

STATE OF TEXAS

DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

PROJECT NO: BR 2023(771)

FM 978
MADISON COUNTY

TOTAL LENGTH OF PROJECT = 1,090.00 FT = 0.206 MI

FOR THE CONSTRUCTION OF A BRIDGE REPLACEMENT
CONSISTING OF REPLACE BRIDGE AND APPROACHES

SEE SHEET 2
FOR INDEX OF SHEETS
AND SHEET 3 FOR
PROJECT LOCATION MAP

FED. RD. DIV. NO.	FEDERAL AID-PROJECT NO.	HIGHWAY NO.	
6	BR 2023(771)	FM 978	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	MADISON	
CONTROL	SECTION	JOB	SHEET NO.
0552	02	027	1

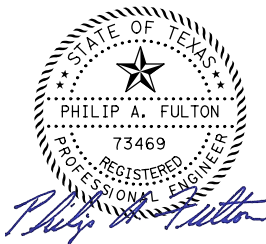
DESIGN SPEED: 50 MPH

Registered Accessibility Specialist (RAS) Inspection Not Required

FINAL PLANS

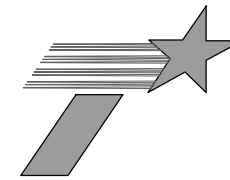
CONTRACTOR: _____
 LETTING DATE: _____
 DATE CONTRACTOR BEGAN WORK: _____
 DATE WORK WAS COMPLETED: _____
 DATE WORK WAS ACCEPTED: _____
 FINAL CONTRACT COST: \$ _____

LOCATION NO.	HIGHWAY	CONTROL NO.	EXIST NBI NO.	LIMITS	ADT	REFERENCE MARKERS		RDWY LENGTH (FT)	BRIDGE LENGTH (FT)	TOTAL LENGTH (FT)
						BEGIN	END			
1	FM 978	0552-02-027	17-154-0-0552-02-010 17-154-0-0552-02-011	AT MUSTANG CREEK	ADT 2020: 908 ADT 2041: 1,271	RM: 642+1.343 MP: 11.304	RM: 642+1.549 MP: 11.510	530.00	560.00	1090.00
TOTAL=1090.00 FT 0.206 MI										



03/17/2023

HDR ENGINEERING, INC.
TBPE F-754



TEXAS DEPARTMENT OF TRANSPORTATION®

SUBMITTED FOR LETTING: 3/30/2023
 Recommended by: *Luca N...*
 01EBC5C65E334CE
 BRIDGE ENGINEER

RECOMMENDED FOR LETTING: 3/30/2023
 Recommended by: *Dave J...*
 DAA3B0624EE3419
 DIRECTOR OF TRANSPORTATION
 PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 3/30/2023
 Approved by: *Chad Bolone*
 60E5537715D24EA
 DISTRICT ENGINEER

NO EXCEPTIONS
NO EQUATIONS
NO RAILROAD CROSSINGS

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, AND SPECIFICATION ITEMS LISTED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, JULY 5, 2022)


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7, 7A	SUMMARY OF QUANTITIES
8	SUMMARY OF SMALL SIGNS
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22A	*WZ(STPM)-23
22B	*WZ(RS)-22
22C	*TCP(1-2)-18
22D	*TCP(3-1)-13
22E	*TCP(3-3)-14
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68	**IGSK
69	**IGTS
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72 - 75	**PCP
76	**PCP-FAB
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79 - 80	NOT USED
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83 - 84	**SRR
85 - 87	**TYPE T223

SHEET NUMBERS	DESCRIPTION
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PLOT DRIVER: TXDOT_PDF_LM.pltcfq
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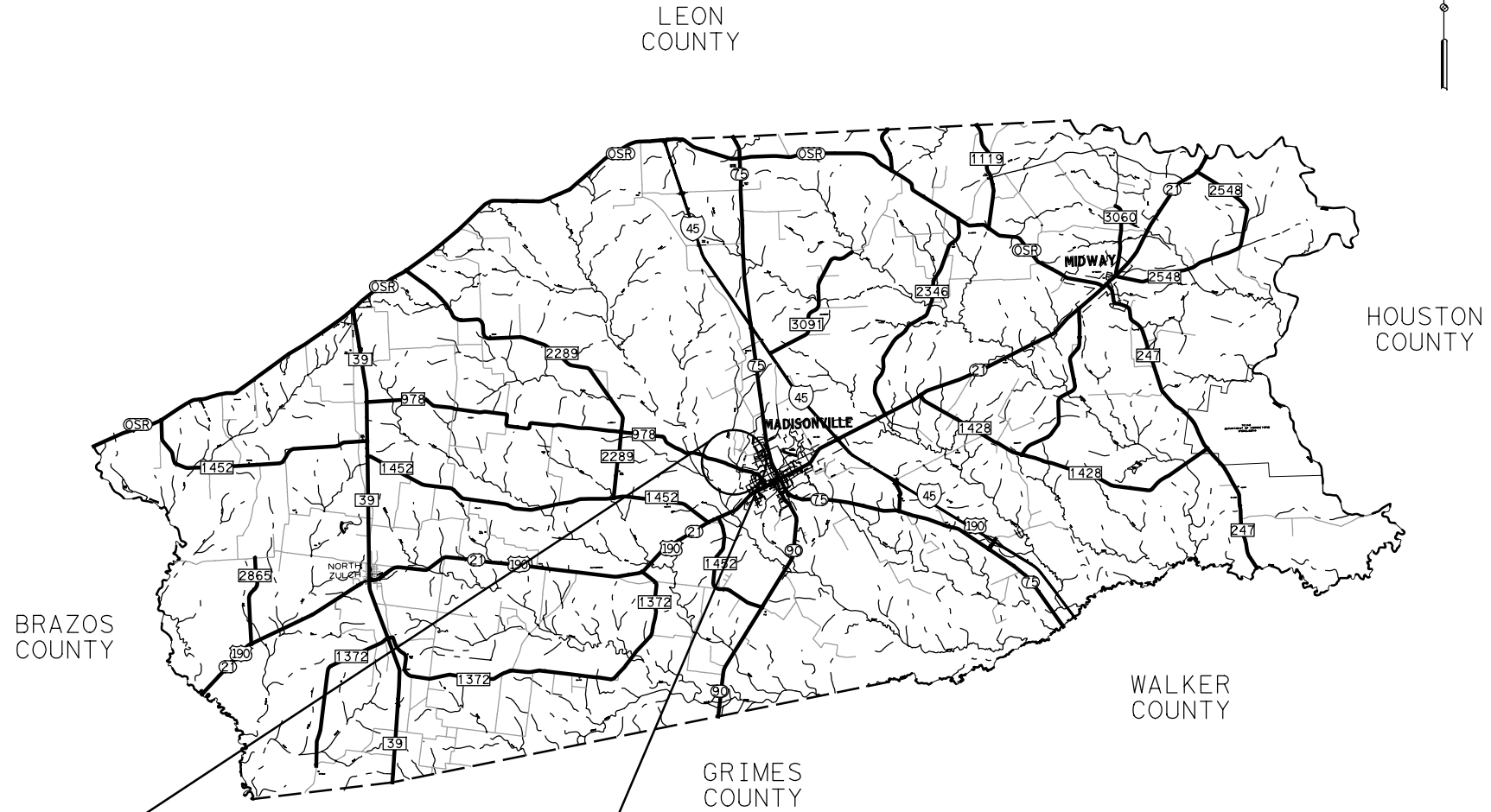
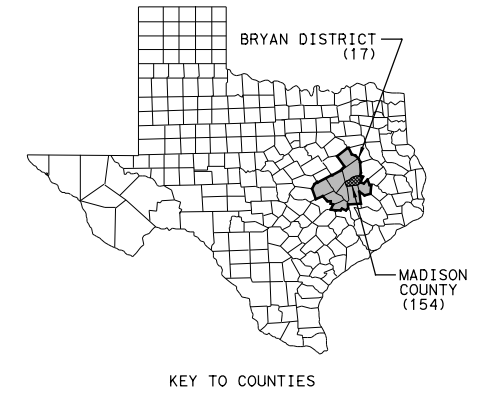

Philip A. Fulton
 03/23/2023

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


David P. Hohmann
 3/22/2023

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

NO.	DATE	REVISION	APPROVED
HDR		HDR Firm Registration No. F-754 710 Hesters Crossing, Suite 150 Round Rock, Texas 78681 512.685.2900	
 Texas Department of Transportation © 2023			
INDEX OF SHEETS			
FM 978			
SHEET 1 OF 1			
FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 978
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	BRY	MADISON	2
CONTROL	SECTION	JOB	
0552	02	027	

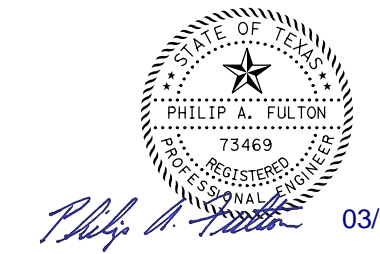


NOTES:

1. REFERENCE MARKERS AND MILE POINTS SHOWN ON THIS SHEET AND THE TITLE SHEET ARE FOR REFERENCE PURPOSES ONLY. THE PROJECT LIMIT STATIONS SHOWN REPRESENT THE PROJECT CONSTRUCTION LENGTH. THE PROJECT QUANTITIES ARE BASED ON STATIONS, NOT THE MILE POINTS OR REFERENCE MARKERS.

BEGIN PROJECT
 BEGIN CSJ: 0552-02-027
 STA 17+00.00
 RM: 642+1.343
 MP: 11.304

END PROJECT
 END CSJ: 0552-02-027
 STA 27+90.00
 RM: 642+1.549
 MP: 11.510



NO.	DATE	REVISION	APPROVED

HDR
 HDR Firm Registration No. F-754
 710 Hesters Crossing, Suite 150
 Round Rock, Texas 78681
 512.685.2900

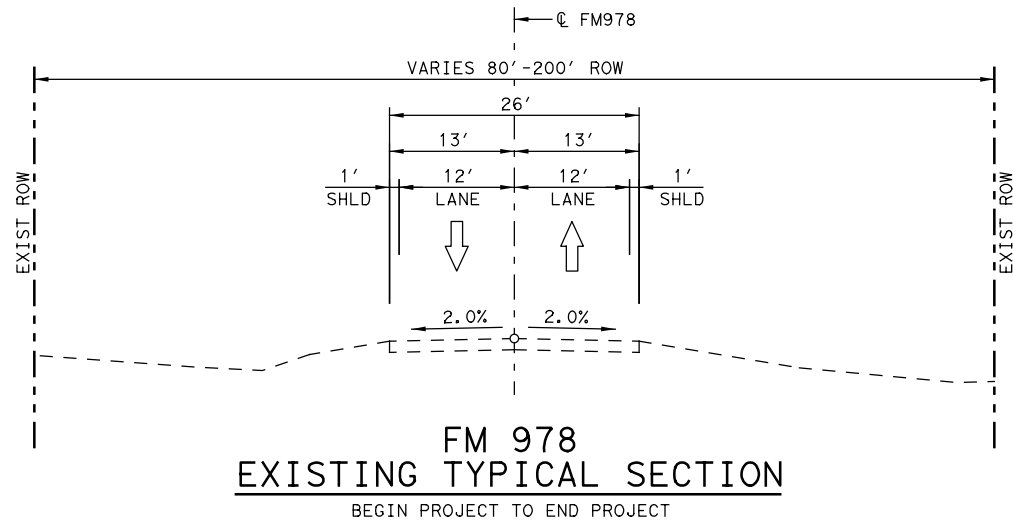


PROJECT LOCATION MAP

FM 978

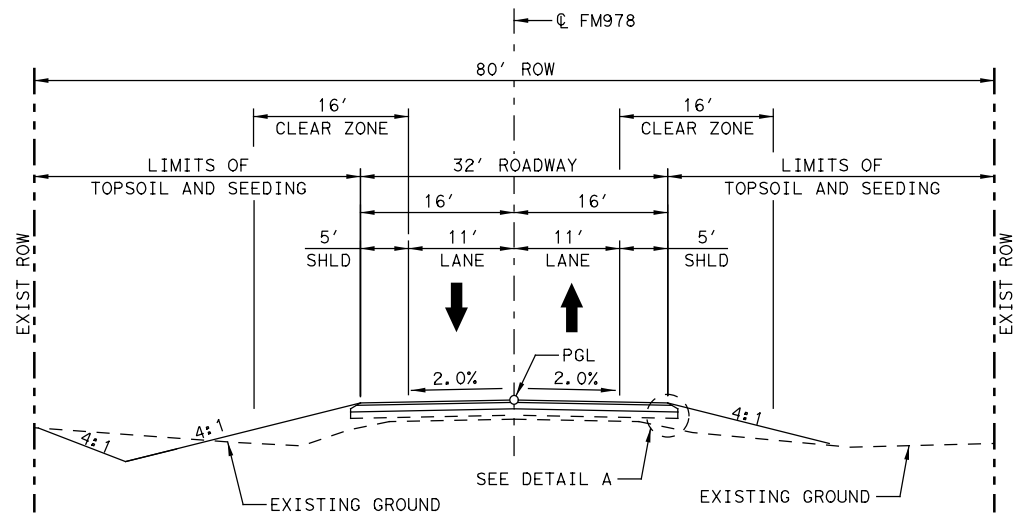
NOT TO SCALE SHEET 1 OF 1

FED. RD. DIV. NO.:	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 978
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	BRY	MADISON	3
CONTROL	SECTION	JOB	
0552	02	027	



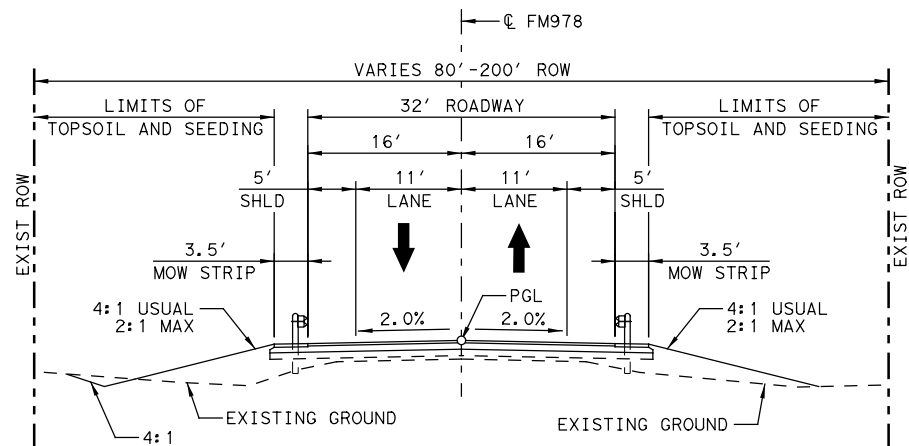
**FM 978
EXISTING TYPICAL SECTION**

BEGIN PROJECT TO END PROJECT



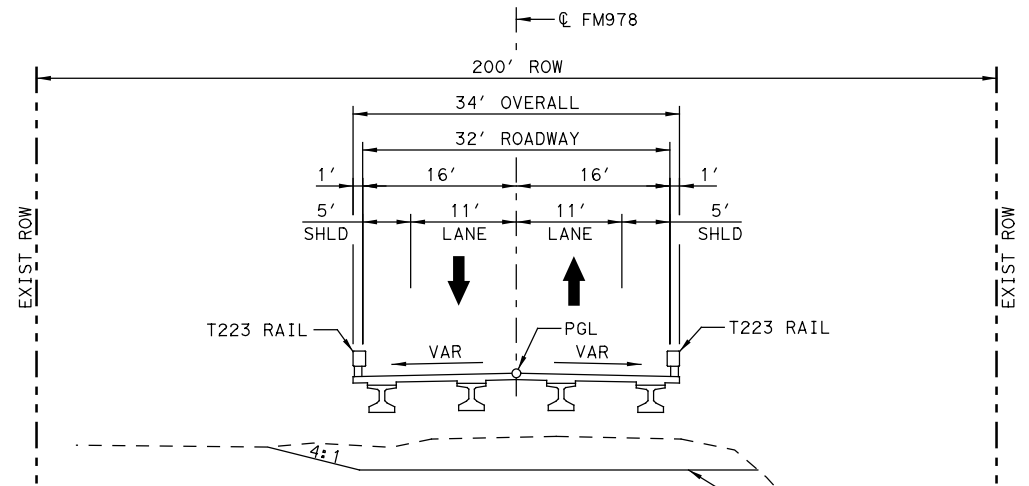
**FM 978
PROPOSED TYPICAL SECTION**

BEGIN PROJECT TO STA 17+08
STA 27+50 TO END PROJECT



**FM 978
PROPOSED TYPICAL SECTION**

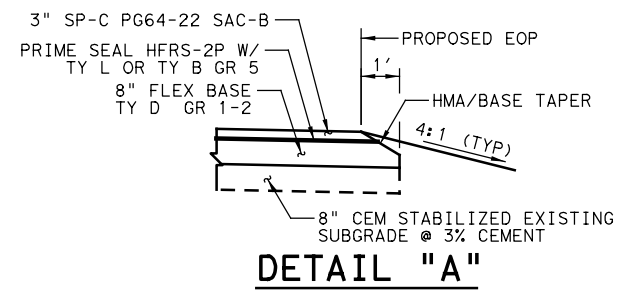
STA 17+08 TO STA 19+10
STA 24+70 TO STA 27+50



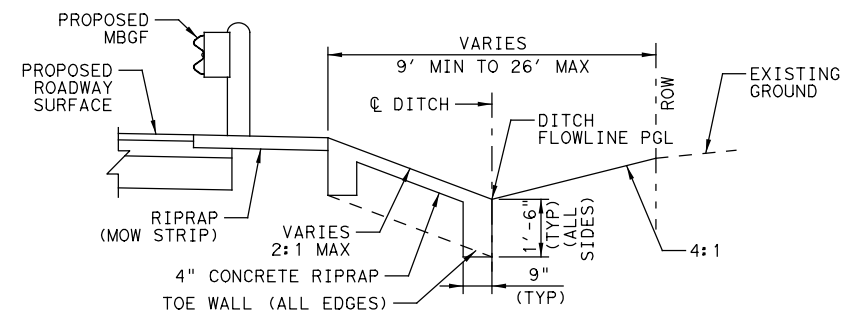
**FM 978
PROPOSED TYPICAL SECTION**

STA 19+10 TO STA 24+70 (BRIDGE)

EXCAVATE BENEATH PROPOSED BRIDGE AS SHOWN ON CROSS SECTIONS



DETAIL "A"

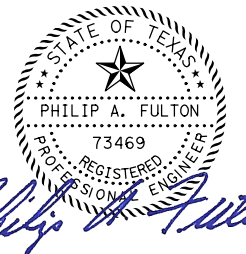


CONCRETE LINED V-DITCH DETAIL

STA 24+82 TO STA 26+00 LT
STA 24+82 TO STA 26+35 RT

NOTES:

- EXISTING PAVEMENT OUTSIDE OF PROPOSED ABUTMENT LIMITS CAN BE LEFT IN PLACE, OR USED AS EMBANKMENT, OR BECOME PROPERTY OF THE CONTRACTOR, AND MAY REPLACE EMBANKMENT AS LONG AS IT MEETS ITEM 132-6006 SPECIFICATION REQUIREMENTS. THIS WILL NOT BE COMPENSATED DIRECTLY, AND WILL BE CONSIDERED SUBSIDIARY TO THE OTHER ITEMS



06/18/2020

NO.	DATE	REVISION	APPROVED

HDR
HDR Firm Registration No. F-754
710 Hesters Crossing, Suite 150
Round Rock, Texas 78681
512.685.2900



TYPICAL SECTIONS

FM 978

NOT TO SCALE			SHEET 1 OF 1
FED. RD. DIV. NO.:	FEDERAL PROJECT NO.	HIGHWAY NO.	
6	SEE TITLE SHEET	FM 978	
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	BRY	MADISON	4
CONTROL	SECTION	JOB	
0552	02	027	

Highway: FM 978
 County: Madison

Control: 0552-02-027

BASIS OF ESTIMATE					
ITEM	DESCRIPTION	COURSE	RATE	AMOUNT	QUANTITY
168-6001	VEGETATIVE WATERING		10 GAL/SY	3,588 SY	35.9 MG
275-6001	CEMENT	8" SUBGRADE 3% 110 LB/CF	0.0099 TON/SY	2,261 SY	22 TON
316-6026	ASPH (HFRS-2P)	PRIME SEAL	0.25 GAL/SY	2,198 SY	550 GAL
316-6403	AGGR (TY-B GR-5 OR TY-L GR-5)	PRIME SEAL	1 CY/135 SY	2,198 SY	16 CY
3077-6013	SP MIXES SP-C SAC-B PG64-22	3"	330 LB/SY	1,721 SY	284 TON

BASIS OF ESTIMATE * for contractor's information only					
ITEM	DESCRIPTION	COURSE	RATE	AMOUNT	QUANTITY
166-6002*	FERTILIZER **		60 LB/AC	0.74 AC	0.02 TON

Note: Rates are for estimating purposes only. Actual Rates will be determined in the field.
 ** Tonnage represents Nitrogen content only.

GENERAL:

Contractor questions on this project are to be addressed to the following individual(s):
 Delmy Reyes, P.E., A.E., Delmy.Reyes@txdot.gov
 Matt Hensarling, P.E., A.A.E., Matt.Hensarling@txdot.gov

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>

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.

Highway: FM 978
 County: Madison

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For non-bridge items, send eligible shop plan submittals with PDF attachments directly to the reviewing office. Submit bridge, retaining wall, and structural item shop drawings following the directions described at <http://www.txdot.gov/business/resources/specifications/shop-drawings.html>

ITEM 5 “CONTROL OF THE WORK”

Prior to letting, earthwork construction cross-section data is available at the Area Engineer’s office in *Huntsville* for inspection by prospective bidders. In addition, bidders may request electronic earthwork construction cross-section data by sending an email to: Delmy.Reyes@txdot.gov.

Earthwork files will be provided by email or by using TxDOT’s FTP Service. These cross-sections are for non-construction purposes only, and it is the responsibility of the prospective bidder to validate the data for this project.

After letting, the Engineer will provide final earthwork construction cross-section data necessary for the contractor to establish and control the work.

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 “CONTROL OF MATERIALS”

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.

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ITEM 7 “LEGAL RELATIONS AND RESPONSIBILITIES”

State contract mowers will mow the right of way during the growing season. The Contractor will be notified by the Engineer one week in advance of the anticipated time when mowers will be in the limits of the project. Clean the right of way to such a condition that allows the mowing contractors to safely mow.

In the event of the declaration of a hurricane watch, warning, other severe weather warning or national or state emergency that requires the roadways in the vicinity be used as evacuation routes, cease all work that requires the Contractor’s, sub-contractors’ or material suppliers’ vehicles to enter the stream of traffic on these primary or secondary evacuation routes. This work includes material hauling and delivery, and mobilization or demobilization of equipment.

The following roadways are recognized evacuation routes in the Bryan District:

Primary Evacuation Routes: IH 45, US 290, SH 6, SH 36.

Secondary Evacuation Routes: US 79, US 84, SH 7, SH 30, SH 21, SH 105.

Other routes may be designated.

No significant traffic generator events identified.

ITEM 8 “PROSECUTION AND PROGRESS”

The following standard detail sheets have been modified.
BAS-A, SIG-32, IGND

By noon of each Wednesday, provide the Engineer a written outline of the daily work schedule for the following week. Include in the outline the times and places for proposed traffic control changes, lane and shoulder closures, and moving operations or other operations that affect traffic on the roadway. Unless otherwise authorized by the Engineer, prosecute the work on this project in accordance with the following sequence of work:

- 1) Set advance signing and barricades; install SW3P devices; implement detour plan; construct bridge and approach pavement; complete MBGF and mow strip. Stabilize disturbed soils (temporary and/or permanent). Note: Place two Portable Changeable Message Signs (PCMS) one week prior to closing FM 978.
- 2) Place final HMAC pavement; stabilize disturbed soil (permanent). Place permanent pavement markings, signage, and delineation.

Highway: FM 978
County: Madison

Control: 0552-02-027

- 3) Final cleanup and stabilization of disturbed soil. Remove SW3P devices. Remove detour signage and re-open FM 978.

Some of these operations may be performed simultaneously.

Prepare Progress Schedule Bar Chart.

Working days will be computed and charged in accordance with Article 8.3.1.1. Five-Day Workweek.

Work is allowed to be performed during the nighttime.

Equipment and material may be pre-staged at approved locations.

The 90-day delayed start allowed after authorization under SP008-003 is for Contractor time for material acquisition.

ITEM 100 “PREPARING RIGHT OF WAY”

During burn bans obtain written approval from the Commissioners Court prior to burning brush.

Prevent ashes from burned vegetation to be transported into any stream.

If burning is not allowed, all trees and brush will be disposed of by shredding, logging or other methods approved by the Engineer. Create a windrow, stockpile, or topdress biomass on disturbed areas along the project at locations approved by necessary permits and the Engineer.

ITEM 105 “REMOVING TREATED AND UNTREATED BASE AND ASPHALT PAVEMENT”

Take ownership of reclaimed asphalt material.

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County: Madison

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ITEM 132 “EMBANKMENT”

Provide Embankment material for areas within the limits of the Pavement Structure that meet one of the following requirements:

- Sources outside the ROW provide material with a plasticity index between 10 and 25 and with less than 30% silt.
- Sources within the ROW provide material with a plasticity index between 10 and 25 and with less than 30% silt.

Provide Embankment material for areas outside the limits of the Pavement Structure with a plasticity index between 10 and 35.

ITEM 160 “TOPSOIL”

All slopes requiring topsoil will be tracked immediately upon final grading to prevent erosion per standard sheet EC(1)-16. Tracking slopes to prevent erosion will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Topsoil may be obtained from the right of way at sites of proposed excavation and embankment.

ITEM 166 “FERTILIZER”

Fertilize all areas of project that are being seeded or sodded.

ITEM 168 “VEGETATIVE WATERING”

Vegetative watering is required for all areas of the project that are being seeded or sodded.

ITEM 247 “FLEXIBLE BASE”

Place flexible base in equal lifts of 4 to 8 in. in depth unless otherwise approved by the Engineer.

ITEM 301 “ASPHALT ANTISTRIPPING AGENT”

When the Contractor adds lime as an anti-stripping agent (or an equivalent anti-stripping agent) the lime or equivalent shall be added to the asphaltic concrete in the methods specified in this item unless otherwise approved by the Engineer. If an alternate method is proposed, the Engineer’s approval will be based on test method Tex-242-F performed on the asphaltic concrete produced through the plant.

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ITEM 316 “SEAL COAT”

Remove vegetation and blade pavement edges.

When placing surface treatment on base material, prepare surface by sweeping or other approved methods. Before applying bituminous material, lightly sprinkle the surface with water. When directed, sweep the surface after sprinkling with water. Do not apply bituminous material when water is puddling on the surface.

Sweep excess aggregate no sooner than 2 hours after rolling or as directed.

Vehicles used to haul aggregate from the stockpile to the chip spreader will not be overloaded. Any damage to the roadway caused by the vehicles will be repaired by the Contractor at his expense and subsequent loads will be reduced so as not to cause further damage.

Transverse variance rates shall be used as directed. The nozzles outside the wheel paths will output up to 20% more asphalt by volume than the nozzles over the wheel paths.

The Contractor may be required to furnish and set string line to insure straight and uniform alignment as directed by the Engineer. The Contractor may use other methods subject to approval of the Engineer.

Cure surface treatments placed with an emulsion asphalt binder for 7 days before placing subsequent surface courses unless otherwise directed by the engineer.

ITEM 320 “EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT”

Unless otherwise approved by the Engineer, provide a Material Transfer Device with remixing capabilities as specified in Item 320.2.3.3 Placement and Compaction Equipment for all asphaltic concrete pavement.

ITEM 416 “DRILLED SHAFT FOUNDATIONS”

Stake foundation locations and have them approved by the Engineer before installation.

ITEM 421 “HYDRAULIC CEMENT CONCRETE”

Optimized Aggregate Gradation is required for this project.

Highway: FM 978
County: Madison

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ITEM 432 “RIPRAP”

Concrete from existing culvert structures to be removed may be used as ‘Stone Protection’ as long as the concrete pieces meet all other requirements of this Item.

ITEM 496 “REMOVING STRUCTURES”

Notify the Engineer of the exact date of bridge removal at least twenty (20) working days prior to the removal of the existing structure to allow for compliance with the Texas Department of State Health Services requirements for structural demolition. Bridge removal will not be allowed to take place until this notice is given.

ITEM 502 “BARRICADES, SIGNS AND TRAFFIC HANDLING”

Removal of ground mounted temporary signs and supports as specified on standard sheet BC(5), shall include the immediate backfilling of support holes with Type B embankment material and the compaction of the backfill material.

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.

ITEM 529 “CONCRETE CURB, GUTTER, AND COMBINED CURB AND GUTTER”

Provide steel reinforcement in all concrete curb, gutter, and combined curb and gutter in accordance with the plans and specifications.

ITEM 540 “METAL BEAM GUARD FENCE”

Furnish and Install only one type of timber post.

ITEM 544 “GUARDRAIL END TREATMENTS”

Furnish and install only MASH compliant guardrail end treatments.

Highway: FM 978
County: Madison

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ITEM 644 “SMALL ROADSIDE SIGN ASSEMBLIES”

Salvage and deliver all aluminum sign faces to the local TxDOT maintenance office.

ITEM 666 “REFLECTORIZED PAVEMENT MARKINGS”

Unless authorized by the Engineer, the Contractor will not place the pavement markings on the resurfaced roadway until it has cured for 3 days.

All striping limits must be approved by the Engineer before striping operations may begin.

Use an acrylic sealer on concrete pavement.

ITEM 672 “RAISED PAVEMENT MARKERS”

Use flexible bituminous adhesive for applications on all pavement types.

ITEM 3077 “SUPERPAVE MIXTURES”

Hydrated lime, commercial lime slurry or an equivalent anti-stripping agent may be used. If hydrated lime or commercial lime slurry is used up to 1.0 percent may be added. If an equivalent anti-stripping agent is used, add according to manufacturers recommendations. Provide hydrated lime or commercial lime slurry in accordance with DMS-6350, “Lime and Lime Slurry”. Add hydrated lime, commercial lime slurry, or an equivalent anti-stripping agent in accordance with Section 301.4.2.

Apply tack coat through a distributor spray bar in accordance with Section 316.3.1. Distributor. If residual from emulsion tack is not tacky, then the Engineer can require the use of PG binder.

RAS is not permitted in thin level-up courses.

ITEM 6001 “PORTABLE CHANGEABLE MESSAGE SIGN”

Furnish, install, and operate up to 2 Portable Changeable Message Signs (PCMS) for this project. The signs can be used both on the project and within a ten (10) mile radius of the project. Locations, messages, and durations of use will be specified by the Engineer. The primary uses will be to inform the public of special events, lane and road closures, and changes in traffic control. Signs will be paid for only when used as directed by the Engineer.

Highway: FM 978
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ITEM 6185 “TRUCK MOUNTED ATTENUATOR (TMA) AND TRAILER ATTENUATOR (TA)”

In addition to the shadow vehicles with truck mounted attenuator (TMA) that are specified as being required on the traffic control plan (TCP) for this project,

provide one (1) shadow vehicle with TMA for TCP(1-2)-18 as detailed on General Note 5 of this standard sheet.

provide two (2) (shadow and trail) vehicle(s) with TMA for TCP(3-1)-13 as detailed on General Note 3 of this standard sheet.

provide two (2) (shadow and trail) vehicle(s) with TMA for TCP(3-3)-14 as detailed on General Note 3 of this standard sheet.

provide one (1) shadow vehicle(s) with TMA for TCP(S-1)-08A as detailed on General Note 4 of this standard sheet.

provide one (1) shadow vehicle(s) with TMA for TCP(S-2)-08A as detailed on General Note 11 of this standard sheet.

Therefore, seven (7) total shadow vehicles with TMA will be required for this type of work. The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

Ten (10) TMA days are provided in the project estimate for stationary operations. Four (4) TMA days are provided in the project estimate for mobile operations.



CONTROLLING PROJECT ID 0552-02-027

DISTRICT Bryan
HIGHWAY FM 978

Estimate & Quantity Sheet

COUNTY Madison

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	100-6002	PREPARING ROW	STA	11.000	
	105-6108	RMV STAB BASE & ASPH PV (17")	SY	2,933.000	
	110-6001	EXCAVATION (ROADWAY)	CY	4,024.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	2,944.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	3,588.000	
	164-6021	CELL FBR MLCH SEED(PERM)(RURAL)(SANDY)	SY	3,588.000	
	164-6029	CELL FBR MLCH SEED(TEMP)(WARM)	SY	1,794.000	
	164-6031	CELL FBR MLCH SEED(TEMP)(COOL)	SY	1,794.000	
	168-6001	VEGETATIVE WATERING	MG	35.900	
	247-6312	FL BS (CMP IN PLC)(TY D GR1-2)(8")	SY	2,261.000	
	275-6001	CEMENT	TON	22.000	
	275-6010	CEMENT TREAT (SUBGRADE) (8")	SY	2,261.000	
	316-6026	ASPH (HFRS-2P)	GAL	550.000	
	316-6403	AGGR (TY-B GR-5 OR TY-L GR-5)	CY	16.000	
	400-6005	CEM STABIL BKFL	CY	88.000	
	416-6004	DRILL SHAFT (36 IN)	LF	1,120.000	
	420-6013	CL C CONC (ABUT)	CY	42.200	
	420-6029	CL C CONC (CAP)	CY	114.400	
	420-6037	CL C CONC (COLUMN)	CY	33.000	
	422-6001	REINF CONC SLAB	SF	19,040.000	
	422-6015	APPROACH SLAB	CY	47.400	
	425-6035	PRESTR CONC GIRDER (TX28)	LF	2,222.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	68.000	
	432-6033	RIPRAP (STONE PROTECTION)(18 IN)	CY	1,244.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	50.000	
	450-6006	RAIL (TY T223)	LF	1,168.000	
	454-6004	ARMOR JOINT (SEALED)	LF	132.000	
	496-6001	REMOV STR (BOX CULVERT)	EA	2.000	
	496-6077	REMOVE STR (PILING)	LF	175.000	
	500-6001	MOBILIZATION	LS	1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	9.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	80.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	80.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	111.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	111.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	2,036.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	2,036.000	
	529-6002	CONC CURB (TY II)	LF	52.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	600.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	1,475.000	

DISTRICT	COUNTY	CCSJ	SHEET
Bryan	Madison	0552-02-027	6



CONTROLLING PROJECT ID 0552-02-027

DISTRICT Bryan
HIGHWAY FM 978

COUNTY Madison

Estimate & Quantity Sheet

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	6.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	3.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	1.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	10.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	12.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	113.000	
	666-6225	PAVEMENT SEALER 6"	LF	2,400.000	
	666-6308	RE PM W/RET REQ TY I (W)6"(SLD)(090MIL)	LF	2,180.000	
	666-6317	RE PM W/RET REQ TY I (Y)6"(BRK)(090MIL)	LF	50.000	
	666-6320	RE PM W/RET REQ TY I (Y)6"(SLD)(090MIL)	LF	1,965.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	27.000	
	678-6002	PAV SURF PREP FOR MRK (6")	LF	2,400.000	
	678-6033	PAV SURF PREP FOR MRK (RPM)	EA	27.000	
	3077-6013	SP MIXESSP-CSAC-B PG64-22	TON	284.000	
	4171-6001	INSTALL BRIDGE IDENTIFICATION NUMBERS	EA	2.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000	
	6185-6002	TMA (STATIONARY)	DAY	10.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	4.000	
18		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000	

SUMMARY OF ENVIRONMENTAL QUANTITIES

	160 6003	164 6021	164 6029	164 6031	168 6001	506 6002	506 6011	506 6020	506 6024	506 6038	506 6039
LOCATION	FURNISHING AND PLACING TOPSOIL (4")	CELL FBR MLCH SEED (PERM) (RURAL) (SANDY)	CELL FBR MLCH SEED (TEMP) (WARM)	CELL FBR MLCH SEED (TEMP) (COOL)	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
	SY	SY	SY	SY	SY	LF	LF	SY	SY	LF	LF
SW3P PLAN											
FM978	3,588	3,588	1,794	1,794	3,588*	80	80	111	111	2,036	2,036

SUMMARY OF ROADWAY QUANTITIES



	247 6312	275 6001	275 6010	316 6026	316 6403	3077 6013	432 6001	432 6045
LOCATION	FL BS (CMP IN PLC) (TY D GR1-2) (8")	CEMENT	CEMENT TREAT (SUBGRADE) (8")	ASPH (HFRS-2P)	AGGR (TY-B GR-5 OR TY-L GR-5)	SP MIXESSP-CSAC-B PG64-22	RIPRAP (CONC) (4 IN)	RIPRAP (MOW STRIP) (4 IN)
	SY	SY	SY	SY	SY	SY	CY	CY
ROADWAY PLAN AND PROFILE								
FM978	2,261	2,261*	2,261	2,198*	2,198*	1,721*	68	50

	529 6002	540 6001	540 6006	544 6001
LOCATION	CONC CURB (TY II)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)
	LF	LF	EA	EA
ROADWAY PLAN AND PROFILE				
FM978	52	600	4	4

* DENOTES ITEMS FOR CONTRACTOR INFORMATION USE ONLY. SEE BASIS OF ESTIMATE FOR APPLICATION RATES AND QUANTITIES.

SUMMARY OF REMOVAL QUANTITIES

	100 6002	105 6108	496 6001	496 6077	542 6001	544 6003	644 6076
LOCATION	PREPARING ROW	RMV STAB BASE & ASPH PV (17")	REMOV STR (BOX CULVERT)	REMOVE STR (PILING)	REMOVE METAL BEAM GUARD FENCE	GUARDRAIL END TREATMENT (REMOVE)	REMOVE SM RD SN SUP&AM
	STA	SY	EA	LF	LF	EA	EA
REMOVALS							
FM978	11	2,933	2	175	1,475	6	1

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SUMMARY OF QUANTITIES			
FM 978			
SHEET 1 OF 2			
FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 978
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	BRY	MADISON	7
CONTROL	SECTION	JOB	
0552	02	027	

SUMMARY OF SIGNING AND PAVEMENT MARKING QUANTITIES

LOCATION	644	658	658	662	666	666	666	666	672	678	678
	6001	6014	6062	6111	6225	6308	6317	6320	6009	6002	6033
	IN SM RD SN SUP&AM TY10BWG (1) SA (P)	INSL DEL ASSM (D-SW) SZ (BRF) CTB (BI)	INSL DEL ASSM (D-SW) SZ 1 (BRF) GF2 (BI)	WK ZN PAV MRK SHT TERM (TAB) TY Y-2	PAVEMENT SEALER 6"	RE PM W/RET REQ TY I (W) 6" (SLD) (090MIL)	RE PM W/RET REQ TY I (Y) 6" (BRK) (090MIL)	RE PM W/RET REQ TY I (Y) 6" (SLD) (090MIL)	REFL PAV MRKR TY II-A-A	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (RPM)
EA	EA	EA	EA	LF	LF	LF	LF	EA	LF	EA	
SIGNING AND PAVEMENT MARKING LAYOUT											
FM978	3	10	12	113	2,400	2,180	50	1,965	27	2,400	27

SUMMARY OF ROADWAY QUANTITIES

STATION	110	132
	6001	6006
	EXCAVATION (ROADWAY) CY	EMBANKMENT (FINAL) (DENS CONT) (TY C) CY
17+00.00	0	0
17+50.00	0	29
18+00.00	2	111
18+50.00	1	234
19+00.00	7	334
19+10.00	4	309
19+50.00	306	124
20+00.00	576	0
20+50.00	358	0
21+00.00	307	0
21+50.00	314	0
22+00.00	318	0
22+50.00	321	0
23+00.00	322	0
23+50.00	161	0
24+00.00	258	0
24+50.00	510	0
24+70.00	251	149
25+00.00	0	439
25+31.00	0	330
25+50.00	0	172
26+00.00	2	338
26+50.00	3	218
26+60.00	0	34
27+00.00	0	93
27+50.00	0	59
27+90.00	0	23
PROJECT TOTALS	4,024	2,994

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		 Texas Department of Transportation © 2023		
SUMMARY OF QUANTITIES FM 978				
SHEET 2 OF 2				
FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.	
6	SEE TITLE SHEET		FM978	
STATE	DISTRICT	COUNTY		SHEET NO.
TEXAS	BRY	MADISON		7A
CONTROL	SECTION	JOB		
0552	02	027		

SUMMARY OF SMALL SIGNS

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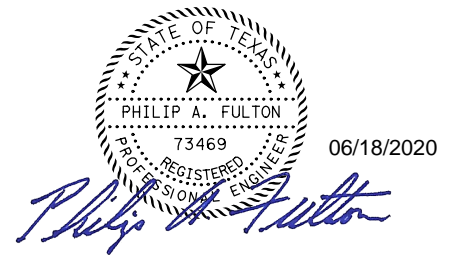
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PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)					BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
							POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION		
										PREFABRICATED	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL = Extruded Alum Sign Panels	
88	1	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36x36	x		10 BWG	1	SA	P		
	2	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36x36	x		10 BWG	1	SA	P		
	3	W3-5	25 MPH	36x36	x		10 BWG	1	SA	P		

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).

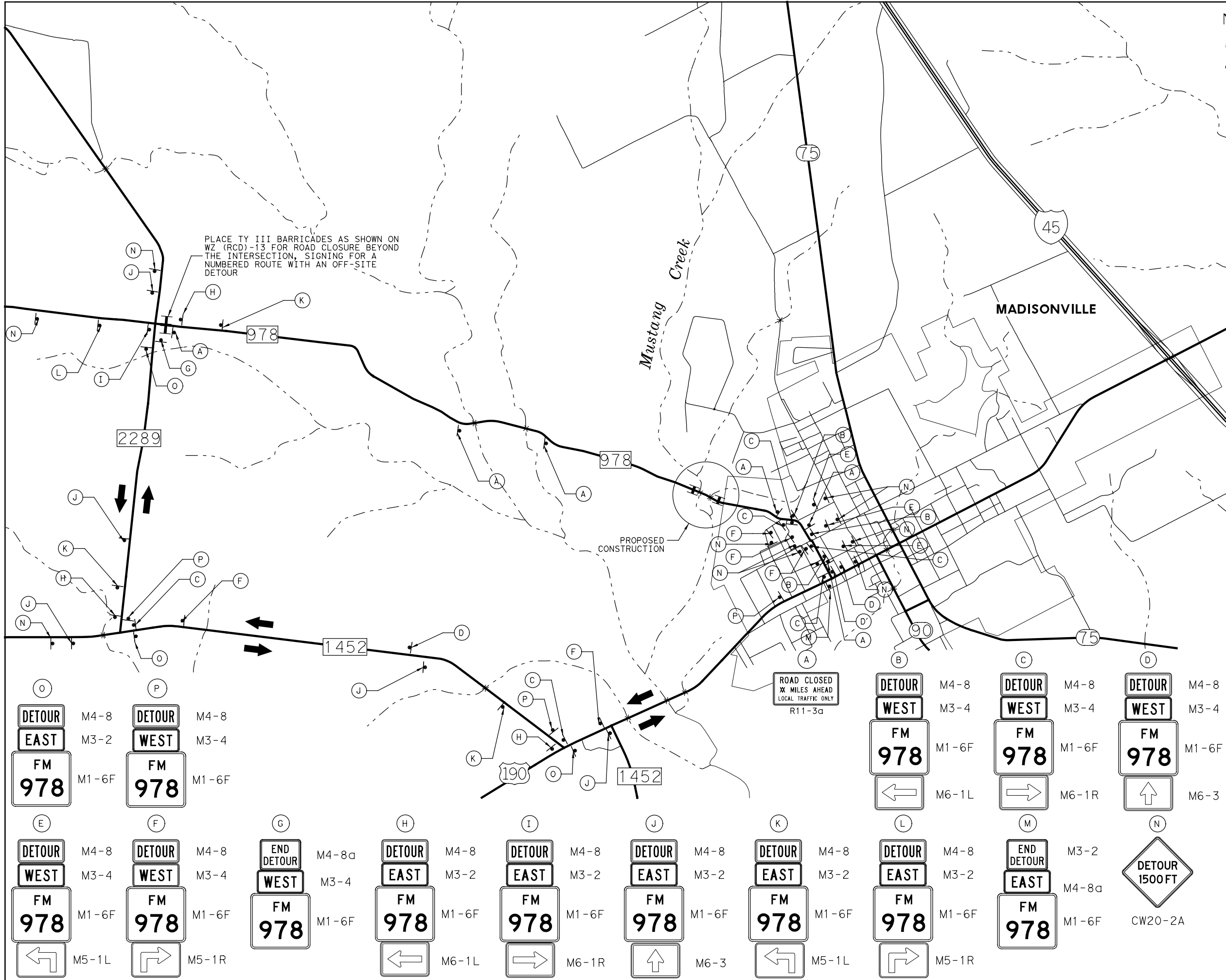


SUMMARY OF SMALL SIGNS

FM 978

SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
	REVISIONS	0552	02	027	FM978
4-16		DIST	COUNTY		SHEET NO.
8-16		BRY	MADISON		8



- NOTES:**
1. DETOUR WILL REMAIN IN PLACE THROUGHOUT THE DURATION OF CONSTRUCTION.
 2. SEE BARRICADE AND CONSTRUCTION STANDARDS FOR SIGN SPACING AND DETAILS NOT SHOWN. SIGNS MAY BE ADJUSTED TO FIELD CONDITIONS.
 3. STANDARD BC(10)-21 & WZ(RCD)-13 SHALL BE FOLLOWED FOR ALL APPLICABLE SIGN INSTALLATIONS
 4. PLACE TWO PORTABLE MESSAGE SIGNS ONE WEEK PRIOR TO CLOSING ROADWAY AND DETOURING TRAFFIC.

Philip A. Fulton 03/17/2023

NO.	DATE	REVISION	APPROVED

HDR
 Firm Registration No. F-754
 710 Hesters Crossing, Suite 150
 Round Rock, Texas 78681
 512.685.2900

Texas Department of Transportation
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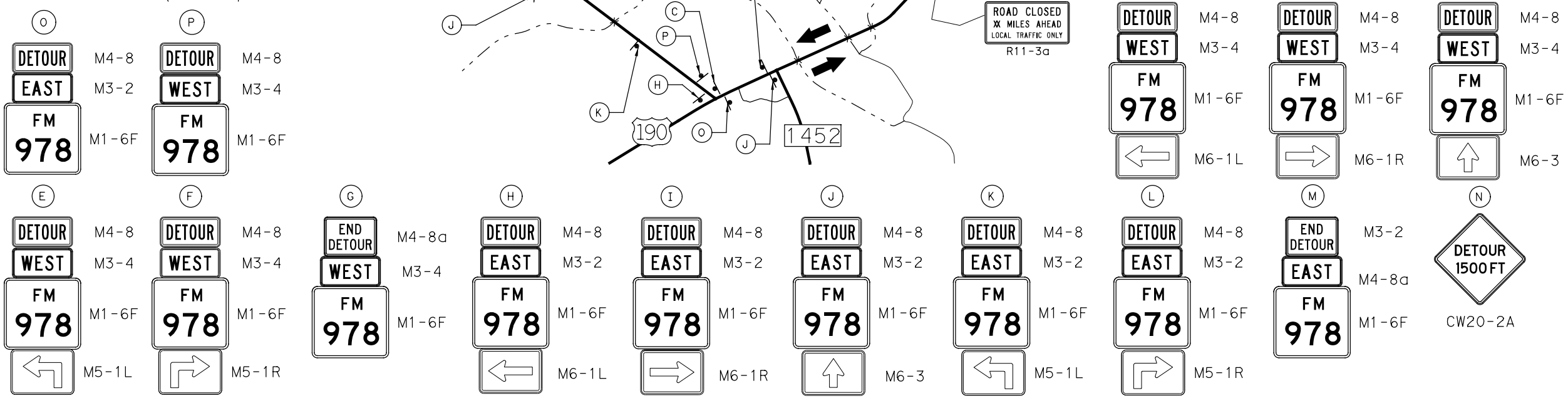
DETOUR LAYOUT

FM 978

NOT TO SCALE SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL PROJECT NO.	HIGHWAY NO.
6	SEE TITLE SHEET	FM 978
STATE	DISTRICT	COUNTY
TEXAS	BRY	MADISON
CONTROL	SECTION	JOB
0552	02	027

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

SHEET 1 OF 12



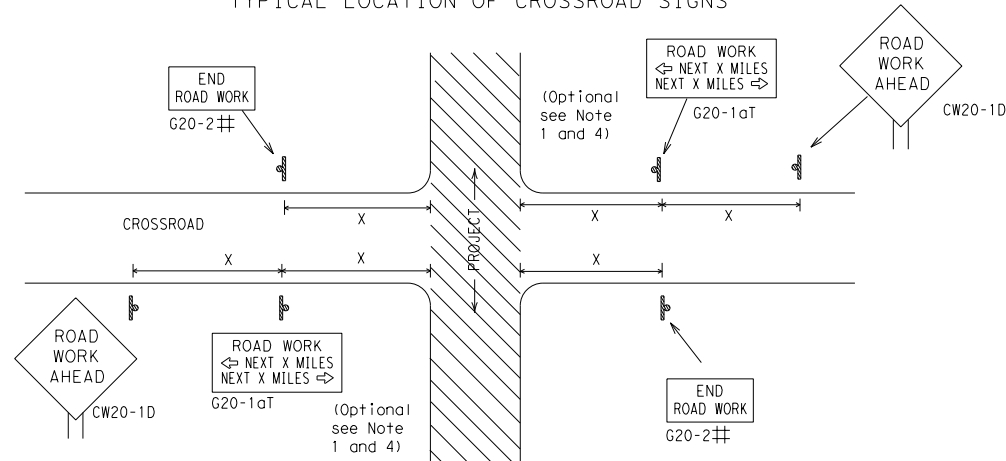
**BARRICADE AND CONSTRUCTION
GENERAL NOTES
AND REQUIREMENTS**

BC (1) - 21

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REVISIONS		0552	02	027	FM978				
4-03	7-13	DIST	COUNTY		SHEET NO.				
9-07	8-14	BRY	MADISON		10				
5-10	5-21								

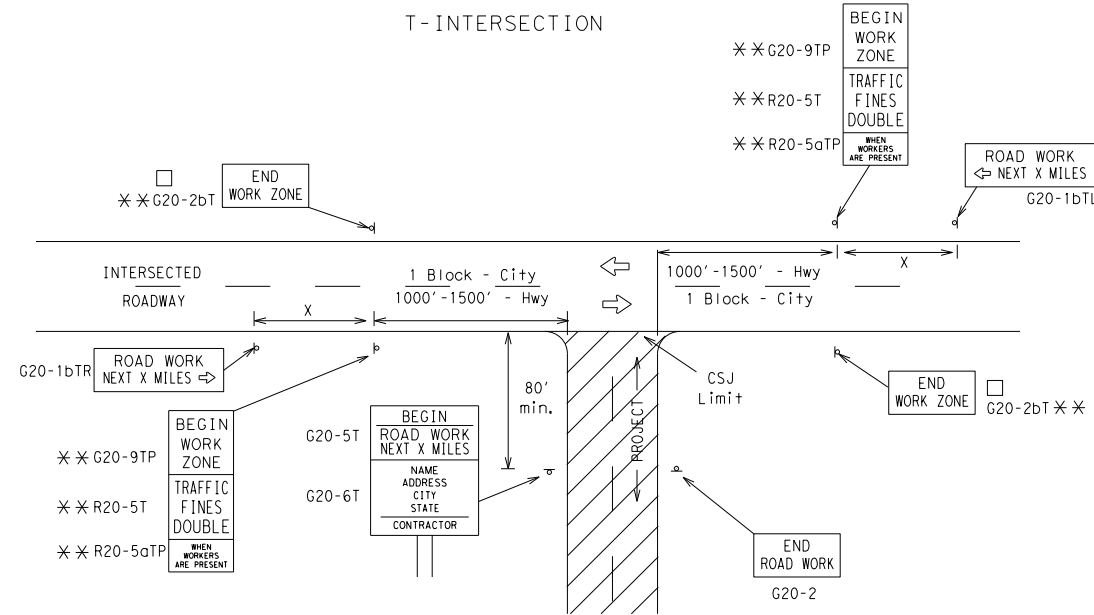
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TYPICAL LOCATION OF CROSSROAD SIGNS



- ## May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer. (See note 2 below)
- 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.
 - 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.
 - 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.
 - 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.
 - Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
 - 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

- 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.
- 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}

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Δ Spacing "x" Feet (Apprx.)
CW20 ⁴	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW25			50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	55	500 ²
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	60	600 ²
			65	700 ²
			70	800 ²
			80	1000 ²
*			*	* ³

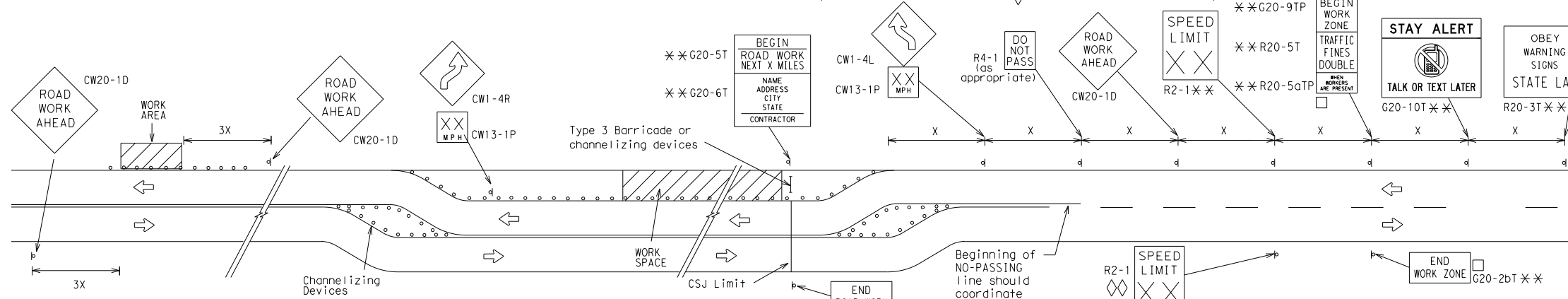
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

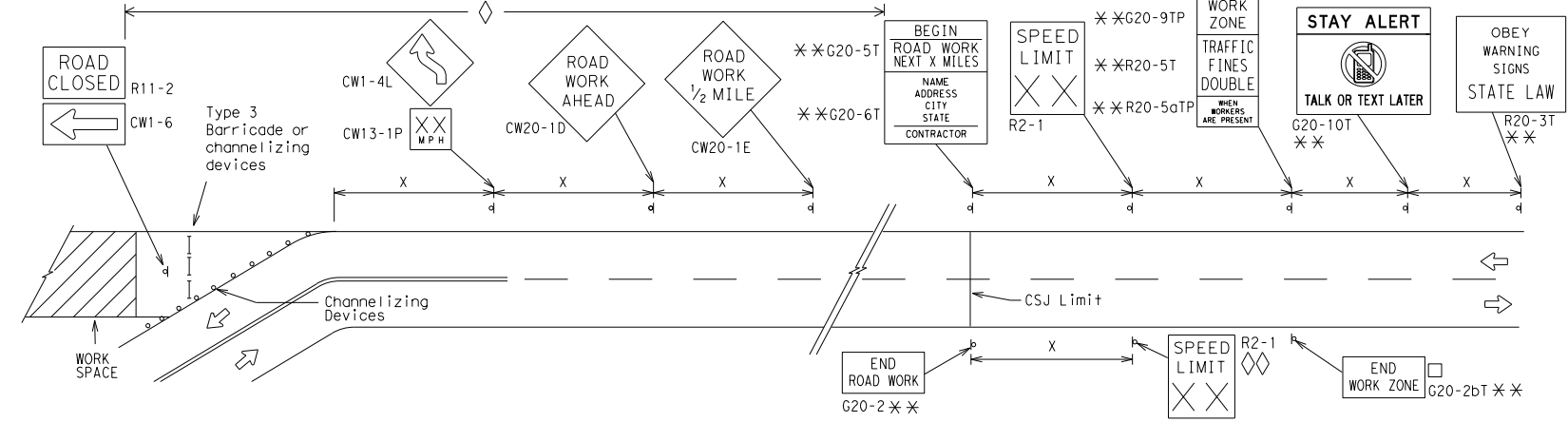
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be 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".
- Only diamond shaped warning sign sizes are indicated.
- See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

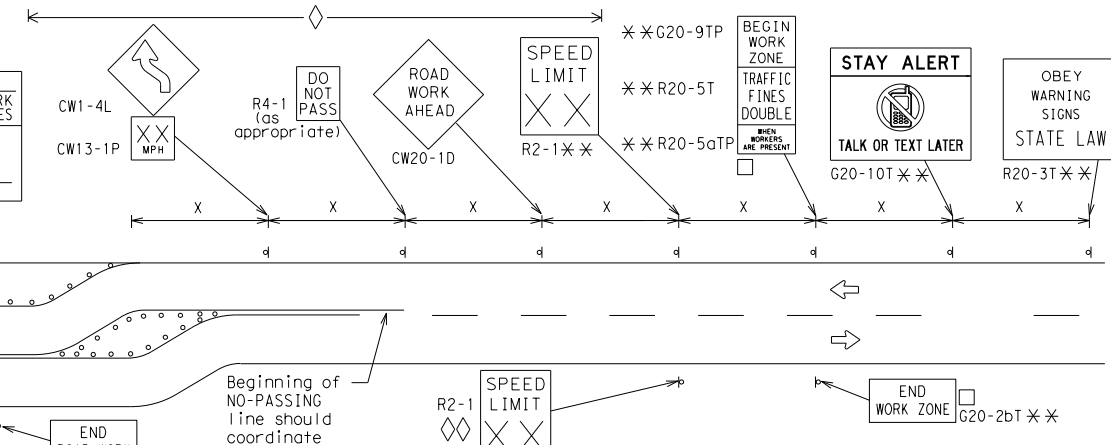


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



NOTES

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "x" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
- CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.
- Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
- Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

	Type 3 Barricade
	Channelizing Devices
	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

SHEET 2 OF 12



BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

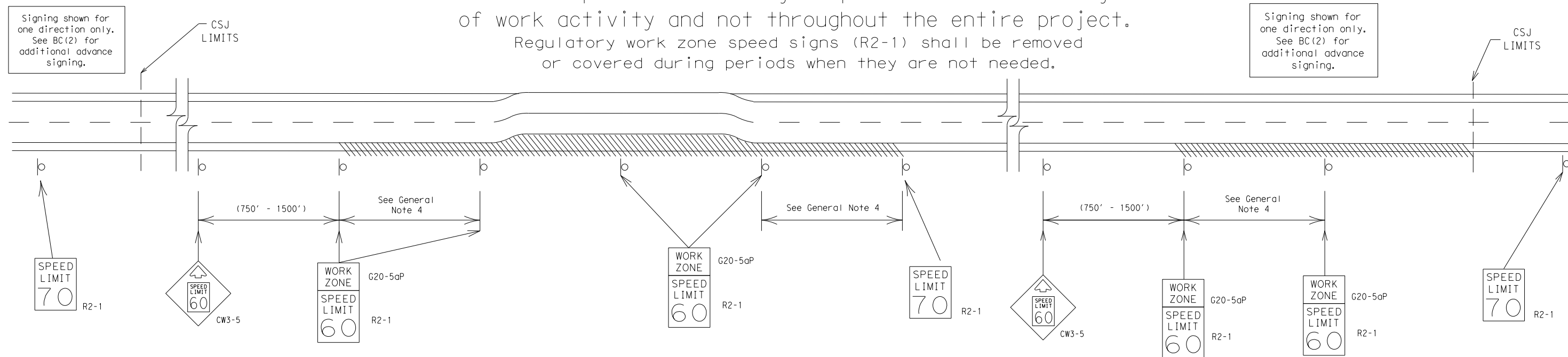
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the traveled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered. (See Removing or Covering on BC(4)).

GENERAL NOTES

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- Frequency of work zone speed limit signs should be:

40 mph and greater	0.2 to 2 miles
35 mph and less	0.2 to 1 mile
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- Fabrication, erection and maintenance of the "ADVANCE SPEED LIMIT" (CW3-5) sign, "WORK ZONE" (G20-5aP) plaque and the "SPEED LIMIT" (R2-1) signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
- Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- Techniques that may help reduce traffic speeds include but are not limited to:
 - Law enforcement.
 - Flagger stationed next to sign.
 - Portable changeable message sign (PCMS).
 - Low-power (drone) radar transmitter.
 - Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

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SHEET 3 OF 12



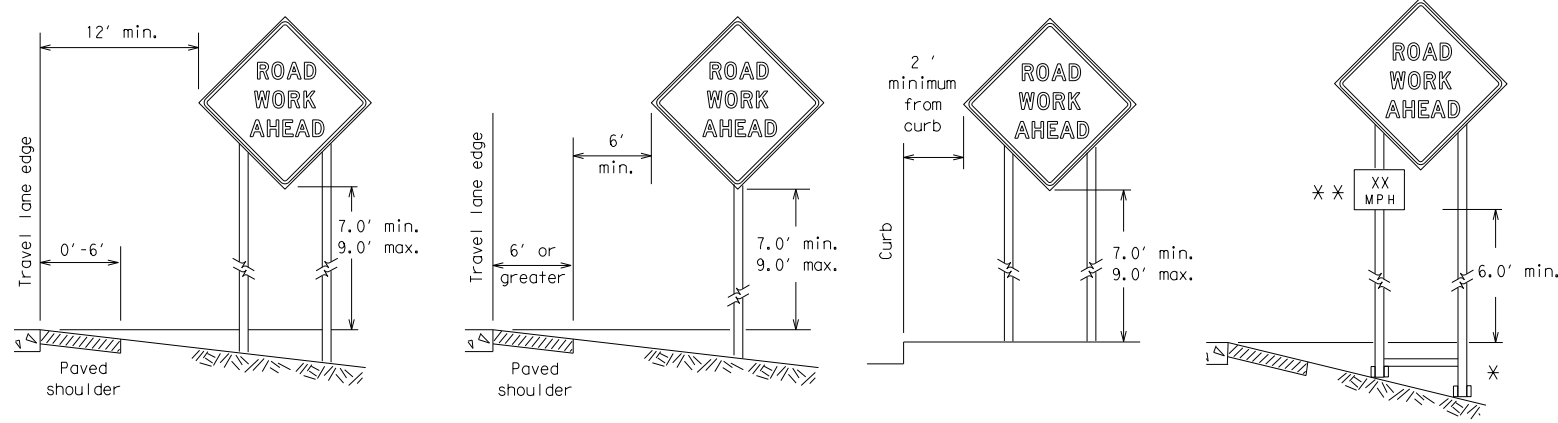
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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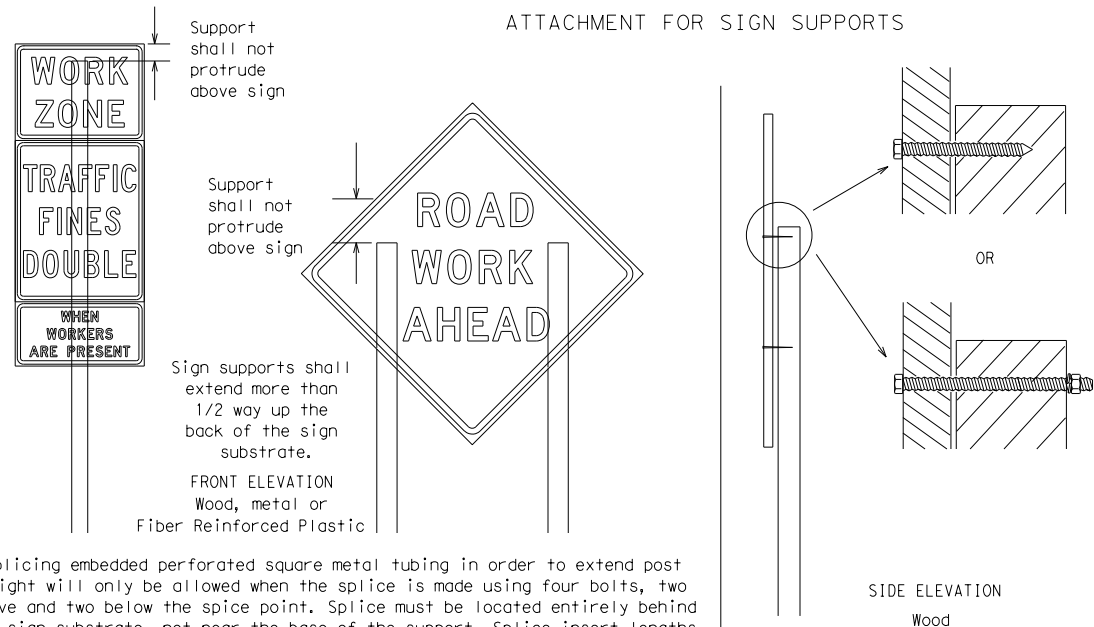
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



* 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 splice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

GENERAL NOTES FOR WORK ZONE SIGNS

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
- The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
- The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
- The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
- Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
- The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

- The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
 - Long-term stationary - work that occupies a location more than 3 days.
 - Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
 - Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
 - Short, duration - work that occupies a location up to 1 hour.
 - Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

- The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
- The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
- Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
- Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

- The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

- The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
- "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
- All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

- All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
- White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
- Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

- All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
- Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
- Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
- When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
- Burlap shall NOT be used to cover signs.
- Duct tape or other adhesive material shall NOT be affixed to a sign face.
- Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

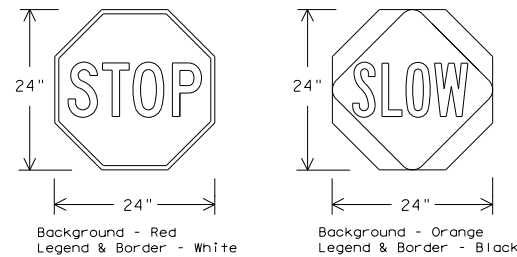
- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
- Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
- Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
- Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
- Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

- Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

STOP/SLOW PADDLES

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



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

- Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
- When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
- When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
- If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
- If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRS standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
- Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.



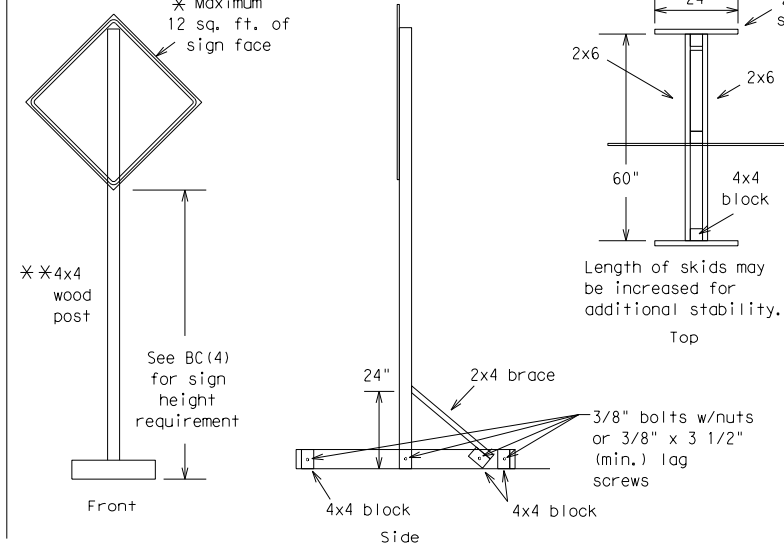
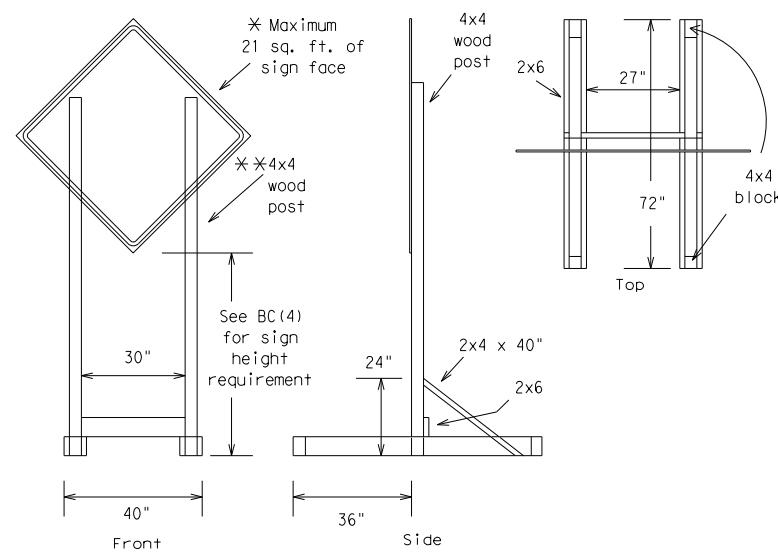
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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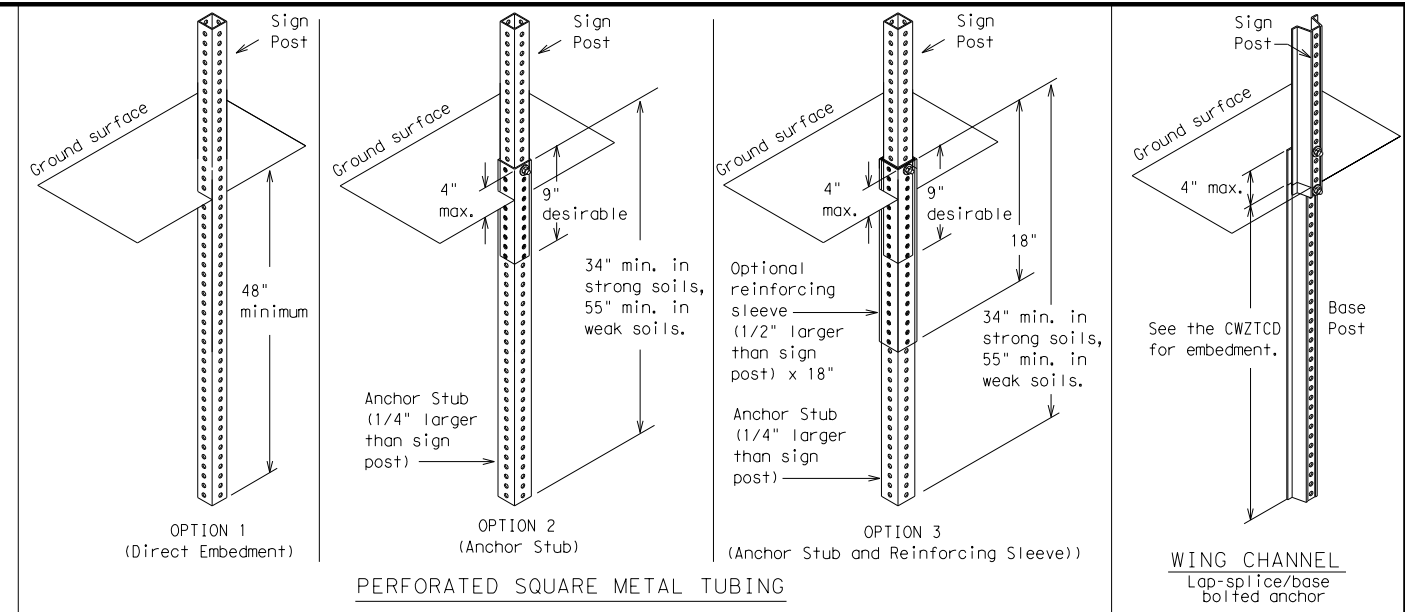
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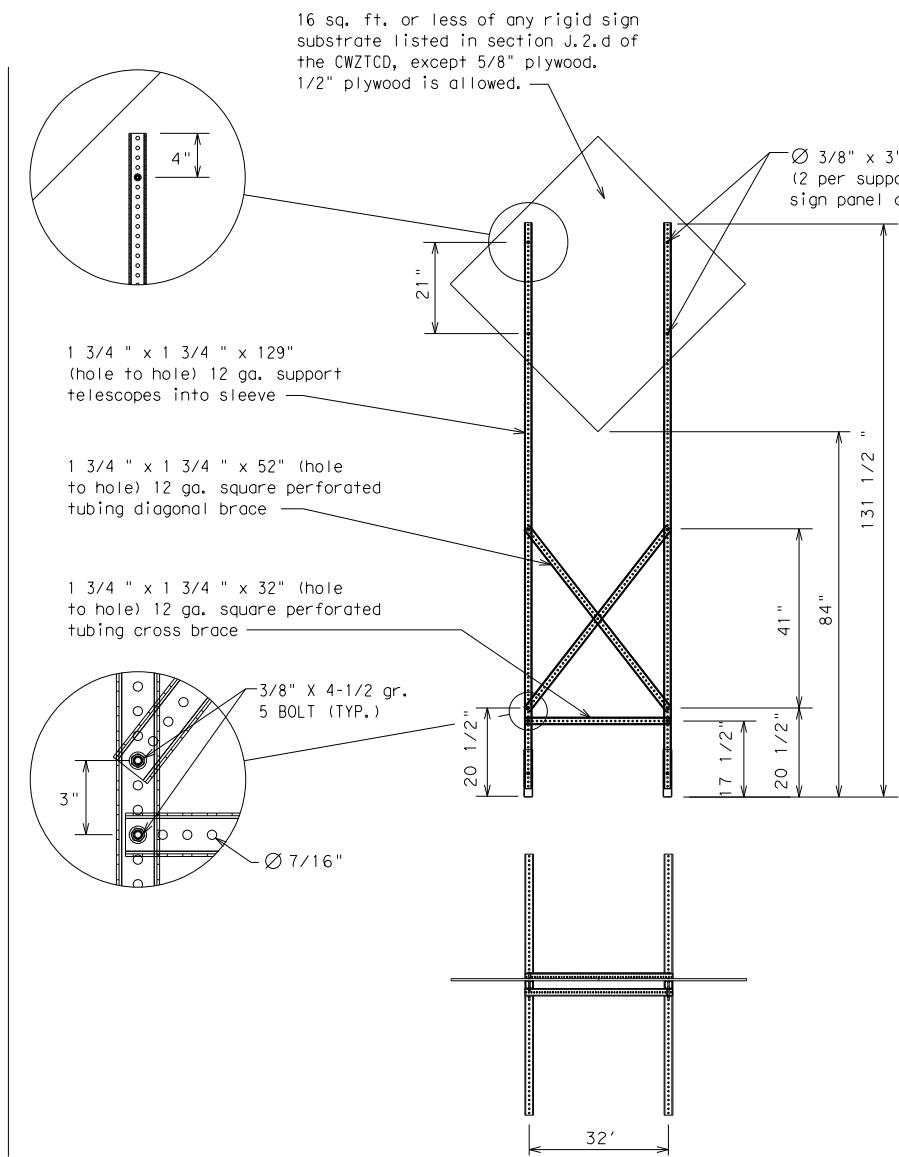
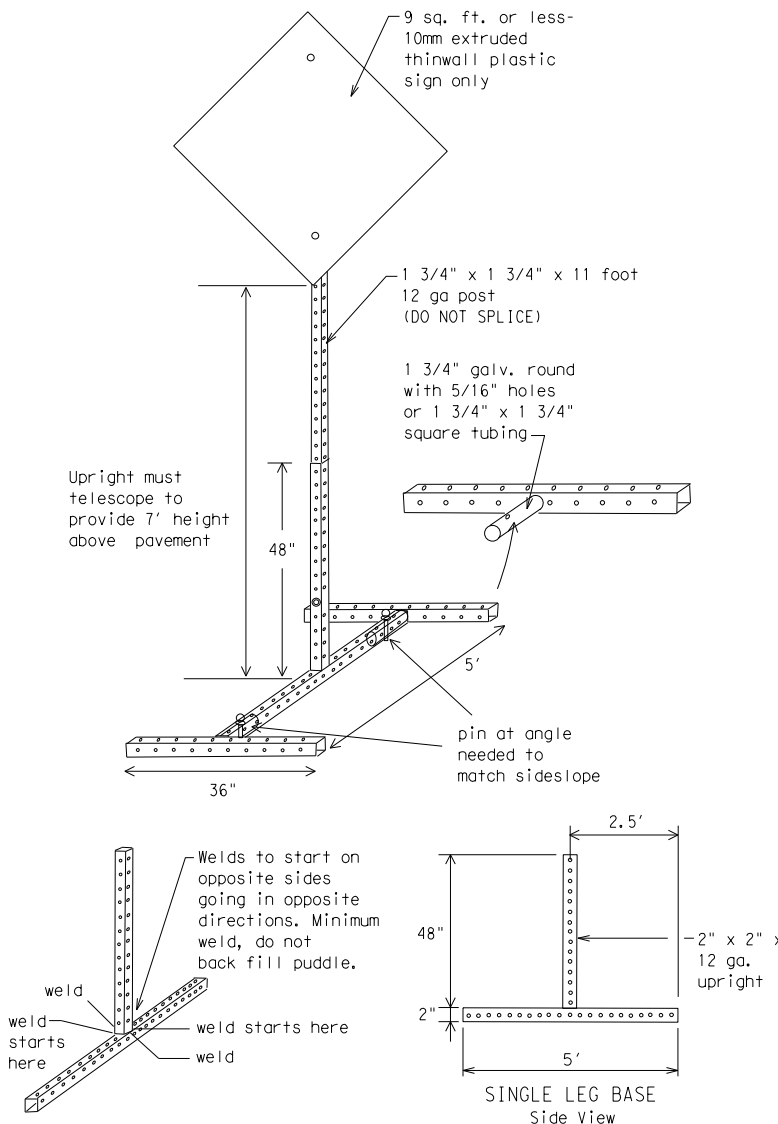
SKID MOUNTED WOOD SIGN SUPPORTS

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



GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support. The maximum sign square footage shall adhere to the manufacturer's recommendation. Two post installations can be used for larger signs.



SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

- * See BC(4) for definition of "Work Duration."
- ** Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.
- See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12



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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
- Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
- The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
- Do not use the word "Danger" in message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
- PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
- Each line of text should be centered on the message board rather than left or right justified.
- If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Canot	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLR
High-Occupancy Vehicle	HOV	Tuesday	TUES
Highway	HWY	Time Minutes	TIME MIN
Hour(s)	HR, HRS	Upper Level	UPR LEVEL
Information	INFO	Vehicles (s)	VEH, VEHS
It Is	ITS	Warning	WARN
Junction	JCT	Wednesday	WED
Left	LFT	Weight Limit	WT LIMIT
Left Lane	LFT LN	West	W
Lane Closed	LN CLOSED	Westbound	(route) W
Lower Level	LWR LEVEL	Wet Pavement	WET PVMT
Maintenance	MAINT	Will Not	WONT

Roadway designation # IH-number, US-number, SH-number, FM-number

Phase 1: Condition Lists

Road/Lane/Ramp Closure List		Other Condition List	
FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED	ROADWORK XXX FT	ROAD REPAIRS XXXX FT
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT	FLAGGER XXXX FT	LANE NARROWS XXXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT	RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
RIGHT X LANES CLOSED	RIGHT X LANES OPEN	MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
CENTER LANE CLOSED	DAYTIME LANE CLOSURES	LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED	DETOUR X MILE	ROUGH ROAD XXXX FT
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE	ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
EXIT CLOSED	RIGHT LN TO BE CLOSED	BUMP XXXX FT	US XXX EXIT X MILES
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI	TRAFFIC SIGNAL XXXX FT	LANES SHIFT *
XXXXXXXXX BLVD CLOSED			

* 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	Location List	Warning List	** Advance Notice List
MERGE RIGHT	AT FM XXXX	SPEED LIMIT XX MPH	TUE-FRI XX AM - X PM
DETOUR NEXT X EXITS	BEFORE RAILROAD CROSSING	MAXIMUM SPEED XX MPH	APR XX - XX X PM - X AM
USE EXIT XXX	NEXT X MILES	MINIMUM SPEED XX MPH	BEGINS MONDAY
STAY ON US XXX SOUTH	PAST US XXX EXIT	ADVISORY SPEED XX MPH	BEGINS MAY XX
TRUCKS USE US XXX N	XXXXXXXXX TO XXXXXXXX	RIGHT LANE EXIT	MAY X-X XX PM - XX AM
WATCH FOR TRUCKS	US XXX TO FM XXXX	USE CAUTION	NEXT FRI-SUN
EXPECT DELAYS		DRIVE SAFELY	XX AM TO XX PM
REDUCE SPEED XXX FT		DRIVE WITH CARE	NEXT TUE AUG XX
USE OTHER ROUTES			TONIGHT XX PM - XX AM
STAY IN LANE *			

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

- Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
- For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

- When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
- When symbol signs, such as the "Flagger Symbol" (CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
- When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
- A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.



BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC (6) - 21

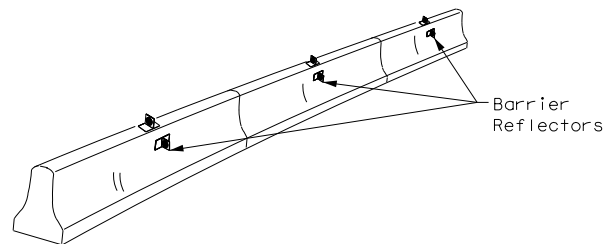
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	BRY	MADISON		15

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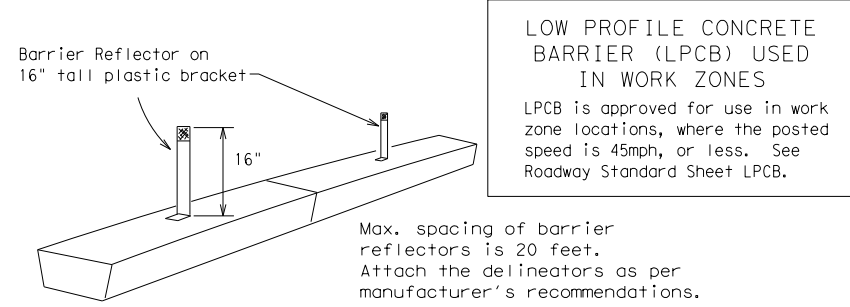
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



CONCRETE TRAFFIC BARRIER (CTB)



LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

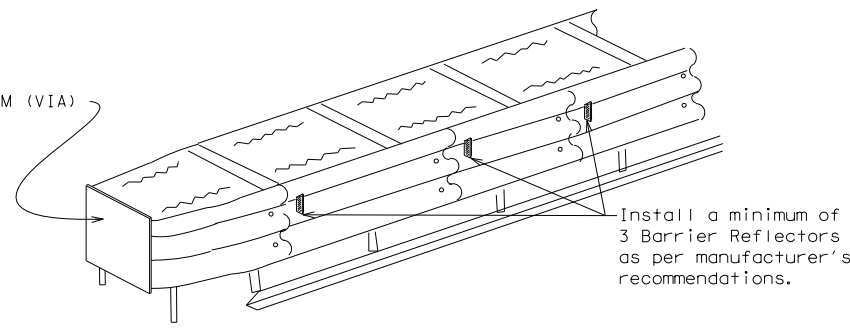
LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

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

LOW PROFILE CONCRETE BARRIER (LPCB)

- Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
- Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional) while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.

See D & OM (VIA)



DELINEATION OF END TREATMENTS

END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the appropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

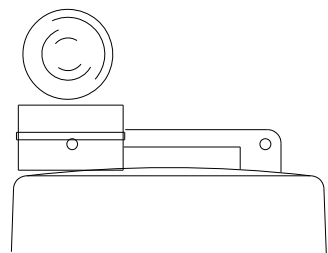
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
- Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
- When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

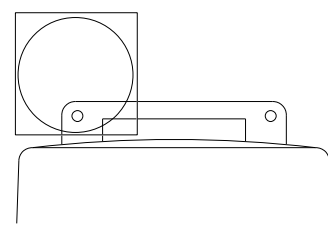
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
- Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
- Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

- A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
- The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
- The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.



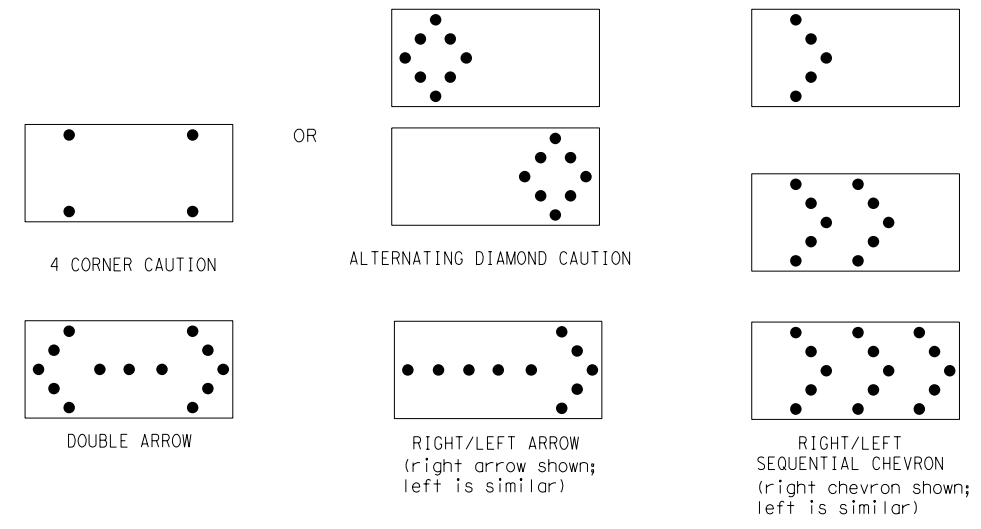
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

- The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
- Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
- The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
- Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
- Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION
Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
- The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

SHEET 7 OF 12

Texas Department of Transportation
Traffic Safety Division Standard

**BARRICADE AND CONSTRUCTION
ARROW PANEL, REFLECTORS,
WARNING LIGHTS & ATTENUATOR**

BC(7)-21

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GENERAL NOTES

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
- For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
- Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
- The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

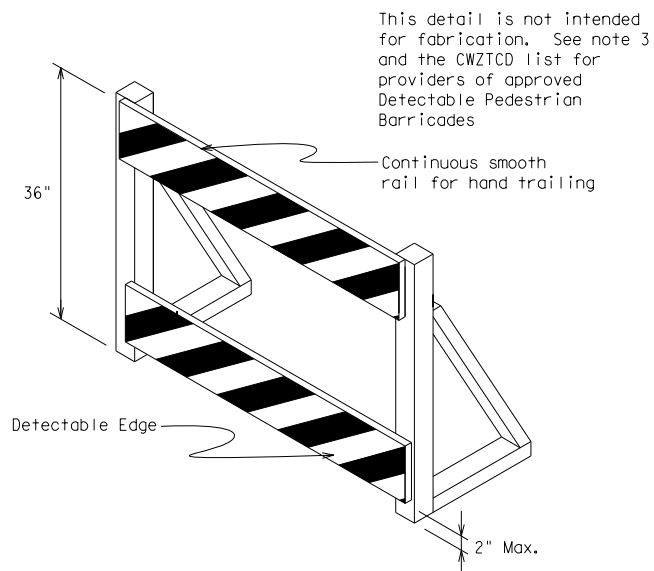
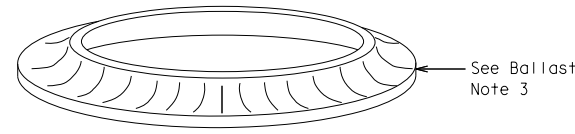
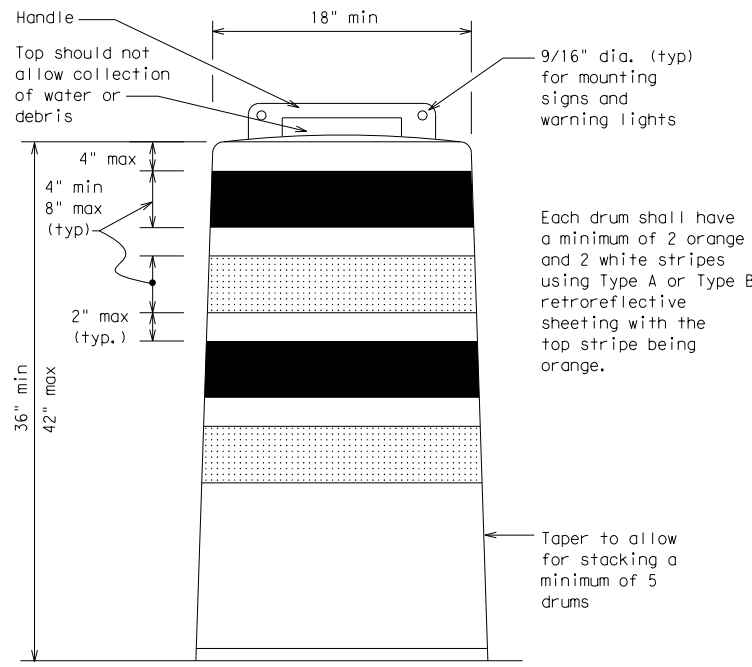
- Pre-qualified plastic drums shall meet the following requirements:
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
 - The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
 - Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
 - Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
 - The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
 - The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
 - Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
 - Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
 - Drum body shall have a maximum unballasted weight of 11 lbs.
 - Drum and base shall be marked with manufacturer's name and model number.

RETROREFLECTIVE SHEETING

- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

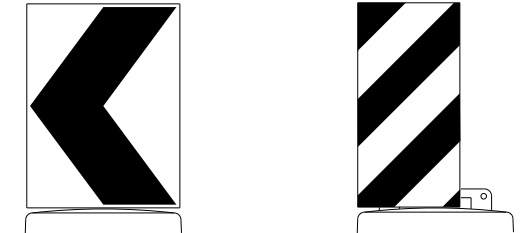
BALLAST

- Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
- Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
- When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.



DETECTABLE PEDESTRIAN BARRICADES

- When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
- Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
- Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" and should not be used as a control for pedestrian movements.
- Warning lights shall not be attached to detectable pedestrian barricades.
- Detectable pedestrian barricades should use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign (Maximum Sign Dimension)
 Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer

12" x 24" Vertical Panel
 mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{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.
- Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
- R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

SHEET 8 OF 12

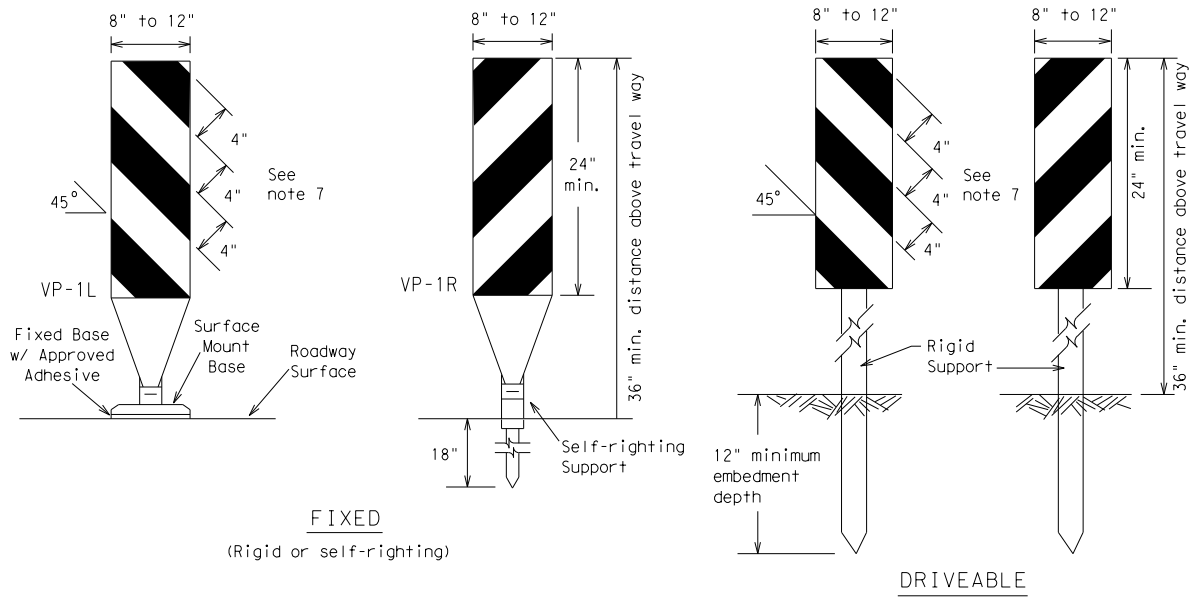


BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

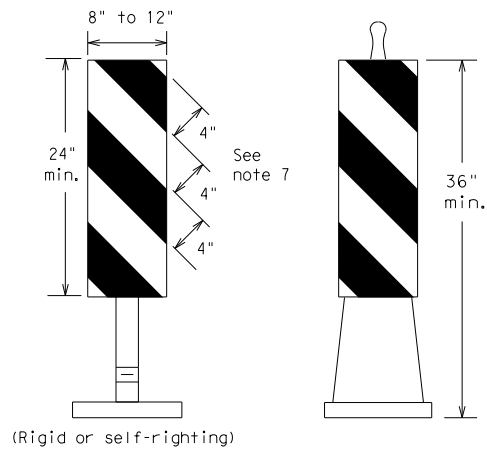
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FIXED
(Rigid or self-righting)

DRIVEABLE

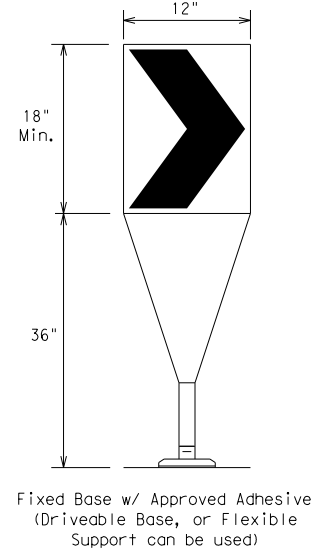


(Rigid or self-righting)

PORTABLE

VERTICAL PANELS (VPs)

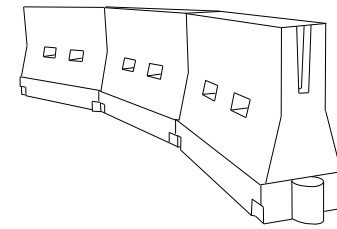
- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use VP's for drop-offs.
- VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
- VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
- Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
- Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



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

- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
- Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
- To be effective, the chevron should be visible for at least 500 feet.
- Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
- For Long Term Stationary use on tapers or transitions on freeways and divided highways, self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

- LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
- LCDs may be used instead of a line of cones or drums.
- LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
- LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
- LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

- Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
- Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
- Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
- When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long 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

GENERAL NOTES

- Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
- Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
- Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
- The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.

Posted Speed	Formula	Minimum Desirable Taper Lengths * X			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = 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'

*X Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (9) - 21

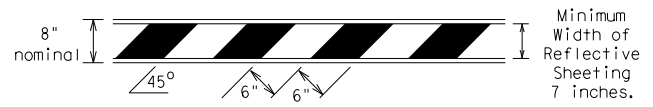
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	BRY	MADISON	18	

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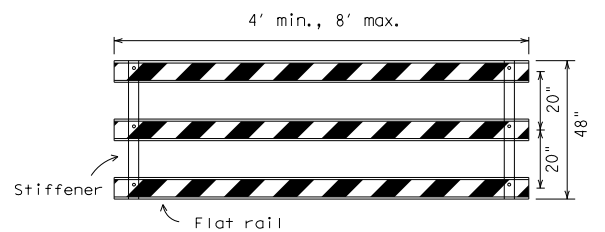
TYPE 3 BARRICADES

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.



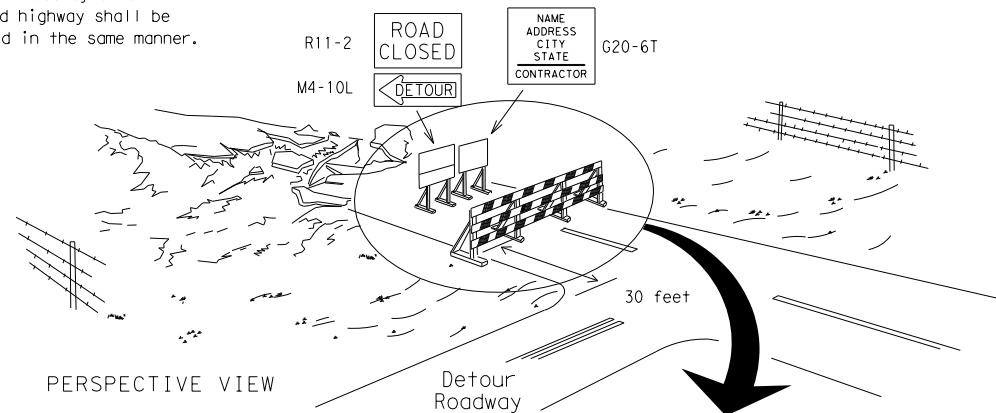
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

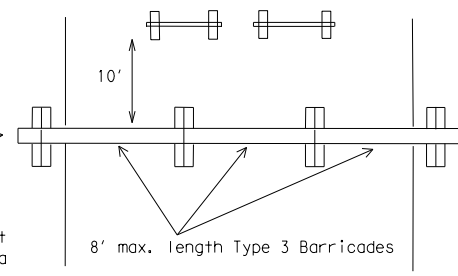
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

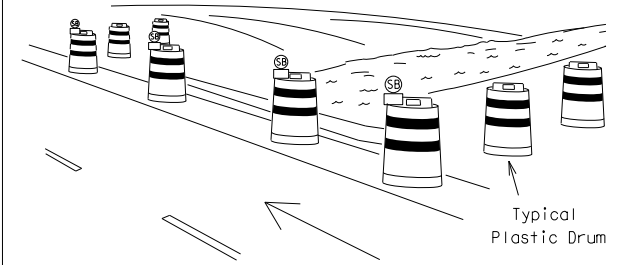
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



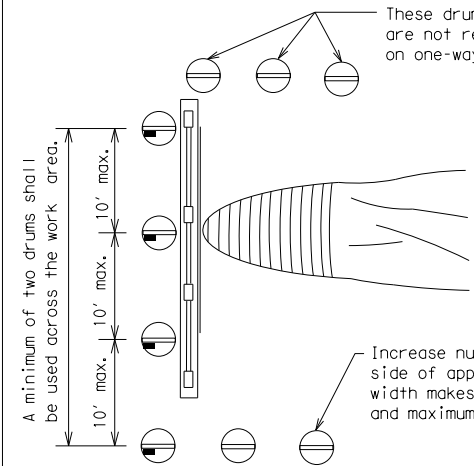
PLAN VIEW

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

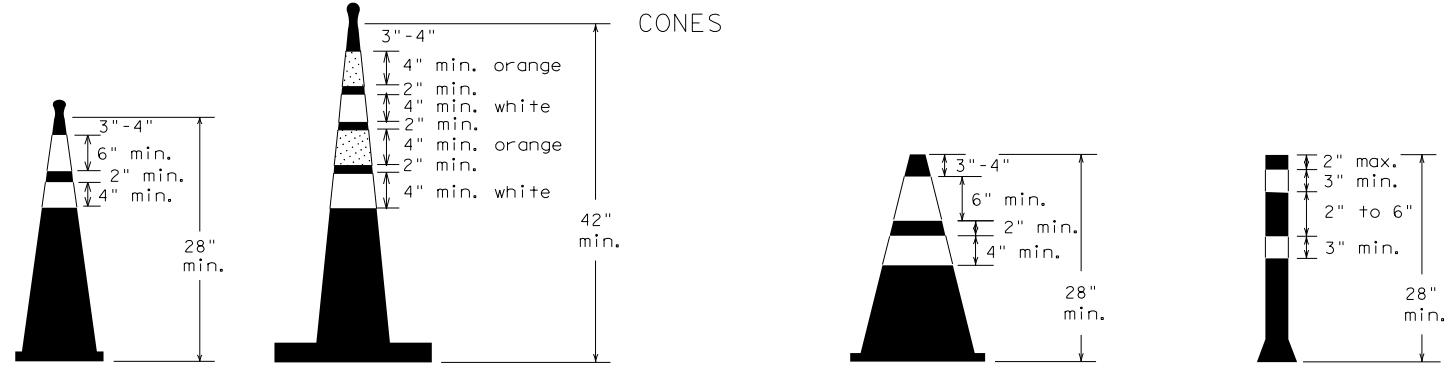


PLAN VIEW

1. Where positive redirection 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
	Steady burn warning light or yellow warning reflector

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

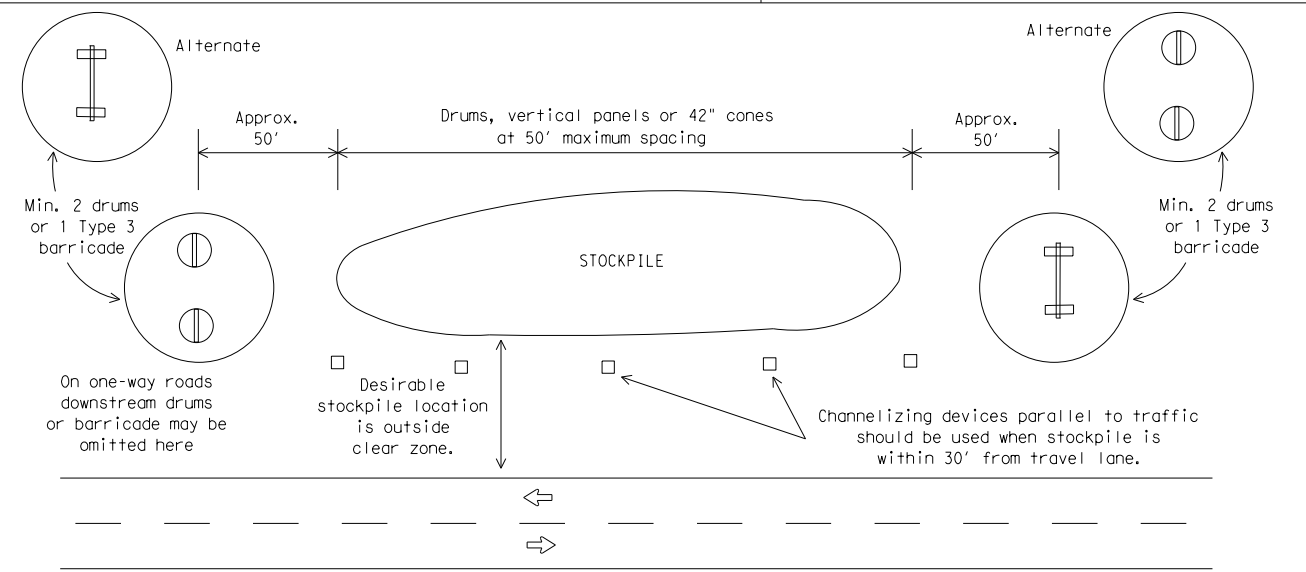


Two-Piece cones

One-Piece cones

Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.
 42" 2-piece cones shall have a minimum weight of 30 lbs. including base.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a 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.



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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7-13 5-21	BRY	MADISON	19	

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WORK ZONE PAVEMENT MARKINGS

GENERAL

- The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
- When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

- Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
- Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

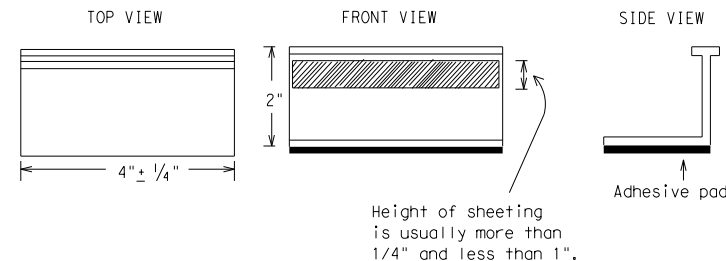
MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
- The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
- Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

- Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
- The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
- Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
- Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
 - Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
 - Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
- Small design variances may be noted between tab manufacturers.
- See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
 YELLOW - (two amber reflective surfaces with yellow body).
 WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

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SHEET 11 OF 12

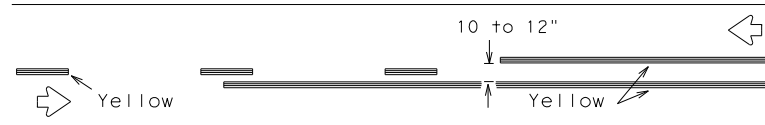


BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

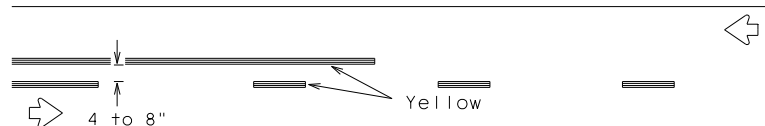
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11-02 8-14				

PAVEMENT MARKING PATTERNS

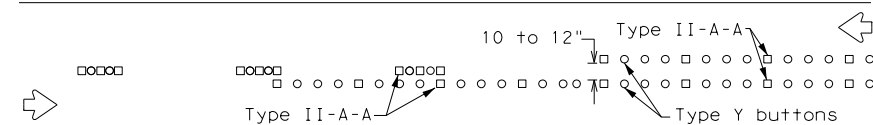


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

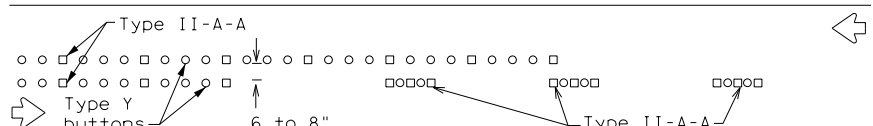


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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.

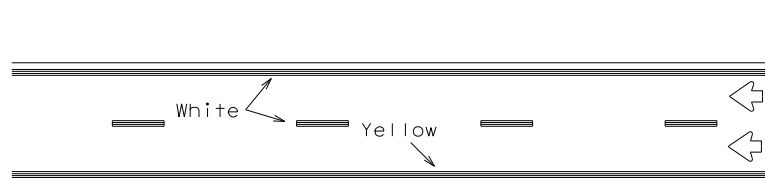


RAISED PAVEMENT MARKERS - PATTERN A



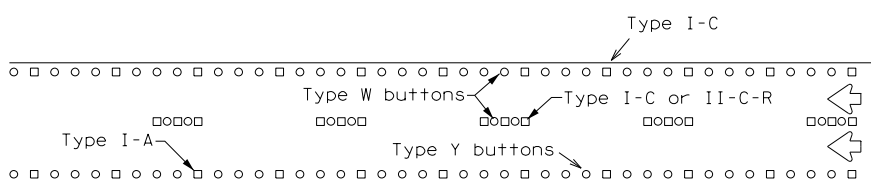
RAISED PAVEMENT MARKERS - PATTERN B

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



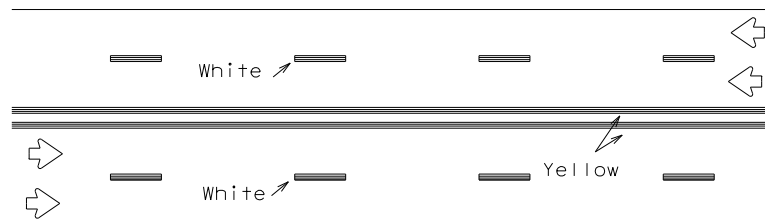
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



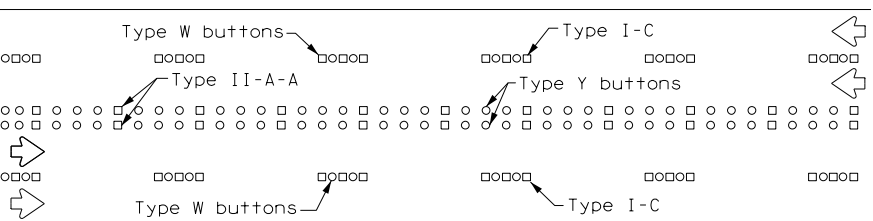
RAISED PAVEMENT MARKERS

EDGE & LANE LINES FOR DIVIDED HIGHWAY



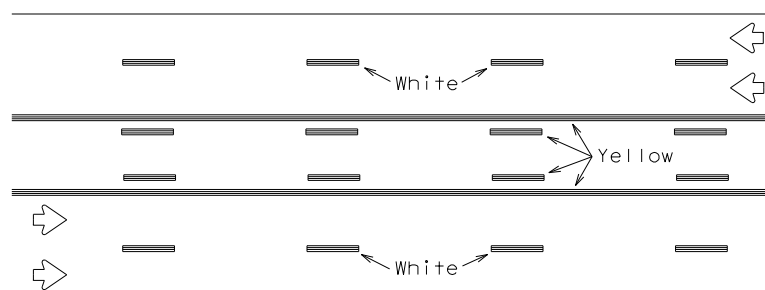
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



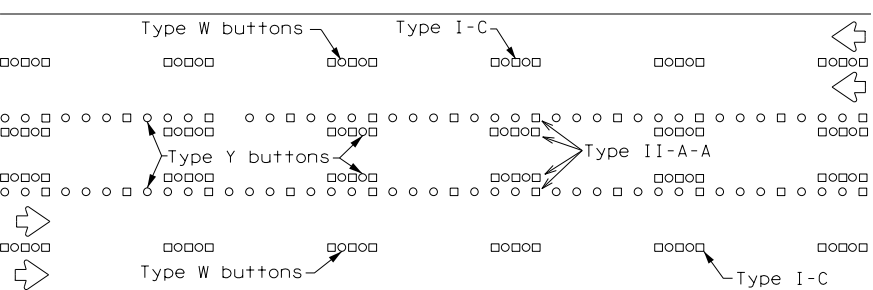
RAISED PAVEMENT MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

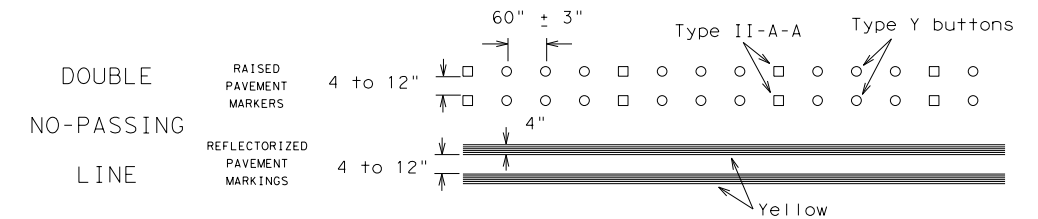
Prefabricated markings may be substituted for reflectORIZED pavement markings.



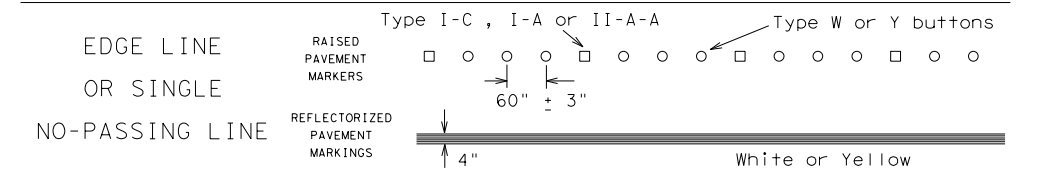
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE

STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



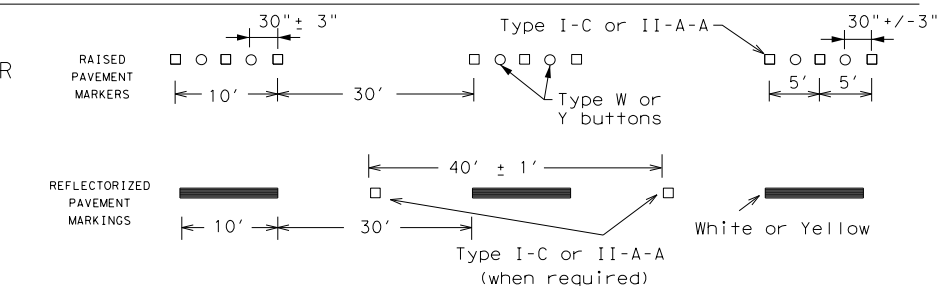
SOLID LINES



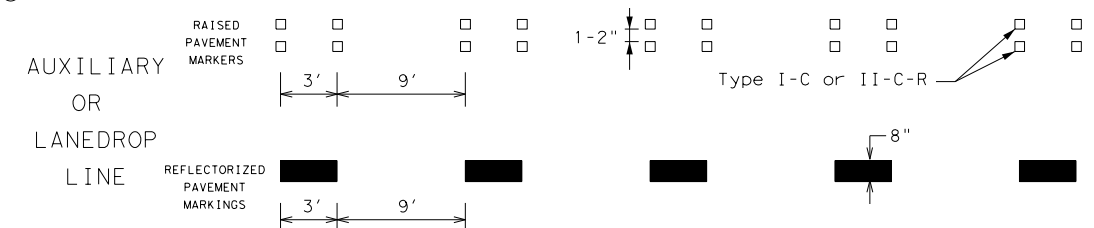
WIDE LINE



CENTER LINE OR LANE LINE

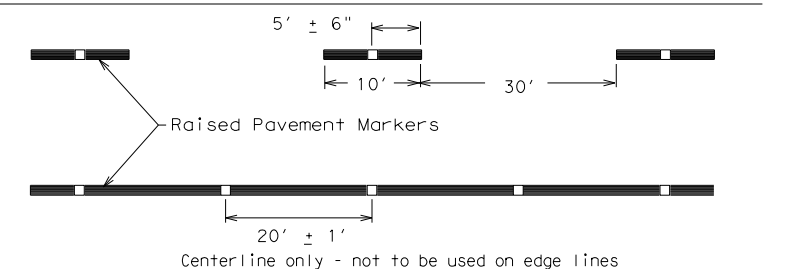


BROKEN LINES



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.



SHEET 12 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

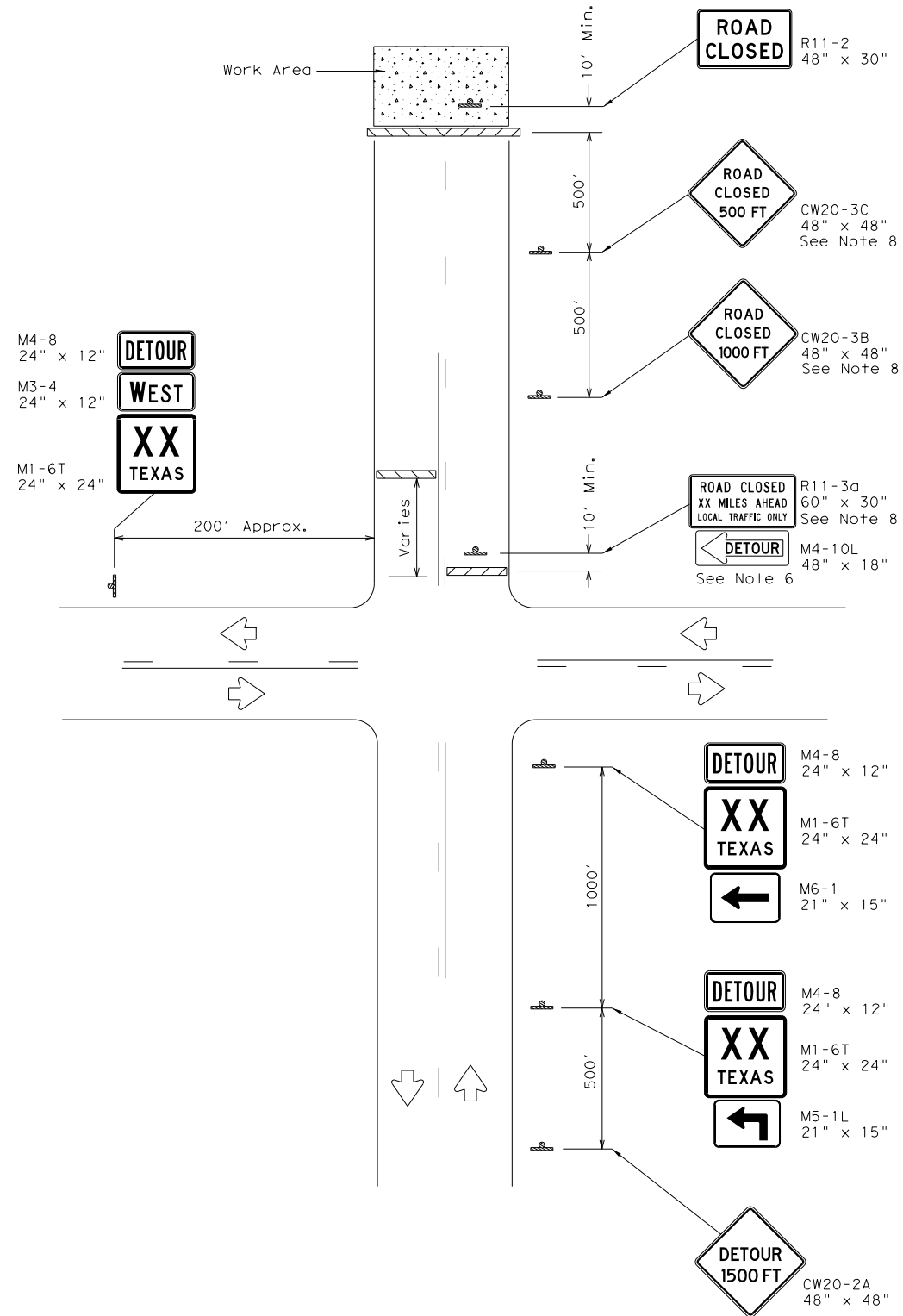
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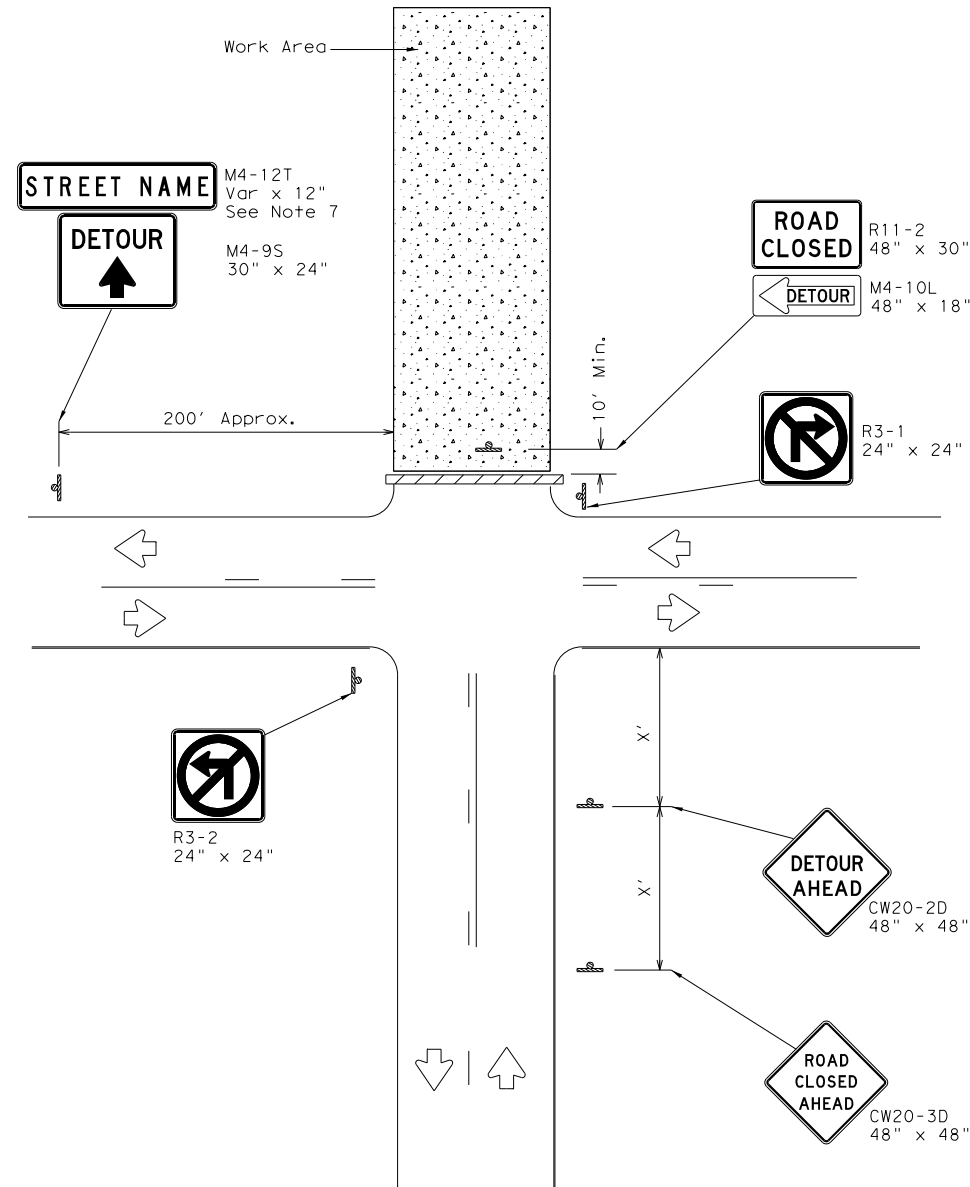
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ROAD CLOSURE BEYOND THE INTERSECTION
 Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION
 Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

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

* Conventional Roads Only

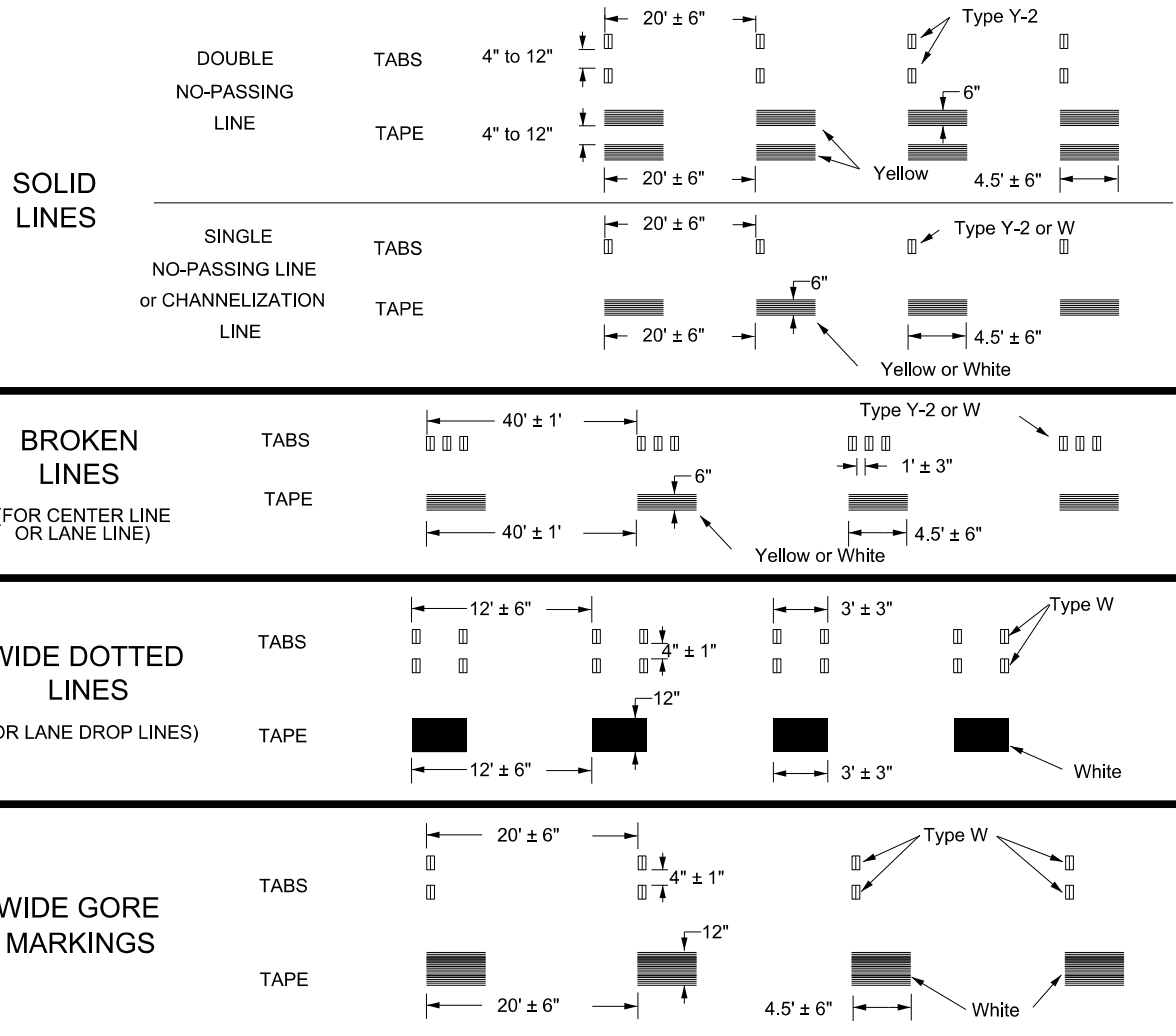
GENERAL NOTES

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

		Traffic Operations Division Standard	
WORK ZONE ROAD CLOSURE DETAILS			
WZ (RCD) - 13			
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© TxDOT August 1995	CONT	SECT	JOB
REVISIONS	0552	02	027
1-97 4-98 7-13	DIST	COUNTY	SHEET NO.
2-98 3-03	BRY	MADISON	22

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WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



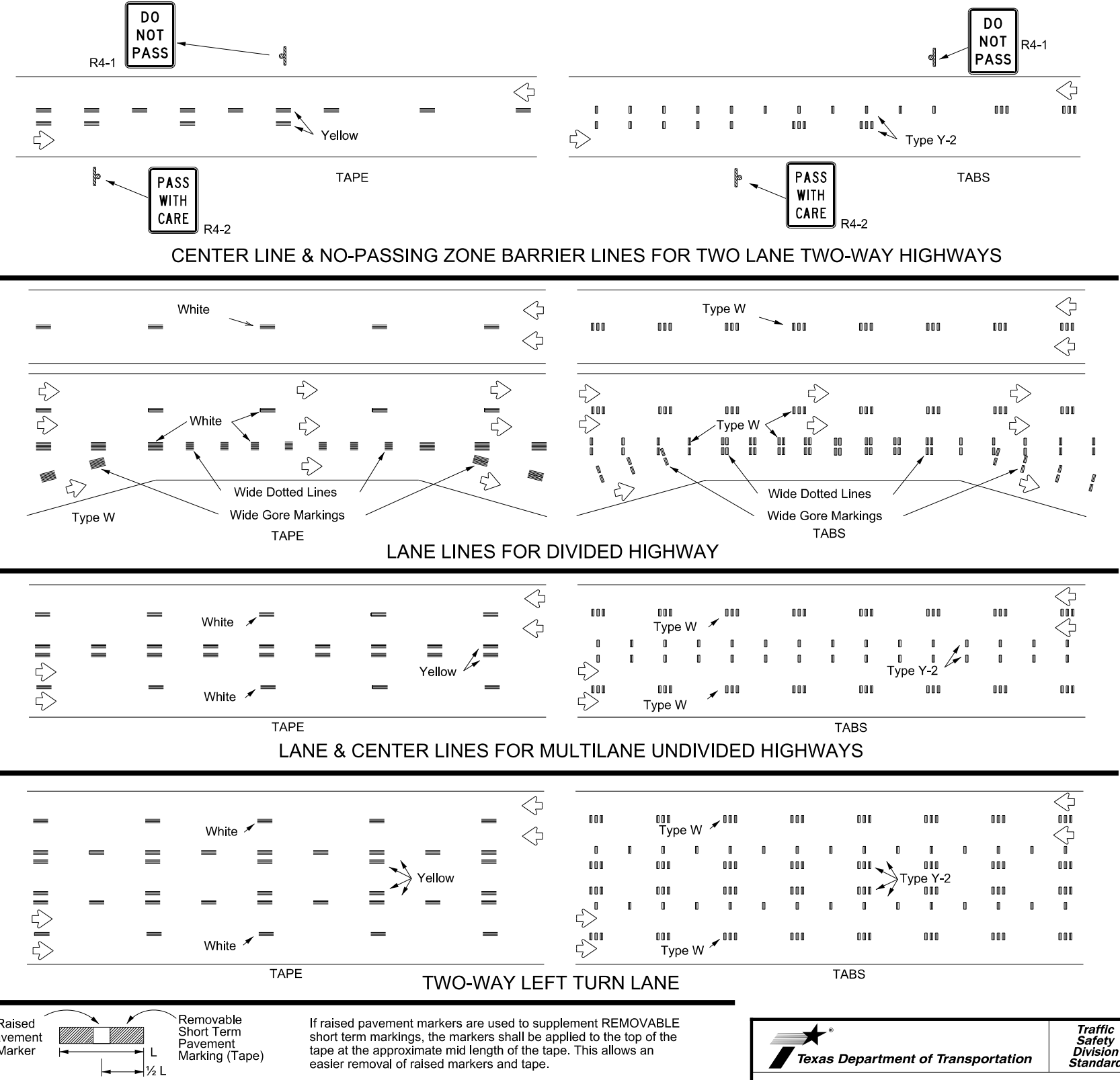
NOTES:

- Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible reflective roadway marker tabs unless otherwise specified elsewhere in plans.
- Short term pavement markings shall NOT be used to simulate edge lines.
- Dimensions indicated on this sheet are typical and approximate. Variations in size and height may occur between markers or devices made by manufacturers, by as much as 1/4 inch, unless otherwise noted.
- Temporary flexible-reflective roadway marker tabs will require normal maintenance replacement when used on roadways with an ADT per lane of up to 7500 vehicles with no more than 10% truck mix. When roadways exceed these values, additional maintenance replacement of devices should be planned.
- No segment of roadway open to traffic shall remain without permanent pavement markings for a period greater than 14 calendar days. The Contractor will be responsible for maintaining short term pavement markings until permanent pavement markings are in place. When the Contractor is responsible for placement of permanent pavement markings, no segment of roadway shall remain without permanent pavement markings for a period greater than 14 calendar days unless weather conditions prohibit placement. Permanent pavement markings shall be placed as soon as weather permits.
- For two lane, two-way roadways, DO NOT PASS signs shall be erected to mark the beginning of sections where passing is prohibited and PASS WITH CARE signs shall be erected to mark the beginning of sections where passing is permitted. Signs shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and may be used to indicate the limits of no-passing zones for up to 14 calendar days. Permanent pavement markings should then be placed.
- For low volume two lane, two-way roadways of 4000 ADT or less, no-passing lines may be omitted when approved by the Engineer. DO NOT PASS and PASS WITH CARE signs shall be erected (see note 6).
- For exit gores where a lane is being dropped place wide gore markings or retroreflective channelizing devices to guide motorist through the exit. If channelizing devices are to be used it should be noted elsewhere in the plans. One piece cones are not allowed for this purpose.

TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

- Temporary flexible-reflective roadway marker tabs detailed on this sheet will be designated Type Y-2 (two amber reflective surfaces with yellow body); Type Y (one amber reflective surface with yellow body); and Type W (one white or silver reflective surface with white body). Additional details may be found on BC(11).
- Tabs shall meet requirements of Departmental Material Specification DMS-8242.
- When dry, tabs shall be visible for a minimum distance of 200 feet during normal daylight hours and when illuminated by automobile low-beam head light at night, unless sight distance is restricted by roadway geometrics.
- No two consecutive tabs nor four tabs per 1000 feet of line shall be missing or fail to meet the visual performance requirements of Note 3.

WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



PREFABRICATED PAVEMENT MARKINGS

- Temporary Removable Prefabricated Pavement Markings shall meet the requirements of DMS-8241.

- Non-removable Prefabricated Pavement Markings shall meet the requirements of either DMS-8240 "Permanent Prefabricated Pavement Markings" or DMS-8243 "Temporary Construction-Grade Prefabricated Pavement Markings."

RAISED PAVEMENT MARKERS

- All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and DMS-4200.

DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS) & MATERIAL PRODUCER LISTS (MPL)

- DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:

http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm



WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-23

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© TxDOT	February 2023	CONT:	0552	SECT:	02
		JOB:	027	HIGHWAY:	FM978
4-92	7-13	DIST:		COUNTY:	
1-97	2-23	BRY:	MADISON	SHEET NO.:	22A
3-03					

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DATE: 3/16/2023 1:33:49 PM
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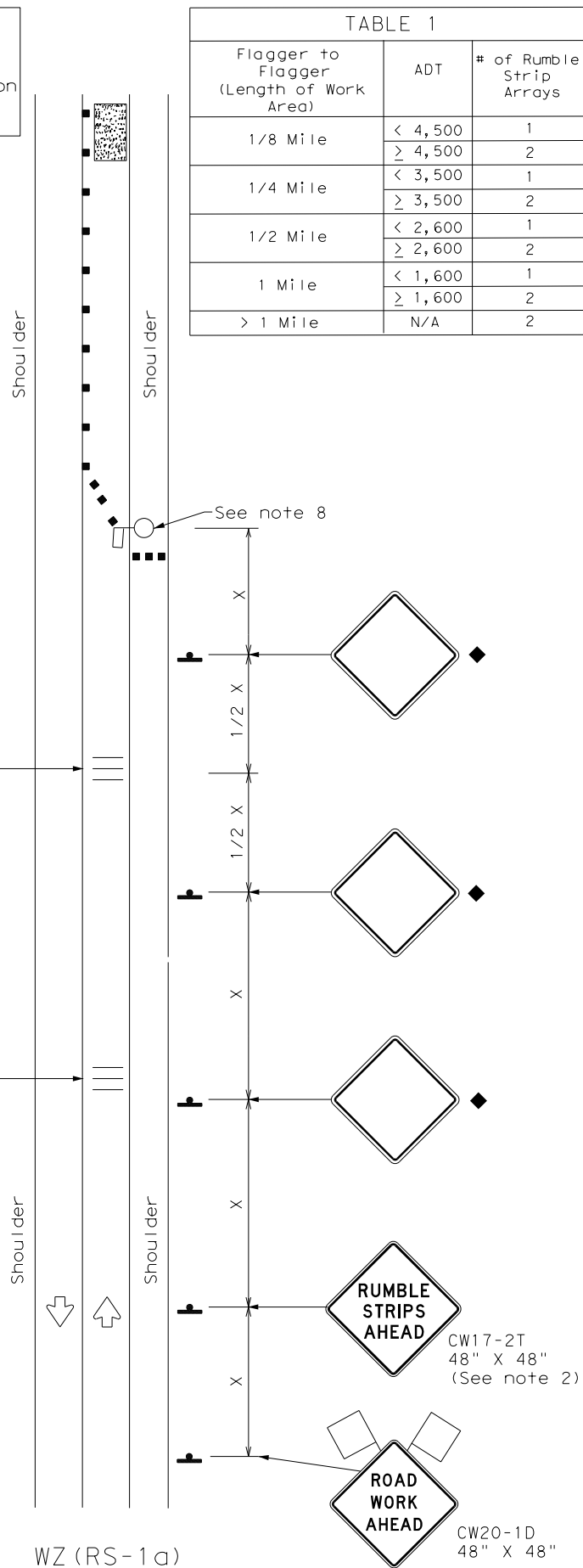
Warning sign and rumble strip sequence in opposite direction is same as below.

Flagger to Flagger (Length of Work Area)	ADT	# of Rumble Strip Arrays
1/8 Mile	< 4,500	1
	≥ 4,500	2
1/4 Mile	< 3,500	1
	≥ 3,500	2
1/2 Mile	< 2,600	1
	≥ 2,600	2
1 Mile	< 1,600	1
	≥ 1,600	2
> 1 Mile	N/A	2

Rumble Strip Array (See note 1)

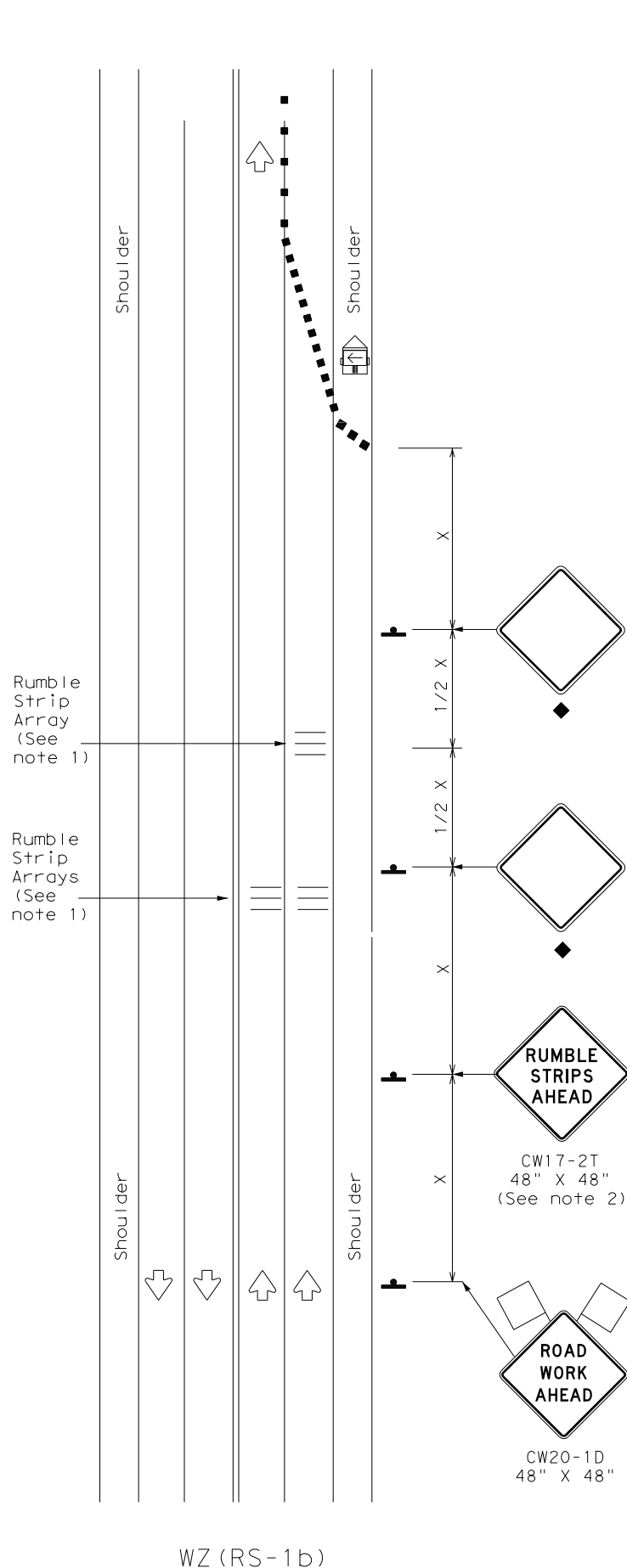
Rumble Strip Array (See note 1)

The second Rumble Strip Array is required when the ADT thresholds in Table 1 indicate the need for 2 Arrays.



WZ (RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ (RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

- Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
- The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD" sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
- Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
- Remove Temporary Rumble Strips before removing the advanced warning signs.
- Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
- Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
- This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
- The one-lane two-way application may utilize a flagger, an Automated Flagger Assistance Device (AFAD) or a Portable Traffic Signal (PTS).
- Replace defective Temporary Rumble Strips as directed by the Engineer.
- Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment and written direction from the Engineer.

Speed	Approximate distance between strips in an array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
= 60 MPH	20'
≥ 65 MPH	* 35' +

	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Panel		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS ² / 60	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only
 ** Taper lengths have been rounded off.
 L=Length of Taper (FT) W=Width of Offset (FT)
 S=Posted Speed (MPH)

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

◆ Signs are for illustrative purposes only. Signs required may vary depending on the TCP, TMUTCD Typical Application, or project specific details for the project.
 * For posted speeds in excess of 65 MPH, it is recommended that spacing is increased as speed limits increase. Increasing space between rumble strips will improve effectiveness.

Texas Department of Transportation Traffic Safety Division Standard

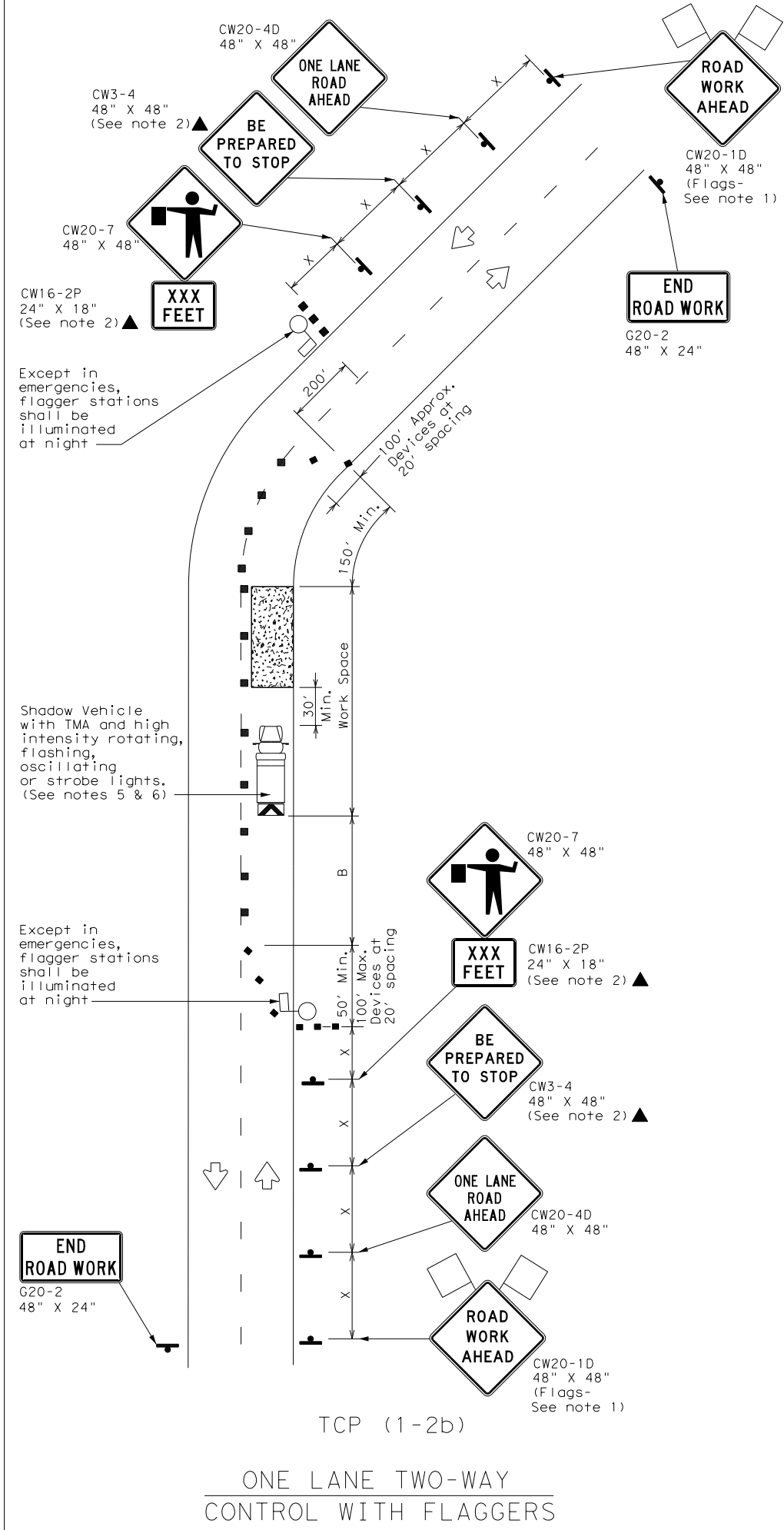
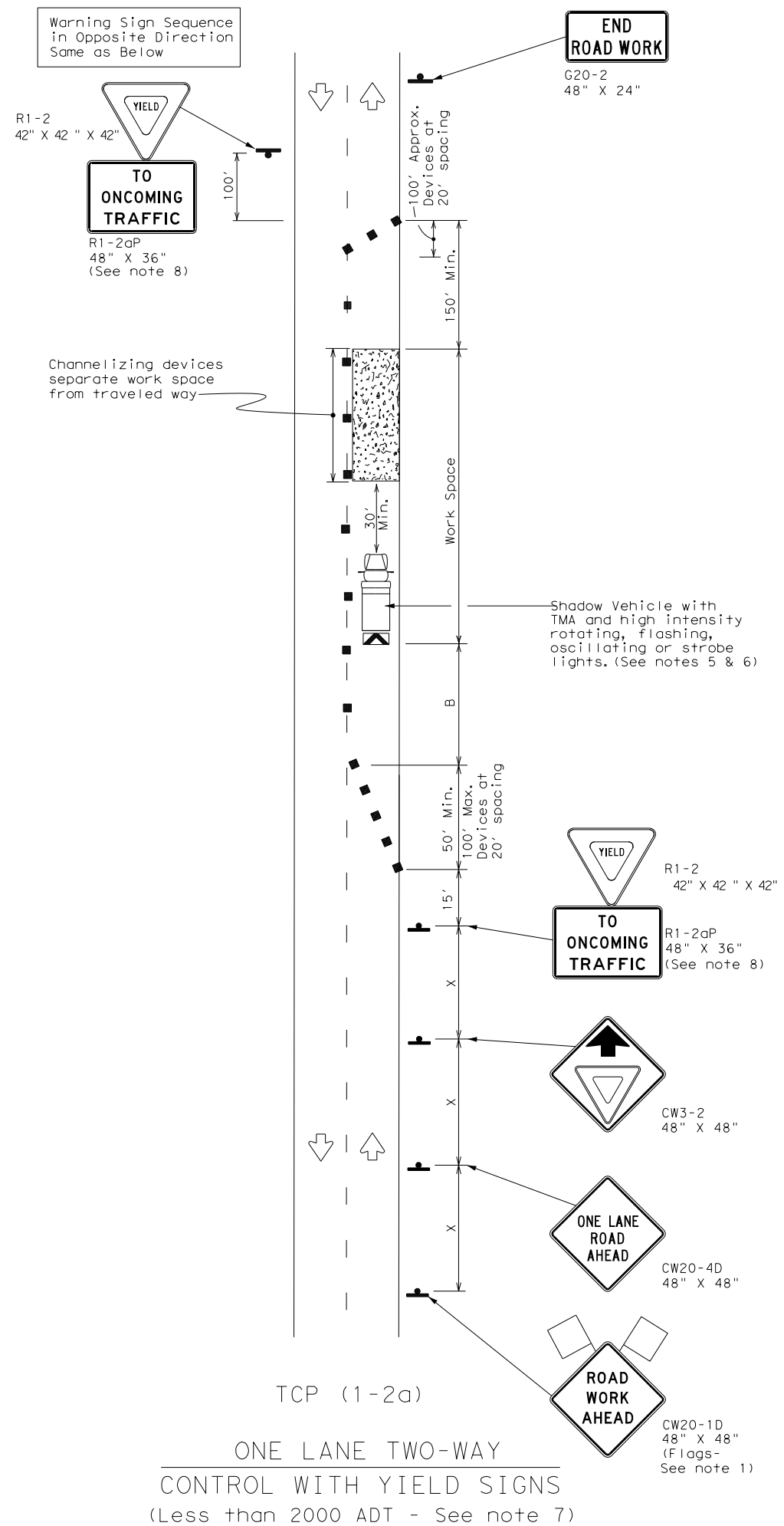
TEMPORARY RUMBLE STRIPS

WZ (RS) - 22

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© TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
2-14 1-22	DIST	COUNTY	SHEET NO.	
4-16	BRY	MADISON		22B

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LEGEND

	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45		450'	495'	540'	45'	90'	320'	195'	360'
50	L = WS	500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* Conventional Roads Only
 ** Taper lengths have been rounded off.
 L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

- Flags attached to signs where shown are REQUIRED.
 - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
 - The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
 - Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 150 feet.
 - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
 - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
- TCP (1-2a)
- R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
 - R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.
- TCP (1-2b)
- Flaggers should use two-way radios or other methods of communication to control traffic.
 - Length of work space should be based on the ability of flaggers to communicate.
 - If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
 - Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
 - Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Texas Department of Transportation
 Traffic Operations Division Standard

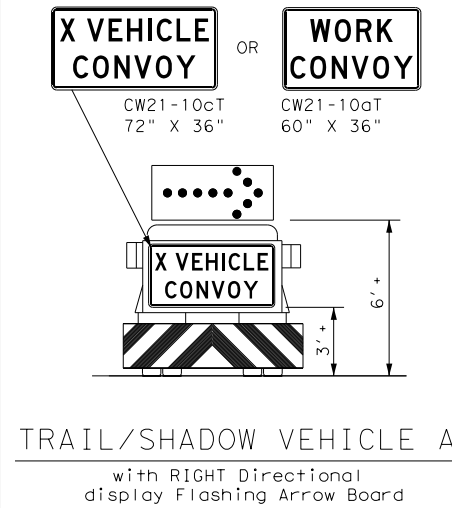
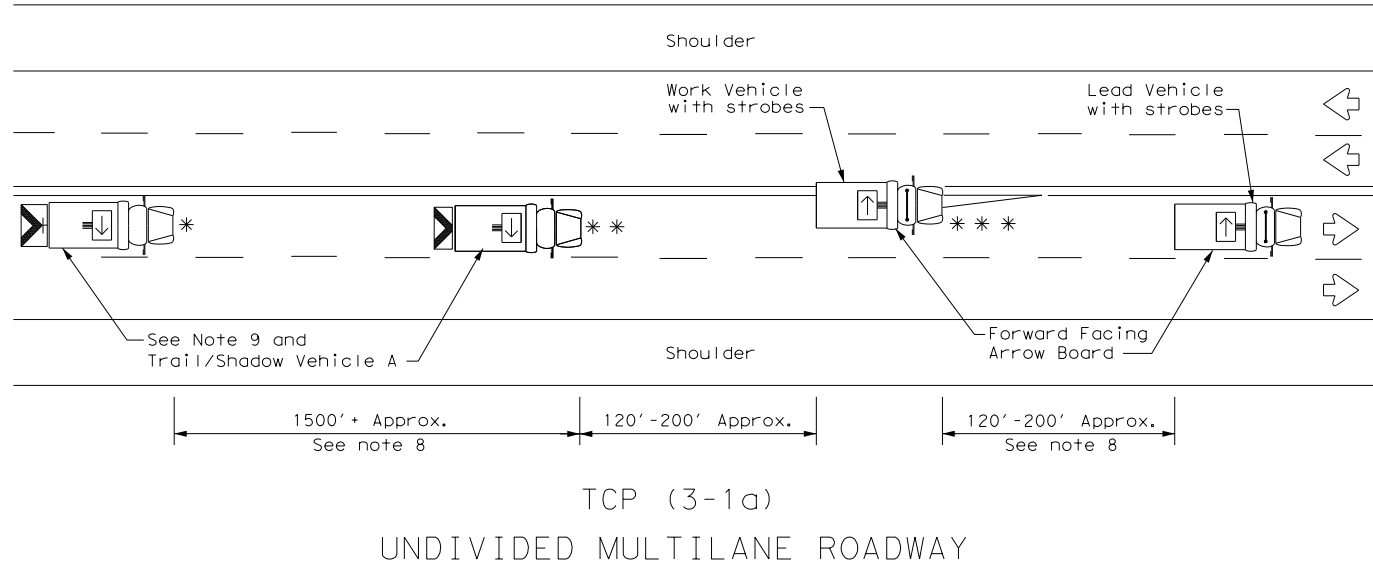
TRAFFIC CONTROL PLAN
 ONE-LANE TWO-WAY
 TRAFFIC CONTROL

TCP (1-2) - 18

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© TxDOT December 1985	CON:	SECT:	JOB:	HIGHWAY:
REVISIONS	0552	02	027	FM978
4-90 4-98	DIST:	COUNTY:	SHEET NO.:	
2-94 2-12	BRY	MADISON	22C	
1-97 2-18				

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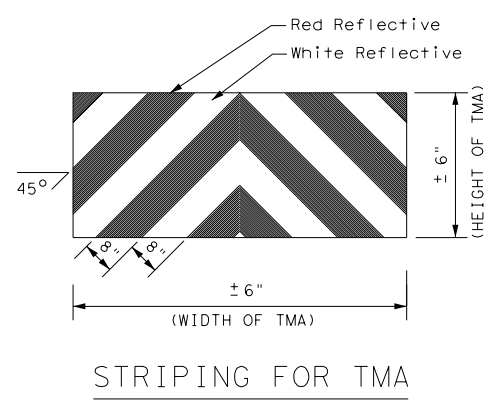
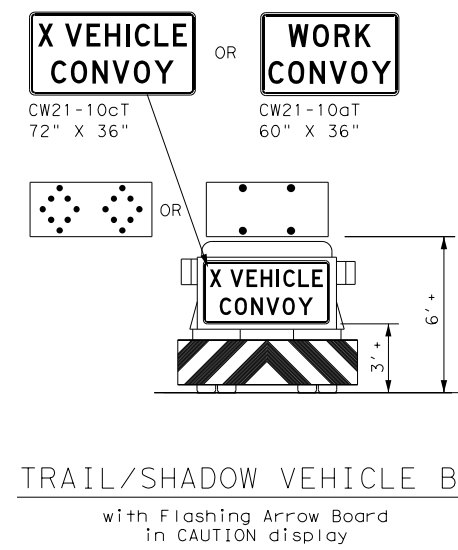
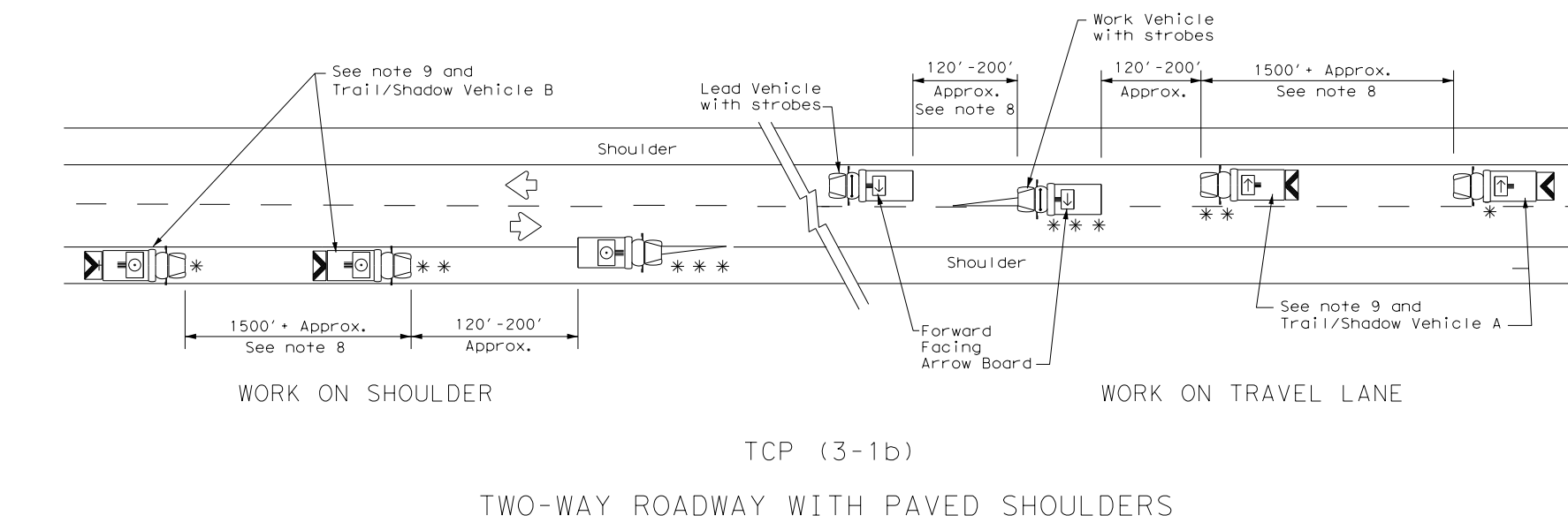


LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
** *	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY" (CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



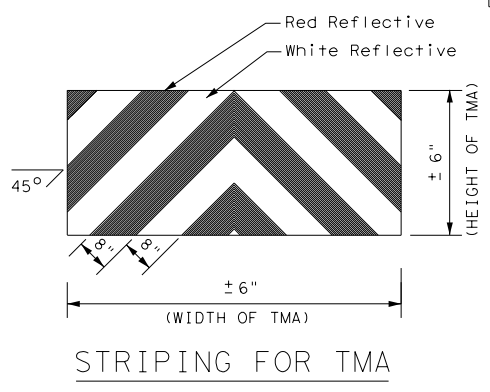
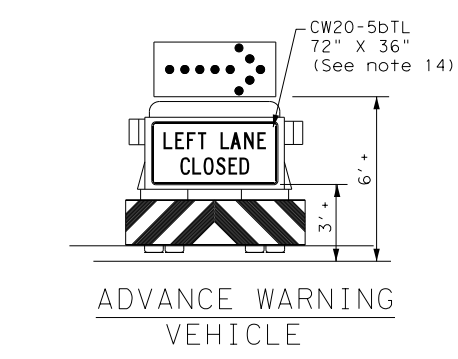
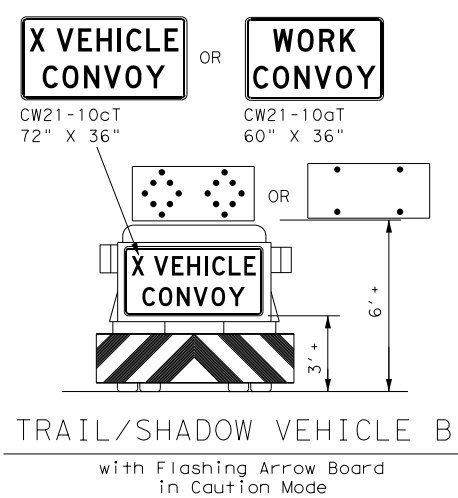
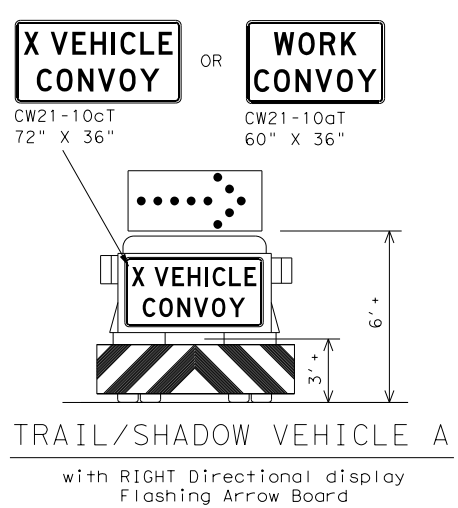
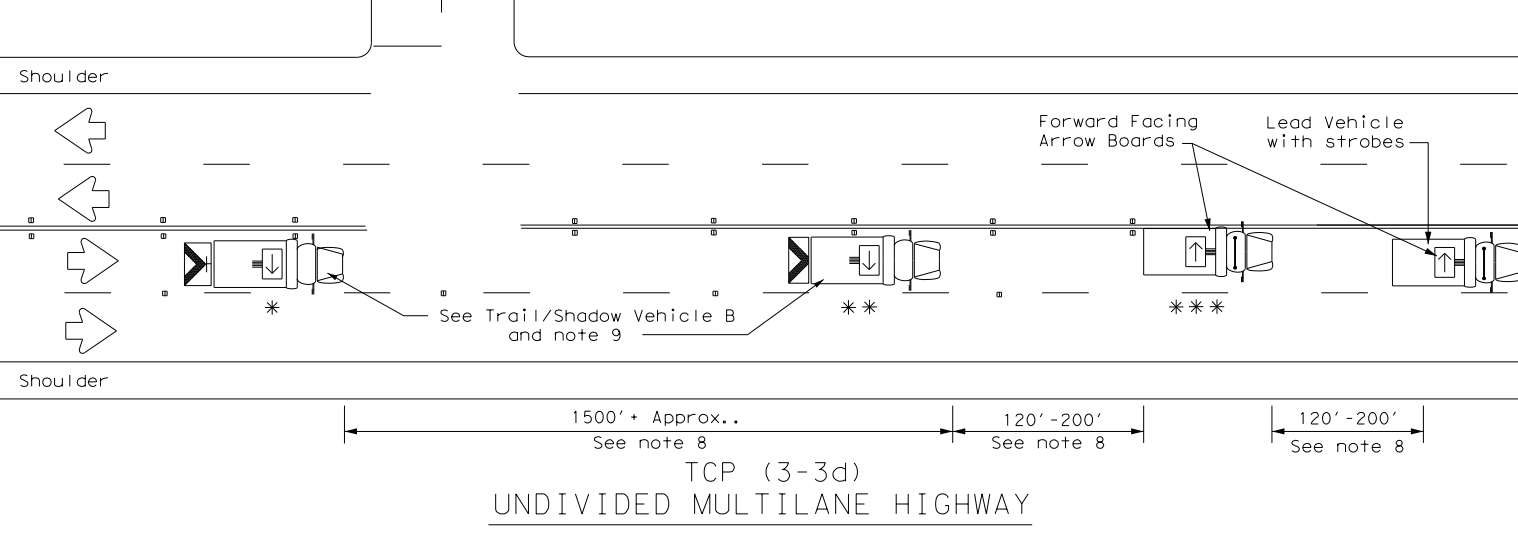
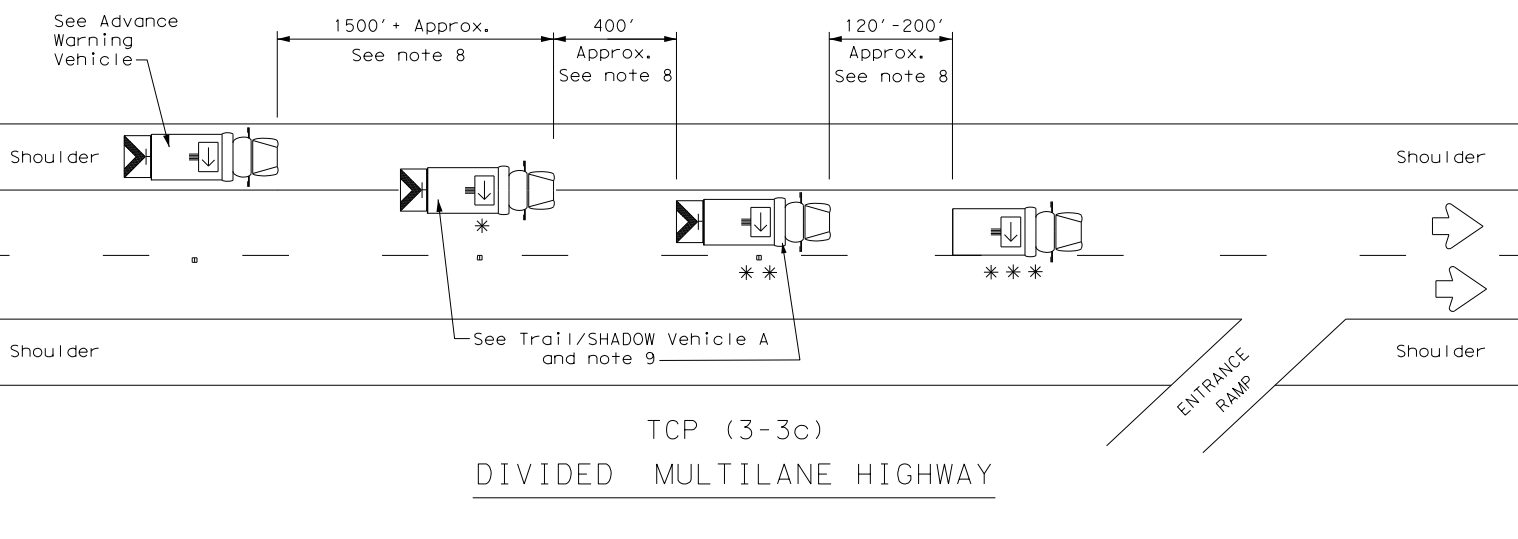
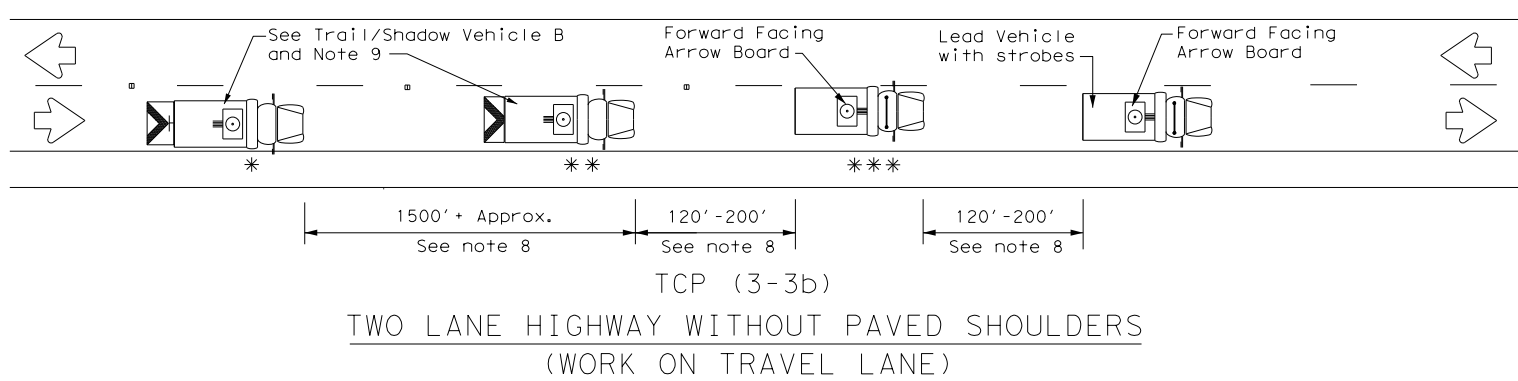
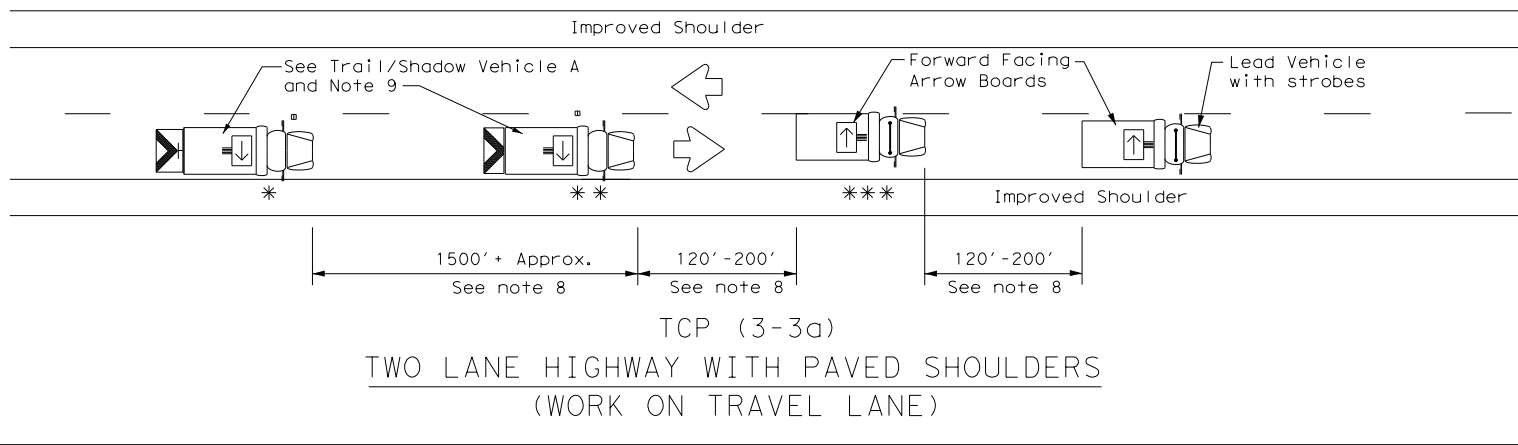
TRAFFIC CONTROL PLAN
 MOBILE OPERATIONS
 UNDIVIDED HIGHWAYS

TCP (3-1) - 13

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REVISIONS		0552	02	027	FM978				
2-94	4-98	DIST	COUNTY		SHEET NO.				
8-95	7-13	BRY	MADISON		22D				
1-97									

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LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
** *	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
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GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer will determine if the LEAD vehicle and/or TRAIL vehicle are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating, or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. X VEHICLE CONVOY (CW21-10cT) or WORK CONVOY (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" x 48" diamond shaped WORK CONVOY (CW21-10T) or X VEHICLE CONVOY (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The X VEHICLE CONVOY sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. For divided highways with two or three lanes in one direction, the appropriate LEFT LANE CLOSED (CW20-5bTL), RIGHT LANE CLOSED (CW20-5bTR), or CENTER LANE CLOSED (CW20-5dT) sign should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board may be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
12. For divided highways with three or four lanes in each direction, use TCP(3-2).
13. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
14. The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
15. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

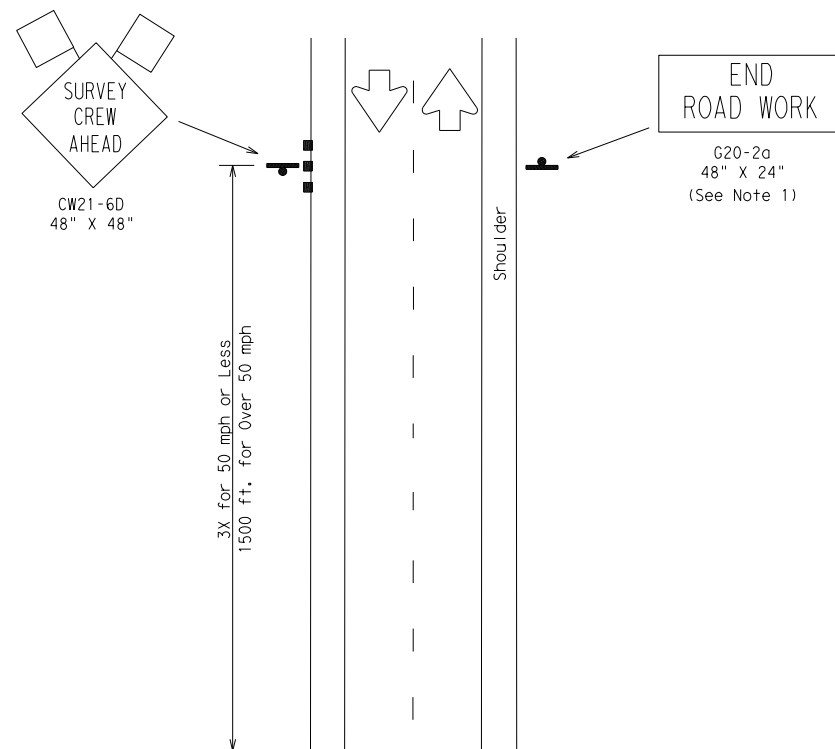
Texas Department of Transportation

**TRAFFIC CONTROL PLAN
MOBILE OPERATIONS
RAISED PAVEMENT
MARKER INSTALLATION/
REMOVAL
TCP (3-3) - 14**

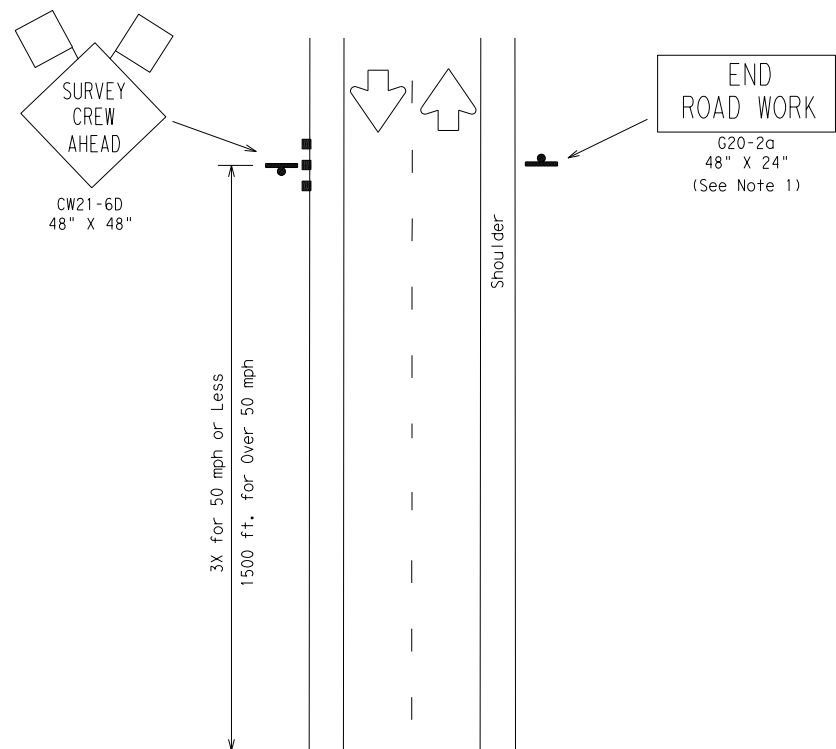
FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 7-13	BRY	MADISON	22E	
1-97 7-14				

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TCP (S-1a)
 WORK OFF SHOULDER
 OR PAVED SURFACE



TCP (S-1b)
 WORK ON SHOULDER

Work Vehicle with high intensity rotating, flashing, oscillating or strobe lights (See Notes 3 and 4)

WHENEVER POSSIBLE, SURVEY PARTIES SHOULD AVOID, BY THE USE OF OFFSET LINES, ANY UNNECESSARY PERIODS OF TIME ON THE ROAD SURFACE.

8-18-08 Revision
 Corrected misspelling.

LEGEND

	Type III Barricade		Channelizing Devices		Flag
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)		
	Trailer Mounted Flashing Arrow Panel		Portable Changeable Message Sign (PCMS)		
	Flagger		Sign Post		

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Device		Min. Sign Spacing "X" Distance	Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60' - 75'	120'	90'
35		205'	225'	245'	35'	70' - 90'	160'	120'
40		265'	295'	320'	40'	80' - 100'	240'	155'
45		450'	495'	540'	45'	90' - 110'	320'	195'
50	L=WS	500'	550'	600'	50'	100' - 125'	400'	240'
55		550'	605'	660'	55'	110' - 140'	500'	295'
60		600'	660'	720'	60'	120' - 150'	600'	350'
65		650'	715'	780'	65'	130' - 165'	700'	410'
70		700'	770'	840'	70'	140' - 175'	800'	475'
75		750'	825'	900'	75'	150' - 185'	900'	540'

* Conventional Roads Only
 ** Taper lengths have been rounded off.
 L=Length of Taper (FT.) W=Width of Offset (FT.) S=Posted Speed (MPH)

TYPICAL USAGE:

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

DEFINITIONS:
 SHORT DURATION - work that occupies a location up to 1 hour.
 SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

- GENERAL NOTES:
- The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
 - Channelizing devices on the shoulder taper and tangent section may be omitted for short duration (less than 1 hour) work.
 - If line-of-sight requirements for surveying operations will preclude the placement of the Work Vehicle to protect workers, the channelizing devices mentioned in Note 2 are required.
 - A Shadow Vehicle with a Truck Mounted Attenuator and flashing warning lights/arrow panel in caution mode may be used in lieu of the Work Vehicle to protect the work space.
 - The CW20-1D "ROAD WORK AHEAD" sign may be substituted for the CW21-6D "SURVEY CREW AHEAD" sign.
 - This plan may also be used for shoulder work or off shoulder work for multilane undivided roadways.
 - The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.
- TCP (S-1a)
- Cones may be placed at edge of pavement adjacent to the work space to enhance safety.

Texas Department of Transportation
 Traffic Operations Division

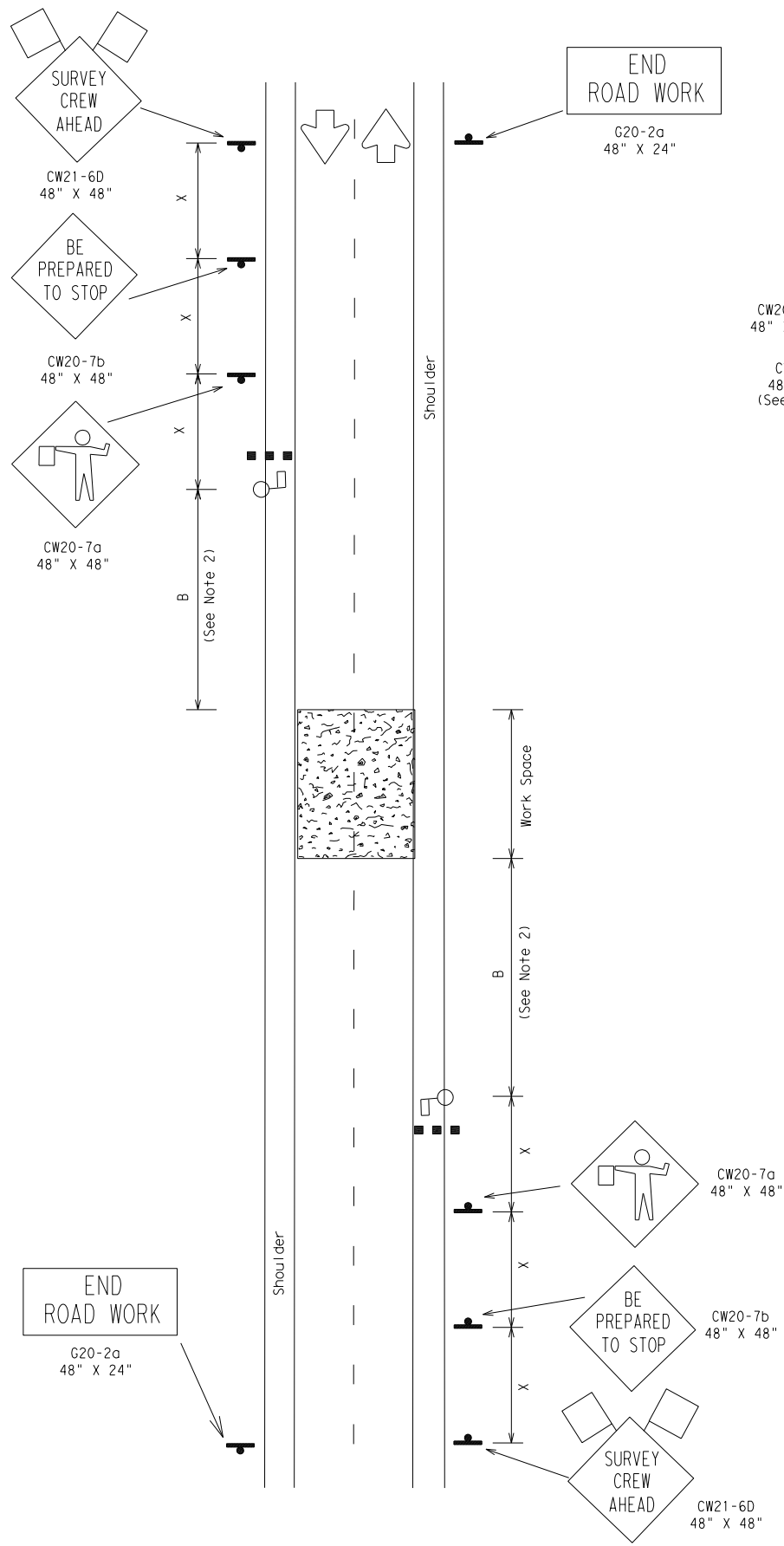
TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP (S-1) - 08A

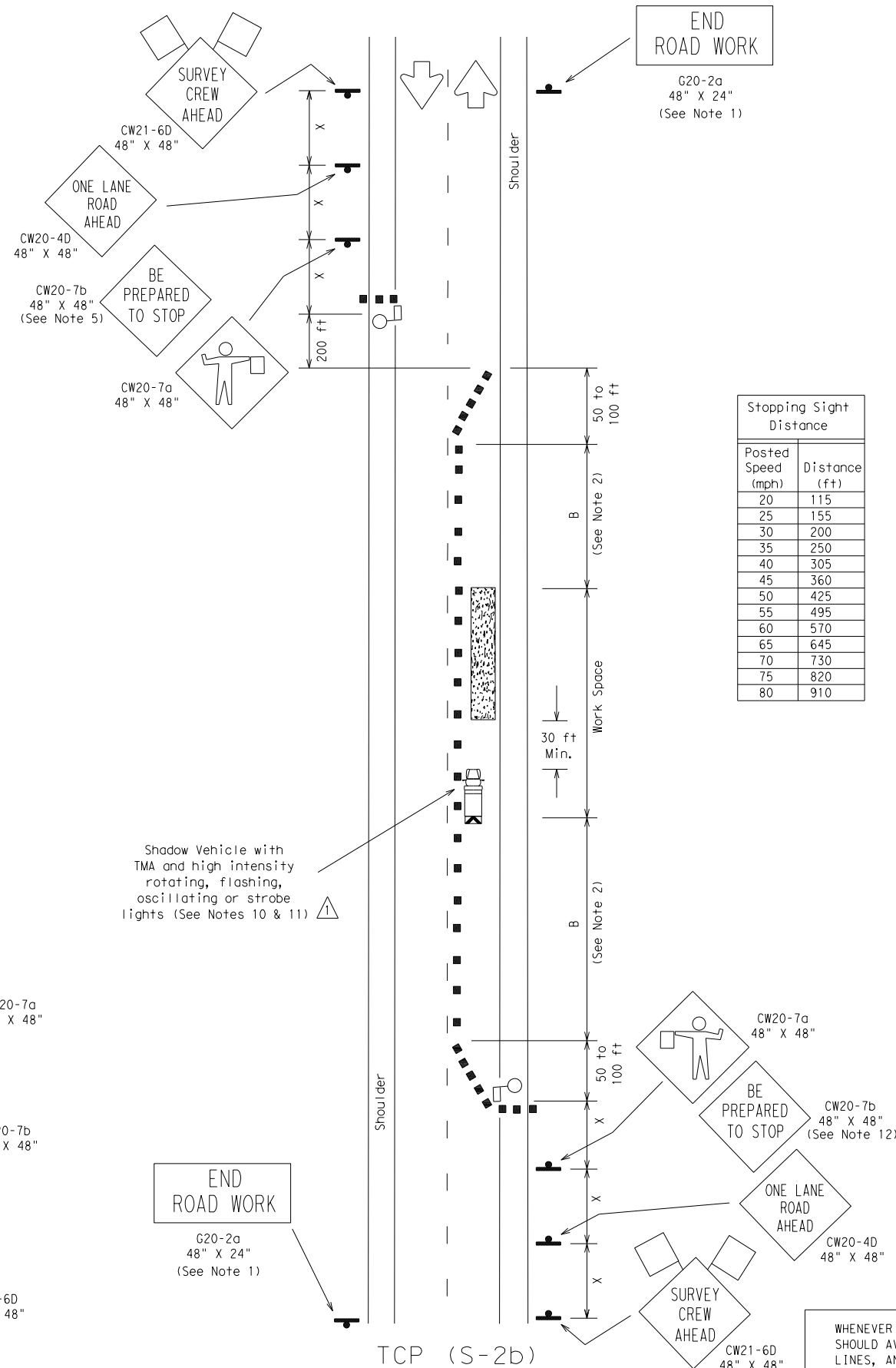
© TxDOT August 2008		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
8-08	REVISIONS		CONT	SECT	JOB
			0552	02	027
	DIST	COUNTY	SHEET NO.		
	BRY	MADISON			22F

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TCP (S-2a)
 ROAD CLOSED FOR LESS THAN 20 MINUTES -
 OFF PEAK TRAFFIC HOURS
 WITH OR WITHOUT SHOULDERS



TCP (S-2b)
 WORK IN ROADWAY
 OFF PEAK TRAFFIC HOURS
 WITH OR WITHOUT SHOULDERS

Stopping Sight Distance	
Posted Speed (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820
80	910

WHENEVER POSSIBLE, SURVEY PARTIES SHOULD AVOID, BY THE USE OF OFFSET LINES, ANY UNNECESSARY PERIODS OF TIME ON THE ROAD SURFACE.

8-18-08 Revision
 ⚠ Corrected reference to notes.

LEGEND

- Type III Barricade
- Channelizing Devices
- Flag
- Heavy Work Vehicle
- Truck Mounted Attenuator (TMA)
- Trailer Mounted Flashing Arrow Panel
- Portable Changeable Message Sign (PCMS)
- Flagger
- Sign Post

Posted Speed \times	Formula	Minimum Desirable Taper Lengths $\times \times$			Suggested Maximum Spacing of Device		Min. Sign Spacing "X" Distance	Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'-75'	120'	90'
35		205'	225'	245'	35'	70'-90'	160'	120'
40		265'	295'	320'	40'	80'-100'	240'	155'
45	$L = WS$	450'	495'	540'	45'	90'-110'	320'	195'
50		500'	550'	600'	50'	100'-125'	400'	240'
55		550'	605'	660'	55'	110'-140'	500'	295'
60		600'	660'	720'	60'	120'-150'	600'	350'
65		650'	715'	780'	65'	130'-165'	700'	410'
70		700'	770'	840'	70'	140'-175'	800'	475'
75		750'	825'	900'	75'	150'-185'	900'	540'

\times Conventional Roads Only
 $\times \times$ Taper lengths have been rounded off.
 L=Length of Taper (FT.) W=Width of Offset (FT.) S=Posted Speed (MPH)

TYPICAL USAGE:				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

DEFINITIONS:
 SHORT DURATION - work that occupies a location up to 1 hour.
 SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

- GENERAL NOTES:
- The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
 - Adequate Stopping Sight Distance (see Stopping Sight Distance table) should be maintained from approaching traffic to the flagger or a queue of stopped vehicles. The Buffer Space "B" should be extended around curves or other obstacles, when necessary, to have adequate Stopping Sight Distance to the flagger station.
 - Flaggers should use two-way radios or other means of communication while flagging.
 - The length of the work space should be based on the ability of the flaggers to communicate.
 - CW20-1D "ROAD WORK AHEAD" signs may be substituted for CW21-6D "SURVEY CREW AHEAD" signs.
 - The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.

- TCP (S-2a)
- Road closures shall be less than 20 minutes. Closures less than 5 minutes are desirable.
 - Sign spacing should be increased if traffic repeatedly queues past the CW20-7b "BE PREPARED TO STOP" sign.
 - The surveying instrument should not be located on the paved surface.
- TCP (S-2b)
- For short duration work the Shadow Vehicle with a TMA may be replaced by another Work Vehicle with high intensity rotating, flashing or strobe lights.
 - Shadow Vehicles with a TMA are desirable when workers or equipment are in the work space. When approved by the engineer, Type III barricades or other channelizing devices may be substituted for the Shadow Vehicle.
 - The CW20-7b "BE PREPARED TO STOP" sign is optional. When used, it should be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign.



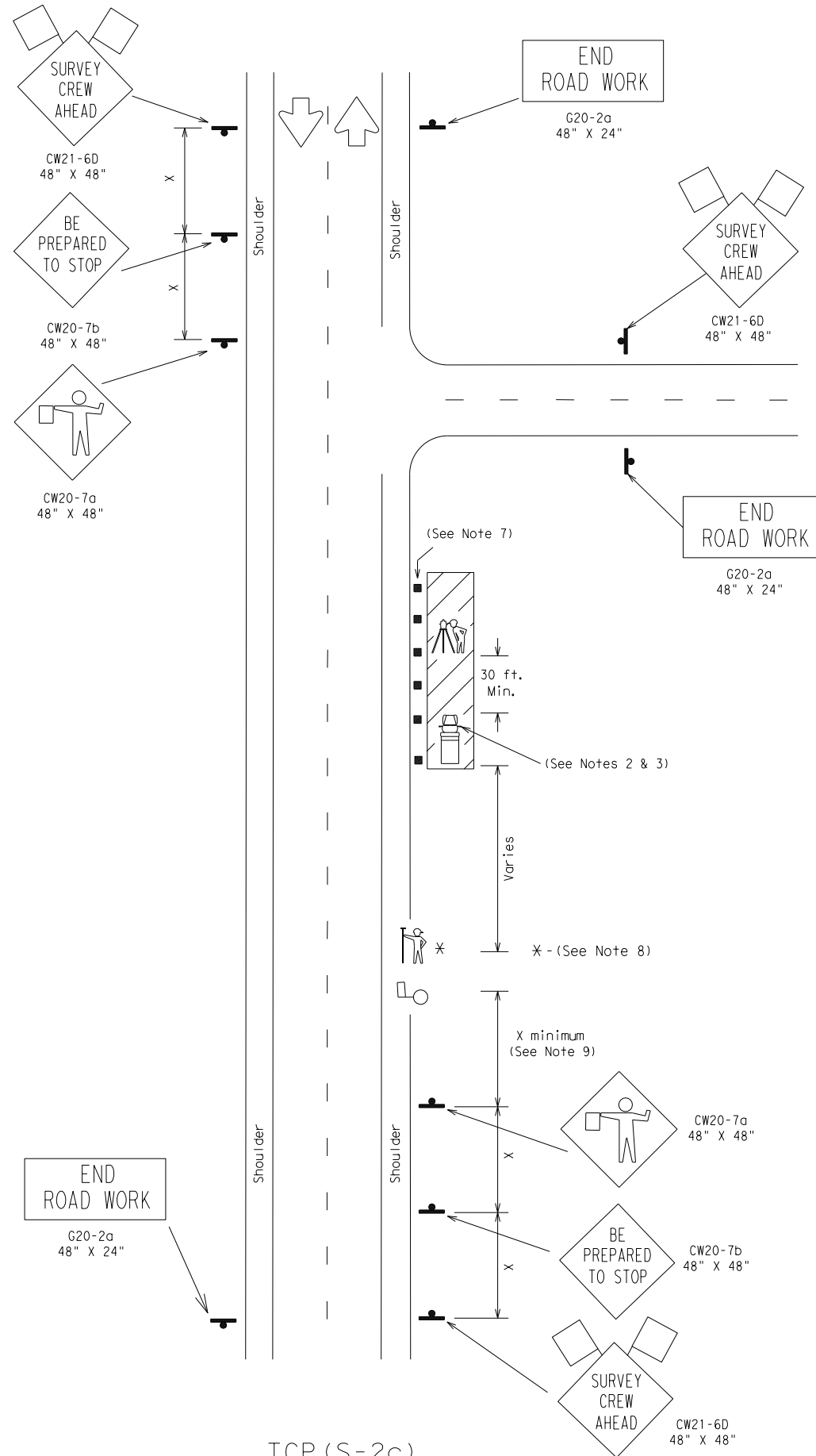
TRAFFIC CONTROL PLAN
 FOR SURVEYING
 OPERATIONS

TCP (S-2) - 08A

© TxDOT August 2008		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS					
8-08	0552	02	027	FM978	
	DIST	COUNTY		SHEET NO.	
	BRY	MADISON		226	

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DATE: 3/16/2023 1:34:01 PM
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Posted Speed (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820
80	910

LEGEND

- Type III Barricade
- Channelizing Devices
- Flag
- Work Vehicle
- Truck Mounted Attenuator (TMA)
- Flagger
- Sign Post
- Survey Rodman
- Instrument Person

Posted Speed \times	Formula	Minimum Desirable Taper Lengths $\times \times$			Suggested Maximum Spacing of Device		Min. Sign Spacing "x" Distance	Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60' - 75'	120'	90'
35		205'	225'	245'	35'	70' - 90'	160'	120'
40		265'	295'	320'	40'	80' - 100'	240'	155'
45	L=WS	450'	495'	540'	45'	90' - 110'	320'	195'
50		500'	550'	600'	50'	100' - 125'	400'	240'
55		550'	605'	660'	55'	110' - 140'	500'	295'
60		600'	660'	720'	60'	120' - 150'	600'	350'
65		650'	715'	780'	65'	130' - 165'	700'	410'
70		700'	770'	840'	70'	140' - 175'	800'	475'
75		750'	825'	900'	75'	150' - 185'	900'	540'

\times Conventional Roads Only
 $\times \times$ Taper lengths have been rounded off.
 L=Length of Taper (FT.) W=Width of Offset (FT.) S=Posted Speed (MPH)

	MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
		✓	✓		

DEFINITIONS:
 MOBILE - work that moves continuously or intermittently (stopping up to approximately 15 minutes).
 SHORT DURATION - work that occupies a location up to 1 hour.
 SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

- GENERAL NOTES:
- The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
 - Work Vehicle with high intensity rotating, flashing, oscillating or strobe lights should be used to protect work space.
 - When approved by the engineer, Type III barricades or other channelizing devices may be substituted for the Heavy Work Vehicle.
 - CW20-1D "ROAD WORK AHEAD" signs may be substituted for CW21-6D "SURVEY CREW AHEAD" SIGNS.
 - The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads may be omitted when approved by the Engineer.
 - The Surveying Instrument shall not be located on the paved surface.
 - Cones at edge of pavement adjacent to instrument person may be omitted when approved by the Engineer.
 - Rodman may only enter roadway when accompanied by flagger and as traffic allows.
 - The distance between the advance warning signs and the work should not exceed a two mile maximum.
 - Flaggers and Survey Crew should use two-way radios or other means of communication.
 - Survey Crew and Flaggers shall wear high-visibility apparel meeting the ANSI 107-2007 standard performance for Class 2 or Class 3 risk exposure.
 - Additional traffic control devices may be required to address local site conditions.
 - Stopping Sight Distance shall be maintained from approaching traffic to the flagger. See "Stopping Sight Distance" table.

SURVEY PARTIES SHOULD AVOID ANY UNNECESSARY PERIODS OF TIME ON THE ROAD SURFACE.

This TCP is to cover two lane rural type roadways as determined by the Engineer. All other type roadways will be covered by other established Survey TCP'S.

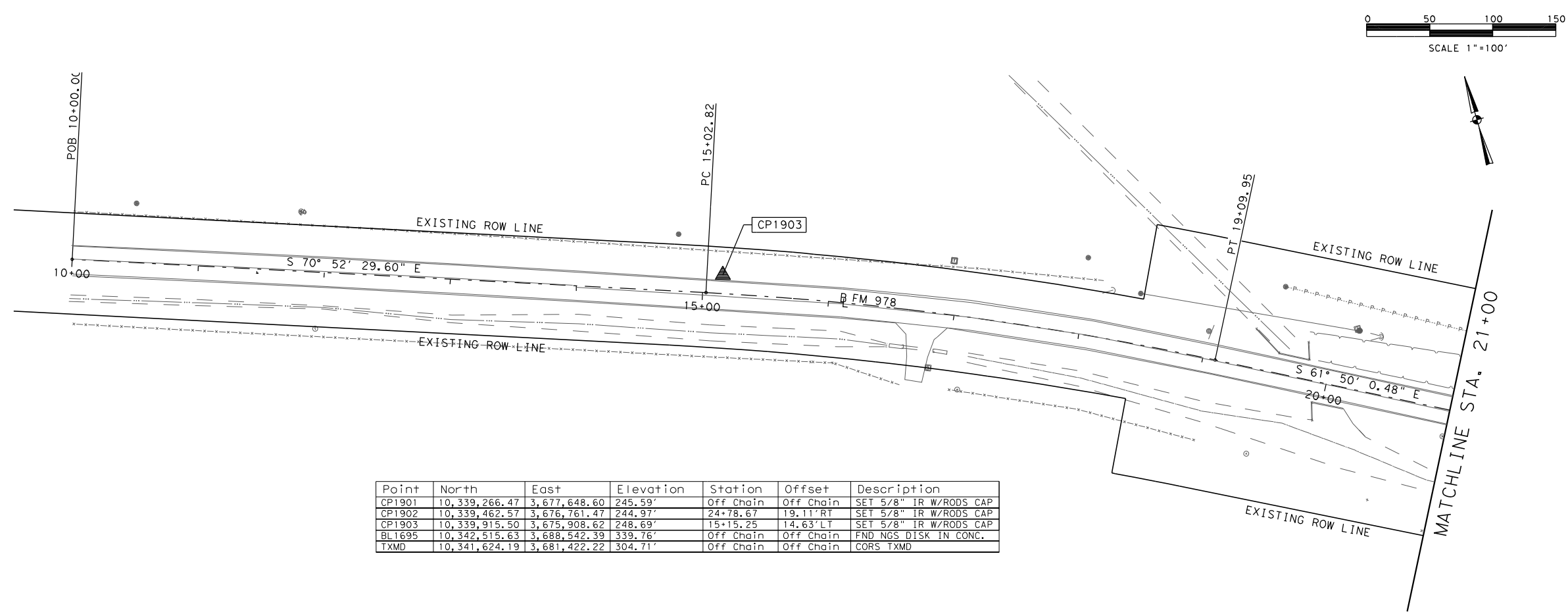
Texas Department of Transportation
 Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP (S-2c) -10

© TxDOT January 2010		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS		CONT	SECT	JOB	HIGHWAY
		0552	02	027	FM978
		DIST	COUNTY		SHEET NO.
		BRY	MADISON		22H

G:\My Drive\RODS\Client\HDR Engineering 188\21545003\C - FM 978 @ Mustang Creek\CAD\H&V Control\H&V Index Sheet 1.dgn



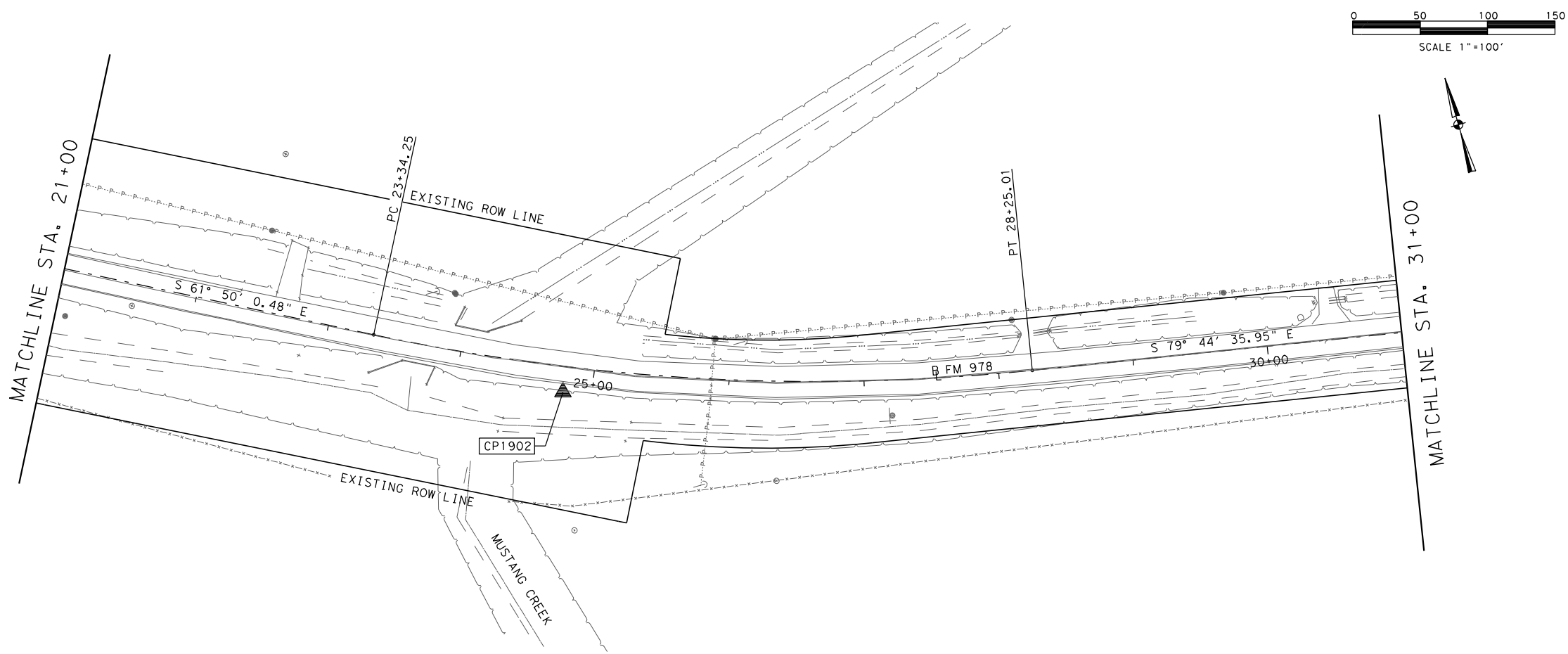
Point	North	East	Elevation	Station	Offset	Description
CP1901	10,339,266.47	3,677,648.60	245.59'	Off Chain	Off Chain	SET 5/8" IR W/RODS CAP
CP1902	10,339,462.57	3,676,761.47	244.97'	24+78.67	19.11' RT	SET 5/8" IR W/RODS CAP
CP1903	10,339,915.50	3,675,908.62	248.69'	15+15.25	14.63' LT	SET 5/8" IR W/RODS CAP
BL1695	10,342,515.63	3,688,542.39	339.76'	Off Chain	Off Chain	FND NGS DISK IN CONC.
TXMD	10,341,624.19	3,681,422.22	304.71'	Off Chain	Off Chain	CORS TXMD

- NOTES:
1. ALL COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS COORDINATE SYSTEM, CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (2011 ADJ.). BEARINGS ARE BASED ON GRID NORTH.
 2. ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID MODEL 12B).
 3. COORDINATES AND DISTANCES ARE U.S. SURVEY FEET, DISPLAYED IN SURFACE VALUES, AND MAY BE CONVERTED TO NAD83 (GRID) VALUES BY APPLYING THE TXDOT COMBINED ADJUSTMENT FACTOR (CAF) FOR MADISON COUNTY, CAF = 1.00012, USING THE FORMULA: SURFACE / CAF = GRID
 4. HORIZONTAL COORDINATE SOLUTIONS ARE BASED ON REDUNDANT GPS RTN OBSERVATIONS OBSERVED IN OCTOBER, 2018 FROM TXDOT CORS: TXMD.
 5. ELEVATIONS HAVE BEEN ESTABLISHED VIA DIGITAL LEVELING, HOLDING FIXED THE GPS DERIVED ELEVATION OF POINT 1901.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.



THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E



Sheet 1 of 2
Survey Date: OCTOBER, 2018

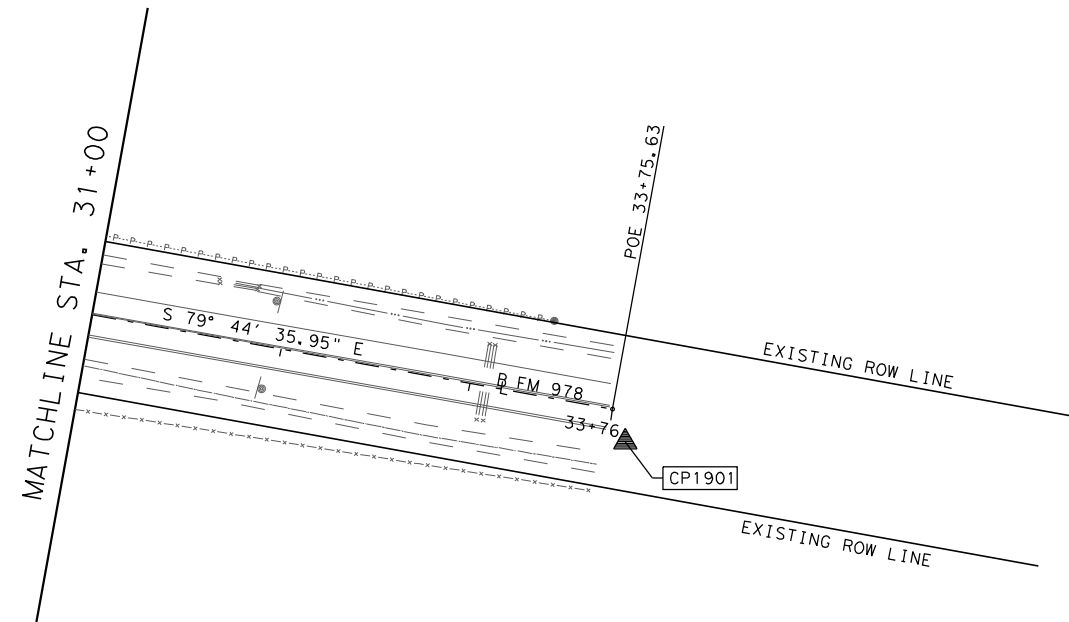
RODS
Surveying, Inc.
Central Infrastructure Transportation Land Development
6810 LEE ROAD, STE. 100
SPRING, TEXAS 77379
TEL (281) 257-4020
FAX (281) 257-4021
TBPELS SURVEYING FIRM REG. No. 10030700



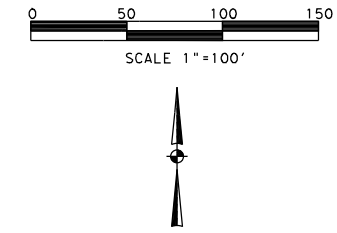
FM978 @ MUSTANG CREEK
SURVEY CONTROL
INDEX SHEET

FEDERAL AID PROJECT NO.			SHEET NO.
SEE COVER SHEET			23
FED. RD. DIV. NO.	STATE	DISTRICT	COUNTY
6	TEXAS	BRY	MADISON
STATE DIST. NO.	CONTROL	SECTION	JOB HIGHWAY
17	0552	02	027 FM978

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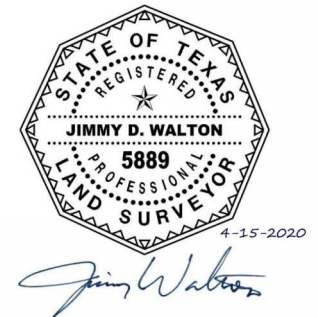


BL1695



- NOTES:
1. ALL COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS COORDINATE SYSTEM, CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (2011 ADJ.). BEARINGS ARE BASED ON GRID NORTH.
 2. ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID MODEL 12B).
 3. COORDINATES AND DISTANCES ARE U.S. SURVEY FEET, DISPLAYED IN SURFACE VALUES, AND MAY BE CONVERTED TO NAD83 (GRID) VALUES BY APPLYING THE TXDOT COMBINED ADJUSTMENT FACTOR (CAF) FOR MADISON COUNTY, CAF = 1.00012, USING THE FORMULA: SURFACE / CAF = GRID
 4. HORIZONTAL COORDINATE SOLUTIONS ARE BASED ON REDUNDANT GPS RTN OBSERVATIONS OBSERVED IN OCTOBER, 2018 FROM TXDOT CORS: TXMD.
 5. ELEVATIONS HAVE BEEN ESTABLISHED VIA DIGITAL LEVELING, HOLDING FIXED THE GPS DERIVED ELEVATION OF POINT 1901.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.



THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E



03/06/2023

Sheet 2 of 2
Survey Date: OCTOBER, 2018

RODS
Surveying, Inc.
Central Infrastructure Transportation Land Development
6810 LEE ROAD, STE. 100
SPRING, TEXAS 77379
TEL (281) 257-4020
FAX (281) 257-4021
TBPELS SURVEYING FIRM REG. No. 10030700



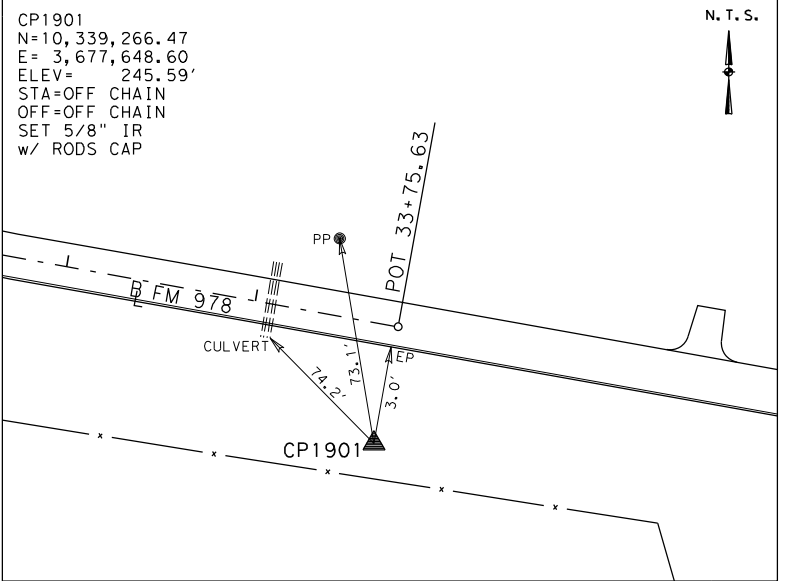
FM978 @ MUSTANG CREEK
SURVEY CONTROL
INDEX SHEET

Control Name	Published: NAD83 (1986) Coordinate Information			Measured: NAD83 (2011) Coordinate Information			Deferent (Published - Measured)		
	N. Coord.	E. Coord.	Elev.	N. Coord.	E. Coord.	Elev.	N. Coord.	E. Coord.	Elev.
BL1695*	10,341,274	3,688,099	339.6	10,341,274.68	3,688,099.82	339.76	-0.68	-0.81	-0.16

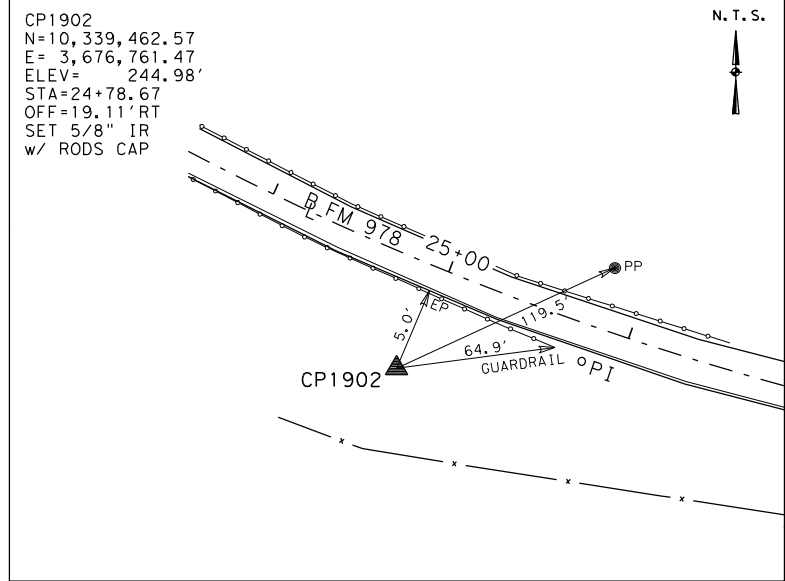
* NGS Monument is of Second Vertical Order, Class 0.

FEDERAL AID PROJECT NO.				SHEET NO.
SEE COVER SHEET				24
FED. RD. DIV. NO.	STATE	DISTRICT	COUNTY	
6	TEXAS	BRY	MADISON	
STATE DIST. NO.	CONTROL	SECTION	JOB	HIGHWAY
17	0552	02	027	FM978

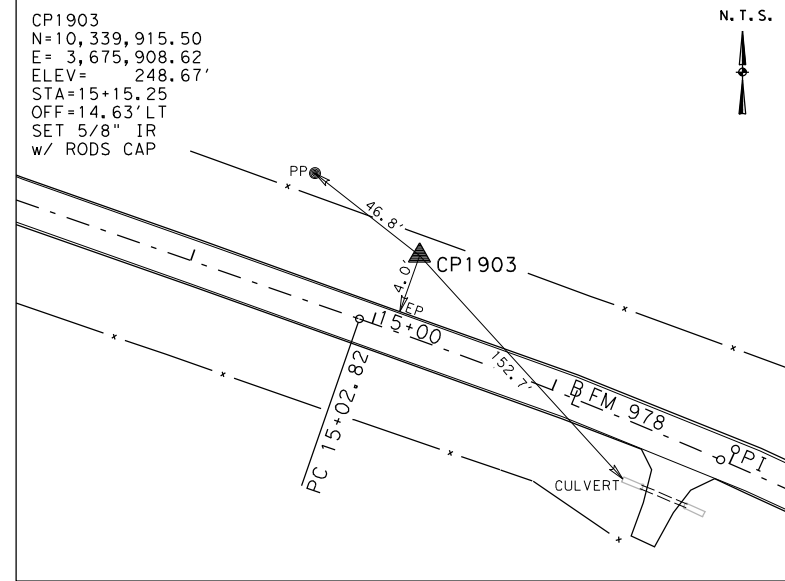
G:\My Drive\RODS\client\HDR Engineering 188\21545003\C - FM 978 @ Mustang Creek\CAD\H&V Control\H&V Sketches.dgn



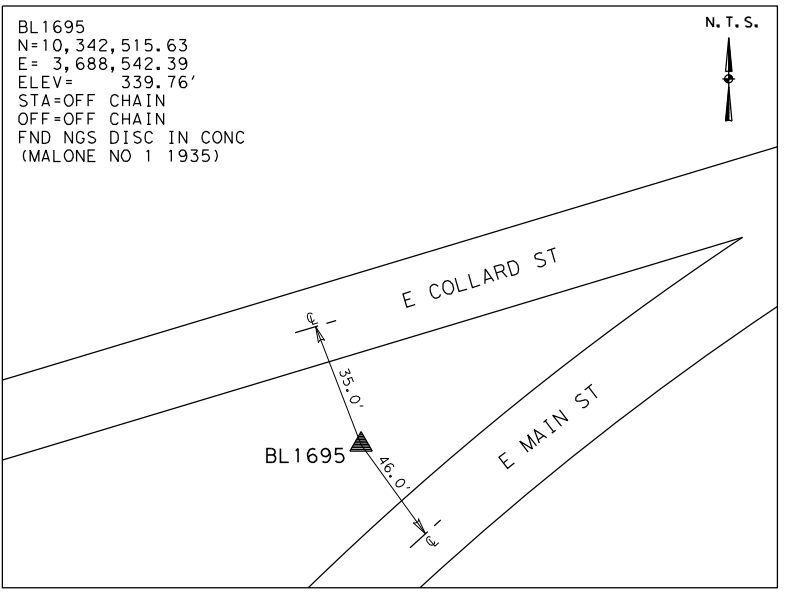
STATION IS LOCATED ON THE SOUTH SIDE OF FM 978, LYING 0.28 MILE NORTH OF CASEY STREET.



STATION IS LOCATED ON THE SOUTH SIDE OF FM 978, LYING 0.45 MILE NORTH OF CASEY STREET.



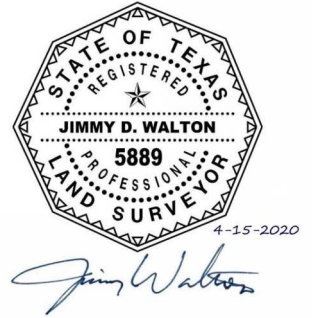
STATION IS LOCATED ON THE NORTH SIDE OF FM 978, LYING 0.63 MILE NORTH OF CASEY STREET.



STATION IS LOCATED ON THE SOUTH SIDE OF THE INTERSECTION OF COLLARD STREET AND SH 21 WEST BOUND.

- NOTES:
1. ALL COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS COORDINATE SYSTEM, CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (2011 ADJ.). BEARINGS ARE BASED ON GRID NORTH.
 2. ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID MODEL 12B).
 3. COORDINATES AND DISTANCES ARE U.S. SURVEY FEET, DISPLAYED IN SURFACE VALUES, AND MAY BE CONVERTED TO NAD83 (GRID) VALUES BY APPLYING THE TXDOT COMBINED ADJUSTMENT FACTOR (CAF) FOR MADISON COUNTY, CAF = 1.00012, USING THE FORMULA: SURFACE / CAF = GRID
 4. HORIZONTAL COORDINATE SOLUTIONS ARE BASED ON REDUNDANT GPS RTN OBSERVATIONS OBSERVED IN OCTOBER, 2018 FROM TXDOT CORS: TXMD.
 5. ELEVATIONS HAVE BEEN ESTABLISHED VIA DIGITAL LEVELING, HOLDING FIXED THE GPS DERIVED ELEVATION OF POINT 1901.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.



THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E



Sheet 1 of 1
Survey Date: OCTOBER, 2018

RODS
Surveying, Inc.

Control Infrastructure Transportation Land Development

6810 LEE ROAD, STE. 100
SPRING, TEXAS 77379
TEL (281) 257-4020
FAX (281) 257-4021
TBPELS SURVEYING FIRM REG. No. 10030700



FM978 @ MUSTANG CREEK
HORIZONTAL & VERTICAL
CONTROL SHEET

FEDERAL AID PROJECT NO.			SHEET NO.
SEE COVER SHEET			25
FED. RD. DIV. NO.	STATE	DISTRICT	COUNTY
6	TEXAS	BRY	MADISON
STATE DIST. NO.	CONTROL	SECTION	JOB HIGHWAY
17	0552	02	027 FM978

ALIGNMENT: FM978

	STATION	NORTHING	EASTING
Element: Linear			
POB ()	10+00.00	10340070.544	3675416.956
PC ()	15+02.82	10339905.805	3675892.022
Tangent Direction:	S 70° 52' 29.60" E		
Tangent Length:	502.8184		
Element: Circular			
PC ()	15+02.82	10339905.805	3675892.022
PI ()	17+06.81	10339838.971	3676084.751
CC ()		10337468.207	3675046.731
PT ()	19+09.95	10339742.681	3676264.584
Radius:	2580.0000		
Delta:	9° 02' 29.12" Right		
Degree of Curvature (Arc):	2° 13' 14.76"		
Length:	407.1307		
Tangent:	203.9888		
Chord:	406.7084		
Middle Ordinate:	8.0266		
External:	8.0517		
Tangent Direction:	S 70° 52' 29.60" E		
Radial Direction:	S 19° 07' 30.40" W		
Chord Direction:	S 66° 21' 15.04" E		
Radial Direction:	S 28° 09' 59.52" W		
Tangent Direction:	S 61° 50' 00.48" E		
Element: Linear			
PT ()	19+09.95	10339742.681	3676264.584
PC ()	23+34.25	10339542.397	3676638.636
Tangent Direction:	S 61° 50' 00.48" E		
Tangent Length:	424.2984		
Element: Circular			
PC ()	23+34.25	10339542.397	3676638.636
PI ()	25+81.65	10339425.617	3676856.737
CC ()		10340926.477	3677379.733
PT ()	28+25.01	10339381.565	3677100.181
Radius:	1570.0000		
Delta:	17° 54' 35.47" Left		
Degree of Curvature (Arc):	3° 38' 57.89"		
Length:	490.7599		
Tangent:	247.3977		
Chord:	488.7643		
Middle Ordinate:	19.1366		
External:	19.3727		
Tangent Direction:	S 61° 50' 00.48" E		
Radial Direction:	S 28° 09' 59.52" W		
Chord Direction:	S 70° 47' 18.22" E		
Radial Direction:	S 10° 15' 24.05" W		
Tangent Direction:	S 79° 44' 35.95" E		
Element: Linear			
PT ()	28+25.01	10339381.565	3677100.181
POE ()	33+75.63	10339283.522	3677642.007
Tangent Direction:	S 79° 44' 35.95" E		
Tangent Length:	550.6245		

PLOT DRIVER: TXDOT_PDF_BW.pltcf9
 USER: SANLEE DATE: 6/17/2020
 PENTABLE: FM978-10134847.tbl
 TIME: 6:49:27 PM SCALE: 1:1
 FILE: FM978HAD01.dgn



PHILIP A. FULTON
73469
REGISTERED PROFESSIONAL ENGINEER
06/18/2020

Philip A. Fulton

NO.	DATE	REVISION	APPROVED



HDR
 Firm Registration No. F-754
 710 Hesters Crossing, Suite 150
 Round Rock, Texas 78681
 512.685.2900

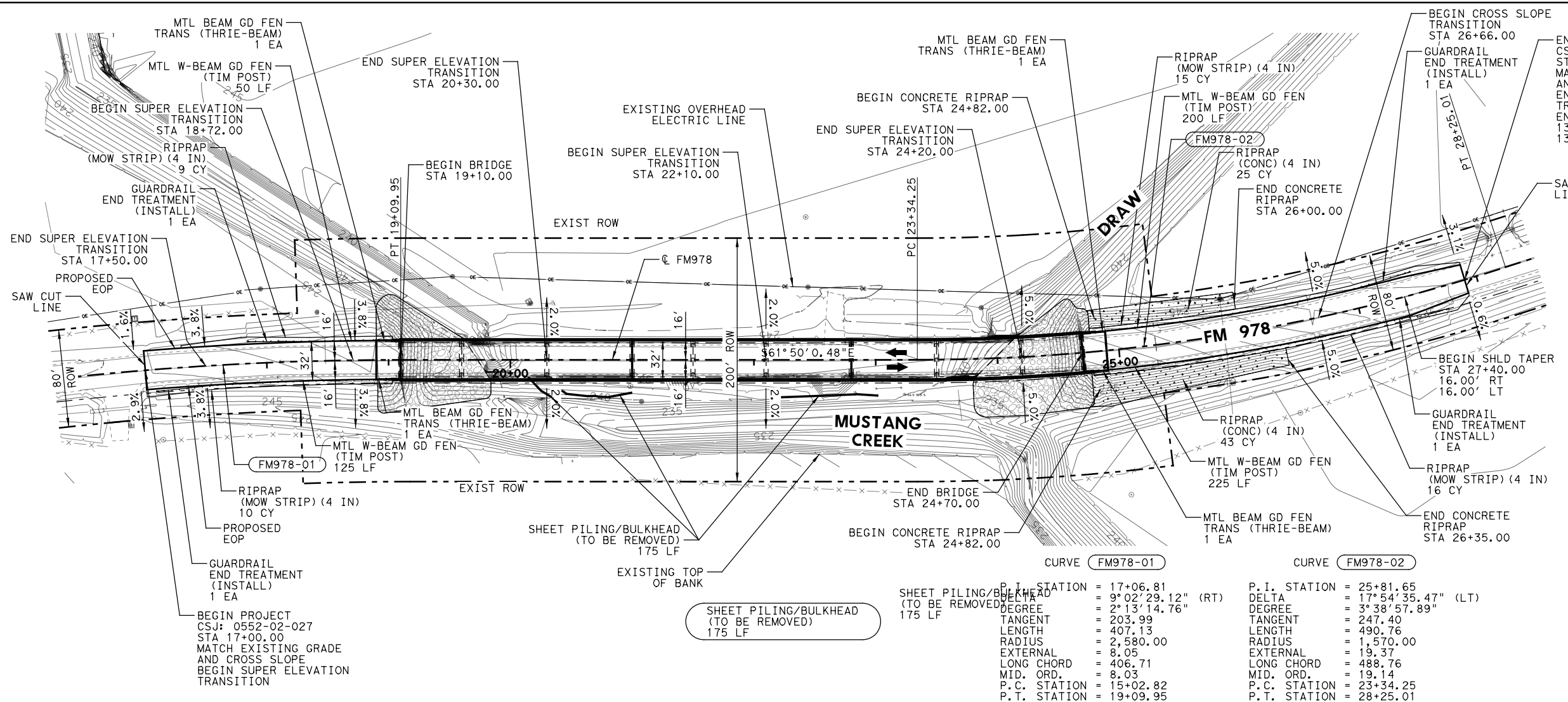

Texas Department of Transportation
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**HORIZONTAL
ALIGNMENT DATA
FM 978 AT MUSTANG CREEK**

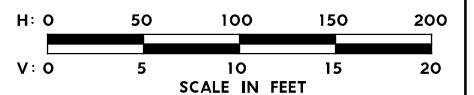
SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL PROJECT NO.	HIGHWAY NO.
6	SEE TITLE SHEET	FM 978
STATE	DISTRICT	COUNTY
TEXAS	BRY	MADISON
CONTROL	SECTION	JOB
0552	02	027

26

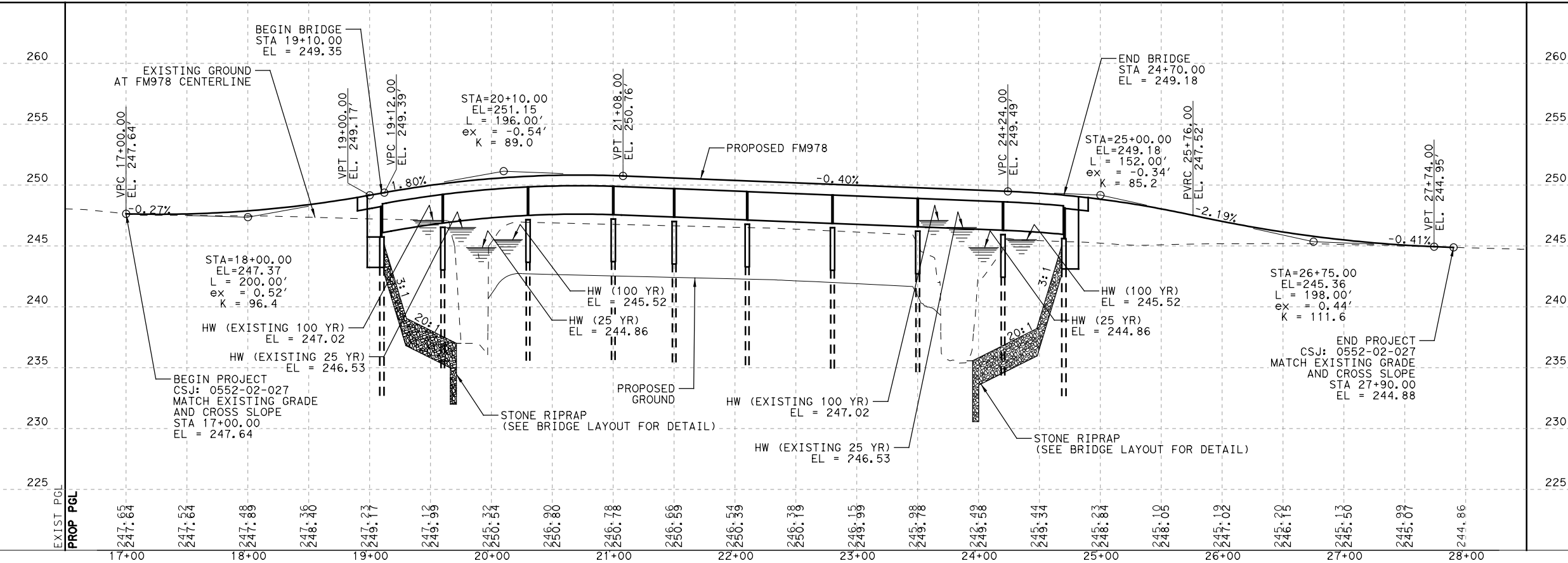


- NOTES:**
1. ALL STATION AND OFFSETS ARE FROM "CL FM978" UNLESS OTHERWISE NOTED. SEE "HORIZONTAL ALIGNMENT DATA" SHEET FOR HORIZONTAL ALIGNMENT INFORMATION.
 2. ALL EMBANKMENT SHALL BE DENSITY CONTROLLED AND SHALL MEET THE REQUIREMENTS SET FORTH IN THE GENERAL NOTES.
 3. SAW CUTTING WILL NOT BE PAID FOR SEPARATELY BUT WILL BE CONSIDERED SUBSIDIARY TO PERTINENT BID ITEMS.
 4. THE CONTRACTOR SHALL PROVIDE FOR SAFE AND CONVENIENT INGRESS AND EGRESS TO ADJACENT PROPERTY, HIGHWAY AND PUBLIC ROAD, AND STREET CROSSINGS WITHIN PROJECT LIMITS AT ALL TIMES. CONTRACTOR SHALL COORDINATE HIS WORK ACTIVITIES TO MINIMIZE ANY INCONVENIENCE TO THE PUBLIC.
 5. THE UTILITY INFORMATION SHOWN IS APPROXIMATE. CONTRACTOR WILL FIELD VERIFY LIMITS AND LOCATIONS OF UTILITIES PRIOR TO CONSTRUCTION.
 6. ALL DITCH WILL BE GRADED TO DRAIN. SEE CROSS SECTIONS FOR DITCH FLOW LINE ELEVATION



CURVE FM978-01		CURVE FM978-02	
P. I. STATION	= 17+06.81	P. I. STATION	= 25+81.65
DELTA	= 9° 02' 29.12" (RT)	DELTA	= 17° 54' 35.47" (LT)
DEGREE	= 2° 13' 14.76"	DEGREE	= 3° 38' 57.89"
TANGENT	= 203.99	TANGENT	= 247.40
LENGTH	= 407.13	LENGTH	= 490.76
RADIUS	= 2,580.00	RADIUS	= 1,570.00
EXTERNAL	= 8.05	EXTERNAL	= 19.37
LONG CHORD	= 406.71	LONG CHORD	= 488.76
MID. ORD.	= 8.03	MID. ORD.	= 19.14
P. C. STATION	= 15+02.82	P. C. STATION	= 23+34.25
P. T. STATION	= 19+09.95	P. T. STATION	= 28+25.01

PLOT DRIVER: TXDOT_PDF_LM.pltcfgr
 USER: BRTORRES DATE: 3/16/2023
 FILE: FM978BROPPONE BRIDGE



STATE OF TEXAS
 PHILIP A. FULTON
 73469
 REGISTERED PROFESSIONAL ENGINEER
Philip A. Fulton 03/17/2023

NO.	DATE	REVISION	APPROVED

HDR
 Firm Registration No. F-754
 710 Hesters Crossing, Suite 150
 Round Rock, Texas 78681
 512.685.2900

Texas Department of Transportation
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PLAN AND PROFILE
FM 978

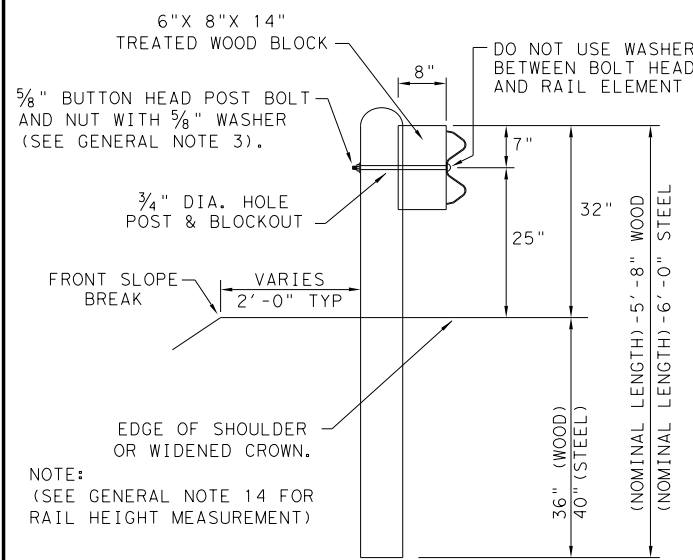
SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL PROJECT NO.	HIGHWAY NO.
6	SEE TITLE SHEET	FM 978
STATE	DISTRICT	COUNTY
TEXAS	BRY	MADISON
CONTROL	SECTION	JOB
0552	02	027

27

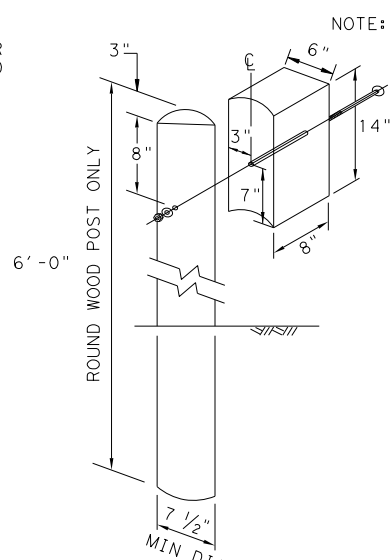
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DATE: 6/17/2020
FILE: c:\pwworking\centra101\dl320780\gf3119.dgn

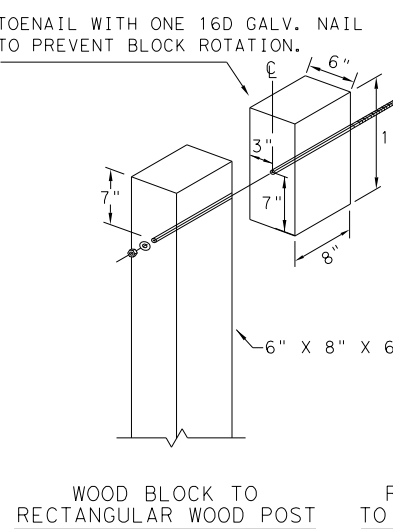


TYPICAL POST PLACEMENT

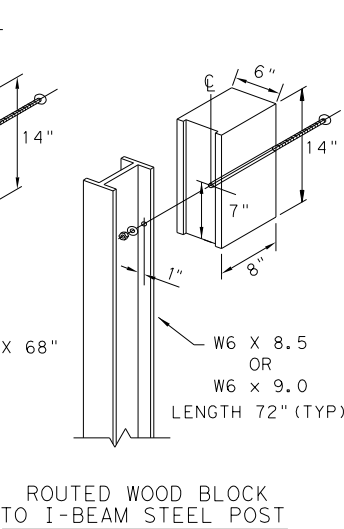
NOTE: (SEE GENERAL NOTE 14 FOR RAIL HEIGHT MEASUREMENT)



WOOD BLOCK TO ROUND WOOD POST



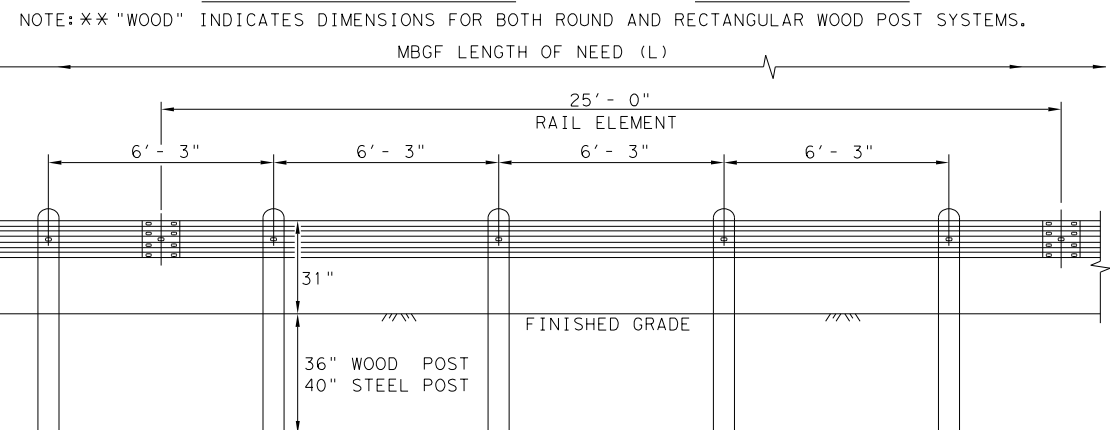
WOOD BLOCK TO RECTANGULAR WOOD POST



ROUTED WOOD BLOCK TO I-BEAM STEEL POST

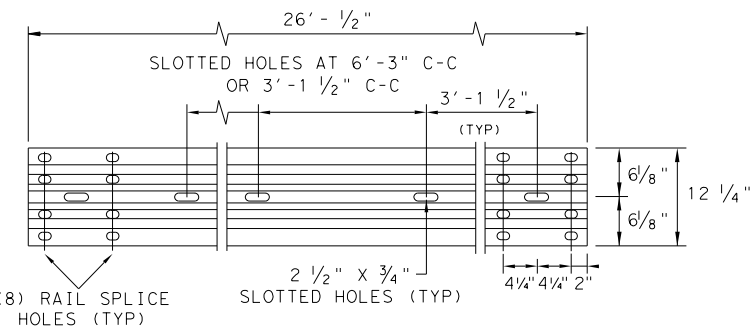
GENERAL NOTES

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 1/2" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
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 5/8" WASHER (FWC16G) 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.



ELEVATION MID-SPAN RAIL SPLICE

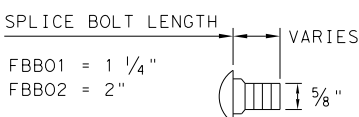
SHOWING A 25'-0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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

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

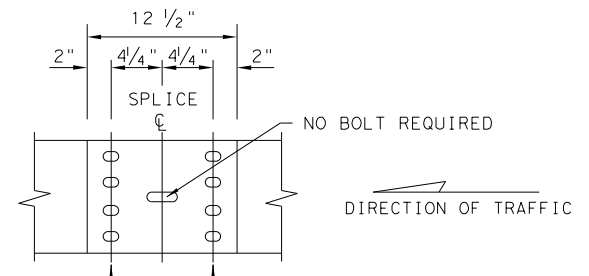
NOTE: FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECESSED NUT.



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

BUTTON HEAD BOLT

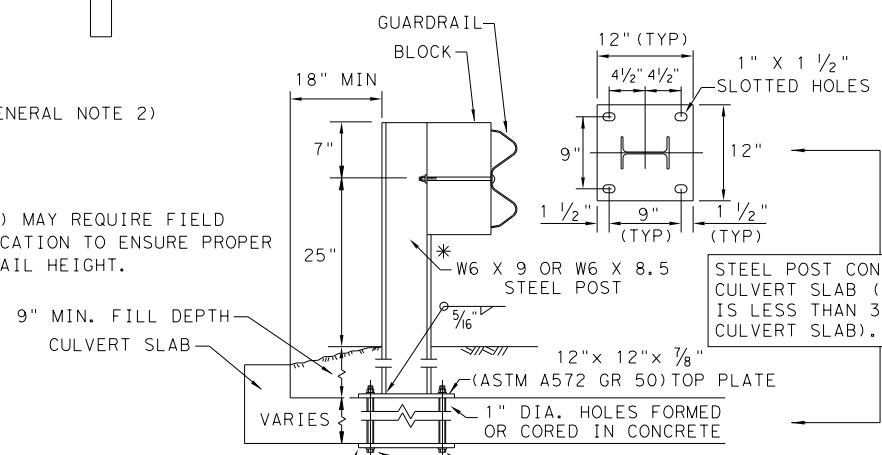
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



MID-SPAN RAIL SPLICE DETAIL

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

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.
2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS 1/4" MIN. BEYOND NUT.

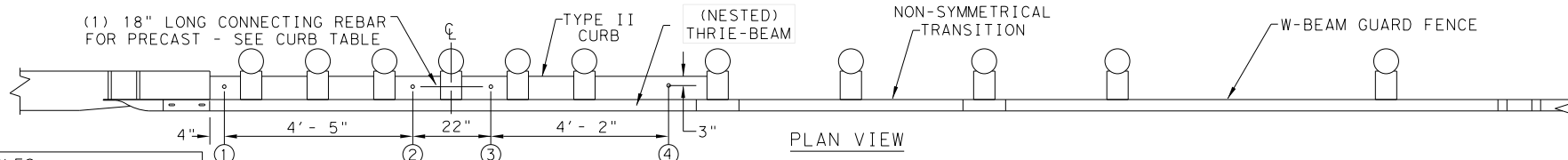
NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.



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	0552	02	027	FM978
	DIST	COUNTY		SHEET NO.
	BRY	MADISON		28

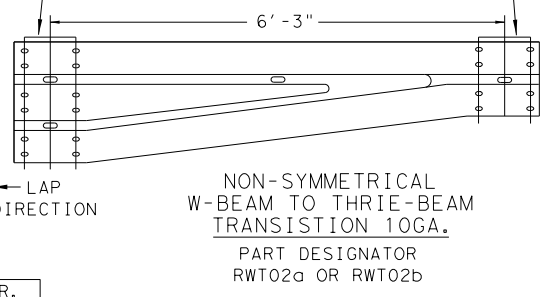
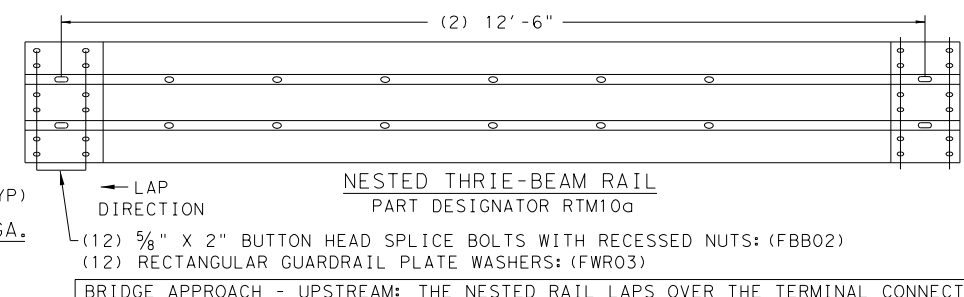
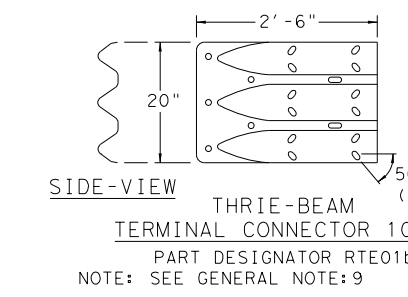
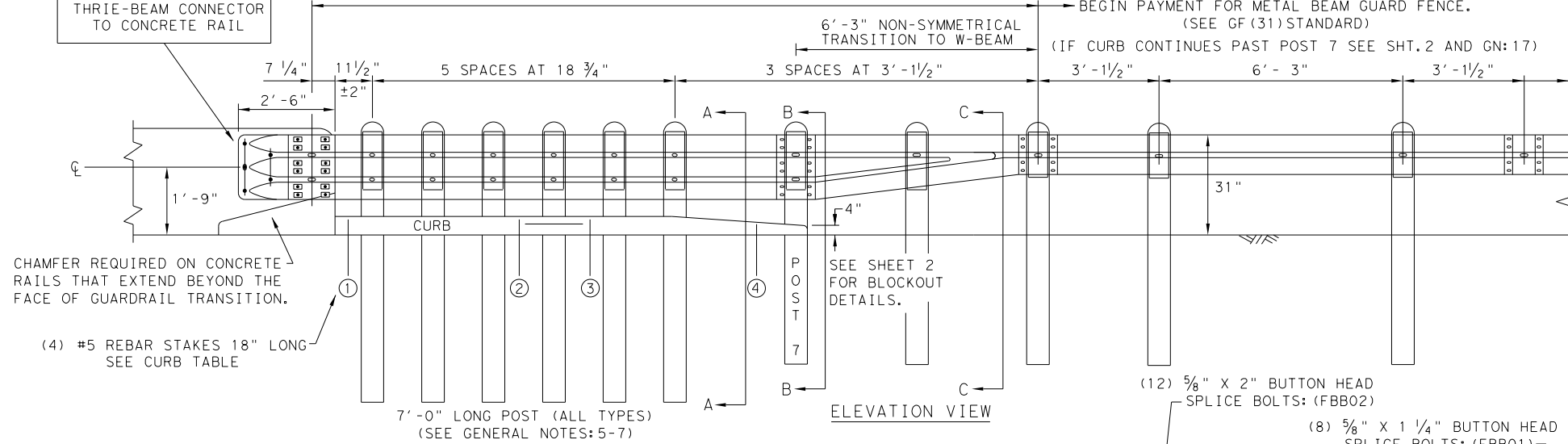
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 DISCLAIMER: THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.



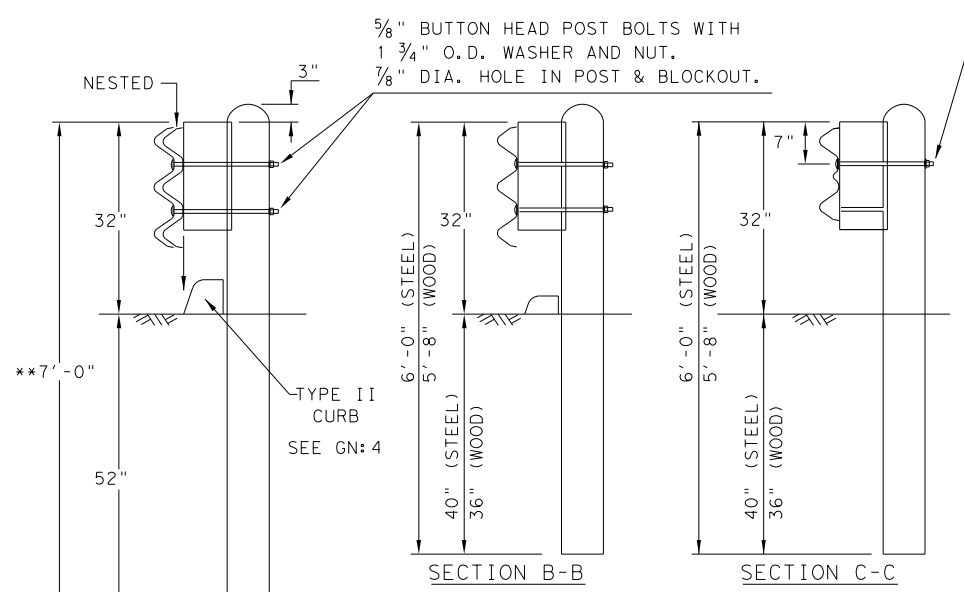
- (5) 1" DIA. HOLES.
- (5) 7/8" DIA. HEAVY HEX HEAD BOLTS (FACING TRAFFIC SIDE) (ASTM F3125 GR A325 OR A449).
- (10) 1 3/4" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
- (5) 7/8" DIA. HEAVY HEX NUTS (ASTM A194 OR A563).

NOTE:
 HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL, LEAVE 1" OF BOLT LENGTH PAST THE 7/8" 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.



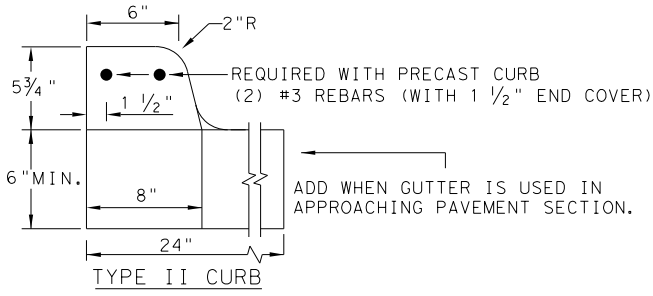
BRIDGE APPROACH - UPSTREAM: THE NESTED RAIL LAPS OVER THE TERMINAL CONNECTOR. PLATE WASHERS ARE INSTALLED UNDER THE SPLICE NUTS AGAINST INSIDE OF CONNECTOR.
 BRIDGE EXIT - DOWNSTREAM: THE TERMINAL CONNECTOR LAPS OVER THE NESTED RAIL. PLATE WASHERS ARE INSTALLED UNDER THE BOLT HEAD AGAINST OUTSIDE OF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



NOTE: ONLY (1) 5/8" BOLT REQUIRED AT THIS POST LOCATION.

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

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



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

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 (5-3/4" HEIGHT); SEE CURRENT CCG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE: 17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
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 1/2" 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 5/8" 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 5/8" WASHER (FWC16a) 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

		Design Division Standard		
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT GF(31) TR TL3-20				
FILE: gf31tr+1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
© TXDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
DIST	COUNTY		SHEET NO.	
BRY	MADISON		29	

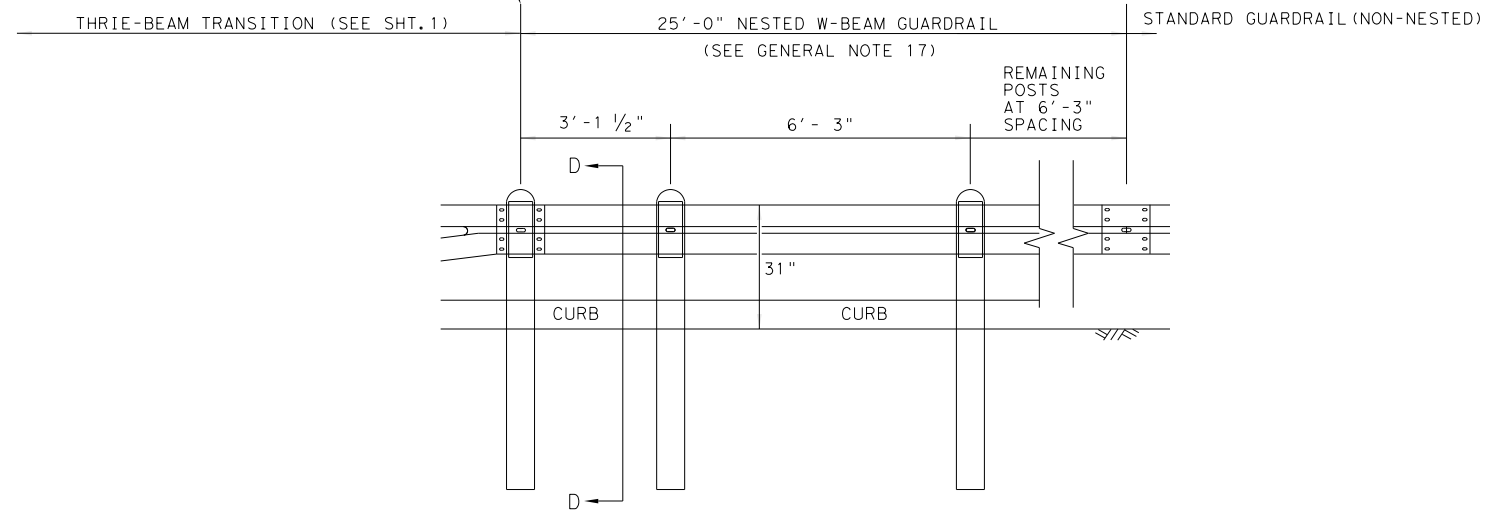
DISCLAIMER: THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

DATE: 3/16/2023
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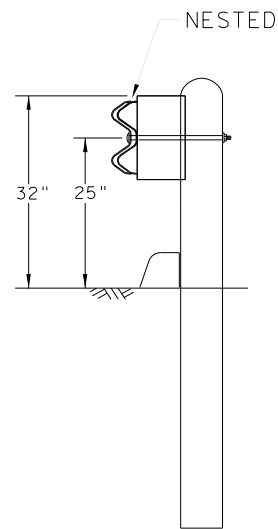
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)

END PAYMENT FOR METAL BEAM GUARD FENCE TRANSITION.
 BEGIN PAYMENT FOR METAL BEAM GUARD FENCE.

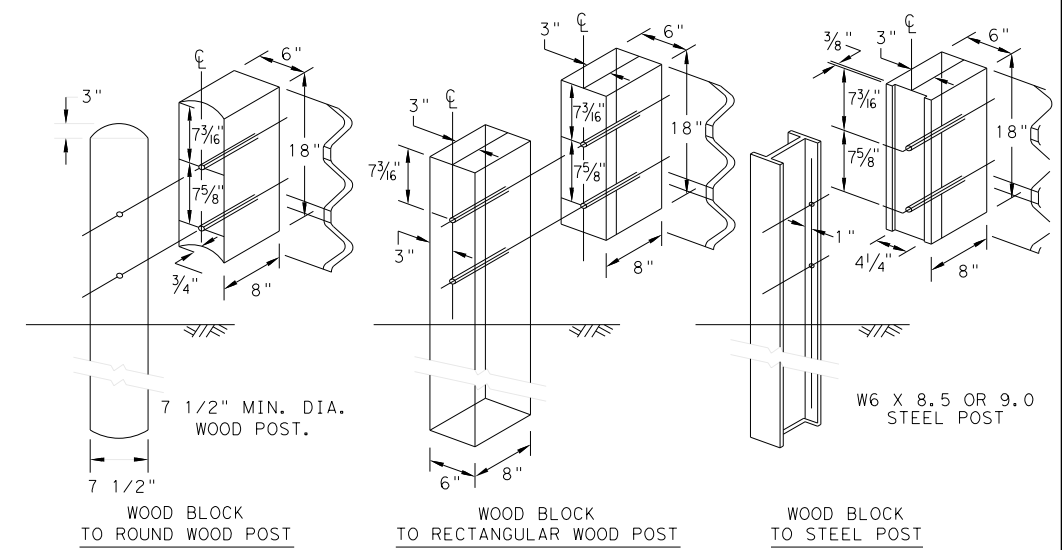
(SEE GF (31) STANDARD SHEET)



ELEVATION VIEW



SECTION D-D



THREE BEAM TRANSITION BLOCKOUT DETAILS

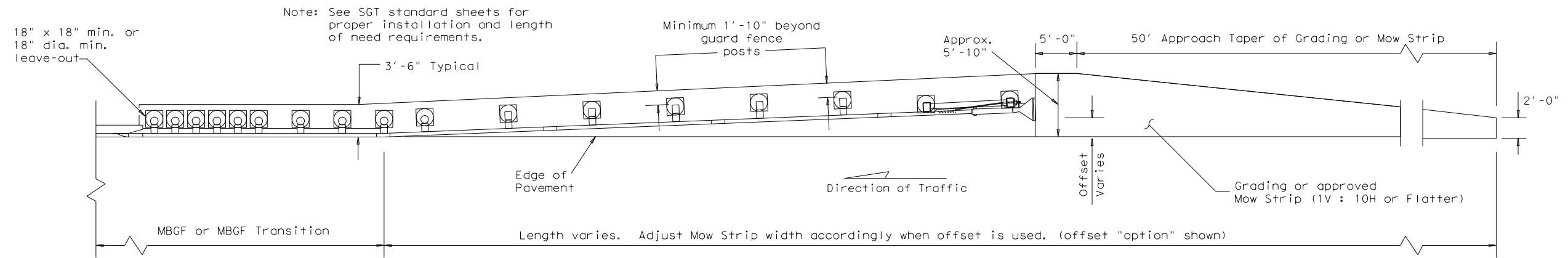
HIGH-SPEED TRANSITION

SHEET 2 OF 2

				Design Division Standard	
METAL BEAM GUARD FENCE THREE-BEAM TRANSITION TL-3 MASH COMPLIANT GF (31) TR TL3-20					
FILE: gf31trt1320.dgn	DN: TXDOT	CK: KM	DW: KM	CK: CGL/AG	
©TXDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS		0552	02	027	FM978
	DIST	COUNTY		SHEET NO.	
	BRY	MADISON		30	

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DATE: 6/17/2020
 FILE: c:\pwworking\centra101\dl1320780\gf31ms19.dgn

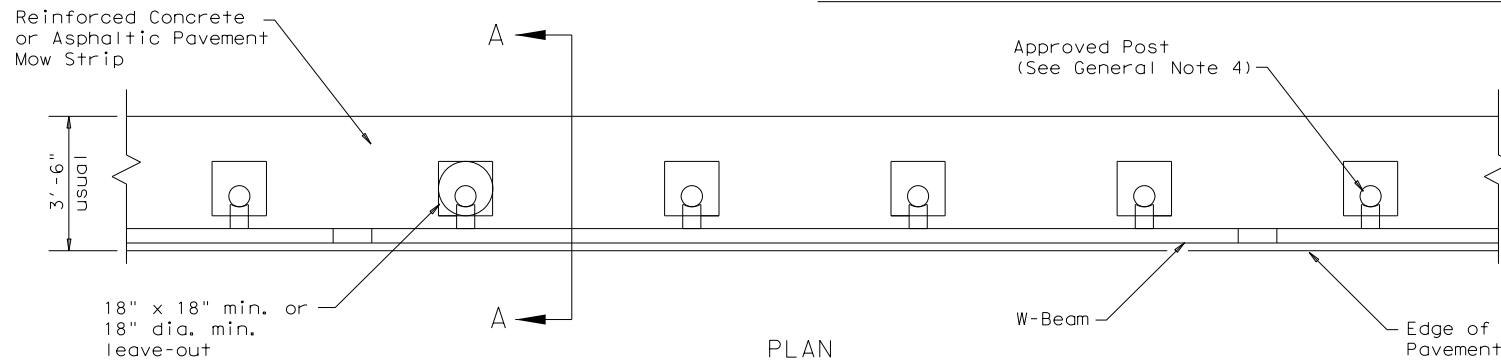


Note: See SGT standard sheets for proper installation and length of need requirements.

GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS

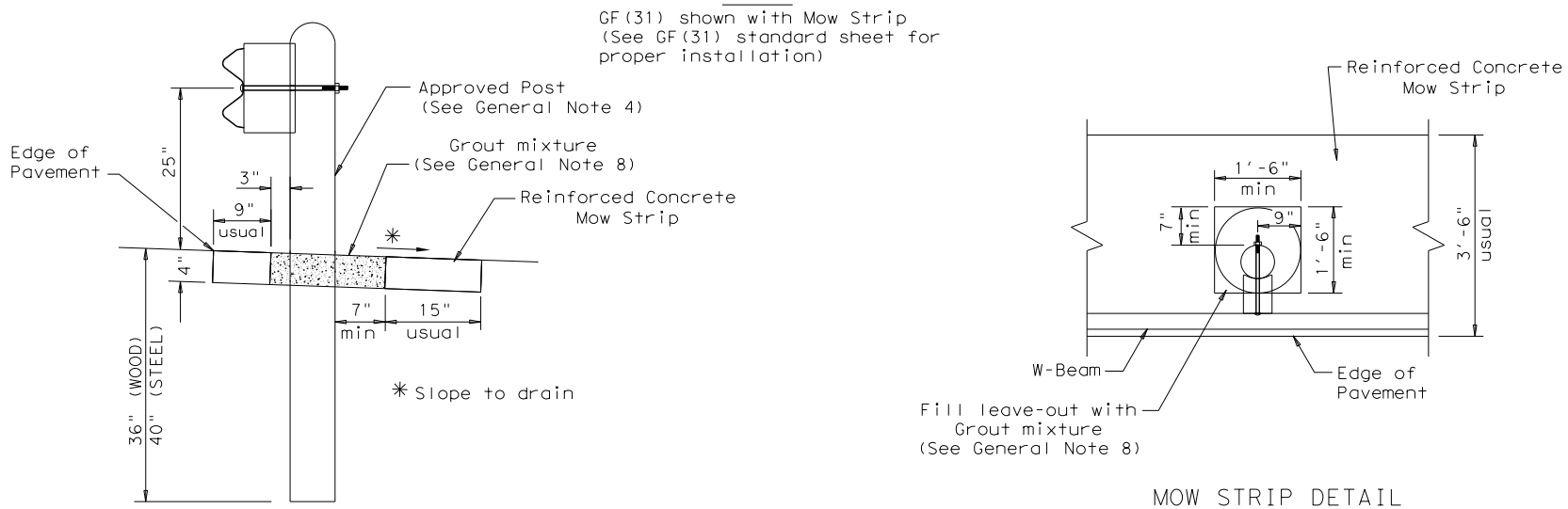
Note: Site Condition(s)

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

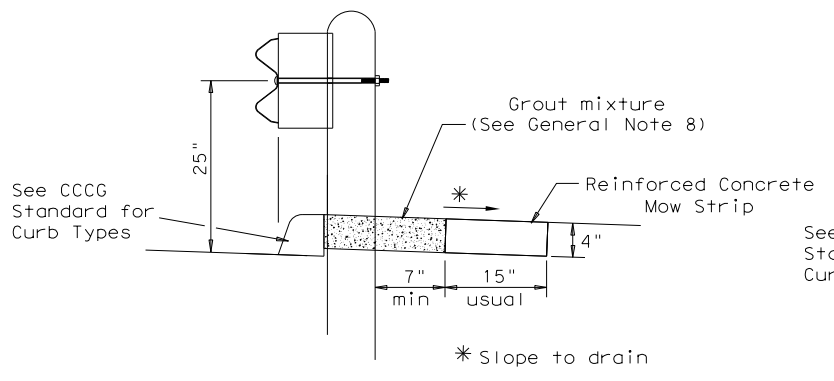
1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown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



SECTION A-A
Typical

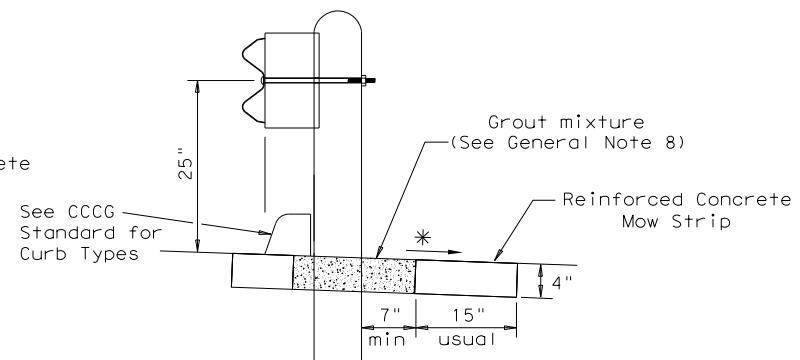
MOW STRIP DETAIL

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



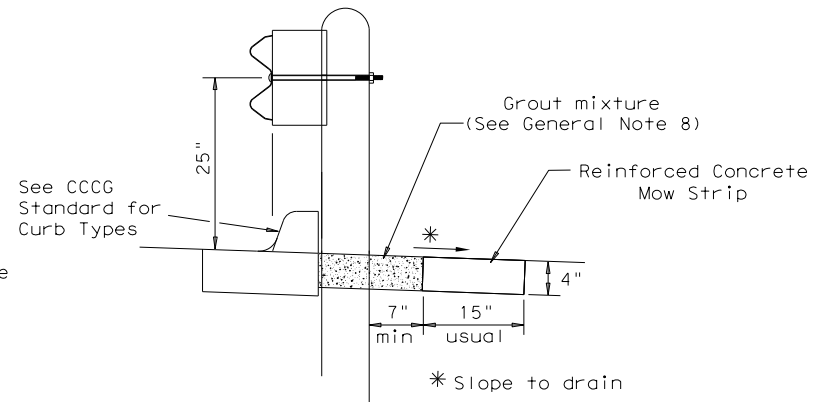
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip

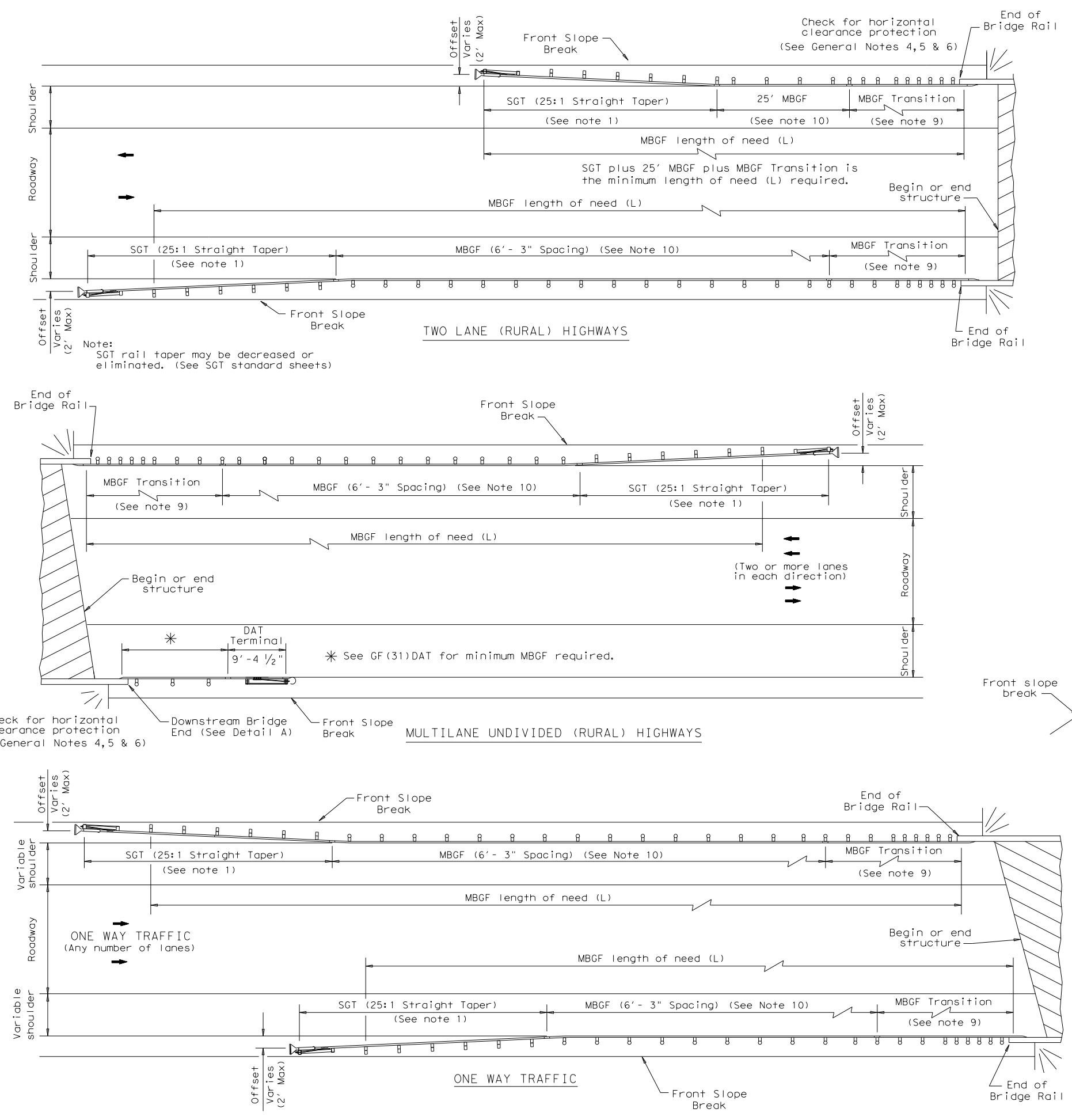


CURB OPTION (3)

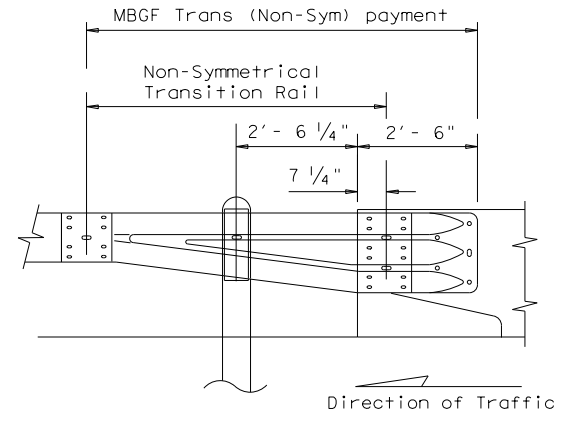
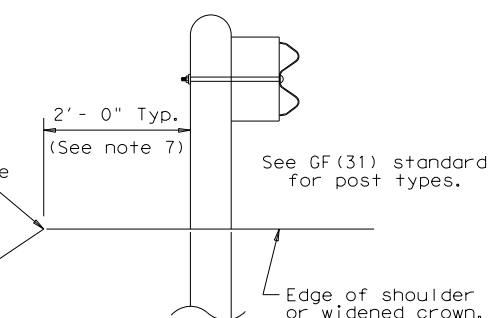
		Design Division Standard	
METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT GF (31) MS-19			
FILE: gf31ms19.dgn	DN: TXDOT	CK: KM	DW: VP
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB
REVISIONS		0552 02	027
		DIST	COUNTY
		BRY	MADISON
		CK: CGL/AG	HIGHWAY
			FM978
			SHEET NO.
			31

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- ### GENERAL NOTES
- For more detail: See GF(31), SGT()31, GF(31)TR, and GF(31)TL2 standard sheets.
 - Quantities of metal beam guard fence (MBGF) at individual bridge ends are as shown in the plans.
 - 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.
 - 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.
 - Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
 - 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)
 - 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).
 - For restrictive bridge widths: 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.
 - Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
 - A minimum 25' length of MBGF will be required.



TYPICAL CROSS SECTION AT MBGF

DETAIL A
 Showing Downstream Rail Attachment

Texas Department of Transportation Design Division Standard

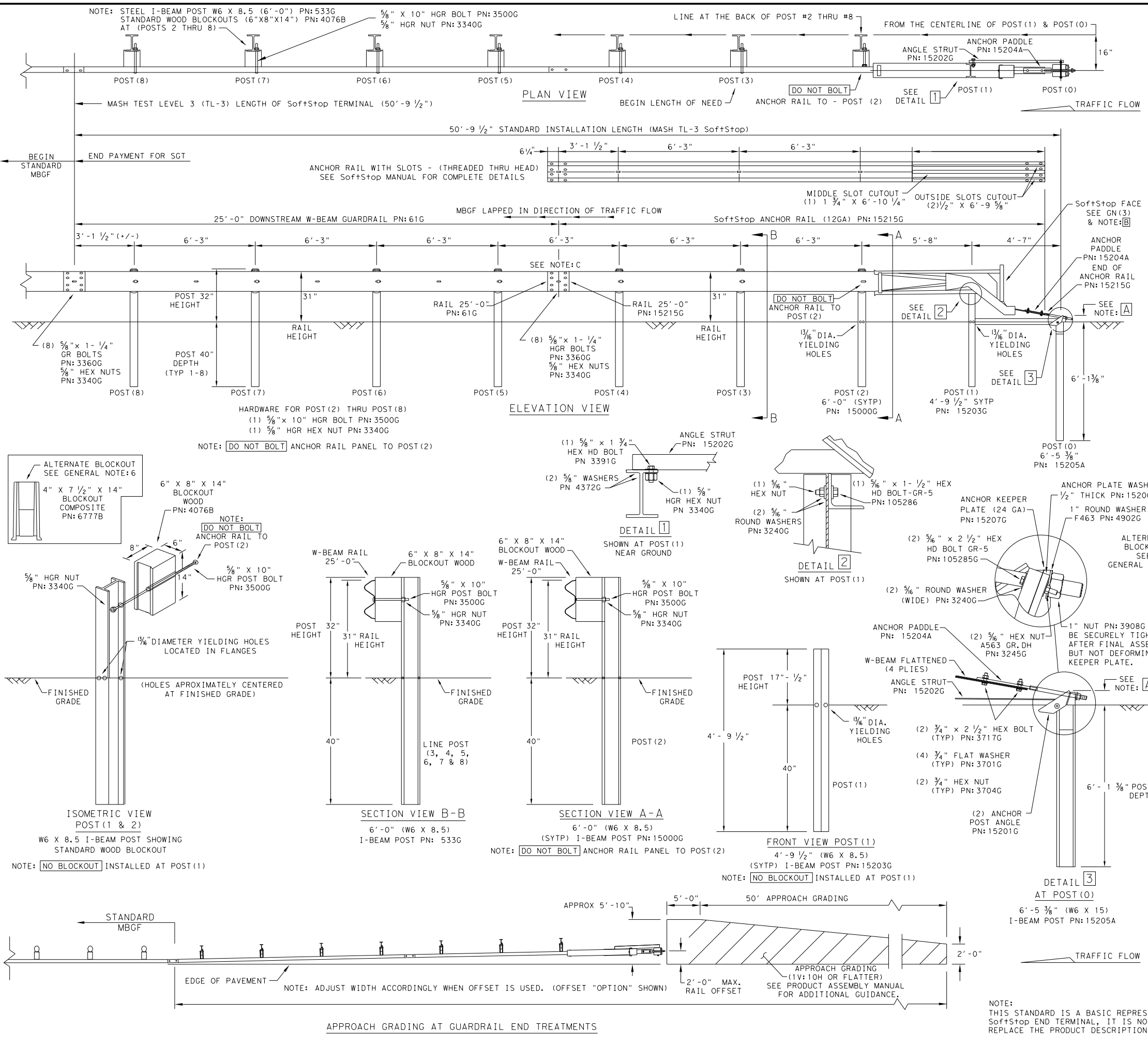
BRIDGE END DETAILS (METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISED APRIL 2014 SEE (MEMO 0414)	0552	02	027	FM978
	DIST	COUNTY	SHEET NO.	
	BRY	MADISON	32	

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DATE: 6/17/2020
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- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374, 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
 - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN:620237B
 - APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
 - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
 - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
 - A COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
 - IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MOW STRIP STANDARD FOR INSTALLATION GUIDANCE.
 - POSTS SHALL NOT BE SET IN CONCRETE.
 - IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
 - DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
 - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
 - A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCRoaching ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

NOTE: A THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-3/4" MIN. TO 4" MAX. ABOVE FINISHED GRADE.

NOTE: B PART PN:5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)
 PART PN:5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)

NOTE: C W-BEAM SPLICE LOCATED BETWEEN LINE POST(4) AND LINE POST(5)
 GUARDRAIL PANEL 25'-0" PN:61G
 ANCHOR RAIL 25'-0" PN:15215G
 LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

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

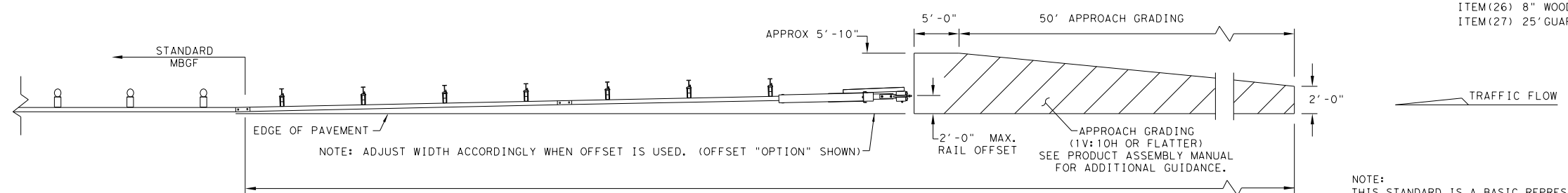
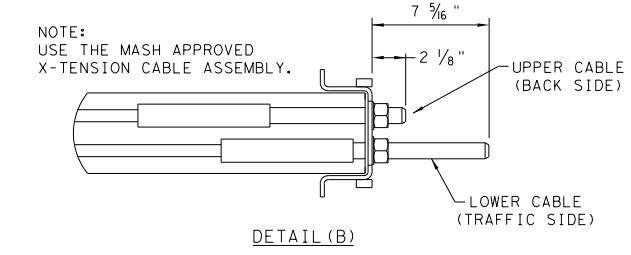
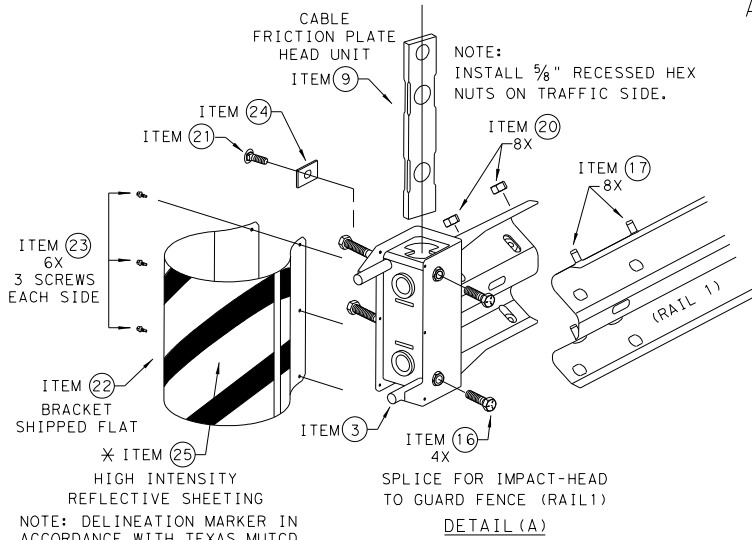
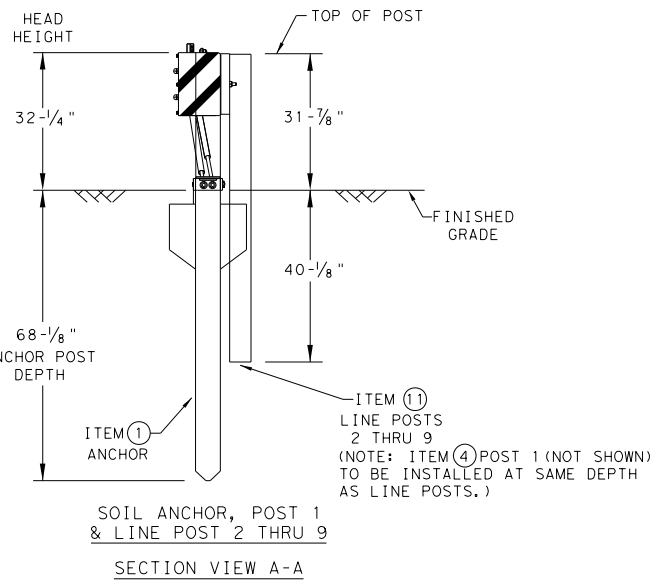
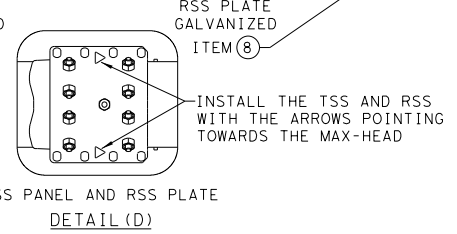
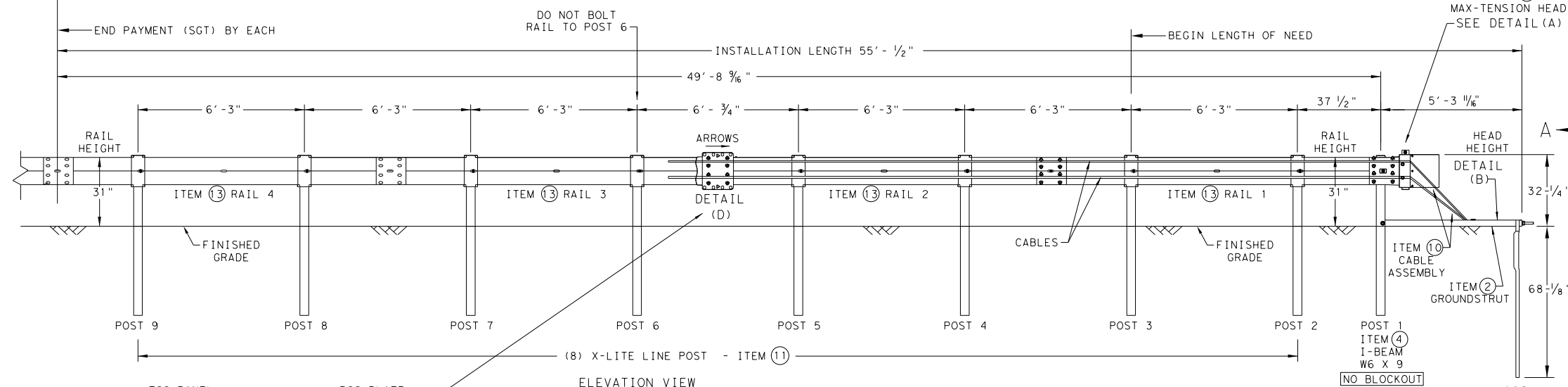
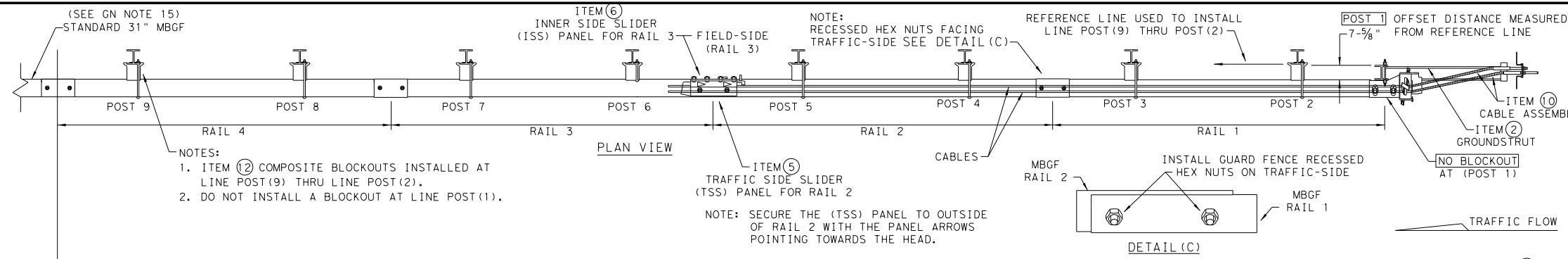
Texas Department of Transportation
 Design Division Standard

**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	0552	02	027	FM978
	DIST	COUNTY	SHEET NO.	
	BRY	MADISON	33	

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GENERAL NOTES

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

ITEM#	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT. -GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST - GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	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 FWRO3	1
25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL, 8-SPACE, 12GA.	2
28	MANMAX Rev- (D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.
 ** ALTERNATIVE ITEMS NOT SHOWN. ITEM(26) 8" WOOD-BLOCKOUTS ITEM(27) 25' GUARD FENCE PANELS

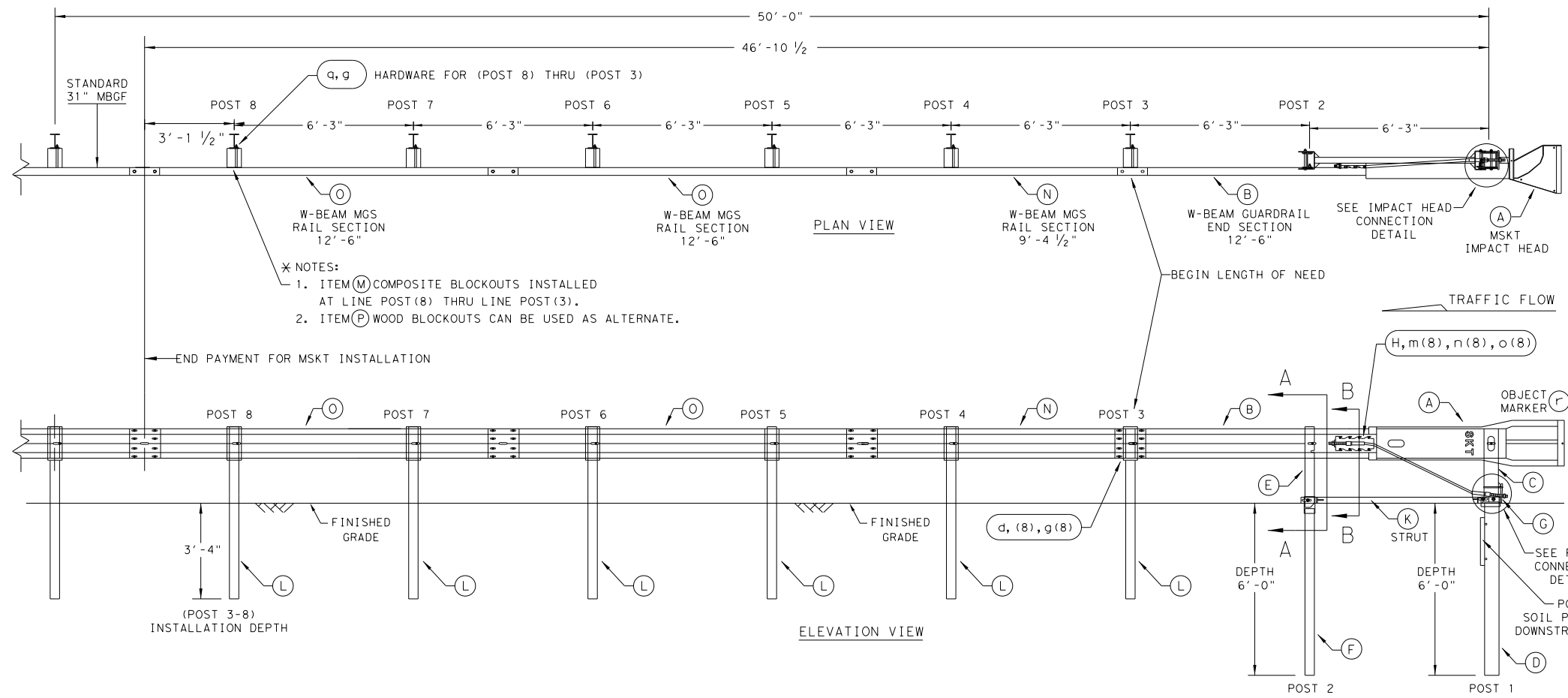
Texas Department of Transportation
Design Division Standard

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

FILE: sg+11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
	DIST	COUNTY	SHEET NO.	
	BRY	MADISON	34	

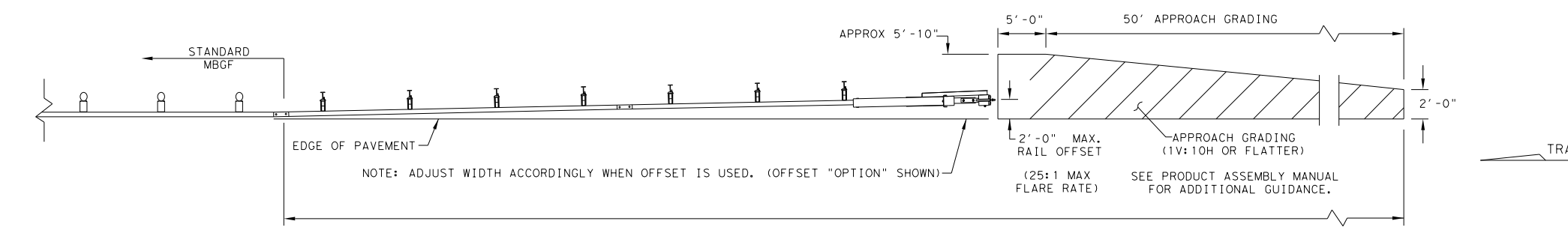
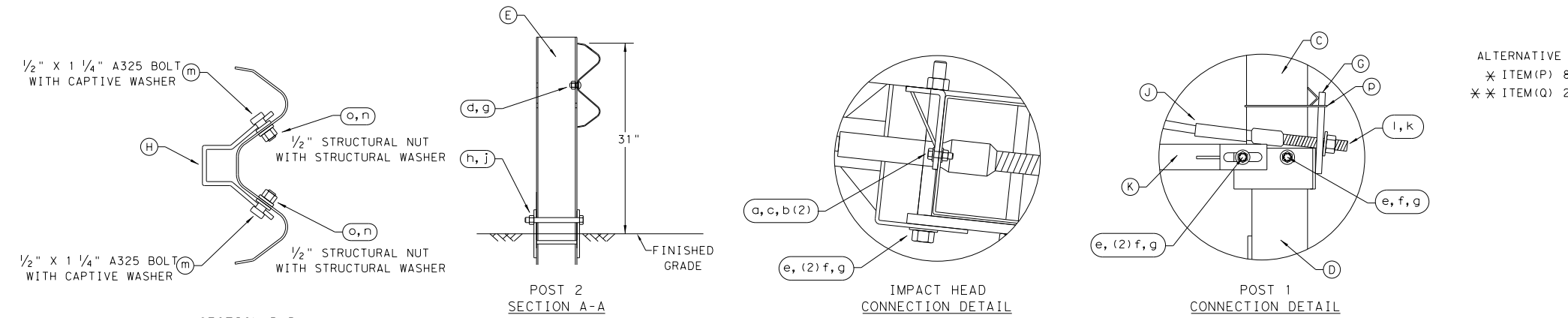
NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MAX-TENSION END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

DISCLAIMER: THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. THE USE OF THIS STANDARD ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.
 DATE: 6/17/2020
 FILE: c:\pwworking\centra101\dl1320780\sgt12s3118.dgn



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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6X9 OR W6X8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
SMALL HARDWARE			
a	2	5/8" X 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/8" WASHER	W0516
c	2	5/8" HEX NUT	N0516
d	25	5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" X 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/8" O.D. x 3/8" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" X 10" H.C.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151



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

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

Texas Department of Transportation

Design Division Standard

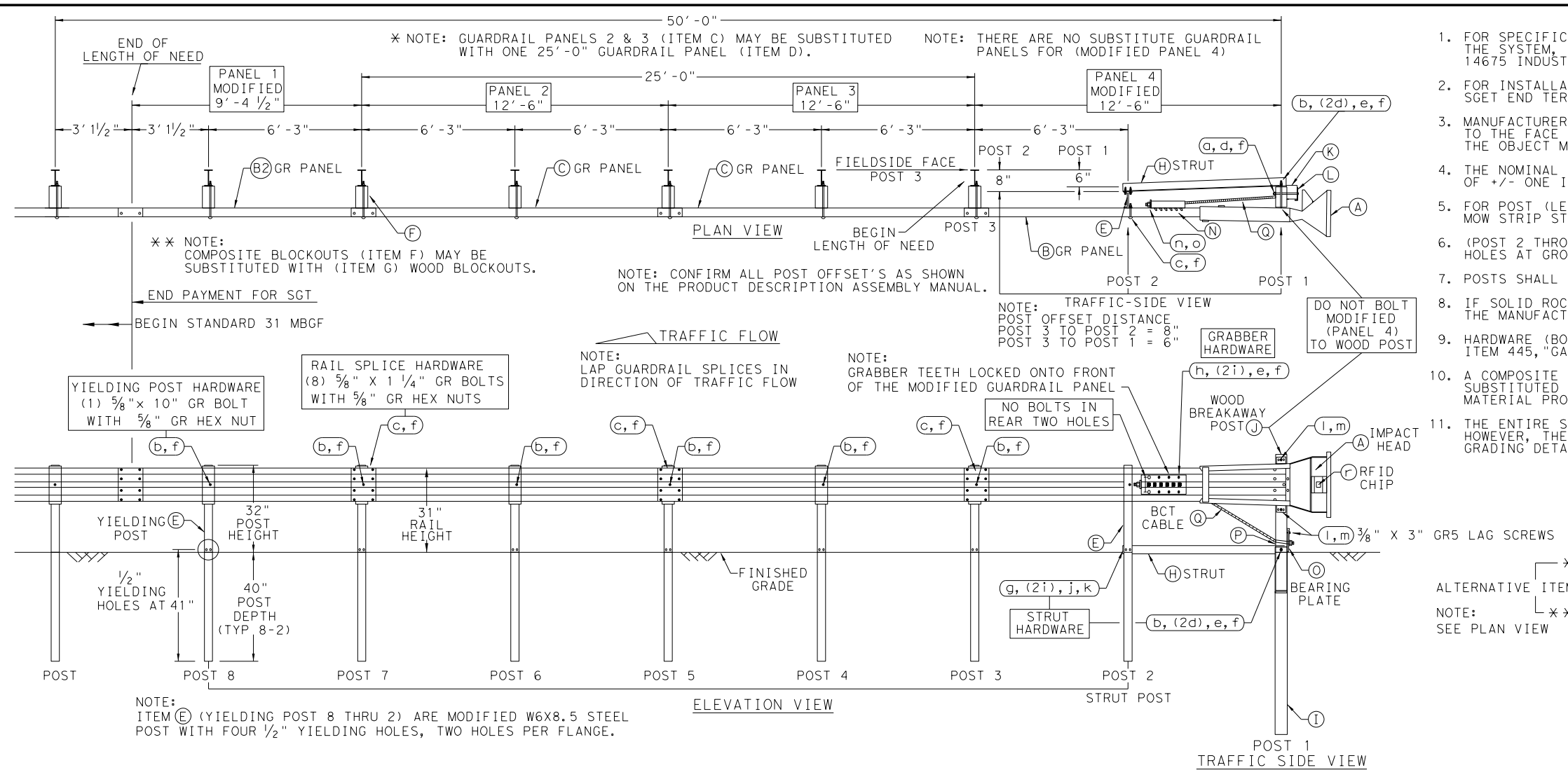
SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT (12S) 31-18

FILE: sgt12s3118.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CL
© TXDOT: APRIL 2018	CONT SECT	JOB	HIGHWAY	
REVISIONS		0552 02 027	FM978	
DIST	COUNTY		SHEET NO.	
BRY	MADISON		35	

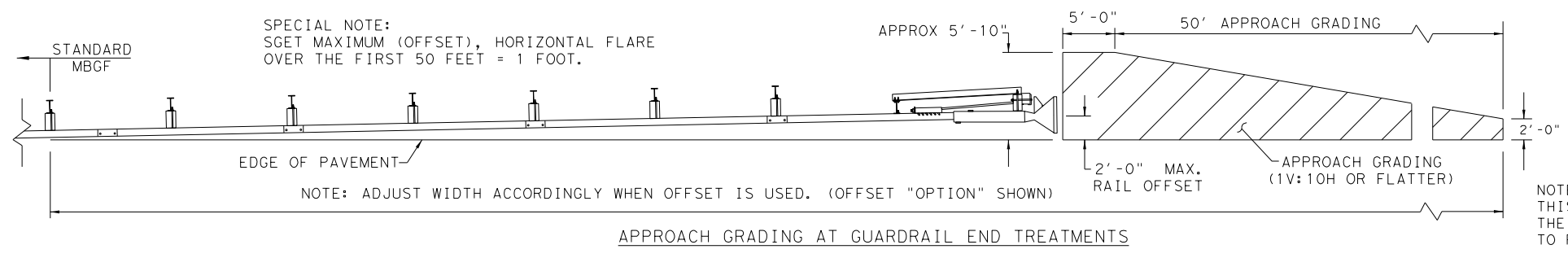
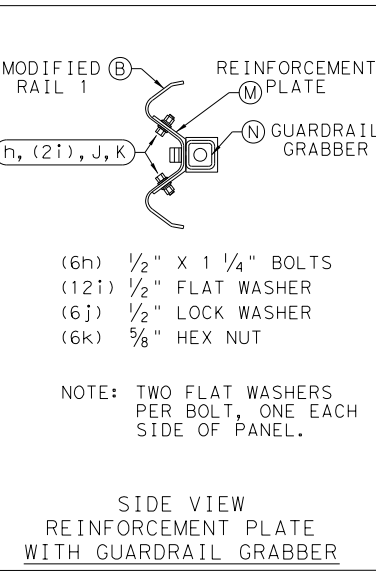
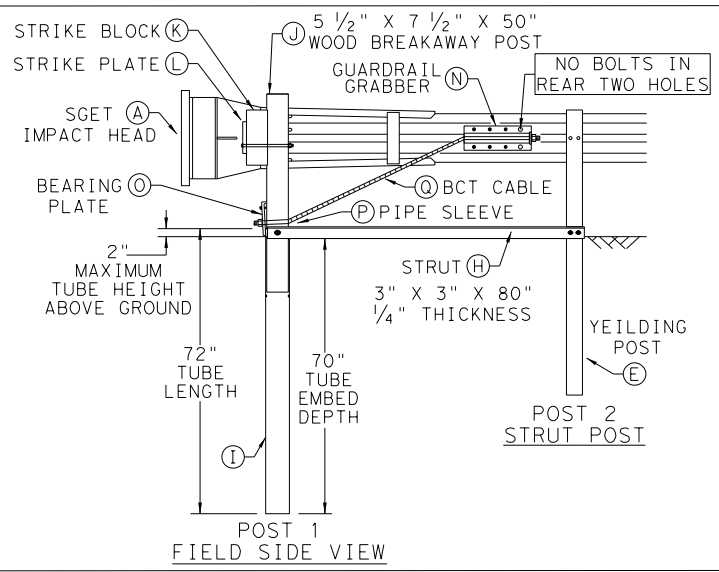
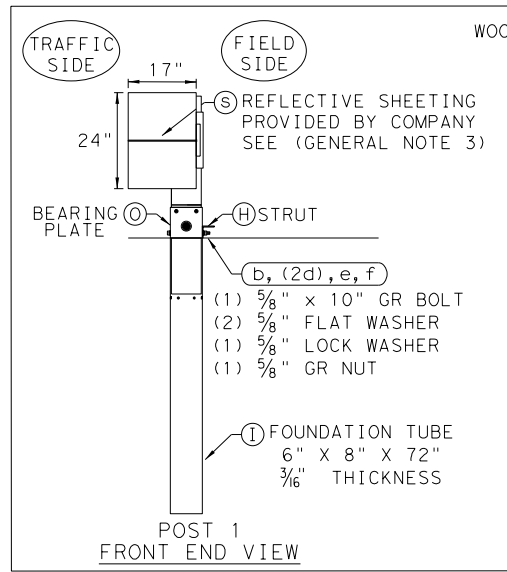
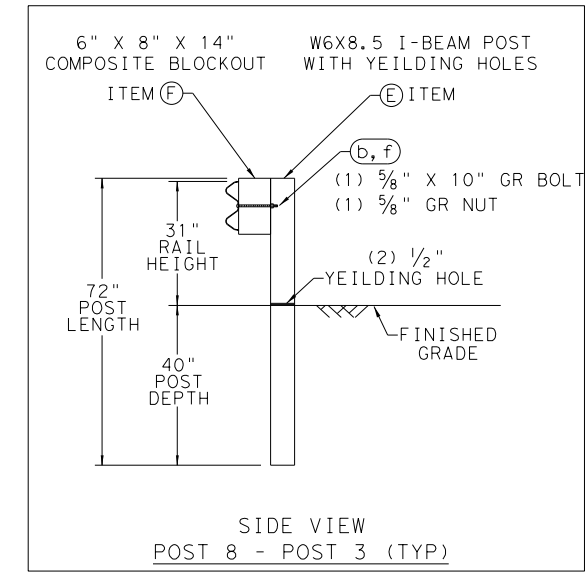
DISCLAIMER: THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.



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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	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	YPMOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G	6	WOOD BLOCKOUT 6" X 8" X 14"	WB08
H	1	STRUT 3" X 3" X 80" X 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" X 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" X 7 1/2" X 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GR17
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 A563HD 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



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

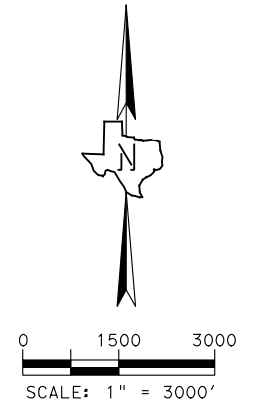
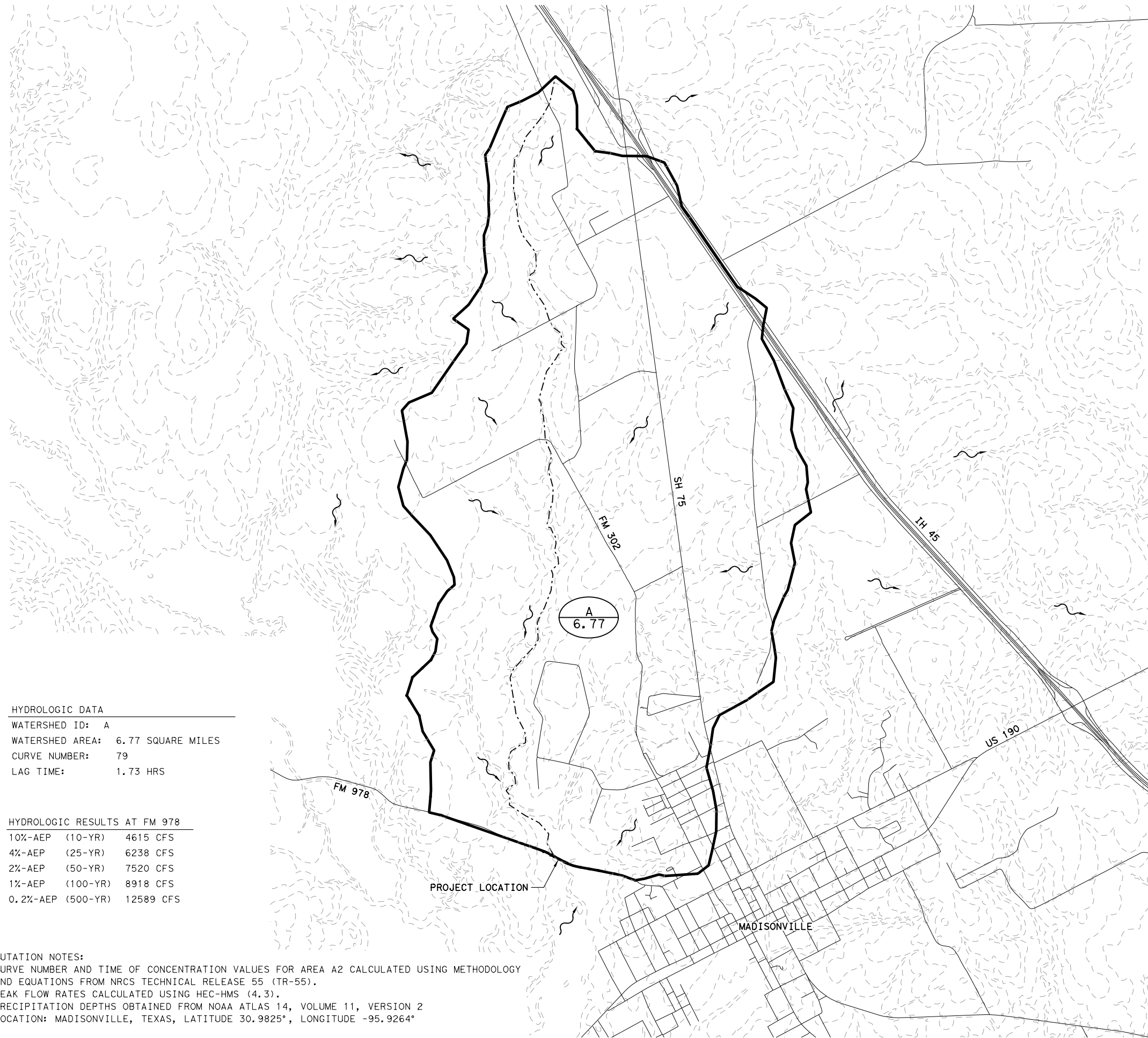
SPIG INDUSTRY, LLC

SINGLE GUARDRAIL TERMINAL

SGET - TL-3 - MASH

SGT (15) 31-20

FILE: sg+153120.dgn	DN: TXDOT	CK: KM	DW: VP	CK: VP
© TXDOT: APRIL 2020	CONT: 0552	SECT: 02	JOB: 027	HIGHWAY: FM978
REVISIONS	0552	02	027	FM978
DIST: BRY	COUNTY: MADISON	SHEET NO.: 36		



LEGEND

- AREA I. D.
- AREA IN SQUARE MILES
- DIRECTION OF FLOW
- DRAINAGE AREA BOUNDARY

NOTES:

1. CONTOUR DATA FROM STRATMAP HYSOGRAPHY (DIGITAL LINE GRAPH) DATA OBTAINED FROM TEXAS NATURAL RESOURCES INFORMATION SYSTEM (TNRIS). CONTOUR INTERVAL = 10-FOOT.
2. WATERSHED DELINEATIONS BASED ON 10-FOOT CONTOUR DATA AND AERIAL IMAGERY.

HYDROLOGIC DATA

WATERSHED ID:	A
WATERSHED AREA:	6.77 SQUARE MILES
CURVE NUMBER:	79
LAG TIME:	1.73 HRS

HYDROLOGIC RESULTS AT FM 978

10%-AEP (10-YR)	4615 CFS
4%-AEP (25-YR)	6238 CFS
2%-AEP (50-YR)	7520 CFS
1%-AEP (100-YR)	8918 CFS
0.2%-AEP (500-YR)	12589 CFS

- COMPUTATION NOTES:**
1. CURVE NUMBER AND TIME OF CONCENTRATION VALUES FOR AREA A2 CALCULATED USING METHODOLOGY AND EQUATIONS FROM NRCS TECHNICAL RELEASE 55 (TR-55).
 2. PEAK FLOW RATES CALCULATED USING HEC-HMS (4.3).
 3. PRECIPITATION DEPTHS OBTAINED FROM NOAA ATLAS 14, VOLUME 11, VERSION 2
LOCATION: MADISONVILLE, TEXAS, LATITUDE 30.9825°, LONGITUDE -95.9264°

6/11/2020

Andres M. Cardenas

SHEET 1 OF 1

NO.	REVISION	BY	DATE

RTG

RODRIGUEZ
TRANSPORTATION
GROUP

FIRM #587

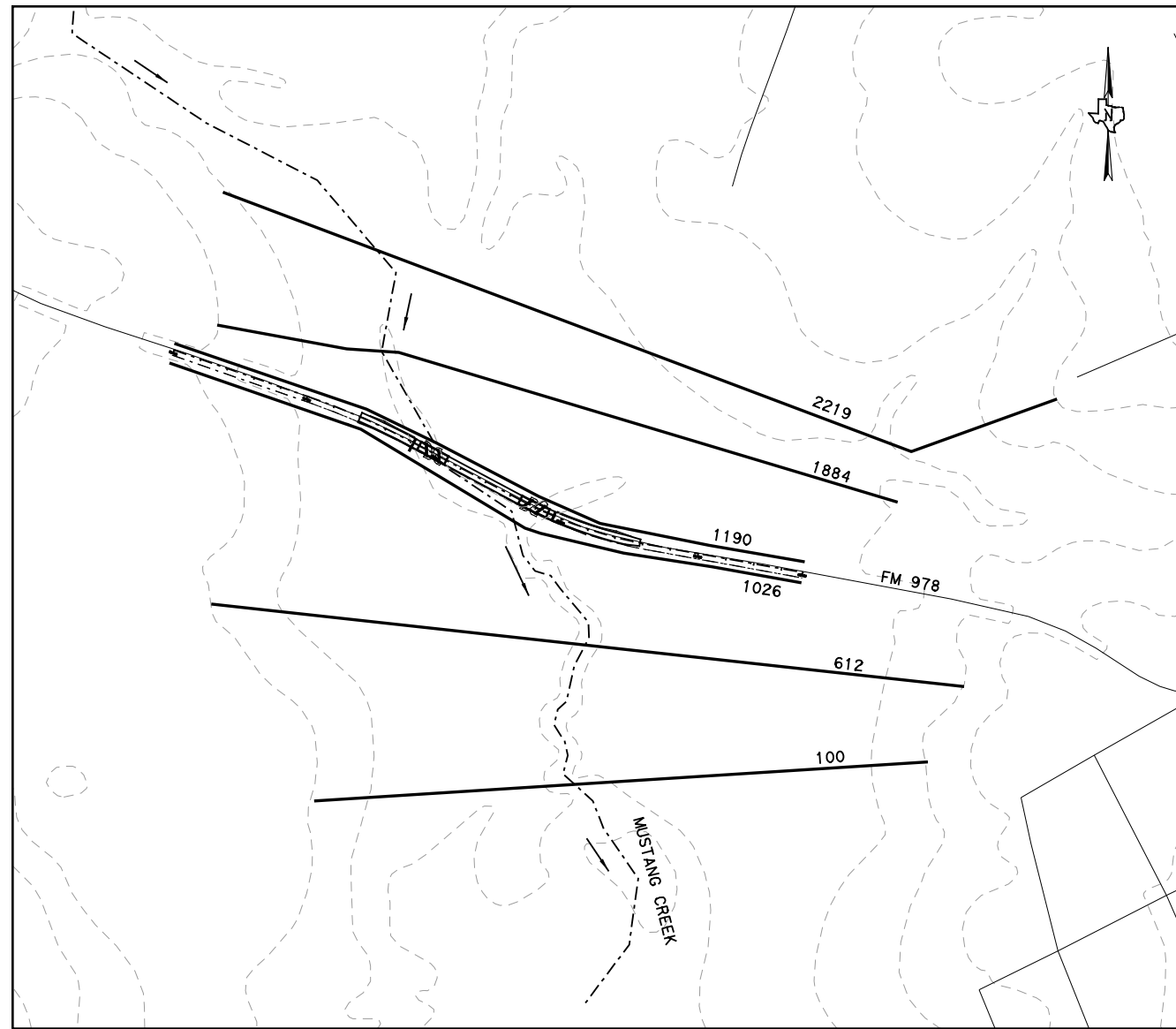
Texas Department
of Transportation © 2023

Bryan District

FM 978

DRAINAGE AREA MAP

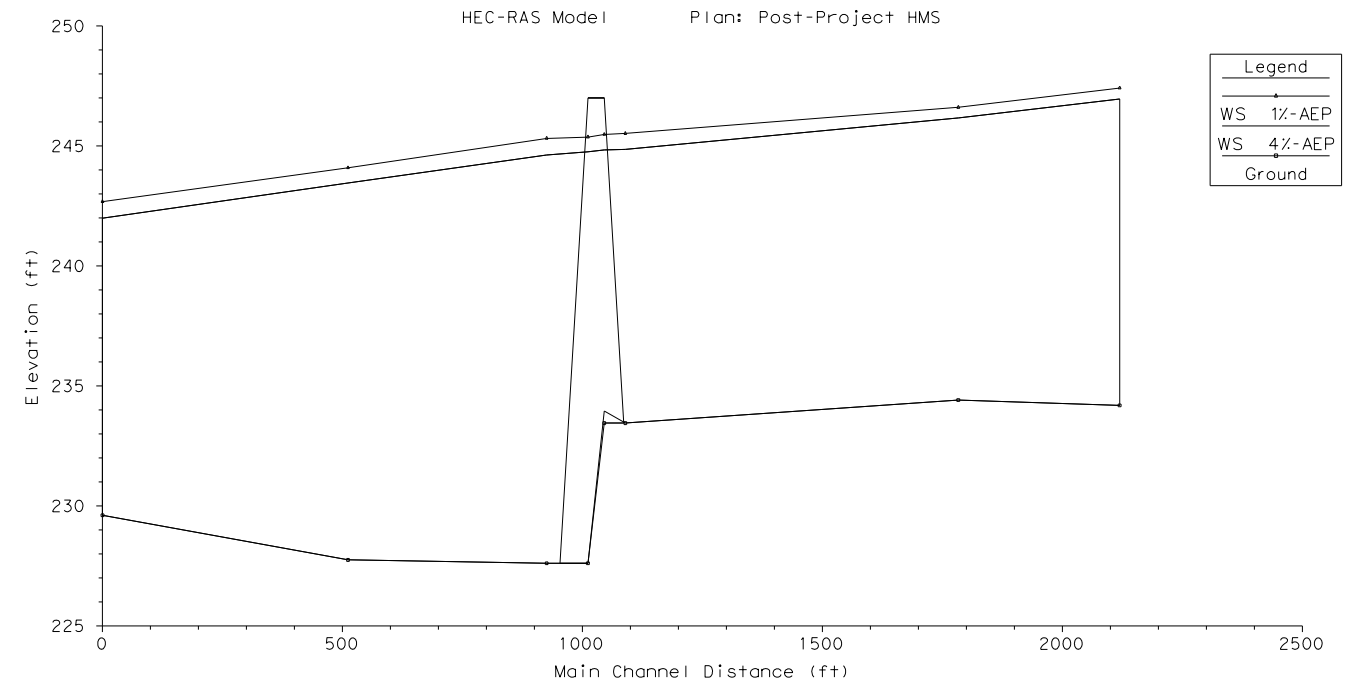
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	SEE TITLE SHEET	FM 978	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	MADISON	
CONTROL	SECTION	JOB	SHEET NO.
0552	02	027	37



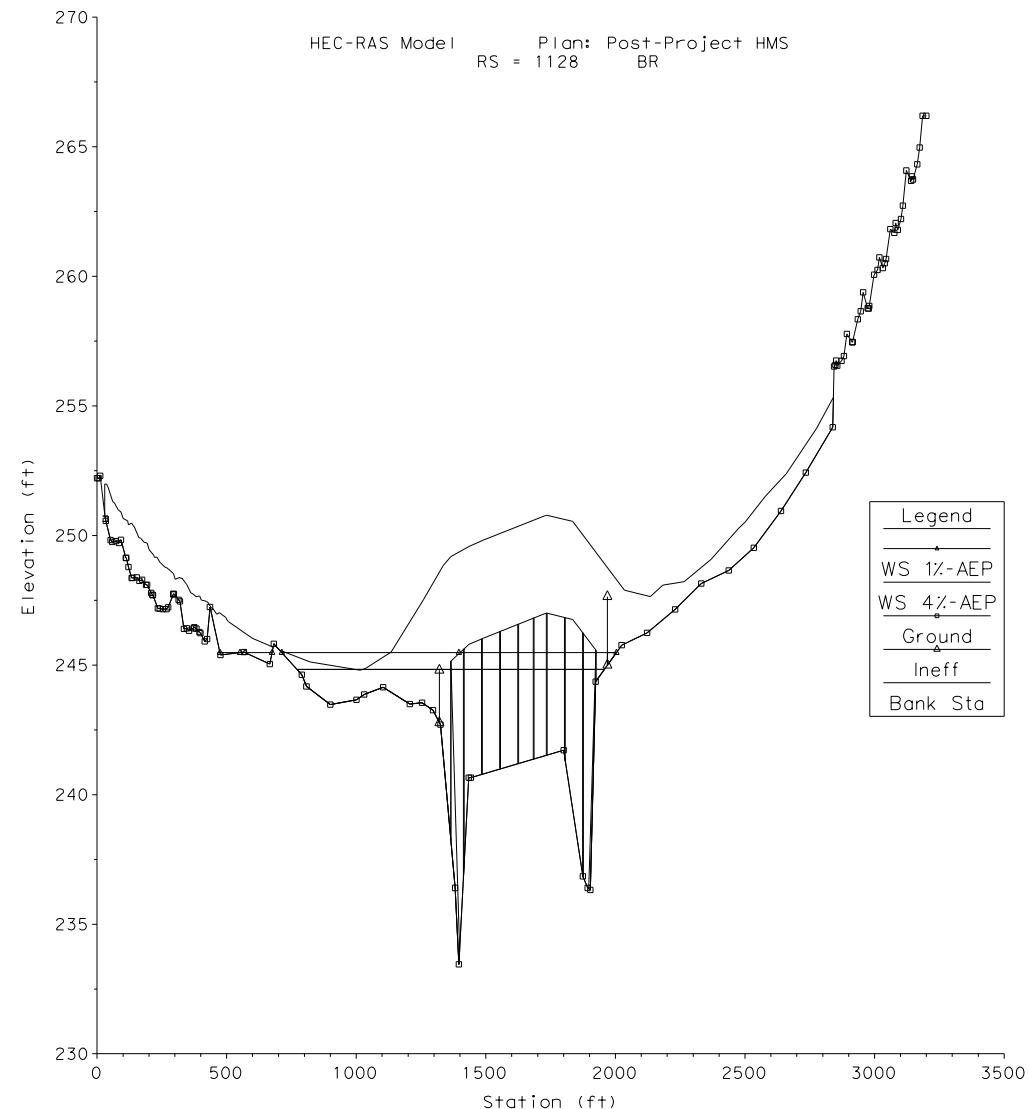
HEC-RAS CROSS SECTION MAP
SCALE: 1" = 600'

HEC-RAS SUMMARY TABLE

River Sta	Profile	Q Total (cfs)	Pre-Project		Post-Project	
			W.S. Elev (ft)	Vel Chnl (ft/s)	W.S. Elev (ft)	Vel Chnl (ft/s)
2219	4% AEP (25-YR)	6238	247.07	6.15	246.95	6.51
2219	1% AEP (100-YR)	8918	247.64	6.65	247.42	7.43
1884	4% AEP (25-YR)	6238	246.75	5.13	246.17	7.48
1884	1% AEP (100-YR)	8918	247.31	5.41	246.61	7.94
1190	4% AEP (25-YR)	6238	246.53	1.69	244.86	3.07
1190	1% AEP (100-YR)	8918	247.02	2.04	245.52	3.36
1128	FM 978	Bridge				
1026	4% AEP (25-YR)	6238	244.62	3.50	244.62	3.78
1026	1% AEP (100-YR)	8918	245.32	3.82	245.32	3.82
612	4% AEP (25-YR)	6238	243.46	7.34	243.46	7.34
612	1% AEP (100-YR)	8918	244.09	8.15	244.09	8.14
100	4% AEP (25-YR)	6238	241.99	8.14	241.99	8.14
100	1% AEP (100-YR)	8918	242.68	8.64	242.68	8.64

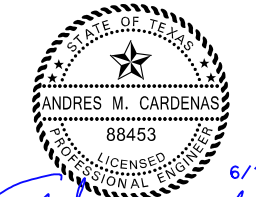


HEC-RAS PROFILE PLOT



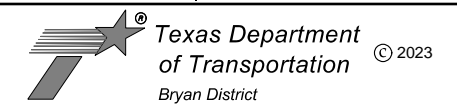
HEC-RAS CROSS SECTION
UPSTREAM OF FM 978

- NOTES:
1. HYDRAULIC ANALYSIS CONDUCTED USING HEC-RAS VERSION 5.0.7.
 2. DOWNSTREAM BOUNDARY CONDITION BASED ON NORMAL DEPTH CALCULATION.
 3. PEAK FLOW RATES OBTAINED FROM HEC-HMS (NRCS HYDROGRAPH METHOD)
 4. HEC-RAS CROSS SECTION GEOMETRY BASED ON TOPOGRAPHIC SURVEY PREPARED BY RODS SURVEYING AND SUPPLEMENTED BY AVAILABLE TNRS DEM DATA. (VERTICAL DATUM = NAD 83)



6/11/2020
Andres M. Cardenas
SHEET 1 OF 1

NO.	REVISION	BY	DATE



FM 978
HYDRAULIC DATA SHEET

FED. RD. DIST. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	SEE TITLE SHEET	FM 978	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	MADISON	
CONTROL	SECTION	JOB	SHEET NO.
0552	02	027	38

2%-AEP (50-Yr) Scour Design Data

Contraction Scour	Left	Channel	Right
Input Data			
Average Depth (ft):	1.17	6	0.64
Approach Velocity (ft/s):	2.24	8.03	1.48
Br Average Depth (ft):		4.78	1.5
BR Opening Flow (cfs):		7362.14	0.01
BR Top WD (ft):		534.26	0.04
Grain Size D50 (mm):	0.2	0.2	0.2
Approach Flow (cfs):	3765.39	3695.65	58.96
Approach Top WD (ft):	1441.52	76.67	61.96
K1 Coefficient:	0.69	0.69	0.69
Results			
Scour Depth Ys (ft):		0	0
Critical Velocity (ft/s):		1.31	0.9
Equation:		Live	Live

Pier Scour
All piers have the same scour depth

Input Data	Round nose
Pier Shape:	Round nose
Pier Width (ft):	3
Grain Size D50 (mm):	0.2
Depth Upstream (ft):	3.31
Velocity Upstream (ft/s):	3.22
K1 Nose Shape:	1
Pier Angle:	0
Pier Length (ft):	34
K2 Angle Coef:	1
K3 Bed Cond Coef:	1.1
Grain Size D90 (mm):	0.17
K4 Armouring Coef:	1
Results	
Scour Depth Ys (ft):	4.14
Froude #:	0.31
Equation:	CSU equation

Combined Scour Depths

Pier Scour + Contraction Scour (ft):
Channel: 4.14

TOTAL CALCULATED SCOUR = 2.07 FT
(0.5 REDUCTION FACTOR TO PIER SCOUR
APPLIED PER TXDOT GEOTECHNICAL MANUAL
FOR COHESIVE SOILS)

1%-AEP (100-Yr) Scour Design Data

Contraction Scour	Left	Channel	Right
Input Data			
Average Depth (ft):	1.38	6.28	0.89
Approach Velocity (ft/s):	2.39	7.94	1.76
Br Average Depth (ft):		5.46	0.22
BR Opening Flow (cfs):		8427.44	0.04
BR Top WD (ft):		499.15	0.91
Grain Size D50 (mm):	0.2	0.2	0.2
Approach Flow (cfs):	4994.74	3822.25	101.02
Approach Top WD (ft):	1519.22	76.67	64.27
K1 Coefficient:	0.69	0.69	0.69
Results			
Scour Depth Ys (ft):		0	0
Critical Velocity (ft/s):		1.32	0.95
Equation:		Live	Live

Pier Scour
All piers have the same scour depth

Input Data	Round nose
Pier Shape:	Round nose
Pier Width (ft):	3
Grain Size D50 (mm):	0.2
Depth Upstream (ft):	3.64
Velocity Upstream (ft/s):	3.36
K1 Nose Shape:	1
Pier Angle:	0
Pier Length (ft):	34
K2 Angle Coef:	1
K3 Bed Cond Coef:	1.1
Grain Size D90 (mm):	0.17
K4 Armouring Coef:	1
Results	
Scour Depth Ys (ft):	4.27
Froude #:	0.31
Equation:	CSU equation

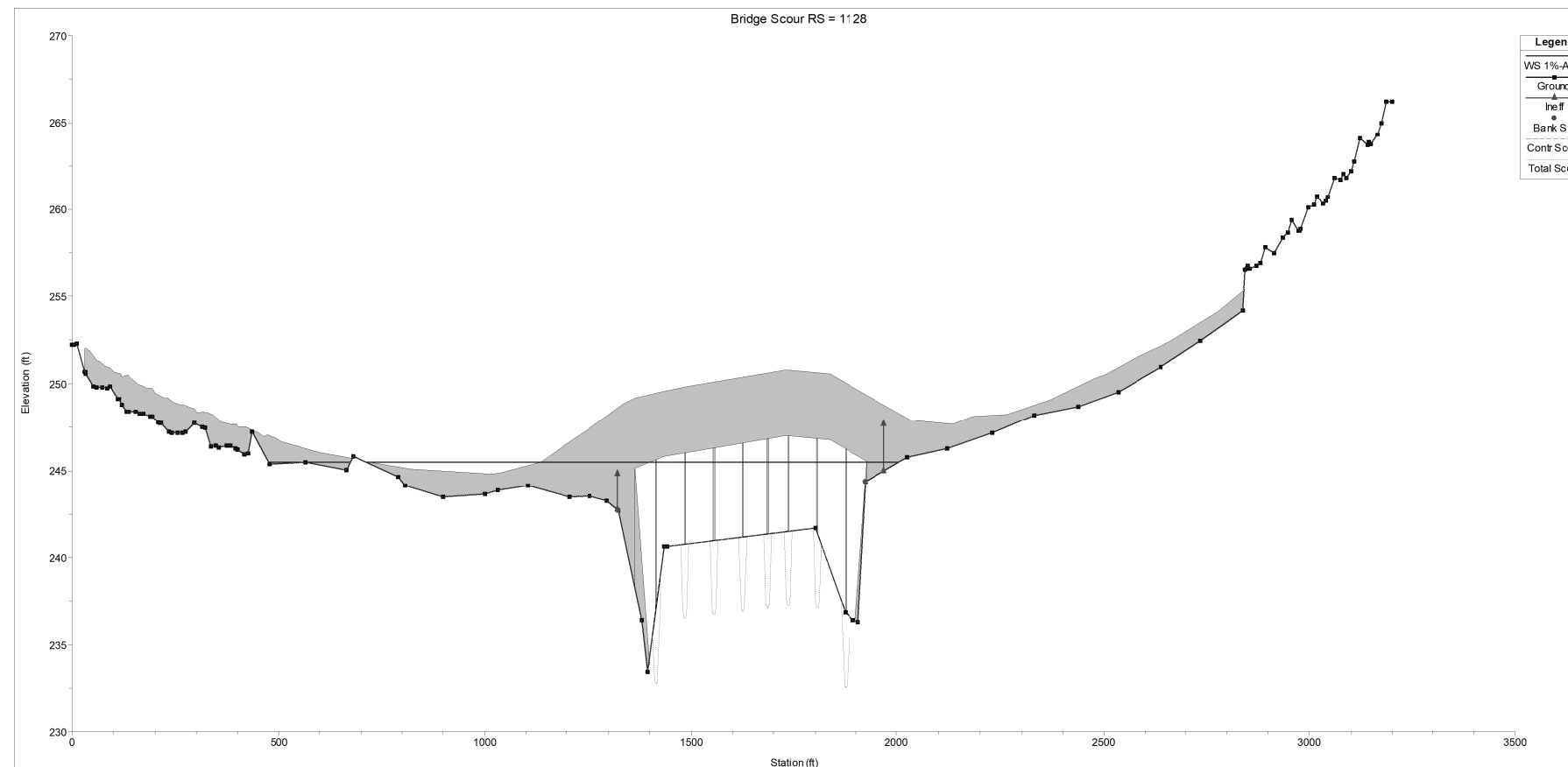
Combined Scour Depths

Pier Scour + Contraction Scour (ft):
Channel: 4.27

TOTAL CALCULATED SCOUR = 2.14 FT
(0.5 REDUCTION FACTOR TO PIER SCOUR
APPLIED PER TXDOT GEOTECHNICAL MANUAL
FOR COHESIVE SOILS)

THE MAXIMUM ALLOWABLE SCOUR, BASED ON EITHER THE LATERAL STABILITY OR THE BEARING LOAD STABILITY, OF THE FOUNDATION IS 19 FEET OR ELEV. 219 FEET.

STRUCTURE TO BE RE-EVALUATED FOR STABILITY IF THE CHANNEL PROFILE DROPS BELOW ELEV. 229 FEET.



6/11/2020
SHEET 1 OF 1

NO.	REVISION	BY	DATE

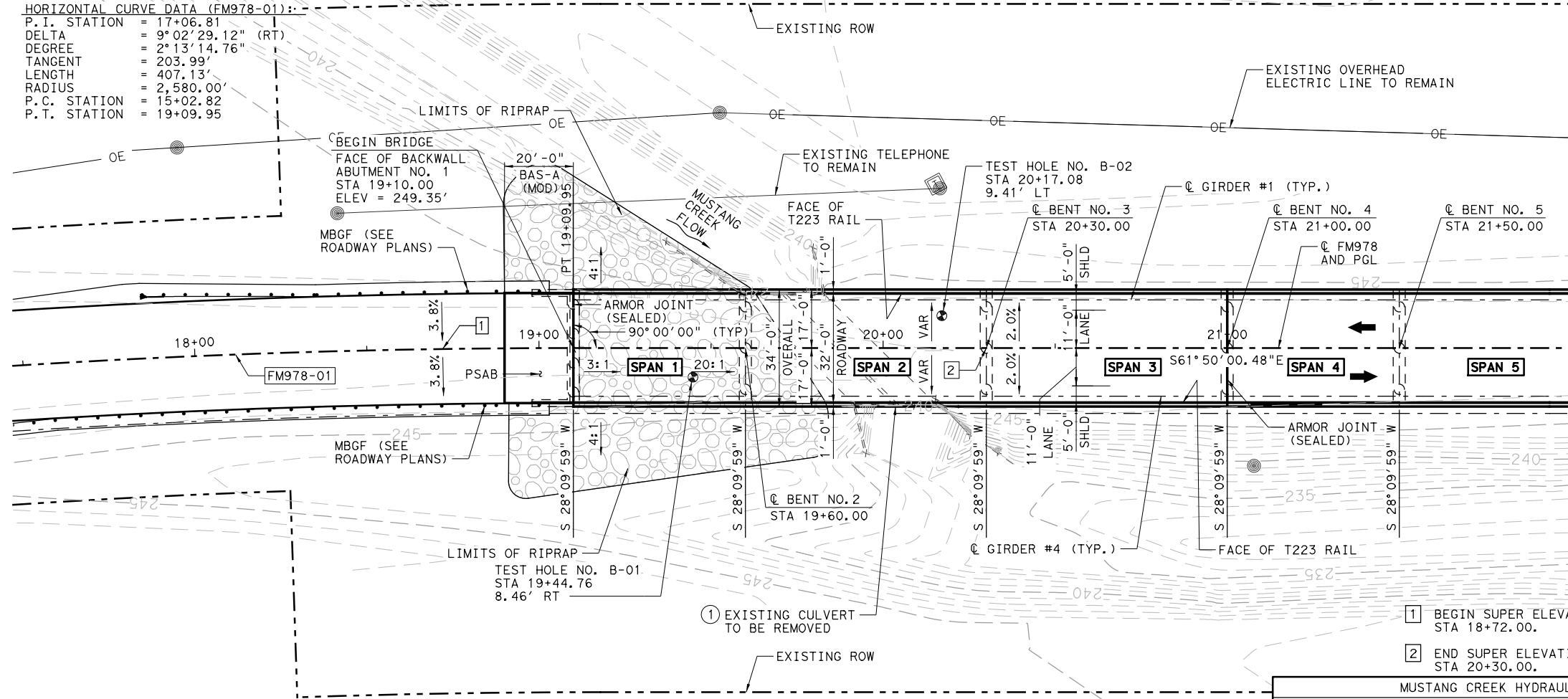
RODRIGUEZ TRANSPORTATION GROUP
FRM #587

Texas Department of Transportation © 2023
Bryan District

FM 978
SCOUR DATA SHEET

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	SEE TITLE SHEET	FM 978	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	MADISON	
CONTROL	SECTION	JOB	SHEET NO.
0552	02	027	39

HORIZONTAL CURVE DATA (FM978-01):
 P. I. STATION = 17+06.81
 DELTA = 9° 02' 29.12" (RT)
 DEGREE = 2° 13' 14.76"
 TANGENT = 203.99'
 LENGTH = 407.13'
 RADIUS = 2,580.00'
 P. C. STATION = 15+02.82
 P. T. STATION = 19+09.95

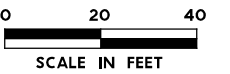


PLAN

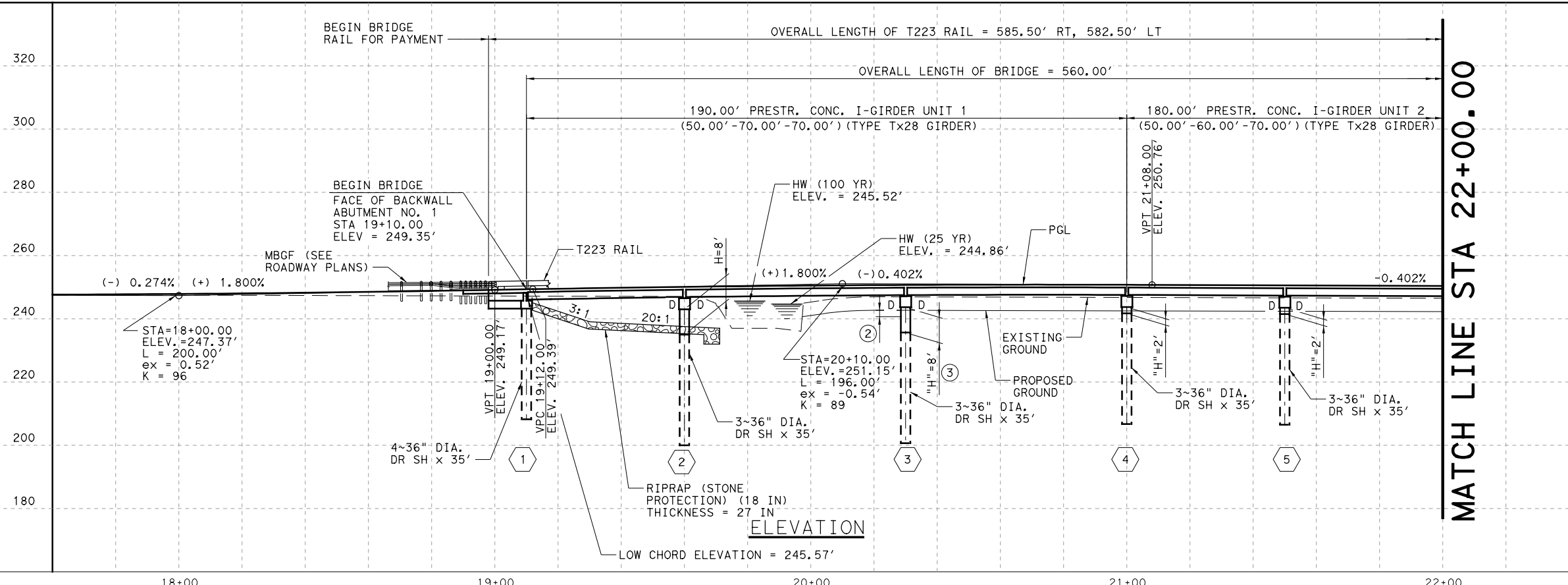
MATCH LINE STA 22+00.00

- ① EXISTING CULVERT IS A MULTI BOX CULVERT CONSISTING OF 2-8' x 8' CONCRETE CELLS.
- ② PIER SCOUR DESIGN FLOOD FREQUENCY $Q_{100} = 2.14'$ TYP. ALL BENTS.
- ③ 8' "H" TO BE PROVIDED, BENTS 3 AND 8. COLUMNS MAY BE BURIED BASED ON LIMITS EXCAVATED FOR CULVERT REMOVAL.

MUSTANG CREEK HYDRAULIC DATA			
DRAINAGE AREA = 6.77 SQ MI			
25 YEAR	ELEV = 244.86'	Q = 6,238 CFS	VEL = 3.07 FT/S
100 YEAR	ELEV = 245.52'	Q = 8,918 CFS	VEL = 3.36 FT/S



HL93 LOADING



ELEVATION

MATCH LINE STA 22+00.00

03/23/2023

NO.	DATE	REVISION	APPROVED

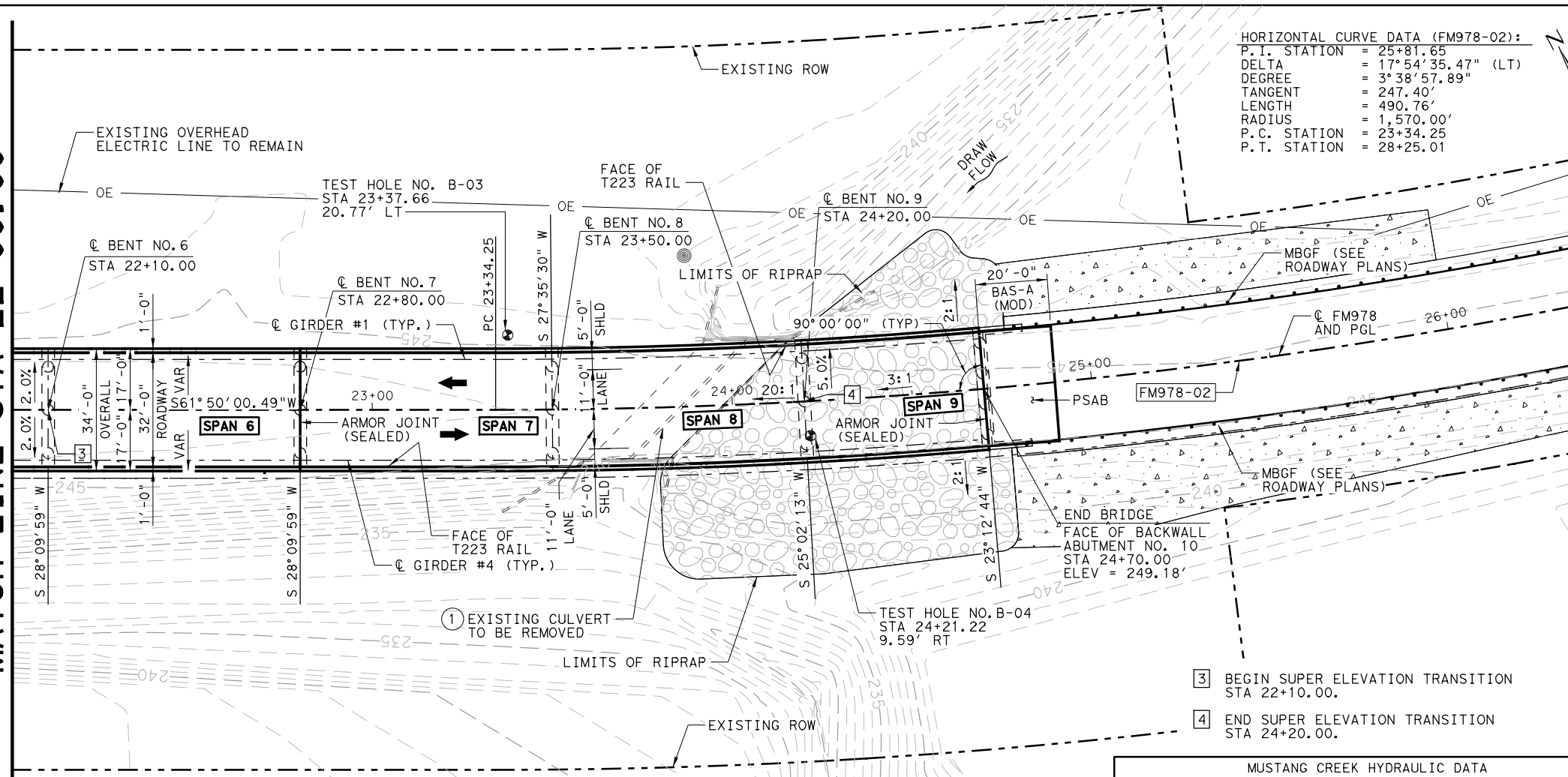
HDR
 HDR Firm Registration No. F-754
 710 Heesters Crossing, Suite 150
 Round Rock, Texas 78681
 512.685.2900

Texas Department of Transportation
 © 2023

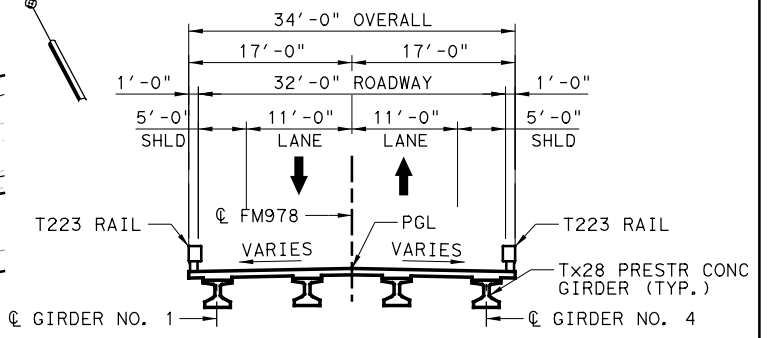
BRIDGE LAYOUT			
FM 978 AT MUSTANG CREEK			
SHEET 1 OF 2			
FED. RD. DIV. NO.	FEDERAL PROJECT NO.	HIGHWAY NO.	
6	SEE TITLE SHEET	FM 978	
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	BRY	MADISON	40
CONTROL	SECTION	JOB	
0552	02	027	

PLOT DRIVER: TXDOT_PDF_BW.pltcfgr
 USER: TGENTRY DATE: 3/23/2023 TIME: 11:08:38 AM SCALE: 1/40
 FILE: FM978BLO1.dgn

MATCH LINE STA 22+00.00



DESIGN SPEED:	50 MPH
ADT (2016):	1,359
FUNCNT CLASS:	RURAL MAJOR COLLECTOR
EXISTING NBI (MUSTANG CREEK):	17-154-0-0552-02-010
EXISTING NBI (DRAW):	17-154-0-0552-02-011
PROPOSED NBI:	17-154-0-0552-02-021

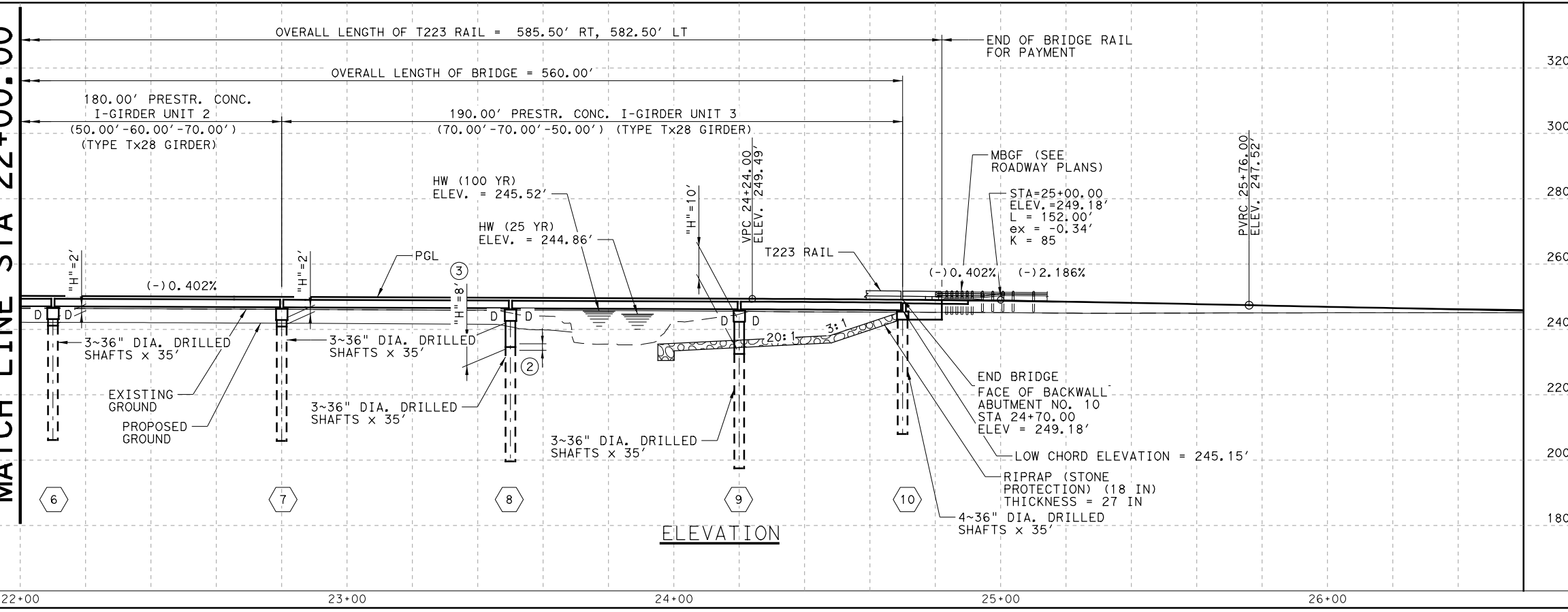


MUSTANG CREEK HYDRAULIC DATA			
DRAINAGE AREA = 6.77 SQ MI			
25 YEAR	ELEV = 244.86'	Q = 6,238 CFS	VEL = 3.07 FT/S
100 YEAR	ELEV = 245.52'	Q = 8,918 CFS	VEL = 3.36 FT/S

PLAN

HL93 LOADING SCALE IN FEET

MATCH LINE STA 22+00.00



STATE OF TEXAS
 DAVID P. HOHMANN
 60983
 REGISTERED PROFESSIONAL ENGINEER
 03/23/2023

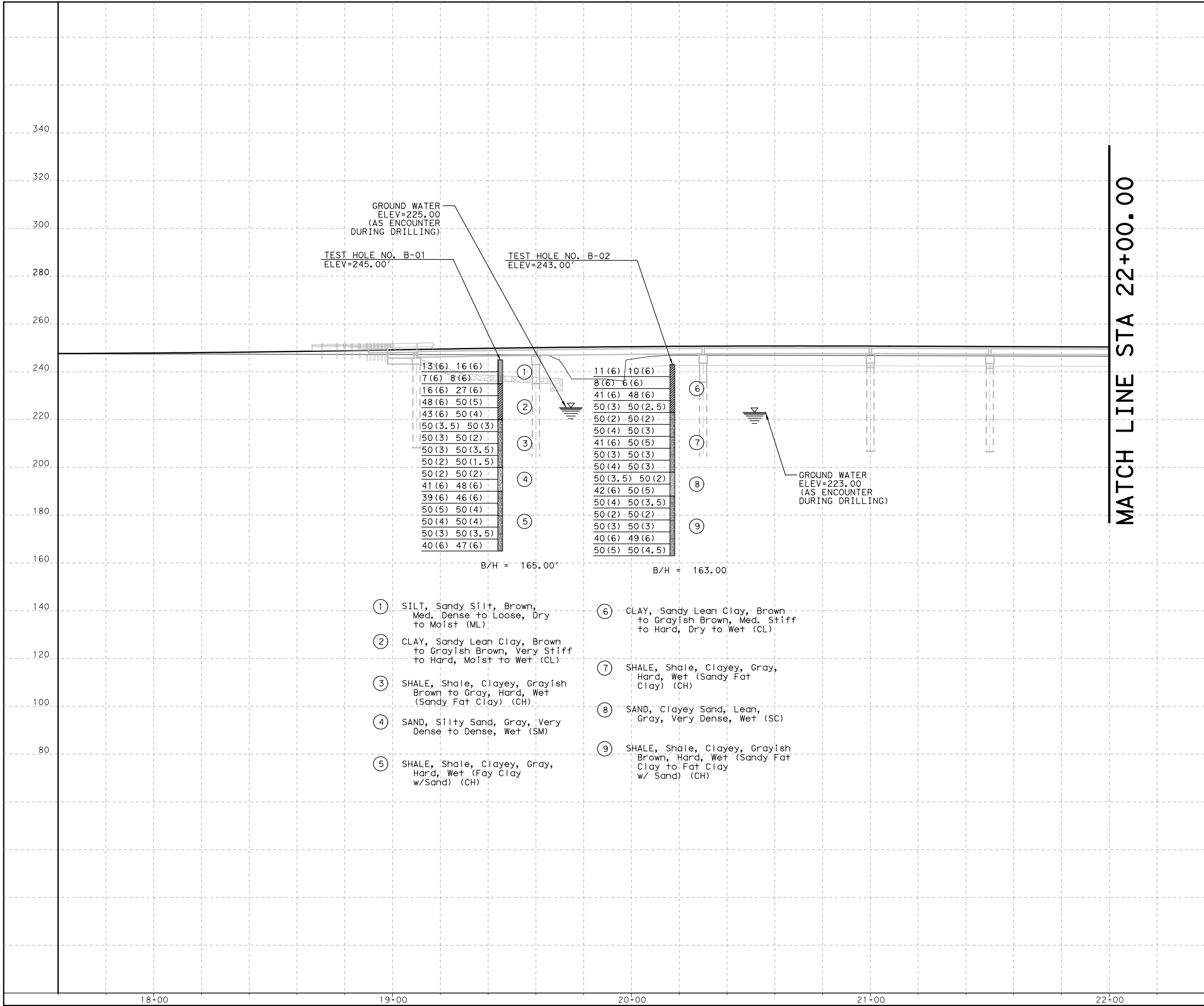
NO.	DATE	REVISION	APPROVED

HDR
 Firm Registration No. F-754
 710 Hesters Crossing, Suite 150
 Round Rock, Texas 78681
 512.685.2900

BRIDGE LAYOUT
FM 978 AT MUSTANG CREEK

SHEET 2 OF 2

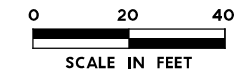
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6	SEE TITLE SHEET		FM 978
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	BRY	MADISON	41
CONTROL	SECTION	JOB	
0552	02	027	



NOTE:
 Test Hole Data is taken from Geotechnical Memos prepared by L&G Engineering Dated January 31, 2019.

"WA #4: Bryan District On-System Bridge Replacement-FM 978 at Mustang Creek" and
 "WA #4: Bryan District On-System Bridge Replacement-FM 978 at Draw"

MATCH LINE STA 22+00.00



HL93 LOADING



Philip A. Fulton 03/17/2023

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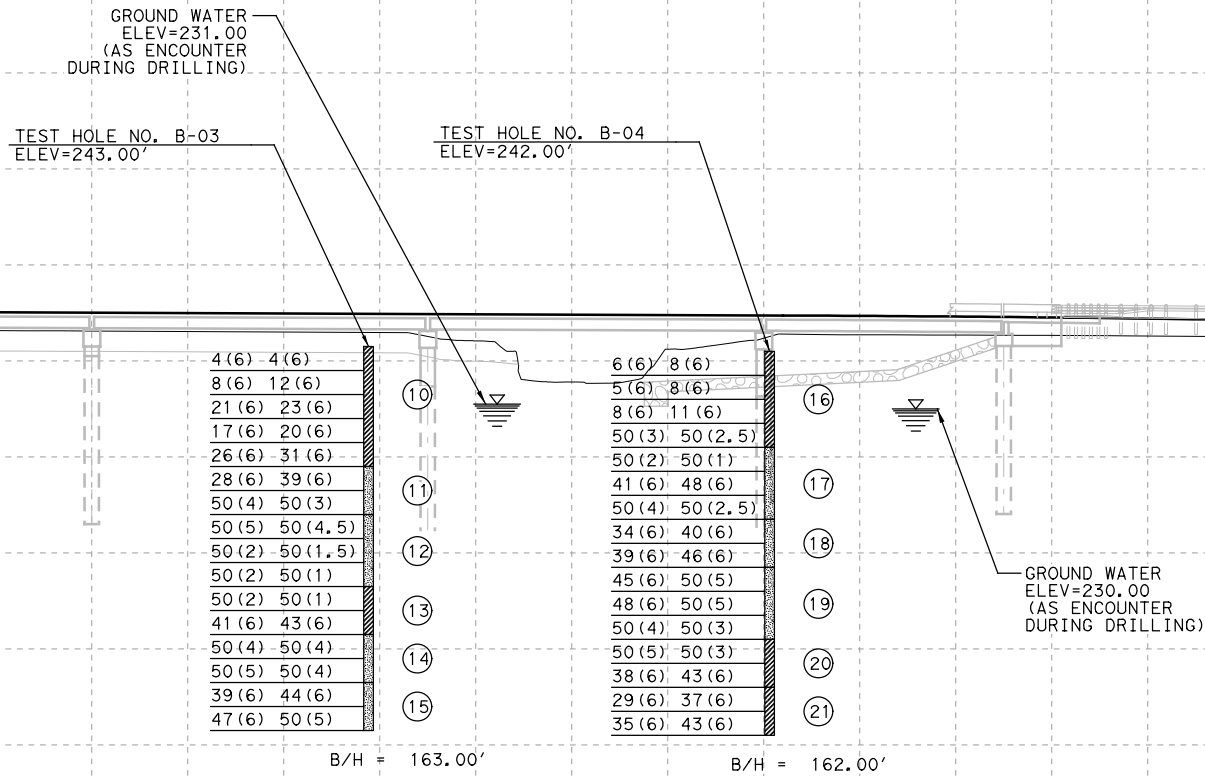
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 HDR Firm Registration No. F-754
 710 Hesters Crossing, Suite 150
 Round Rock, Texas 78681
 512.685.2900



TEST HOLE DATA
FM 978 AT MUSTANG CREEK

SHEET 1 OF 2			
FED. RD. DIV. NO. 6	FEDERAL PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. FM 978
STATE TEXAS	DISTRICT BRY	COUNTY MADISON	SHEET NO. 42
CONTROL 0552	SECTION 02	JOB 027	

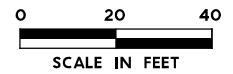
MATCH LINE STA 22+00.00



- | | |
|---|--|
| <ul style="list-style-type: none"> ⑩ CLAY, Sandy Lean Clay, Dk. Brown to Brown, Stiff to Very Stiff, Moist to Wet (CL) ⑪ SAND, Clayey Sand, Lean, Grayish Brown to Gray, Dense to Very Dense, Wet (SC) ⑫ SAND, Poorly Graded Sand w/ Silt, Gray, Very Dense, Wet (SP-SM) ⑬ CLAY, Sandy Lean Clay, Gray, Hard, Wet (CL) ⑭ SAND, Clayey Sand, Lean, Gray, Very Dense, Wet (SC) ⑮ SAND, Poorly Graded Sand w/ Silt, Gray, Dense to Very Dense, Wet (SP-SM) | <ul style="list-style-type: none"> ⑯ CLAY, Sandy Lean Clay, DK. Brown to Grayish Brown, Med. Stiff to Hard, Dry to Wet (CL) ⑰ SAND, Silty Sand, Grayish Brown to Gray, Very Dense, Wet (SM) ⑱ SAND, Clayey Sand, Lean, Gray, Dense, Wet (SC) ⑲ SAND, Silty Sand, Gray, Dense to Very Dense, Wet (SM) ⑳ CLAY, Lean Clay, Gray, Hard, Wet (CL) ㉑ CLAY, Sandy Lean Clay, Gray, Hard, Wet (CL) |
|---|--|

NOTE:
 Test Hole Data is taken from Geotechnical Memos prepared by L&G Engineering Dated January 31, 2019.

"WA #4: Bryan District On-System Bridge Replacement-FM 978 at Mustang Creek"
 and
 "WA #4: Bryan District On-System Bridge Replacement-FM 978 at Draw"



HL93 LOADING



Philip A. Fulton 03/17/2023

NO.	DATE	REVISION	APPROVED

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 HDR Firm Registration No. F-754
 710 Hesters Crossing, Suite 150
 Round Rock, Texas 78681
 512.685.2900



TEST HOLE DATA
 FM 978 AT MUSTANG CREEK

SHEET 2 OF 2

FED. RD. DIV. NO. 6	FEDERAL PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. FM 978
STATE TEXAS	DISTRICT BRY	COUNTY MADISON	SHEET NO. 43
CONTROL 0552	SECTION 02	JOB 027	

SUMMARY OF ESTIMATED QUANTITIES

BRIDGE ELEMENT	BID CODES	400-6005	416-6004	420-6013	420-6029	420-6037	422-6001	422-6015	425-6035	432-6033	450-6006	454-6004
	BID ITEM DESCRIPTION	CEM STABIL BKFL	DRILL SHAFT (36 IN)	CL "C" CONC * (ABUT)	CL "C" CONC * (CAP)	CL "C" CONC (COLUMN)	REINF CONC SLAB	APPROACH SLAB	PRESTR CONC GIRDER (TX 28)	RIPRAP (STONE PROTECTION) (18 IN)	RAIL (T223)	ARMOR JOINT (SEALED)
		CY	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF
2 ~ ABUTMENTS		88	280	42.2				47.4		1,244		66
8 ~ INTERIOR BENTS			840		114.4	33.0						66
1 ~ 190.00' PRESTR CONC I-GIRDER UNIT 1							6,460		754.00		404.0	
1 ~ 180.00' PRESTR CONC I-GIRDER UNIT 2							6,120		714.00		360.0	
1 ~ 190.00' PRESTR CONC I-GIRDER UNIT 3							6,460		754.00		404.0	
TOTAL		88	1,120	42.2	114.4	33.0	19,040	47.4	2,222.00	1,244	1,168.0	132

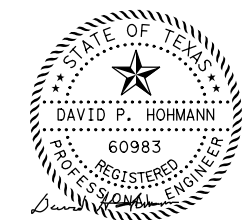
* INCLUDES QUANTITIES FOR SHEAR KEYS

BEARING SEAT ELEVATIONS

	BEAM 1	BEAM 2	BEAM 3	BEAM 4
BENT 1 (FWD)	246.137	245.916	245.649	245.336
BENT 2 (BK) (FWD)	246.630 246.645	246.574 246.595	246.414 246.441	246.152 246.181
BENT 3 (BK) (FWD)	246.886 246.890	247.069 247.077	247.067 247.077	246.879 246.890
BENT 4 (BK) (FWD)	246.945 246.939	247.132 247.126	247.132 247.126	246.945 246.939
BENT 5 (BK) (FWD)	246.749 246.741	246.935 246.927	246.935 246.927	246.749 246.741
BENT 6 (BK) (FWD)	246.507 246.497	246.694 246.685	246.694 246.688	246.507 246.504
BENT 7 (BK) (FWD)	246.088 246.034	246.367 246.316	246.520 246.473	246.548 246.508
BENT 8 (BK) (FWD)	245.625 245.612	245.997 245.987	246.306 246.300	246.551 246.552
BENT 9 (BK) (FWD)	245.202 245.234	245.668 245.701	246.132 246.168	246.596 246.634
BENT 10 (BK)	244.923	245.389	245.856	246.323

HL93 LOADING

BEARING SEAT ELEVATIONS ONLY



06/16/2020

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 Round Rock, Texas 78681
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**ESTIMATED QUANTITIES
 AND BEARING SEAT
 ELEVATIONS
 FM 978 AT MUSTANG CREEK**

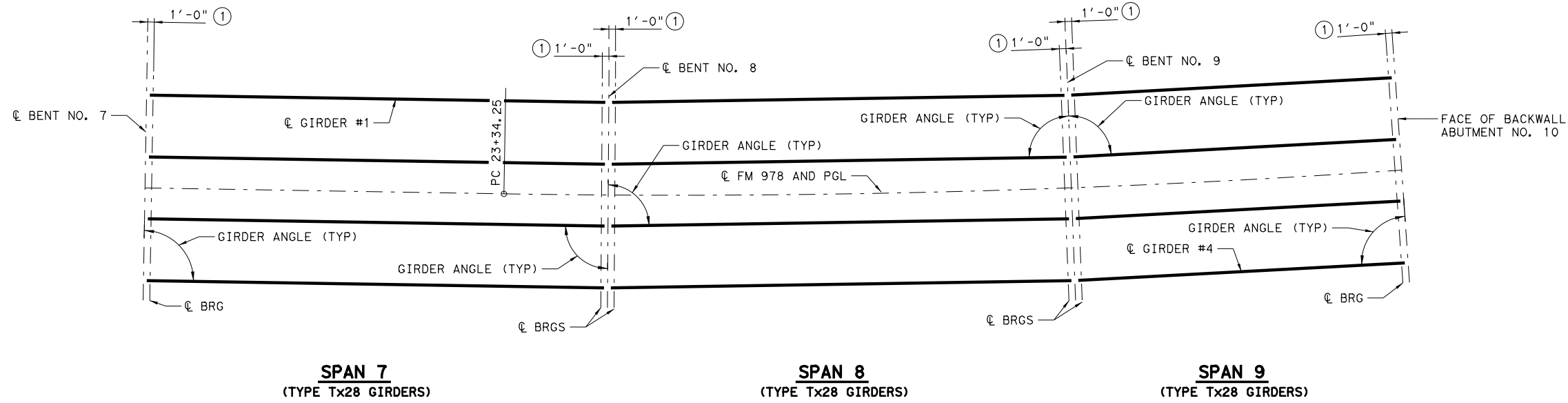
SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL PROJECT NO.	HIGHWAY NO.
6	SEE TITLE SHEET	FM 978
STATE	DISTRICT	COUNTY
TEXAS	BRY	MADISON
CONTROL	SECTION	JOB
0552	02	027

44

100% PLANS SUBMITTAL

PLOT DRIVER: TXDOT_PDF_BW.pltcfq
 USER: CLINDSAY DATE: 6/15/2020
 PENTABLE: FM978-10134847.tbl
 TIME: 4:54:19 PM SCALE: 1:1
 FILE: FM978BRIDGE01.dgn



- ① SEE IGEB STANDARD FOR ORIENTATION OF DIMENSIONS.
- ② GIRDER LENGTHS SHOWN ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS FOR GIRDER SLOPE.

BENT REPORT

BENT NO. 7 (S 28 9 59.54 W)			BENT NO. 8 (S 27 35 30.19 W)		
DISTANCE BETWEEN STATION LINE AND GIRDER 1, 14.000 L			DISTANCE BETWEEN STATION LINE AND GIRDER 1, 14.000 L		
GIRDER SPAC (C.L. BENT)	GIRDER ANGLE		GIRDER SPAC (C.L. BENT)	GIRDER ANGLE	
	D M S			D M S	
SPAN 7 GIRDER 1	0.000	89 56 9	SPAN 7 GIRDER 1	0.000	89 29 22
GIRDER 2	9.333	89 56 8	GIRDER 2	9.333	89 29 23
GIRDER 3	9.333	89 56 7	GIRDER 3	9.333	89 29 24
GIRDER 4	9.333	89 56 6	GIRDER 4	9.333	89 29 25
TOTAL	28.000		TOTAL	28.000	

BENT NO. 9 (S 25 2 13.67 W)			BENT NO. 10 (S 23 12 44.73 W)		
DISTANCE BETWEEN STATION LINE AND GIRDER 1, 14.000 L			DISTANCE BETWEEN STATION LINE AND GIRDER 1, 14.000 L		
GIRDER SPAC (C.L. BENT)	GIRDER ANGLE		GIRDER SPAC (C.L. BENT)	GIRDER ANGLE	
	D M S			D M S	
SPAN 8 GIRDER 1	0.000	88 43 22	SPAN 9 GIRDER 1	0.000	89 5 16
GIRDER 2	9.333	88 43 22	GIRDER 2	9.333	89 5 16
GIRDER 3	9.333	88 43 22	GIRDER 3	9.333	89 5 16
GIRDER 4	9.333	88 43 22	GIRDER 4	9.333	89 5 16
TOTAL	28.000		TOTAL	28.000	

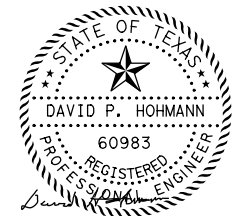
GIRDER REPORT

GIRDER REPORT, SPAN 7			
GIRDER	HORIZONTAL DISTANCE		TRUE DISTANCE BOT. GR. FLG. ②
	C-C BENT	C-C BRG.	
GIRDER 1	69.859	67.859	69.36
GIRDER 2	69.953	67.953	69.45
GIRDER 3	70.047	68.047	69.55
GIRDER 4	70.140	68.140	69.64

GIRDER REPORT, SPAN 8			
GIRDER	HORIZONTAL DISTANCE		TRUE DISTANCE BOT. GR. FLG. ②
	C-C BENT	C-C BRG.	
GIRDER 1	69.370	67.370	68.87
GIRDER 2	69.786	67.786	69.29
GIRDER 3	70.202	68.202	69.70
GIRDER 4	70.618	68.618	70.12

GIRDER REPORT, SPAN 9			
GIRDER	HORIZONTAL DISTANCE		TRUE DISTANCE BOT. GR. FLG. ②
	C-C BENT	C-C BRG.	
GIRDER 1	49.552	47.552	49.05
GIRDER 2	49.849	47.849	49.35
GIRDER 3	50.147	48.146	49.65
GIRDER 4	50.444	48.444	49.94

HL93 LOADING



06/16/2020

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 710 Hesters Crossing, Suite 150
 Round Rock, Texas 78681
 512.685.2900

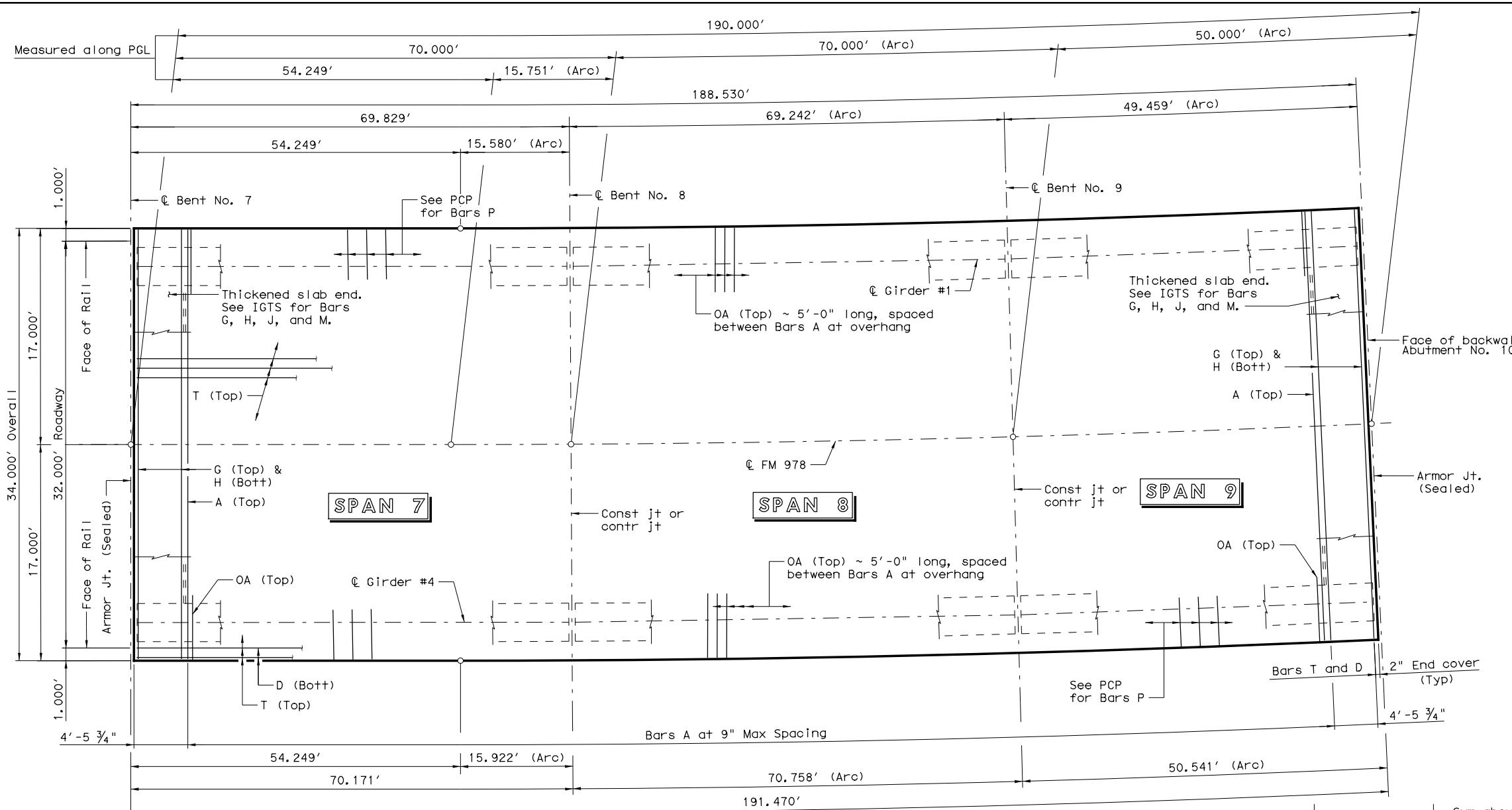


FRAMING PLAN

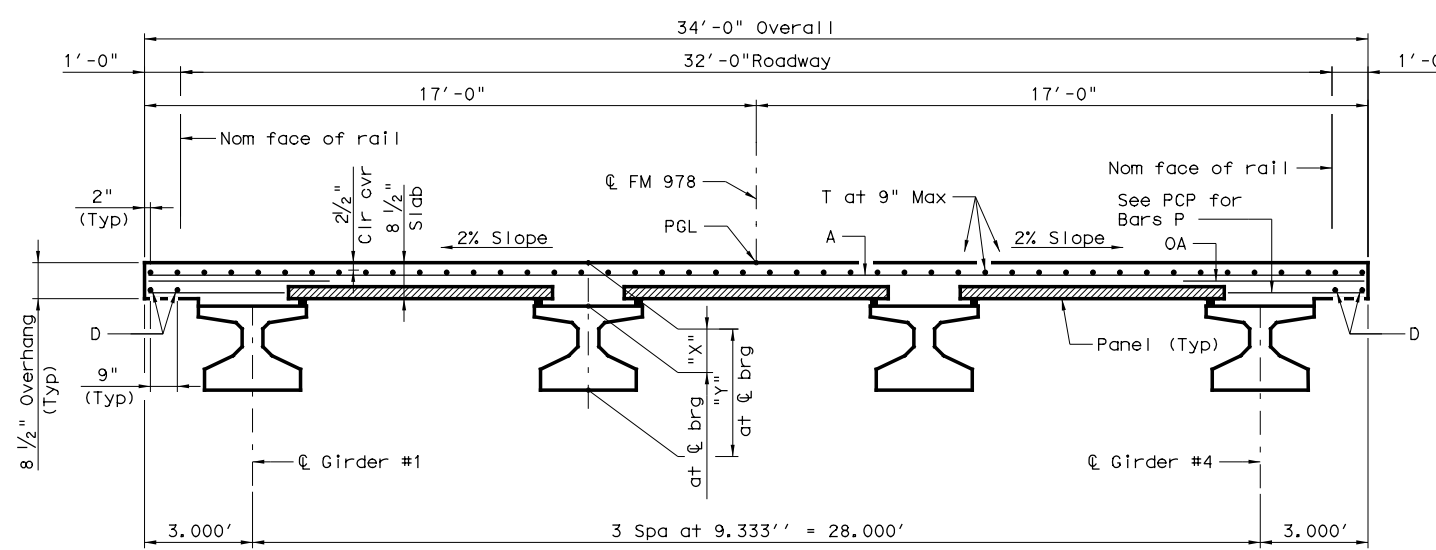
FM 978 AT MUSTANG CREEK

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 978
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	BRY	MADISON	45
CONTROL	SECTION	JOB	
0552	02	027	



PLAN



TYPICAL TRANSVERSE SECTION

(Girder type Tx28)

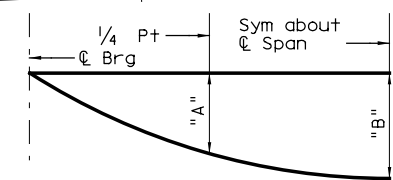
BAR TABLE	
BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

TABLE OF ESTIMATED QUANTITIES			
Span	Reinf Concrete Slab (HPC)	Prestr Concrete Girder (Tx 28) ②	Reinf Steel ①
7	2380	278.00	5474.0
8	2380	277.98	5474.0
9	1700	198.00	3910.0
Total	6460	753.98	14858.0

- ① Reinforcing steel weight is calculated using an approximate factor of 2.3 Lbs/SF.
- ② Fabricator will adjust lengths for girder slopes as required.

GENERAL NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications, 8th Edition (2018).
 See IGTS standard for Thickened Slab End details and quantity adjustments.
 All concrete shall be Class S (HPC), f'c = 4000 psi.
 All reinforcing steel shall be Grade 60.
 See rail standard for anchorage in slab.
 See PCP and PCP-FAB standards for panel details not shown.
 See IGMS standard for miscellaneous details.
 See PMDF standard for details and quantity adjustments if this option is used.
 Cover dimensions are clear dimensions, unless noted otherwise.
 Bar laps, where required shall be as follows:
 Uncoated ~ #4 = 1'-7"
 Deformed Welded Wire Reinforcement (WRR) (ASTM A1064) of equal size and spacing may be substituted for Bars A, D, OA, P or T unless noted otherwise.



DEAD LOAD DEFLECTION DIAGRAM

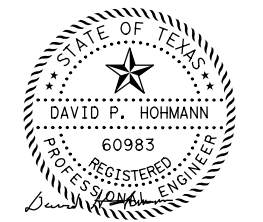
NOTE: Deflections shown are due to concrete slab only. (Ec = 5000 ksi). Calculated deflections shown are theoretical and actual deflection may be less. Deflection shall be adjusted based on field observation.

Span No.	Girder No.	"A"	"B"
		F+	F+
7	1, 4	0.094	0.134
7	2, 3	0.106	0.151
8	1, 4	0.094	0.164
8	2, 3	0.106	0.151
9	1, 4	0.023	0.033
9	2, 3	0.027	0.038

TABLE OF SECTION DEPTHS

Span No.	"X"	"Y"
	at C Brg	at C Brg
7	1'-0 1/2"	3'-4 1/2"
8	1'-0 1/2"	3'-4 1/2"
9	1'-0"	3'-4"

HL93 LOADING



06/16/2020

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HDR
 HDR Firm Registration No. F-754
 710 Heesters Crossing, Suite 150
 Round Rock, Texas 78681
 512.685.2900



190.00' PRESTRESSED CONCRETE GIRDER UNIT 3 FM 978 AT MUSTANG CREEK

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL PROJECT NO.	HIGHWAY NO.
6	SEE TITLE SHEET	FM 978
STATE	DISTRICT	COUNTY
TEXAS	BRY	MADISON
CONTROL	SECTION	JOB
0552	02	027

46

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DATE: 6/15/2020 4:15:35 PM
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STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN				
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					NO.	TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP €) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT €) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" € (in)								"e" END (in)	Moment	Shear
FM 978 AT MUSTANG CREEK	1,4	1-4	Tx28		16	0.6	270	10.23	9.23	4	8.5	4	5.8	1.853	-2.508	2040	0.8	1.08
	2,3,6-8	1-4	Tx28		32	0.6	270	5.73	9.11	6	24.5	6	6.7	3.587	-4.465	3349	0.701	0.907
	5	1-4	Tx28		22	0.6	270	9.75	7.57	4	16.5	4.8	6.9	2.655	-3.462	2715	0.76	1.09
	9	1-4	Tx28		26	0.6	270	7.71	9.56	4	16.5	5.6	7.3	1.835	-2.453	2606	0.771	0.907

NON-STANDARD STRAND PATTERNS	
PATTERN	STRAND ARRANGEMENT AT € OF GIRDER

- ① Based on the following allowable stresses (ksi):
 Compression = 0.65 f'ci
 Tension = 0.24 √ f'ci¹
 Optional designs must likewise conform.
- ② Portion of full HL93.

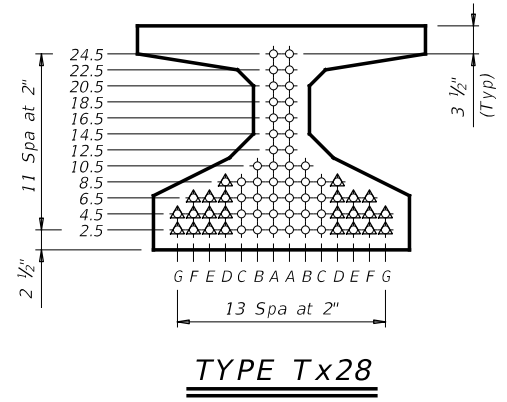
DESIGN NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications. Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder. Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

FABRICATION NOTES:
 Provide Class H concrete. Provide Grade 60 reinforcing steel bars. Use low relaxation strands, each pretensioned to 75 percent of fpu. Strand debonding must comply with Item 424.4.2.2.4. Full-length debonded strands are only permitted in positions marked Δ. Double wrap full-length debonded strands in outer most position of each row.

When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas. Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

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

To complete this sheet input the girder designs in the table and the relative humidity under Design Notes. In all cases, remove this block. This sheet must be signed, sealed, and dated by a registered Professional Engineer.



HL93 LOADING

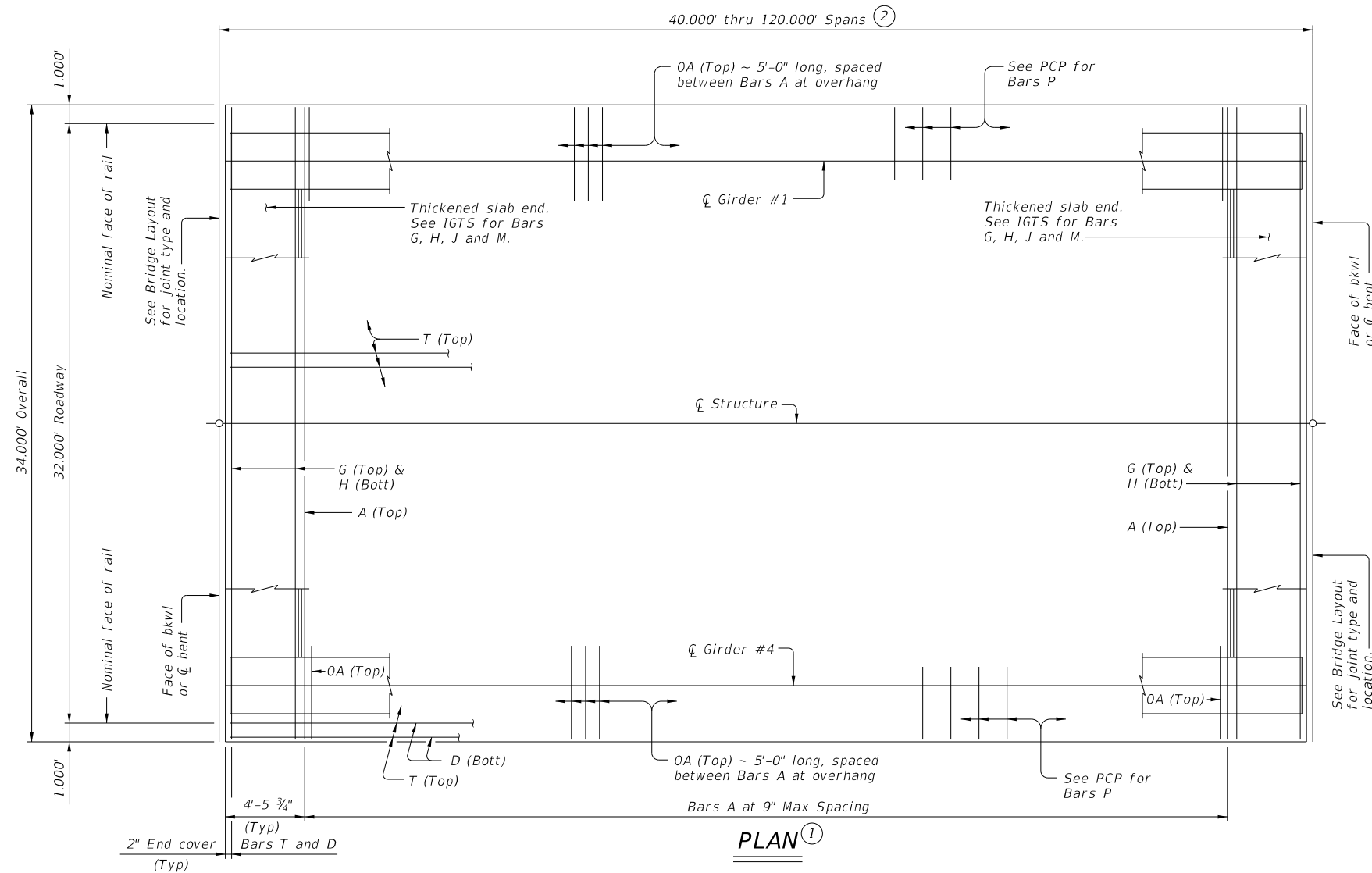


06/16/2020

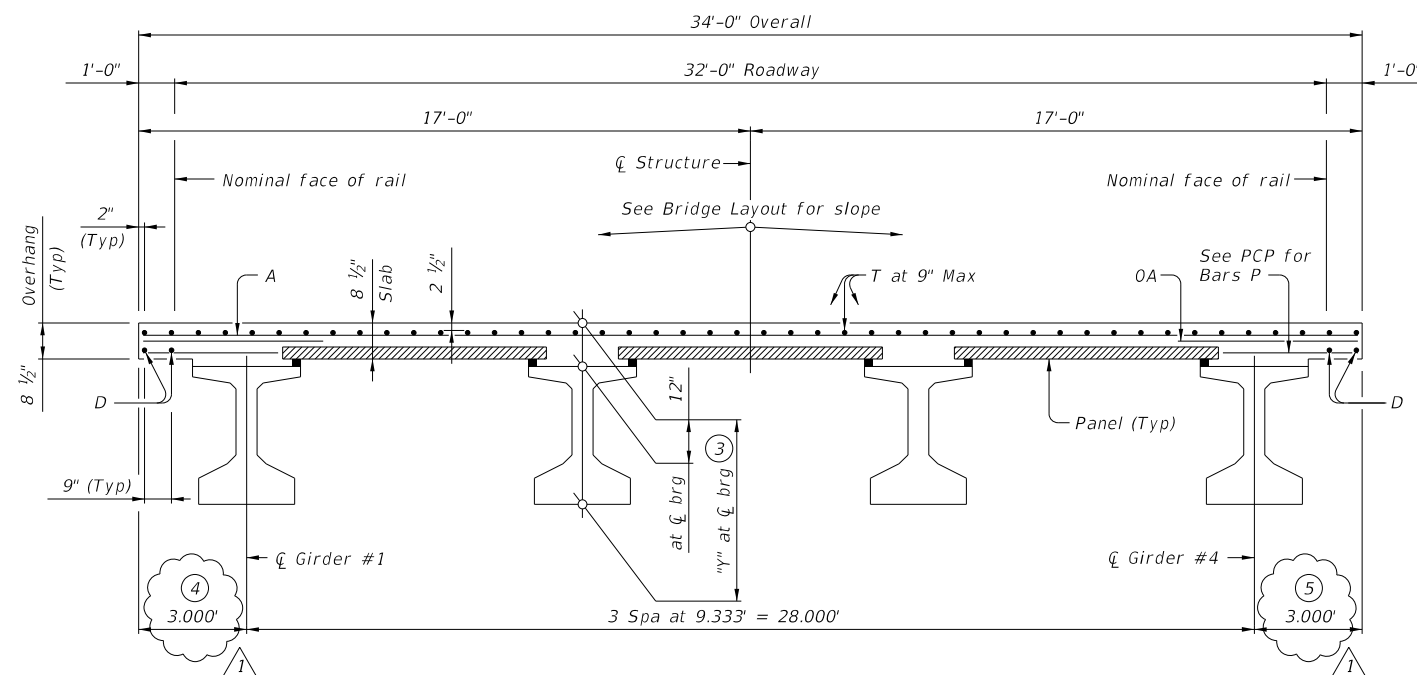
		Bridge Division Standard	
PRESTRESSED CONCRETE I-GIRDER DESIGNS (NON-STANDARD SPANS)			
IGND(MOD)			
FILE: igndsts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: EFC
CONTRACT: August 2017	SECT:	JOB:	HIGHWAY:
REVISIONS: 0552 02	027	FM978	
10-19: Modified for depressed strands only.		COUNTY:	SHEET NO.:
BRY	MADISON		47

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PLAN ①



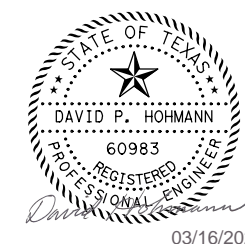
TYPICAL TRANSVERSE SECTION
 (Showing girder type Tx46)

TABLE OF SECTION DEPTHS	
GIRDER TYPE	"Y" AT \bar{C} BRG ③ Ft/In
Tx28	3'-4"
Tx34	3'-10"
Tx40	4'-4"
Tx46	4'-10"
Tx54	5'-6"

- 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 65.000'.
 Type Tx34 for spans lengths 40.000' thru 80.000'.
 Type Tx40 for spans lengths 40.000' thru 90.000'.
 Type Tx46 for spans lengths 40.000' thru 100.000'.
 Type Tx54 for spans lengths 40.000' thru 120.000'.
- ③ "Y" value shown is based on theoretical girder camber, dead load deflection from an 8 1/2" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve.

- ④ Varies 3.000' to 2.939' ~ Span 7
 Varies 3.000' to 2.614' ~ Span 8
 Varies 3.000' to 2.804' ~ Span 9
- ⑤ Varies 3.000' to 3.061' ~ Span 7
 Varies 3.000' to 3.386' ~ Span 8
 Varies 3.000' to 3.196' ~ Span 9

HL93 LOADING SHEET 1 OF 2



Texas Department of Transportation
 PRESTRESSED CONCRETE I-GIRDER SPANS
 (TYPE Tx28 THRU Tx54)
 32' ROADWAY
 SIG-32(MOD)

FILE: IG-SIG3200-23.dgn	DN: JMH	CK: ASB	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
10-19: Increased "X" and "Y" Values. 01-23: Removed PCPD reference.	DIST	COUNTY	SHEET NO.	
BRY	MADISON	48		

① Mod: 70-ft Tx28 Span. Variable overhangs for curved bridge.

BAR TABLE	
BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

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TABLE OF DEAD LOAD DEFLECTIONS

TYPE Tx28 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.011	0.015
45	0.017	0.024
50	0.026	0.037
55	0.040	0.056
60	0.057	0.080
65	0.079	0.111
70	0.106	0.151

TYPE Tx34 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.006	0.009
45	0.010	0.014
50	0.016	0.022
55	0.024	0.033
60	0.034	0.048
65	0.047	0.066
70	0.064	0.090
75	0.085	0.120
80	0.111	0.156

TYPE Tx40 GIRDERS

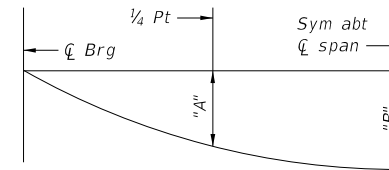
SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.004	0.006
45	0.006	0.009
50	0.011	0.015
55	0.016	0.022
60	0.022	0.031
65	0.031	0.043
70	0.042	0.059
75	0.056	0.078
80	0.073	0.102
85	0.093	0.131
90	0.118	0.165

TYPE Tx46 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.003	0.004
45	0.004	0.006
50	0.007	0.010
55	0.011	0.015
60	0.015	0.021
65	0.021	0.030
70	0.028	0.040
75	0.038	0.053
80	0.049	0.069
85	0.063	0.089
90	0.080	0.113
95	0.100	0.140
100	0.123	0.173

TYPE Tx54 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.002	0.003
45	0.003	0.004
50	0.005	0.007
55	0.007	0.010
60	0.010	0.014
65	0.014	0.020
70	0.019	0.027
75	0.025	0.035
80	0.033	0.046
85	0.042	0.059
90	0.053	0.074
95	0.066	0.093
100	0.081	0.114
105	0.100	0.140
110	0.120	0.169
115	0.144	0.202
120	0.172	0.241



DEAD LOAD DEFLECTION DIAGRAM

Calculated deflections shown are due to the concrete slab on interior girders only ($E_c = 5000$ 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	1,360	158.00	158.00	158.00	3,128
45	1,530	178.00	178.00	178.00	3,519
50	1,700	198.00	198.00	198.00	3,910
55	1,870	218.00	218.00	218.00	4,301
60	2,040	238.00	238.00	238.00	4,692
65	2,210	258.00	258.00	258.00	5,083
70	2,380	278.00	278.00	278.00	5,474
75	2,550	298.00	298.00	298.00	5,865
80	2,720	318.00	318.00	318.00	6,256
85	2,890	338.00	338.00	338.00	6,647
90	3,060	358.00	358.00	358.00	7,038
95	3,230	378.00	378.00	378.00	7,429
100	3,400	398.00	398.00	398.00	7,820
105	3,570	418.00	418.00	418.00	8,211
110	3,740	438.00	438.00	438.00	8,602
115	3,910	458.00	458.00	458.00	8,993
120	4,080	478.00	478.00	478.00	9,384

- (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:

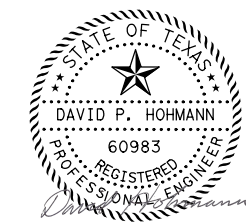
Provide Class 5 concrete ($f'_c = 4,000$ psi).
 Provide Class 5 (HPC) concrete if shown elsewhere in the plans.
 Provide Grade 60 reinforcing steel.
 Provide bar laps, where required, as follows:
 Uncoated ~ #4 = 1'-7"
 Epoxy coated ~ #4 = 2'-5"
 Deformed welded wire reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars A, D, OA, 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 (PMD) 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 SHEET 2 OF 2



03/16/2023

		Bridge Division Standard	
PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54) 32' ROADWAY			
SIG-32(MOD)			
FILE: IG-SIG3200-23.dgn	DN: JMH	CK: ASB	DW: JTR
©TxDOT August 2017	CONT	SECT	JOB
REVISIONS	0552	02	027
10-19: Increased "X" and "Y" Values.	DIST	COUNTY	SHEET NO.
01-23: Removed PCPD reference.	BRY	MADISON	49

Mod: 70-ft Tx28 Span. Variable overhangs for curved bridge.

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TABLE OF FOUNDATION LOADS		
Span Length	All Girder Types	
	Tons/Shaft	Tons/Pile
40	53	47
45	56	49
50	60	51
55	63	53
60	66	54
65	70	56
70	73	58
75	76	59
80	79	61
85	82	62
90	86	64
95	89	66
100	92	67
105	95	69
110	98	70
115	101	72
120	104	74

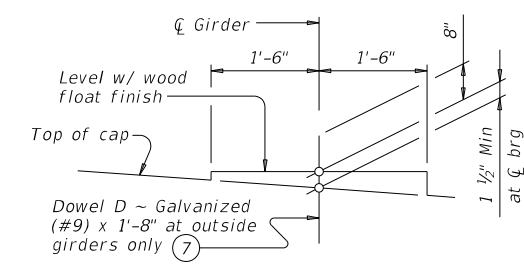
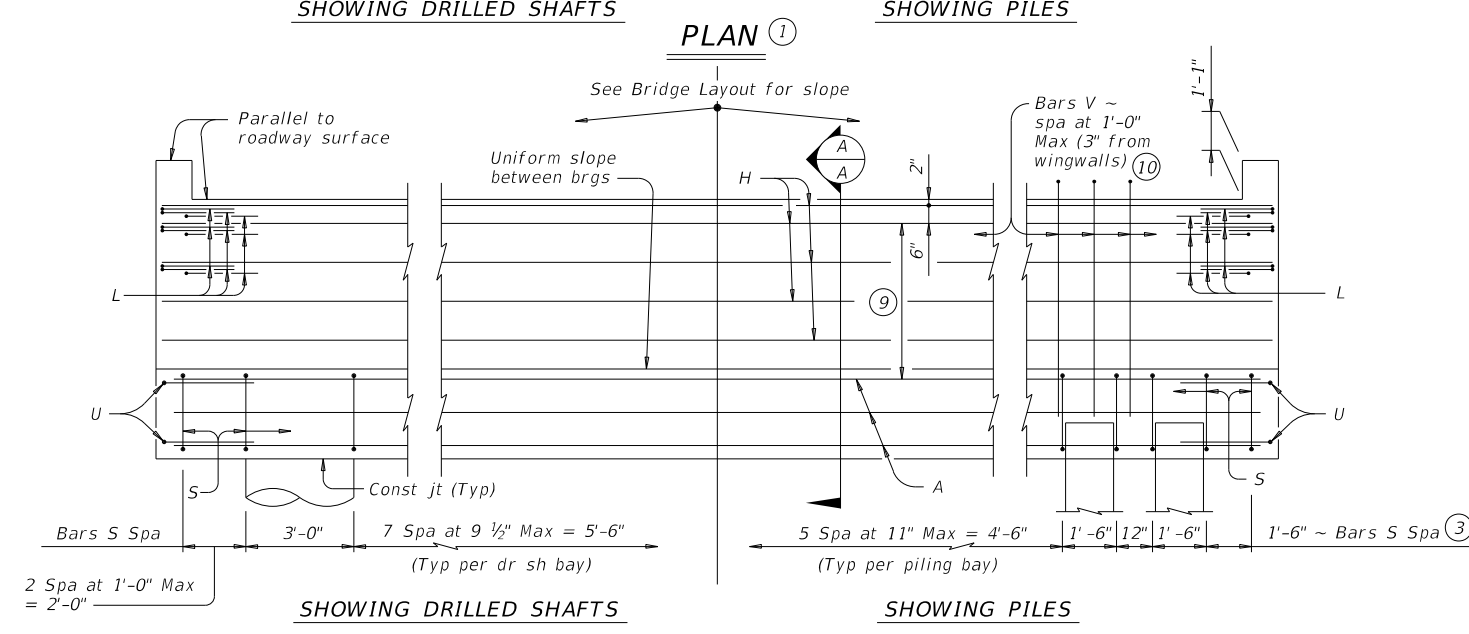
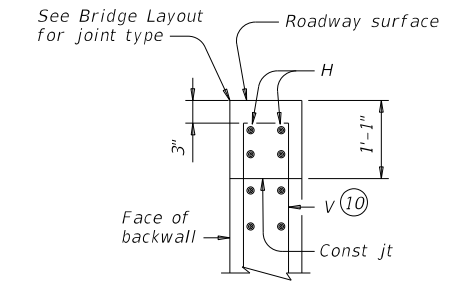
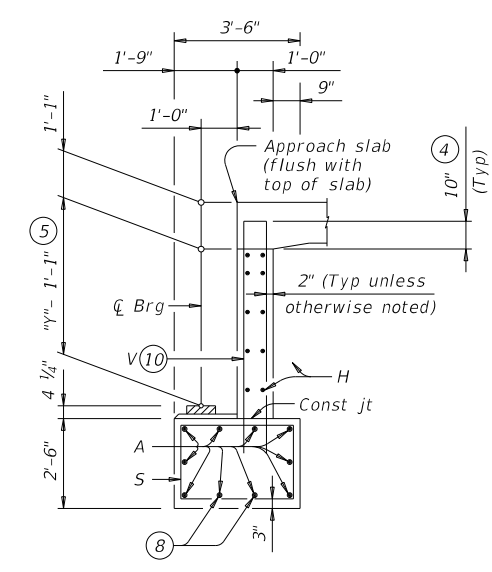
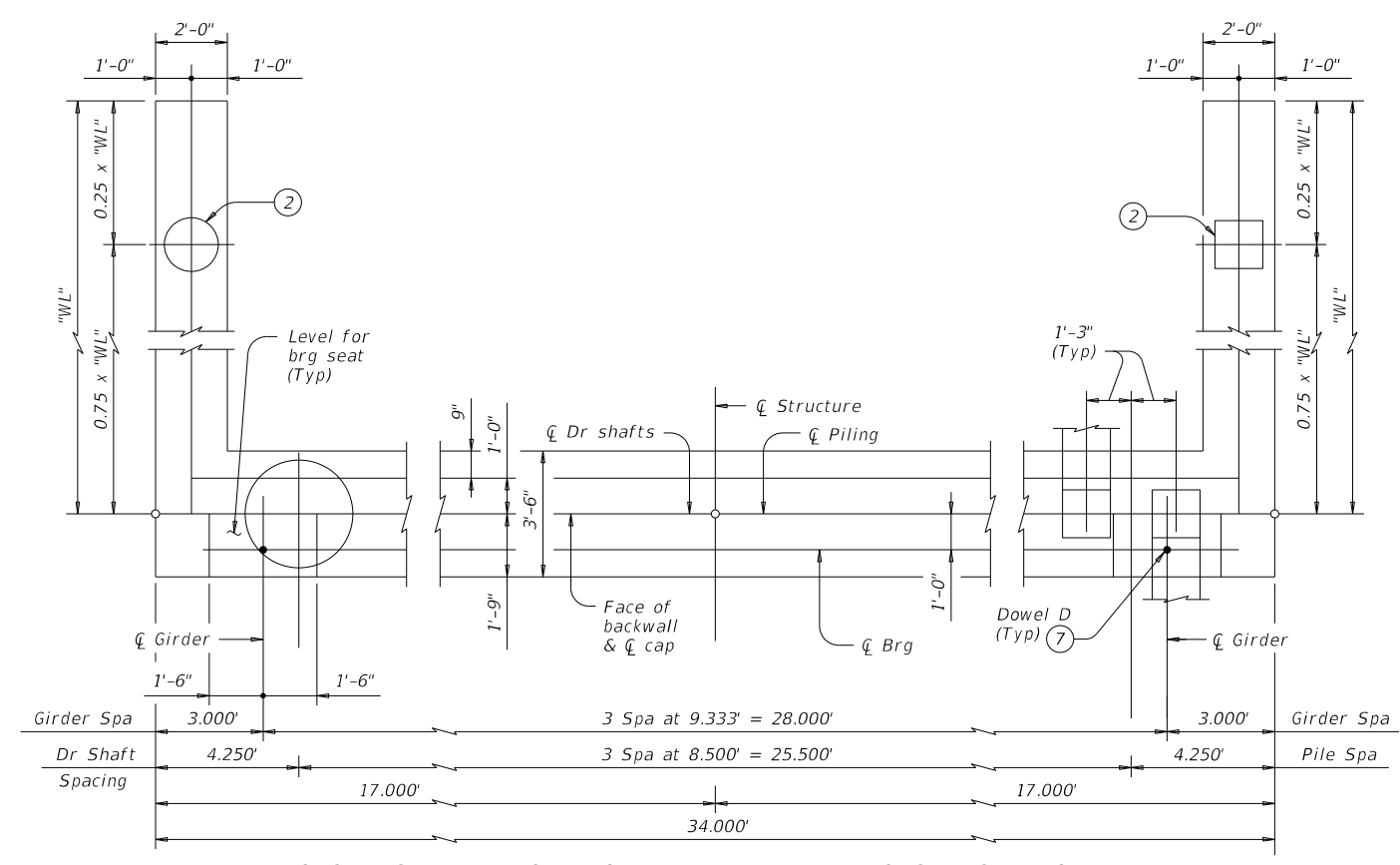


TABLE A			
Header Slope	Girder Type	Wingwall Type	Wingwall Lgth "WL"
2:1	Tx28	Cantilevered	8.000'
	Tx34	Cantilevered	9.000'
	Tx40	Cantilevered	10.000'
	Tx46	Cantilevered	11.000'
	Tx54	Cantilevered	12.000'
3:1	Tx28	Cantilevered	12.000'
	Tx34	Founded	13.000'
	Tx40	Founded	15.000'
	Tx46	Founded	16.000'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

- See Table A for variable dimensions based on header slope and girder type.
- See Table A to determine if wingwall foundations are required.
- For piling larger than 16" adjust Bars S spacing as required to avoid piling.
- Increase as required to maintain 3" from finished grade.
- See Span details for "Y" value.
- See Bridge Layout to determine if approach slab is present.
- Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.
- With pile foundations, move Bars A shown to clear piles.
- 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
- Field bend as needed to clear piles.

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-32 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

Bridge Division Standard

ABUTMENTS

TYPE TX28 THRU TX54

PRESTR CONC I-GIRDERS

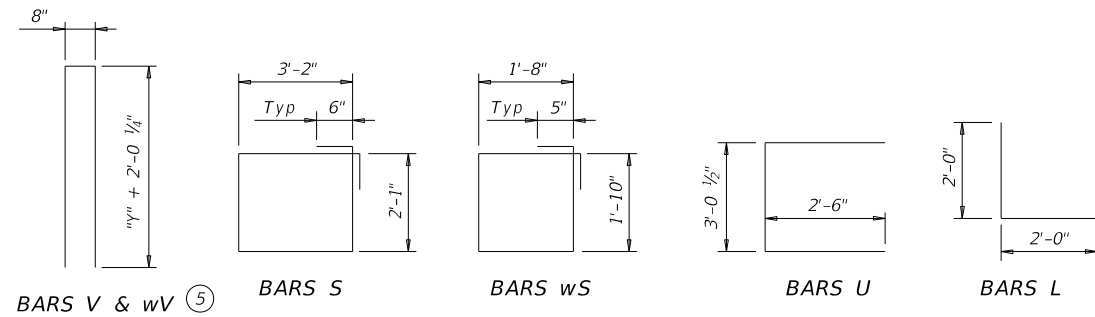
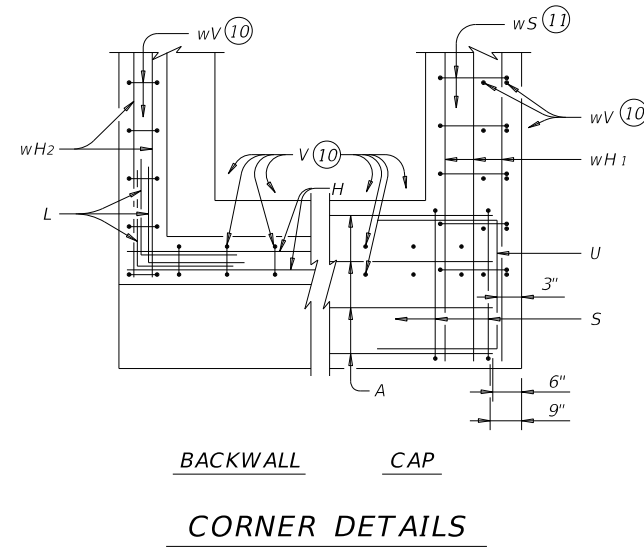
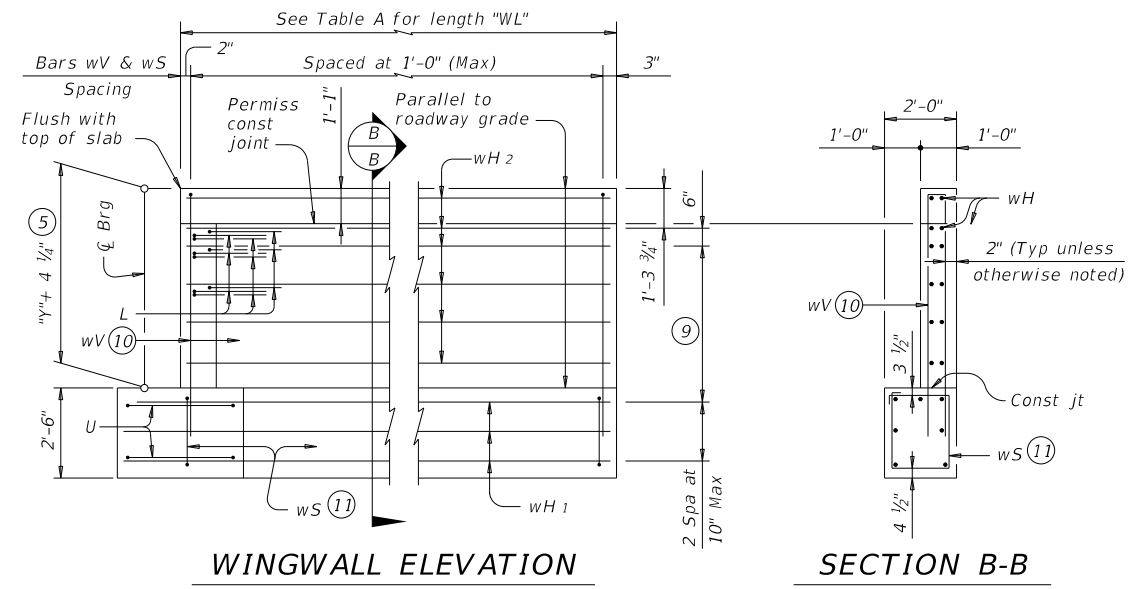
32' ROADWAY

AIG-32

FILE: aig41sts-17.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
	DIST	COUNTY	SHEET NO.	
	BRY	MADISON	50	

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- 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

ABUTMENTS TYPE TX28 THRU TX54 PRESTR CONC I-GIRDERS 32' ROADWAY AIG-32				
FILE: aig41sts-17.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
DIST	COUNTY	SHEET NO.		
BRY	MADISON	51		

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


TYPE Tx28 Girders					TYPE Tx34 Girders					TYPE Tx40 Girders					TYPE Tx46 Girders					TYPE Tx54 Girders									
Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight					
A	10	#11	33'-0"	1,753	A	10	#11	33'-0"	1,753	A	10	#11	33'-0"	1,753	A	10	#11	33'-0"	1,753	A	10	#11	33'-0"	1,753					
D ⁽⁷⁾	2	#9	1'-8"	11	D ⁽⁷⁾	2	#9	1'-8"	11	D ⁽⁷⁾	2	#9	1'-8"	11	D ⁽⁷⁾	2	#9	1'-8"	11	D ⁽⁷⁾	2	#9	1'-8"	11					
H	8	#6	33'-8"	405	H	8	#6	33'-8"	405	H	10	#6	33'-8"	506	H	10	#6	33'-8"	506	H	12	#6	33'-8"	607					
L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108					
S	30	#5	11'-6"	360	S	30	#5	11'-6"	360	S	30	#5	11'-6"	360	S	30	#5	11'-6"	360	S	30	#5	11'-6"	360					
U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49					
V	33	#5	11'-4"	390	V	33	#5	12'-4"	425	V	33	#5	13'-4"	459	V	33	#5	14'-4"	493	V	33	#5	15'-8"	539					
wH1	14	#6	9'-5"	198	wH1	14	#6	10'-5"	219	wH1	14	#6	11'-5"	240	wH1	14	#6	12'-5"	261	wH1	14	#6	13'-5"	282					
wH2	20	#6	7'-8"	230	wH2	20	#6	8'-8"	260	wH2	24	#6	9'-8"	348	wH2	24	#6	10'-8"	385	wH2	28	#6	11'-8"	491					
wS	18	#4	7'-10"	94	wS	20	#4	7'-10"	105	wS	22	#4	7'-10"	115	wS	24	#4	7'-10"	126	wS	26	#4	7'-10"	136					
wV	18	#5	11'-4"	213	wV	20	#5	12'-4"	257	wV	22	#5	13'-4"	306	wV	24	#5	14'-4"	359	wV	26	#5	15'-8"	425					
Reinforcing Steel				Lb	3,811	Reinforcing Steel				Lb	3,952	Reinforcing Steel				Lb	4,255	Reinforcing Steel				Lb	4,411	Reinforcing Steel				Lb	4,761
Class "C" Concrete				CY	18.5	Class "C" Concrete				CY	20.1	Class "C" Concrete				CY	21.8	Class "C" Concrete				CY	23.5	Class "C" Concrete				CY	25.6

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

TYPE Tx28 Girders					TYPE Tx34 Girders					TYPE Tx40 Girders					TYPE Tx46 Girders					TYPE Tx54 Girders									
Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight					
A	10	#11	33'-0"	1,753	A	10	#11	33'-0"	1,753	A	10	#11	33'-0"	1,753	A	10	#11	33'-0"	1,753	A	10	#11	33'-0"	1,753					
D ⁽⁷⁾	2	#9	1'-8"	11	D ⁽⁷⁾	2	#9	1'-8"	11	D ⁽⁷⁾	2	#9	1'-8"	11	D ⁽⁷⁾	2	#9	1'-8"	11	D ⁽⁷⁾	2	#9	1'-8"	11					
H	8	#6	33'-8"	405	H	8	#6	33'-8"	405	H	10	#6	33'-8"	506	H	10	#6	33'-8"	506	H	12	#6	33'-8"	607					
L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108					
S	30	#5	11'-6"	360	S	30	#5	11'-6"	360	S	30	#5	11'-6"	360	S	30	#5	11'-6"	360	S	30	#5	11'-6"	360					
U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49					
V	33	#5	11'-4"	390	V	33	#5	12'-4"	425	V	33	#5	13'-4"	459	V	33	#5	14'-4"	493	V	33	#5	15'-8"	539					
wH1	14	#6	13'-5"	282	wH1	14	#6	14'-5"	303	wH1	14	#6	16'-5"	345	wH1	14	#6	17'-5"	366	wH1	14	#6	19'-5"	408					
wH2	20	#6	11'-8"	350	wH2	20	#6	12'-8"	381	wH2	24	#6	14'-8"	529	wH2	24	#6	15'-8"	565	wH2	28	#6	17'-8"	743					
wS	26	#4	7'-10"	136	wS	28	#4	7'-10"	147	wS	32	#4	7'-10"	167	wS	34	#4	7'-10"	178	wS	38	#4	7'-10"	199					
wV	26	#5	11'-4"	307	wV	28	#5	12'-4"	360	wV	32	#5	13'-4"	445	wV	34	#5	14'-4"	508	wV	38	#5	15'-8"	621					
Reinforcing Steel				Lb	4,151	Reinforcing Steel				Lb	4,302	Reinforcing Steel				Lb	4,732	Reinforcing Steel				Lb	4,897	Reinforcing Steel				Lb	5,398
Class "C" Concrete				CY	21.1	Class "C" Concrete				CY	22.8	Class "C" Concrete				CY	25.3	Class "C" Concrete				CY	27.2	Class "C" Concrete				CY	30.4

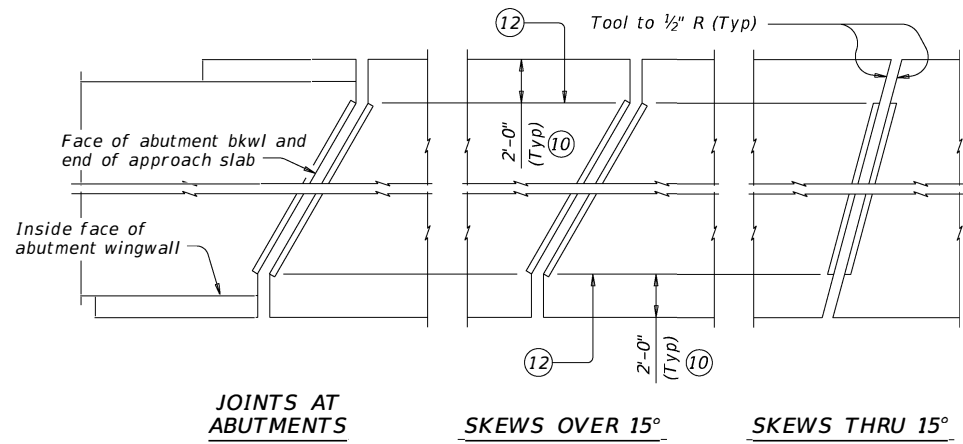
⁽⁷⁾ Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.

⁽¹²⁾ Quantities shown are for one abutment only (with approach slab). With no approach slab, add 1.3 CY Class "C" concrete and 202 lbs reinforcing steel for 4 additional Bars H.

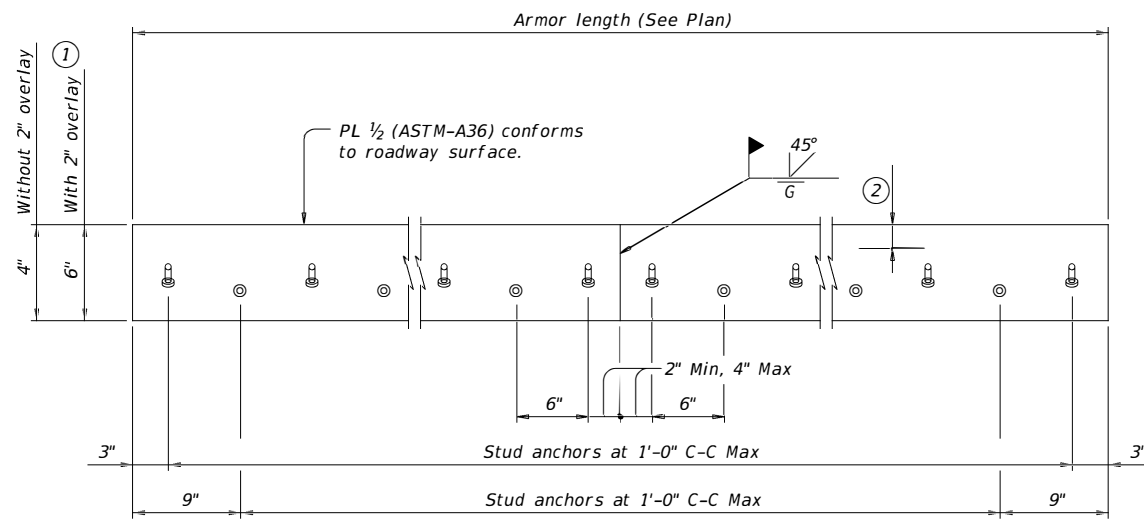
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ABUTMENTS TYPE TX28 THRU TX54 PRESTR CONC I-GIRDERS 32' ROADWAY AIG-32					
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DATE:	August 2017	SECT:		JOB:	
REVISIONS:		0552	02	027	FM978
DIST:		COUNTY:		SHEET NO.:	
BRY		MADISON		52	

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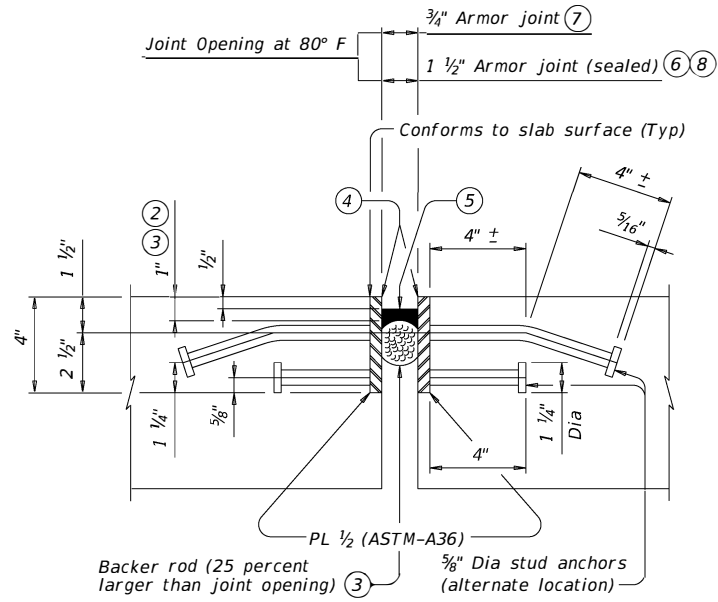


JOINTS AT ABUTMENTS **SKEWS OVER 15°** **SKEWS THRU 15°**
PLANS OF ARMOR PLATES

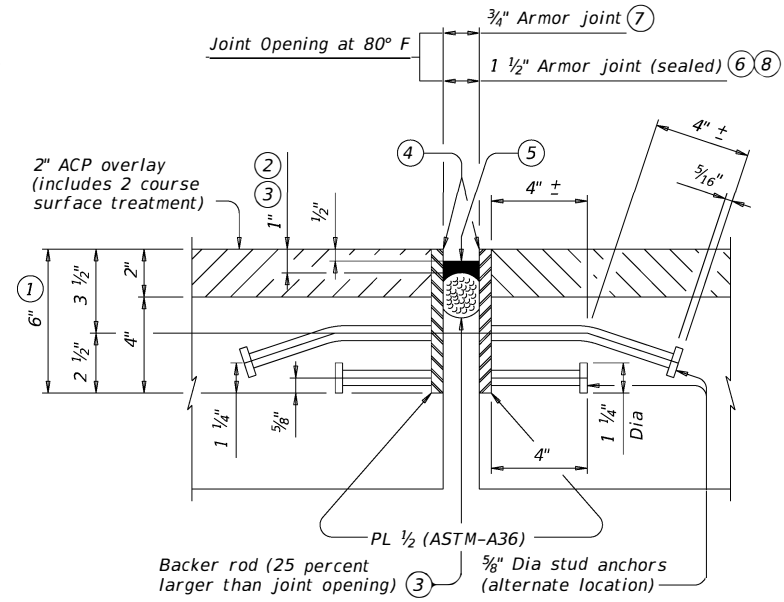


ELEVATION OF BASIC ARMOR PLATE

- ① Adjust 6" plate height for overlay thicknesses other than the 2" shown. Adjust weight by 1.70 plf for each 1/2" variation in thickness.
- ② Do not paint top 1 1/2" 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

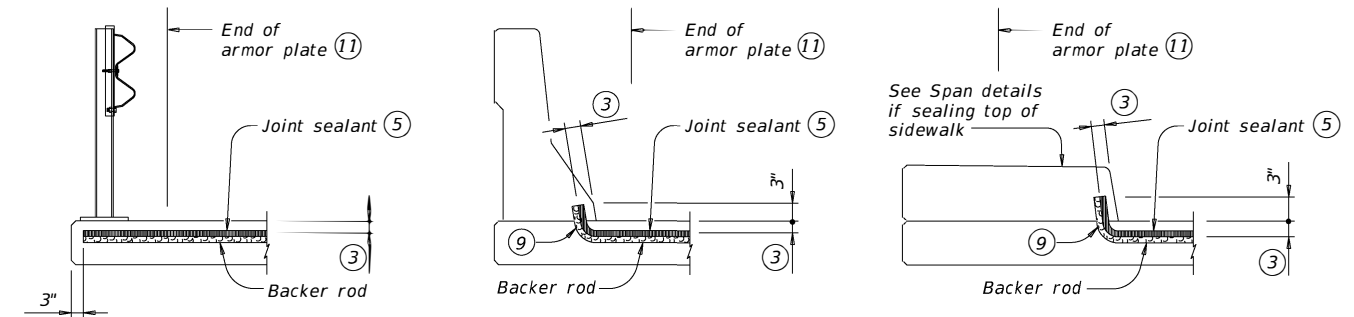
ARMOR JOINT SECTIONS
 Showing Armor Joint (Sealed)

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.

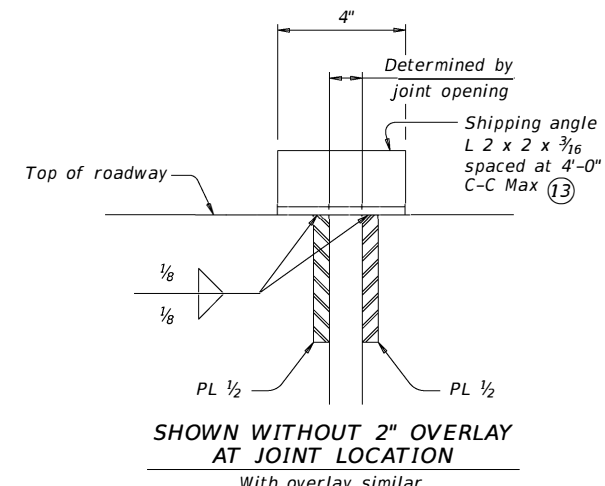
CONSTRUCTION NOTES:
 Secure armor joints in position and place to proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for Armor Joint. Remove shipping angle 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 3/8" (3/4" opening movement and 5/8" closure movement). Payment for armor joint, with or without seal, is based on length of armor plate.

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



JOINT SEALANT TERMINATION DETAILS
 Armor joint (sealed) only. Armor plate is not shown for clarity.



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

Texas Department of Transportation **Bridge Division Standard**

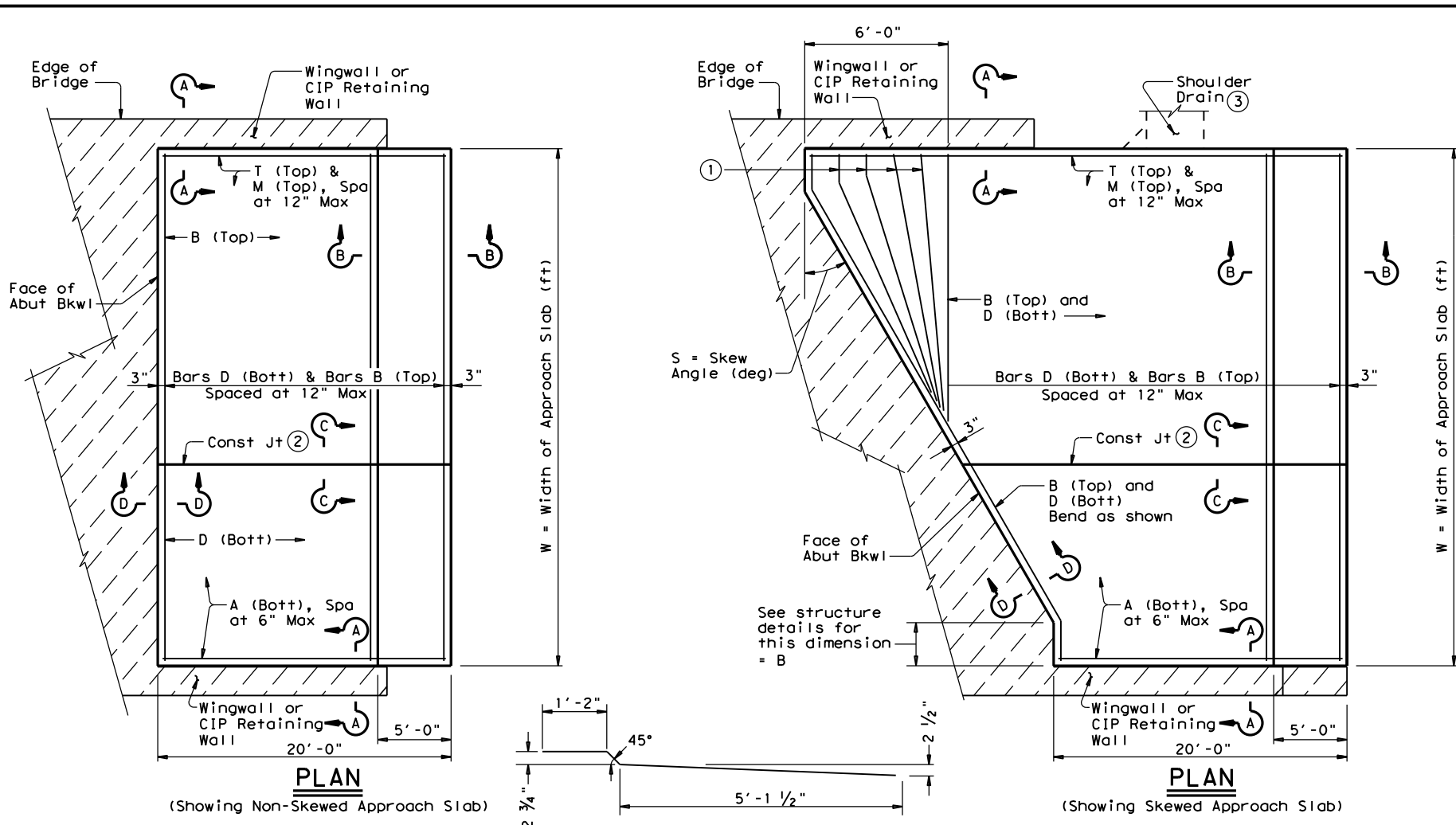
ARMOR JOINT DETAILS

AJ

FILE: ajstd01-19.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
	0552	02	027	FM978
	DIST	COUNTY	SHEET NO.	
	BRY	MADISON	53	

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REV DATE: 2-12-2015
 CSJ: XXXX-XX-XXX
 FILENAME: G:\055202\027\Draws\Plan_Review\BRY-BAS_Details.dgn

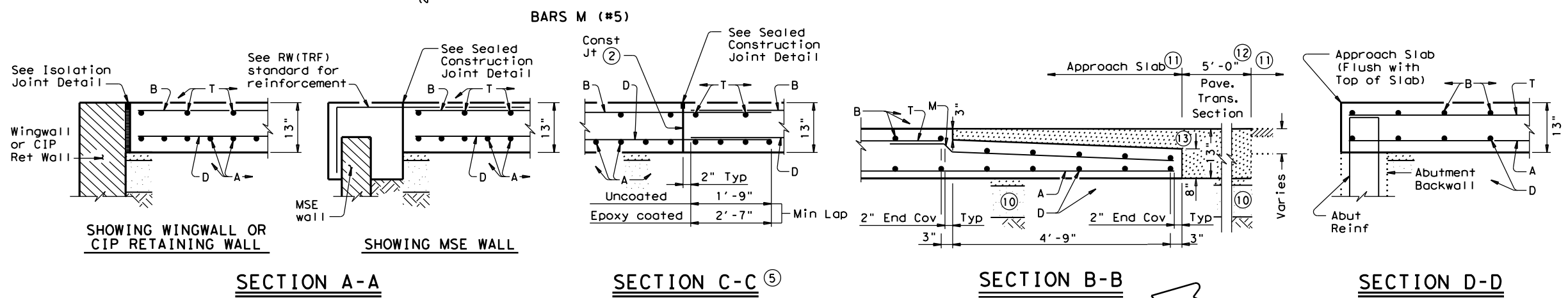


BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
M	#5
T	#5

APPROXIMATE QUANTITIES ⁽⁴⁾	
Reinf steel weight = 8.5 Lbs/SF of Approach Slab	
Area of Appr Slab = $W [0.5(W - 2B) \tan S + 20]$ (SF)	
W = Width of Approach Slab (ft)	
B = Width of Brkback Inside Wingwall (ft)	
S = Skew Angle (deg)	

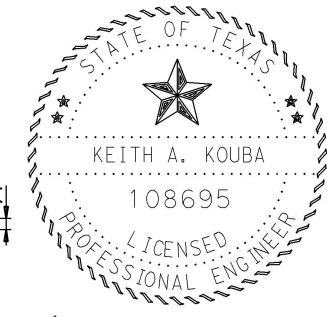
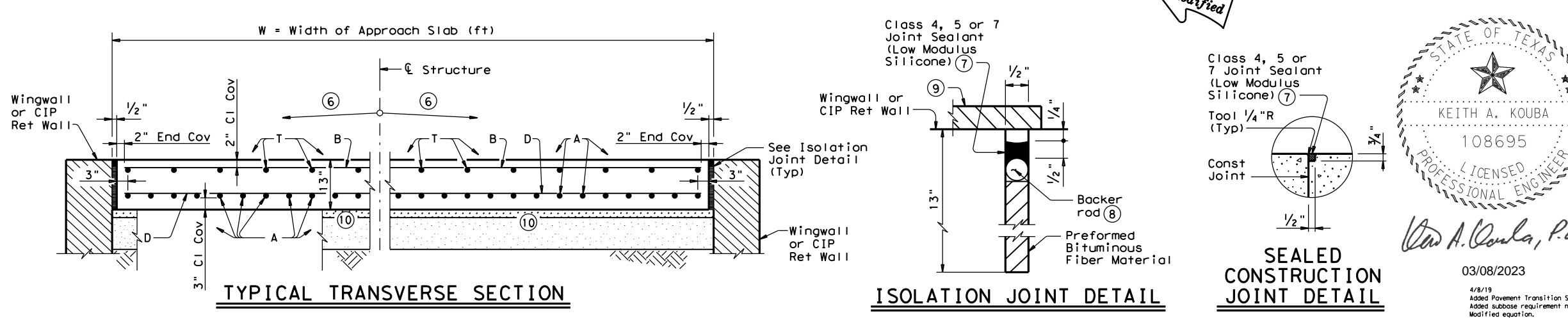
- Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.
- Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.
- See details elsewhere in plans for shoulder drain location and details.
- For Contractor's information only.
- Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.
- See details elsewhere in plans for required cross-slope.
- Place in accordance with Item 438.
- Backer rod shall be 25% larger than joint opening and shall be compatible with the sealant.
- Place 1/2" Preformed Bituminous Fiber Material between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.
- Material requirements for the subbase will be shown elsewhere in the plans.
- See details elsewhere in plans for adjacent pavement section and additional HMA overlay placement on the bridge and bridge approach slabs.
- Minimum dimensions for Pavement Transition Section unless otherwise shown elsewhere in plans. Limits can be adjusted to match existing field condition as directed by the Engineer.
- Unless it is shown in plans, use Superpave Mixtures: Type C, SAC "B" with PG 64-22, in accordance with Item 3077. Material type and requirements can be modified to match existing field condition as directed by the Engineer.

Modified



GENERAL NOTES:

Construct approach slab in accordance with Item 422.
 Concrete shall be Class "S".
 All reinforcing steel shall be Grade 60.
 Construct the subgrade or subbase from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.
 Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans.
 Cure for 4 days using water or membrane curing per Item 422.
 Sealant, backer rod and preformed bituminous fiber material is subsidiary to approach slab concrete.

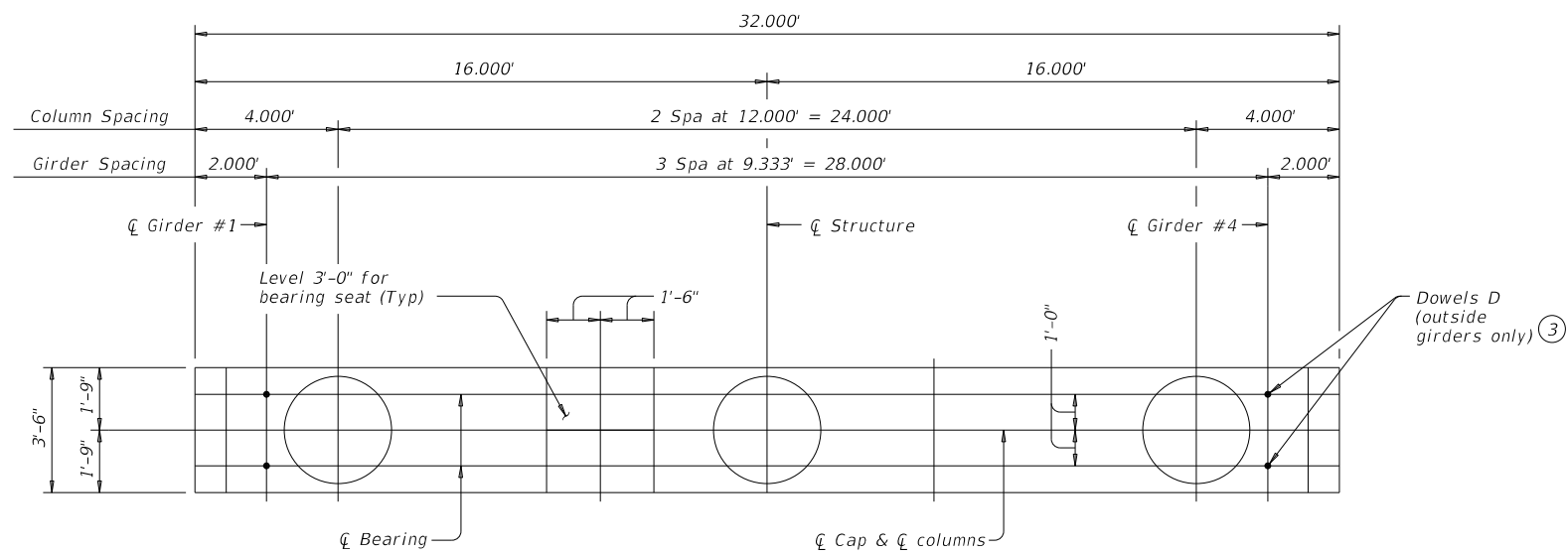


03/08/2023
 Keith A. Kouba, P.E.

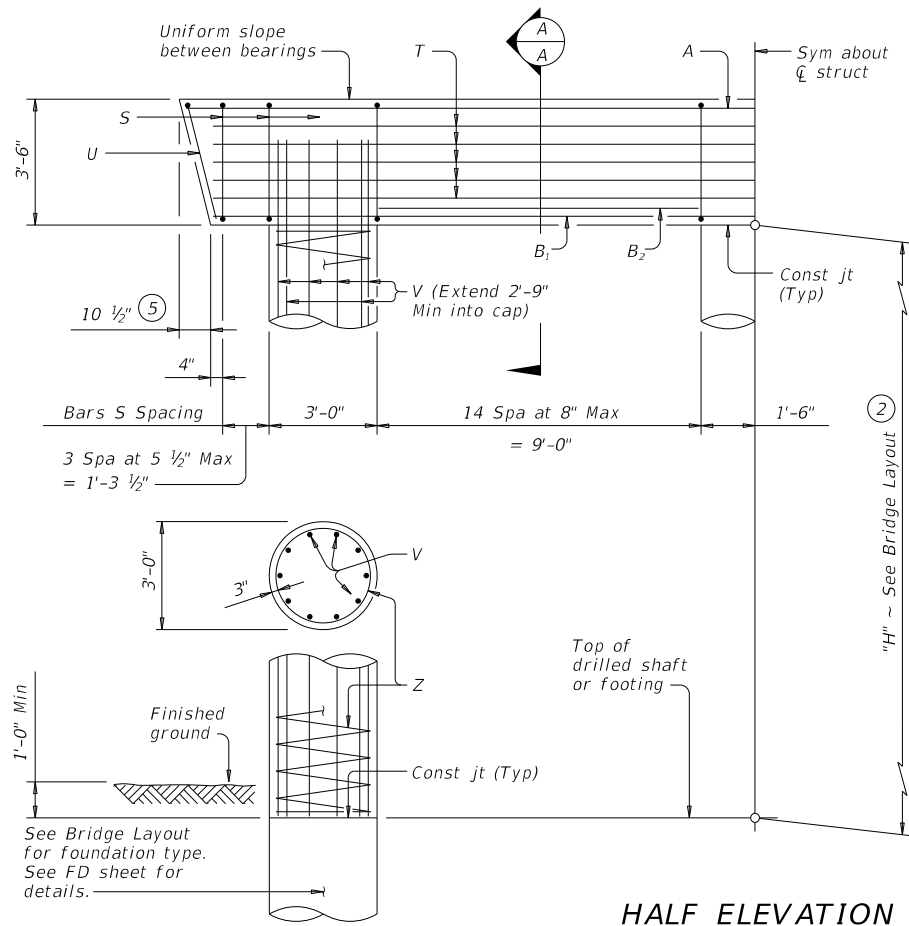
Texas Department of Transportation		Bryan District	
BRIDGE APPROACH SLAB			
ASPHALTIC PAVEMENT			
BAS-A (MOD)			
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	SEE TITLE SHEET	FM 978	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	MADISON	
CONTROL	SECTION	JOB	SHEET NO.
0552	02	027	54

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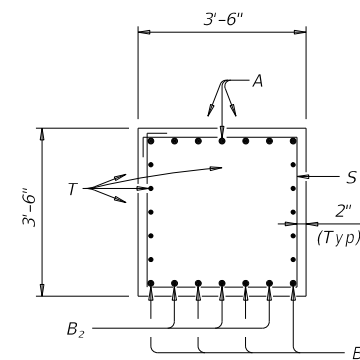
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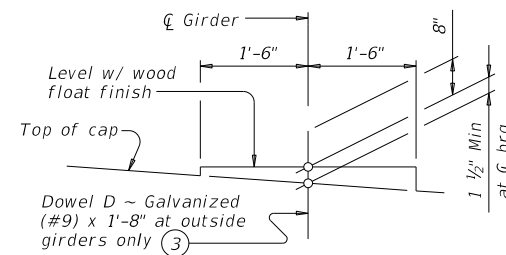
PLAN



HALF ELEVATION

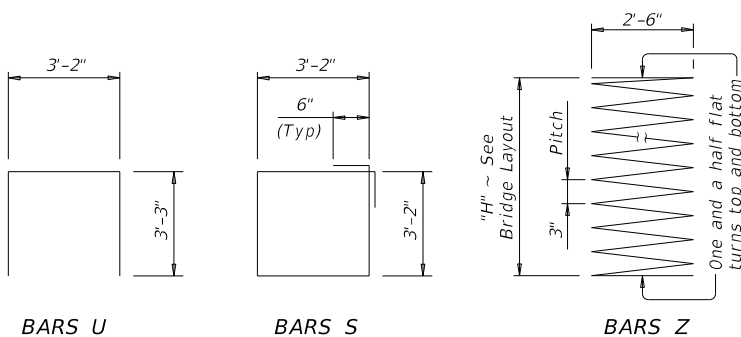


SECTION A-A



BEARING SEAT DETAIL

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



BARS U

BARS S

BARS Z

- ① Quantities shown are based on an "H" value of 36'. For each linear foot variation in "H" value, make the following adjustments:
 Bars V length, 1'-0"
 Bars Z length, 31'-5"
 Reinforcing steel, 165 Lb
 Class "C" conc (col), 0.78 CY
- ② This standard may not be used for "H" heights exceeding 36'. In areas of very soft soil or where scour is anticipated, allowable "H" heights must be evaluated by the Engineer prior to the use of this standard.
- ③ Omit Dowels D at end of multi-span units. Adjust reinforcing steel total accordingly.
- ④ Foundation Loads based on "H" = 36'.
- ⑤ Measured parallel to top of cap cross-slope.

TABLE OF ESTIMATED QUANTITIES ①

Bar	No.	Size	Length	Weight	
A	7	#11	31'- 6"	1,172	
B ₁	4	#11	30'- 0"	638	
B ₂	6	#11	9'- 0"	287	
D ③	4	#9	1'- 8"	23	
S	38	#5	13'- 8"	627	
T	10	#5	30'- 0"	313	
U	2	#5	9'- 8"	20	
V	30	#9	38'- 9"	3,953	
Z	3	#4	1154'- 7"	2,314	
Reinforcing Steel				Lb	9,262
Class "C" Concrete (Cap)				CY	14.3
Class "C" Concrete (Col)				CY	28.3

FOUNDATION LOADS ④

Span Average	Drilled Shaft Loads	Pile Load (Tons/Pile)		
		3 Pile Ftg	4 Pile Ftg	5 Pile Ftg
Ft	Tons/Shaft			
40	113	41	31	26
45	121	44	33	27
50	130	47	36	29
55	138	49	38	31
60	147	52	40	33
65	155	55	42	34
70	163	58	44	36
75	172	61	46	38
80	180	63	48	39
85	188	66	50	41
90	196	69	52	42
95	205	72	54	44
100	213	74	56	46
105	221	77	58	47
110	229	80	60	49
115	237	82	62	51
120	245	85	64	52

GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications. See Bridge Layout for foundation type, size and length. See Common Foundation Details (FD) standard sheet for all foundation details and notes. See Shear Key (IGSK) standard sheet for all shear key details and notes, if applicable. Bent selected must be based on the average span length rounded up to the next 5 ft increment. These bent details may be used with standard SIG-32 only.

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

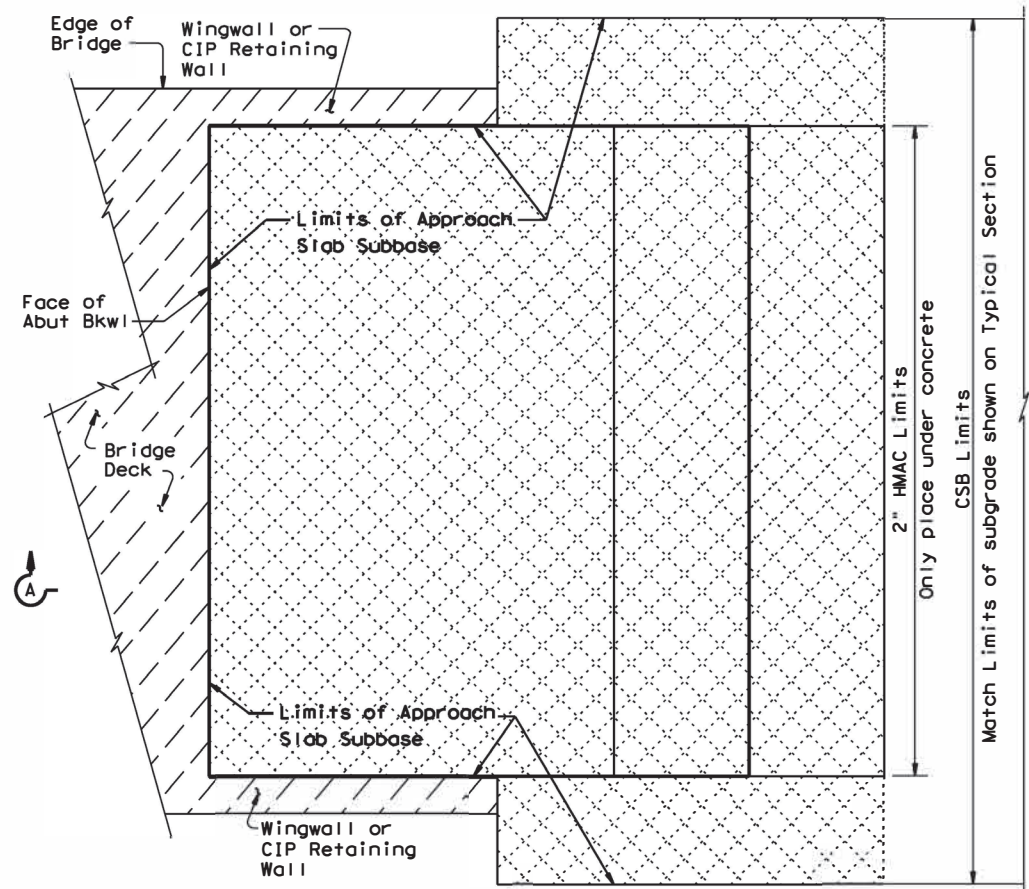
MATERIAL NOTES:
 Provide Class C concrete (f'c = 3,600 psi). Provide Class C (HPC) concrete if shown elsewhere in the plans. Provide Grade 60 reinforcing steel. Galvanize dowel bars D.

HL93 LOADING

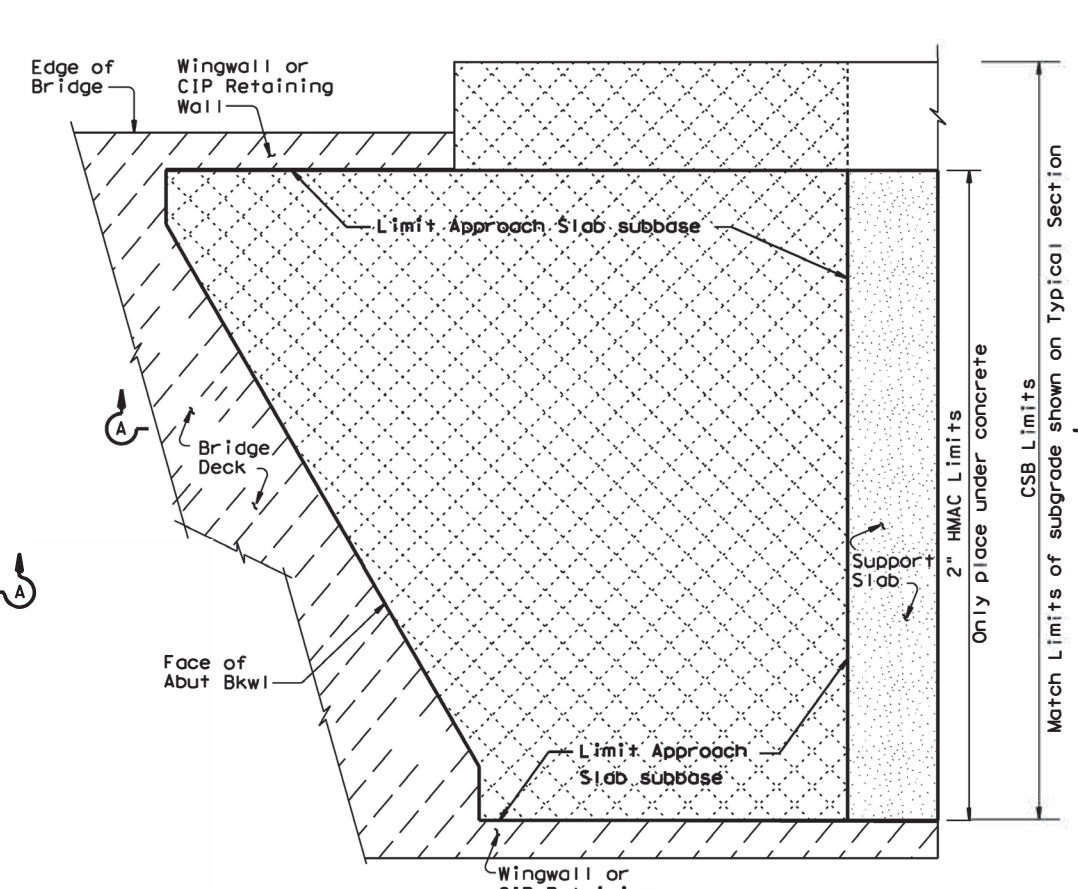
				Bridge Division Standard	
INTERIOR BENTS TYPE TX28 THRU TX54 PRESTR CONC I-GIRDERS 32' ROADWAY					
BIG-32					
FILE: big41sts-17.dgn	DN: TAR	CK: SDB	DW: JTR	CK: TAR	
©TxDOT August 2017	CONTRACT	SECTION	JOB	HIGHWAY	
REVISIONS	0552	02	027	FM978	
	DIST	COUNTY	SHEET NO.		
	BRY	MADISON	55		

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REV DATE: 2-12-2015
 CSJ: XXXX-XX-XXX
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PLAN
 (Showing Non-Skewed Approach with Transition to Flexible Pavement)



PLAN
 (Showing Skewed Approach Slab with Support Slab)

General Notes:

Minimum Subbase for Approach Slab shall be 2" HMAC with 8" Cement Stabilized Backfill.

Provide Superpave Type C, PG64-22 in accordance with Item 3077 unless otherwise approved.

Provide Cement Stabilized Backfill in accordance with Item 400, "Excavation and Embankment for Structures", to the limits shown.

Design Cement Stabilized Backfill in accordance with Tex-120-E, with a minimum unconfined compressive strength of 175 psi. Use either Fine Aggregate meeting the requirements of Item 421, "Hydraulic Cement Concrete" or Type E Grade 4 flexible base meeting the following requirements:

Type E material is crushed stone produced and graded from oversize quarried aggregate that originates from a single, naturally occurring source. Do not use multiple sources.

Master gradation, (Tex-110-E)

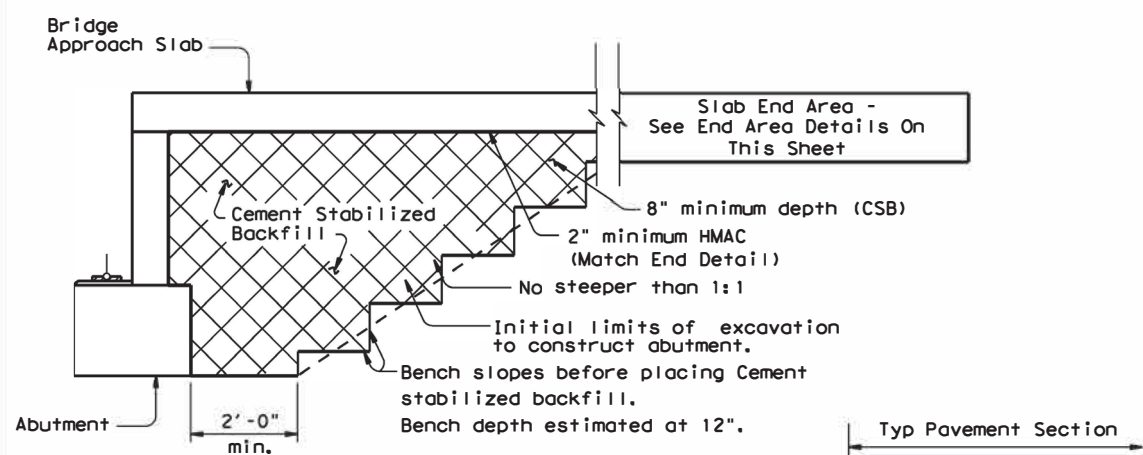
Sieve size	% Retained
1 3/4"	0-10
No. 4	45-70
No. 40	50-85

Liquid limit, (Tex-104-E) 40 % max.
 Plasticity index, (Tex-106-E) 12 max.
 (Determine plastic index in accordance with Tex-107-E when liquid limit is unattainable as defined in Tex-104-E.)

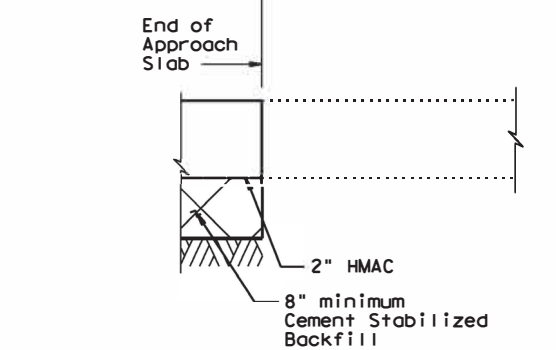
Place Cement Stabilized Backfill in uniform layers at 8 in. deep, by loose measurement. Compact each layer to meet the density requirements of the roadbed, retaining wall, embankment material, or as shown on the plans.

Plan views and BAS end details are drawn for general information. See Bridge Layout, BAS Standards, and typical sections for additional details.

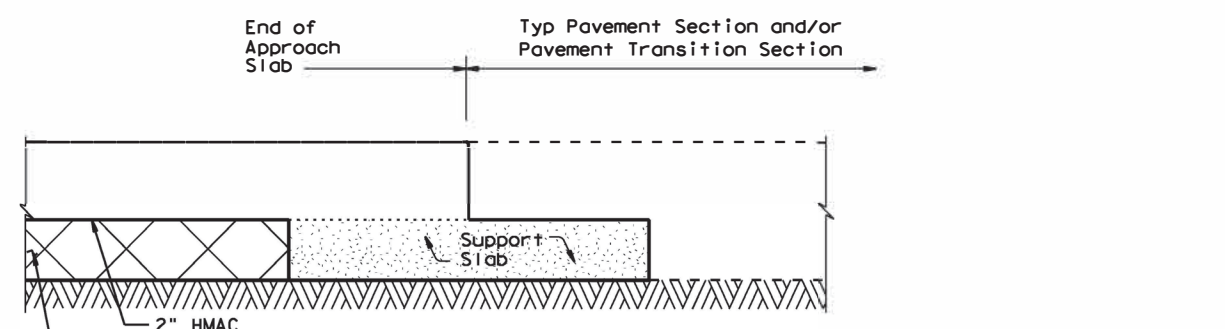
Do not place materials shown on this detail in locations that conflict with structural parts of a retaining wall, such as MSE Wall straps.



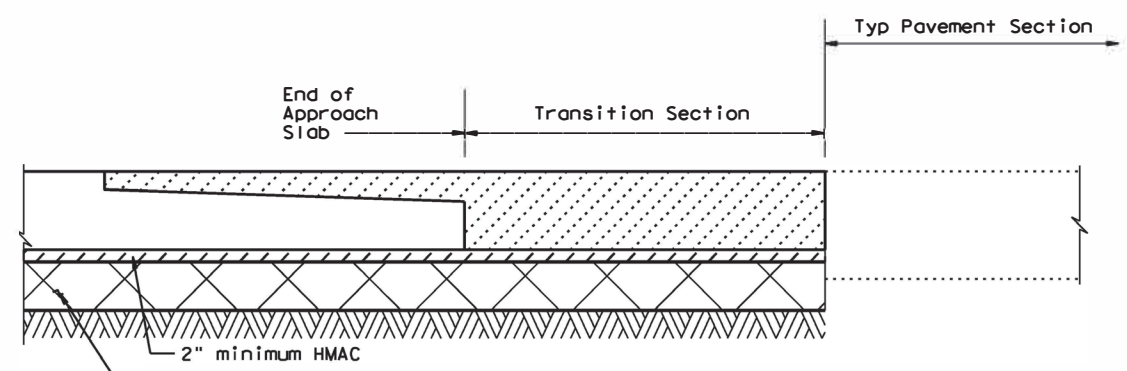
SECTION A-A



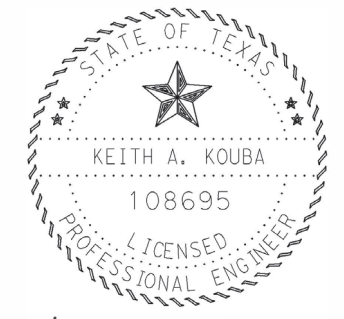
BAS END DETAIL FOR BAS-A



BAS END DETAIL FOR BAS-C (MOD) AND BAS (MOD)



BAS END DETAIL FOR BAS-A (MOD)

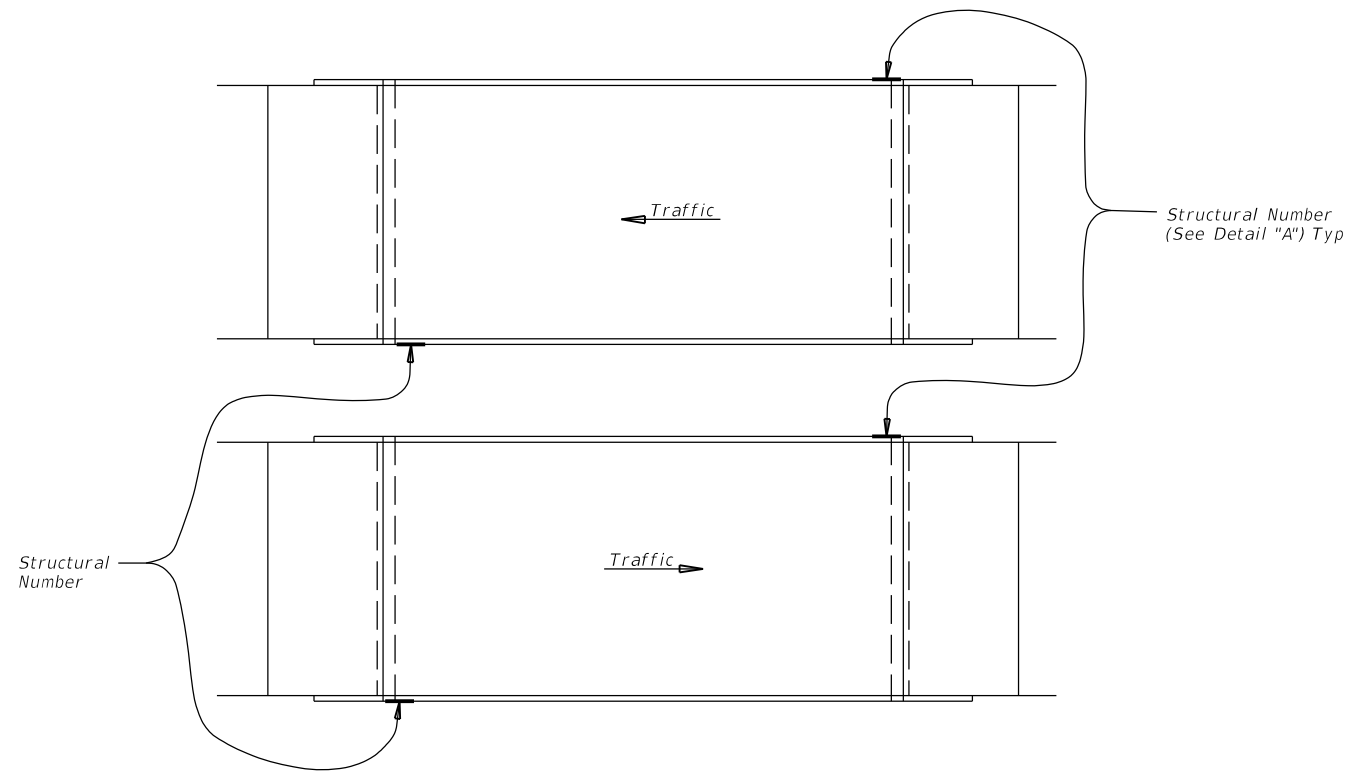


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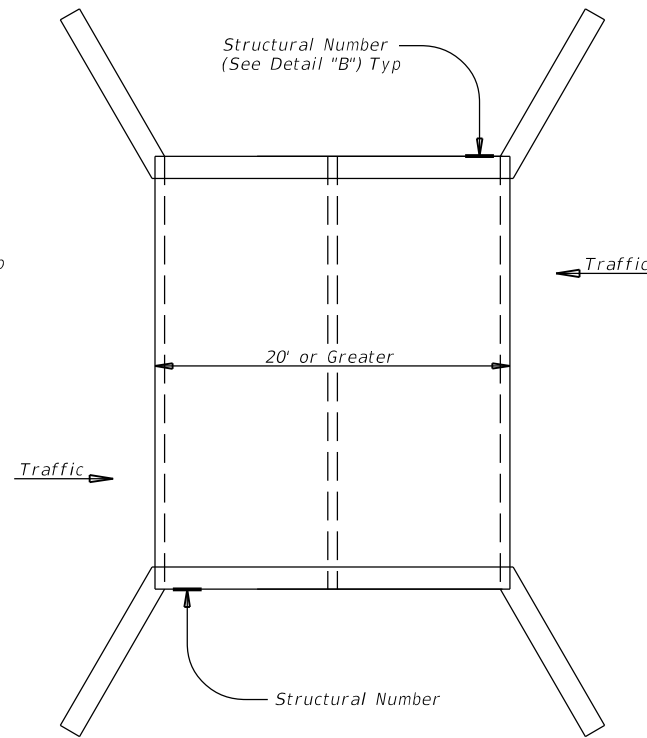
03/08/2023

PRINT DATE	REVISION DATE
3/8/2023	3/09/2010

Texas Department of Transportation ©2023 Bryan District			
BRIDGE APPROACH SLAB PAVEMENT SUBBASE AND ABUTMENT BACKFILL			
PSAB			
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	SEE TITLE SHEET	FM 978	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	MADISON	
CONTROL	SECTION	JOB	SHEET NO.
0552	02	027	56



AT BRIDGE LOCATIONS



AT CULVERT LOCATIONS

XX-XXX-X-XXXX-XX-XXX
 ② NBI Number

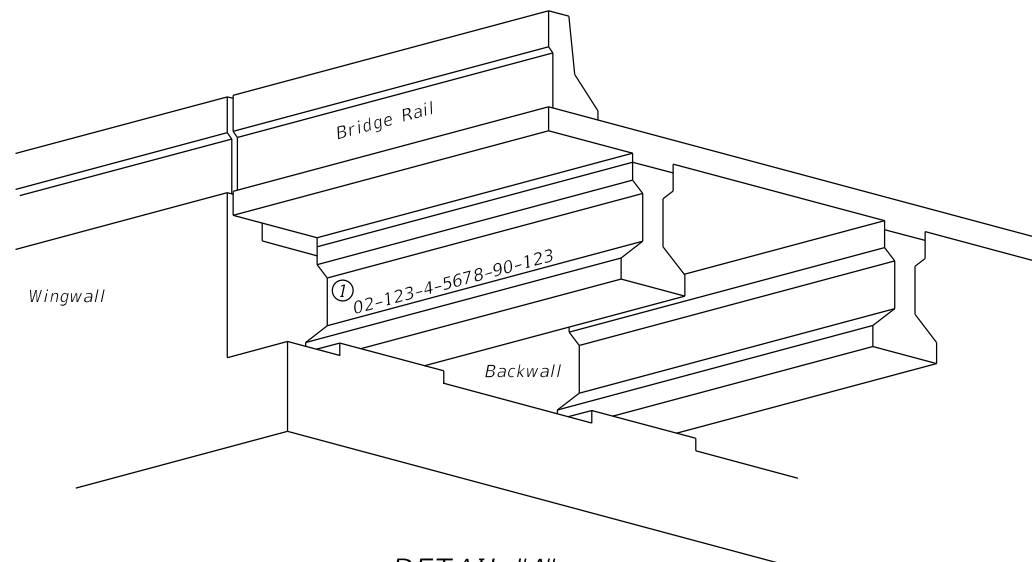
DETAIL FOR NBI NUMBERS

STRUCTURE NAME	NBI NUMBER TO APPLY	4171-6001
		INSTALL BRIDGE IDENTIFICATION NUMBERS
		EA
FM 978 AT MUSTANG CREEK	17-154-0-0552-02-021	2

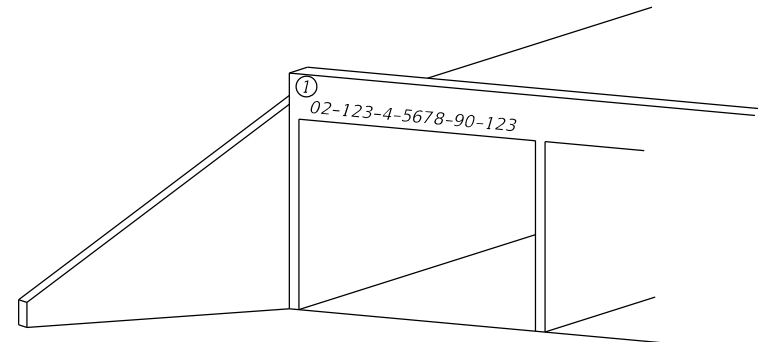
GENERAL NOTES:

Cost of furnishing and applying NBI numbers, including ink and stencil plates shall be paid at the unit bid price for "Install Bridge Identification Numbers" under SS 4171.

Each structure shall have 2 (two) NBI numbers applied per structure.



DETAIL "A"

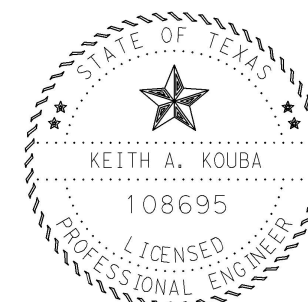


DETAIL "B"

① Apply NBI number on both sides of structure (once each side). Apply to outside beam close to abutment on the upstream traffic side at bridge locations. Apply to headwall adjacent to wingwall at culvert locations.

② Use brass stencil, 3 inch, numbers and letters, adjustable interlocking stencil set or equal of legend height 3 inches, symbol height 3 inches.

NBI_Design.dgn



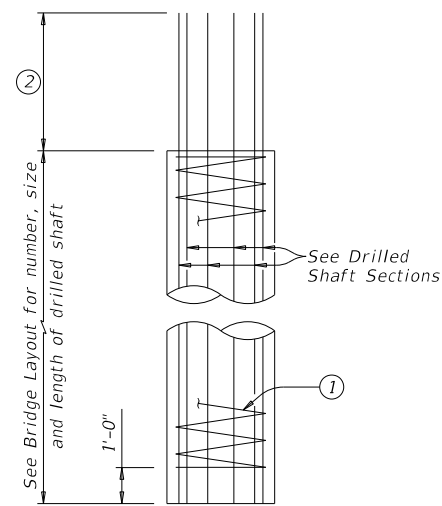
Keith A. Kouba, P.E.

03/21/2023

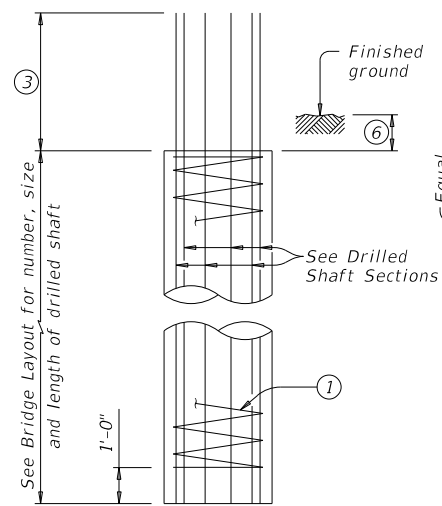
PRINT DATE 3/21/2023		REVISION DATE
Texas Department of Transportation ©2023 Bryan District		
NBI DETAILS		
FED. RD. DIV. NO. 6	PROJECT NUMBER SEE TITLE SHEET	HIGHWAY NUMBER FM978
STATE TEXAS	DISTRICT BRY	COUNTY MADISON
CONTROL 0552	SECTION 02	JOB 027
		SHEET NO. 57

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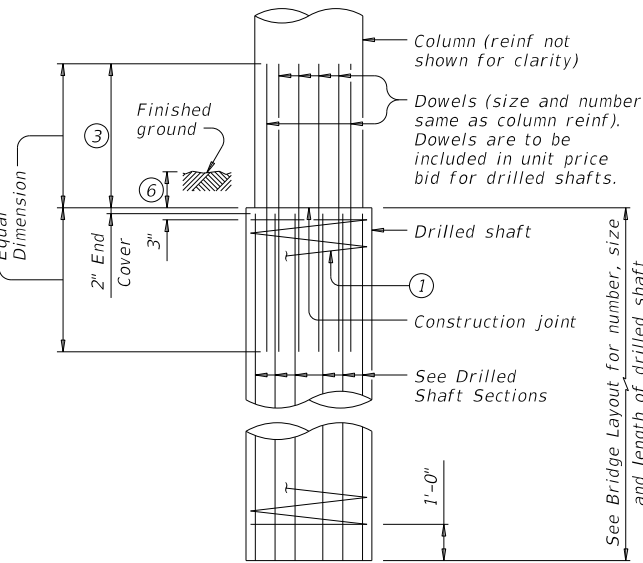
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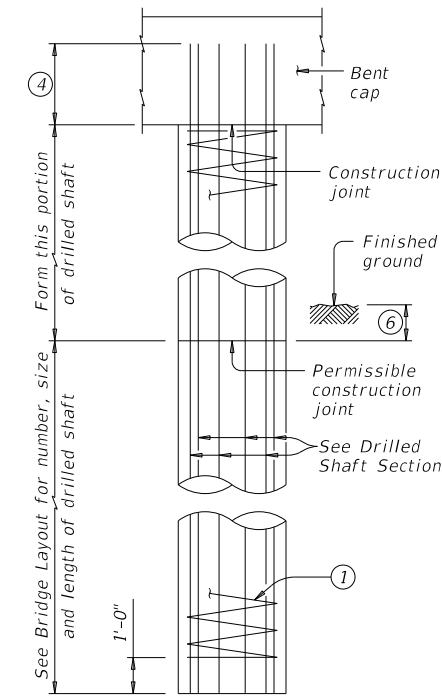
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



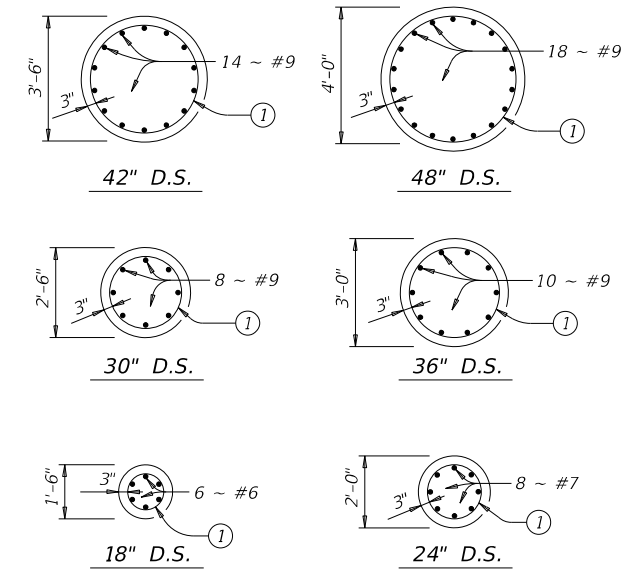
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL 5



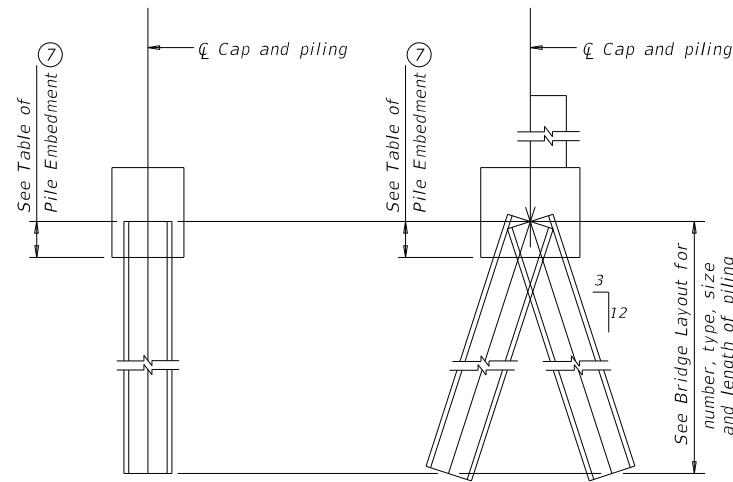
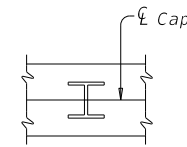
DRILLED SHAFT SECTIONS

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.

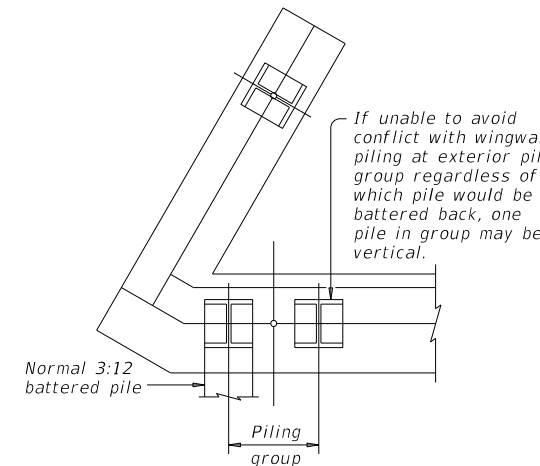
ORIENTATION OF STEEL H-PILING



VERTICAL PILE

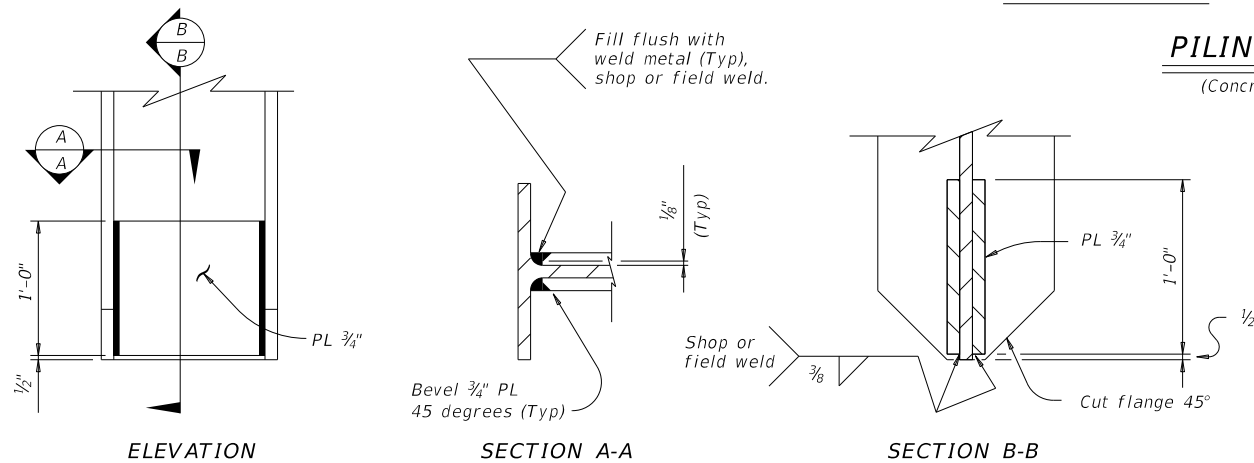
BATTERED PILE

PILING DETAILS
(Concrete or steel H)



DETAIL "A"

(Showing plan view of a 30° skewed abutment)



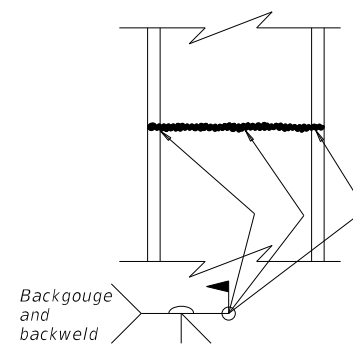
ELEVATION

SECTION A-A

SECTION B-B

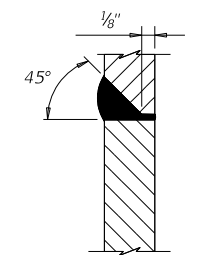
STEEL H-PILE TIP REINFORCEMENT

See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.



STEEL H-PILE SPLICE DETAIL

Use when required.



SECTION THRU FLANGE OR WEB

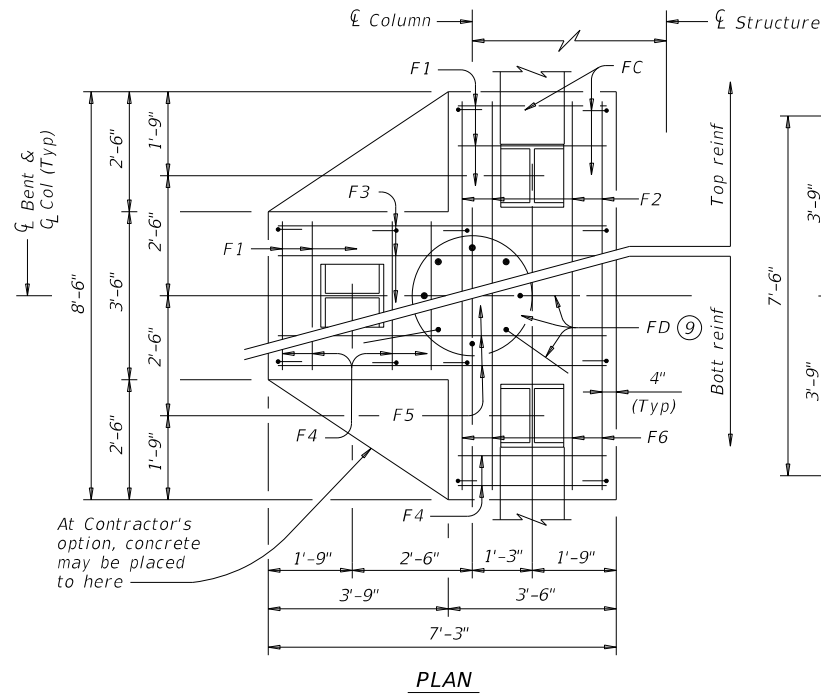
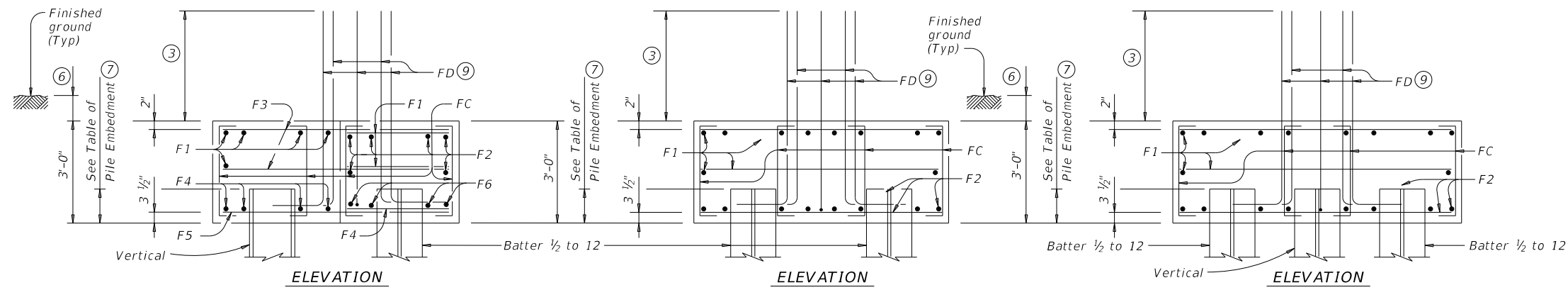
- 1 #3 spiral at 6" pitch (one and a half flat turns top and bottom).
- 2 Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-0"
#9 Bars = 2'-3"
- 3 Min lap with column reinf:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"
- 4 Min extension into supported element:
#6 Bars = 1'-11"
#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.

SHEET 1 OF 2

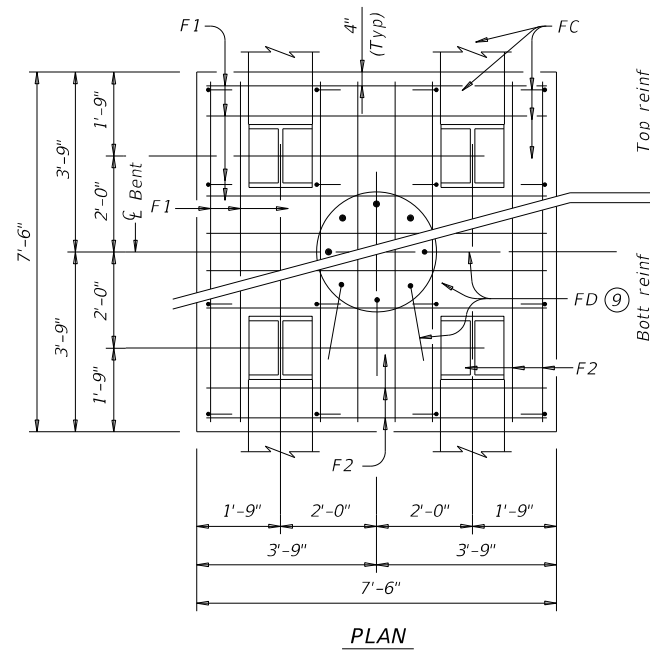
		Bridge Division Standard	
<h2>COMMON FOUNDATION DETAILS</h2>			
FD			
FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT April 2019	CONTRACT	SECTION	JOB
01-20: Added #11 bars to the FD bars.	0552	02	027
	DIST	COUNTY	SHEET NO.
	BRY	MADISON	58

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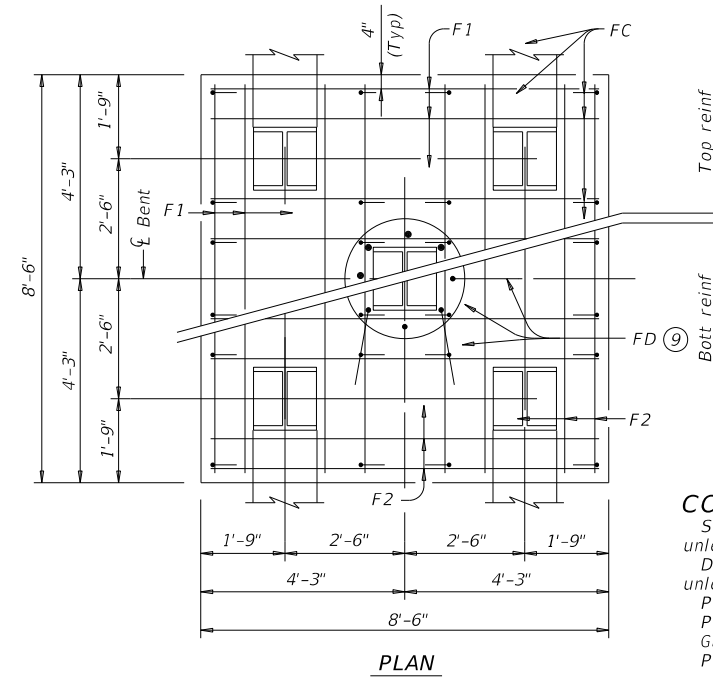
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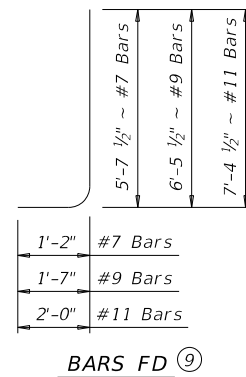
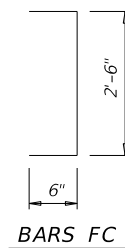
THREE PILE FOOTING^⑧
 For 36" Dia and smaller columns.



FOUR PILE FOOTING^⑧
 For 42" Dia and smaller columns.



FIVE PILE FOOTING^⑧
 For 42" Dia and smaller columns.



- 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

SHEET 2 OF 2



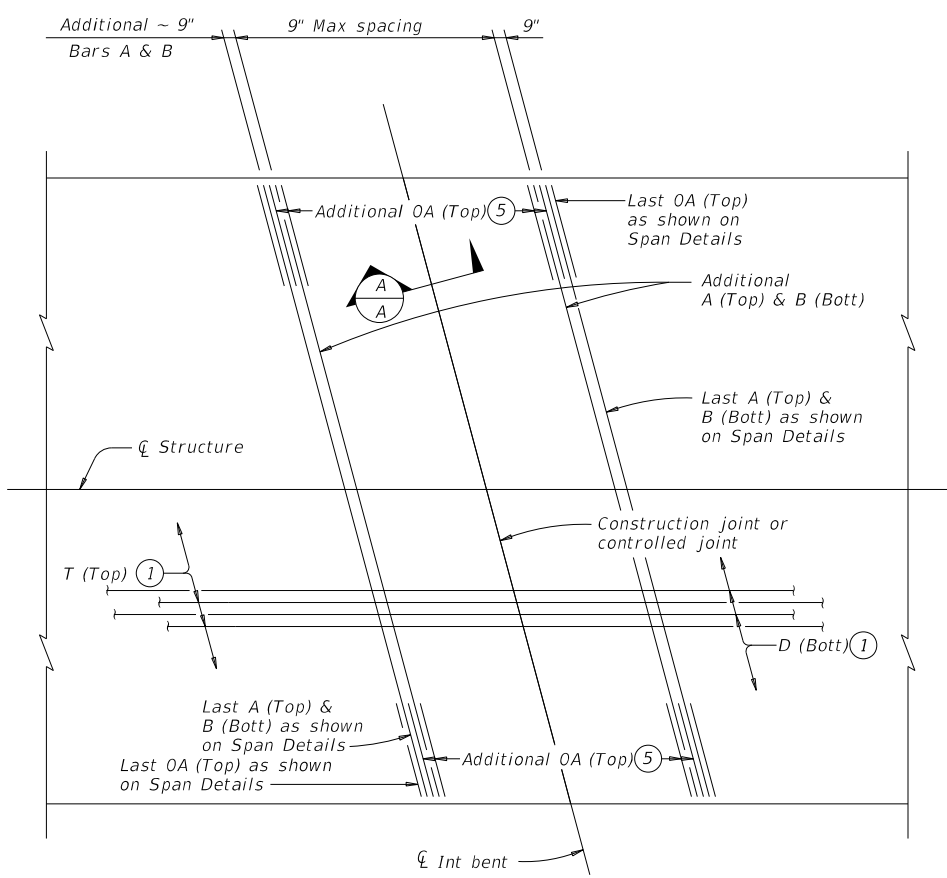
COMMON FOUNDATION DETAILS

FD

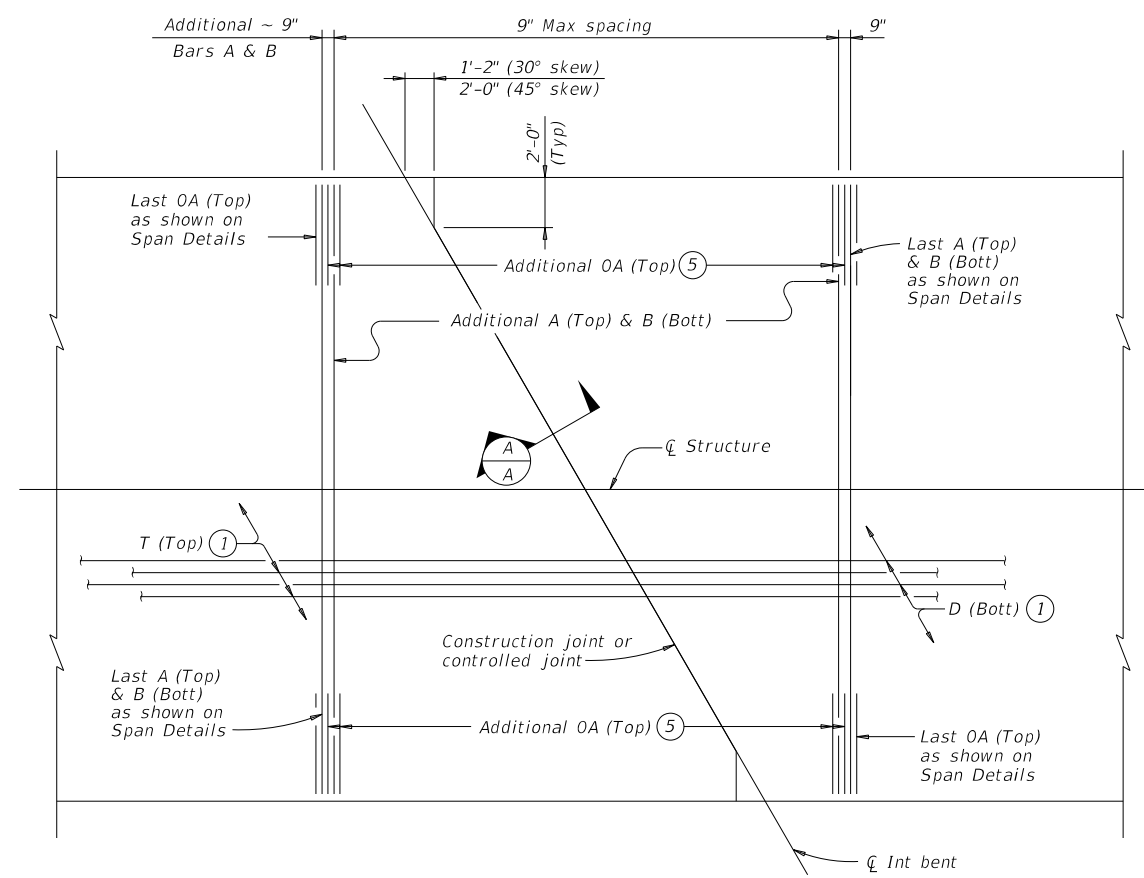
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©TxDOT April 2019	CONTRACT	SECTION	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
01-20: Added #11 bars to the FD bars.	DIST	COUNTY	SHEET NO.	
	BRY	MADISON	59	

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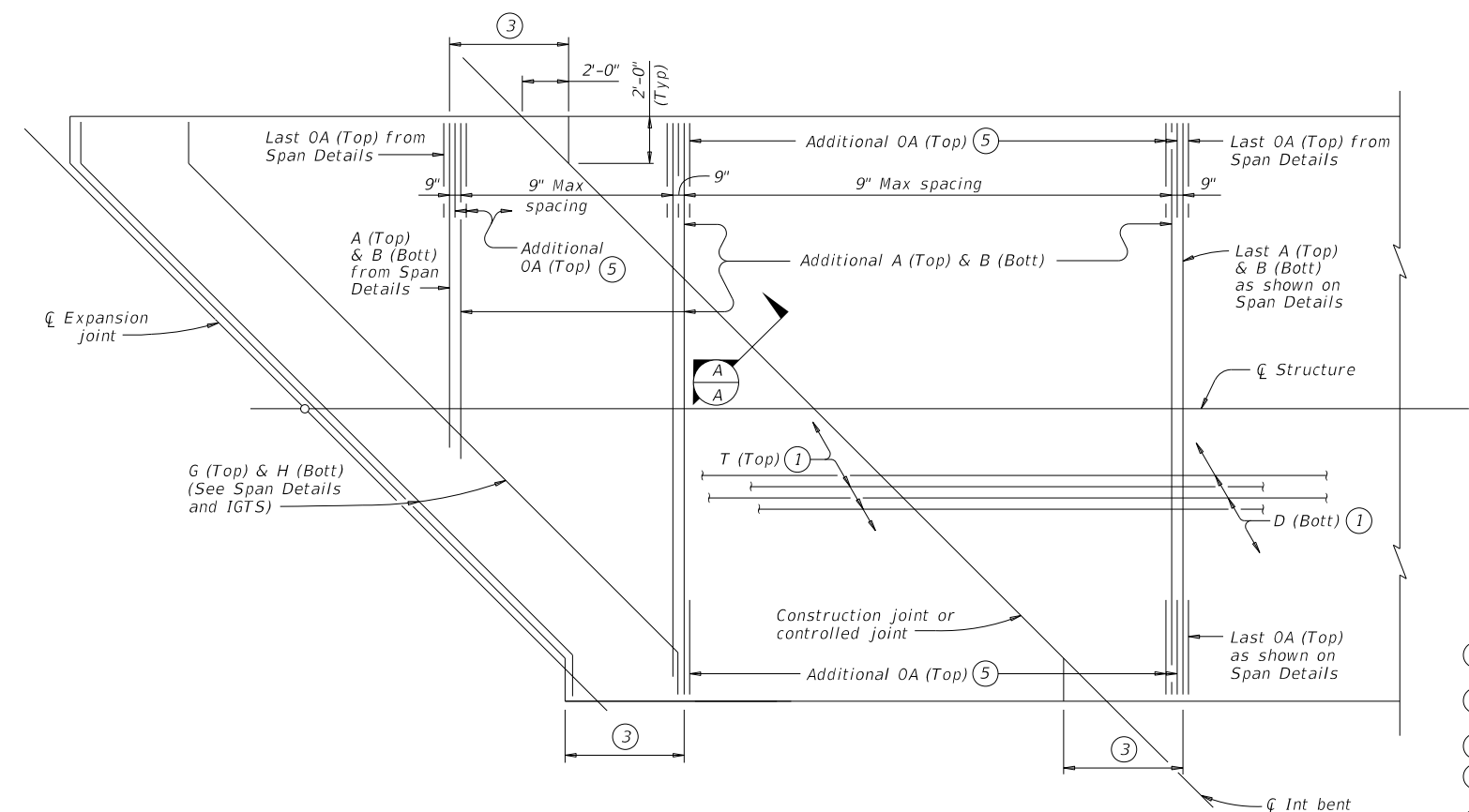
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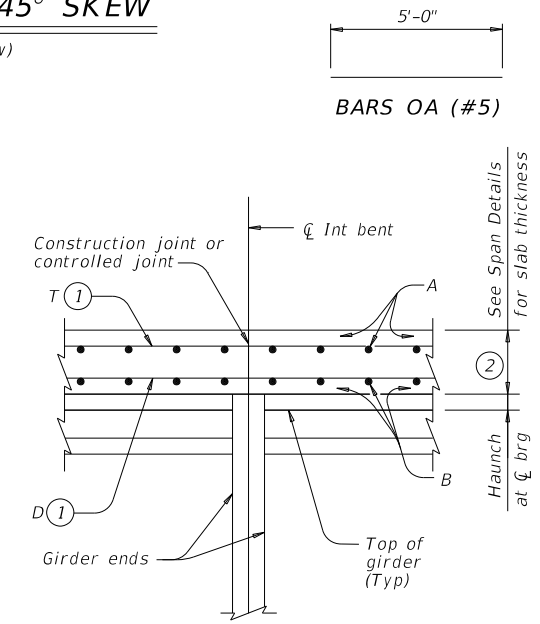
PLAN FOR 0° OR 15° SKEW
 (Showing 15° skew)



PLAN FOR 30° OR 45° SKEW
 (Showing 30° skew)



PLAN FOR 45° SKEW
 (Showing short span condition.)



SECTION A-A
 Bars OA (Top) not shown for clarity.

TABLE OF ALLOWABLE UNIT LENGTH

Max Rdwy Grade, Percent	Unit Length Factor
0.00	4.1
1.00	3.9
2.00	3.7
3.00	3.5
4.00	3.3
5.00	3.1

BAR TABLE

BAR	SIZE
A	#4
B	#4
D	#4
T	#4
OA	#5

Unit length must not exceed the length of the shortest end span times the Unit Length Factor shown in table or 400', whichever is less.

The details shown on this sheet are applicable for two and three span units comprised of the same girder type. Units may be comprised of different span lengths. See "Table of Allowable Unit Length".

GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications.
 This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

CONSTRUCTION NOTES:
 Where multi-span units are indicated on the Bridge Layout, the thickened slab end details and reinforcement shown on IGTS standard (Bars AA, G, H, J, K, and M) and on the Span Details will be omitted where slabs are continuous over interior bents. At these locations, the slab details and reinforcement will be as shown on this sheet or on PCP standard (if using this option).
 Thickened slab end reinforcement and details still apply at expansion joint locations (ends of units).
 See Span Details for remainder of slab reinforcement and details.

MATERIAL NOTES:
 Provide Grade 60 reinforcing steel.
 Provide Class "S" concrete ($f'_c = 4,000$ psi).
 Provide Class "S" (HPC) if shown elsewhere on the plans.
 Provide bar laps, where required, as follows:
 Uncoated ~ #4 = 1'-7"
 Epoxy Coated ~ #4 = 2'-5"

The details shown on this sheet are applicable for use only with the Prestressed Concrete I-Girder Standard Designs shown on standards IGSD-24, IGSD-28, IGSD-30, IGSD-32, IGSD-34, IGSD-38, IGSD-40 and IGSD-44.

- Top and bottom mats must be continuous through joint.
- Maintain a constant slab thickness over the bent.
- 5'-4" as shown on Span Details.
- Use these details when no full slab width bars A and B are shown on Span Details.
- Bars OA (Top) at 9" Max spacing between Bars A (Top).
- Values in table assume a temperature change of 70° F after erection when calculating thermal movement in one direction (not total).

HL93 LOADING

Texas Department of Transportation
 Bridge Division Standard

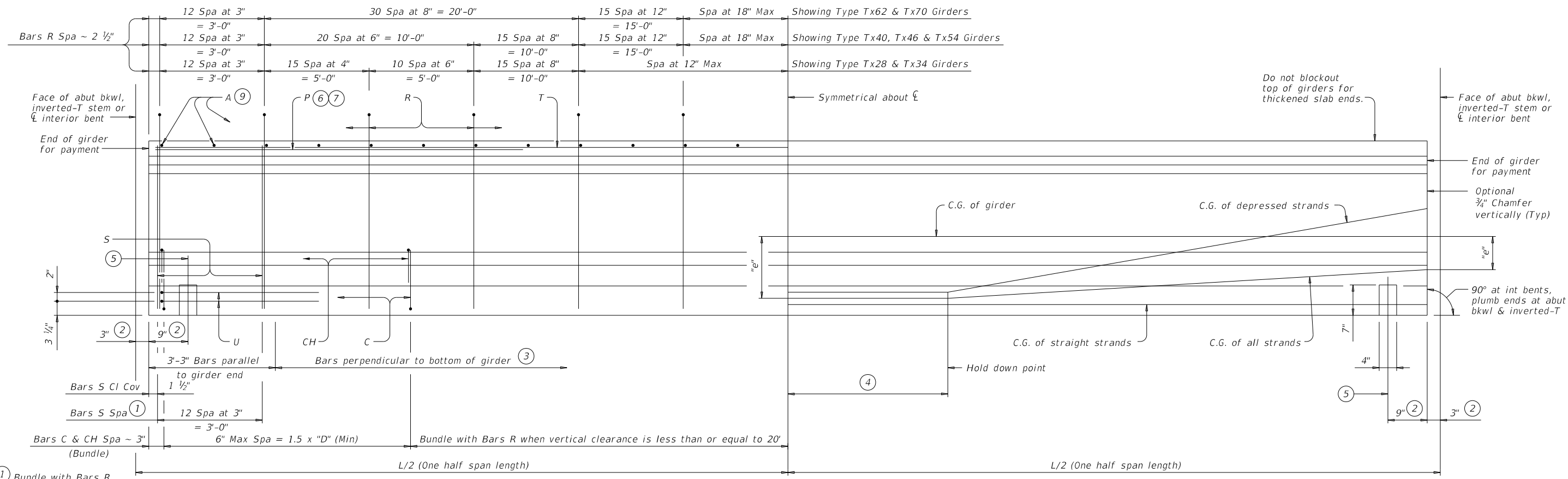
CONTINUOUS SLAB DETAILS
PRESTR CONC I-GIRDER SPANS

IGCS

FILE: IG-IGCS-23.dgn	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
10-19: Added bubble note 6. 01-23: Added 34' Rdwy.	DIST	COUNTY	SHEET NO.	
	BRY	MADISON	60	

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- ① Bundle with Bars R.
- ② Measured along \bar{c} Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.
- ③ The average of the top and bottom spacing of Bars R cannot exceed the required spacing.
- ④ L/20, but not less than 5'-0" (-0,+2').

GIRDER ELEVATION

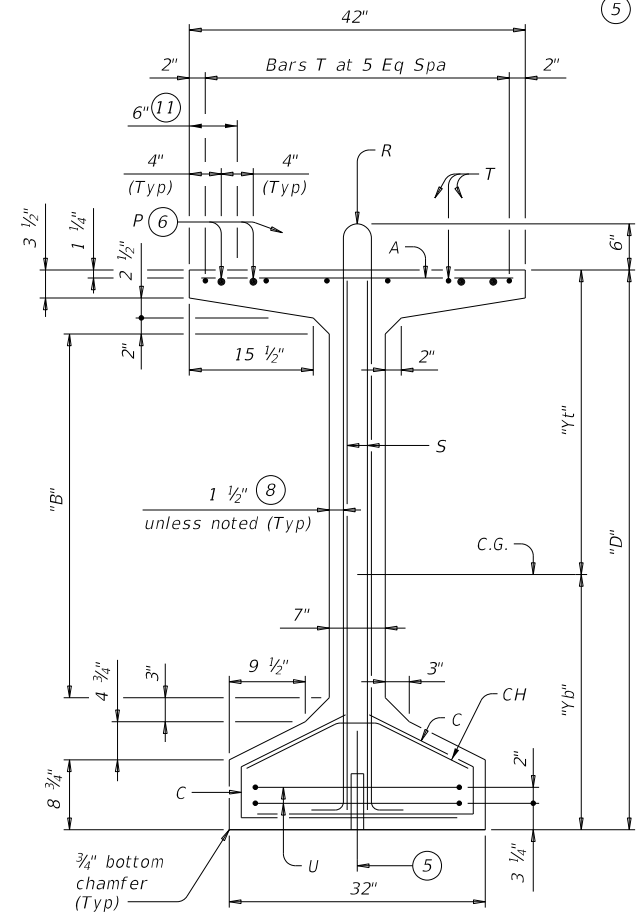
- ⑥ Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.
- ⑦ Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.
- ⑧ 1 3/8" Clear Cover to Bars S.
- ⑨ Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".
- ⑩ Based on 155 pcf total weight of concrete and reinforcing steel.
- ⑪ Smooth trowel finish on the slab overhang side of exterior girder.

GIRDER DIMENSIONS AND SECTION PROPERTIES

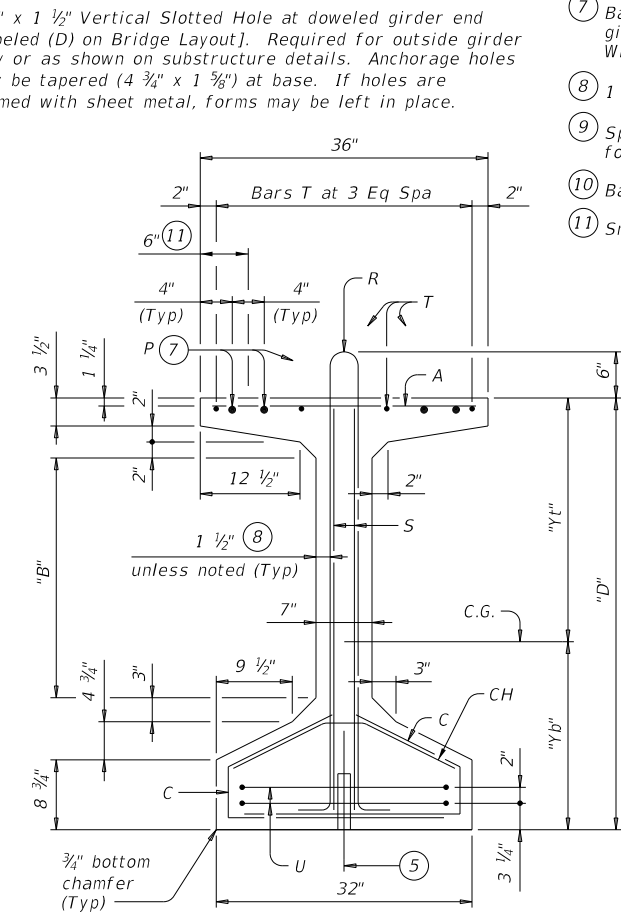
Girder Type	"D" (in.)	"B" (in.)	"yt" (in.)	"yb" (in.)	Area (in. ²)	"Ix" (in. ⁴)	"Iy" (in. ⁴)	Weight (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49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

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

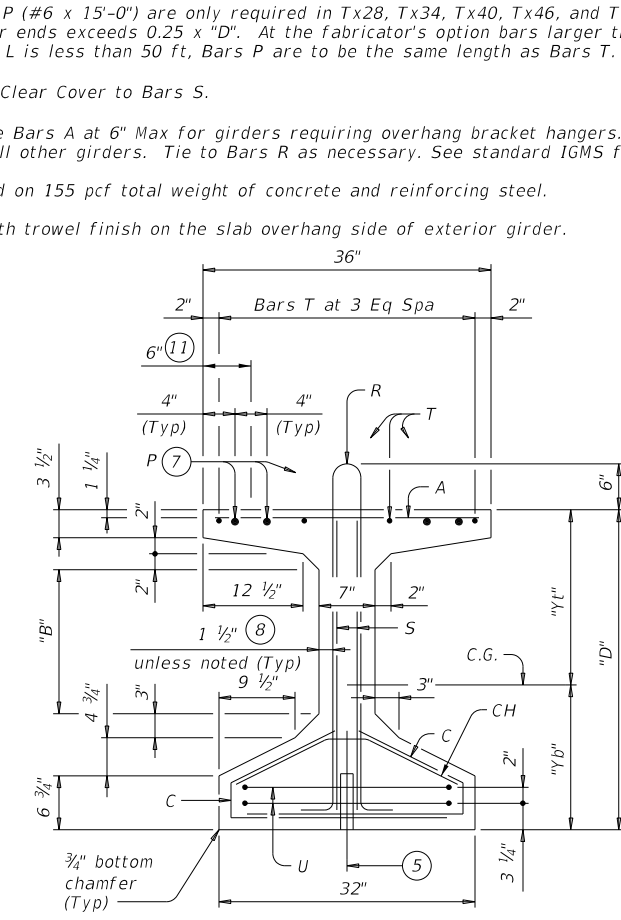
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40



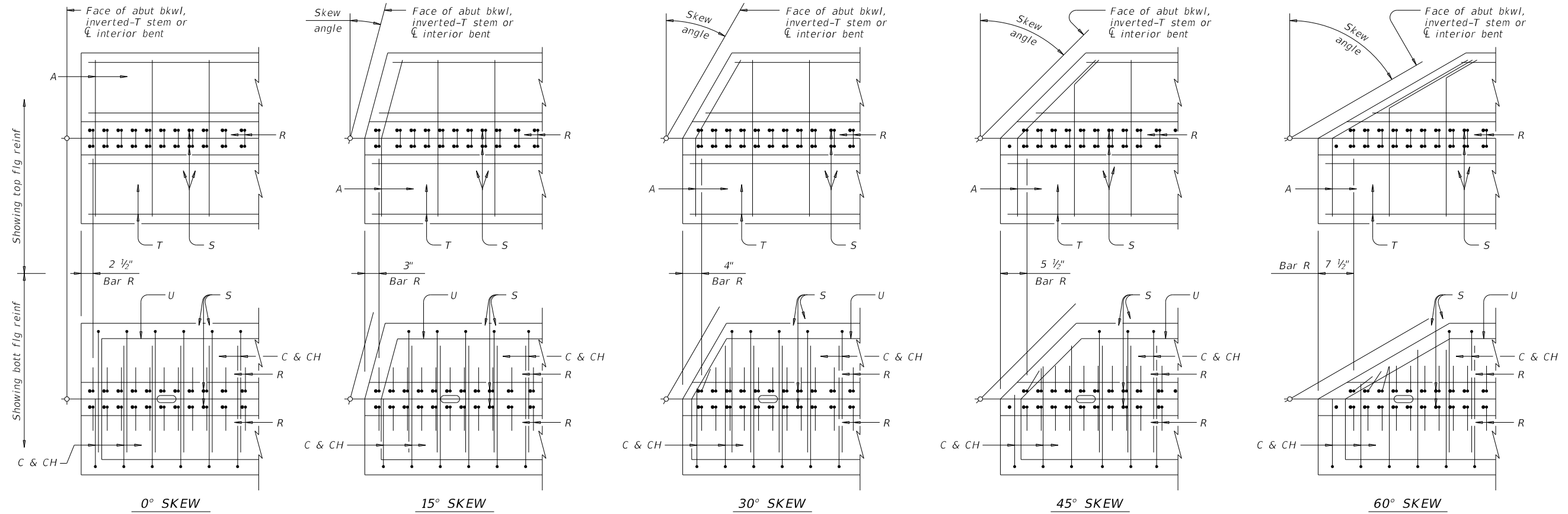
PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONV	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
10-19: Added Bars C and CH full length for VC <= 20'	DIST	COUNTY	SHEET NO.	
	BRY	MADISON	61	

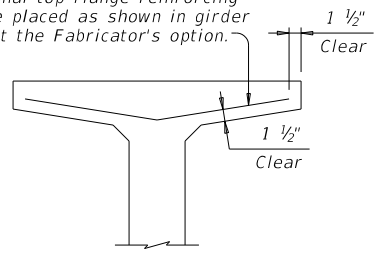
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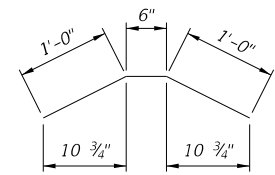


PLAN OF GIRDER ENDS (12)

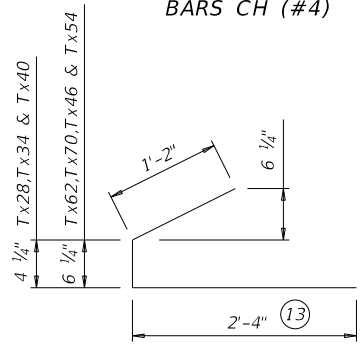
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



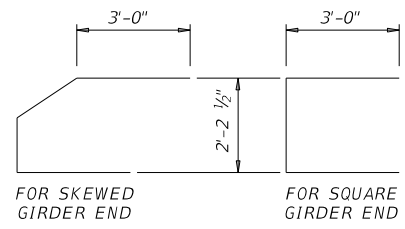
OPTIONAL TOP FLANGE REINFORCING DETAIL



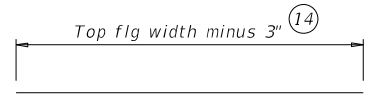
BARS CH (#4)



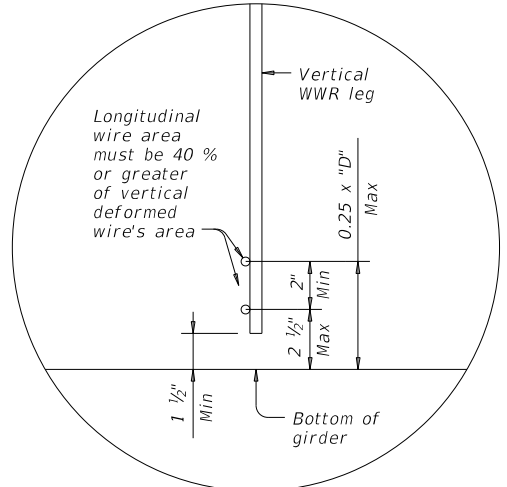
BARS C (#4)



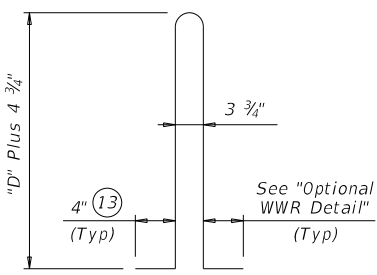
BARS U (#5)



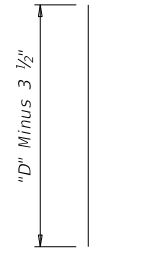
BARS A (#3)



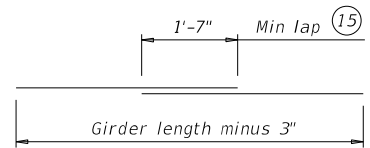
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



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.



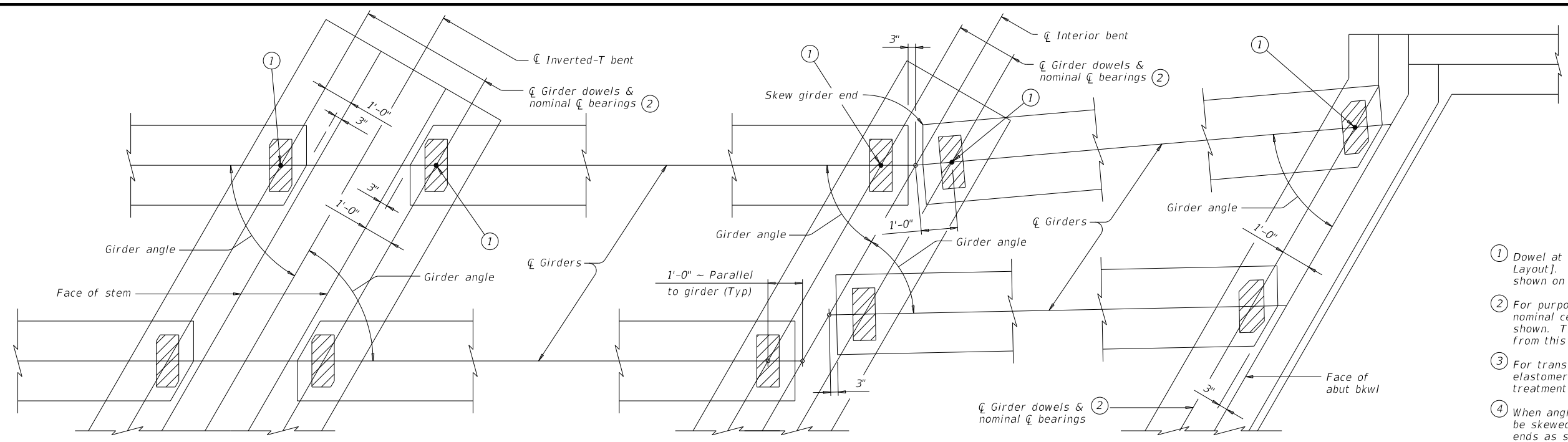
PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
10-19: Added Bars C and CH full length for VC <= 20'	DIST	COUNTY	SHEET NO.	
BRY	MADISON	62		

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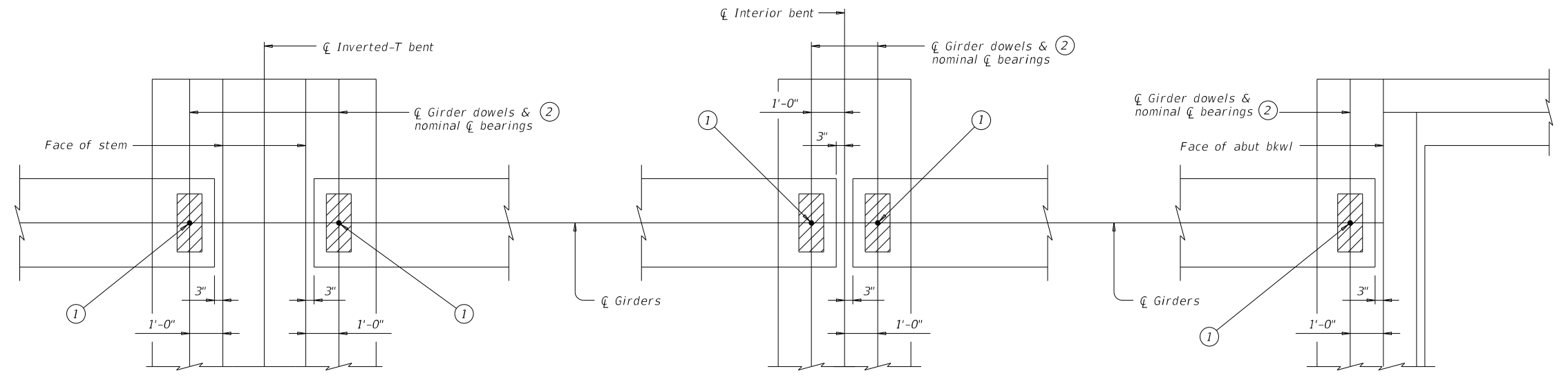


AT INVERTED-T BENT W/SKEW

AT CONVENTIONAL INTERIOR BENT W/SKEW

AT ABUTMENT W/SKEW³

- 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 girder ends must be skewed to maintain the clearance between girder ends as shown in view.
- ⑤ See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.



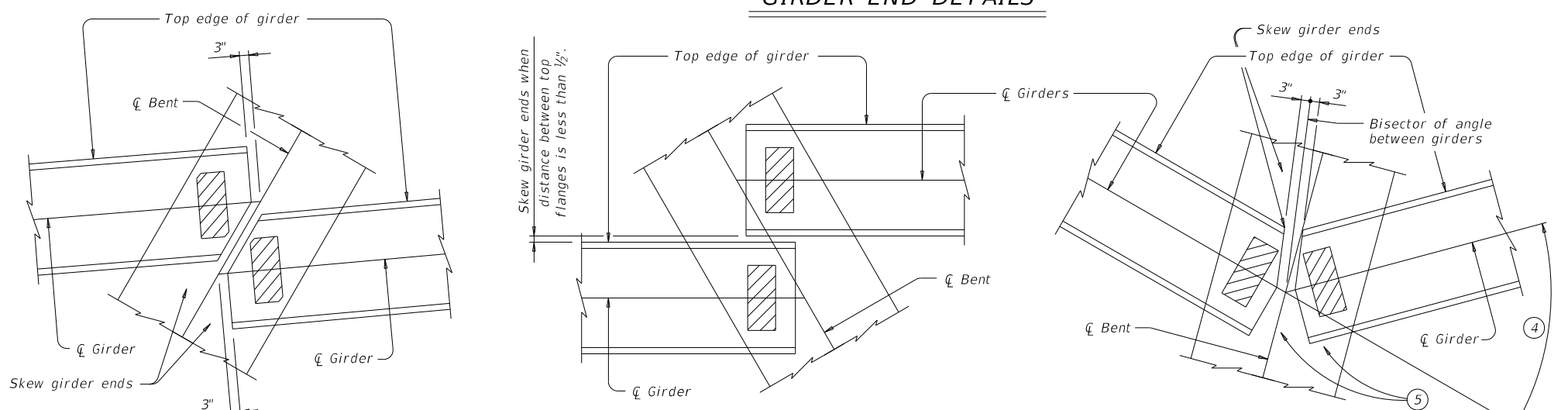
AT INVERTED-T BENT

AT CONVENTIONAL INTERIOR BENT

AT ABUTMENT³

GIRDER END DETAILS

GENERAL NOTES:
 These details accommodate skew angles up to 60°. Shop drawings for approval are required. A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer. Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".



GIRDER CONFLICT DETAILS



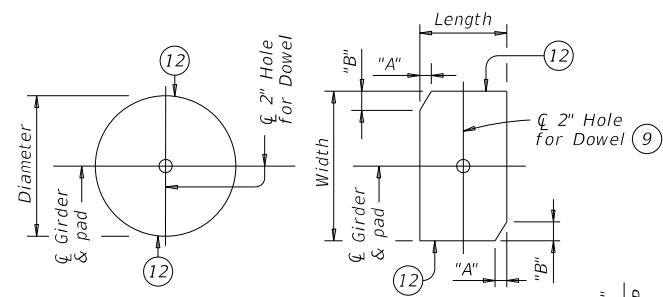
ELASTOMERIC BEARING AND GIRDER END DETAILS
 PRESTR CONCRETE I-GIRDERS

IGEB

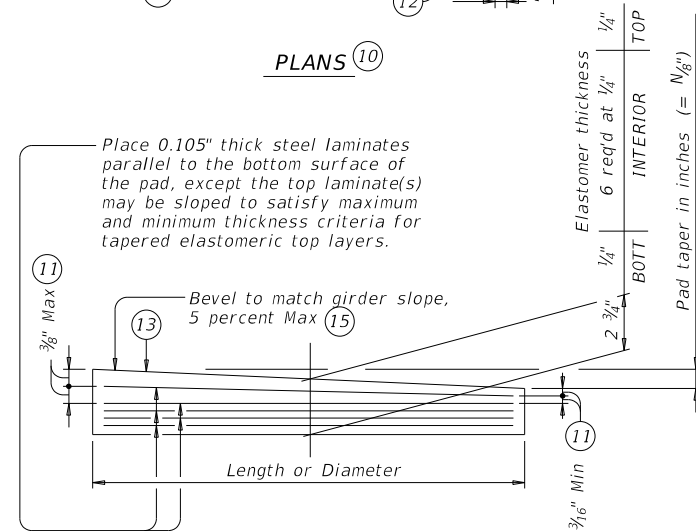
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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
DIST	COUNTY		SHEET NO.	
BRY	MADISON		63	

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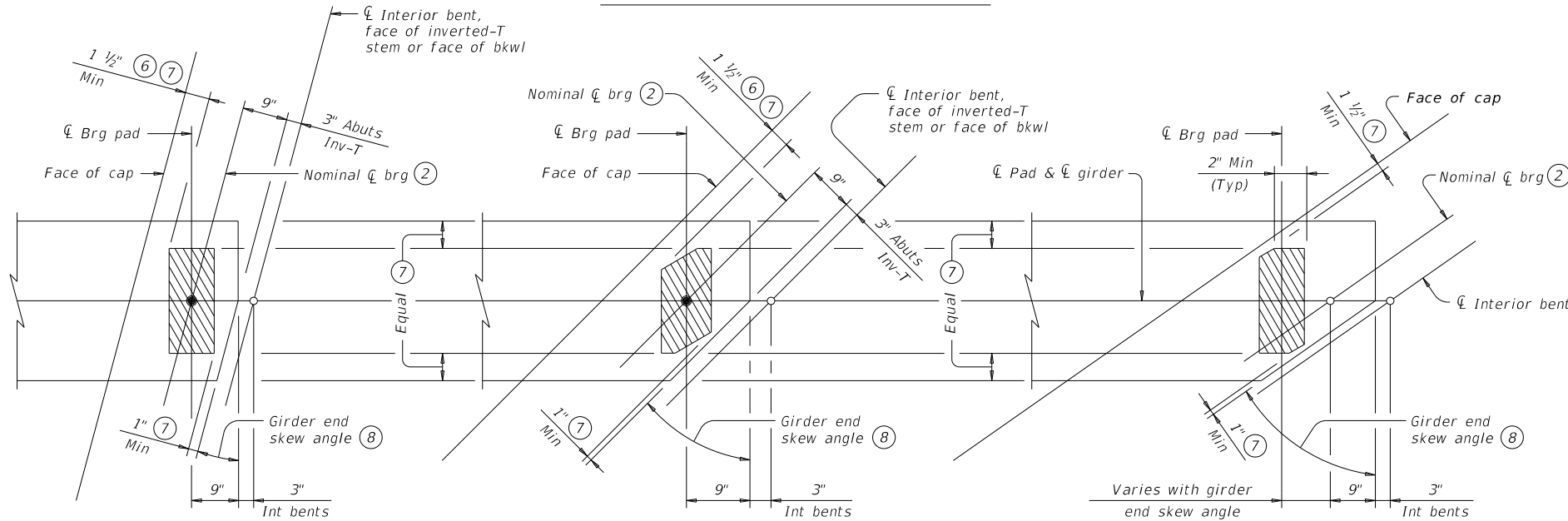
PLANS (10)



ELEVATION

LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)



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

SKewed GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (NO GIRDER DOWELS)

BEARING PAD PLACEMENT DIAGRAMS

TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)

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

TABLE OF BEARING PAD DIMENSIONS

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

- (2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.
- (6) 3" for inverted-T.
- (7) Place centerline pad as near nominal centerline bearing as possible between limits shown.
- (8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.
- (9) Provide 2" dia hole only at locations required. See Substructure details for location.
- (10) See Table of Bearing Pad Dimensions for dimensions.
- (11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.
- (12) Locate Permanent Mark here.
- (13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in 1/8" increments) in this mark.
 Examples: N=0, (for 0" taper)
 N=1, (for 1/8" taper)
 N=2, (for 1/4" taper)
 (etc.)
 Fabricated pad top surface slope must not vary from plan girder slope by more than $\left(\frac{0.0625}{\text{Length or Dia}}\right)$ 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 SHEET 2 OF 3

Texas Department of Transportation Bridge Division Standard

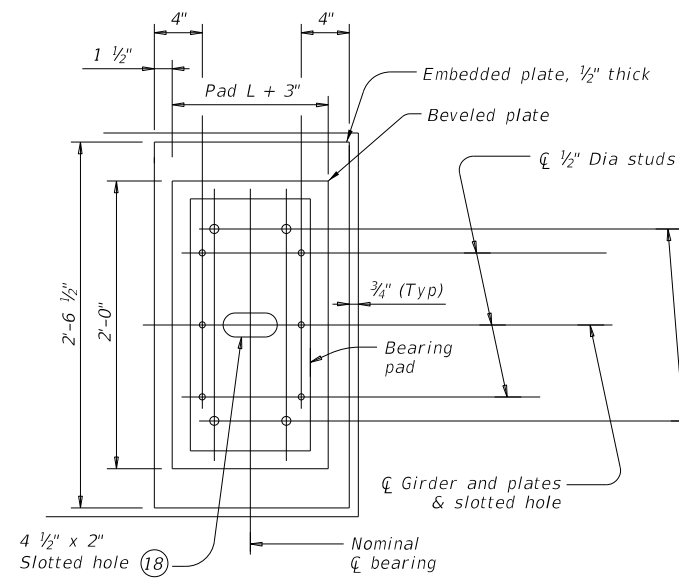
ELASTOMERIC BEARING AND GIRDER END DETAILS PRESTR CONCRETE I-GIRDERS

IGEB

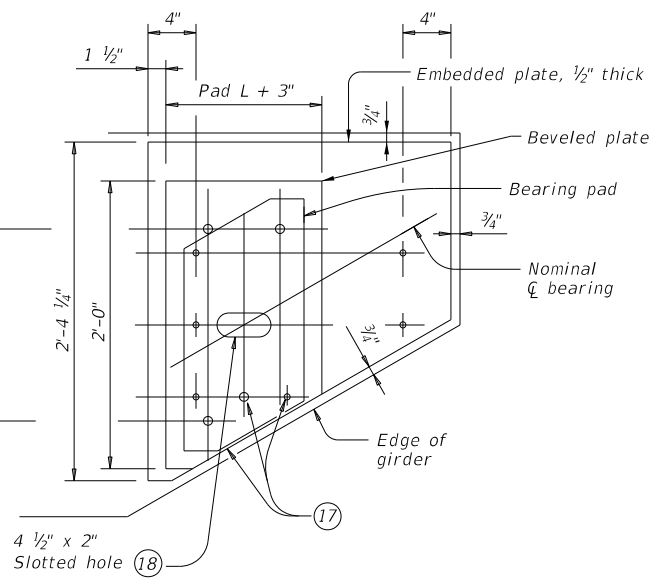
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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
	DIST	COUNTY	SHEET NO.	
	BRY	MADISON	64	

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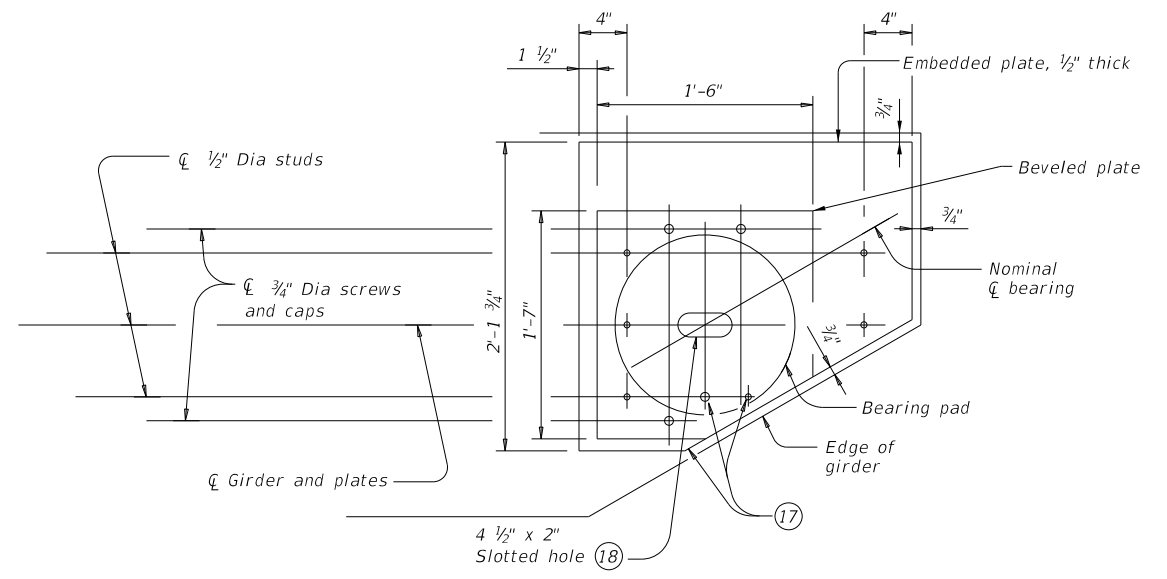
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**NORMAL GIRDER END
 RECTANGULAR BEARING PAD**

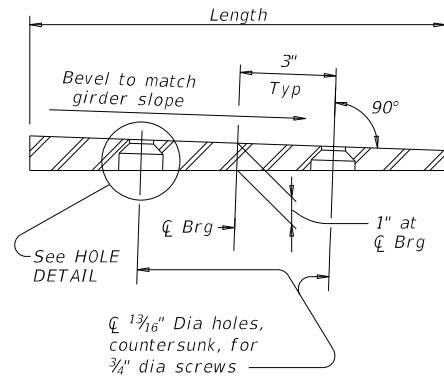


**SKewed GIRDER END
 CLIPPED RECTANGULAR BEARING PAD**

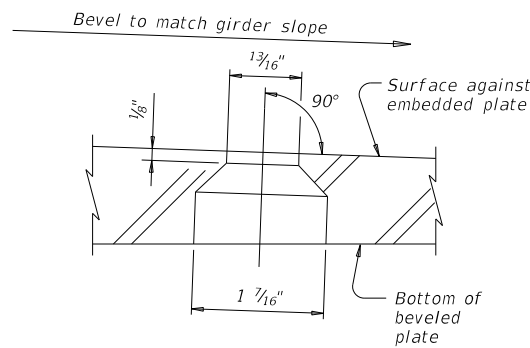


**SKewed GIRDER END
 15" DIA BEARING PAD**

PLAN VIEW OF SOLE PLATE DETAILS



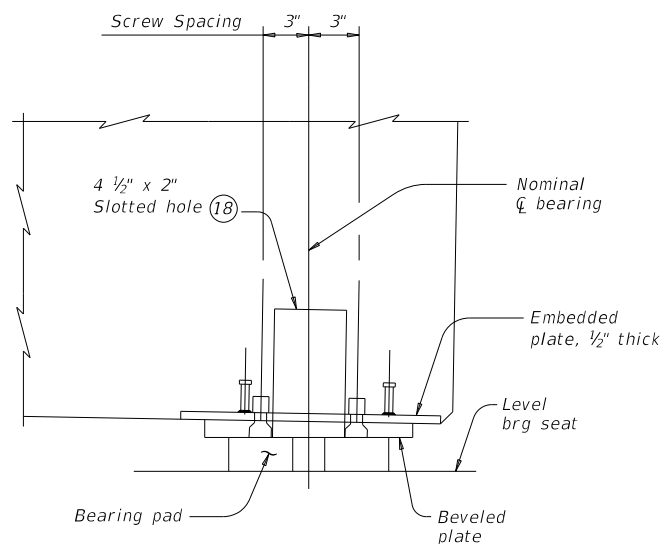
SECTION



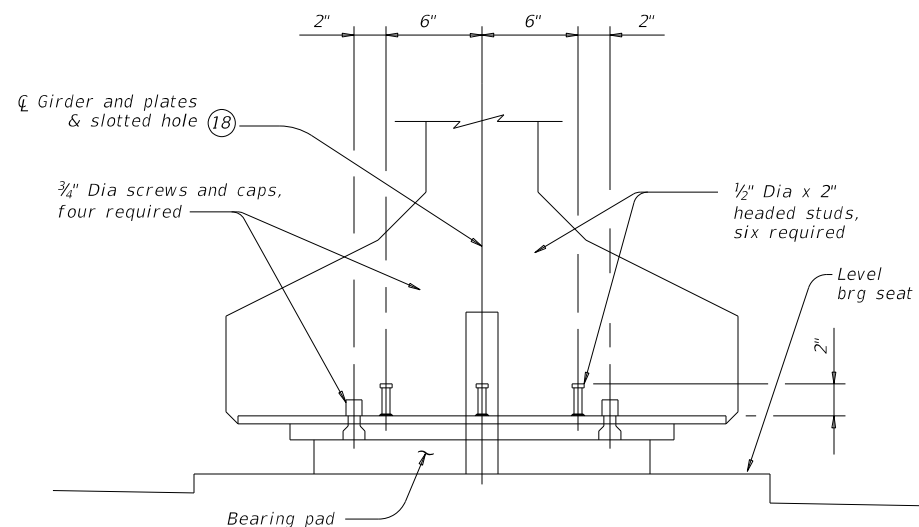
HOLE DETAIL

- 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.

BEVELED PLATE DETAILS



SIDE ELEVATION



**END ELEVATION
 Showing normal girder end.**

GIRDER DETAILS

SOLE PLATE NOTES:

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

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

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

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

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

3/4" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a 3/4" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than 1/2" deep or deeper than 1".

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

HL93 LOADING

SHEET 3 OF 3



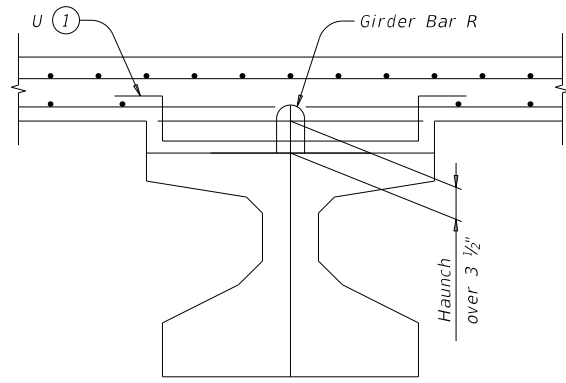
**ELASTOMERIC BEARING
 AND GIRDER END DETAILS
 PRESTR CONCRETE I-GIRDERS**

IGEB

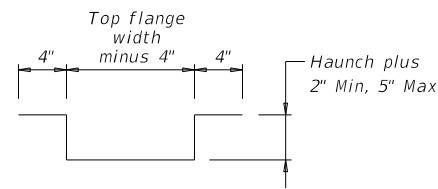
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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
	DIST	COUNTY	SHEET NO.	
	BRY	MADISON	65	

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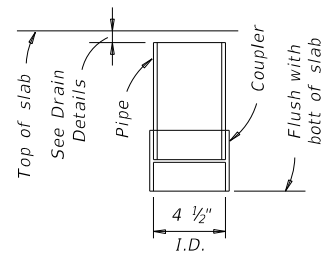
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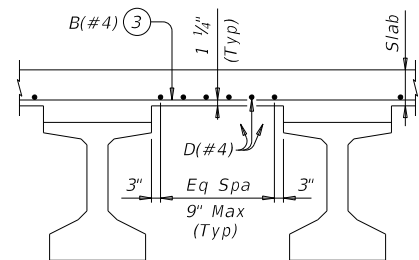
HAUNCH REINFORCING DETAIL



BARS U (#4)

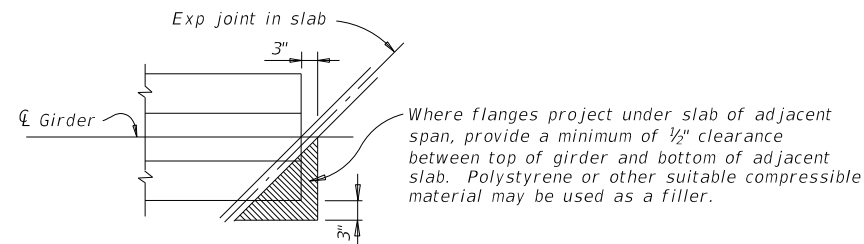


C-I-P DRAIN DETAIL

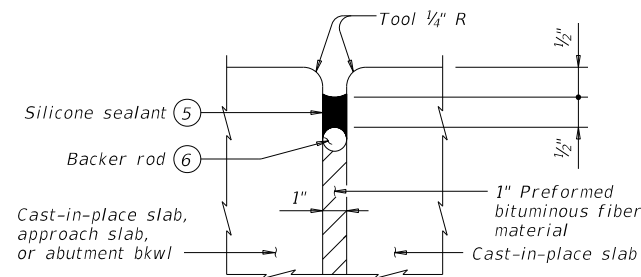


TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP

Top reinforcing steel not shown for clarity.

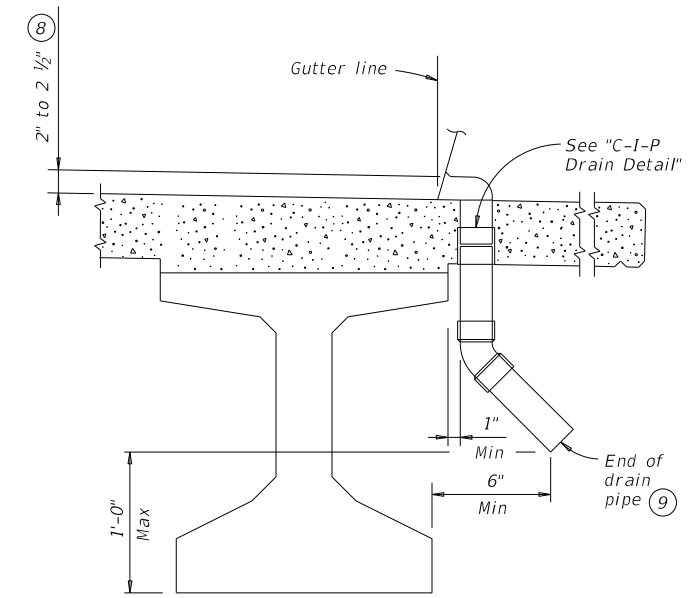


TREATMENT AT GIRDER END FOR SKEWED SPANS



TYPE A JOINT DETAIL

- ① Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 1/2".
- ② Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.
- ③ Bars B(#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#4) at centerline outside girder.
- ④ Provide Grade 60 reinforcing steel. Provide bar laps, where required, as follows:
 Uncoated ~ #4 = 1'-7"
 Epoxy coated ~ #4 = 2'-5"
- ⑤ Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.
- ⑥ 1 1/4" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.
- ⑦ The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.
- ⑧ Drain entrance formed in rail or sidewalk.
- ⑨ Water may not be discharged onto girders.
- ⑩ All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railroads, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.



DRAIN DETAIL

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.

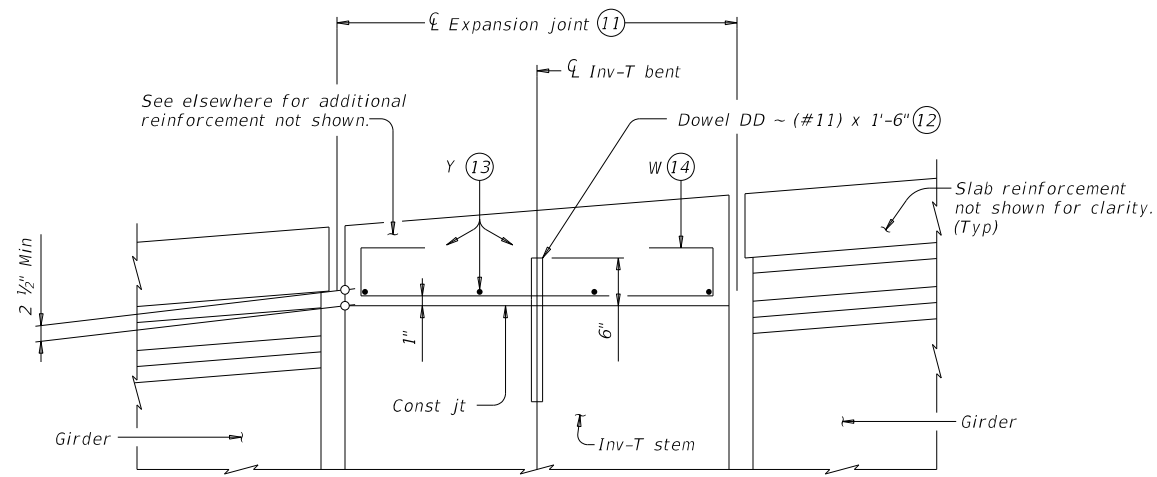
DECK FORMWORK NOTES:
 Overhang bracket hangers are limited to a safe working load of 3,600 lbs, applied to and along the axis of a coil rod at 45 degrees from vertical, regardless of higher loads permitted by hanger manufacturers. Do not place a hanger less than 12" from girder end. Space hangers accordingly.

SHEET 1 OF 2

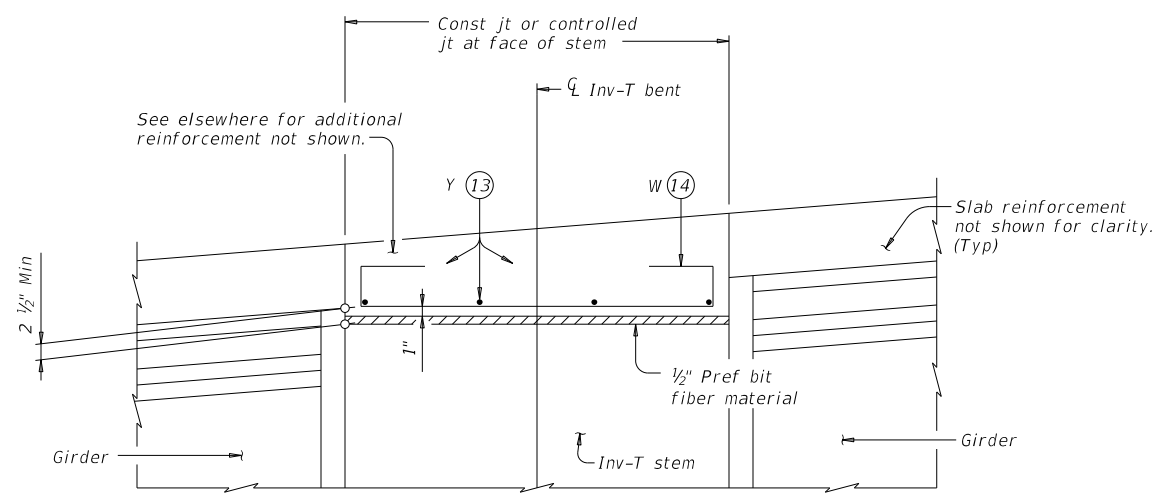
		Bridge Division Standard	
MISCELLANEOUS SLAB DETAILS PRESTR CONCRETE I-GIRDERS			
IGMS			
FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT August 2017	CONT	SECT	HIGHWAY
REVISIONS	0552	02	027 FM978
10-19: Modified Note 7. Type A now a pay item.	DIST	COUNTY	SHEET NO.
	BRY	MADISON	66

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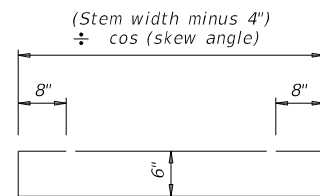
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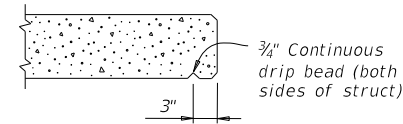
SHOWING EXPANSION JOINTS



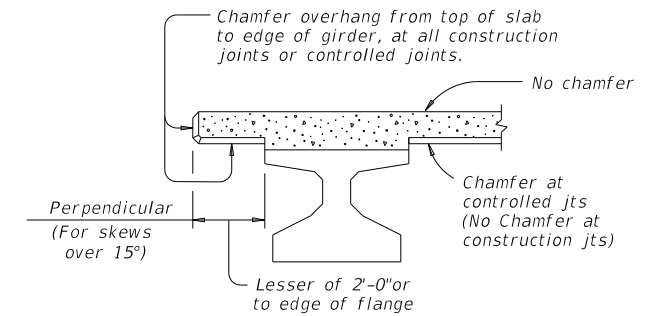
SHOWING CONST JTS OR CONTROLLED JTS
 REINFORCEMENT OVER INV-T BENTS



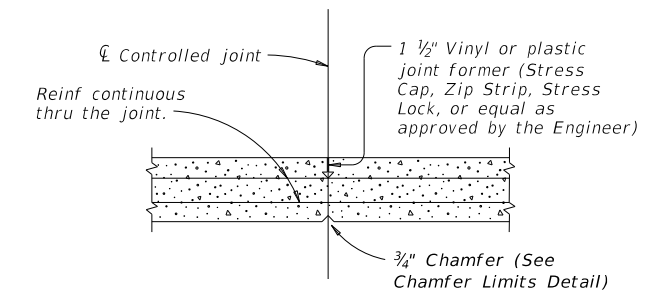
BARS W (#4)



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.

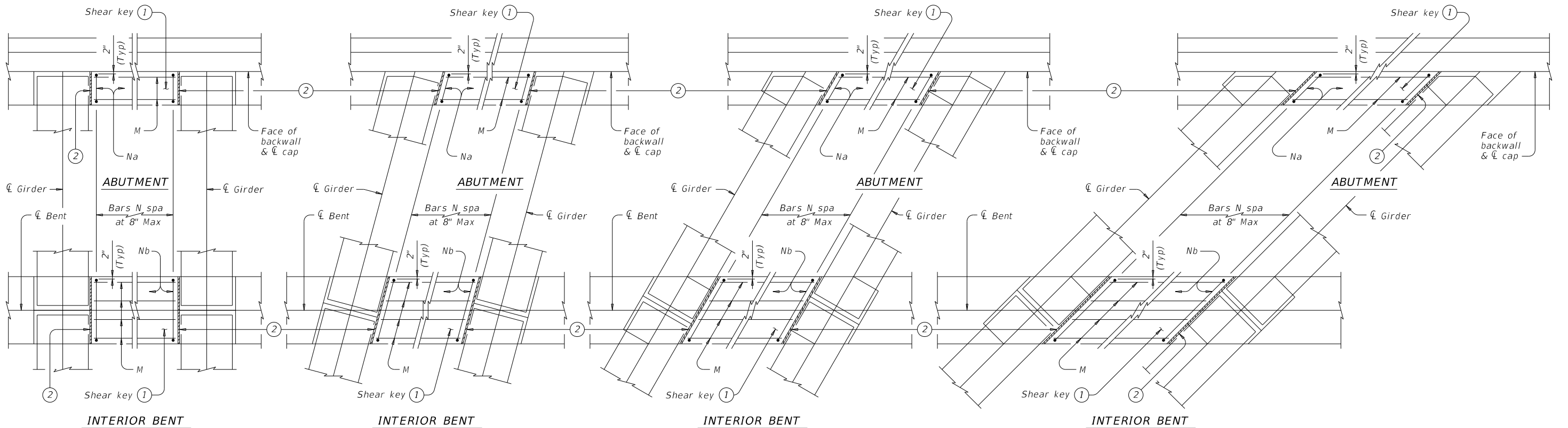
MISCELLANEOUS
 SLAB DETAILS
 PRESTR CONCRETE I-GIRDERS

IGMS

FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
10-19: Modified Note 7. Type A now a pay item.	DIST	COUNTY	SHEET NO.	
	BRY	MADISON	67	

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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

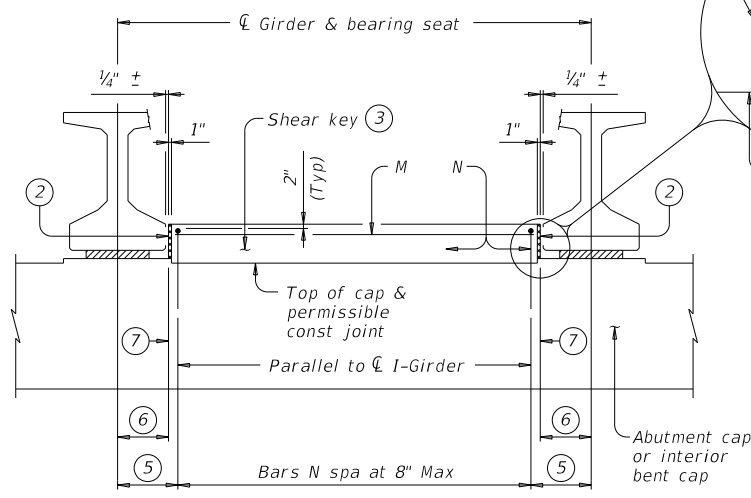
Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

PARTIAL PLANS WITH 45° SKEW

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

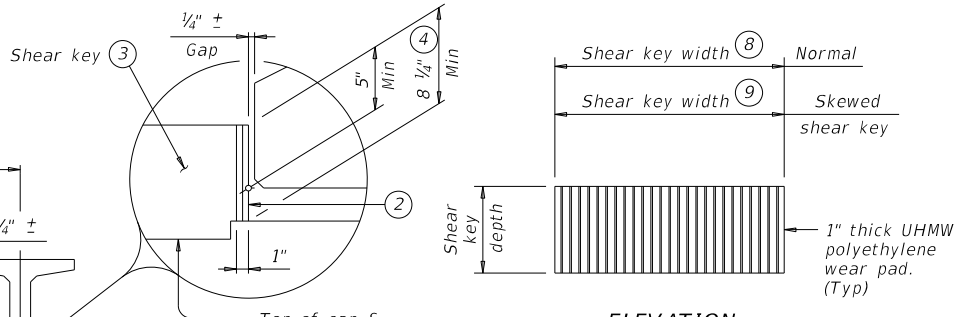
- ① Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.
- ② UHMW polyethylene wear pad. (Typ)
- ③ Leave a 1/4" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. 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 1/4", measured along ℓ cap.
 With Skew = $1'-8 \frac{1}{4} \div \cos \text{Skew}$, measured along ℓ cap.

- ⑥ With No Skew = 1'-4 1/4", measured along ℓ cap.
 With Skew = $1'-4 \frac{1}{4} \div \cos \text{Skew}$, measured along ℓ cap.
- ⑦ Face of UHMW polyethylene wear pad. Smooth side of pad facing girder.
- ⑧ Abutments = 1/2 Cap width.
 Interior bents = Cap width.
- ⑨ Abutments = 1/2 Cap width \div Cos Skew.
 Interior bents = Cap width \div Cos Skew.

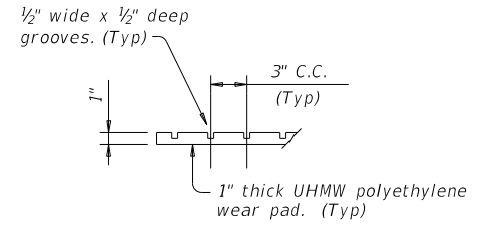


PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP

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

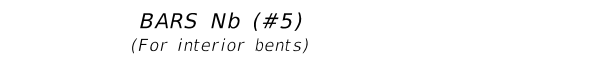
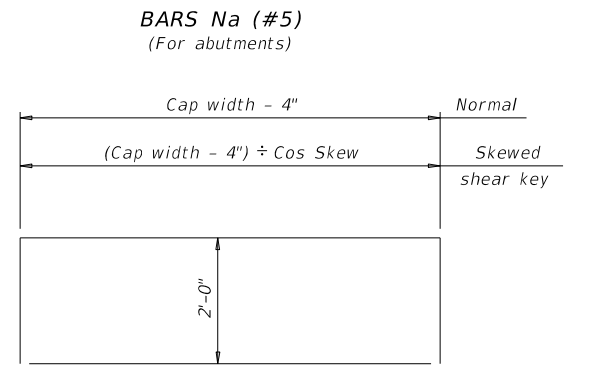
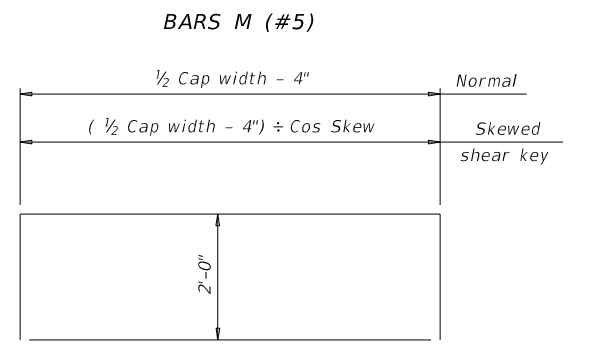
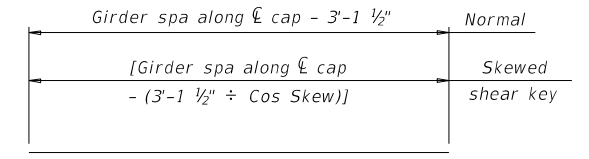


ELEVATION



PART SECTION

ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS

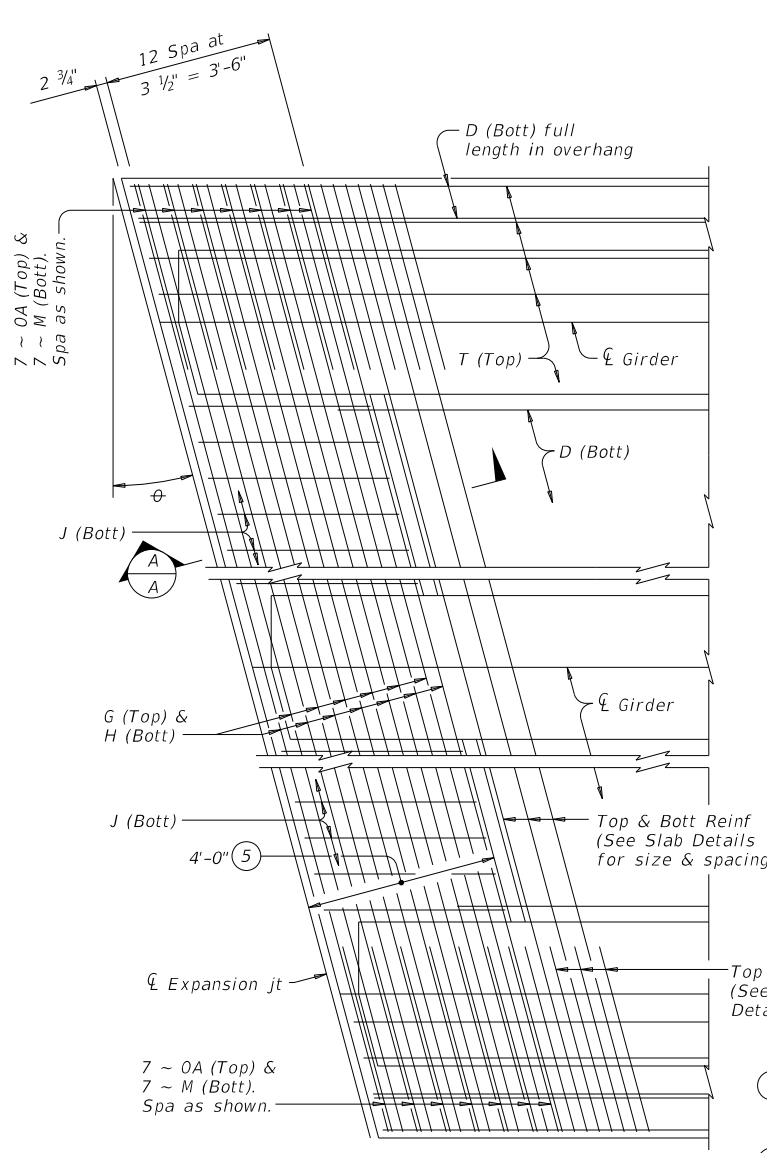


CONSTRUCTION NOTES:
 Provide Class "C" concrete ($f'c = 3,600$ psi). Provide Class "C" (HPC) if shown elsewhere on the plans.
 Provide Grade 60 reinforcing steel.
 Provide epoxy coated reinforcing steel for shear key if abutment or interior bent reinforcing steel is epoxy coated.
 Provide Ultra High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

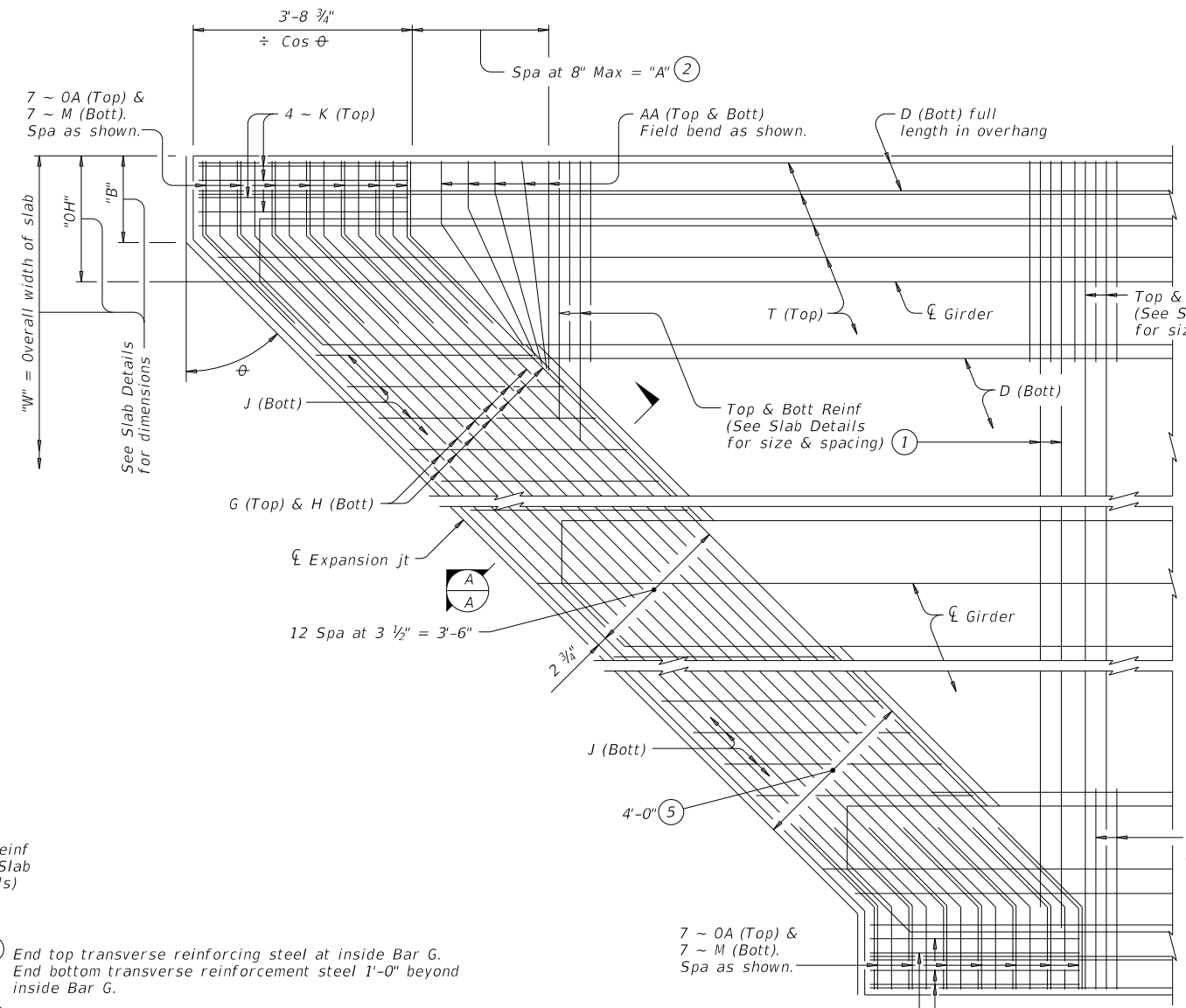
GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications. Details showing skew are drawn showing right forward skew. See Bridge Layout for actual skew direction.
 These details are limited to bridges skewed 45 degrees and less. This standard is only applicable for I-Girders.
 Modify 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.

		Bridge Division Standard	
SHEAR KEY DETAILS PRESTR CONCRETE I-GIRDERS			
IGSK			
FILE: igskstds-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT August 2017	CONTRACT: 0552	SECTION: 02	JOB: 027
REVISIONS			HIGHWAY: FM978
	DIST: BRY	COUNTY: MADISON	SHEET NO: 68

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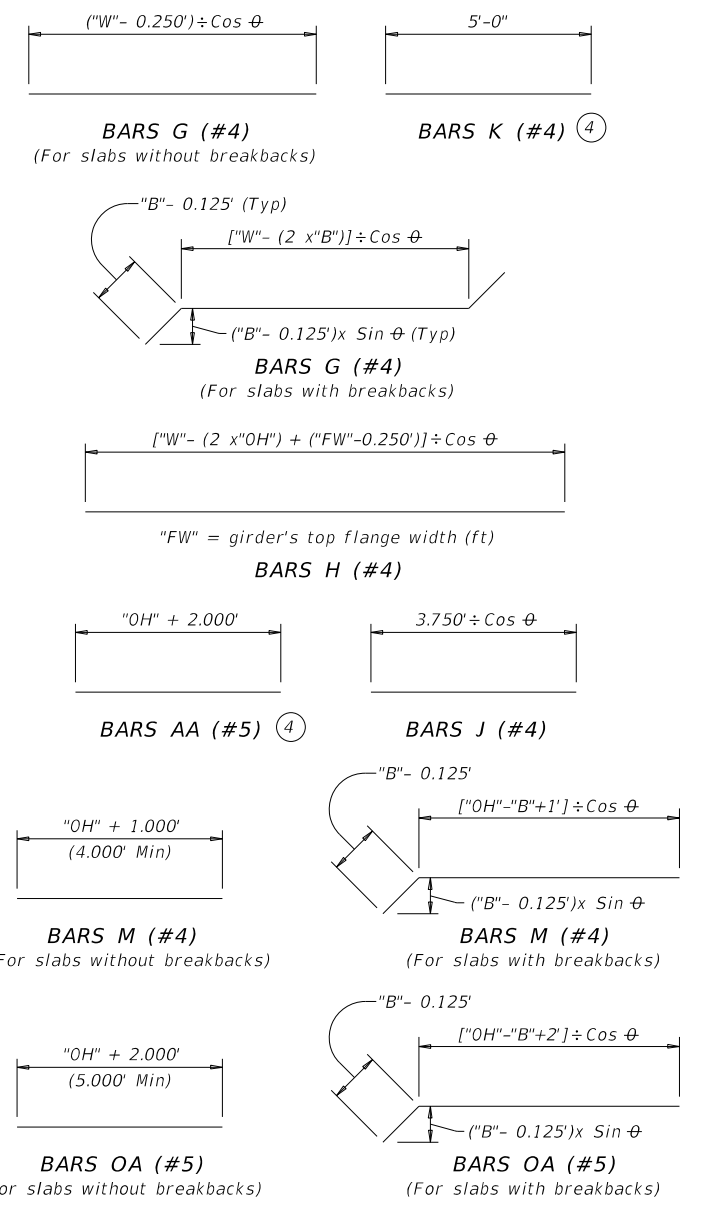


PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



PARTIAL PLAN FOR SLABS WITH BREAKBACK

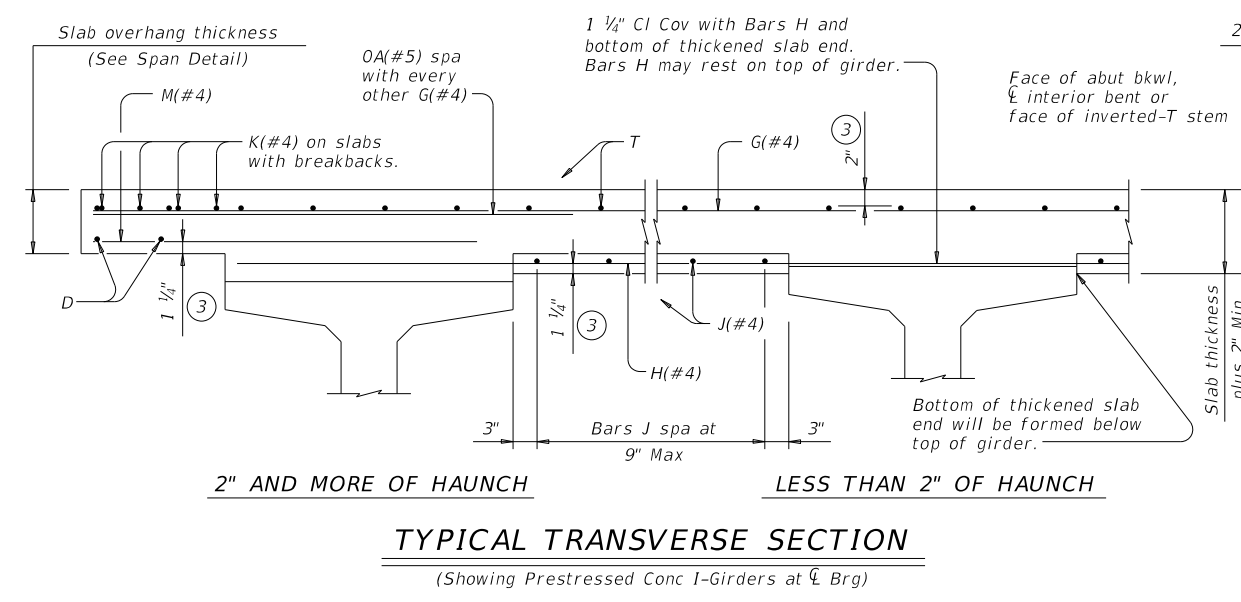
- 1 End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
- 2 "A" = ("OH" + 2.333 "B") x Tan θ
- 3 Provide clear cover as indicated unless otherwise shown on Span Details.
- 4 Only required on slabs with breakbacks.
- 5 Thickened slab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



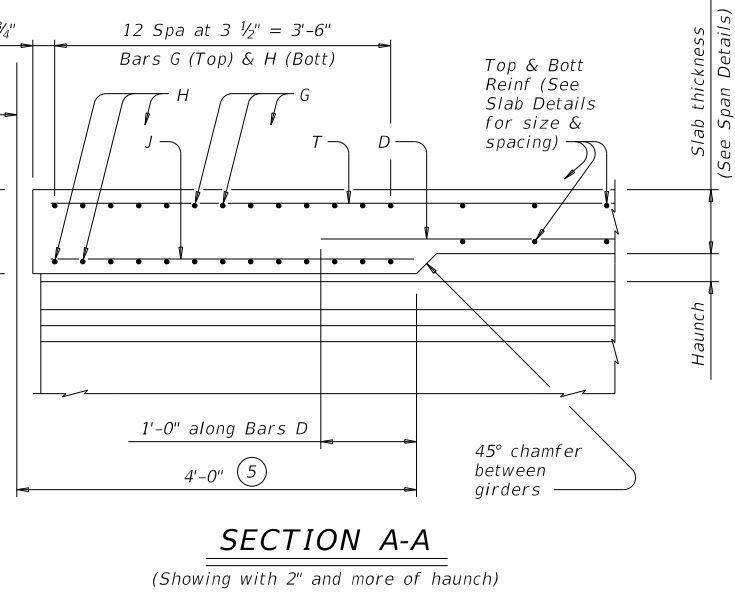
GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications. These details are restricted to Prestressed Concrete I-Girder Spans. These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used). When Option 2 from PCP standard 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.



TYPICAL TRANSVERSE SECTION
 (Showing Prestressed Conc I-Girders at $\bar{\bar{C}}$ Brg)



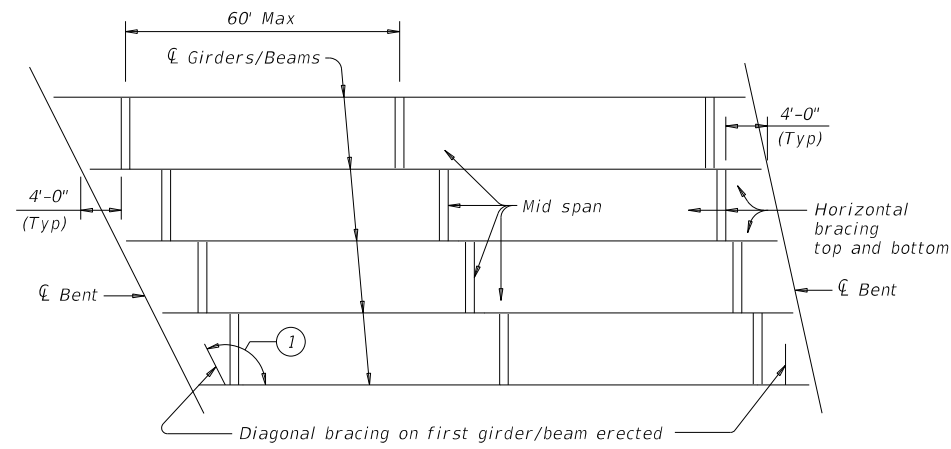
SECTION A-A
 (Showing with 2" and more of haunch)

Texas Department of Transportation		Bridge Division Standard	
THICKENED SLAB END DETAILS			
PRESTRESSED CONCRETE I-GIRDER SPANS			
IGTS			
FILE: igtss1-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
REV: August 2017	CONTRACT: 0552	SECTION: 02	JOB: 027
DIST: BRY	COUNTY: MADISON	SHEET NO. 69	

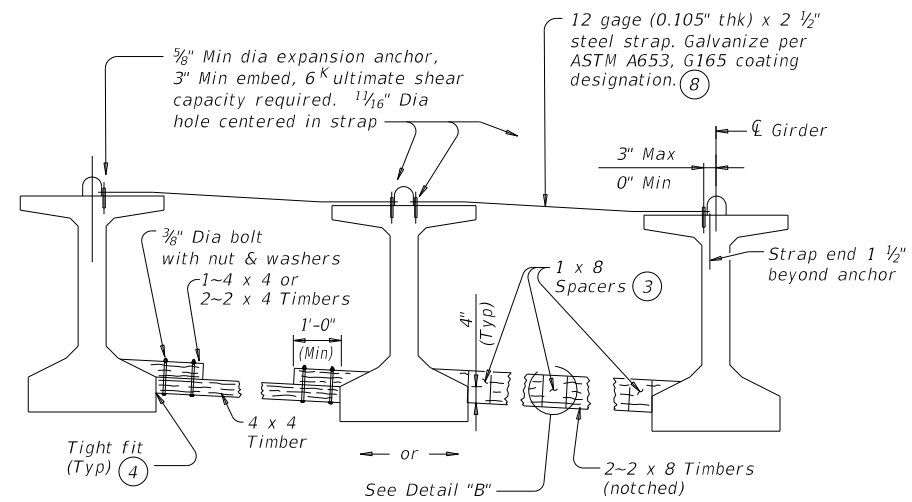
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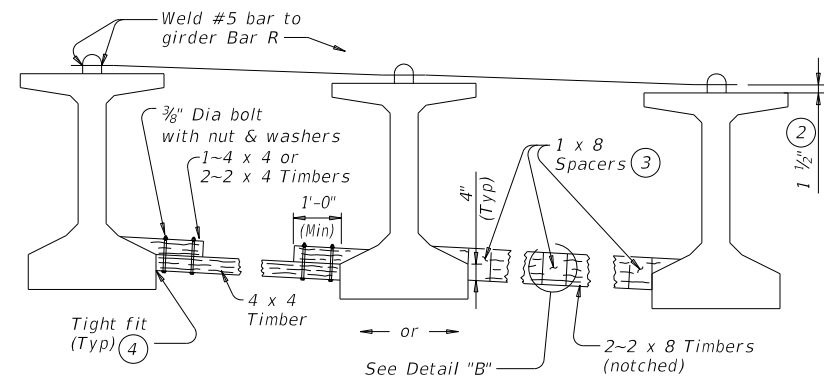


ERECTION BRACING



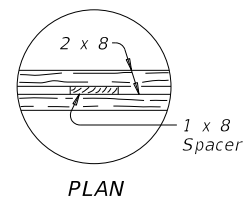
FOR ERECTION BRACING, OPTION 1

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

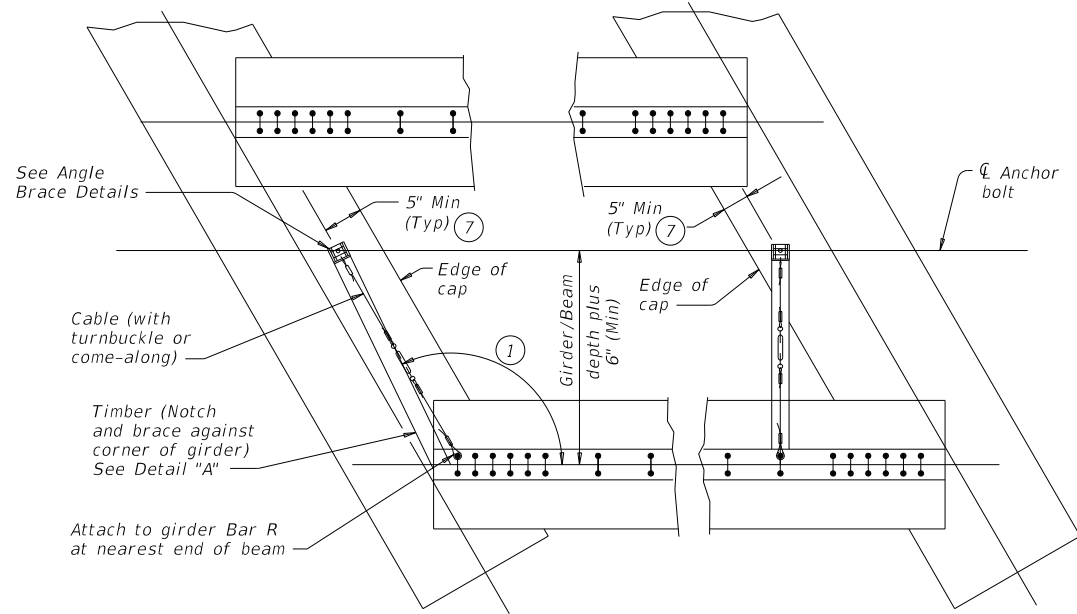


FOR ERECTION BRACING, OPTION 2

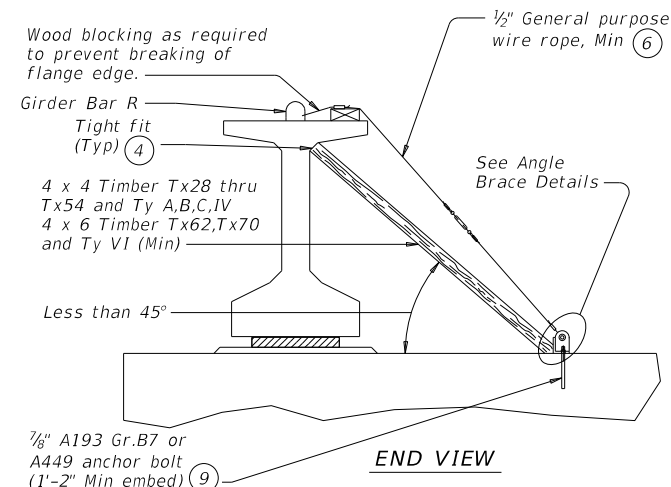
HORIZONTAL BRACING DETAILS



DETAIL "B"



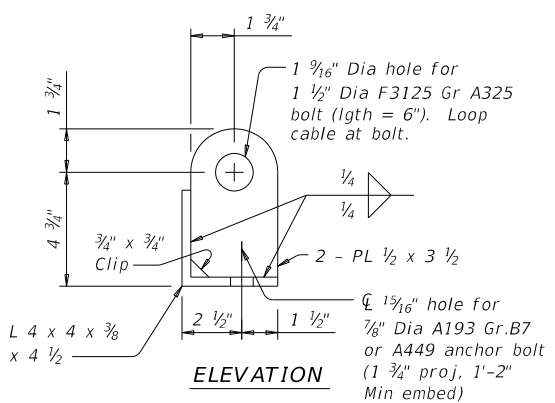
PLAN



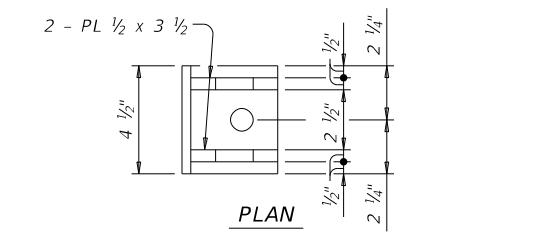
END VIEW

DIAGONAL BRACING DETAILS

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



ELEVATION



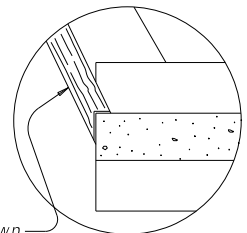
PLAN

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"

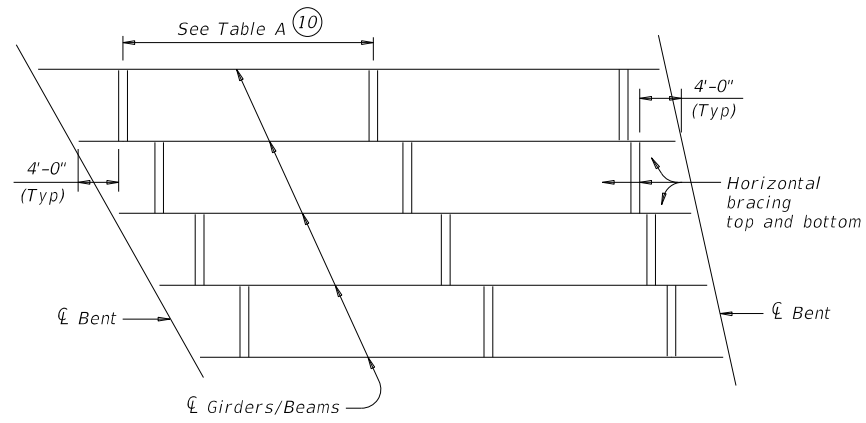
- 1 If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.
- 2 Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, 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 against the dead end.
- 7 It is acceptable to tie anchor bolts to cap reinforcement.
- 8 Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.
- 9 Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

SHEET 1 OF 2

		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
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REVISIONS			HIGHWAY: FM978
	DIST: BRY	COUNTY: MADISON	SHEET NO: 70

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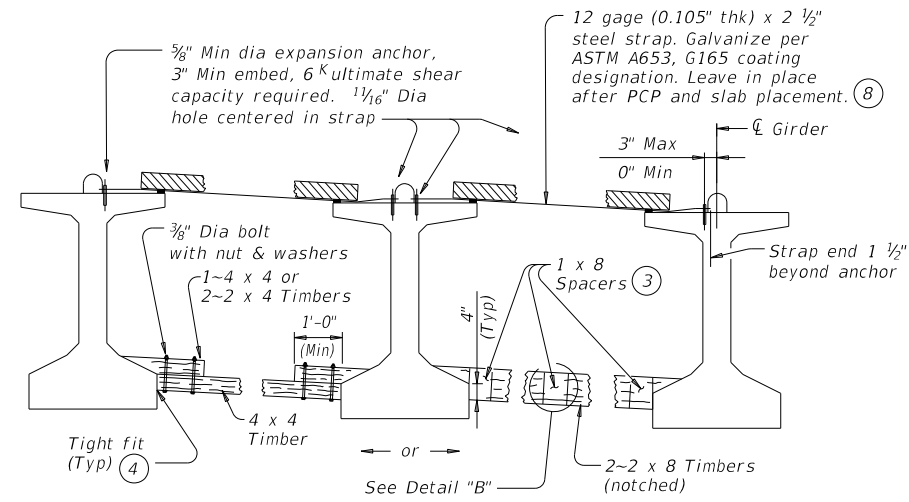
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SLAB PLACEMENT BRACING

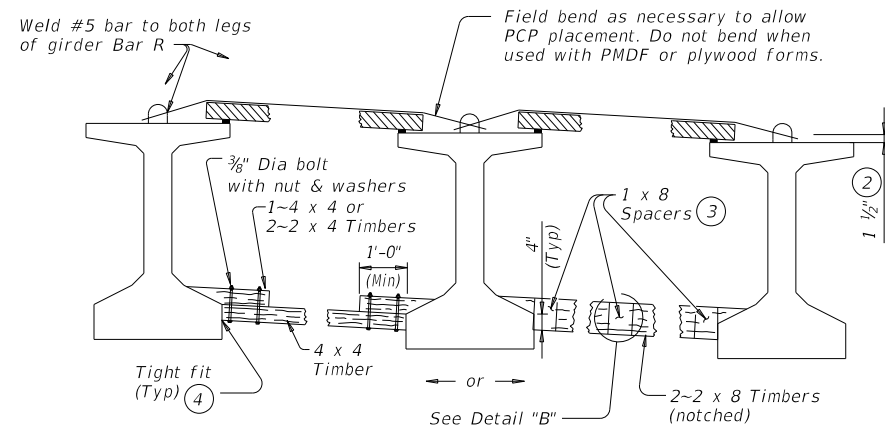
TABLE A		
Girder or Beam Type	OPTION 1-RIGID BRACING (STEEL STRAP)	
	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	1/4 points	1/4 points
Tx34	1/4 points	1/4 points
Tx40	1/4 points	1/8 points
Tx46	1/4 points	1/8 points
Tx54	1/4 points	1/8 points
Tx62	1/4 points	1/8 points
Tx70	1/4 points	1/8 points
A	1/8 points	1/8 points
B	1/8 points	1/8 points
C	1/8 points	1/8 points
IV	1/4 points	1/8 points
VI	1/4 points	1/8 points

Girder or Beam Type	OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)	
	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	1/4 points	1/8 points
Tx34	1/4 points	1/8 points
Tx40	1/4 points	1/8 points
Tx46	1/4 points	1/8 points
Tx54	1/4 points	1/8 points
Tx62	1/4 points	1/8 points
Tx70	1/4 points	1/8 points
A	2.0 ft	1.5 ft
B	3.0 ft	2.0 ft
C	4.5 ft	2.0 ft
IV	1/4 points	4.0 ft
VI	1/4 points	4.0 ft



FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID

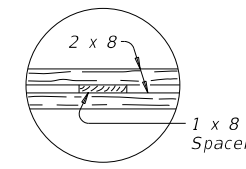
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE

(Showing slab formed with PCP.)

HORIZONTAL BRACING DETAILS (5)



PLAN
DETAIL "B"

- 2 Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.
- 3 Clear distance between spacers must not exceed 3'. Nail together with 16d nails.
- 4 Use wedges as necessary to obtain tight fit. Nail wedges to timbers.
- 5 Pressure treated landscape timbers can not be used.
- 8 Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.
- 10 Bracing spacing (1/4 and 1/8 points) measured between first and last typical brace location.
- 11 Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

SLAB PLACEMENT BRACING:

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425. Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

GENERAL NOTES:

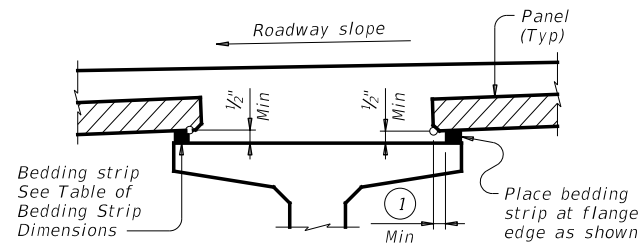
Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection. Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection. Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure. Removal of bracing for short periods of time to align girders and beams is permissible. All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown. Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

SHEET 2 OF 2

		Bridge Division Standard	
MINIMUM ERECTION AND BRACING REQUIREMENTS PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS			
MEBR(C)			
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REVISIONS			HIGHWAY: FM978
	DIST: BRY	COUNTY: MADISON	SHEET NO: 71

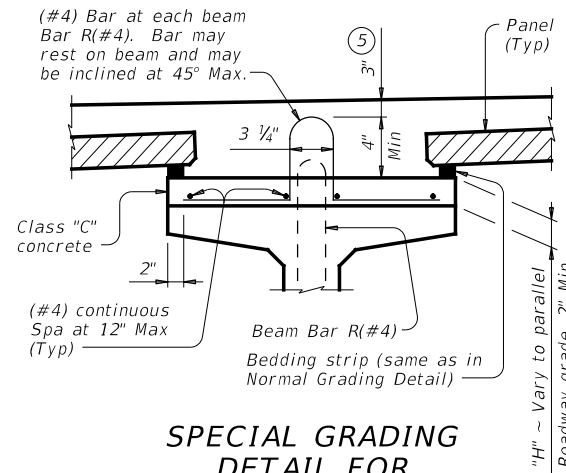
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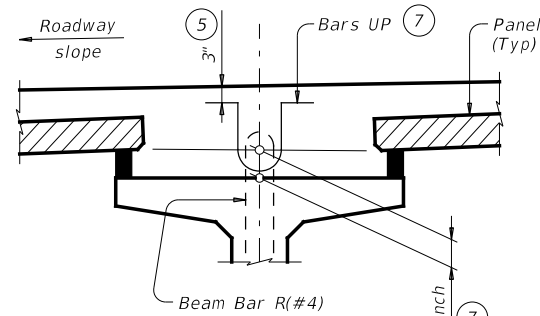
NORMAL GRADING DETAIL ③

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



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

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

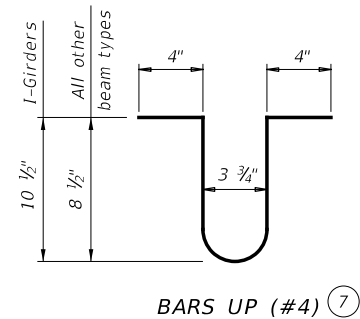


HAUNCH REINFORCING DETAIL

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

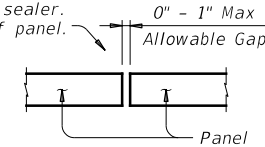
WIDTH	HEIGHT ④	
	Min	Max
1" (Min)	1/2"	2"
1 1/4"	1/2"	2 1/2"
1 1/2"	1/2"	3"
1 3/4"	1/2"	3 1/2"
2"	1/2"	4"
2 1/4"	1/2"	4 1/2" ②
2 1/2"	1/2"	5" ②
2 3/4"	1/2"	5 1/2" ②
3" (Max)	1/2"	6" ②

- ① 2" Min for I-girders, 1 1/2" 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 1/4" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is 1/4". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.
- 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 1/2" 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 1/4" deep, in the top of the bedding strips at 8" o.c..



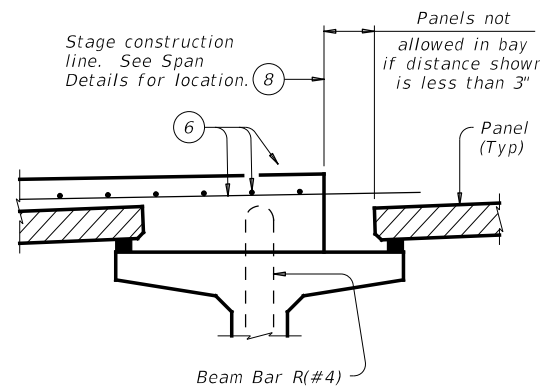
BARS UP (#4) ⑦

Seal joint between panels when gap exceeds 1/4" with polyurethane sealant or expanding foam sealer. Make seal flush with top of panel.

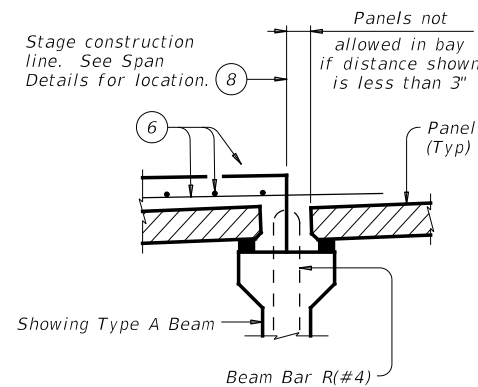


PANEL JOINTS

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



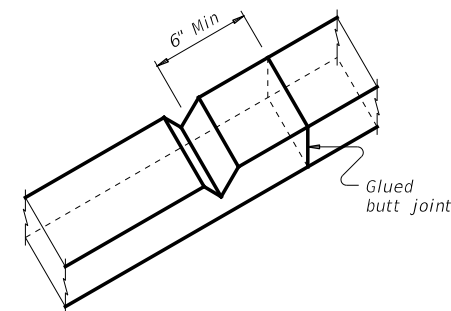
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)



BEDDING STRIP DETAIL ⑨

CONSTRUCTION NOTES:

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges. Placing panels to minimize joint openings is recommended. If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction. Bars U, shown on PCP-FAB, may be bent over or cut off if necessary. Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 1/2" under the panels as the slab concrete is placed. To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least 1/2". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required. For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement. If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated. Provide bar Laps, where required, as follows:
 Uncoated ~ #4 = 1'-7"
 Epoxy Coated ~ #4 = 2'-5"

GENERAL NOTES:

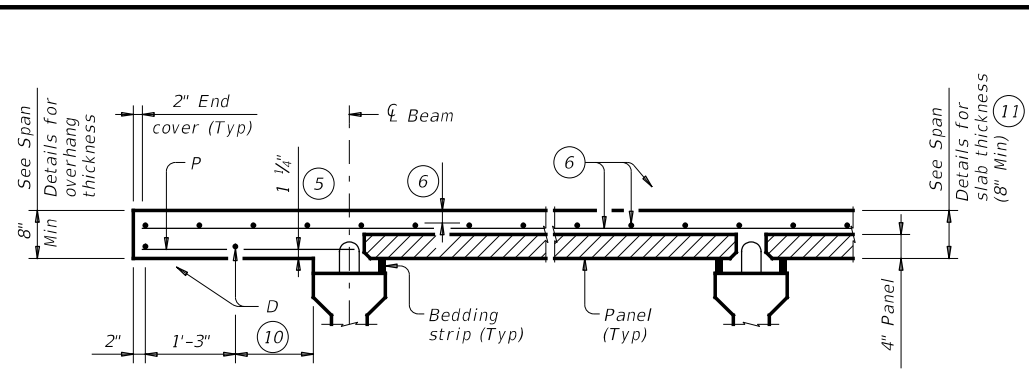
Designed according to AASHTO LRFD Bridge Design Specifications. Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees. Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use. These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings. When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer. Any additional reinforcing 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.

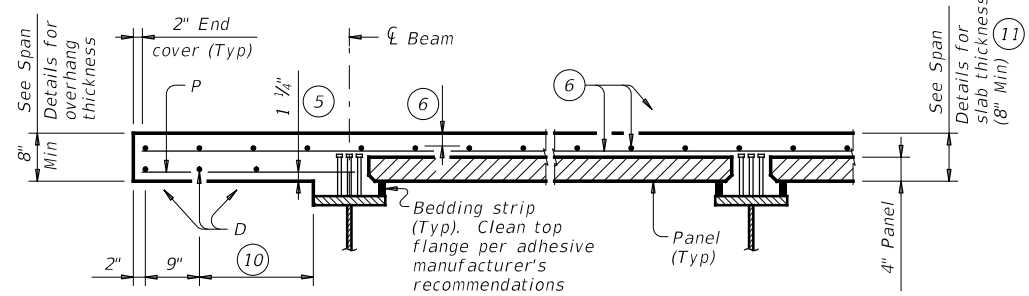
		Bridge Division Standard	
PRESTRESSED CONCRETE PANELS DECK DETAILS			
PCP			
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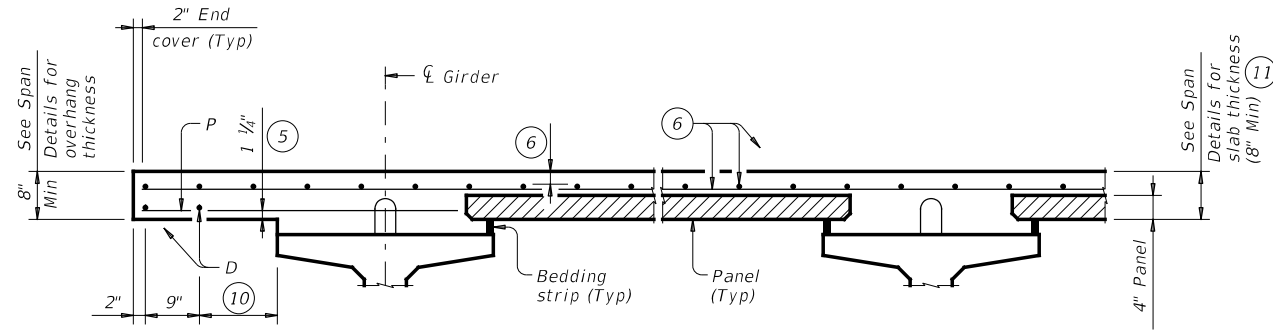
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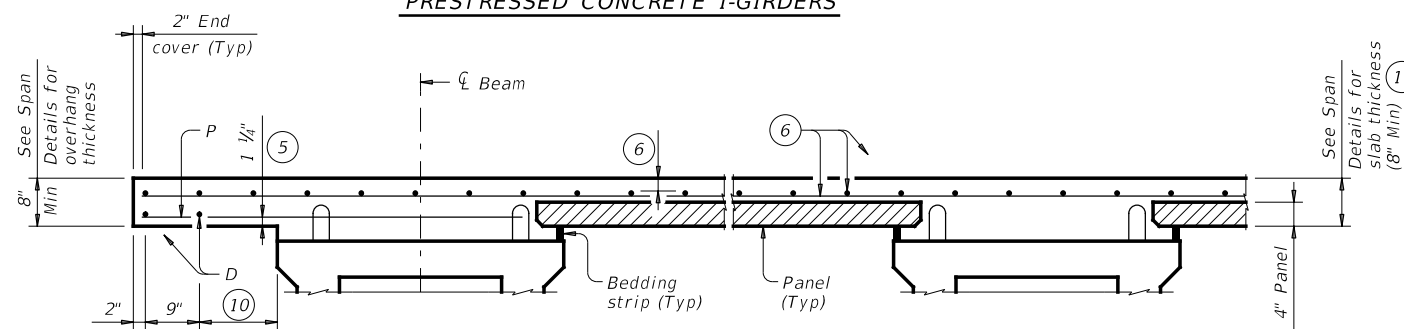
PRESTRESSED CONCRETE I-BEAMS



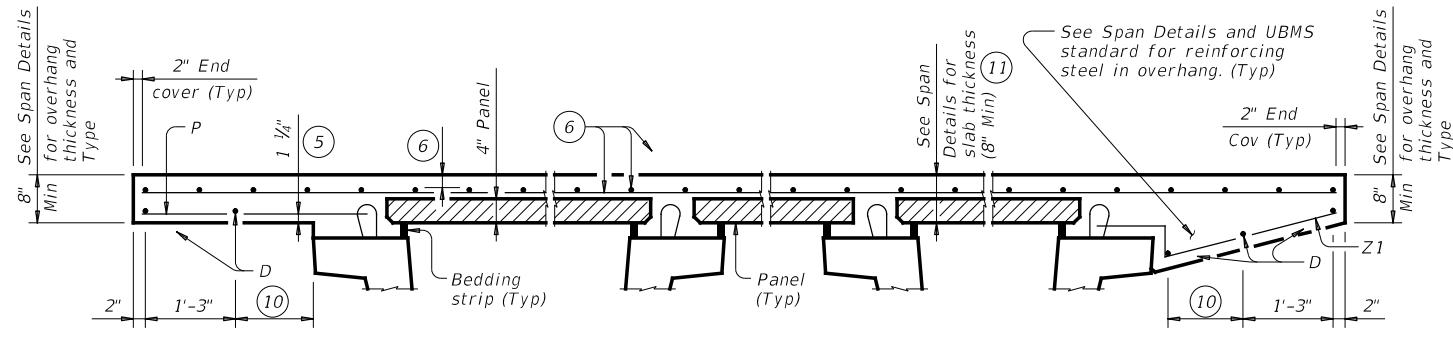
STEEL BEAMS



PRESTRESSED CONCRETE I-GIRDERS



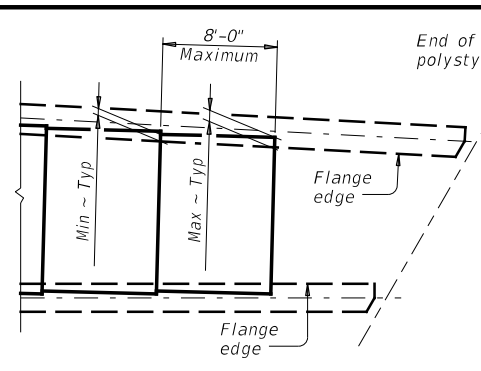
PRESTRESSED CONCRETE X-BEAMS



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

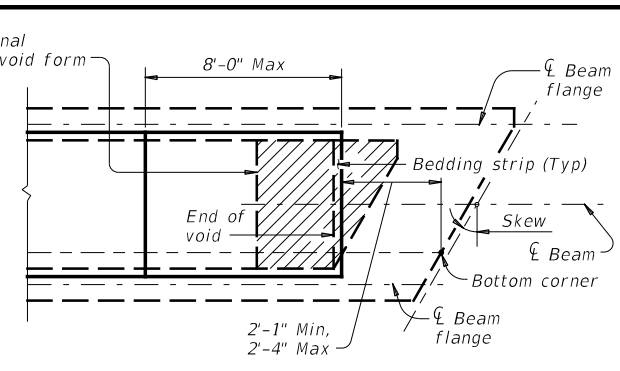
TYPICAL PART TRANSVERSE SECTIONS

SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

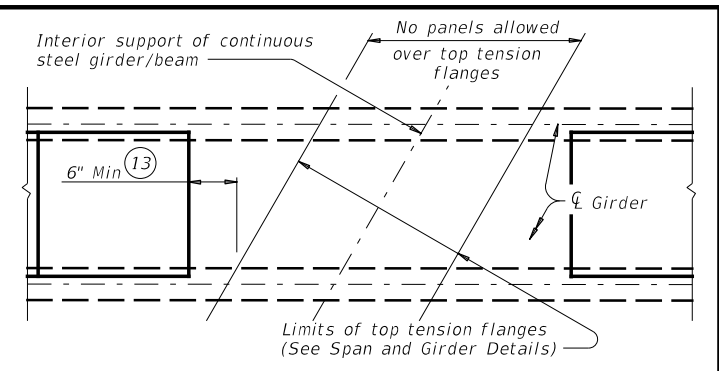


AT FLARED BEAMS OR GIRDERS

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



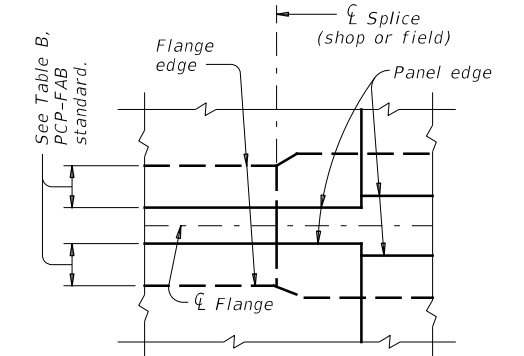
OVER CONC U-BEAMS



AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS

PART PLANS OF PANEL PLACEMENT

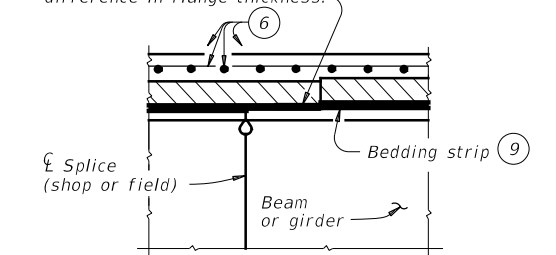
- 5 Provide clear cover as indicated unless otherwise shown on Span Details.
- 6 See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- 9 Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8' o.c..
- 10 Equally space additional bar if more than 1'-3" Max.
- 11 The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.
- 12 Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.
- 13 Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



PLAN AT SPLICE

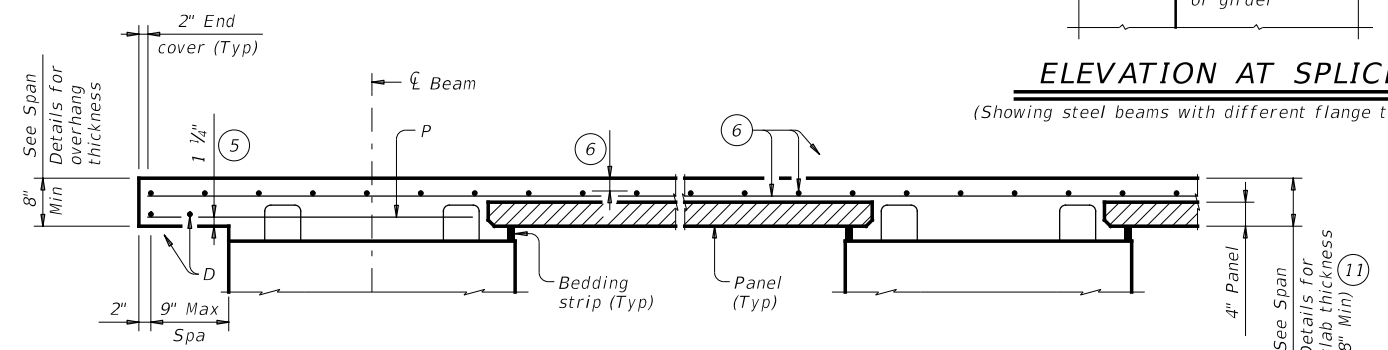
(Showing steel beams with flange width transition)

Cut bedding strip to adjust for difference in flange thickness.



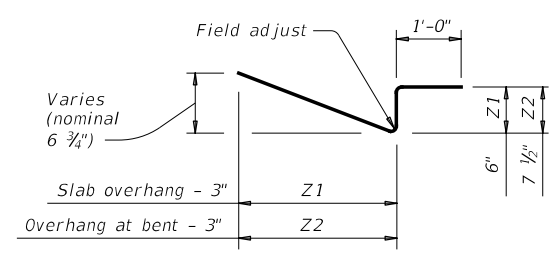
ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



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)

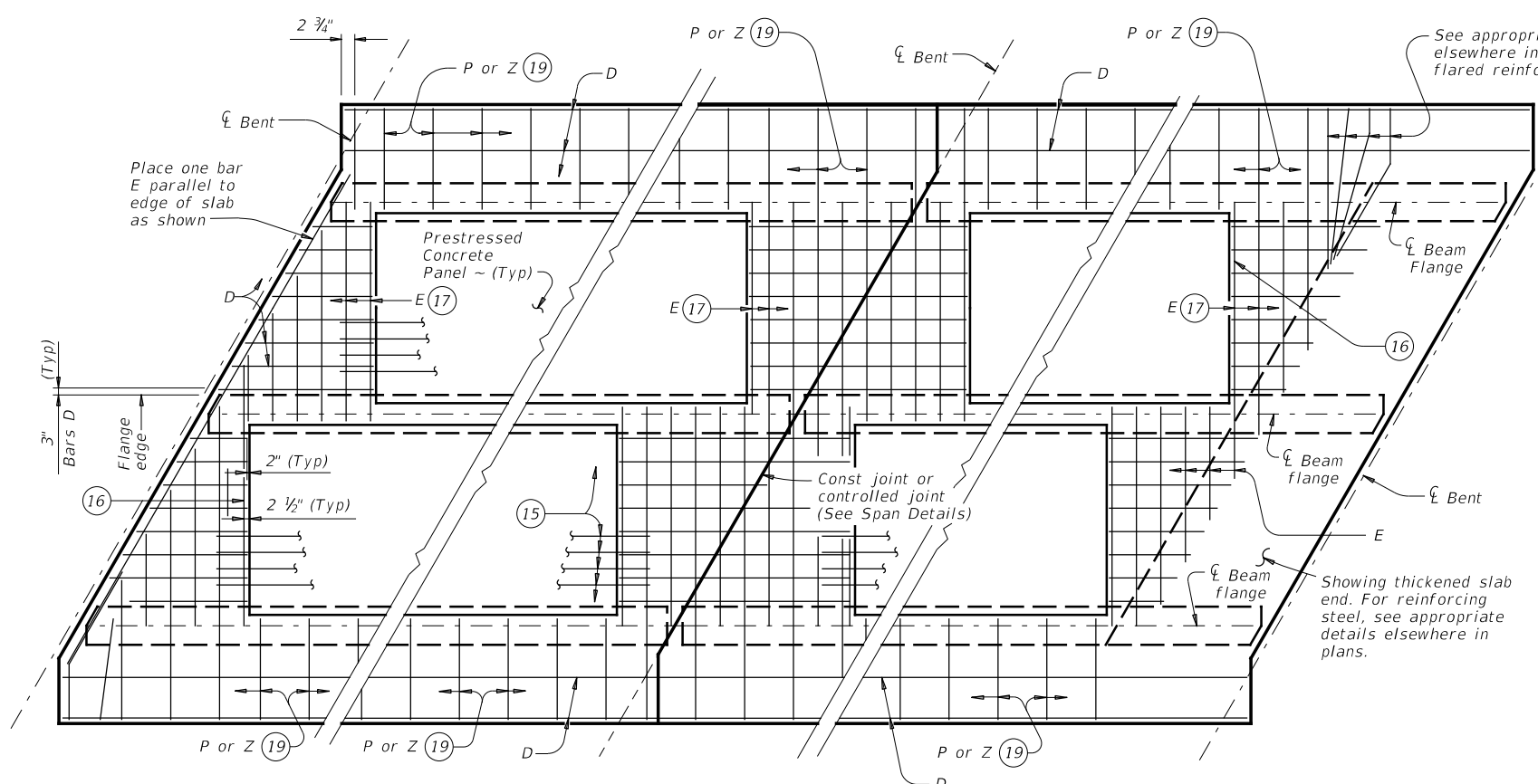
PRESTRESSED CONCRETE PANELS DECK DETAILS

PCP

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REV: April 2019	CONT: 0552	SECT: 02	JOB: 027	HIGHWAY: FM978
DIST: BRY	COUNTY: MADISON	SHEET NO. 73		

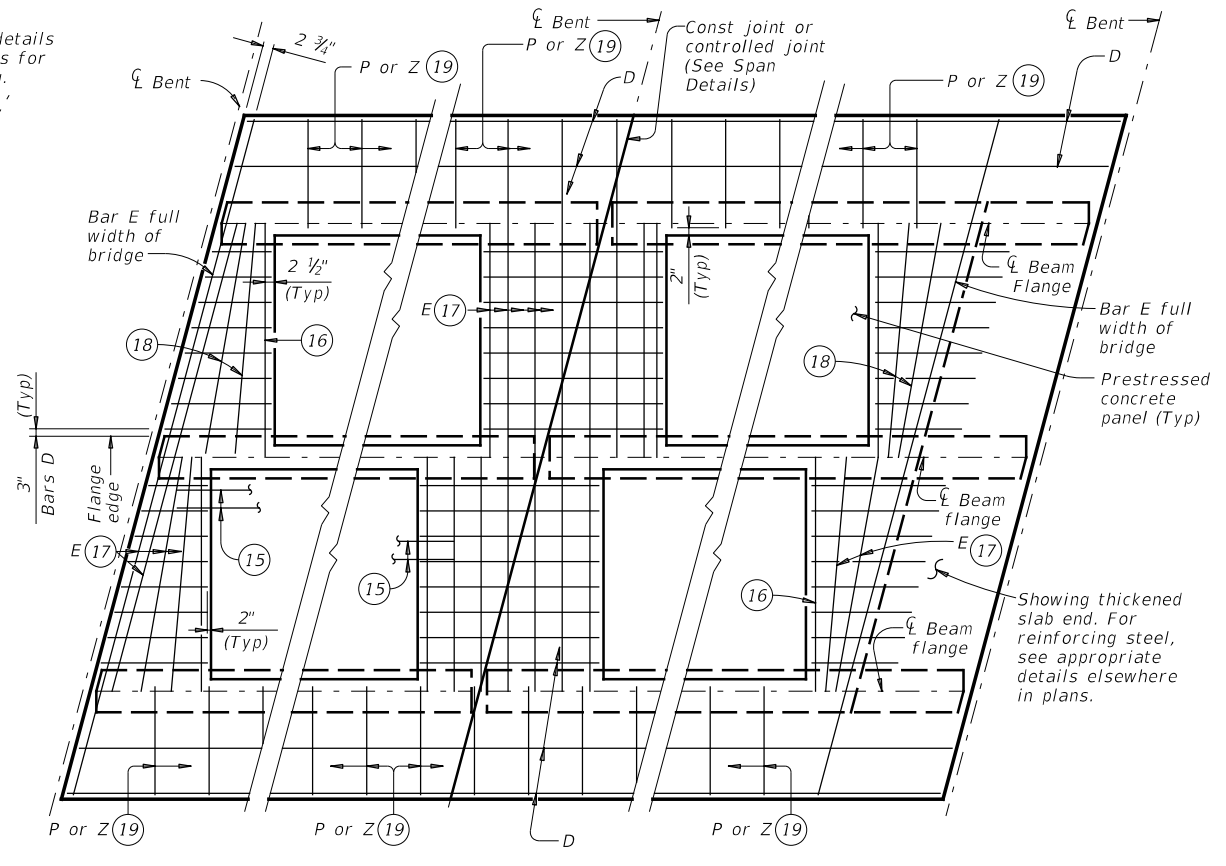
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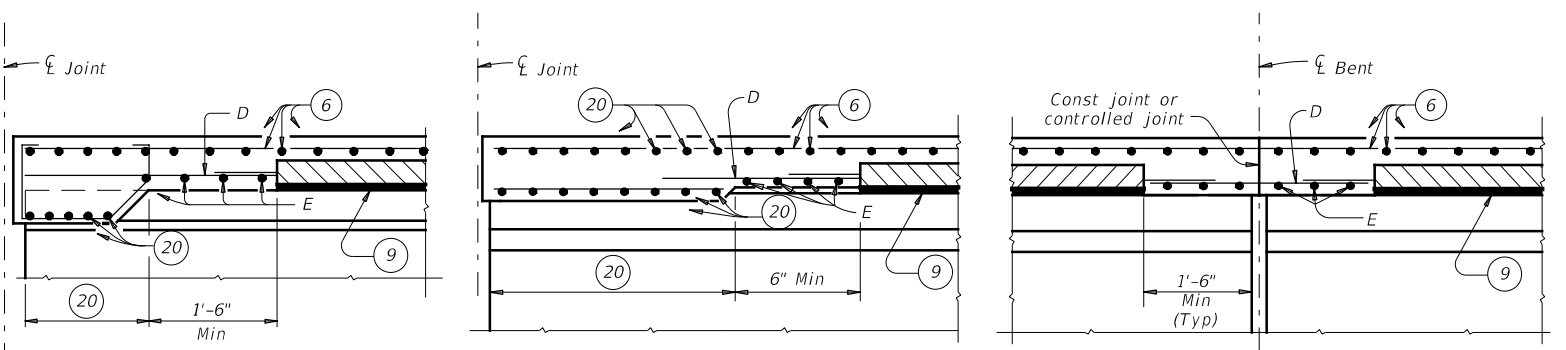
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE
 AT INTERIOR BENTS
 AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

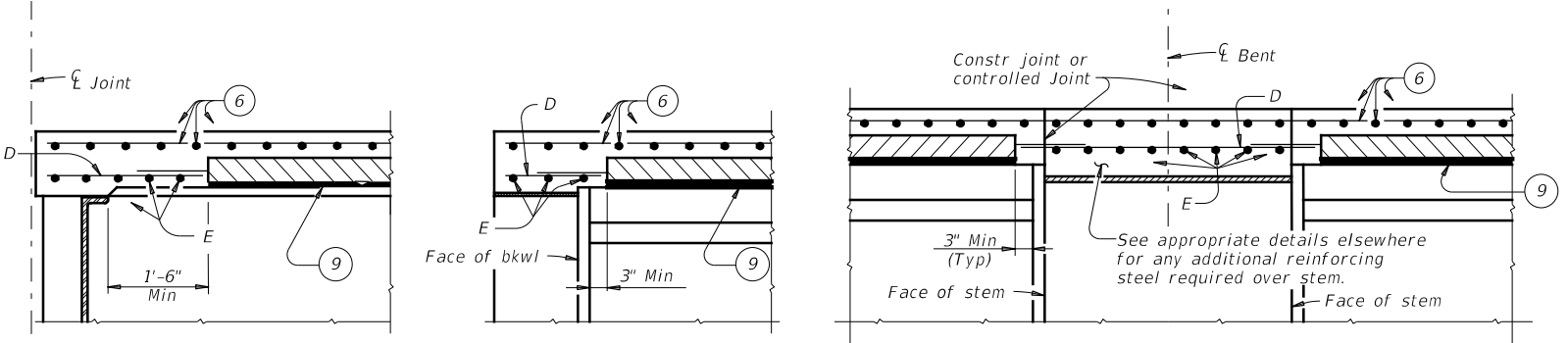


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE
 AT INTERIOR BENTS
 AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS
 AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS
 AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS
 AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS
 AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

OPTION 1 ~ ELEVATIONS AT BEAM ENDS

- 6 See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- 9 Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8" o.c.
- 14 Max Spacing as listed unless otherwise shown.
- 15 At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.
- 16 Maintain one Bar E(#4) parallel to panel ends (Typ).
- 17 Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.
- 18 Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.
- 19 Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.
- 20 See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



PRESTRESSED CONCRETE PANELS DECK DETAILS

PCP

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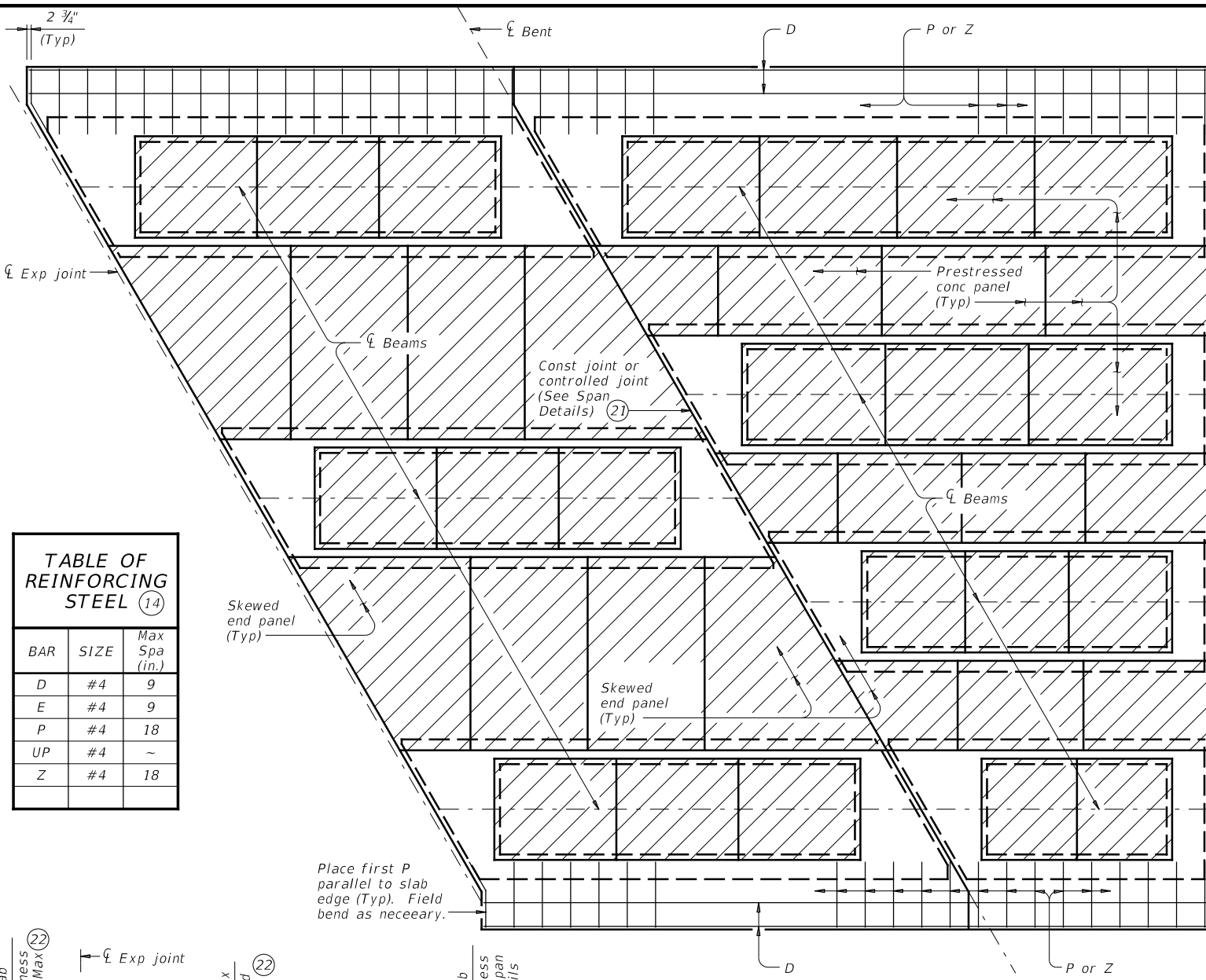
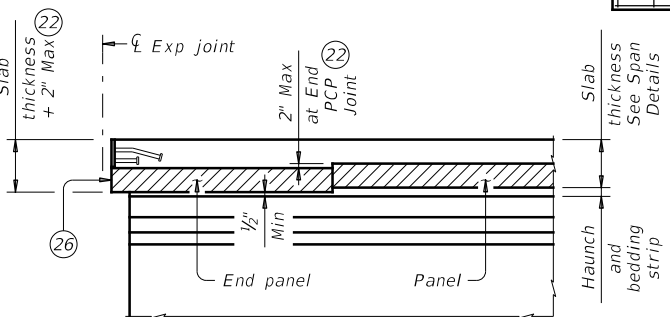
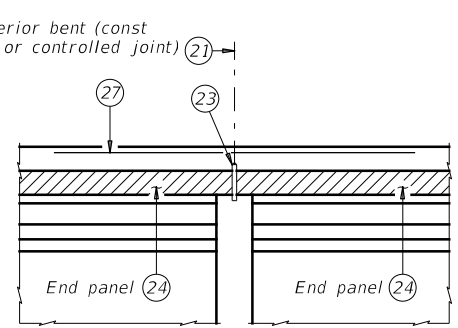


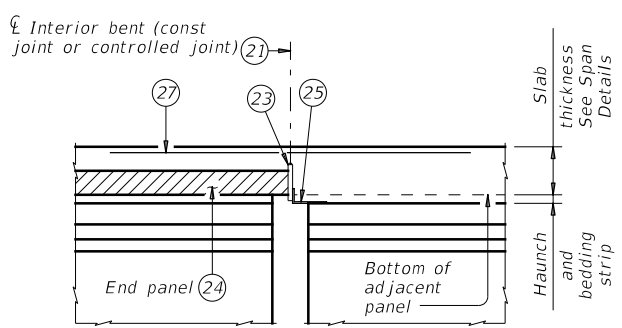
TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



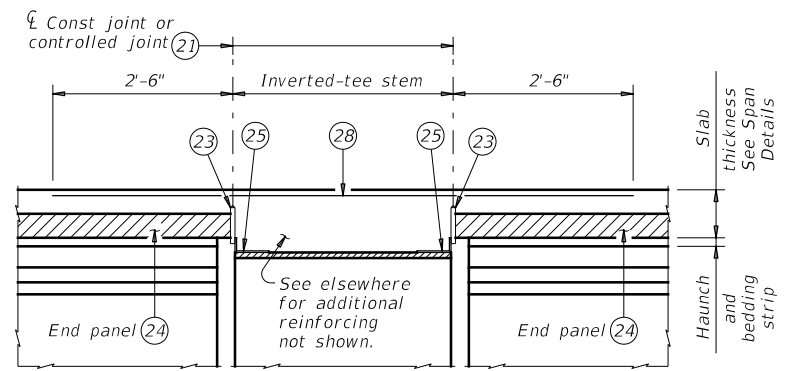
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)
 For SEJ-A, SEJ-S(0), AJ, and Type A expansion joints only.



CONVENTIONAL INTERIOR BENT
 Panel against panel between beams/girders.



CONVENTIONAL INTERIOR BENT
 Panel against beam/girder end in adjacent span.



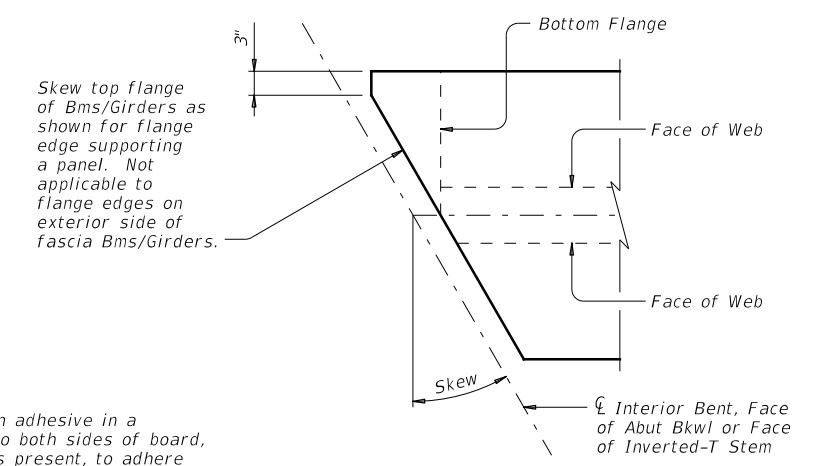
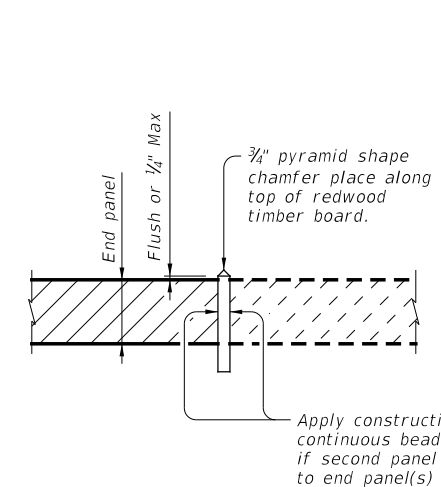
INVERTED-T BENT
 Panels against inverted-tee stem

OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)

ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)

See "Option 2 ~ Elevation At Beam Ends".

- (6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- (14) Max Spacing as listed unless otherwise shown.
- (21) 1 1/2" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)
- (22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than 1/2" thick.
- (23) 3/4" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within 1/4" Max above panel. Place 3/4" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within 1/4" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.
- (24) Place panel within 1/2" of 3/4" thick board.
- (25) Permanent galvanized steel sheet form. Removable formwork is acceptable.
- (26) Place end panel within 1/2" of expansion joint opening. End panel cannot encroach on required expansion joint opening.
- (27) Place additional (#4) bar 5'-0" in length between every slab bars T. Center (#4) bar on Joint.
- (28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.



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

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

SPECIAL OPTION 2 CONSTRUCTION NOTES:

- When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.
- Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 1/2".
- Do not extend the longitudinal panel reinforcement into the cast-in-place slab.
- Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.
- Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.
- Bending of anchor studs of expansion joints shown on standards AJ, SEJ-A and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.
- Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.
- Provide Bars AA, G, K and OA from standard IGTS in the slab.

HL93 LOADING SHEET 4 OF 4

Texas Department of Transportation Bridge Division Standard

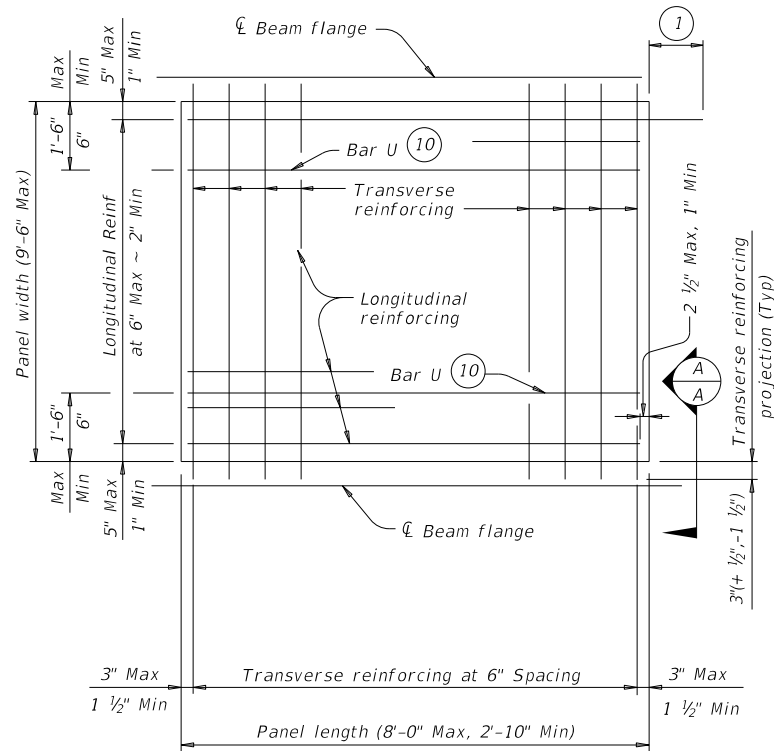
PRESTRESSED CONCRETE PANELS DECK DETAILS

PCP

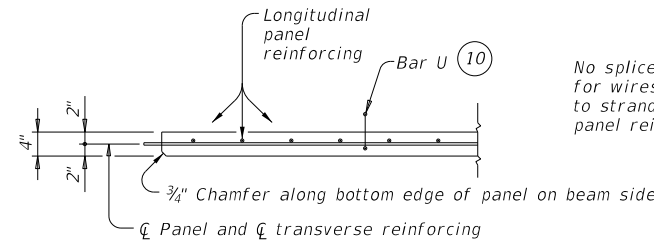
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	DIST	COUNTY	SHEET NO.	
	BRY	MADISON	75	

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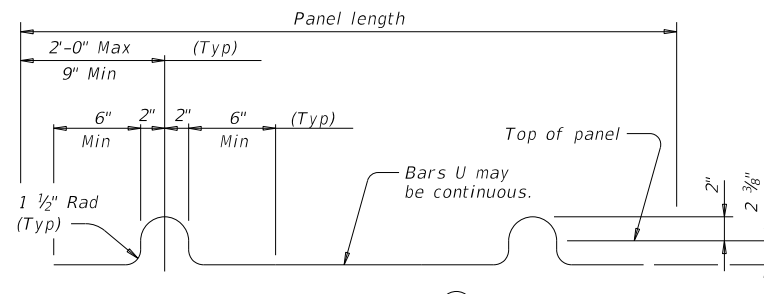


TYPICAL NON-SKEWED PANEL PLAN

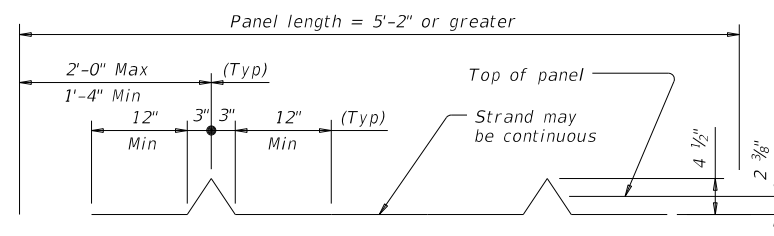


SECTION A-A

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



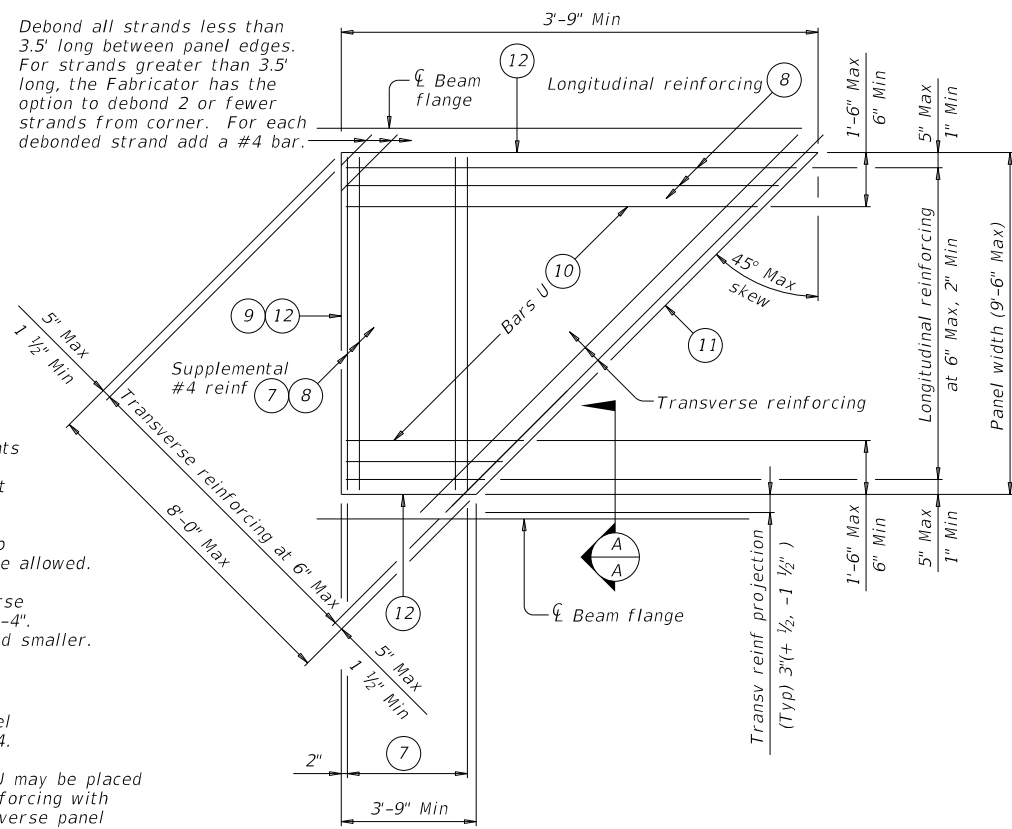
BARS U (#3)



OPTIONAL STRAND FOR BARS U

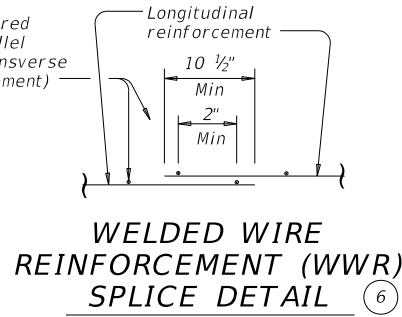
- 1 At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2", -0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
- 2 Four loops required per panel.
- 3 Four loops required per panel. 3/8" or 1/2" strands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

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.

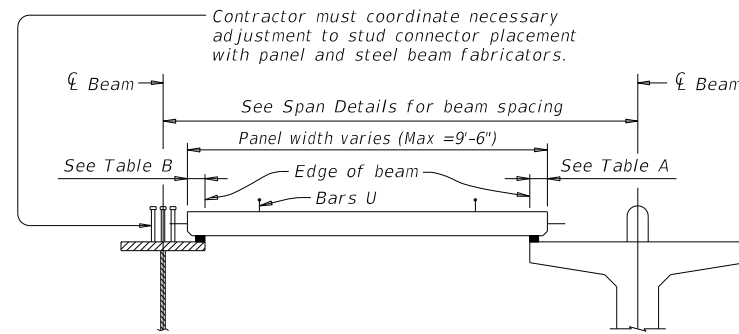


TYPICAL SKEWED END PANEL PLAN

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

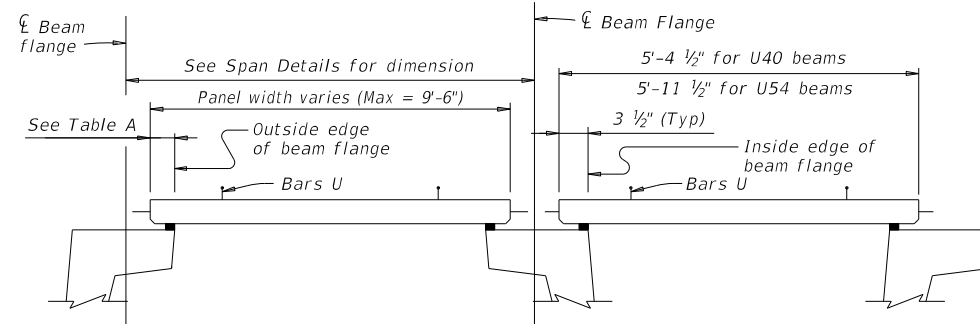


WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL



STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS
 Typ unless noted otherwise



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

Beam Type	TABLE A (4) (5)		
	Normal (In.)	Min (In.)	Max (In.)
A	3	2 1/2	3 1/2
B	3	2 1/2	3 1/2
C	4	3	4 1/2
IV	6	4	7 1/2
VI	6 1/2	4 1/2	8 1/2
U40 - 54	5 1/2	5 1/2	7
Tx28-70	6	5	7 1/2
XB20 - 40	4	3	4 1/2
XSB12 - 15	4	3	4 1/2

Top Flange Width	TABLE B (4) (5)		
	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 3/4	2 1/2	2 3/4
Over 12" to 15"	3 1/4	3	3 1/4
Over 15" to 18"	4	3	4 3/4
Over 18"	5	3 1/2	6 1/4

GENERAL NOTES:

- Provide Class H concrete for panels. Release strength $f'_{ci}=3,500$ psi. Minimum 28 day strength $f'_c=5,000$ psi.
- Provide 3/4" chamfer along bottom edge of panel on beam side.
- Do not use epoxy-coated reinforcing steel bar or strand in panels. Remove laitance from top panel surface.
- Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).
- Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.
- A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:

- For panel widths over 5', use 3/8" or 1/2" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.
- For panel widths over 3'-6" up to and including 5', use 3/8" or 1/2" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.
- For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).
- Place transverse panel reinforcement at panel centroid and space at 6" Max.

LONGITUDINAL PANEL REINFORCEMENT:

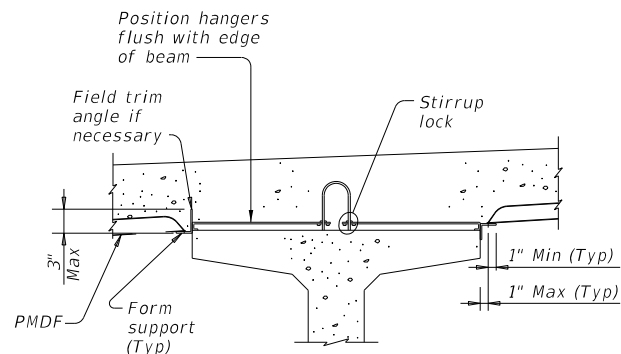
- Any of the following options may be used for longitudinal panel reinforcement:
 1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
 2. 3/8" Dia prestressing strands at 4 1/2" Max Spacing (unstressed). No splices allowed.
 3. 1/2" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
 4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.
- No combination of longitudinal reinforcement options in a panel is allowed.
- Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.

HL93 LOADING

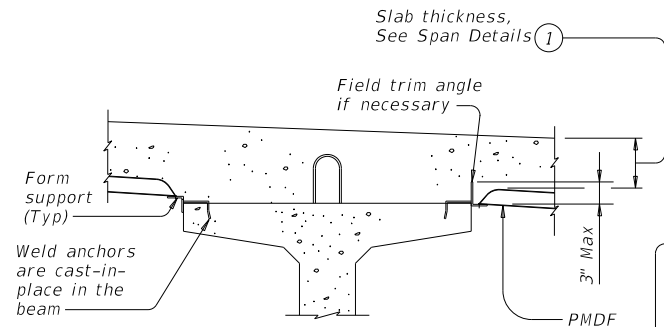
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PRESTRESSED CONCRETE PANEL FABRICATION DETAILS			
PCP-FAB			
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©TxDOT April 2019	CONTRACT: 0552	SECTION: 02	JOB: 027
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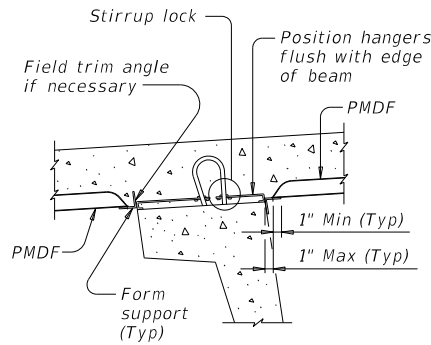
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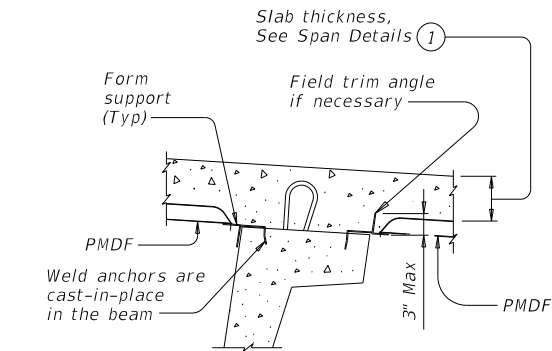
PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS



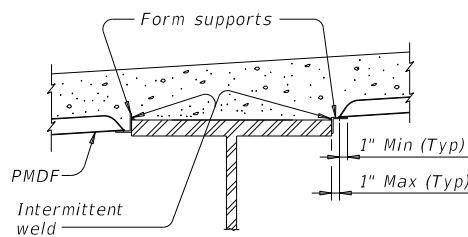
PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS



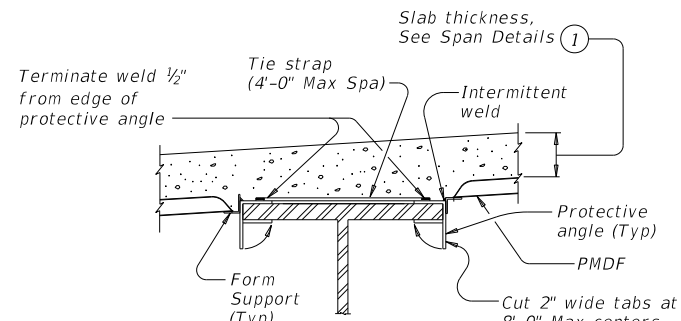
U-BEAMS WITH STIRRUP LOCKS



U-BEAMS WITH WELD ANCHORS

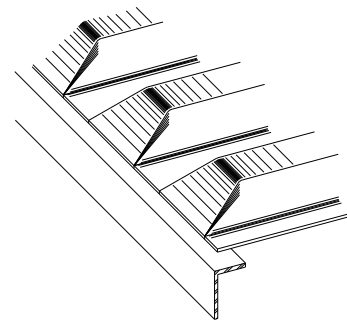


STEEL BEAMS AT COMPRESSION FLANGES

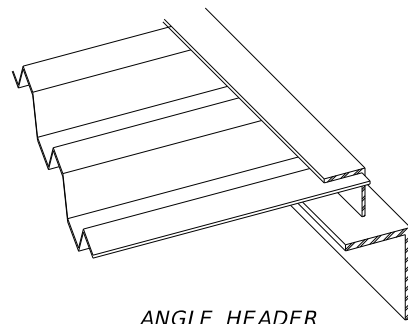


STEEL BEAMS AT TENSION FLANGES (2)

TYPICAL TRANSVERSE SECTIONS



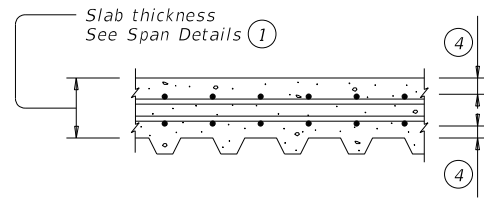
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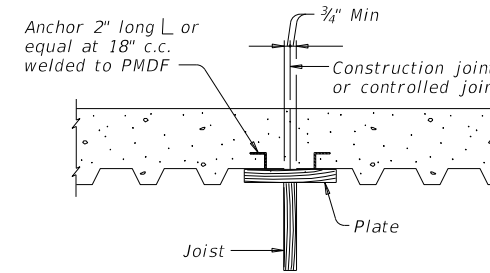
ANGLE HEADER

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

TYPES OF END CLOSURES



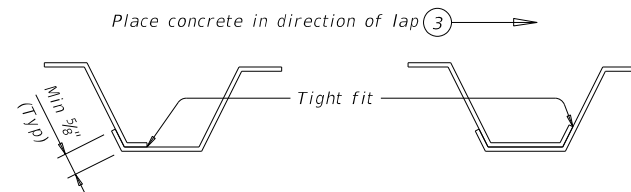
TYP LONGITUDINAL SLAB SECTION



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

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.



SIDE LAP DETAILS

- Slab thickness minus 5/8" if corrugations match reinforcing bars.
- 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.
- The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.
- See Span details for cover requirements.

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.

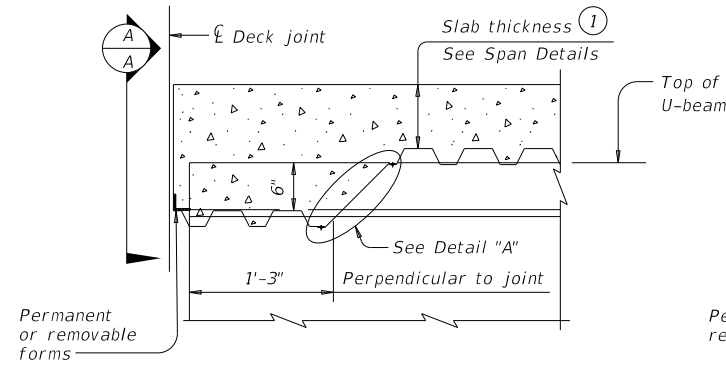
The form design span must not be less than the clear distance between beam flanges, measured parallel to the form flutes, minus 2".

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 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.

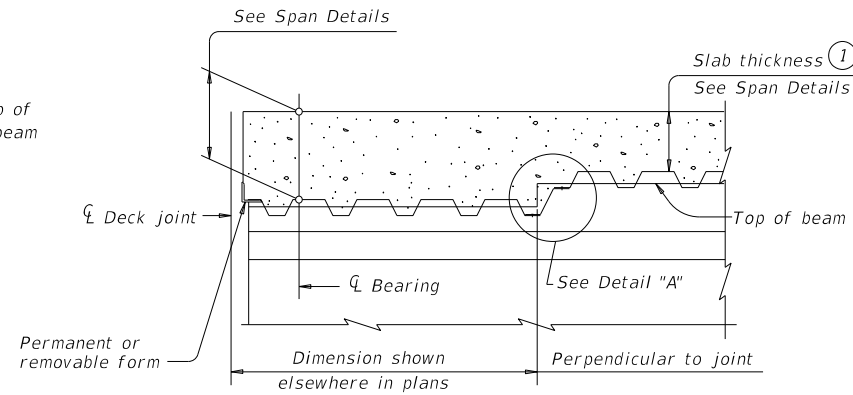
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02-20: Modified box note by adding steel beams/girders and subsidiary	DIST	COUNTY	SHEET NO.
12-21: Updated max deflection for RR.	BRY	MADISON	81

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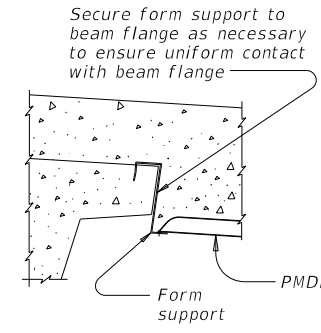
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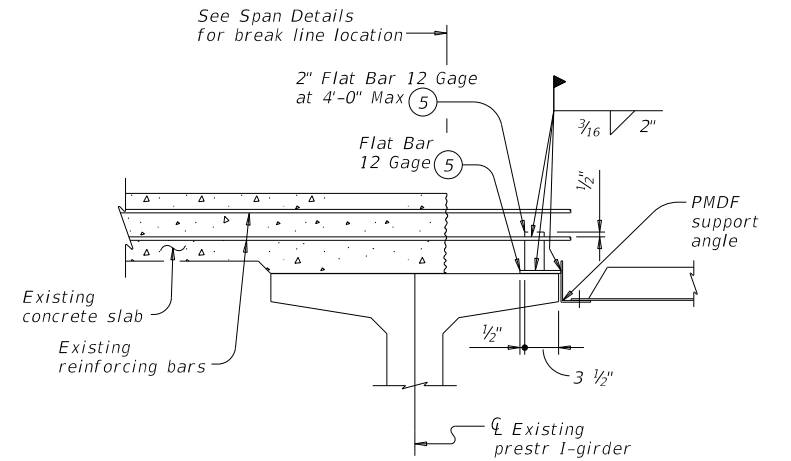
AT THICKENED SLAB END FOR U-BEAMS



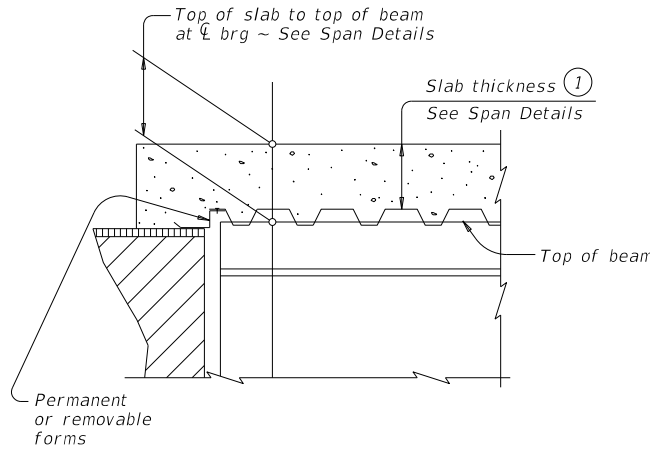
AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS
 Showing I-beam block-out. No block-out for I-girders or steel beams.



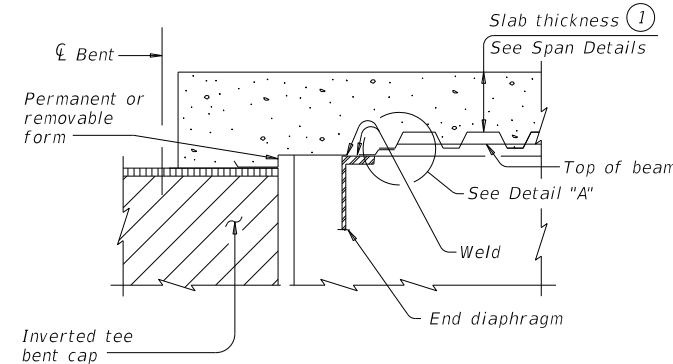
SECTION A-A



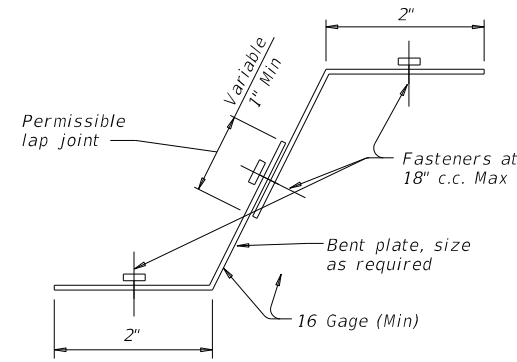
SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS



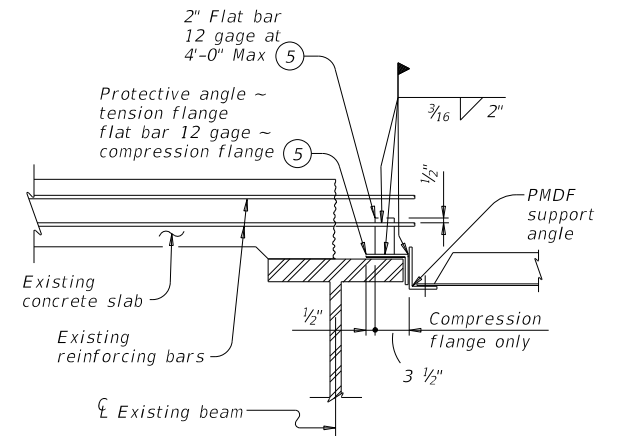
AT SLAB OVER ABUT BKWL OR INV TEE STEM FOR CONC BEAMS WITHOUT THICKENED SLAB END



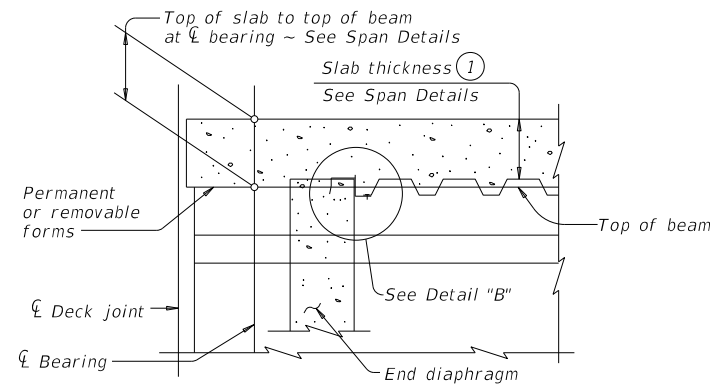
AT SLAB OVER INV TEE STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END



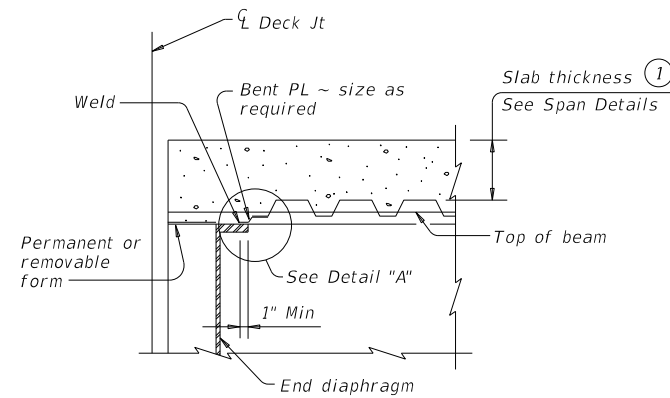
DETAIL "A"



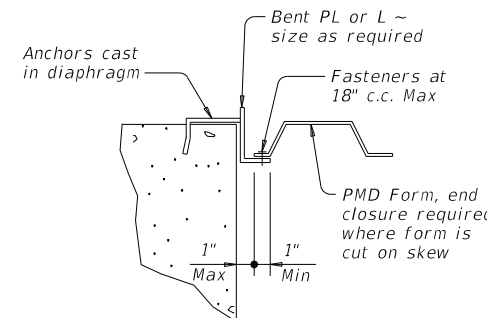
SHOWING STEEL BEAMS



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

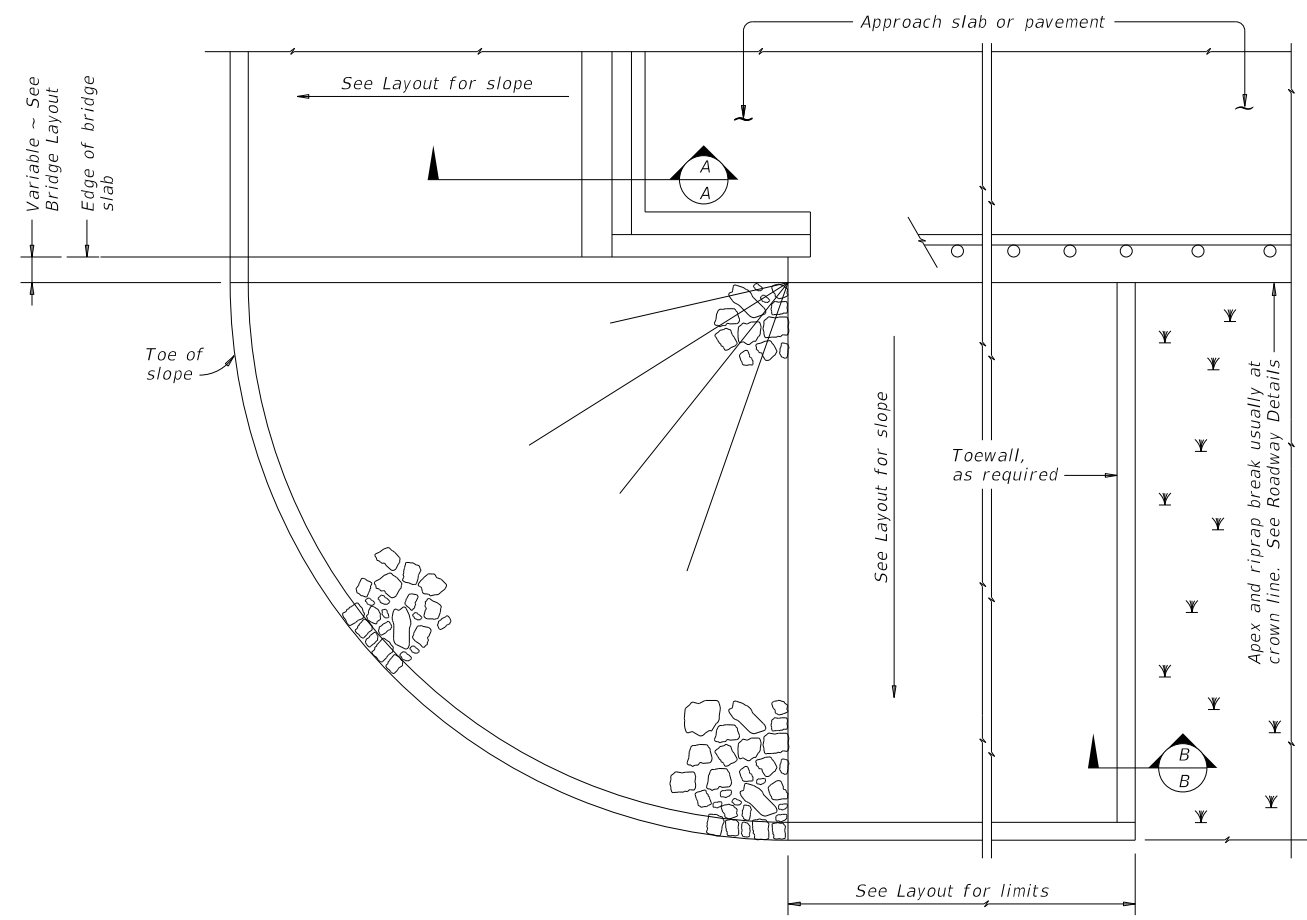
WIDENING DETAILS

SHEET 2 OF 2

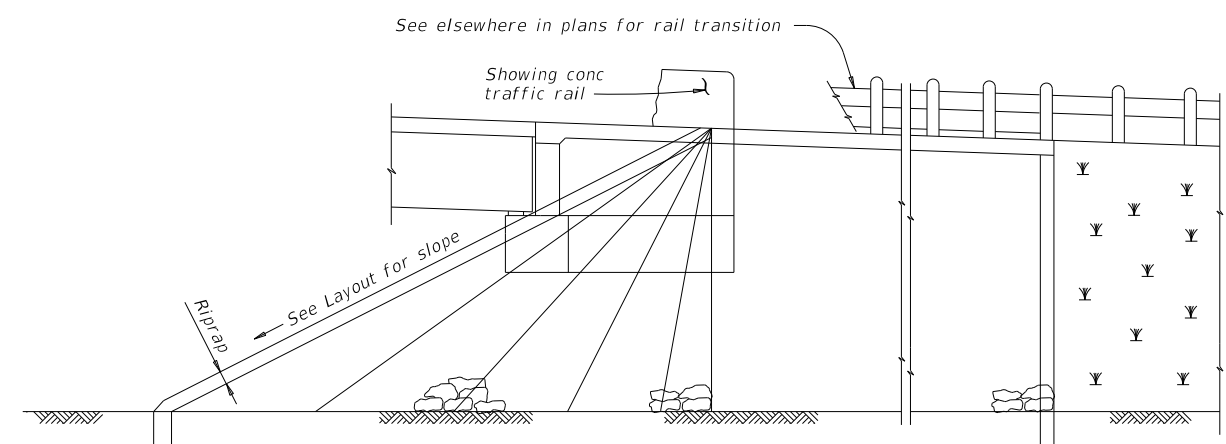
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©TxDOT April 2019	CONTRACT	SECTION	JOB
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02-20: Modified box note by adding steel beams/girders and Subsidiary	DIST	COUNTY	SHEET NO.
12-21: Updated max deflection for RR.	BRY	MADISON	82

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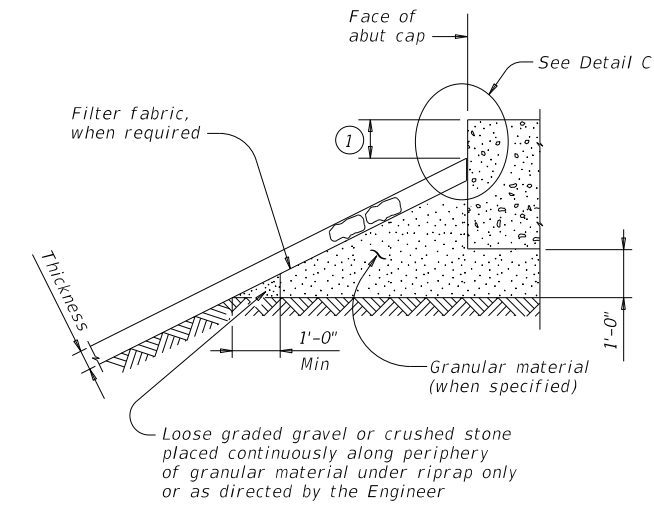
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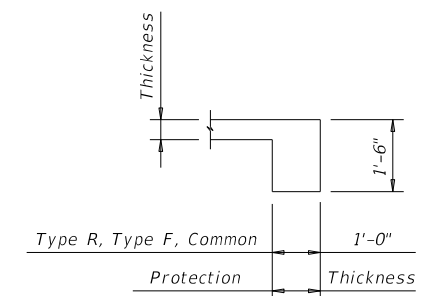
PLAN



ELEVATION

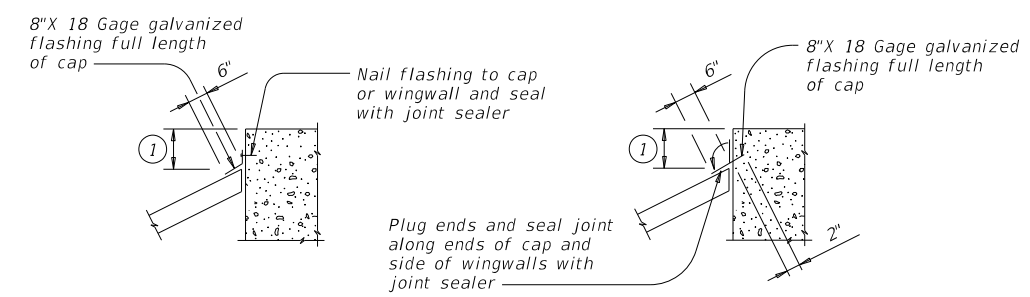


SECTION A-A AT CAP



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.

		Bridge Division Standard	
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<h2>SRR</h2>			
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	DIST	COUNTY	SHEET NO.
	BRY	MADISON	83

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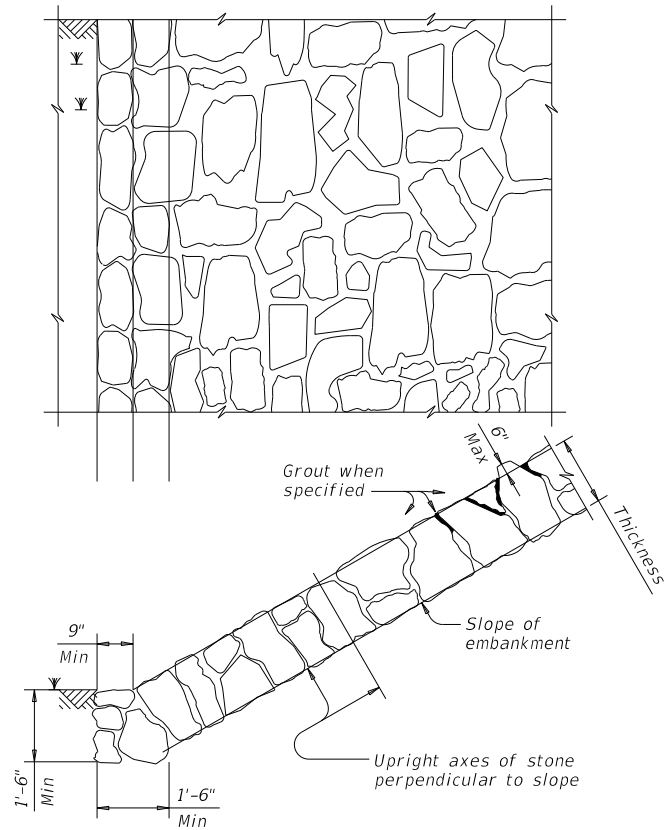


FIGURE 1 ~ TYPE R STONE RIPRAP
dry or grouted

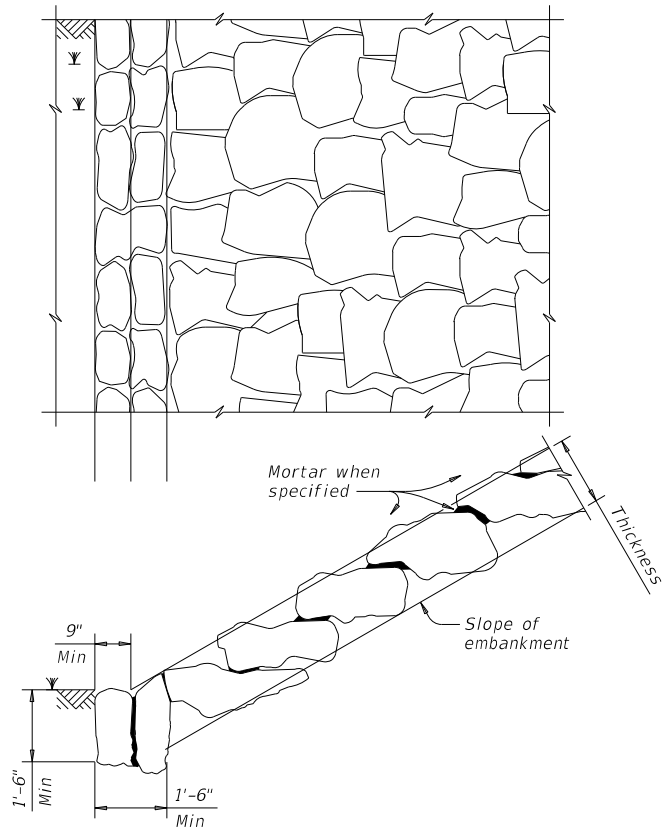


FIGURE 2 ~ TYPE F STONE RIPRAP
dry or mortared

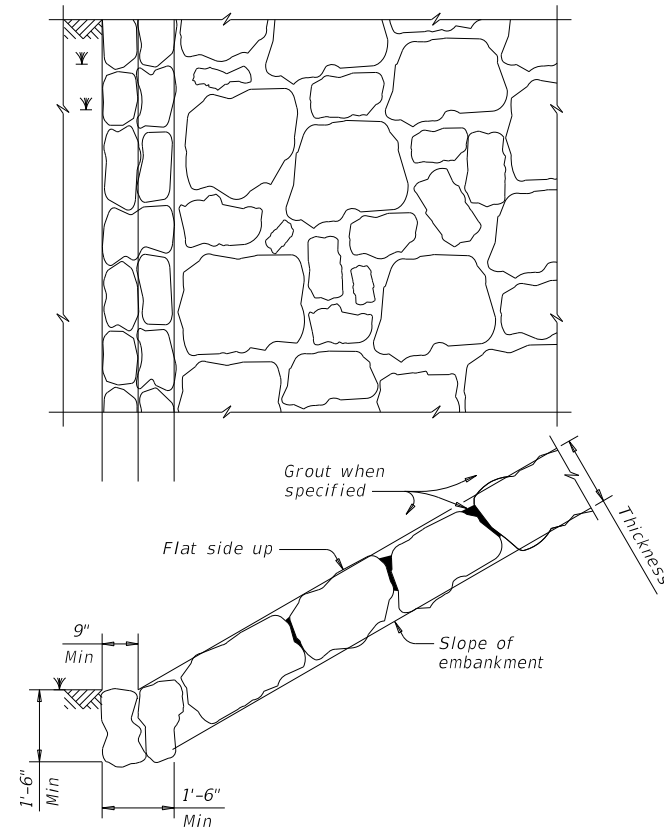


FIGURE 3 ~ TYPE F STONE RIPRAP
grouted

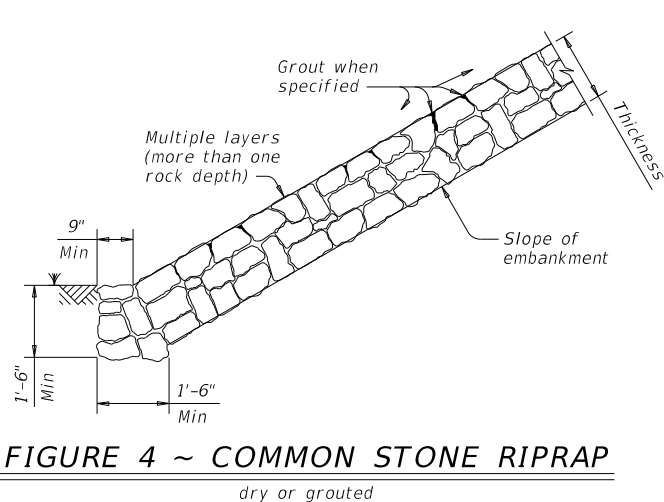
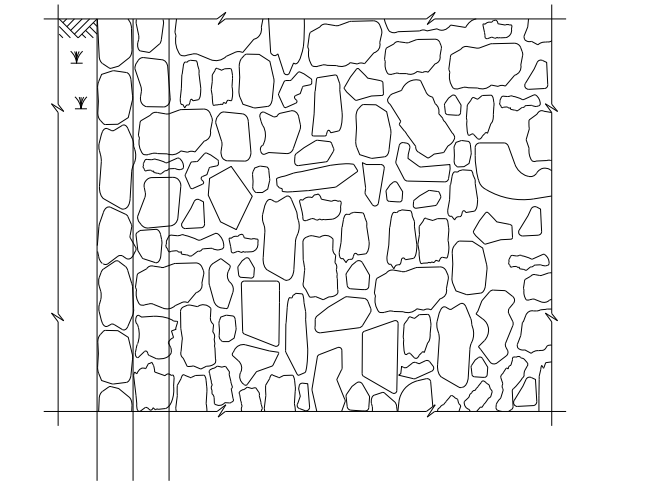


FIGURE 4 ~ COMMON STONE RIPRAP
dry or grouted

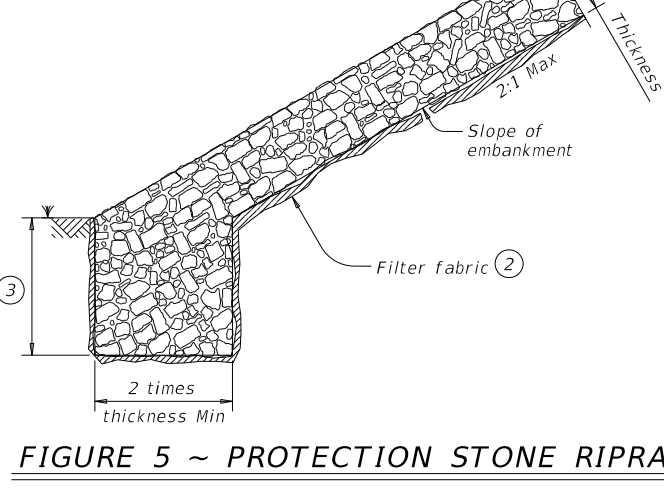
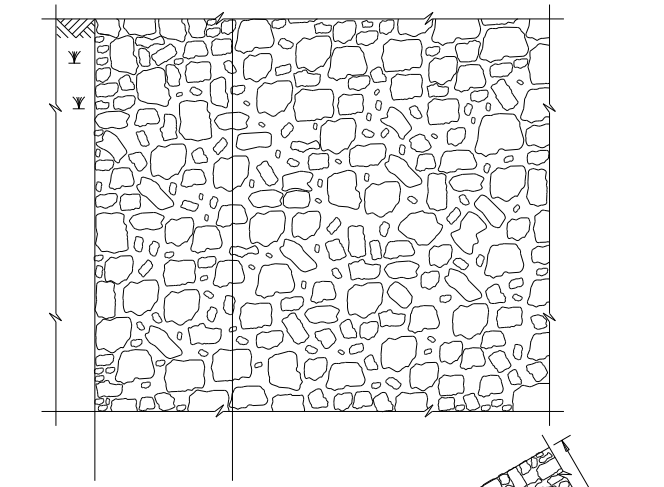
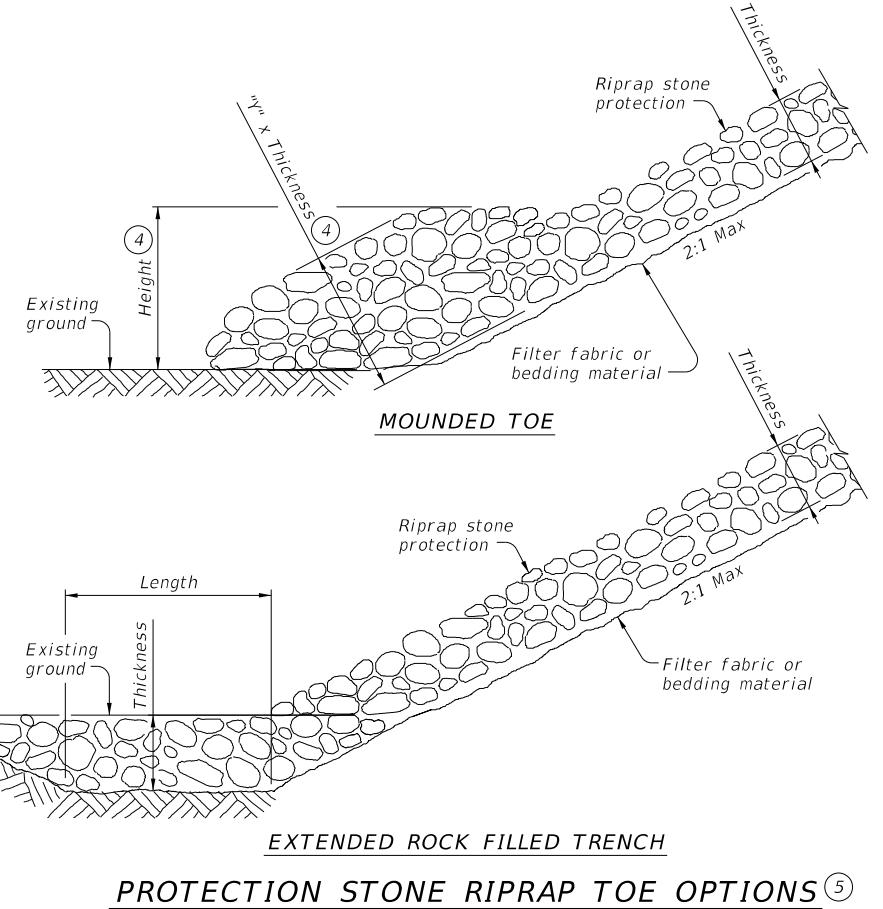


FIGURE 5 ~ PROTECTION STONE RIPRAP ⑤

- 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.



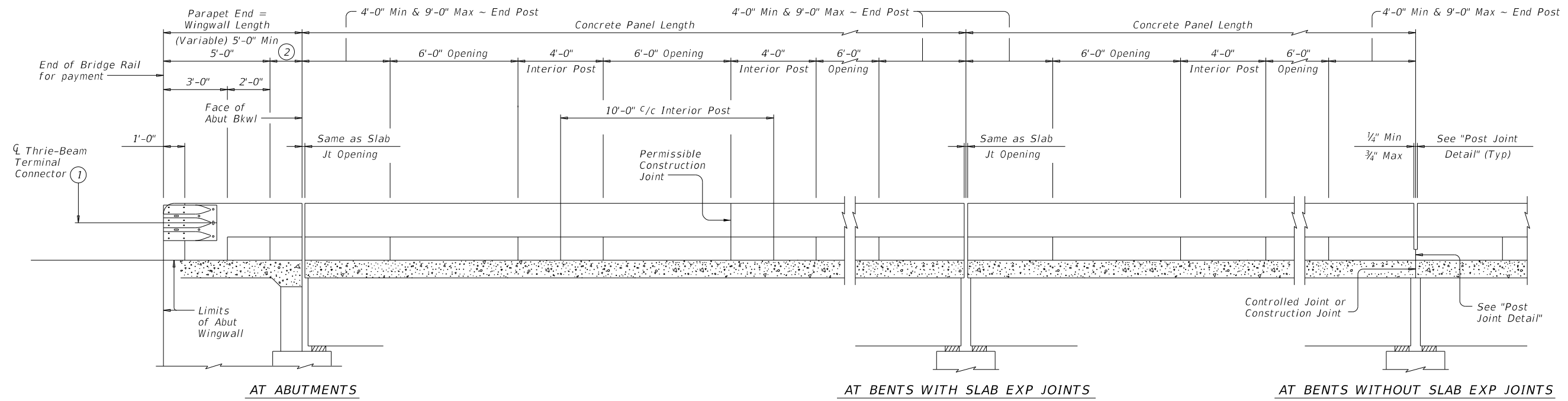
PROTECTION STONE RIPRAP TOE OPTIONS ⑤

SHEET 2 OF 2

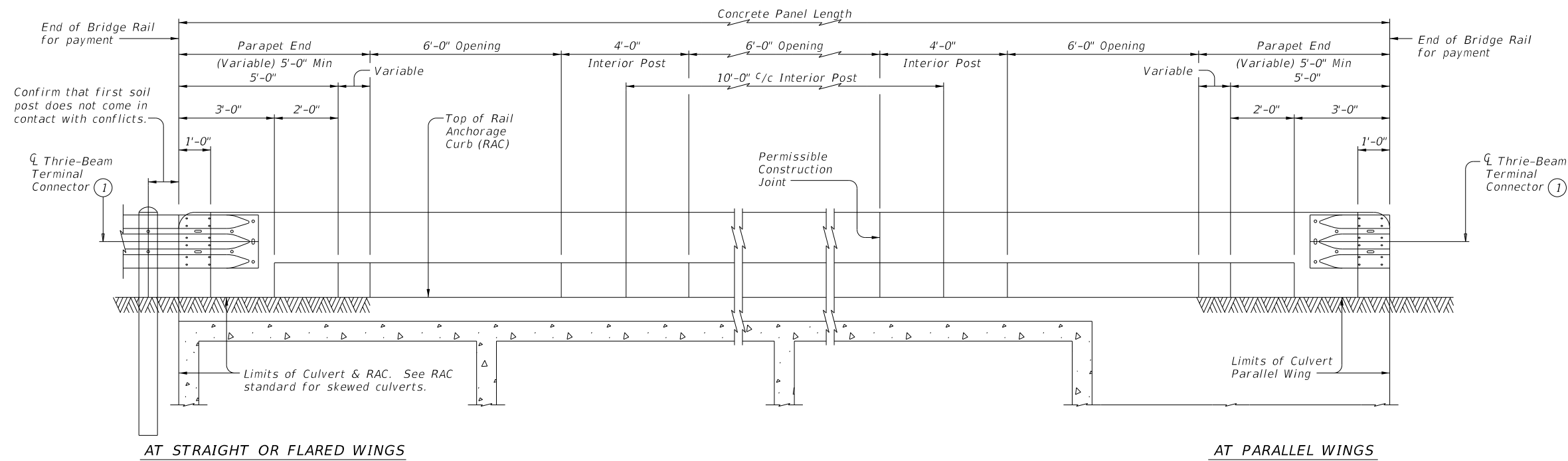
		Bridge Division Standard	
<h2>STONE RIPRAP</h2>			
<h3>SRR</h3>			
FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH
©TxDOT April 2019	CONT: 0552	SECT: 02	JOB: 027
REVISIONS			HIGHWAY: FM978
	DIST: BRY	COUNTY: MADISON	SHEET NO: 84

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DATE: 6/17/2020 6:51:48 PM
 FILE: c:\pwworking\centra101\d1612360\rlstd005-19.dgn



ROADWAY ELEVATION OF RAIL ON BRIDGE



ROADWAY ELEVATION OF RAIL ON BOX CULVERTS

Showing 0° skew culvert. Skewed culverts similar. See RAC standard for details not shown. Vertical joints in concrete rail are not required, unless shown elsewhere.

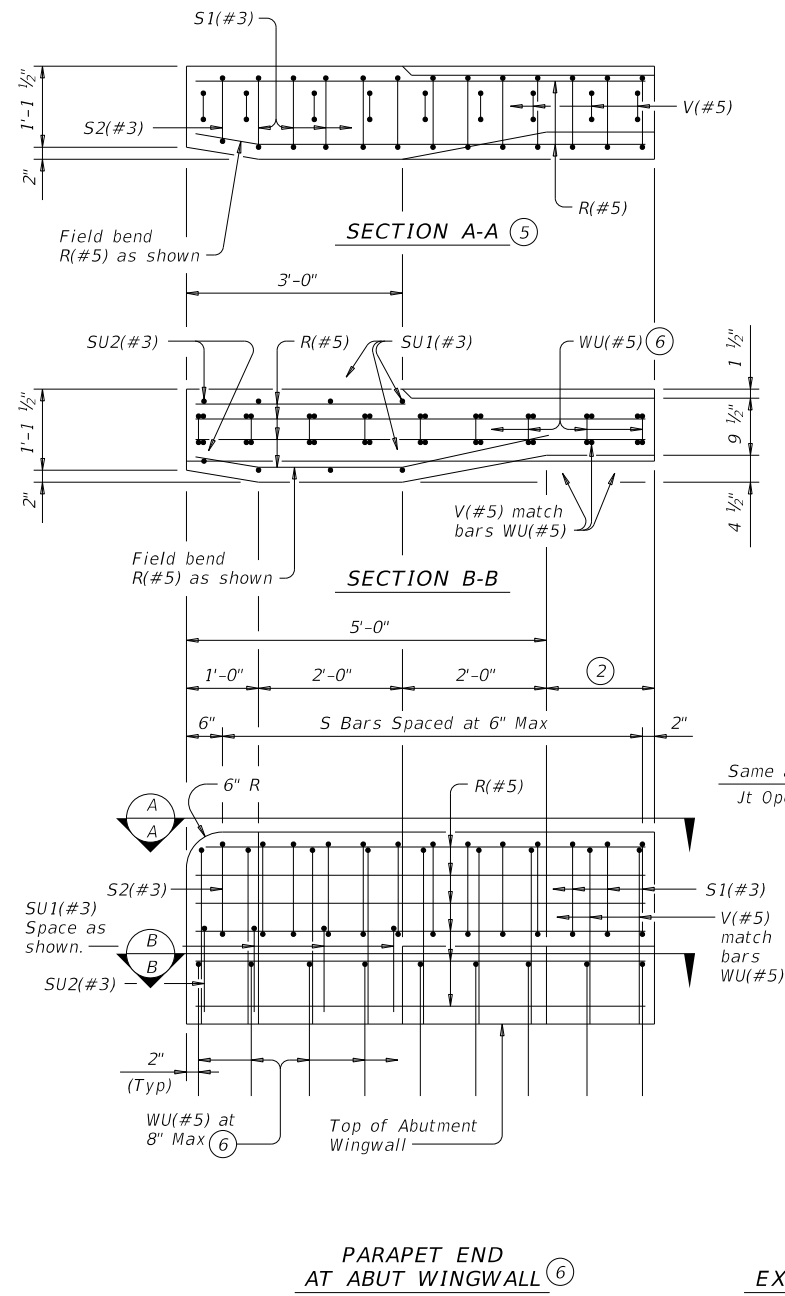
- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Wingwall Length minus 5'-0" (Varies)

SHEET 1 OF 3

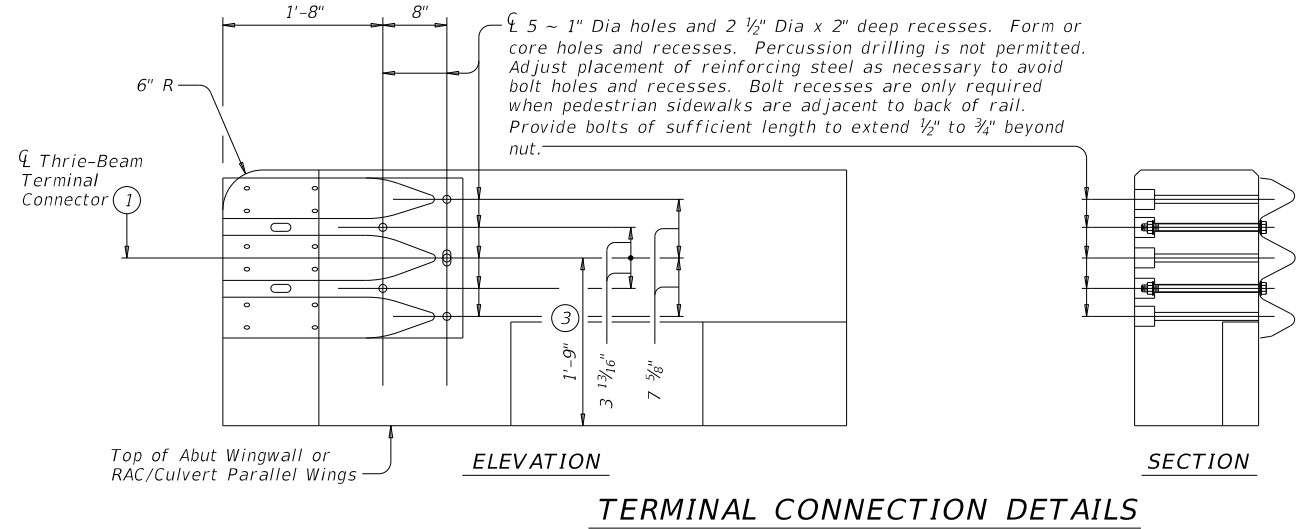
				Bridge Division Standard	
<h2>TRAFFIC RAIL</h2>					
<h3>TYPE T223</h3>					
FILE: r1std005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES	
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0552	02	027	FM978	
	DIST	COUNTY	SHEET NO.		
	BRY	MADISON	85		

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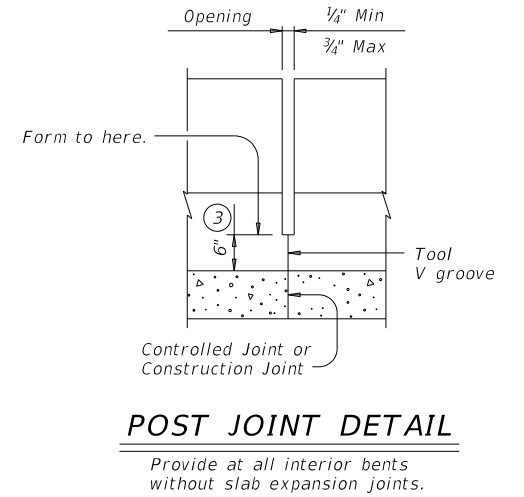
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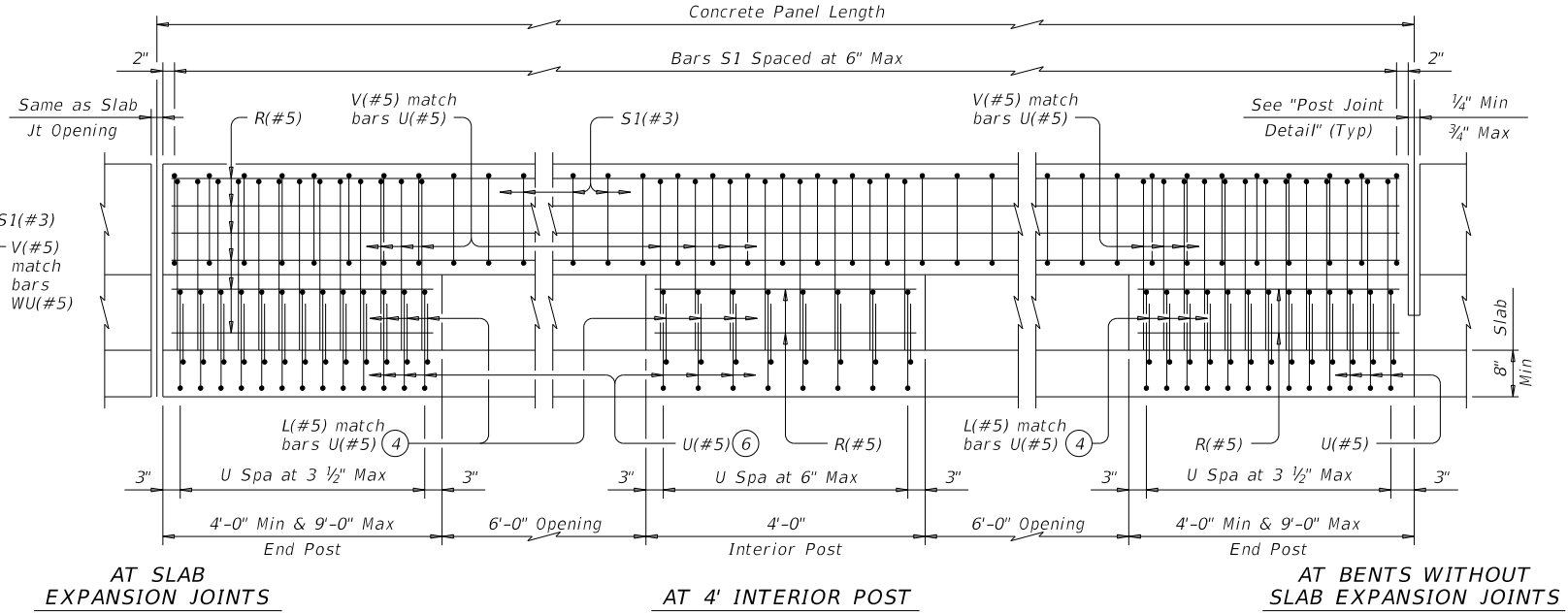
PARAPET END AT ABUT WINGWALL ⑥



TERMINAL CONNECTION DETAILS



POST JOINT DETAIL



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

Showing rail on slab. Rail on box culvert similar.

- 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 Wingwall Length minus 5'-0" (Varies)
- ③ Increase 2" for structures with overlay.
- ④ Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.
- ⑤ Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.
- ⑥ Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

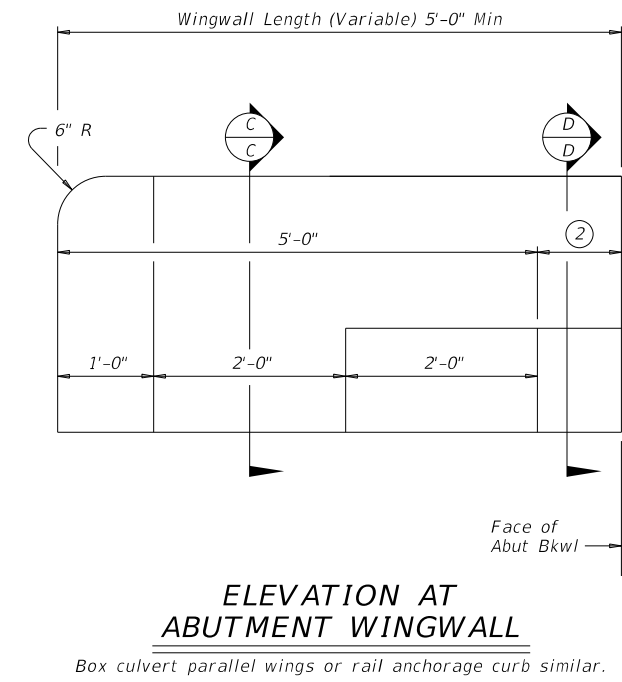
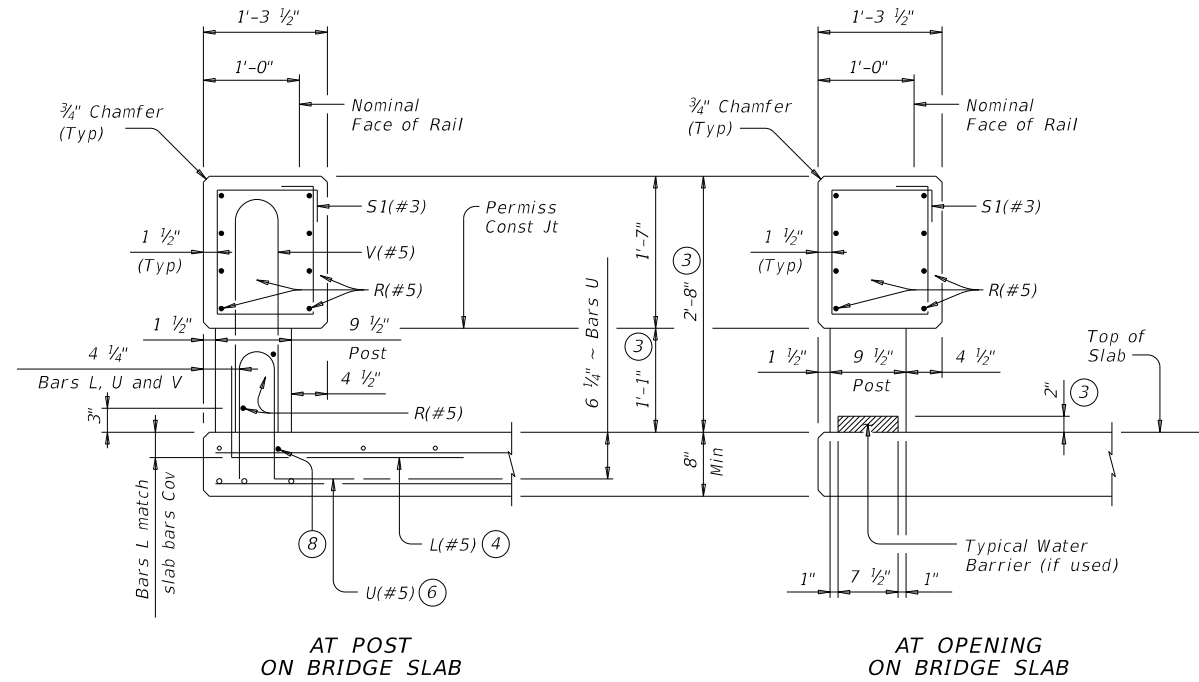
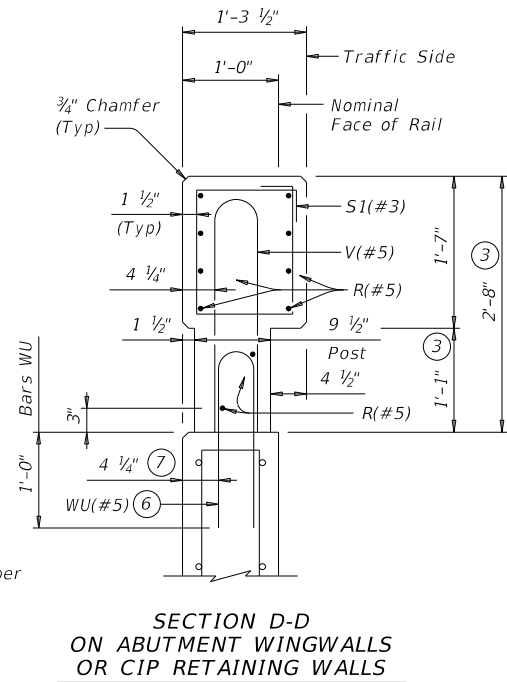
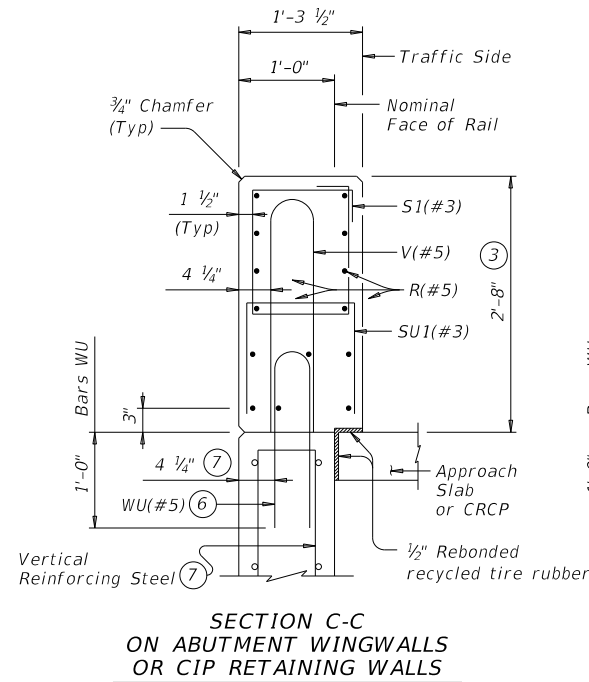
TRAFFIC RAIL

TYPE T223

FILE: r1std005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
DIST	COUNTY		SHEET NO.	
BRY	MADISON		86	

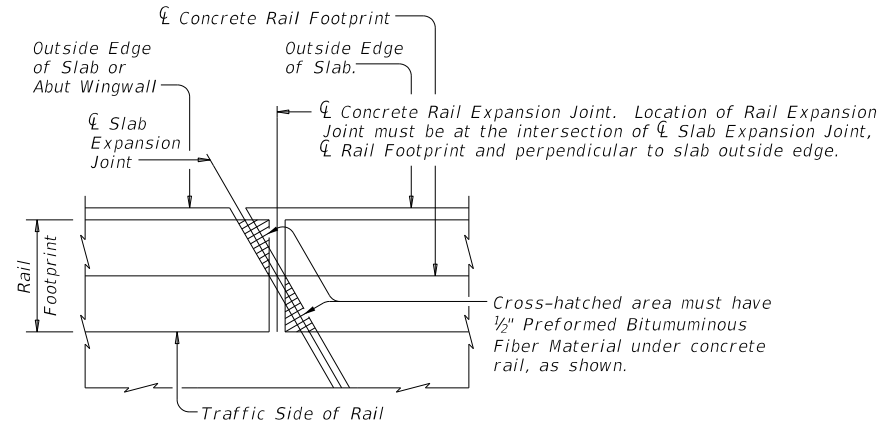
DISCLAIMER: This standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 6/17/2020 6:51:51 PM
 FILE: c:\pwworking\centra101\d1612360\rlstd005-19.dgn



SECTIONS THRU RAIL
 Sections on box culverts similar.

- ② Wingwall Length minus 5'-0" (Varies)
- ③ Increase 2" for structures with overlay.
- ④ Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.
- ⑥ Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.
- ⑦ When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on traffic side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars conflict.
- ⑧ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑨ At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5 1/4" above the roadway surface without overlay.



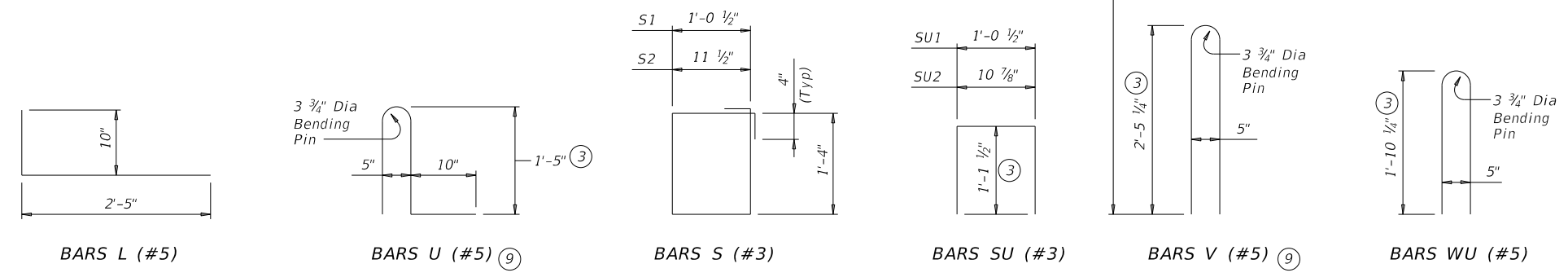
PLAN OF RAIL AT EXPANSION JOINTS
 Example showing Slab Expansion Joints without breakbacks.

CONSTRUCTION NOTES:
 Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.
 Provide water barriers at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.
 Chamfer all exposed 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 Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise. Provide the same laps as required for reinforcing bars.
 Provide bar laps, where required, as follows:
 Uncoated or galvanized ~ #5 = 2'-0"
 Epoxy coated ~ #5 = 3'-0"

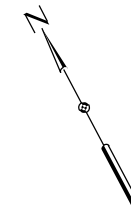
GENERAL NOTES:
 This rail has been evaluated by full-scale crash test to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph 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 358 plf.

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



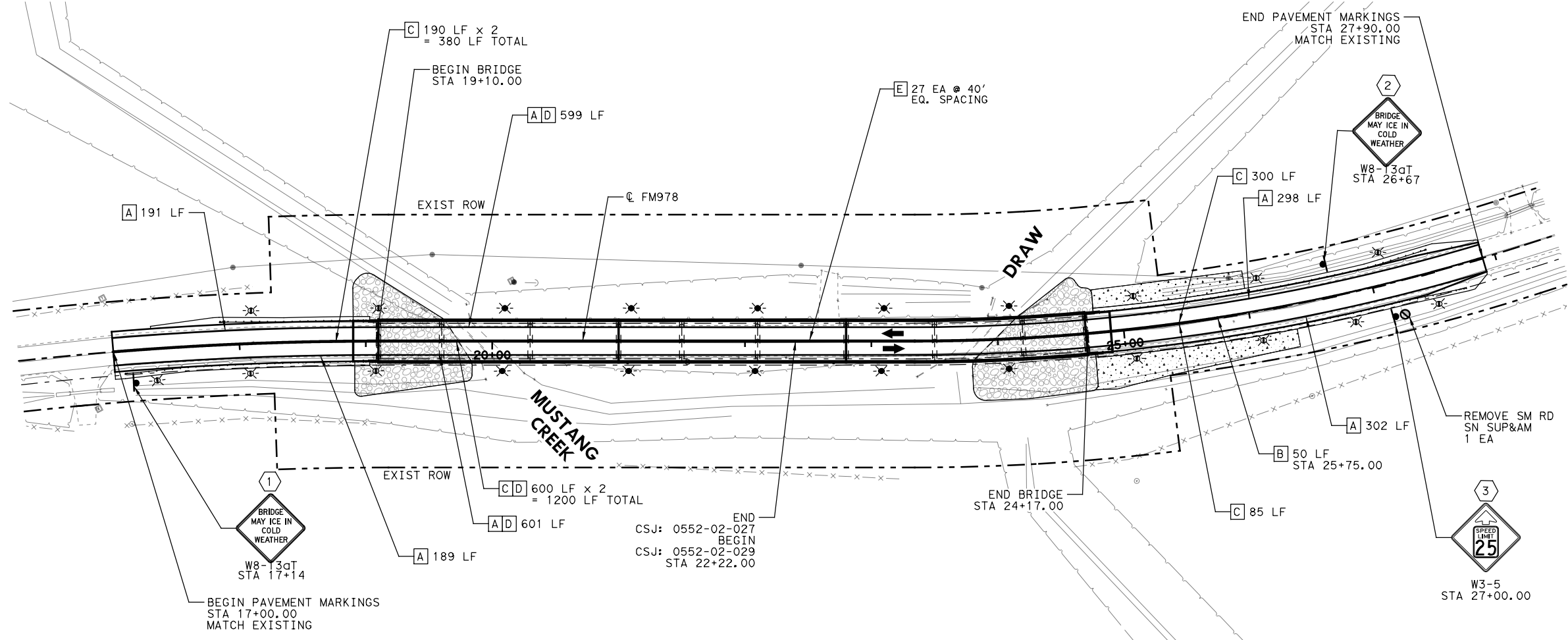
SHEET 3 OF 3

		Bridge Division Standard	
<h1>TRAFFIC RAIL</h1>			
<h2>TYPE T223</h2>			
FILE: r1std005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CONTRACT: 0552	SECTION: 02	JOB: 027
REVISIONS		HIGHWAY: FM978	
DIST: BRY	COUNTY: MADISON	SHEET NO: 87	



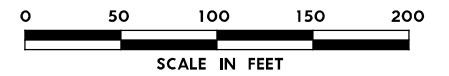
LEGEND

- A RE PM W/ RET REQ TY I (W) 6" (SLD)
- B RE PM W/ RET REQ TY I (Y) 6" (BRK)
- C RE PM W/ RET REQ TY I (Y) 6" (SLD)
- D PAVEMENT SEALER (6")
- E REFL PAV MRKR TY II A-A
- INSTL DEL ASSM (D-SW) SZ 1 (BRF) GF2 (BI)
- INSTL DEL ASSM (D-SW) SZ (BRF) CTB (BI)
- OBJECT MARKER
- PROPOSED SIGN
- EXISTING SIGN
- EXISTING SIGN TO BE REMOVED



NOTES:

1. ALL STATION AND OFFSETS ARE FROM "CL FM978" UNLESS OTHERWISE NOTED. SEE "HORIZONTAL ALIGNMENT DATA" SHEET FOR HORIZONTAL ALIGNMENT INFORMATION.
2. ALL PAVEMENT MARKINGS AND SIGNAGE SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD).



PHILIP A. FULTON
 73469
 REGISTERED PROFESSIONAL ENGINEER
Philip A. Fulton 03/17/2023

NO.	DATE	REVISION	APPROVED

HDR
 Firm Registration No. F-754
 710 Hesters Crossing, Suite 150
 Round Rock, Texas 78681
 512.685.2900

Texas Department of Transportation
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SIGNING AND PAVEMENT MARKING PLAN
FM 978

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL PROJECT NO.	HIGHWAY NO.
6	SEE TITLE SHEET	FM 978
STATE	DISTRICT	COUNTY
TEXAS	BRY	MADISON
CONTROL	SECTION	JOB
0552	02	027

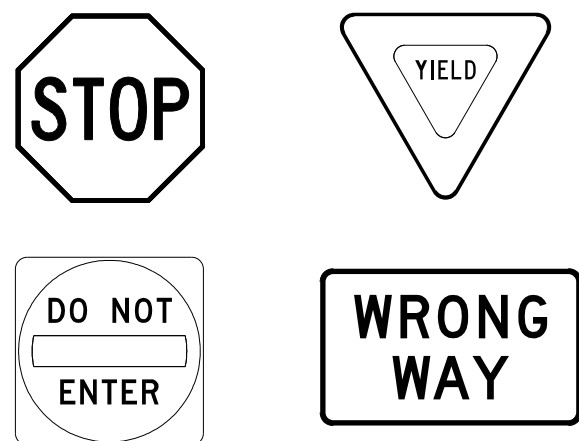
88

DATE: 6/17/2020 6:51:57 PM
 FILE: c:\pwworking\centra101\dl262436\tsr4-13.dgn

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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

GENERAL NOTES

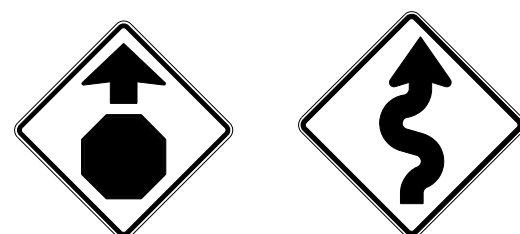
- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
- Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
- White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
- Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

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

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:
<http://www.txdot.gov/>

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

				Traffic Operations Division Standard	
<h2>TYPICAL SIGN REQUIREMENTS</h2>					
<h3>TSR (4) - 13</h3>					
FILE:	tsr4-13.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS		0552	02	027	FM978
12-03	7-13	DIST	COUNTY		SHEET NO.
9-08		BRY	MADISON		89

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DATE: FILE:

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS				DELINEATORS				D & OM DESCRIPTIVE CODES	
DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4	SINGLE		DOUBLE		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 BRFL = 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
SHEETING	Yellow, White or Red Type B or C reflective sheeting				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 (fix). 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.				POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
					MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

OBJECT MARKERS								D & OM DESCRIPTIVE CODES	
DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)	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 unit (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
SHEETING	Yellow-Type B _{FL} or C _{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroreflective 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	

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)			CHEVRONS				ONE DIRECTION LARGE ARROW		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.	
GF1 GF2 CTB 			W1-8 				W1-6 			
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.			SIZE (W x L)	18" x 24" (Conventional)	24" x 30" (Conventional Oversize)	30" x 36" (Expressway)	36" x 48" (Freeway)	SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
			MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only		MOUNTING HEIGHT	7'-0"	
SHEETING			Yellow, White, Red							
NOTE			1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches. 2. 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). 3. 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).							



DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION				
D & OM(1)-20				
FILE: dom1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM 978
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	BRY	MADISON		90

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POST TYPE AND SUPPORT FOUNDATION DETAILS

TYPE OF BARRIER MOUNTS

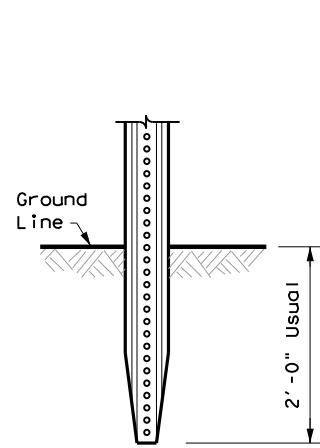
WING CHANNEL (WC)

FLEXIBLE POSTS (YFLX, WFLX)

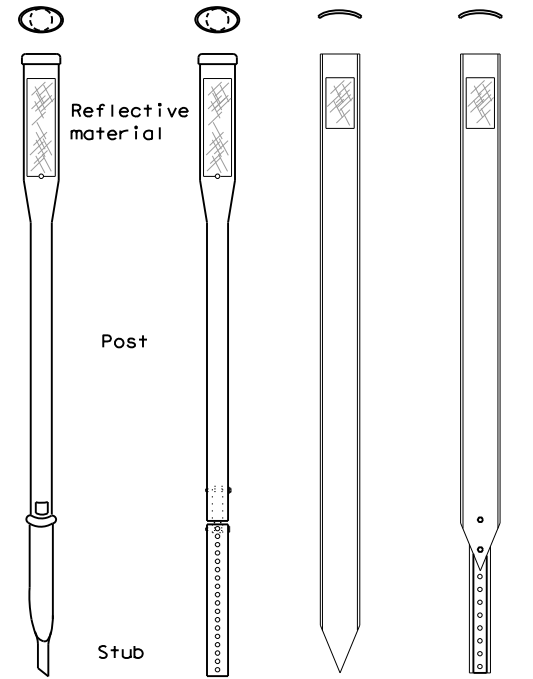
WEDGE ANCHOR SYSTEMS

GUARD FENCE ATTACHMENT

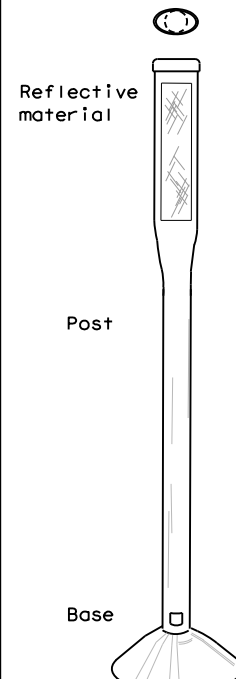
GND



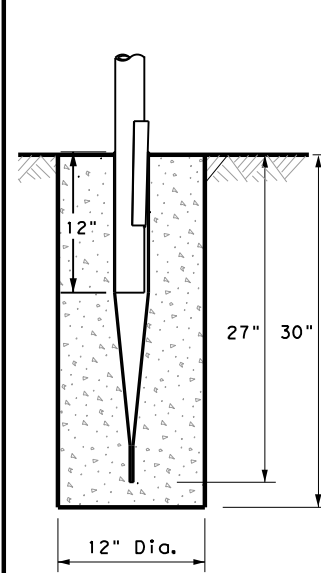
GND



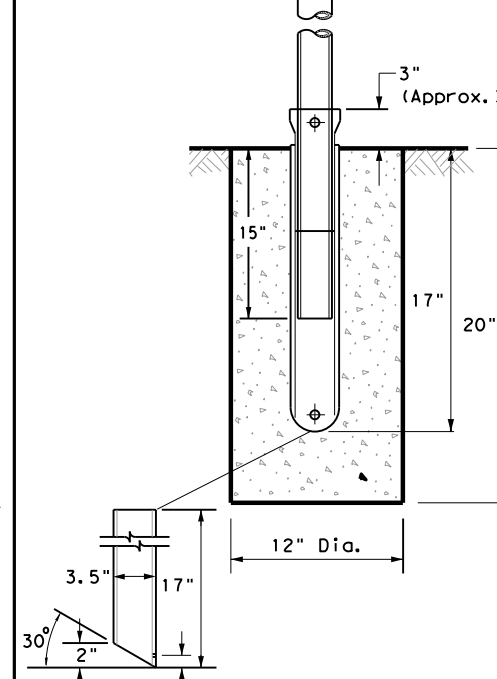
SRF



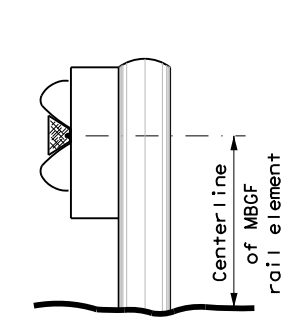
WAS



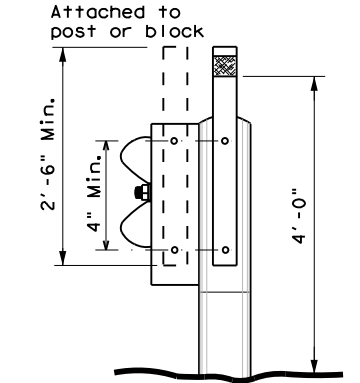
WAP



GF 1



GF 2



NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

NOTE

1. Install per manufacturer's recommendations.

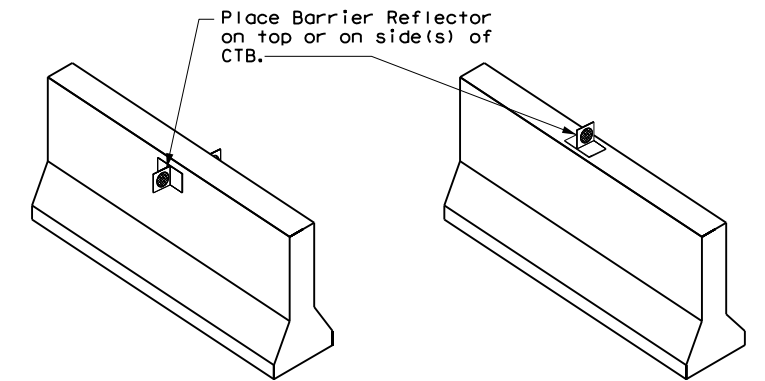
EMBEDDED

SURFACE MOUNT

STEEL

PLASTIC

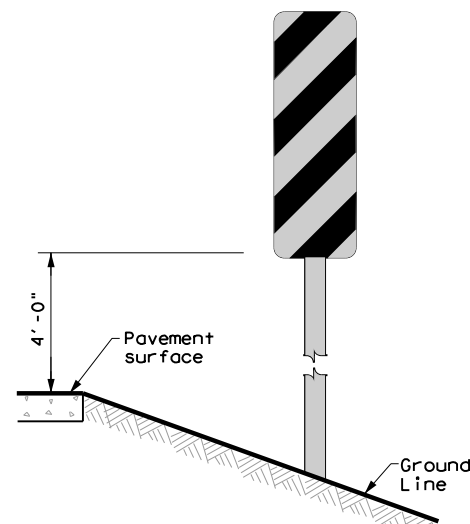
CONCRETE TRAFFIC BARRIER (CTB)



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.

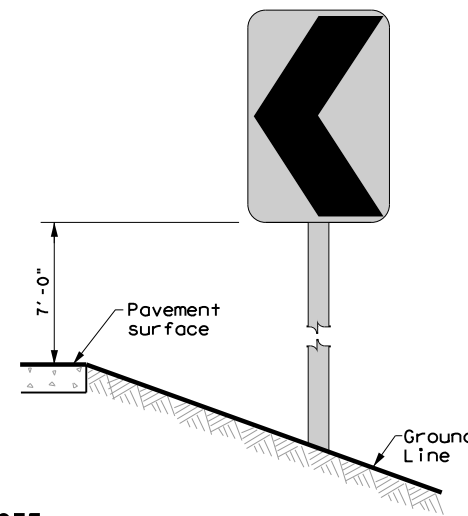
TYPES 1,3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

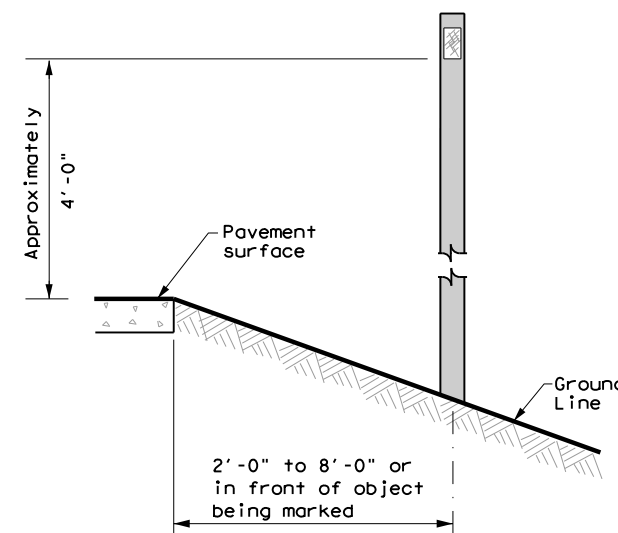
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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.

DATE:
FILE:



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
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4-10 7-20	BRY	MADISON	91	

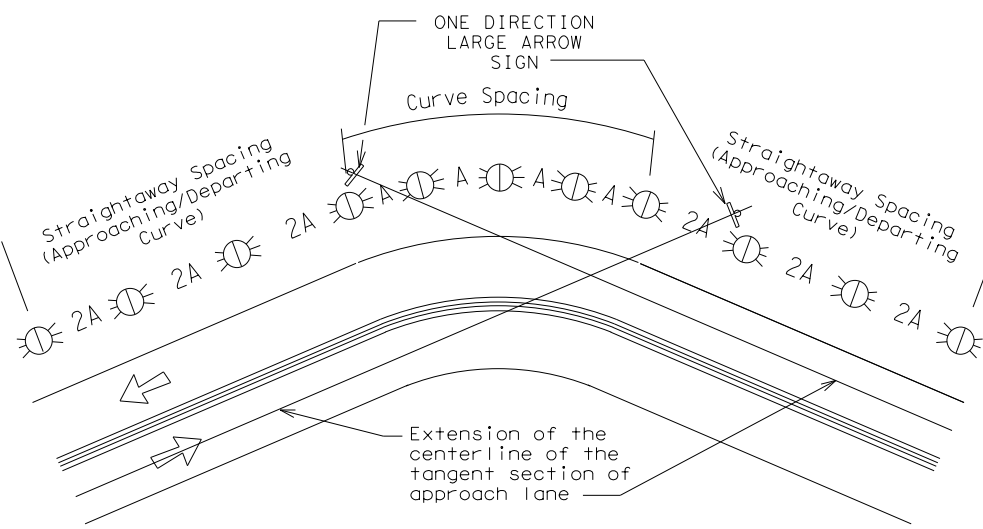
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MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

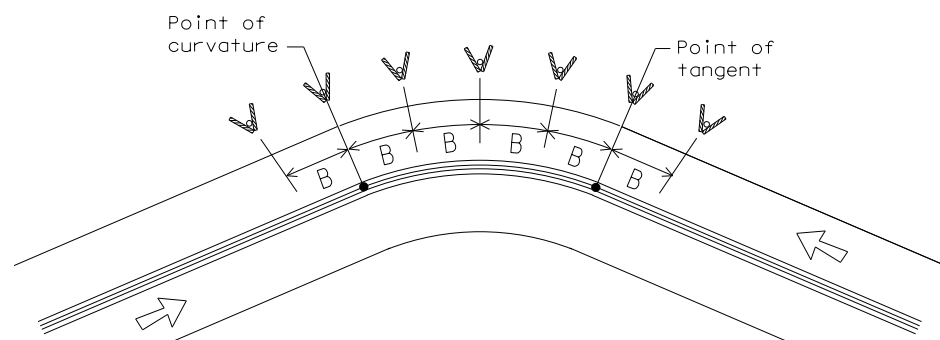
Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	● RPMs	● RPMs
15 MPH & 20 MPH	● RPMs and One Direction Large Arrow sign	● RPMs and Chevrons; or ● RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	● RPMs and Chevrons; or ● RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	● RPMs and Chevrons

SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE
 ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE
 At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

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

- Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
- Barrier reflectors may be used to replace required delineators.
- Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

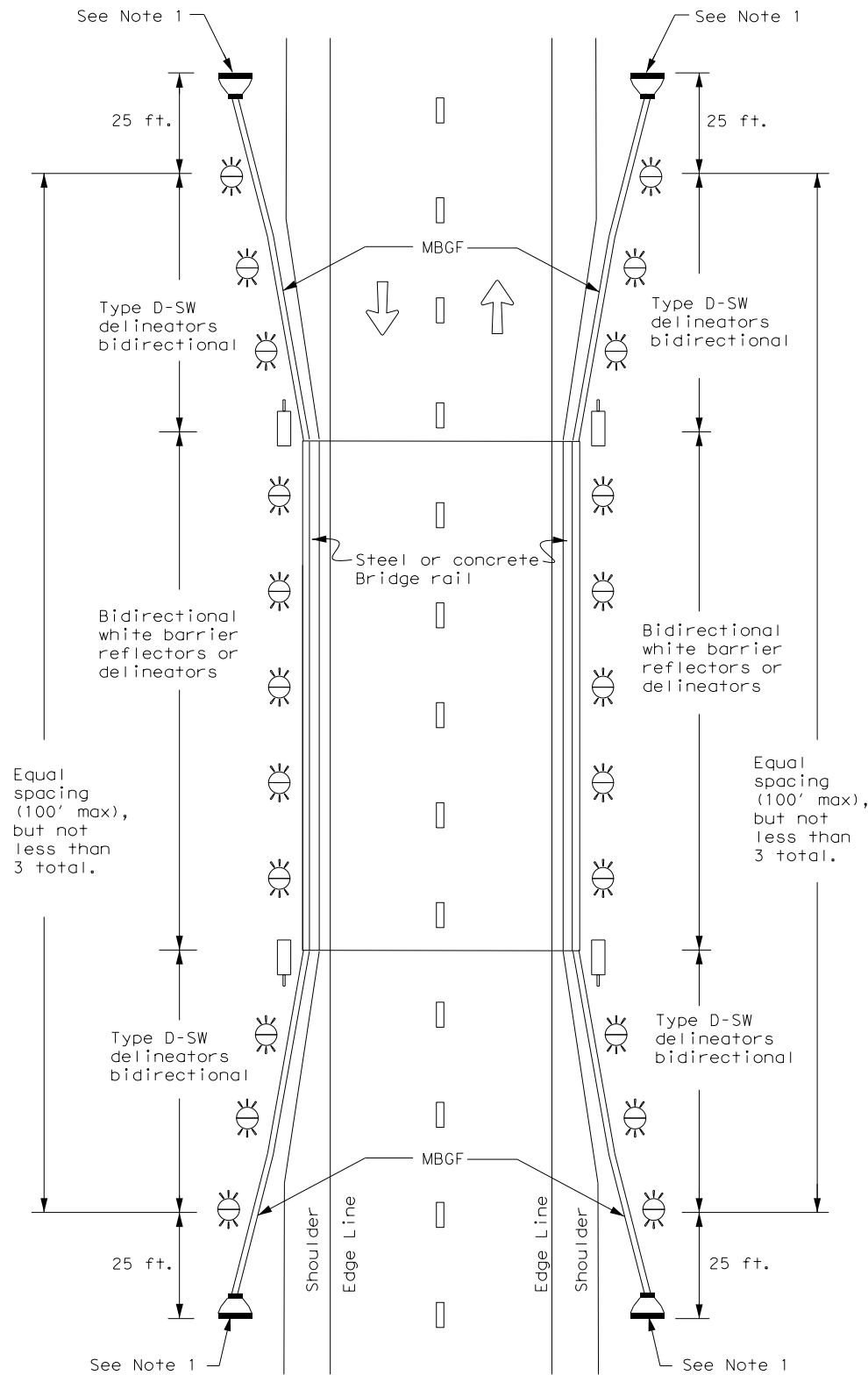


DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

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© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY	
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3-15 8-15	DIST	COUNTY		SHEET NO.	
8-15 7-20	BRY	MADISON		92	

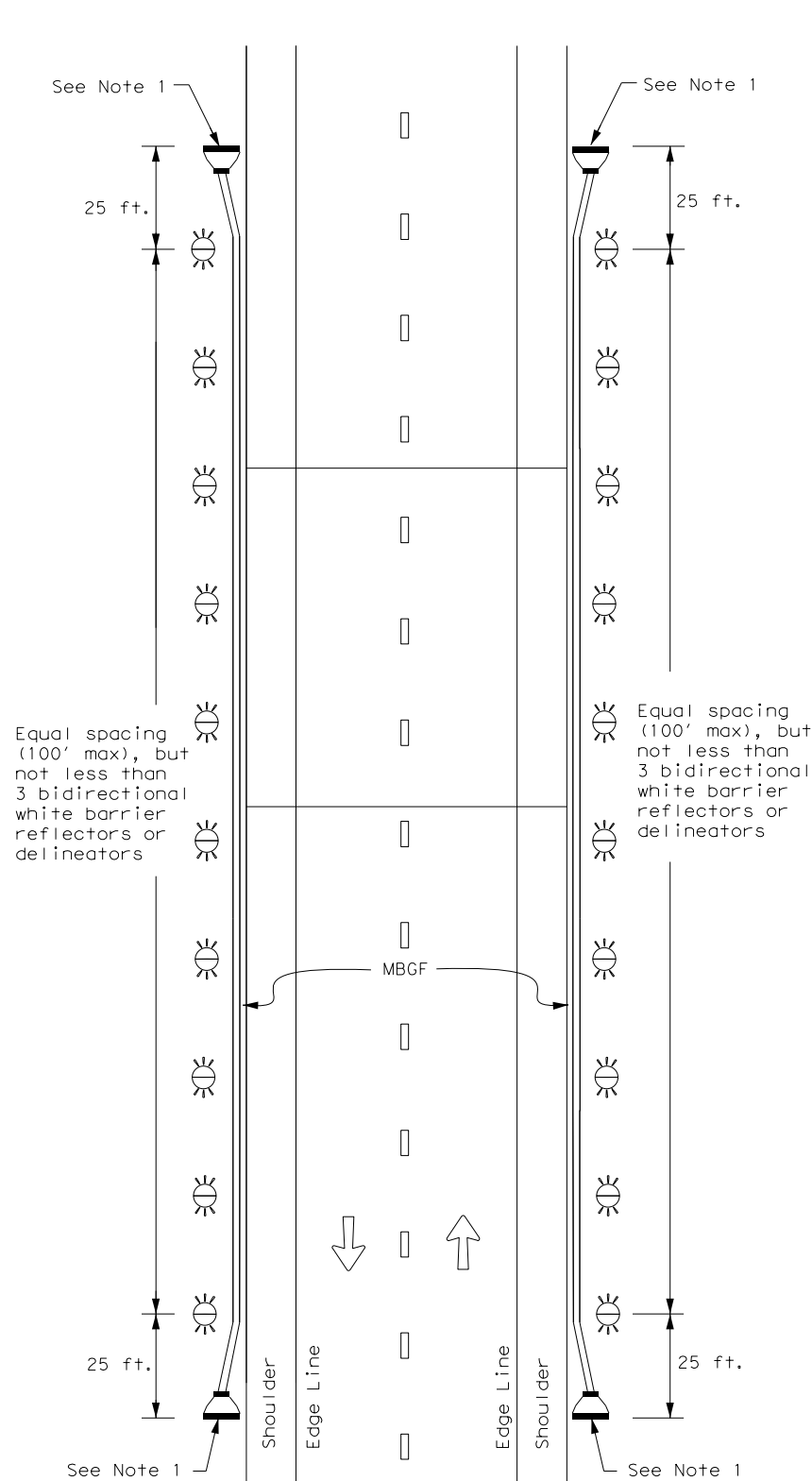
**TWO-WAY, TWO LANE ROADWAY
WITH REDUCED WIDTH APPROACH RAIL**



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

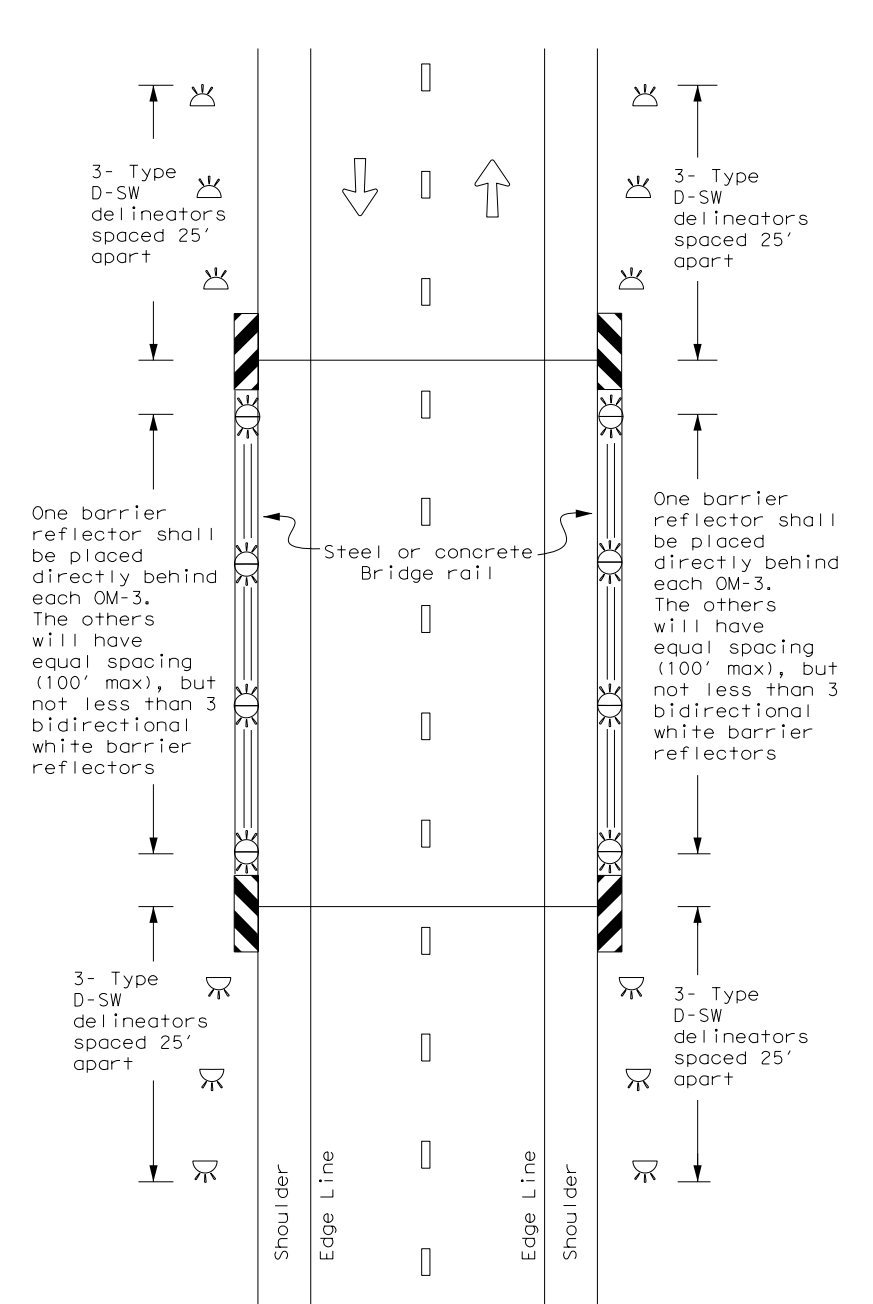
**TWO-WAY, TWO LANE ROADWAY
WITH METAL BEAM GUARD FENCE (MBGF)**



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

**TWO-WAY, TWO LANE ROADWAY
BRIDGE WITH NO APPROACH RAIL**



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow



Traffic Safety Division Standard

**DELINEATOR &
OBJECT MARKER
PLACEMENT DETAILS**

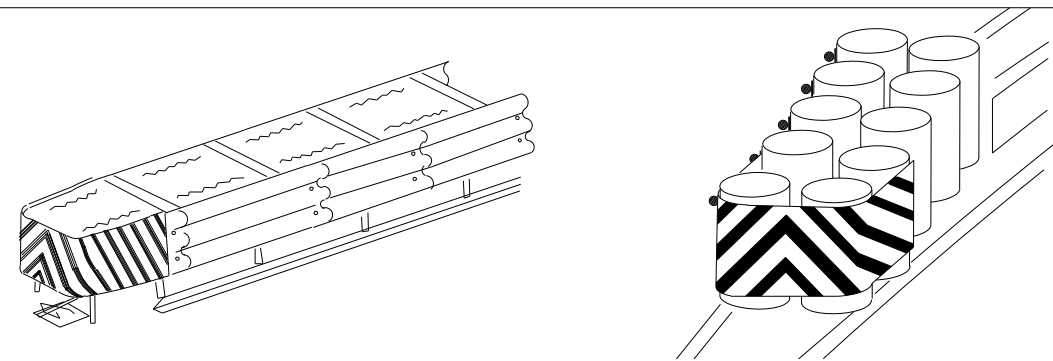
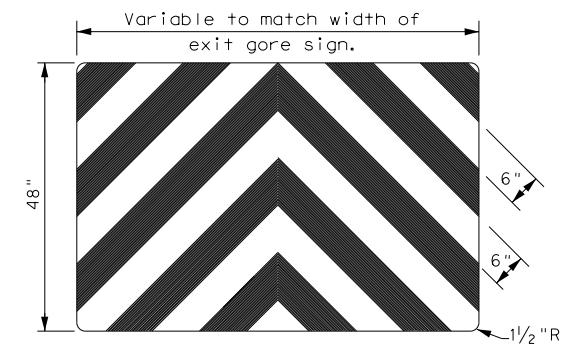
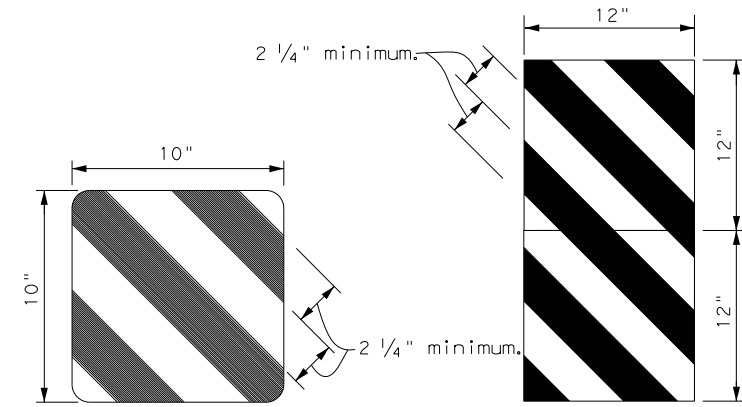
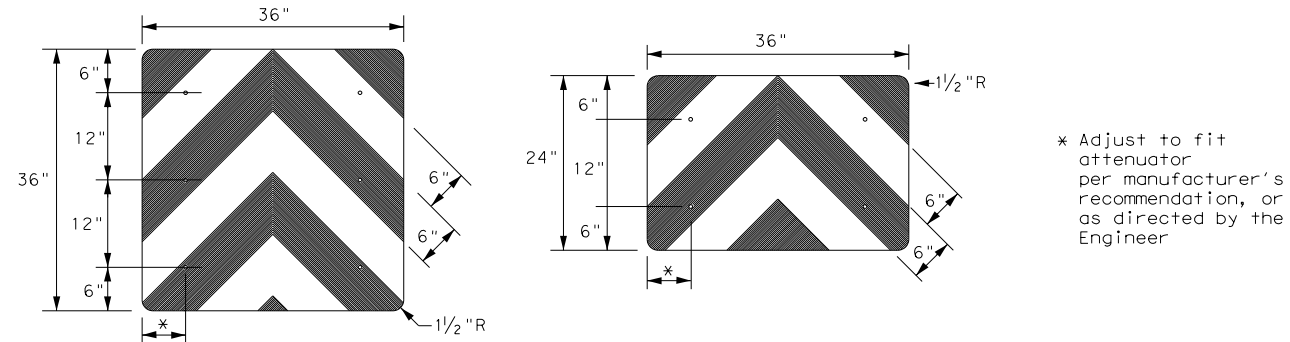
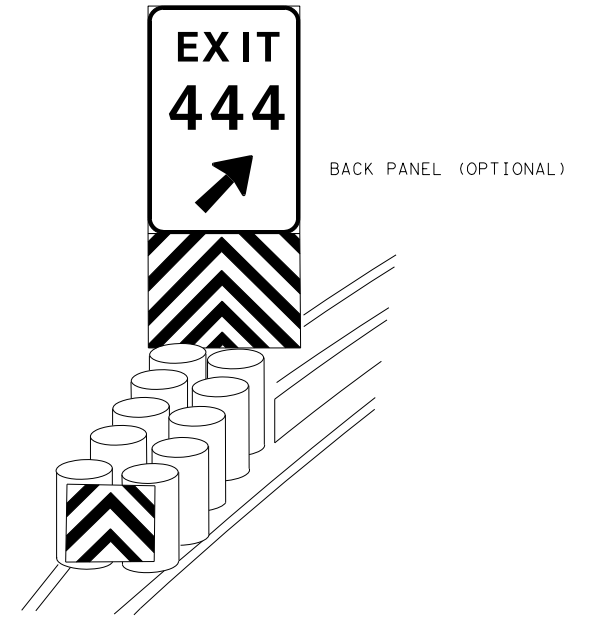
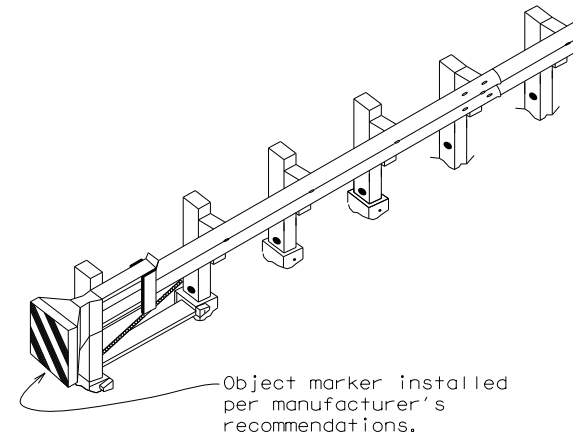
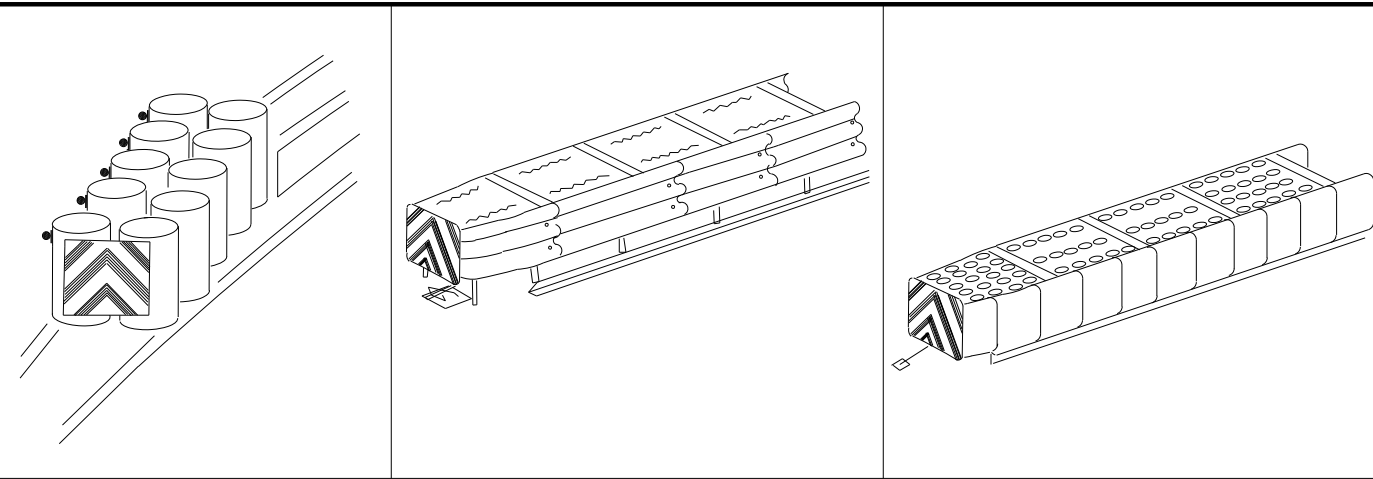
D & OM(5) - 20

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7-20	DIST: BRY	COUNTY: MADISON	SHEET NO. 93	

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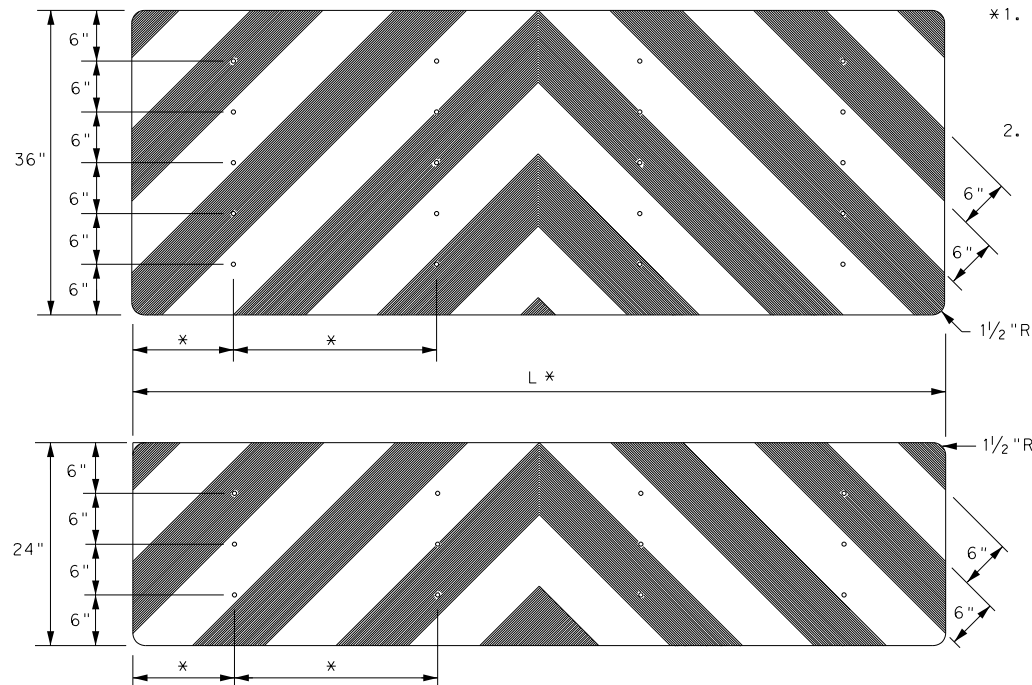
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NOTES

1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturer's recommendation, or as directed by the Engineer.
2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".



NOTES

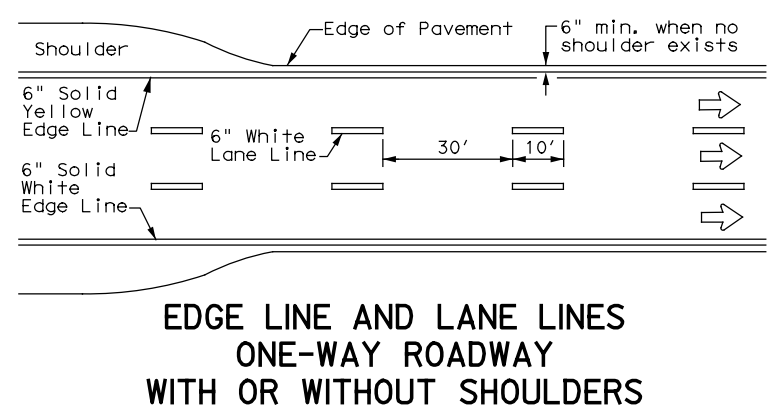
1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.
2. Object Markers may be fabricated from adhesive backed reflective 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 1/4".
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.

DATE: 3/16/2023 1:34:29 PM
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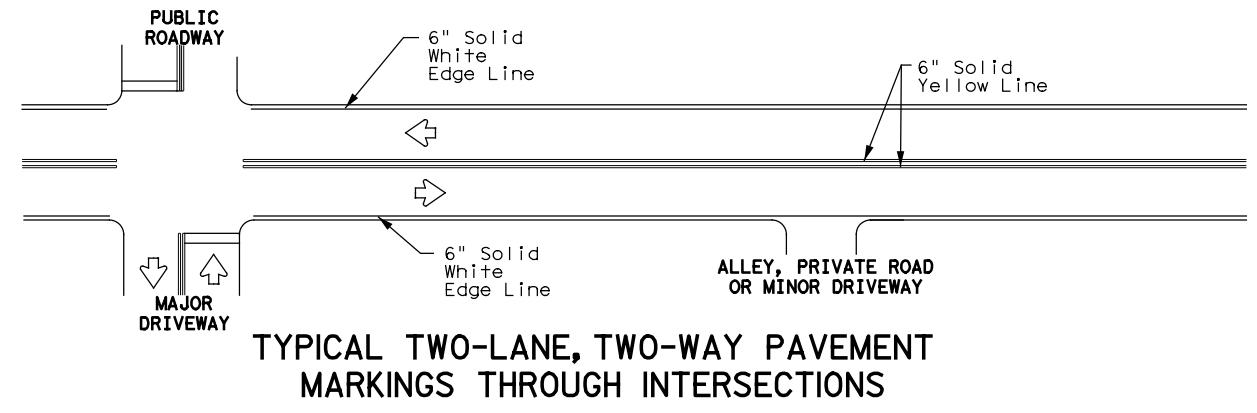
DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS D & OM(VIA) - 20			
FILE: domvia20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT December 1989	CONT	SECT	JOB
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8-95 3-15	BRY	MADISON	95
4-98 7-20			
206			

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**EDGE LINE AND LANE LINES
 ONE-WAY ROADWAY
 WITH OR WITHOUT SHOULDERS**

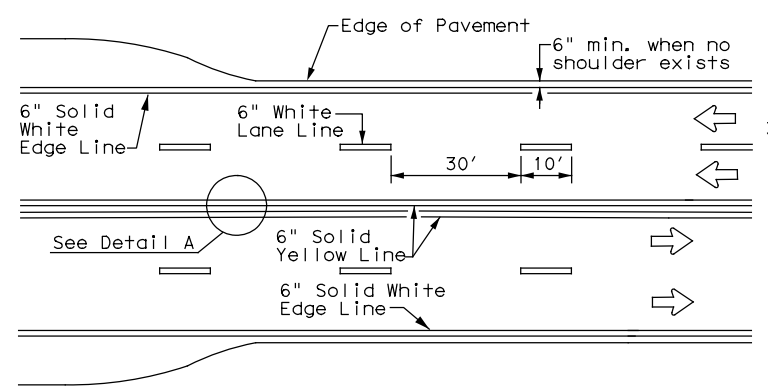


**TYPICAL TWO-LANE, TWO-WAY PAVEMENT
 MARKINGS THROUGH INTERSECTIONS**

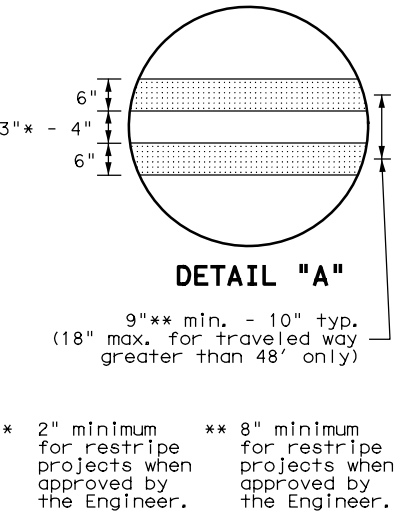
- GENERAL NOTES**
1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
 2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

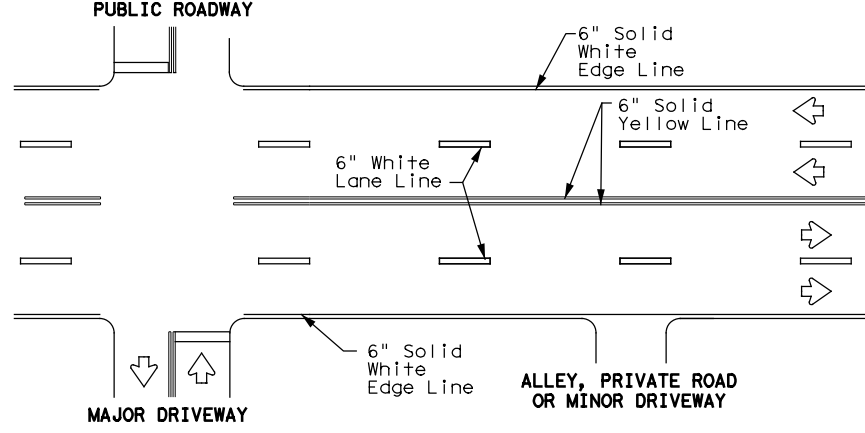
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



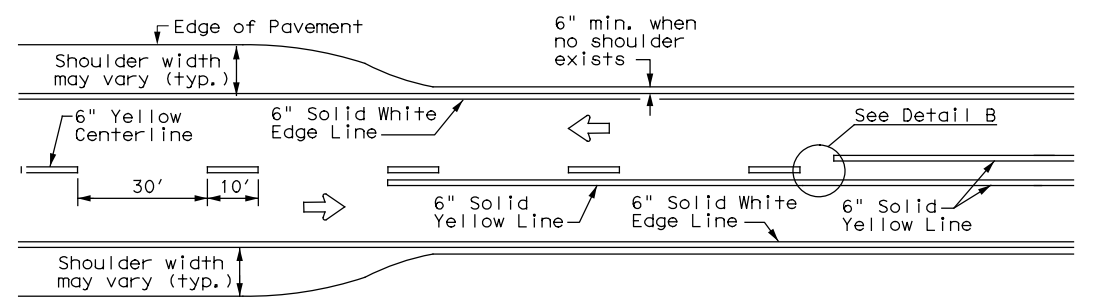
**CENTERLINE AND LANE LINES
 FOUR LANE TWO-WAY ROADWAY
 WITH OR WITHOUT SHOULDERS**



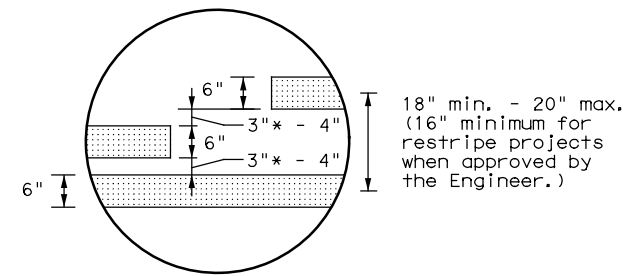
* 2" minimum for restripe projects when approved by the Engineer.
 ** 8" minimum for restripe projects when approved by the Engineer.



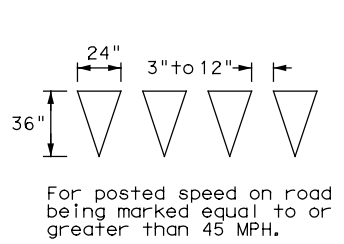
**TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
 MARKINGS THROUGH INTERSECTIONS**



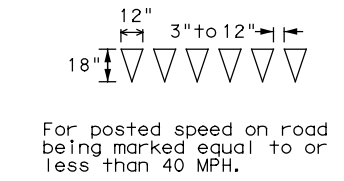
**TWO LANE TWO-WAY ROADWAY
 WITH OR WITHOUT SHOULDERS**



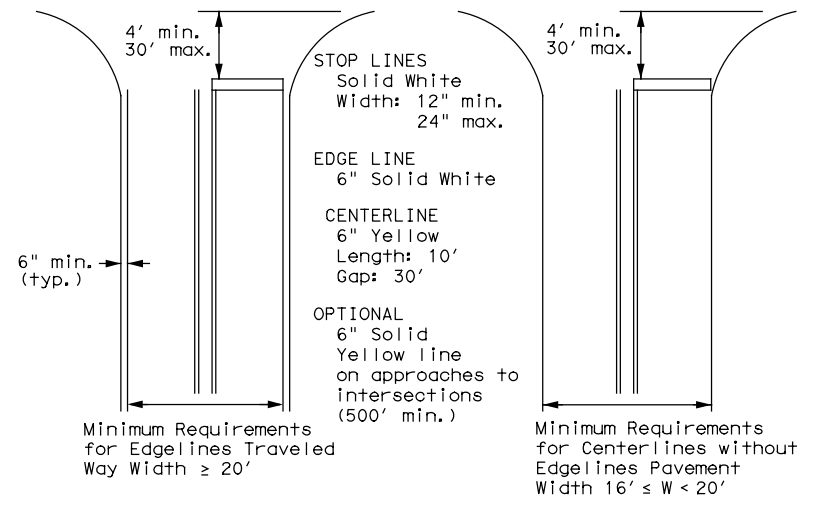
* 2" minimum for restripe projects when approved by the Engineer.



YIELD LINES



For posted speed on road being marked equal to or less than 40 MPH.

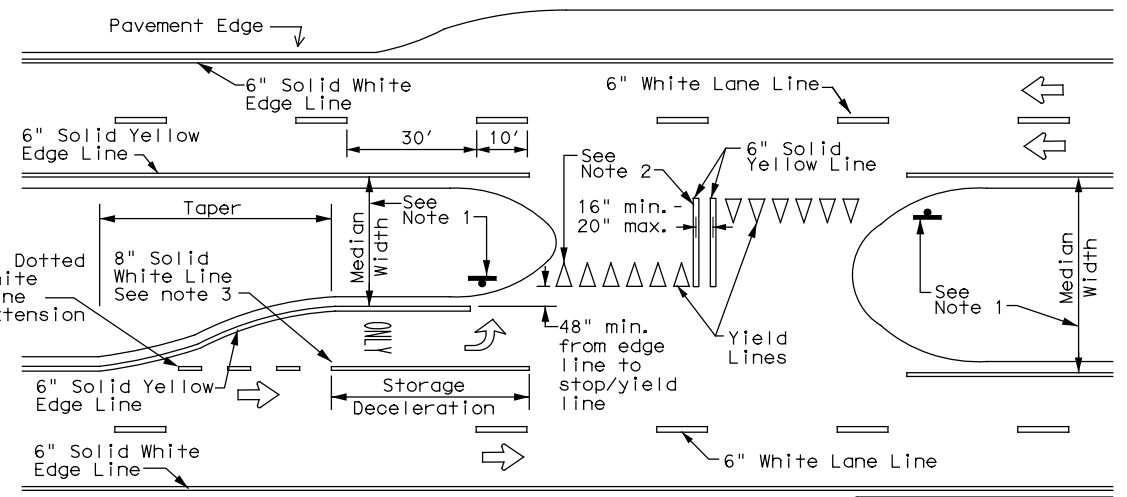


NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

**GUIDE FOR PLACEMENT OF STOP LINES,
 EDGE LINE & CENTERLINE**
 Based on Traveled Way and Pavement Widths for Undivided Roadways

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.



FOUR LANE DIVIDED ROADWAY CROSSOVERS

Texas Department of Transportation
 Traffic Safety Division Standard

**TYPICAL STANDARD
 PAVEMENT MARKINGS**

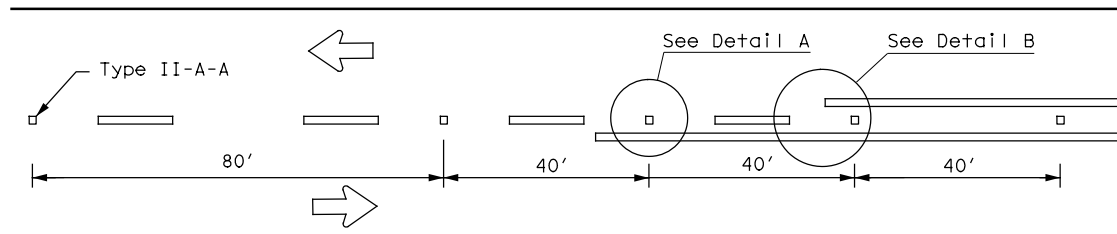
PM(1)-22

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5-00 2-12				

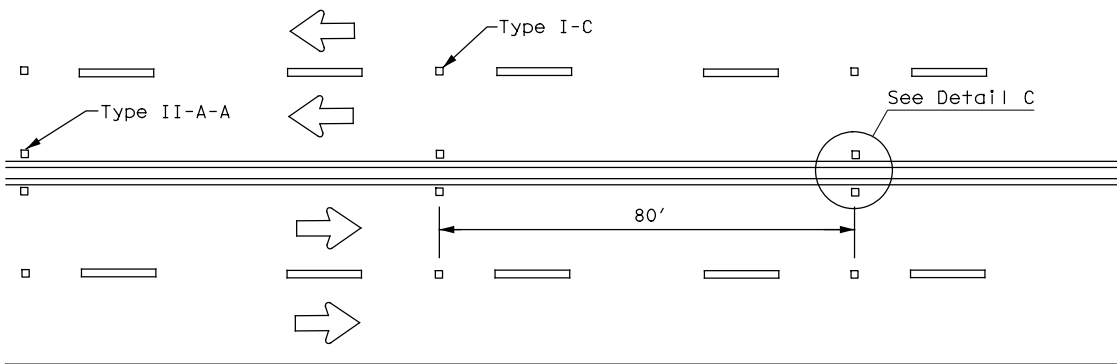
22A

REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

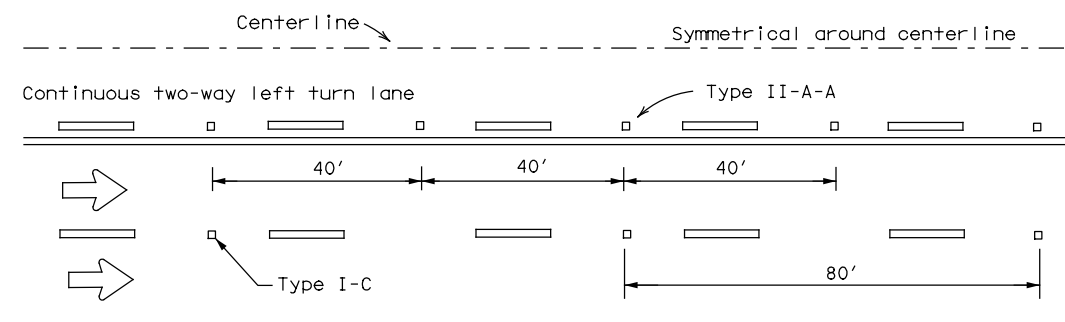
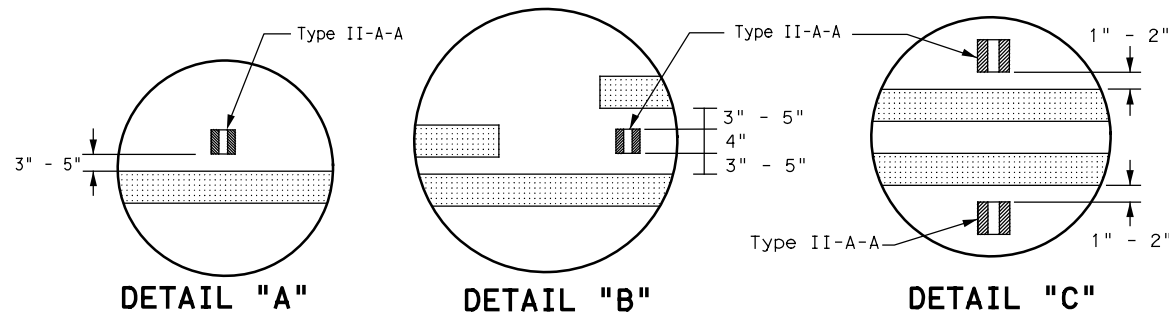
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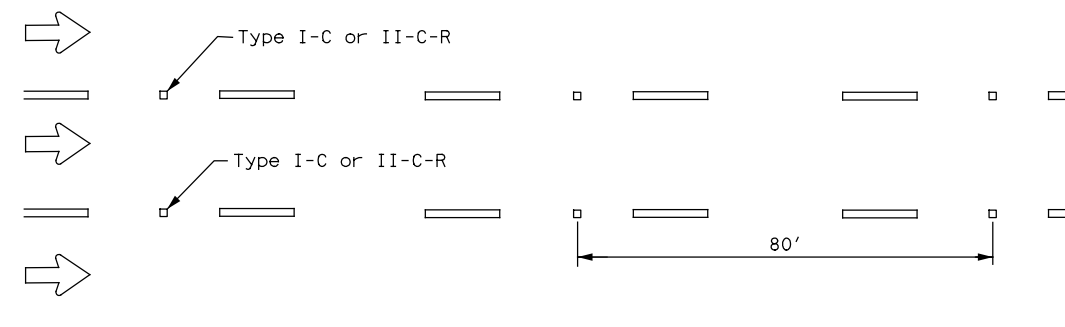
CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS



**CENTERLINE & LANE LINES
FOR FOUR LANE TWO-WAY ROADWAYS**

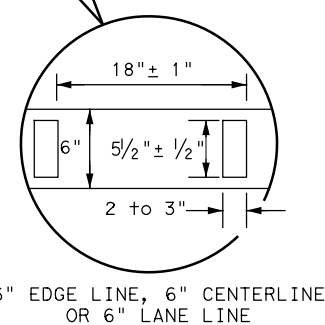
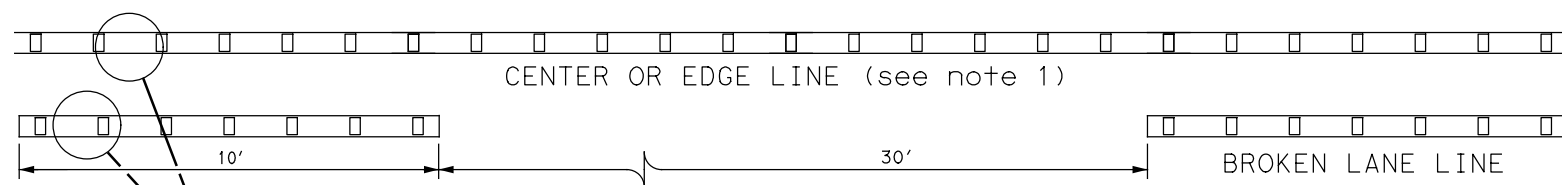


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

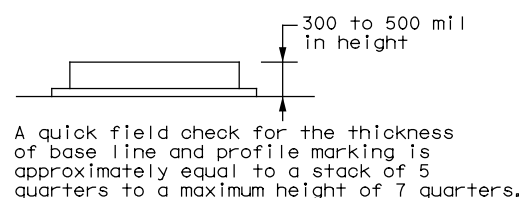


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.
See Note 3.



**REFLECTORIZED PROFILE
PATTERN DETAIL**
USING REFLECTIVE PROFILE PAVEMENT MARKINGS

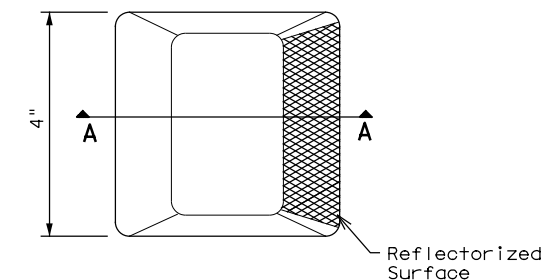


NOTES

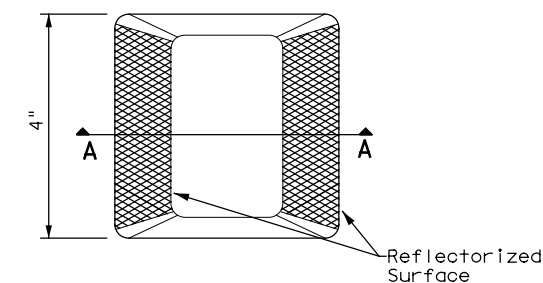
- Edge lines should typically be 6" wide and the materials shall be specified in the plans.
- Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

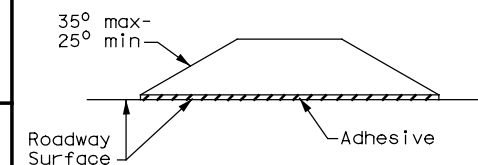
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



**POSITION GUIDANCE USING
RAISED MARKERS
REFLECTORIZED PROFILE
MARKINGS
PM(2)-22**

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0552	02	027	FM978
4-77 8-00 6-20	DIST	COUNTY	SHEET NO.	
4-92 2-10 12-22	BRY	MADISON	97	
5-00 2-12				

DATE: 3/16/2023 1:34:32 PM
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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

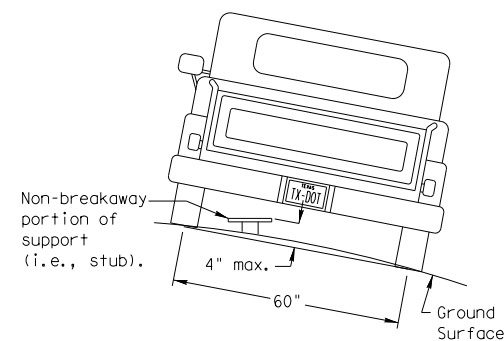
Post Type _____
 FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
 TWT = Thin-Walled Tubing (see SMD(TWT))
 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
 S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2) _____

Anchor Type _____
 UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
 UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
 WS = Wedge Anchor Steel - (see SMD(TWT))
 WP = Wedge Anchor Plastic (see SMD(TWT))
 SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
 SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation
 P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
 T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
 U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
 IF REQUIRED
 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
 BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
 WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
 EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

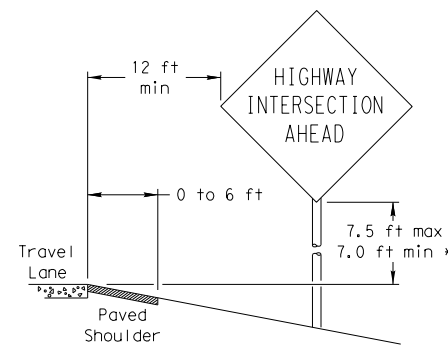
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

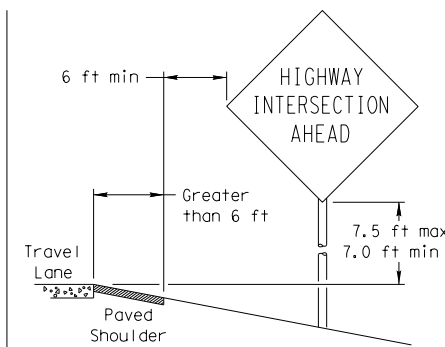
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

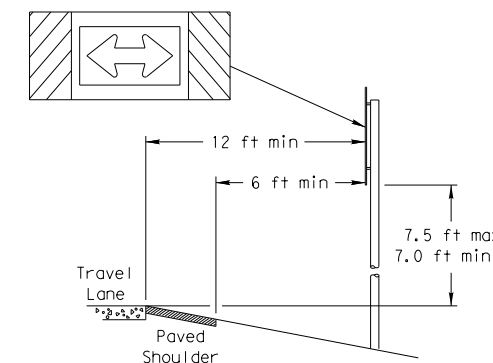
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



GREATER THAN 6 FT. WIDE

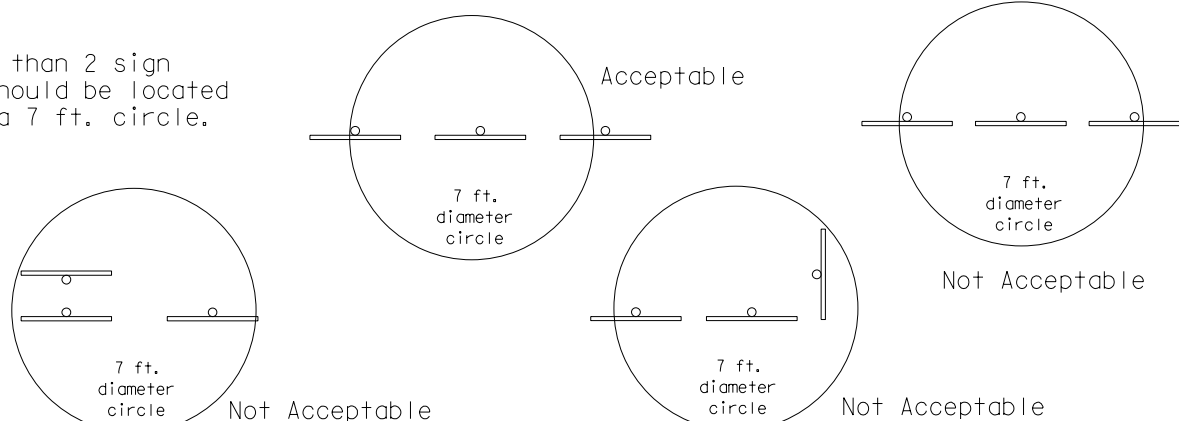
When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

T-INTERSECTION

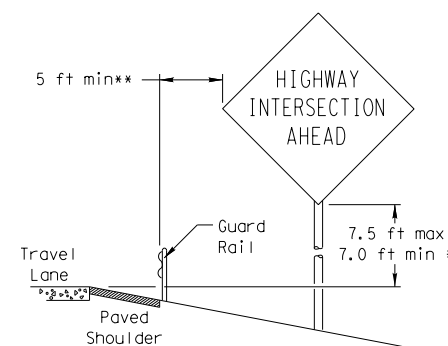


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

No more than 2 sign posts should be located within a 7 ft. circle.

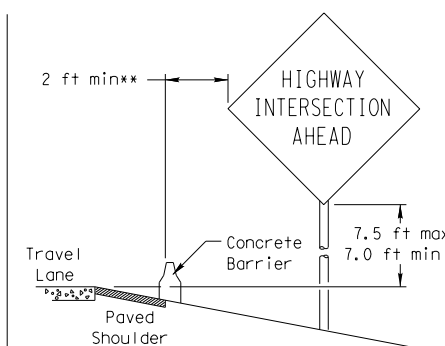


BEHIND BARRIER



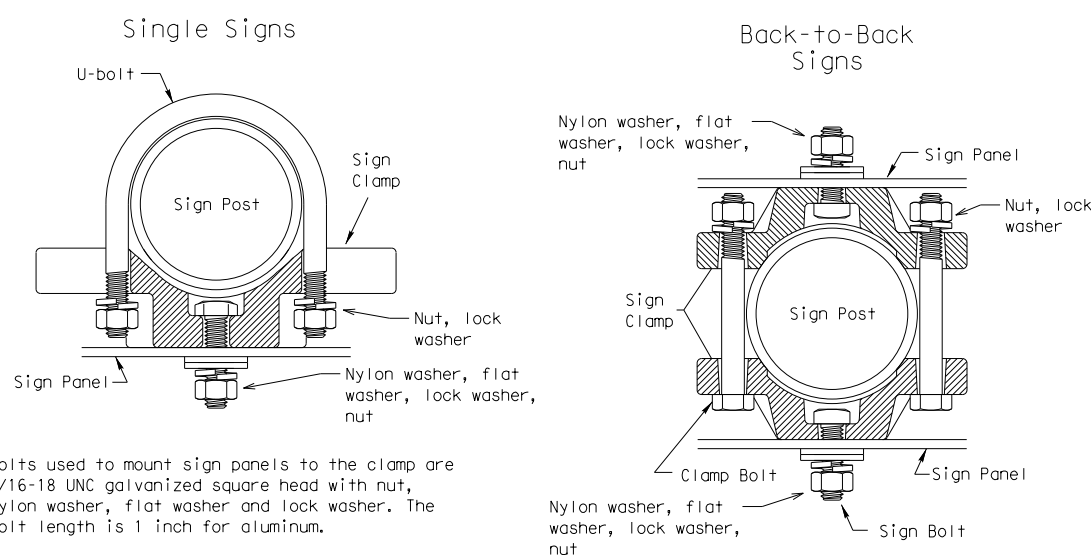
BEHIND GUARDRAIL

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.



BEHIND CONCRETE BARRIER

TYPICAL SIGN ATTACHMENT DETAIL



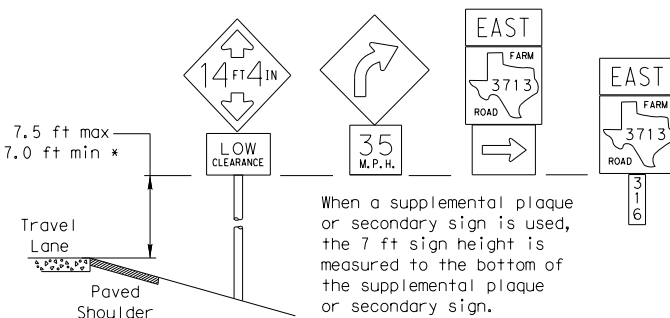
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

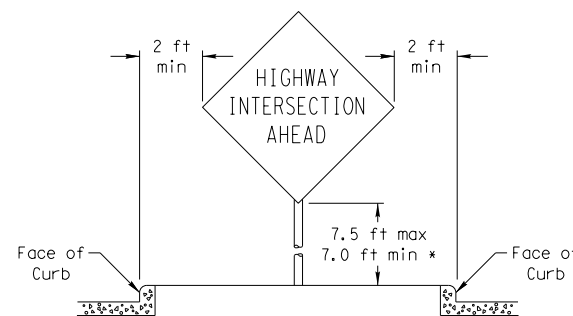
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES

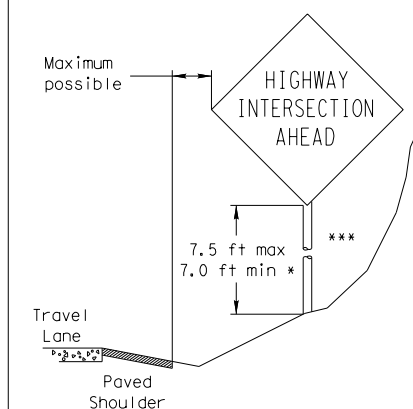


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY (When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
<http://www.txdot.gov/publications/traffic.htm>



SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

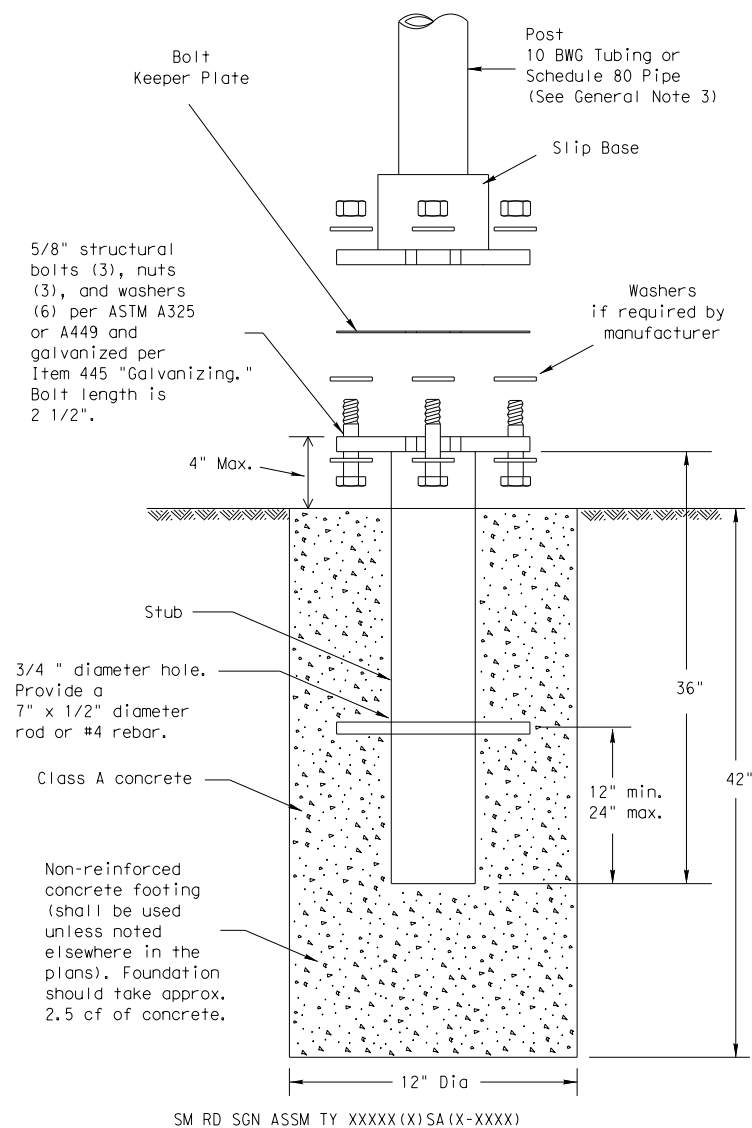
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9-08	REVISIONS	CONT	SECT	JOB
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TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

- Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
- Material used as post with this system shall conform to the following specifications:
 - 10 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
- See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

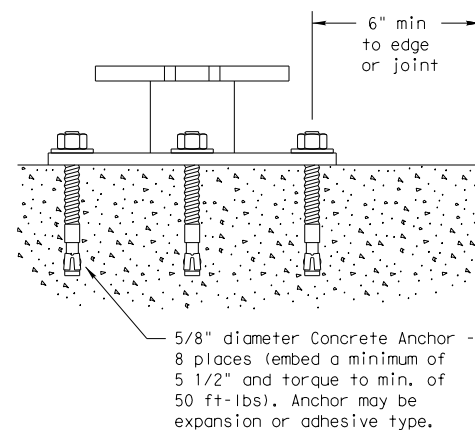
Foundation

- Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
- The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
- Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
- Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
- The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support

- Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
- Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



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, "Epoxyes and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.



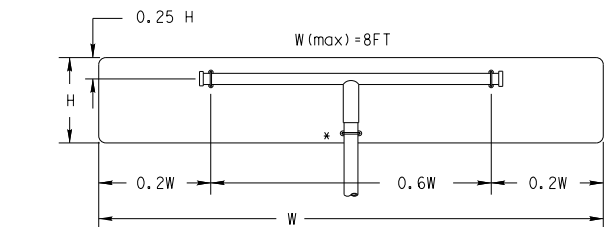
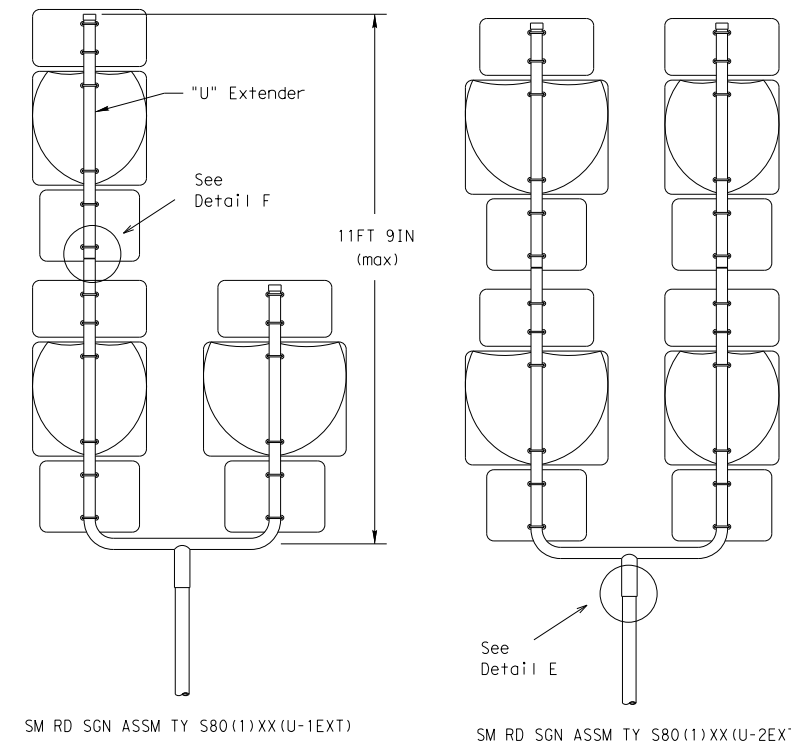
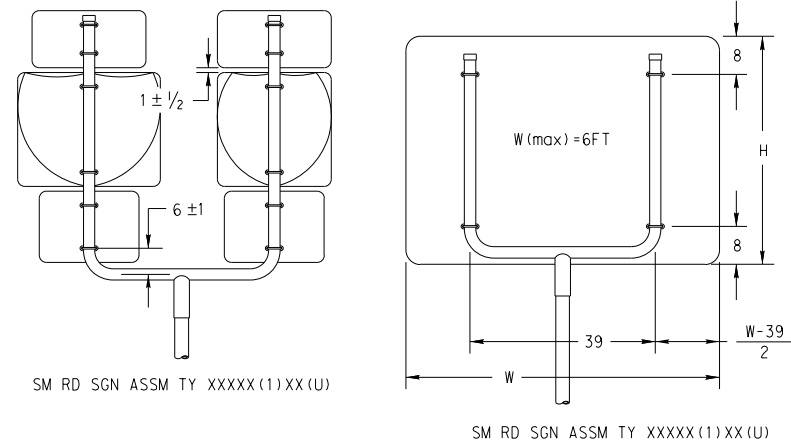
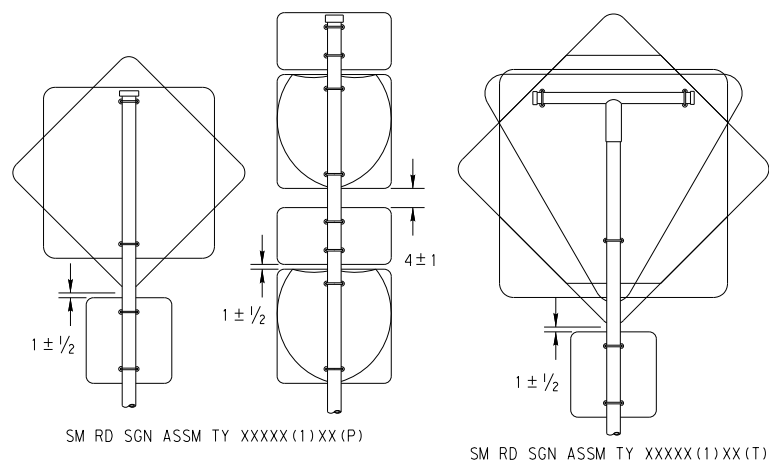
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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			DIST	COUNTY	
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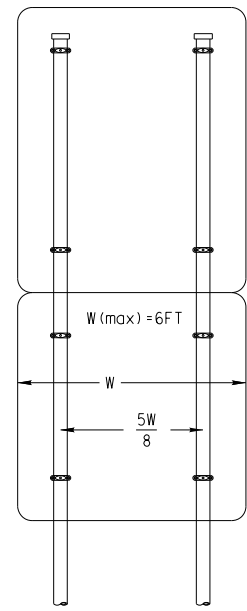
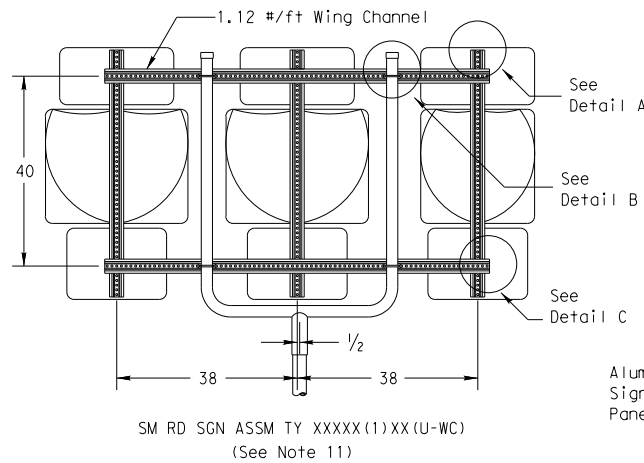
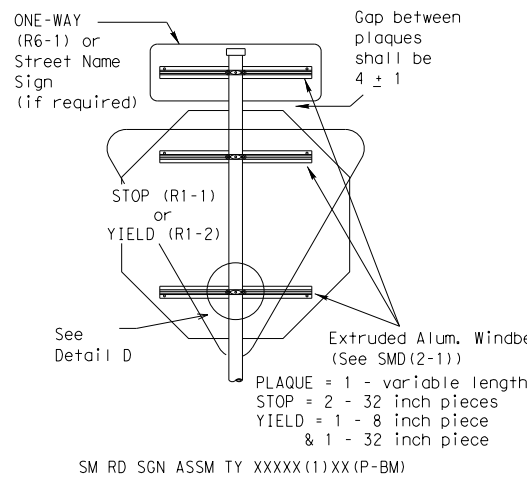
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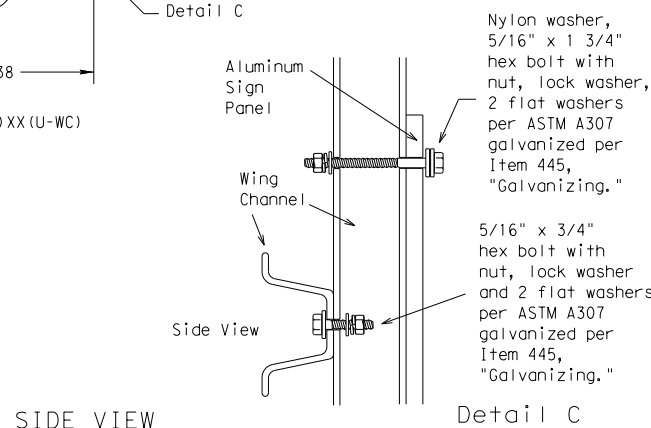
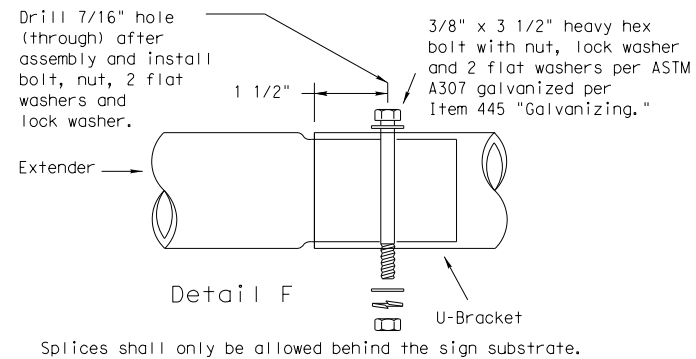
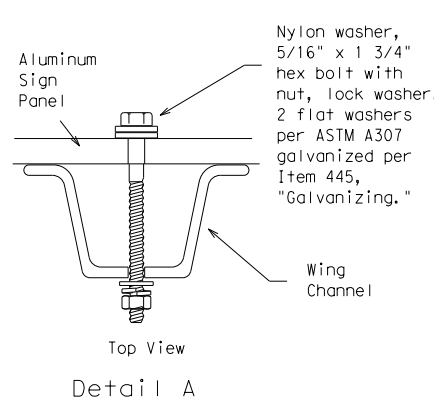


All dimensions are in english unless detailed otherwise.

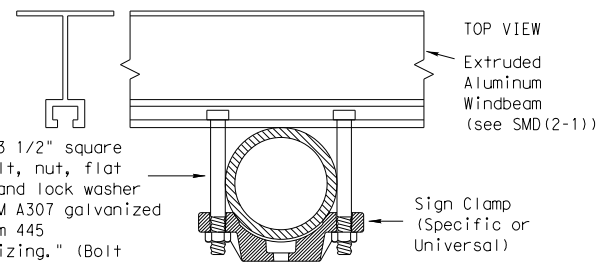
SM RD SGN ASSM TY XXXX(1)XX(T) (* - See Note 12)



SM RD SGN ASSM TY XXXX(2)XX(P)

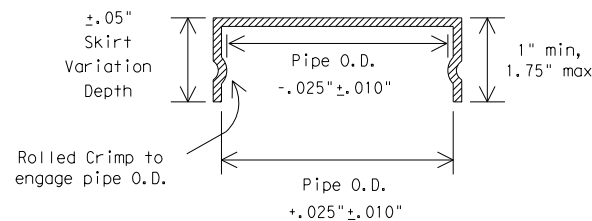


SIDE VIEW



Detail D

FRICION 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.

GENERAL NOTES:

- | SIGN SUPPORT | # OF POSTS | MAX. SIGN AREA |
|--------------|------------|----------------|
| 10 BWG | 1 | 16 SF |
| 10 BWG | 2 | 32 SF |
| Sch 80 | 1 | 32 SF |
| Sch 80 | 2 | 64 SF |
- The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
- When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
- Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
- Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
- Post open ends shall be fitted with Friction Caps.
- Sign blanks shall be the sizes and shapes shown on the plans.

		REQUIRED SUPPORT	
		SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)		TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)		TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)		TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs		TY 10BWG(1)XX(T)
Warning	48x60-inch signs		TY S80(1)XX(T)
	48x48-inch signs (diamond or square)		TY 10BWG(1)XX(T)
	48x60-inch signs		TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)		TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)		TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)		TY 10BWG(1)XX(T)

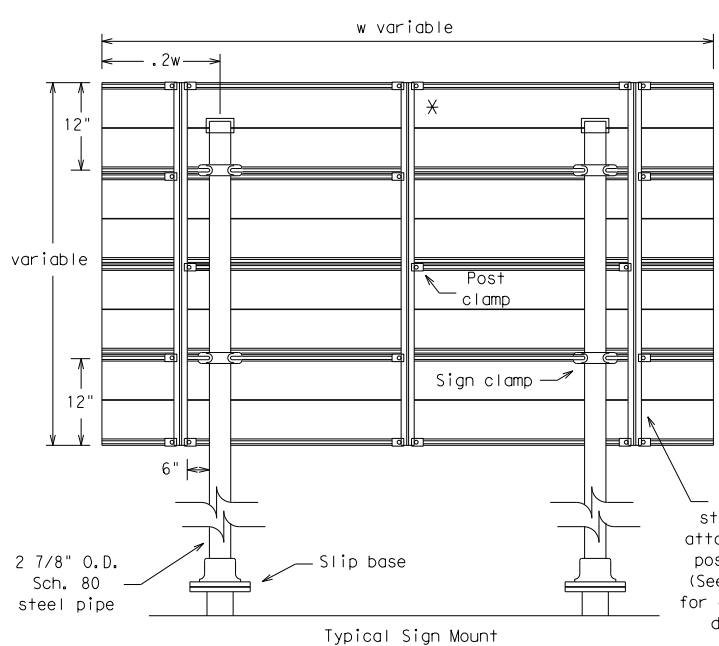
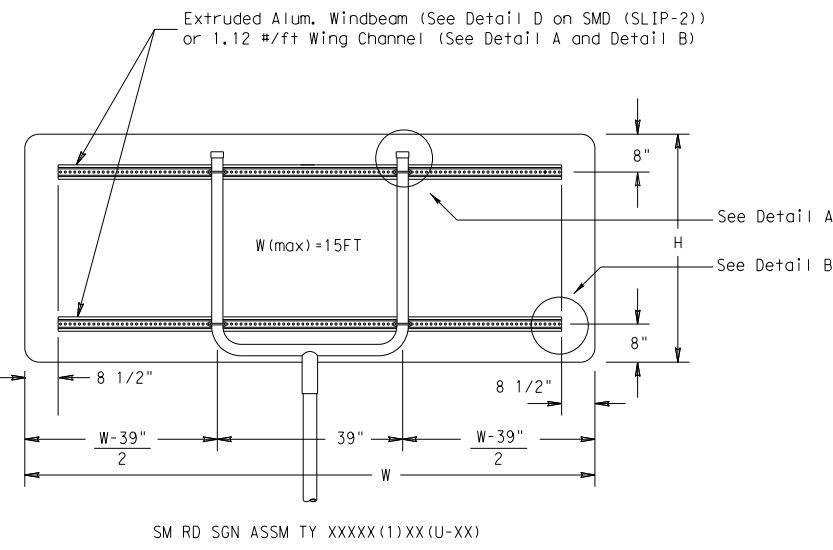
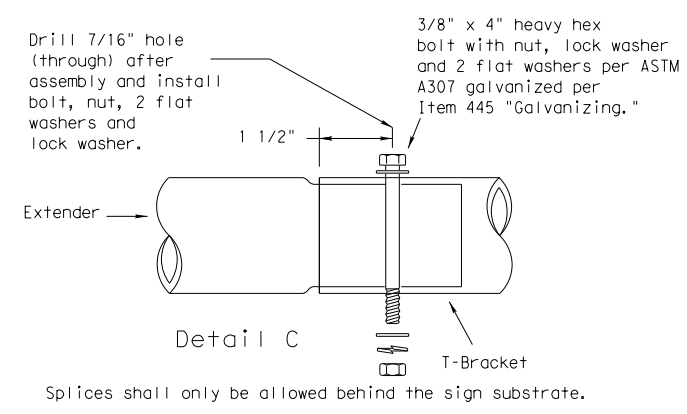
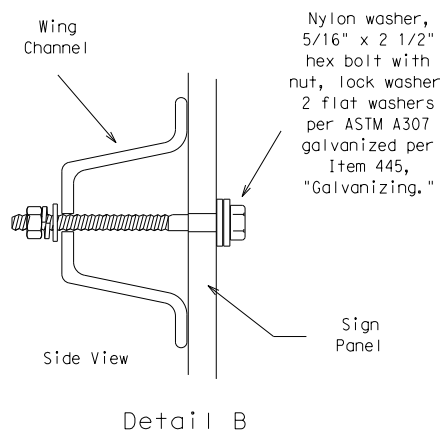
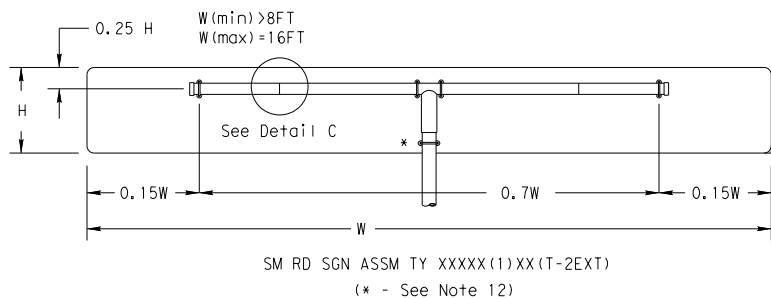


SIGN MOUNTING DETAILS
 SMALL ROADSIDE SIGNS
 TRIANGULAR SLIPBASE SYSTEM
 SMD(SLIP-2)-08

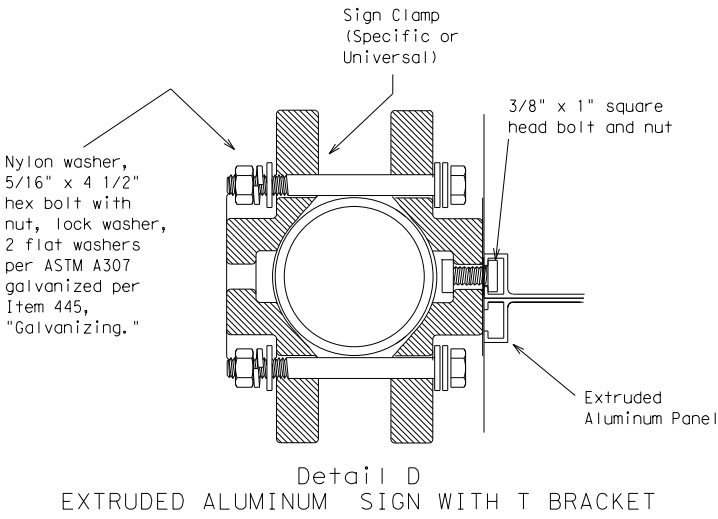
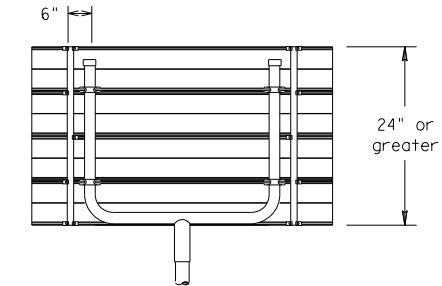
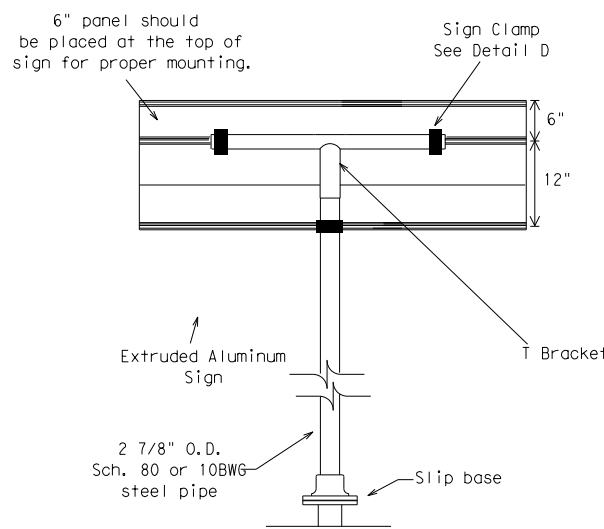
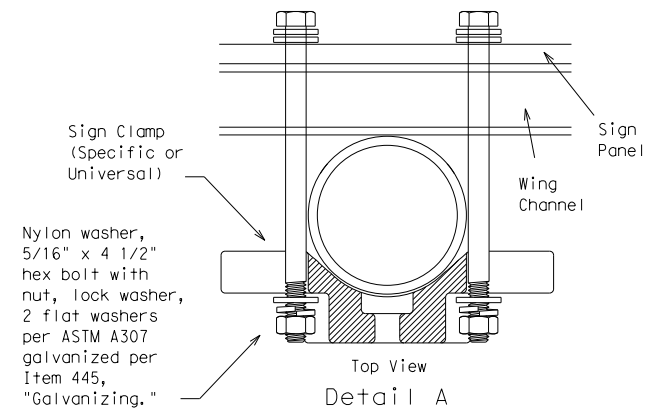
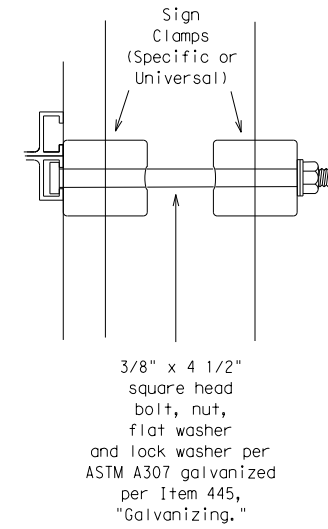
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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
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		DIST	COUNTY		SHEET NO.
		BRY	MADISON		101

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* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



GENERAL NOTES:

- | SIGN SUPPORT | # OF POSTS | MAX. SIGN AREA |
|--------------|------------|----------------|
| 10 BWG | 1 | 16 SF |
| 10 BWG | 2 | 32 SF |
| Sch 80 | 1 | 32 SF |
| Sch 80 | 2 | 64 SF |
- The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
- When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
- Sign blanks shall be the sizes and shapes shown on the plans.
- Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
- Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
Warning	48x60-inch signs	TY S80(1)XX(T)
	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)



SIGN MOUNTING DETAILS
 SMALL ROADSIDE SIGNS
 TRIANGULAR SLIPBASE SYSTEM
 SMD(SLIP-3) -08

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
		0552	02	027	FM978
		DIST	COUNTY		SHEET NO.
		BRY	MADISON		102

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

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 in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
0552-02-027

1.2 PROJECT LIMITS:

From: FM 978: 0.08 Miles west of Mustang Creek

To: 0.16 Miles- East of Mustang Creek

1.3 PROJECT COORDINATES:

BEGIN: (Lat) 30°-57'-18" N, (Long) 95°-55'-51" W

END: (Lat) _____, (Long) _____

1.4 TOTAL PROJECT AREA (Acres): 4.28

1.5 TOTAL AREA TO BE DISTURBED (Acres): 1.00

1.6 NATURE OF CONSTRUCTION ACTIVITY:

- Remove 2 existing box culverts and replace with a bridge structure. Re-pave approach roadways with asphalt paving
- Place stone riprap, topsoil, seeding

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Nahatche Loam	Vegetation covers approx. 95%

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 2.5.)

- 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: Construct Bridge, abutment slopes and stone protection
- 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
Mustang Creek flows via Caney Creek to Bedias Creek & Lake Livingston (Trinity River Basin)	

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

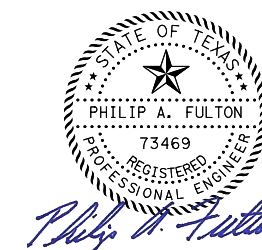
- Development of plans and specifications
- Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- Post Construction Site Notice
- Submit NOI/CSN to local MS4
- Perform SWP3 inspections
- Maintain SWP3 records and update to reflect daily operations
- Complete and submit Notice of Termination to TCEQ
- Maintain SWP3 records for 3 years
- Other: _____
- Other: _____
- Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

- Day To Day Operational Control
- Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- Post Construction Site Notice
- Submit NOI/CSN to local MS4
- Maintain schedule of major construction activities
- Install, maintain and modify BMPs
- Complete and submit Notice of Termination to TCEQ
- Maintain SWP3 records for 3 years
- Other: _____
- Other: _____
- Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity



Philip A. Fulton

03/17/2023

STORMWATER POLLUTION PREVENTION PLAN (SWP3)



Sheet 1 of 2

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
6	SEE TITLE SHEET			103
STATE	STATE DIST.	COUNTY		
TEXAS	BRY	MADISON		
CONT.	SECT.	JOB	HIGHWAY NO.	
0552	02	027	FM978	

STORMWATER POLLUTION PREVENTION 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

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- Sediment Trap
 - Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
 - 3,600 cubic feet of storage per acre drained
- Sedimentation Basin
 - Not required (<10 acres disturbed)
 - Required (>10 acres) and implemented.
 - Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
 - 3,600 cubic feet of storage per acre drained
 - Required (>10 acres), but not feasible due to:
 - Available area/Site geometry
 - Site slope/Drainage patterns
 - Site soils/Geotechnical factors
 - Public safety
 - Other: _____

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

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

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

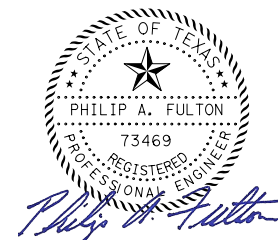
- Fire hydrant flushings
- Irrigation drainage
- Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- Potable water sources
- Springs
- Uncontaminated groundwater
- Water used to wash vehicles or control dust
- Other allowable non-stormwater discharges as allowed 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 2.5 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 2.5 of this SWP3.



03/17/2023

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

© 2022 Sheet 2 of 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		103A
STATE	STATE DIST.	COUNTY	
TEXAS	BRY	MADISON	
CONT.	SECT.	JOB	HIGHWAY NO.
0552	02	027	FM978

During the planning phase of project development the following environmental permits, issues and commitments have been developed during coordination with resource agencies, local governmental entities and the general public. Any change orders and/or deviations from the final design must be reported to the Engineer prior to the commencement of construction activities. As additional environmental clearances may be required.

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.

Required Action No Action Required

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.

Refer to 2014 TxDOT Standard Specification Items:

- 7.7.2 Texas Pollutant Discharge Elimination System (TPDES) Permits and Storm Water Pollution Prevention Plans (SWP3)
- 506 Temporary Erosion, Sedimentation and Environmental Controls
- 734 Litter Removal
- 735 Debris Removal
- 738 Cleaning and Sweeping Highways

II. WORK IN OR NEAR STREAMS, WATER BODIES 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 locations of waters of the US.

1. FM 978 at Mustang Creek - Sta 19+90

Information regarding the USACE Nationwide Permit Program can be found at: <http://www.swf.usace.army.mil/Missions/Regulatory/Permitting/GeneralPermits.aspx>

- Refer to 2014 TxDOT Standard Specification Items:
- 7.7.3 Work in Waters of the United States
 - 7.7.6 Project Specific Locations
 - 496 Removing Structures
 - 506 Temporary Erosion, Sedimentation and Environmental Controls
 - 506.4.3.4 Restricted Activities and Required Precautions

III. CULTURAL RESOURCES

Refer to 2014 TxDOT Standard Specification Item 7.7.1 Cultural Resources, in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) immediately cease work in the vicinity and contact the Engineer.

Required Action No Action Required

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.

Required Action No Action Required

Action No.

1. Tree removal to be done in accordance with the Migratory Bird Treaty Act (see Section V)

Refer to 2014 TxDOT Standard Specification Items:

- 160 Topsoil
- 161 Compost
- 162 Sodding for Erosion Control
- 164 Seeding for Erosion Control
- 166 Fertilizer
- 168 Vegetative Watering
- 169 Soil Retention Blankets
- 170 Irrigation System
- 180 Wildflower Seeding
- 192 Landscape Planting
- 193 Landscape Establishment
- 506 Temporary Erosion, Sedimentation, and Environmental Controls
- 730 Roadside Mowing
- 751 Landscape Maintenance
- 752 Tree and Brush Removal

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

Required Action No Action Required

Action No.

1. Do not kill snakes or other animals!
2. Do not destroy nests on structures within the project limits.

Temporarily prevent the building of nests on any structures that require work within the project limits during the construction timeframe.

This can be accomplished by application of bird repellent gel, netting, or removal by hand every 3-4 days.

The nesting/breeding season for migratory birds is March 1 - September 1.

Under the Migratory Bird Treaty Act (MBTA), it is unlawful by any means or manner, to pursue, hunt, take, capture, [or] kill any migratory birds except as permitted by regulation (16 U.S.C. 703-704). Neither the statute nor its implementing regulations (Title 50, Code of Federal Regulations, Parts 10, 13, 21) exempt unintentional take of migratory birds. The unauthorized take (e.g. killing, capturing, or collecting) of migratory birds is a strict liability criminal offense that does not require knowledge or specific intent on the part of the offender. Even when engaged in an otherwise lawful activity for which the intent is not the killing of migratory birds, a violation may be committed.

3. If caves or sinkholes are discovered, cease work in the immediate area to verify the presence or absence of wildlife.
4. BMPs for T and E species will be discussed at the preconstruction meeting.

The Bryan District Environmental Section can be contacted at (979) 778-9766 to assist with the removal of wildlife that will not leave on their own with gentle persuasion.

Refer to 2014 TxDOT Standard Specification Item:
7.7.6 Project Specific Locations

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 Engineer 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 discoverd on site. Hazardous Materials or Contamination Issues Specific to this Project:

Required Action No Action Required

Action No.

1. The Clean Water Act, in part, requires that any spill of oil that could enter a waterway, as defined by the Act, and that violates applicable water quality standards or causes a film or sheen on water require reporting to the TCEQ and local authorities. Contact the Bryan District Environmental Section at 979-778-9766.

If potentially hazardous material and/or contaminated media (i.e. soil, groundwater, surface water, sediment, building materials) are unexpectedly encountered during construction, immediately cease work in the vicinity and contact the Engineer.

- Refer to 2014 TxDOT Standard Specification Items:
- 6.10 Hazardous Materials
- 7.12 Responsibility for Hazardous Materials

VII. OTHER ENVIRONMENTAL ISSUES

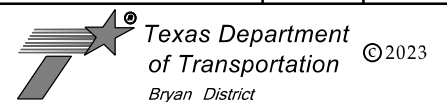
Required Action No Action Required

Refer to 2014 TxDOT Standard Specification Items:
7.7.6 Project Specific Locations
751 Landscape Maintenance

Contacts:

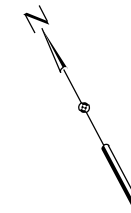
Mr. John D. Moravec
Environmental Coordinator
Texas Department of Transportation
Bryan District
2591 N. Earl Rudder Freeway
Bryan, TX 77803
Phone: (979) 778-9766
Fax: (979) 778-9702
e-mail: John.Moravec@txdot.gov

PRINT DATE	REVISION DATE
3/21/2023	02/12/2015



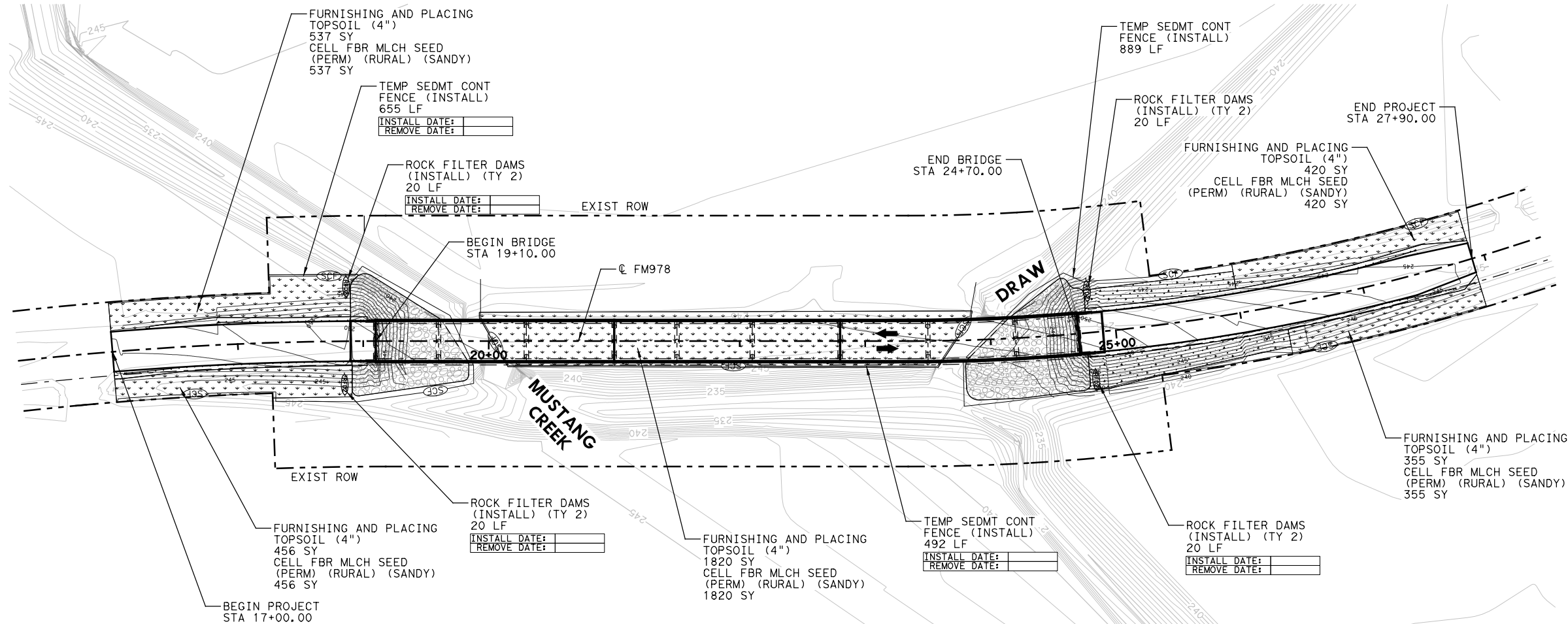
ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	SEE TITLE SHEET	FM978	
STATE	DISTRICT	COUNTY	
TEXAS	BRY	MADISON	
CONTROL	SECTION	JOB	SHEET NO.
0552	02	027	104



LEGEND

- LIMITS OF TOPSOIL AND SEEDING
- TEMPORARY SEDIMENT CONTROL FENCE
- ROCK FILTER DAM (TY 2)
- FLOW ARROW



NOTES:

1. CONSTRUCTION EXIT/ENTRANCE LOCATIONS ARE TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.
2. FIELD VERIFY LOCATIONS OF BMPs SHOWN AND ALTER LOCATIONS AS NEEDED TO ACHIEVE INTENDED PURPOSE AS APPROVED.
3. MAINTAIN SW3P CONTROL MEASURES THROUGHOUT CONSTRUCTION.
4. APPLY VEGETATIVE WATERING AS NEEDED TO SUPPLEMENT NATURAL RAINFALL.
5. SW3P MEASURES ARE NOT TO SCALE.



Philip A. Fulton 03/17/2023

NO.	DATE	REVISION	APPROVED

HDR
 HDR
 Firm Registration No. F-754
 710 Heesters Crossing, Suite 150
 Round Rock, Texas 78681
 512.685.2900



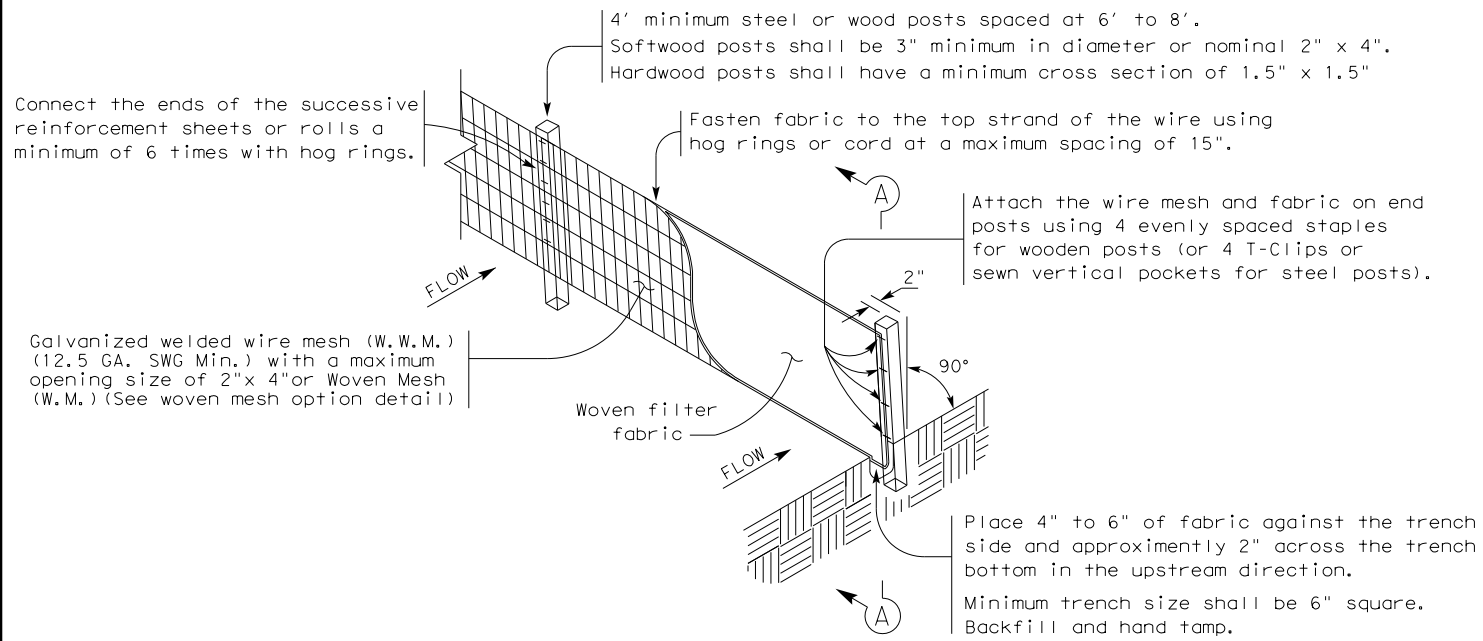
SW3P PLAN
FM 978

SHEET 1 OF 1

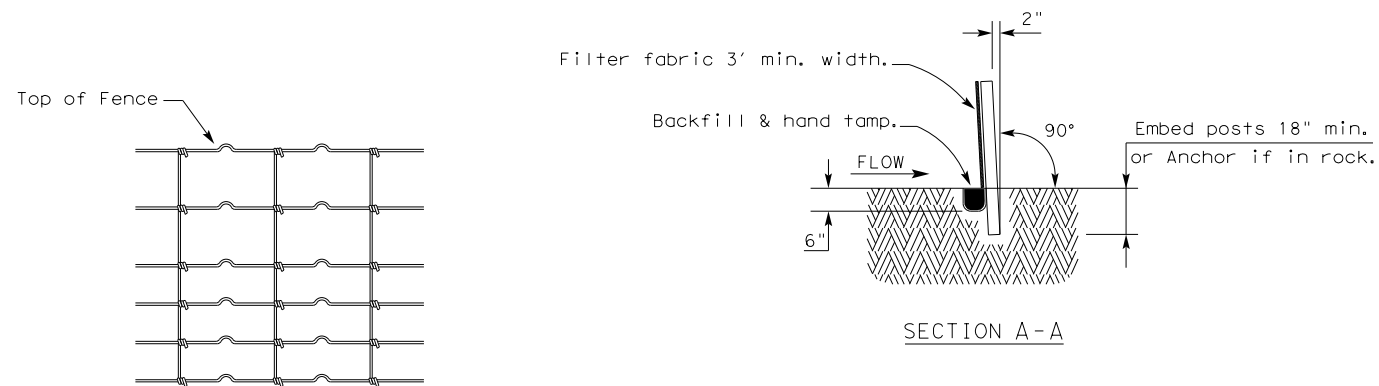
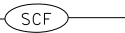
FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 978
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	BRY	MADISON	105
CONTROL	SECTION	JOB	
0552	02	027	

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TEMPORARY SEDIMENT CONTROL FENCE



HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA. SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT². Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

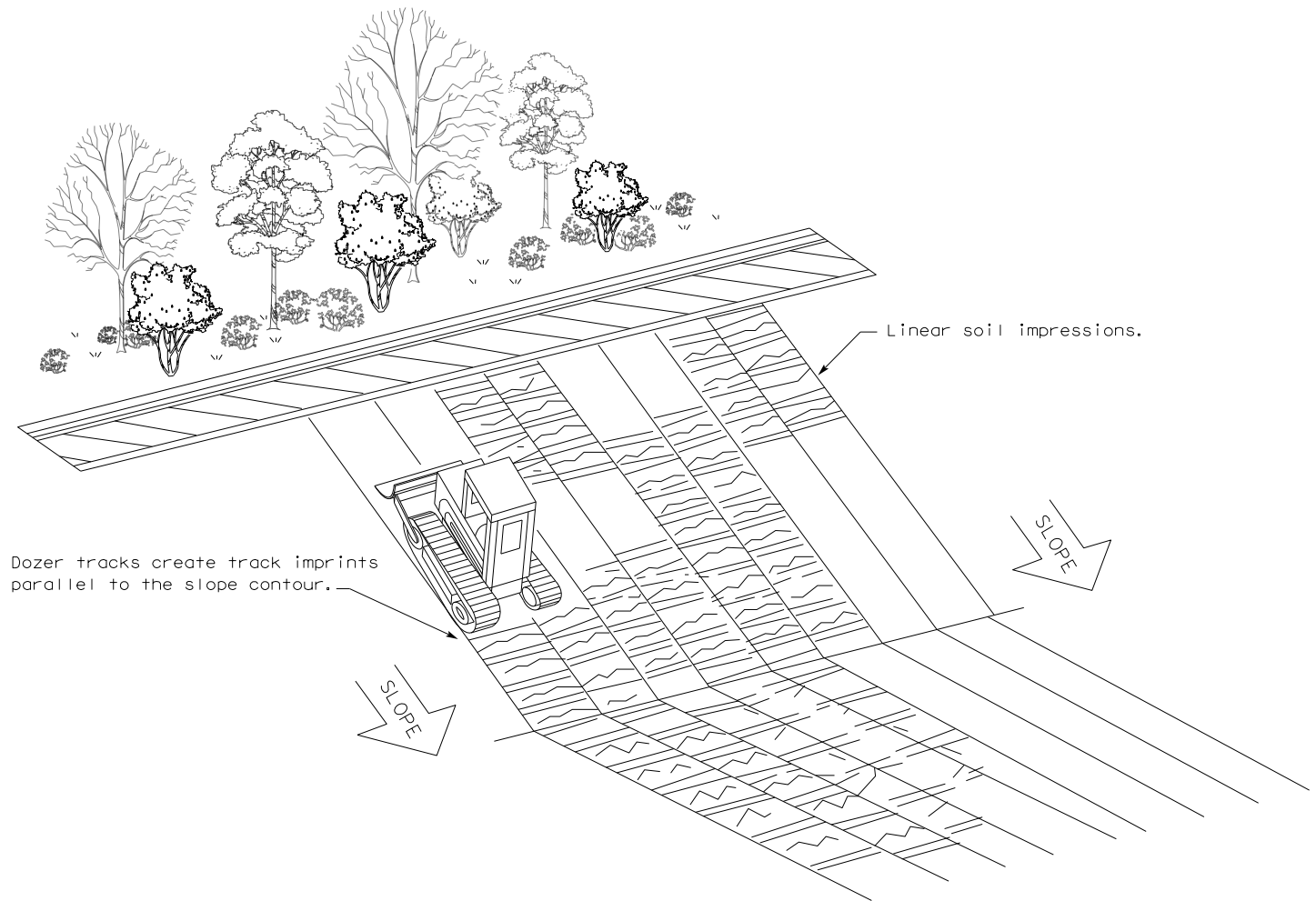
LEGEND

Sediment Control Fence



GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.

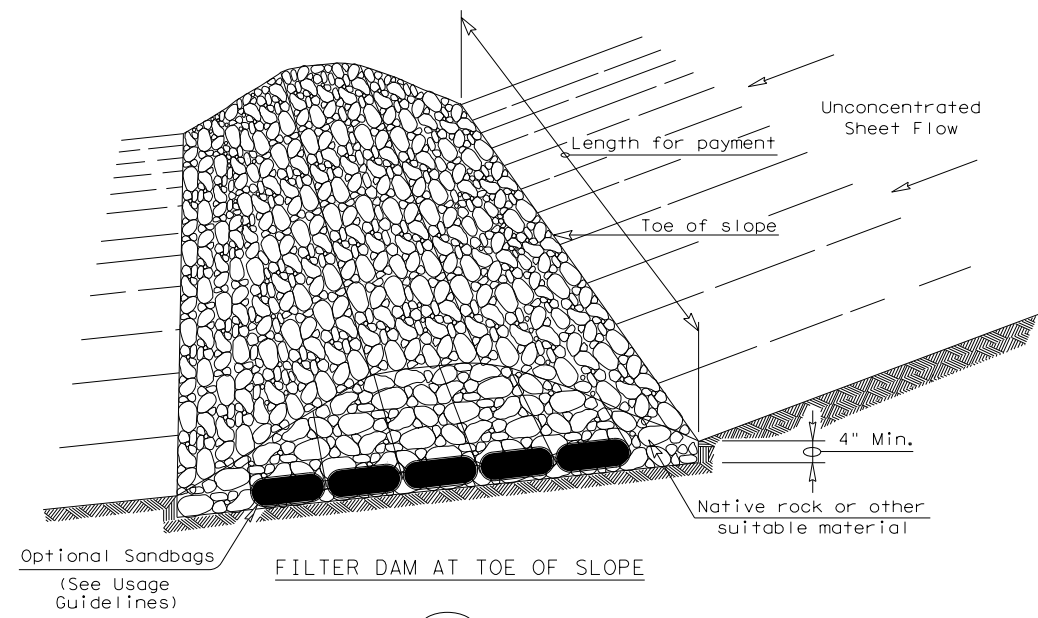


VERTICAL TRACKING

				Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & VERTICAL TRACKING					
EC(1)-16					
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS		0552	02	027	FM978
DIST	COUNTY		SHEET NO.		
BRY	MADISON		106		

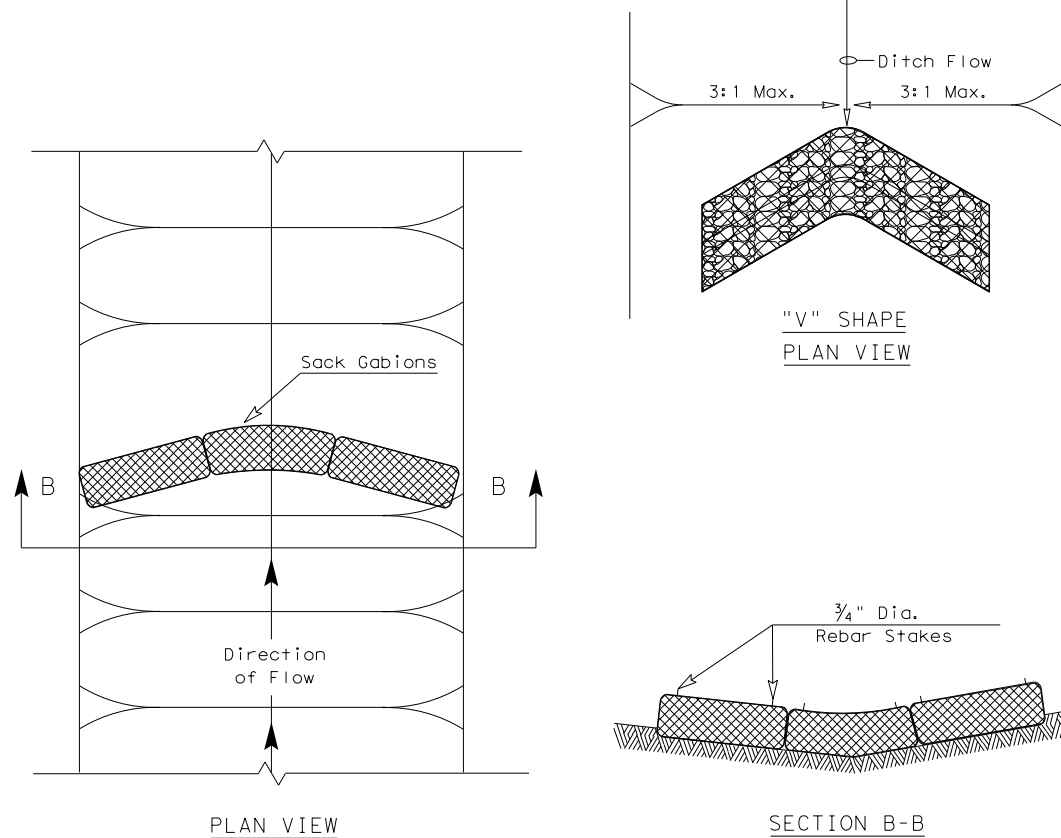
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DATE: 6/17/2020
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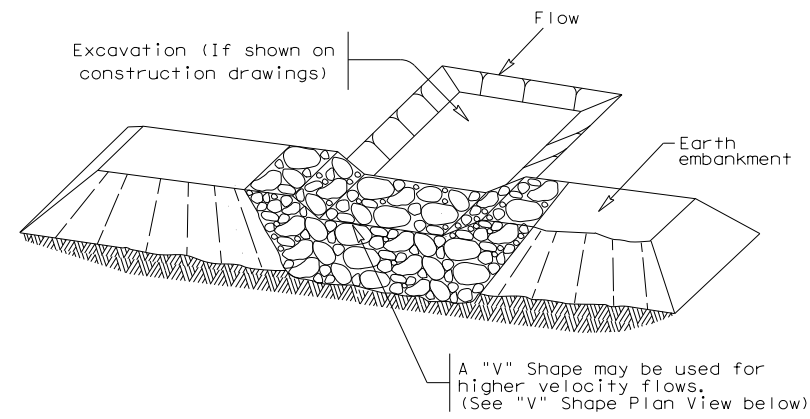
FILTER DAM AT TOE OF SLOPE

— (RFD1) —



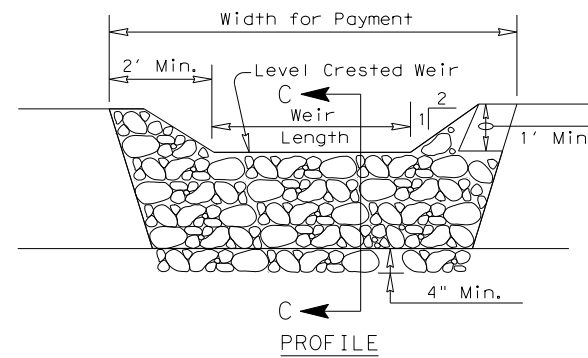
"V" SHAPE PLAN VIEW

SECTION B-B

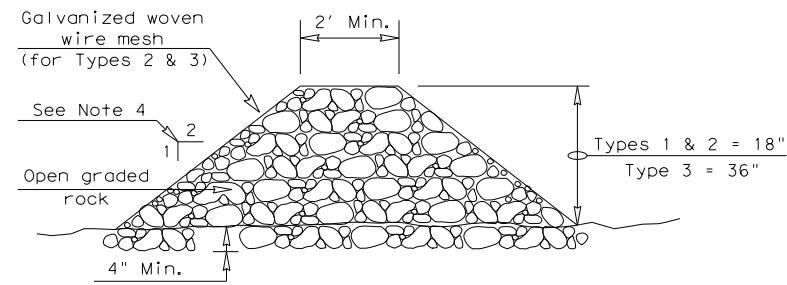


FILTER DAM AT SEDIMENT TRAP

— (RFD1) — OR — (RFD2) —



PROFILE



SECTION C-C

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/FT² of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

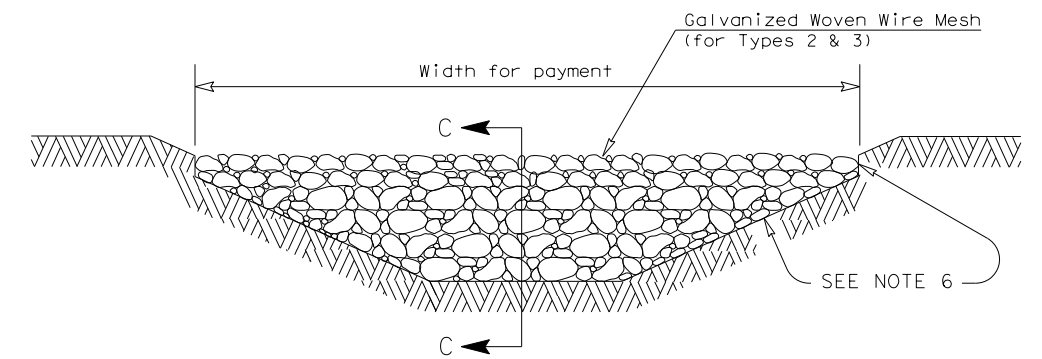
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximately 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.



FILTER DAM AT CHANNEL SECTIONS

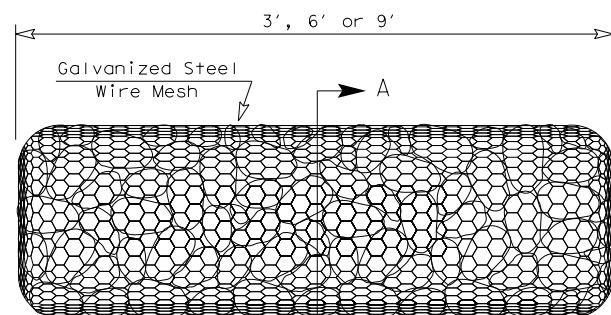
— (RFD1) — OR — (RFD2) — OR — (RFD3) —

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with 3/4" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 1/2" x 3 1/4".
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

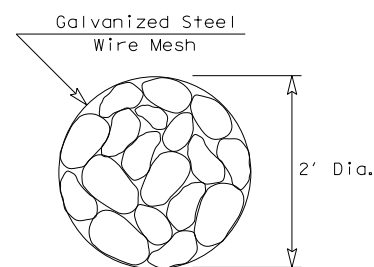
PLAN SHEET LEGEND

- Type 1 Rock Filter Dam — (RFD1) —
- Type 2 Rock Filter Dam — (RFD2) —
- Type 3 Rock Filter Dam — (RFD3) —
- Type 4 Rock Filter Dam — (RFD4) —



TYPE 4 (SACK GABIONS)

— (RFD4) —

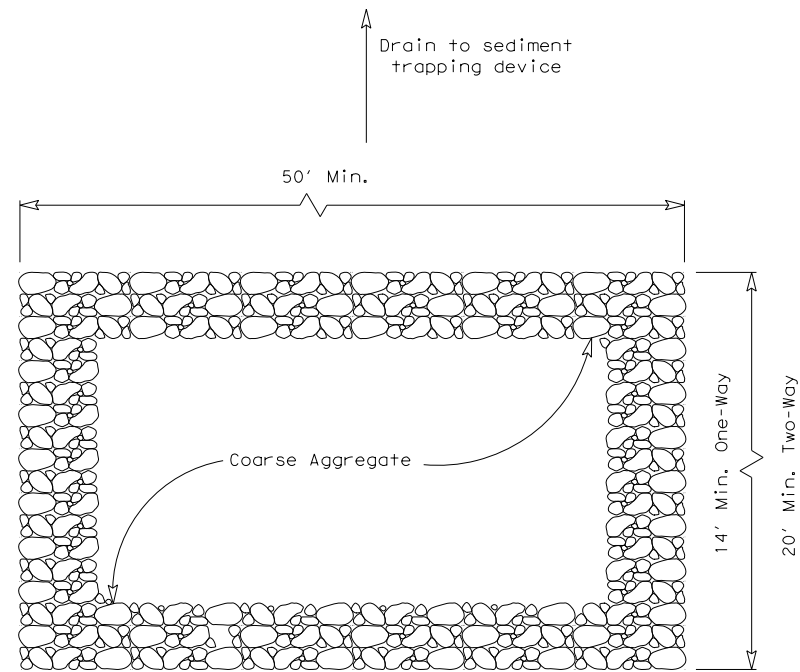


SECTION A-A

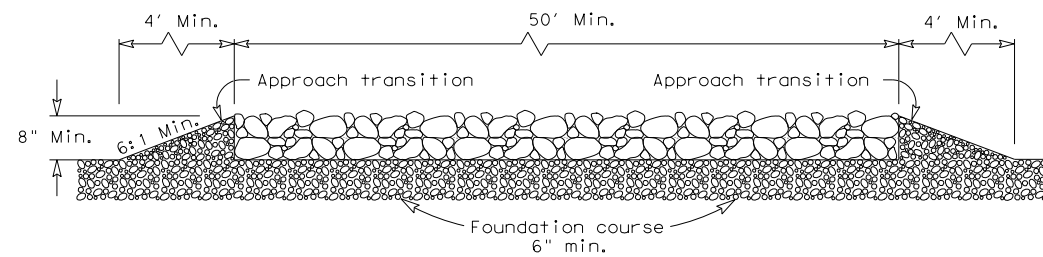
		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES ROCK FILTER DAMS EC (2) - 16			
FILE: ec216	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT: 0552	SECT: 02	JOB: 027
REVISIONS		HIGHWAY: FM978	
DIST: BRY	COUNTY: MADISON	SHEET NO.: 107	

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PLAN VIEW

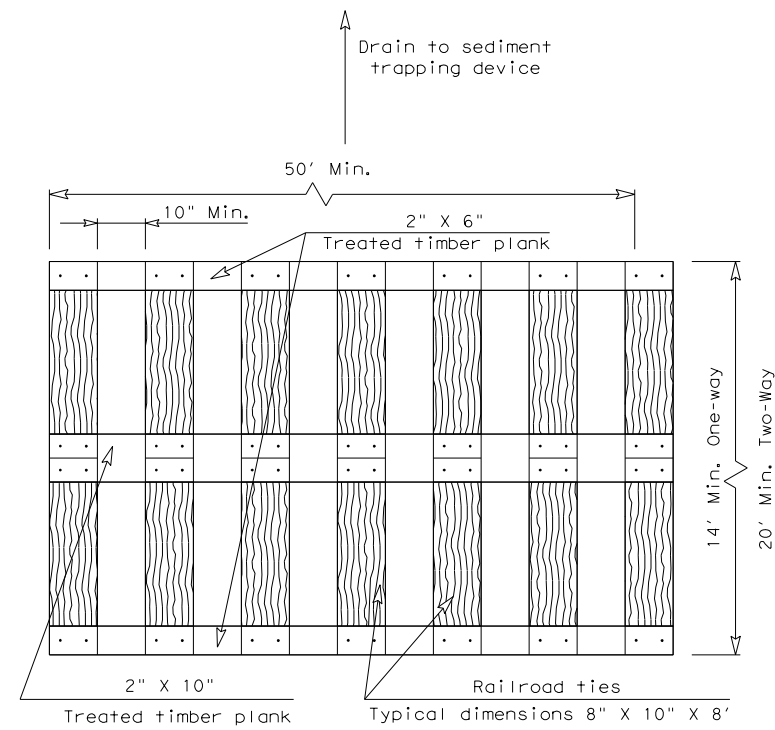


ELEVATION VIEW

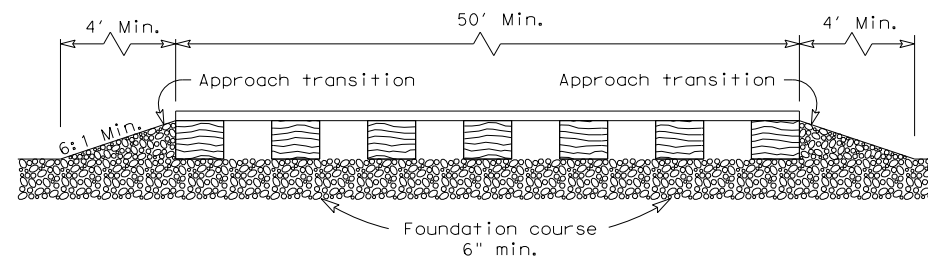
CONSTRUCTION EXIT (TYPE 1)
 ROCK CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materials approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



PLAN VIEW

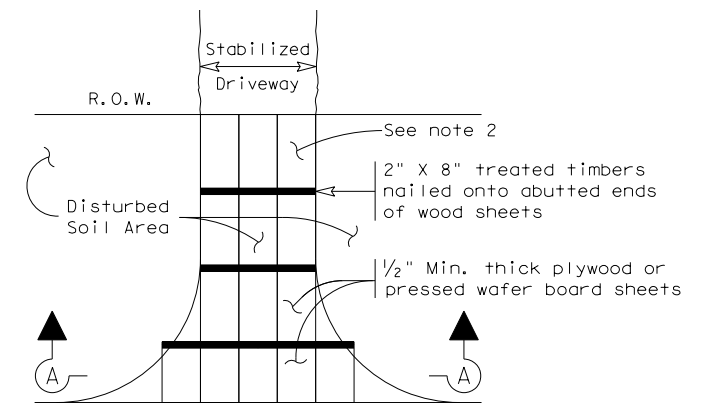


ELEVATION VIEW

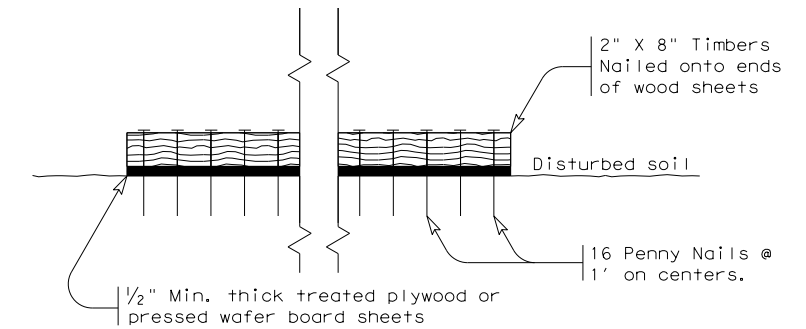
CONSTRUCTION EXIT (TYPE 2)
 TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with 1/2" x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



PLAN VIEW



SECTION A-A
 CONSTRUCTION EXIT (TYPE 3)
 SHORT TERM

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES CONSTRUCTION EXITS EC(3)-16			
FILE: ec316	DN: TxDOT	CK: KM	DW: VP
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REVISIONS		0552	02
DIST	COUNTY	SHEET NO.	
BRY	MADISON	108	