

INDEX OF SHEETS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
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STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT
FEDERAL PROJECT: F2021(391)
HIGHWAY - US 87
POTTER COUNTY

0041-05-053

FOR THE CONSTRUCTION OF SAFETY IMPROVEMENTS,
CONSISTING OF A NB RIGHT TURN LANE, SB ACCELERATION LANE, AND MEDIAN PROTECTION.

PROJECT LIMITS: FROM: CANADIAN RIVER BRIDGE
TO: 0.56 MILES SOUTH

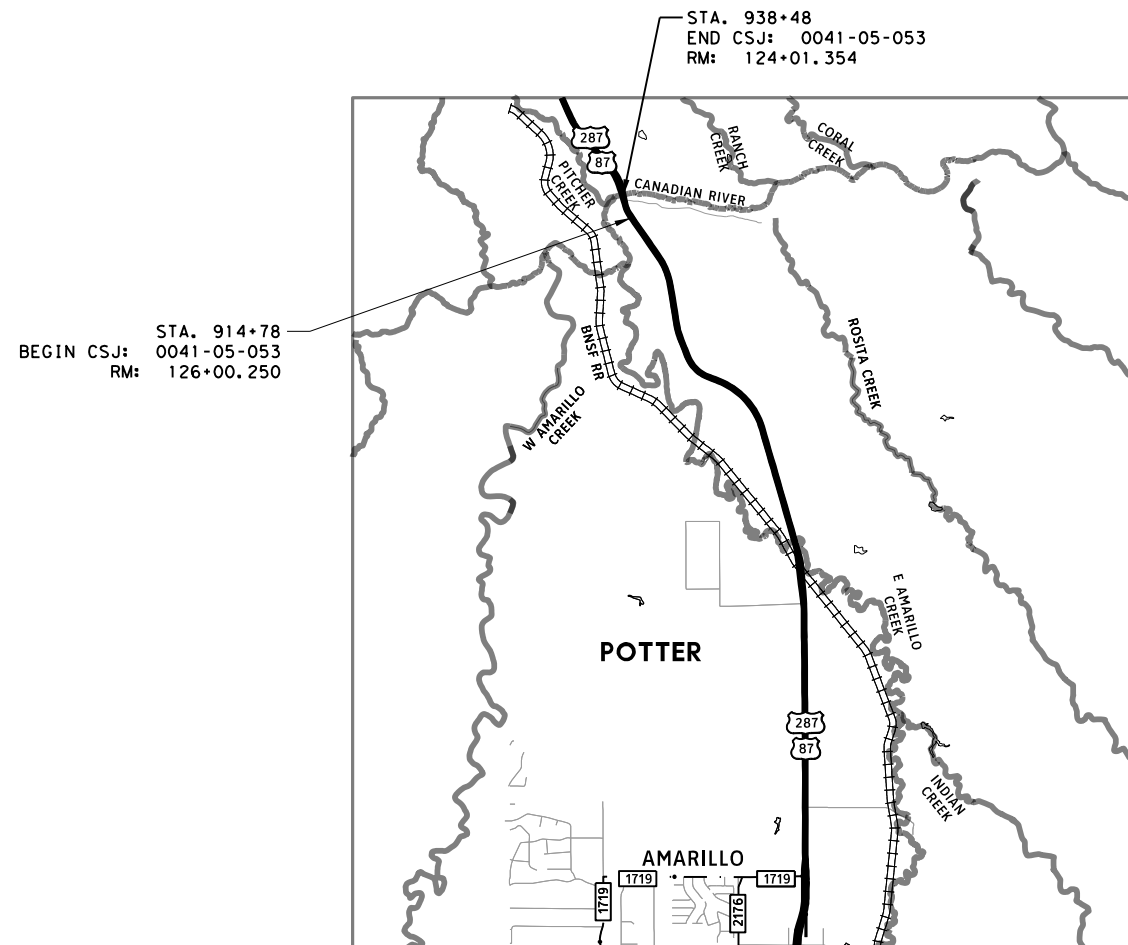
ROADWAY LENGTH = 2,370.00 FT. = 00.449 MILES
TOTAL LENGTH = 2,370.00 FT. = 00.449 MILES

FED. RD. DIV. NO.	FEDERAL PROJECT NO.	SHEET NO.	
6	F2021 (391)	1	
STATE	STATE DIST.	COUNTY	
TEXAS	AMA	POTTER	
CONT.	SECT.	JOB	HIGHWAY NO.
0041	05	053	US 87

US 87
DESIGN SPEED = 50 MPH
2021 ADT = 12,179
2041 ADT = 17,051
PRINCIPAL ARTERIAL

FINAL PLANS

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



EXCEPTIONS:
NONE

RAILROADS:
NONE

EQUATIONS:
NONE

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



RECOMMENDED FOR LETTING: DATE: 12/21/2020

DocuSigned by: *Corley Munkam*

DocuSigned by: DATE: 12/28/2020

Kit Black

ASSISTANT DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: DATE: 12/28/2020

DocuSigned by: *Blair Johnson*

DISTRICT ENGINEER

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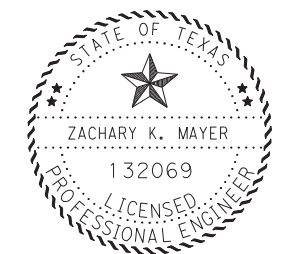
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THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.



Zachary K. Mayer P.E.

12/02/2020
 US 87

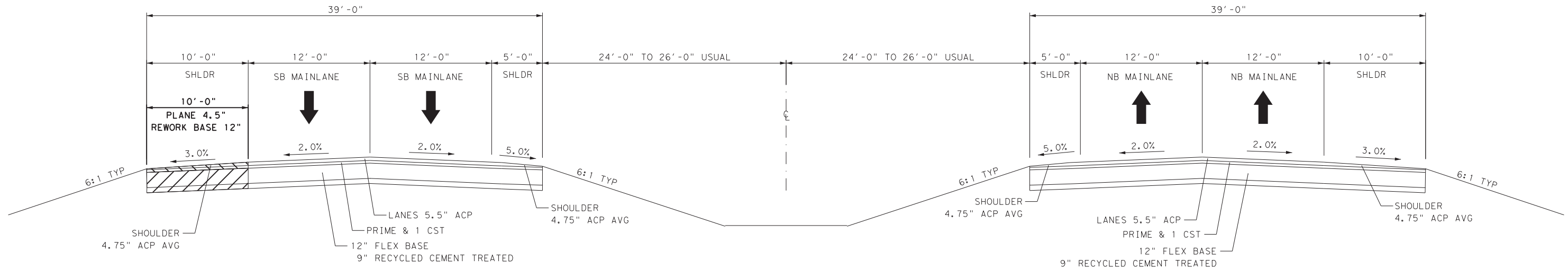
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DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		2

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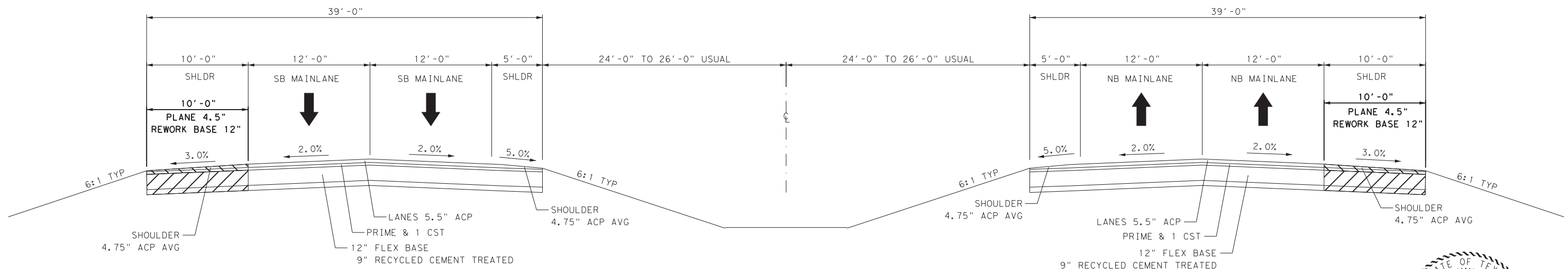
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SOUTHBOUND LANES
 STA. 915+00 TO STA. 924+60

(A) EXISTING SECTION
 CSJ: 0041-05-053

NORTHBOUND LANES
 STA. 915+00 TO STA. 924+60
 STA. 935+03 TO STA. 938+20



SOUTHBOUND LANES
 STA. 924+60 TO STA. 935+33

(B) EXISTING SECTION
 CSJ: 0041-05-053

NORTHBOUND LANES
 STA. 924+60 TO STA. 930+20



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12/02/2020
 US 87

TYPICAL SECTIONS

NOTES:
 ① REFER TO REMOVAL LAYOUT FOR QUANTITIES

LEGEND:

- PLANE ASPH CONC PAV (4.5")
- REWORK BS MTL (TY B) (12") (DENS CONT)

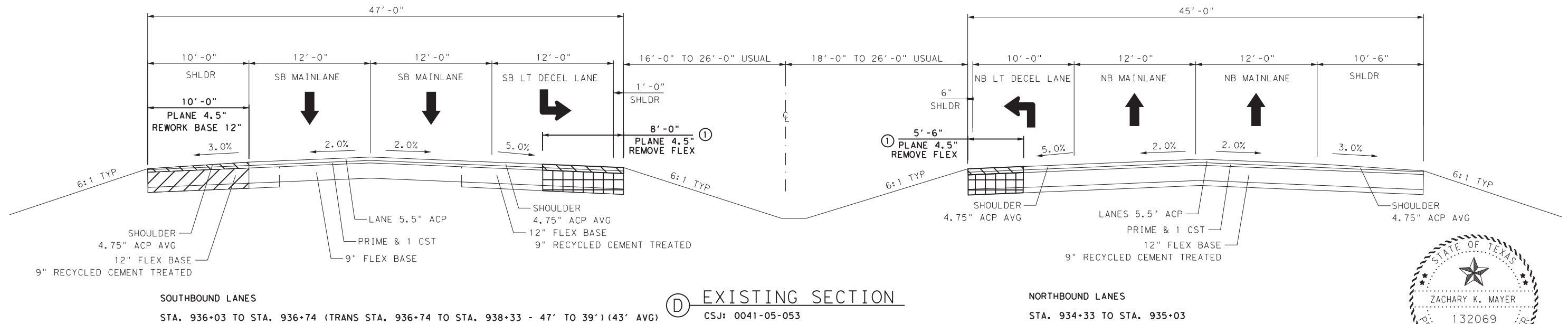
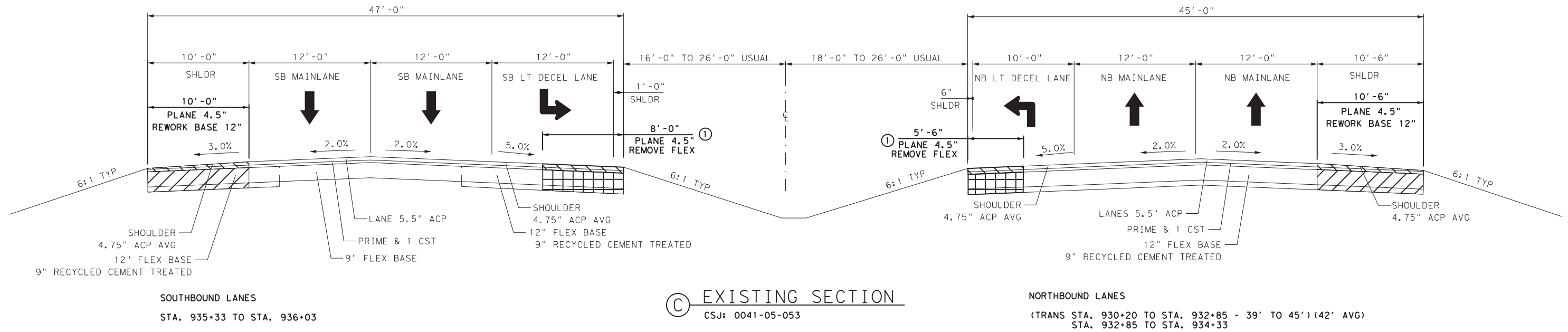
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SHEET 1 OF 5

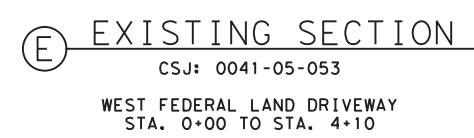
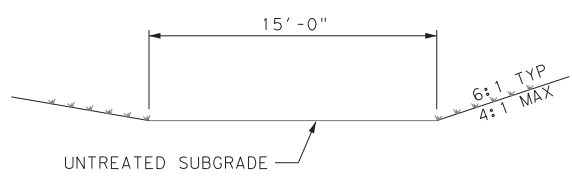
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JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		3

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NOTES:
① REFER TO REMOVAL LAYOUT FOR QUANTITIES

- LEGEND:**
- PLANE ASPH CONC PAV (4.5")
 - REWORK BS MTL (TY B) (12") (DENS CONT)
 - REMOVING STAB BASE AND ASPH PAV (12")



Zachary K. Mayer P.E.

12/02/2020
US 87

TYPICAL SECTIONS

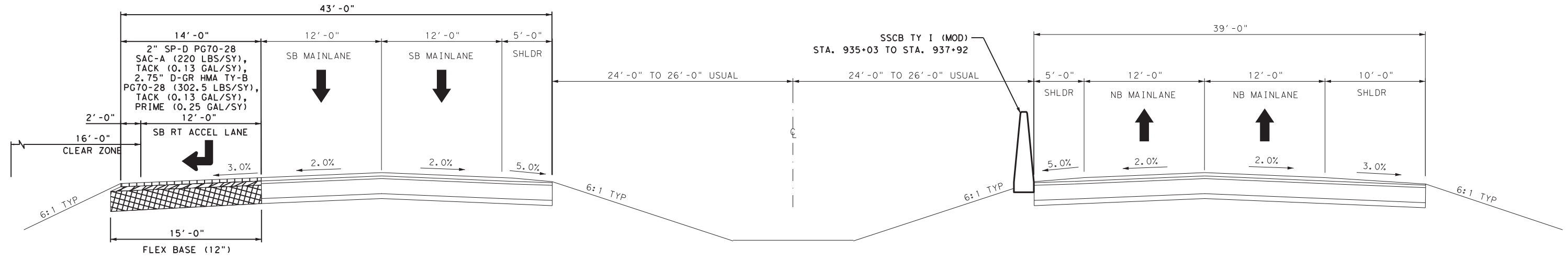
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SHEET 2 OF 5

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JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY	SHEET NO.	
JD	ZM	AMA	POTTER	4	

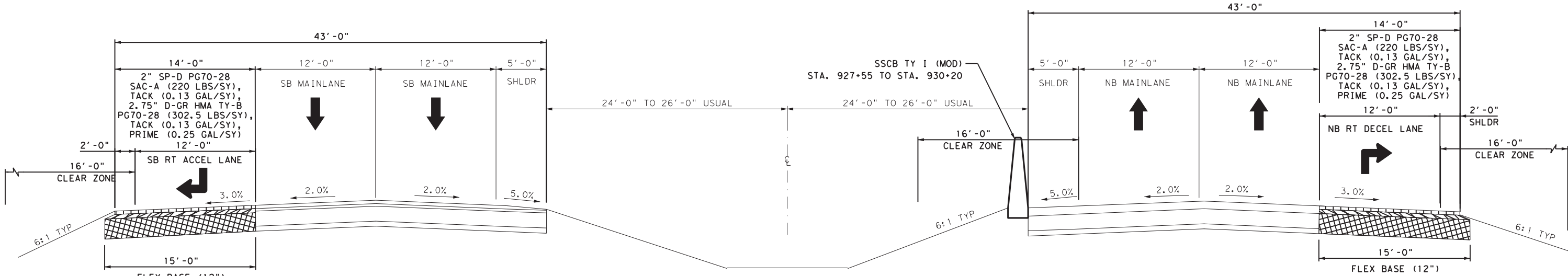
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SOUTHBOUND LANES
 (TRANS STA. 915+00 TO STA. 918+00 - 39' TO 43') (41' AVG)
 STA. 918+00 TO STA. 924+60

(A) PROPOSED SECTION
 CSJ: 0041-05-053

NORTHBOUND LANES
 STA. 915+00 TO STA. 924+60
 STA. 935+03 TO STA. 938+20



SOUTHBOUND LANES
 STA. 924+60 TO STA. 935+33

(B) PROPOSED SECTION
 CSJ: 0041-05-053

NORTHBOUND LANES
 (TRANS STA. 924+60 TO STA. 926+10 - 39' TO 43') (41' AVG)
 STA. 926+10 TO STA. 930+20

LEGEND:

- 2" SP-D PG70-28 SAC-A (220 LBS/SY)
- 2.75" D-GR HMA TY-B PG70-28 (302.5 LBS/SY)
- FLEXIBLE BASE (12")



Zachary K. Mayer P.E.

12/02/2020
 US 87

TYPICAL SECTIONS

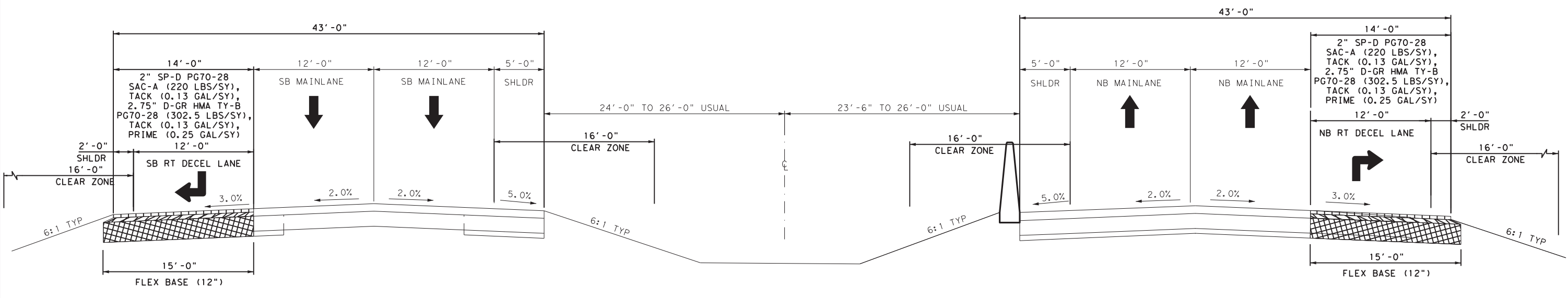
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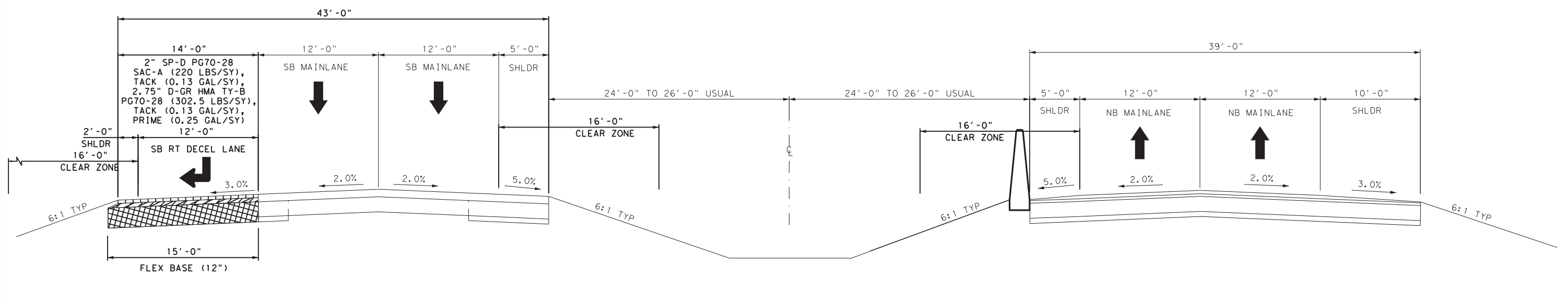
SHEET 3 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY	SHEET NO.	
JD	ZM	AMA	POTTER	5	

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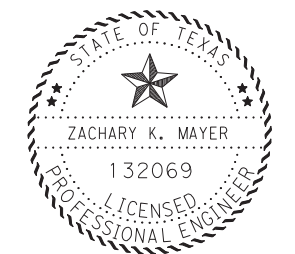
C PROPOSED SECTION
 CSJ: 0041-05-053



D PROPOSED SECTION
 CSJ: 0041-05-053

LEGEND:

- 2" SP-D PG70-28
SAC-A (220 LBS/SY)
- 2.75" D-GR HMA
TY-B PG70-28 (302.5 LBS/SY)
- FLEXIBLE BASE (12")



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12/02/2020
 US 87

TYPICAL SECTIONS

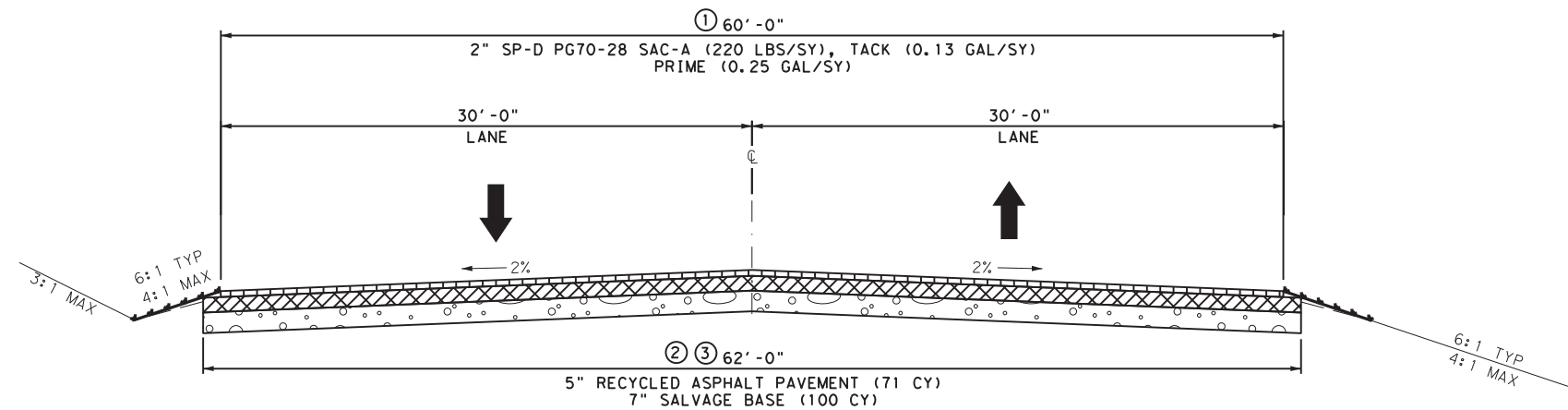
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SHEET 4 OF 5

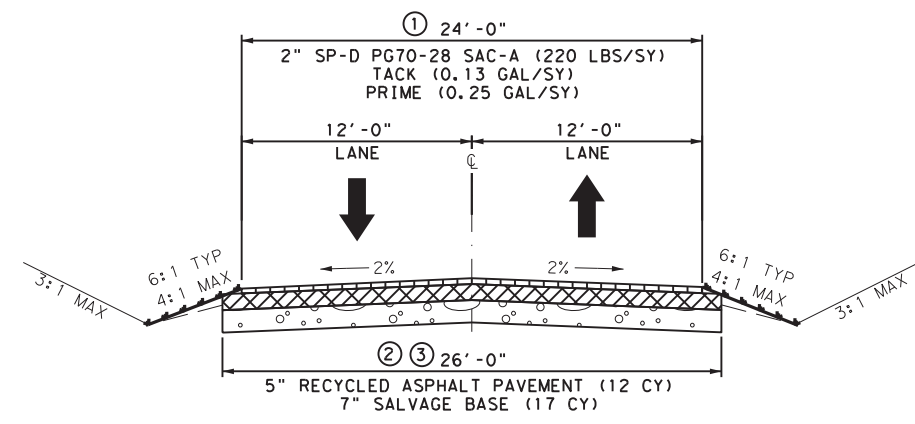
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JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY	SHEET NO.	
JD	ZM	AMA	POTTER	6	

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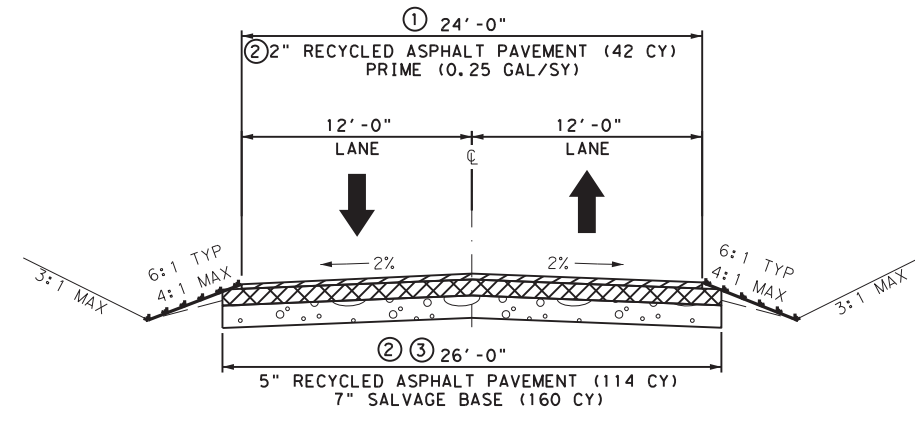
E1 PROPOSED SECTION

CSJ: 0041-05-053
 WEST FEDERAL LAND DRIVEWAY
 STA. 0+00 TO STA. 0+25 (STA. 0+25 TO 0+95 - 60' TO 24') (42' AVG)



E2 PROPOSED SECTION

CSJ: 0041-05-053
 WEST FEDERAL LAND DRIVEWAY
 STA. 0+95 TO STA. 1+25



E3 PROPOSED SECTION

CSJ: 0041-05-053
 WEST FEDERAL LAND DRIVEWAY
 STA. 1+25 TO STA. 4+10

NOTES:

- ① NOTCHED WEDGE LONGITUDINAL JOINT WILL BE REQUIRED AT ALL LONGITUDINAL HOT MIX JOINTS. VARIANCE TO THE DIMENSIONS SHOWN WILL BE ALLOWED ONLY AS APPROVED BY THE ENGINEER.
- ② PLACEMENT OF RAP SALVAGED FROM REMOVAL AREAS WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO ITEM 354. PLACE AS SHOWN HERE, IN ACCORDANCE WITH ITEM 354.
- ③ PLACEMENT OF BASE SALVAGED FROM REMOVAL AREAS WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO ITEM 251. PLACE AS SHOWN HERE, IN ACCORDANCE WITH ITEM 251.

LEGEND:

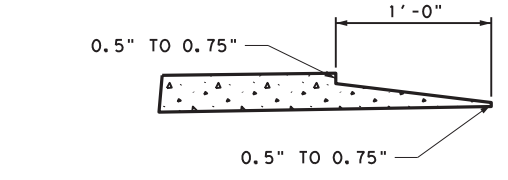
- 2" SP-D PG70-28 SAC-A (220 LBS/SY)
- RECYCLED ASPHALT PAVEMENT (2")
- RECYCLED ASPHALT PAVEMENT (5")
- SALVAGE BASE (7")



Zachary K. Mayer P.E.

12/02/2020
 US 87

TYPICAL SECTIONS



① NOTCHED WEDGE LONGITUDINAL JOINT DETAIL

SCALE H: 1" = 10'
 V: 1" = 5'



SHEET 5 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY	SHEET NO.	
JD	ZM	AMA	POTTER	7	

GENERAL NOTES

BASIS OF ESTIMATE FOR CONSTRUCTION				
Item	Description	Unit	Rate	
164	SEEDING		SEE PLAN SHEETS	
166	FERTILIZER		SEE PLAN SHEETS	
310	PRIME COAT (MC-30)	GAL	0.25 GAL/SY	
314 ⁽³⁾	EMULSION ASPHALT (EROSN CONT)(MS-2)	GAL	SEE NOTE 3	
3076 ⁽¹⁾	D-GR HMA	TON	2.75"	302.5 LB/SY/2000
3077 ⁽²⁾	SUPERPAVE MIXTURE	TON	2"	220 LB/SY/2000
3076 or 3077	TACK COAT	GAL	0.13 GAL / SY	
NOTE:				
(1)	D-GR HMA Weight Based On 110Lbs/SY/In			
(2)	SUPERPAVE MIXTURE Weight Based On 110Lbs/SY/In			
(3)	40% Emulsified Asphalt 60% Water Mixture Applied At 0.25 Gal/SY Paid using 0.10 Gal/SY			

General

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

TO: Amarillo Area Engineer Roy.Neukam@txdot.gov
 CC: Assistant Area Engineer CC.Sysombath@txdot.gov
 Director of Construction Kenneth.Petr@txdot.gov
 Construction Manager Thomas.Nagel@txdot.gov

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

All Contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address.

<https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/>

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

Verify all survey control prior to beginning construction. Notify Engineer of any discrepancies in control prior to beginning construction.

There are approximately 1 "reference markers" within the project limits. If a marker needs to be moved for any reason during construction operations, the Contractor is to remove it, install it in a temporary location and then reinstall it in its correct permanent location. Both the temporary and permanent locations are to be on a line that is perpendicular to the original "station" along the roadway. The temporary location is to be at or near the right-of-way. The permanent location is to be directed by the Engineer.

The following Standard Detail Sheets have been modified:

- SSCB (1F)-10 (MOD)
- TSR (3)-13 (MOD)
- TSR (4)-13 (MOD)

The Contractor is advised that a 65 mph construction speed zone will be applicable for this project. The construction speed zone is to be limited to the actual work areas under construction.

If portions of the right-of-way is used to store materials, equipment, and other uses with the approval of the Engineer, materials, equipment, etc., must either be located outside the 30 feet traffic safety clearance zone or be adequately protected.

Contractor facilities, such as asphalt plants, concrete plants, rock crushers, etc. are not allowed to be located within Department right of way.

The slopes indicated on the typical sections may be varied when fixed features required slopes are re-established as directed by the Engineer.

Dust caused by construction operations is to be controlled by applying water in conformance with the requirements of Item 204, "Sprinkling". Sprinkling for dust control will not be paid for directly, but will be considered as subsidiary work to the various bid items.

Any work necessary to provide temporary ingress and egress during construction (such as building gravel ramps, etc.) Will not be paid for directly, but will be considered as subsidiary work to the various bid items.

Verify all existing grades, elevations, and cross slopes that will connect to any proposed grades and elevations. If adjustments are warranted, the Contractor is to submit proposed changes to the Engineer for verification.

Item 7 Legal Relations and Responsibilities

No significant traffic generator events identified.

The total area disturbed for this project is approximately 3.04 acres. The disturbed area in this project, 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, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer and to the local government that operates a separate storm sewer system.

Item 8 Prosecution and Progress

Create, maintain, and submit for approval, a Critical Path Method (CPM) project schedule and a Project Schedule Summary Report (PSSR) using computer software that is fully compatible with the latest version of Primavera Systems, Inc. or Primavera P6.

In accordance with SP 008-005, the latest start work date for this project is July 5, 2021. All paving work must be completed prior to the end of the 2021 asphalt season.

Item 100 Preparing Right Of Way

Preparing right of way will consist exclusively of mowing the vegetation to the width shown in the plans for Backfilling Pavement Edges. Set mower cutting height to cut as low as practical but no higher than 6 inches. Payment for Preparing Right Of Way will be made only in the case where mowing is actually used.

All tree removal activities are to take place outside nesting season. The nesting season is April 1st thru August 30th.

Remove trees of various diameters as shown on the plans, or as directed. Remove tree stumps to at least 12 in. below the surrounding terrain. Before backfilling holes treat the remainder of the stump with the following herbicide: Manufacture - Dow AgroScience; Product - Remedy or other as approved by the Engineer. Follow manufacture recommendations for herbicide. Backfill holes with acceptable material and compact flush with surrounding areas. Identify each individual tree proposed to be removed. Obtain approval from the Engineer in the field for each individual tree proposed to be removed prior to any tree being removed.

Item 110 Excavation

Before grading begins, the vegetative cover within the areas to be graded are to be bladed into a windrow outside the limits of the slopes. After all grading is complete; the vegetative cover is to be spread over the adjacent disturbed areas. This work is not to be paid for directly, but will be considered subsidiary work to the various bid items.

Item 132 Embankment

The plasticity index for *TYB* will not exceed 25.

Materials excavated from the project will be allowed to be used on the project as directed by the Engineer.

Item 164 Seeding for Erosion Control

Perform planting operations in accordance with the recommendations contained in the latest version of the TxDOT manual “A Guide to Roadside Vegetation Establishment” developed by the Vegetation Management Section of the Maintenance Division.

Seeding may require more than one mobilization, depending upon the Contractor’s sequence of work.

Item 166 Fertilizer

Fertilize all areas of project to be seeded or sodded in accordance with the Amarillo District Vegetation Specification Sheet.

Item 247 Flexible Base

SPECIFICATION FOR FLEX BASE TY A OR B GR 4								
GRADING REQUIREMENTS PERCENT RETAINED – SIEVES SIEVE SIZES INCHES					SOIL CONSTANTS		MAX WET BALL *	MAX % INCREASE IN PASSING # 40 *
1 3/4	7/8	3/8	# 4	# 40	L.L. MAX	P.I. MAX		
0	17-32	40-60	50-70	70-85	40	12	45	20

*Applies to TY A material only.

Item 300 Asphalts, Oils, and Emulsions

Asphalt from different sources is not to be blended.

The "Open" seasons for applying asphaltic materials and mixtures for the listed items are to be as follows, unless authorized otherwise in writing by the Engineer:

ITEMS	OPEN SEASON
310, 314	All Year
3076, 3077	From April 15 th through October 31st

Item 314 Emulsified Asphalt Treatment

A 10 foot wide strip of finished material adjacent to each shoulder is to be treated with an emulsified asphalt mixture. The mixture may be placed in one or more applications at a total rate of 0.25 gallons per square yard, unless directed otherwise by the Engineer. The homogeneous mixture may be composed of approximately 40% asphalt (MS-2 or SS-1) and 60% water, unless directed otherwise by the Engineer.

Item 354 Planing and Texturing Pavement

The material planed from existing roadway is estimated at 626 CY for this project.

The contractor will retain ownership of planed materials not used in proposed construction.

Item 464 Reinforced Concrete Pipe

Joint material for all pipes will be cold applied plastic asphalt sewer joint compound.

Bedding for pipe culverts is to be 6 inches of sand. The excavation required to place the sand will not be paid for directly but will be considered subsidiary to this item.

Backfill pipe up to the springline with granular material. The ponding method of backfilling will be allowed for the granular material only.

Item 467 Safety End Treatment

Pre-cast Safety End Treatments are allowed; however, a cast-in-place concrete apron will be required as shown on the plans & will be subsidiary to the Safety End Treatment.

Item 502 Barricades, Signs, and Traffic Handling

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.

Temporary rumble strips will be required as shown on WZ(RS)-16 regardless of loose gravel, and/or soft or bleeding asphalt. Adjust the traffic control setup such that rumble strips are not placed in areas of heavily rutted pavements, unpaved surfaces, or horizontal curves. Temporary rumble strips will not be allowed on interstate highway.

The Contractor is to have the option of using either plastic drums, vertical panels, grabber cones or a combination where drums are shown as channelizing devices, as approved by the Engineer. Plastic drums are to be used in all transition areas in accordance with BC(8)-14 and WZ(TD)-17.

Furnish and install "soft shoulder" signs as directed by the Engineer. This work will not be paid for directly, but will be considered as subsidiary to item 502, "Barricades, Signs and Traffic Handling".

Notify the Engineer 24 hours prior to any lane closure.

Item 504 Field Office and Laboratory

The following buildings will be required for this project:

One Type (D) structure, asphalt mix control laboratory

Each building is to be provided before work is begun on the pertinent construction items for which it is needed.

Any laboratory furnished is to be a minimum of 10 ft in width.

Chain link security fence will be required to be placed around the perimeter of all field offices. The dimensions of the fence will be as directed by the Engineer.

The Type D structures are to be equipped with the following in addition to requirements specified under item 504:

- a. Safety equipment
 - (1) One eye wash station
 - (2) One fire extinguisher
 - (3) One first aid kit

Furnish a Type D structure for the asphalt mix control laboratory for the Engineer's exclusive use. In addition to requirements of item 504, this structure is to have a minimum height of 8 feet and provide a minimum 400 square feet gross floor area for permanently located plants or 200 square feet for temporary located plants serving one project. The floor area will be partitioned

into a minimum of two interconnected rooms, each room furnished with an exterior door and a minimum of two windows. The floor is to have sufficient strength to support the testing equipment and have an impervious covering.

The Type D structures are to be adequately air conditioned and be furnished with a minimum of one desk, three chairs, one file cabinet, a telephone and one built-in equipment storage cabinet for the storage of nuclear equipment. The cabinet is to be a minimum of 3 feet wide by 2 feet deep by 3 feet high and have provisions for locking security. The structure is to be provided with a 240-volt electrical service entrance. The service is to consist of a minimum of 4 - 120 volt circuits with 20 amp breakers and no more than two grounded convenience outlets per circuit and provisions for a minimum of two 220-volt ovens with vents to the outside. The structure is to have a minimum of 2 convenience outlets per wall, and a utility sink with an adequate clean potable water supply for testing. The state building is to be equipped with at minimum a hot water dispenser or hot water heater capable of generating 1 gallon of water per use at 140° F with adequate water pressure. Space heaters for heating the structure are unacceptable. Portable structures are to be support blocked for stability and are to be tied down.

If needed, each building is to be moved to a new location as directed by the Engineer. Any building that is no longer required on the job after completion of the pertinent construction items may be released to the Contractor upon consent of the Engineer.

Item 506 Temporary Erosion, Sedimentation, and Environmental Controls

Erosion control devices are to be installed as needed in coordination with the work progress, or as directed by the Engineer.

Item 542 Removing Metal Beam Guard Fence

All MBGF, GET & TAS materials will remain property of the Contractor.

Item 644 Small Roadside Sign Supports and Assemblies

All slip base signs will have a triangular slip base with a 2-bolt clamp to prevent rotation of signpost. Set screw type slip base will not be allowed.

A 7" x 1/2" diameter galvanized rod or #4 rebar is to be installed in the sign stub as shown on SMD(SLIP-1)-08 to prevent rotation of the sign stub in the concrete footing.

The exact locations of the large and small roadside signs are to be as designated by the Engineer.

The existing riprap aprons are to be removed and disposed of as approved by the Engineer. This work is not to be paid for directly, but will be considered subsidiary to the removal of foundations under this item.

Probe before drilling for foundations to determine the location of all utilities and structures. This work will not be paid for directly, but will be considered subsidiary to bid items involved.

Details for standard signs not shown on the signing standards of the signing detail plan sheets are to be in conformance with the department's "Standard Highway Sign Designs for Texas" Manual, Latest Edition.

Install a wrap of retroreflective sheeting conforming to DMS-8300 on all posts for small road sign assemblies. Sign post wraps will not be paid for directly, but are considered subsidiary to Item 644.

Install red sheeting on the posts containing the following signs:
Stop, Yield, Wrong Way & Do Not Enter

Install yellow sheeting on all other small sign posts.

Install all retroreflective wraps at a height of 4 ft. from bottom of the wrap to the edge of the travel lane surface. All retroreflective wraps will cover the full circumference of the sign post for a vertical width of 12 inches.

Item 658 Delineator and Object Marker Assemblies

For all ground mount applications provide hollow or tubular posts embedded in concrete using plastic wedged anchor system.

For all concrete barrier, bridge rail, and guard fence post mounted applications provide hollow or tubular posts with approved anchorage.

Item 662 Work Zone Pavement Markings

The adhesive used for temporary flexible-reflective roadway marker tabs is to be butyl rubber pads.

Item 666 Reflectorized Pavement Markings

Retroreflectivity Requirements:

All Type I markings must meet the minimum retroreflectivity values for edgeline markings, centerline or no passing barrier-line, and lane lines when measured any time after 3 days, but not later than 10 days after application:

- ◆ White markings: 250 millicandelas per square meter per lux (mcd/m²/lx)
- ◆ Yellow markings: 175 mcd/m²/lx

Retroreflectivity Measurements: Mobile or portable retroreflectometers may be used at the Contractor's discretion.

All Type I markings must meet the minimum retroreflectivity values for edgeline markings, centerline or no passing barrier-line, and lane lines when measured any time after 3 days, but not later than 10 days after application.

Item 3076 Dense Graded Hot Mix Asphalt

Use aggregate that meets the SAC requirement of class A.

Use of RAS is not allowed.

Only fractionated RAP is allowed.

Provide a laboratory mixture design with the minimum target asphalt binder content shown below:

D-GR HMA TY B 4.6%

Make a smooth, clean, minimum 1 inch deep butt joint where each end of the new pavement joins the existing pavement. Any method approved by the Engineer can be used to make the joint.

The District Lab will perform a maximum of 2(two) design verification tests. If additional verification tests are needed, the Contractor will be billed \$3,500.00 per each additional verification test required to obtain an approved asphaltic concrete pavement mix design.

Hot Mix will be TY B PG64-28 or approved equal, by the engineer.

If lime is not used as an antistrip agent, then the production and placement testing frequency for the Boil test (TEX-530-C) shown in the table below.

Description	Test Method	Minimum Contractor Testing Frequency	Minimum Engineer Testing Frequency
Boil test	Tex-530-C	1 per lot	1 per 12 sublots

If used, the IR bar read out screen must be visible at all times to the Engineer.

Item 3077 Superpave Mixtures

Use aggregate that meets the SAC requirement of class A.

Only fractionated RAP is allowed.

Use of RAS is not allowed.

All SP-D on this project is considered surface mix. A substitution PG binder is not allowed, as shown in Table 5.

Make a smooth, clean, minimum 1 inch deep butt joint where each end of the new pavement joins the existing pavement. Any method approved by the Engineer can be used to make the joint.

The District Lab will perform a maximum of 2(two) design verification tests. If additional verification tests are needed, the Contractor will be billed \$3,500.00 per each additional verification test required to obtain an approved asphaltic concrete pavement mix design.

Superpave will be SP-D SAC-A PG70-28 or approved equal, by the engineer.

If lime is not used as an antistrip agent, then the production and placement testing frequency for the Boil test (TEX-530-C) shown in the table below.

Description	Test Method	Minimum Contractor Testing Frequency	Minimum Engineer Testing Frequency
Boil test	Tex-530-C	1 per lot	1 per 12 sublots

If used, the IR bar read out screen must be visible at all times to the Engineer.

Item 6001 Portable Changeable Message Sign

Supply 2 Portable Changeable Message Signs (Type II – Lamp Matrix) for this project. This work will be paid at the unit price bid for each unit, which will include any moving, maintenance, and removing of the PCMS. No payment will be made for removing and replacing damaged PCMS. The Portable Changeable Message Signs will become property of the Contractor at the completion of the project.

If the Contractor chooses to have more than one lane closure set-up at a time, provide additional PCMS in accordance with TCP at no additional charge to the department.

Item 6185 Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)

In addition to the shadow vehicles with truck mounted attenuator (TMA) that are specified as being required on the traffic control plan for this project, provide 0 additional shadow vehicle(s) with TMA for TCP (1-5)-18, (2-6)-18, (3-2)-13, (3-3)-14 as detailed on the General Notes of this standard sheets.

Therefore, 2 total shadow vehicles with TMA will be required for this type of work. The Contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.



QUANTITY SHEET

CONTROLLING PROJECT ID 0041-05-053

DISTRICT Amarillo
HIGHWAY US 87

COUNTY Potter

CONTROL SECTION JOB				0041-05-053		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00132595			
COUNTY				Potter			
HIGHWAY				US 87			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	100-6001	PREPARING ROW	AC	1.070		1.070	
	100-6008	PREPARING ROW (TREE) (0" TO 6" DIA)	EA	2.000		2.000	
	105-6020	REMOVING STAB BASE & ASPH PAV (12")	SY	780.000		780.000	
	110-6001	EXCAVATION (ROADWAY)	CY	2,682.000		2,682.000	
	132-6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	CY	1,113.000		1,113.000	
	150-6001	BLADING	STA	5.300		5.300	
	164-6034	DRILL SEEDING (PERM) (RURAL) (SANDY)	AC	8.570		8.570	
	164-6053	DRILL SEEDING (TEMP)(WARM OR COOL)	AC	8.570		8.570	
	247-6233	FL BS (CMP IN PLACE)(TY A GR 1-2)(12")	SY	5,510.000		5,510.000	
	251-6081	REWORK BS MTL (TY B)(12")(DENS CONT)	SY	3,697.000		3,697.000	
	310-6009	PRIME COAT (MC-30)	GAL	1,712.000		1,712.000	
	314-6014	EMULS ASPH (EROSN CONT)(MS-2)	GAL	4,148.000		4,148.000	
	354-6091	PLANE ASPH CONC PAV(4.5")	SY	5,038.000		5,038.000	
	401-6001	FLOWABLE BACKFILL	CY	8.500		8.500	
	464-6005	RC PIPE (CL III)(24 IN)	LF	2.000		2.000	
	467-6394	SET (TY II) (24 IN) (RCP) (6: 1) (C)	EA	1.000		1.000	
	479-6006	ADJUSTING INLET (CAP)	EA	2.000		2.000	
	496-6007	REMOV STR (PIPE)	LF	22.000		22.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	4.000		4.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	160.000		160.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	160.000		160.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	650.000		650.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	650.000		650.000	
	514-6038	PERM CTB (SSCB)(TY 1)(MOD)	LF	1,054.000		1,054.000	
	514-6047	PERM CTB (SGL SLOPE)(TY 1)(TRANSITION)	LF	28.000		28.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	340.000		340.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	1.000		1.000	
	545-6007	CRASH CUSH ATTEN (INSTL)(L)(N)(TL3)	EA	1.000		1.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	7.000		7.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	10.000		10.000	
	644-6028	IN SM RD SN SUP&AM TYS80(1)SA(P-BM)	EA	2.000		2.000	
	644-6068	RELOCATE SM RD SN SUP&AM TY 10BWG	EA	1.000		1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	6.000		6.000	
	658-6001	INSTL DEL ASSM (D-SW)SZ 1(F LX)GND	EA	26.000		26.000	
	658-6018	INSTL DEL ASSM (D-SY)SZ 1(F LX)GND	EA	2.000		2.000	
	658-6026	INSTL DEL ASSM (D-SY)SZ (BRF)CTB	EA	11.000		11.000	

DISTRICT	COUNTY	CCSJ	SHEET
Amarillo	Potter	0041-05-053	9



QUANTITY SHEET

CONTROLLING PROJECT ID 0041-05-053

DISTRICT Amarillo
HIGHWAY US 87

COUNTY Potter

CONTROL SECTION JOB				0041-05-053		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00132595			
COUNTY				Potter			
HIGHWAY				US 87			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	658-6049	INSTL OM ASSM (OM-2Z)(FLX)GND(BI)	EA	5.000		5.000	
	658-6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	20.000		20.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	52.000		52.000	
	666-6005	REFL PAV MRK TY I (W)4"(DOT)(090MIL)	LF	215.000		215.000	
	666-6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	2,560.000		2,560.000	
	666-6047	REFL PAV MRK TY I (W)24"(SLD)(090MIL)	LF	50.000		50.000	
	666-6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	6.000		6.000	
	666-6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	4.000		4.000	
	666-6299	RE PM W/RET REQ TY I (W)4"(BRK)(090MIL)	LF	4,147.000		4,147.000	
	666-6302	RE PM W/RET REQ TY I (W)4"(SLD)(090MIL)	LF	4,004.000		4,004.000	
	666-6314	RE PM W/RET REQ TY I (Y)4"(SLD)(090MIL)	LF	4,148.000		4,148.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA	52.000		52.000	
	3076-6005	D-GR HMA TY-B PG64-28	TON	806.000		806.000	
	3076-6066	TACK COAT	GAL	692.000		692.000	
	3077-6058	SP MIXESSP-DSAC-A PG70-28	TON	628.000		628.000	
	3077-6075	TACK COAT	GAL	742.000		742.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6185-6002	TMA (STATIONARY)	DAY	75.000		75.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	20.000		20.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

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SUMMARY OF WORKZONE ITEMS	
LOCATION	0662 6109
	WK ZN PAV MRK SHT TERM (TAB) TY W
	EA
PROJECT SUMMARY	52
PROJECT TOTALS:	52

SUMMARY OF REMOVAL ITEMS						
LOCATION	0105 6020	0354 6091	0542 6001	0544 6003	0644 6076	0658 6060
	REMOVING STAB BASE AND ASPH PAV (12")	PLANE ASPH CONC PAV (4.5")	REMOVE METAL BEAM GUARD FENCE	GUARDRAIL END TREATMENT (REMOVE)	REMOVE SM RD SN SUP&AM	REMOVE DELIN & OBJECT MARKER ASSMS
	SY	SY	LF	EA	EA	EA
REMOVAL LAYOUT	780	780	340	1	3	20
PROJECT TOTALS:	780	780	340	1	3	20

SUMMARY OF ROADWAY ITEMS										
LOCATION	0100 6001	150 6001	0247 6233	0251 6081	0310 6009	0354 6091	3076 6005	3076 6066	3077 6058	3077 6075
	PREPARING ROW	BLADING	FL BS (CMP IN PLC) (TY A GR 1-2) (12")	REWORK BS MTL (TY B) (12") (DENS CONT)	PRIME COAT (MC-30) (0.25 GAL/SY)	PLANE ASPH CONC PAV (4.5")	D-GR HMA TY-B PG 64-28 (302.5 LB/SY)	TACK COAT (0.13 GAL/SY)	SP MIXES SP-D SAC-A PG 70-28 (220 LB/SY)	TACK COAT (0.13 GAL/SY)
	AC	STA	SY	SY	GAL	SY	TON	GAL	TON	GAL
TYPICAL SECTION "A"	0.22		1,600	1,067	400	1,067	234	201	164	194
TYPICAL SECTION "B"	0.51		2,721	1,814	680	1,814	398	342	279	330
TYPICAL SECTION "C"	0.22		806	560	202	874	118	101	83	98
TYPICAL SECTION "D"	0.12		383	256	96	503	56	48	39	46
TYPICAL SECTION "E1"					124				54	64
TYPICAL SECTION "E2"					20				9	10
TYPICAL SECTION "E3"					190					
PROPOSED DITCH PLAN & PROFILE		5.30								
PROJECT TOTALS:	1.07	5.30	5,510	3,697	1,712	4,258	806	692	628	742

SUMMARY OF DRAINAGE ITEMS					
LOCATION	0401 6001	0464 6005	0467 6394	0479 6006	0496 6007
	FLOWABLE BACKFILL	RC PIPE (CL III) (24 IN)	SET (TY II) (24 IN) (RCP) (6:1) (C)	ADJUSTING INLET (CAP)	REMOVE STR (PIPE)
	CY	LF	EA	EA	LF
DRAINAGE SHEET 1 OF 2		2	1		14
DRAINAGE SHEET 2 OF 2	8.50			2	8
PROJECT TOTALS:	8.50	2	1	2	22

TRAFFIC BARRIER SUMMARY			
LOCATION	0514 6038	0514 6047	0545 6007
	PERM CTB (SSCB) (TY I) (MOD)	PERM CTB (SGL SLOPE) (TY I) (TRANSITION)	CRASH CUSH ATTEN (INSTL) (L) (N) (TL3)
	LF	LF	EA
TRAFFIC BARRIER LAYOUT	1,054	28	1
PROJECT TOTALS:	1,054	28	1

US 87
PROJECT
SUMMARY



SHEET 1 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		10

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SUMMARY OF SMALL SIGNS					
LOCATION	0644 6001	0644 6004	0644 6028	0644 6068	0644 6076
	IN SM RD SN SUP&AM TY10BWG(1) SA(P)	IN SM RD SN SUP&AM TY10BWG(1) SA(T)	IN SM RD SN SUP&AM TYS80 (1) SA(P-BM)	RELOCATE SM RD SN SUP&AM TY 10BWG	REMOVE SM RD SN SUP&AM
	EA	EA	EA	EA	EA
SIGN LAYOUT	6	6	1		1
SIGN LAYOUT	1	4	1	1	2
PROJECT TOTALS:	7	10	2	1	3

SUMMARY OF PAVEMENT MARKINGS													
LOCATION	0658 6001	0658 6026	0658 6018	0658 6049	0666 6005	0666 6035	0666 6047	0666 6053	0666 6077	0666 6299	0666 6302	0666 6314	0672 6010
	INSTR DEL ASSM (D-5W) SZ 1 (FLX) GND	INSTR DEL ASSM (D-SY) SZ (BRF) (CTB)	INSTR DEL ASSM (D-SY) SZ 1 (FLX) (GND)	INSTR DEL ASSM (OM-2Z) (FLX) GND (BI)	REFL PAV MRK TY I (W) 4" (DOT) (090MIL)	RE PM W/RET REQ TY I (W) 8" (SLD) (090MIL)	RE PM W/RET REQ TY I (W) 24" (SLD) (090MIL)	REFL PAV MRK TY I (W) (ARROW) (090MIL)	RE PM W/RET REQ TY I (W) (WORD) (090MIL)	RE PM W/RET REQ TY I (W) 4" (BRK) (090MIL)	RE PM W/RET REQ TY I (W) 4" (SLD) (090MIL)	RE PM W/RET REQ TY I (Y) 4" (SLD) (090MIL)	REFL PAV MRKR TY II-C-R
	EA	EA	EA	EA	LF	LF	LF	EA	EA	LF	LF	LF	EA
PAVEMENT MARKING AND DELINEATION LAYOUT	26	11	2	5	215	2,560	50	6	4	4,147	4,004	4,148	52
PROJECT TOTALS:	26	11	2	5	215	2,560	50	6	4	4,147	4,004	4,148	52

SUMMARY OF EROSION CONTROL ITEMS								
LOCATION	0100 6008	0164 6034	0164 6053	0314 6014	0506 6038	0506 6039	0506 6040	0506 6043
	PREPARING ROW (TREE) (0" TO 6" DIA)	DRILL SEEDING (PERM) (RURAL) (SANDY)	DRILL SEEDING (TEMP) (WARM OR COOL)	EMULS ASPH (EROSN CONT) (MS-2) (0.10 GAL/SY)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (8")	BIODEG EROSN CONT LOGS (REMOVE)
	EA	AC	AC	GAL	LF	LF	LF	LF
EROSION CONTROL LAYOUT SHEET 1 OF 2	2				160	160	650	650
EROSION CONTROL LAYOUT SHEET 2 OF 2		8.57	8.57	4,148				
PROJECT TOTALS:	2	8.57	8.57	4,148	160	160	650	650

US 87
**PROJECT
 SUMMARY**



SHEET 2 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		11

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EARTHWORK SUMMARY		
STATION	110 6001	132 6004
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY B)
	CY	CY
US 87 NB		
924 + 60	0	0
925 + 00	2	1
926 + 00	16	6
927 + 00	23	8
928 + 00	21	8
929 + 00	20	8
930 + 00	20	9
931 + 00	23	20
932 + 00	38	23
933 + 00	66	11
934 + 00	86	4
935 + 00	105	1
936 + 00	113	1
937 + 00	94	1
US 87 SB		
915 + 00	0	0
916 + 00	6	0
917 + 00	15	3
918 + 00	24	8
919 + 00	27	11
920 + 00	27	10
921 + 00	27	9
922 + 00	31	18
923 + 00	28	40
924 + 00	23	47
925 + 00	23	93
926 + 00	20	83
927 + 00	18	18
928 + 00	17	19
929 + 00	17	19
930 + 00	16	19
931 + 00	16	20
932 + 00	18	18
933 + 00	19	98
934 + 00	69	167
935 + 00	147	92
936 + 00	159	51
937 + 00	142	76
938 + 00	175	55
WEST FEDERAL LAND DRIVEWAY		
0 + 00	0	0
1 + 00	292	5
2 + 00	183	11
3 + 00	206	17
4 + 00	278	11
4 + 10	33	0
PROJECT TOTALS:	2,682	1,113

US 87
 PROJECT
 SUMMARY

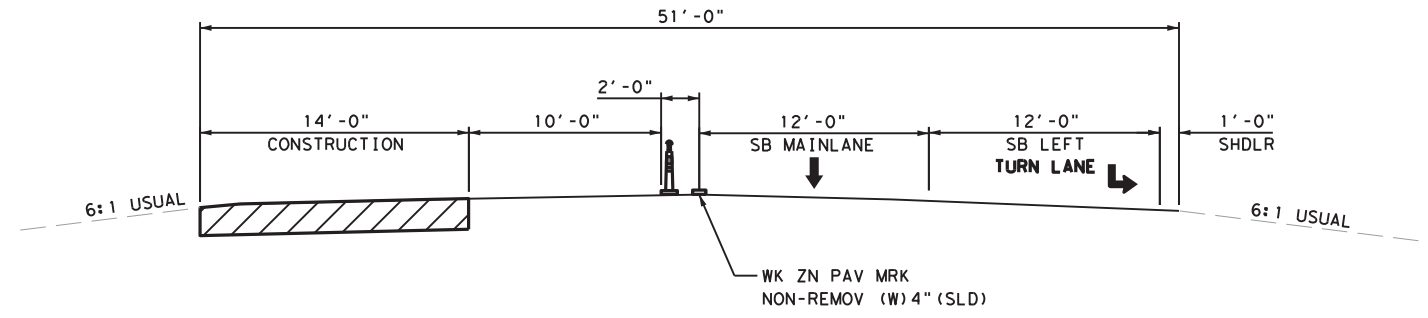


SHEET 3 OF 3

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		12

TRAFFIC CONTROL PLAN GENERAL NOTES

1. THE FOLLOWING NARRATIVE IS A SUPPLEMENT TO THE TRAFFIC CONTROL PLAN (TCP) STANDARDS.
2. THE FOLLOWING IS TO PROVIDE A SEQUENCE FOR THIS PROJECT'S TRAFFIC CONTROL PLAN (TCP) AND ARE NOT INTENDED TO PROHIBIT THE CONTRACTOR FROM PROPOSING MODIFICATIONS TO THESE PLANS OR SUBMITTING AN ALTERNATE. IF THE CONTRACTOR PROPOSES MODIFICATIONS TO THE PLANS OR ALTERNATE PLANS, THE CONTRACTOR WILL FORMALLY SUBMIT ALL CHANGES TO THE ENGINEER FOR REVIEW AND APPROVAL. ANY CHANGES PROPOSED BY THE CONTRACTOR WILL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER.
3. THE CONTRACTOR WILL NOT BEGIN ANY WORK ASSOCIATED WITH A CHANGE IN THE PLANS WITHOUT THE ENGINEER'S APPROVAL IN WRITING.
4. THE CONTRACTOR WILL GIVE AT LEAST 7 CALENDAR DAY ADVANCED NOTICE TO THE TRAVELING PUBLIC OF THE INTENDED START OF CONSTRUCTION. THIS WORK WILL BE PAID UNDER ITEM 6001 PORTABLE CHANGEABLE MESSAGE SIGN.
5. ALL BARRICADES, SIGNS, AND FLAGGERS WILL BE SUBSIDIARY TO ITEM 502 BARRICADES, SIGNS, AND TRAFFIC HANDLING.
6. ANY EXISTING SIGNS INCLUDING SPEED LIMIT SIGNS THAT MAY BE IN CONFLICT WITH PROPOSED TRAFFIC CONTROL PLANS WILL BE REMOVED OR COVERED TEMPORARILY AS DIRECTED BY THE ENGINEER. THE CONTRACTOR WILL BE RESPONSIBLE TO MAINTAIN REMOVED/COVERED SIGNS IN GOOD CONDITION. REMOVAL, COVERING, AND MAINTAINING OF SIGNS WILL BE SUBSIDIARY TO ITEM 502. DAMAGES TO EXISTING SIGNS THAT ARE TO REMAIN WILL BE REPLACED AT NO ADDITIONAL COST.
7. AS PERMANENT PAVEMENT IS OPENED TO TRAFFIC DURING VARIOUS PHASES OF THE TRAFFIC CONTROL PLAN, THE CONTRACTOR SHALL INSTALL PERMANENT SIGNING AND STRIPING BEFORE OPENING TO TRAFFIC UNLESS IT CONFLICTS WITH TCP SIGNING AND STRIPING IN SUBSEQUENT PHASES OF CONSTRUCTION.
8. PLACE ADVANCED WARNING SIGNS PER BC STANDARDS PRIOR TO COMMENCING WORK. THE ADVANCED WARNING SIGNS WILL REMAIN IN PLACE FOR THE DURATION OF THE PROJECT.
9. THE CONTRACTOR IS TO HAVE 2 PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) AND USE AS NEEDED FOR THE ENTIRE DURATION OF THE PROJECT.
10. ALL WORK ZONE PAVEMENT MARKING WILL BE PAID FOR UNDER ITEM 662 WORK ZONE PAVEMENT MARKINGS.
11. THE CONTRACTOR SHALL MAINTAIN DRAINAGE DURING ALL PHASES OF CONSTRUCTION IN A MANNER ACCEPTABLE TO THE ENGINEER. ALL DRAINAGE FACILITIES INCLUDING ANY TEMPORARY PIPES WILL BE KEPT IN GOOD CONDITION. WORK WILL BE SUBSIDIARY TO ITEM 506.
12. INSTALL EROSION CONTROL DEVICES AS SHOWN ON SW3P LAYOUTS AND AS DIRECTED BY THE ENGINEER. ALL EROSION CONTROL AND SEDIMENT CONTROL DEVICES WILL BE PAID FOR UNDER ITEM 506.



PHASE 1 - STAGE 1

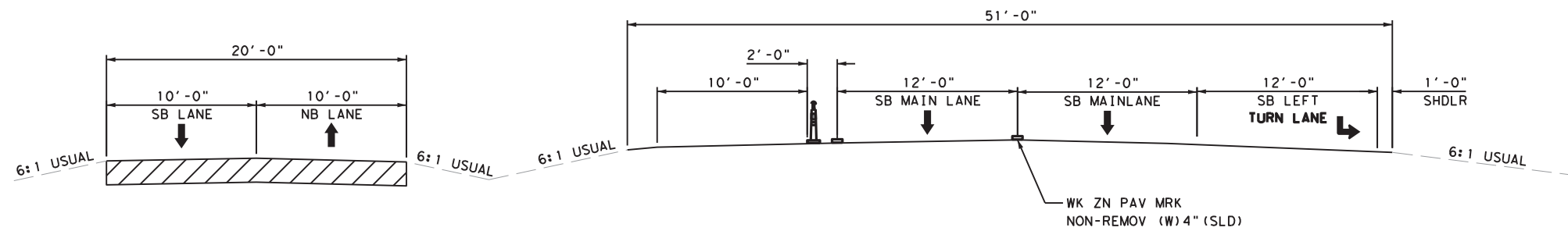
SOUTHBOUND ACCELERATION LANE WIDENING PHASE 1 - STAGE 1:

TRAFFIC:

1. UTILIZE THE APPROPRIATE TCP, WZ, OR BC STANDARDS TO CLOSE THE OUTSIDE SOUTHBOUND LANE AND SHOULDER OF US 87.
2. CONTRACTOR SHALL SHOULDER UP DROP-OFFS GREATER THAN 2" DURING THE DURATION OF WORK WITH A MAX 3:1 SLOPE.

CONSTRUCTION:

1. PERFORM CONSTRUCTION ON SOUTHBOUND DECEL/ACCEL LANE WIDENING.
2. THIS PHASE CANNOT BE COMPLETED CONCURRENTLY WITH ANY OTHER PHASE.



PHASE 1 - STAGE 2

WEST ACCESS ROAD CONSTRUCTION PHASE 1 - STAGE 2:

TRAFFIC:

1. UTILIZE THE APPROPRIATE TCP, WZ, OR BC STANDARDS TO CLOSE THE OUTSIDE SOUTHBOUND SHOULDER OF US 87.
2. CONTRACTOR SHALL SHOULDER UP DROP-OFFS GREATER THAN 2" DURING THE DURATION OF WORK WITH A MAX 3:1 SLOPE.

CONSTRUCTION:

1. PERFORM CONSTRUCTION ON WEST FEDERAL LAND DRIVEWAY CONSTRUCTION.
2. THIS PHASE CANNOT BE COMPLETED CONCURRENTLY WITH ANY OTHER PHASE.



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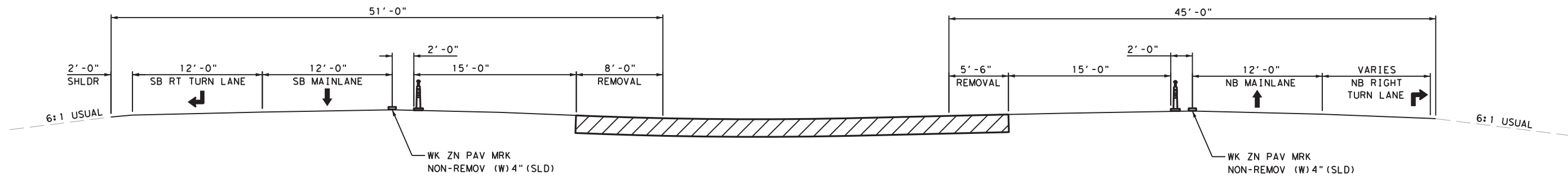
12/02/2020
US 87

TRAFFIC CONTROL NARRATIVE



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PHASE 2

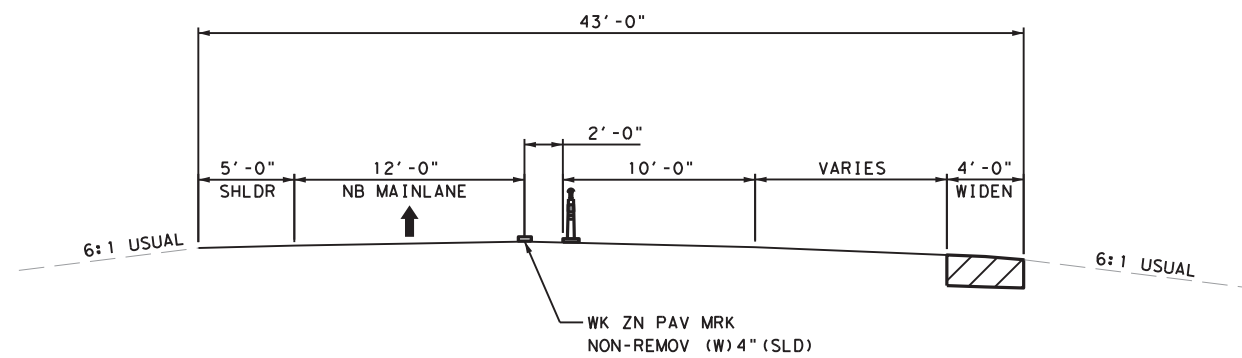
DECEL LANES AND CROSSOVER LANE REMOVAL PHASE 2:

TRAFFIC:

1. UTILIZE THE APPROPRIATE TCP, WZ, OR BC STANDARDS TO CLOSE THE INSIDE NORTHBOUND LANE AND SHOULDER AND INSIDE SOUTHBOUND LANE AND SHOULDER OF US 87.
2. CONTRACTOR SHALL SHOULDER UP DROP-OFFS GREATER THAN 2" DURING THE DURATION OF WORK WITH A MAX 3:1 SLOPE.

CONSTRUCTION:

1. PERFORM CONSTRUCTION ON SOUTHBOUND LEFT DECEL LANE REMOVAL, CROSSOVER REMOVAL, NORTHBOUND LEFT DECEL LANE REMOVAL, AND SINGLE SLOPE CONCRETE BARRIER.
2. THIS PHASE CANNOT BE COMPLETED CONCURRENTLY WITH ANY OTHER PHASE OF CONSTRUCTION.



PHASE 3

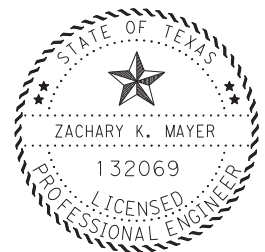
NORTHBOUND ROAD LANE WIDENING PHASE 3:

TRAFFIC:

1. UTILIZE THE APPROPRIATE TCP, WZ, OR BC STANDARDS TO CLOSE THE OUTSIDE NORTHBOUND LANE AND SHOULDER OF US 87.
2. CONTRACTOR SHALL SHOULDER UP DROP-OFFS GREATER THAN 2" DURING THE DURATION OF WORK WITH A MAX 3:1 SLOPE.

CONSTRUCTION:

1. PERFORM CONSTRUCTION ON NORTHBOUND RIGHT TURN LANE.
2. THIS PHASE CANNOT BE COMPLETED CONCURRENTLY WITH ANY OTHER PHASE OF CONSTRUCTION.



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12/02/2020
US 87

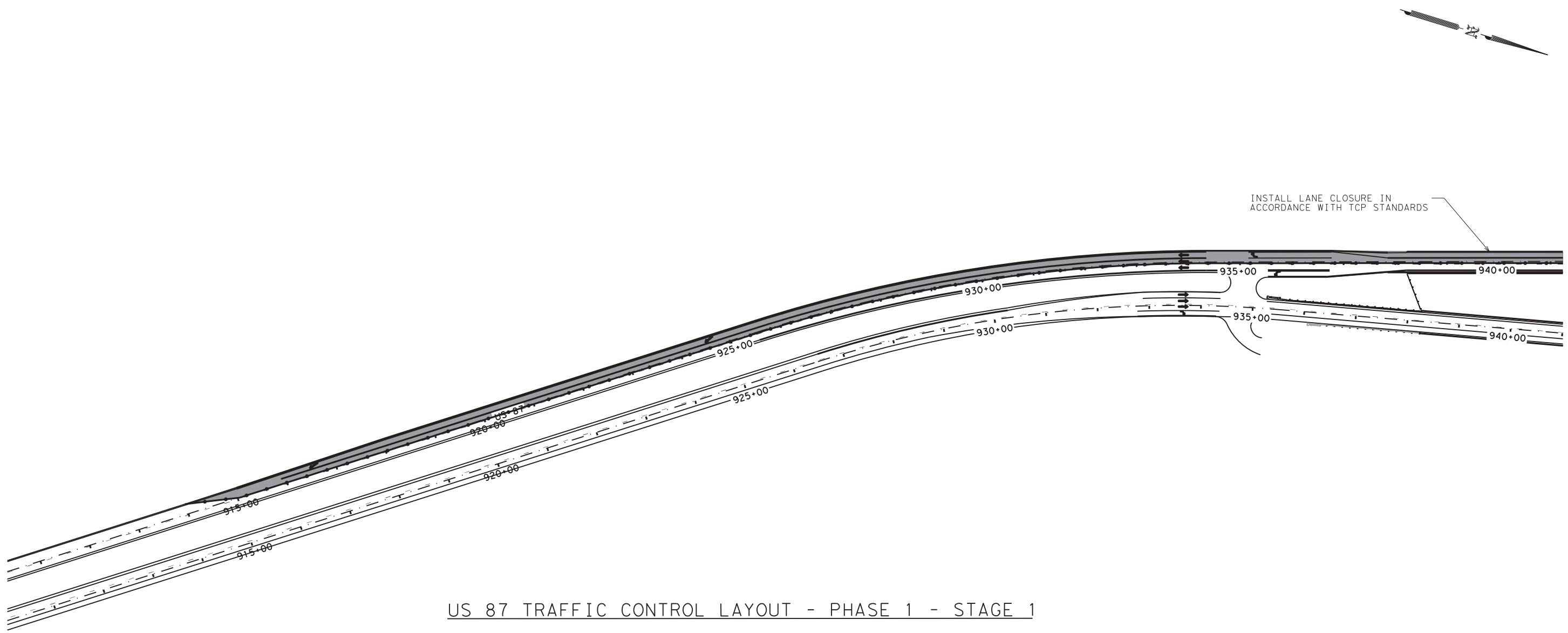
TRAFFIC CONTROL NARRATIVE



SHEET 2 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		14

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INSTALL LANE CLOSURE IN ACCORDANCE WITH TCP STANDARDS

US 87 TRAFFIC CONTROL LAYOUT - PHASE 1 - STAGE 1

NOTES:

SEE LATEST TMUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

LEGEND:

-  LANE CLOSURE
-  CHANNELIZING
-  PROPOSED TRAFFIC



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12/02/2020
 US 87

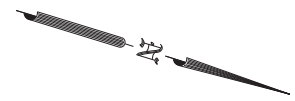
TRAFFIC CONTROL LAYOUT

SCALE: 1" = 200'

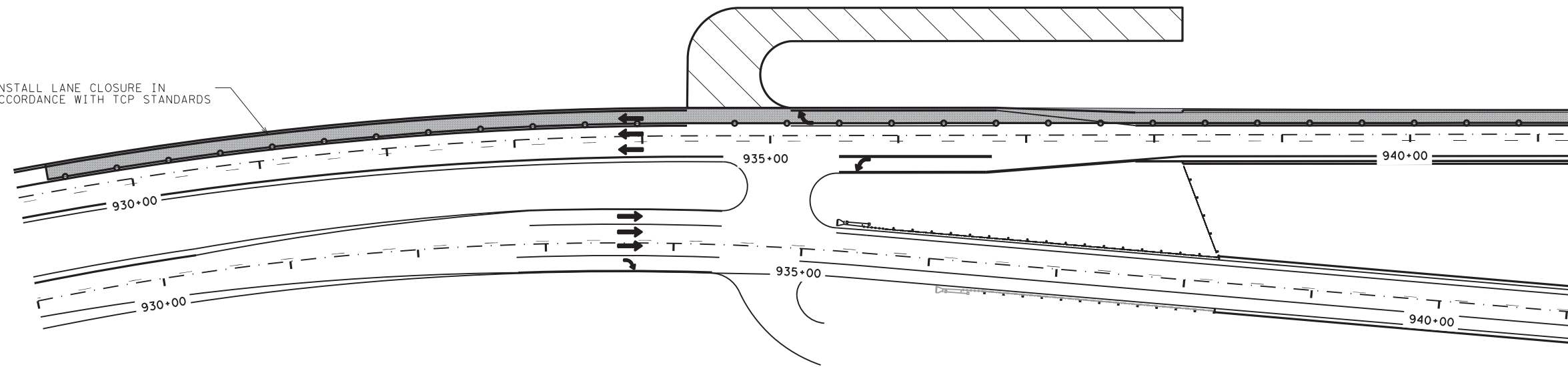


SHEET 1 OF 4

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		15



INSTALL LANE CLOSURE IN ACCORDANCE WITH TCP STANDARDS






US 87 TRAFFIC CONTROL LAYOUT - PHASE 1 - STAGE 2

NOTES:

SEE LATEST TMUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

LEGEND:

-  LANE CLOSURE
-  CHANNELIZING
-  PROPOSED TRAFFIC



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US 87

TRAFFIC CONTROL LAYOUT

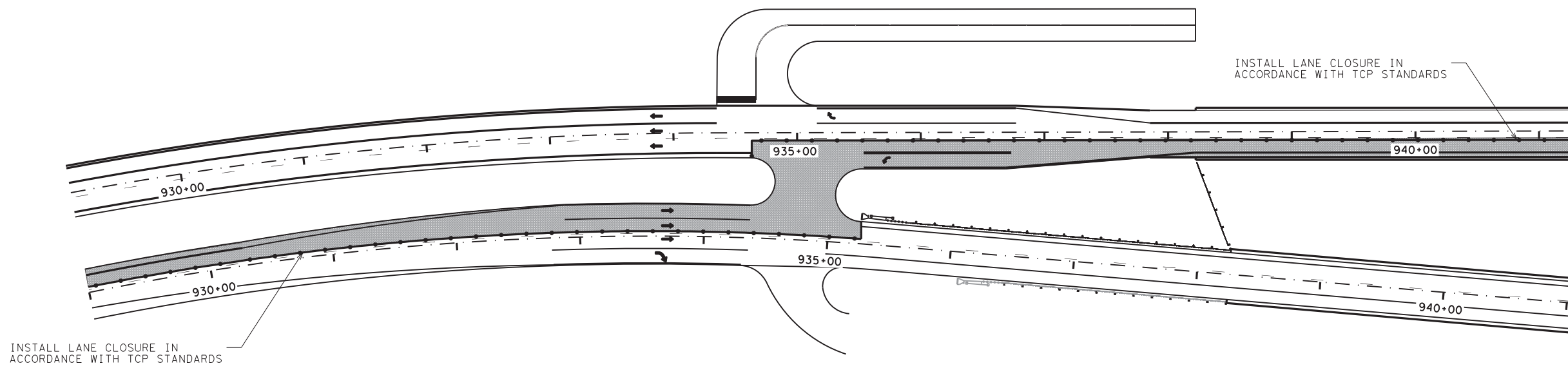
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SHEET 2 OF 4

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JD	ZM	AMA	POTTER		16

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US 87 TRAFFIC CONTROL LAYOUT - PHASE 2

NOTES:

SEE LATEST T MUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

LEGEND:

-  LANE CLOSURE
-  CHANNELIZING
-  PROPOSED TRAFFIC



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12/02/2020
US 87

TRAFFIC CONTROL LAYOUT

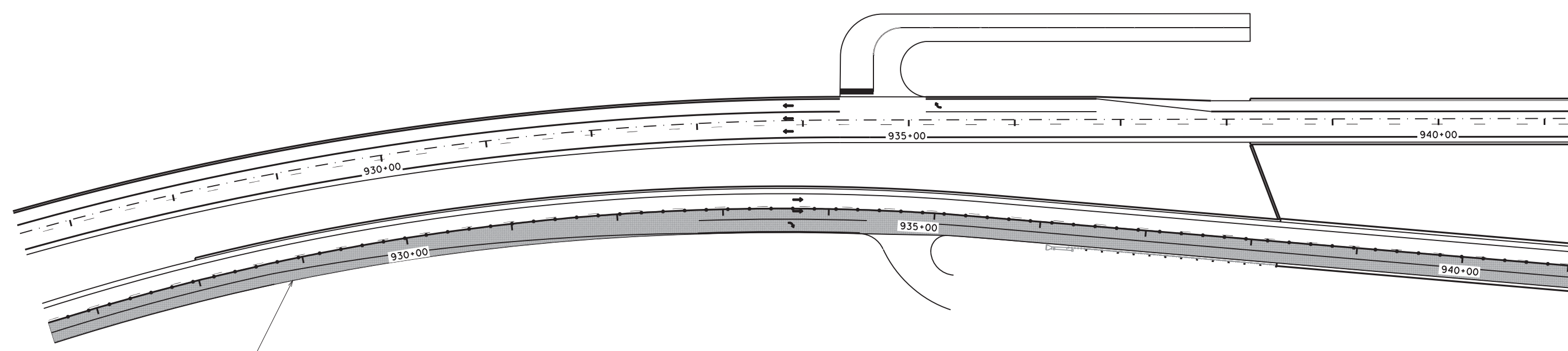
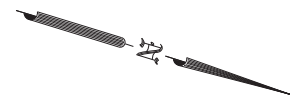
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SHEET 3 OF 4

DSN	CK	CONT	SECT	JOB	HIGHWAY
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JD	ZM	AMA	POTTER		17

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INSTALL LANE CLOSURE IN ACCORDANCE WITH TCP STANDARDS

US 87 TRAFFIC CONTROL LAYOUT - PHASE 3

NOTES:

SEE LATEST TMTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

LEGEND:

-  LANE CLOSURE
-  CHANNELIZING
-  PROPOSED TRAFFIC



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12/02/2020
US 87

TRAFFIC CONTROL LAYOUT

SCALE: 1" = 100'



SHEET 4 OF 4

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		18

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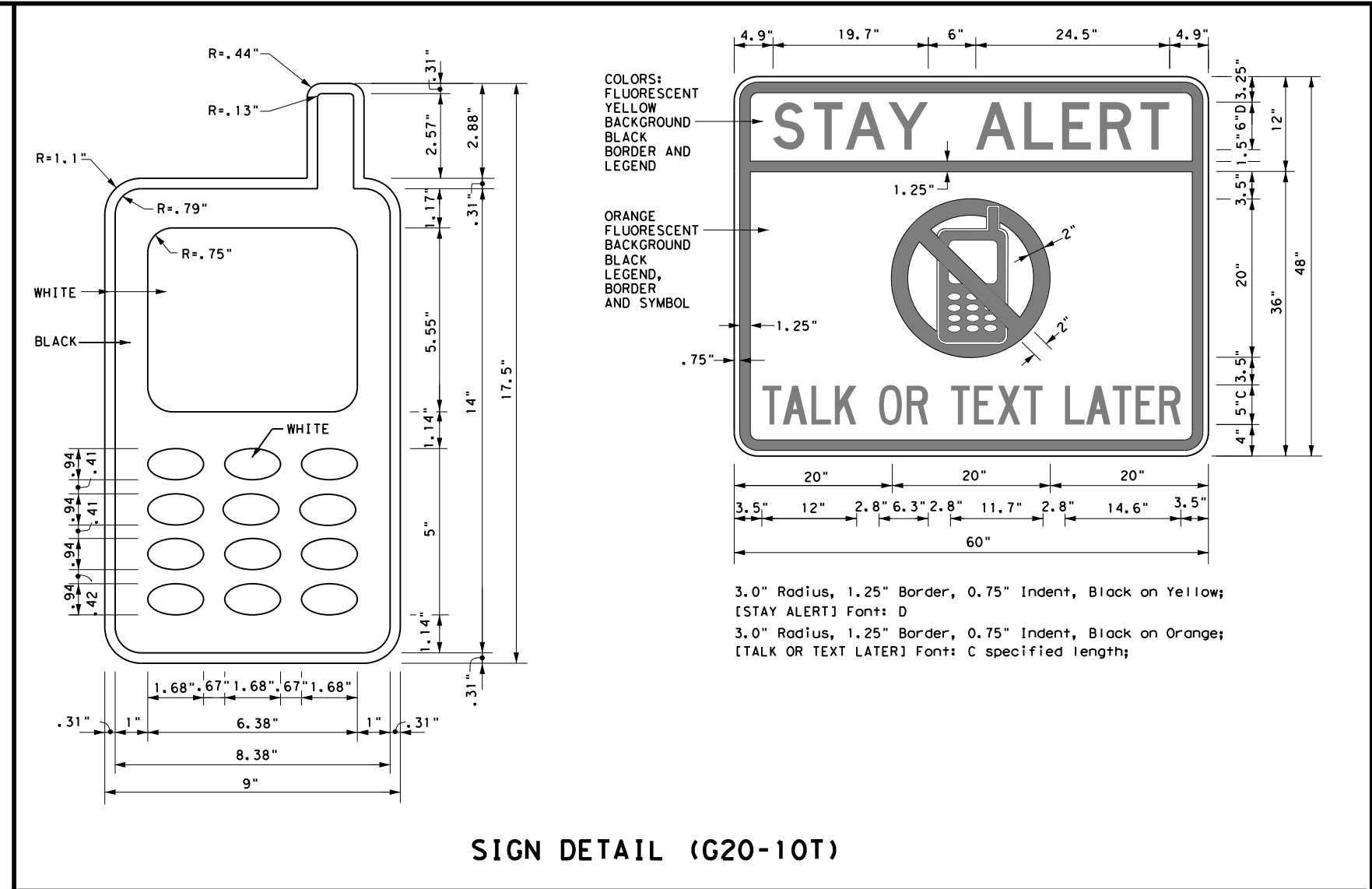
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

- 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).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.
- Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.
- The Engineer has the final decision on the location of all traffic control devices.
- 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 APPAREL NOTES:

- 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.



Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
 Traffic Operations Division - TE
 Phone (512) 416-3118

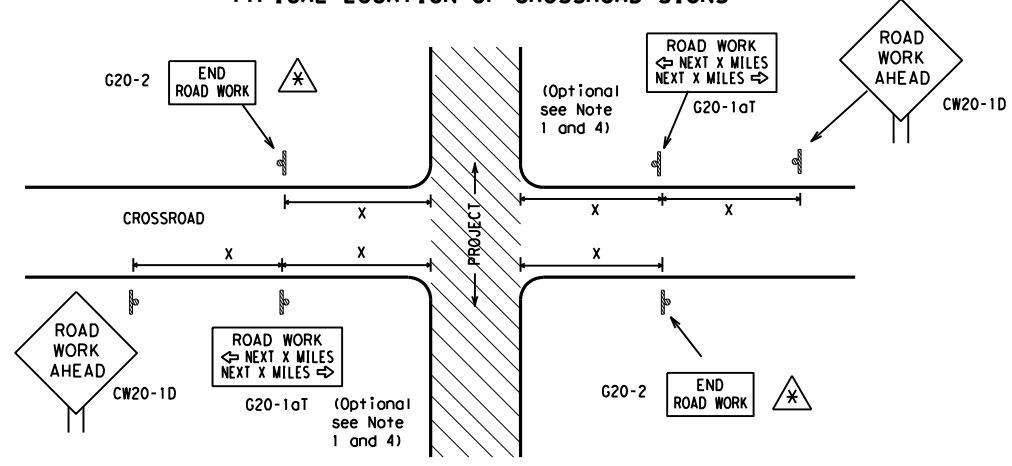
THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov	
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)	
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)	
MATERIAL PRODUCER LIST (MPL)	
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"	
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)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

SHEET 1 OF 12

 Texas Department of Transportation		<i>Traffic Operations Division Standard</i>
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS		
BC (1) - 14		
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT: 0041	SECT: 05
REVISIONS	JOB: 053	
4-03 5-10 8-14	HIGHWAY: US 87	
9-07 7-13	DIST: AMA	COUNTY: POTTER
		SHEET NO.: 19

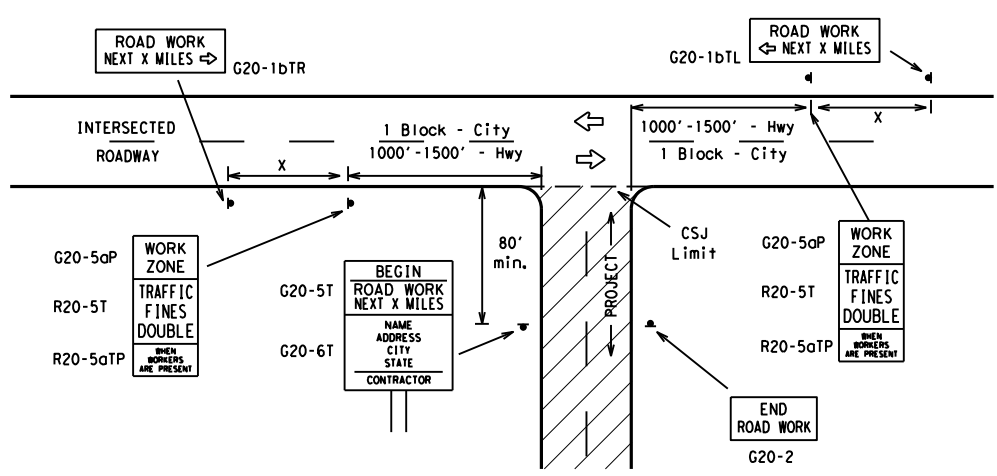
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TYPICAL LOCATION OF CROSSROAD SIGNS



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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING^{1,5,6}

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Spacing "X" Feet (Approx.)
CW20 ⁴	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW25			50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	55	500 ²
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	60	600 ²
			65	700 ²
			70	800 ²
			75	900 ²
			80	1000 ²
			*	* ³

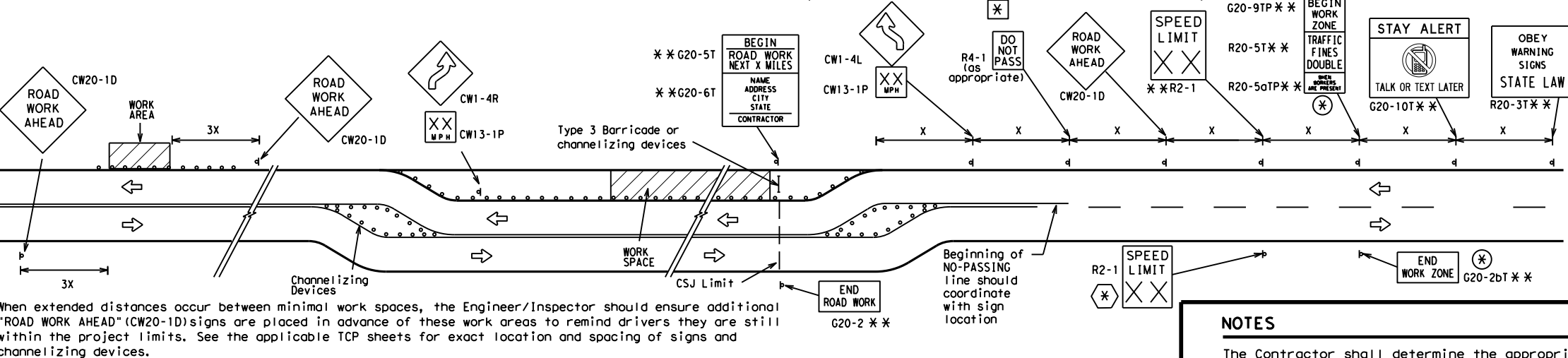
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

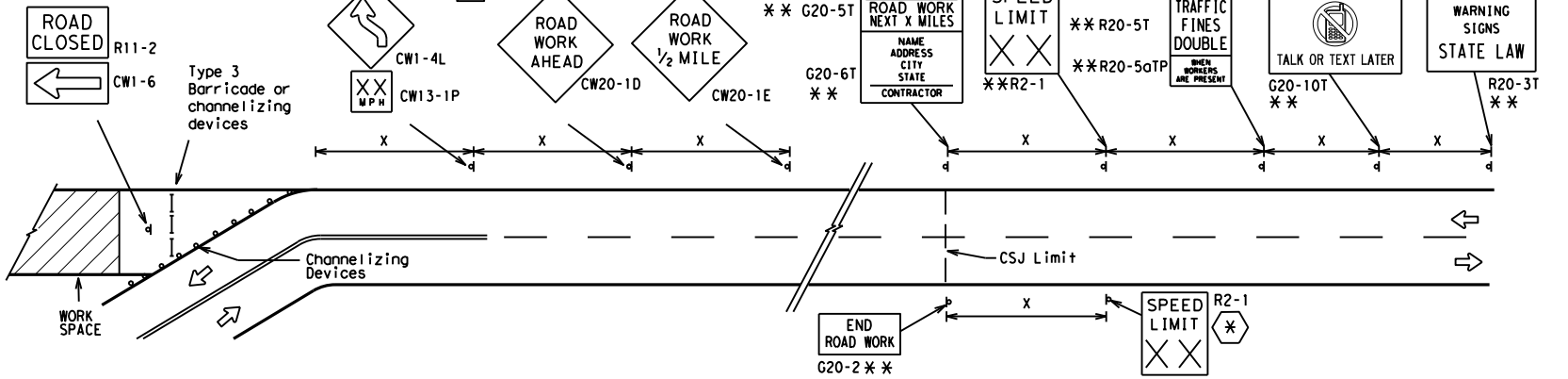
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

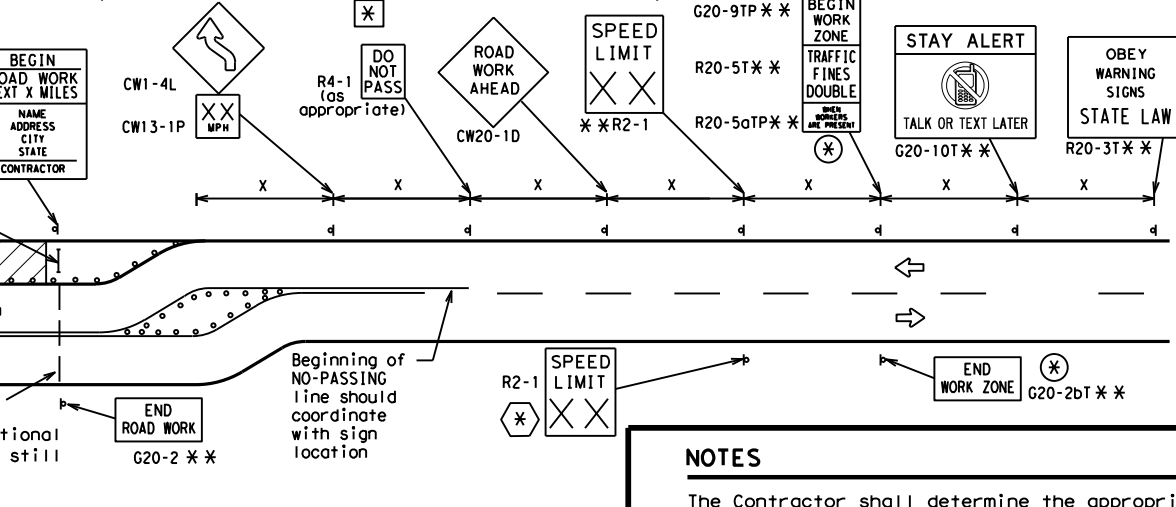


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



NOTES

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- ⊗ The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
- ** Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.
- ⊗ Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
- ⊗ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

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

SHEET 2 OF 12



BARRICADE AND CONSTRUCTION PROJECT LIMIT

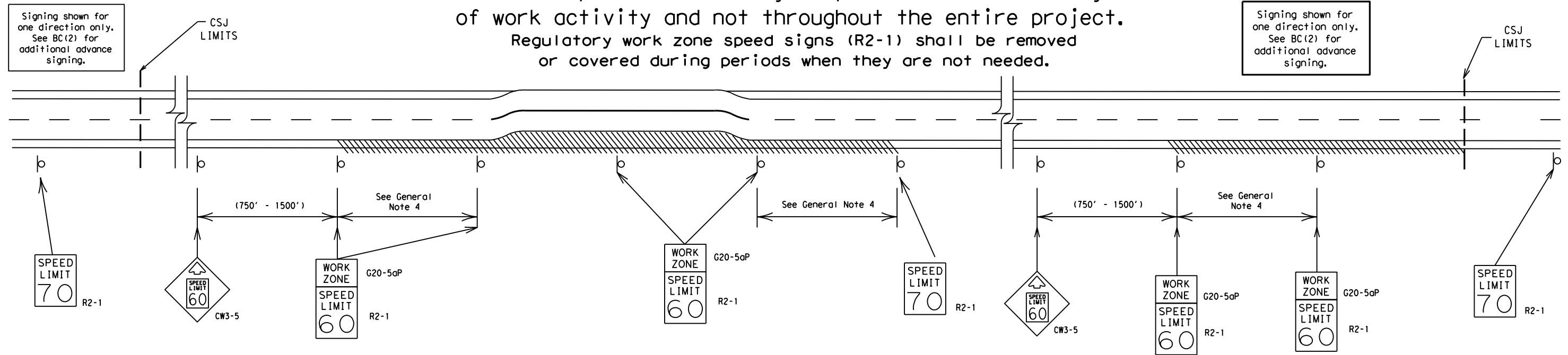
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FILE: bc-14.dgn	DN: TxDOT	CR: TxDOT	OW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT SECT	JOB	HIGHWAY	
REVISIONS	0041 05	053	US 87	
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13	AMA	POTTER	20	

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

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

SHEET 3 OF 12

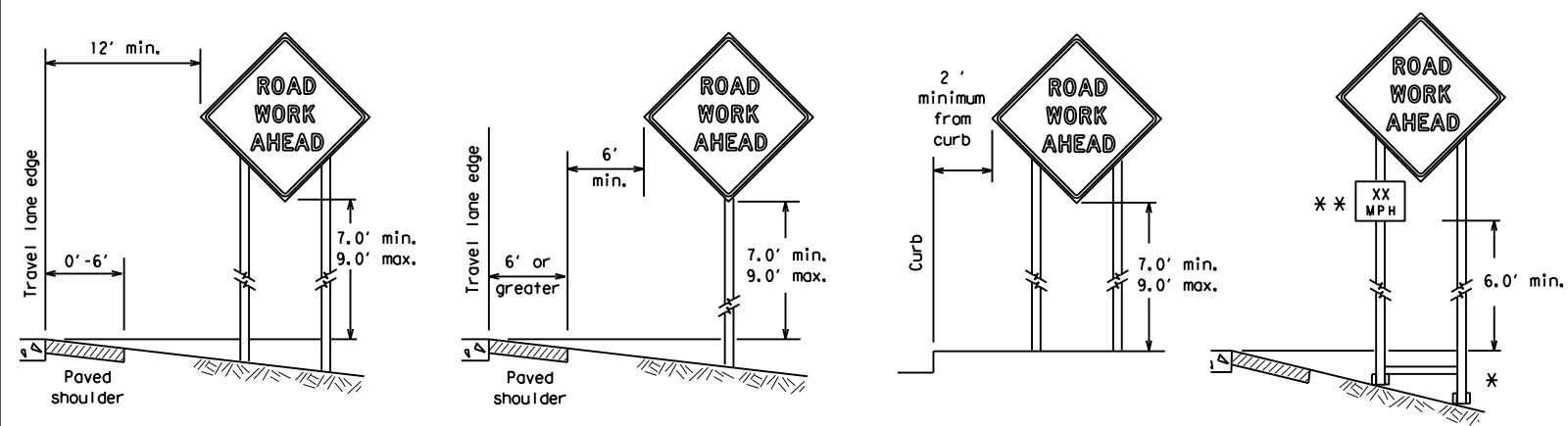
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© TxDOT	November 2002	CON: 0041	SECT: 05
REVISIONS		JOB: 053	HIGHWAY: US 87
9-07	8-14	DIST: AMA	COUNTY: POTTER
7-13			SHEET NO.: 21

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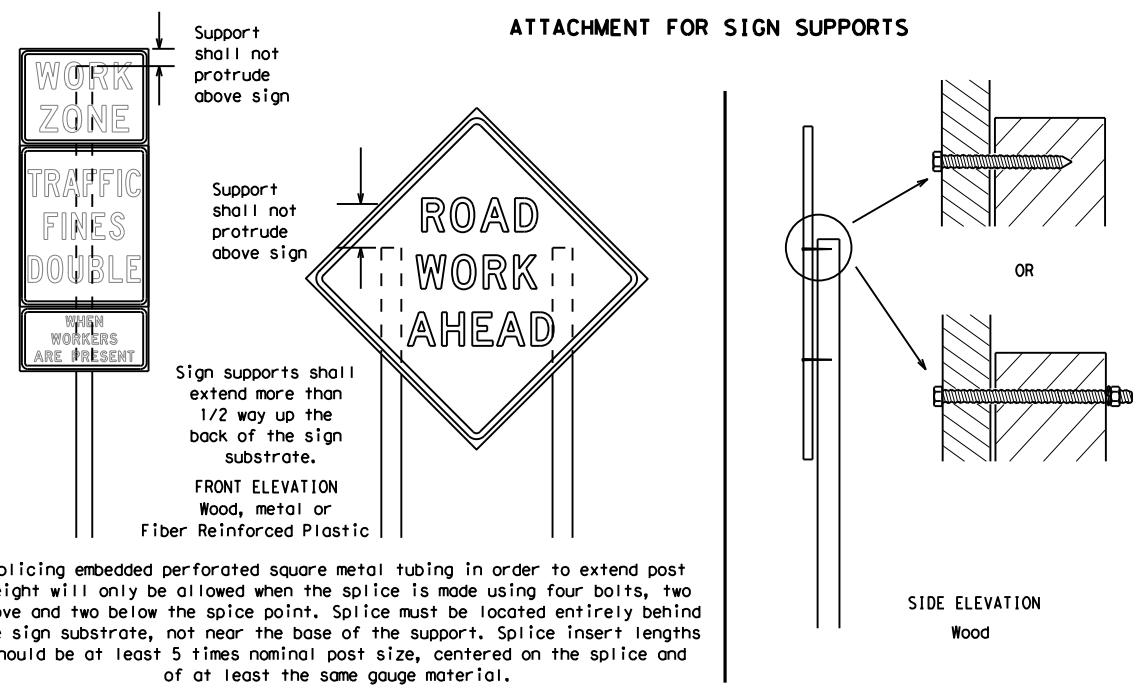
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



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

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

ATTACHMENT FOR SIGN SUPPORTS



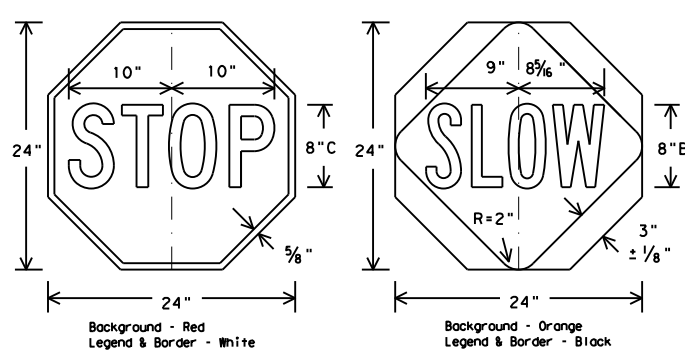
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

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" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectORIZED.
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.



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, 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.
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 sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards 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). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
 7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
 8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
 9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.
- DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)**
1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
 - a. Long-term stationary - work that occupies a location more than 3 days.
 - b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
 - c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
 - d. Short, duration - work that occupies a location up to 1 hour.
 - e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

SHEET 4 OF 12

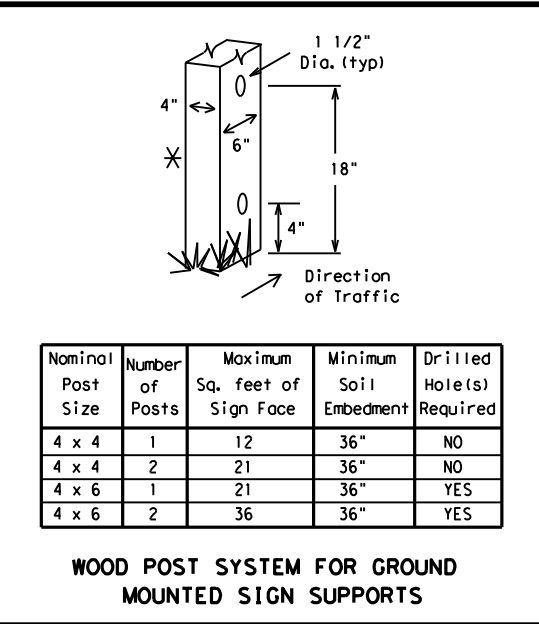
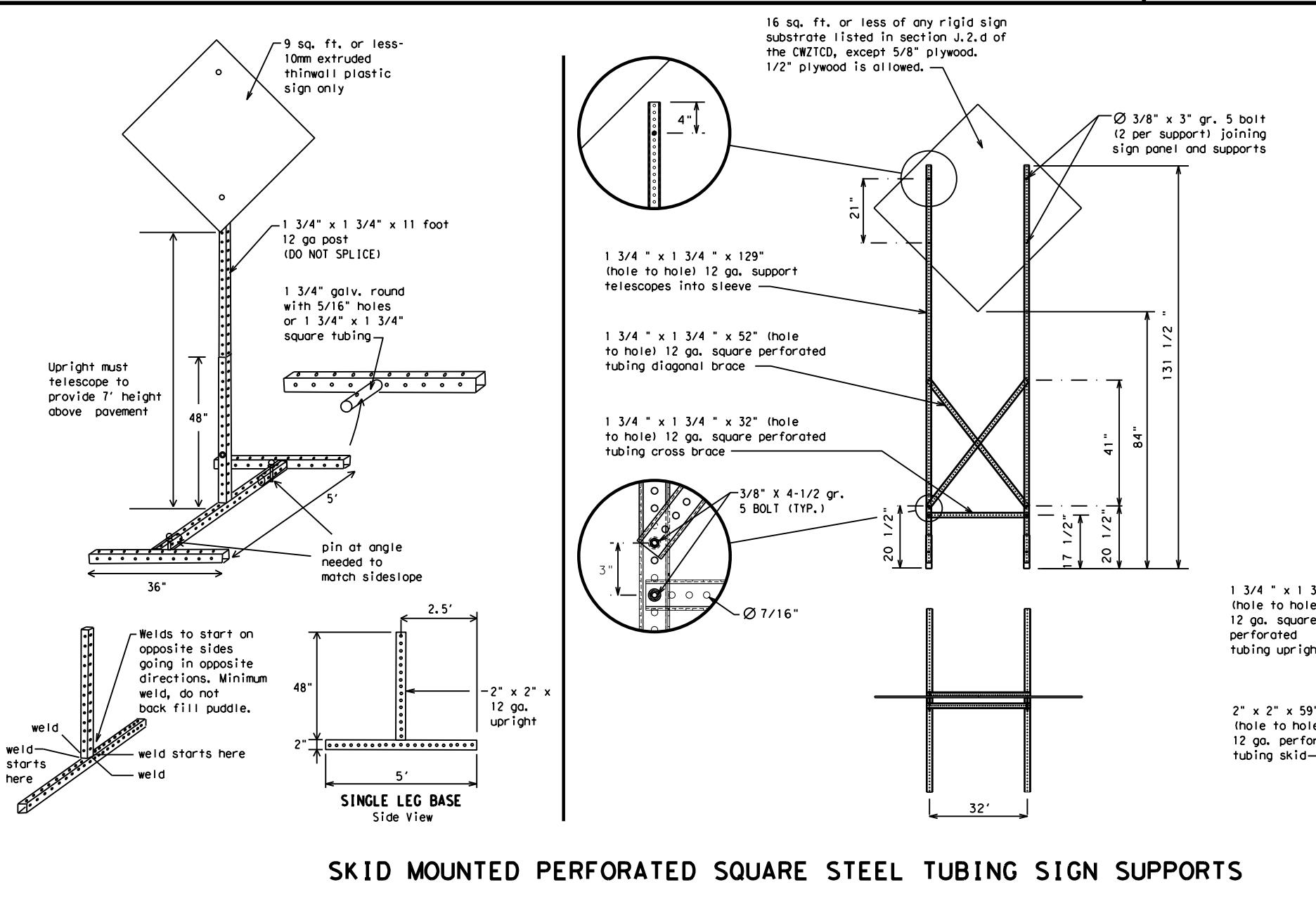
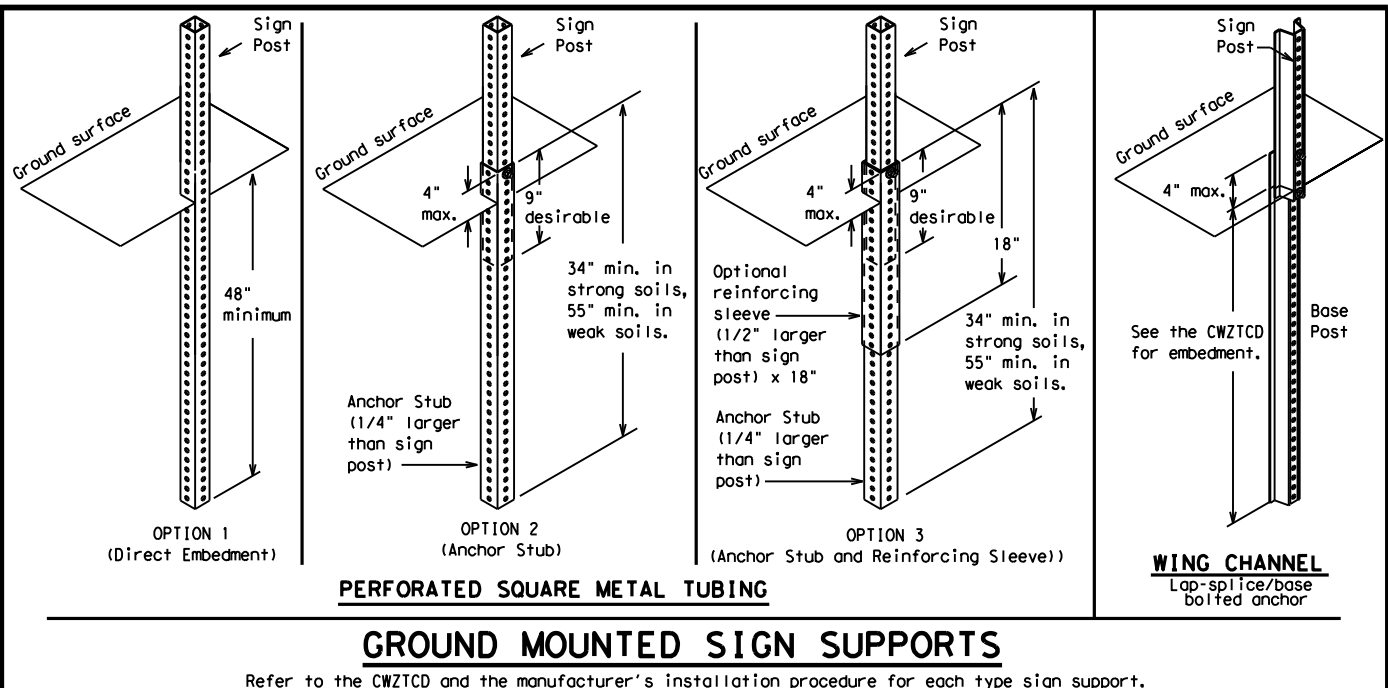
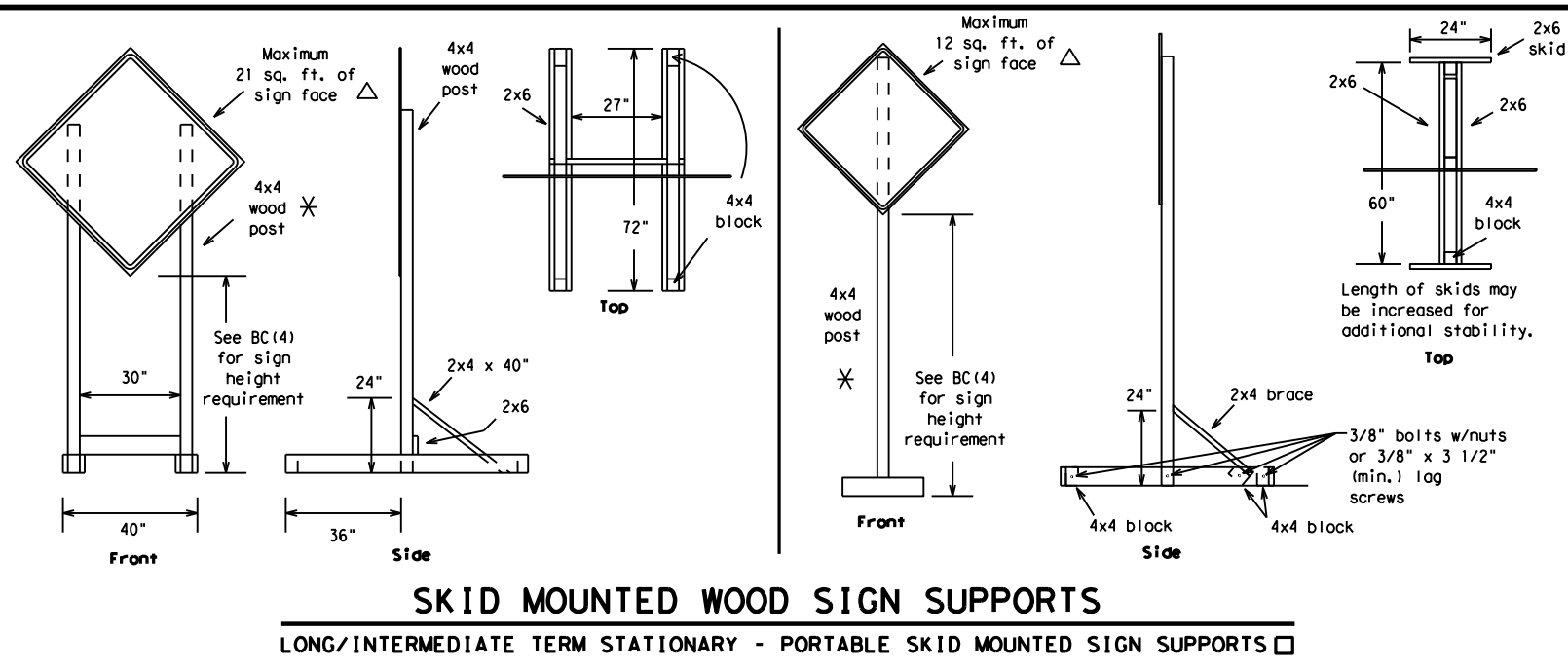


BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC (4) - 14

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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

- 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.
- No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
- When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

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

SHEET 5 OF 12

Texas Department of Transportation
 Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5) - 14

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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

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

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

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

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

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

Phase 2: Possible Component Lists

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

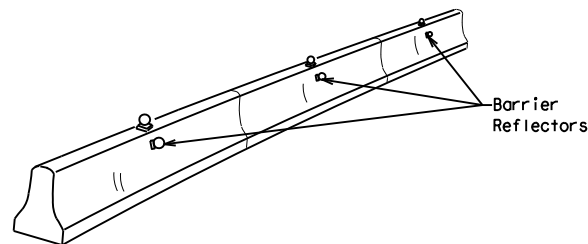
FULL MATRIX PCMS SIGNS

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

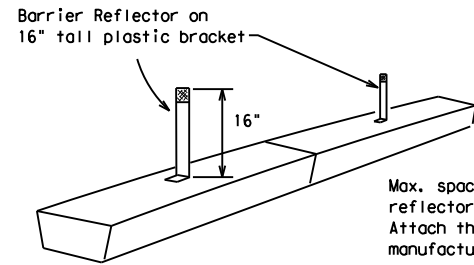
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)			
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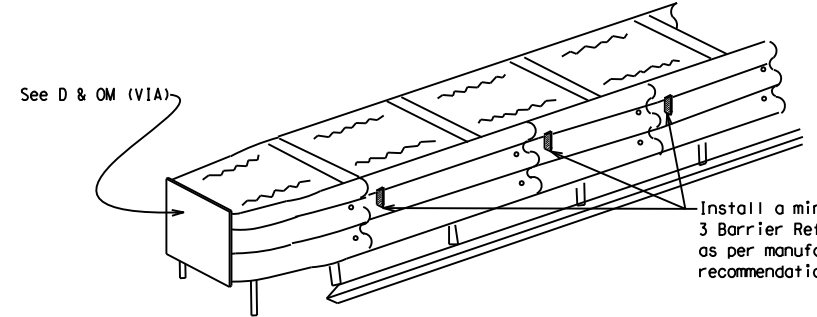
- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



CONCRETE TRAFFIC BARRIER (CTB)



LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

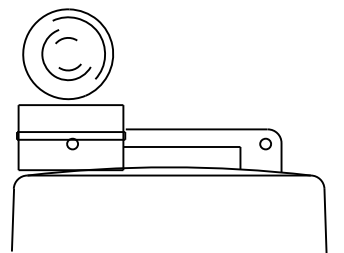
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

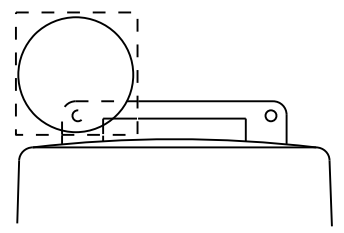
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing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

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

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



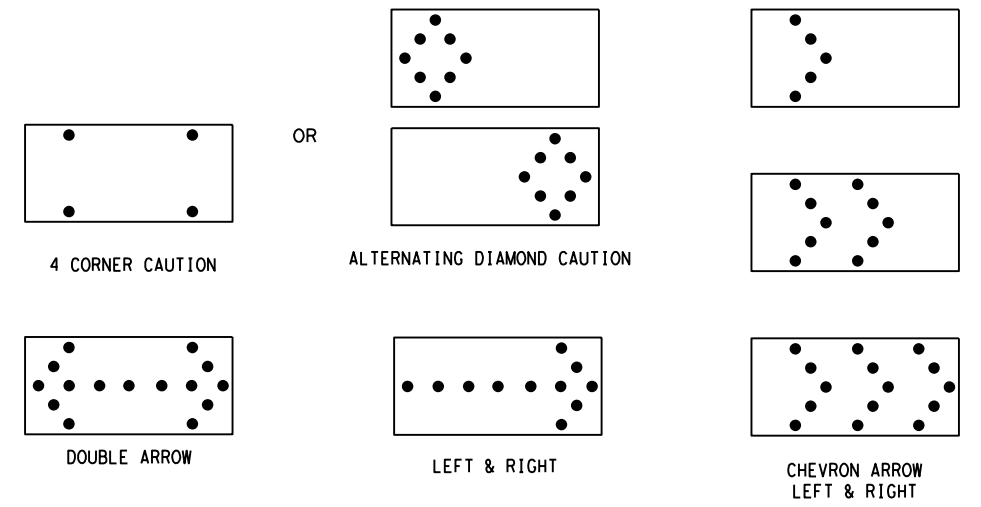
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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

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

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



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

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

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

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

FLASHING ARROW BOARDS

SHEET 7 OF 12

TRUCK-MOUNTED ATTENUATORS

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
- The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.



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

BC (7) - 14

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

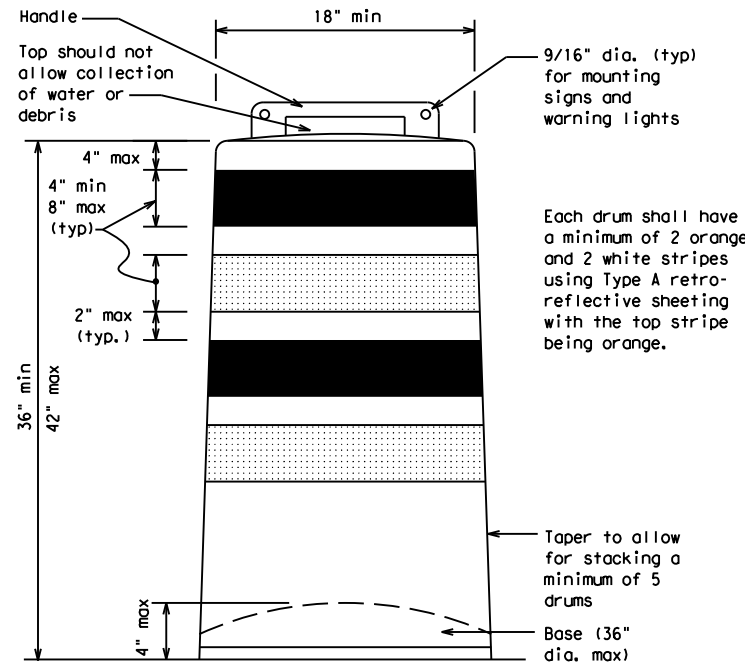
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

RETROREFLECTIVE SHEETING

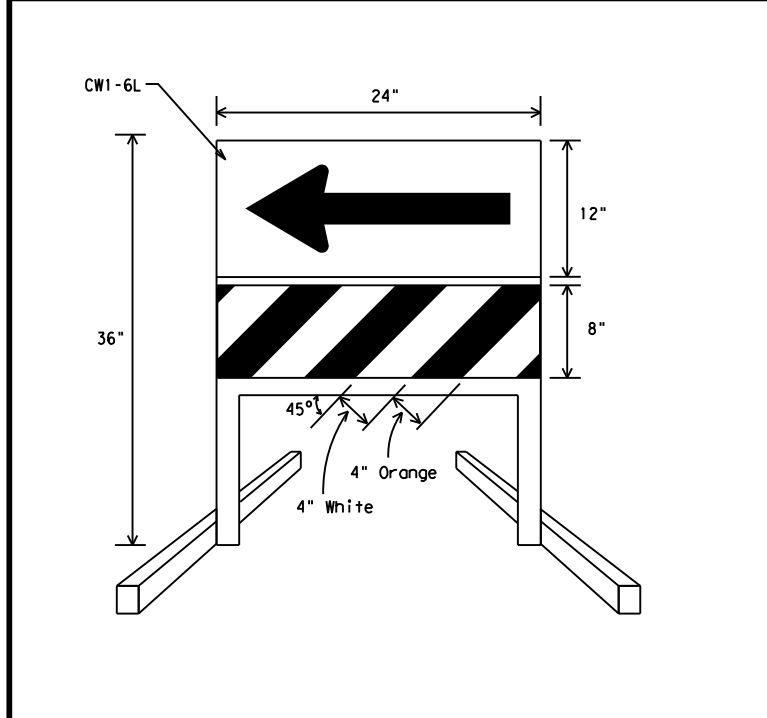
- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable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

BALLAST

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

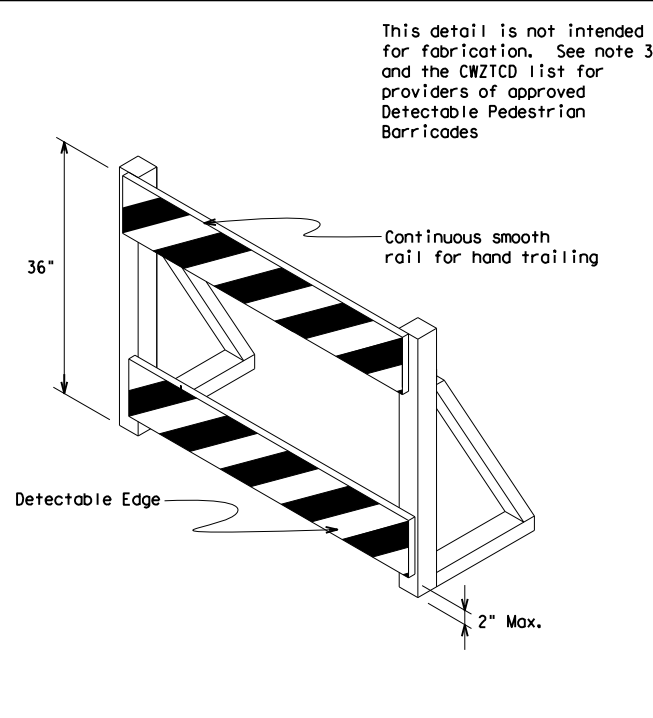


Each drum shall have a minimum of 2 orange and 2 white stripes using Type A retro-reflective sheeting with the top stripe being orange.



DIRECTION INDICATOR BARRICADE

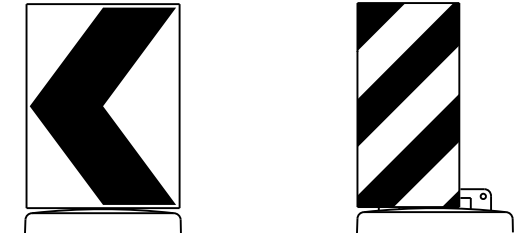
- The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
- If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
- The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CWI-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheet types shall be as per DMS 8300.
- Double arrows on the Direction Indicator Barricade will not be allowed.
- Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.



DETECTABLE PEDESTRIAN BARRICADES

- When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
- Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
- Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" and should not be used as a control for pedestrian movements.
- Warning lights shall not be attached to detectable pedestrian barricades.
- Detectable pedestrian barricades may 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.

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades



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

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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

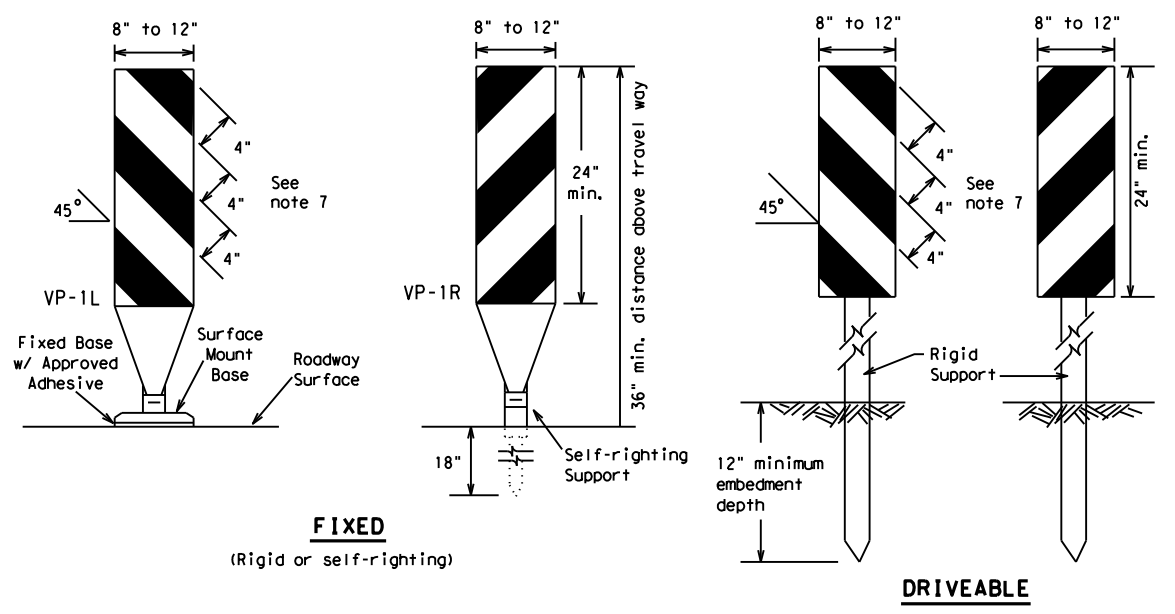
- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES			
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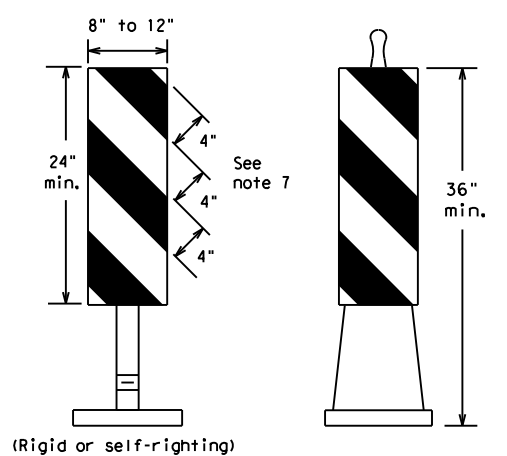
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FIXED
(Rigid or self-righting)

DRIVEABLE

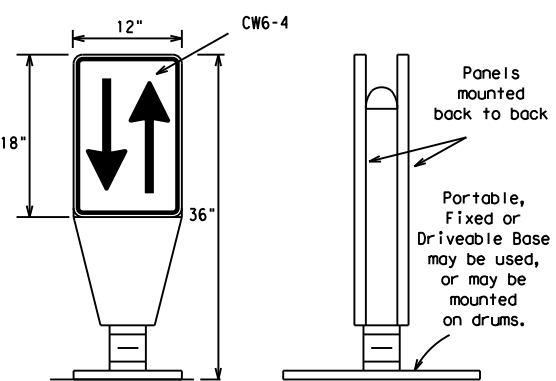


(Rigid or self-righting)

PORTABLE

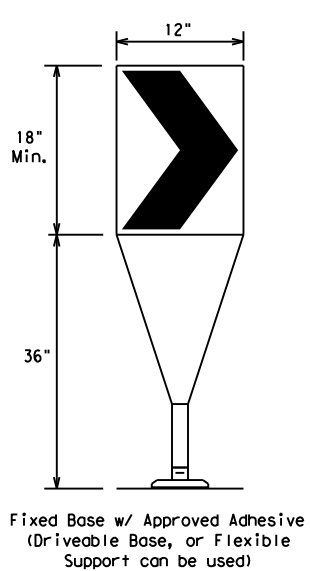
VERTICAL PANELS (VPs)

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



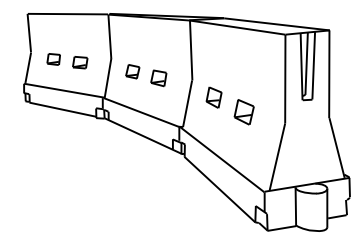
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

- 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.
- The OTLD may be used in combination with 42" cones or VPs.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
- 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.



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

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

- Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
- Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
- Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
- When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

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

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

GENERAL NOTES

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (9) - 14

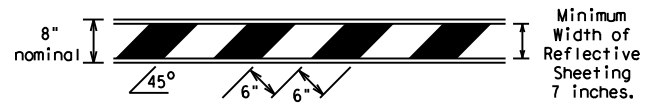
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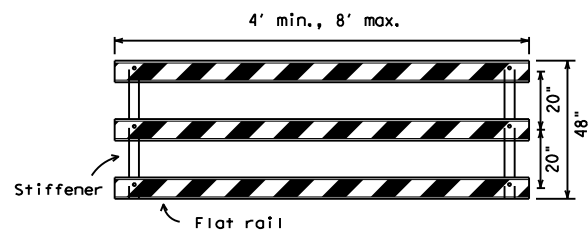
TYPE 3 BARRICADES

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 conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

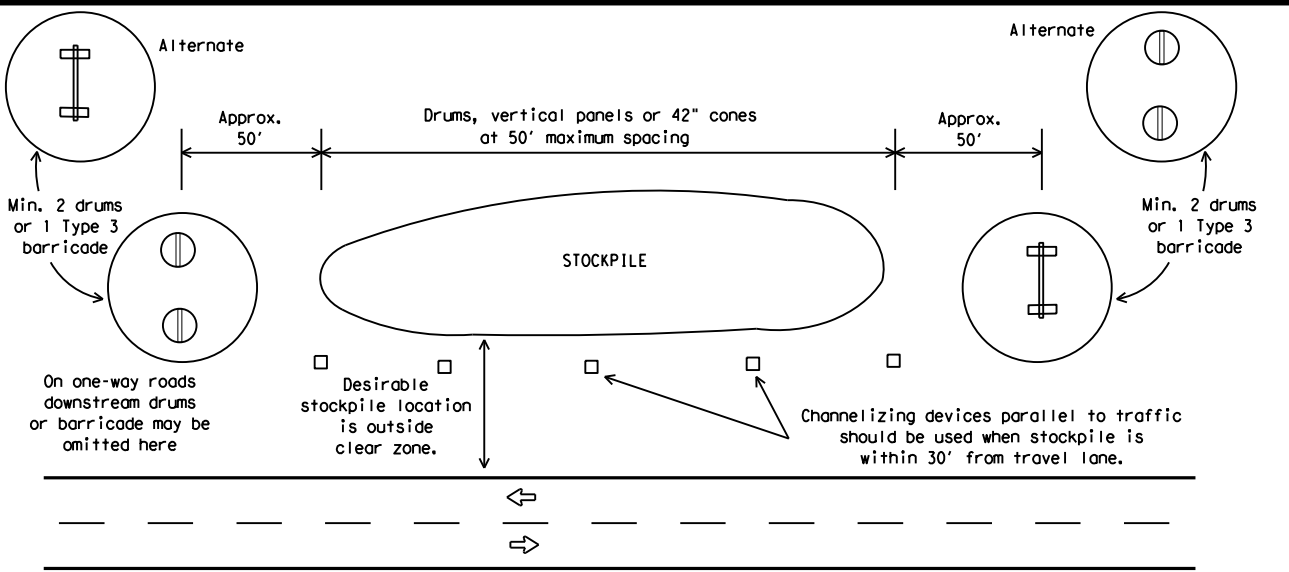
Barricades shall NOT be used as a sign support.



TYPICAL STRIPING DETAIL FOR BARRICADE RAIL

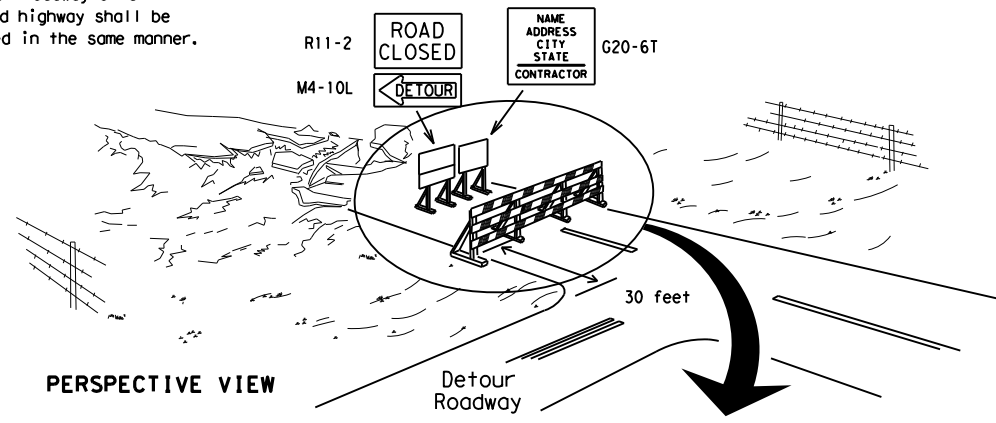


TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

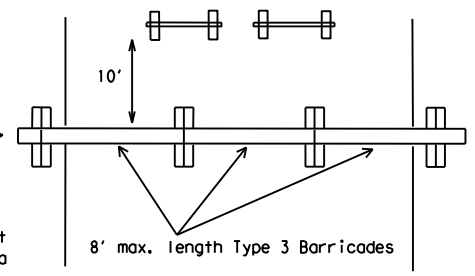
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

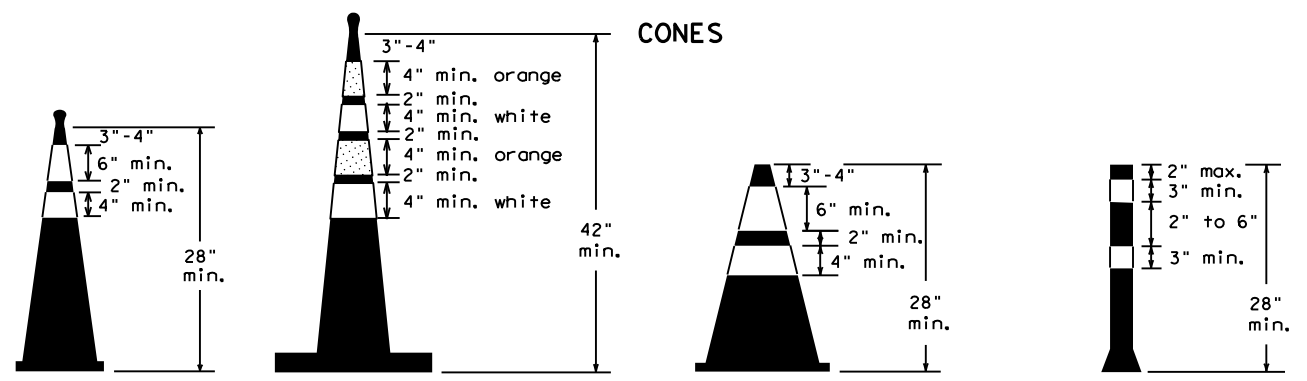
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.

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



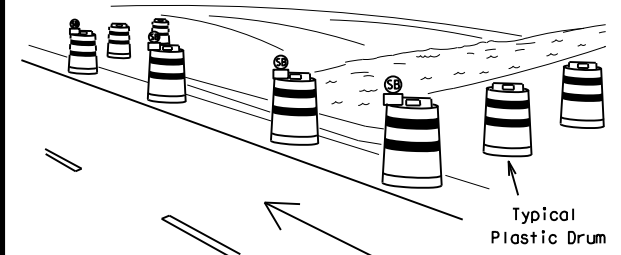
PLAN VIEW

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION

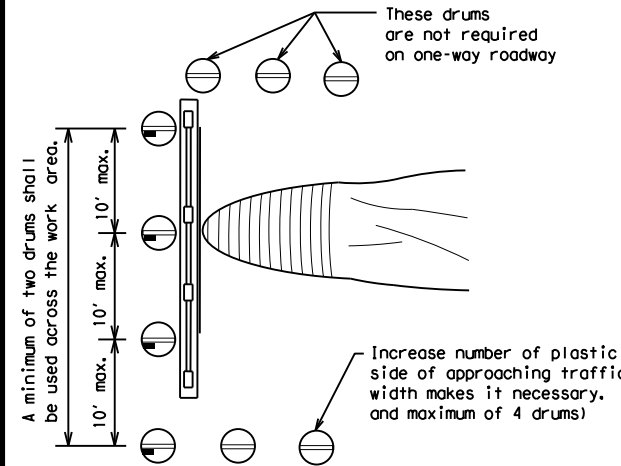


28" Cones shall have a minimum weight of 9 1/2 lbs.
 42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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 used at night 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.
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.



PERSPECTIVE VIEW



PLAN VIEW

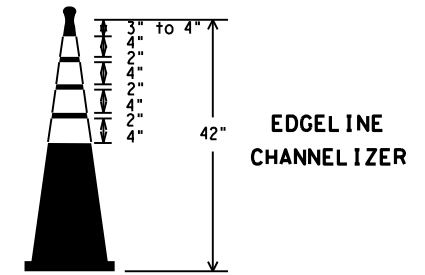
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

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

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

Increase number of plastic drums on the side of approaching traffic if the crown width makes it necessary. (minimum of 2 and maximum of 4 drums)

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGE LINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

SHEET 10 OF 12

Texas Department of Transportation Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (10) - 14

FILE: bc-14.dgn	DW: TxDOT	CK: TxDOT	OW: TxDOT	CR: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0041	05	053	US 87
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13	AMA	POTTER	28	

WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

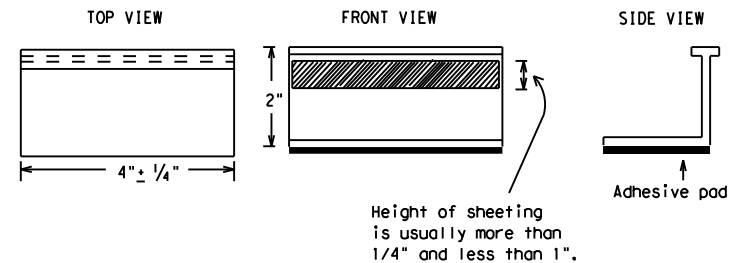
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

SHEET 11 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

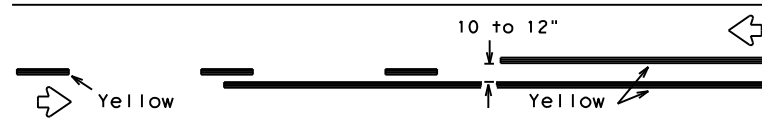
BC(11) - 14

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© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
	0041	05	053	US 87
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2-98 9-07				
1-02 7-13	DIST	COUNTY	SHEET NO.	
11-02 8-14	AMA	POTTER	29	

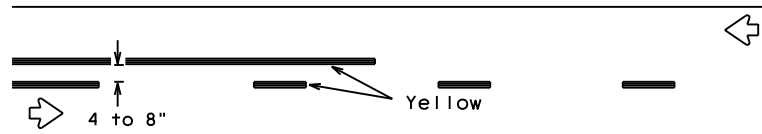
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PAVEMENT MARKING PATTERNS

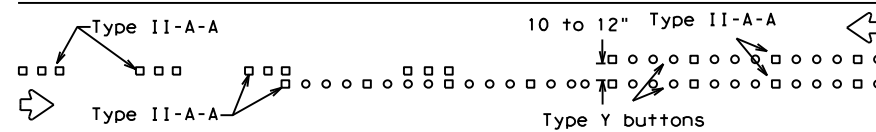


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

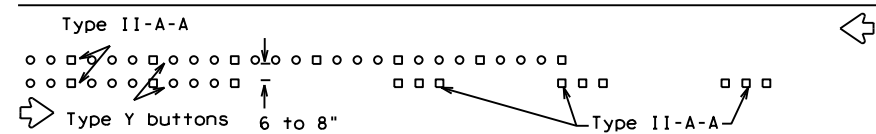


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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

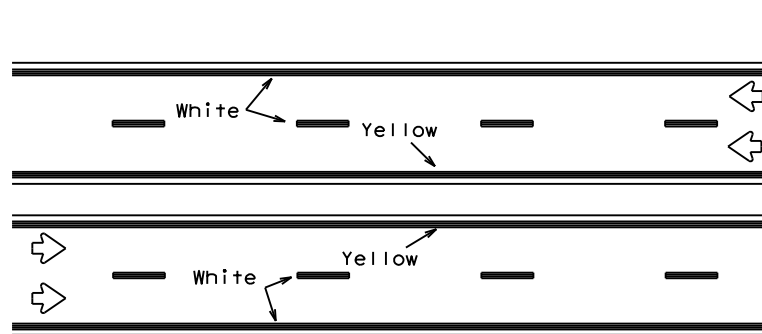


RAISED PAVEMENT MARKERS - PATTERN A



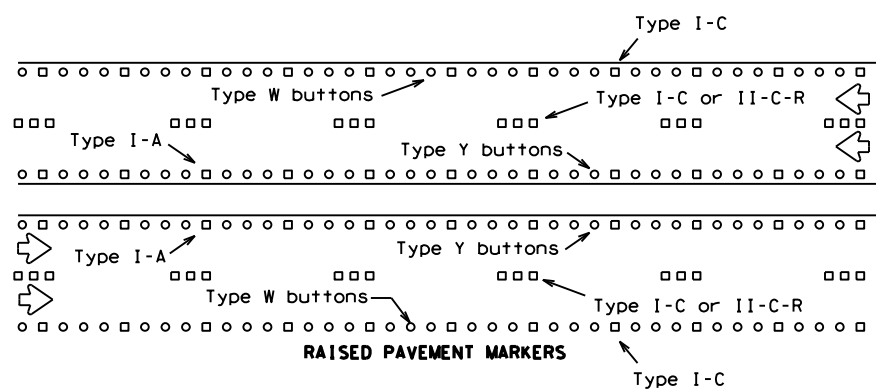
RAISED PAVEMENT MARKERS - PATTERN B

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



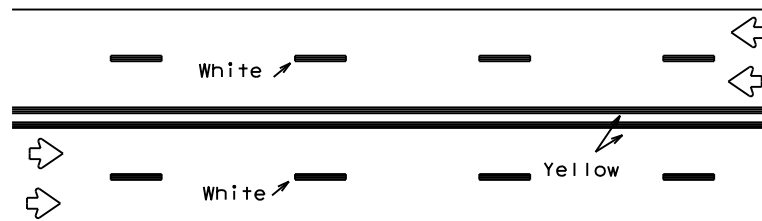
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



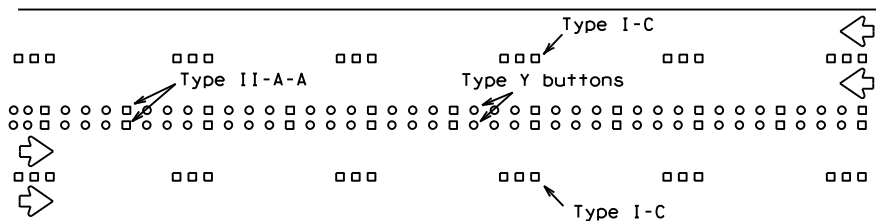
RAISED PAVEMENT MARKERS

EDGE & LANE LINES FOR DIVIDED HIGHWAY



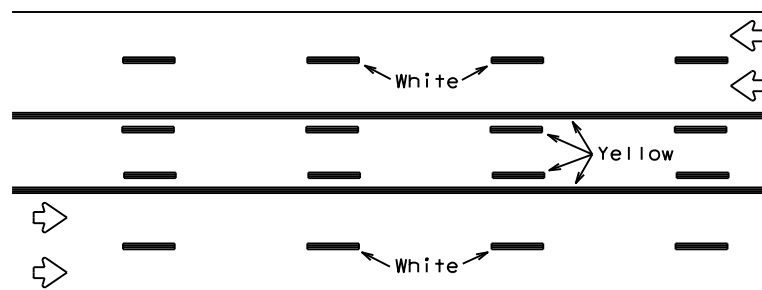
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



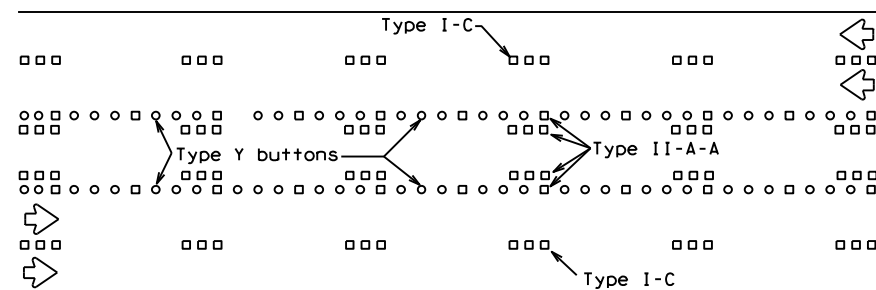
RAISED PAVEMENT MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

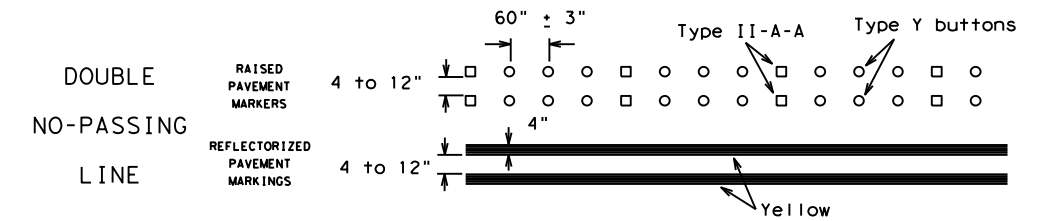
Prefabricated markings may be substituted for reflectorized pavement markings.



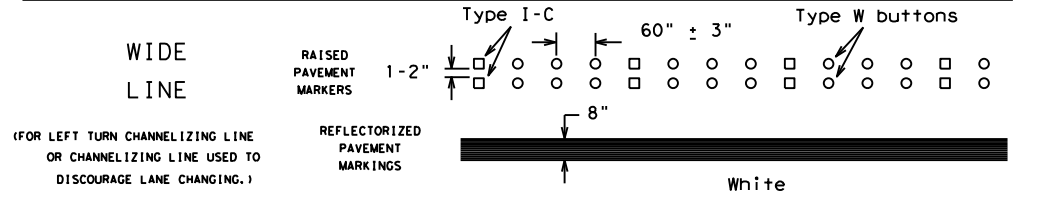
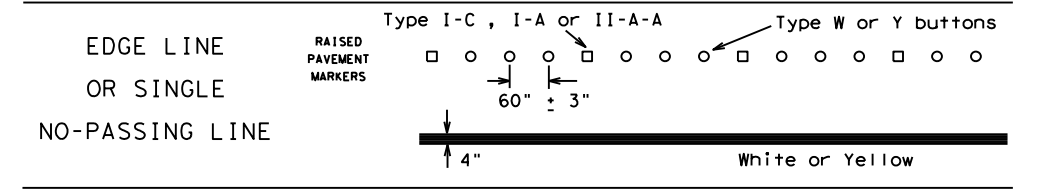
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE

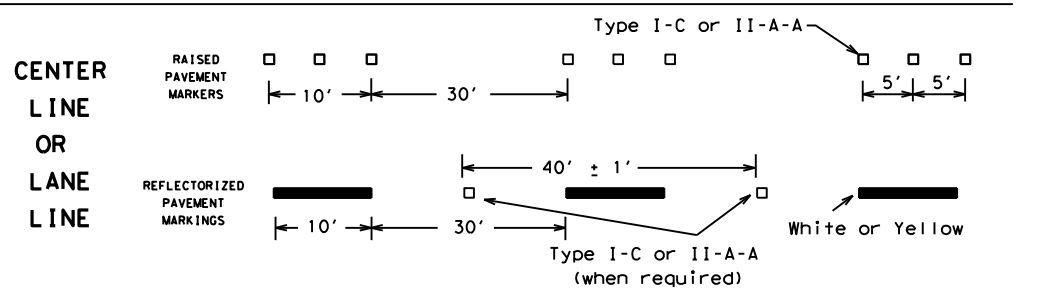
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



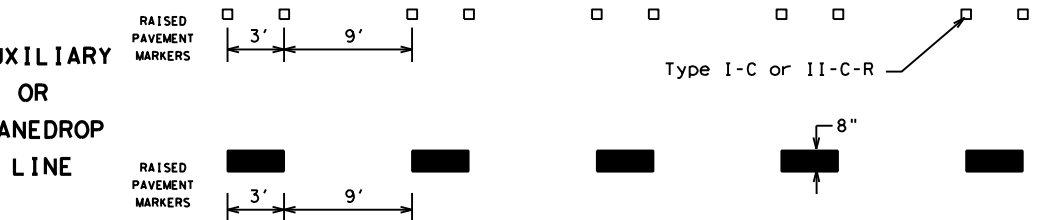
SOLID LINES



BROKEN LINES

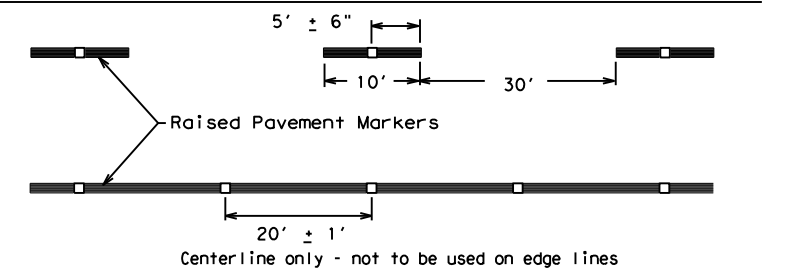


AUXILIARY OR LANEDROP LINE



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.



SHEET 12 OF 12

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."



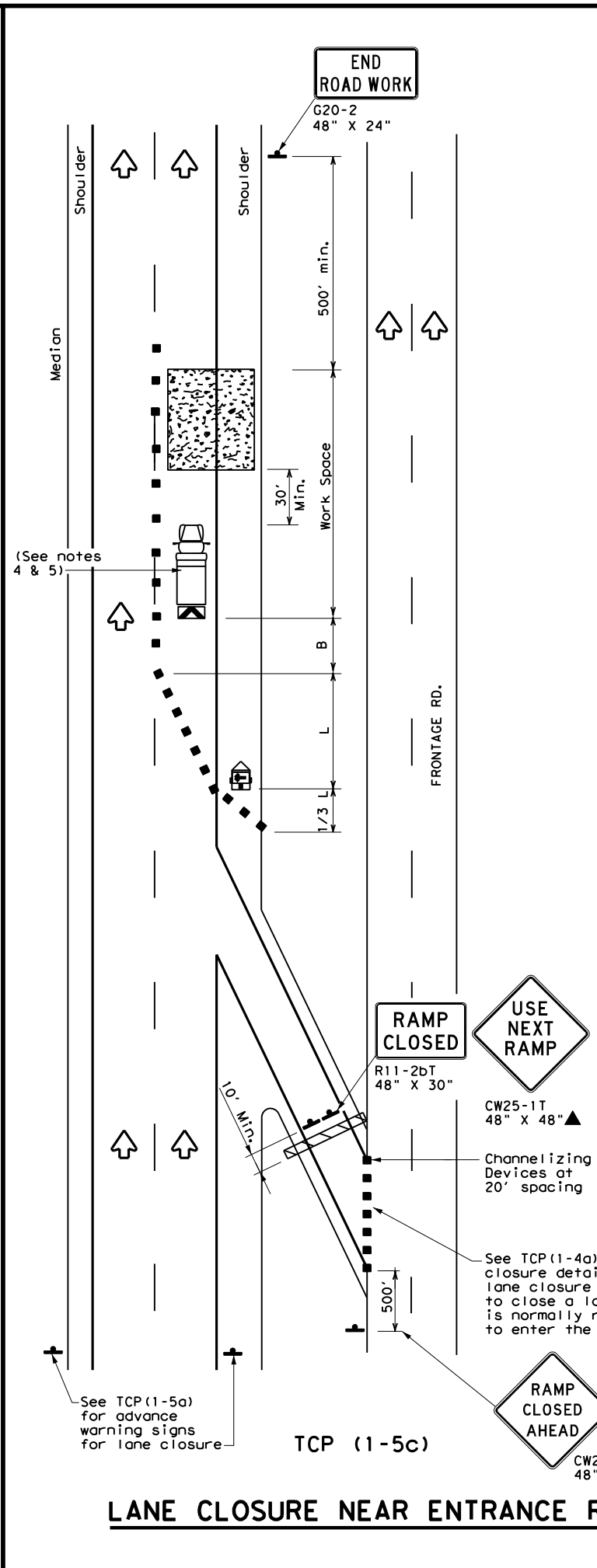
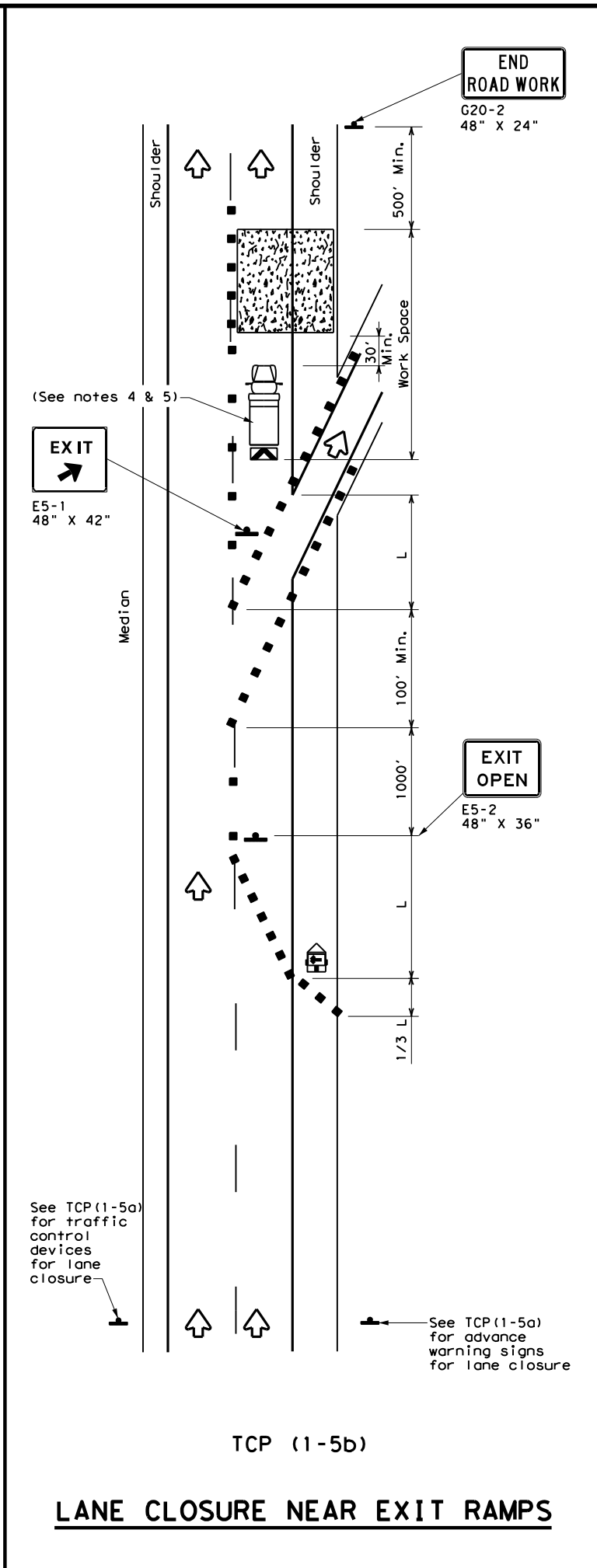
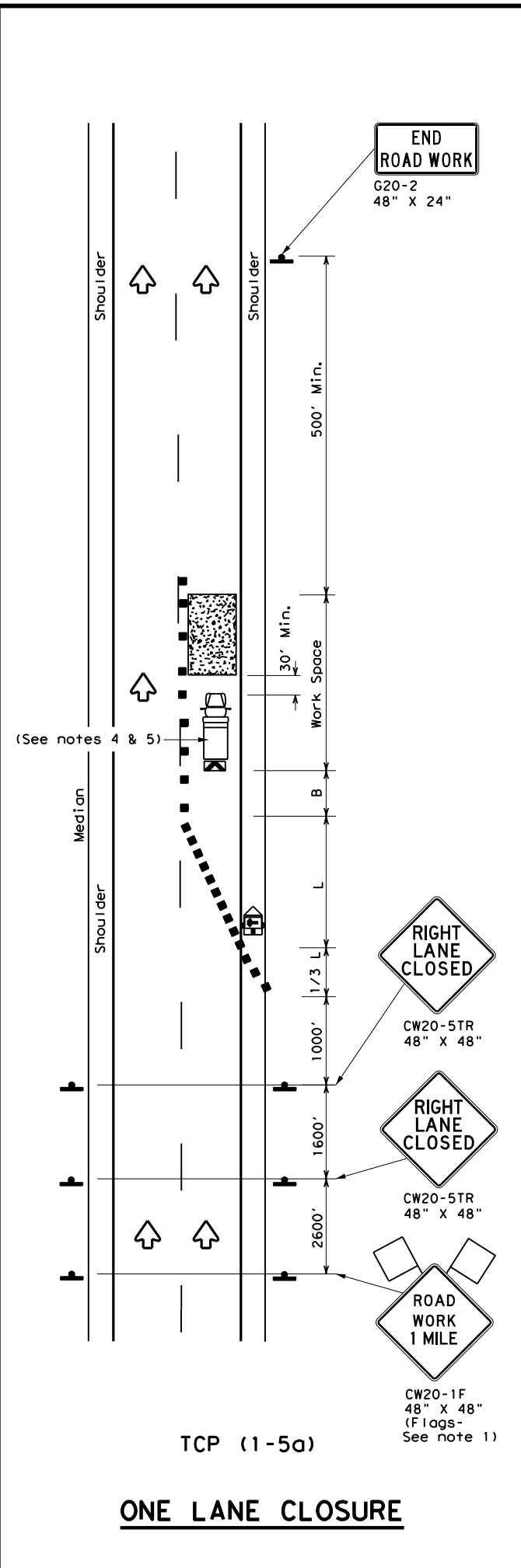
BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC (12) - 14

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REVISIONS	0041	05	053	US 87
1-97 9-07	DIST	COUNTY	SHEET NO.	
2-98 7-13	AMA	POTTER	30	
11-02 8-14				

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LEGEND

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		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)

TYPICAL USAGE

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

GENERAL NOTES

- Flags attached to signs where shown, are REQUIRED.
- All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
- Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
- 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.
- Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

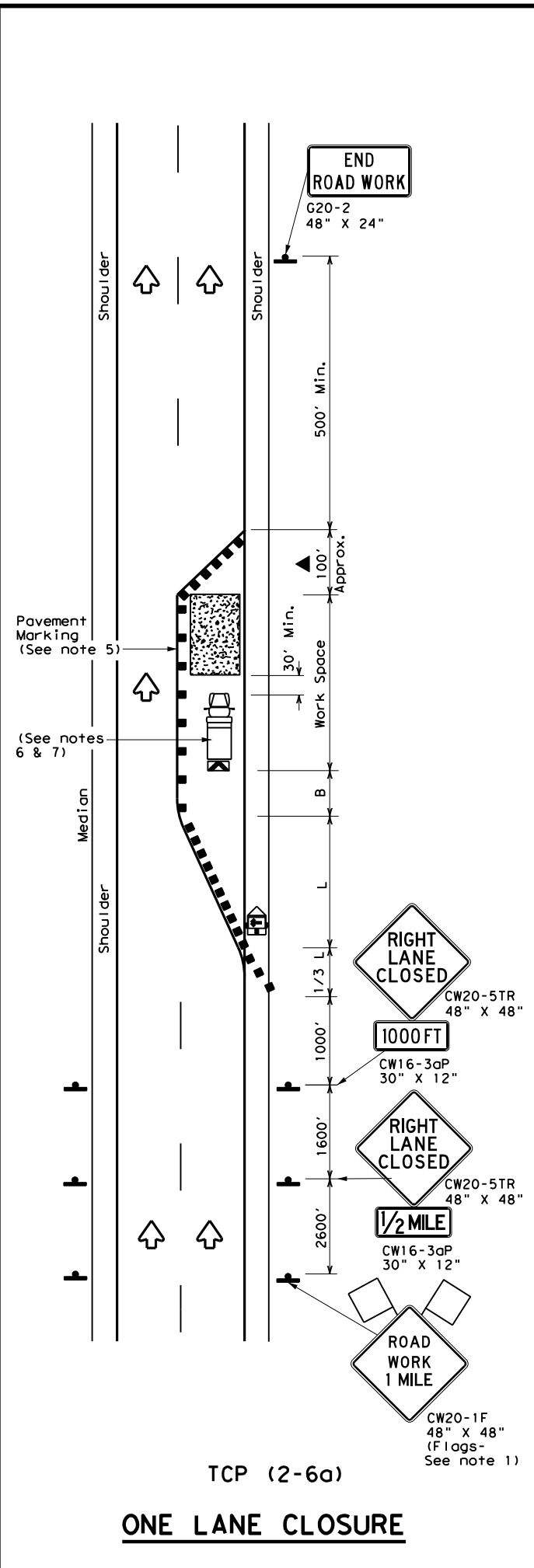
Texas Department of Transportation Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
LANE CLOSURES FOR
DIVIDED HIGHWAYS
TCP (1-5) - 18

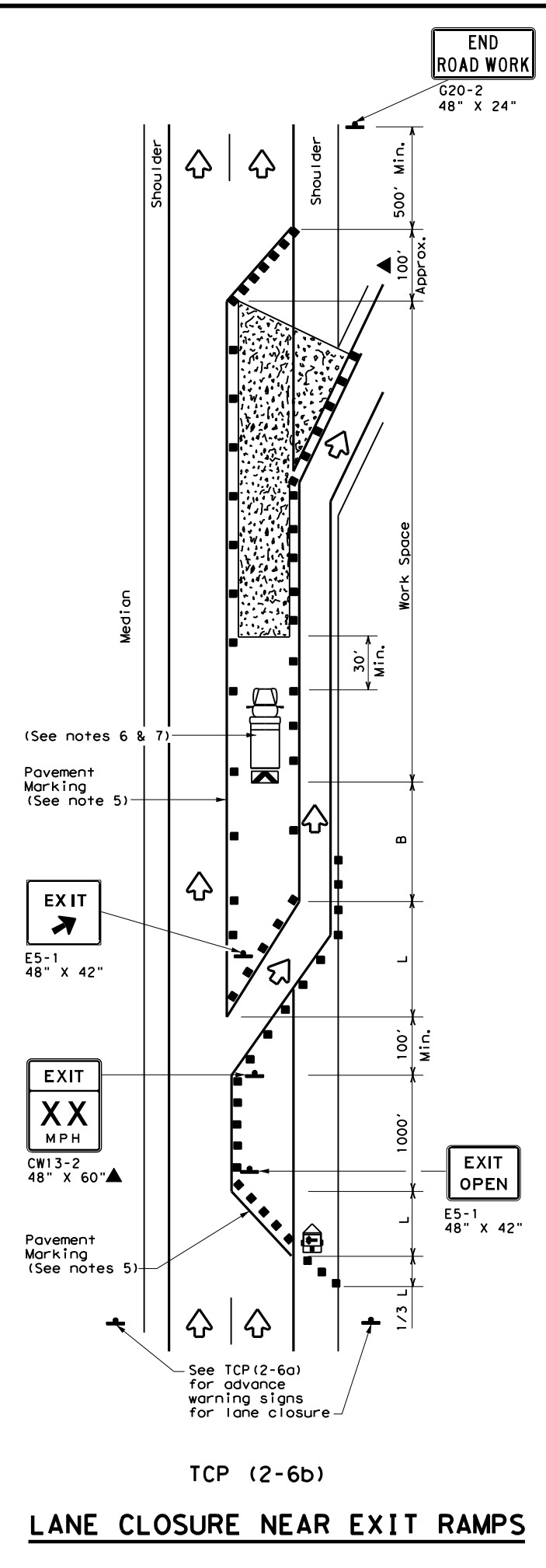
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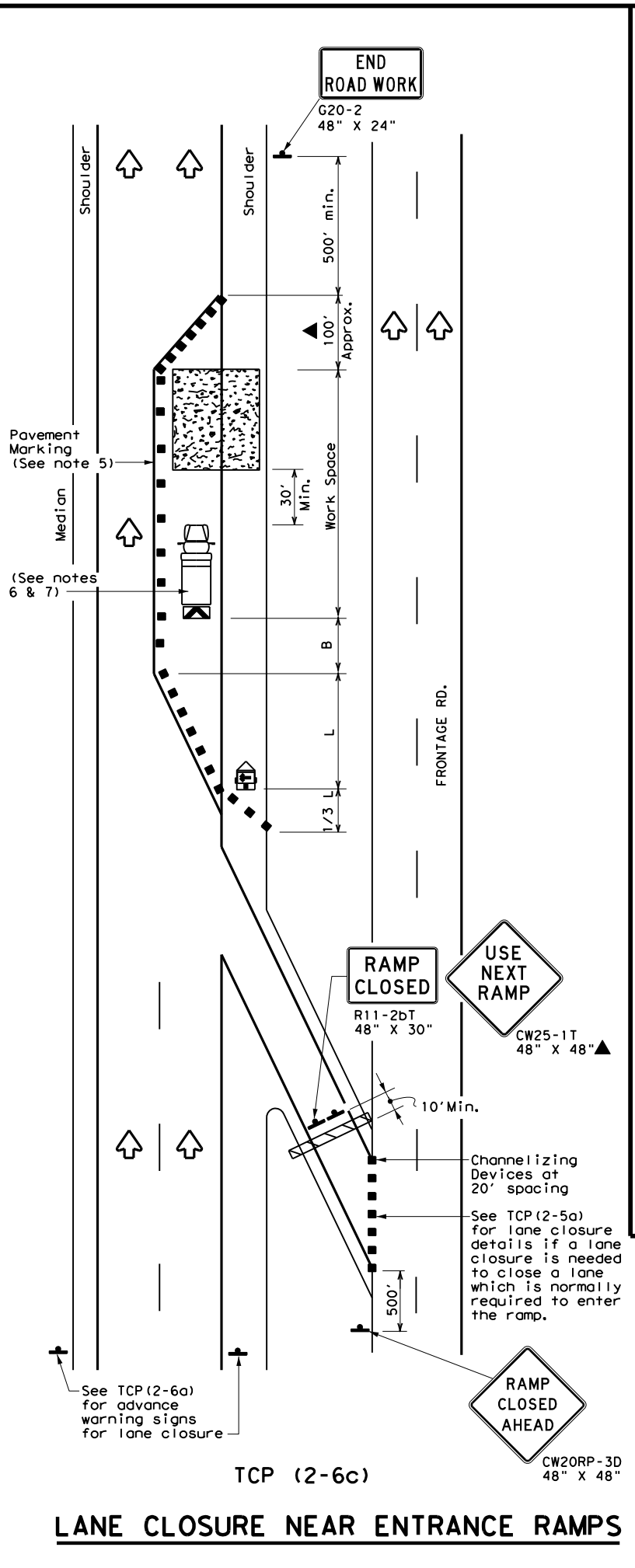
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TCP (2-6a)
ONE LANE CLOSURE



TCP (2-6b)
LANE CLOSURE NEAR EXIT RAMPs



TCP (2-6c)
LANE CLOSURE NEAR ENTRANCE RAMPs

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		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)

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

- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
 - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
 - Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
 - Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on every other channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
 - The placement of pavement markings may be omitted on intermediate-term stationary work zones with the approval of the Engineer.
 - 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.
 - Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation
 Traffic Operations Division Standard

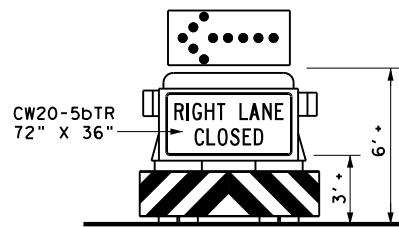
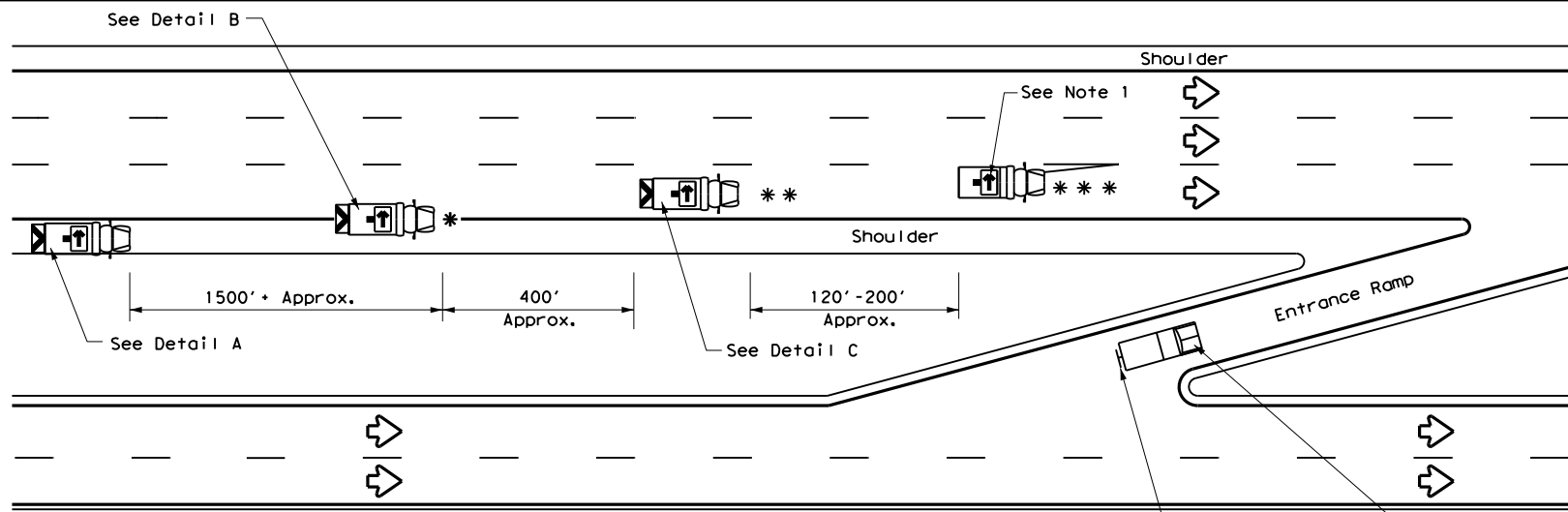
TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP (2-6) - 18

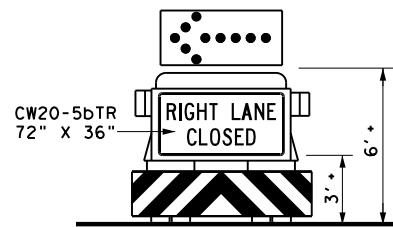
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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0041	05	053	US 87
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 2-12	AMA	POTTER	32	
1-97 2-18				

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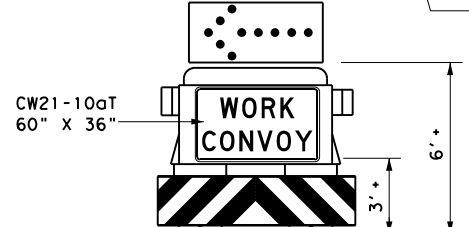
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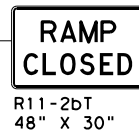
A ADVANCE WARNING VEHICLE



B TRAIL VEHICLE *
(See Note 2)

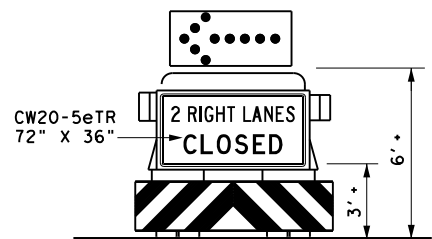
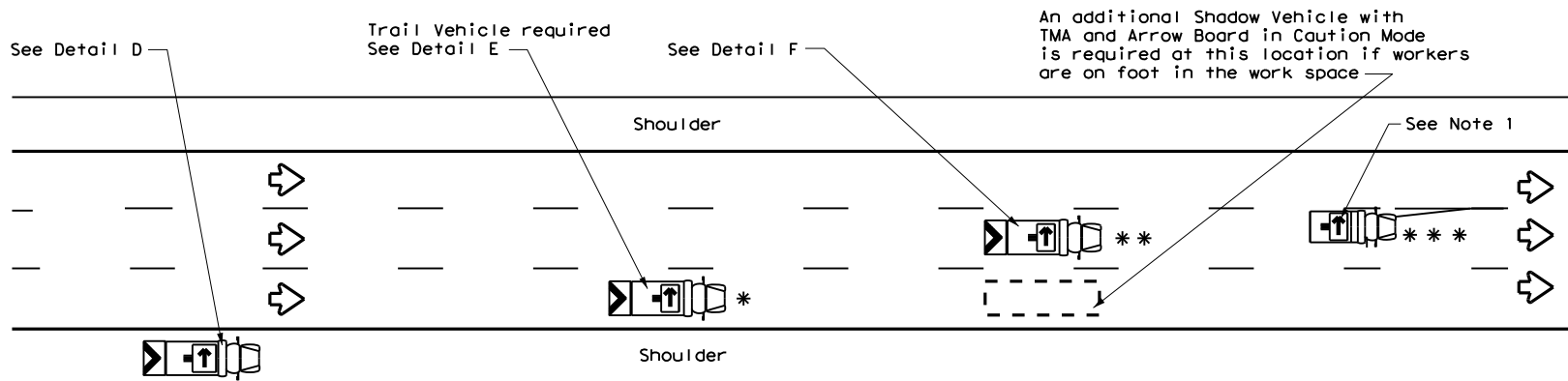


C SHADOW VEHICLE **

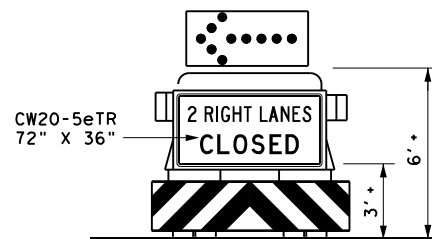


Ramp Control Vehicle shall be used when required by the Engineer

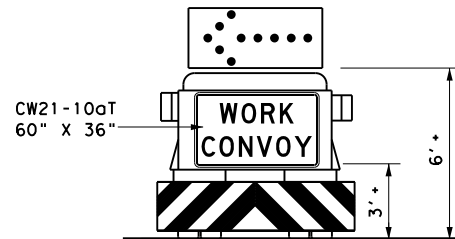
RIGHT LANE CLOSURE ON DIVIDED HIGHWAY - TCP(3-2a)



D ADVANCE WARNING VEHICLE



E REQUIRED TRAIL VEHICLE *



F SHADOW VEHICLE **

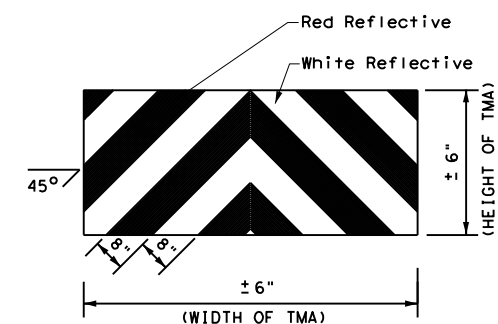
INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP(3-2b)

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

GENERAL NOTES

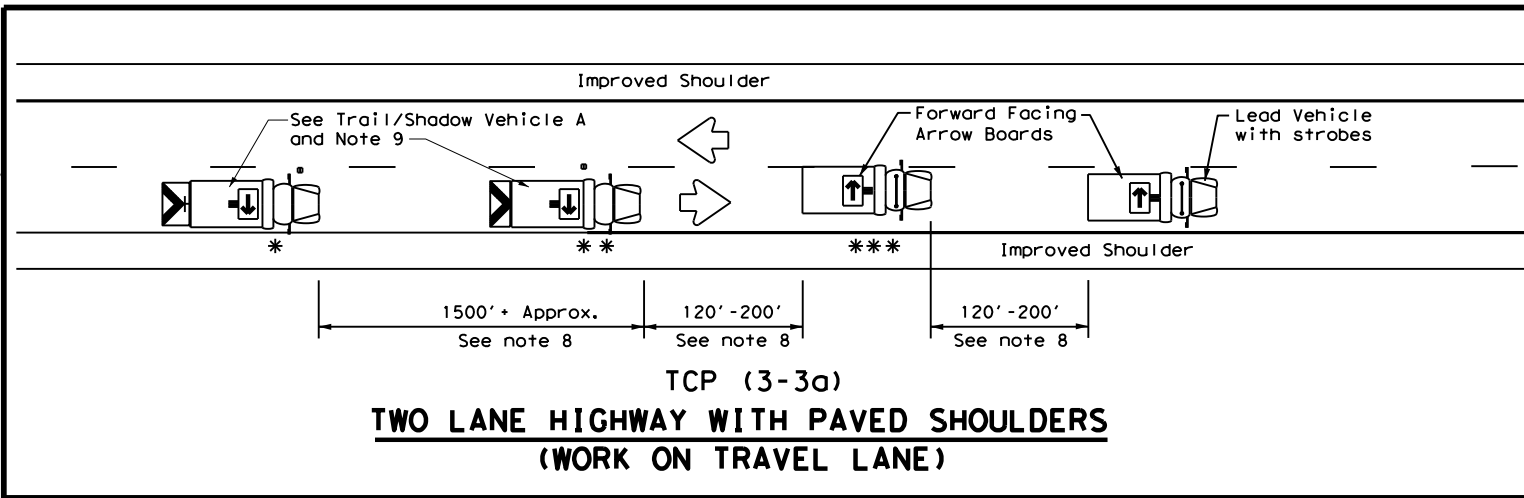
- ADVANCE WARNING, TRAIL and SHADOW vehicles shall be equipped with Type B or Type C flashing arrow boards as per the Barricade and Construction (BC) standards. Arrow boards on WORK vehicles will be optional based on the type of work being performed. The arrow boards shall be operated from inside the vehicle.
- For TCP(3-2a) the Engineer will determine if the TRAIL VEHICLE is required based on prevailing roadway conditions, traffic volume, and sight distance restrictions. All other vehicles shown for both TCP(3-2a) and TCP(3-2b) are required.
- 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.
- The use of truck mounted attenuators (TMA) on the ADVANCE WARNING, SHADOW, and TRAIL vehicles are required.
- Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DMS 8300, Type A.
- Each vehicle shall have two-way radio communication capability.
- When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
- Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE may vary according to terrain, work activity and other factors.
- Standard 48" X 48" diamond shaped warning signs with the same message as those shown may be used where adequate mounting space exists.
- The signs shown should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or a truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board, must be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
- Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
- The principles on this sheet may be used to close lanes from the left side of the roadway considering the number of lanes, shoulder width, sight distance, and ramp frequency.
- Signs and flashing arrow board modes shall be appropriately altered when implementing left lane closures or interior closures which close the left lanes.
- The Advance Warning Vehicle may straddle the edgeline when shoulder width makes it necessary.



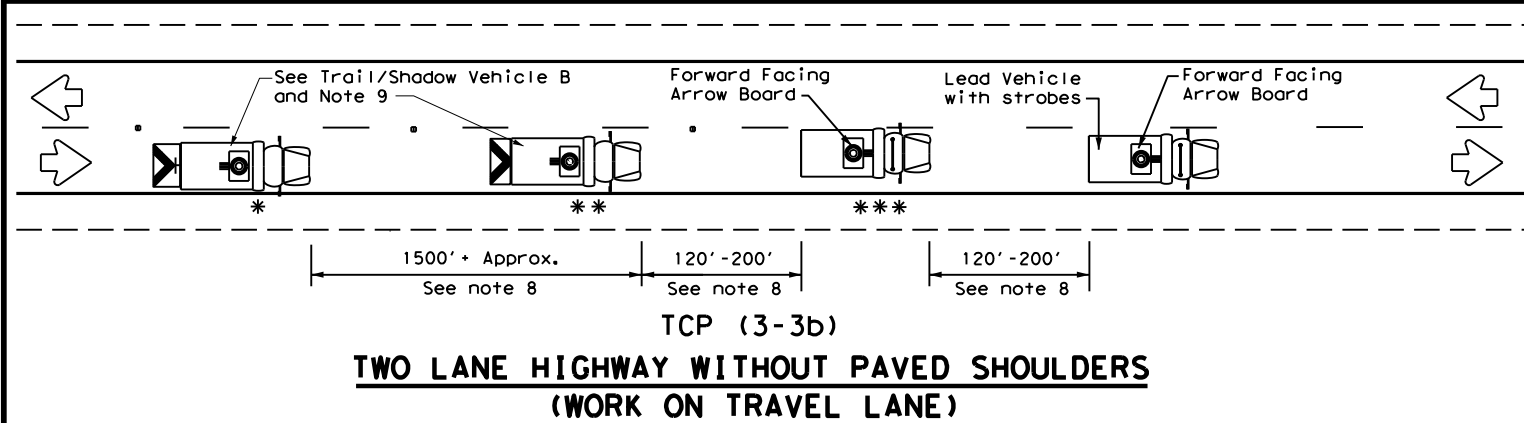
STRIPING FOR TMA

		Traffic Operations Division Standard	
TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS			
TCP(3-2)-13			
FILE: tcp3-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT December 1985	CONT: 0041	SECT: 05	JOB: 053
REVISIONS	0041	05	US 87
2-94 4-98			
8-95 7-13			
1-97			
AMA	POTTER		SHEET NO. 33

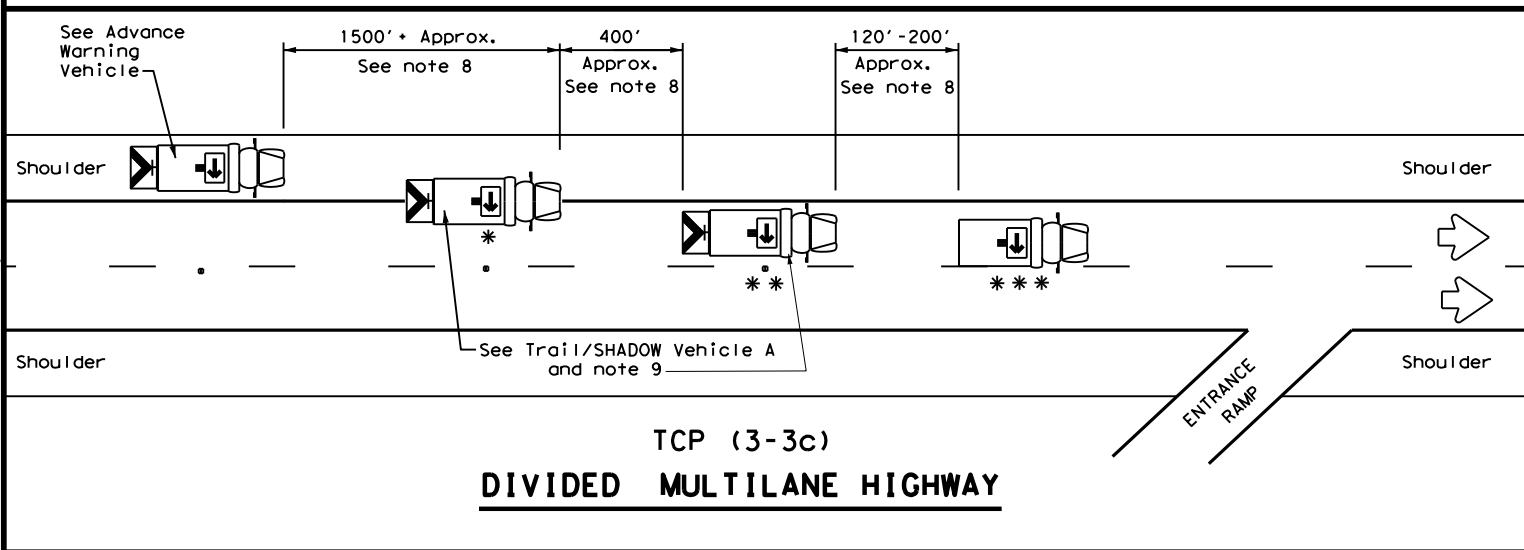
DATE: 11/17/2020 11:37:51 AM
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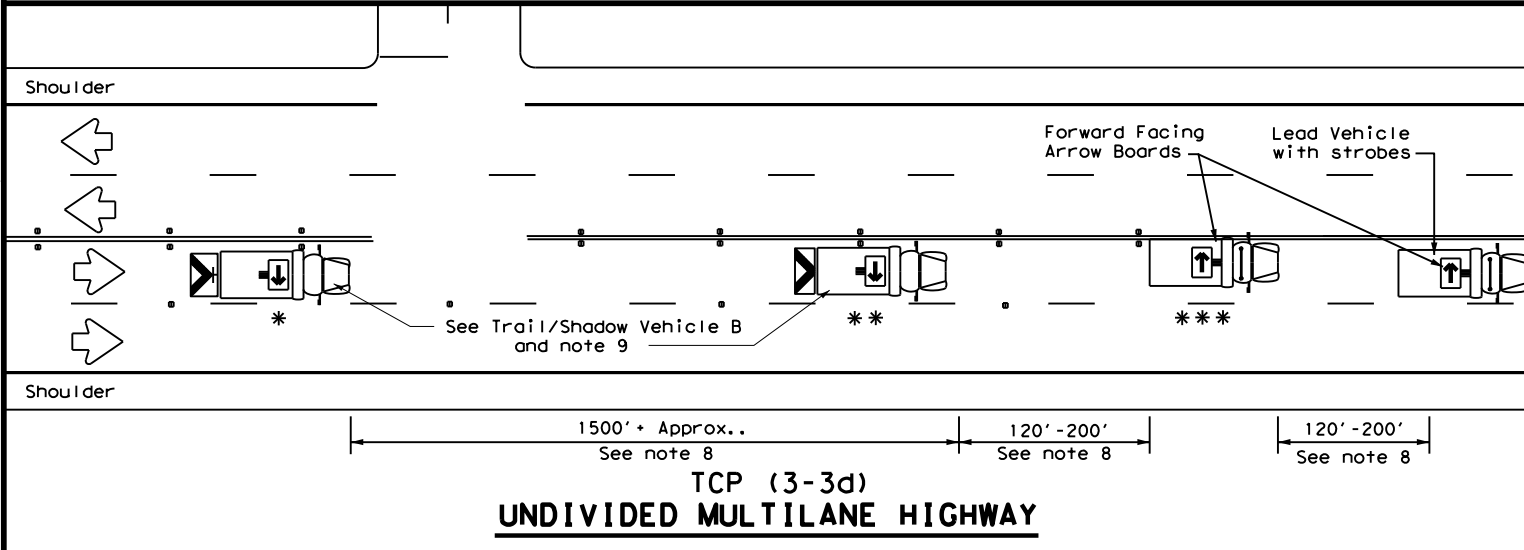
TCP (3-3a)
TWO LANE HIGHWAY WITH PAVED SHOULDERS
(WORK ON TRAVEL LANE)



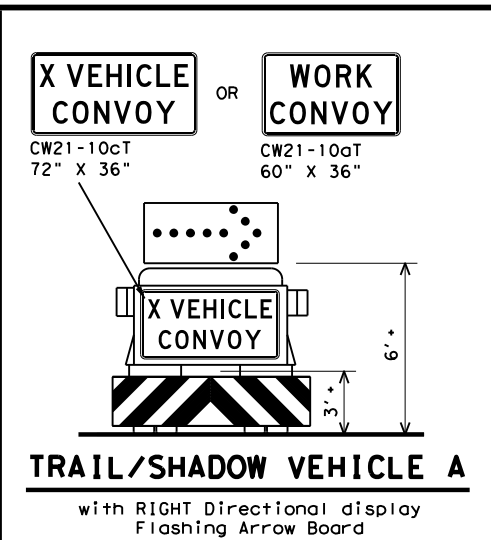
TCP (3-3b)
TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS
(WORK ON TRAVEL LANE)



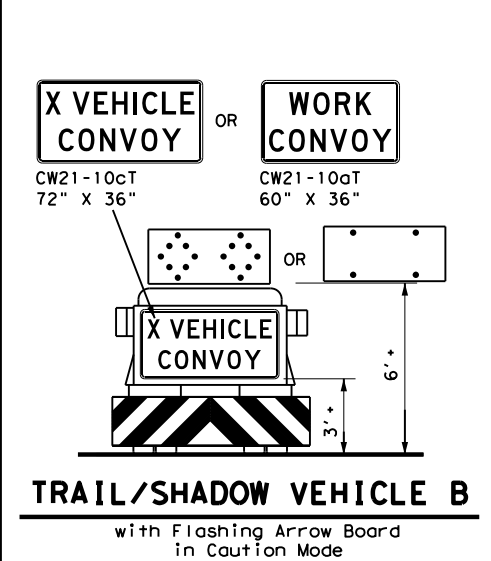
TCP (3-3c)
DIVIDED MULTILANE HIGHWAY



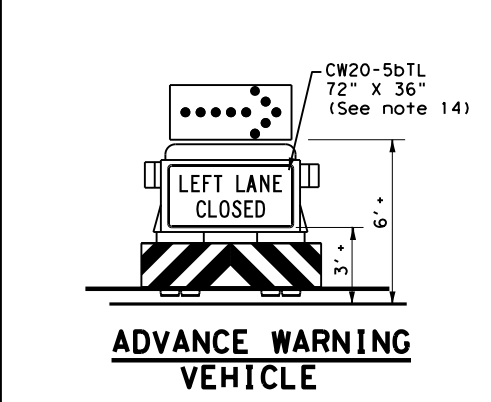
TCP (3-3d)
UNDIVIDED MULTILANE HIGHWAY



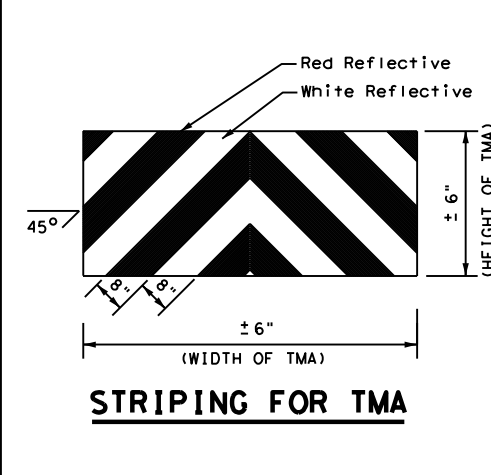
TRAIL/SHADOW VEHICLE A
 with RIGHT Directional display
 Flashing Arrow Board



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
		LEFT Directional
		Double Arrow
		CAUTION (Alternating Diamond or 4 Corner Flash)

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

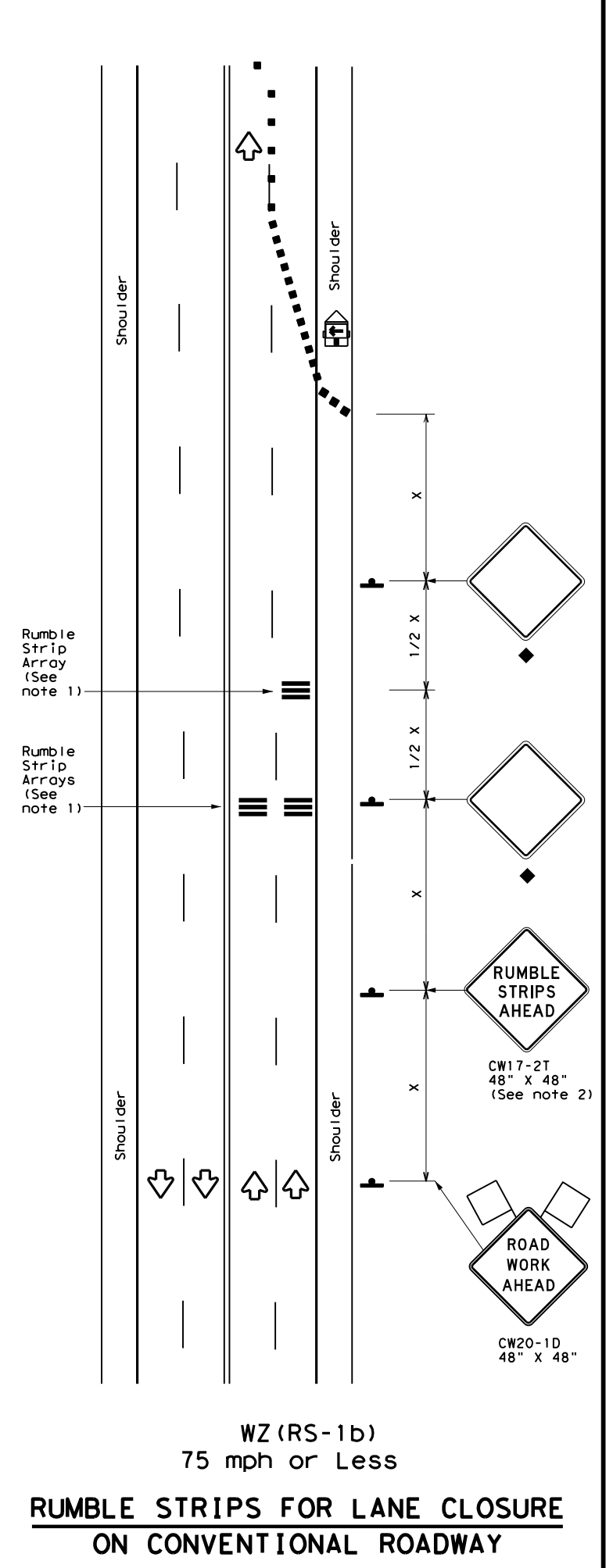
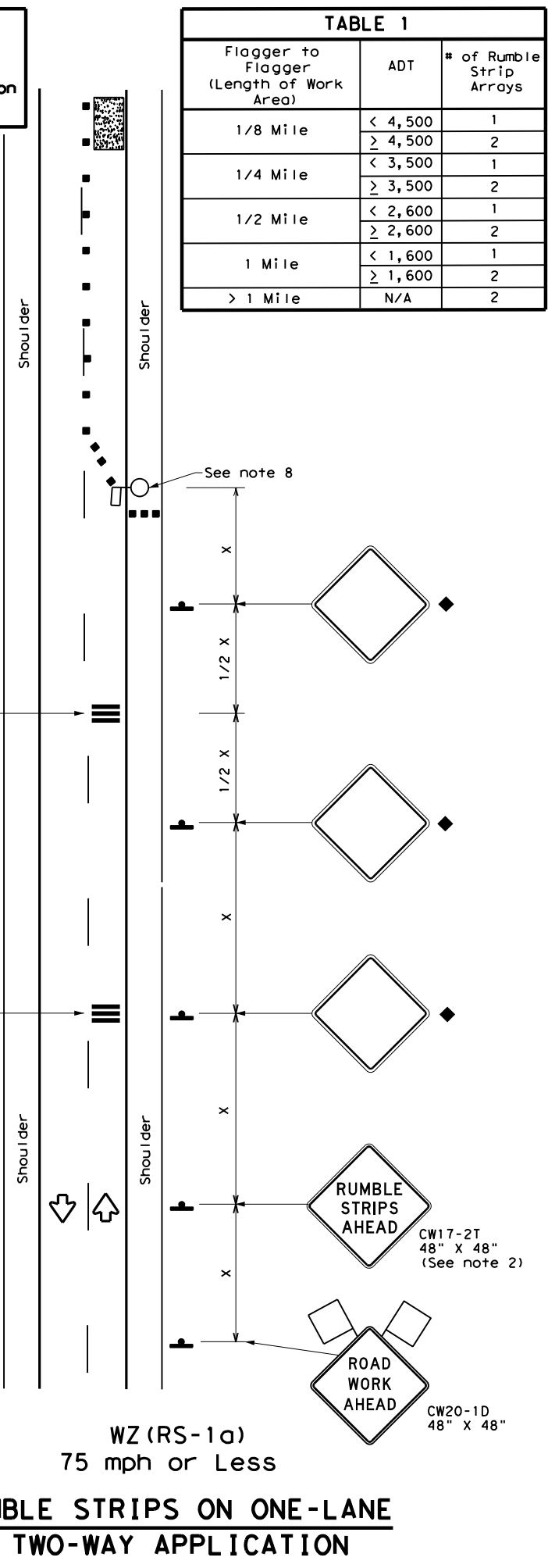
GENERAL NOTES

- 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.
- 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.
- The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
- 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.
- 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.
- Each vehicle shall have two-way radio communication capability.
- When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
- 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.
- 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.
- 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.
- A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
- For divided highways with three or four lanes in each direction, use TCP(3-2).
- Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
- The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
- On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

 Texas Department of Transportation		Traffic Operations Division Standard		
TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL TCP (3-3) - 14				
FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0041	05	053	US 87
2-94 4-98				
8-95 7-13	DIST	COUNTY		SHEET NO.
1-97 7-14	AMA	POTTER		34

DATE: 11/17/2020 11:38:30 AM
 FILE: T:\AMATPD\Construction Projects\0041-05\053_Candidate_FLAP\4 - Design\Plan_Set\2 - Temporary_Rumble_Strips.dgn
 DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.
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Warning sign and rumble strip sequence in opposite direction is same as below



GENERAL NOTES

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

Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'

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

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

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

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

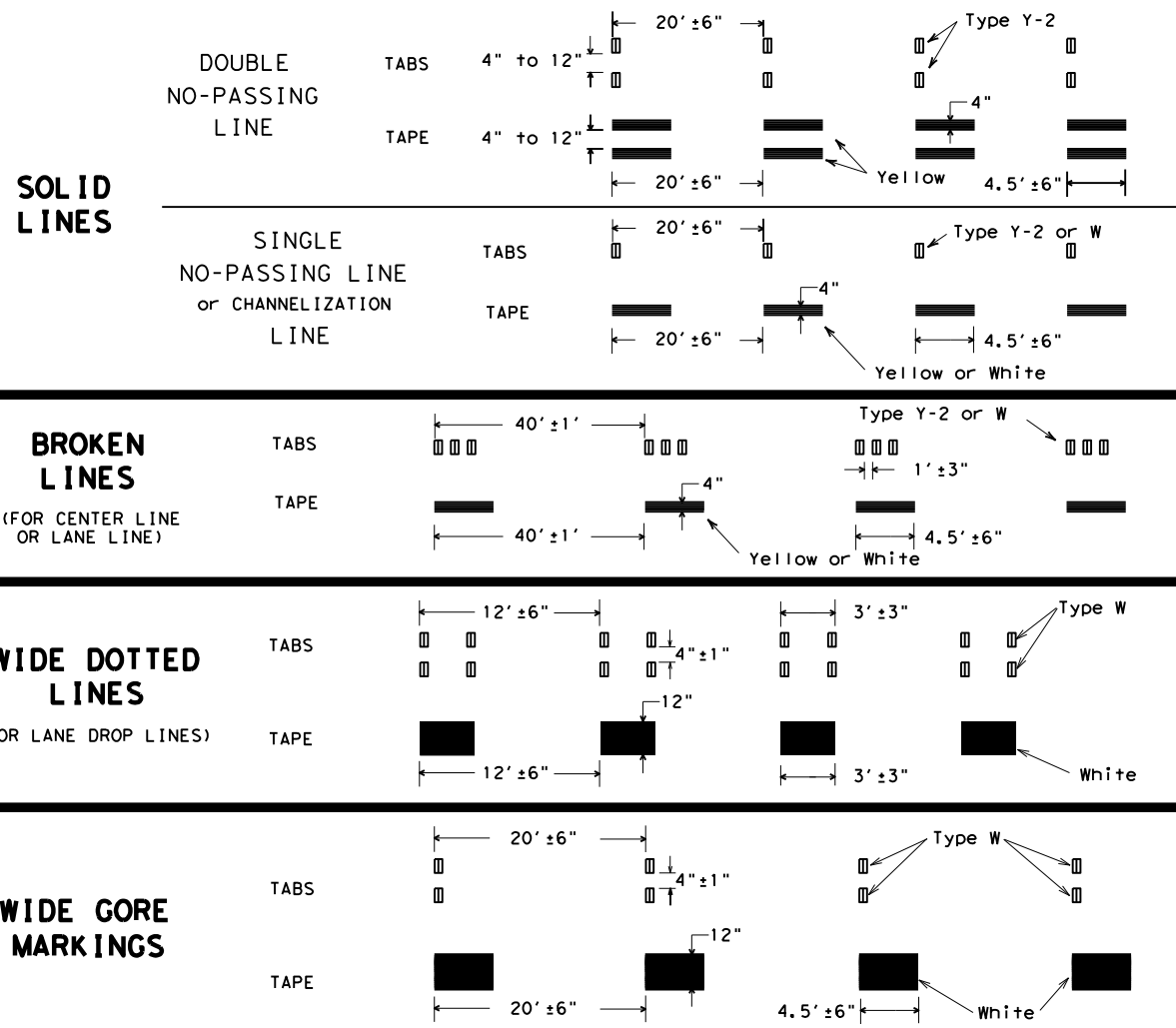
◆ Signs are for illustrative purposes only. Signs required may vary depending on the TCP, TMUTCD Typical Application, or project specific details for the project.

		Traffic Operations Division Standard	
TEMPORARY RUMBLE STRIPS			
WZ (RS) - 16			
FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT November 2012	CONT	SECT	JOB
REVISIONS	0041	05	053
2-14	DIST	COUNTY	SHEET NO.
4-16	AMA	POTTER	35

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DATE: 11/17/2020 11:39:06 AM
 FILE: T:\AMATPD\Construction Projects\0041-05\053_Candidate_FLAPV4 - Design\Plan_Set\2. TCP\Standards\WZ (STPM)-13 - Work Zone Short Term Pavement Markings.dgn

WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



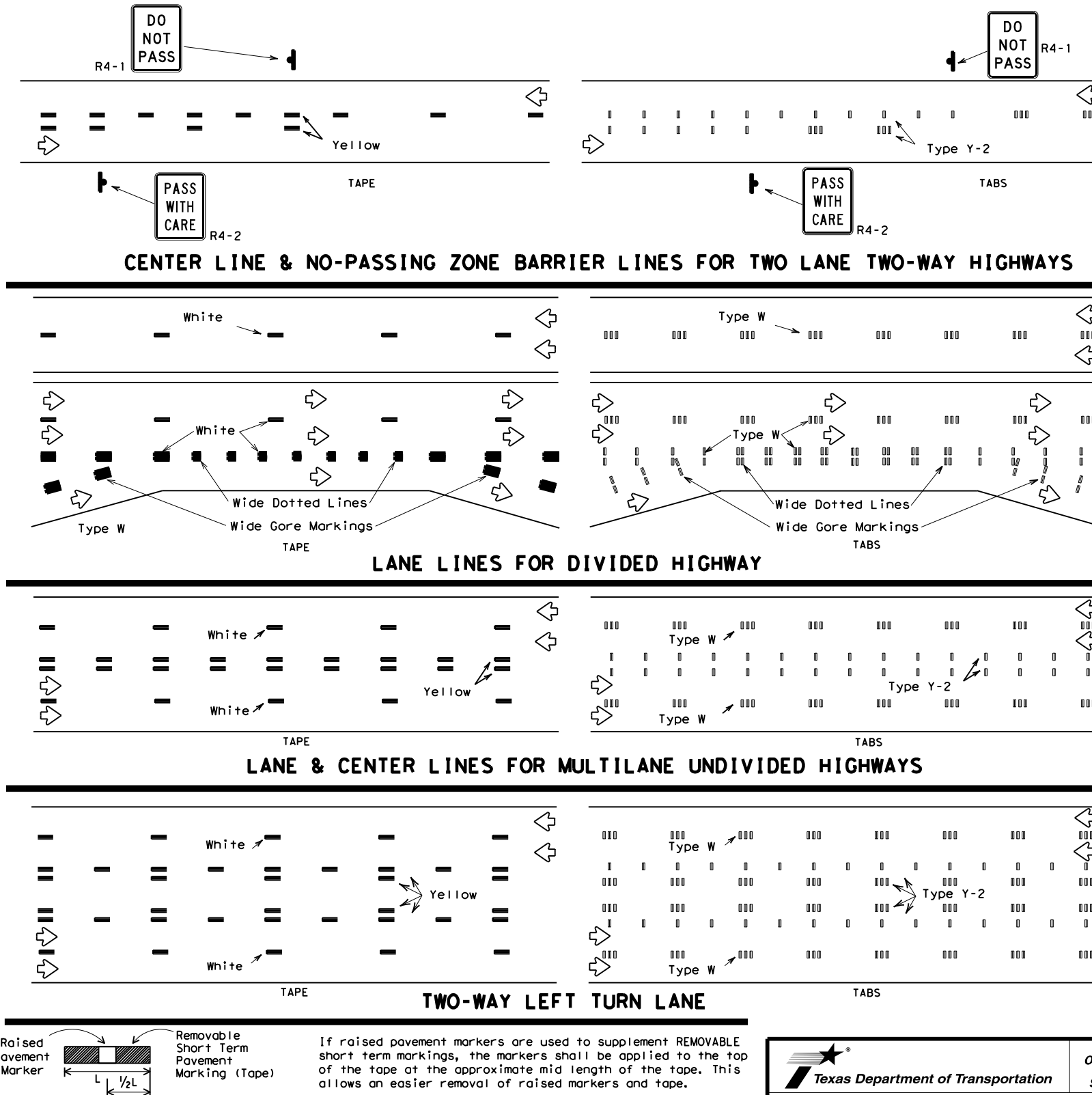
NOTES:

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

TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

- DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:
http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm



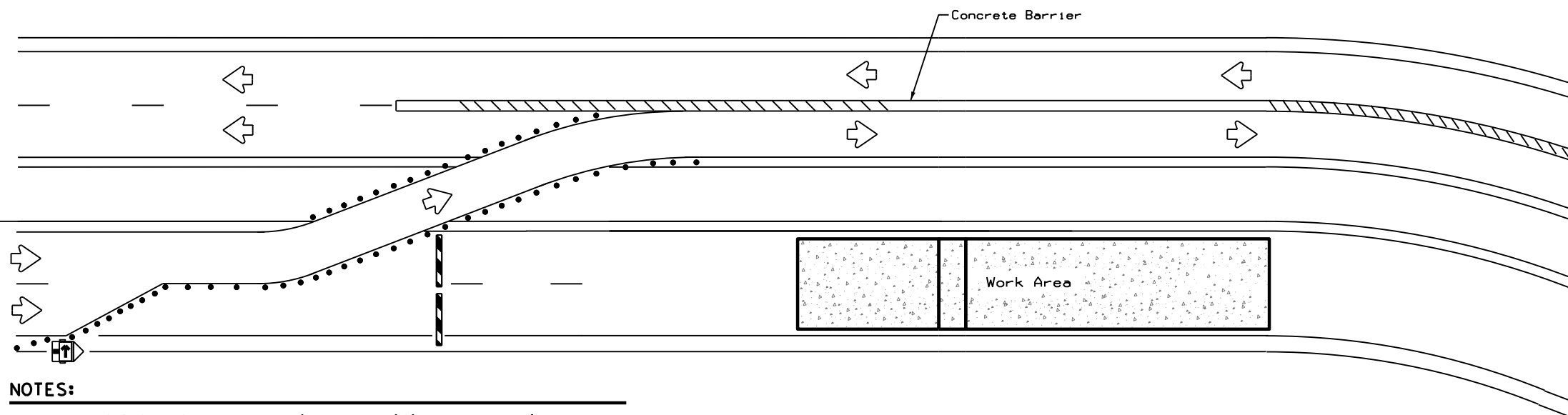
WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ (STPM) - 13

FILE:	wzstpm-13.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
© TxDOT	April 1992	CONT	0041	SECT	05	JOB	053	US	87
REVISIONS		DIST	AMA	COUNTY	POTTER	SHEET NO.			36

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LEGEND	
	Type 3 Barricade
	Channelizing Devices
	Trailer Mounted Flashing Arrow Board
	Sign
	Safety glare screen

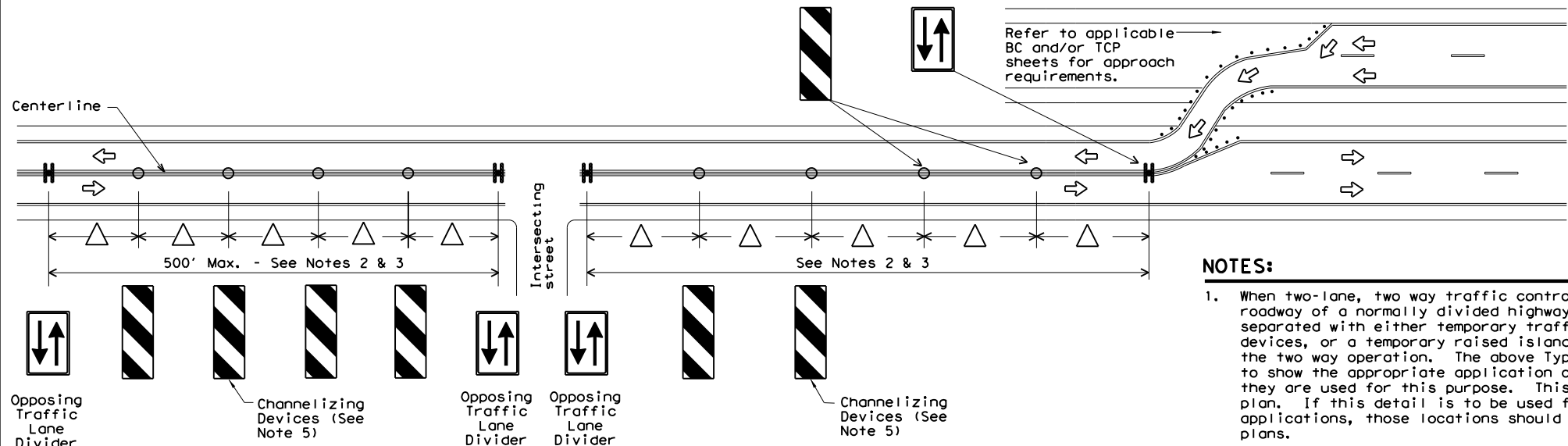
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
DELINEATORS AND OBJECT MARKERS	DMS-8600
MODULAR GLARE SCREENS FOR HEADLIGHT BARRIER	DMS-8610

Only pre-qualified products shall be used. A copy of the Compliant Work Zone Traffic Control Devices List (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:

<http://www.txdot.gov/business/resources/producer-list.html>

- NOTES:**
- Length of Safety Glare screen will be specified elsewhere in the plans.
 - The cumulative nominal length of the modular safety glare screen units shall equal the length of the individual sections of temporary concrete traffic barrier on which they are installed so the joint between barrier sections will not be spanned by any one safety glare screen unit.
 - Screen Panel/blades will be designed such that reflective sheeting conforming with Departmental Material Specification DMS-8300, Sign Face Materials, Type B or C Yellow, minimum size of 2 inches by 12 inches can be attached to the edge of the panel/blade. The sheeting shall be attached to one glare screen panel/blade per section of concrete barrier not to exceed a spacing of 30 feet. Barrier reflectors are not necessary when panel/blades are installed with reflective sheeting as described.
 - Payment for these devices will be under statewide Special Specification "Modular Glare Screens for Headlight Barrier."
 - This detail is only intended to show types of locations where Glare Screens would be appropriate. Required signing and other devices shall be as shown elsewhere in the plans.

BARRIER DELINEATION WITH MODULAR GLARE SCREENS



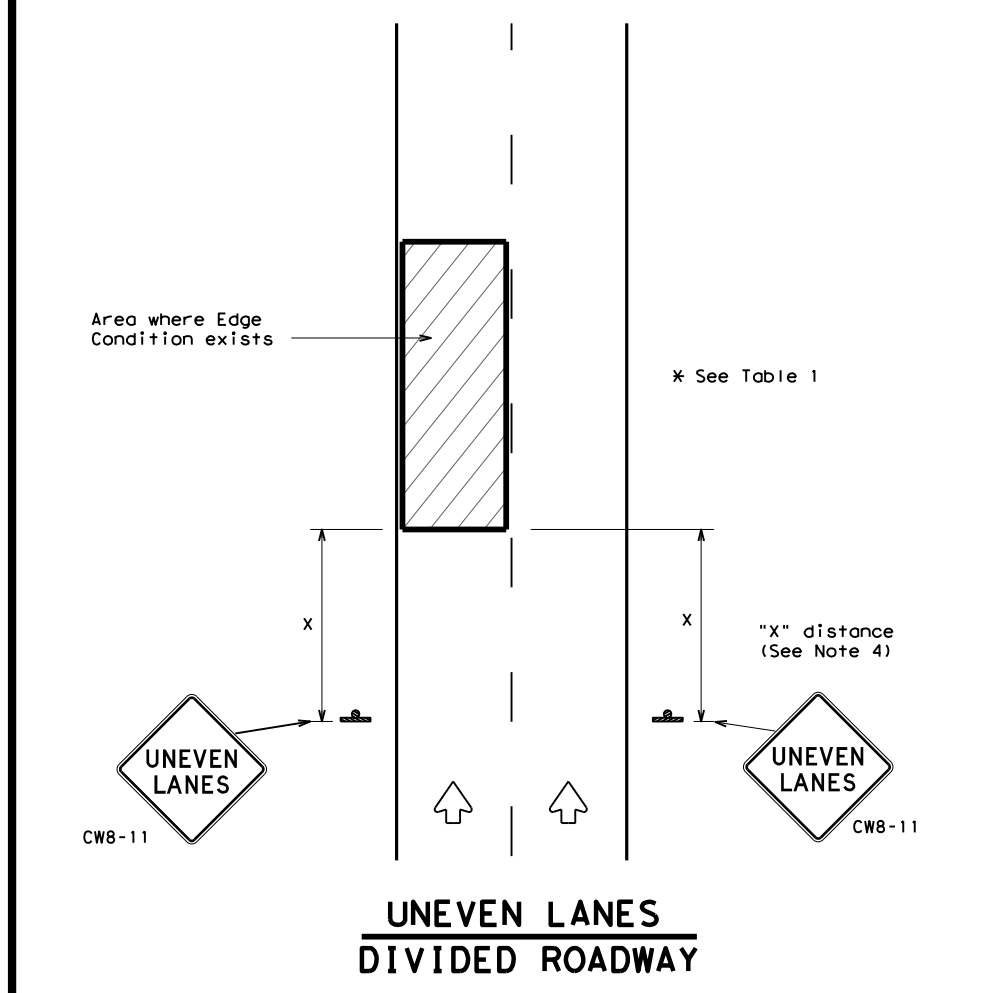
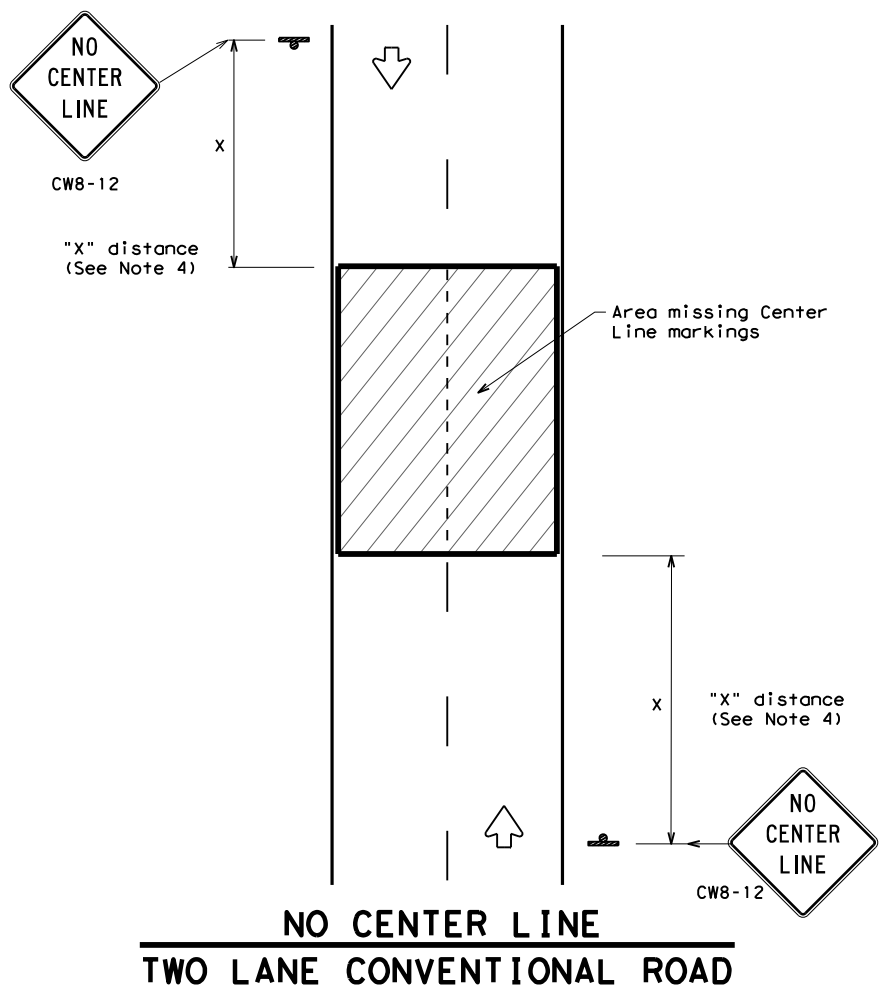
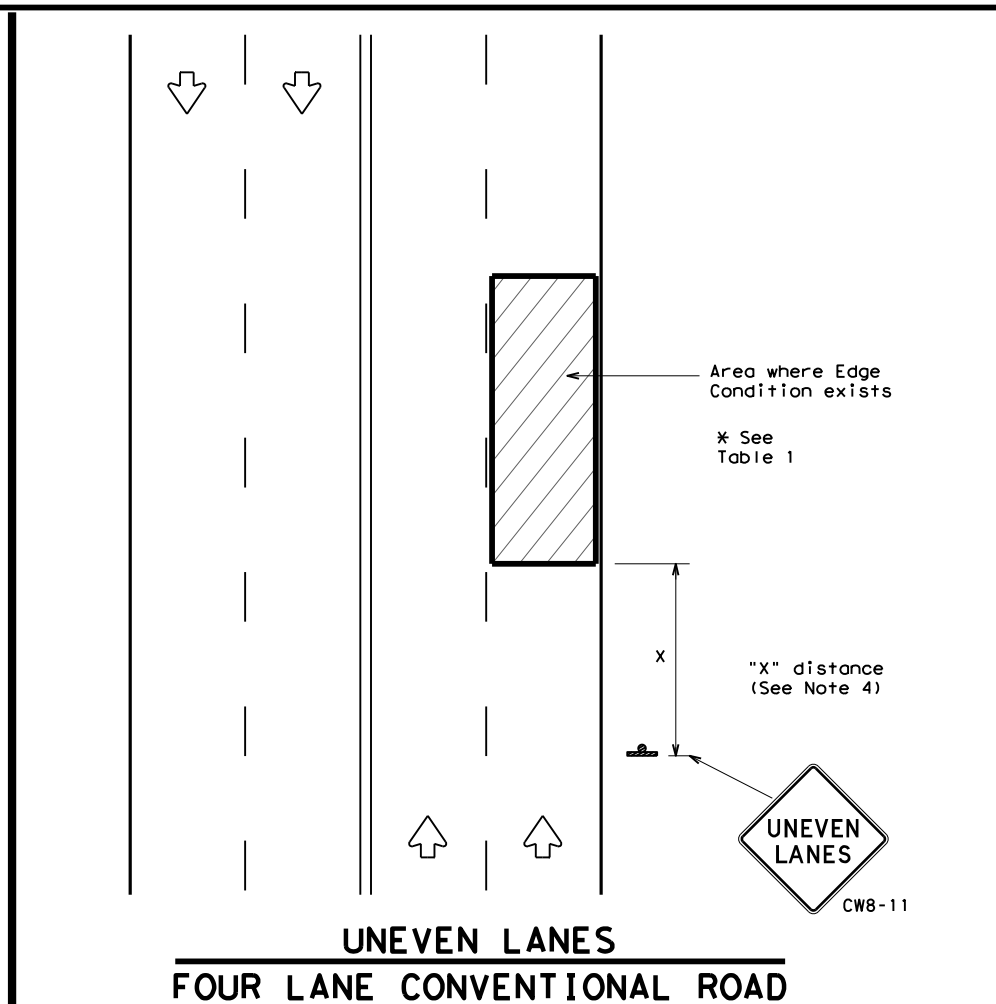
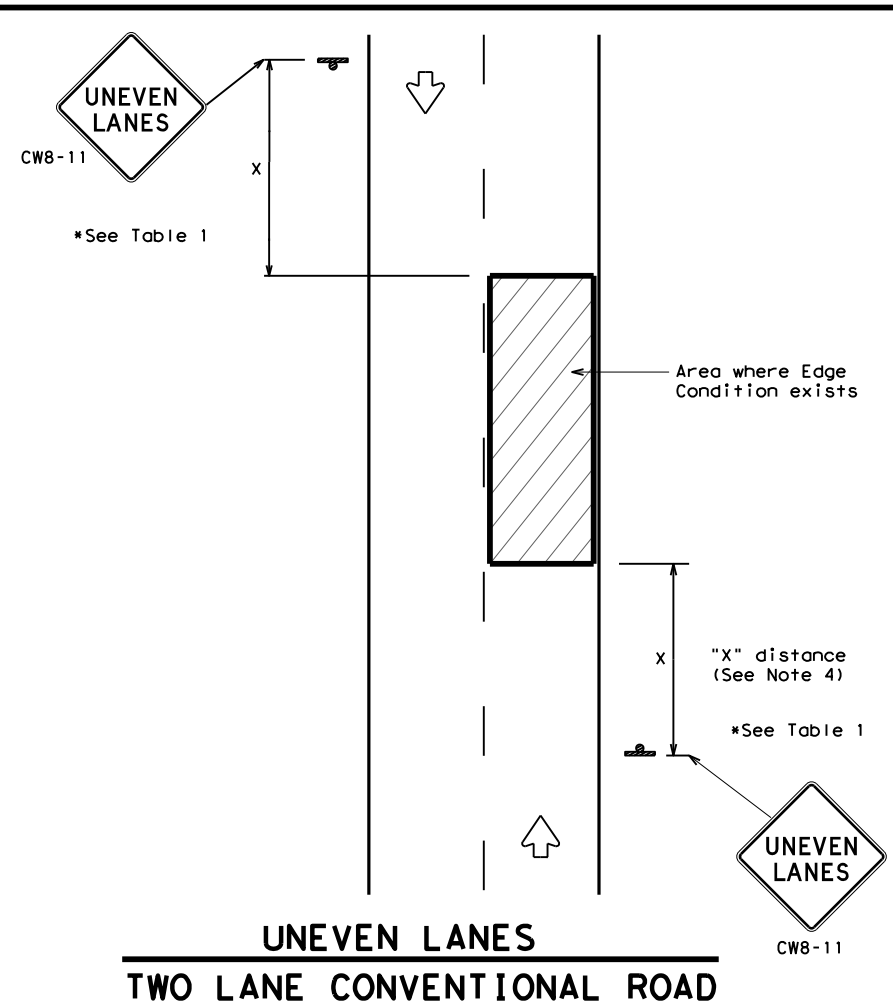
- NOTES:**
- When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.
 - Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.
 - Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
 - Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
 - Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

VERTICAL PANELS & OPPOSING TRAFFIC LANE DIVIDERS (OTLD) SEPARATING TWO-WAY TRAFFIC ON NORMALLY DIVIDED HIGHWAYS

		Traffic Operations Division Standard	
TRAFFIC CONTROL PLAN TYPICAL DETAILS			
WZ(TD) - 17			
FILE:	wz1d-17.dgn	DN:	TxDOT
© TxDOT	February 1998	CONT:	SECT
REVISIONS		JOB:	HIGHWAY
4-98	2-17	0041 05	053 US 87
3-03		DIST:	COUNTY
7-13		AMA	POTTER
			SHEET NO.
			37

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DATE: 11/17/2020 11:40:13 AM
 FILE: T:\AMATPD\Construction Projects\0041-05\053_Candidate_FLAPV4 - Design\Plan_Set\2_TCP\Standards\WZ (UL)-13 - Signing for Uneven Lanes.dgn



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: 1/4" (maximum-planing) 1/2" (typical-overlay)	Sign: CW8-11
②	Less than or equal to 3"	Sign: CW8-11
③	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"



SIGNING FOR UNEVEN LANES

WZ (UL) - 13

FILE: WZUL-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT	APRIL 1992	CONT	SECT	JOB
REVISIONS	0041	05	053	US 87
8-95	2-98	7-13	DIST	COUNTY
1-97	3-03	AMA	POTTER	SHEET NO. 38

NOTES:

ALL COORDINATES AND ELEVATIONS ARE U.S. SURVEY FEET AND WERE ESTABLISHED IN APRIL, 2018.

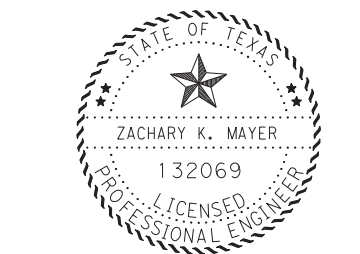
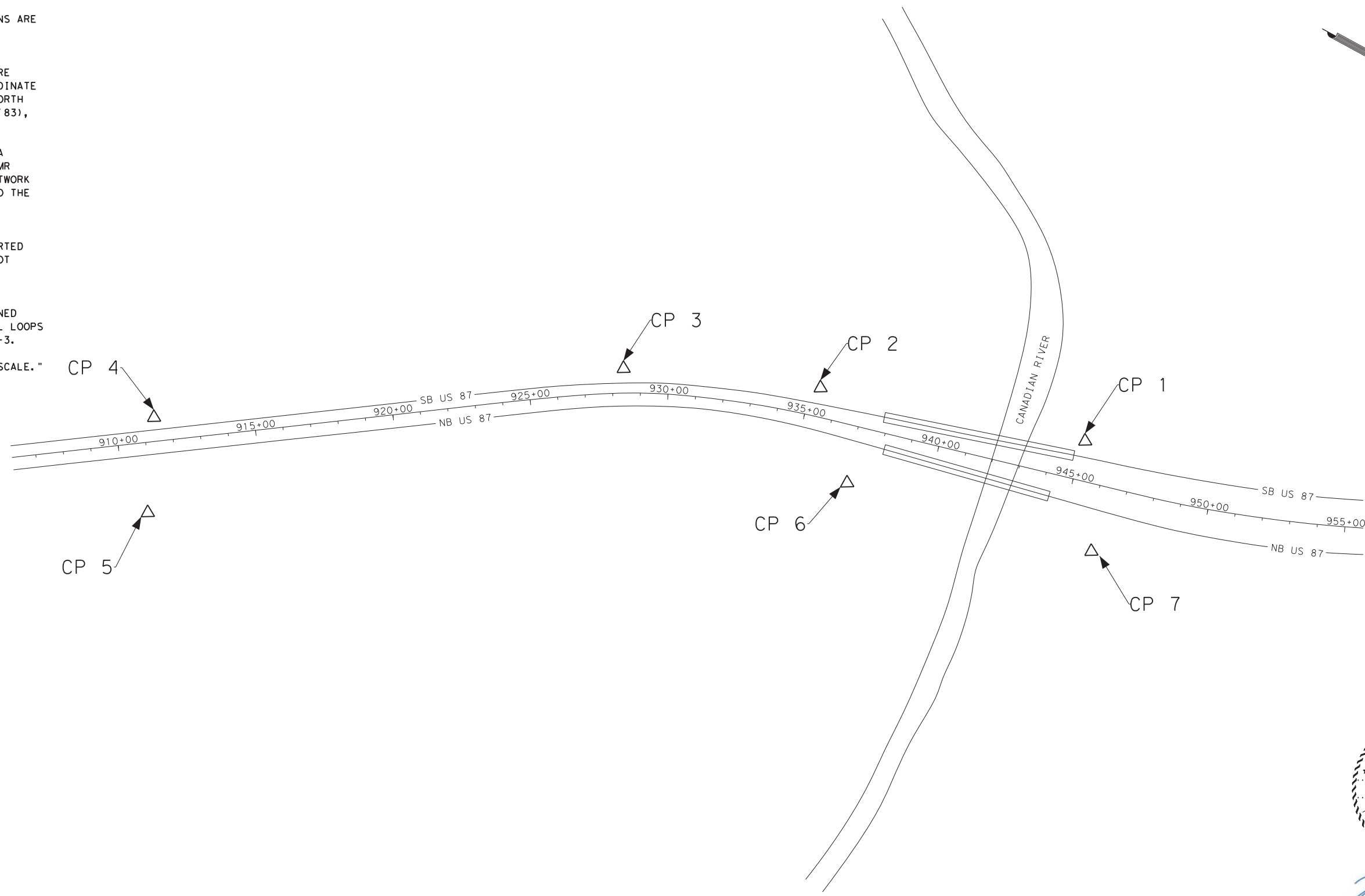
ALL HORIZONTAL COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM, NORTH ZONE (4201), NORTH AMERICAN DATUM OF 1983 (NAD '83), 2011 ADJUSTMENT, 2010 EPOCH.

COORDINATES ARE BASED ON DATA OBTAINED FROM THE WEST_VRS_CMR SOLUTION IN THE TxDOT RTK NETWORK AND ESTABLISHED CONFORMING TO THE TxDOT SURVEY MANUAL.

ALL COORDINATES ARE SURFACE COORDINATES AND MAY BE CONVERTED TO GRID BY DIVIDING BY A TxDOT SURFACE ADJUSTMENT FACTOR OF 1.00020686.

VERTICAL VALUES WERE DETERMINED BY DIGITAL DIFFERENTIAL LEVEL LOOPS AND ARE BASED ON MONUMENT KM-3.

DETAIL SKETCHES ARE "NOT TO SCALE."



Zachary K. Mayer P.E.

12/02/2020
US 87

CONTROL INDEX SHEET

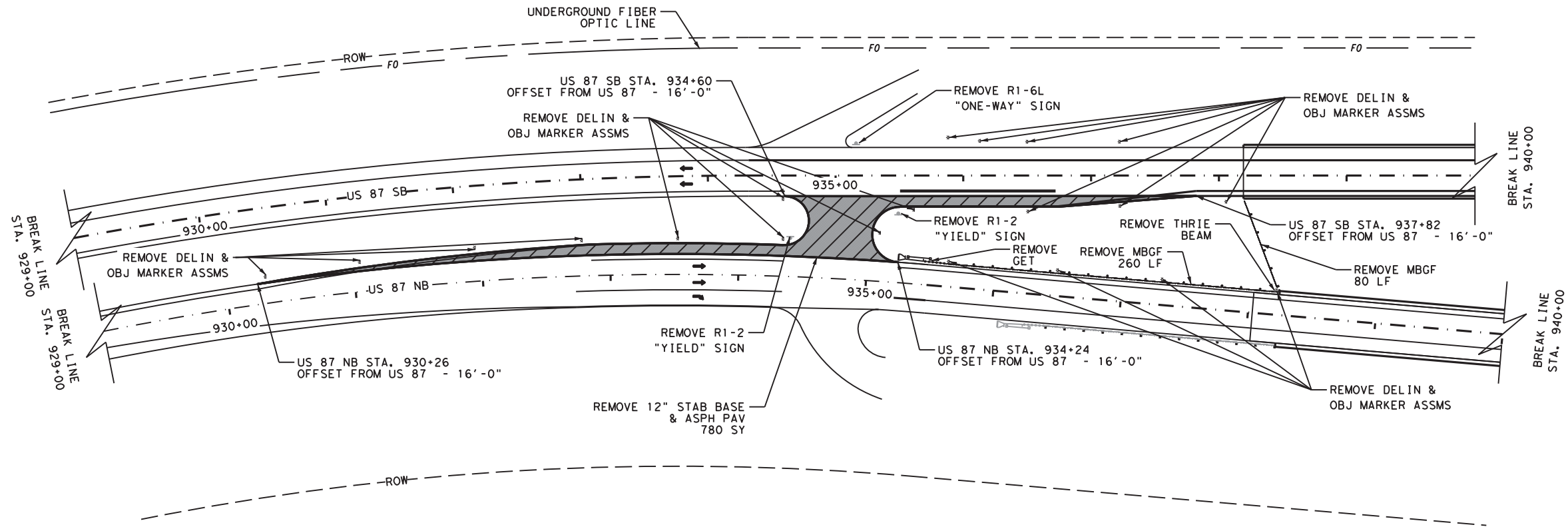
2021 Texas Department of Transportation					SHEET 1 OF 1	
DSN	CK	CONT	SECT	JOB	HIGHWAY	
JD	BM	0041	05	053	US 87	
DRWN	CK	DIST	COUNTY		SHEET NO.	
JD	ZM	AMA	POTTER		39	

CONTROL POINT	STATE PLANE COORDINATES (TEXAS NORTH)		PROJECT COORDINATES		ELEVATION (FT)	STATION	OFFSET (FT)
	NORTHING	EASTING	NORTHING	EASTING			
CP 1	3816997.404	542936.605	3816207.960	542824.313	3042.84	945+18	44' LT OF CL OF SB US 87
CP 2	3816025.260	543211.968	3815236.017	543099.619	3007.74	935+07	65' LT OF CL OF SB US 87
CP 3	3815405.248	543484.396	3814616.134	543371.991	3012.43	928+41	47' LT OF CL OF SB US 87
CP 4	3813987.996	544451.879	3813199.175	544339.274	3086.77	911+33	41' LT OF CL OF SB US 87
CP 5	3814106.721	544726.646	3813317.875	544613.984	3075.24	910+72	167' RT OF CL OF NB US 87
CP 6	3816318.685	543446.626	3815529.382	543334.229	3005.87	937+15	155' RT OF CL OF NB US 87
CP 7	3817221.464	543254.937	3816431.974	543142.579	3032.42	946+36	155' RT OF CL OF NB US 87

SURFACE ADJUSTMENT FACTOR OF 1.000206866

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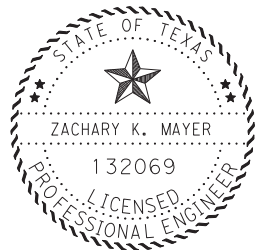


EXISTING CROSSOVER REMOVAL

LOCATION	REMOVAL SHEET SUMMARY					
	0105 6020	0354 6091	0542 6001	0544 6003	0644 6076	0658 6060
	REMOVING STAB BASE AND ASPH PAV (12")	PLANE ASPH CONC PAV (4.5")	REMOVE METAL BEAM GUARD FENCE	GUARDRAIL END TREATMENT (REMOVE)	REMOVE SM RD SN SUP&AM	REMOVE DELIN & OBJECT MARKER ASSMS
	SY	SY	LF	EA	EA	EA
CROSSOVER	780	780	340	1	3	20
SHEET TOTALS:	780	780	340	1	3	20

LEGEND:

-  REMOVING STAB BASE AND ASPH PAV
-  PLANE ASPH CONC PAV (4.5")



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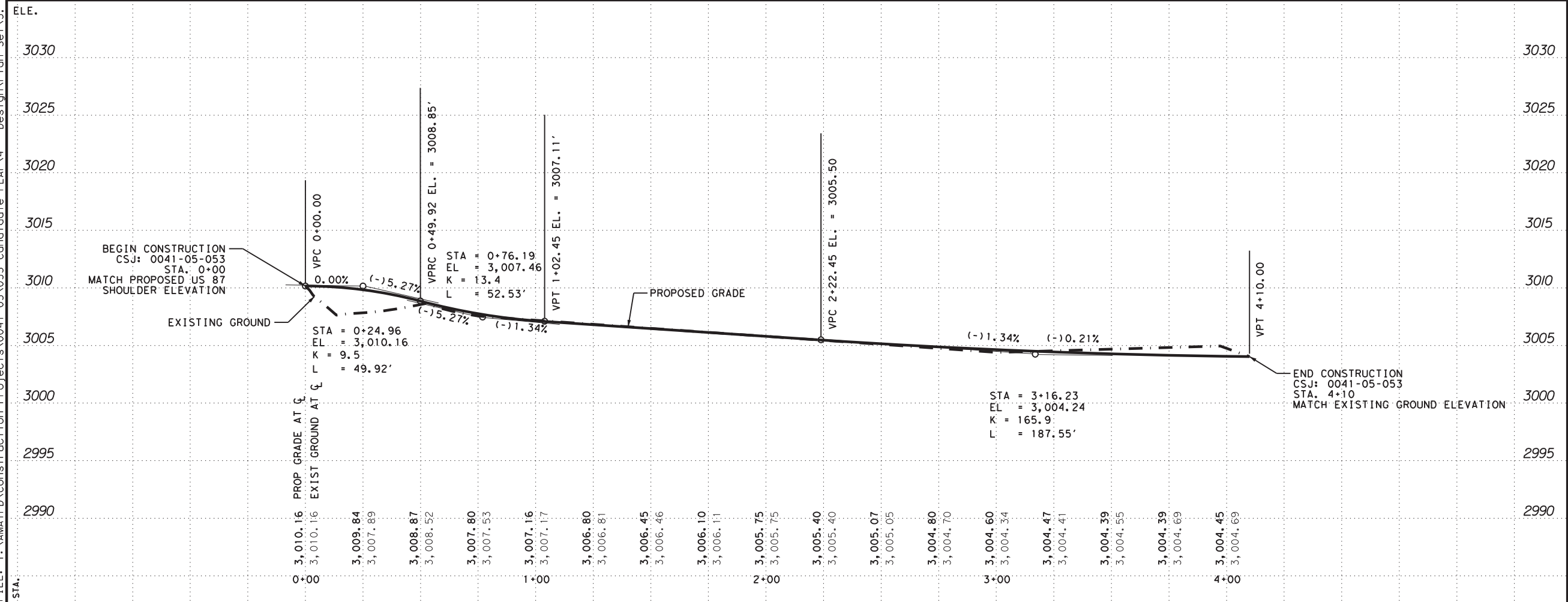
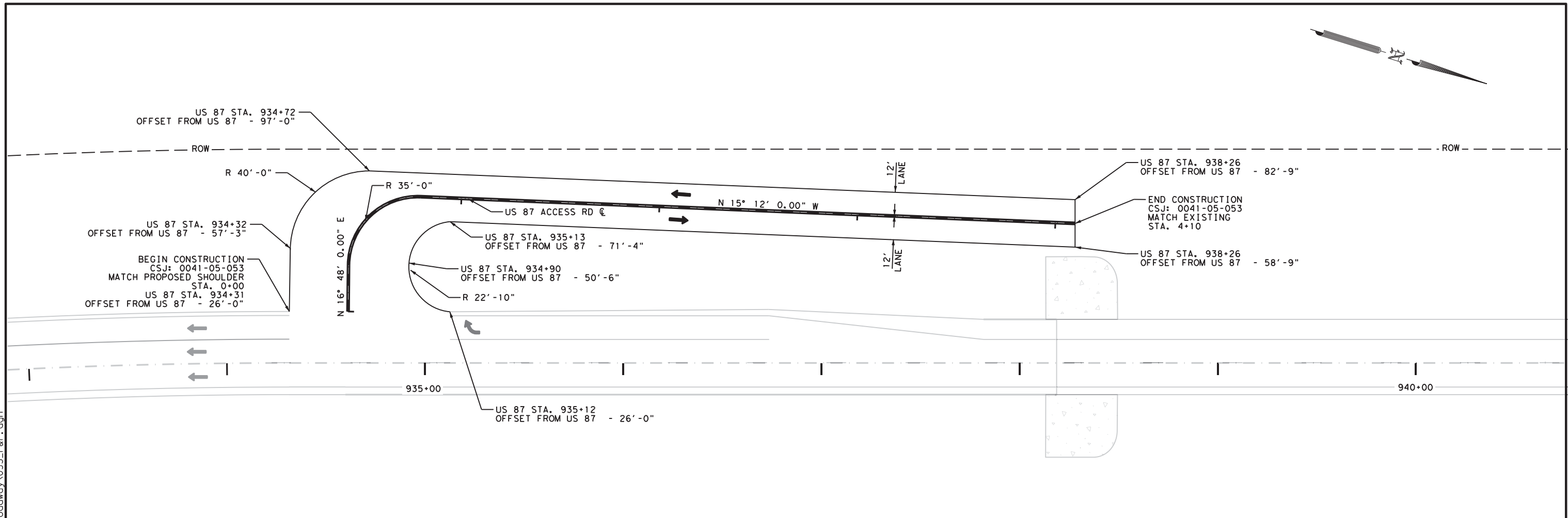
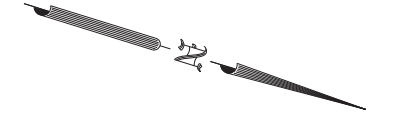
REMOVAL LAYOUT

SCALE: 1" = 100'



SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		40



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12/02/2020
 US 87
**PROPOSED FEDERAL
 LAND DRIVEWAY
 PLAN AND PROFILE**

HORIZ: 1" = 50'
 VERT: 1" = 10'

2021 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY	SHEET NO.	
JD	ZM	AMA	POTTER	41	

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DATE: 11/17/2020 9:07:31 AM
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HORIZONTAL ALIGNMENT DATA

Chain PROP_ACCESS contains:
 1 CUR PROP_ACCESS_3 2

Beginning chain PROP_ACCESS description
 Feature: Road_Centerline

Point 1 X 543,282.6402 Y 3,816,078.0803 Sta 0+00.00

Course from 1 to PC PROP_ACCESS_3 S 73° 24' 02.21" W Dist 23.4223

Curve Data

Curve PROP_ACCESS_3
 P.I. Station 0+59.49 X 543,225.6272 Y 3,816,061.0847
 Delta = 91° 43' 31.05" (RT)
 Degree = 163° 42' 08.02"
 Tangent = 36.0701
 Length = 56.0318
 Radius = 35.0000
 External = 15.2599
 Long Chord = 50.2371
 Mid. Ord. = 10.6267
 P.C. Station 0+23.42 X 543,260.1941 Y 3,816,071.3891
 P.T. Station 0+79.45 X 543,216.3681 Y 3,816,095.9462
 C.C. X 543,250.1954 Y 3,816,104.9305
 Back = S 73° 24' 02.21" W
 Ahead = N 14° 52' 26.74" W
 Chord Bear = N 60° 44' 12.27" W

Course from PT PROP_ACCESS_3 to 2 N 14° 52' 26.74" W Dist 330.5459

Point 2 X 543,131.5184 Y 3,816,415.4162 Sta 4+10.00

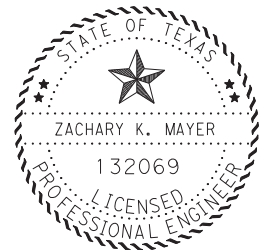
Ending chain PROP_ACCESS description

VERTICAL ALIGNMENT DATA

Beginning profile PROP_ACCESS description:
 Feature: Road_Centerline

		STATION	ELEV	GRADE	TOTAL L	BACK L	AHEAD L
VPI	1	0+00.00	3,010.1605				
VPC		0+00.00	3,010.1605	0.0000	K = 9.5	SSD = 229.7	
VPI	2	0+24.96	3,010.1605		49.9202	24.9601	24.9601
VPT		0+49.92	3,008.8451	-5.2701			
VPC		0+49.92	3,008.8451	-5.2701	K = 13.4		
VPI	3	0+76.19	3,007.4608		52.5312	26.2656	26.2656
VPT		1+02.45	3,007.1082	-1.3428			
VPC		2+22.45	3,005.4969	-1.3428	K = 165.9		
VPI	4	3+16.23	3,004.2377		187.5485	93.7743	93.7743
VPT		4+10.00	3,004.0387	-0.2121			

Ending profile PROP_ACCESS description



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12/02/2020
 US 87

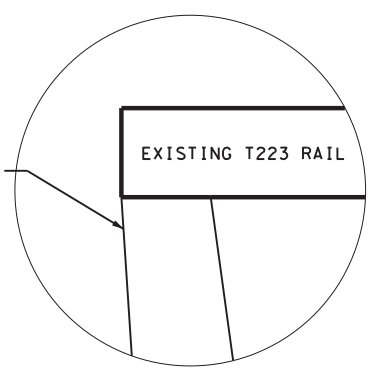
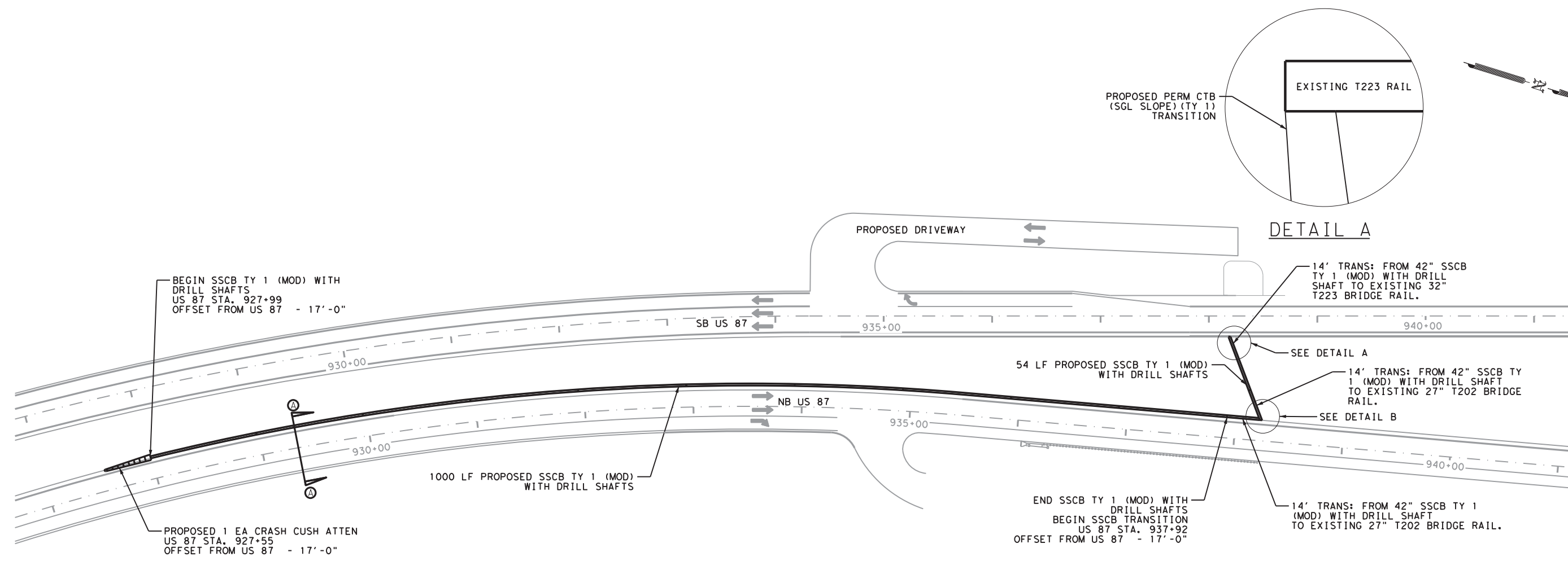
**PROPOSED FEDERAL
 LAND DRIVEWAY
 ALIGNMENT DATA**



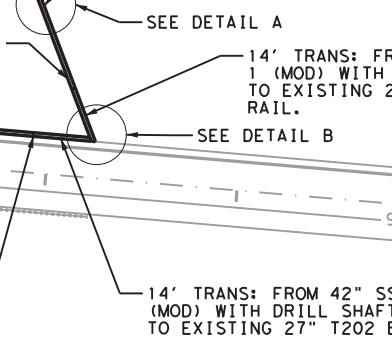
SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		42

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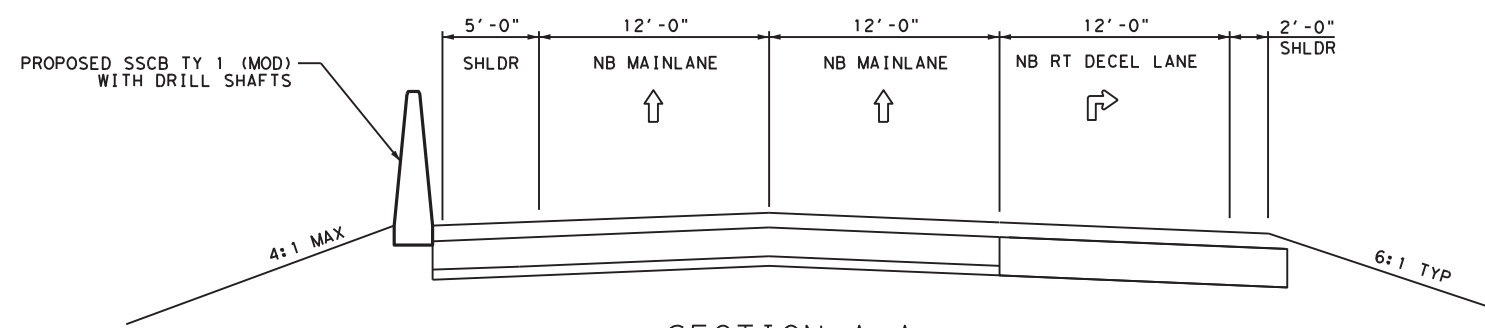


DETAIL A



DETAIL B

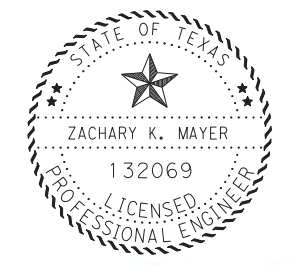
PROPOSED US 87 TRAFFIC BARRIER



SECTION A-A
NOT TO SCALE

NOTE: INSTALL DRAINAGE SLOTS BETWEEN STA. 935+13 TO STA. 938+22.
 INSTALL DRILL SHAFT FOUNDATIONS AS SPECIFIED IN SSSCB(1F)-10(MOD)
 QUANTITIES CARRIED TO PROJECT SUMMARY

TRAFFIC BARRIER SUMMARY			
LOCATION	0513 6038	0514 6047	0545 6007
	PERM CTB (SSCB) (TY 1) (MOD)	PERM CTB (SGL SLOPE) (TY 1) (TRANSITION)	CRASH CUSH ATTEN (INSTR) (L) (N) (TL3)
	LF	LF	EA
NORTHBOUND US 87	1,054	28	1
SHEET TOTALS:	1,054	28	1



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12/14/2020
US 87

TRAFFIC BARRIER LAYOUT

SCALE: 1" = 100'



SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		43

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LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION													
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE / RESET		L N	L W	R N	R W	S N	S W				
															MOVE / RESET	FROM LOC. #										
1	0041-05-053	43	NB US 87 (INSIDE)	927+50	TL-3	UNI	REIF. CONC.	6"	TBOSS	3'-0"	3'-6"		1				X									
TOTALS												1														

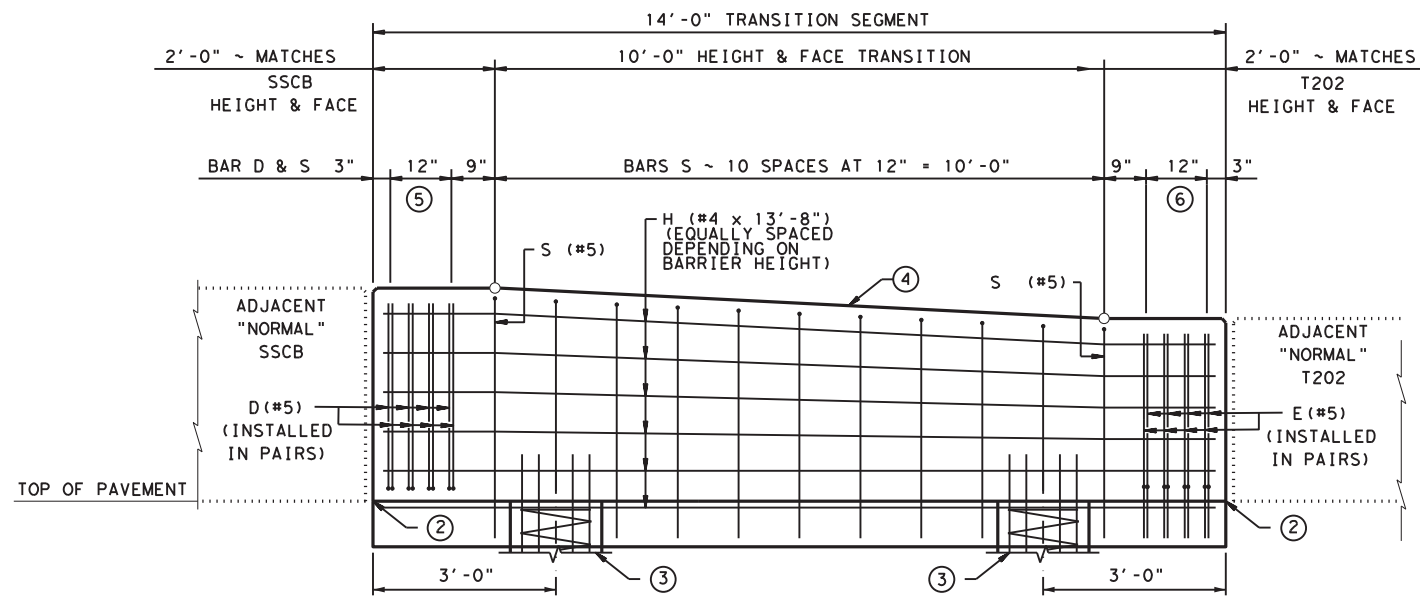
LEGEND:
L=LOW MAINTENANCE
R=REUSABLE
S=SACRIFICIAL
N=NARROW
W=WIDE

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

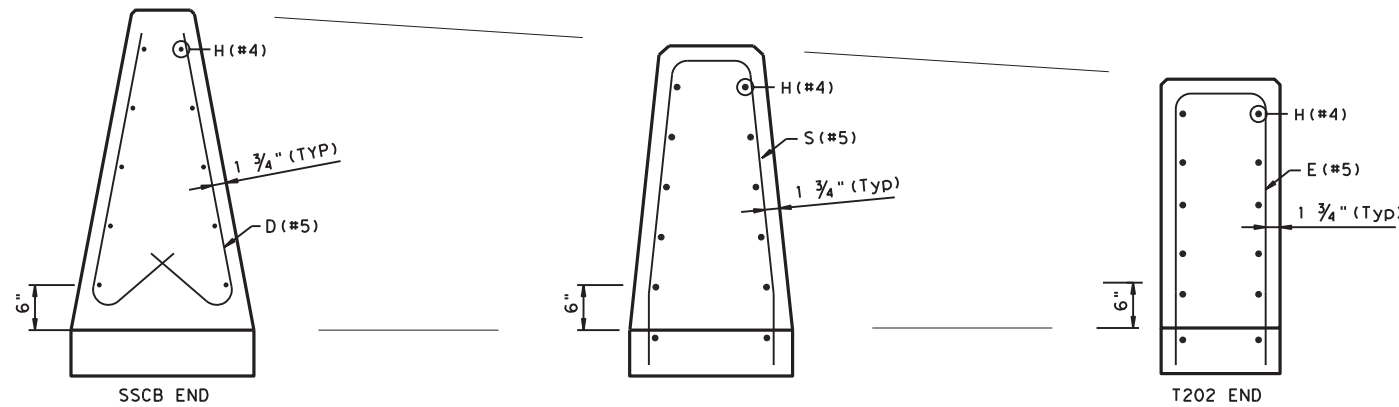
CRASH CUSHION SUMMARY SHEET

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© TxDOT	CONT	SECT	JOB
REVISIONS	0041	05	053
	DIST	COUNTY	
	AMA	POTTER	
	FEDERAL AID PROJECT	SHEET NO.	
		44	

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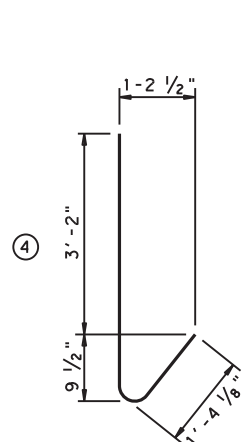


SIDE ELEVATION OF SEGMENT

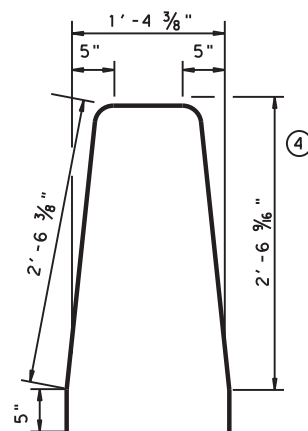


TYPICAL SECTIONS THRU TRANSITION SEGMENT

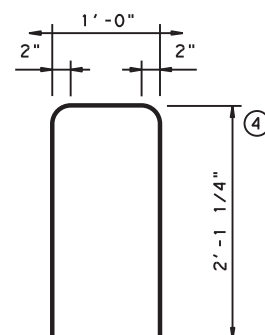
SHOWING REINFORCING AND SHAPE TRANSITIONS ONLY



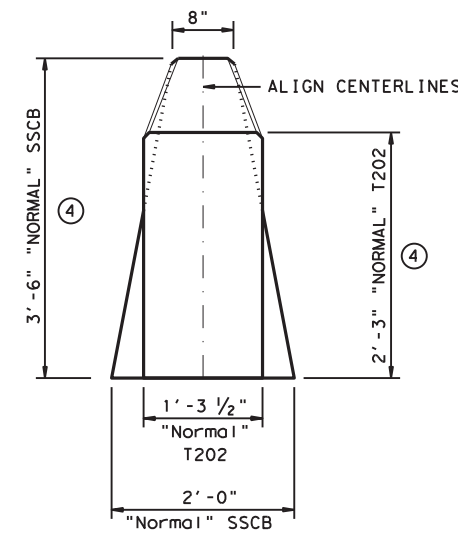
BARS D (#5)
 INSTALLED IN PAIRS
 (LGTH = 4'-0")



BARS S (#5)
 (LGTH = 7'-3")

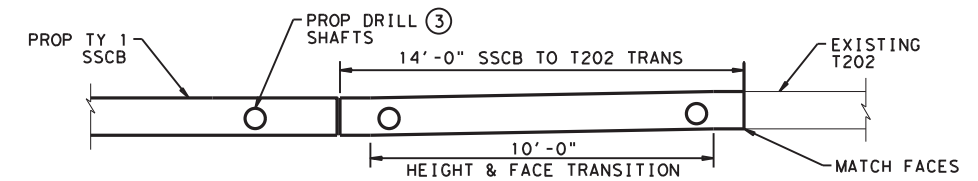


BARS E (#5)
 (LGTH = 5'-2 1/4")



END ELEVATION OF SEGMENT

SHOWING GEOMETRY ONLY



PLAN VIEW OF SEGMENT

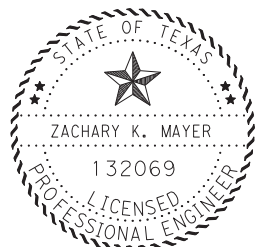
GENERAL NOTES:

REINFORCING FOR THE TRANSITION SEGMENT SHALL BE GRADE 60. ALL CONCRETE SHALL BE CLASS "C" UNLESS OTHERWISE SPECIFIED IN PLANS. CHAMFER ALL EXPOSED CORNERS 3/4" x 3/4".

THIS TRANSITION SEGMENT IS CAST-IN-PLACE. THE TRANSITION SEGMENT SHALL HAVE END FACES THAT ARE PARALLEL TO THE ADJACENT BARRIER.

HEIGHT AND FACE PROFILE OF THE TRANSITION SEGMENT SHALL BE GRADUALLY CHANGED, WITHIN THE LIMITS DETAILED, SO AS TO MATCH THE HEIGHT AND PROFILE OF THE ADJACENT BARRIERS. ADJUST (BEND AND RELOCATE) THE REINFORCING WITHIN THE TRANSITION PORTION OF THE SEGMENT AS NECESSARY TO CONFORM TO THE ALTERED BARRIER SHAPE. COVER AND MINIMUM SPACING REQUIREMENT OF THE REINFORCING SHALL NOT BE VIOLATED.

- ① BARS S WITHIN THE TRANSITION SHALL BE ADJUSTED TO THE TRANSITION'S FACES AND HEIGHT. CARE SHALL BE TAKEN DURING REINFORCING ADJUSTMENT AND INSTALLATION TO ENSURE THAT COVER AND SPACING REQUIREMENTS ARE MET.
- ② SEE SSCB STANDARDS FOR JOINT DETAILS.
- ③ SEE SSCB STANDARDS FOR LATERAL SUPPORT AND ANCHOR DETAILS.
- ④ INCREASE BARRIER 2" FOR OVERLAYS. ADJUST LENGTH OF REBAR AS NECESSARY



Zachary K. Mayer P.E.

12/02/2020
 US 87

**TRANSITION
 42" SSCB TO
 T202 RAIL**

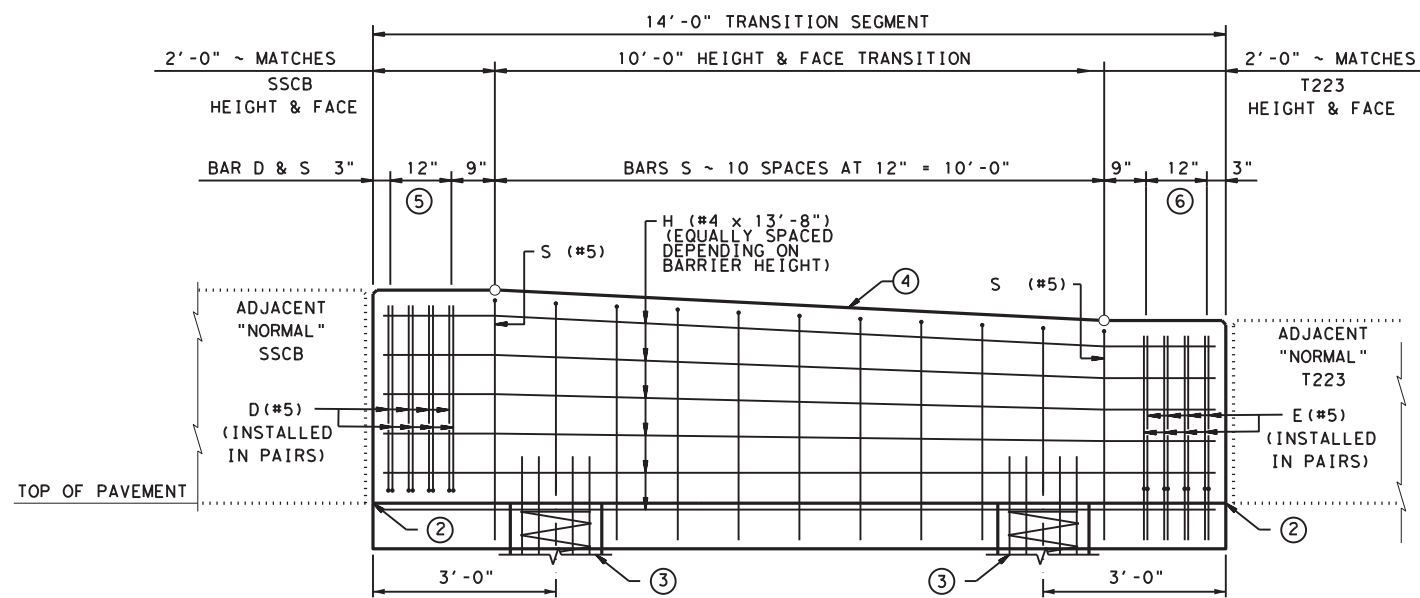
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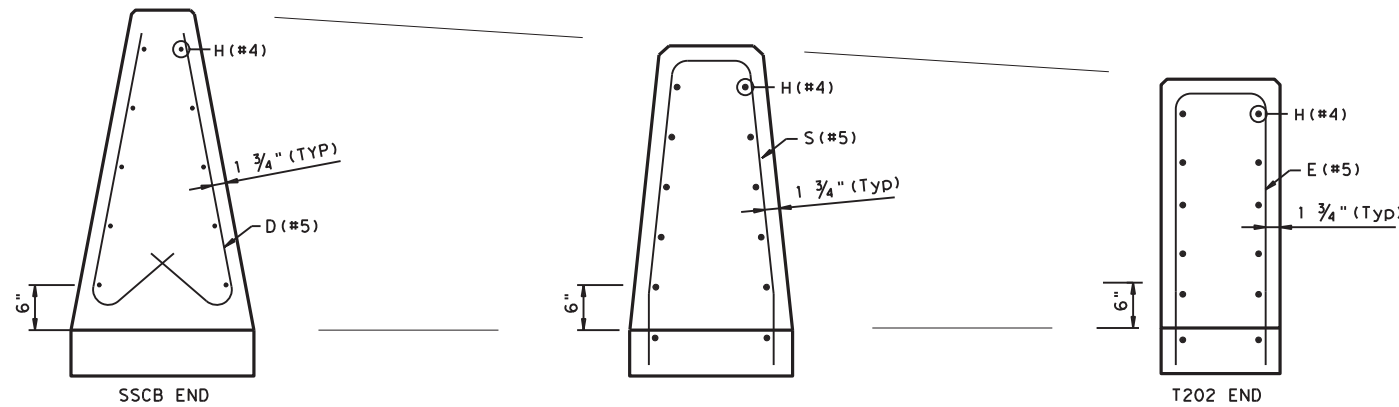
SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY	SHEET NO.	
JD	ZM	AMA	POTTER	45	

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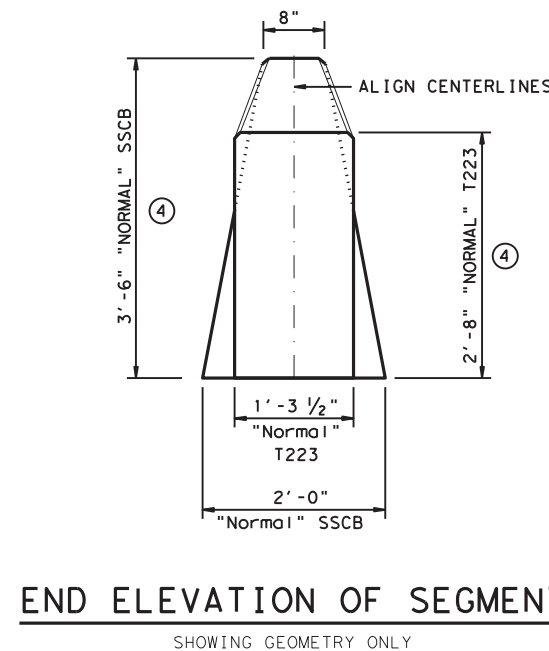
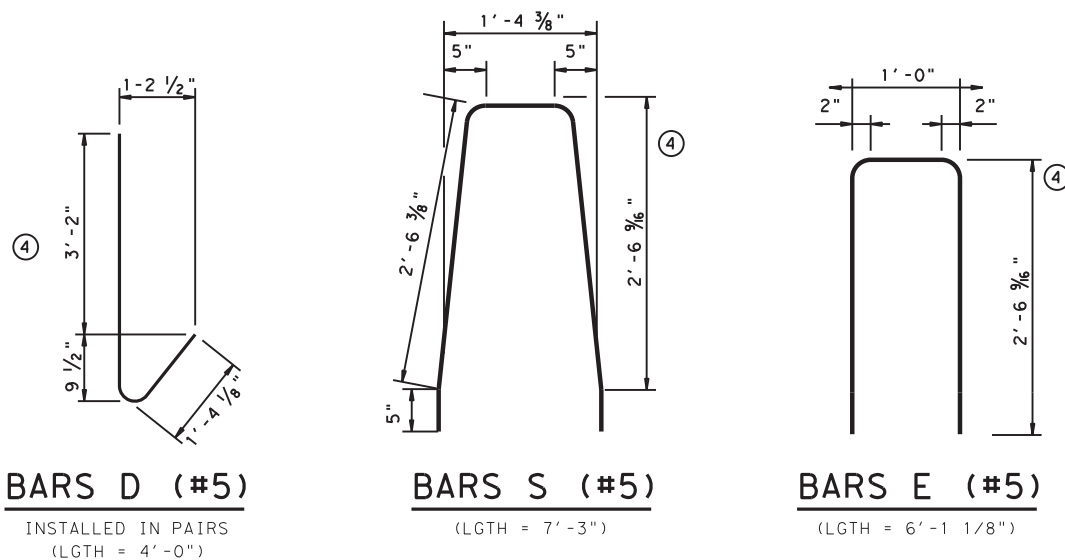


SIDE ELEVATION OF SEGMENT



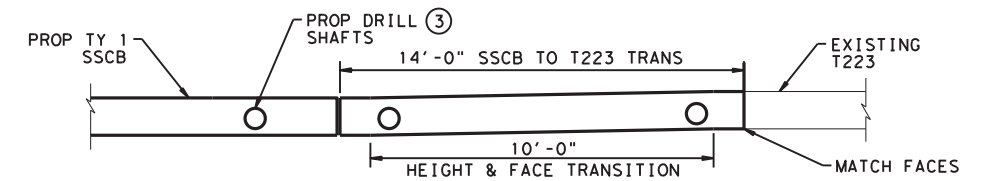
TYPICAL SECTIONS THRU TRANSITION SEGMENT

SHOWING REINFORCING AND SHAPE TRANSITIONS ONLY



END ELEVATION OF SEGMENT

SHOWING GEOMETRY ONLY



PLAN VIEW OF SEGMENT

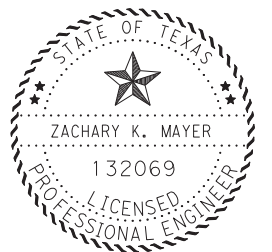
GENERAL NOTES:

REINFORCING FOR THE TRANSITION SEGMENT SHALL BE GRADE 60. ALL CONCRETE SHALL BE CLASS "C" UNLESS OTHERWISE SPECIFIED IN PLANS. CHAMFER ALL EXPOSED CORNERS 3/4" x 3/4".

THIS TRANSITION SEGMENT IS CAST-IN-PLACE. THE TRANSITION SEGMENT SHALL HAVE END FACES THAT ARE PARALLEL TO THE ADJACENT BARRIER.

HEIGHT AND FACE PROFILE OF THE TRANSITION SEGMENT SHALL BE GRADUALLY CHANGED, WITHIN THE LIMITS DETAILED, SO AS TO MATCH THE HEIGHT AND PROFILE OF THE ADJACENT BARRIERS. ADJUST (BEND AND RELOCATE) THE REINFORCING WITHIN THE TRANSITION PORTION OF THE SEGMENT AS NECESSARY TO CONFORM TO THE ALTERED BARRIER SHAPE. COVER AND MINIMUM SPACING REQUIREMENT OF THE REINFORCING SHALL NOT BE VIOLATED.

- ① BARS S WITHIN THE TRANSITION SHALL BE ADJUSTED TO THE TRANSITION'S FACES AND HEIGHT. CARE SHALL BE TAKEN DURING REINFORCING ADJUSTMENT AND INSTALLATION TO ENSURE THAT COVER AND SPACING REQUIREMENTS ARE MET.
- ② SEE SSCB STANDARDS FOR JOINT DETAILS.
- ③ SEE SSCB STANDARDS FOR LATERAL SUPPORT AND ANCHOR DETAILS.
- ④ INCREASE BARRIER 2" FOR OVERLAYS. ADJUST LENGTH OF REBAR AS NECESSARY



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12/02/2020
US 87

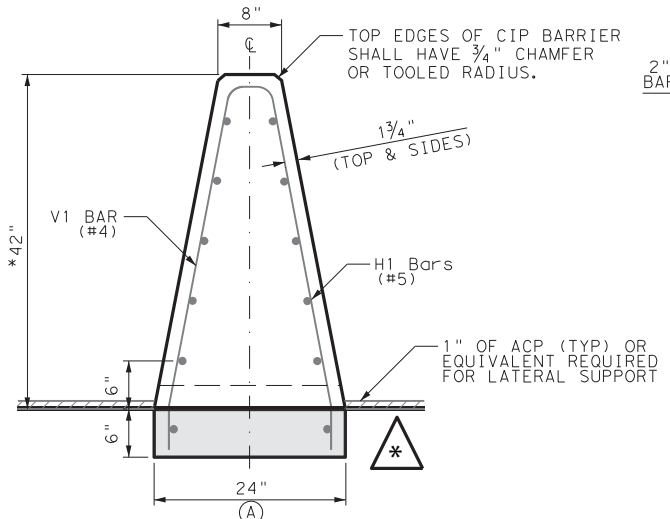
**TRANSITION
42" SSCB TO
T223 RAIL**

SCALE: N. T. S.



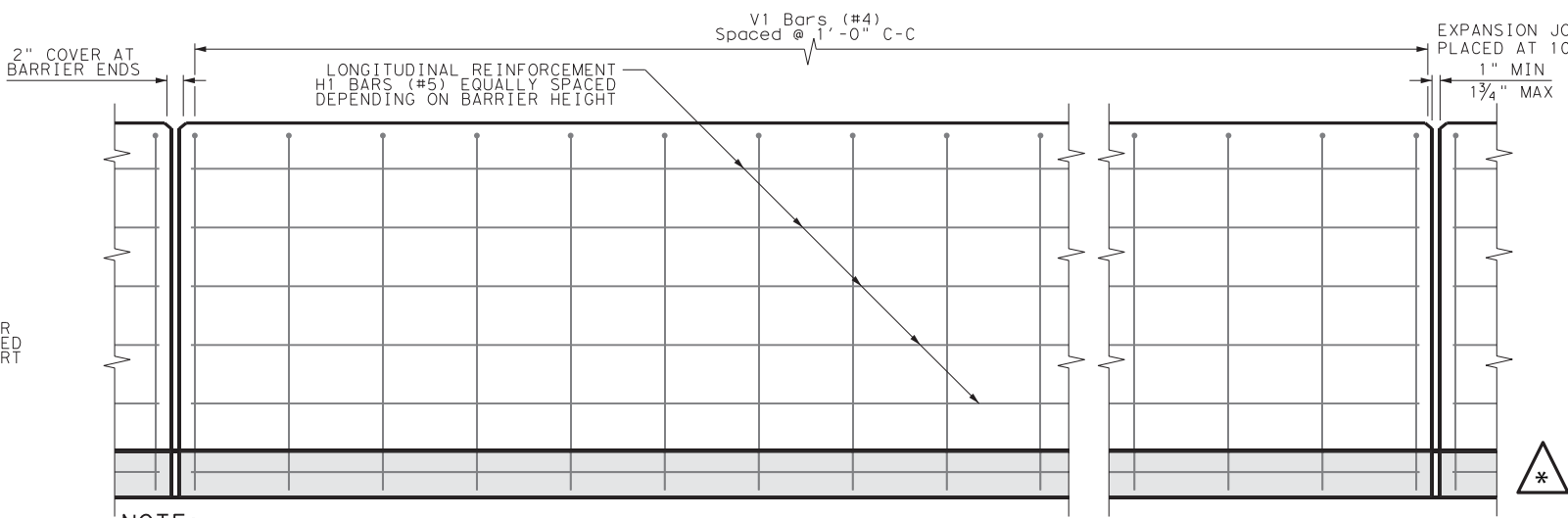
SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY	SHEET NO.	
JD	ZM	AMA	POTTER	46	



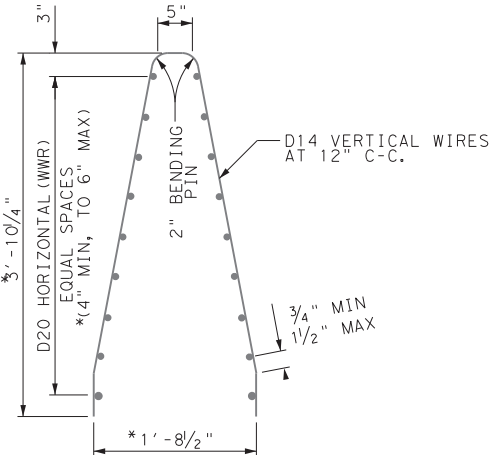
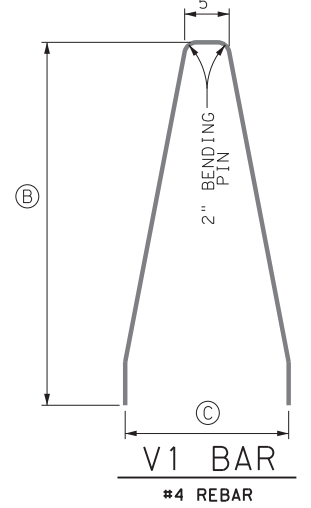
SINGLE SLOPE CONCRETE BARRIER (END VIEW)

SSCB (42") CAST-IN-PLACE (CIP) BARRIER
BARRIER IS SYMMETRICAL ABOUT THE CENTER LINE



NOTE:
BOTTOM OF REINFORCEMENT CAGE
MAY REST ON TOP OF THE FINISHED GRADE.

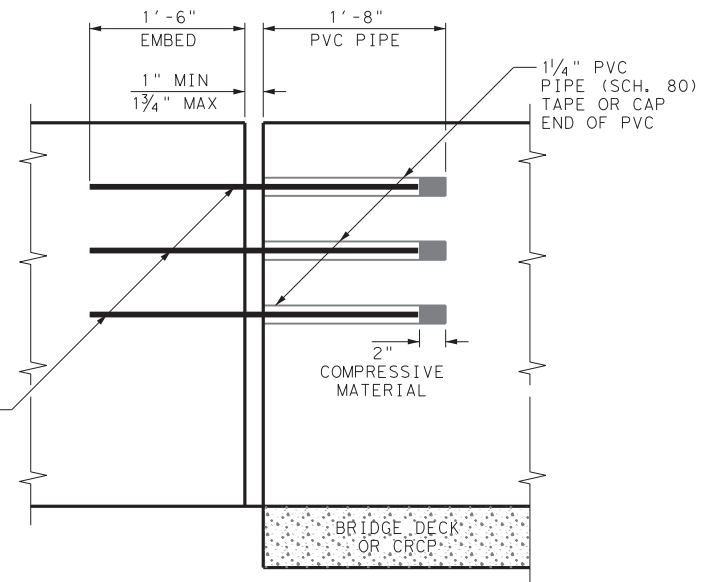
ELEVATION VIEW
CAST-IN-PLACE (SSCB) (TYPE 2) ON ROADWAY



WELDED WIRE REINFORCEMENT (WWR) OPTION FOR BARS V1 AND H1

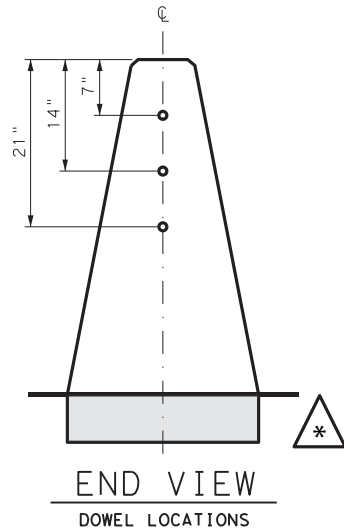
(WWR) GENERAL NOTES:

1. DEFORMED WELDED WIRE REINFORCEMENT (WWR) SHALL CONFORM TO ASTM A497.
2. WELDED WIRE CAGE MAY BE CUT AND BENT TO ACCOMMODATE THE DRAINAGE SLOTS, AS DIRECTED BY THE ENGINEER.
3. WELDED WIRE SPICE LOCATIONS SHALL HAVE A "MINIMUM" SPLICE LAP LENGTH OF 12".
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".

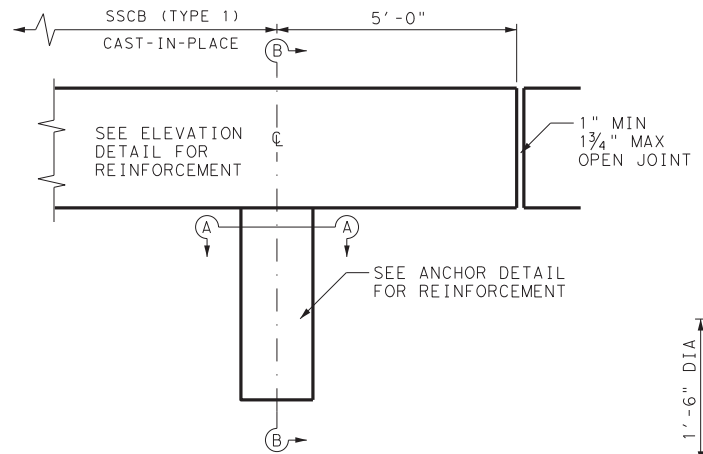


EXPANSION JOINT (DOWEL CONNECTION)

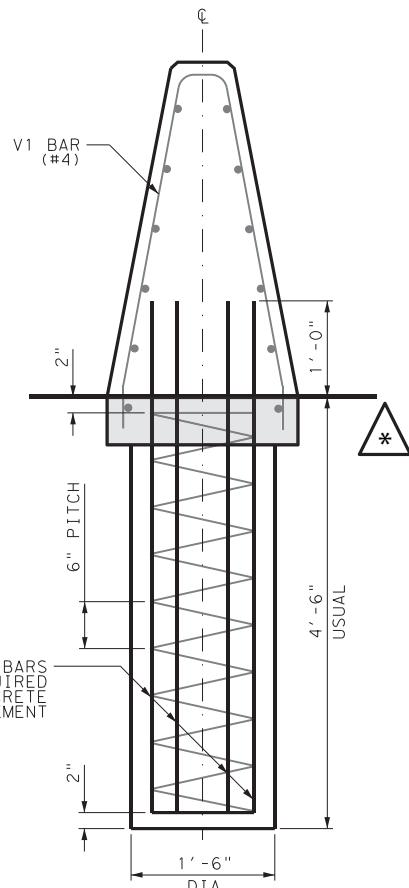
DOWELS MAY BE USED, AS DIRECTED BY THE ENGINEER, IN LOCATIONS WHERE THE BARRIER COULD BE LATERALLY DISPLACED.



END VIEW
DOWEL LOCATIONS

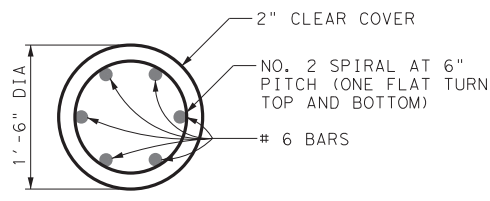


ELEVATION
ANCHOR LOCATION



SECTION B-B
ANCHOR DETAIL

6 BARS TO CLEAR INSIDE CONCRETE BARRIER REINFORCEMENT



SECTION A-A
ANCHOR DETAIL

NOTE:
DRILLED SHAFT ANCHORS ARE THE EQUIVALENT LATERAL SUPPORT OVER 1" ACP KEY-IN. ONE DRILL SHAFT REQUIRED ON EACH SIDE OF EVERY OPEN JOINT.

* ADDED A 6" CONCRETE BASE

GENERAL NOTES:

1. CONCRETE SHALL BE CLASS C. UNLESS OTHERWISE SPECIFIED IN THE PLANS.
2. WHERE USED, REBAR REINFORCEMENT SHALL BE GRADE 60 AND CONFORM TO ASTM A615.
3. THESE DETAILS COVER BARRIER PER ITEM 514, "PERMANENT CONCRETE TRAFFIC BARRIER".
4. THE ANCHORAGE SHOWN IS CONSIDERED SUBSIDIARY TO THE BID ITEM.
5. TOP EDGES OF CIP BARRIER SHALL HAVE A 3/4" CHAMFER OR TOOLED RADIUS.
6. CAST-IN-PLACE BARRIER MAY BE SLIP FORMED. BRACING MAY BE TIED OR TACK WELDED TO THE REINFORCEMENT CAGE TO PROVIDE CAGE STABILITY. DO NOT WELD TO ANCHORAGE.

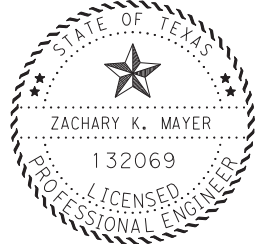
BARRIER HEIGHT	* DIMENSIONS		
	(A)	(B)	(C)
42"	24"	46 1/4"	20 1/2"
48"	26 1/4"	52 1/4"	22 3/4"
54"	28 1/2"	58 1/4"	25 1/6"

* (SSCB) (42") BARRIER HEIGHT MAY BE INCREASED TO 48" OR 54". THIS WOULD INCREASE THE BARRIER AND REINFORCEMENT DIMENSIONS ACCORDINGLY.

CAST-IN-PLACE (CIP) OR SLIP-FORMED (SSCB)

CAST-IN-PLACE BARRIER MAY BE CONNECTED TO PRECAST SSCB. JOINT CONNECTION "TYPES" MAY BE USED IN CAST-IN-PLACE BARRIER, TO MATCH THE PRECAST BARRIER CONNECTION. (SEE REQUIRED CONNECTION "TYPE" ELSEWHERE IN THE PLANS)

* THE WEIGHT OF CAST-IN-PLACE (SSCB) 42" IS APPROX. 861 LBS PER FT.



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SINGLE SLOPE CONCRETE BARRIER CAST-IN-PLACE (TY 1)

SSCB (1F)-10 (MOD)



SHEET 1 OF 1

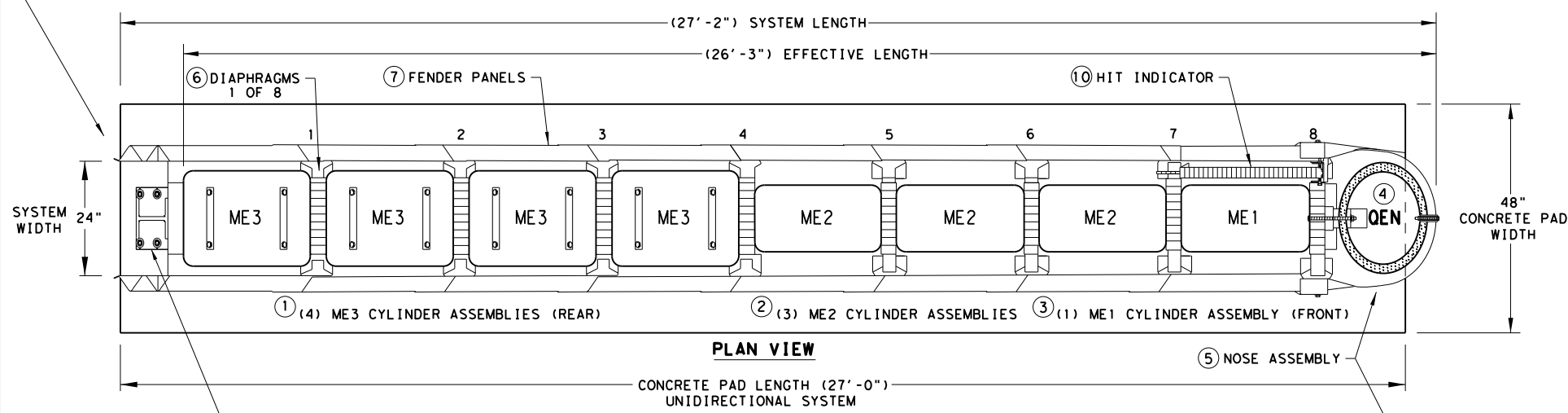
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JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY	SHEET NO.	
JD	ZM	AMA	POTTER	47	

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DATE: 11/19/2020
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 DISCLAIMER: THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

NOTE:
A TRANSITION MAY BE REQUIRED TO INSTALL THE QUADGUARD ELITE M10 TO THE OBJECT BEING SHIELDED.

QUADGUARD ELITE M10 24" WIDE (8 BAY) SYSTEM



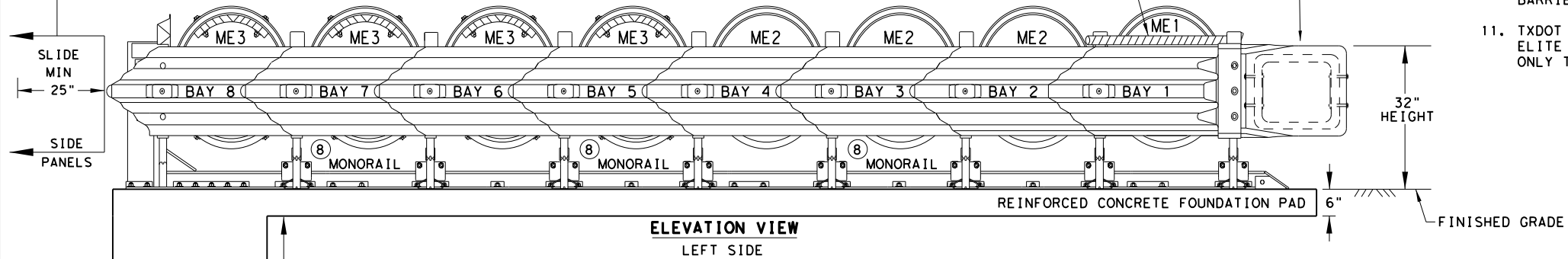
KEY	KEY
① ME3 CYLINDER ASSEMBLIES	⑥ DIAPHRAGMS
② ME2 CYLINDER ASSEMBLIES	⑦ FENDER PANELS
③ ME1 CYLINDER ASSEMBLY	⑧ MONORAILS
④ QEN CYLINDER	⑨ TYPE OF BACKUP
⑤ NOSE BELT ASSEMBLY	⑩ HIT INDICATOR

⑨ SHOWN WITH TENSION STRUT BACKUP ASSEMBLY

NOTE: PROVISION SHALL BE MADE FOR REAR FENDER SIDE PANELS TO SLIDE REARWARD UPON IMPACT, 25" MIN.

NOTE: HIT INDICATOR WILL RAISE UPON IMPACT.

④ QEN CYLINDER INSTALLED INSIDE OF NOSE BELT ASSEMBLY ⑤



NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR CONCRETE PAD AND ANCHOR BLOCK INSTALLATION REQUIREMENTS.

A MANUFACTURER'S DRAWING PACKAGE UNIQUE AND SPECIFIC FOR THE QUADGUARD ELITE M10 FIELD INSTALLATION AND INFORMATION REGARDING THE TYPE OF BACKUP ASSEMBLY REQUIRED FOR THE TRANSITION WILL BE PROVIDED BY THE MANUFACTURER TO THE ENGINEER AND INSTALLER.

6" REINFORCED CONCRETE PAD REQUIRES THE INSTALLATION OF AN ANCHOR BLOCK AS SHOWN ON THE MANUFACTURER'S DRAWING PACKAGE.

8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.

CONCRETE PAD AND ANCHOR BLOCK COMBINATIONS SHALL BE CONFIRMED WITH THE MANUFACTURER BASED UPON SITE SPECIFIC DATA (SSD).

NOTE:
THE QUADGUARD ELITE M10 8-BAY, 24" WIDE - NARROW SYSTEM TESTED TO MASH TEST LEVEL 3.

TL-3 MODEL #	QM10024E	CYLINDER TYPES IN BAYS			
BAYS	8	TYPE-ME3	TYPE-ME2	TYPE-ME1	TYPE-QEN
DIAPHRAGMS	8	4	3	1	1
WIDTH	24"	REAR	FRONT		NOSE

BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS

SEE GENERAL NOTE 10 FOR CLEARANCE LIMITATIONS

⑨ TENSION STRUT BACKUP

⑨ CONCRETE BACKUP

SYSTEM TRANSITIONS TYPES	
1	QUAD-BEAM TO CONCRETE SAFETY BARRIER
2	QUAD-BEAM TO CONCRETE BRIDGE RAIL
3	QUAD-BEAM TO CONCRETE END SHOE
4	QUAD-BEAM TO THRIE-BEAM RAIL
5	QUAD-BEAM TO W-BEAM RAIL

NOTE:
TRANSITION ASSEMBLIES FOR THE QUADGUARD ELITE M10 TO THRIE-BEAM OR W-BEAM FENCE REQUIRES I-BEAM POSTS:
ALL POSTS W6X8.5/9 I-BEAMS (78" LONG).

NOTES:
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR THE CORRECT BACKUP ASSEMBLY AND TRANSITION PANELS OR SIDE PANELS USED FOR STANDARD AND BI-DIRECTIONAL INSTALLATIONS: AT DIVIDED-HIGHWAY MEDIANS OR UNDIVIDED ROADWAYS WHERE THE SYSTEM IS EXPOSED TO IMPACTS FROM ONE OR TWO DIFFERENT DIRECTIONS OF TRAFFIC FLOW.

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE QUADGUARD ELITE M10 SYSTEM AND IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

GENERAL NOTES

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION INC. AT 1 (888) 323-6374.
- SEE THE RECENT QUADGUARD ELITE M10 PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS AND THE DRAWING PACKAGE FOR THE NARROW 24" SYSTEM BEFORE INSTALLING THE QUADGUARD ELITE M10 AT ANY GIVEN LOCATION.
- FOR BI-DIRECTIONAL TRAFFIC: THE LOCATION AND OR WIDTH OF THE QUADGUARD ELITE M10 IS RESTRICTED. AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD ELITE M10, THE QUADGUARD ELITE M10 SHOULD NOT EXTEND FURTHER INTO THE TRAFFIC-SIDE OF THE BARRIER THAN THE OBSTACLE. ANY TRANSITION INSTALLED MUST EITHER BE TANGENT TO BOTH QUADGUARD ELITE M10 AND OBSTACLE OR MUST ANGLE TOWARD FIELD SIDE OF THE BARRIER.
- SYSTEM TRANSITION: APPROPRIATE TRANSITION PANELS OR SIDE PANELS WILL BE REQUIRED FOR PROPER IMPACT PERFORMANCE. THE CORRECT PANEL(S) TO USE WILL DEPEND ON THE DIRECTION OF TRAFFIC FLOW AND WHAT TYPE OF BARRIER OR ROAD FEATURE THE QUADGUARD ELITE M10 SYSTEM IS SHIELDING. SEE THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
- COMPONENTS FOR THE QUADGUARD ELITE (M10) BACKUP AND REINFORCING DETAILS ARE SHOWN ON THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL.
- CONCRETE PAD SHALL BE 6" MIN. REINFORCED 28MPa [4,000 PSI] (P.C.) OR 8" MIN. NON-REINFORCED 28MPa [4,000 PSI] CONCRETE ROADWAY MEASURING AT LEAST 12'-0" WIDE BY 50'-0" LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE, E.G. CONCRETE WALL.
- IF THE CROSS-SLOPE VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
- THE INSTALLATION AREA SHOULD BE FREE OF CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- THE QUADGUARD ELITE M10 SYSTEM SHOULD BE INSTALLED APPROXIMATELY PARALLEL WITH THE BARRIER.
- FOR THE TENSION STRUT BACKUP THE DISTANCE BETWEEN THE BACK OF BACKUP AND THE BARRIER WALL SHOULD NOT EXCEED 7" IN ANY CASE.
- TXDOT HAS ONLY APPROVED THE 24" WIDE QUADGUARD ELITE M10 SYSTEM. THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION AND ASSEMBLY MANUAL INCLUDES SYSTEM WIDTH OF 24". ONLY THE 24" SYSTEM IS ALLOWED TO BE INSTALLED ON TEXAS ROADWAYS.

FOUNDATION & ANCHORING REQUIREMENTS	
FOUNDATION TYPES: A, B, C, & D	
FOUNDATION TYPE: A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE: B	ASPHALT OVER P.C.C.
FOUNDATION:	3" MIN. (A.C.) OVER 3" MIN. (P.C.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE: C	ASPHALT OVER SUBBASE
FOUNDATION:	6" MIN. (A.C.) OVER 6" MIN. (C.S.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE: D	ASPHALT ONLY
FOUNDATION:	8" MIN. (A.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE

KEY:
ASPHALT CONCRETE (A.C.)
COMPACTED SUBBASE (C.S.)
PORTLAND CEMENT CONCRETE (P.C.C.)

NOTE: SEE TRINITY'S PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR THE APPROVED ADHESIVE.

IF THE UNIT IS ANCHORED TO ASPHALTIC CONCRETE, IT SHOULD BE RELOCATED TO FRESH, UNDISTURBED ASPHALT AND RE-ANCHORED AFTER EACH IMPACT TO ENSURE ADEQUATE FUTURE PERFORMANCE.

TENSION STRUT BACKUP MAY BE USED IN CONSTRUCTION ZONES ON ASPHALT CONCRETE (A.C.) FOR TEMPORARY USE ONLY.

Texas Department of Transportation
Design Division Standard

**TRINITY HIGHWAY
ENERGY ABSORPTION
QUADGUARD ELITE M10
(MASH TL-3)
QGELITE (M10) (N) -20**

FILE: qgelite1em10n20.dgn	DN: TXDOT	CK: KM	DW: VJP	CK: AG
© TXDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0041	05	053	US 87
	DIST	COUNTY	SHEET NO.	
	AMA	POTTER		48

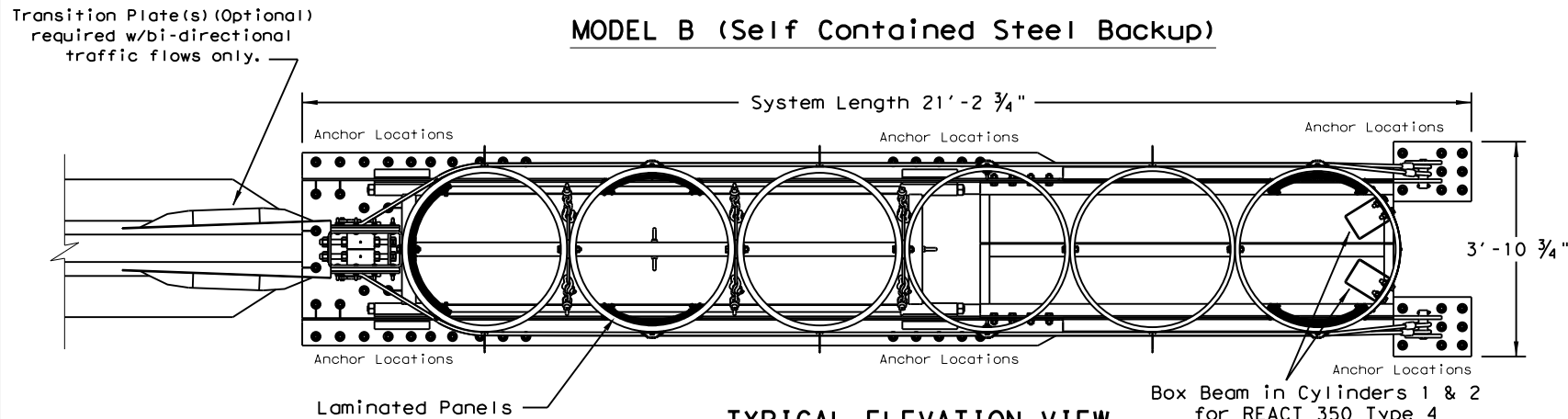
LOW MAINTENANCE

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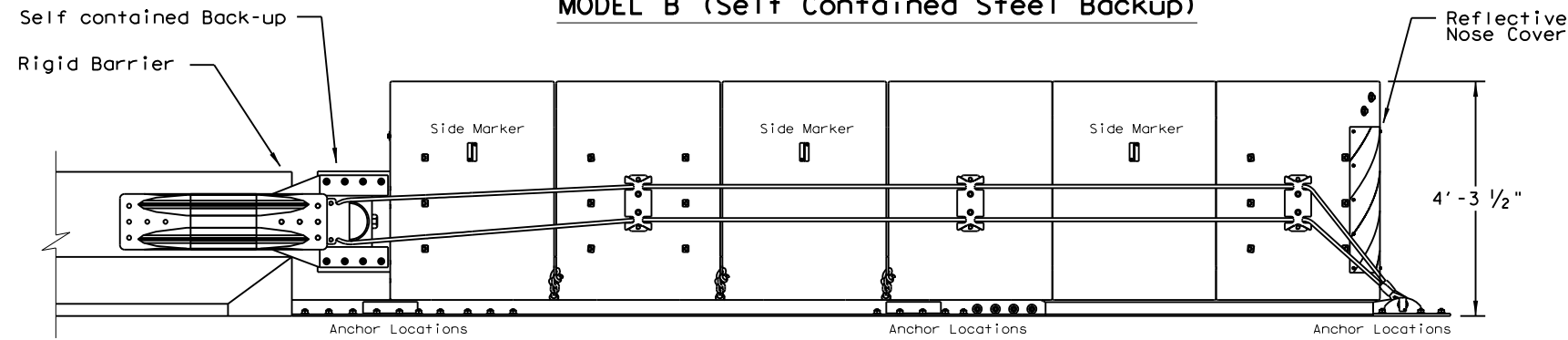
TYPICAL PLAN VIEW

MODEL B (Self Contained Steel Backup)



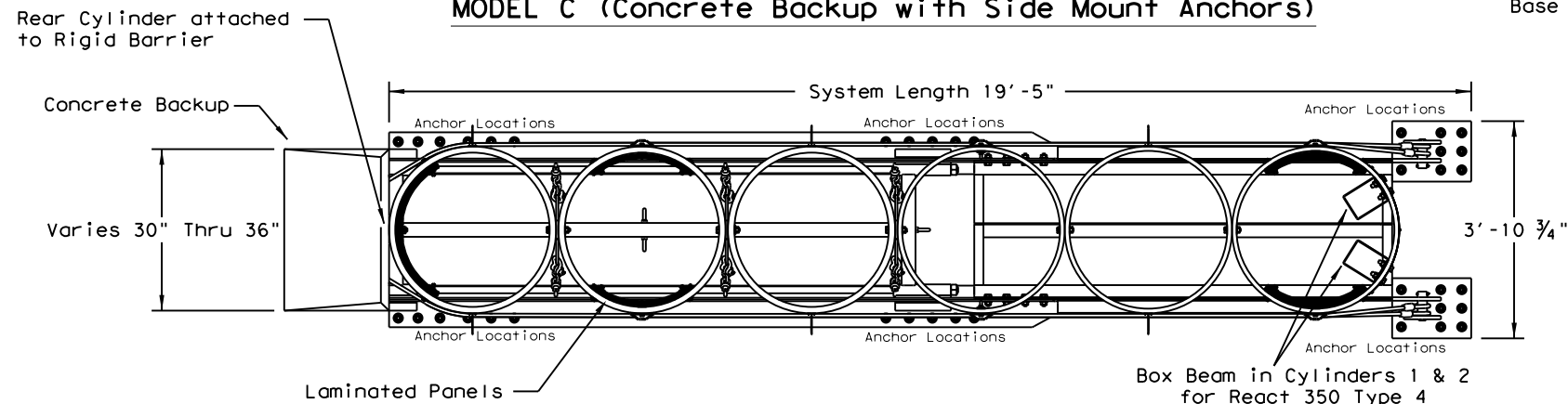
TYPICAL ELEVATION VIEW

MODEL B (Self Contained Steel Backup)



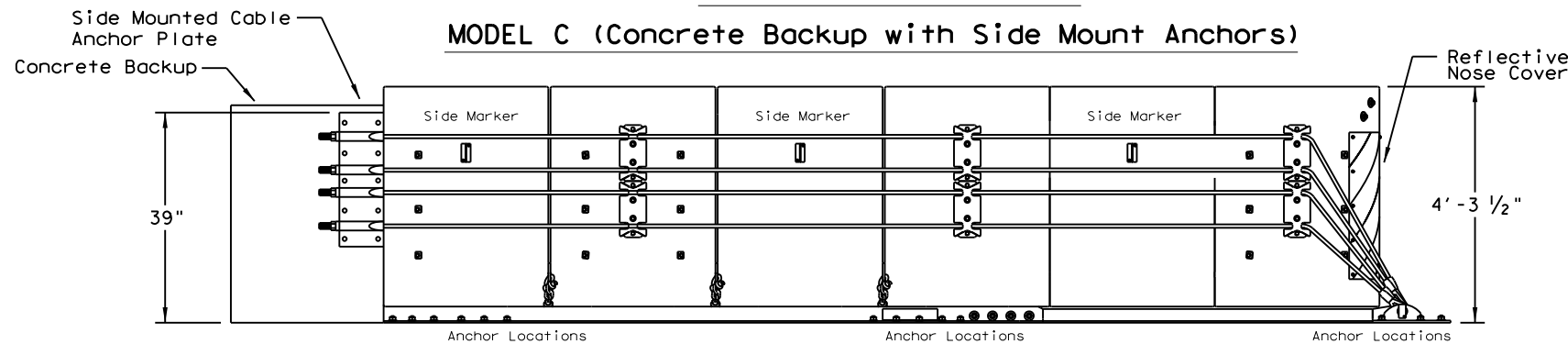
TYPICAL PLAN VIEW

MODEL C (Concrete Backup with Side Mount Anchors)



TYPICAL ELEVATION VIEW

MODEL C (Concrete Backup with Side Mount Anchors)

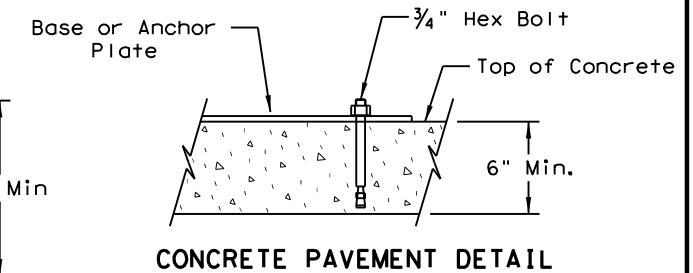
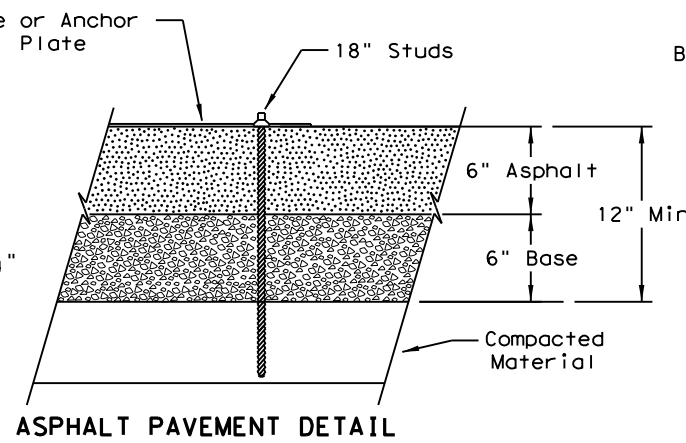


GENERAL NOTES

1. For specific information regarding installation and technical guidance of the system, contact: Trinity Highway - Energy Absorption at 1(888)323-6374, 70 W. Madison St. Suite 2350, Chicago, IL 60602
2. The nose of the REACT 350 shall be clad with a plastic wrap with standard delineation adhered to the wrap and shall have a series of side marker reflectors on both sides of the unit. See site plan views for marker and plastic wrap color orientation.
3. All steel components to be hot dipped galvanized except stakes, drive spikes, threaded bolts in backup unit, and wedge fittings on cables.
4. The installation area should be free from curbs, elevated objects, or depressions. If the REACT system is to span expansion joints contact the manufacturer.
5. The REACT system should be approximately parallel with the barrier or centerline of merging barriers. The maximum permissible cross-slope is 8%.
6. REACT 350 II has laminated panels in cylinders 1, 5, & 6.

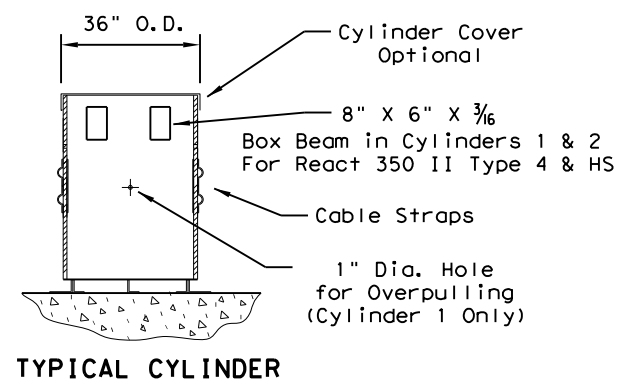
TYPE	REACT 350 4-B	REACT 350 4-C	REACT 350 II 6-B	REACT 350 II 6-C
Test Level	TL-2	TL-2	TL-3	TL-3
OVERALL LENGTH	15'-3"	13'-9"	21'-3"	19'-5"

FOUNDATION TYPE	MINIMUM THICKNESS	ANCHORAGE
A CONCRETE PAD OR ROADWAY	6"	MP-3 WITH 7" STUDS [5.5" EMBEDMENT]
B ASPHALT OVER CONCRETE PAVEMENT	6" CONCRETE PAVEMENT	ANCHOR LENGTH REQUIRED IS 7" STUD PLUS ASPHALT THICKNESS
C ASPHALT OVER BASE	6" ACP + 6" BASE	MP-3 WITH 18" STUDS [16.5" EMBEDMENT]
D ASPHALT ONLY	8"	MP-3 WITH 18" STUDS [16.5" EMBEDMENT]



ASPHALT PAVEMENT DETAIL

CONCRETE PAVEMENT DETAIL



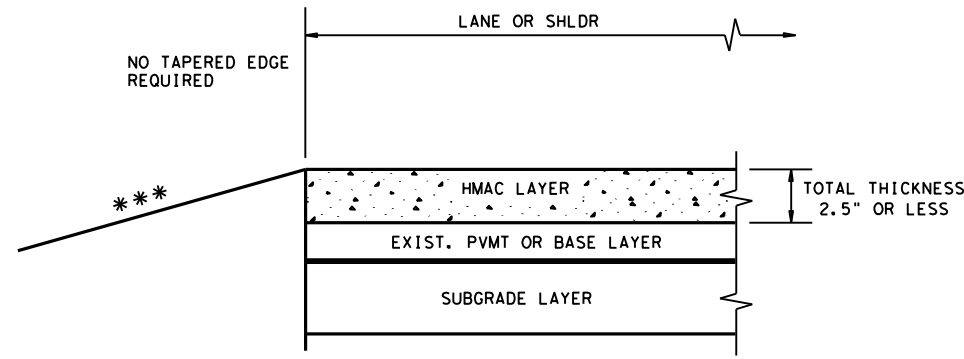
TYPICAL CYLINDER

LOW MAINTENANCE

		Design Division Standard	
TRINITY HIGHWAY ENERGY ABSORPTION (REACT 350 NARROW) (REACT 350 II NARROW) REACT (N) - 16			
FILE: reactn16.dgn	DN: TxDOT	CK: KM	DW: VP
© TxDOT February 1998	CONT	SECT	JOB
REVISIONS	0041	05	053
REVISOR	DIST	COUNTY	SHEET NO.
REVISOR: 06, 2013 (VP)	AMA	POTTER	49
REVISOR: 03, 2016 (VP)			

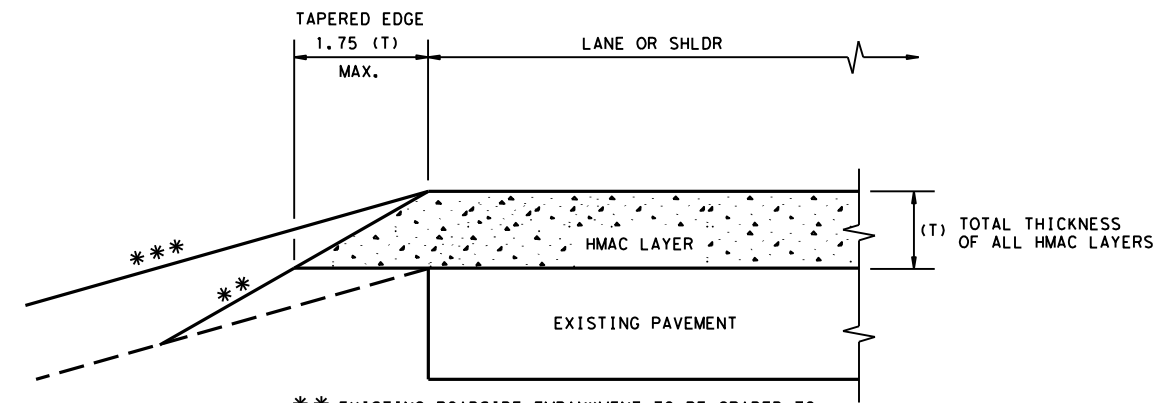
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*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

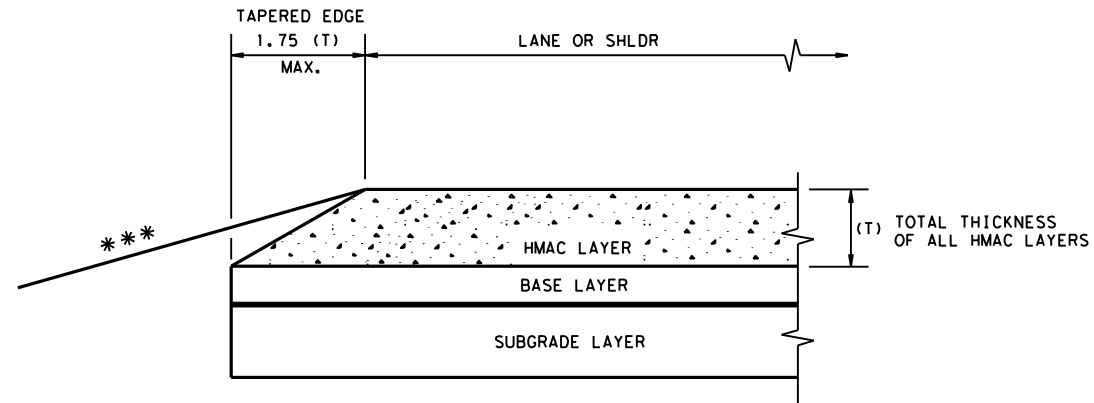
CONDITION - 1
 THIN HMAC SURFACES OR HMAC OVERLAY
 WITH THICKNESS OF 2.5" OR LESS



** EXISTING ROADSIDE EMBANKMENT TO BE GRADED TO PRODUCE A SMOOTH LEVEL SURFACE FOR PLACEMENT OF TAPERED EDGE. THIS WORK IS SUBSIDIARY TO THE VARIOUS BID ITEMS.

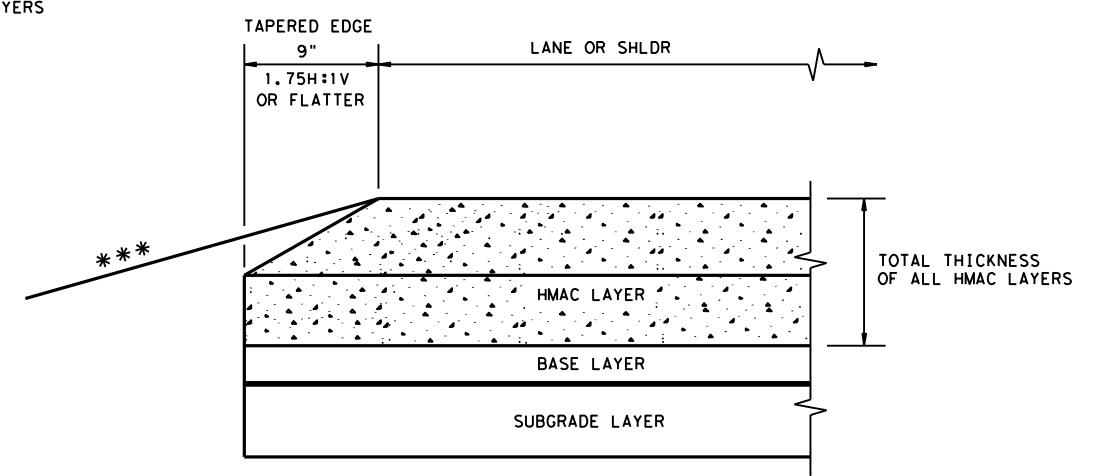
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 2
 OVERLAY OF EXISTING PAVEMENT
 HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 3
 NEW OR RECONSTRUCTED PAVEMENT
 HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 4
 NEW OR RECONSTRUCTED PAVEMENT
 HMAC THICKNESS 5" OR GREATER

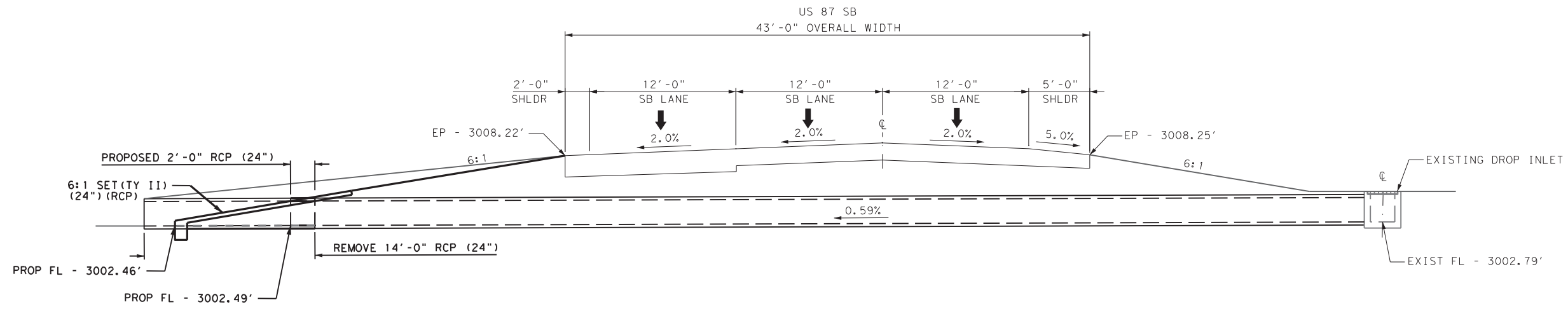
GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
3. PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
4. THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
5. THE TAPERED EDGE SHALL BE PRODUCED BY USE OF A SCREED ATTACHMENT CAPABLE OF PRODUCING A SMOOTH COMPACTED SURFACE. ADDITIONAL COMPACTING EFFORT BEHIND THE SCREED IS NOT REQUIRED.

(NOT TO SCALE)

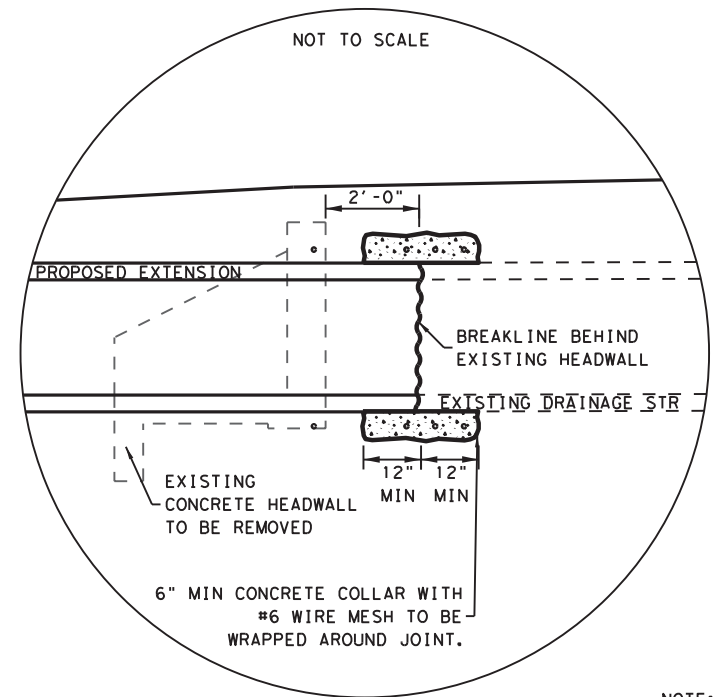
				Design Division Standard	
TAPERED EDGE DETAILS HMAC PAVEMENT					
TE (HMAC) - 11					
FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:	
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0041	05	053	US 87	
	DIST	COUNTY	SHEET NO.		
	AMA	POTTER	50		

DATE: 12/14/2020 3:52:43 PM
 FILE: I:\AMATPD\Construction Projects\0041-05\053 Candidate FLAP\4 - Design\Plan Set\5. Drainage\053_Drainage_Detail\1.s.dgn



US 87 SB STA. 933+00

EXISTING - 1-24" X 100' RCP W/ TYPE A DROP INLET CONCRETE
 PROPOSED - 1-24" X 88' RCP W/ TYPE A DROP INLET CONCRETE AND TY II SET

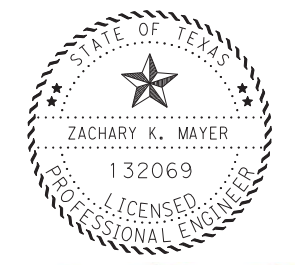


CONCRETE COLLAR DETAIL

NOTE:
 CONCRETE COLLAR TO BE USED FOR ALL EXTENSIONS AS SHOWN ON CULVERT LAYOUTS AND WILL BE SUBSIDIARY TO PERTINENT BID ITEMS

QUANTITIES CARRIED TO PROJECT SUMMARY

LOCATION	DRAINAGE DETAIL SUMMARY		
	0464 6005	0467 6394	0496 6007
	RC PIPE (CL III) (24 IN)	SET (TY II) (24 IN) (RCP) (6:1) (C)	REMOVE STR (PIPE)
	LF	EA	LF
STA. 933+00	2	1	14
SHEET TOTALS:	2	1	14



Zachary K. Mayer P.E.

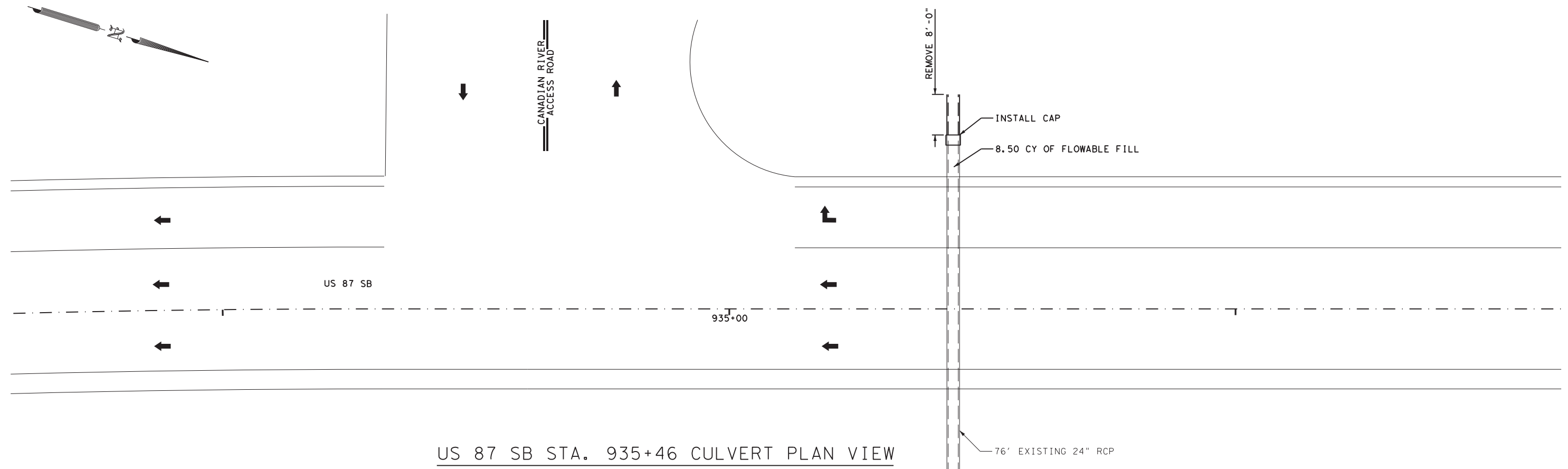
12/16/2020
 US 87

DRAINAGE DETAILS

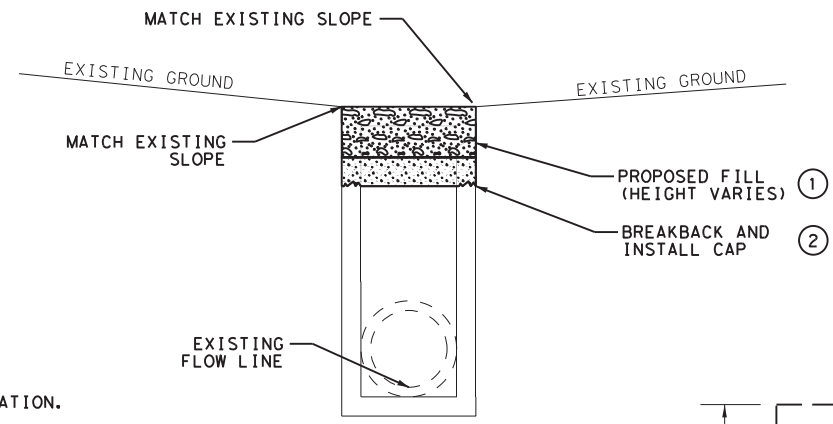
SCALE: 1" = 10'

2021 Texas Department of Transportation				SHEET 1 OF 3	
DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		51

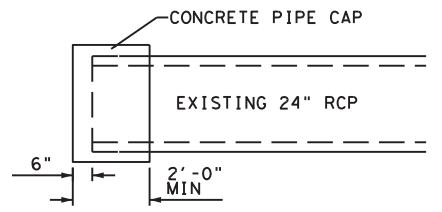
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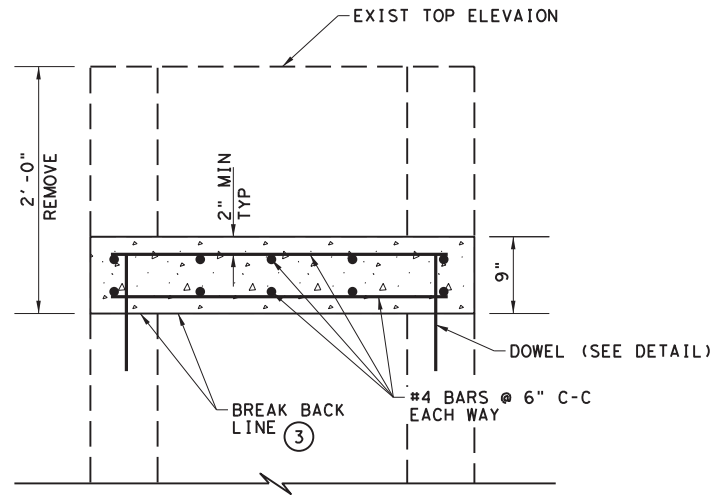
US 87 SB STA. 935+46 CULVERT PLAN VIEW



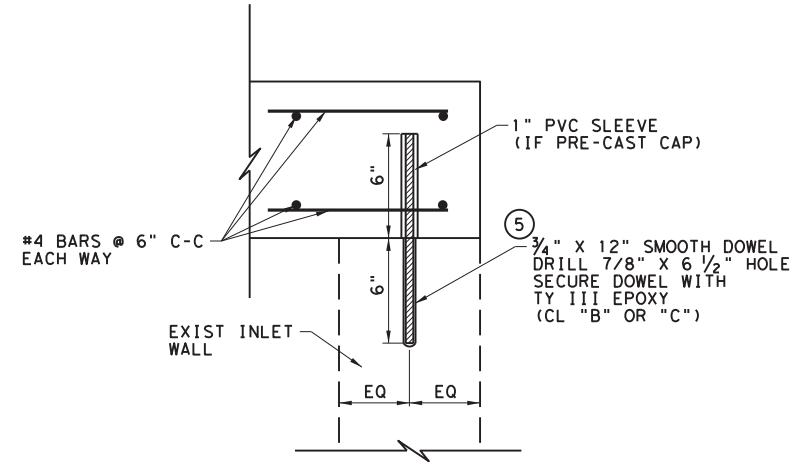
PROPOSED GRATE INLET CAP



PROPOSED PIPE CAP



INLET CAP TY 1 (NTS) ② ④



DOWEL DETAIL (NTS)

- NOTES:
- ① TOP OF PROPOSED FILL WILL MATCH NATURAL GROUND ELEVATION.
 - ② SEE INLET CAP TY 1 DETAIL THIS SHEET
 - ③ CUT STEEL FLUSH WITH CONCRETE & LEVEL WITH GROUT.
 - ④ TY 1 CAP IS TO BE INSTALLED FOR ALL INLET CAPS UNLESS OTHERWISE CALLED OUT ON PLANS.
 - ⑤ 4 DOWELS PLACED AT CORNERS OF INLETS OR MANHOLE. (MIN OF 4 DOWELS)

DRAINAGE DETAIL SUMMARY			
LOCATION	0401 6001	0479 6006	0496 6007
	FLOWABLE BACKFILL	ADJUSTING INLET (CAP)	REMOVE STR (PIPE)
	CY	EA	LF
STA. 935+46	8.50	2	8
SHEET TOTALS:	8.50	2	8



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12/02/2020
US 87

DRAINAGE DETAILS

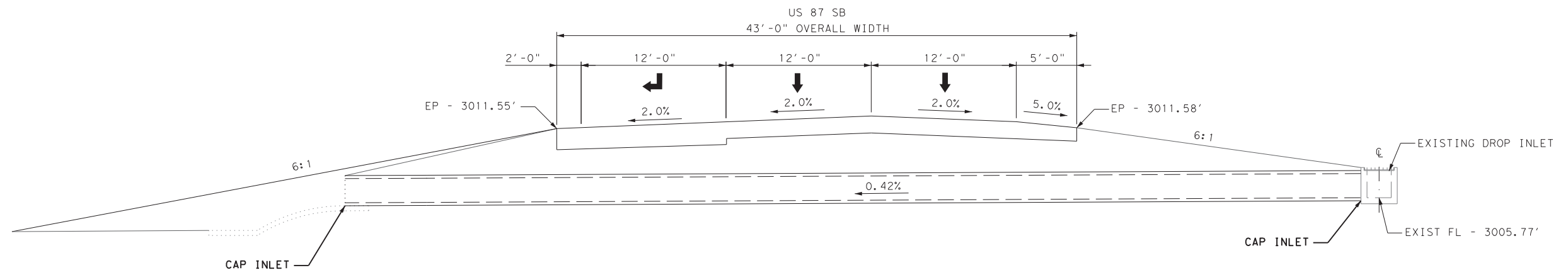
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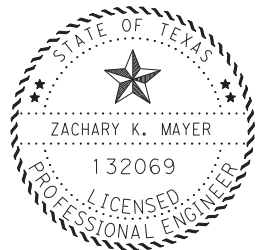
SHEET 2 OF 3

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		52

DATE: 12/2/2020 9:31:49 AM
 FILE: I:\AMATPD\Construction Projects\0041-05\053 Candidate FLAP\4 - Design\Plan Set\5. Drainage\053_Drainage_Detail\5.dgn



US 87 SB STA. 935+46 (NORTH FACING)



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12/02/2020
 US 87

DRAINAGE DETAILS

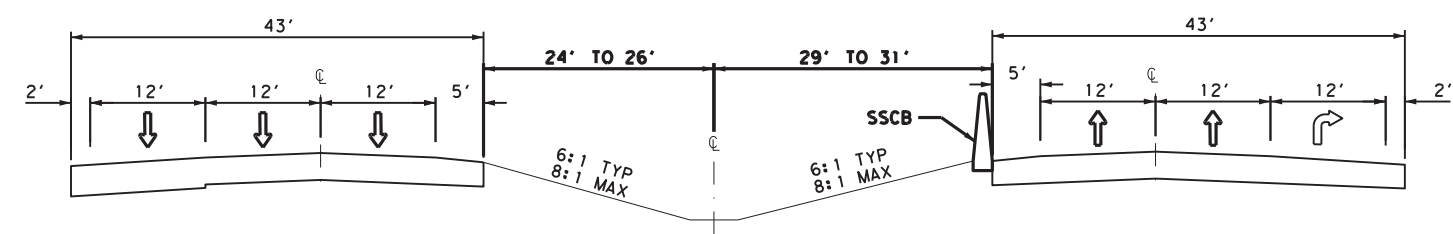
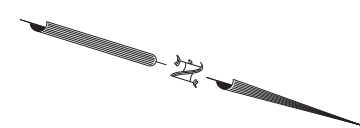
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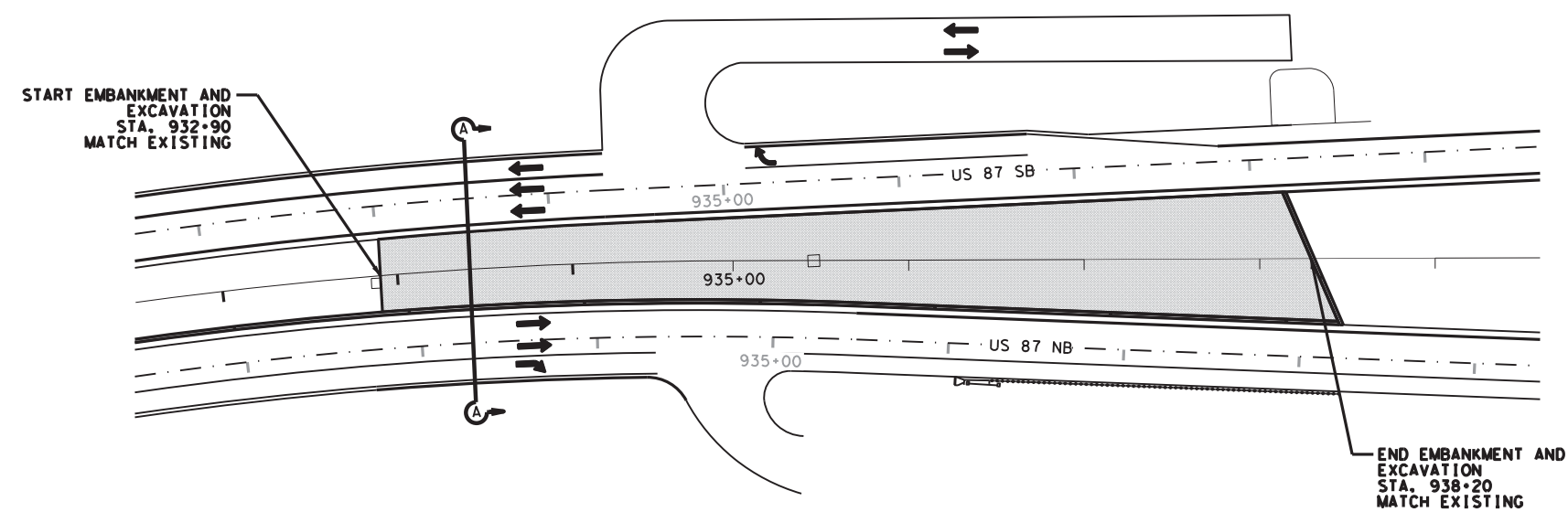
DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		53

SEE PREVIOUS SHEET FOR QUANTITIES.

DATE: 12/2/2020 9:46:16 AM
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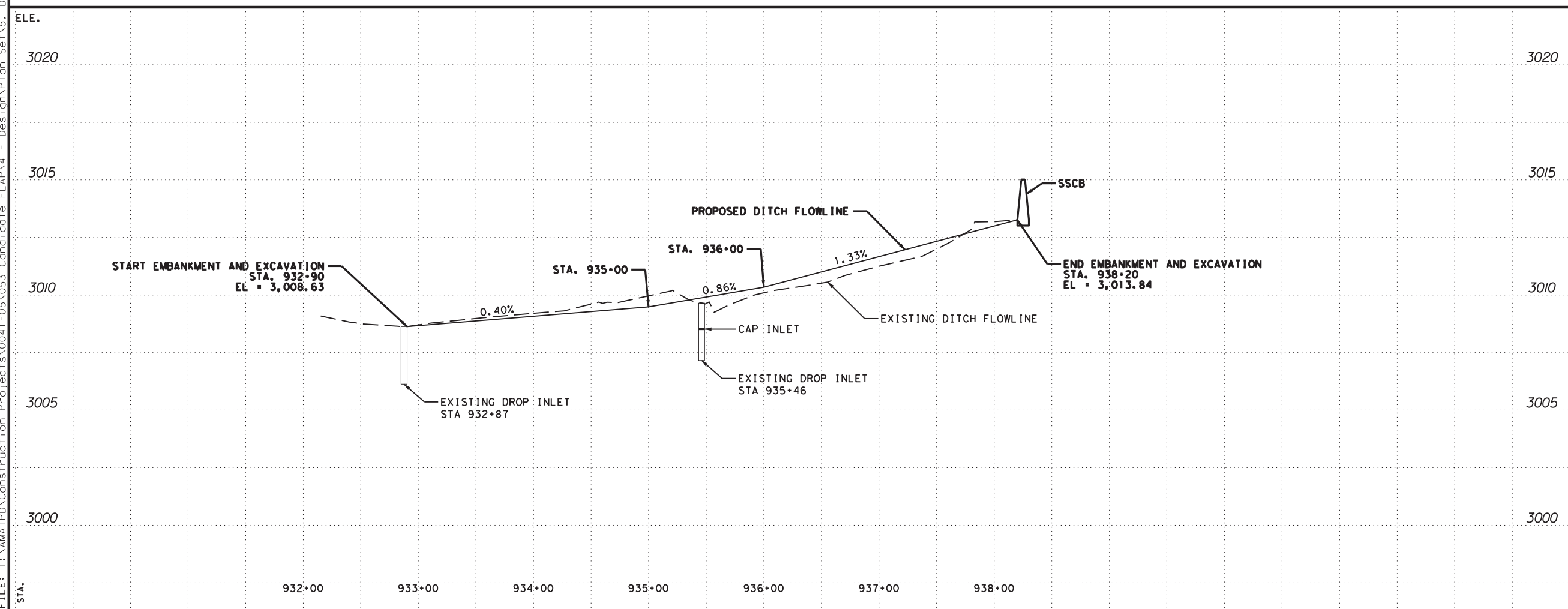
SECTION A-A



LEGEND:

LIMITS OF BLADING

NOTE: EMBANKMENT AND EXCAVATION WILL NOT BE PAID FOR DIRECTLY BUT WILL BE CONSIDERED SUBSIDIARY TO ITEM 150-6001.



Zachary K. Mayer P.E.

12/02/2020
US 87

PROPOSED DITCH
PLAN AND PROFILE

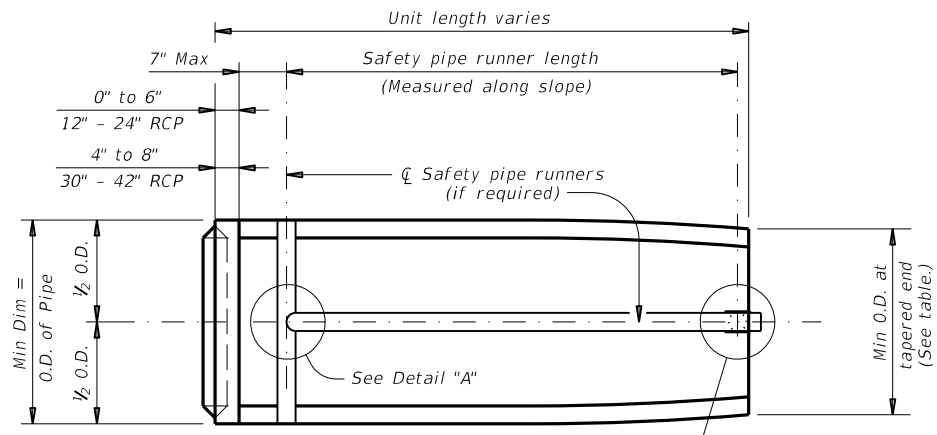
HORIZ: 1" = 100'
VERT: 1" = 5'



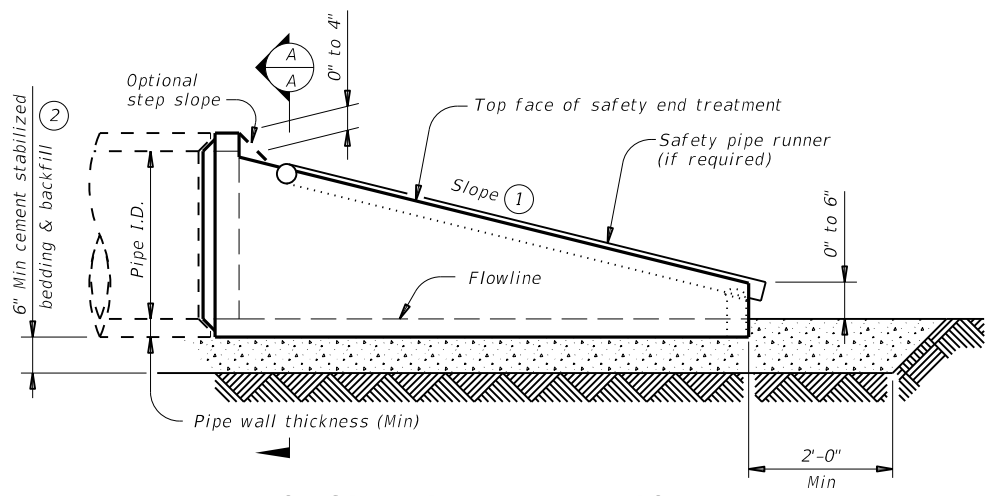
SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		54

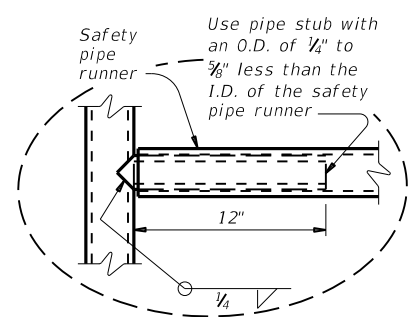
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 The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of units or for the accuracy of the information presented.



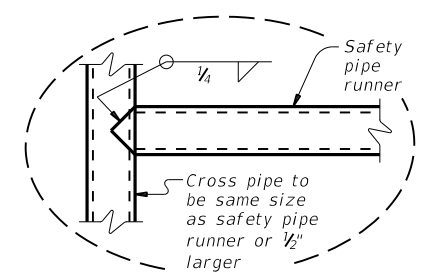
PLAN VIEW
(Showing spigot end connection.)



LONGITUDINAL ELEVATION
(Showing spigot end connection.)

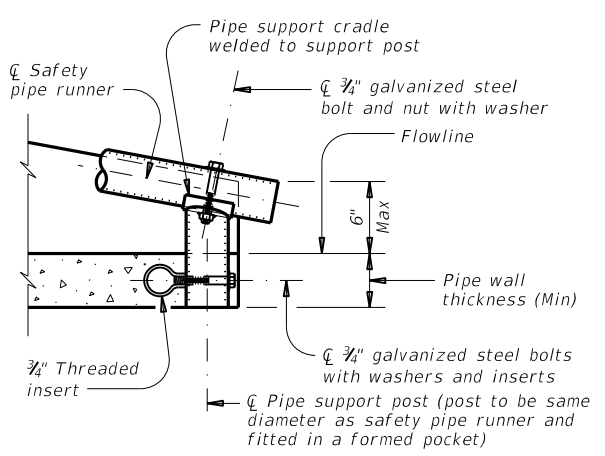


OPTION A

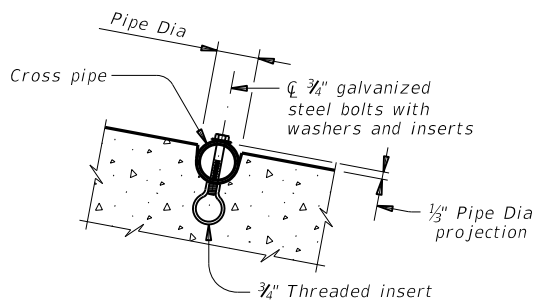


OPTION B

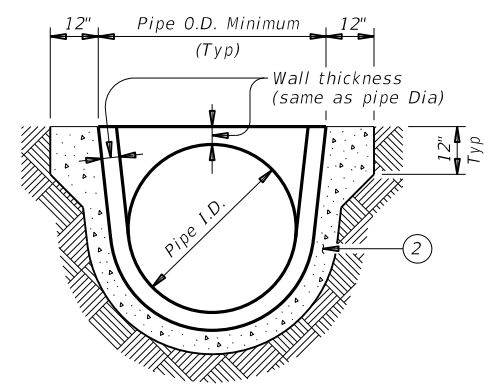
DETAIL A



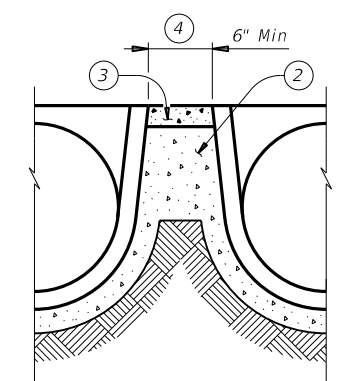
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS
(If required)



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS
(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

MAX SAFETY PIPE RUNNER LENGTHS AND REQUIRED SAFETY PIPE RUNNER SIZES

Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 1/2" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. / ft. of pipe)	Slope	Minimum Length of Unit	Single Pipe		Multiple Pipe	
							Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	16"	16"	0.07 Circ.	3:1	2'-0"	≤ 45°	No	≤ 45°	No
15"	2 1/4"	19 1/2"	19"	0.07 Circ.	3:1	2'-10"	≤ 45°	No	≤ 45°	No
18"	2 1/2"	23"	21 1/2"	0.07 Circ.	3:1	3'-8"	≤ 45°	No	≤ 45°	No
24"	3"	30"	27"	0.07 Circ.	3:1	5'-3"	≤ 45°	No	≤ 30°	No
									4:1	7'-0"
30"	3 1/2"	37"	31"	0.18 Circ.	3:1	6'-3"	≤ 15°	No	≤ 15°	No
									4:1	8'-2"
36"	4"	44"	36"	0.19 Ellip.	3:1	7'-10"	= 0°	No	≥ 0°	Yes
									4:1	10'-4"
42"	4 1/2"	51"	41 1/2"	0.23 Ellip.	3:1	9'-6"	≥ 0°	Yes	≥ 0°	Yes
									4:1	12'-6"

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

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

GENERAL NOTES:

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

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

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

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

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

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Bridge Division Standard

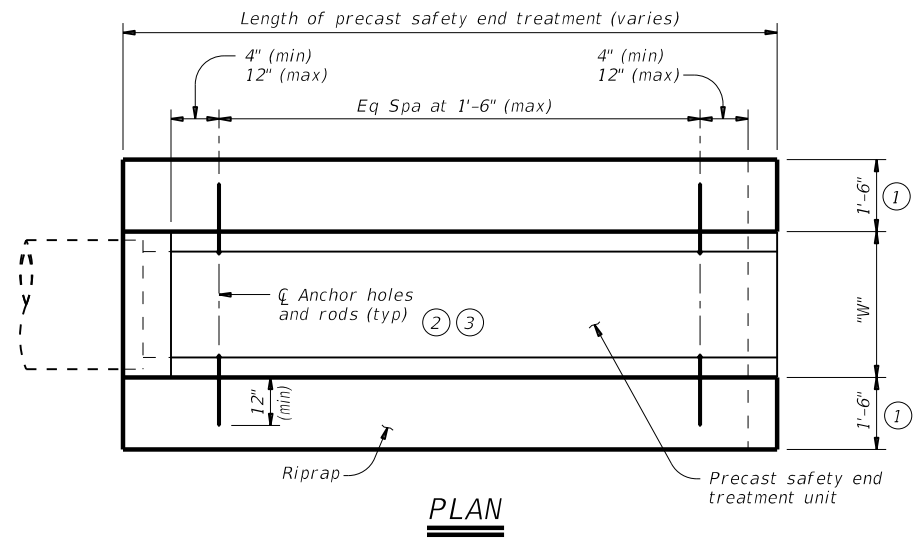
PRECAST SAFETY END TREATMENT TYPE II ~ CROSS DRAINAGE

PSET-RC

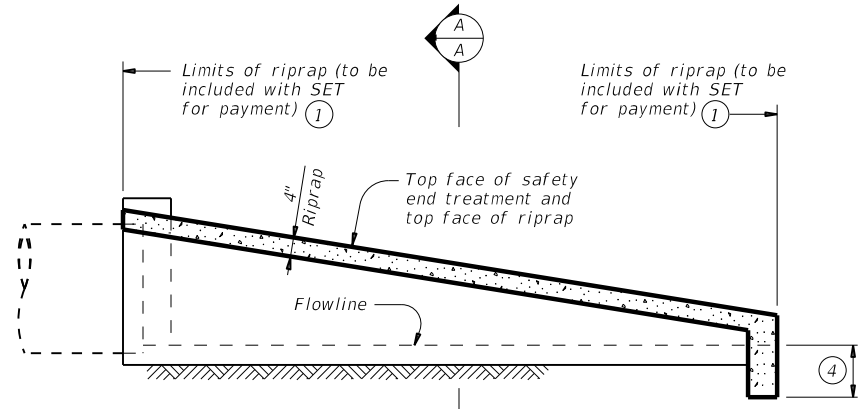
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CONTRACT: February 2020	CONTRACT SECT: 0041 05	JOB: 053	HIGHWAY: US 87	
DIST: AMA	COUNTY: POTTER	SHEET NO: 55		

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of units or for the accuracy of the information shown on this drawing. The user of this drawing is advised to verify the accuracy of the information shown on this drawing.

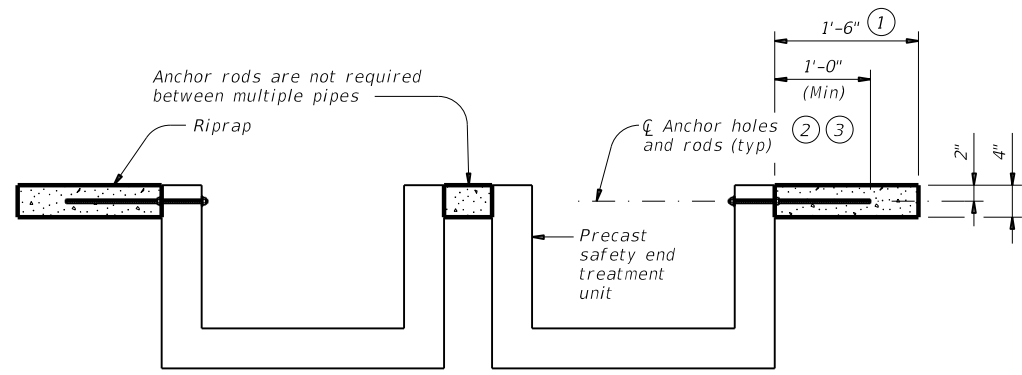
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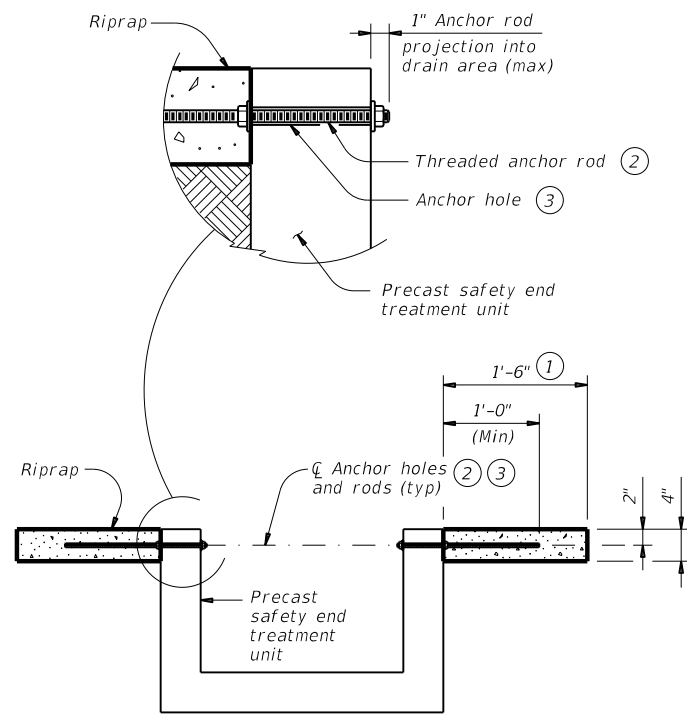
PLAN



LONGITUDINAL ELEVATION



MULTIPLE PIPE INSTALLATION



SINGLE PIPE INSTALLATION

SECTION A-A

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY)

Nominal Culvert (Pipe) I.D.	PSET-SC and PSET-SP Standards					PSET-RC and PSET-RP Standards		
	Unit Width "W"	Side Slope			Unit Width "W"	Side Slope		
		3:1	4:1	6:1		3:1	4:1	6:1
12"	23.0"	0.1	0.2	0.2	16.0"	0.1	0.1	0.2
15"	26.5"	0.2	0.2	0.3	19.5"	0.1	0.2	0.2
18"	30.0"	0.2	0.2	0.3	23.0"	0.2	0.2	0.3
24"	37.0"	0.3	0.3	0.5	30.0"	0.2	0.3	0.4
30"	44.5"	0.3	0.4	0.6	37.0"	0.3	0.3	0.5
36"	51.5"	0.4	0.5	0.7	44.0"	0.3	0.4	0.6
42"	58.5"	0.5	0.6	0.8	51.0"	0.4	0.5	0.7

- ① Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap". When riprap is cast integrally with the precast safety end treatment, this dimension is 1'-0" minimum.
- ② 1#2" Dia ASTM A307 Gr A threaded anchor rod with 2 nuts and 2 washers. Galvanize all components in accordance with Item 445, "Galvanizing". Repair galvanizing that is damaged during transport or construction in accordance with the specifications.
- ③ 3#4" through holes in walls of safety end treatment for riprap anchor rods may be drilled with rotary (coring or masonry) type drilling equipment or may be formed. Do not use percussive (star) type drilling equipment. If holes are drilled, patch spalls in the inside face of the wall exceeding 1#2" from the holes.
- ④ Provide riprap toe wall when dimension is shown elsewhere in the plans or when field conditions require a toe wall.
- ⑤ Quantities shown are for one end of one reinforced concrete pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only. Quantities are based on the minimum unit lengths shown on the Precast Safety End Treatment (SET) standard sheets.

MATERIAL NOTES:

Provide Class "B" riprap in accordance with Item 432, "Riprap".
 Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. The anchor rods shown are always required.

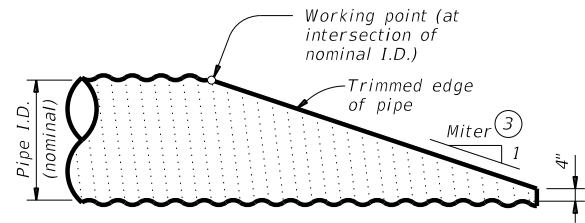
GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".
 Refer to PSET-SC or PSET-SP standard sheets for details of square safety end treatments not shown. Refer to PSET-RC or PSET-RP standard sheets for details of round safety end treatments not shown.
 For precast units with integrally cast riprap, substitute reinforcing steel in the amount on 0.26 in./ft. minimum for the threaded anchor rods shown. When requested, submit sealed engineering drawings for approval prior to construction. Shop drawings will not be required. Note that a proprietary precast unit with integral riprap is available from L&R Precast Concrete Works, Inc. (956) 583-6293 or www.lrpccast.com.
 Payment for riprap and toewalls is included in the price bid for each safety end treatment.

These riprap details are only applicable when notes that require placement of riprap with precast safety end treatments are shown elsewhere in the plans.
 Precast units with integrally cast riprap are permitted unless noted otherwise on the plans.

				Bridge Division Standard	
PRECAST SAFETY END TREATMENT TYPE II RIPRAP DETAILS PSET-RR					
FILE: psetrrse-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF	
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0041	05	053	US 87	
	DIST	COUNTY	SHEET NO.		
	AMA	POTTER	56		

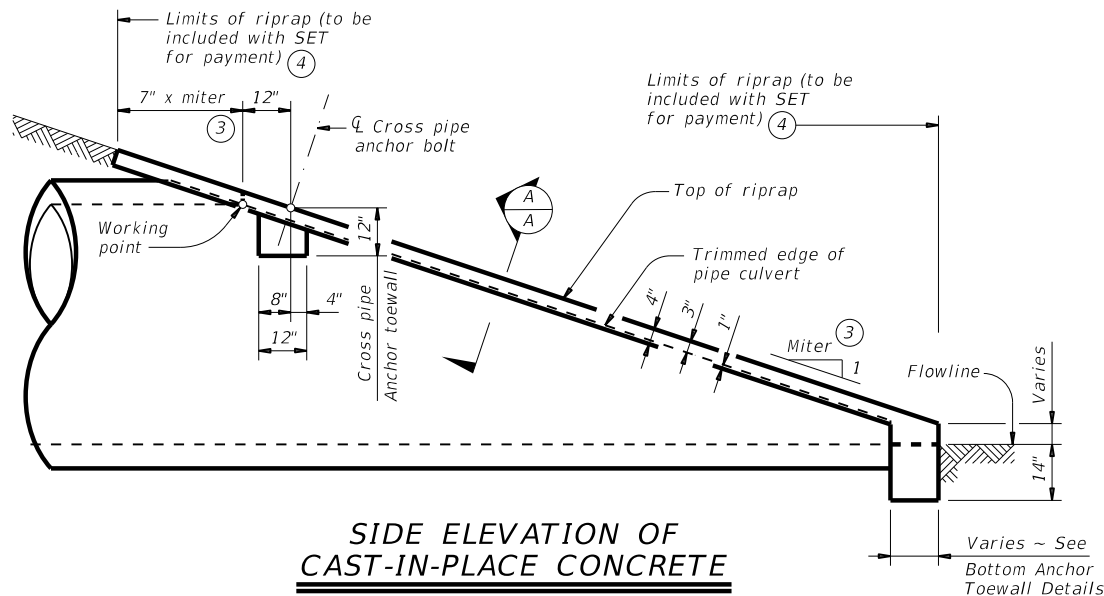
11/17/2020 9:49:14 AM
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 No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard is governed by the "Texas Engineering Practice Act".



NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

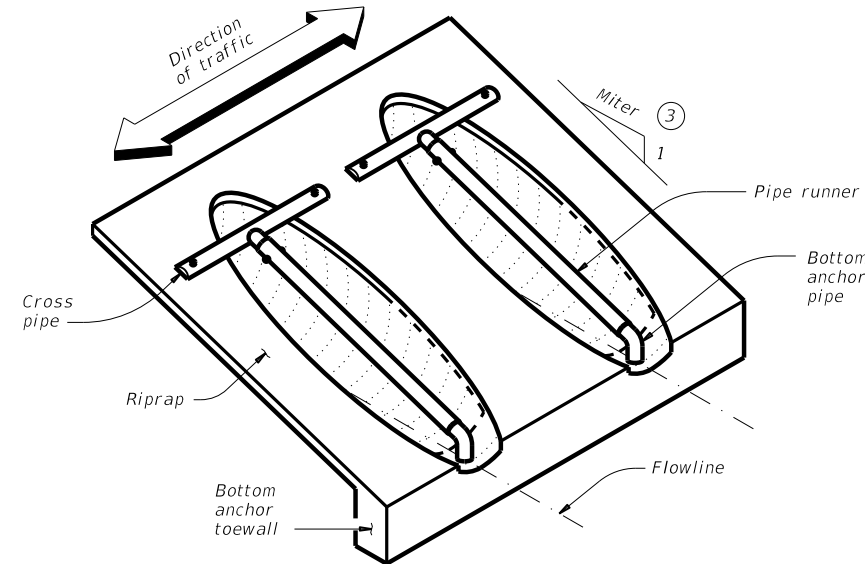
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert. Details of reinforced concrete pipe (RCP) culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details of corrugated metal pipe (CMP) culvert are similar. Pipe runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS ① ②

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1' - 7"	3' - 5"	N/A	N/A	N/A	5' - 10"	N/A	N/A	N/A	8' - 1"	N/A	N/A	N/A	12' - 9"
27"	1' - 8"	3' - 8"	N/A	N/A	5' - 5"	6' - 11"	N/A	N/A	7' - 7"	9' - 7"	N/A	N/A	11' - 11"	14' - 11"
30"	1' - 10"	3' - 11"	N/A	N/A	6' - 4"	8' - 0"	N/A	N/A	8' - 9"	11' - 0"	N/A	N/A	13' - 8"	17' - 0"
33"	1' - 11"	4' - 2"	6' - 2"	6' - 5"	7' - 3"	9' - 1"	8' - 6"	8' - 10"	10' - 0"	12' - 5"	13' - 3"	13' - 9"	15' - 5"	19' - 2"
36"	2' - 1"	4' - 5"	6' - 11"	7' - 3"	8' - 2"	10' - 2"	9' - 6"	9' - 11"	11' - 2"	13' - 10"	14' - 9"	15' - 3"	17' - 2"	21' - 3"
42"	2' - 4"	4' - 11"	8' - 6"	8' - 10"	9' - 11"	12' - 4"	11' - 7"	12' - 0"	13' - 6"	16' - 8"	17' - 9"	18' - 5"	20' - 8"	25' - 7"
48"	2' - 7"	5' - 5"	10' - 1"	10' - 5"	11' - 9"	N/A	13' - 7"	14' - 2"	15' - 10"	N/A	20' - 9"	21' - 6"	24' - 2"	N/A
54"	3' - 0"	5' - 11"	11' - 8"	12' - 1"	N/A	N/A	15' - 8"	16' - 3"	N/A	N/A	23' - 10"	24' - 8"	N/A	N/A
60"	3' - 3"	6' - 5"	13' - 3"	N/A	N/A	N/A	17' - 9"	N/A	N/A	N/A	26' - 10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS ③

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED ②

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always required	Always required

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS ①

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10' - 0"
4" STD	4.500"	4.026"	19' - 8"
5" STD	5.563"	5.047"	34' - 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) ⑤

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

① Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.

② This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
 For 54" culvert pipes, the skew must not exceed 15°.
 For 48" culvert pipes, the skew must not exceed 30°.
 For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT Roadway Design Manual.

③ Miter = slope of mitered end of pipe culvert.

④ Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

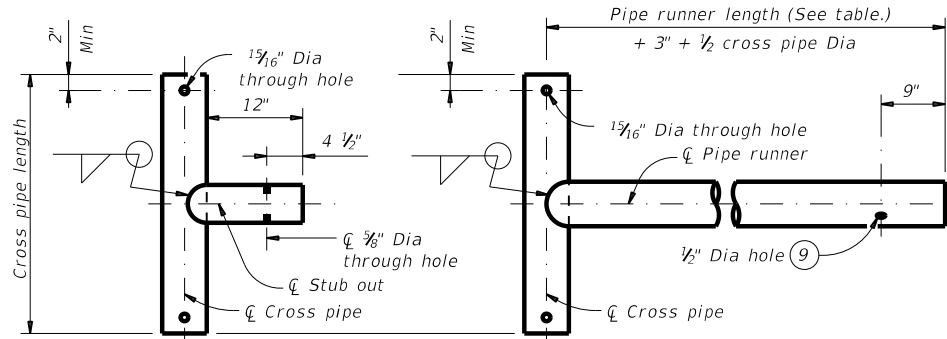
⑤ Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

SHEET 1 OF 2

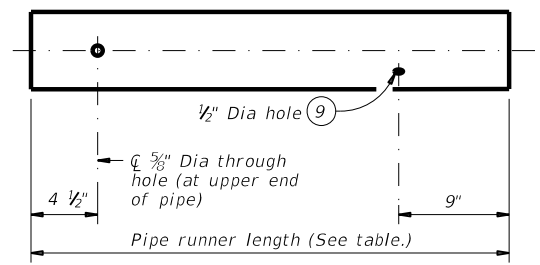
		Bridge Division Standard	
SAFETY END TREATMENT FOR 12" DIA TO 60" DIA PIPE CULVERTS TYPE II ~ CROSS DRAINAGE			
SETP-CD			
FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP
©TxDOT February 2020	CON: 0041	SECT: 05	JOB: 053
REVISIONS	DIST: AMA	COUNTY: POTTER	HIGHWAY: US 87
			SHEET NO.: 57

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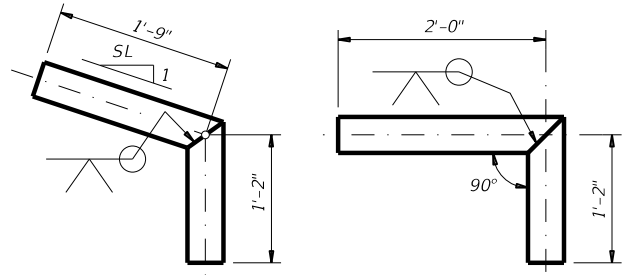


OPTION A1 **OPTION A2**
CROSS PIPE AND CONNECTIONS DETAILS

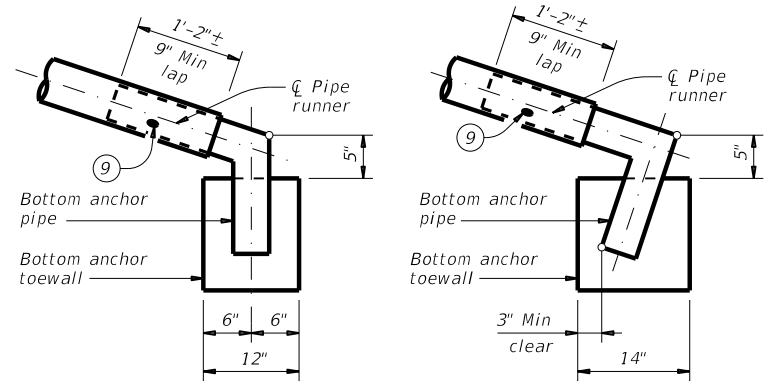


NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS



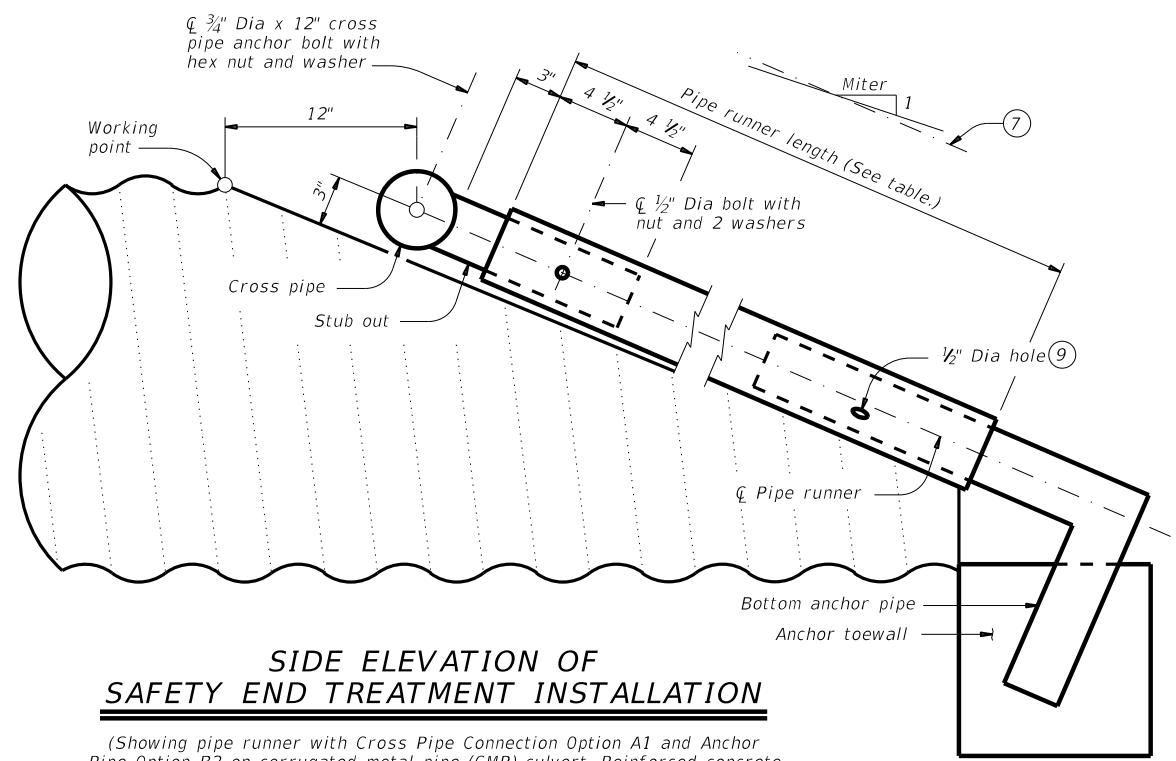
OPTION B1 **OPTION B2**
BOTTOM ANCHOR PIPE DETAILS ⑩



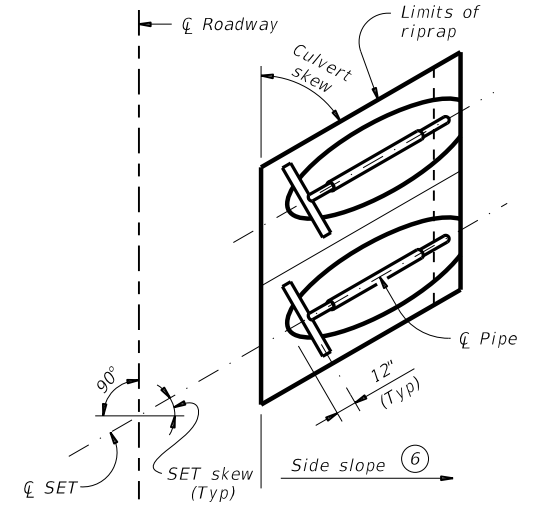
OPTION B1 **OPTION B2**
BOTTOM ANCHOR TOEWALL DETAILS
 (Culvert and riprap not shown for clarity.)

MATERIAL NOTES:
 Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
 Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
 Provide ASTM A307 bolts and nuts.
 Galvanize all steel components, except concrete reinforcing, after fabrication.
 Repair galvanizing damaged during transport or construction in accordance with the specifications.

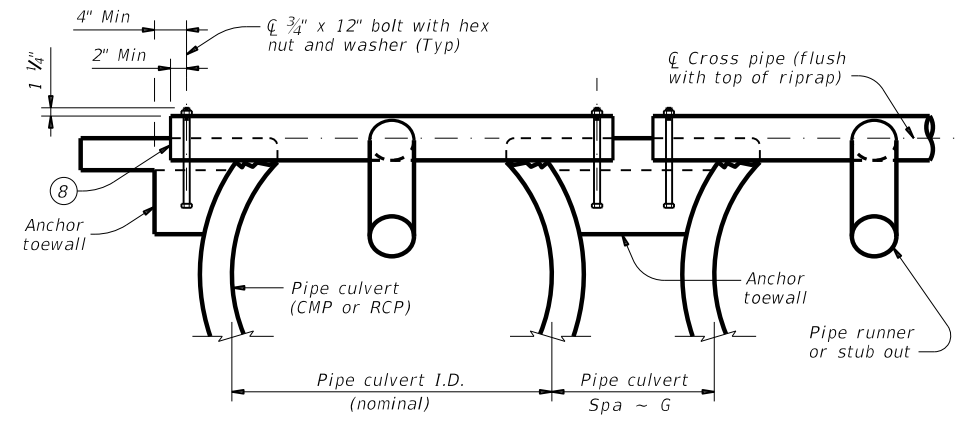
GENERAL NOTES:
 Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
 Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
 Payment for riprap and toewall is included in the price bid for each safety end treatment.
 Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".



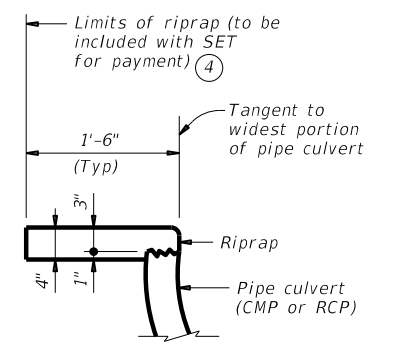
SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION
 (Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity.)



PLAN OF SKEWED INSTALLATION



SECTION A-A
 SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

- ④ Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".
- ⑥ Recommended values of side slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.
- ⑦ Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.
- ⑧ Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.
- ⑨ After installation, inspect the 1/2 inch hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.
- ⑩ At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.










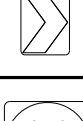
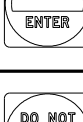





SECTION A-A

SHEET 2 OF 2

		Bridge Division Standard	
SAFETY END TREATMENT FOR 12" DIA TO 60" DIA PIPE CULVERTS TYPE II ~ CROSS DRAINAGE			
SETP-CD			
FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP
©TxDOT February 2020	CONT SECT	JOB	HIGHWAY
REVISIONS	0041 05	053	US 87
	DIST	COUNTY	SHEET NO.
	AMA	POTTER	58

DATE: 11/17/2020 9:50:34 AM
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SUMMARY OF SMALL SIGNS - CSJ: 0041-05-053 - NORTHBOUND LANES

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)				BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
							POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION	
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	PREFABRICATED P = "Plain" T = "T" U = "U" 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	
918+66	L1	W1-2R	RIGHT CURVE 	48 X 48	X		10BWG	1	SA	T	
918+66	R2	W1-2R	RIGHT CURVE 	48 X 48	X		10BWG	1	SA	T	
922+77	R3	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER 	48 X 48	X		10BWG	1	SA	T	
924+49	L4	W1-8R	CHEVRON ALIGNMENT - RIGHT 	30 X 36	X		10BWG	1	SA	P	
926+49	L5	W1-8R	CHEVRON ALIGNMENT - RIGHT 	30 X 36	X		10BWG	1	SA	P	
928+48	L6	W1-8R	CHEVRON ALIGNMENT - RIGHT 	30 X 36	X		10BWG	1	SA	P	
930+45	L7	W1-8R	CHEVRON ALIGNMENT - RIGHT 	30 X 36	X		10BWG	1	SA	P	
932+42	L8	W1-8R	CHEVRON ALIGNMENT - RIGHT 	30 X 36	X		10BWG	1	SA	P	
934+39	L9	W1-8R	CHEVRON ALIGNMENT - RIGHT 	30 X 36	X		10BWG	1	SA	P	
934+00	R4	R5-1	DO NOT ENTER 	48 X 48			10BWG	1	SA	T	
934+00	L10	R5-1	DO NOT ENTER 	48 X 48			10BWG	1	SA	T	
934+30	L11	R1-2	YIELD (REMOVE) 		X						
934+80	L12	R6-1R	ONE-WAY (IN RIGHT ARROW) 	54 X 18	X		10BWG	1	SA	T	
935+60	R5	R6-1R R1-1 W4-4P	ONE-WAY (IN RIGHT ARROW) STOP CROSS TRAFFIC DOES NOT STOP (PLAQUE)   	54 X 18 36 X 36 36 X 18	X		S80	1	SA	P	BM

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.100"
7.5 or Greater	0.125"

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

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












SUMMARY OF SMALL SIGNS

SOSS

FILE: slums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0041	05	053	US 87
4-16	DIST	COUNTY	SHEET NO.	
8-16	AMA	POTTER	59	

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SUMMARY OF SMALL SIGNS - CSJ: 0041-05-053 - SOUTHBOUND LANES

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)				BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)	
							POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION		
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	PREFABRICATED P = "Plain" T = "T" U = "U"		1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels
922+24	L13	M1-4 M1-4	US 87 US 287 	24 X 24 30 X 24	X		10BWG	1	SA	P		
933+30	L14	D7-6aTR	HISTORICAL MARKER 1 MILE ON RIGHT 	48 X 48	X		10BWG	1	SA	T		
934+10	L15	R6-1R R1-1 W4-4P	ONE-WAY (IN RIGHT ARROW) STOP CROSS TRAFFIC DOES NOT STOP (PLAQUE) 	54 X 18 36 X 36 36 X 18	X		S80	1	SA	P	BM	
934+00	R6	R6-1R	ONE-WAY (IN RIGHT ARROW) 	54 X 18	X		10BWG	1	SA	T		
935+20	L16	R5-1	DO NOT ENTER 	48 X 48	X		10BWG	1	SA	T		
935+20	R7	R5-1	DO NOT ENTER 	48 X 48	X		10BWG	1	SA	T		
935+46	R8	R6-1	ONE-WAY (REMOVE) 									
935+52	R9	R1-2	YIELD (REMOVE) 									
937+35	L17	D14-4T	ADOPT A HIGHWAY (RELOCATE) 									

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.100"
7.5 or Greater	0.125"

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

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

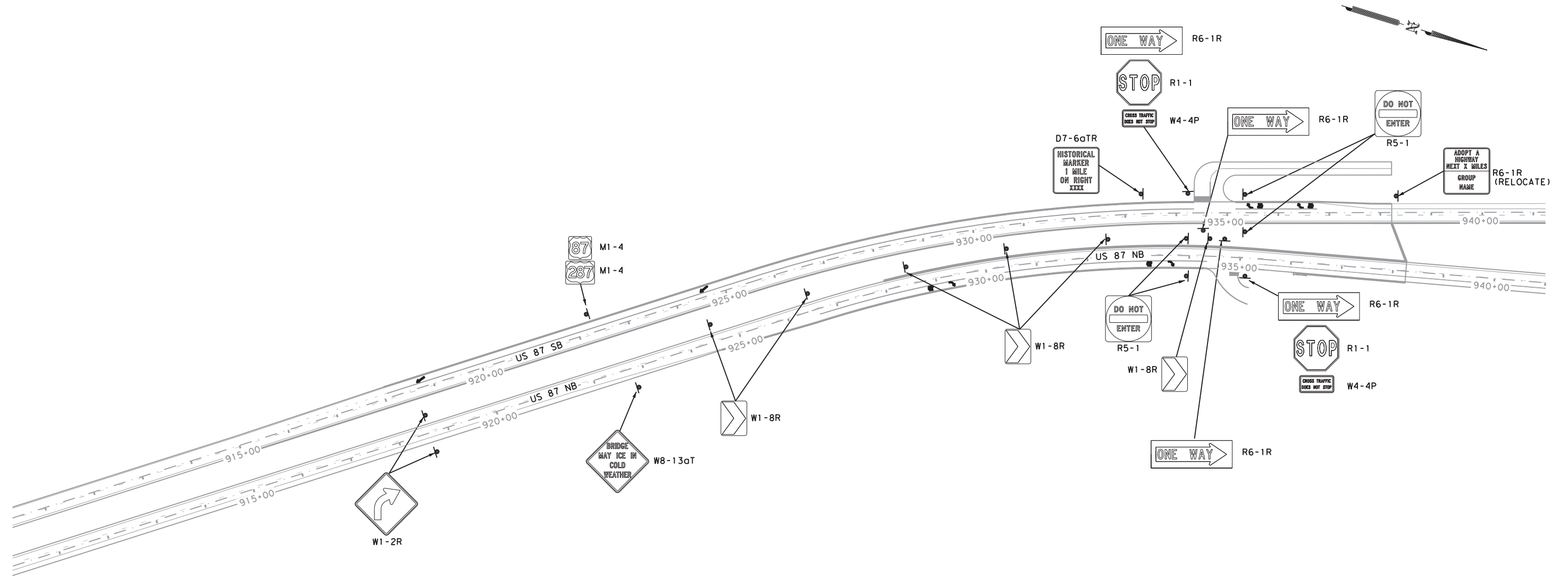


SUMMARY OF SMALL SIGNS

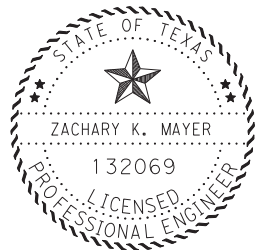
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© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
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US 87 PROPOSED SIGN LAYOUT



Zachary K. Mayer P.E.

12/02/2020
US 87

SIGN LAYOUT

SCALE: 1" = 200'



SHEET 1 OF 1

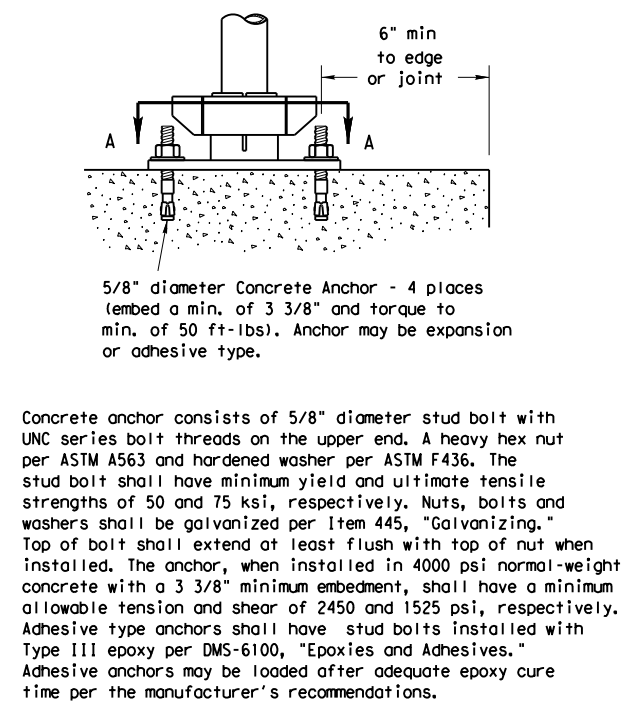
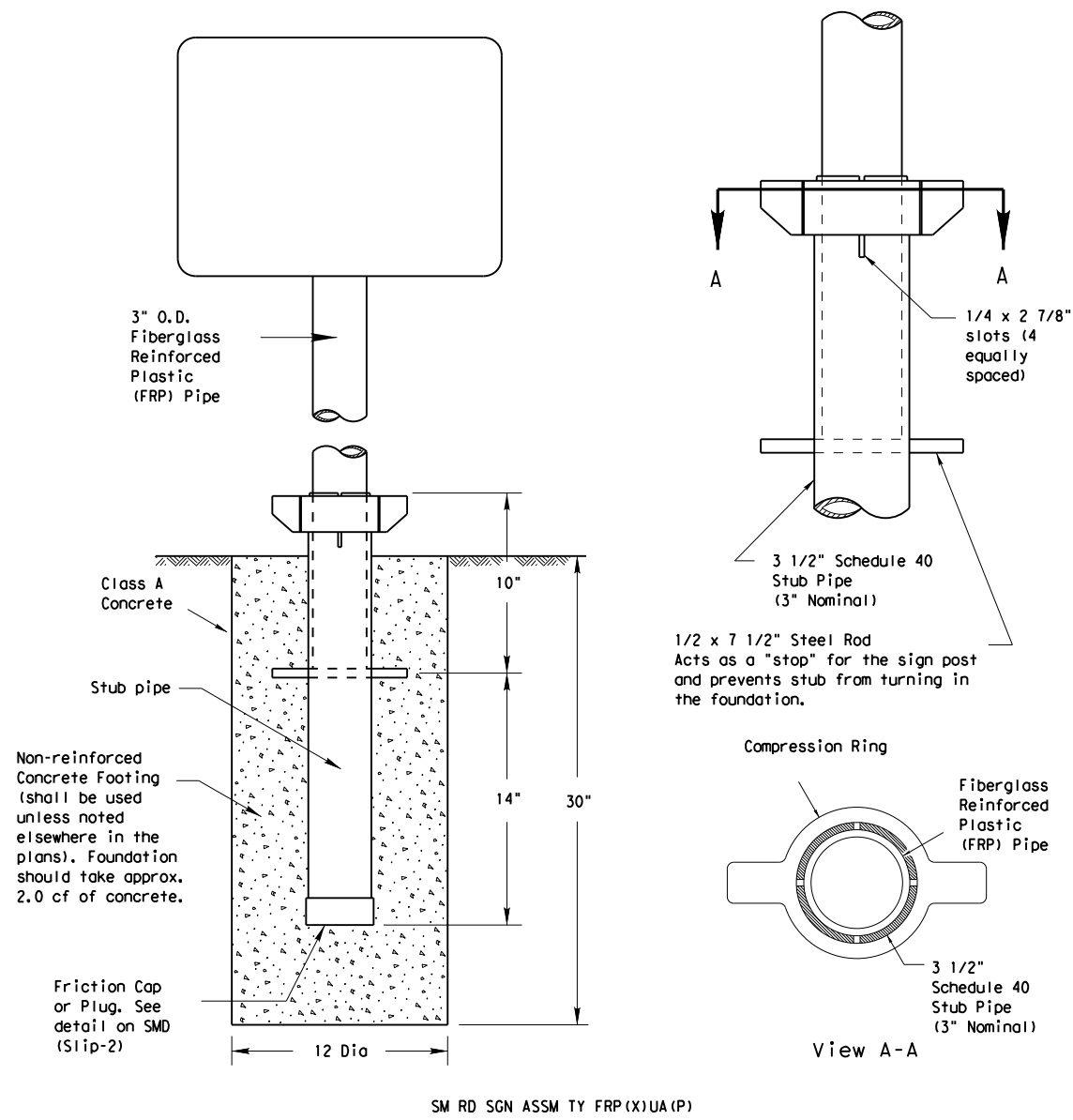
NOTES:

1. REFERENCE SMALL SIGN SUMMARY SHEETS FOR TOTALS AND ADDITIONAL NOTES PERTAINING TO THIS PROJECT.
2. THE CONTRACTOR WILL BE RESPONSIBLE FOR REPLACING SIGNS IN THEIR ORIGINAL LOCATIONS, EXCEPT AS CALLED OUT IN THESE PLANS OR AS DIRECTED BY THE ENGINEER.
3. SIGNS SHALL BE INSTALLED IN ACCORDANCE TO THE LATEST TxDOT STANDARDS AND THE LATEST EDITION OF THE TEXAS MUTCD.
4. ADDITIONAL SIGNS NOT COVERED IN THESE PLANS SHALL REMAIN AS IS, UNLESS DIRECTED BY THE ENGINEER.

LOCATION	SUMMARY OF SMALL SIGNS				
	0644 6001	0644 6004	0644 6028	0644 6068	0644 6076
	IN SM RD SN SUP&AM TY10BWG (1) SA (P)	IN SM RD SN SUP&AM TY10BWG (1) SA (T)	IN SM RD SN SUP&AM TYS80 (1) SA (P-BM)	RELOCATE SM RD SN SUP&AM TY 10BWG	REMOVE SM RD SN SUP&AM
	EA	EA	EA	EA	EA
NORTHBOUND LANES	6	6	1		1
SOUTHBOUND LANES	1	4	1	1	2
SHEET TOTALS:	7	10	2	1	3

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY	SHEET NO.	
JD	ZM	AMA	POTTER	61	

Universal Anchor System with Fiberglass Reinforced Plastic (FRP) Post



GENERAL NOTES:

1. FRP sign supports for a single type sign support may be used for signs up to and including 16 square feet. Dual post installation may be used for signs up to and including 32 square feet.
2. All nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing."
3. See the Traffic Operations Division website for detailed drawings of sign clamps. The website address is: <http://www.txdot.gov/publications/traffic.htm>

FRP POST REQUIREMENTS

1. Materials shall conform to the requirements of Departmental Material Specification DMS-4410 and will be furnished in a yellow or gray color as specified elsewhere in the plans.
2. Thickness of FRP sign support is 0.125" + 0.031", - 0.0".
3. FRP sign supports are prequalified by the Traffic Operations Division. Prequalification procedures are obtained by writing:
Texas Department of Transportation
Traffic Operations Division
125 East 11th Street
Austin, Texas 78701-2483

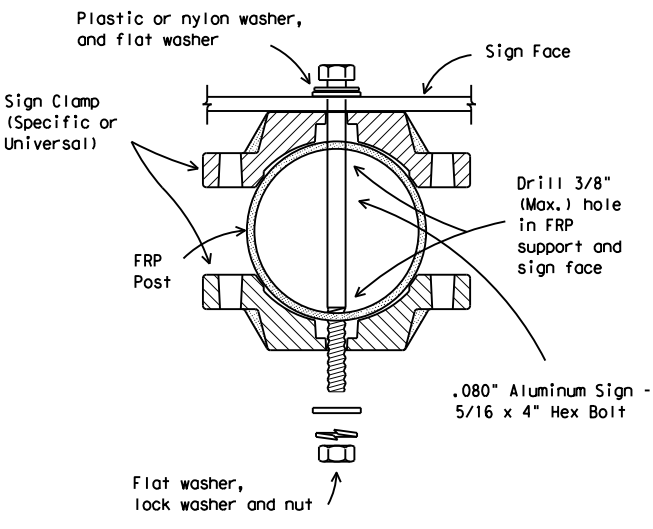
UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURES

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Insert base post in foundation hole to depths shown and fill hole with concrete. Cut base post from bottom and ensure a minimum of 18" embedment if installed in solid rock.
4. Level and plumb the base post with coupler using a torpedo level and let concrete set a minimum of 4 days, unless otherwise directed by Engineer. Bottom of base post slots shall be above the concrete footing.
5. Attach sign to FRP post.
6. Insert sign post into base post. Lower until the post comes to rest on the steel rod.
7. Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
8. Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

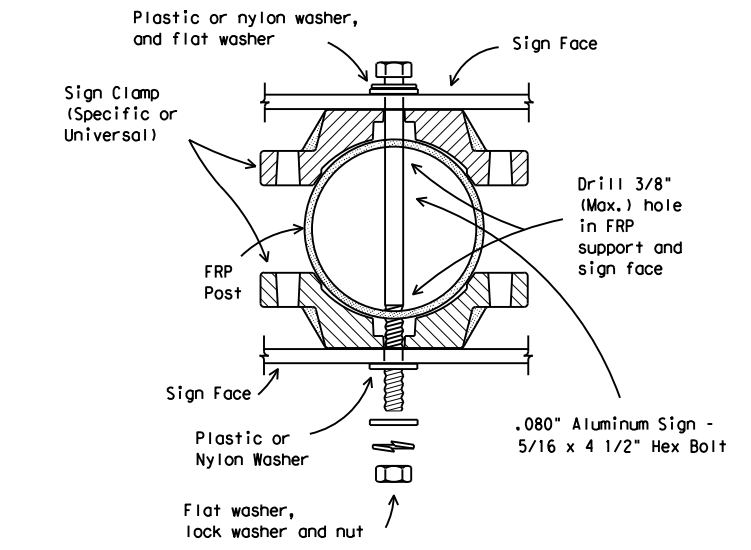
BOLT DOWN SIGN SUPPORT


1. Position base plate with coupler on existing concrete.
2. Drill holes into concrete and insert the 5/8" diameter bolts with wedge anchors, and tighten nuts.
3. Attach sign to FRP post.
4. Insert bottom of sign post into pipe stub.
5. Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
6. Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

Typical Sign Mounting Detail for FRP Support with Single Sign



Typical Sign Mounting Detail for FRP Support with Back-to-Back Signs





Texas Department of Transportation
Traffic Operations Division

**SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
UNIVERSAL ANCHOR SYSTEM
WITH FRP POST**

SMD (FRP) -08

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
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		DIST	COUNTY		SHEET NO.
		AMA	POTTER		62

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

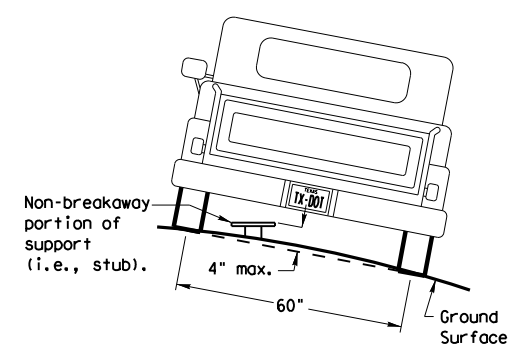
Anchor Type

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

Sign Mounting Designation

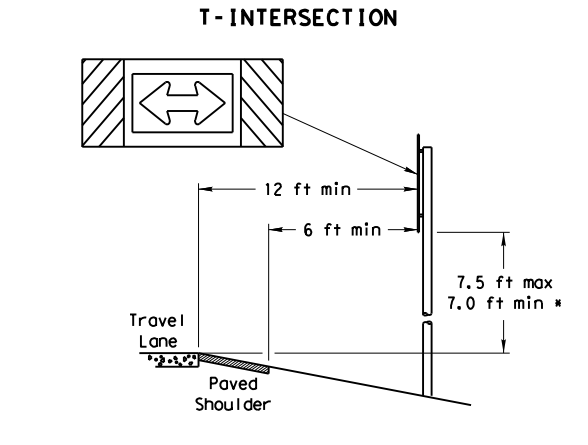
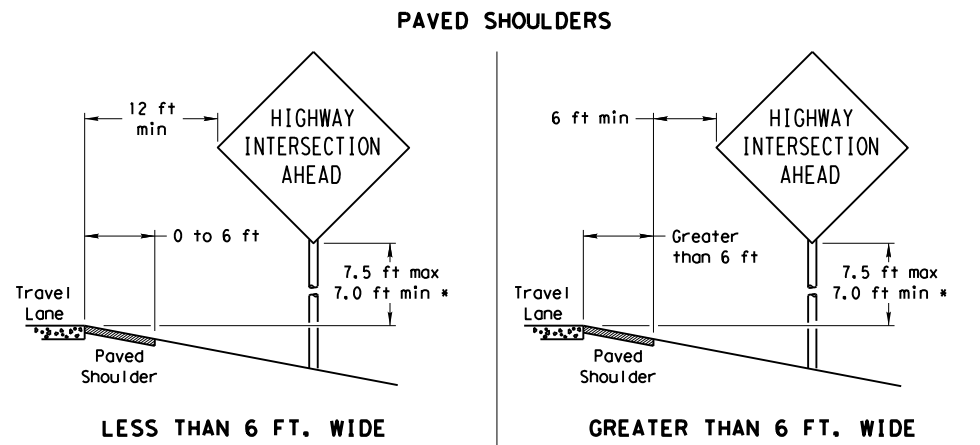
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
 T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
 U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
 IF REQUIRED
 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
 BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))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

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT

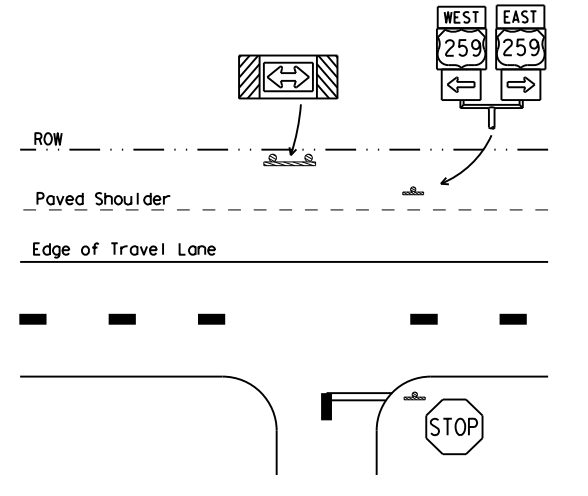
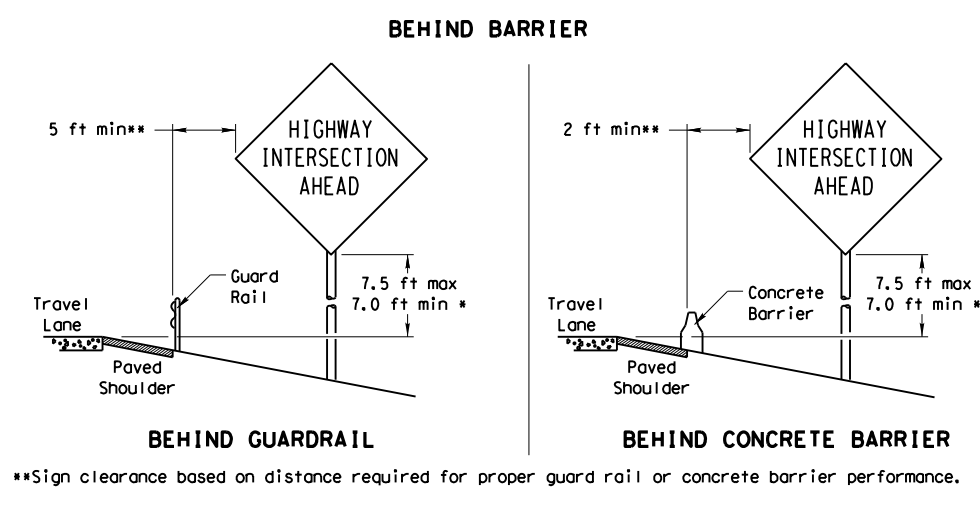
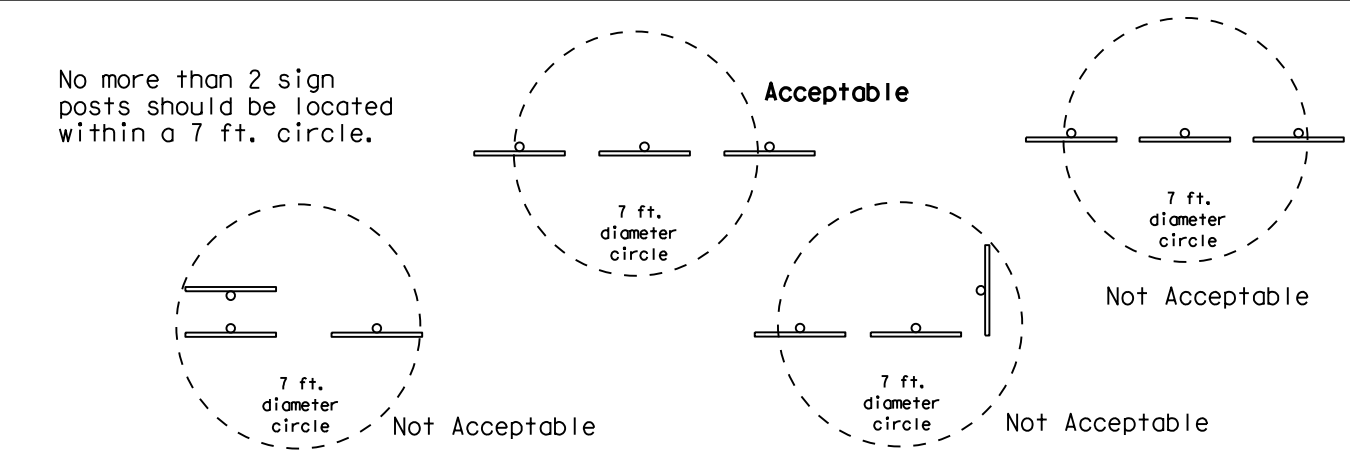


To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

SIGN LOCATION



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



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

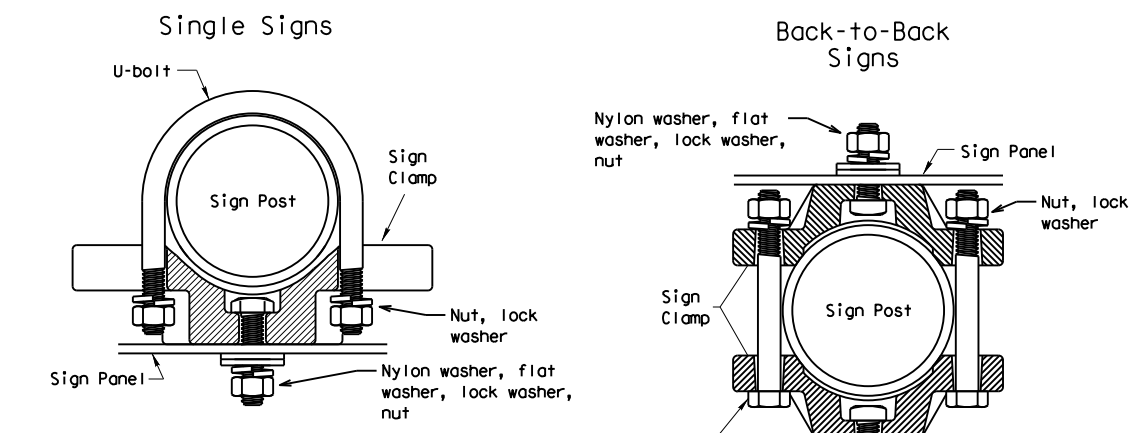
- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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

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

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

TYPICAL SIGN ATTACHMENT DETAIL



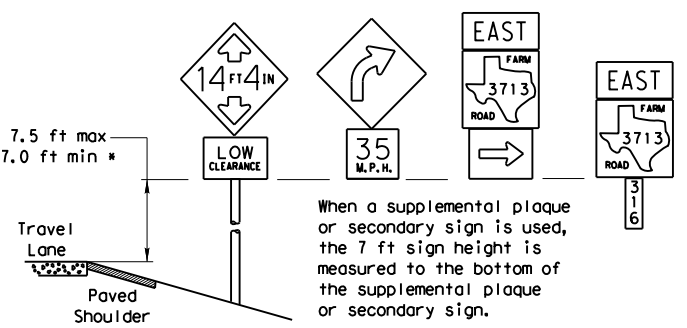
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

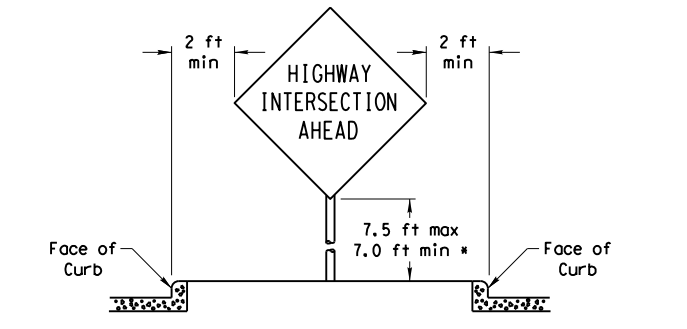
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

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

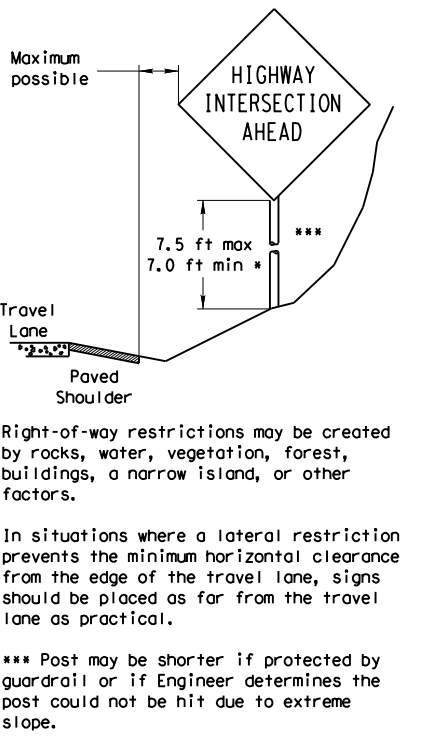
SIGNS WITH PLAQUES



CURB & GUTTER OR RAISED ISLAND



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



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

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

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

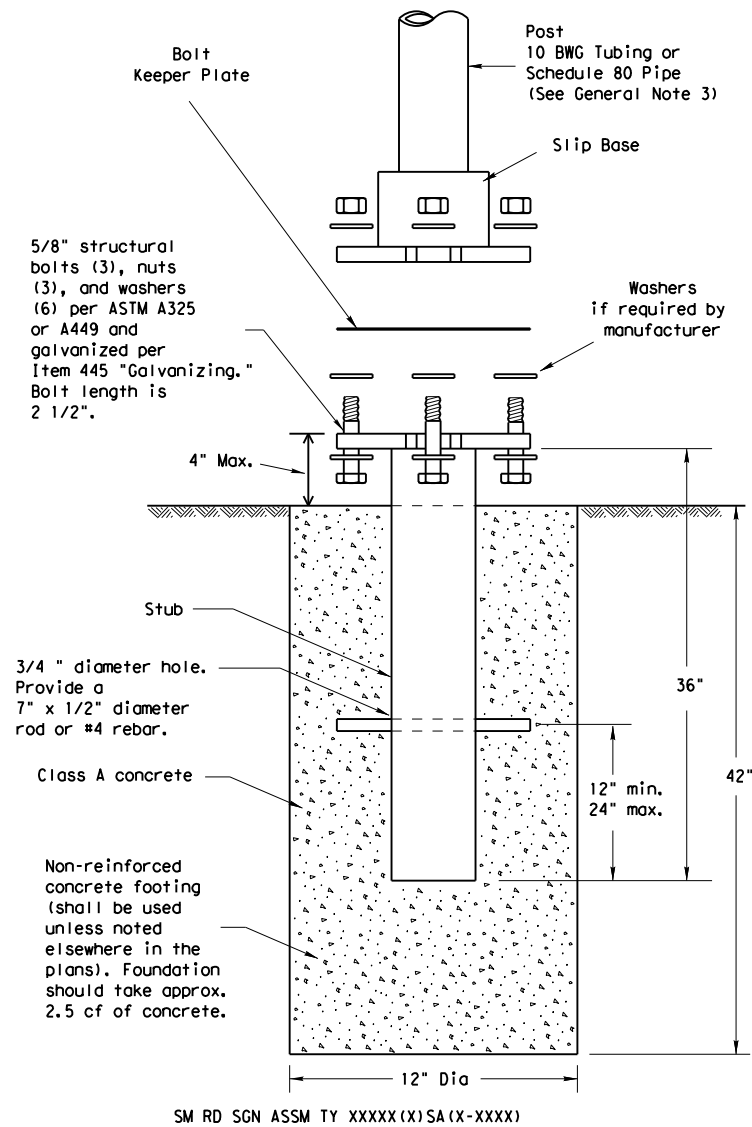


SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD (GEN) - 08

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		AMA	POTTER		63

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



NOTE

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

GENERAL NOTES:

- Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
- Material used as post with this system shall conform to the following specifications:
 - 10 BWG Tubing (2.875" outside diameter)
 - 0.134" nominal wall thickness
 - Seamless or electric-resistance welded steel tubing or pipe
 - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
 - Other steels may be used if they meet the following:
 - 55,000 PSI minimum yield strength
 - 70,000 PSI minimum tensile strength
 - 20% minimum elongation in 2"
 - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
 - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
 - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
 - Schedule 80 Pipe (2.875" outside diameter)
 - 0.276" nominal wall thickness
 - Steel tubing per ASTM A500 Gr C
 - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
 - 46,000 PSI minimum yield strength
 - 62,000 PSI minimum tensile strength
 - 21% minimum elongation in 2"
 - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
 - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
 - Galvanization per ASTM A123
- See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

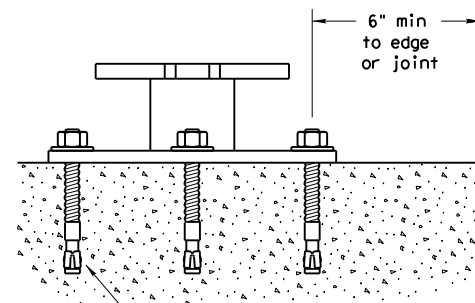
Foundation

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

Support

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

CONCRETE ANCHOR



Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxyes and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

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Texas Department of Transportation
Traffic Operations Division

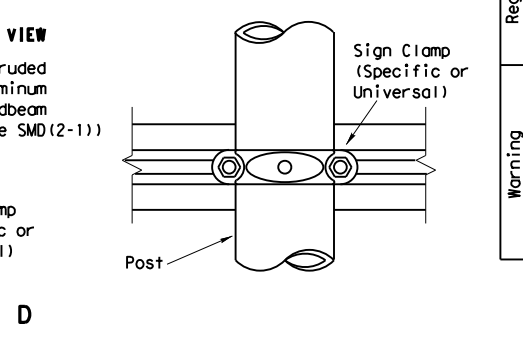
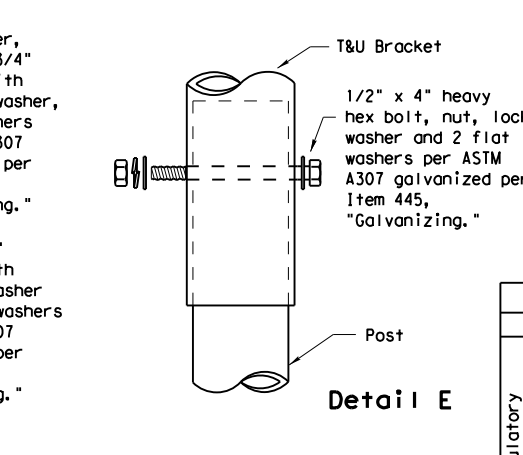
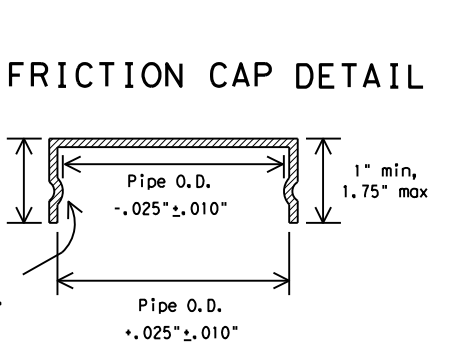
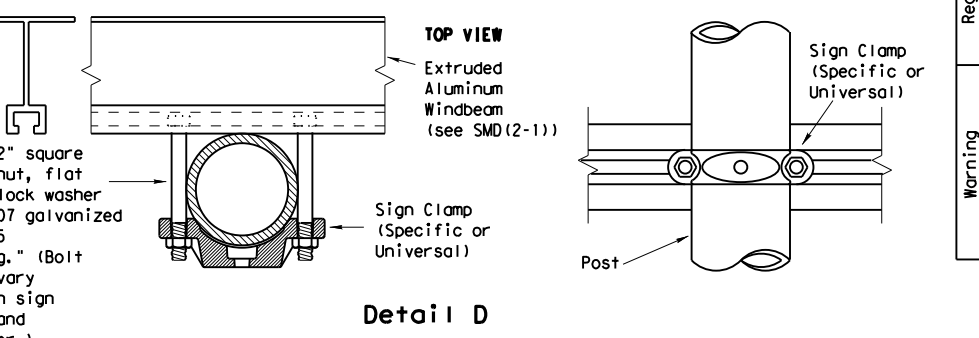
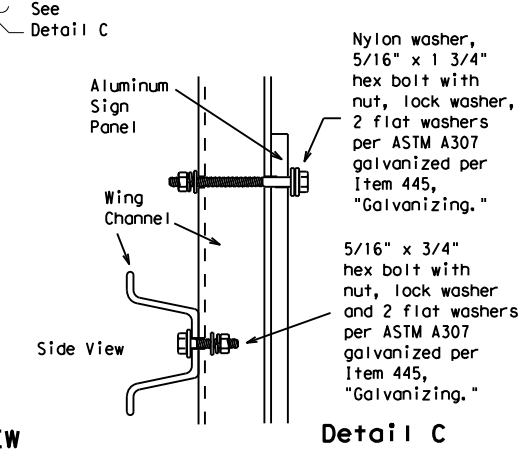
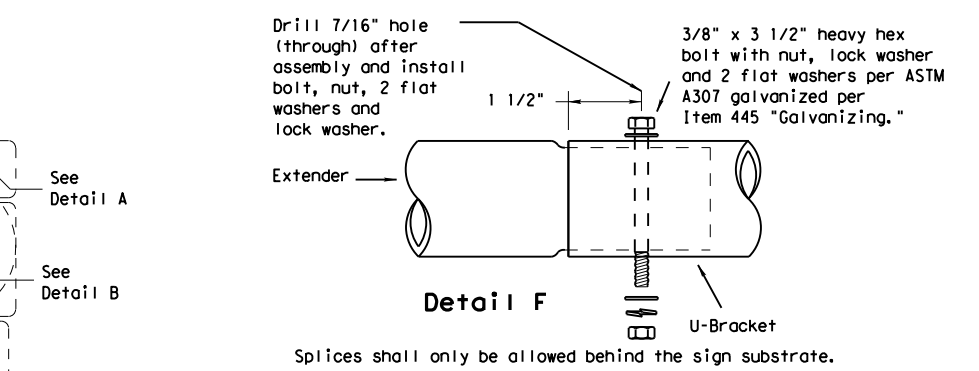
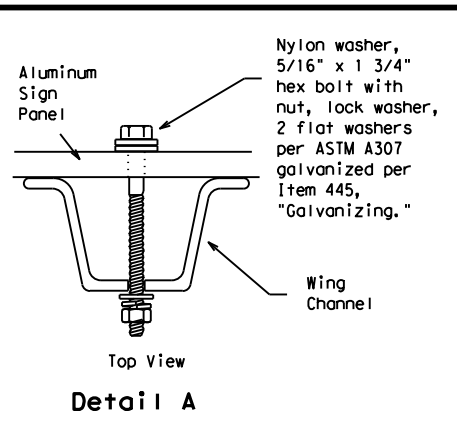
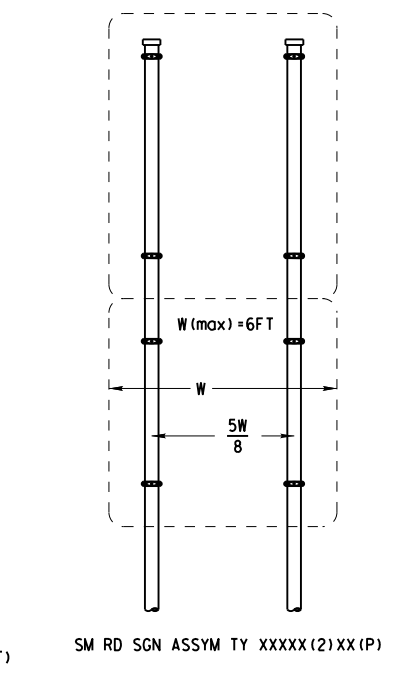
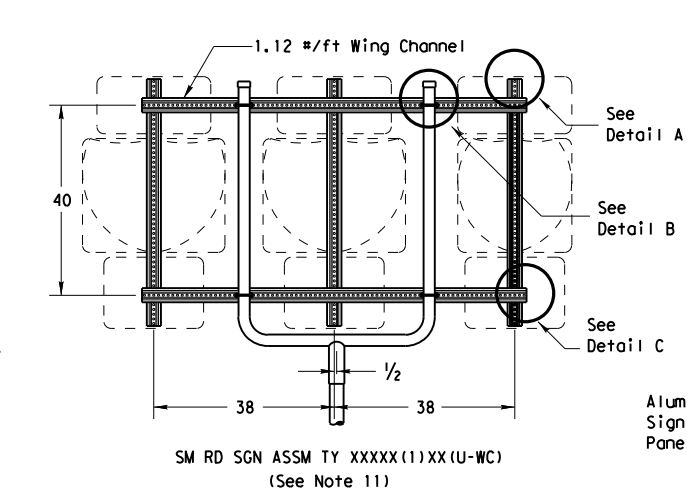
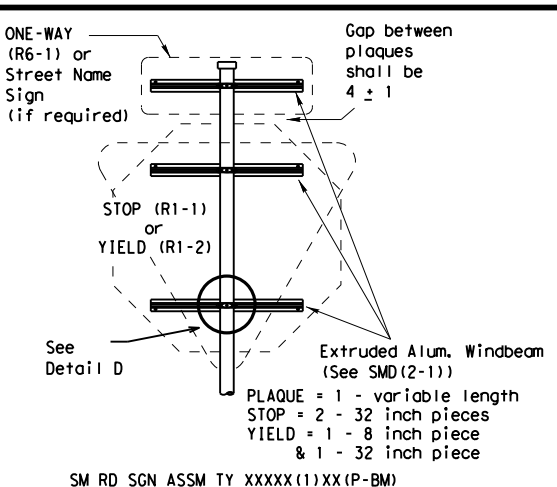
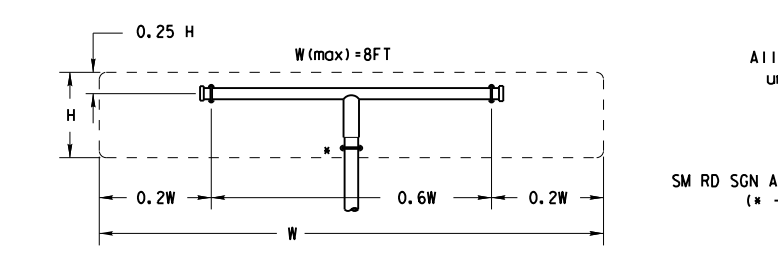
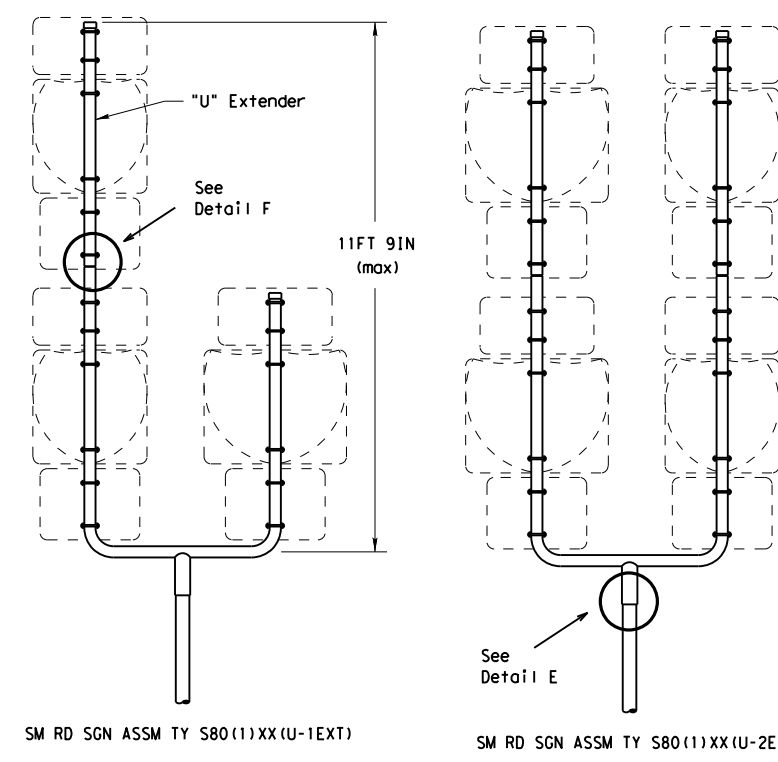
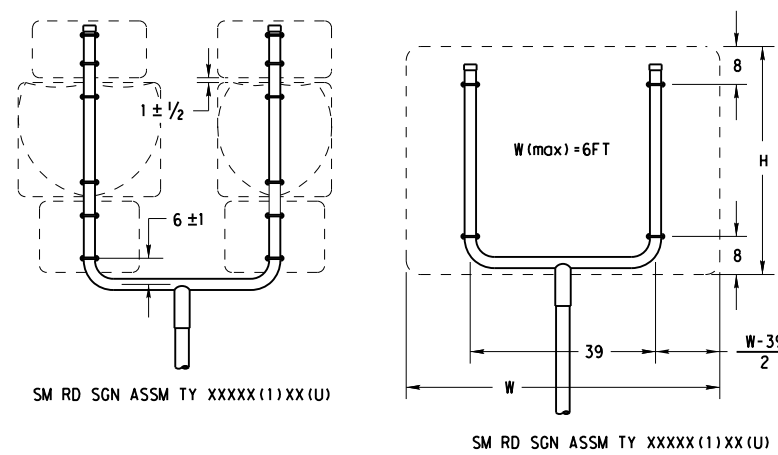
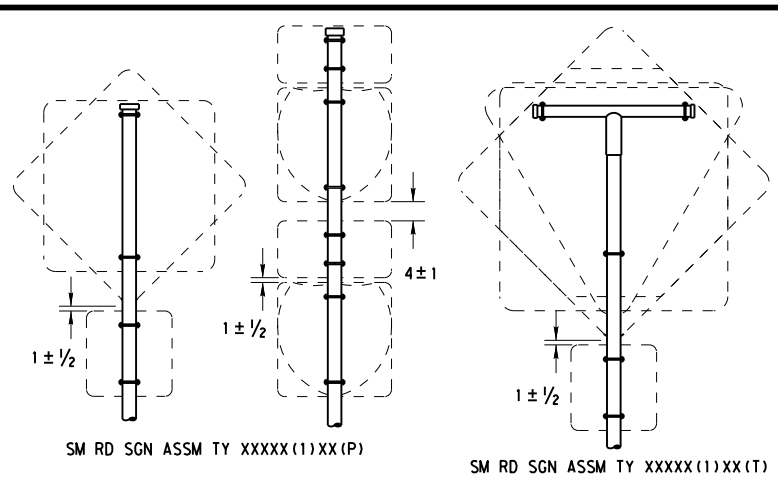
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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All dimensions are in english unless detailed otherwise.

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

GENERAL NOTES:

1. SIGN SUPPORT # OF POSTS MAX. SIGN AREA

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

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

Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes. The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture. Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

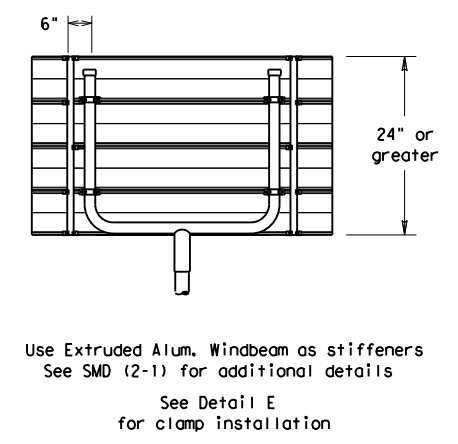
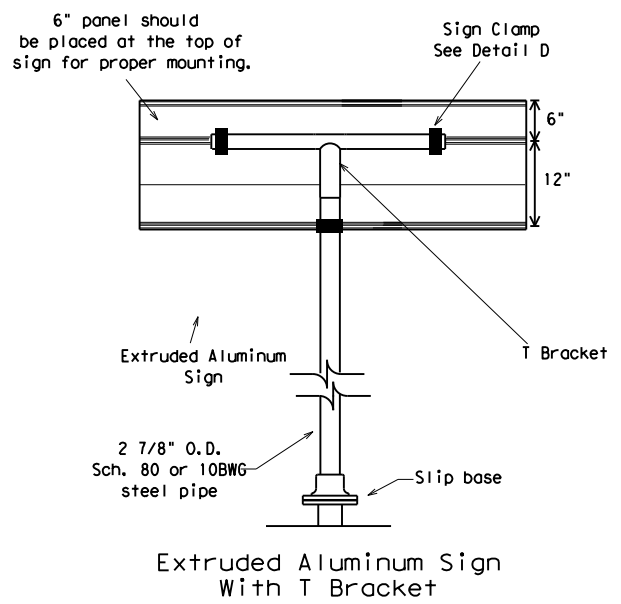
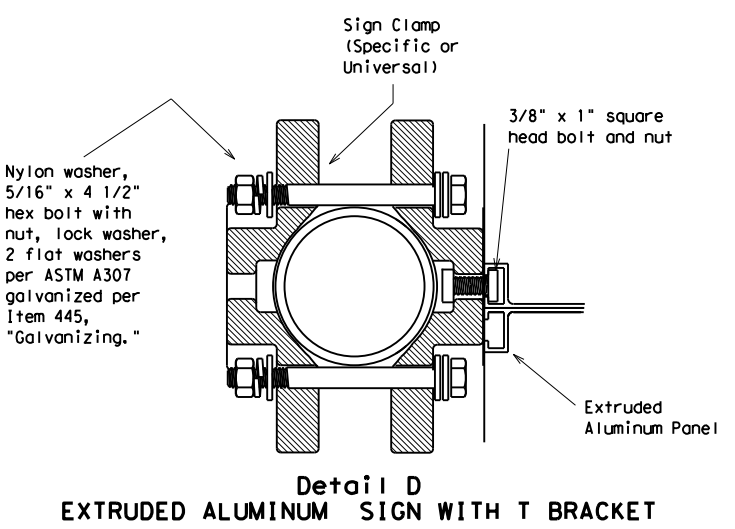
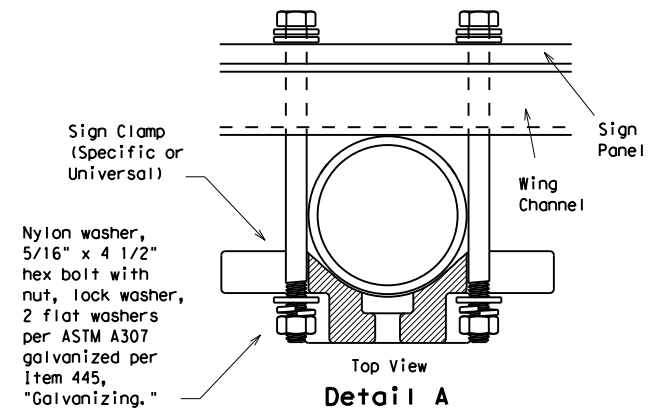
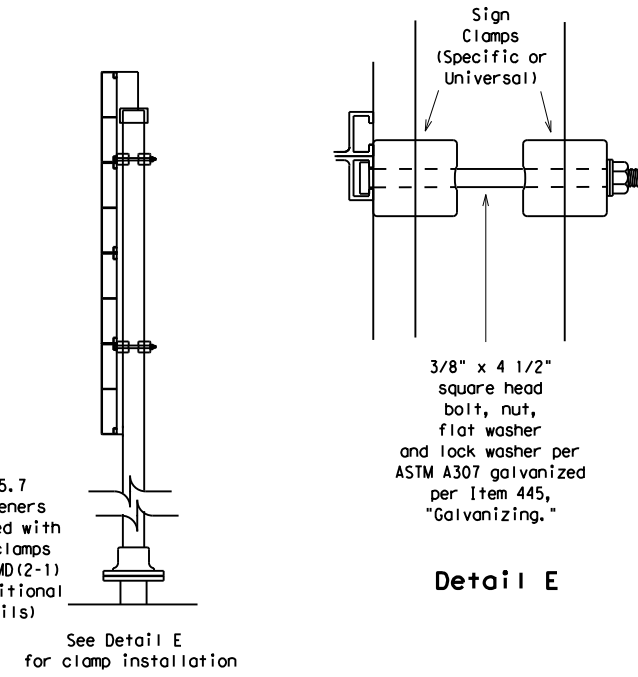
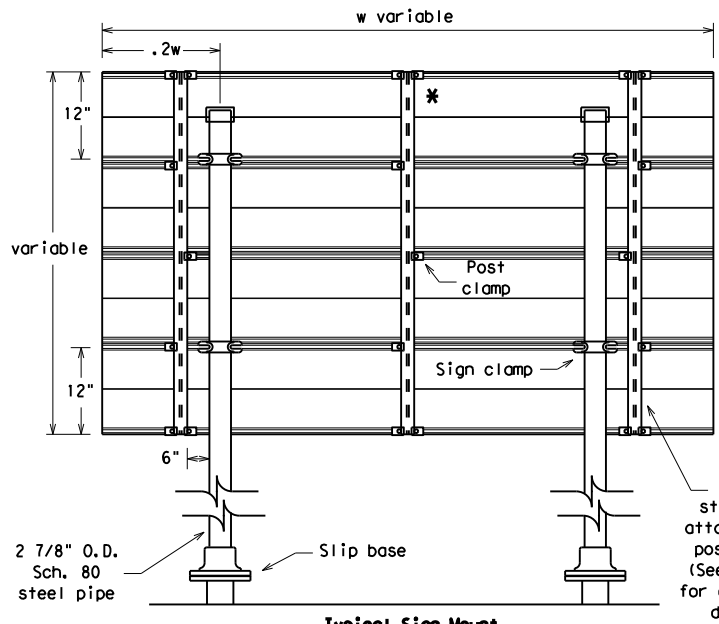
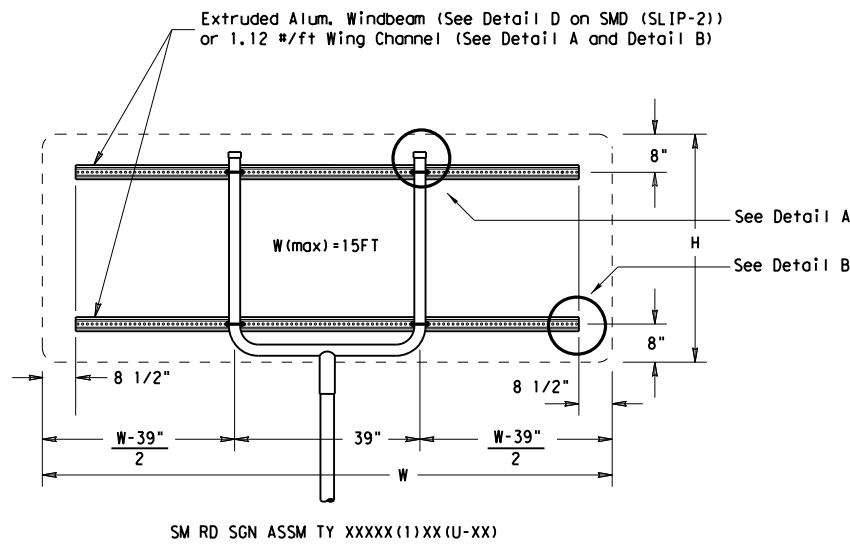
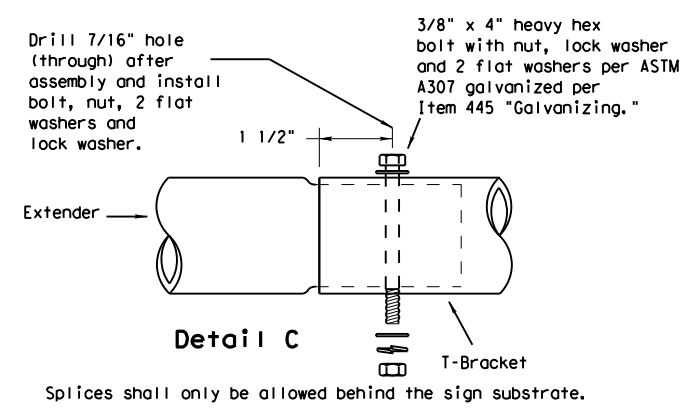
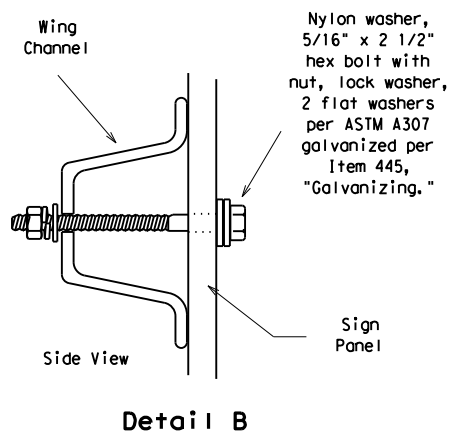
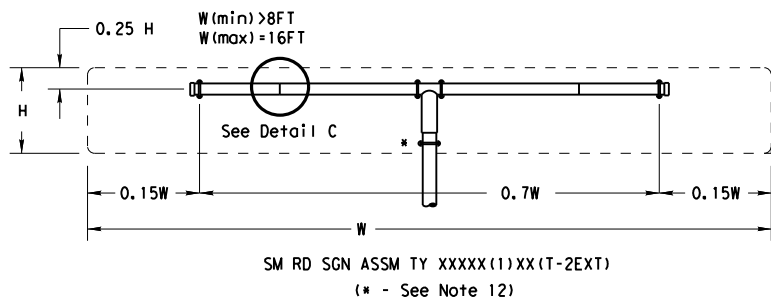


**SIGN MOUNTING DETAILS
 SMALL ROADSIDE SIGNS
 TRIANGULAR SLIPBASE SYSTEM
 SMD(SLIP-2)-08**

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GENERAL NOTES:

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

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

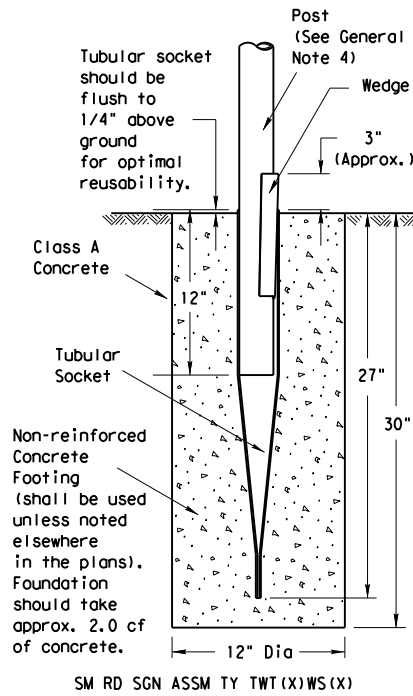


**SIGN MOUNTING DETAILS
 SMALL ROADSIDE SIGNS
 TRIANGULAR SLIPBASE SYSTEM
 SMD(SLIP-3)-08**

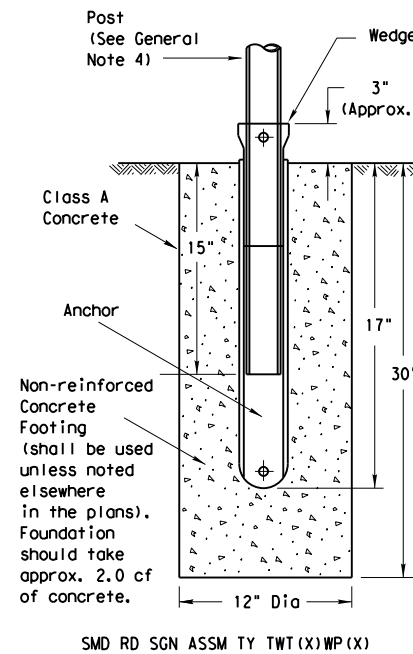
© TxDOT July 2002		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
9-08	REVISIONS	CON: 0041	SECT: 05	JOB: 053	HIGHWAY: US 87
		DIST: AMA	COUNTY: POTTER	SHEET NO. 66	

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

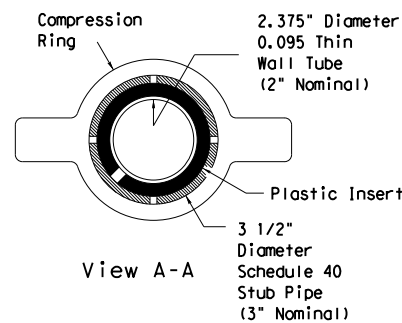
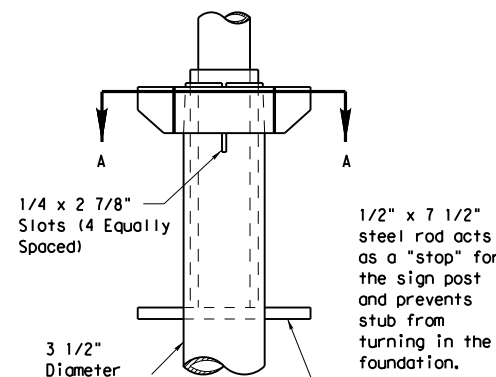
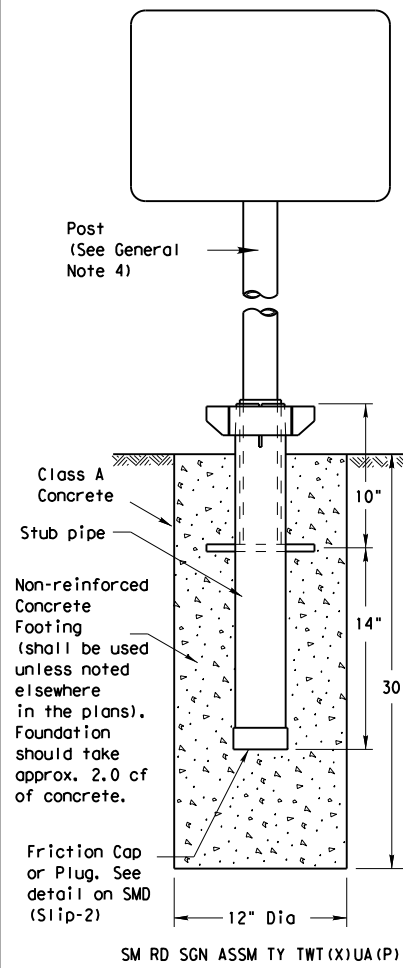
Wedge Anchor Steel System



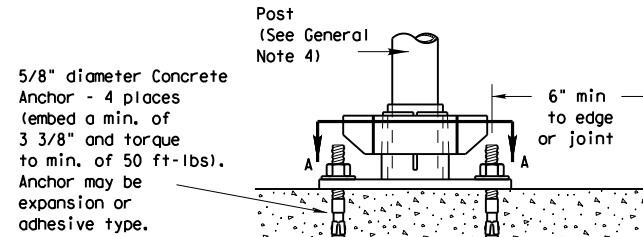
Wedge Anchor High Density Polyethylene (HDPE) System



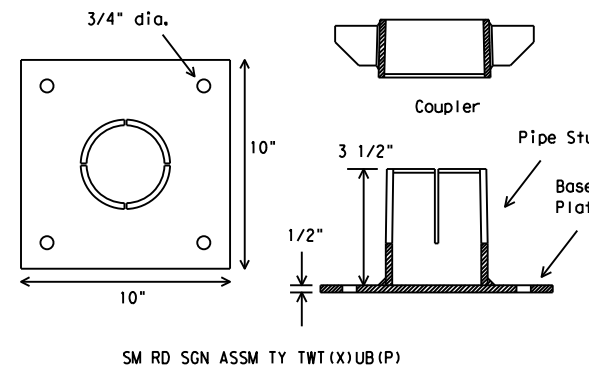
Universal Anchor System with Thin-Walled Tubing Post



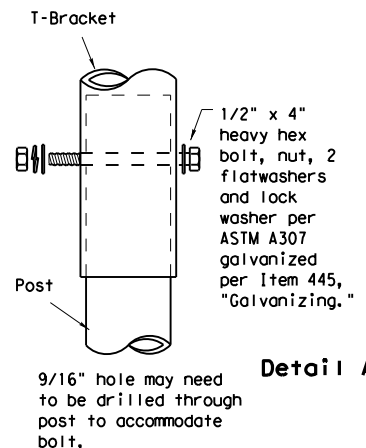
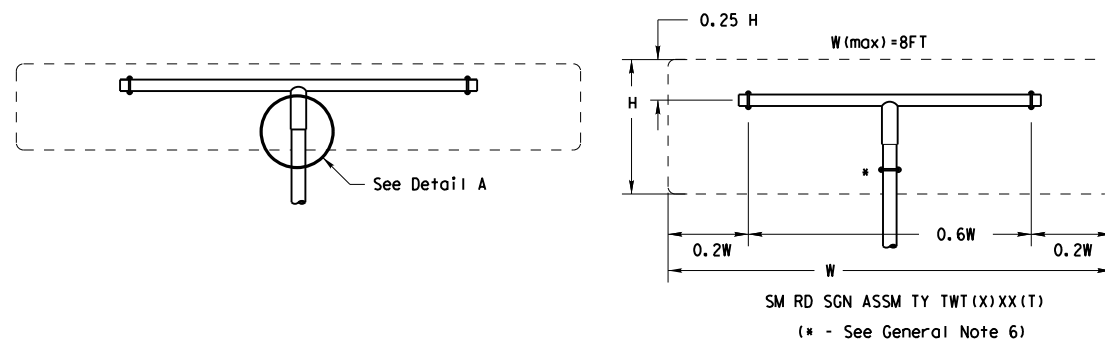
Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.



Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxyes and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post



NOTE
The devices shall be installed per manufacturer's recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

- The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
- The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
- Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer_list.htm
- Material used as post with this system shall conform to the following specifications:
13 BWG Tubing (2.375" outside diameter) (TWT)
0.095" nominal wall thickness
Seamless or electric-resistance welded steel tubing
Steel shall be HSLA Gr 55 per ASTM A1011 or ASTM A1008
Other steels may be used if they meet the following:
55,000 PSI minimum yield strength
70,000 PSI minimum tensile strength
18% minimum elongation in 2"
Wall thickness (uncoated) shall be within the range of .083" to .099"
Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
- Sign blanks shall be the sizes and shapes shown on the plans.
- Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
- The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
- Insert tubular socket into concrete until top of socket is approximately 1/4" above the concrete footing.
- Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer.
- Attach the sign to the sign post.
- Insert the sign post into socket and align sign face with roadway.
- Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
- Insert base post in hole to depths shown and backfill hole with concrete.
- Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
- Attach the sign to the sign post.
- Install plastic insert around bottom of post.
- Insert sign post into base post. Lower until the post comes to rest on steel rod.
- Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
- Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

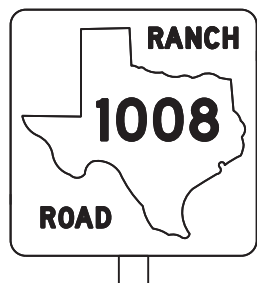
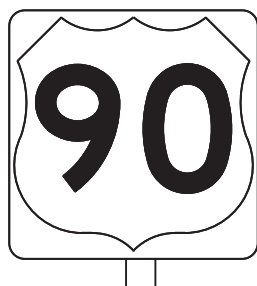


SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST SMD (TWT) -08

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
		0041	05	053	US 87
		DIST	COUNTY		SHEET NO.
		AMA	POTTER		67

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

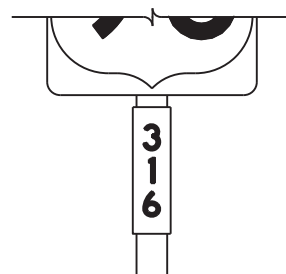
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES:

- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
- White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

- Route sign legend (i.e. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.
- Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

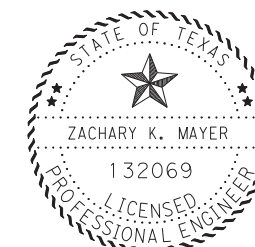
DEPARTMENTAL MATERIAL SPECIFICATIONS

ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080 0.100
7.5 to 15	0.100
7.5 or Greater <small>Greater than 15</small>	0.125

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

<http://www.txdot.gov/>



Zachary K. Mayer P.E.

12/02/2020
US 87
TYPICAL SIGN REQUIREMENTS

TSR (3) - 13 (MOD)



SHEET 1 OF 1

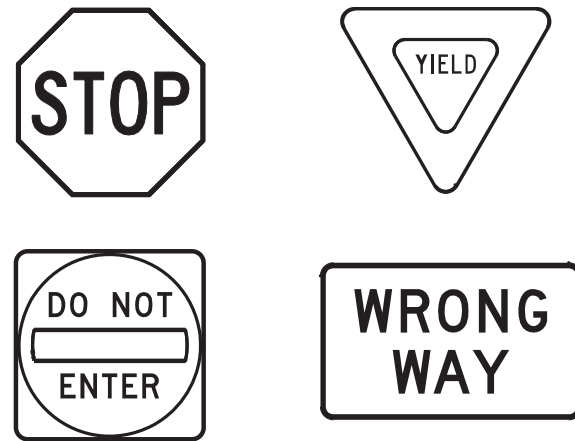
REVISED MINIMUM SIGN BLANK THICKNESS

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		68

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REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

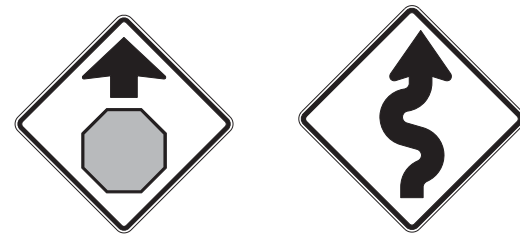
(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B _{FL} OR C _{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B _{FL} OR C _{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

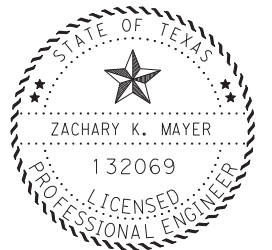
GENERAL NOTES:

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

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

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

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



Zachary K. Mayer P.E.

12/02/2020
 US 87

TYPICAL SIGN REQUIREMENTS

TSR(4)-13 (MOD)



SHEET 1 OF 1

REVISED MINIMUM SIGN BLANK THICKNESS

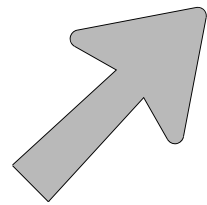
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JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		69

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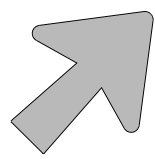
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ARROW DETAILS

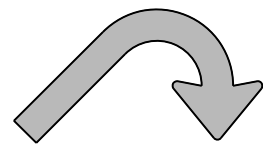
for Large Ground-Mounted and Overhead Guide Signs



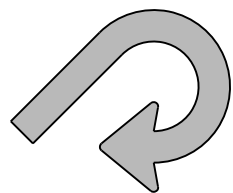
Type A



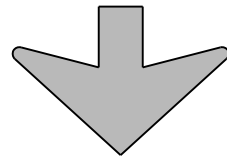
Type B



E-3



E-4



Down Arrow

TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

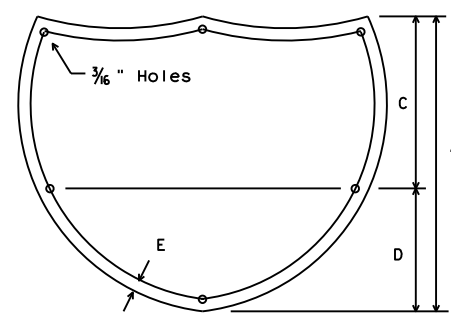
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

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

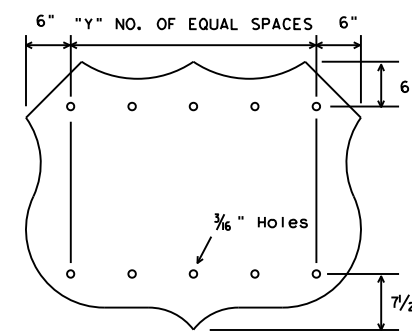
<http://www.txdot.gov/>

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)



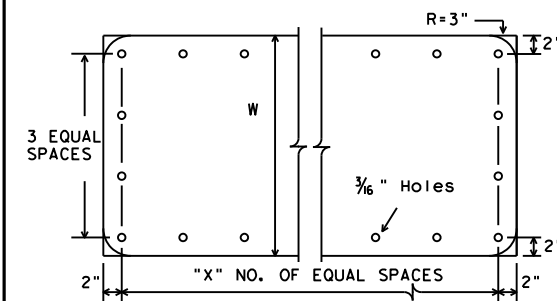
INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4



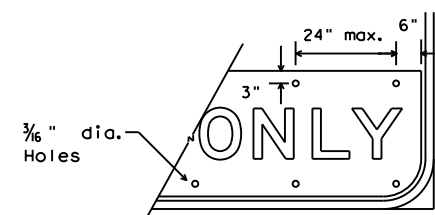
U.S. ROUTE MARKERS

Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



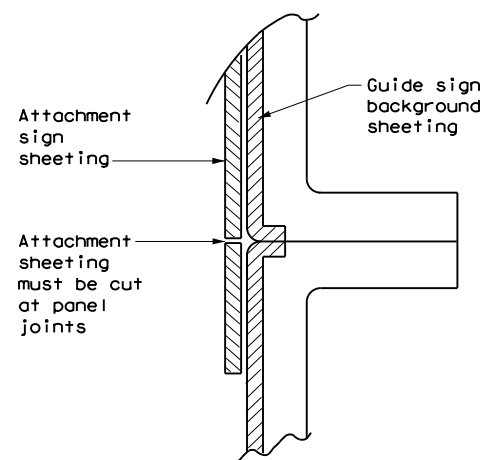
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5



EXIT ONLY PANEL

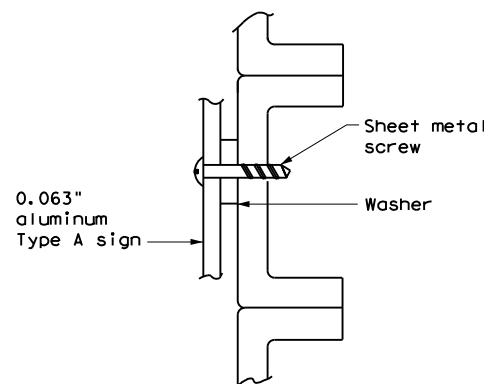
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



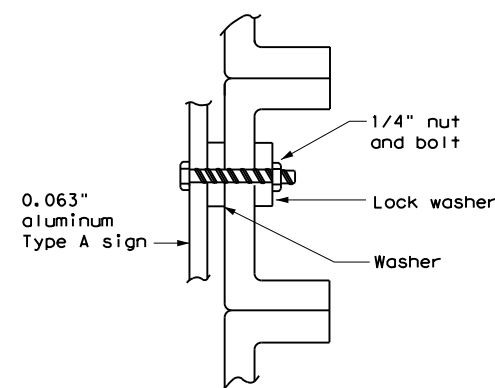
DIRECT APPLIED ATTACHMENT

NOTE:

- Sheeting for legend, symbols, and borders must be cut at panel joints.
- Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT

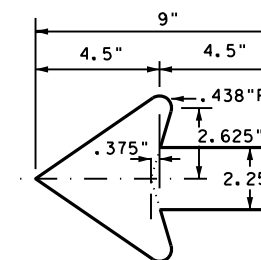


NUT/BOLT ATTACHMENT

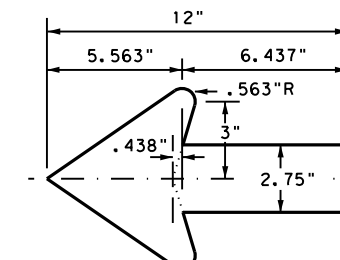
NOTE:

Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

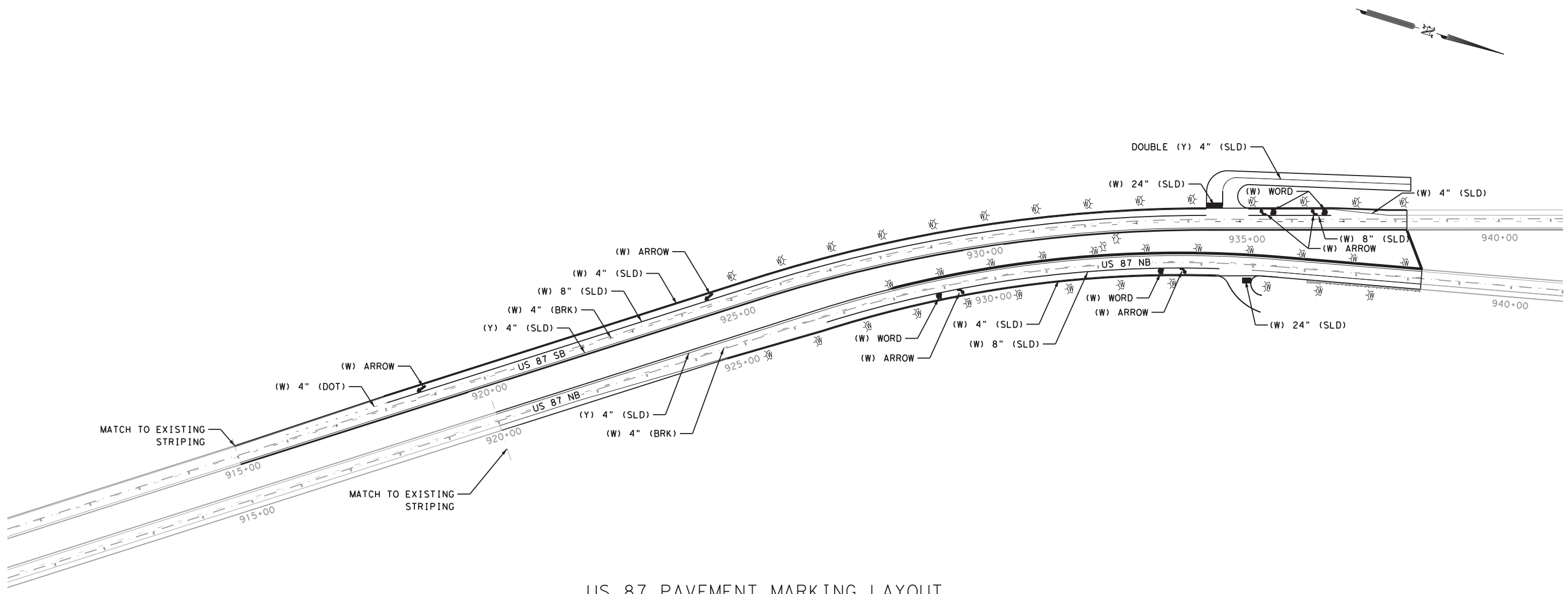


TYPICAL SIGN REQUIREMENTS

TSR (5) - 13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0041	05	053	US 87
12-03 7-13	DIST	COUNTY	SHEET NO.	
9-08	AMA	POTTER	70	

DATE: 12/2/2020 9:30:31 AM
 FILE: I:\AMATPD\Construction Projects\0041-05\053 Candidate FLAP\4 - Design\Plan Set\8 - Traffic\Pavement Marking & Delineation\053_PAVEMENT MARKER LAYOUT.dgn



US 87 PAVEMENT MARKING LAYOUT



Zachary K. Mayer P.E.

12/02/2020
 US 87
 PAVEMENT
 MARKING &
 DELINEATION
 LAYOUT

SCALE: 1" = 200'



SHEET 1 OF 1

LOCATION	PAVEMENT MARKING SUMMARY													
	0658 6001	0658 6026	0658 6018	0658 6049	0666 6005	0666 6035	0666 6047	0666 6053	0666 6077	0666 6299	0666 6302	0666 6314	0672 6010	
	INSTR DEL ASSM (D-5W) SZ 1 (FLX) GND	INSTR DEL ASSM (D-SY) SZ (BRF) (CTB)	INSTR DEL ASSM (D-5Y) SZ 1 (FLX) GND	INSTR DEL ASSM (OM-2Z) (FLX) GND (BI)	REFL PAV MRK TY I (W) 4" (DOT) (090MIL)	RE PM W/RET REQ TY I (W) 8" (SLD) (090MIL)	RE PM W/RET REQ TY I (W) 24" (SLD) (090MIL)	REFL PAV MRK TY I (W) (ARROW) (090MIL)	RE PM W/RET REQ TY I (W) (WORD) (090MIL)	RE PM W/RET REQ TY I (W) 4" (BRK) (090MIL)	RE PM W/RET REQ TY I (W) 4" (SLD) (090MIL)	RE PM W/RET REQ TY I (Y) 4" (SLD) (090MIL)	REFL PAV MRKR TY II-C-R	
	EA	EA	EA	EA	LF	LF	LF	EA	EA	LF	LF	LF	EA	
US 87 NORTH AND SOUTHBOUND LANES	26	11	2	5	215	2,560	50	6	4	4,147	4,004	4,148	52	
SHEET TOTALS:	26	11	2	5	215	2,560	50	6	4	4,147	4,004	4,148	52	

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		71

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REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS				DELINEATORS				D & OM DESCRIPTIVE CODES		
DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4	SINGLE		DOUBLE			
SHEETING	Yellow, White or Red Type B or C reflective sheeting				Yellow, White or Red Type B or C Reflective Sheeting				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 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	
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (fix). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.				POST TYPE	WC	YFLX, WFLX	WC		YFLX, WFLX
					MOUNT TYPE	GND	GND, SRF	GND		GND, SRF

OBJECT MARKERS								
DEVICE	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
SHEETING	Yellow-Type B _{FL} or C _{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroreflective yellow - Type B _{FL} or C _{FL} Sheeting			Red -Type B _{FL} or C _{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

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

BARRIER REFLECTORS (BRF)			CHEVRONS				ONE DIRECTION LARGE ARROW	
DEVICE	GF1	GF2	CTB	W1-8				W1-6
SHEETING	Yellow, White, Red							
NOTE	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.			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).				

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.

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

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REVISIONS	0041	05	053	US 87
10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20	AMA	POTTER	72	

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POST TYPE AND SUPPORT FOUNDATION DETAILS				TYPE OF BARRIER MOUNTS	
WING CHANNEL (WC)	FLEXIBLE POSTS (YFLX, WFLX)		WEDGE ANCHOR SYSTEMS		GUARD FENCE ATTACHMENT
GND	GND	SRF	WAS	WAP	GF1
	EMBEDDED		SURFACE MOUNT	STEEL	PLASTIC
NOTES 1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only. 2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.	NOTES 1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices. 2. Install per manufacturer's recommendations. 3. Post length may vary to meet field conditions. 4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.		NOTE 1. Install per manufacturer's recommendations.		

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.

		Traffic Safety Division Standard	
<h2>DELINEATOR & OBJECT MARKER INSTALLATION</h2> <h3>D & OM(2)-20</h3>			
FILE: dom2-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
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REVISIONS	0041	05	053
10-09 3-15	DIST	COUNTY	US 87
4-10 7-20	AMA	POTTER	SHEET NO. 73

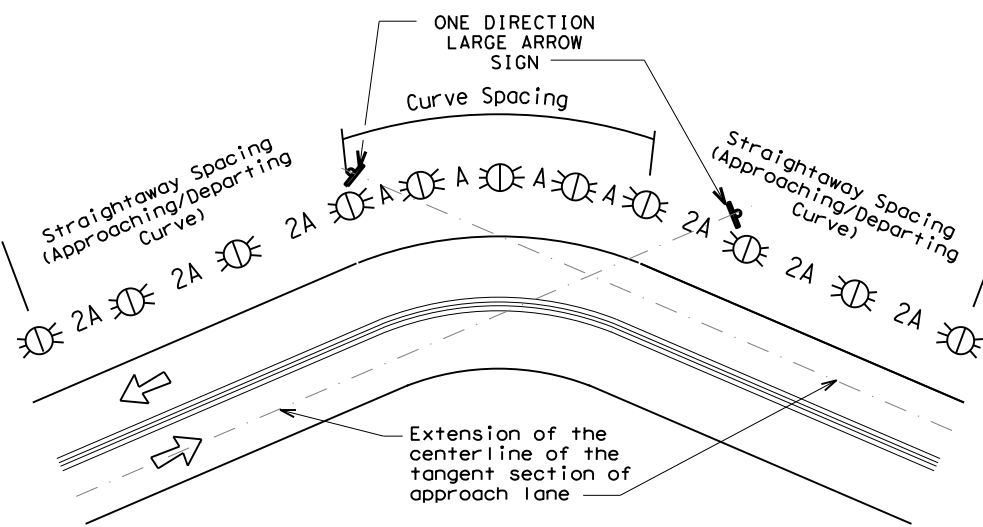
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MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

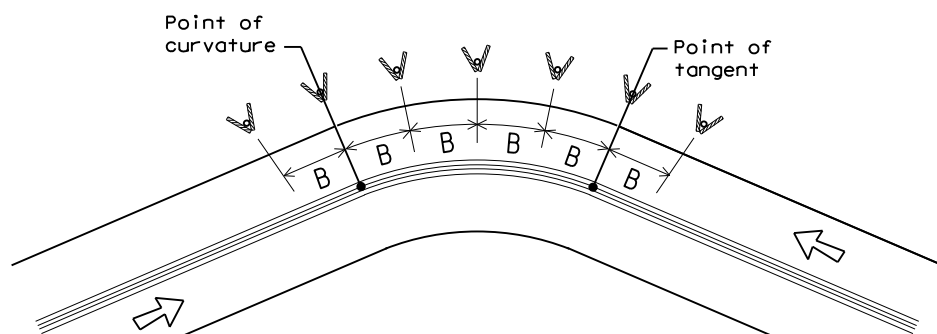
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN				
Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN			
Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp. Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete) and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100' max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100' max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

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

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign



DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

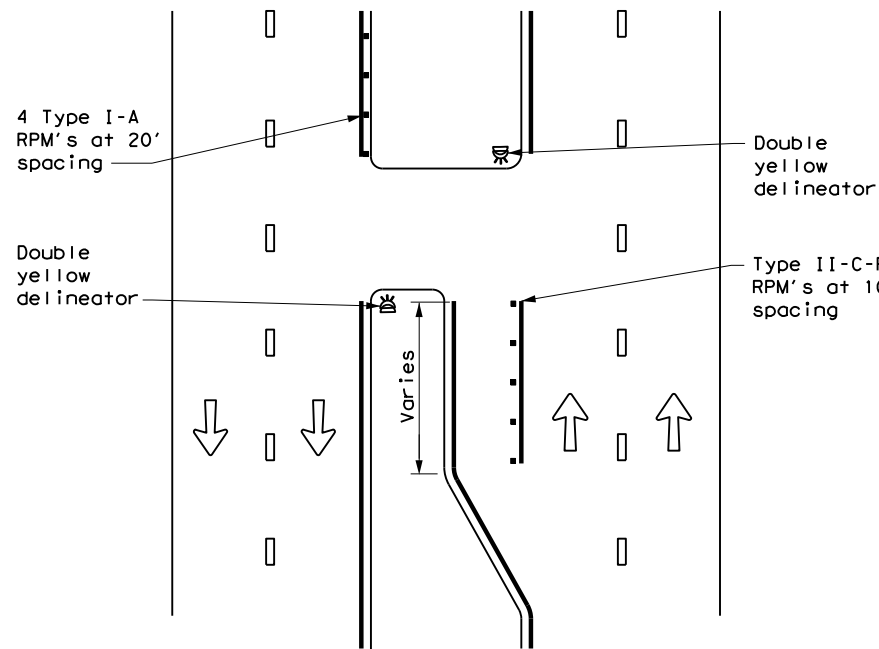
D & OM(3)-20

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© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0041	05	053	US 87
3-15 8-15	DIST	COUNTY	SHEET NO.	
8-15 7-20	AMA	POTTER	74	

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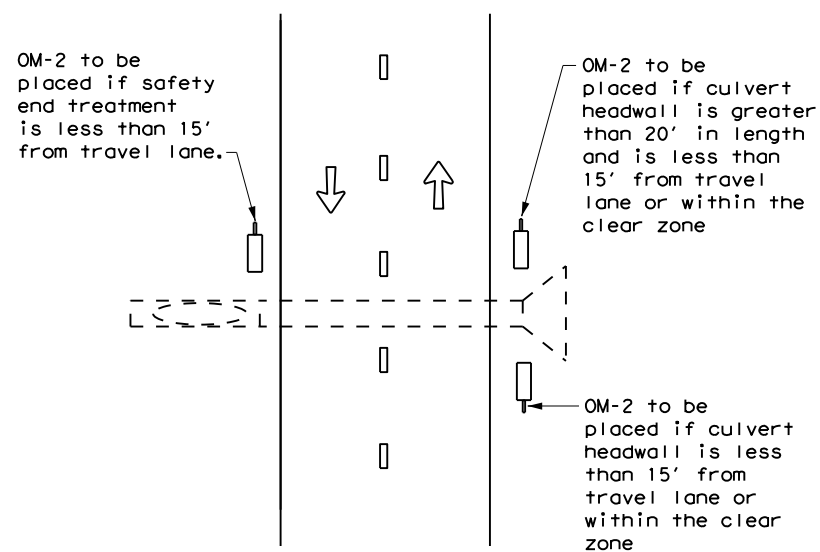
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CROSSOVERS



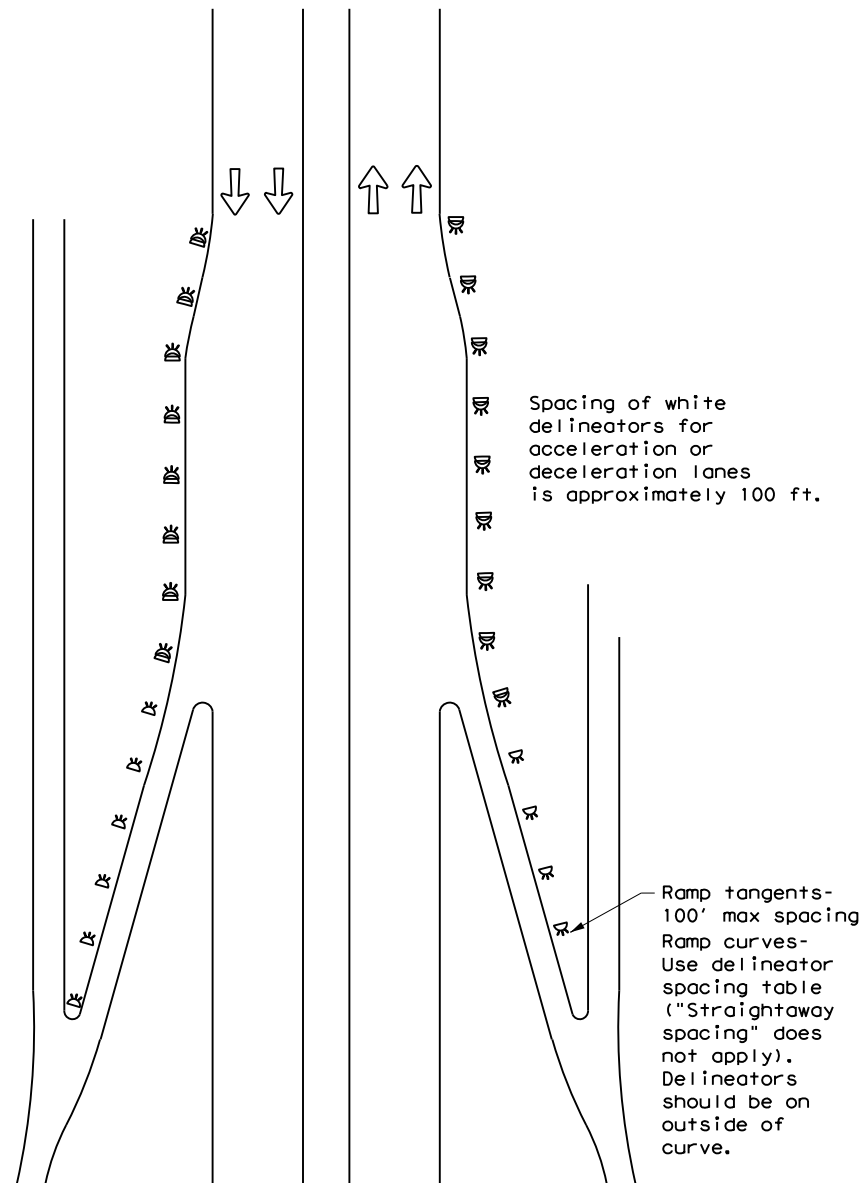
DETAIL 1

FOR CULVERTS WITHOUT MBGF



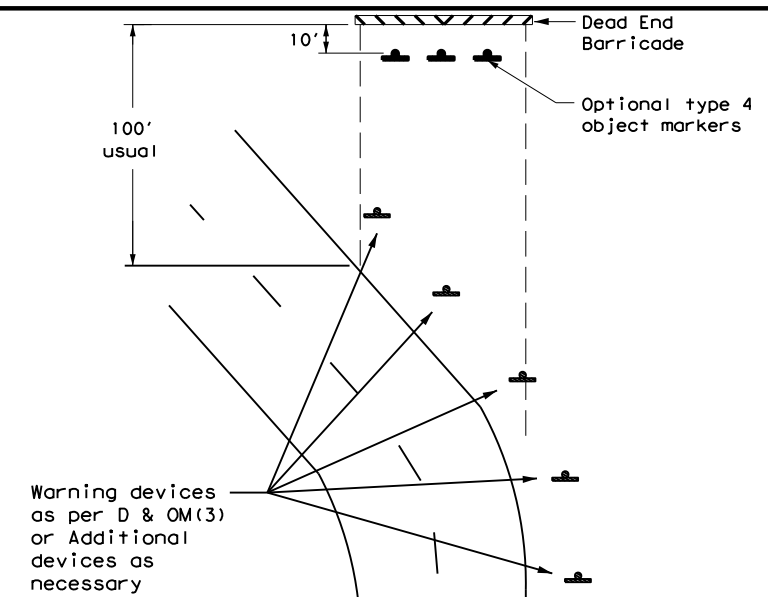
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



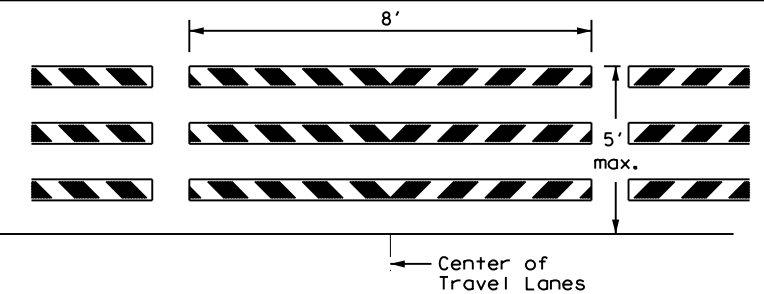
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

- Barricade striping shall be red and white reflective sheeting for all permanent road closures.
- Barricade striping is red and white sloping toward the center of the roadway.
- 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



DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

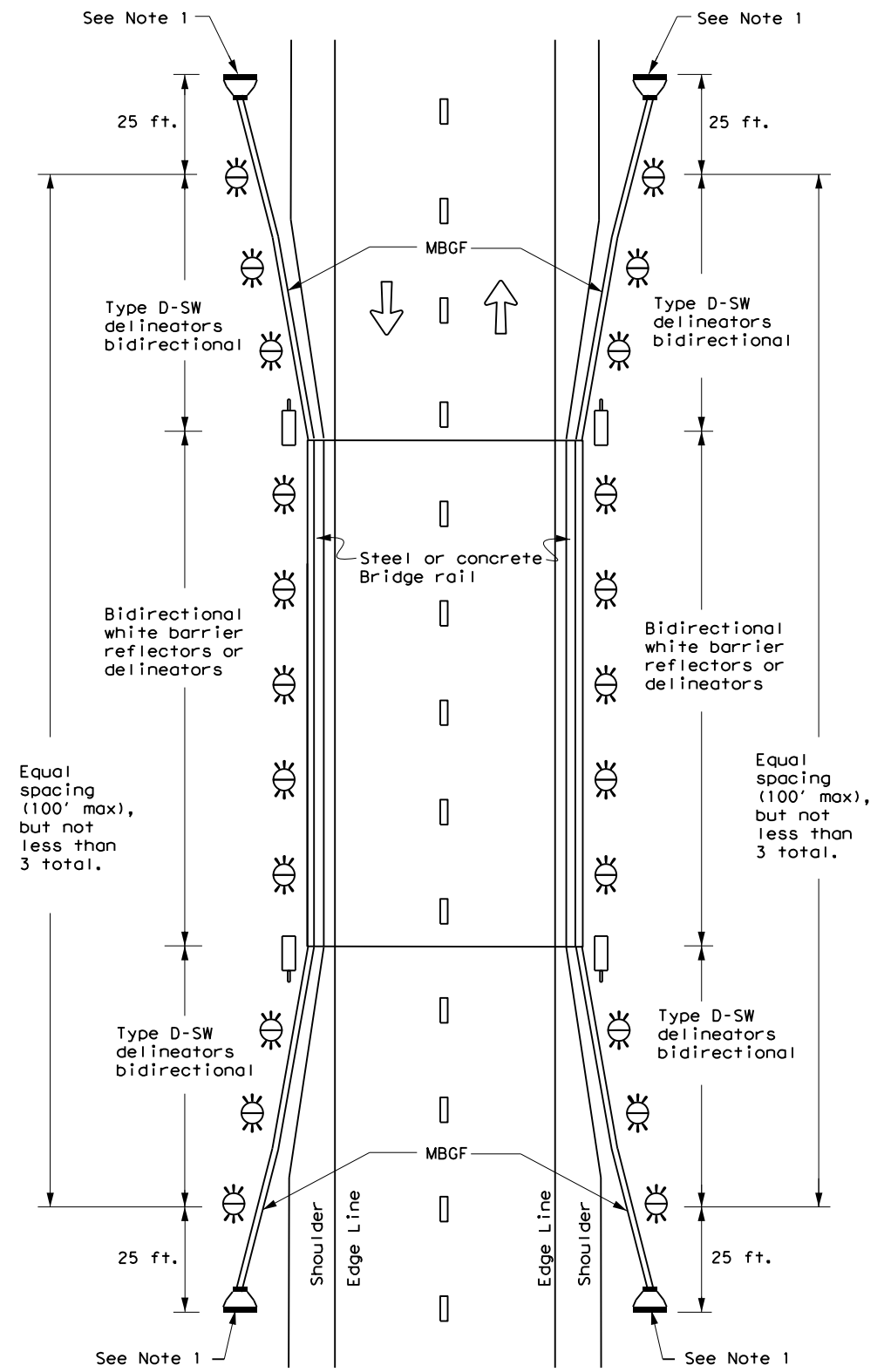
D & OM(4)-20

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REVISIONS	0041	05	053	US 87
3-15	DIST	COUNTY	SHEET NO.	
7-20	AMA	POTTER	75	

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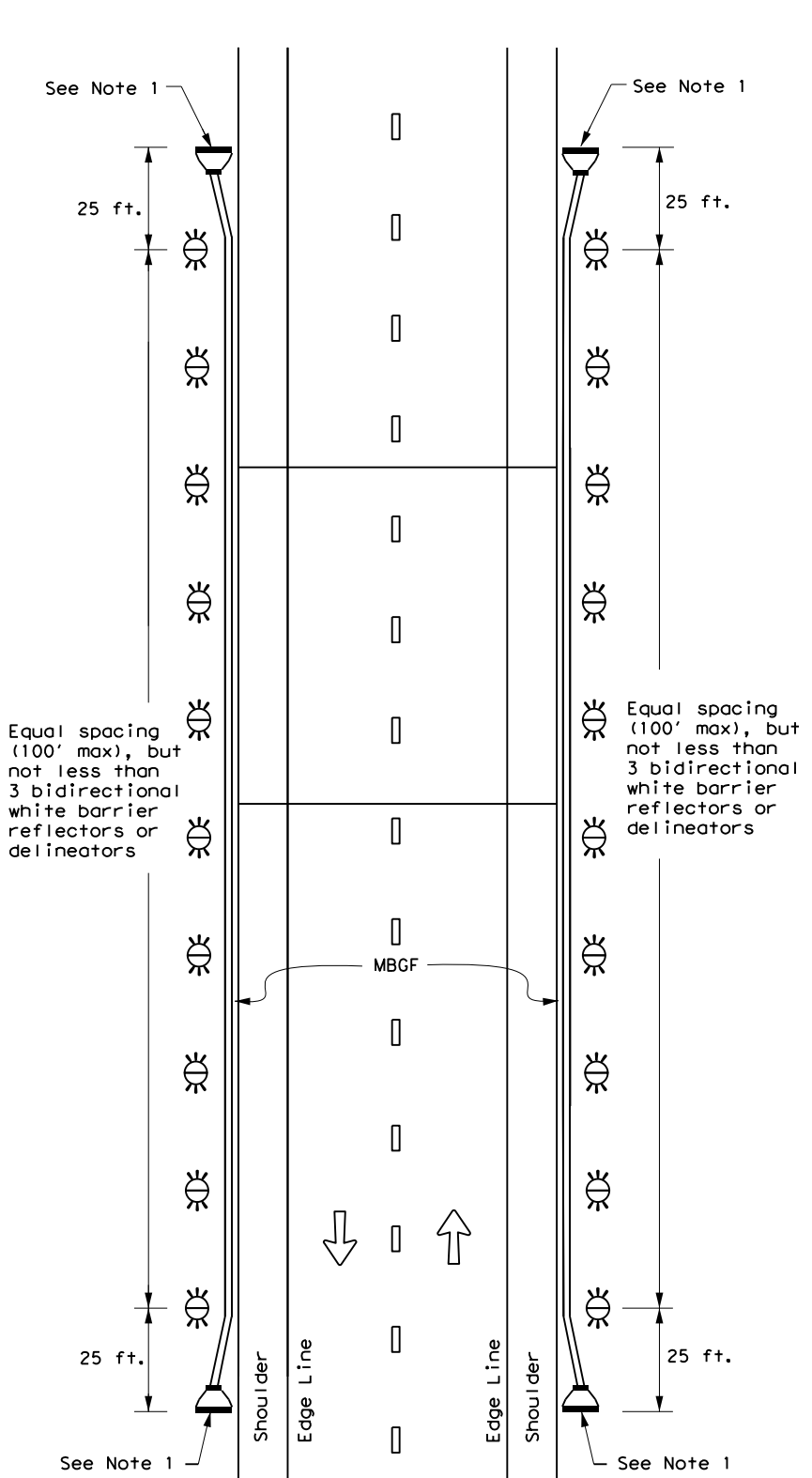
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TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



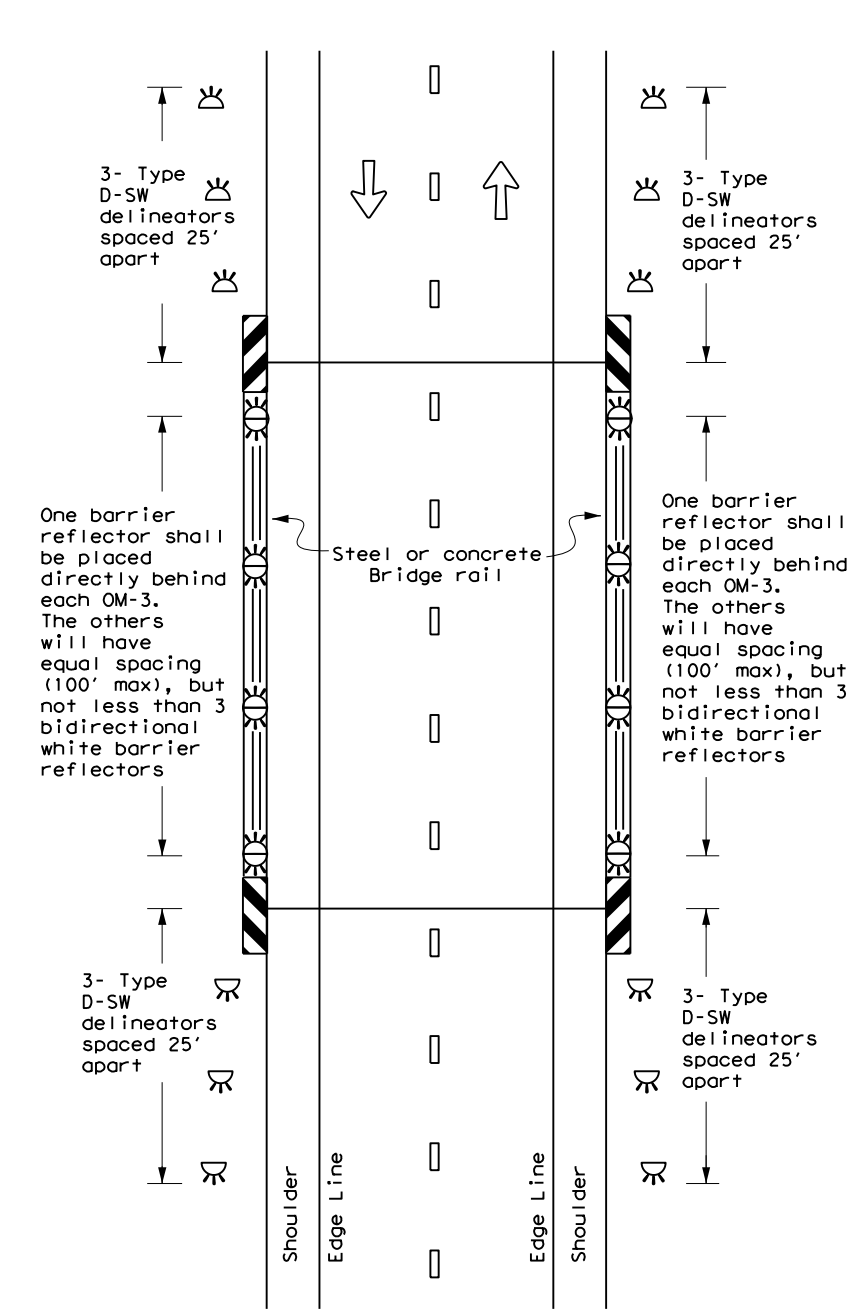
NOTE:
 1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

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

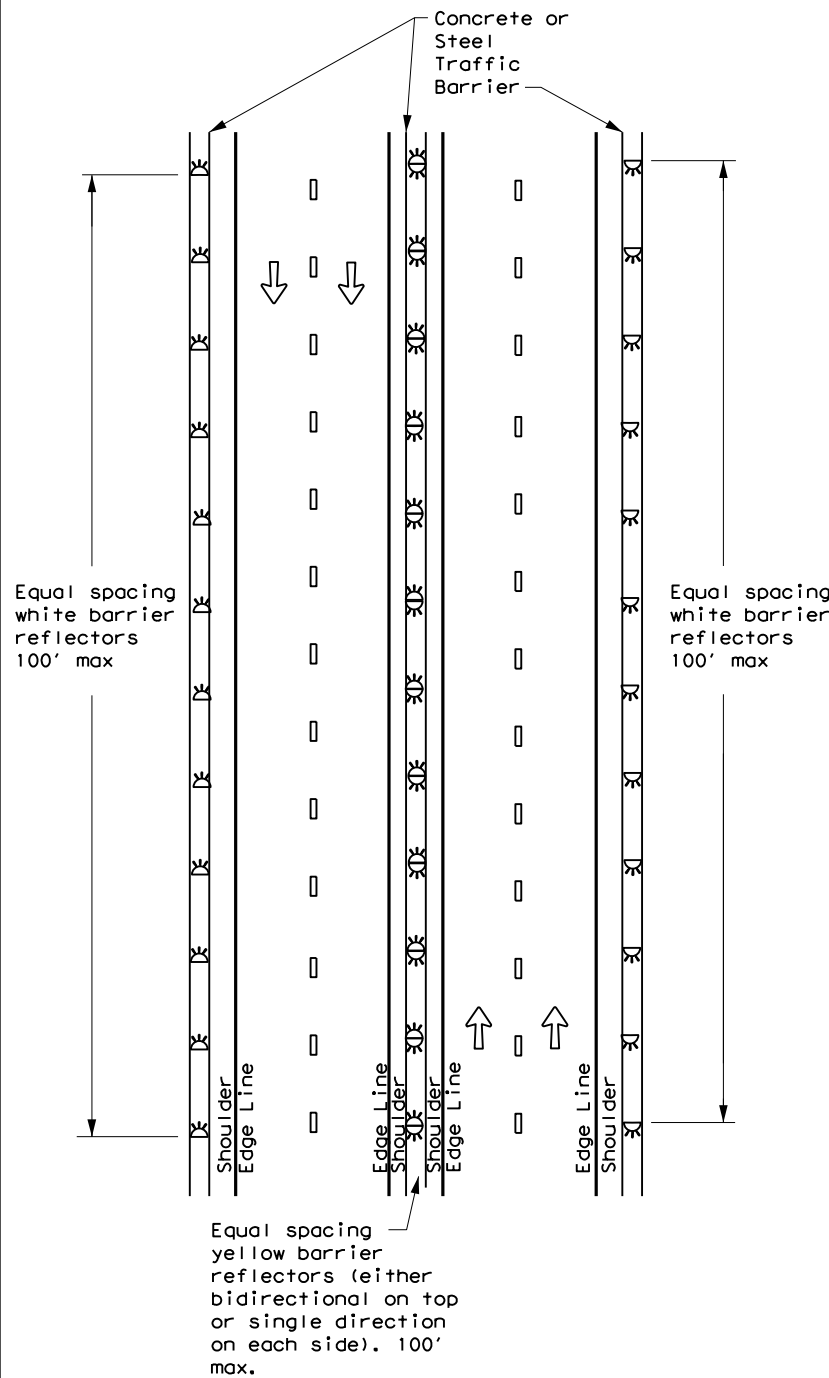
D & OM(5)-20

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7-20	DIST	COUNTY	SHEET NO.	
	AMA	POTTER	76	

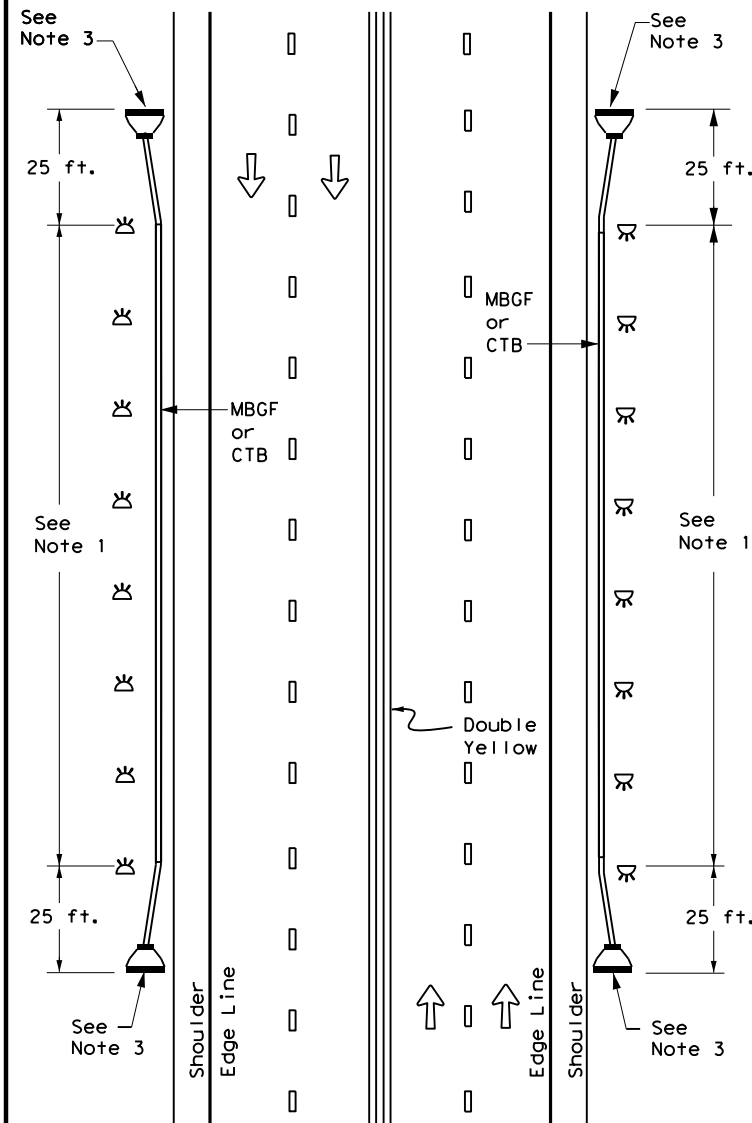
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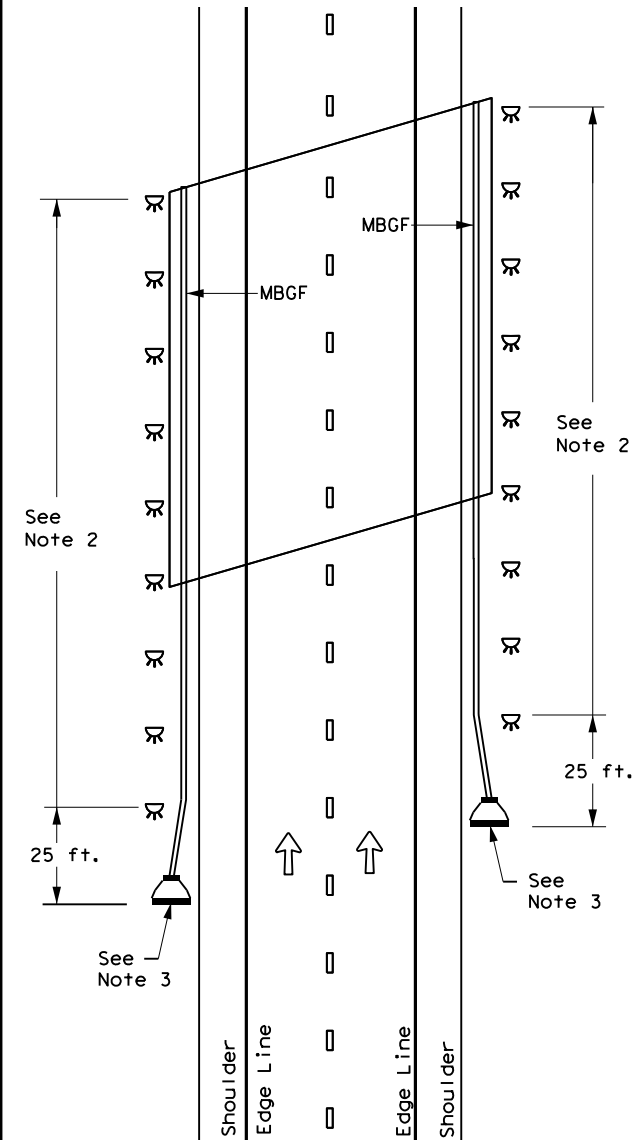
CONTINUOUS CONCRETE OR STEEL BARRIER



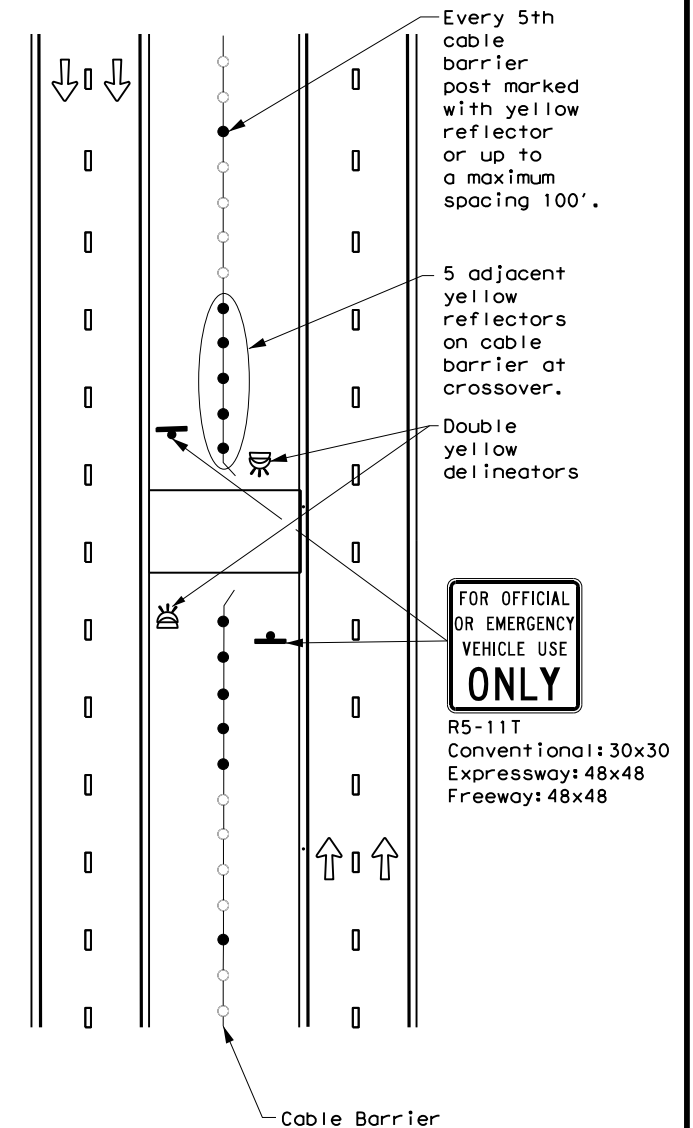
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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 Continuous 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



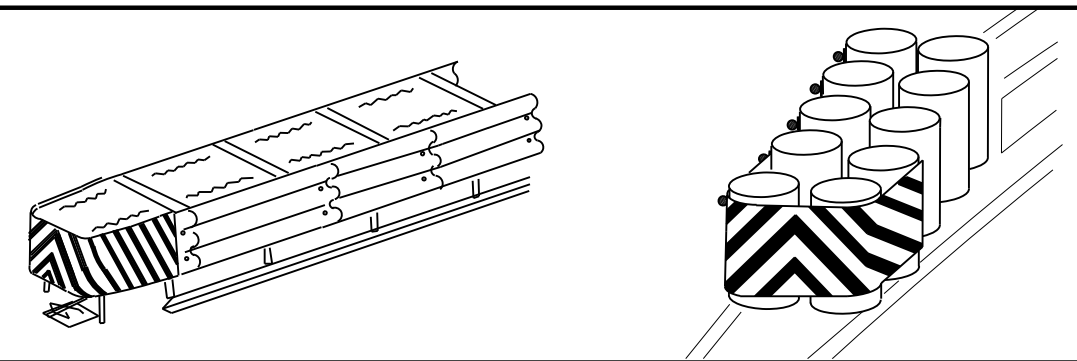
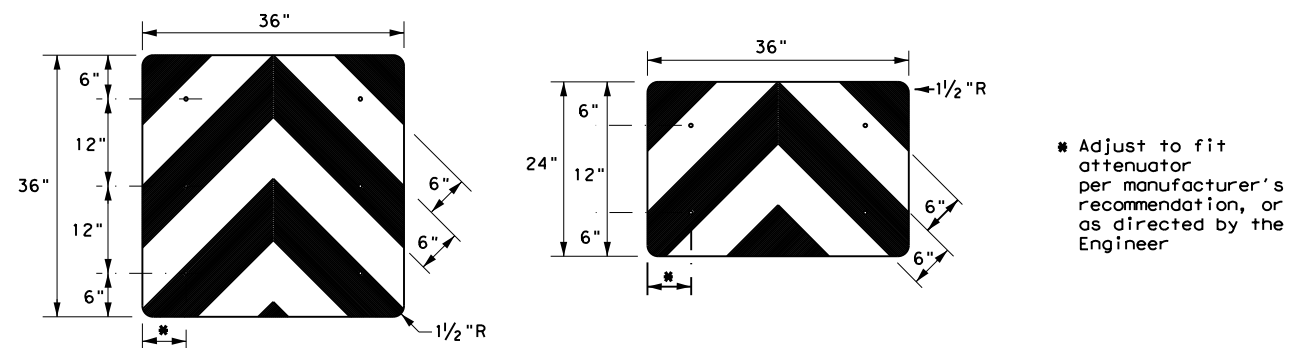
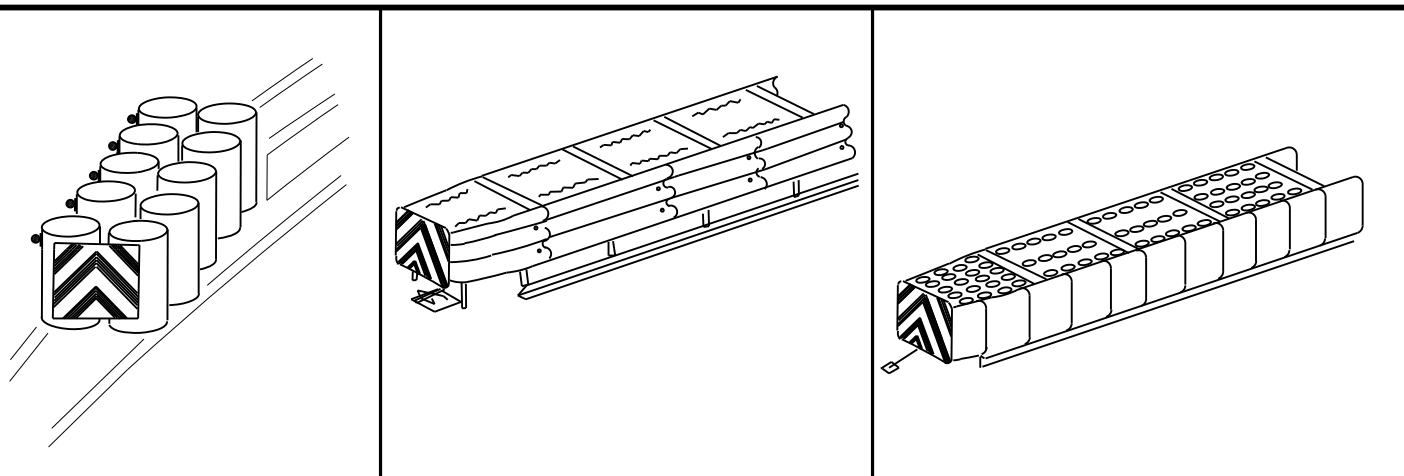
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

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7-20	0041	05	053	US 87
	DIST	COUNTY	SHEET NO.	
	AMA	POTTER	77	

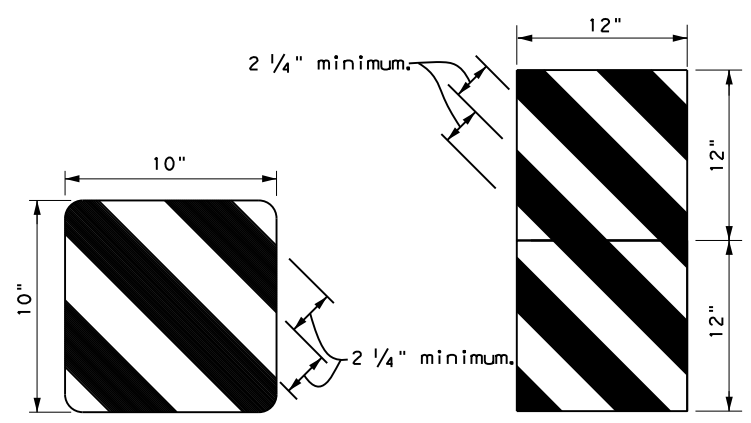
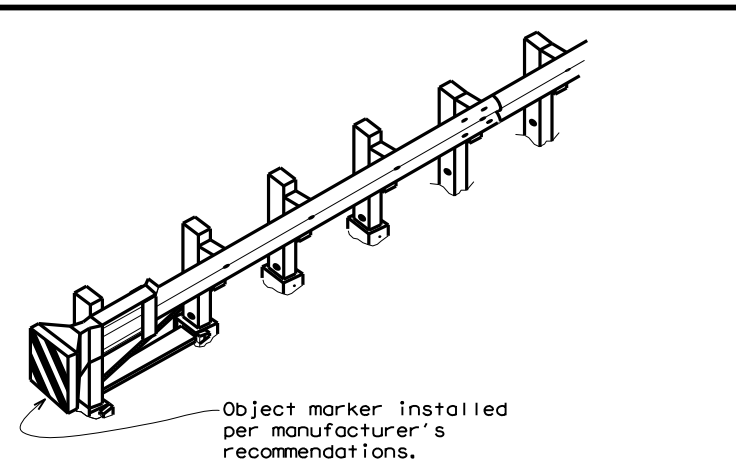
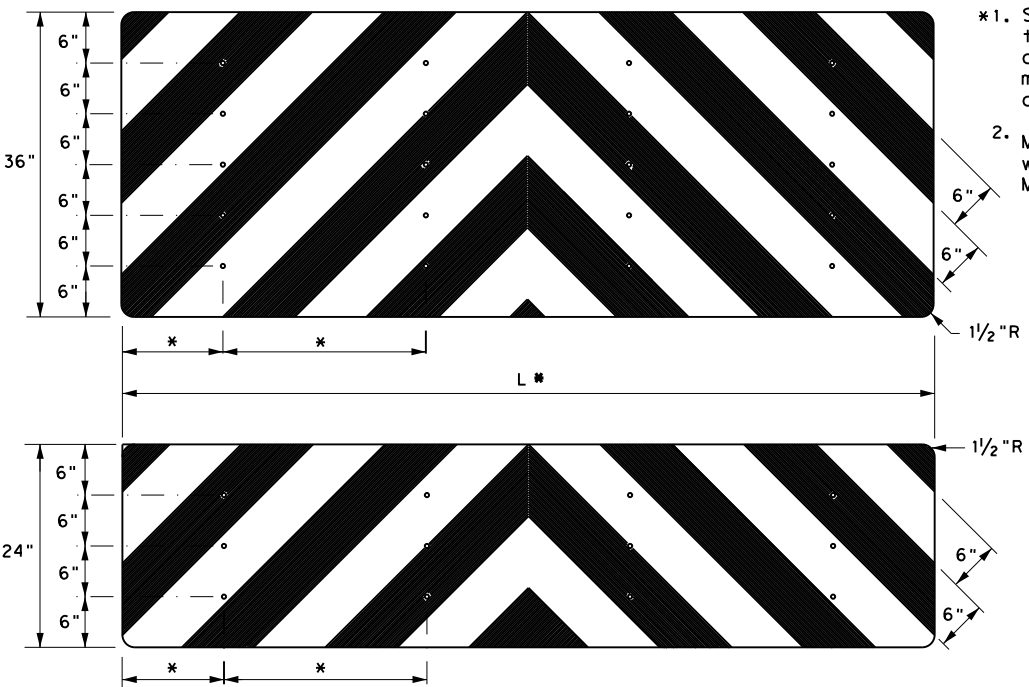
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NOTES

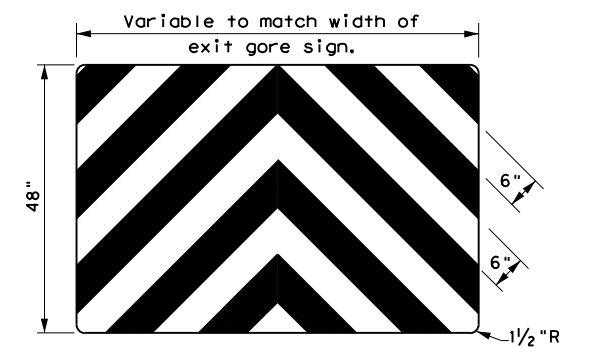
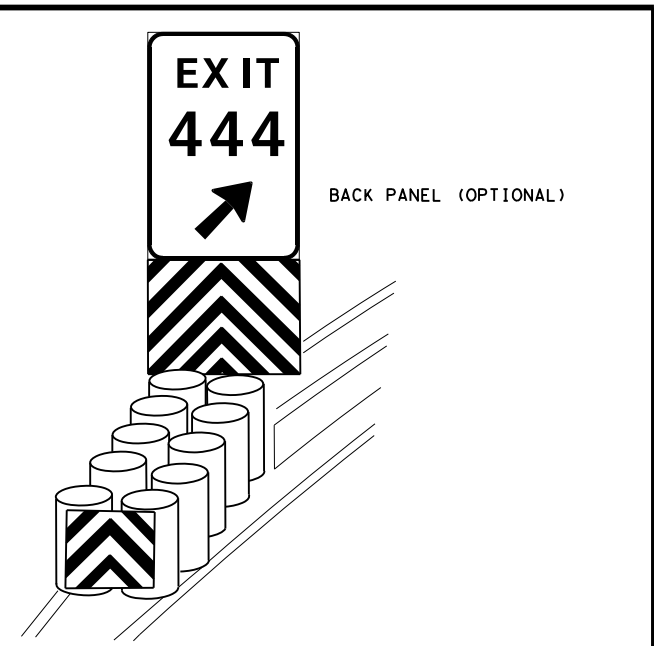
- *1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturer's recommendation, or as directed by the Engineer.
- *2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".



OBJECT MARKERS SMALLER THAN 3 FT²

NOTES

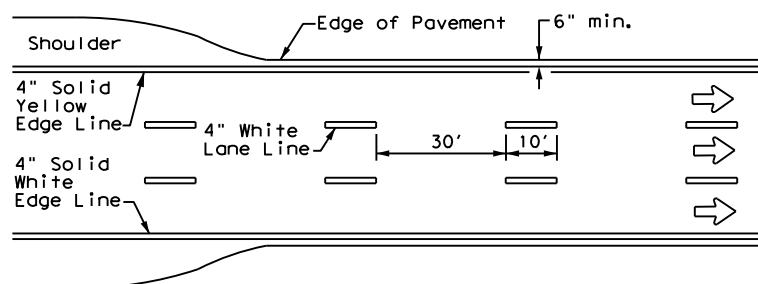
1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.
2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.
3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 1/4".
4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.
5. Object Marker at nose of attenuator is subsidiary to the attenuator.
6. See D & OM (1-4) for required barrier reflectors.



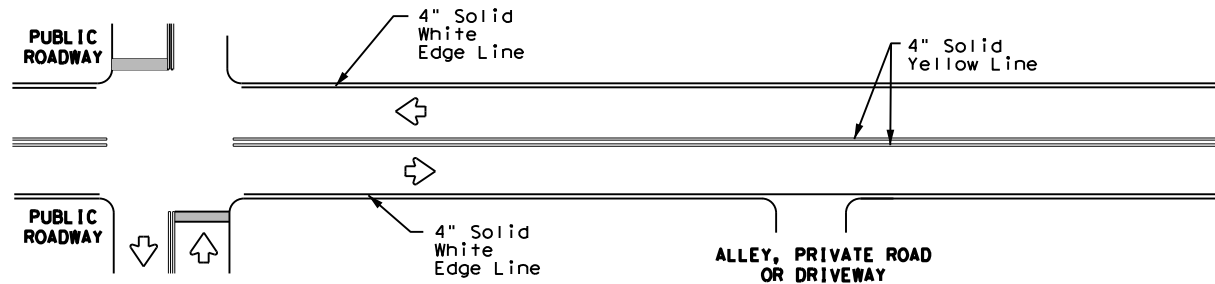
		Traffic Safety Division Standard	
DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS D & OM(VIA) -20			
FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT
© TXDOT December 1989	CONT	SECT	HIGHWAY
REVISIONS	0041	05	053 US 87
4-92 8-04	DIST	COUNTY	SHEET NO.
8-95 3-15	AMA	POTTER	78
4-98 7-20			
20G			

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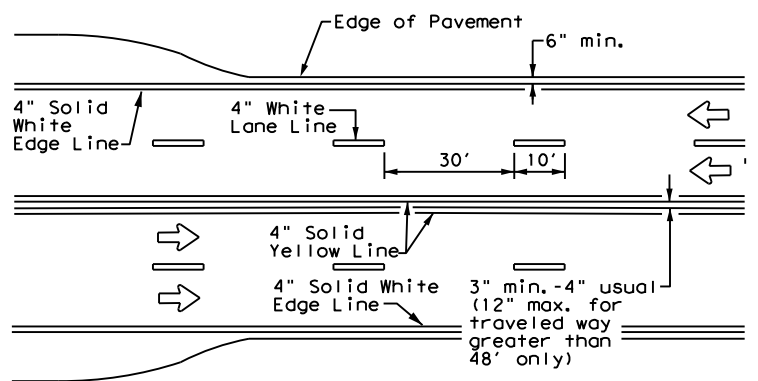
DATE: 11/17/2020 10:11:50 AM
 FILE: I:\XAMATPD\Construction Projects\0041-05\053 Candidate FLAPV4 - Design\Plan_Set\8. Traffic\Pavement Marking & Delineators\Standards\PM (1)-20.dgn



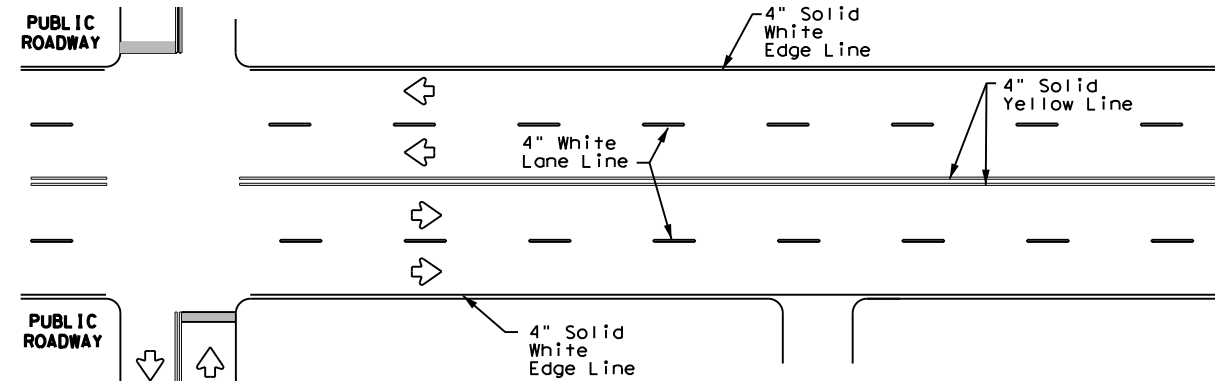
**EDGE LINE AND LANE LINES
 ONE-WAY ROADWAY
 WITH OR WITHOUT SHOULDERS**



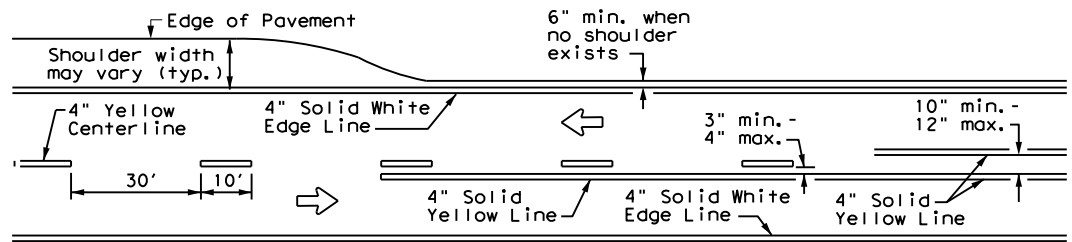
**TYPICAL TWO-LANE, TWO-WAY PAVEMENT
 MARKINGS THROUGH INTERSECTIONS**



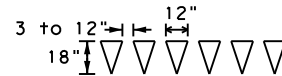
**CENTERLINE AND LANE LINES
 FOUR LANE TWO-WAY ROADWAY
 WITH OR WITHOUT SHOULDERS**



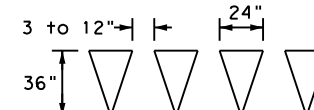
**TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
 MARKINGS THROUGH INTERSECTIONS**



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

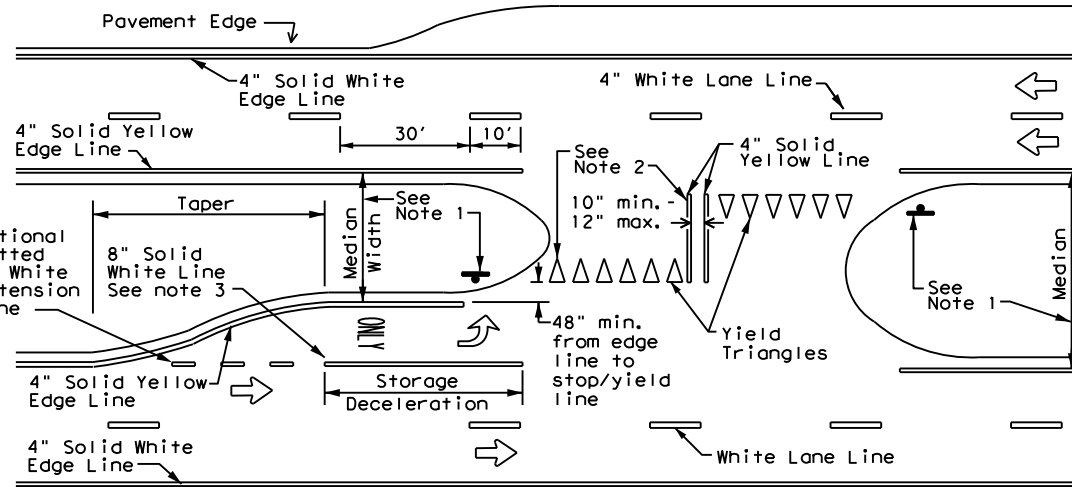


For posted speed on road being marked equal to or less than 40 MPH.



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

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

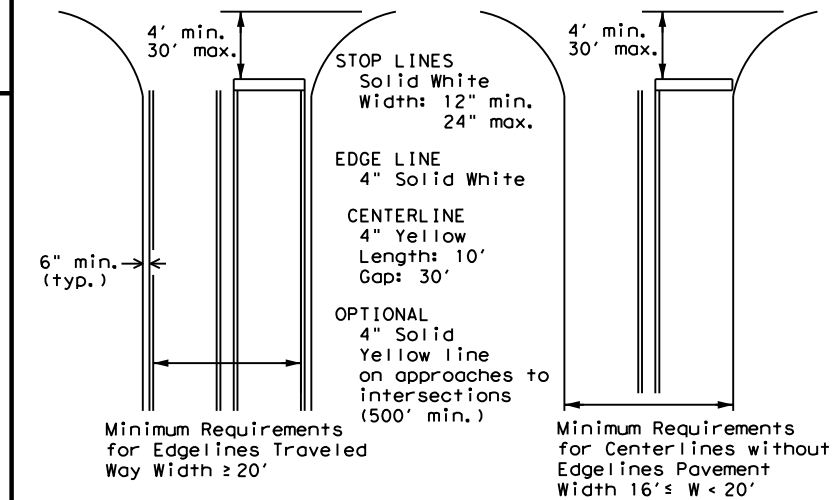
- Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling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

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

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

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



**GUIDE FOR PLACEMENT OF STOP LINES,
 EDGE LINE & CENTERLINE**

Based on Traveled Way and Pavement Widths for Undivided Highways



**TYPICAL STANDARD
 PAVEMENT MARKINGS**

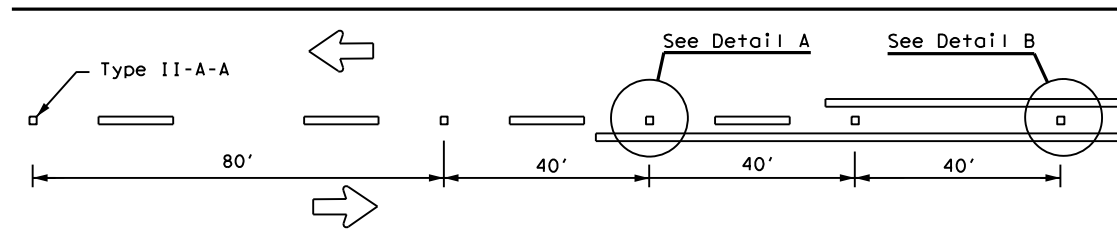
PM(1)-20

FILE: pm1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TXDOT November 1978	CONT	SECT	JOB	HIGHWAY
8-95 3-03 REVISIONS	0041	05	053	US 87
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	AMA	POTTER		79

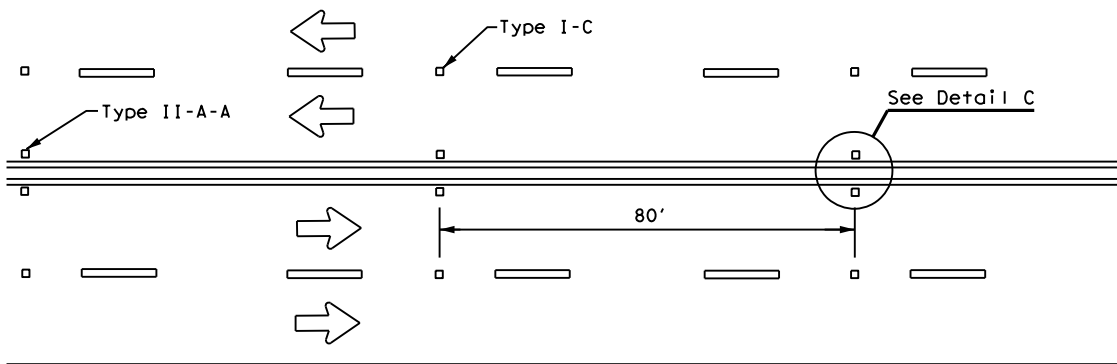
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

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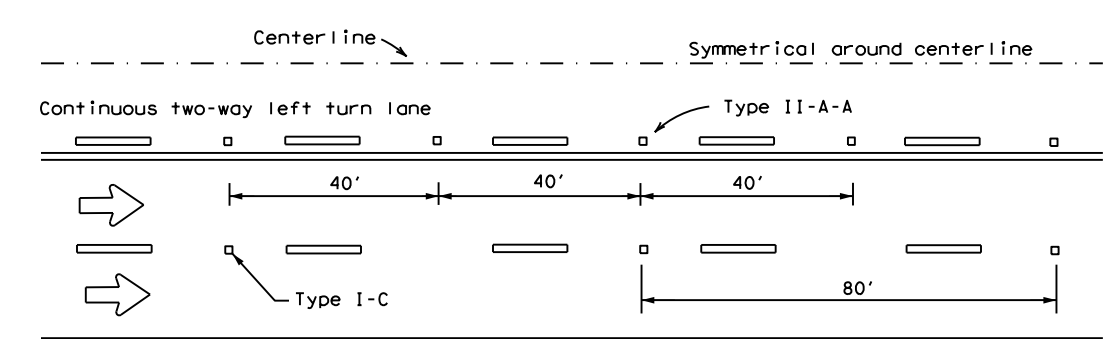
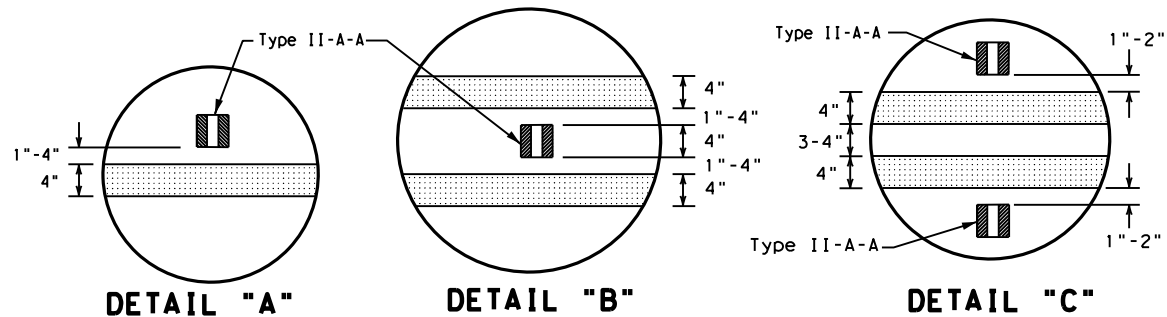
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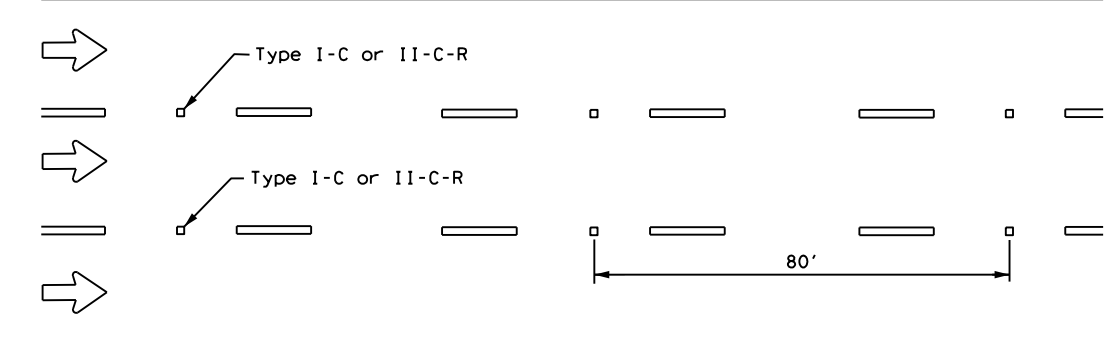
CENTERLINE FOR ALL TWO LANE ROADWAYS



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



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

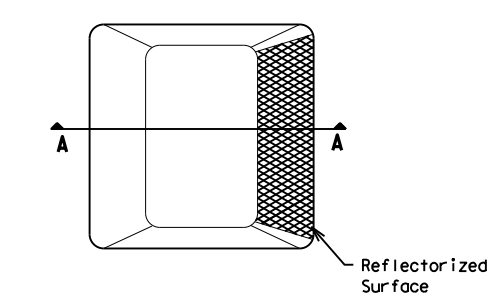


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

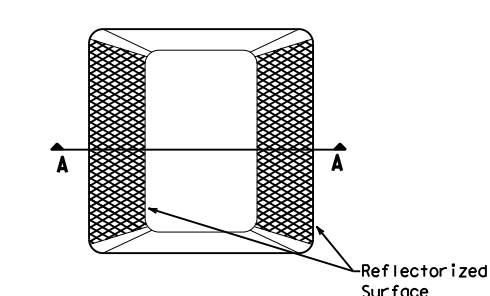
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

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

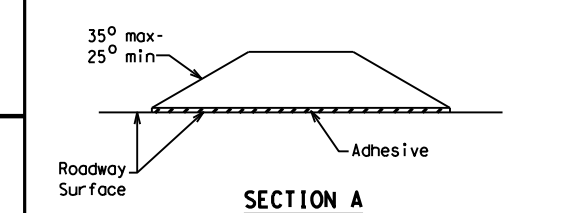
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



RAISED PAVEMENT MARKERS

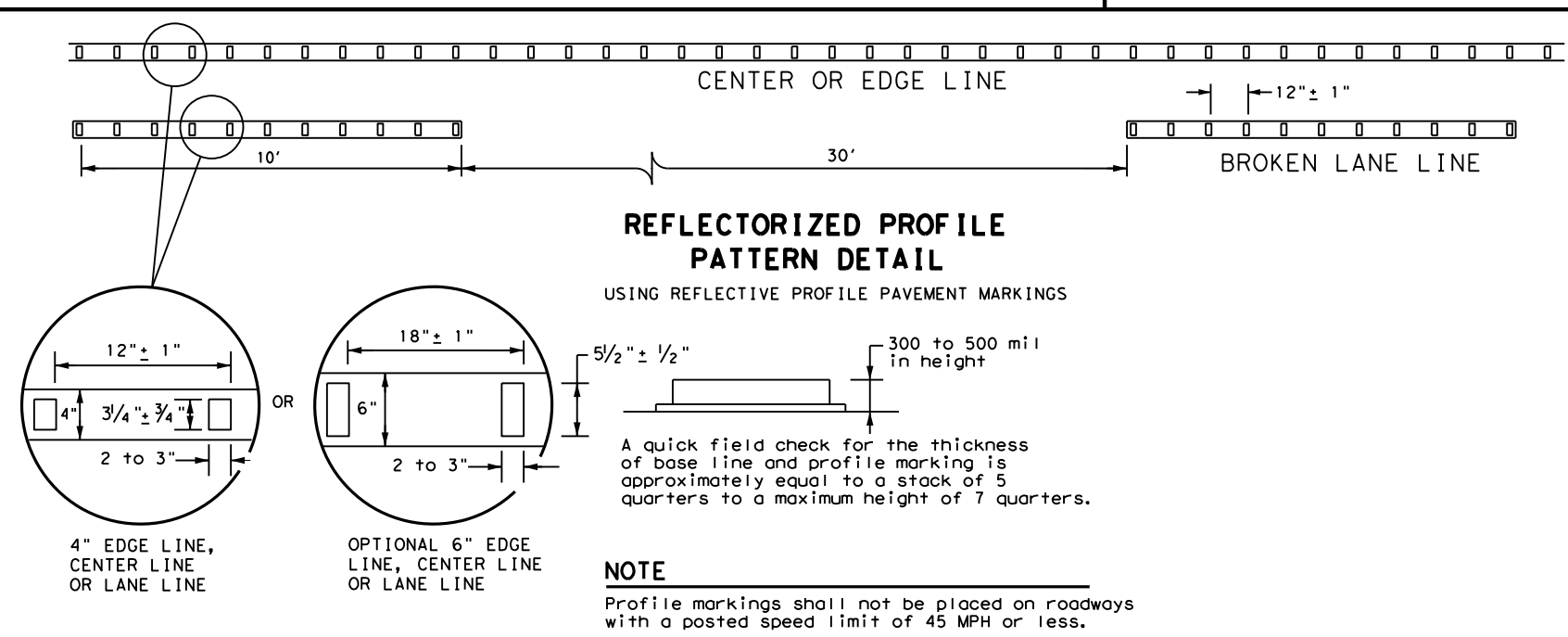
GENERAL NOTES

- All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
- On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.



POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS PM(2) -20

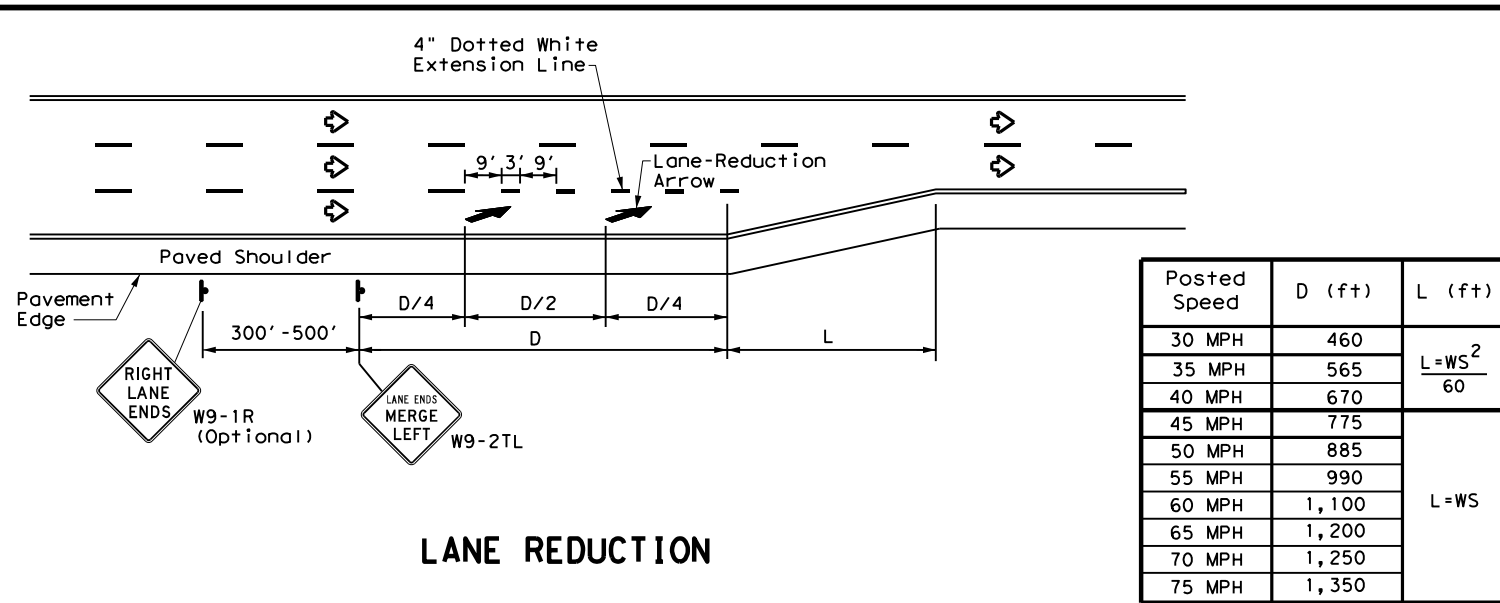
FILE: pm2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
4-92 2-10 REVISIONS	0041	05	053	US 87
5-00 2-12	DIST	COUNTY	SHEET NO.	
8-00 6-20	AMA	POTTER	80	



NOTE
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

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DATE: 11/17/2020 10:13:17 AM
 FILE: T:\AMATPD\Construction Projects\0041-05\053 Candidate FLAPV4 - Design\Plan_Set\8. Traffic\Pavement Marking & Delineators\Standards\PM (3)-20.dgn



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

LANE REDUCTION

NOTES

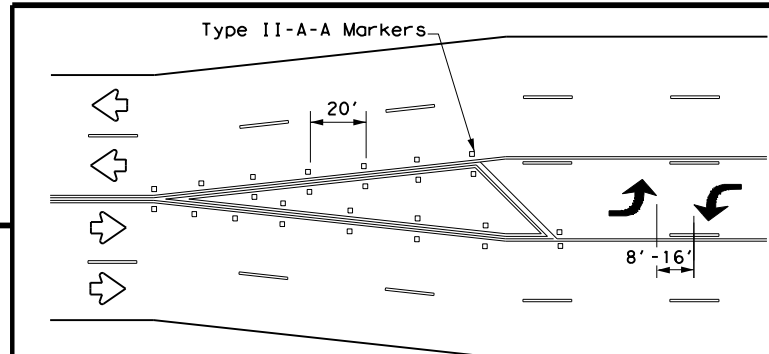
- Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
- On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
- 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.
- For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

GENERAL NOTES

- 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.
- 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.
- 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.
- Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

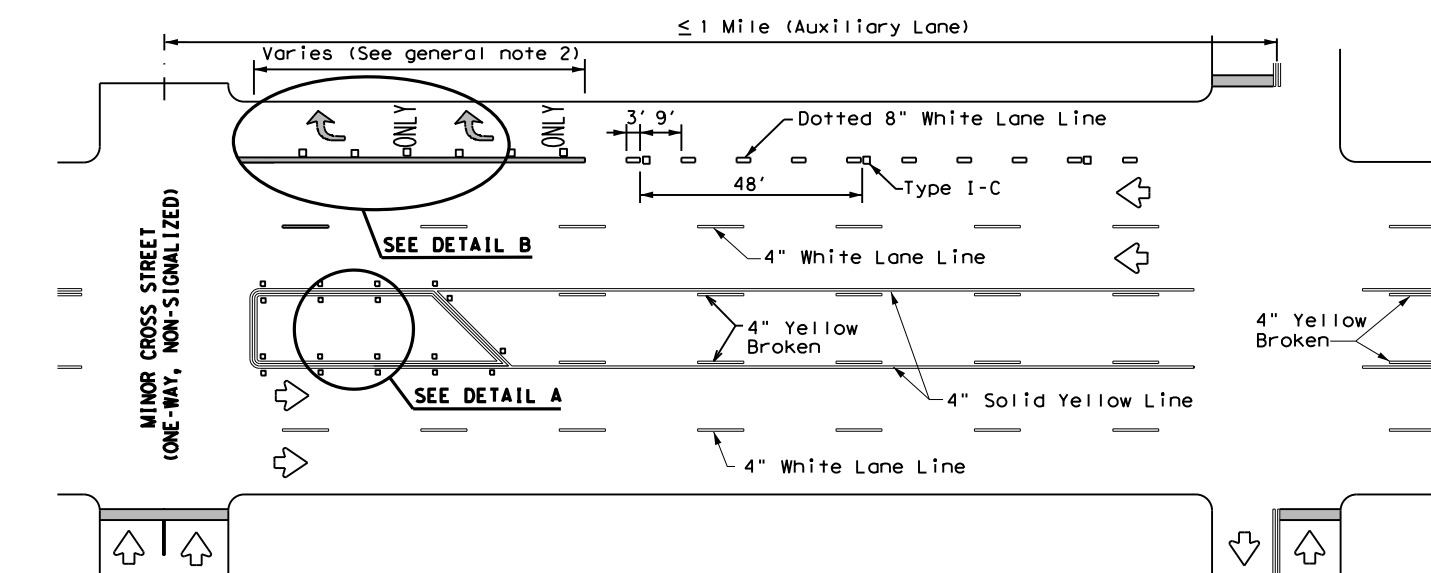
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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

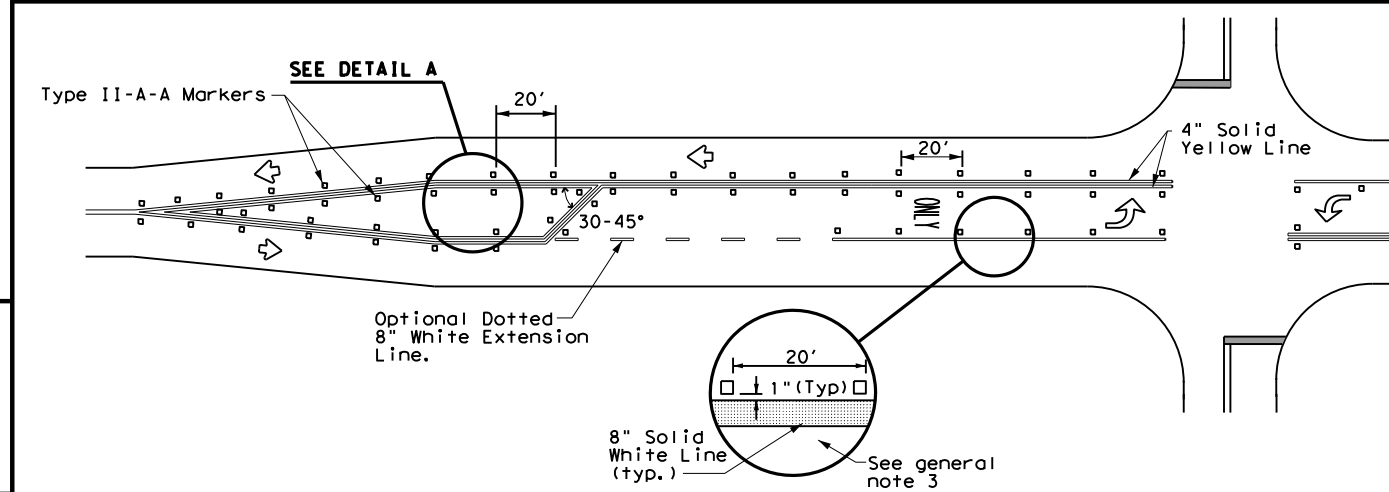


A two-way left-turn (TWLTL) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

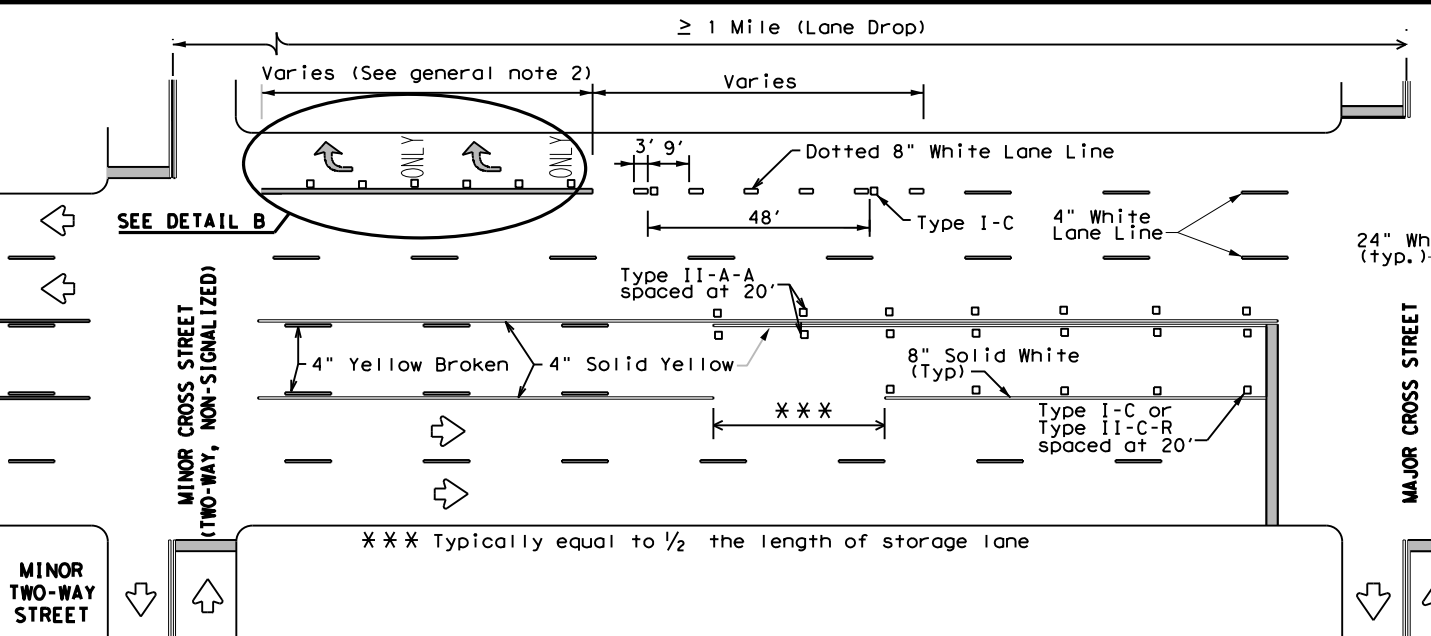
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY



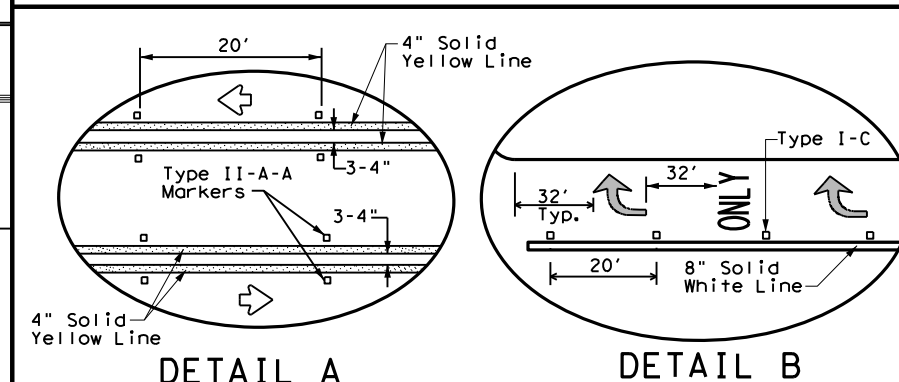
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



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



DETAIL A




DETAIL B

Texas Department of Transportation
 Traffic Safety Division Standard

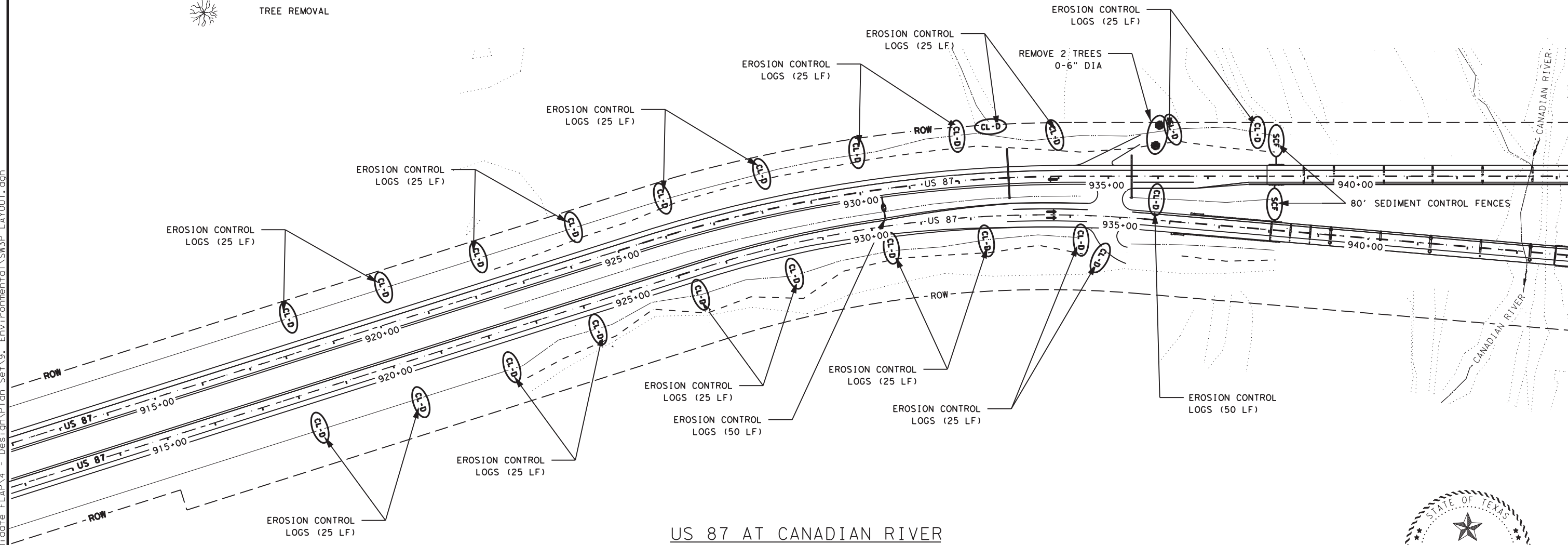
TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-20

FILE: pm3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0041	05	053	US 87
5-00 2-10	DIST	COUNTY	SHEET NO.	
8-00 2-12	AMA	POTTER	81	
3-03 6-20				

LEGEND:

-  EROSION CONTROL LOG DAM
-  SEDIMENT CONTROL FENCE
-  TREE REMOVAL

DATE: 11/17/2020 10:23:10 AM
FILE: I:\AMATPD\Construction Projects\0041-05\053 Candidate FLAPV4 - Design\Plan Set\9. Environmental\SW3P_LAYOUT.dgn



US 87 AT CANADIAN RIVER



Zachary K. Mayer P.E.

12/02/2020
US 87

**SW3P
LAYOUT**

SCALE: 1" = 200'



SHEET 1 OF 2

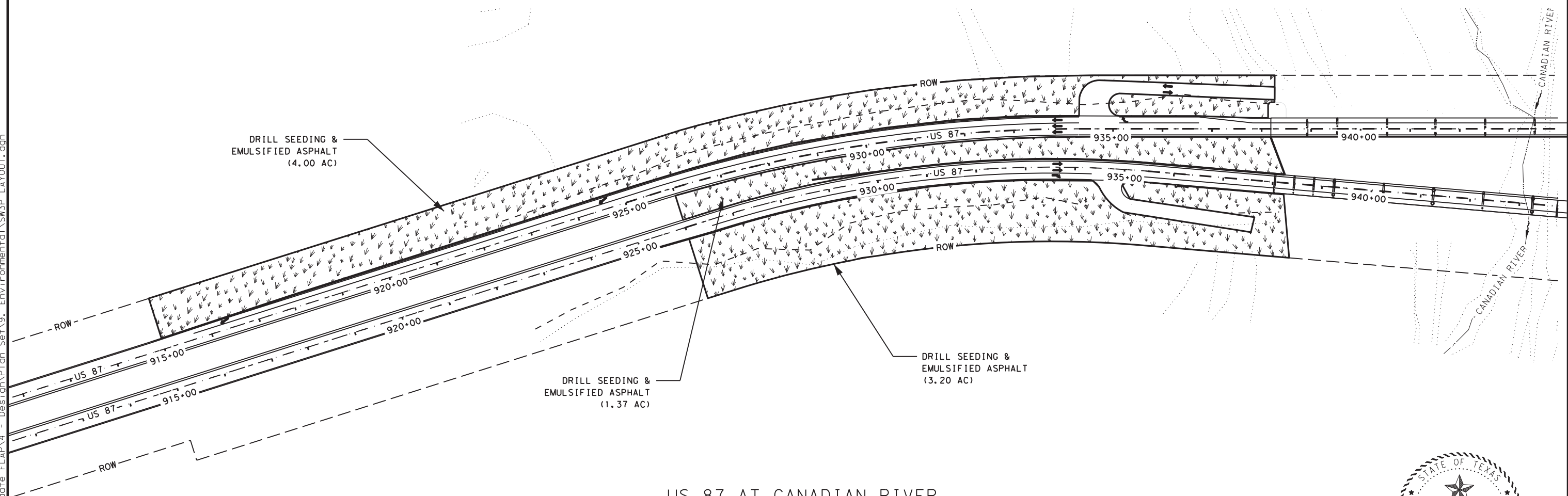
SUMMARY OF EROSION CONTROL ITEMS - SHEET 1 OF 2						
LOCATION	0100 6008	0506 6038	0506 6039	0506 6040	0506 6043	
	PREPARING ROW (TREE) (0" TO 6" DIA)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (8")	BIODEG EROSN CONT LOGS (REMOVE)	
	EA	LF	LF	LF	LF	LF
PHASE 1 SUMMARY	2	160	160	650		650
SHEET TOTALS:	2	160	160	650		650

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY	SHEET NO.	
JD	ZM	AMA	POTTER	82	

DATE: 11/17/2020 10:24:28 AM
 FILE: I:\AMATPD\Construction Projects\0041-05\053 Candidate FLAPV4 - Design\Plan Set\9. Environmental\SW3P_LAYOUT.dgn

LEGEND:

 DRILL SEEDING



**US 87 AT CANADIAN RIVER
 POST CONSTRUCTION**



Zachary K. Mayer P.E.

12/02/2020
 US 87

**SW3P
 LAYOUT**

SCALE: 1" = 200'



SHEET 2 OF 2

SUMMARY OF EROSION CONTROL ITEMS - SHEET 2 OF 2			
LOCATION	0164 6034	0164 6053	0314 6014
	DRILL SEEDING (PERM) (RURAL) (SANDY)	DRILL SEEDING (TEMP) (WARM OR COOL)	EMULS ASPH (EROSN CONT) (MS-2) (0.10 GAL/SY)
	AC	AC	GAL
PHASE 2 SUMMARY	8.57	8.57	4,148
SHEET TOTALS	8.57	8.57	4,148

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST	COUNTY		SHEET NO.
JD	ZM	AMA	POTTER		83

DATE: 12/15/2020 1:53:13 PM
 FILE: I:\AMATPD\Construction Projects\0041-05\053 Candidate FLAPV4 - Design\Plan Set\9. Environment\TXDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P).dgn

SITE DESCRIPTION

PROJECT LIMITS: FROM 2,370 FT SOUTH OF CANADIAN RIVER BRIDGE TO SOUTH END OF CANADIAN RIVER BRIDGE.

PROJECT DESCRIPTION: ADDITION OF NORTHBOUND RIGHT TURN LANE, SOUTHBOUND ACCELERATION LANE, SOUTHBOUND ACCESS ROAD, AND MEDIAN PROTECTION.

MAJOR SOIL DISTURBING ACTIVITIES: ROADWAY WIDENING FOR LANE ADDITIONS, CREATION OF SOUTHBOUND ACCESS ROAD, AND CROSSOVER REMOVAL.

TOTAL PROJECT AREA: APPROX. 8.57 ACRES

TOTAL AREA TO BE DISTURBED: APPROX. 3.04 ACRES

WEIGHTED RUNOFF COEFFICIENT
 (BEFORE CONSTRUCTION): _____
 (AFTER CONSTRUCTION): _____

EXPLANATION OF THE TECHNICAL BASIS USED TO SELECT THE PRACTICES TO CONTROL POLLUTION WHERE FLOWS EXCEED PRE-DEVELOPMENT LEVELS: _____

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER: 50% GRASS AND NATIVE VEGETATION

NAME OF RECEIVING WATERS: CANADIAN RIVER

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

- TEMPORARY SEEDING
- PERMANENT PLANTING, SODDING, OR SEEDING
- MULCHING
- SOIL RETENTION BLANKET
- BUFFER ZONES
- PRESERVATION OF NATURAL RESOURCES

OTHER: _____

EROSION AND SEDIMENT CONTROLS (CONT.)

STRUCTURAL PRACTICES:

Permanent	Temporary	
_____	<input checked="" type="checkbox"/>	SILT FENCES
_____	_____	HAY BALES
_____	_____	ROCK BERMS
_____	_____	DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
_____	_____	DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
_____	_____	DIVERSION DIKE AND SWALE COMBINATIONS
_____	_____	PIPE SLOPE DRAINS
_____	_____	PAVED FLUMES
_____	_____	ROCK BEDDING AT CONSTRUCTION EXIT
_____	_____	TIMBER MATTING AT CONSTRUCTION EXIT
_____	_____	CHANNEL LINERS
_____	_____	SEDIMENT TRAPS
_____	_____	SEDIMENT BASINS
_____	_____	STORM INLET SEDIMENT TRAP
_____	_____	STONE OUTLET STRUCTURES
_____	_____	CURBS AND GUTTERS
_____	_____	STORM SEWERS
_____	<input checked="" type="checkbox"/>	VELOCITY CONTROL DEVICES
_____	<input checked="" type="checkbox"/>	EROSION CONTROL LOGS

OTHER: _____

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

THE ORDER OF ACTIVITIES ARE AS FOLLOWS:

1. INSTALL CONTROL DEVICES AS SHOWN ON PLANS AND DIRECTED BY THE ENGINEER.
2. MAINTAIN AND UPGRADE DEVICES AS NEEDED.
3. WHEN CONSTRUCTION ACTIVITY IS COMPLETED TEMPORARY CONTROLS SHALL BE REMOVED AS APPROVED BY THE ENGINEER.

STORM WATER MANAGEMENT: CARE SHOULD BE TAKEN TO DISTURB AS LITTLE OF THE NATURAL AREA AS POSSIBLE.

STORM WATER DRAINAGE WILL BE PROVIDED BY EXISTING DITCHES AND CULVERTS.
STORM WATER SHALL BE FILTERED THROUGH SEDIMENT CONTROL DEVICES BEFORE LEAVING THE PROJECT.

DESCRIPTION OF ANY MEASURES INSTALLED DURING THE CONSTRUCTION PROCESS TO CONTROL STORM WATER DISCHARGES AFTER CONSTRUCTION OPERATIONS HAVE BEEN COMPLETED:
ALL DISTURBED AREAS SHALL BE SEEDED BEFORE CONSTRUCTION COMPLETION.

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE: ALL EROSION AND SEDIMENT CONTROLS WILL BE MAINTAINED IN GOOD WORKING ORDER. IF A REPAIR IS NECESSARY, IT WILL BE DONE AT THE EARLIEST DATE POSSIBLE, BUT NO LATER THAN 7 CALENDAR DAYS AFTER THE SURROUNDING EXPOSED GROUND HAS DRIED SUFFICIENTLY TO PREVENT FURTHER DAMAGE FROM HEAVY EQUIPMENT.

INSPECTION: AN INSPECTION WILL BE PERFORMED BY A TXDOT INSPECTOR OF THE CONSTRUCTION SITE AT LEAST ONCE EVERY 7 CALENDAR DAYS REGARDLESS OF RAINFALL. AN INSPECTION AND MAINTENANCE REPORT WILL BE MADE PER EACH INSPECTION. BASED ON THE INSPECTION RESULTS, THE CONTROLS SHALL BE REVISED PER THE INSPECTION REPORT.

WASTE MATERIALS: ALL WASTE MATERIALS WILL BE COLLECTED AND STORED IN A SECURELY LIDDED METAL DUMPSTER. THE DUMPSTER WILL MEET ALL STATE AND LOCAL CITY SOLID WASTE MANAGEMENT REGULATIONS. ALL TRASH AND CONSTRUCTION DEBRIS FROM THE SITE WILL BE DEPOSITED IN THE DUMPSTER. THE DUMPSTER WILL BE EMPTIED AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION, AND THE TRASH WILL BE HAULED TO A PERMITTED LANDFILL. NO CONSTRUCTION WASTE MATERIAL WILL BE BURIED ON SITE.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): AT A MINIMUM, ANY PRODUCTS IN THE FOLLOWING CATEGORIES ARE CONSIDERED TO BE HAZARDOUS: PAINTS, ACIDS FOR CLEANING MASONRY SURFACES, CLEANING SOLVENTS, ASPHALT PRODUCTS, CHEMICAL ADDITIVES FOR SOIL STABILIZATION, OR CONCRETE CURING COMPOUNDS AND ADDITIVES. IN THE EVENT OF A SPILL WHICH MAY BE HAZARDOUS, THE SPILL COORDINATOR SHOULD BE CONTACTED IMMEDIATELY AT (806) 356-3200.

SANITARY WASTE: ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

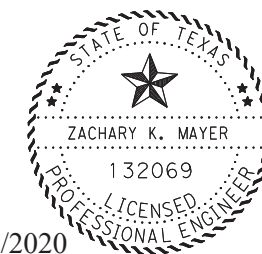
OFF SITE VEHICLE TRACKING:

- _____ HAUL ROADS DAMPENED FOR DUST CONTROL
- LOADED HAUL TRUCKS TO BE COVERED WITH TARPULIN
- EXCESS DIRT ON ROAD REMOVED DAILY
- STABILIZED CONSTRUCTION ENTRANCE

OTHER: _____

REMARKS: DISPOSAL AREAS, STOCKPILES, AND HAUL ROADS SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE AND CONTROL THE AMOUNT OF SEDIMENT THAT MAY ENTER RECEIVING WATERS. DISPOSAL AREAS SHALL NOT BE LOCATED IN ANY WETLAND, WATERBODY OR STREAMBED. CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS SHALL BE CONSTRUCTED BY THE CONTRACTOR IN A MANNER TO MINIMIZE THE RUNOFF OF POLLUTANTS.

ALL WATERWAYS SHALL BE CLEARED AS SOON AS PRACTICABLE OF TEMPORARY EMBANKMENT, TEMPORARY BRIDGES, MATTING, FALSEWORK, PILING, DEBRIS OR OTHER OBSTRUCTIONS PLACED DURING CONSTRUCTION OPERATIONS THAT ARE NOT A PART OF THE FINISHED WORK.



Zachary K. Mayer P.E.

**US 87
 TxDOT STORM
 WATER POLLUTION
 PREVENTION PLAN
 (SW3P)**

SCALE: 1" = 100'



SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
JD	BM	0041	05	053	US 87
DRWN	CK	DIST		COUNTY	SHEET NO.
JD	ZM	AMA		POTTER	84

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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. NONE
2. No Action Required Required Action

Action No.

- Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
- Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
- Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
- Comply with project SW3P and CGP, and post a construction site notice in project area.

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
- 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.

-
-

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
<input checked="" type="checkbox"/> Temporary Vegetation	<input type="checkbox"/> Silt Fence	<input checked="" type="checkbox"/> Vegetative Filter Strips
<input type="checkbox"/> Blankets/Matting	<input type="checkbox"/> Rock Berm	<input type="checkbox"/> Retention/Irrigation Systems
<input type="checkbox"/> Mulch	<input type="checkbox"/> Triangular Filter Dike	<input type="checkbox"/> Extended Detention Basin
<input type="checkbox"/> Sodding	<input type="checkbox"/> Sand Bag Berm	<input type="checkbox"/> Constructed Wetlands
<input type="checkbox"/> Interceptor Swale	<input type="checkbox"/> Straw Bale Dike	<input type="checkbox"/> Wet Basin
<input type="checkbox"/> Diversion Dike	<input type="checkbox"/> Brush Berms	<input type="checkbox"/> Erosion Control Compost
<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Mulch Filter Berm and Socks
<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks
<input checked="" type="checkbox"/> Compost Filter Berm and Socks	<input checked="" type="checkbox"/> Compost Filter Berm and Socks	<input checked="" type="checkbox"/> Vegetation Lined Ditches
	<input type="checkbox"/> Stone Outlet Sediment Traps	<input type="checkbox"/> Sand Filter Systems
	<input type="checkbox"/> Sediment Basins	

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.

- In the event that unanticipated archeological deposits are encountered during construction, work in the immediate area will cease, and TxDOT archeological staff will be contacted to initiate post-review discovery procedures.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.

- No Action Required Required Action

Action No.

- Comply with Executive Order 13112 on Invasive Species and the intent of the Executive Order Memorandum on Beneficial Landscapes for re-vegetating the project area. The proposed seed mixture (both grasses and forbs) would be in accordance with Item 164, Seeding for Erosion Control, contained within TxDOT's Standard Specifications for the Construction & Maintenance of Highways, Streets, and Bridges.

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

- No Action Required Required Action

Action No.

- If any species on the Potter County Threatened & Endangered List is sighted in the project area during construction, stop construction and notify the area engineer.
- American Badger, Eastern Spotted Skunk, Swift Fox, Thirteen-lined Ground Squirrel: Contractors will be advised of potential occurrence in the project area, and to avoid harming the species if encountered, and to avoid unnecessary impacts to dens.
- Western Box Turtle, Texas Horned Lizard, Western Hognose Snake, Prairie Rattlesnake, Massasauga:
 - Contractors will be advised of potential occurrence in the project area, and to avoid harming the species if encountered. If reptiles are found on the project site, allow them to safely leave the project area. For the Texas Horned Lizard, avoidance should include avoiding harvester ant beds in the selection of Project Specific Locations (PSL's).
 - Apply hydromulching and/or hydroseeding in areas for soil stabilization and/or revegetation of disturbed areas where feasible. If hydromulching and/or hydroseeding are not feasible due to site conditions, utilize erosion control blankets that contain no netting or contain loosely woven, natural fiber netting. Plastic netting should be avoided to the extent practicable.
- Arkansas River Shiner, Peppered Chub: Use Water Quality Best Management Practices to insure that sediment from ground disturbance in the project area does not impact the Canadian River.
- Bird BMP's: a) Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season; b) avoid the removal of unoccupied, inactive nests, as practicable; c) do not collect, capture, relocate, or transport birds, eggs, young, or active nests without a permit.
- The Migratory Bird Treaty Act of 1918 states that it is unlawful to kill, capture, collect, possess, buy, sell, trade, or transport any migratory bird, nest, young, feather, egg in part or in whole, without a Federal permit issued in accordance with the Act's policies and regulations. In the event that migratory birds are encountered on-site during project construction, adverse impacts on protected birds, active nests, eggs, and/or young would be avoided and bridge work would not begin until the young have left the nest.
- Tree removal should be planned to take place outside the bird nesting season (April 1 - Aug 31). If the tree removal occurs between April 1 and August 31, the contractor shall complete a survey of active bird nests and will coordinate with the TxDOT Amarillo District Environmental Coordinator to determine appropriate survey procedures in accordance with TxDOT requirements.

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	NOT: Notice of Termination	TPDES: Texas Pollutant Discharge Elimination System
CGP: Construction General Permit	NWP: Nationwide Permit	TPWD: Texas Parks and Wildlife Department
DSHS: Texas Department of State Health Services	NOI: Notice of Intent	TxDOT: Texas Department of Transportation
FHWA: Federal Highway Administration	SPCC: Spill Prevention Control and Countermeasure	T&E: Threatened and Endangered Species
MOA: Memorandum of Agreement	SW3P: Storm Water Pollution Prevention Plan	USACE: U.S. Army Corp of Engineers
MOU: Memorandum of Understanding	PCN: Pre-Construction Notification	USFWS: U.S. Fish and Wildlife Service
MS4: Municipal Separate Stormwater Sewer System	PSL: Project Specific Location	
MBTA: Migratory Bird Treaty Act	TCEQ: Texas Commission on Environmental Quality	

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.

-

VII. OTHER ENVIRONMENTAL ISSUES

(Includes regional issues such as Edwards Aquifer District, etc.)

- No Action Required Required Action

Action No.

-



ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC

FILE: epic.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT January 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0041	05	053	US 87
12-12-2011 (05)	DIST	COUNTY	SHEET NO.	
	AMA	POTTER	85	

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ITEM 164 SEEDING FOR EROSION CONTROL

SEED (PERM) (RURAL or URBAN) (SAND or CLAY)

"WARM SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH
PERMANENT: EARLY SPRING SEED FROM FEBRUARY 15th THROUGH May 15th. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE: BUFFALO GRASS (Texoka) "Fluffy" WESTERN WHEATGRASS (ARRIBA) "Hard" BERMUDA GRASS (BLACK JACK) "Hard" Tiny Seed" 100% "Unhulled"	3.0 LBS PLS / ACRE 6.0 LBS PLS / ACRE 5.0 LBS PLS / ACRE @ 1/4" - 1/2" SOIL DEPTH
PERMANENT and TEMP. LATE SPRING SEED FROM MAY 15th THROUGH AUGUST 1st AS AREAS OF THE ROW THAT ARE LAID BY BUT DETERMINED TO BE OUT OF SEASON FOR PERMANENT DRILL SEEDING.	TYPE: MILLET (BROWN TOP) "Hard Shell", "Small Seed" - Nurse crop BERMUDA GRASS (BLACK JACK) "Hard" Tiny Seed" 100% "Unhulled"	30. LBS PLS / ACRE @ 1/4" SOIL DEPTH 5.0 LBS PLS / ACRE

SOIL PREPARATION EQUIPMENT AND PRACTICES:
RIPPER --- DISK --- HARROW --- CULTI-PACKER.

NOTES:

- ALL SEED MIXTURE TYPES SHALL BE PURCHASED IN PRE-MIXED BAGS, "BY TYPE" BLENDED BY THE GROWER SHIPPER.
- SOILS THAT ARE COMPACTED, HAVE CLODS, SHALL BE REWORKED UNTIL READY FOR SEEDING, AS DIRECTED.
- ALL SOIL SURFACES SHALL BE LEVEL WITH NATURAL FLOWING SMOOTH GRADES. NO TIRE RUTS OR FURTHER TRAFFIC ALLOWED.
- SOIL SURFACE SHALL BE FIRM BUT NOT COMPACTED, ALLOWING 1/4" DEPRESSION UNDER NORMAL FOOT TRAFFIC.
- SEED 100% OF THE BED AREA. NO SKIPS OR VOID AREAS ALLOWED. EXAMPLE: AREAS AROUND SIGN POSTS AND INLETS.
- SEED UP TO THE FIRST 6" OF THE EDGE OF PAVEMENT. AS DIRECTED, HAND RAKE ISOLATED SEEDED AREAS.
- WEIGH ALL CALIBRATED SEED SAMPLES FOR ACCURACY AND PRESENT DOCUMENTATION TO ENGINEER.

FOR DRILL SEEDING

- USE ONLY PROFESSIONAL NATIVE GRASS OR TURF GRASS (MULTI- 3 BIN) DRILL SEEDERS.
- CALIBRATE DRILL SEEDER FOR SPECIFIED (PLS) PER ACRE BEFORE DRILL SEEDING.
- DRILL SEEDER MUST BE EQUIPPED WITH THE LARGE FRONT CUTTING COULTERS DURING THE INSPECTION OF DRILL SEEDER.

FOR BROADCAST SEEDING

- USE ONLY COMMERCIAL TYPE CYCLONE TYPE SPREADERS.
- CALIBRATE CYCLONE SPREADER FOR 1000 Sq. Ft. (PLS) PER ACRE BEFORE SEEDING.
- TO PREVENT SEED SEPARATION IN SPREADERS, SPREAD ALL SEED TYPES INDEPENDENTLY IN A SEPARATE APPLICATION.
- IMMEDIATELY AFTER SEEDING, IN ONE OR TWO OPERATIONS, CULTI-PACK THE SEEDED SOILS AND FIRM SEED INTO SURFACE.
- DISCONTINUE SEEDING IF WIND EXCEEDS 10 MPH.

ITEM 164 SEEDING FOR EROSION CONTROL

SEED (TEMPORARY) COOL SEASON SEEDING

"COOL SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH
TEMPORARY: EARLY FALL SEED FROM AUGUST 1st THROUGH DECEMBER 1st. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE: WESTERN WHEATGRASS "Hard Shell" RED WINTER WHEAT, VAR: TAM III "Hard Shell"	6.0 LBS PLS / ACRE 34. LBS PLS / ACRE @ 1" SOIL DEPTH
TEMPORARY: LATE FALL SEED FROM DECEMBER 1st THROUGH DECEMBER 31st. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE: RED WINTER WHEAT, VAR: TAM III "Hard Shell"	34. LBS ACRE / PLS @ 1" SOIL DEPTH

SOIL PREPARATION EQUIPMENT AND PRACTICES:
RIPPER --- DISK --- HARROW --- CULTI-PACKER.

ITEM 314 EMULSIFIED ASPHALT TREATMENT

TIME SCHEDULE:

IMMEDIATELY AFTER SOIL PREPARATION OR WITHIN 24 HOURS AFTER SEEDING, APPLY THE TACK COAT TO DESIGNATED SOIL SURFACES.

FUNCTIONAL USE:

SOIL EROSION CONTROL, OR MOISTURE RETENTION BARRIER.

NOTES:

- ALL TRUCK APPLICATIONS SHALL BE COMPLETED IN ONE PASS OF THE DISTRIBUTOR. ALL TOUCH UP WORK WILL BE FINISHED BY HAND AND HOSE PROCEDURES. APPLY FROM EDGE OF PAVEMENT THROUGH THE FULL SPECIFIED AREAS.
- ENGINEER WILL INSPECT FOR ACCURACY THE OVERALL DEPTH OF THE APPLIED TACK COAT MATERIALS.
- FURTHER VEHICULAR TRAFFIC IS NOT ALLOWED ON LAID BY TACK COAT SURFACES. AT THE CONTRACTORS EXPENSE ALL DAMAGES TO TACK COAT SURFACES WILL BE RE -SHOT AS DIRECTED BY THE ENGINEER.

ITEM 166 FERTILIZER

TIME SCHEDULE:

AFTER TOPSOIL PLOWING PREPARATIONS ARE COMPLETED, FERTILIZE R.O.W. SOIL SURFACES AND HARROW 2" TO 4" DEEP INTO PLACE.

FUNCTIONAL USE:

PLANT NUTRIENTS FOR PLANT AND ROOT DEVELOPMENT.

FERTILIZER SHALL BE EVENLY DISTRIBUTED AT A RATE OF 28 LBS OF NITROGEN PER ACRE. THE BREAK DOWN OF THE NITROGEN ELEMENT SHALL BE IN A 50% SLOW RELEASE FORM. ANALYSIS OF THE (NPK) IS: 1-5-0 A HIGH PHOSPHATE BLEND. AS DIRECTED BY THE VEGETATION MANAGER.

ITEM 166 NOTES:

- BROADCAST SPECIFIED FERTILIZER FROM THE EDGE OF PAVEMENT, THROUGH THE ENTIRE ROW SEED BED AREA. APPLICATIONS FOR EDGE OF PAVEMENT, CULVERTS, SIGN POST AREAS, GUARD RAILS AND ISOLATED AREAS SHALL BE APPLIED BY WALK BEHIND SPREADERS AND BY HAND. NO FERTILIZER ALLOWED ON PAVEMENT SURFACES.
- ALL SPREADERS SHALL BE CALIBRATED BY THE CONTRACTOR AND THE ENGINEER FOR ACCURACY AND PERFORMANCE. SHALL USE UNOPENED 50# BAGS OF SPECIFIED FERTILIZER FOR DAILY CALIBRATIONS. APPLICATION SHALL BE AN EVEN DISTRIBUTION OF PRODUCT ON DESIGNATED SOIL SURFACES.
- FERTILIZER SHALL BE DELIVERED IN 50# BAGS UNLESS OTHERWISE SPECIFIED OR APPROVED PRIOR TO DELIVERY. BAGS SHALL BE CLEARLY LABELED SHOWING CONTENTS. IF BULK FERTILIZER IS APPROVED, DOCUMENTATION WILL BE REQUIRED FOR EACH LOAD OF MATERIAL DELIVERED VERIFYING AUTHENTICITY OF THE MATERIAL. CULTURAL PROCEDURES ARE UNDER THE DIRECTION OF THE TxDOT VEGETATION MANAGER.



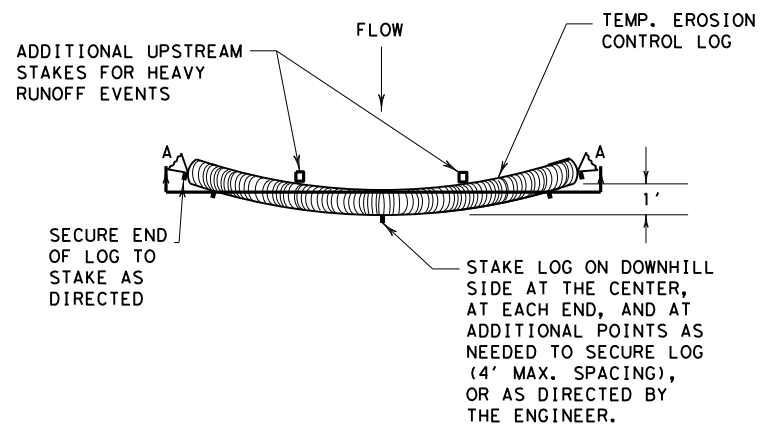
AMARILLO DISTRICT STANDARD

VEGETATION SPECIFICATION SHEET

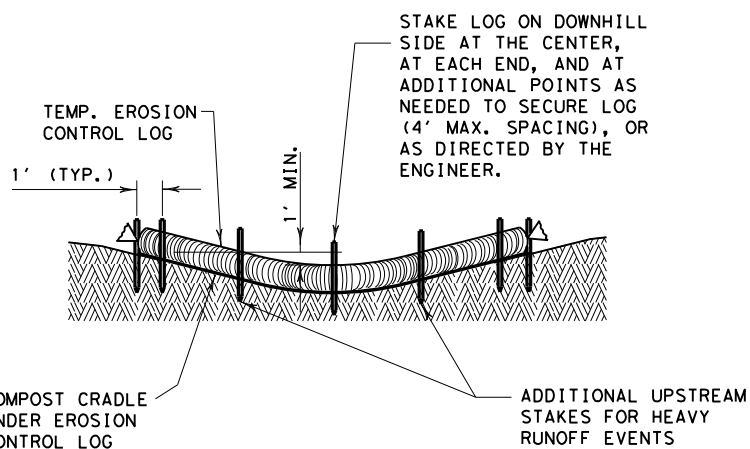
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SEE TITLE SHEET	CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.	
AMA	POTTER		86	

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PLAN VIEW



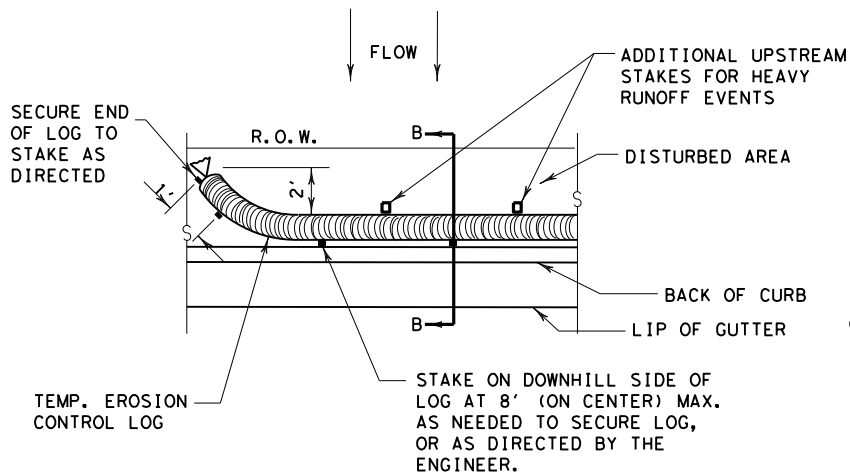
SECTION A-A

EROSION CONTROL LOG DAM

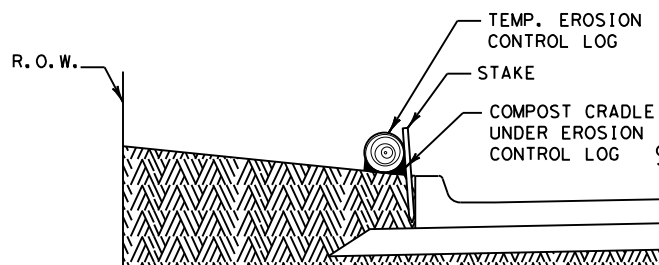
CL-D

LEGEND

- CL-D EROSION CONTROL LOG DAM
- CL-BOC EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI EROSION CONTROL LOG AT DROP INLET
- CL-CI EROSION CONTROL LOG AT CURB INLET
- CL-GI EROSION CONTROL LOG AT CURB & GRATE INLET



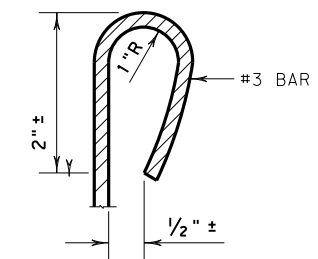
PLAN VIEW



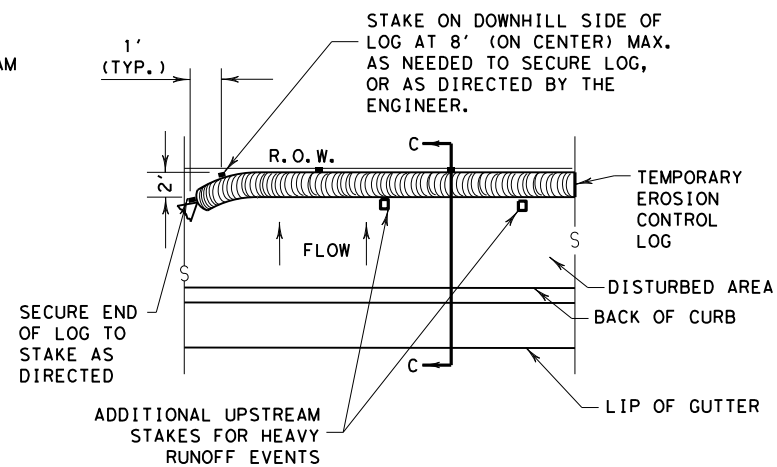
SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

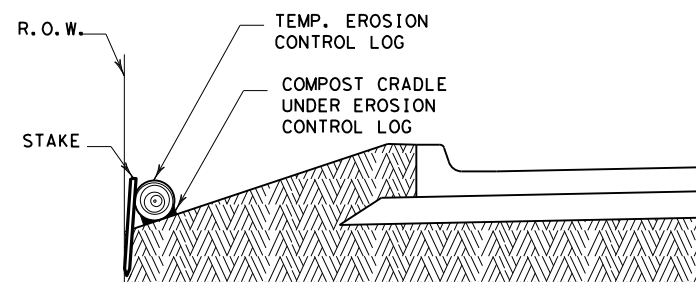
CL-BOC



REBAR STAKE DETAIL



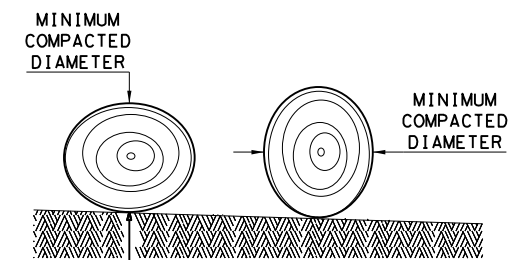
PLAN VIEW



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

GENERAL NOTES:

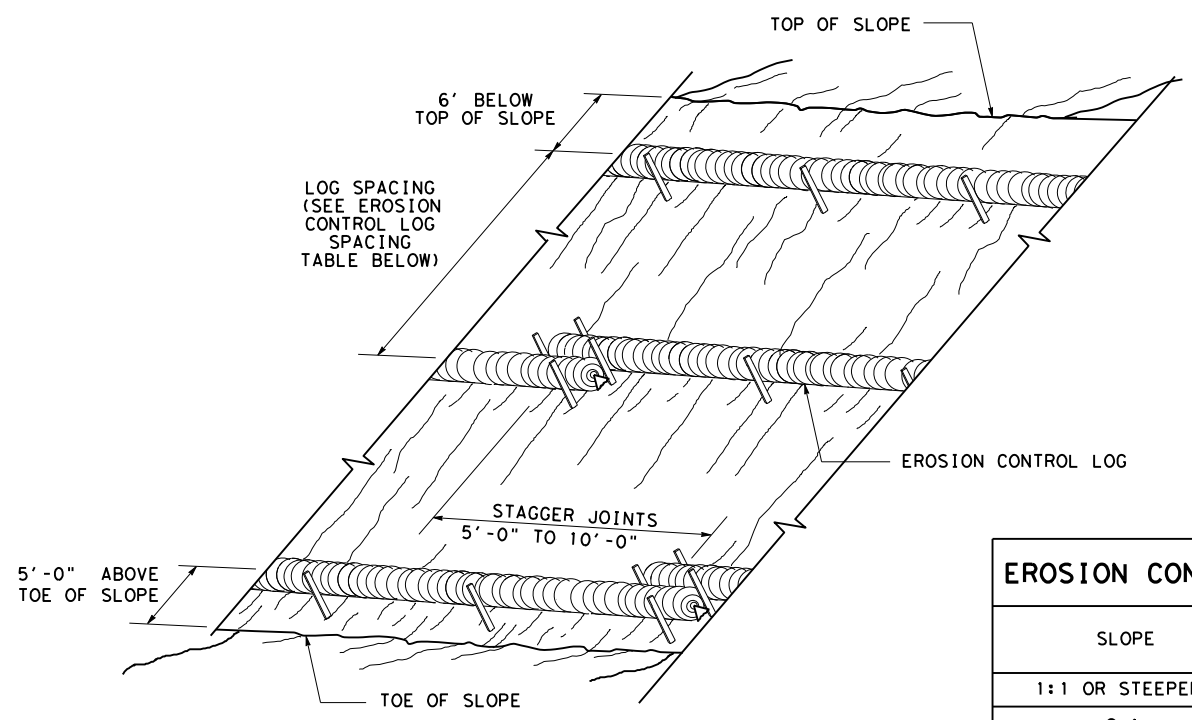
1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SHEET 1 OF 3

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC (9) - 16			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT: 0041	SECT: 05	JOB: US 87
REVISIONS	DIST: AMA	COUNTY: POTTER	SHEET NO.: 87

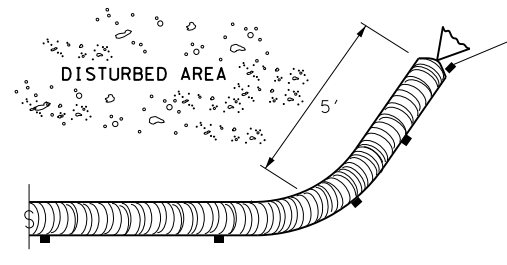
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**EROSION CONTROL LOGS ON SLOPES
 STAKE AND TRENCHING ANCHORING**

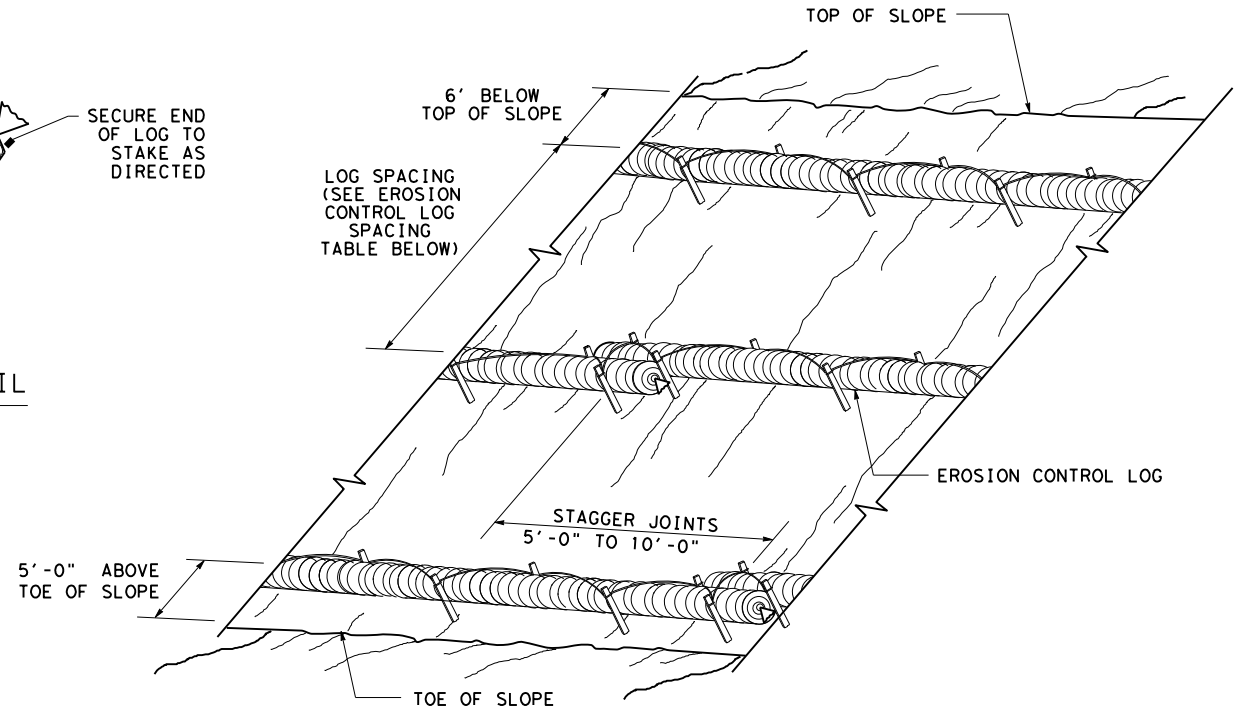
CL-SST



END SECTION RAP DETAIL

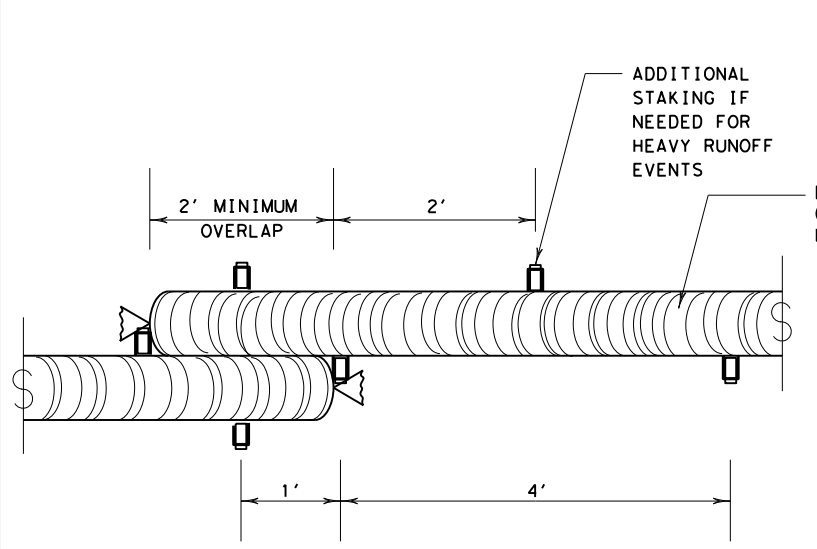
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
 SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
 HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



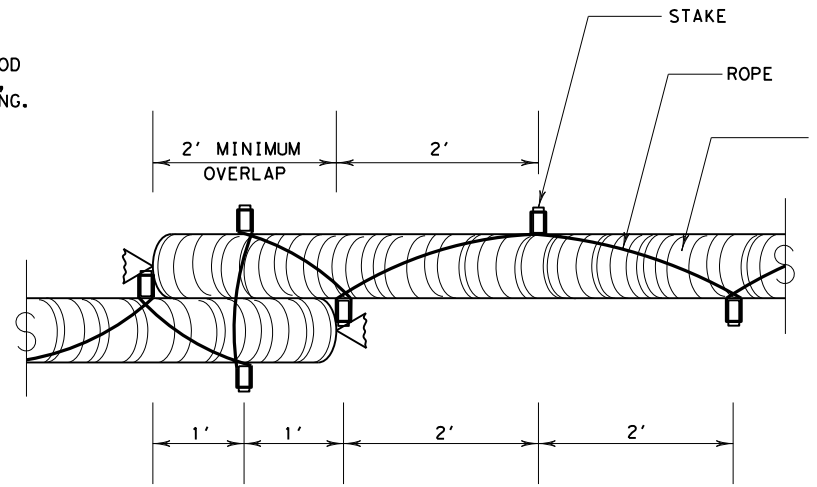
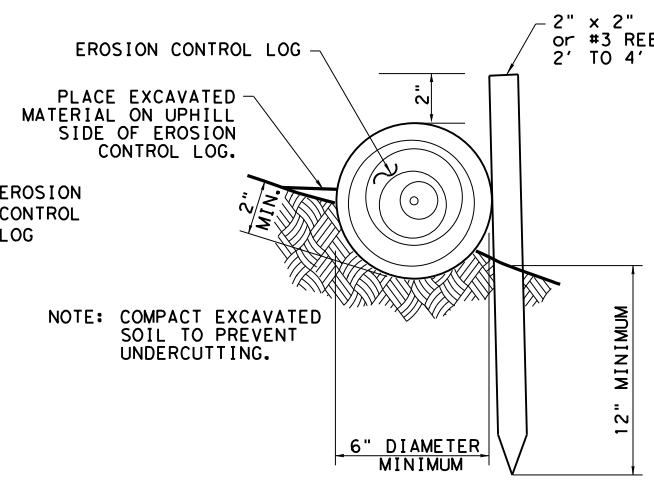
**EROSION CONTROL LOGS ON SLOPES
 STAKE AND LASHING ANCHORING**

CL-SSL



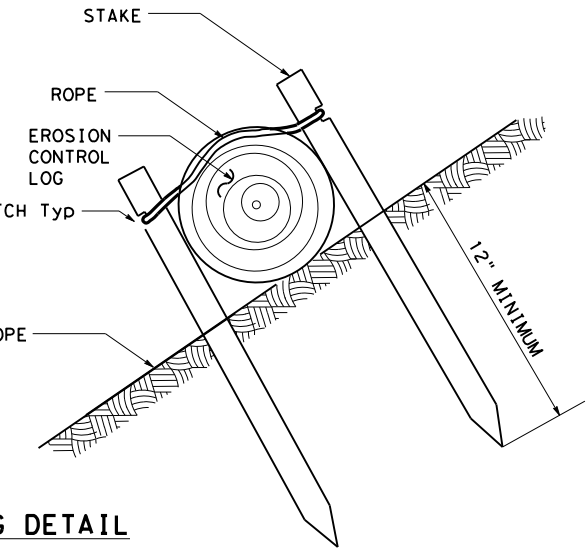
STAKE AND TRENCHING ANCHORING DETAIL

CL-SST



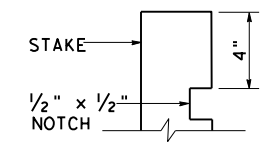
STAKE AND LASHING ANCHORING DETAIL

CL-SSL



LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"

TRENCH DEPTH TABLE



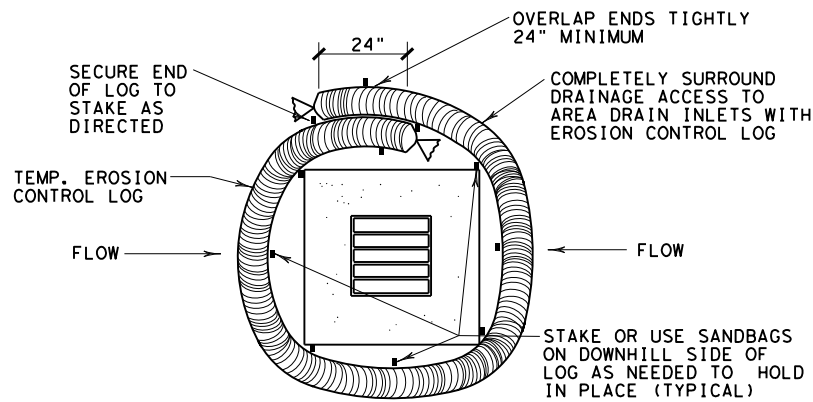
STAKE NOTCH DETAIL

SHEET 2 OF 3

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC (9) - 16			
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT	SECT	JOB
REVISIONS	0041	05	053
DIST	COUNTY	SHEET NO.	
AMA	POTTER	88	

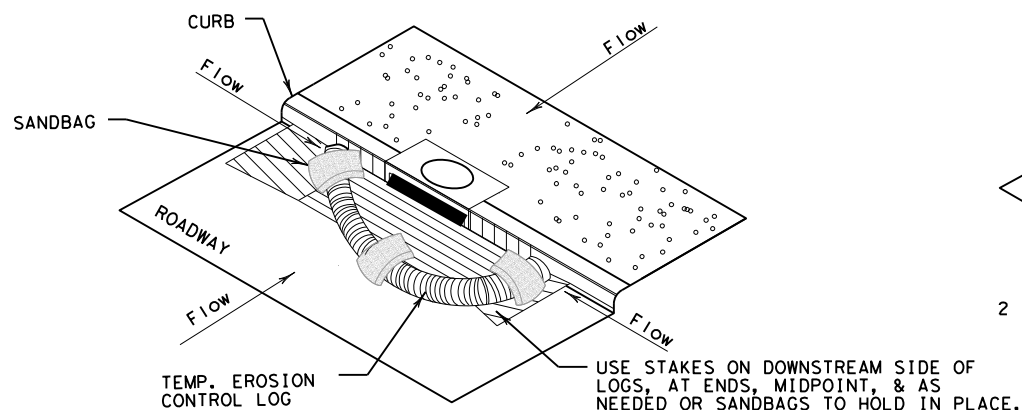
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DATE: 11/17/2020 10:28:54 AM
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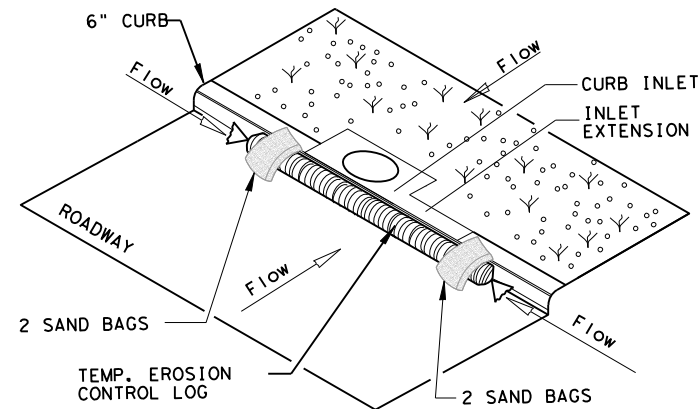
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

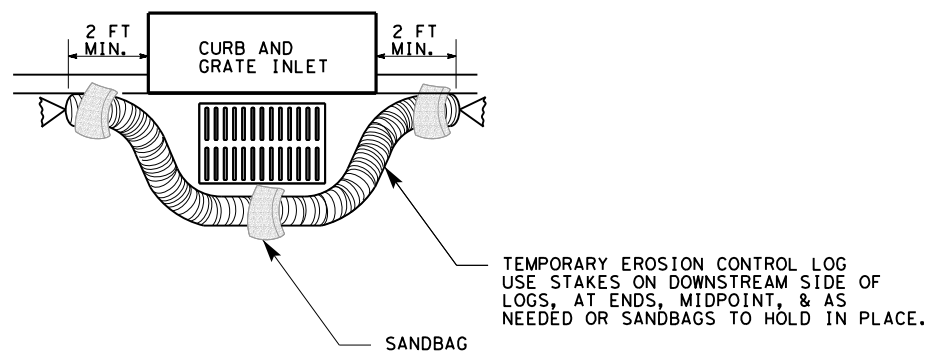
CL-CI



EROSION CONTROL LOG AT CURB INLET

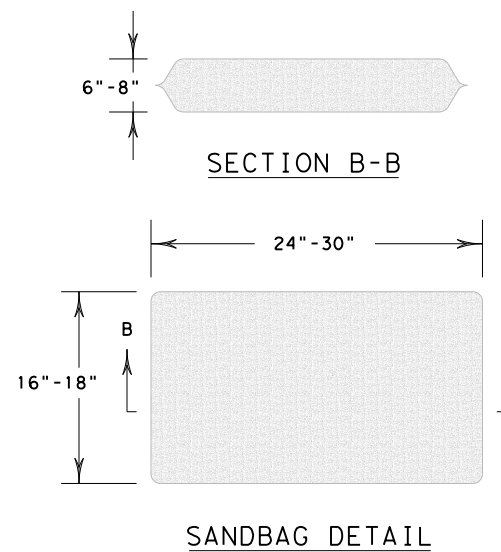
CL-CI

NOTE:
 EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI



SHEET 3 OF 3

		<i>Design Division Standard</i>	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC (9) - 16			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT	SECT	HIGHWAY
REVISIONS	0041	05	053 US 87
	DIST	COUNTY	SHEET NO.
	AMA	POTTER	89