INDEX OF SHEETS

SHEET NO.	DESCRIPTION
SEE SHEET 2	

PROJECT LOCATION REFERENCE

SEE SHEET 3

VOLUME I
(CONTRACT CSJ: 0022-05-025)

CSJ: 2628-01-012 (VOLUME II)
REGISTERED ACCESSIBILITY SPECIALIST (RAS) INSPECTION REQUIRED. TDLR NO. EABPRJTABS2022017214

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENTS
FEDERAL AID PROJECT No. F 2022 (601), etc.

US 90, etc.
VAL VERDE, etc.
CCSJ: 0022-05-025, etc.

NET LENGTH OF PROJECT: 74,569.44 FT = 14.123 MI { ROADWAY = 74,156.44 FT = 14.045 MILES; BRIDGE = 413.00 FT = 0.078 MILES }

CONTROLLING LIMITS: FROM: SL 25 (NORTH)
TO: 9.4 MI EAST OF SL 25 (NORTH)

FOR THE CONSTRUCTION OF OVERLAY
CONSISTING OF PLANING, OVERLAYING, RAIL UPGRADES & PAVEMEMT MARKINGS

FEDROAD DIV NO	STATE	FEDERAL AID PROJECT NO	SHEET NO
6	TEXAS	F 2022 (601), etc.	1
STATE DIST NO	**COUNTY**	**STATE CONTROL NO**	**HIGHWAY NO**
22	VAL VERDE, etc.	0022-05-025, etc.	US 90, etc.

DESIGN CRITERIA: PM
ADT (XXXX): N/A
ADT (XXXX): N/A
% TRUCK IN ADT: N/A
FUNCTIONAL CLASS: PRINCIPAL ARTERIAL, etc.
DESIGN SPEED: N/A
TDLR REQUIRED YES ✓ NO

LOCATION #1

CSJ: 0022-05-025
LIMITS
FROM: SL 25 (NORTH)
TO: 9.4 MI EAST OF SL 25 (NORTH)

NET LENGTH OF ROADWAY	49,424.24 FT	= 9.361	MI
NET LENGTH OF BRIDGE:	382 FT	= 0.072	MI
NET LENGTH OF PROJECT	49,806.24 FT	= 9.433	MI

LOCATION #2

CSJ: 0022-10-077
LIMITS
FROM: AGARITA DR
TO: 0.7 MI N OF US 277 INT

NET LENGTH OF ROADWAY	6,879.84 FT	= 1.303	MI
NET LENGTH OF BRIDGE:	- FT	= 0.000	MI
NET LENGTH OF PROJECT	6,879.84 FT	= 1.303	MI

LOCATION #3

CSJ: 0037-07-020
LIMITS
FROM: US 83
TO: SH 85/US 83 INTERSECTION

NET LENGTH OF ROADWAY	4,641.80 FT	= 0.879	MI
NET LENGTH OF BRIDGE:	31 FT	= 0.006	MI
NET LENGTH OF PROJECT	4,672.80 FT	= 0.885	MI

LOCATION #4

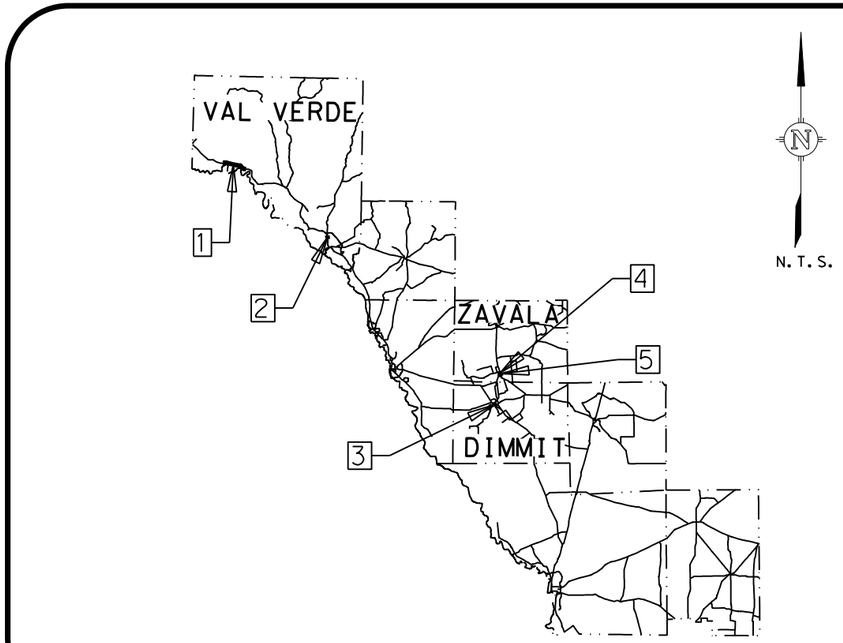
CSJ: 0878-05-025
LIMITS
FROM: FM 1433
TO: 12TH STREET

NET LENGTH OF ROADWAY	2,001.12 FT	= 0.379	MI
NET LENGTH OF BRIDGE:	- FT	= 0.000	MI
NET LENGTH OF PROJECT	2,001.12 FT	= 0.379	MI

LOCATION #5

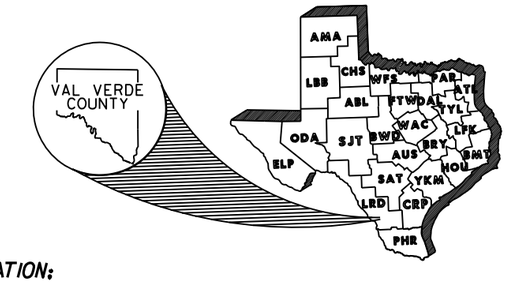
CSJ: 2628-01-011
LIMITS
FROM: FM 65
TO: US 83

NET LENGTH OF ROADWAY	11,209.44 FT	= 2.123	MI
NET LENGTH OF BRIDGE:	- FT	= 0.000	MI
NET LENGTH OF PROJECT	11,209.44 FT	= 2.123	MI



EQUATIONS: NONE
EXCEPTIONS: NONE
RAILROAD CROSSINGS: NONE

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL - AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, MAY 1, 2012).



Texas Department of Transportation®

FINAL PLANS

LETTING DATE:
DATE CONTRACTOR BEGAN WORK:
DATE WORK WAS ACCEPTED:
CONTRACTOR:
TOTAL CONTRACTOR COST:

FINALS AS BUILTS

THE CONSTRUCTION WAS PERFORMED UNDER MY SUPERVISION IN ACCORDANCE WITH THE PLANS AND CONTRACT

AREA ENGINEER

DATE

SUBMITTED FOR LETTING: 4/29/2022
DocuSigned by:
TRANSPORTATION ENGINEER
98C72D65D494466...

RECOMMENDED FOR LETTING: 4/29/2022
DocuSigned by:
Vanessa Rosales-Herrera
AREA ENGINEER
70CAB6EA8F3B42B...

RECOMMENDED FOR LETTING: 4/29/2022
DocuSigned by:
Humberto Gonzalez Jr, P.E
DIRECTOR OF TRANSPORTATION, PLANNING, & DEVELOPMENT
F7B9A3B5BF2544F...

APPROVED FOR LETTING: 4/29/2022
DocuSigned by:
David Salazar
DISTRICT ENGINEER
B741E64FAD82411...

4/29/2022 amunozl c:\txdot\pw\online\txdot5\pwonline\adriana.munoz\d0649790\025title sht.dgn

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ON THIS SHEET HAVE BEEN SELECTED BY ME OR UNDER MYRESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

5/3/2022

DocuSigned by:

98C72D65D494466...

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED
PROFESSIONAL ENGINEER

INDEX OF SHEETS

DN: MT	DW: MT	STATE	SHEET NUMBER	SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1	

FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	005, etc.	US 90, etc.

2

COUNTY	LOCATION	PROJECT CSJ	HIGHWAY	LENGTH		TYPE OF WORK	PROJECT LIMITS		REFERENCE MARKER		
				FEET	MILES						
VAL VERDE	1	0022-05-025	US 90	49,806.24	9.433	2.0" OVERLAY	FROM:	SL 25 (NORTH)	358	+	1.810
							TO:	9.4 MI EAST OF SL 25 (NORTH)	368	+	1.501
	2	0022-10-077	US 90	6,879.84	1.303	2.0" MILL & INLAY	FROM:	AGARITA DR	414	+	1.495
							TO:	0.7 MI N OF US 277 INT	416	+	0.793
DIMMIT	3	0037-07-020	SL 225	4,672.80	0.885	2.5" MILL & INLAY	FROM:	US 83	573	-	0.851
							TO:	SH 85/US 83 INTERSECTION	573	+	0.034
ZAVALA	4	0878-05-025	FM 582	2,001.12	0.379	2.0" MILL & INLAY	FROM:	FM 1433	416	-	1.557
							TO:	12TH STREET	416	-	1.177
	5	2628-01-011	FM 1433	11,209.44	2.123	2.0" MILL & INLAY	FROM:	FM 65	552	-	0.040
							TO:	US 83	554	+	0.046
			TOTAL	74,569.44	14.123						

NOTE:
FOR CONSTRUCTION PURPOSES REFER TO
REFERENCE MARKERS FOR PROJECT LIMITS.

TEXAS DEPARTMENT OF TRANSPORTATION ®

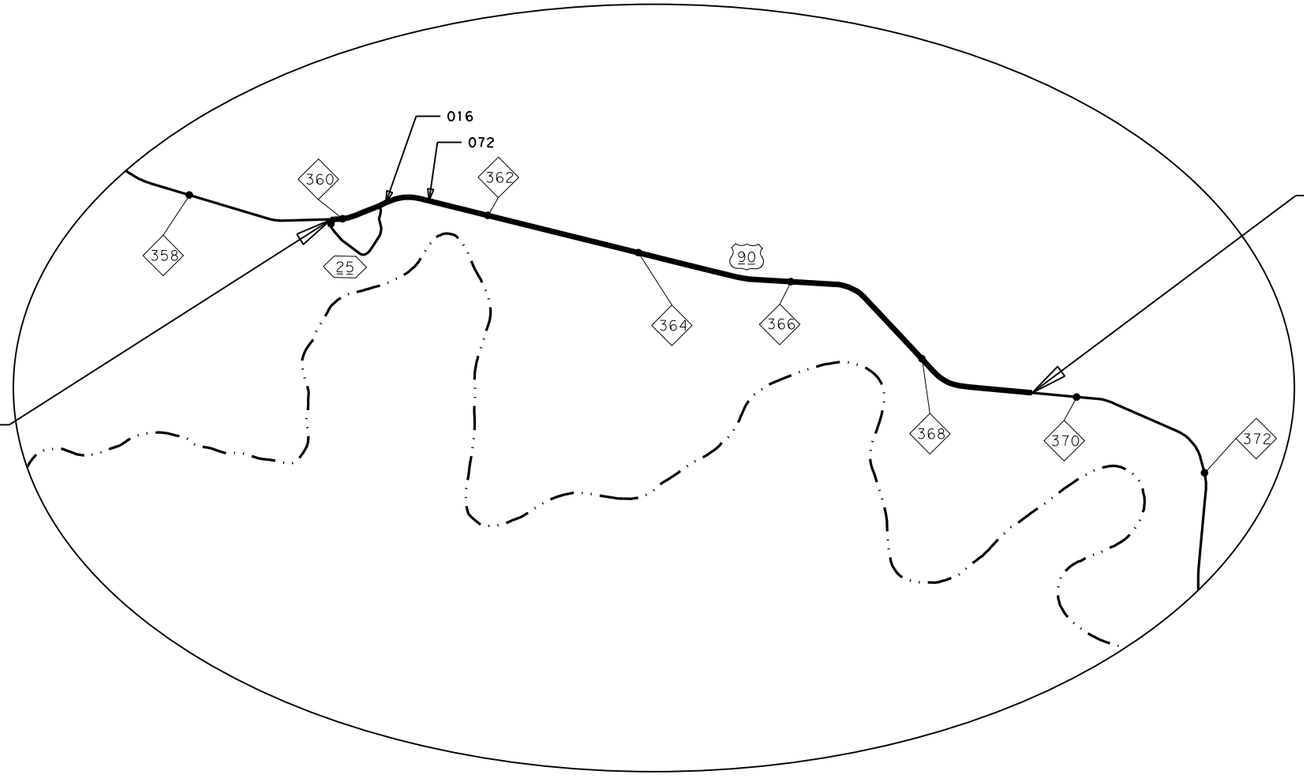
PROJECT LOCATION REFERENCE

DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.

3

LOC. #	HWY	PSN #	TYPE	LENGTH (FT)
1	US 90	222330002205016	MBC	22
1	US 90	222330002205072	SPAN	360

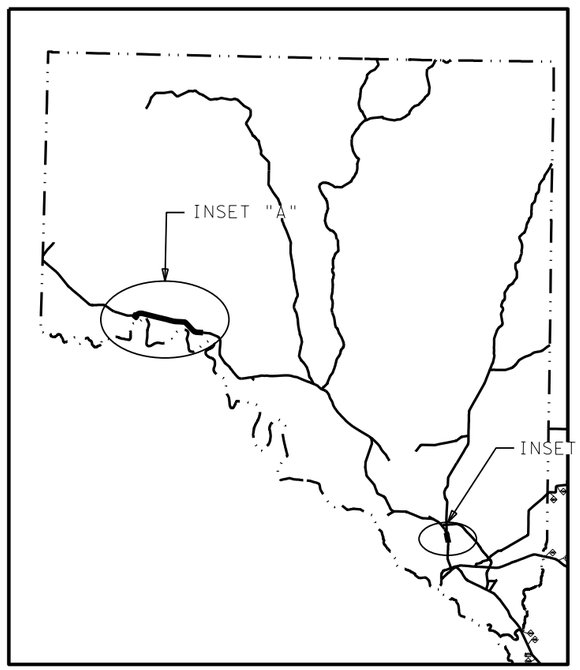
NOTES:
REFER TO "PROJECT LOCATION REFERENCE" SHEET FOR PROJECT LIMITS NOT SHOWN.



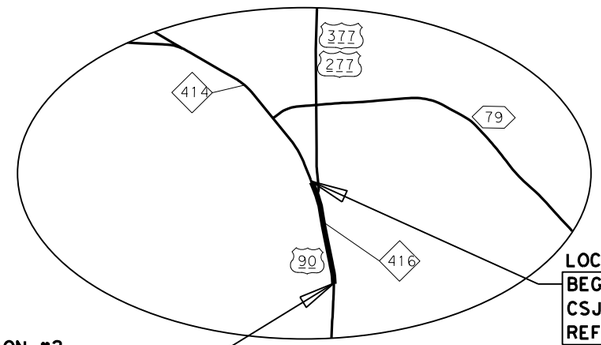
LOCATION #1
BEGIN PROJECT
CSJ: 0022-05-025
REF.MRK.: 358+1.810

LOCATION #1
END PROJECT
CSJ: 0022-05-025
REF.MRK.: 368+1.501

INSET "A"



VAL VERDE MAP INSET
NOT TO SCALE



LOCATION #2
BEGIN PROJECT
CSJ: 0022-10-077
REF.MRK.: 414+1.495

LOCATION #2
END PROJECT
CSJ: 0022-10-077
REF.MRK.: 416+0.793

INSET "B"

VAL VERDE
COUNTY

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on 5/3/2022

DocuSigned by:
98C72D65D494466...

NOT TO SCALE

LOCATION MAP

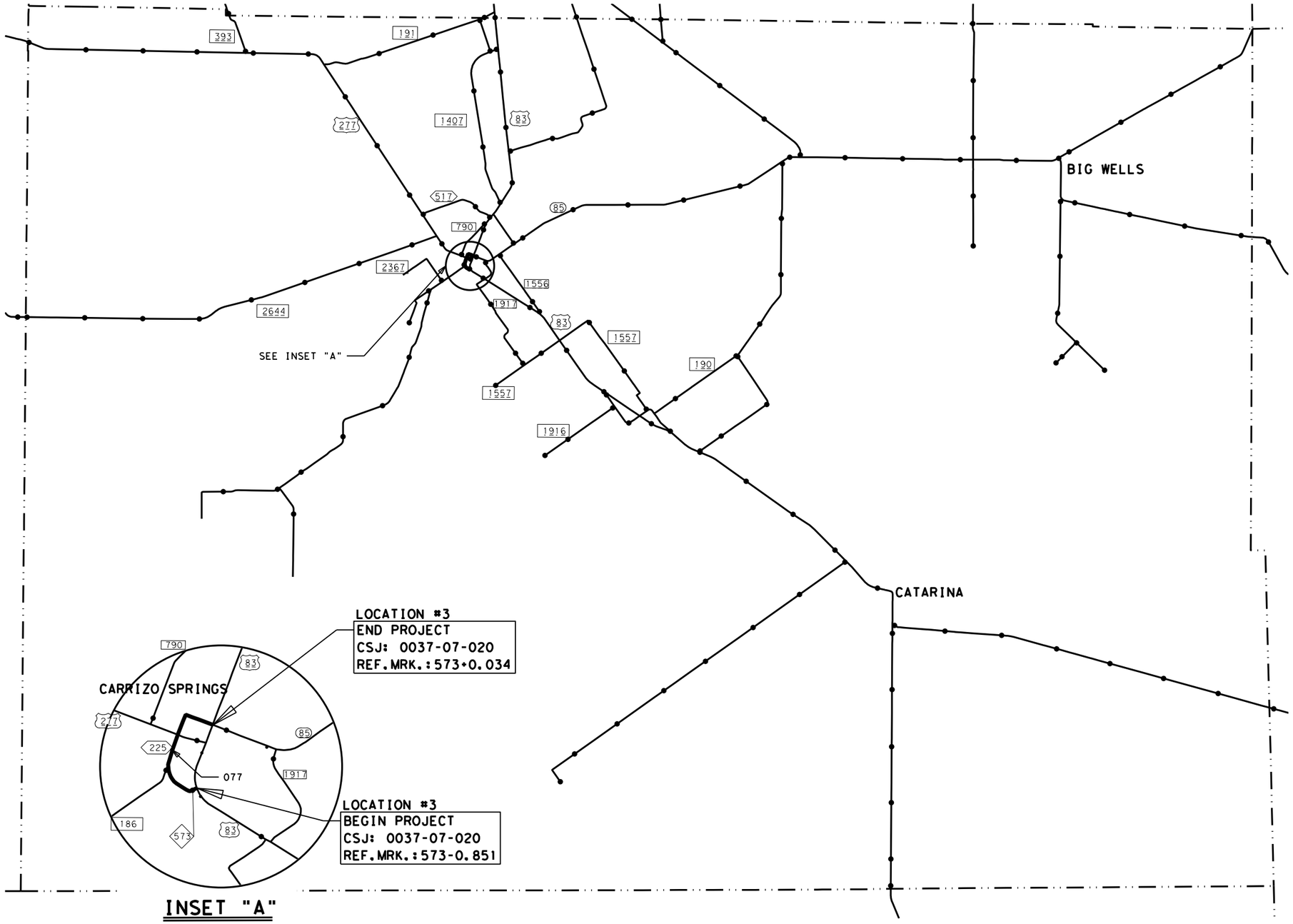
DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 3			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.

4

5/2/2022 mtorrel c:\txdot\pw*online\txdot5\max.torres\d0649790\025locmap-valverde.dgn

LOC. #	HWY	PSN #	TYPE	LENGTH (FT)
3	SL 225	220640003707017	MBC	31

NOTES:
REFER TO "PROJECT LOCATION REFERENCE" SHEET FOR PROJECT LIMITS NOT SHOWN.



DIMMIT COUNTY

SCALE: 1" = 20,000'
SCALE 0 SCALE

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on

5/3/2022

DocuSigned by:
98C72D65D494466...

HORIZ: 1"= 20,000'

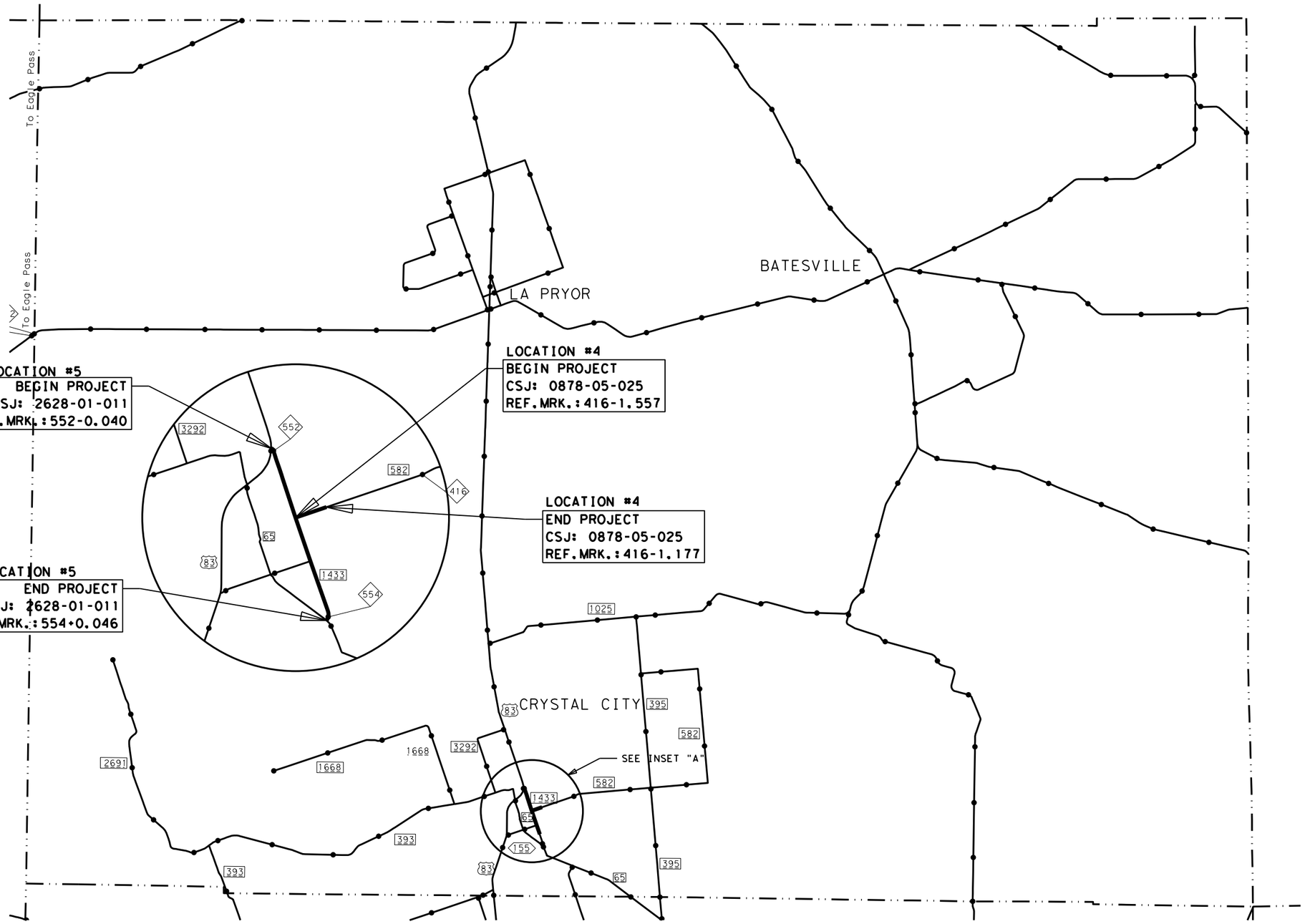
TEXAS DEPARTMENT OF TRANSPORTATION ®

LOCATION MAP

DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 2 OF 3			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	5
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	

5/2/2022 mtorrel c:\txdot\pw*online\txdot5\max.torres\d0649790\025locmap*dimmit.dgn

NOTES:
REFER TO "PROJECT LOCATION REFERENCE" SHEET FOR PROJECT LIMITS NOT SHOWN.



ZAVALA COUNTY

SCALE: 1" = 20,000'
SCALE 0 SCALE

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on 5/3/2022

DocuSigned by:
98C72D65D494466...

HORIZ: 1"= 20,000'

TEXAS DEPARTMENT OF TRANSPORTATION ®

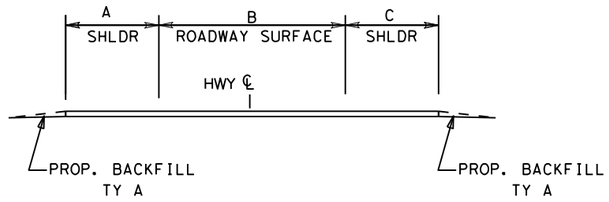
LOCATION MAP

DN: MT	CK: LGU	DW: MT	CK: LGU	STATE	SHEET NUMBER			SHEET NO.
				TEXAS	SHEET 3 OF 3			
FED.RD. DIV.NO.	STATE DIST.NO.	COUNTY		CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.		0022	05	025, etc.	US 90,etc.	6

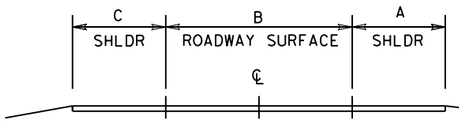
5/2/2022 mtorrel c:\txdot\pw*online\txdot5\max.torres\d0649790\025locmap-zavala.dgn

	SHLDR WIDTH	ROADWAY WIDTH (TRAVEL LANES)			SHLDR WIDTH	SURFACE WIDTH	SURFACE AREA	DESCRIPTION					
	A	B			C			TYPICAL SECTION	LOCATION NUMBER		HIGHWAY	COUNTY	APPROX. FT.
	LT	LT	TOTAL	RT	RT								
	FT	FT	FT	FT	FT	FT	SY						
	9	33	66	33	9	84	3,267	1	LOC.	1	US 90	VA VERDE	350.00
	9	33	55.5	22.5	9	73.5	1,225	1	LOC.	1	US 90	VA VERDE	150.00
	9	33	45	12	9	63	2,625	1	LOC.	1	US 90	VA VERDE	375.00
	9	28.5	40.5	12	9	58.5	1,495	1	LOC.	1	US 90	VA VERDE	230.00
	9	24	36	12	9	54	10,350	1	LOC.	1	US 90	VA VERDE	1725.00
	9	24	42	18	9	60	1,333	1	LOC.	1	US 90	VA VERDE	200.00
	9	24	48	24	9	66	2,860	1	LOC.	1	US 90	VA VERDE	390.00
	9	22	48	26	9	66	2,420	1	LOC.	1	US 90	VA VERDE	330.00
	9	22	45	23	9	63	1,400	1	LOC.	1	US 90	VA VERDE	200.00
	9	22	42	20	9	60	3,133	1	LOC.	1	US 90	VA VERDE	470.00
	9	24	36	12	9	54	6,660	1	LOC.	1	US 90	VA VERDE	1110.00
	9	18	30	12	9	48	3,653	1	LOC.	1	US 90	VA VERDE	685.00
	9	12	24	12	9	42	1,885	1	LOC.	1	US 90	VA VERDE	404.00
	9	12	24	12	9	42	1,680	1	LOC.	1	US 90	VA VERDE	360.00
	9	12	24	12	9	42	1,167	1	LOC.	1	US 90	VA VERDE	250.00
	9	12	30	18	9	48	1,893	1	LOC.	1	US 90	VA VERDE	355.00
	9	12	36	24	9	54	22,050	1	LOC.	1	US 90	VA VERDE	3675.00
	9	12	30	18	9	48	4,213	1	LOC.	1	US 90	VA VERDE	790.00
	9	12	24	12	9	42	4,200	1	LOC.	1	US 90	VA VERDE	900.00
	9	12	30	18	9	48	2,827	1	LOC.	1	US 90	VA VERDE	530.00
	9	12	36	24	8	53	1,708	1	LOC.	1	US 90	VA VERDE	290.00
	9	18	42	24	9	60	4,067	1	LOC.	1	US 90	VA VERDE	610.00
	9	24	42	18	9	60	3,467	1	LOC.	1	US 90	VA VERDE	520.00
	9	24	36	12	9	54	5,160	1	LOC.	1	US 90	VA VERDE	860.00
	9	18	30	12	9	48	2,133	1	LOC.	1	US 90	VA VERDE	400.00
	9	12	24	12	9	42	4,760	1	LOC.	1	US 90	VA VERDE	1020.00
	9	12	30	18	9	48	3,040	1	LOC.	1	US 90	VA VERDE	570.00
	9	12	36	24	9	54	9,300	1	LOC.	1	US 90	VA VERDE	1550.00
	9	18	42	24	9	60	9,667	1	LOC.	1	US 90	VA VERDE	1450.00
	9	24	48	24	9	66	7,773	1	LOC.	1	US 90	VA VERDE	1060.00
	9	24	42	18	9	60	4,220	1	LOC.	1	US 90	VA VERDE	633.00
	9	24	36	12	9	54	10,542	1	LOC.	1	US 90	VA VERDE	1757.00
	9	18	30	12	9	48	3,413	1	LOC.	1	US 90	VA VERDE	640.00
	9	12	24	12	9	42	29,806	1	LOC.	1	US 90	VA VERDE	6387.00
	9	18	36	18	9	54	2,838	1	LOC.	1	US 90	VA VERDE	473.00
	9	24	48	24	9	66	7,517	1	LOC.	1	US 90	VA VERDE	1025.00
	9	24	42	18	9	60	3,567	1	LOC.	1	US 90	VA VERDE	535.00
	9	24	36	12	9	54	12,600	1	LOC.	1	US 90	VA VERDE	2100.00
	9	18	30	12	9	48	2,400	1	LOC.	1	US 90	VA VERDE	450.00
	9	12	24	12	9	42	18,387	1	LOC.	1	US 90	VA VERDE	3940.00
	9	12	30	18	9	48	3,467	1	LOC.	1	US 90	VA VERDE	650.00
	9	18	42	24	9	60	3,800	1	LOC.	1	US 90	VA VERDE	570.00
	9	24	48	24	9	66	10,523	1	LOC.	1	US 90	VA VERDE	1435.00
	9	18	42	24	9	60	4,033	1	LOC.	1	US 90	VA VERDE	605.00
	9	12	36	24	9	54	11,340	1	LOC.	1	US 90	VA VERDE	1890.00
	9	18	42	24	9	60	3,267	1	LOC.	1	US 90	VA VERDE	490.00
	9	24	48	24	9	66	4,620	1	LOC.	1	US 90	VA VERDE	630.00
	9	24	42	18	9	60	4,800	1	LOC.	1	US 90	VA VERDE	720.00
	9	24	36	12	9	54	6,840	1	LOC.	1	US 90	VA VERDE	1140.00
	9	18	30	12	9	48	10,279	1	LOC.	1	US 90	VA VERDE	1927.24
				TOTAL			289,669						49806.2
NB	4	12	24	12	10	38	25,079	3	LOC.	2	US 90	VAL VERDE	5939.84
SB	12	12	24	12	10	46	30,359	2	LOC.	2	US 90	VAL VERDE	5939.84
	10	24	62	38	9	81	3,600	4	LOC.	2	US 90	VAL VERDE	400.00
	8	24	62	38	8	78	4,680	4	LOC.	2	US 90	VAL VERDE	540.00
A1				CROSSOVER 1			228	#	LOC.	2	US 90	VAL VERDE	#
A2				CROSSOVER 2			711	#	LOC.	2	US 90	VAL VERDE	#
A3				CROSSOVER 3			514	#	LOC.	2	US 90	VAL VERDE	#
A4				CROSSOVER 4			934	#	LOC.	2	US 90	VAL VERDE	#
A5				CROSSOVER 5			1533	#	LOC.	2	US 90	VAL VERDE	#
A6				RAMP TO US 277/AVENUE DR			702	#	LOC.	2	US 90	VAL VERDE	#
				TOTAL			68,341						12819.7
RURAL	8	12	24	12	8	40	5,071	4	LOC.	3	SL 225	DIMMIT	1141.00
URBAN	8	12	24	12	8	40	15,697	5	LOC.	3	SL 225	DIMMIT	3531.80
				TOTAL			20,768						4672.8
	0	28.95	57.9	28.95	0	57.9	8,106	5	LOC.	4	FM 582	ZAVALA	1260.00
	11.8	11.8	23.6	11.8	11.8	47.2	3,887	5	LOC.	4	FM 582	ZAVALA	741.12
				TOTAL			11,993						2001.1
	12	12	24	12	12	48	48,660	5	LOC.	5	FM 1433	ZAVALA	9123.84
	0	12	24	12	0	24	5,562	5	LOC.	5	FM 1433	ZAVALA	2085.60
R1				AT US 83 INTERSECTION			318	#	LOC.	5	FM 1433	ZAVALA	#
				TOTAL			54,540						11209.44

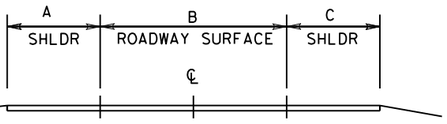
CROSSOVER AND RAMPS HAVE BEEN QUANTIFIED AS TOTAL AREA MATCHING EXISTING WIDTHS



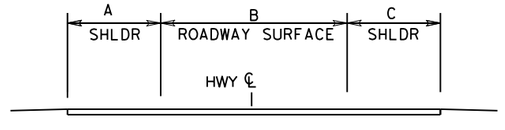
TYPICAL SECTION Loc. 1 and 5
(OVERLAY)



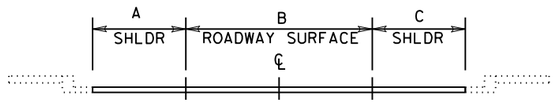
TYPICAL SECTION Loc. 2
SOUTHBOUND
(MILL/INLAY)



TYPICAL SECTION Loc. 3
NORTHBOUND
(MILL/INLAY)



TYPICAL SECTION Loc. 4
(MILL/INLAY)



TYPICAL SECTION Loc. 5
(MILL/INLAY)
⚹SECTION WITH CURB AND GUTTER

NOTES:

REFERENCE ALL EXISTING STRIPING AND PAVEMENT MARKINGS IN A MANNER WHICH ALLOWS THE MARKINGS TO BE RE-ESTABLISHED. PLACE EXTRA REFERENCE (IF NEEDED) TO ENSURE THAT THE MARKINGS (LANE LINES, EDGE LINES, ETC.) ARE IN LINE WITH SIGNS ON OSB'S, TMS ARROWS, ETC.

REFER TO "RATES OF APPLICATION" SHEET FOR PAVEMENT DESIGN.

SURFACE AREAS HAVE BEEN ADJUSTED TO OMIT ALL SPAN BRIDGES AND CONCRETE SECTIONS THAT WILL NOT BE OVERLAID.

MAINTAIN EXISTING CROSS SLOPES AND RESPECTIVE PGL THROUGHOUT THE PROJECT(S).

DRIVEWAYS AND CONCRETE PAVEMENTS WILL NOT BE PLANED/OVERLAYED ON THIS PROJECT.

REFER TO "RATE OF APPLICATION" SHEET(S) FOR MORE INFORMATION ON PAVEMENT DESIGN.

REFER TO "MISCELLANEOUS ROADWAY DETAIL" SHEET(S) FOR MORE INFORMATION

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED
PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on

5/3/2022

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NOT TO SCALE

TEXAS DEPARTMENT OF TRANSPORTATION ®

TYPICAL SECTIONS

DN: MT	CK: LGU	DW: MT	CK: LGU	STATE	SHEET NUMBER			SHEET NO.
				TEXAS	SHEET 1 OF 1			
FED.RD. DIV.NO.	STATE DIST.NO.	COUNTY		CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.		0022	05	025, etc.	US 90, etc.	7

LOC. 1---CSJ: 0022-05-025---(US 90)

PAVEMENT DESIGN
OVERLAY: 3.0" FLEXIBLE PAVEMENT STRUCTURE REPAIR FOR ROADWAY D-GR HMA TY-B (SAC-B)PG 70-22 6.0" FLEXIBLE PAVEMENT STRUCTURE REPAIR FOR SHOULDER D-GR HMA TY-B (SAC-B)PG 70-22 D-GR HMA TY-D PG 70-22 (LEVEL-UP) ⬣ BONDING COURSE 2.0" SUPER PAVE MIXTURES SP-C (SAC-A)(PG76-22) - (115 LBS/SY/IN)

LOC. 2---CSJ: 0022-10-077---(US 90 NB &SB)

PAVEMENT DESIGN
MILL/INLAY: 2.0" MILLING 5.0" FLEXIBLE PAVEMENT STRUCTURE REPAIR FOR ROADWAY D-GR HMA TY-B (SAC-B)PG 70-22 ⬣ BONDING COURSE 2.0" SUPER PAVE MIXTURES SP-C (SAC-A)(PG76-22) - (115 LBS/SY/IN)

LOC. 3---CSJ: 0037-07-020---(SL 225)

PAVEMENT DESIGN
MILL/INLAY: 2.5" MILLING 5.0" FLEXIBLE PAVEMENT STRUCTURE REPAIR FOR ROADWAY D-GR HMA TY-B (SAC-B)PG 70-22 ⬣ BONDING COURSE 2.5" SUPER PAVE MIXTURES SP-C (SAC-A)(PG76-22) - (115 LBS/SY/IN)

LOC. 4---CSJ: 0878-05-025---(FM 582)

PAVEMENT DESIGN
MILL/INLAY: 2.0" MILLING 3.0" FLEXIBLE PAVEMENT STRUCTURE REPAIR FOR ROADWAY D-GR HMA TY-B (SAC-B)PG 70-22 ⬣ BONDING COURSE 2.0" SUPER PAVE MIXTURES SP-C (SAC-A)(PG76-22) - (115 LBS/SY/IN)

LOC. 5---CSJ: 2628-01-011---(FM 1433)

PAVEMENT DESIGN
MILL/INLAY: 2.0" MILLING 3.0" FLEXIBLE PAVEMENT STRUCTURE REPAIR FOR ROADWAY D-GR HMA TY-B (SAC-B)PG 70-22 ⬣ BONDING COURSE 2.0" SUPER PAVE MIXTURES SP-C (SAC-A)(PG76-22) - (115 LBS/SY/IN)

NOTES:

APPLICATION RATES NOTED IN THE PLANS ARE FOR BIDDING AND ESTIMATION PURPOSES ONLY. ACTUAL APPLICATION RATES WILL BE DETERMINED AND ADJUSTED AS NECESSARY.

⬣ REFER TO GENERAL NOTES FOR ITEM 3084 FOR MORE INFORMATION AND CONTRACTOR'S OPTION.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED
PROFESSIONAL ENGINEER

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RATES OF APPLICATION

DN: MT	CK: LGU	DW: MT	CK: LGU	STATE	SHEET NUMBER			SHEET NO.
				TEXAS	SHEET 1 OF 1			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY		CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.		0022	05	025, etc.	US 90, etc.	8

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

Antonio Reyna – Antonio.Reyna1@txdot.gov

Alberto Chavez – Alberto.Chavez@txdot.gov

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

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following address: https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/

All questions submitted that generate a response will be posted through this site. The site is organized by the District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name.

Item 5 - Control of the Work

The Contractor shall maintain and preserve the integrity of all "existing survey markers" by avoiding the disturbance of such markers; which include all control points (horizontal and/or vertical), stakes, marks, and right-of-way markers. The Department will repair all Contractor disturbed control points, stakes, marks, and right-of-way markers. The cost for any and all repairs to the "existing survey markers" will be deducted from money due or to become due to the Contractor.

Reference all existing striping and pavement markings in a manner which allow the markings to be re-established. Place extra reference (if needed) to ensure that the markings (lane lines, edge lines, ramp gores, etc.) are in-line with signs on OSB's, TMS arrows, etc.

Contact the Laredo District Signal Section (956-712-7770) for coordination with TxDOT underground lines and/or facilities.

Prior to construction must call 811 to verify any utilities located within project limits. Contractor will also coordinate with utility owners listed below for any adjustments needed to sanitary sewer manholes, water valves, gas valve, telecommunication, television manhole located within project limits. The utility

company is responsible for any adjustment when necessary. The work should be performed in a manner as to not delay construction contractor work activity.

Contractor will make necessary arrangements with the utility owner(s) when utility adjustments are required, as a result of construction activities.

Utility Owner	Phone Number	City/County
AT&T	210-804-2961	
AEP Texas	956-721-3029	

Place temporary asphalt around the manholes and/or valves to provide a minimum of 50:1 taper when manholes and/or valves are exposed to traffic. The cost of the elevation adjustment and asphalt tapers will not be paid for directly but will be subsidiary to the price bid for other manhole and/or valve work.

Item 6 - Control of Materials

Contact the project engineer to request material a minimum of one work day prior to pick up. Load material with contract personnel. Store material in a safe location off TxDOT property or Right of Way, unless otherwise approved by the Engineer. Use material furnished by TxDOT only on the TxDOT project(s) intended. Return any unused material as soon as possible.

Item 7 - Legal Relations and Responsibilities

No significant traffic generator events identified.

Jurisdictional Waters of the United States and Project Specific Locations (PSL) Coordination - This project requires permit(s) with environmental resource agencies. There is a high probability that environmentally sensitive areas will be encountered on contractor designated project specific locations (PSLS) for the project (including but not limited to haul roads, equipment staging areas, parking areas, etc.).
Requirements for Work within Jurisdictional Waters of the United States:
The department has been authorized to perform work within designated areas of the project under U.S. Army Corps of Engineers (USACE) nationwide permit (NWP) #14 and/or #3a and/or #3b.

The contractor will not initiate activities in a project specific location (PSL) associated with a U.S. Army Corps of Engineers (USACE) permit area (i.e. an area where the USACE has jurisdiction) that has not been previously evaluated by the USACE as part of the permitting for this project. Such activities include, but are not limited to, haul roads, equipment staging areas, borrow and disposal sites. Associated defined here includes materials delivered to or from the PSL. The permit area includes all waters of the U.S. and their associated wetlands affected by activities associated with this project. Special restrictions may be required for such work in these USACE jurisdictional areas. The contractor will be responsible for any and all consultations with the USACE regarding activities, including PSLs, which have not been previously evaluated by the USACE. The Contractor will provide the department with a copy of all consultation(s) or approval(s) from the USACE prior to initiating activities.

The contractor may proceed with activities in PSLs that do not affect a USACE permit area if a self determination has been made that the PSL is non-jurisdictional or proper USACE clearances have been obtained in jurisdictional areas or have been previously evaluated by the USACE as part of the permit review of this project. The contractor is solely responsible for documenting any determination(s) that their activities do not affect a USACE permit area. The contractor will maintain copies of their determination(s) for review by the department and/or any regulatory agency.

The disturbed area for all project locations in the Contract, and the Contractor project specific locations (PSLs) within 1 mile of the project limits for the Contract, will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, the Contractor shall provide a copy of the Contractor Notice of Intent (NOI) for the PSLs to the Engineer and to the local government operating a municipal separate storm sewer system (MS4) if applicable. If the total area of project disturbed areas and PSLs total between 1-acre but less than 5-acres, the Contractor shall post the appropriate Contractor Construction Site Notice for all Contractor PSLs to be in compliance with TCEQ storm water regulations.

In order to expedite the approval process for PSLs or to eliminate or minimize potential impacts to project progress, initiate coordination efforts with the U.S.A.C.E. within 30 days from the date of “authorization to begin work” for all

County: Val Verde, etc. **Control:** 0022-05-025, etc.

Highway: US 90, etc.

PSLs that are in areas where the USACE has jurisdiction (i.e. USACE permit areas). If this is not done, the contractor waives the right to request any contract time considerations if project progress is impacted and PSL’S approval is still pending.

Requests submitted to the area engineer will be evaluated on this basis, and will require documentation showing substantial early coordination efforts to expedite the approval process as herein stated. The request will include a detailed chronological summary status with dates of coordination activities with the resource agencies, including those occurring after the initial coordination, to be reviewed and confirmed by the district’s environmental section.

For PSLs that fall within USACE permit areas, the Contractor must document and coordinate with the USACE, if required, before any excavation hauled from or embankment hauled into a USACE permit area by either (1) or (2) below.

1. Restricted Use of Materials for Previously Evaluated Permit Areas. The Contractor will document both the project specific location (PSL) and their authorization and the Contractor will maintain copies for review by the Department and/or any regulatory agency. When an area within the project limits has been evaluated by the USACE as part of the permit process for this project, then:
   a. Suitable excavation of required material in the areas shown on the plans and cross sections as specified in Item 110 is used for permanent or temporary fill (Item 132, Embankment) within a USACE permit area may be restricted;
   b. Suitable embankment (Item 132) from within the USACE permit area is used as fill within a USACE evaluated area may be restricted; and,
   c. Unsuitable excavation or excess excavation [“Waste”] (Item 110) that is disposed of at an approved location within a USACE evaluated area may be restricted.

2. Contractor Materials from Areas Other than Previously Evaluated Areas. The Contractor will provide the Department with a copy of all USACE coordination or approvals before initiating any activities for an area within the project limits that has not been evaluated by the USACE or for any off right-of-way locations used for the following, but not limited to, haul roads, equipment staging areas, borrow and disposal sites, including:
   a. Item 132, Embankment, used for temporary or permanent fill within a USACE permit area; and,
   b. Unsuitable excavation or excess excavation [“Waste”] (Item 110, Excavation) that is disposed of outside a USACE evaluated area.

Storm Water Regulations Requirements:
The Contractor shall be responsible for (off ROW) PSLs applicable to the TCEQ Construction General Permit (CGP) requirements and will notify the Engineer of the disturbed acreage within one (1) mile of the project limits. The Contractor shall obtain any required authorization form the TCEQ for any Contractor PSLs for construction support activities on or off ROW.

The total disturbed areas within the ROW are anticipated at less than one (1) acre and/or this project is classified as "surface work" consisting of an asphalt overlay of an existing roadway without shoulder-up disturbances. Due to this type of construction, the project qualifies for exclusion under the *Construction General Permit* (CGP) issued by the Texas Commission on Environmental Quality (TCEQ) on February 15, 2008. However; should the sum of the Engineer's anticipated disturbances and all of the Contractor's (On ROW and off ROW) PSLs equal or exceed the one (1) acre threshold, both TxDOT and the Contractor shall have project responsibilities under the CGP that reverts to non-exclusion status. To insure project compliance with all applicable water quality regulations, the Contractor shall obtain Engineer approval for all non-depicted areas of disturbance that increases the Engineer's initial soil and vegetation disturbed area estimates before associated work operations start.

Item 8 - Prosecution and Progress

No closures will be allowed on the weekends which include the following holidays: January 1, the last Monday in May, July 4, the first Monday in September, the fourth Thursday in November, December 25 and Easter weekend.

Nighttime work will be allowed to be performed, as approved and directed by the Engineer. Refer to the Sequence of Work, Traffic Control Plan, etc. shown in the plans, for other details.

Work that interferes with traffic is required to be performed during off-peak hours, 7 pm until 6 am.

Perform work at night, with traffic control set up no earlier than **9:00 P.M.** and all work completed, and traffic control removed by **6:00 A.M.,** when work is required on the following highways:

Ref. Loc.	Highway	From	To
2	US 90	AGARITA DR	0.7 MI N of US 277 INT
3	SL 225	US 83	SH 85/ US 83 INTERSECTION
4	FM 582	FM 1433	12 TH STEET
5	FM 1433	US 83	FM 65

Concrete Intersection work at FM1433 and Refugio St. will be allowed only on weekend days, Friday night to Monday morning. Or as approved by the Engineer.

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

Failure to complete work within the seal coat season established by the plans will result in liquidated damages as described in Section 8.6, "Failure to Complete Work on Time." This includes any surface treatment work carried over to the next year.

The Engineer may consider extending working days beyond the end of the seal coat season.

Reimbursement for project overhead will not be considered until project completion has extended beyond the original Contract Time.

Item 9 - Measurement and Payment

Coordinate and provide off-duty law enforcement officers with officially marked vehicles (if patrol cruisers are available from the enforcement agency involved) during the following operations: transitioning to a new sequence of construction, lane closures, and during a one-way traffic control situation. For payment through TxDOT state force account method, complete the weekly tracking forms provided by the department and submit invoices that agree with the tracking form for payment at the end of each month approved services were provided.

Submit Material on hand (MOH) payment requests at least 5 working days prior to the end of the month for payment on that month's estimate. For out of town MOH submit requests at least 10 working days prior to the end of the month.

Item 100 - Preparing Right of Way

Burning of brush will not be permitted.

Do not begin any clearing operations until the trees and areas of vegetation that should not be removed or disturbed by construction activities have been identified. To ensure that these areas are not disturbed, place protection fencing as shown in the plans or as directed/approved by the Engineer.

All right of way clearing operations will be coordinated with the project's SW3P and as directed/approved by the Engineer.

Item 134 - Backfilling Pavement Edges

TY "A" material will meet the following testing requirements:

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

Or as directed by the Engineer.

Item 160 - Topsoil

Place 5 inches of Topsoil to designated areas.

Item 162 - Sodding for Erosion Control

Furnish and place Bermuda grass sod.

Item 164 - Seeding for Erosion Control

Drill seeding will be used for this project. Refer to the Laredo District Standard Revegetation notes and specifications for additional information

Item 168 - Vegetative Watering

Water all areas of project to be seeded or sodded at a rate of 0.02MG/SY.

County: Val Verde, etc. **Control:** 0022-05-025, etc.

Highway: US 90, etc.

Maintain the seed bed in a condition favorable for the growth of grass. Watering can be postponed immediately after a rainfall on the site of ½ in. or greater but will be resumed before the soil dries out. Watering will continue until final acceptance.

Obtain water at a source that is metered or furnish the manufacturer's specifications showing the tank capacity for each truck used. Notify the Engineer before watering so meter readings or truck counts may be verified.

Establish 70% uniform vegetative coverage during this period in order to comply with stabilization requirements. Operate and meter water equipment under pumping pressure in order to deliver the required quantities of water necessary. During periods of adequate moisture, as determined by the Engineer, mechanical watering may not be required. In addition to metering the water equipment, provide a log book showing daily water usage and receipts of water applied upon request of the Engineer.
Upon establishment of 70% vegetative coverage as determined by the Engineer, the Engineer has the option to require the Contractor to continue watering as specified for a period not to exceed 30 days.

Item 320 – Equipment for Hot Mix Asphalt Materials

For staged construction, all longitudinal ACP joints shall be constructed with a 3:1 to 6:1 taper. For placement of 2 inches or more, the device will provide a maximum ½ inch vertical edge. Outside edges (next to the grass/earth) will also have a taper or will be backfilled the same day.

Final Surface course: all longitudinal ACP joints for the final Hot Mix surface course shall be in widths equal to travel lane widths so that all final course ACP joints will match the proposed lane striping (pavement markings), unless otherwise directed by the engineer.

Item 351 - Flexible Pavement Structure Repair

The section of roadway where the repair is to be made will be the entire width of the lane and a minimum length of 50 feet, unless otherwise directed by the Engineer.
The section of shoulder where the repair is to be made will be the existing shoulder and proposed widening shown on plans.

Item 354 - Planing and Texturing Pavement

Pavement sections to be planed and overlaid are planed no more than one week prior to placing overlay.

The contractor will be responsible for verifying the existing asphalt depth at the bridge before beginning planing operations. The contractor will be responsible for any needed repairs to the armor joint(s) and/or deck(s) as a result of the planing operations. The repairs will be conducted to the satisfaction of the Engineer. The Contractor will be responsible for all costs incurred for the repairs, including but not limited to materials, labor, equipment, and pertinent incidentals.

Stockpile salvaged planed materials per location at the following:

- ***Ref. Loc. #2- CSJ: 0022-10-077 LAT: 29°25'48.93"N LONG: 100°54'31.73"W***
- ***Ref. Loc. #3- CSJ: 0037-07-020 LAT: 28°30'40.89"N LONG: 99°52'36.08"W***
- ***Ref. Loc. #4- CSJ: 0878-05-025 LAT: 28°41'57.33"N LONG: 99°45'18.75"W***
- ***Ref. Loc. #5- CSJ: 2628-01-011 LAT: 28°41'57.33"N LONG: 99°45'18.75"W***

Item 420 - Concrete Substructures

Sulfate resistant concrete shall be used in all situations for concrete structures in contact with the natural ground.

Check the sign plans for locations of clearance signs and brackets on structures which will require inserts in the pre-stressed beams. Forward such locations to the beam fabricator.

Item 421 - Hydraulic Cement Concrete

Sulfate resistant cement concrete shall be used in all situations for structural elements in contact with the natural ground. These includes, but is not limited to, all reinforced concrete pipe, concrete box culverts, drill shafts, bridge columns, bridge abutments, wingwalls, approach slabs, inlets, manholes, junction boxes, ground boxes and all concrete riprap.

Air entrainment is not required. If concrete is supplied with air entrainment, the concrete must adhere to the requirements of item 421.4.2.4.

Item 432 - Riprap

Provide Class B Concrete for riprap.

Item 496 - Removing Structures

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

Item 500 - Mobilization

"Materials-on-Hand" payments will not be considered in determining percentages used to compute mobilization payments.

Item 502 - Barricades, Signs, and Traffic Handling

Designate, as the Contractor Responsible Person (CRP), an English speaking employee on-call nights and weekends (or any other time that work is not in progress) with a local address and telephone number for maintenance of signs and barricades. This employee will be located within one (1) hour of traveling time to the project site. Notify the Engineer in writing of the name, address and telephone number of this employee. Furnish this information to local law enforcement officials.

The time frame for the Contractor to provide properly maintained traffic control devices before they are considered to be in non-compliance with this Item, is 48 hours regardless of the days of the week involved after notification is done in writing by the Engineer.

Traffic control required for this project will not be paid for directly, but will be considered subsidiary to the various bid items.

Provide two-way radios in areas where flagmen do not have visual contact with one another or cannot communicate with one another.

Limit lane closures to a maximum of 2 miles. If more than one lane closure location is desired, provide a minimum of a 2 mile passing zone between locations. Provide a separate sign set up for each location.

Ensure equipment not in use, stockpile aggregate, and other working materials are:
A minimum of 30 feet from the edge of the travel lane;
Do not obstruct traffic or sight distance;
Do not interfere with the access from abutting property; or
Do not interfere with roadway drainage.

Erect signs in locations not obstructing the traveling public's view of the normal roadway signing or necessary sight distance at intersections and curves.

During the holiday time frame of December 21st through January 1st, every effort should be taken to ensure that all travel lanes remain open where possible.

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 504 - Field Office and Laboratory

Provide a Type D Structure and Asphalt Content by Ignition Method for TxDOT Quality Assurance Testing. Contractor's quality control testing shall be performed in a separate space or facility. If a separate space is utilized within a shared facility, partition the space with a floor to ceiling wall with a door access for indoor use that is lockable with a key. Each separate space shall have an exterior door access.

Ensure that the field lab has an office for TxDOT use along with lockable file cabinet, desk and chair.

The floor and landing of the facility shall support the weight of all equipment and personnel providing a stable, essentially zero deflection during testing operations, acceptable to the Engineer.

Contractor is responsible to transport to and from the field lab TxDOT owned testing equipment required for hot mix operations. Contractor will pick up, deliver,

install and set up TxDOT owned equipment required in the field lab. TxDOT owned equipment required in the field lab will be picked up at LRD DST LAB or as determined by the LRD DST LAB Supervisor.

Pick up and deliver TxDOT owned equipment under the supervision of a TxDOT lab technician. A TxDOT lab technician will verify the installation and set-up of the equipment at least 48 hours prior to beginning of hot mix operations (trial batch included).

All equipment will be returned by the Contractor in the same manner and location as it was picked up. Contractor is responsible for any damages incurred to TxDOT equipment.

Item 506 - Temporary Erosion, Sedimentation, and Environmental Controls

It is not anticipated that any erosion, sedimentation, or environmental control devices will be needed on this project. However, in the event that such controls are necessary, the SW3P for this project shall consist of the use of any temporary erosion control measures deemed necessary by the Engineer and as provided under this item. Payment for this work will be determined in accordance with Article 4.4, "Changes in the Work".

CSJ: 2628-01-012:

The Department will take over responsibility for the establishment of 70% vegetative cover, based on adjacent undisturbed vegetation, upon the completion of all other work in accordance with the contract and final acceptance.

Item 512 - Portable Traffic Barrier

Do not use different types of Portable Traffic Barriers in a single continuous installation.

Item 540 – Metal Beam Guard Fence

Install cast-in place concrete curb Type II in the metal beam guard fence transition (Thrie-Beam Transition). Pre-cast concrete curb will not be allowed.

Item 585 - Ride Quality for Pavement Surfaces

Reference Location #1 thru 5
Use pay adjustment schedule 2

Item 644 - Small Roadside Sign Assemblies

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

Item 658 – Delineator and Object Marker Assemblies

Proposed delineators for this project will consist of oval shape tube flexible post with a quick release embedded anchor insert stub only, such as Flexstake Inc. – 650 series or Shur-Tite – SD series or equal flexible driveable delineators.

Item 666 – Reflectorized Pavement Markings

Reflectivity requirements for Type I will be as per Item 666.

Payment on Type I markings requiring retroreflective testing will be made at a 75% rate until passing test results are received.

Item 3077 – Superpave Mixtures

Use aggregate that meets the SAC-A only for final riding surface.

Excess RAP will be retained by the contractor.
Apply the Bonding Course in accordance to item 3084.

For mill and inlay sections:
Only mill what can be paved by the end of the workday.

The use of RAP, RAS, and/or Substitute Binders will not be allowed on the final riding surface.

RAP 20% is allowed for Ty B mixes, but RAS will not be allowed. Substitute Binders (grade dumping) may be allowed when the surface HMA layer is placed continuously after the intermediate layer as approved by the Engineer.

Over lay requirements will only be for the final riding surface.

Mixture Property	Test Method	Surface Mixtures
Critical Fracture Energy (CFE), in.-lb/in.^{2}, Min	Tex-248-F[1]	1.0
Crack Progression Rate (CPR), Max		0.45

1. For JMF 2 and greater, Tex-250-F and the IDEAL CT correlation developed during the trial batch may be used to monitor cracking performance. If at any time the minimum correlation limit is not met, use Tex-248-F and the limits above to determine specification compliance.

Methylene Blue (AASHTO T 330.07) will be tested for informational purposes only.

- Asphalt content will be determined by nuclear gauge.

For Reference Location #2 CSJ:0037-07-020 only, no vibratory compaction equipment will be allowed to achieve density. The contractor will provide adequate equipment to achieve final compaction.

Item 3084 – Bonding Course

An average rate of 0.20 gal/sy was used for estimation purposes. Contractor shall choose an option shown below and bid accordingly.

OPTIONS:

MATERIAL	TYPICAL APPLICATION RATE (GAL/SY)
TRAIL – Emulsified Asphalt	#
TRAIL – Hot Applied	#
Spray Applied Underseal Membrane	#

Typical Application Rate may vary from 0.07 to 0.20 gal/sy depending on option

Apply bonding course at every intermediate layer, unless otherwise directed. The type of tack coat must be approved by the Engineer.

The Engineer may adjust the application rates as per field conditions.

County: Val Verde, etc.

Control: 0022-05-025, etc.

Highway: US 90, etc.

Control: 0022-05-025, etc.

Shear Bond Strength Test will be performed for informational purposes and will not be used for specification compliance. The target shear bond strength is a minimum of 40 psi and for final surface layer a minimum of 50 psi.

Item 6001 - Portable Changeable Message Sign

Provide Four (04) electronic portable changeable message signs as required by the Engineer. Provide backups and keep operational and available on the jobsite at all times during traffic control operations. The electronic portable changeable message signs will be made available for utilization for the entire duration of the project, including all alternative locations.

Item 6185 – Truck Mounted Attenuator (TMA) and Trailer

Provide 2 Truck Mounted Attenuator as required by the Engineer. Provide backup and keep operational and available on the jobsite at all times during traffic control operations. The Truck Mounted Attenuator will be made available for utilization for the entire duration of the project, including all alternative locations.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0022-05-025 **DISTRICT** Laredo **COUNTY** Dimmit, Val Verde, Zavala
HIGHWAY FM 1433, FM 582, SL 225, US 90

			CONTROL SECTION JOB	0022-05-025		0022-10-077		0037-07-020		0878-05-025		2628-01-011		2628-01-012	
			PROJECT ID	A00119726		A00180270		A00124463		A00180288		A00124214		A00183529	
			COUNTY	Val Verde		Val Verde		Dimmit		Zavala		Zavala		Zavala	
			HIGHWAY	US 90		US 90		SL 225		FM 582		FM 1433		FM 1433	
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL
	100-6002	PREPARING ROW	STA											76.000	
	100-6016	PREPARING ROW (TREE) (36" TO 48" DIA)	EA											2.000	
	104-6001	REMOVING CONC (PAV)	SY											41.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY											456.000	
	104-6022	REMOVING CONC (CURB AND GUTTER)	LF											9,518.000	
	104-6036	REMOVING CONC (SIDEWALK OR RAMP)	SY											5,469.000	
	104-6054	REMOVING CONCRETE(MOW STRIP)	LF					200.000							
	104-6067	REMOVING CONC (SAWCUT)	LF											348.000	
	110-6001	EXCAVATION (ROADWAY)	CY									890.000			
	134-6001	BACKFILL (TY A)	STA	498.070				14.000							
	160-6010	FURNISH AND PLACE TOPSOIL (5")	SY											5,479.000	
	162-6002	BLOCK SODDING	SY											5,479.000	
	164-6001	BROADCAST SEED (PERM) (RURAL) (SANDY)	SY											5,479.000	
	168-6001	VEGETATIVE WATERING	MG											206.000	
	351-6001	FLEXIBLE PAVEMENT STRUCTURE REPAIR(5")	SY			6,835.000		2,077.000							
	351-6002	FLEXIBLE PAVEMENT STRUCTURE REPAIR(6")	SY	4,802.000											
	351-6019	FLEXIBLE PAVEMENT STRUCTURE REPAIR(3")	SY	28,967.000						1,200.000		5,348.000			
	354-6021	PLANE ASPH CONC PAV(0" TO 2")	SY	1,467.000											
	354-6045	PLANE ASPH CONC PAV (2")	SY			68,341.000				11,993.000		53,474.000			
	354-6064	PLANE ASPH CONC PAV (2 1/2")	SY					20,768.000							
	360-6054	CONC PVMT (CONT REINF-CRCP) (HES) (9")	SY									1,066.000			
	360-6080	CONC PVMT(CRCP)(TRANSITION SLAB)	SY									160.000			
	361-6002	FULL - DEPTH REPAIR CRCP (8")	SY					300.000							
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	784.000		50.000		31.000							
	438-6001	CLEANING AND SEALING EXISTING JOINTS	LF	132.000											
	450-6050	RAIL (HANDRAIL)(TY D)	LF											20.000	
	467-6091	SET (TY I)(S=2 FT)(HW=3FT)(4:1)(C)	EA			1.000									
	467-6224	SET (TY I)(S= 6 FT)(HW= 6 FT)(4:1) (C)	EA			2.000									
	467-6276	SET (TY I)(S= 8 FT)(HW= 5 FT)(4:1) (C)	EA			2.000									
	480-6001	CLEAN EXIST CULVERTS	EA			4.000									
	496-6005	REMOV STR (WINGWALL)	EA			4.000									
	500-6001	MOBILIZATION	LS	1.000											
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	23.000											
	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)	LF			64.000									
	506-6011	ROCK FILTER DAMS (REMOVE)	LF			64.000									
	506-6030	BACKHOE WORK (EROSION & SEDMT CONT)	HR			7.000									
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF			258.000									

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0022-05-025 **DISTRICT** Laredo **COUNTY** Dimmit, Val Verde, Zavala
HIGHWAY FM 1433, FM 582, SL 225, US 90

		CONTROL SECTION JOB		**0022-05-025**		**0022-10-077**		**0037-07-020**		**0878-05-025**		**2628-01-011**		**2628-01-012**	
		PROJECT ID		**A00119726**		**A00180270**		**A00124463**		**A00180288**		**A00124214**		**A00183529**	
		COUNTY		**Val Verde**		**Val Verde**		**Dimmit**		**Zavala**		**Zavala**		**Zavala**	
		HIGHWAY		**US 90**		**US 90**		**SL 225**		**FM 582**		**FM 1433**		**FM 1433**	
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF			258.000									
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF											8,130.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF											8,130.000	
	510-6001	ONE-WAY TRAF CONT (FLAGGER CONT)	HR	440.000		20.000				64.000		152.000			
	510-6002	ONE-WAY TRAF CONT (PILOT CAR)	HR	440.000				115.000							
	512-6072	PTB (FRN&INSTL)(SGL SLP)(TY 1) OR (STL)	LF			120.000									
	512-6074	PTB (MOVE)(SGL SLP)(TY 1) OR (STL)	LF			360.000									
	512-6076	PTB (REMOVE)(SGL SLP)(TY 1) OR (STL)	LF			120.000									
	529-6008	CONC CURB & GUTTER (TY II)	LF											9,518.000	
	529-6030	CONC CURB & GUTTER (VALLEY GUTTER)	LF							75.000		60.000			
	530-6025	DRIVEWAYS (CONC) (FAST TRACK)	SY											1,201.000	
	531-6001	CONC SIDEWALKS (4")	SY											5,469.000	
	531-6004	CURB RAMPS (TY 1)	EA											17.000	
	531-6005	CURB RAMPS (TY 2)	EA											2.000	
	531-6006	CURB RAMPS (TY 3)	EA											1.000	
	531-6008	CURB RAMPS (TY 5)	EA											3.000	
	531-6010	CURB RAMPS (TY 7)	EA											3.000	
	531-6013	CURB RAMPS (TY 10)	EA											31.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	99,613.000											
	533-6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF	49,807.000											
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	15,725.000		525.000		200.000							
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000											
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA			3.000									
	540-6017	MTL BM GD FEN (LONG SPAN SYSTEM)	LF			150.000									
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	15,275.000		400.000		250.000							
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA			2.000									
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	EA	4.000											
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	74.000		3.000		2.000							
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	4.000		2.000		2.000							
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA			3.000									
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA			1.000									
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA			1.000									
	560-6004	MAILBOX INSTALL-S (TWG-POST) TY 2	EA											16.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA									8.000		19.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA											1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA									3.000		19.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	220.000											

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0022-05-025 **DISTRICT** Laredo **COUNTY** Dimmit, Val Verde, Zavala
HIGHWAY FM 1433, FM 582, SL 225, US 90

			CONTROL SECTION JOB	**0022-05-025**		**0022-10-077**		**0037-07-020**		**0878-05-025**		**2628-01-011**		**2628-01-012**	
			PROJECT ID	**A00119726**		**A00180270**		**A00124463**		**A00180288**		**A00124214**		**A00183529**	
			COUNTY	**Val Verde**		**Val Verde**		**Dimmit**		**Zavala**		**Zavala**		**Zavala**	
			HIGHWAY	**US 90**		**US 90**		**SL 225**		**FM 582**		**FM 1433**		**FM 1433**	
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL
	662-6001	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	LF			860.000				500.000		2,275.000			
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF			118.000		2,239.000		2,000.000		4,550.000			
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	2,593.000		1,033.000				165.000		1,327.000			
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	4,916.000		180.000		449.000		346.000		2,197.000			
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	220.000		2,280.000		450.000		620.000		875.000			
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF			140.000		1,232.000		175.000		765.000			
	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	2.000		15.000		5.000		7.000		4.000			
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	2.000		15.000		5.000		6.000		4.000			
	666-6099	REF PAV MRK TY I(W)18"(YLD TRI)(100MIL)	EA									132.000			
	666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	2,858.000		284.000				550.000		4,288.000			
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	99,613.000		7,820.000		8,954.000		4,003.000		4,160.000			
	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	8,617.000		1,956.000				550.000		4,655.000			
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	84,987.000		7,820.000		8,954.000		3,603.000		21,410.000			
	672-6007	REFL PAV MRKR TY I-C	EA	450.000		214.000		23.000		45.000		248.000			
	672-6009	REFL PAV MRKR TY II-A-A	EA	1,172.000		39.000		121.000		79.000		495.000			
	3076-6043	D-GR HMA TY-D PG70-22 (LEVEL-UP)	TON	8,691.000											
	3077-6033	SP MIXESSP-CSAC-A PG76-22	TON	33,312.000		7,860.000		2,986.000		1,380.000		6,150.000			
	3084-6001	BONDING COURSE	GAL	57,934.000		13,669.000		4,154.000		2,399.000		10,695.000			
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	4.000											
	6049-6001	LONG CHANNEL MOUNT CURB SYS (INSTALL)	LF			415.000									
	6049-6003	LONG CHANNEL MOUNT CURB SYS (REMOVE)	LF			415.000									
	6185-6002	TMA (STATIONARY)	DAY	60.000		38.000		13.000		8.000		19.000		260.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	160.000		40.000		32.000		24.000		30.000			
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000											
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000											
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000											

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0022-05-025 **DISTRICT** Laredo **COUNTY** Dimmit, Val Verde, Zavala

HIGHWAY FM 1433, FM 582, SL 225, US 90

				TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB			
		PROJECT ID			
		COUNTY			
		HIGHWAY			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**		
	100-6002	PREPARING ROW	STA	76.000	
	100-6016	PREPARING ROW (TREE) (36" TO 48" DIA)	EA	2.000	
	104-6001	REMOVING CONC (PAV)	SY	41.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	456.000	
	104-6022	REMOVING CONC (CURB AND GUTTER)	LF	9,518.000	
	104-6036	REMOVING CONC (SIDEWALK OR RAMP)	SY	5,469.000	
	104-6054	REMOVING CONCRETE(MOW STRIP)	LF	200.000	
	104-6067	REMOVING CONC (SAWCUT)	LF	348.000	
	110-6001	EXCAVATION (ROADWAY)	CY	890.000	
	134-6001	BACKFILL (TY A)	STA	512.070	
	160-6010	FURNISH AND PLACE TOPSOIL (5")	SY	5,479.000	
	162-6002	BLOCK SODDING	SY	5,479.000	
	164-6001	BROADCAST SEED (PERM) (RURAL) (SANDY)	SY	5,479.000	
	168-6001	VEGETATIVE WATERING	MG	206.000	
	351-6001	FLEXIBLE PAVEMENT STRUCTURE REPAIR(5")	SY	8,912.000	
	351-6002	FLEXIBLE PAVEMENT STRUCTURE REPAIR(6")	SY	4,802.000	
	351-6019	FLEXIBLE PAVEMENT STRUCTURE REPAIR(3")	SY	35,515.000	
	354-6021	PLANE ASPH CONC PAV(0" TO 2")	SY	1,467.000	
	354-6045	PLANE ASPH CONC PAV (2")	SY	133,808.000	
	354-6064	PLANE ASPH CONC PAV (2 1/2")	SY	20,768.000	
	360-6054	CONC PVMT (CONT REINF-CRCP) (HES) (9")	SY	1,066.000	
	360-6080	CONC PVMT(CRCP)(TRANSITION SLAB)	SY	160.000	
	361-6002	FULL - DEPTH REPAIR CRCP (8")	SY	300.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	865.000	
	438-6001	CLEANING AND SEALING EXISTING JOINTS	LF	132.000	
	450-6050	RAIL (HANDRAIL)(TY D)	LF	20.000	
	467-6091	SET (TY I)(S=2 FT)(HW=3FT)(4:1)(C)	EA	1.000	
	467-6224	SET (TY I)(S= 6 FT)(HW= 6 FT)(4:1) (C)	EA	2.000	
	467-6276	SET (TY I)(S= 8 FT)(HW= 5 FT)(4:1) (C)	EA	2.000	
	480-6001	CLEAN EXIST CULVERTS	EA	4.000	
	496-6005	REMOV STR (WINGWALL)	EA	4.000	
	500-6001	MOBILIZATION	LS	1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	23.000	
	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)	LF	64.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	64.000	
	506-6030	BACKHOE WORK (EROSION & SEDMT CONT)	HR	7.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	258.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0022-05-025 **DISTRICT** Laredo **COUNTY** Dimmit, Val Verde, Zavala
HIGHWAY FM 1433, FM 582, SL 225, US 90

CONTROL SECTION JOB / PROJECT ID / COUNTY / HIGHWAY				TOTAL EST.	TOTAL FINAL
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**		
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	258.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	8,130.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	8,130.000	
	510-6001	ONE-WAY TRAF CONT (FLAGGER CONT)	HR	676.000	
	510-6002	ONE-WAY TRAF CONT (PILOT CAR)	HR	555.000	
	512-6072	PTB (FRN&INSTL)(SGL SLP)(TY 1) OR (STL)	LF	120.000	
	512-6074	PTB (MOVE)(SGL SLP)(TY 1) OR (STL)	LF	360.000	
	512-6076	PTB (REMOVE)(SGL SLP)(TY 1) OR (STL)	LF	120.000	
	529-6008	CONC CURB & GUTTER (TY II)	LF	9,518.000	
	529-6030	CONC CURB & GUTTER (VALLEY GUTTER)	LF	135.000	
	530-6025	DRIVEWAYS (CONC) (FAST TRACK)	SY	1,201.000	
	531-6001	CONC SIDEWALKS (4")	SY	5,469.000	
	531-6004	CURB RAMPS (TY 1)	EA	17.000	
	531-6005	CURB RAMPS (TY 2)	EA	2.000	
	531-6006	CURB RAMPS (TY 3)	EA	1.000	
	531-6008	CURB RAMPS (TY 5)	EA	3.000	
	531-6010	CURB RAMPS (TY 7)	EA	3.000	
	531-6013	CURB RAMPS (TY 10)	EA	31.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	99,613.000	
	533-6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF	49,807.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	16,450.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	3.000	
	540-6017	MTL BM GD FEN (LONG SPAN SYSTEM)	LF	150.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	15,925.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA	2.000	
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	EA	4.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	79.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	8.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	3.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	1.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	1.000	
	560-6004	MAILBOX INSTALL-S (TWG-POST) TY 2	EA	16.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	27.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA	1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	22.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	220.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0022-05-025 **DISTRICT** Laredo **COUNTY** Dimmit, Val Verde, Zavala
HIGHWAY FM 1433, FM 582, SL 225, US 90

				TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB			
		PROJECT ID			
		COUNTY			
		HIGHWAY			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**		
	662-6001	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	LF	3,635.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	8,907.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	5,118.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	8,088.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	4,445.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	2,312.000	
	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	33.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	32.000	
	666-6099	REF PAV MRK TY I(W)18"(YLD TRI)(100MIL)	EA	132.000	
	666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	7,980.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	124,550.000	
	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	15,778.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	126,774.000	
	672-6007	REFL PAV MRKR TY I-C	EA	980.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	1,906.000	
	3076-6043	D-GR HMA TY-D PG70-22 (LEVEL-UP)	TON	8,691.000	
	3077-6033	SP MIXESSP-CSAC-A PG76-22	TON	51,688.000	
	3084-6001	BONDING COURSE	GAL	88,851.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	4.000	
	6049-6001	LONG CHANNEL MOUNT CURB SYS (INSTALL)	LF	415.000	
	6049-6003	LONG CHANNEL MOUNT CURB SYS (REMOVE)	LF	415.000	
	6185-6002	TMA (STATIONARY)	DAY	398.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	286.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000	

SUMMARY OF MOBILIZATION ITEMS

LOCATION - CSJ	500 6001 MOBILIZATION	502 6001 BARRICADES, SIGNS AND TRAFFIC HANDLING
	LS	MO
1 - 0022-05-025	1	10
PROJECT TOTALS	1	10

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION - CSJ	510 6001 ONE-WAY TRAF CONT (FLAGGER CONT)	510 6002 ONE-WAY TRAF CONT (PILOT CAR)	662 6109 WK ZN PAV MRK SHT TERM (TAB)TY W	662 6111 WK ZN PAV MRK SHT TERM (TAB)TY Y-2	6001 6002 PORTABLE CHANGEABLE MESSAGE SIGN	6185 6002 TMA (STATIONARY)	6185 6003 TMA (MOBILE OPERATION)
	HR	HR	EA	EA	EA	DAY	HR
1 - 0022-05-025	440	440	2593	4916	4	60	160
PROJECT TOTALS	440	440	2593	4916	4	60	160

SUMMARY OF ROADWAY

LOCATION-CSJ	LENGTH	134 6001 BACKFILL (TY A)	354 6021 PLANE ASPH CONC PAV(0" TO 2")	351 6019 △ FLEXIBLE PAVEMENT STRUCTURE REPAIR(3")	351 6002 ◉ FLEXIBLE PAVEMENT STRUCTURE REPAIR(6")	LEVEL UP 3076 6043 D-GR HMA TY-D PG70-22 (LEVEL-UP)	BONDING COURSE 3084 6001 * AREA	BONDING COURSE BONDING COURSE	HOTMIX * AREA	HOTMIX 3077 6033 SP MIXES SP-C SAC-A PG76-22	RUMBLE STRIPS 533 6003 RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS 533 6004 RUMBLE STRIPS (CENTERLINE) ASPHALT
	LF	STA	SY	SY	SY	TON	SY	GAL	SY	TON	LF	LF
1 - 0022-05-025	49806.24	498.062	1466.7	28966.9	4802.0	8690.1	289669.4	57933.9	289669.4	33312.0	99613.0	49807.0
TOTAL	49,806.24	498.07	1,467	28,967	4,802	8,691	289,670	57,934	289,670	33,312	99,613	49,807

SUMMARY OF PAVEMENT MARKINGS & DELINEATOR ITEMS

LOCATION - CSJ	658 6062 INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2 (BI)	666 6036 REFL PAV MRK TY I (W)8"(SLD) (100MIL)	666 6054 REFL PAV MRK TY I (W)(ARROW) (100MIL)	666 6078 REFL PAV MRK TY I (W)(WORD) (100MIL)	666 6300 RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	666 6303 RE PM W/RET REQ TY I (W)4"(SLD) (100MIL)	666 6312 RE PM W/RET REQ TY I (Y)4"(BRK) (100MIL)	666 6315 RE PM W/RET REQ TY I (Y)4"(SLD) (100MIL)	672 6007 REFL PAV MRKR TY I-C	672 6009 REFL PAV MRKR TY II-A-A
	EA	LF	EA	EA	LF	LF	LF	LF	EA	EA
1 - 0022-05-025	220	220	2	2	2858	99613	8617	84987	450	1172
PROJECT TOTALS	220	220	2	2	2858	99613	8617	84987	450	1172

SUMMARY OF MBGF

REF. LOC# - HWY - REF. MRK - SIDE	432 6045 RIPRAP (MOW STRIP)(4 IN)	540 6001 MTL W-BEAM GD FEN (TIM POST)	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM)	542 6001 REMOVE METAL BEAM GUARD FENCE	542 6004 RM MTL BM GD FENCE TRANS (THRIE-BEAM)	544 6001 GUARDRAIL END TREATMENT (INSTALL)	544 6003 GUARDRAIL END TREATMENT (REMOVE)
	CY	LF	EA	LF	EA	EA	EA
1 - US 90 - 364+0.687 - RT	14.8	275		275		2	
1 - US 90 - 364+0.687 - LT	14.8	275		275		2	
1 - US 90 - 364+0.952 - RT	28.8	600		600		2	
1 - US 90 - 364+0.952 - LT	28.8	600		600		2	
1 - US 90 - 364+1.286 - RT	31	650		650		2	
1 - US 90 - 364+1.286 - LT	31	650		650		2	
1 - US 90 - 364+1.459 - RT	6.1	75		75		2	
1 - US 90 - 364+1.459 - LT	6.1	75		75		2	
1 - US 90 - 364+1.606 - RT	20.2	400		400		2	
1 - US 90 - 364+1.608 - LT	16.9	325		325		2	
1 - US 90 - 364+1.778 - RT	27.7	575		575		2	
1 - US 90 - 364+1.82 - LT	15.9	300		300		2	
1 - US 90 - 366+0.023 - RT	13.7	250		250		2	
1 - US 90 - 366+0.035 - LT	11.5	200		200		2	
1 - US 90 - 366+0.269 - RT	12.6	225		225		2	
1 - US 90 - 366+0.258 - LT	13.7	250		250		2	
1 - US 90 - 366+0.536 - RT	15.9	300		300		2	
1 - US 90 - 366+0.621 - LT	42.9	925		925		2	
1 - US 90 - 366+0.92 - RT	15.9	300		300		2	
1 - US 90 - 366+0.904 - LT	14.8	275		275		2	
1 - US 90 - 366+1.208 - RT	15.9	300		300		2	
1 - US 90 - 366+1.232 - LT	10.5	175		175		2	
1 - US 90 - 366+1.441 - RT	23.4	475		475		2	
1 - US 90 - 366+1.43 - LT	12.6	225		225		2	
1 - US 90 - 366+1.636 - RT	14.8	275		275		2	
1 - US 90 - 366+1.659 - LT	22.3	450		450		2	
1 - US 90 - 368+0 - RT	34.2	725		725		2	
1 - US 90 - 368+0.01 - LT	28.8	600		600		2	
1 - US 90 - 368+0.263 - RT	61.2	1350		1350		2	
1 - US 90 - 368+0.272 - LT	61.2	1350		1350		2	
1 - US 90 - 368+0.666 - LT	21.3	425		425		2	
1 - US 90 - 368+0.892 - RT	15.9	300		300		2	
1 - US 90 - 368+1.084 - RT	24.5	500		500		2	
BRIDGE PSN #							
22-233-0-0022-05-016 LT&RT	22.3	450				4	
22-233-0-0022-05-072 LT&RT	32	600	4	600	4	4	4
TOTAL	784	15,725	4	15,275	4	74	4

SUMMARY OF SIGNING ITEMS

LOCATION - CSJ	644 6001 IN SM RD SN SUP&AM TY10BWG(1)SA(P)	644 6004 IN SM RD SN SUP&AM TY10BWG(1)SA(T)	644 6005 IN SM RD SN SUP&AM TY10BWG(1)SA(T-2EXT)	644 6007 IN SM RD SN SUP&AM TY10BWG(1)SA(U)	644 6030 IN SM RD SN SUP&AM TYS80(1)SA(T)	644 6031 IN SM RD SN SUP&AM TYS80(1)SA(T-2EXT)	644 6033 IN SM RD SN SUP&AM TYS80(1)SA(U)	644 6050 IN SM RD SN SUP&AM TYS80(2)SA(P)	644 6076 REMOVE SM RD SN SUP&AM
	EA	EA	EA	EA	EA	EA	EA	EA	EA
1 - 0022-05-025	5	3	2	3	1	2	2	1	19
PROJECT TOTALS	5	3	2	3	1	2	2	1	19

SUMMARY OF BRIDGE # 1 ITEMS

LOCATION - PSN	438 6001 CLEANING AND SEALING EXISTING JOINTS
	LF
1 - 222330002205072	132
PROJECT TOTALS	132

NOTES:

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◉ REFER TO US 90 AND SL 25 INTERSECTION WEST AND EAST DETAIL SHEETS FOR MORE INFORMATION ON THIS ITEM.

REFERENCE ALL EXISTING STRIPING AND PAVEMENT MARKINGS IN A MANNER WHICH ALLOWS THE PASSING/NO PASSING ZONES TO BE RE-ESTABLISHED. PLACE EXTRA REFERENCE (IF NEEDED) TO ENSURE THAT THE MARKINGS (LANE LINES, PASSING LANES, LEFT TURN LANES, GORES, ETC.). PROPOSED RAISED PAVEMENT MARKERS WILL BE PLACED IN ACCORDANCE WITH STANDARD PLAN SHEET(S) INCLUDED IN THIS PROJECT.

PORTABLE CHANGEABLE MESSAGE SIGN WILL BE USED AS NEEDED IN THE CONSTRUCTION SITE.

TEXAS DEPARTMENT OF TRANSPORTATION ®

SUMMARY OF QUANTITIES

DN: MT	CK: LGU	DW: MT	CK: LGU	STATE	SHEET NUMBER	SHEET NO.
				TEXAS	SHEET 1 OF 5	11

FED.RD. DIV.NO.	STATE DIST.NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION - CSJ	510 6001 ONE-WAY TRAF CONT (FLAGGER CONT)	512 6072 PTB (FRN&INSTL) (SGL SLP) (TY 1) OR (STL)	512 6074 PTB (MOVE) (SGL SLP) (TY 1) OR (STL)	512 6076 PTB (REMOVE) (SGL SLP) (TY 1) OR (STL)	545 6003 CRASH CUSH ATTEN (MOVE & RESET)	545 6005 CRASH CUSH ATTEN (REMOVE)	545 6019 CRASH CUSH ATTEN (INSTL) (S) (N) (T L3)	662 6001 WK ZN PAV MRK NON-REMOV (W) 4" (BRK)	662 6034 WK ZN PAV MRK NON-REMOV (Y) 4" (SLD)	662 6109 WK ZN PAV MRK SHT TERM (TAB) TY W	662 6111 WK ZN PAV MRK SHT TERM (TAB) TY Y-2	6185 6002 TMA (STATIONARY)	6185 6003 TMA (MOBILE OPERATION)
	HR	LF	LF	LF	EA	EA	EA	LF	LF	EA	EA	DAY	HR
2 - 0022-10-077	20	120	360	120	3	1	1	860	118	1033	180	38	40
PROJECT TOTALS	20	120	360	120	3	1	1	860	118	1033	180	38	40

SUMMARY OF ROADWAY

LOCATION-CSJ	LENGTH	MILLING 354 6045 PLANE ASPH CONC PAV (2")	SPOT BASE REPAIR 351 6001 △ FLEXIBLE PAVEMENT STRUCTURE REPAIR(5")	BONDING COURSE * AREA	BONDING COURSE 3084 6001 BONDING COURSE	HOTMIX * AREA	HOTMIX 3077 6033 SP MIXES SP-C SAC-A PG76-22
	LF	SY	SY	SY	GAL	SY	TON
2 - 0022-10-077	6879.84	68340.5	6834.1	68340.5	13668.1	68340.5	7859.2
TOTAL	6,879.84	**68,341**	**6,835**	68,341	**13,669**	68,341	**7,860**

SUMMARY OF MBGF

REF. LOC# - HWY - REF. MRK - SIDE	432 6045 RIPRAP (MOW STRIP) (4 IN)	540 6001 MTL W-BEAM GD FEN (TIM POST)	540 6016 DOWNSTREAM ANCHOR TERMINAL SECTION	540 6017 MTL BM GD FEN (LONG SPAN SYSTEM)	542 6001 REMOVE METAL BEAM GUARD FENCE	542 6002 REMOVE TERMINAL ANCHOR SECTION	544 6001 GUARDRAIL END TREATMENT (INSTALL)	544 6003 GUARDRAIL END TREATMENT (REMOVE)
	CY	LF	EA	LF	LF	EA	EA	EA
2 - US 90(SB) - 416+0.430 - LT	17.1	200	1	50	200	1	1	1
2 - US 90(SB) - 416+0.430 - RT	18.2	200	1	50	200	1	1	1
2 - US 90(SB) - 414+1.995 - RT	14.2	125	1	50			1	
TOTAL	50	525	3	150	400	2	3	2

SUMMARY OF DRAINAGE ITEMS

LOCATION# 2- US 90	467 6224	467 6276	467 6091	480 6001	496 6005
REF MRK - SIDE	SET (TY I) (S= 6 FT) (HW= 6 FT) (4:1) (C)	SET (TY I) (S= 8 FT) (HW= 5 FT) (4:1) (C)	SET (TY I) (S=2 FT) (HW=3FT) (4:1) (C)	CLEAN EXIST CULVERTS	REMOV STR (WINGWALL)
	EA	EA	EA	EA	EA
414+1.525(NB) (RT)		1		1	1
414+1.525(SB) (LT)		1		1	1
416+0.005(NB) (RT)	2			1	1
416+0.665(SB) (LT)			1	1	1
PROJECT TOTALS	2	2	1	4	4

SUMMARY OF PAVEMENT MARKINGS & DELINEATOR ITEMS

LOCATION - CSJ	666 6036 REFL PAV MRK TY I (W) 8" (SLD) (100MIL)	666 6048 REFL PAV MRK TY I (W) 24" (SLD) (100MIL)	666 6054 REFL PAV MRK TY I (W) (ARROW) (100MIL)	666 6078 REFL PAV MRK TY I (W) (WORD) (100MIL)	666 6300 RE PM W/RET REQ TY I (W) 4" (BRK) (100MIL)	666 6303 RE PM W/RET REQ TY I (W) 4" (SLD) (100MIL)	666 6312 RE PM W/RET REQ TY I (Y) 4" (BRK) (100MIL)	666 6315 RE PM W/RET REQ TY I (Y) 4" (SLD) (100MIL)	672 6007 REFL PAV MRKR TY I-C	672 6009 REFL PAV MRKR TY II-A-A	6049 6001 LONG CHANNEL MOUNT CURB SYS (INSTALL)	6049 6003 LONG CHANNEL MOUNT CURB SYS (REMOVE)
	LF	LF	EA	EA	LF	LF	LF	LF	EA	EA	LF	LF
2 - 0022-10-077	2280	140	15	15	284	7820	1956	7820	214	39	415	415
PROJECT TOTALS	2280	140	15	15	284	7820	1956	7820	214	39	415	415

NOTES:

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SUMMARY OF EROSION CONTROL ITEMS

LOCATION - CSJ	506 6003 ROCK FILTER DAMS (INSTALL) (TY 3)	506 6011 ROCK FILTER DAMS (REMOVE)	506 6030 BACKHOE WORK (EROSION & SEDMT CONT)	506 6038 TEMP SEDMT CONT FENCE (INSTALL)	506 6039 TEMP SEDMT CONT FENCE (REMOVE)
	LF	LF	HR	LF	LF
2 - 0022-10-077	64	64	7	258	258
PROJECT TOTALS	64	64	7	258	258

SUMMARY OF QUANTITIES

DN: MT	CK: LGU	DW: MT	CK: LGU	STATE	SHEET NUMBER	SHEET NO.
				TEXAS	SHEET 2 OF 5	12

FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS					
	510 6002	662 6034	662 6111	6185 6002	6185 6003
LOCATION - CSJ	ONE-WAY TRAF CONT (PILOT CAR)	WK ZN PAV MRK NON-REMOV (Y)4" (SLD)	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	HR	LF	EA	DAY	HR
3 - 0037-07-020	115	2239	449	13	32
PROJECT TOTALS	115	2239	449	13	32

SUMMARY OF ROADWAY									
			MILLING	SPOT BASE REPAIR		BONDING COURSE		HOTMIX	
		134	354	351	361		3084		3077
		6001	6064	6001	6002		6001		6033
LOCATION-CSJ	LENGTH	BACKFILL (TY A)	△ PLANE ASPH CONC PAV (2 1/2")	FLEXIBLE PAVEMENT STRUCTURE REPAIR(5")	✱ FULL - DEPTH REPAIR CRCP (8")	✱ AREA	BONDING COURSE	✱ AREA	SP MIXES SP-C SAC-A PG76-22
	LF	STA	SY	SY	SY	SY	GAL	SY	TON
3 - 0037-07-020	4672.80	14.0	20768.0	2076.8	300.0	20768.0	4153.6	20768.0	2985.4
TOTAL	4,672.80	14	20,768	2,077	300	20,768	4,154	20,768	2,986

SUMMARY OF MBGF						
	432	540	104	542	544	544
	6045	6001	6054	6001	6001	6003
REF. LOC# - HWY - REF. MRK - SIDE	RIPRAP (MOW STRIP)(4 IN)	MTL W-BEAM GD FEN (TIM POST)	REMOVING CONCRETE(MOW STRIP)	REMOVE METAL BEAM GUARD FENCE	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)
	CY	LF	LF	LF	EA	EA
3 - SL 225 - 573+0.926 - LT	30.6	200	300	250	2	2
TOTAL	31	200	300	250	2	2

SUMMARY OF PAVEMENT MARKINGS ITEMS								
	666 6036	666 6048	666 6054	666 6078	666 6303	666 6315	672 6007	672 6009
LOCATION - CSJ	REFL PAV MRK TY I (W)8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W)(ARROW) (100MIL)	REFL PAV MRK TY I (W)(WORD) (100MIL)	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
	LF	LF	EA	EA	LF	LF	EA	EA
3 - 0037-07-020	450	1232	5	5	8954	8954	23	121
PROJECT TOTALS	450	1232	5	5	8954	8954	23	121

NOTES:

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TEXAS DEPARTMENT OF TRANSPORTATION ®

SUMMARY OF QUANTITIES

DN: MT	DW: MT	STATE	SHEET NUMBER				SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 3 OF 5				
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	13
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION - CSJ	510 6001	662 6001	662 6034	662 6109	662 6111	6185 6002	6185 6003
	ONE-WAY TRAF CONT (FLAGGER CONT)	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY W	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	HR	LF	LF	EA	EA	DAY	HR
4 - 0878-05-025	64	500	2000	165	346	8	24
PROJECT TOTALS	64	500	2000	165	346	8	24

SUMMARY OF ROADWAY

LOCATION-CSJ	LENGTH		MILLING	SPOT BASE REPAIR	BONDING COURSE		HOTMIX	
		529 6030	354 6045	351 6019		3084 6001		3077 6033
		CONC CURB & GUTTER (VALLEY GUTTER)	PLANE ASPH CONC PAV (2")	△ FLEXIBLE PAVEMENT STRUCTURE REPAIR(3")	* AREA	BONDING COURSE	* AREA	SP MIXES SP-C SAC-A PG76-22
	LF	LF	SY	SY	SY	GAL	SY	TON
4 - 0878-05-025	2001.12	75.0	11992.8	1199.3	11992.8	2398.6	11992.8	1379.2
TOTAL	2,001.12	75	11,993	1,200	11,993	2,399	11,993	1,380

SUMMARY OF PAVEMENT MARKINGS & SIGNS ITEMS

LOCATION - CSJ	644 6001	666 6036	666 6048	666 6054	666 6078	666 6300	666 6303	666 6312	666 6315	672 6007	672 6009
	IN SM RD SN SUP&AM TY10BWG(1) SA(P)	REFL PAV MRK TY I (W)8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W)(ARROW) (100MIL)	REFL PAV MRK TY I (W)(WORD)(100MIL)	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	RE PM W/RET REQ TY I (W)4"(SLD) (100MIL)	RE PM W/RET REQ TY I (Y)4"(BRK) (100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
	EA	LF	LF	EA	EA	LF	LF	LF	LF	EA	EA
4 - 0878-05-025	2	620	175	7	6	550	4003	550	3603	45	79
PROJECT TOTALS	2	620	175	7	6	550	4003	550	3603	45	79

NOTES:

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TEXAS DEPARTMENT OF TRANSPORTATION ®

SUMMARY OF QUANTITIES

DN: MT	DW: MT	STATE	SHEET NUMBER	SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 4 OF 5	

FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.

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SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION - CSJ	510 6001	662 6001	662 6034	662 6109	662 6111	6185 6002	6185 6003
	ONE-WAY TRAF CONT (FLAGGER CONT)	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY W	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	HR	LF	LF	EA	EA	DAY	HR
5 - 2628-01-011	152	2275	4550	1327	2197	19	30
PROJECT TOTALS	152	2275	4550	1327	2197	19	30

SUMMARY OF ROADWAY

LOCATION-CSJ	LENGTH		SPOT BASE REPAIR	MILLING	CONCRETE			BONDING COURSE		HOTMIX	
		110	351	354	360	360	529	✱	3084	✱	3077
		6001	6019	6045	6054	6080	6030	AREA	6001	AREA	6033
		EXCAVATION (ROADWAY)	△ FLEXIBLE PAVEMENT STRUCTURE REPAIR(3")	PLANE ASPH CONC PAV (2")	CONC PVMT (CONT REINF-CRCP) (HES) (9")	CONC PVMT(CRCP)(TRANSITION SLAB)	CONC CURB & GUTTER (VALLEY GUTTER)		BONDING COURSE		SP MIXES SP-C SAC-A PG76-22
	LF	CY	SY	SY	SY	SY	LF	SY	GAL	SY	TON
5 - 2628-01-011	11009.44		5347.3	53473.4			60.0	53473.4	10694.7	53473.4	6149.4
CONCRETE INTERSECTION	200	890			1066	160					
TOTAL	11,209.44	890	5,348	53,474	1,066	160	60	53,474	10,695	53,474	6,150

SUMMARY OF PAVEMENT MARKINGS & SIGNS ITEMS

LOCATION - CSJ	644 6001	644 6076	666 6036	666 6048	666 6054	666 6303	666 6078	666 6099	666 6300	666 6312	666 6315	672 6007	672 6009
	IN SM RD SN SUP&AM TY10BWG(1)SA (P)	REMOVE SM RD SN SUP&AM	REFL PAV MRK TY I (W)8"(SLD)(100 MIL)	REFL PAV MRK TY I (W)24"(SLD)(1 00MIL)	REFL PAV MRK TY I (W)(ARROW)(1 00MIL)	RE PM W/RET REQ TY I (W)4"(SLD)(100 MIL)	REFL PAV MRK TY I (W)(WORD)(10 0MIL)	REF PAV MRK TY I(W)18"(YLD TRI)(100MIL)	RE PM W/RET REQ TY I (W)4"(BRK)(10 0MIL)	RE PM W/RET REQ TY I (Y)4"(BRK)(100 MIL)	RE PM W/RET REQ TY I (Y)4"(SLD)(100 MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
	EA	EA	LF	LF	EA	LF	EA	EA	LF	LF	LF	EA	EA
5 - 2628-01-011	8	3	875	765	4	4160	4	132	4288	4655	21410	248	495
PROJECT TOTALS	8	3	875	765	4	4160	4	132	4288	4655	21410	248	495

NOTES:

✱ FOR CONTRACTOR'S INFORMATION ONLY

△ ESTIMATED FLEXIBLE STRUCTURE REPAIR CONSIST OF ROADWAY AND BRIDGE APPROACH WORK, AS DIRECTED BY THE ENGINEER. REFER TO "ROADWAY MISCELLANEOUS DETAILS PAVEMENT REPAIR" SHEET(S) FOR ADDITIONAL INFORMATION.

REFERENCE ALL EXISTING STRIPING AND PAVEMENT MARKINGS IN A MANNER WHICH ALLOWS THE PASSING/NO PASSING ZONES TO BE RE-ESTABLISHED. PLACE EXTRA REFERENCE (IF NEEDED) TO ENSURE THAT THE MARKINGS (LANE LINES, PASSING LANES, LEFT TURN LANES, GORES, ETC.). PROPOSED RAISED PAVEMENT MARKERS WILL BE PLACED IN ACCORDANCE WITH STANDARD PLAN SHEET(S) INCLUDED IN THIS PROJECT.

PORTABLE CHANGEABLE MESSAGE SIGN WILL BE USED AS NEEDED IN THE CONSTRUCTION SITE.

TEXAS DEPARTMENT OF TRANSPORTATION ®

SUMMARY OF QUANTITIES

DN: MT	DW: MT	STATE	SHEET NUMBER	SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 5 OF 5	
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL / SECTION / JOB / HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022 / 05 / 025, etc. / US 90, etc.	15

TCP GENERAL NOTES:

1. This is a suggested Traffic Control Plan (TCP). The Contractor may submit an alternate Traffic Control Plan, signed and sealed by a Licensed Professional Engineer in Texas, for approval by the Engineer. When mutually beneficial changes are proposed to the existing Traffic Control Plan and are agreed upon by the Contractor and the Department, the plan sheets may be developed and signed and sealed by the Engineer.

2. Refer to Item 8 "Prosecution and Progress" and project general notes for additional information regarding the Traffic Control Plan.

3. Furnish and install all Traffic Control Plans devices, including but not limited to barricades, signs, and work zone markings, in compliance with the latest version of the Texas Manual on Uniform Traffic Control Devices (TxMUTCD), the State Standard Traffic Control Plans (TCP) sheets, and the Barricades and Construction (BC) sheets. Refer to the project general notes for additional information regarding the Traffic Control Plan.

4. Limit the length of lane closures to maximum of two miles. Refer to sequence of construction for further information. Allow for all lanes open to traffic during non-working hours unless otherwise specified in the sequence of construction. Any additional overnight lane closures not specified in the sequence of construction will require approval by the engineer.

5. Verify the location and spacing of signs, barricades, and channelizing devices prior to their placement along vertical curves, horizontal curves, and other geometric constraints to assure visibility to all motorists.

6. The work has been identified by reference location numbers. Various reference locations can be worked on simultaneously when approved by the engineer. Once work has begun at a reference location, it must be worked on continuously through completion. Additional signing to safely guide traffic through the work area will be required as directed by the engineer.

7. Place the traffic control devices only while work is actually in progress or a definite need exists. Always have enough barricades, channelizing devices, and signs at all times to replace those damaged.

8. Cover all existing signs that conflict with the Traffic Control Plan and uncover during non-working hours or as directed by the Engineer. Partial coverage of the sign or coverage by material that will not cover the entire sign all the time is not permitted.

9. Vary the spacing of signs to meet traffic conditions or as directed by the engineer and assure that all traffic control devices and work zone pavement markings are kept in a highly visible condition (clean, upright and at proper location).

10. Maintain the roadway surface and work zone striping within the project while the traffic control plan is in effect. Place and be responsible for all work zone pavement markings in accordance with standard sheets WZ(STPM)-13, BC (10), BC (11) and the TxMUTCD.

11. Conduct construction operations so as to provide the least possible interference to traffic and to permit the continuous movement of traffic in all allowable directions at all times or as permitted by the sequence of construction. Provide for safe and convenient access to abutting property, highways, public roads, and street crossings except as otherwise shown on the sequence of construction. The contractor will maintain at all times two-way traffic or a minimum of one lane using a pilot vehicle and flaggers.

12. Place all stockpiled material, waste material, signs, barricades, channelizing devices and work vehicles not in use, at a minimum of 30 feet from the outer edge of the nearest travel lane.

13. Maintain all existing drainage conditions during all construction phases until the permanent drainage facilities are constructed and ready to use. Handle excavated and stockpiled material in such a way that it will not block drainage.

14. Regulate all construction traffic so as to cause a minimal inconvenience to the traveling public. At the times when it is necessary for trucks to stop, unload or cross roadways under traffic, provide warning signs and flaggers as needed to adequately protect the traveling public.

15. During non-working hours, all drop-offs are to be filled. Refer to standard WZ(UL)-13 for lateral drop-offs and to details shown in plans for longitudinal drop-offs or as directed by the Engineer.

16. Notify the Engineer in writing two weeks prior to shifting of traffic within each phase of the Traffic Control Plan.

17. During the holiday time frame of December 21st through January 1st, every effort should be taken to ensure that all travel lanes remain open where possible.

18. Remove from the work area all loose materials and debris resulting from construction operations at the end of each work day.

19. Maintain a minimum of one through lane open in each direction during working hours except as directed by the Engineer.

20. Implement all required erosion control measures as shown in the plans during the various stages of construction.

21. Moving an existing sign to a temporary location is subsidiary to this item. Installations with permanent supports at permanent locations will be paid for under the applicable bid item(s).

22. Use of portable changeable message sign as advance notice of lane closures will be required, as directed by the engineer. For locations that are adjacent to each other, a single sign in advance of the entire work area is acceptable.

23. Place portable changeable message boards at locations requiring lane closures for 1 week(s) before the closures or as directed by the engineer.

24. Additional signs, barricades and channelizing devices may be required to maintain traffic during construction, as shown on TCP standards. Additional signs, barricades, etc. (if any), will be subsidiary to items 502 "Barricades, Signs and Traffic Handling".

25. If the contractor chooses to work multiple locations in urban/rural areas simultaneously, contractor will be responsible for providing all applicable traffic control devices, including portable changeable message boards, and truck mounted attenuators at their own expense.

26. Use of truck mounted attenuators as noted on plans, TxDOT traffic control plan standards, or as directed by the engineer. For locations that are adjacent to each other, a single truck mounted attenuator of the entire work area is acceptable.

27. Refer to BC(6)-14 Portable Changeable Message Sign (PCMS) Standards for a listing of abbreviated words and two-word phrases that are acceptable for use on PCMS. Submit the suggested message for the board to the Engineer for approval.

28. Use plastic drums to channelize traffic when existing pavement markings have been obliterated.

29. Limit the length of daily work to that area of operation that can be completed in one work day in order to allow for two-way traffic at night. Such area must not exceed two (2) miles, unless approved by the engineer. Within the 2 mile section, only close off the area where actual work is being performed.

30. A pilot car and radio equipped flaggers are required for all undivided roadway locations as directed by the engineer. The pilot car with necessary flaggers and/or radio equipped flaggers and all signs, equipment, labor and incidentals required for this method of traffic control will be paid for directly through item 510.

31. Provide full-time off-duty uniformed peace officers in officially marked vehicles as Part of traffic control operations as approved or directed by the engineer. The peace Officer must supply proof of certification by the texas commission on law enforcement Standards. This work will be paid for under the provisions of item 9.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED
PROFESSIONAL ENGINEER

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5/3/2022

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NOT TO SCALE

TEXAS DEPARTMENT OF TRANSPORTATION ®

TCP
GENERAL NOTES

DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.

16

SEQUENCE OF CONSTRUCTION

GENERAL INSTRUCTIONS

THE FOLLOWING WORK WILL BE PERFORMED ON THE ROADWAY. PLEASE REFER TO THE TCP PHASES, TCP GENERAL NOTES AND CORRESPONDING PLAN SHEETS FOR MORE DETAILED INFORMATION.

INSTALL ALL APPLICABLE BARRICADES, SIGNS, WORK ZONE MARKINGS IN ACCORDANCE WITH TCP, BC AND WZ TxDOT STANDARD SHEETS FOR TRAFFIC CONTROL SETUP.

ONCE WORK HAS BEGUN AT A REFERENCE LOCATION, THE ENTIRE SEQUENCE MUST BE WORKED ON CONTINUOUSLY TO COMPLETION. ADJACENT LOCATIONS (SAME DIRECTION OF TRAVEL) MAY BE COMBINED, AS APPROVED BY THE ENGINEER.

* NIGHT WORK (9pm-6am) MUST BE PERFORMED FOR THE FOLLOWING LOCATION: REF. LOC. #2- US 90, REF. LOC. #3-SL 225, #4-FM 582 AND #5-FM 1433 UNLESS OTHERWISE APPROVED BY THE ENGINEER.

GENERAL SEQUENCE OF WORK DESCRIPTION PER LOCATION

PHASE I - SET UP TRAFFIC CONTROL PLAN.

PHASE II- PLANING AND MILLING, FLEXIBLE PAVEMENT STRUCTURE REPAIR, BONDING COURSES AND PLACE HOTMIX

PHASE III - PERFORM THE TEXTURIZING OF PAVEMENT SHOULDERS AND/OR CENTERLINE; PLACE FINAL PAVEMENT MARKINGS AND RAISED PAVEMENT MARKERS.

PHASE IV- REMOVE/INSTALL MBGF AT AT LOCATIONS SHOWN ON PLANS.

PHASE V- FINAL CLEAN UP

BOXED INFORMATION IS SPECIFIC TO REFERENCE LOCATION (HWY)

PHASE I

LOCATION #2 CSJ: 0022-10-077 US 90

WHEN WORKING ON THIS LOCATION CONSTRUCT S.E.T.'S PRIOR TO ROADWAY WORK. PLACE TRAFFIC CONTROL AS SHOWN ON "TCP - PTB INSTALLATION LAYOUTS" FOR LOCATIONS SHOWN IN ADDITION TO CONVENTIONAL ROAD SHOULDER WORK TCP (2-1)-18 AND BC STANDARDS.

SET UP TRAFFIC CONTROL PLAN AS PER STANDARDS (TCP(1-5)-18)(TCP(2-1)-18), (TCP(2-2)-18), AND/OR (TCP(2-4)-18) AS APPLICABLE TO LOCATION. PERFORM ROADWAY SWEEPING PRIOR TO RESURFACING OPERATIONS.

PHASE II

LOCATION #2 CSJ: 0022-10-077 US 90

BREAK BACK AND INSTALL SAFETY END TREATMENTS FOR HALF OF THE ROADWAY (NB OR SB). COMMENCE TO NEXT LOCATION UNTIL COMPLETED. THIS PHASE CAN BE DONE IN CONJUNCTION WITH THE OTHER REFERENCE LOCATIONS AS APPROVED BY THE ENGINEER. ONCE S.E.T.'S HAVE BEEN COMPLETED REMOVE TCP AND COMMENCE TO PHASE I TO CONTINUE WITH ROADWAY WORK.

PERFORM PLANNING OPERATIONS ON LOCATIONS SHOWN ON THE PLANS AND PERFORM ROADWAY SWEEPING PRIOR TO RESURFACING OPERATIONS.

BEFORE OPENING LANES TO TRAFFIC, INSTALL ANY REQUIRED WORK WORK ZONE PREFABRICATED STRIPING TO GUIDE TRAFFIC.

LOCATION #3 CSJ: 0037-07-020 (SL 225)

CONTRACTOR SHALL PERFORM PLANNING OPERATIONS ACCORDINGLY TO WHERE ROADWAY SURFACE IS NOT EXPOSED FOR MORE THAN 2 DAYS, BEFORE PLACING THE CORRESPONDING BONDING COURSE AND SURFACE MIX.

PERFORM FLEXIBLE PAVEMENT STRUCTURE REPAIR ON LOCATIONS SHOWN AND/OR FIELD VERIFIED BY CONTRACTOR AND TXDOT PERSONNEL AND APPROVED BY THE ENGINEER

LOCATION #1 CSJ: 0022-05-025 (US 90)

PERFORM LEVEL-UP OPERATIONS THROUGHOUT ROADWAY LIMITS AND/OR AS DIRECTED BY THE ENGINEER.

PLACE BONDING COURSE ON LOCATIONS SHOWN ON THE PLANS.

PLACE OVERLAY MIX WITHIN EXISTING PAVEMENT AREAS AT WIDTH SPECIFIED ON TYPICAL SECTIONS ON LOCATIONS SHOWN ON THE PLANS.

OPTION NO. 1

PLACE MIX ON ONE-HALF OF THE ROADWAY AT A TIME. THEN, MIRROR SAME WORK ON OTHER HALF OF ROADWAY WITHIN THE SAME WORK DAY.

OPTION NO. 2

STAGE 1:
PLACE MIX CONTINUOUSLY ON ONE-HALF OF ROADWAY THAT MAY BE COMPLETED WITHIN ONE WORK DAY. REFER TO STANDARD WZ(UL)-13, EDGE CONDITION NO. 3.

STAGE 2:
PLACE MIX CONTINUOUSLY ON OTHER HALF OF ROADWAY WITHIN THE OVERLAID LIMITS OF THE PREVIOUS DAY.

IMPLEMENT PLAN SHEET(S) TCP CONSTRUCTION JOINT DETAIL FOR LONGITUDINAL DROP OFFS AND CONDUCT ROADWAY SWEEPING PRIOR TO OPENING MILLED LANES TO TRAFFIC, WHEN APPLICABLE.

LOCATION #3 CSJ: 0037-07-020 (SL 225)

ONCE SURFACE MIX PLACEMENT HAS BEGUN, CONTRACTOR IS TO COMPLETE FULL ROADWAY WIDTH AS SHOWN ON TYPICAL SECTIONS TO AVOID TRANSVERSE (SIDE TO SIDE) DROP OFFS.

NO VIBRATORY COMPACTION EQUIPMENT WILL BE ALLOWED, CONTRACTOR WILL PROVIDE ADEQUATE EQUIPMENT TO MEET COMPACTION ON SPOT BASE REPAIR AND HOT MIX OPERATIONS AT THIS LOCAITON.

REFER TO "PROJECT LOCATION REFERENCE" SHEET FOR LIMITS OF RESURFACING.

RESURFACING WILL INCLUDE ANY LEFT OR RIGHT TURN LANES, FOR THE LIMITS SHOWN ON TYPICAL SECTIONS, WHERE APPLICABLE. PERFORM ROADWAY SWEEPING PRIOR TO OPERATIONS.

CONCRETE PAVED AREAS WILL BE LEFT UNDISTURBED UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

AT THE END OF EACH DAY AND BEFORE OPENING LANES TO TRAFFIC, INSTALL ANY REQUIRED WORK ZONE SHORT TERM TABS AND/OR WORK ZONE PREFABRICATED STRIPING TO GUIDE TRAFFIC.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

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TEXAS DEPARTMENT OF TRANSPORTATION ®

TCP SEQUENCE OF CONSTRUCTION

DN: MT	CK: LGU	DW: MT	CK: LGU	STATE	SHEET NUMBER			SHEET NO.
				TEXAS	SHEET 1 OF 2			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY		CONTROL	SECTION	JOB	HIGHWAY NO.	17
6	22	VAL VERDE, etc.		0022	05	025, etc.	US 90, etc.	

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SEQUENCE OF CONSTRUCTION

PHASE III

NOTE: PHASE III WORK WILL CONSIST OF THE TEXTURIZING OF PAVEMENT AS AS DESCRIBED BELOW:
REFERENCE LOCATION #1- (US 90) WILL CONSIST OF SHOULDER AND CENTERLINE TEXTURIZING.
REFERENCE LOCATION #2- (US 90) WILL CONSIST OF SHOULDER TEXTURIZING.
REFERENCE LOCATION #3 THRU #5 (SL 225), (FM 582) AND (FM 1433) WILL NOT BE TEXTURIZED.

PLEASE REFER TO THE TCP PHASES, TCP GENERAL NOTES AND CORRESPONDING PLAN SHEETS FOR MORE DETAILED INFORMATION.

ONCE WORK HAS BEGUN AT A REFERENCE LOCATION, THE ENTIRE SEQUENCE MUST BE WORKED ON CONTINUOUSLY TO COMPLETION.

INSTALL TRAFFIC PAINT TY II AT ROADWAY CENTERLINE AS TY I PAVEMENT MARKER SEALER AFTER PERFORMING THE TEXTURIZING OF ROADWAY CENTERLINE IF APPLICABLE.

SET UP TRAFFIC CONTROL UTILIZING TCP STANDARDS AS APPLICABLE PER ROADWAY. TEXTURIZE SHOULDERS AND/OR CENTERLINE OF ROADWAY AS PER STANDARDS AND SPECIFICATIONS.

TEXTURIZING ROADWAY WILL CONSIST OF MILLING SHOULDERS AND/OR CENTERLINE ACCORDING TO STANDARDS AND SPECIFICATIONS.

THE FOLLOWING STAGING PERTAINS TO MILLING OPERATIONS:

STAGE 1: PERFORM RUMBLE STRIPS AT RIGHT SHOULDER, RS(4)-13, OPTION 4.

STAGE 2: PERFORM RUMBLE STRIPS AT CENTERLINE, RS(2)-13 & RS(3)-13, OPTION 1, WHEN APPLICABLE.

STAGE 3: PLACE WORK ZONE SHORT TERM TABS ALONG CENTERLINE, WHEN APPLICABLE.

STAGE 4: PERFORM RUMBLE STRIPS AT SHOULDER, RS(4)-13, OPTION 4.

MILLED STRIP WIDTH TABLE	
> 2' & < 4' SHOULDER WIDTH	> 4' SHOULDER WIDTH
USE OPTION 3 - 8" STRIP	USE OPTION 4

COMPLETE THE AFOREMENTIONED STAGES DAILY THROUGHOUT PROJECT LIMITS. AS PER TRAFFIC CONDITIONS, OTHER OPTIONS FOR STAGING OF TEXTURIZING WILL BE REVIEWED AND APPROVED BY THE ENGINEER.

INSTALL FINAL PAVEMENT MARKINGS. REMOVE WORK ZONE SHORT TERM TABS AND MARKINGS FOR THE LIMITS SHOWN. REFER TO PM STANDARDS SHEETS AND SUPPLEMENTAL PAVEMENT MARKINGS SHEETS FOR MORE DETAILS.

PHASE IV

THIS PHASE CAN BE DONE IN CONJUNCTION WITH PHASE II AS APPROVED BY THE ENGINEER.

SET UP TRAFFIC CONTROL UTILIZING TCP STANDARDS AS APPLICABLE PER ROADWAY.

BEGIN PROPOSED WORK FOR MBGF INSTALLATION IN LOCATIONS WHERE THE PROPOSED OVERLAY AREA HAS BEEN COMPLETED OVER THE LIMITS OF THE MBGF PROP. WORK. (REFER TO "MBGF & TERMINAL REPLACEMENT LAYOUT" SHEETS.

REMOVAL OF EXISTING MBGF WILL BE LIMITED TO THAT WHICH CAN BE CONSTRUCTED WITHIN THE SAME DAY. UPON COMPLETING THE PROPOSED MBGF SECTIONS, THE BLUNT EXPOSED END WILL BE TIED-DOWN AND/OR TIED TO THE REMAINING EXISTING MBGF APPURTENANCES (IF THEY ARE STILL IN PLACE) AT THE END OF THE WORKING DAY.

NOTE: THE CONTRACTOR SHALL PLACE MBGF AFTER FINAL SURFACING HAS BEEN COMPLETED TO MEET HEIGHT REQUIREMENTS.

PHASE V

PERFORM FINAL CLEAN UP AND REMOVE ALL BARRICADES AS DIRECTED BY THE ENGINEER.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

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TEXAS DEPARTMENT OF TRANSPORTATION ®

TCP
SEQUENCE OF CONSTRUCTION

DN: MT	DW: MT	STATE	SHEET NUMBER				SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 2 OF 2				
FED.RD. DIV.NO.	STATE DIST.NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	18

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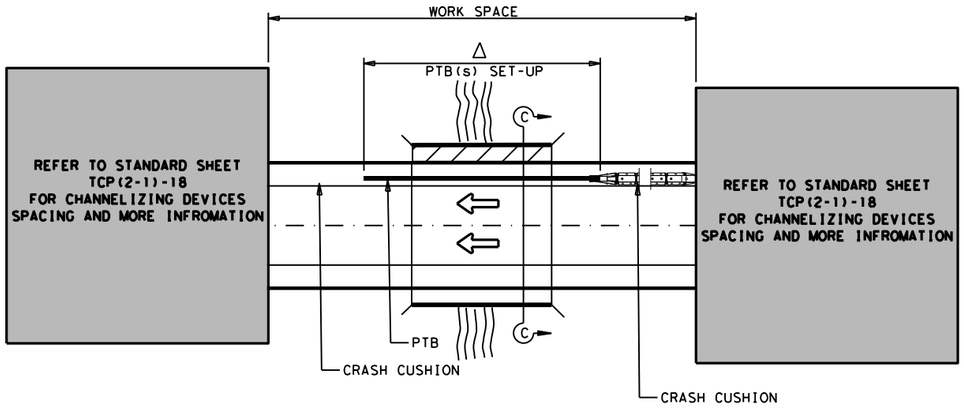
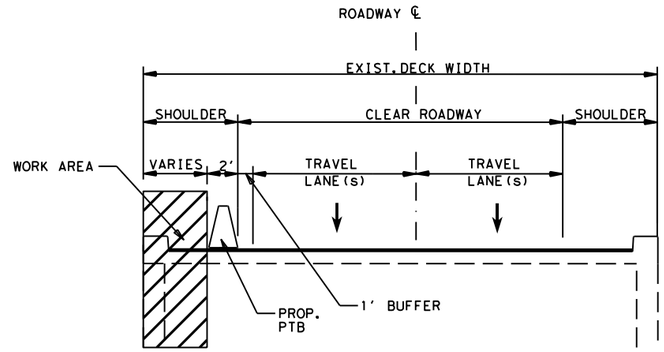


PHASE I - (PCTB LAYOUT)
TYPE 2

PORTABLE TRAFFIC BARRIER QUANTITIES

REFERENCE LOCATION	PSN NUMBER	SIDE	512 A FURNISH & INSTALL	512 A MOVE	512 A REMOVE
			LF	LF	LF
2	414+1.525(NB)(RT)	RT	120		
2	414+1.525(SB)(LT)	LT		120	
2	416+0.005(NB)(RT)	RT		120	
2	416+0.665(SB)(LT)	LT		120	120
TOTAL			120	360	120

△ FOR CONTRACTORS INFORMATION ONLY, PTB's SET-UP INSTALLATION TO BE PROPOSED (120').
REFER TO "CRASH CUSHION SUMMARY SHEET" FOR ADDITIONAL INFORMATION NOT SHOWN.



PHASE I
TYPICAL SECTION
SECTION C-C

MIRROR WORK FROM PHASE I ON THE OTHER HALF OF ROADWAY WITHIN THE SAME CONSTRUCTION LIMITS.

LEGEND

- CRASH CUSHION ATTENUATOR
- PORTABLE TRAFFIC BARRIER
- DIRECTIONAL TRAFFIC
- WORK ZONE
- TRUCK MOUNTED ATTENUATOR (TMA)

NOTES

REFER TO STANDARD BC(12)-14 FOR PAVEMENT MARKINGS DETAILS SET-UP, AND SPACING.

REFER TO THE "SUMMARY OF QUANTITIES" PLAN SHEET FOR ADDITIONAL INFORMATION.

REMOVAL OF DRAINAGE STRUCTURE WILL BE LIMITED TO ONE SIDE OF THE ROADWAY AT A TIME, OR AS SPECIFIED BY THE ENGINEER.

REFER TO "BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS" SHEETS FOR ADDITIONAL NOTES

REFER TO STANDARD TCP (2-1)-18 FOR TRAFFIC CONTROL SET-UP, TAPER LENGTHS AND SPACING FOR SIGNS. THE WORK AREA WILL CONSIST OF THE REMOVAL OF BRIDGE RAIL AND GUARDRAIL FOR LT & RT SIDE OF THE ROADWAY.

ALL MATERIALS & WORK REQUIRED TO INSTALL CRASH CUSHION ATTENUATOR WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO ITEM 545 "CRASH CUSHION ATTENUATOR".

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

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5/3/2022

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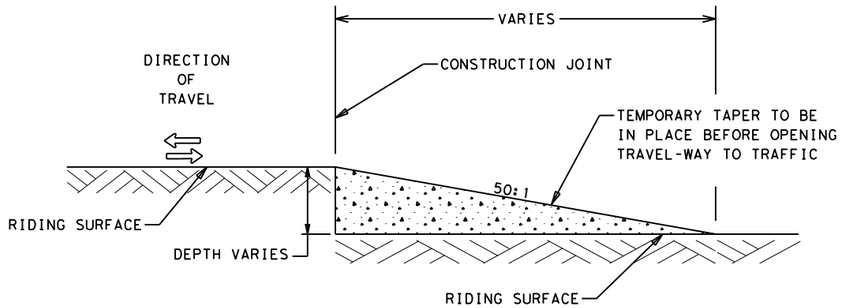
TCP - PTB INSTALLATION LAYOUT TYPE 2

DN: MT	DW: MT	STATE	SHEET NUMBER	SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 2 OF 2	

FED.RD. DIV.NO.	STATE DIST.NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	19



CONSTRUCTION JOINT TAPER - END OF WORK DAY
(PROFILE)

NOTES:

- DURING ANY PHASE OF CONSTRUCTION, A CONSTRUCTION JOINT TAPER IS TO BE IN PLACE AT THE END OF THE WORK DAY PRIOR TO OPENING ALL LANES TO TRAFFIC, IN ALL DIRECTIONS.
- USE FOR ALL LONGITUDINAL DROP-OFFS WHICH MAY RESULT FROM PLANING, OVERLAYS, OR ANY OTHER CONSTRUCTION OPERATIONS.
- PLACEMENT AND REMOVAL OF THIS CONSTRUCTION TAPER DURING CONSTRUCTION WILL NOT BE PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO ITEM 502.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

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TEXAS DEPARTMENT OF TRANSPORTATION ®

TCP CONSTRUCTION JOINT DETAIL

DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	20

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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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0022	05	025	US 90, etc.
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	22	VAL VERDE, etc.		21
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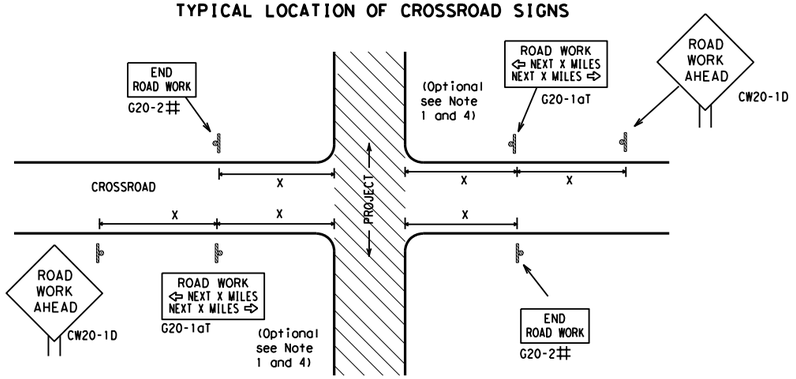
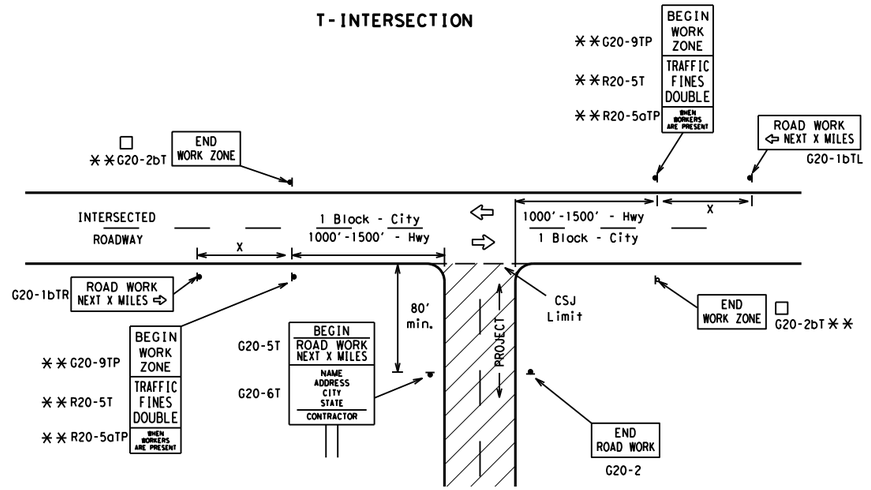
TYPICAL LOCATION OF CROSSROAD SIGNS



May be mounted on back of "ROAD WORK AHEAD"(CW20-1D) sign with approval of Engineer. (See note 2 below)

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume as per TMUTCD Part 5. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
2. If construction closes the road at a T-intersection, the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[1,5,6]

SIZE

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

SPACING

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

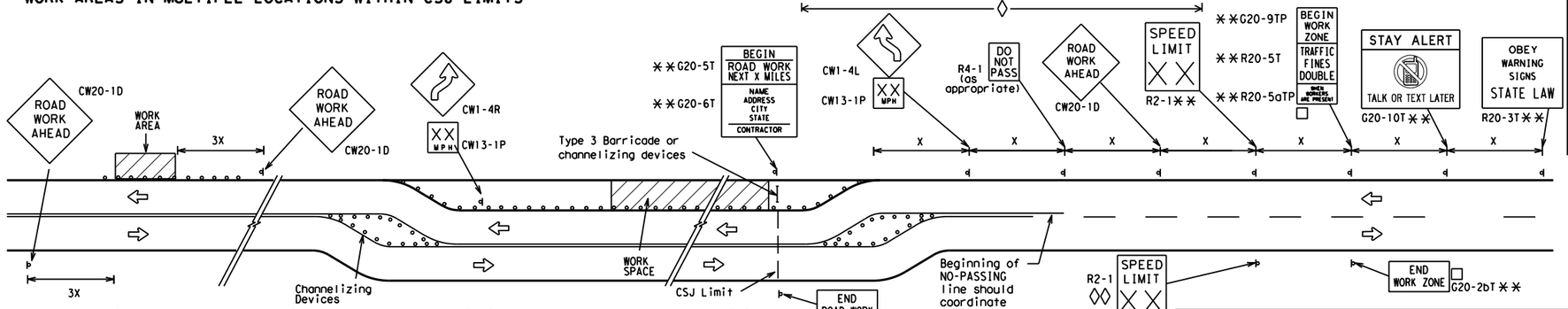
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer as per TMUTCD Part 5. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

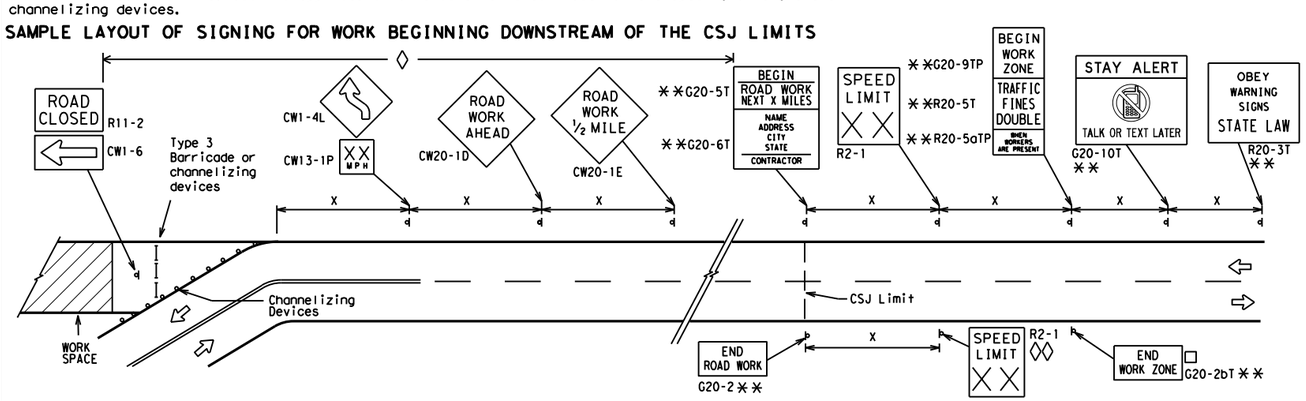
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

□ The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

** CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.

◊ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

◊◊ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

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

SHEET 2 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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REVISIONS	0022	05	025	US 90, etc.
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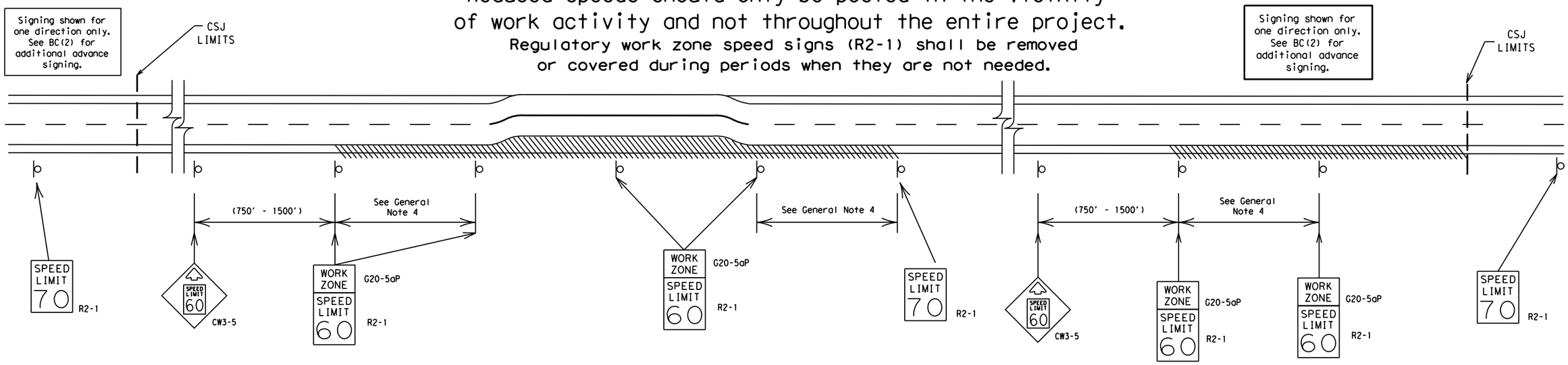
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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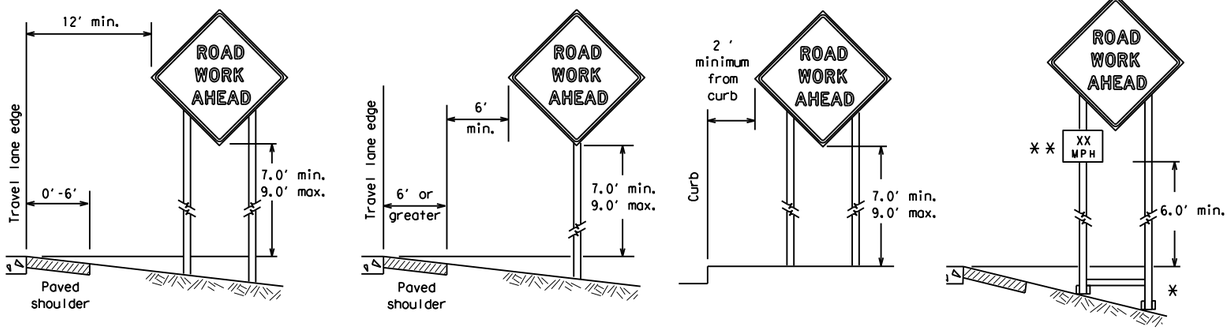
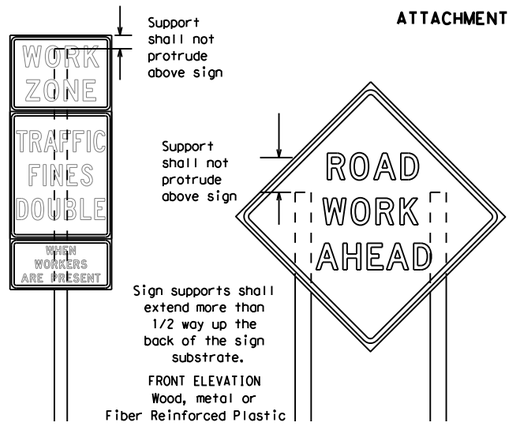
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



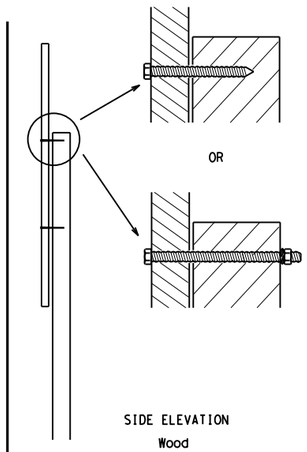
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS



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

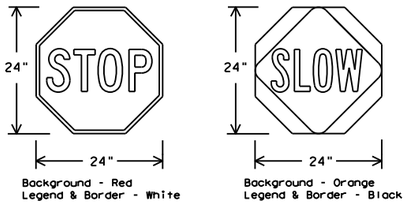


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

STOP/SLOW PADDLES

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



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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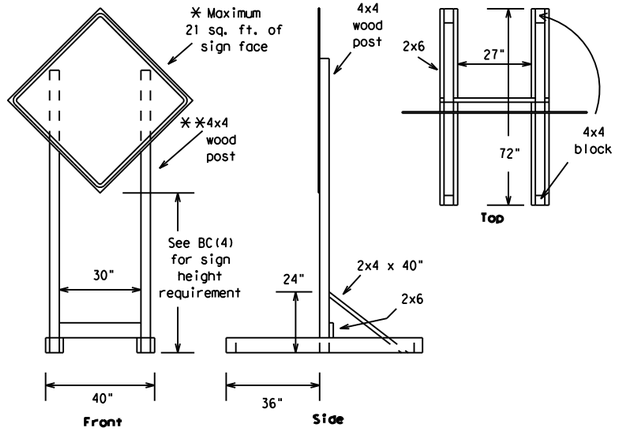
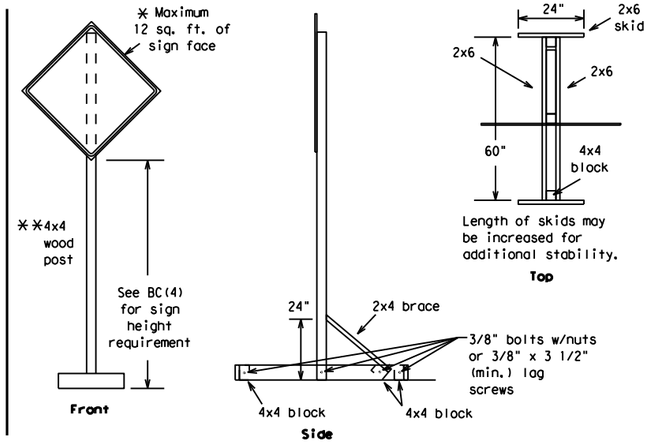
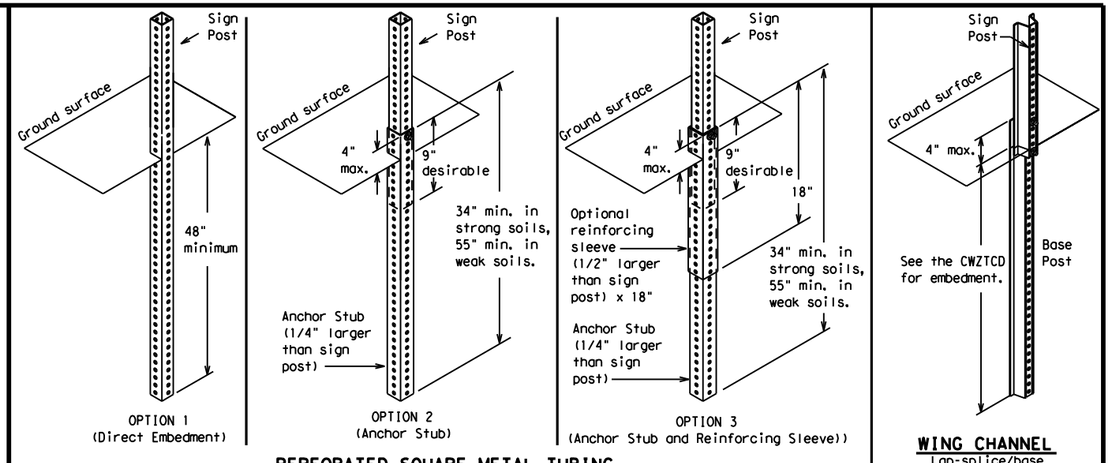




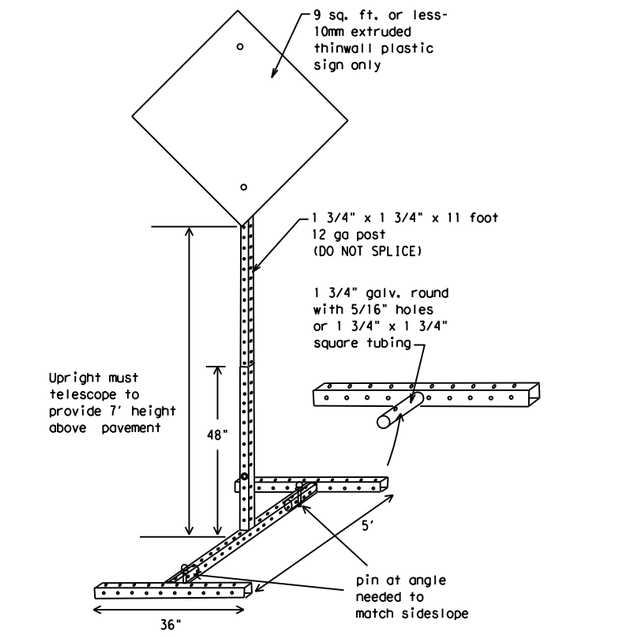
SKID MOUNTED WOOD SIGN SUPPORTS

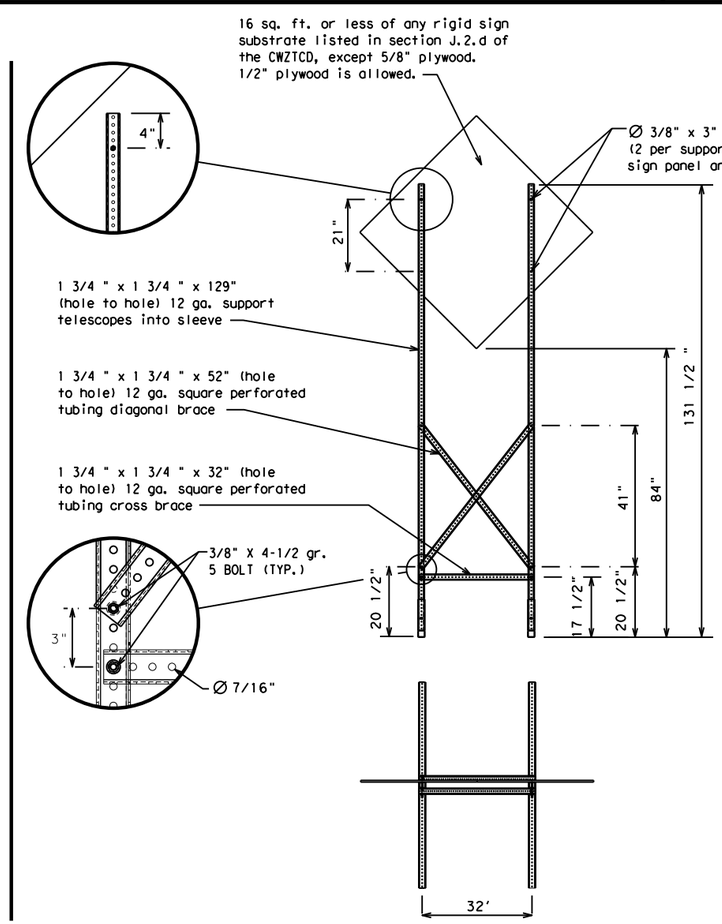
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

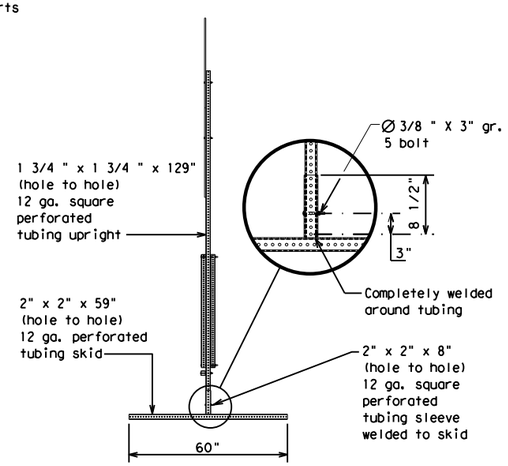


GROUND MOUNTED SIGN SUPPORTS

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.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	22	VAL VERDE, etc.		25

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

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

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

- FREEWAY CLOSED X MILE
- FRONTAGE ROAD CLOSED
- ROAD CLOSED AT SH XXX
- SHOULDER CLOSED XXX FT
- ROAD CLSD AT FM XXXX
- RIGHT LN CLOSED XXX FT
- RIGHT X LANES CLOSED
- RIGHT X LANES OPEN
- CENTER LANE CLOSED
- DAYTIME LANE CLOSURES
- NIGHT LANE CLOSURES
- I-XX SOUTH EXIT CLOSED
- VARIOUS LANES CLOSED
- EXIT XXX CLOSED X MILE
- EXIT CLOSED
- RIGHT LN TO BE CLOSED
- MALL DRIVEWAY CLOSED
- X LANES CLOSED TUE - FRI
- XXXXXXXX BLVD CLOSED

Other Condition List

- ROADWORK XXX FT
- ROAD REPAIRS XXXX FT
- FLAGGER XXXX FT
- LANE NARROWS XXXX FT
- RIGHT LN NARROWS XXXX FT
- TWO-WAY TRAFFIC XX MILE
- MERGING TRAFFIC XXXX FT
- CONST TRAFFIC XXX FT
- LOOSE GRAVEL XXXX FT
- UNEVEN LANES XXXX FT
- DETOUR X MILE
- ROUGH ROAD XXXX FT
- ROADWORK PAST SH XXXX
- ROADWORK NEXT FRI-SUN
- BUMP XXXX FT
- US XXX EXIT X MILES
- TRAFFIC SIGNAL XXXX FT
- LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

- MERGE RIGHT
- FORM X LINES RIGHT
- DETOUR NEXT X EXITS
- USE XXXXX RD EXIT
- USE EXIT XXX
- USE EXIT I-XX NORTH
- STAY ON US XXX SOUTH
- USE I-XX E TO I-XX N
- TRUCKS USE US XXX N
- WATCH FOR TRUCKS
- WATCH FOR TRUCKS
- EXPECT DELAYS
- EXPECT DELAYS
- PREPARE TO STOP
- REDUCE SPEED XXX FT
- END SHOULDER USE
- USE OTHER ROUTES
- WATCH FOR WORKERS
- STAY IN LANE *

Location List

- AT FM XXXX
- BEFORE RAILROAD CROSSING
- NEXT X MILES
- PAST US XXX EXIT
- XXXXXXX TO XXXXXXX
- US XXX TO FM XXXX

Warning List

- SPEED LIMIT XX MPH
- MAXIMUM SPEED XX MPH
- MINIMUM SPEED XX MPH
- ADVISORY SPEED XX MPH
- RIGHT LANE EXIT
- USE CAUTION
- DRIVE SAFELY
- DRIVE WITH CARE

** Advance Notice List

- TUE-FRI XX AM- X PM
- APR XX-XX X PM-X AM
- BEGINS MONDAY
- BEGINS MAY XX
- MAY X-X XX PM - XX AM
- NEXT FRI-SUN
- XX AM TO XX PM
- NEXT TUE AUG XX
- TONIGHT XX PM- XX AM

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

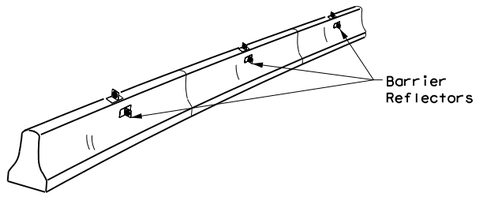
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	22	VAL VERDE, etc.		26

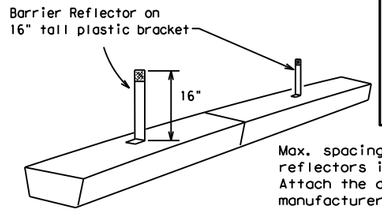
100

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



CONCRETE TRAFFIC BARRIER (CTB)

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

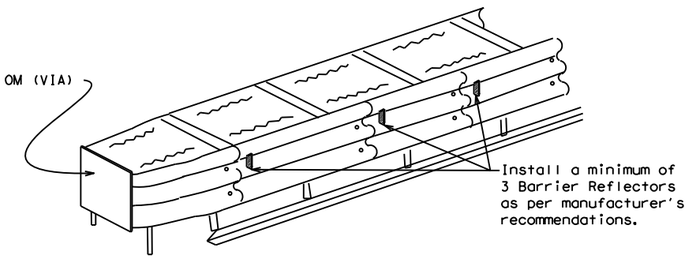


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

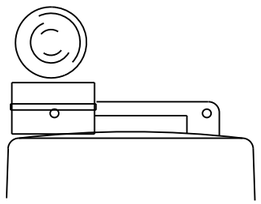


DELINEATION OF END TREATMENTS

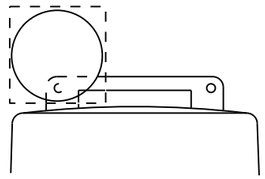
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

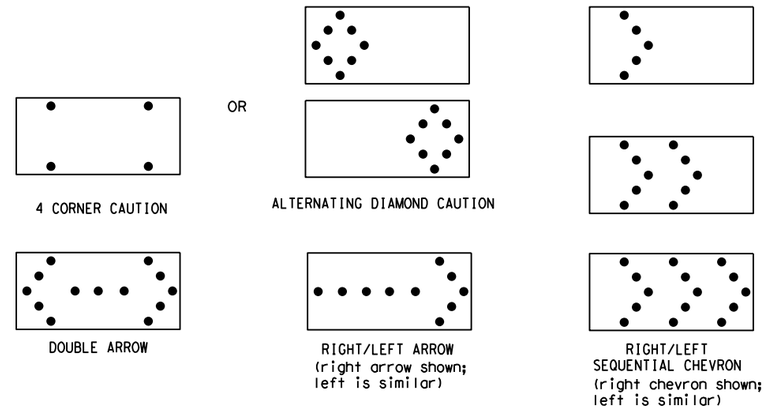
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

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Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	22	VAL VERDE, etc.		27

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

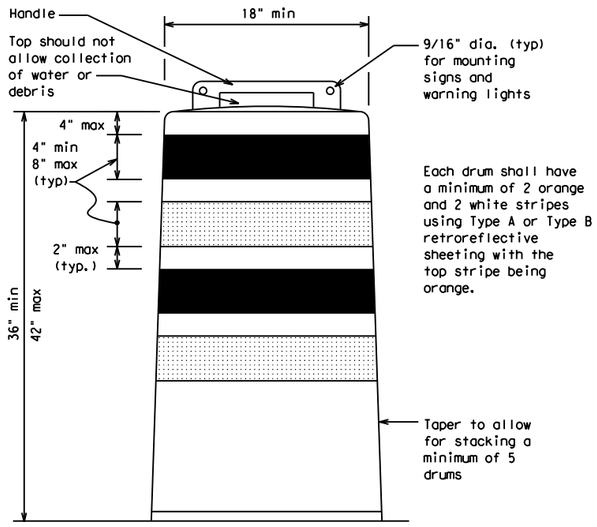
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

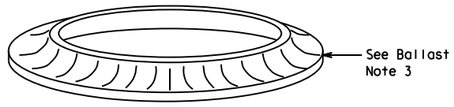
RETROREFLECTIVE SHEETING

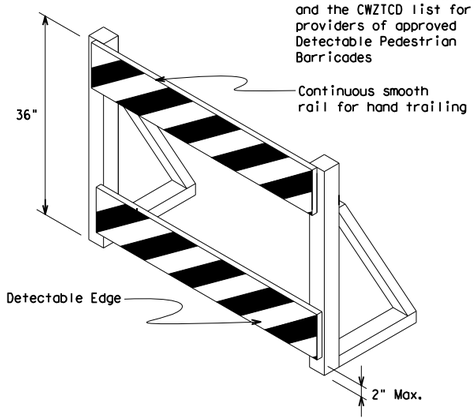
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

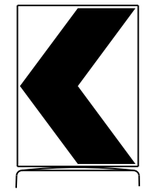




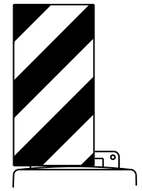


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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4-03 8-14	DIST	COUNTY		SHEET NO.
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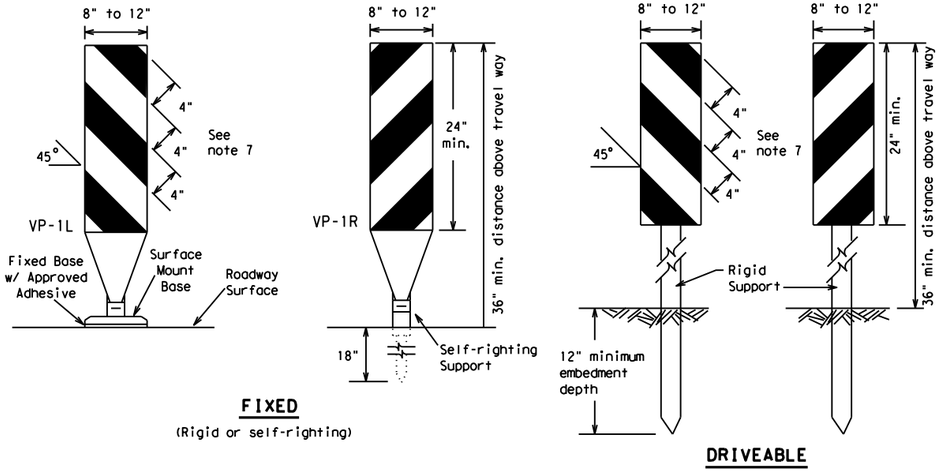
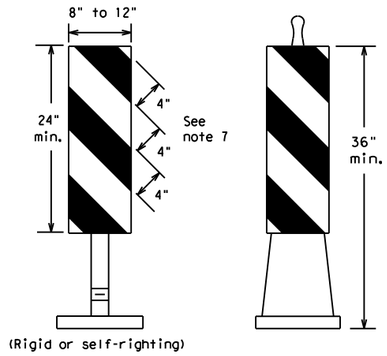


FIXED
(Rigid or self-righting)

DRIVEABLE

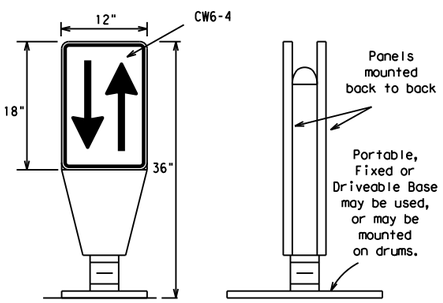


(Rigid or self-righting)

PORTABLE

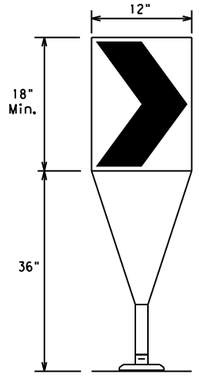
VERTICAL PANELS (VPs)

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



1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



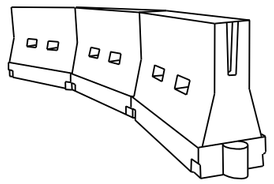
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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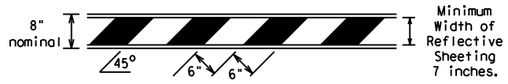
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	22	VAL VERDE, etc.		29

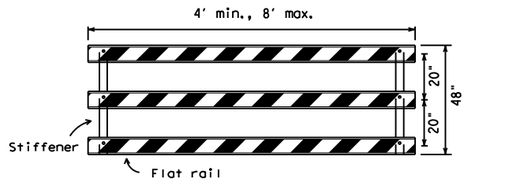
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road, striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



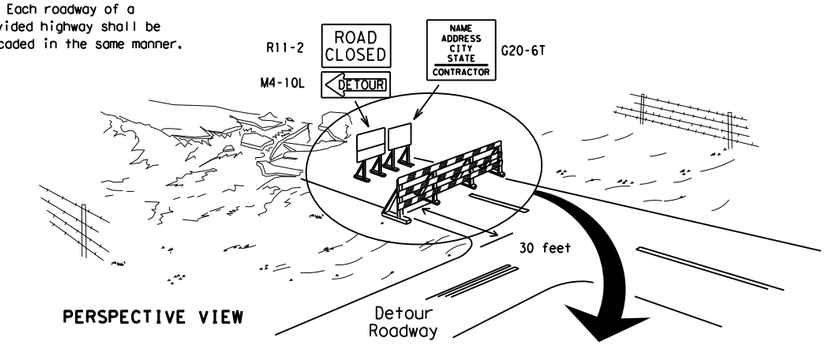
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

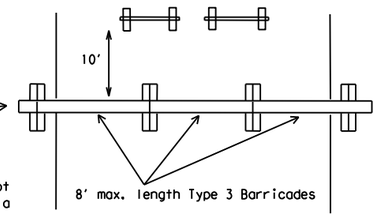
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

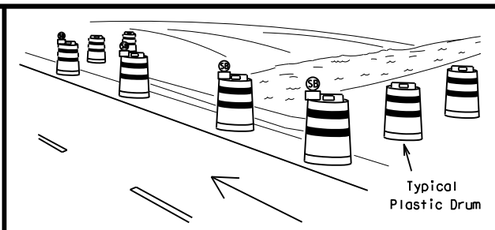
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

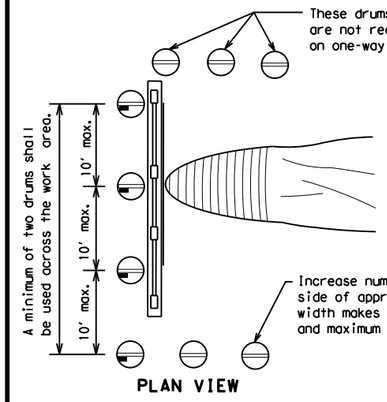
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

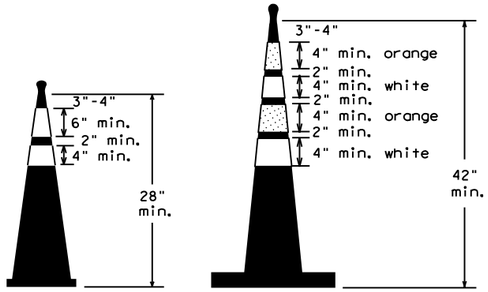
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



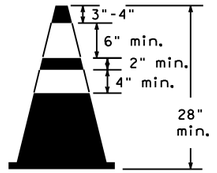
LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

PLAN VIEW

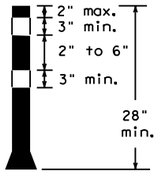
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

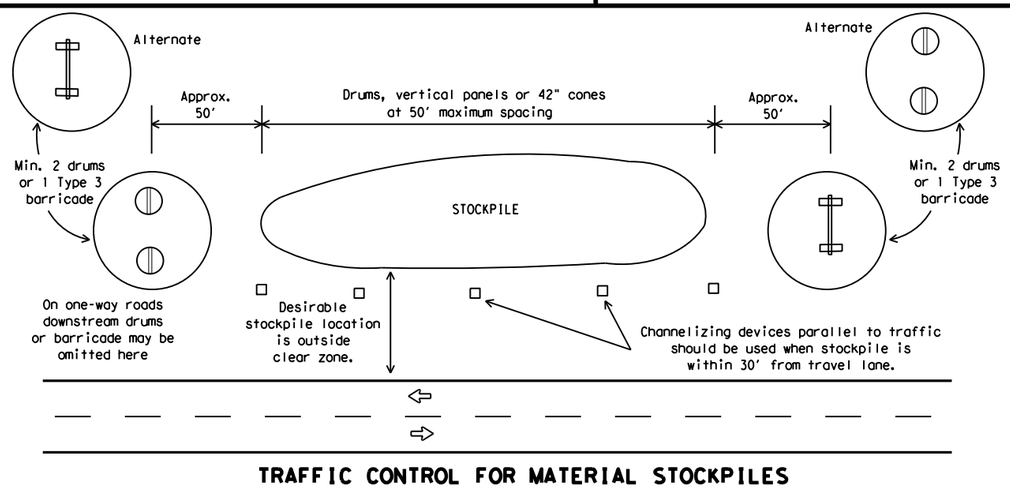


Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.

42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A or Type B.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		30

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

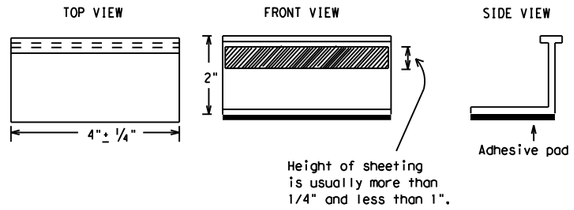
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-98 9-07 5-21	0022	05	025	US 90, etc.
1-02 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14	22	VAL VERDE, etc.		31

105

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DATE: 4/22/2022 2:48:51 PM
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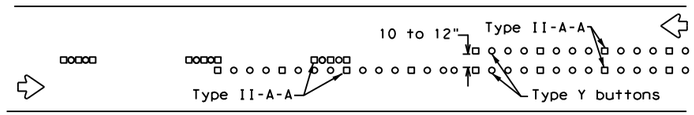
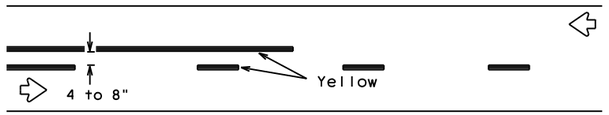
PAVEMENT MARKING PATTERNS

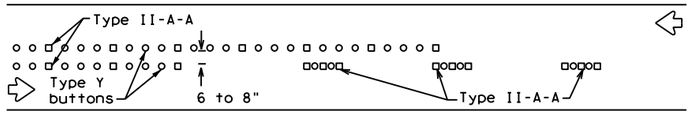
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



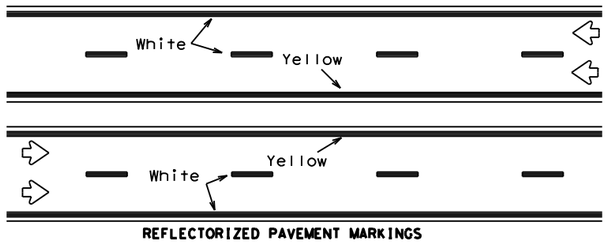
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



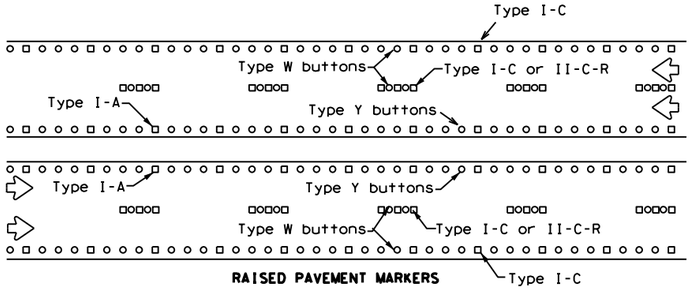
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

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



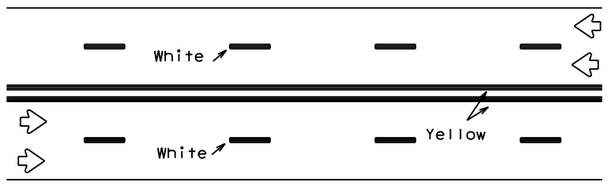
REFLECTORIZED PAVEMENT MARKINGS



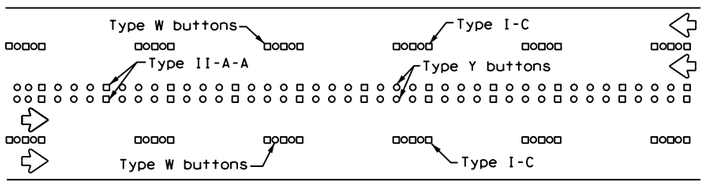
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



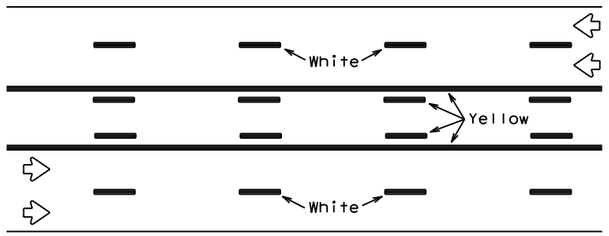
REFLECTORIZED PAVEMENT MARKINGS



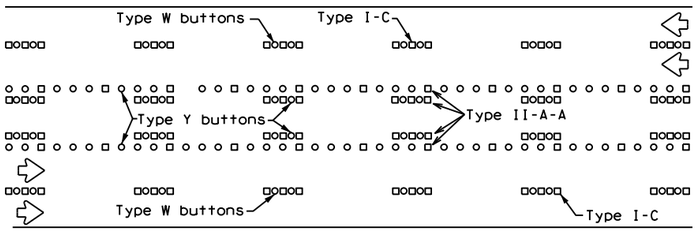
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

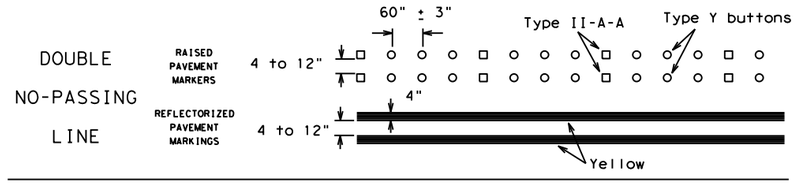
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

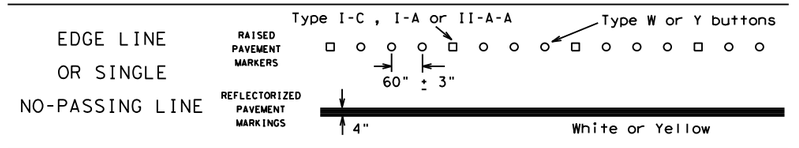
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

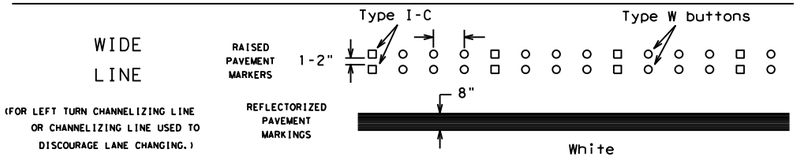


EDGE LINE OR SINGLE NO-PASSING LINE



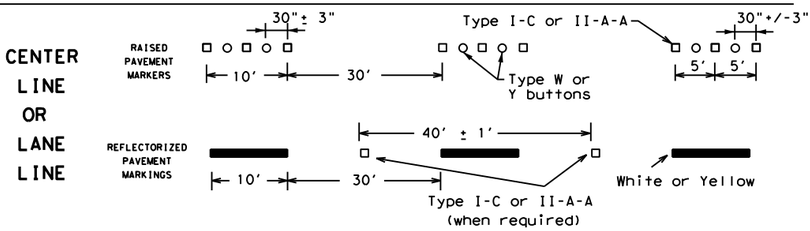
WIDE LINE

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

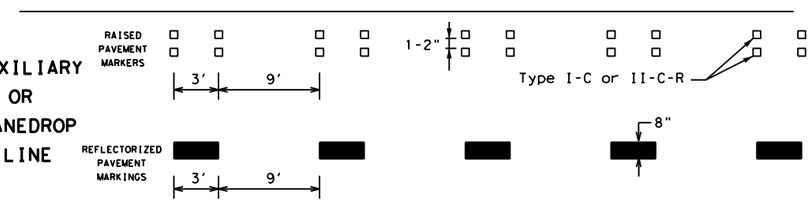


BROKEN LINES

CENTER LINE OR LANE LINE

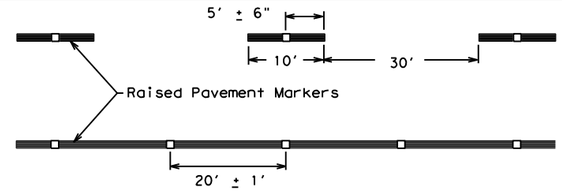


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		32

106

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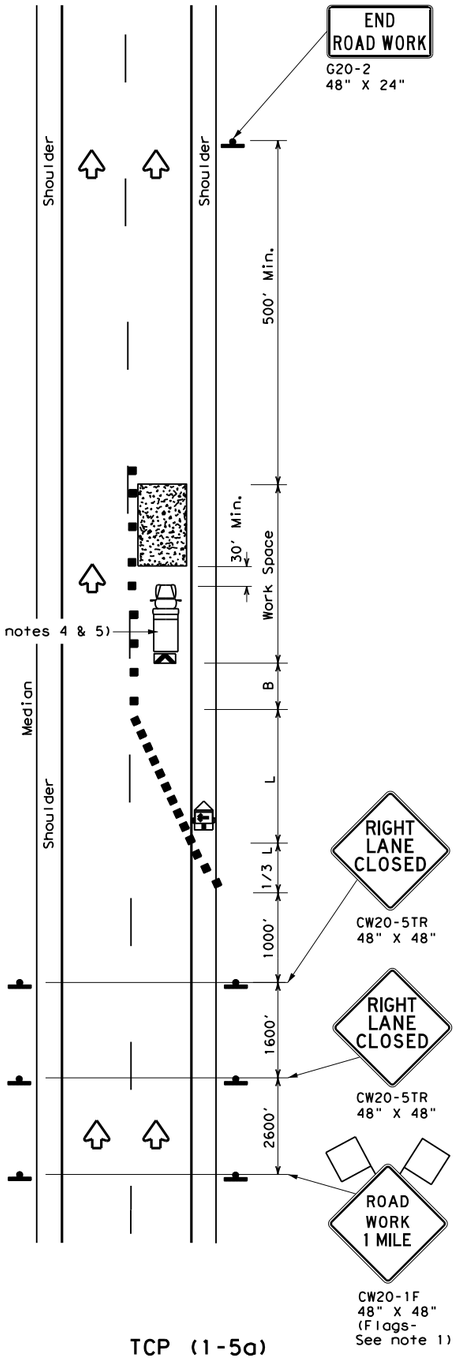
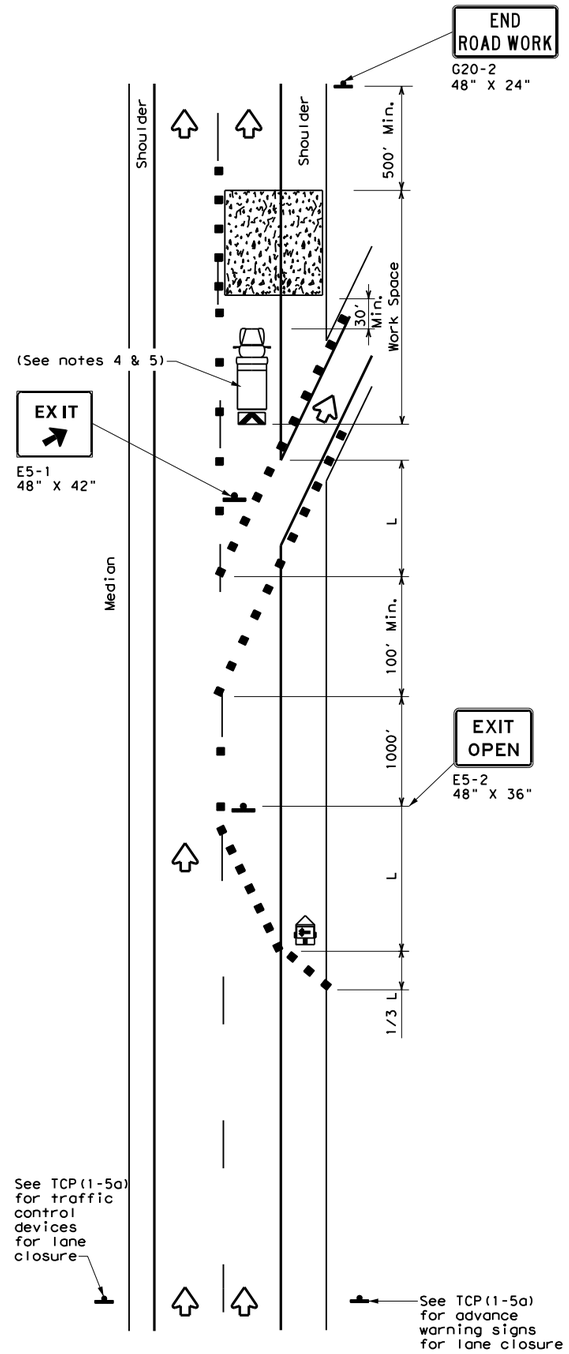


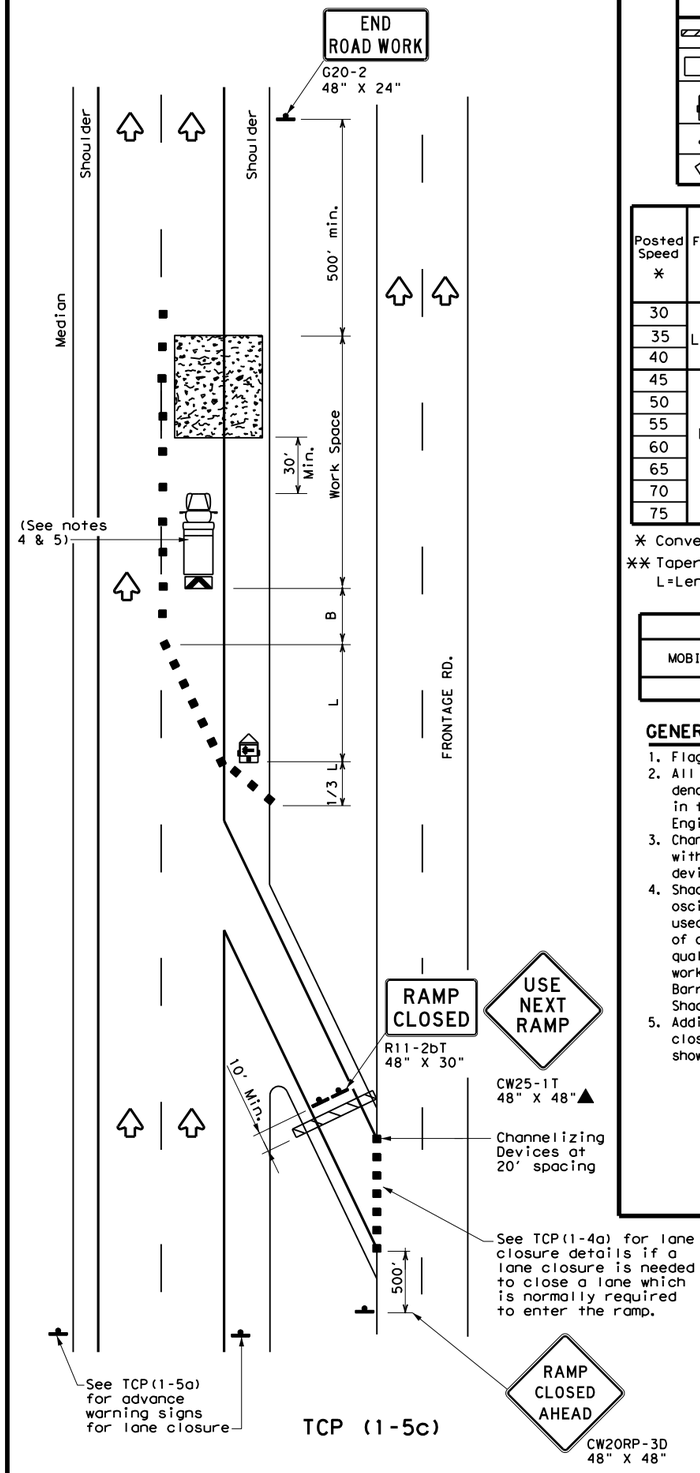
TCP (1-5a)

ONE LANE CLOSURE



TCP (1-5b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (1-5c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

TCP(1-5)-18

FILE: tcp1-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		33

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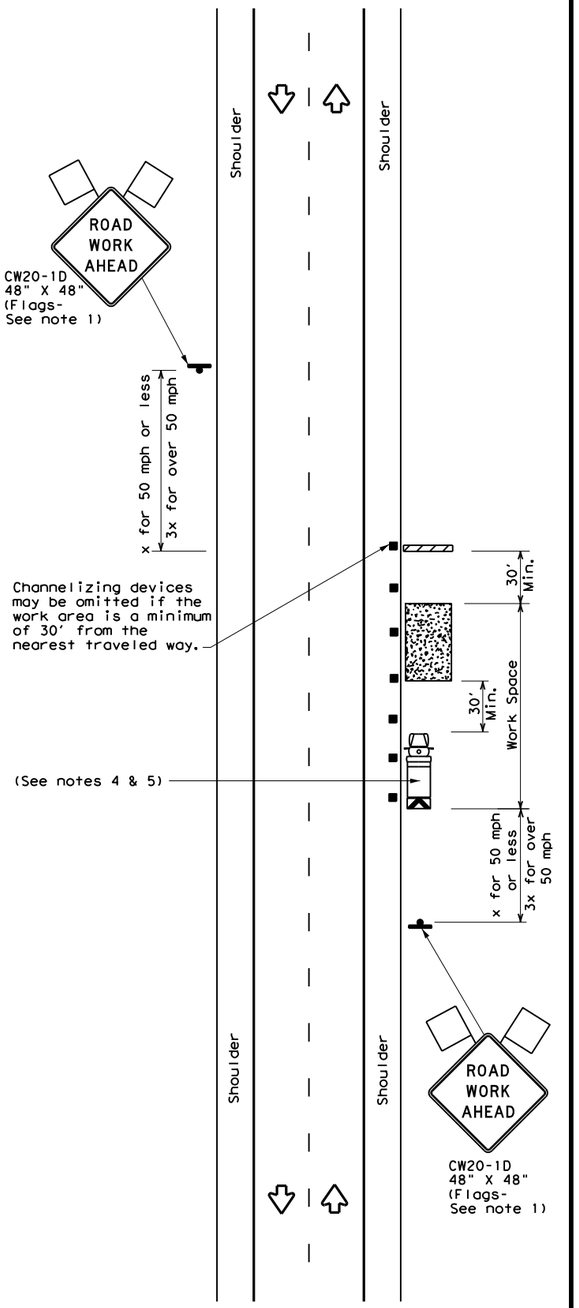
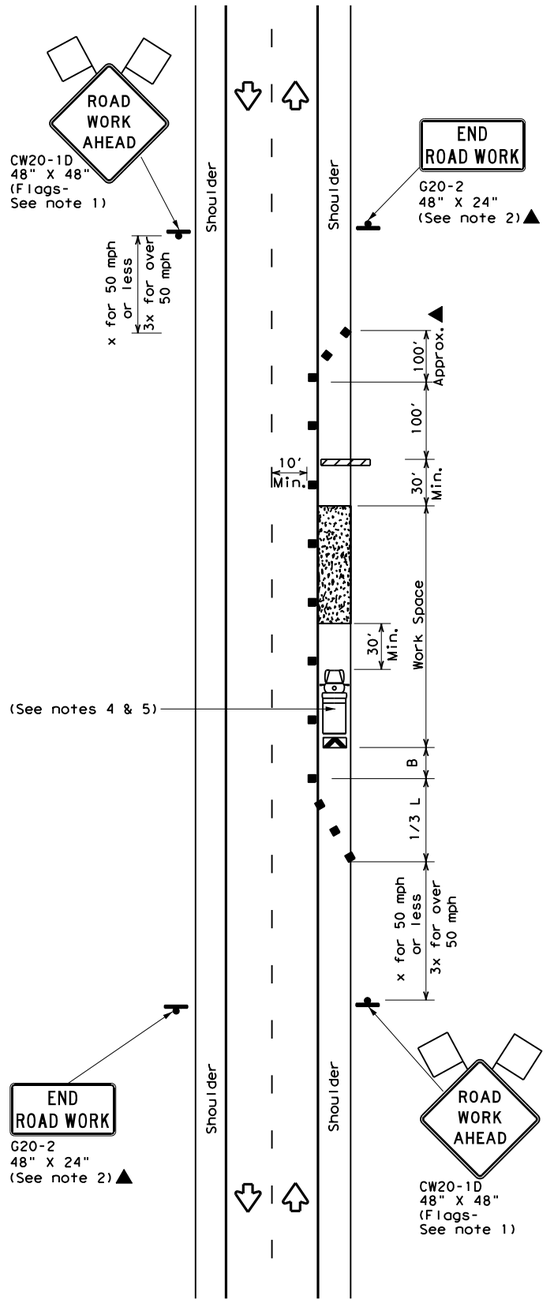


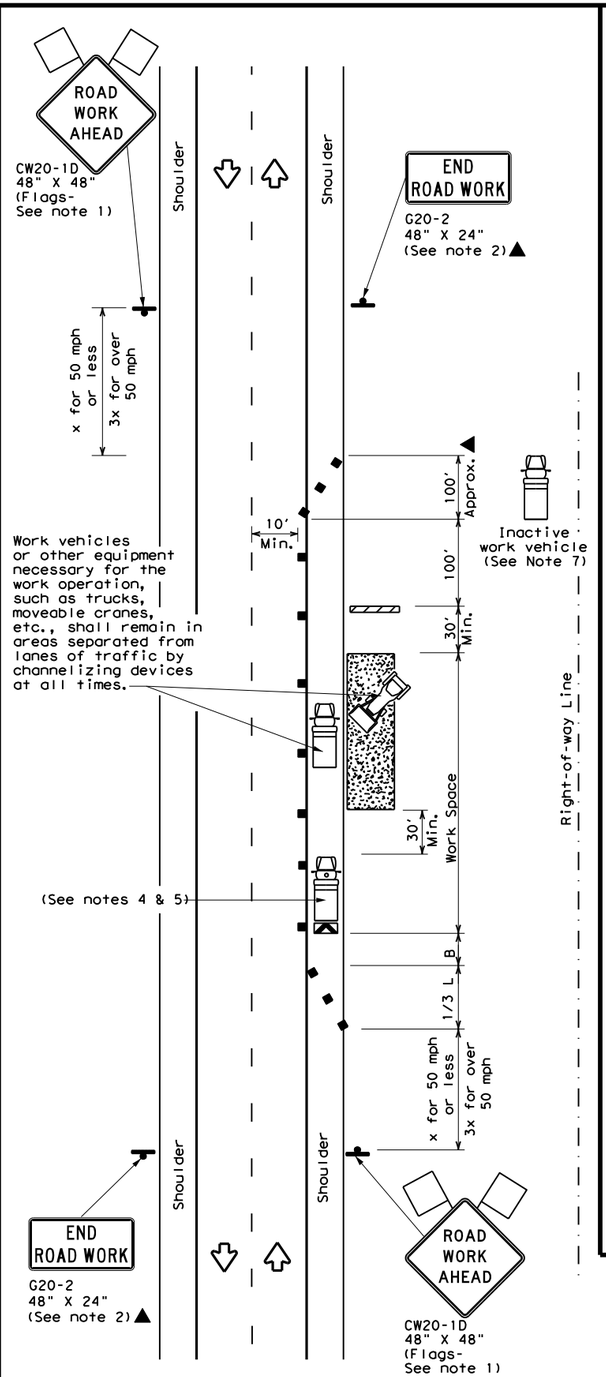
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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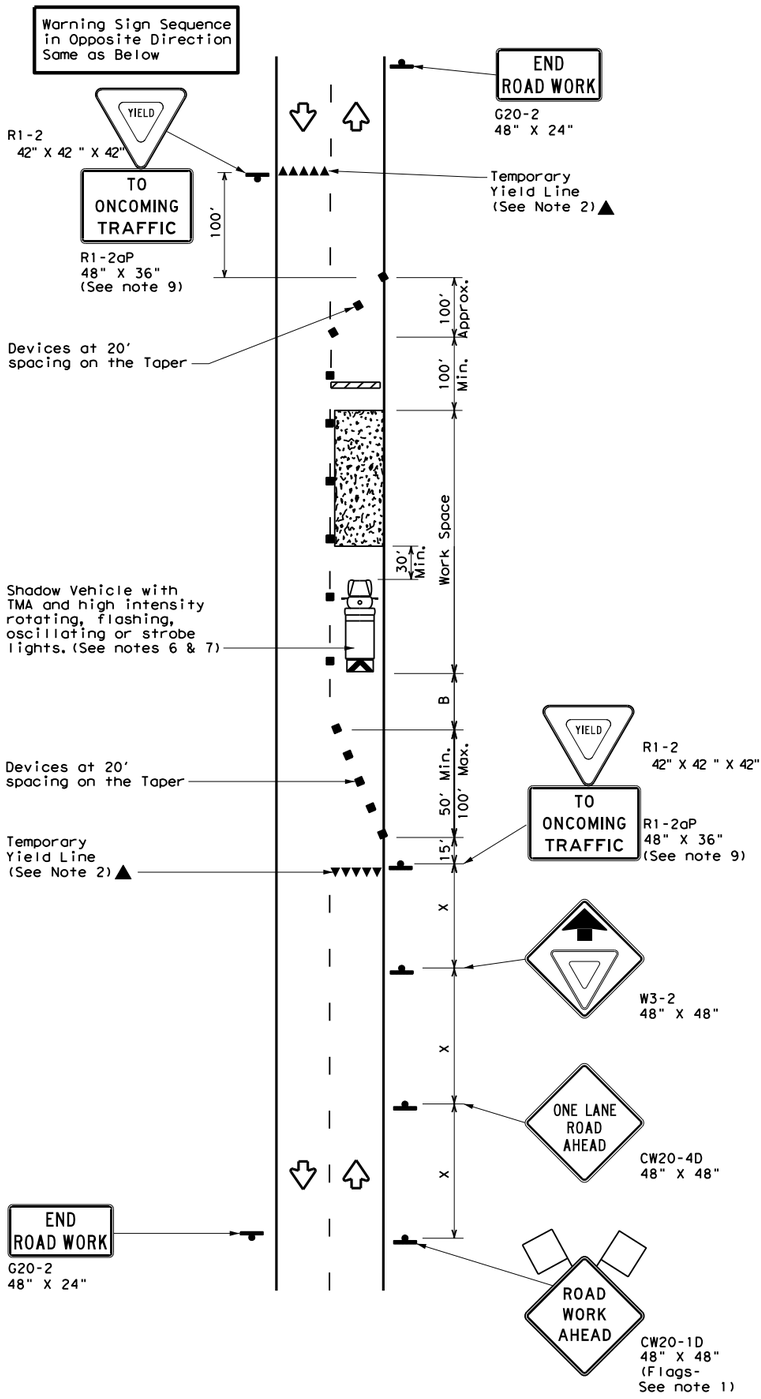
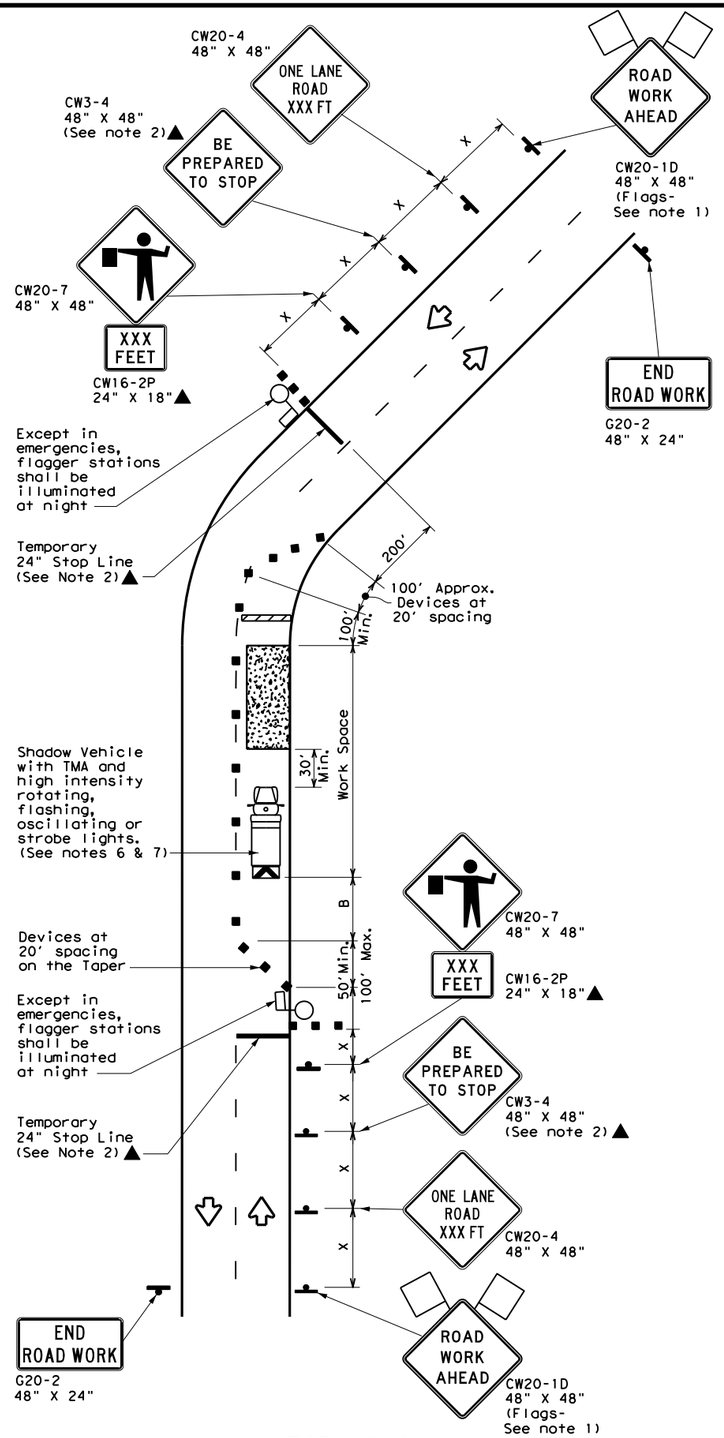
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	22	VAL VERDE, etc.		34
1-97 2-18				



TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



TCP (2-2b)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
4. Flaggers should use two-way radios or other methods of communication to control traffic.
5. Length of work space should be based on the ability of flaggers to communicate.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-2a)

8. The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block. In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.
9. The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.

TCP (2-2b)

10. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
12. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situtations.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	22	VAL VERDE, etc.		35
4-98 2-18				

DATE: 4/22/2022 2:49:13 PM
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DATE: 4/22/2022 2:49:19 PM
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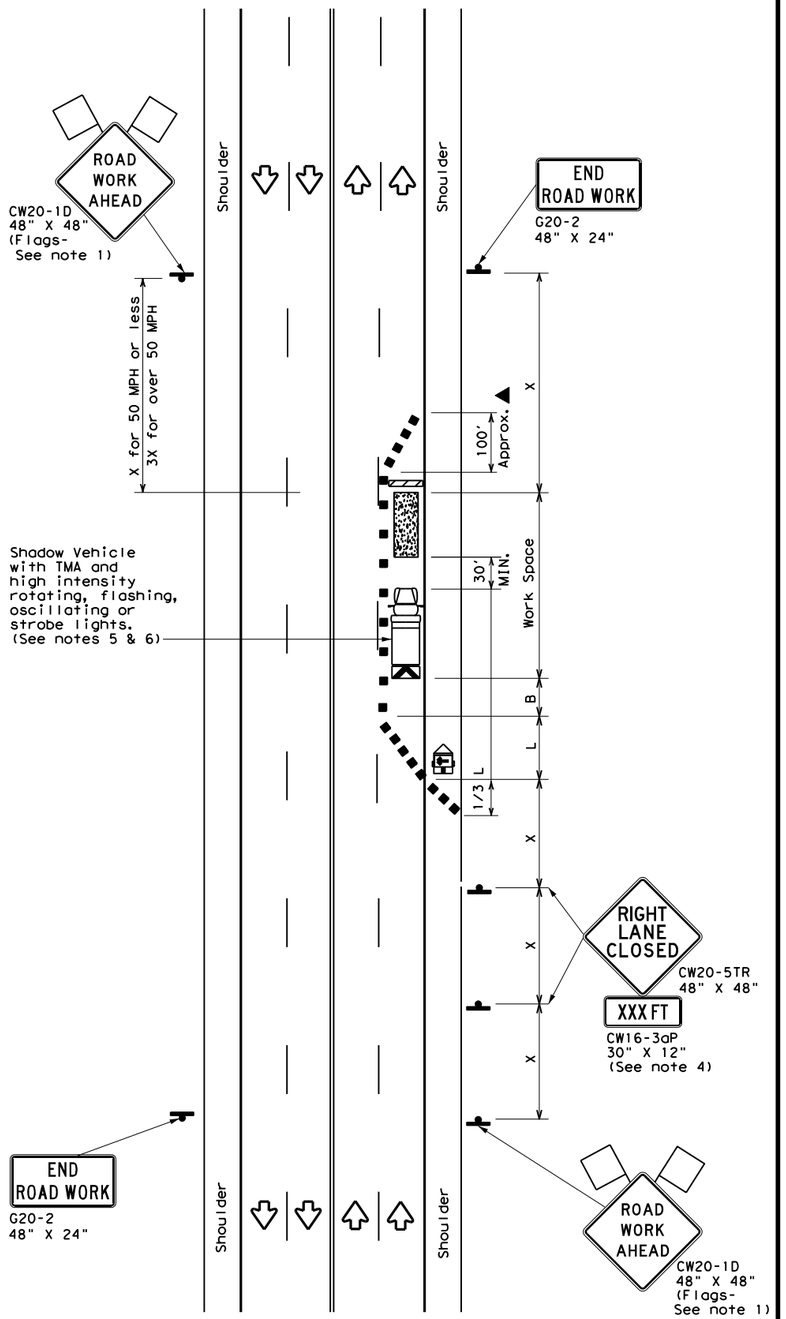
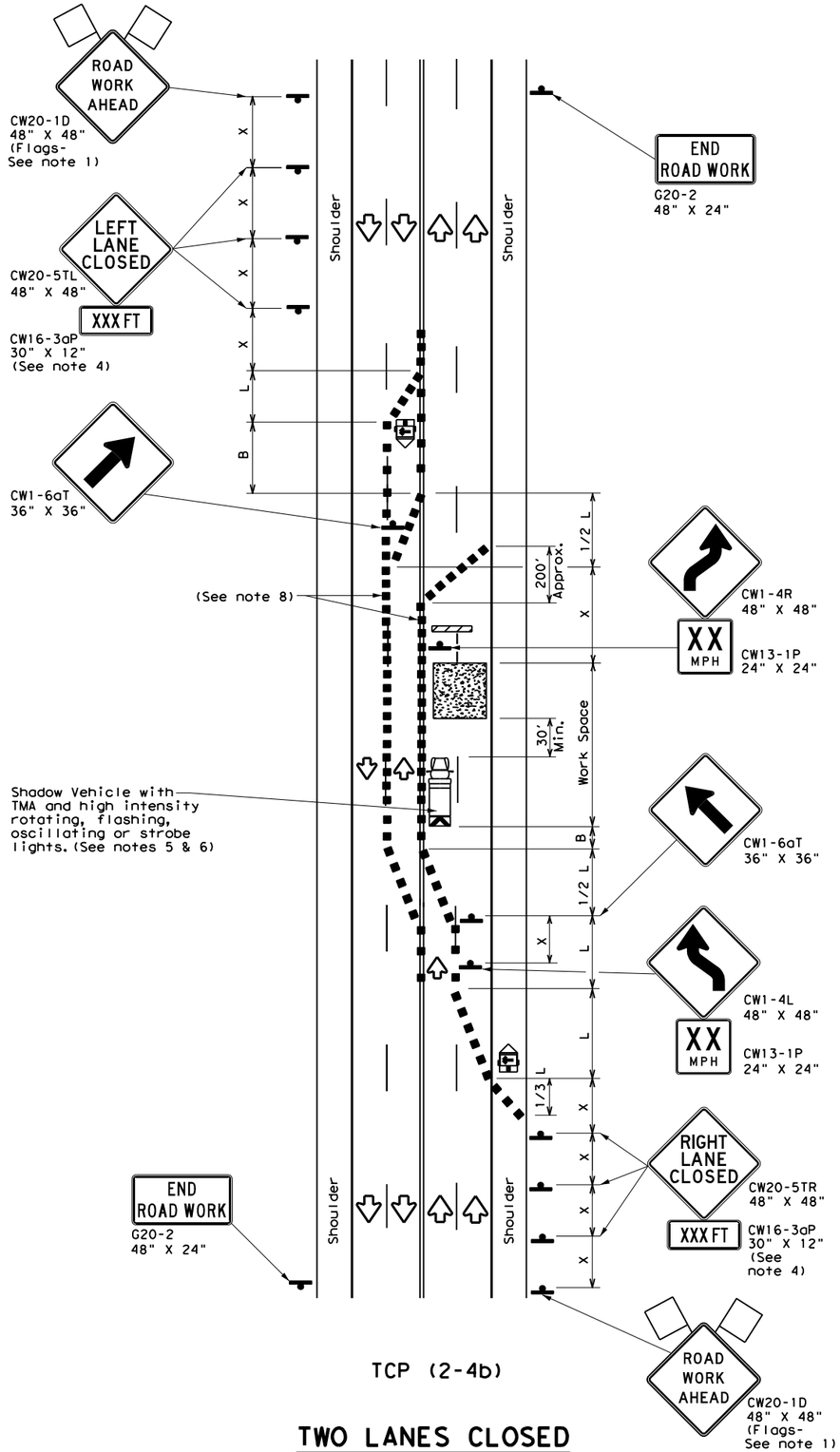


TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
4. For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
5. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
6. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-4a)

7. If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED"signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic with the arrow board placed in the closed lane near the end of the merging taper.

TCP (2-4b)

8. For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter devices spacing is intended for the area of conflicting markings, not the entire work zone.

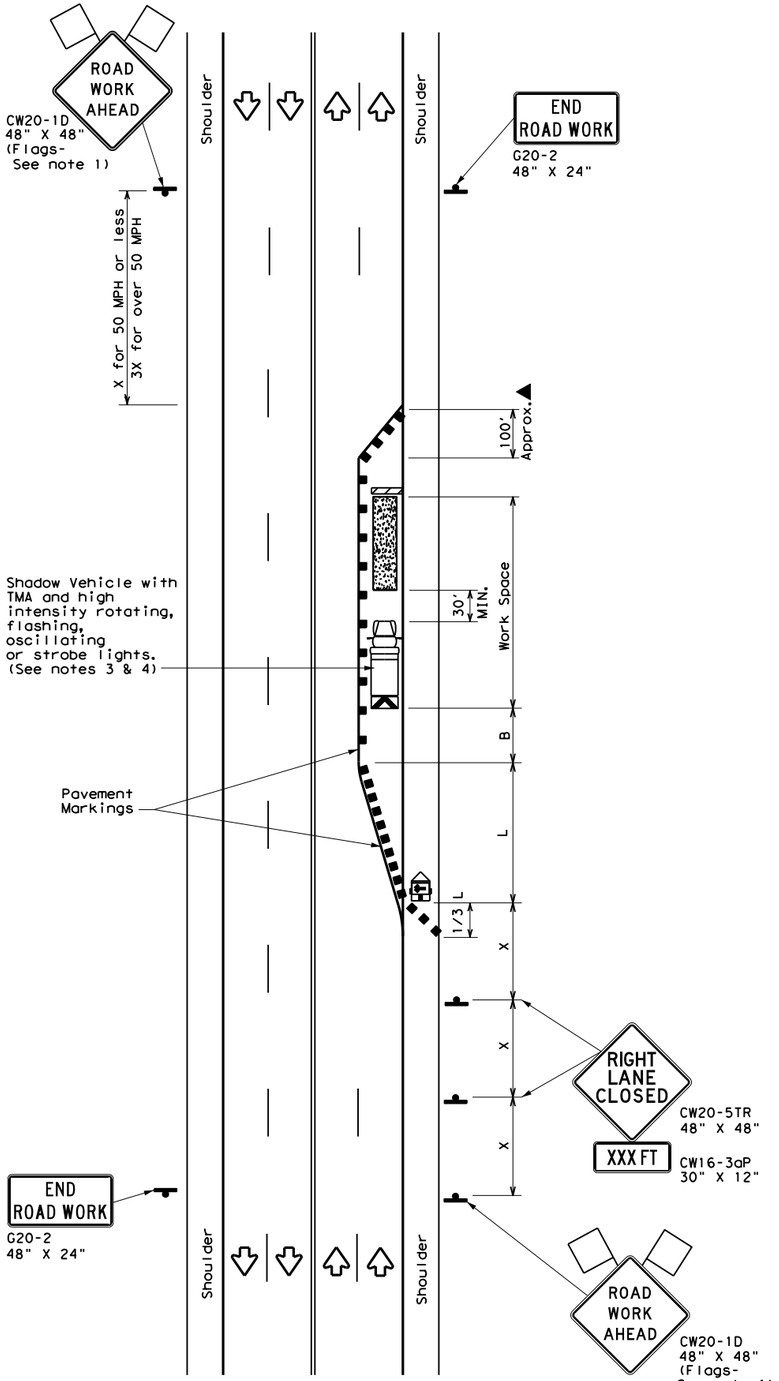
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

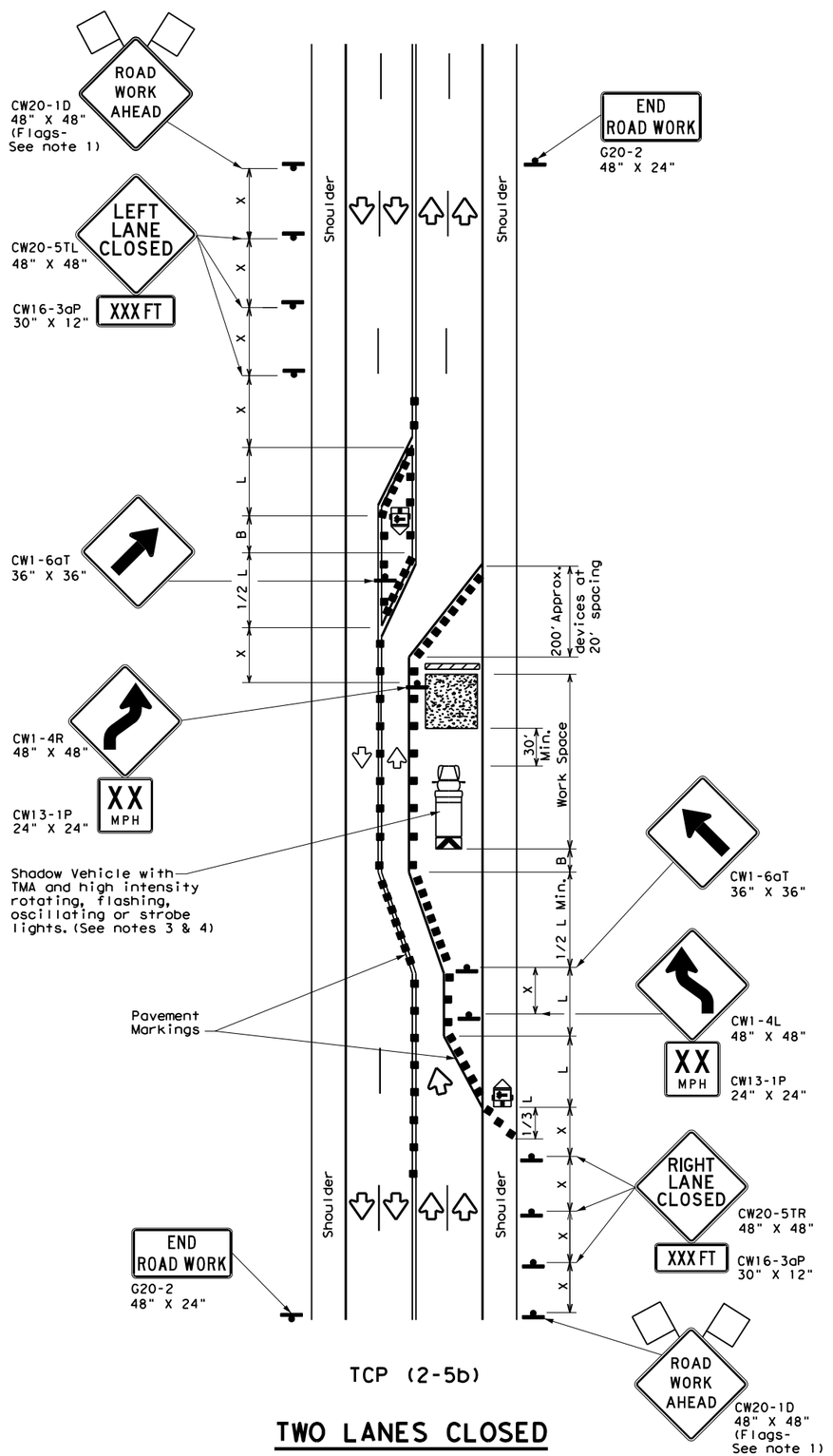
TCP(2-4)-18

FILE: tcp2-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0022	05	025	US 90,etc.
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	22	VAL VERDE, etc.		36



TCP (2-5a)

ONE LANE CLOSED



TCP (2-5b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. 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 eposure 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 substitutued for the Shadow Vehicle and TMA.
4. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.
5. The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

TCP (2-5a)

6. If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic, with the arrow board placed in the closed lane near the end of the merging taper.

TCP (2-5b)

7. Conflicting pavement markings shall be removed for long-term projects.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LONG TERM LANE CLOSURES MULTILANE CONVENTIONAL RDS.

TCP(2-5)-18

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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4-98 2-18	22	VAL VERDE, etc.		37

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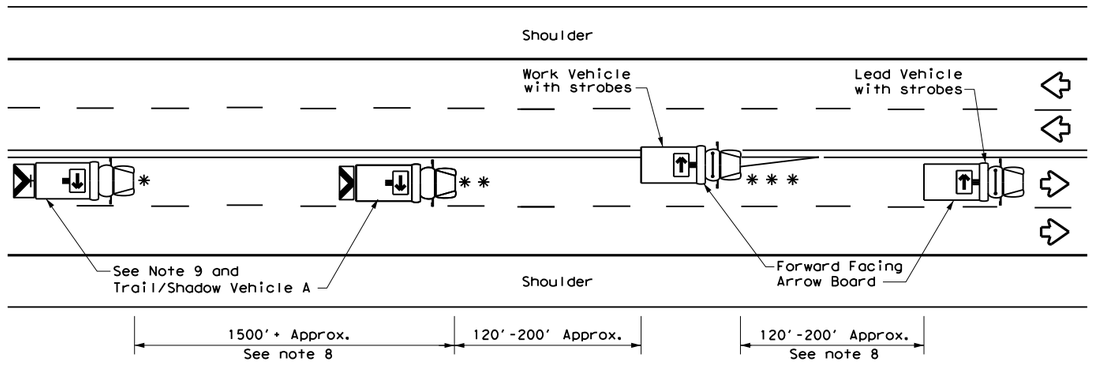
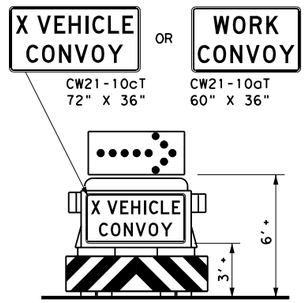


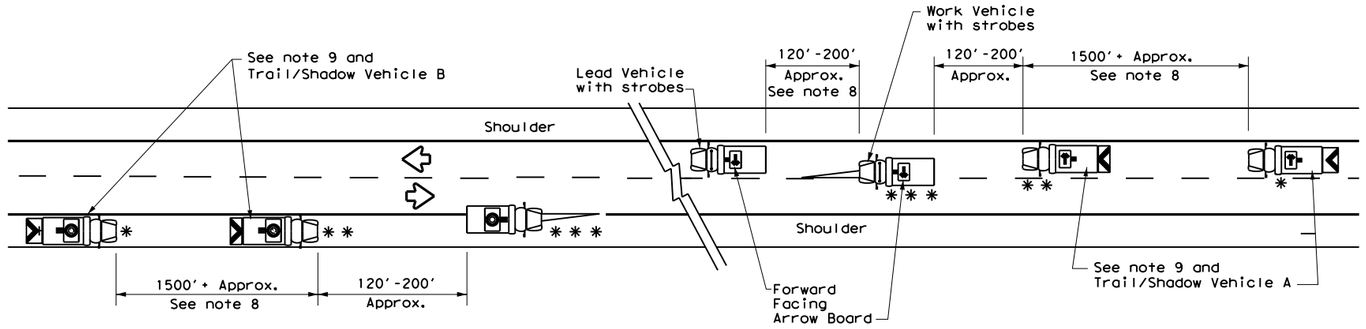
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

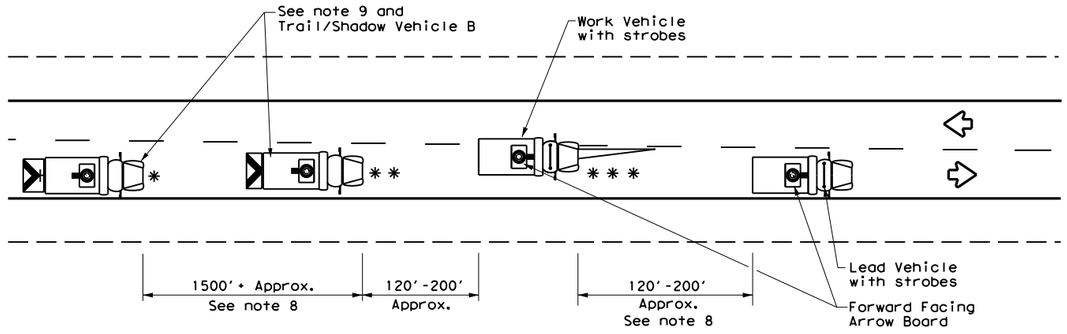


WORK ON SHOULDER

WORK ON TRAVEL LANE

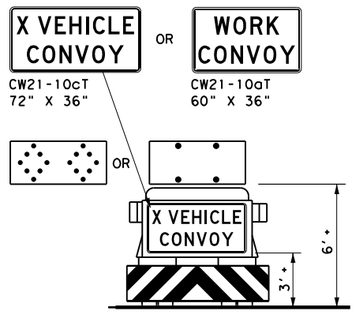
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

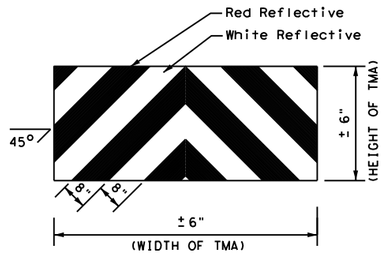
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0022	05	025	US 90, etc.
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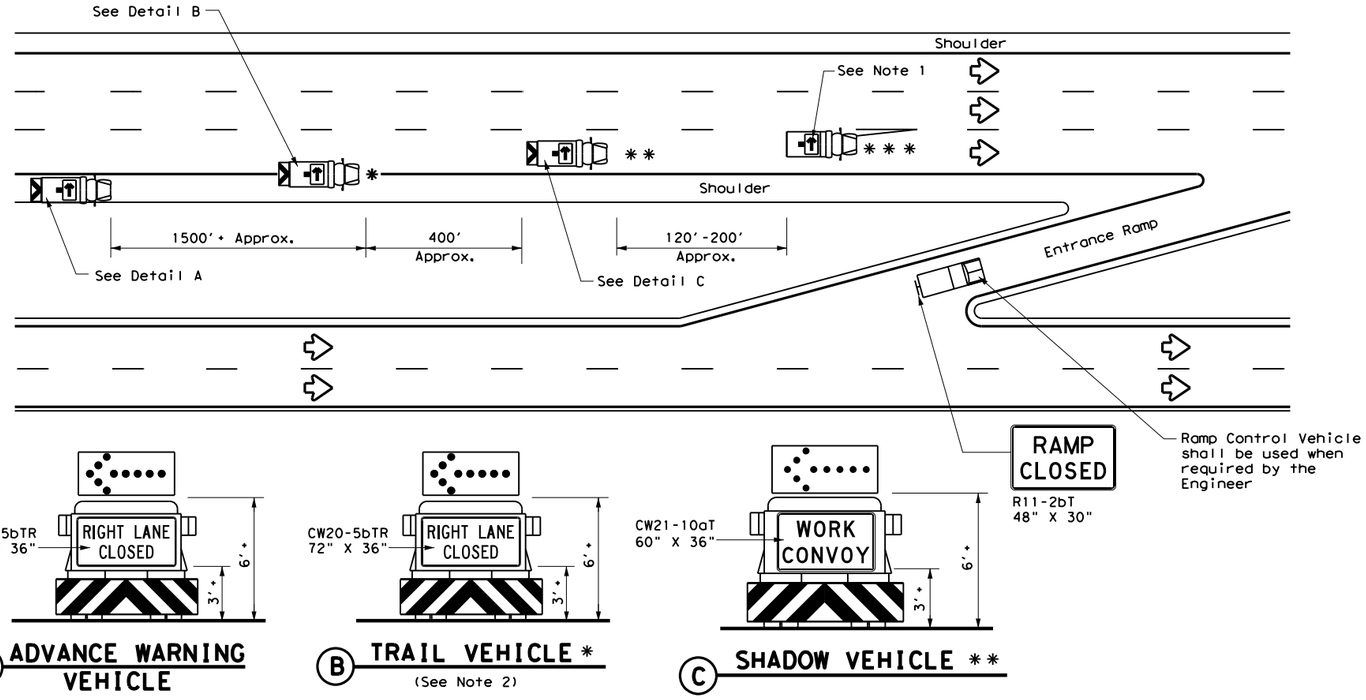
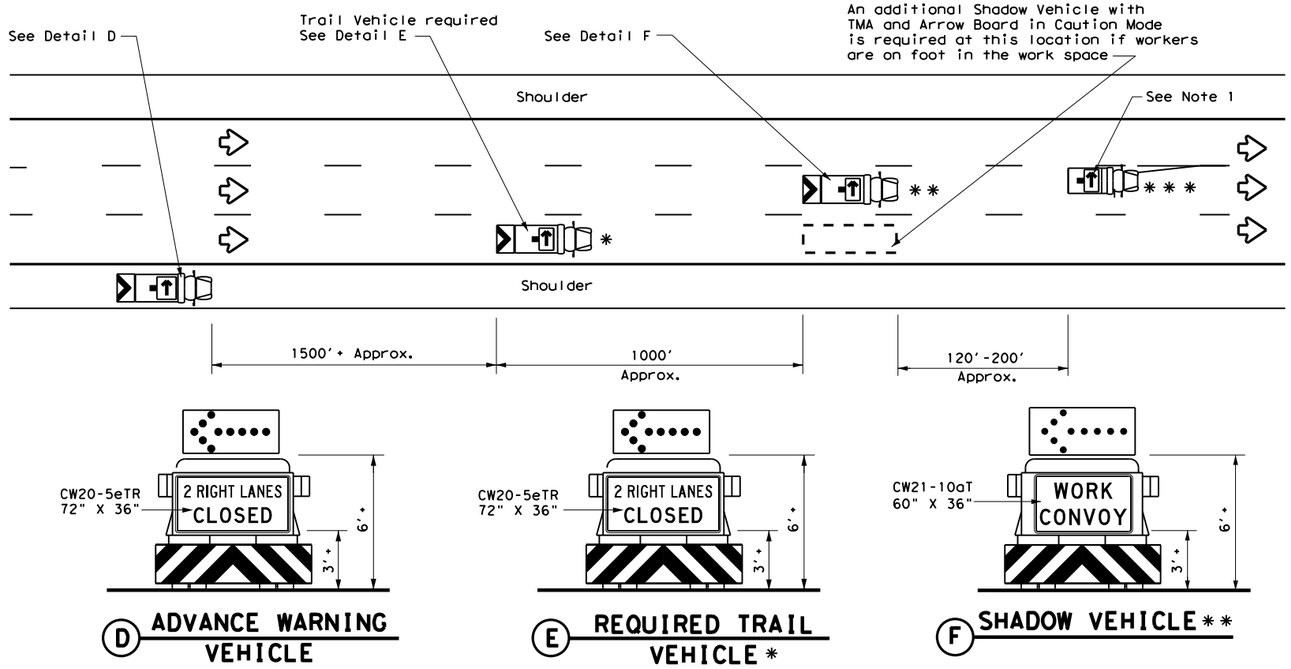


RIGHT LANE CLOSURE ON DIVIDED HIGHWAY - TCP(3-2a)



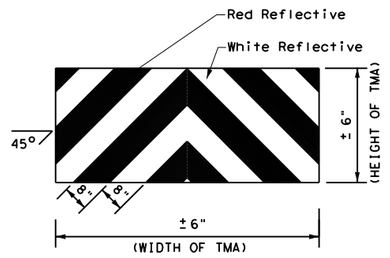
INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP(3-2b)

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. ADVANCE WARNING, TRAIL and SHADOW vehicles shall be equipped with Type B or Type C flashing arrow boards as per the Barricade and Construction (BC) standards. Arrow boards on WORK vehicles will be optional based on the type of work being performed. The arrow boards shall be operated from inside the vehicle.
2. For TCP(3-2a) the Engineer will determine if the TRAIL VEHICLE is required based on prevailing roadway conditions, traffic volume, and sight distance restrictions. All other vehicles shown for both TCP(3-2a) and TCP(3-2b) are required.
3. 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.
4. The use of truck mounted attenuators (TMA) on the ADVANCE WARNING, SHADOW, and TRAIL vehicles are required.
5. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DMS 8300, Type A.
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 may vary according to terrain, work activity and other factors.
9. Standard 48" X 48" diamond shaped warning signs with the same message as those shown may be used where adequate mounting space exists.
10. The signs shown should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or a 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, must 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. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
12. The principles on this sheet may be used to close lanes from the left side of the roadway considering the number of lanes, shoulder width, sight distance, and ramp frequency.
13. Signs and flashing arrow board modes shall be appropriately altered when implementing left lane closures or interior closures which close the left lanes.
14. The Advance Warning Vehicle may straddle the edgeline when shoulder width makes it necessary.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS

TCP(3-2)-13

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REVISIONS	0022	05	025	US 90, etc.
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	22	VAL VERDE, etc.		39
1-97				

176

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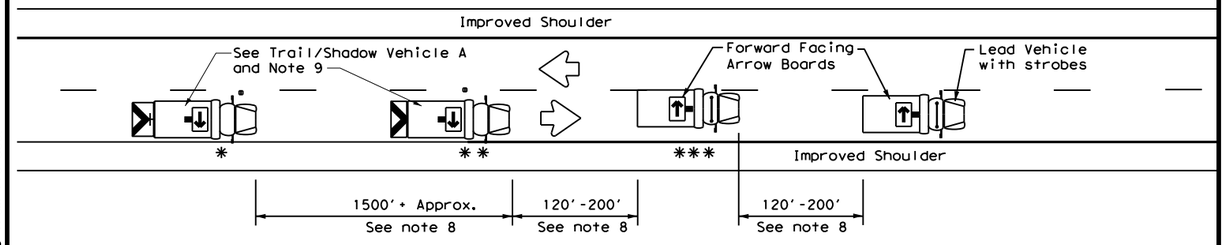
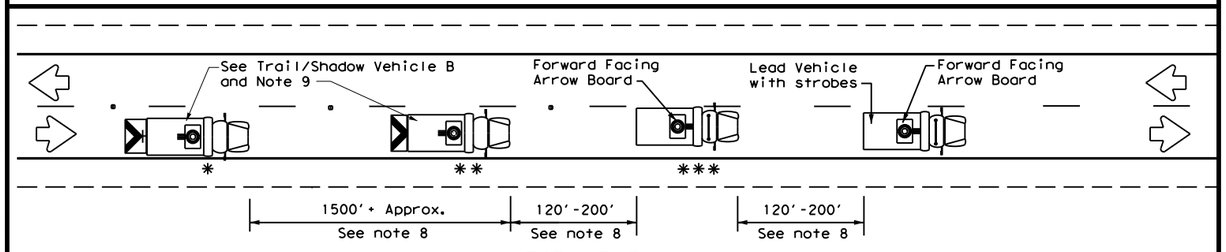


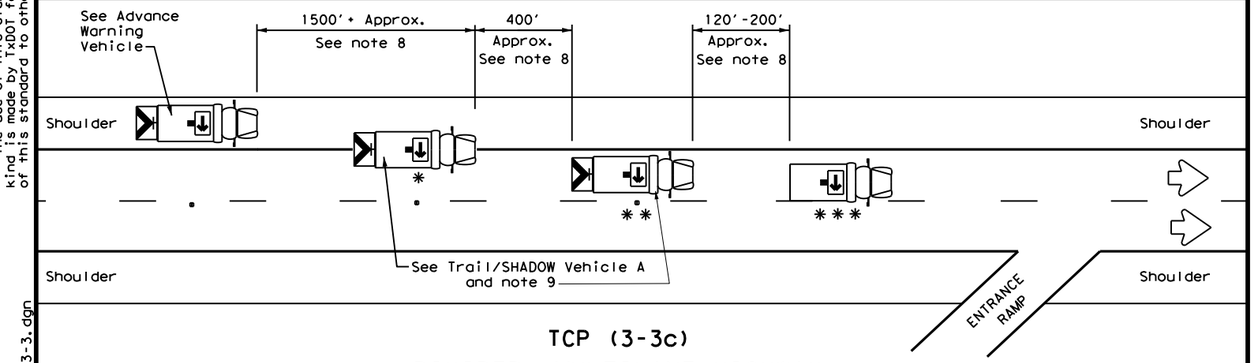
TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS
(WORK ON TRAVEL LANE)



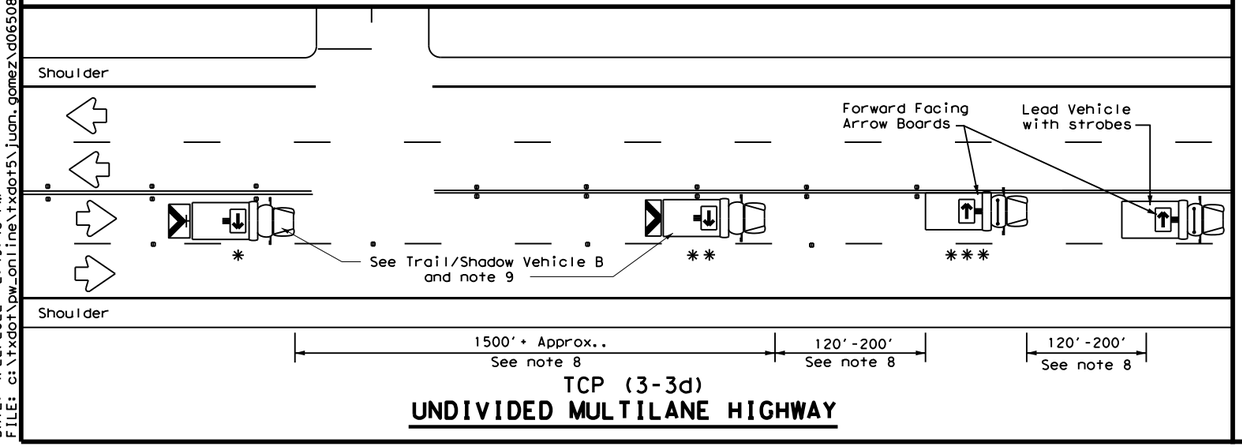
TCP (3-3b)

TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS
(WORK ON TRAVEL LANE)



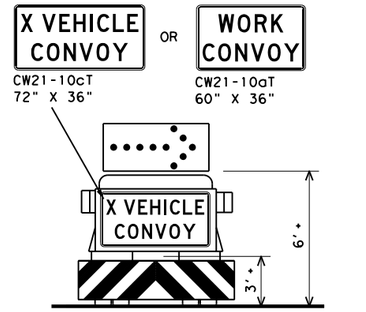
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



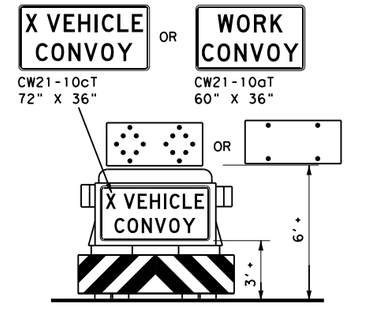
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



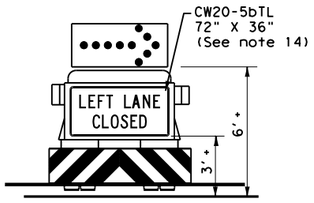
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

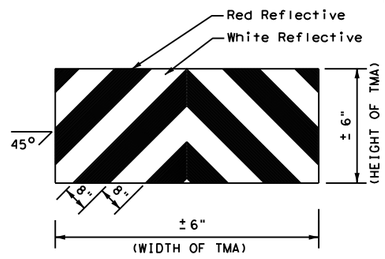


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

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

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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8-95 7-13	22	VAL VERDE, etc.		40
1-97 7-14				

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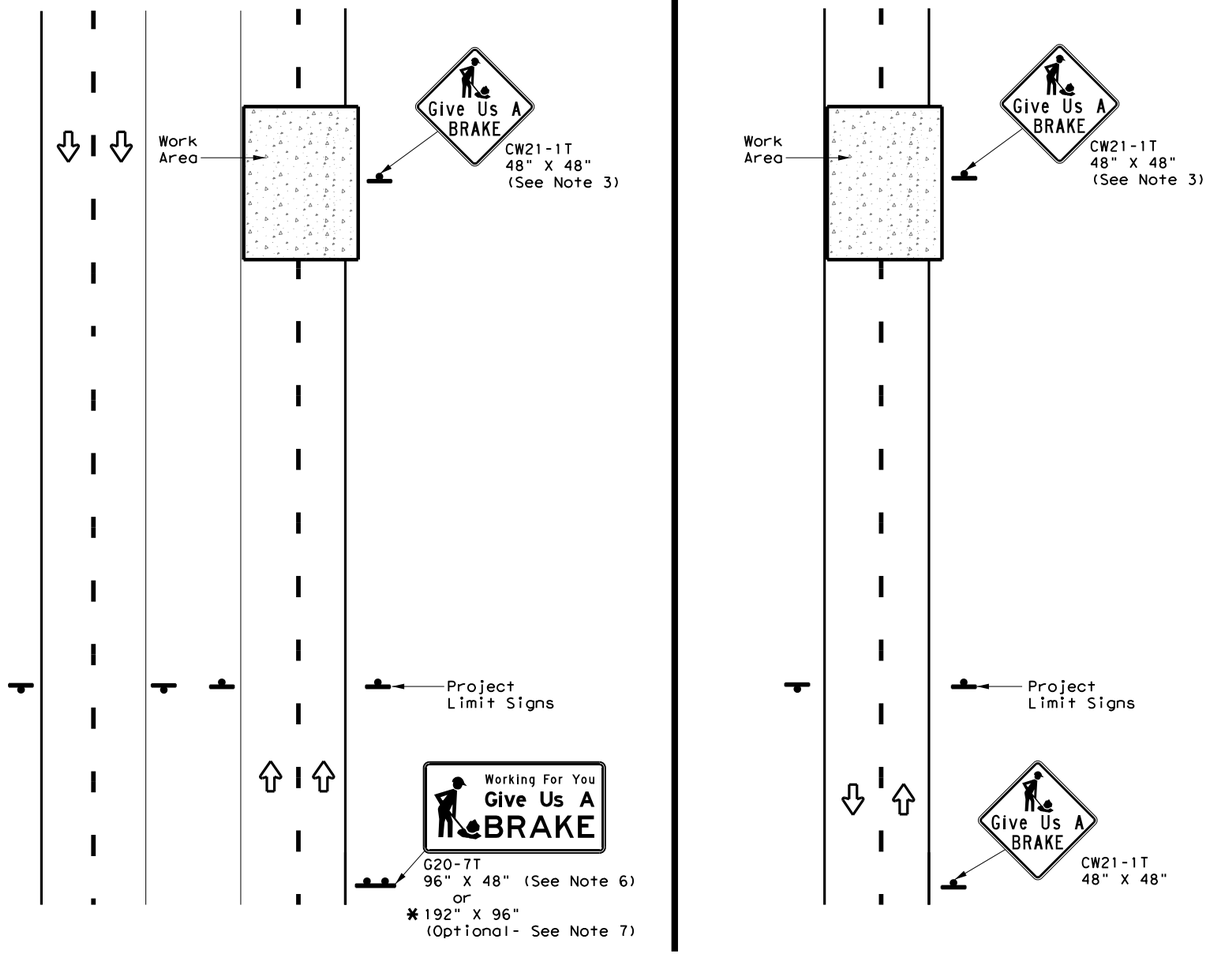

DIVIDED HIGHWAY

UNDIVIDED HIGHWAY

SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

* When the optional larger WORKING FOR YOU GIVE US A BRAKE (G20-7T) 192" x 96" sign is required, the locations shall be noted elsewhere in the plans.

SUMMARY OF LARGE SIGNS

BACKGROUND COLOR	SIGN DESIGNATION	SIGN	SIGN DIMENSIONS	REFLECTIVE SHEETING	SQ FT	GALVANIZED STRUCTURAL STEEL			DRILLED SHAFT 24" DIA. (LF)
						Size	(LF) ①	(LF) ②	
Orange	G20-7T	Working For You Give Us A BRAKE	96" X 48"	Type B_{FL} or C_{FL}	32	▲	▲	▲	▲
Orange	G20-7T	Working For You Give Us A BRAKE	192" X 96"	Type B_{FL} or C_{FL}	128	W8x18	16	17	12

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PLYWOOD SIGN BLANKS	DMS-7100
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL}
BLACK	LEGEND & BORDERS	NON-REFLECTIVE ACRYLIC FILM

GENERAL NOTES

1. See BC and SMD sheets for additional sign support details.
2. Sign locations shall be approved by the Engineer.
3. For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.
4. Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.
5. Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
6. The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.
7. The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:
   Item 636 - Aluminum Signs
   Item 647 - Large Roadside Sign Supports and Assemblies.
   Item 416 - Drilled Shaft Foundations
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.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
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6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	22	VAL VERDE, etc.		41

116

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DATE: 4/22/2022 2:50:03 PM
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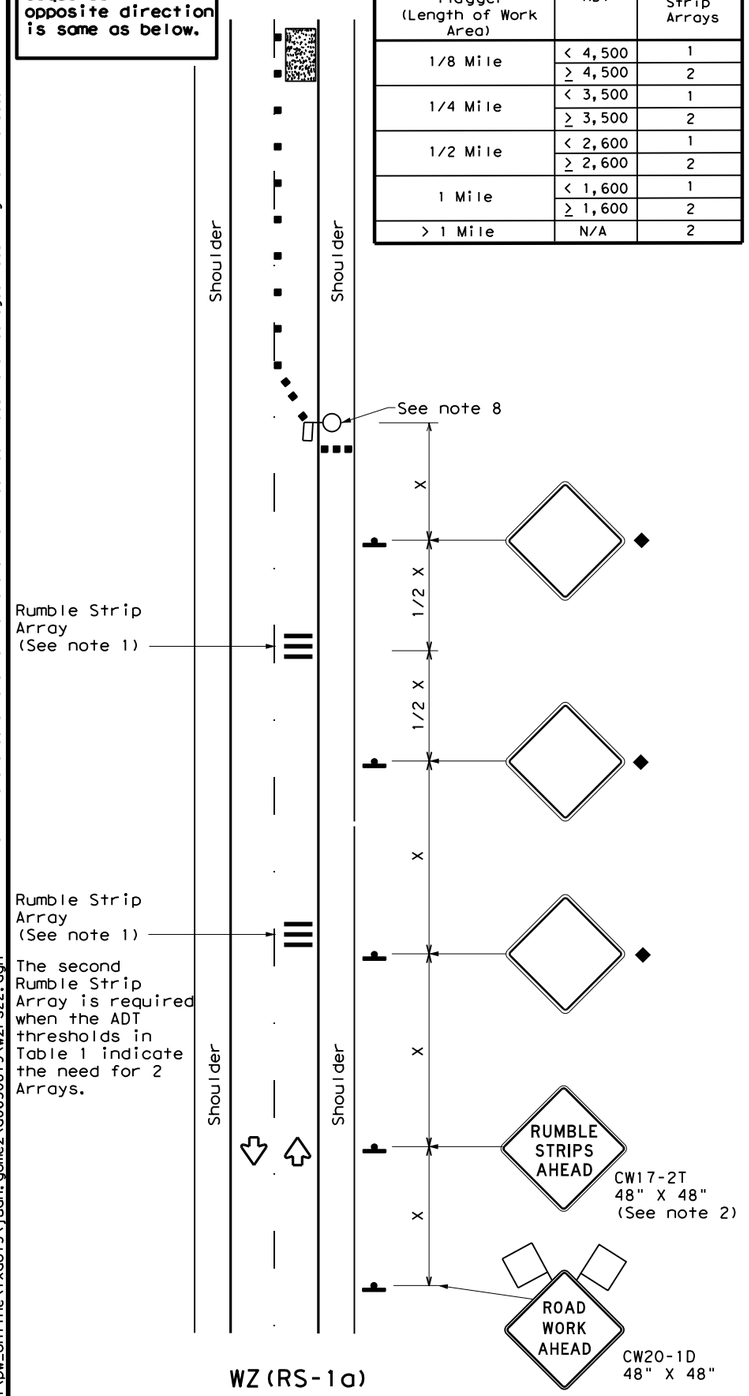
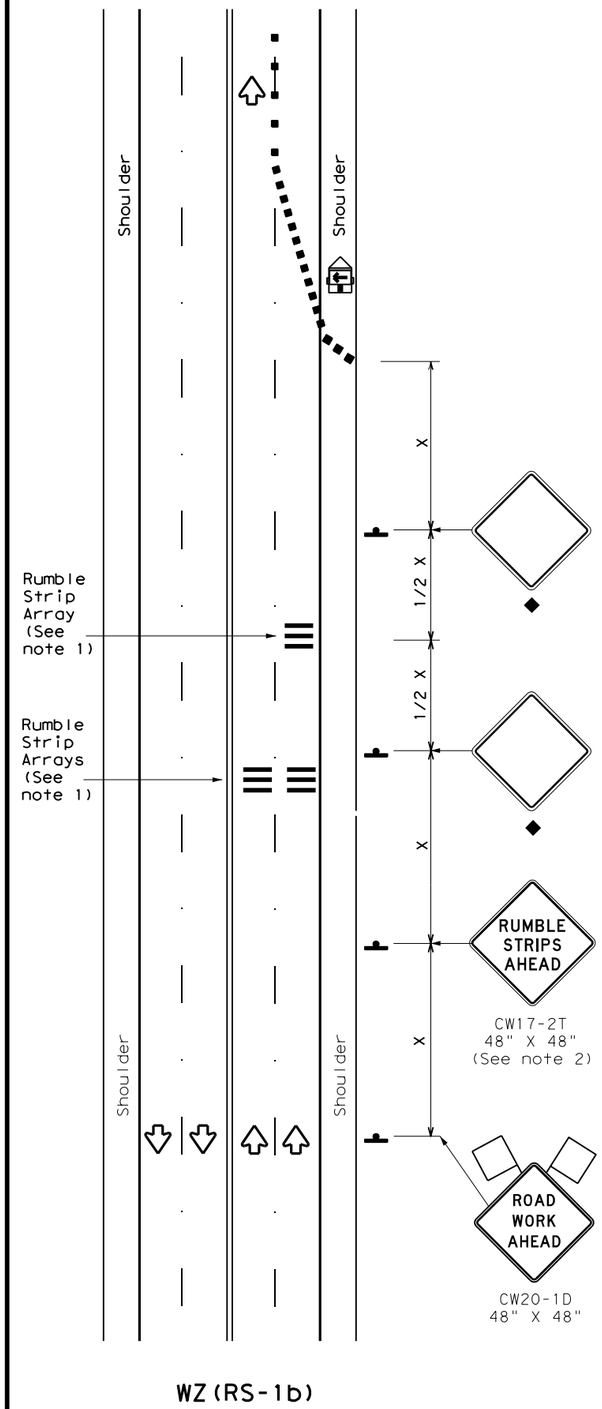
Warning sign and rumble strip sequence in opposite direction is same as below.

TABLE 1		
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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

1. 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.
2. 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.
3. Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
4. Remove Temporary Rumble Strips before removing the advanced warning signs.
5. Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
6. Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
7. This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
8. The one-lane two-way application may utilize a flagger, an Automated Flagger Assistance Device (AFAD) or a Portable Traffic Signal (PTS).
9. Replace defective Temporary Rumble Strips as directed by the Engineer.
10. Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment and written direction from the Engineer.

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

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

* Conventional Roads Only

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

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

◆ 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.

TABLE 2	
Speed	Approximate distance between strips in an array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
= 60 MPH	20'
≥ 65 MPH	* 35' +

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
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	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		42

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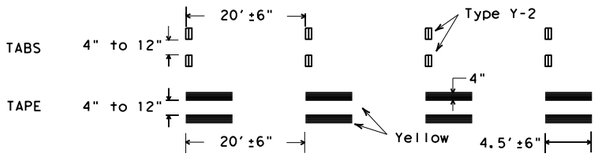
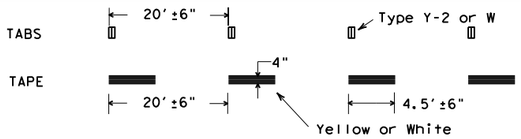
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

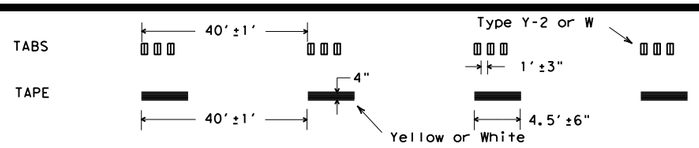


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



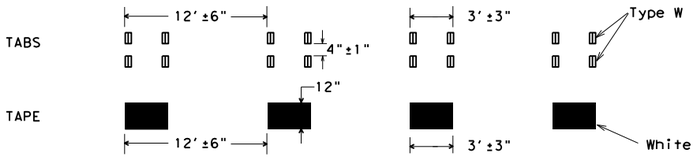
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

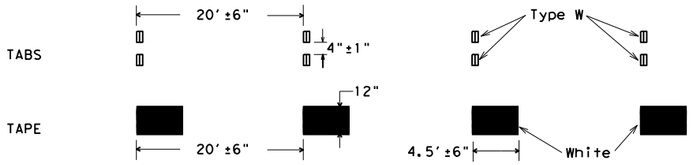


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



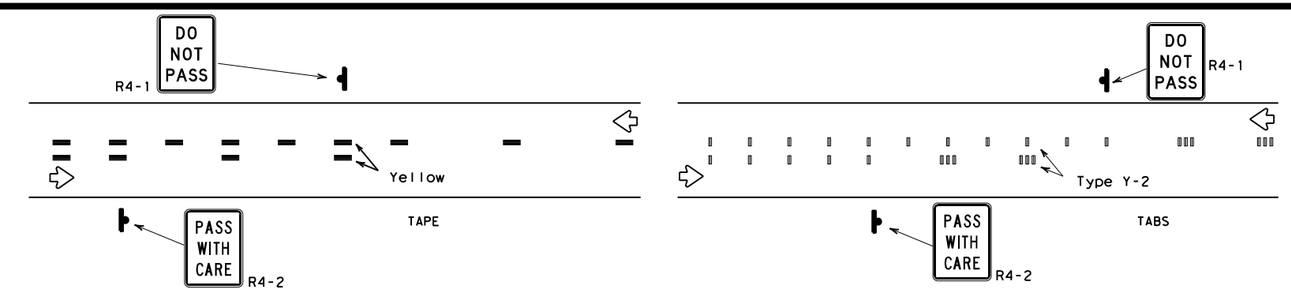
NOTES:

1. Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
2. Short term pavement markings shall NOT be used to simulate edge lines.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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).
8. 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.

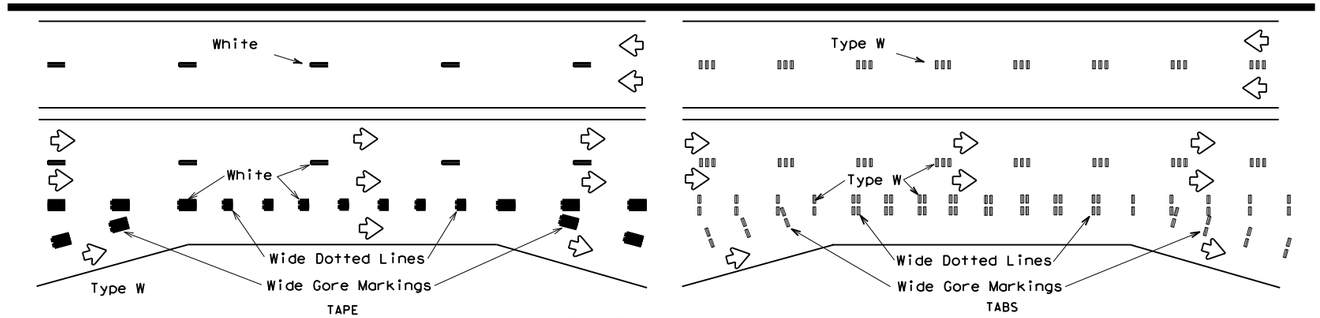
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

1. 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).
2. Tabs shall meet requirements of Departmental Material Specification DMS-8242.
3. 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.
4. 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.

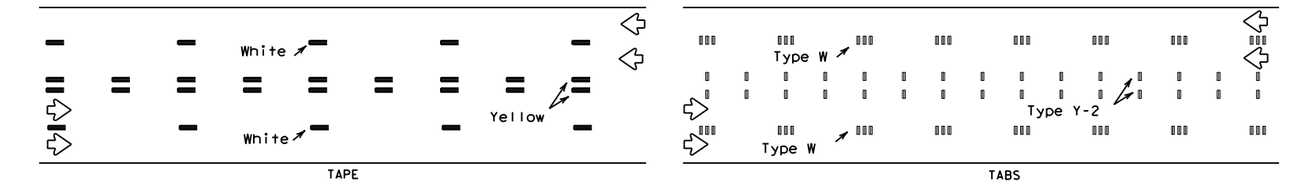
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



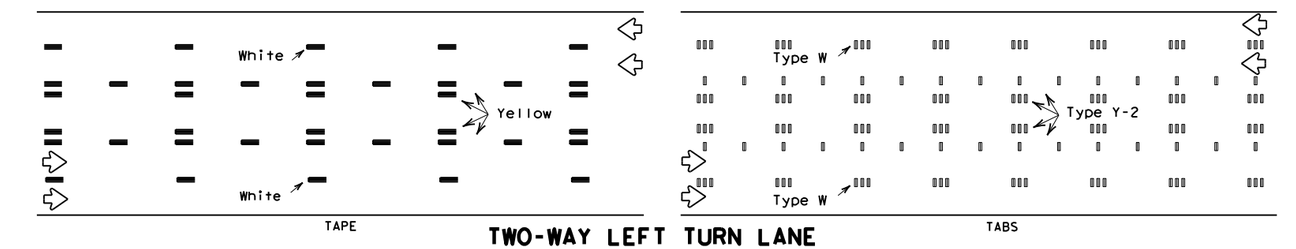
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



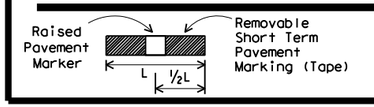
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



If raised pavement markers are used to supplement REMOVABLE short term markings, the markers shall be applied to the top of the tape at the approximate mid length of the tape. This allows an easier removal of raised markers and tape.

PREFABRICATED PAVEMENT MARKINGS

1. Temporary Removable Prefabricated Pavement Markings shall meet the requirements of DMS-8241.
2. Non-removable Prefabricated Pavement Markings shall meet the requirements of either DMS-8240 "Permanent Prefabricated Pavement Markings" or DMS-8243 "Temporary Costruction-Grade Prefabricated Pavement Markings."

RAISED PAVEMENT MARKERS

1. 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)

1. 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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

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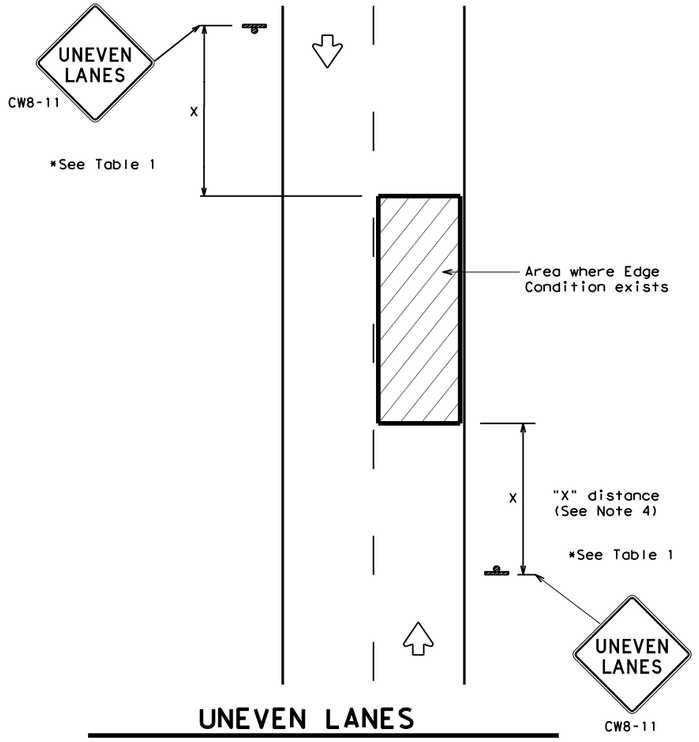
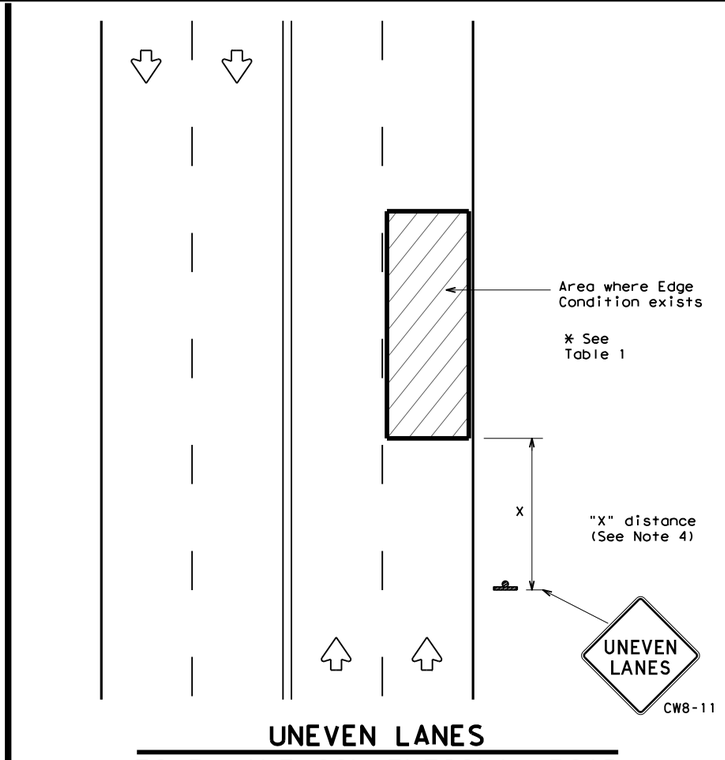
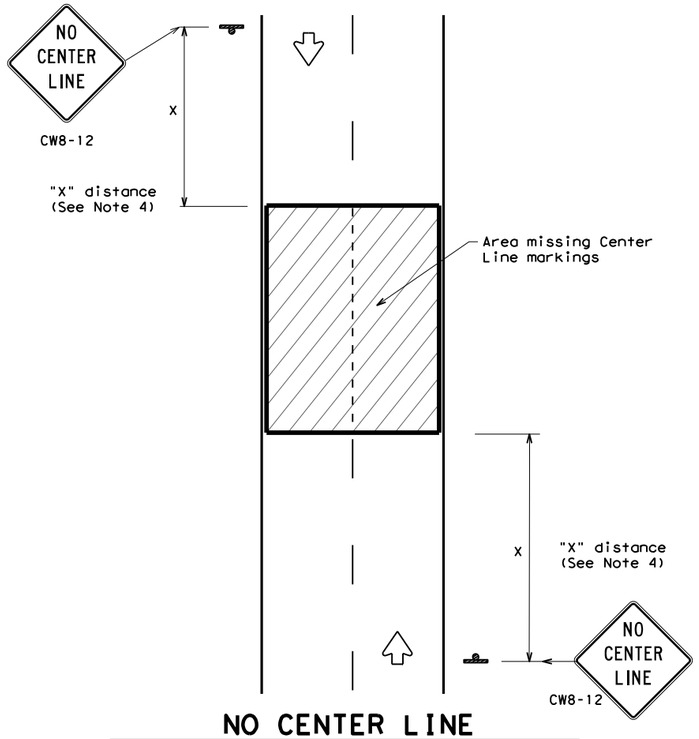
3-03		22	VAL VERDE, etc.		43
7-13					



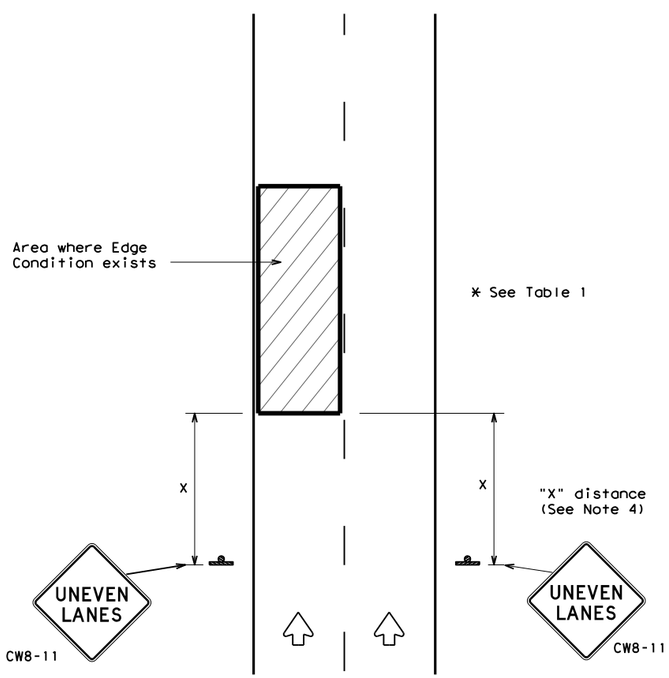
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

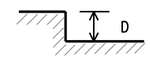
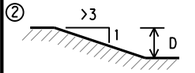
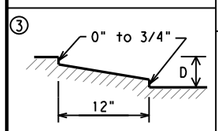
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL} SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

GENERAL NOTES

1. If spalling or holes occur, ROUGH ROAD (CW8-8) signs should be placed in advance of the condition and be repeated every two miles where the condition persists.
2. UNEVEN LANES (CW8-11) signs shall be installed in advance of the condition and repeated every mile. Signs installed along the uneven lane condition may be supplemented with the NEXT XX MILES (CW7-3aP) plaque or Advisory Speed (CW13-1P) plaque.
3. NO CENTER LINE (CW8-12) signs and temporary pavement markings as per the WZ(STPM) standard shall be installed if yellow centerlines separating two way traffic are obscured or obliterated. Repeat NO CENTER LINE signs every two miles where the center line markings are not in place. The signs and markings shall remain in place until permanent pavement markings are installed.
4. Signs shall be spaced at the distances recommended as per BC standards.
5. Additional signs may be required as directed by the Engineer. Signs shall remain in place until final surface is applied. Signs shall be considered subsidiary to Item 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING."
6. Signs shall be fabricated and mounted on supports as shown on the BC standards and/or listed on the "Compliant Work Zone Traffic Control Devices" list.
7. Short term markings shall not be used to simulate edge lines.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition.

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① 	Less than or equal to: 1¼" (maximum-planing) 1½" (typical-overlay)	Sign: CW8-11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② 	Less than or equal to 3"	Sign: CW8-11
③  Notched Wedge Joint	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

TRAFFIC CONTROL DURING PLANING, OVERLAY AND LEVELING OPERATIONS ARE SHOWN ELSEWHERE IN THE PLANS.

MINIMUM WARNING SIGN SIZE	
Conventional roads	36" x 36"
Freeways/expressways, divided roadways	48" x 48"

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE:	wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
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1-97 3-03		22	VAL VERDE, etc.		44

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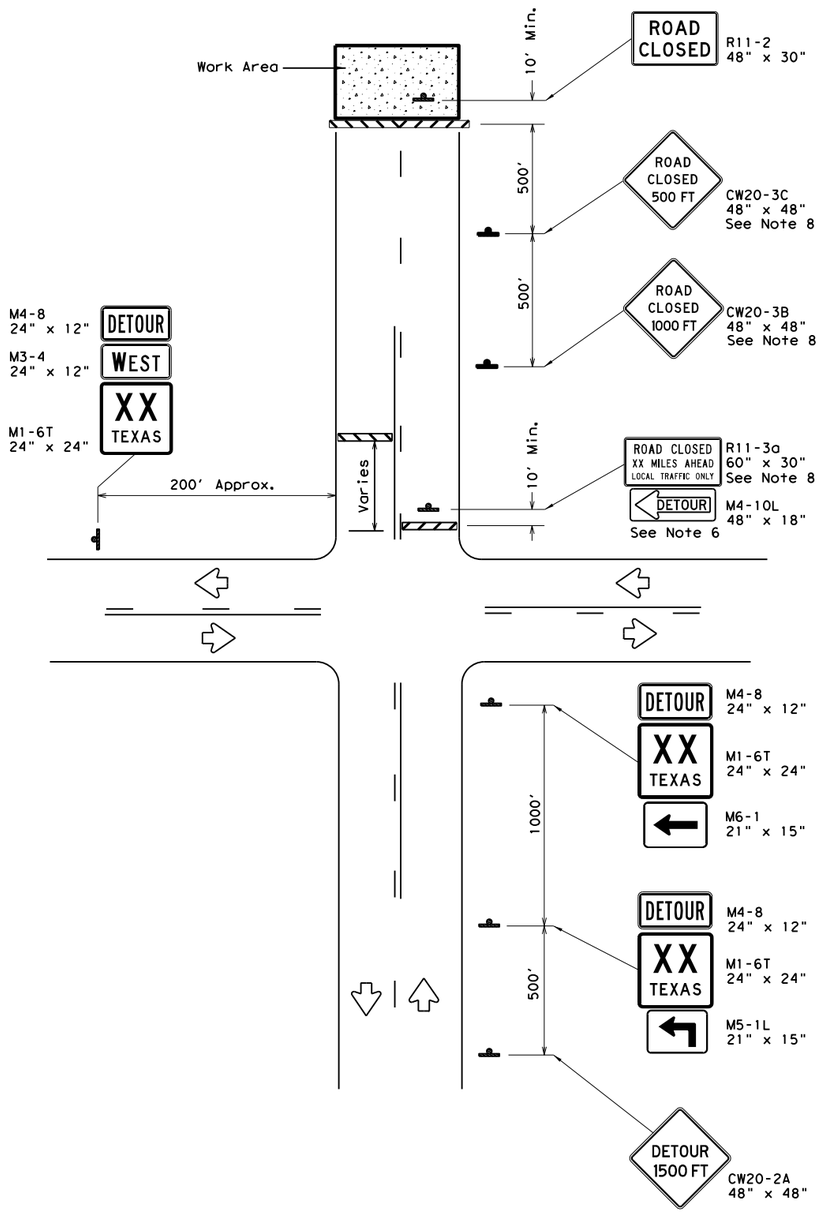
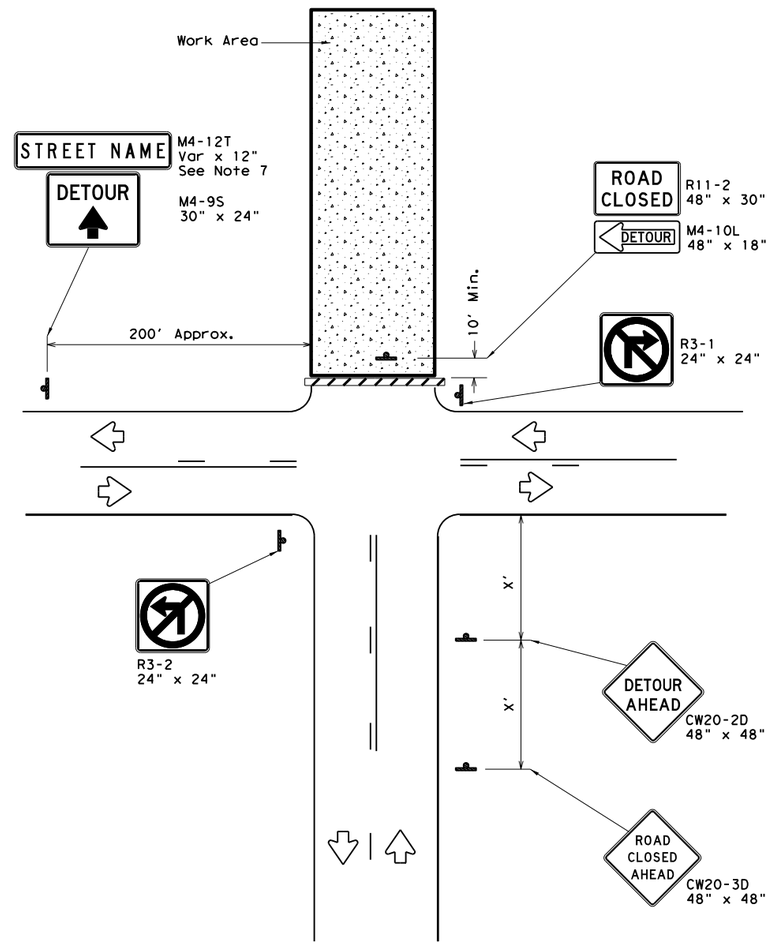


ROAD CLOSURE BEYOND THE INTERSECTION

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

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03	22	VAL VERDE, etc.		45

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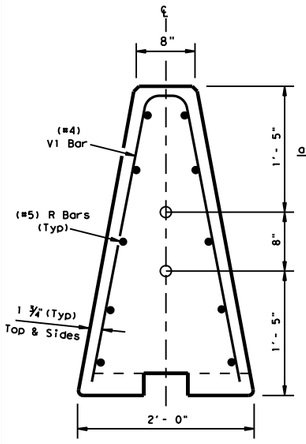
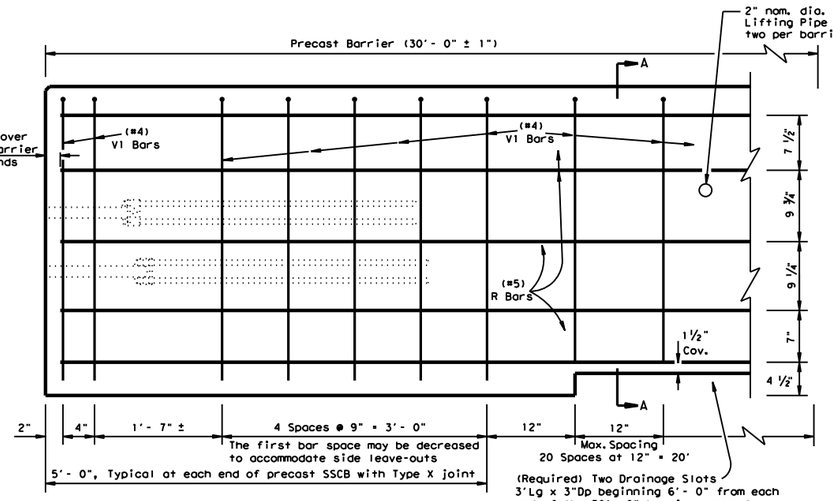


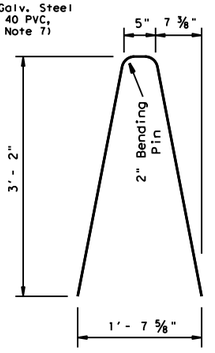
End View
Precast Barrier

Pipe locations for Joint Type X connection



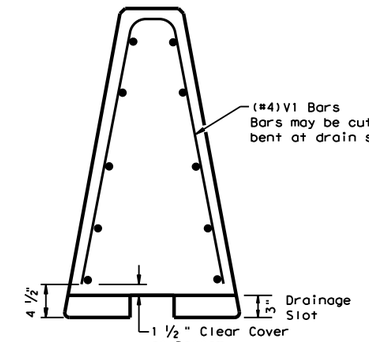
Reinforcement for Precast (SSCB)
Single Slope Concrete Barrier (Type 1)

Showing reinforcement for Joint Connection (Type X)



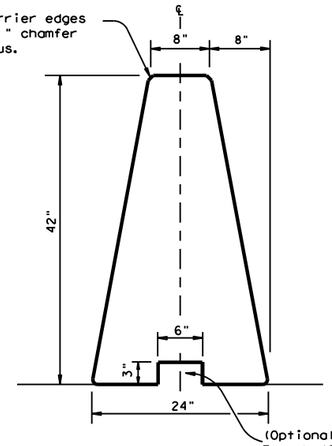
V1 Bar
#4 Rebar

Note:
V1 Bars above the drainage slots may bent to accomadate 1 ½" clear cover as directed by the Engineer.



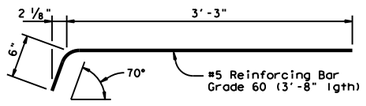
Section A-A
Steel Placement at (Required) Drainage Slots

All precast barrier edges shall have a ¾" chamfer or tooled radius.



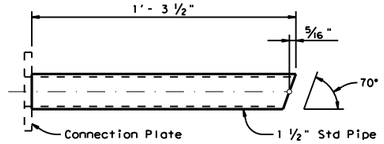
Single Slope Concrete Traffic Barrier

Precast SSCB barrier may be connected to cast-in-place SSBC. The joint connection "Types" may be used in the cast-in-place barrier, to match the precast barrier connection.



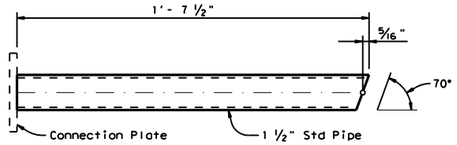
DEFORMED BAR ANCHOR DETAILS

Two (2) Bars required per assembly.
Eight (8) required per Joint.



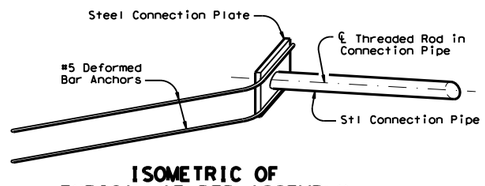
UPPER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Upper Assembly.
Two (2) required per Joint.



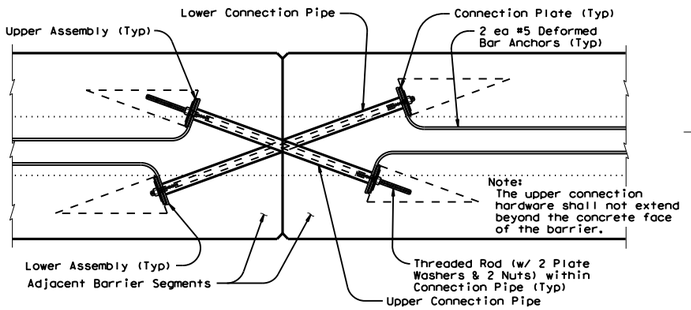
LOWER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Lower Assembly.
Two (2) required per Joint.



ISOMETRIC OF TYPICAL WELDED ASSEMBLY

Four (4) [2 Upper & 2 Lower] Assemblies required per Joint.



TYPE X JOINT INSTALLATION DETAIL

Barrier reinforcing and Type X Joint Leave-Out dimensions not shown for clarity.

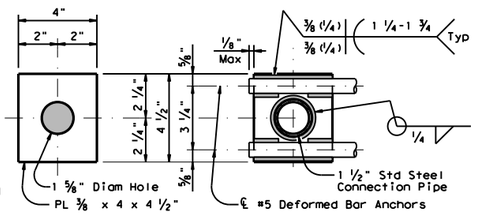
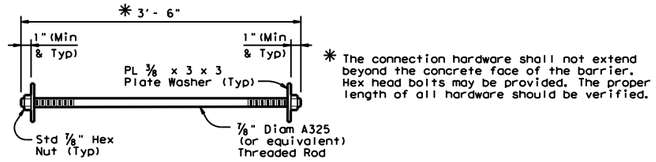


PLATE DIMENSIONS **WELDING DETAILS**

CONNECTION PLATE DETAILS

One (1) Plate required per assembly.
Four (4) required per Joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.



* The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.

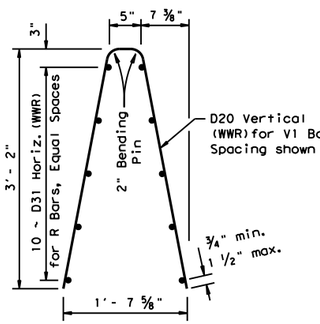
CONNECTION BOLT OR THREADED ROD DETAIL

Two (2) Threaded Rods (Or Equivalent Hex Hd. Bolts)
(w/ Two (2) PL ⅜ x 3 x 3 Plate Washers & Two (2) Std Hex Nuts)
required per Joint.

Weight of one precast 30 ft. (SSCB) segment = Approx. 10.5 Tons or 717 lbs per ft.

General Notes

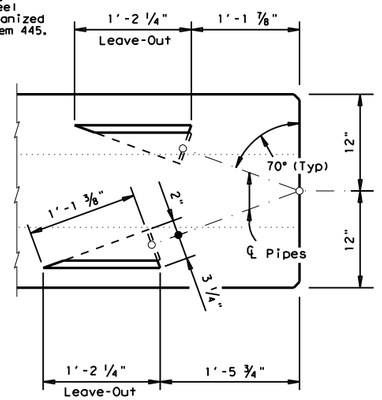
1. Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
4. All precast barrier edges shall have a ¾" chamfer or a tooled radius.
5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
6. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.
7. Regardless of the method of handling, barrier lifting points shall be approx. 7.5 feet from the ends of the barrier. Lifting devices and attachments to barrier sections shall be approved by the Engineer.
8. Surface finishing and grouting (where required) shall be two parts sand one part cement with enough water to make the mixture plastic. Grouting shall be done in a manner that will assure a smooth surface. Surface finishing shall be considered subsidiary to the various bid items.
9. All steel assemblies shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."



Welded Wire Reinforcement (WWR) Option for Bars R and V1

(WWR) General Notes

1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



BARRIER PLAN AT JOINT

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1)

SSCB(2)-10

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©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
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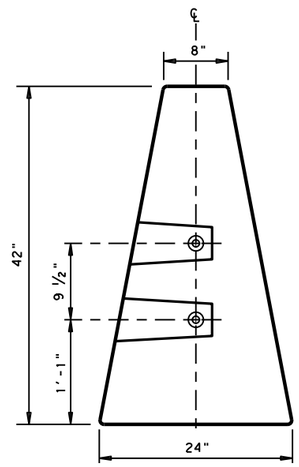
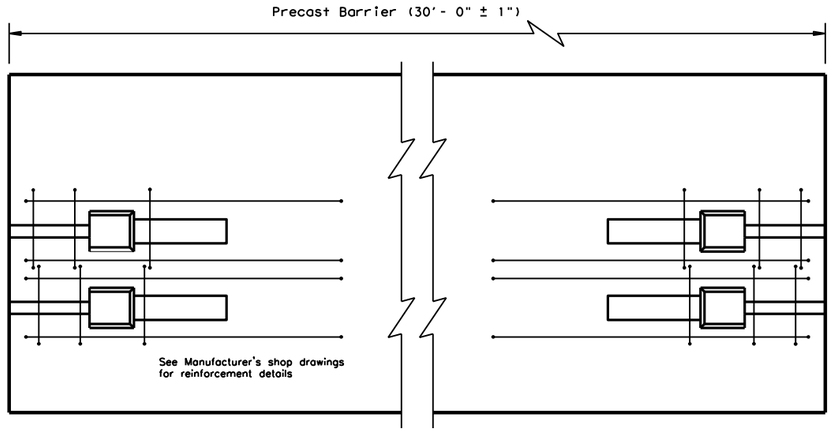
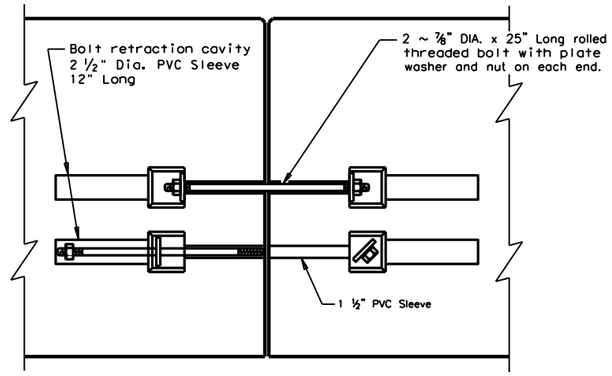


END VIEW
"QUICK-BOLT" POCKET LOCATIONS



ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details



ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

Joint Connection (Type Q)

TOP VIEW
PRECAST (SSCB) WITH J-J HOOKS
See Manufacturer's shop drawing for additional details

VIEW FROM ABOVE
J-J HOOK CONNECTION

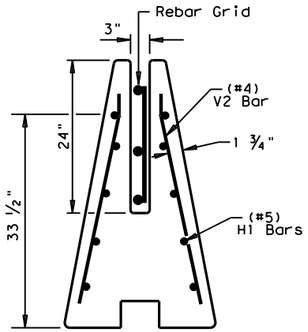
END VIEW

Proprietary Joint Connections (SSCB)

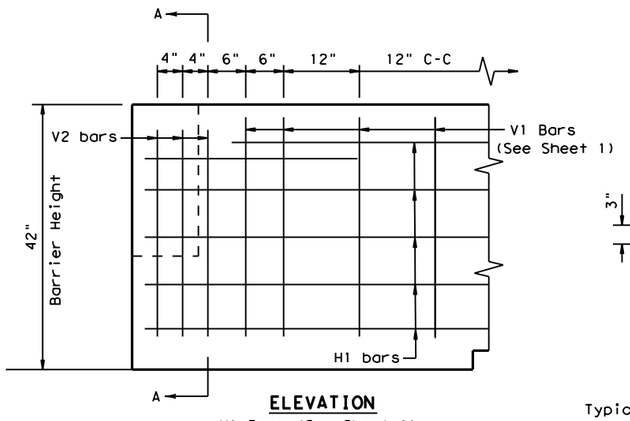
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

J-J Hooks by Easi-Set Industries, (800)547-4045
Quick-Bolt by Bexar Concrete, (210)497-3773

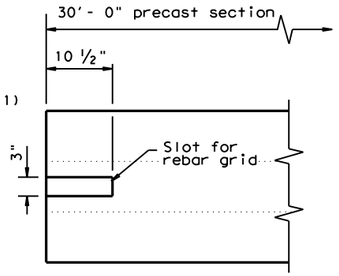
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



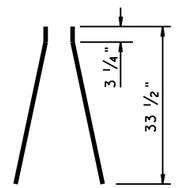
SECTION A-A
Showing (Type R) Rebar Grid



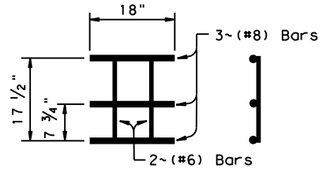
ELEVATION
V1 Bars (See Sheet 1)



TOP VIEW
JOINT CONNECTION
Typical at both ends of barrier segment



(#4) V2 BARS
6 ~ two piece bars per barrier segment



WELDED REBAR GRID

Joint Connection (Type R)

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1)

SSCB(2)-10

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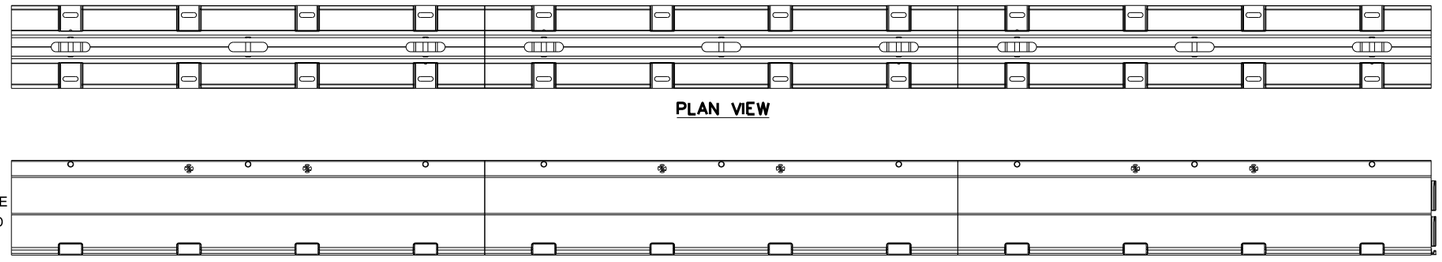
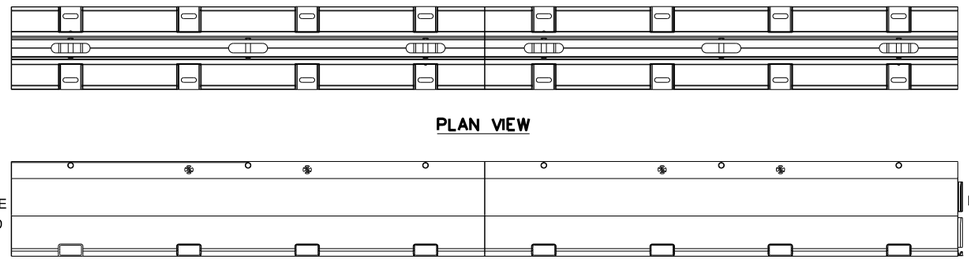
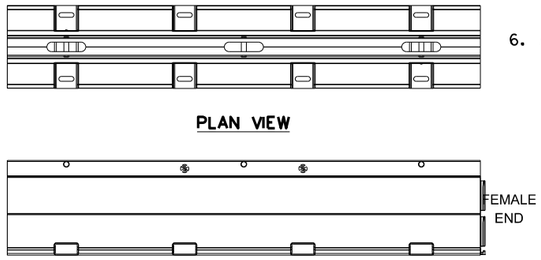


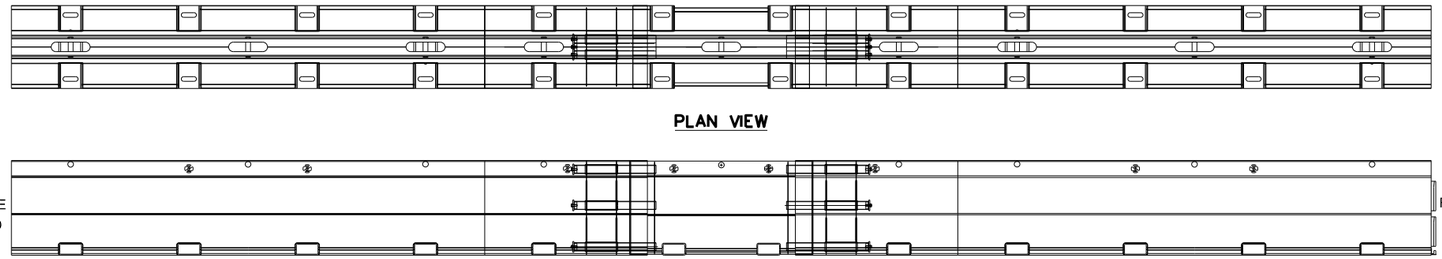
ELEVATION VIEW
ZONEGUARD STANDARD UNIT x 50'-0"



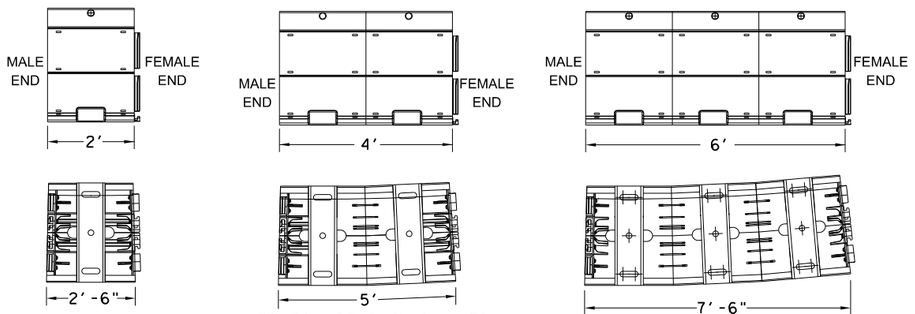
ELEVATION VIEW
ZONEGUARD STANDARD UNIT x 33'-4"



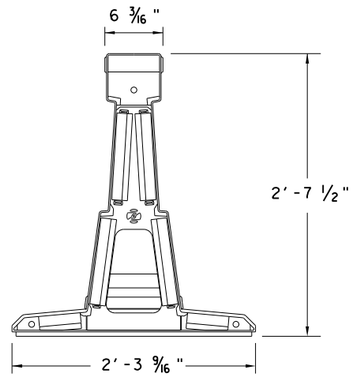
ELEVATION VIEW
ZONEGUARD STANDARD UNIT x 16'-8"



ELEVATION VIEW
ZONEGUARD EXPANSION UNIT x 46'-5½"
(SEE GENERAL NOTE 5)



ZONEGUARD RADIUS UNITS



ZONEGUARD TYPICAL SECTION

GENERAL NOTES

1. FOR TECHNICAL AND APPLICATION SUPPORT PLEASE CONTACT HILL & SMITH INC. AT 614-340-6294.
2. ZONEGUARD HAS BEEN ACCEPTED BY FHWA AS A MASH TL-3 LONGITUDINAL BARRIER.
3. STANDARD INSTALLATIONS REQUIRE ANCHORING AT EACH END OF THE RUN. MINIMUM DEFLECTION INSTALLATIONS REQUIRE ANCHORING AT 33'-4 CENTERS. NO MODIFICATIONS ARE NECESSARY OTHER THAN INCREASED ANCHORING.
4. 50-0' UNITS CAN BE USED TO ACHIEVE DOWN TO AN 800' RADIUS CURVE. 16'-8" UNITS CAN BE USED TO ACHIEVE CURVES DOWN TO 250' RADIUS. SPECIAL SHORT UNITS (SHOWN) IN 2.5 DEGREE INCREMENTS CAN BE USED TO ACHIEVE DIRECTION CHANGES OR AT A FIXED RADIUS OF 47'-0".
5. HILL & SMITH OFFERS AN EXPANSION UNIT THAT CAN BE USED ACROSS A BRIDGE EXPANSION JOINT OR TO ACCOMMODATE THERMAL EXPANSION. THE UNIT IS ANCHORED IN THE MIDDLE, AND ADJUSTED ACCORDING TO THE TEMPERATURE AT THE TIME OF INSTALLATION. THE EXPANSION JOINT CAN BE USED WITH ENGINEER APPROVAL. THE EXPANSION UNIT HAS NOT BEEN ASSESSED TO MASH CRITERIA.
6. ANCHOR PINS ARE 1 ¼" DIAMETER. LENGTH IS 1'-8" FOR ASPHALT AND 1'-0" FOR CONCRETE. SEE ANCHORING TABLE FOR ADDITIONAL DETAILS.

	STANDARD INSTALLATION	MINIMUM DEFLECTION INSTALLATION CONCRETE	MINIMUM DEFLECTION INSTALLATION ASPHALT
	FOUR ANCHORS AT END OF THE RUN	TWO ANCHORS (ONE EACH SIDE) EVERY 33'-4"	TWO ANCHORS (ONE EACH SIDE) EVERY 33'-4"
MASH TL-3 DEFLECTION (2270 KG TRUCK @ 25° & 100 KM/HR)	6'-10"	5"	2'-0"

EXPECTED DEFLECTION TABLE

DESCRIPTION	ASPHALT	CONCRETE
1 1/4" PIN ANCHOR	1'-8" LONG, MINIMUM ASPHALT COVER OF 3"	1'-0" LONG, MINIMUM CONCRETE COVER OF 6"
1 1/4" ALL THREAD ANCHOR	-	1'-0" LONG, MINIMUM EMBEDMENT OF 6"

ANCHORING TABLE

ALTERNATE ANCHORING METHODS CERTIFIED BY HILL & SMITH, INC. ARE AVAILABLE PER FHWA APPROVAL LETTER.

Texas Department of Transportation

Design Division Standard

ZONEGUARD SYSTEM
STEEL BARRIER
MASH TL-3
ZONEGUARD-19

FILE: zoneguard19	DN: TxDOT	CK: KM	DW: VP	CK: CGL	
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY	
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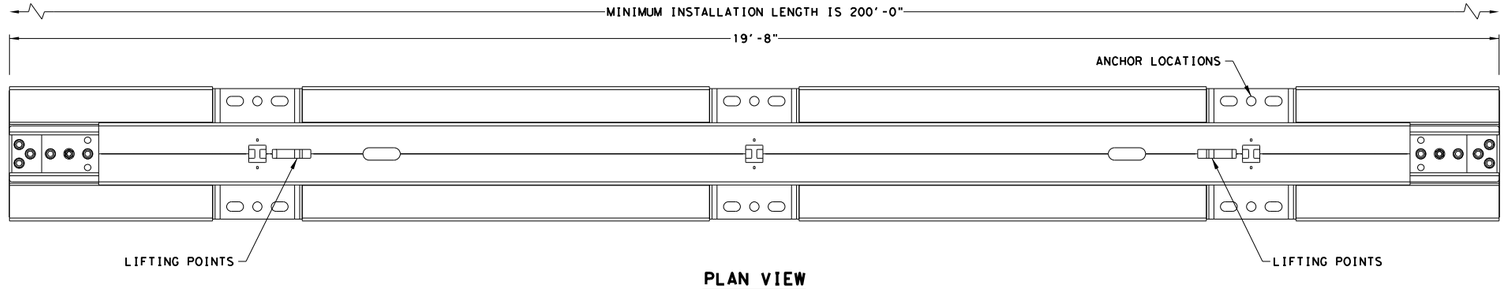
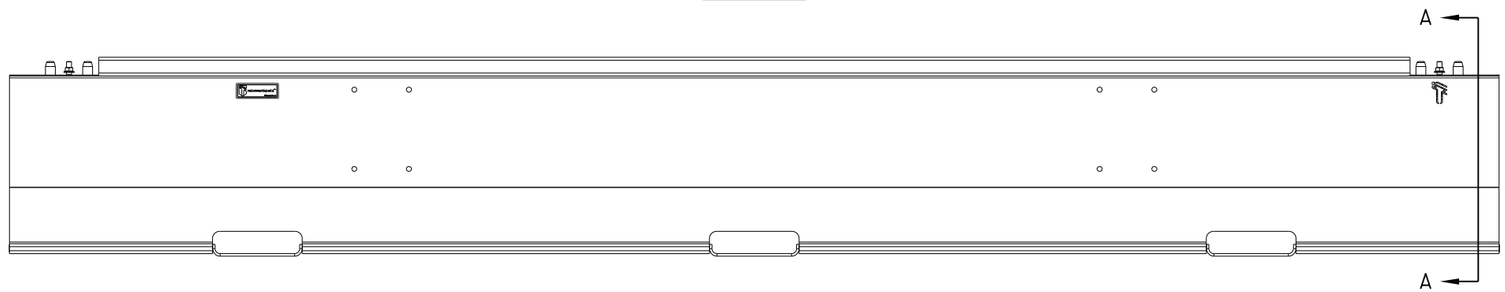
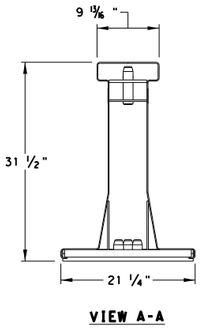


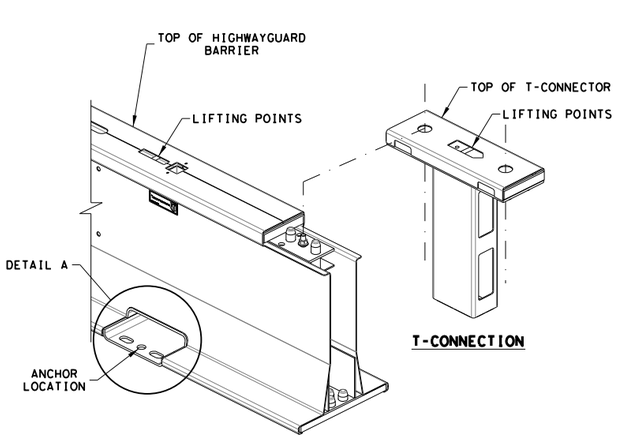
PLAN VIEW



ELEVATION VIEW
LEFT SIDE

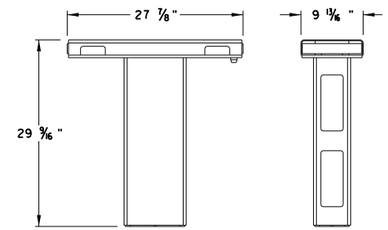


VIEW A-A

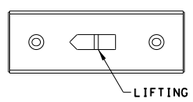


ISOMETRIC VIEW

T-CONNECTION



ELEVATION VIEW SIDE VIEW

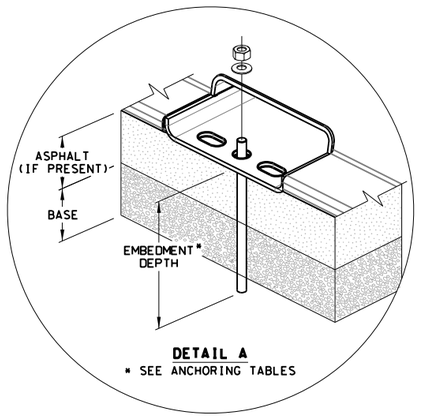


PLAN VIEW

T-CONNECTOR DETAILS

HIGHWAYGUARD BARRIER T-CONNECTOR TABLE *		
METHOD	DESCRIPTION	APPROX. RADIUS (FT)
1	20FT BARRIER SECTION WITH STANDARD T-CONNECTIONS AT MAXIMUM ANGLE	581
2	20FT BARRIER SECTION WITH 2.5° T-CONNECTION	460
3	20FT BARRIER SECTION WITH 5° T-CONNECTION	230
4	20FT BARRIER SECTION WITH 10° T-CONNECTION	115
5	20FT BARRIER SECTION WITH 10° BARRIER SECTION AND STANDARD T-CONNECTION	135
6	10° BARRIER SECTION WITH STANDARD T-CONNECTIONS	22
7	10° BARRIER SECTION WITH 10° T-SECTION	12

* SEE PRODUCT MANUAL OR CONTACT HIGHWAY CARE LTD. FOR MORE INFORMATION ON ANGLE T-CONNECTORS



DETAIL A
* SEE ANCHORING TABLES

GENERAL NOTES

1. THE SYSTEM SHOWN ON THIS DRAWING IS A PROPRIETARY BARRIER TRADED AS HIGHWAYGUARD AND HIGHWAYGUARD LDS AND HAS BEEN DESIGNED AND MANUFACTURED BY HIGHWAY CARE LTD. FOR TECHNICAL ASSISTANCE AND APPLICATION SUPPORT CONTACT AT (888) 323-6374 OR engineering@highwaycare.com
2. THE HIGHWAYGUARD HAS BEEN CRASH TESTED TO MASH AND HAS FHWA APPROVAL AS A TL-3 & TL-4 BARRIER. THE DEFLECTION TABLE OUTLINES BASIC SYSTEM PERFORMANCE AND COMPONENT ANCHORING REQUIREMENTS.
3. THIS DRAWING PACKAGE PROVIDES THE RELEVANT INFORMATION AND GENERAL GRAPHICS REQUIRED TO IDENTIFY THE COMPONENT PARTS OF HIGHWAYGUARD AND THEIR INCORPORATION AS A WHOLE SYSTEM FOR DEPARTMENTAL STANDARD APPLICATIONS.
4. INSTALLATION OF HIGHWAYGUARD BARRIER OR HIGHWAYGUARD LDS BARRIER, NORMALLY STARTS WITH AN END CAP THAT MUST BE PROTECTED WITH A SUITABLE CRASH CUSHION END TREATMENT IF EXPOSED TO ONCOMING TRAFFIC. THE CRASH CUSHION CONNECTIONS ARE NOT DETAILED WITHIN THESE DRAWINGS, PLEASE CONTACT HIGHWAY CARE LTD. FOR MORE DETAILS.
5. THE FULL HEIGHT OF HIGHWAYGUARD BARRIER 20FT SEGMENT IS 31.5". EACH SEGMENT IS LOWERED INTO POSITION WITH THE T-CONNECTION ALREADY ATTACHED TO THE END OF THE BARRIER THAT IS BEING JOINED TO THE RUN OF BARRIER. ENSURE ORIENTATION OF T-CONNECTOR ALLOWS ALIGNMENT PINS TO BE LOWERED ONTO NEXT SECTION. THE T-CONNECTOR ALLOWS THE BARRIER FOR ADJUSTMENTS, QUICK INSTALLATION, QUICK REMOVAL AND REPLACEMENT OF DAMAGED BARRIERS. MINIMUM INSTALLATION LENGTH OF HIGHWAYGUARD BARRIER IS 200'-0".
6. THERE ARE SEVERAL METHODS OF ACHIEVING RADIUS IN A LENGTH OF HIGHWAYGUARD BARRIER. RADIUS CAN BE ACHIEVED USING VARIOUS T-CONNECTORS AND THUS ALLOWING THE HIGHWAYGUARD BARRIER TO FOLLOW THE DESIRED CURVATURE IN THE INSTALLATION, THESE TYPE OF T-CONNECTORS ARE, 2.5°, 5° AND 10° ANGLES. FOR FURTHER INFORMATION AND ADVICE CONTACT HIGHWAY CARE LTD.
7. USING HIGHWAYGUARD BARRIER OR HIGHWAYGUARD BARRIER LDS ON BRIDGE STRUCTURES, POSSIBLE ANCHORING SHOULD TAKE PLACE OFF BRIDGE DECKS. ANY ANCHORING ON BRIDGE DECKS NEEDS TO BE AGREED IN ADVANCE WITH THE TECHNICAL EXPERT RESPONSIBLE FOR THE BRIDGE TO ENSURE IT IS NOT DAMAGED. IF ANCHORING EITHER SIDE OF A BRIDGE DECK EXPANSION JOINT, THEN THIS MOVEMENT MUST BE MIRRORED IN THE BARRIER. FOR FURTHER INFORMATION AND ADVICE CONTACT HIGHWAY CARE LTD.
8. THE HIGHWAYGUARD BARRIER SECTIONS CAN BE EQUIPPED WITH OPTIONAL WHEELSETS THAT ALLOW THE BARRIERS TO BE MANEUVERED WITHOUT LIFTING THE MACHINERY/ EQUIPMENT SUCH AS INSTALLING IN TUNNELS OR AREAS WITH OVERHEAD RESTRICTIONS. THE WHEELSETS CAN BE RAISED AND LOWERED FROM THE TOP OF THE BARRIER USING A MANUAL WRENCH AND 1" SOCKET.
9. THE HIGHWAYGUARD BARRIER HAS BEEN MASH TESTED, USING 1 3/16" DIA. DROP IN PIN ANCHORS AND EMBEDDED 1'-6" INTO ASPHALT. ALTERNATIVE GROUND EMBEDMENT CONDITIONS MAY BE ACCEPTABLE BUT MIGHT REQUIRE DIFFERENT ANCHOR SOLUTIONS, PLEASE CONTACT HIGHWAY CARE LTD. FOR FURTHER INFORMATION.
10. ALL COMPONENTS ARE FULLY GALVANIZED.
11. HIGHWAYGUARD BARRIER SYSTEMS SHALL BE ASSEMBLED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS DETAILED DRAWINGS, PROCEDURES AND SPECIFICATIONS. FOR ANY INSTALLATIONS OUTSIDE OF THE SCOPE OF THESE DRAWINGS, PLEASE CONTACT HIGHWAY CARE LTD. FOR DETAILS.
12. FOR ANCHORING LAYOUTS FOR HIGHWAYGUARD AND HIGHWAYGUARD LDS, PLEASE SEE MANUFACTURER'S PRODUCT MANUAL OR CONTACT HIGHWAY CAR LTD. FOR INFORMATION.

STANDARD ANCHORING REQUIREMENTS (ASPHALT)**				
	ANCHOR OPTIONS	ANCHOR LENGTH	EMBEDMENT DEPTH (MIN.)	DRILL DIAMETER
1	1" GALV. RESIN THREADED ANCHOR (WITH 1" GALV. WASHER & NUT)	1'-1"	11 3/4"	1 1/8"
2	1 3/16" GALV. DROP IN PIN (NOT DRIVEN PIN)	1'-2 3/8"	1'-1 3/4"	1 1/4"
3	1" GALV. RESIN THREADED ANCHOR (WITH 1" GALV. WASHER & NUT)	1'-6"	1'-4 1/2"	1 1/4"
4	1" GALV. CHEMICAL THREADED "LEFTY" KELKEN REMOVABLE ANCHOR (WITH 1" GALV. WASHER & NUT)	NA	1'-0"	1 1/4"

** 2" MIN. ASPHALT DEPTH ABOVE AN APPROPRIATELY COMPACTED DGA SUBBASE AND 2" MIN. ASPHALT DEPTH ABOVE A MIN. OF 6" REINFORCED CONCRETE SUBBASE.

NOTE:
ANCHORS ARE TO BE POSITIONED A MINIMUM OF 5 3/4" AWAY FROM THE EDGE OF AN EXCAVATION FOR RESIN ANCHORS OR 7 3/4" FOR DROP IN PINS.

STANDARD ANCHORING REQUIREMENTS (CONCRETE)***				
	ANCHOR OPTIONS	ANCHOR LENGTH	EMBEDMENT DEPTH (MIN.)	DRILL DIAMETER
1	1" GALV. RESIN THREADED ANCHOR (WITH 1" GALV. WASHER & NUT)	9"	6"	1 1/8"
2	1" HILTI HSL-3 MECHANICAL ANCHOR	9 1/4"	****	****
3	1" GALV. CHEMICAL THREADED "LEFTY" KELKEN REMOVABLE ANCHOR (WITH 1" GALV. WASHER & NUT)	NA	6"	1 1/4"
4	1 3/16" GALV. DROP IN PIN (NOT DRIVEN PIN)	1'-2 3/8"	1'-1 3/4"	1 1/4"

*** 7 7/8" MINIMUM REINFORCED CONCRETE DEPTH.
10" MINIMUM UNREINFORCED CONCRETE DEPTH.
**** CONTACT: HIGHWAY CARE LTD. FOR SPECIFIC APPLICATION.

NOTE:
ANCHORS ARE TO BE POSITIONED A MINIMUM OF 11 7/8" FROM THE EDGE OF THE CONCRETE PAD.

HIGHWAYGUARD DEFLECTION TABLE		
	STANDARD SYSTEM	MINIMUM DEFLECTION SYSTEMS (LDS)
DESCRIPTION	ONLY ANCHORED AT THE FIRST AND ENDS OF THE BARRIER LENGTH	ANCHORS ARE STAGGERED EVERY 39'-4 1/2"
DEFLECTION AT MASH TL-3	64"	2'-3"
DEFLECTION AT MASH TL-4	71"	2'-7"

NOTE:
SEE PRODUCT MANUAL OR CONTACT HIGHWAY CARE LTD. FOR MORE INFORMATION ON ANCHOR REQUIREMENTS FOR THE LENGTH OF BARRIER.

Texas Department of Transportation

Design Division Standard

HIGHWAYGUARD SYSTEM STEEL BARRIER

MASH TL-3 & TL-4

HIGHWAYGUARD-21

FILE: highwayguard21.dgn	DN: TXDOT	CK: KM	DW: SS	CK: XX
©TxDOT: JULY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		49

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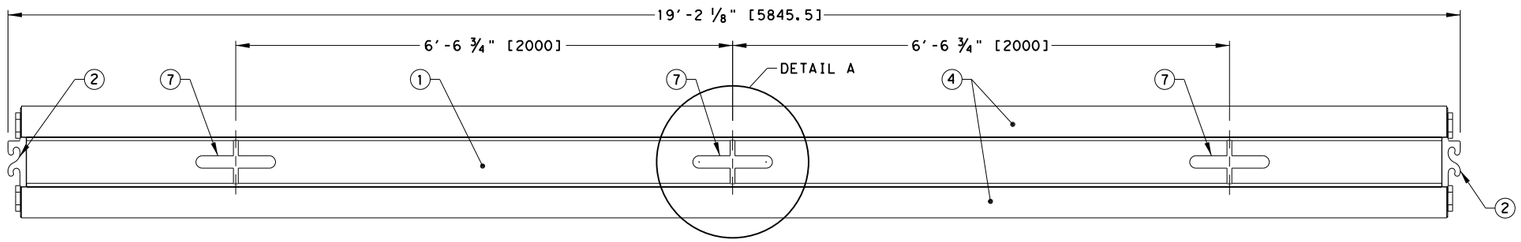
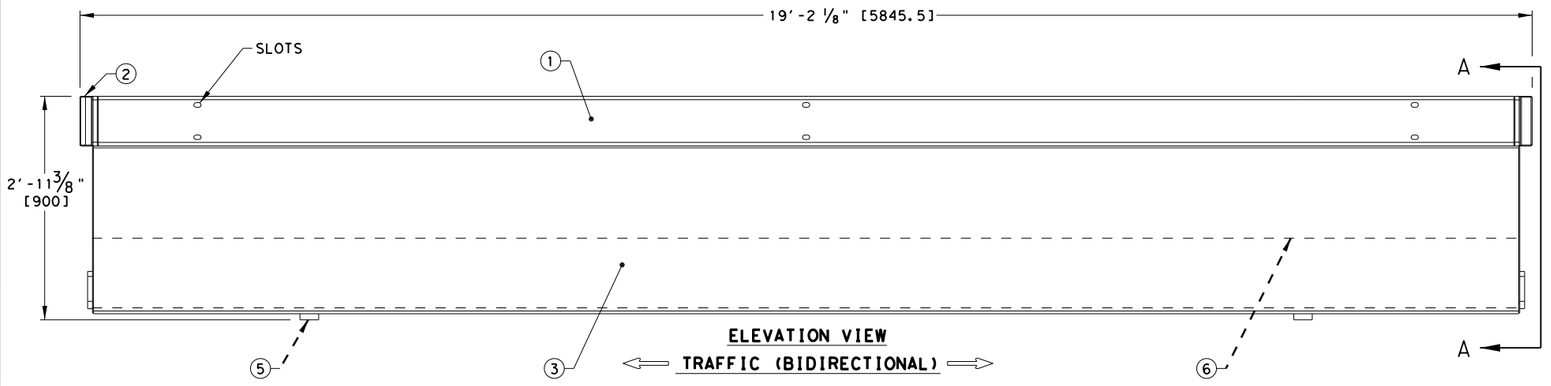
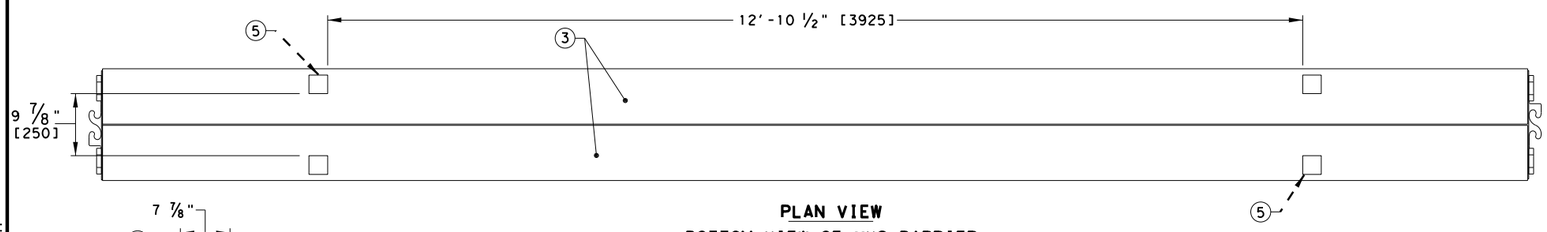


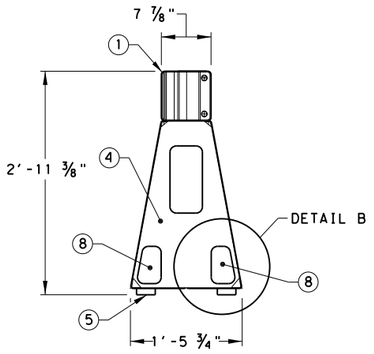
PLAN VIEW
HV2 SQUARE TOP RAIL



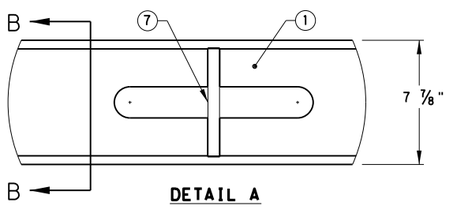
ELEVATION VIEW



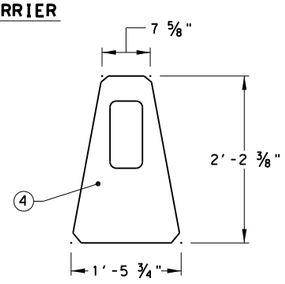
PLAN VIEW
BOTTOM VIEW OF HV2 BARRIER



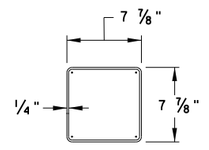
VIEW A-A
SCALE 1:25



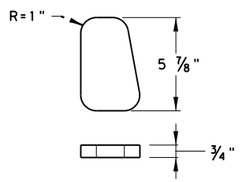
DETAIL A
HV2 LIFTING BAR
SCALE 1:20



HV2 END
SCALE 1:25



VIEW B-B
HV2 SQUARE TOP RAIL
SCALE 1:10



DETAIL B
HV2 SPACER
SCALE 1:5

ITEM NO.	PART NUMBER	DESCRIPTION
1	SRP000036	HV2 SQUARE TOP RAIL
2	SRP000037	CONNECTOR
3	SRP000038	HV2 SKIN
4	SRP000039	HV2 END
5	SRP000040	HV2 FEET
6	SRP000041	CONCRETE BALLAST
7	SRP000043	HV2 LIFTING BAR
8	SRP000048	HV2 SPACER

GENERAL NOTES

1. FOR TECHNICAL AND APPLICATION SUPPORT PLEASE CONTACT SAFEROADS PTY, LTD, AT (859)469-0364, WEBSITE: www.saferoads.com.au OR www.hv2barrier.com.
2. HV2 BARRIER HAS BEEN ACCEPTED BY FHWA AS A MASH TL-4 LONGITUDINAL BARRIER.
3. STANDARD INSTALLATIONS IS A FREE STANDING TEMPORARY LONGITUDINAL BARRIER SYSTEM. HIGH CONTAINMENT AND LOW DEFLECTION INSTALLATIONS REQUIRE NO ANCHORING. NO MODIFICATIONS ARE NECESSARY OTHER THAN FAST DEPLOYMENT AND RETRIEVAL.
4. OVERALL LENGTH PER BARRIER IS 19.2FT. AND WEIGHS 4,600LBS EACH. HV2 SAFETY BARRIER CAN BE DEPLOYED ON A HORIZONTAL RADIUS AS TIGHT AS 255.9FT/78M. HV2 SAFETY BARRIER INSTALLATIONS REQUIRE A MIN. DEPLOYMENT LENGTH OF 323.5FT/98.6M (17NO. HV2 BARRIERS) PLUS THE REQUIRED END TREATMENTS, TO SAFELY CONTAIN AND REDIRECT AT MASH TL3.
5. SAFEROADS HV2 SAFETY BARRIER SHOULD NOT BE INSTALLED IF THERE IS:
   - CURVATURE TIGHTER THAN 262 FT (80m) RADIUS.
   - CROSS SLOPE STEEPER THAN 5%.
   - LONGITUDINAL SLOPE STEEPER THAN 5%.
   - CREST SHARPER THAN 5%.
   - DITCH SHARPER THAN 5%.
   - CURBS OR SIMILAR OBSTACLES RESTRICTING DEFLECTION.
6. SAFEROADS HV2 SAFETY BARRIER COMPONENTS ARE MANUFACTURED IN SI [METRIC] UNITS. ENGLISH UNITS SHOWN ARE APPROXIMATE. ALL COMPONENTS ARE CONSTRUCTED FROM STEEL WITH CONCRETE BALLASTING.
7. WHEN TAPERING HV2 SAFETY BARRIER OUTSIDE THE CLEAR ZONE, THE LENGTH OF NEED BEGINS AND ENDS 74FT/22.5M FROM THE ENDS OF THE SYSTEM FOR A MASH TL-3 DEPLOYMENT AND 164FT/50M FROM THE ENDS OF THE SYSTEM FOR A MASH TL-4 DEPLOYMENT.

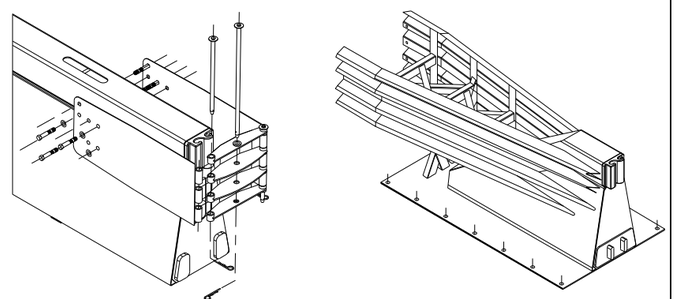
HV2 BARRIER DEFLECTION TABLE (TL-3)

SPEED	25°	20°	15°	10°	5°
62MPH	4'-10" [1.47]	3'-11" [1.18]	2'-11" [0.88]	2'-0" [0.59]	1'-0" [0.30]
56MPH	4'-5" [1.33]	3'-7" [1.07]	2'-8" [0.80]	1'-10" [0.54]	11" [0.27]
50MPH	3'-11" [1.18]	3'-2" [0.95]	2'-4" [0.71]	1'-7" [0.48]	10" [0.24]
43MPH	3'-5" [1.03]	2'-9" [0.83]	2'-1" [0.62]	1'-5" [0.42]	9" [0.21]
37MPH	2'-11" [0.89]	2'-4" [0.71]	1'-9" [0.53]	1'-3" [0.36]	8" [0.18]
31MPH	2'-6" [0.74]	2'-0" [0.59]	1'-6" [0.44]	1'-0" [0.30]	6" [0.15]
25MPH	2'-0" [0.59]	1'-7" [0.48]	1'-3" [0.36]	10" [0.24]	5" [0.12]

HV2 BARRIER DEFLECTION TABLE (TL-4)

SPEED	15°	10°	5°
56MPH	7'-10" [2.37]	5'-3" [1.58]	2'-8" [0.79]
50MPH	7'-0" [2.11]	4'-8" [1.41]	2'-4" [0.71]
43MPH	6'-1" [1.85]	4'-1" [1.23]	2'-1" [0.62]
37MPH	5'-3" [1.58]	3'-6" [1.06]	1'-9" [0.53]
31MPH	4'-4" [1.32]	2'-11" [0.88]	1'-6" [0.44]
25MPH	3'-6" [1.06]	2'-4" [0.71]	1'-2" [0.35]

END TREATMENT TYPES FOR SYSTEM TRANSITIONS*



* NOTE:
REFER TO SAFERROADS HV2 BARRIER MANUFACTURERS MANUAL AND/OR THE APPLICABLE TRANSITION MANUFACTURERS INSTALLATION MANUAL FOR FURTHER TRANSITION DETAILS.

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SAFEROADS HV2 BARRIER, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

Texas Department of Transportation

Design Division Standard

SAFEROADS HV2 SAFETY STEEL BARRIER MASH TL-4

HV2 BARRIER-21

FILE: hv2barrier21.dgn	DN: TxDOT	CK: KM	DW: SS	CK: AG	
©TxDOT: JULY 2021	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0022	05	025	US 90, etc.	
	DIST	COUNTY		SHEET NO.	
	22	VAL VERDE, etc.		50	

LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	REFERENCE MARKER	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
															MOVE / RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE/ RESET	FROM LOC. #	N	W	N	W	N	W
2	Phase I	RT	1-8'x4' Box Culvert	414+1.525	TL-3	BI	N/A	N/A	STEEL BACKUP	24"	2'- 8 1/4"	140'	1								X	
2	Phase I	LT	1-8'x4' Box Culvert	414+1.525	TL-3	BI	N/A	N/A	STEEL BACKUP	24"	2'- 8 1/4"	140'			1						X	
2	Phase I	RT	1-6'x5' Box Culvert	416+0.005	TL-3	BI	N/A	N/A	STEEL BACKUP	24"	2'- 8 1/4"	140'			1						X	
2	Phase I	LT	1-2'x1.5' Box Culvert	416+0.665	TL-3	BI	N/A	N/A	STEEL BACKUP	24"	2'- 8 1/4"	140'		1	1						X	
												TOTALS	1	1	3							

LEGEND:
L=LOW MAINTENANCE
R=REUSABLE
S=SACRIFICIAL
N=NARROW
W=WIDE

FOR DEFINITIONS SEE THE "CRASH CUSHION CATEGORIZATION CHART.PDF" AT THE DESIGN DIVISION (ROADWAY STANDARDS) WEBSITE. USE QUICK LINKS TO ACCESS ATTENUATORS / CRASH CUSHIONS SECTION.
http://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/rdwyise.htm

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on 5/3/2022

DocuSigned by:
98C72D65D494466...

CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:		CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05025, etc.		US 90,etc.
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	FEDERAL AID PROJECT			SHEET NO.
				51

DATE: 4/22/2022
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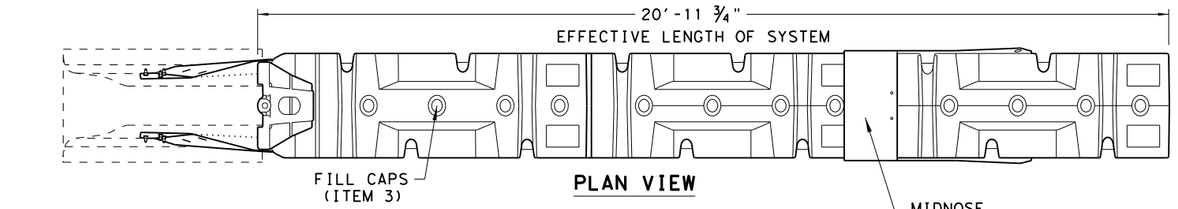
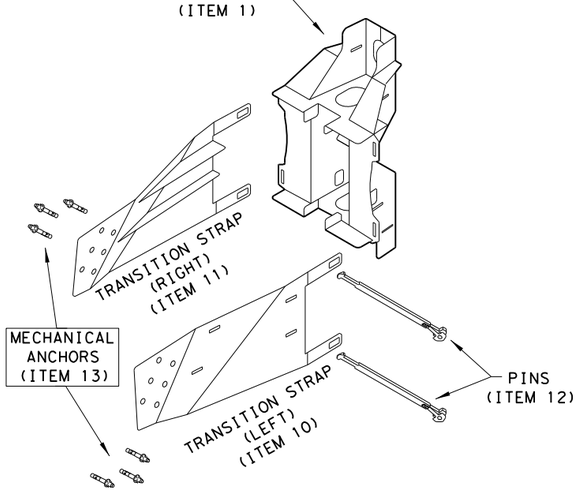
SYSTEM SHOWN - ABSORB-M TL-3





THE ABSORB-M IS A NON-REDIRECTIVE, GATING, CRASH CUSHION DESIGNED TO MEET THE LATEST TL-3 & TL-2 MASH REQUIREMENTS.

THE SYSTEM IS DESIGNED TO ACCOMMODATE A VARIETY OF F-SHAPE AND SINGLE SLOPE CONCRETE BARRIERS. CONTACT THE MANUFACTURER FOR GUIDANCE REGARDING OTHER ALLOWABLE SHAPES.

TEST LEVEL	NUMBER OF ELEMENTS	EFFECTIVE LENGTH	MAXIMUM LENGTH
TL-2	2	14'- 7 3/4"	17'- 4"
TL-3	3	20'- 11 3/4"	23'- 8"

NOTE:
CROSS SLOPES OF UP TO 8% (OR 1:12 SLOPE) CAN BE ACCOMMODATED WITH STANDARD HARDWARE SHOWN WITHIN THE INSTRUCTIONS MANUAL. FOR SLOPES WITH EXCESS OF 8% (OR 1:12) CONTACT, LINDSAY TRANSPORTATION SOLUTIONS.

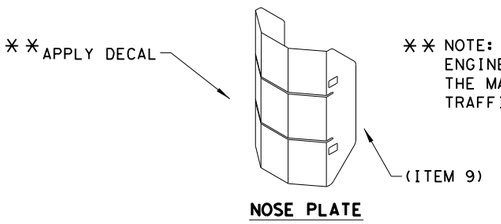
GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. THE ABSORB-M IS A WATER FILLED NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO A FOUNDATION AND CAN BE INSTALLED ON TOP OF CONCRETE, ASPHALT, OR ANY SURFACE CAPABLE OF BEARING THE WEIGHT OF THE SYSTEM.
4. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
5. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
6. THE ABSORB-M SHOULD BE LOCATED APPROXIMATELY PARALLEL WITH THE BARRIER.
7. THE USE OF THE ABSORB-M IS RESTRICTED TO A BARRIER HEIGHT OF UP TO 42 INCHES.
8. DO NOT ADD WATER TO FRONT ELEMENT (TL-2 OR TL-3 UNIT).

BILL OF MATERIALS (BOM) ABSORB-M TL-3 & TL-2 SYSTEMS			QTY	QTY
ITEM #	PART NUMBER	PART DESCRIPTION	TL-2 SYSTEM	TL-3 SYSTEM
1	BSI-1809036-00	TRANSITION-(GALV)	1	1
* 2	BSI-1808002-00	PRE-ASSEMBLED ABSORBING (ELEMENTS)	2	3
* 3	BSI-4004598	FILL CAPS	8	12
* 4	BSI-4004599	DRAIN PLUGS	2	3
* 5	BSI-1809053-00	TENSION STRAP-(GALV)	8	12
* 6	BSI-2001998	C-SCR FH 3/8-16 X 1 1/2 GR5 PLT	8	12
* 7	BSI-2001999	C-SCR FH 3/8-16 X 1 GR5 PLT	8	12
8	BSI-1809035-00	MIDNOSE-(GALV)	1	1
9	BSI-1808014-00	NOSE PLATE	1	1
10	BSI-1809037-00	TRANSITION STRAP (LEFT-HAND)-(GALV)	1	1
11	BSI-1809038-00	TRANSITION STRAP (RIGHT-HAND)-(GALV)	1	1
12	BSI-1808005-00	PIN ASSEMBLY	8	10
13	BSI-2002001	ANC MECH 5/8-11X5 (GALV)	6	6
14	ABSORB-M	INSTALLATION AND INSTRUCTIONS MANUAL	1	1

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE



NOSE PLATE

** NOTE: (PROVIDED BY OTHERS)
ENGINEER OR CONTRACTOR SHALL COORDINATE WITH THE MANUFACTURER FOR THE CORRECT DECAL PER TRAFFIC FLOW, LEFT, RIGHT OR BOTH-SIDES.

NOTE:
APPLY A HIGH REFLECTIVE DECAL TO THE NOSE PLATE. DELINEATION DECAL ORIENTATION IS SHOWN ON THE CONSTRUCTION PLAN SET AND SHALL BE IN ACCORDANCE WITH THE TEXAS MUTCD FOR (TRAFFIC CONTROL DEVICES). DECALs ARE AVAILABLE FOR TRAFFIC FLOW ON THE LEFT-SIDE, BOTH -SIDES AND RIGHT-SIDE.

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE ABSORB-M, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

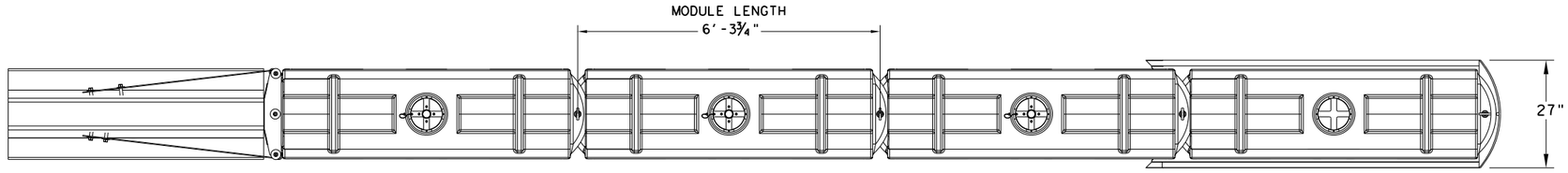
SACRIFICIAL

Texas Department of Transportation — Design Division Standard

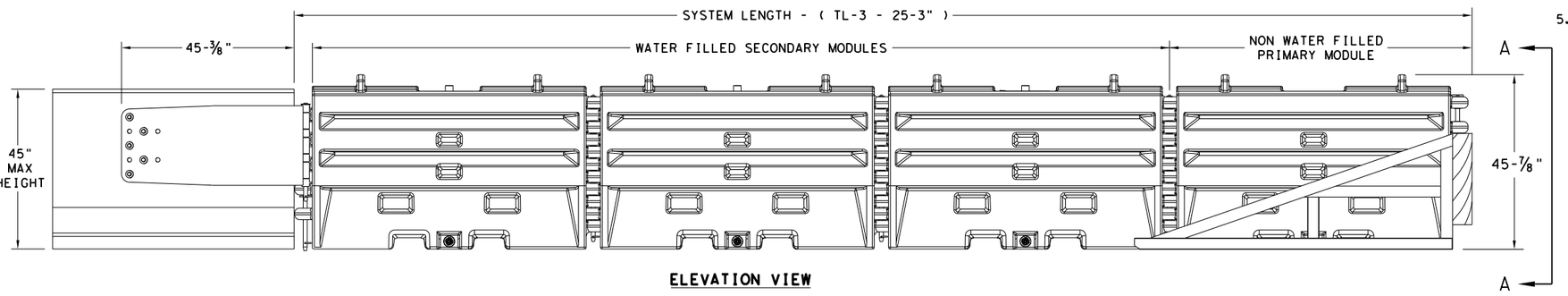
LINDSAY TRANSPORTATION SOLUTIONS
CRASH CUSHION
(MASH TL-3 & TL-2)
TEMPORARY - WORK ZONE
ABSORB(M)-19

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		52

DATE: 4/22/2022
FILE: c:\txdot\pw_online\txdot5\juan.gomez\d0650879\sled19.dgn



PLAN VIEW



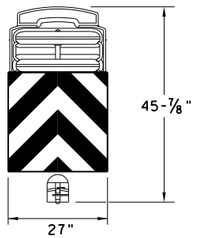
ELEVATION VIEW

GENERAL NOTES

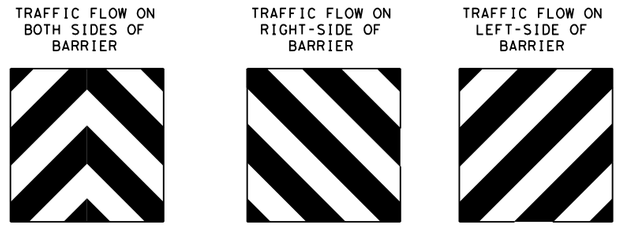
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO THE GROUND AND CAN BE INSTALLED ON CONCRETE, ASPHALT, GRAVEL OR COMPACTED SOIL.
3. MAXIMUM PERMISSIBLE CROSS SLOPE IS 8° (DEGREES) (14%).
4. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
5. THE SLED SYSTEM CAN BE ATTACHED TO:

- CONCRETE BARRIER, TEMPORARY OR PERMANENT, 45" MAXIMUM HEIGHT
- STEEL BARRIER
- PLASTIC BARRIER
- CONCRETE BRIDGE ABUTMENTS
- W-BEAM GUARD RAIL
- THRIE BEAM GUARD RAIL

TEST LEVEL	NUMBER OF SECONDARY MODULES	SYSTEM LENGTH
TL-3	3	25' 3"



SECTION A-A

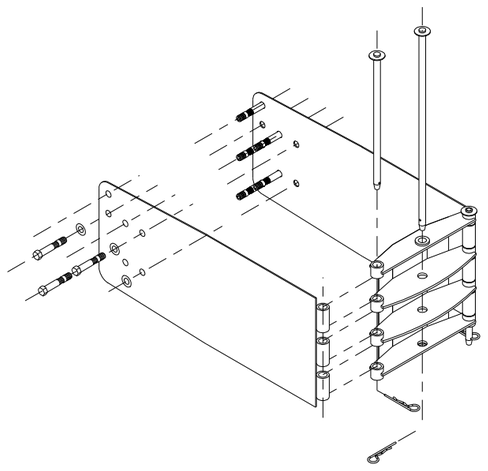


NOSE SHEETING PANEL DELINEATION

NOTE:
SEE INSTALLATION MANUAL FOR CUSTOMIZED DELINEATION NOSE SHEETING FOR DECAL PLACEMENT.

BILL OF MATERIAL

PART NUMBER	DESCRIPTION	QTY: TL-3
45131	TRANSITION FRAME, GALVANIZED	1
45150	TRANSITION PANEL, GALVANIZED	2
45147-CP	TRANSITION SHORT DROP PIN W/ KEEPER PIN, GALVANIZED	2
45148-CP	TRANSITION LONG DROP PIN W/ KEEPER PIN, GALVANIZED	1
45050	ANCHOR BOLTS	9
12060	WASHER, 3/4" ID X 2" OD	9
45044-Y	SLED YELLOW WATER FILLED MODULE	3
45044-YH	SLED YELLOW "NO FILL" MODULE	1
45044-S	CIS (CONTAINMENT IMPACT SLED), GALVANIZED	1
45043-CP	T-PIN W/ KEEPER PIN	4
18009-B-I	FILL CAP W/ "DRIVE BY" FLOAT INDICATOR	3
45033-RC-B	DRAIN PLUG	3
45032-DPT	DRAIN PLUG REMOVAL TOOL	1



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

NOTE:
SEE MANUFACTURER'S INSTALLATION MANUAL FOR FURTHER DETAILS.

TRANSITION OPTIONS
SLED TRANSITION TO CONCRETE TRAFFIC BARRIER (TEMPORARY OR PERMANENT)
SLED TRANSITION TO STEEL TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO PLASTIC TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO W-BEAM OR THRIE BEAM GUARD RAIL (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO CONCRETE BRIDGE ABUTMENT

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SLED, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

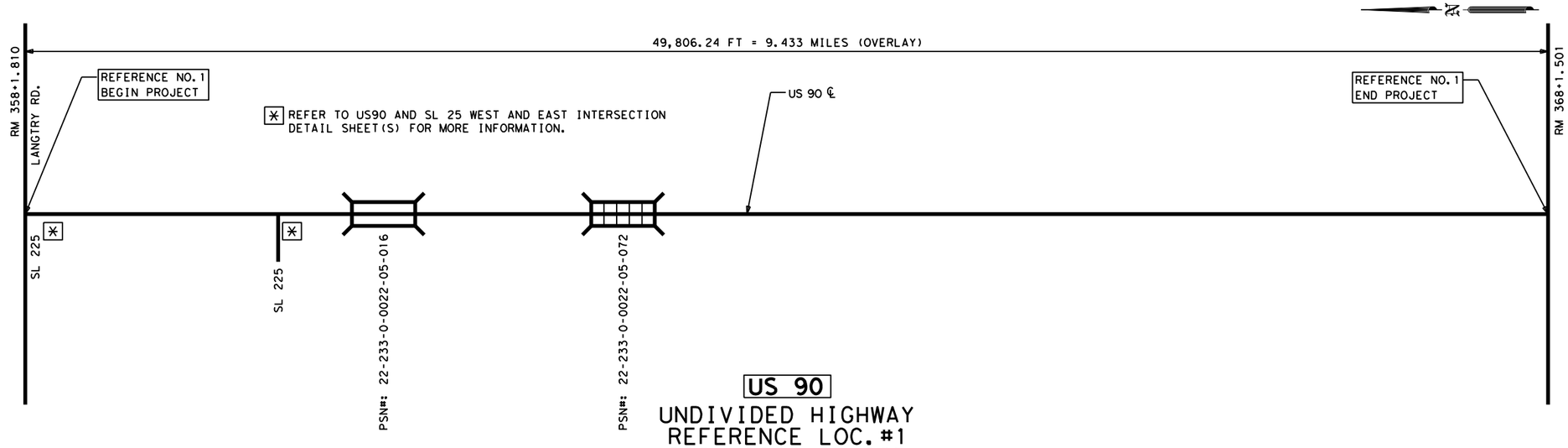
SACRIFICIAL

Texas Department of Transportation

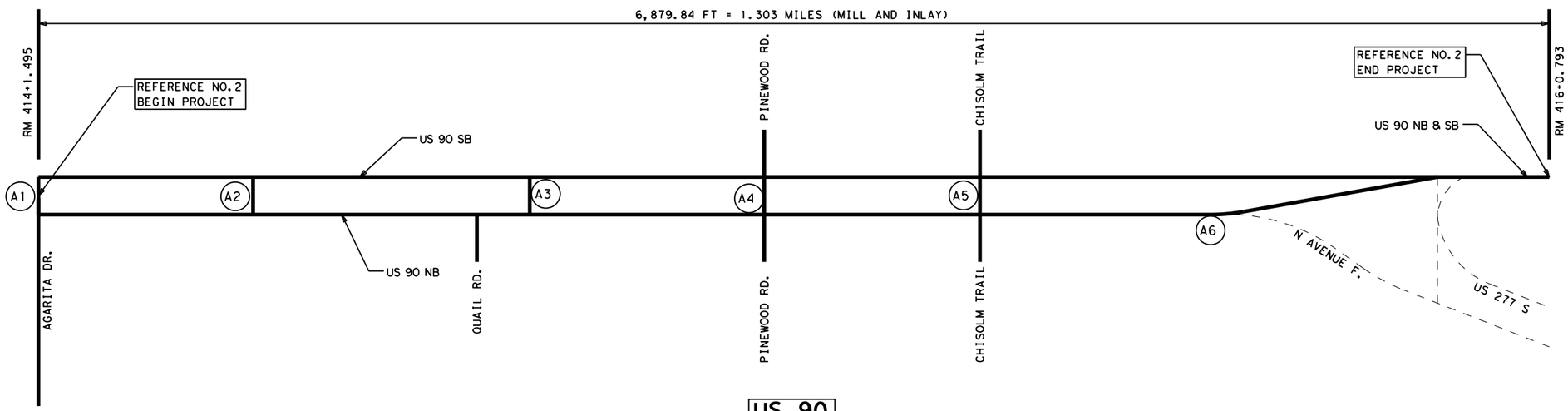
Design Division Standard

SLED
CRASH CUSHION
TL-3 MASH COMPLIANT
(TEMPORARY, WORK ZONE)
SLED-19

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
©TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		53



US 90
UNDIVIDED HIGHWAY
REFERENCE LOC. #1
CCSJ: 0022-05-025



US 90
DIVIDED/UNDIVIDED HIGHWAY
REFERENCE LOC. #2
CSJ: 0022-10-077

LEGEND

▦ - CLEANING AND SEALING JOINTS

NOTES:

REFER TO "RATES OF APPLICATION" SHEET FOR PAVEMENT DESIGN.

REFERENCE ALL EXISTING STRIPING AND PAVEMENT MARKINGS IN A MANNER WHICH ALLOWS THE MARKINGS TO BE RE-ESTABLISHED. PLACE EXTRA REFERENCE (IF NEEDED) TO ENSURE THAT THE MARKINGS (LANE LINES, EDGE LINES, ETC.) ARE IN LINE WITH SIGNS ON OSB'S, TMS ARROWS, ETC.

ALL STATION LOCATION(S)/ STREET(S) SHOWN ON THE DIAGRAMMATIC LAYOUT ARE APPROXIMATE.

REFER TO "ROADWAY MISCELLANEOUS DETAIL" SHEET(S) FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

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NOT TO SCALE

TEXAS DEPARTMENT OF TRANSPORTATION ®

DIAGRAMMATIC LAYOUT

DN: MT	DW: MT	STATE	SHEET NUMBER	SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 2	

FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	54

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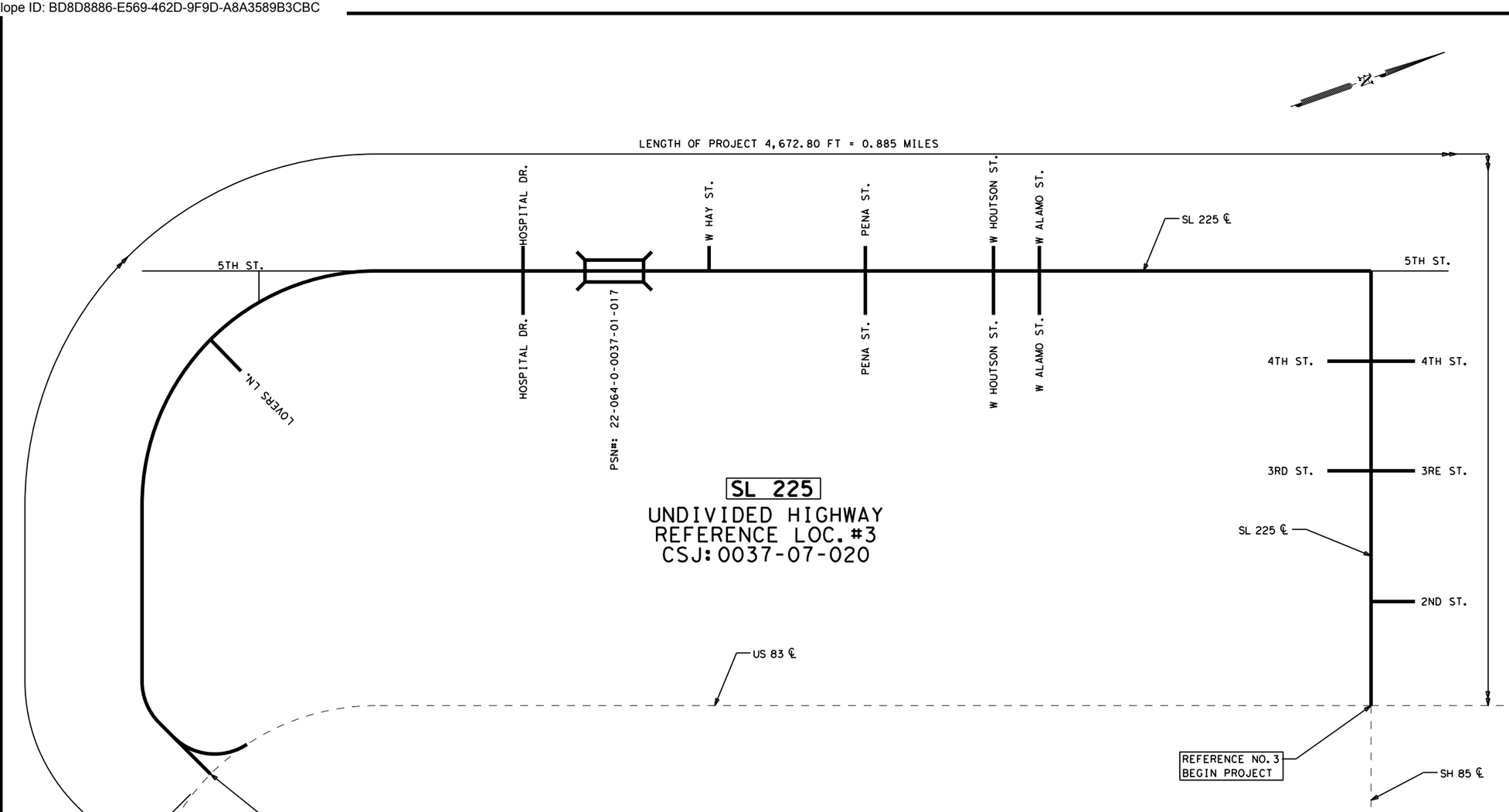

SL 225
UNDIVIDED HIGHWAY
REFERENCE LOC. #3
CSJ: 0037-07-020

NOTES:

REFER TO "RATES OF APPLICATION" SHEET FOR PAVEMENT DESIGN.

REFERENCE ALL EXISTING STRIPING AND PAVEMENT MARKINGS IN A MANNER WHICH ALLOWS THE MARKINGS TO BE RE-ESTABLISHED. PLACE EXTRA REFERENCE (IF NEEDED) TO ENSURE THAT THE MARKINGS (LANE LINES, EDGE LINES, ETC.) ARE IN LINE WITH SIGNS ON OSB'S, TMS ARROWS, ETC.

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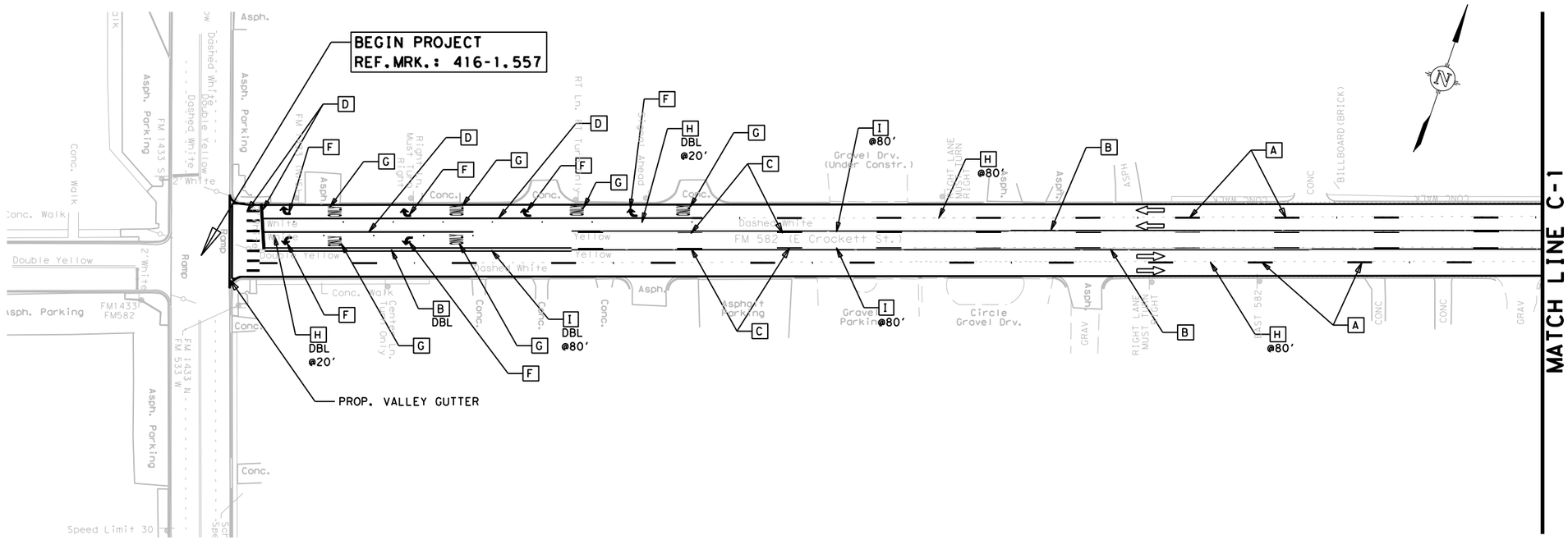
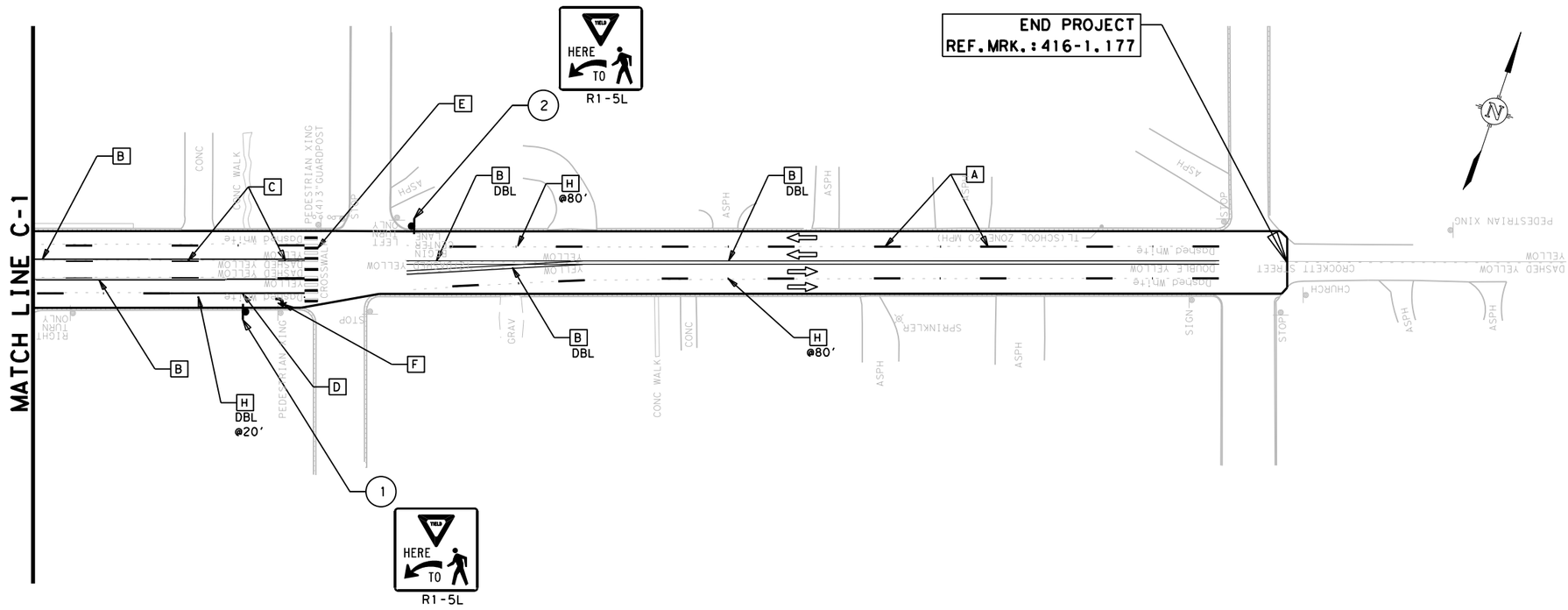
DIAGRAMMATIC LAYOUT

DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 2 OF 2			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.

55





LEGEND

- ⇦ — DIRECTION OF TRAFFIC
- [A] — 4" WHITE BROKEN
- [B] — 4" YELLOW SOLID
- [C] — 4" YELLOW BROKEN
- [D] — 8" WHITE SOLID
- [E] — 24" WHITE SOLID
- [F] — WHITE ARROW
- [G] — WHITE WORDING
- [H] — PAVEMENT MARKER TYPE I-C
- [I] — PAVEMENT MARKER TYPE II-A-A
- (#) — PROPOSED SMALL SIGN

NOTES:

REFERENCE ALL EXISTING PAVEMENT MARKINGS IN A MANNER WHICH ALLOWS THE MARKINGS TO BE RE-ESTABLISHED.

PLACE EXTRA REFERENCE (IF NEEDED) TO ENSURE THAT THE MARKINGS (LANE LINES, EDGE LINES, ETC.) ARE IN LINE WITH SIGNS ON OSB'S, TMS ARROWS, ETC.

✳ INCIDENTAL CONSTRUCTION RESTRIPING AREAS ARE QUANTIFY TO REPRESENTS EXISTING STRIPING CONDITIONS. CONTRACTOR WILL NEED TO FILED VERIFY ALL LOCATIONS.

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PLAN LAYOUT
FM 582

REF. NO.4 (CSJ:0878-05-025)

DN: MT	DW: MT	STATE	SHEET NUMBER				SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1				
FED.RO. DIV.NO.	STATE DIST.NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	56
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	

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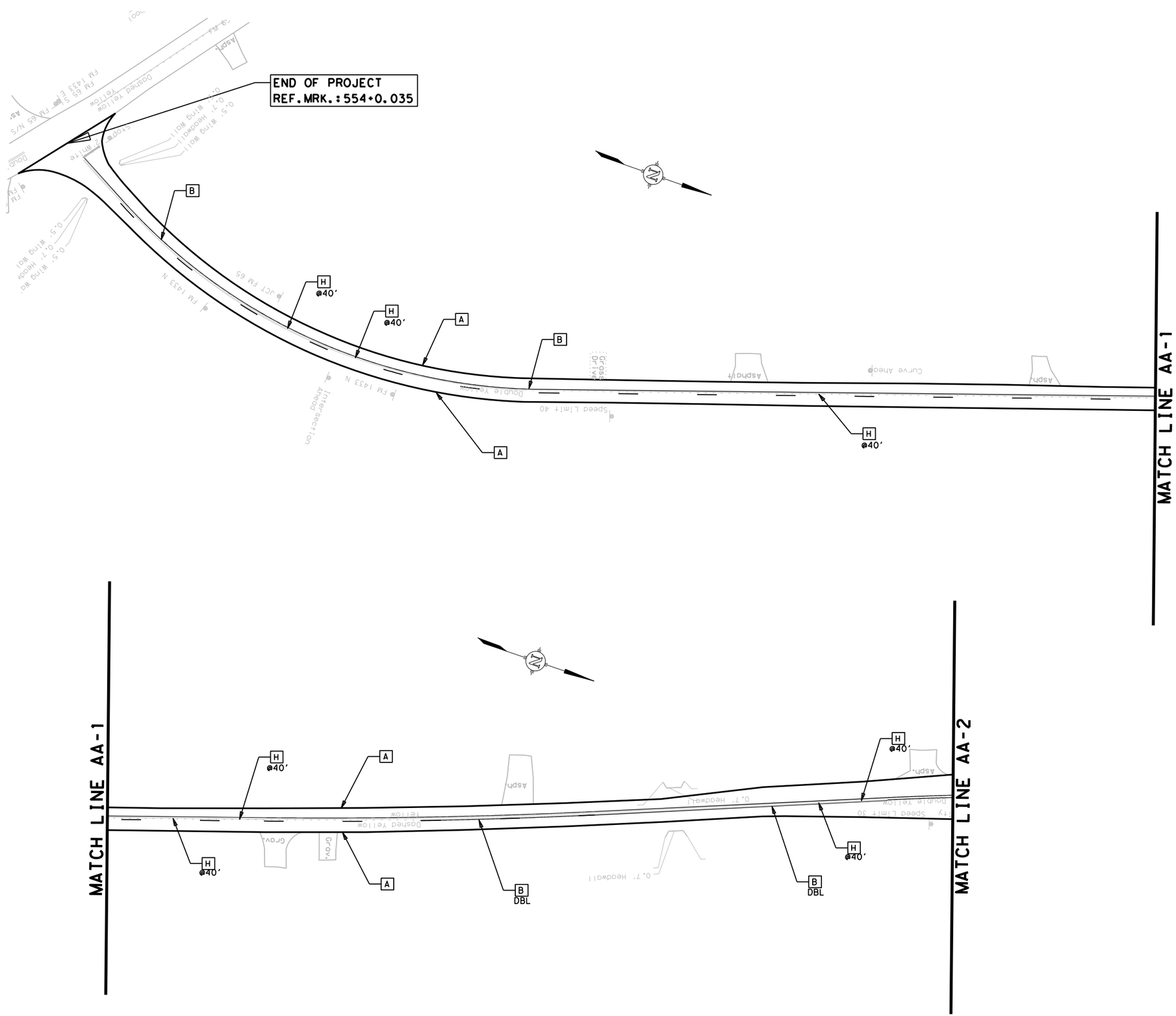

LEGEND

- ⇦ — DIRECTION OF TRAFFIC
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- [D] — 24" WHITE SOLID
- [E] — WHITE ARROW
- [F] — WHITE WORDING
- [G] — PAVEMENT MARKER TYPE I-C
- [H] — PAVEMENT MARKER TYPE II-A-A

NOTES:

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PLAN LAYOUT
FM 1433

REF. NO.5 (CSJ:2628-01-011)

DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 5			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	57

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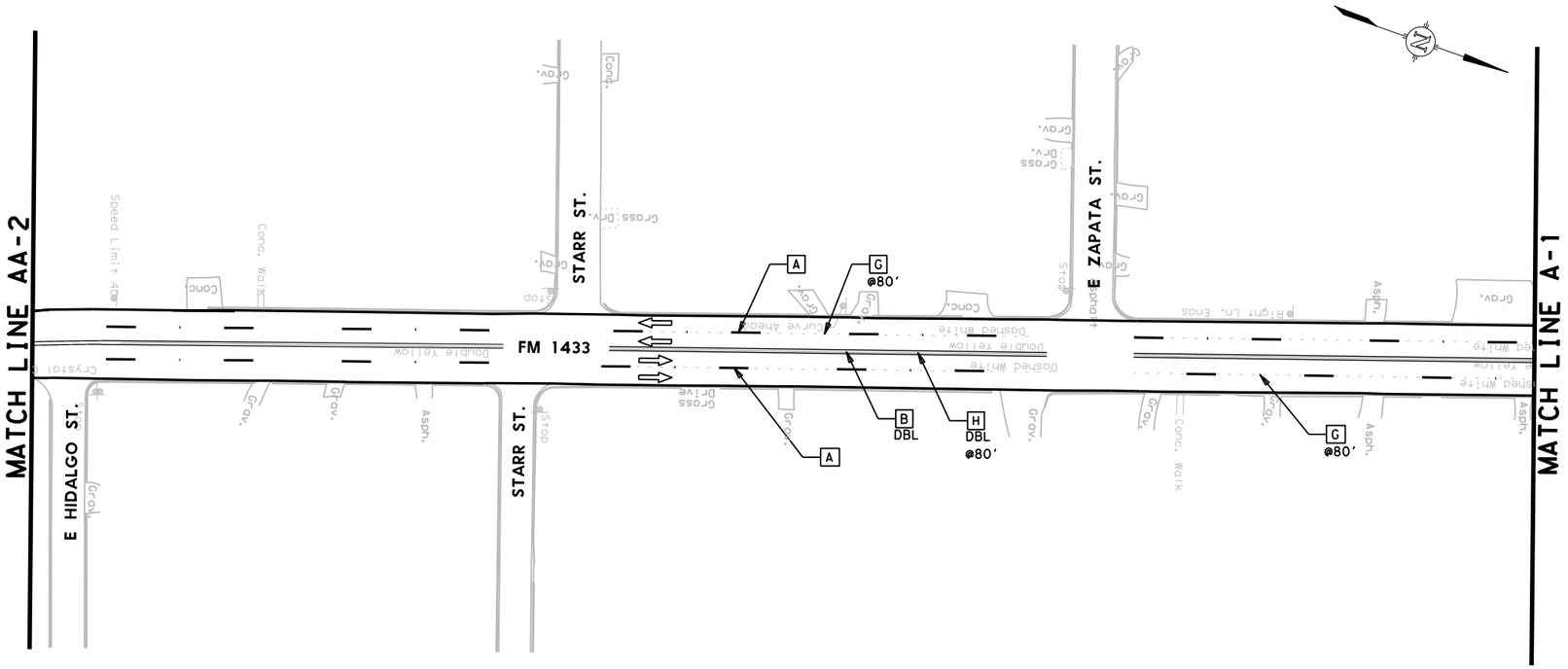

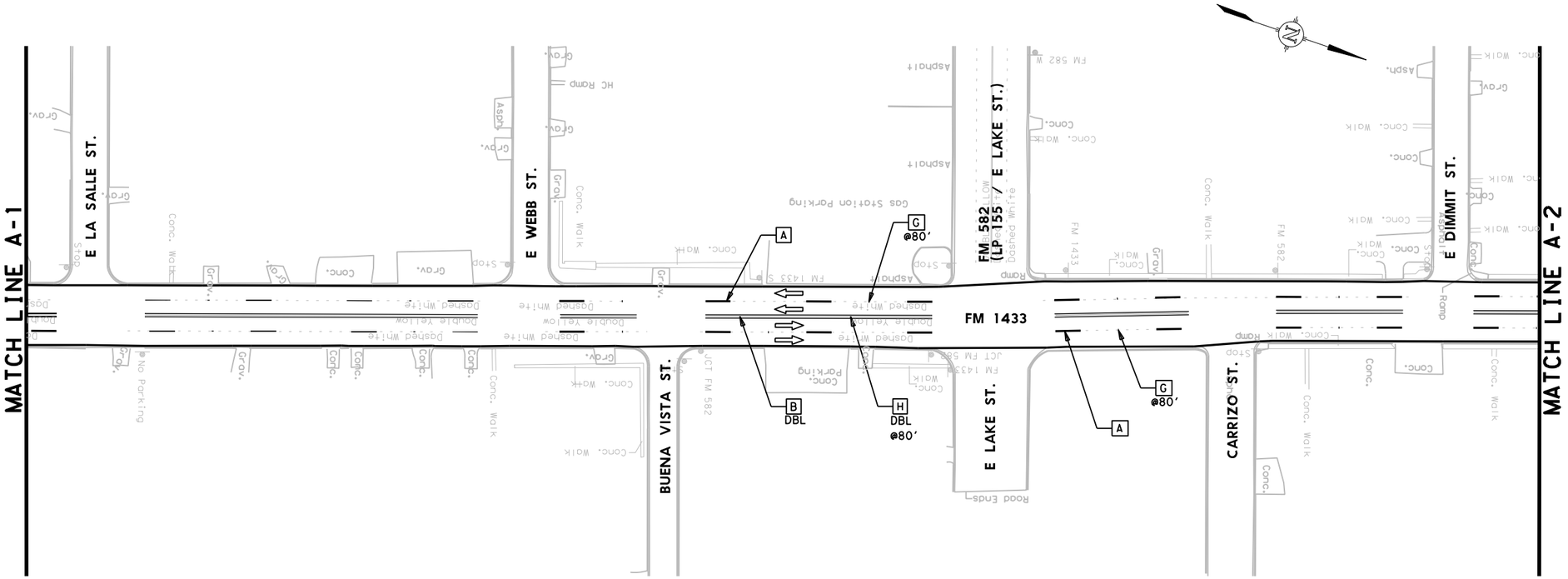

LEGEND

- ⇦ — DIRECTION OF TRAFFIC
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- [F] — WHITE WORDING
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- [H] — PAVEMENT MARKER TYPE II-A-A

NOTES:

REFERENCE ALL EXISTING PAVEMENT MARKINGS IN A MANNER WHICH ALLOWS THE MARKINGS TO BE RE-ESTABLISHED.

PLACE EXTRA REFERENCE (IF NEEDED) TO ENSURE THAT THE MARKINGS (LANE LINES, EDGE LINES, ETC.) ARE IN LINE WITH SIGNS ON OSB'S, TMS ARROWS, ETC.

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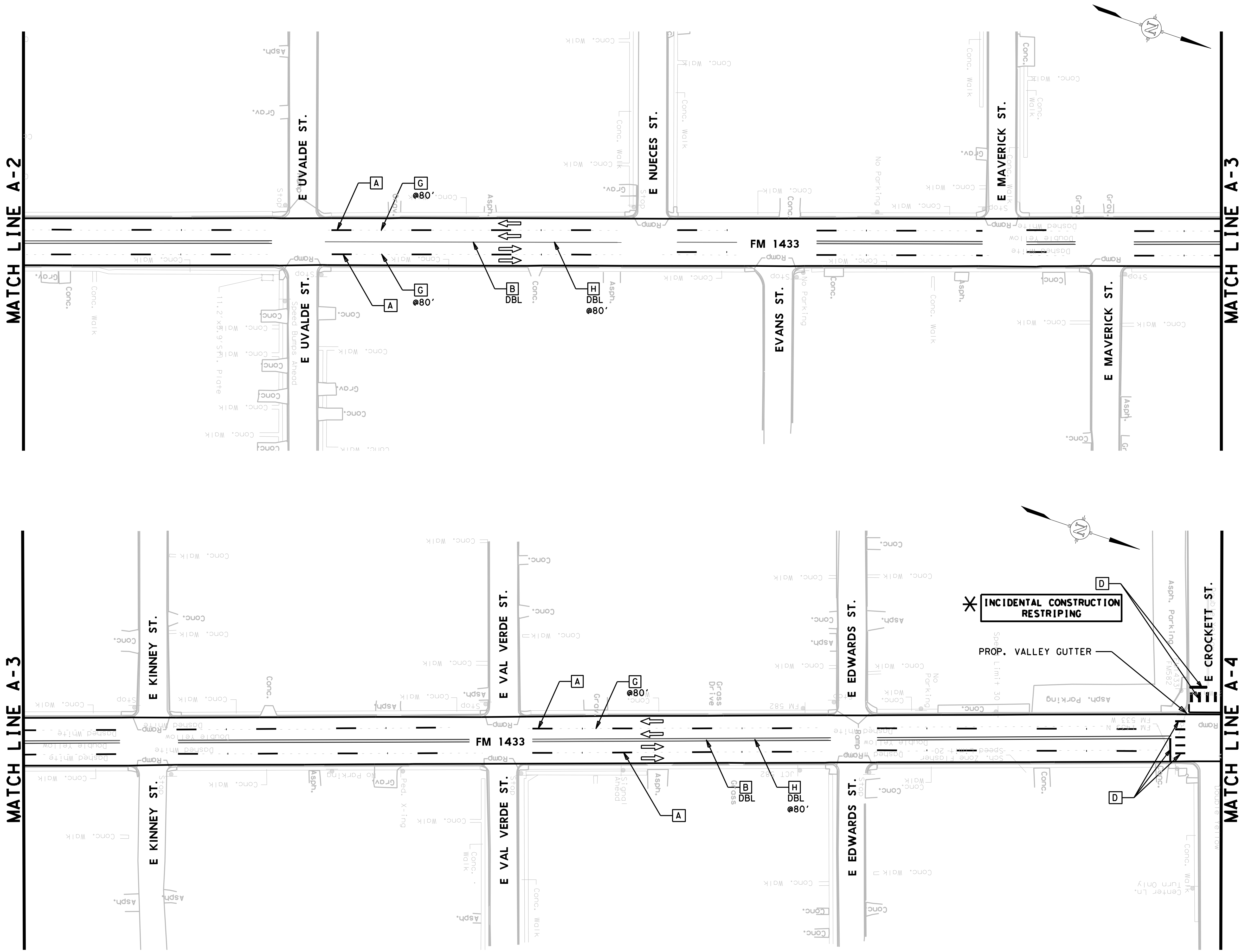
TEXAS DEPARTMENT OF TRANSPORTATION ®

PLAN LAYOUT
FM 1433

REF. NO.5 (CSJ:2628-01-011)

DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 2 OF 5			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.

58



LEGEND

- ⇦ — DIRECTION OF TRAFFIC
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- D — 24" WHITE SOLID
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- F — WHITE WORDING
- G — PAVEMENT MARKER TYPE I-C
- H — PAVEMENT MARKER TYPE II-A-A

NOTES:

REFERENCE ALL EXISTING PAVEMENT MARKINGS IN A MANNER WHICH ALLOWS THE MARKINGS TO BE RE-ESTABLISHED.

PLACE EXTRA REFERENCE (IF NEEDED) TO ENSURE THAT THE MARKINGS (LANE LINES, EDGE LINES, ETC.) ARE IN LINE WITH SIGNS ON OSB'S, TMS ARROWS, ETC.

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© 2022

PLAN LAYOUT
FM 1433

REF. NO.5 (CSJ:2628-01-011)

DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 3 OF 5			
FED. RD. DIV. NO. 6	STATE DIST. NO. 22	COUNTY VAL VERDE, etc.	CONTROL 0022	SECTION 05	JOB 025, etc.	HIGHWAY NO. US 90, etc.	59

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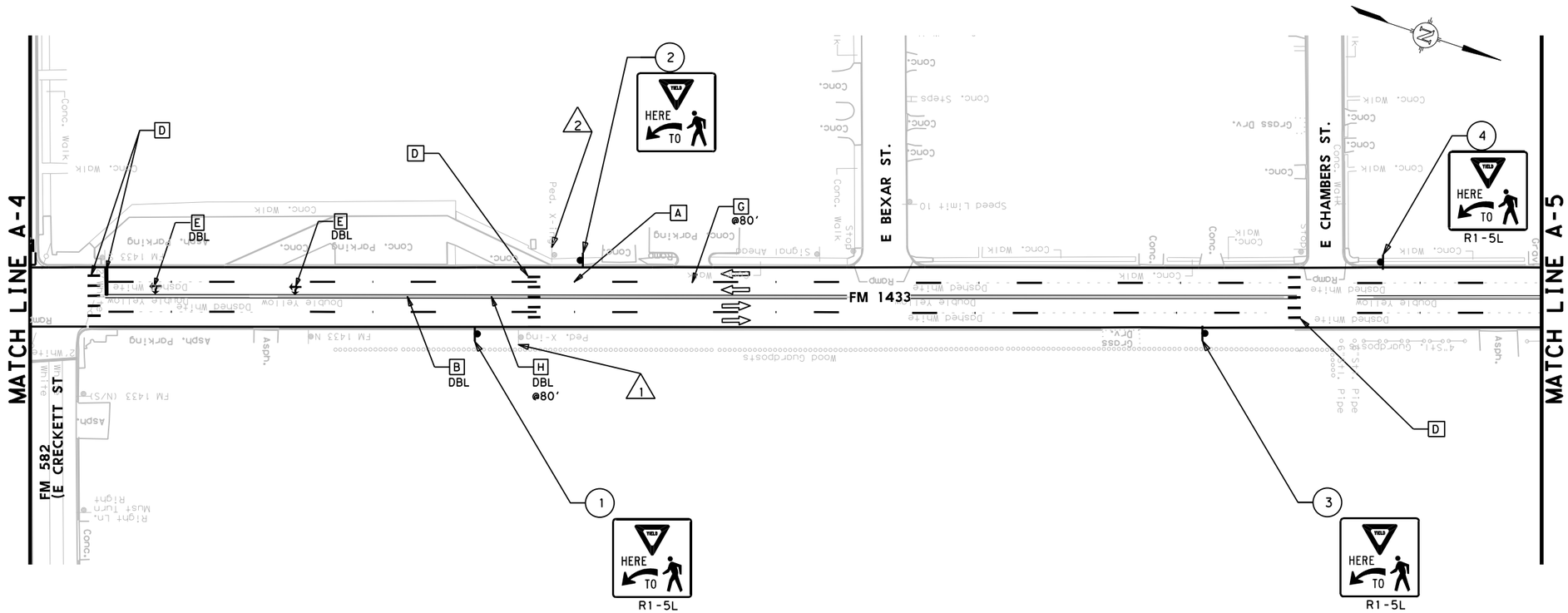

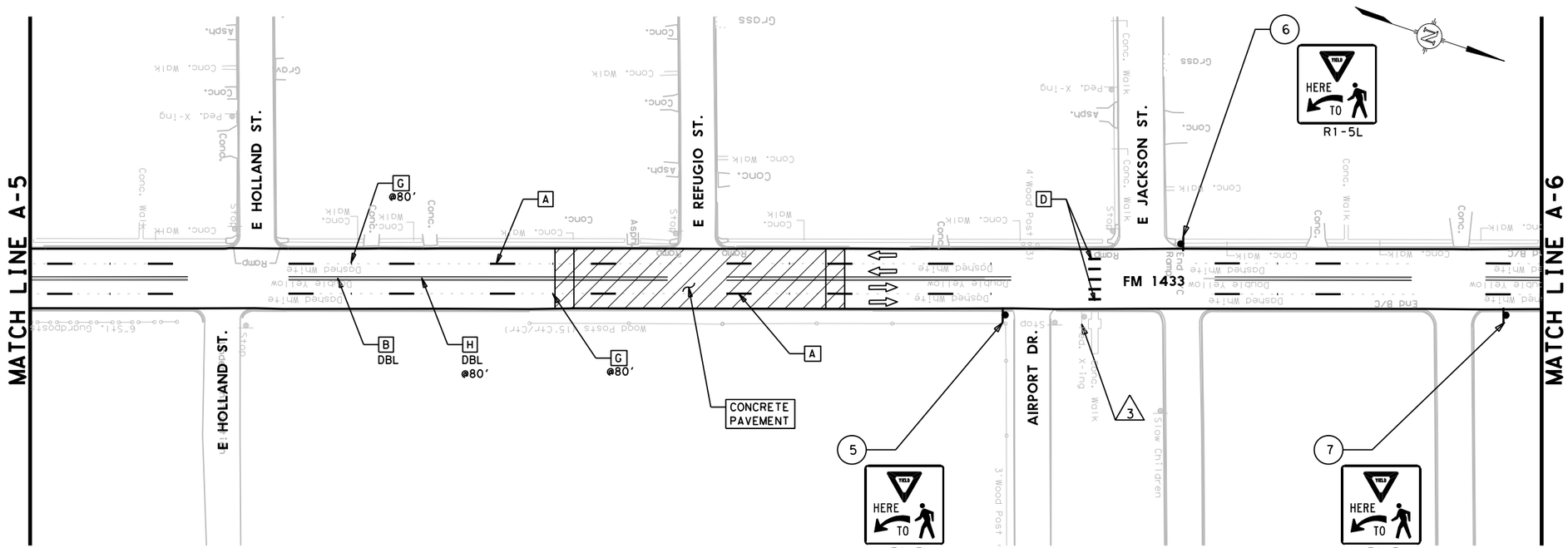

LEGEND

- ⇦ — DIRECTION OF TRAFFIC
- A — 4" WHITE
- B — 4" YELLOW
- C — 8" WHITE SOLID
- D — 24" WHITE SOLID
- E — WHITE ARROW
- F — WHITE WORDING
- G — PAVEMENT MARKER TYPE I-C
- H — PAVEMENT MARKER TYPE II-A-A
- (#) — PROPOSED SMALL SIGN (PED X-ING'S)
- △# — EXISTING SMALL SIGN TO BE REMOVED (PED X-ING'S)
- ▨ — HES CONCRETE PAVEMENT

NOTES:

REFERENCE ALL EXISTING PAVEMENT MARKINGS IN A MANNER WHICH ALLOWS THE MARKINGS TO BE RE-ESTABLISHED.

PLACE EXTRA REFERENCE (IF NEEDED) TO ENSURE THAT THE MARKINGS (LANE LINES, EDGE LINES, ETC.) ARE IN LINE WITH SIGNS ON OSB'S, TMS ARROWS, ETC.

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SEE "FM1433 & REFUGIO ST. CONCRETE INTERSECTION" DETAIL SHEET FOR CONCRETE PAVEMENT DETAILS.

STATE OF TEXAS
LUIS G. URBINA
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LICENSED PROFESSIONAL ENGINEER

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TEXAS DEPARTMENT OF TRANSPORTATION ®

PLAN LAYOUT
FM 1433

REF. NO.5 (CSJ:2628-01-011)

DN: MT	DW: MT	STATE	SHEET NUMBER	SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 4 OF 5	

FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	60

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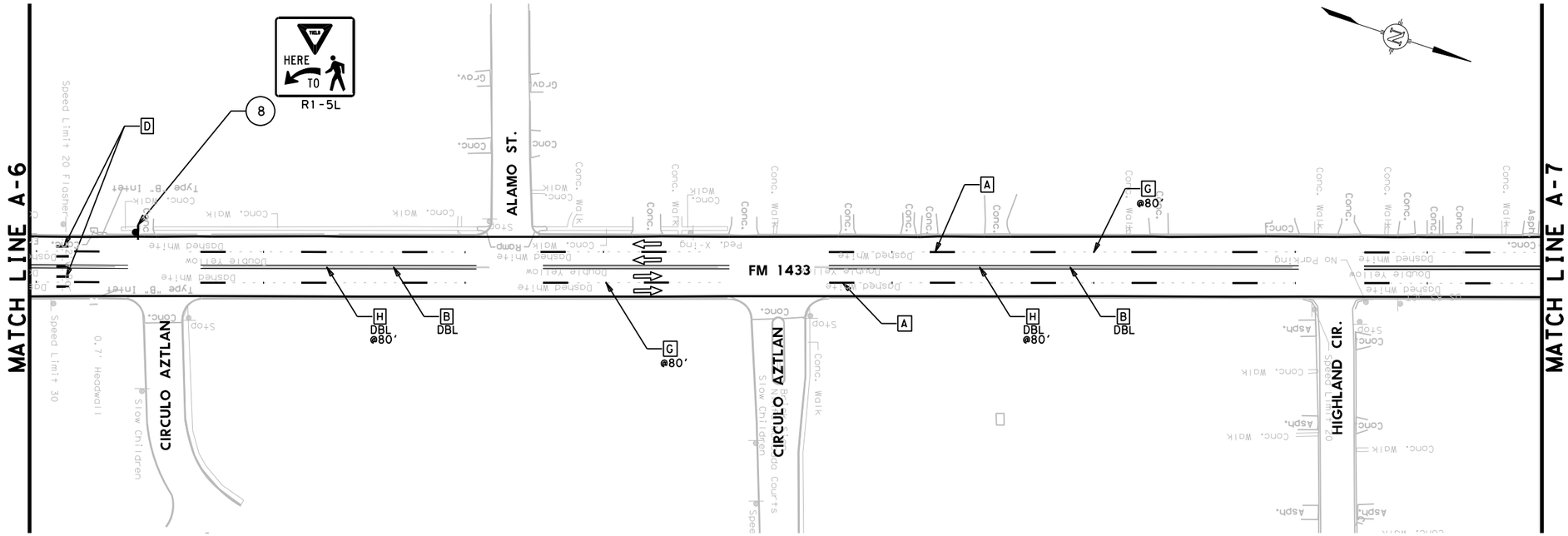

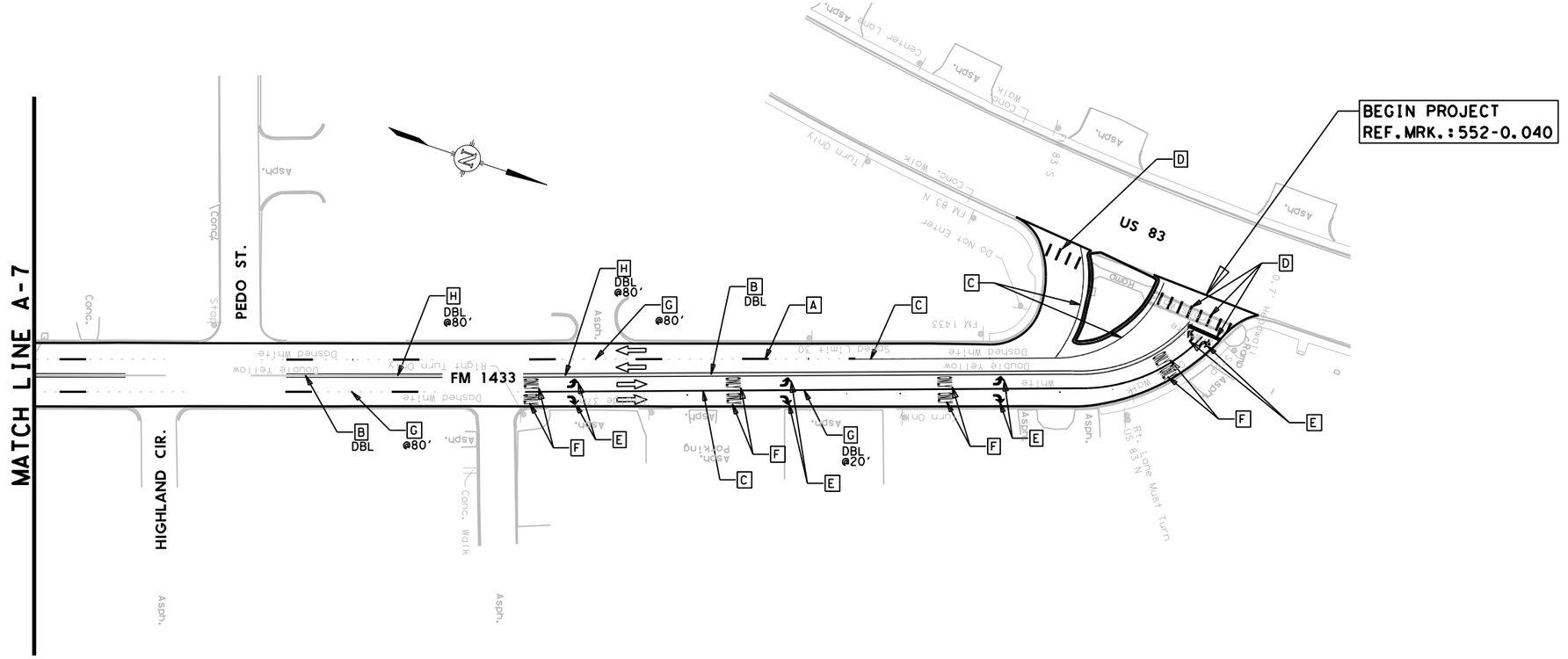

LEGEND

- ⇦ — DIRECTION OF TRAFFIC
- [A] — 4" WHITE BROKEN
- [B] — 4" YELLOW SOLID
- [C] — 8" WHITE SOLID
- [D] — 24" WHITE SOLID
- [E] — WHITE ARROW
- [F] — WHITE WORDING
- [G] — PAVEMENT MARKER TYPE I-C
- [H] — PAVEMENT MARKER TYPE II-A-A
- (#) — PROPOSED SMALL SIGN

NOTES:

REFERENCE ALL EXISTING PAVEMENT MARKINGS IN A MANNER WHICH ALLOWS THE MARKINGS TO BE RE-ESTABLISHED.

PLACE EXTRA REFERENCE (IF NEEDED) TO ENSURE THAT THE MARKINGS (LANE LINES, EDGE LINES, ETC.) ARE IN LINE WITH SIGNS ON OSB'S, TMS ARROWS, ETC.

✳ INCIDENTAL CONSTRUCTION RESTRIPING AREAS ARE QUANTIFY TO REPRESENTS EXISTING STRIPING CONDITIONS. CONTRACTOR WILL NEED TO FILED VERIFY ALL LOCATIONS.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED
PROFESSIONAL ENGINEER

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HORIZ: 1" = 100'

TEXAS DEPARTMENT OF TRANSPORTATION ®
© 2022

PLAN LAYOUT
FM 1433

REF. NO.5 (CSJ:2628-01-011)

DN: MT	DN: MT	STATE	SHEET NUMBER				SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 5 OF 5				
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	61

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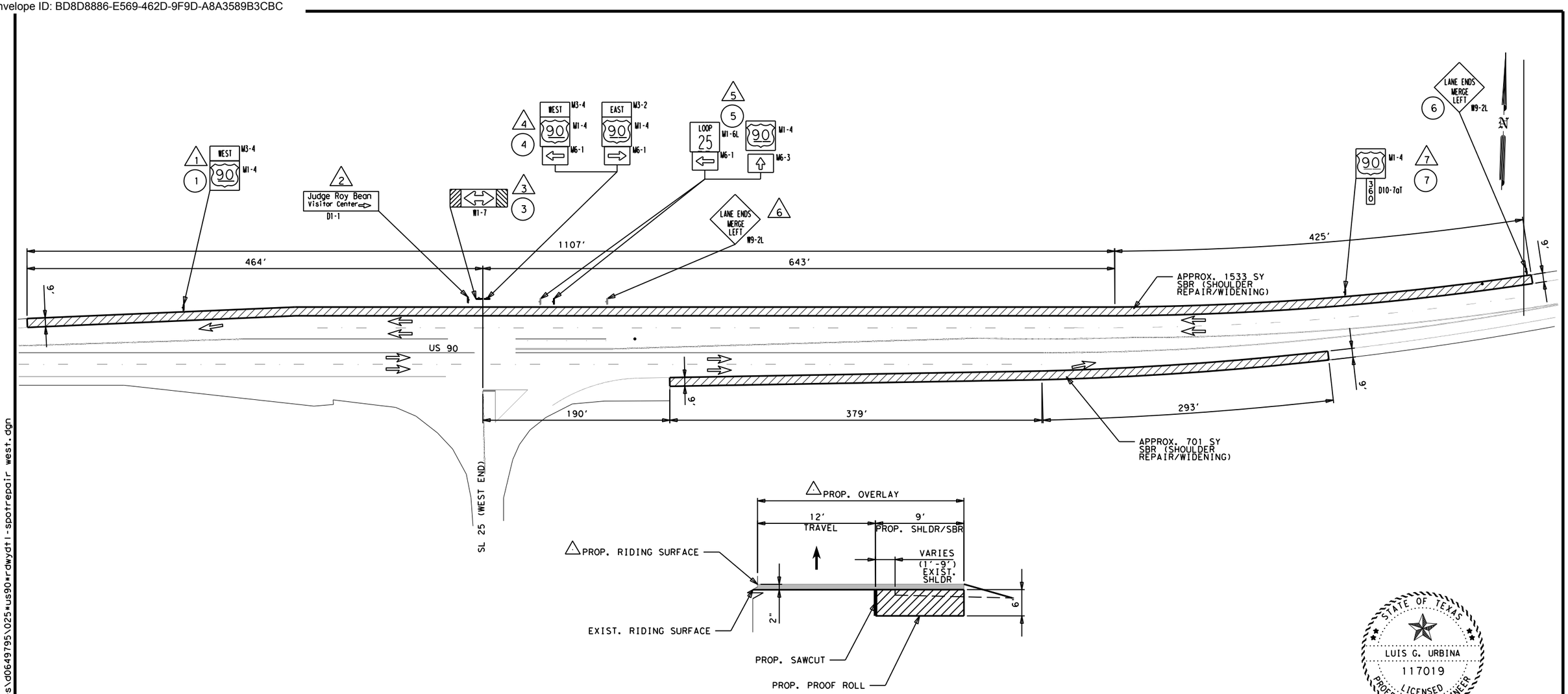

SPOT BASE REPAIR (SBR) SHOULDER REPAIR WIDENING DETAIL

RATES OF APPLICATION

HOTMIX:
6" DG HMA TY-B (SAC - B) (PG70 - 22): 120 LB/SY/IN

NOTES

1. CONTRACTOR WILL FIELD VERIFIED ALL SPOT BASE REPAIR LENGTHS, DEPTHS, AND TRANSITION LENGTHS WITH TXDOT PERSONNEL PRIOR TO CONSTRUCTION.
2. CONTRACTOR WILL SAW CUT TO PROVIDE A SMOOTH SURFACE. THIS WILL NOT BE PAID DIRECTLY BUT BE SUBSIDIARY TO ITEM "351" FLEXIBLE PAVEMENT STRUCTURE REPAIR.
3. EXISTING SIGN WILL BE REMOVE AND CAN VARY ON ATTACHED SIGNAGE COMPARED TO THE PROPOSED.

△ REFER TO TYPICAL SECTIONS FOR RIDING SURFACE AND OVERLAY INFORMATION.

REFERENCE LOCATION #1- US 90
CCSJ: 0022-05-025

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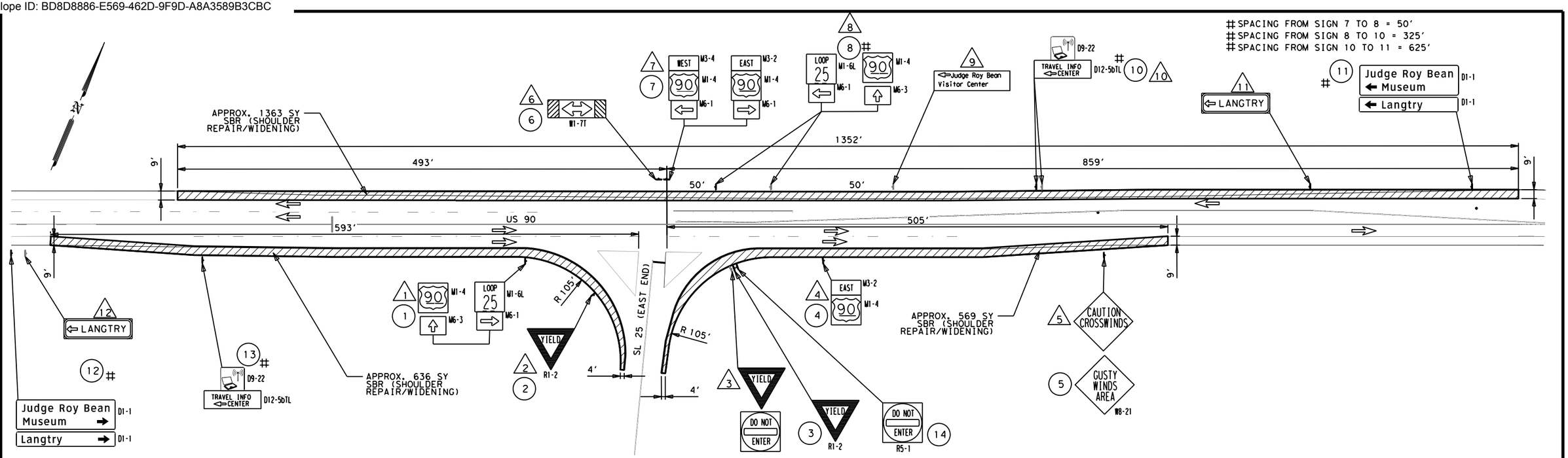
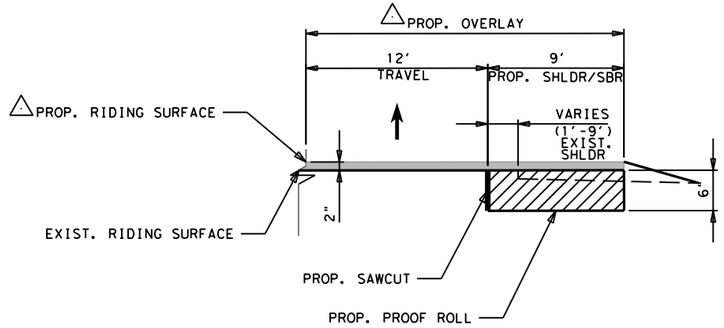
TEXAS DEPARTMENT OF TRANSPORTATION ®

US90 AND SL25 WEST END INTERSECTION DETAIL

DN: MT	DW: MT	STATE	SHEET NUMBER	SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1	

FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	62





SPOT BASE REPAIR (SBR) SHOULDER REPAIR WIDENING DETAIL

RATES OF APPLICATION

HOTMIX:
6" DG HMA TY-B (SAC - B) (PG70 - 22): 120 LB/SY/IN

NOTES

1. CONTRACTOR WILL FIELD VERIFIED ALL SPOT BASE REPAIR LENGTHS, DEPTHS, AND TRANSITION LENGTHS WITH TXDOT PERSONNEL PRIOR TO CONSTRUCTION.
2. CONTRACTOR WILL SAW CUT TO PROVIDE A SMOOTH SURFACE. THIS WILL NOT BE PAID DIRECTLY BUT BE SUBSIDIARY TO ITEM "351" FLEXIBLE PAVEMENT STRUCTURE REPAIR.
3. EXISTING SIGN WILL BE REMOVE AND CAN VARY ON ATTACHED SIGNAGE COMPARED TO THE PROPOSED.

△ REFER TO TYPICAL SECTIONS FOR RIDING SURFACE AND OVERLAY INFORMATION.

REFERENCE LOCATION #1- US 90
CCSJ: 0022-05-025

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TEXAS DEPARTMENT OF TRANSPORTATION ®

US90 AND SL25 EAST END INTERSECTION DETAIL

DN: MT	DN: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	63
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	

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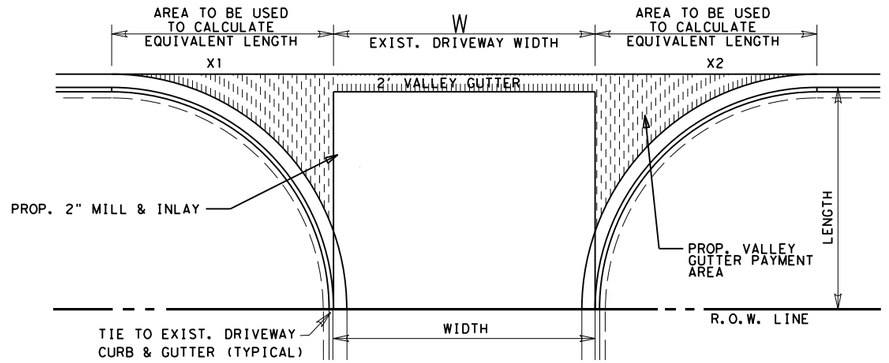
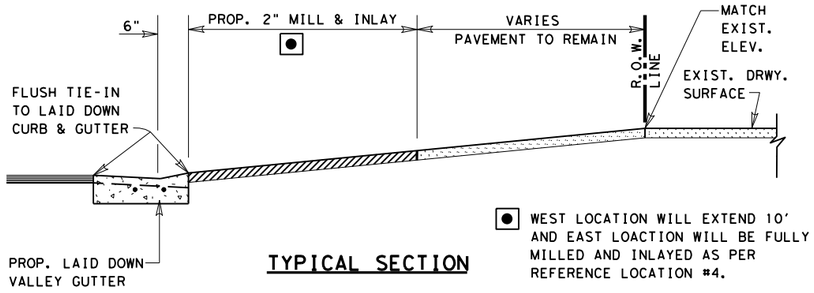


VALLEY GUTTER DETAIL
@ FM 1433 & FM 582 INTERSECTION
LOCATION #5

NOTES:

1. REFER TO CCCG-21 STANDARD FOR VALLEY GUTTER REINFORCEMENT
2. CONCRETE WILL BE SAW CUT TO THE LIMITS OF REMOVAL WHERE APPLICABLE
3. HOTMIX MATERIAL WILL BE TO THE SAME AS THE ROADWAY MIX. REFER TO TYPICAL SECTIONS FOR MORE INFORMATION.
4. MATCH EXIST ROADWAY ELEVATION FOR PROP. VALLEY GUTTER.



TYPICAL SECTION

● WEST LOCATION WILL EXTEND 10' AND EAST LOACTION WILL BE FULLY MILLED AND INLAYED AS PER REFERENCE LOCATION #4.

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VALLEY GUTTER DETAIL

DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1			
FED.RD. DIV.NO.	STATE DIST.NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	64

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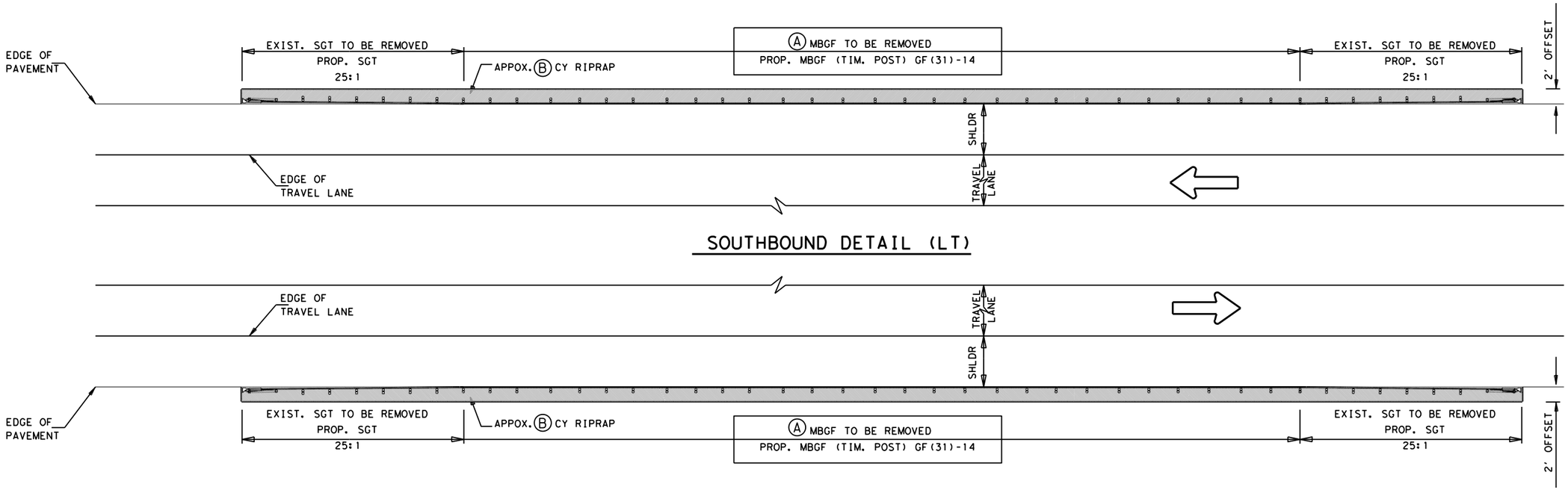

REFERENCE LOCATION	HWY	APPROX. REF. MRK	SIDE	APPOX. DISTANCE FROM BEGIN OF PROJECT	MOW STRIP WIDTH	THICKNESS	(A) GF(31)	(B) PROP. MOW STRIP	SGT
				FT	FT	INCHES	FT	CY	EA
1	US 90	364+0.687	RT	24971.5	4.5	4	275	14.8	2
1	US 90	364+0.687	LT	24971.5	4.5	4	275	14.8	2
1	US 90	364+0.952	RT	26374.0	4.5	4	600	28.8	2
1	US 90	364+0.952	LT	26374.0	4.5	4	600	28.8	2
1	US 90	364+1.286	RT	28139.0	4.5	4	650	31	2
1	US 90	364+1.286	LT	28139.0	4.5	4	650	31	2
1	US 90	364+1.459	RT	29051.5	4.5	4	75	6.1	2
1	US 90	364+1.459	LT	29051.5	4.5	4	75	6.1	2
1	US 90	364+1.606	RT	29824.0	4.5	4	400	20.2	2
1	US 90	364+1.608	LT	29836.5	4.5	4	325	16.9	2
1	US 90	364+1.778	RT	30736.5	4.5	4	575	27.7	2
1	US 90	364+1.82	LT	30954.0	4.5	4	300	15.9	2
1	US 90	366+0.023	RT	31789.0	4.5	4	250	13.7	2
1	US 90	366+0.035	LT	31849.0	4.5	4	200	11.5	2
1	US 90	366+0.269	RT	33086.5	4.5	4	225	12.6	2
1	US 90	366+0.258	LT	33029.0	4.5	4	250	13.7	2
1	US 90	366+0.536	RT	34494.0	4.5	4	300	15.9	2
1	US 90	366+0.621	LT	34946.5	4.5	4	925	42.9	2
1	US 90	366+0.92	RT	36524.0	4.5	4	300	15.9	2
1	US 90	366+0.904	LT	36441.5	4.5	4	275	14.8	2
1	US 90	366+1.208	RT	38042.0	4.5	4	300	15.9	2
1	US 90	366+1.232	LT	38171.5	4.5	4	175	10.5	2
1	US 90	366+1.441	RT	39276.5	4.5	4	475	23.4	2
1	US 90	366+1.43	LT	39216.5	4.5	4	225	12.6	2
1	US 90	366+1.636	RT	40303.5	4.5	4	275	14.8	2
1	US 90	366+1.659	LT	40426.0	4.5	4	450	22.3	2
1	US 90	368+0	RT	42493.0	4.5	4	725	34.2	2
1	US 90	368+0.01	LT	42544.0	4.5	4	600	28.8	2
1	US 90	368+0.263	RT	43879.0	4.5	4	1350	61.2	2
1	US 90	368+0.272	LT	43924.0	4.5	4	1350	61.2	2
1	US 90	368+0.666	LT	46006.5	4.5	4	425	21.3	2
1	US 90	368+0.892	RT	47199.0	4.5	4	300	15.9	2
1	US 90	368+1.084	RT	48214.0	4.5	4	500	24.5	2
2	US 90(SB)	416+0.430	LT	4950.0	4.5	4	200	17.1	2
2	US 90(SB)	416+0.430	RT	4950.0	4.5	4	200	18.2	2
2	US 90(SB)	414+1.995	RT	2640.0	4.5	4	125	14.2	2

REFERENCE LOCATION	HWY	APPROX. REF. MRK	SIDE	APPOX. DISTANCE FROM BEGIN OF PROJECT	MOW STRIP WIDTH	THICKNESS	MOW STRIP LENGTH TO BE REMOVED	(A) GF(31)	(B) PROP. MOW STRIP	SGT
				FT	FT	INCHES	FT	FT	CY	EA
3	SL 225	573+0.926	LT	250.0	4.5	4	300	200	30.6	2

GENERAL NOTES:

1. MBGF AND SGT INSTALLATION TO BE DONE IN SECTIONS (APPROACH UPSTREAM TRAFFIC, BRIDGE, DEPARTURE DOWNSTREAM TRAFFIC). EACH SECTION WILL BE COMPLETED IN ONE DAY, UNLESS MORE SECTIONS CAN BE COMPLETED. WHERE EXISTING MBGF IS LOCATED, PROPOSED MBGF MUST BE CONNECTED TO THE REMAINING EXISTING MBGF AT THE END OF THE DAY. ALL EXPOSED MBGF ENDS WILL BE TIED DOWN AT THE END OF THE DAY AS STATED IN "TRAFFIC CONTROL PLAN GENERAL NOTES".

2. REFER TO TXDOT STANDARD GF(31)-19, GF(31)LS-19, GF(31)TR TL3-20, GF(31)MS-19, SGT(10S)31-16, SGT(11S)31-18, SGT(12S)31-18 AND SGT(15)31-20 SHEET(S) FOR INSTALLATION, DIMENSIONS AND OTHER INFORMATION.

STATE OF TEXAS
LUIS G. URBINA
117019
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PROFESSIONAL ENGINEER

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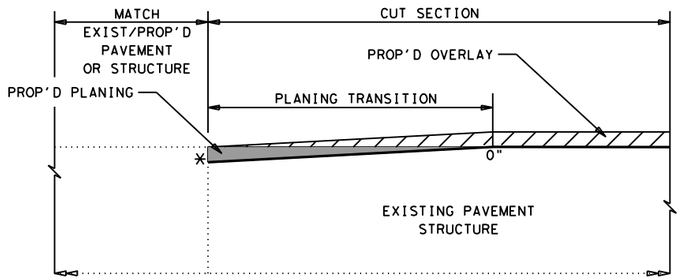
TEXAS DEPARTMENT OF TRANSPORTATION ®

MBGF DETAIL

DN: MT	DW: MT	STATE	SHEET NUMBER	SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1	

FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	005, etc.	US 90, etc.

65

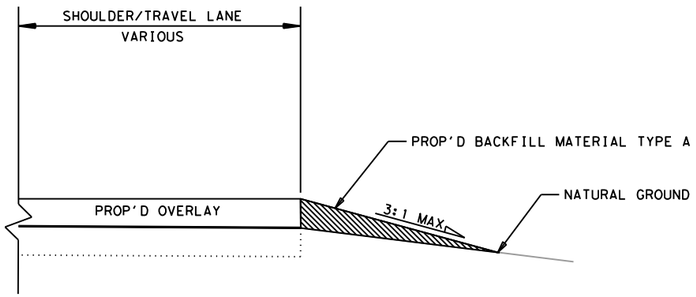


LONGITUDINAL
PLANING/OVERLAY
(PROFILE)

OVERLAY- LONGITUDINAL

NOTES

1. TRANSITION LOCATIONS WILL BE LIMITED TO 100 FT. UNLESS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER
2. BEGIN/END PROJECT LIMITS AND BRIDGES (APPROACHES/DEPARTURES)LOCATIONS TRANSITIONS WILL CONSIST OF HMA MATERIAL.
3. CONTRACTOR WILL FIELD VERIFY ALL LIMITS THAT WILL REQUIRE PLANING TRANSITIONS PRIOR TO CONSTRUCTION.
4. REFER TO "TYPICAL SECTION" SHEET(S) FOR RATES OF APPLICATION.
5. ✳ REFER TO "DIAGRAMMATIC LAYOUT" SHEET(S) FOR PAVEMENT DESIGN LIMITS.
6. REFER TO "TCP CONSTRUCTION JOINT DETAIL" IN ORDER TO AVOID LONGITUDINAL PAVEMENT DROP-OFF.



BACKFILL
OVERLAY/BACKFILL
(CROSS SECTION)

OVERLAY- BACKFILL

NOTES

1. BACKFILL WILL VARY DUE TO EXISTING NATURAL GROUND CONDITIONS.
2. REFER TO "SUMMARY OF QUANTITIES" SHEET(S) FOR BACKFILL MATERIAL TYPE TO BE PLACED.
3. DURING ALL NON-WORK HOURS ALL PAVEMENT EDGE DROP-OFFS ARE TO BE FILLED TO A 3:1 MAXIMUM SLOPE, UNTIL FINAL BACKFILL MATERIAL CAN BE PLACED.

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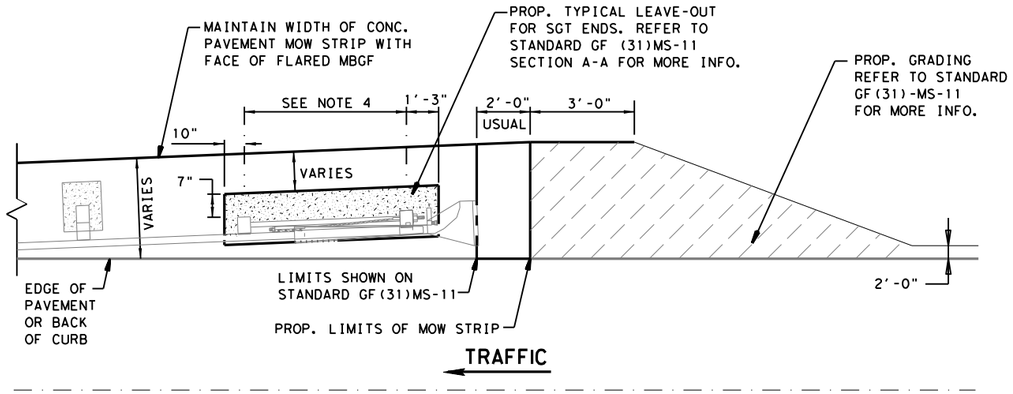
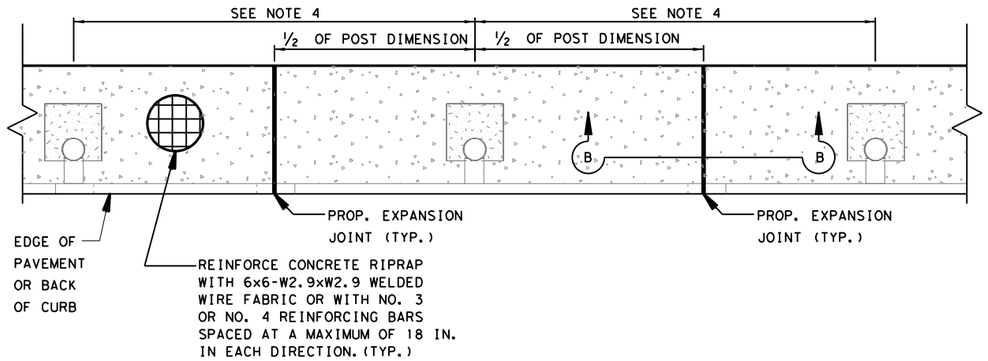
ROADWAY
MISCELLANEOUS DETAILS
TRANSITION

DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 3			
FED.RD. DIV.NO.	STATE DIST.NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.



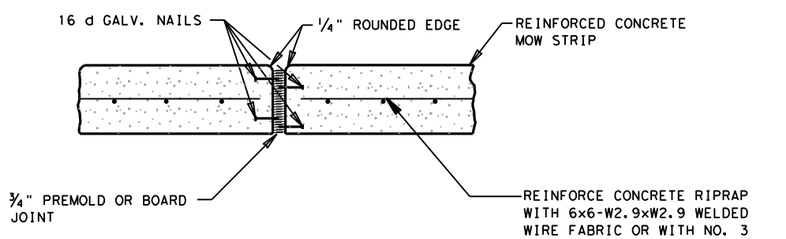
TYPICAL SGT ENDS MOW STRIP DETAIL

N. T. S.



TYPICAL MOW STRIP EXPANSION JOINT DETAIL

N. T. S.



SECTION B-B DETAIL

N. T. S.

NOTES:

1. PLACE CONCRETE MOW STRIPS AS SHOWN ON THE PLANS AND IN ACCORDANCE WITH ITEM 432 "RIPRAP". USE CLASS B REINFORCED CONCRETE.
2. PLACE THE MOW STRIP THE ENTIRE LENGTH OF THE GUARD FENCE PLUS ANY DOWNSTREAM ANCHOR TERMINAL (DAT) OR SINGLE GUARDRAIL TERMINAL (SGT) TO 2' BEYOND THE FACE OF THE OBJECT MARKER AT THE END OF THE TERMINAL. DO NOT ALLOW CONCRETE TO ADHERE TO THE GROUND LINE STRUT SHOWN ON THE SGT STANDARD SHEET.
3. MOWSTRIP TO BE CONVENTIONALLY FORMED CONCRETE. PROVIDE MOWSTRIP SECTIONS SEPARATED BY PREMOLD OR BOARD JOINT OF THE THICKNESS SHOWN ON THE PLANS IN LENGTHS GREATER THAN 8 FT. BUT LESS THAN OR EQUAL TO 12.5 FT, UNLESS OTHERWISE DIRECTED. TERMINATE WORKDAY PRODUCTION AT AN EXPANSION JOINT.
4. REFER TO TXDOT STANDARD GF(31)-19, GF(31)LS-19, GF(31)TR TL3-20, GF(31)MS-19, SGT(10S)31-16, SGT(11S)31-18, SGT(12S)31-18 AND SGT(15)31-20 SHEET(S) FOR INSTALLATION, DIMENSIONS AND OTHER INFORMATION.

MOWSTRIP QUANTITY CALCULATIONS
FOR ESTIMATION PURPOSES

EVERY 25 FT. OF MBGF = 1.08 CY (9.72 SY)
EVERY SGT SYSTEM = 2.85 CY (25.74 SY)
EVERY THRIE-BEAM TRANS = 0.81 CY (7.29 SY)

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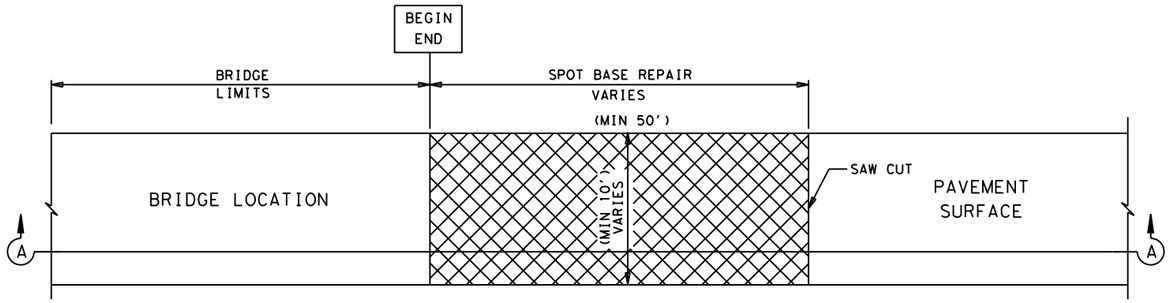
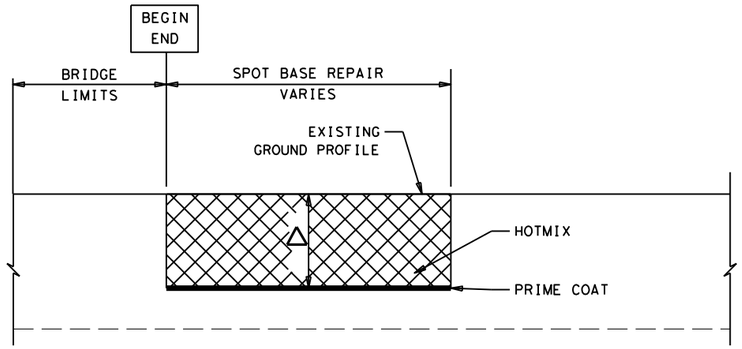
TEXAS DEPARTMENT OF TRANSPORTATION ®

ROADWAY MISCELLANEOUS DETAILS MOWSTRIP

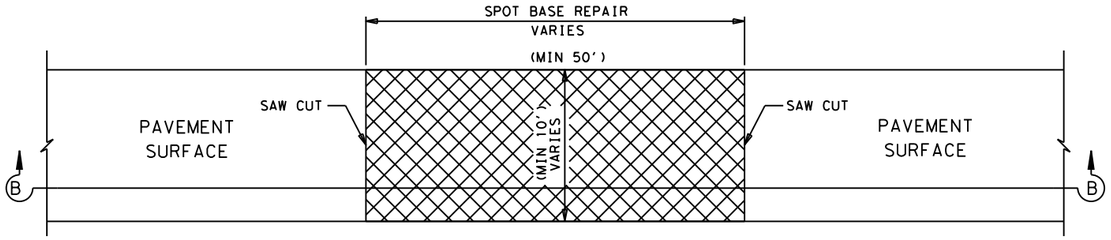
DN: MT	CK: LGU	DW: MT	CK: LGU	STATE	SHEET NUMBER			SHEET NO.
				TEXAS	SHEET 2 OF 3			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY		CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.		0022	05	025, etc.	US 90, etc.	67



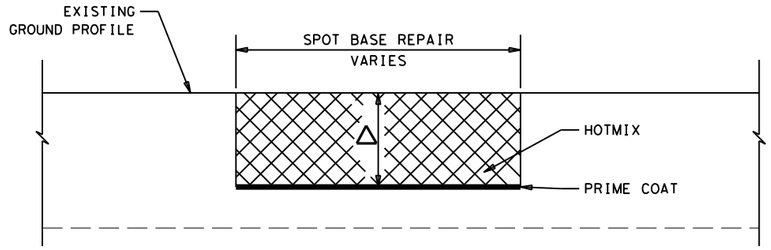
SPOT BASE REPAIR DETAIL
BRIDGE LOCATIONS



SPOT BASE REPAIR
BRIDGE SECTION A-A



SPOT BASE REPAIR DETAIL
ROADWAY SECTION



SPOT BASE REPAIR
ROADWAY SECTION B-B

RATES OF APPLICATION

HOTMIX:
DG HMA TY-B (SAC - B) (PG70 - 22): 120 LB/SY/IN

NOTES

1. CONTRACTOR WILL FIELD VERIFIED ALL SPOT BASE REPAIR LENGTHS, DEPTHS, AND TRANSITION LENGTHS WITH TXDOT PERSONNEL PRIOR TO CONSTRUCTION.
2. CONTRACTOR WILL SAW CUT TO PROVIDE A SMOOTH SURFACE. THIS WILL NOT BE PAID DIRECTLY BUT BE SUBSIDIARY TO ITEM "351" FLEXIBLE PAVEMENT STRUCTURE REPAIR.
3. △ REFER TO "SUMMARY OF QUANTITIES" AND "TYPICAL SECTIONS" FOR SPECIFIC REPAIR DEPTHS AT EACH LOCATION.

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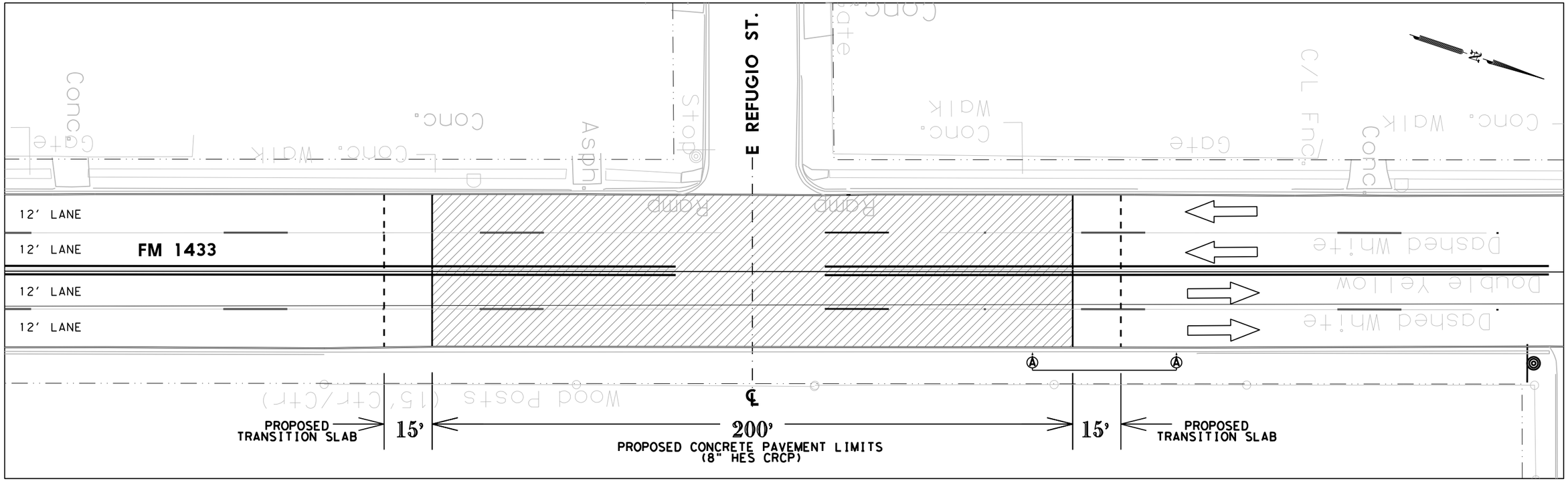
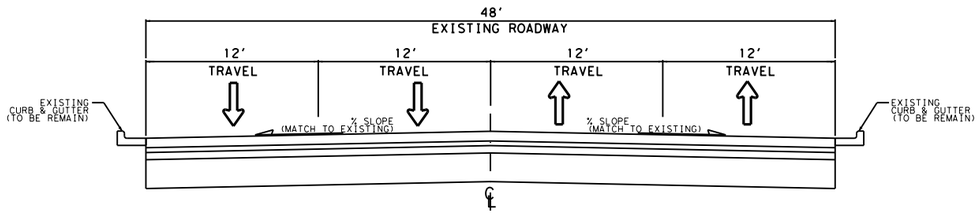
TEXAS DEPARTMENT OF TRANSPORTATION ®

ROADWAY
MISCELLANEOUS DETAILS
SPOT BASE REPAIR

DN: MT	DW: MT	STATE	SHEET NUMBER				SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 3 OF 3				
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	68

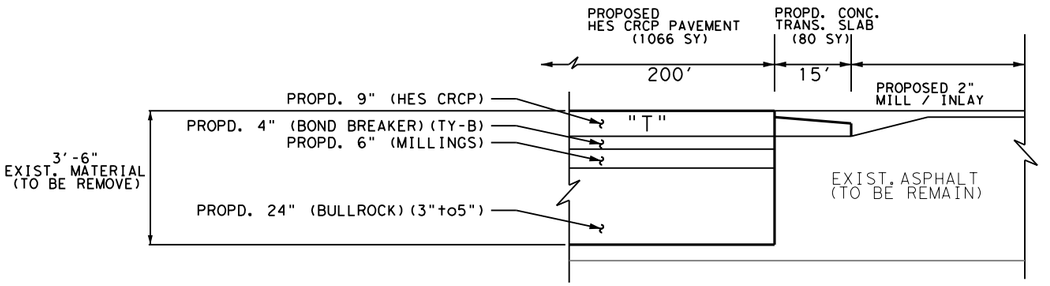




FM 1433
PROPOSED TYPICAL SECTION

NOTES:

1. WORK SHOWN SHALL BE DONE AT NIGHT AND WEEKENDS TO MINIMIZE INCONVENIENCE TO THE TRAVELING PUBLIC AND SURROUNDING BUSINESSES.
2. REFER TO STANDARDS TCP (2-5b)-18, BC SHEETS, TCP GENERAL NOTES, TMUTCD AND AND ALL OTHER APPLICABLE SHEETS FOR SIGNS, SIGN SPACING, AND CHANNELIZING DEVICE SPACING NOT SHOWN. WORK SPACE ON OPPOSITE SIDE SHALL BE MIRROR.
3. SEE TxDOT STANDARDS TRANS-20 & CRCP(1)-20 FOR MORE INFORMATION ON PROPOSED CONCRETE PAVEMENT.
4. FLAGGERS AND LAW ENFORCEMENT SHALL BE USED TO FACILITATE TRAFFIC MANAGEMENT.
5. TEMPORARY ILLUMINATION SHALL BE POSITIONED SUCH THAT THE ENTIRE INTERSECTION IS ILLUMINATED AND GLARE IS MINIMIZED FOR APPROACHING TRAFFIC.
6. ILLUMINATION, BULLROCK & MILLING MATERIALS AND LABOR SHALL BE CONSIDERED SUBSIDIARY TO ITEM 360 "CONCRETE PAVEMENTS".



PROPOSED PAVEMENT
DETAIL "A-A"

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on 5/3/2022

DocuSigned by:
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NOT TO SCALE

FM 1433 & REFUGIO ST.
CONCRETE INTERSECTION

DN: MT	DW: MT	STATE	SHEET NUMBER				SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1				
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	69

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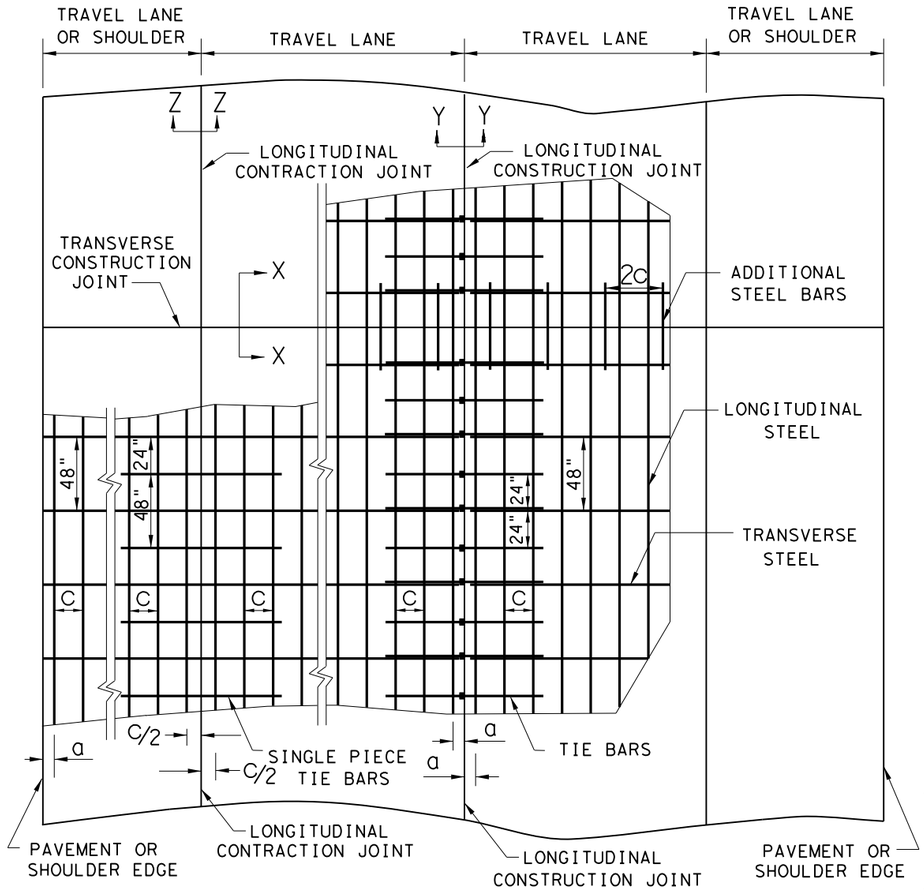
TABLE NO. 1 LONGITUDINAL STEEL					
SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING C (IN.)	SPACING a (IN.)	SPACING 2 X C (IN.)	LENGTH L (IN.)
7.0	#5	6.5	3 TO 4	13	50
7.5	#5	6.0	3 TO 4	12	50
8.0	#6	9.0	3 TO 4	18	50
8.5	#6	8.5	3 TO 4	17	50
9.0	#6	8.0	3 TO 4	16	50
9.5	#6	7.5	3 TO 4	15	50
10.0	#6	7.0	3 TO 4	14	50
10.5	#6	6.75	3 TO 4	13.5	50
11.0	#6	6.5	3 TO 4	13	50
11.5	#6	6.25	3 TO 4	12.5	50
12.0	#6	6.0	3 TO 4	12	50
12.5	#6	5.75	3 TO 4	11.5	50
13.0	#6	5.5	3 TO 4	11	50

TABLE NO. 2 TRANSVERSE STEEL AND TIE BARS						
SLAB THICKNESS (IN.)	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z)		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Y-Y)	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
7.0 - 7.5	#5	48	#5	48	#5	24
8.0 - 13.0	#5	48	#6	48	#6	24

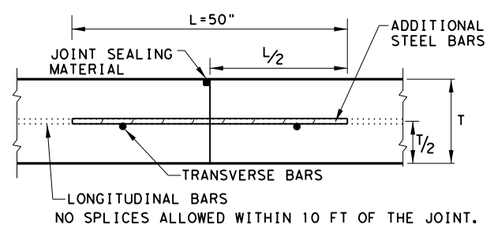


TYPICAL PAVEMENT LAYOUT

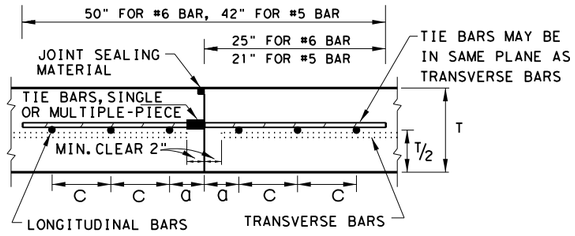
PLAN VIEW (NOT TO SCALE)

GENERAL NOTES

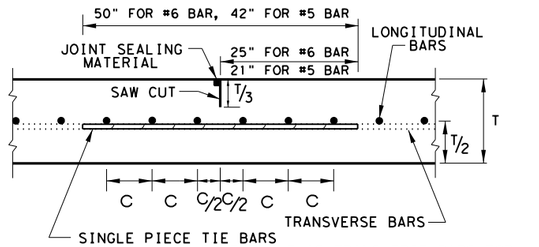
1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. USE COARSE AGGREGATES WITH A RATED COEFFICIENT OF THERMAL EXPANSION (CoTE) OF NOT MORE THAN 5.5 X 10^{-6} IN/IN/ °F AS LISTED IN THE CONCRETE RATED SOURCE QUALITY CATALOG (CRSQC).
3. ALL THE REINFORCING STEEL AND TIE BARS SHALL BE DEFORMED STEEL BARS CONFORMING TO ASTM A 615 (GRADE 60) OR ASTM A 996 (GRADE 60) OR ABOVE. STEEL BAR SIZES AND SPACINGS SHALL CONFORM TO TABLE NO. 1 AND TABLE NO. 2.
4. STEEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1 IN. HORIZONTALLY AND +/- 0.5 IN. VERTICALLY. CALCULATED AVERAGE BAR SPACING (CONCRETE PLACEMENT WIDTH / NUMBER OF LONGITUDINAL BARS) SHALL CONFORM TO TABLE NO. 1
5. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
6. THE SAW CUT DEPTH FOR THE LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLAB THICKNESS (T/3).
7. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
8. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
9. OMIT TIE BARS LOCATED WITHIN 18-IN. OF THE TRANSVERSE CONSTRUCTION JOINTS (SECTION X-X). USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL FORMED JOINTS.
10. LONGITUDINAL REINFORCING STEEL SPLICES SHALL BE A MINIMUM OF 25 IN. STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT.
11. THE DETAIL FOR THE JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



TRANSVERSE CONSTRUCTION JOINT
SECTION X - X



LONGITUDINAL CONSTRUCTION JOINT
SECTION Y - Y



LONGITUDINAL CONTRACTION JOINT
SECTION Z - Z

Texas Department of Transportation | Design Division Standard

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

ONE LAYER STEEL BAR PLACEMENT T - 7 to 13 INCHES

CRCP(1)-20

FILE: crcp120.dgn	DN: TxDOT	CK: KM	DW: AN	CK: VP
© TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 10/10/2011 ADD GN #12 04/09/2013 REMOVE 6" AND 6.5" ADD CTE REQUIREMENTS 05/05/2017 CoTE AS RATED 4.3	0022	05	025, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		70

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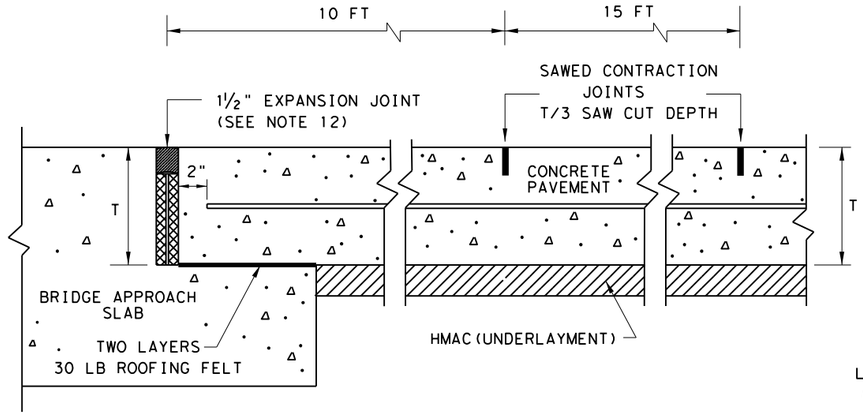
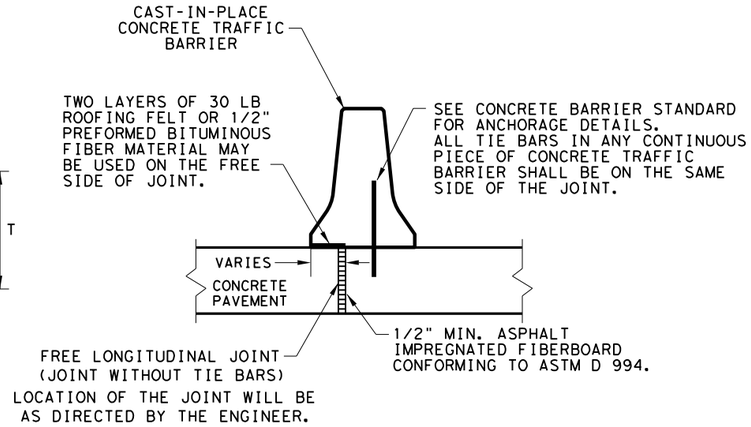
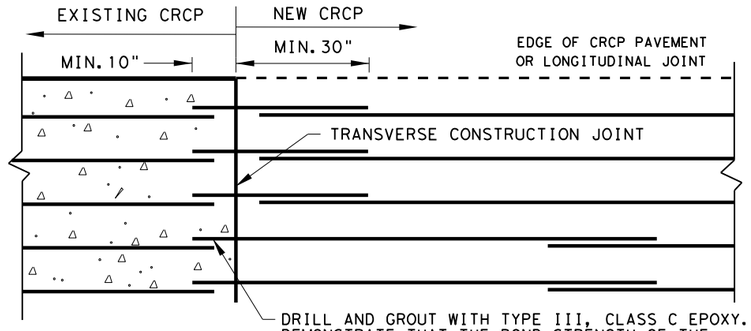


TRANSVERSE EXPANSION JOINT DETAIL
AT BRIDGE APPROACH



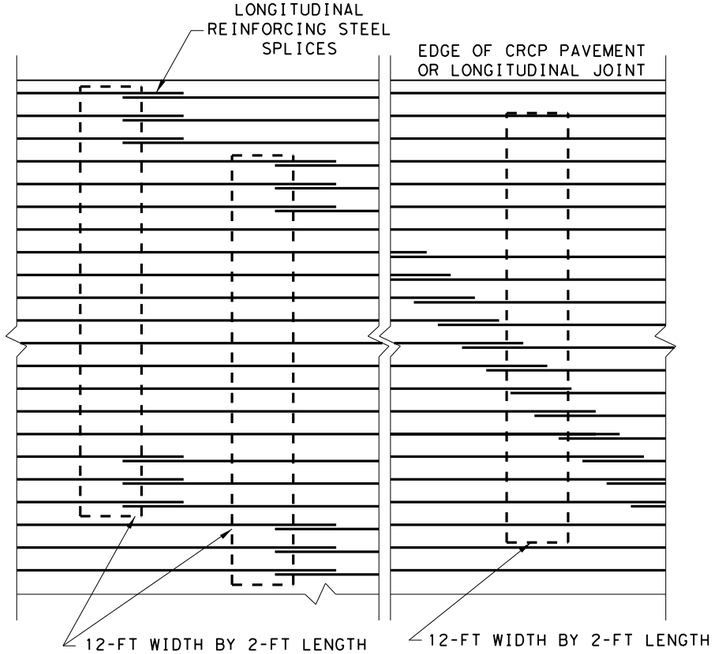
FREE LONGITUDINAL JOINT DETAIL



OPTION A: DRILL AND EPOXY
PLAN VIEW (NOT TO SCALE)

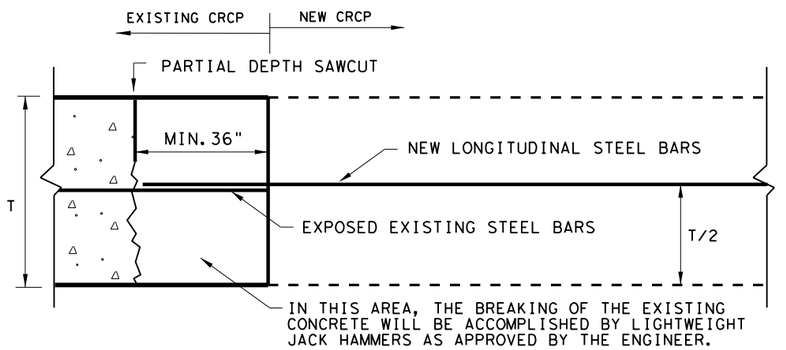
1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIRMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 TIE BARS FOR 8" AND THICKER SLABS, USE #5 TIE BARS FOR LESS THAN 8" THICK SLABS.

LONGITUDINAL WIDENING JOINT DETAIL



STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT. ANY OTHER LAP CONFIGURATION MEETING THIS REQUIREMENT WILL BE ALLOWED.

EXAMPLES OF LAP CONFIGURATION
PLAN VIEW (NOT TO SCALE)



OPTION B: BREAKBACK AND LAP

TRANSVERSE TIE JOINT DETAIL
EXISTING CRCP TO NEW CRCP

SHEET 2 OF 2

Texas Department of Transportation

Design Division Standard

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

ONE LAYER STEEL BAR PLACEMENT
T - 7 to 13 INCHES

CRCP(1)-20

FILE: crcp120.dgn	DN: TxDOT	CK: KM	DW: AN	CK: VP
© TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 03/16/2020 REMOVED TABLE 1A	0022	05	025, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		71

DATE: 4/22/2022
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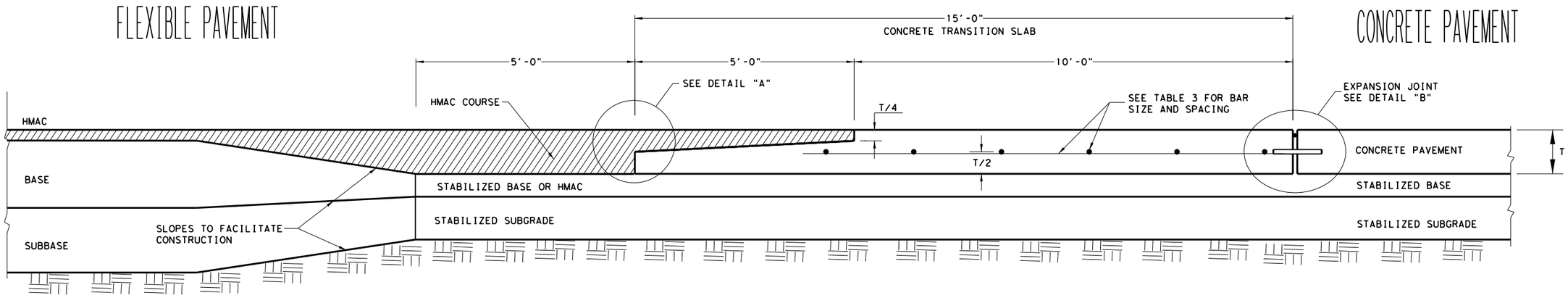
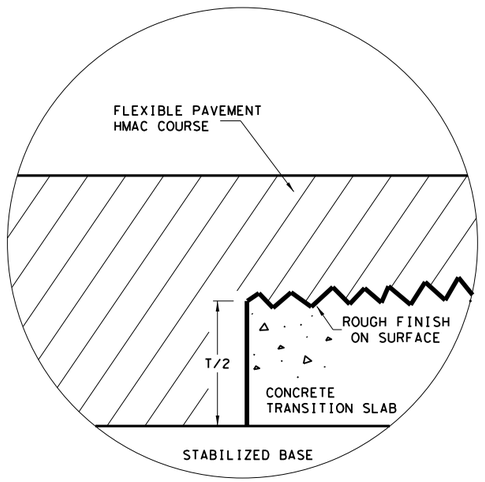
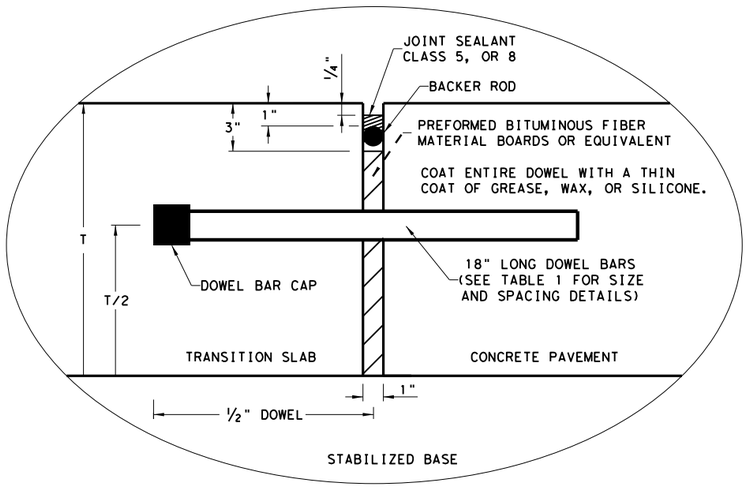


TYPICAL JUNCTION OF CONCRETE PAVEMENT WITH FLEXIBLE PAVEMENT

(NOT TO SCALE)



DETAIL "A"



DETAIL "B"

GENERAL NOTES

1. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND LOAD TRANSFER DEVICES REFER TO THE GOVERNING SPECIFICATIONS FOR "CONCRETE PAVEMENT" AND "REINFORCING STEEL."
2. DETAILS FOR PAVEMENT WIDTH AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS.
3. MATCH THE LONGITUDINAL JOINTS OF THE CONCRETE TRANSITION SLAB WITH ADJOINING CONCRETE PAVEMENT. PROVIDE EQUIVALENT TIEBARS OR TRANSVERSE BARS AT THESE LONGITUDINAL JOINTS, SEE TABLE NO. 2.
4. REFER TO DMS-6310, "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
5. TRANSITION SLABS WILL BE PAID UNDER ITEM 360, "CONCRETE PAVEMENTS."

TABLE NO. 1 DOWELS (SMOOTH BARS)

SLAB THICKNESS T (IN.)	BAR DIA. AND LENGTH	SPACING (IN.)
7 TO 7.5	1" X 18"	12
8 TO 10	1 1/4" X 18"	12
10 TO 13	1 1/2" X 18"	12

TABLE NO. 2 TIE BARS (DEFORMED BARS)

SLAB THICKNESS T (IN.)	BAR SIZE	SPACING (IN.)
7 TO 7.5	#5	24
8 TO 13	#6	24

TABLE NO. 3 TRANSITION SLAB STEEL (DEFORMED BARS)

SLAB THICKNESS T (IN.)	BAR SIZE	SPACING (IN.) TRANSVERSE DIRECTION	SPACING (IN.) LONGITUDINAL DIRECTION
7 TO 7.5	#5	24	12
8 TO 13	#6	24	12

ADJUST SPACING OF LONGITUDINAL BARS AS NEEDED TO ACCOMDATE DOWEL BAR SPACING.

Texas Department of Transportation

Design Division Standard

CONCRETE PAVEMENT DETAILS TRANSITION SLAB

T-7 to 13 INCHES

TRANS-20

FILE: transitslab20.dgn	DN: TxDOT	DN: TxDOT	DW: AN	CK: KM
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		72

DATE: 4/22/2022
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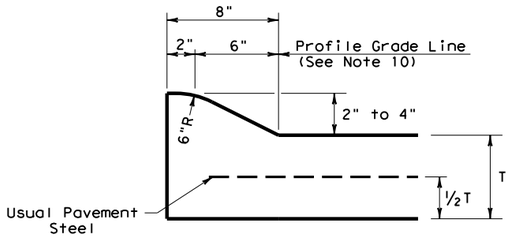
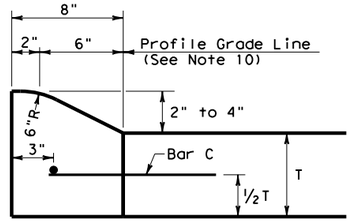
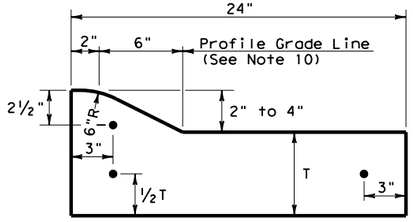


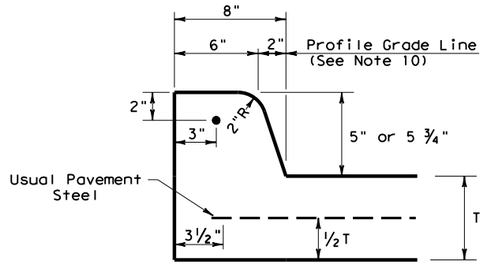
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



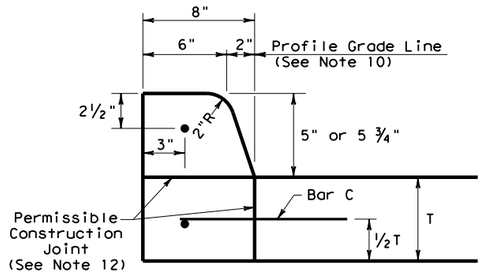
TYPE I CURB
2" - 4" HEIGHT



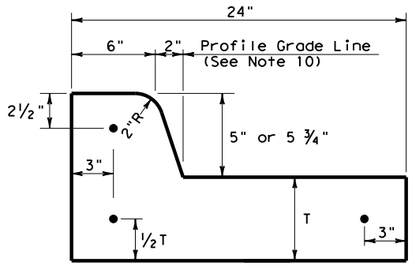
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



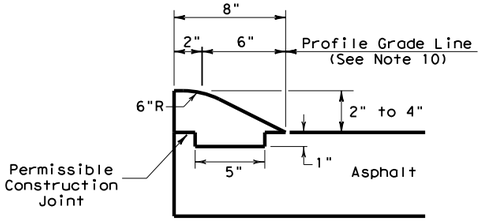
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



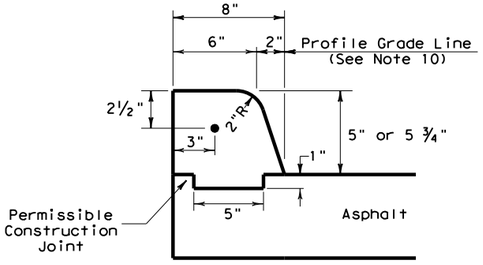
TYPE II CURB
5" - 5 ¾" HEIGHT



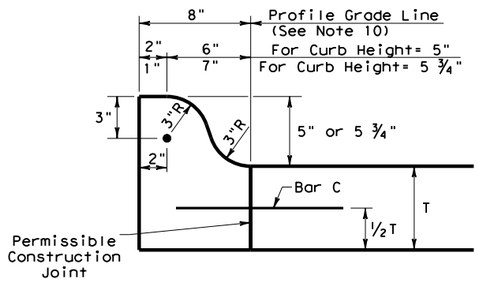
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



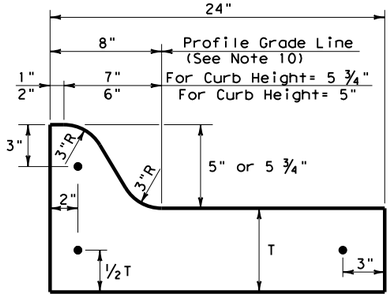
TYPE III CURB (KEYED)
2" - 4" HEIGHT



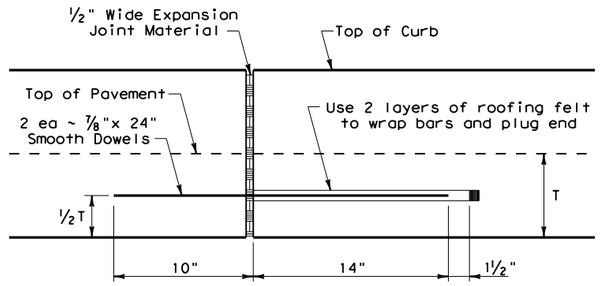
TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



TYPE IIa CURB
5" - 5 ¾" HEIGHT

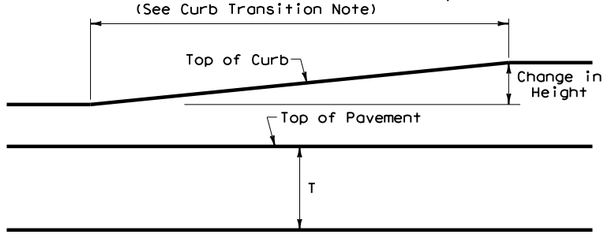


TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

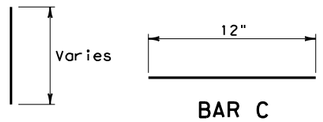
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

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



BAR B

BAR C

Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-21

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: SS	CK: KM
© TxDOT: FEBRUARY 2021 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		73

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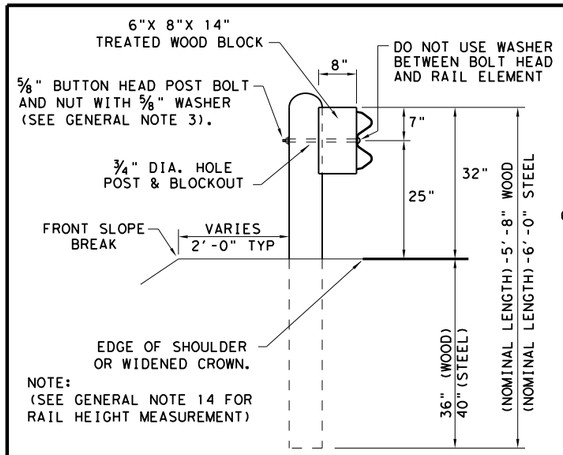
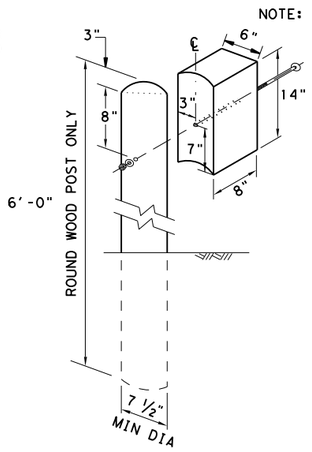
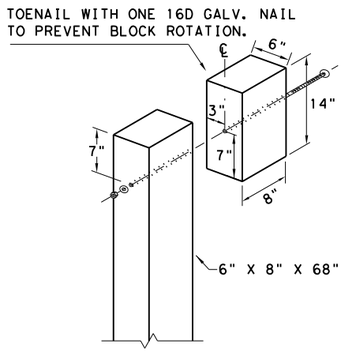


TYPICAL POST PLACEMENT

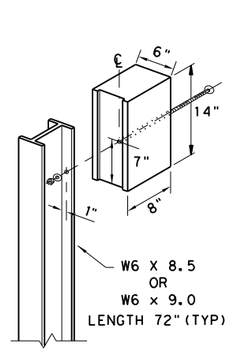


WOOD BLOCK TO ROUND WOOD POST

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

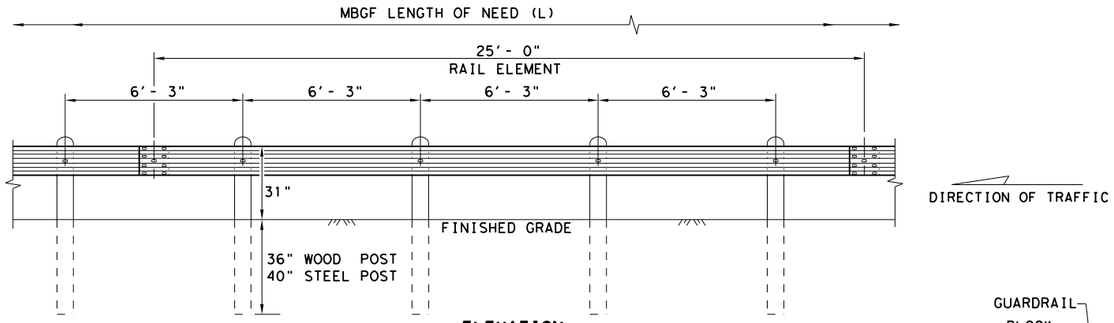


WOOD BLOCK TO RECTANGULAR WOOD POST



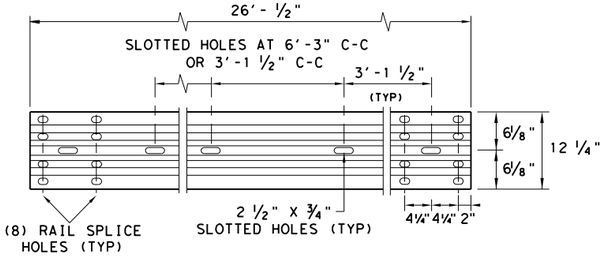
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



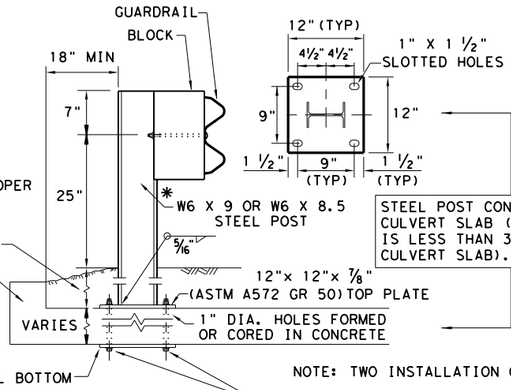
ELEVATION MID-SPAN RAIL SPLICE

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



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

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



LOW FILL CULVERT POST

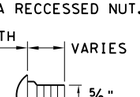
NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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

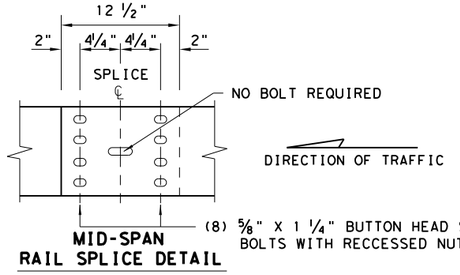


FBB01 = 1 ¼"
FBB02 = 2"

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

BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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

GENERAL NOTES

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

Texas Department of Transportation — Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
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	22	VAL VERDE, etc.		74

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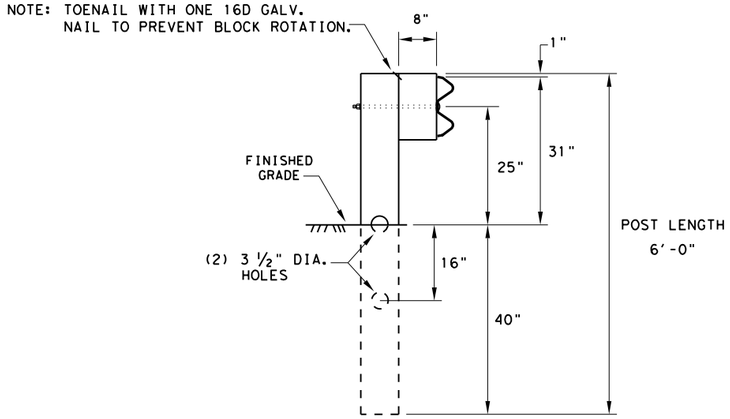
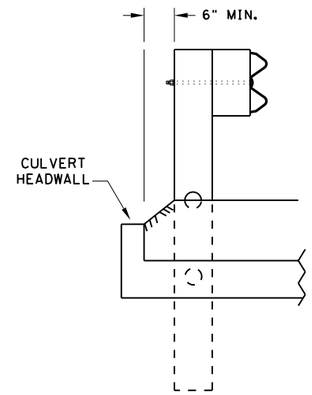


RECTANGULAR CRT POST (6"X 8" X 6' LONG)

(6) CRT REQUIRED
SEE ELEVATION DETAIL FOR LOCATIONS



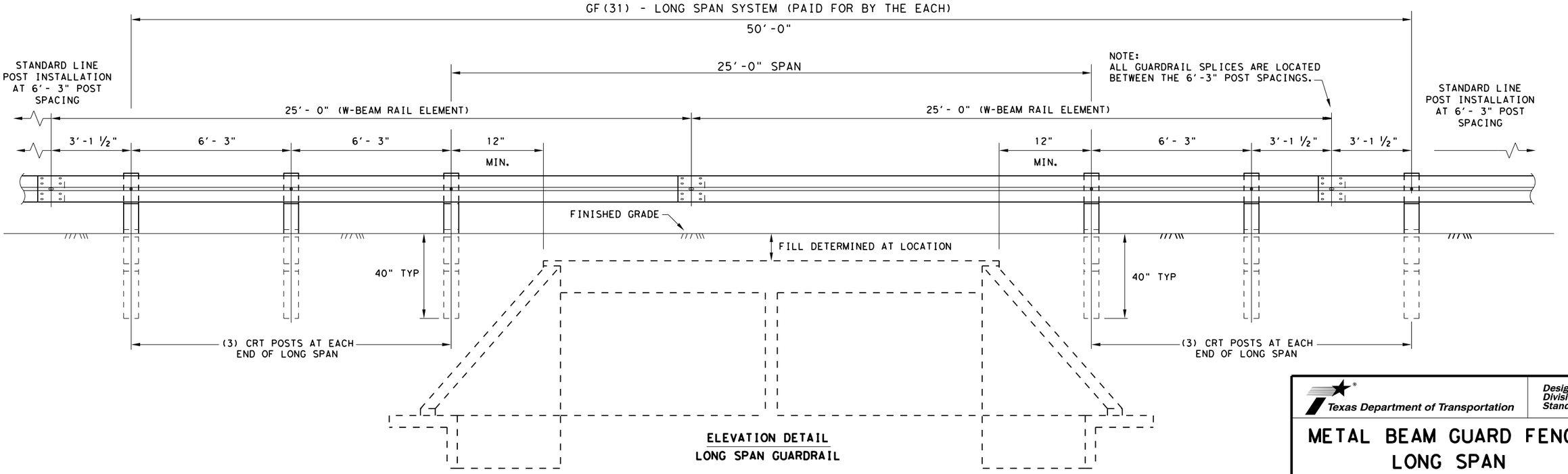
LATERAL OFFSET BETWEEN THE GUARDRAIL AND THE CULVERT HEADWALL

GENERAL NOTES

1. THE TYPE OF LINE POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF THE TRANSITIONS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT SHALL MEET ALL REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 12'- 6" OR 25'- 0" NOMINAL LENGTHS.
3. RAIL POST HOLES ARE OFFSET 3'- 1 ½" FROM STANDARD GUARDRAIL TO ACCOMMODATE THE MIDSPAN SPLICING.
4. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NO MORE THAN 1" BEYOND IT.
5. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
7. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
8. REFER TO GF(31) STANDARD SHEET FOR ADDITIONAL DETAILS.
9. FLAME CUTTING OF HOLES IN GUARDRAIL SHALL NOT BE PERMITTED. IF YOU ENCOUNTER MIS-ALIGNED BOLT HOLES IN GUARDRAIL CONTACT THE DESIGN DIVISION FOR ADDITIONAL INFORMATION & OPTIONS.

NOTE: SEE GF(31) STANDARD FOR STANDARD LINE POSTS.

DIRECTION OF TRAFFIC



ELEVATION DETAIL
LONG SPAN GUARDRAIL

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE LONG SPAN TL-3 MASH COMPLIANT

GF(31)LS-19

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©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
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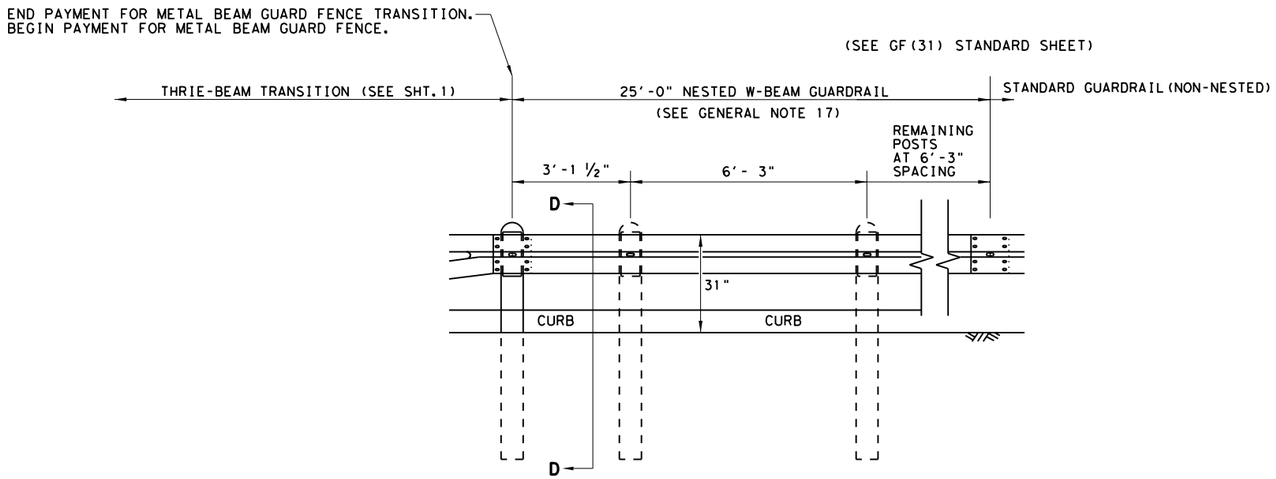
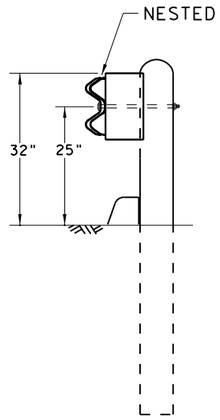
	22	VAL VERDE, etc.		75	

DATE: 4/22/2022
FILE: c:\txdot\pw_online\txdot5\juan.gomez\d0650879\gf31trt1320.dgn

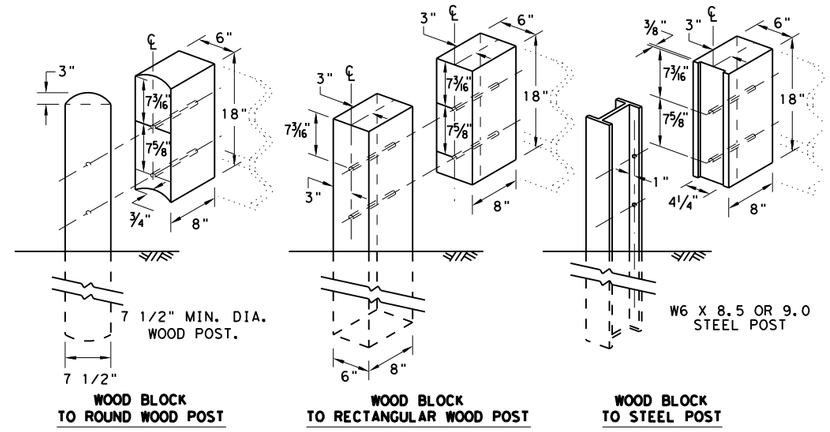
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG
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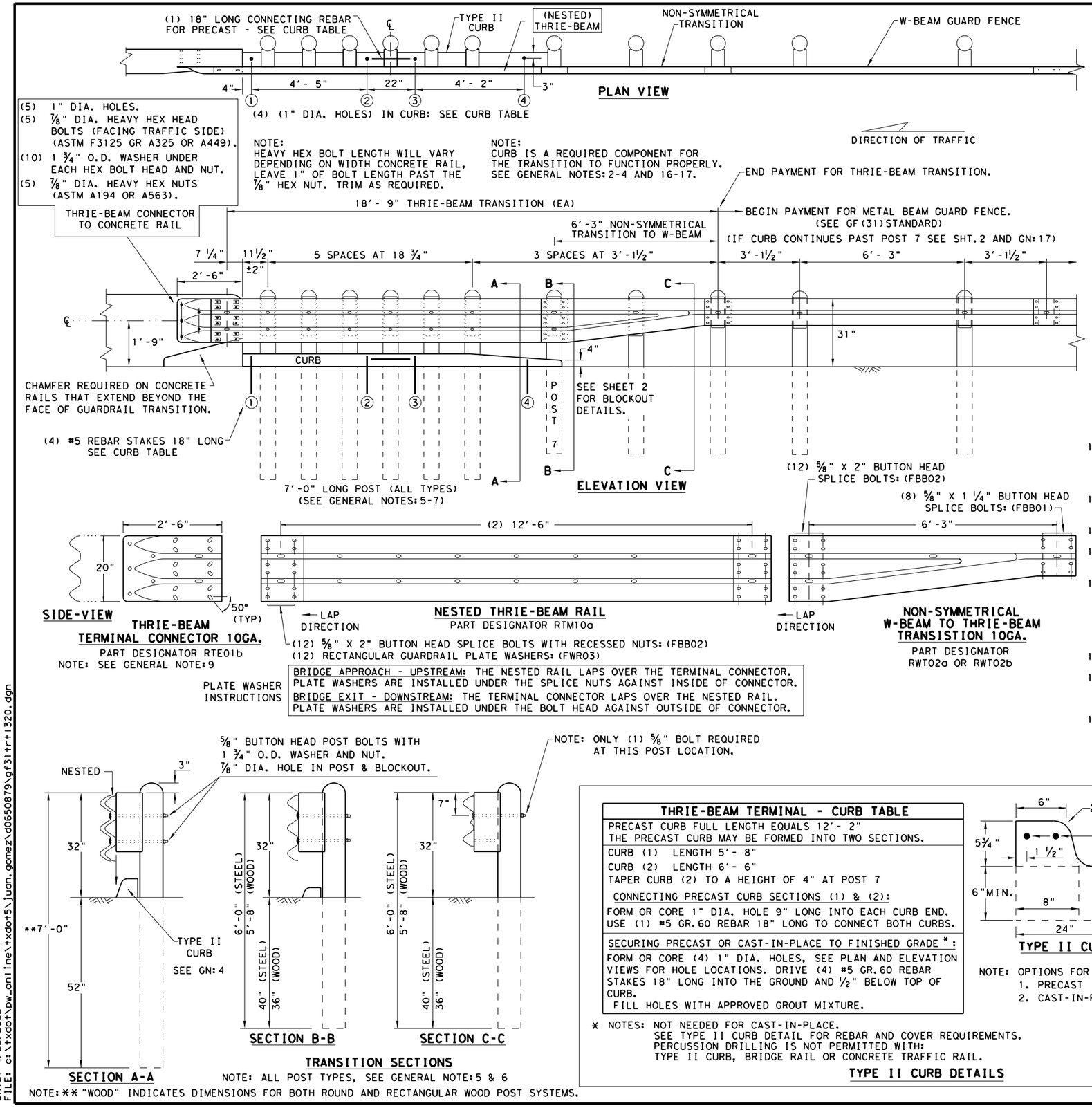


GENERAL NOTES

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 CCCG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE: 17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
3. CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
4. UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
5. FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 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.

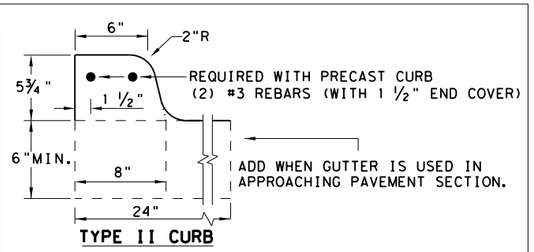
THRIE-BEAM TERMINAL - CURB TABLE

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.



TYPE II CURB

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

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

TYPE II CURB DETAILS

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
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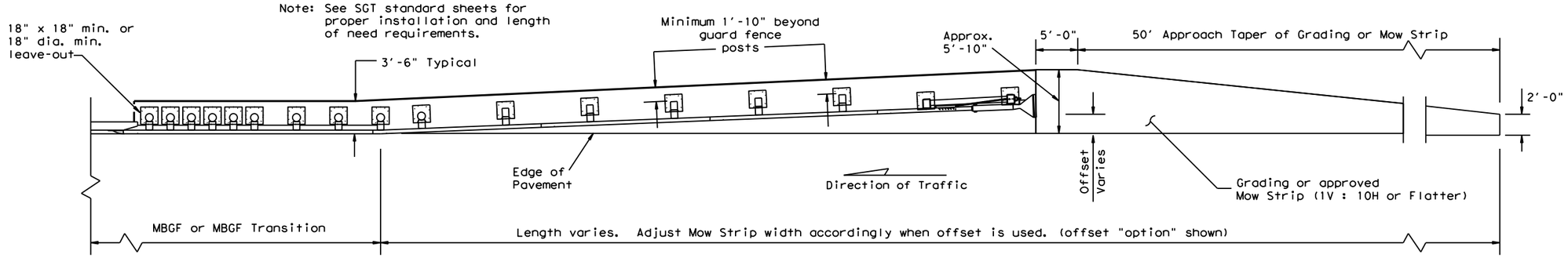
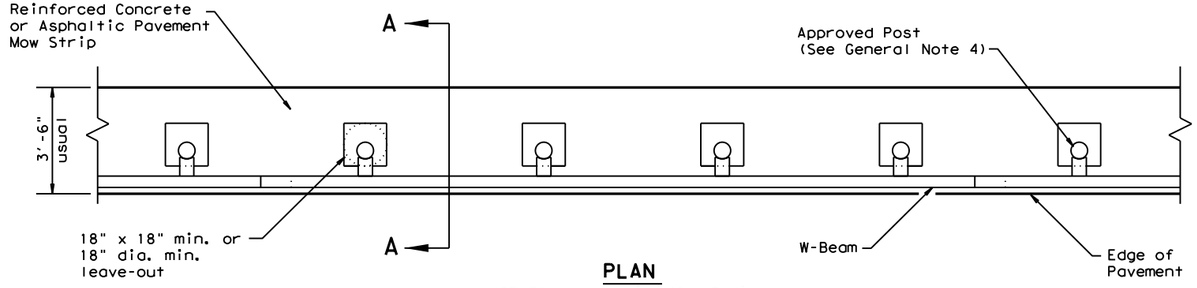
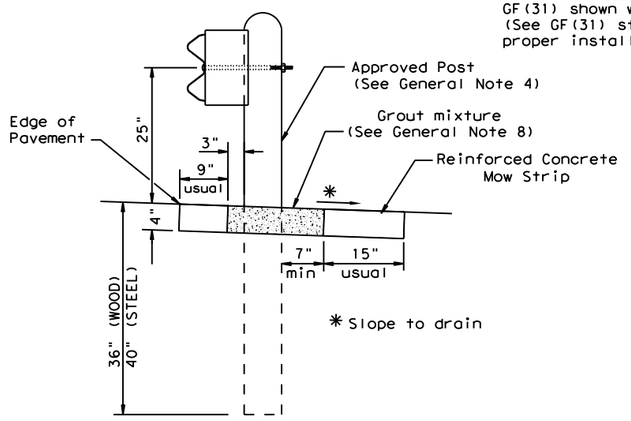


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



PLAN

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

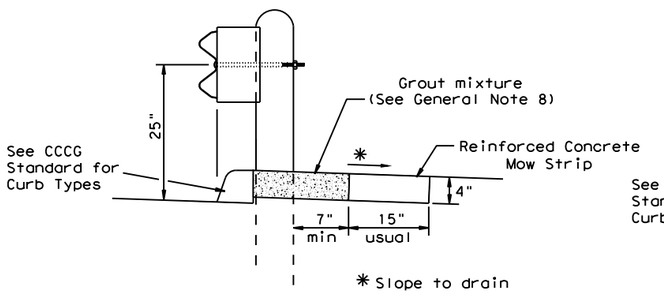


SECTION A-A

Typical

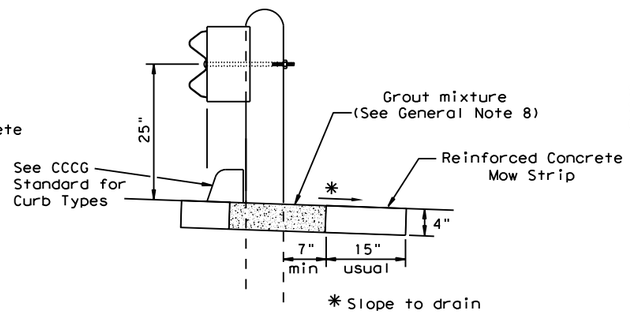
MOW STRIP DETAIL

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



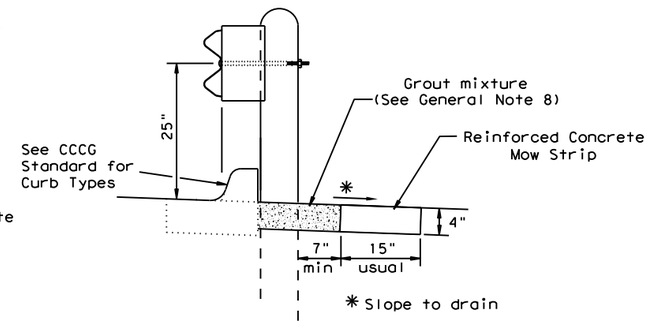
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

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

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

GENERAL NOTES

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

Texas Department of Transportation | Design Division Standard

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

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		78

DATE: 4/22/2022
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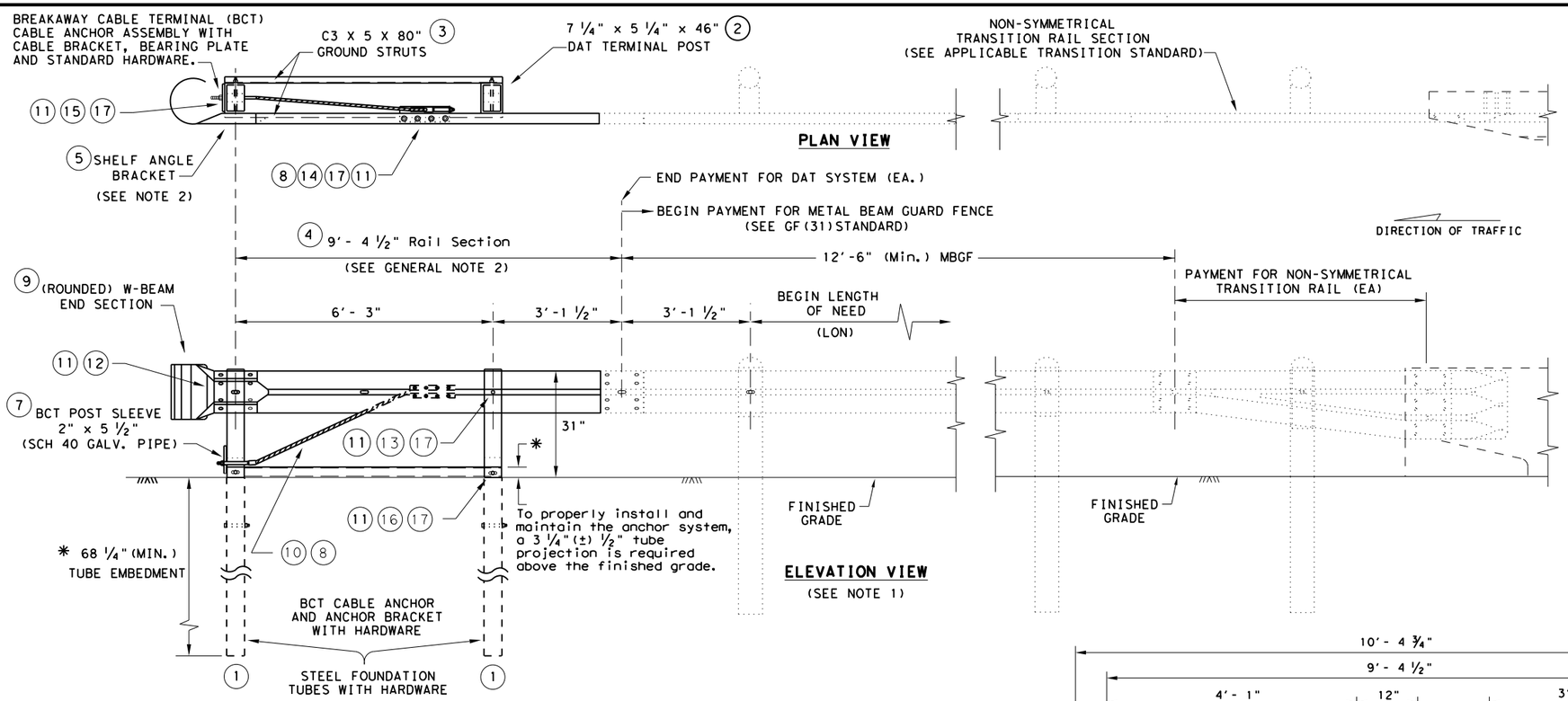


DOWNSTREAM ANCHOR TERMINAL (DAT)

NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

GENERAL NOTES

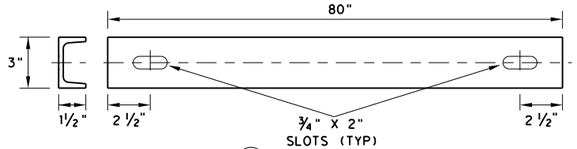
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 3 3/4" ABOVE THE FINISHED GRADE.
4. ALL HARDWARE FOR DAT SHALL BE ASTM A307 UNLESS OTHERWISE SHOWN.
5. REFER TO GF(31) SHEET FOR TERMINAL CONNECTION DETAILS.

MOW STRIP INSTALLATION

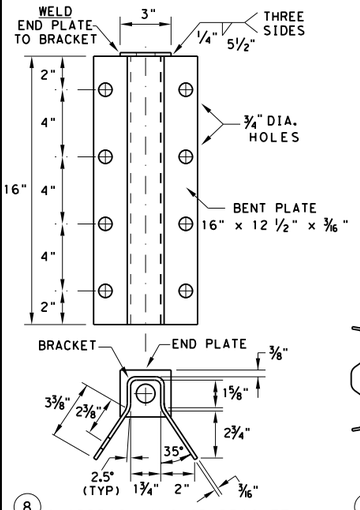
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(DAT) PARTS LIST	QTY
(1)	STEEL FOUNDATION TUBE	2
(2)	DAT TERMINAL POST	2
(3)	CHANNEL STRUT	2
(4)	TERMINAL RAIL ELEMENT	1
(5)	SHELF ANGLE BRACKET	1
(6)	BCT BEARING PLATE	1
(7)	BCT POST SLEEVE	1
(8)	GUARDRAIL ANCHOR BRACKET	1
(9)	(ROUNDED) W-BEAM END SECTION	1
(10)	BCT CABLE ANCHOR	1
(11)	RECESSED NUT, GUARDRAIL	20
(12)	1 1/4" BUTTON HEAD BOLT	4
(13)	10" BUTTON HEAD BOLT	2
(14)	5/8" X 2" HEX HEAD BOLT	8
(15)	5/8" X 8" HEX HEAD BOLT	4
(16)	5/8" X 10" HEX HEAD BOLT	2
(17)	5/8" FLAT WASHER	18

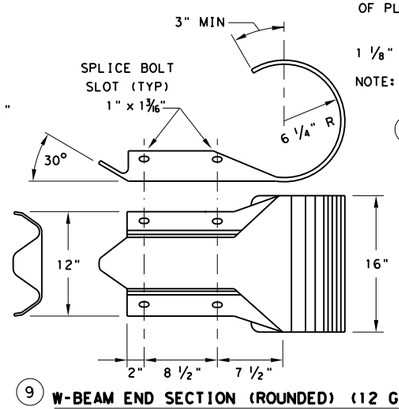
(4) TERMINAL RAIL ELEMENT FOR DAT



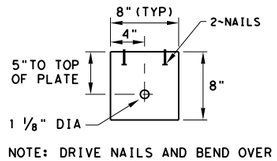
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



(8) GUARDRAIL ANCHOR BRACKET

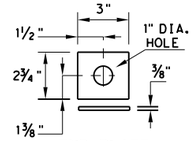


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

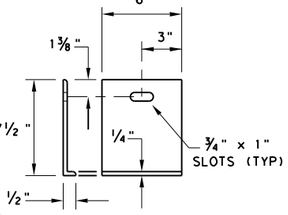


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

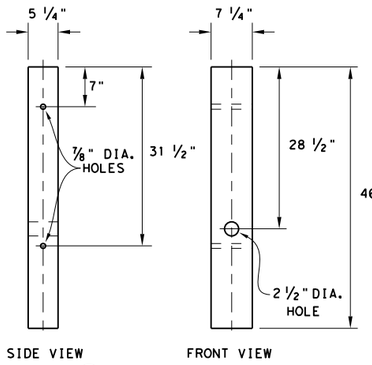
(6) BEARING PLATE
8"x 8"x 5/8" R



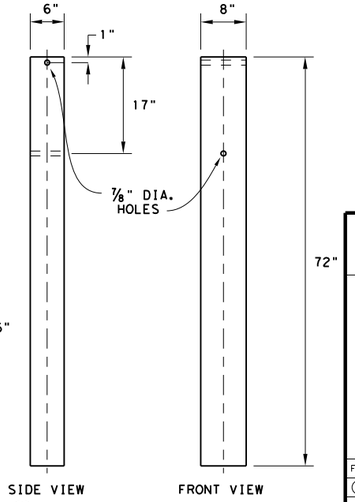
END PLATE



(5) SHELF ANGLE BRACKET



(2) TERMINAL POST
7 1/4"x 5 1/4"x 46" WOOD POST



(1) STEEL FOUNDATION TUBE
6"x 8"x 1/8" x 72" STEEL TUBE

Texas Department of Transportation — Design Division Standard

METAL BEAM GUARD FENCE
(DOWNSTREAM ANCHOR TERMINAL)
TL-3 MASH COMPLIANT

GF(31)DAT-19

FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		79

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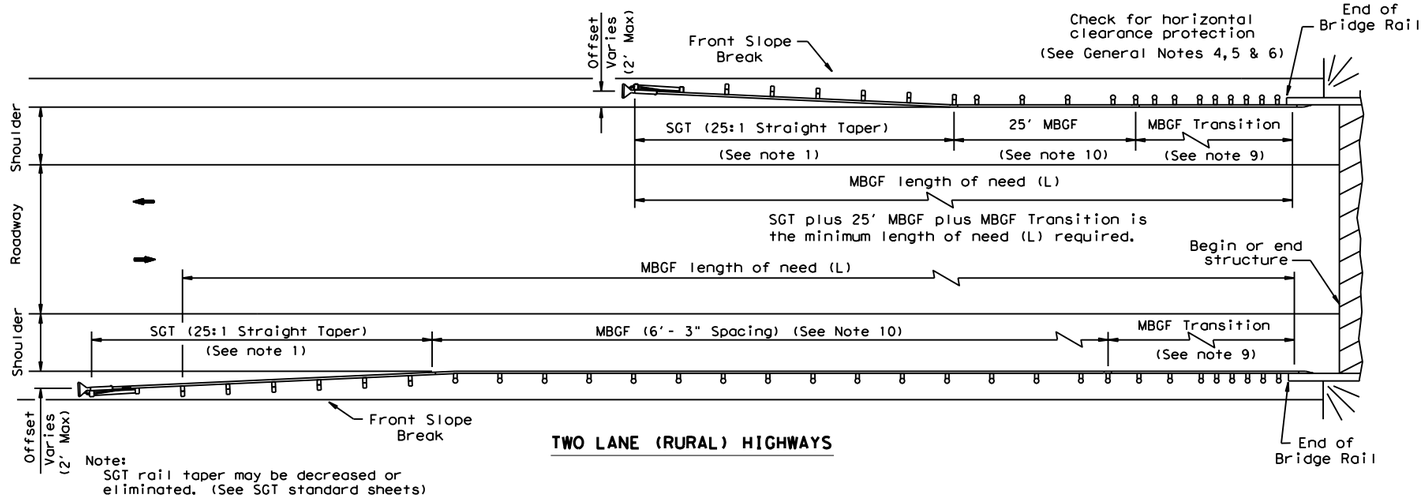
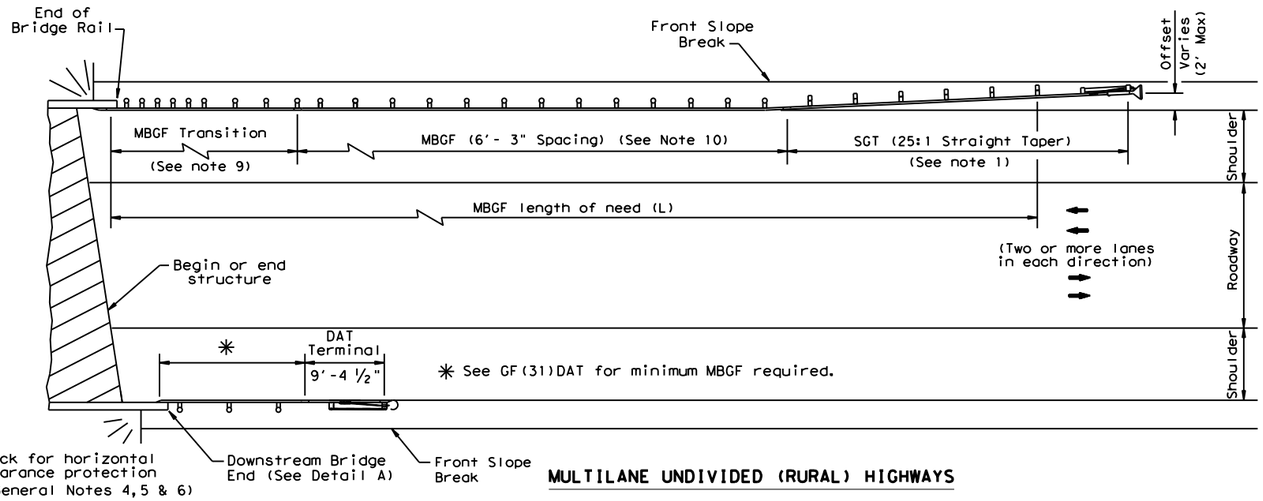
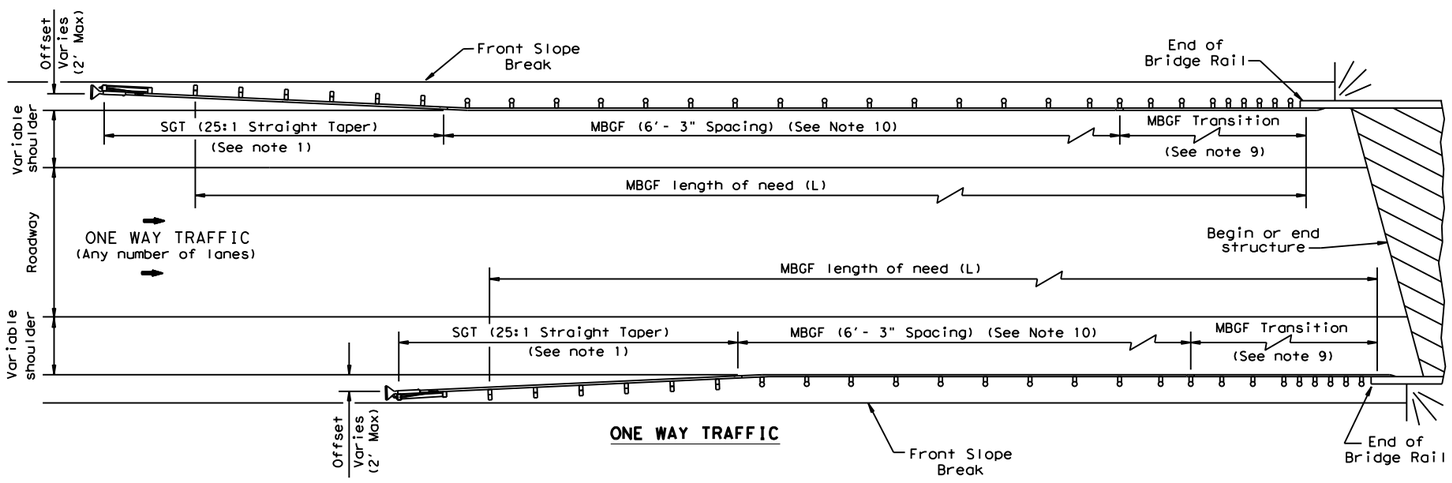


TWO LANE (RURAL) HIGHWAYS

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



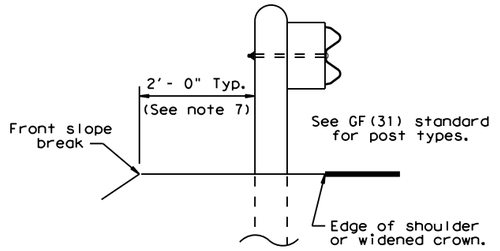
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



ONE WAY TRAFFIC

GENERAL NOTES

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



TYPICAL CROSS SECTION AT MBGF

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

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		80

DATE: 4/22/2022
FILE: c:\txdot\pw_online\txdot5\juan.gomez\d0650879\sgt10s3116.dgn

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

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

LINE AT THE BACK OF POST #2 THRU #8

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

ANCHOR PADDLE PN: 15204A

ANGLE STRUT PN: 15202G

16"

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(2) POST(1) POST(0)

PLAN VIEW

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

BEGIN LENGTH OF NEED

DO NOT BOLT ANCHOR RAIL TO - POST (2)

SEE DETAIL 1

TRAFFIC FLOW

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

BEGIN STANDARD MBGF

END PAYMENT FOR SGT

6¼" 3'-1 ½" 6'-3" 6'-3"

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

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

OUTSIDE SLOTS CUTOUT (2)1½" X 6'-9 ⅝"

MBGF LAPPED IN DIRECTION OF TRAFFIC FLOW

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

SoftStop ANCHOR RAIL (12GA) PN: 15215G

SoftStop FACE SEE GN(3) & NOTE: B

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

ANCHOR PADDLE PN: 15204A

END OF ANCHOR RAIL PN: 15215G

SEE NOTE: A

SEE NOTE: C

POST 32" HEIGHT

31"

RAIL HEIGHT

RAIL 25'-0" PN: 61G

RAIL 25'-0" PN: 15215G

DO NOT BOLT ANCHOR RAIL TO POST(2)

SEE DETAIL 2

SEE DETAIL 3

13/16" DIA. YIELDING HOLES

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

POST 40" DEPTH (TYP 1-8)

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

POST(2) 6'-0" (SYTP) PN: 15000G

POST(1) 4'-9 ½" SYTP PN: 15203G

6'-1⅜"

POST(0) 6'-5 ⅜" PN: 15205A

ELEVATION VIEW

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

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

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

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

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

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

8" 6" 14"

⅝" HGR NUT PN: 3340G

⅝" X 10" HGR POST BOLT PN: 3500G

13/16" DIAMETER YIELDING HOLES LOCATED IN FLANGES

FINISHED GRADE

(HOLES APROXIMATELY CENTERED AT FINISHED GRADE)

ISOMETRIC VIEW POST(1 & 2)

W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

(1) ⅝" x 1 ¾" HEX HD BOLT PN 3391G

ANGLE STRUT PN: 15202G

(2) ⅝" WASHERS PN 4372G

(1) ⅝" HGR HEX NUT PN 3340G

DETAIL 1

SHOWN AT POST(1) NEAR GROUND

(1) ⅝" HEX NUT

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

(2) ⅝" ROUND WASHERS PN: 3240G

DETAIL 2

SHOWN AT POST(1)

ANCHOR KEEPER PLATE (24 GA) PN: 15207G

ANCHOR PLATE WASHER ½" THICK PN: 15206G

1" ROUND WASHER F463 PN: 4902G

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

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

(2) ⅝" ROUND WASHER (WIDE) PN: 3240G

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

ANCHOR PADDLE PN: 15204A

(2) ⅝" HEX NUT A563 GR.DH PN: 3245G

W-BEAM FLATTENED (4 PLIES)

ANGLE STRUT PN: 15202G

SEE NOTE: A

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

(4) ¾" FLAT WASHER (TYP) PN: 3701G

(2) ¾" HEX NUT (TYP) PN: 3704G

(2) ANCHOR POST ANGLE PN: 15201G

6'-1 ⅜" POST DEPTH

DETAIL 3 AT POST(0)

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

TRAFFIC FLOW

W-BEAM RAIL 25'-0"

6" X 8" X 14" BLOCKOUT WOOD

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

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

FINISHED GRADE

SECTION VIEW B-B

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

W-BEAM RAIL 25'-0"

6" X 8" X 14" BLOCKOUT WOOD

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

POST(2)

FINISHED GRADE

SECTION VIEW A-A

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

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

POST 17"- ½" HEIGHT

4'-9 ½"

13/16" DIA. YIELDING HOLES

40"

POST(1)

FRONT VIEW POST(1)

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

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

2'-0"

STANDARD MBGF

EDGE OF PAVEMENT

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

2'-0" MAX. RAIL OFFSET

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt10s3116	DN: TxDOT		CK: KM	DW: VP		CK: MB/VP
©TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0022	05	025		US 90, etc.	
	DIST	COUNTY			SHEET NO.	
	22	VAL VERDE, etc.			81	

DATE: 4/22/2022
FILE: c:\txdot\pw_online\txdot5\juan.gamez\d0650879\sgt11s3118.dgn

(SEE GN NOTE 15)
STANDARD 31" MBGF

ITEM (6)
INNER SIDE SLIDER
(ISS) PANEL FOR RAIL 3

FIELD-SIDE
(RAIL 3)

NOTE:
RECESSED HEX NUTS FACING
TRAFFIC-SIDE **SEE DETAIL (C)**

REFERENCE LINE USED TO INSTALL
LINE POST(9) THRU POST(2)

POST 1 OFFSET DISTANCE MEASURED
7-⅝" FROM REFERENCE LINE

POST 9 POST 8 POST 7 POST 6 POST 5 POST 4 POST 3 POST 2

ITEM (10)
CABLE ASSEMBLY

ITEM (2)
GROUNDSTRUT

NO BLOCKOUT
AT (POST 1)

RAIL 4 RAIL 3 RAIL 2 RAIL 1

CABLES

NOTES:
1. ITEM (12) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST(9) THRU LINE POST(2).
2. DO NOT INSTALL A BLOCKOUT AT LINE POST(1).

PLAN VIEW

ITEM (5)
TRAFFIC SIDE SLIDER
(TSS) PANEL FOR RAIL 2

NOTE: SECURE THE (TSS) PANEL TO OUTSIDE OF RAIL 2 WITH THE PANEL ARROWS POINTING TOWARDS THE HEAD.

INSTALL GUARD FENCE RECESSED
HEX NUTS ON TRAFFIC-SIDE

MBGF
RAIL 2

MBGF
RAIL 1

DETAIL (C)

TRAFFIC FLOW

ITEM (25)
MAX-TENSION HEAD
SEE DETAIL (A)

END PAYMENT (SGT) BY EACH

DO NOT BOLT
RAIL TO POST 6

BEGIN LENGTH OF NEED

INSTALLATION LENGTH 55'- ½"

49'-8 9/16"

6'-3" 6'-3" 6'-3" 6'-3/4" 6'-3" 6'-3" 6'-3" 37½" 5'-3 11/16"

RAIL HEIGHT 31"

ARROWS

RAIL HEIGHT 31"

HEAD HEIGHT

DETAIL (B)

32-¼"

ITEM (13) RAIL 4 ITEM (13) RAIL 3 ITEM (13) RAIL 2 ITEM (13) RAIL 1

DETAIL (D)

CABLES

FINISHED GRADE FINISHED GRADE

ITEM (10)
CABLE ASSEMBLY

ITEM (2)
GROUNDSTRUT

68-⅛"

POST 9 POST 8 POST 7 POST 6 POST 5 POST 4 POST 3 POST 2

POST 1
ITEM (4)
I-BEAM
W6 X 9

NO BLOCKOUT
AT (POST 1)

SOIL
ANCHOR POST
ITEM (1)

(8) X-LITE LINE POST - ITEM (11)

ELEVATION VIEW

A

A

TSS PANEL
GALVANIZED
ITEM (5)

RSS PLATE
GALVANIZED
ITEM (8)

INSTALL THE TSS AND RSS
WITH THE ARROWS POINTING
TOWARDS THE MAX-HEAD

TSS PANEL AND RSS PLATE
DETAIL (D)

NOTE:
USE THE MASH APPROVED
X-TENSION CABLE ASSEMBLY.

7 5/16"

2 1/8"

UPPER CABLE
(BACK SIDE)

LOWER CABLE
(TRAFFIC SIDE)

DETAIL (B)

HEAD HEIGHT 32-¼"

TOP OF POST

31-⅞"

FINISHED GRADE

40-⅛"

68-⅛"
ANCHOR POST
DEPTH

ITEM (1)
ANCHOR

ITEM (11)
LINE POSTS
2 THRU 9
(NOTE: ITEM (4) POST 1 (NOT SHOWN),
TO BE INSTALLED AT SAME DEPTH
AS LINE POSTS.)

SOIL ANCHOR, POST 1
& LINE POST 2 THRU 9

SECTION VIEW A-A

CABLE
FRICTION PLATE
HEAD UNIT
ITEM (9)

NOTE:
INSTALL ⅝" RECESSED HEX
NUTS ON TRAFFIC SIDE.

ITEM (24)
ITEM (21)

ITEM (20)
8X

ITEM (17)
8X

ITEM (23)
6X
3 SCREWS
EACH SIDE

(RAIL 1)

ITEM (22)
BRACKET
SHIPPED FLAT

ITEM (3)

ITEM (16)
4X

* ITEM (25)
HIGH INTENSITY
REFLECTIVE SHEETING

NOTE: DELINEATION MARKER IN
ACCORDANCE WITH TEXAS MUTCD.

SPLICE FOR IMPACT-HEAD
TO GUARD FENCE (RAIL1)

DETAIL (A)

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

STANDARD
MBGF

2'-0"

EDGE OF PAVEMENT

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

2'-0" MAX.
RAIL OFFSET

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

TRAFFIC FLOW

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

GENERAL NOTES

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

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	⅝" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	¾" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	⅝" X 1 ¼" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	⅝" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	⅝" WASHER F436 STRUCTURAL MGAL	2
20	4001116	⅝" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	⅝" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	¼" X ¾" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
* 25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
** 26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
** 27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL,8-SPACE,12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

Texas Department of Transportation

Design Division Standard

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

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90,etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		82

DATE: 4/22/2022
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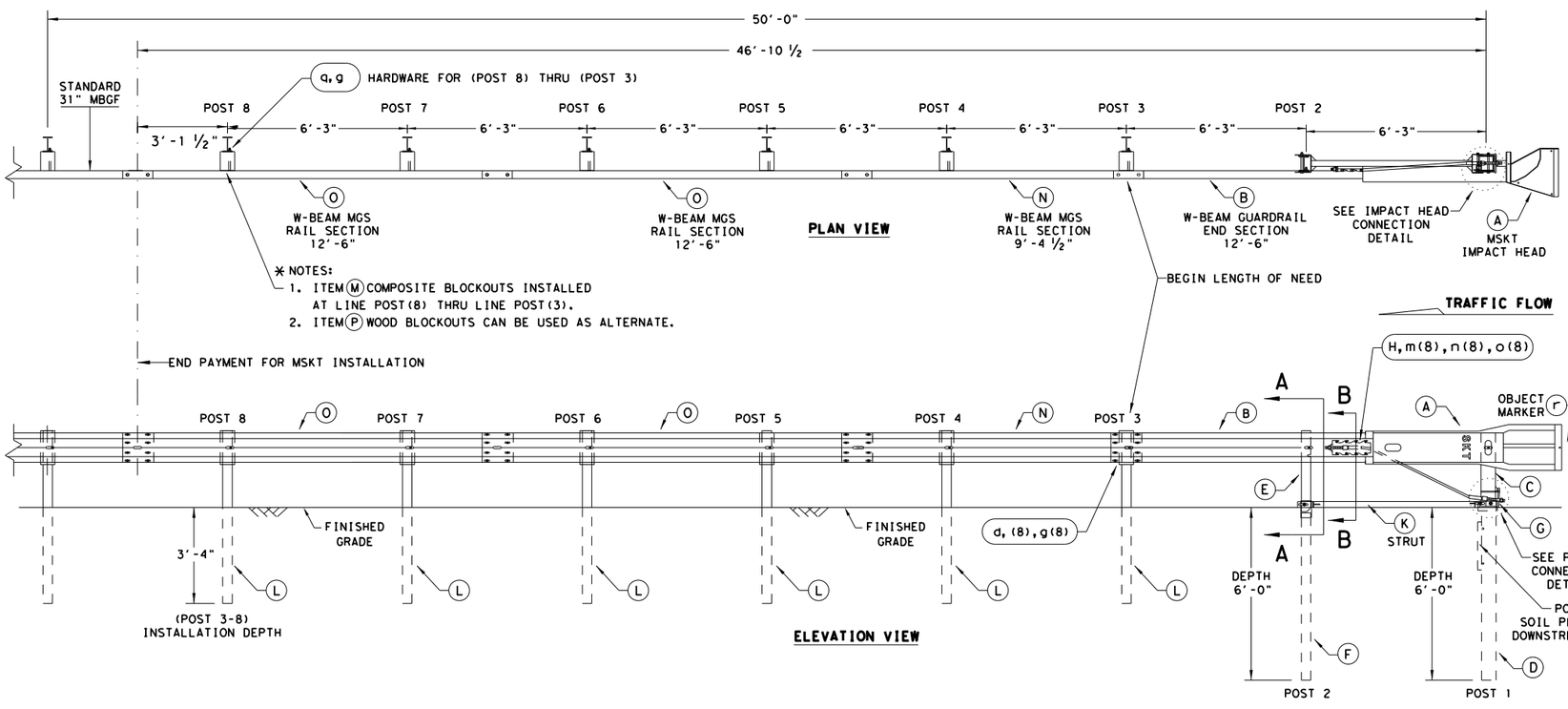
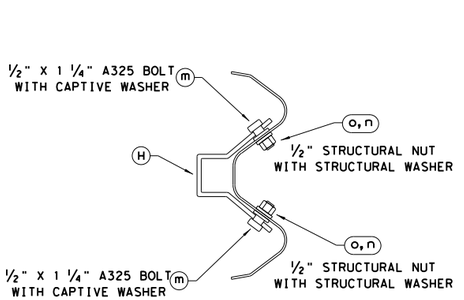
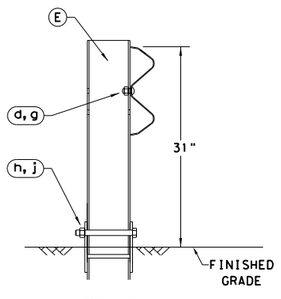
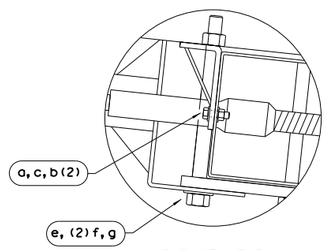
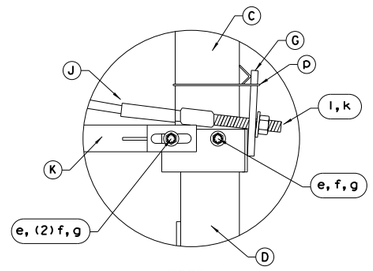


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.









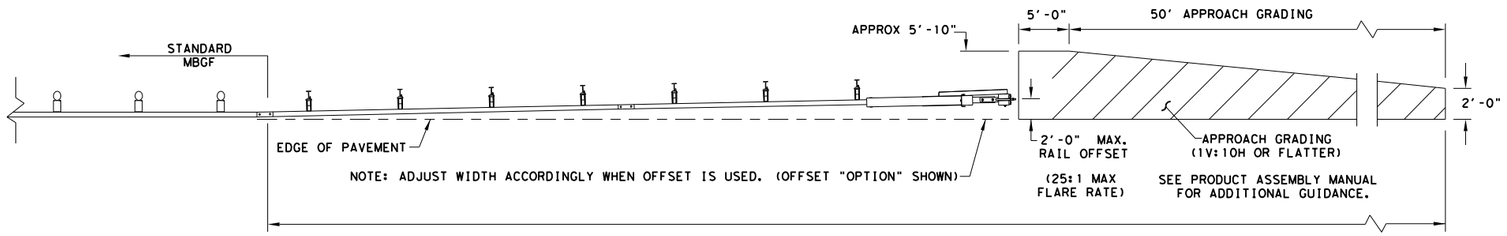
GENERAL NOTES

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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 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	5/16" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/16" WASHER	W0516
c	2	5/16" 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 1/16" O.D. x 9/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

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



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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL
MSKT-MASH-TL-3
SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
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	DIST	COUNTY		SHEET NO.	
	22	VAL VERDE, etc.		83	

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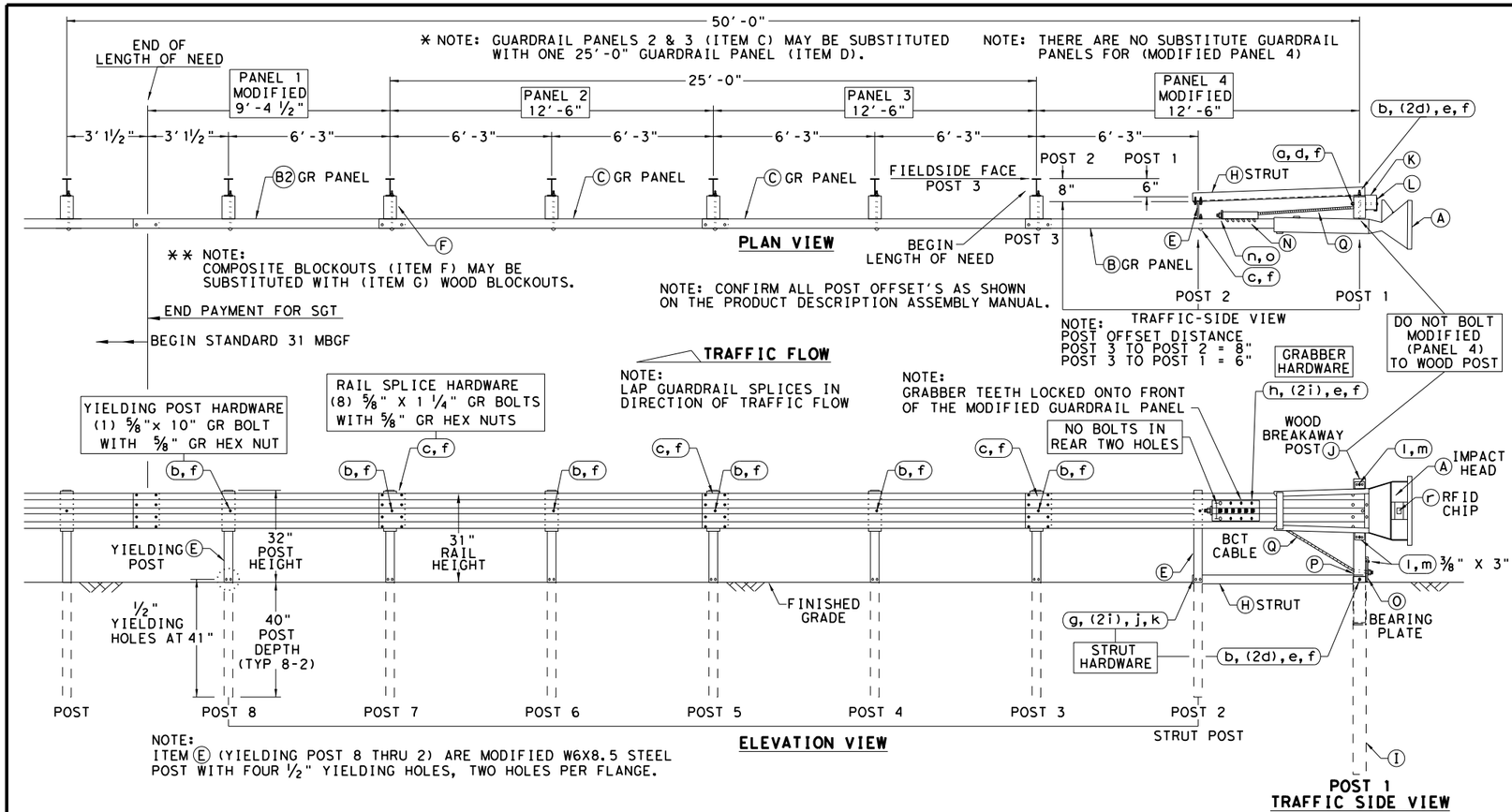
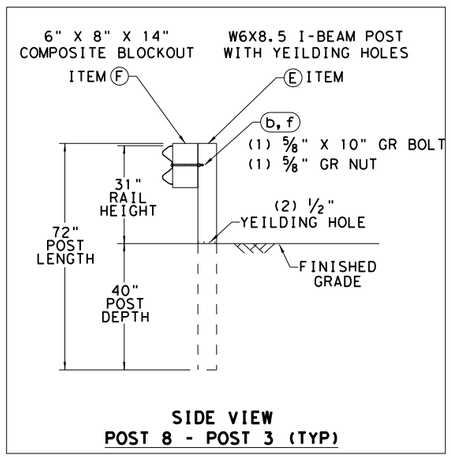


GENERAL NOTES

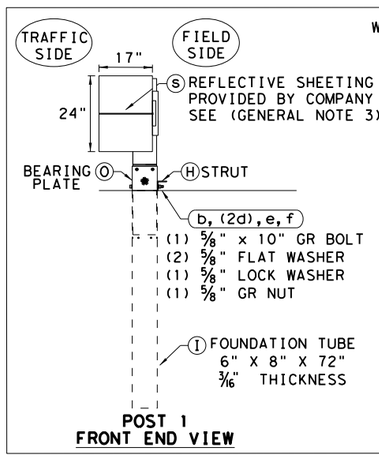
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

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

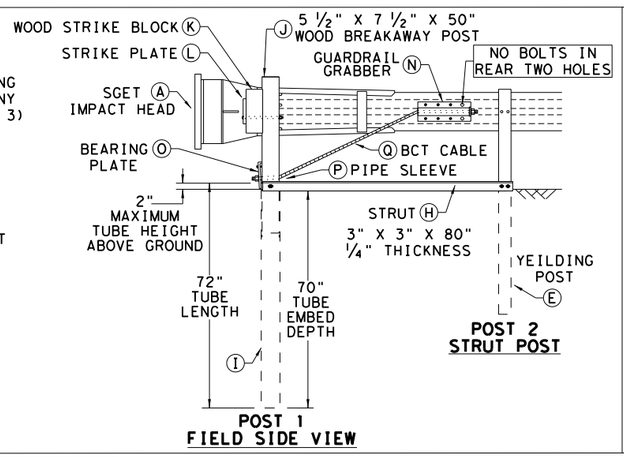
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



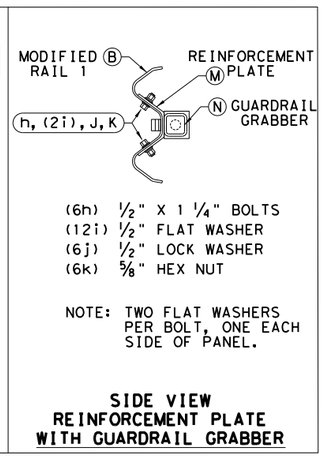
SIDE VIEW
POST 8 - POST 3 (TYP)



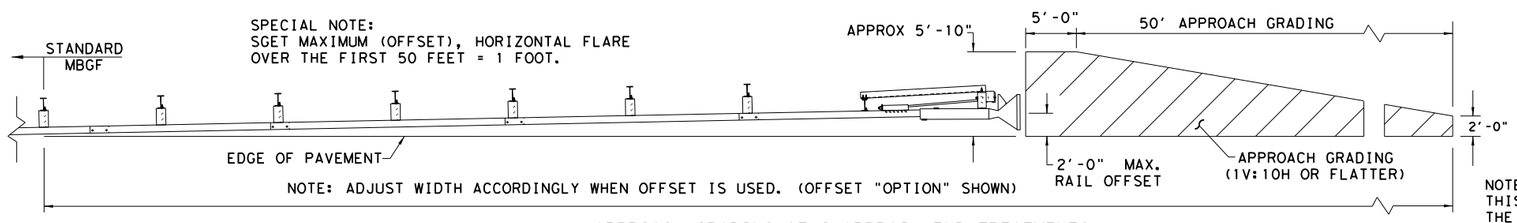
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation
Design Division Standard

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

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP		
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY		
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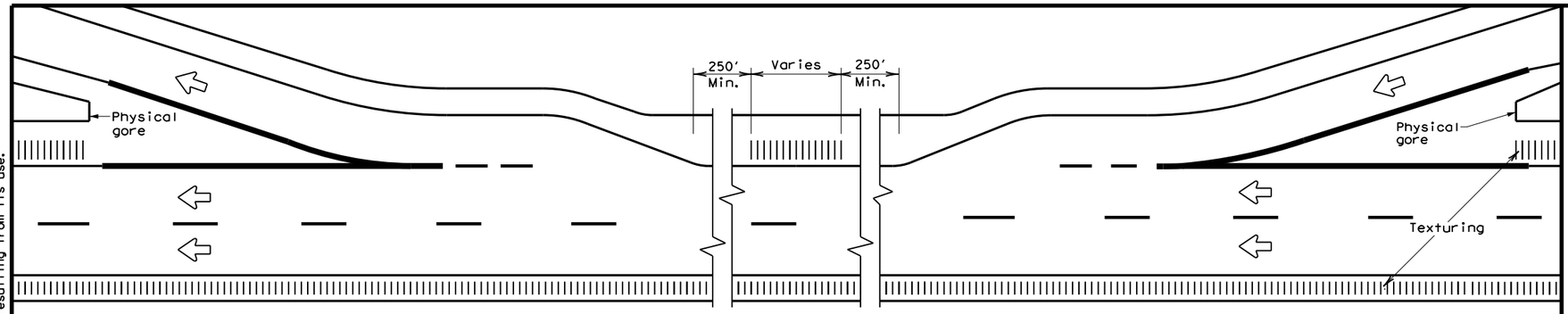
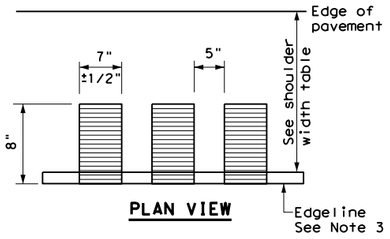
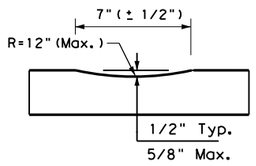
	DIST	COUNTY		SHEET NO.		
	22	VAL VERDE, etc.		84		



TYPICAL RUMBLE STRIP PLACEMENT AT EXIT AND ENTRANCE RAMPS

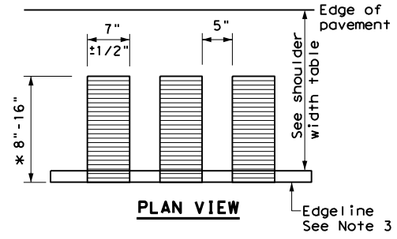


PLAN VIEW



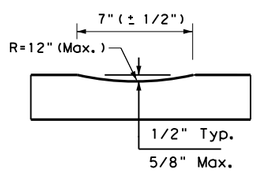
PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



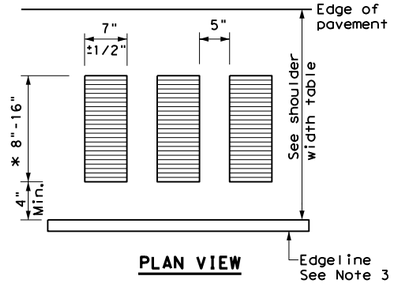
PLAN VIEW

* This distance may vary based on width of shoulder



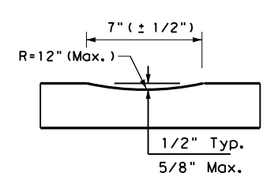
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



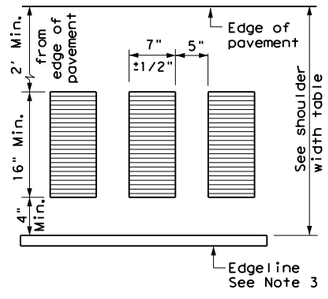
PLAN VIEW

* This distance may vary based on width of shoulder

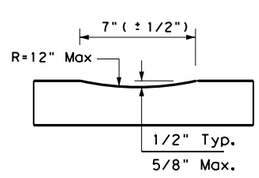


PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW



PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

GENERAL NOTES

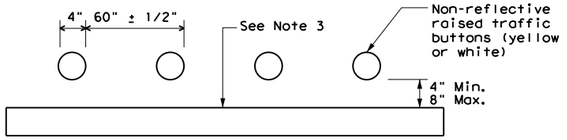
1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

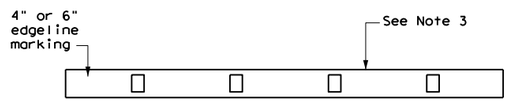
WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3, 5 or 6	Option 2, 4, 5 OR 6

Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON FREEWAYS AND DIVIDED HIGHWAYS
RS(1)-13

FILE: rs(1)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-10 10-13	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		85

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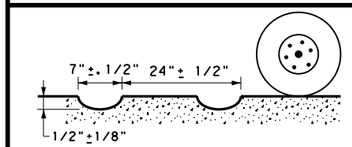
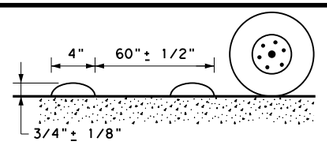
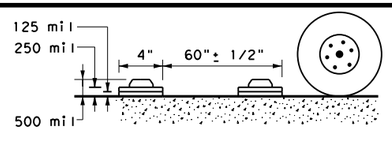
CENTERLINE RUMBLE STRIPS



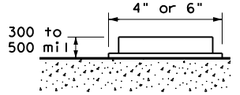
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

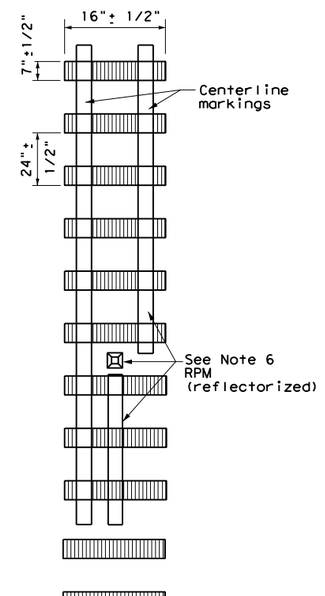


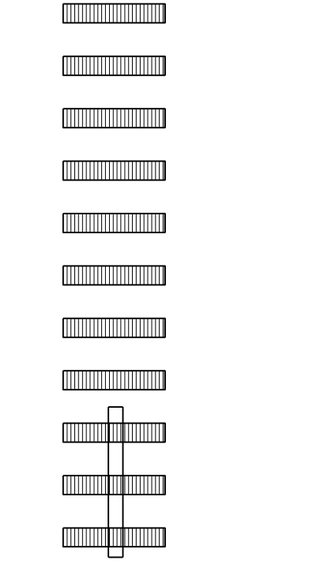
PREFORMED THERMOPLASTIC STRIPS



PROFILE MARKINGS

PROFILE VIEW

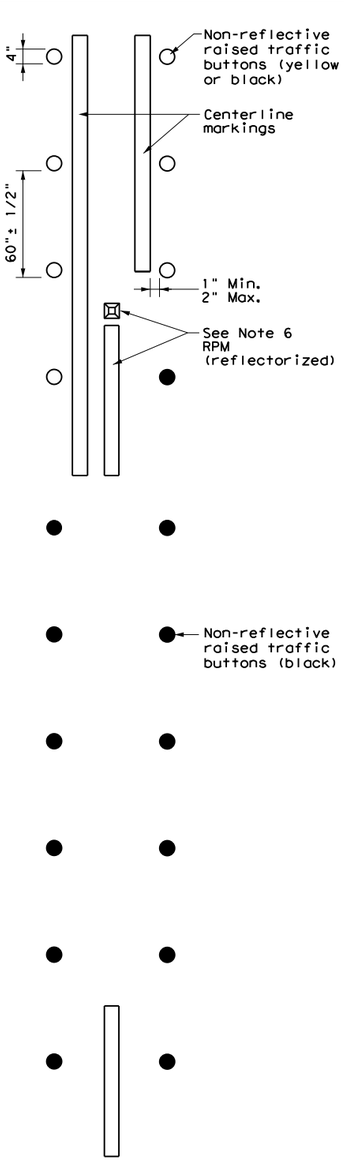




PLAN VIEW
OPTION 1

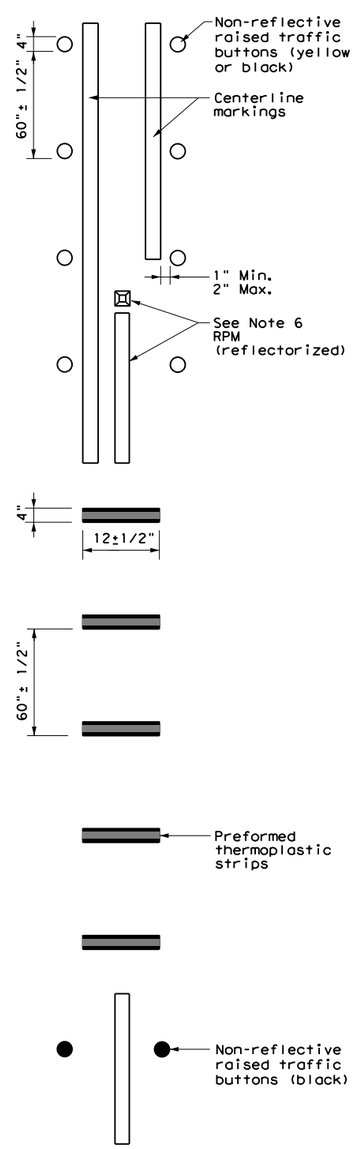
TWO LANE TWO-WAY ROADWAYS

MILLED CENTERLINE RUMBLE STRIPS



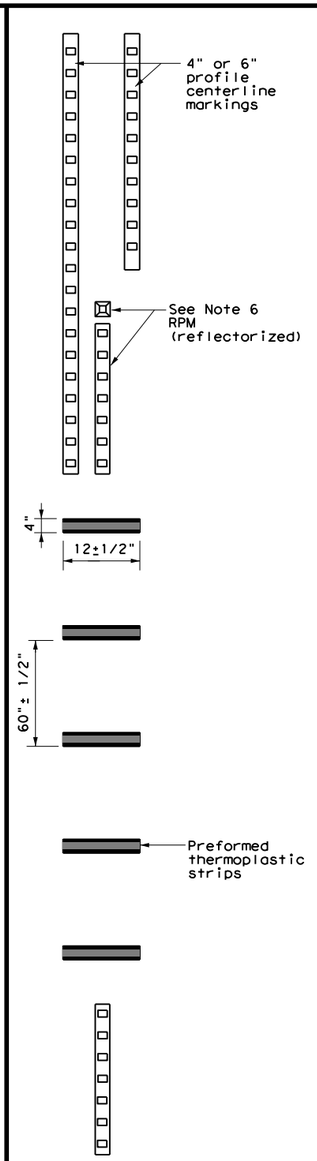
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW
OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

12. See standard sheet RS(4).

Texas Department of Transportation®
Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
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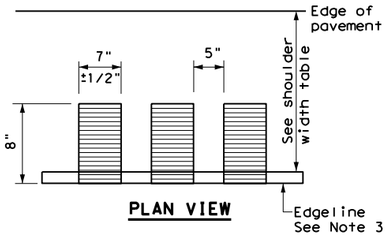
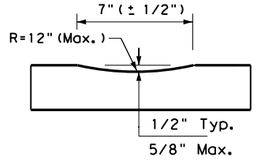
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		86

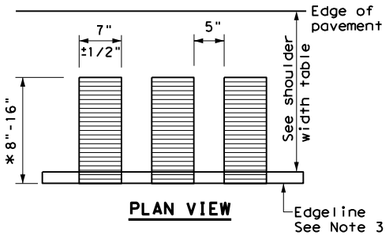


PLAN VIEW

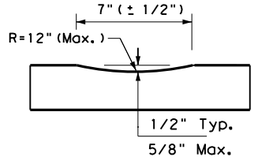


PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



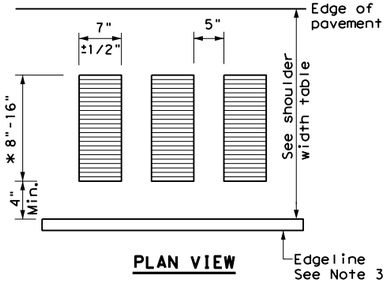
PLAN VIEW



* This distance may vary based on width of shoulder

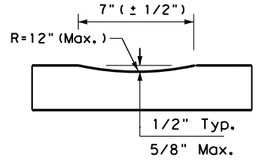
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



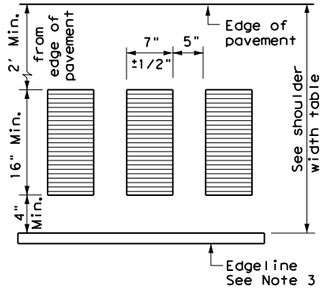
PLAN VIEW

* This distance may vary based on width of shoulder

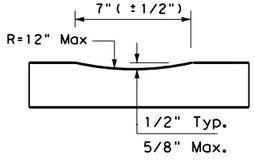


PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

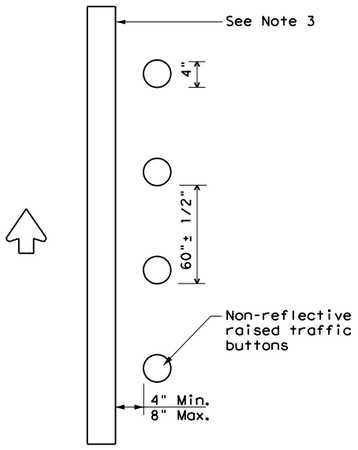


PLAN VIEW



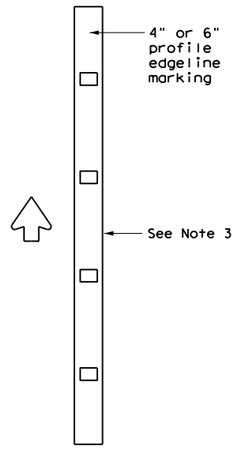
PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(4)-13

FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		87

DATE: 4/22/2022 2:54:12 PM
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SUMMARY OF SMALL DRAINAGE STRUCTURES (CROSSINGS)

REFERENCE LOACTION	STRUCTURE NUMBER	HIGHWAY	REFERENCE MARKER	DESCRIPTION OF CULVERTS			TABLE OF DIMENSIONS		
				EXISTING STRUCTURE	DETAIL TYPE	PROPOSED STRUCTURE	A	B	C
							FT	FT	FT
2	1	US 90	414+1.525(NB)(RT)	1-8' X 4' X 139' MBC TO BE MODIFIED W/WINGWALLS (RT)	1	1-8' X 4' X 123' W/1-S.E.T. RT	34.00	10.00	#
2	1	US 90	414+1.525(SB)(LT)	1-8' X 4' X 139' MBC TO BE MODIFIED W/WINGWALLS (LT)	2	1-8' X 4' X 123' W/2-S.E.T. LT	29.00	5.00	#
2	2	US 90	416+0.005(NB)(RT)	2-6' X 5' TO REMAIN W/1-WINGWALL (RT) TO BE REMOVED	4	2-6' X 5' W/1-S.E.T. RT	26.00	0.00	#
2	3	US 90	416+0.665(SB)(LT)	1-2' X 1.5' SBC TO BE MODIFIED W/1-WINGWALLS LT	3	1-2' X 1.5' SBC W/ 1 S.E.T LT	52.00	3.00	#

GENERAL NOTES:
CONTRACTOR WILL FIELD VERIFY THE SIZE OF ALL STRUCTURES TO BE EXTENDED/BREAK BACK BEFORE FABRICATING AND/OR ACQUIRING MATERIALS.

REMOVAL OF HEADWALL/WINGWALL WILL CONSIST OF REMOVING CURBWALL, HEADWALLS, WINGWALLS & RIPRAP APRON, IF APPLICABLE.

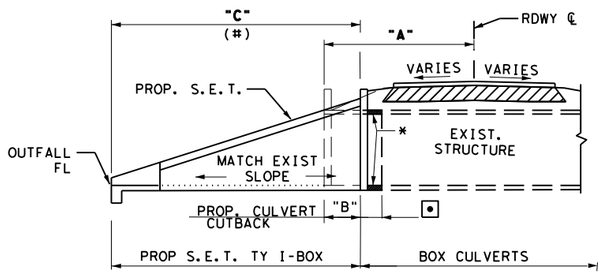
CONTRACTOR TO VERIFY EXISTING SLOPE 1% AND WIDEN CULVERT EXTENSIONS AT SAME SLOPE.

ALL EXCAVATION, SHAPING, BEDDING, AND BACKFILLING REQUIRED FOR PROPER INSTALLATION OF S.E.T.'s ALONG WITH ANY WORK REQUIRED TO PROVIDE A SMOOTH DRAINAGE TRANSITION IN ADJACENT AREAS WILL NOT BE PAID FOR DIRECTLY BUT WILL BE CONSIDERED SUBSIDIARY TO ITEM 467 "SAFETY END TREATMENT".

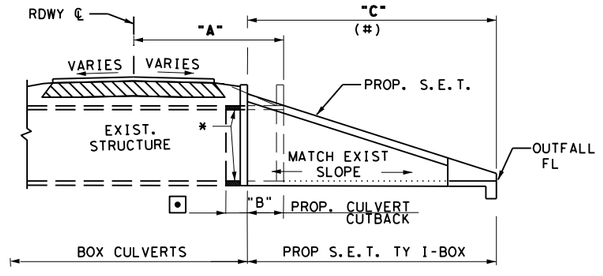
⊙ BREAK BACK DIMENSION WILL VARY FROM THE EXISTING HEADWALL/WINGWALLS EDGE (REFER TO BREAK BACK TYPICAL DETAIL) AND WILL BE DETERMINED BY THE ENGINEER AS PER FIELD CONDITIONS. BREAK BACK WILL NOT BE PAID FOR DIRECTLY BUT WILL BE CONSIDERED SUBSIDIARY TO ITEM(S):
467 "SAFETY END TREATMENT"
496 "REMOVE STR"
462 "CONCRETE BOX CULVERT AND DRAINS"

* ANY REINFORCEMENT THAT CURRENTLY BENDS OUT OF THE CULVERT'S TOP SLAB AND INTO IT'S CURB WILL BE CLEANED, STRAIGHTENED, AND INCORPORATED INTO THE CULVERT EXTENSION OR BREAK BACK CALLOUT.

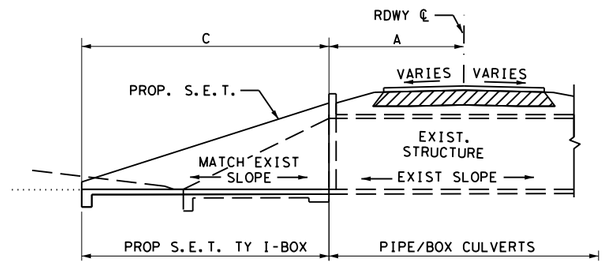
ON PROPOSED BRIDGE & DRAINAGE STRUCTURES, SEE BCS & SETB-CD STANDARD DETAILS FOR MORE INFORMATION



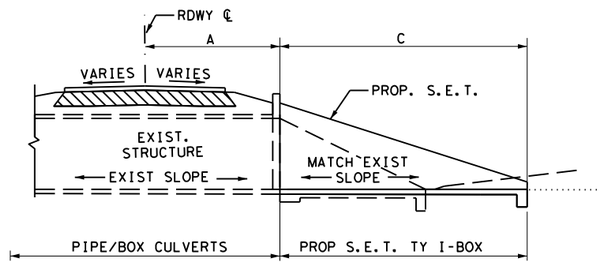
① DETAIL FOR CROSSING BOX CULVERT(S) LT WITH CUTBACK



② DETAIL FOR CROSSING BOX CULVERT(S) RT WITH CUTBACK



③ DETAIL FOR CROSSING CULVERT(S) LT
N.T.S.



④ DETAIL FOR CROSSING CULVERT(S) RT
N.T.S.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on
5/3/2022

DocuSigned by:
98C72D65D494466...

NOT TO SCALE

TEXAS DEPARTMENT OF TRANSPORTATION ®

SUMMARY OF DRAINAGE STRUCTURES

DN: MT	DN: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.

88

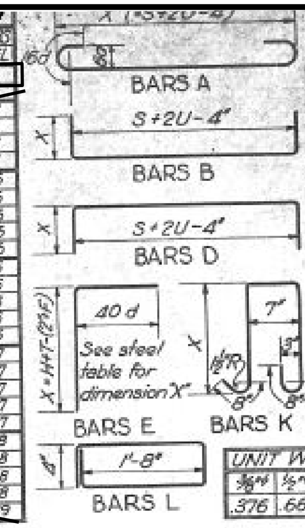
5/2/2022 mtorrel c:\txdot\pw*online\txdot5\max.torres\d0649797\025strdetailsdgn.dgn

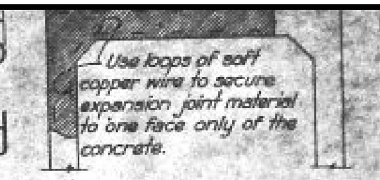
BILLS OF BARREL REINFORCING BARS FOR 42' CLEAR WIDTH

CULVERT SIZE S H	BARS A NO.	SIZE	SPA	LENGTH	WT.	"X"	BARS B NO.	SIZE	SPA	LENGTH	WT.	"X"	BARS C NO.	SIZE	SPA	LENGTH	WT.
2'×1'-6"	136	3/8"	8"	4'-0"	367	1'-8"	67	1/2"	8"	7'-2"	321	2'-3"	None				
2'×2'	136	3/8"	8"	4'-0"	367	2'-5"	67	1/2"	8"	7'-2"	321	2'-3"	"				
3'×1'-6"	146	3/8"	7½"	5'-0"	761	3'-8"	71	1/2"	7½"	8'-6"	395	2'-4"	"				
3'×2'	146	3/8"	7½"	5'-0"	761	3'-8"	71	1/2"	7½"	8'-4"	395	2'-4"	"				
3'×2'-6"	146	3/8"	7½"	5'-0"	761	3'-8"	71	1/2"	7½"	8'-4"	395	2'-4"	"				
3'×3'	146	3/8"	7½"	5'-0"	761	3'-8"	71	1/2"	7½"	8'-4"	395	2'-4"	"				
4'×1'-6"	146	3/8"	7½"	6'-2"	939	4'-10"	71	1/2"	7½"	9'-8"	458	2'-5"	"				
4'×2'	146	3/8"	7½"	6'-2"	939	4'-10"	71	1/2"	7½"	9'-8"	458	2'-5"	"				
4'×2'-6"	146	3/8"	7½"	6'-2"	939	4'-10"	71	1/2"	7½"	9'-8"	458	2'-5"	"				
4'×3'	146	3/8"	7½"	6'-2"	939	4'-10"	71	1/2"	7½"	9'-8"	458	2'-5"	"				
4'×4'	146	3/8"	7½"	6'-2"	939	4'-10"	71	1/2"	7½"	9'-8"	458	2'-5"	"				
5'×1'-6"	146	3/8"	7½"	7'-2"	1091	5'-10"	71	1/2"	7½"	11'-0"	522	2'-7"	"				
5'×2'	146	3/8"	7½"	7'-2"	1091	5'-10"	71	1/2"	7½"	11'-0"	522	2'-7"	"				
5'×3'	146	3/8"	7½"	7'-2"	1091	5'-10"	71	1/2"	7½"	11'-0"	522	2'-7"	"				
5'×4'	146	3/8"	7½"	7'-2"	1091	5'-10"	71	1/2"	7½"	11'-0"	522	2'-7"	"				
5'×5'	146	3/8"	7½"	7'-2"	1091	5'-10"	71	1/2"	7½"	11'-0"	522	2'-7"	67	1/2"	7½"	5'-10"	261
6'×2'	178	3/8"	6"	8'-0"	1210	6'-11"	87	1/2"	6"	12'-1"	702	2'-7"	None				
6'×3'	178	3/8"	6"	8'-0"	1210	6'-11"	87	1/2"	6"	12'-1"	702	2'-7"	"				
6'×4'	154	3/8"	7"	8'-5"	1325	6'-11"	75	1/2"	7"	12'-1"	605	2'-7"	"				
6'×5'	154	3/8"	7"	8'-5"	1325	6'-11"	75	1/2"	7"	12'-3"	614	2'-8"	71	1/2"	7"	6'-11"	328
6'×6'	154	3/8"	7"	8'-5"	1325	6'-11"	75	1/2"	7"	12'-3"	614	2'-8"	71	1/2"	7"	6'-11"	328
7'×3'	178	3/8"	6"	9'-0"	1362	7'-11"	87	1/2"	6"	13'-5"	980	2'-8"	None				
7'×4'	166	3/8"	6½"	9'-3"	1602	7'-11"	81	1/2"	6½"	13'-8"	912	2'-8"	"				
7'×5'	154	3/8"	7"	9'-5"	1486	7'-11"	75	1/2"	7"	13'-5"	855	2'-9"	71	1/2"	7"	7'-11"	478
7'×6'	154	3/8"	7"	9'-5"	1486	7'-11"	75	1/2"	7"	13'-5"	855	2'-9"	71	1/2"	7"	7'-11"	478
7'×7'	154	3/8"	7"	9'-9"	1486	8'-0"	75	1/2"	7"	13'-6"	861	2'-9"	71	1/2"	7"	8'-0"	483

CULVERT SIZE S H	BARS D NO.	SIZE	SPA	LENGTH	WT.	"X"	BARS E NO.	SIZE	SPA	LENGTH	WT.	"X"	BARS I NO.	SIZE	SPA	LENGTH	WT.
2'×1'-6"	67	1/2"	8"	6'-0"	289	1'-8"	None						12	1/2"	18"	45'-0"	361
2'×2'	67	1/2"	8"	7'-0"	313	2'-2"	"						12	1/2"	18"	45'-0"	361
3'×1'-6"	71	1/2"	7½"	6'-10"	324	1'-7"	"						16	1/2"	18"	45'-0"	481
3'×2'	71	1/2"	7½"	7'-10"	372	2'-1"	"						16	1/2"	18"	45'-0"	481
3'×2'-6"	71	1/2"	7½"	8'-10"	419	2'-7"	"						16	1/2"	18"	45'-0"	481
3'×3'	71	1/2"	7½"	9'-10"	466	3'-1"	"						16	1/2"	18"	45'-0"	481
4'×1'-6"	71	1/2"	7½"	8'-0"	379	1'-7"	"						16	1/2"	18"	45'-0"	481
4'×2'	71	1/2"	7½"	9'-0"	427	2'-1"	"						16	1/2"	18"	45'-0"	481
4'×2'-6"	71	1/2"	7½"	10'-0"	474	2'-7"	"						16	1/2"	18"	45'-0"	481
4'×3'	71	1/2"	7½"	11'-0"	522	3'-1"	"						16	1/2"	18"	45'-0"	481
4'×4'	71	1/2"	7½"	13'-0"	617	4'-1"	"						18	1/2"	18"	45'-0"	541
5'×1'-6"	71	1/2"	7½"	8'-10"	419	1'-6"	"						20	1/2"	18"	45'-0"	601
5'×2'	71	1/2"	7½"	9'-10"	466	2'-0"	"						20	1/2"	18"	45'-0"	601
5'×3'	71	1/2"	7½"	11'-10"	561	3'-0"	"						20	1/2"	18"	45'-0"	601
5'×4'	71	1/2"	7½"	13'-10"	656	4'-0"	"						22	1/2"	18"	45'-0"	661
5'×5'	None						142	1/2"	7½"	6'-8"	632	5'-0"	28	1/2"	18"	45'-0"	842
6'×2'	87	1/2"	6"	10'-9"	625	1'-11"	None						20	1/2"	18"	45'-0"	601
6'×3'	87	1/2"	6"	12'-9"	741	2'-11"	"						20	1/2"	18"	45'-0"	601
6'×4'	75	1/2"	7"	14'-9"	739	3'-11"	"						22	1/2"	18"	45'-0"	661
6'×5'	None						150	1/2"	7"	6'-7"	660	4'-11"	28	1/2"	18"	45'-0"	842
6'×6'	"						150	1/2"	7"	7'-7"	760	5'-11"	32	1/2"	18"	45'-0"	962
7'×3'	87	1/2"	6"	13'-7"	1004	2'-10"	None						24	1/2"	18"	45'-0"	721
7'×4'	81	1/2"	6½"	15'-7"	1073	3'-10"	"						26	1/2"	18"	45'-0"	782
7'×5'	None						150	1/2"	7"	6'-6"	828	4'-10"	32	1/2"	18"	45'-0"	962
7'×6'	"						150	1/2"	7"	7'-6"	956	5'-10"	36	1/2"	18"	45'-0"	1082
7'×7'	"						150	1/2"	7"	8'-6"	1084	6'-10"	36	1/2"	18"	45'-0"	1082

BARS J NO.	SIZE	SPA	LENGTH	WT.	1/2" BARS K @ 12" NO.	LENGTH	WT.	"X"	TOTAL WEIGHT 42' WIDTH	CULVERT SIZE S H	ADD FOR 2 AUXILIARY SLABS: 1/2" BARS L @ 12" NO.	LENGTH	WT.	1/2" BARS M NO.	LENGTH	WT.	TOTALS 2 AUX. SLABS CONC.	STEEL
None					6	5'-2"	21	1'-9"	1539	2'×1'-6"	6	4'-4"	17	8	2'-8"	14	.26	31
"					6	5'-2"	21	1'-9"	1583	2'×2'	6	4'-4"	17	8	2'-8"	14	.26	31
"					8	5'-2"	28	1'-9"	1989	3'×1'-6"	8	4'-4"	23	8	3'-8"	20	.34	43
"					8	5'-2"	28	1'-9"	2037	3'×2'	8	4'-4"	23	8	3'-8"	20	.34	43
"					8	5'-2"	28	1'-9"	2084	3'×2'-6"	8	4'-4"	23	8	3'-8"	20	.34	43
"					8	5'-2"	28	1'-9"	2131	3'×3'	8	4'-4"	23	8	3'-8"	20	.34	43
"					10	5'-2"	35	1'-9"	2292	4'×1'-6"	10	4'-4"	29	8	4'-10"	26	.44	55
"					10	5'-2"	35	1'-9"	2340	4'×2'	10	4'-4"	29	8	4'-10"	26	.44	55
"					10	5'-2"	35	1'-9"	2387	4'×2'-6"	10	4'-4"	29	8	4'-10"	26	.44	55
"					10	5'-2"	35	1'-9"	2435	4'×3'	10	4'-4"	29	8	4'-10"	26	.44	55
"					10	5'-2"	35	1'-9"	2590	4'×4'	10	4'-4"	29	8	4'-10"	26	.44	55
"					12	5'-2"	41	1'-9"	2674	5'×1'-6"	12	4'-4"	35	8	5'-10"	31	.53	66
"					12	5'-2"	41	1'-9"	2721	5'×2'	12	4'-4"	35	8	5'-10"	31	.53	66
"					12	5'-2"	41	1'-9"	2816	5'×3'	12	4'-4"	35	8	5'-10"	31	.53	66
"					12	5'-2"	41	1'-9"	2971	5'×4'	12	4'-4"	35	8	5'-10"	31	.53	66
72	1/2"	15"	4'-0"	192	12	5'-2"	41	1'-9"	3581	5'×5'	12	4'-4"	35	8	5'-10"	31	.53	66
None					14	5'-2"	48	1'-9"	3186	6'×2'	14	4'-4"	40	8	6'-11"	37	.62	77
"					14	5'-2"	48	1'-9"	3302	6'×3'	14	4'-4"	40	8	6'-11"	37	.62	77
"					14	5'-2"	48	1'-9"	3378	6'×4'	14	4'-4"	40	8	6'-11"	37	.62	77
76	1/2"	14"	3'-10"	195	14	5'-4"	50	1'-10"	4014	6'×5'	14	4'-4"	40	8	6'-11"	37	.62	77
76	1/2"	14"	4'-10"	245	14	5'-4"	50	1'-10"	4284	6'×6'	14	4'-4"	40	8	6'-11"	37	.62	77
None					16	5'-2"	55	1'-9"	4122	7'×3'	16	4'-4"	46	8	7'-11"	42	.71	88
"					16	5'-2"	55	1'-9"	4424	7'×4'	16	4'-4"	46	8	7'-11"	42	.71	88
76	1/2"	14"	3'-8"	186	16	5'-4"	57	1'-10"	4852	7'×5'	16	4'-4"	46	8	7'-11"	42	.71	88
76	1/2"	14"	4'-8"	237	16	5'-4"	57	1'-10"	5151	7'×6'	16	4'-4"	46	8	7'-11"	42	.71	88
76	1/2"	14"	5'-8"	288	16	5'-4"	57	1'-10"	5341	7'×7'	16	4'-4"	46	8	8'-0"	43	.72	89





Note:- For wing quantities and details see separate sheets. Culvert totals include quantities for W-2 wings only for convenience of usage since it is expected that BC-1, W-2 will be the common combination.

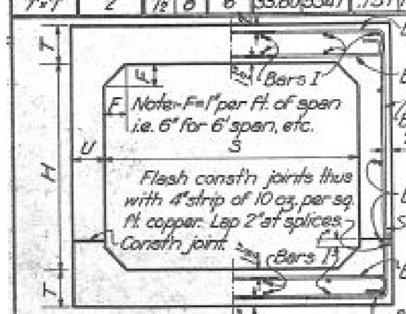
UNIT WEIGHTS OF STEEL				
3/8" ϕ	1/2" ϕ	1/2" □	5/8" ϕ	3/4" ϕ
.376	.668	.85	1.043	1.502

DIMENSIONS AND QUANTITIES WITH TABLE OF EXTENSIONS FOR COMBINATION OF BC-1 BARRELS AND W-2 WINGS

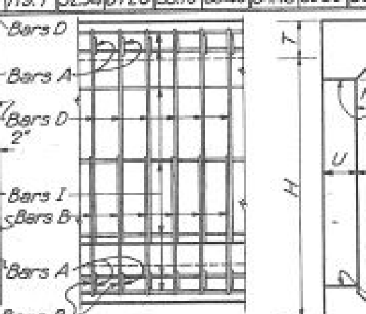
CULVERT SIZE S H	TYPE OF SECTION	DIMENSIONS T	U	MAX FILL FT.	42' BARREL ONLY CONC.	STEEL	P.L.F. BARREL CONC.	STEEL	42' WIDTH TOTALS CONC.	STEEL	43' WIDTH TOTALS CONC.	STEEL	44' WIDTH TOTALS CONC.	STEEL	45' WIDTH TOTALS CONC.	STEEL	46' WIDTH TOTALS CONC.	STEEL	47' WIDTH TOTALS CONC.	STEEL
2'×1'-6"	1	6½"	6"	30	8.05	1539	.178	33.7	10.12	1670	10.30	1704	10.48	1737	10.65	1771	10.83	1805	11.01	1838
2'×2'	1	6½"	6"	30	8.85	1583	.197	34.7	11.56	1774	11.76	1809	11.95	1843	12.15	1878	12.35	1913	12.55	1947
3'×1'-6"	1	6½"	6"	20	10.27	1989	.227	43.6	12.62	2133	12.85	2177	13.07	2220	13.30	2264	13.53	2307	13.75	2351
3'×2'	1	6½"	6"	20	11.08	2037	.246	44.6	14.16	2245	14.41	2290	14.65	2334	14.90	2379	15.14	2423	15.39	2468
3'×2'-6"	1	6½"	6"	20	11.89	2084	.264	45.7	15.79	2367	16.05	2413	16.32	2458	16.58	2504	16.85	2550	17.11	2596
3'×3'	1	6½"	6"	20	12.70	2131	.283	46.8	16.87	2427	17.15	2474	17.44	2521	17.72	2567	18.00	2614	18.28	2661
4'×1'-6"	1	7"	7"	15	13.40	2292	.296	50.2	16.13	2449	16.43	2499	16.72	2549	17.02	2600	17.31	2650	17.61	2700
4'×2'	1	7"	7"	15	14.34	2340	.318	51.2	17.87	2562	18.19	2613	18.51	2664	18.82	2716	19.14	2767	19.46	2818
4'×2'-6"	1	7"	7"	15	15.28	2387	.339	52.3	19.70	2683	20.04	2735	20.38	2788	20.72	2840	21.06	2892	21.40	2944
4'×3'	1	7"	7"	15	16.23	2435	.361	53.4	20.92	2751	21.28	2804	21.64	2858	22.00	2911	22.36	2965	22.72	3018
4'×4'	1	7"	7"	15	18.11	2590	.404	56.8	24.95	3047	25.35	3099	25.76	3156	26.16	3212	26.57	3269	26.97	3326
5'×1'-6"	1	7¼"	7"	12	15.99	2674	.354	58.5	19.06	2843	19.41	2901	19.77	2960	20.12	3018	20.48	3077	20.83	3135
5'×2'	1	7¼"	7"	12	16.94	2721	.375	59.6	20.88	2958	21.25	3018	21.63	3077	22.00	3137	22.38	3196	22.75	3256
5'×3'	1	7¼"	7"	12	18.83	2816	.418	61.7	24.00	3146	24.42	3208	24.84	3269	25.25	3331	25.67	3393	26.09	3454
5'×4'	1	7¼"	7"	12	20.71	2971	.462	65.2	28.18	3442	28.64	3507	29.10	3572	29.57	3638	30.03	3703	30.49	3768
5'×5'	2	7½"	7"	12	22.60	3581	.505	79.2	33.26	4229	33.76	4308	34.27	4387	34.77	4467	35.28	4546	35.78	4625
6'×2'	1	7"	7½"	10	19.11	3186	.423	71.1	23.33	3433	23.75	3504	24.18	3575	24.60	3646	25.02	3717	25.44	3788
6'×3'	1	7¼"	7½"	10	21.70	3302	.482	73.7	27.38	3644	27.86	3718	28.34	3791	28.83	3865	29.31	3939	29.79	4012
6'×4'	1	7¼"	7½"	10	23.72	3378	.528	74.9	31.85	3865	32.38	3940	32.91	4015	33.43	4090	33.96	4165	34.49	4239
6'×5'	2	7½"	7½"	10	26.23	4014	.586	89.6	37.76	4685	38.35	4775	38.93	4865	39.52	4954	40.10	5043	40.69	5133
6'×6'	2	7½"	7½"	10	28.25	4284	.632	95.7	42.35	5323	42.98	5419	43.61	5514	44.25	5610	44.88	5706	45.51	5801
7'×3'	1	7¼"	7½"	6	24.03	4122	.533	92.2	30.07	4575	30.60	4667	31.14	4759	31.67	4852	32.20	4944	32.73	5036
7'×4'	1	7¼"	7½"	6	26.05	4424	.579	98.2	34.63	5064	35.21	5162	35.79	5260	36.37	5359	36.95	5457	37.52	5555
7'×5'	2	7½"	7½"	6	28.63	4852	.639	108.7	40.71	5723	41.35	5832	41.99	5940	42.63	6049	43.27	6158	43.90	6266
7'×6'	2	7½"	7½"	6	30.66	5151	.685	115.4	44.37	6225	45.05	6340	45.74	6456	46.42	6571	47.11	6687	47.79	6802
7'×7'	2	7½"	8"	6	33.80	5341	.757	119.7	52.94	6720	53.70	6840	54.45	6959	55.21	7079	55.97	7199	56.72	7318

CULVERT SIZE S H	48' WIDTH TOTALS CONC.	STEEL	49' WIDTH TOTALS CONC.	STEEL	50' WIDTH TOTALS CONC.	STEEL	51' WIDTH TOTALS CONC.	STEEL	52' WIDTH TOTALS CONC.	STEEL	53' WIDTH TOTALS CONC.	STEEL	54' WIDTH TOTALS CONC.	STEEL	55' WIDTH TOTALS CONC.	STEEL
2'×1'-6"	11.19	1872	11.37	1906	11.54	1940	11.72	1973	11.90	2007	12.08	2041	12.26	2074	12.43	2108
2'×2'	12.74	1982	12.94	2017	13.14	2052	13.33	2086	13.53	2121	13.73	2156	13.92	2190	14.12	2225
3'×1'-6"	13.98	2395	14.21	2438	14.44	2481	14.66	2525	14.89	2569	15.12	2613	15.34	2656	15.57	2700
3'×2'	15.64	2513	15.88	2557	16.13	2602	16.37	2646	16.62	2691	16.87	2736	17.11	2780	17.36	2825
3'×2'-6"	17.37	2641	17.64	2687	17.90	2733	18.17	2778	18.43	2824	18.69	2870	18.96	2915	19.22	2961
3'×3'	18.57	2708	18.85	2755	19.13	2801	19.42	2848	19.70	2895	19.98	2942	20.27	2989	20.55	3035
4'×1'-6"	17.91	2750	18.20	2800	18.50	2851	18.79	2901	19.09	2951	19.39	3001	19.68	3051	19.98	3102
4'×2'	19.78	2869	20.10	2920	20.41	2972	20.73	3023	21.05	3074	21.37	3125	21.69	3176	22.00	3228
4'×2'-6"	21.73	2997	22.07	3049	22.41	3101	22.75	3154	23.09	3206	23.43	3258	23.77	3311	24.11	3363
4'×3'	23.09	3071	23.45	3125	23.81	3178	24.17	3232	24.53	3285	24.89	3338	25.25	3392	25.61	3445
4'×4'	27.37	3384	27.78	3440	28.18	3496	28.59	3553	28.99	3610	29.39	3667	29.80	3724	30.20	3780
5'×1'-6"	21.18	3194	21.54	3252	21.89	3311	22.25	3369	22.60	3428	22.95	3486	23.31	3545	23.66	3603
5'×2'	23.13	3316	23.50	3375	23.88	3435	24.25	3494	24.63	3554	25.00	3614	25.38	3673	25.75	3733
5'×3'	26.51	3516	26.93	3578	27.34	3640	27.76	3701	28.18	3763	28.60	3825	29.02	3886	29.43	3948
5'×4'	30.95	3833	31.41	3898	31.88	3964	32.34	4029	32.80	4094	33.26	4159	33.72	4224	34.19	4290
5'×5'	36.29	4704	36.79	4783	37.30	4863	37.80	4942	38.31	5021	38.81	5100	39.32	5179	39.82	5259
6'×2'	25.87	3860	26.29	3931	26.71	4002	27.14	4073	27.56	4144	27.98	4215	28.41	4286	28.83	4357
6'×3'	30.27	4086	30.75	4160	31.24	4234	31.72	4307	32.20	4381	32.68	4455	33.16	4528	33.65	4602
6'×4'	35.02	4314	35.55	4389	36.07	4464	36.60	4539	37.13	4614	37.66	4689	38.19	4764	38.71	4839
6'×5'	41.28	5223	41.86	5312	42.45	5402	43.03	5491	43.62	5581	44.21	5671	44.79	5760	45.38	5850
6'×6'	46.14	5897	46.77	5993	47.41	6089	48.04	6184	48.67	6280	49.30	6376	49.93	6471	50.57	6567
7'×3'	33.27	5128	33.80	5220	34.33	5313	34.87	5405	35.40	5497	35.93	5589	36.47	5681	37.00	5774
7'×4'	38.10	5653	38.68	5751	39.26	5850	39.84	5948	40.42	6046	41.00	6144	41.58	6242	42.16	6341
7'×5'	44.54	6375	45.18	6484	45.82	6593	46.46	6701	47.10	6810	47.74	6919	48.38	7027	49.02	7136
7'×6'	48.48	6917	49.16	7033	49.85	7148	50.53	7264	51.22	7379	51.90	7494	52.59	7610	53.27	7725
7'×7'	57.48	7438	58.24	7558	59.00	7678	59.75	7797	60.51	7917	61.27	8037	62.02	8156	62.78	8276

CULVERT SIZE S H	56' WIDTH TOTALS CONC.	STEEL	57' WIDTH TOTALS CONC.	STEEL	58' WIDTH TOTALS CONC.	STEEL	59' WIDTH TOTALS CONC.	STEEL	60' WIDTH TOTALS CONC.	STEEL	61' WIDTH TOTALS CONC.	STEEL	62' WIDTH TOTALS CONC.	STEEL	63' WIDTH TOTALS CONC.	STEEL	P.L.F. BARREL CONC.	STEEL	CULVERT SIZE S H
2'×1'-6"	12.61	2142	12.79	2175	12.97	2209	13.15	2243	13.58	2308	13.76	2341	13.94	2375	14.12	2409	.178	33.7	2'×1'-6"
2'×2'	14.32	2260	14.51	2294	14.71	2329	14.91	2364	15.37	2430	15.56	2464	15.76	2499	15.96	2534	.197	34.7	2'×2'
3'×1'-6"	15.80	2743	16.02	2787	16.25	2831	16.48	2874	17.05	2961	17.27	3004	17.50	3048	17.73	3092	.227	43.6	3'×1'-6"
3'×2'	17.60	2869	17.85	2914	18.10	2959	18.34	3005	18.93	3091	19.17	3135	19.42	3180	19.67	3225	.246	44.6	3'×2'
3'×2'-6"	19.49	3007	19.75	3052	20.01	3098	20.28	3144	20.88	3233	21.15	3278	21.41	3324	21.67	3370	.264	45.7	3'×2'-6"
3'×3'	20.83	3082	21.11	3129	21.40	3176	21.68	3223	22.30	3312	22.59	3359	22.87	3406	23.15	3453	.283	46.8	3'×3'
4'×1'-6"	20.27	3152	20.57	3202	20.87	3252	21.16	3302	21.90	3408	22.19	3458	22.49	3508	22.79	3558	.296	50.2	4'×1'-6"
4'×2'	22.32	3279	22.64	3330	22.96	3381	23.28	3432	24.03	3539	24.35	3590	24.67	3641	24.99	3692	.318	51.2	4'×2'
4'×2'-6"	24.45	3415	24.78	3467	25.12	3520	25.46	3572	26.24	3679	26.58	3732	26.92	3784	27.26	3836	.339	52.3	4'×2'-6"
4'×3'	25.97	3499	26.33	3552	26.70	3605	27.06	3659	27.86	3767	28.22	3821	28.58	3874	28.94	3927	.361	53.4	4'×3'
4'×4'	30.61	3837	31.01	3894	31.41	3951	31.82	4008	32.66	4119	33.07	4176	33.47	4233	33.87	4290	.404	56.8	4'×4'
5'×1'-6"	24.02	3662	24.37	3720	24.72	3779	25.08	3837	25.96	3962	26.32	4020	26.67	4079	27.02	4137	.354	58.5	5'×1'-6"
5'×2'	26.13	3792	26.50	3852	26.88	3912	27.25	3971	28.16	4097	28.53	4156	28.91	4216	29.28	4276	.375	59.6	5'×2'
5'×3'	29.85	4010	30.27	4071	30.69	4133	31.11	4195	32.05	4323	32.47	4384	32.89	4446	33.31	4508	.418	61.7	5'×3'
5'×4'	34.65	4355	35.11	4420	35.57	4485	36.03	4550	37.03	4682	37.49	4747	37.95	4812	38.41	4877	.462	65.2	5'×4'
5'×5'	40.33	5338	40.83	5417	41.34	5497	41.84	5575	42.88	5721	43.38	5800	43.89	5879	44.39	5958	.505	79.2	5'×5'
6'×2'	29.25	4428	29.67	4500	30.10	4571	30.52	4642	31.56	4790	31.99	4861	32.41	4932	32.83	5003	.423	71.1	6'×2'
6'×3'	34.13	4676	34.61	4749	35.09	4823	35.57	4897	36.68	5048	37.16	5121	37.64	5195	38.12	5269	.482	73.7	6'×3'
6'×4'	39.24	4914	39.77	4988	40.30	5063	40.83	5138	41.97	5290	42.50	5365	43.03	5440	43.56	5515	.528	74.9	6'×4'
6'×5'	45.96	5939	46.55	6029	47.14	6119	47.72	6208	48.93	6375	49.51	6464	50.10	6554	50.69	6644	.586	89.6	6'×5'
6'×6'	51.20	6663	51.83	6758	52.46	6854	53.09	6950	54.35	7123	54.98	7218	55.61	7314	56.24	7410	.632	95.7	6'×6'
7'×3'	37.53	5866	38.06	5958	38.60	6050	39.13	6142	40.37	6323	40.91	6415	41.44	6507	41.97	6599	.533	92.2	7'×3'
7'×4'	42.74	6439	43.31	6537	43.89	6635	44.47	6733	45.76	6920	46.34	7018	46.92	7116	47.50	7214	.579	98.2	7'×4'
7'×5'	49.66	7245	50.29	7353	50.93	7462	51.57	7571	52.92	7768	53.56	7876	54.20	7985	54.84	8094	.639	108.7	7'×5'
7'×6'	53.96	7841	54.64	7956	55.33	8071	56.01	8187	57.41	8390	58.09	8506	58.78	8621	59.46	8736	.685	115.4	7'×6'
7'×7'	63.54	8396	64.29	8515	65.05	8635	65.81	8755	67.29	8964	68.04	9083	68.80	9203	69.56	9323	.757	119.7	7'×7'

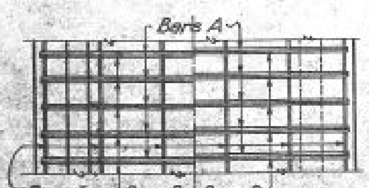


BARREL SECTION 1



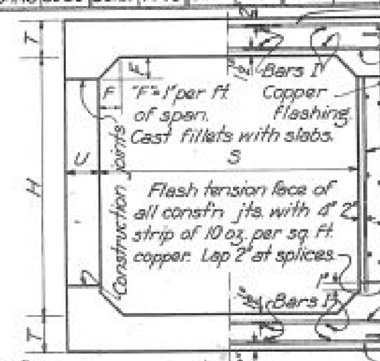
PART ELEVATION

This section is Type 1 and applies to low fill culverts of "H"=4' and less.

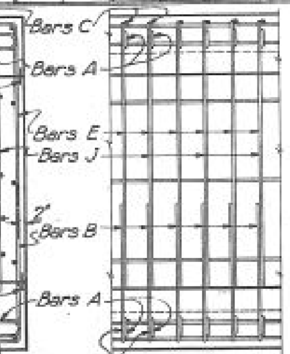


BOTTOM PART PLAN TOP

NOTE:- The entire range of normal single culvert barrels for primary drainage is covered by 6 types of sections designated as 1, 1-E, 2, 2-E, 3, and 3-E. Letters E indicate extra fill types which have bars H substituted for alternate bars A.



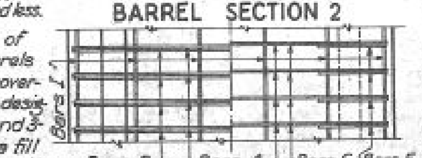
BARREL SECTION 2



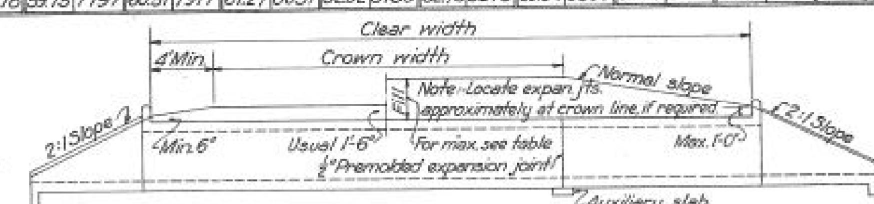
PART ELEVATION

This section is Type 2 and applies to low fill culverts as shown in above table.

NOTE:- Lay out steel both ways from an "A" bar placed at the exact center of barrel. Otherwise bars will not fit.



BOTTOM PART PLAN TOP



MINIMUM FILL CONDITION

SIDE ELEVATION

SHOWING USE WITH W-2 WINGS

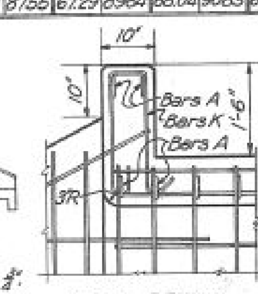
TYPICAL FILL CONDITION

GENERAL NOTES:- All concrete shall be Class "A". All exposed corners shall be chamfered ¾". All surfaces exposed to view shall receive a surface finish.* Under no circumstances shall construction joints shown in these details be moved, increased, omitted or otherwise altered. Auxiliary slabs under the crown lines are provided for clear widths of 60' or more and are included in barrel quantities. No lateral bars shall pass thru expansion joints.

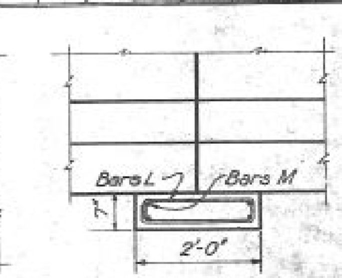
All reinforcing steel shall be deformed bars. All dimensions relating to reinforcement are to centers of bars. Bar dimensions shown are finished dimensions after bending and must be accurate. The proper allowance for elongation due to bends shall be made in the fabrication. All bars shall be supported in their proper positions by means of metal bar chairs and spacers, or other approved means, and wired at all intersections. Where bars are spliced a 40 diam. lap shall be used.

Payment for materials used and for the installation of expansion joints and copper flashing shall be included in the unit price bid for Class "A" concrete.

Design:- Direct traffic live load of 1-15 ton truck distributed in accordance with the A.A.S.H.O. specifications. Live load neglected where height of fill exceeds span and 4 feet. Unit dead loads, unit stresses and L.L. dist. thru fill conform to Texas S.H.D. specifications.

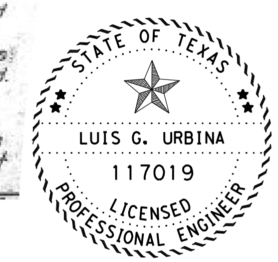


CURB DETAIL



AUXILIARY SLAB

THIS SHEET IS INTENDED FOR CONTRACTOR'S USE IF APPLICABLE DURING CONSTRUCTION SINCE BREAK BACK IS PROPOSED AND BOX SIZE AND THICKNESSES ARE NON STANDARD.



The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on 5/3/2022

NOT TO SCALE

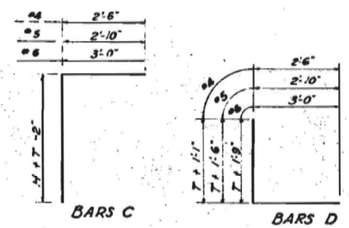
TEXAS DEPARTMENT OF TRANSPORTATION ®

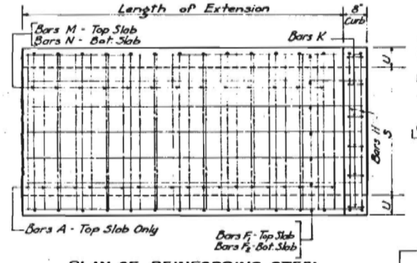
BOX CULVERT BARRELS LOW FILL TYPE SIZE 2'X1'-6"

DN: MT	DW: MT	STATE	SHEET NUMBER				SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1				
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	89

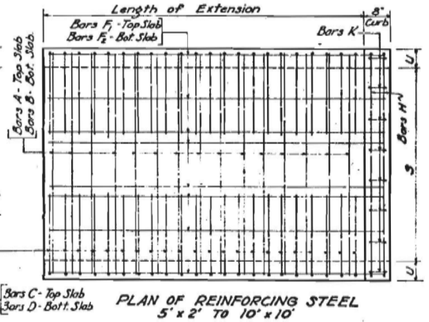
BILL OF REINFORCING STEEL FOR A 10'-0" EXTENSION ON ONE END OF CULVERT ONLY

CULVERT SIZE		TYPE OF SECTION	DIMENSIONS		MAX. FILL	TOTAL QUANTITIES FOR A 10' EXTENSION		QUANTITIES PER LIN. FT. OF BARREL EXTENSION		BARS A IN TOP SLAB					BARS B IN BOTTOM SLAB					BARS C WALLS & TOP CORNER					BARS D IN BOTTOM CORNERS					#6-#4 BARS E @18" c-c		#4 BARS F Length 10'-4"							2-#4 BARS H @12'-3"±Lengths		#4 BARS K IN TOP SLAB & WALLS		#4 BARS M IN BOTTOM SLAB				#4 BARS N IN BOTTOM SLAB				CULVERT SIZE	
S	H		T	U	Ft.	CONC.	REINF	CONC.	REINF	NO.	SIZE	SPAC.	LGTH	WT.	NO.	SIZE	SPAC.	LGTH	WT.	NO.	SIZE	SPAC.	LGTH	WT.	NO.	SIZE	SPAC.	LGTH	WT.	LGTH	WT.	F_1	SPAC.	F_2	SPAC.	F_3	SPAC.	TOTAL	WT.	LGTH	WT.	NO.	WT.	NO.	SPAC.	LGTH	WT.	NO.	SPAC.	LGTH	WT.	S	H
3	2	1	6"	6"	14	2.47	312	0.222	26.92	19	#4	7"	5'-8"	47																	7	12"±	3	20½	4	10"	16	97	3'-9"	5	5	13	15	9"	8'-4"	89	15	9"	6'-8"	67	3	2
	3	1	6"	6"	14	2.86	333	0.259	28.70	19	#4	7"	5'-8"	47																	7	12"±	3	20½	4	14"	14	97	3'-9"	5	5	13	15	9"	10'-4"	104	15	9"	8'-8"	87		3
4	2	1	6"	6"	12	2.89	423	0.259	37.06	22	#4	6"	6'-8"	69																	9	12"±	4	18"±	4	10"	17	117	4'-9"	6	6	16	19	7"	9'-8"	118	19	7"	7'-8"	97	4	2
	3	1	6"	6"	12	3.28	449	0.296	39.35	22	#4	6"	6'-8"	69																	9	12"±	4	18"±	4	14"	17	117	4'-9"	6	6	16	19	7"	11'-4"	144	19	7"	7'-8"	97	4	3
	4	1	6"	6"	12	3.68	488	0.333	42.98	22	#4	6"	6'-8"	69																	9	12"±	4	18"±	6	15"	19	131	4'-9"	6	6	16	19	7"	13'-4"	169	19	7"	7'-8"	97		4
5	2	2	6"	6"	8	3.31	525	0.296	44.87	17	#5	8"	5'-8"	101	15	#4	9½"	5'-8"	57	34	#4	8"	4'-10"	110	34	#4	8"	4'-1"	93			9	12"±	7	18"±	4	10"	20	138	5'-9"	8	7	18									5	2
	3	2	6"	6"	8	3.70	547	0.333	46.87	17	#5	8"	5'-8"	101	15	#4	9½"	5'-8"	57	34	#4	8"	5'-10"	132	34	#4	8"	4'-1"	93			9	12"±	7	18"±	4	14"	20	138	5'-9"	8	7	18										3
	4	2	6"	6"	8	4.10	584	0.370	50.21	17	#5	8"	5'-8"	101	15	#4	9½"	5'-8"	57	34	#4	8"	6'-10"	155	34	#4	8"	4'-1"	93			9	12"±	7	16"±	6	15"	22	152	5'-9"	8	7	18										4
	5	3	6"	7"	8	4.89	732	0.444	63.66	17	#5	8"	5'-10"	103	15	#4	9½"	5'-10"	58	34	#4	8"	7'-10"	178	34	#4	8"	4'-1"	93	4'-11"	53	9	12"±	7	18"±	16	18"	32	221	5'-11"	8	7	18										5
6	3	2	6"	6"	8	4.12	695	0.370	60.70	17	#5	8"	6'-8"	118	17	#5	8"	6'-8"	118	44	#4	6"	5'-10"	171	44	#4	6"	4'-1"	120			8	18"±	8	18"±	4	14"	20	138	6'-9"	9	8	21									6	3
	4	2	6"	6"	8	4.52	739	0.407	64.72	17	#5	8"	6'-8"	118	17	#5	8"	6'-8"	118	44	#4	6"	6'-10"	201	44	#4	6"	4'-1"	120			8	18"±	8	18"±	6	15"	22	152	6'-9"	9	8	21										4
	5	3	6"	7"	8	5.31	896	0.481	78.95	17	#5	8"	6'-10"	121	17	#5	8"	6'-10"	121	44	#4	6"	7'-10"	230	44	#4	6"	4'-1"	120	4'-11"	53	8	18"±	8	18"±	16	14"	32	221	6'-11"	9	8	21										5
	6	3	6"	7"	8	5.78	970	0.525	85.65	17	#5	8"	6'-10"	121	17	#5	8"	6'-10"	121	48	#4	5½"	8'-10"	283	48	#4	5½"	4'-1"	131	5'-11"	63	8	18"±	8	18"±	16	16"	32	221	6'-11"	9	8	21										6
7	3	2	6½"	6"	10	4.81	903	0.432	78.84	19	#5	7"	7'-8"	152	19	#5	7"	7'-8"	152	36	#5	7½"	6'-2"	232	36	#5	7½"	4'-10"	181			9	18"±	9	18"±	4	14"	22	158	7'-9"	10	9	24									7	3
	4	2	6½"	6"	10	5.20	945	0.469	83.12	20	#5	6½"	7'-8"	160	20	#5	6½"	7'-8"	160	34	#5	8"	7'-2"	254	34	#5	8"	4'-10"	171			9	18"±	9	18"±	6	14"	24	166	7'-9"	10	9	24										4
	5	3	6½"	7"	10	6.01	1110	0.544	97.93	20	#5	6½"	7'-10"	163	20	#5	6½"	7'-10"	163	34	#5	8"	8'-2"	290	34	#5	8"	4'-10"	171	6'-11"	53	9	18"±	9	18"±	16	14"	34	235	7'-11"	11	9	26									7	5
	6	3	6½"	7"	10	6.47	1155	0.587	101.94	20	#5	6½"	7'-10"	163	20	#5	6½"	7'-10"	163	34	#5	8"	9'-2"	325	34	#5	8"	4'-10"	171	5'-11"	63	9	18"±	9	12"±	16	16"	34	235	7'-11"	11	9	24										6
	7	3	6½"	7"	10	6.94	1260	0.630	111.76	20	#5	6½"	7'-10"	163	20	#5	6½"	7'-10"	163	36	#5	7½"	10'-2"	382	36	#5	7½"	4'-10"	181	6'-11"	74	9	18"±	9	18"±	20	15"	38	262	7'-11"	11	9	24										7
	4	2	7½"	6"	10	6.25	1116	0.565	97.05	17	#6	8"	8'-8"	221	17	#6	8"	8'-8"	221	36	#5	7½"	7'-3"	272	36	#5	7½"	4'-11"	185			10	18"±	10	18"±	4	14"	26	179	8'-9"	12	10	26										4
	5	3	7½"	6"	10	6.86	1258	0.618	109.13	17	#6	8"	8'-10"	225	17	#6	8"	8'-10"	225	36	#5	8"	8'-2"	293	36	#5	8"	4'-11"	174	6'-11"	85	10	18"±	10	18"±	16	14"	36	248	8'-11"	12	10	26										5
8	6	3	7½"	7"	10	7.53	1303	0.684	113.45	17	#6	8"	8'-10"	225	17	#6	8"	8'-10"	225	34	#5	8"	9'-3"	328	34	#5	8"	4'-11"	174	5'-11"	63	10	18"±	10	18"±	16	16½"	36	248	8'-11"	12	10	26	8	6
	7	3	7½"	7"	10	7.98	1410	0.727	123.30	17	#6	8"	8'-10"	225	17	#6	8"	8'-10"	225	36	#5	7½"	10'-3"	385	36	#5	7½"	4'-11"	185	6'-11"	74	10	18"±	10	18"±	20	16"	40	276	8'-11"	12	10	26										7
	8	3	7½"	8"	10	9.06	1500	0.827	132.15	17	#6	8"	9'-0"	230	17	#6	8"	9'-0"	230	38	#5	7"	11'-5"	446	38	#5	7"	4'-11"	195	7'-11"	85	10	18"±	10	18"±	20	18"	40	276	9'-1"	12	10	26										8
	5	3	8"	7"	10	7.91	1462	0.718	130.39	19	#6	7"	9'-10"	281	19	#6	7"	9'-10"	281	40	#5	6½"	8'-4"	348	40	#5	6½"	5'-0"	209	4'-11"	53	10	18"±	10	18"±	16	14"	36	248	9'-11"	13	11	29										5
	6	3	8"	7"	10	8.37	1513	0.761	135.13	19	#6	7"	9'-10"	281	19	#6	7"	9'-10"	281	40	#5	6½"	9'-4"	389	40	#5	6½"	5'-0"	209	5'-11"	63	10	18"±	10	18"±	16	16½"	38	248	9'-11"	13	11	29										6
	7	3	8"	7"	10	8.84	1622	0.805	146.43	20	#6	6½"	9'-10"	295	20	#6	6½"	9'-10"	295	40	#5	6½"	10'-4"	431	40	#5	6½"	5'-0"	209	6'-11"	74	10	18"±	10	18"±	20	16"	40	276	9'-11"	13	11	29	9	7
	8	3	8"	8"	10	9.91	1685	0.905	152.12	20	#6	6½"	10'-0"	300	20	#6	6½"	10'-0"	300	40	#5	6½"	11'-4"	473	40	#5	6½"	5'-0"	209	7'-11"	85	10	18"±	10	18"±	20	18"	40	276	10'-1"	13	11	29										8
	9	3	8"	8"	10	10.45	1836	0.955	165.09	20	#6	6½"	10'-0"	300	20	#6	6½"	10'-0"	300	44	#5	6"	12'-4"	566	44	#5	6"	5'-0"	229	8'-11"	95	10	18"±	10	18"±	24	17"	44	304	10'-1"	13	11	29										9
	5	3	8½"	7"	10	8.83	1780	0.802	154.95	16	#7	8½"	10'-10"	352	16	#7	8½"	10'-10"	352	34	#6	8"	8'-6"	434	34	#6	8"	5'-5"	277	4'-11"	53	11	18"±	11	18"±	16	14"	38	262	10'-11"	15	12	31										5
	6	3	8½"	7"	10	9.29	1885	0.845	164.30	17	#7	8"	10'-10"	376	17	#7	8"	10'-10"	376	34	#6	8"	9'-6"	485	34	#6	8"	5'-5"	277	5'-11"	63	11	18"±	11	18"±	16	16½"	38	262	10'-11"	15	12	31										6
	7	3	8½"	7"	10	9.75	1975	0.888	172.36	17	#7	8"	10'-10"	376	17	#7	8"	10'-10"	376	34	#6	8"	10'-6"	536	34	#6	8"	5'-5"	277	6'-11"	74	11	18"±	11	18"±	20	16"	42	290	10'-11"	15	12	31										7
	8	3	8½"	8"	10	10.84	2019	0.990	187.80	17	#7	8"	11'-0"	382	17	#7	8"	11'-0"	382	34	#6	8"	11'-6"	587	34	#6	8"	5'-5"	277	7'-11"	85	11	18"±	11	18"±	20	18"	42	290	11'-1"	15	12	31	10	8
	9	3	8½"	8"	10	11.37	2191	1.039	192.24	17	#7	8"	11'-0"	382	17	#7	8"	11'-0"	382	36	#6	7½"	12'-6"	676	36	#6	7½"	5'-5"	293	8'-11"	95	11	18"±	11	18"±	24	17"	46	317	11'-1"	15	12	31										9
	10	3	8½"	8"	10	11.89	2387	1.088	211.62	18	#7	7½"	11'-0"	405	18	#7	7½"	11'-0"	405	38	#6	7"	13'-6"	771	38	#6	7"	5'-5"	309	9'-11"	106	11	18"±	11	18"±	28	16"	50	345	11'-1"	15	12	31										10



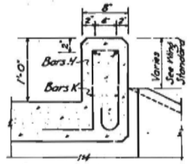


PLAN OF REINFORCING STEEL
3' x 2' TO 4' x 4'

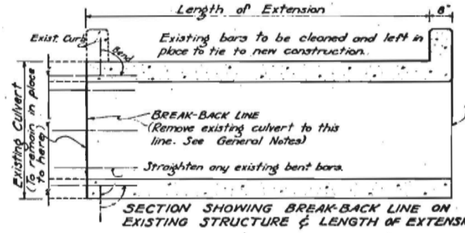


PLAN OF REINFORCING STEEL
5' x 2' TO 10' x 10'

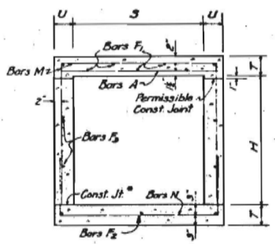
UNIT BAR WEIGHTS					
Bar Size	#4	#5	#6	#7	
Wt. per Lin. Ft.	0.668	1.043	1.502	2.044	



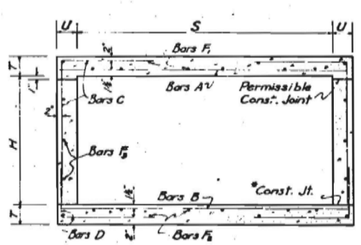
SECTION THRU CURB



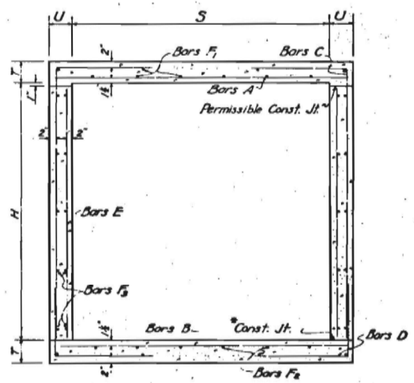
SECTION SHOWING BREAK-BACK LINE ON EXISTING STRUCTURE & LENGTH OF EXTENSION



SECTION
TYPE 1



SECTION
TYPE 2



SECTION
TYPE 3

CONSTRUCTION JOINT SHOWN AT THE FLOW LINE MAY BE RAISED A MAXIMUM OF 6" AT THE CONTRACTOR'S OPTION. BARS E MAY BE CUT OFF OR RAISED AND BARS C & D MAY BE REVERSED (D OR TOP).

GENERAL NOTES

This design is adopted from Texas Highway Department Standard for "Single Culverts-Normal," SC-N, as prepared in May, 1948.

All concrete shall be Class A. All exposed corners shall be chamfered ¾".

All dimensions relating to reinforcing bars are to centers of bars.

Quantities of concrete and reinforcing steel shown hereon are for a 10Ft. extension of one end of the barrel. For other lengths of extension adjust the bar lengths or number, and the total quantities of concrete and steel according to "Quantities per Lin.Ft. of Extension."

Existing bars exposed by break-back shall be cleaned and bent into position to provide a tie to the new concrete extension.

The removal of the existing structure to the break-back line shown will not be paid for directly but shall be considered subsidiary work to the bid item "Class A" Concrete for Extending Culverts."

The quantities for the new wings are not included hereon. Refer to the Standard "Flared Wings-Normal" (FW-N) or "Parallel Wings-Normal (PW-N) for wing quantities and design". Refer to plans for proposed type of Wing.

THIS SHEET IS INTENDED FOR CONTRACTOR'S USE IF APPLICABLE DURING CONSTRUCTION SINCE BREAK BACK IS PROPOSED AND BOX THICKNESSES ARE NON STANDARD.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED
PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on 5/3/2022

DocuSigned by:
98C72D65D494466...

NOT TO SCALE

TEXAS DEPARTMENT OF TRANSPORTATION ®

SINGLE BOX CULVERT
SCL
8'X4'

DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.

90

Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
LOCATION #2-US 90-STR. 1 (Lt)	1 ~ 8'x 4'	1'	Non-Stndrd	SETB-CD	0°	4:1	7.5"	6"	0.250'	4.625'	N/A	N/A	17.167'	N/A	9.167'	0.0	0.1	5.5	N/A
LOCATION #2-US 90-STR. 1 (Rt)	1 ~ 8'x 4'	1'	Non-Stndrd	SETB-CD	0°	4:1	7.5"	6"	0.250'	4.625'	N/A	N/A	17.167'	N/A	9.167'	0.0	0.1	5.5	N/A
LOCATION #2-US 90-STR. 2 (Rt)	2 ~ 6'x 5'	1'	Non-Stndrd	SETB-CD	0°	4:1	7"	6"	0.500'	5.833'	N/A	N/A	22.000'	N/A	13.667'	0.0	0.3	11.2	N/A
LOCATION #2-US 90-STR. 3 (Lt)	1 ~ 2'x 1.5'	1'	Non-Stndrd	SETB-CD	0°	4:1	6.5"	6"	0.250'	2.042'	N/A	N/A	6.833'	N/A	3.167'	0.0	0.0	0.9	N/A

NOTES:
Skew = 0° on SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standard sheets;
30° maximum for safety end treatment

SL:1 = Horizontal : 1 Vertical
- Side slope at culvert for flared or straight wingwalls.
- Channel slope for parallel wingwalls.
- Slope must be 3:1 or flatter for safety end treatments.

T = Box culvert top slab thickness. Dimension can be found on the applicable box culvert standard sheet.

U = Box culvert wall thickness. Dimension can be found on the applicable box culvert standard sheet.

C = Curb height

See applicable wing or end treatment standard sheets for calculations of Hw, A, B, Lw, Ltw, Atw, and Total Wingwall Area.

Hw = Height of wingwall

A = Distance from face of curb to end of wingwall (not applicable to parallel or straight wingwalls)

B = Offset of end of wingwall (not applicable to parallel or straight wingwalls)

Lw = Length of longest wingwall.

Ltw = Length of culvert toewall (not applicable when using riprap apron)

Atw = Length of anchor toewall (applicable to safety end treatment only)
Total Wingwall Area = Wingwall area in sq. ft. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

(1) Round the wall heights shown to the nearest foot for bidding purposes.

(2) Concrete volume shown is for box culvert curb only. For curbs using the Box Culvert Rail Mounting Details (RAC) standard sheet quantities shown must be increased by a factor of 2.25. If Class S concrete is required for the top slab of the culvert, also provide Class S concrete for the curb. Curb concrete is considered part of the Box Culvert for payment.

(3) Concrete volume shown is total of wings, footings, culvert toewall (if any), anchor toewalls (if any) and wingwall toewalls. Riprap aprons, culverts, and curb quantities are not included.

(4) Regardless of the type of culvert shown on this sheet, the Contractor has the option of furnishing cast-in-place or precast culverts unless otherwise shown elsewhere on the plans. If the Contractor elects to provide culverts of a different type than those shown on this sheet, it is the Contractor's responsibility to make the necessary adjustments to the dimensions and quantities shown.

SPECIAL NOTE:

This sheet is a supplement to the box culvert standards. It is to be filled out by the culvert specifier and provides dimensions for the construction of the box culvert wingwalls and safety end treatments.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED
PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on
4/22/2022

DocuSigned by:
98C72D65D494466...

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90,etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		91

DATE: 4/22/2022 2:54:56 PM
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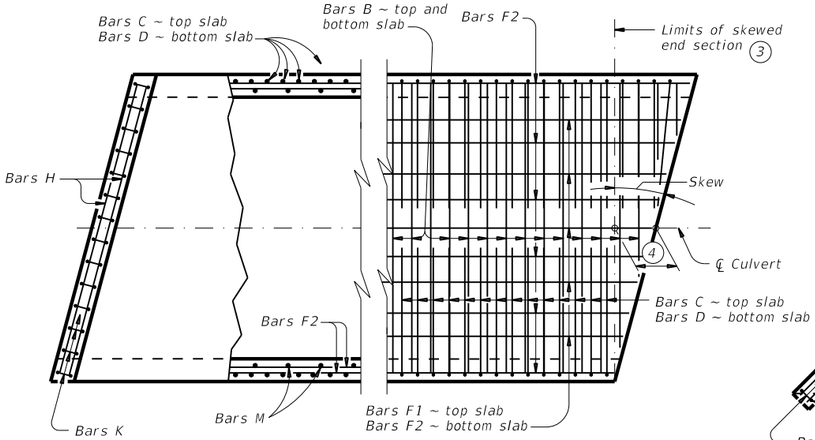
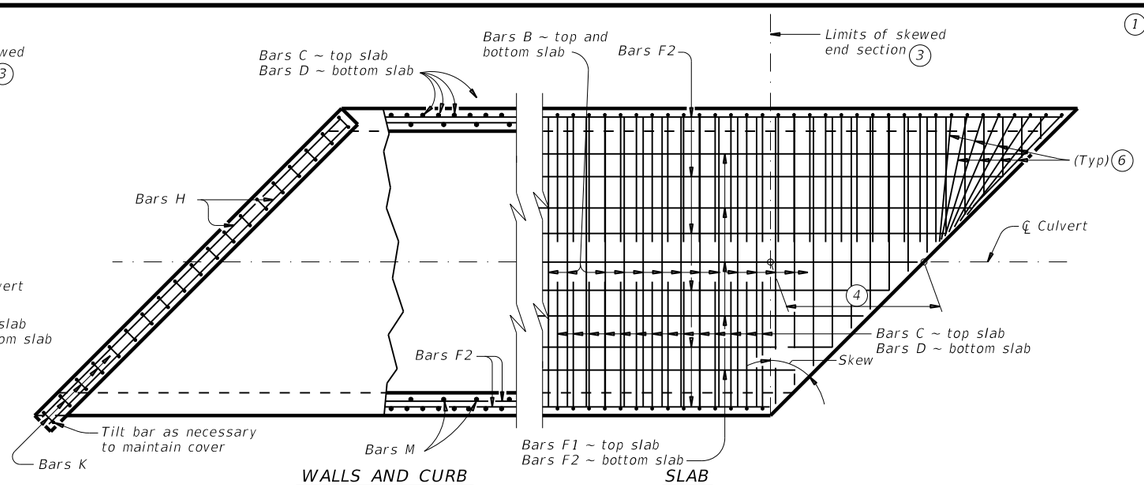
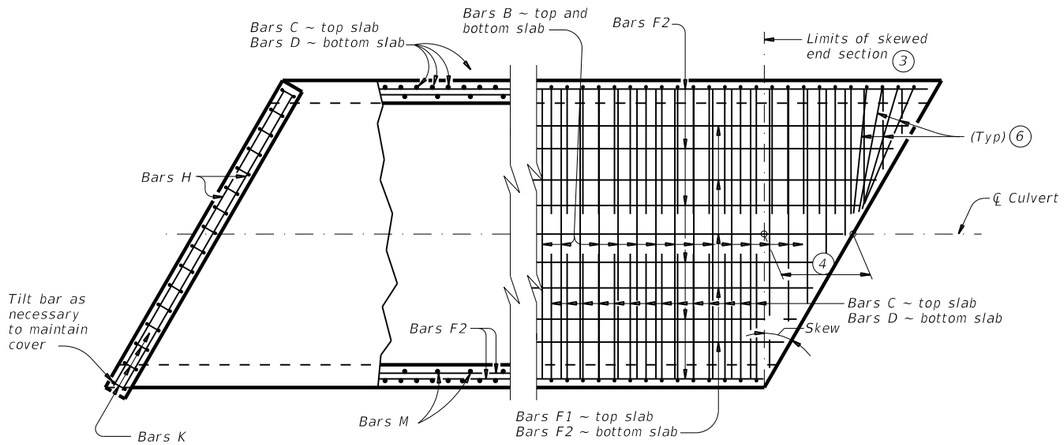


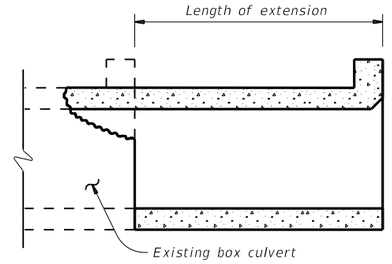
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



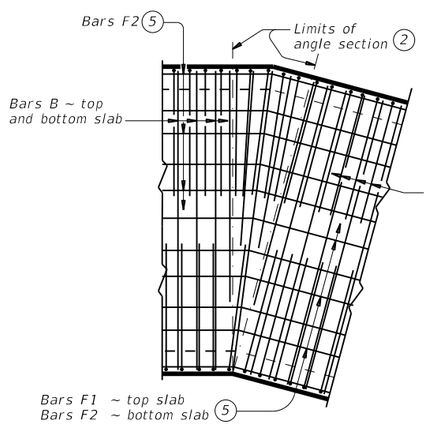
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



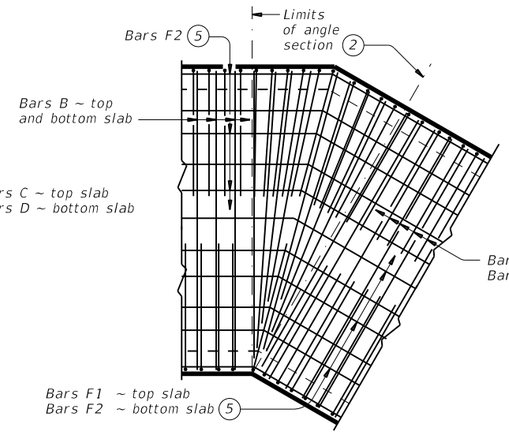
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



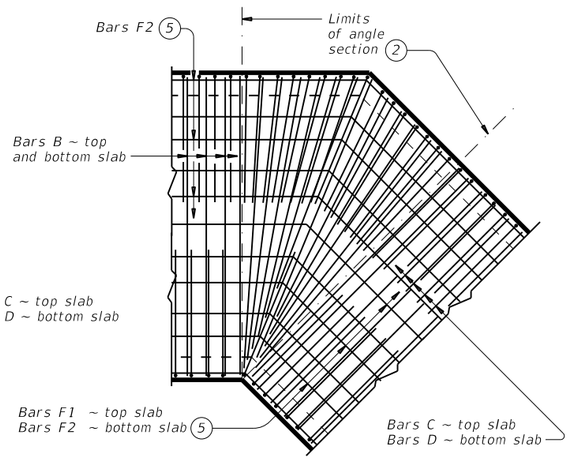
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, C, D , E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

(2) When the spacing between Bars B becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B vary in the skewed end sections.

(4) [One half of overall width] x [tangent of the skew angle]

(5) Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

(6) When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

(7) At the Contractor's option, for skews of 15° or less, place Bars B, C, and D parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B shown on the Single Box Culverts Cast-In-Place (SCC) standards sheets to accommodate the skew.

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions:
provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.

For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.

For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

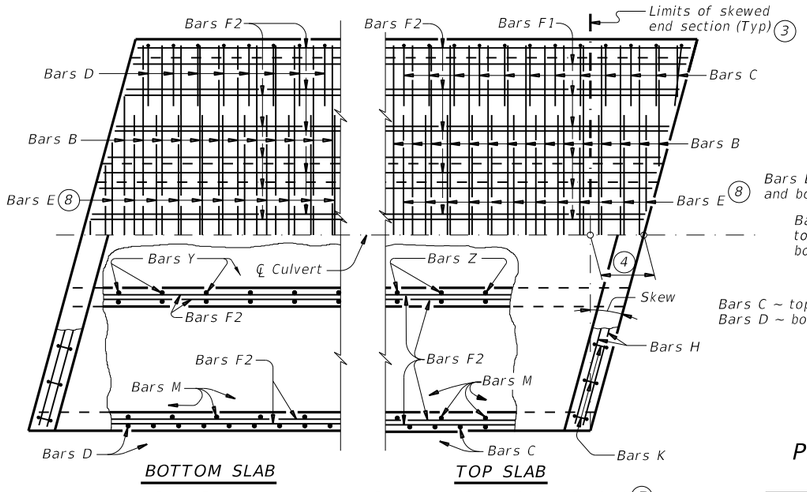
Texas Department of Transportation

Bridge Division Standard

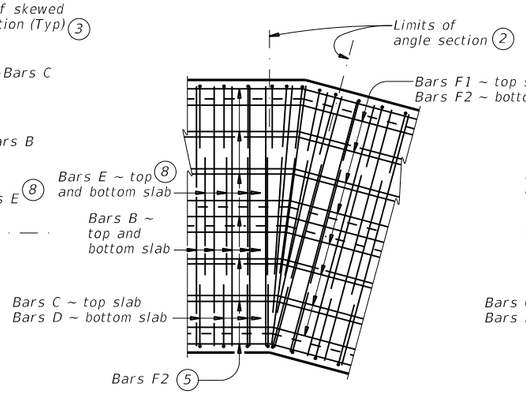
SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

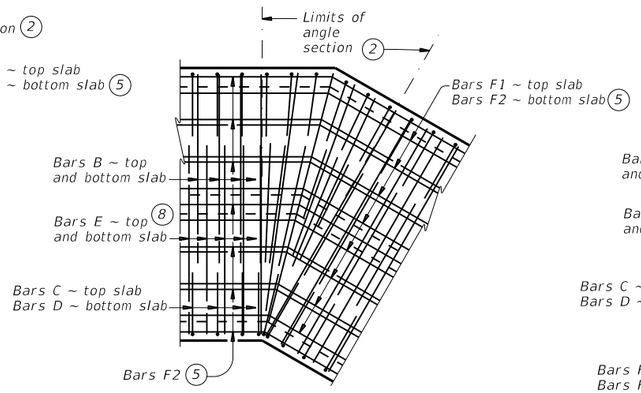
FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90,etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		92



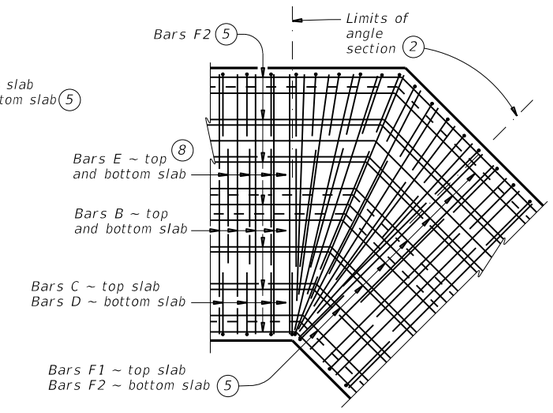
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° 7



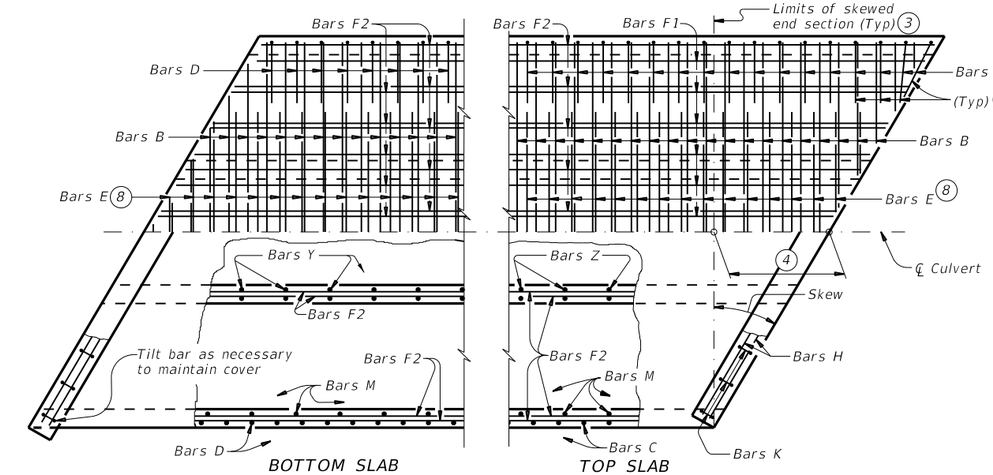
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



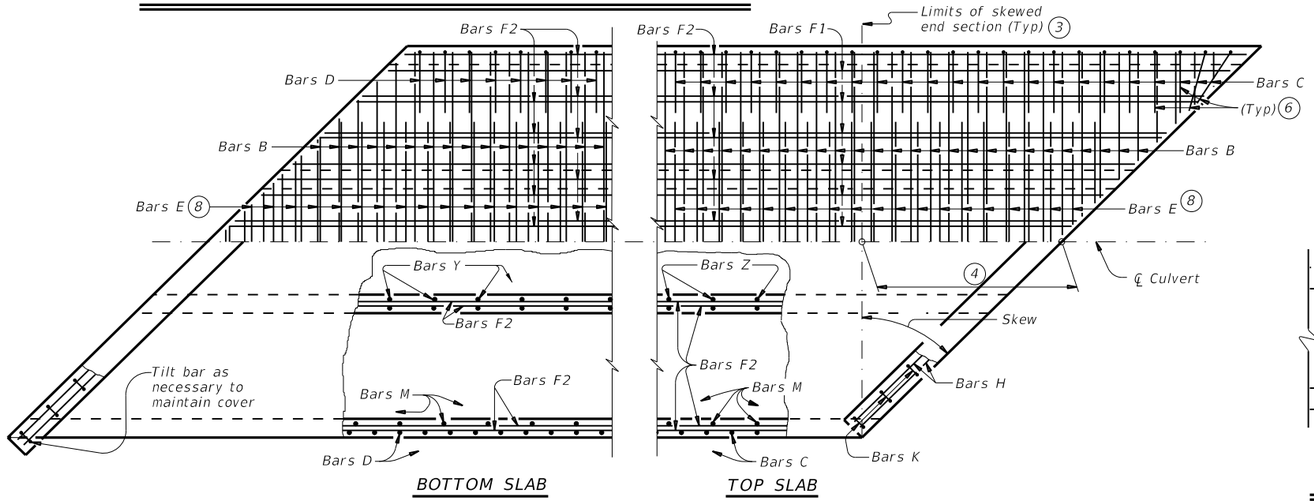
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°

1 For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, Class C, D, E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

2 When the spacing between Bars B or Bars E becomes less than half of the normal spacing, cut bars to avoid conflict.

3 The length of Bars B and Bars E will vary in the skewed end sections.

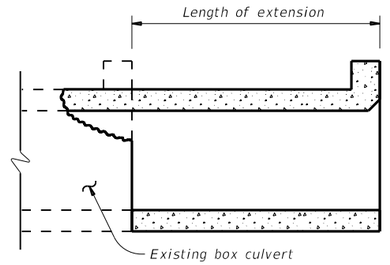
4 [One half of overall width] x [tangent of the skew angle]

5 Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

6 When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

7 At the Contractor's option, for skews of 15° or less, place Bars B, C, D, and E parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B and Bars E shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets to accommodate the skew.

8 Extend Bars E as shown on the MC standard sheet for direct traffic culverts.



LENGTHENING DETAIL 1

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for details of straight sections of culvert.
For skewed sections and angle sections, refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.
For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

MC-MD

FILE: mc-mdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		93

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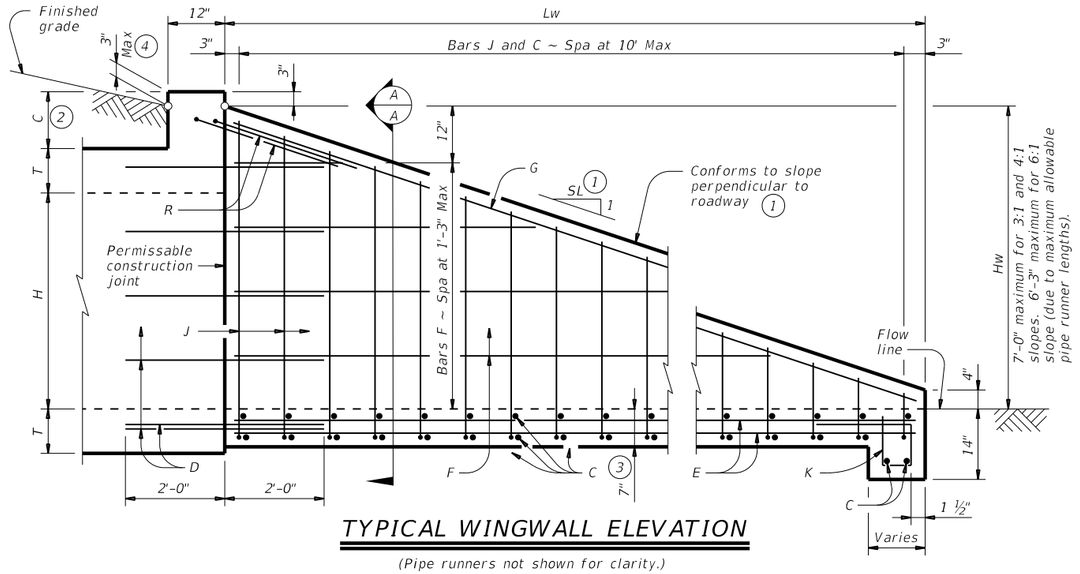
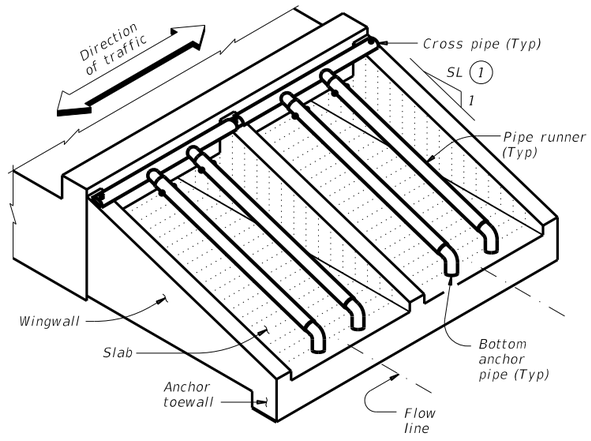


TYPICAL WINGWALL ELEVATION

(Pipe runners not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

WING DIMENSION CALCULATIONS:

$Hw = H + T + C - 0.250'$

$Lw = (Hw - 0.333') (SL)$

For cast-in-place culverts:

$Atw = (N) (S) + (N + 1) (U)$

For precast culverts:

$Atw = (N) (2U + S) + (N - 1) (0.500')$

Total Wingwall Area (SF)
$= (0.5) (Hw + 0.333') (Lw) (N + 1)$

Total Concrete Volume (CY)
$= [(\text{Wingwall Area}) (0.583') + (Lw) (Atw) (0.583') + (Atw) (1.167') (1.167' - 0.583')] \div (27)$

PIPE RUNNER DIMENSION CALCULATIONS:

Pipe Runner Length
$= (Lw) (K1) - (1.917')$

Total Reinforcing (Lb)
$= (1.55) (Lw) (Atw) + (4.43) (Atw) + (K2) (Hw) (N + 1) (\sqrt{Lw})$

C = Height of curb above top of top slab (feet)
Hw = Height of wingwall (feet)
K = Constant value for use in formulas

Slope SL:1	K1	K2
3:1	~ 1.054 ~	7.45
4:1	~ 1.031 ~	8.49
6:1	~ 1.014 ~	10.30

Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)

See applicable box culvert standard for H, S, T, and U values.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".

Provide Class "C" concrete (f`c = 3,600 psi).

Provide pipe runners, cross pipes, and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts.

Galvanize all steel components, except the concrete reinforcing, unless required elsewhere in the plans, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.

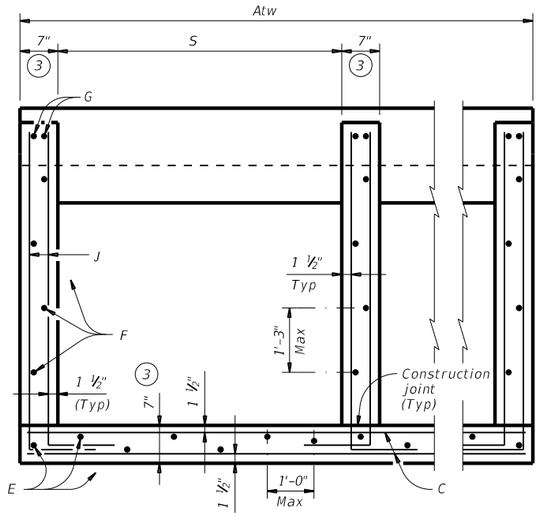
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

The quantities for pipe runners, reinforcing steel, and concrete resulting from the formulas given herein are for Contractor's information only.

See the Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.

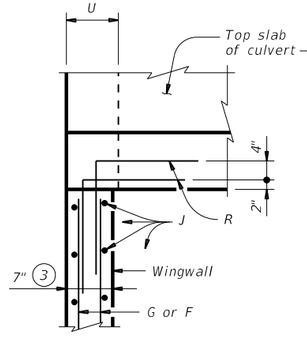
Alternate design drawings bearing the seal of a professional engineer will be acceptable for precast construction of the safety end treatments.

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



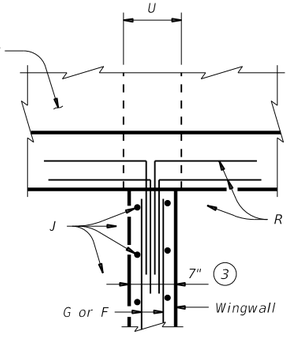
SECTION A-A

(Showing typical wingwall and wing slab reinforcing. Pipe runners not shown for clarity.)



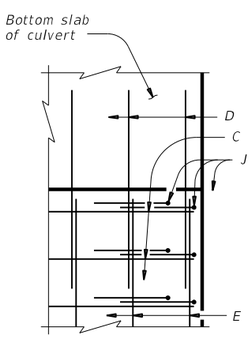
AT TOP OF EXTERIOR WINGWALL

(Cast-in-place culvert)



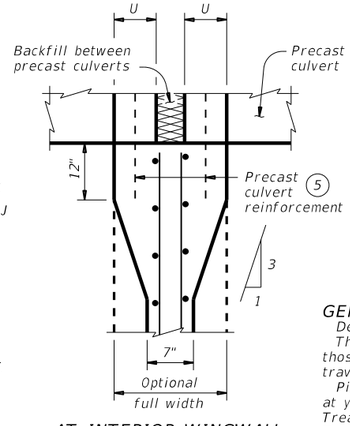
AT TOP OF INTERIOR WINGWALL

(Cast-in-place culvert)



AT OUTSIDE OF BOTTOM SLAB

(Cast-in-place culvert)



AT INTERIOR WINGWALL

(Precast culvert)

PLAN VIEWS OF CORNER DETAILS

(1) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(2) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet.

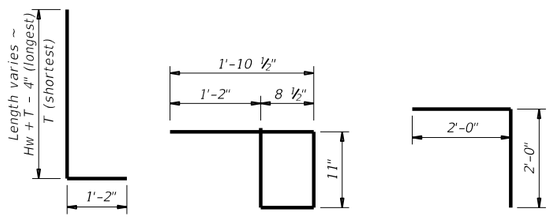
(3) Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.

(4) For vehicle safety, reduce curb height, if necessary, to provide a maximum 3" projection. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) For culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into wingwall. Wingwall Bars D and R may be omitted. Otherwise, refer to the Wingwall Connection detail on the Box Culvert Precast Miscellaneous Details (SCP-MD) standard sheet.

TABLE OF REINFORCING BAR SIZES AND SPACING

Bar	Size	Spacing
C	#4	10" Max
D	#4	Match F and E
E	#4	1'-0" Max
F	#4	1'-3" Max
G	#6	As shown
J	#4	10" Max
K	#4	1'-0" Max
R	#4	As shown



SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT

FOR 0° SKEW BOX CULVERTS
(MAXIMUM Hw = 7'-0")
TYPE I ~ CROSS DRAINAGE

SETB-CD

FILE: setbcdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90,etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		94

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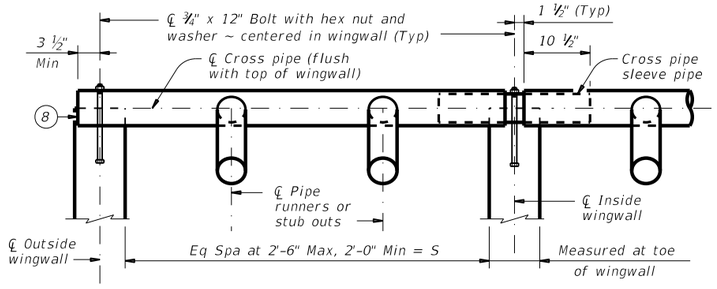
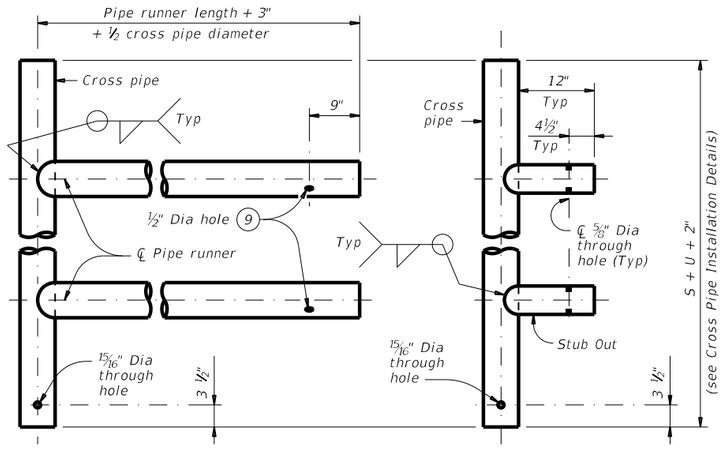


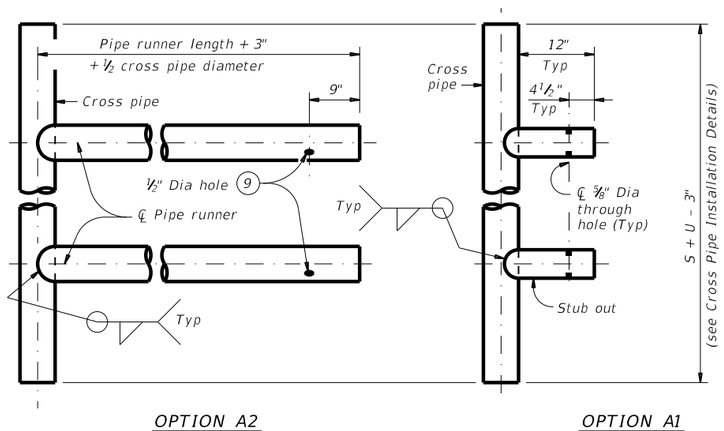
NOTE: At Contractor's option, make the cross pipe continuous across the inside wingwalls. If option is selected, omit the sleeve pipe and make a 15⁄16" diameter through hole in the cross pipe to accept the anchor bolt at the centerline of each inside wingwall.

CROSS PIPE INSTALLATION DETAILS



OPTION A2 OPTION A1

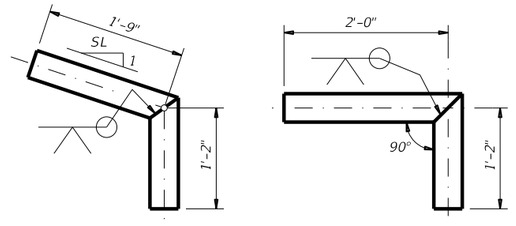
FOR USE IN OUTSIDE CULVERT BAY



OPTION A2 OPTION A1

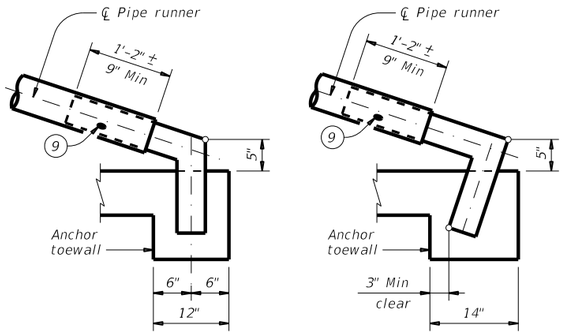
FOR USE IN INSIDE CULVERT BAY

CROSS PIPE AND CONNECTIONS DETAILS



OPTION A OPTION B

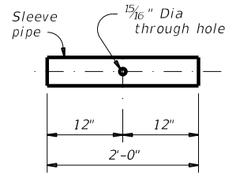
BOTTOM ANCHOR PIPE DETAILS (10)



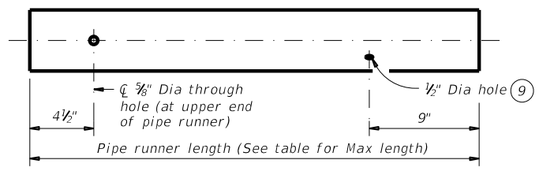
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Wingwall not shown for clarity.)

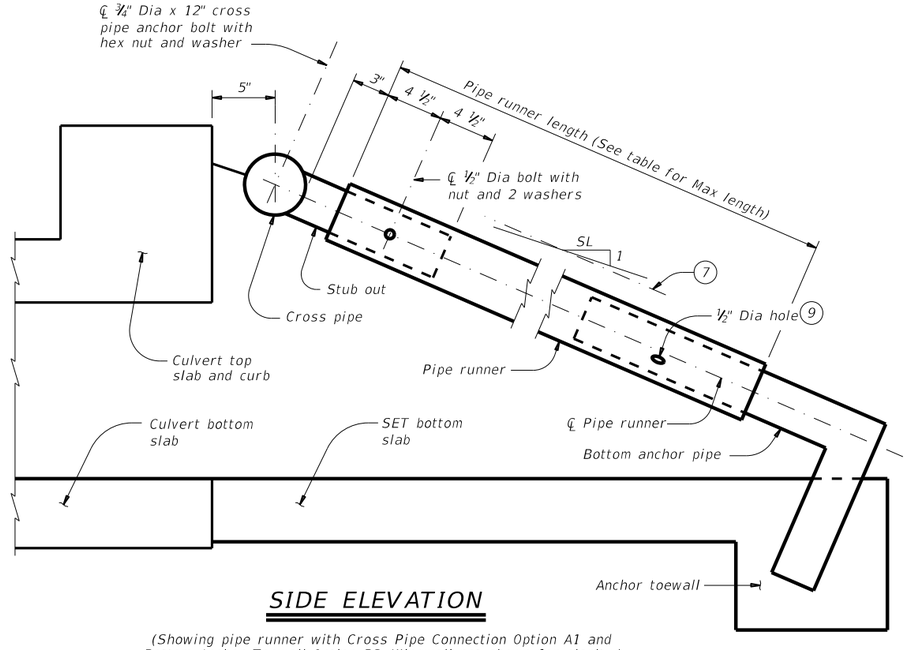


CROSS PIPE SLEEVE PIPE DETAILS



NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS



SIDE ELEVATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Bottom Anchor Toewall Option B2. Wingwall not shown for clarity.)

6 Cross pipe is the same size as the pipe runner. Cross pipe stub out is the same size as the anchor pipe.

7 Note that actual slope of safety pipe runner may vary slightly from side slope.

8 Take care to ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

9 After installation, inspect the 1#2" hole to ensure that the lap of the safety pipe runner with the bottom anchor pipe is adequate.

10 At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MAXIMUM PIPE RUNNER LENGTHS AND (6) REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

Maximum Pipe Runner Length	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
10'- 0"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'- 8"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
34'- 2"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT

FOR 0° SKEW BOX CULVERTS
(MAXIMUM Hw = 7'-0")
TYPE I ~ CROSS DRAINAGE

SETB-CD

FILE: setbcdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90,etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		95

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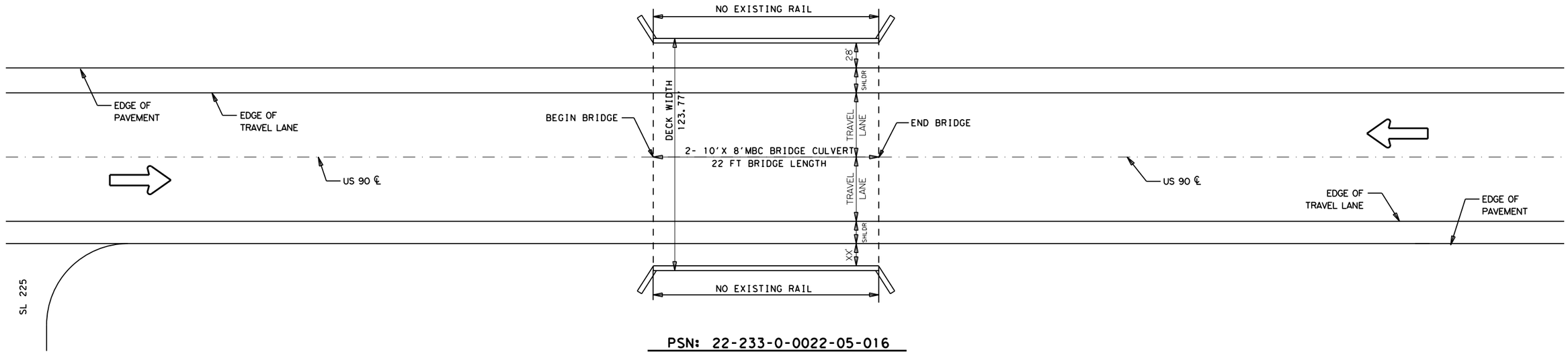
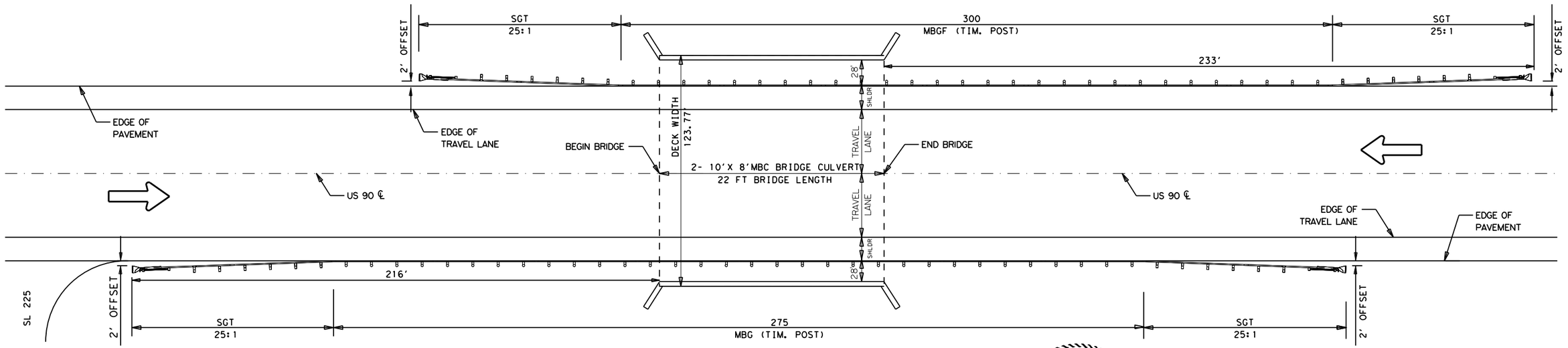


PSN: 22-233-0-0022-05-016
EXISTING MBGF, RAIL & TERMINAL



PSN: 22-233-0-0022-05-016
PROPOSED MBGF, RAIL & TERMINAL

GENERAL NOTES:

1. MBGF, THRIE-BEAM TRANSITION AND SGT INSTALLATION IS TO BE CONSTRUCTED IN SECTIONS (APPROACH UPSTREAM TRAFFIC, DEPARTURE DOWNSTREAM TRAFFIC). EACH SECTION WILL BE COMPLETED BEFORE THE END OF THE WORKING DAY ON WHICH IT WAS INITIATED. CONSTRUCTION OF A SECOND APPROACH/DEPARTURE SECTION MAY NOT COMMENCE UNTIL CONSTRUCTION OF A COMPLETE SECTION (THRIE-BEAM TRANSITION, MBGF, AND TERMINAL) IS COMPLETE. IF UNDER EXTREME CIRCUMSTANCES, A SECTION CAN NOT BE COMPLETED BEFORE THE END OF THE WORKING DAY, THE BLUNT, EXPOSED END WILL BE TIED DOWN AND/OR TIED TO THE REMAINING EXISTING MBGF APPURTENANCES (IF THEY ARE STILL IN PLACE) AT THE END OF THE WORKING DAY.
2. REFER TO TXDOT STANDARDS GF(31)-14, GF(31)TR-14, GF(31)MS-11 GF(31)T101-13, SGT(8)31-14, SGT(8S)31-14, SGT(9S)31-14, SGT(10S)31-16 AND BED-14 SHEET(S) FOR MORE INFORMATION.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on

5/3/2022

DocuSigned by:
08C72D65D494166...

REFERENCE LOCATION #1 US 90

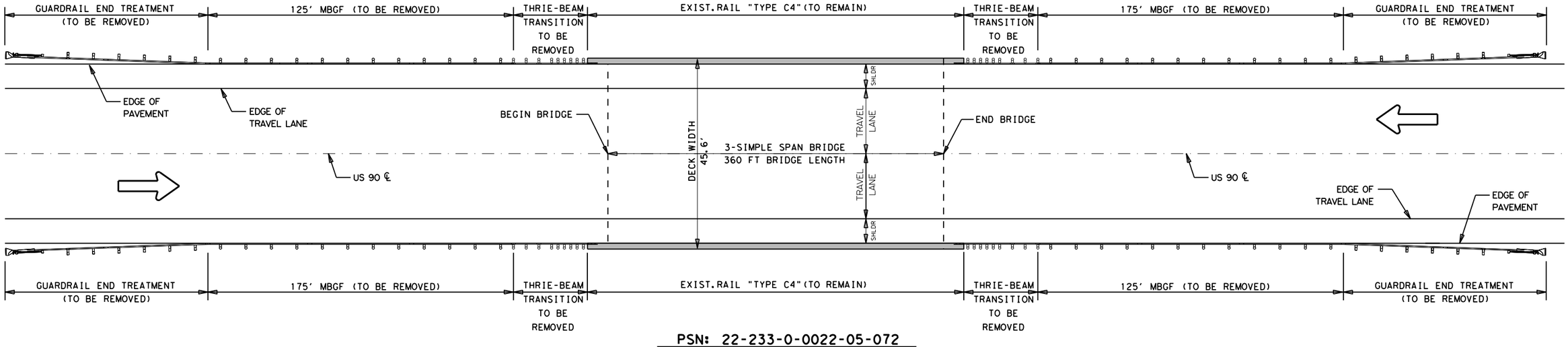
NOT TO SCALE

TEXAS DEPARTMENT OF TRANSPORTATION ®

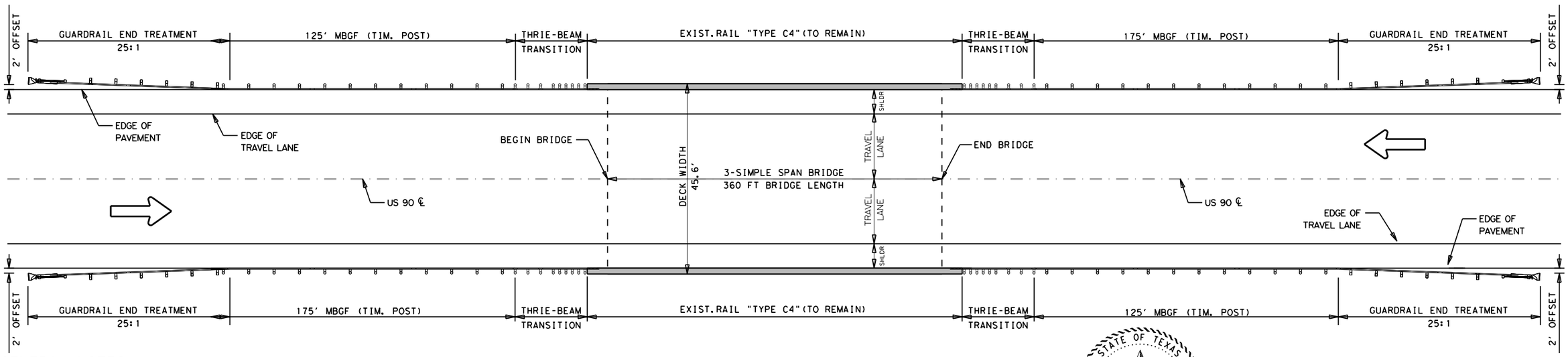
BRIDGE
MBGF, RAIL & TERMINAL
REPLACEMENT LAYOUT

DN:	DW:	STATE	SHEET NUMBER				SHEET NO.
CK:	CK:	TEXAS					
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.	96

5/2/2022 mtorrel c:\txdot\pw\online\txdot5\max.torres\d0649799\025brdlay-rail.dgn



PSN: 22-233-0-0022-05-072
EXISTING MBGF, RAIL & TERMINAL



GENERAL NOTES:

1. MBGF, THRIE-BEAM TRANSITION AND SGT INSTALLATION IS TO BE CONSTRUCTED IN SECTIONS (APPROACH UPSTREAM TRAFFIC, DEPARTURE DOWNSTREAM TRAFFIC). EACH SECTION WILL BE COMPLETED BEFORE THE END OF THE WORKING DAY ON WHICH IT WAS INITIATED. CONSTRUCTION OF A SECOND APPROACH/DEPARTURE SECTION MAY NOT COMMENCE UNTIL CONSTRUCTION OF A COMPLETE SECTION (THRIE-BEAM TRANSITION, MBGF, AND TERMINAL) IS COMPLETE. IF UNDER EXTREME CIRCUMSTANCES, A SECTION CAN NOT BE COMPLETED BEFORE THE END OF THE WORKING DAY, THE BLUNT, EXPOSED END WILL BE TIED DOWN AND/OR TIED TO THE REMAINING EXISTING MBGF APPURTENANCES (IF THEY ARE STILL IN PLACE) AT THE END OF THE WORKING DAY.
2. REFER TO TXDOT STANDARDS GF(31)-14, GF(31)TR-14, GF(31)MS-11 GF(31)T101-13, SGT(8)31-14, SGT(8S)31-14, SGT(9S)31-14, SGT(10S)31-16 AND BED-14 SHEET(S) FOR MORE INFORMATION.
3. USE CURB OPTION IN THRIE-BEAM TRANSITION AND MOW STRIP STANDARD. THE CONCRETE CURB WILL BE CONTINUOUS TO END BETWEEN THE FIRST 6'-3" POST SPACING NOTED FOR THE MBGF. THE CURB WILL TAPER TO A 4" MAXIMUM HEIGHT AT THE TERMINAL POINT AS NOTED IN THE GF(31)TR-14 STANDARD.

PSN: 22-233-0-0022-05-072
PROPOSED MBGF, RAIL & TERMINAL

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

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TEXAS DEPARTMENT OF TRANSPORTATION ®
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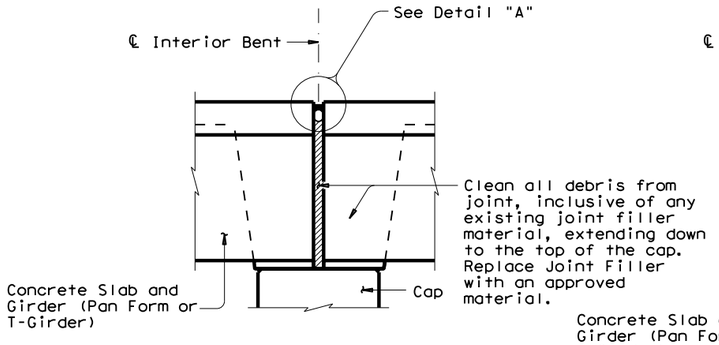
BRIDGE MBGF, RAIL & TERMINAL REPLACEMENT LAYOUT

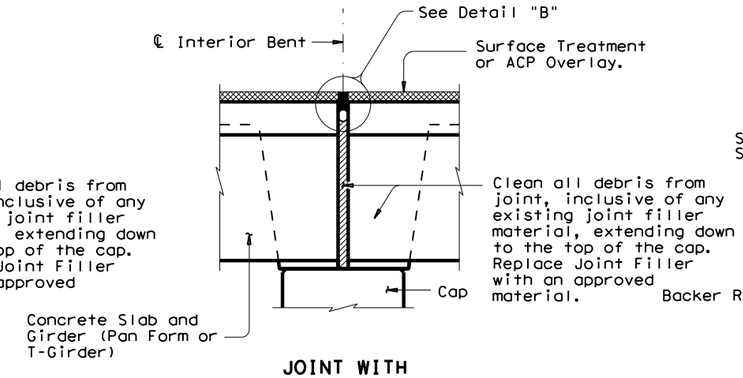
REFERENCE LOCATION #1 US 90

DN:	CK:	DW:	CK:	STATE	SHEET NUMBER			SHEET NO.
				TEXAS				
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY		CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.		0022	05	025, etc.	US 90, etc.	97

5/2/2022 mtorrel c:\txdot\pw\online\txdot5\max.torres\d0649799\025brdlgy-rail.dgn



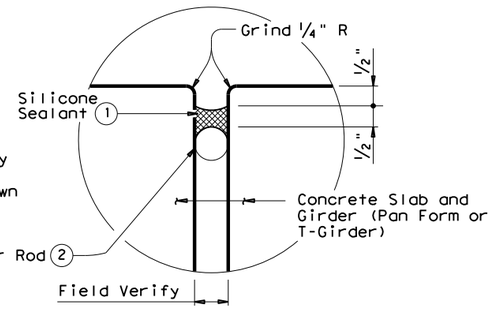
JOINT WITH
SILICONE SEAL
(used without ACP Overlay)



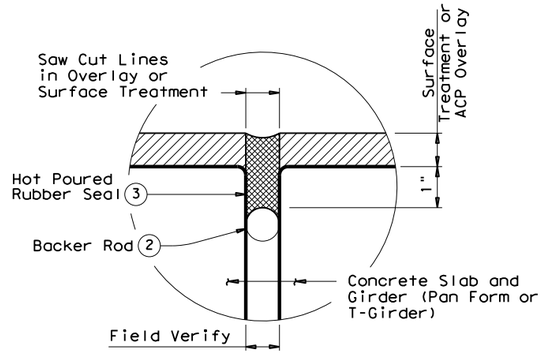
JOINT WITH
HOT POURED RUBBER SEAL
(used with ACP Overlay)

EXISTING CONCRETE SLAB & GIRDER JOINT DETAIL

(T-Girder not depicted for clarification purposes.)



DETAIL "A"



DETAIL "B"

NOTES:

(1) Use Class 7 silicone sealant. Prepare joint and seal in accordance with Item 438 "Cleaning and Sealing Joints and Cracks."

(2) Backer rod must be 25% larger than joint opening and must be compatible with the sealant.

(3) Use Class 3 hot poured rubber seal. Prepare joint and seal in accordance with Item 438 "Cleaning and Sealing Joints and Cracks."

PROCEDURE FOR CLEANING AND SEALING EXISTING CONCRETE GIRDER JOINT WITH SILICONE SEAL:

1) Clean joint opening of all old expansion materials/devices, dirt, and all other deleterious materials in accordance with Item 438, "Cleaning and Sealing Joints and Cracks." Clean joint out full depth of the joint.

2) Obtain approval of cleaned joint prior to proceeding with joint sealing operation.

3) Place backer rod into joint opening 1" below the top of concrete. The backer rod must be 25% larger than the joint opening.

4) Seal the joint opening with a Class 7 Silicone. Recess seal 1/2" below top of concrete in travel lanes and 1/8" below top of concrete in shoulders.

PROCEDURE FOR CLEANING AND SEALING EXISTING CONCRETE GIRDER JOINT WITH HOT POURED RUBBER SEAL:

1) Saw cut through the asphalt at the centerline of joint. Make multiple saw cuts to create a 1/2" minimum joint opening or match the existing joint opening. Clean joint opening of all old expansion materials/devices, bituminous materials, dirt, grease and all other deleterious materials in accordance with Item 438, "Cleaning and Sealing Joints and Cracks."

2) Obtain approval of cleaned joint prior to proceeding with joint sealing operation.

3) Place backer rod into joint opening 1" below the top of concrete. Backer rod must be of the type that can handle the heat and be compatible with the hot poured rubber seal. The backer rod must be 25% larger than the joint opening.

4) Seal the joint opening with a Class 3, "Hot Poured Rubber." Seal flush to the top of the asphaltic concrete pavement.

GENERAL NOTES:

Verify actual joint condition and bridge configuration prior to begining work and selecting appropriate detail to be used.

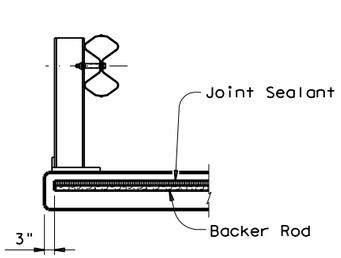
Cleaning existing joint opening (full depth) of all debris, providing and placing backer rod, saw-cutting joint opening, and sealing joint is paid for by Item 438, "Cleaning and Sealing Joints and Cracks" and measured by the foot of "Cleaning and Sealing of Existing Joints."

Obtain approval for all tools, equipment, materials and techniques proposed for use to prepare the joint.

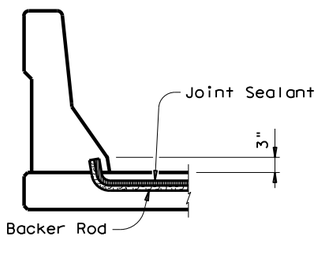
For Class 3 Hot Poured Rubber Seal, provide backer rod compatible with the hot poured rubber sealant and rated for a minimum of 400°F. Provide Class 3 sealant in accordance with DMS-6310, "Joint Sealants and Fillers" for joints in asphalt overlay.

Provide Class 7 silicone sealant in accordance with DMS-6310, "Joint Sealants and Fillers" for joints in concrete.

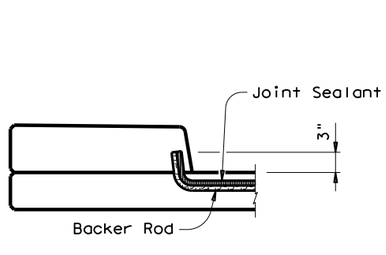
Extend sealant up into rail or curb 3 inches on low side or sides of deck. If the Class 7 Sealant cannot be effectively placed in the vertical position, a Class 4 Sealant compatible with the Class 7 sealant is allowed for the extension of the seal into the curb or rail. Prepare surfaces where sealant is to be placed in accordance with manufacturer's specifications.



SHOWN AT STEEL RAIL

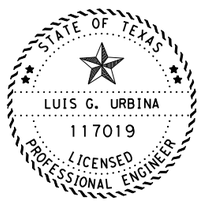


SHOWN AT BARRIER RAIL



SHOWN AT CURB

JOINT SEALANT TERMINATION DETAILS



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5/3/2022

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NOT TO SCALE

TEXAS DEPARTMENT OF TRANSPORTATION ®

CLEANING AND SEALING
EXISTING BRIDGE JOINTS

DN: MT	DW: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 2			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.

98

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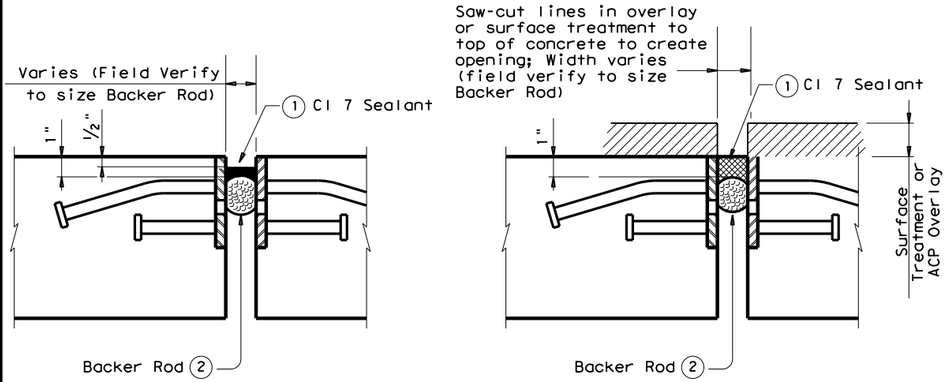


CLEANING AND SEALING EXISTING ARMOR JOINTS

PROCEDURE FOR CLEANING AND SEALING EXISTING ARMOR JOINTS:

1a) FOR DECKS WITHOUT SURFACE TREATMENT:
Remove existing seal.

1b) FOR DECKS WITH SURFACE TREATMENT:
Sawcut through the asphalt at the cenerline of the joint. make multiple sawcuts to create a ½" minimum joint opening or match existing joint opening. Clean joint opening of all deleterious materials in accordance with Item 438, "Cleaning and Sealing Joints and Cracks".

2) Abrasive blast clean existing steel surface where seal is to be placed.

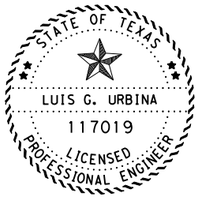
3) Obtain approval of cleaned joint prior to proceeding with joint sealing operation.

4) Condition of existing steel angle, plate, or rail shall be determined prior to sealing the exist joint. The entire length of existing joint shall be checked and any portion that is determined to be unsound by the Engineer shall be removed and replaced as directed by the Engineer. Compensation for any work beyond the scope of cleaning and sealing will be addressed with the Engineer.

5) Place backer rod into joint opening 1" below the top of concrete. The backer rod must be 25% larger than the joint opening.

6a) FOR DECKS WITH NO SURFACE TREATMENT:
Seal the joint opening with a Class 7 Sealant. Recess seal ½" below top of concrete in travel lanes and ⅛" below top of concrete in shoulders.

6b) FOR DECKS WITH SURFACE TREATMENTS:
Seal the joint opening with a Class 7 Sealant flush with top surface of deck, below the surface treatment.



The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on

5/3/2022

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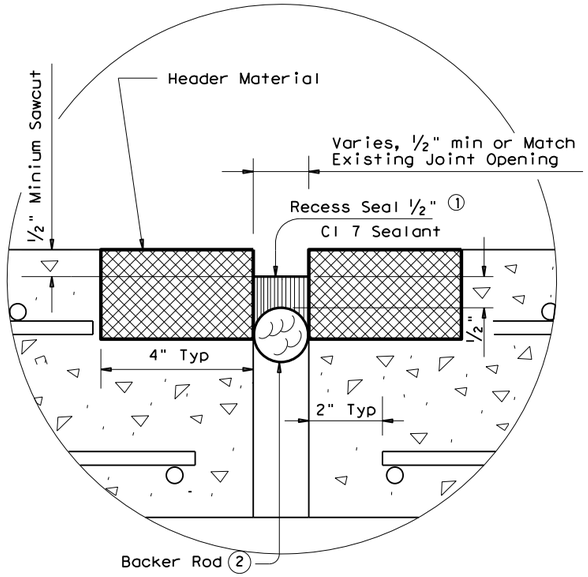

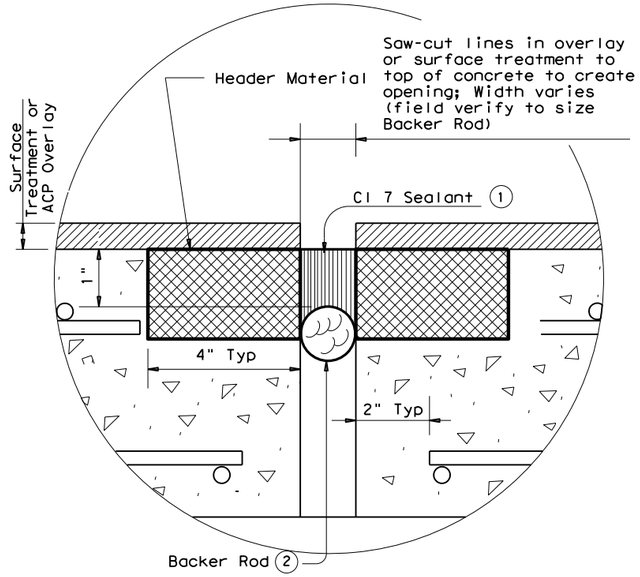

CLEANING AND SEALING EXISTING HEADER JOINTS

PROCEDURE FOR CLEANING AND SEALING EXISTING HEADER JOINTS:

1a) FOR DECKS WITHOUT SURFACE TREATMENT:
Remove existing seal.

1b) FOR DECKS WITH SURFACE TREATMENT:
Sawcut through the asphalt at the cenerline of the joint. make multiple sawcuts to create a ½" minimum joint opening or match existing joint opening. Clean joint opening of all deleterious materials in accordance with Item 438, "Cleaning and Sealing Joints and Cracks".

2) Abrasive blast clean existing concrete where seal is to be placed.

3) Obtain approval of cleaned joint prior to proceeding with joint sealing operation.

4) Condition of existing header material shall be determined prior to sealing the exist joint. The entire length of existsing joint shall be checked and any portion that is determined to be unsound by the Engineer shall be removed and replaced as directed by the Engineer. Compensation for any work beyond the scope of cleaning and sealing will be addressed with the Engineer.

5) Place backer rod into joint opening 1" below the top of concrete. The backer rod must be 25% larger than the joint opening.

6a) FOR DECKS WITH NO SURFACE TREATMENT:
Seal the joint opening with a Class 7 Sealant. Recess seal ½" below top of concrete in travel lanes and ⅛" below top of concrete in shoulders.

6b) FOR DECKS WITH SURFACE TREATMENTS:
Seal the joint opening with a Class 7 Sealant, flush with top of header material, below the surface treatment.

NOTES:

1. Use Class 7 sealant that conforms to DMS-6310. Prepare joint and seal in accordance with Item 438 "Cleaning and Sealing Joints and Cracks."
2. Backer rod must be 25% larger than joint opening and must be compatible with the sealant.

GENERAL NOTES:

Verify actual joint condition and bridge configuration prior to begining work and selecting appropriate detail to be used.

Cleaning existing joint opening (full depth) of all debris, providing and placing backer rod, saw-cutting joint opening, and sealing joint is paid for by Item 438, "Cleaning and Sealing Joints and Cracks" and measured by the foot of "Cleaning and Sealing of Existing Joints."

Obtain approval for all tools, equipment, materials and techniques proposed for use to prepare the joint.

For Class 3 Hot Poured Rubber Seal, provide backer rod compatible with the hot poured rubber sealant and rated for a minimum of 400°F. Provide Class 3 sealant in accordance with DMS-6310, "Joint Sealants and Fillers" for joints in asphalt overlay.

Provide Class 7 silicone sealant in accordance with DMS-6310, "Joint Sealants and Fillers" for joints in concrete.

Extend sealant up into rail or curb 3 inches on low side or sides of deck. If the Class 7 Sealant cannot be effectively placed in the vertical position, a Class 4 Sealant compatible with the Class 7 sealant is allowed for the extension of the seal into the curb or rail. Prepare surfaces where sealant is to be placed in accordance with manufacturer's specifications.

NOT TO SCALE

TEXAS DEPARTMENT OF TRANSPORTATION ®

CLEANING AND SEALING EXISTING BRIDGE JOINTS

DN: MT	CK: LGU	DW: MT	CK: LGU	STATE	SHEET NUMBER			SHEET NO.
				TEXAS	SHEET 2 OF 2			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY		CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.		0022	05	025, etc.	US 90, etc.	99

5/2/2022 mtorrel c:\txdot\pwonline\txdot5\max.torres\d0649799\025brddtl.dgn

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
LOCATION #1-		US90 AND SL25 EAST END INTERSECTION DETAIL										
1		M1-4(2 dgt)	<US HIGHWAY ROUTE SHIELD> (90)	24 x 24								
1		M6-3	<ARROW - VERTICAL STRGHT> <AUX. SIGN>	21 x 15			10BWG	1	SA	U		
1		M1-6L(2 dgt)	LOOP (25)	24 x 24								
1		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15								
2		R1-2	YIELD	48 x 48 x 48			10BWG	1	SA	T		
3		R1-2	YIELD	48 x 48 x 48			10BWG	1	SA	T		
14		R5-1	DO NOT ENTER	36 x 36			10BWG	1	SA	P		
4		M3-2	EAST <AUXILIARY SIGN>	24 x 12			10BWG	1	SA	P		
4		M1-4(2 dgt)	<US HIGHWAY ROUTE SHIELD> (90)	24 x 24								
5		W8-21	GUSTY WINDS AREA	36 x 36			10BWG	1	SA	P		
6		W1-7T	<BI-DIRECTIONAL LRG ARRW w/ CHEVRONS>	96 x 36			S80	1	SA	T	2EXT	

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).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90,etc.
4-16	DIST	COUNTY		SHEET NO.
8-16	22	VAL VERDE, etc.		100

DATE: 4/22/2022 4:42:59 PM
FILE: c:\txdot\pw_online\txdot5\juan.gomez\d0649800\sums16.dgn

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
7		M3-4	WEST <AUXILIARY SIGN>	24 x 12								
			WEST									
7		M1-4(2 dgt)	<US HIGHWAY ROUTE SHIELD> (90)	24 x 24								
			90									
7		#REF! #REF! M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15			S80	1	SA	U		
7			EAST <AUXILIARY SIGN>	24 x 12								
			EAST									
7		M1-4(2 dgt)	<US HIGHWAY ROUTE SHIELD> (90)	24 x 24								
			90									
7		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15								
8		M1-6L(2 dgt)	LOOP (25)	24 x 24								
			LOOP 25									
8		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15								
8		M1-4(2 dgt)	<US HIGHWAY ROUTE SHIELD> (90)	24 x 24			10BWG	1	SA	U		
			90									
8		M6-3	<ARROW - VERTICAL STRGHT> <AUX. SIGN>	21 x 15								
10		D9-22	SYMBOL - WIRELESS INTERNET AHEAD	24 x 24			10BWG	1	SA	T		
10		D12-5bL	TEXAS TRAVEL INFOR CENTER	54 x 18								
			TRAVEL INFO CENTER									

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.

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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).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90,etc.
4-16 8-16	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		101

DATE: 4/22/2022 4:42:59 PM
FILE: c:\txdot\pw_online\txdot5\juan.gomez\d0649800\sums16.dgn

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
11		D1-1	Judge Roy Bean Museum Judge Roy Bean ← Museum	78 x 24			S80	2	SA	P	EXAL	
11		D1-1	Langtry ← Langtry	78 x 12								
12		D1-1	Judge Roy Bean Museum Judge Roy Bean Museum →	78 x 24			S80	2	SA	P	EXAL	
12		D1-1	Langtry Langtry →	78 x 12								
13		D9-22	SYMBOL - WIRELESS INTERNET AHEAD	24 x 24			10BWG	1	SA	T		
13		D12-5bL	TEXAS TRAVEL INFOR CENTER TRAVEL INFO CENTER	54 x 18								

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"

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http://www.txdot.gov/

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
4-16 8-16	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		102

18

DATE: 4/22/2022 4:42:59 PM
FILE: c:\txdot\pw_online\txdot5\juan.gomez\d0649800\sums16.dgn

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
LOCATION #1-US90 AND SL25 WEST END INTERSECTION DETAIL												
1		M3-4	WEST <AUXILIARY SIGN>	24 x 12			10BWG	1	SA	P		
1		M1-4(2 dgt)	<US HIGHWAY ROUTE SHIELD> (90)	24 x 24								
3		W1-7T	<BI-DIRECTIONAL LRG ARRW w/ CHEVRONS>	96 x 36			S80	1	SA	T	2EXT	
4		M3-4	WEST <AUXILIARY SIGN>	24 x 12								
4		M1-4(2 dgt)	<US HIGHWAY ROUTE SHIELD> (90)	24 x 24								
4		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15			S80	1	SA	U		
4		M3-2	EAST <AUXILIARY SIGN>	24 x 12								
4		M1-4(2 dgt)	<US HIGHWAY ROUTE SHIELD> (90)	24 x 24								
4		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15								

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).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90,etc.
4-16	DIST	COUNTY		SHEET NO.
8-16	22	VAL VERDE, etc.		103

DATE: 4/22/2022 4:42:59 PM
FILE: c:\txdot\pw_online\txdot5\juan.gomez\d0649800\sums16.dgn

SUMMARY OF SMALL SIGNS

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) POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
5		M1-6L(2 dgt)	LOOP (25)	24 x 24								
5		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15			10BWG	1	SA	U		
5		M1-4(2 dgt)	<US HIGHWAY ROUTE SHIELD> (90)	24 x 24								
5		M6-3	<ARROW - VERTICAL STRGHT> <AUX. SIGN>	21 x 15								
6		W9-2L	LANE ENDS MERGE LEFT	36 x 36			10BWG	1	SA	P		
7		M1-4(2 dgt)	<US HIGHWAY ROUTE SHIELD> (90)	24 x 24								
7		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10			10BWG	1	SA	P		
LOCATION #4 & #5- FM 582 & FM 1433-8 TOTAL SIGNS TO BE PLACE AT PEDESTRIAN CROSS WALKS AS PER (PM (4)-20)												
		R1-5L	YIELD HERE TO <PED SYMBOL + LT ARROW>	36 x 36			10BWG	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).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90,etc.
4-16	DIST	COUNTY		SHEET NO.
8-16	22	VAL VERDE, etc.		104

DATE: 4/22/2022 4:43:00 PM
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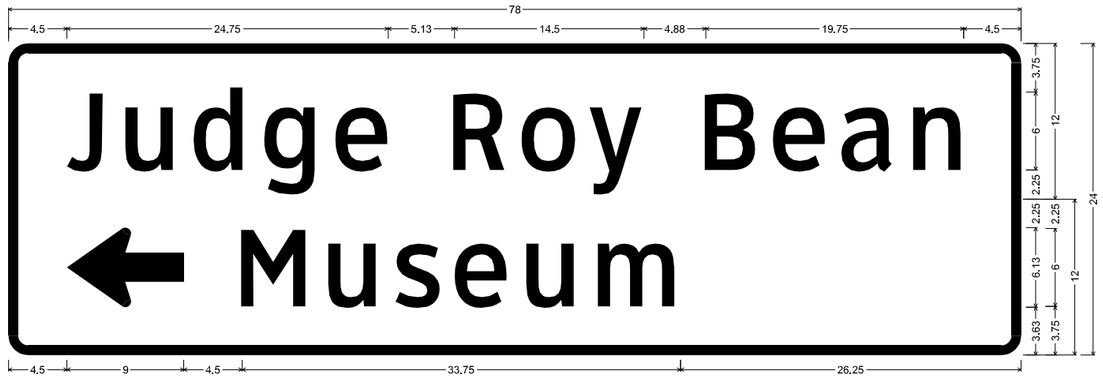
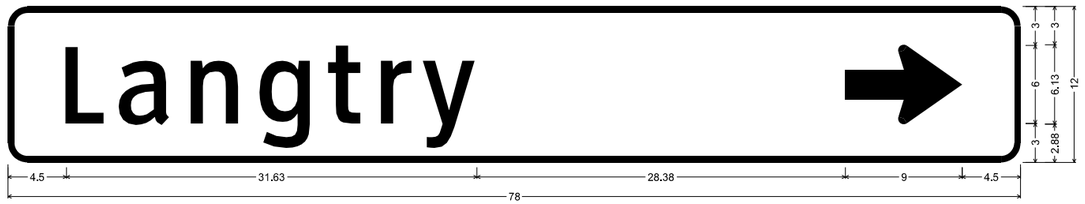


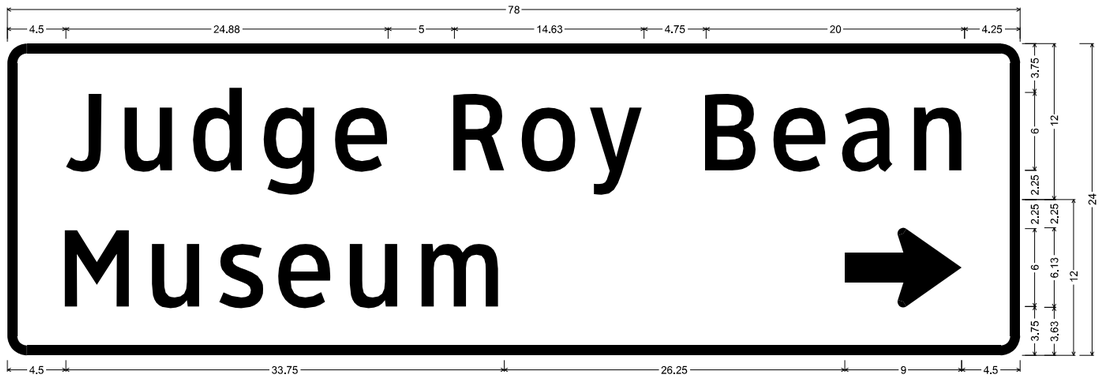
D1-2 6in LT-LT;

1.50" Radius, 0.75" Border, White on, Brown;
"Judge Roy Bean", ClearviewHwy-3-W 99% spacing;

1.50" Radius, 0.75" Border, White on, Brown;
Standard Arrow Custom 9.00" X 6.13" 180"; "Museum", ClearviewHwy-3-W;

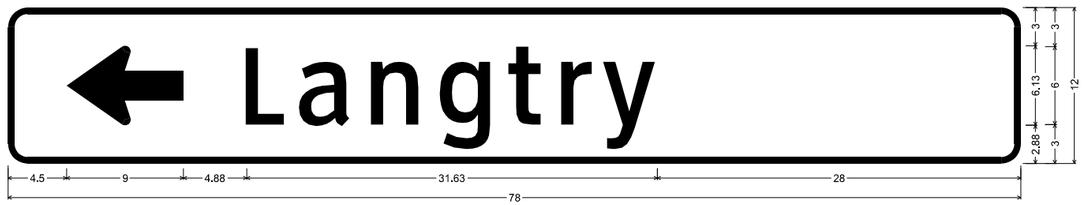


D1-1 6in RT;
1.50" Radius, 0.50" Border, White on, Green;
"Langtry", ClearviewHwy-3-W; Standard Arrow Custom 9.00" X 6.13" 0";



D1-2 6in RT-RT;

1.50" Radius, 0.75" Border, White on, Brown;
"Judge Roy Bean", ClearviewHwy-3-W;
1.50" Radius, 0.75" Border, White on, Brown;
"Museum", ClearviewHwy-3-W; Standard Arrow Custom 9.00" X 6.13" 0";



D1-1 6in LT;
1.50" Radius, 0.50" Border, White on, Green;
Standard Arrow Custom 9.00" X 6.13" 180"; "Langtry", ClearviewHwy-3-W;

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on

5/3/2022

DocuSigned by:
98C72D65D494466...

NOT TO SCALE

US 90
SPECIAL SIGNS

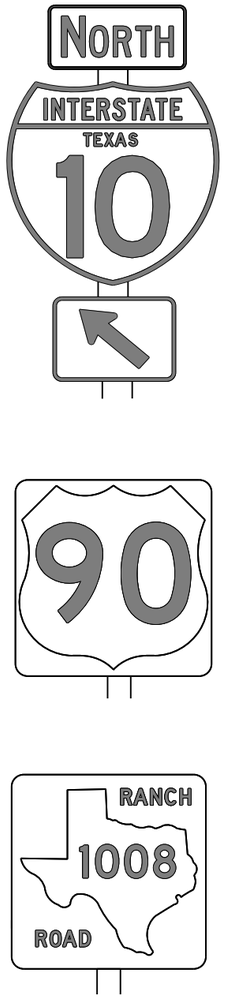
DN: MT	CK: LGU	DW: MT	CK: LGU	STATE	SHEET NUMBER			SHEET NO.
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY		CONTROL	SECTION	JOB	HIGHWAY NO.	
6	22	VAL VERDE, etc.		0022	05	025, etc.	US 90, etc.	105

TEXAS | SHEET 1 OF 1

DATE: 4/22/2022 2:56:09 PM
FILE: c:\txdot\pw_online\txdot5\juan.gomez\d0650879\tsr3-13.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

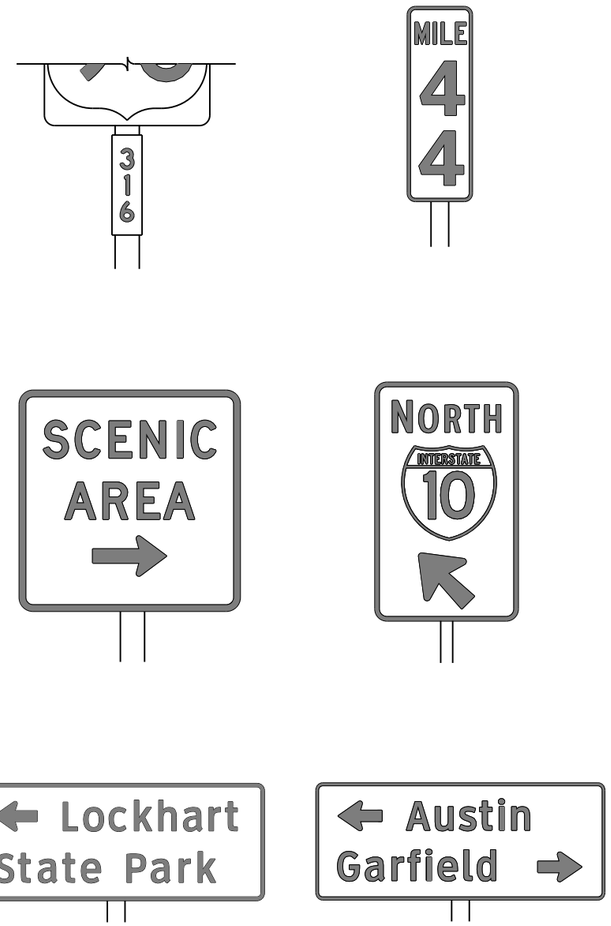
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. 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.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

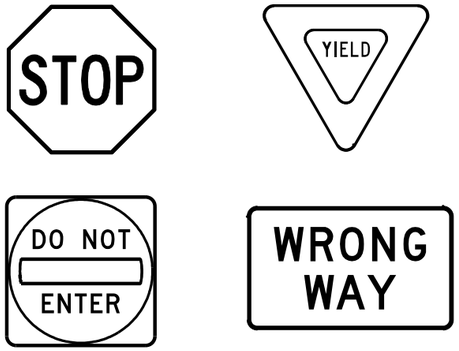
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	22	VAL VERDE, etc.		106

DATE: 4/22/2022 2:56:14 PM
FILE: c:\txdot\pw_online\txdot5\juan.gomez\d0650879\tsr4-13.dgn

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

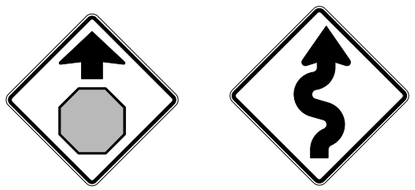
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

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

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

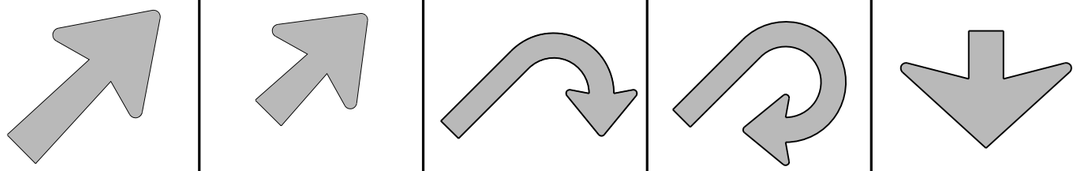
TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		107

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

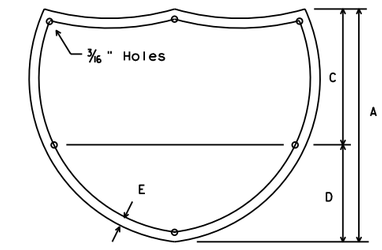
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

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

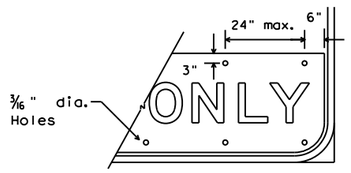
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

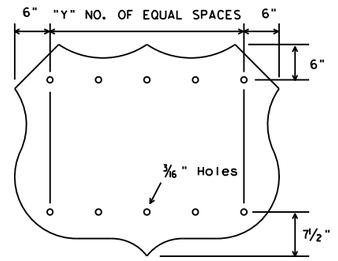


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

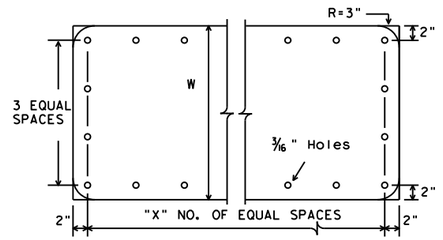


EXIT ONLY PANEL



U.S. ROUTE MARKERS

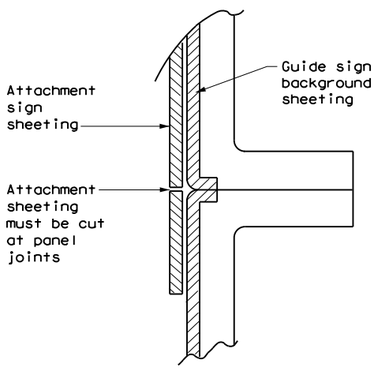
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

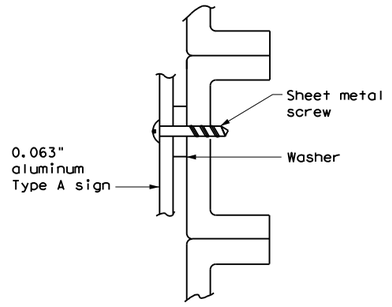
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



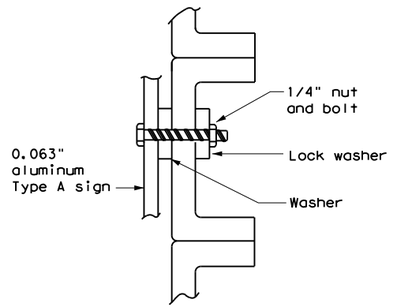
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



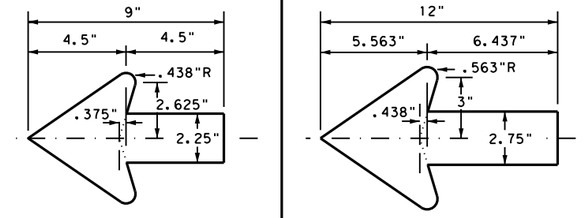
NUT/BOLT ATTACHMENT

NOTE:

Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.

Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	22	VAL VERDE, etc.		108

5

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)

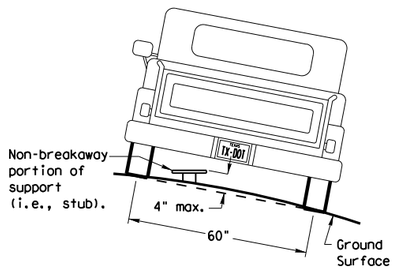
Anchor Type

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))

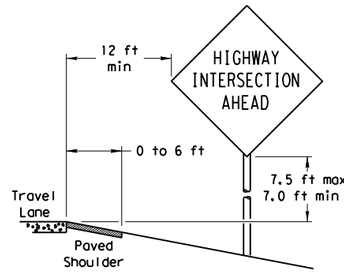
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

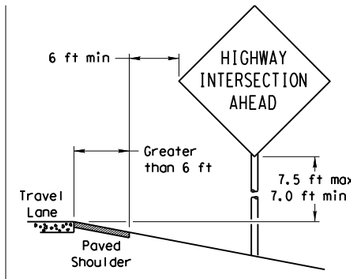
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

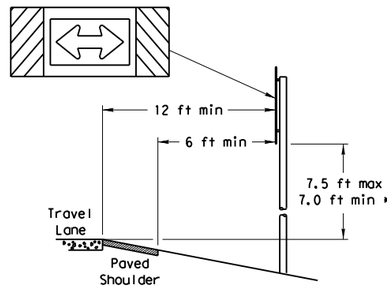
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



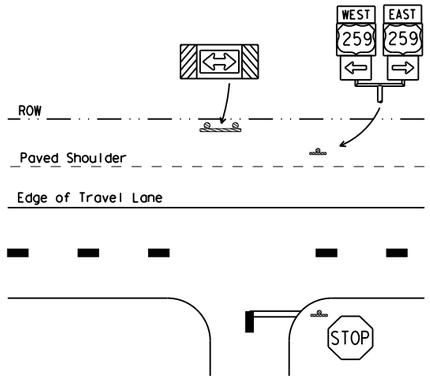
GREATER THAN 6 FT. WIDE

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.

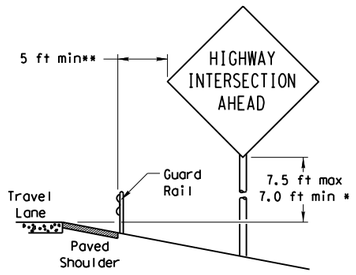
T-INTERSECTION



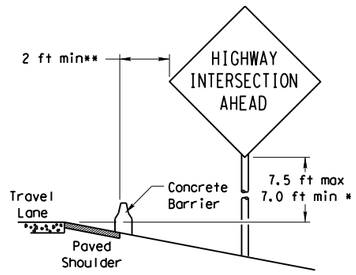
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



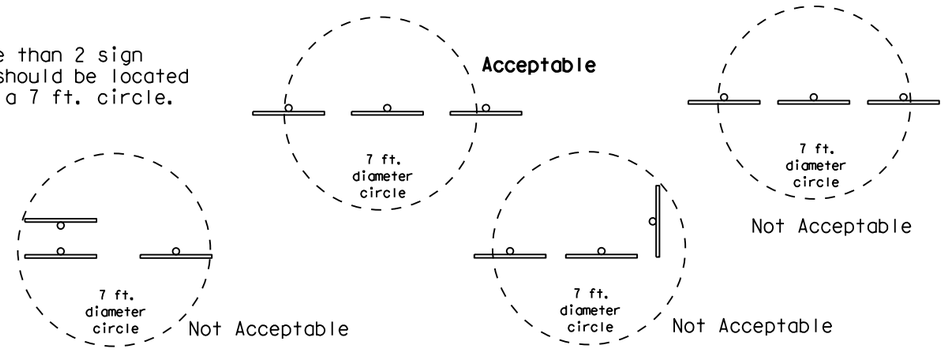
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

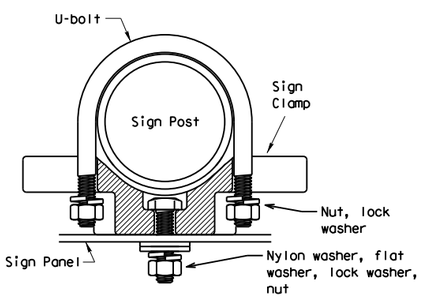
**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

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



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

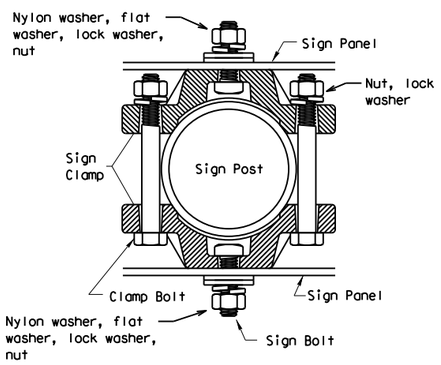


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

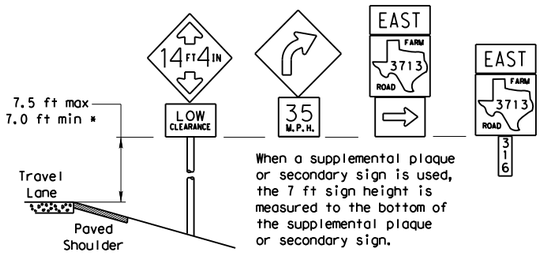
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



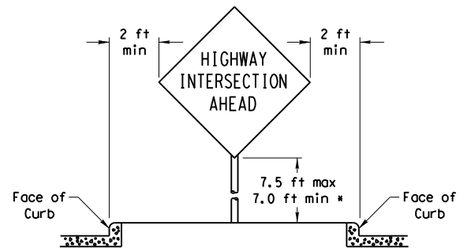
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



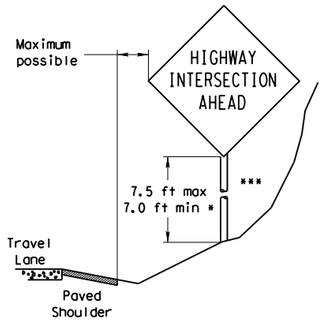
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

* 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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
0022	05	025	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		109

9-08 REVISIONS

26A

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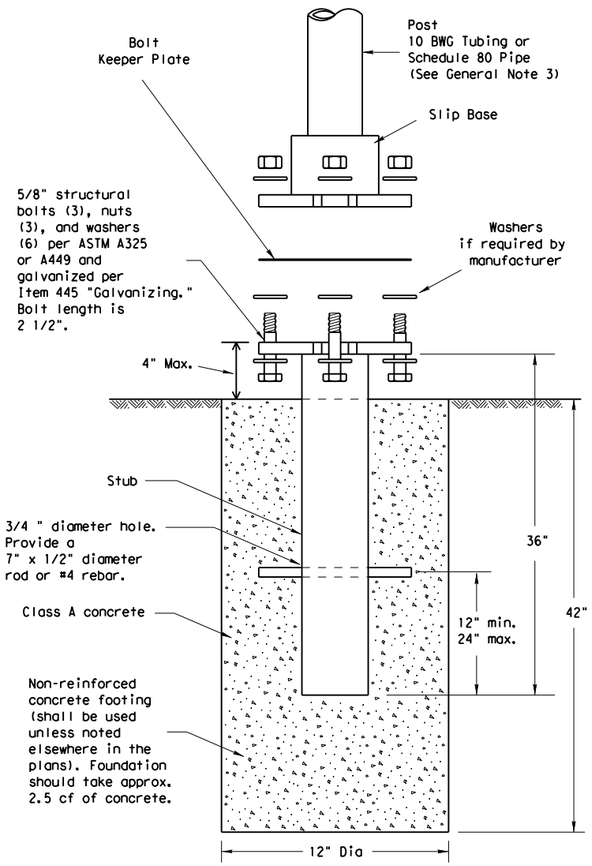
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

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

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

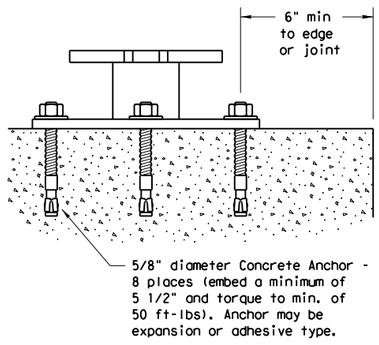
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

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

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

CONCRETE ANCHOR



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

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS 9-08

CONT	SECT	JOB	HIGHWAY
0022	05	025	US 90, etc.

DIST	COUNTY	SHEET NO.
22	VAL VERDE, etc.	110

DATE: 4/22/2022 2:56:30 PM
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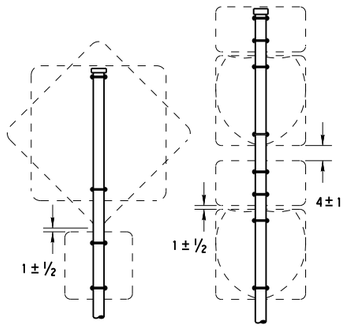
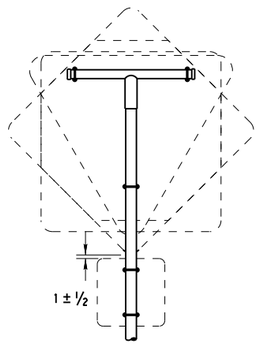
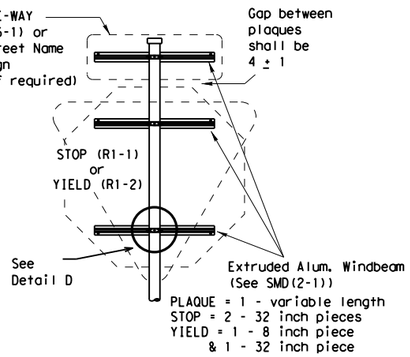


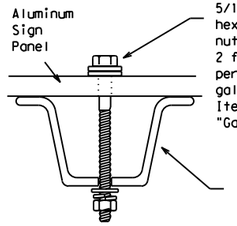
SM RD SGN ASSM TY XXXXX(1)XX(P)



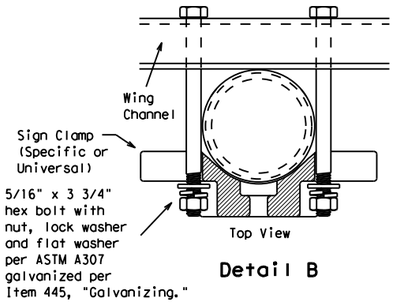
SM RD SGN ASSM TY XXXXX(1)XX(T)



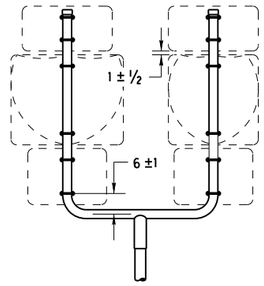
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



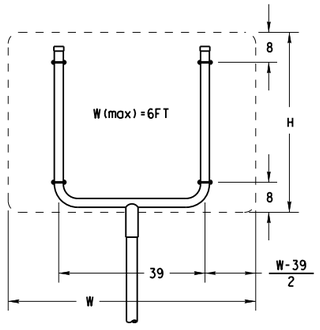
Detail A



Detail B



SM RD SGN ASSM TY XXXXX(1)XX(U)



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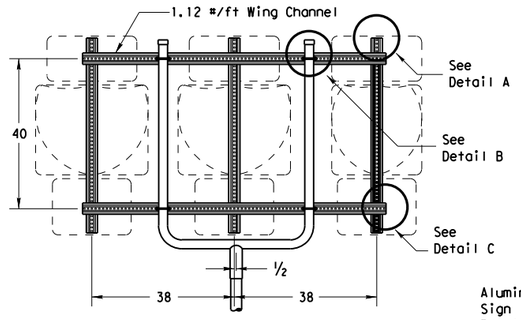
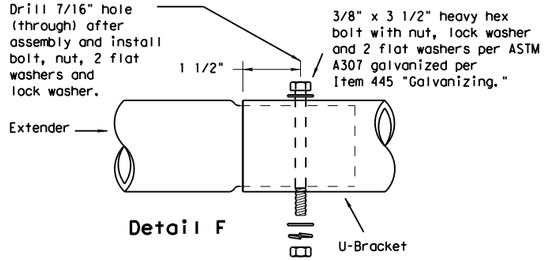
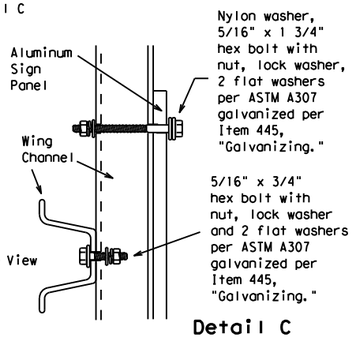


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

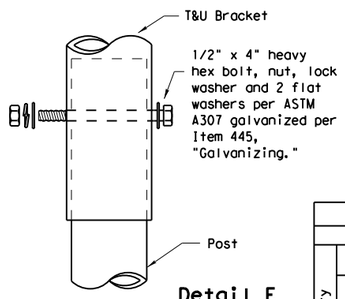


Detail F

Splices shall only be allowed behind the sign substrate.



Detail C



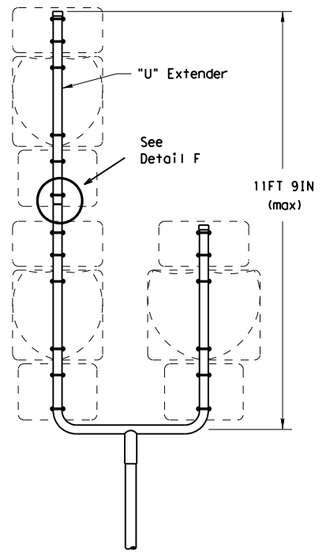
Detail E

GENERAL NOTES:

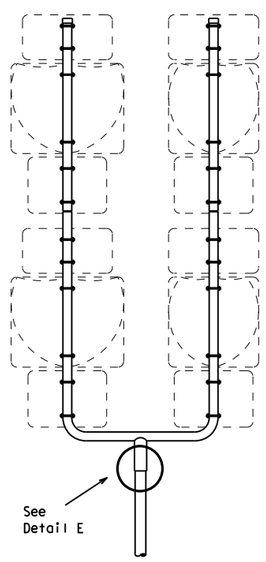
1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

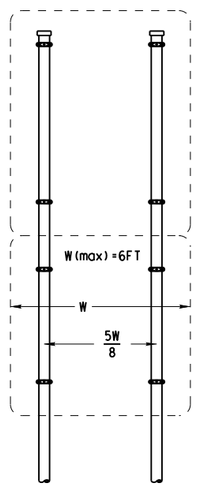
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material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



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

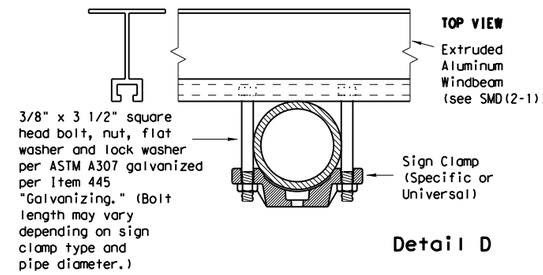


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

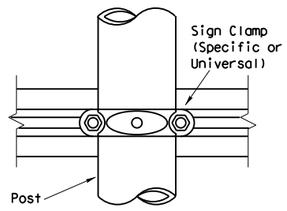


SM RD SGN ASSYM TY XXXXX(2)XX(P)

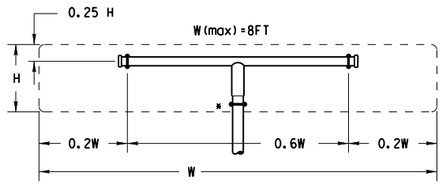
SIDE VIEW



Detail D



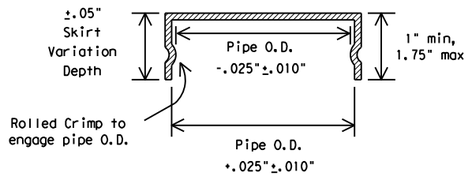
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)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



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

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
0022	05	025	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		111

9-08 REVISIONS

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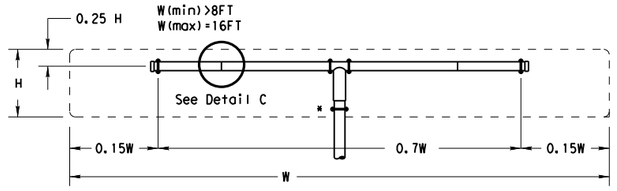
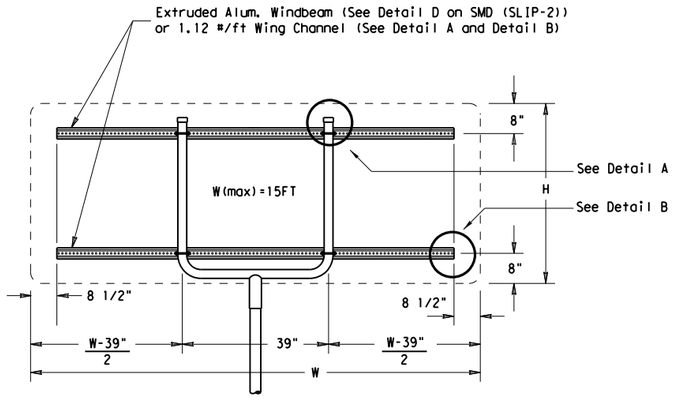
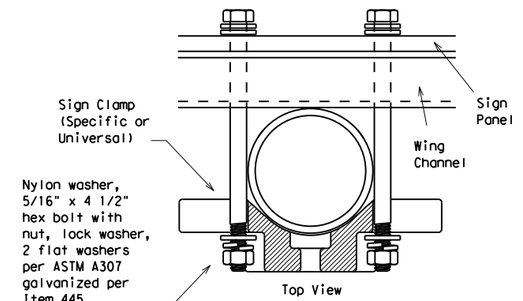


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

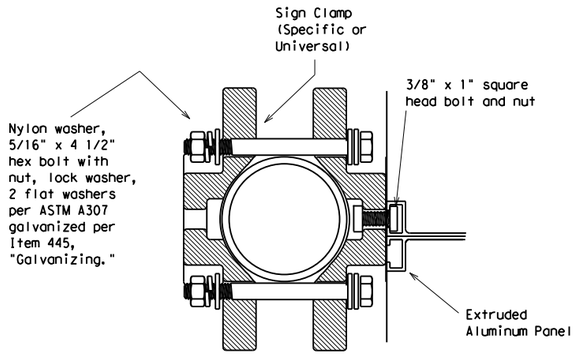
(* - See Note 12)



SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

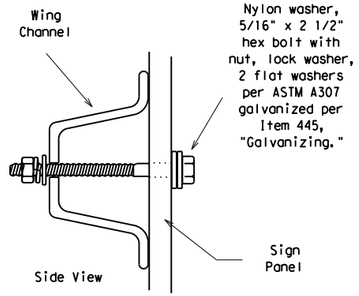


Detail A

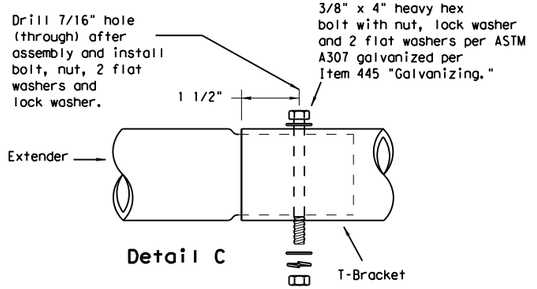


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET

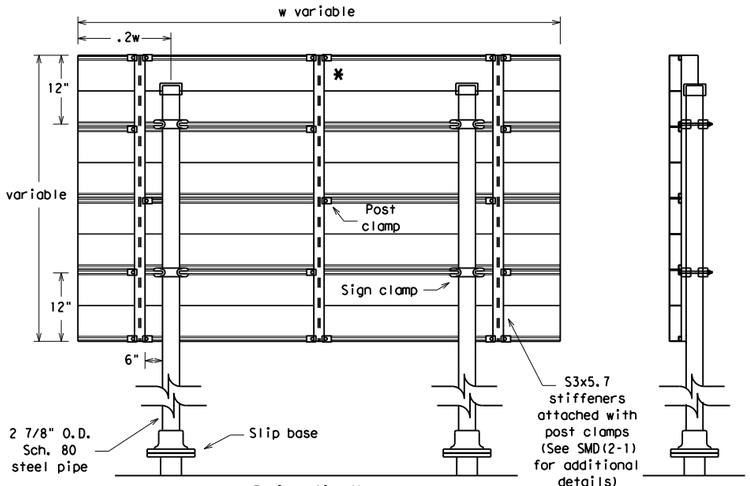


Detail B



Detail C

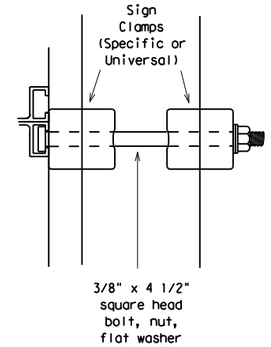
Splices shall only be allowed behind the sign substrate.



Typical Sign Mount

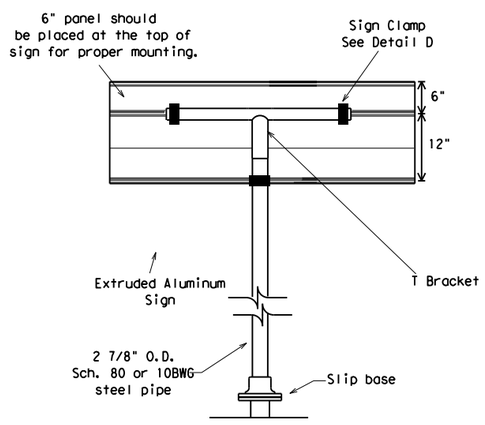
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

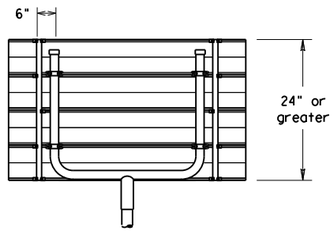


See Detail E
for clamp installation

Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

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

REQUIRED SUPPORT

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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0022	05	025	US 90,etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		112

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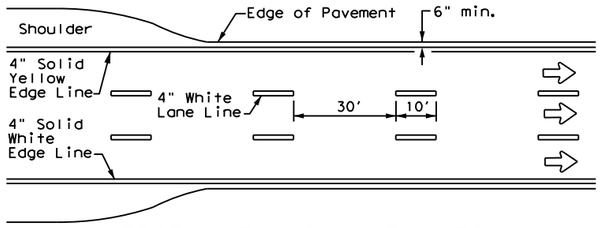
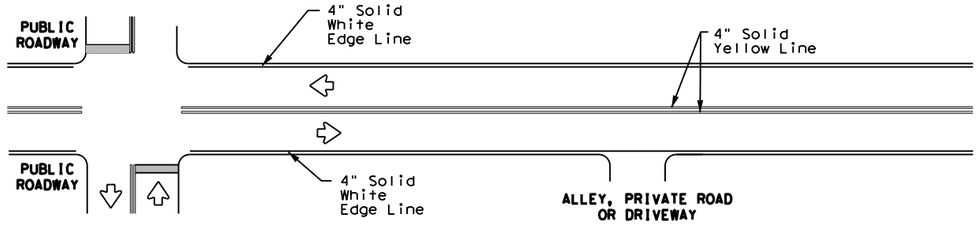
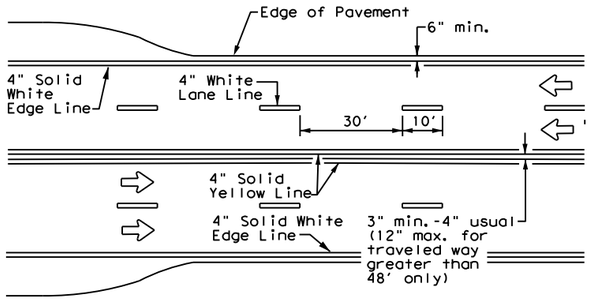


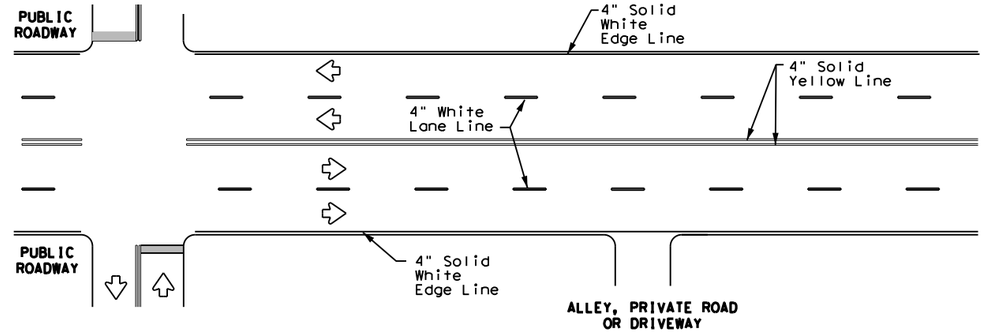
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



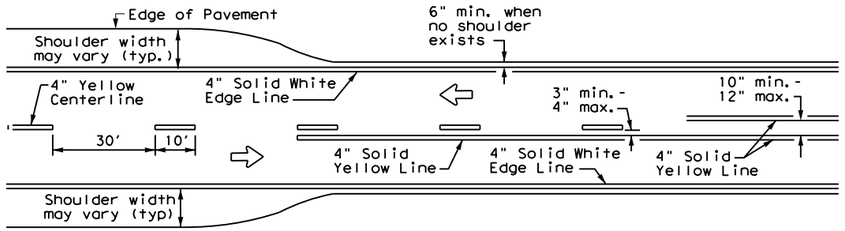
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



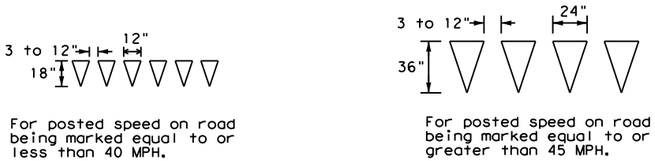
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



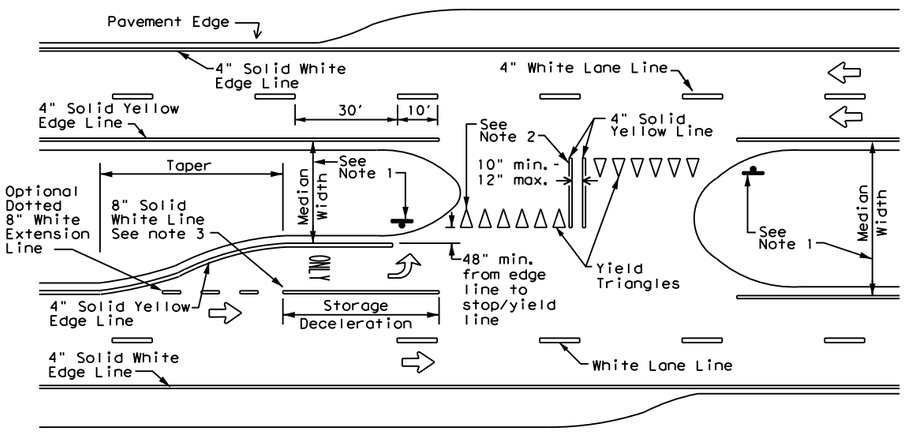
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

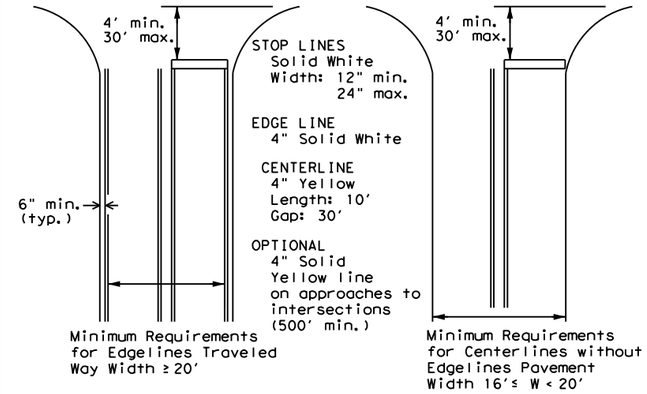
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

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

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



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0022	05	025	US 90, etc.
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8-00 6-20	22	VAL VERDE, etc.		113

22A

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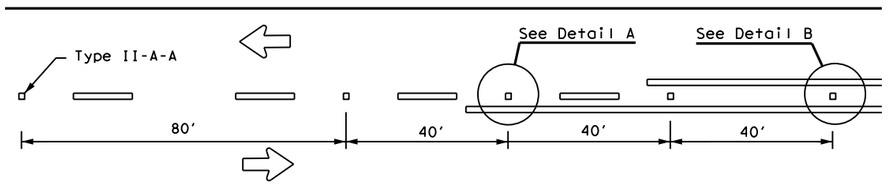
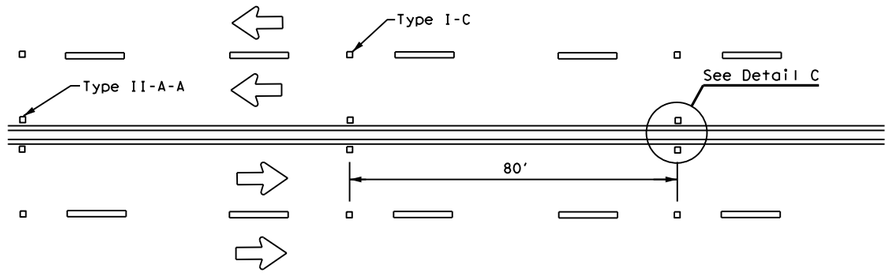
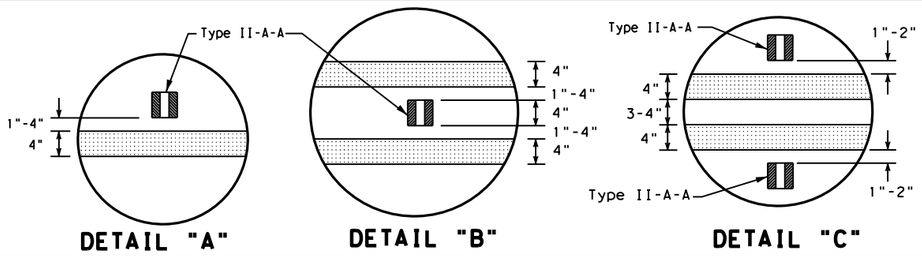
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



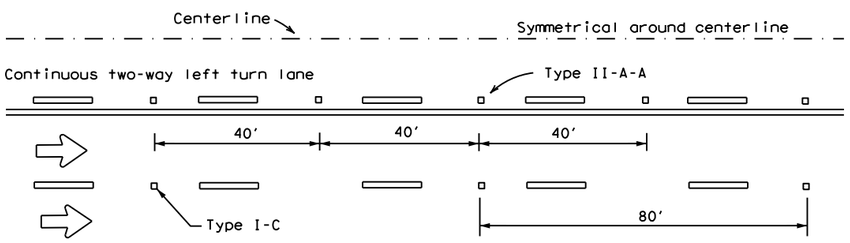
CENTERLINE FOR ALL TWO LANE ROADWAYS



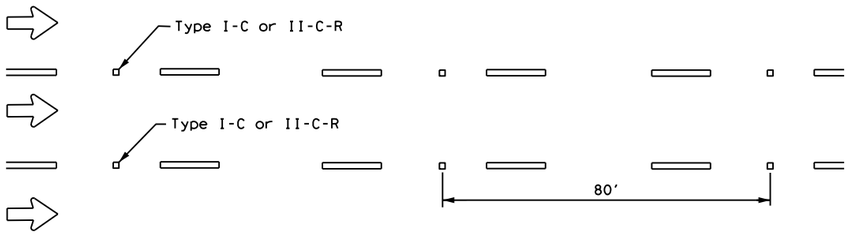
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

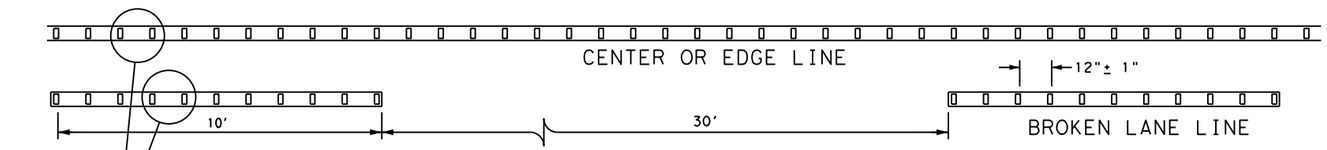


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



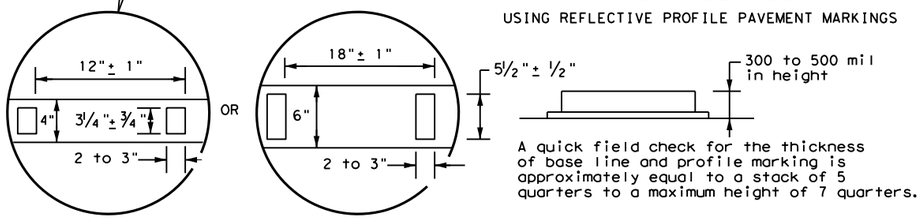
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE

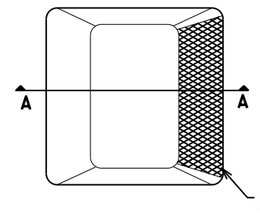
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

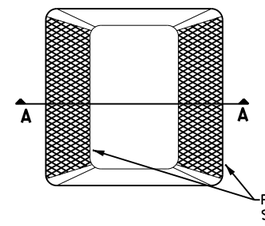
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

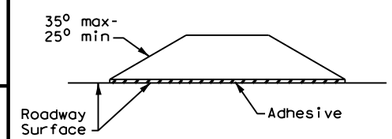
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10	0022	05	025	US 90, etc.
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	22	VAL VERDE, etc.		114

22B

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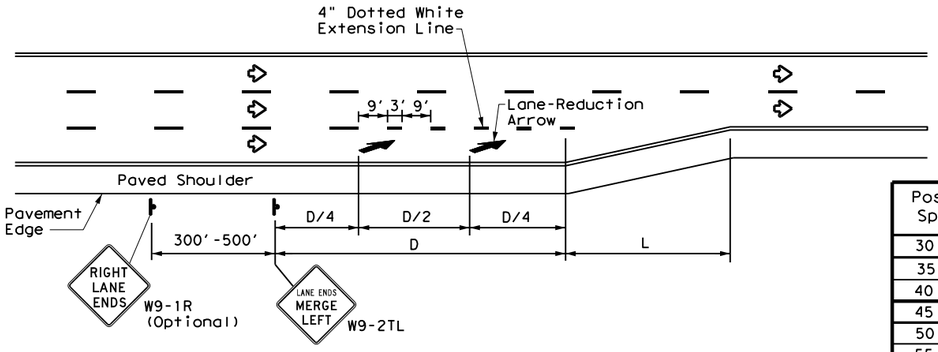
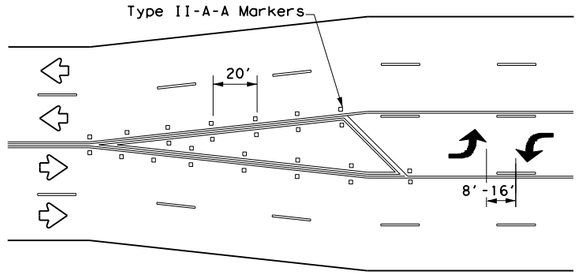


LANE REDUCTION

Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.



A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

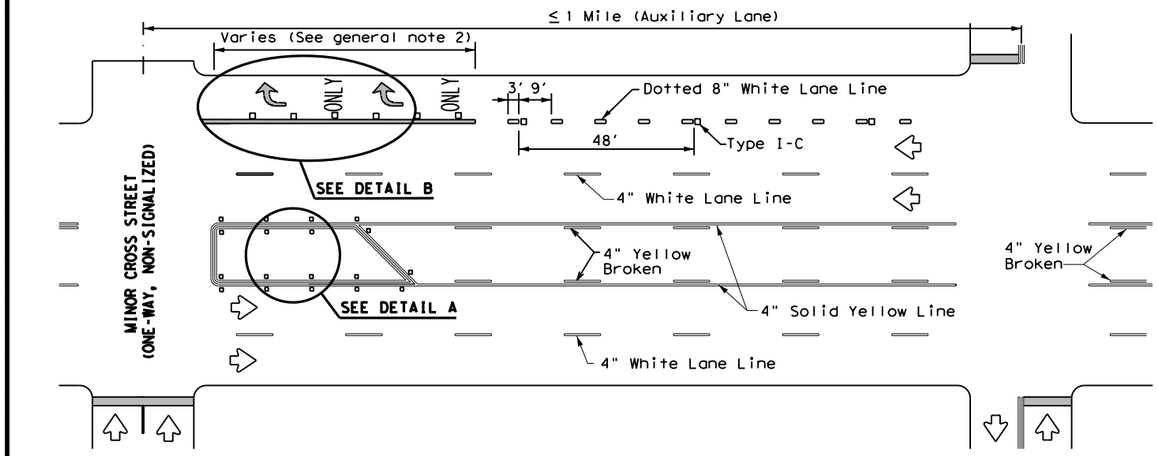
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

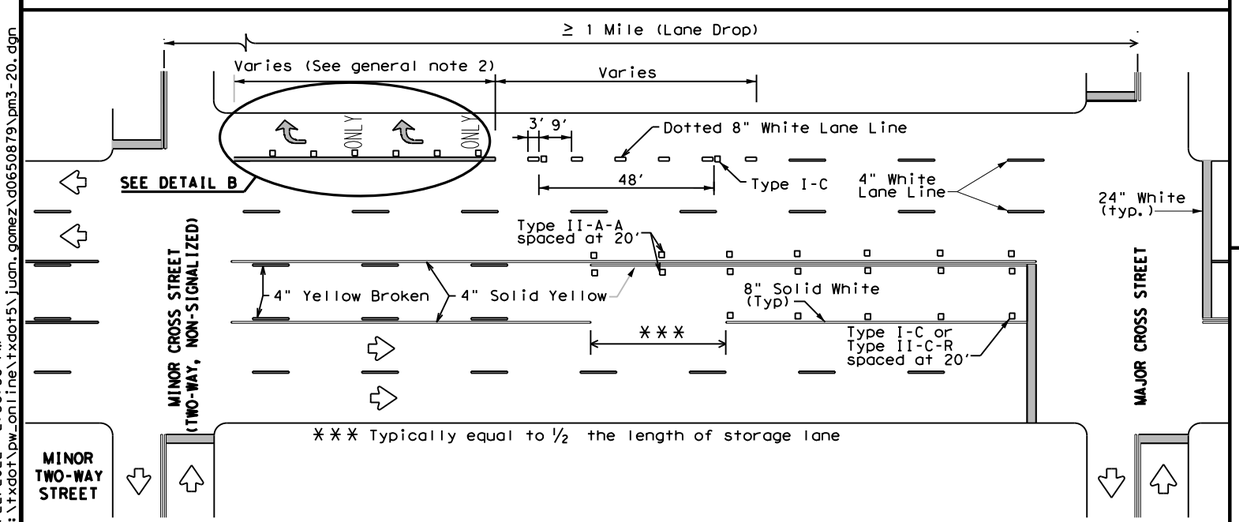
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

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

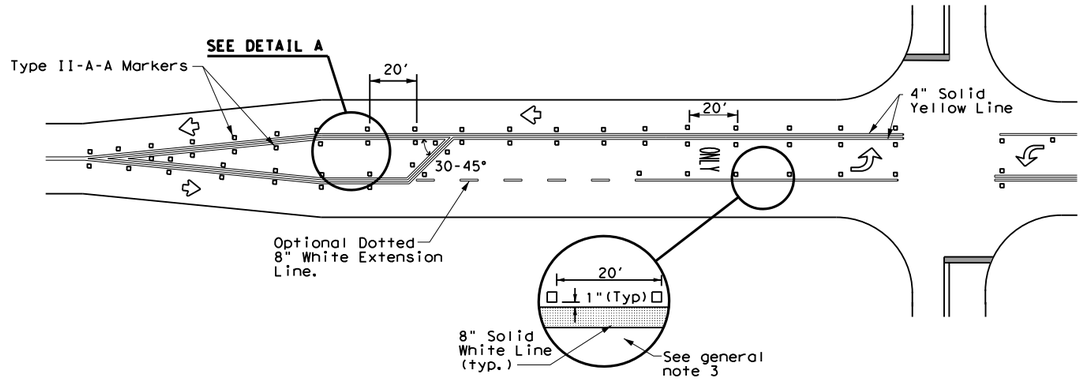
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



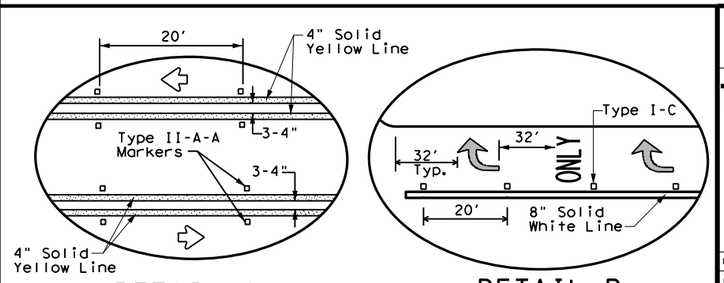
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-20

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	22	VAL VERDE, etc.		115
3-03 6-20				

220

DATE: 4/22/2022 2:56:56 PM
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DATE: 4/22/2022 2:57:02 PM
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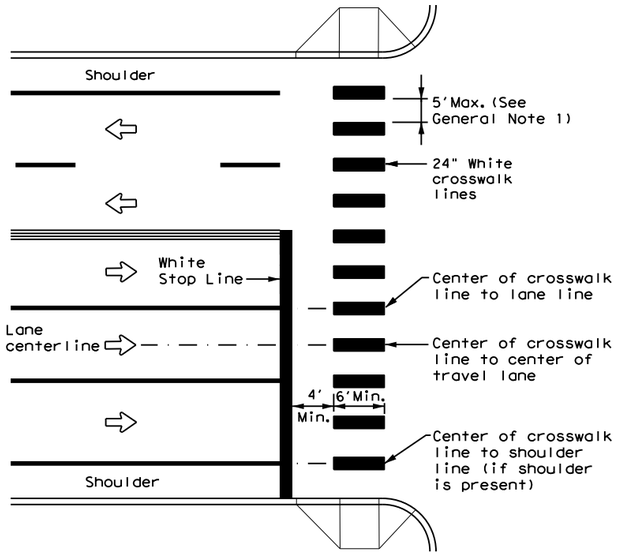


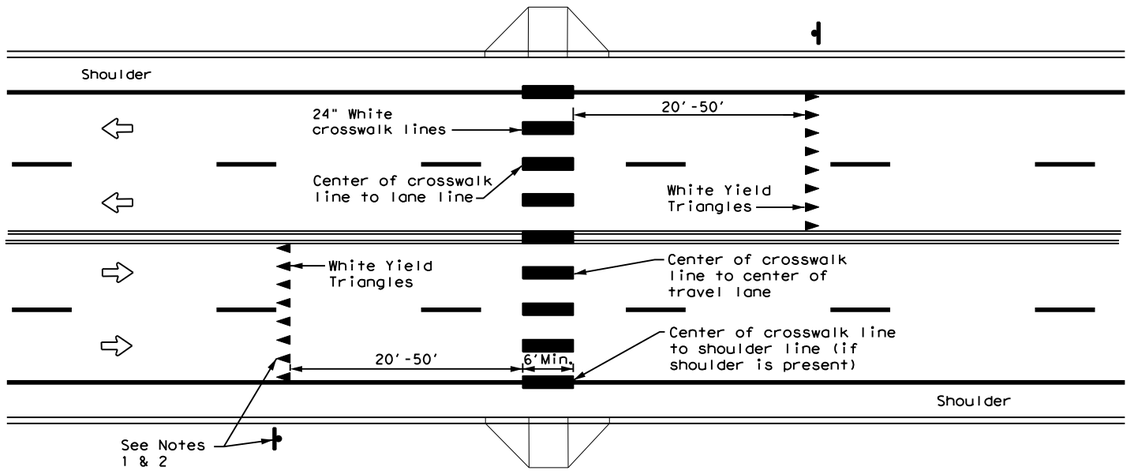
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar/Yield Triangles and Crosswalk shall be approved by the Engineer in the field.

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.



UNSIGNALIZED MID BLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES

1. Use yield triangles with "Yield Here to Pedestrians" signs at unsignalized mid block crosswalks.
2. Use stop bars with "Stop Here on Red" signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

PM(4)-20

FILE: pm4-20.dgn	DN:	CK:	DW:	CK:
© TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
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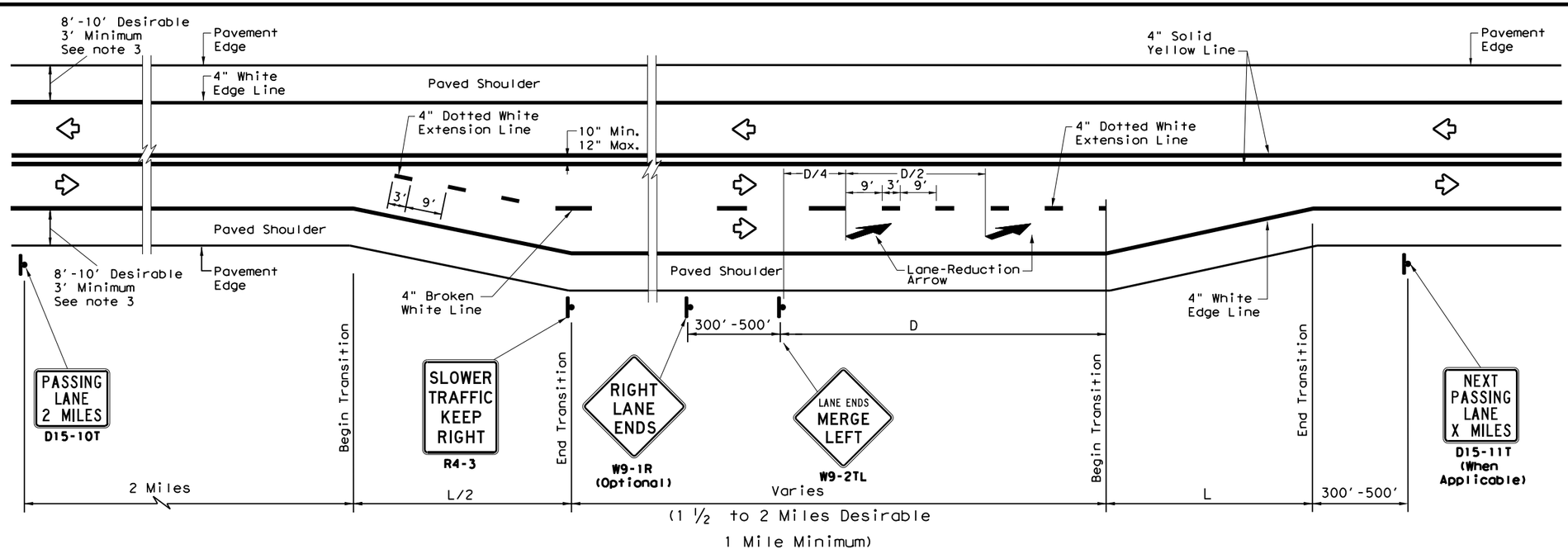
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		116

22D



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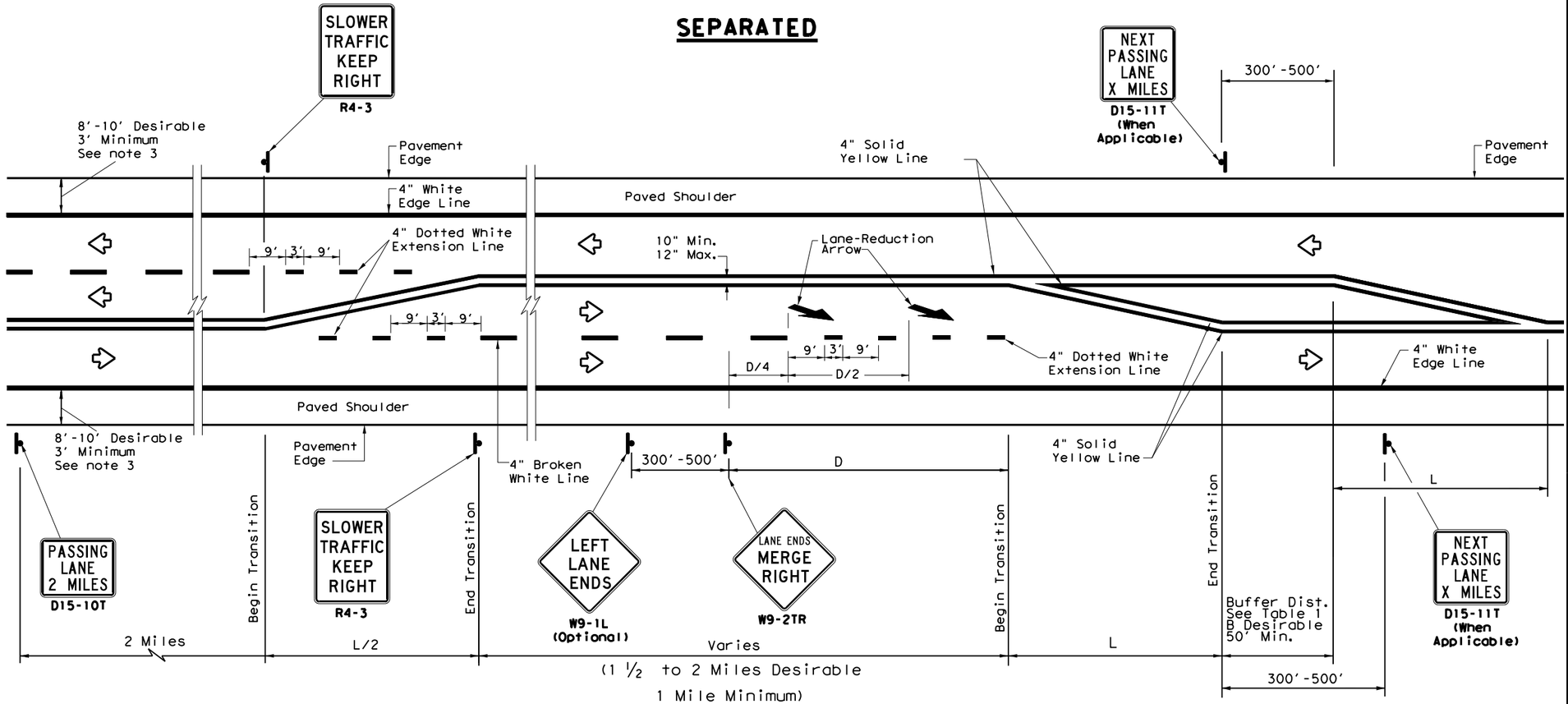

ALTERNATING

LEGEND	
	Sign
	Traffic Flow

TYPICAL TAPER LENGTH (L)

Formula *	L = WS

* Transition length should be rounded up to nearest 5 foot increment.

L=Length of Transition (FT)
W=Width of Offset (FT)
S=Posted Speed (MPH)

EXAMPLE

A 12 foot lane is added on a 70 mph roadway. The length of the transition should be:

L=12x70=840 ft

TABLE 1
ADVANCE WARNING SIGN DISTANCE (D) AND BUFFER DISTANCE (B)

Posted Speed	D (FT)	B (FT)
40	670	305
45	775	360
50	885	425
55	990	495
60	1100	570
65	1200	645
70	1250	730
75	1350	820

GENERAL NOTES

1. For minimum and desirable design details, see the Roadway Design Manual, Chapter 4, Section 6, Super 2 Highways.
2. For Raised Pavement Markers(RPM)details, see Pavement Markings Standard sheet, PM(2). Note that RPMs are not recommended on the 4" dotted white extension lines.
3. For rumble strip options available for the designed shoulder width, see rumble strip standard sheet RS(4).

Texas Department of Transportation

Traffic Operations Division Standard

TEXAS SUPER 2 PASSING LANES

TS2(PL-1)-18

FILE: ts2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT May 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
2-12	DIST	COUNTY		SHEET NO.
3-12	22	VAL VERDE, etc.		117
3-18				

DATE: 4/22/2022 2:57:06 PM
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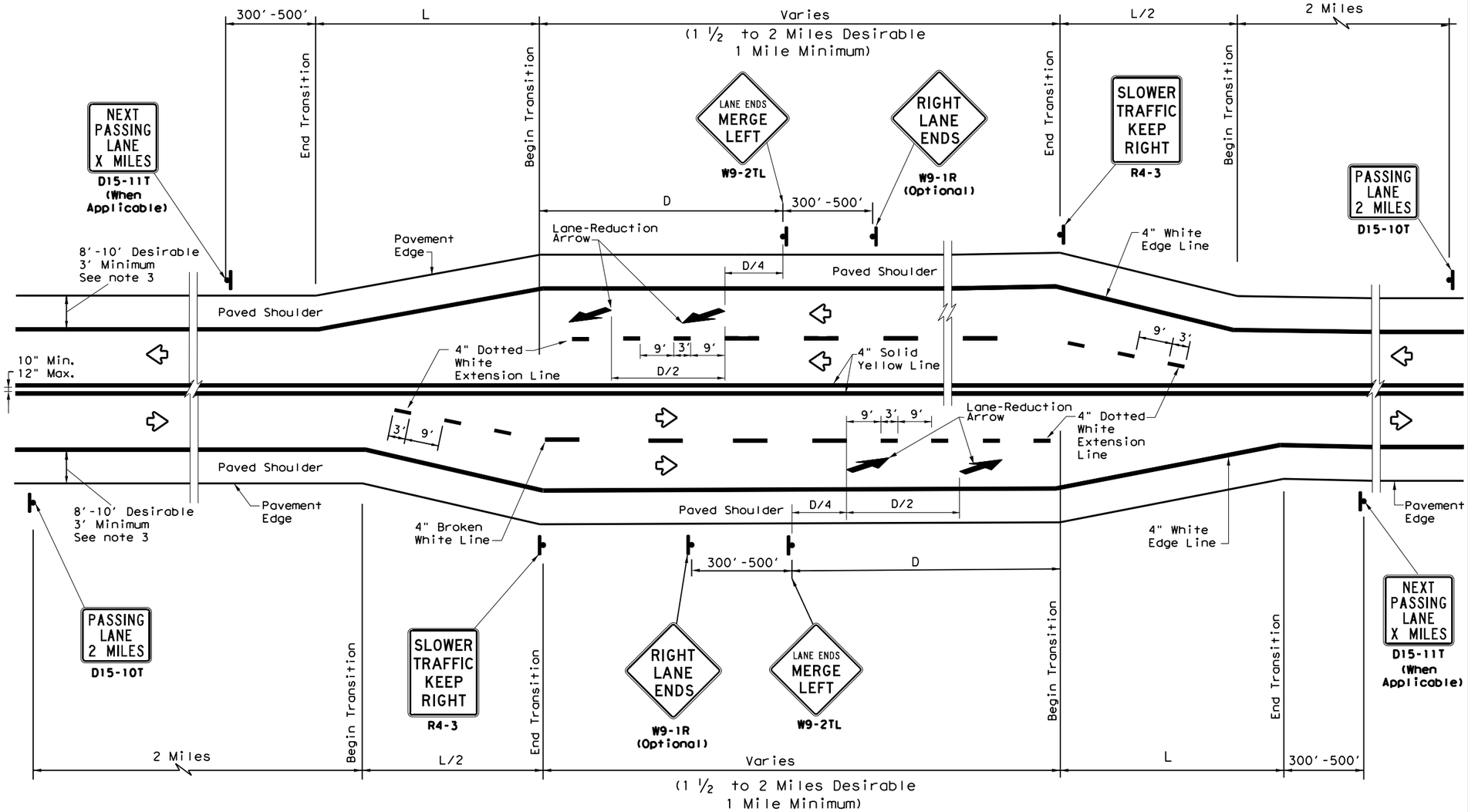

SIDE BY SIDE PASSING LANES

LEGEND	
	Sign
	Traffic Flow

TYPICAL TAPER LENGTH (L)	
Formula *	L = WS

* Transition length should be rounded up to nearest 5 foot increment.

L=Length of Transition (FT)
W=Width of Offset (FT)
S=Posted Speed (MPH)

EXAMPLE

A 12 foot lane is added on a 70 mph roadway. The length of the transition should be:

L=12x70=840 ft

TABLE 1
ADVANCE WARNING SIGN DISTANCE (D)

Posted Speed	D (FT)
40	670
45	775
50	885
55	990
60	1100
65	1200
70	1250
75	1350

GENERAL NOTES

1. For minimum and desirable design details, see the Roadway Design Manual, Chapter 4, Section 6, Super 2 Highways.
2. For Raised Pavement Markers(RPM)details, see Pavement Markings Standard sheet, PM(2). Note that RPMs are not recommended on the 4" dotted white extension lines.
3. For rumble strip options available for the designed shoulder width, see rumble strip standard sheet RS(4).

Texas Department of Transportation

Traffic Operations Division Standard

TEXAS SUPER 2 PASSING LANES

TS2(PL-2)-18

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© TxDOT May 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
2-12	DIST	COUNTY		SHEET NO.
3-12	22	VAL VERDE, etc.		118
3-18				

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REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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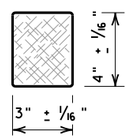
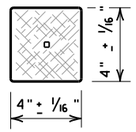
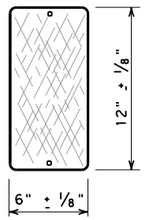
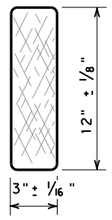
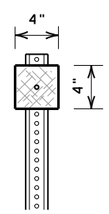
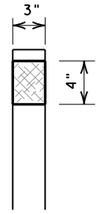
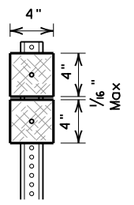
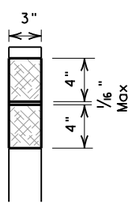
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

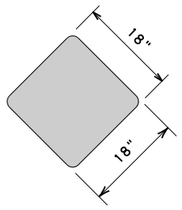
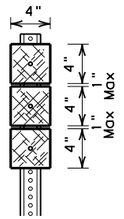
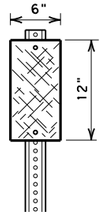
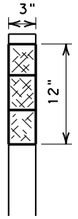
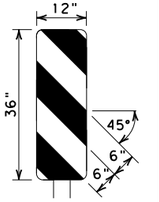
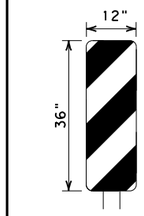
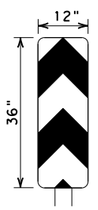
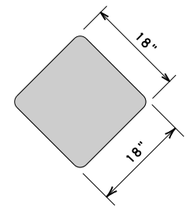
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

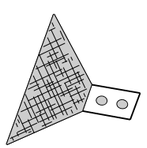
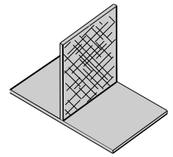
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

DEPARTMENTAL MATERIAL SPECIFICATIONS

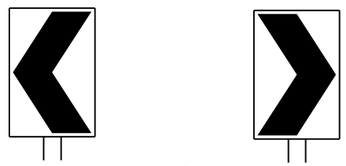
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE



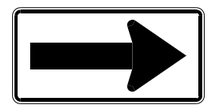
W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE



W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90,etc.
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	22	VAL VERDE, etc.		119

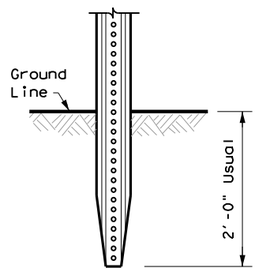
20A

DATE: 4/22/2022 2:57:16 PM
FILE: c:\txdot\pw_online\txdot5\juan.gomez\d0650879\dom1-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

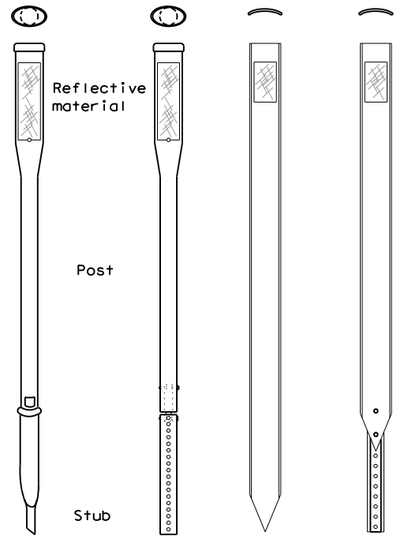


NOTES

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

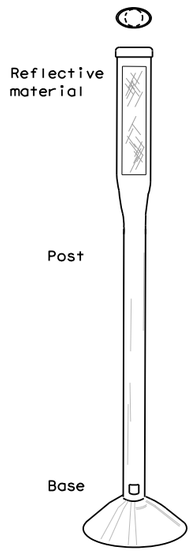
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



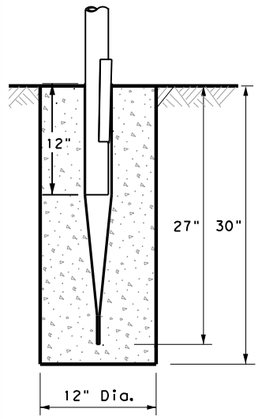
SURFACE MOUNT

NOTES

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

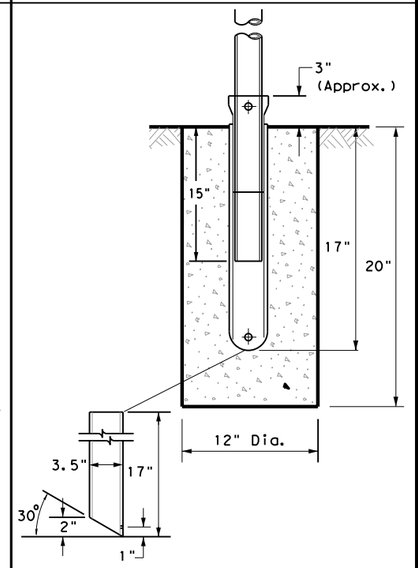
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

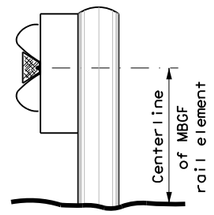
NOTE

1. Install per manufacturer's recommendations.

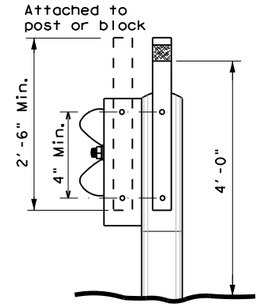
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

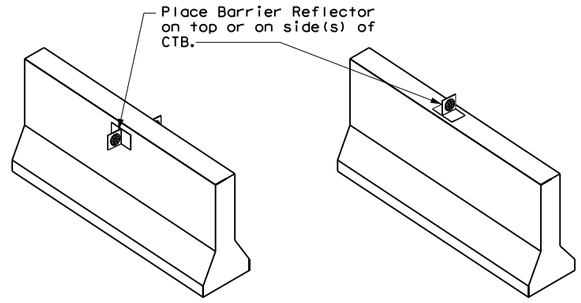
GF1



GF2



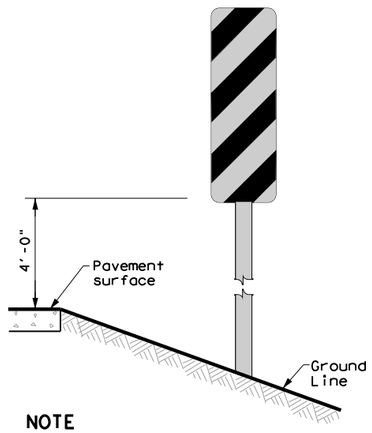
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

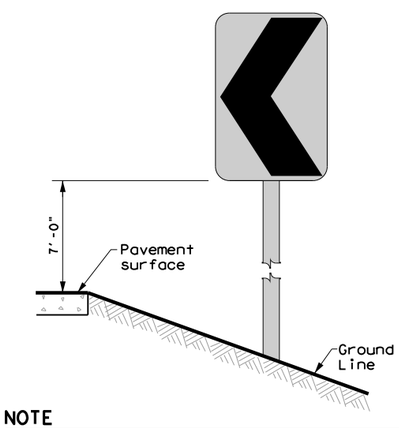
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

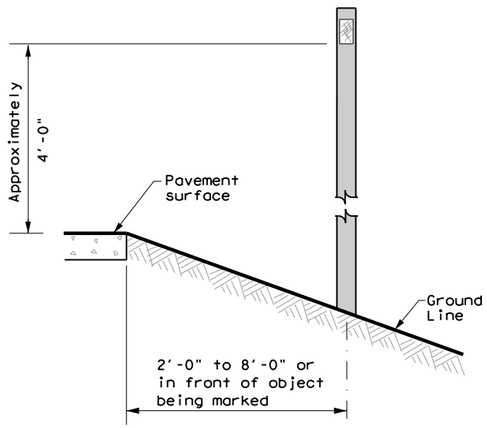
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

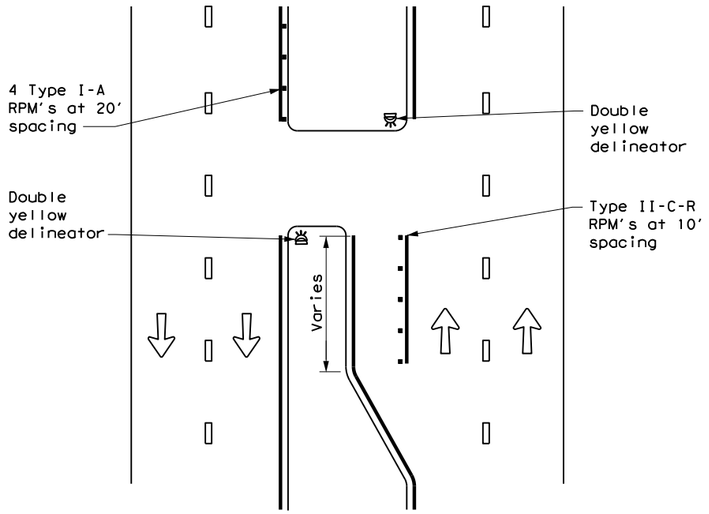
DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	22	VAL VERDE, etc.		120

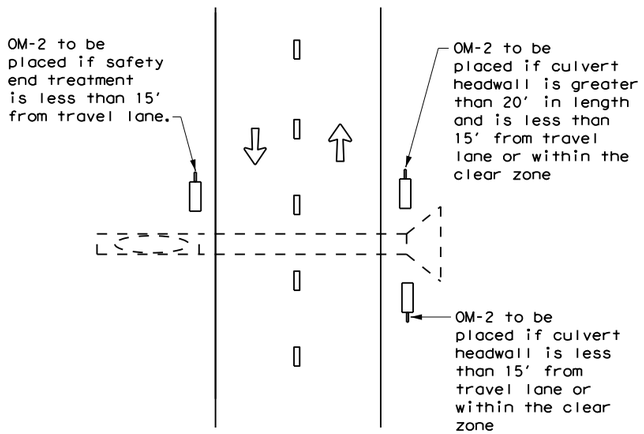
20B

CROSSOVERS



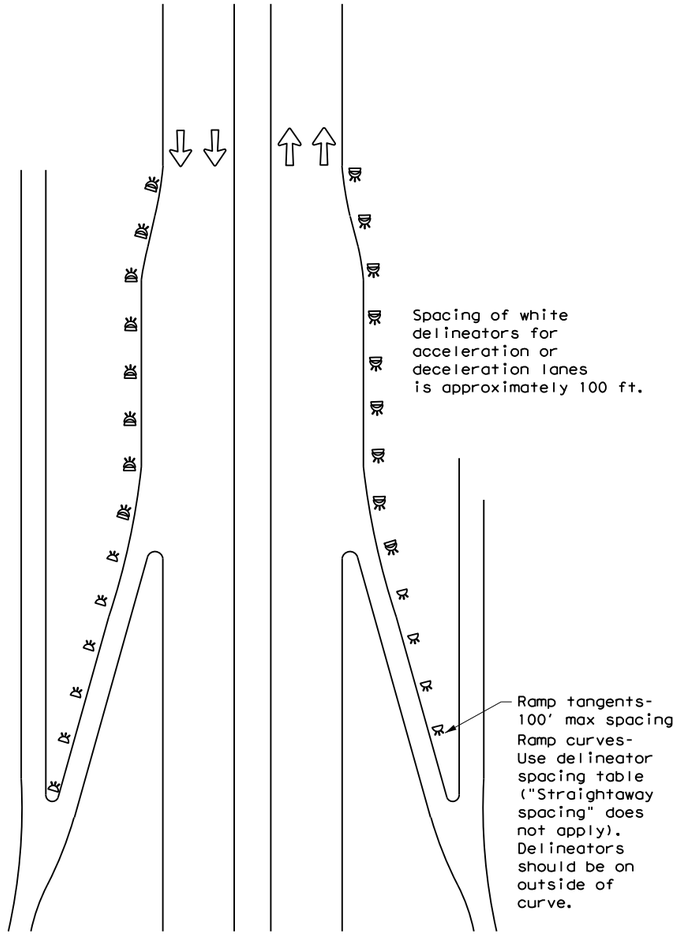
DETAIL 1

FOR CULVERTS WITHOUT MBGF



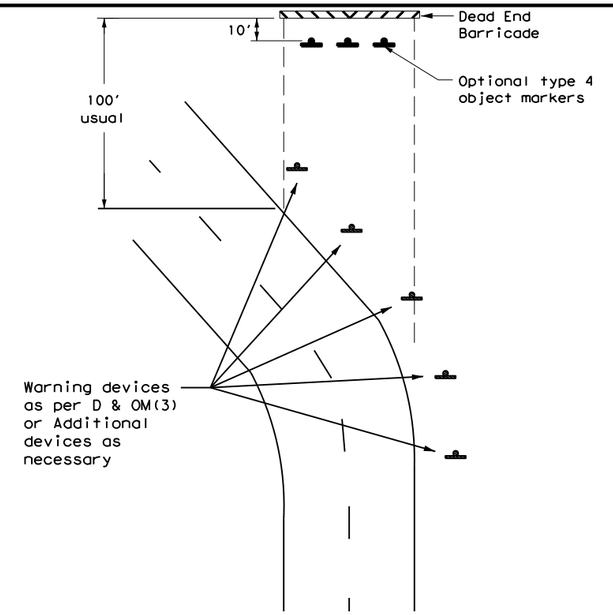
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



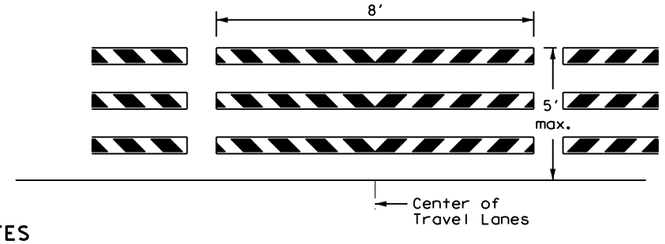
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
3-15	DIST	COUNTY		SHEET NO.
7-20	22	VAL VERDE, etc.		121

20D

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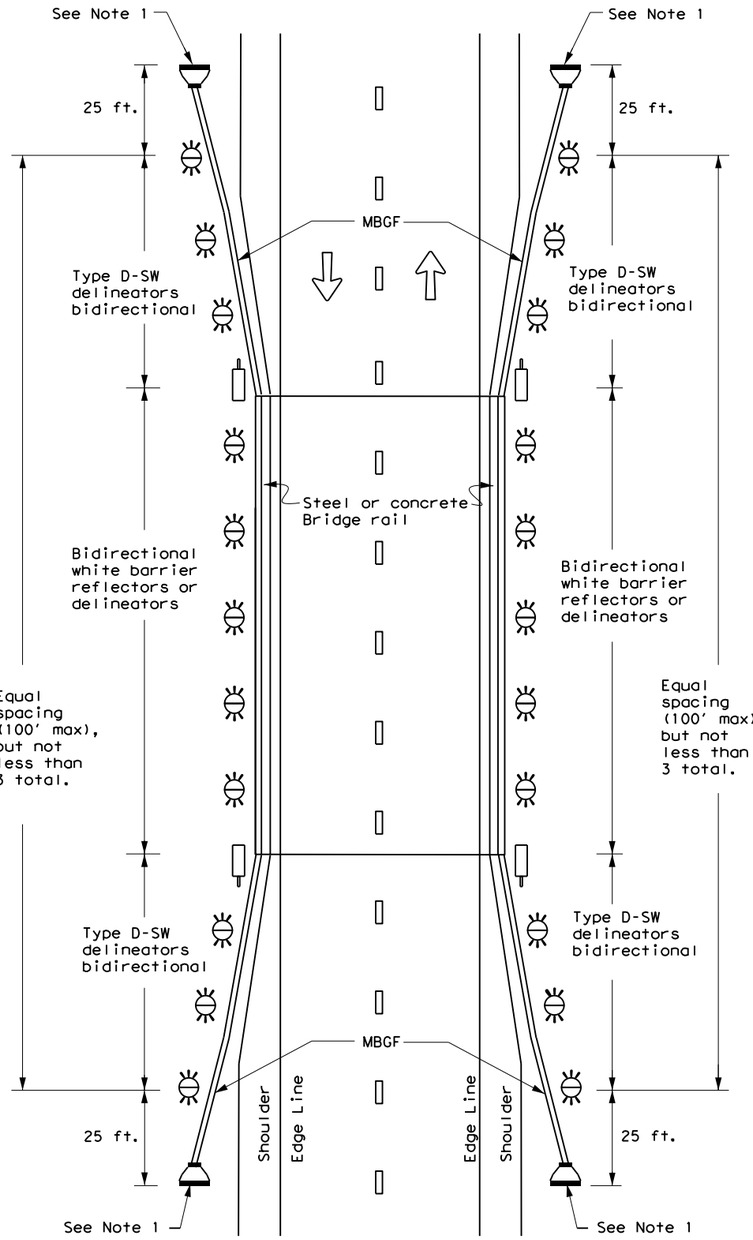
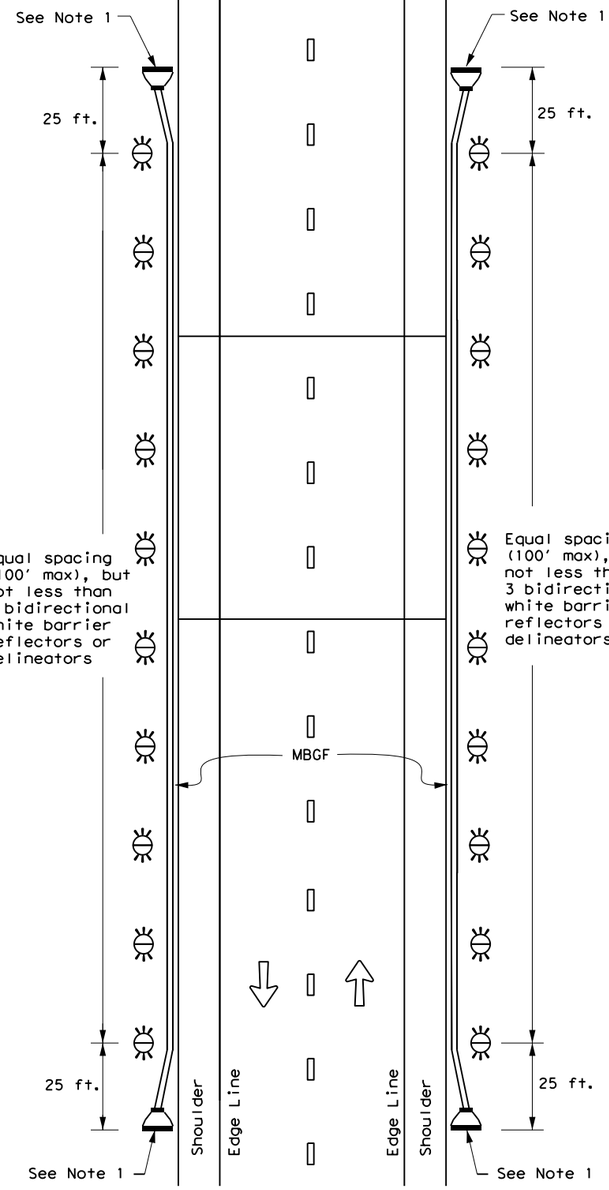
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

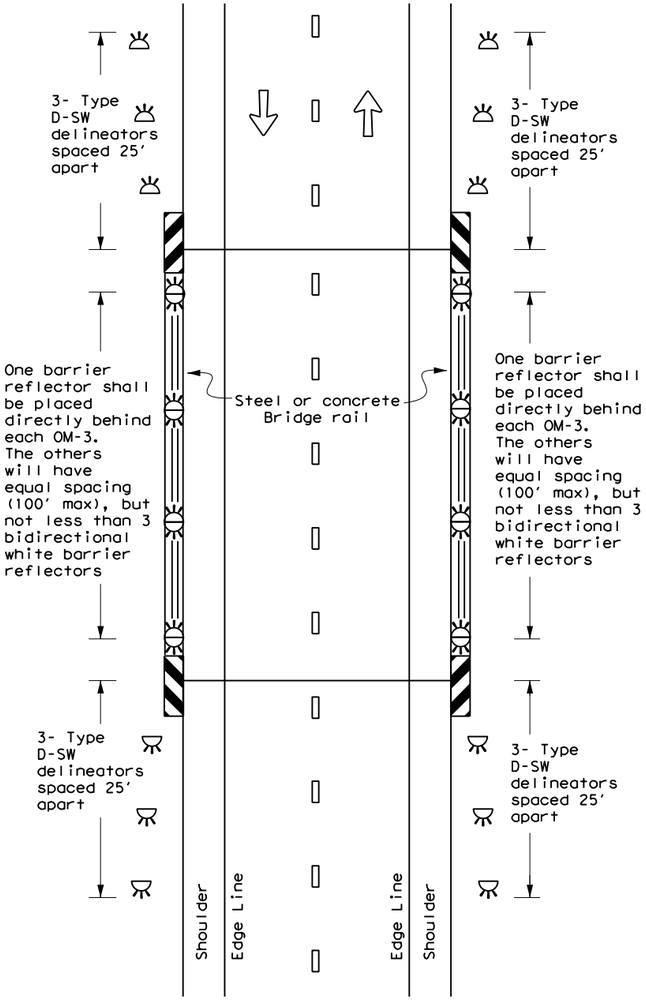
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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

Texas Department of Transportation

Traffic Safety Division Standard

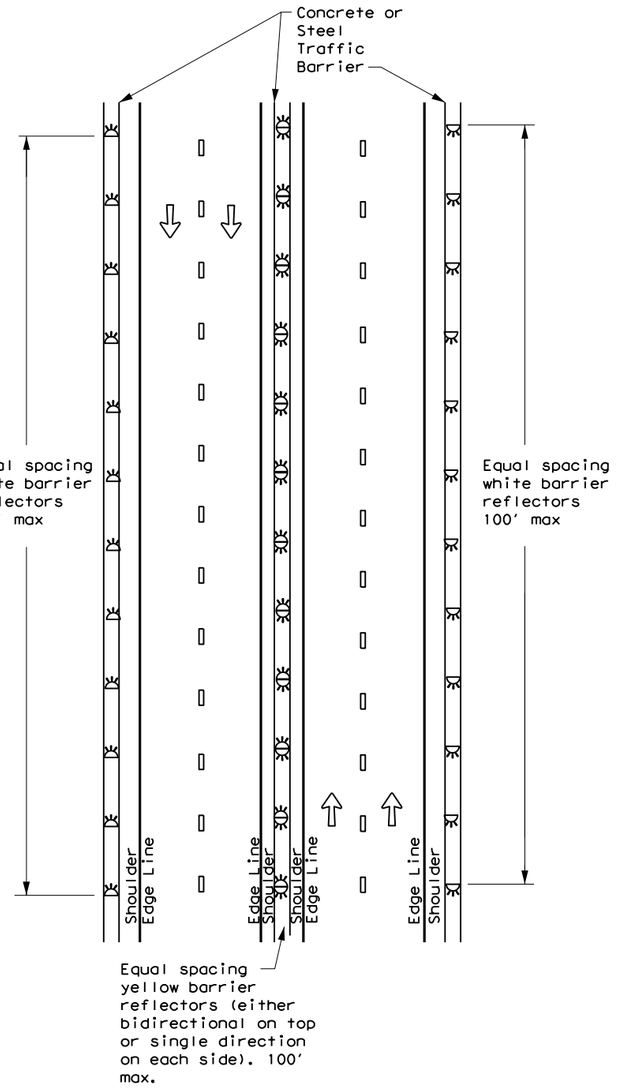
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

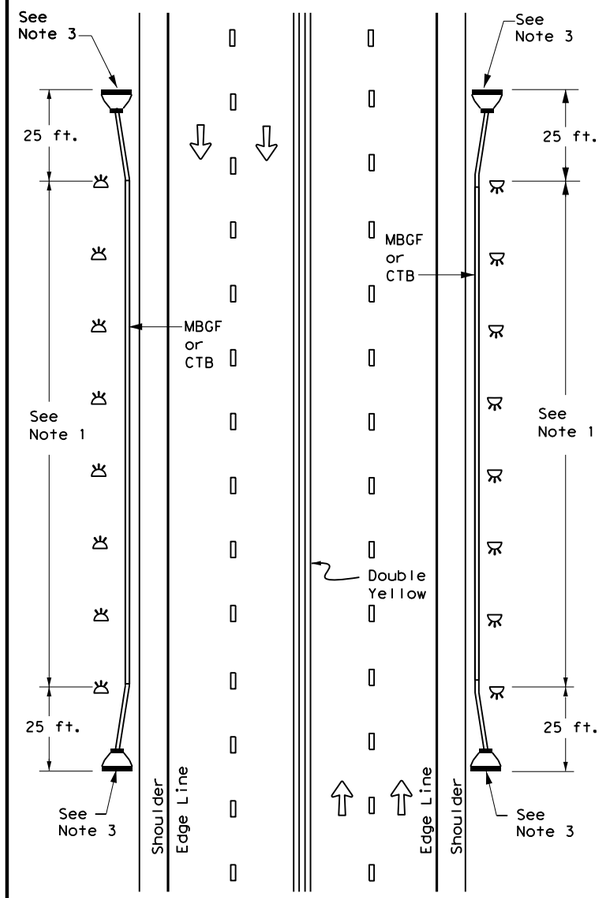
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
7-20	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		122

20E

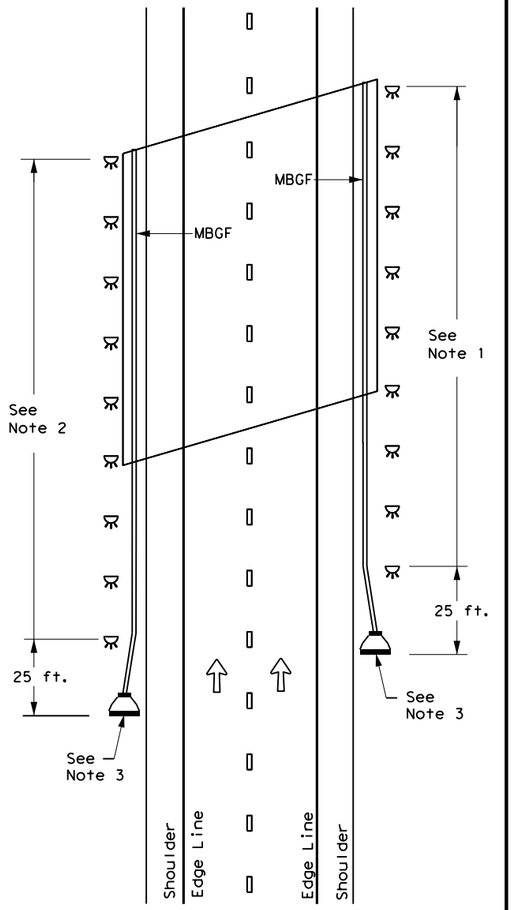
CONTINUOUS CONCRETE OR STEEL BARRIER



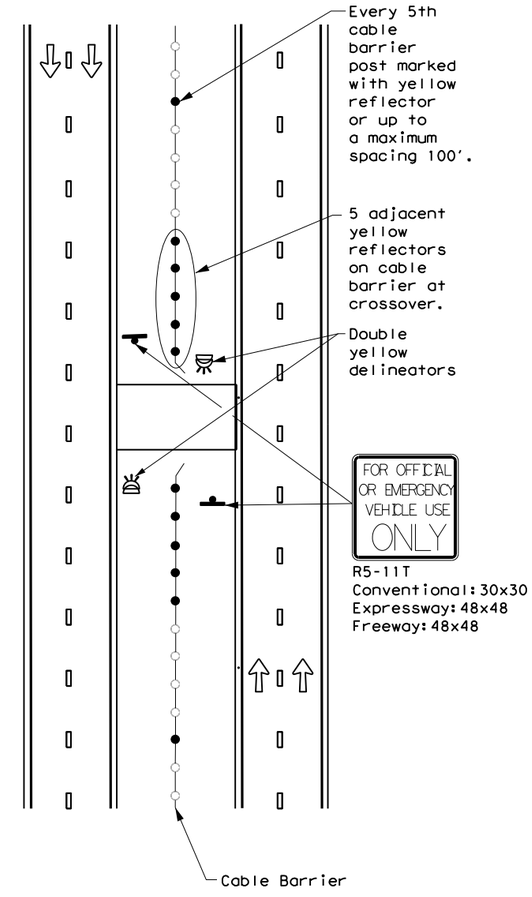
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100′ max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100′ max.)
2. Equal spacing (100′ max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3)in front of the terminal end.

LEGEND

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

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©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
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7-20	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		123

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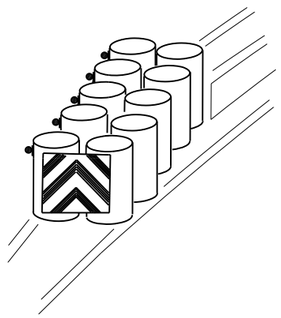
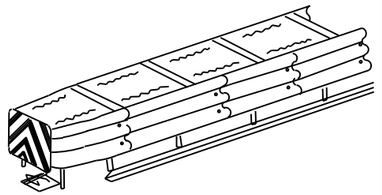
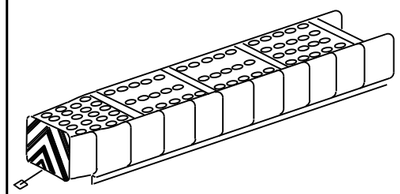
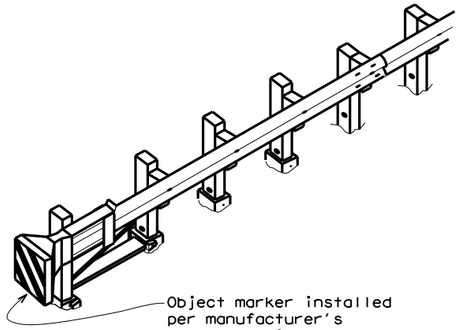
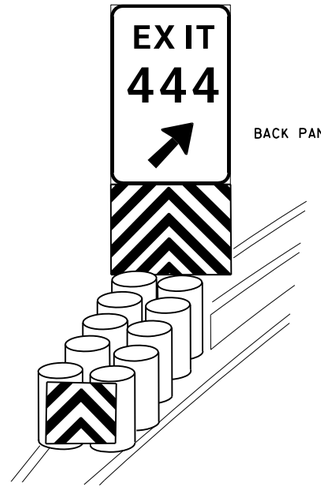
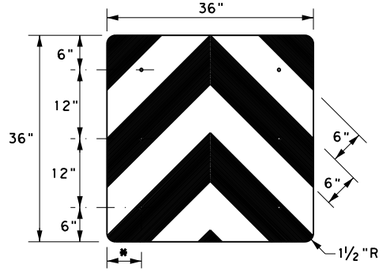


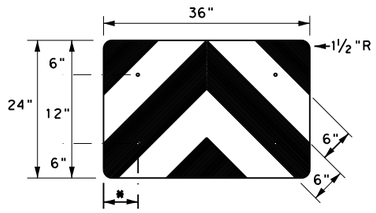




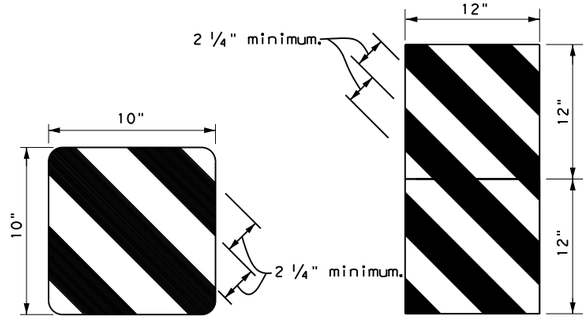




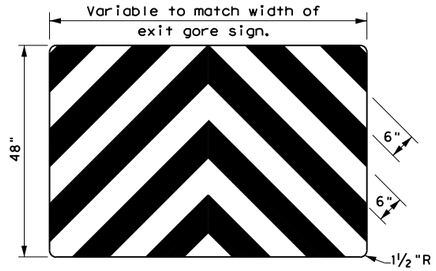


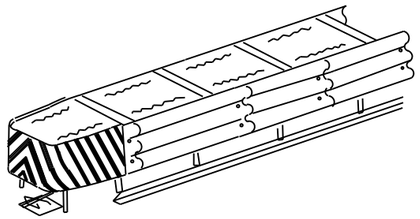


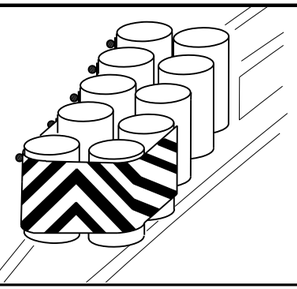
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

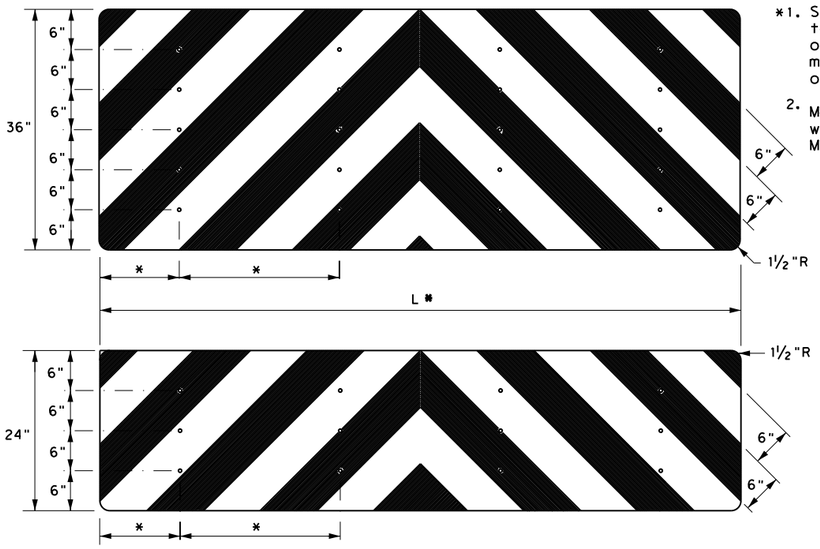


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
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4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	22	VAL VERDE, etc.		124
4-98 7-20				

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I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required
☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1. Reference Marker 416+0.005
2.
3.
4.
5.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☐ Temporary Vegetation	☒ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☒ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☒ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.
2.
3.
4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☒ No Action Required ☐ Required Action

Action No.

1.
2.
3.
4.

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

☐ No Action Required ☒ Required Action

Action No.

1. Texas Horned Lizard - The Contractor will avoid harvester ant mound in the selection of PSLs where feasible.
2. Texas Tortoise -The Contractor should cover utility trenches overnight, and should visually inspect all trenches before filling.
3. Reticulated Collared Lizard - This lizard may potentially occur in the project area. The Contractor shall avoid harming or handling this species.
4. Texas Indigo Snake - This snake may potentially occur in the project area. The Contractor shall avoid harming or handling this species.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):
Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☒ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1.
2.
3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.
2.
3.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
© TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-12-2011 (DS)	0022	05	025	US 90, etc.
05-07-14 ADDED NOTE SECTION IV.	DIST	COUNTY		SHEET NO.
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	22	VAL VERDE, etc.		125

SUMMARY OF EROSION CONTROL ITEMS						
		506	506	506	506	506
		6003	6011	6030	6038	6039
REF. MRK - SIDE	DETAIL	ROCK FILTER DAMS (INSTALL) (TY 3)	ROCK FILTER DAMS (REMOVE)	☒ BACKHOE WORK (EROSION & SEDMT CONT)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
REF. LOCATION #2		LF	LF	HR	LF	LF
414+1.525(NB)(LT)&(RT)	1	30	30	3.0	120	120
416+0.005(NB)(RT)	1	34	34	1.9	74	74
416+0.665(SB)(LT)	1			1.6	64	64
PROJECT TOTALS		64	64	7	258	258

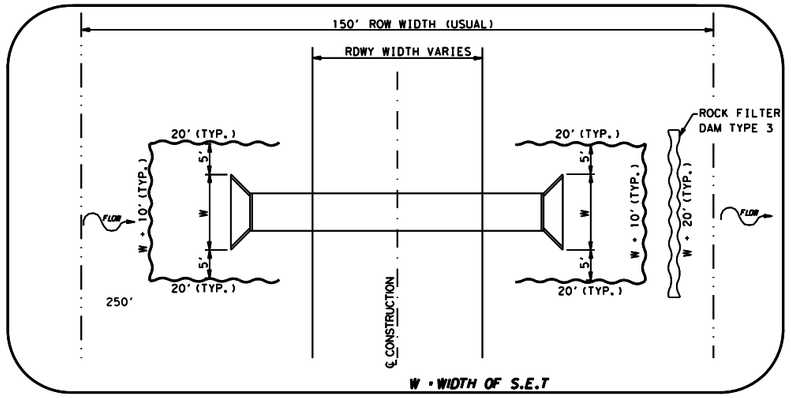
SYMBOL LEGEND

Silt Fence

Rock Filter Dam Type 3

NOTES:

☒ BACKHOE EROSION CONTROL BASED ON A RATE OF 40 LF OF TEMPORARY SEDIMENTATION CONTROL FENCE PER HOUR.



1 SILT FENCE DETAIL FOR BOX CULVERT ON ROADWAY

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED
PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by LUIS G. URBINA P.E. 117019, on

5/3/2022

DocuSigned by:

98C72D65D494466...

HORIZ: 1"= 100'

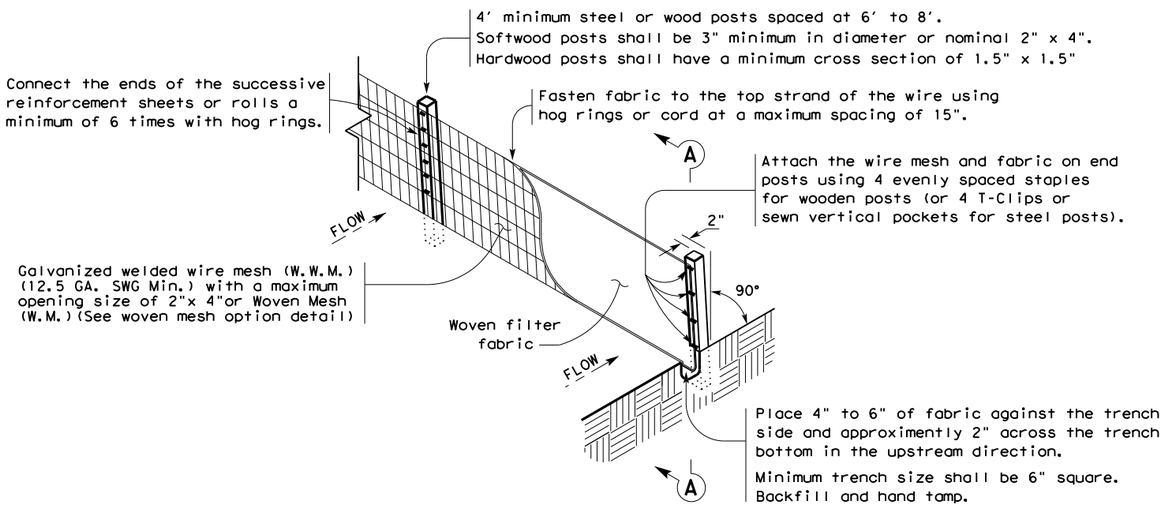
TEXAS DEPARTMENT OF TRANSPORTATION ®

SUMMARY OF SW3P AND SOIL STABILIZATION

DN: MT	DN: MT	STATE	SHEET NUMBER			SHEET NO.
CK: LGU	CK: LGU	TEXAS	SHEET 1 OF 1			
FED. RD. DIV. NO.	STATE DIST. NO.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY NO.
6	22	VAL VERDE, etc.	0022	05	025, etc.	US 90, etc.

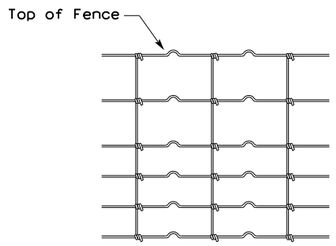
126

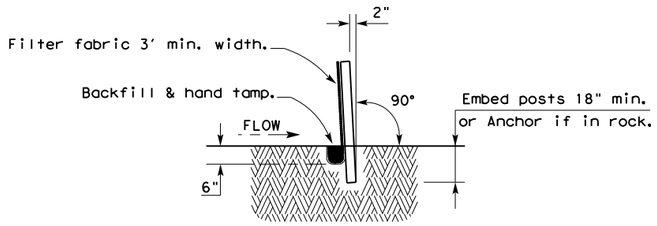
5/2/2022 mtorrel c:\txdot\pw\online\txdot5\max.torres\d0649801\025 sw3p detail.dgn



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

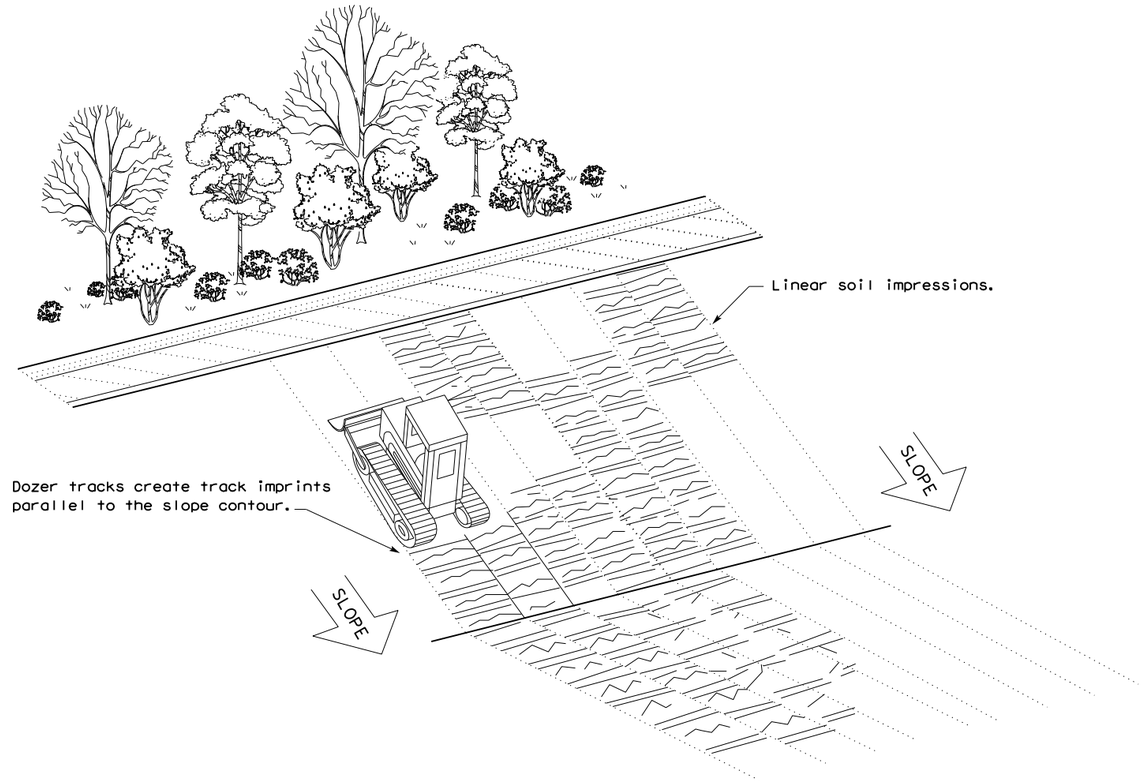
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		127

4/8/2022
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DATE: 4/22/2022
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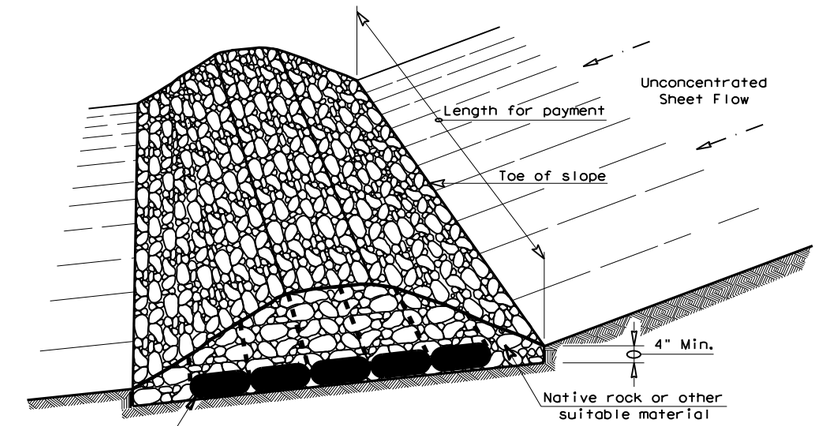
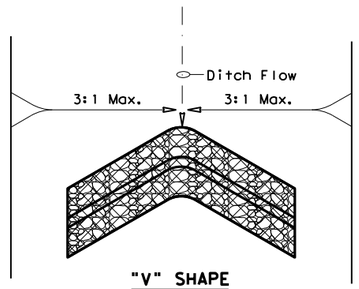
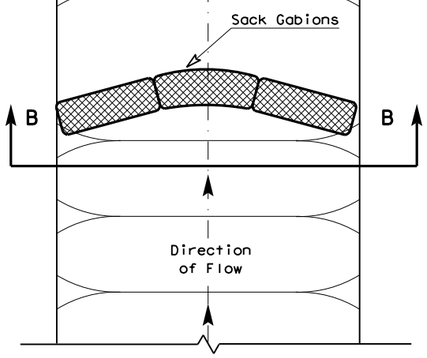


FILTER DAM AT TOE OF SLOPE

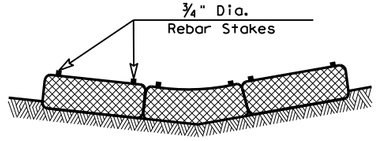
RFD1



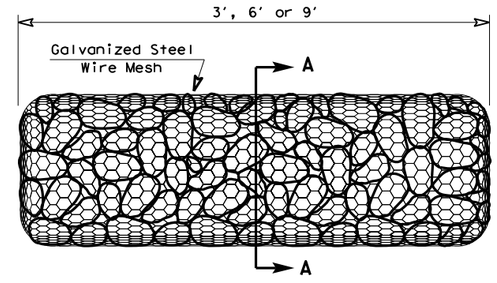
"V" SHAPE
PLAN VIEW



PLAN VIEW

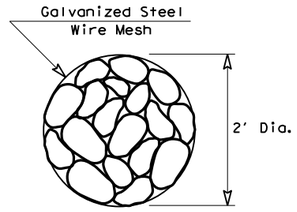


SECTION B-B

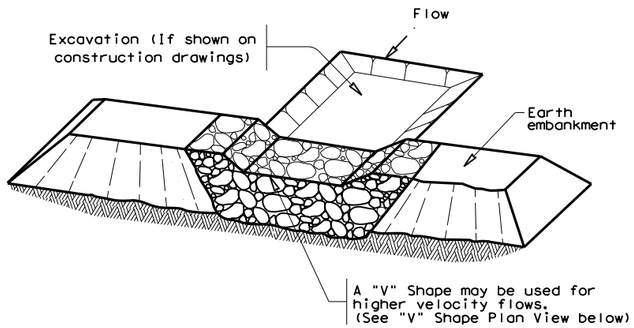


TYPE 4 (SACK GABIONS)

RFD4

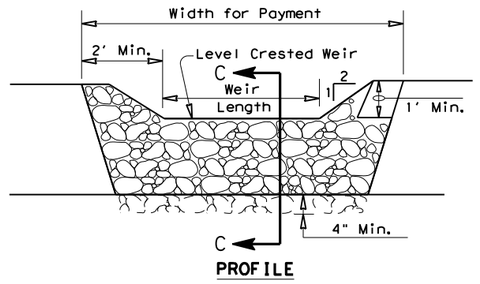


SECTION A-A

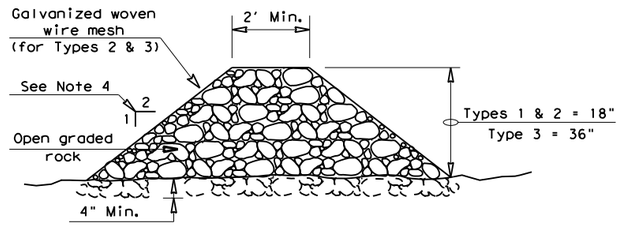


FILTER DAM AT SEDIMENT TRAP

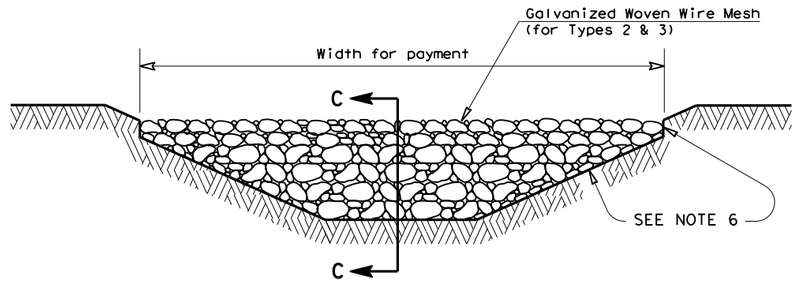
RFD1 OR RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3
Type 4 Rock Filter Dam — RFD4

Texas Department of Transportation | Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		128

DATE: 4/22/2022
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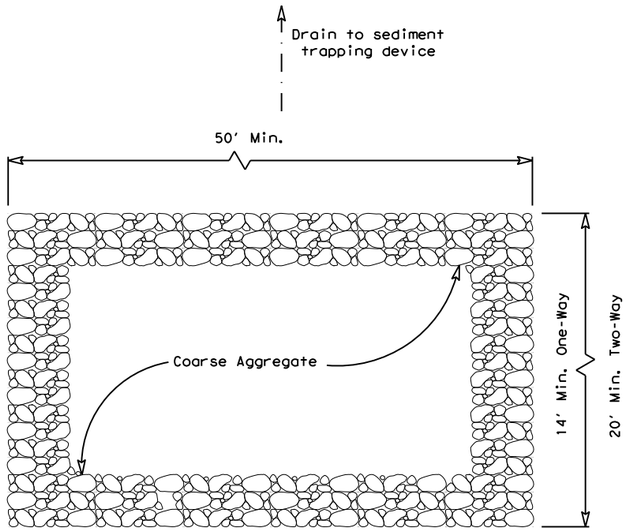
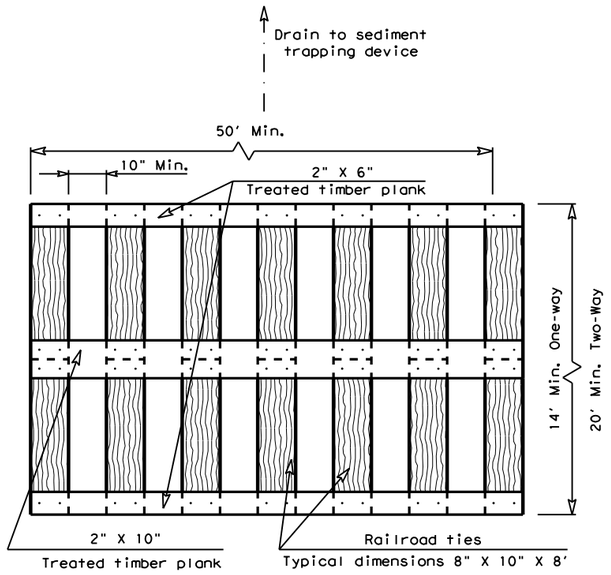
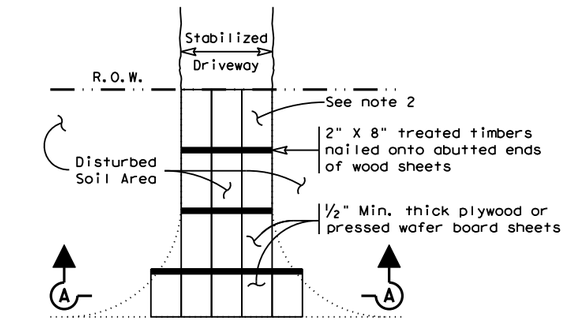


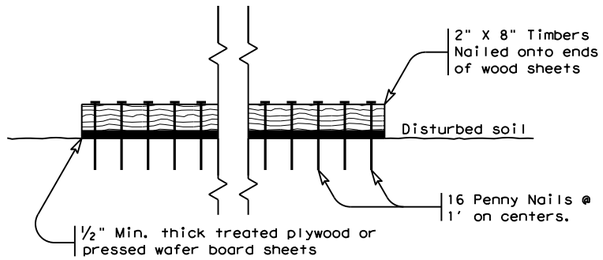
PLAN VIEW



PLAN VIEW



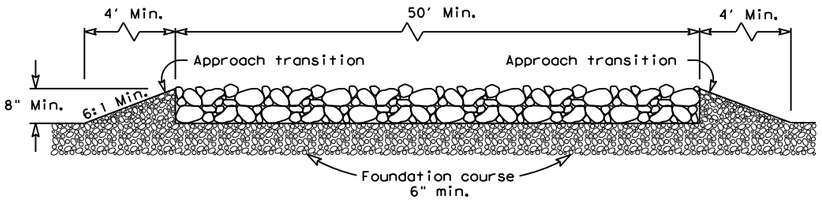
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

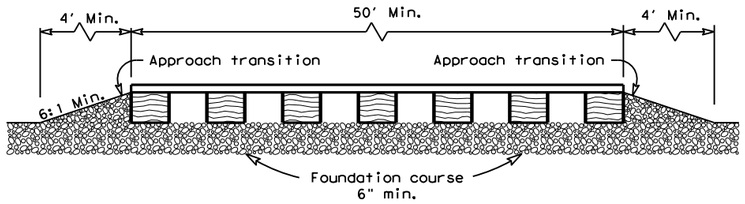
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified 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.

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 ½"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.

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.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	05	025	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		129