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FED. ROAD DIV. NO.	STATE	STATE AID PROJECT NO.	
6	TEXAS	C 22 -9 -55, etc.	
CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		1
DESIGN CRITERIA: PREVENTIVE MAINTENANCE			
A.D.T. (20XX): N/A			
A.D.T. (20XX): N/A			
% TRUCK IN ADT: N/A			
FUNCTIONAL CLASS: PRINCIPAL ARTERIAL - OTHER			
DESIGN SPEED: N/A			
TDLR REQUIRED: NO			

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

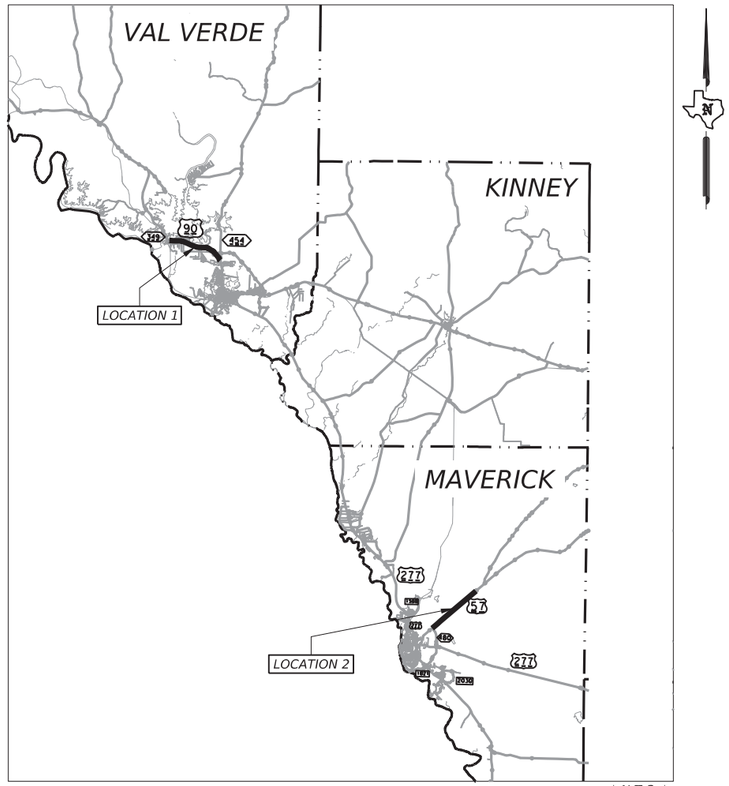
STATE AID PROJECT NO. C 22 -9 -55, etc.

US-90, etc.
VAL VERDE COUNTY, etc.
CCSJ: 0022-09-055, etc.

NET LENGTH OF ROADWAY = 72,900.96 FT.= 13.807 MI.
NET LENGTH OF BRIDGE = 80.00 FT.= 0.015 MI.
NET LENGTH OF PROJECT = 72,900.96 FT.= 13.807 MI.

LIMITS FROM: 0.28 MI EAST OF SPUR 349, etc. TO: 0.205 MI WEST OF US 277, etc.

FOR THE CONSTRUCTION OF OVERLAY CONSISTING OF RESURFACE OF EXISTING HIGHWAY MILL & INLAY WITH SPOT BASE REPAIR



* N.T.S. *

EXCEPTIONS: NONE
EQUATIONS: 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: SPECIAL LABOR PROVISIONS FOR STATE PROJECTS (000---008).

INDEX OF SHEETS
SEE SHEET 2

FINAL PLANS

LETTING DATE: _____

DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS COMPLETED & ACCEPTED: _____

FINAL CONTRACT COST: $ _____

CONTRACTOR : _____

FINAL AS BUILTS

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

_____
AREA ENGINEER

_____
DATE

Texas Department of Transportation
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SUBMITTED FOR LETTING: 2/27/2023
DocuSigned by:
TRA NEER
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RECOMMENDED FOR LETTING: 2/27/2023
DocuSigned by:
Vanessa Rosales-Herrera
70CAB6EA8F3B42B...

RECOMMENDED FOR LETTING: 2/27/2023
DocuSigned by:
Roberto Rodriguez III
B6BEDC41D58848E...
DIST ION
PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 2/27/2023
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STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ON THE "INDEX OF SHEETS" HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

DocuSigned by:
98C72D65D494466...
P.E.

2/27/2023
DATE

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INDEX OF SHEETS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		2

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NOTES:

REFER TO REFERENCE MARKERS FOR CONSTRUCTION PURPOSES AND PROJECT LIMITS.

COUNTY	LOCATION	PROJECT CSJ	HIGHWAY	LENGTH		TYPE OF WORK	PROJECT LIMITS		REFERENCE MARKER		
				FEET	MILES						
VAL VERDE	1	0022-09-055	US 90	38,206.08	7.236	MILL&INLAY/ OVERLAY W/SBR	FROM:	0.28 MI EAST OF SPUR 349	408	+	0.290
							TO:	0.205 MI WEST OF US277	414	+	1.462
MAVERICK	2	0276-01-041	US 57	34,694.88	6.571	OVERLAY W/SBR	FROM:	SL 480	374	+	1.364
							TO:	REFERENCE MARKER 382	382	+	0.000
			TOTAL	72,900.96	13.807						

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Texas Department of Transportation

PROJECT LOCATION REFERENCE

SHEET 1 OF 1

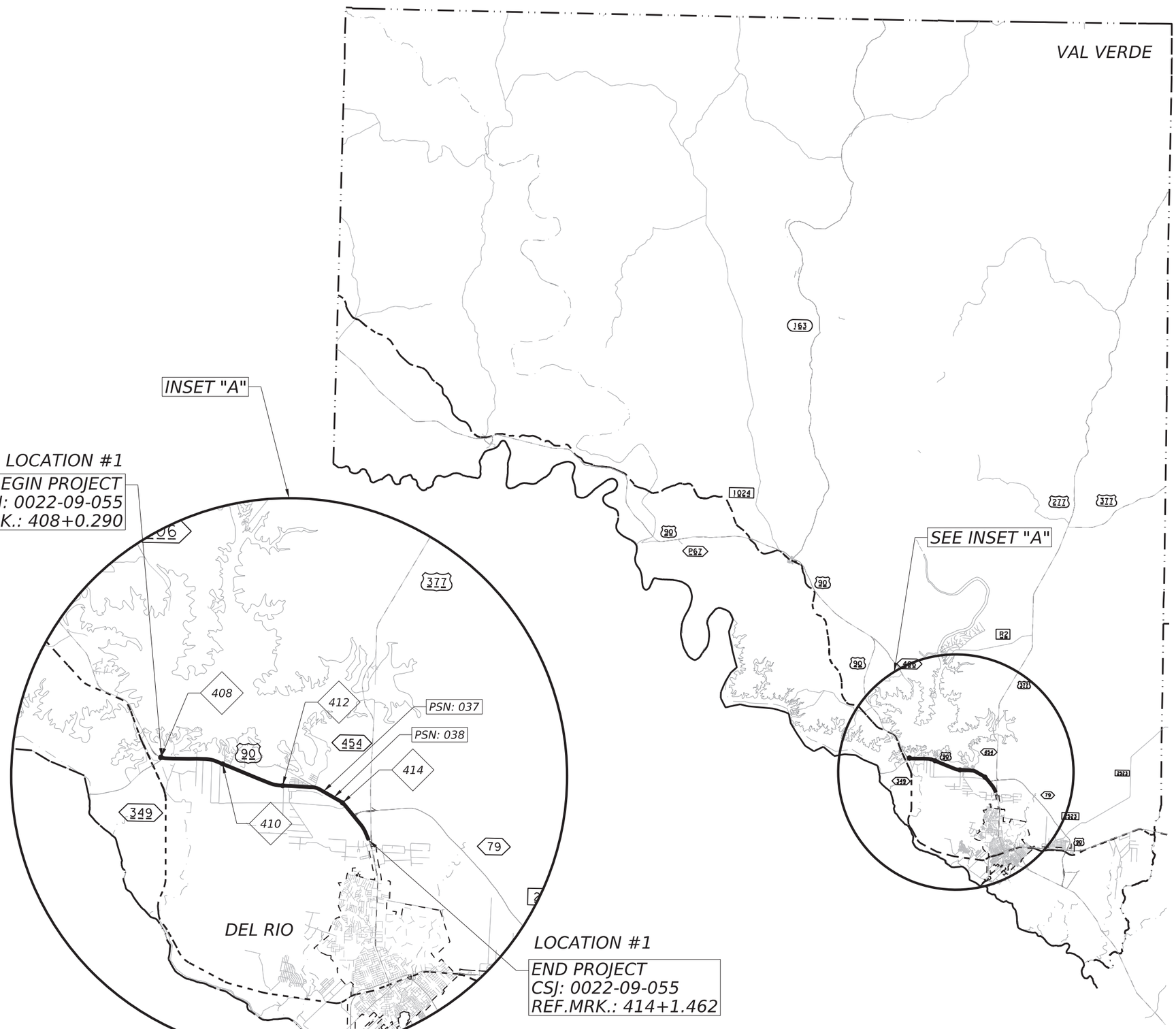
CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		3

DocuSign Envelope ID: 5F2C706A-C115-4476-B6BE-50B58D9FB95E

LOC. #	HWY	NBI	TYPE	LENGTH (FT)
1	US 90	22-233-0-0022-09-037	CULV	34
1	US 90	22-233-0-0022-09-038	CULV	23

NOTES:

1. REFER TO "PROJECT LOCATION REFERENCE" SHEET FOR MORE PROJECT INFORMATION.
2. NO WORK SHALL BE DONE ON NBI'S LABELED WITH AN ASTERISK (*).
3. THE BRIDGE LENGTH WILL BE EXCLUDED FROM THE PROJECT NET LENGTH OF BRIDGE SHOWN ON THE TITLE SHEET.



VAL VERDE COUNTY
SCALE: 1" = 500,000'

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LOCATION MAP
VAL VERDE

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		4

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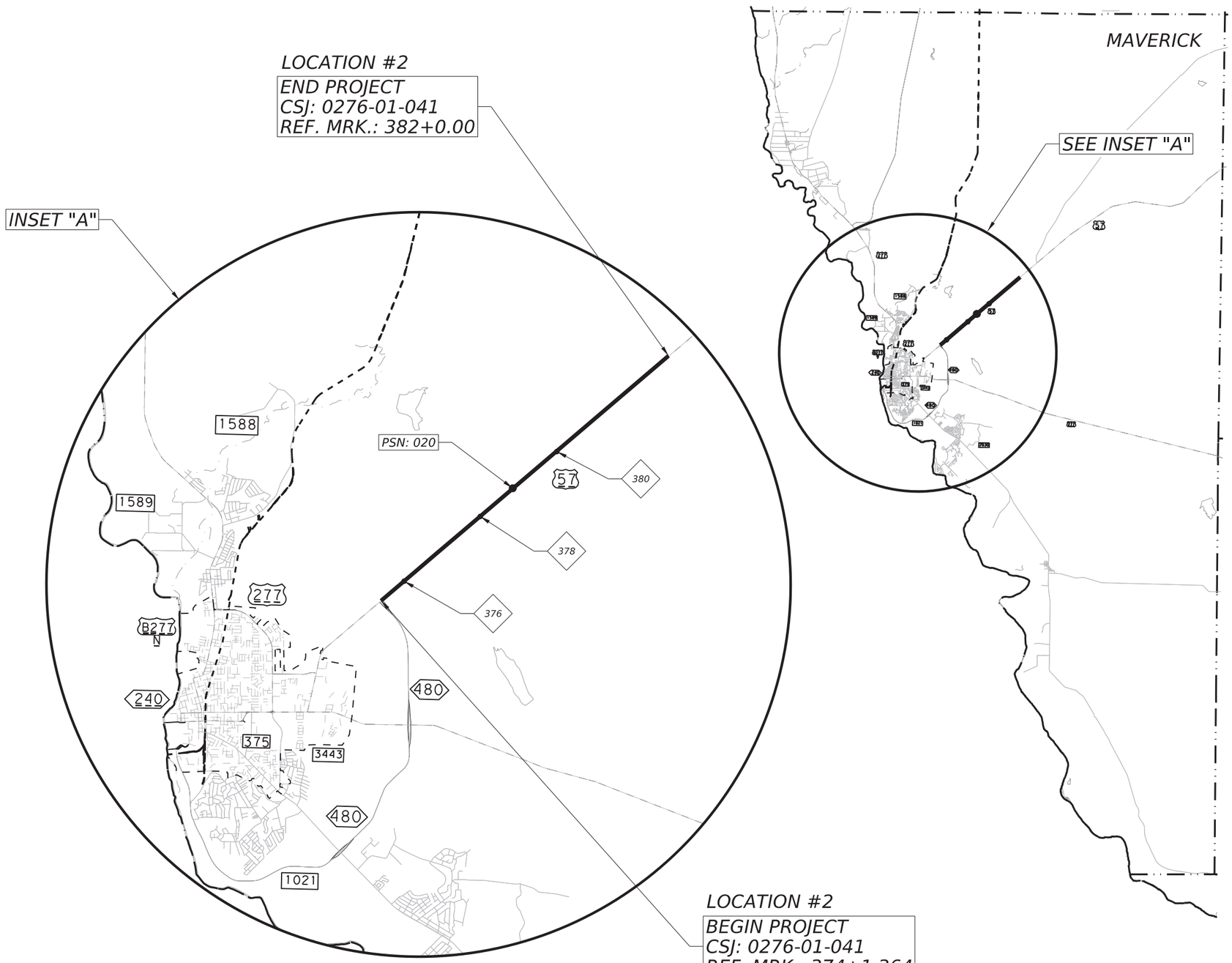
	LOC. #	HWY	NBI	TYPE	LENGTH (FT)
*	2	US 57	22-159-0-0276-01-020	CULV	23

NOTES:

1. REFER TO "PROJECT LOCATION REFERENCE" SHEET FOR MORE PROJECT INFORMATION.
2. NO WORK SHALL BE DONE ON NBI'S LABELED WITH AN ASTERISK (*).
3. THE BRIDGE LENGTH WILL BE EXCLUDED FROM THE PROJECT NET LENGTH OF BRIDGE SHOWN ON THE TITLE SHEET.



MAVERICK COUNTY
SCALE: 1" = 500,000'

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LOCATION MAP
MAVERICK

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		5

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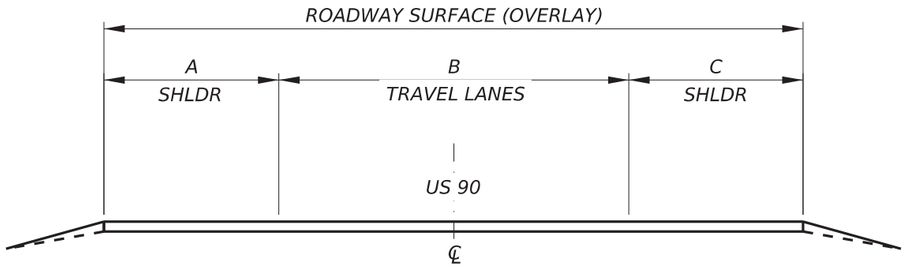
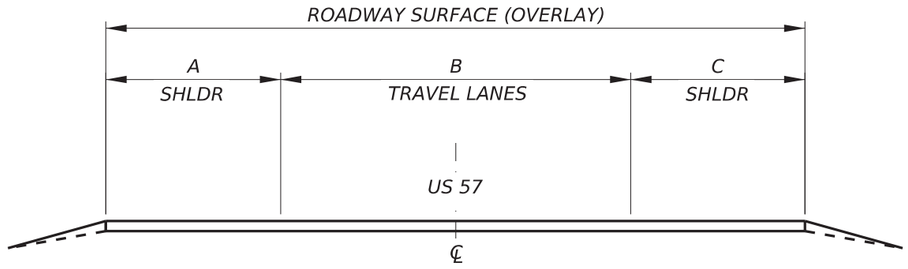
SHLDR WIDTH	ROADWAY WIDTH (TRAVEL LANES)			SHLDR WIDTH	SURFACE WIDTH	SURFACE AREA	DESCRIPTION					
A	B			C			TYPICAL SECTION	LOCATION NUMBER		HIGHWAY	COUNTY	APPROX. FT.
LT	LT	TOTAL	RT	RT								
FT	FT	FT	FT	FT	FT	SY						
8	31	62	31	8	78	270,400	1	LOC.	1	US 90	VAL VERDE	31200
0	31	62	31	0	62	4,299	1	LOC.	1	US 90	VAL VERDE	624
8	36	72	36	8	88	4,234	1	LOC.	1	US 90	VAL VERDE	433
0	32	64	32	0	64	711	1	LOC.	1	US 90	VAL VERDE	100
8	36	72	36	8	88	57,191	1	LOC.	1	US 90	VAL VERDE	5849.08
TOTAL						336,835						38206.1



TYPICAL SECTION NO. 1

SHLDR WIDTH	ROADWAY WIDTH			SHLDR WIDTH	SURFACE WIDTH	SURFACE AREA	DESCRIPTION					
A	B			C			TYPICAL SECTION	LOCATION NUMBER		HIGHWAY	COUNTY	APPROX. FT.
LT	LT	TOTA	RT	RT								
FT	FT	FT	FT	FT	FT	SY						
4	31	62	31	2	68	4,700	2	LOC.	2	US 57	MAVERICK	622.00
6	30	60	30	6	72	2,736	2	LOC.	2	US 57	MAVERICK	342.00
10	24	48	24	10	68	254,856	2	LOC.	2	US 57	MAVERICK	33730.88
6	18	36	18	6	48	5,333	INCIDENTAL CONSTRUCTION AT SL480					1000.00
TOTAL						267,624						35694.9

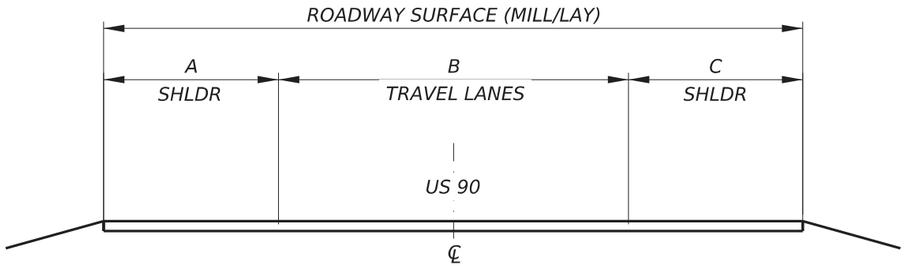


TYPICAL SECTION NO. 2

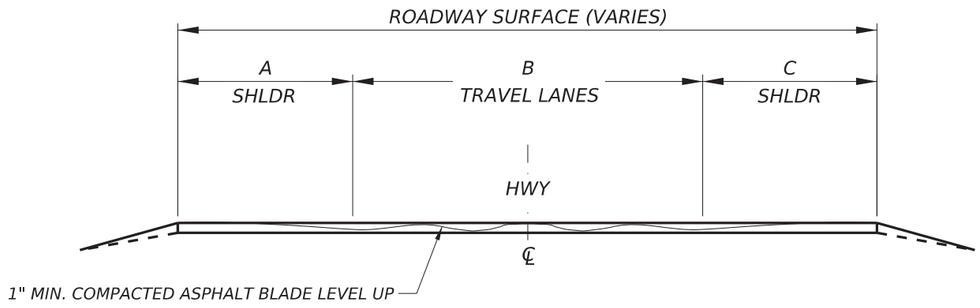
NOTES:

1. 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.
2. SURFACE AREAS HAVE BEEN ADJUSTED TO OMIT ALL SPAN BRIDGES AND CONCRETE SECTIONS THAT WILL NOT BE OVERLAID.
3. MAINTAIN EXISTING CROSS SLOPES AND RESPECTIVE PGL THROUGHOUT THE PROJECT(S).
4. DRIVEWAYS AND CONCRETE PAVEMENTS WILL NOT BE PLANED/OVERLAYED ON THIS PROJECT.
5. REFER TO "RATES OF APPLICATION" SHEET(S) FOR MORE INFORMATION ON PAVEMENT DESIGN.
6. REFER TO "ROADWAY MISCELLANEOUS DETAIL" SHEET(S) FOR MORE INFORMATION

∗ 7. BLADE LEVEL-UP TO OCCUR WITHIN PROJECT LIMITS SHOWN - NON-CONTINUOUSLY AS DETERMINED BY THE ENGINEER OR DESIGNATED REPRESENTATIVE.



TYPICAL SECTION NO. 1



∗ TYPICAL SECTION (BLADE LEVEL-UP)

NOT TO SCALE

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TYPICAL SECTIONS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		6

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CK
DW
CK
DW

LOC. 1 - US-90

PAVEMENT DESIGN	
OVERLAY & MILL/INLAY:	
1" D-GR HMA TY-D (LEVEL-UP) PG70-22	*- 115 LBS/SY/IN*
5" FLEXIBLE PAVEMENT STRUCTURE REPAIR FOR ROADWAY	
DG HMA TY-B - (SAC-B) PG70-22	*- (20%)*
⚠ BONDING COURSE (TRACKLESS TACK-COAT)	*- 0.20 GAL/SY*
2" DG HMA TY-C (SAC-A) PG76-22	*- 115 LBS/SY/IN*

LOC. 2 - US-57

PAVEMENT DESIGN	
OVERLAY:	
1" D-GR HMA TY-D (LEVEL-UP) PG70-22	*- 115 LBS/SY/IN*
5" FLEXIBLE PAVEMENT STRUCTURE REPAIR FOR ROADWAY	
DG HMA TY-B - (SAC-B) PG70-22	*- (20%)*
⚠ BONDING COURSE (TRACKLESS TACK-COAT)	*- 0.2 GAL/SY*
2" DG HMA TY-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 ITEM 3084 FOR MORE INFORMATION.

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Texas Department of Transportation

RATES OF APPLICATION

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		7

GENERAL NOTES:

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

Luis G. Urbina, P.E. – Luis.Urbina@txdot.gov

Angel F. Martinez, P.E. – Angel.Martinez@txdot.gov

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address:

Https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors

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

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

Item 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.

Project Number: **Sheet8**

County: Val Verde, Etc. **Control:** 0022-09-055, Etc.

Highway: US 90, 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 Border Patrol Agent in charge two weeks before beginning work at Border Patrol Check Point located at Location 2 US 57.

Border Patrol Agent has been advised that inspections shall be performed on the passenger side of inspected vehicles, if Border Patrol Check Point decides to perform inspections on the driver side of vehicles a TMA shall be required on each approach as per TXDOT Standard ISSU-20.

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

Item 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 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
   b. temporary fill (Item 132, Embankment) within a USACE permit area may be restricted.

c. Suitable embankment (Item 132) from within the USACE permit area is used as fill within a USACE evaluated area may be restricted; and,
d. 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 March 5, 2018 and amended on January 28, 2022. 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 ensure 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

Before starting work, provide a sequence of work and estimated progress schedule meeting the requirements of Section 8.5.2, “Progress Schedule.”

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.

Working days will be computed and charged in accordance with Article 8.3.1.4 *Standard Work Week.*

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

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 *or* 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 134 - Backfilling Pavement Edges

TY “B” backfill, place and compact backfill material using a light pneumatic roller to provide a 4:1 slope to tie to existing terrain. Apply Emulsion Asphalt mixture in accordance with Article 314.4 at a rate of 0.10 Gal/Sy or as directed by the engineer. Asphalt emulsion will be subsidiary to item 134.

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. Refer to item 3076.

Salvaged material can be used for back fill pavement edges, refer to item 134.

Item 354 - Planing and Texturing Pavement

Contractor to retain ownership of planed materials.

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

The contractor will not be allowed to remove all existing asphalt from (edge of pavement to edge of pavement) when TCP requires to be done in phases.

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.

Salvaged material can be used for back fill pavement edges according to item 134.

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 432 - Riprap

Provide Class B Concrete for riprap.

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.

When advanced warning flashing arrow panel(s) is/are specified, maintain one standby unit in good condition at the job site ready for immediate use is required.

Notify the Area Engineer at least two weeks prior to a proposed traffic pattern change(s) that will require a revision to traffic signals. This is required to provide the State/City time to perform a traffic study, determine the new signal timing and phasing settings that need to be implemented with the traffic change.

Whenever it is necessary for the signals to be turned off, when directed/approved by the Engineer, hire off-duty law enforcement officers as covered by Item 9 to control the traffic until the signals are back in satisfactory condition.

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".

Item 512 - Portable Traffic Barrier

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

All Portable Traffic Barriers (PTB) will remain the property of the State.

Stockpile portable traffic barrier (PTB) to the storage site located at
Lat: 29.429933, Long: -100.908632 when no longer needed on the project.

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

Use pay adjustment schedule 2

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.

Provide and place delineator Type 1, 2, 3, 4, object markers/chevrons and large arrows signs project 4' or 7' above the pavement surface and not the ground line. (Provide adequate length for proper anchor and projection above ground line).

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 3076 - Dense-Graded Hot-Mix Asphalt

Apply the Bonding Course in accordance with Item 3084.

Substitute Binders (grade dumping) will not be allowed on the final riding surface.

Refer to item 585 for ride quality requirements.

The use of RAP or RAS will not be allowed on the final riding surface.

For Mill inlays sections:
Only mill what can be paved at the end of the workday.

RAP 20% is allowed for TY B mixes, but RAS will not be allowed. Substitute Binders in the intermediate layer (grade dumping) may be allowed when the surface HMA layer is placed not more than 6 months after the intermediate layer is complete or as approved by the engineer.

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	MINIMUM 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.

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.

Sheet14

Control: 0022-09-055, Etc.

Item 6158 – Trailer Mounted Solar Powered Radar Speed Control Monitor

Provide Two (02) trailer mounted solar powered radar speed detection radar unit with light emitting diode (LED) display panel. Install as per plans or as directed by the Engineer.

Provide a display panel that consist of two characters, each a minimum of 18 in. height. Display Panel shall be in amber color and visible from a minimum of 600 ft. Provide a display panel that is equipped to alert motorist when they are traveling over the posted speed, either by flashing the traveling speed, changing the display color, or by blinking out the display.

Item 6185 – Truck Mounted Attenuator (TMA) and Trailer

Provide two (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 0022-09-055 **DISTRICT** Laredo **COUNTY** Maverick, Val Verde
HIGHWAY US 57, US 90

			CONTROL SECTION JOB		**0022-09-055**		**0276-01-041**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00189699**		**A00125088**			
			COUNTY		**Val Verde**		**Maverick**			
			HIGHWAY		**US 90**		**US 57**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	134-6001	BACKFILL (TY A)		STA	383.000		347.000		730.000	
	150-6002	BLADING		HR	40.000		40.000		80.000	
	351-6001	FLEXIBLE PAVEMENT STRUCTURE REPAIR(5")		SY	50,526.000		40,144.000		90,670.000	
	354-6021	PLANE ASPH CONC PAV(0" TO 2")		SY	1,734.000		2,579.000		4,313.000	
	354-6045	PLANE ASPH CONC PAV (2")		SY	59,547.000				59,547.000	
	420-6136	CL C CONC (RAC-R)		CY	18.000				18.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)		CY	169.000		233.000		402.000	
	451-6005	RETROFIT RAIL (TY T221)		LF	114.000				114.000	
	500-6001	MOBILIZATION		LS	1.000				1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING		MO	12.000				12.000	
	510-6001	ONE-WAY TRAF CONT (FLAGGER CONT)		HR	200.000		150.000		350.000	
	512-6072	PTB (FRN&INSTL)(SGL SLP)(TY 1) OR (STL)		LF	90.000				90.000	
	512-6074	PTB (MOVE)(SGL SLP)(TY 1) OR (STL)		LF	270.000				270.000	
	512-6076	PTB (REMOVE)(SGL SLP)(TY 1) OR (STL)		LF	90.000				90.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT		LF	76,413.000		69,390.000		145,803.000	
	533-6004	RUMBLE STRIPS (CENTERLINE) ASPHALT		LF			34,695.000		34,695.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)		LF	3,350.000		4,250.000		7,600.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)		EA	8.000				8.000	
	540-6014	SHORT RADIUS		LF			275.000		275.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION		EA	10.000		26.000		36.000	
	540-6018	MTL BM GD FEN TRANS (NON - SYM)		EA	8.000				8.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE		LF	3,375.000		3,765.000		7,140.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION		EA	10.000		26.000		36.000	
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)		EA	8.000				8.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)		EA	10.000		26.000		36.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)		EA	10.000		26.000		36.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)		EA	6.000				6.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)		EA	2.000				2.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)		EA	2.000				2.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)		EA	6.000				6.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)		EA	67.000		85.000		152.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W		EA	5,732.000		5,206.000		10,938.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2		EA	9,445.000		3,565.000		13,010.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)		LF	271.000		700.000		971.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)		LF			160.000		160.000	
	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)		EA	3.000		6.000		9.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)		EA	2.000		6.000		8.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0022-09-055 **DISTRICT** Laredo **COUNTY** Maverick, Val Verde
HIGHWAY US 57, US 90

									TOTAL EST.	TOTAL FINAL
			CONTROL SECTION JOB		**0022-09-055**		**0276-01-041**			
			PROJECT ID		**A00189699**		**A00125088**			
			COUNTY		**Val Verde**		**Maverick**			
			HIGHWAY		**US 90**		**US 57**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	666-6138	REFL PAV MRK TY I (Y)8"(SLD)(100MIL)		LF			700.000		700.000	
	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)		LF	19,104.000		17,848.000		36,952.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)		LF	76,413.000		71,390.000		147,803.000	
	666-6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)		LF	18,742.000		311.000		19,053.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)		LF	76,413.000		71,390.000		147,803.000	
	672-6007	REFL PAV MRKR TY I-C		EA	971.000		894.000		1,865.000	
	672-6009	REFL PAV MRKR TY II-A-A		EA	1,894.000		885.000		2,779.000	
	3076-6032	D-GR HMA TY-C SAC-A PG76-22		TON	38,736.000		31,329.000		70,065.000	
	3076-6043	D-GR HMA TY-D PG70-22 (LEVEL-UP)		TON	1,172.000		1,064.000		2,236.000	
	3084-6001	BONDING COURSE		GAL	67,367.000		54,592.000		121,959.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN		EA	4.000				4.000	
	6056-6001	PREFORMED IN-LANE(TRANS) RUMBLE STRIP		LF			96.000		96.000	
	6158-6001	TMSP RADAR SPEED CONTROL MONITOR		EA	2.000				2.000	
	6185-6002	TMA (STATIONARY)		DAY	83.000		150.000		233.000	
	6185-6005	TMA (MOBILE OPERATION)		DAY	6.000		5.000		11.000	
	08	CONTRACTOR FORCE ACCOUNT SAFETY CONTINGENCY (NON-PARTICIPATING)		LS	1.000				1.000	
		CONTRACTOR FORCE ACCOUNT LAW ENFORCEMENT (NON-PARTICIPATING)		LS	1.000				1.000	
		CONTRACTOR FORCE ACCOUNT EROSION CONTROL MAINTENANCE (NON-PARTICIPATING)		LS	1.000				1.000	

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SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION - CSJ	510 6001	662 6109	662 6111	6001 6002	6185 6002	6185 6005	6158 6001	512 6072	512 6074	512 6076	545 6003	545 6005	545 6019	658 6014
	ONE-WAY TRAF CONT (FLAGGER CONT)	WK ZN PAV MRK SHT TERM (TAB)TY W	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)	TMSP RADAR SPEED CONTROL MONITOR	PTB (FRN&INSTL)(SGL SLP)(TY 1) OR (STL)	PTB (MOVE)(SGL SLP)(TY 1) OR (STL)	PTB (REMOVE)(SGL SLP)(TY 1) OR (STL)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)
	HR	EA	EA	EA	DAY	DAY	EA	LF	LF	LF	EA	EA	EA	EA
1 - 0022-09-055	200	5732	9445	4	83	6	2	90	270	90	6	2	2	6
PROJECT TOTALS	200	5732	9445	4	83	6	2	90	270	90	6	2	2	6

SUMMARY OF MOBILIZATION ITEMS

LOCATION - CSJ	500 6001	502 6001
	MOBILIZATION	BARRICADES, SIGNS AND TRAFFIC HANDLING
	LS	MO
1 - 0022-09-055	1	12
PROJECT TOTALS	1	12

SUMMARY OF MBGF

REFERENCE LOCATION DESCRIPTION	432 6045	540 6001	540 6006	540 6016	540 6018	542 6001	542 6002	542 6004	544 6001	544 6003
	RIPRAP (MOW STRIP)(4 IN)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	DOWNSTREAM ANCHOR TERMINAL SECTION	MTL BM GD FEN TRANS (NON - SYM)	REMOVE METAL BEAM GUARD FENCE	REMOVE TERMINAL ANCHOR SECTION	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)
	CY	LF	EA	EA	EA	LF	EA	EA	EA	EA
CSJ: 0022-09-055										
CROSSING DRAINAGE										
GF1	52.6	1150		2		1200	2		2	2
GF2	37.5	800		1		800	1		1	1
GF3	33.1	700		2		700	2		2	2
GF4	12.6	225		1		200	1		1	1
BRIDGE PSN:										
222330002209037	15.8	225	4	2	4	225	2	4	2	2
222330002209038	16.9	250	4	2	4	250	2	4	2	2
TOTAL	169	3,350	8	10	8	3,375	10	8	10	10

SUMMARY OF PAVEMENT MARKING & DELINEATOR ITEMS

LOCATION - CSJ	658 6062	666 6036	666 6054	666 6078	666 6306	666 6309	666 6318	666 6321	672 6007	672 6009
	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	REFL PAV MRK TY I (W)(ARROW)(100MIL)	REFL PAV MRK TY I (W)(WORD)(100MIL)	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
	EA	LF	EA	EA	LF	LF	LF	LF	EA	EA
1 - 0022-09-055	67	271	3	2	19104	76413	18742	76413	971	1894
PROJECT TOTALS	67	271	3	2	19104	76413	18742	76413	971	1894

SUMMARY OF BRIDGE # 1 ITEMS

LOCATION - PSN	420 6136	451 6005
	CL C CONC (RAC-R)	RETROFIT RAIL (TY T221)
	CY	LF
1 - 222330002209037	12	68
PROJECT TOTALS	12	68

SUMMAR OF BRIDGE # 2 ITEMS

LOCATION - PSN#	420 6136	451 6005
	CL C CONC (RAC-R)	RETROFIT RAIL (TY T221)
	CY	LF
2 - 222330002209038	6	46
PROJECT TOTALS	6	46

SUMMARY OF ROADWAY

LOCATION-CSJ	LENGTH	134 6001	150 6002	351 6001	354 6021	BONDING COURSE	3084 6001	HOTMIX	3076 6032	LEVEL UP	3076 6043	RUMBLE STRIPS 6003	MILLING 6045
		BACKFILL (TY A)	BLADING	FLEXIBLE PAVEMENT STRUCTURE REPAIR(5")	PLANE ASPH CONC PAV(0" TO 2")	AREA	BONDING COURSE	AREA	D-GR HMA TY-C SAC-A PG76-22	AREA	D-GR HMA TY-D PG70-22 (LEVEL-UP)	RUMBLE STRIPS (SHOULDER) ASPHALT	PLANE ASPH CONC PAV (2")
	LF	STA	HR	SY	SY	SY	GAL	SY	TON	SY	TON	LF	SY
1 - 0022-09-055	38206.08	382.1	40	50525.2	1734.0	336834.6	67366.9	336834.6	38736.0	336834.6	1171.7	76412.2	59546.7
TOTAL	38,206.08	383	40	50,526	1,734	336,835	67,367	336,835	38,736	336,835	1,172	76,413	59,547

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Texas Department of Transportation

SUMMARY OF QUANTITIES

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		17

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SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS					
	510	662	662	6185	6185
	6001	6109	6111	6002	6005
LOCATION - CSJ	ONE-WAY TRAF CONT (FLAGGER CONT)	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	EA	EA	DAY	DAY
2 - 0276-01-041	150	5206	3565	150	5
PROJECT TOTALS	150	5206	3565	150	5

SUMMARY OF ROADWAY														
		134	150	351	354	BONDING COURSE	3084	HOTMIX	3076	HMA	3076	RUMBLE STRIPS	533	533	6056
		6001	6002	6001	6021		6001		6043		6032		6003	6004	6001
LOCATION-CSJ	LENGTH	BACKFILL (TY A)	BLADING	FLEXIBLE PAVEMENT STRUCTURE REPAIR(5")	PLANE ASPH CONC PAV(0" TO 2")	AREA	BONDING COURSE	AREA	D-GR HMA TY-D PG70-22 (LEVEL-UP)	AREA	D-GR HMA TY-C SAC-A PG76-22	RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
	LF	STA	HR	SY	SY	SY	GAL	SY	TON	SY	TON	LF	LF	LF
2 - 0276-01-041	34695	347	40	40144	2045	267624.4	53524.9	267624.4	1064.0	267624.4	30776.8	69389.8	34694.9	96.0
INCIDENTAL CONSTRUCTION AT SL480	1000				533		1066.7				552.0			
TOTAL	35,695	347	40	40,144	2,579	267,625	54,592	267,625	1,064	267,625	31,329	69,390	34,695	96

SUMMARY OF PAVEMENT MARKING & DELINEATOR ITEMS												
	658 6062	666 6036	666 6048	666 6054	666 6078	666 6138	666 6306	666 6309	666 6318	666 6321	672 6007	672 6009
LOCATION - CSJ	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	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)	REFL PAV MRK TY I (Y)8"(SLD)(100MIL)	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
	EA	LF	LF	EA	EA	LF	LF	LF	LF	LF	EA	EA
2 - 0276-01-041	85	500	125	2	2	700	17348	69390	311	69390	894	885
INCIDENTAL CONSTRUCTION AT SL480		200	35	4	4		500	2000		2000		
PROJECT TOTALS	85	700	160	6	6	700	17848	71390	311	71390	894	885

SUMMARY OF MBGF								
	432	540	540	540	542	542	544	544
	6045	6001	6014	6016	6001	6002	6001	6003
REFERENCE LOCATION DESCRIPTION	RIPRAP (MOW STRIP)(4 IN)	MTL W-BEAM GD FEN (TIM POST)	SHORT RADIUS	DOWNSTREAM ANCHOR TERMINAL SECTION	REMOVE METAL BEAM GUARD FENCE	REMOVE TERMINAL ANCHOR SECTION	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)
	CY	LF	LF	EA	LF	EA	EA	EA
CSJ: 0276-01-041								
CROSSING								
US57/SL480 INTERSECTION	29.9	350	275	2	625	2	2	2
GF1	16.9	325		2	300	2	2	2
GF2	18	350		2	200	2	2	2
GF3	15.9	300		2	250	2	2	2
GF4	18	350		2	250	2	2	2
GF5	18	350		2	300	2	2	2
GF6	18	350		2	300	2	2	2
GF7	15.9	300		2	250	2	2	2
GF8	18	350		2	250	2	2	2
GF9	16.9	325		2	290	2	2	2
GF10	15.9	300		2	250	2	2	2
GF11	15.9	300		2	250	2	2	2
GF12	15.9	300		2	250	2	2	2
TOTAL	233	4,250	275	26	3,765	26	26	26

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SUMMARY OF QUANTITIES

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		18

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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 shall be developed, signed and sealed by a Profesional 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 (TMUTCD), 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. Moving an existing sign to a temporary location is subsidiary to Item 502. Installations with permanent supports at permanent locations will be paid for under the applicable bid item(s).

5. 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 Item 502 - "Barricades, Signs and Traffic Handling".

6. Refer to BC(6)-21 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.

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)-23, BC (11), BC (12) and the TMUTCD.

11. 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.

12. 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.

13. 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.

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

15. 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.

16. 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. 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.

19. Place portable changeable message boards at locations requiring lane closures for 2 week(s) before the closures or as directed by the Engineer.

20. If the contractor chooses to work multiple locations simultaneously, with approval from the Engineer, contractor will be responsible for providing all applicable traffic control devices, including portable changeable message boards, and truck mounted attenuators at their own expense.

21. Use 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 for the entire work area is acceptable.

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

23. Regulatory construction speed limit signs are erected only for the limits of the section of roadway where speed reduction is necessary for the safe operation of traffic and protection of construction personnel. If the regulatory construction speed limit signs are not necessary for the safe operation of traffic during certain construction operations or those days and hours when the contractor is not working, these signs should be made inoperative following guidance in BC(4)-21.

24. Contractor shall plan milling operations accordingly to where milled roadway surface is not exposed for more than 2 days, before placing the corresponding bonding course and surface mix unless otherwise approved by the Engineer.

25. Contractor is to construct longitudinal joint at approaches and departures prior to opening to traffic. Refer to "roadway miscellaneous details transition" sheet to be used when opening roadway(s) to traffic.

26. Limit the work to that area of operation that can be completed in one work day in order to allow for traffic at night. Limit the length of lane closures to a maximum of 2 miles. Refer to "TCP 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.

27. 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.

28. 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 flaggers.

29. 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.

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

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

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED
PROFESSIONAL ENGINEER

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TCP
GENERAL NOTES

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		19

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SEQUENCE OF CONSTRUCTION

GENERAL INSTRUCTIONS

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

INSTALL ALL APPLICABLE BARRICADES, SIGNS, AND WORK ZONE MARKINGS IN ACCORDANCE WITH TCP, BC, AND WZ TXDOT STANDARD SHEETS FOR TRAFFIC CONTROL SETUP. TEMPORARY RUMBLE STRIPS SHALL BE USED IN ALL APPLICABLE LOCATIONS. REFER TO WZ(RS)-22.

ONCE WORK HAS BEGUN AT A REFERENCE LOCATION, THE ENTIRE SEGMENT MUST BE WORKED ON CONTINUOUSLY TO COMPLETION. CONTRACTOR SHALL MAINTAIN LANE CLOSURE UNTIL ALL WORK IN AREA HAS BEEN COMPLETED. ADJACENT LANES (SAME DIRECTION OF TRAVEL) MAY BE COMBINED WHEN APPLICABLE.

FOR ALL LOCATIONS, IN THE EVENT OF A SEGMENT NOT BEING COMPLETED AT THE END OF THE DAY NO DROPOFFS GREATER THAN 2" SHALL BE LEFT. CONTRACTOR SHALL IMPLEMENT "TCP CONSTRUCTION JOINT DETAIL" FOR LONGITUDINAL DROP OFFS AND CONDUCT ROADWAY SWEEPING. INSTALL ANY REQUIRED WORK ZONE SHORT TERM TABS TO GUIDE TRAFFIC PRIOR TO OPENING TRAVEL LANES. ROADWAY SURFACE SHALL NOT BE EXPOSED TO MORE THAN 2 DAYS, BEFORE PLACING THE CORRESPONDING BONDING COURSE UNLESS OTHERWISE APPROVED BY THE ENGINEER.

SPEED RADAR FEEDBACK SIGNS MUST BE USED IN ALL PHASES OF THE PROJECT AND IS INTENDED TO BE RELOCATED AS NEEDED OR AS DIRECTED BY THE ENGINEER.

SUMMARY OF WORK (OVERLAY)

A) IDENTIFY AREAS IN NEED OF LEVEL-UP WHEN APPLICABLE, COORDINATE WITH TXDOT PERSONNEL.
B) CONDUCT 1" LEVEL-UP WHERE PREVIOUSLY IDENTIFIED OR AS DIRECTED BY THE ENGINEER.
C) IDENTIFY AREAS IN NEED OF 5" SPOT BASE REPAIR WHEN APPLICABLE, COORDINATE WITH TXDOT PERSONNEL.
D) CONDUCT 5" SPOT BASE REPAIRS WHERE PREVIOUSLY IDENTIFIED OR AS DIRECTED BY THE ENGINEER.
E) PERFORM SURFACE CLEAN UP AND PLACE BONDING COURSE.
F) LAY 2" HMA ON LOCATIONS WITH PRIOR ASSOCIATED BONDING COURSE.
G) PLACE FINAL PAVEMENT MARKINGS AND RAISED PAVEMENT MARKERS.
H) MILL RUMBLE STRIPS.
I) PERFORM BLADING & BACKFILL EDGES.
J) PERFORM PROPOSED MBGF & BRIDGE WORK AT LOCATIONS SHOWN ON PLANS.

SUMMARY OF WORK (MILL/INLAY)

A) IDENTIFY AREAS IN NEED OF 5" SPOT BASE REPAIR WHEN APPLICABLE, COORDINATE WITH TXDOT PERSONNEL.
B) MILL 2" FROM SURFACE WITHIN PROJECT LIMITS AT WIDTH SPECIFIED IN TYPICAL SECTIONS.
C) CONDUCT 5" SPOT BASE REPAIRS WHERE PREVIOUSLY IDENTIFIED OR AS DIRECTED BY THE ENGINEER.
D) PERFORM SURFACE CLEAN UP AND PLACE BONDING COURSE
E) LAY 2" HMA ON LOCATION WITH PRIOR ASSOCIATED BONDING COURSE.
F) PLACE FINAL PAVEMENT MARKINGS AND RAISED PAVEMENT MARKERS.
G) MILL RUMBLE STRIPS.
H) PERFORM BLADING & BACKFILL EDGES
I) PERFORM PROPOSED MBGF & BRIDGE WORK AT LOCATIONS SHOWN ON PLANS.

GENERAL SEQUENCE OF WORK

THIS IS A DISTRICT-WIDE RESURFACING PROJECT. WORK FOR EACH PROJECT LOCATION SHALL BE PERFORMED IN SIX (6) PHASES, AS APPLICABLE.

PHASE I - PERFORM SPOT BASE REPAIR/LEVEL-UP/MILLING.

PHASE II - PLACE SURFACE MIX

PHASE III - PLACE FINAL PAVEMENT MARKINGS/RAISED PAVEMENT MARKERS AND MILL RUMBLE STRIPS.

PHASE IV - PERFORM BLADING AND BACKFILL EDGES.

PHASE V - REMOVE/ INSTALL NEW MBGF/ BRIDGE RAIL AT LOCATIONS SPECIFIED IN THE PLANS.

PHASE VI - PERFORM FINAL CLEAN UP.

PHASE I - PERFORM SPOT BASE REPAIR/LEVEL-UP/MILLING

FOR ROADWAY AREAS REQUIRING LEVEL-UP (OVERLAY)

FOR LANES CLOSURE USE STANDARDS TCP (2-4a)-18, 4 LANE TCP HIGHWAY DETAIL, 5 LANE TCP HIGHWAY DETAIL AS REFERENCE.

IDENTIFY LEVEL-UP REPAIR AREAS NEEDED WITHIN THE PROJECT SEGMENT IN COORDINATION WITH TXDOT PERSONNEL AND APPROVED BY THE ENGINEER. CONDUCT LEVEL-UP REPAIRS PREVIOUSLY IDENTIFIED OR AS DIRECTED BY THE ENGINEER.

FOR ROADWAY AREAS REQUIRING SBR (OVERLAY)

FOR LANES CLOSURE USE STANDARDS TCP (2-4a)-18, 4 LANE TCP HIGHWAY DETAIL, 5 LANE TCP HIGHWAY DETAIL AS REFERENCE.

IDENTIFY SPOT BASE REPAIR AREAS NEEDED WITHIN THE PROJECT SURFACE SEGMENT IN COORDINATION WITH TXDOT PERSONNEL AND APPROVED BY THE ENGINEER. CONDUCT SPOT BASE REPAIRS PREVIOUSLY IDENTIFIED OR AS DIRECTED BY THE ENGINEER. SPOT BASE REPAIRS SHALL BE COMPLETED THE SAME DAY TO AVOID DROPOFFS AT THE END OF A WORKING DAY.

CONTRACTOR SHALL PERFORM SBR OPERATIONS ACCORDINGLY TO WHERE ROADWAY SURFACE OVERLAY THE SAME DAY

FOR ROADWAY AREAS REQUIRING SBR (MILL/INLAY)

FOR LANES CLOSURE USE STANDARDS TCP (2-4a)-18, 4 LANE TCP HIGHWAY DETAIL, 5 LANE TCP HIGHWAY DETAIL AS REFERENCE.

PERFORM ONE LANE ROADWAY MILLING OPERATIONS AS SHOWN ON THE PLANS "TYPICAL SECTIONS". MAINTAIN LANE CLOSURE UNTIL ALL WORK IN AREA HAS BEEN COMPLETED.

IDENTIFY SPOT BASE REPAIR AREAS NEEDED WITHIN THE MILLED SURFACE SEGMENT IN COORDINATION WITH TXDOT PERSONNEL AND APPROVED BY THE ENGINEER. CONDUCT SPOT BASE REPAIRS PREVIOUSLY IDENTIFIED OR AS DIRECTED BY THE ENGINEER. SPOT BASE REPAIRS SHALL BE COMPLETED THE SAME DAY TO AVOID DROPOFFS AT THE END OF A WORKING DAY.

CONTRACTOR SHALL PERFORM PLANING OPERATIONS ACCORDINGLY TO WHERE ROADWAY SURFACE IS MILLED AND INLAY THE SAME DAY.

STATE OF TEXAS
LUIS G. URBINA
117019
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PROFESSIONAL ENGINEER

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TCP
SEQUENCE OF CONSTRUCTION

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		20

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SEQUENCE OF CONSTRUCTION (CONT.)

PHASE II - PLACE SURFACE MIX

FOR LANES CLOSURE USE STANDARDS TCP (2-4a)-18, 4 LANE TCP HIGHWAY DETAIL, 5 LANE TCP HIGHWAY DETAIL AS REFERENCE.

PERFORM ROADWAY SWEEPING PRIOR TO RESURFACING AND PROCEED TO PLACE BONDING COURSE ON LOCATIONS AS SHOWN ON PLANS.

PLACE SURFACE MIX ON EXISTING PAVEMENT AT WIDTHS AND RATES OF APPLICATION SPECIFIED ON TYPICAL SECTIONS.MAINTAIN ONE LANE CLOSURE UNTIL ALL WORK IN AREA HAS BEEN COMPLETED.

INSTALL WORK ZONE SHORT TERM TABS/ MARKINGS.

PHASE III - PLACE FINAL PAVEMENT MARKINGS/RAISED PAVEMENT MARKERS AND MILL RUMBLE STRIPS.

FOR PAVEMENT MARKINGS AND RAISE PAVEMENT MARKER INSTALLATION USE TCP (3-1)-13, TCP (3-3)-14 AND TCP (3-4)-13 AS REFERENCE. REMOVE WORK ZONE SHORT TERM TABS/MARKINGS AND INSTALL FINAL PAVEMENT MARKING FOR THE LIMITS SHOWN. REFER TO PM STANDARD SHEETS AND SUPPLEMENTAL PAVEMENT MARKING SHEETS FOR MORE DETAILS.

FOR MILLED RUMBLE STRIPS OPERATIONS USE TCP (3-1)-13 OR TCP (2-4a)-18 AS REFERENCE. MILL RUMBLE STRIPS ON SHOULDERS AS PER STANDARD AND SPECIFICATIONS. USE RS(2)-23 AND OPTION 4 FOR RS(4)-23 FOR CONTINUOUS MILLED DEPRESIONS.

PHASE IV - PERFORM BLADING AND BACKFILL EDGES

IDENTIFY AREAS IN NEED OF BLADING WORK IN COORDINATION WITH TXDOT PERSONNEL AND APPROVED BY THE ENGINEER. CONDUCT BLADING WORK PREVIOUSLY IDENTIFIED OR DIRECTED BY THE ENGINEER.

BACKFILL EDGES AT AREAS SPECIFIED IN THE PLANS.

PHASE V - REMOVE/INSTALL NEW MBGF/BRIDGE RAIL AT LOCATIONS SPECIFIED IN THE PLANS

FOR PROPOSED BRIDGE RAIL WORK SHOWN IN THE PLANS USE BRIDGE PROTECTION INSTALLATION LAYOUT AS REFERENCE.

INSTALL TEMPORARY PORTABLE TRAFFIC BARRIER AND CRASH CUSHION ATTENUATOR SYSTEMS TO REMOVE EXISTING CONCRETE BRIDGE RAIL AND INSTALL PROPOSED RETROFIT RAIL T221 AS SHOWN ON PLANS.

ALL PTB(S) SET-UP'S ARE TO REMAIN IN PLACE OVERNIGHT UNTIL WORK IS COMPLETE AT EACH LOCATION.

ONCE WORK HAS BEEN COMPLETED, MOVE AND RESET CRASH CUSHION ATTENUATOR AND PTB ON OPPOSITE SIDE OF LOCATION, AS SHOWN ON THE PLANS.

FOR PROPOSED MBGF WORK SHOWN IN THE PLANS USE TCP (2-1)-18 AS REFERENCE.

REPLACE THE EXISTING MBGF/ RAIL SECTIONS (REFER TO "BRIDGE MBGF, RAIL & TERMINAL REPLACEMENT LAYOUT", "US 57 & SL480 INTERSECTION MBGF LAYOUT" & "DIAGRAMATIC LAYOUT" SHEETS)

REMOVAL OF EXISTING MBGF LENGTH 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.

PROCEED TO PLACEMENT OF MOW STRIP NEEDED AT LOCATIONS MENTIONED IN THE PLANS.

UPON APPROVAL FROM THE ENGINEER THIS STAGE CAN BE CONDUCTED IN CONJUNCTION WITH OTHER PHASES OF THE PROJECT.

PHASE VI - PERFORM FINAL CLEAN UP

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

STATE OF TEXAS
LUIS G. URBINA
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TCP
SEQUENCE OF CONSTRUCTION

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		21

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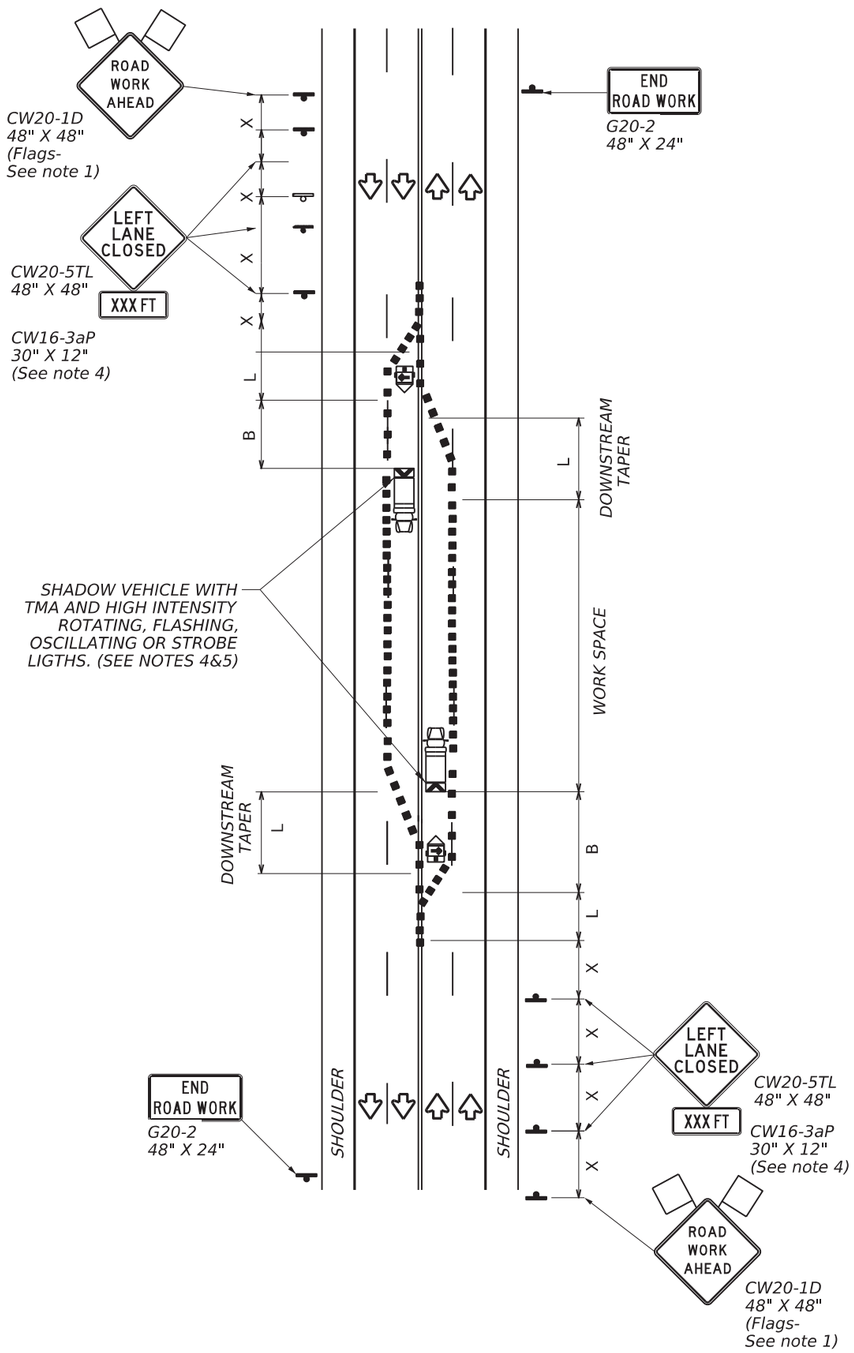

LEGEND			
	FLAG		CHANNELIZING DEVICES
	HEAVY WORK VEHICLE		TRUCK MOUNTED ATTENUATOR (TMA)
	TRAILER MOUNTED FLASHING ARROW BOARD	M	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
	SIGN		TRAFFIC FLOW

Posted Speed *	Formula	Minimum Desirable Taper Lengths * *			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L=\frac{WS^2}{60}$	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)

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 MA BE OMITTED WHEN STATED ELSEWHERE IN THE PLANS, OR FOR ROUTINE MAINTENANCE WORK, WHEN APPROVED BY THE ENGINEER.
3. 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.
4. A SHADOW VEHICLE WITH A TMA SHOULD BE USED ANYTIME IT CAN BE POSITIONED 30 TO 100 FEET IN ADVANCE OF THE AREA OF CREW EXPOSURE WITHOUT ADVERSELY AFFECTING THE PERFORMANCE OR QUALITY OF THE WORK. IF WORKERS ARE NO LONGER PRESENT BUT ROAD OR WORK CONDITIONS REQUIRE THE TRAFFIC CONTROL TO REMAIN IN PLACE, TYPE 3 BARRICADES OR OTHER CHANNELIZING DEVICES MAY BE SUBSTITUTED FOR THE SHADOW VEHICLE AND TMA.
5. ADDITIONAL SHADOW VEHICLES WITH TMAS MAY BE POSITIONED IN EACH CLOSED LANE, ON THE SHOULDER OR OFF THE PAVED SURFACE, NEXT TO THOSE SHOWN IN ORDER TO PROTECT A WIDER WORK SPACE.

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4 LANE TCP HIGHWAY DETAIL

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		22

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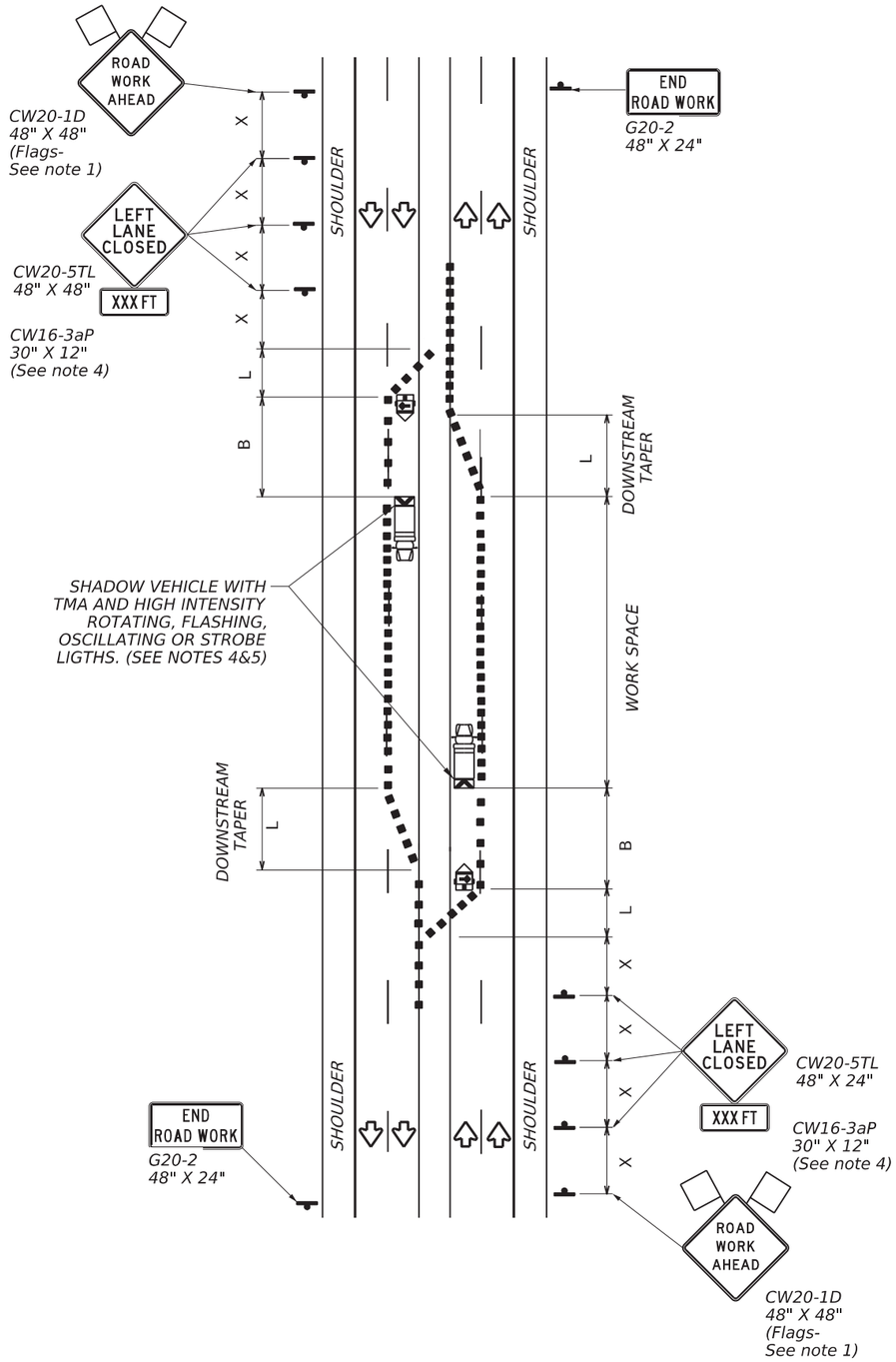

	LEGEND		
	FLAG		CHANNELIZING DEVICES
	HEAVY WORK VEHICLE		TRUCK MOUNTED ATTENUATOR (TMA)
	TRAILER MOUNTED FLASHING ARROW BOARD	M	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
	SIGN		TRAFFIC FLOW

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)

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. 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.
4. A SHADOW VEHICLE WITH A TMA SHOULD BE USED ANYTIME IT CAN BE POSITIONED 30 TO 100 FEET IN ADVANCE OF THE AREA OF CREW EXPOSURE WITHOUT ADVERSELY AFFECTING THE PERFORMANCE OR QUALITY OF THE WORK. IF WORKERS ARE NO LONGER PRESENT BUT ROAD OR WORK CONDITIONS REQUIRE THE TRAFFIC CONTROL TO REMAIN IN PLACE, TYPE 3 BARRICADES OR OTHER CHANNELIZING DEVICES MAY BE SUBSTITUTED FOR THE SHADOW VEHICLE AND TMA.
5. ADDITIONAL SHADOW VEHICLES WITH TMAS MAY BE POSITIONED IN EACH CLOSED LANE, ON THE SHOULDER OR OFF THE PAVED SURFACE, NEXT TO THOSE SHOWN IN ORDER TO PROTECT A WIDER WORK SPACE.

STATE OF TEXAS
LUIS G. URBINA
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LICENSED PROFESSIONAL ENGINEER

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5 LANE TCP HIGHWAY DETAIL

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		23

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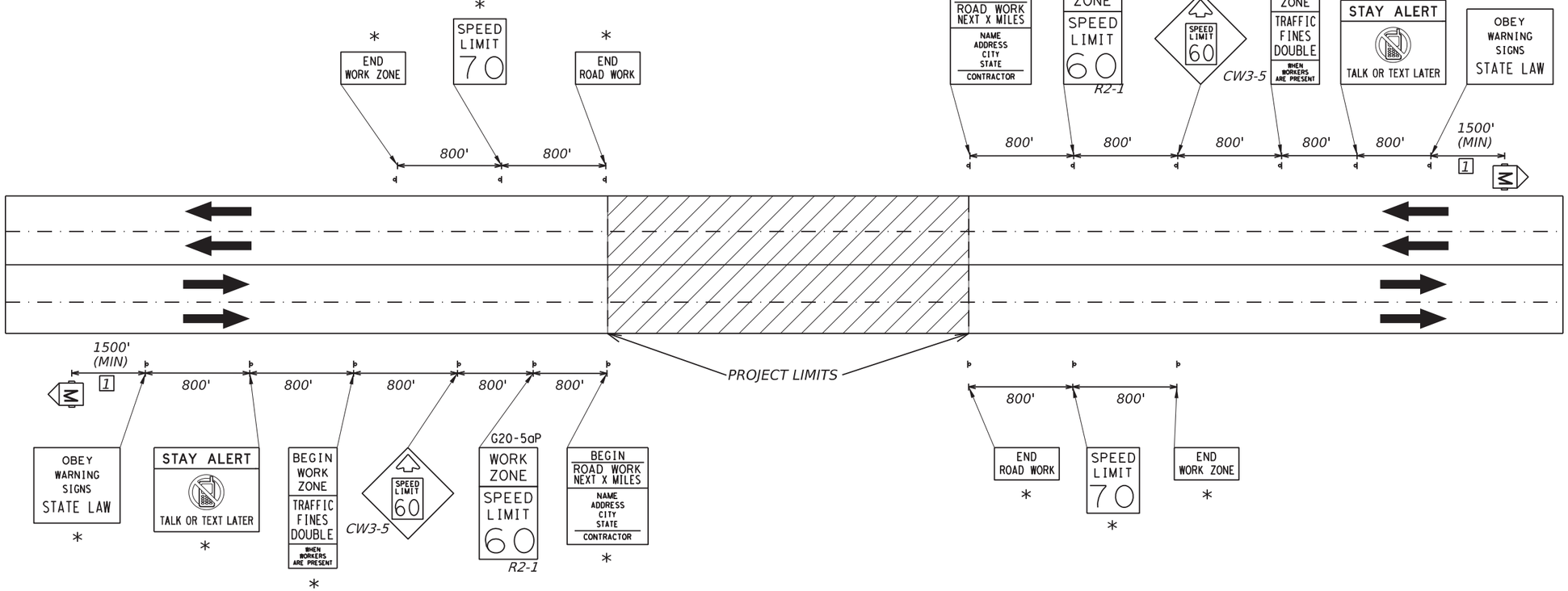
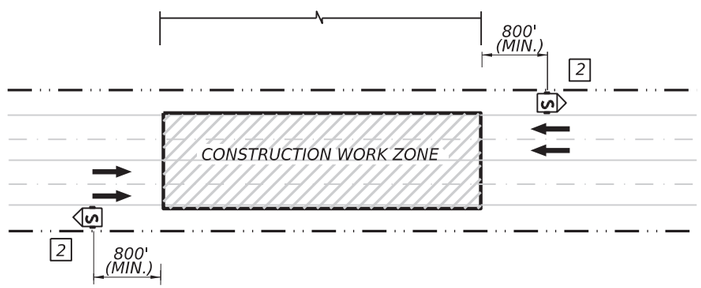


US 90 SPEED RADAR LOCATION LAYOUT

REFER TO TCP STANDARDS FOR CONSTRUCTION ZONE SIGN SETUP



LEGEND	
	WORK AREA
M	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
	TRAFFIC FLOW

NOTES

1. DISTANCE BETWEEN SIGNS SHOULD BE INCREASED AS REQUIRED TO HAVE 1500 FT OR MORE ADVANCE WARNING
2. * REFER TO BC(2)-21 FOR MORE INFORMATION
3. DRIVER FEEDBACK SPEED SIGN TO BE PLACED MIN. 800FT BEFORE FIRST SIGN OF APPLICABLE TCP STANDARD FOR THE CONSTRUCTION WORK ZONE OR AS DIRECTED BY THE ENGINEER.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

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TCP MESSAGING SIGN LOCATION LAYOUT

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		24

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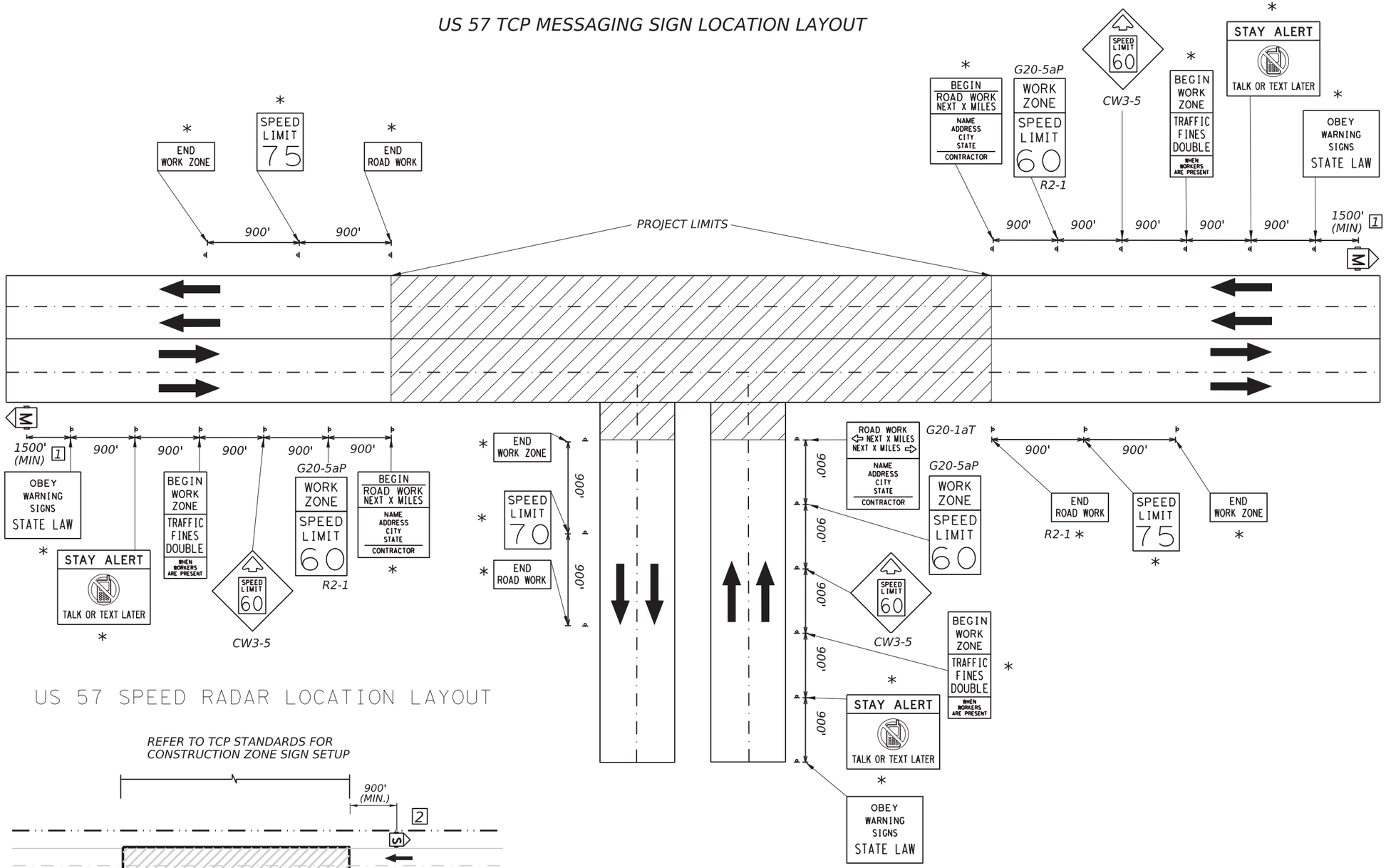
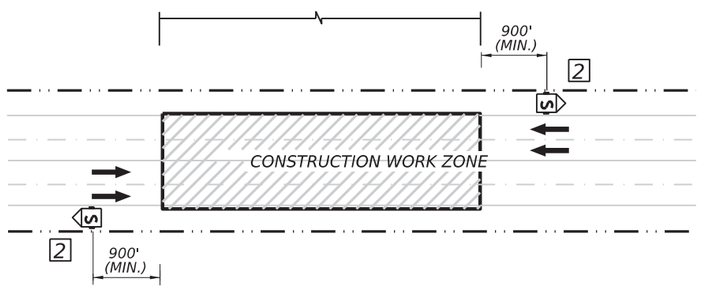
US 57 TCP MESSAGING SIGN LOCATION LAYOUT



US 57 SPEED RADAR LOCATION LAYOUT

REFER TO TCP STANDARDS FOR CONSTRUCTION ZONE SIGN SETUP



LEGEND	
	WORK AREA
M	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
	TRAFFIC FLOW

NOTES

1. DISTANCE BETWEEN SIGNS SHOULD BE INCREASED AS REQUIRED TO HAVE 1500 FT OR MORE ADVANCE WARNING
2. DRIVER FEEDBACK SPEED SIGN TO BE PLACED MIN. 900FT BEFORE FIRST SIGN OF APPLICABLE TCP STANDARD FOR THE CONSTRUCTION WORK ZONE OR AS DIRECTED BY THE ENGINEER.

* REFER TO BC(2)-21 FOR MORE INFORMATION

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TCP MESSAGING SIGN LOCATION LAYOUT

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		25

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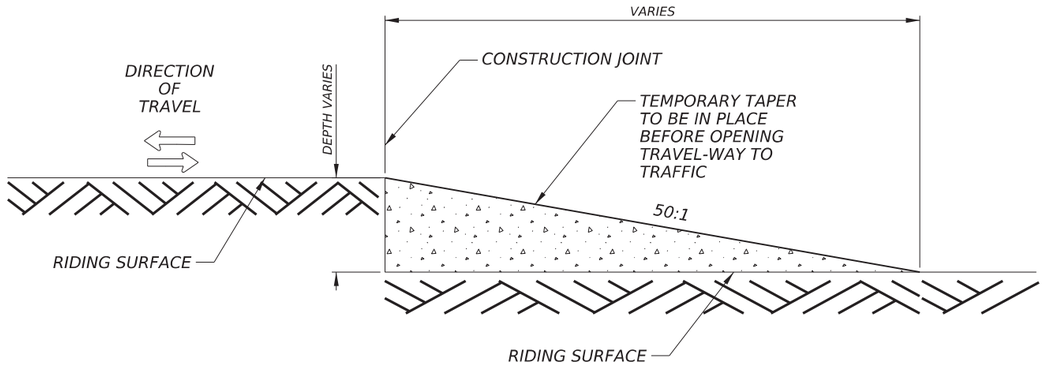
CK
DW
CK
DW

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.



CONSTRUCTION JOINT TAPER - END OF WORK DAY
(PROFILE)

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TCP
CONSTRUCTION JOINT
DETAIL

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		26

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.

11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.

12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.

2. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.

2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13	0022	09	055, etc.	US 90, etc.
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21	22	VAL VERDE, etc.		27

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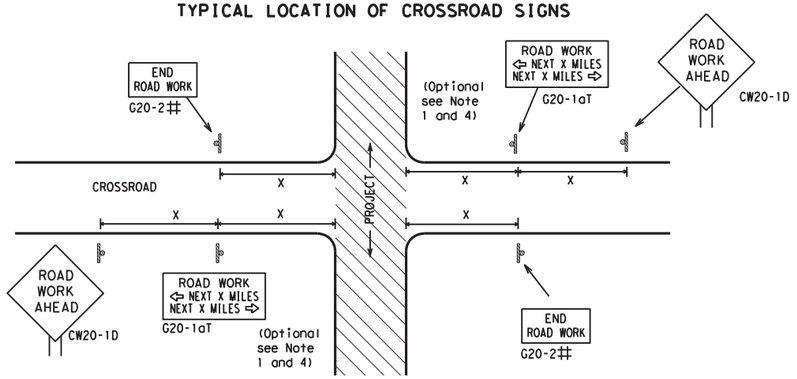
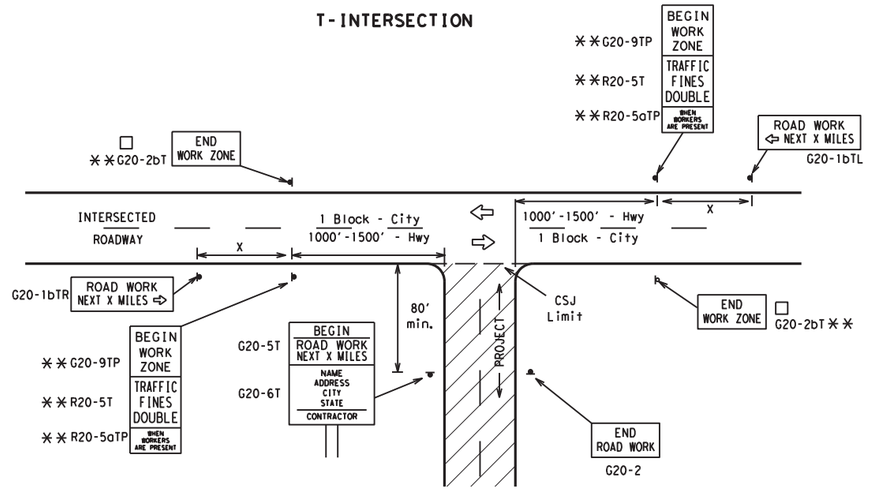
TYPICAL LOCATION OF CROSSROAD SIGNS



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.

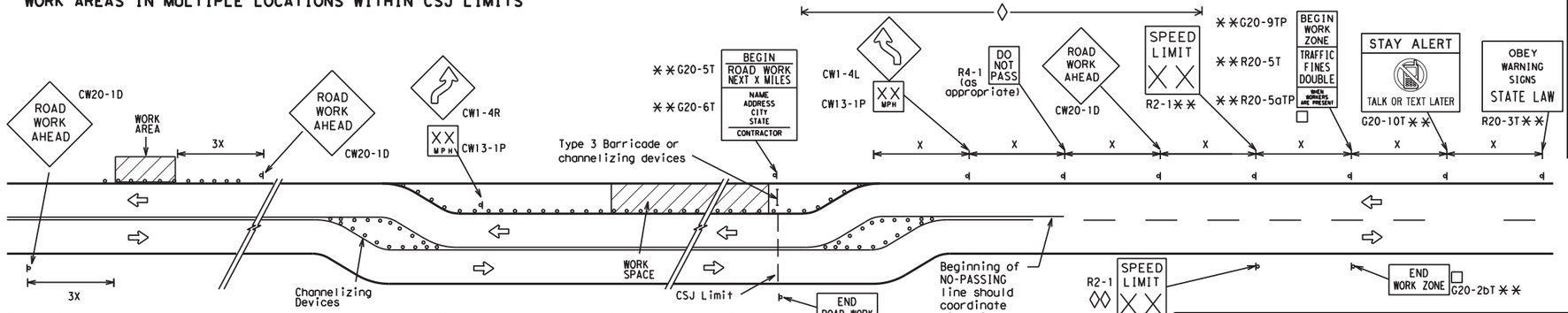
△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

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.

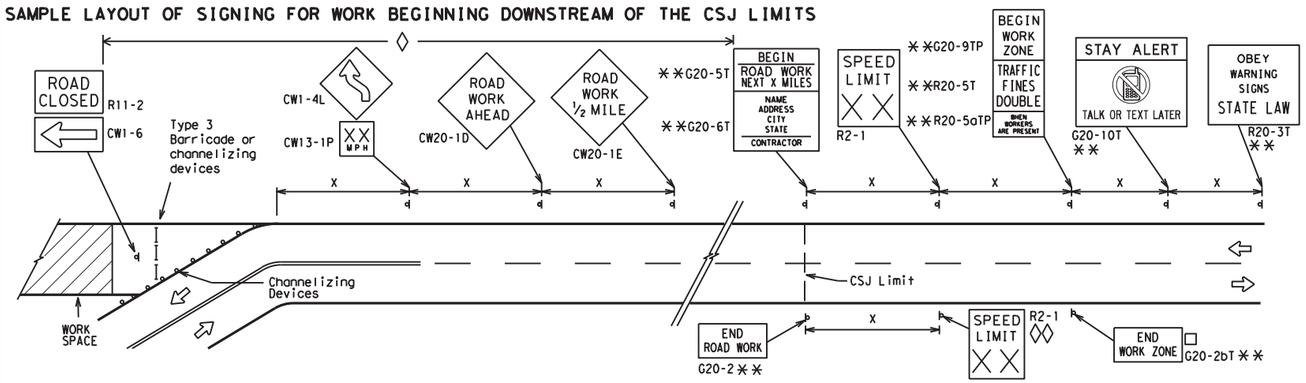
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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

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



NOTES

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

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

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

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

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

LEGEND

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	22	VAL VERDE, etc.		28

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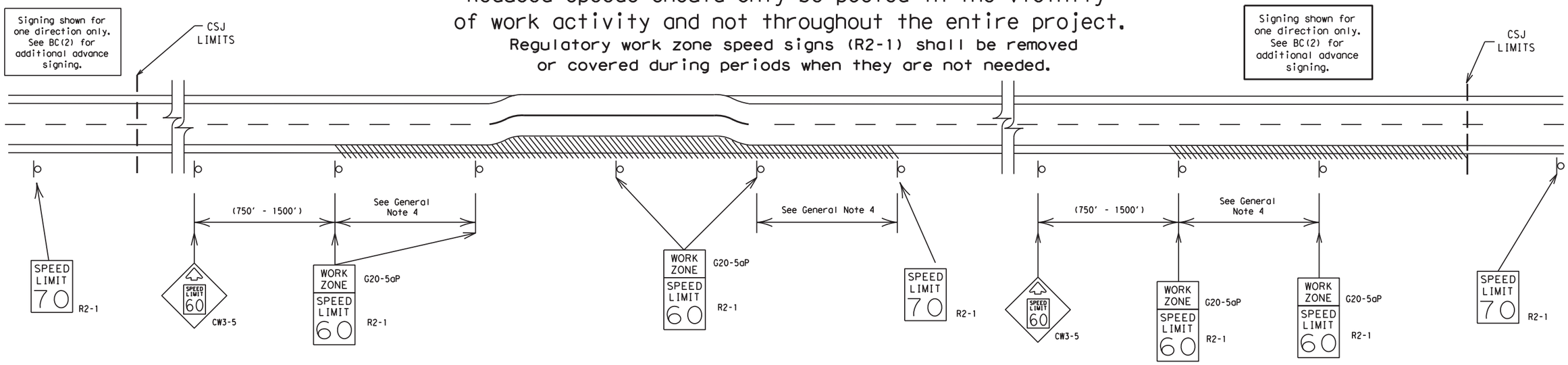
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13 5-21	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		29

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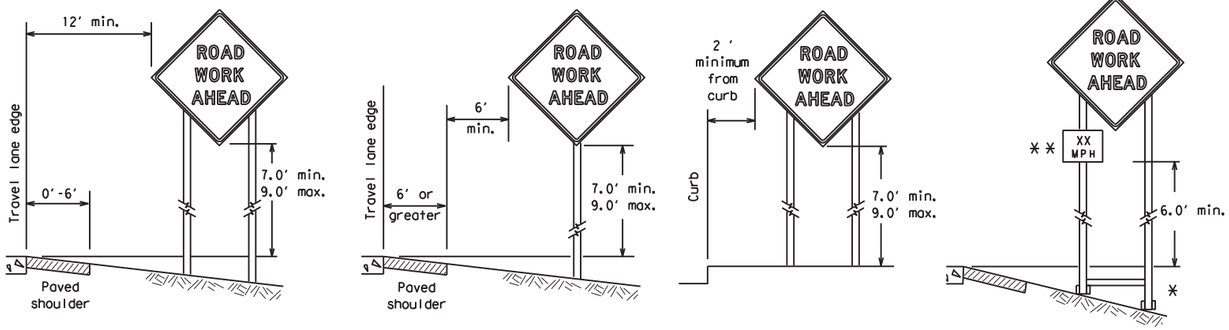
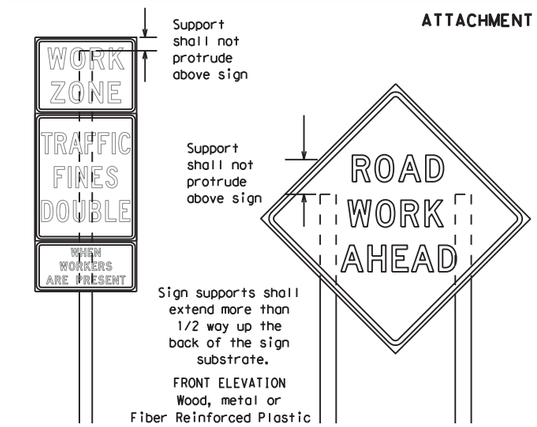
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

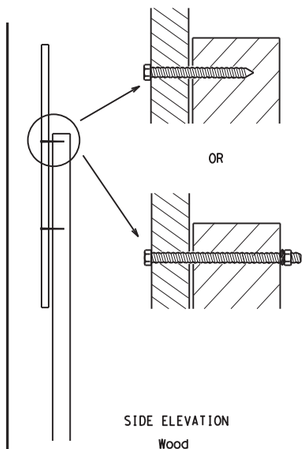


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





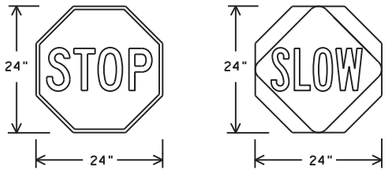
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	22	VAL VERDE, etc.		30

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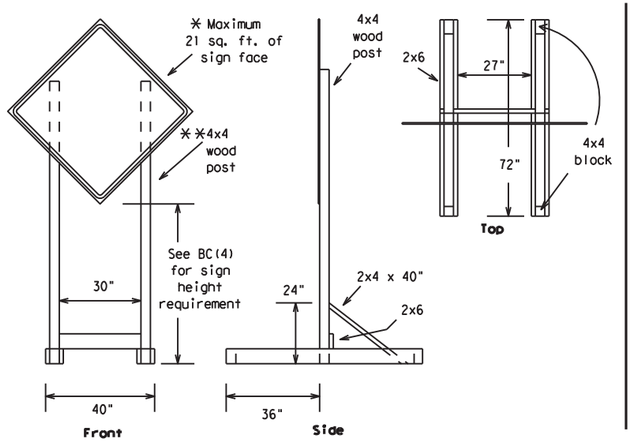
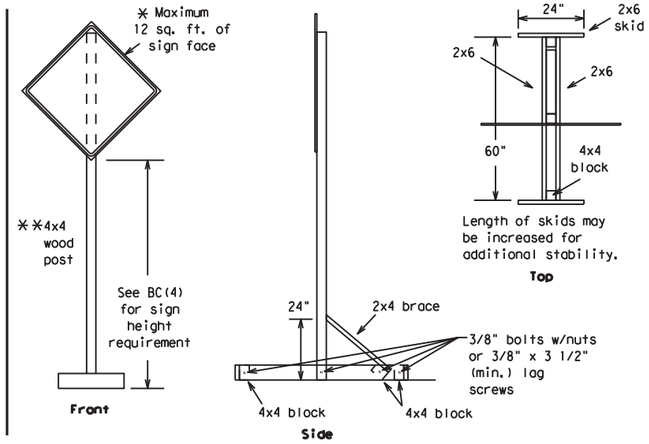
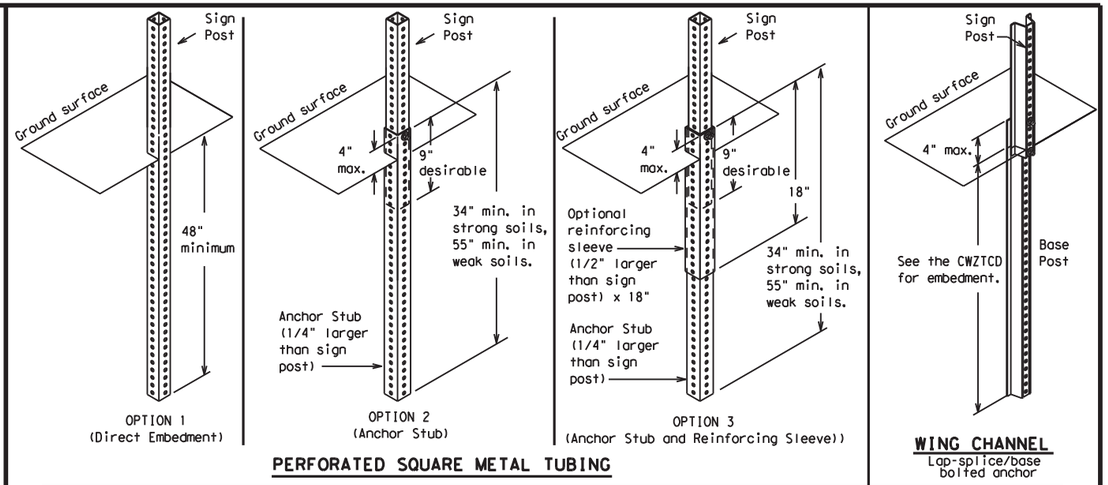




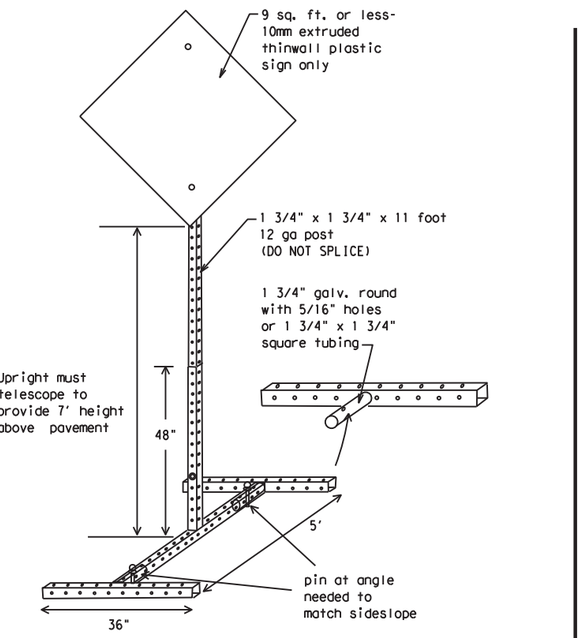
SKID MOUNTED WOOD SIGN SUPPORTS

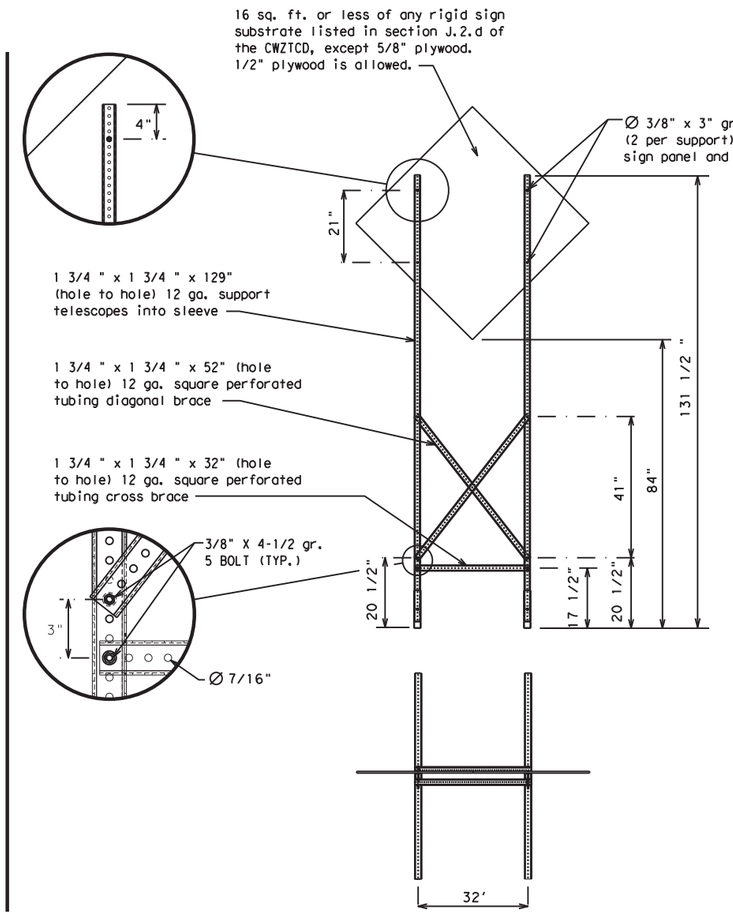
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

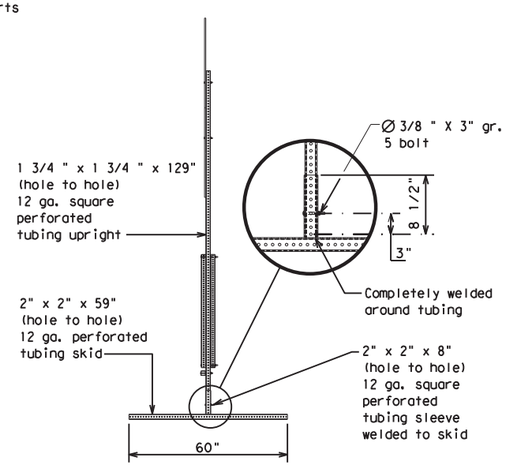


GROUND MOUNTED SIGN SUPPORTS

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

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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

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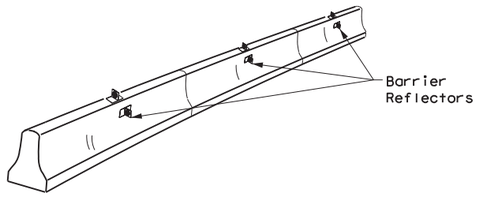
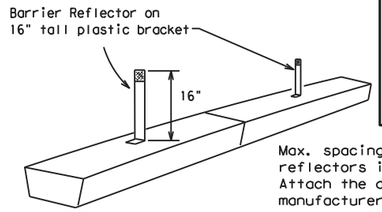
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



CONCRETE TRAFFIC BARRIER (CTB)

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

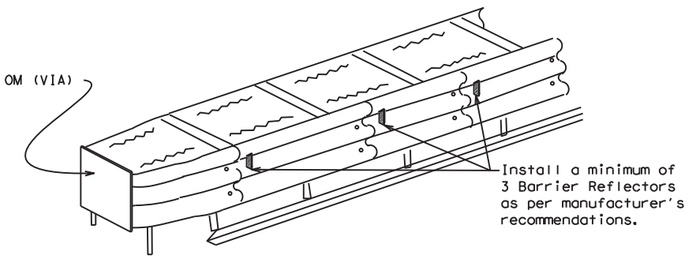


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

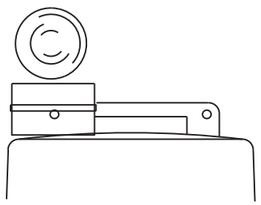


DELINEATION OF END TREATMENTS

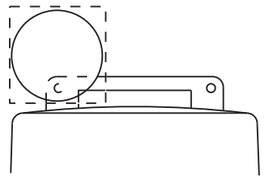
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

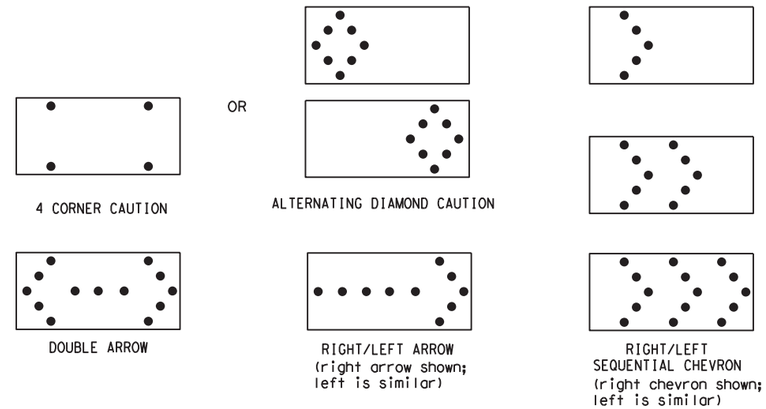
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	22	VAL VERDE, etc.		33

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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:

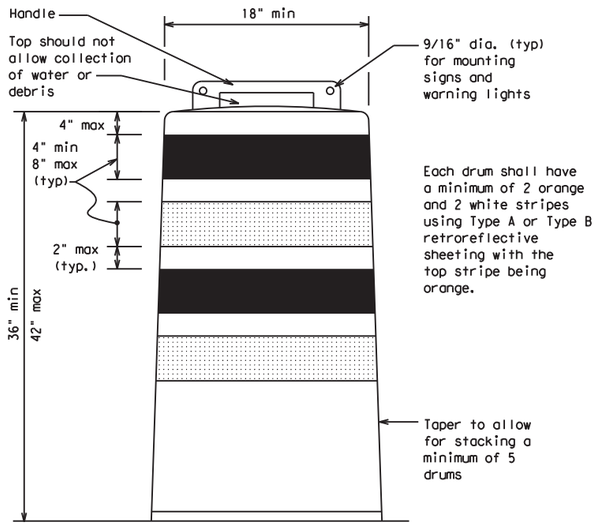
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

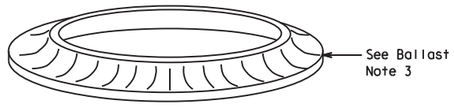
RETROREFLECTIVE SHEETING

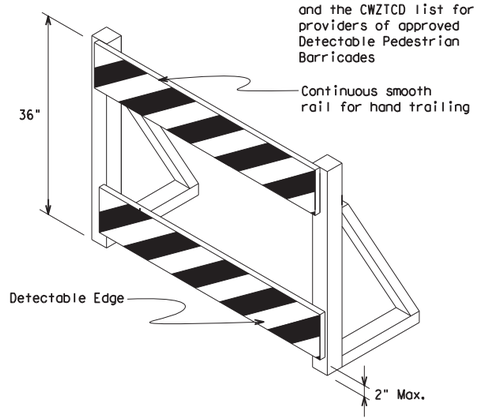
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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



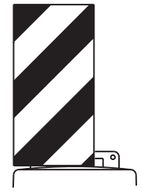




DETECTABLE PEDESTRIAN BARRICADES

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.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	22	VAL VERDE, etc.		34
7-13				

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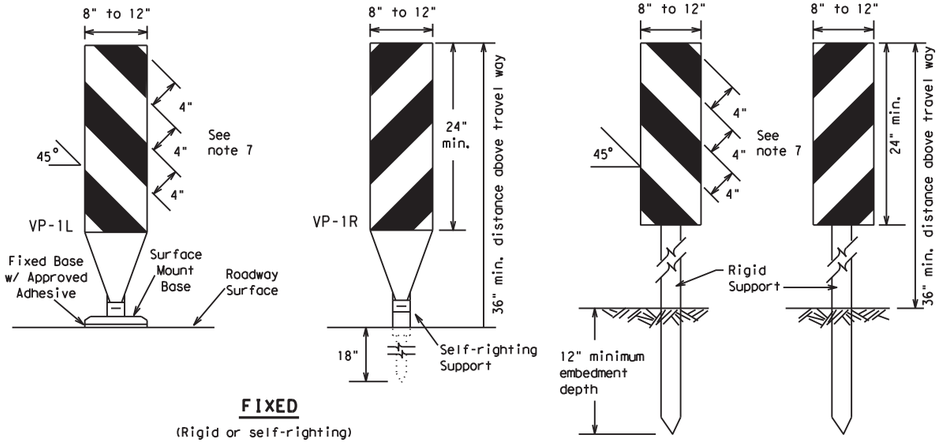
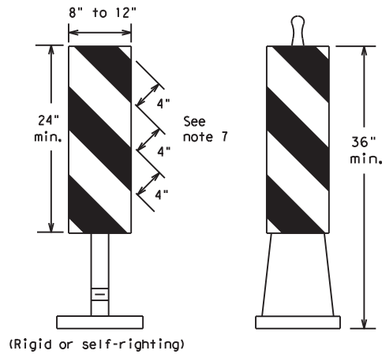


FIXED
(Rigid or self-righting)

DRIVEABLE

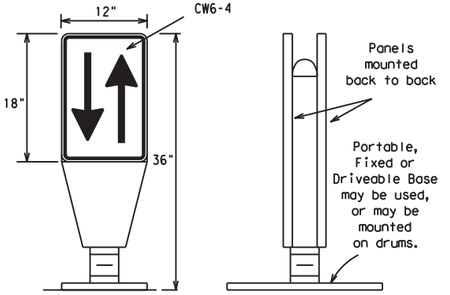


(Rigid or self-righting)

PORTABLE

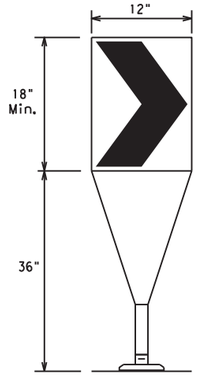
VERTICAL PANELS (VPs)

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



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



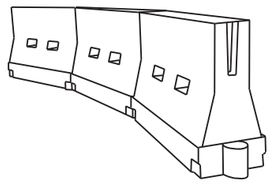
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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REVISIONS	0022	09	055, etc.	US 90, etc.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	22	VAL VERDE, etc.		35

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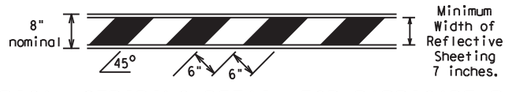
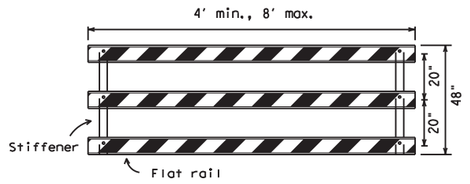
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



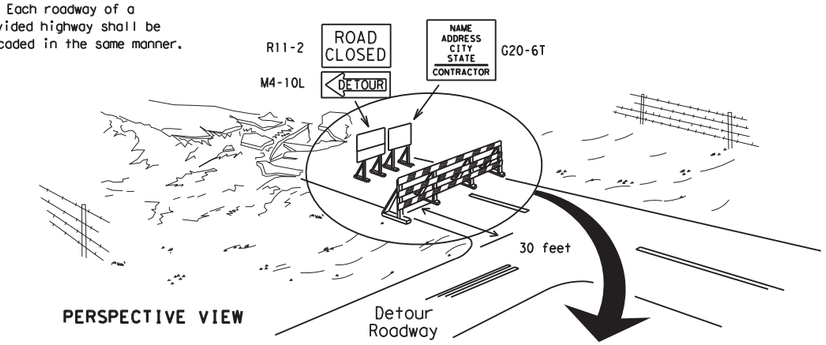
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

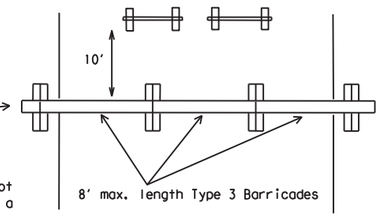
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

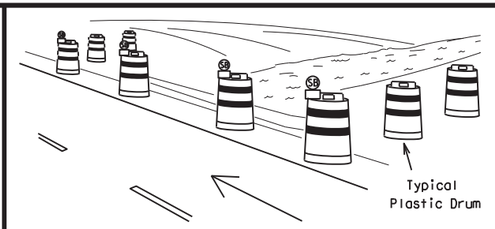
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

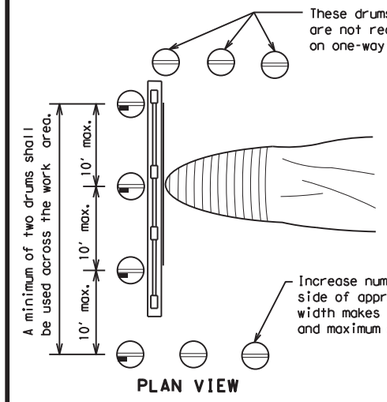
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

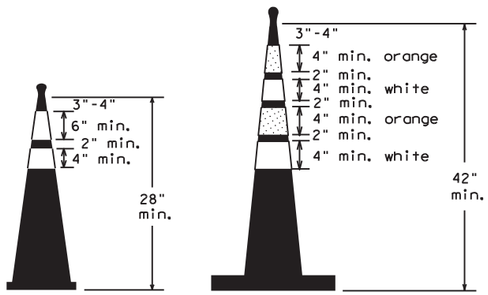
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



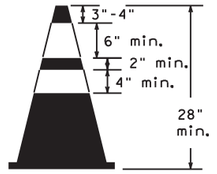
PLAN VIEW

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

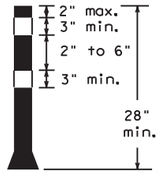
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

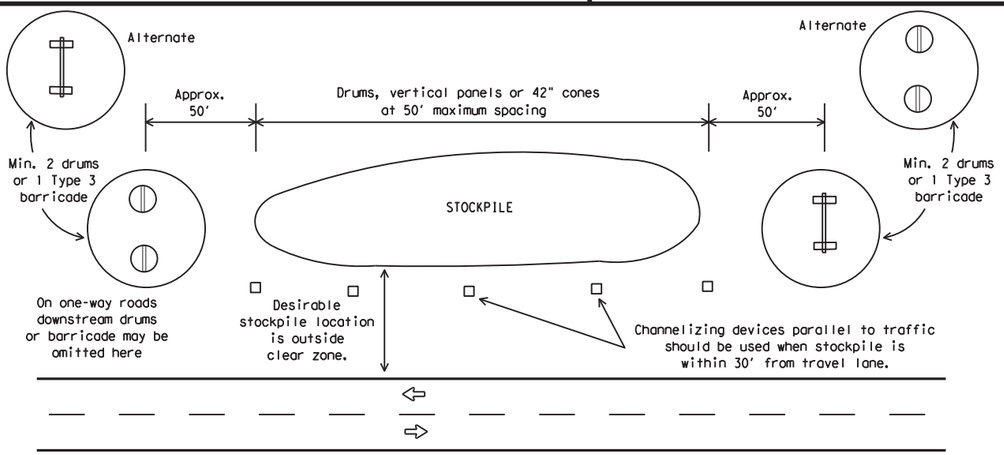


Tubular Marker

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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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REVISIONS 9-07 8-14 7-13 5-21	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		36

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

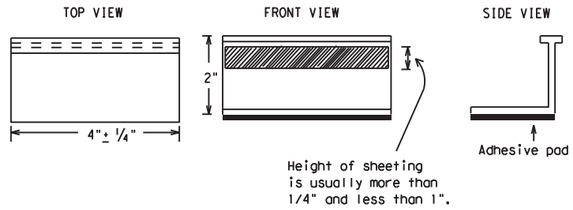
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	22	VAL VERDE, etc.		37
11-02 8-14				

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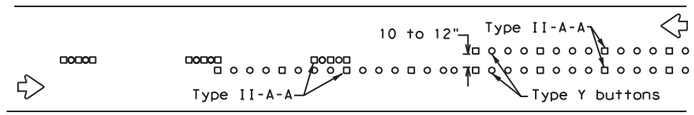
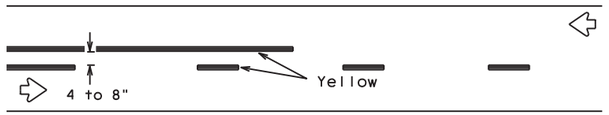
PAVEMENT MARKING PATTERNS

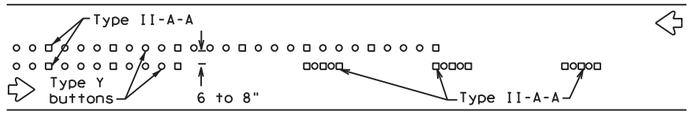
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



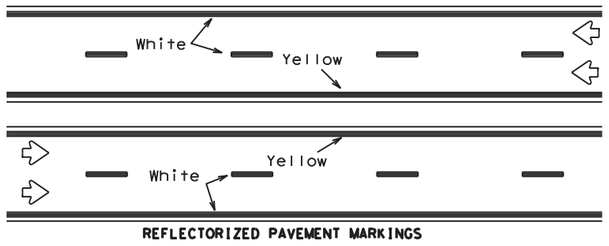
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



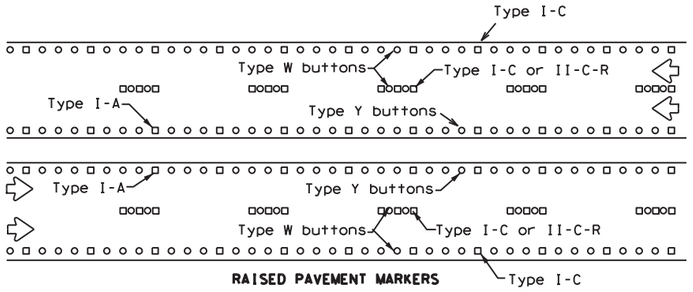
RAISED PAVEMENT MARKERS - PATTERN B

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



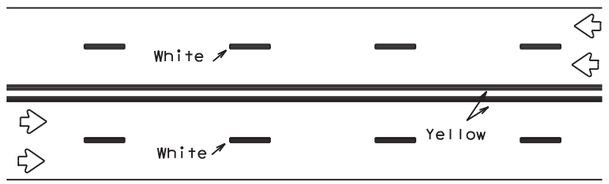
REFLECTORIZED PAVEMENT MARKINGS



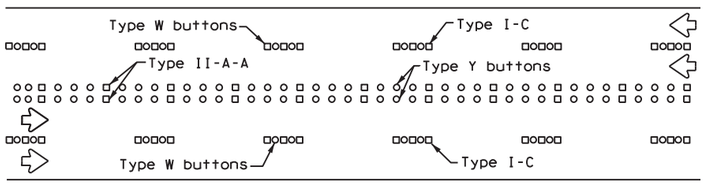
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



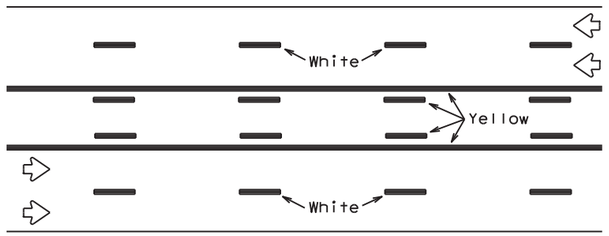
REFLECTORIZED PAVEMENT MARKINGS



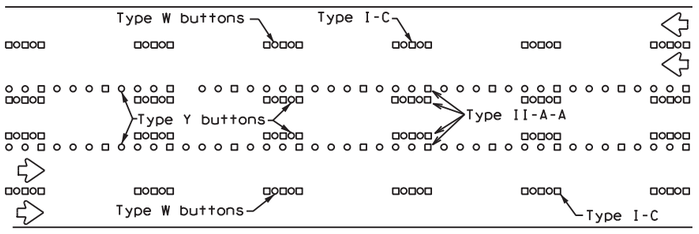
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

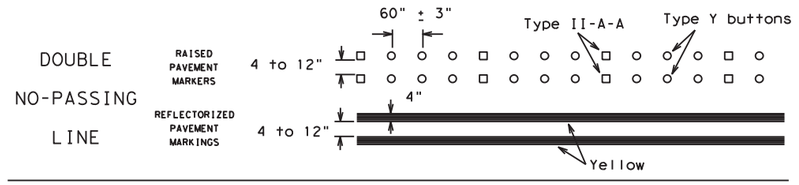
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

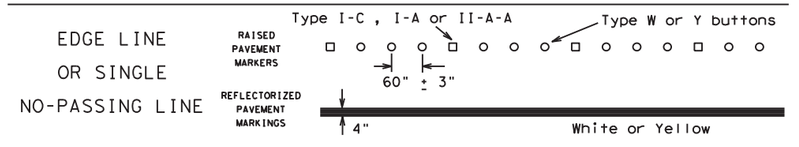
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

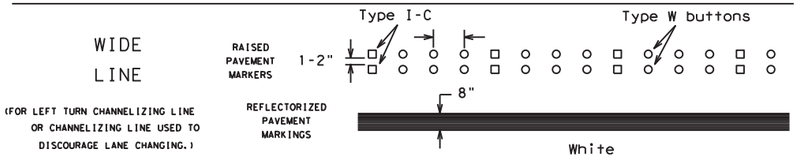


EDGE LINE OR SINGLE NO-PASSING LINE



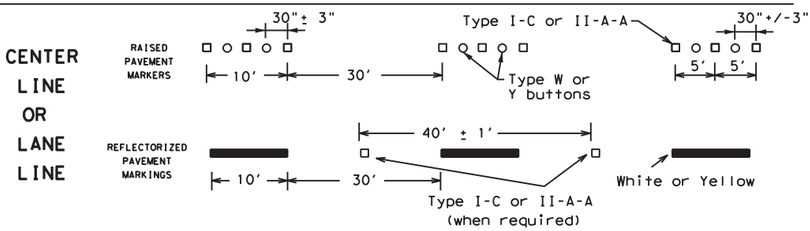
WIDE LINE

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

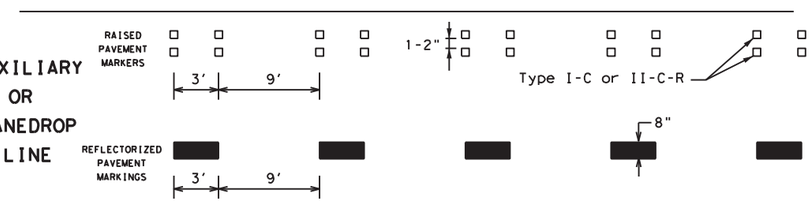


BROKEN LINES

CENTER LINE OR LANE LINE

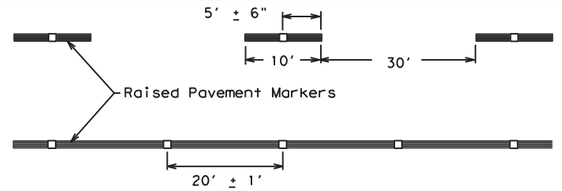


AUXILIARY OR LANEDROP LINE



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."

SHEET 12 OF 12

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	0022	09	055, etc.	US 90, etc.
1-97 9-07 5-21	DIST	COUNTY		SHEET NO.
2-98 7-13	22	VAL VERDE, etc.		38
11-02 8-14				

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DATE: 2/27/2023 6:44:55 PM
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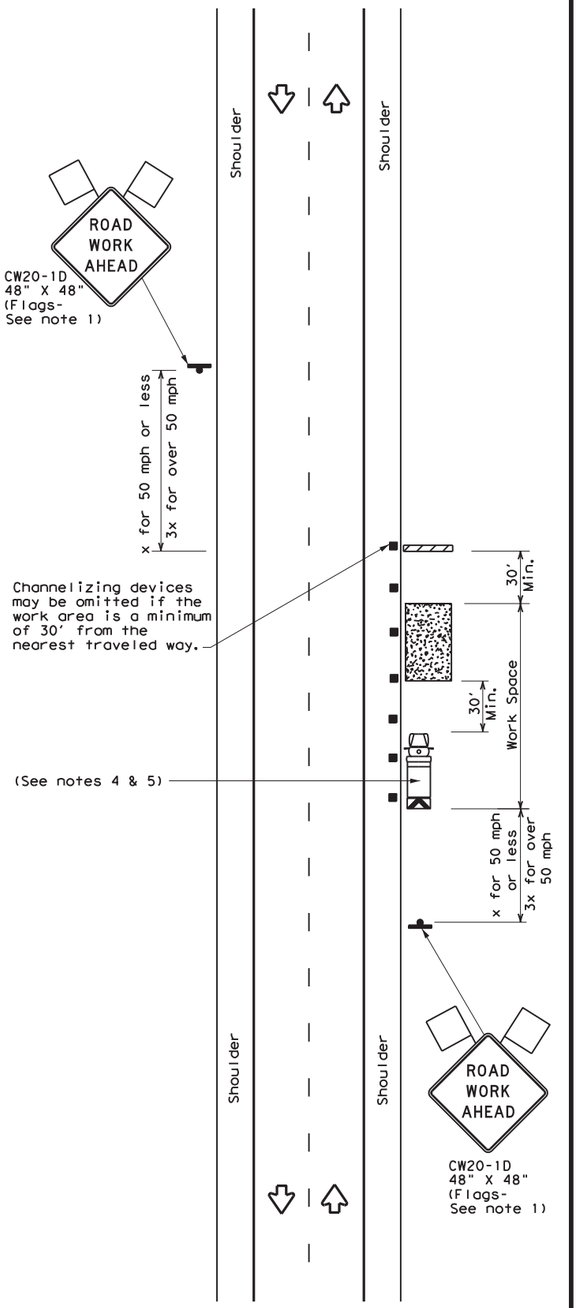
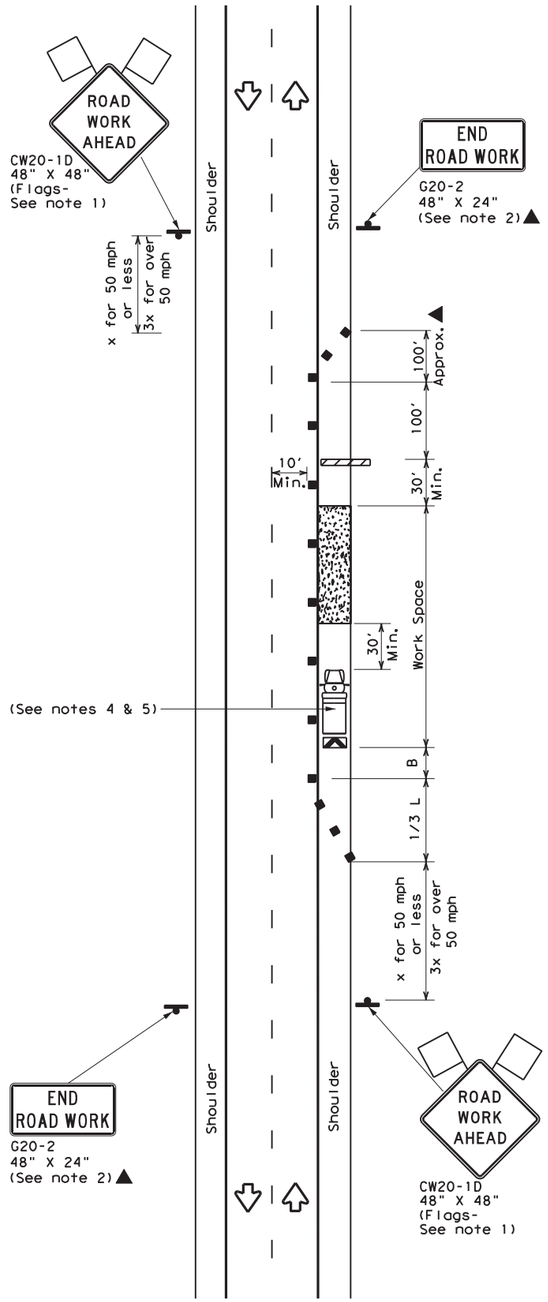


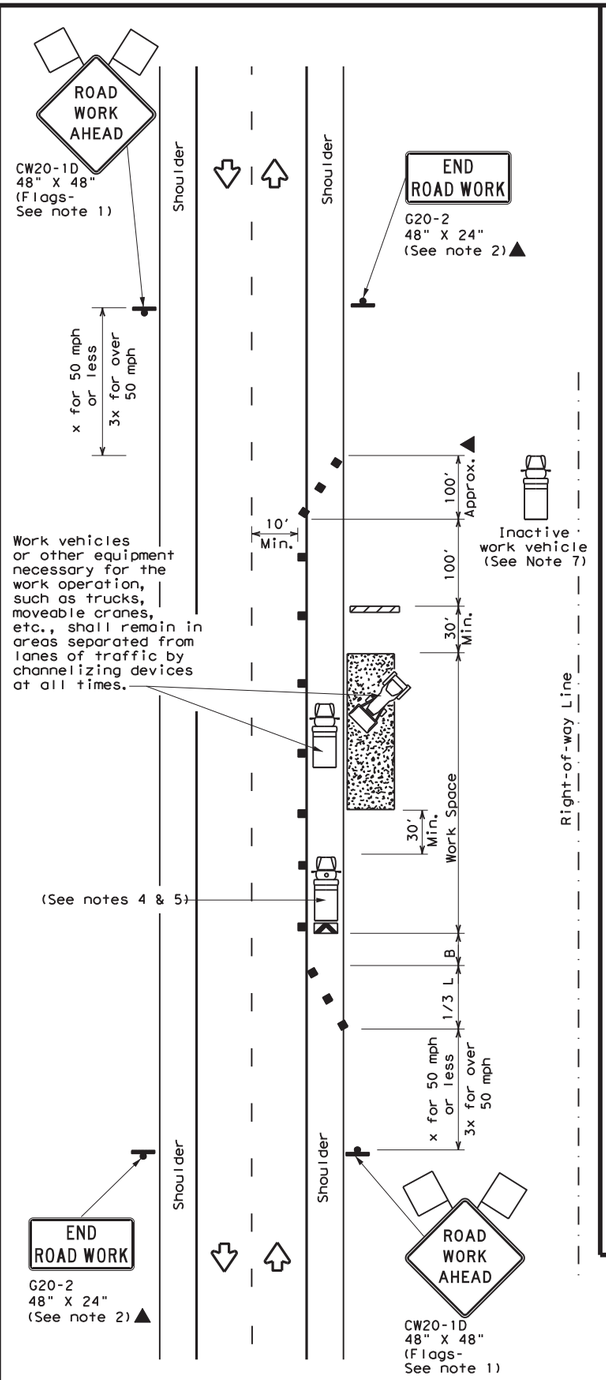
TCP (2-1a)

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
REVISIONS	0022	09	055, etc.	US 90, etc.
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	22	VAL VERDE, etc.		39
1-97 2-18				

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DATE: 2/27/2023 6:45:13 PM
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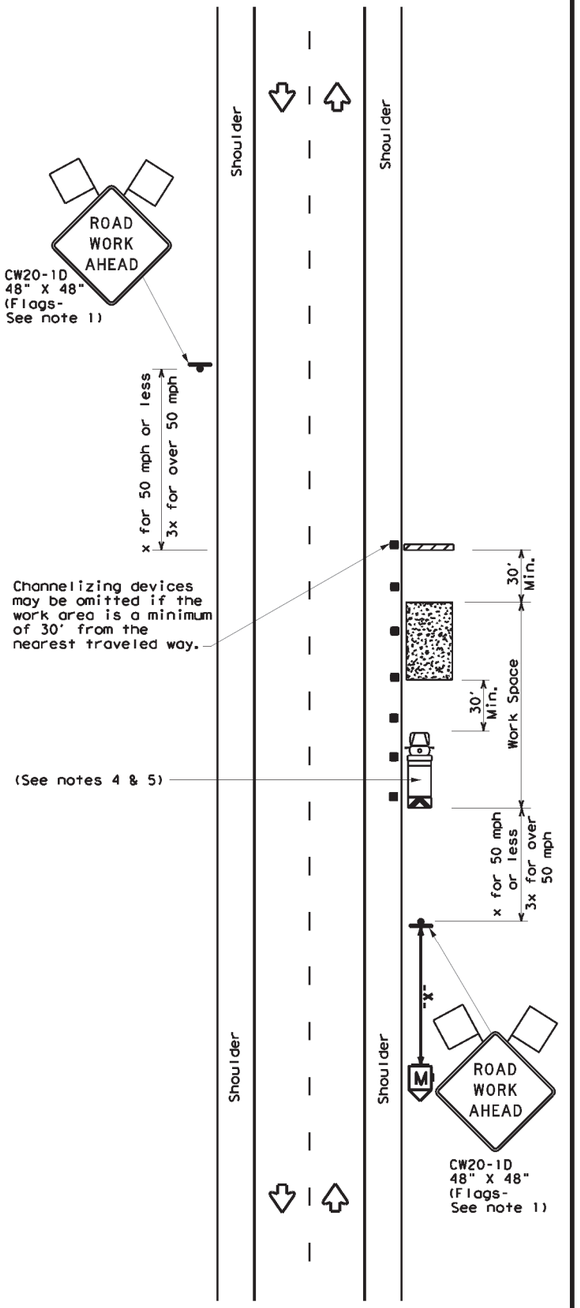
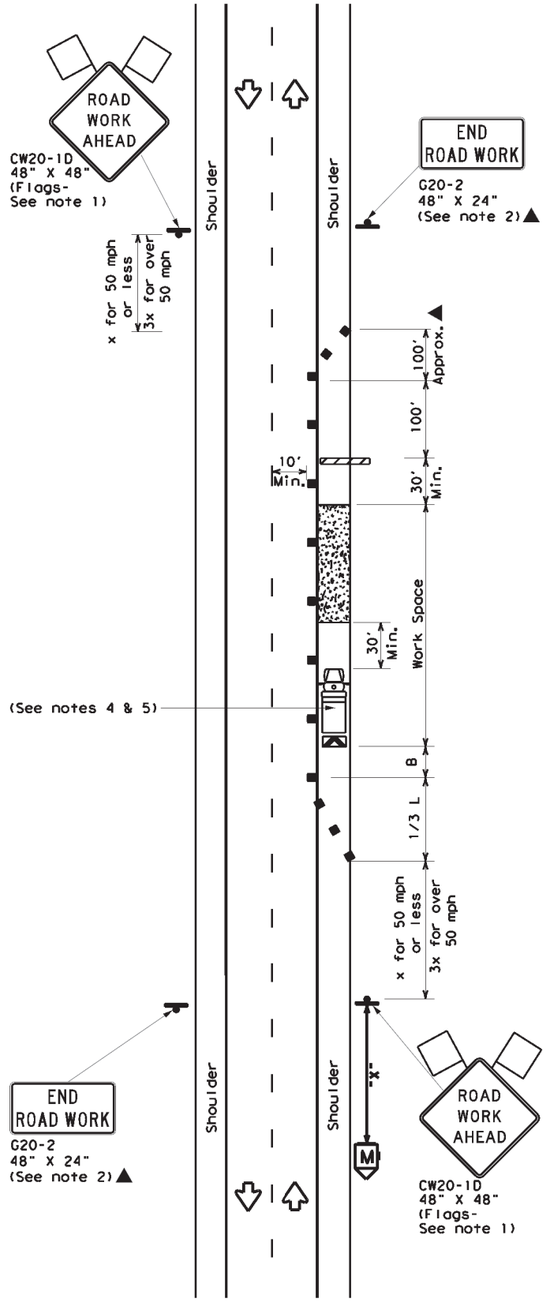


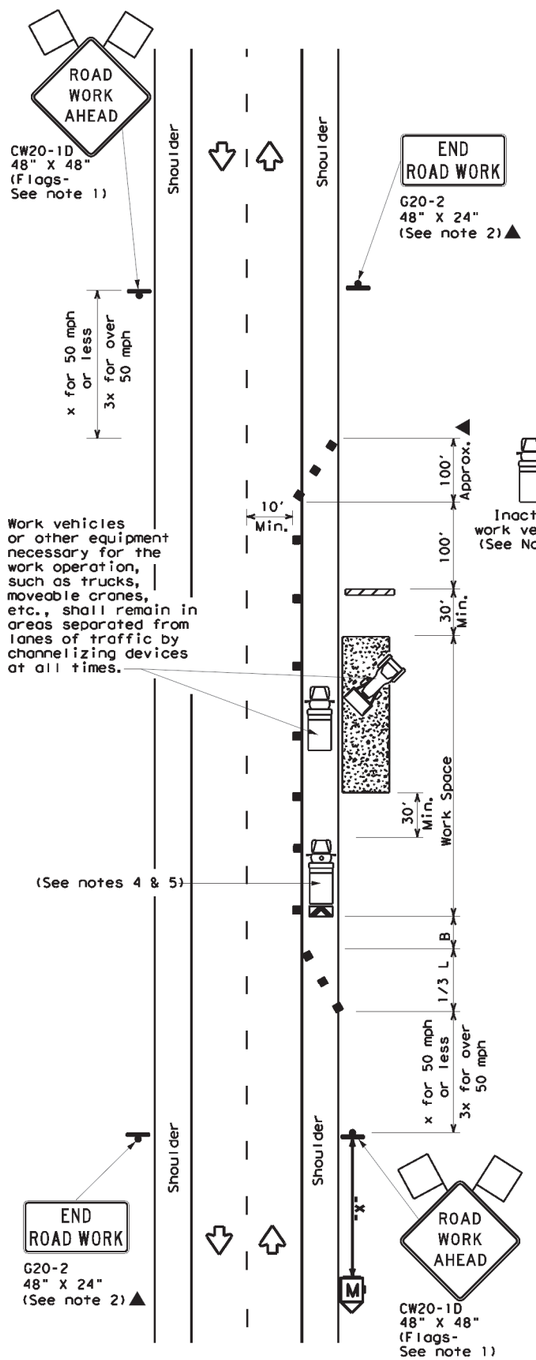
TCP (2-1a) (mod)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b) (mod)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c) (mod)

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 CW21-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

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

DocuSigned by:
98C72D65D494466...
2/27/2023

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18(mod)

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	22	VAL VERDE, etc.		40
1-97 2-18				

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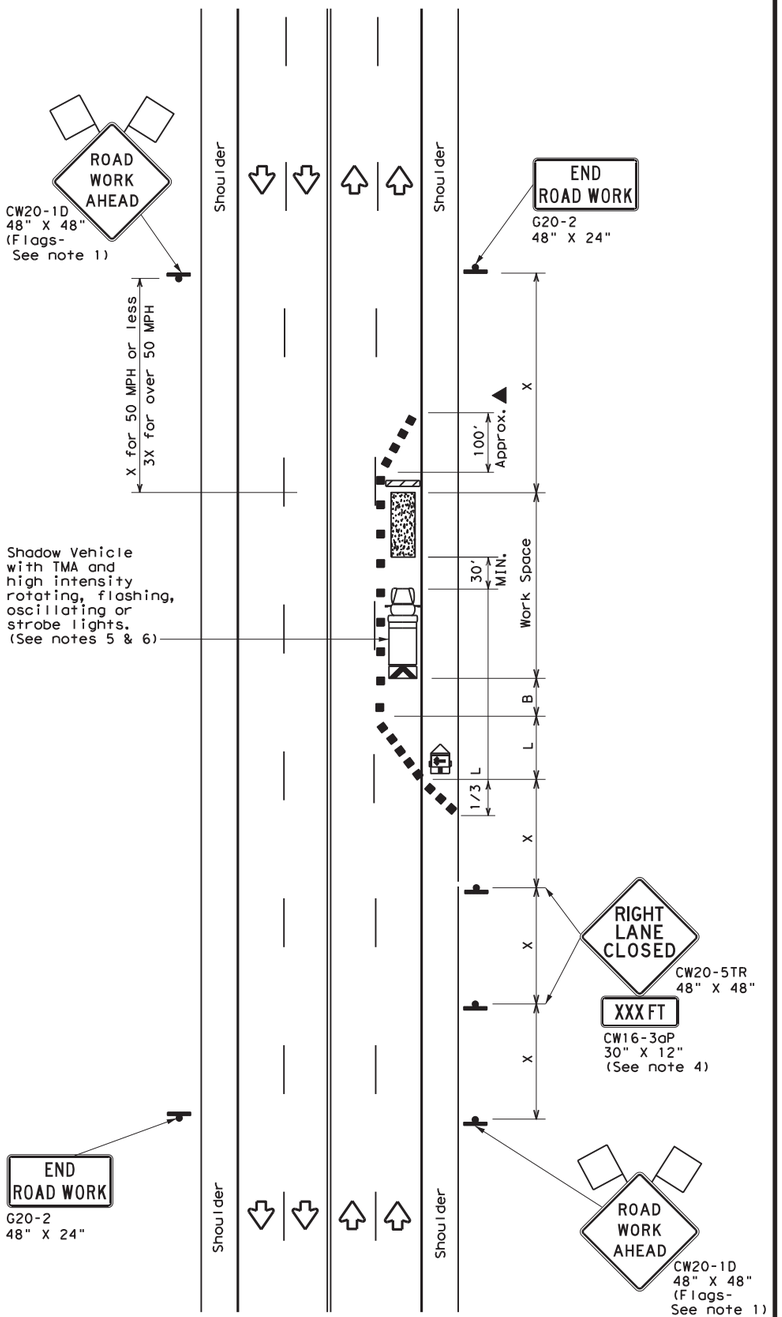
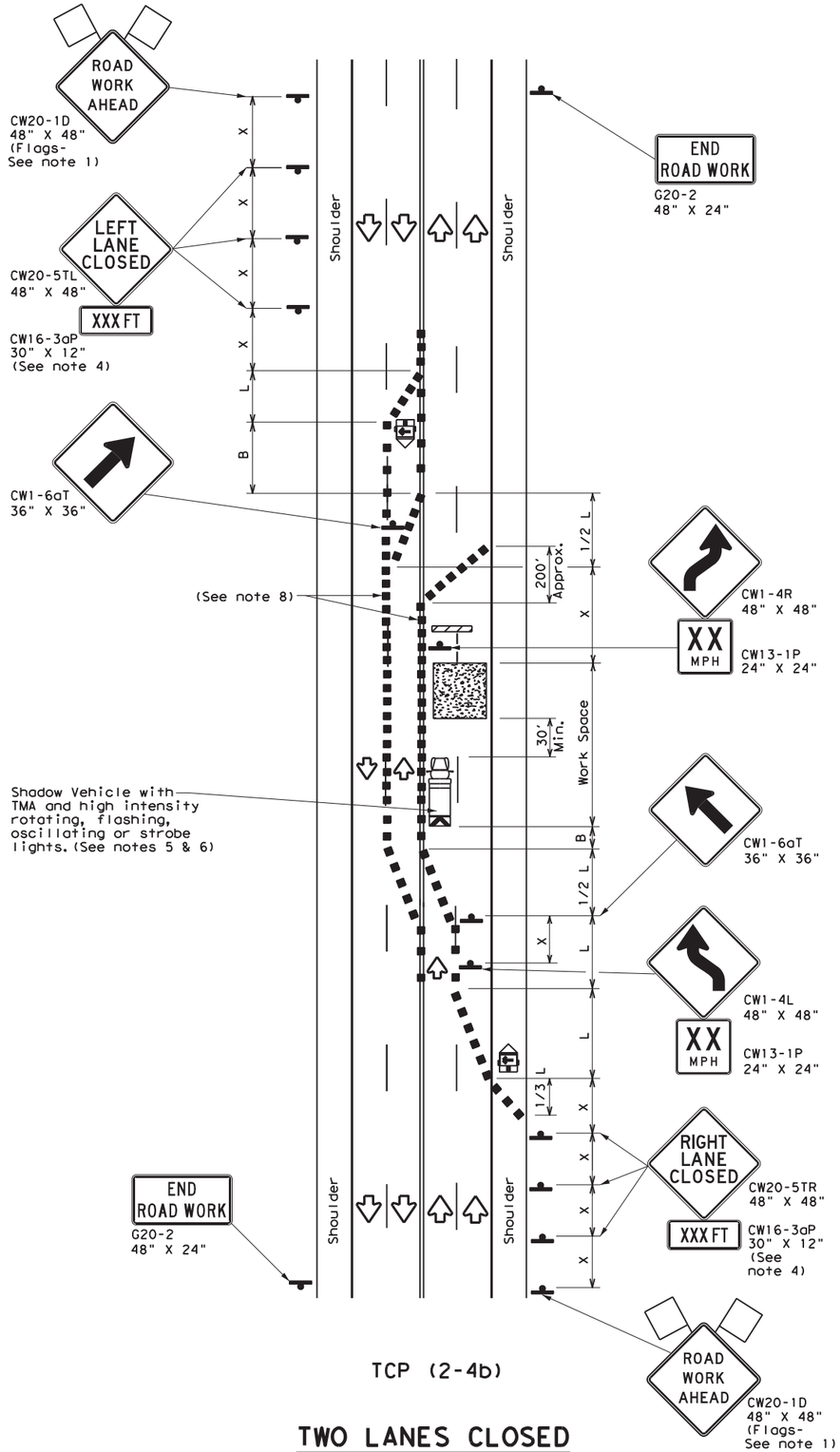


TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-4a)

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

TCP (2-4b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(2-4)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0022	09	055, etc.	US 90, etc.
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	22	VAL VERDE, etc.		41

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DATE: 2023/00224 6:45:45 PM
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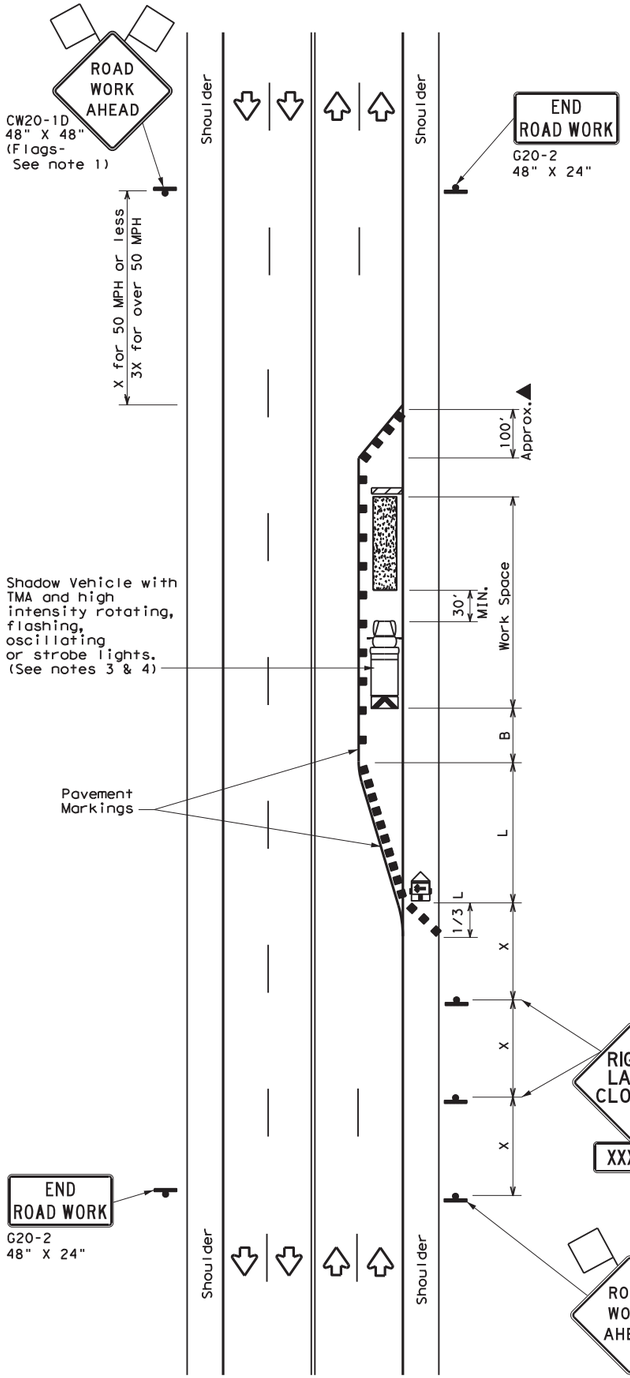
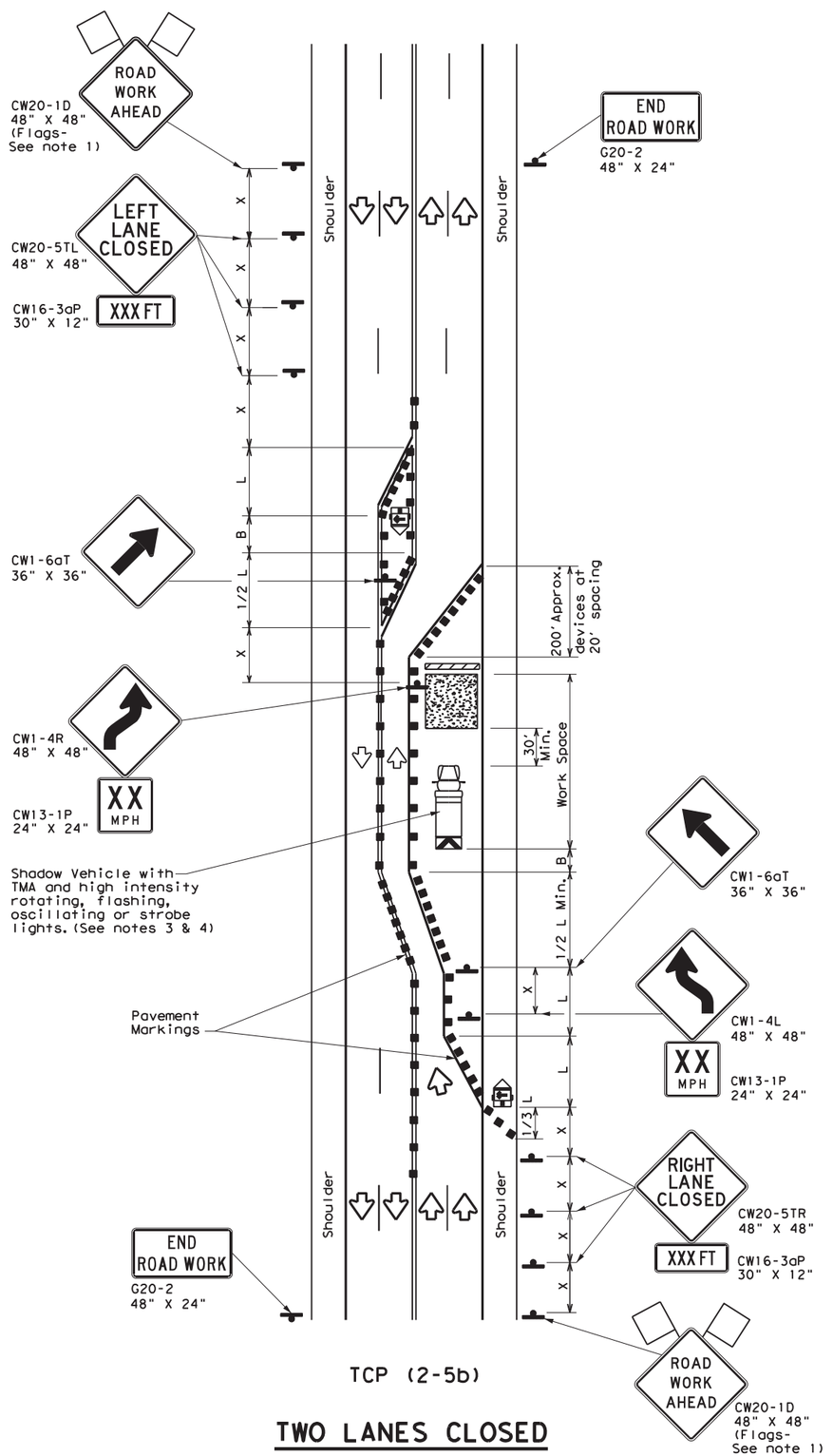


TCP (2-5a)

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

FILE: tcp2-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 2-12	0022	09	055, etc.	US 90, etc.
1-97 3-03	DIST	COUNTY		SHEET NO.
4-98 2-18	22	VAL VERDE, etc.		42

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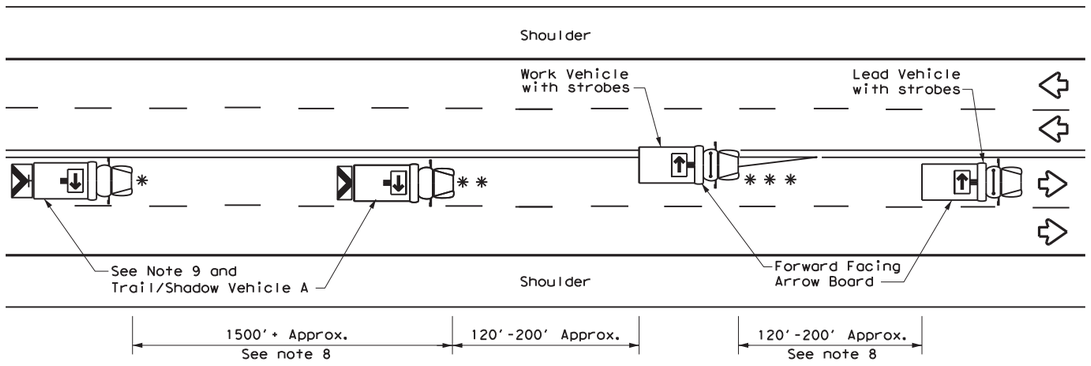
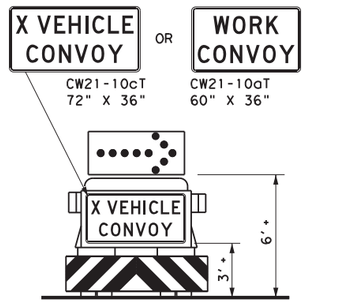


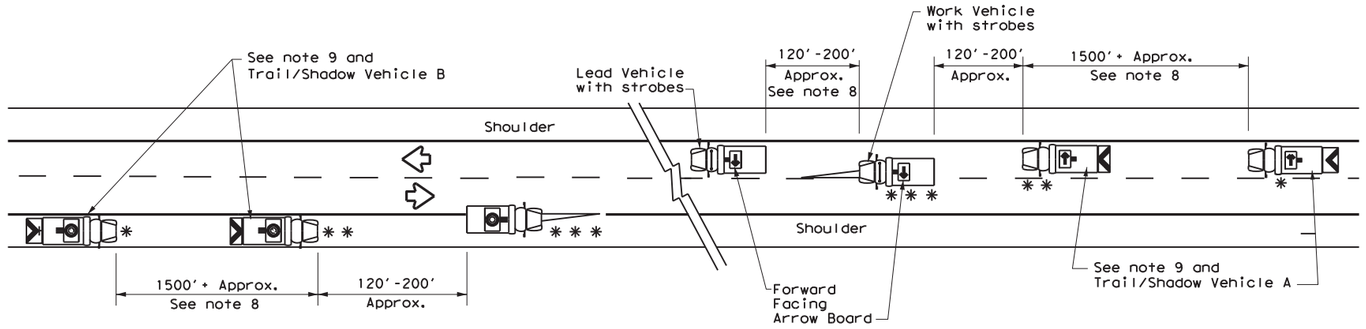
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

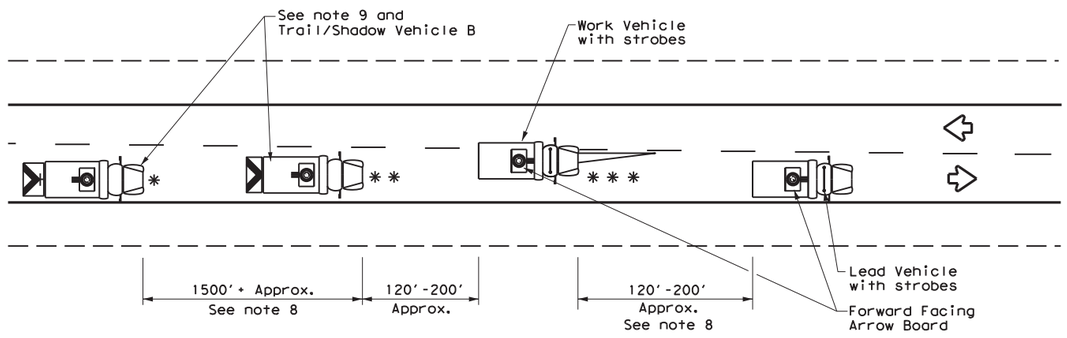


WORK ON SHOULDER

WORK ON TRAVEL LANE

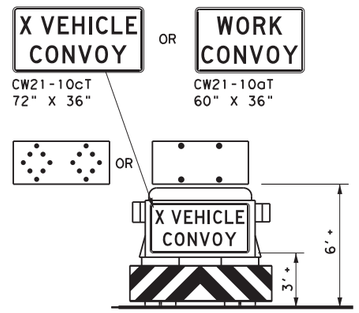
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

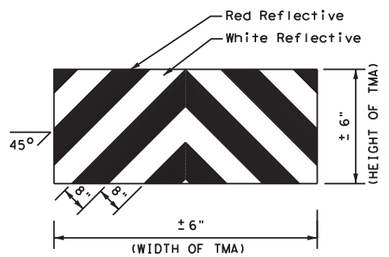
with Flashing Arrow Board in CAUTION display

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
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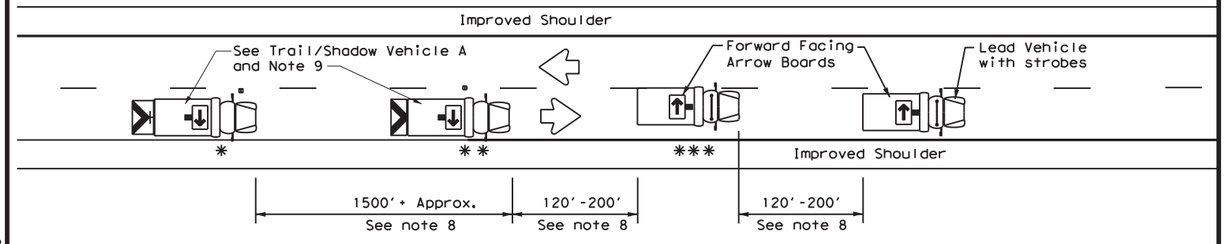
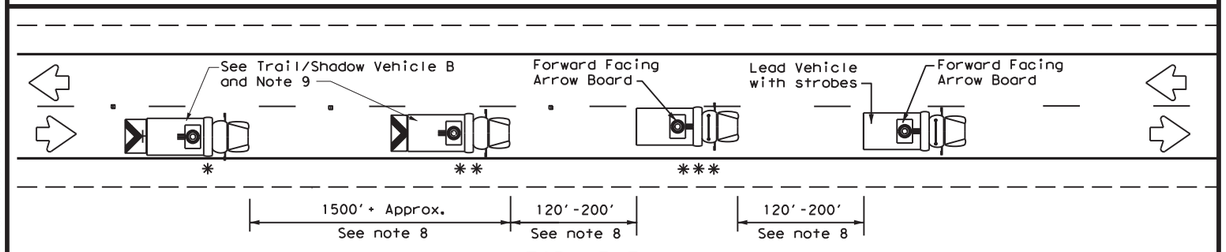


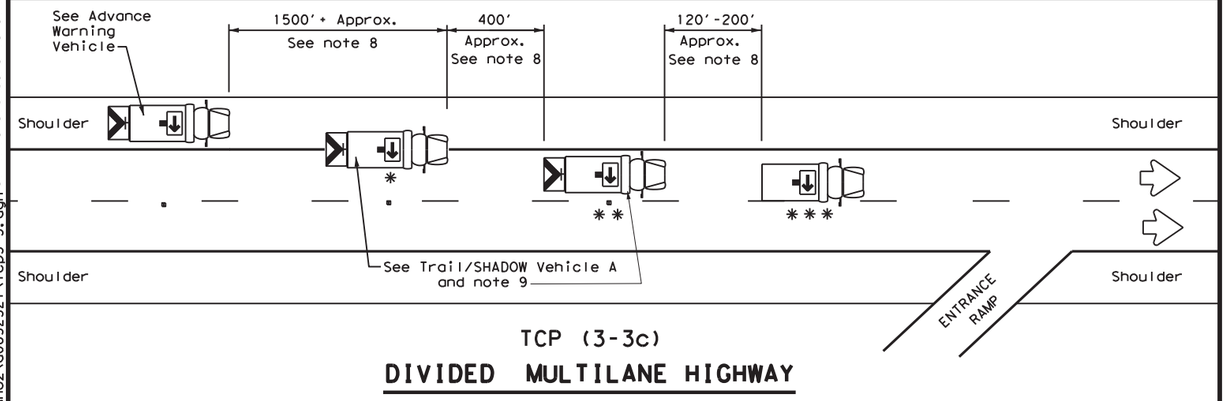
TCP (3-3a)

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



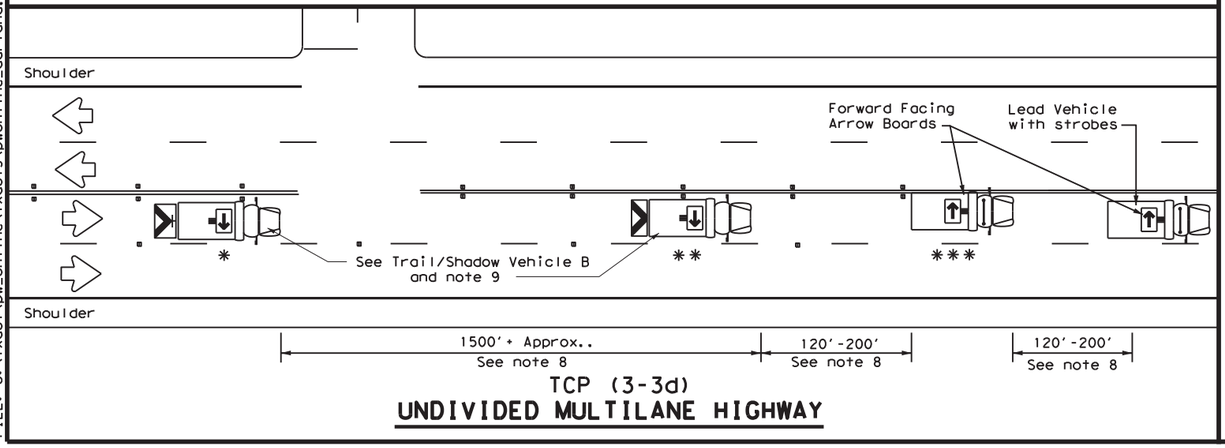
TCP (3-3b)

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



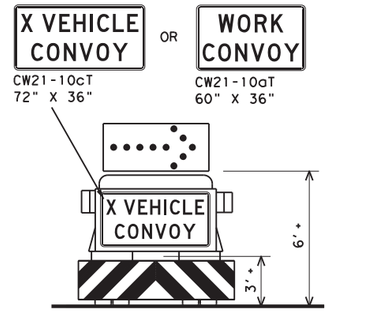
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



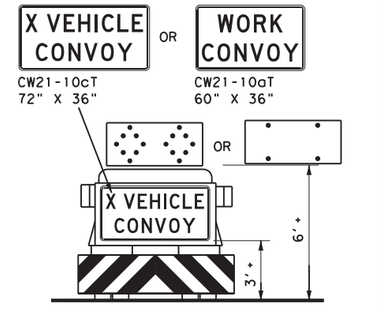
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



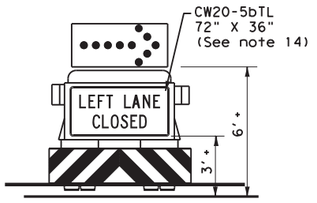
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

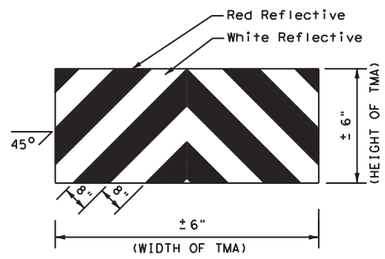


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

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

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8-95 7-13	22	VAL VERDE, etc.		44
1-97 7-14				

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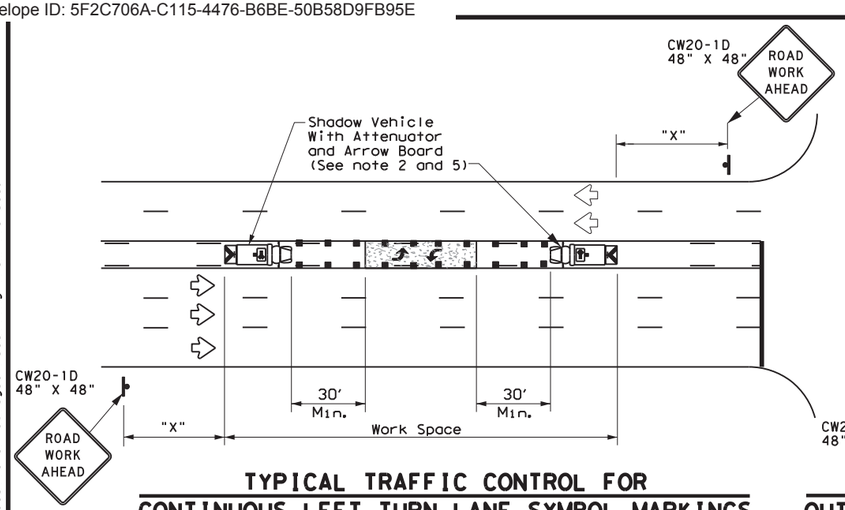
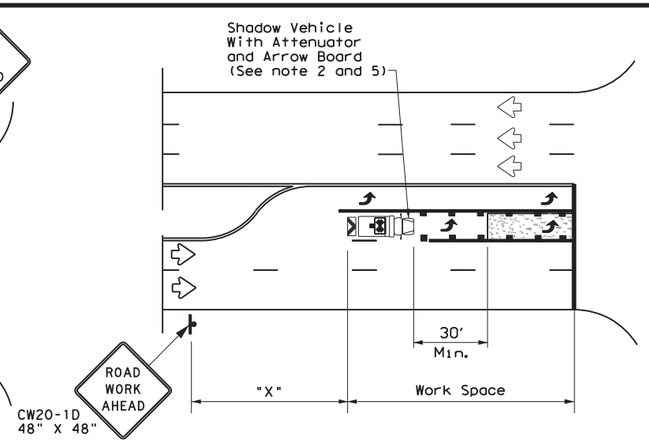
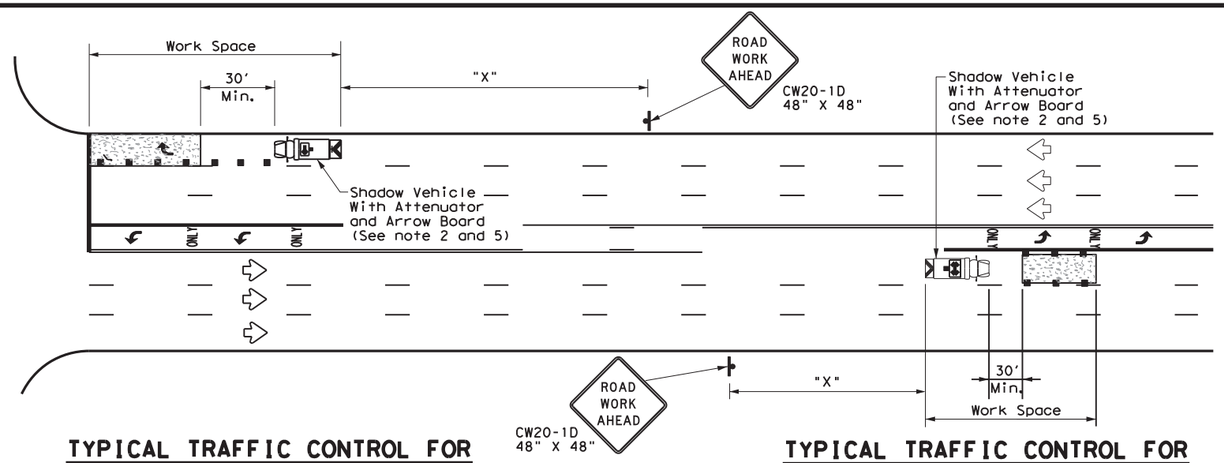


TYPICAL TRAFFIC CONTROL FOR
CONTINUOUS LEFT TURN LANE SYMBOL MARKINGS

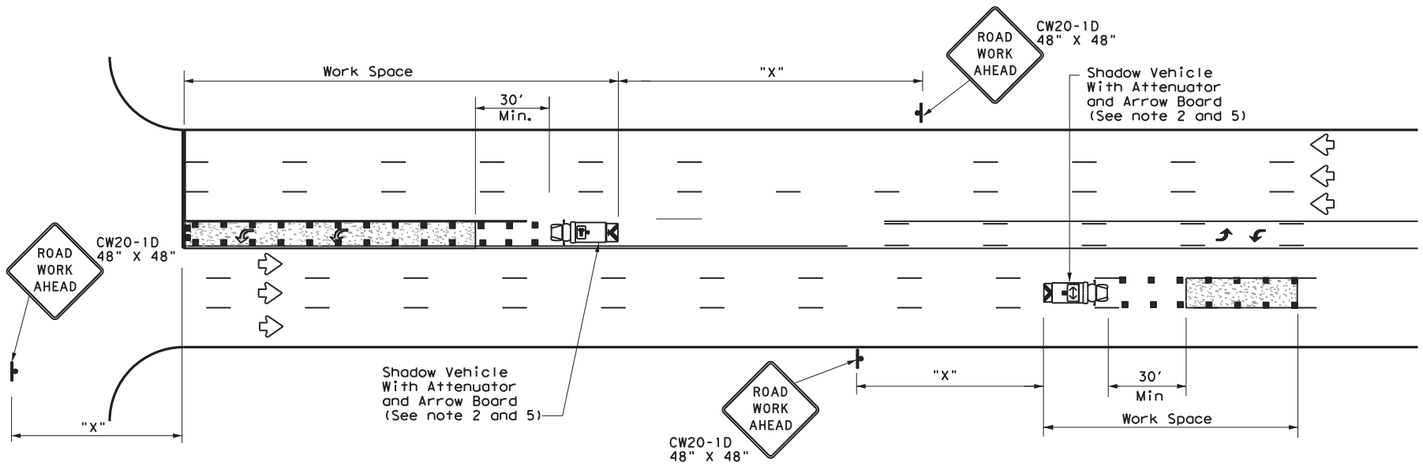


TYPICAL TRAFFIC CONTROL FOR
OUTSIDE DUAL LEFT TURN LANE SYMBOL MARKINGS



TYPICAL TRAFFIC CONTROL FOR
OUTSIDE LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
INSIDE LANE MARKINGS



TYPICAL TRAFFIC CONTROL FOR
LEFT TURN LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
CENTER LANE MARKINGS

LEGEND

*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		Channelizing Devices

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

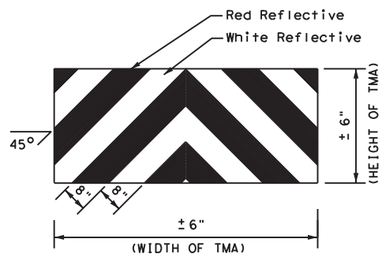
* Conventional Roads Only

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

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

GENERAL NOTES

1. This traffic control plan is for use on conventional roads posted at 45 mph or less and is intended for mobile operations that move continuously or intermittently (stopping up to approximately 15 minutes) such as short-line striping and in-lane rumble strips. When activities are anticipated to take longer amounts of time or traffic conditions warrant, a short duration or short-term stationary traffic control plan should be used.
2. A Truck Mounted Attenuator shall be used on Shadow Vehicle. Striping on the back panel of all truck mounted attenuators shall be 8" red and white reflective sheeting placed in an inverted "V" design. Reflective sheeting shall meet or exceed the reflectivity and color requirements of departmental material specification DMS-8300, Type A.
3. All traffic control devices shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), latest edition.
4. The use of yellow rotating beacons or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the drivers side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
5. Flashing arrow board shall be used on Shadow Vehicle. Flashing arrow board shall be Type B or Type C as per BC Standards. The arrow board operation shall be controlled from inside the truck.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS FOR ISOLATED WORK AREAS UNDIVIDED HIGHWAYS

TCP(3-4)-13

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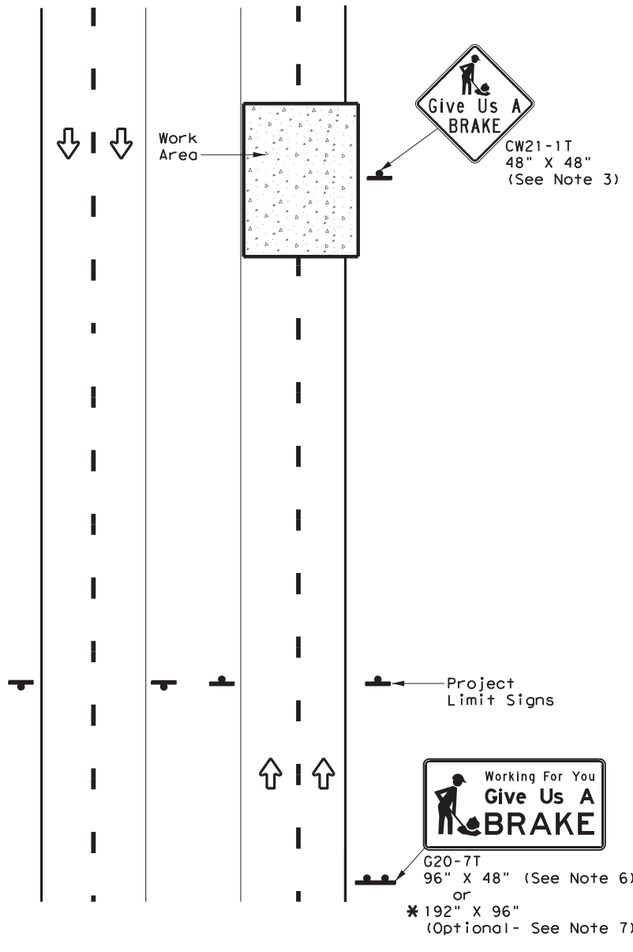
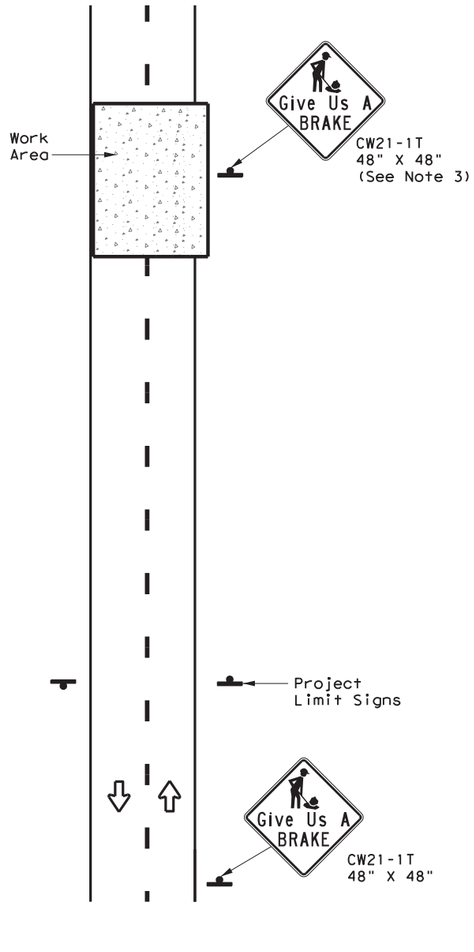


DIVIDED HIGHWAY



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

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8-96 3-03	22	VAL VERDE, etc.		46

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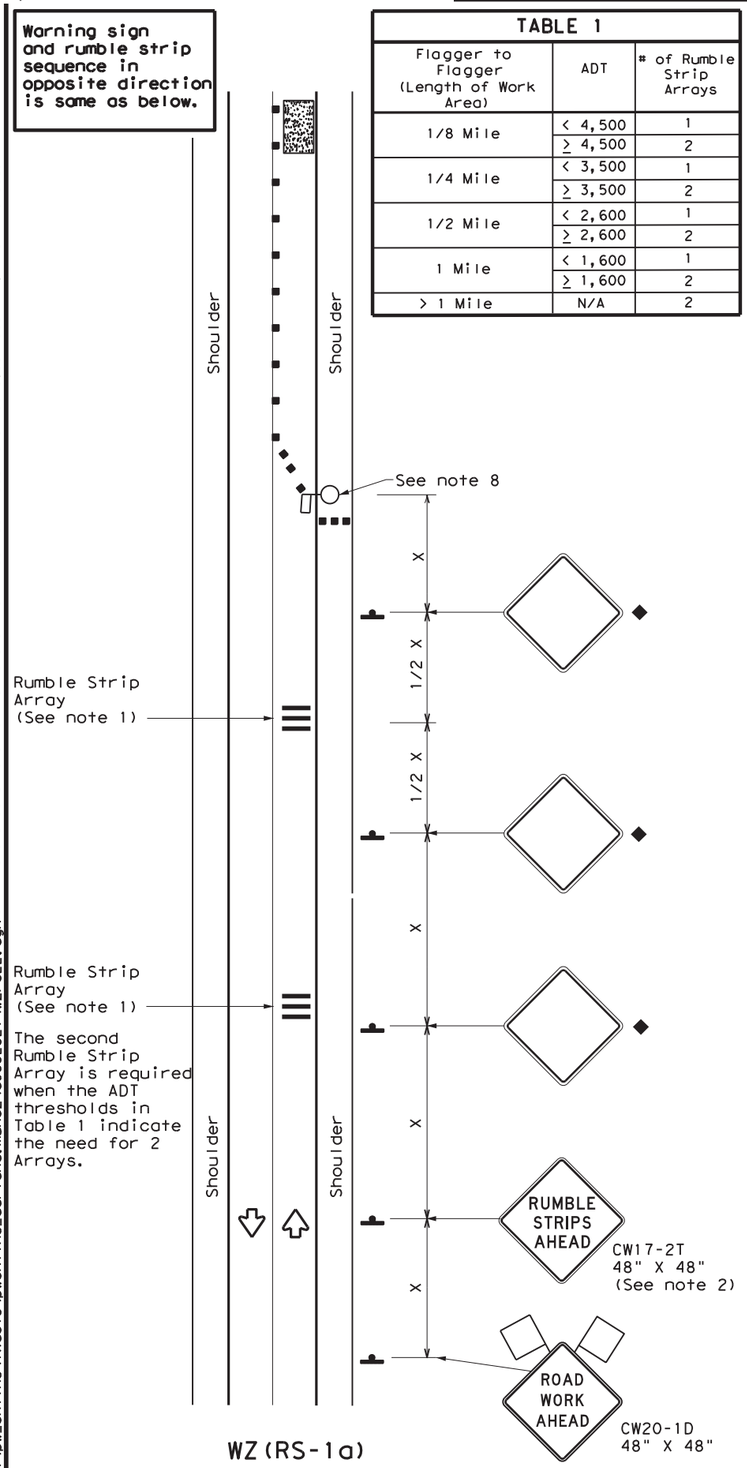
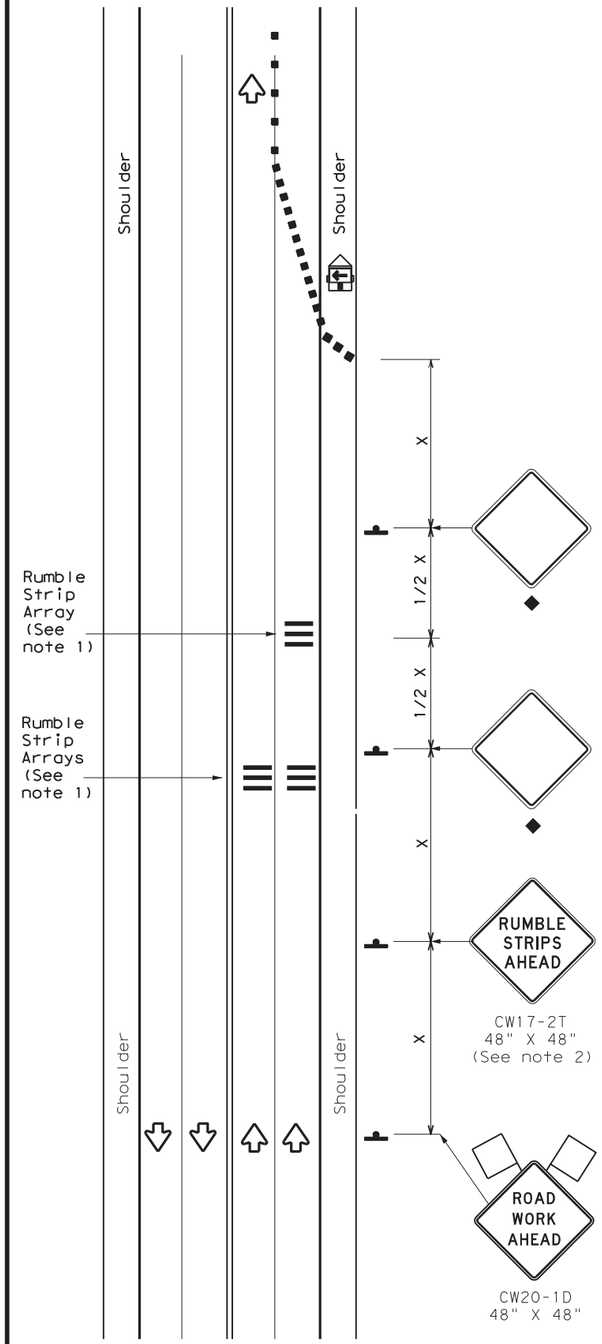
Warning sign and rumble strip sequence in opposite direction is same as below.

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

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		47

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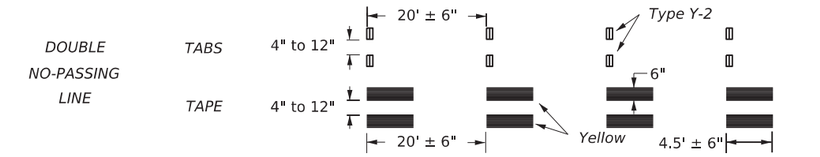
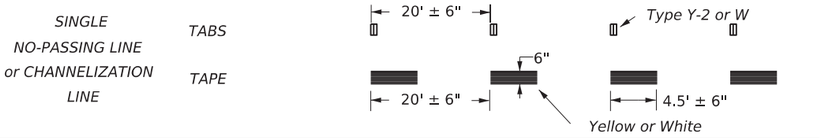
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

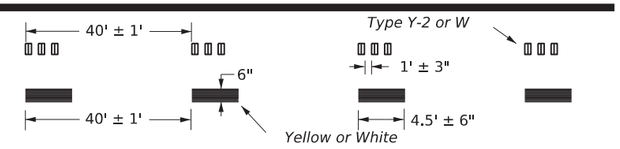


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



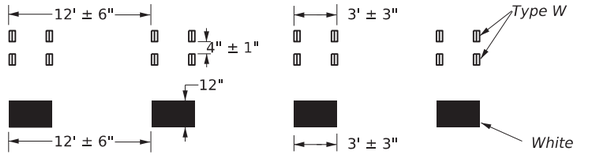
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

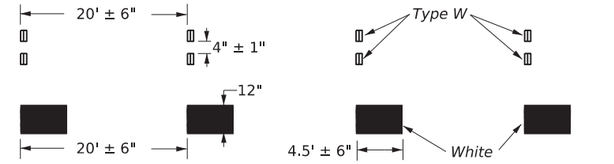


WIDE DOTTED LINES

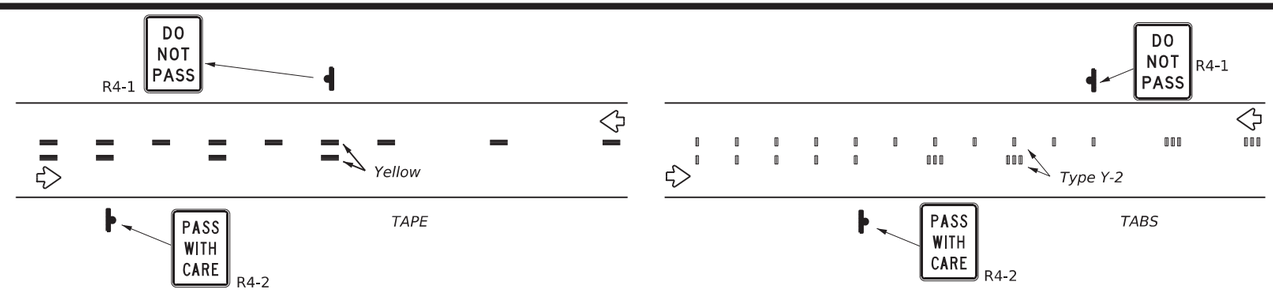
(FOR LANE DROP LINES)



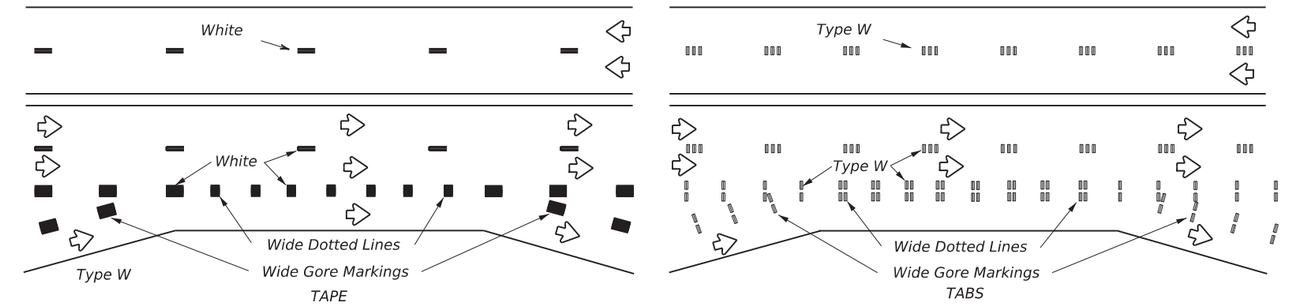
WIDE GORE MARKINGS



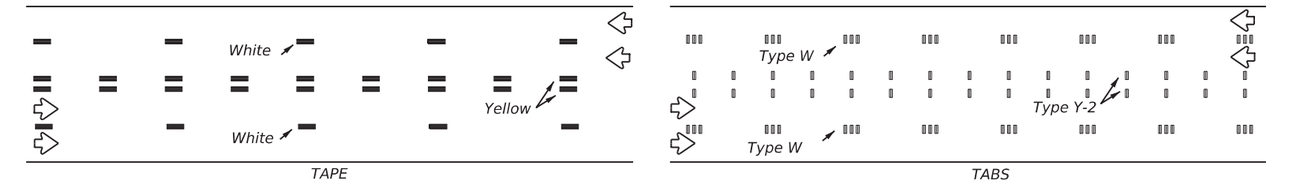
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



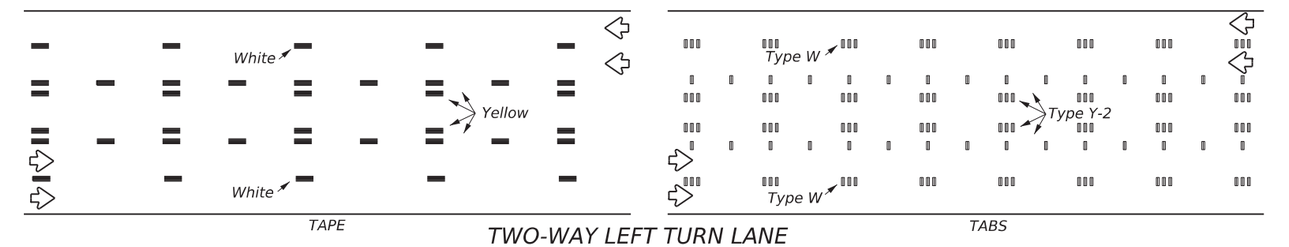
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



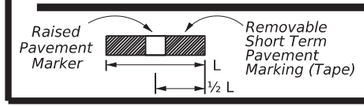
LANE LINES FOR DIVIDED HIGHWAY



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.

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.

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 Safety Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-23

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©TxDOT February 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
4-92 7-13	DIST	COUNTY		SHEET NO.
1-97 2-23	22	VAL VERDE, etc.		48
3-03				

111

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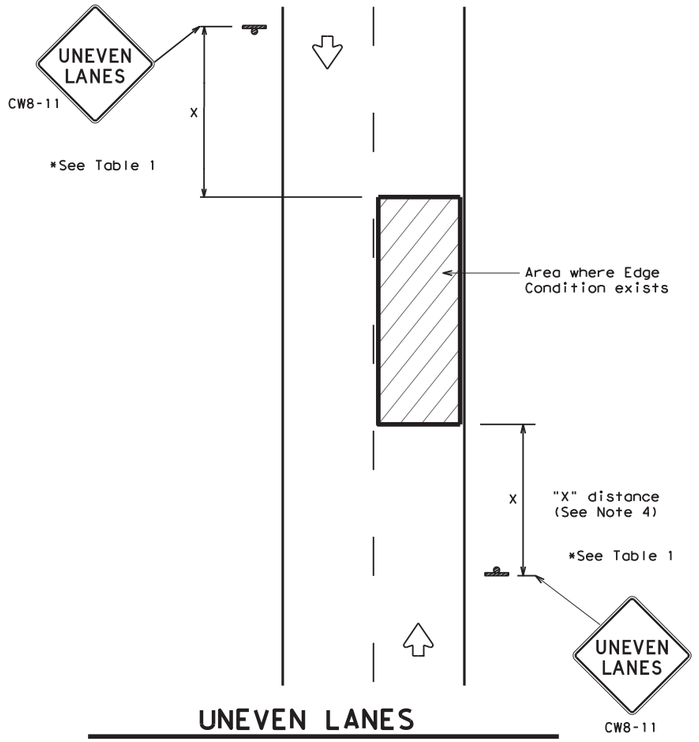
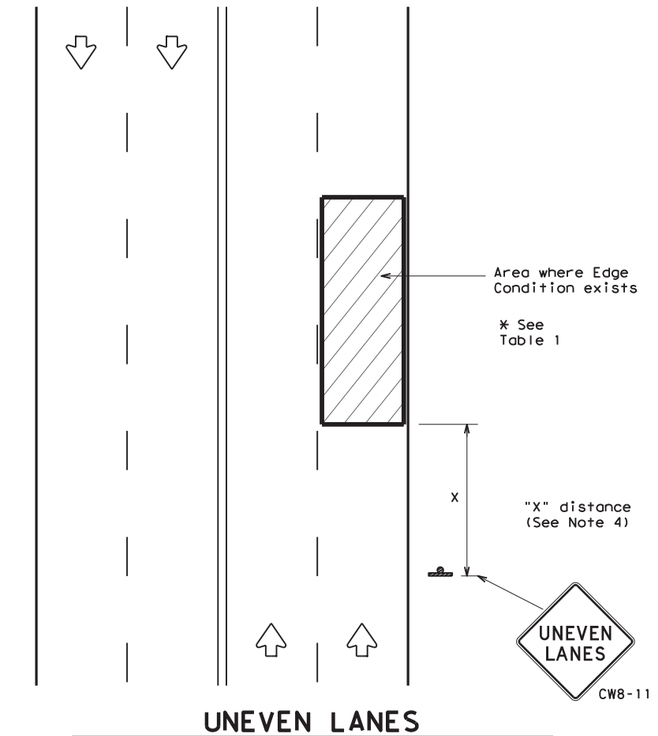
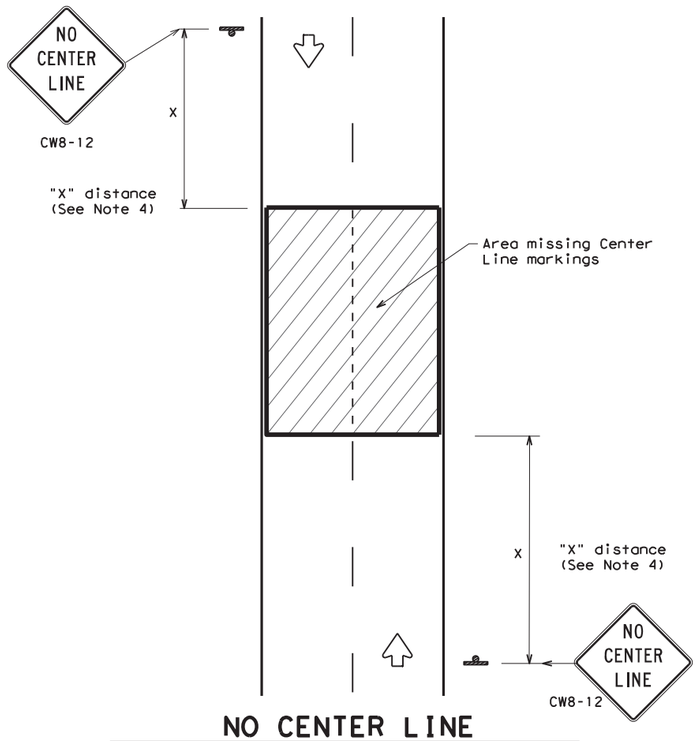


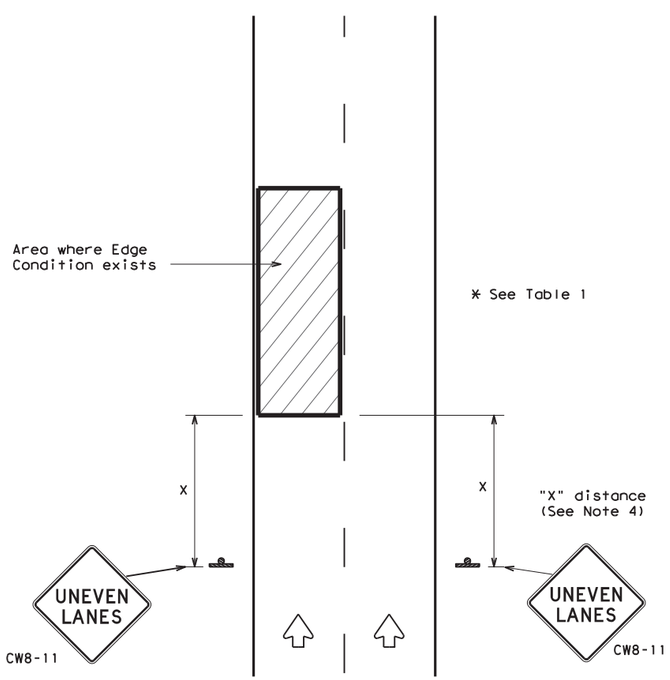
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

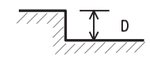
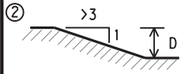
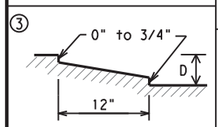
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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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8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	22	VAL VERDE, etc.		49

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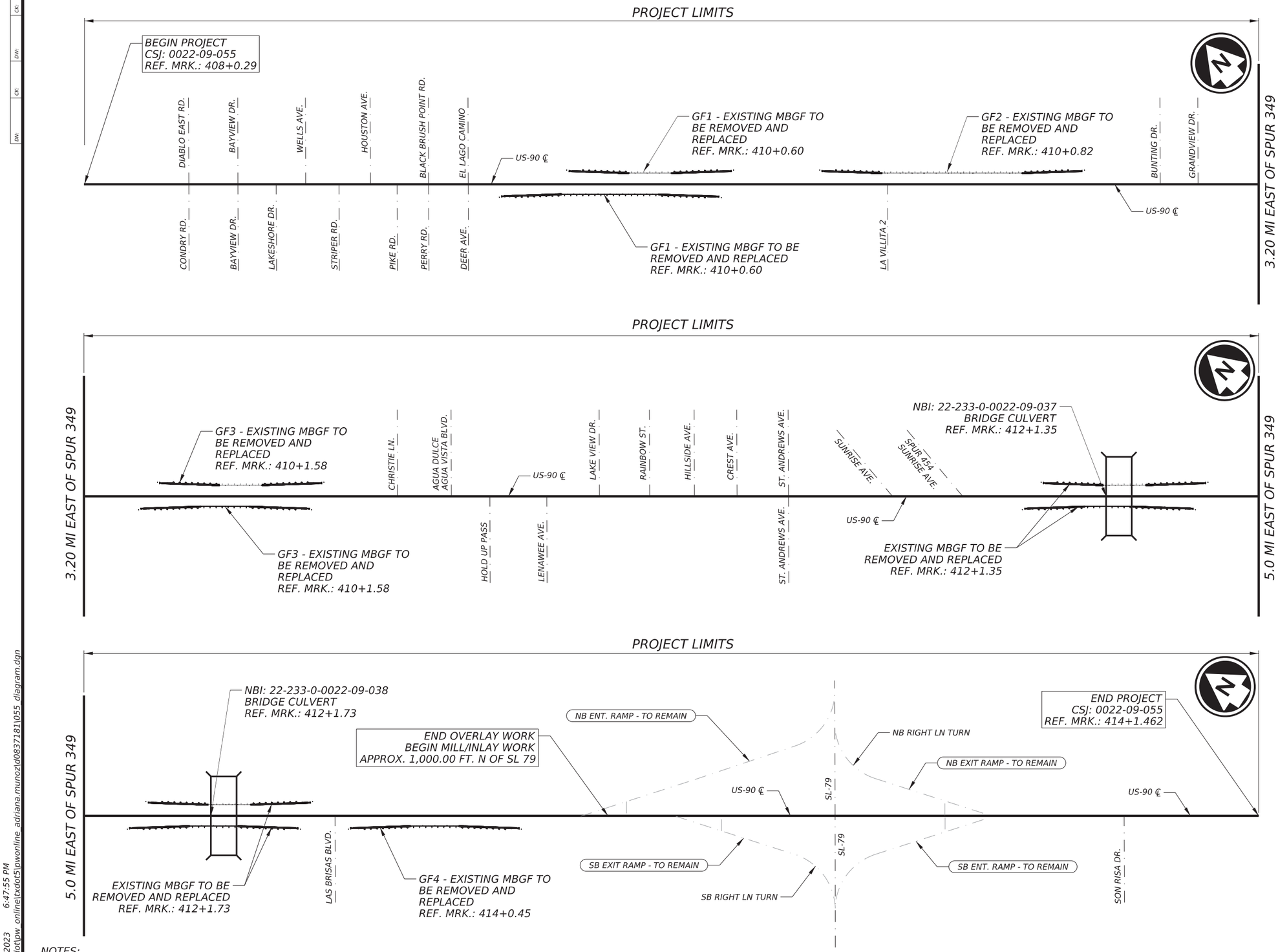

LEGEND

- CONCRETE AREA TO REMAIN
- BRIDGE
- METAL BEAM GUARD FENCE

NOTES:
1. REFER TO "TYPICAL SECTIONS" SHEET FOR ROADWAY WIDTH TO BE WORKED ON.
2. REFER TO "RATES OF APPLICATION" SHEET FOR RATES OF APPLICATION.
3. REFER TO "SUMMARY OF QUANTITIES" SHEET FOR ALL APPLICABLE ITEMS.

LOCATION #1 CSJ: 0022-09-055

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117019
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PROFESSIONAL ENGINEER

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DIAGRAMMATIC LAYOUT

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		50

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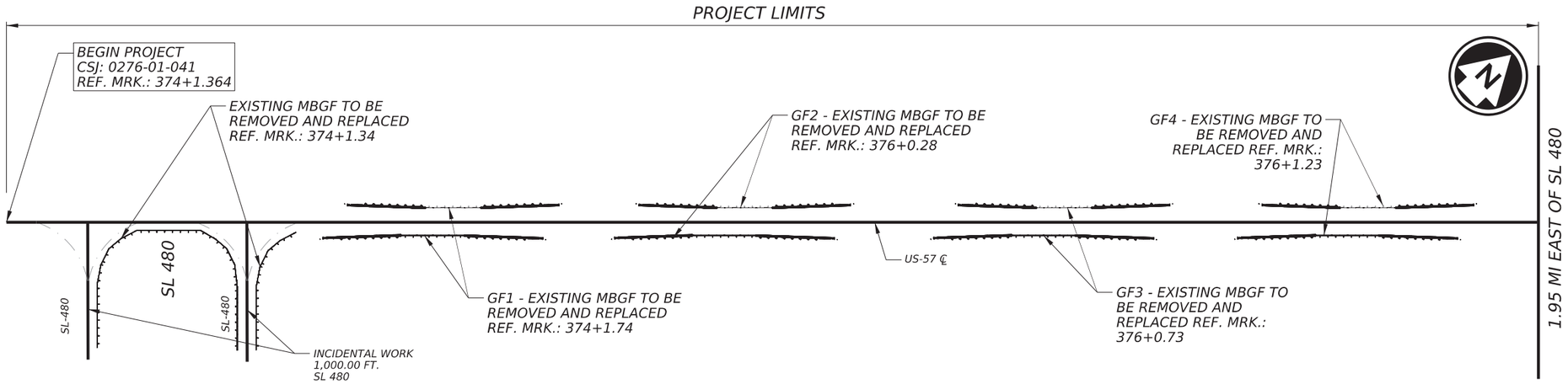
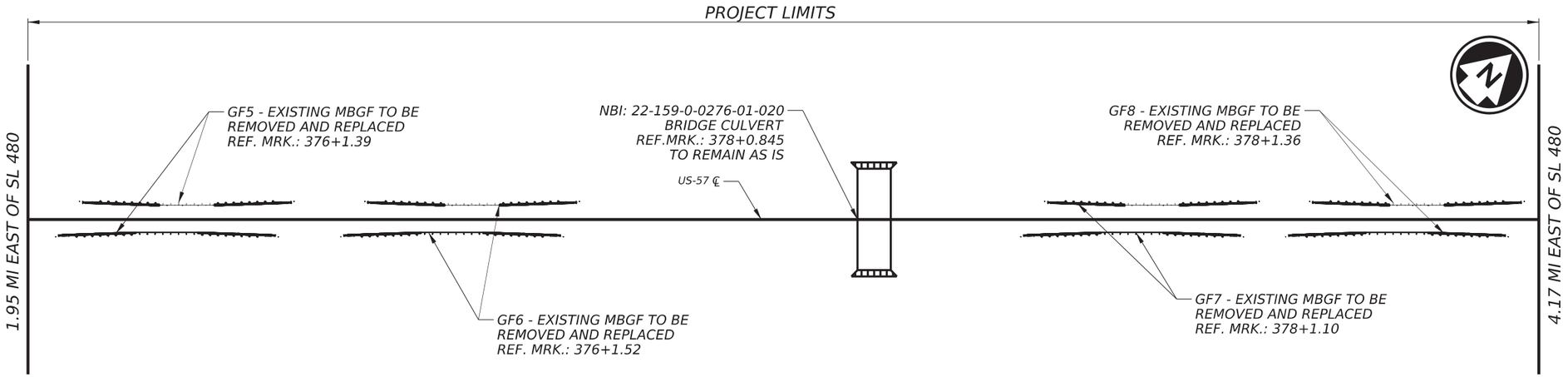
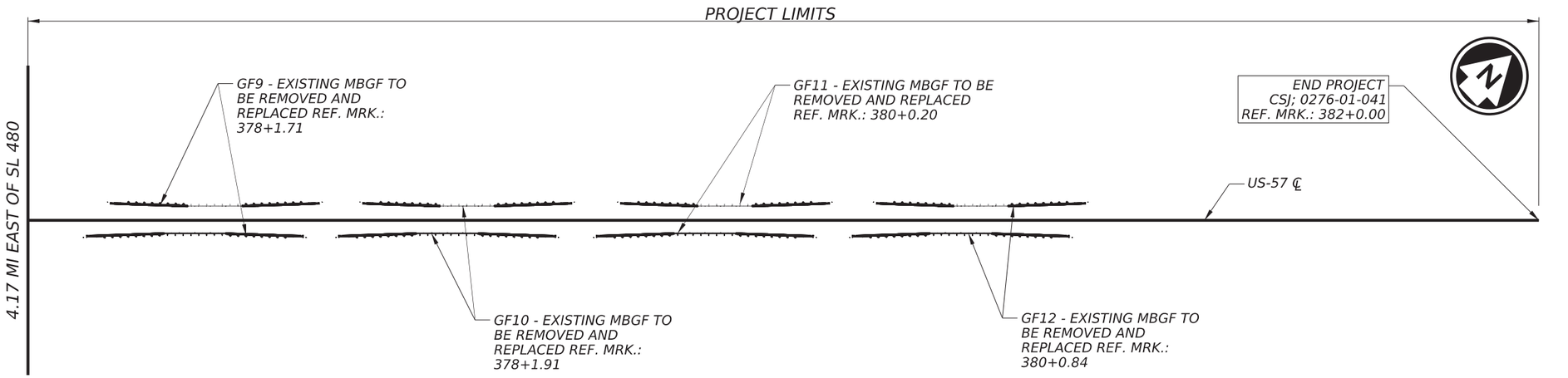
LEGEND
- CONCRETE AREA TO REMAIN
- BRIDGE
- METAL BEAM GUARD FENCE







NOTES:
1. REFER TO "TYPICAL SECTIONS" SHEET FOR ROADWAY WIDTH TO BE WORKED ON.
2. REFER TO "RATES OF APPLICATION" SHEET FOR RATES OF APPLICATION.
3. REFER TO "SUMMARY OF QUANTITIES" SHEET FOR ALL APPLICABLE ITEMS.

LOCATION #2 CSJ: 0276-01-041

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DIAGRAMMATIC LAYOUT

SHEET 2 OF 2

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0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
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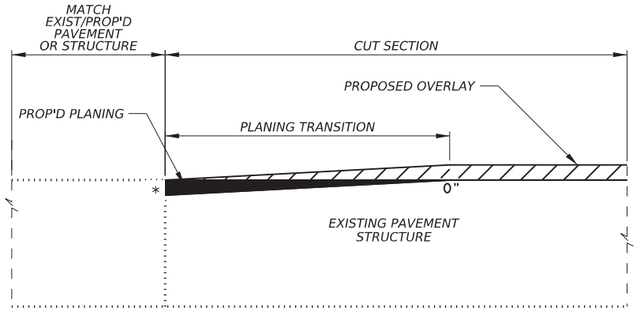
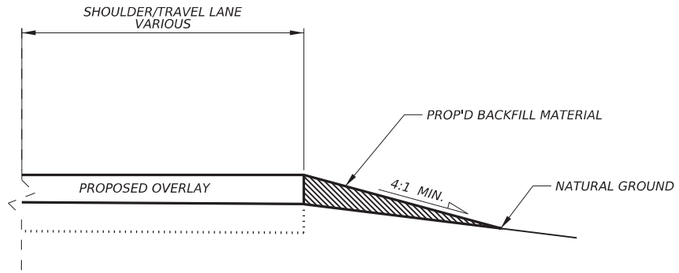


LONGITUDINAL

PLANING/OVERLAY (PROFILE)

NOTES OVERLAY- LONGITUDINAL

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 "RATES OF APPLICATION" 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)

NOTES OVERLAY- BACKFILL

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

SHEET 1 OF 4

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
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22	VAL VERDE, etc.		52

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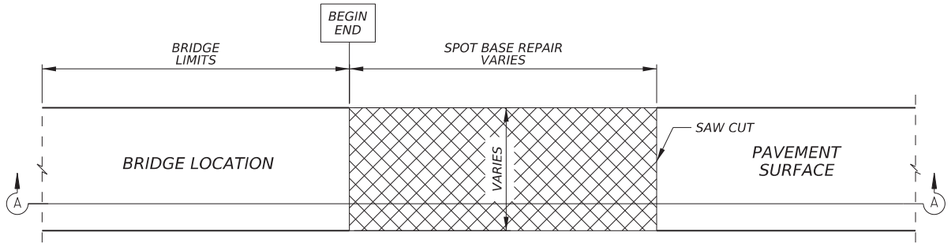
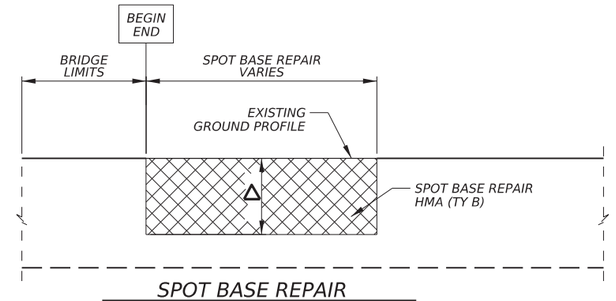
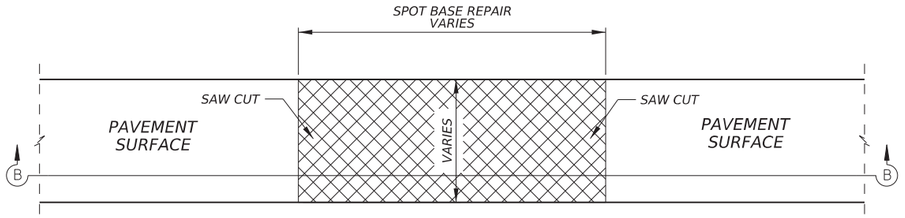


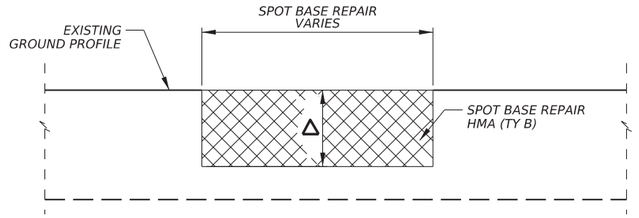
SPOT BASE REPAIR DETAIL
BRIDGE LOCATIONS



SPOT BASE REPAIR
BRIDGE SECTION A-A



SPOT BASE REPAIR DETAIL
ROADWAY SECTION



SPOT BASE REPAIR
ROADWAY SECTION B-B

RATES OF APPLICATION

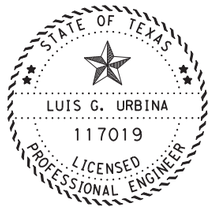
SPOT BASE REPAIR:

FLEXIBLE PAVEMENT STRUCTURE REPAIR - 115 LBS/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.

Δ 3. REFER TO "SUMMARY OF QUANTITIES" FOR SPECIFIC REPAIR DEPTHS AT EACH LOCATION.



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ROADWAY
MISCELLANEOUS DETAILS
SPOT BASE REPAIR

SHEET 2 OF 4

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		53

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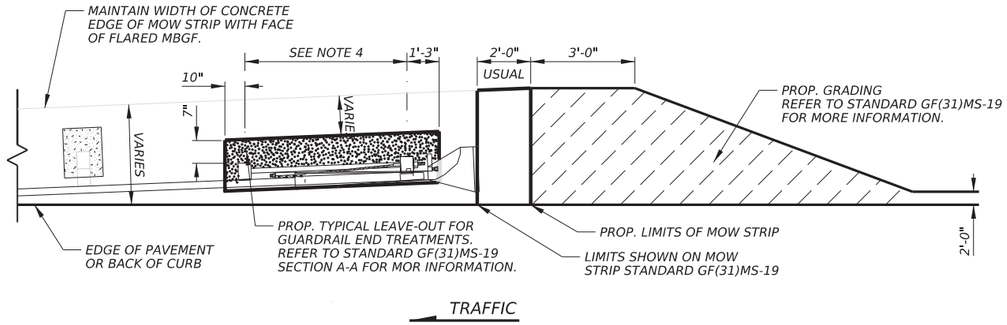
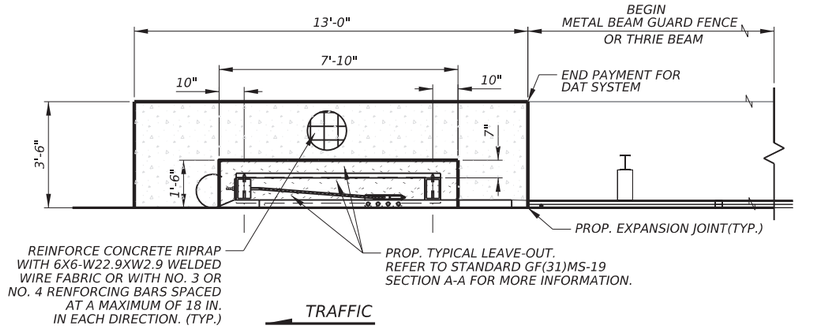


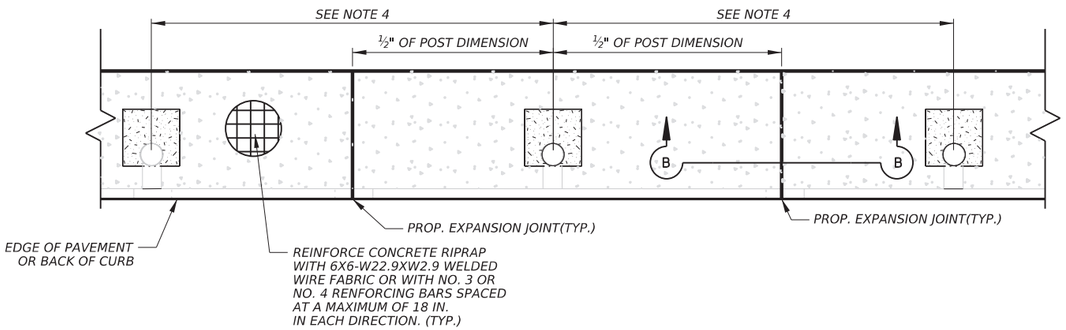
TYPICAL GUARDRAIL END TREATMENT MOW STRIP DETAIL

N.T.S.



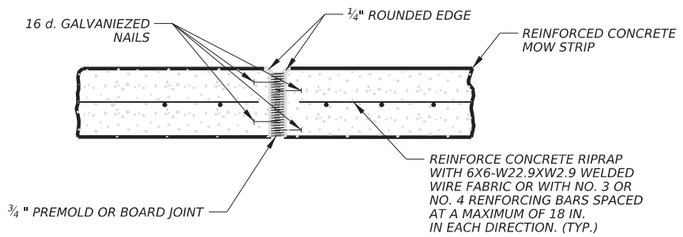
TYPICAL DOWNSTREAM ANCHOR TERMINAL MOW STRIP DETAIL

N.T.S.



TYPICAL GUARDRAIL END TREATMENT MOW STRIP EXPANSION JOINT DETAIL

\- N.T.S.



SECTION B-B

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)TRTL3-20, GF(31)MS-19, SGT(10S)31-16, SGT(11S)31-18, SGT(12S)31-18, SGT(15)31-20 SHEET(S) IF APPLICABLE FOR INSTALLATION, DIMENSIONS AND OTHER INFORMATION.
5. MOWSTRIP EXPANSION JOINT SPACING SHALL BE MINIMUM 24 FT. AND NO MORE THAN 40 FT.

MOWSTRIP QUANTITY CALCULATIONS

FOR ESTIMATION PURPOSES

EVERY THRIE-BEAM TRANS = 0.81 CY (7.29 SY)
EVERY 25 FT. OF MBGF = 1.08 CY (9.72 SY)
EVERY GET SYSTEM = 2.85 CY (25.74 SY)
EVERY DAT SYSTEM = 0.56 CY (5.0 SY)

STATE OF TEXAS
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ROADWAY MISCELLANEOUS DETAILS MOWSTRIP

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		54

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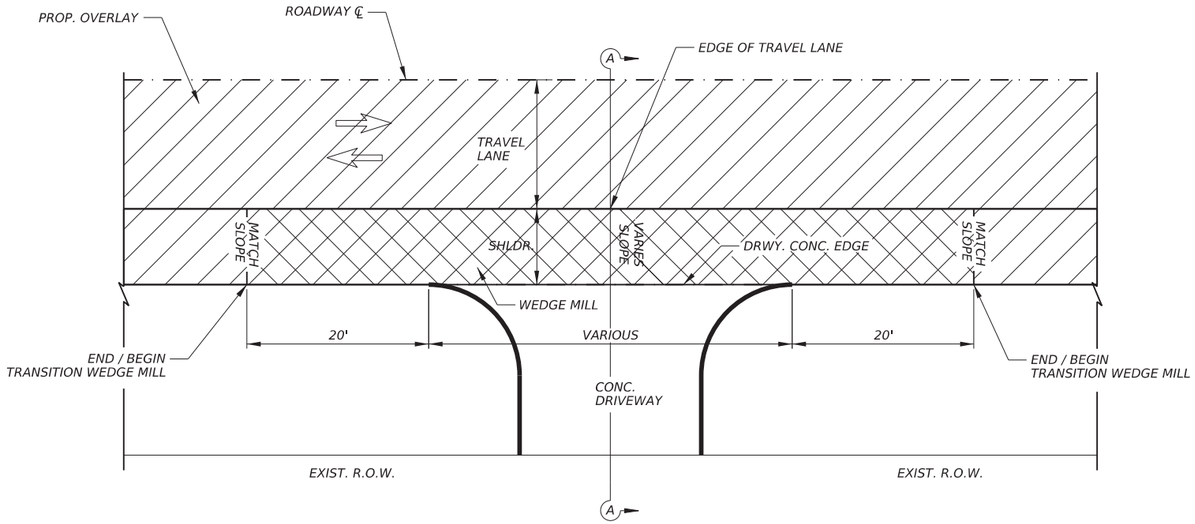
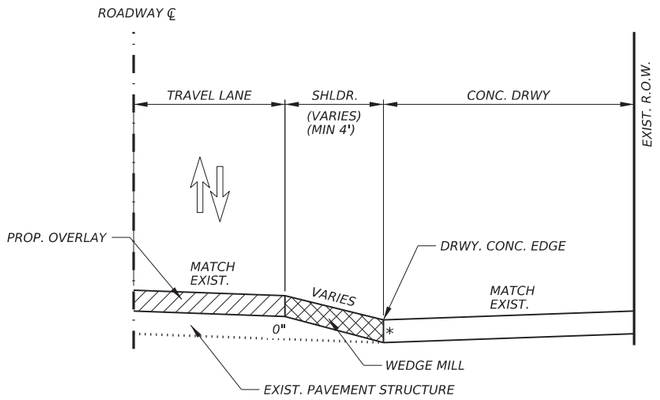


PLAN VIEW
CONC. DRIVEWAY ROADWAY SECTION



CROSS SECTION
CONC. DRIVEWAY SECTION A-A

NOTES:

OVERLAY - CONCRETE DRIVEWAY(S)

1. PLANING TRANSITION LOCATIONS WILL BE LIMITED TO A 4 FT SECTION FROM THE EDGE OF DRIVEWAY(S) INTO THE SHOULDER/TRAVEL LANE, ON ALL LOCATIONS WITH EXISTING CONCRETE DRIVEWAY(S).

2. PLANING WORK ON ROADWAY SECTION MAY VARY DUE TO EXISTING ROADWAY CONDITIONS.

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.*

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ROADWAY MISCELLANEOUS DETAILS DRIVEWAY WEDGE MILLING

SHEET 4 OF 4

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		55

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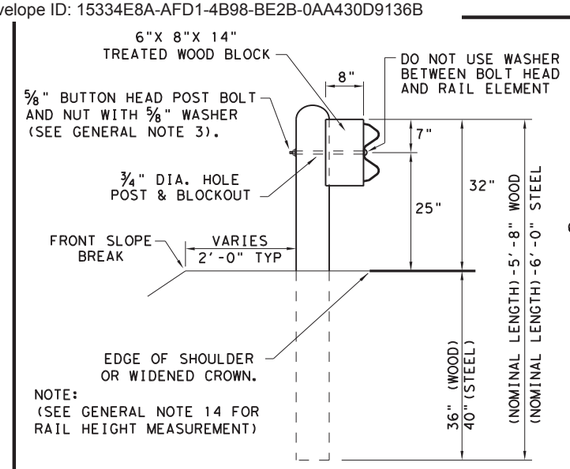
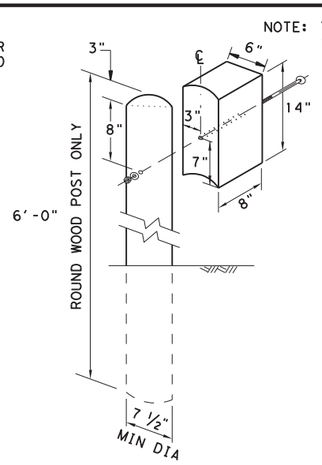
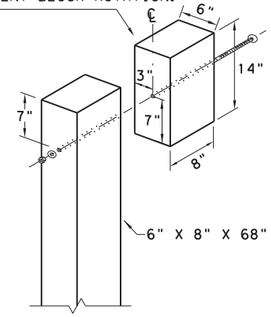


TYPICAL POST PLACEMENT

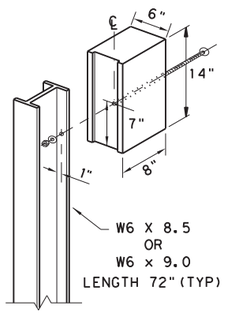


WOOD BLOCK TO ROUND WOOD POST

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

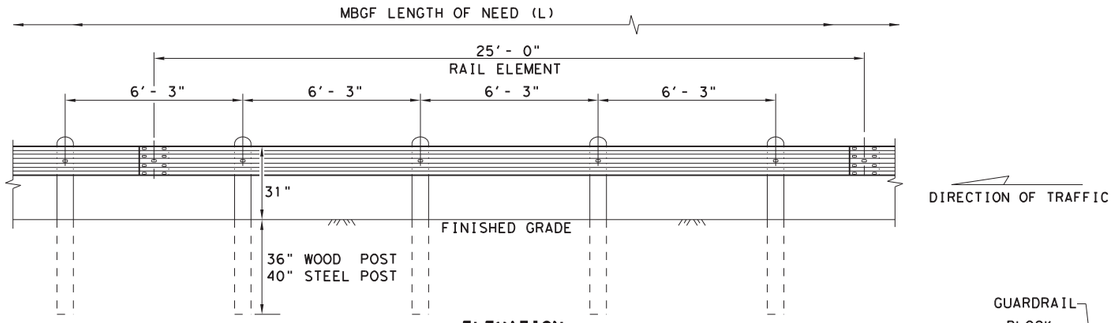


WOOD BLOCK TO RECTANGULAR WOOD POST



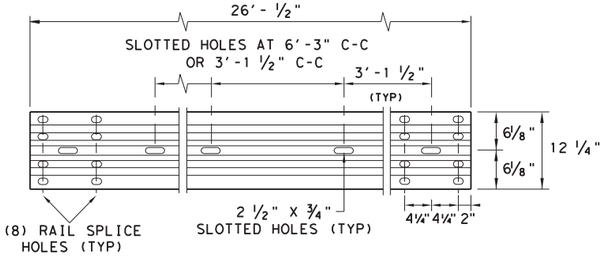
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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.

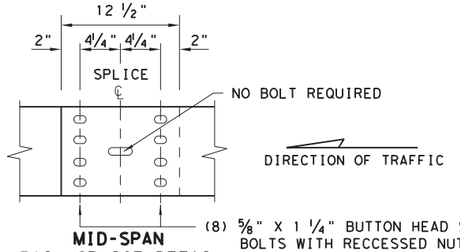
NOTE:
FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECCESSED NUT.

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

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

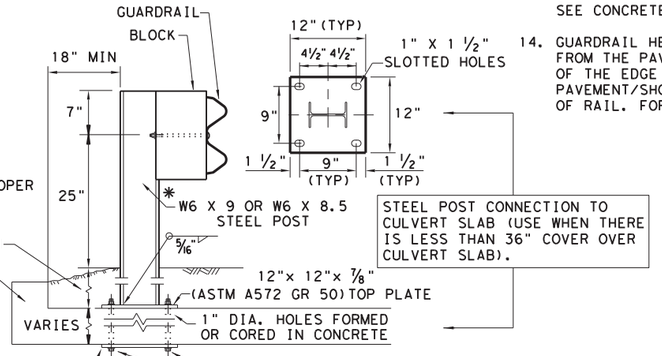
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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



12" X 12" X ¼" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

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.

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.

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.

Texas Department of Transportation

Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		56

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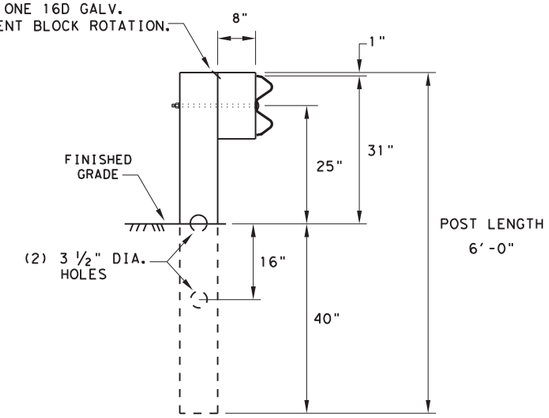
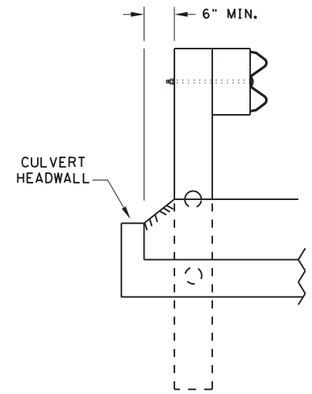
NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.



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

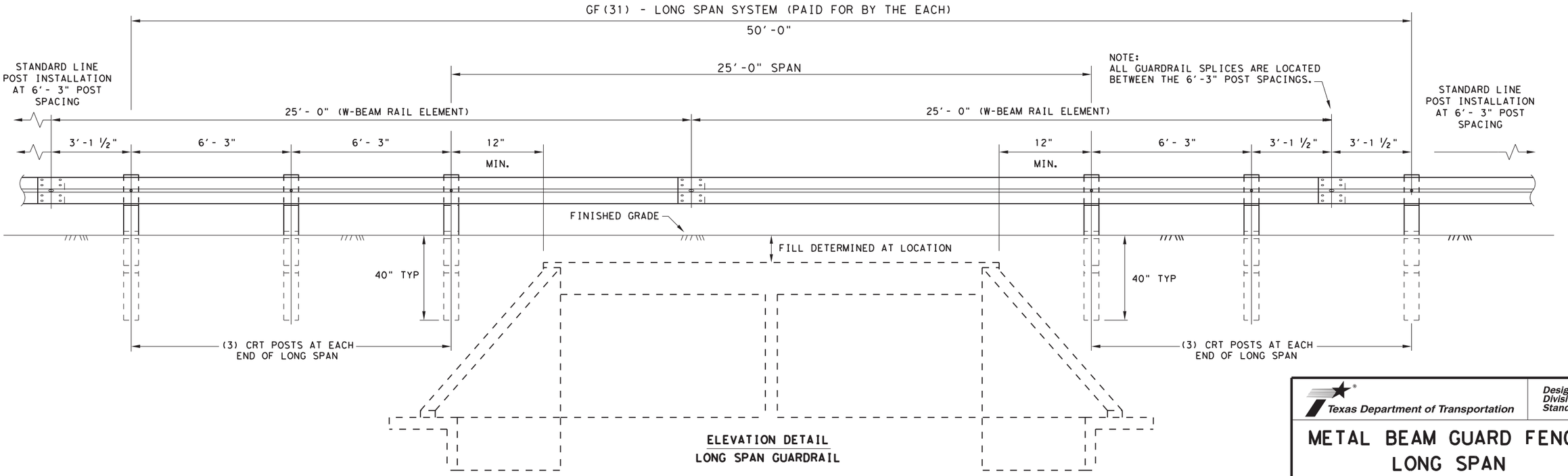
GENERAL NOTES

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.

DIRECTION OF TRAFFIC

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

GF(31) - LONG SPAN SYSTEM (PAID FOR BY THE EACH)



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

FILE: gf31ls19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
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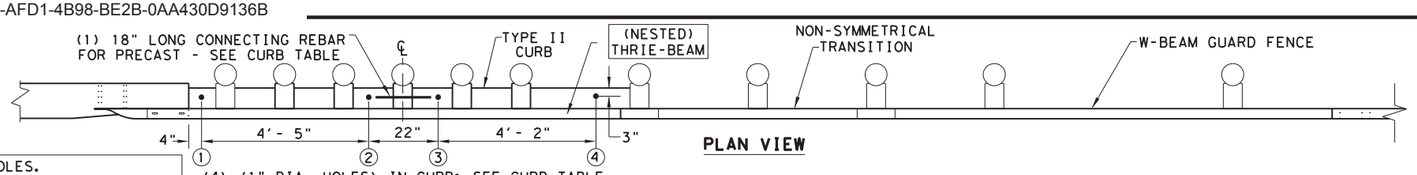
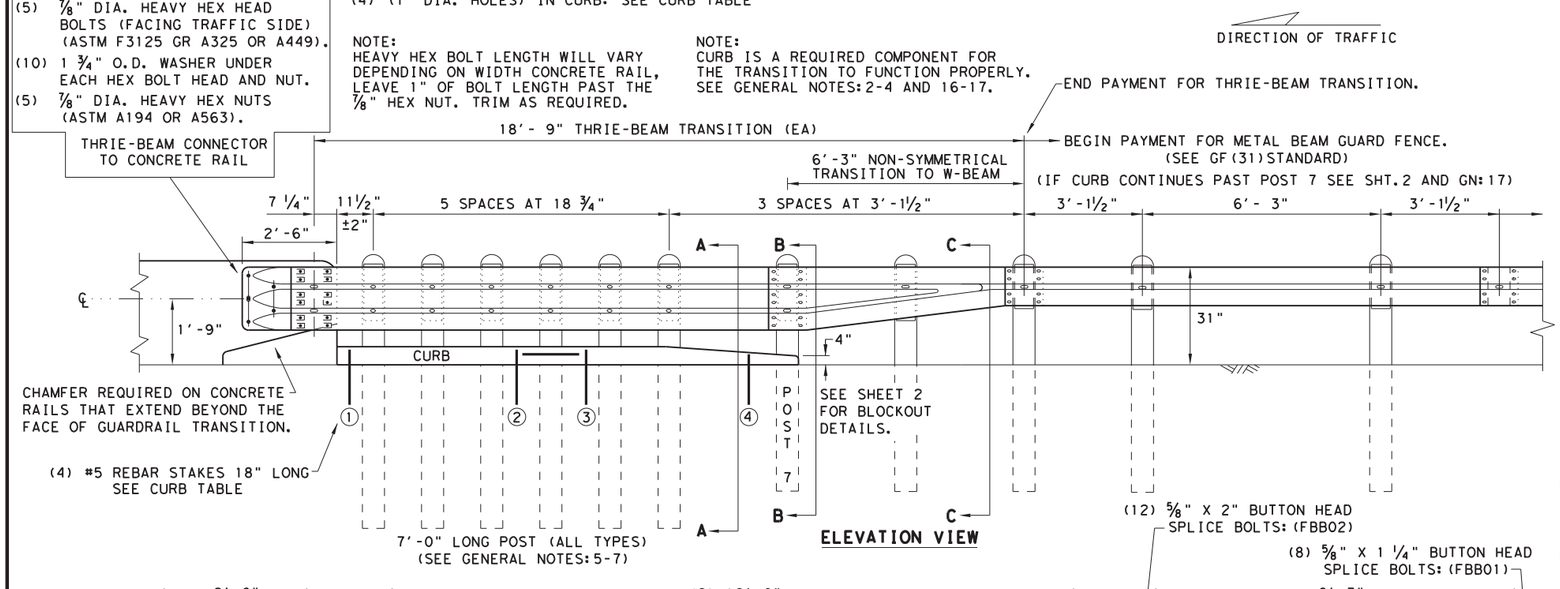


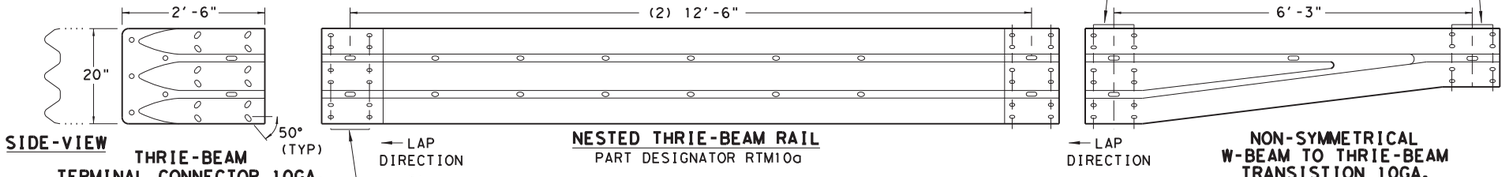
(5) 1" DIA. HOLES.
(5) ⅞" DIA. HEAVY HEX HEAD BOLTS (FACING TRAFFIC SIDE) (ASTM F3125 GR A325 OR A449).
(10) 1 ¾" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
(5) ⅞" DIA. HEAVY HEX NUTS (ASTM A194 OR A563).

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

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

DIRECTION OF TRAFFIC

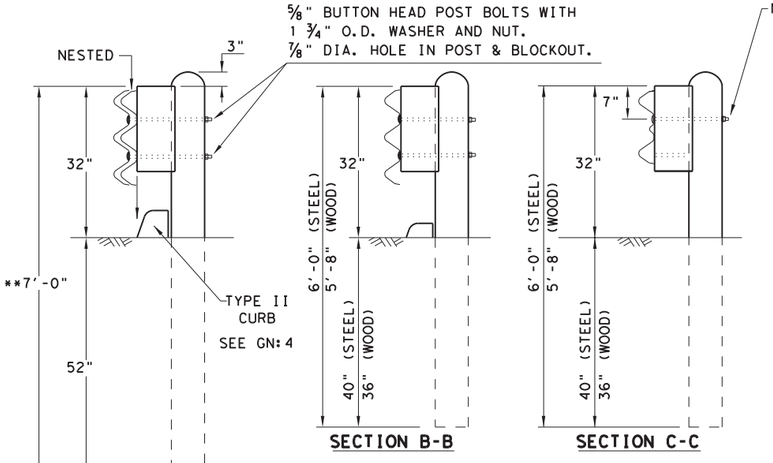




(12) ⅝" X 2" BUTTON HEAD SPLICE BOLTS WITH RECESSED NUTS: (FBB02)
(12) RECTANGULAR GUARDRAIL PLATE WASHERS: (FWR03)

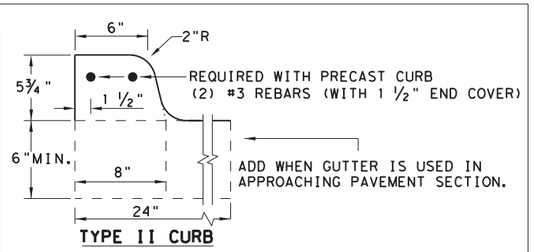
PLATE WASHER INSTRUCTIONS

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



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

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



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

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

TYPE II CURB DETAILS

GENERAL NOTES

1. CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
2. CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5- ¾" HEIGHT); SEE CURRENT CCCG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE: 17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
3. CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
4. UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
5. FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 ½" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
6. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF(31) STANDARD SHEET.
7. THE POST LENGTH SHALL BE MARKED ON ALL 7'- 0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST ⅝" IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
8. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
9. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT SHALL NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
10. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED)(TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED)(STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

HIGH-SPEED TRANSITION

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
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		58

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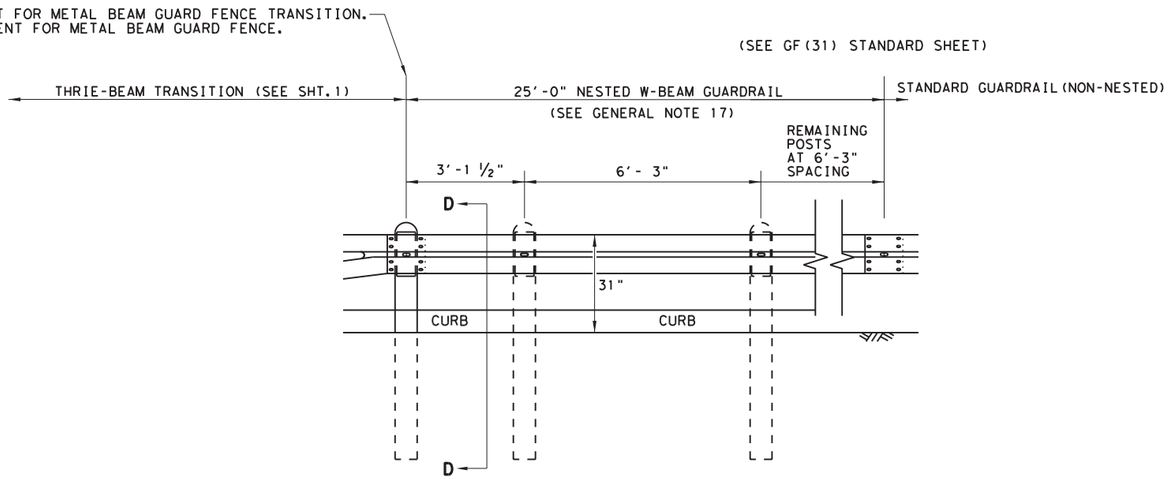
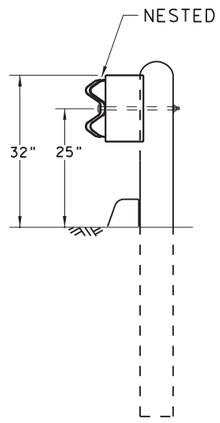
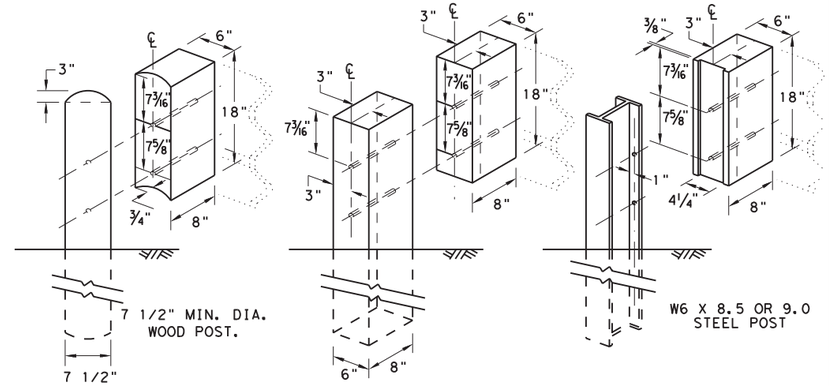
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

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	DIST	COUNTY		SHEET NO.	
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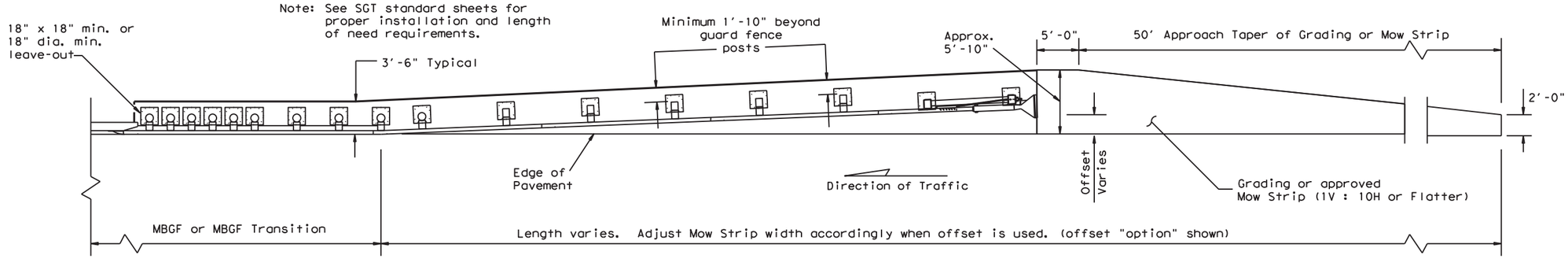
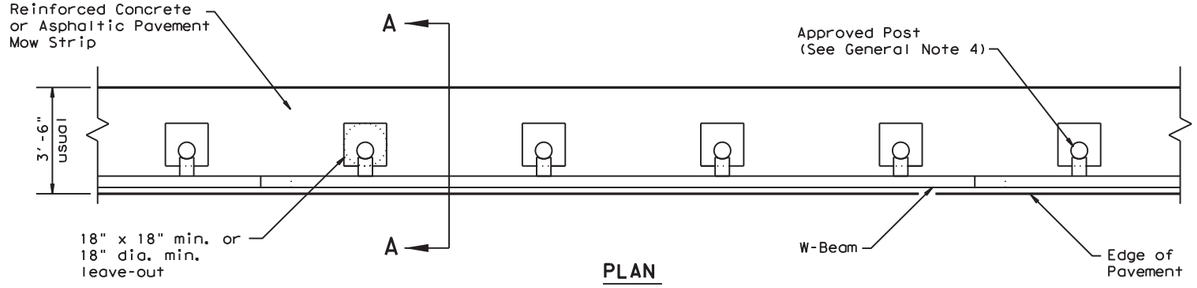
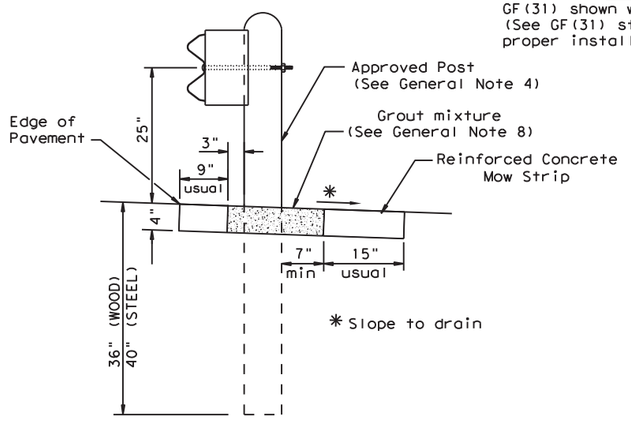


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



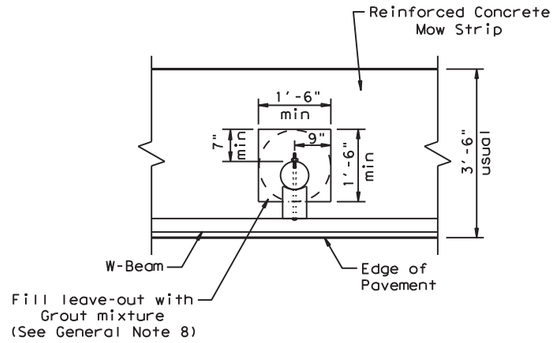
PLAN

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



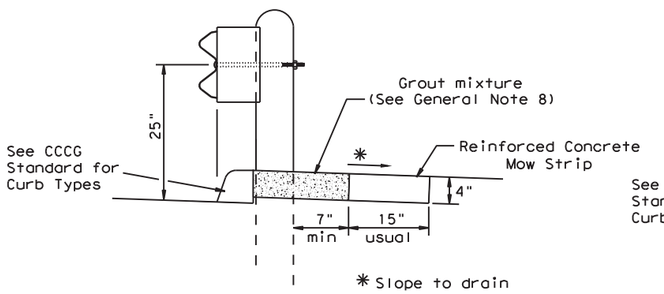
SECTION A-A

Typical



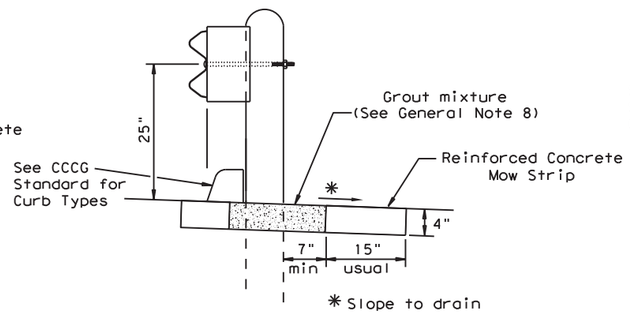
MOW STRIP DETAIL

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



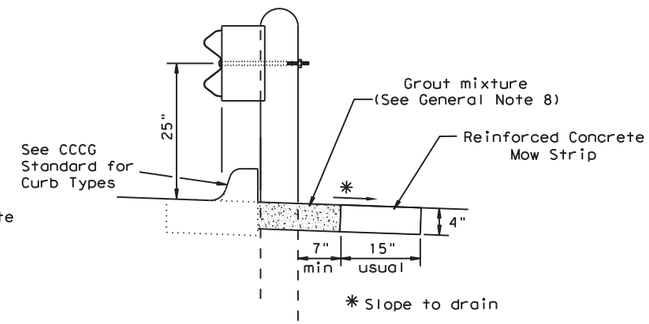
CURB OPTION (1)

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

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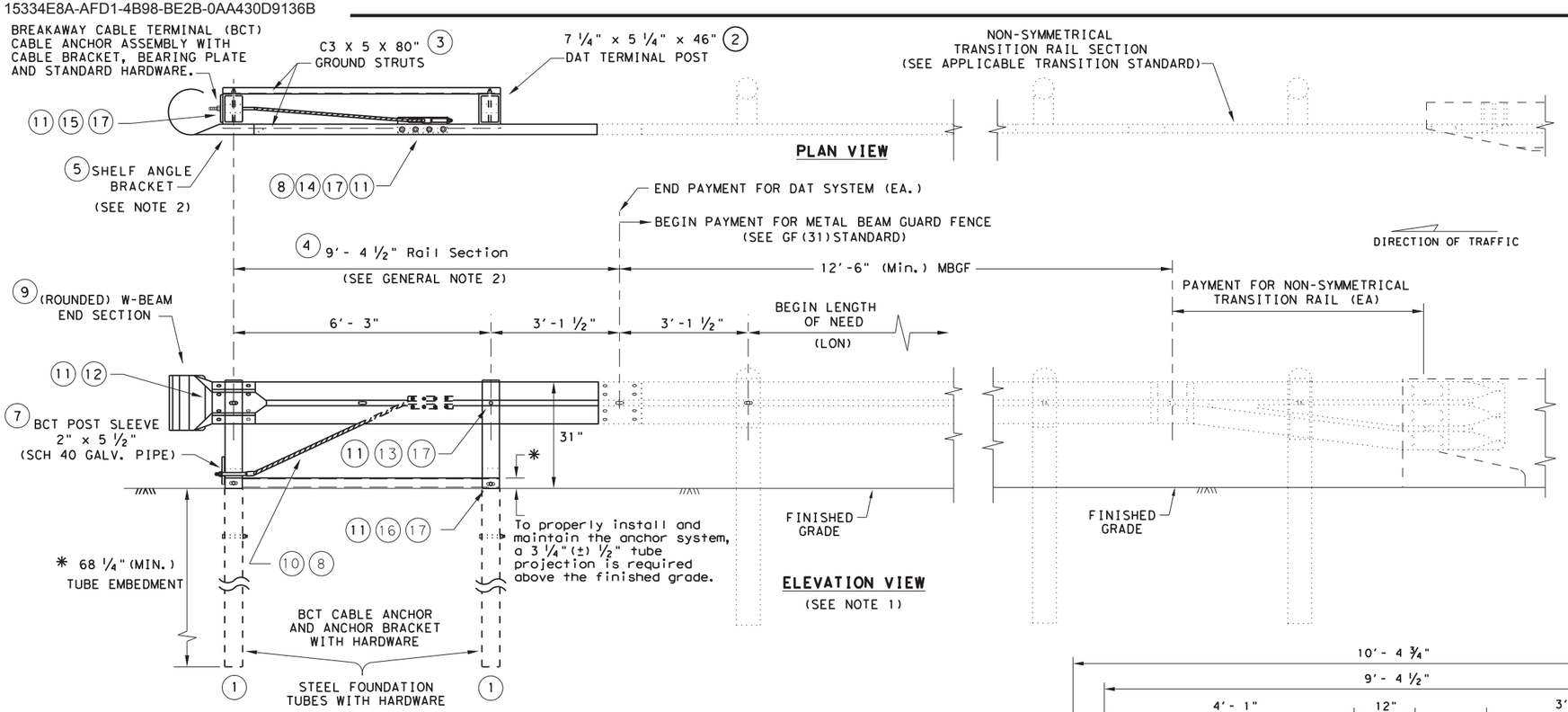


DOWNSTREAM ANCHOR TERMINAL (DAT)

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

GENERAL NOTES

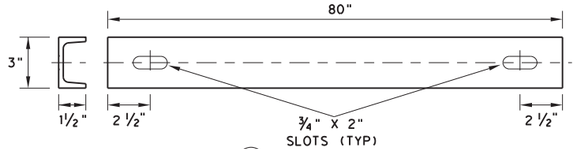
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 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

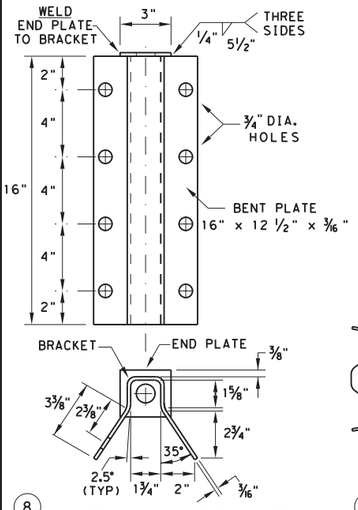
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(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

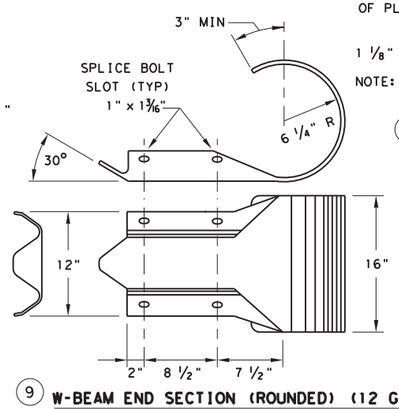
(4) TERMINAL RAIL ELEMENT FOR DAT



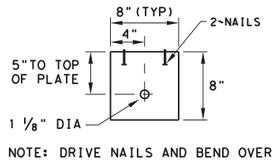
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



(8) GUARDRAIL ANCHOR BRACKET

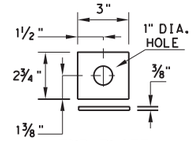


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

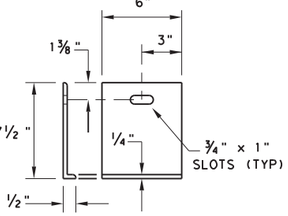


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

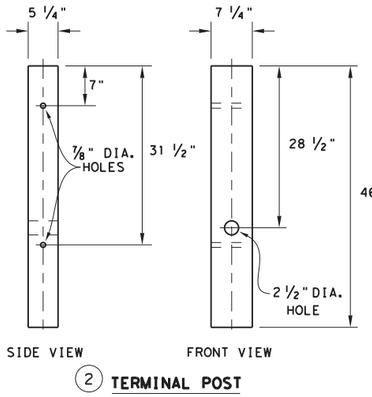
(6) BEARING PLATE
8"x 8"x 5/8" R



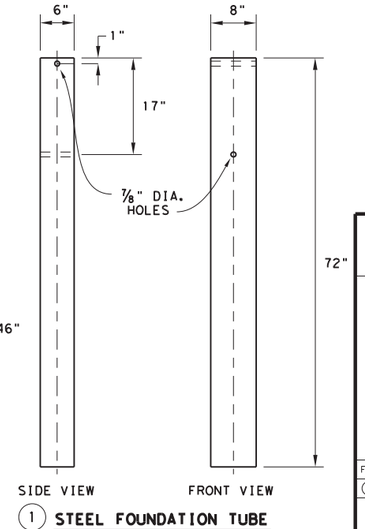
END PLATE



(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

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	22	VAL VERDE, etc.		61

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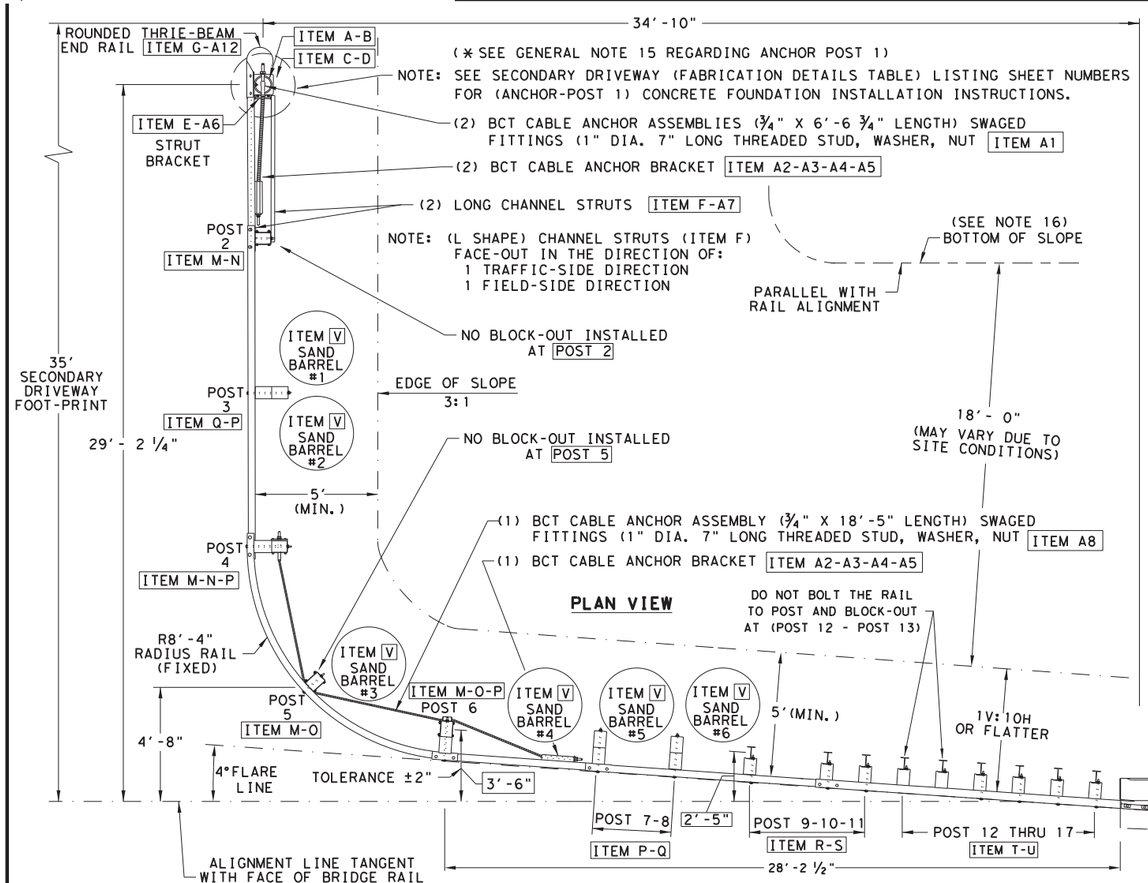
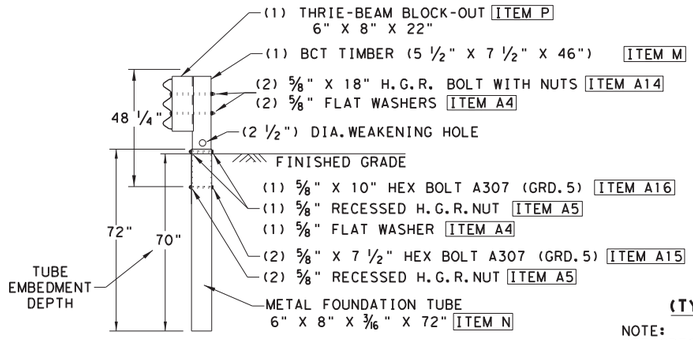
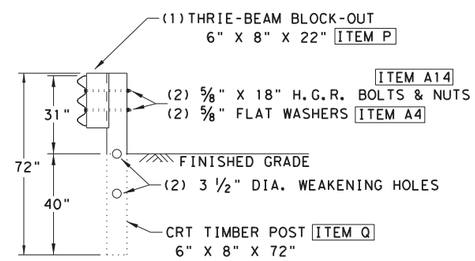




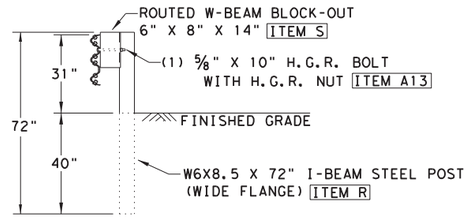
SECTION VIEW (A-A)
TIMBER POST WITH METAL FOUNDATION TUBE
(TYP) BCT POSTS 2-4-5-6

NOTE:
NO BLOCK-OUTS INSTALLED AT BCT POST 2 - POST 5

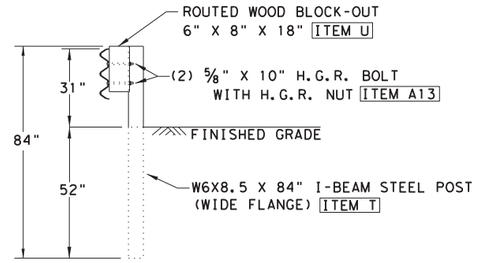


SECTION VIEW (B-B)
(TYP) CRT TIMBER POSTS 3-7-8

NOTE:
SEE SPECIAL APPLICATION NOTES ON SHEET 3 OF 3.
CRT POST WILL REQUIRE AN ADDITIONAL 3/4" HOLE TO ACCOMMODATE THE 22" LONG BLOCKOUT.



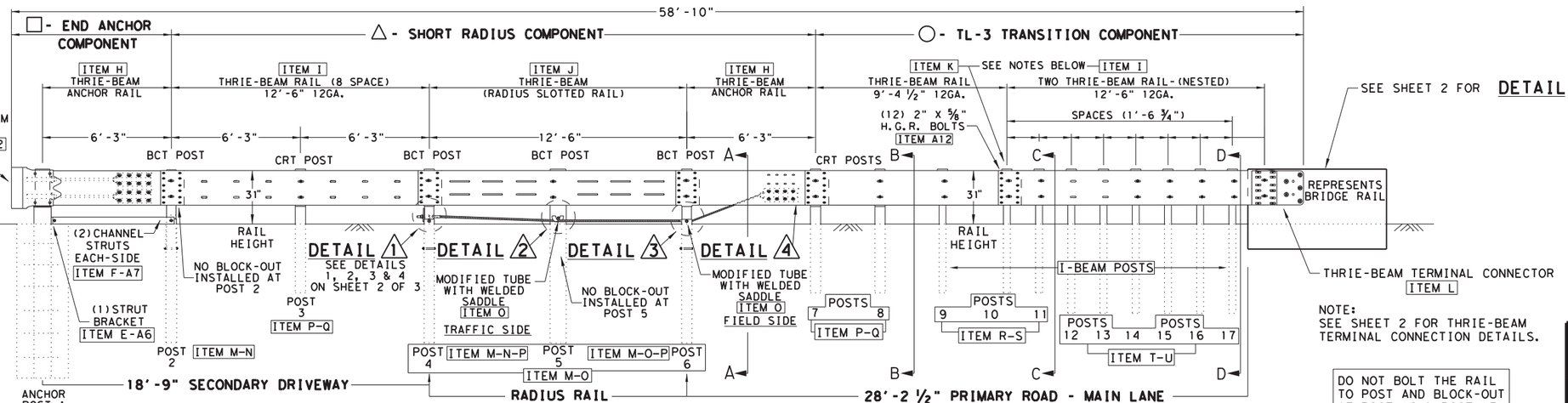
SECTION VIEW C-C
(TYP) AT POSTS 9-10-11



*** SECTION VIEW D-D**
(TYP) AT POSTS 12-13-14-15-16-17

DO NOT BOLT THE RAIL TO POST AND BLOCK-OUT AT (POST 12 & POST 13)

NOTE: FOR POST 12 & 13



NOTE:
SEE SHEET 2 FOR THRIE-BEAM TERMINAL CONNECTION DETAILS.

DO NOT BOLT THE RAIL TO POST AND BLOCK-OUT AT (POST 12 & POST 13)

NOTE: FOR POST 12 & 13

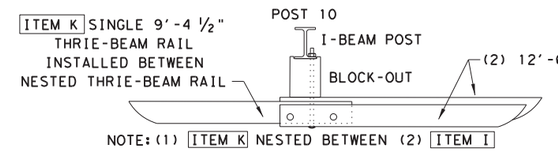
(MASH TL-3 COMPLIANT)
TESTED TO MASH TL-3 WITH A 3:1 SLOPE

ANCHOR POST 1 FABRICATION DETAILS	
SHEET DESCRIPTION	SHEET NUMBER
ANCHOR POST	SHEET 1 OF 8
ANCHOR SLEAVE	SHEET 2 OF 8
RADIUS RAIL	SHEET 3 OF 8
THRIE-BEAM RAILS	SHEET 4 OF 8
BCT TIMBER POST	SHEET 5 OF 8
STRUT RADIUS ANCHOR	SHEET 6 OF 8
FOUNDATION TUBE	SHEET 7 OF 8
ANCHOR CABLE	SHEET 8 OF 8

FULL-LENGTH ELEVATION VIEW

NOTE: ALL CABLE BRACKET ASSEMBLIES ARE LOCATED ON THE FIELD-SIDE. SHOWN HERE FOR CLARITY.

NOTE: FOR BCT POSTS 2-4-5-6 INSTALL (1) OR (2) ITEM A15-A4-A5 BOLT ASSEMBLIES TO PREVENT TIMBER POST SLIDING DOWN FOUNDATION TUBE.



NOTE: (1) ITEM K NESTED BETWEEN (2) ITEM I

NESTED-GUARDRAIL SPLICE AT POST 10

SHEET 1 OF 3

Texas Department of Transportation

Design Division Standard

TL-3
SHORT RADIUS GUARDRAIL
MASH COMPLIANT
SRG(TL-3)-21

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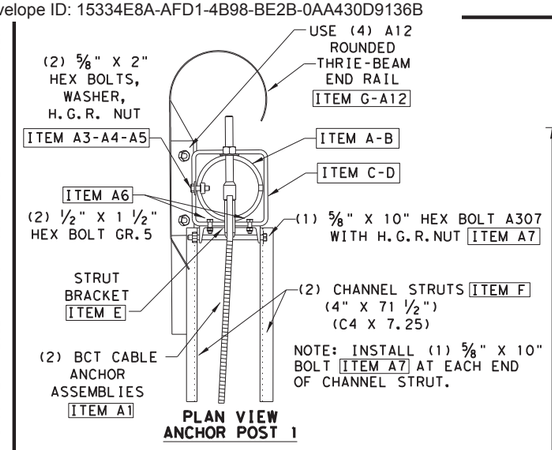
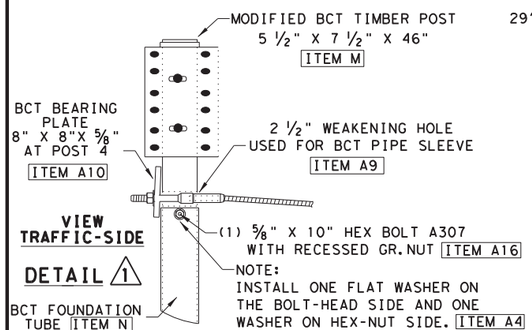


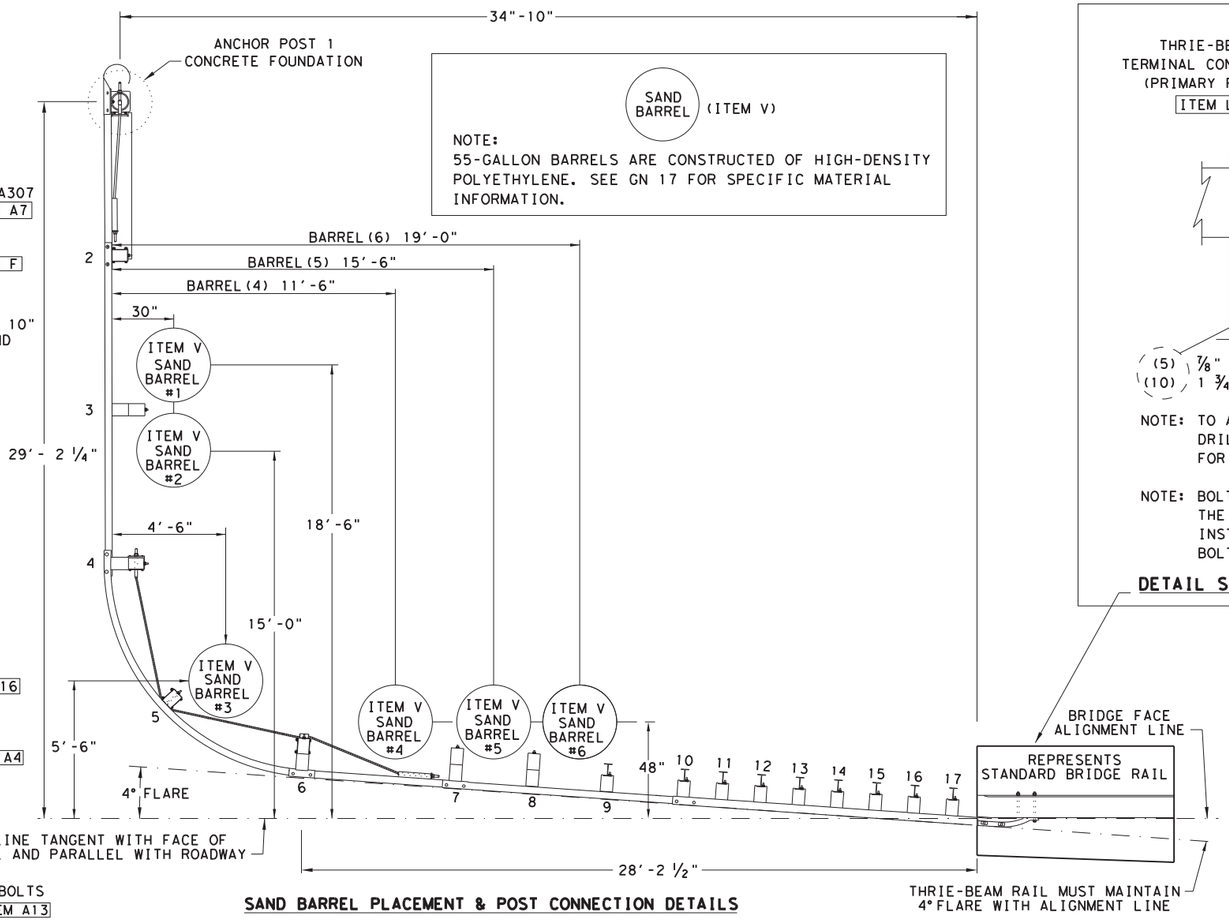
PLAN VIEW ANCHOR POST 1



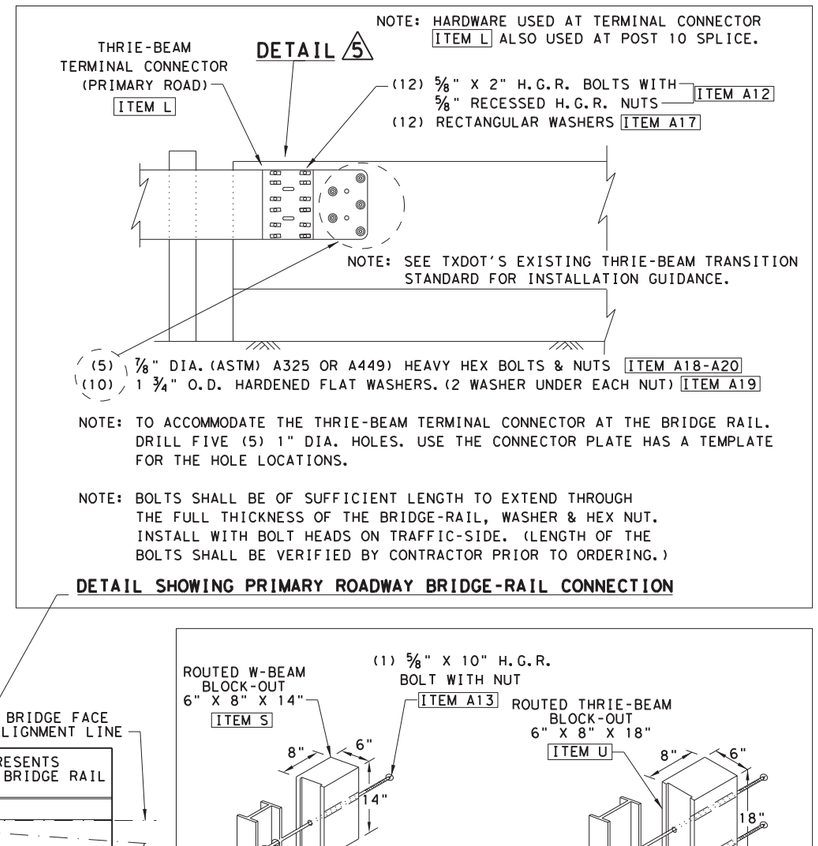
VIEW TRAFFIC-SIDE

DETAIL 1

BCT (POST 4) TIMBER POST WITH METAL FOUNDATION TUBE



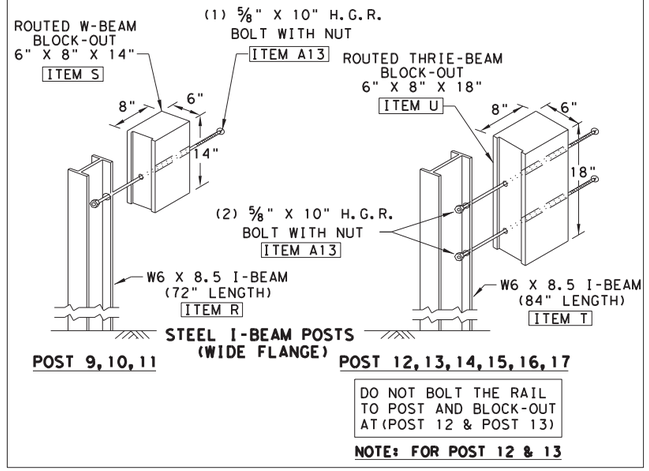
SAND BARREL PLACEMENT & POST CONNECTION DETAILS



NOTE: TO ACCOMMODATE THE THRIE-BEAM TERMINAL CONNECTOR AT THE BRIDGE RAIL. DRILL FIVE (5) 1" DIA. HOLES. USE THE CONNECTOR PLATE HAS A TEMPLATE FOR THE HOLE LOCATIONS.

NOTE: BOLTS SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE BRIDGE-RAIL, WASHER & HEX NUT. INSTALL WITH BOLT HEADS ON TRAFFIC-SIDE. (LENGTH OF THE BOLTS SHALL BE VERIFIED BY CONTRACTOR PRIOR TO ORDERING.)

DETAIL SHOWING PRIMARY ROADWAY BRIDGE-RAIL CONNECTION



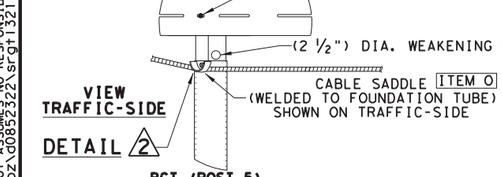
STEEL I-BEAM POSTS (WIDE FLANGE)

POST 9, 10, 11

POST 12, 13, 14, 15, 16, 17

DO NOT BOLT THE RAIL TO POST AND BLOCK-OUT AT (POST 12 & POST 13)

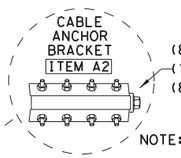
NOTE: FOR POST 12 & 13



VIEW TRAFFIC-SIDE

DETAIL 2

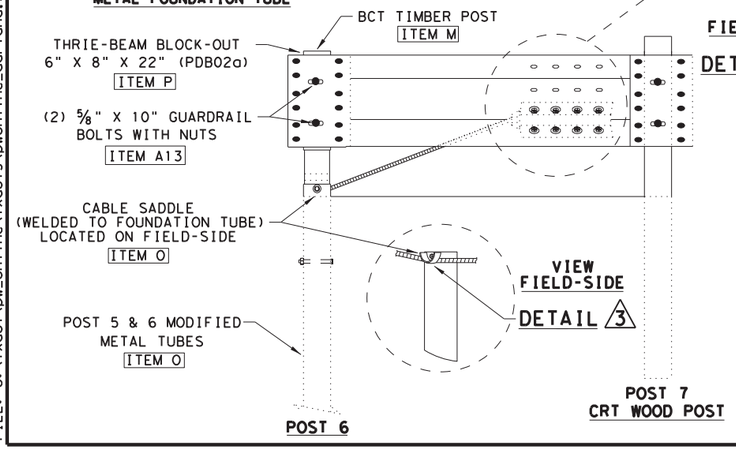
BCT (POST 5) TIMBER POST WITH METAL FOUNDATION TUBE



NOTE: INSTALL (1) FLAT WASHER UNDER EACH BOLT HEAD.

VIEW FIELD-SIDE

DETAIL 4



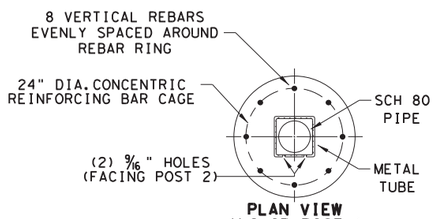
VIEW FIELD-SIDE

DETAIL 3

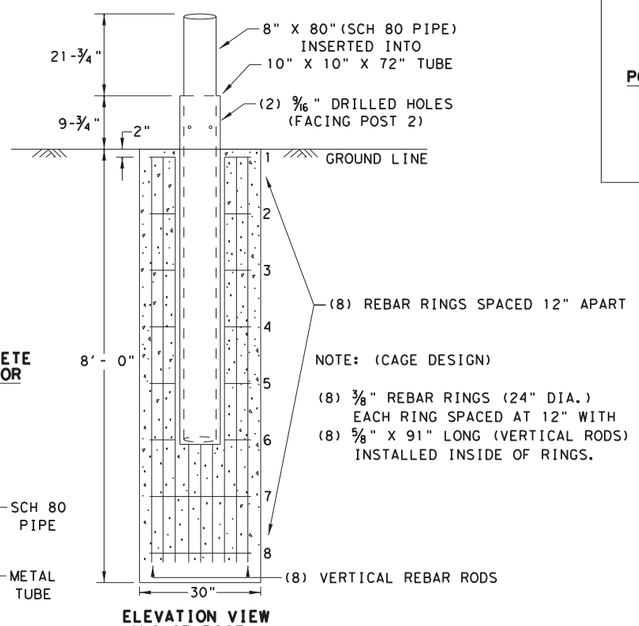
POST 6

POST 7 CRT WOOD POST

POST 1 REINFORCED CONCRETE FOUNDATION ANCHOR



PLAN VIEW ANCHOR POST 1



NOTE: (CAGE DESIGN)

(8) 3/8" REBAR RINGS (24" DIA.) EACH RING SPACED AT 12" WITH (8) 5/8" X 91" LONG (VERTICAL RODS) INSTALLED INSIDE OF RINGS.

ELEVATION VIEW ANCHOR POST 1

(MASH TL-3 COMPLIANT)
TESTED TO MASH TL-3 WITH A 3:1 SLOPE

Texas Department of Transportation | Design Division Standard

TL-3
SHORT RADIUS GUARDRAIL
MASH COMPLIANT

SRG(TL-3)-21

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		END ANCHOR (POST 1 & POST 2) □		TL-3 SHORT RADIUS (POST 2 TO POST 7) △		TL-3 TRANSITION (POST 7 TO POST 17) ○		TL-3 SHORT RADIUS GUARDRAIL COMPLETE SYSTEM	
ITEM	ALL LARGE & SMALL COMPONENT DESCRIPTIONS	ITEM	QTY	ITEM	QTY	ITEM	QTY	ITEM	TOTAL QTY
A	POST 1 TOP (SCH.80 PIPE) (8" X 80" LENGTH)	A	1					A	1
B	POST 1 TOP (WELDED SUPPORT COLLAR 10" X 10" X ½" ASTM A36)	B	1					B	1
C	POST 1 TUBE (HSS 10" X 10" X ½" X 72" LENGTH) A500 GR.B	C	1					C	1
D	POST 1 (WELDED PLATE 9 ¼" X 9 ¼" X ⅛") A36	D	1					D	1
E	POST 1 STRUT BRACKET (C8 X 11.50 A36)	E	1					E	1
F	(POST 1 & 2) CHANNEL STRUTS (4" X 71 ½")(C4 X 7.25)A36	F	2					F	2
G	THRIE-BEAM RAIL (END ANCHOR - ROUNDED TYPE) 12GA. (RTE02a)	G	1					G	1
H	THRIE-BEAM RAIL (ANCHOR) (6'-3" LENGTH) 12GA. (RWM14a)	H	1	H	1			H	2
I	THRIE-BEAM RAIL (8 SPACE) (12'-6" LENGTH) 12GA. (RTM08)			I	1	I	2	I	3
J	THRIE-BEAM RAIL (RADIUS 8'-4 ½") (SLOTTED) 12GA.			J	1			J	1
K	THRIE-BEAM RAIL (3 SPACE) (9'-4 ½" LENGTH) 12GA.					K	1	K	1
L	THRIE BEAM RAIL (TERMINAL CONNECTOR) (BRIDGE-RAIL) (RTE01b)					L	1	L	1
M	POST 2,4,5,6 BCT TIMBER (5 ½" X 7 ½" X 46") (PDF04)			M	4			M	4
N	POST 2,4, BCT TUBE (6" X 8" X 3/16" X 72" LENGTH) (PTE05)			N	2			N	2
O	POST 5,6 MODIFIED BCT TUBES (FOR WELDED CABLE SADDLES)			O	2			O	2
P	POST 3,4,6,7,8 THRIE-BEAM BLOCK-OUT (6" X 8" X 22")(PDB02a)			P	4	P	1	P	5
Q	POST 3,7,8 CRT TIMBER POSTS (6" X 8" X 72" LENGTH)(PDE09)			Q	2	Q	1	Q	3
R	POST 9,10,11 I-BEAM POSTS (W6X8.5 X 72" LENGTH) (PWE01)					R	3	R	3
S	POST 9,10,11 ROUTED W-BEAM BLOCK-OUT(6" X 8" X 14")(PDB01b)					S	3	S	3
T	POST 12 THRU 17 I-BEAM POSTS (W6X8.5 X 84" LENGTH) (PWE07)					T	6	T	6
U	POST 12 THRU 17 ROUTED BLOCK-OUT (6" X 8" X 18") (PDB??)					U	6	U	6
V	SAND BARRELS 700-715 LBS							V	6
A1	BCT CABLE ANCHOR ASSEMBLIES (¾" X 6'-6 ¾" LENGTH) (FCA01)	A1	2					A1	2
A2	BCT CABLE ANCHOR BRACKET (FPA01)	A2	2	A2	1			A2	3
A3	⅝" X 2" HEX BOLT A307 GRD.5 (FOR CABLE BRACKETS)	A3	18	A3	8			A3	26
A4	⅝" FLAT WASHER A307 GRD.5 (1 WASHER UNDER BOLT HEAD & 1 NUT)	A4	36	A4	40			A4	76
A5	⅝" RECESSED H.G.R NUT (NUTS FOR HEX BOLTS)	A5	22	A5	20			A5	42
A6	STRUT BRACKET HARDWARE (½" X 1 ½") HEX BOLT A307 GRD.5	A6	2					A6	2
A7	CHANNEL STRUT HARDWARE (⅝" X 10") HEX BOLT A307 GRD.5	A7	2					A7	2
A8	BCT CABLE ANCHOR ASSEMBLY (FCA02) (¾" X 18'-5" LENGTH)			A8	1			A8	1
A9	BCT POST SLEEVE (FMM02a) (POST 4 ONLY)			A9	1			A9	1
A10	BCT CABLE BEARING PLATE (⅝" X 8" X 8" (FPB01) (POST 4 ONLY)			A10	1			A10	1
A11	⅝" X 1 ¼" H.G.R. BOLTS (FBB01) (SPLICES AT POST 2,4,6,7)			A11	48			A11	48
A12	⅝" X 2" H.G.R. BOLTS (FBB02)(ROUND TERM-POST 10-END SPLICE)	A12	4			A12	24	A12	28
A13	⅝" X 10" H.G.R. BOLTS (FBB03) (I-BEAM POSTS RAIL & BLOCKOUT)					A13	18	A13	18
A14	⅝" X 18" H.G.R. BOLTS (FBB04) (POSTS 3,4,6,7,8)			A14	8	A14	2	A14	10
A15	⅝" X 7 ½" HEX BOLTS A307 GRD.5 (BCT POSTS 2,4,5,6)			A15	8			A15	8
A16	⅝" X 10" HEX BOLTS A307 GRD.5 (BCT POSTS 2,4,5,6)			A16	4			A16	4
A17	RECTANGULAR WASHERS (FWR03) (FOR TERMINAL CONNECTOR RTE01b)					A17	12	A17	12
A18	⅞" X (LENGTH VARIES) HEX BOLTS A325 OR A449 GR.5					A18	5	A18	5
A19	1 ¾" O.D. HARDENED FLAT WASHER A325					A19	10	A19	10
A20	⅞" HEX NUT GR.5 A325					A20	5	A20	5

GENERAL NOTES

1. FOR ADDITIONAL INSTALLATION INFORMATION AND GUIDANCE CONTACT: TEXAS DEPARTMENT OF TRANSPORTATION, (TXDOT'S DESIGN DIVISION). (512) 416-2678. THE EXACT POSITION OF MBGF SHALL BE SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER. THE SIGHT DISTANCE OF THE INSTALLATION WILL NEED TO BE VERIFIED WITH RESPECT TO THE SPECIFIC SITE PLACEMENT.
2. STEEL POSTS ARE NOT PERMITTED AT CRT OR BCT POST POSITIONS.
3. RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 12 ½" OR 25 FOOT NOMINAL LENGTHS.
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 NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
5. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
7. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A SLOPE RATE OF NOT MORE THAN 1V:10H.
8. IT IS NOT RECOMMENDED THAT GUARD FENCE BE PLACED IN THE VICINITY OF CURBS.
9. GUARDRAIL POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
10. SPECIAL FABRICATION WILL BE REQUIRED FOR THRIE BEAM RAIL RADIUS (ITEM J).
11. ALL MATERIAL AND WORK INVOLVED IS SUBSIDIARY TO SHORT RADIUS BID ITEM, INCLUDING, BUT NOT LIMITED TO FOUNDATIONS, GRADING, THRIE BEAM RAIL, SAND BARRELS, AND OTHER PARTS.
12. ALL CABLE ASSEMBLIES SHOULD BE TAUT AFTER INSTALLATION. WHEN CABLES ARE MANIPULATED BY HAND THE CABLES SHOULD NOT MOVE MORE THAN 1" IN ANY DIRECTION PERPENDICULAR TO THE CABLE.
13. THE BCT BEARING PLATE INSTALLED AT POST 4 SHOULD BE ORIENTED SUCH THAT THE 3" DIMENSION FROM PLATE EDGE TO CENTER OF BOLT HOLE IS ON THE BOTTOM AND 5" DIMENSION FROM PLATE EDGE TO CENTER OF BOLT HOLE IS ON THE TOP.
14. FOUNDATION AT POST 1 SHALL BE CLASS C CONCRETE.
*15. POST (1) IS NOT A CRASHWORTHY TERMINAL. THE DESIGN AND PLACEMENT OF POST (1) MUST BE OUTSIDE OF THE CLEAR ZONE OF THE SECONDARY ROADWAY USING THE RESPECTIVE CLEAR ZONE CRITERIA. PLEASE CONTACT THE DESIGN DIVISION (512) 416-2678 FOR ASSISTANCE IN DETERMINING THE APPROPRIATE USE AND/OR PLACEMENT OF THE SYSTEM IN CONSTRAINED LOCATIONS. THE PAYMENT OF THE COMPLETE SYSTEM WILL BE WITH BID ITEMS: 540 XXXX TL-3 31" SHORT RADIUS (COMPLETE).
16. TESTED TO MASH WITH A 3:1 SLOPE OR SHALLOWER IS PREFERABLE IN THE LIMITS OF THE TOP AND BOTTOM OF THE SLOPE AS SHOWN IN THE PLAN VIEW. IF FIELD CONDITIONS REQUIRE A STEEPER SLOPE, THIS MAY BE ALLOWABLE UP TO A 2:1 SLOPE. CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE.
17. THE BARRELS ARE ENERGY ABSORPTION ENERGITE III, MODEL 640 FILLED WITH 715 LB (+/-15) SAND; OR AN APPROVED EQUIVALENT. THE APPROXIMATE HEIGHT OF THE BARREL IS 41" (+/-).
18. ALTERNATE METHODS TO TERMINATE THE SRG ALONG THE PRIMARY ROADWAY ARE AVAILABLE WHEN SITE CONDITIONS DICTATE. CONTACT DESIGN DIVISION FOR DETAILS: 512 416-2678

NOTE: SEE SHEET 1 OF 3.

(MASH TL-3 COMPLIANT)
TESTED TO MASH TL-3 WITH A 3:1 SLOPE

SPECIAL APPLICATION NOTES.

1. THIS IS A MASH COMPLIANT TL-3 SHORT RADIUS GUARDRAIL SYSTEM WITH A TOP RAIL HEIGHT OF 31". AVAILABLE FOR USE ON ANY SPEED ROADWAY. THE SYSTEM REQUIRES A MINIMUM PLACEMENT FOOTPRINT OF 34'-10" ALONG THE PRIMARY ROAD AND A 35'-0" ALONG SECONDARY DRIVEWAY.
2. IT IS CRITICAL THAT THE PRIMARY GUARDRAIL MAINTAIN A (4 DEGREE FLARE) WITH THE SECONDARY DRIVEWAY.
3. THE SYSTEM REQUIRES A MINIMUM 5' WIDE (WORK ZONE) DIRECTLY BEHIND THE GUARDRAIL SYSTEM WITH A SLOPE AT 1V:10H OR FLATTER FROM THERE A MAXIMUM 3:1 SLOPE IS RECOMMENDED. SEE SHEET 1 OF 3 FOR FLARE AND SLOPE DETAILS.
4. NOTE FOR INSTALLER: THE THREE (3) CRT POSTS ITEM (Q), AT POST LOCATIONS, 3, 7, & 8.), REQUIRE THE FOLLOWING FIELD ADJUSTMENT. USING A ¾" X 10" LONG SPADE BIT DRILL ONE (1) ADDITIONAL HOLE 7-⅞" DIRECTLY BELOW THE EXISTING TOP HOLE TO ACCOMMODATE THE HARDWARE FOR THE 22" LONG BLOCKOUT.

   OPTION FOR ADDITIONAL ¾" HOLE. THE 22" LONG BLOCKOUT (PDB01a) IS MANUFACTURED WITH TWO ¾" DRILLED HOLES FOR THE POST HARDWARE, THEREFORE THE BLOCKOUT CAN BE USED AS A TEMPLATE GUIDE FOR THE BOTTOM ¾" HOLE. AFTER INSTALLING THE CRT POST USE THE TOP HOLE TO MOUNT THE 22" LONG BLOCKOUT TO POST, USE THE BLOCKOUT'S PRE-DRILLED HOLE AS A GUIDE FOR THE BOTTOM ¾" HOLE.

Texas Department of Transportation — Design Division Standard

TL-3 SHORT RADIUS GUARDRAIL MASH COMPLIANT

SRG(TL-3)-21

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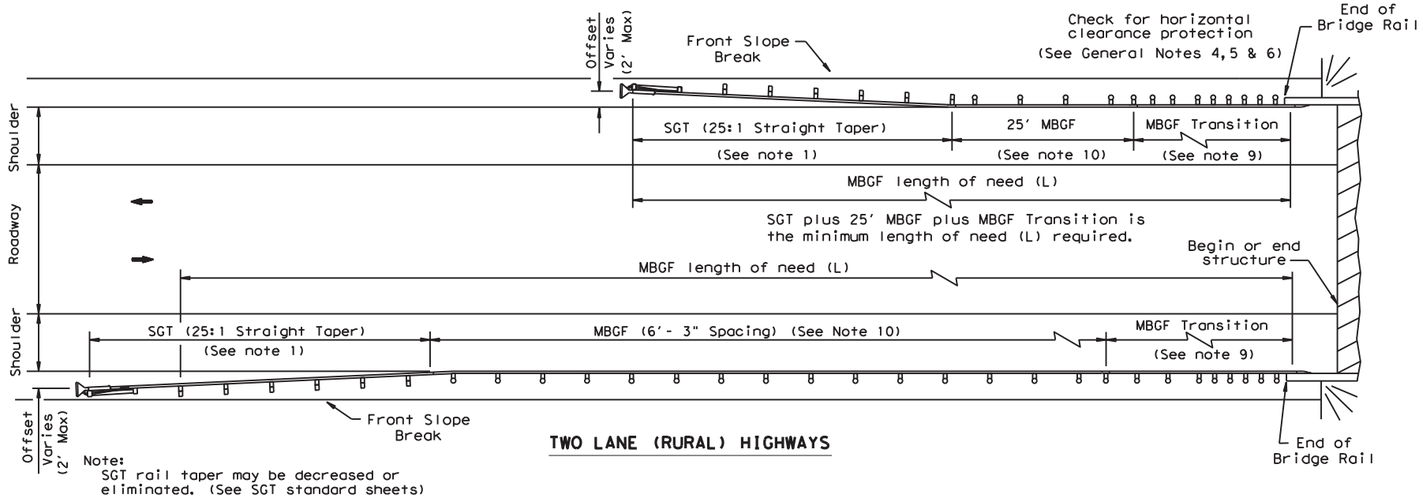
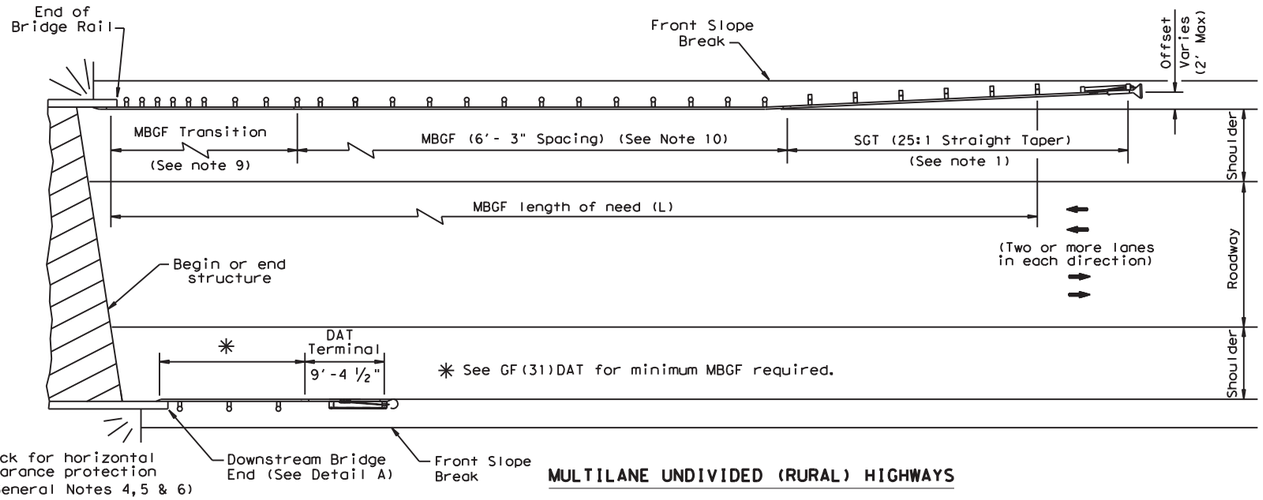
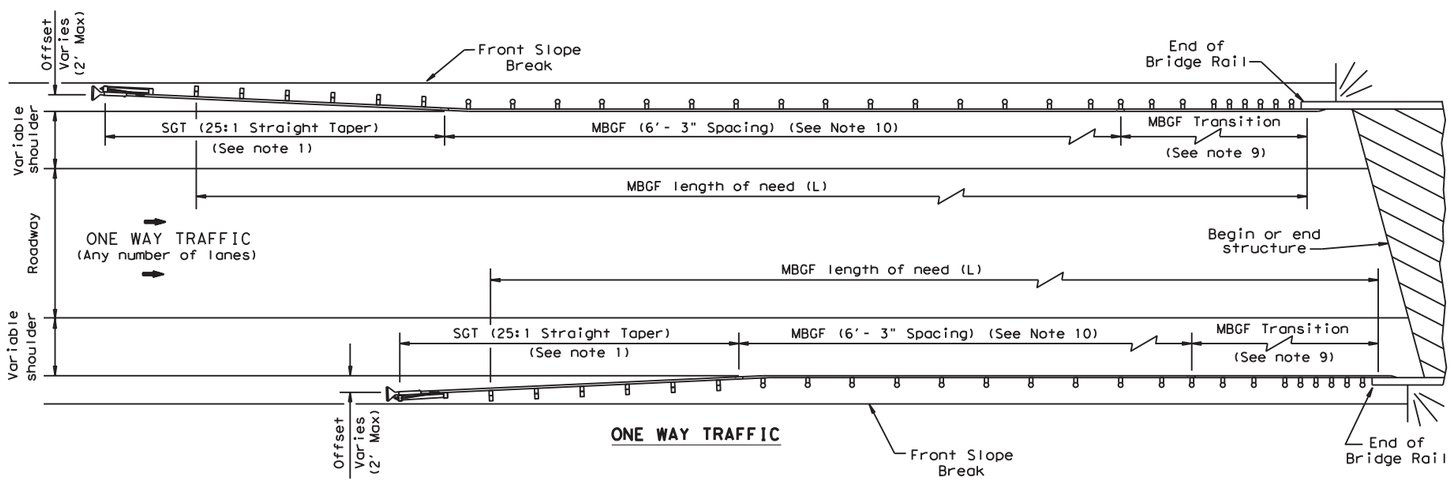


TWO LANE (RURAL) HIGHWAYS

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



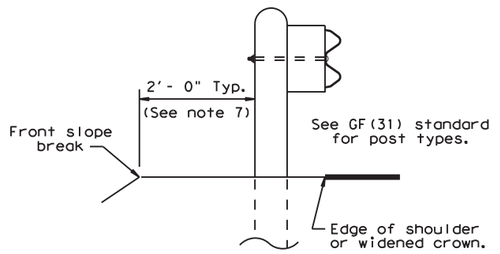
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



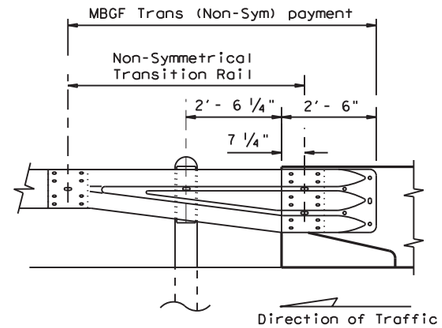
ONE WAY TRAFFIC

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 REVISED APRIL 2014 SEE (MEMO 0414)	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		65

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DATE: 2/27/2023
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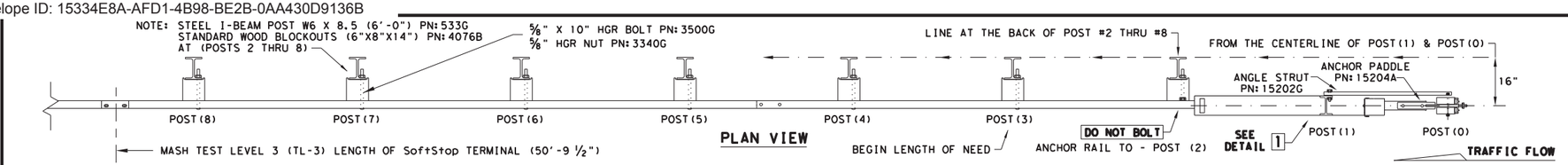
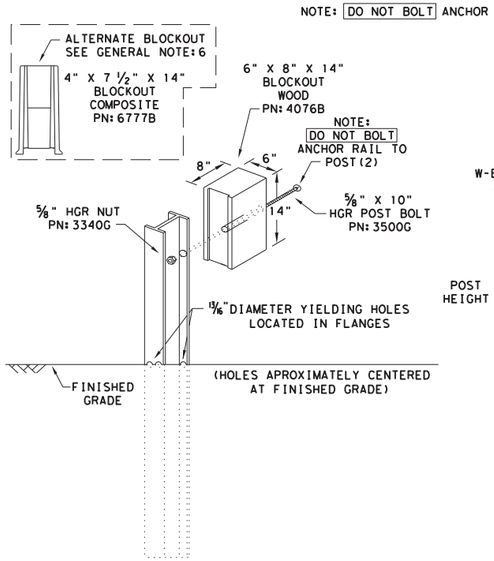
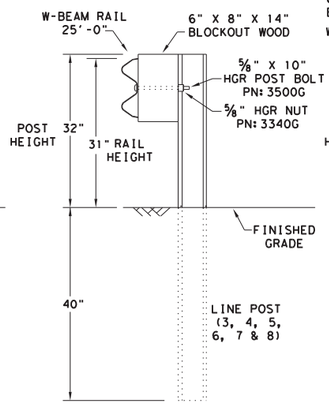




ISOMETRIC VIEW POST(1 & 2)

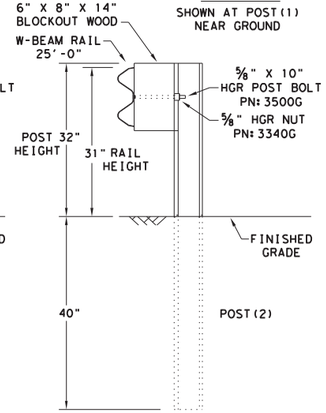
W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)



SECTION VIEW B-B

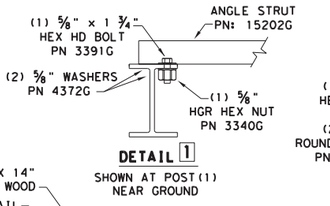
6'-0" (W6 X 8.5)
I-BEAM POST PN: 533G



SECTION VIEW A-A

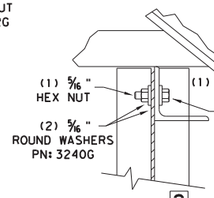
6'-0" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15000G

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



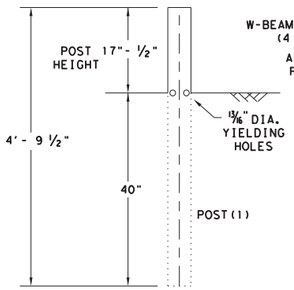
DETAIL 1

SHOWN AT POST(1) NEAR GROUND



DETAIL 2

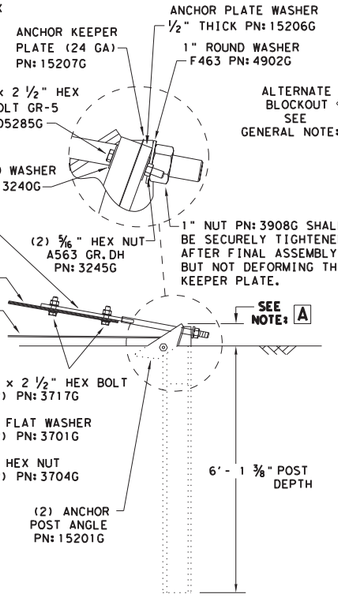
SHOWN AT POST(1)



FRONT VIEW POST(1)

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

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

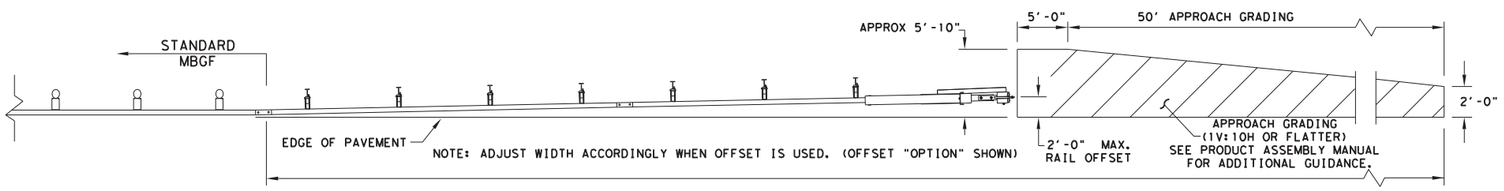


DETAIL 3

AT POST(0)

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

TRAFFIC FLOW



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	09	055, etc.		US 90, etc.	
	DIST	COUNTY			SHEET NO.	
	22	VAL VERDE, etc.			66	

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(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

ITEM (10) CABLE ASSEMBLY

ITEM (2) GROUNDSTRUT

NO BLOCKOUT AT (POST 1)

POST 9 POST 8 POST 7 POST 6 POST 5 POST 4 POST 3 POST 2

RAIL 4 RAIL 3 RAIL 2 RAIL 1

CABLES

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.

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

MBGF RAIL 2

INSTALL GUARD FENCE RECESSED HEX NUTS ON TRAFFIC-SIDE

MBGF RAIL 1

DETAIL (C)

TRAFFIC FLOW

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'- ¾" 6'-3" 6'-3" 6'-3" 37 ½" 5'-3 11/16"

ITEM (25) MAX-TENSION HEAD **SEE DETAIL (A)**

RAIL HEIGHT 31"

ITEM (13) RAIL 4 ITEM (13) RAIL 3 ITEM (13) RAIL 2 ITEM (13) RAIL 1

ARROWS

DETAIL (D)

RAIL HEIGHT 31"

HEAD HEIGHT

DETAIL (B)

32-¼"

FINISHED GRADE

CABLES

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)

(8) X-LITE LINE POST - ITEM (11)

ELEVATION VIEW

SOIL ANCHOR POST ITEM (1)

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)

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

NOTE:
USE THE MASH APPROVED X-TENSION CABLE ASSEMBLY.

7 5/16"

2 ⅛"

UPPER CABLE (BACK SIDE)

LOWER CABLE (TRAFFIC SIDE)

DETAIL (B)

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)

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.

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

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

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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

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

Texas Department of Transportation

Design Division Standard

MAX-TENSION END TERMINAL MASH - TL-3

SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		67

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DATE: 2/27/2023
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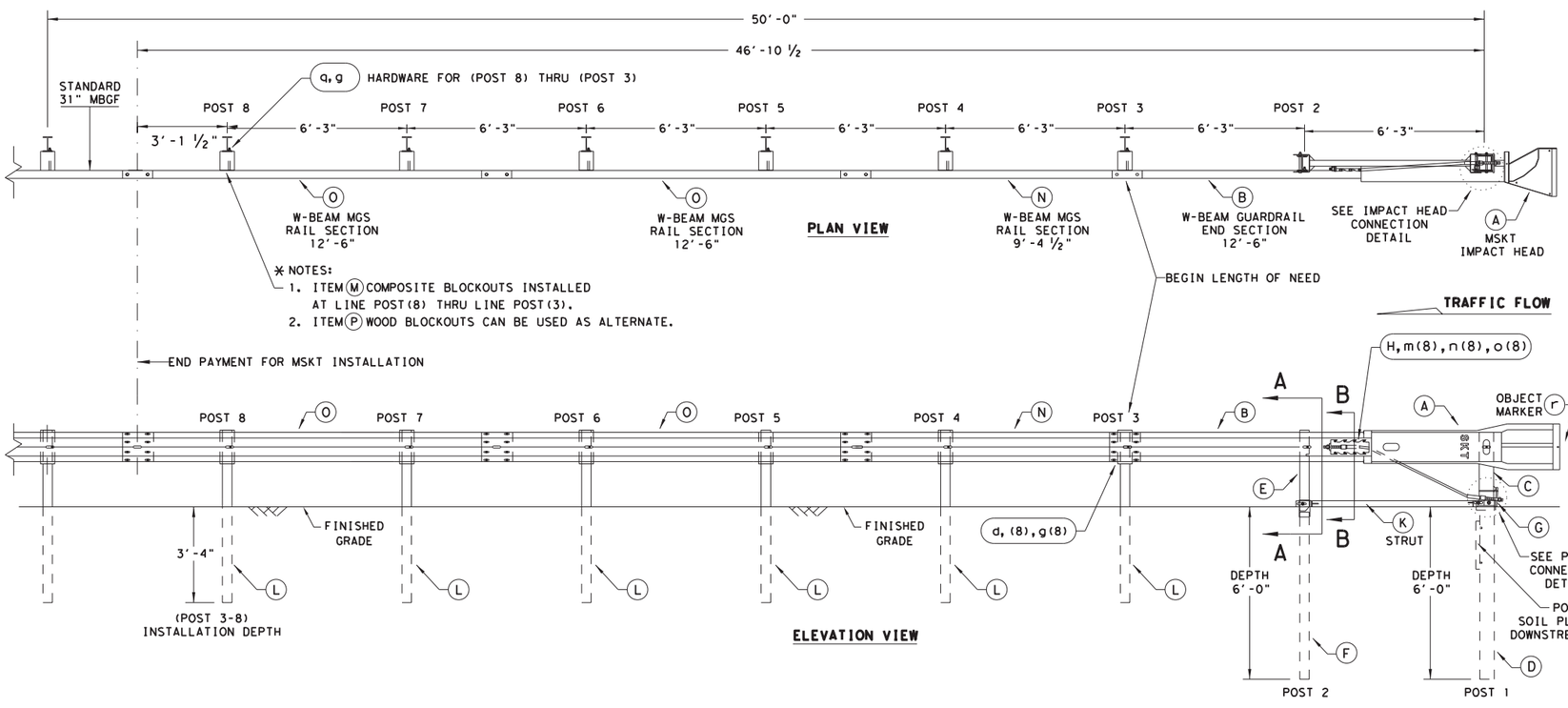
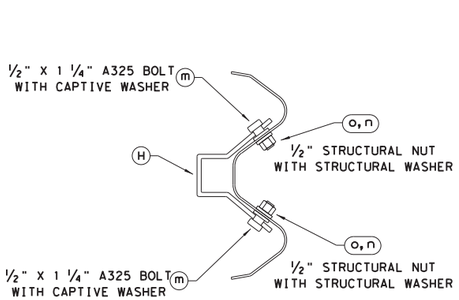
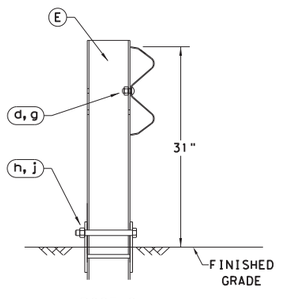


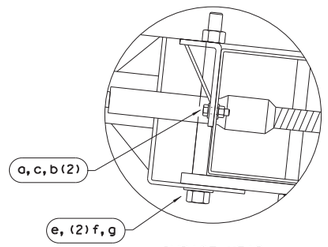
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



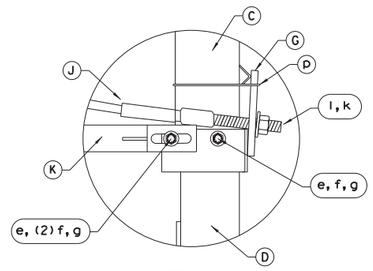
SECTION B-B
ANCHOR BRACKET



POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL

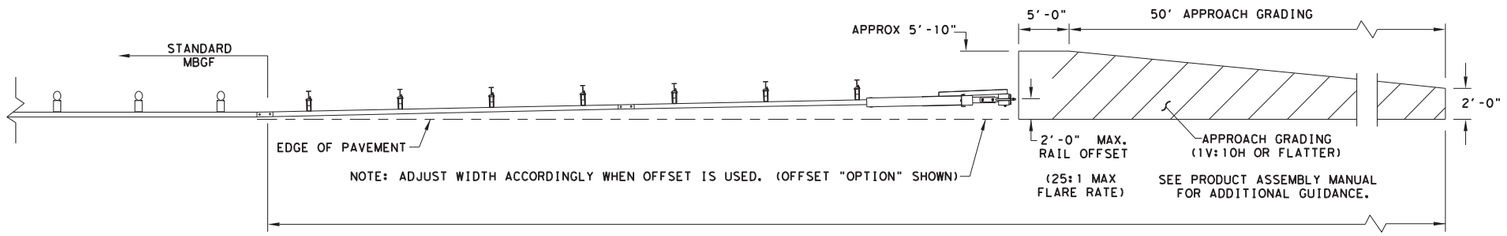
GENERAL NOTES

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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X ⅛" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 ½")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	⅝" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	⅝" WASHER	W0516
c	2	⅝" HEX NUT	N0516
d	25	⅝" Dia. x 1 ¼" SPLICE BOLT (POST 2)	B580122
e	2	⅝" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	⅝" WASHER	W050
g	33	⅝" Dia. H.G.R NUT	N050
h	1	¾" Dia. x 8 ½" HEX BOLT (GRD A449)	B340854A
j	1	¾" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	½" x 1 ¼" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	½" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x ⅜" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	⅝" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

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



APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

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

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

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL
MSKT-MASH-TL-3
SGT(12S)31-18

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© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0022	09	055, etc.	US 90, etc.	
	DIST	COUNTY		SHEET NO.	
	22	VAL VERDE, etc.		68	

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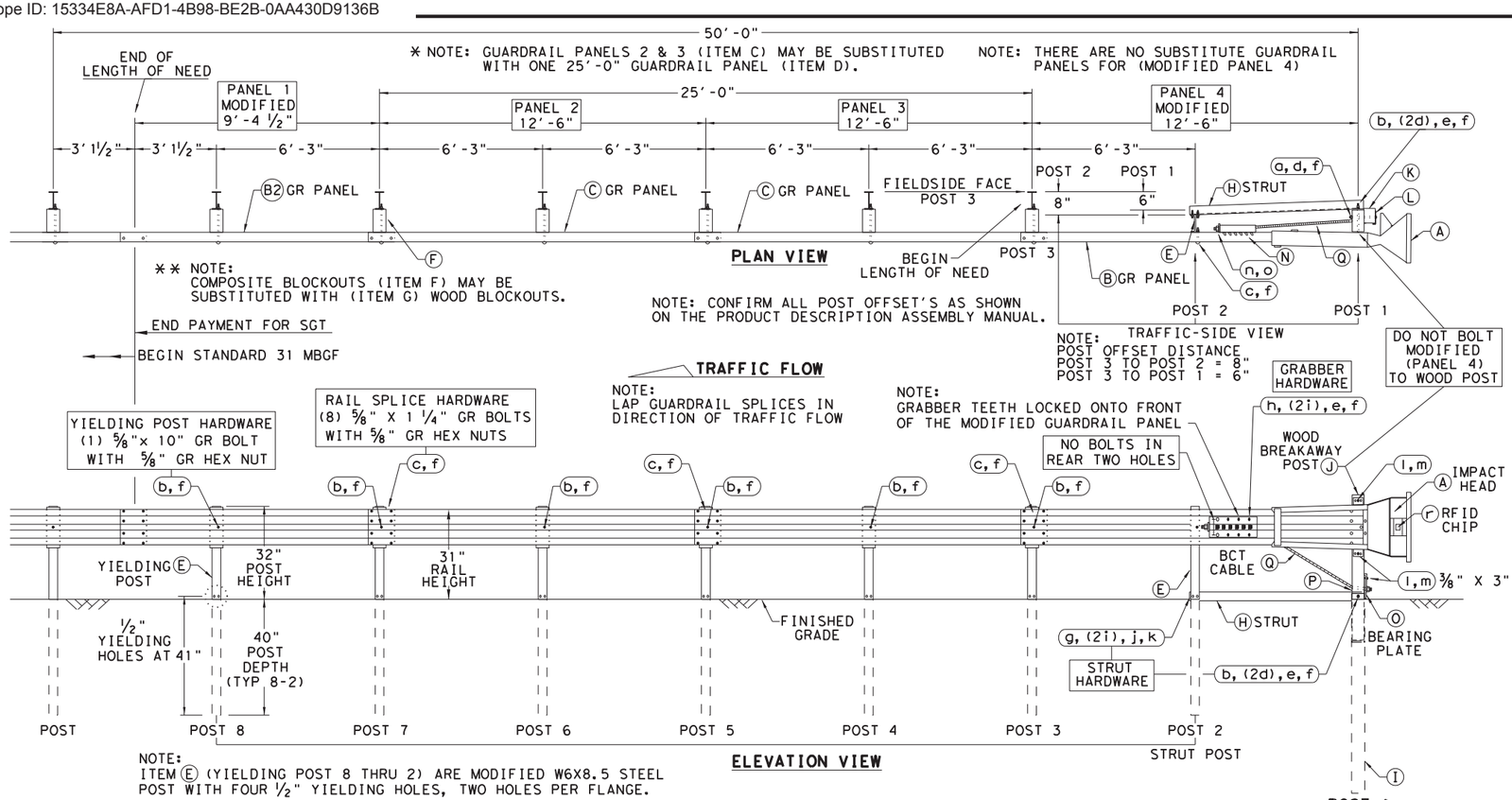
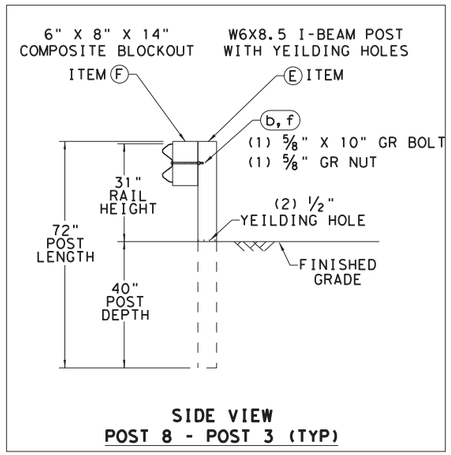


GENERAL NOTES

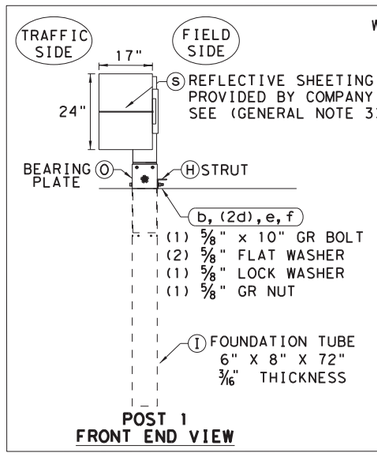
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY 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

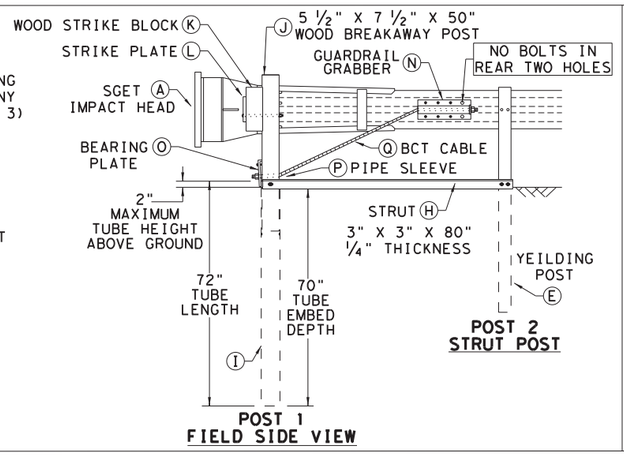
ALTERNATIVE ITEMS * D
NOTE: SEE PLAN VIEW ** G



SIDE VIEW
POST 8 - POST 3 (TYP)

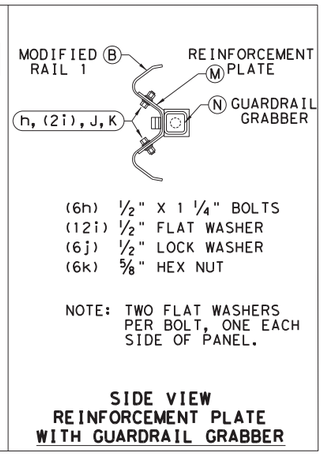


POST 1
FRONT END VIEW



POST 2
STRUT POST

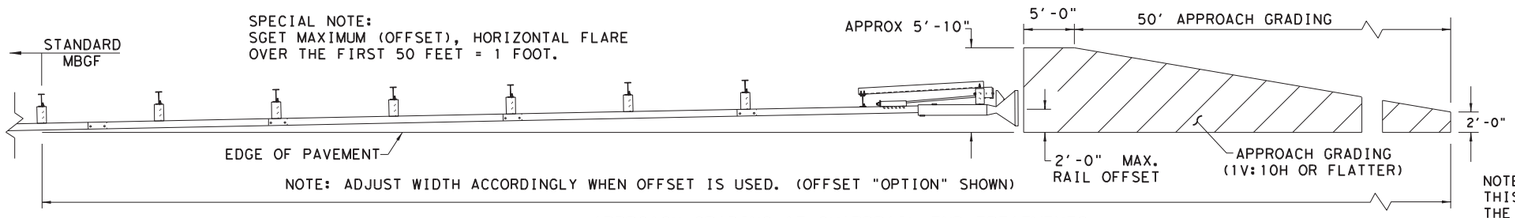
POST 1
FIELD SIDE VIEW



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

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

SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation
Design Division Standard

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

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	DIST	COUNTY		SHEET NO.		
	22	VAL VERDE, etc.		69		

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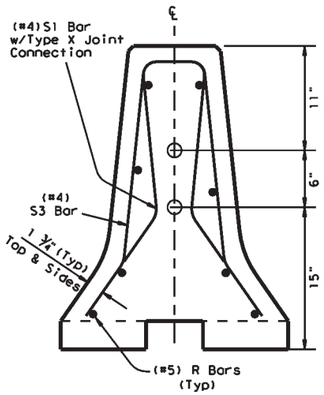
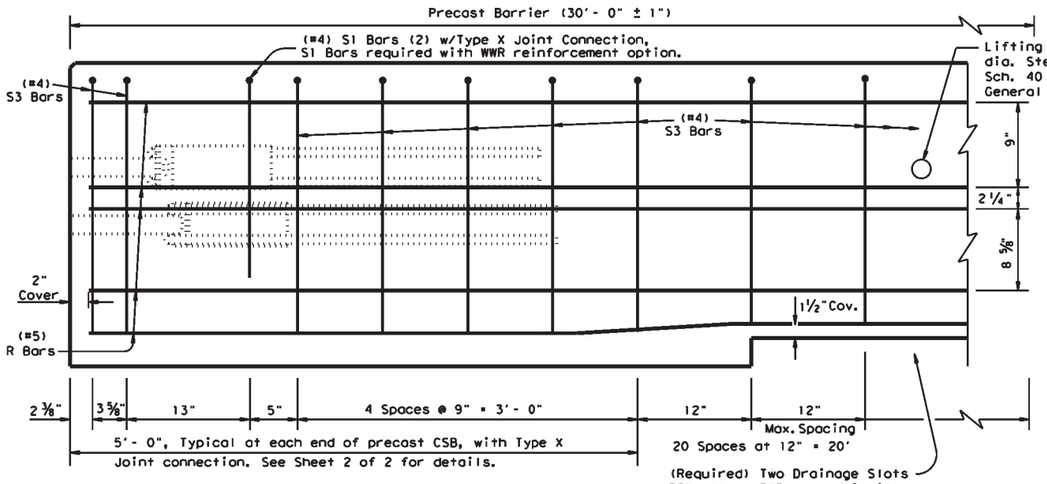


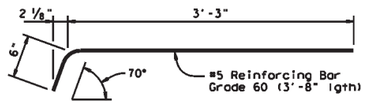
End View Precast Barrier

See sheet 2 of 3 for Joint connection Type X



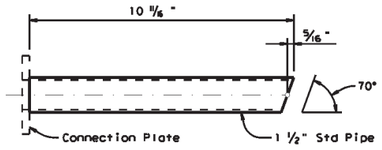
Reinforcement for Precast (CSB) Concrete Safety Barrier (Type 1)

Showing reinforcement for Joint Type X



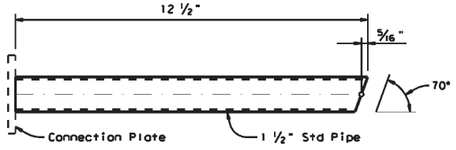
DEFORMED BAR ANCHOR DETAILS

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



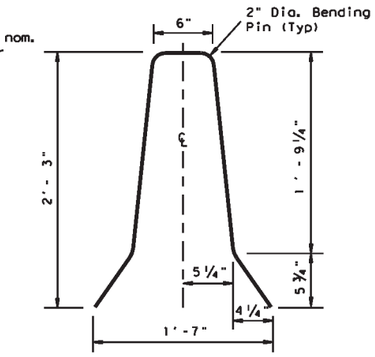
UPPER CONNECTION PIPE DETAILS

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



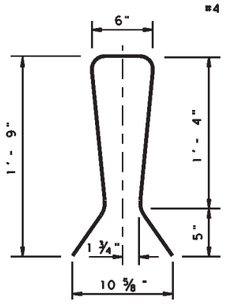
LOWER CONNECTION PIPE DETAILS

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



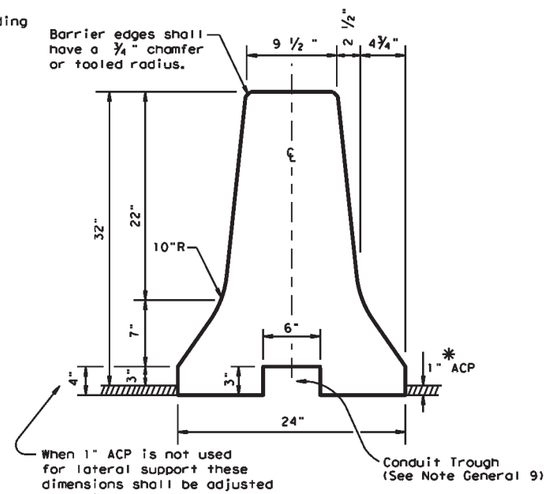
S3 Bar

#4 Bar



S1 Bar

#4 Bar (2)
(Joint Type X)

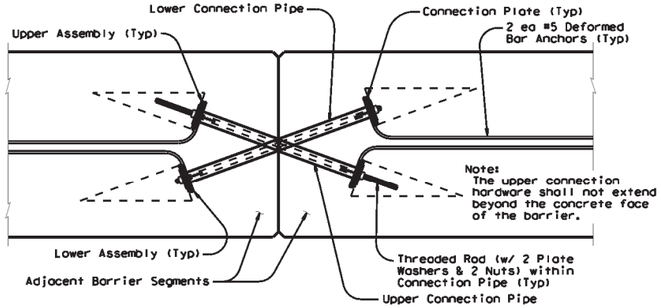


Concrete Safety Barrier

✱ When 1" ACP is "not" used as lateral support for permanent barrier placement. A permissible method of attaining the equivalent lateral support may be used, See CSB(6) sheet.

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 tooled radius.
5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
6. All steel assemblies for joint shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
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 involved.
9. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.



TYPE X JOINT INSTALLATION DETAIL

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

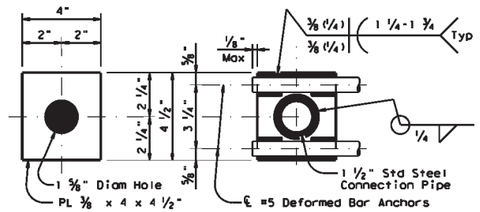
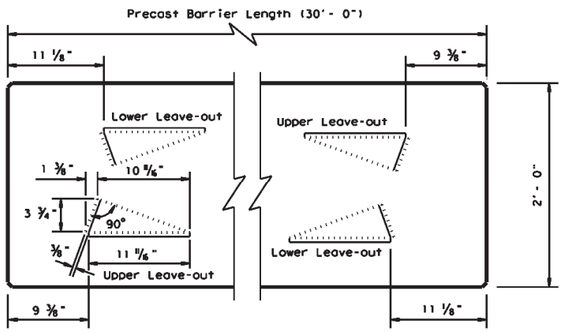


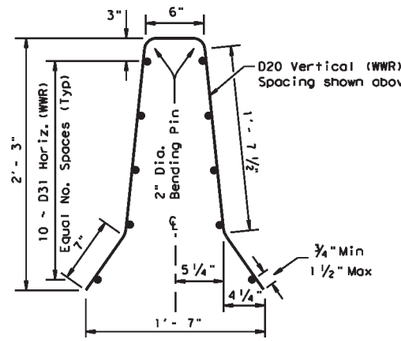
PLATE DIMENSIONS WELDING DETAILS

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.



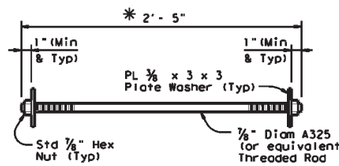
BARRIER PLAN AT END JOINTS



Welded Wire Reinforcement (WWR) Option for Bars R and S3

(WWR) General Notes

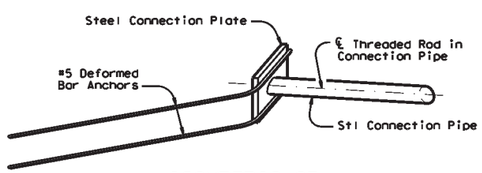
1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing 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".



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.

✱ 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.



ISOMETRIC OF TYPICAL WELDED ASSEMBLY

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

Weight of one Precast 30 ft. (CSB) segment = Approx. 6.5 Tons or 440 lbs per ft.

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER (TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
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REVISIONS	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		70

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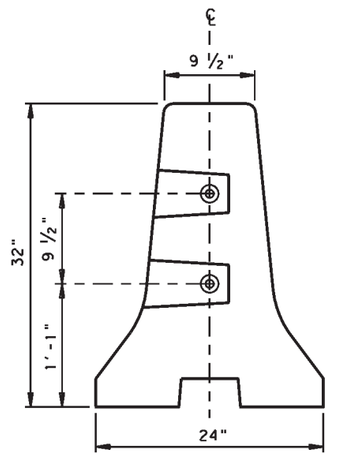
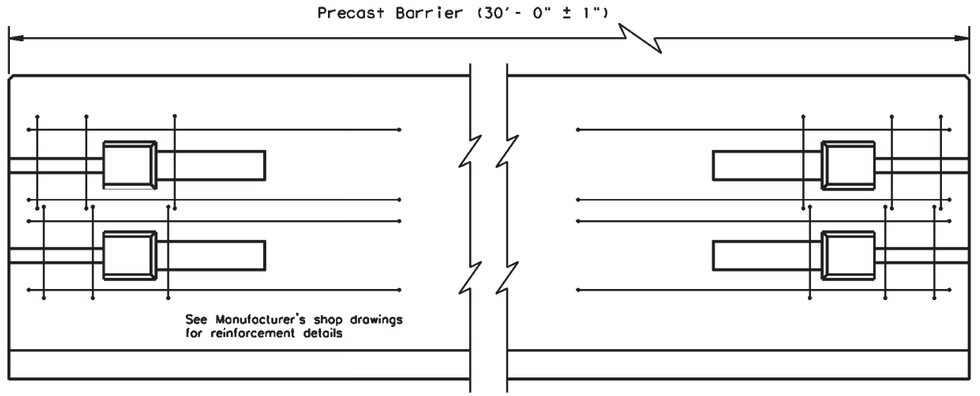
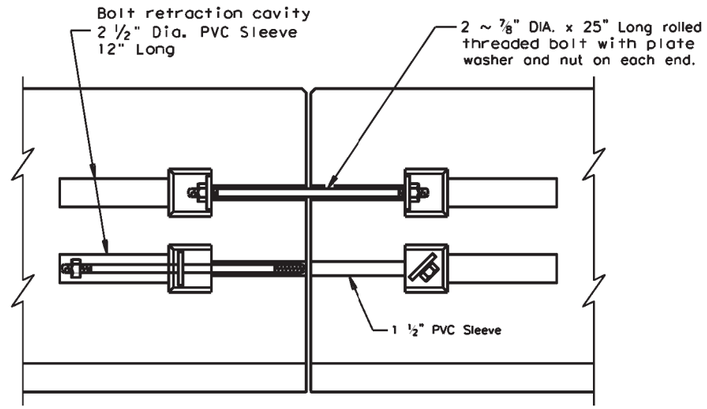


END VIEW (CSB) QUICK-BOLT
QUICK-BOLT POCKET LOCATIONS

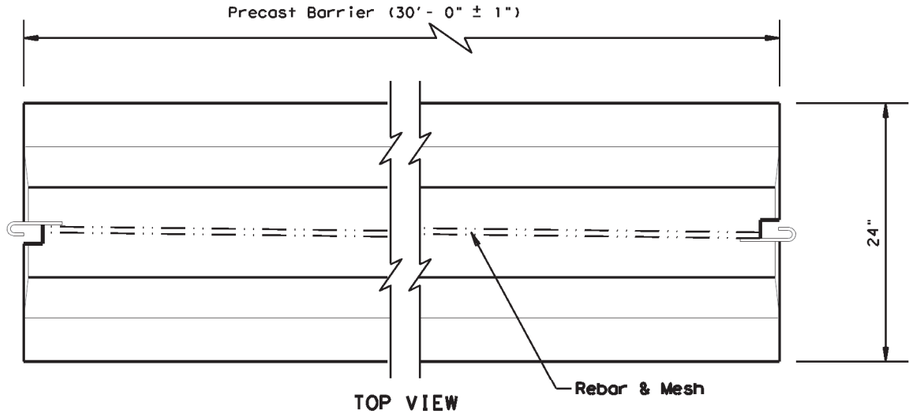


ELEVATION (CSB) QUICK-BOLT
See Manufacturer's shop drawing for additional details

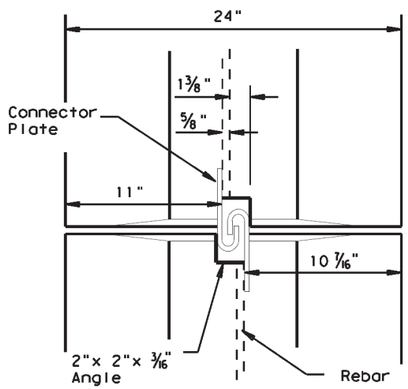


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

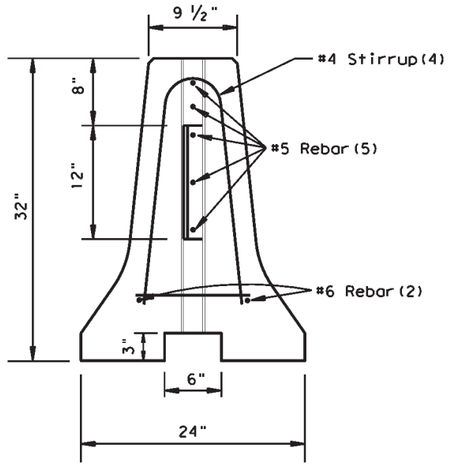
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



END VIEW
J-J HOOK CONNECTION

Joint Connection (Type J)

Proprietary Joint Connections (CSB)

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.

Texas Department of Transportation
Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER (TYPE 1)

CSB(1)-10

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	DIST	COUNTY		SHEET NO.
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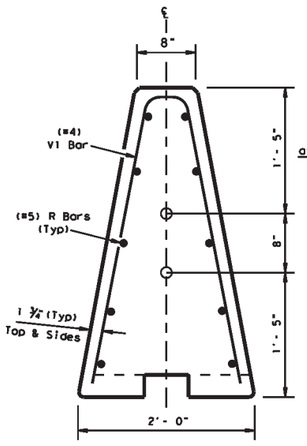
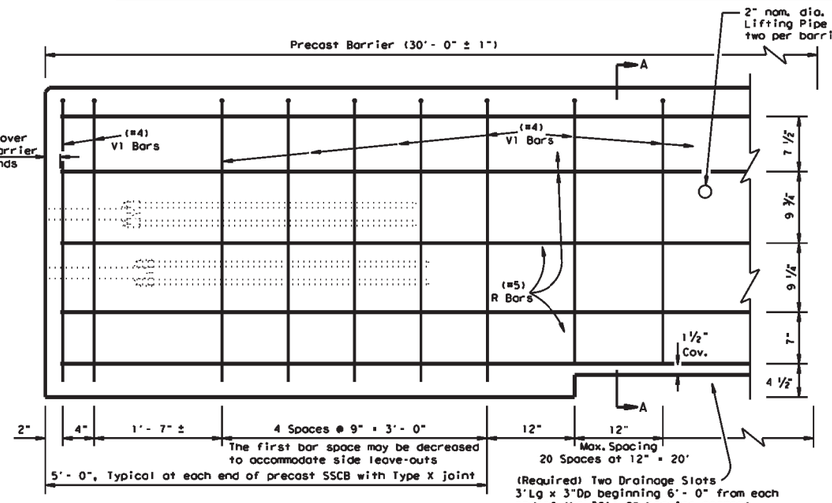


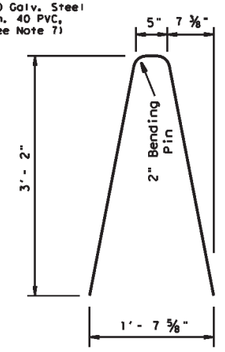
End View
Precast Barrier

Pipe locations for Joint Type X connection



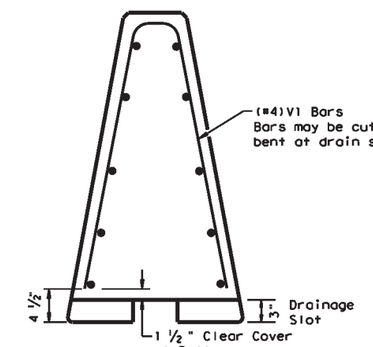
Reinforcement for Precast (SSCB)
Single Slope Concrete Barrier (Type 1)

Showing reinforcement for Joint Connection (Type X)



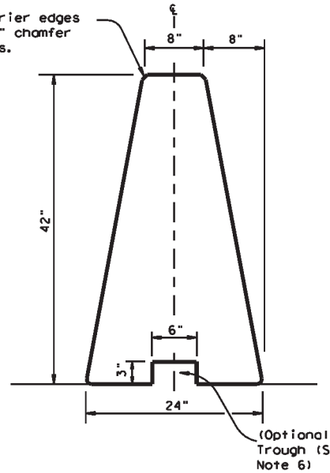
V1 Bar
#4 Rebar

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



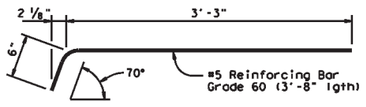
Section A-A
Steel Placement at (Required) Drainage Slots

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



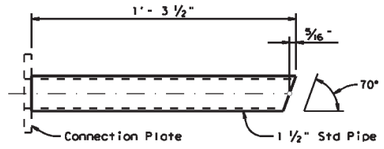
Single Slope Concrete Traffic Barrier

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



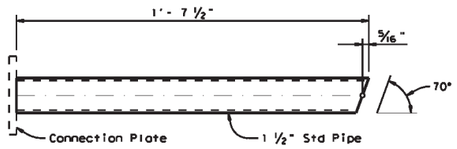
DEFORMED BAR ANCHOR DETAILS

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



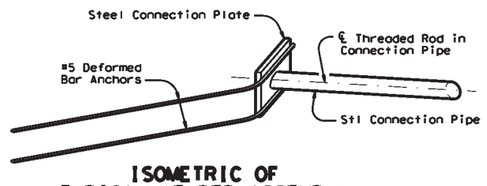
UPPER CONNECTION PIPE DETAILS

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



LOWER CONNECTION PIPE DETAILS

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

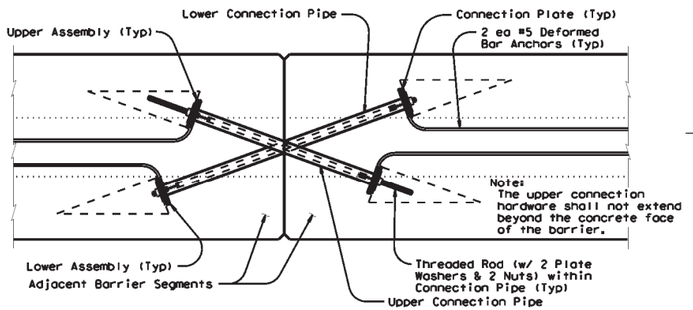


ISOMETRIC OF TYPICAL WELDED ASSEMBLY

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

General Notes

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



TYPE X JOINT INSTALLATION DETAIL

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

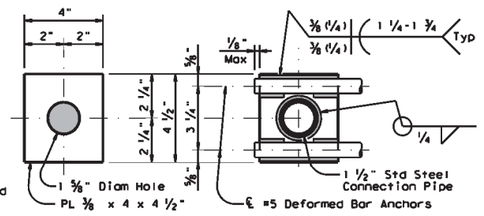
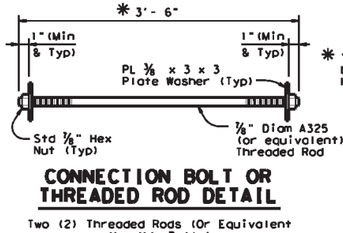


PLATE DIMENSIONS **WELDING DETAILS**

CONNECTION PLATE DETAILS

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

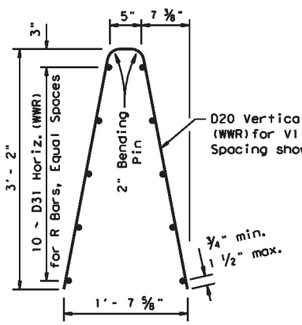


* The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.

CONNECTION BOLT OR THREADED ROD DETAIL

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

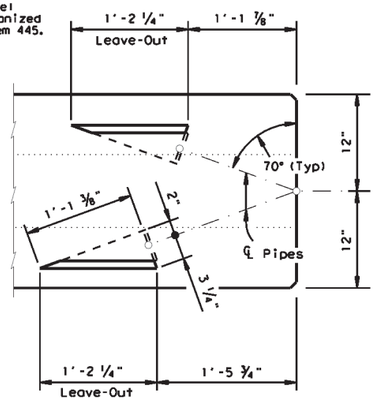
Weight of one precast 30 ft. (SSCB) segment = Approx. 10.5 Tons or 717 lbs per ft.



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

(WWR) General Notes

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



BARRIER PLAN AT JOINT

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1)

SSCB(2)-10

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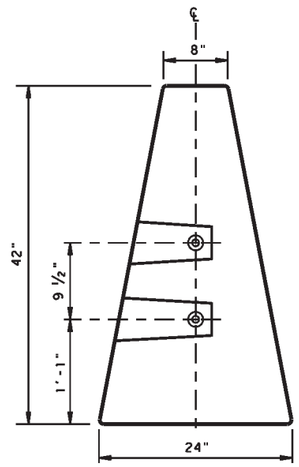
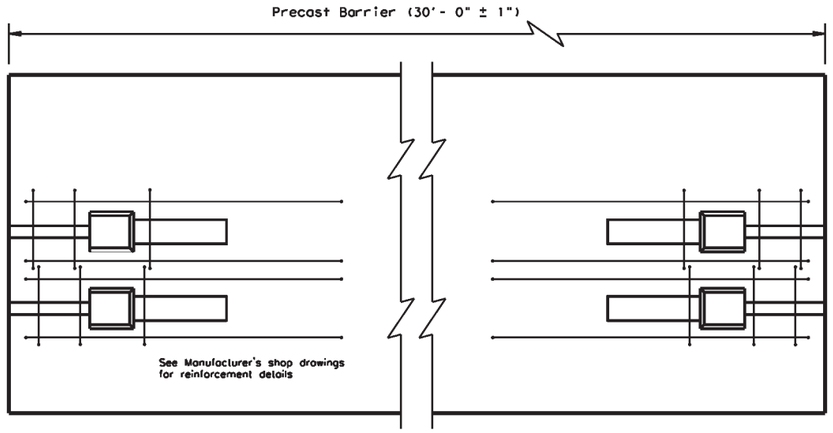
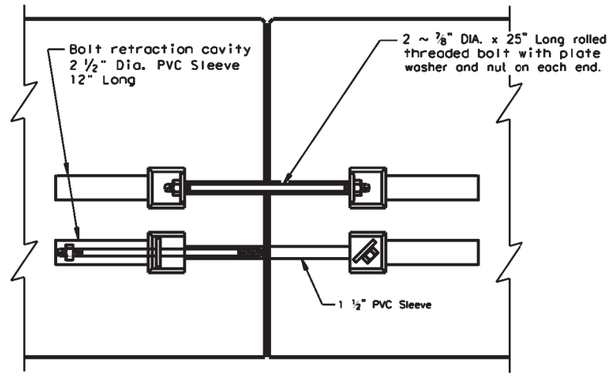


END VIEW
"QUICK-BOLT" POCKET LOCATIONS

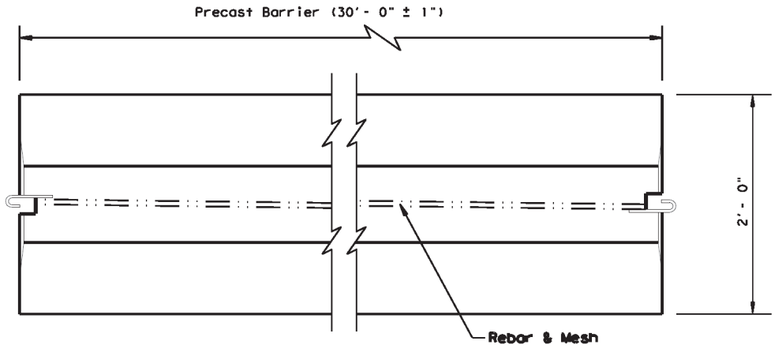


ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details

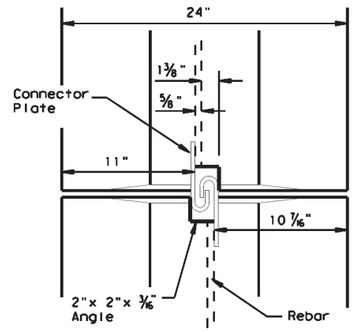


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

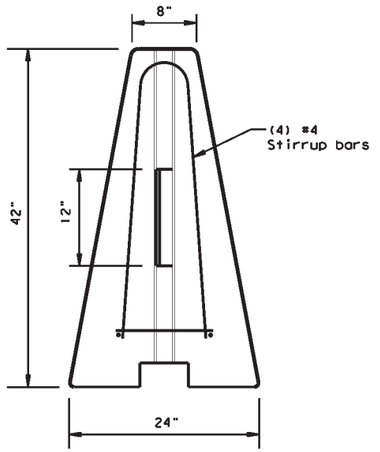
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



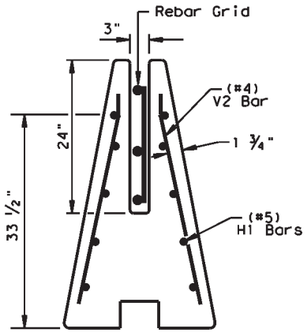
END VIEW

Proprietary Joint Connections (SSCB)

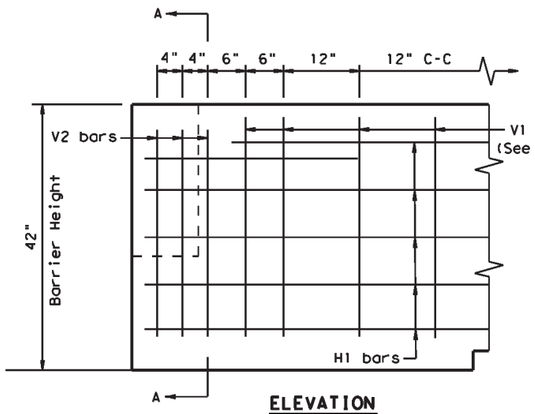
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

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

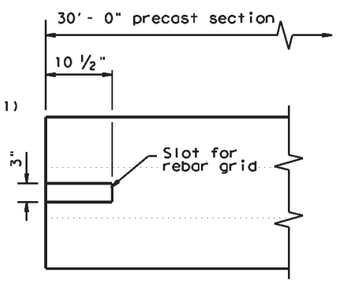
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



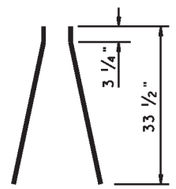
SECTION A-A
Showing (Type R) Rebar Grid



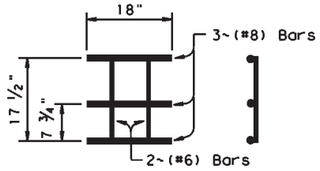
ELEVATION
V1 Bars (See Sheet 1)



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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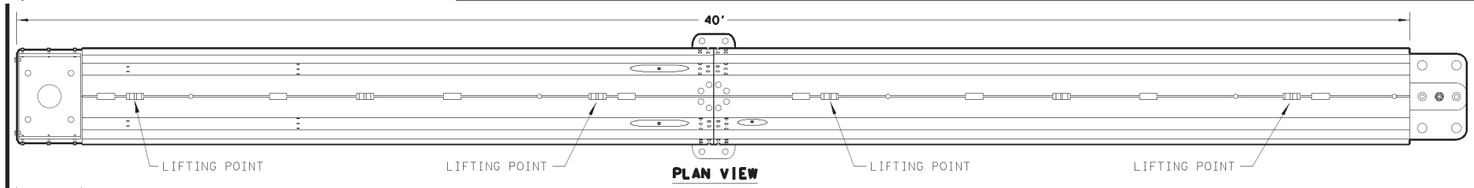
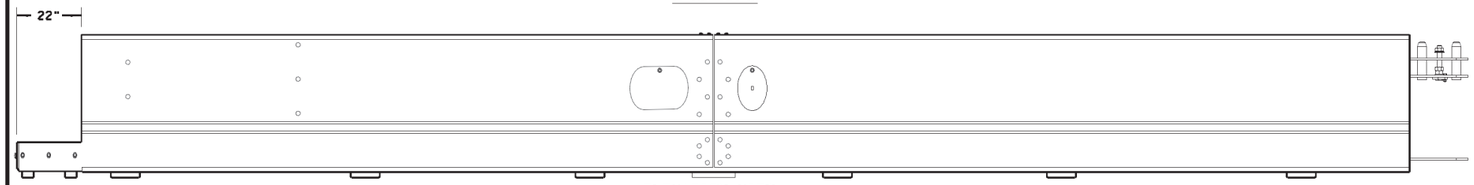
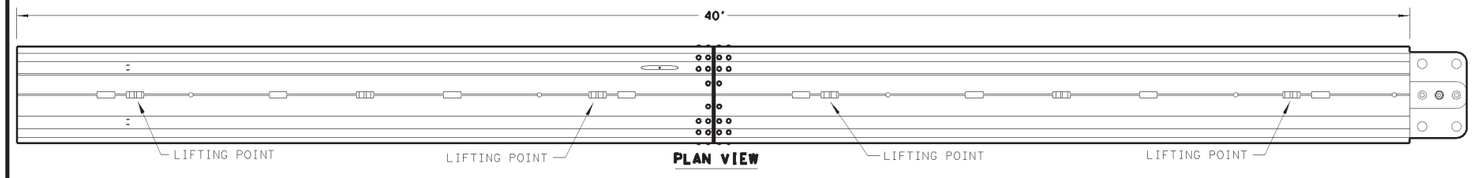


PLAN VIEW

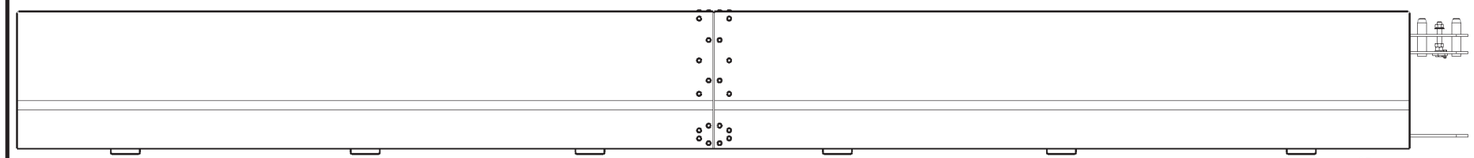


ELEVATION VIEW

BARRIERGUARD END SECTION - 40 FT. MALE OR FEMALE END SECTION

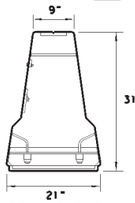


PLAN VIEW

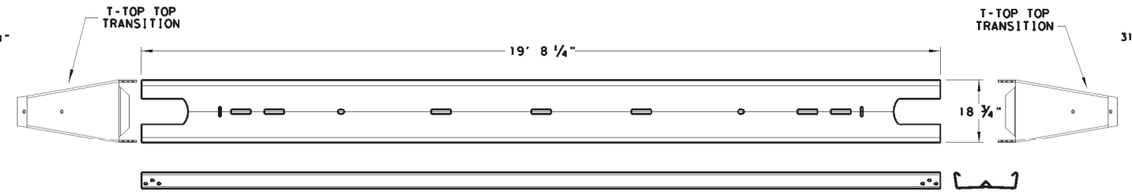


ELEVATION VIEW

BARRIERGUARD STANDARD SECTION - 40 FT.

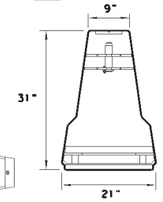


FEMALE END CROSS SECTION

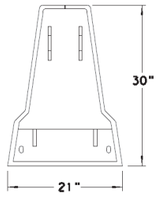


20' T-TOP SECTION

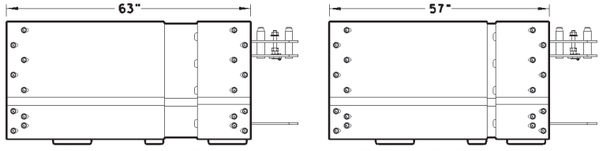
SIDE VIEW



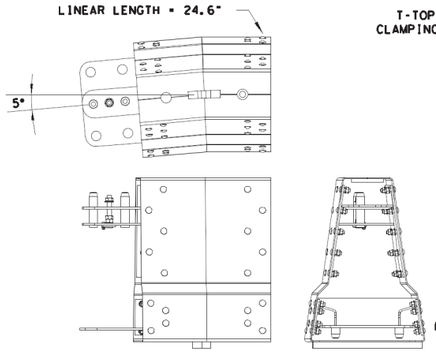
MALE END CROSS SECTION



FULL HEIGHT TERMINAL COVER

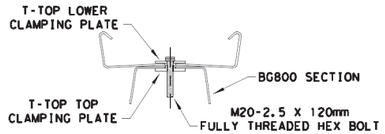


VARIABLE LENGTH BARRIER

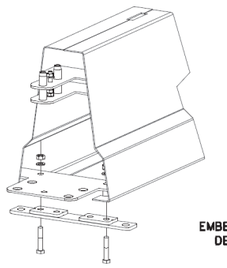


5° (LH) LEFT HAND ANGLE SECTION

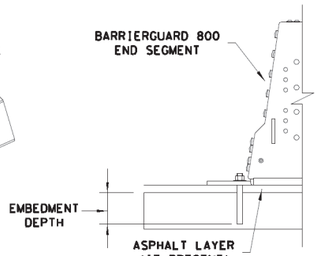
NOTE: ADDITIONAL ANGLE SECTION AVAILABLE
5° (RH) RIGHT HAND ANGLE SECTION
10° (LH) LEFT HAND ANGLE SECTION
10° (RH) RIGHT HAND ANGLE SECTION



T-TOP MOUNTING DETAIL



INTERMEDIATE ANCHOR AT QUICKLINK



SEE ANCHORING TABLE

GENERAL NOTES

1. THE SYSTEM SHOWN ON THIS DRAWING IS A PROPRIETARY BARRIER TRADED AS BARRIERGUARD 800 AND BARRIERGUARD 800 MDS AND HAS BEEN DESIGNED AND MANUFACTURED BY LAURA METAAL ROAD SAFETY INC. FOR TECHNICAL ASSISTANCE AND APPLICATION SUPPORT CONTACT LEE STUART AT LAURA METAAL ROAD SAFETY INC. AT (702) 664-2009 OR lstuart.laurametaal@outlook.com
2. THE BARRIERGUARD 800 SYSTEM HAS BEEN CRASH TESTED TO MASH AND HAS FHWA APPROVAL AS A TL-3 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 BARRIERGUARD 800 AND THEIR INCORPORATION AS A WHOLE SYSTEM FOR DEPARTMENTAL STANDARD APPLICATIONS.
4. BARRIERGUARD 800 REQUIRES ANCHORING (PINNING) AT EACH END OF THE INSTALLED LENGTH. (INTERMEDIATE ANCHORS CAN BE USED TO REDUCE DEFLECTION).
5. INSTALLATION OF BARRIERGUARD 800 OR BARRIERGUARD 800 MDS, NORMALLY STARTS WITH A MALE TERMINAL SECTION AND IS FINISHED WITH A FEMALE TERMINAL SECTION. STANDARD SECTIONS ARE USED BETWEEN THE TERMINAL SECTIONS TO OBTAIN THE REQUIRED LENGTH OF POSITIVE BARRIER PROTECTION.
6. THE FULL HEIGHT TERMINAL (FHT) SECTIONS MAY BE CAPPED WITH A FHT COVER, HOWEVER IF EXPOSED TO ON-COMING TRAFFIC THE END SHOULD BE PROTECTED WITH A SUITABLE CRASH CUSHION. THE BARRIERGUARD 800 RANGE IS COMPATIBLE WITH MOST COMMONLY USED CRASH CUSHION END TREATMENTS. FOR DETAILS OF BARRIERGUARD 800 CRASH CUSHION CONNECTIONS THAT ARE NOT DETAILED WITHIN THESE DRAWINGS, PLEASE CONTACT LAURA METAAL ROAD SAFETY INC. FOR MORE DETAILS. THE FULL HEIGHT TERMINAL COVER IS SUITABLE FOR THE "DOWN STREAM" END OF A SYSTEM THAT DOES NOT HAVE EXPOSURE TO ON-COMING TRAFFIC.
7. WHEN INSTALLING THE MINIMUM DEFLECTION SYSTEM (MDS), THE SYSTEM CAN BE INSTALLED WITH ADDITIONAL INTERMEDIATE ANCHORS ALONG THE LENGTH OF THE BARRIER RUN AT INTERVALS SHOWN IN THE DEFLECTION TABLE. EACH BARRIER RUN CAN BE MADE UP OF ANY MIXTURE OF THE SYSTEMS BY THE INTRODUCTION OF INTERMEDIATE ANCHORS AND/OR T-TOP AS REQUIRED.
8. THERE ARE SEVERAL METHODS OF ACHIEVING RADIUS IN A LENGTH OF BARRIERGUARD 800. RADIUS CAN BE ACHIEVED USING VARIOUS METHODS AND THUS ALLOWING THE BARRIERGUARD TO FOLLOW THE DESIRED CURVATURE IN THE INSTALLATION, THESE METHODS ARE, THE MOVEMENT IN THE QUICKLINK, ADJUSTABLE 20FT. SECTIONS OR SHORT ANGLED SECTIONS WHICH ALLOW A RADIUS AS LOW AS 12FT. FOR FURTHER INFORMATION AND ADVICE CONTACT LAURA METAAL ROAD SAFETY INC.
9. A BARRIERGUARD 800 VARIABLE LENGTH BARRIER (VLB) SECTION SHOULD BE USED WHEN BARRIERGUARD 800 OR BARRIERGUARD 800 MDS IS ANCHORED ACROSS A BRIDGE EXPANSION JOINT. IF T-TOP IS TO BE USED IN CONJUNCTION WITH THE VLB, THE T-TOP SHOULD BE USED FOR MINIMUM 40FT ON EITHER SIDE OF THE VLB AND TERMINATED WITH TRANSITIONS. THE VLB SECTION PROVIDES APPROXIMATELY 7in OF EXTENSION AND 7in OF CONTRACTION. MULTIPLE VLB'S CAN BE LINKED TOGETHER TO PROVIDE MORE EXPANSION OR CONTRACTION. THE VLB'S SHOULD BE PLACED IN THE VICINITY OF THE EXPANSION JOINT. THE VLB DOES NOT NEED TO BE PLACED DIRECTLY OVER THE EXPANSION JOINT BUT MUST BE BETWEEN THE NEAREST ANCHORS ON EACH SIDE OF THE JOINT. IT IS RECOMMENDED THAT THE VLB IS PLACED WITHIN 40FT OF THE JOINT.
10. THE T-TOP CAN BE INSTALLED EITHER BEFORE OR AFTER THE BARRIERGUARD 800 HAS BEEN FULLY ASSEMBLED AND ANCHORED IN PLACE. T-TOP IS REQUIRED WHEN THE BARRIERGUARD 800 IS USED AS A MDS, ANCHORED EVERY 20FT, GATE SECTIONS AND VARIABLE LENGTH BARRIERS. THE T-TOP SHOULD EXTEND 40FT ON EITHER SIDE OF THESE CONDITIONS AND BE TERMINATED WITH TRANSITIONS.
11. THE BARRIERGUARD 800 RANGE HAS BEEN DESIGNED TO BE USED ON AND HAS BEEN TESTED ANCHORED ON ASPHALT, CONCRETE AND COMPACTED SUBBASE. CONTACT LAURA METAAL ROAD SAFETY INC. FOR FURTHER INFORMATION.
12. BARRIERGUARD 800 COMPONENTS ARE MANUFACTURED IN SI (METRIC) UNITS. ENGLISH UNITS SHOWN ARE APPROXIMATE. ALL COMPONENTS ARE FULLY GALVANIZED.
13. BARRIERGUARD 800 SYSTEMS SHALL BE ASSEMBLED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS DETAILED DRAWINGS, PROCEDURES AND SPECIFICATIONS. FOR ANY INSTALATIONS OUTSIDE OF THE SCOPE OF THESE DRAWINGS PLEASE CONTACT LAURA METAAL ROAD SAFETY INC. FOR DETAILS.

BARRIERGUARD 800 DEFLECTION TABLE

	STANDARD SYSTEM	MINIMUM DEFLECTION SYSTEMS (MDS)
DESCRIPTION	ONLY ANCHORED AT THE EXTREME ENDS OF THE BARRIER LENGTH	ANCHORED EVERY 20 FT.
DEFLECTION AT MASH TL-3	5'-6"	18 1/2"
T-TOP REQUIREMENTS	NONE REQUIRED	REQUIRED FOR MDS SECTIONS

STANDARD ANCHORING REQUIREMENTS (TABLE)

	RESIN STUD ANCHORS			DRIVEN ANCHORS		Hilti HSL-3 SHALLOW MECHANICAL
	CONCRETE *	UNREINFORCED CONCRETE *	ASPHALT	ASPHALT	SUBBASE/SOIL	CONCRETE
ANCHOR DIAMETER	1 in.	1 in.	1 in.	1-3/16 in.	5-1/2 in.	**
EMBEDMENT DEPTH	6 in.	8 in.	16 in.	16 in.	32 in.	**
DRILL DIAMETER	1-1/8 in.	1-1/8 in.	1-1/8 in.	1-3/16 in.	DRIVEN	**
PULL OUT CAPACITY (MIN)	17500 lb	17500 lb	N/A	N/A	N/A	**
SHEAR CAPACITY (MIN)	25000 lb	25000 lb	N/A	N/A	N/A	**

* ALTERNATIVE ANCHORS INCLUDING MECHANICAL ANCHORS FOR CONCRETE MAYBE USED IF THEY MEET THE STRENGTH REQUIREMENTS LISTED, DETAILS WILL BE MANUFACTURER SPECIFIC.

** CONTACT: LAURA METAAL ROAD SAFETY INC. FOR SPECIFIC APPLICATION.

Texas Department of Transportation

Design Division Standard

BARRIERGUARD 800 SYSTEM
STEEL BARRIER
MASH TL-3
BARRIERGUARD-19

FILE: barrierguard19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		74

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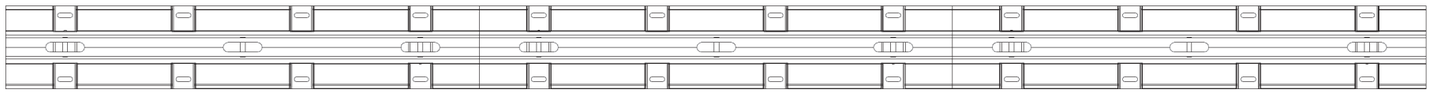
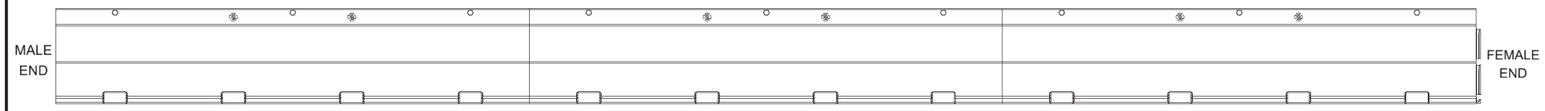
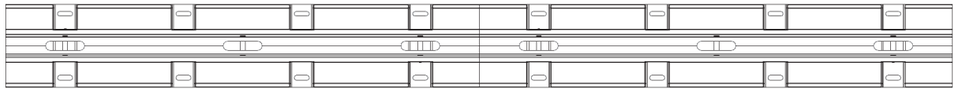


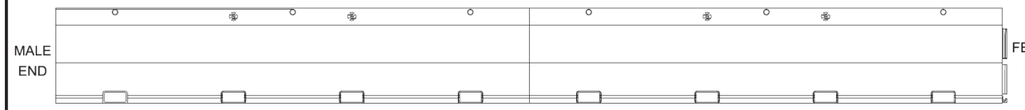
PLAN VIEW



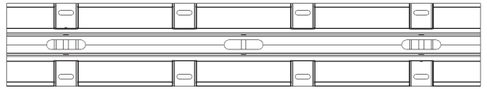
ELEVATION VIEW
ZONEGUARD STANDARD UNIT x 50'-0"



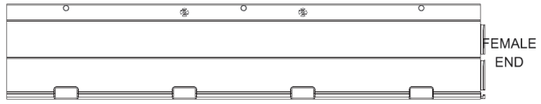
PLAN VIEW



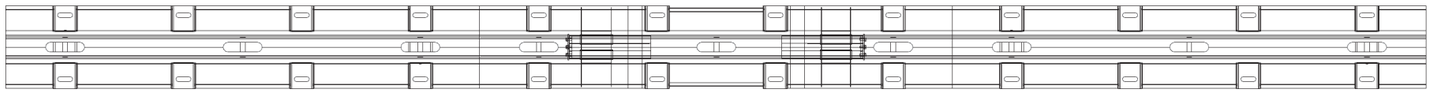
ELEVATION VIEW
ZONEGUARD STANDARD UNIT x 33'-4"



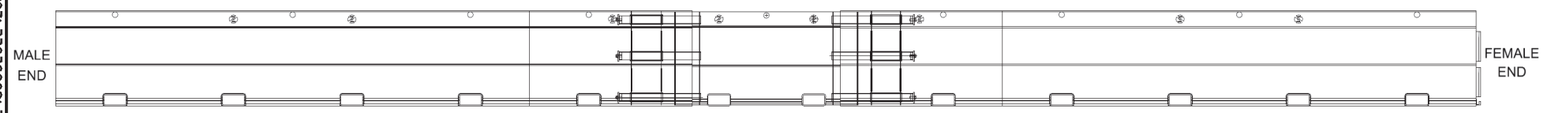
PLAN VIEW



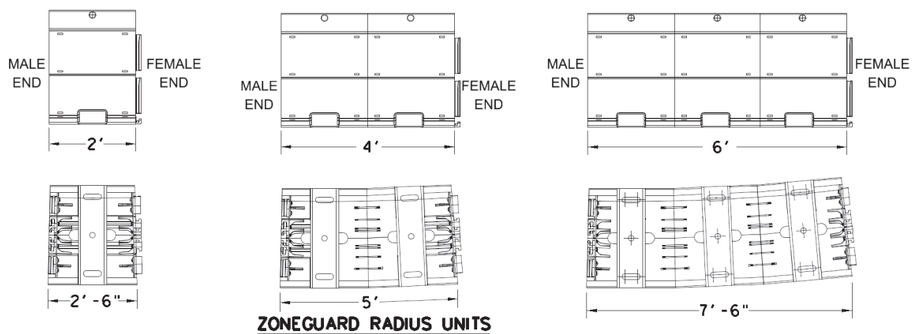
ELEVATION VIEW
ZONEGUARD STANDARD UNIT x 16'-8"



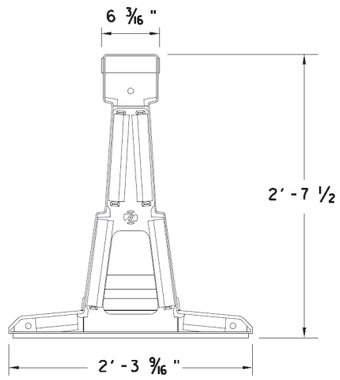
PLAN VIEW



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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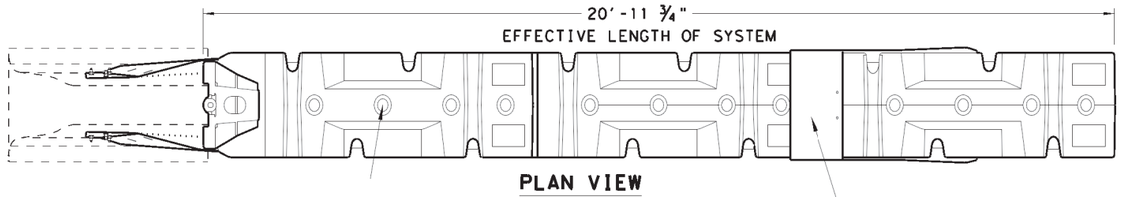
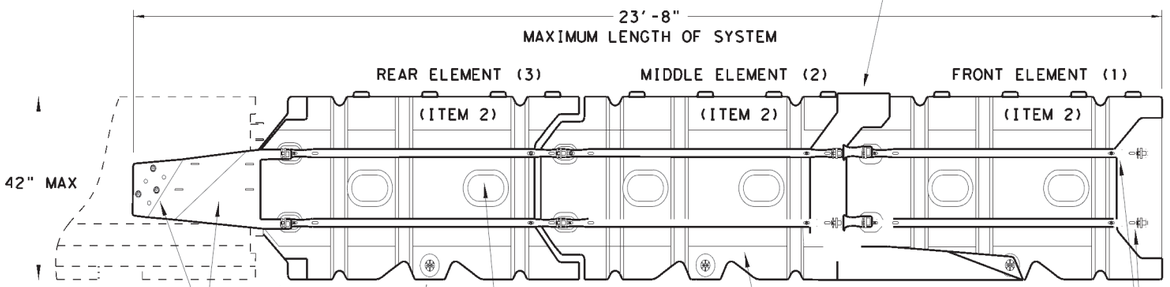
SYSTEM SHOWN - ABSORB-M TL-3



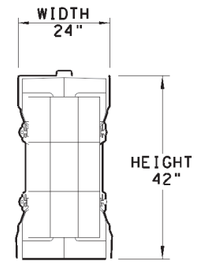
PLAN VIEW

TRAFFIC FLOW

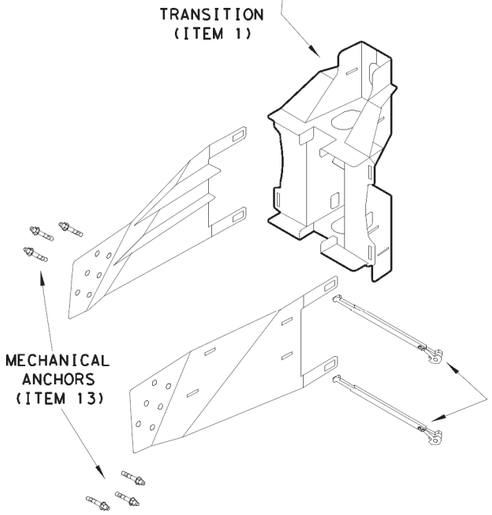


ELEVATION VIEW

TRAFFIC FLOW



SECTION A-A



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"

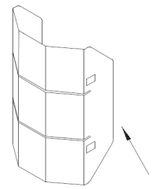
GENERAL NOTES

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

**APPLY DECAL



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.

DELINEATION DECAL PLACEMENT GUIDE

TRAFFIC FLOW LEFT-SIDE BARRIER | TRAFFIC FLOW BOTH-SIDE BARRIER | TRAFFIC FLOW RIGHT-SIDE BARRIER

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	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		76

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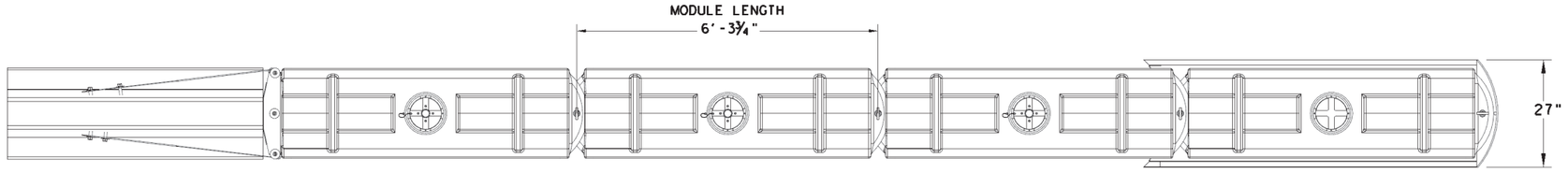
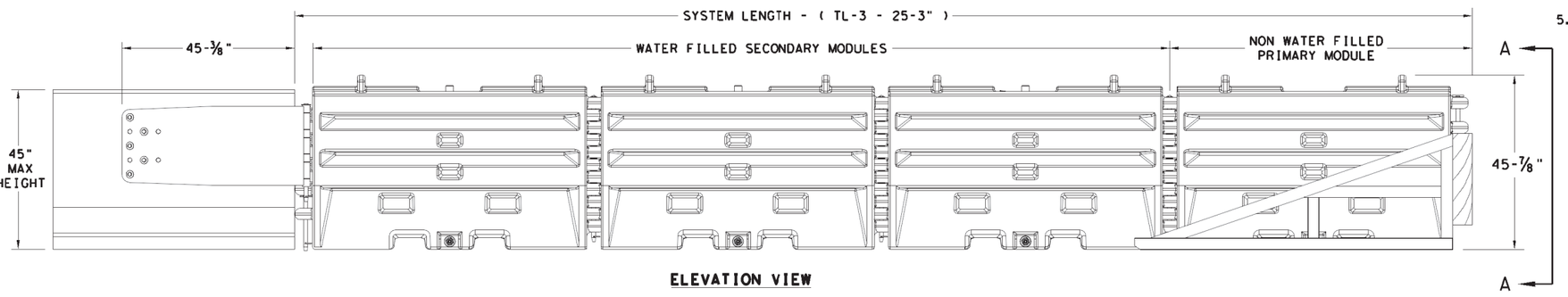


PLAN VIEW

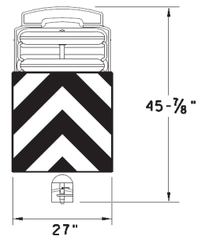


ELEVATION VIEW

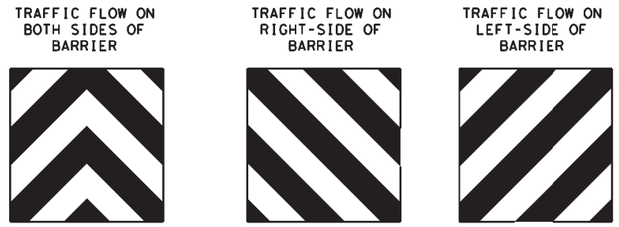
GENERAL NOTES

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"

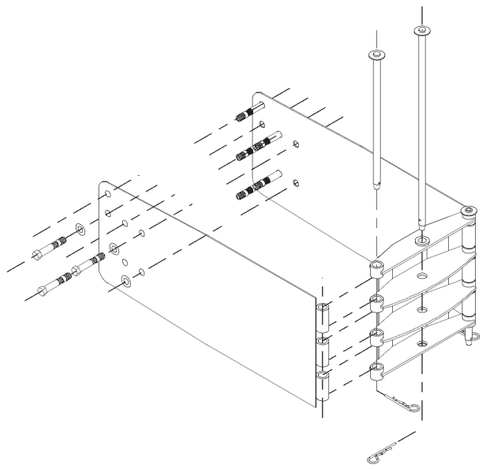


SECTION A-A



NOSE SHEETING PANEL DELINEATION

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



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

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

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	09 055, etc.		US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		77

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LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA (PSN:)	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
1	LT/RT	75	0.25 MI SE OF SPUR 454	222330002209037	TL-3	BI	N/A	N/A	PTB	24"	32"	APPROX. 35'	2		2						X	
2	LT/RT	75	2.1 MI NW OF US 277	222330002209038	TL-3	BI	N/A	N/A	PTB	24"	32"	APPROX. 35'		2	4	1					X	
												TOTALS	2	2	6							

LEGEND:
L=LOW MAINTENANCE
R=REUSABLE
S=SACRIFICIAL
N=NARROW
W=WIDE
# =REFER TO STANDARD SSCC-16 FOR THE CRASH CUSHION (BEAT) INSTALLATION TO THE RIGID STRUCTURE AS STATIONARY.

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

NOTES:

-REFER TO "BRIDGE PROTECTION INSTALLATION LAYOUT" SHEET FOR PCTB LENGTH(S), QUANTITIES AND ADDITIONAL INFORMATION.

-REFER TO "TCP SEQUENCE OF CONSTRUCTION" SHEET(S) FOR PHASING AND ADDITIONAL INFORMATION.

-REFER TO "BRIDGE MBGF, RAIL & TERMINAL REPLACEMENT LAYOUT" SHEET(S) FOR BRDIGE INFORMATION AND LIMITS.

CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:	CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		
	22	VAL VERDE, etc.		
	FEDERAL AID PROJECT			SHEET NO.
				78

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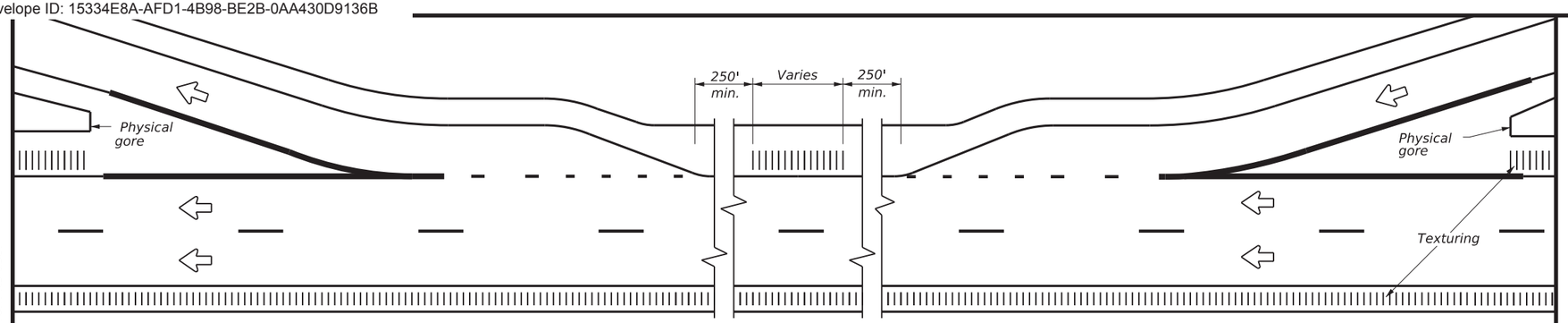
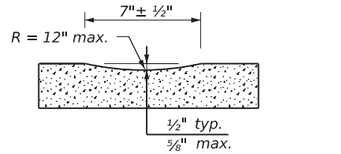
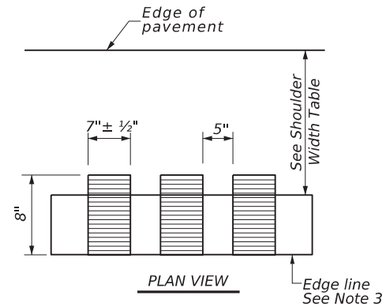


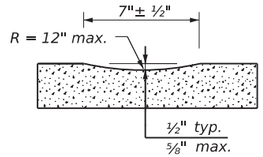
TYPICAL RUMBLE STRIP PLACEMENT AT EXIT AND ENTRANCE RAMPS



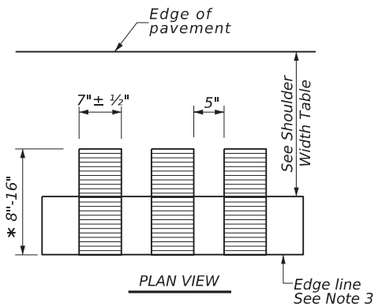
PROFILE VIEW
OPTION 1



CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

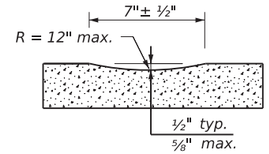


PROFILE VIEW
OPTION 2

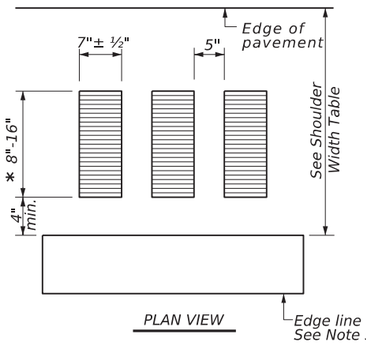


* This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

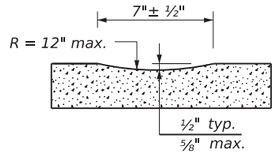


PROFILE VIEW
OPTION 3

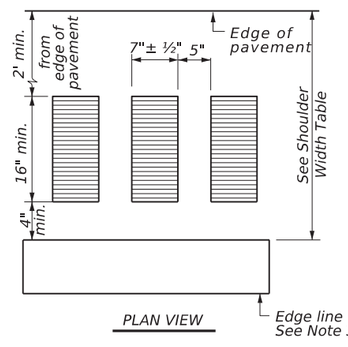


* This distance may vary based on width of shoulder

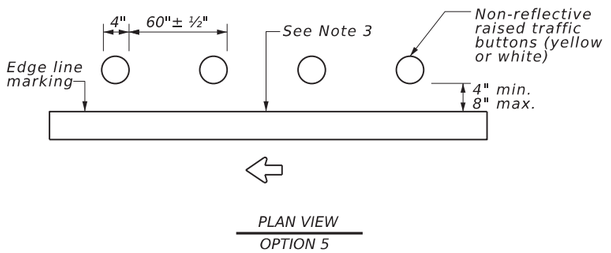
CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PROFILE VIEW
OPTION 4

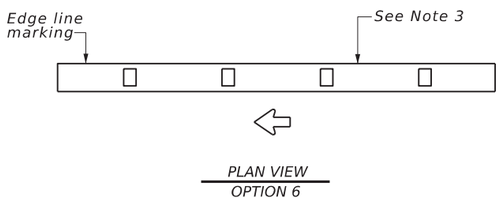


CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGE LINE
(Rumble Strips)



PLAN VIEW
OPTION 6

PROFILE EDGE LINE MARKINGS
(Rumble Strips)

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 sheets PM(2) and FPM(1) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the Shoulder Width Table below for determining what options may be used for edge line rumble strips.
5. Breaks in edge line rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections, or driveways with high usage of large trucks when installed on conventional highways.
6. Rumble strips shall not be placed across exit or entrance ramps, acceleration or deceleration lanes, crossovers, gore areas, or intersections with other roadways.
7. Consideration should be given to noise levels when edge line rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

9. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
10. Pavement markings can be applied over milled shoulder rumble strips to create an edge line rumble stripe.

WHEN INSTALLING RAISED OR PROFILE EDGE LINE 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 edge line when used as a rumble strip. The color of the button should match the color of the adjacent edge line 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. The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.
15. Raised profile thermoplastic markings used as edge lines may substitute for buttons.

Texas Department of Transportation

Traffic Safety Division Standard

EDGE LINE RUMBLE STRIPS ON FREEWAYS AND DIVIDED HIGHWAYS RS(1)-23

FILE: rs(1)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
4-06 1-23	DIST	COUNTY		SHEET NO.
2-10	22	VAL VERDE, etc.		79
10-13				

DATE: 2/21/2023 6:54:32 PM
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DocuSign Envelope ID: 15334E8A-AFD1-4B98-BE2B-0AA430D9136B

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DATE: 2/27/2023 6:54:48 PM
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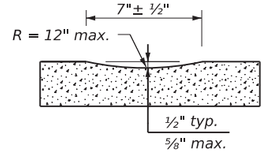
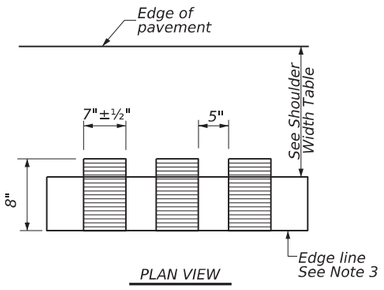
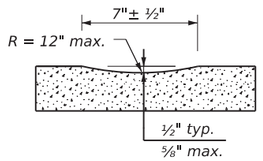


PROFILE VIEW
OPTION 1

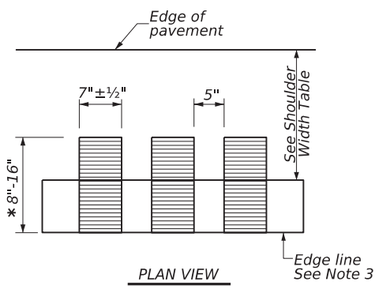


PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



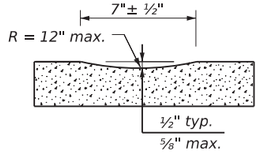
PROFILE VIEW
OPTION 2



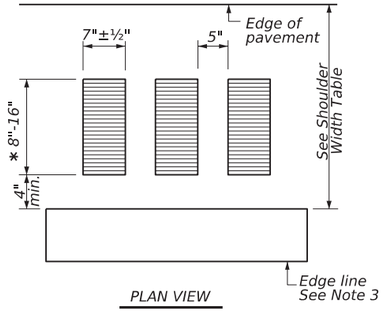
PLAN VIEW

∗ This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



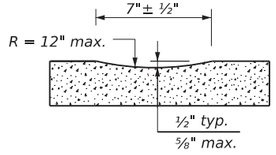
PROFILE VIEW
OPTION 3



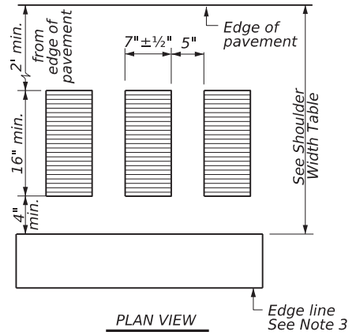
PLAN VIEW

∗ This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

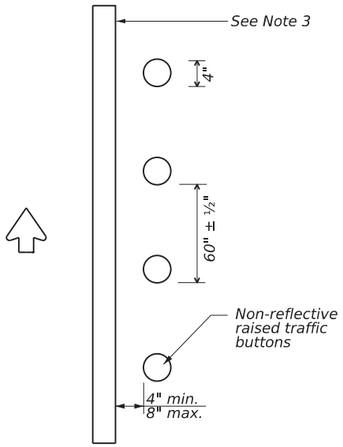


PROFILE VIEW
OPTION 4



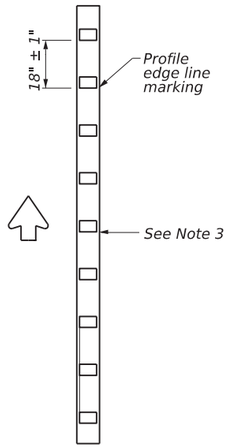
PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



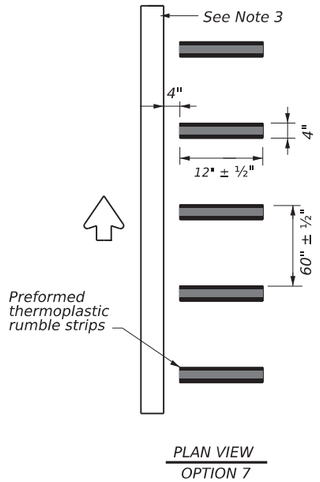
PLAN VIEW
OPTION 5

RAISED EDGE LINE (Rumble Strips)



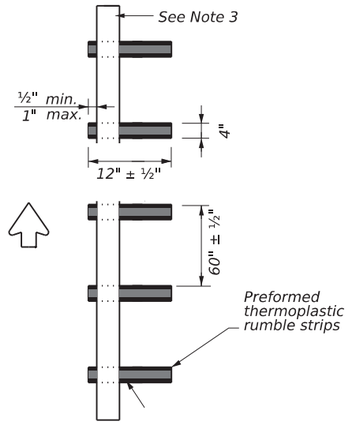
PLAN VIEW
OPTION 6

PROFILE EDGE LINE MARKINGS (Rumble Strips)



PLAN VIEW
OPTION 7

PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)



PLAN VIEW
OPTION 8

PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)

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, 6 or 8	Option 1, 2, 3 5, 6 or 7	Option 2, 4, 5 6 or 7

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) and FPM(1) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.*
4. *See the Shoulder Width Table below for determining what options may be used for edge line rumble strips.*
5. *Breaks in edge line rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections, or driveways with high usage of large trucks when installed on conventional highways.*
6. *Rumble strips shall not be placed across exit or entrance ramps, acceleration or deceleration lanes, crossovers, gore areas, or intersections with other roadways.*
7. *Consideration should be given to noise levels when edgeline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.*
8. *Consideration shall be given to bicyclists. See RS(6).*

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

9. *See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.*
10. *Pavement markings can be applied over milled shoulder rumble strips to create an edge line rumble strip.*

WHEN INSTALLING RAISED OR PROFILE EDGE LINE 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 edge line when used as a rumble strip. The color of the button should match the color of the adjacent edge line 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. *The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.*
15. *Raised profile thermoplastic markings used as edge lines may substitute for buttons.*

Texas Department of Transportation

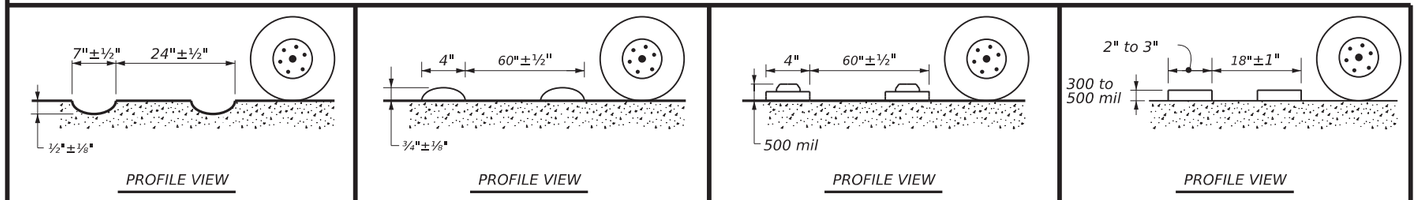
Traffic Safety Division Standard

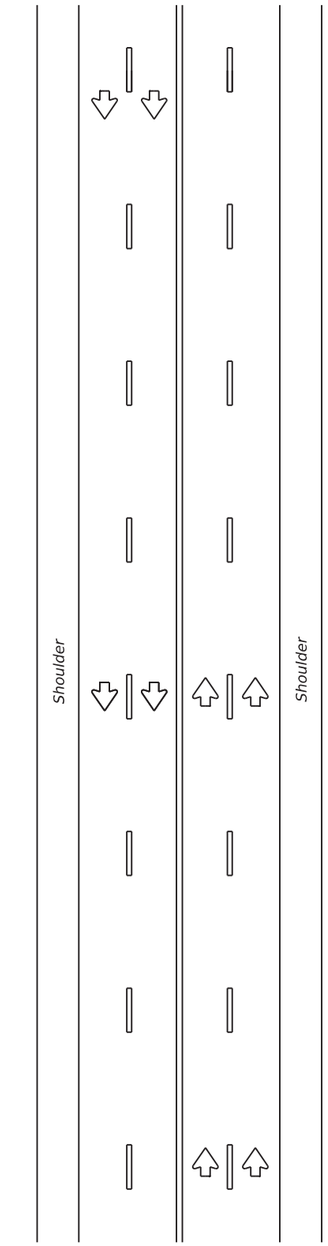
EDGE LINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23

FILE: rs(2)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
10-13 1-23	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		80

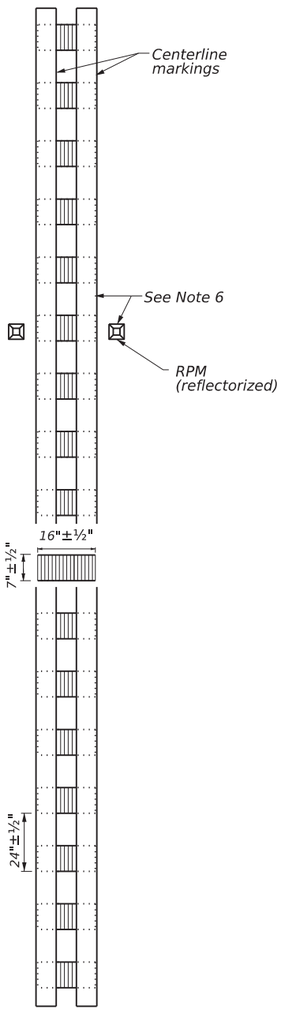
DocuSign Envelope ID: 15334E8A-AFD1-4B98-BE2B-0AA430D9136B

CENTERLINE RUMBLE STRIPS



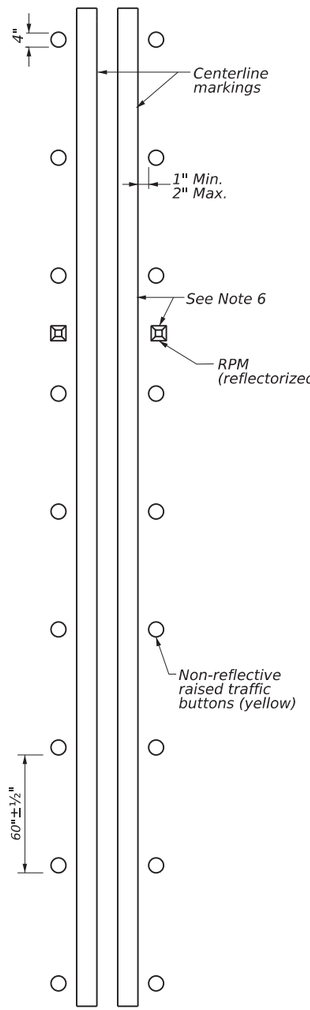


MULTILANE UNDIVIDED HIGHWAY WITH SHOULDER



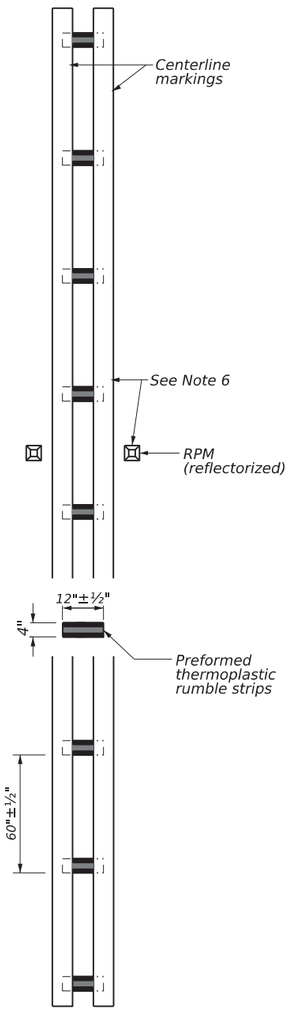
PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS



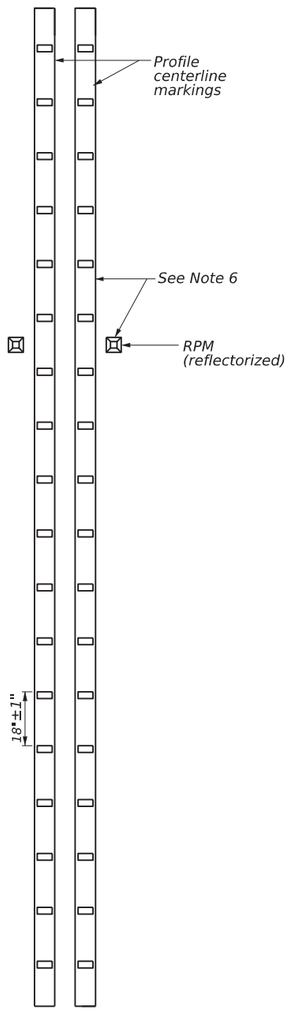
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW
OPTION 3

PREFORMED THERMOPLASTIC RUMBLE STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on multilane undivided highways.
2. Centerline and edge line rumble strips or profile markings shall not be placedon 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 beused if approved by the Traffic Safety Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and nomore than 150 feet in advance of bridges, railroad crossing, intersections ordriveways with high usage of large trucks.
6. Use standard sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips for normal centerline spacing. For wider medians, specify in the plans the exact placement of the rumble strips. Place the rumble strips under each centerline marking or centered in the middle of the median.

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 color of the button should be yellow for a continuous no passing roadway. The button will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING EDGE LINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

12. See standard sheet RS(2).

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Texas Department of Transportation

Traffic Safety Division Standard

CENTERLINE RUMBLE STRIPS ON MULTILANE UNDIVIDED HIGHWAYS RS(3)-23

FILE: rs(3)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
10-13 1-23	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		81

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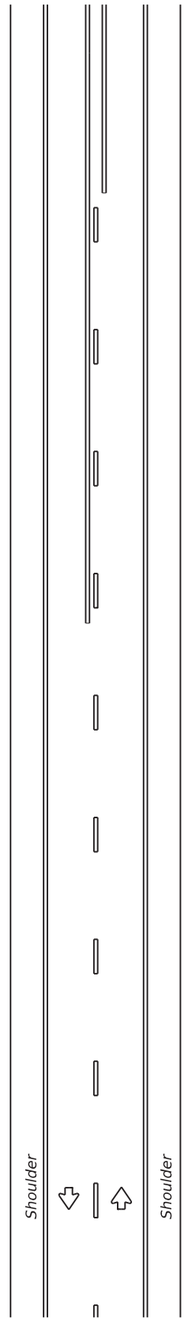
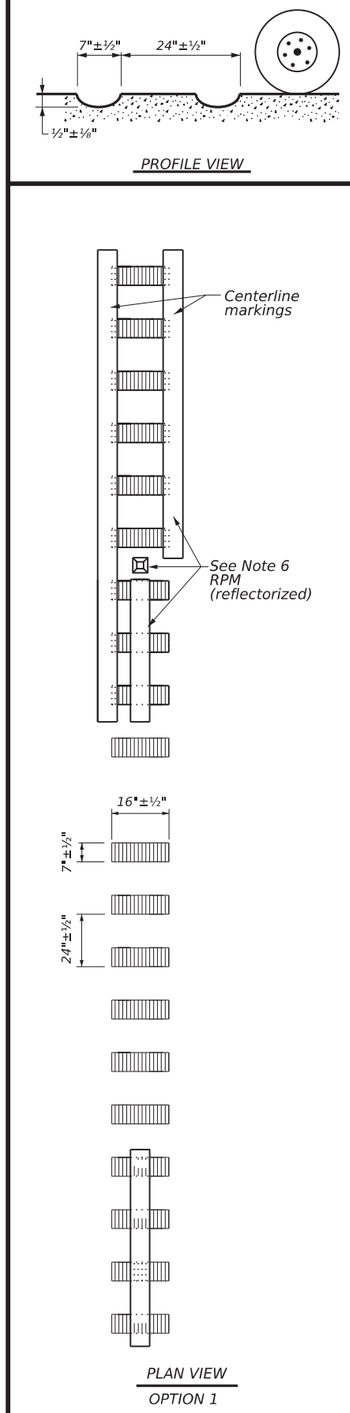
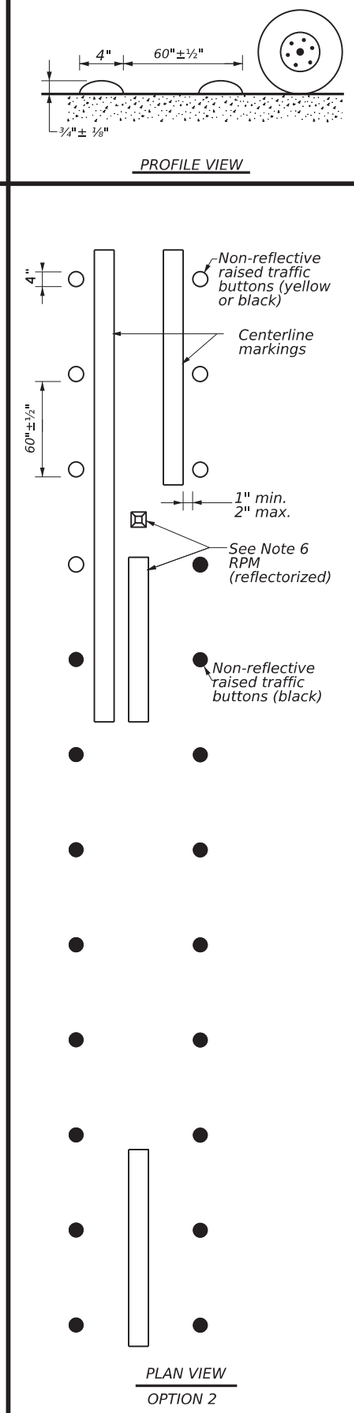
CENTERLINE RUMBLE STRIPS



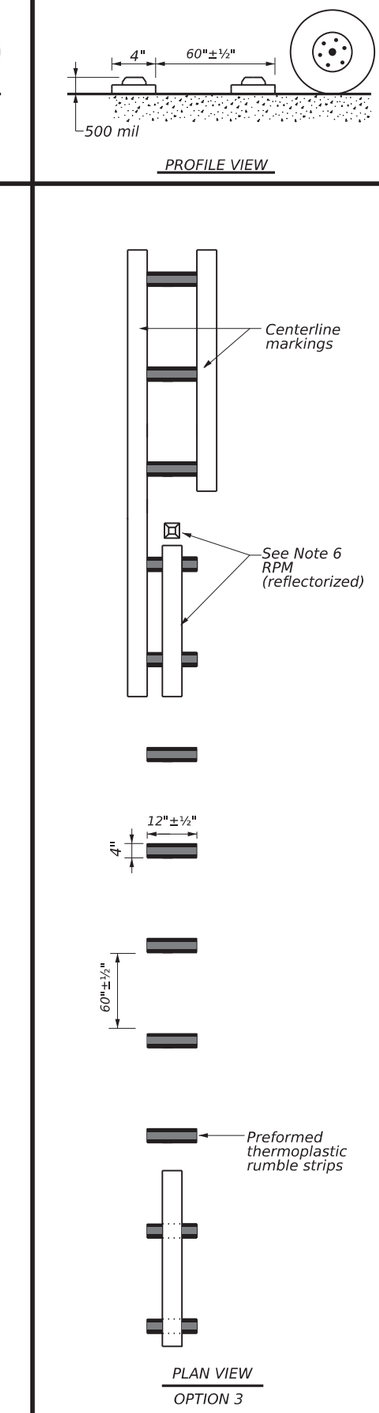
TWO LANE TWO-WAY HIGHWAYS



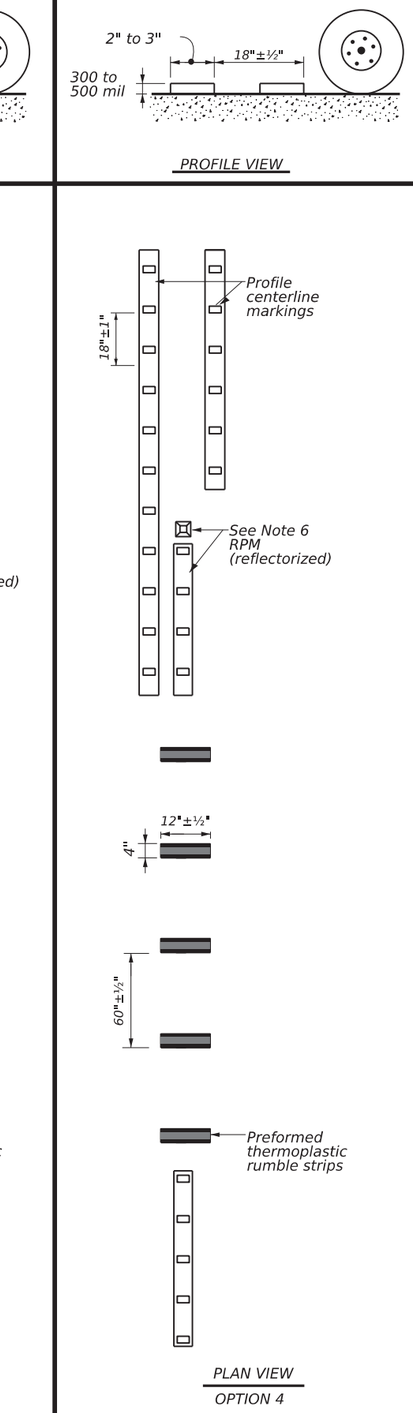
MILLED CENTERLINE RUMBLE STRIPS



RAISED CENTERLINE RUMBLE STRIPS



PREFORMED THERMOPLASTIC RUMBLE STRIPS



PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC RUMBLE 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 edge line 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 Safety 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 or driveways with high usage of large trucks.
6. Use standard sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) 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.
12. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING EDGE LINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

13. See standard sheet RS(2).

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Texas Department of Transportation — Traffic Safety Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23

FILE: rs(4)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-13 1-23	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		82

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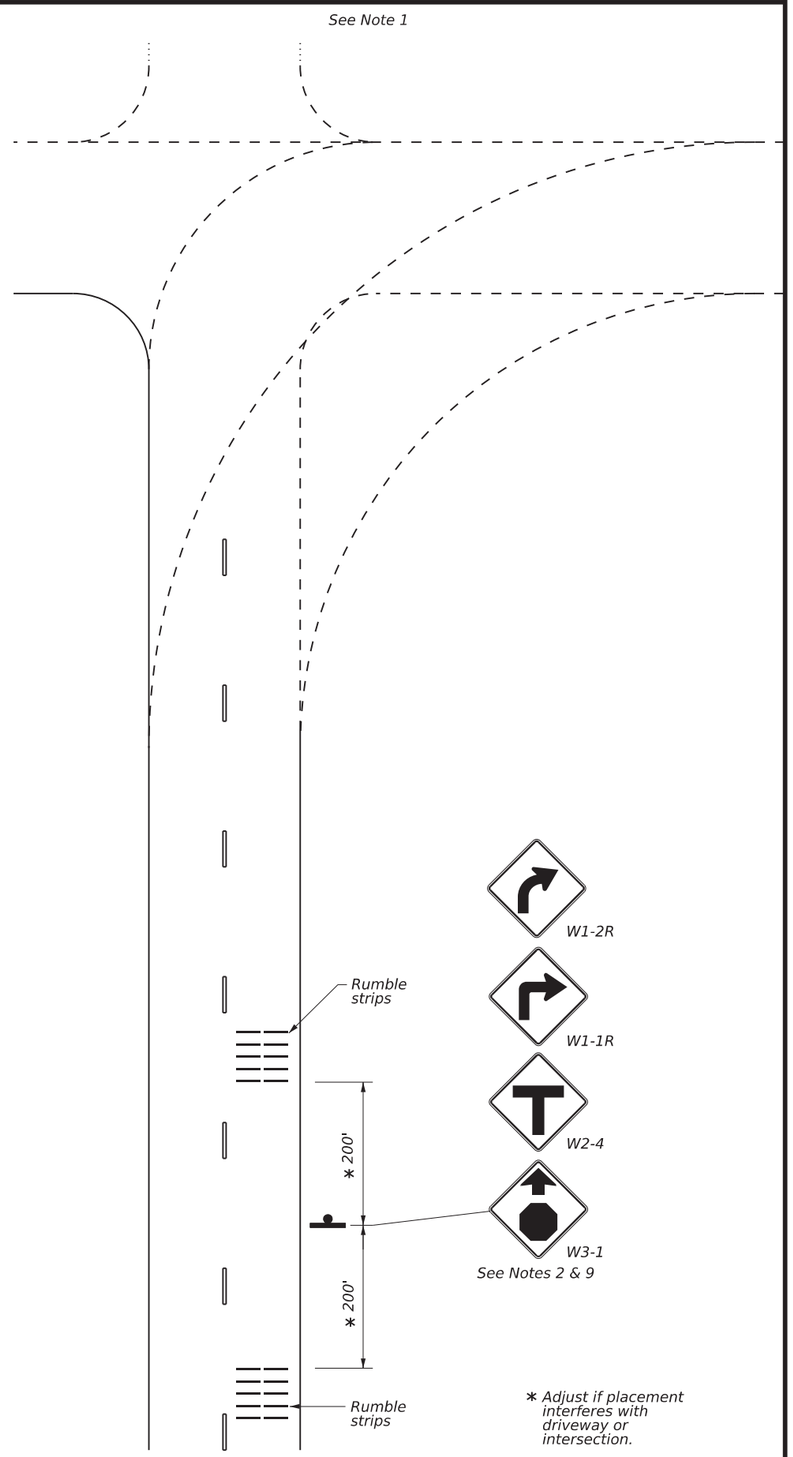
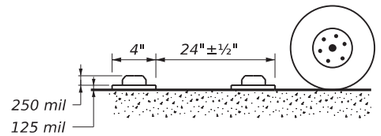
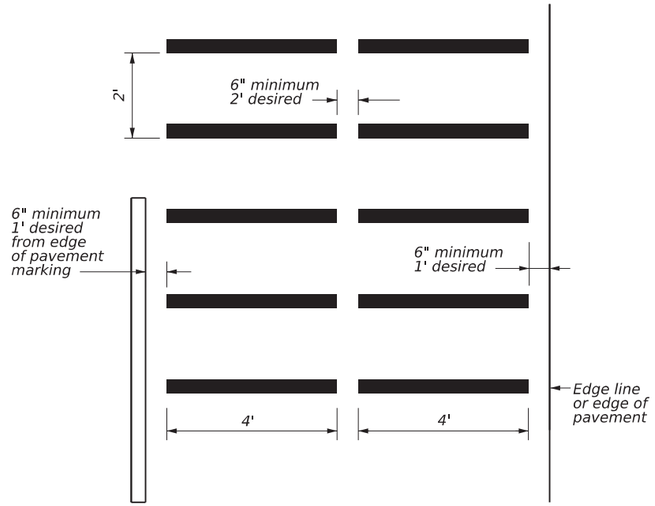
RUMBLE STRIP TYPICAL APPLICATION





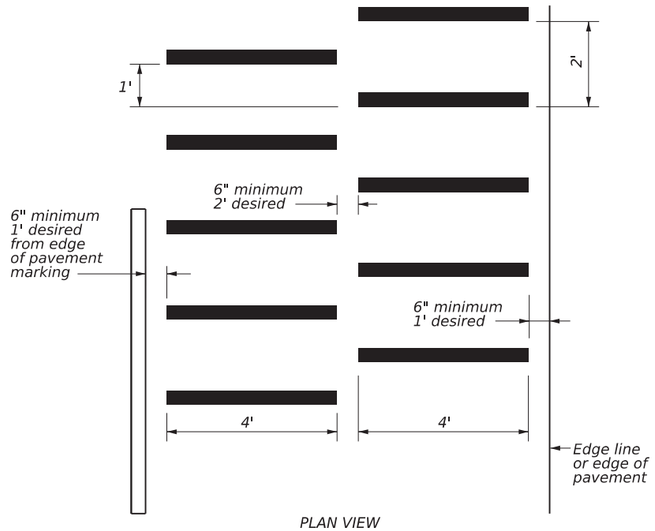
PROFILE VIEW

RUMBLE STRIP STANDARD PATTERN



PLAN VIEW

RUMBLE STRIP ALTERNATIVE PATTERN



PLAN VIEW

GENERAL NOTES

1. *Transverse or in-lane rumble strips should only be used at high incident and special geometric locations. These special geometric locations may include: approaches to rural, high speed signalized or stop-controlled intersections with sight restrictions and/or high crash rates, approaches to unexpected urban intersections, approaches to newly installed stop or signalized controlled intersections, approaches to toll plazas, approaches to hazardous horizontal curves, and approaches to railroad grade crossings.*
2. *When used, the rumble strips shall be placed 200 feet upstream and downstream of the warning sign.*
3. *The use of rumble strips should not be widespread or indiscriminate.*
4. *Preformed black raised rumble strips should be used. They should be installed in accordance with the manufacturer's recommendations.*
5. *Please reference the TxDOT Material Producers List for approved rumble strips (transverse): http://www.txdot.gov/*
6. *Consideration should be given to noise levels when in-lane or transverse rumble strips are to be installed near residential areas, schools, churches, etc.*
7. *The RUMBLE STRIPS AHEAD (W17-2T) sign may be used in advance of in-lane or transverse rumble strips, based on engineering judgement. This sign is typically not necessary for rumble strip installations built to the guidelines on this standard sheet. When used, this sign should be spaced in advance of the rumble strips based on the Guidelines for Advance Placement of Warning Signs table of the Texas Manual on Uniform Traffic Control Devices.*

W17-2T

8. *Consideration shall be given to bicyclists. See RS(6).*
9. *Other signs can be used as conditions warrant.*

Texas Department of Transportation

Traffic Safety Division Standard

TRANSVERSE OR IN-LANE RUMBLE STRIPS

RS(5)-23

FILE: rs(5)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-06 1-12 2-10 10-13	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		83

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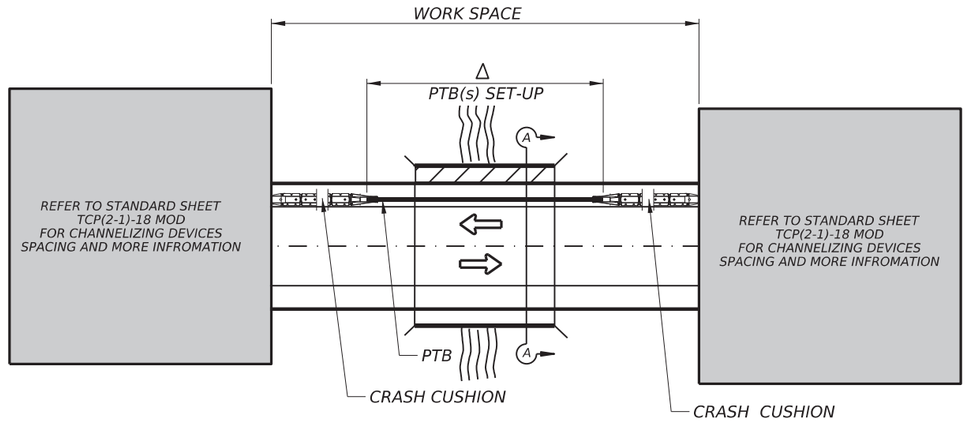
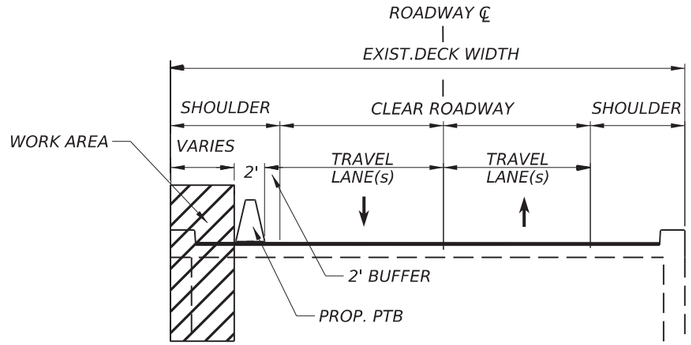


PHASE I - (PCTB LAYOUT)

TYPE 1



PHASE I
TYPICAL SECTION

SECTION A-A

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)

PORTABLE TRAFFIC BARRIER QUANTITIES				
NBI NUMBER	SIDE	△512 A		
		FURNISH & INSTALL	MOVE	REMOVE
		LF	LF	LF
22-233-0-0022-09-037	LT	90		
22-233-0-0022-09-037	RT		90	
22-233-0-0022-09-038	LT		90	
22-233-0-0022-09-038	RT		90	90
TOTAL		90	270	90

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

NOTES

1. REFER TO THE "SUMMARY OF QUANTITIES" PLAN SHEET FOR ADDITIONAL INFORMATION.
2. REMOVAL OF DRAINAGE STRUCTURE WILL BE LIMITED TO ONE SIDE OF THE ROADWAY AT A TIME, OR AS SPECIFIED BY THE ENGINEER.
3. REFER TO "BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS" SHEETS FOR ADDITIONAL NOTES.
4. 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.
5. 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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TCP
BRIDGE PROTECTION
INSTALLATION LAYOUT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		84

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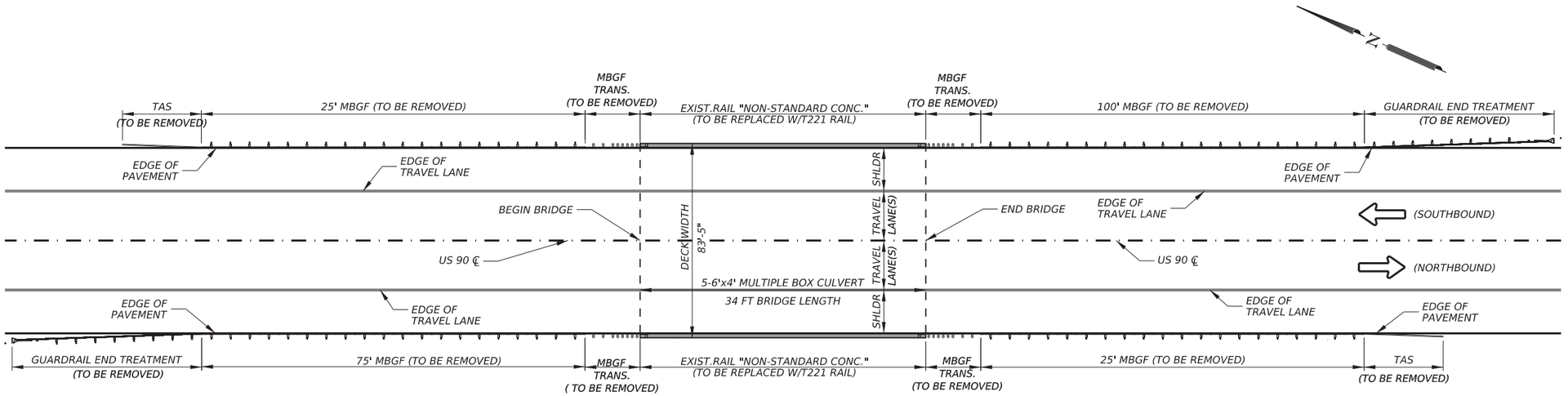
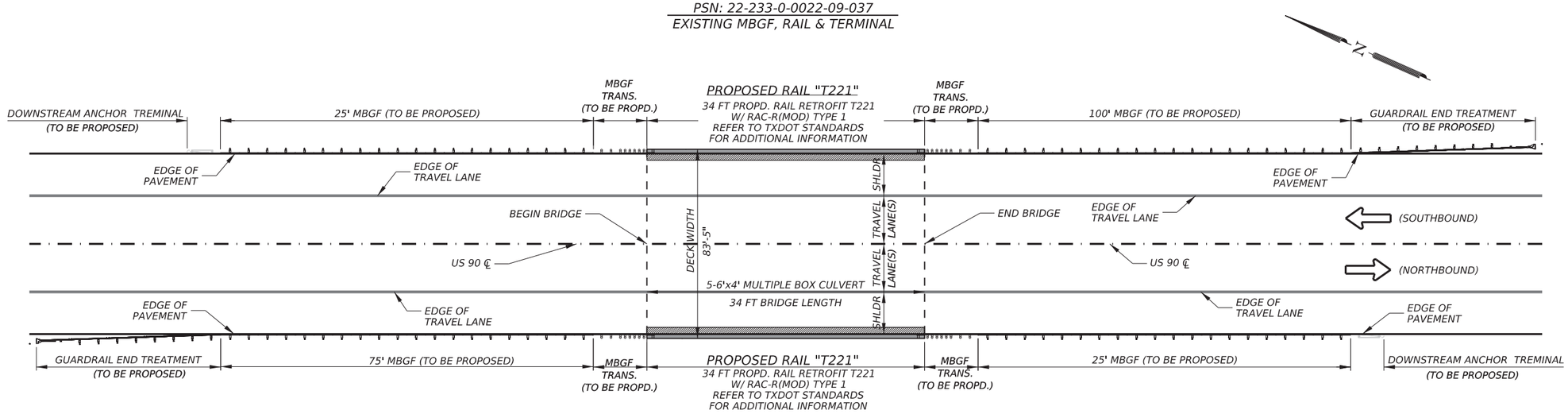


PSN: 22-233-0-0022-09-037

EXISTING MBGF, RAIL & TERMINAL



PSN: 22-233-0-0022-09-037

PROPOSED MBGF, RAIL & TERMINAL

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 T221, RAC-R(MOD), GF(31)-19, GF(31)DAT-19, GF(31)LS-19, GF(31)TRTL3-20, GF(31)TRTL2-19, GF(31)T101-19, GF(31)T6-19, GF(31)MS-19, SRG(TL-2)-21, SRG(TL-3)-21, BED-14, SGT(10S)31-16, SGT(11S)31-18, SGT(12S)31-18, SGT(15S)31-20 AND "ROADWAY MISCELLANEOUS DETAILS MOW STRIP" 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 METAL BEAM GUARD FENCE TRANSITION STANDARD(S).

BRIDGE LOCATION #1 - US 90 (NB - SB) @ VAL VERDE COUNTY

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED
PROFESSIONAL ENGINEER

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BRIDGE MBGF RAIL & TERMINAL REPLACEMENT LAYOUT

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		85

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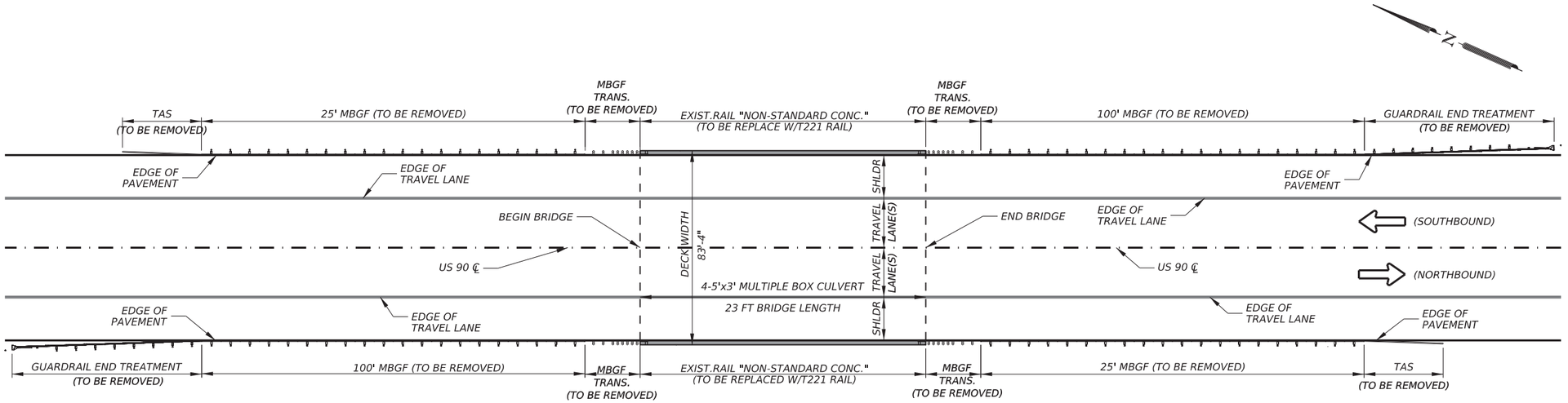

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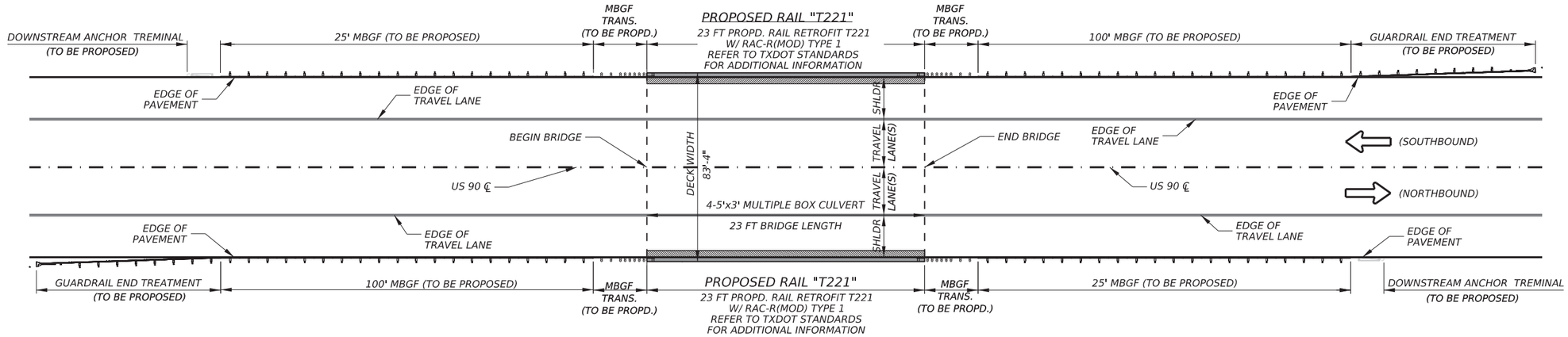
EXISTING MBGF, RAIL & TERMINAL



PSN: 22-233-0-0022-09-038

PROPOSED MBGF, RAIL & TERMINAL

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 T221, RAC-R(MOD), GF(31)-19, GF(31)DAT-19, GF(31)LS-19, GF(31)TRTL3-20, GF(31)TRTL2-19, GF(31)T101-19, GF(31)T6-19, GF(31)MS-19, SRG(TL-2)-21, SRG(TL-3)-21, BED-14, SGT(10S)31-16, SGT(11S)31-18, SGT(12S)31-18, SGT(15S)31-20 AND "ROADWAY MISCELLANEOUS DETAILS MOW STRIP" 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 METAL BEAM GUARD FENCE TRANSITION STANDARD(S).

BRIDGE LOCATION #2 - US 90 (NB - SB) @ VAL VERDE COUNTY

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BRIDGE MBGF RAIL & TERMINAL REPLACEMENT LAYOUT

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		86

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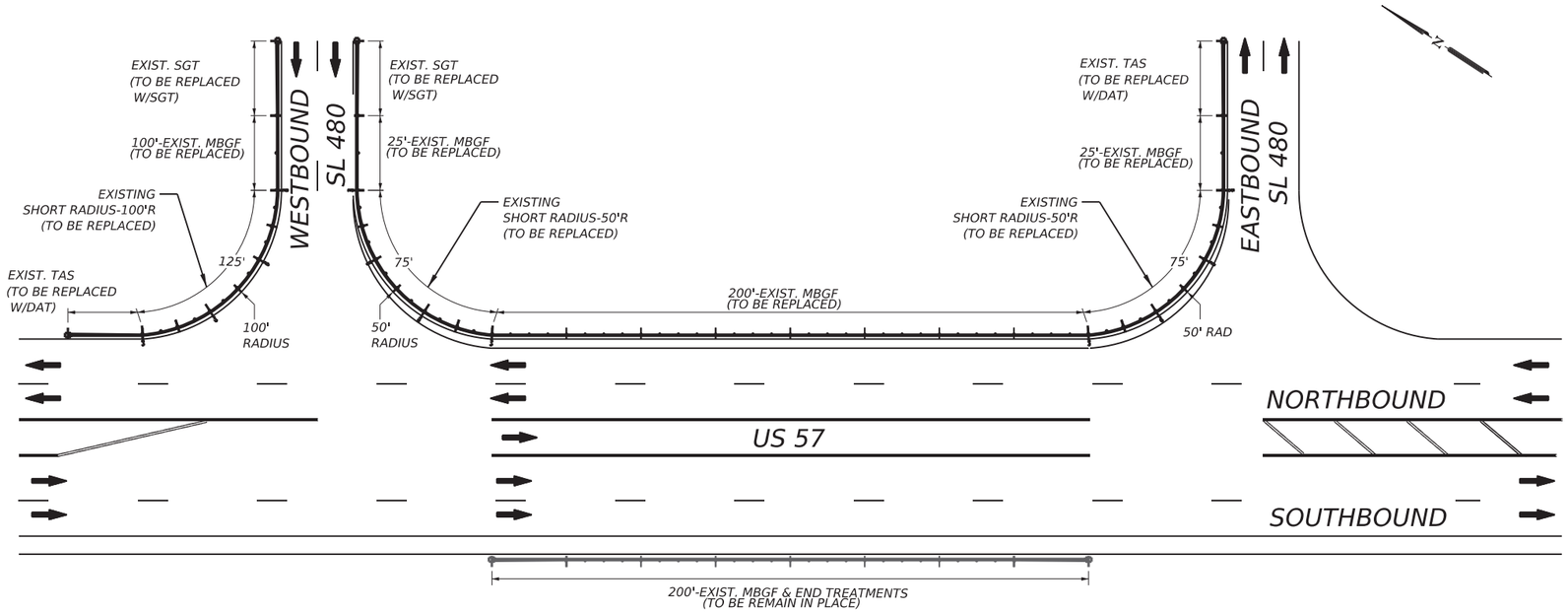
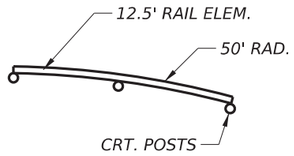
LEGEND

FLOW OF TRAFFIC

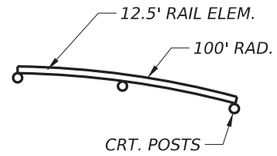
METAL BEAM GUARD FENCE



PLAN VIEW
US57 & SL480 INTERSECTION



SHORT RADIUS RAIL ELEMENT
(6-12.5' ELEM. REQUIRED)



SHORT RADIUS RAIL ELEMENT
(10-12.5' ELEM. REQUIRED)

NOTES:

1. MBGF, TRANSITIONS AND SGT INSTALLATION IS TO BE REMOVED OR 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 FOR MORE INFORMATION: GF(31), MBGF(TR), GF(31)DAT, SGT(31), GF(31)MS, D&OM AND MOW-STRIP DETAIL SHEET(s).

STATE OF TEXAS
LUIS G. URBINA
117019
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PROFESSIONAL ENGINEER

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US 57 & SL 480
INTERSECTION
MBGF LAYOUT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		87

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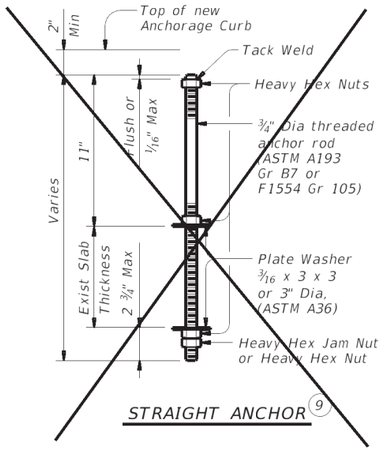
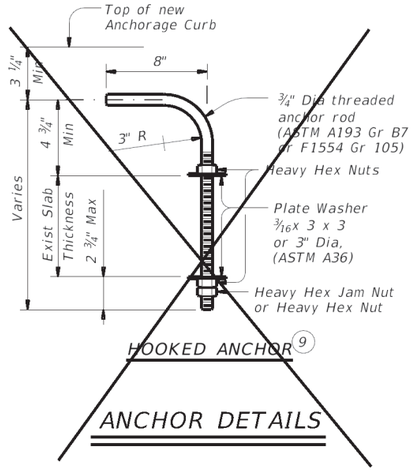
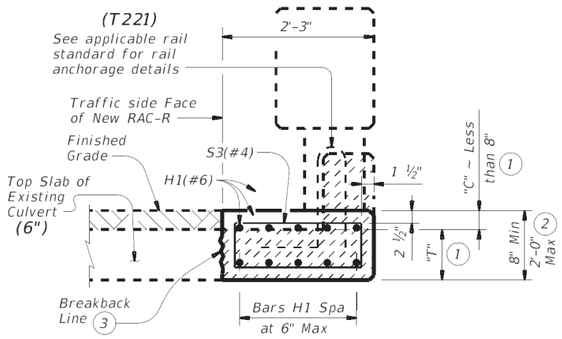


STRAIGHT ANCHOR (9)



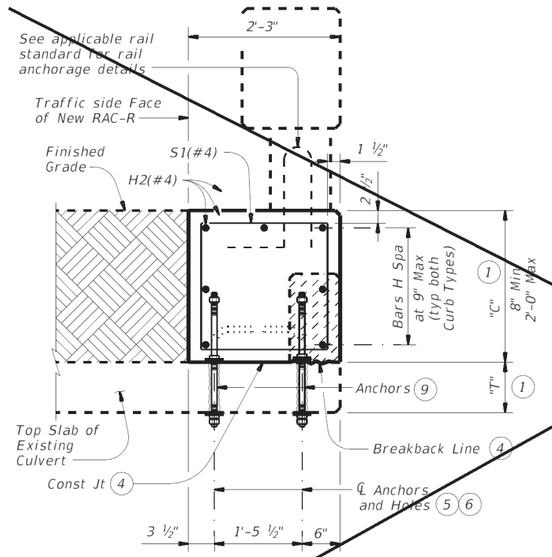
HOOKED ANCHOR (9)

ANCHOR DETAILS



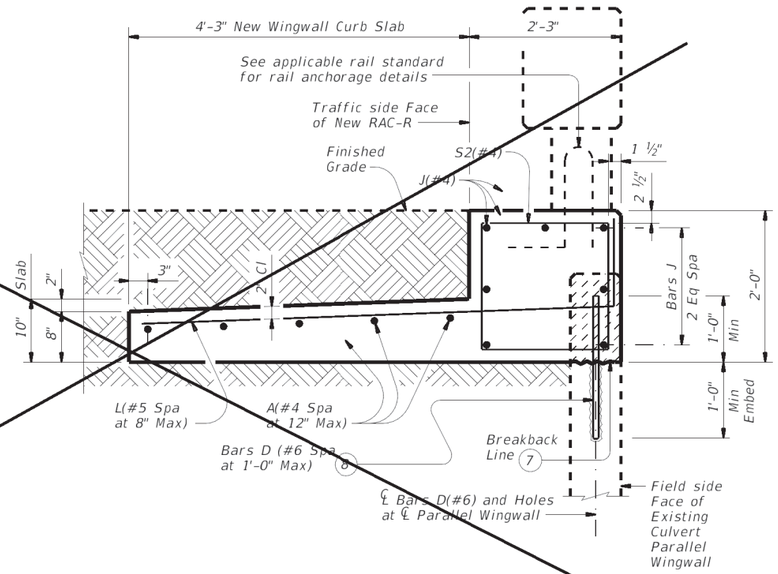
TYPICAL SECTION ~ TYPE 1

Used when the top of the Retrofit Curb is less than 8" above existing slab. Showing T223 Rail other rails similar. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC-R standard.



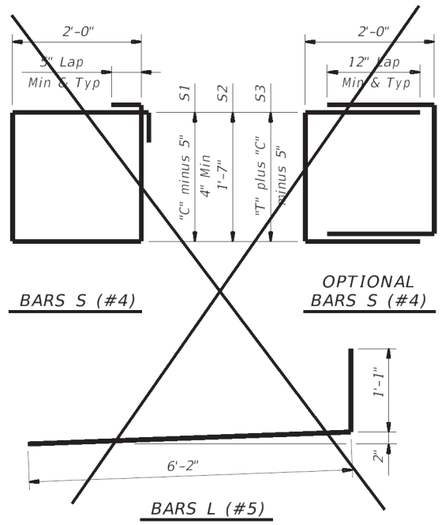
TYPICAL SECTION ~ TYPE 2

Used when the Retrofit Curb is 8" in height or greater. Showing T223 Rail, other rails similar. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC-R standard.



TYPICAL SECTION ~ PARALLEL WINGWALL

Wingwall Anchorage Curb is required on Parallel Wingwalls only. Omit Wingwall Anchorage Curb on Flared and Straight Wingwalls. Showing T223 Rail, other rails similar. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with RAC-R standard.



(1) "T" is equal to the existing culvert top slab thickness. If "T" is less than 6", a special design will be required. "C" is equal to the Retrofit Rail Anchorage Curb thickness.

(2) The total thickness ("T" plus "C") must be 8" minimum in order to properly install the railing anchorage reinforcing.

(3) Remove shaded portion of existing concrete to Breakback Line shown. Care must be taken so as to not damage existing reinforcing. Replace damaged reinforcing with new, like reinforcing. Clean existing reinforcing and incorporate into new concrete construction.

(4) Saw cut (score) 1" deep flush with top of existing culvert slab, on the field side face of existing curb, if present. After scoring, remove shaded portion of existing concrete to Breakback Line shown. Do not damage existing reinforcing. Clean, bend and incorporate existing reinforcing into new concrete construction. Note that new anchors, as shown in the detail, are required even when existing reinforcing remains in use. Remove existing overlay and/or base material to flush with top of culvert in areas of new construction. Care must be taken to not damage the existing slab. In order to prevent existing asphalt remnants from acting as a bond breaker between the exposed, existing concrete and the retrofitted concrete curb, clean the newly exposed concrete with abrasive blasting or shot blasting. Remove all loose debris prior to placing new anchorage curb.

(5) Core drill 1" diameter holes through existing slab. Percussion drilling is not permitted. Patch spalls, when directed by the Engineer, in accordance with Item 429, "Concrete Structure Repair", at the Contractor's expense. Tighten nuts snug tight.

(6) Space field side anchors at 36" maximum. Space traffic side anchors at 11" maximum. Do not align field side and traffic side anchors transversely.

(7) Retrofit Wingwall Anchorage Curb must always be 2'-0" in height. Breakback existing wingwall as needed in order to properly align the wingwall Anchorage Curb with that placed on the existing culvert. Saw cut (score) 1" deep on field side face of the existing wingwall prior to breakback. Care must be taken so as to not damage existing reinforcing. Clean and extend existing reinforcing into new construction. Note that new Bars D(#6), as shown in the detail, are required even when existing reinforcing remains in use.

(8) Embed bars D(#6) into existing wingwall with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 12". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26 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." If existing parallel wingwall thickness is less than 8", a special design will be required.

(9) Use straight anchors if retrofit anchorage curb is 1'-2" or greater in thickness. Use hooked anchors for retrofit anchorage curb less than 1'-2" thick.

CONSTRUCTION NOTES:

Field verify dimensions before commencing work and ordering materials.

MATERIAL NOTES:

Provide Class "C" concrete (f'c=3,600 psi). Provide Class "C" (HPC) concrete if shown elsewhere in the plans.
Chamfer all exposed corners ¾" unless shown otherwise.
Provide Grade 60 reinforcing steel.
Galvanize all reinforcing steel if required elsewhere.
Provide bar laps, where required, as follows: Uncoated or galvanized ~ #4 = 1'-11"
Galvanize ¾" Dia threaded rods, heavy hex nuts and plate washers, unless otherwise shown on plans.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
The rail anchorage curb details have sufficient strength for use with all standard rail types.
See appropriate rail standard for approved speed restrictions, notes and details not shown.
For vehicle safety, the top of the new curb must be flush with the finished grade.
These details are for use with curbs with a maximum height of 2'-0" only. Curb heights greater than 2'-0" will require special design.
Removal and replacement of backfill, subgrade, and asphalt or concrete pavement necessary for this installation is considered subsidiary to the rail anchorage curb.
Payment for rail anchorage curb (including wingwall curb slab) will be by CY of Class "C" or Class "C" (HPC) concrete.
Not all possible combinations of existing box culverts, curbs, wingwalls etc. have been shown on this sheet. Other combinations and reinforcement arrangements are permissible if they meet the same strength requirements as indicated on this sheet.

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

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED
PROFESSIONAL ENGINEER

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LOCATION US90 - BRIDGE PSN:22-233-0-0022-09-037
RAIL TYPE T221 - "C" = 2'-0"

LOCATION US90 - BRIDGE PSN:22-233-0-0022-09-038
RAIL TYPE T221 - "C" = 1'-6"

Texas Department of Transportation

Bridge Division Standard

RAIL ANCHORAGE CURB RETROFIT GUIDE

BOX CULVERT RAIL MOUNTING DETAILS
(CURBS 2'-0" TALL AND LESS ONLY)

RAC-R(MOD)

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REVISIONS	0022	09	055, etc.	US 90, etc.
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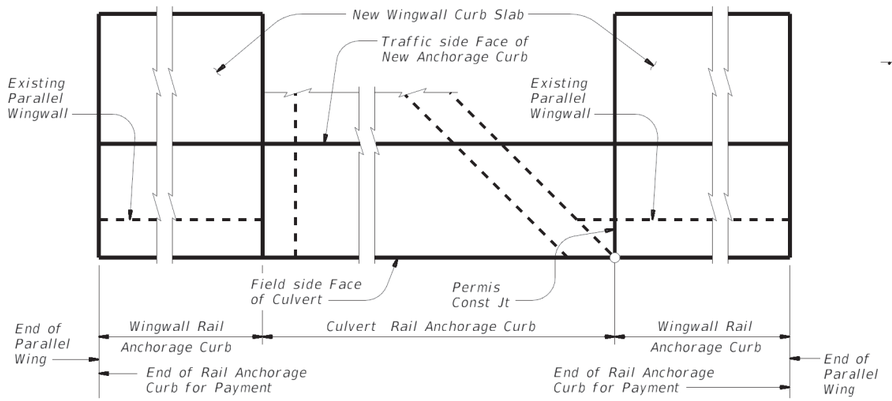
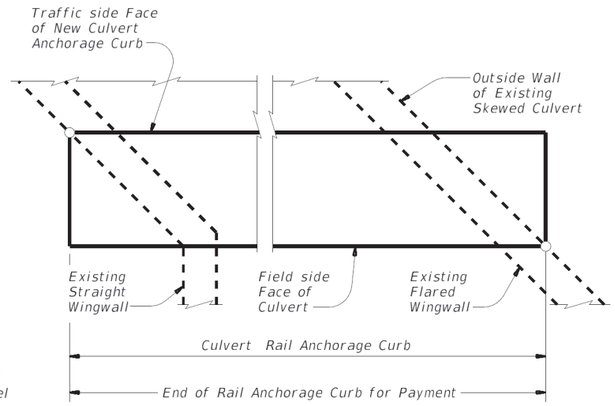


PARALLEL WINGWALL AT 0° SKEW CULVERT

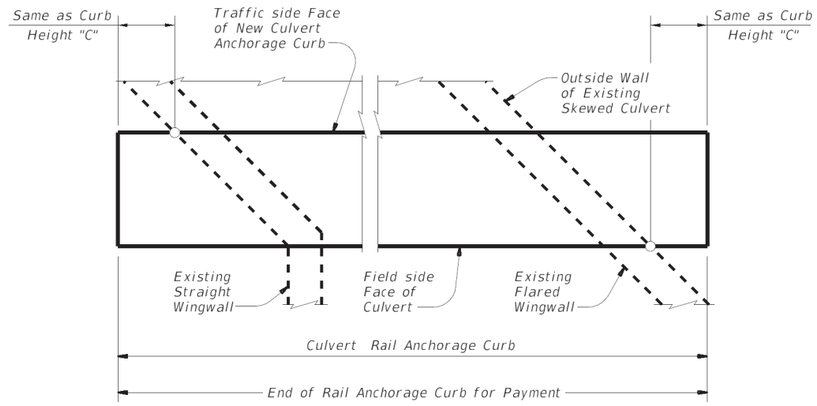
PARALLEL WINGWALL AT SKEWED CULVERT

Note that Wingwall Rail Anchorage Curb is used only at culverts with parallel wingwalls.



OPTION A ~ STRAIGHT WINGWALL AT SKEWED CULVERT (10)

OPTION A ~ FLARED WINGWALL AT SKEWED CULVERT (10)

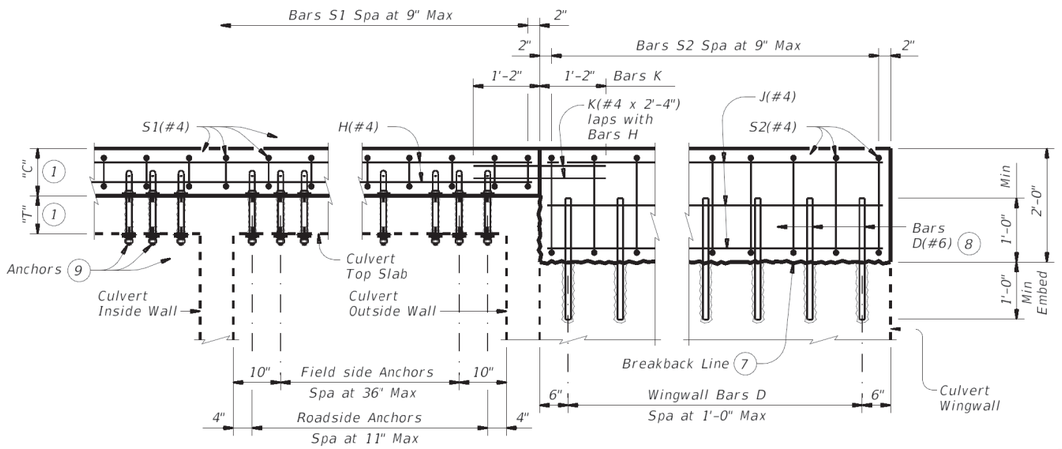


OPTION B ~ STRAIGHT WINGWALL AT SKEWED CULVERT (11)

OPTION B ~ FLARED WINGWALL AT SKEWED CULVERT (11)

TYPICAL CURB PLANS

Showing Geometry only. Reinforcing, Curb Anchors, and Railing not shown for clarity.



SHOWING CULVERT ANCHORAGE CURB

Showing Anchorage Curb Type 2. Anchor and Bars S spacing are the same for Anchorage Type 1.

SHOWING WINGWALL ANCHORAGE CURB

Curb Slab and Slab reinforcing not shown for clarity.

TYPICAL ELEVATIONS OF INSTALLATION

(1) "T" is equal to the existing culvert top slab thickness. If "T" is less than 6", a special design will be required. "C" is equal to the Retrofit Rail Anchorage Curb thickness.

(7) Retrofit Wingwall Anchorage Curb must always be 2'-0" in height. Breakback existing wingwall as needed in order to properly align the wingwall Anchorage Curb with that placed on the existing culvert. Saw cut (score) 1" deep on field side face of the existing wingwall prior to breakback. Care must be taken so as to not damage existing reinforcing. Clean and extend existing reinforcing into new construction. Note that new Bars D(#6), as shown in the detail, are required even when existing reinforcing remains in use.

(8) Embed bars D(#6) into existing wingwall with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 12". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26 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." If existing parallel wingwall thickness is less than 8", a special design will be required.

(9) Use straight anchors if retrofit anchorage curb is 1'-2" or greater in thickness. Use hooked anchors for retrofit anchorage curb less than 1'-2" thick.

(10) Use Option A if finished grade at face of rail anchorage curb remains unchanged, or if both wingwalls and rail anchorage curb will be vertically raised. Existing wingwalls must be checked for suitability of vertically raising.

(11) Use Option B if wingwalls will not be vertically raised when the curb height is increased. Verify adequacy of existing or proposed finished grade between end of rail anchorage curb and wingwall. Extension of rail anchorage curb beyond wingwall may need to be greater than "C" depending on side slope conditions.

STATE OF TEXAS
LUIS G. URBINA
117019
LICENSED PROFESSIONAL ENGINEER

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2/27/2023

Texas Department of Transportation

Bridge Division Standard

RAIL ANCHORAGE CURB RETROFIT GUIDE

BOX CULVERT RAIL MOUNTING DETAILS
(CURBS 2'-0" TALL AND LESS ONLY)
(NOT TO BE USED AS A STANDARD)

RAC-R(MOD)

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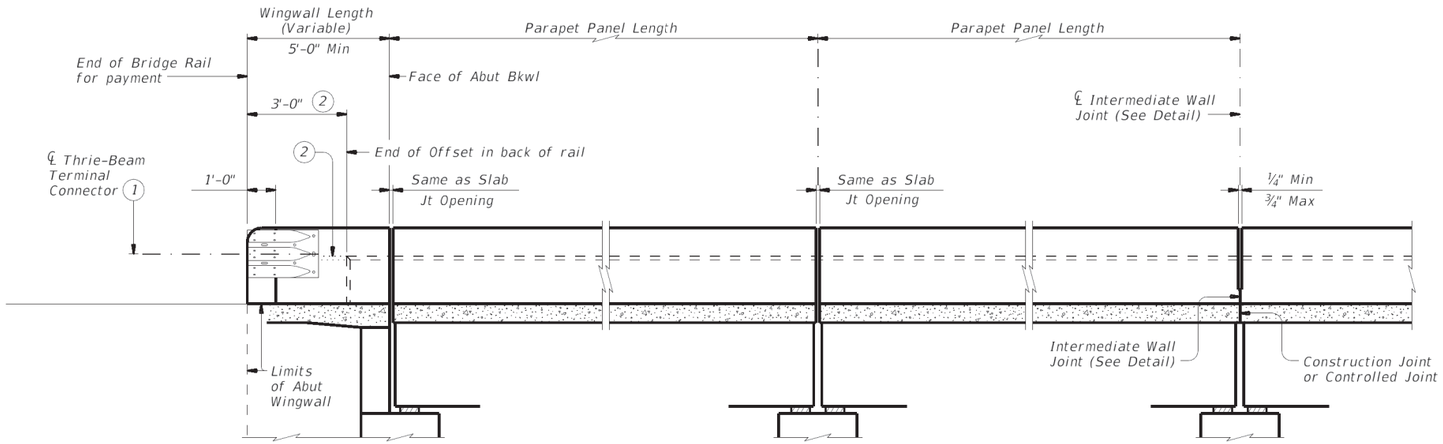
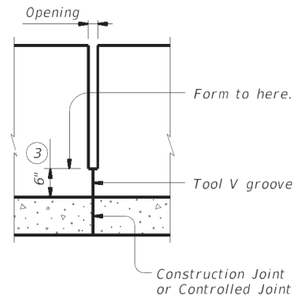


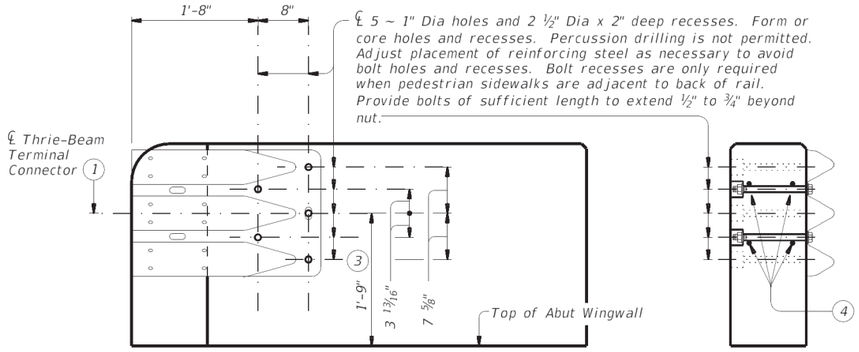
AT ABUTMENTS | AT BENTS WITH SLAB EXP JOINTS | AT BENTS WITHOUT SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL



INTERMEDIATE WALL JOINT DETAIL

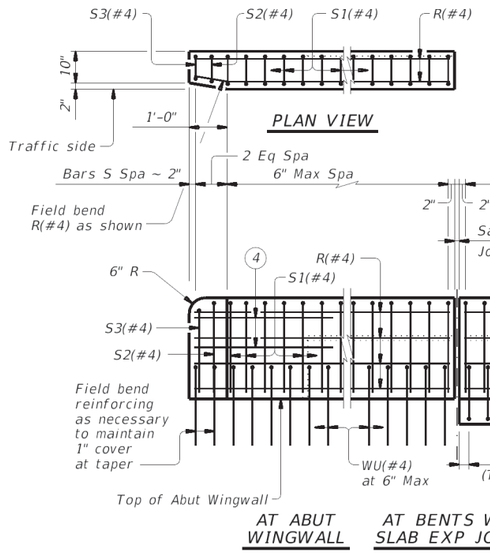
Provide at all interior bents without slab expansion joints.



ELEVATION | SECTION

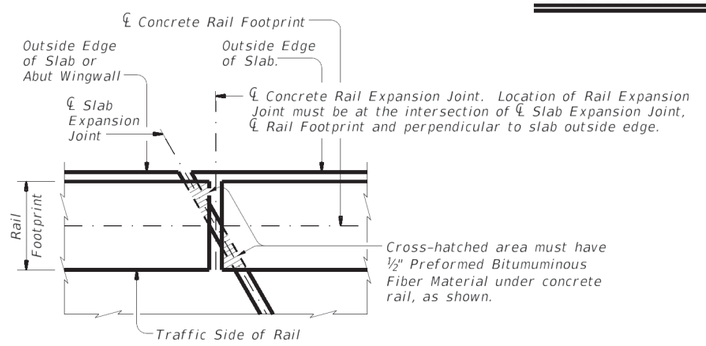
TERMINAL CONNECTION DETAILS

1. Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
2. Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
3. Increase 2" for structures with overlay.
4. Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required. Field bend as needed.



AT ABUT WINGWALL | AT BENTS WITH SLAB EXP JOINTS | AT SLAB | AT BENTS WITHOUT SLAB EXP JOINTS

ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

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TRAFFIC RAIL

TYPE T221

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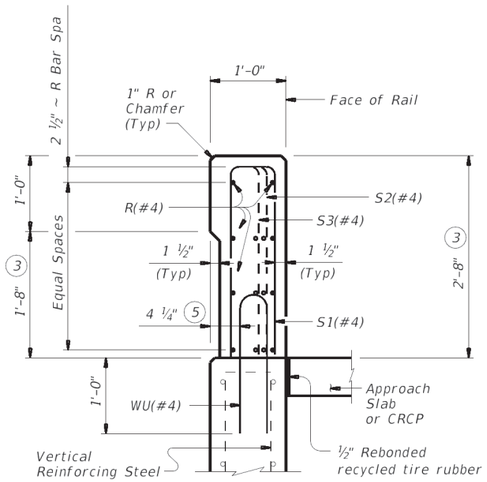
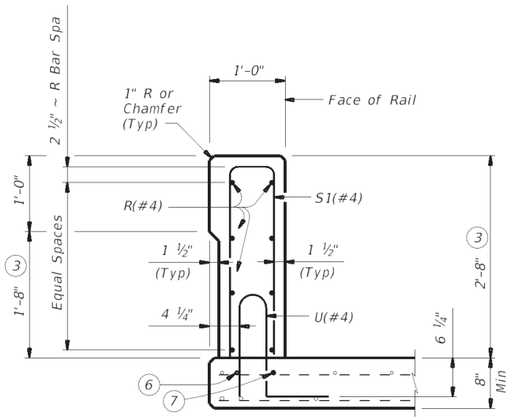


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB

SECTIONS THRU RAIL

(3) Increase 2" for structures with overlay.

(5) 5 ¼" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.

(6) As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars will be furnished at the Contractors expense.

(7) Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.

(8) Bend or cut as required to clear drain slots.

(9) No longitudinal wires may be in top center of cage.

(10) Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".

If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a ⅜" width x ¼" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.

Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.

Chamfer all exposed concrete corners.

MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM 1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other that shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #4 = 1'-7"

Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:

This rail has been evaluated and accepted to be of equal strength to railings with like geometry, which have been crash tested to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

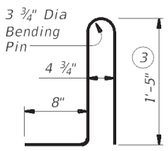
Do not use this railing on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

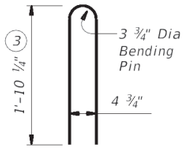
Shop drawings are not required for this rail.

Average weight of railing with no overlay is 370 plf.

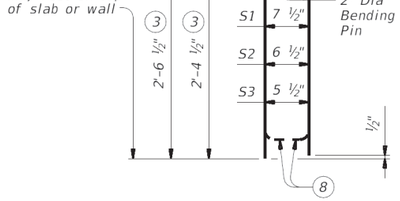
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



BARS U (#4)



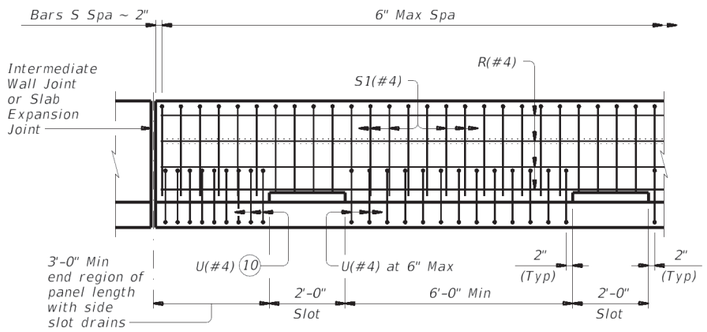
BARS WU (#4)



BARS S (#4)

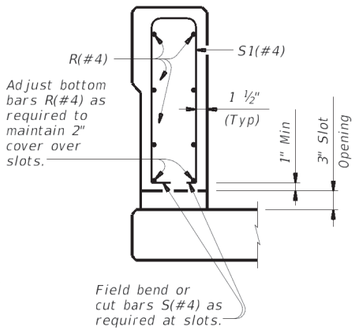
OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
	No. of Wires	Spacing
Minimum	8	4"
Maximum	10	8"
Maximum Wire Size Differential	The smaller wire must have an area of 40% or more of the larger wire.	



OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



SECTION THRU OPTIONAL SIDE SLOT DRAIN

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T221

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	22	VAL VERDE, etc.		91

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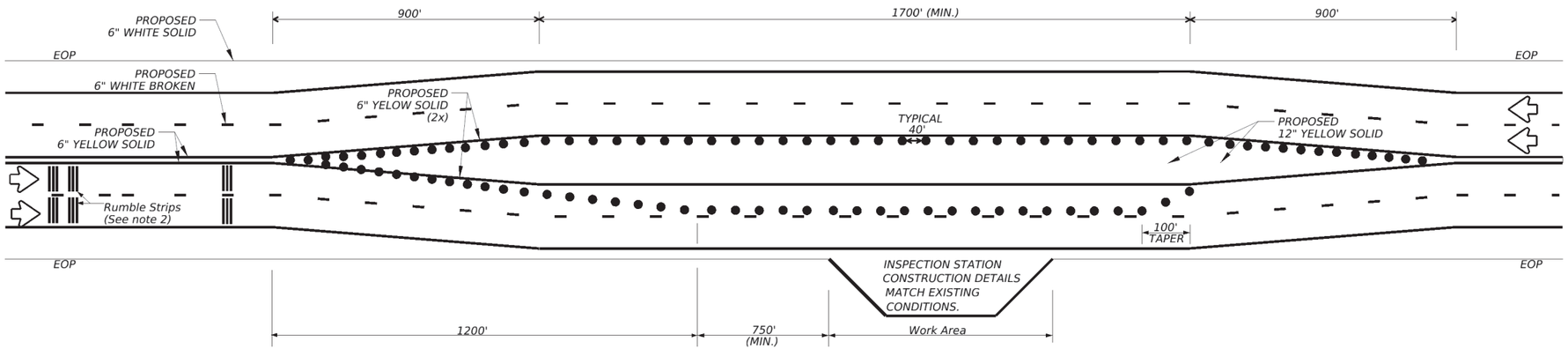
U.S. BORDER PATROL INSPECTION STATION PAVEMENT MARKINGS ON 4-LANE HIGHWAY



NOTES:

1. WHEN INSPECTION STATION IS CLOSED, CHANNELIZING DEVICES AND WORK VEHICLES CAN BE REMOVED, ADVANCE SIGNS CAN BE FOLDED DOWN OR TURNED, STOP SIGN SHALL BE TURNED, COVERED OR MOVED AWAY AND FLASHING BEACONS SHALL BE TURNED OFF.

2. RUMBLE STRIPS (RAISED) SHALL BE INSTALLED AT LEAST 1 MILE IN ADVANCE OF THE STOP CONDITION FOR "PERMANENT" BORDER PATROL CHECKPOINT LOCATIONS. EXACT PLACEMENT OF TRANSVERSE RUMBLE STRIPS WILL BE DETERMINED BY TxDOT. TRANSVERSE RUMBLE STRIP DETAILS ARE SHOWN IN THE "RS" SERIES STANDARD PLAN SHEETS.

3. CHANNELIZING DEVICES SHALL BE PLACED BY CONTRACTOR AND MAINTAINED BY BORDER PATROL.

4. REFER TO PAVEMENT MARKINGS & DELINEATION STANDARDS 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

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2/27/2023

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Texas Department of Transportation

U.S. BORDER PATROL CHECKPOINT PAVEMENT MARKINGS LAYOUT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0022	09	055, etc.	US 90, etc.
DIST	COUNTY		SHEET NO.
22	VAL VERDE, etc.		92

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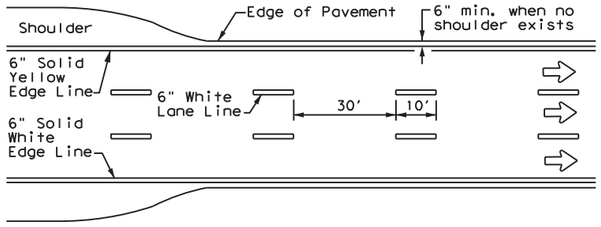
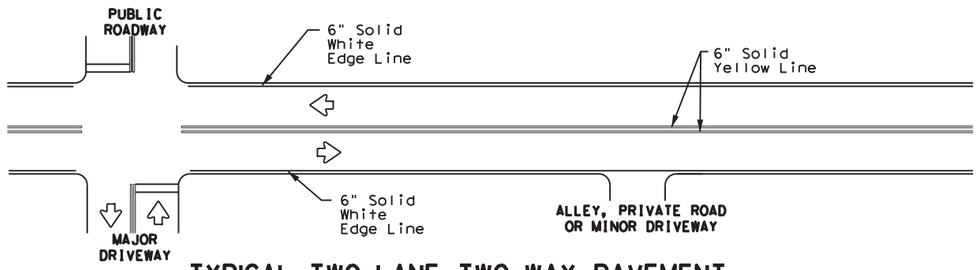
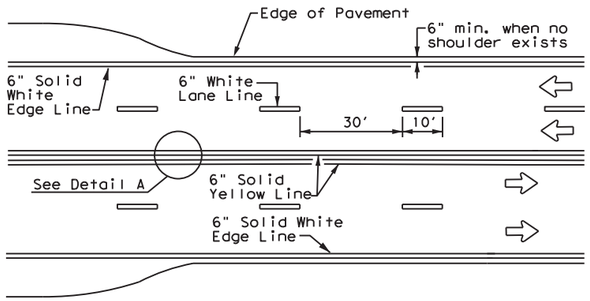
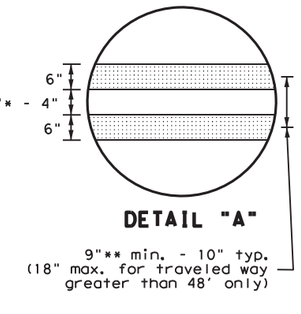


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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

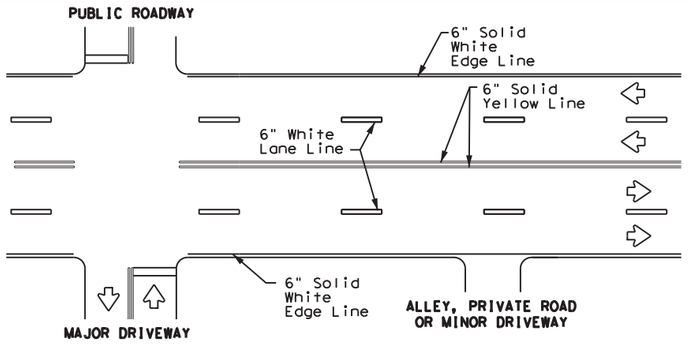




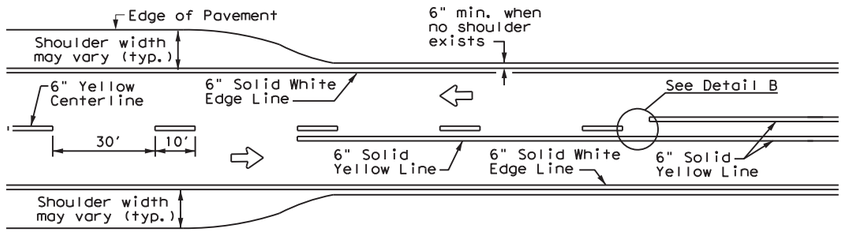
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

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

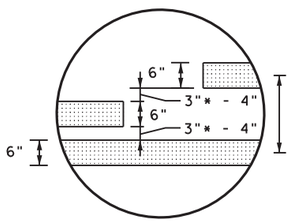
** 8" minimum for restripe projects when approved by the Engineer.



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

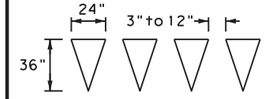


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



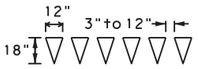
DETAIL "B"

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

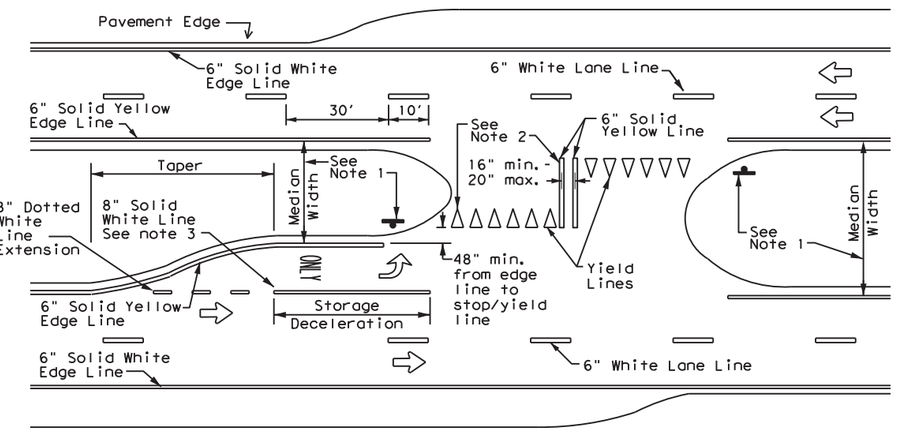


For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



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



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

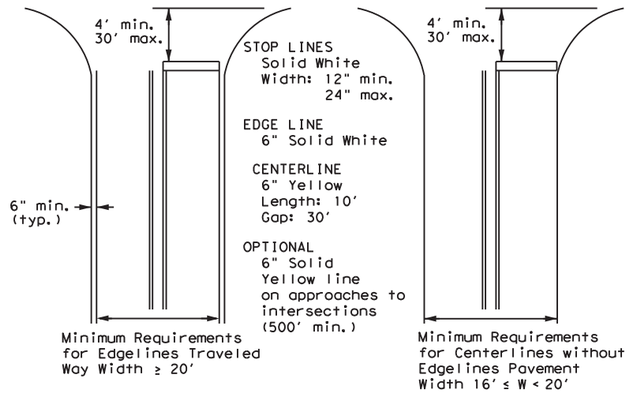
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections.
   Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling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

GENERAL NOTES

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

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

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



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

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

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REVISIONS 11-78 8-00 6-20	0022	09	055, etc.	US 90, etc.
8-95 3-03 12-22	DIST	COUNTY		SHEET NO.
5-00 2-12	22	VAL VERDE, etc.		93

22A

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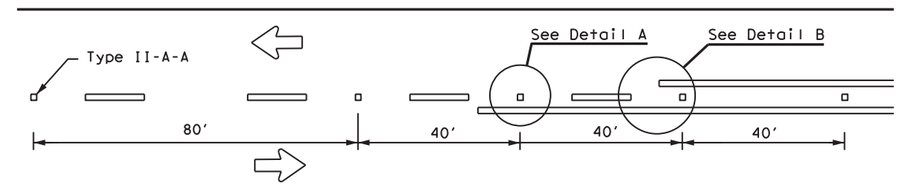
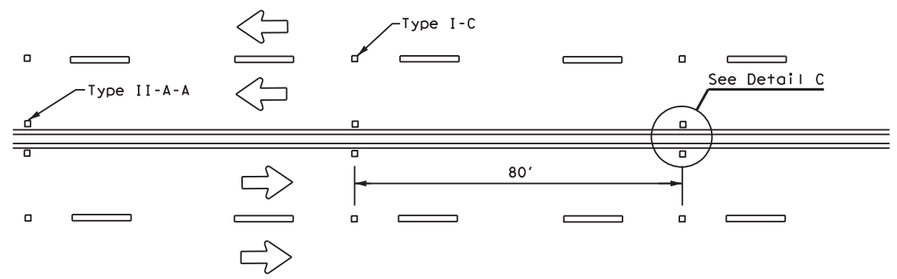
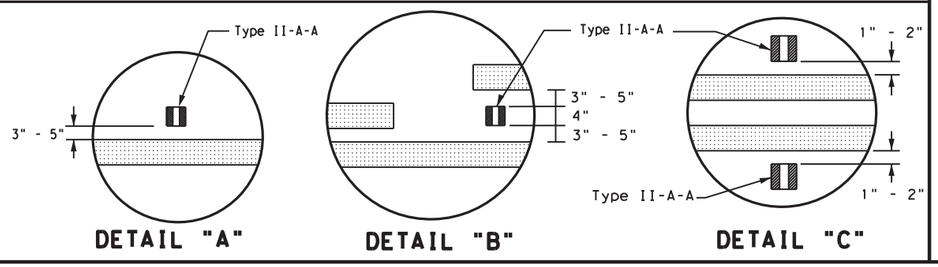
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

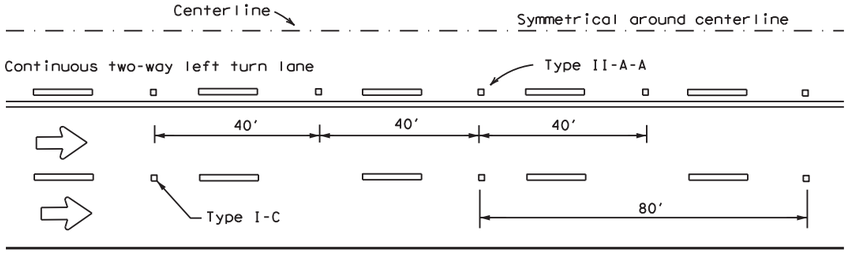


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

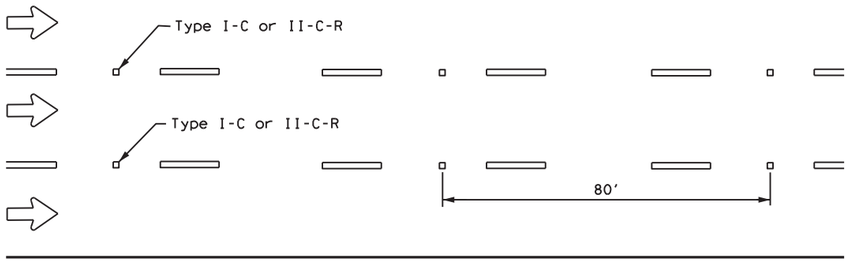


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



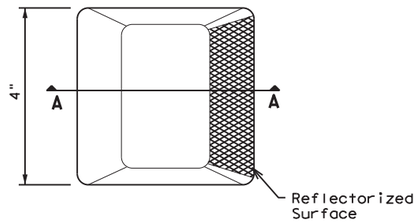
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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

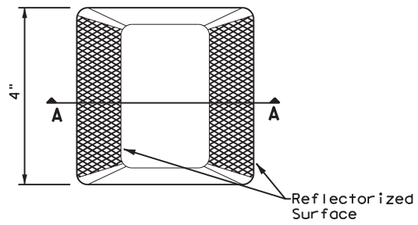
See Note 3.

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

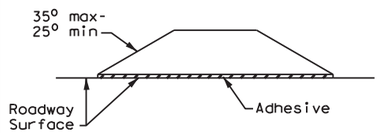
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

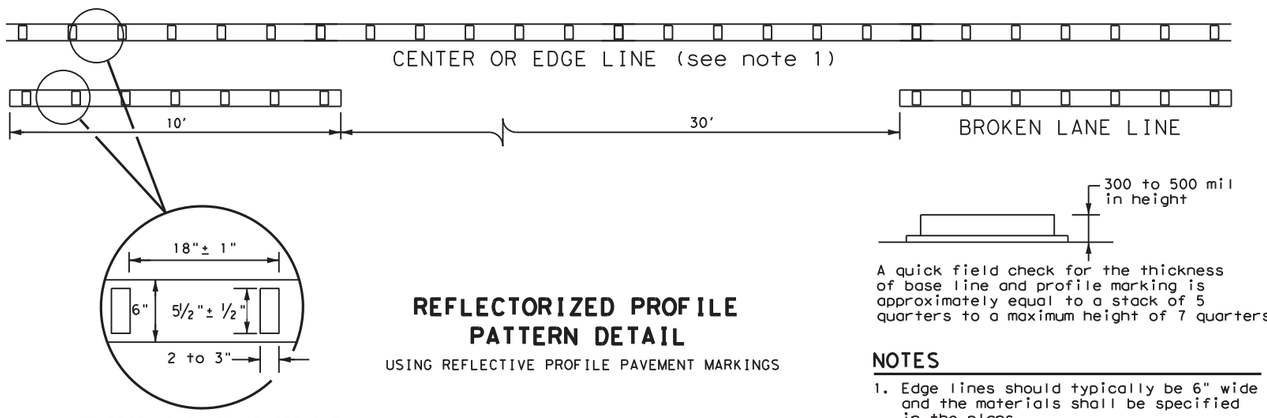


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

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.

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. 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 along 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.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

Traffic Safety Division Standard

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

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
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	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		94

22B

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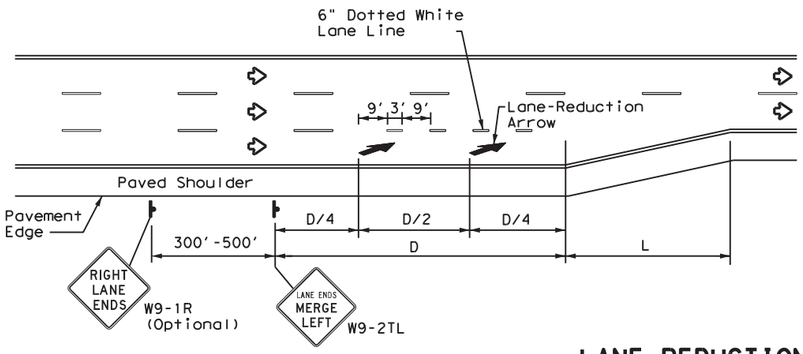
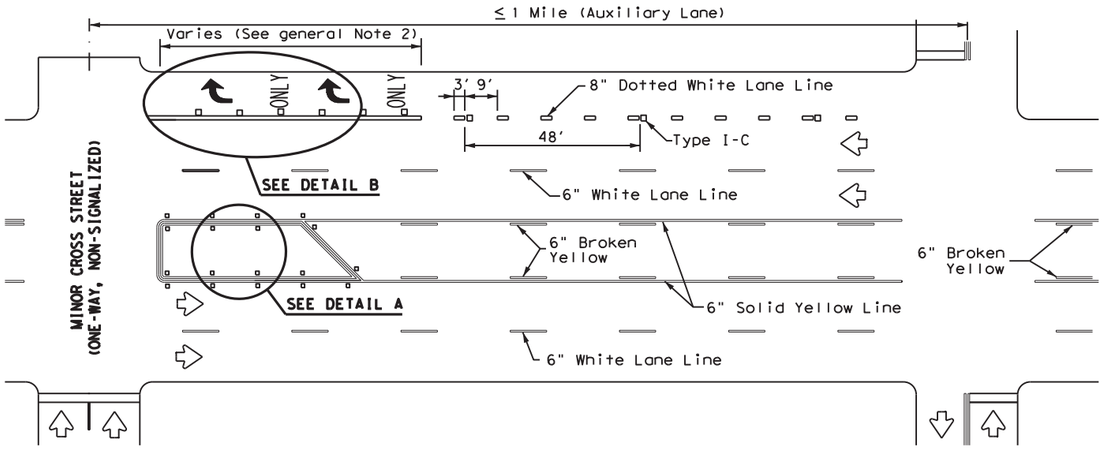


LANE REDUCTION

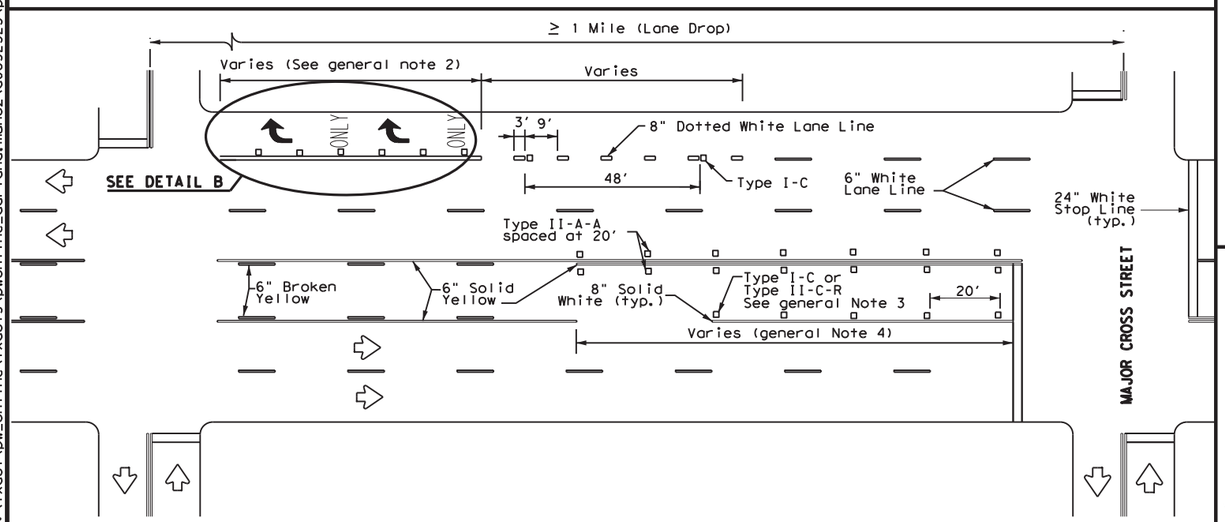
NOTES

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 RIGHT LANE ENDS (W9-1R) 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.

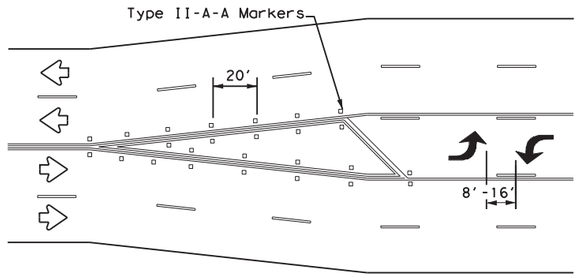
ADVANCED WARNING SIGN DISTANCE (D)		
Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	



TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



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.

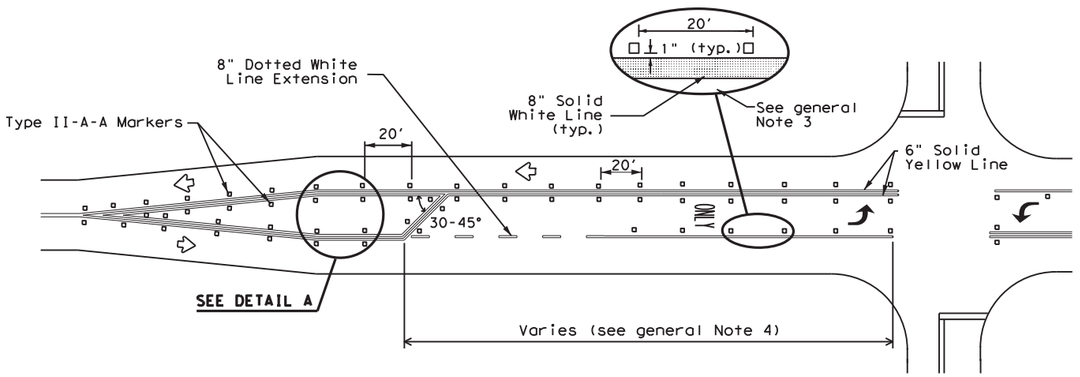
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

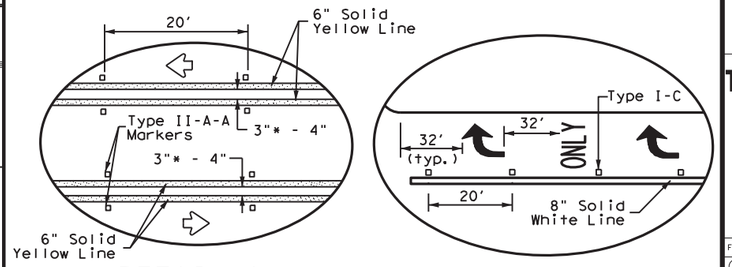
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn 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. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

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 TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



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

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-22

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8-00 2-12	22	VAL VERDE, etc.		95

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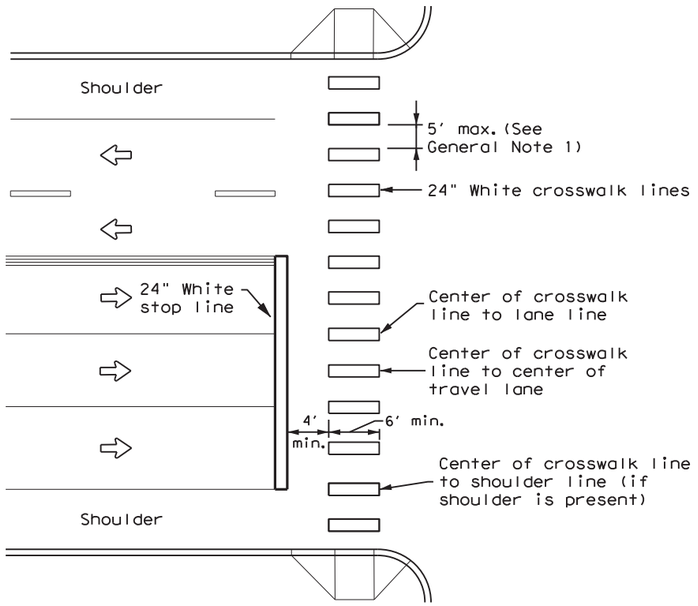


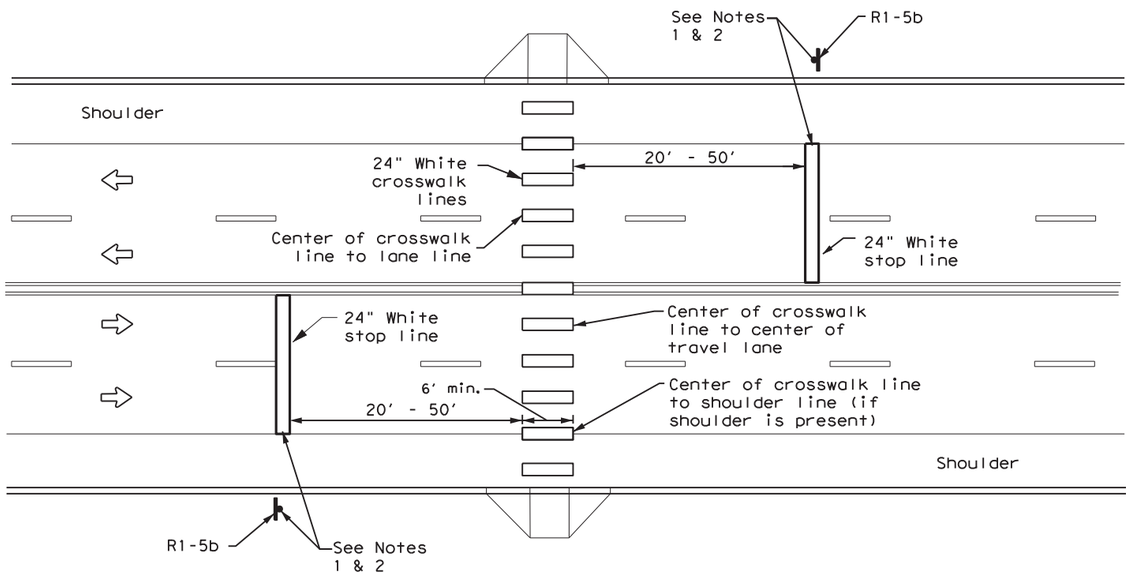
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

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 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 MIDBLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES:

1. Use stop bars with Stop Here For Pedestrians (R1-5b) signs at unsignalized midblock cross walks.
2. Use stop bars with STOP HERE ON RED (R10-6 or R10-6a) signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

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CROSSWALK PAVEMENT MARKINGS

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REVISIONS	0022	09	055, etc.	US 90, etc.
6-20				
6-22	DIST	COUNTY		SHEET NO.
12-22	22	VAL VERDE, etc.		96

22D

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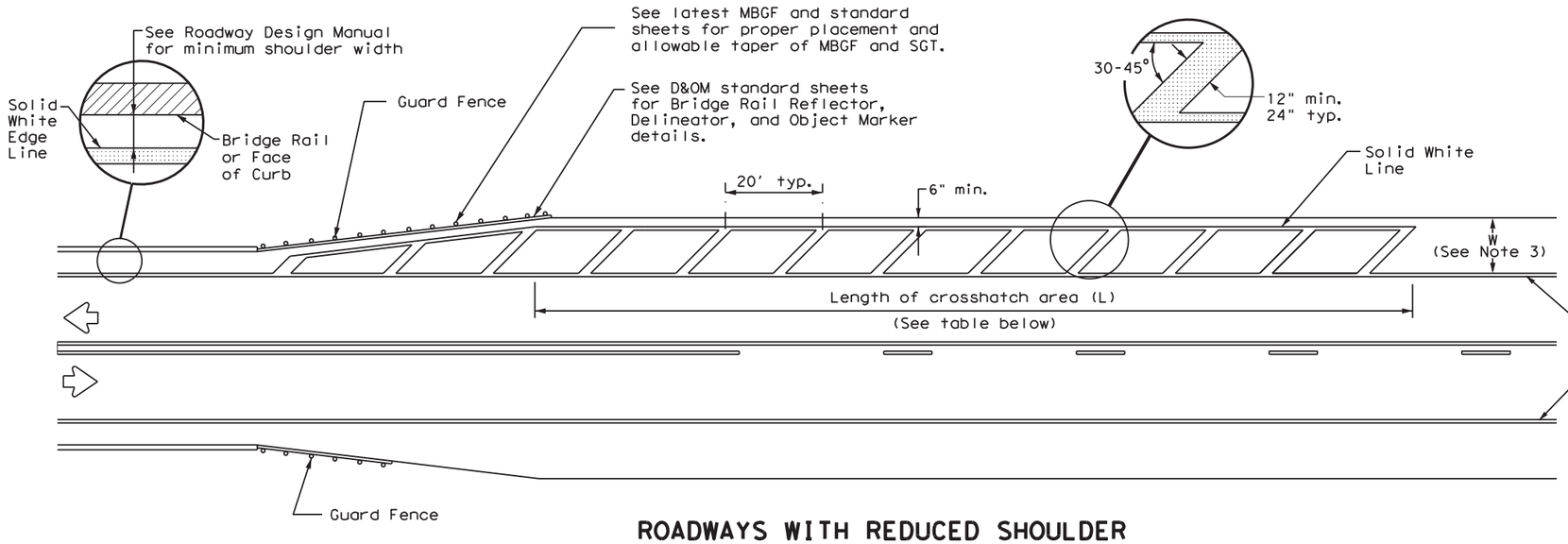
DATE: 2/27/2023 6:59:18 PM
FILE: c:\txdot\pw_online\txdot5\pwonline_adriana.munoz\d0852323\pm5-22.dgn



ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT

CROSSHATCH LENGTH (L)	
Posted Speed (MPH)	L (ft)
30	300 ft
35	
40	
45	
50	500 ft
55	
60	
65	
70	
75	

NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 4 inches from the bridge rail or face of curb or 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions.
2. No-passing zone on bridge approach is optional. If used, the no-passing zone shall be a minimum 500 feet long from the beginning of the bridge.
3. The crosshatching should be required if the shoulder width in advance of the bridge is 4 feet or wider and a reduction of at least 3 feet in shoulder width across the bridge occurs.
4. On divided highways, review both the right and left shoulder widths for the need for narrow bridge pavement markings.

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.

Texas Department of Transportation

Traffic Safety Division Standard

PAVEMENT MARKINGS FOR ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT
PM(5)-22

FILE: pm5-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		97

22E

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REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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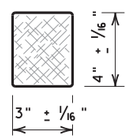
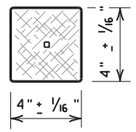
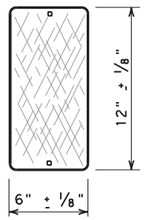
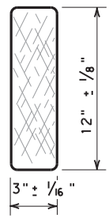
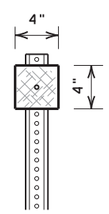
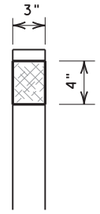
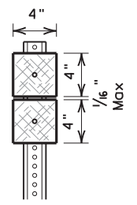
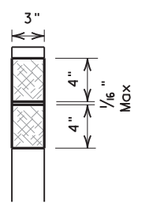
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

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

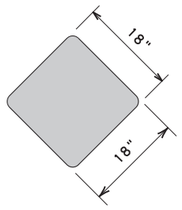
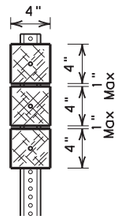
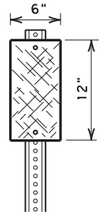
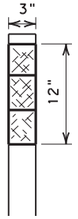
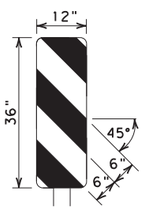
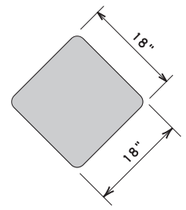
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

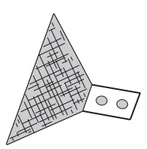
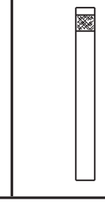
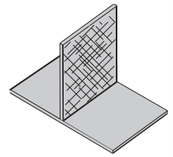
OBJECT MARKERS

	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

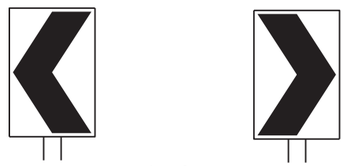
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

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

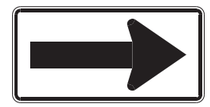


SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

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



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	09	055, etc.	US 90, etc.
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	22	VAL VERDE, etc.		98

20A

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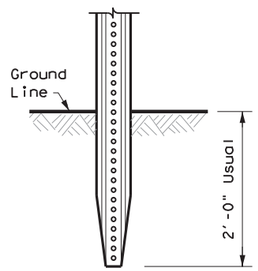
FILE: c:\txdot\pw_online\txdot5\pwonline_adriana.munoz\d0852323\dom2-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

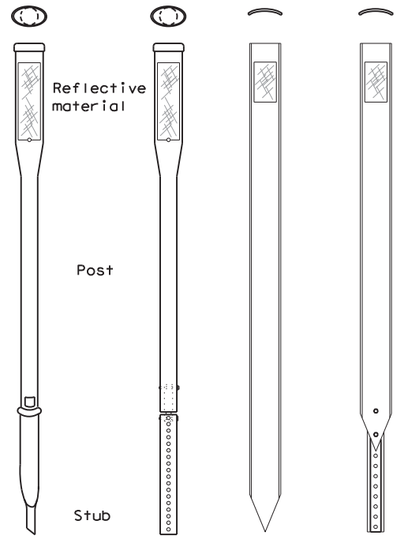


NOTES

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.

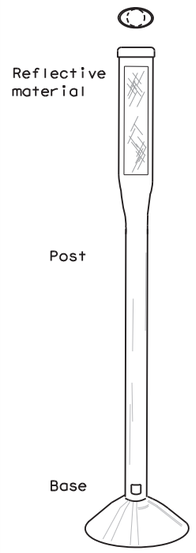
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



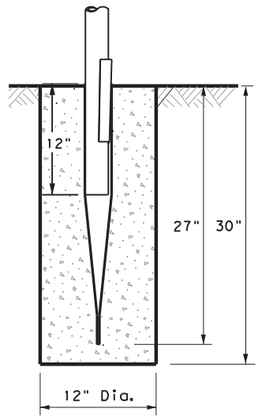
SURFACE MOUNT

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.

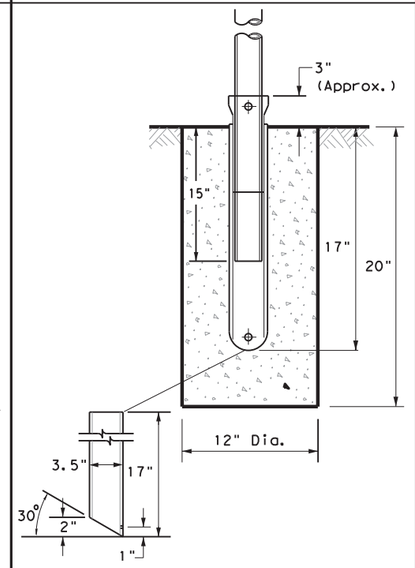
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

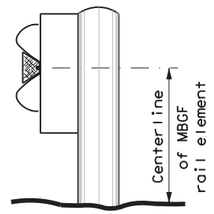
NOTE

1. Install per manufacturer's recommendations.

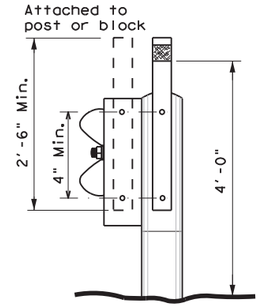
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

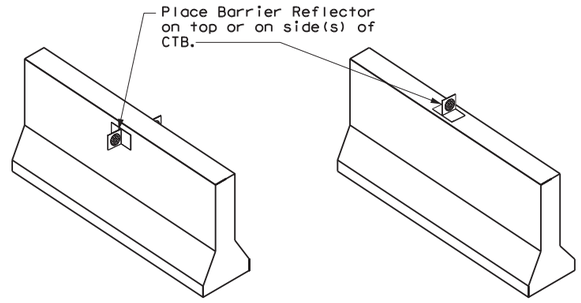
GF1



GF2



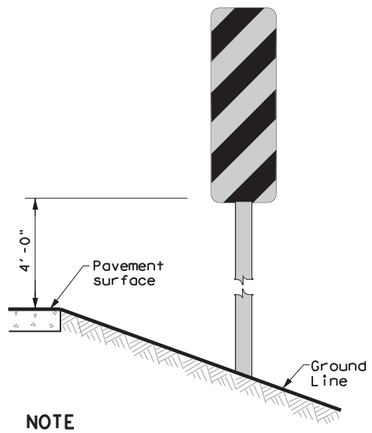
CONCRETE TRAFFIC BARRIER (CTB)



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.

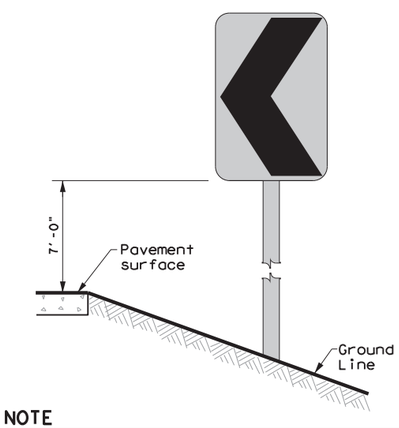
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

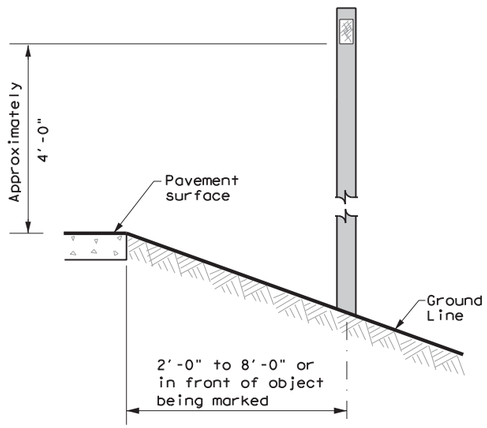
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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

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© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0022	09	055, etc.	US 90, etc.
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	22	VAL VERDE, etc.		99

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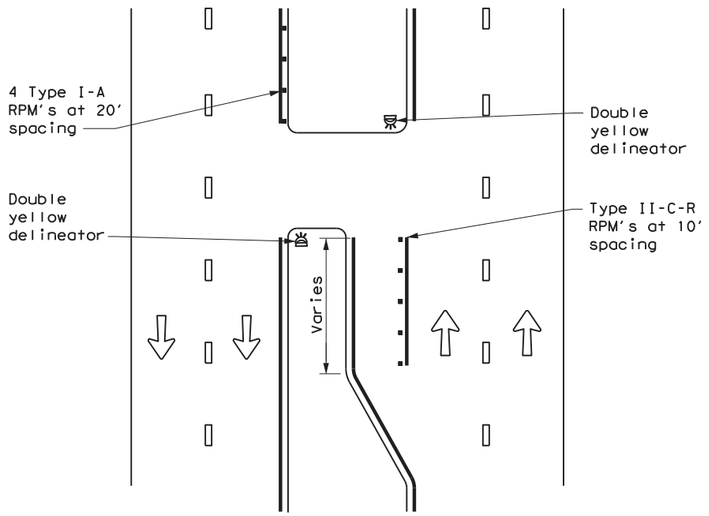
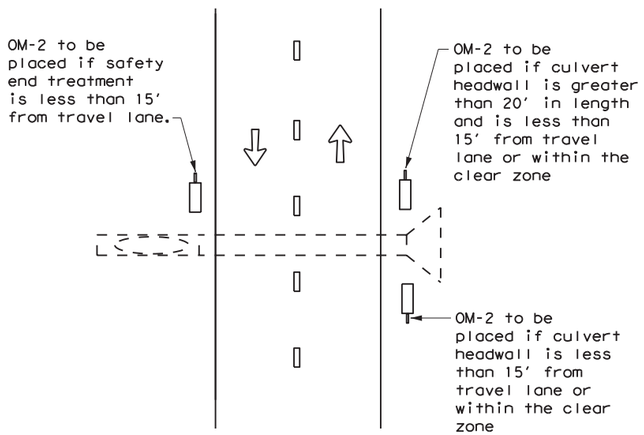
CROSSOVERS



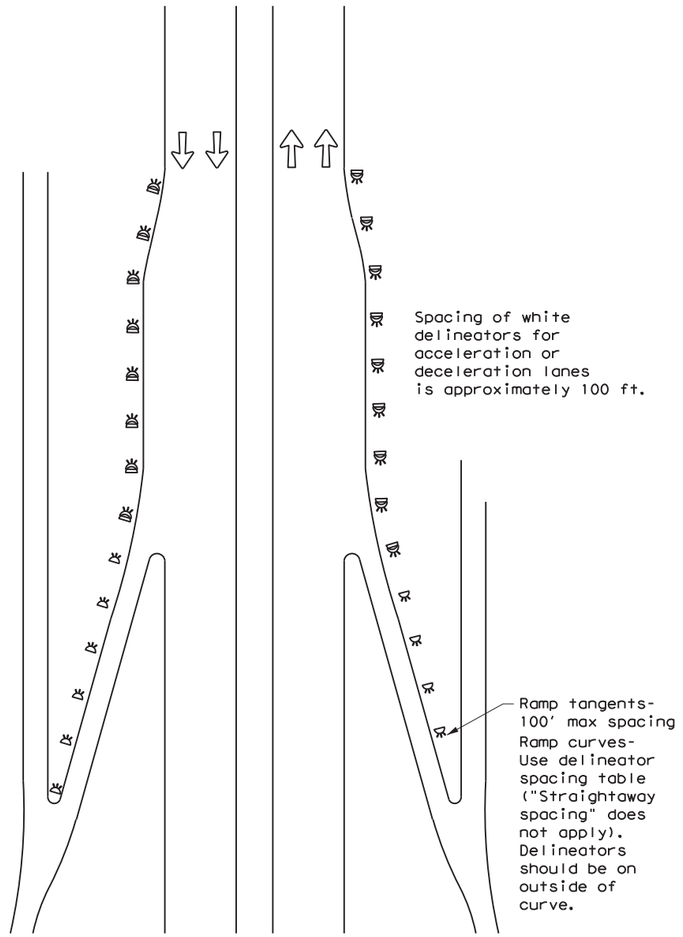
DETAIL 1

FOR CULVERTS WITHOUT MBGF



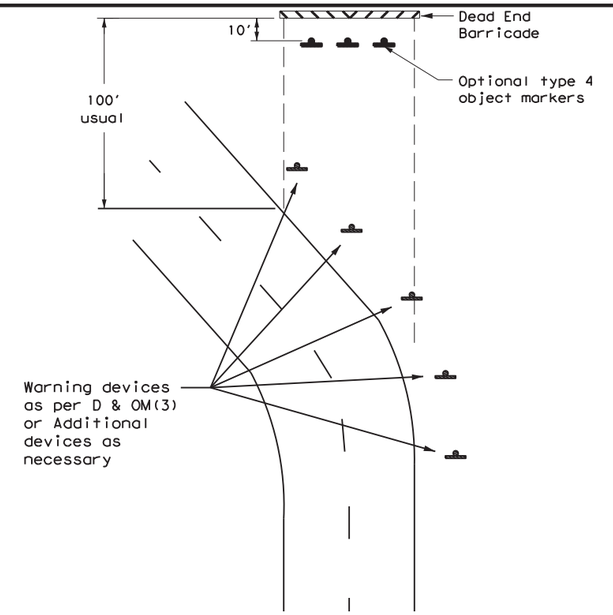
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



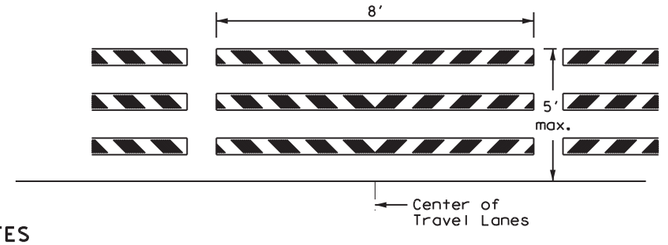
DETAIL 3

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	09	055, etc.	US 90, etc.
3-15 7-20	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		100

20D

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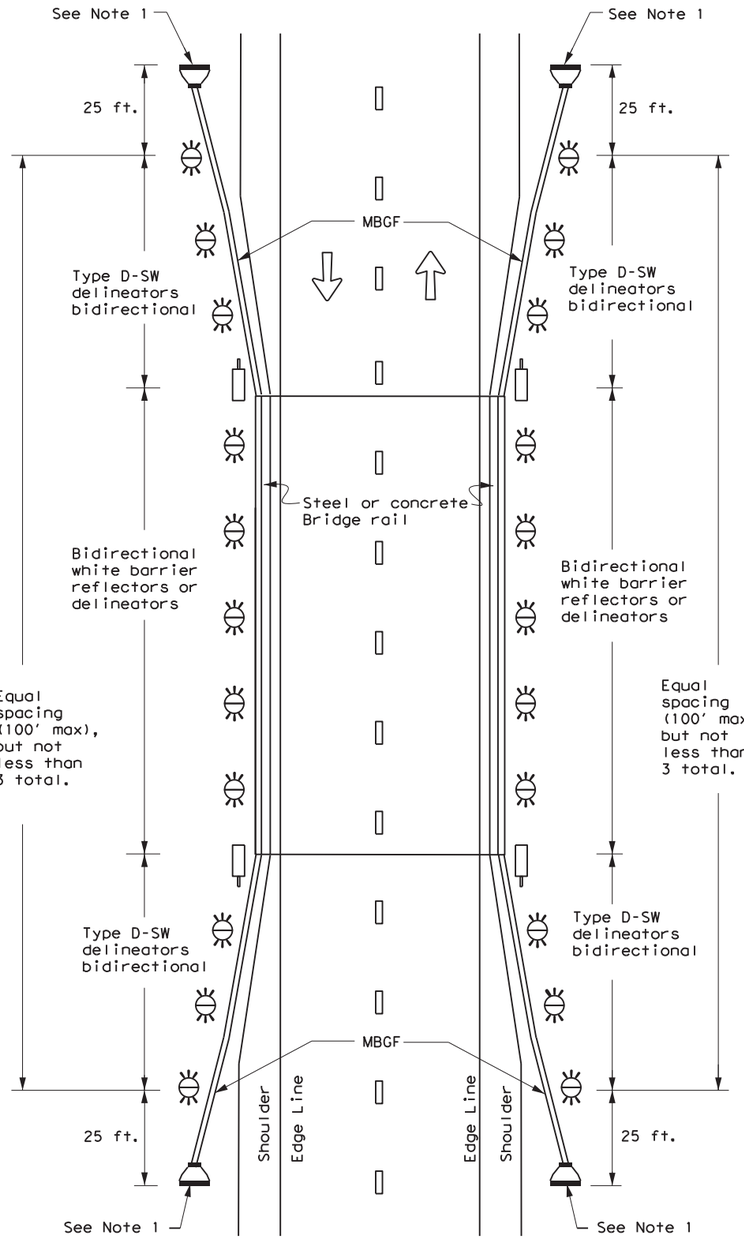
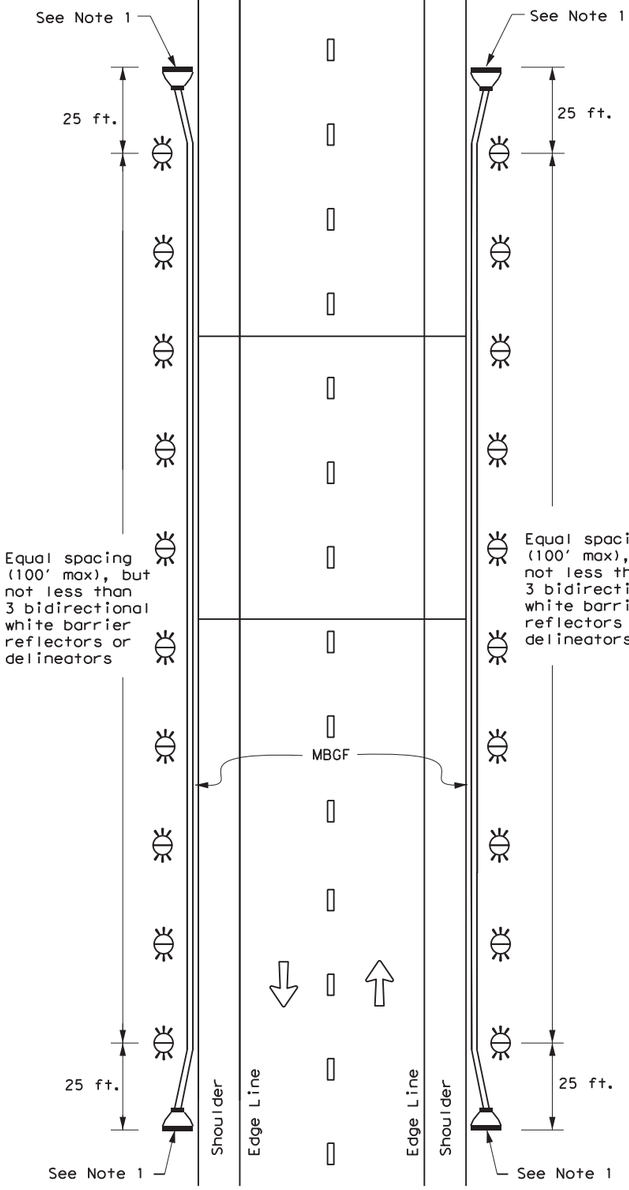
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

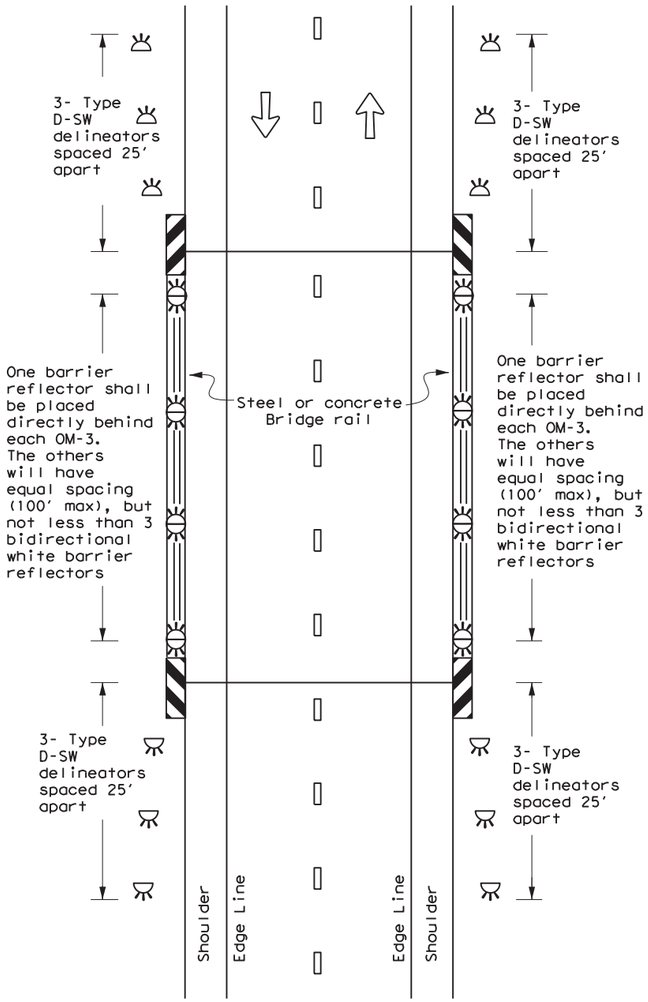
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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

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REVISIONS	0022	09	055, etc.	US 90, etc.
7-20	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		101

20E

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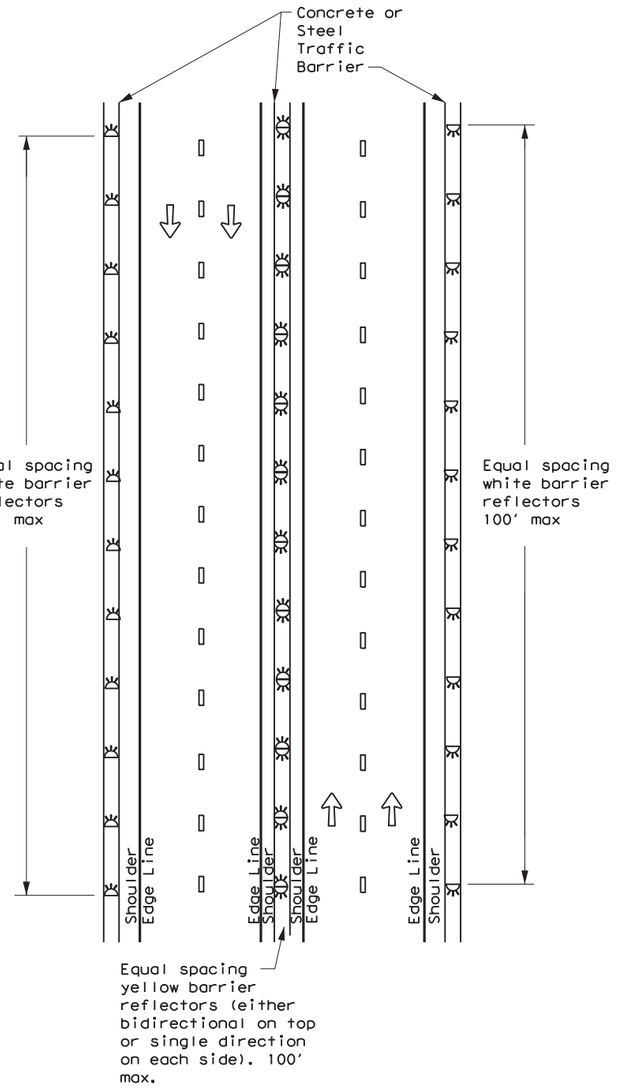
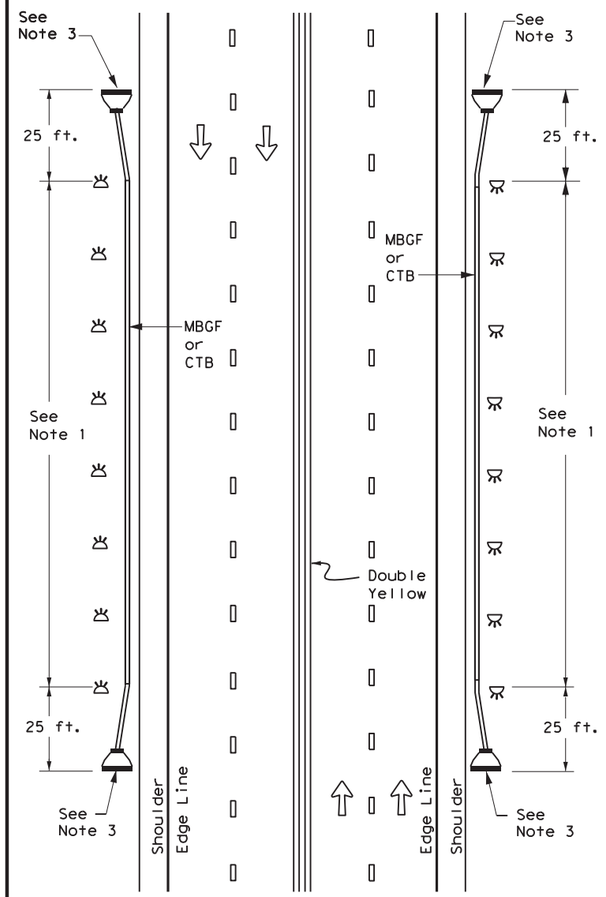
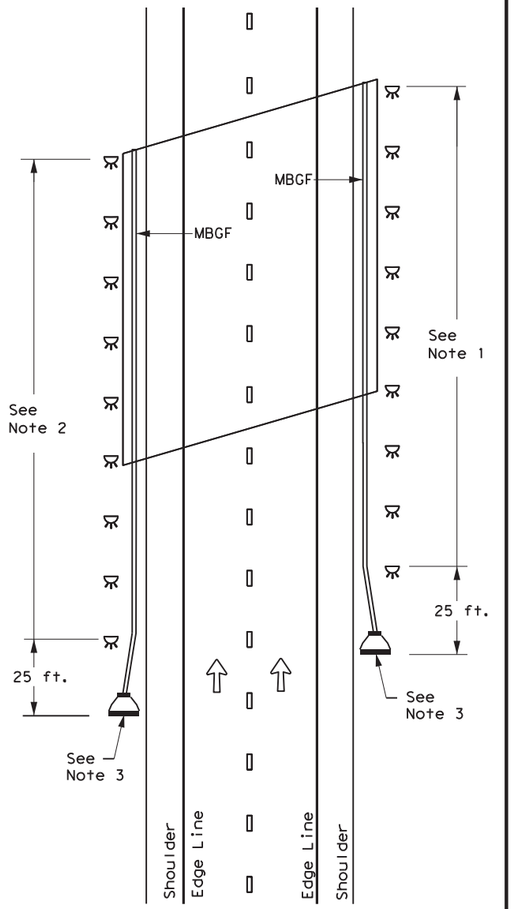
CONTINUOUS CONCRETE OR STEEL BARRIER



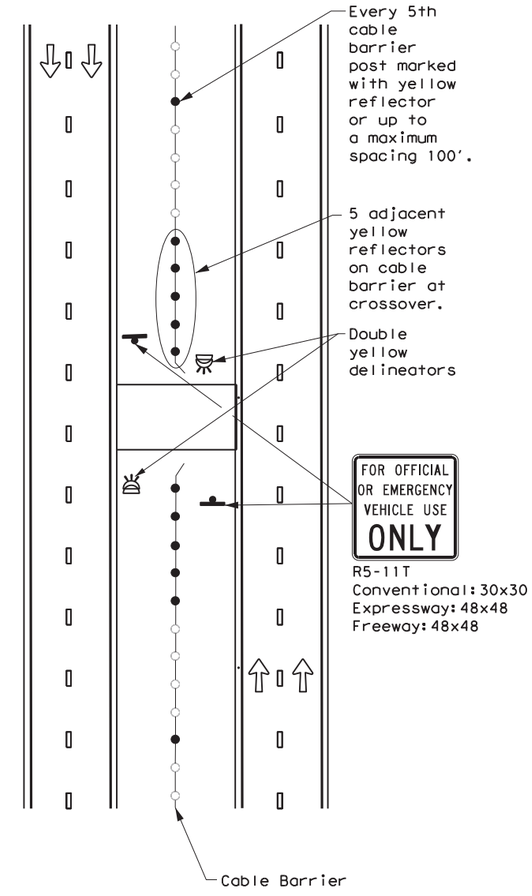
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



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

FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0022	09	055, etc.	US 90, etc.
7-20	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		102

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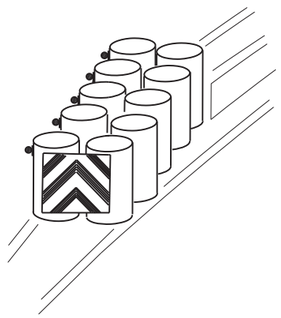
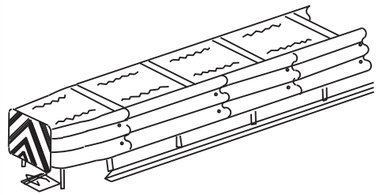
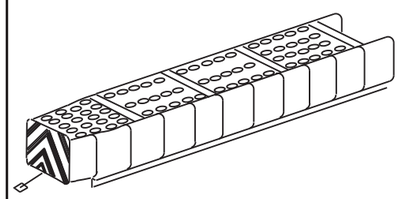
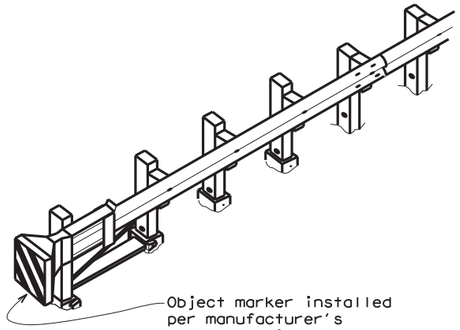
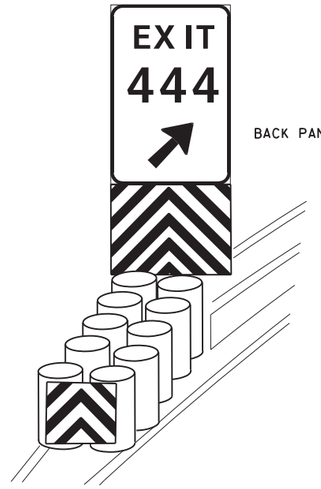
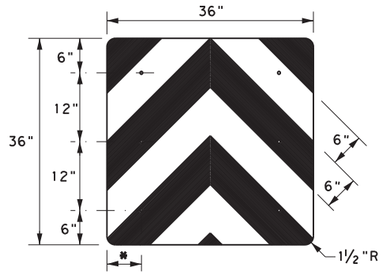


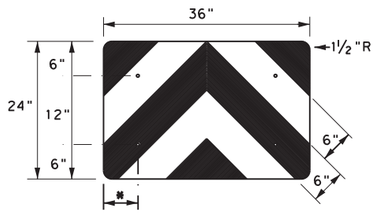




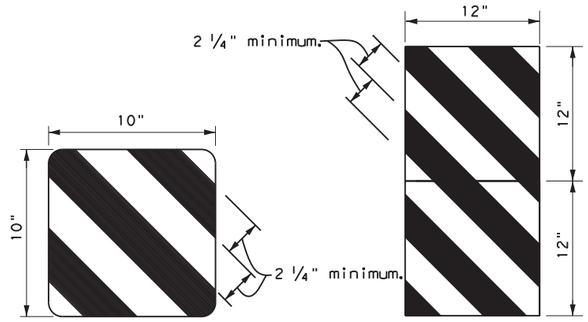




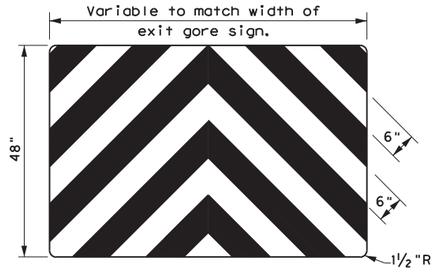


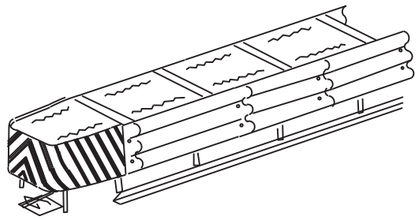


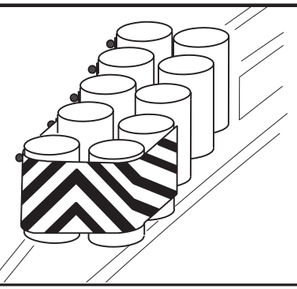
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

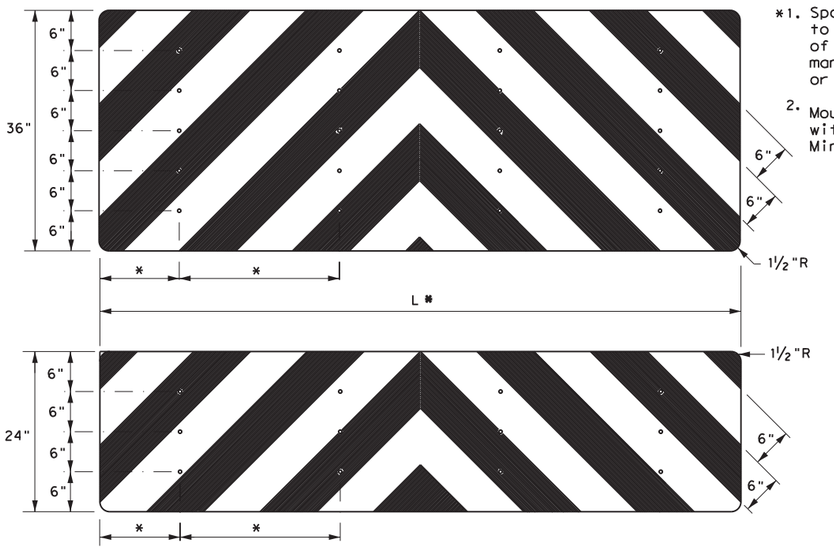


OBJECT MARKERS SMALLER THAN 3 FT^2









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
REVISIONS	0022	09	055, etc.	US 90, etc.
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	22	VAL VERDE, etc.		103
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.

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. Texas Horned Lizard
2. Reticulated Collared Lizard
3. Texas Tortoise
4. Texas Indigo Snake

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 handeling this species.
4. Texas Indigo Snake - This snake may potentially occur in the project area. The Contractor shall avoid harming or handeling 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) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		104

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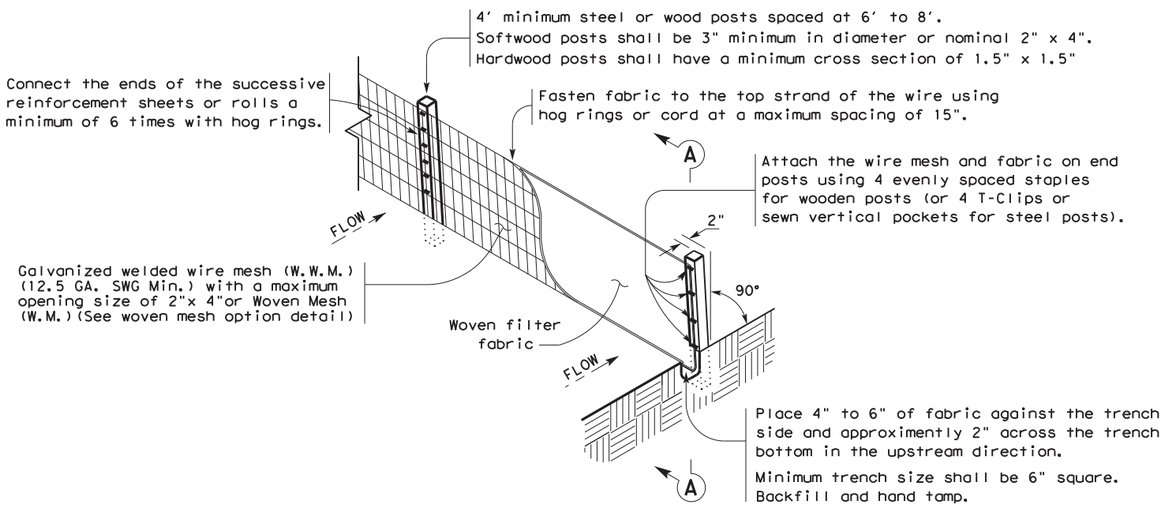
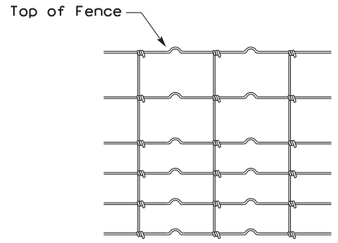
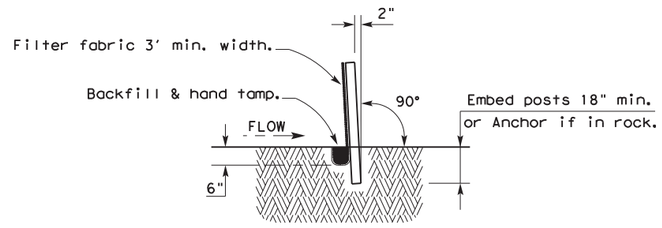


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

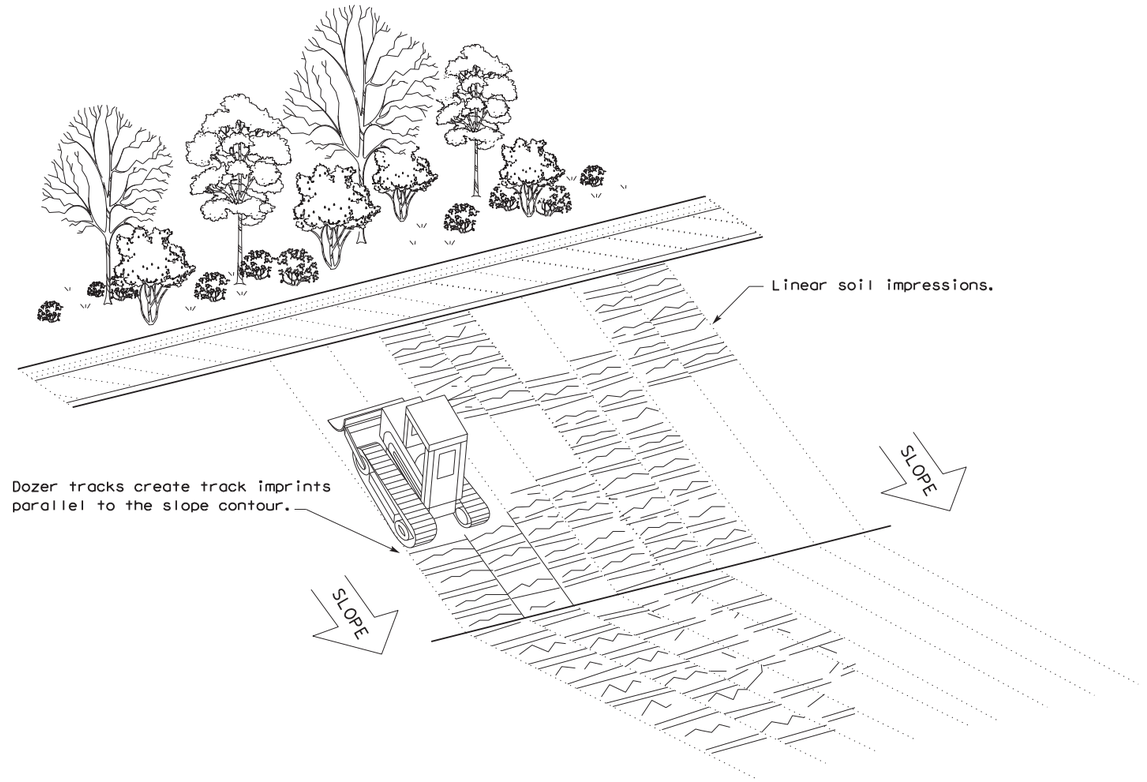
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0022	09	055, etc.		US 90, etc.	
	DIST	COUNTY			SHEET NO.	
	22	VAL VERDE, etc.			105	

2/27/2023
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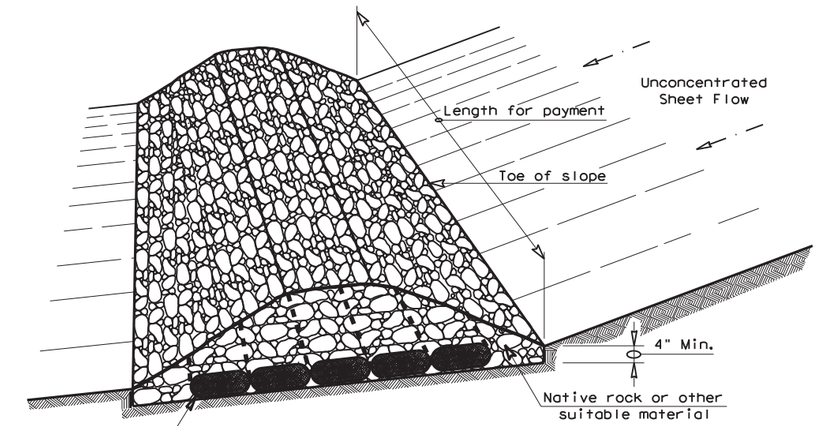
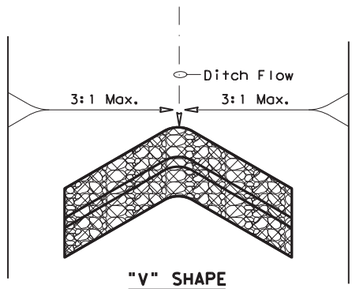
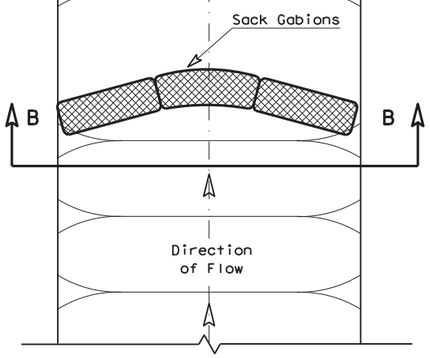


FILTER DAM AT TOE OF SLOPE

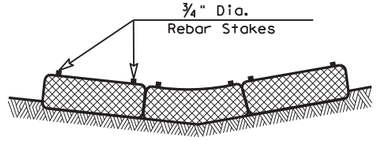
RFD1



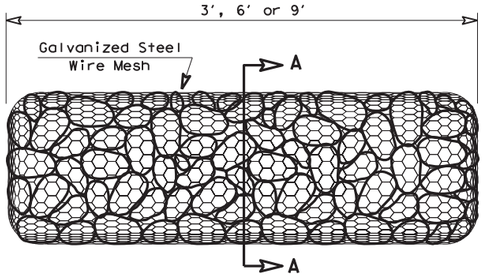
"V" SHAPE
PLAN VIEW



PLAN VIEW

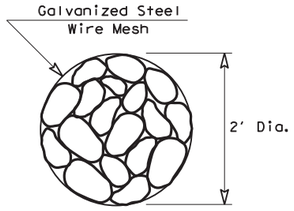


SECTION B-B

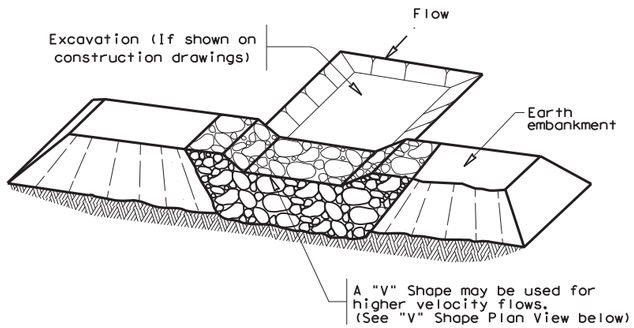


TYPE 4 (SACK GABIONS)

RFD4

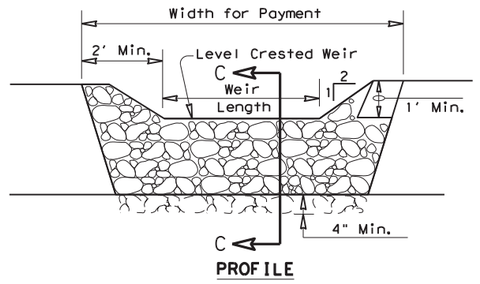


SECTION A-A

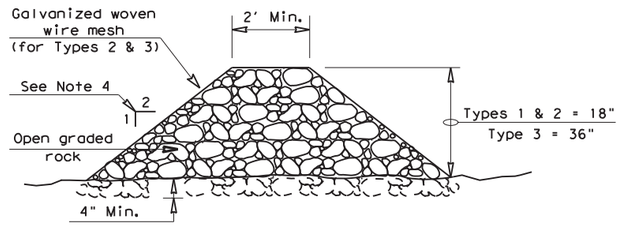


FILTER DAM AT SEDIMENT TRAP

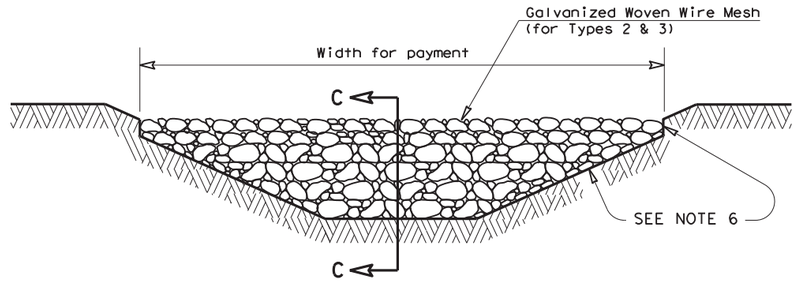
RFD1 — OR — RFD2



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
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REVISIONS	0022	09	055, etc.	US 90, etc.
	DIST	COUNTY		SHEET NO.
	22	VAL VERDE, etc.		106

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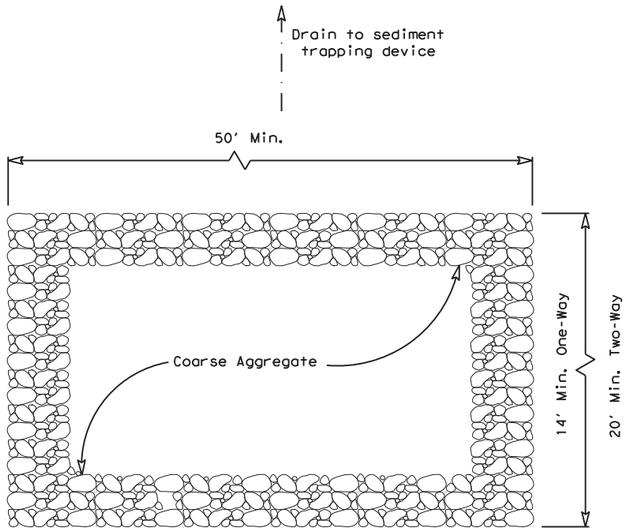
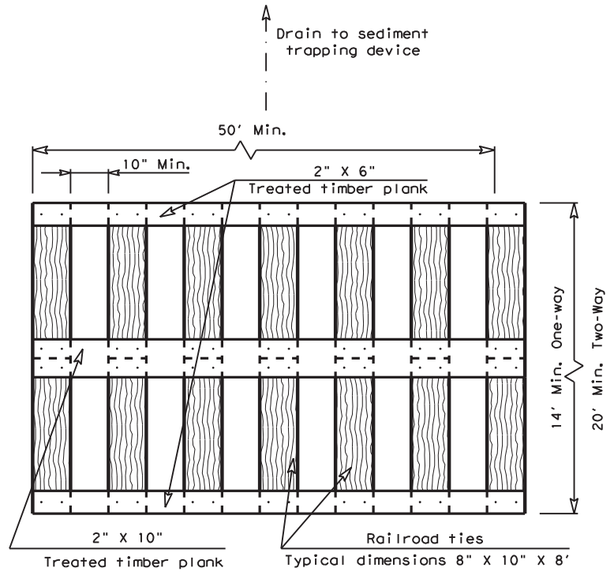
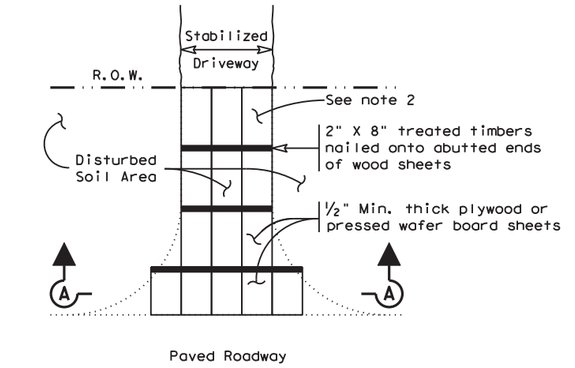


PLAN VIEW



PLAN VIEW



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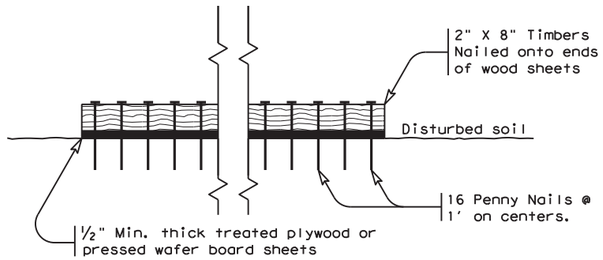
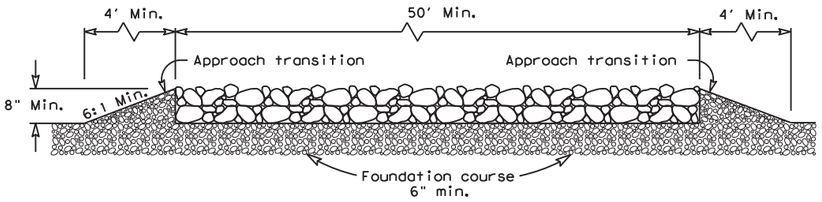


SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

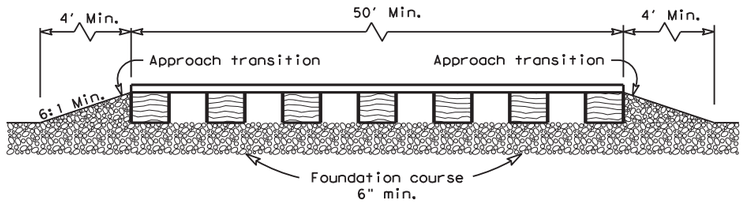
SHORT TERM



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
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	DIST	COUNTY		SHEET NO.
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