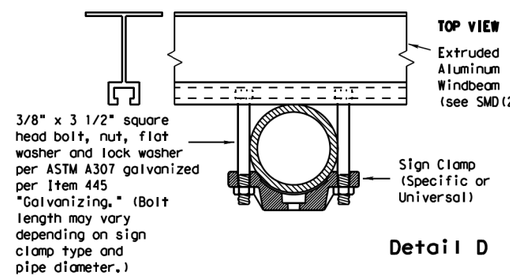


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

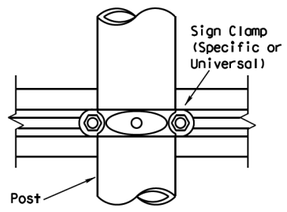


SM RD SGN ASSYM TY XXXXX(2)XX(P)

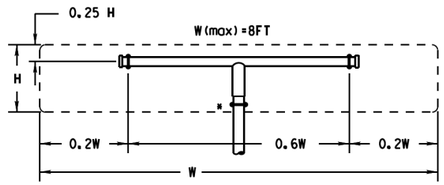
SIDE VIEW



Detail D



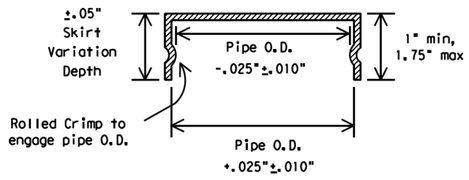
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	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)



All dimensions are in english unless detailed otherwise.

SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

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.

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

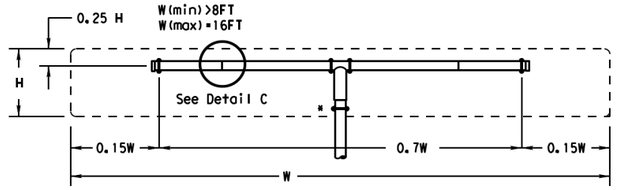
CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187

DIST	COUNTY	SHEET NO.
CRP	BEE	94

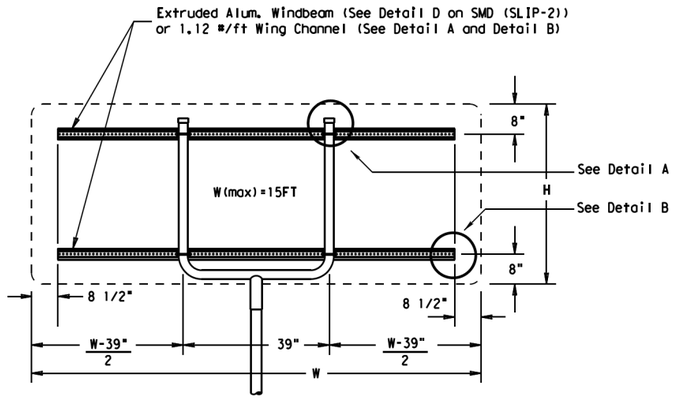
9-08 REVISIONS

DATE:
FILE:

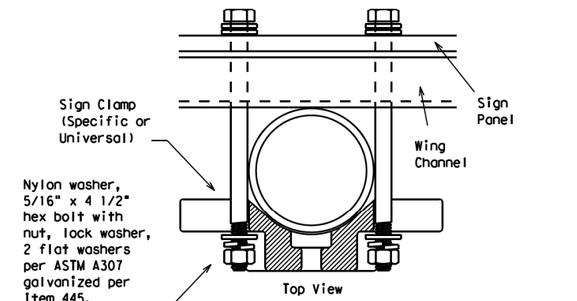
26C



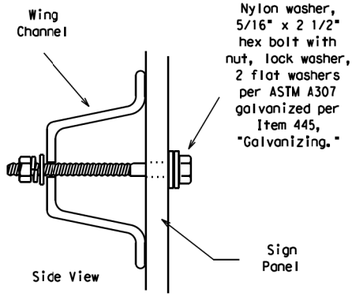
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



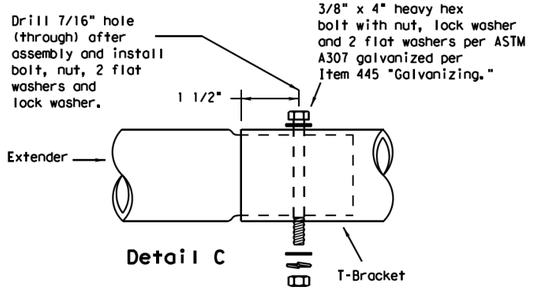
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



Detail A

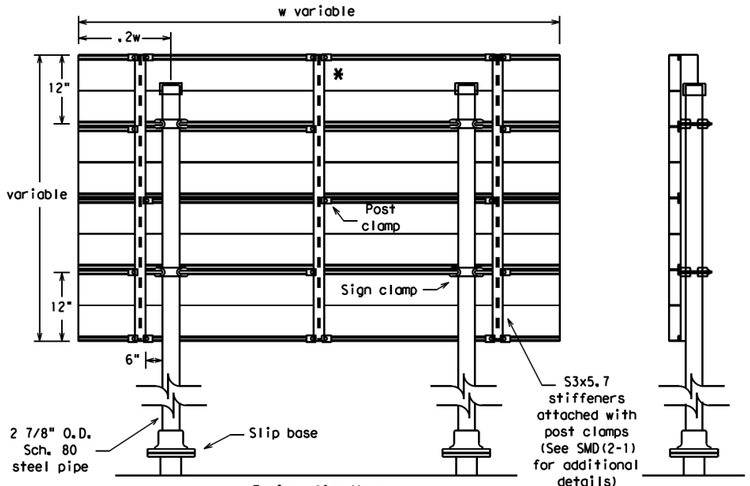


Detail B



Detail C

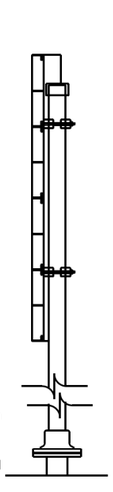
Splices shall only be allowed behind the sign substrate.



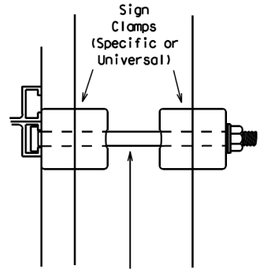
Typical Sign Mount

SM RD SGN ASSM TY S80(2)XX(P-EXAL)

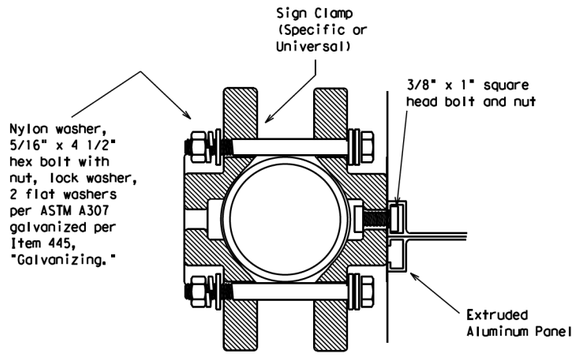
* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



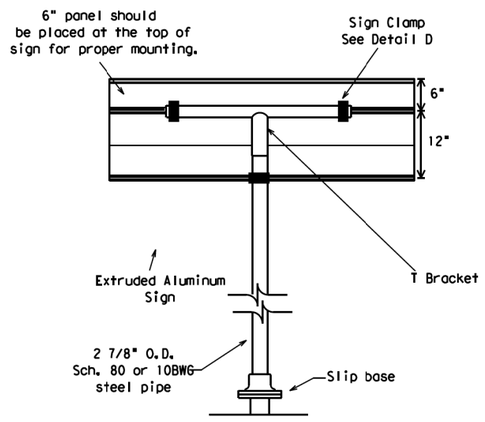
See Detail E
for clamp installation



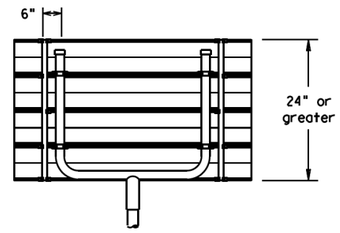
Detail E



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



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.
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. Sign blanks shall be the sizes and shapes shown on the plans.
11. 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.
12. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-Inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-Inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187

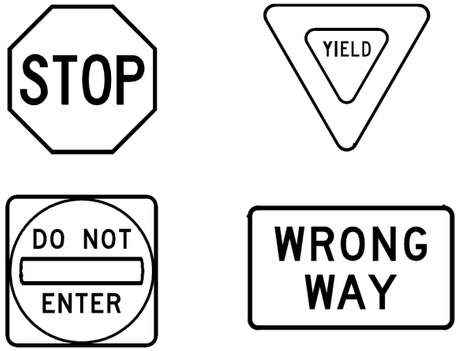
DIST	COUNTY	SHEET NO.
CRP	BEE	95

DATE:
FILE:

26D

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

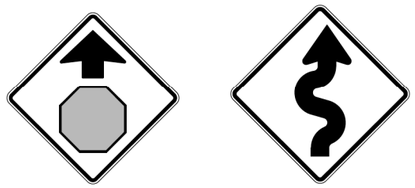
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1188
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	CRP	BEE		96

DATE:
FILE:

4

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with TxDOT policy for projects disturbing less than 1 acre of soil, and not part of a larger common plan of development.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept at the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans, and the project's environmental permits, issues, and commitments (EPICs).

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
0916-25-019; Federal Aid Project No. BR 2023 (296)

1.2 PROJECT LIMITS:
From: At Blanco Creek

To: At Blanco Creek

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 28.5239° (N) ,(Long) 97.5904° (W)

END: (Lat) 28.5239° (N) ,(Long) 97.5904° (W)

1.4 TOTAL PROJECT AREA (Acres): 0.4

1.5 TOTAL AREA TO BE DISTURBED (Acres): 0.3

1.6 NATURE OF CONSTRUCTION ACTIVITY:
Bridge replacement consisting of replacing bridge and approaches.

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Odem-Riverwash complex, 0 to 1% slopes, frequently flooded	50% odem and similar soils, 45% riverwash, 5% minor components, well drained, negligible runoff, and minor erosion potential
Odem fine sandy loam, 0 to 1% slopes, occasionally flooded	75% odem and similar soils, 25% minor components, well drained, negligible runoff, and Class 1 erosion potential
Papalote fine sandy loam, 0 to 1% slopes	90% papalote and similar soils, 10% minor components, moderately well drained, low runoff, and Class 1 erosion potential

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):
PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

☐ PSLs determined during preconstruction meeting
☐ PSLs determined during construction
☒ No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:
(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.3.)

☒ Mobilization
☒ Install sediment and erosion controls
☒ Blade existing topsoil into windrows, prep ROW, clear and grub
☒ Remove existing pavement
☒ Grading operations, excavation, and embankment
☒ Excavate and prepare subgrade for proposed pavement widening
☐ Remove existing culverts, safety end treatments (SETs)
☒ Remove existing metal beam guard fence (MBGF), bridge rail
☒ Install proposed pavement per plans
☐ Install culverts, culvert extensions, SETs
☒ Install mow strip, MBGF, bridge rail
☒ Place flex base
☒ Rework slopes, grade ditches
☒ Blade windrowed material back across slopes
☒ Revegetation of unpaved areas
☒ Achieve site stabilization and remove sediment and erosion control measures
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

☒ Sediment laden stormwater from stormwater conveyance over disturbed area
☒ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
☒ Solvents, paints, adhesives, etc. from various construction activities
☒ Transported soils from offsite vehicle tracking
☒ Construction debris and waste from various construction activities
☒ Contaminated water from excavation or dewatering pump-out water
☒ Sanitary waste from onsite restroom facilities
☒ Trash from various construction activities/receptacles
☐ Long-term stockpiles of material and waste
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.11 RECEIVING WATERS:
Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
Blanco Creek	Mission River Above Tidal (2002)

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☐ Other: _____
☐ Other: _____
☐ Other: _____

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			97
STATE	STATE DIST.	COUNTY	
TEXAS	CRP	BEE	
CONT.	SECT.	JOB	HIGHWAY NO.
0916	25	019	CR 1187

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- ☐ ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- ☐ ☐ Temporary Seeding
- ☐ ☒ Permanent Planting, Sodding or Seeding
- ☐ ☐ Biodegradable Erosion Control Logs
- ☒ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ ☒ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- ☒ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- ☒ ☐ Sediment Control Fence
- ☐ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To
Permanent Seeding	101+65 103+60	102+74 104+60
Riprap	102+74 103+33	103+02 103+60

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- ☒ Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- ☒ Loaded haul trucks to be covered with tarpaulin
- ☐ Stabilized construction exit
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- ☒ Chemical Management
- ☒ Concrete and Materials Waste Management
- ☒ Debris and Trash Management
- ☐ Dust Control
- ☐ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To
No surface waters present, vegetated buffer zones are not planned		

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3 .

2.9 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3.

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			98
STATE	STATE DIST.	COUNTY	
TEXAS	CRP	BEE	
CONT.	SECT.	JOB	HIGHWAY NO.
0916	25	019	CR 1187

DATE:
FILE:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1. None

2.

☒ No Action Required ☐ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required
☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1. Blanco Creek (Segment 2002C)
2.
3.
4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☐ Temporary Vegetation	☒ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☒ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☐ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.
2.
3.
4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ Required Action

Action No.

1. See Sheet 2 of 2
2.
3.
4.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☐ No Action Required ☒ Required Action

Action No.

1. See Sheet 2 of 2
2.
3.
4.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☒ Yes ☐ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☐ No Action Required ☐ Required Action

Action No.

1. Proposed demolition of the bridge structure may include potential exposure to lead-based paint (LBP) and/or asbestos containing material (ACM). Surveys for LBP and ACM are being completed for this project and results are pending. Copies of LBP and ACM survey reports will be made available by the Engineer upon completion.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☐ No Action Required ☒ Required Action

Action No.

1. Water Quality, see Sheet 2 of 2
2.
3.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
© TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0916	25	019	CR 1187
12-12-2011 (DS)	DIST	COUNTY		SHEET NO.
05-07-14 ADDED NOTE SECTION IV.	CRP	BEE		99
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.				

DATE:
FILE:

IV. VEGETATION RESOURCES

1. Minimize the amount of vegetation cleared. Removal of native vegetation, particularly mature native trees and shrubs should be avoided to the greatest extent practicable. Wherever practicable, impacted vegetation should be replaced with in-kind on-site replacement/restoration of native vegetation. The use of seed mix that contains seeds from only locally adapted native species is recommended.

2. Avoid vegetation clearing activities during the general bird nesting season, March through August, to minimize adverse impacts to birds.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

Amphibians

1. Be advised of the potential occurrence of the black-spotted newt in the project area. This species prefers warm shallow watered areas with vegetative cover such as arroyos, canals, ditches, or even shallow depressions. During dry seasons, the newt lays dormant underground. Ensure that SW3Pand 401 BMPs are implemented and maintained during construction. Avoid harming this species if encountered.

2. Be advised of the potential occurrence of sheep frog in the project area. This species prefers subterranean burrows, such as those of pack rats. They will also burrow under fallen tree limbs. Although this species will remain in its burrow for most of the year, they may emerge with heavy rains in the late summer season. Breeding takes place in August and September. Minimize disturbance to downed woody debris. Ensure that SW3P and 401 BMPs are implemented and maintained during construction. Avoid harming this species if encountered.

3. Be advised of the potential occurrence of South Texas siren in the project area. This species prefers warm shallow waters with vegetative cover such as ponds, ditches and swamps. This is a nocturnal species that burrows during the day. Ensure that SWPPP and 401 BMPs are implemented and maintained during construction. Avoid harming this species if encountered.

4. Minimize impacts to wetland, temporary and permanent open water features, including depressions, and riverine habitats. Maintain hydrologic regime and connections between wetlands and other aquatic features. Use barrier fencing to direct animal movements away from construction activities and areas of potential wildlife-vehicle collisions in construction areas directly adjacent, or that may directly impact, potential habitat for the target species.

5. Consider applying hydromulching and/or hydroseeding in areas for soil stabilization and/or revegetation of disturbed areas where feasible. If hydromulching and/or hydroseeding are not feasible due to site conditions, using erosion control blankets or mats that contain no netting, or only contain loosely woven natural fiber netting is preferred. Plastic netting should be avoided to the extent practicable.

6. Project Specific Locations (PSLs) proposed within state-owned ROW should be located in uplands away from aquatic features. When work is directly adjacent to the water, minimize impacts to shoreline basking sites (e.g., downed trees, sand bars, exposed bedrock) and overwinter sites (e.g., brush and debris piles, crawfish burrows), where feasible. Avoid or minimize disturbing or removing downed trees, rotting stumps, and leaf litter, which may be refugia for terrestrial amphibians, where feasible.

Birds

7. The Federal Migratory Bird Treaty Act (MBTA) states that it is unlawful to pursue, hunt, take, kill, capture, collect, possess, buy, sell, trade, or transport any migratory bird, nest, young, feather, or egg in part or in whole, without a federal permit. This project does not have a federal permit; therefore, in accordance with this regulation, the Contractor will avoid disturbing, destroying, removing, or relocating migratory birds and active nests found in trees, culverts, bridges, on the ground, etc. Typical breeding season occurs from March through August; therefore, tree trimming and other vegetation clearing activities that may disturb breeding birds should be done in the non-breeding season (September-February), when possible. If work must be performed during the breeding season, the Contractor shall have a qualified biologist conduct a survey of the right of way to determine if bird nests are present. In the event that active nests are encountered on-site during construction, the Contractor shall notify the Engineer and measures shall be taken to avoid disturbance of these birds, their occupied nest, eggs, and/or young, in accordance with the MBTA. Phasing of work during construction may be necessary to stay in compliance with the MBTA. The Contractor can discuss other preventative measures with the Project Engineer and/or District Environmental Staff.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS. (CONT.)

Birds (Cont.)

8. Prior to construction, perform daytime surveys for nests including under bridges and in culverts to determine if they are active before removal. Nests that are active should not be disturbed. Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season. Avoid the removal of unoccupied, inactive nests, as practicable. Prevent the establishment of active nests during the nesting season on TxDOT owned and operated facilities and structures proposed for replacement or repair. Do not collect, capture, relocate, or transport birds, eggs, young, or active nests without a permit.

Insects

9. Be advised of the potential occurrence of Monarch Butterfly in the project area. This species can inhabit a variety of habitats including native prairies, pastures, open woodlands and savannas, desert scrub, roadsides, and other habitats with abundant nectar plants, including urbanized areas. Although adults may be present year-round, they are primarily observed between March and November (Caterpillars; April and September). Common host plants in Texas are milkweeds, milkweed vines, climbing milkweed, swallowworts, and Anglepod.

Mammals

10. Be advised of the potential occurrence of Eastern spotted skunk in the project area. This species prefers open fields prairies, croplands, fence rows, farmyards, forest edges. It can be found in found in wooded areas and tallgrass prairies, preferring rocky canyons and outcrops when such sites are available. Avoid unnecessary impacts to dens if encountered. Avoid harming this species if encountered.

11. Be advised of the potential occurrence of long-tailed weasel in the project area. This species prefers to inhabit brushlands, fence rows, upland woods and bottomland hardwoods, forest edges & rocky desert scrub and usually lives close to water. Avoid unnecessary impacts to dens if encountered. Avoid harming this species if encountered.

Reptiles

12. Be advised of the potential occurrence of spot-tailed earless lizard in the project area. This species prefers prairie-brushland that is fairly flat and free of vegetation or other obstructions, including disturbed areas; it utilizes cleared and disturbed areas, as well as, graded roadways. Avoid harming this species if encountered.

13. Be advised of the potential occurrence of Texas indigo snake in the project area. This species prefers lightly vegetated areas not far from permanent water sources and is active year round. During severely dry weather, this species will retreat to dens/burrows left by other animals or brush piles. Avoid harming this species and unnecessary impacts to burrows if encountered.

14. Due to the increased activity (mating) of reptiles during the spring, construction activities like clearing or grading should attempt to be scheduled outside of the spring (April-May) season. It is also encouraged to conduct ground disturbing activities before October to prevent disturbing reptiles that become less active and may be using burrows in the project area.

15. Apply hydromulching and/or hydroseeding in areas for soil stabilization and/or revegetation of disturbed areas where feasible. If hydormulching and/or hydroseeding are not feasible due to site conditions, utilize erosion control blankets or mats that contain no netting or contain loosely woven natural fiber netting is preferred. Plastic netting should be avoided to the extent practicable.

16. If reptiles are found on project site allow species to safely leave the project area. Avoid or minimize disturbing or removing downed trees, rotting stumps, and leaf litter where feasible.

Other

17. Do not attempt to handle or catch any of these species. Report all sightings and/or impacts to the TxDOT-Corpus Christ District Environmental Section.

VII. OTHER ENVIRONMENTAL ISSUES

Water Quality

1. Minimize the use of equipment in streams and riparian areas during construction. When possible, equipment access should be from banks, bridge decks, or barges. When temporary stream crossings are unavoidable, remove stream crossing once they are no longer needed and stabilize banks and soil around the crossings.

2. Rubbish found near bridges on TxDOT ROW should be removed and disposed of properly to minimize the risk of pollution. Rubbish does not include brush piles or snags.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
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NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

Texas Department of Transportation

Design Division Standard

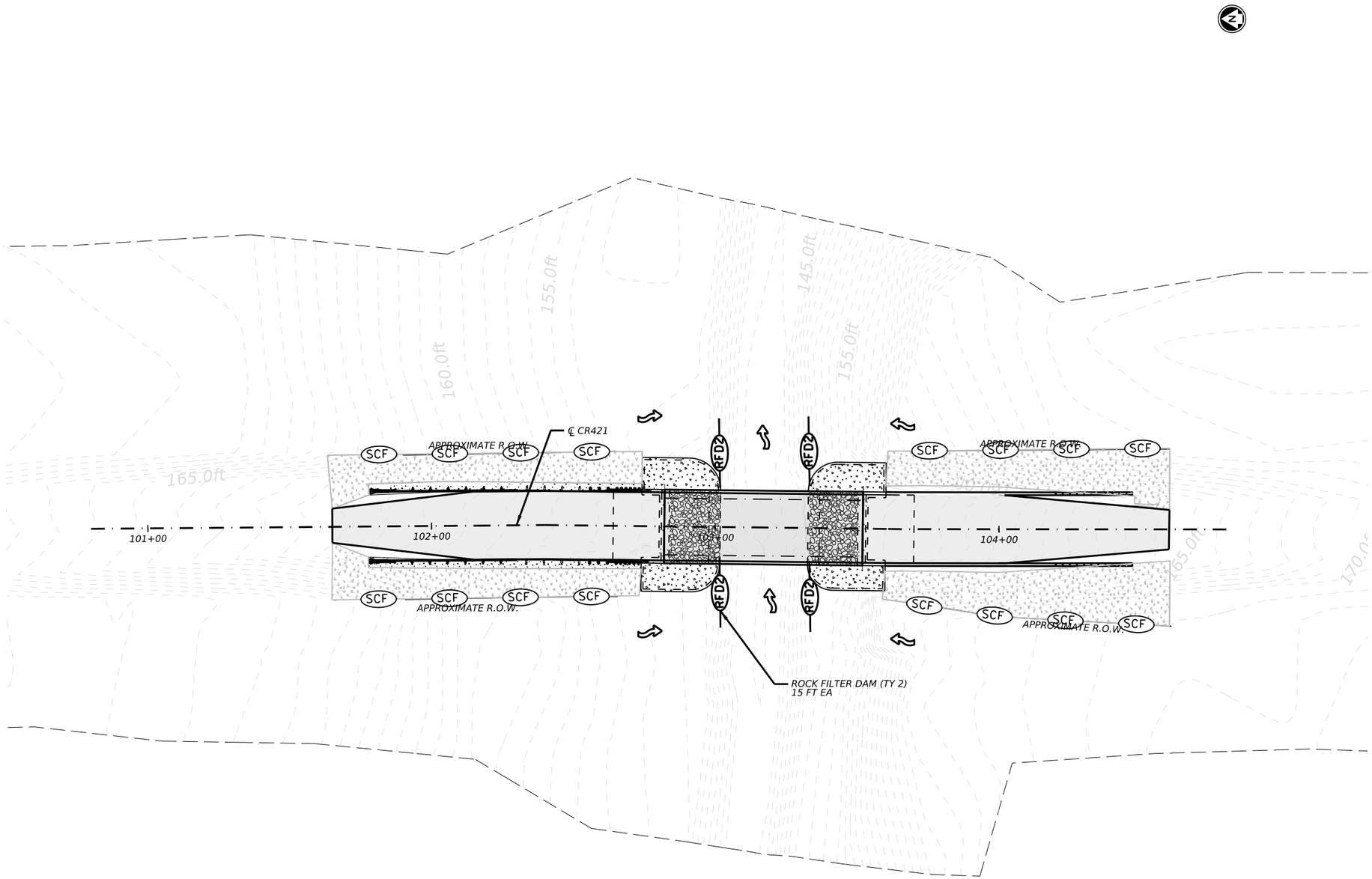
ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR	
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0916	25	019	CR 1187	
12-12-2011 (DS)	DIST	COUNTY		SHEET NO.	
05-07-14 ADDED NOTE SECTION IV.	CRP	BEE		100	
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.					

KM CK: KP DW:
KM CK: KP DW:

0 20 40
SCALE IN FEET



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- DRAINAGE FLOW ARROWS
- SEEDING AREA
- PERMANENT PAVEMENT
- RIPRAP (CONCRETE)
- RIPRAP (STONE PROTECTION)

NOTE:

1. AREAS NOT SHOWN BY SEEDING OR AREAS CONSIDERED TO BE VEGETATION BUFFERS AND MAY NOT BE DISTURBED UNLESS AS DIRECTED.
2. EROSION CONTROL QUANTITIES LISTED ARE APPROXIMATE AND MAY NEED TO BE VARIED TO MEET FIELD CONDITIONS.

Jacobs Engineering Group
STATE OF TEXAS
KIRANKUMAR PATIL
129587
LICENSED PROFESSIONAL ENGINEER
F-2966

03/28/2023

Jacobs
1999 BRYAN ST, SUITE 3500
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

Texas Department of Transportation

CR 421

ENVIRONMENTAL SW3P LAYOUT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0916	25	019	CR 1187
DIST	COUNTY		SHEET NO.
CRP	BEE		101

DATE: 3/28/2023 9:08 AM
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DATE:
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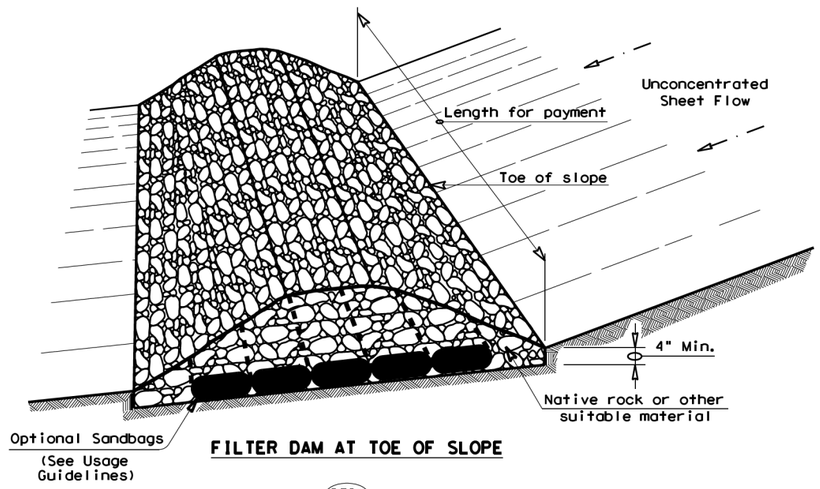
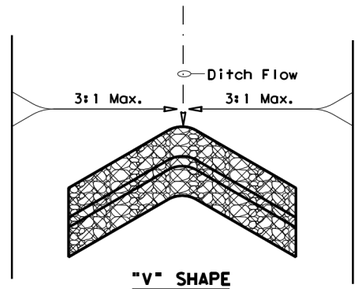
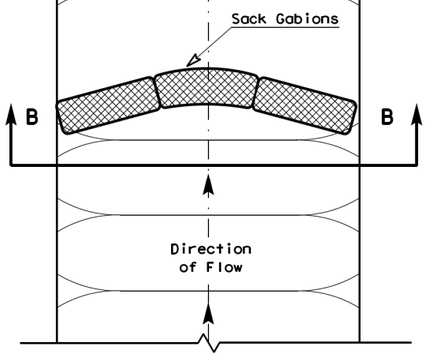


FILTER DAM AT TOE OF SLOPE

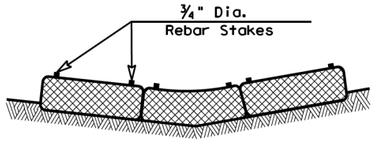
RFD1



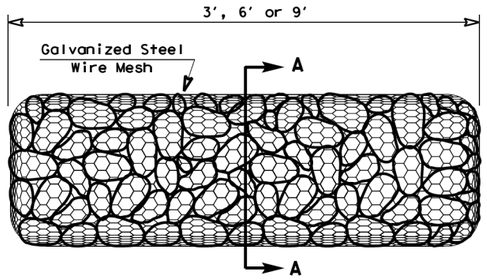
"V" SHAPE PLAN VIEW



PLAN VIEW

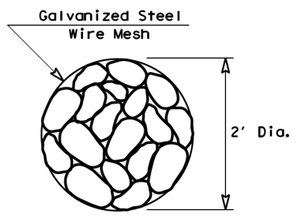


SECTION B-B

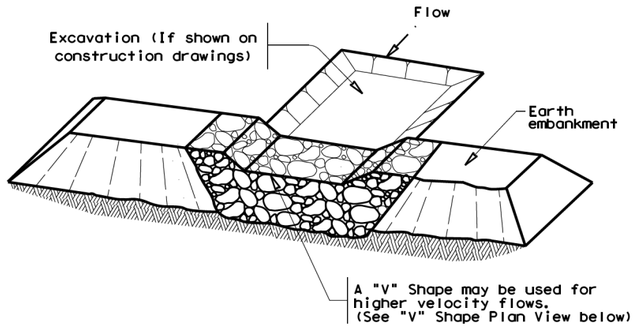


TYPE 4 (SACK GABIONS)

RFD4

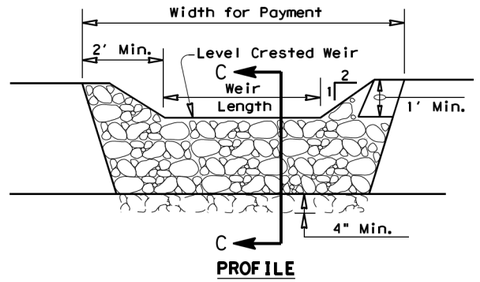


SECTION A-A

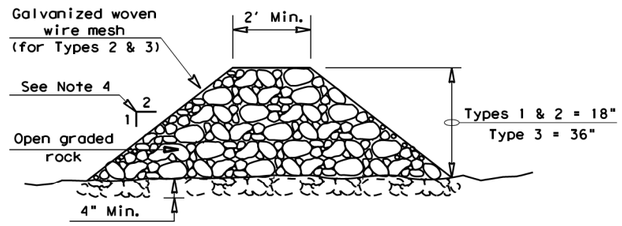


FILTER DAM AT SEDIMENT TRAP

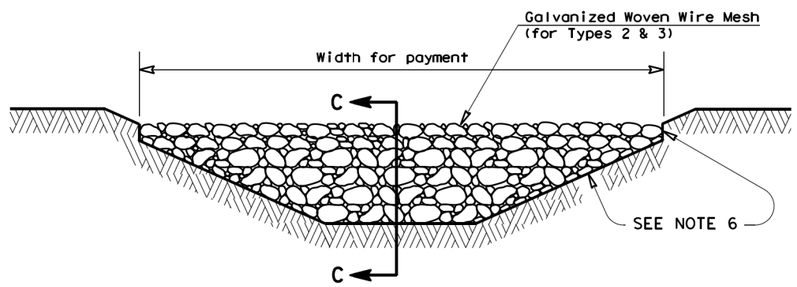
RFD1 — OR — RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3
Type 4 Rock Filter Dam — RFD4

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DW/CK: LS
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