FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	BR 2023(007)		1
STATE	STATE DIST.	COUNTY	
TEXAS	YKM	DEWITT	
CONT.	SECT.	JOB	HIGHWAY NO.
0143	08	098	US 87

SEE SHEET 2 FOR "INDEX OF SHEETS"

STATE OF TEXAS
TEXAS DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FOR THE MAINTENANCE OF BRIDGE
REAHBILITATE EXISTING BRIDGES

US 87
DEWITT COUNTY
CSJ: 0143-08-098
PROJECT NO.: BR 2023(007)

LIMITS - AT GUADALUPE RIVER AND RELIEF

HWY FUNCTIONAL CLASS: RURAL PRINCIPAL ARTERIAL
DESIGN SPEED: 60 MPH
ADT: 3,344 VPD (2017)
4,680 VPD (2037)

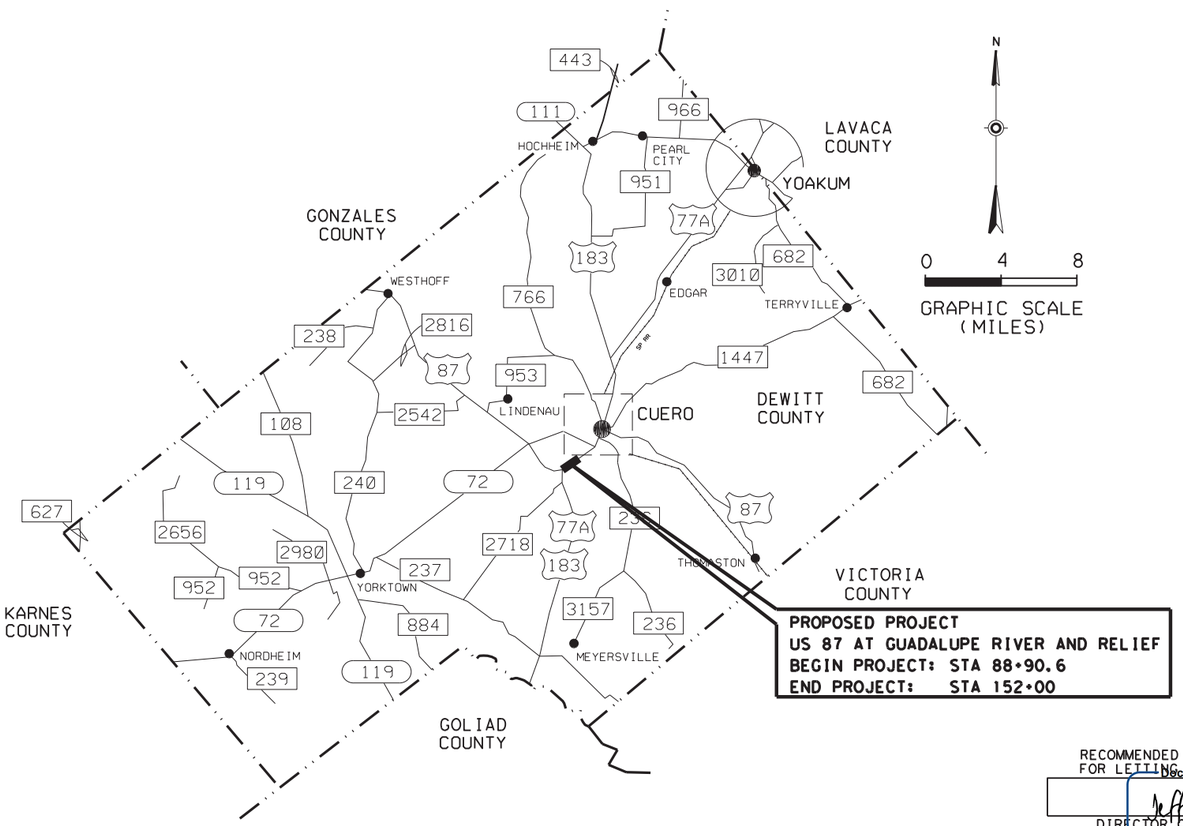
PROJECT LENGTH

ROADWAY	=	4,232.90 FT	=	0.802 MI
BRIDGES	=	2,076.50 FT	=	0.393 MI
TOTAL	=	6,309.40 FT	=	1.195 MI

EXCEPTIONS: NONE

EQUATIONS: NONE

RAILROAD CROSSINGS: NONE



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

LIST OF APPROVED FIELD CHANGES:

THIS IS TO CERTIFY THAT THE CONSTRUCTION WORK WAS PERFORMED IN ACCORDANCE WITH THE PLANS, CONTRACT AND LISTED FIELD CHANGES.

_____, P. E. _____
AREA ENGINEER DATE

STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED
PROFESSIONAL ENGINEER

Mojtaba Ranjbar, P.E.
06/06/2022

RECOMMENDED FOR LETTING 6/7/2022
DocuSigned by: Jeffery Vinklarek, P.E.
DIRECTOR OF TRANSPORTATION PLANNING & DEVELOPMENT

SUBMITTED FOR LETTING 06/06/2022
Mojtaba Ranjbar, P.E.
DESIGN ENGINEER

APPROVED FOR LETTING 6/7/2022
DocuSigned by: Martin C. Horst, P.E.
DISTRICT ENGINEER

DEWITT COUNTY
YOAKUM DISTRICT

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).

TEXAS DEPARTMENT OF TRANSPORTATION

DATE: 06/01/2022 03:13 PM
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GENERAL

	1	TITLE SHEET
	2	INDEX OF SHEETS
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	11-11A-11C	GENERAL NOTES
	12	QUANTITY SUMMARY
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STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED
PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH A " * " HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

Mojtaba Ranjbar, P.E.
NAME

06/06/2022
DATE

STATE OF TEXAS
LAURA ORTIZ
137207
LICENSED
PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH A " ^ " HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

Laura Ortiz
NAME

06/07/2022
DATE

US 87

INDEX OF SHEETS

Texas Department of Transportation

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0143	08	098	US 87
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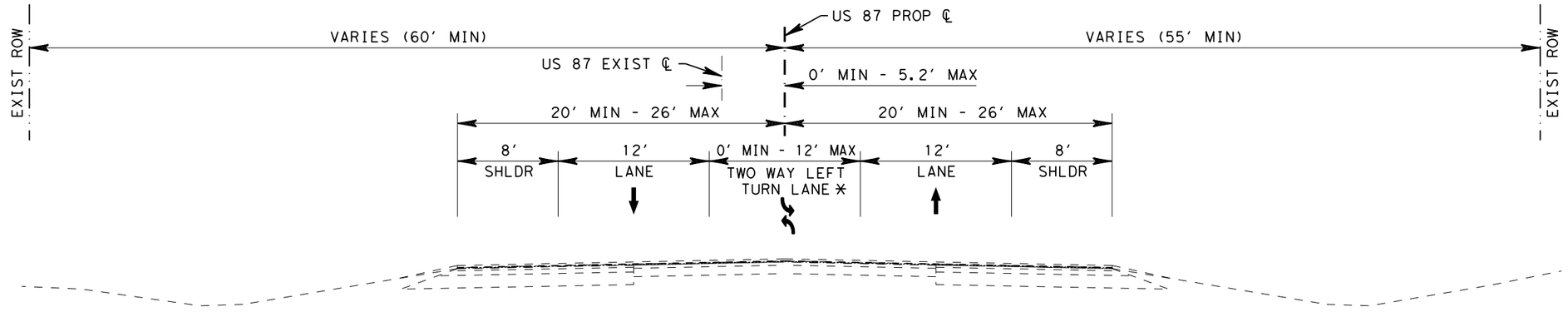
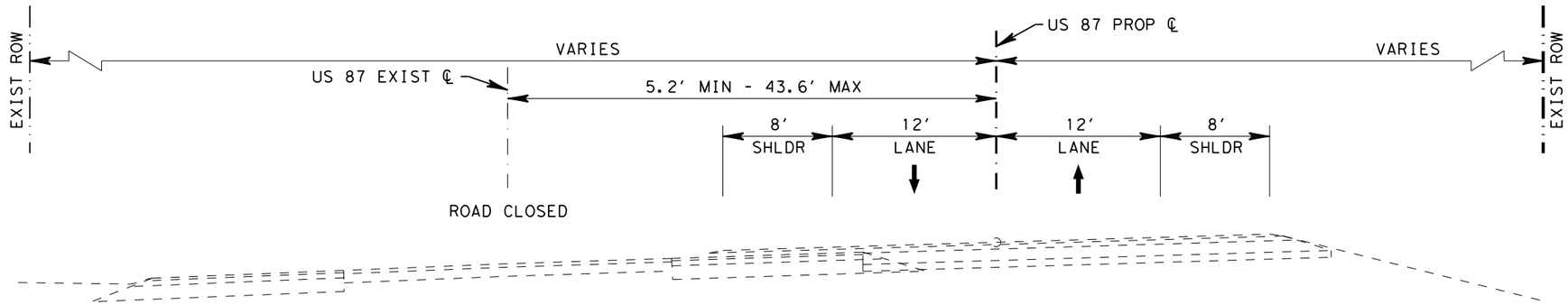
YKM	DE WITT		2



US 87
EXISTING TYPICAL SECTION

① STA 88+90.6 TO STA 91+08
STA 1084+91.5 TO STA 1091+00

① US 87 PROP ℄ STA 1084+91.5 = US 87 EXIST ℄ STA 85+00



US 87
EXISTING TYPICAL SECTION

STA 91+08 TO STA 102+00
STA 1091+00 TO STA 1102+00

STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED PROFESSIONAL ENGINEER

Mojtaba Ranjbar, P.E.

06/08/2022

US 87
TYPICAL SECTIONS

SHEET 1 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87
DIST	COUNTY		SHEET NO.
YKM	DE WITT		3

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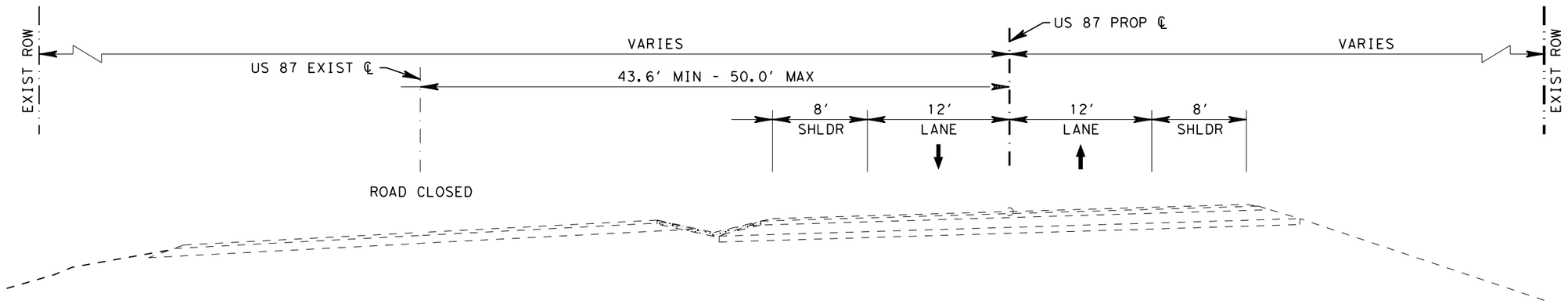
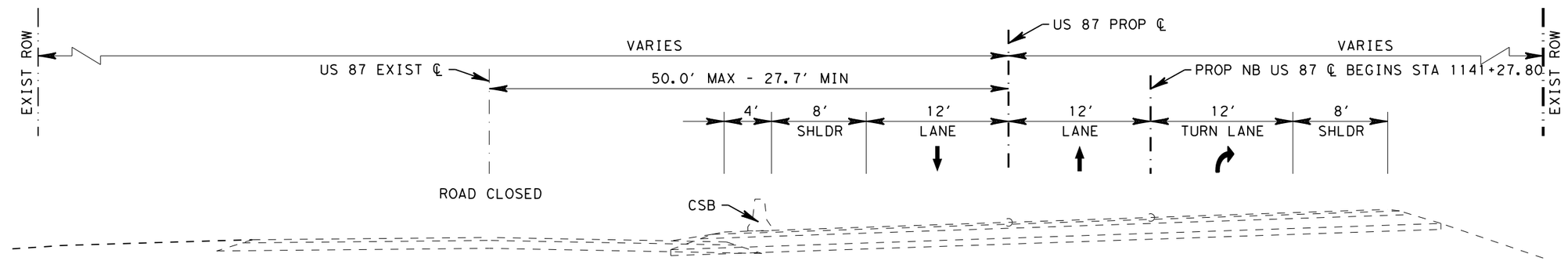


US 87
EXISTING TYPICAL SECTION

STA 102+00 TO STA 108+00.00
STA 134+57.77 TO STA 137+00
STA 1102+00 TO STA 1107+50
STA 1135+07 TO STA 1137+00

NOTE: GUADALUPE RIVER BRIDGE STA 108+00.00 TO STA 134+57.77
GUADALUPE RIVER BRIDGE STA 1107+50.00 TO STA 1135+07.00

MATCH THE STRIPING AT BRIDGES WITH THE ROADWAY STRIPING OF APPROACH AND DEPARTURE OF THE BRIDGE



US 87
EXISTING TYPICAL SECTION

STA 1137+00 TO STA 1141+75

STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED
PROFESSIONAL ENGINEER

Mojtaba Ranjbar, P.E.

06/08/2022

US 87
TYPICAL SECTIONS

SHEET 2 OF 8

Texas Department of Transportation

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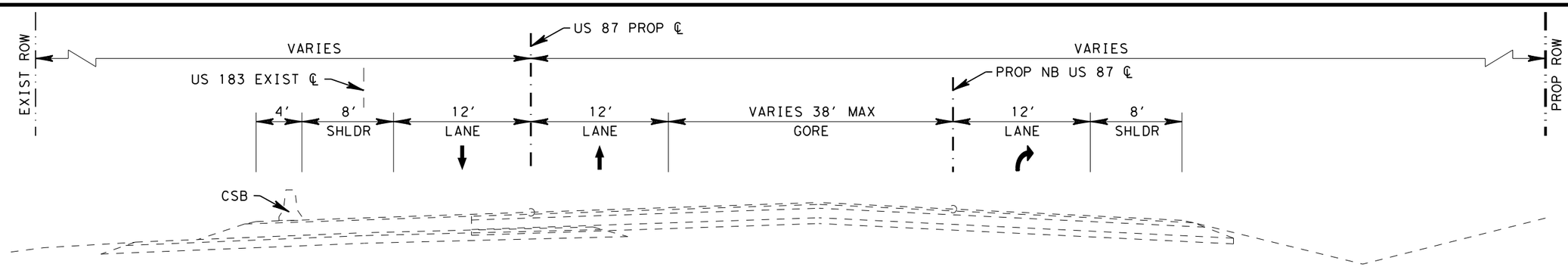
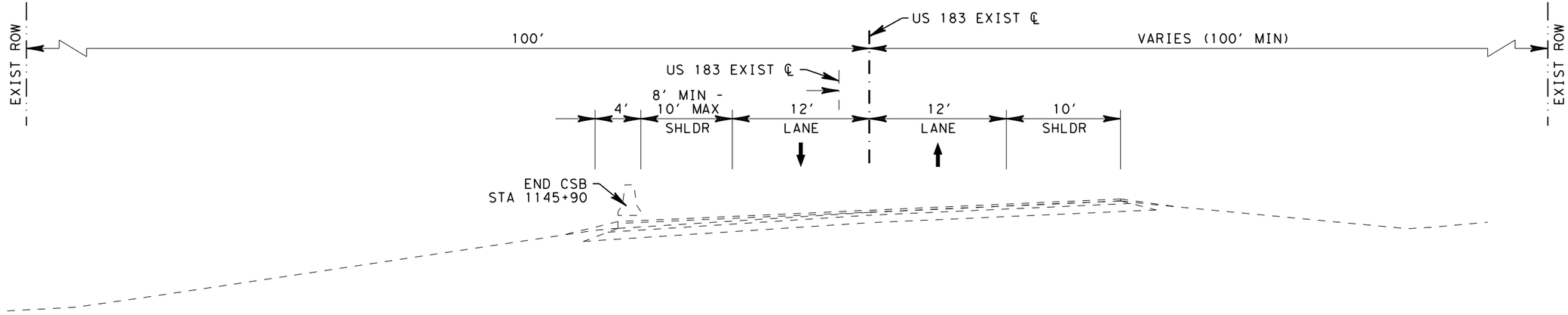


US 87
EXISTING TYPICAL SECTION
STA 1141+75 TO STA 1144+60



US 183
EXISTING TYPICAL SECTION
STA 148+83.5 TO STA 152+00

STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED
PROFESSIONAL ENGINEER

Mojtaba Ranjbar, P.E.

06/08/2022

US 87
TYPICAL SECTIONS

SHEET 3 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.
YKM	DE WITT		5

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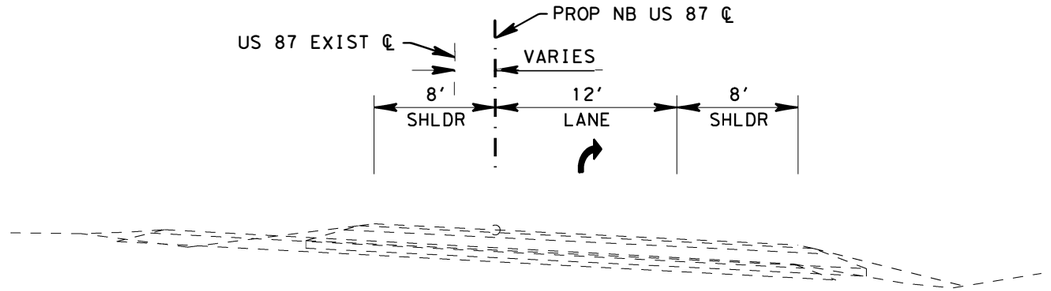
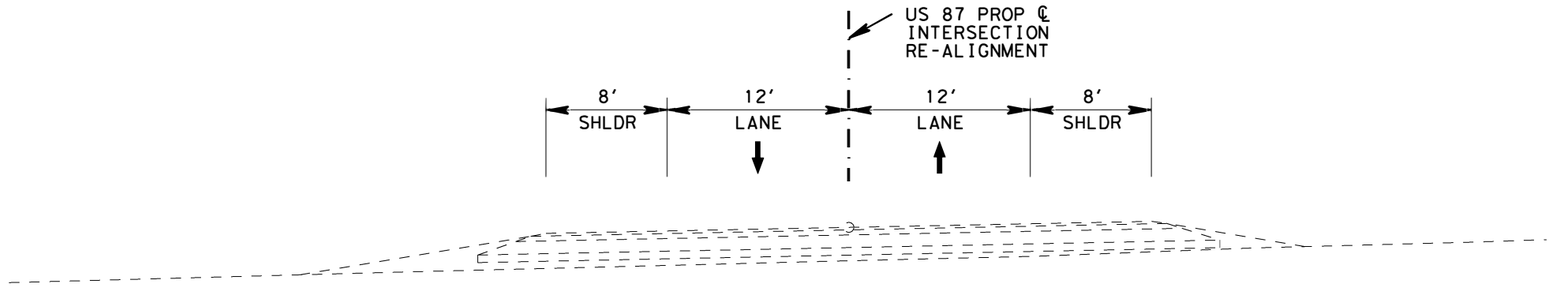


NORTHBOUND US 87
EXISTING TYPICAL SECTION
STA 1144+60 TO STA 1149+75



US 87 INTERSECTION
EXISTING TYPICAL SECTION
STA 147+82 TO STA 149+85

06/08/2022

NOTE: US 87 PROP ℄ ALIGNMENT ENDS STA 1148+89
US 87 PROP ℄ STA 1148+89 = US 183 EXIST ℄ STA 148+83.5

STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED
PROFESSIONAL ENGINEER

Mojtaba Ranjbar, P.E.

US 87
TYPICAL SECTIONS

SHEET 4 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.
YKM	DE WITT		6

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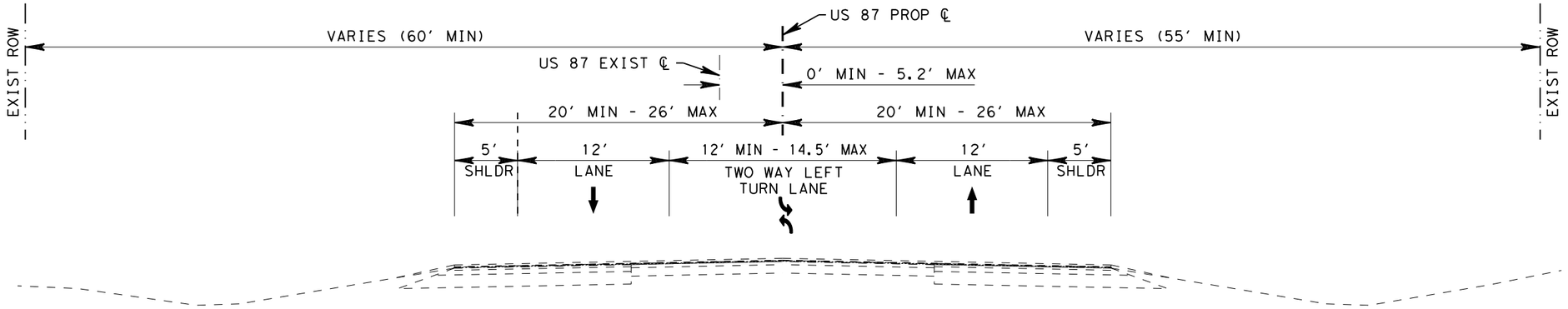
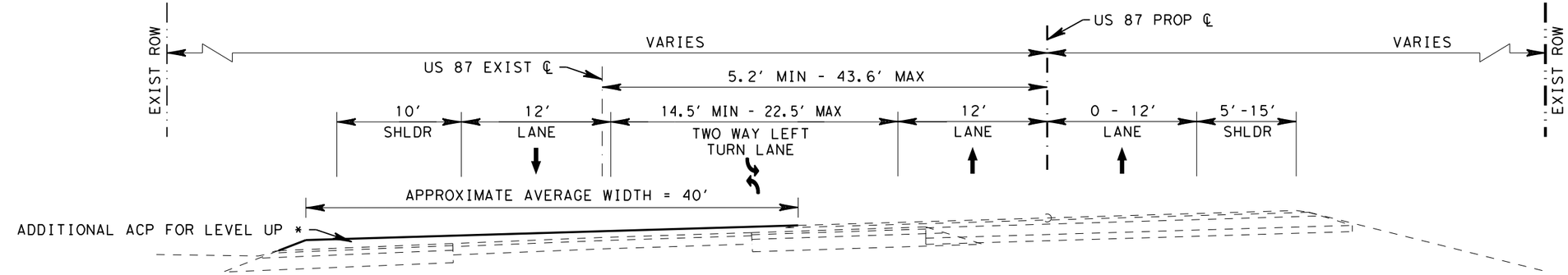


US 87
PROPOSED TYPICAL SECTION

① STA 88+90.6 TO STA 91+08
STA 1084+91.5 TO STA 1091+00

① US 87 PROP ℄ STA 1084+91.5 = US 87 EXIST ℄ STA 85+00

PROPOSED WORK IS ONLY PAVEMENT MARKING RELATED



US 87
PROPOSED TYPICAL SECTION

STA 91+08 TO STA 102+00
STA 1091+00 TO STA 1102+00

* APPROXIMATE AVERAGE DEPTH = 3"

STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED PROFESSIONAL ENGINEER

Mojtaba Ranjbar, P.E.

06/08/2022

US 87
TYPICAL SECTIONS

Texas Department of Transportation

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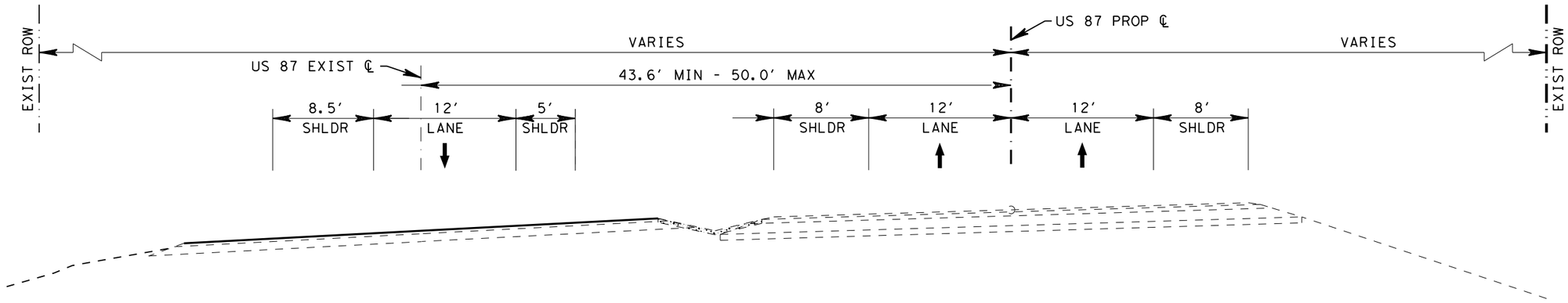


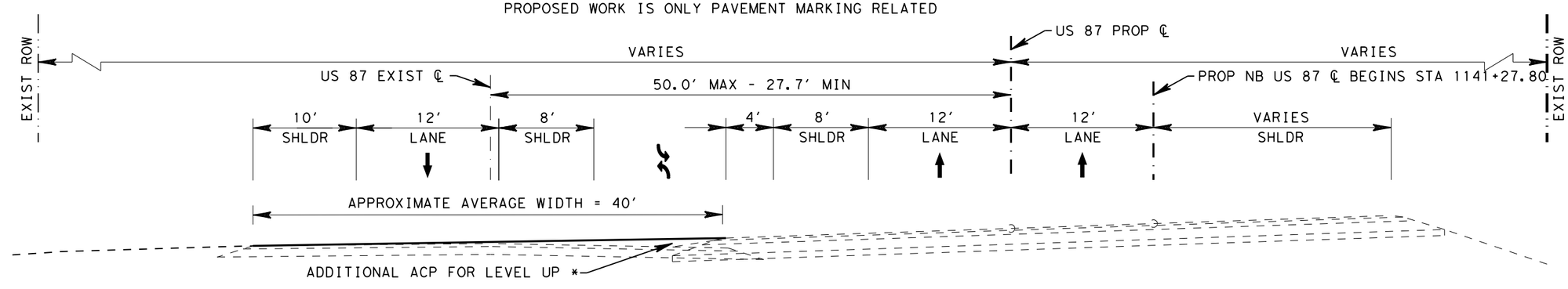
US 87
PROPOSED TYPICAL SECTION

STA 102+00 TO STA 108+00.00
STA 134+57.77 TO STA 137+00
STA 1102+00 TO STA 1107+50
STA 1135+07 TO STA 1137+00

NOTE: GUADALUPE RIVER BRIDGE STA 108+00.00 TO STA 134+57.77
GUADALUPE RIVER BRIDGE STA 1107+50.00 TO STA 1135+07.00

MATCH THE STRIPING AT BRIDGES WITH THE ROADWAY STRIPING OF APPROACH AND DEPARTURE OF THE BRIDGE

PROPOSED WORK IS ONLY PAVEMENT MARKING RELATED



US 87
PROPOSED TYPICAL SECTION

STA 1137+00 TO STA 1141+75

* APPROXIMATE AVERAGE DEPTH = 3"

STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED PROFESSIONAL ENGINEER

Mojtaba Ranjbar, P.E.
06/08/2022

US 87
TYPICAL SECTIONS

SHEET 6 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
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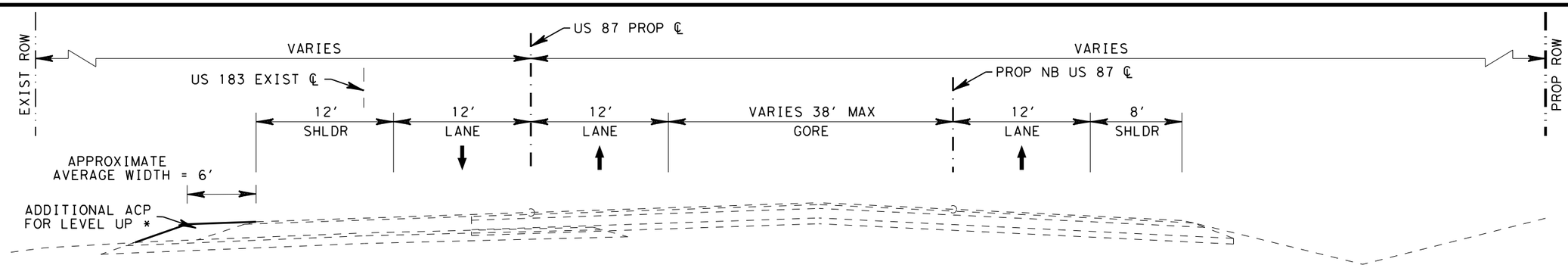
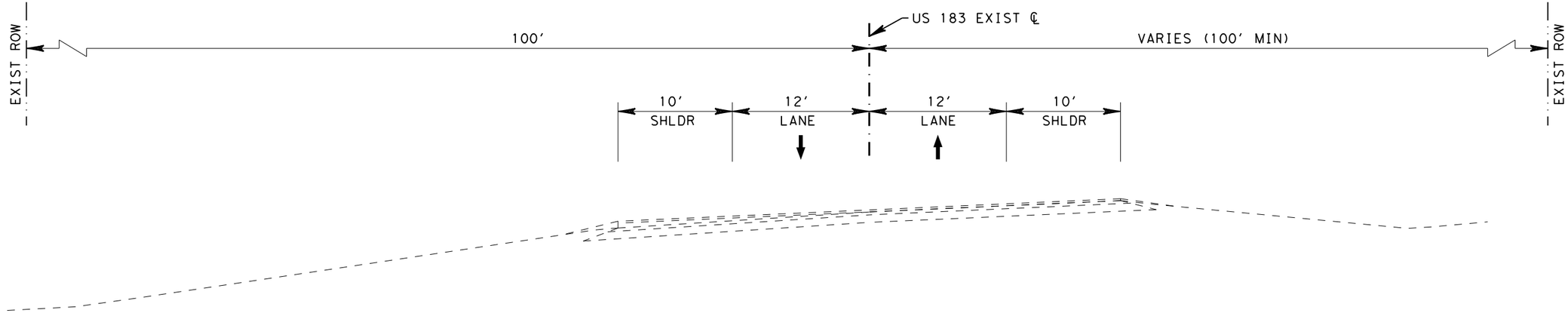


US 87
PROPOSED TYPICAL SECTION
STA 1141+75 TO STA 1144+60



US 183
PROPOSED TYPICAL SECTION
STA 148+83.5 TO STA 152+00

PROPOSED WORK IS ONLY PAVEMENT MARKING RELATED

* APPROXIMATE AVERAGE DEPTH = 3"

STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED
PROFESSIONAL ENGINEER

Mojtaba Ranjbar, P.E.

06/08/2022

US 87
TYPICAL SECTIONS

SHEET 7 OF 8

Texas Department of Transportation

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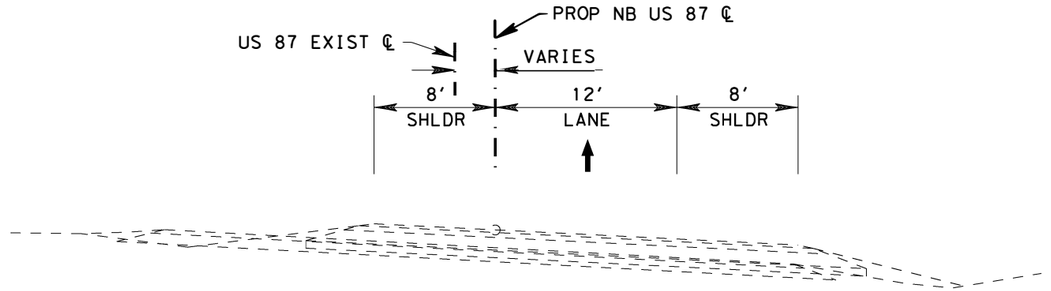
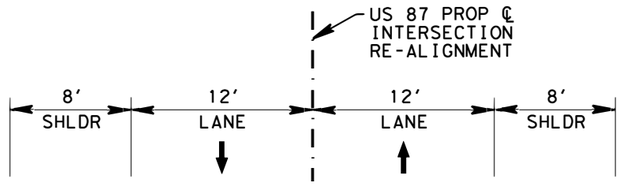


NORTHBOUND US 87
PROPOSED TYPICAL SECTION

STA 1144+60 TO STA 1149+75

PROPOSED WORK IS ONLY PAVEMENT MARKING RELATED



US 87 INTERSECTION
PROPOSED TYPICAL SECTION

STA 147+82 TO STA 149+85

PROPOSED WORK IS ONLY PAVEMENT MARKING RELATED

06/08/2022

NOTE: US 87 PROP ℄ ALIGNMENT ENDS STA 1148+89
US 87 PROP ℄ STA 1148+89 = US 183 EXIST ℄ STA 148+83.5

MOJTABA RANJBAR
110222
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

Mojtaba Ranjbar, P.E.

US 87
TYPICAL SECTIONS

SHEET 8 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87
DIST	COUNTY		SHEET NO.
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GENERAL:

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

Clayton Harris Clayton.Harris@txdot.gov
Covey Morrow IV Covey.Morrow@txdot.gov

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

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

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

Superelevate all curves to match the existing superelevation.

Remove and dispose of existing raised pavement markers as directed. All work involved in the removal and disposal of these markers will not be paid for directly but shall be considered subsidiary to the various bid items involved.

Do not work on the roadway before sunrise or after sunset unless otherwise approved.

Leave all traffic lanes open to traffic at night, weekends and holidays unless otherwise approved.

The following standard detail sheets have been modified:
CC-RAIL-R(MOD)

Furnish a certified copy of the legal gross weight of each vehicle hauling materials by weight and certified measurements for all trucks hauling material by volume.

Unless otherwise approved, maintain a minimum safety clearance from the edge of the travelway for material stockpiled in proximity of traffic lanes based on the current average traffic count of the particular highway as follows:

0 - 1500 = 16 feet
Over 1500 = 30 feet

In the event the above requirements cannot be met, make arrangements to stockpile material off the right of way.

Project Number: **Sheet: 11**

County: De Witt **Control: 0143-08-098**

Highway: US 87

The Department will provide the cylinder testing machine for this project. Deliver the test specimens to the engineer's curing facilities as directed.

Do not clean out concrete trucks within the right of way.

SPECIAL PROVISION TO ITEM 6:

As reported by Burcham Environmental Services, L.L.C. in the NESHAP Asbestos/Lead Inspection Report dated January 14, 2014, the green paint on the steel bridge rails, beams and trestle components has a lead content ranging from 0.11% to 0.77%.

Provide for the safety and health of employees and abide by all OSHA standards and regulations when removing or disposing of painted steel. Remove painted elements in complete units. Do not saw or flame cut through painted areas. Obtain the Engineer's approval of the proposed removal process prior to removing steel elements. Per Item 446, the containment and disposal of hazardous materials (lead) on the truss is the responsibility of the Contractor.

ITEM 7: LEGAL RELATIONS AND RESPONSIBILITIES

As-built documents indicate that the Relief Bridge once had a bronze "Works Progress Administration 1935-1937" plaque. If a plaque is uncovered and/or discovered during construction, the contractor shall protect in place until discussed with the Area Engineer. If it's determined that the existing plaque location is in an area slated for repair and cannot be salvaged in place, the contractor shall remove the plaque intact and make it available to the DeWitt County Historical Commission.

PSLs shall be located at least 100ft. from the water.

The Contractor's attention is directed to the fact that discharge of permanent or temporary fill material into the waters of the United States (U.S.) including jurisdictional wetlands, as necessary for construction, will require specific approval of the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act.

The Department will obtain the appropriate permit(s), Nationwide or Individual, when necessary as dictated by the proposed actions for the project and its potential to affect USACE jurisdictional areas. The Contractor may review the permitted plans at the office of the Area Engineer in charge of construction. The Department will hold the Contractor responsible for following all conditions of the approved permit. If the Contractor cannot work within the limits of this permit(s), then it becomes the Contractor's entire responsibility to consult with the USACE pertaining to the need for changes or amendments to the conditions of the existing permit(s) as originally obtained by the Department.

Particular importance is stressed on the fact that any impacts to USACE jurisdictional waters of the U.S., including jurisdictional wetlands, be the minimum necessary to complete the proposed work. The Contractor shall maintain near normal flow of any jurisdictional waters of the U.S. at all times during construction. If the Contractor needs further explanation of the conditions of the permit, including means of compliance, they may contact the TXDOT Yoakum District Environmental Coordinator.

If the Contractor elects to work on a structure when the stream is flowing, near normal flow shall be maintained by a method approved by the Engineer. Labor and materials involved in this work will not be paid for directly, but will be considered subsidiary to the various bid items of the contract.

No significant traffic generator events identified.

If the contractor proposes work beyond the TxDOT obtained permit limitations, the contractor is responsible for additional costs, delays, and obtaining new or revised permits prior to construction.

ITEM 8: PROSECUTION AND PROGRESS

The contractor cannot begin work until YKM District Environmental provides Notice to Proceed. Notice to Proceed cannot be issued until the district has received written concurrence from the U.S. Fish and Wildlife Service that the voluntary conservation measures of the BE will prevent adverse effects to the freshwater mussels or their critical habitat. YKM District Environmental can provide Notice to Proceed for work (MBGF, Rail, Concrete Structure Repair, ACP & Concrete Overlay, Joints, Signs, etc.) that is at least 500 feet away from the water after January 2, 2023.

The earliest work-start date is January 2, 2023.

Provide progress schedule as a Bar Chart.

ITEM 105: REMOVING TREATED AND UNTREATED BASE AND ASPHALT PAVEMENT

Place the removed salvageable material at the stockpile location sites listed. The location and approximate quantities for the location are:
The intersection of US 87 and SH 72 with an approximate quantity of 800 CY.

Project Number: **Sheet: 11A**

County: De Witt **Control: 0143-08-098**

Highway: US 87

ITEM 320: EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT

Provide a material transfer device capable of transferring mix from the haul trucks to the paver. Monitor its loading such that no damage is done to the existing pavement structures if a material transfer vehicle is used.

Securely attach a waterproof tarpaulin to the top of all trucks hauling ACP, to prevent air flow across the mix, for the duration of all ACP operations.

ITEM 427: SURFACE FINISHES FOR CONCRETE

Provide Surface Area II, railing, and culvert headwalls and wingwalls with a Slurry Coat Finish per 427.4.3.2 for cast-in-place concrete surfaces.

ITEM 429: CONC. STRUCTURE REPAIR (VERTICAL & OVERHEAD)

1. Damage at most locations is considered intermediate spall repair unless noted in the plans.

2. Use Type C – Vertical or Overhead Repair Materials as shown in DMS-4655

3. Perform all concrete repairs in accordance with Item 429 and Section 3.1, 3.2 and 3.3 of the Concrete Repair Manual which can be found at http://gsd-ultraseek/txdotmanuals/crm/index.htm

After all loose concrete removed from repair area, use hand/power hand tool metal wire brush to clean exposed reinforcing steel. Very tightly adhering rust may remain on bars but a thorough cleaned bar is required.

ITEM 446: FIELD CLEANING AND PAINTING STEEL

Existing truss has lead paint. Treat as hazardous materials and comply with requirements of Item 6 and Item 446. For System II paint system, substitute a Type III (Water-Cleanable) Anti-Graffiti Coating in accordance with DMS-8111, “Anti-Graffiti Coatings,” for the System II appearance coat. Submit the proposed anti-graffiti coating to the Engineer for approval. Nonrecycled abrasive cleaning meeting SSPC AB 1 are allowed per the Special Provision issued for Item 446. QP 7 certification is permitted for this project.

Proposed paint color shall closely resemble the existing bridge paint color of Green. The Federal Standard 595 Paint Spec RGB Hex Code FS number will be determined prior to construction and used as a base color guide for choosing an approved color and material producer. Engineer will approve final color choice before application begins.

ITEM 496: REMOVING STRUCTURES

Prior to the scheduling of a Pre-Construction Meeting, submit removal methods to the Area Engineer and to District Environmental Staff for their approval. Provide for approval a removal method that prevents materials from falling into the water and/or traffic. The method used and work performed will not be measured or paid for directly, but will be subsidiary to pertinent items.

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.

Law enforcement assistance for this project will be required, as approved, for major traffic control changes and lane closures. Coordinate with local law enforcement and arrange for law enforcement in a marked vehicle as approved by the Engineer. Complete the daily tracking form provided by the department, including all signatures, and submit invoices that agree with the tracking form for payment at the end of each month approved services were provided.

Use WZ(RS)-22 in conjunction with TCP(2-2).

Use TCP(2-2b) for one-lane, two-way traffic control.

When using TCP(2-2b), a pilot car is required to lead traffic through the work space with or without channelizing devices on the center line unless otherwise approved.

When using TCP(2-2b), channelizing devices may be omitted during base, subgrade and seal coat operations unless otherwise directed. Flaggers will be required at public intersections when channelizing devices are omitted.

When using TCP(2-2b), arrow boards, displaying the caution mode, may be used to enhance the flagger stations. If used, place the arrow board in advance of the flagger station a distance of ½X, the sign spacing distance shown on BC(2). Use arrow boards as shown on BC(7).

Project Number: **Sheet: 11B**

County: De Witt **Control: 0143-08-098**

Highway: US 87

When using TCP(2-2b), the temporary 24" stop line and the CW16-2P plaques may be omitted.

When using TCP(2-2b), an additional "Road Work Ahead" and "Be Prepared To Stop" signs will be required on each end of the lane closure unless otherwise approved.
Provide trail and lead vehicles when using TCP(3-1) or TCP(3-3).

Utilize TCP(3-3) for sweeping operations or for installing and removing tabs or raised pavement markers.

Provide suitable warning lights mounted high enough to be visible from all directions on all construction equipment, including pilot vehicles, and operate warning lights when the equipment is within the right of way. Equip other equipment such as trucks, trailers, autos, etc., with emergency flashers and use emergency flashers while within the work area.

Signs warning of temporary conditions, such as "NO CENTER LINE," "LOOSE GRAVEL," etc., shall only be displayed when conditions are present. Remove or completely cover signs that do not apply to the roadway conditions. These signs may be installed prior to beginning work but shall remain completely covered until the signs are applicable.

In accordance with Article 502.4.2, no payment will be made for the month if the contractor fails to provide or properly maintain signs in compliance with the contract requirements. Temporary warning signs that are visible when conditions do not apply will be considered improper maintenance of signs.

ITEM 504: FIELD OFFICE AND LABORATORY

Provide a Type D structure for the asphalt mix control laboratory for the engineer's exclusive use. Equip the structure with a 240 volt electrical entrance service. The service will consist of a minimum of four 120 volt circuits with 20 amp breakers and at most two grounded convenience outlets per circuit and provisions for a minimum of two 220 volt ovens. Space heaters for heating the structure are unacceptable. Portable structures will be support blocked for stability and will be tied down.

ITEM 506: TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS

The Storm Water Pollution Prevention Plan (SWP3) consists of temporary erosion control measures needed and provided for under this Item. The disturbed area is less than one acre and use of erosion control measures is not anticipated. If physical conditions encountered at the job site require necessary controls, BMP installation, maintenance, and removal will be paid as extra work on a force account basis per Articles 4.4 and 9.7.

ITEM 540: METAL BEAM GUARD FENCE

Furnish and install only one type of timber post at each location.

Furnish Type II rail elements at all locations.

ITEM 585: RIDE QUALITY FOR PAVEMENT SURFACES

Use Surface Test Type A to evaluate ride quality of travel lanes.

ITEM 644: SMALL ROADSIDE SIGN SUPPORTS AND ASSEMBLIES

Use Class B concrete for all small roadside sign assembly concrete footings.
The exact location of the foundations to be placed will be determined in the field by the Engineer.

Install the wedge anchor system in a concrete footing 42" in depth and 12" in diameter. Foundation should take approximately 2.7 cubic feet of concrete.

ITEM 662: WORK ZONE PAVEMENT MARKINGS

Use raised pavement markers for removable work zone pavement markings.

ITEM 666: REFLECTORIZED PAVEMENT MARKINGS

Use a mobile retroreflectometer to measure retroreflectivity unless otherwise directed. A DVD video of the retroreflectometer data will not be required.

ITEM 668: PREFABRICATED PAVEMENT MARKINGS

Pavement marking material may be placed on roadways at any time during the year, subject to temperature and moisture limitations specified.

Project Number: **Sheet: 11C**

County: De Witt **Control: 0143-08-098**

Highway: US 87

ITEM 3076: DENSE-GRADED HOT-MIX ASPHALT

Quantities shown for asphaltic concrete level-up are based on the average amount of material needed to bring depressed areas up to a desired grade and are shown on an average square yard basis. Place the level-up courses as directed.

Tie HMACP tapers to a vertical transition joint created by the milling operation at the beginning and ending transitions and at all exceptions, or as directed. Provide a temporary HMACP taper at vertical joints until overlay operations begin. Milling and HMACP work will not be paid for directly but will be considered subsidiary to this item.

Mixture designs, using the PG binder originally specified and without additives, failing to meet the requirements of Table 10 will require the addition of a minimum 1.0% of Type A hydrated lime based on dry weight of the total aggregate.

Use of RAS in the HMACP surface course is not permitted.

Do not add additional quantity of RAP to stockpiles tested and approved. If additional RAP is added to a stockpile, a new design and trial batch will be required prior to placement on the roadway.

The extracted aggregate from contractor-owned RAP shall have a minimum of 85% two crushed faces when tested in accordance with TEX-460-A, Part I.

ITEM 6001: PORTABLE CHANGEABLE MESSAGE SIGN

Provide Portable Changeable Message Signs (PCMS) for the duration of the project. Locations and messages or other miscellaneous uses of PCMS, shall be as approved or directed by the Engineer.

ITEM 6185: TRUCK MOUNTED ATTENUATOR (TMA) AND TRAILER ATTENUATOR (TA)

Shadow vehicle(s) with TMA are set up for stationary and/or mobile operations. The contractor will be responsible for determining if operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS					
LOCATION	512 6041	6001 6002	6185 6005	6185 6002	662 6095
	PORT CTB (STKPL)(F-SHAPE)(TY 1)	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (MOBILE OPERATION)	TMA (STATIONARY)	WK ZN PAV MRK REMOV (Y)4"(SLD)
	LF	EA	DAY	DAY	LF
	1000	3	10	10	1000
PROJECT TOTALS	1000	3	10	10	1000

SUMMARY OF ROADWAY ITEMS							
LOCATION	420 6066	450 6029	540 6001	540 6006	544 6001	3076 6042	3076 6066
	CL C CONC (RAIL FOUNDATION)	RAIL (TY C1W)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	D-GR HMA TY-D SAC-B PG 70-22	TACK COAT
	CY	LF	LF	EA	EA	TON	GAL
	91.6	608	1175	4	4	1250	750
PROJECT TOTALS	91.6	608	1175	4	4	1250	750

* Approximate average depth = 3"

SUMMARY OF REMOVAL ITEMS						
LOCATION	105 6039	496 6099	542 6001	542 6002	542 6004	658 6060
	REMOVE STAB BASE AND ASPH PAV (6"-20")	REMOVE STR (RAIL)	REMOVE METAL BEAM GUARD FENCE	REMOVE TERMINAL ANCHOR SECTION	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	REMOVE DELIN & OBJECT MARKER ASSMS
	SY	LF	LF	EA	EA	EA
	2095	150	600	4	4	130
PROJECT TOTALS	2095	150	600	4	4	130

SUMMARY OF SIGNING ITEMS	
LOCATION	644 6060
	IN SM RD SN SUP&AM TYTWT(1)WS(P)
	EA
	4
PROJECT TOTALS	4

SUMMARY OF PAVEMENT MARKING ITEMS															
LOCATION	533 6001	533 6002	658 6013	658 6047	658 6062	658 6080	666 6036	668 6106	672 6009	677 6001	677 6007	6439 6002	6439 6004	6439 6010	6439 6012
	RUMBLE STRIPS (SHOULDER)	RUMBLE STRIPS (CENTERLINE)	INSTL DEL ASSM (D-SW)SZ (BRF)CTB	INSTL OM ASSM (OM-2Y)(WC)GND	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF 2(BI)	INSTL DEL ASSM (D-SW)SZ 1(WFLX)GND	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	PREFAB PAV MRK TY C (Y)(12")(SLD)	REFL PAV MRKR TY II-A-A	ELIM EXT PAV MRK & MRKS (4")	ELIM EXT PAV MRK & MRKS (24")	HPPM-RIB W/RET REQ TYI(W)4"(BRK)100MIL	HPPM-RIB W/RET REQ TYI(W)4"(SLD)100MIL	HPPM-RIB W/RET REQ TYI(Y)4"(BRK)100MIL	HPPM-RIB W/RET REQ TYI(Y)4"(SLD)100MIL
	LF	LF	EA	EA	EA	EA	LF	LF	EA	LF	LF	LF	LF	LF	LF
	1000	1000	16	4	120	8	910	440	50	33800	500	1205	4820	14070	15070
PROJECT TOTALS	1000	1000	16	4	120	8	910	440	50	33800	500	1205	4820	14070	15070

SUMMARY OF EROSION CONTROL ITEMS		
LOCATION	506 6038	506 6039
	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
	LF	LF
	100	100
PROJECT TOTALS	100	100

US 87
QUANTITY SUMMARY

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87
DIST	COUNTY		SHEET NO.
YKM	DE WITT		12

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0143-08-098 **DISTRICT** Yoakum **COUNTY** De Witt
HIGHWAY US 87

			CONTROL SECTION JOB		**0143-08-098**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00126108**		
			COUNTY		**De Witt**		
			HIGHWAY		**US 87**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	105-6039	REMOVE STAB BASE AND ASPH PAV (6"-20")	SY	2,095.000		2,095.000	
	416-6018	DRILL SHAFT (SIGN MTS) (24 IN)	LF	16.000		16.000	
	420-6066	CL C CONC (RAIL FOUNDATION)	CY	91.600		91.600	
	422-6041	REINF CONC SLAB (LIGHTWEIGHT)	SF	6,304.000		6,304.000	
	429-6007	CONC STR REPAIR (VERTICAL & OVERHEAD)	SF	108.000		108.000	
	429-6009	CONC STR REPAIR (STANDARD)	SF	16.000		16.000	
	438-6001	CLEANING AND SEALING EXISTING JOINTS	LF	810.000		810.000	
	442-6010	STR STEEL (SHEAR CONNECTOR)	LB	3,556.000		3,556.000	
	442-6019	STR STEEL (SHEAR ANCHOR)	LB	22,665.000		22,665.000	
	446-6029	CLEAN AND PAINT EXIST STR (REF NO.1)	LS	1.000		1.000	
	446-6030	CLEAN AND PAINT EXIST STR (REF NO.2)	LS	1.000		1.000	
	446-6031	CLEAN AND PAINT EXIST STR (REF NO.3)	LS	1.000		1.000	
	450-6029	RAIL (TY C1W)	LF	4,748.000		4,748.000	
	454-6004	ARMOR JOINT (SEALED)	LF	25.000		25.000	
	454-6018	SEALED EXPANSION JOINT (4 IN) (SEJ - M)	LF	25.000		25.000	
	496-6099	REMOVE STR (RAIL)	LF	150.000		150.000	
	496-6103	REMOVE STRUCTURE (BRIDGE SLAB)(REF 1)	EA	1.000		1.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	9.000		9.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	100.000		100.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	100.000		100.000	
	512-6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	1,000.000		1,000.000	
	533-6001	RUMBLE STRIPS (SHOULDER)	LF	1,000.000		1,000.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF	1,000.000		1,000.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	1,175.000		1,175.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		4.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	600.000		600.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA	4.000		4.000	
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	EA	4.000		4.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000		4.000	
	636-6002	ALUMINUM SIGNS (TY G)	SF	263.250		263.250	
	644-6060	IN SM RD SN SUP&AM TYTWT(1)WS(P)	EA	4.000		4.000	
	647-6001	INSTALL LRSS (STRUCT STEEL)	LB	1,766.960		1,766.960	
	658-6013	INSTL DEL ASSM (D-SW)SZ (BRF)CTB	EA	16.000		16.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	4.000		4.000	
	658-6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	130.000		130.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	120.000		120.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0143-08-098 **DISTRICT** Yoakum **COUNTY** De Witt
HIGHWAY US 87

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0143-08-098**			
		PROJECT ID		**A00126108**			
		COUNTY		**De Witt**			
		HIGHWAY		**US 87**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	658-6080	INSTL DEL ASSM (D-SW)SZ 1(WFLX)GND	EA	8.000		8.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	1,000.000		1,000.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	910.000		910.000	
	668-6106	PREFAB PAV MRK TY C (Y) (12") (SLD)	LF	440.000		440.000	
	668-6115	PREFAB PAV MRK TY C (MULTI) (SHIELD)	EA	2.000		2.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	50.000		50.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	33,800.000		33,800.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	500.000		500.000	
	678-6025	PAV SURF PREP FOR MRKS (SHIELD)	EA	2.000		2.000	
	784-6019	REP STL BRIDGE MEMBER (BATTEN PLATES)	EA	72.000		72.000	
	784-6022	REP STL BRIDGE MEMBER (FLOORBEAM)	EA	5.000		5.000	
	784-6034	REP STL BRIDGE MEMBER(STRAIGHTEN MEMB)	EA	31.000		31.000	
	784-6038	REP STL BRIDGE MEMBER(REPL RIVET/BOLT)	EA	4,010.000		4,010.000	
	784-6133	REPR STL BRG MEMB(GUSSET PLATES)(TY I)	EA	16.000		16.000	
	784-6134	REPR STL BRG MEMB(GUSSET PLATES)(TY II)	EA	14.000		14.000	
	784-6135	REPR STL BRG MEMB(GUSSET PLATES)(TYIII)	EA	3.000		3.000	
	784-6136	REPR STL BRG MEMB(GUSSET PLATES)(TY IV)	EA	2.000		2.000	
	3076-6042	D-GR HMA TY-D SAC-B PG70-22	TON	1,250.000		1,250.000	
	3076-6066	TACK COAT	GAL	750.000		750.000	
	4106-6007	POLYESTER POLYMER CONC OVERLAY (1")	SY	4,319.000		4,319.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	3.000		3.000	
	6185-6002	TMA (STATIONARY)	DAY	10.000		10.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	10.000		10.000	
	6439-6002	HPPM-RIB W/RET REQ TYI(W)4"(BRK)100MIL	LF	1,250.000		1,250.000	
	6439-6004	HPPM-RIB W/RET REQ TYI(W)4"(SLD)100MIL	LF	4,820.000		4,820.000	
	6439-6010	HPPM-RIB W/RET REQ TYI(Y)4"(BRK)100MIL	LF	14,070.000		14,070.000	
	6439-6012	HPPM-RIB W/RET REQ TYI(Y)4"(SLD)100MIL	LF	15,070.000		15,070.000	
	18	LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		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	

SEQUENCE OF CONSTRUCTION

ABBREVIATIONS:
NB-NORTHBOUND
SB-SOUTHBOUND
EB-EASTBOUND
WB-WESTBOUND

INSTALL BARRICADES, SIGNS, AND TRAFFIC CONTROL DEVICES AS SHOWN.

1. INSTALL ADVANCE WARNING SIGNS PER TXDOT BC AND TCP STANDARDS, THE LATEST EDITION OF THE TMUTCD, AND AS DIRECTED BY THE ENGINEER.
2. MAINTAIN ALL TRAFFIC AT EXISTING CLOSURE OF TRUSS BRIDGE.
3. REHABILITATE EXISTING BRIDGE
4. INSTALL PERMANENT SIGN, DELINEATORS AND NEW STRIPING ON NB US 87 TRUSS BRIDGE AND NB US 87 ROADWAY.
5. REMOVE EXISTING PAVEMENT STRIPING, BARRICADES, CTBs AND DELINEATORS ON NB US 87 TRUSS BRIDGE AND NB US 87 ROADWAY.
6. DIRECT TRAFFIC ON SOUTH END OF THE PROJECT TO TO THE EXISTING US 87 NB (US87EX).
7. REMOVE EXISTING PAVEMENT STRIPING AND SIGNS AND DELINEATORS ON SB US 87 NEW BRIDGE AND SB US 87 ROADWAY.
8. INSTALL PERMANENT SIGN, DELINEATORS AND NEW STRIPING ON NB US 87 NEW BRIDGE.
9. DIRECT US 87 TRAFFIC AT THE NORTH END OF THE PROJECT TO TO THE US 87 SB (US87PROP).
10. REMOVE TEMPORARY TCP ON US 87 NB AND SB.
11. PROVIDE FINAL CLEAN UP AS APPROVED BY ENGINEER.

STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED
PROFESSIONAL ENGINEER

Mojtaba Ranjbar, P.E.

05/09/2022

US 87
TRAFFIC CONTROL PLAN NARRATIVE

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87
DIST	COUNTY		SHEET NO.
YKM	DE WITT		15

DATE: 05/06/2022 04:10 AM
FILE: pw:\txdot.projectwiseonline.com:TxDOT4\Documents\13 - YKM\Design Projects\0266080134 - Design\Plan Set\2. TCP\BS71-TC_NAR.dgn

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

SHEET 1 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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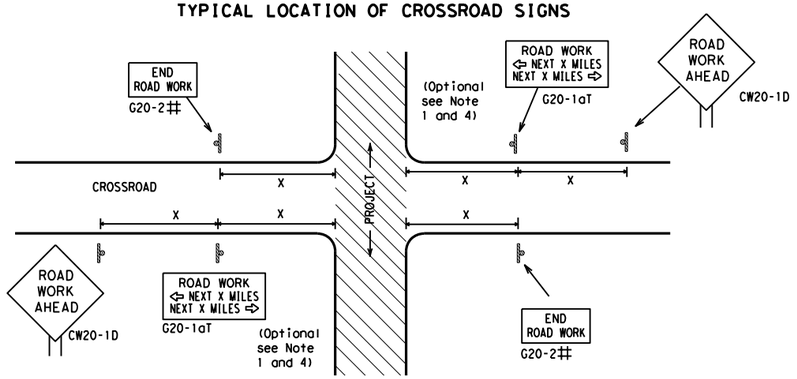
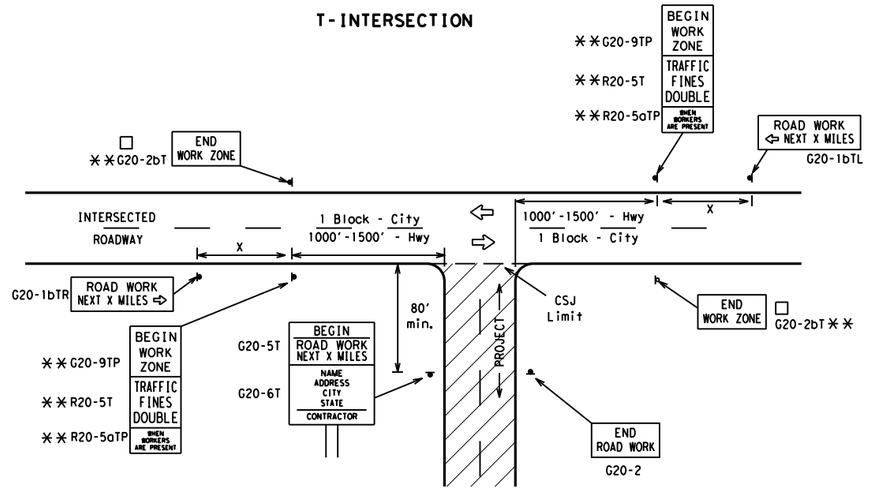
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

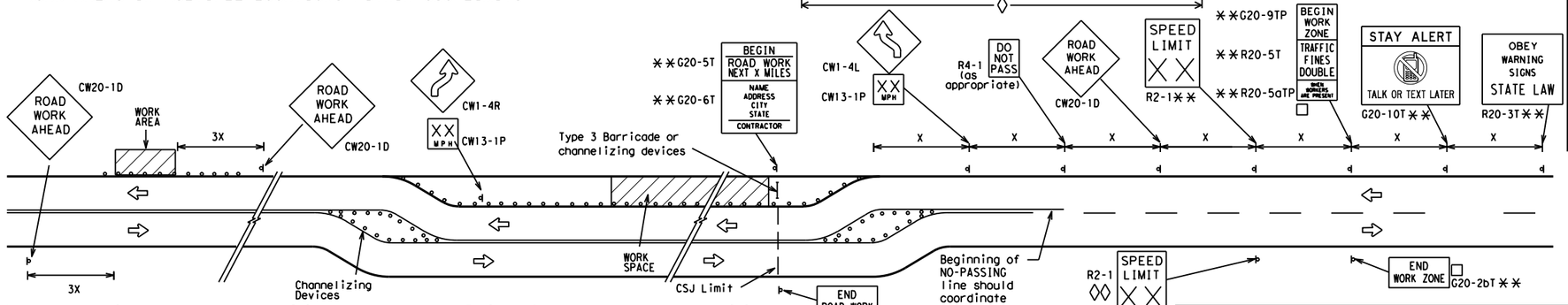
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

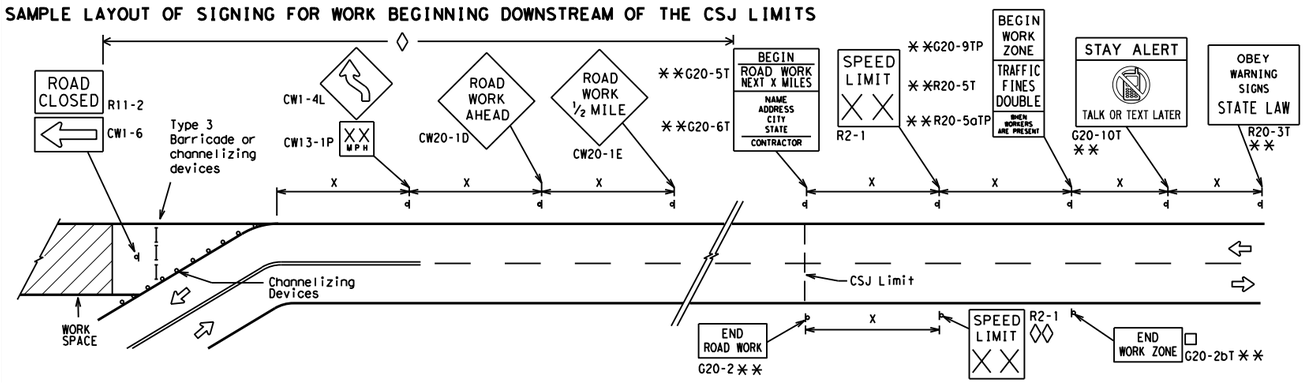
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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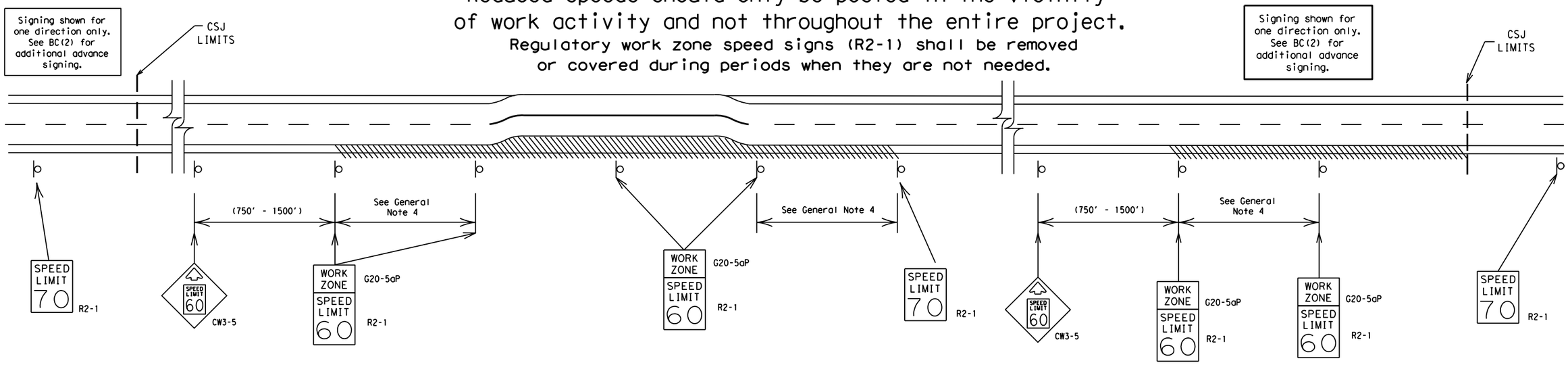
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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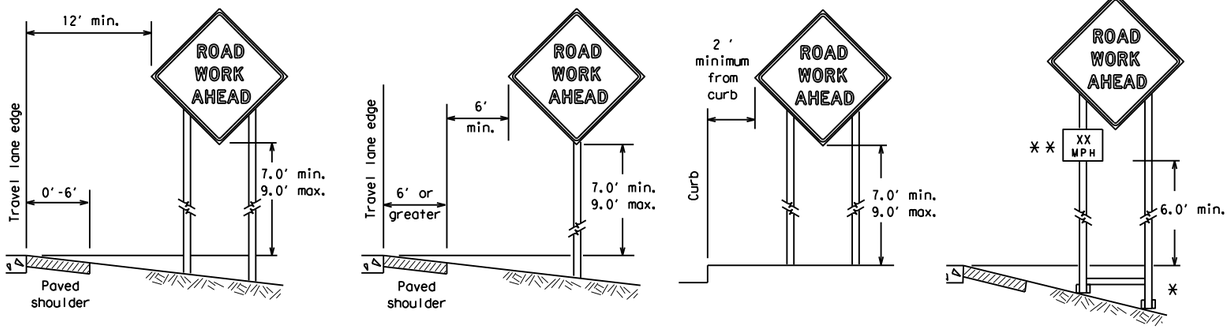
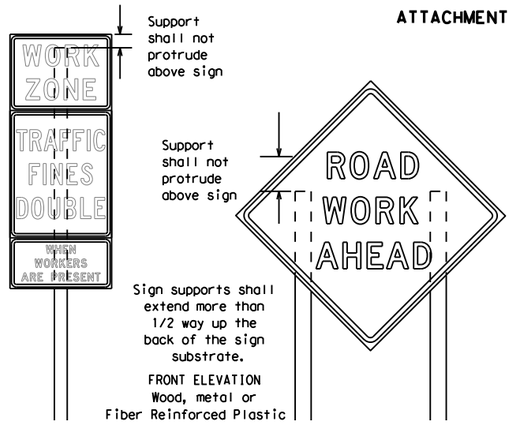
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

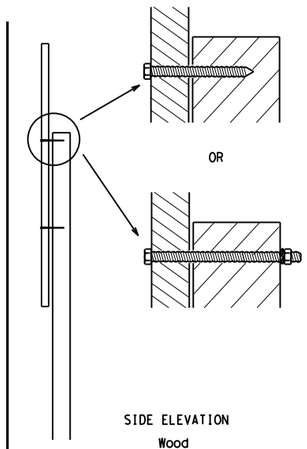


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





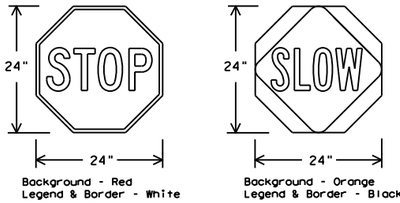
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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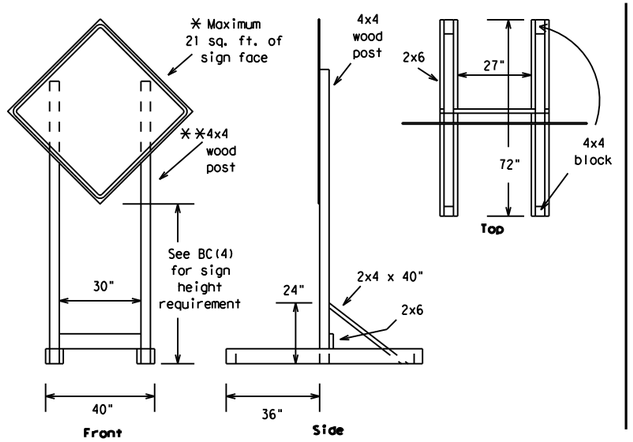
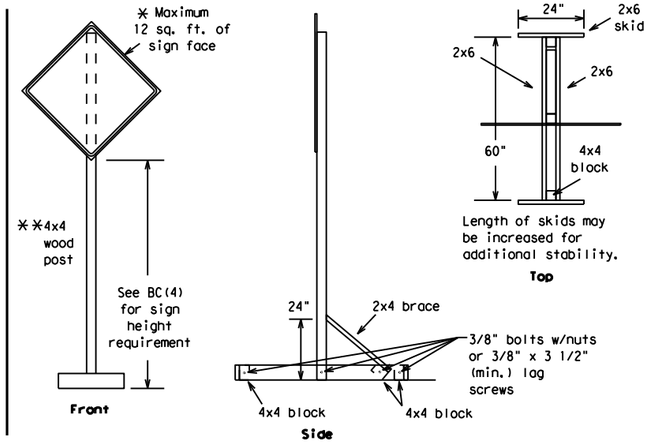
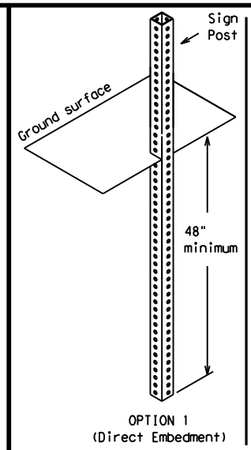
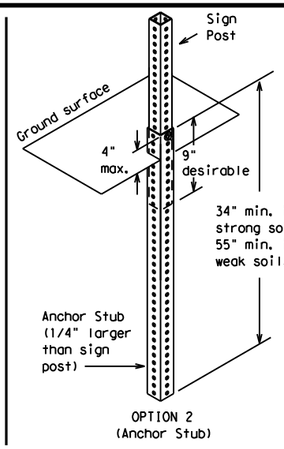


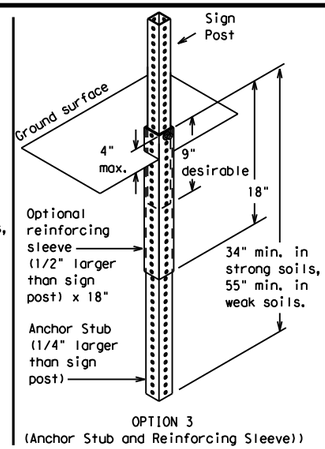


SKID MOUNTED WOOD SIGN SUPPORTS

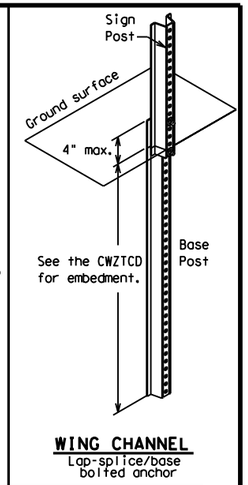
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







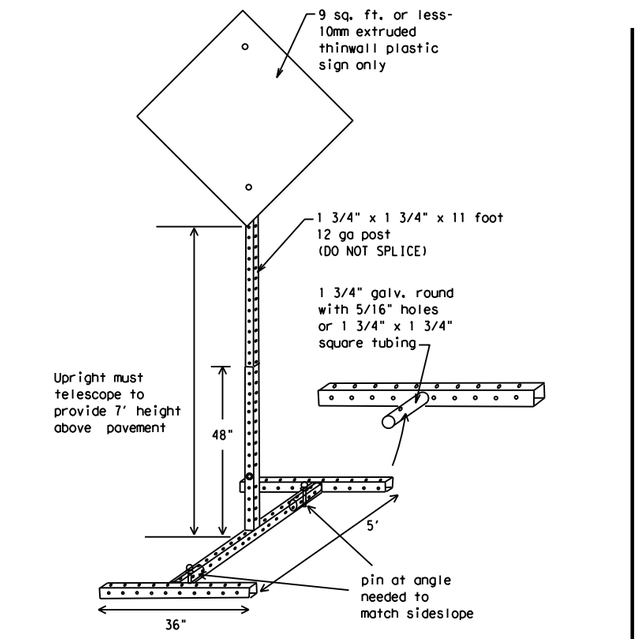
PERFORATED SQUARE METAL TUBING

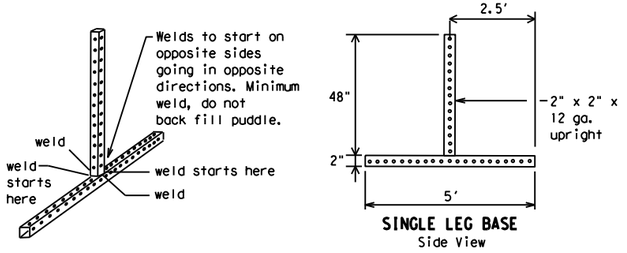


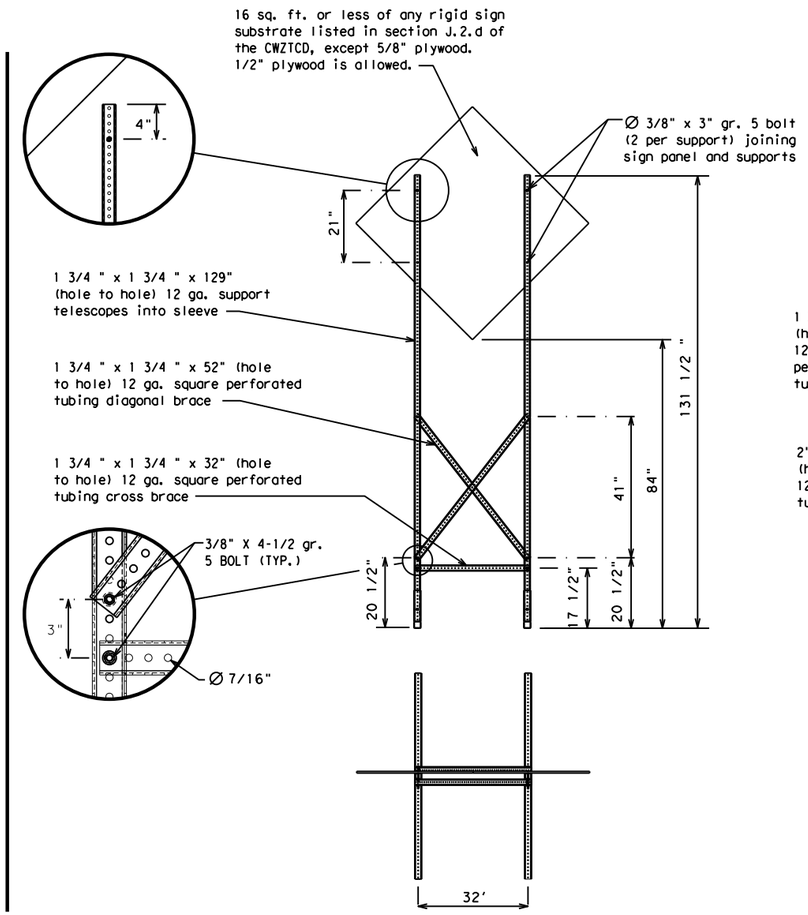
WING CHANNEL
Lap-splice/base bolted anchor

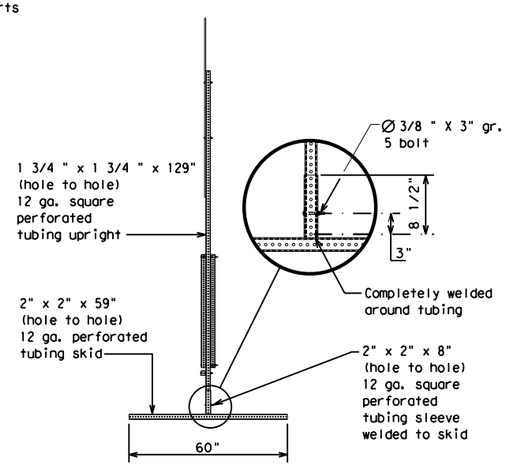
GROUND MOUNTED SIGN SUPPORTS

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









SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

* See BC(4) for definition of "Work Duration."

** Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

☐ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	YKM	DE WITT		20

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

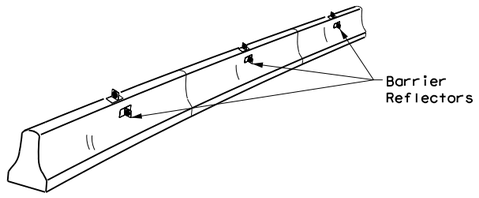
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	YKM	DE WITT		21

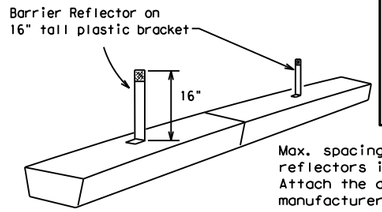
100

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



CONCRETE TRAFFIC BARRIER (CTB)

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

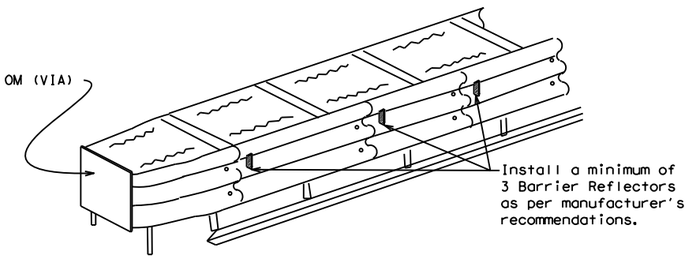


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

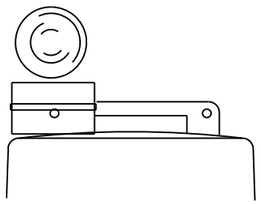


DELINEATION OF END TREATMENTS

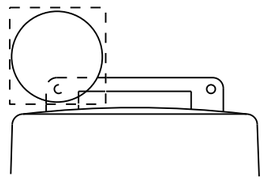
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

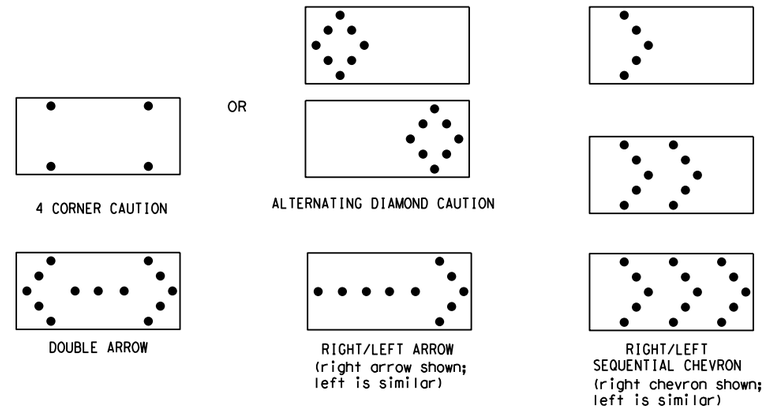
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

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

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

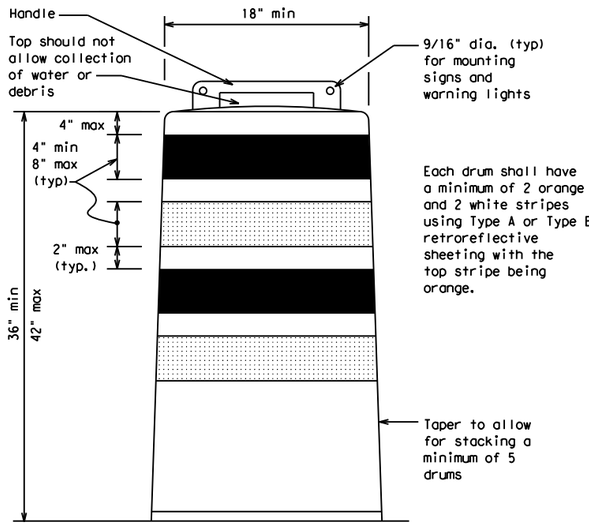
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

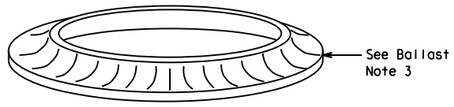
RETROREFLECTIVE SHEETING

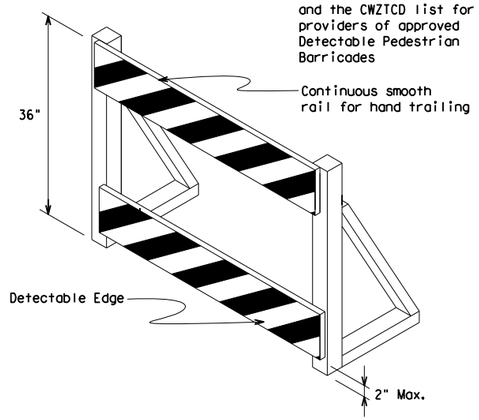
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

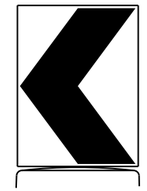




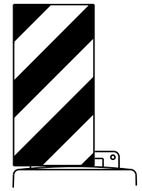


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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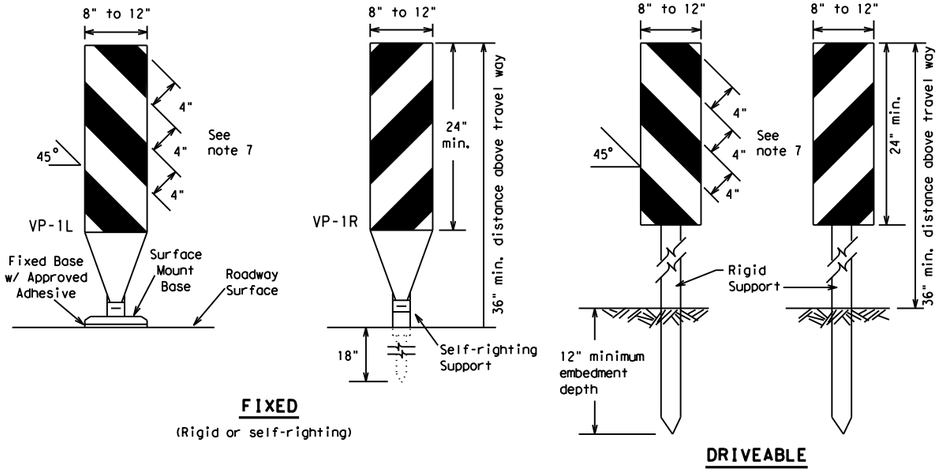
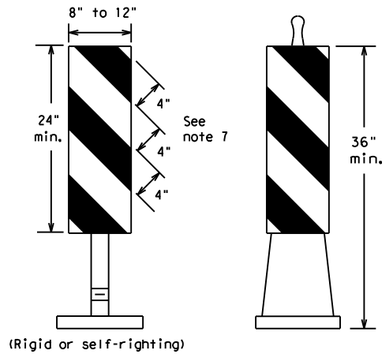


FIXED
(Rigid or self-righting)

DRIVEABLE

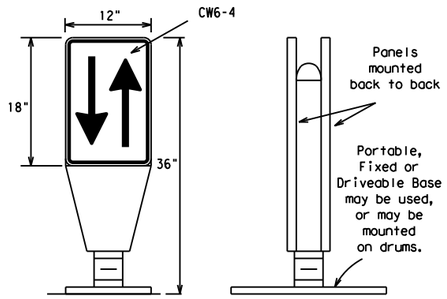


(Rigid or self-righting)

PORTABLE

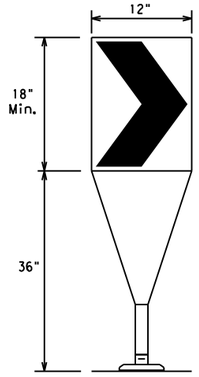
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

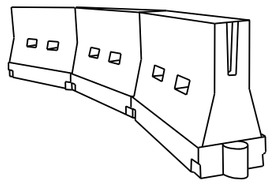
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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

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

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

GENERAL NOTES

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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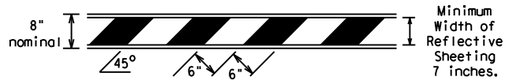
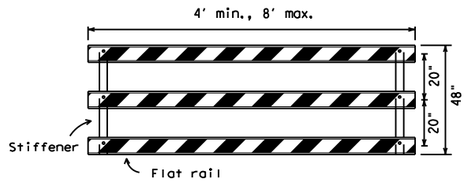
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



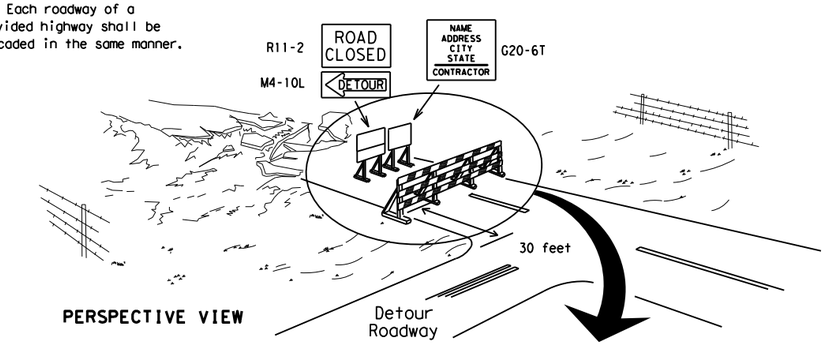
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

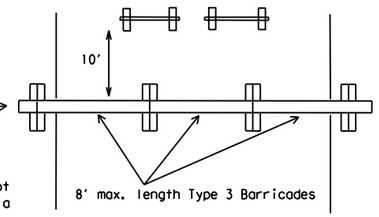
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

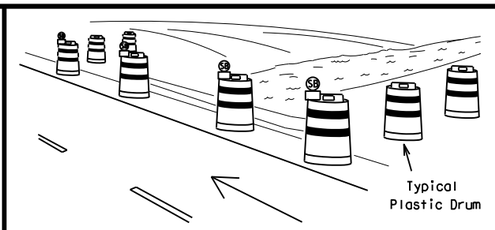
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

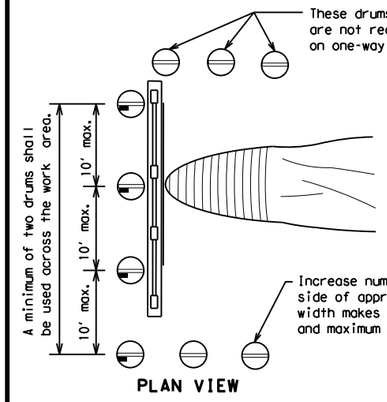
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

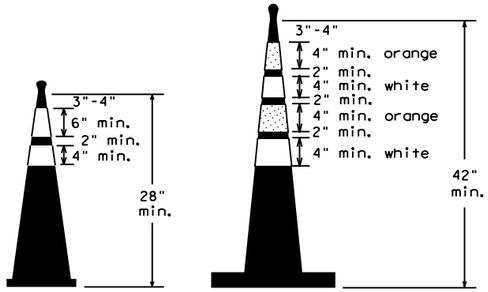
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

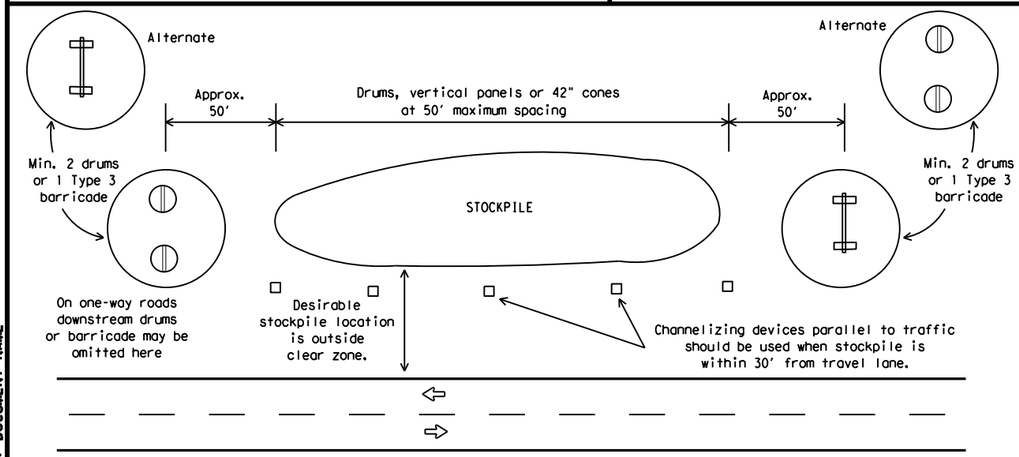
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	YKM	DE WITT		25

104

DATE: 01/23/2022 06:19 PM
FILE: DOCUMENT NAME

WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

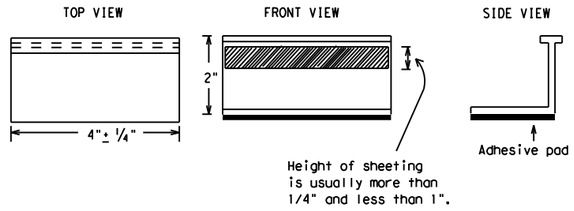
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	YKM	DE WITT		26
11-02 8-14				

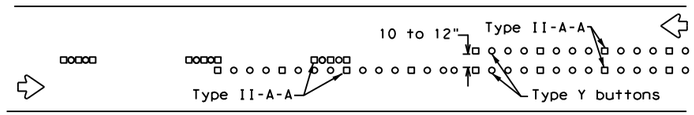
105

DATE: 01/23/2022 06:19 PM
FILE: DOCUMENT NAME

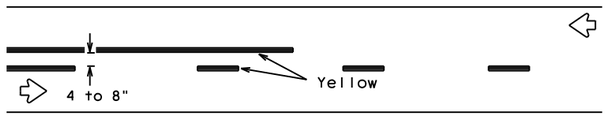
DATE: 01/23/2022 06:19 PM
FILE: DOCUMENT NAME

PAVEMENT MARKING PATTERNS

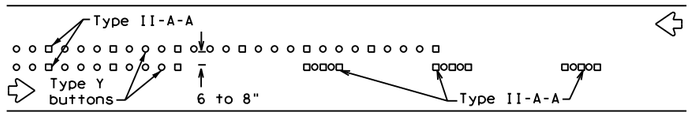
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



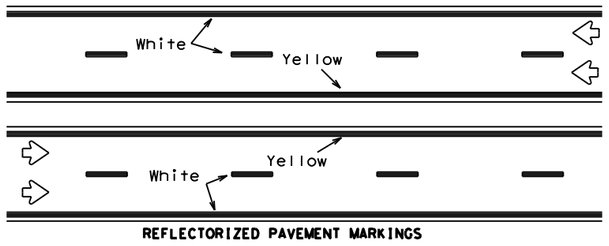
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



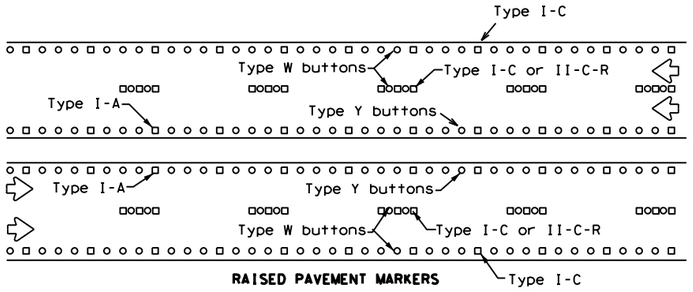
RAISED PAVEMENT MARKERS - PATTERN B

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

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



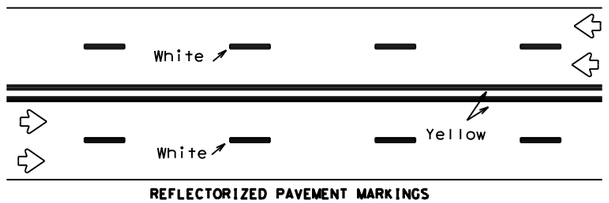
REFLECTORIZED PAVEMENT MARKINGS



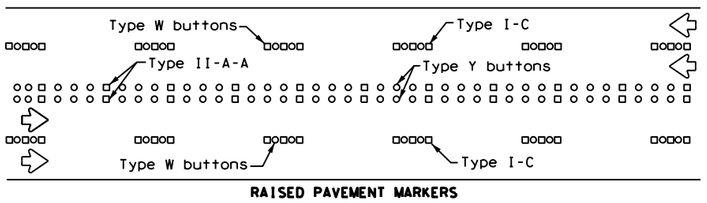
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



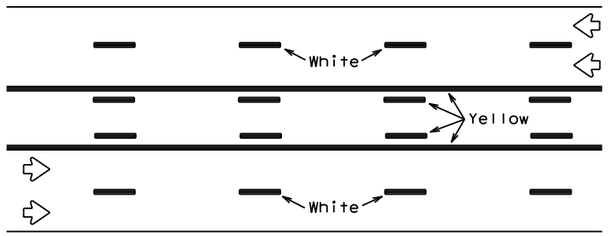
REFLECTORIZED PAVEMENT MARKINGS



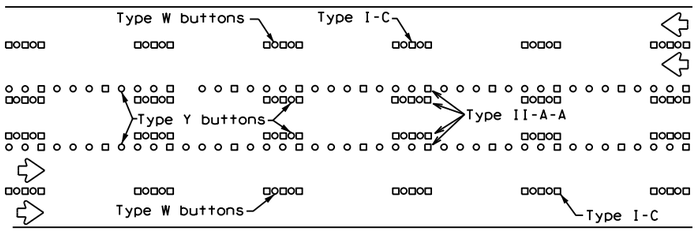
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

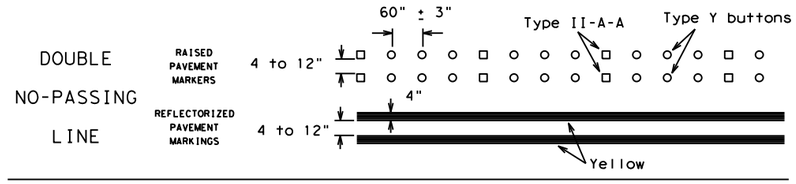
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

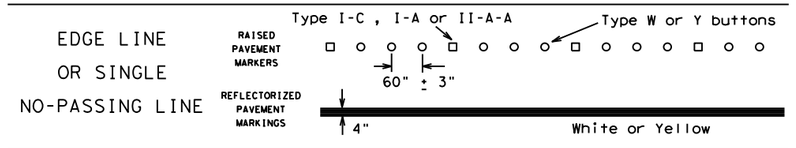
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

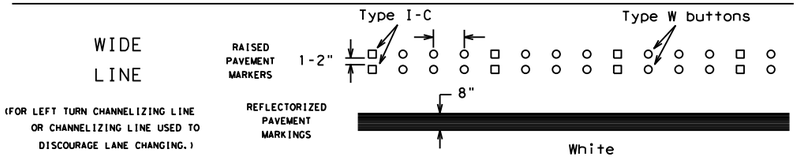


EDGE LINE OR SINGLE NO-PASSING LINE



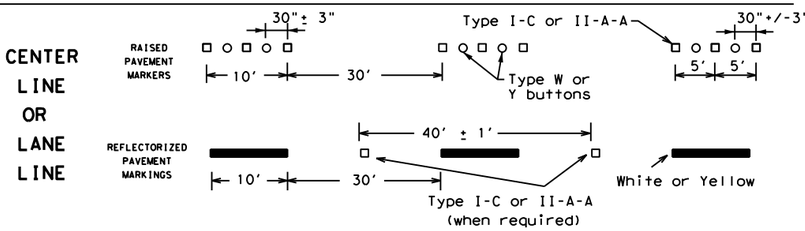
WIDE LINE

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

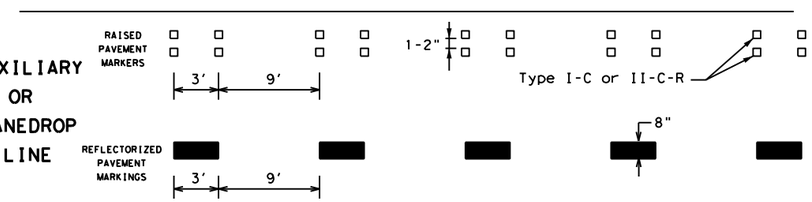


BROKEN LINES

CENTER LINE OR LANE LINE

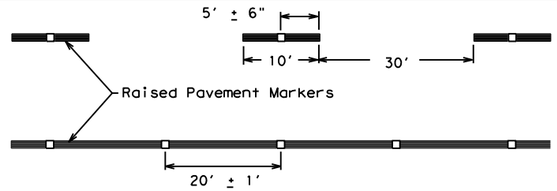


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0143	08	098	US 87
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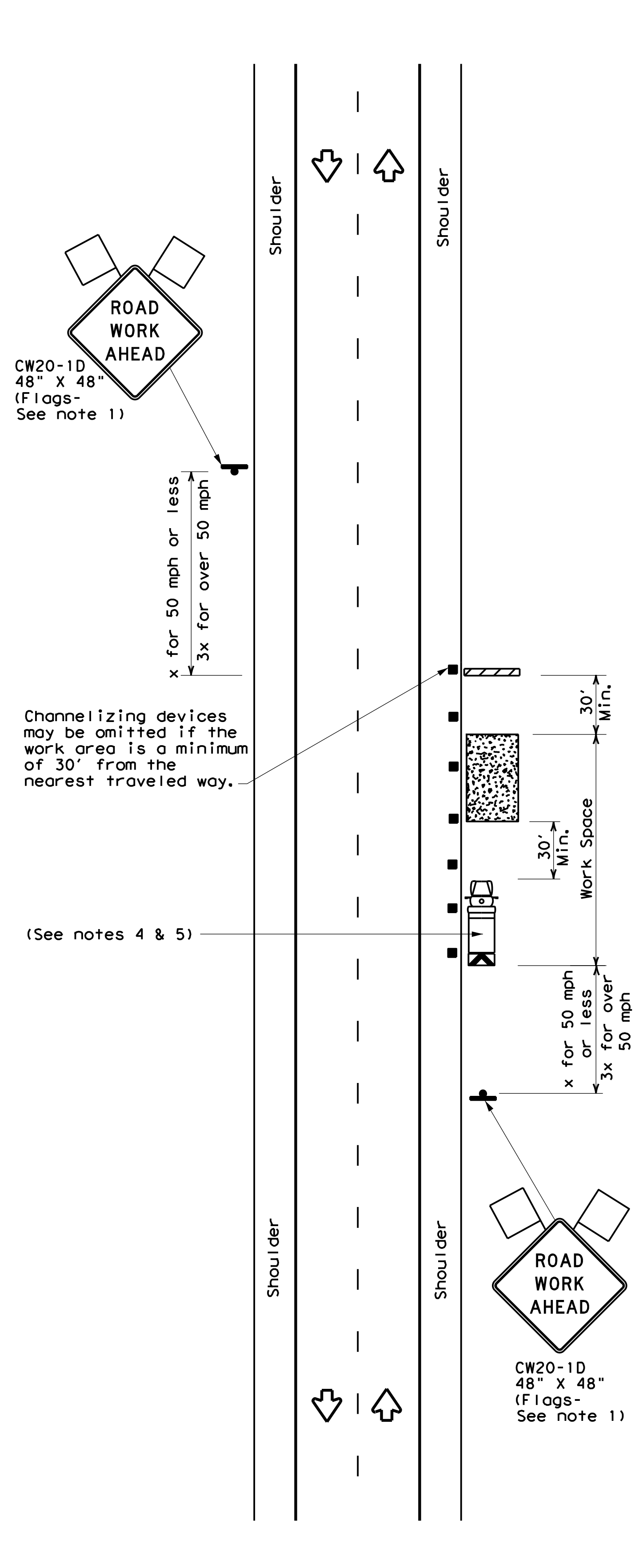
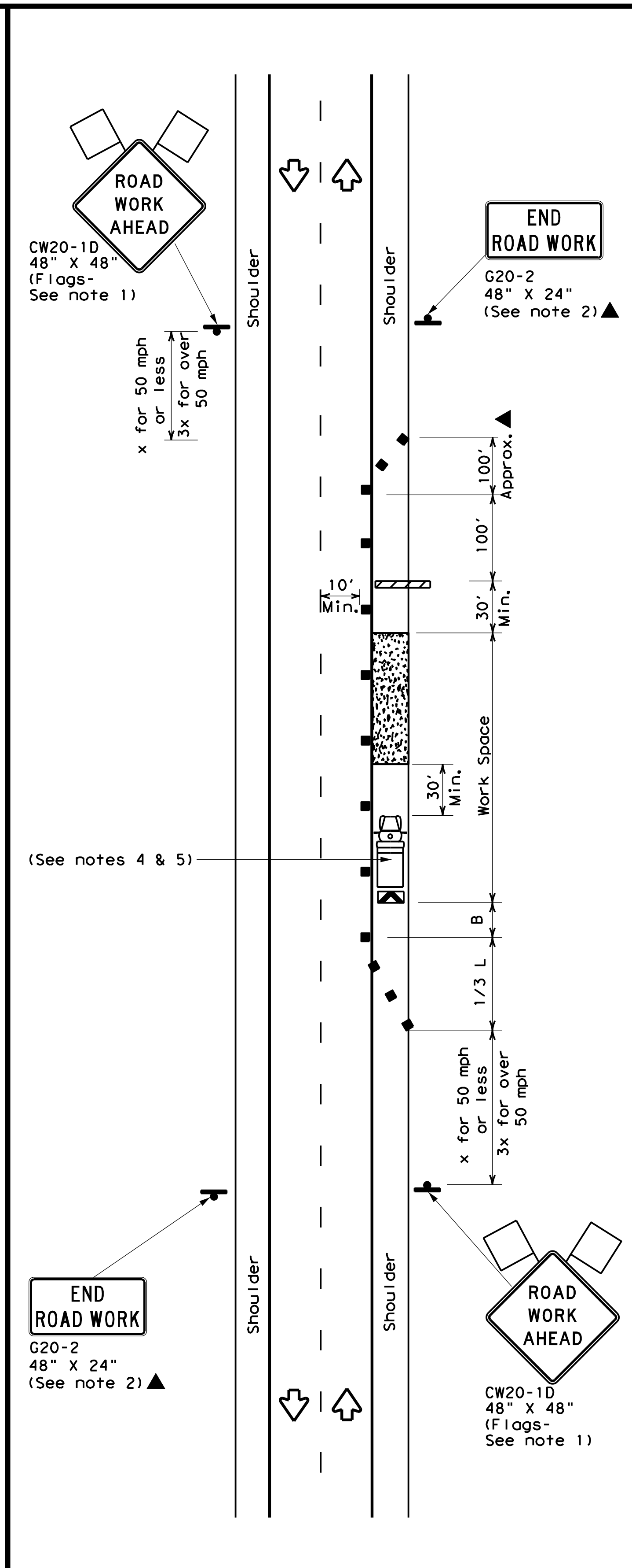
	YKM	DE WITT		27



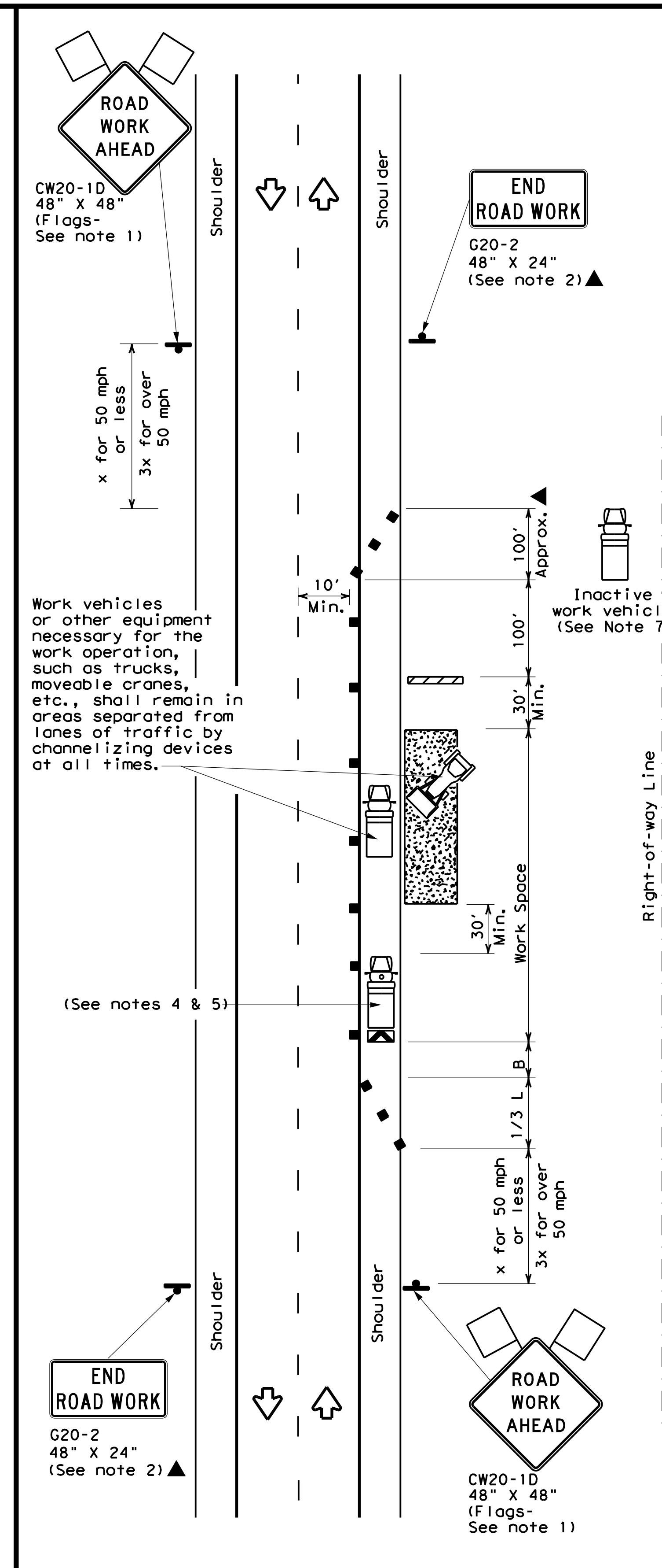
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0143	08	098	BS 71-F
	DIST	COUNTY		SHEET NO.
	YKM	DEWITT		28

DATE: 5/6/2022 6:16:44 AM
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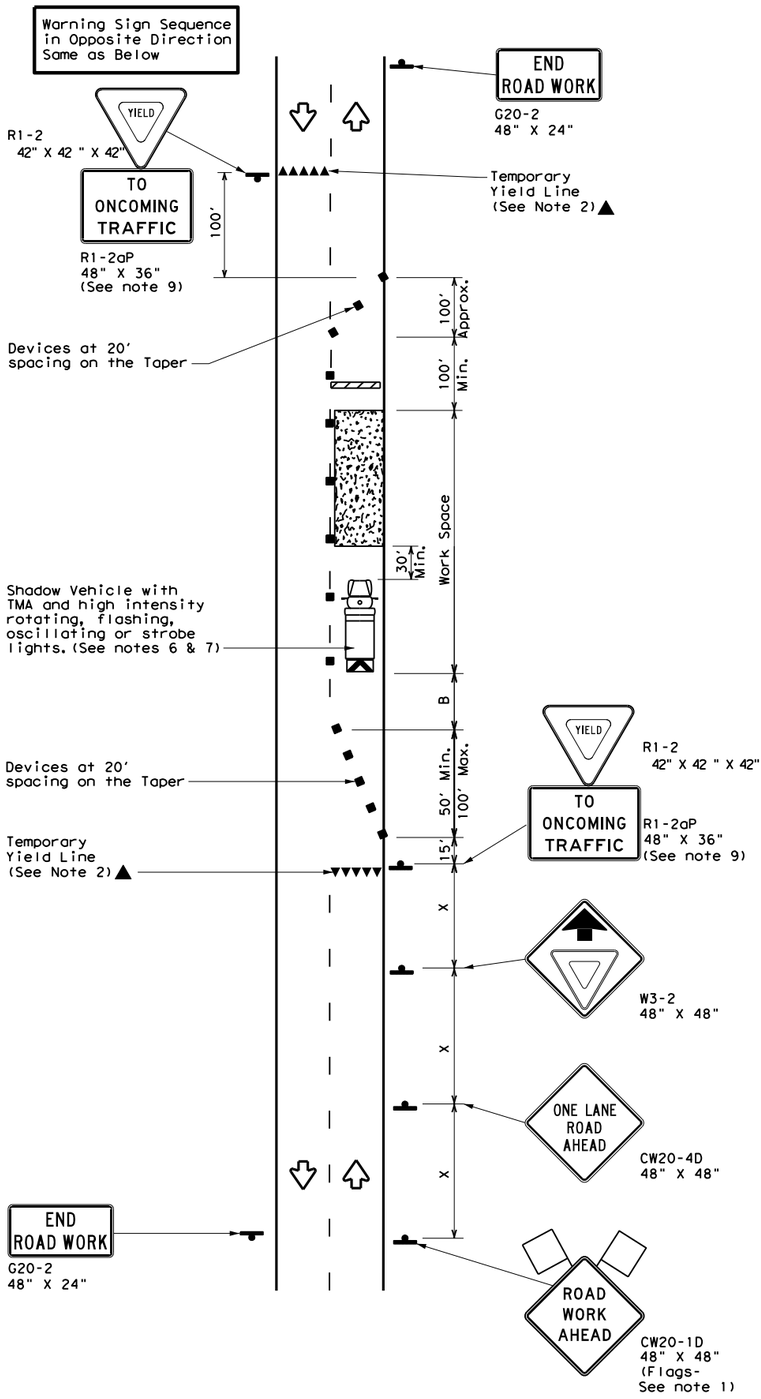
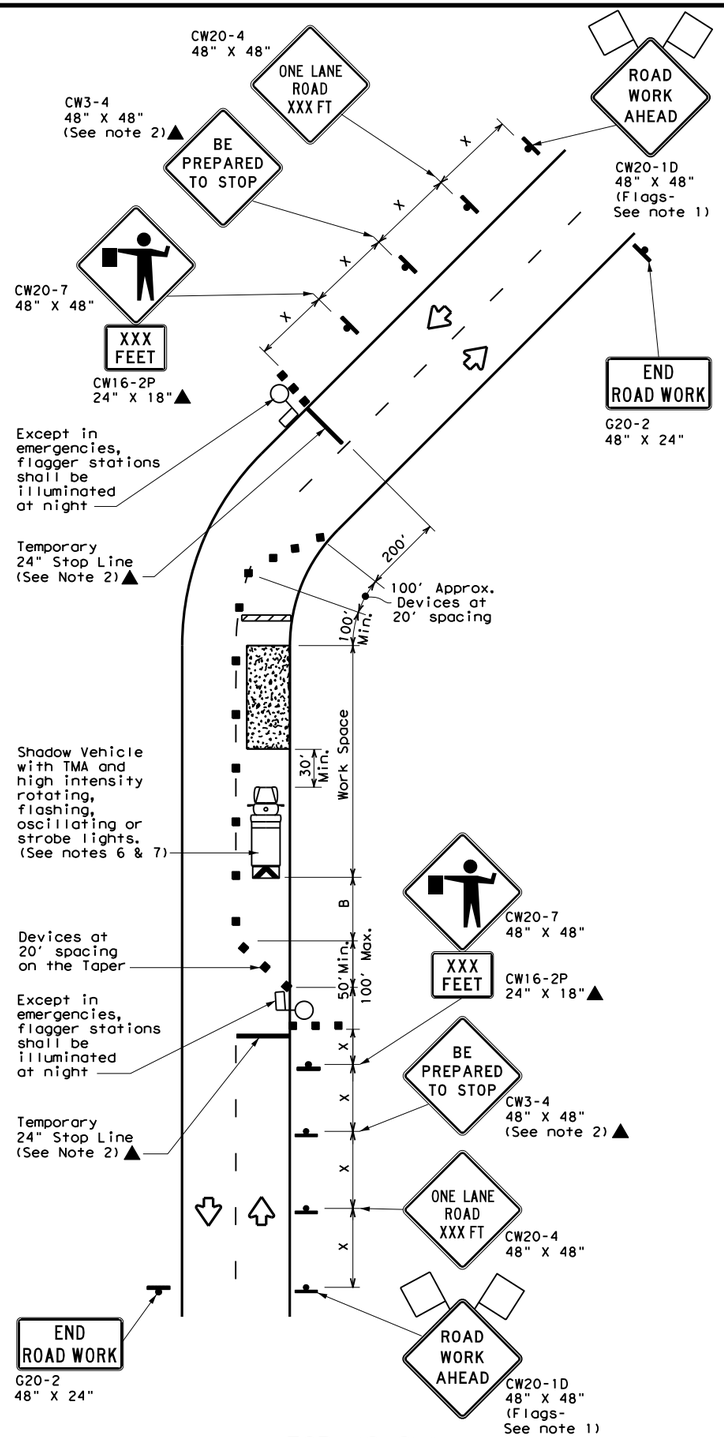


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

LEGEND

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	BS 71-F
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	YKM	DEWITT		29
4-98 2-18				

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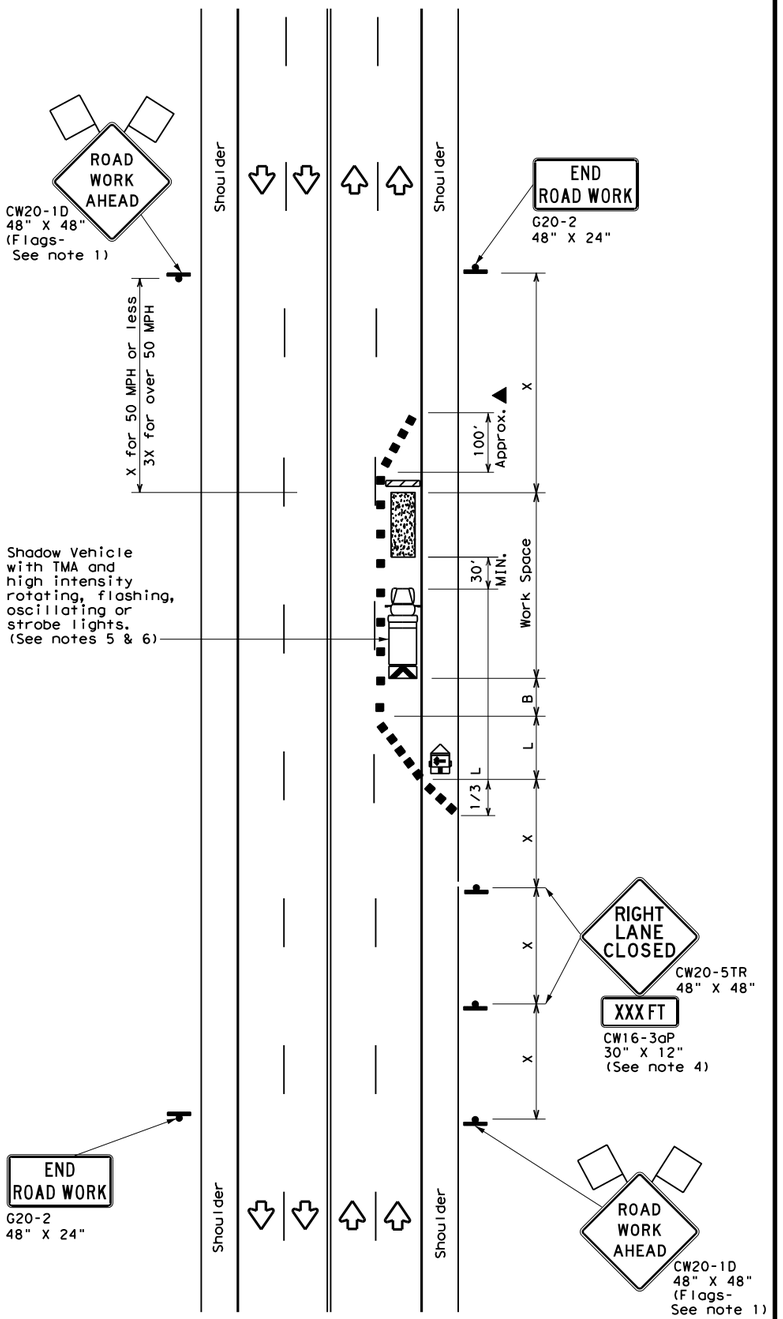
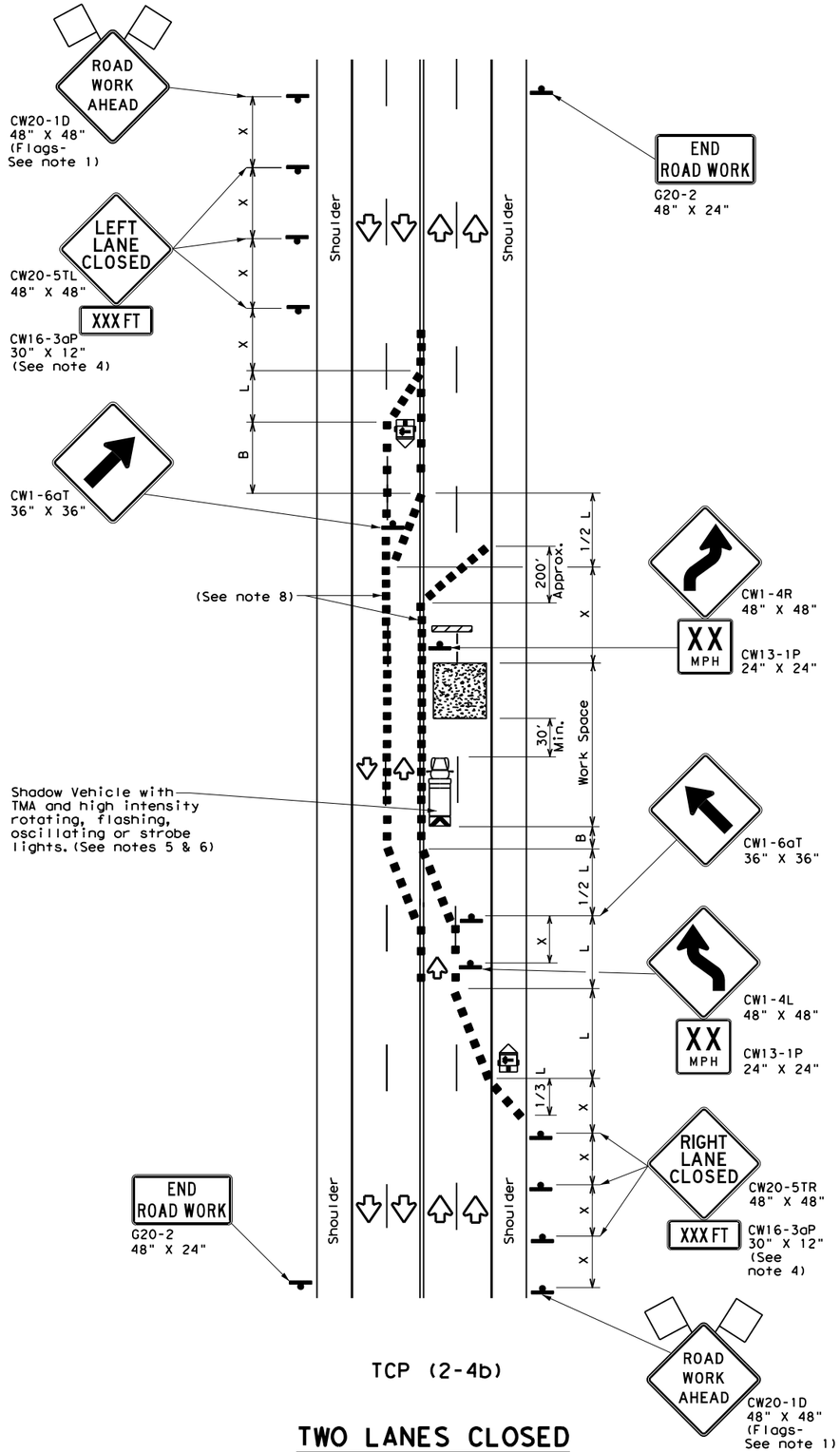


TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-4a)

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

TCP (2-4b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(2-4)-18

FILE: tcp2-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
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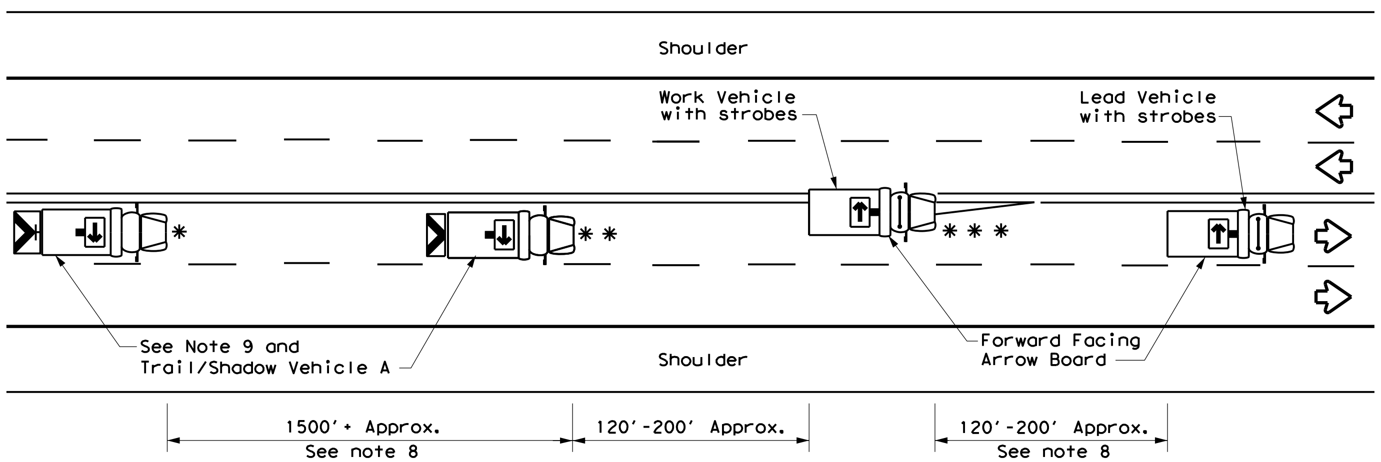
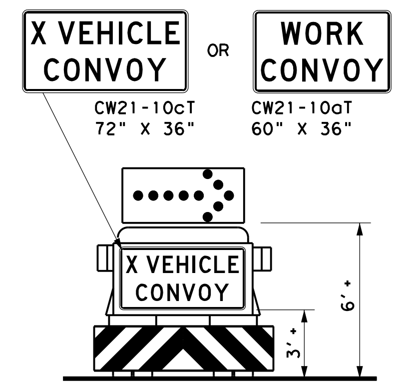
1-97 2-12	YKM	DE WITT		29A
4-98 2-18				



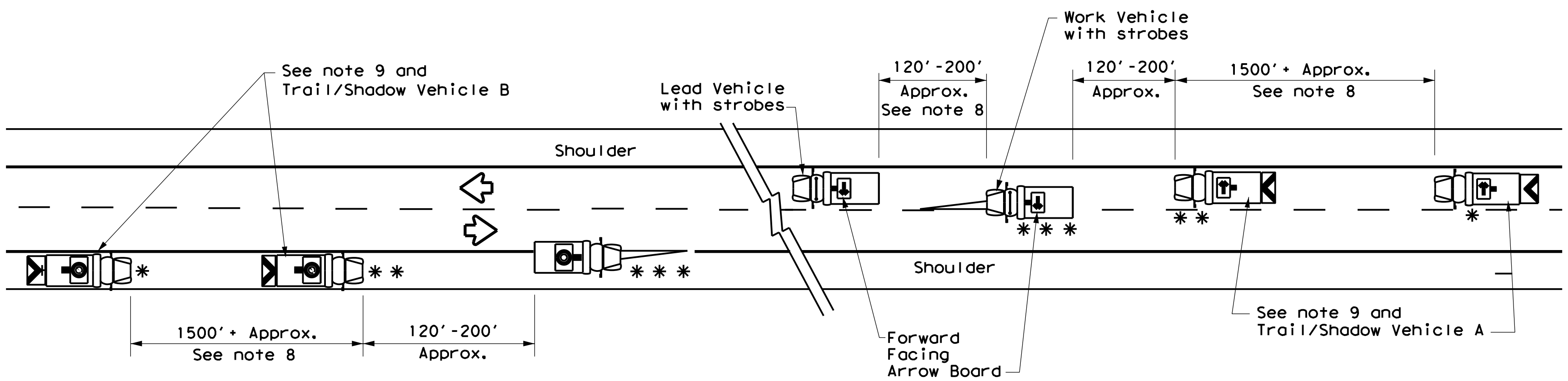
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

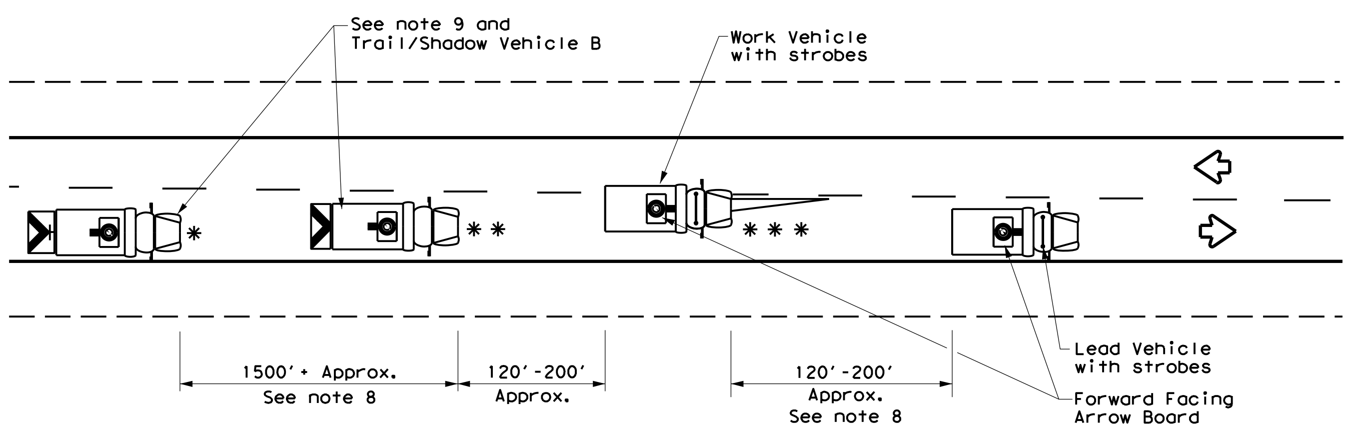


WORK ON SHOULDER

WORK ON TRAVEL LANE

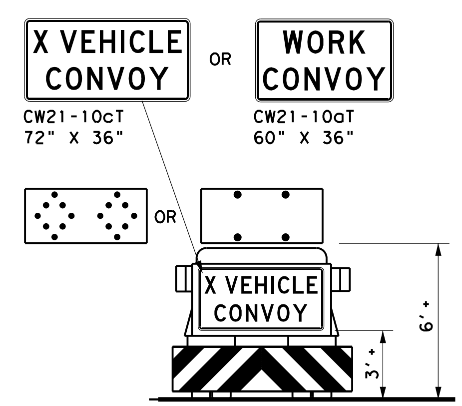
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display

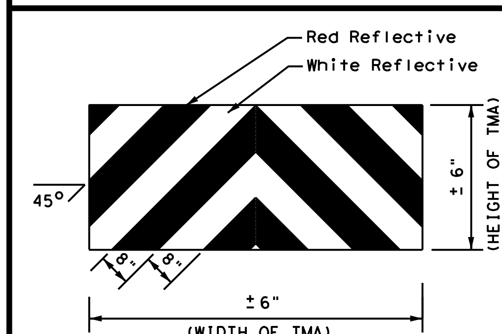
LEGEND

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0143	08	098	US 87
	DIST		COUNTY	SHEET NO.
	YKM		DEWITT	30

175

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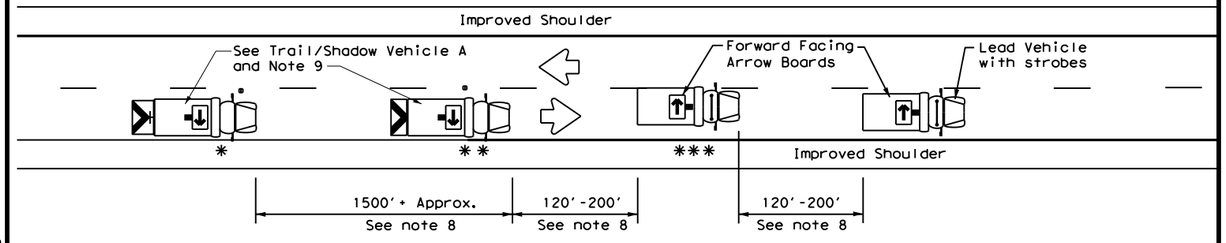
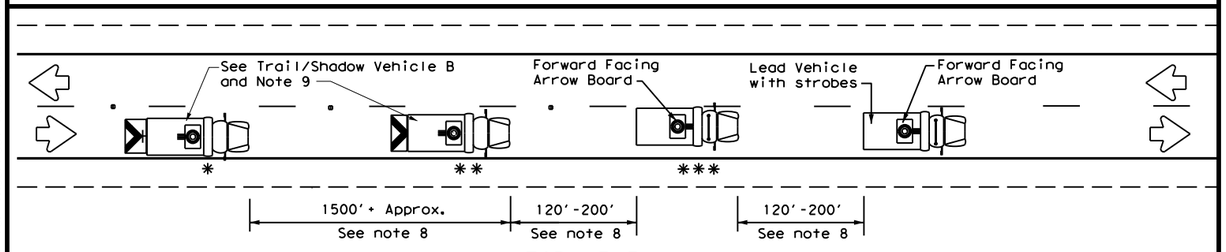


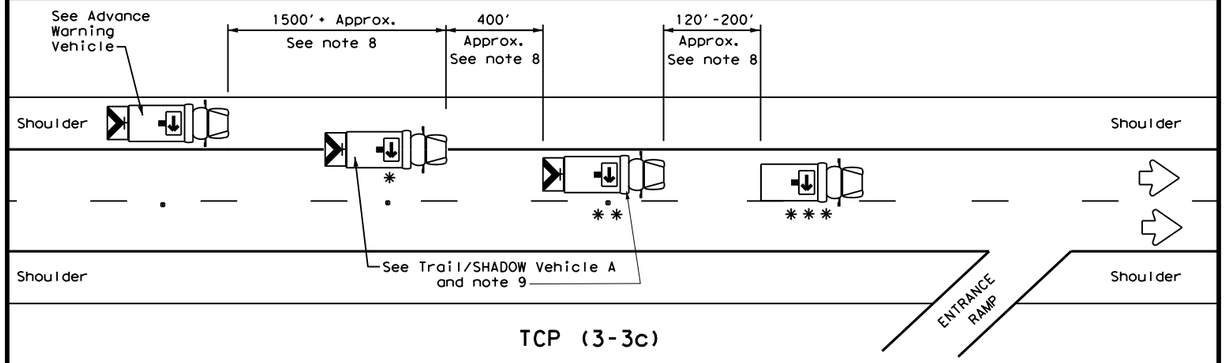
TCP (3-3a)

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



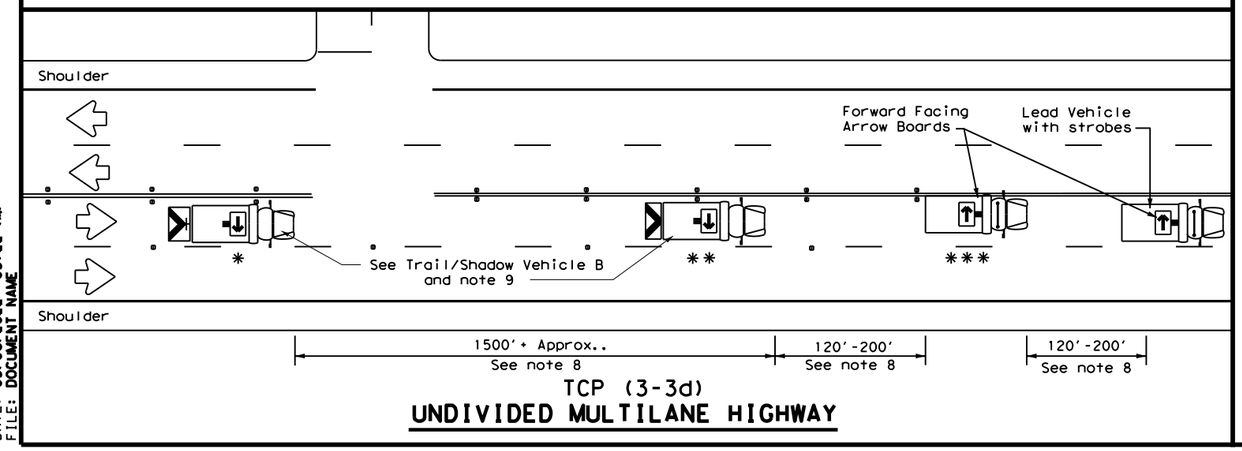
TCP (3-3b)

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



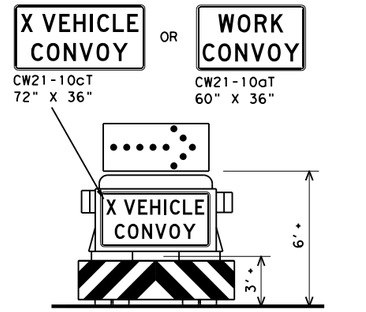
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



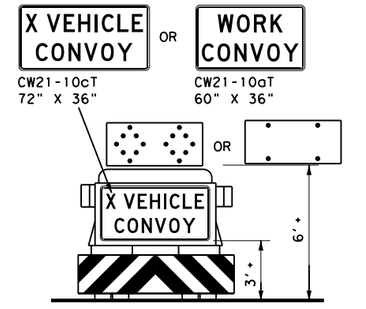
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



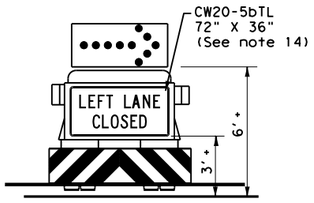
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

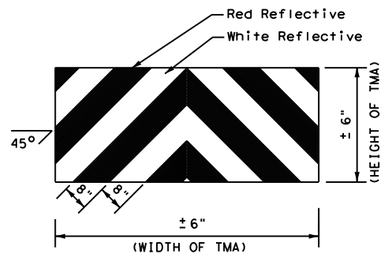


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

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

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©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	YKM	DE WITT		31
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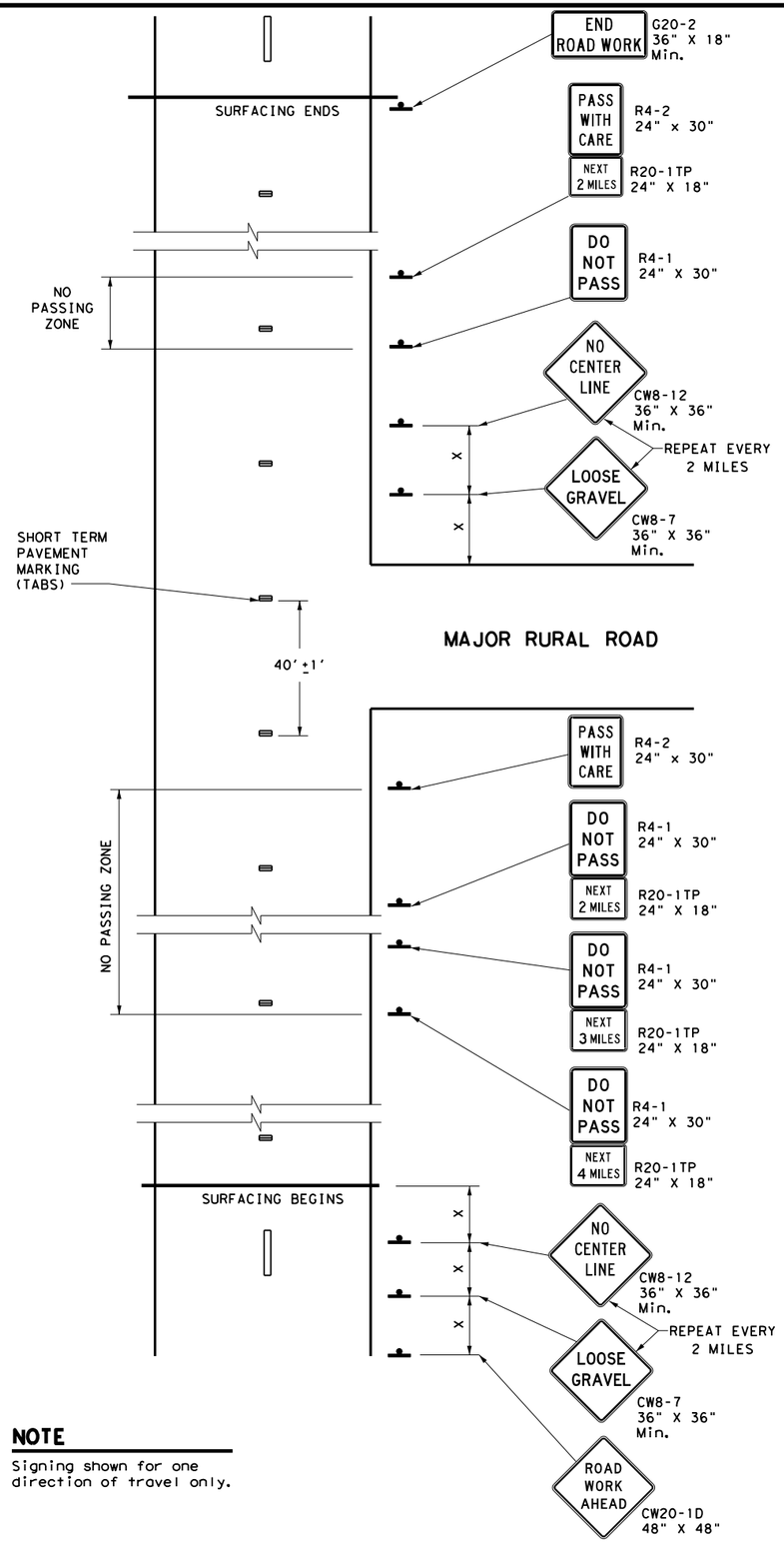
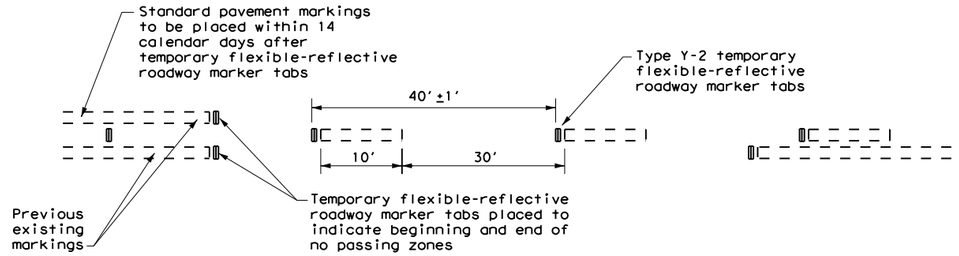


NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

"DO NOT PASS" SIGN (R4-1) and NO-PASSING ZONES

A. Prior to the beginning of construction, all currently striped no-passing zones shall be signed with the DO NOT PASS (R4-1) signs and PASS WITH CARE (R4-2) signs placed at the beginning and end of each zone for each direction of travel except as otherwise provided herein. Signs marking these individual no-passing zones need not be covered prior to construction if the signs supplement the existing pavement markings.

B. At the discretion of the Engineer, in areas of numerous no-passing zones, several zones may be combined as a single zone. If passing is to be prohibited over one or more lengthy sections, a DO NOT PASS sign and a NEXT XX MILES (R20-1TP) plaque may be used at the beginning of such zones. The DO NOT PASS sign and the NEXT XX MILES plaque should be repeated every mile to the end of the no-passing zone. In areas where there is considerable distance between no-passing zones, the end of the no-passing zone may be signed with a PASS WITH CARE sign and a NEXT XX MILES plaque.

C. Depending on traffic volumes and length of sections, it may be desirable to prohibit passing throughout the project to prevent damage to windshield and lights. The DO NOT PASS sign and NEXT XX MILES plaque should be used and repeated as often as necessary for this purpose. Where several existing zones are to be combined into one individual no-passing zone, the sign at the beginning of the zone should be covered until the surfacing operation has passed this location so as not to have the DO NOT PASS sign conflict with the existing pavement markings. Also, unless one days operation completes the entire length of such combined zones, appropriate DO NOT PASS and PASS WITH CARE signs should be placed at the beginning and end of the no-passing zones where the surfacing operation has stopped for the day.

D. R4-1 and R4-2 are to remain in place until standard pavement markings are installed.

"NO CENTER LINE" SIGN (CW8-12)

A. Center line markings are yellow pavement markings that delineate the separation of travel lanes that have opposite directions of travel on a roadway. Divided highways do not typically have center line markings.

B. At the time construction activity obliterates the existing center line markings(low volume roads may not have an existing centerline), a NO CENTER LINE (CW8-12) sign should be erected at the beginning of the work area, at approximately 2 mile intervals within the work area, beyond major intersections and other locations deemed necessary by the Engineer.

C. The NO CENTER LINE signs are to remain in place until standard pavement markings are installed.

"LOOSE GRAVEL" SIGN (CW8-7)

A. When construction begins, a LOOSE GRAVEL (CW8-7) sign should be erected at each end of the work area and repeated at intervals of approximately 2 miles in rural areas and closer in urban areas.

B. The LOOSE GRAVEL signs are to remain in place until the condition no longer exists.

PAVEMENT MARKINGS

A. Temporary markings for surfacing projects shall be Temporary Flexible-reflective Roadway Marker Tabs unless otherwise approved by the Engineer. Tabs are to be installed to provide true alignment for striping crews or as directed by the Engineer. Tabs will be placed at the spacing indicated. Tabs should be applied to the pavement
no more than two (2) days before the surfacing is applied. After the surfacing is rolled and swept, the cover over the reflective strip shall be removed.

B. Tabs shall not be used to simulate edge lines.

C. Tab placement for overlay/inlay operations shall be as shown on the WZ(STPM) standard sheet.

COORDINATION OF SIGN LOCATIONS

A. The location of warning signs at the beginning and end of a work area are to be coordinated with other signing typically shown on the Barricade and Construction Standards for project limits to ensure adequate sign spacing.

B. Where possible the ROAD WORK AHEAD (CW20-1D), LOOSE GRAVEL (CW8-7), and NO CENTER LINE (CW8-12) signs should be placed in the sequence shown following the OBEY WARNING SIGNS STATE LAW (R20-3T) and the TRAFFIC FINES DOUBLE (R20-5T) sign, and one "X" sign spacing prior to the CONTRACTOR (G20-6T)sign typically located at or near the limits of surfacing. LOOSE GRAVEL and NO CENTER LINE signs will then be repeated as described above.

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

* Conventional Roads Only

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

GENERAL NOTES

1. The traffic control devices detailed on this sheet will be furnished and erected as directed by the Engineer on sections of roadway where tabs must be placed prior to the surfacing operation which will cover or obliterate the existing pavement markings.
2. The devices shown on this sheet are to be used to supplement those required by the BC Standards or others required elsewhere in the plans.
3. Signs shall be erected as detailed on the BC Standards or the Compliant Work Zone Traffic Control Devices List (CWZTCD) on supports approved for Long-Term / Intermediate-Term Work Zone Sign Supports.
4. When surfacing operations take place on divided highways, freeways or expressways, the size of diamond shaped construction warning signs shall be 48" x 48".
5. Signs on divided highways, freeways and expressways will be placed on both right and left sides of the roadway based on roadway conditions as directed by the Engineer.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

FILE: tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
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4-92 4-98	DIST	COUNTY		SHEET NO.
1-97 7-13	YKM	DE WITT		31A

210

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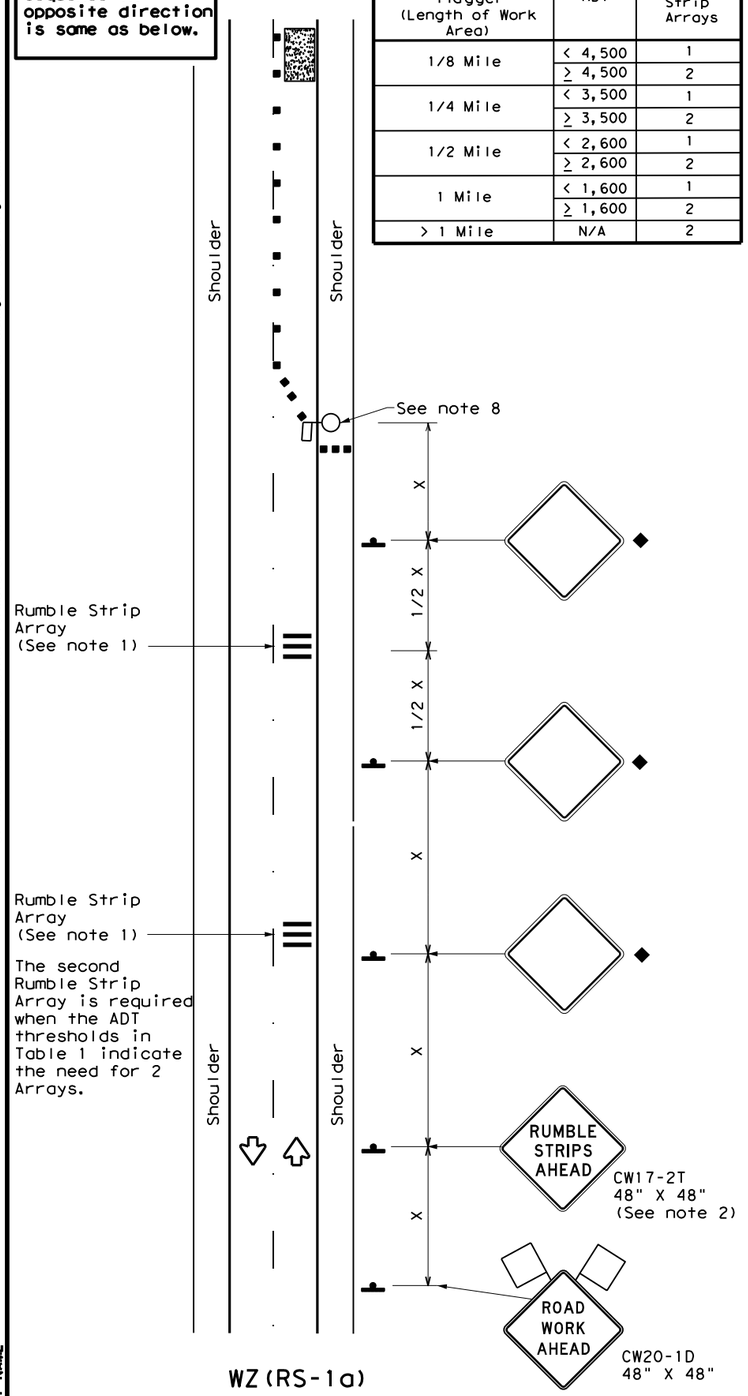
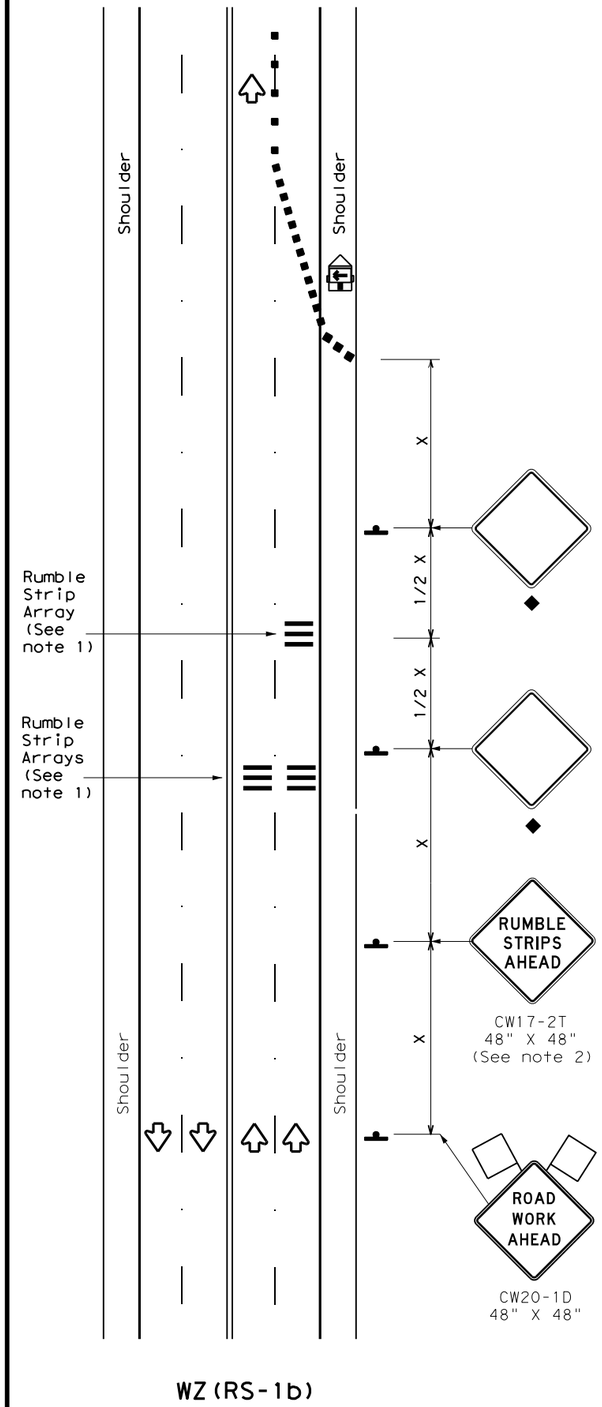
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

* For posted speeds in excess of 65 MPH, it is recommended that spacing is increased as speed limits increase. Increasing space between rumble strips will improve effectiveness.

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

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DE WITT		32

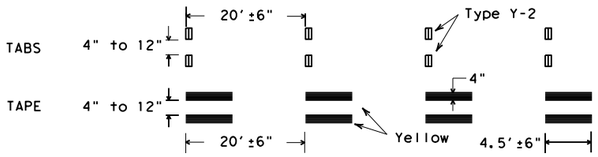
117

DATE: 05/27/2022 02:41 AM
FILE: DOCUMENT NAME

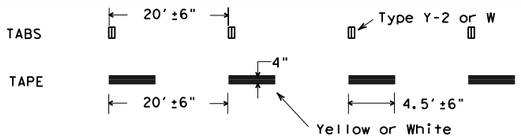
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

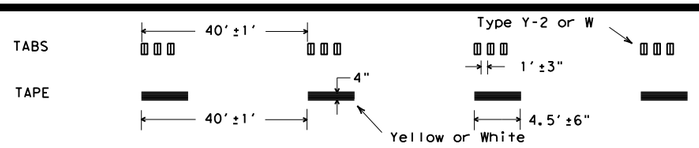


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



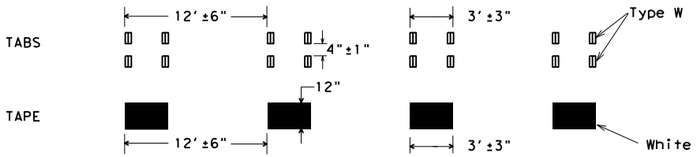
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

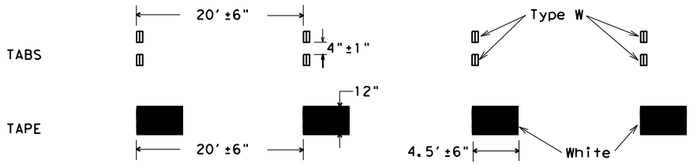


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



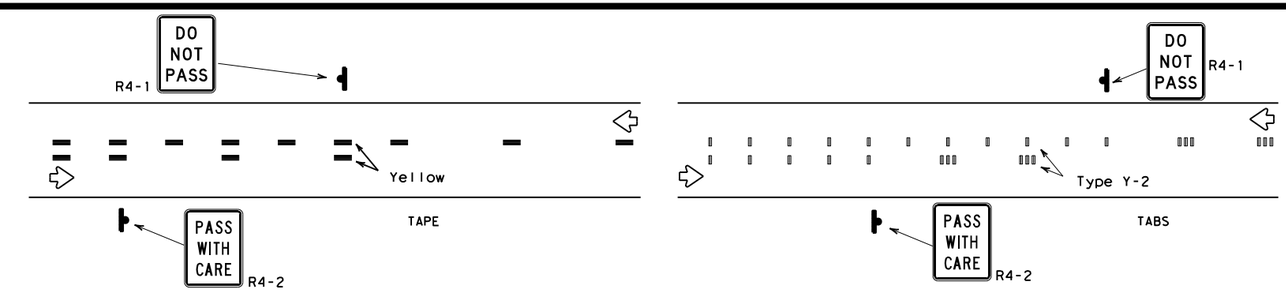
NOTES:

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

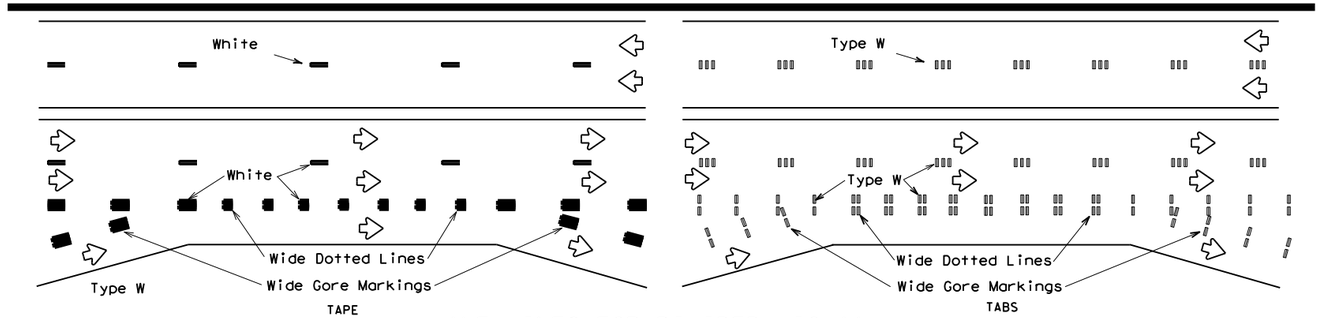
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

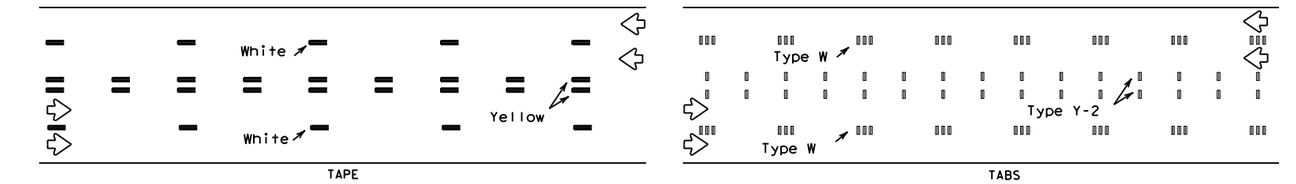
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



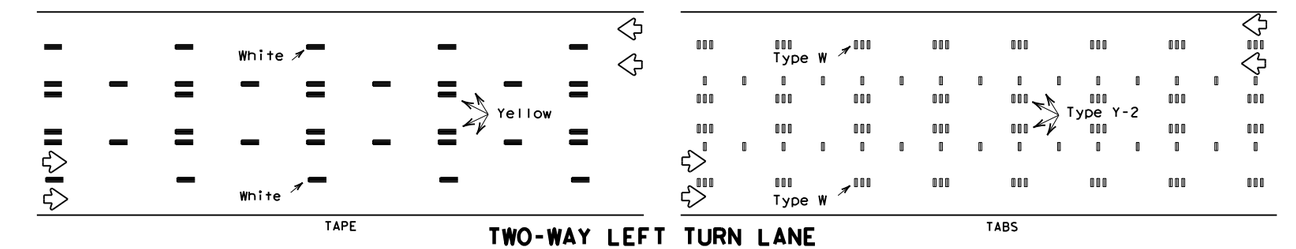
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



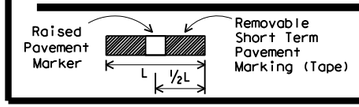
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

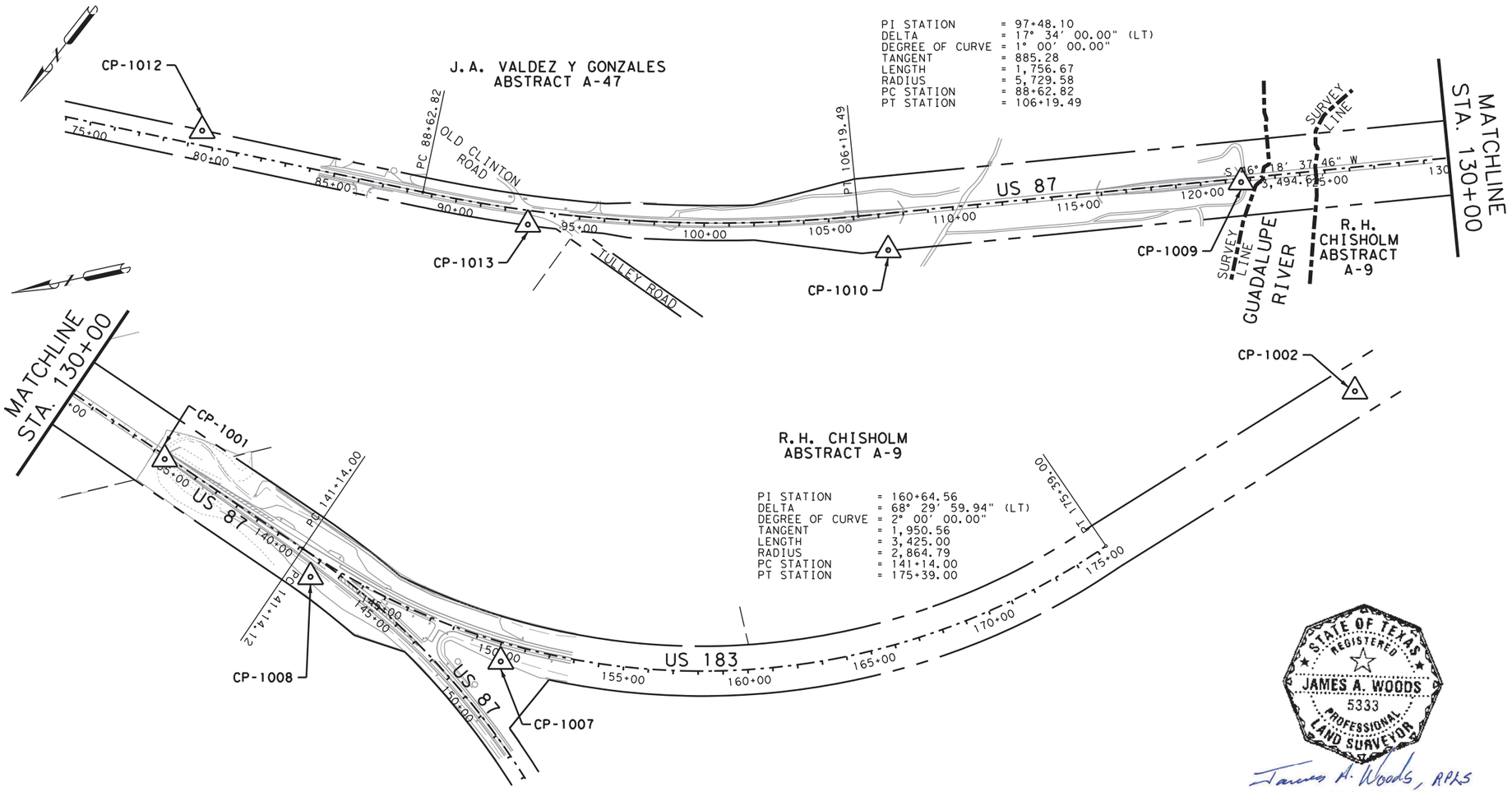
WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		0143	08	098	US 87
1-97		DIST	COUNTY		SHEET NO.
3-03		YKM	DE WITT		32A
7-13					

NOTES:

1. ALL BEARINGS AND COORDINATES SHOWN ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204) NAD 83 USING THE TXDOT VRS SYSTEM. ALL COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A TXDOT COMBINED ADJUSTMENT FACTOR OF 1.00013.
2. HORIZONTAL COORDINATE SOLUTIONS ARE BASED ON GPS RTK OBSERVATION MEANS UTILIZING THE TXDOT VRS NETWORK AT THE TIME OF THE SURVEY AND LOCALIZED TO THE PROJECT CONTROL.
3. ALL PROJECT ELEVATIONS ARE NAVD88 UTILIZING GEOID 12B AND BASED ON GPS OBSERVATIONS USING THE TXDOT VRS NETWORK ON NGS MONUMENT K889. DIGITAL LEVEL LOOPS WERE RUN BETWEEN ALL CONTROL POINTS TO HOLD AN ELEVATION OF 176.968 FEET ON K889.
4. ALL MEASUREMENTS ARE IN US SURVEY FEET.
5. FIELD SURVEYS PERFORMED JANUARY 2017 TO SEPTEMBER 2017.



Beginning chain US87-BL description

Point ALIGN101 N 13,581,771.495 E 2,512,427.562 Sta 35+62.90

Course from ALIGN101 to PC US87-BL-1 S 63° 52' 37.463" W Dist 5,299.921

Curve Data			
Curve US87-BL-1			
P.I. Station	97+48.10 N	13,579,048.160 E	2,506,874.171
Delta =	17° 34' 00.005" (LT)		
Degree =	1° 00' 00.000"		
Tangent =	885.279		
Length =	1,756.667		
Radius =	5,729.578		
External =	67.989		
Long Chord =	1,749.795		
Mid. Ord. =	67.192		
P.C. Station	88+62.82 N	13,579,437.947 E	2,507,669.020
P.T. Station	106+19.49 N	13,578,436.653 E	2,506,234.032
C.C.	N	13,574,293.637 E	2,510,191.745
Back	= S 63° 52' 37.463" W		
Ahead	= S 46° 18' 37.458" W		
Chord Bear	= S 55° 05' 37.461" W		

Course from PT US87-BL-1 to PC US87-BL-2 S 46° 18' 37.458" W Dist 3,494.630

Curve Data			
Curve US87-BL-2			
P.I. Station	170+79.74 N	13,573,974.225 E	2,501,562.670
Delta =	86° 59' 52.843" (RT)		
Degree =	1° 50' 00.001"		
Tangent =	2,965.624		
Length =	4,745.346		
Radius =	3,125.224		
External =	1,183.134		
Long Chord =	4,302.446		
Mid. Ord. =	858.229		
P.C. Station	141+14.12 N	13,576,022.733 E	2,503,707.091
P.T. Station	188+59.46 N	13,576,008.421 E	2,499,404.669
C.C.	N	13,578,282.559 E	2,501,548.339
Back	= S 46° 18' 37.458" W		
Ahead	= N 46° 41' 29.699" W		
Chord Bear	= S 89° 48' 33.880" W		

Ending chain US87-BL description

LEGEND

- CONTROL POINT
- PROPOSED ALIGNMENT
- EXISTING RIGHT OF WAY
- SURVEY LINE

SCALE: 1" = 250' (22" X 34")
SCALE: 1" = 500' (11" X 17")
0' 250' 500'
GRAPHIC SCALE IN FEET

POINT	NORTH	EAST	ELEVATION	STATION	OFFSET	DESCRIPTION
CP-1001	13,576,488.58	2,504,172.00	176.97	134+56.16	15.71'	FOUND BRASS DISK SET IN BRIDGE ABUTMENT STAMPED "K889"
CP-1002	13,571,761.77	2,503,425.29	207.65	N/A	N/A	FOUND BRASS DISK SET IN CULVERT HEADWALL STAMPED "L889 RESET"
CP-1007	13,575,342.42	2,503,092.34	181.95	149+85.95	-195.67'	SET 5/8" IR W/YELLOW PLASTIC CAP STAMPED "CIVILCORP"
CP-1008	13,576,016.84	2,503,585.91	181.01	142+08.18	78.06'	SET 5/8" IR W/YELLOW PLASTIC CAP STAMPED "CIVILCORP"
CP-1009	13,577,381.35	2,505,108.86	178.78	121+62.04	14.13'	FOUND BRASS DISK IN BRIDGE ABUTMENT STAMPED"US GEOLOGICAL
						SURVEY GAUGING STATION"
CP-1010	13,578,469.68	2,506,055.28	160.24	107+25.93	147.35'	SET 5/8" IR W/YELLOW PLASTIC CAP STAMPED "CIVILCORP"
CP-1012	13,579,790.00	2,508,519.13	170.86	79+44.54	-58.21'	1004 RESET 5/8" IR W/RED CONTROL POINT CAP
CP-1013	13,579,280.27	2,507,257.45	169.94	92+97.92	56.32'	1011 RESET 5/8" IR W/RED CONTROL POINT CAP

FROM	TO	DIRECTION	DISTANCE
CP-1012	CP-1013	S 68° 00' 03" W	1,360.76'
CP-1013	CP-1010	S 56° 00' 33" W	1,449.92'
CP-1010	CP-1009	S 41° 00' 38" W	1,442.28'
CP-1009	CP-1001	S 46° 22' 50" W	1,294.12'
CP-1001	CP-1008	S 51° 10' 09" W	752.36'
CP-1008	CP-1007	S 36° 11' 54" W	835.73'
CP-1007	CP-1002	S 05° 18' 45" E	3,596.09'

STATE OF TEXAS REGISTERED JAMES A. WOODS 5333 PROFESSIONAL LAND SURVEYOR

James A. Woods, RPLS
05/17/22

CivilCorp ENGINEERS • SURVEYORS
4611 AIRLINE ROAD, SUITE 300, VICTORIA, TEXAS 77904
TBPE REGISTRATION #F-10283 TBPLS REGISTRATION #100576-00

Texas Department of Transportation

SURVEY CONTROL INDEX SHEET

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			33
STATE	STATE DISTRICT	COUNTY	
TEXAS	13	DEWITT	
CONT.	SECT.	JOB	HIGHWAY NO.
CONST. C.S.J.	0143	08	098	US 87

...\MRF0143-08-098*US87 CONTROL INDEX.dgn

DATE: 5/13/2022 12:02:35 PM
FILE: L:\CIVILCORP*LLC\ACTIVE\TXDOT - NO. 36-6IDP1307\1780001*WA5 US87 Yoakum\Data\Dgn\ROW\MRF0143-08-098*US87 CONTROL INDEX.dgn

EXISTING US 87/US 183 CENTERLINE

Beginning chain US87EX description
Feature: Geom_Centerline

Point 58 X 2,508,622.8716 Y 13,579,904.7180 Sta 78+00.00

Course from 58 to PC US87EX_3 S 63° 52′ 47.07" W Dist 1,063.7340

Curve US87EX_3					
P.I. Station	97+49.39	X	2,506,872.5701	Y	13,579,046.4866
Delta =	17° 34′ 21.84" (LT)				
Degree =	0° 59′ 59.73"				
Tangent =	885.6548				
Length =	1,757.4027				
Radius =	5,730.0000				
External =	68.0414				
Long Chord =	1,750.5228				
Mid. Ord. =	67.2429				
P.C. Station	88+63.73	X	2,507,667.7747	Y	13,579,436.4020
P.T. Station	106+21.14	X	2,506,232.1959	Y	13,578,434.6816
C.C.		X	2,510,190.4454	Y	13,574,291.5957
Back = S	63° 52′ 47.07" W				
Ahead = S	46° 18′ 25.23" W				
Chord Bear = S	55° 05′ 36.15" W				

Course from PT US87EX_3 to PC US87EX_6 S 46° 18′ 25.23" W Dist 3,491.0755

Curve US87EX_6					
P.I. Station	160+65.28	X	2,502,295.8010	Y	13,574,673.9020
Delta =	68° 33′ 51.72" (LT)				
Degree =	1° 59′ 59.47"				
Tangent =	1,953.0653				
Length =	3,428.4709				
Radius =	2,865.0000				
External =	602.3750				
Long Chord =	3,227.5322				
Mid. Ord. =	497.7265				
P.C. Station	141+12.21	X	2,503,707.9681	Y	13,576,023.0677
P.T. Station	175+40.68	X	2,503,035.5586	Y	13,572,866.3559
C.C.		X	2,505,687.0928	Y	13,573,951.5247
Back = S	46° 18′ 25.23" W				
Ahead = S	22° 15′ 26.49" E				
Chord Bear = S	12° 01′ 29.37" W				

Course from PT US87EX_6 to 59 S 22° 15′ 26.49" E Dist 1,604.0387

Point 59 X 2,503,643.1163 Y 13,571,381.8312 Sta 191+44.72

Ending chain US87EX description

PROPOSED US 87 CENTERLINE

Beginning chain US87PROP description
Feature: Geom_Centerline

Point 71 X 2,507,994.3612 Y 13,579,596.5383 Sta 1084+91.50

Course from 71 to PC US87PROP_3 S 63° 52′ 47.07" W Dist 642.1750

Curve US87PROP_3					
P.I. Station	1099+06.50	X	2,506,723.8745	Y	13,578,973.5762
Delta =	17° 34′ 21.84" (LT)				
Degree =	1° 08′ 45.30"				
Tangent =	772.8227				
Length =	1,533.5102				
Radius =	5,000.0000				
External =	59.3730				
Long Chord =	1,527.5068				
Mid. Ord. =	58.6762				
P.C. Station	1091+33.68	X	2,507,417.7703	Y	13,579,313.8165
P.T. Station	1106+67.19	X	2,506,165.0838	Y	13,578,439.7149
C.C.		X	2,509,619.0537	Y	13,574,824.4567
Back = S	63° 52′ 47.07" W				
Ahead = S	46° 18′ 25.23" W				
Chord Bear = S	55° 05′ 36.15" W				

Course from PT US87PROP_3 to PC US87PROP_6 S 46° 18′ 25.23" W Dist 3,077.2449

Curve US87PROP_6					
P.I. Station	1143+19.98	X	2,503,523.9233	Y	13,575,916.3851
Delta =	15° 25′ 28.56" (LT)				
Degree =	1° 20′ 53.29"				
Tangent =	575.5516				
Length =	1,144.1428				
Radius =	4,250.0000				
External =	38.7947				
Long Chord =	1,140.6909				
Mid. Ord. =	38.4437				
P.C. Station	1137+44.43	X	2,503,940.0768	Y	13,576,313.9727
P.T. Station	1148+88.57	X	2,503,228.5054	Y	13,575,422.4337
C.C.		X	2,506,875.9512	Y	13,573,241.0032
Back = S	46° 18′ 25.23" W				
Ahead = S	30° 52′ 56.67" W				
Chord Bear = S	38° 35′ 40.95" W				

Course from PT US87PROP_6 to 72 S 30° 52′ 56.58" W Dist 0.4290

Point 72 X 2,503,228.2852 Y 13,575,422.0655 Sta 1148+89.00

Ending chain US87PROP description

PROPOSED US 87 INTERSECTION CENTERLINE

Beginning chain US87INT description
Feature: Geom_Ramp

Point 74 X 2,503,222.3865 Y 13,575,412.1575 Sta 147+60.22

Course from 74 to PC US87INT_3 N 59° 20′ 53.50" W Dist 39.1583

Curve US87INT_3					
P.I. Station	149+83.38	X	2,503,030.4046	Y	13,575,525.9298
Delta =	55° 27′ 50.44" (LT)				
Degree =	16° 22′ 12.80"				
Tangent =	184.0036				
Length =	338.8104				
Radius =	350.0000				
External =	45.4204				
Long Chord =	325.7356				
Mid. Ord. =	40.2032				
P.C. Station	147+99.37	X	2,503,188.6994	Y	13,575,432.1211
P.T. Station	151+38.19	X	2,502,863.3867	Y	13,575,448.7135
C.C.		X	2,503,010.2626	Y	13,575,131.0226
Back = N	59° 20′ 53.50" W				
Ahead = S	65° 11′ 16.06" W				
Chord Bear = N	87° 04′ 48.72" W				

Ending chain US87INT description

EXISTING NB US 87 CENTERLINE

Beginning chain NB87EXIST description
Feature: Geom_Secondary

Point 75 X 2,503,716.7981 Y 13,576,031.5038 Sta 141+00.00

Course from 75 to PC NB87EXIST_3 S 46° 18′ 25.22" W Dist 8.3982

Curve NB87EXIST_3					
P.I. Station	150+77.60	X	2,503,009.9426	Y	13,575,356.1834
Delta =	34° 27′ 43.19" (RT)				
Degree =	1° 50′ 00.47"				
Tangent =	969.2021				
Length =	1,879.6103				
Radius =	3,125.0000				
External =	146.8462				
Long Chord =	1,851.4052				
Mid. Ord. =	140.2555				
P.C. Station	141+08.40	X	2,503,710.7258	Y	13,576,025.7024
P.T. Station	159+88.01	X	2,502,053.2920	Y	13,575,200.7087
C.C.		X	2,501,551.9946	Y	13,578,285.2388
Back = S	46° 18′ 25.23" W				
Ahead = S	80° 46′ 08.42" W				
Chord Bear = S	63° 32′ 16.82" W				

Ending chain NB87EXIST description

PROPOSED NB US 87 CENTERLINE

Beginning chain NB87PROP description
Feature: Geom_Ramp

Curve NB87PROP_1					
P.I. Station	1145+94.87	X	2,503,358.8767	Y	13,575,693.1429
Delta =	22° 28′ 57.61" (RT)				
Degree =	2° 26′ 17.23"				
Tangent =	467.0746				
Length =	922.1320				
Radius =	2,350.0000				
External =	45.9672				
Long Chord =	916.2273				
Mid. Ord. =	45.0853				
P.C. Station	1141+27.80	X	2,503,666.1577	Y	13,576,044.9057
P.T. Station	1150+49.93	X	2,502,940.4350	Y	13,575,485.6213
C.C.		X	2,501,896.3278	Y	13,577,590.9336
Back = S	41° 08′ 19.36" W				
Ahead = S	63° 37′ 16.96" W				
Chord Bear = S	52° 22′ 48.16" W				

Ending chain NB87PROP description

DATE: 05/06/2022 05:48 AM
FILE: DOCUMENT NAME

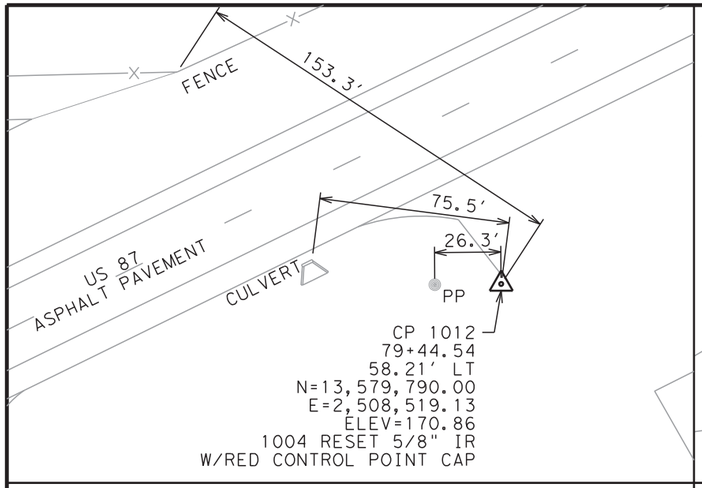
STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED PROFESSIONAL ENGINEER
Mojtaba Ranjbar, P.E.
05/09/2022

US 87

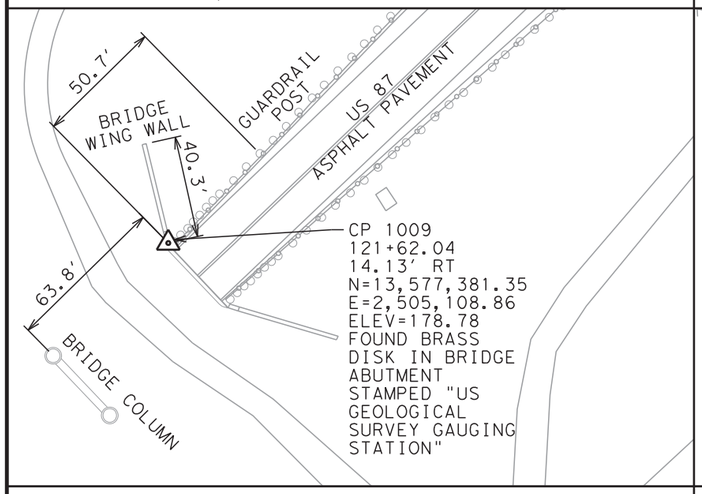
HORIZONTAL ALIGNMENT DATA

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87
DIST	COUNTY		SHEET NO.
YKM	DE WITT		34



SITUATED ON THE SOUTHEAST SIDE OF US87
APPROXIMATELY 1,300 FEET NORTHEAST OF OLD CLINTON RD.



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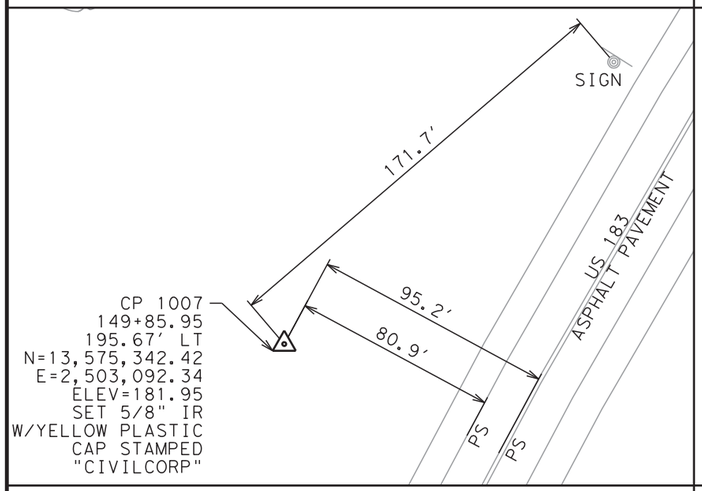

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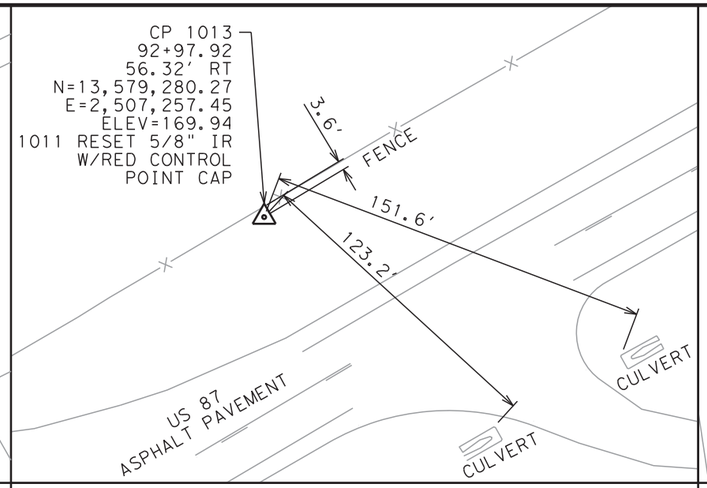
APPROXIMATELY 250 FEET SOUTHWEST OF US87



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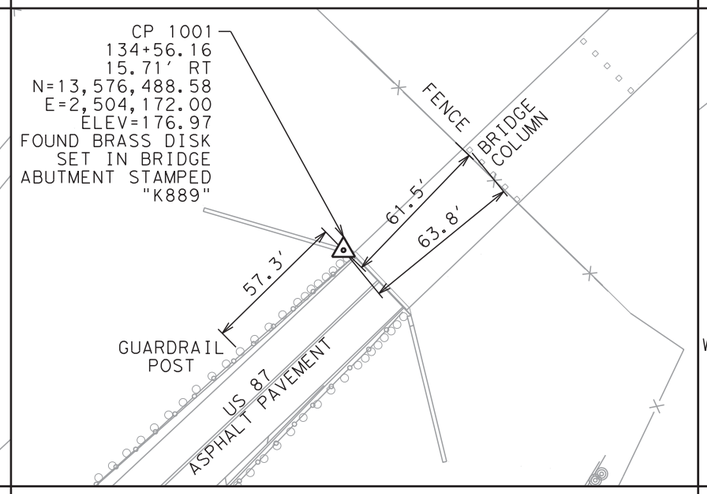
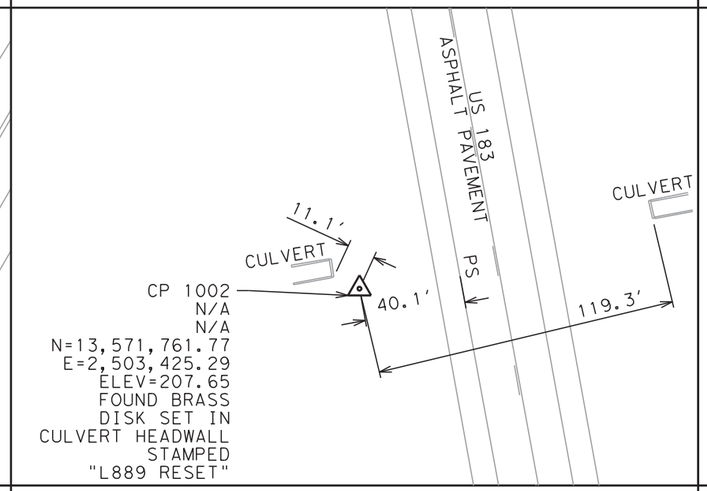
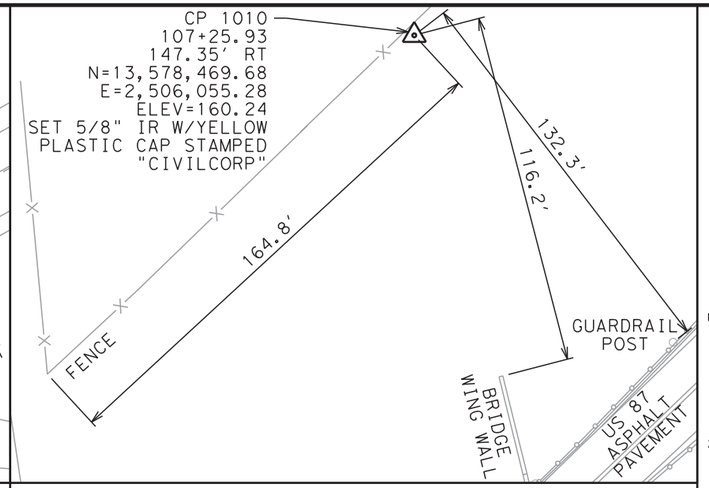
APPROXIMATELY 140 FEET NORTHEAST OF CR440



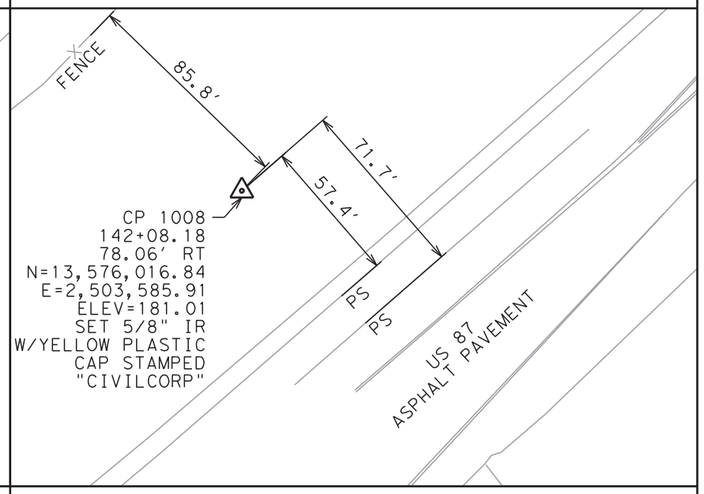
SITUATED ON THE NORTHWEST SIDE OF US87
APPROXIMATELY 840 FEET NORTHEAST US183



SITUATED ON THE NORTHWEST SIDE OF US87
APPROXIMATELY 220 FEET NORTHEAST US183



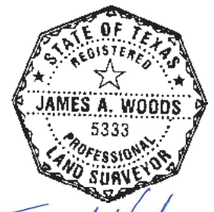
SITUATED ON THE NORTHWEST SIDE OF US87
APPROXIMATELY 190 FEET NORTHEAST OF TULLEY RD.



SITUATED ON THE NORTHWEST SIDE OF US87
APPROXIMATELY 220 FEET NORTHEAST US183

NOTES:

1. ALL BEARINGS AND COORDINATES SHOWN ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204) NAD 83 USING THE TXDOT VRS SYSTEM. ALL COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A TXDOT COMBINED ADJUSTMENT FACTOR OF 1.00013.
2. HORIZONTAL COORDINATE SOLUTIONS ARE BASED ON GPS RTK OBSERVATION MEANS UTILIZING THE TXDOT VRS NETWORK AT THE TIME OF THE SURVEY AND LOCALIZED TO THE PROJECT CONTROL.
3. ALL PROJECT ELEVATIONS ARE NAVD88 UTILIZING GEOID 12B AND BASED ON GPS OBSERVATIONS USING THE TXDOT VRS NETWORK ON NGS MONUMENT K889. DIGITAL LEVEL LOOPS WERE RUN BETWEEN ALL CONTROL POINTS TO HOLD AN ELEVATION OF 176.968 FEET ON K889.
4. ALL MEASUREMENTS ARE IN US SURVEY FEET.
5. FIELD SURVEYS PERFORMED JANUARY 2017 TO SEPTEMBER 2017.



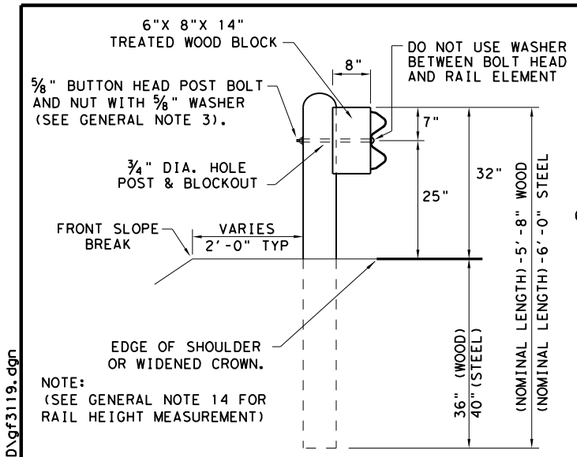
James A. Woods, RPLS
05/17/22

CivilCorp
ENGINEERS • SURVEYORS
4611 AIRLINE ROAD, SUITE 300, VICTORIA, TEXAS 77904
TBPE REGISTRATION #F-10283 TBPLS REGISTRATION #100576-00

HORIZONTAL AND VERTICAL CONTROL

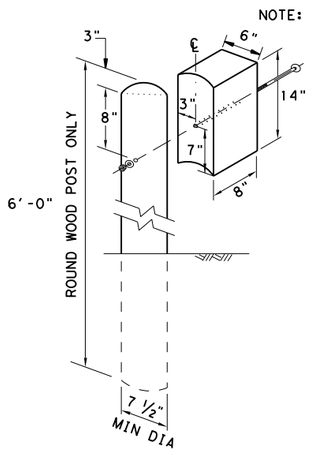
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			34A
STATE	STATE DISTRICT	COUNTY	
TEXAS	13	DEWITT	
CONT.	SECT.	JOB	HIGHWAY NO.
			US 87
CONST. C.S.J. 0143	08	098	

DATE: 5/6/2022
FILE: pw:\\txdot.projectwiseonline.com:TXDOT4\Documents\13 - YKM\Design Projects\0143098\4 - Design\Plan Set\3. Roadway\STDRD\gf3119.dgn



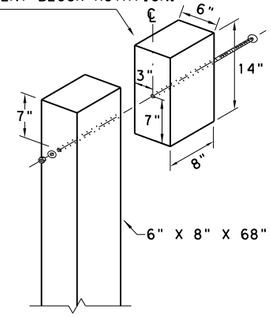
NOTE:
(SEE GENERAL NOTE 14 FOR
RAIL HEIGHT MEASUREMENT)

TYPICAL POST PLACEMENT

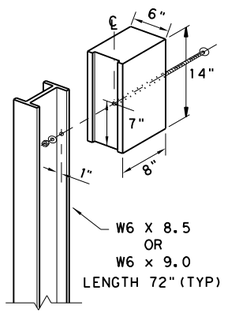


**WOOD BLOCK TO
ROUND WOOD POST**

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



**WOOD BLOCK TO
RECTANGULAR WOOD POST**

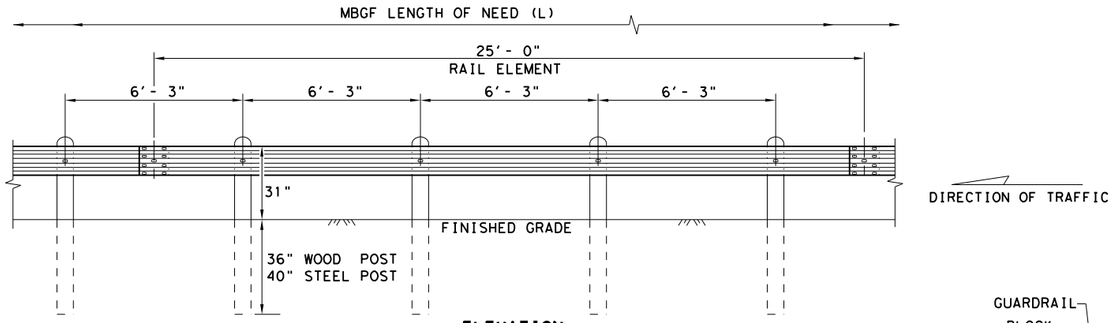


**ROUTED WOOD BLOCK
TO I-BEAM STEEL POST**

GENERAL NOTES

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

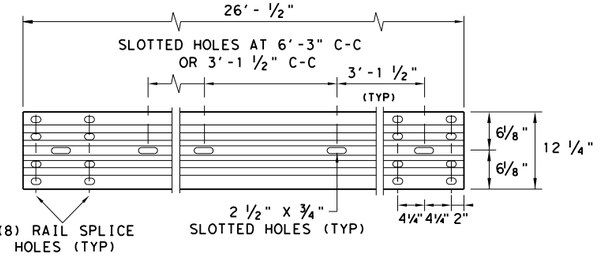
NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



DIRECTION OF TRAFFIC

**ELEVATION
MID-SPAN RAIL SPLICE**

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



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

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

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

SPLICE BOLT LENGTH → VARIES

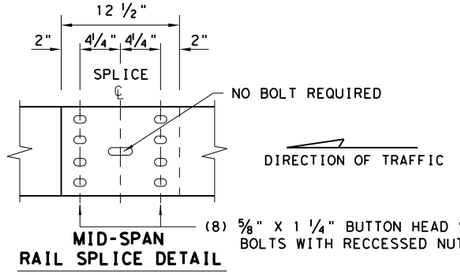
FBB01 = 1 ¼"
FBB02 = 2"

⅝"

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

BUTTON HEAD BOLT

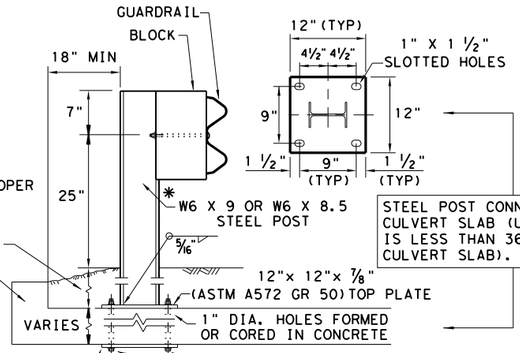
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



DIRECTION OF TRAFFIC

**MID-SPAN
RAIL SPLICE DETAIL**

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



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

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

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

Texas Department of Transportation

Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DEWITT		35

DATE: 5/9/2022
FILE: pw:\\txdot.projectwiseonline.com:TXDOT4\Documents\13 - YKM\Design Projects\0143080\4 - Design\Plan Set\3. Roadway\STDRD\gf31tr+1320.dgn

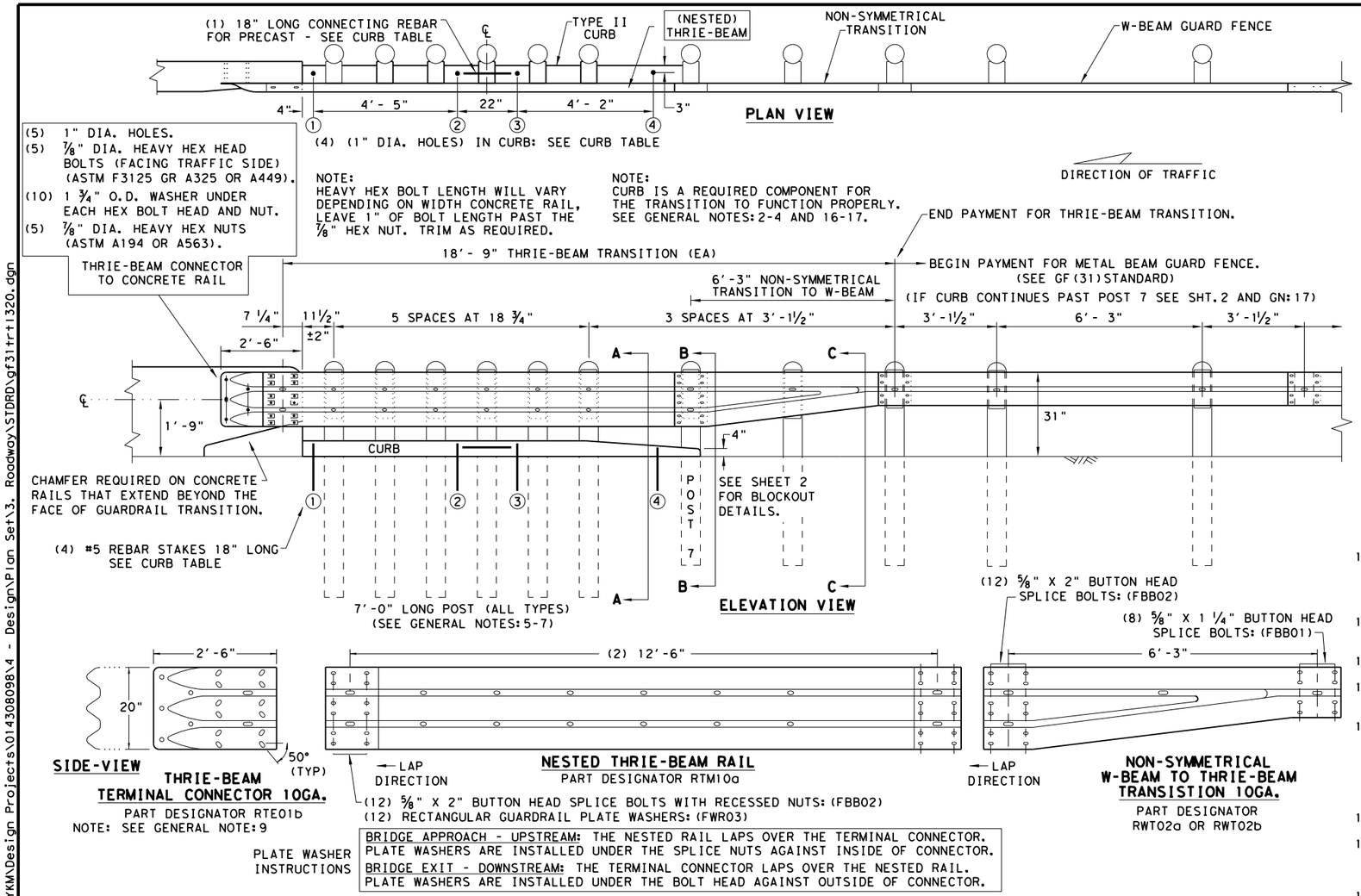
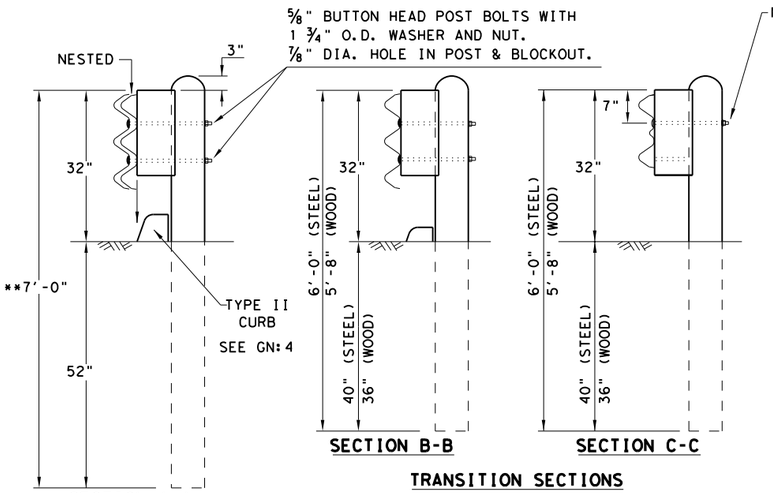


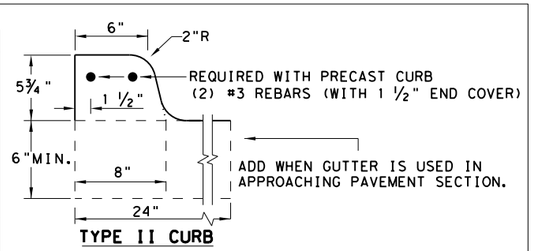
PLATE WASHER INSTRUCTIONS

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

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



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



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

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

TYPE II CURB DETAILS

GENERAL NOTES

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

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

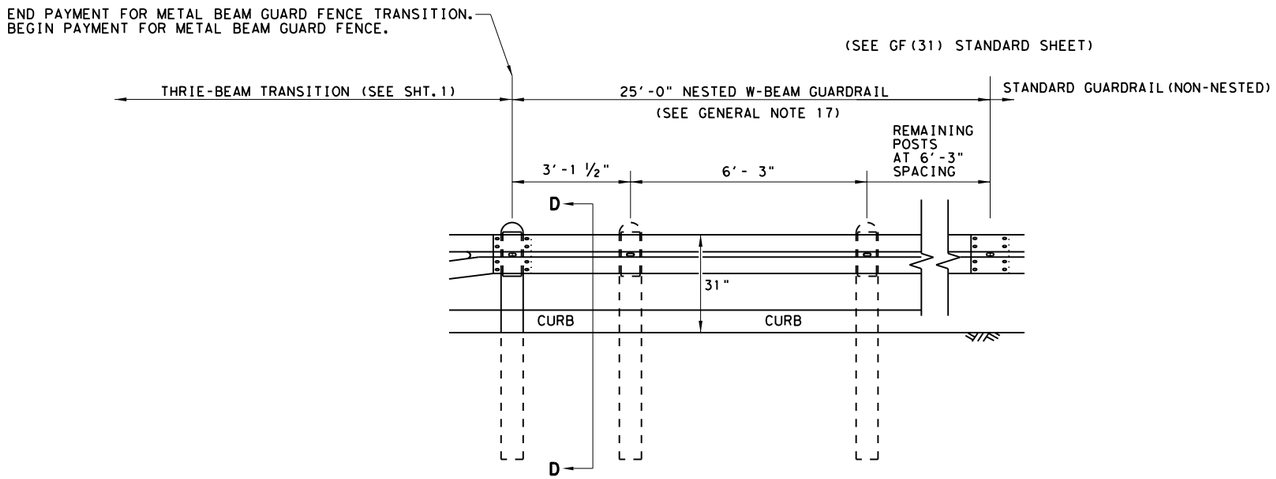
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-20

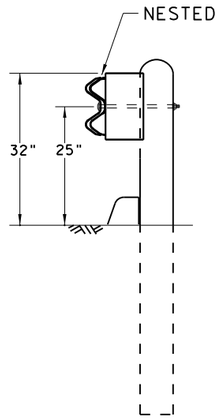
FILE: gf31tr+1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG		
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0143	08	098	US 87		
	DIST	COUNTY		SHEET NO.		
	YKM	DEWITT		36		

DATE: 5/9/2022
FILE: pw:\\txdot.projectwiseonline.com:TXDOT4\Documents\13 - YKM\Design Projects\0143080984 - Design\Plan Set\3. Roadway\STDRD\gf31tr1320.dgn

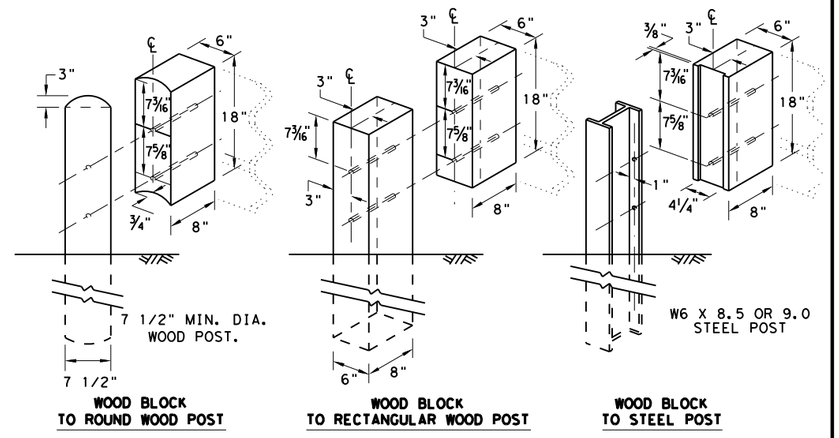
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

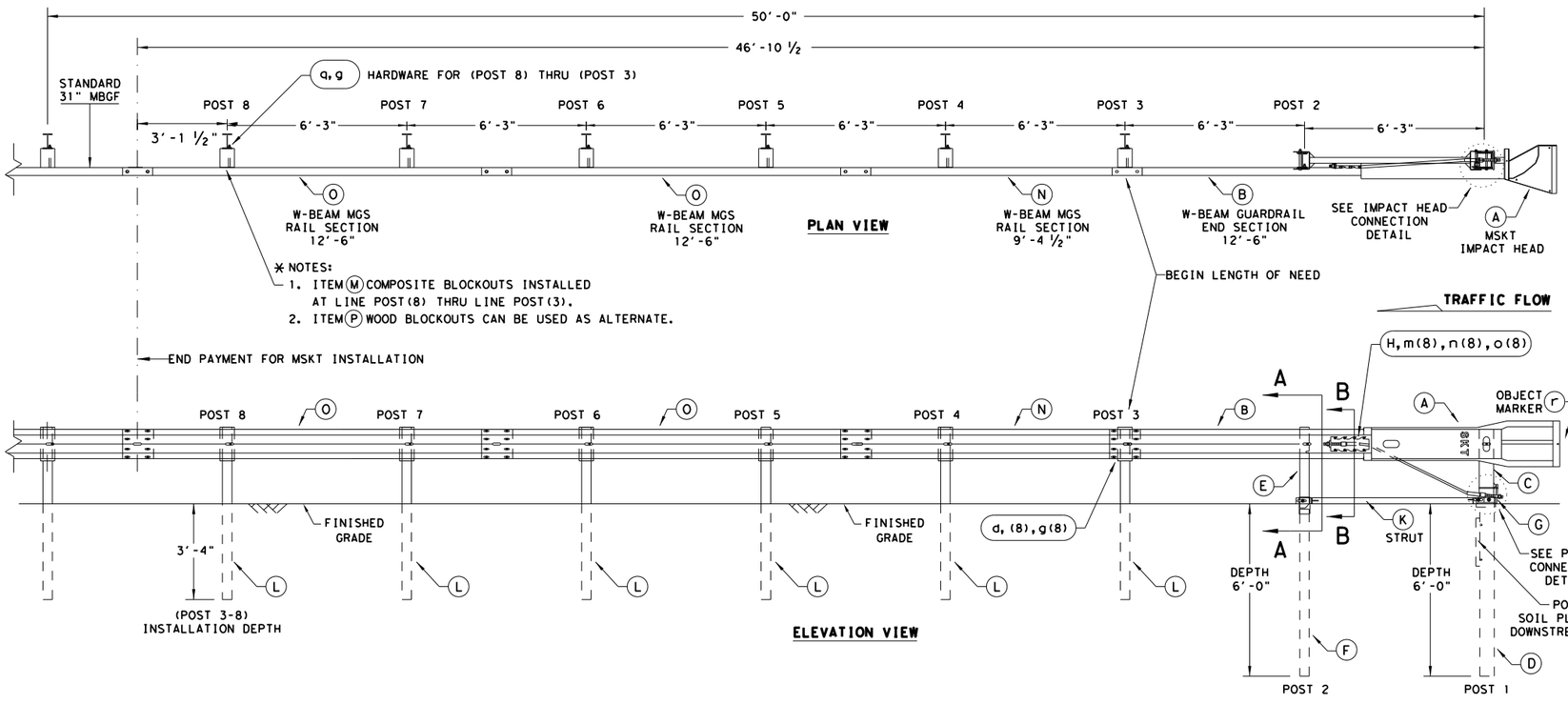
Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DEWITT		37

DATE: 5/6/2022
FILE: pw:\\txdot.projectwiseonline.com:TXDOT4\Documents\13 - YKM\Design Projects\0143098\4 - Design\Plan Set\3. Roadway\STDRD\sgt12s3118.dgn



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

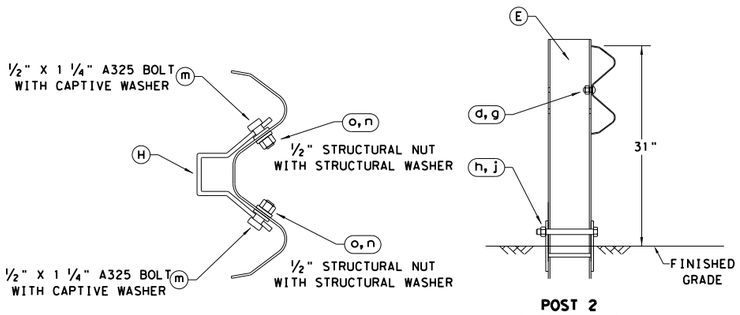
GENERAL NOTES

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

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

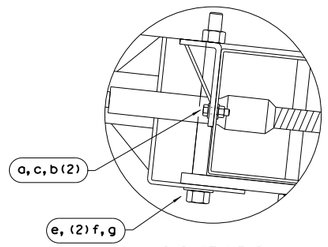
SEE NOTES: *

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

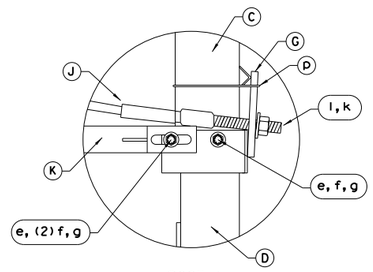


SECTION B-B
ANCHOR BRACKET

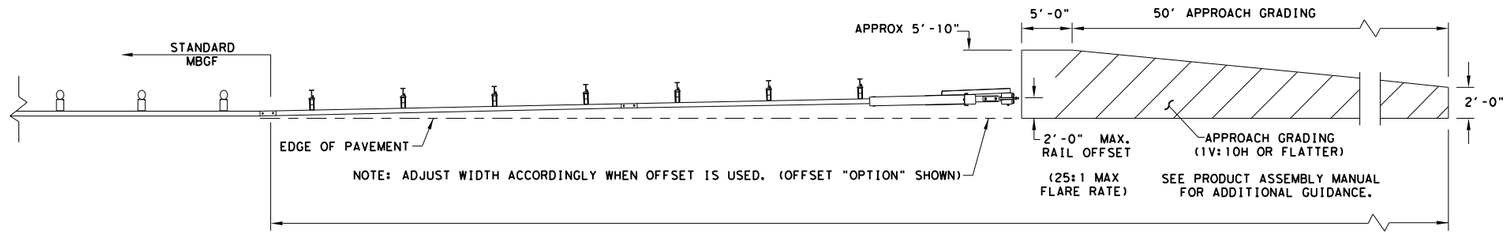
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

Texas Department of Transportation

Design Division Standard

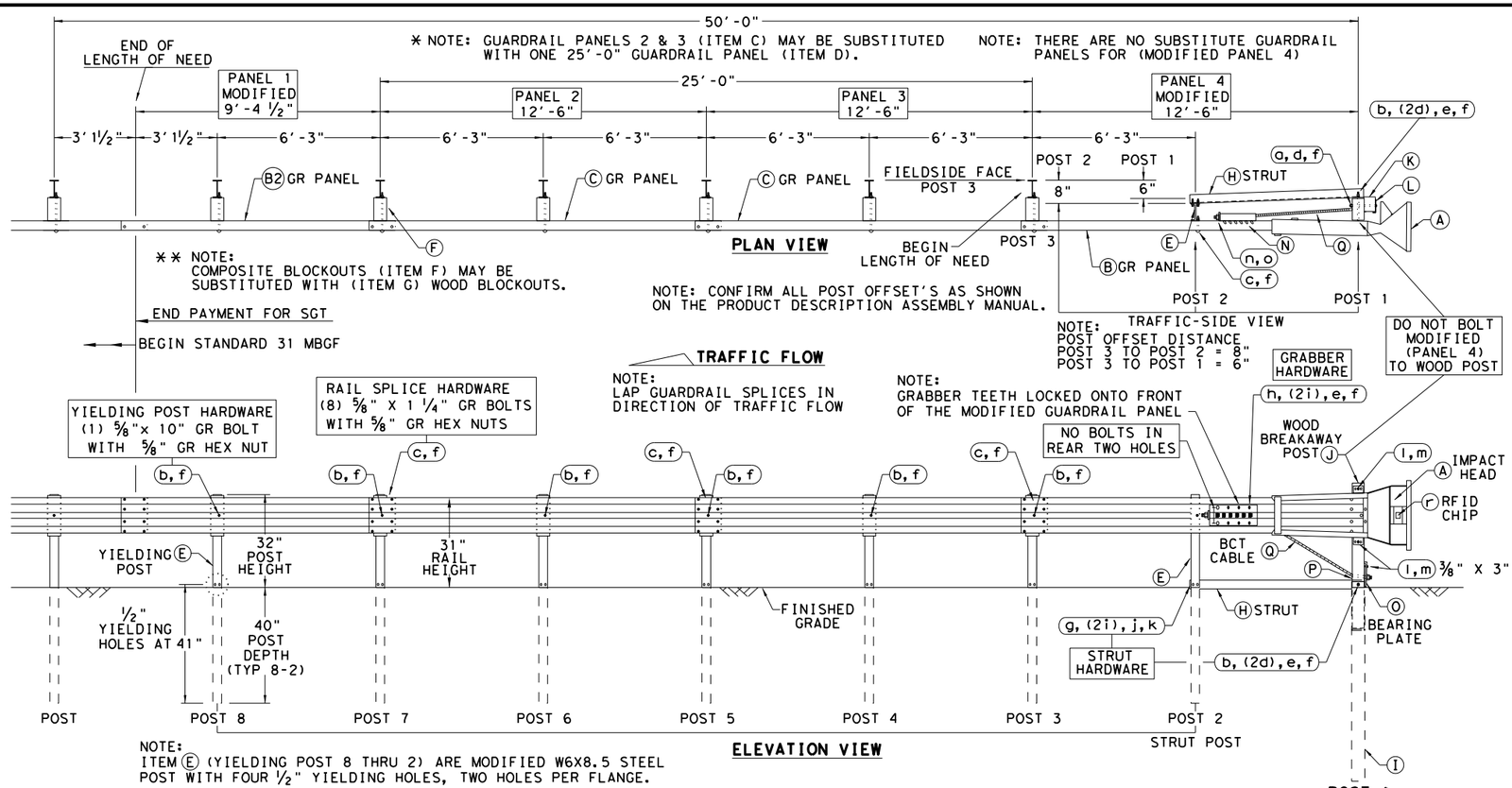
SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0143	08	098	US 87	
	DIST	COUNTY		SHEET NO.	
	YKM	DEWITT		38	

DATE: 5/6/2022
FILE: pw:\\txdot.projectwiseonline.com:TXDOT4\Documents\13 - YKM\Design Projects\0143080984 - Design\Plan Set\3. Roadway\STDRD\sgt153120.dgn

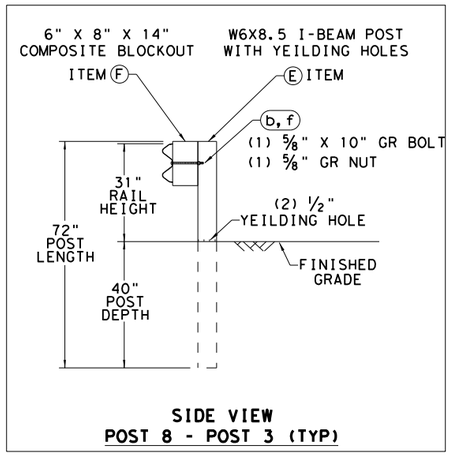


GENERAL NOTES

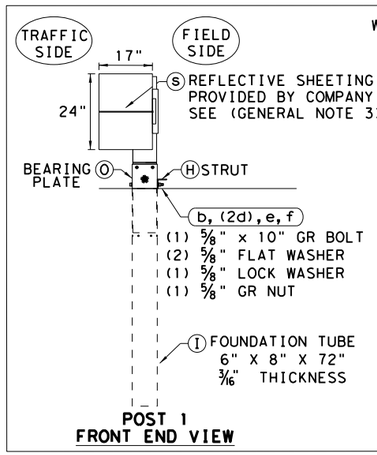
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

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

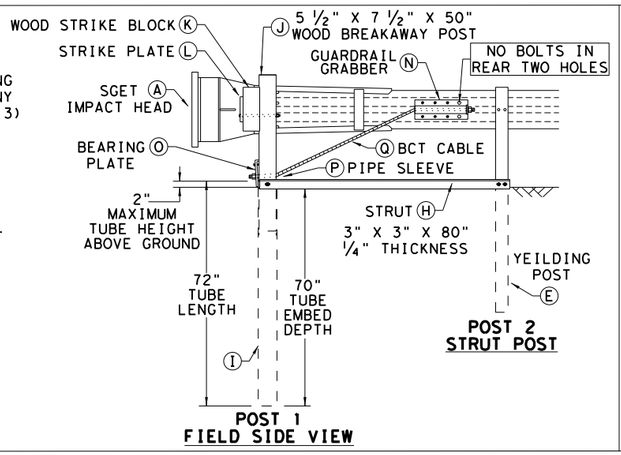
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



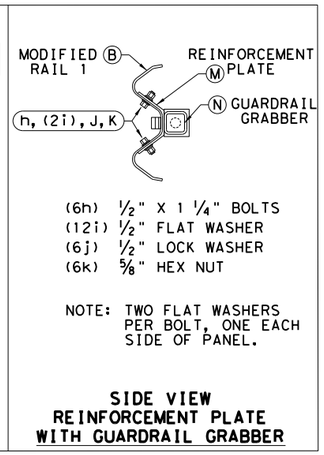
SIDE VIEW
POST 8 - POST 3 (TYP)



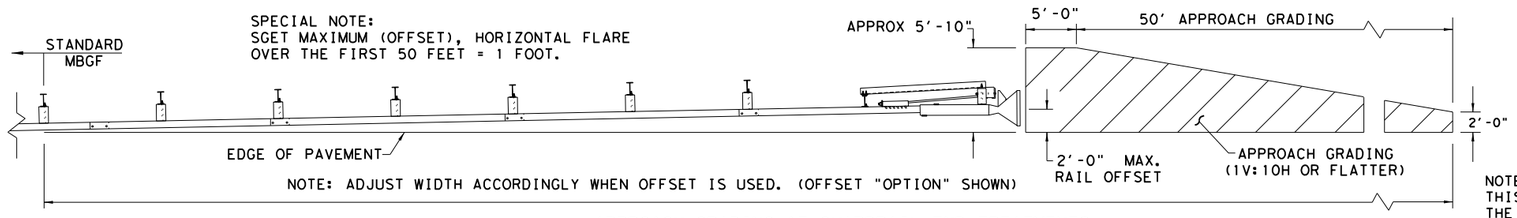
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

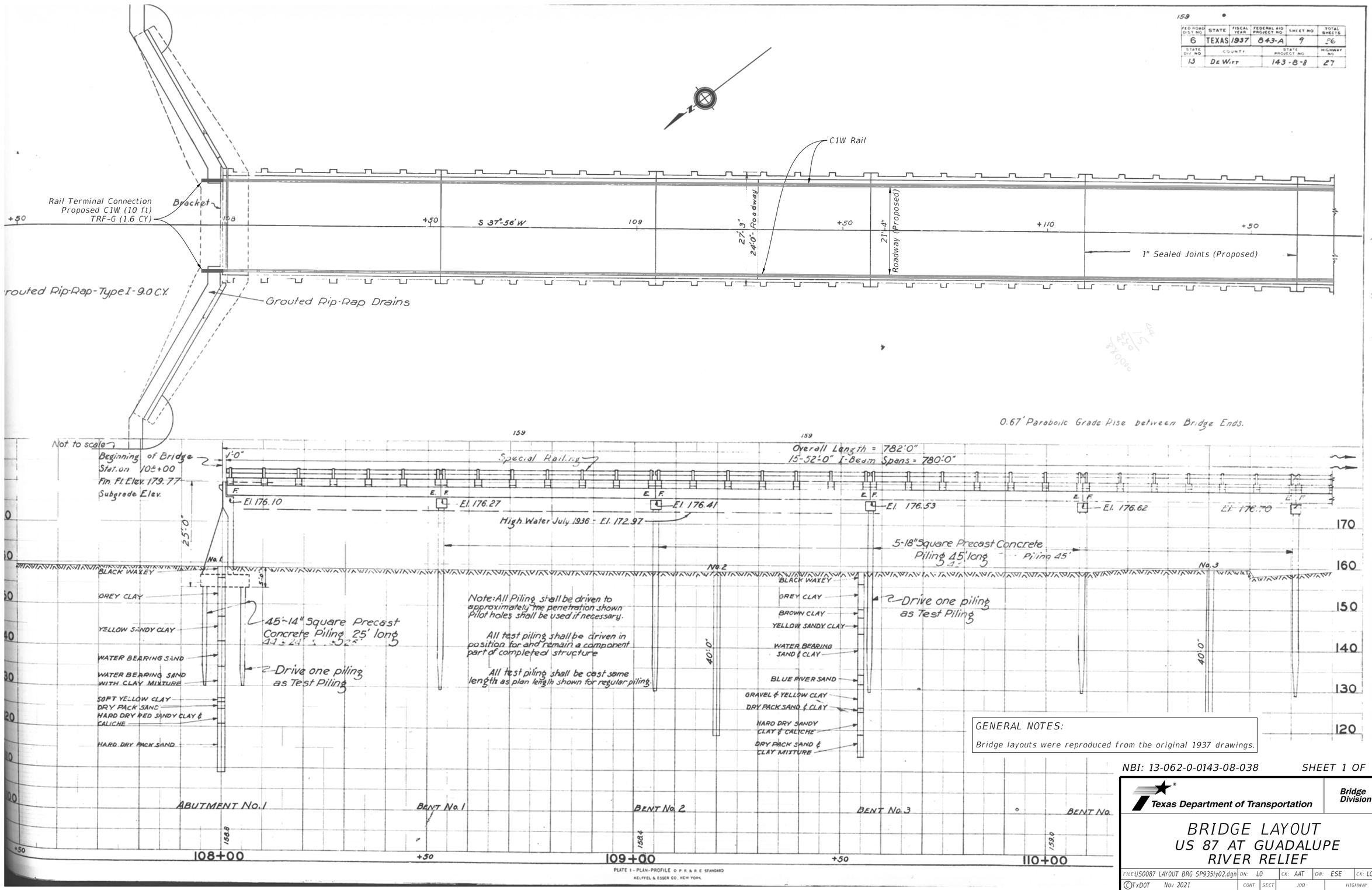
Texas Department of Transportation
Design Division Standard

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

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP		
© TxDOT: APRIL 2020	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0143	08	098		US 87	
	DIST	COUNTY			SHEET NO.	
	YKM	DEWITT			39	

159

FED ROAD DIST NO.	STATE	FISCAL YEAR	FEDERAL AID PROJECT NO.	SHEET NO	TOTAL SHEETS
6	TEXAS	1937	843-A	9	56
STATE DIV NO	COUNTY		STATE PROJECT NO		HIGHWAY NO
13	DeWitt		143-B-8		27



GENERAL NOTES:

Bridge layouts were reproduced from the original 1937 drawings.

NBI: 13-062-0-0143-08-038 SHEET 1 OF 3

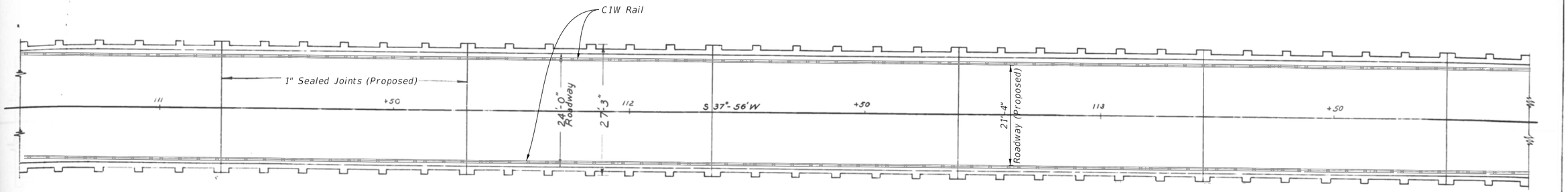
Texas Department of Transportation — Bridge Division

BRIDGE LAYOUT
US 87 AT GUADALUPE RIVER RELIEF

FILE: US0087 LAYOUT BRG SP935ly02.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
©TxDOT Nov 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DEWITT		40

DATE:
FILE:

FED ROAD DIST NO.	STATE	FISCAL YEAR	FEDERAL AID PROJECT NO	SHEET NO.	TOTAL SHEETS
6	TEXAS	1937	843-A	10	36
STATE DIV. NO.	COUNTY		STATE PROJECT NO.		HIGHWAY NO.
13	DE WITT		143-8-8		27



159

0.67' Parabolic Grade Rise between Bridge Ends.

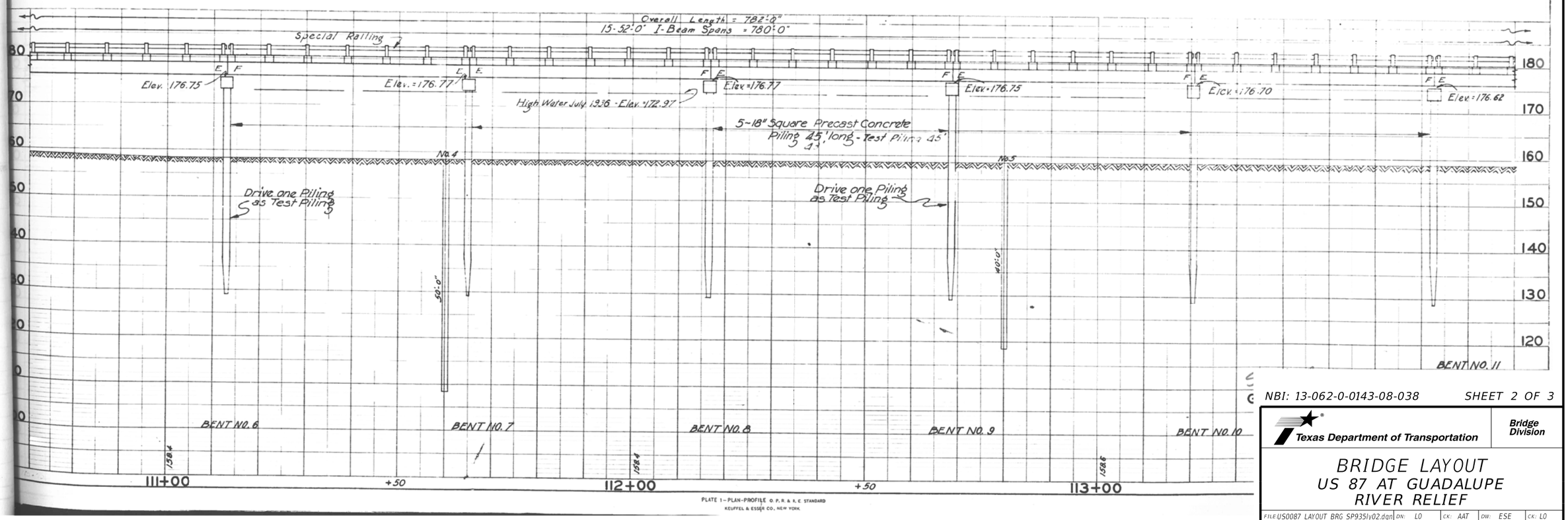


PLATE 1 — PLAN-PROFILE O. P. R. & R. E. STANDARD
KEUFFEL & ESSER CO., NEW YORK

DATE:
FILE:

NBI: 13-062-0-0143-08-038 SHEET 2 OF 3

Texas Department of Transportation | Bridge Division

BRIDGE LAYOUT
US 87 AT GUADALUPE RIVER RELIEF

FILE: US0087 LAYOUT BRG SP935ly02.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
©TxDOT Nov 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DEWITT		41

FED ROAD DIST. NO.	STATE	FISCAL YEAR	FEDERAL AID PROJECT NO.	SHEET NO.	TOTAL SHEETS
6	TEXAS	1937	849-A	11	36
STATE DIV. NO.	COUNTY		STATE PROJECT NO.		HIGHWAY NO.
13	DEWITT		143-8-8		27

C1W Rail

Rail Terminal Connection
Proposed C1W (5 Ft)
TRF-G (0.8 CY)

Proposed MBFG

Proposed C1W and TRF-G

Grouted Rip-Rap Drains

Paving Bracket

114 +50 115 +50 116 +50 117

159.9 159.3 159.5 160.4

S 37°56'W

1" Sealed Joints (Proposed)

21'-4" Roadway (Proposed)

27'-3"

24'-0" Roadway

Grouted Rip-Rap Type I..... 9.0 C.Y.

0.67' Parabolic Grade Rise between Bridge Ends.

Overall Length, 782'-0"
15- 52'-0" I-Beam Spans = 780'-0"

Special Railing

End of Bridge
Sta 115+82
Fin. Fl. El. 179.77

El.=176.53 El.176.41 El.176.27 El.=176.10

High Water July 1936 El. 172.97

5-18" Square Precast Concrete Piling 45' Long Test Piling 45'

No. 6 No. 7 No. 8

45' 45' 45'

Drive one Piling as Test Piling

Black Waxy Soil
Gray Clay
Yellow Sand
Water Bearing Sand
River Sand & Gravel
Hard Dry Clay & Gravel
Pack Sand
Soft Sandstone

44-14" Z 1-25'
45-14" Square Precast Concrete Piling 25' long

Drive one piling as Test Piling

Black Waxy Soil
Gray Clay
Yellow Sandy Clay
Water Bearing Sand
River Sand Clay & Gravel
Pack Sand

23'-0"

5'-6"

1'-0"

ABUTMENT NO.2

BENT NO.12 BENT NO.13 BENT NO.14

168.8 168.3 169.5

114 +50 115 +50 116 +50

180 170 160 150 140 130 120

PLATE 1—PLAN-PROFILE O. P. R. & R. E. STANDARD
KEUFFEL & ESSER CO., NEW YORK.

NBI: 13-062-0-0143-08-038 SHEET 3 OF 3

Texas Department of Transportation — Bridge Division

BRIDGE LAYOUT
US 87 AT GUADALUPE RIVER RELIEF

FILE: US0087 LAYOUT BRG SP935ly01.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
©TxDOT Nov 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DEWITT		42

DATE:
FILE:

Proposed C1W (578ft)
& TRF-G (88 CY)

Proposed MBGF

Rail Terminal Connection
Proposed C1W (5 ft)
TRF-G (0.8 CY)

34'-0" Crown

27'-3"

30'-0" Roadway

Grouted Rip Rap, Type I..... 9.0 C.Y.

Grouted Rip Rap Drain

Overall Length - 1294'-6"
±0.2%

1-52'-0" I-Beam Span
Special Railing

Beginning of Bridge
Station 12/+60.27
Finished Grade 181.64
Subgrade

Fix.
Elev. 177.98

250'

No.9

BLACK WAXY SOIL
SANDY LOAM
YELLOW SANDY CLAY
HARD BROWN CLAY
YELLOW SANDY CLAY
YELLOW CLAY & CALICHE
BLUE CLAY & GRAVEL WATER BEARING SAND & GRAVEL
DRY RED SANDY CLAY
HARD DRY RED CLAY
HARD SANDSTONE
HARD RED CLAY

45-14"ø Precast Concrete Piling 25' long

ABUTMENT NO. 1

Drive one piling as Test Piling

Note: All piling shall be driven to approximately the penetration shown. Pilot holes shall be used if necessary.
All test piling shall be driven in position for and remain a component part of the completed structure.
All test piling shall be cast same length as plan length shown for regular piling.

119 +50 120 +50 121

S 37°56' W

119+00 +50 120+00 +50 121+00

161.2 161.4 161.9

157 158 159 160 161 162

180 170 160 150 140 130 120

PLATE 1 – PLAN-PROFILE O. P. R. & R. E. STANDARD
KEUFFEL & ESSER CO., NEW YORK.

NBI: 13-062-0-0143-08-037 SHEET 1 OF 5

Texas Department of Transportation

Bridge Division

BRIDGE LAYOUT
US 87 AT GUADALUPE RIVER

FILE: US0087 LAYOUT BRG SP935ly01.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
©TxDOT Nov 2021	CONT.	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DEWITT		43

DATE:
FILE:

RIVER

GUADALUPE

AJ (Sealed)

C1W Rail

SEJ-M (4")

24'-0" Rdwy.

27'-2" C-C. Trusses

21'-4" Roadway (Proposed)

S 37°-56' W

See TRUST REPAIR KEY sheets for repair details

1-52'-0" I-Beam Span

1:3"

Overall Length 1294'-6"

250'-0"

19-52'-0" I-Beam Spans

Special Railing

+0.2% Grade

-0.2% Grade

Exp.

Fix.

Elev. 178.08'

Elev. 176.08

250' V.C.

P.I. Elev. 182.00 (Based on Fin. Gr.)

Sta. 123+39.52

250'-7" C-C. Piers.

High Water July 1936 El. 172.9'

No. 10

Black Waxy Soil

Sandy Loam

Hard Brown Clay

Yellow Sandy Clay

Yellow clay & caliche

Water

Blue clay & Gravel

Water bearing Sand & Gravel

Dry Red Sandy clay

Hard red sandy clay & caliche

Hard red sandy clay

Soft sandstone and rock sand

Red sandy clay

Hard pack sand

℄ Pier No. 1 Sta. 122+14.23

62 Untreated Timber Piling 26'-0" long.

Hard Sandstone

Hard red clay

Water Elev. Nov. 6, 1936 - 140.39'

Note: Normal water elevation is approximately 138.0 During low water stages the water elevation has a daily fluctuation of approximately 1.8' due to the variation in amount of water discharged at power dams located upstream from the bridge location.

LAYOUT STR#37

GUADALUPE RIVER BRIDGE

HIGHWAY 27 DE WITT CO.

SHEET 2 OF 5

PLATE 1 - PLAN-PROFILE O. P. R. & R. E. STANDARD

KEUFFEL & ESSER CO., NEW YORK.

122+00 +50 123+00 +50 124+00

℄ Pier No. 2 Sta. 124+64.81

No. 11

Red Sandy Clay

Hard Pack Sand

Hard Red Joint Clay

Red Sandy Clay

Hard Pack Sand & Soft Pack Sand

Clay Balls & Sand

Hard Red Clay

Black Waxy

Water Bearing Sand & Gravel

Red Sandy Clay - Dry

Red Sand Clay & Caliche

180 170 160 150 140 130 120

NBI: 13-062-0-0143-08-037 SHEET 2 OF 5

Texas Department of Transportation | Bridge Division

BRIDGE LAYOUT

US 87 AT GUADALUPE RIVER

FILE: US0087 LAYOUT BRG SP935ly01.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
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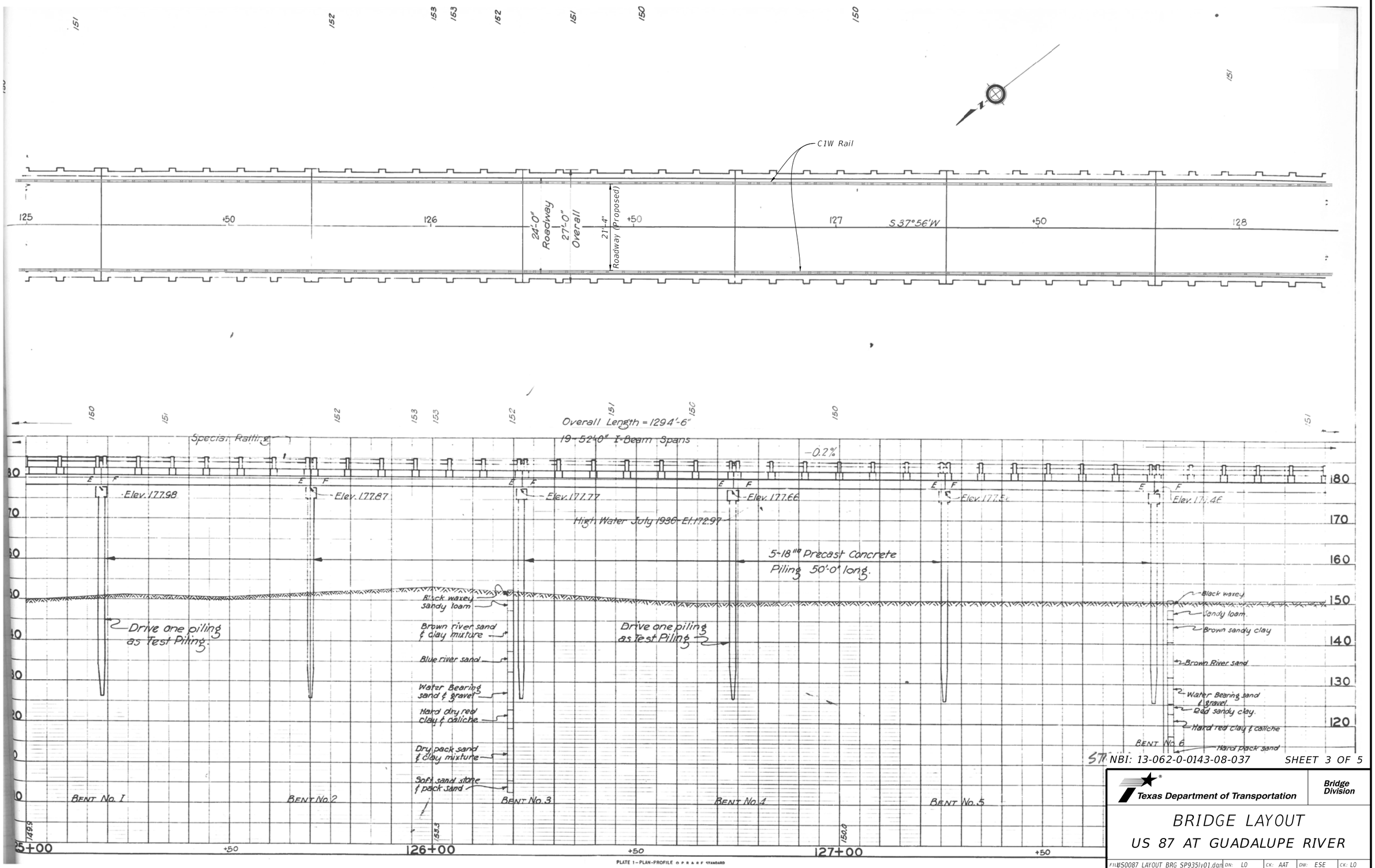

PLATE 1 – PLAN-PROFILE O P R & B F STANDARD

STP NBI: 13-062-0-0143-08-037 SHEET 3 OF 5

DATE:
FILE:

Texas Department of Transportation | Bridge Division

BRIDGE LAYOUT

US 87 AT GUADALUPE RIVER

FILE: S0087 LAYOUT BRG SP935ly01.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
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	YKM	DEWITT		45

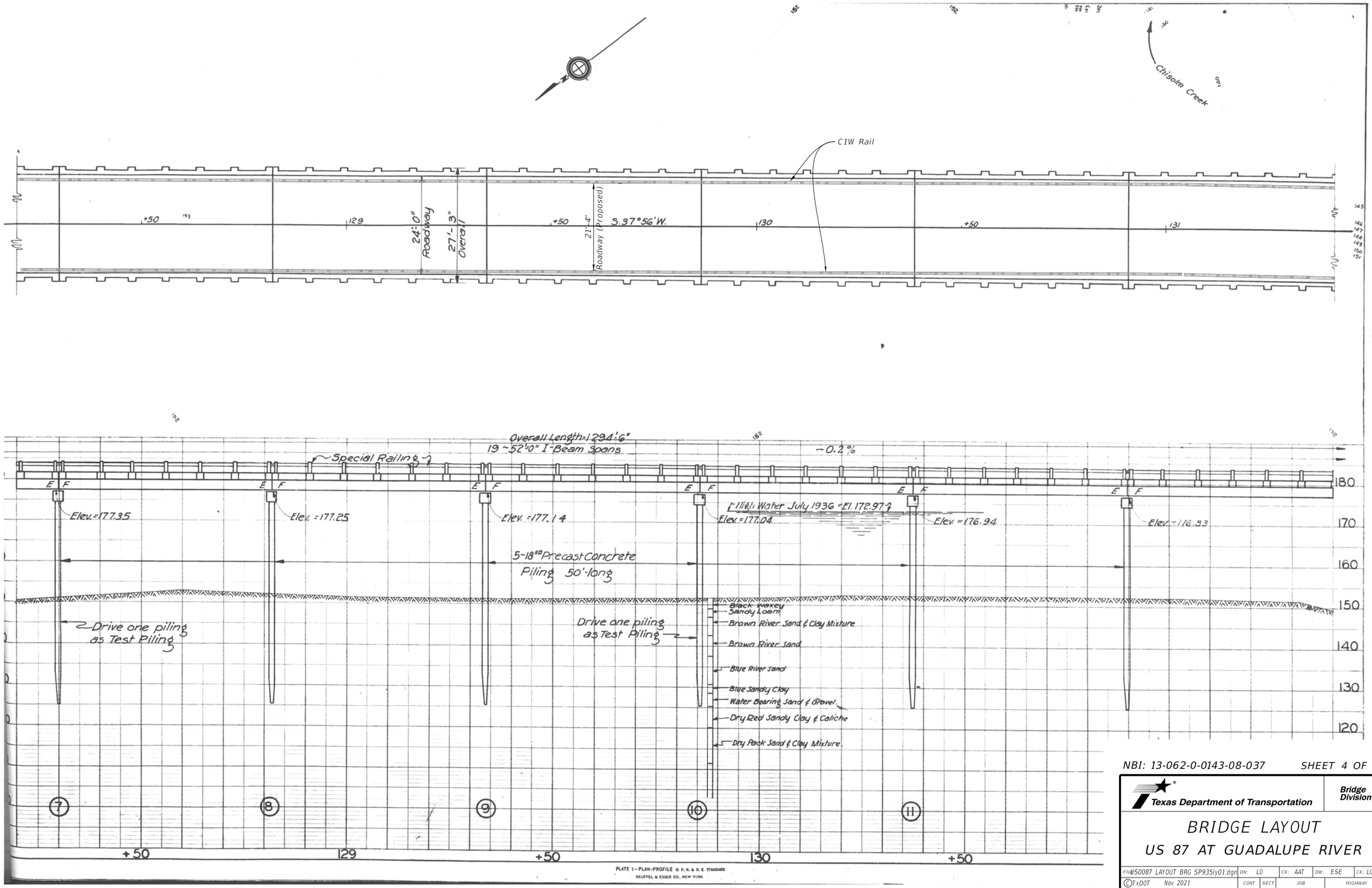

PLATE 1 – PLAN-PROFILE O. P. R. & R. E. STANDARD
KEUFFEL & ESSER CO., NEW YORK

NBI: 13-062-0-0143-08-037 SHEET 4 OF 5

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BRIDGE LAYOUT
US 87 AT GUADALUPE RIVER

FILE: BS0087 LAYOUT BRG SP935ly01.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
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	YKM	DEWITT		46

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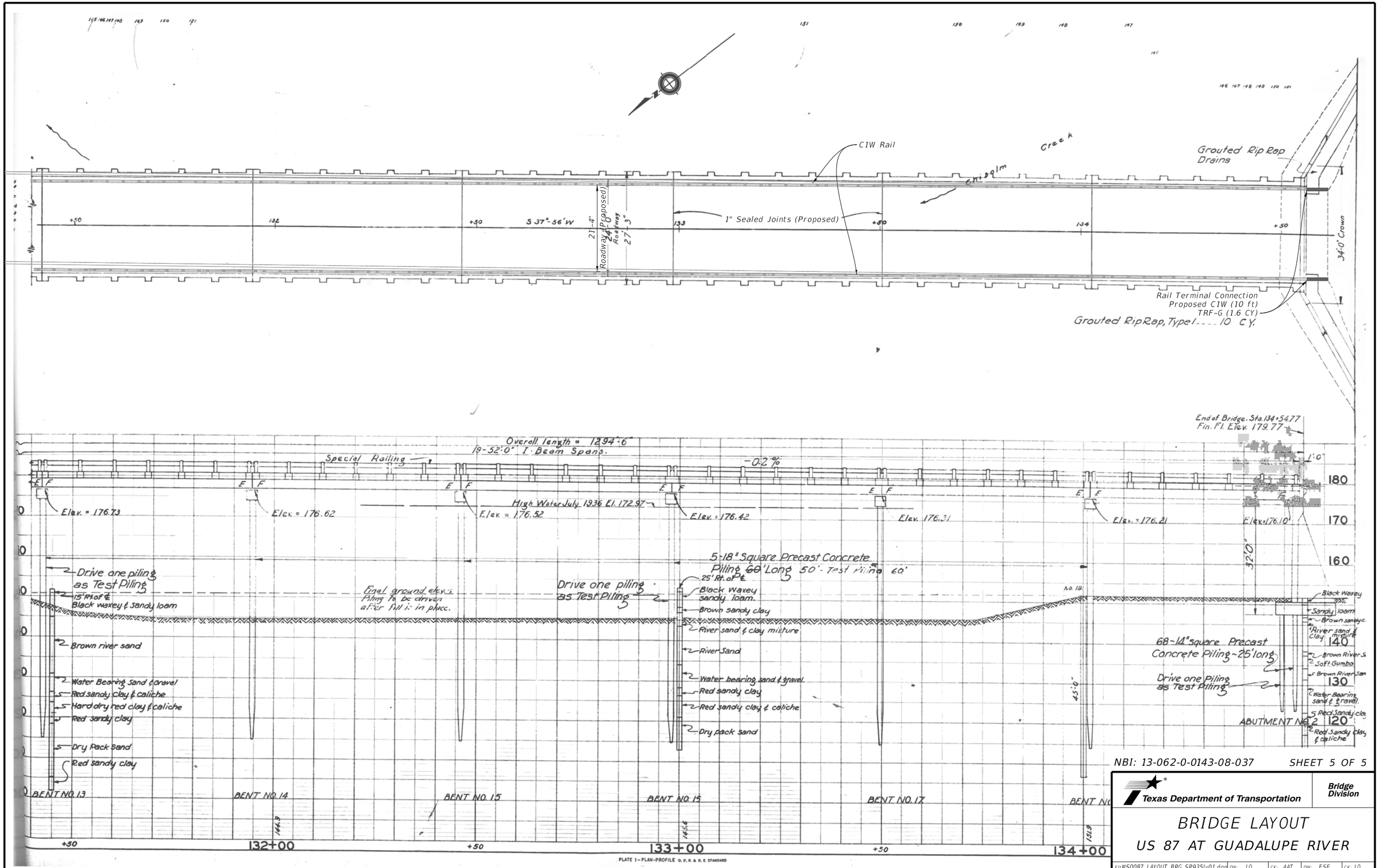

PLATE 1—PLAN-PROFILE O. P. R. & R. E. STANDARD

NBI: 13-062-0-0143-08-037 SHEET 5 OF 5

Texas Department of Transportation — Bridge Division

BRIDGE LAYOUT
US 87 AT GUADALUPE RIVER

FILE:	BS0087 LAYOUT BRG SP935ly01.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
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	DIST	COUNTY		SHEET NO.	
	YKM	DEWITT		47	

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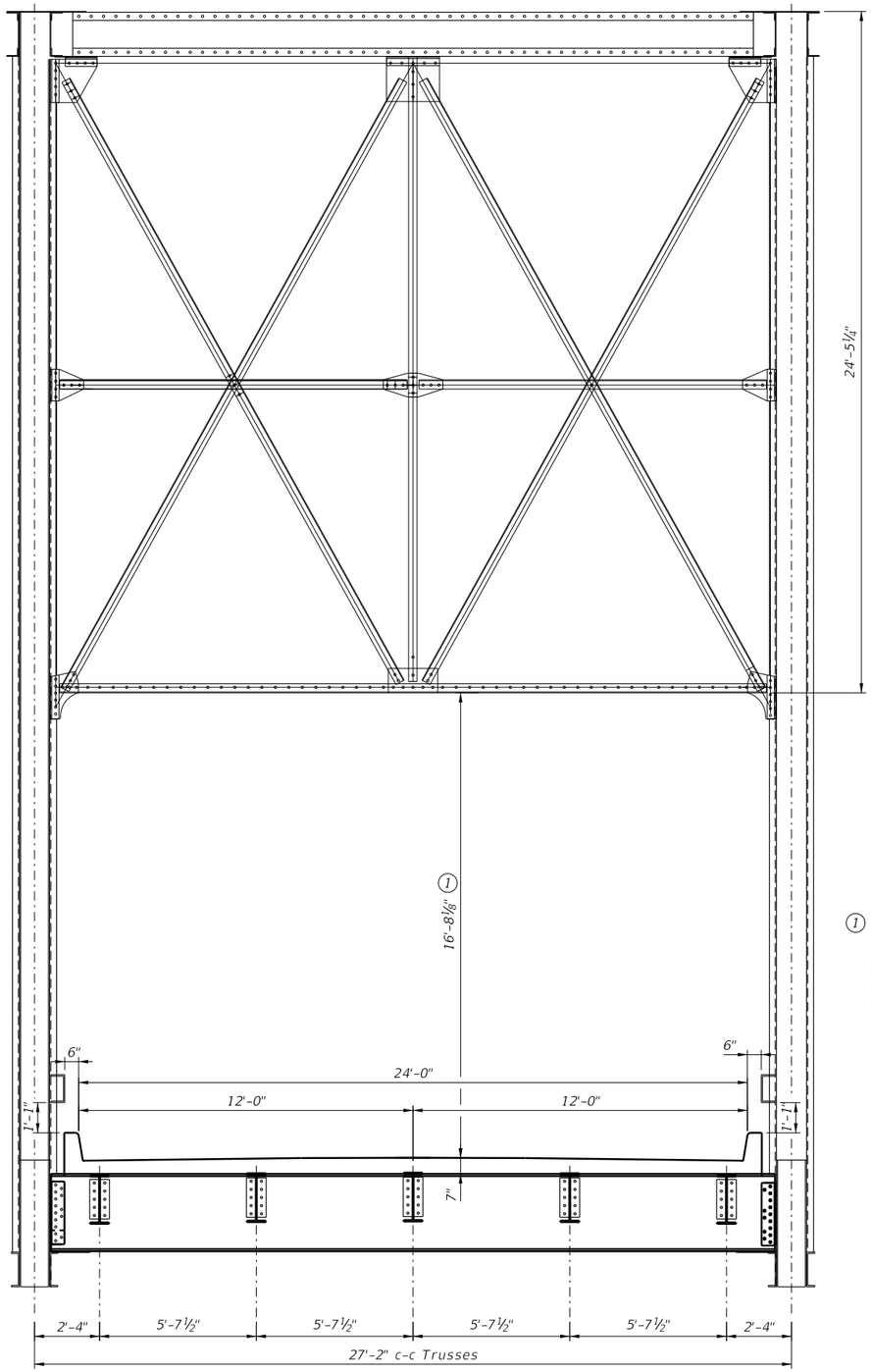
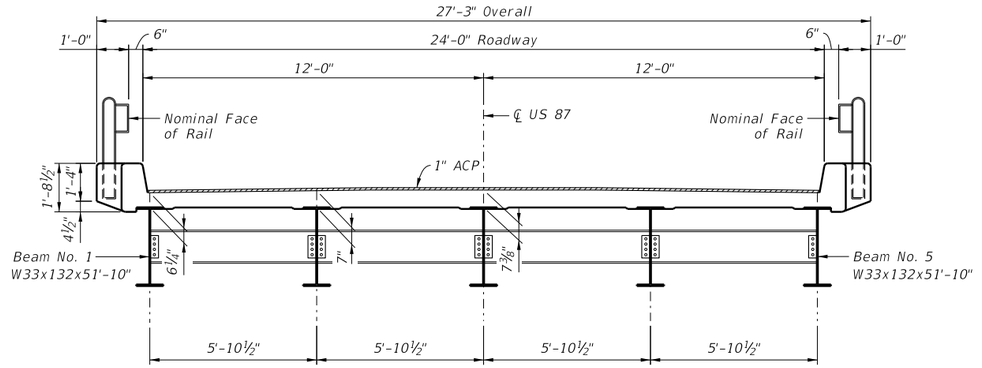


EXISTING TRUSS SPAN

Looking Northeast

1 The estimated vertical clearance at center frame is 16'-8⅛". The posted vertical clearance of the bridge is 16'-2". Confirm and report to the Engineer vertical clearance before mobilizing elevated equipment.



EXISTING APPROACH SPANS AND RELIEF STRUCTURE SPANS

Looking Northeast

HS20 LOADING

STATE OF TEXAS
LAURA M. ORTIZ
137207
LICENSED PROFESSIONAL ENGINEER

05/20/2022

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EXISTING TYPICAL SECTION

US 87 AT GUADALUPE RIVER & US 87 GUADALUPE RIVER RELIEF

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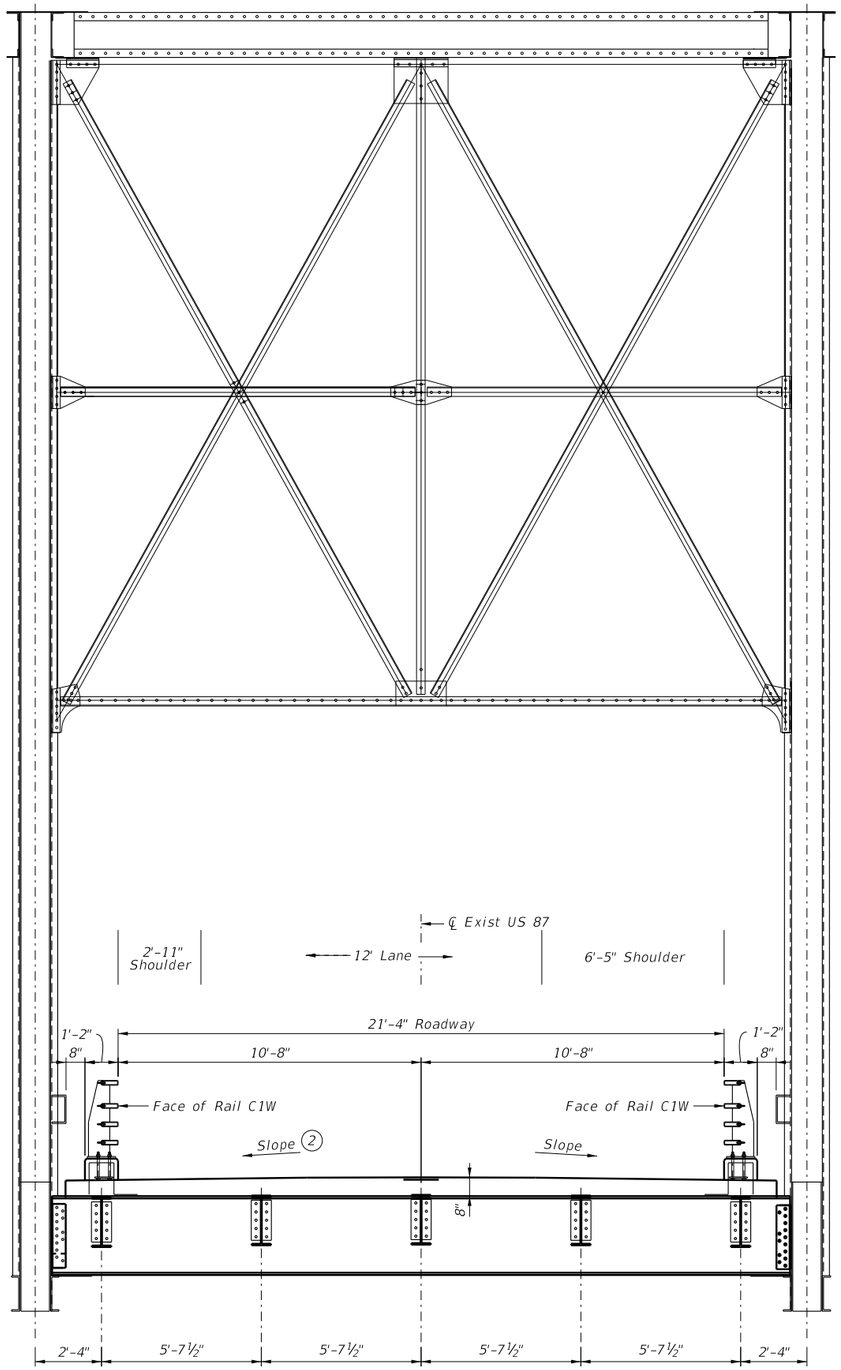
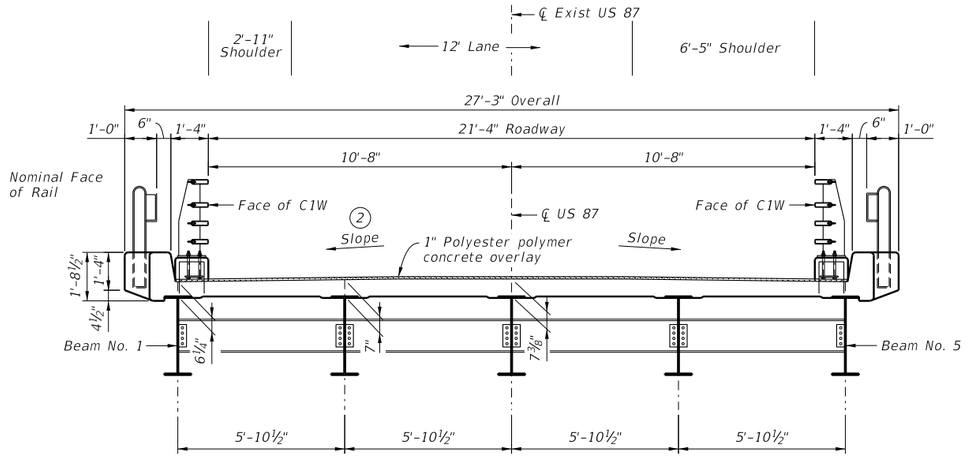
REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DEWITT		48

DATE:
FILE:



PROPOSED TRUSS SPAN

Looking Northeast



PROPOSED APPROACH SPANS AND RELIEF STRUCTURE SPANS

Looking Northeast

CONSTRUCTION NOTES: (1)

Repair 1:

1. For truss span, blast clean truss members above the deck slab prior to repair.
2. Complete the following: floorbeam horizontal gusset plate replacement (repair 2), sway and portal frame heat straightening (repair 6), diagonal members strengthening (repair 9), and heat straightening vertical members (repair 10).
3. Remove existing deck slab from truss spans.
4. For truss spans, blast clean the lower truss members after deck removal.
5. Perform repairs 1, 3, 4, 5, 7, & 8.
6. Perform substructure repairs.

Repair 2:

1. Clean and paint truss members on truss span.
2. Cast the new deck slab and install deck joints for truss span.
3. Install new C1W rails on the truss spans.

Repair Phase 3:

1. Remove existing ACP on approach and relief spans.
2. Clean existing joints of approach and reliefspans.
3. Place overlays on approach and relief spans.
4. Paint existing I-beams below the approach and relief spans. Add post-installed connectors on interior beams of approach and relief spans.
5. Install new C1W rails on approach spans.

(1) Contractor may propose alternate construction sequence to Engineer of Record for review and approval.

(2) Match existing slope.

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05/20/2022

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PROPOSED TYPICAL SECTION

US 87 AT GUADALUPE RIVER & US 87 GUADALUPE RIVER RELIEF

FILE: US0087 LAYOUT BRG SP935ly04.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
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REVISIONS	0143	08	098	US 87
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	YKM	DEWITT		49

DATE:
FILE:

SUMMARY OF ESTIMATED QUANTITIES

BID ITEM / BID CODE / BID ITEM DESCRIPTION / BRIDGE ELEMENT	4106 6007	0422 6041	0429 6007	0429 6009	0438 6001	0442 6010	0442 6019	0446 6029	0446 6030	0446 6031	0450 6029
	POLYESTER POLYMER CONC OVERLAY (1")	REINF CONC SLAB (LIGHTWEIGHT)	CONC STR REPAIR (VERTICAL & OVERHEAD)	CONC STR REPAIR (STANDARD)	CLEANING AND SEALING EXISTING JOINTS	STR STEEL (SHEAR CONNECTOR)	STR STEEL (SHEAR ANCHOR)	CLEAN AND PAINT EXIST STR (REF NO.1)	CLEAN AND PAINT EXIST STR (REF NO.2)	CLEAN AND PAINT EXIST STR (REF NO.3)	RAIL (TY C1W)
	SY	SF	SF	SF	LF	LB	LB	LS	LS	LS	LF
US 87 at Guadalupe River Bridge											
2 ~ Abutments											
18 ~ Interior Bents			72.0	4							
1 ~252.50' Through Truss Span		6304				3556				1	500
20~ 52.00' Steel I-Beam Span	2465				450		12951	1			2080
US 87 at Guadalupe River Relief Bridge											
2~ Abutments											
14 ~ Interior Bents			36.0								
15 ~ 52.00' Steel I-Beam Span	1854			12	360		9714		1		1560
OVERALL TOTALS:	4319 (1)	6304	108 (2)	16 (3)	810	3556 (4)	22665	1	1	1	4140

BID ITEM / BID CODE / BID ITEM DESCRIPTION / BRIDGE ELEMENT	0454 6004	0454 6018	0496 6103	0784 6019	0784 6022	0784 6034	0784 6038	0784 6133	0784 6134	0784 6135	0784 6136
	ARMOR JOINT (SEALED)	SEALED EXPANSION JOINT (4 IN) (SEJ - M)	REMOVE STRUCTURE (BRIDGE SLAB)(REF 1)	REP STL BRIDGE MEMBER (BATTEN PLATES)	REP STL BRIDGE MEMBER (FLOORBEAM)	REP STL BRIDGE MEMBER(STRAIGHTEN MEMB)	REP STL BRIDGE MEMBER(REPL RIVET/BOLT)	REPR STL BRG MEMB(GUSSET PLATES)(TY I)	REPR STL BRG MEMB(GUSSET PLATES)(TY II)	REPR STL BRG MEMB(GUSSET PLATES)(TYIII)	REPR STL BRG MEMB(GUSSET PLATES)(TY IV)
	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA
US 87 at Guadalupe River Bridge											
2 ~ Abutments											
18 ~ Interior Bents											
1 ~252.50' Through Truss Span	25	25	1	72	5	31	4010	16	14	3	2
20~ 52.00' Steel I-Beam Span											
US 87 at Guadalupe River Relief Bridge											
2~ Abutments											
14 ~ Interior Bents											
15 ~ 52.00' Steel I-Beam Span											
OVERALL TOTALS:	25	25	1	72 (12)	5 (5)	31 (10)	4010 (8)	16 (6)	14 (7)	3 (9)	2 (11)

NOTES:

(1) For approach spans and relief structure
(2) For Bents
(3) For Rail and Curbs, 50% Contingency
(4) Post installed shear connectors on the approach spans and relief structure
(5) Repair 1: Replace Floorbeams
(6) Repair 2: Floorbeam Horizontal Gussets
(7) Repair 3: Lower Chord Vertical Gussets
(8) Repair 4: Quantity accounts for replacing rivets for Repair 1-3, 5 & rivets between U3 and U7 plus a 10% increase
(9) Repair 5: Top Horizontal Gussets
(10) Straighten members in Repair 6, 9 and 10
(11) Repair 7 Upper Chord Vertical Gussets
(12) Repair 8: Replace all batten plates

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LICENSED
PROFESSIONAL ENGINEER

05/20/2022

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ESTIMATED QUANTITIES

US 87 AT GUADALUPE RIVER &
US 87 GUADALUPE RIVER RELIEF

FILE: US0087 BRG SP935eq01.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
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REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
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FILE:

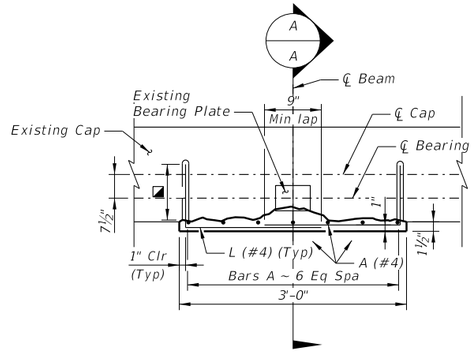
US 87 AT GUADALUPE RIVER – SPALL WITH EXPOSED REBAR ON TOP OF BENT CAP 12 UNDER AN INTERIOR BEAM LOOKING SOUTHWEST. SITE CONDITIONS AS OF 11/04/2020.

US 87 AT GUADALUPE RIVER – SPALL WITH EXPOSED REBAR ON TOP OF BENT CAP 15 UNDER AN INTERIOR BEAM LOOKING SOUTHWEST. SITE CONDITIONS AS OF 11/04/2020.

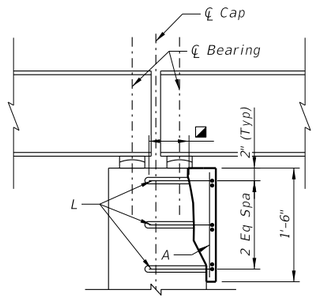
BENT CAP REPAIRS			
Location	Bent Cap Number[a]	Section of Concrete Repair Manual[b]	Comment
US 87 Guadalupe RiverBridge	2	1	
	6	1	
	12	2	Photo shown
	15	2	Photo shown
	16	1	
	18	1	
	19	1	Southeast end
US 87 Guadalupe River Relief Bridge	5	2	
	7	2	
	9	1	
	10	2	

[a] Bent Cap numbers starts at the Northwest corner

[b] This column designates the section in Chapter 3 of the current TxDOT Concrete Repair Manual



PLAN



SECTION A-A

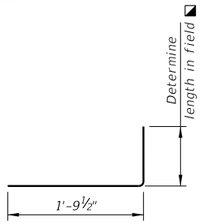
BENT CAP BEARING REPAIR DETAIL

Scale: ¼" = 1'-0"

BEARING REPAIR NOTES:

If a major or intermediate spall is detected per TxDOT Concrete Repair Manual Chapter 3, Section 2 & 3, use detail above to repair spall. Form repair area to lines shown above. Use of prepackaged repair material is permissible.

When bearing is compromised or bearing loss is greater than 20%, jacking beams may be required to repair bearing area.



Bars L (#4)

◪ Follow anchor system manufacturer's recommended installation depth, 6" min.

GENERAL NOTES:

Provide Class C Concrete, with f'c = 3600 psi.

Perform all concrete repairs in accordance with Item 429, "Concrete Structure Repair", and the TxDOT Concrete Repair Manual, Chapter 3, Sections 1 and 2.

A copy of the TxDOT Concrete Repair Manual must be available onsite during all concrete repair operations. Follow all manufacturer specifications and recommendations for the repair materials selected.

Conduct any additional repairs in accordance with TxDOT's "Concrete Repair Manual."

Payment for intermediate spall repair in accordance with Item 429-6007, "Concrete Structure Repair (Vertical & Overhead)."

Notify the Engineer of Record of any damage, including impact damage and section loss, not addressed in the plans.

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05/20/2022

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BENT CAP REPAIRS

US 87 AT GUADALUPE RIVER & US 87 GUADALUPE RIVER RELIEF

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	DIST	COUNTY		SHEET NO.
	YKM	DEWITT		51

DATE:
FILE:

DAMAGE TO SOUTH CORNER CURB LOOKING EAST
SITE CONDITIONS AS OF 3/15/2015

IMPACT DAMAGE TO CONCRETE AND STEEL SE RAILING POST OVER BENT 13 LOOKING NORTHWEST. SITE CONDITIONS AS OF 11/04/2020

IMPACT SPALL WITH EXPOSED REBAR TO NE END OF NW CONCRETE RAILING POST AND DECK OVERHANG LOOKING EAST.
SITE CONDITIONS AS OF 11/04/2020.

US 87 – SOUTHWEST CORNER CONCRETE FOOTING RAIL.
SITE CONDITIONS AS OF 11/04/2020.

CONCRETE RAIL REPAIRS

Location	Span	Item	Section of Concrete Repair Manual*	Comment
US 87 Guadalupe River Relief Bridge	15	South Corner Curb Looking East	3	Photo shown
	14	Southeast Rail over Bent 13	3	Photo shown
	1	Northeast End of Northwest Concrete	3	Photo shown
US 87 Guadalupe RiverBridge	15	Southwest corner Concrete footing for rail	3	Photo shown

*This column designates the section in Chapter 3 of the current TxDOT Concrete Repair Manual

GENERAL NOTES:

Provide Class C Concrete, with f'c = 3600 psi.
Perform all concrete repairs in accordance with Item 429, "Concrete Structure Repair", and the TxDOT Concrete Repair Manual, Chapter 3, Section 3. A copy of the TxDOT Concrete Repair Manual must be available onsite during all concrete repair operations. Follow all manufacturer specifications and recommendations for the repair materials selected.

Conduct any additional repairs in accordance with TxDOT's "Concrete Repair Manual."

Payment for this major repair in accordance with Item 429-6009, "Concrete Structure Repair."
Notify the Engineer of Record of any damage, including impact damage and section loss, not addressed in the plans.

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PROFESSIONAL ENGINEER

05/20/2022

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CONCRETE RAIL REPAIRS

US 87 AT GUADALUPE RIVER & US 87 GUADALUPE RIVER RELIEF

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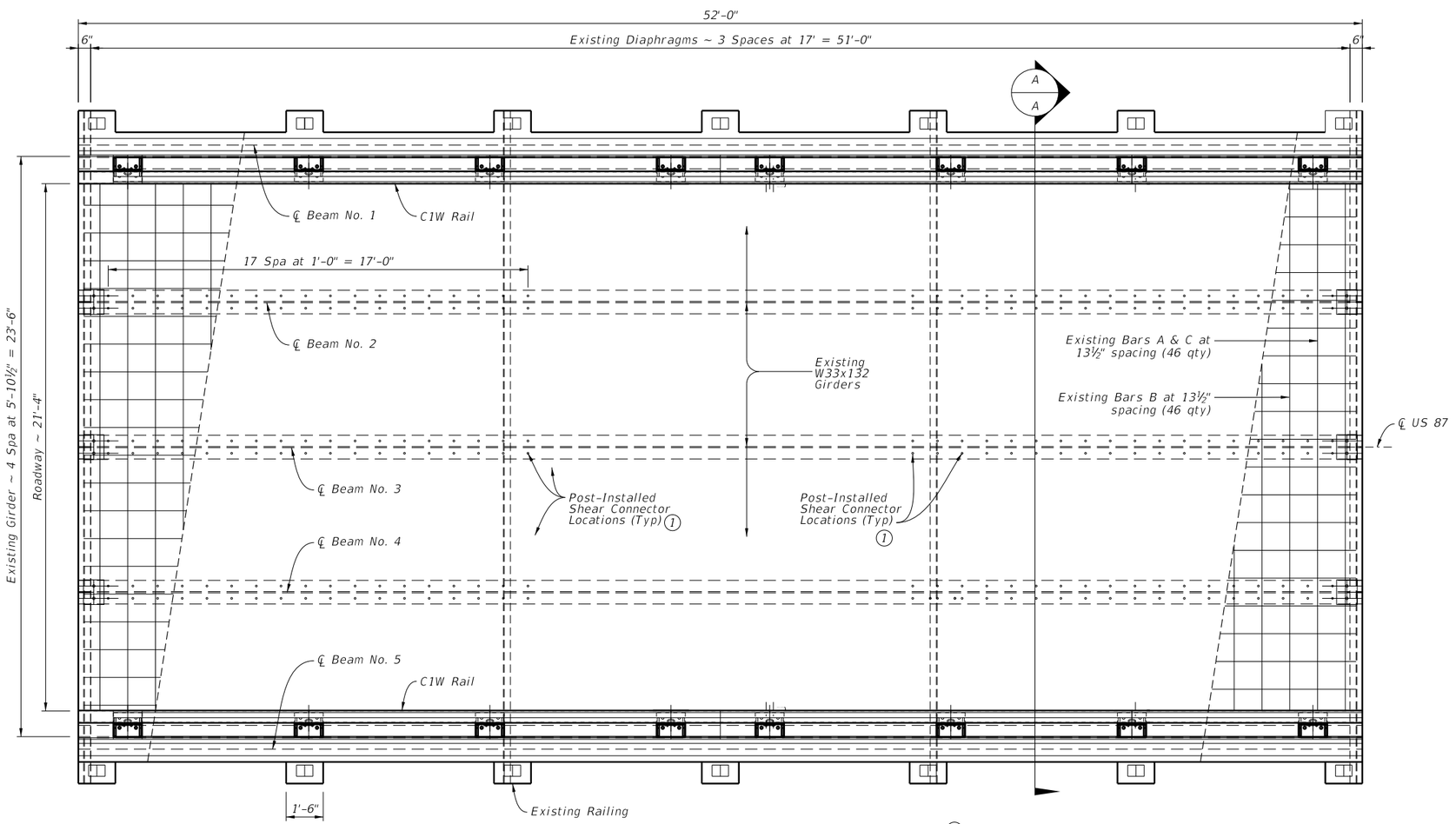
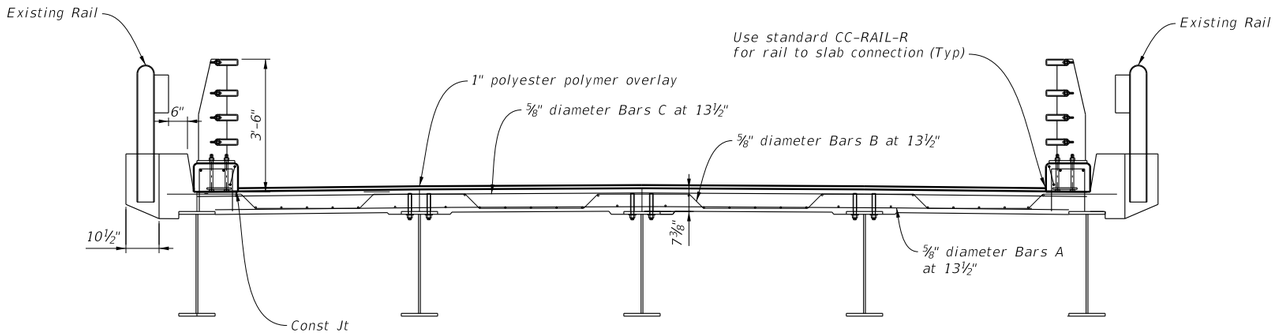


1 See shear connection detail, approach span repairs sheet 2 of 2. Note, shear connectors are only on interior beams.

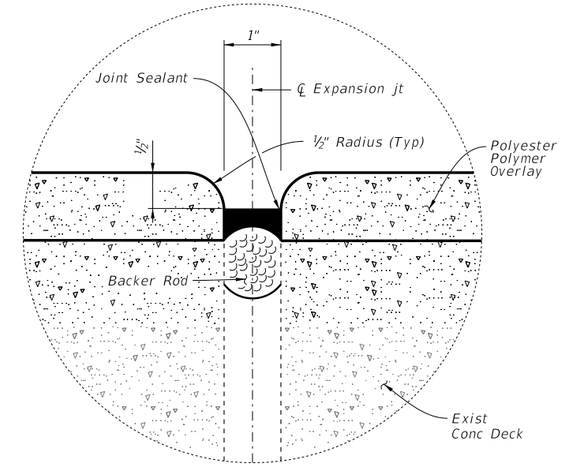
PLAN

(Existing reinforcement shown for contractor information only)



SECTION A-A ~ APPROACH & RELIEF SPAN REPAIRS

(Existing reinforcement shown for contractor information only)



EXPANSION JOINT SEALING DETAIL

(Approach span to Approach span)

OVERLAY NOTES:

1) Remove ACP in accordance with Item 354 "Planning and Texturing Pavement". Do not gouge into concrete deck surface.
2) Mill ¼" to ½" of deck surface to remove all traces of ACP.
3) Shot blast surface to remove approximately ⅛" of deck surface in accordance with Item 483 "Concrete Bridge Deck Surfacing".
4) Follow TxDOT Special Standard Specification 4106 to apply Polyester Polymer Concrete Bridge Overlay.

EXPANSION JOINT NOTES:

1) Clean joint openings.
2) Place backer rods into joint opening 1" below the top of header material. The backer rod must be 25% larger than the joint opening.
3) Seal the joint opening with a Class 7 Silicone. Recess seal 1/2" below the top of header in travel lanes and 1/8" below top of header in shoulders.

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SHEET 1 OF 2

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05/20/2022

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APPROACH & RELIEF SPAN REPAIRS

US 87 GUADALUPE RIVER & US 87 GUADALUPE RIVER RELIEF

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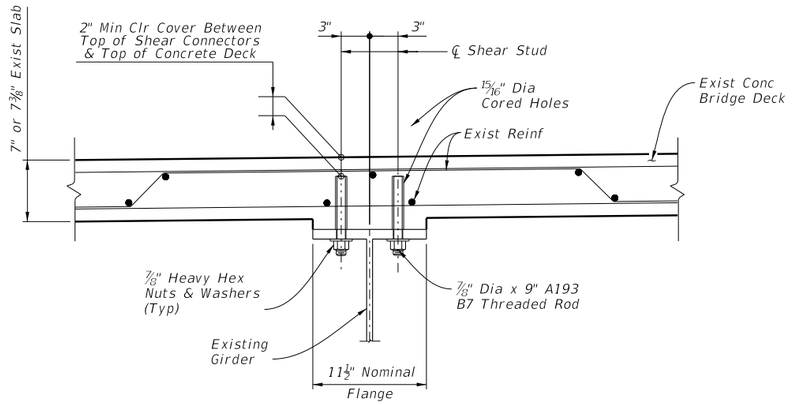

SHEAR CONNECTOR DETAIL

(Existing reinforcement shown for contractor information only)

Shear Connector Installation Steps:

1) *Do not cut reinforcing when coring holes. Locate bars and, as directed by the Engineer, shift holes to avoid steel.*

2) *Drill a 1-inch diameter hole through the top flange of the steel beam at the shear connector location.*

3) *Through the hole in the flange, drill a 15/16 - diameter hole into the concrete deck to the desired depth. Clean the hole with wire brush and compressed air, as specified by the adhesive installation procedure.*

4) *Inject adhesive into the hole using the appropriate dispenser. Fill the hole from the top down to prevent air pockets from forming.*

5) *Place the threaded rod into the hole using a twisting motion so the adhesive fills the threads.*

6) *Allow the adhesive to cure in accordance with the manufacturer's recommendations.*

7) *Tighten the nut to the torque specified by the adhesive manufacturer.*

MATERIAL NOTES

For the shear connectors, a two-part structural adhesive is required.
Use Hilti HIT-HY 150-MAX or 200-R, or equivalent.

GENERAL NOTES

Any deviation from the method shown here must be approved by the Engineer. Submit alternate installation method(s) to the Engineer at least two weeks prior to installation.

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SHEET 2 OF 2

STATE OF TEXAS
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05/20/2022

Texas Department of Transportation

Bridge Division

APPROACH & RELIEF SPAN REPAIRS

US 87 GUADALUPE RIVER & US 87 GUADALUPE RIVER RELIEF

FILE: US0087 BRG SP935rd17.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
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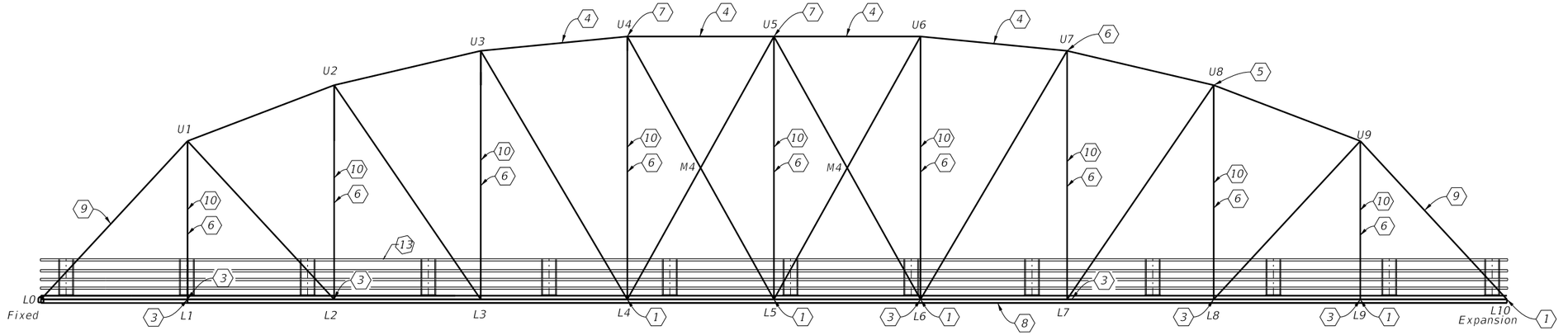
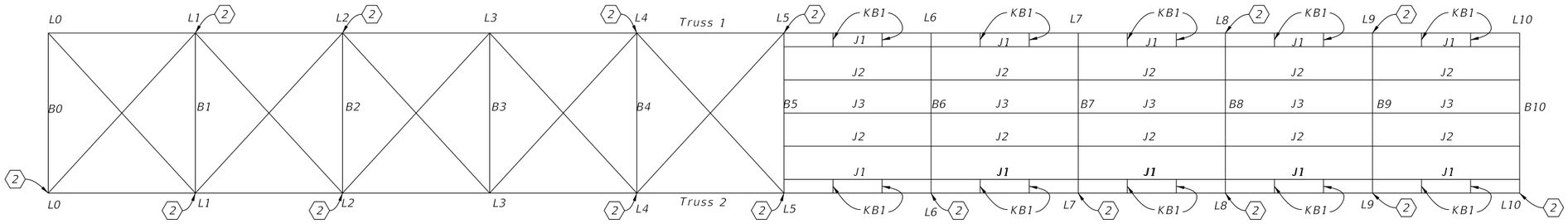


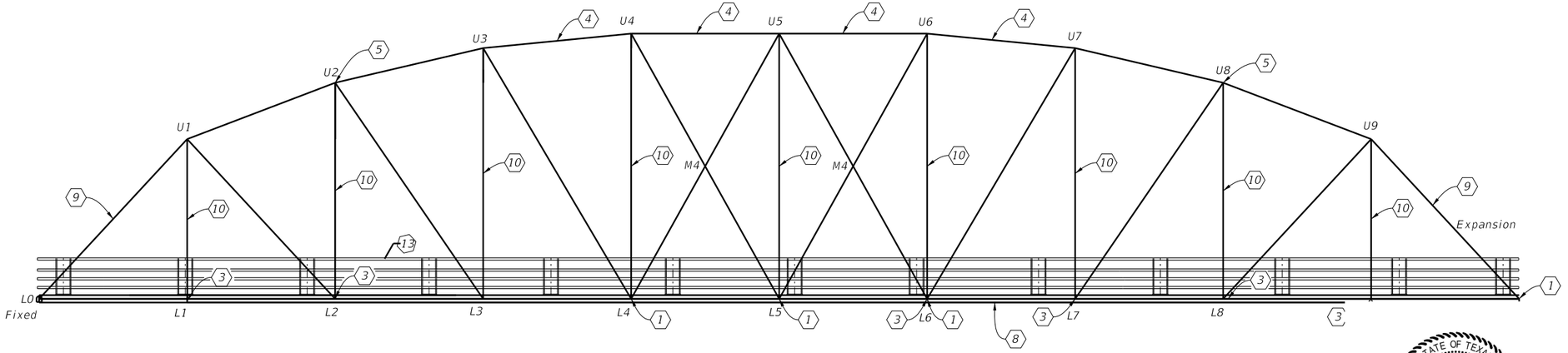
TRUSS 1 (T1)

Southeast Truss – Looking South – Looking at Interior of Truss



BOTTOM PLAN

Left Side shows lateral bracing, right side shows stringers (both repeat across the stucture) – looking down.



TRUSS 2 (T2)

Northwest Truss – Looking South – Looking at Exterior of Truss

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SHEET 1 OF 2

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05/20/2022

Texas Department of Transportation

Bridge Division

TRUSS REPAIR KEY

US 87 AT GUADALUPE RIVER

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TRUSS REPAIR KEY

Symbol	Member	Item Number	Item Description	Repair Description
1	B4, B5, B6, B9, B10	0784 6022	Replace Steel Bridge Member (Floorbeam)	Replace listed beams with a new W33x141 and new connections. Notify the engineer for beams with 25% of more sectional loss in the flange.
2	T1: L1	0784 6133	Repair Steel Bridge Member (Gusset Plates Type I)	Replace listed horizontal gusset plates on lower chord. Notify the Engineer for additional plates with 25% or more sectional loss.
	T1: L2			
	T1: L4			
	T1: L5			
	T1: L8			
	T1: L9			
	T2: L0			
	T2: L1			
	T2: L2			
	T2: L4			
	T2: L5			
	T2: L6			
	T2: L7			
	T2: L8			
	T2: L9			
	T2: L10			
3	T1: L1 Inner	0784 6134	Repair Steel Bridge Member (Gusset Plates Type II)	Replace listed vertical gusset plates on lower chords. Notify the engineer for additional plates with 50% or more section loss.
	T2:L1 Inner			
	T1: L2 Outer			
	T2: L2 Inner			
	T2: L5 Inner			
	L5 Outer (see photo)			
	T1: L6 Inner			
	T2: L6 Inner			
	T1: L7 Inner			
	T2: L7 Inner			
	T1: L8 Inner			
	T2: L8 Inner			
	T1: L9 Inner			
	T2: L9 Inner			
4	All	0784 6038	Replace Steel Bridge Members (Replace Rivet/Bolt)	Replace rivets that are 50% or more corroded with bolts.
5	T2, U2 Upper	0784 6135	Repair Steel Bridge Member (Gusset Plates Type III)	Replace listed top chord horizontal gusset plates with holes. Notify the engineer if additional plates have 50% or more sectional loss.
	T1, U8 Upper			
	T2, U8 Upper			
6	U1–L1	0784 6034	Replace Steel Bridge Member (Straighten members)	Heat straighten sway frame members. If not possible, contact the engineer to replace members.
	U2–L2			
	U3–L3			
	U4–L4			
	U5–L5			
	U6–L6			
	U7–L7			
	U8–L8			
	U9–L9			
7	T1: U4 outside	0784 6136	Replace Steel Bridge Member (Gusset Plates Type IV)	Replace listed upper chord vertical gussets. Notify the Engineer for additional plates with 50% or more section loss.
	T1: U5 outside			
8	Batten Plates	0784 6019	Replace Steel Bridge Member (Batten	Replace batten plates.
9	T1: L0–U1	0784 6034	Replace Steel Bridge Member (Straighten members)	Heat straighten listed diagonal end posts.
	T2: L0–U1			
10	L1–U1	0784 6034	Replace Steel Bridge Member (Straighten members)	Heat straighten vertical members.
	L2–U2			
	L3–U2			
	L4–U4			
	L5–U5			
	L6–U6			
	L7–U7			
	L8–U8			
	L9– U9			
11	Truss	0496 6103	Remove Structure (Bridge Slab) (Ref 1)	Replace concrete deck on truss, see re-decking details.
12	All	0450 6029	Rail (Ty C1W)	Add new C1W railing to approach spans, truss, and relief structure.

GENERAL NOTES:

Perform repairs indicated in the TRUSS REPAIR KEY table, and repair any damage caused by the contractor's operations in accordance with item 784, "Steel Member Repair".

TxDOT personnel will perform an additional truss inspection after the trusses have been blast cleaned and/ or after the existing deck slab is removed for truss span but before painting has begun, to identify any additional repairs. Allow at least two weeks notice for scheduling before deck removal.

Perform all structural steel repairs in the presence of a TxDOT structural steel inspector. Allow at least two weeks notice to schedule inspector prior to beginning repairs.

Take care not to damage existing floor beams, stringers, and truss rails during truss deck removal. Any damage caused by the Contractor operations will be repaired at the Contractor's expense.

Notify the Engineer of any damage, including impact damage and section loss not addressed in the plans.

Contact the Engineer to coordinate third party paint inspection a minimum of two weeks prior to the preconstruction meeting. The Engineer will arrange with TxDOT Materials Test Division Coatings and Traffic Materials Section at MTD_Paint@txdot.gov for the presence of MTD and/or third-party inspector presence at the preconstruction meeting.

Paint set up and completed paint job must be approved by a TxDOT paint inspector. Allow a minimum two weeks notice to schedule paint inspector.

Prime coat faying surfaces. When metal contact surfaces are exposed by the removal of rivets, clean the surfaces and apply the required prime coat in accordance with Item 446, "Field Cleaning and Painting Steel".

Clean and paint truss and beams on approach and relief spans using System II in accordance with Item 446, "Field Cleaning and Painting Steel". Use stripe coats as needed.

Clean and lubricate existing bearing using Prelube 19 or approved equivalent.

Replace existing bolts or rivets that are removed, damaged, or missing with ASTM F3125 A325 bolts of the same diameter as the original fastener, except where otherwise indicated in the plans. Where round-headed bolts are indicated, use ASTM F1852 bolts of the same diameter as the original fastener.

For aesthetic reasons, wherever practical, the contractor should be directed to install the bolts with the head on the side that is exposed to view.

Galvanize all bolts, nuts, washers, and pipe sleeves in accordance with Item 445, "Galvanizing".

Use Grade 50 A 709 steel, except where otherwise indicated.

Prior to beginning work, submit a procedure for removing gussets, rivets and heat straightening. Provide a demonstration of the method to the engineer for approval. Methods which can damage the connection metal will not be approved.

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Bridge Division

TRUSS REPAIR KEY

US 87 AT GUADALUPE RIVER

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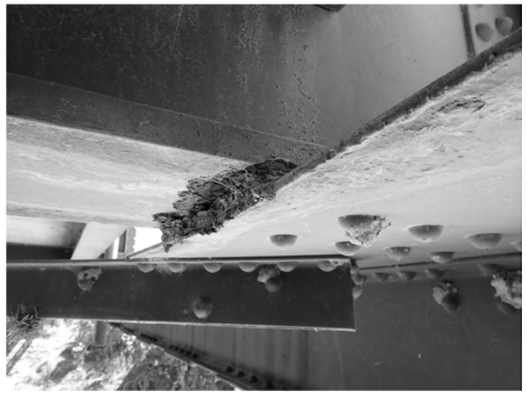
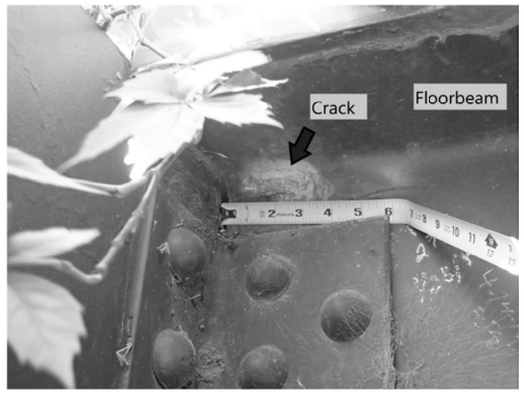
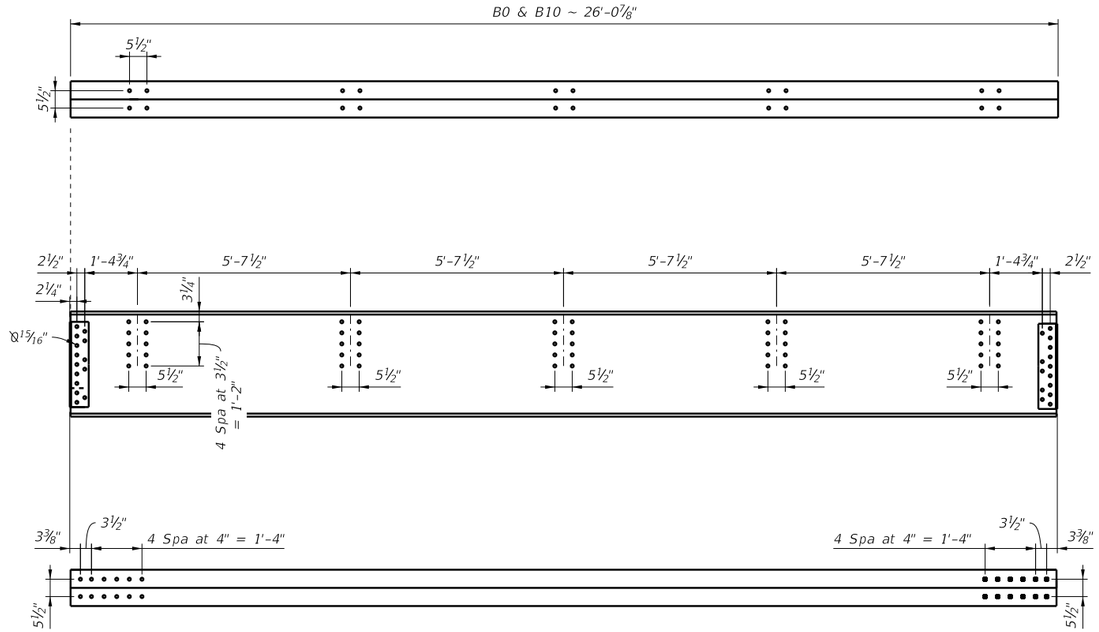


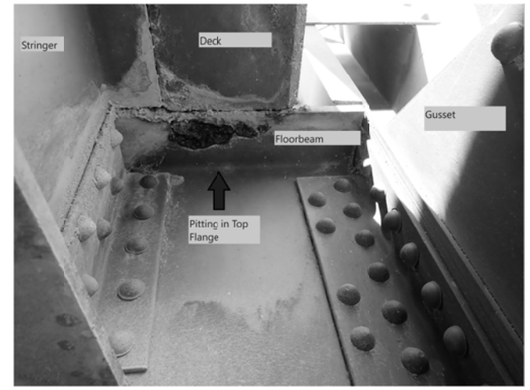
TRUSS 1, BOTTOM FLANGE OF FLOORBEAM HAS SECTION LOSS WITH 50% SECTION REMAINING OVER A LENGTH OF 8". SITE CONDITIONS AS OF 04/16/2020.



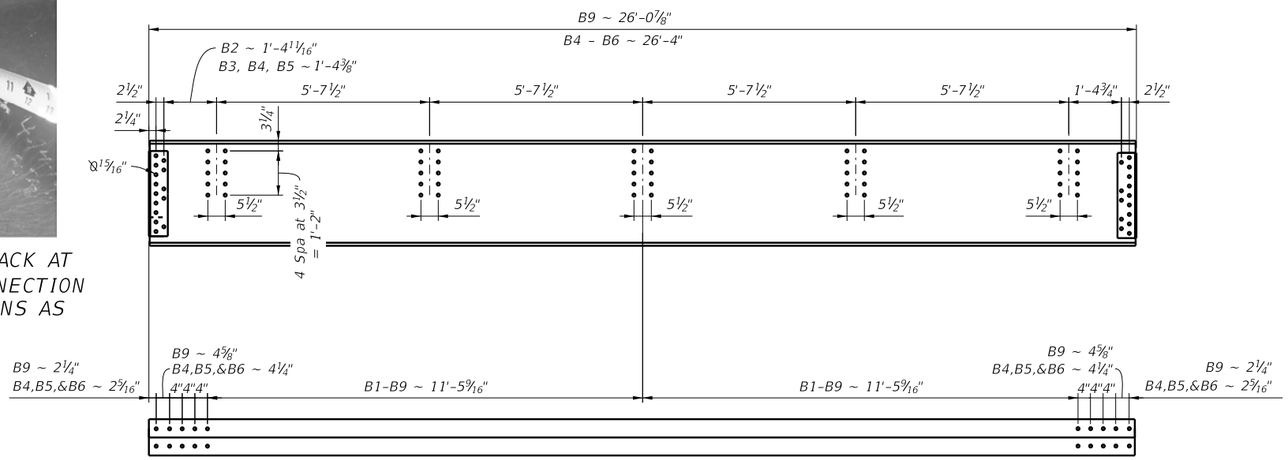
FLOORBEAM 10 AT TRUSS 1, 2-⅝" LONG CRACK AT UPPER FLANGE-TO-WEB INTERFACE AT CONNECTION TO TRUSS LOWER CHORD. SITE CONDITIONS AS OF 04/16/2020.



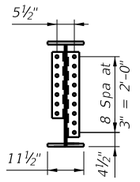
B10 BEAM



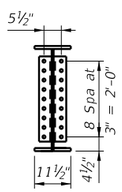
FLOORBEAM 5 AT TRUSS 1, HEAVY PITTING (UP TO 1/4" DEEP) IN FLOORBEAM TOP FLANGE. SITE CONDITIONS AS OF 04/16/2020.



B4, B5, B6, & B9 BEAMS



SECTION A-A



SECTION B-B

GENERAL NOTES:

Replace the listed existing floorbeams with a new W33x141 (ASTM A709 Grade 50) section that matches the length of the existing floorbeams.

Replace angles connecting floorbeam to the girders.

Replace angles to stringers if large amount of corrosion is present.

Dimensions shown here are for information only and will need to be further verified.

Inspect Floorbeam B0 to ensure similar cracks as Floorbeam B10 have not developed.

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REPAIR NO. 1
REPLACE FLOORBEAMS

US 87 AT GUADALUPE RIVER

FILE: US0087 BRG SP935rd06.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
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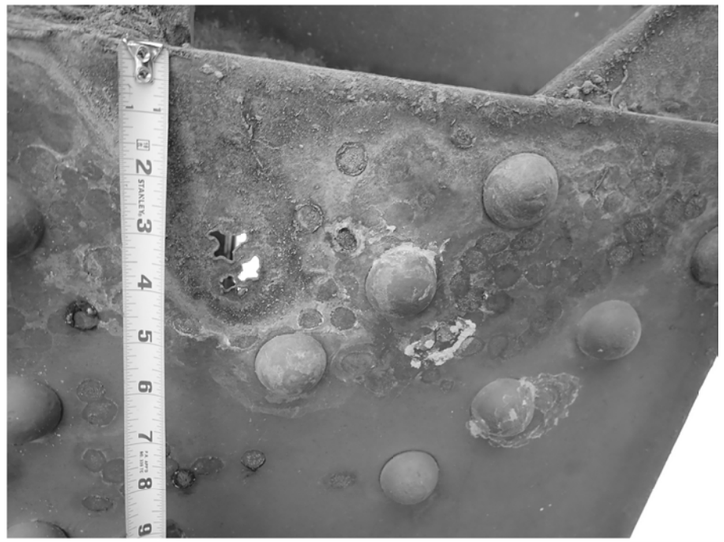
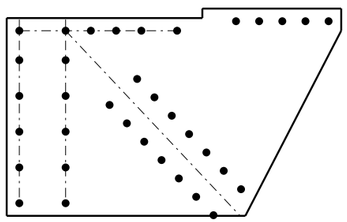
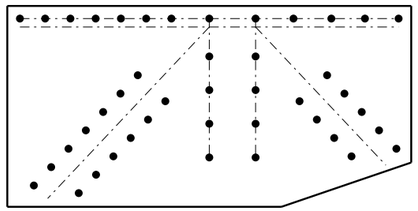


FLOORBEAM 6 AT TRUSS 2, HORIZONTAL GUSSET PLATE HAS A 1.5" DIAMETER CORROSION HOLE.
SITE CONDITIONS AS OF 4/16/2020.

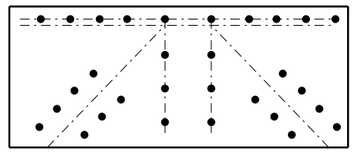
CORROSION UNDER FLOOR BEAM AND BOTTOM GUSSET PLATE (TYPICAL).
SITE CONDITIONS AS OF 4/16/2020.



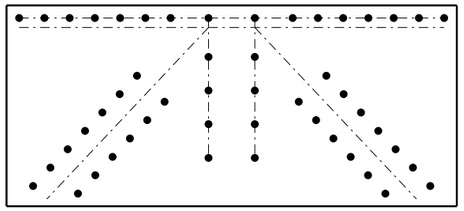
TRUSS 2: L0, L10



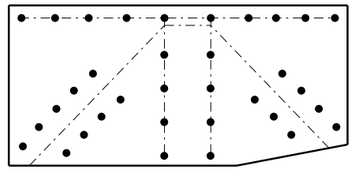
TRUSS 1: L2, L8
TRUSS 2: L2, L8



TRUSS 1: L4, L5
TRUSS 2: L4, L5, L6



TRUSS 1: L1, L9
TRUSS 2: L1, L9



TRUSS 2: L7

GENERAL NOTES:

Located below floorbeams, replace horizontal gussets and rivets which are noted in this drawing.
Match new gusset plates to the existing dimensions using the existing as a template.
Replace gusset plates with A709 Grade 50 steel plate.

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REPAIR NO. 2
FLOORBEAM HORIZONTAL GUSSETS

US 87 AT GUADALUPE RIVER

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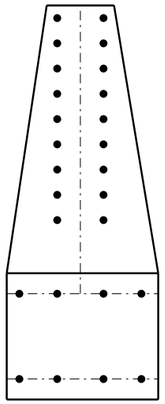
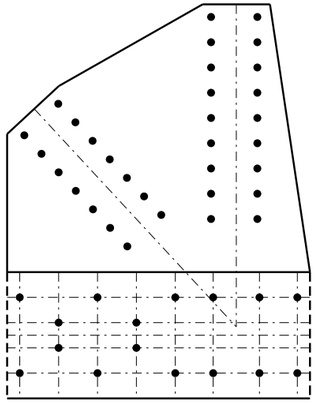
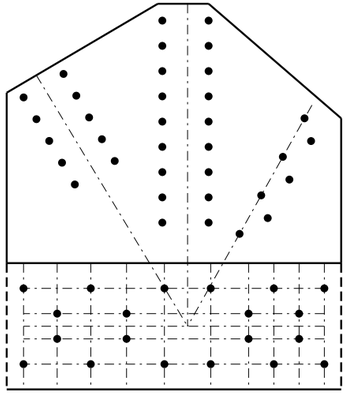


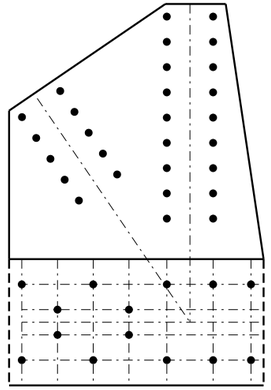
TRUSS 1: L1, L9 (INNER GUSSET)
TRUSS 2: L1, L9 (INNER GUSSET)



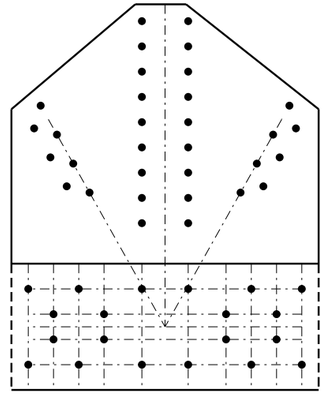
TRUSS 1: L2 (OUTER GUSSET), L8 (INNER GUSSET) TRUSS 2: L2, L8 (INNER GUSSET)



TRUSS 1: L6 (INNER GUSSET)
TRUSS 2: L6 (INNER GUSSET)



TRUSS 1 & 2: L7 (INNER GUSSET)



TRUSS 2: L5 (INNER GUSSET)
TRUSS UNKNOWN: L5 (OUTER GUSSET),
PHOTO SHOWN BELOW

FLOORBEAM 2 AT TRUSS 1, UP TO ¼"
PACK RUST BETWEEN GUSSET PLATES
AND EXTERIOR CHANNEL. SITE
CONDITIONS AS OF 04/16/2020.

DETERIORATION AT L5 GUSSET.
SITE CONDITIONS AS OF 04/16/2020.

FLOORBEAM 6 AT TRUSS 1, VERTICAL GUSSET
PLATE HAS SECTION LOSS WITH 50%
SECTION REMAINING. SITE CONDITIONS
AS OF 04/16/2020.

GENERAL NOTES:

Replace lower vertical gusset plates and rivets identified on this drawing.

Match new gusset plates to the existing dimensions using the existing as a template.

Dimensions and member sizes provided are for information only and must be field verified prior to ordering materials.

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REPAIR NO. 3
LOWER CHORD VERTICAL GUSSETS
US 87 AT GUADALUPE RIVER

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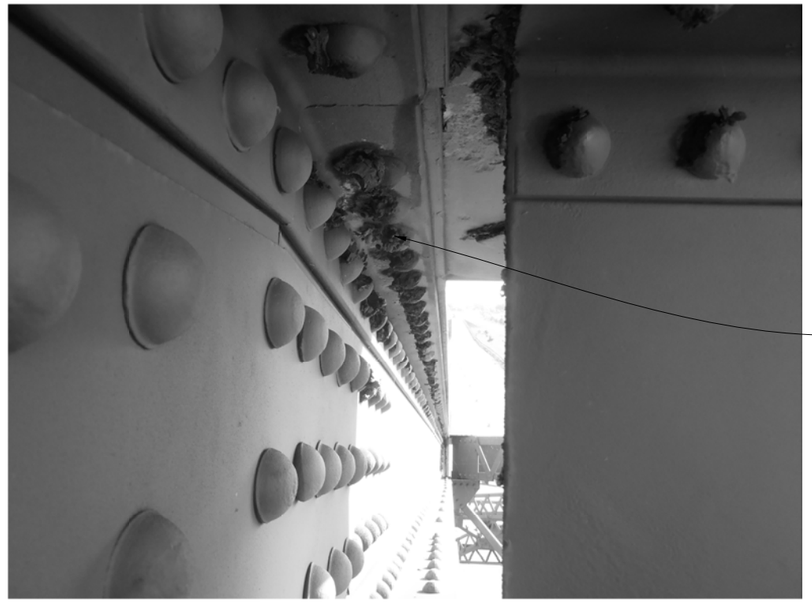
TOPSIDE OF UPPER CHORD WITH UP TO 100% LOSS ON RIVET HEADS.
SITE CONDITIONS AS OF 04/16/2020.



TYPICAL 50% SECTION LOSS TO TOP CHORD RIVET HEADS.
SITE CONDITIONS AS OF 04/10/2018.

Criteria for replacing bolts:

1. Replace all missing rivets.
2. Replace all sheared rivets.
3. Headless rivets or those with rosette heads shall be replaced. A headless rivet is one of which the head has corroded away so that it is completely within the circumference of the shank.
4. Replace all rivets when either head exhibits a loss of metal equal to or exceeding 50% of the original head by volume. For example, 50% loss of head is equivalent to:
   a. 20% loss of head height with 20% loss of head diameter.
   b. 50% loss of head height without 20% loss of head diameter.
   c. 30% loss of head diameter without loss of head height.
5. Replace all rivets if either head has corroded to the point of losing 50% or more of its lip projection beyond the shank.

GENERAL NOTES:

Replace corroded rivets with 50% or more section loss in the head, see criteria listed on this sheet.
Corroded rivets mostly appear on the top chords from U3 through U7.
Use existing rivet holes.
Notify the Engineer of Record of any damage and section loss, not addressed in the plans.
Replace rivets with ASTM FM 3125 A325 bolts of the same diameter as the orignal fastener.
Prior to beginning work, submit a procedure for removing rivets and provide a demonstration of the method to the Engineer for approval. Methods which can damage the connected metal will not be approved.

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REPAIR NO. 4
REPLACE RIVETS

US 87 AT GUADALUPE RIVER

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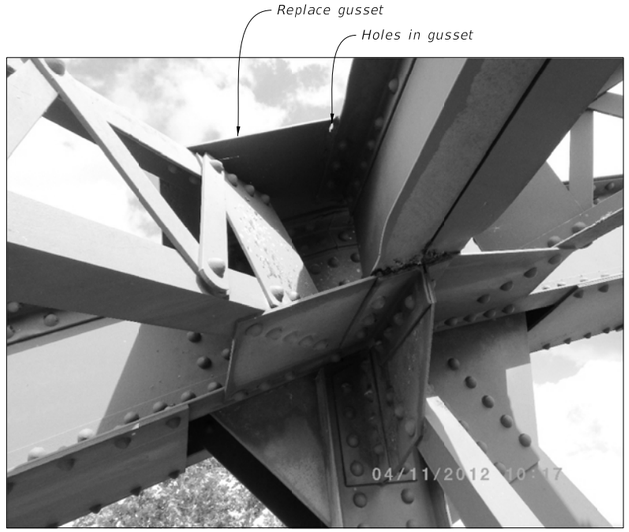
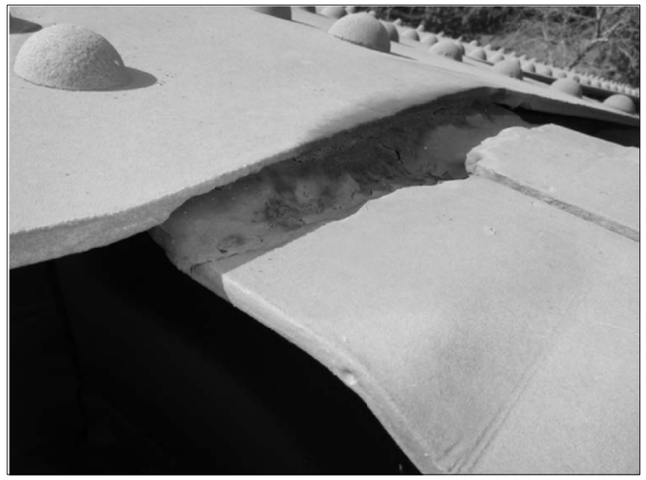
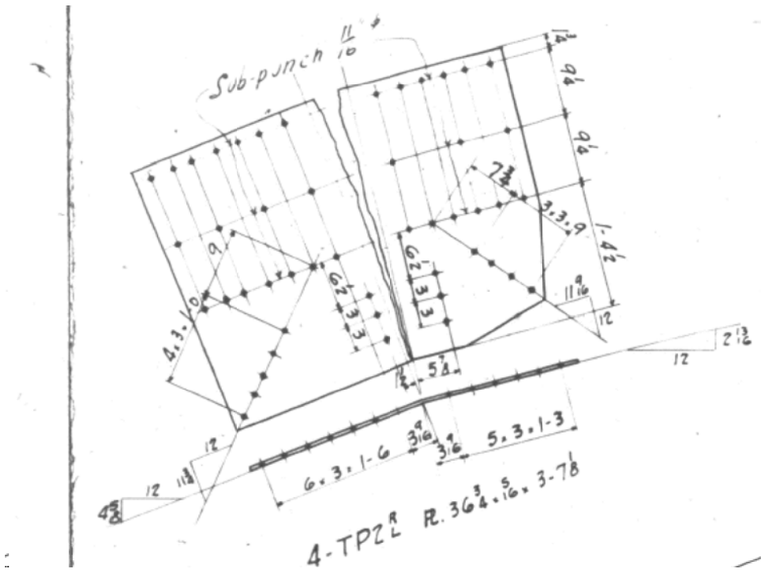


SPAN 2 – TRUSS 2 – NODE U8 – UPPER SECONDARY GUSSET PLACE SECTION LOSS – 100%. SITE CONDITIONS AS OF 04/10/2012.

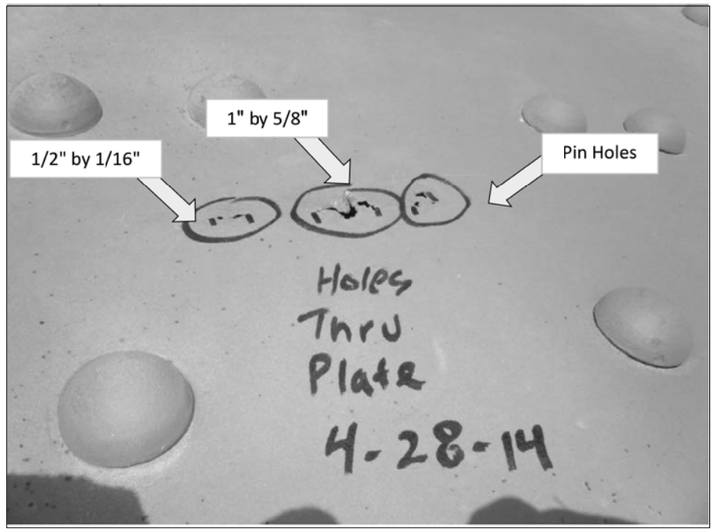


UP TO ¼" DEEP BY FULL WIDTH PITTING TO UPPER CONNECTION PLATE AT HORIZONTAL STRUT (EAST TRUSS, U8 LOOKING SOUTH). SITE CONDITIONS AS OF 04/29/2014.



FABRICATOR DRAWING FROM 1938 (TOP VIEW OF GUSSET U2 AND U8)

SEVERAL UPPER CHORD GUSSET PLATES WITH HEAVY RUST AND CORROSION HOLES. SITE CONDITIONS AS OF 04/16/2020.



100% SECTION LOSS IN TOP OF LATERAL CONNECTION PLATE TO HORIZONTAL STRUT (WEST TRUSS, TOP HORIZONTAL STRUT CONNECTION AT U2). SITE CONDITIONS AS OF 04/29/2014.

GENERAL NOTES:

Replace top Horizontal Gusset plate at Truss 1: U2, and Truss 2: U2 and U8 as noted in photos shown.

Match new gusset plates to the existing dimensions using the existing as a template. Replace gusset plates with A709 Grade 50 plate. Dimensions and member sizes provided are for information only and must be field verified prior to ordering materials.

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05/20/2022

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SHEET 1 OF 2

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REPAIR NO. 5
TOP CHORD HORIZONTAL GUSSETS
US 87 AT GUADALUPE RIVER

FILE: US0087 BRG SP935rd10.dgn	DN: LO	CK: AAT	DW: ESE	CK: LO
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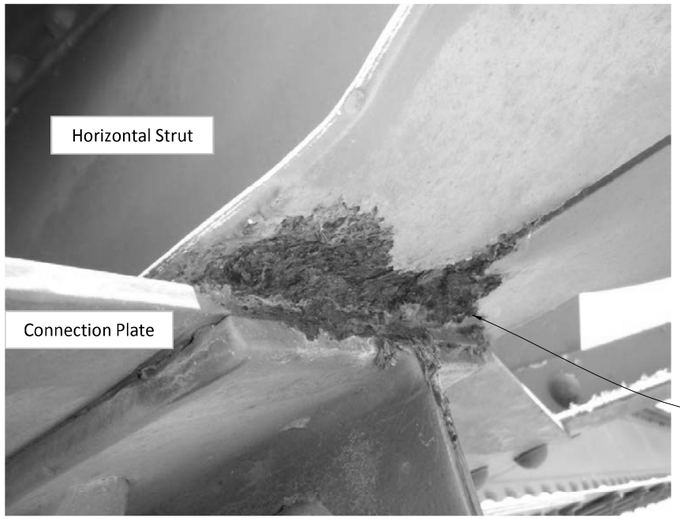
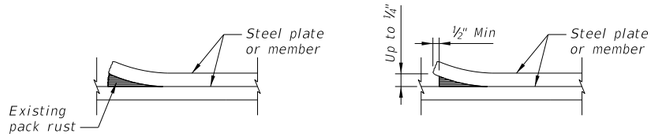


UP TO ⅛" DEEP BY ½" LONG BY FULL WIDTH SECTION LOSS TO ONE HORIZONTAL STRUT ANGLE LEG AND ½" PACK RUST BETWEEN THE CONNECTION PLATE AND STRUT (EAST TRUSS, EAST PLATE, SOUTH SIDE OF U5). SITE CONDITIONS AS OF 04/29/2014.



EXISTING CONDITION REPAIR

PACK RUST DETAIL

GENERAL NOTES:

For pack rust typically located on all the bottom flange of the sway frames, remove pack rust using the following steps:

a. Blast clean joints to remove pack rust between the plates.
b. Waterblast connections with minimum 6,000 psi water pressure to wash out debris and prepare.
c. Blow out connections with cleaned compressed air.
d. Allow to dry a minimum of 24 hours prior to applying prime coat.
e. Apply standard paint system to steel member.
f. Apply Termarust HRCSA TR2100 to final coat in the crevice area and edges.

HS20 PROPOSED SHEET 2 OF 2

Texas Department of Transportation — Bridge Division

REPAIR NO. 5
TOP CHORD HORIZONTAL GUSSETS
US 87 AT GUADALUPE RIVER

05/20/2022

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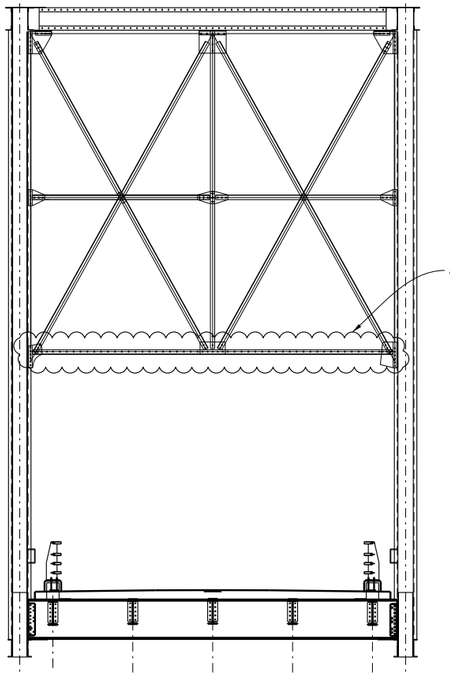
TYPICAL INTERIOR PORTAL FRAME IMPACT DAMAGE.
SITE CONDITIONS AS OF 04/16/2020.

TYPICAL PORTAL FRAME IMPACT DAMAGE.
SITE CONDITIONS AS OF 04/16/2020.

WELD AT SOME JOINTS ON SWAY FRAME.
SITE CONDITIONS AS OF 04/16/2020.



TYPICAL SWAY FRAME

GENERAL NOTES:

Repair all interior sway and portal frames in accordance with Item 784, "Steel Member Repair."

Heat Straighten all lower horizontal cross-bracing. Do not remove rivets unless necessary to complete the repair. Use existing rivet holes where possible.

Sway Frame Members L2-U2 and L8-U8 are welded to vertical members. If heat straightening is not possible for those sway frames or any other sway frames, notify the Engineer for a replacement- in-kind design with bolts rather than welds.

Notify the Engineer of Record of any damage, including impact damage and section loss, not addressed in the plans.

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STATE OF TEXAS
LAURA M. ORTIZ
137207
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PROFESSIONAL ENGINEER

05/20/2022

Texas Department of Transportation

Bridge Division

REPAIR NO. 6 SWAY FRAME MEMBERS

US 87 AT GUADALUPE RIVER

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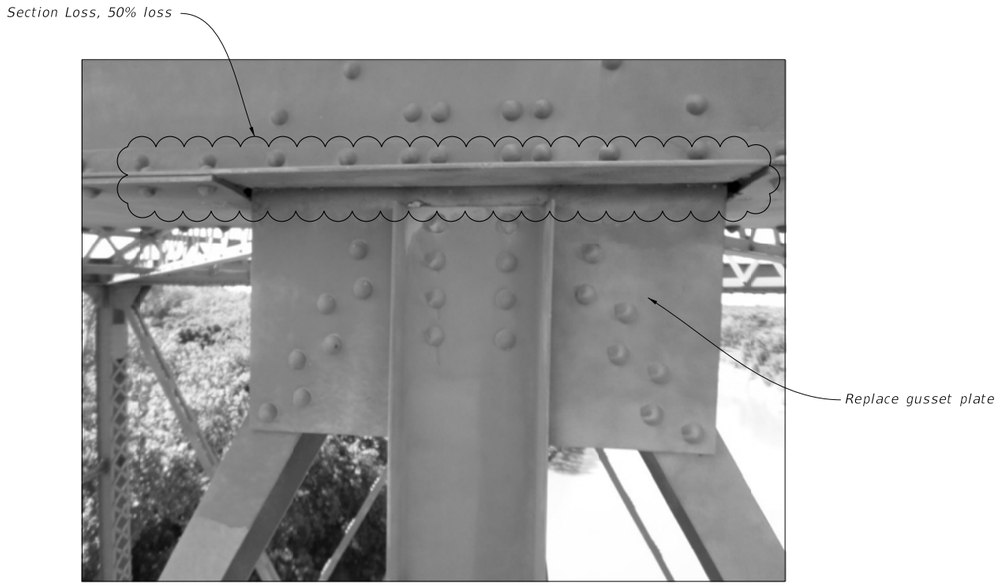
SPAN 2 – TRUSS 1 – NODE U4 – EXTERIOR PRIMARY
GUSSET PLATE SECTION LOSS – 35% – 1"x4"
SITE CONDITIONS AS OF 04/10/2012.



SECTION LOSS UP TO ¼" AT UPPER GUSSET PLATE AT THE
EXTERIOR GUSSET PLATE/UPPER CHORD CONNECTION,
T1 – U4 LOOKING NORTHWEST. SITE CONDITIONS
AS OF 04/14/2016.

GENERAL NOTES:

Replace upper vertical gusset and rivets at U5 in the exterior of Truss 1 and exterior gusset on node U4 on truss 1 in accordance with Item 784 "Steel Member Repair." Match new gusset plates to the existing dimensions using the existing as a template.

Match new gusset plates to the existing dimensions using the existing as a template.

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PROFESSIONAL ENGINEER

05/20/2022

Texas Department of Transportation

Bridge Division

REPAIR NO. 7
UPPER CHORD VERTICAL GUSSETS
US 87 AT GUADALUPE RIVER

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TYPICAL LOWER CHORD BATTEN PLATE SECTION LOSS.
SITE CONDITIONS AS OF 04/16/2020.

TYPICAL LOWER CHORD BATTEN PLATE SECTION LOSS.
SITE CONDITIONS AS OF 04/16/2020.

GENERAL NOTES:

Batten plates are corroded between L4 to L6. Remove all batten plates on bottom chord according to the Item 784, "Steel Member Repair". Remove paint and rust before re-painting.

Re-connect new batten plate with bolts for repairs.

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REPAIR NO. 8
REPLACE BATTEN PLATES

US 87 AT GUADALUPE RIVER

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GENERAL NOTES:

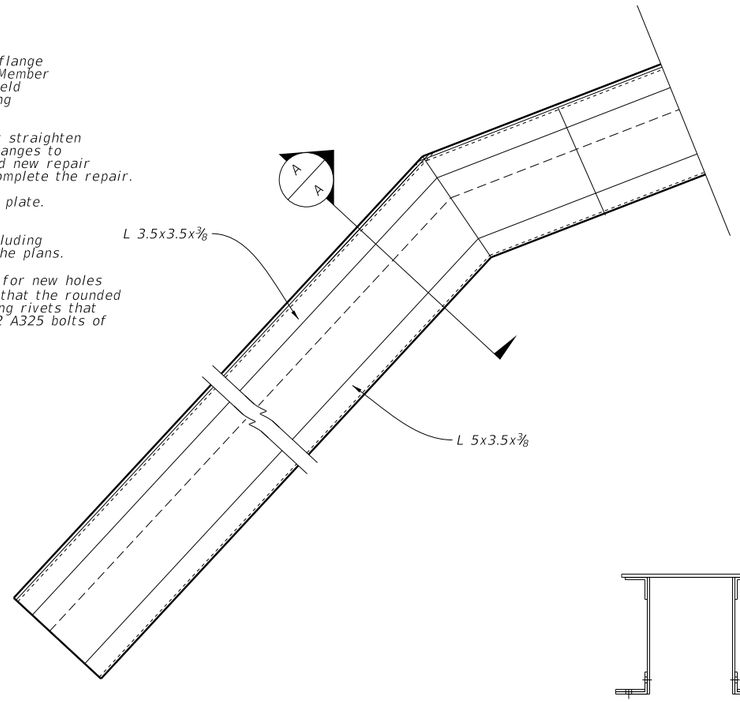
Repair impact damaged end post cover plate and flange as shown, and in accordance with Item 784, "Steel Member Repair". Determine exact length of repair in the field based on extents of impact damage prior to ordering materials.

Remove facing from the area of the repair. Heat straighten impact damaged lacing, cover plate, and end post flanges to eliminate gaps between existing end post flange and new repair plate. Do not remove rivets unless necessary to complete the repair.

Reinstall bolts and lacing after adding the repair plate. Use existing rivet holes where possible.

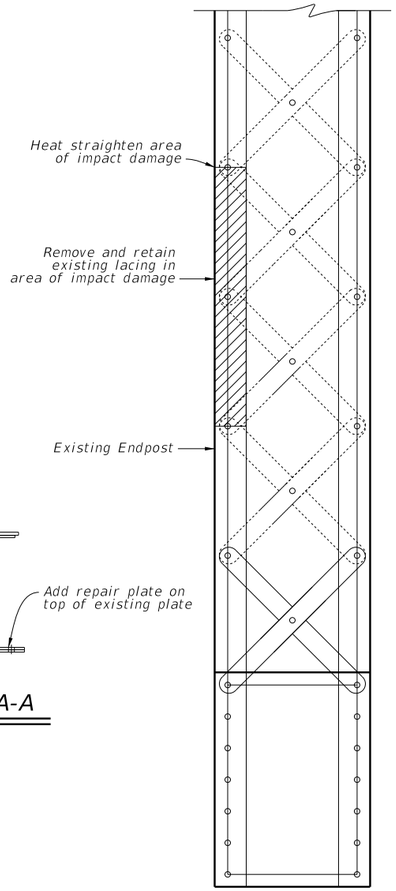
Notify the Engineer of Record of any damage, including impact damage and section loss, not addressed in the plans.

Use ⅞" diameter ASTM F1852 round-headed bolts for new holes that are drilled at this location. Orient bolts such that the rounded heads face the direction of traffic. Replace existing rivets that are removed, damaged, or missing with ASTM F1852 A325 bolts of the same diameter as the original fastener.



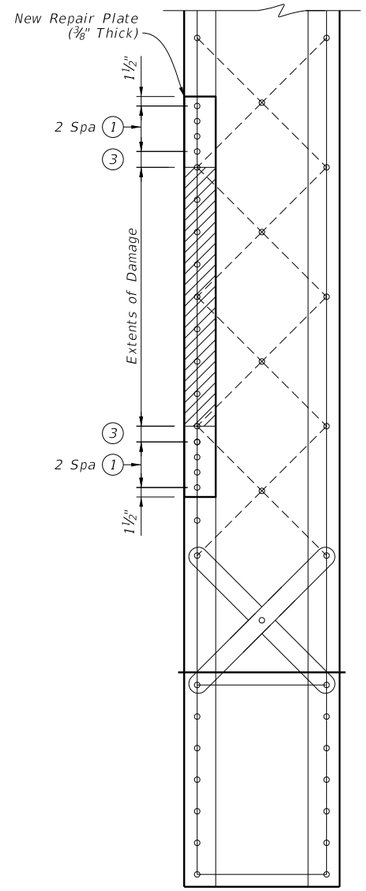
ELEVATION

SECTION A-A



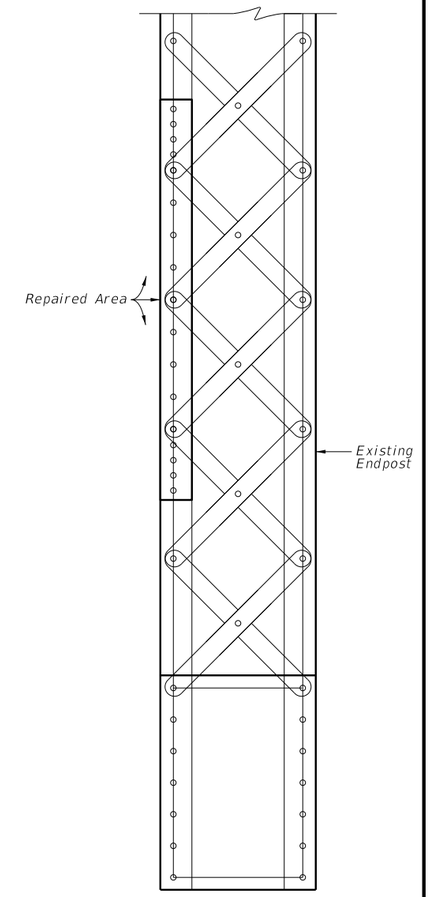
STEP 1

Remove rivets and lacings in area of repair. Heat straighten impact damaged areas.



STEP 2

Install repair plate as per Section A-A and re-install lacing and rivets.



STEP 3

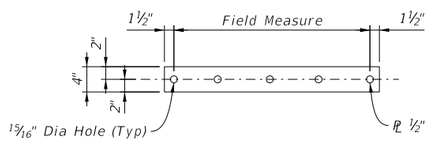
Showing completed repair

END POST REPAIR SEQUENCE

(1) Space holes for new bolts at 2½" Min, 4" Max. Use existing rivet holes were possible, provide a minimum of three bolts past extents of damage.

(2) Provide bolts at 3" Min, 6" Max in area of damage. Use existing rivet holes where possible.

(3) Install first new bolt 3" from extents of damage. Distance may be increased if required to maintain 2½" min spacing from existing rivet hole.



REPAIR PLATE

SECTION LOSS UP TO ¼" AT UPPER GUSSET PLATE AT THE EXTERIOR GUSSET PLATE/UPPER CHORD CONNECTION, T1 – U4 LOOKING NORTHWEST. SITE CONDITIONS AS OF 04/16/2020.

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Texas Department of Transportation — Bridge Division

REPAIR NO. 9 DIAGONAL MEMBER END POSTS

US 87 AT GUADALUPE RIVER

STATE OF TEXAS
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CLOSE-UP OF SECTION LOSS UP AT ¼" AT UPPER GUSSET PLATE
AT THE EXTERIOR GUSSET PLATE/UPPER CHORD CONNECTION,
T1 – U4 LOOKING NORTHWEST. SITE CONDITIONS AS OF 04/16/2020.

GENERAL NOTES:

Various vertical members have impact damage. Repair impact damaged vertical member in accordance with Item 784, "Steel Member Repair." Heat Straighten impact damaged members.

Do not remove rivets unless necessary to complete the repair.

Notify the Engineer of Record of any damage, including impact damage and section loss, not addressed in the plans.

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REPAIR NO. 10
HEAT STRAIGHTEN VERTICAL MEMBERS
US 87 AT GUADALUPE RIVER

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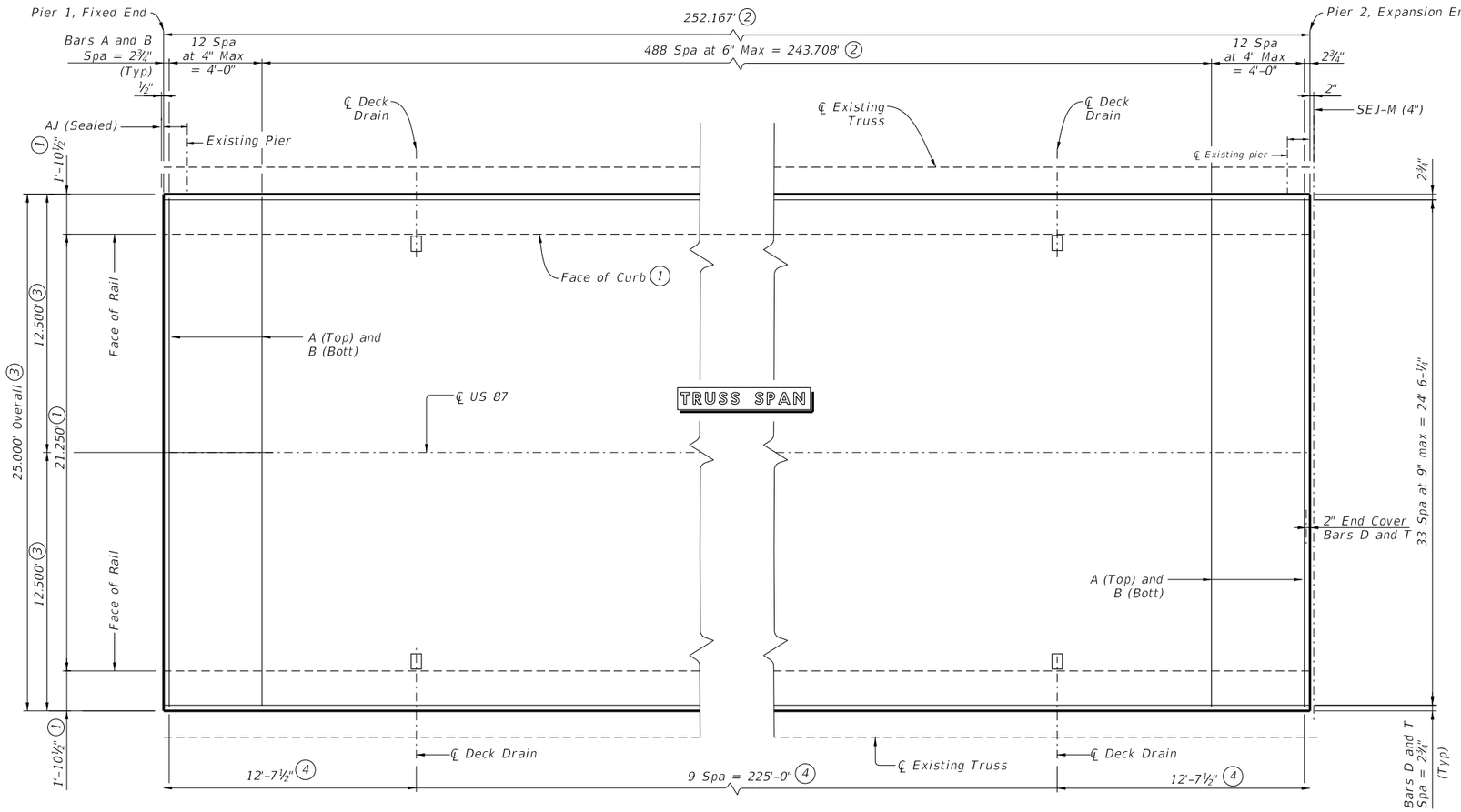
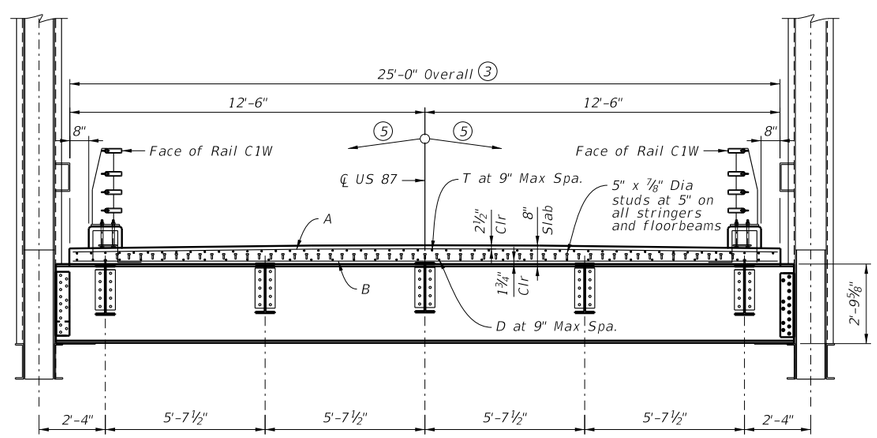


PLAN FOR TRUSS SPAN



TYPICAL TRANSVERSE SECTION

1. Dimensions shown are derived from original plan dimensions. Adjust as required to match face of rail from approach spans.
2. Dimensions shown are based on original plan dimension. Adjust as required to accommodate expansion joint.
3. Dimensions shown are based on original plan dimensions. Match existing.
4. Adjust drain as necessary to ensure that the drains are placed at the center of the panels.
5. Match existing bridge cross –slope.

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SHEET 1 OF 2

STATE OF TEXAS
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05/20/2022

Texas Department of Transportation

Bridge Division

REPAIR NO. 11
TRUSS SPAN REDECKING DETAILS
US 87 AT GUADALUPE RIVER

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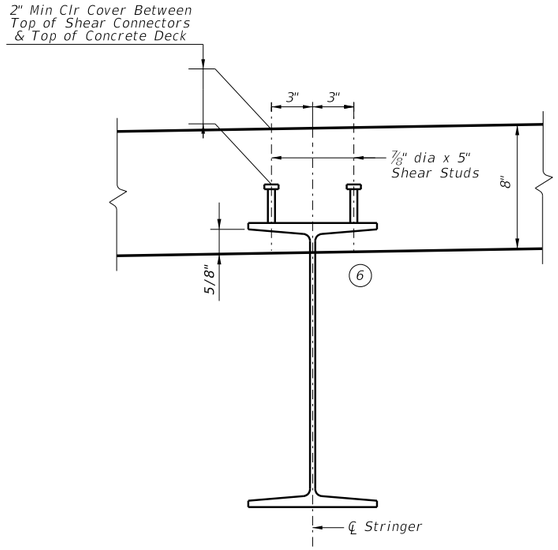
BAR TABLE	
Bar	Size
A	#5
B	#5
D	#5
T	#5

TABLE OF ESTIMATED QUANTITIES

Span	Reinf Conc Slab	Reinforcing Steel (7)
	SF	Lb
Truss	6313	44660
Total	6313	44660

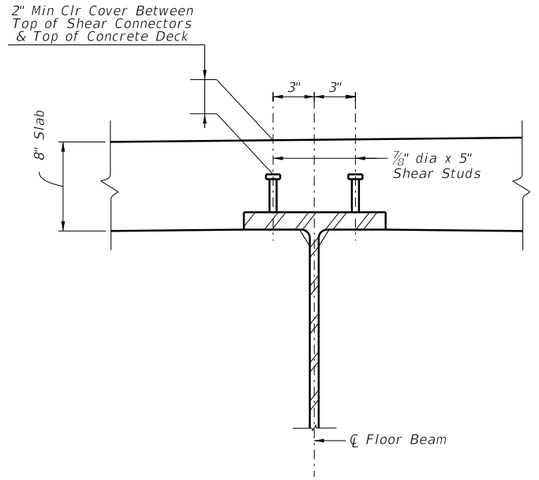
(6) Cast new deck 5/8" below the flanges of existing stringers to maintain cross-slope and uniform deck thickness. See Stringer Details.

(7) Reinforcing steel weight is calculated assuming 7.07 Lbs/Sf.



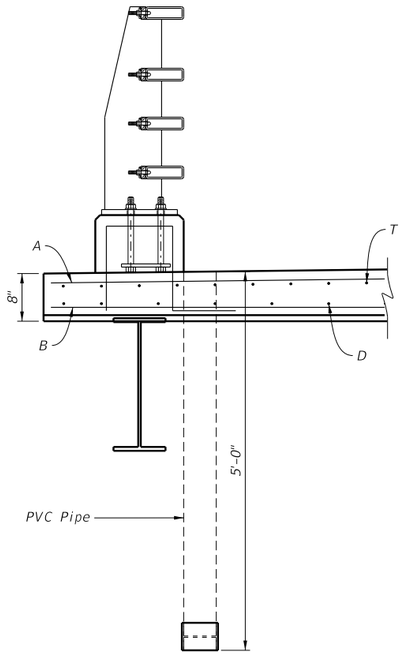
STRINGER SHEAR CONNECTOR DETAIL

Weld studs to the flange in accordance with AWS D1.5



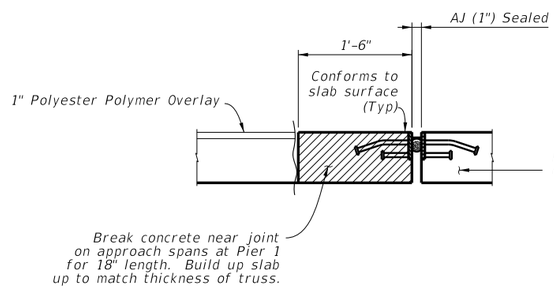
FLOORBEAM SHEAR CONNECTOR DETAIL

Weld studs to the flange in accordance with AWS D1.5

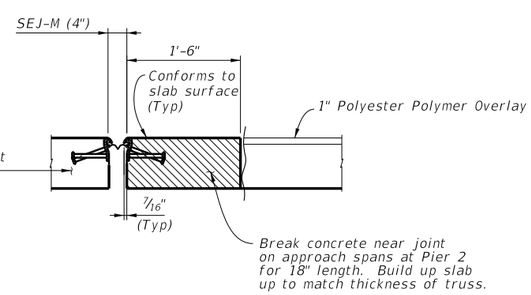


DECK DRAIN/CURB DETAILS

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



AJ SEALED JOINT AT PIER 1



SEJ-M (4") AT PIER 2

Installation Steps for SEJ-M (4") and AJ sealed (1"):

1. Break back approach span existing slab by 18".
2. Rebuild approach span slab to match the riding surface of the new 8" thick slab on both side of the truss.
3. Install expansion joints.
4. See SEJ-M standard for joint at pier 2 for more information. See AJ standard for joint at Pier 1 for more information.

GENERAL NOTES

Provide Class S lightweight concrete (f'c = 4,000 psi) for slab.

Use Grade 60 reinforcing.
Bar laps, where required, will be as follows:
Uncoated ~ #4 = 1'-5"
~ #5 = 1'-9"

Dimensions and member sizes provided are for information only and must be field verified prior to ordering materials.

Use 4" diameter (Sch 40) PVC for deck drains. See Item 481, "Pipe for Drains" for pipe, connections, and solvent welding. Bend reinforcing steel as required to clear PVC by 1". Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material used in Item "446-6030" "Clean and Paint Existing Str (Ref No. 3)".

Install shear studs on stringers and floor beams as indicated in the plans prior to pouring the deck and in accordance with Item 442, "Structural Steel". Payment for shear studs will be in accordance with Item 442.

Payment for deck drains will be subsidiary to Item 422, "Reinforced Concrete Slab."

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05/20/2022

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REPAIR NO. 11
TRUSS SPAN REDECKING DETAILS
US 87 AT GUADALUPE RIVER

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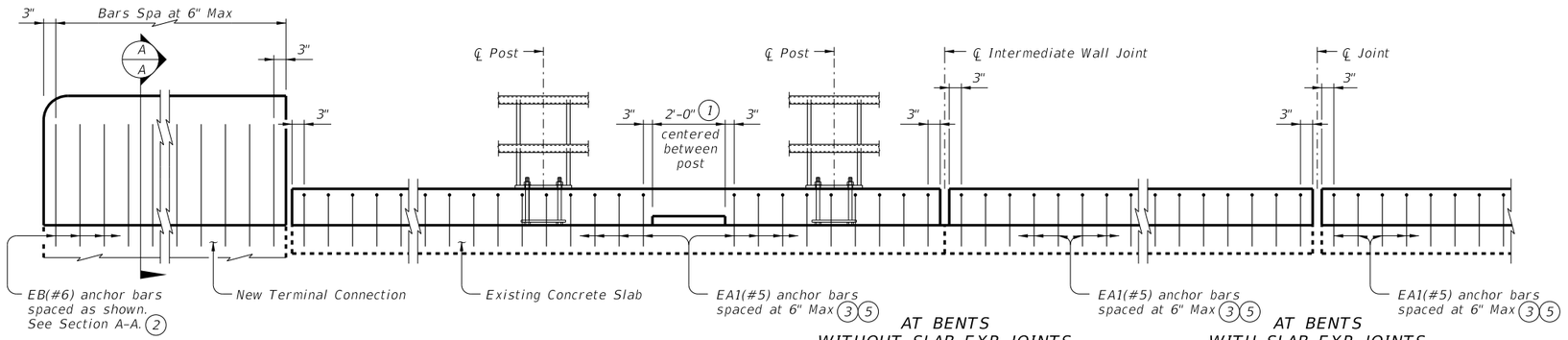


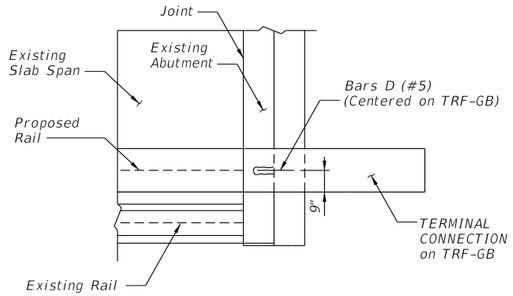
TRF-GRADE BEAM (SEE DETAIL A)

AT BENTS WITHOUT SLAB EXP JOINTS

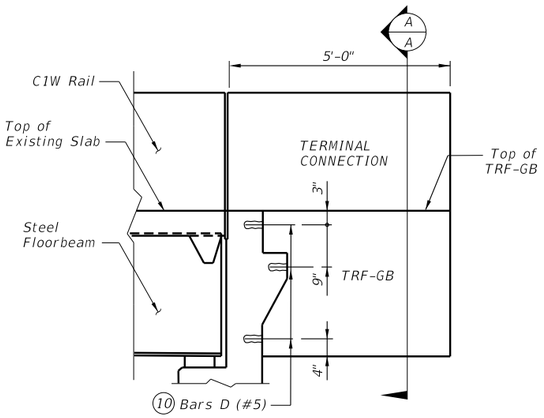
AT BENTS WITH SLAB EXP JOINTS

ROADWAY ELEVATION OF T1W RAIL RETROFIT (4)

(similar to C1W)

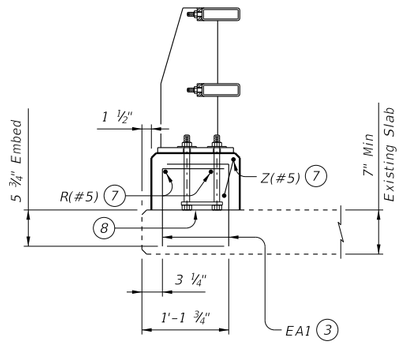


PLAN



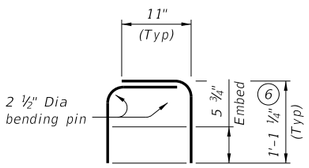
ELEVATION

DETAIL "A" TERMINAL CONNECTION on TRF-GB



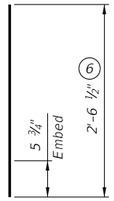
T1W & C1W Rail

Showing T1W Rail, C1W Rail is similar.

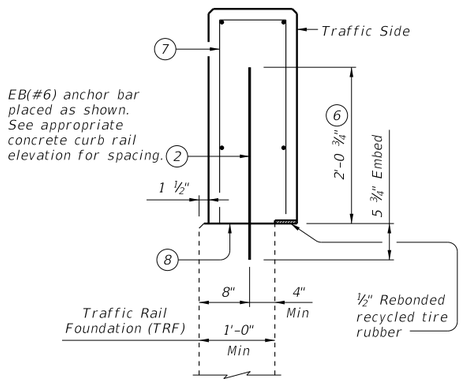


BARS EA1 (#5)

Showing one complete bar.



BARS EB (#6)



SECTION A-A (9)

(Showing rail parapet is at end of T1F Rail and T1W Rail. C1W, similar.)

RAIL RETROFIT SECTIONS ON CONCRETE SLABS USING ADHESIVE ANCHORS (9)

(1) Place optional side slot drains as shown. See appropriate rail standard for side slot drains, except as noted.

(2) Embed EB(#6) anchor bars with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 5 ¾". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

(3) Use drill equipped with depth gauge stop device to keep from drilling through bottom of slab. If hole extends through to bottom of slab, plug bottom of hole prior to placing adhesive anchorage system. Do not drill substitute hole next to drill through hole. Embed EA1(#5) anchor bars with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 5 ¾". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

(4) Showing spacing of adhesive anchors in a rail retrofit condition. Reinforcing steel and terminal connections not shown for clarity. See appropriate rail standard for details and notes not shown.

(5) See C1W Rail Section in "Rail Retrofit Section on Concrete Slabs using Adhesive Anchors".

(6) Increase by amount of existing overlay/seal coat thickness, not to exceed 2". If thickness of existing overlay/seal coat is greater than 2" at toe of rail, taper overlay at a 1:10 or flatter slope over shoulder width to a thickness of 2" or less at toe of rail.

(7) See appropriate rail standard for reinforcing steel.

(8) Do not cast rails or parapet rails on top of overlays/seal coats.

(9) Showing location(s) of anchor bars in a rail retrofit condition. See appropriate rail standard for details and notes not shown.

(10) Embed Bars D (#5), 1'-6" in length, 6" with a Type III Class C Epoxy anchorage system. Follow manufacturer's directions for installing the epoxied anchor bars. Place Bars D (#5) as shown.

CONSTRUCTION NOTES:

Field verify dimensions before commencing work and ordering materials.

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if required elsewhere.

(#6) and (#5) anchor bars used for the adhesive anchorage system must not be epoxy coated within the required embedment.

GENERAL NOTES:

Use of these details will result in a railing acceptable for the MASH Test Level indicated on the applicable rail standard.

Removal and replacement of backfill, subgrade, and asphalt or concrete pavement necessary for this installation is considered subsidiary to the rail (TY C1W).

Payment for all details here are subsidiary to the Item Type C1W rail.

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

Texas Department of Transportation — Bridge Division

RETROFIT GUIDE FOR CONCRETE CURB RAILS C1W

CC-RAIL-R (MOD)

05/20/2022

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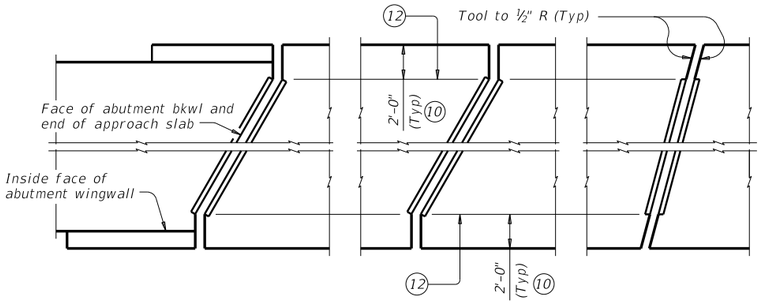
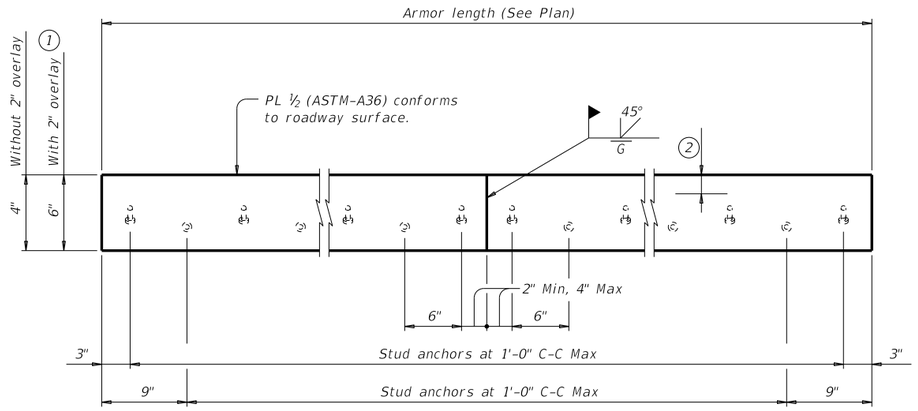


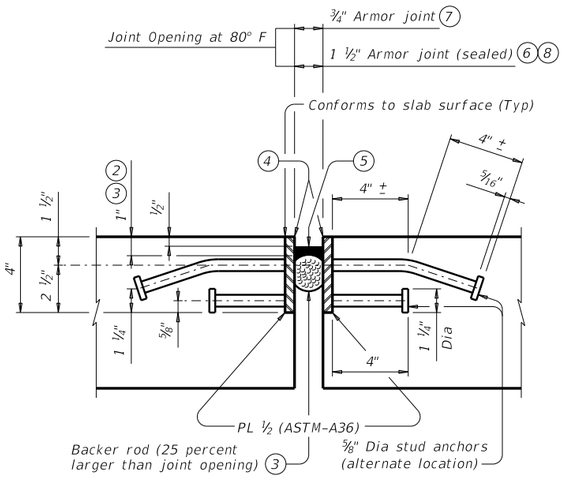
JOINTS AT ABUTMENTS | SKEWS OVER 15° | SKEWS THRU 15°

PLANS OF ARMOR PLATES

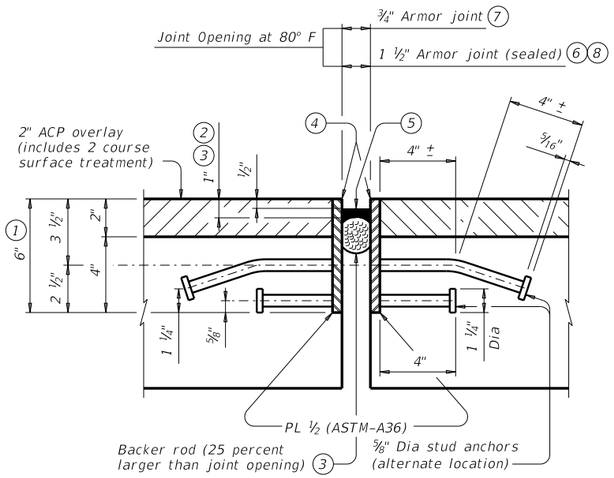


ELEVATION OF BASIC ARMOR PLATE

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



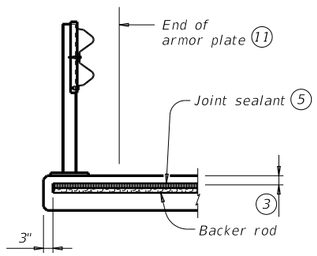
SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION



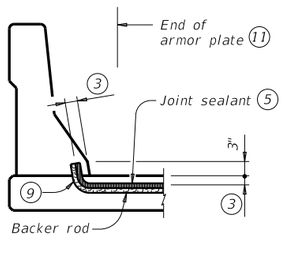
SHOWN WITH 2" OVERLAY AT JOINT LOCATION 1

ARMOR JOINT SECTIONS

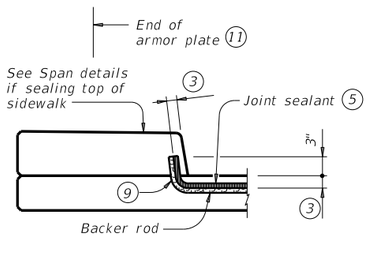
Showing Armor Joint (Sealed)



AT STEEL POST BRIDGE RAIL



AT CONCRETE BRIDGE RAIL



AT SIDEWALK

JOINT SEALANT TERMINATION DETAILS

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

FABRICATION NOTES:

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

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

Weld studs in accordance with AWS D1.1.

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

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

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

CONSTRUCTION NOTES:

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

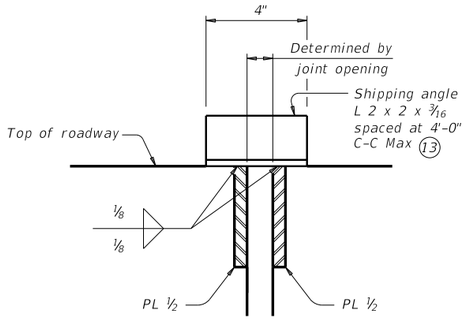
Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

GENERAL NOTES:

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

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

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



SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION
With overlay similar

SHIPPING ANGLE

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

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

Texas Department of Transportation

Bridge Division Standard

ARMOR JOINT DETAILS

AJ

FILE: ajstde01-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DE WITT		71

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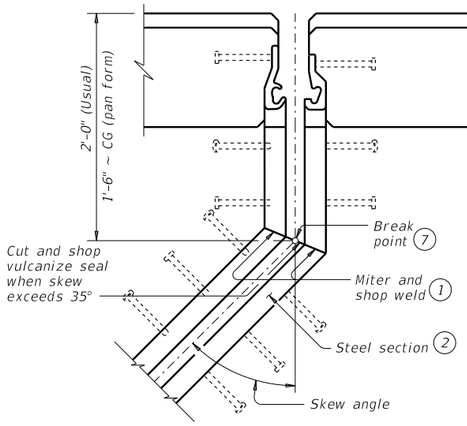
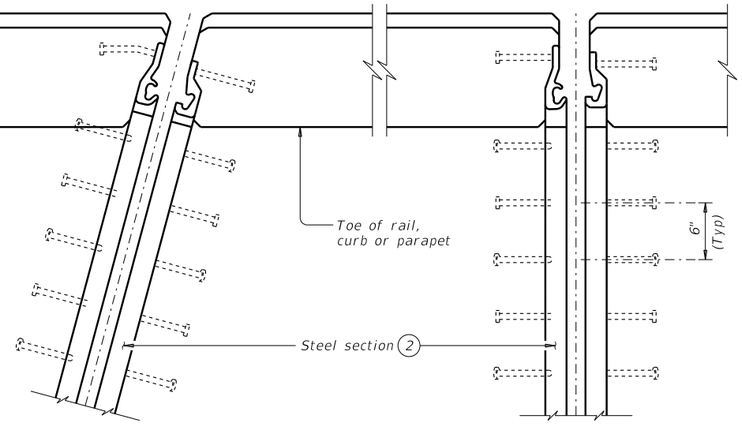


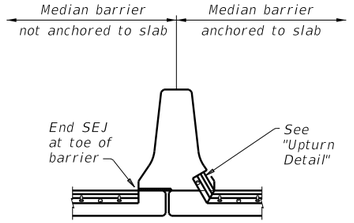
SHOWING SKEWS WITH SLAB BREAKBACKS



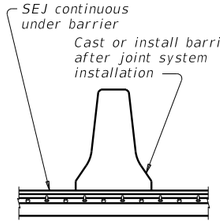
SHOWING SKEWS WITHOUT SLAB BREAKBACKS

SHOWING WITHOUT SKEWS AND SLAB BREAKBACKS

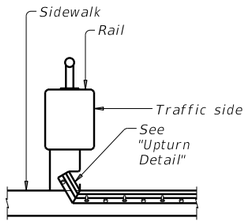
PLANS OF END CONDITIONS



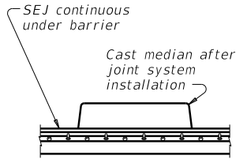
WITH OPEN DECK JOINT BELOW MEDIAN BARRIER



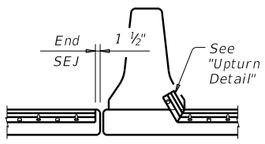
AT MEDIAN BARRIER



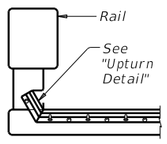
AT SIDEWALK BEHIND BRIDGE RAIL



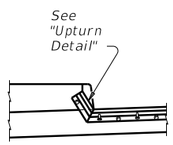
AT RAISED MEDIAN



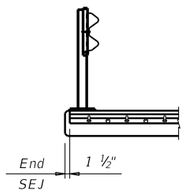
WITH OPEN DECK JOINT ADJACENT TO MEDIAN BARRIER



AT CONCRETE BRIDGE RAIL

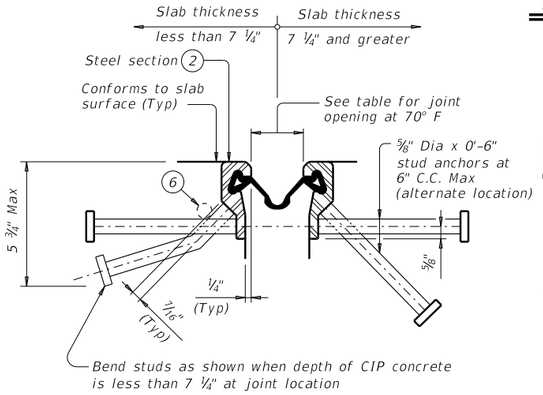


AT SIDEWALK

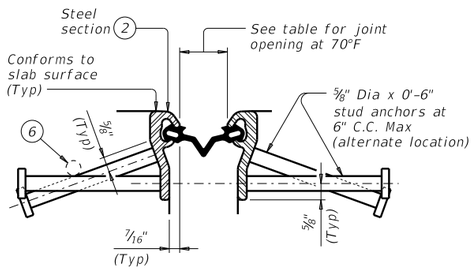


AT STEEL POST BRIDGE RAIL

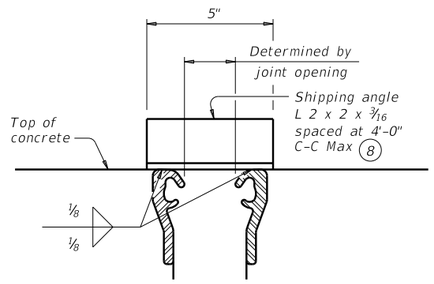
TYPICAL SECTIONS (5)



SECTION THRU WATSON BOWMAN ACME (SE-400 OR SE-500) JOINTS



SECTION THRU D.S. BROWN (A2R-400 OR A2R-XTRA) JOINTS



SHOWING D.S. BROWN (Ty SSCM2)
(All joints are similar.) (Studs are not shown for clarity.)

SHIPPING ANGLE

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

TABLE OF SEALED EXPANSION JOINT INFORMATION

MANUFACTURER	STEEL SECTION (2)	STRIP SEAL			
		4" JOINT		5" JOINT	
		Seal Type	Joint Opening (3)	Seal Type	Joint Opening (3)
D.S. Brown	Type SSCM2	A2R-400	1 ¾"	A2R-XTRA	2"
Watson Bowman Acme	Type R	SE-400	1 ¾"	SE-500	2"

REDUCED LONGITUDINAL MOVEMENT RANGE

SKEW (deg)	JOINT SIZE	
	4"	5"
0	4.0"	5.0"
15	4.0"	5.0"
30	3.5"	4.3"
45	2.8"	3.5"

DESIGN NOTES:

Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations.

For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).

(1) Remove all burrs which will be in contact with seal prior to making splice.

(2) Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.

(3) These openings are also the recommended minimum installation openings.

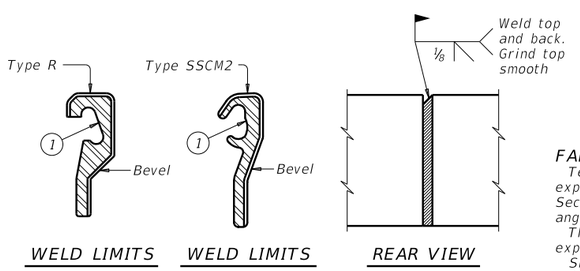
(4) Reduce for sidewalk or parapet heights less than 6".

(5) Other conditions affecting the joint profile should be noted elsewhere.

(6) Move transverse bars that are in conflict with SEJ studs, in either the bridge slab or approach slab, to rest at the junction of the studs.

(7) See Span details for location of break point.

(8) Align shipping angle perpendicular to joint.



WELD LIMITS WELD LIMITS REAR VIEW

FIELD SPLICE DETAIL

FABRICATION NOTES:

Temporarily shop assemble corresponding sections of sealed expansion joints (SEJ), check for fit, and match mark for shipment. Secure corresponding sections together for shipment with shipping angle. Do not use erection bolts.

The seal must be continuous and included in the price bid for sealed expansion joint.

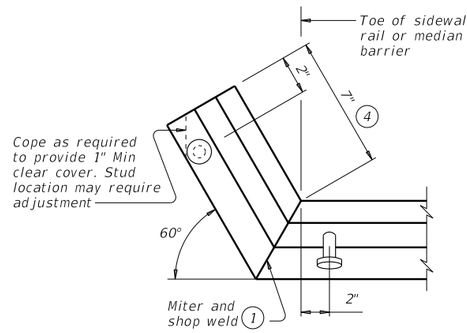
Ship steel sections in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for staged construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min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

Weld studs in accordance with AWS D1.1.

Butt weld all shop and field splices and grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section with System II or IV primer in accordance with Item 446, "Feild Cleaning and Painting Steel", unless required to galvanize when shown in the plans. Provide galvanizing in accordance with Item 445, "Galvanizing". Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Item 446.4.7.3 and 446.4.7.4.

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



UPTURN DETAIL

CONSTRUCTION NOTES:

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

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

Clean and prepare seal cavity for seal installation as per the Manufacturer's installation procedures.

GENERAL NOTES:

Provide sealed expansion joints in the size and at locations shown on the plans.

Minimum slab and overhang thickness required for the use of SEJ-M is 6 ½".

Texas Department of Transportation

Bridge Division Standard

SEALED EXPANSION JOINT TYPE M WITHOUT OVERLAY

SEJ-M

FILE: sejmste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
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	DIST	COUNTY		SHEET NO.
	YKM	DE WITT		72

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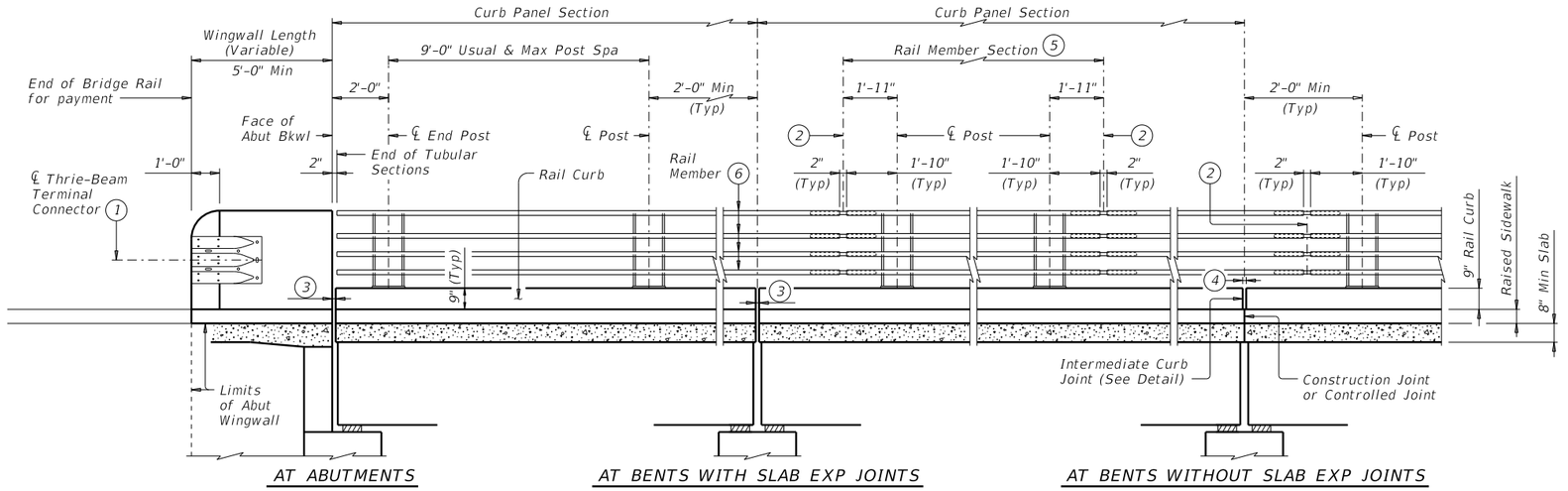
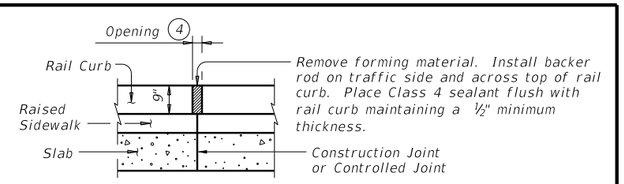


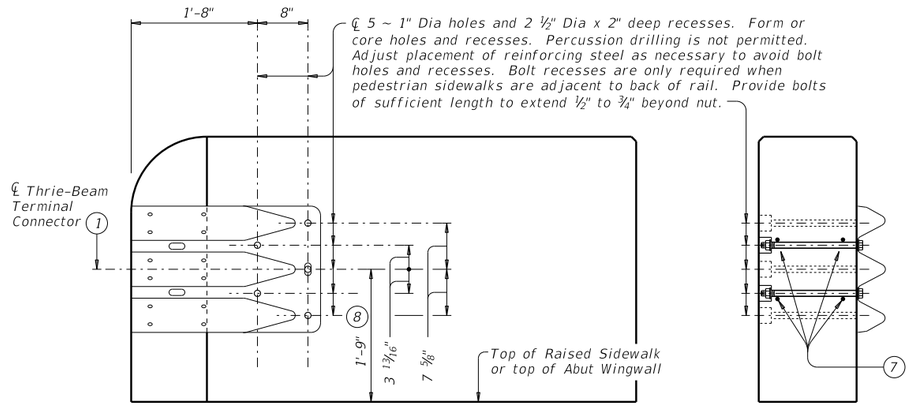
ROADWAY ELEVATION OF RAIL

Showing combination rail on a raised sidewalk.

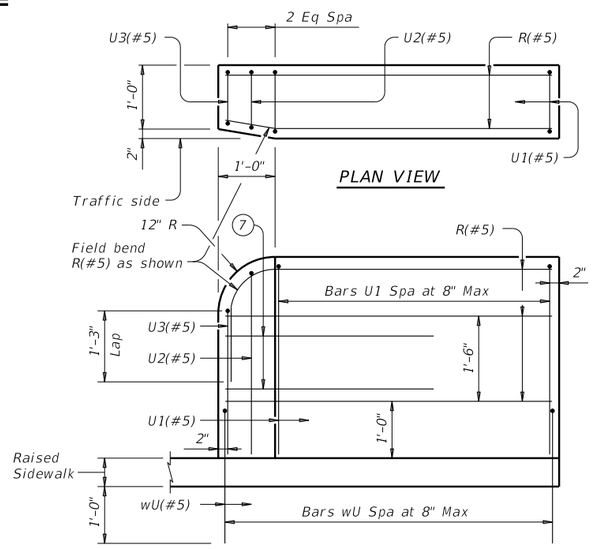


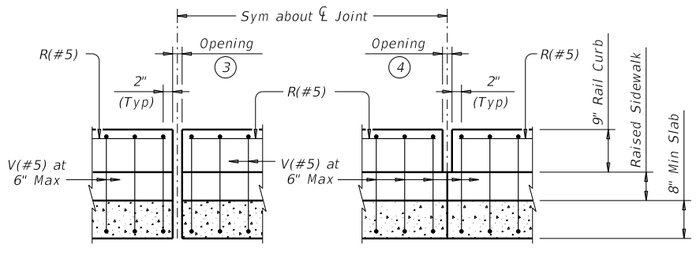
INTERMEDIATE CURB JOINT DETAIL

Provide at all interior bents without slab expansion joints.



TERMINAL CONNECTION DETAILS





ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

Showing with raised sidewalk

1. Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
2. ℄ Expansion Joint or Splice Joint as required.
3. Same as slab joint opening. (5" Max Expansion Joint).
4. ¼" Min, ¾" Max.
5. Rail member sections must have at least two posts but not more than four.
6. HSS 6 x 2 x ¼ (ASTM-A1085 or A500 Grade B).
7. Place 4 additional Bars R(#5) 3'-8" in length inside Bars U(#5) and centered 2'-0" from end of rail when Terminal Connections are required. Field bend as needed.
8. Increase 2" for structures with Overlay.

Texas Department of Transportation

Bridge Division Standard

COMBINATION RAIL

TYPE C1W

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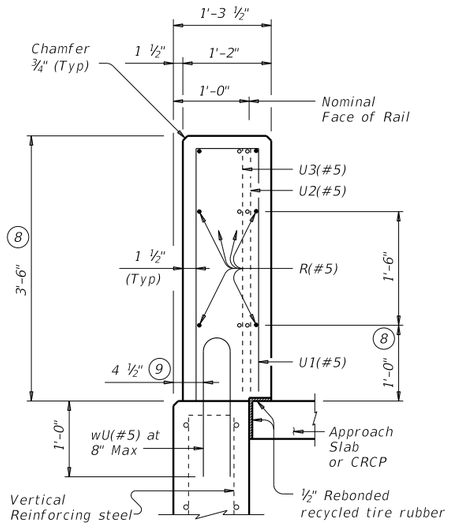
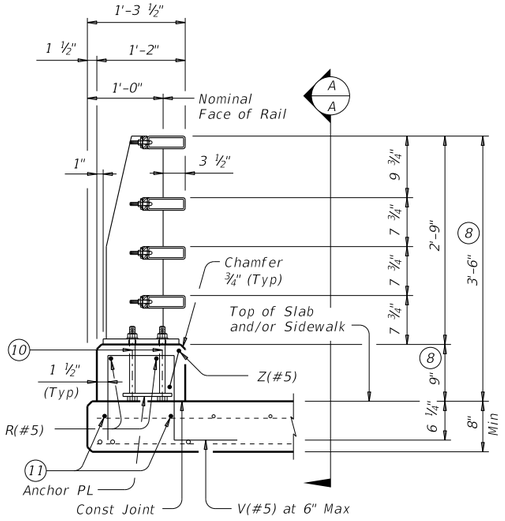
REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DE WITT		73



ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



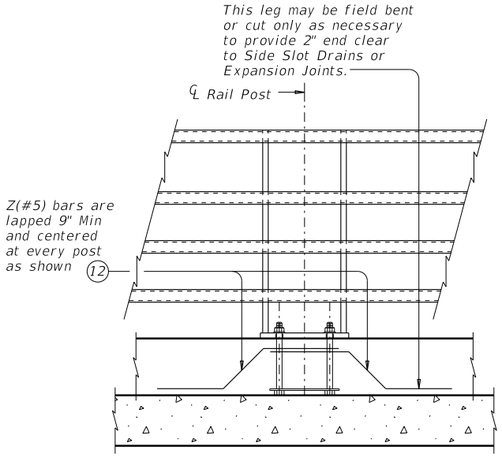
ON BRIDGE SLAB

SECTIONS THRU RAIL WITHOUT RAISED SIDEWALK

ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS

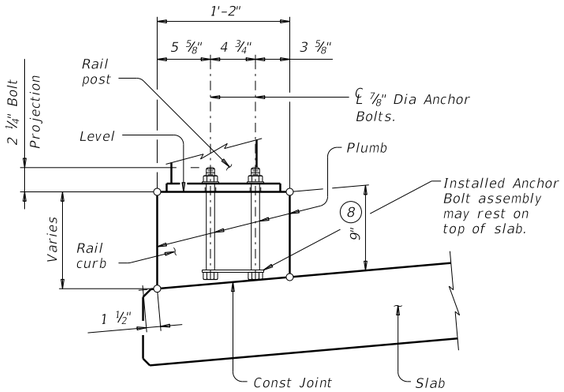
ON BRIDGE SLAB

SECTIONS THRU RAIL WITH RAISED SIDEWALK

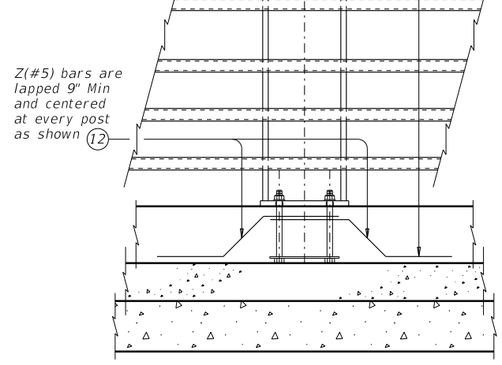


VIEW A-A

Bars V and R omitted for clarity.
Showing without raised sidewalk.



WITHOUT RAISED SIDEWALK



VIEW B-B

Bars V and R omitted for clarity.
Showing with raised sidewalk.

WITH RAISED SIDEWALK

RAIL CURB FORMING DETAIL

Reinforcing steel and rail curb chamfers not shown for clarity.

(8) Increase 2" for structures with Overlay.

(9) 5 ¼" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.

(10) ℄ ⅞" Dia Anchor Bolts. See "Anchor Bolt Assembly Details".

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

(12) Adjust Bars Z(#5) as necessary to avoid Bars V(#5).

(13) Raised Sidewalk.

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Bridge Division Standard

COMBINATION RAIL

TYPE C1W

FILE: rlstd017-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
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REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DE WITT		74

DATE: 05/04/2022 09:18 AM
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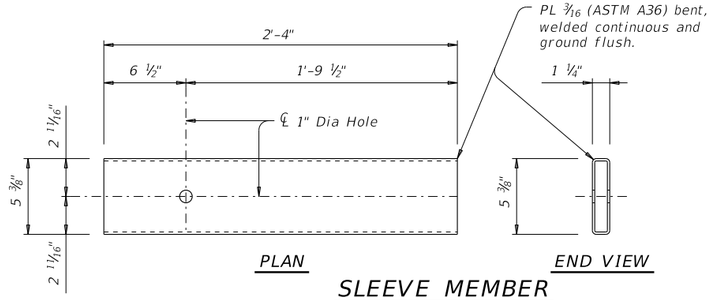
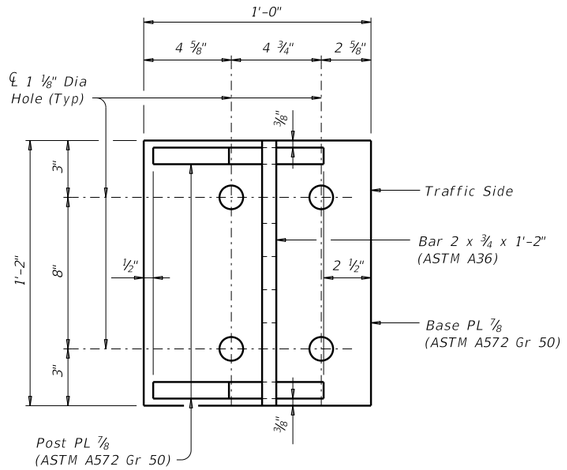
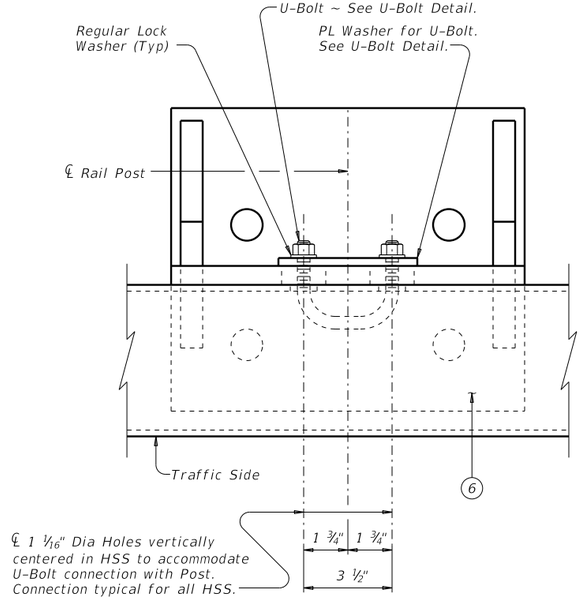


SLEEVE MEMBER



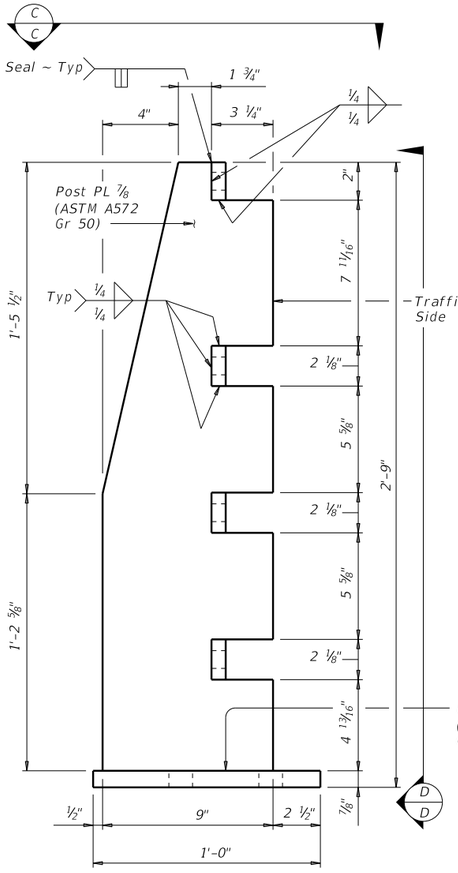
VIEW C-C

(Showing Hole location in Base PL)

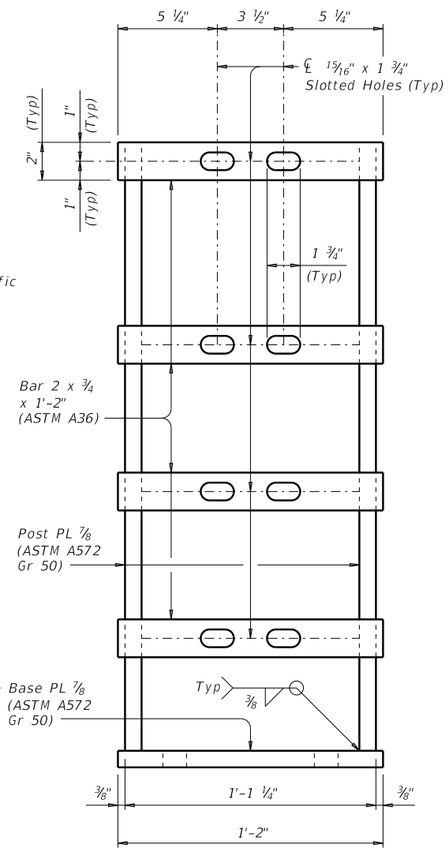


TOP VIEW OF RAIL POST

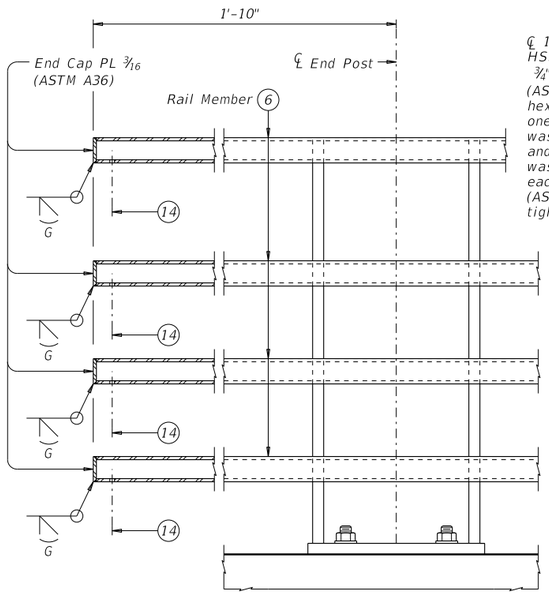
(Showing connection for rail post and HSS.)



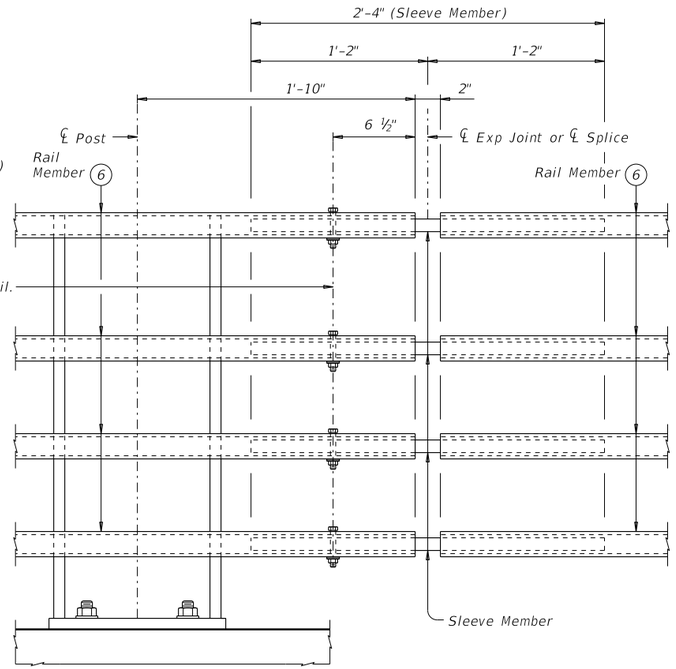
POST DETAIL



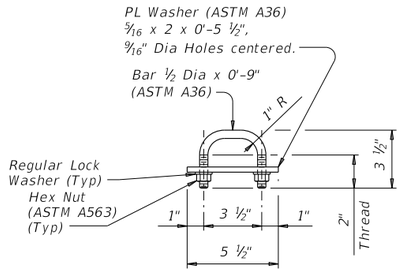
VIEW D-D



END CAPS ON HSS AT END POST



EXPANSION JOINT OR SPLICE



U-BOLT DETAIL

(Showing U-Bolt for rail post and HSS.)

⑥ HSS 6 x 2 x ¼ (ASTM A1085 or A500 Grade B).

⑭ ℄ ⅜" Dia Drain Hole in bottom of HSS.

SHEET 3 OF 4

Texas Department of Transportation

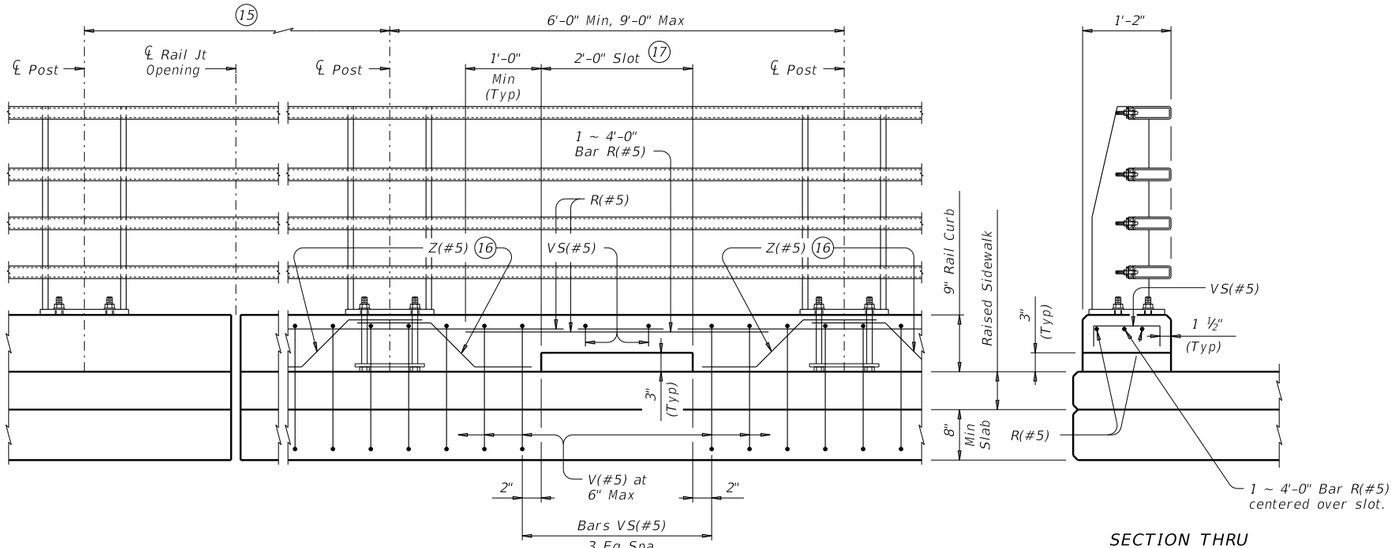
Bridge Division Standard

COMBINATION RAIL

TYPE C1W

FILE: rlstd017-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DE WITT		75

DATE: 05/04/2022 09:18 AM
FILE: DOCUMENT NAME

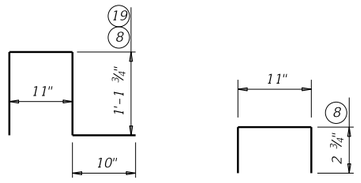


ELEVATION

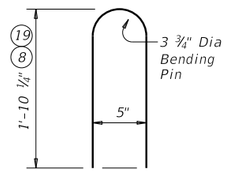
SECTION THRU SIDE SLOT DRAIN

OPTIONAL SIDE SLOT DRAIN DETAILS 18

Showing side slot drain on raised sidewalk, without raised sidewalk similar.



BARS V(#5) BARS VS(#5)



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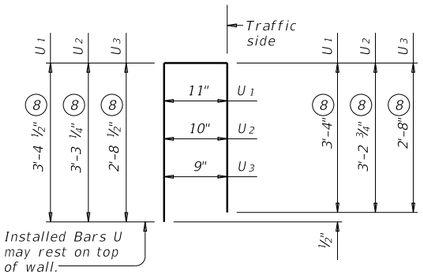
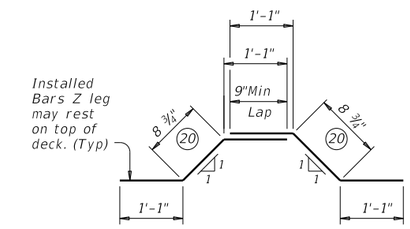


BARS U(#5)



BARS Z(#5)

CONSTRUCTION NOTES:

The face of tubular sections and rail curb must be plumb unless otherwise approved by the Engineer. Steel posts must be square to the top of curb. Use Type VIII epoxy mortar under post base plates if gaps larger than 1/16" exist.

Bend tubes to required radius for curved rails. Shop drawings for approval are required for curved rails.

One shop splice per rail member section is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

Round or chamfer exposed edges of rail members and rail posts must be rounded or chamfered to approximately 1/16" by grinding.

Chamfer all exposed concrete corners.

MATERIAL NOTES:

Provide ASTM A1085 or A500 Gr B for all HSS.

Provide Grade 60 reinforcing steel.

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

Galvanize all metal components of steel rail system. Apply additional coatings when shown elsewhere on the plans. When plans require paint over gavanizing, follow the requirements for painting galvanized steel in Item 445, "Galvanizing" and when field painting, Item 446, "Field Cleaning and Painting Steel". Sleeve members and anchor bolts must receive galvanization prior to installation and only field paint after installation unless directed otherwise by Engineer.

Provide 7/8" Dia ASTM F3125 Gr A325 or A449 bolts (or ASTM A193 Gr B7 or F1554 Gr 105 threaded rods with one tack welded heavy hex nut each) with one hardened steel washer (ASTM F436) placed under each heavy hex nut that conforms to ASTM A563 requirements.

Provide ½" Dia round bar U-bolts (ASTM A36) with plate washer (ASTM A36) and regular lock washers placed under hex nuts that conform to ASTM A563 requirements. See "U-Bolt Detail".

Provide Class "S" concrete. When Class "S" concrete for slab is HPC, include a minimum of 3 gallons of calcium nitrite inorganic corrosion inhibitor per cubic yard of Class "S" concrete.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #5 = 2'-0"
Epoxy coated ~ #5 = 3'-0"

GENERAL NOTES:

This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

This railing cannot be used on bridges with expansion joints providing more than 5" movement or on cast-in-place retaining walls, unless otherwise noted.

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

Submit erection drawings showing panel lengths, rail post spacing, and anchor bolt setting, to the Engineer for approval.

Average weight of railing with no overlay:

205 plf total
131 plf (Conc)
74 plf (Steel).

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

PLAN OF ANCHOR PLATE

ELEVATION

ANCHOR BOLT ASSEMBLY DETAILS

PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

ANCHOR BOLT OPTIONS

(Showing Anchor Bolts for Base Plate)

8 Increase 2" for structures with Overlay.

15 Side slot drains are not allowed in areas where there is a joint in the concrete curb between rail posts.

16 Bars Z(#5). See "Section Thru Rail" and "View A-A or B-B" for Bar Z placement and spacing.

17 Center side slot drain between posts within the limits shown.

18 Side slot drains may be used where shown elsewhere on the plans or as directed by the Engineer. Do not place drains over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway and a sidewalk, side slot drains are not permitted.

19 For raised sidewalks, add sidewalk height to total bar height. Use sidewalk height at rail's location.

20 Increase 2 ¾" for structures with Overlay.

Texas Department of Transportation

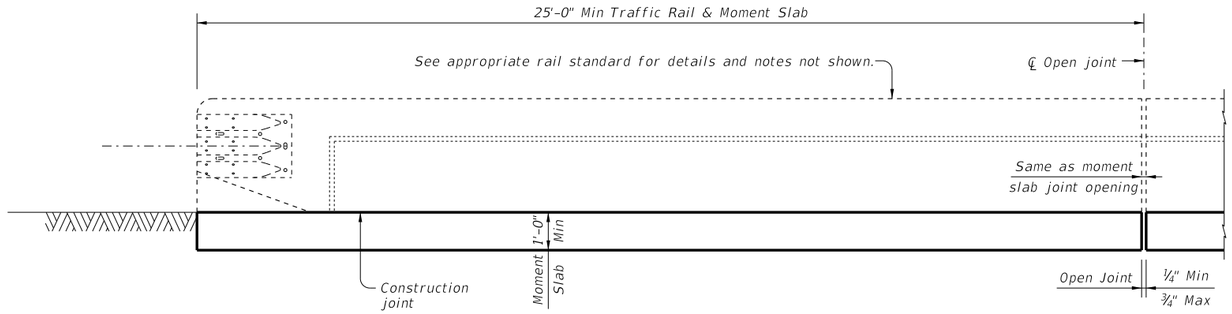
Bridge Division Standard

COMBINATION RAIL

TYPE C1W

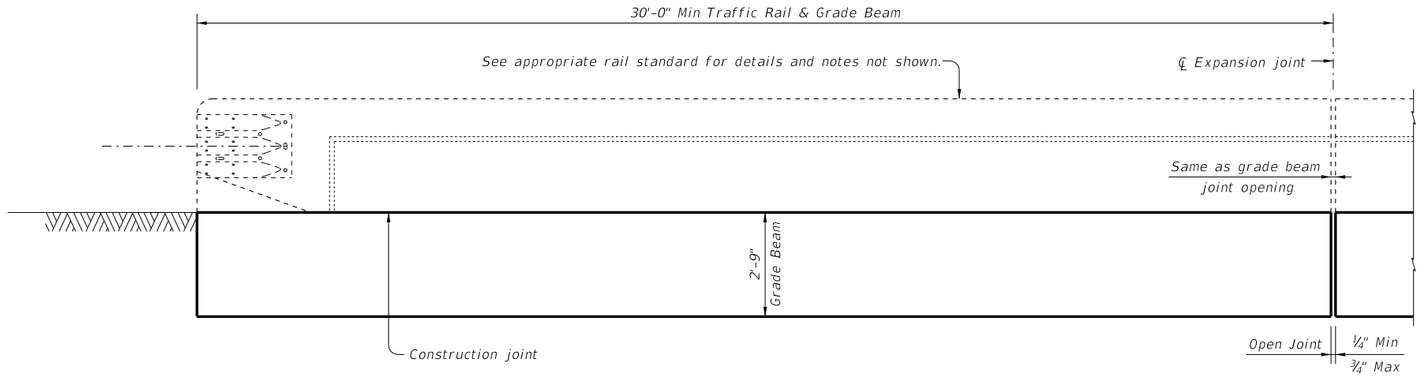
FILE: rlstd017-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DE WITT		76

DATE: 05/04/2022 09:18 AM
FILE: DOCUMENT NAME



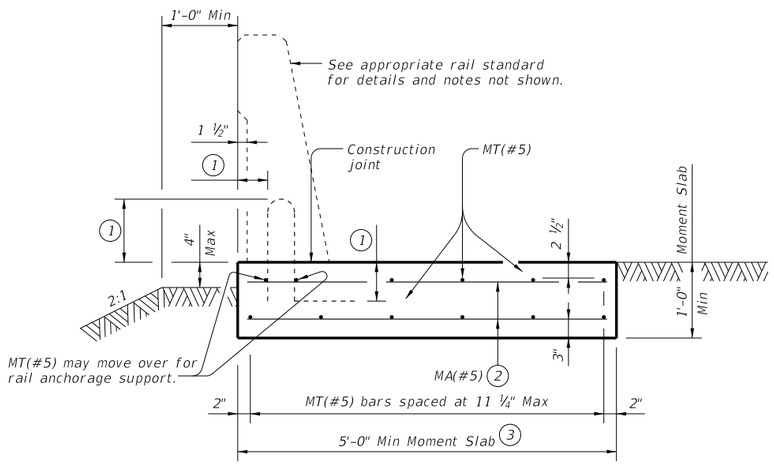
ROADWAY ELEVATION OF TRAFFIC RAIL ON MOMENT SLAB (TRF-MS)

(Showing SSTR rail other rails are similar. Reinforcing not shown for clarity.)



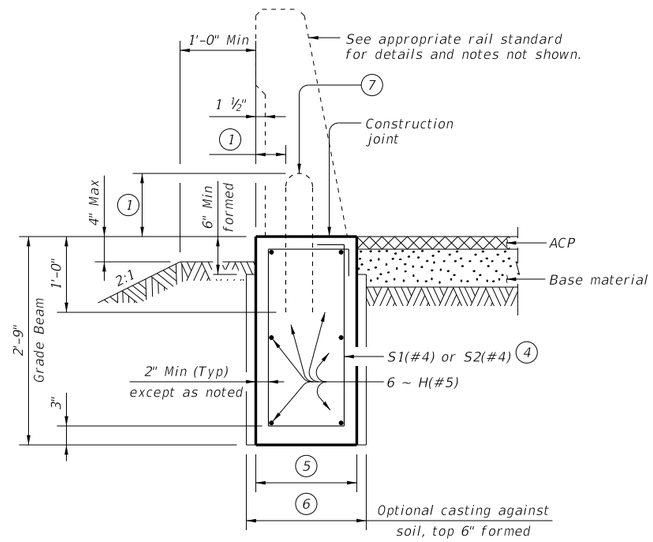
ROADWAY ELEVATION OF TRAFFIC RAIL ON GRADE BEAM (TRF-GB)

(Showing SSTR rail other rails are similar. Reinforcing not shown for clarity.)



SECTION OF TRAFFIC RAIL ON MOMENT SLAB (TRF-MS)

(Showing SSTR rail other rails are similar.)



SECTION OF TRAFFIC RAIL ON GRADE BEAM (TRF-GB)

(Showing SSTR rail other rails are similar.)

1 See applicable bridge rail standard.

2 MA(#5) space longitudinally along moment slab at 12" Max.
(Spaced 2 ½" longitudinally from outside edge of moment slab).

3 Approximate moment slab concrete = 0.19 CY/LF and reinforcement = 22.4 LB/LF.

4 S1(#4) or S2(#4) spaced longitudinally along grade beam at 8" Max.
(Spaced 2 ½" longitudinally from outside edge of grade beam).

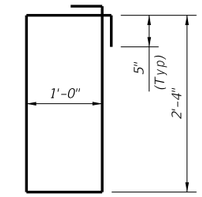
5 Use bar S1(#4) with 1'-4" grade beam width and bridge rail types: All rails except for T224, C412, T66, C66, T80HT and T80SS.
Approximate grade beam concrete = 0.14 CY/LF and reinforcement = 13.8 LB/LF.

Use bar S2(#4) with 1'-7" grade beam width and bridge rail types: T66 and C66.
Approximate grade beam concrete = 0.16 CY/LF and reinforcement = 14.2 LB/LF.

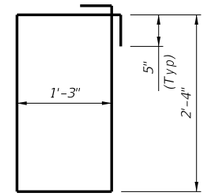
6 1'-6" for bridge rail types: All rails except for T224, C412, T66, C66, T80HT and T80SS.

1'-9" bridge rail types: T66 and C66.

7 Modify reinforcing on standard bridge rail anchorage if necessary by extending rail anchorage 12" Min, vertically into traffic rail



BARS S1(#4)



BARS S2(#4)

CONSTRUCTION NOTES:

Align moment slab (TRF-MS) or grade beam (TRF-GB) open joints with rail open joints maintaining no less than minimum rail length. Provide moment slab (TRF-MS) or grade beam (TRF-GB) with open joints at no greater than 100' spacing unless otherwise shown on the plans or approved by the Engineer.

MATERIAL NOTES:

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

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if required elsewhere.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for bars S1(#4), S2(#4) and H(#5) unless noted otherwise. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:
Uncoated or galvanized ~ #5 = 2'-4"
Epoxy coated ~ #5 = 3'-6"

GENERAL NOTES:

Use of these details will result in a moment slab (TRF-MS) or grade beam (TRF-GB) foundation that is acceptable for traffic rails which are MASH TL-2, TL-3, or TL-4 compliant.

See elsewhere in the plans for selected options between moment slab (TRF-MS) and/or grade beam (TRF-GB).

The foundation design resistance is based on the current AASHTO bridge railing requirements with the assumption of fair to good soil support conditions. Poor soil conditions will require suitably deeper and/or wider foundations.

See appropriate rail standard for details and notes not shown.

This detail is intended for use as a guide to unusual railing anchorage situations but may be included in the plans, modified as necessary to apply to specific installations required on the project.

Payment for moment slab (TRF-MS) and/or grade beam (TRF-GB) will be by Class "C" concrete or Class "C" (HPC) concrete for rail foundations.

The associated bridge railing will be paid for by the linear foot which includes the concrete and reinforcement.

Excavation will be subsidiary to other Items.

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

Texas Department of Transportation

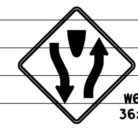
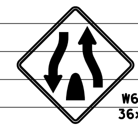
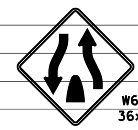
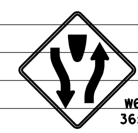
Bridge Division Standard

TRAFFIC RAIL FOUNDATIONS
FOR MASH TL-2, TL-3 & TL-4 BRIDGE RAILS

TRF

FILE: rlstd027-20.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
07-20: Added moment slab with rail foundation lengths.	DIST	COUNTY		SHEET NO.
	YKM	DE WITT		77

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX): POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED P = "Plain" T = "T" U = "U"	MOUNTING DESIGNATION: 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
3	1	W6-1	 W6-1 36x36	36 X 36			TWT	1	WS	P		
4	2	W6-2	 W6-2 36x36	36 X 36			TWT	1	WS	P		
5	3	W6-2	 W6-2 36x36	36 X 36			TWT	1	WS	P		
5	4	W6-1	 W6-1 36x36	36 X 36			TWT	1	WS	P		

ALUMINUM SIGN BLANKS THICKNESS

Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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

NOTE:

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

DATE: 05/05/2022 04:15 AM
FILE: pw:\\txdot.projectwiseonline.com:TxDOT4\Documents\13 - YKM\Design Projects\[illegible]

Texas Department of Transportation — Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT 0143	SECT 08	JOB 098	HIGHWAY US 87
REVISIONS 4-16 8-16	DIST YKM	COUNTY DE WITT		SHEET NO. 78

DATE: 5/6/2022 6:17:42 AM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT4\Documents\13 - YKM\Design Projects\0143080984 - Design\Plan Set\8. Traffic\STDRD\SGN\smdgen.dgn

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

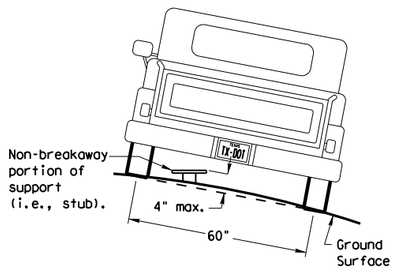
Anchor Type

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

Sign Mounting Designation

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

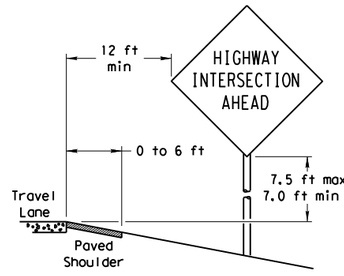
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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

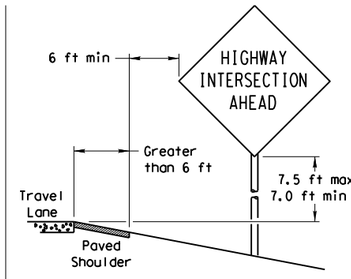
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

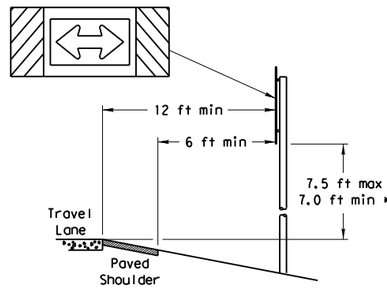
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



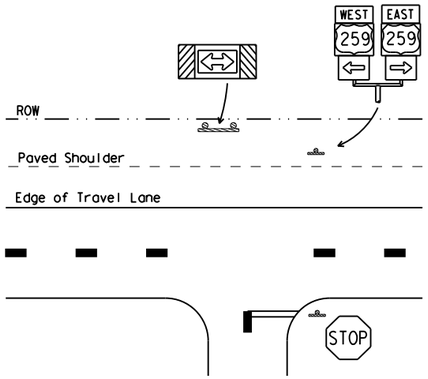
GREATER THAN 6 FT. WIDE

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

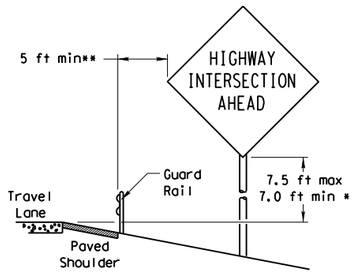
T-INTERSECTION



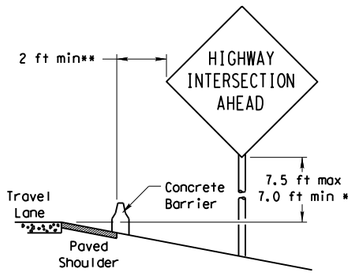
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



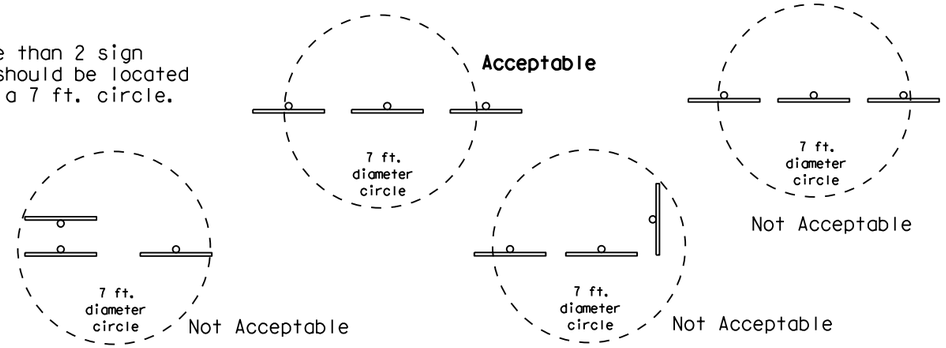
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

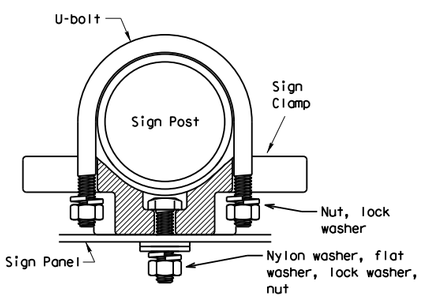
**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

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



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

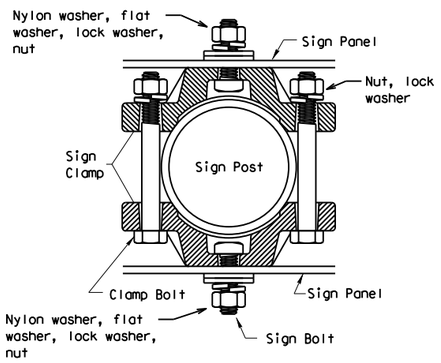


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

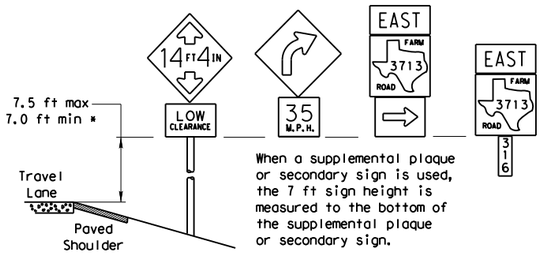
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



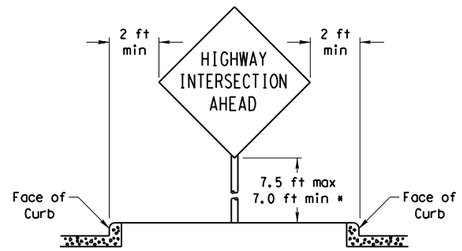
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



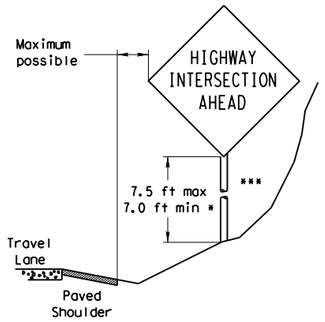
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

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

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

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

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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

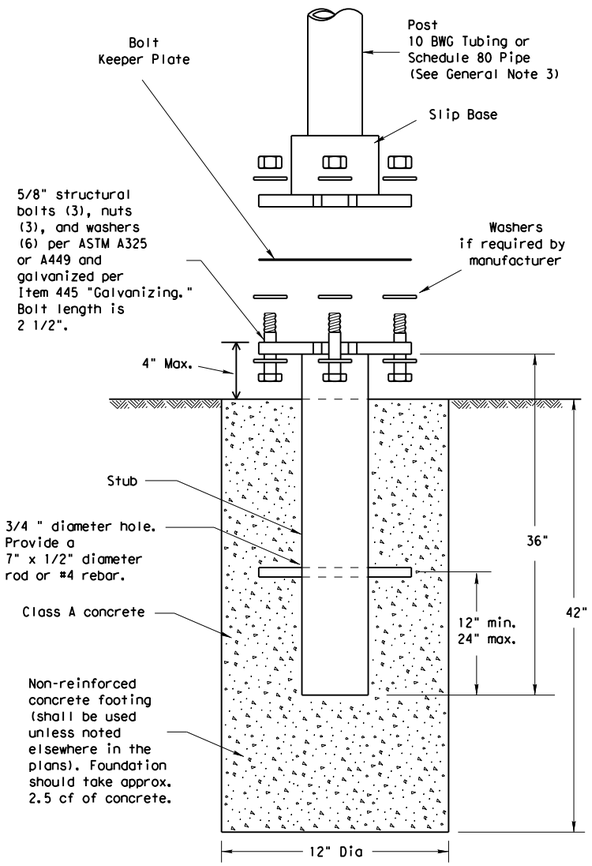
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87
DIST	COUNTY		SHEET NO.
YKM	DEWITT		79

DATE: 5/6/2022 6:17:39 AM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT4\Documents\13 - YKM\Design Projects\0143080984 - Design\Plan Set\8. Traffic\STDRD*SGN\smdsl.dgn

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

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

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

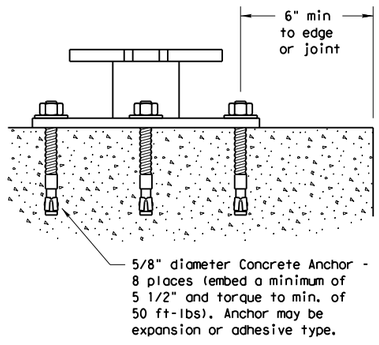
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

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

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

CONCRETE ANCHOR



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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

9-08 REVISIONS

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DIST	COUNTY	SHEET NO.
YKM	DEWITT	80

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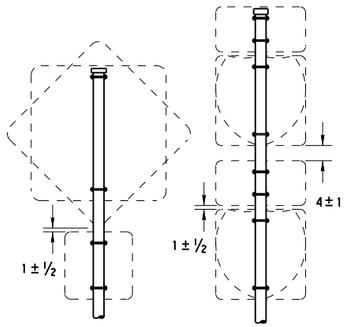
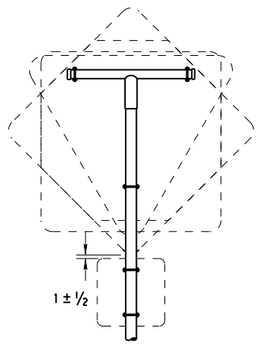
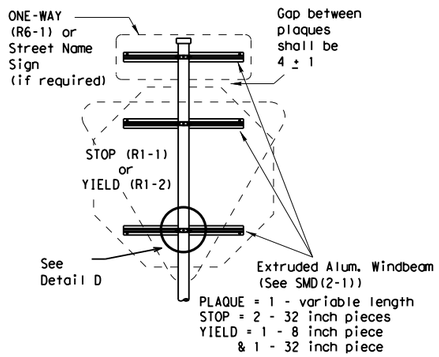


SM RD SGN ASSM TY XXXXX(1)XX(P)

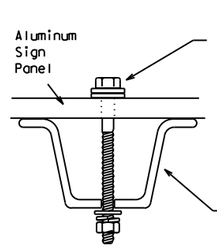


SM RD SGN ASSM TY XXXXX(1)XX(T)



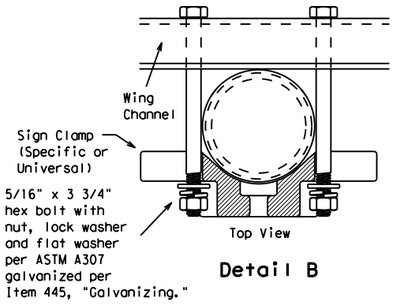
PLAQUE = 1 - variable length
STOP = 2 - 32 inch pieces
YIELD = 1 - 8 inch piece
& 1 - 32 inch piece

SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



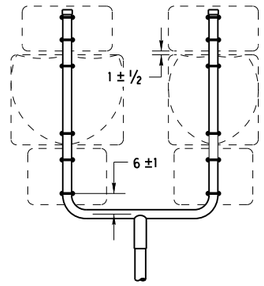
Top View

Detail A

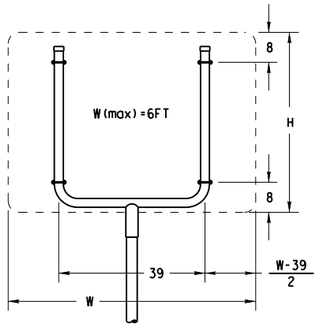


Top View

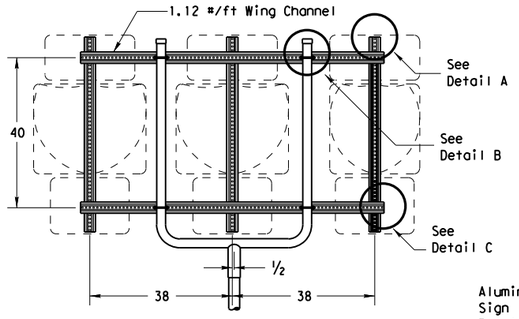
Detail B



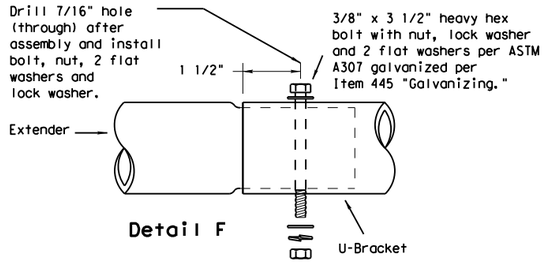
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

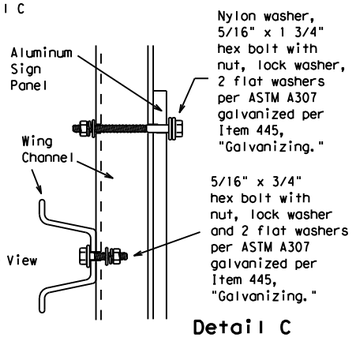


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

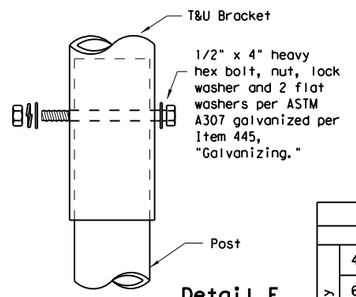


Detail F

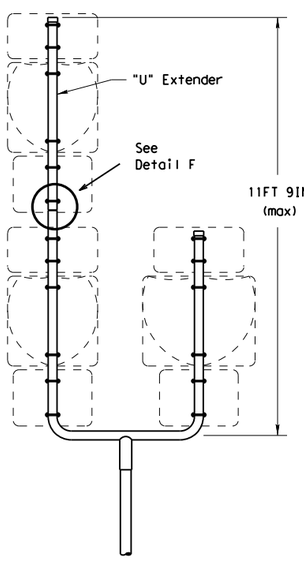
Splices shall only be allowed behind the sign substrate.



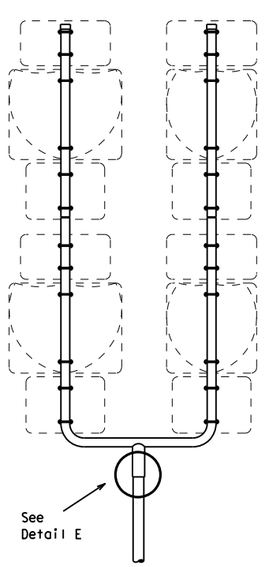
Detail C



Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)



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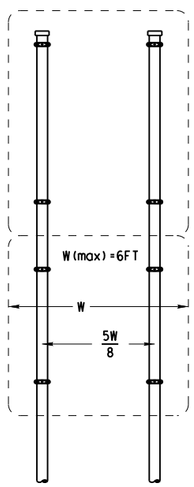
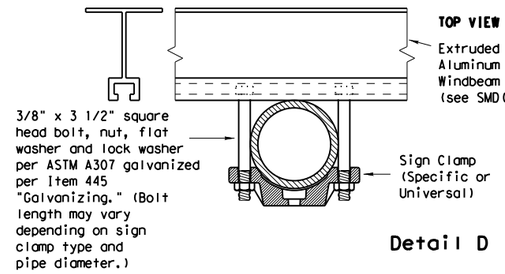
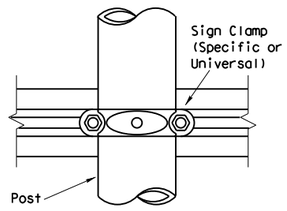


SM RD SGN ASSYM TY XXXXX(2)XX(P)

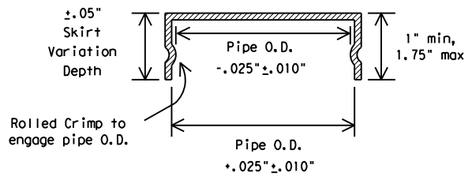
SIDE VIEW



Detail D



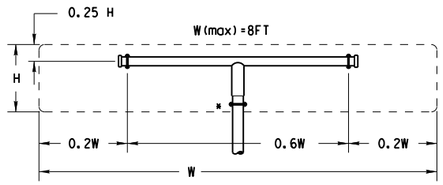
FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.



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

All dimensions are in english unless detailed otherwise.

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)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87

DIST	COUNTY	SHEET NO.
YKM	DEWITT	81

9-08 REVISIONS

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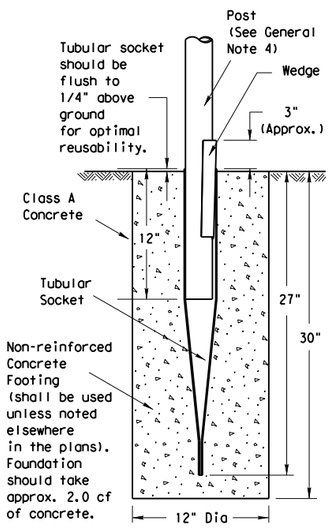
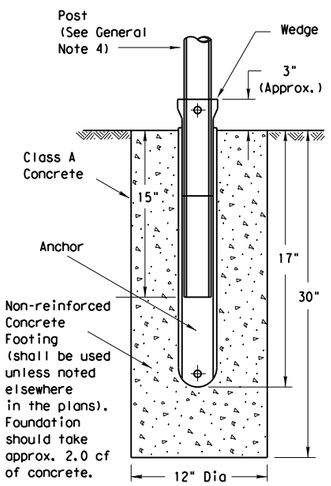
Wedge Anchor Steel System



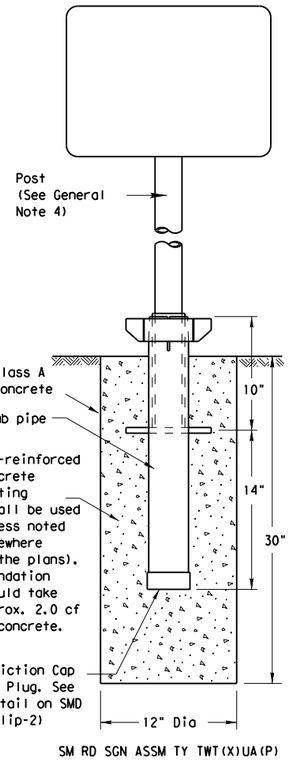
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

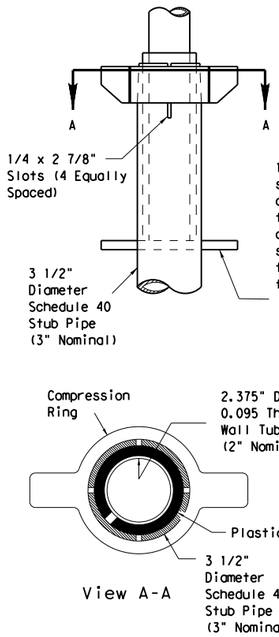


SMD RD SGN ASSM TY TWT(X)WP(X)

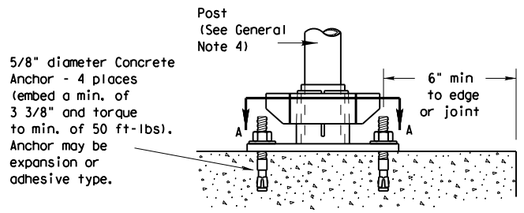
Universal Anchor System with Thin-Walled Tubing Post



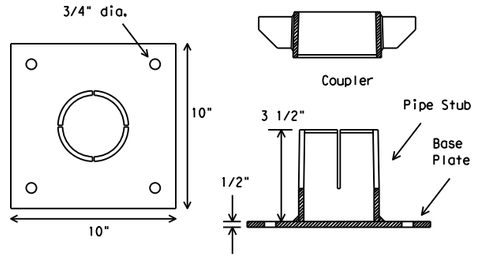
SM RD SGN ASSM TY TWT(X)UA(P)



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.

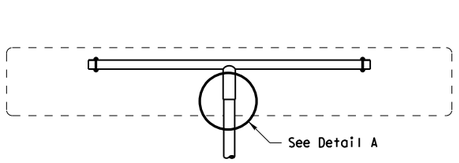


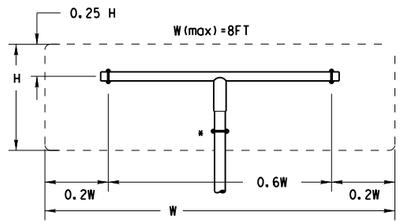
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized 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, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



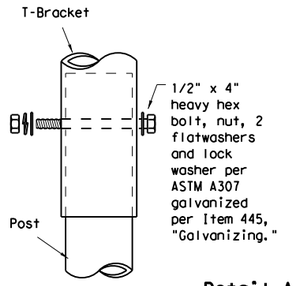
SM RD SGN ASSM TY TWT(X)UB(P)

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





SM RD SGN ASSM TY TWT(X)XX(T)
(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

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

GENERAL NOTES:

1. 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.
2. 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.
3. 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
4. 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 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
   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.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. 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

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. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

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. Insert base post in hole to depths shown and backfill hole with concrete.
3. 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.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

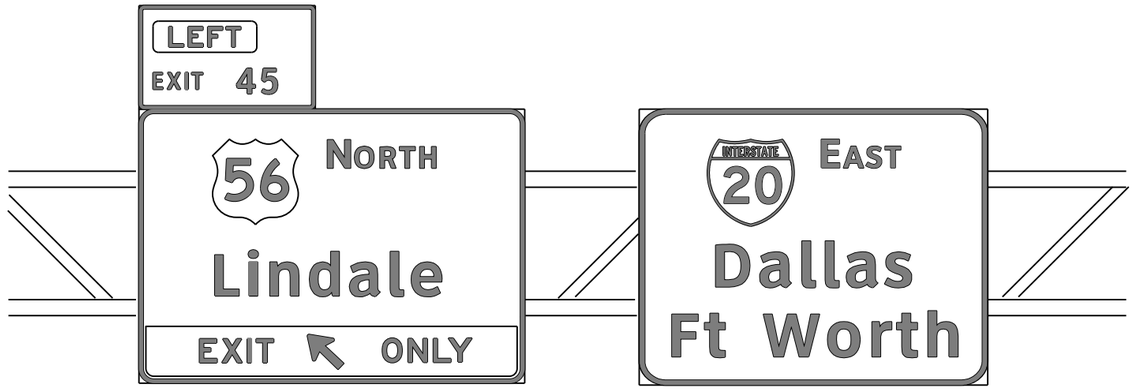
SMD(TWT)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DEWITT		82

REQUIREMENTS FOR OVERHEAD AND LARGE GROUND-MOUNTED SIGNS

TYPICAL EXAMPLES



GENERAL NOTES

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

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

3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be cut-out white sheeting applied to colored background sheeting.
6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius need not be trimmed or rounded if fabricated from an extruded material.
7. Sign substrate for ground-mounted signs shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative. Sign substrate for overhead signs shall be any material that meets DMS-7110. Exit Number Panels attached above the parent sign shall be made with the same substrate and sheeting as the parent sign.
8. Mounting details of attachments to parent sign face are shown on Standard Plan Sheet TSR(5). Mounting details of exit number panels above parent sign are shown in the "SMD series" Standard Plan Sheets.
9. Background sheeting shall be applied to the substrate per sheeting manufacturer's recommendations. Sheeting will not be allowed to bridge the horizontal gap between panels.
10. Cut all legend, symbols, borders, and direct applied sign attachments at panel joints.

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/

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

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(1)-13

FILE: tsr1-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	YKM	DE WITT		82A

DATE: 6/1/2022 11:09:25 AM
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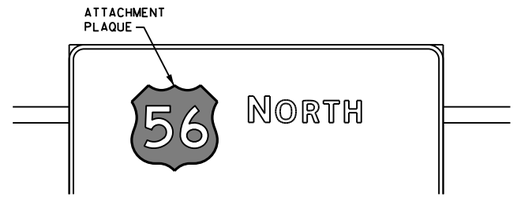
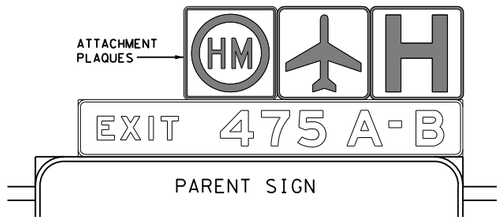
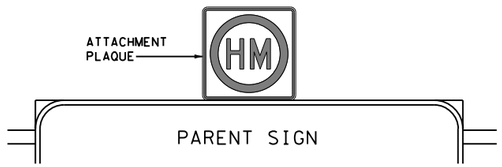
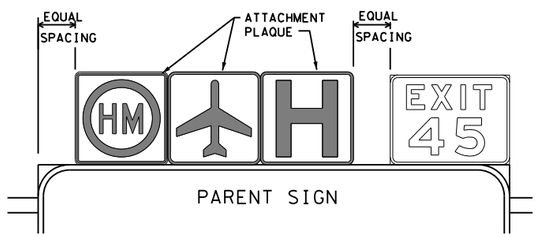
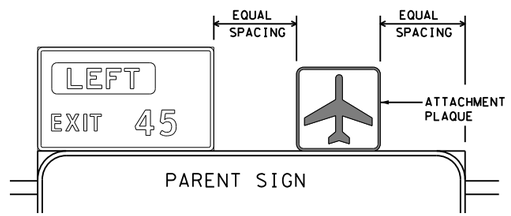
REQUIREMENTS FOR ATTACHMENTS TO OVERHEAD AND LARGE GROUND MOUNTED SIGNS











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

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

GENERAL NOTES

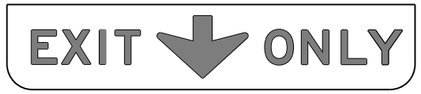
1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Route Marker legends (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod, or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to white background sheeting, or combination thereof.
7. Route markers and other attachments within the parent sign face shall be direct applied unless otherwise specified in the plans. Attachments not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
8. General Service Plaques shall be 0.080 inch thick and Routing Plaques shall be 0.100 inch thick.
9. The priority for Routing Plaques shall be (left to right) Hazardous Material, Airport then Hospital. See examples for mounting location.
10. Mounting details of attachments to parent signs face are shown on Standard Plan Sheet TSR(5). Mounting details of sign plaque attachments above and below parent sign are shown in the "SMD series" Standard Plan Sheets.
11. Plaques shall be horizontally centered at the top of the parent sign. If an exit number panel exists, the plaque shall be centered between the edge of the parent sign and the edge of the exit number panel. The plaque may be placed above the exit number panel when there is insufficient space.

TYPICAL EXAMPLES

REQUIREMENTS FOR EXIT ONLY AND LEFT EXIT PANELS

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

SHEETING REQUIREMENTS FOR OVERHEAD EXIT PANELS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLUORESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND	BLACK	ACRYLIC NON-REFLECTIVE FILM



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD). Individual panel sizes shown in the plans may be adjusted to fit actual parent sign sizes if necessary.
2. Exit Panel legend shall use the Federal Highway Administration (FHWA)Standard Highway Alphabets E Series.
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend shall be applied by screening process or cut-out acrylic non-reflective black film to yellow background sheeting, or combination thereof.
5. Exit Only and Left Exit panels within the parent sign face shall be direct applied unless otherwise specified in the plans. Panels not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
6. Mounting details of Exit Only and Left Exit panel attachments to parent signs face are shown on Standard Plan Sheet TSR(5).

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(2)-13

FILE: tsr2-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	YKM	DE WITT		82B

2

DATE: 6/1/2022 11:09:26 AM
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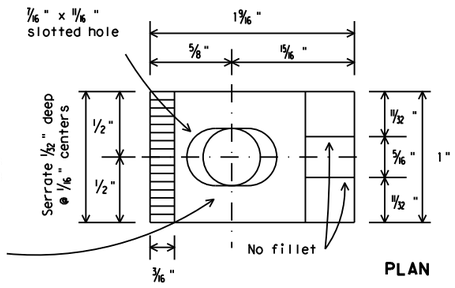
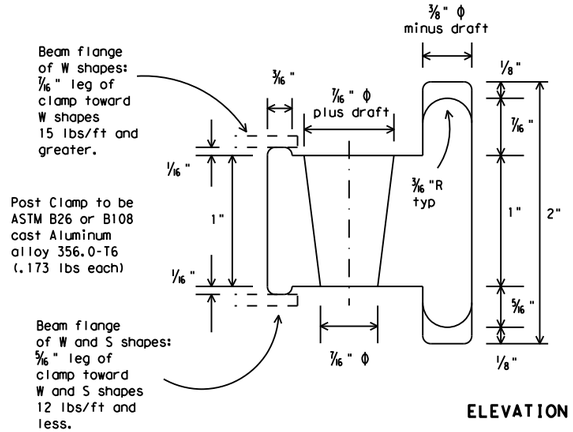


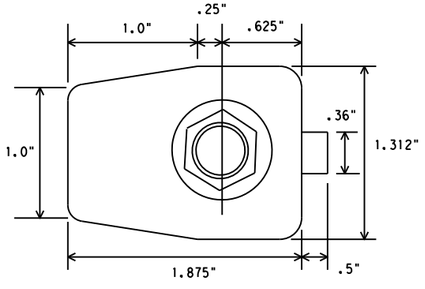
NOTE: centerline of hole for 3/8" diameter squarehead bolt x 2 1/4" long with a flat washer and self-locking nut, or lock washer and hex. nut. Bolt head dimensions shall be in accordance with ANSI B 18.2.1 as referred to in the AISC Manual of steel construction. Bolt assembly shall be galvanized.

PLAN

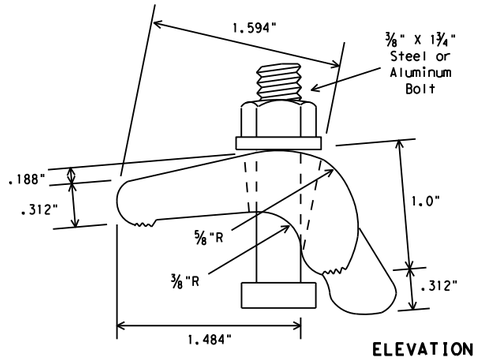


ELEVATION

POST CLAMP DETAIL

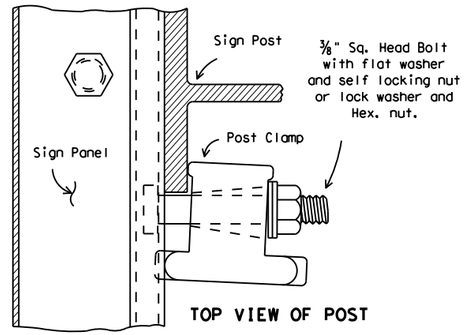


PLAN

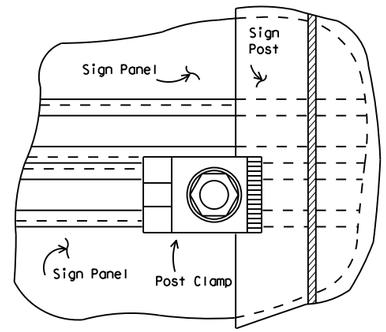


ELEVATION

ALTERNATE POST CLAMP DETAIL



TOP VIEW OF POST

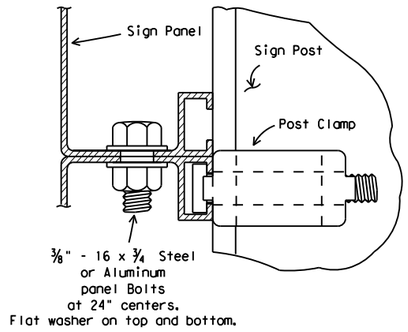


TOP VIEW OF CLAMP

DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN HARDWARE	DMS-7120

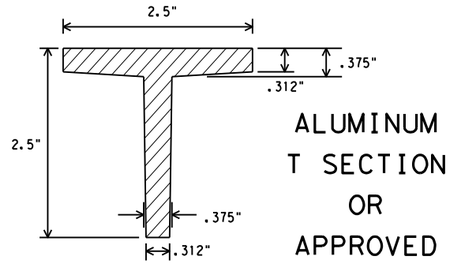
GENERAL NOTES:

1. Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
2. Materials and fabrication shall conform to the requirements of the Department material specifications.
3. Structural steel shall be "low-alloy steel" for non-bridge structures per Item 442, "Metal For Structures."
4. For fiberglass substrate connection details, see manufacturer's recommendations.



SIDE VIEW OF PANELS

CONNECTION DETAILS

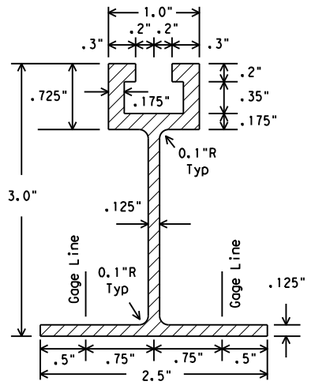


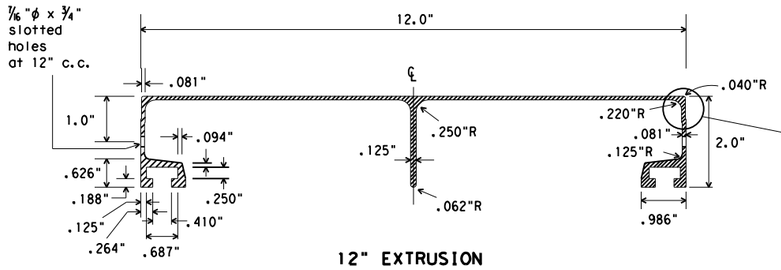
1.912 lbs/ft

ALUMINUM T SECTION OR APPROVED ALTERNATIVE

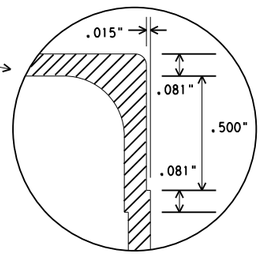
WINDBEAM CROSS SECTION

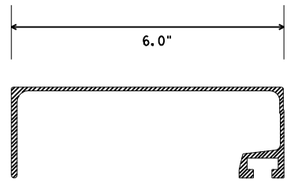
Windbeam to be extruded aluminum (1.175 lbs/ft) or approved alternative





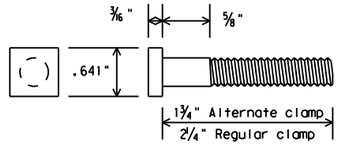
12" EXTRUSION





6" EXTRUSION

ALUMINUM SIGN PANEL EXTRUSION DETAILS



POST CLAMP BOLT DETAIL

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS- EXTRUDED ALUMINUM SIGN PANELS & HARDWARE

SMD(2-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87

DIST	COUNTY	SHEET NO.
YKM	DE WITT	82C

9-08 REVISIONS

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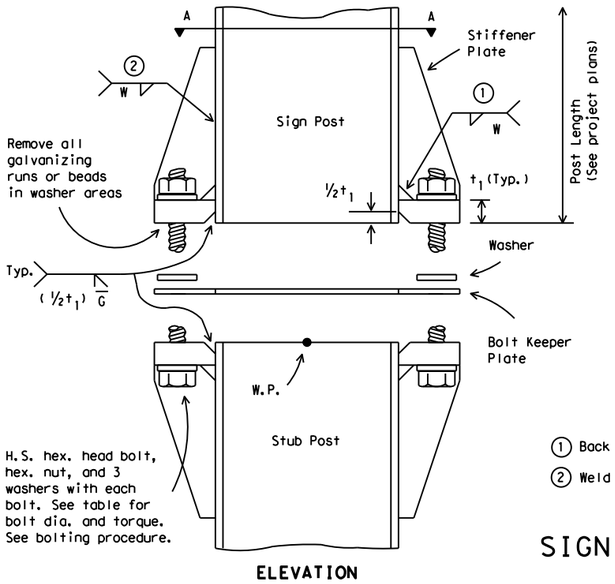
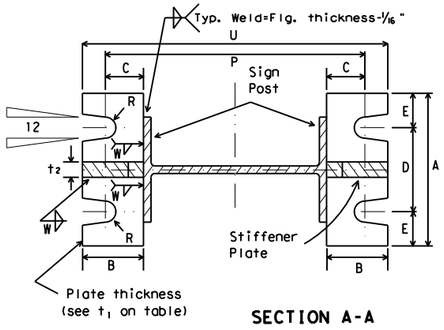
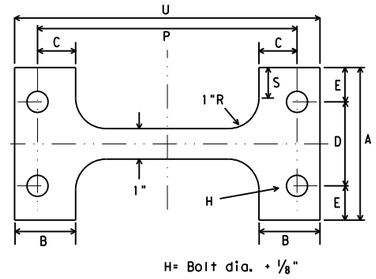


ELEVATION

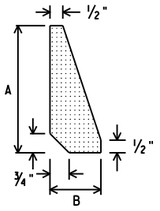


SECTION A-A



H= Bolt dia. + ⅛"

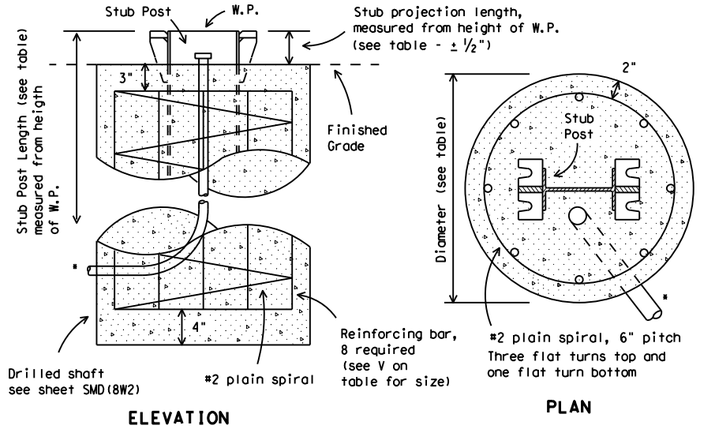
BOLT KEEPER PLATE
30 Ga galv. sheet steel



STIFFENER PLATE DETAIL

Steel Plate (thickness = t_2)

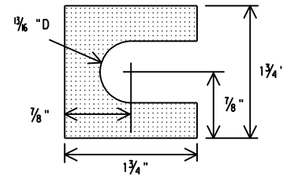
(See table for dimensions)



ELEVATION PLAN

FOUNDATION DETAIL

*Note: For signs with electrical apparatus, see ED(10) for conduit required in founation.



SHIM DETAIL

Furnish two .012"+ thick and two .032"+ thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.

BOLTING PROCEDURE FOR ASSEMBLY OF BASE CONNECTION:

1. Assemble sign post, BOLT KEEPER PLATE and stub post with bolts and three flat washers per bolt as shown.
2. Shim as required to plumb post.
3. Tighten all bolts the maximum possible with a 12 to 15 inch wrench to clean bolt threads and to bed washers and shims.
4. Loosen each bolt in sequence and retighten bolts in a systematic order to the prescribed torque. Do not overtighten.
5. To prevent nut loosening, burr threads of bolt at junction with nut using a center punch.

Dimensions / Post Size	Base Connection Data Table: Bolt Size & Torque	A	B	C	D	E	t_1	t_2	W	R
W6x9	⅝"ϕ x 2¾" 440-450 inch pounds 36-38 foot pounds	5"	2"	1¼"	2¾"	1⅛"	¾"	½"	¼"	11/32"
W6x12										
W6x15										
W8x18										
W8x21	¾"ϕ x 3½" 740-750 inch pounds 62-63 foot pounds	6"	2¼"	1⅜"	3½"	1¼"	1"	¾"	5/16"	13/32"
W10x22										
W10x26										
W12x26										
S3x5.7	½"ϕ x 2½" 440-450 inch pounds 36-38 foot pounds	See Detail Below								
S4x7.7										

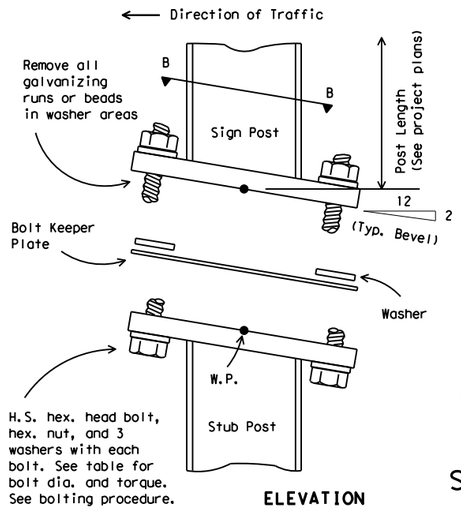
Perforated Fuse Plate Data Table											
F	G	J	K	M	d_1	d_2	t_3	Bolt Dia.	Wt. (ea.) (lbs.)	Bolt length
4¼"	2"	4"	2¼"	1"	9/16"	¾"	¼"	½"	1.01	1½"
5"	2½"	6"	3½"	1½"	11/16"	1¼"	⅜"	⅝"	2.51	2¼"
5"	2½"	5¼"	2¾"	1¼"	11/16"	1 1/16"	⅜"	⅝"	2.26	2¼"
5½"	2½"	5¼"	2¾"	1¼"	13/16"	1"	½"	¾"	3.35	2¼"
6"	3"	5¾"	2¾"	1⅜"	13/16"	1⅛"	½"	¾"	4.03	2¼"
6"	3"	6½"	3½"	1⅝"	13/16"	1 5/16"	½"	¾"	4.47	2¼"
3¾"	1½"	2⅝"	1½"	⅝"	9/16"	⅜"	¼"	½"	0.60	1½"

Bolt Keeper Data			Foundation Data			
P	S	U	Stub length	Stub projection	Dr. Shaft diameter	Bar V Size
8⅜"	1"	9⅞"	2'-0"	3"	24"	#5
8½"		10"	2'-0"	3"		#5
8½"		10"	2'-6"	3"		#6
10⅝"		12⅛"	2'-6"	3"		#7
11"	1½"	12¾"	3'-0"	2½"		#8
12⅞"		14⅝"	3'-0"	2½"		#9
13⅛"		14⅞"	3'-0"	2½"		#10
15"		16¾"	3'-0"	2½"		#11
See Detail Below			3'-3½"	3½"	12"	Non-reinforced ③

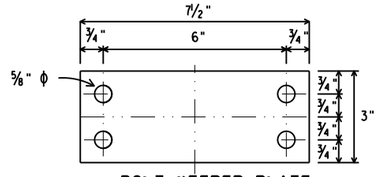
③ Foundation design shall be Type G Mount, see SMD (TY G).

PERFORATED FUSE PLATE DETAIL

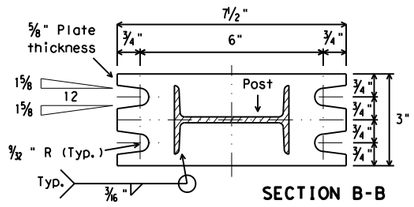
Use H.S. hex head bolts, hex head nut and bevel or flat washer (where req'd) under nut. All holes shall be drilled, sub-punched and reamed. All plate cuts shall preferably be saw cuts. However, flame cutting will be permitted provided all edges are ground. Metal projecting beyond the plane of the plate face will not be permitted. Steel fuse plates shall conform to the requirements of ASTM A36. ASTM A572 Grade 50 or ASTM A588 may be substituted for A36 at the option of the fabricator. Mill test reports shall be submitted for Fuse Plates. Steel used shall have an ultimate tensile strength not to exceed 80 KSI. For alternative Fuse Plate contact Traffic Operations Division.



ELEVATION



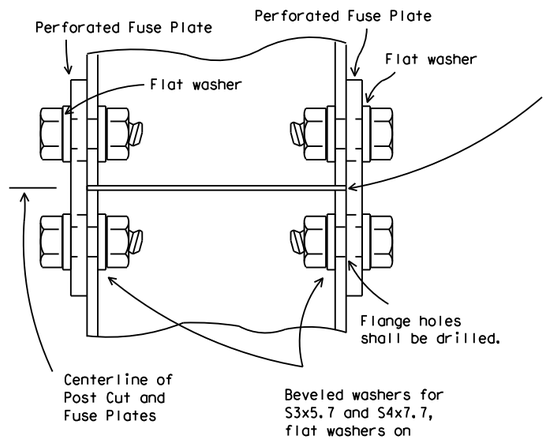
BOLT KEEPER PLATE
30 Ga galv. sheet steel



SECTION B-B

SIGN POST AND STUB POST

(For S4x7.7 and S3x5.7)



DETAIL "A"

Parts shall be saw cut either before galvanizing and the galvanized cut cleaned of zinc build-up, or saw cut after galvanizing and the cut surface repaired per Item 445, "Galvanizing."

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS- LARGE ROADSIDE SIGNS FOUNDATION & STUB

SMD(2-2)-08

REVISIONS
4-98
9-08

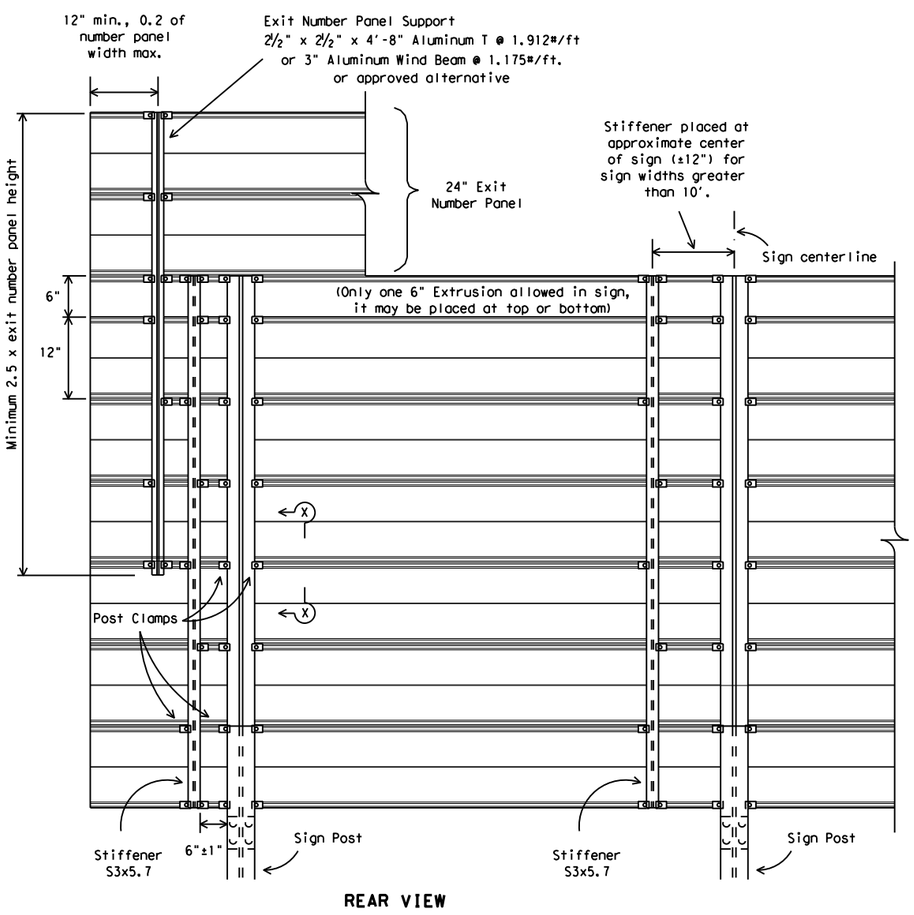
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

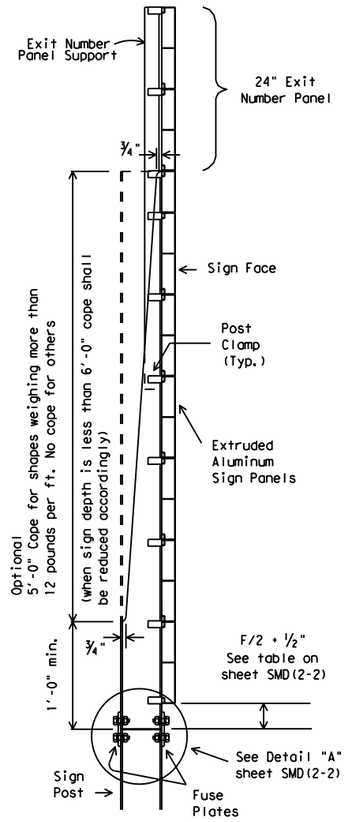
CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87

DIST	COUNTY	SHEET NO.
YKM	DE WITT	82D

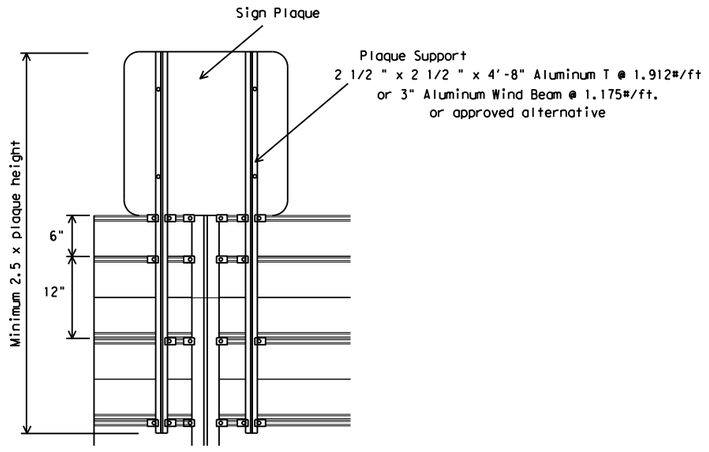
DATE: 6/1/2022 11:09:24 AM
FILE: $FILE$

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.



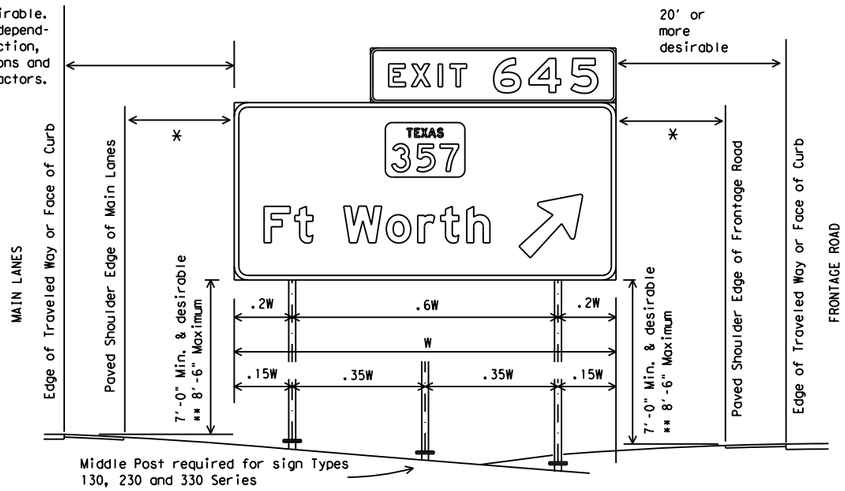


ALUMINUM PARENT SIGN & EXIT NUMBER PANEL MOUNTING DETAILS



SIGN PLAQUE MOUNTING DETAIL TO ALUMINUM PARENT SIGN

30' or more desirable. May be reduced depending on cross section, viewing conditions and other related factors.



TYPICAL SIGN INSTALLATION AND LOCATION

LATERAL CLEARANCE NOTES:

Lateral clearances of signs mounted on median side of main lanes are the same as shown above where space will permit.

Where a sign is to be located behind guardrail, an allowable minimum clearance of five feet may be used, measured from the face of the guardrail to the near edge of sign.

✳ - 6' minimum and desirable may be used only in areas of limited lateral clearance and when approved by the Engineer.

POST SPACING NOTES:

Post spacing on a two post sign may vary a maximum of plus or minus 10% of total sign width to fit field conditions.

Post spacing on a three post sign may vary a maximum of plus or minus 5% of total sign width to fit field conditions.

SIGN HEIGHT NOTES:

** The 8' 6" maximum may be exceeded when placing signs on extreme slopes. In these conditions, a 7' minimum from natural ground to bottom of sign must be maintained.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN HARDWARE	DMS-7120

GENERAL NOTES:

1. Exit number panel shall be mounted to the right hand side of the parent sign for right exits and to the left hand side for left exits. The number panel shall be mounted with two uprights so its right edge is even with the right edge of the parent sign or vice-versa for left hand exits.
2. Exit number panel support shall be symmetrical about number panel centerline.
3. Exit number panel support shall be ASTM A36 structural steel galvanized after fabrication, or ASTM B221 aluminum alloy 6061-T6 or approved alternative.
4. All bolts, nuts and washers shall be galvanized per ASTM Designation: B695 Class 50, or A153 Class C or D.
5. Posts, parent sign panels, and exit number panels shall comply with notes on sheets SMD(2-1) and SMD(2-2).
6. Signs (such as exit number panels) attached above a parent sign shall be made of the same type material as the parent sign. General Service and Routing signs may be fabricated from flat sheet aluminum.
7. Exit number panel support and other connection hardware required to fasten exit number panel to parent sign shall be subsidiary to "Aluminum Signs" or "Fiberglass Signs."
8. For fiberglass sign installation details, see manufacturer's recommendations.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS-LARGE ROADSIDE SIGNS

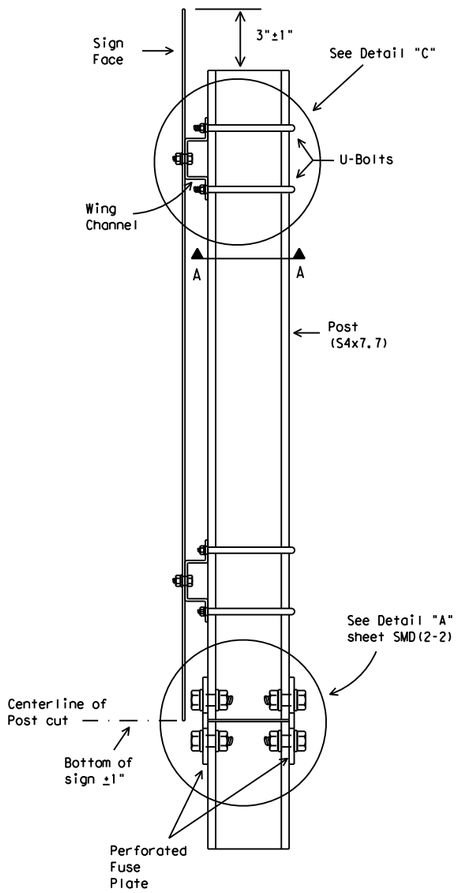
SMD(2-3)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

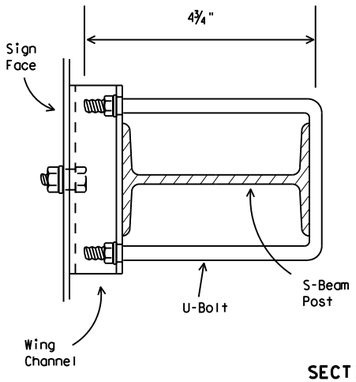
REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DE WITT		82E

DATE: 6/1/2022 11:09:24 AM
FILE: $FILE$

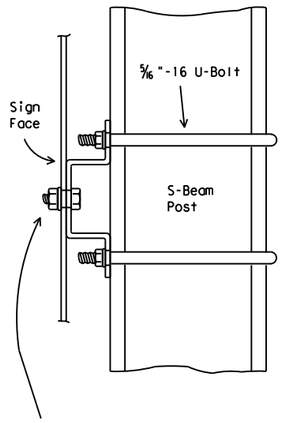
WING CHANNEL CLAMP DETAIL FOR TYPE G MOUNT



SIDE VIEW

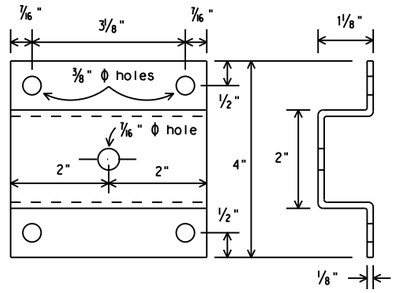


SECTION A-A



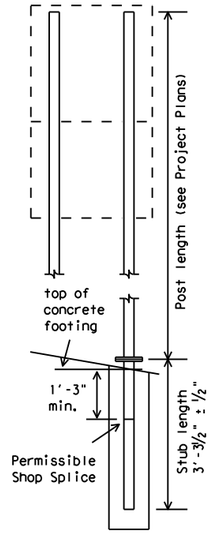
Galvanized steel or aluminum self-locking hex. head nut. 3/8 " - 16 x 3/4 " hex. head bolt for sheet metal. 3/8 " - 16 x 1 1/4 " hex. head bolt for plywood. 3/8 " galvanized medium washer.

DETAIL "C"

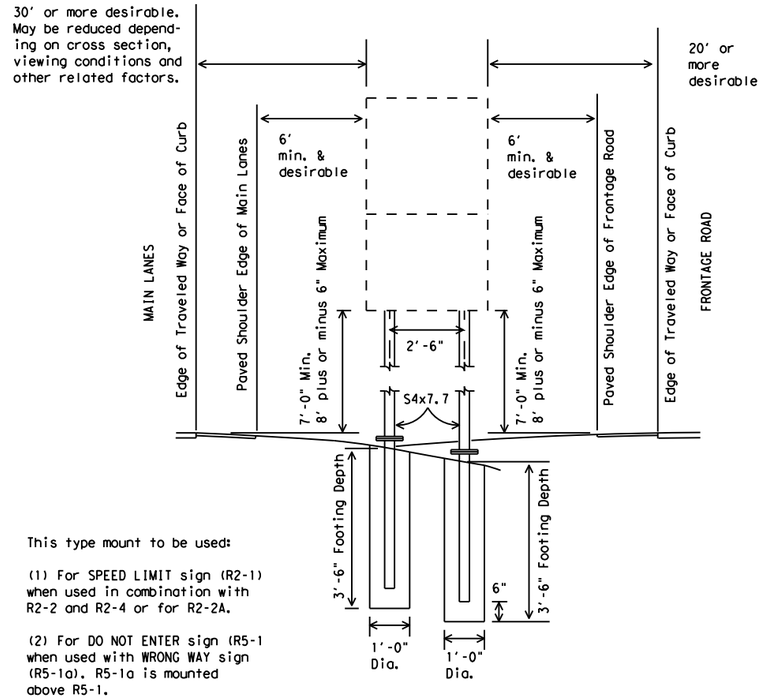


WING CHANNEL

Wing channel, 4" width x 1⅛" depth x ⅛" thickness, shall be aluminum (ASTM B221 6061-T6 or B308 6061-T6), galvanized steel (ASTM A36) or stainless steel (ASTM A167 type 304, No. 2B finish).



The weight of one S4x7.7 post is equal to 112.2 lbs. plus 7.7 lbs./ft x (post length in feet minus 10 ft). The weight of 112.2 lbs. includes 10 feet of post length, post foundation stub, related connection plates, friction fuse plate, and all high strength bolts, nuts and washers.



This type mount to be used:

(1) For SPEED LIMIT sign (R2-1) when used in combination with R2-2 and R2-4 or for R2-2A.

(2) For DO NOT ENTER sign (R5-1 when used with WRONG WAY sign (R5-1a). R5-1a is mounted above R5-1.

DEPARTMENTAL MATERIAL SPECIFICATIONS
SIGN HARDWARE DMS-7120

GENERAL NOTES:

1. Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
2. Materials and fabrication shall conform to the requirements of the Department material specifications.
3. Structural steel shall be "Low-Alloy Steel" for non-bridge structures per Item 442, "Metal For Structures."
4. Parts shall be saw cut either before galvanizing and the galvanized cut cleaned of zinc build-up, or saw cut after galvanizing and the cut surface repaired per Item 445, "Galvanizing." (Cut surface will not be treated until plate is installed and all bolts fully tightened.)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS, TYPE G SUPPORT

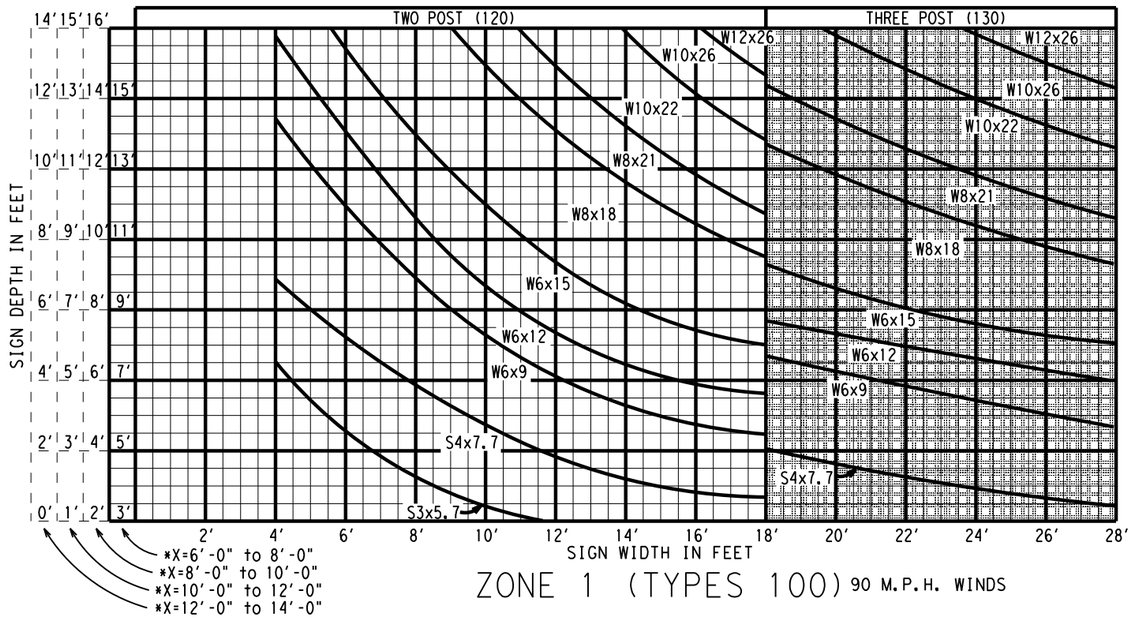
SMD(TY G)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

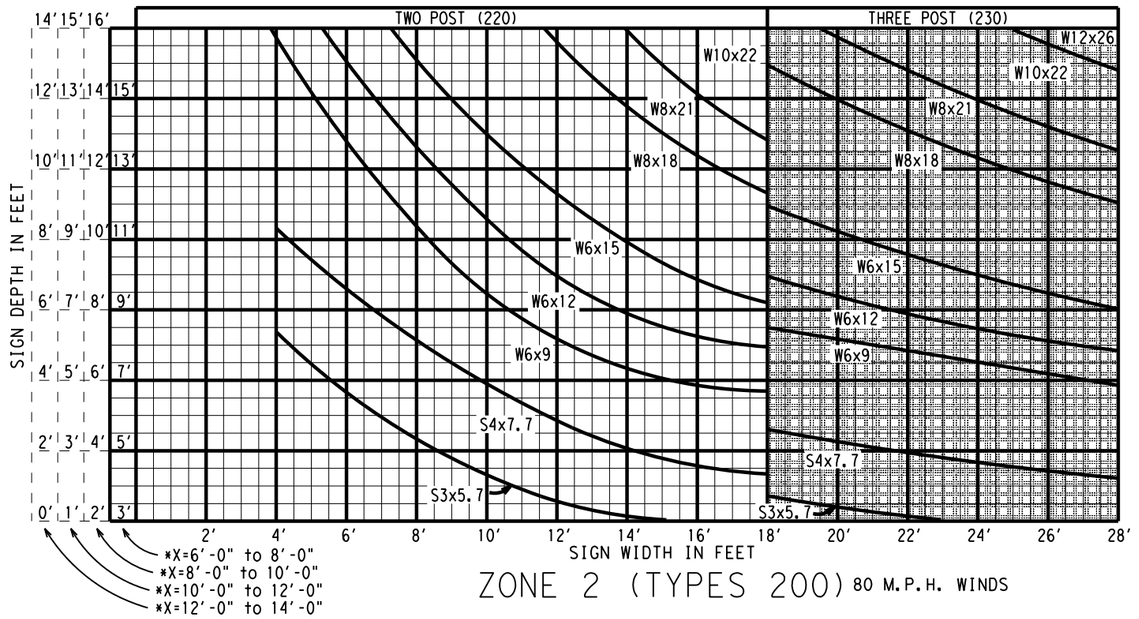
REVISIONS
1-97
9-08

CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87
DIST	COUNTY		SHEET NO.
YKM	DE WITT		82F

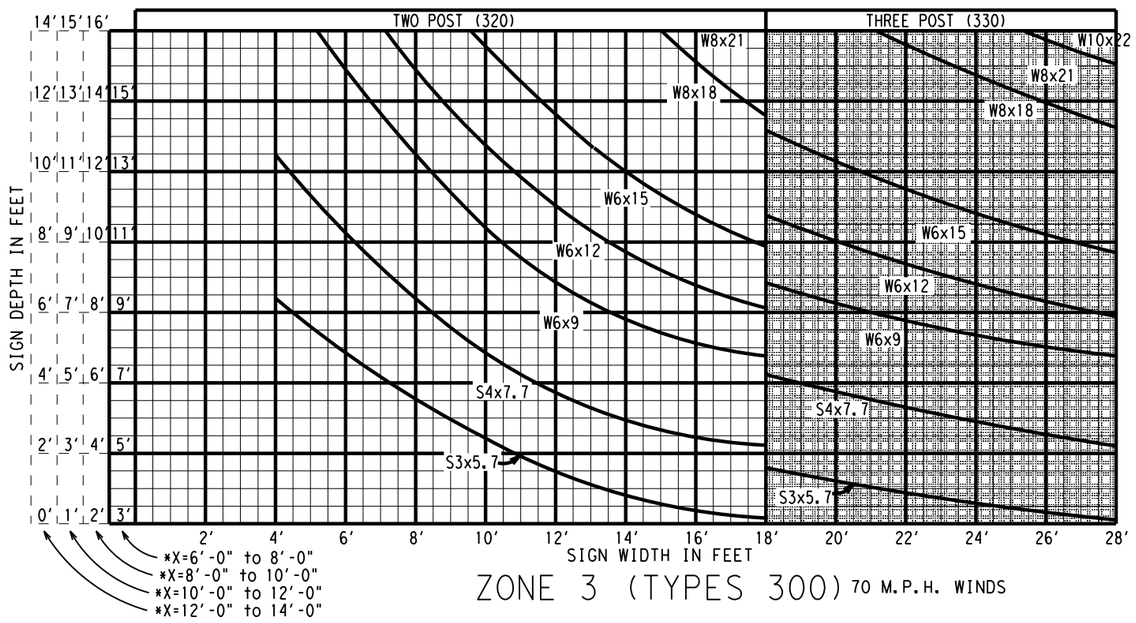
DATE: 6/1/2022 11:09:25 AM
FILE: $FILE$



ZONE 1 (TYPES 100) 90 M.P.H. WINDS



ZONE 2 (TYPES 200) 80 M.P.H. WINDS



ZONE 3 (TYPES 300) 70 M.P.H. WINDS

* NOTE: "X" EQUALS THE AVERAGE HEIGHT FROM THE GROUND LINE TO THE BOTTOM EDGE OF THE SIGN.

SHADED AREA DENOTES 3 POST SUPPORTS

POST WEIGHT DATA

POST SIZE	WEIGHT OF ONE POST (#)	WEIGHT OF TWO POSTS (#)	WEIGHT OF THREE POSTS (#)
W6x9*	123.2	246.4	369.6
W6x12*	160.3	320.6	480.9
W6x15*	167.8	335.6	503.4
W8x18*	201.8	403.6	605.4
W8x21*	254.7	509.4	764.1
W10x22*	266.0	532.0	798.0
W10x26*	308.0	616.0	924.0
W12x26*	308.6	617.2	925.8
S3x5.7*	85.9	171.8	257.7
S4x7.7*	112.2	224.4	336.6

*LAST FIGURES=POST WT. PER FT.

Weight Data is the weight of items shown for one, two or three posts - (includes top 6' of post, bottom 4' of post, post foundation stub, related base connection plates and stiffeners, friction fuse plate and all high strength bolts, nuts and washers).

SIGN TYPE

SIGN TYPE 1 3 0

- 1 — Wind Design Zone
- 3 — Series No.
- 0 — No. of Posts

Series No.: 0 Aluminum/Fiberglass; 1 Aluminum; 2 Fiberglass

Note: Footings for S3x5.7 and S4x7.7 post sizes shall be non-reinforced with Class A concrete, while footing for all other post sizes shall be reinforced with Class C concrete.

Texas Department of Transportation
Traffic Operations Division

LARGE ROADSIDE SIGN SUPPORTS
POST SELECTION
WORKSHEET
SMD(8W1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
1-82
5-01
9-08

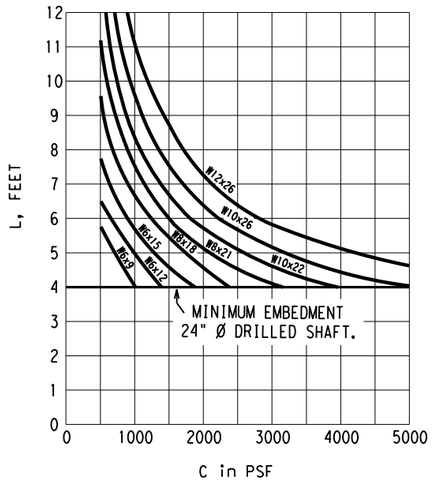
CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87

DIST	COUNTY	SHEET NO.
YKM	DE WITT	82G

DATE: 6/1/2022 11:09:22 AM
FILE: T:\YKMTRAFMAIN\Design Projects\FY 22\US 87 Large Guide Sign\Standards\smd8-08.dgn

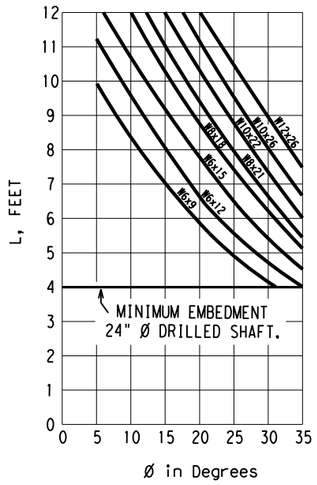
DATE: 6/1/2022 11:09:23 AM
FILE: T:\YKM\TRAFMAINT\Design Projects\FY 22\US 87 Large Guide Sign\Standards\smd8-08.dgn

I



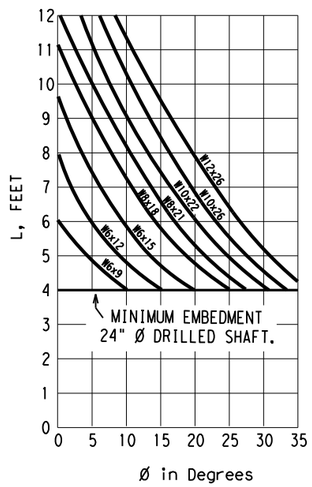
Ø = 0 Degrees

II



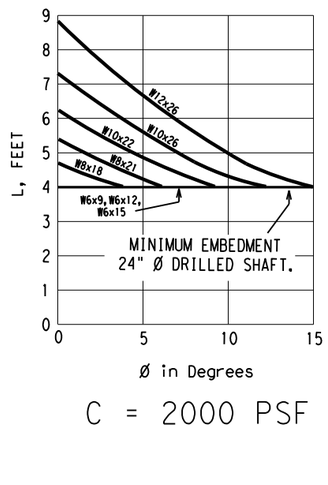
C = 0 PSF

III



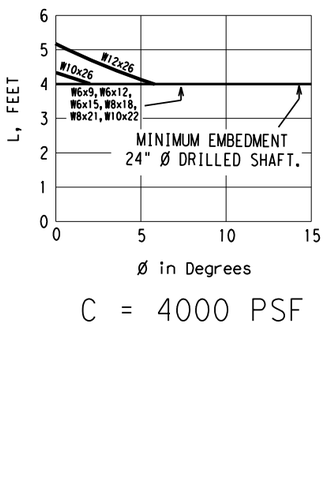
C = 500 PSF

IV



C = 2000 PSF

V



C = 4000 PSF

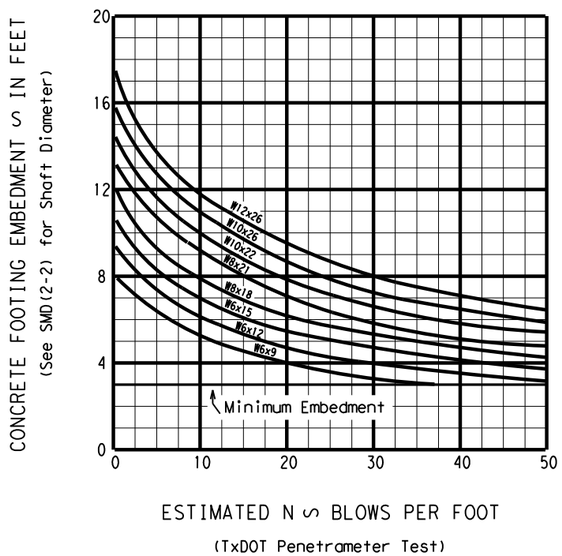
DRILLED CONCRETE FOOTING DEPTH CHART
(COHFRIC DESIGN)

NOTE: THESE CHARTS MAY BE USED AS AN ALTERNATE TO THE CHART BELOW, PROVIDED THAT SOIL COHESION AND INTERNAL FRICTION (COHFRIC) DATA ARE AVAILABLE.

LEGEND:

L = Required embedment of concrete drilled shaft, in feet
C = Cohesive shear strength of soil, in psf
Ø = Angle of internal friction of soil, in degrees

For values of C and Ø which are intermediate to those on the charts, embedments may be determined by straight - line interpolation.



DRILLED CONCRETE FOOTING DEPTH CHART
(TxDOT PENETROMETER DESIGN)

NOTE: ESTIMATED N SHOULD BE BASED AT APPROXIMATELY THE UPPER ONE-THIRD POINT OF THE DRILLED CONCRETE FOOTING BELOW THE GROUND LINE

Note:
1. Curves shown on this sheet are applicable for reinforced concrete footings only.

Texas Department of Transportation
Traffic Operations Division

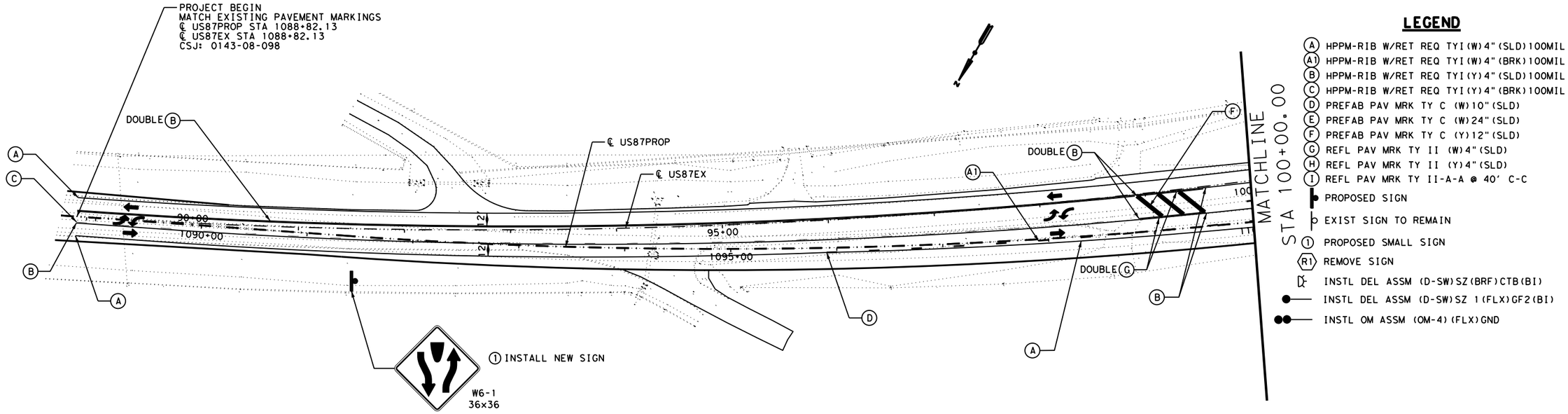
LARGE ROADSIDE SIGN SUPPORTS FOUNDATION WORKSHEET SMD(8W2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
5-74
4-78
9-08

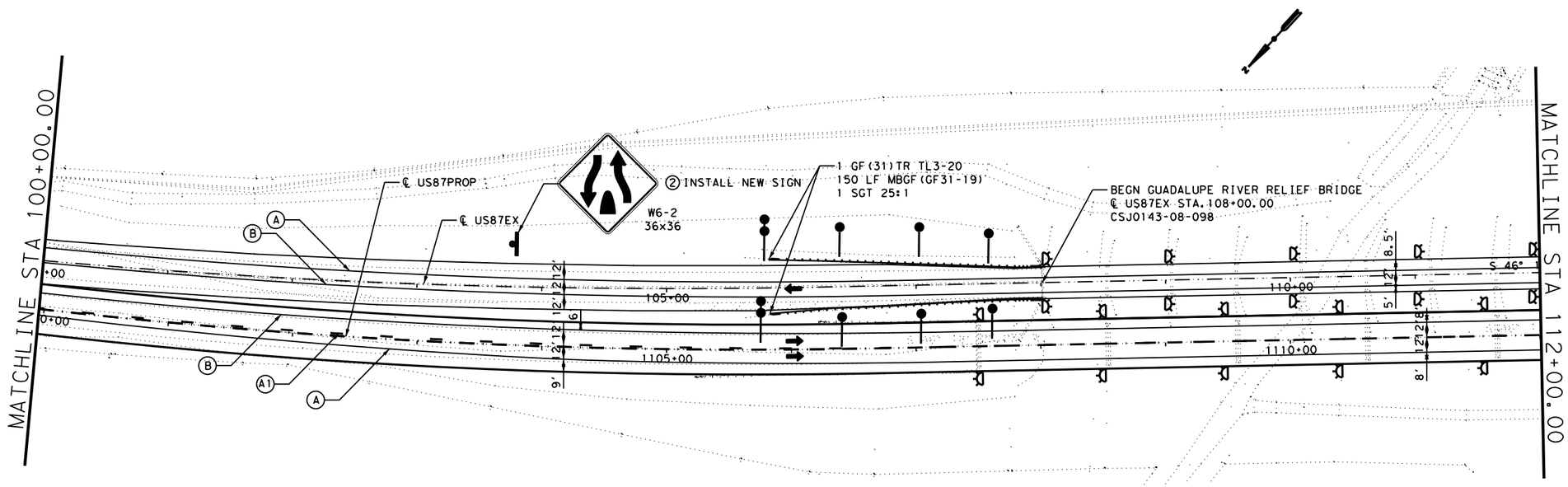
CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87

DIST	COUNTY	SHEET NO.
YKM	DE WITT	82H



LEGEND

- (A) HPPM-RIB W/RET REQ TYI(W)4"(SLD)100MIL
- (A1) HPPM-RIB W/RET REQ TYI(W)4"(BRK)100MIL
- (B) HPPM-RIB W/RET REQ TYI(Y)4"(SLD)100MIL
- (C) HPPM-RIB W/RET REQ TYI(Y)4"(BRK)100MIL
- (D) PREFAB PAV MRK TY C (W)10"(SLD)
- (E) PREFAB PAV MRK TY C (W)24"(SLD)
- (F) PREFAB PAV MRK TY C (Y)12"(SLD)
- (G) REFL PAV MRK TY II (W)4"(SLD)
- (H) REFL PAV MRK TY II (Y)4"(SLD)
- (I) REFL PAV MRK TY II-A-A @ 40' C-C
- PROPOSED SIGN
- EXIST SIGN TO REMAIN
- (1) PROPOSED SMALL SIGN
- (R1) REMOVE SIGN
- INSTL DEL ASSM (D-SW)SZ(BRF)CTB(BI)
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GF2(BI)
- INSTL OM ASSM (OM-4)(FLX)GND



NOTE:
1) REMOVE EXISTING DELINEATORS AND OBJECT MARKERS PER REDIRECTING THE TRAFFIC ON BOTH US87EX AND US87PROP
2) INSTALL PROPOSED DELINEATORS AND OBJECT MARKERS ON BOTH US87EX AND US87PROP

DATE: 05/06/2022 03:36 AM
FILE: DOCUMENT NAME

STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED PROFESSIONAL ENGINEER

Mojtaba Ranjbar, P.E.

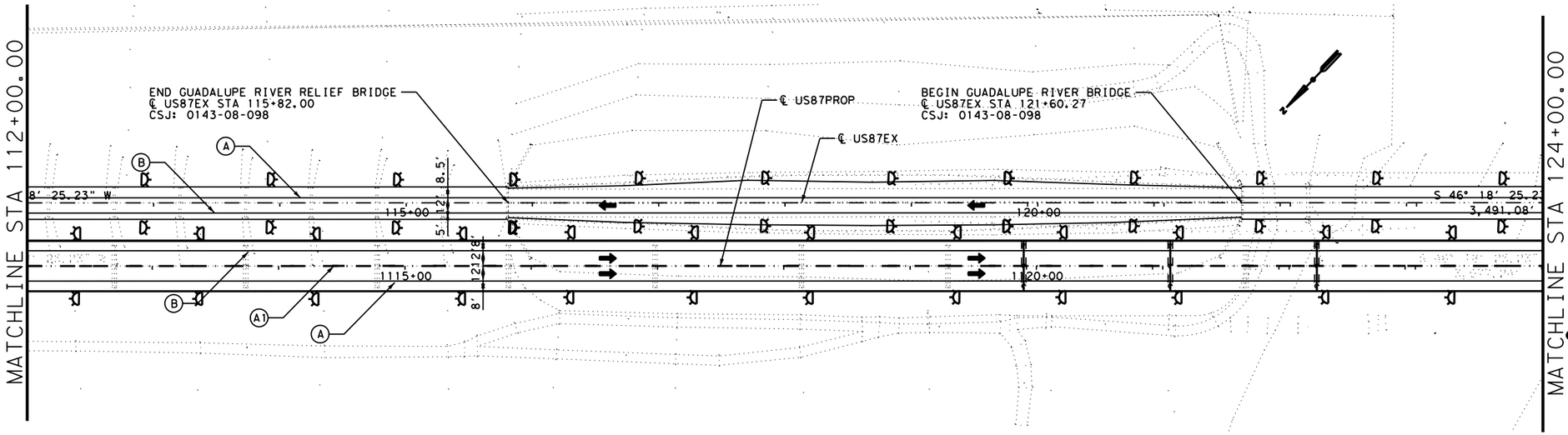
05/27/2022

US 87
SIGNING AND PAVEMENT MARKING LAYOUT

SHEET 1 OF 3

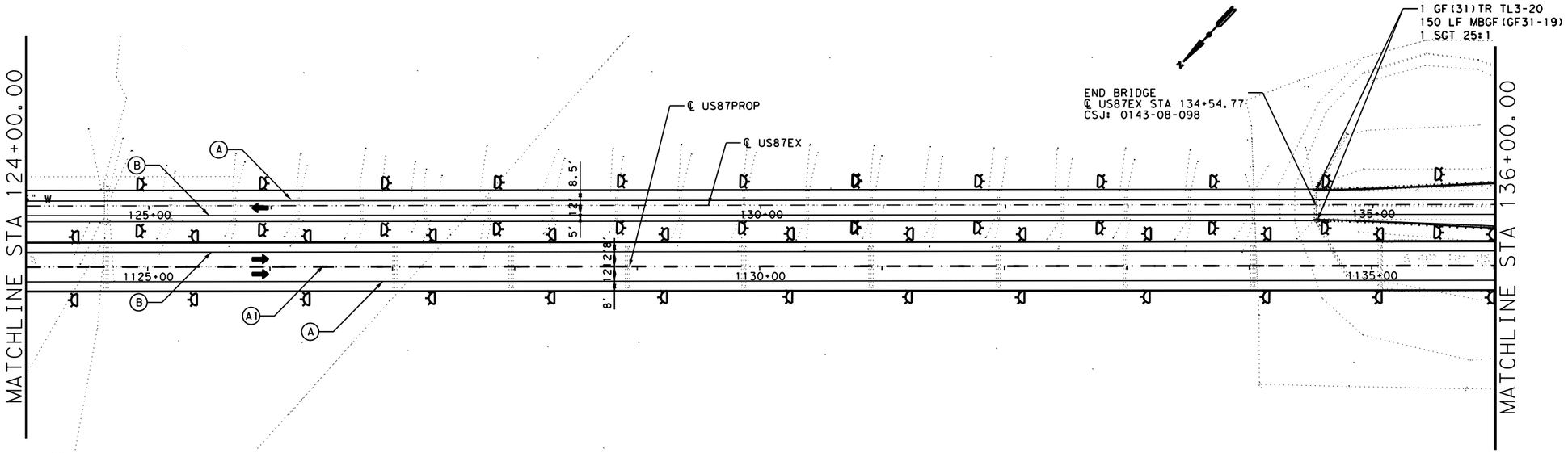
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87
DIST	COUNTY		SHEET NO.
YKM	DE WITT		83



LEGEND

- (A) HPPM-RIB W/RET REQ TYI(W)4"(SLD)100MIL
- (A1) HPPM-RIB W/RET REQ TYI(W)4"(BRK)100MIL
- (B) HPPM-RIB W/RET REQ TYI(Y)4"(SLD)100MIL
- (C) HPPM-RIB W/RET REQ TYI(Y)4"(BRK)100MIL
- (D) PREFAB PAV MRK TY C (W)10"(SLD)
- (E) PREFAB PAV MRK TY C (W)24"(SLD)
- (F) PREFAB PAV MRK TY C (Y)12"(SLD)
- (G) REFL PAV MRK TY II (W)4"(SLD)
- (H) REFL PAV MRK TY II (Y)4"(SLD)
- (I) REFL PAV MRK TY II-A-A @ 40' C-C
- PROPOSED SIGN
- EXIST SIGN TO REMAIN
- (1) PROPOSED SMALL SIGN
- (R1) REMOVE SIGN
- INSTL DEL ASSM (D-SW)SZ(BRF)CTB(BI)
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GF2(BI)
- INSTL OM ASSM (OM-4)(FLX)GND



NOTE:
1) REMOVE EXISTING DELINEATORS AND OBJECT MARKERS PER REDIRECTING THE TRAFFIC ON BOTH US87EX AND US87PROP
2) INSTALL PROPOSED DELINEATORS AND OBJECT MARKERS ON BOTH US87EX AND US87PROP

DATE: 05/06/2022 03:28 AM
FILE: DOCUMENT NAME

STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED PROFESSIONAL ENGINEER

Mojtaba Ranjbar, P.E.

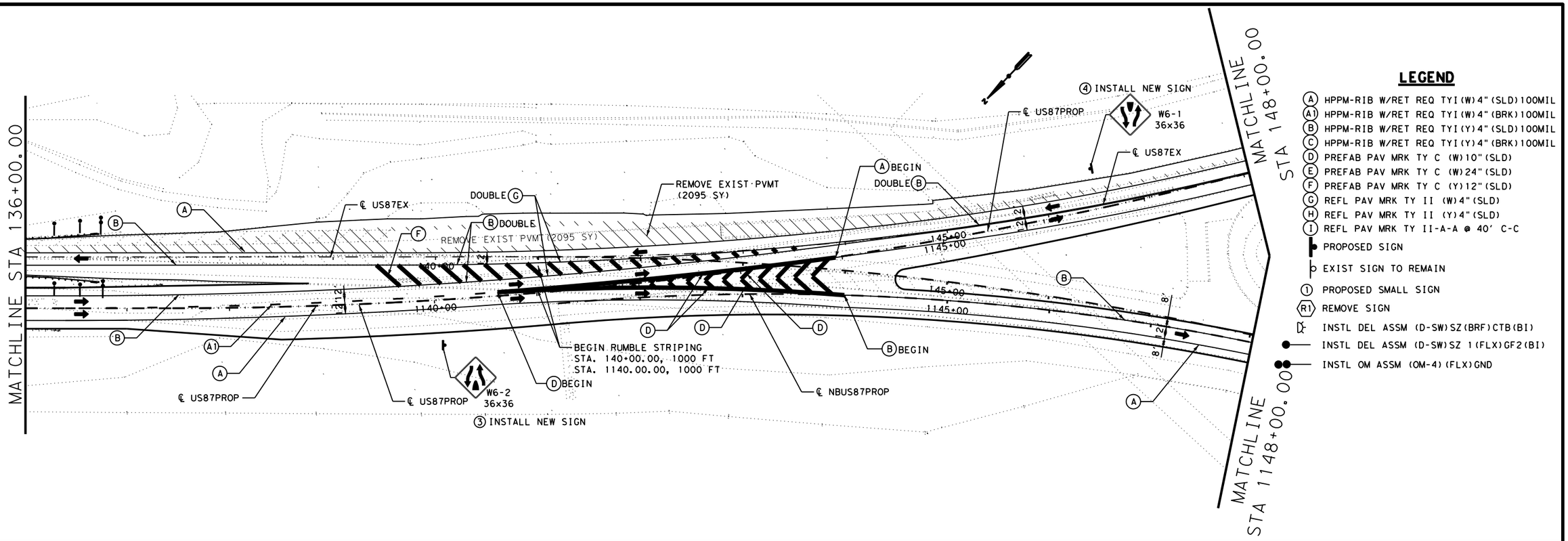
05/27/2022

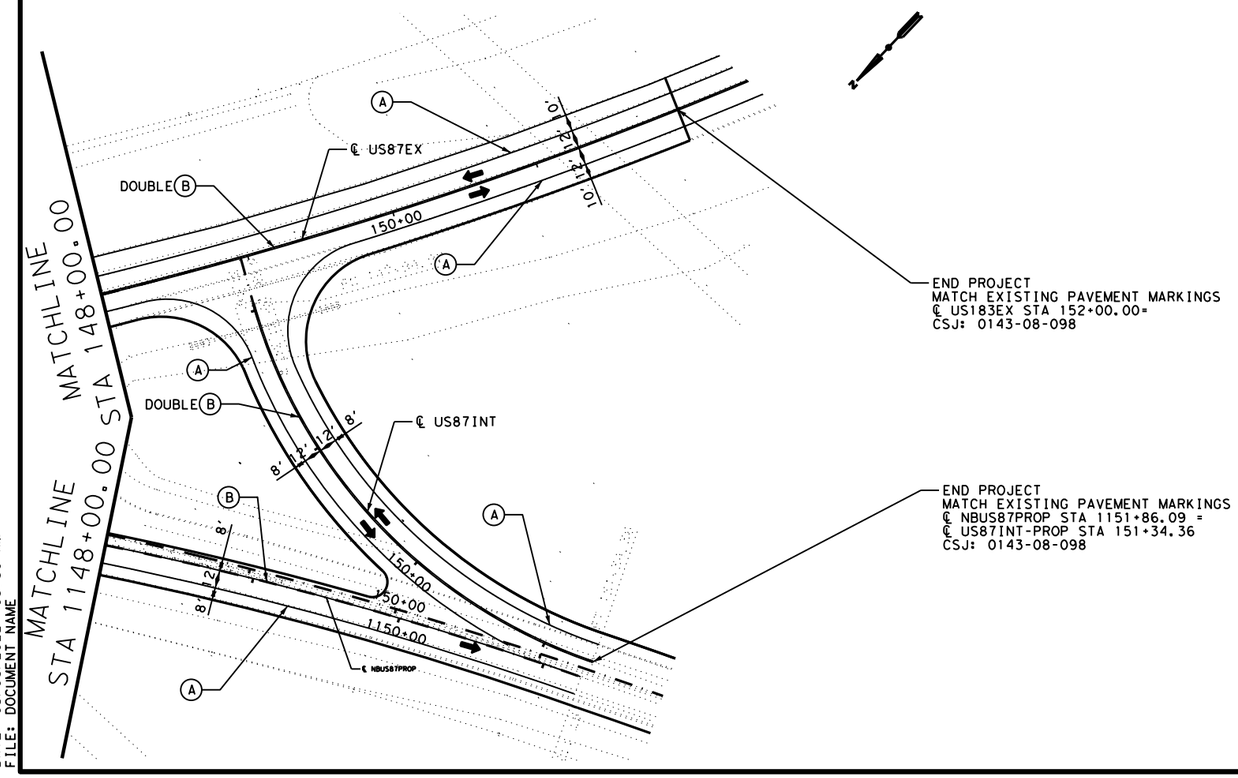
US 87
SIGNING AND PAVEMENT MARKING LAYOUT

SHEET 2 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87
DIST	COUNTY		SHEET NO.
YKM	DE WITT		84





DATE: 05/06/2022 03:30 AM
FILE: DOCUMENT NAME

STATE OF TEXAS
MOJTABA RANJBAR
110222
LICENSED PROFESSIONAL ENGINEER

Mojtaba Ranjbar, P.E.

05/27/2022

US 87
SIGNING AND PAVEMENT MARKING LAYOUT

SHEET 3 OF 3

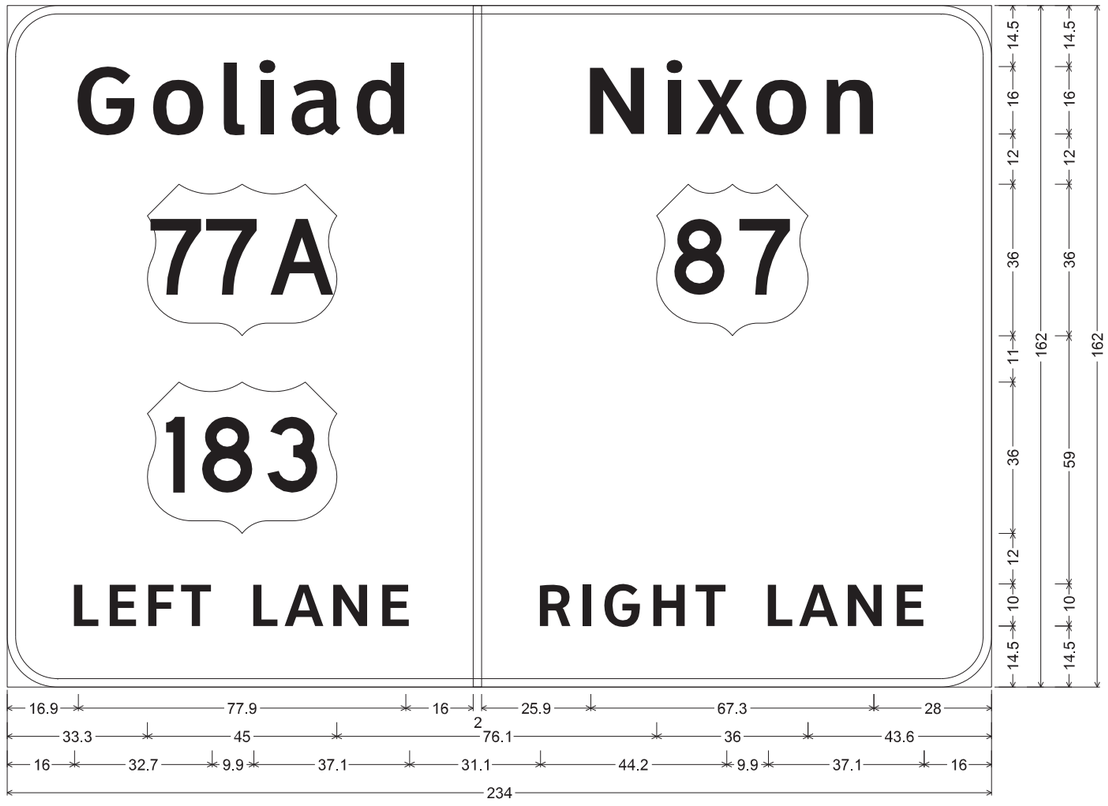
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0143	08	098	US 87
DIST	COUNTY		SHEET NO.
YKM	DE WITT		85

SUMMARY OF LARGE SIGNS

SIGN NO.	SIGN BACK-GROUND COLOR	SIGN TEXT	SIGN DIMENSIONS	PLAQUES, & OTHER ATTACHMENTS		BACKGROUND SUBSTRATE (SQ FT)		TYPE OF MOUNT	"X" DIMENSION ◒			GALVANIZED STRUCTURAL STEEL					DRILLED SHAFT			
				DIRECT APPLY	* ALUMINUM (TYPE A)	GROUND MOUNT (TYPE G)	OVERHEAD (TYPE O)		post ①	post ②	post ③	SIZE	LINEAR FEET post ①	post ②	post ③	TOTAL WEIGHT LBS.	NON-REINF 12"ϕ	LINEAR FEET REINFORCED 24"ϕ	30"ϕ	36"ϕ
* 1	GREEN	GOLIAD / NIXON 77A / 87 183 Left Lane / Right Lane	19.5 x 13.5	20.25 11.25		263.25		131	2.73	4.43	6.14	W10x22	22.98	24.68	26.39	1766.96		16		

* APPROXIMATE LOCATION IS STA 1106+00 RIGHT. FINAL PLACEMENT WILL BE DETERMINED BY ENGINEER.



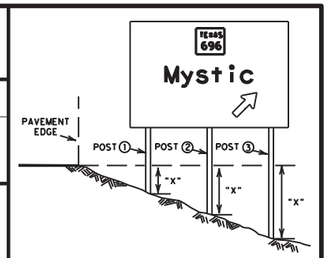
12.0" Radius, 2.0" Border, White on Green;
"Goliad", ClearviewHwy-5-W-R; US 77A M1-4; US 183 M1-4; "LEFT LANE", ClearviewHwy-5-W-R; "Nixon", ClearviewHwy-5-W-R; US 87 M1-4; "RIGHT LANE", ClearviewHwy-5-W-R;
Table of letter and object lefts

G	o	l	i	a	d	|	N	i	x	o	n
16.9	34.7	51.5	60.0	67.6	83.1	110.8	138.7	156.8	163.3	178.1	194.9	

77A	87
33.3	154.4

183	R	I	G	H	T	L	A	N	E	
33.3	126.8	137.0	142.1	153.7	163.8	180.9	188.3	200.0	211.6	

L	E	F	T	L	A	N	E	
16.0	24.5	33.6	41.4	58.6	65.9	77.6	89.3	



◒ The "X" dimension is the elevation difference at the post between the ground and the edge of pavement or top of curb.

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.

The post lengths listed here are approximations, The corrected post lengths will be furnished by the Contractor after the stud posts are placed.

Tower heights shall be verified with the Engineer before fabrication.

* This column is for aluminum Type A and not direct apply. Direct apply is subsidiary to the sign.

SIGN TYPE

SIGN TYPE 1 3 0
- 1 — Wind Design Zone
- 3 — Series No.
- 0 — 0 Aluminum/Fiberglass, 1 Aluminum, 2 Fiberglass
- 0 — No. of Posts

See sheet SMD(8W1)

SUMMARY OF QUANTITIES

ITEM NO.	DESCRIPTION	UNIT	QUANTITY
416-6018	DRILL SHAFT (SIGN MTS) (24 IN)	LF	16
636-6002	ALUMINUM SIGNS (TY G)	SF	263.25
647-6001	INSTALL LRSS (STRUCT STEEL)	LB	1,766.96
668-6115	PREFAB PAV MRK TY C (MULTI)(SHIELD)	EA	2
678-6025	PAV SURF PREP FOR MRKS (SHIELD)	EA	2

NOTES:

1) FOR ITEM 668, THE TWO SHIELDS WILL BE US 87 AND US 183. REFER TO STANDARD HIGHWAY SIGN DESIGN OF TEXAS FOR DETAILS. ALSO, PROVIDE CONTRAST PAVEMENT MARKINGS. THIS WILL BE CONSIDERED SUBSIDIARY TO ITEM 668. PLACEMENT WILL BE AS DIRECTED.

2) FOR ITEM 678, USE WATER BLASTING UNLESS OTHERWISE APPROVED.

STATE OF TEXAS
KATHRYN CAMILLE MAREK
88469
LICENSED PROFESSIONAL ENGINEER

Kathryn C. Marek, P.E.

June 2, 2022

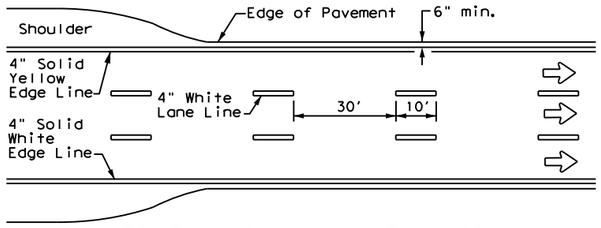
LARGE SIGN AND PAVEMENT MARKING DETAILS

Texas Department of Transportation

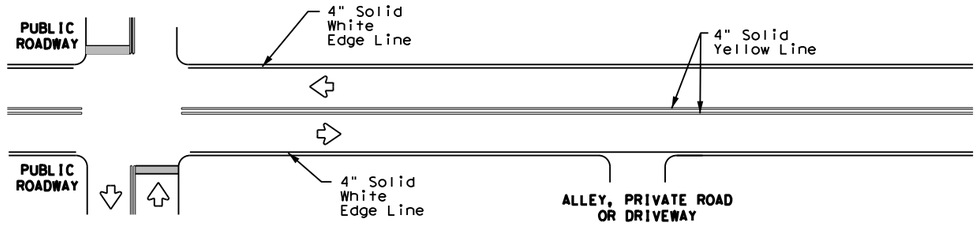
SHEET 1 OF 1

FED.RD. DIV.NO.		PROJECT NO.	
6			
CONT.	SECT.	JOB	HIGHWAY NO.
0143	08	098	US 87
STATE	DIST.	COUNTY	SHEET NO.
TEXAS	YKM	DeWITT	85A

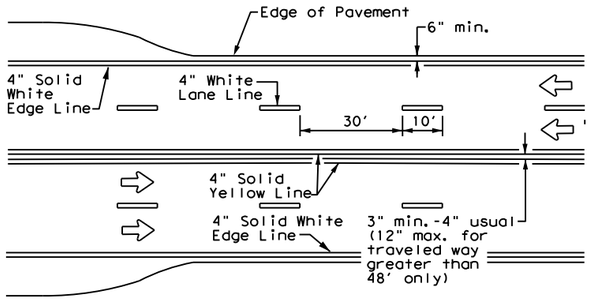
PATH: T:\YKMTRAFMAINT\Design Projects\FY 22\US 87 Large Guide Sign\DGN\
FILE: US87_Details_of_Large_Signs.dgn
DATE: $DATE$ TIME: $TIME$



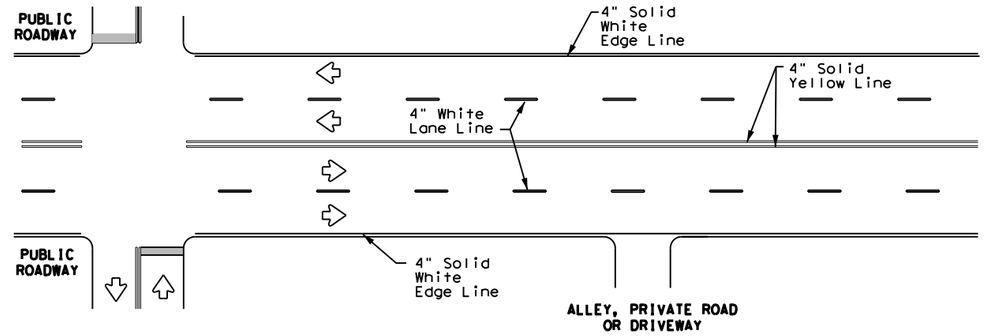
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



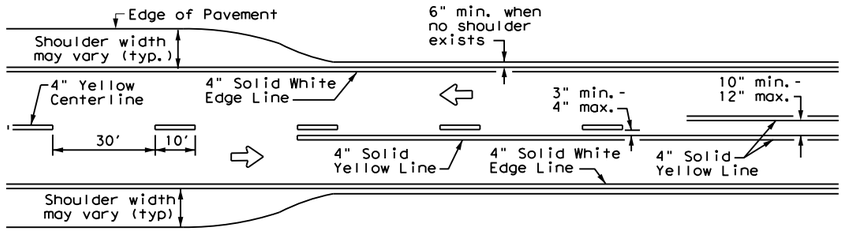
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



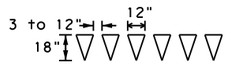
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



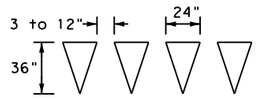
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

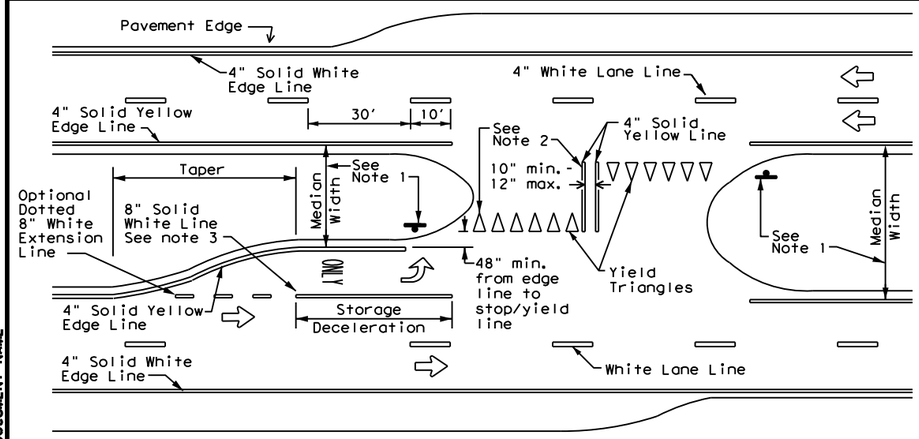


For posted speed on road being marked equal to or less than 40 MPH.



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

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

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

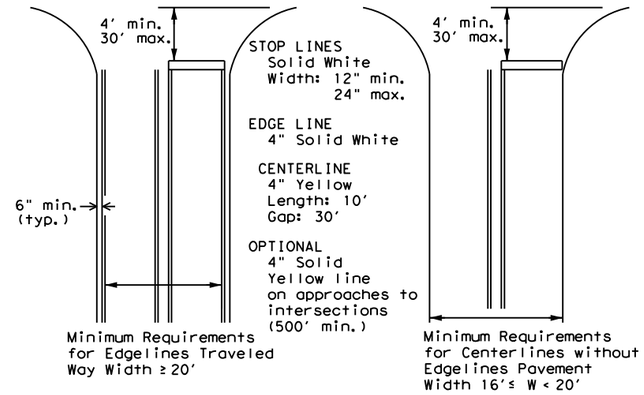
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

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

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



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

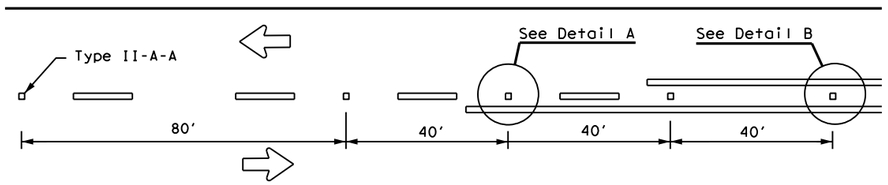
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0143	08	098	US 87
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	YKM	DE WITT		86

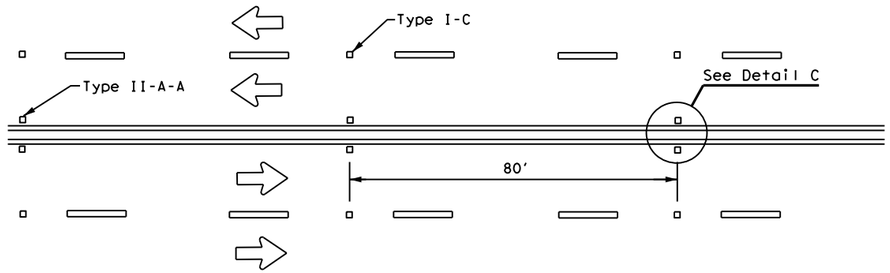
22A

DATE: 05/06/2022 05:27 AM
FILE: DOCUMENT NAME

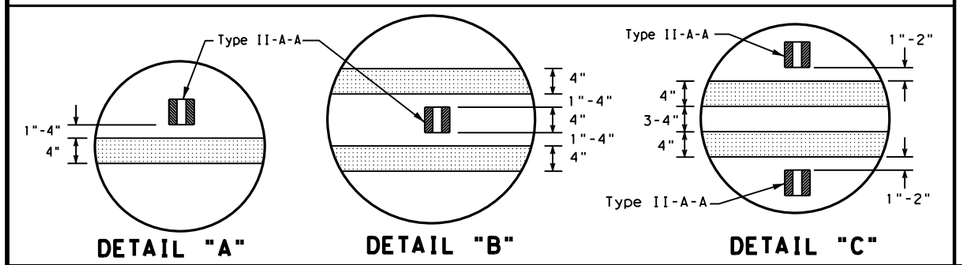
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



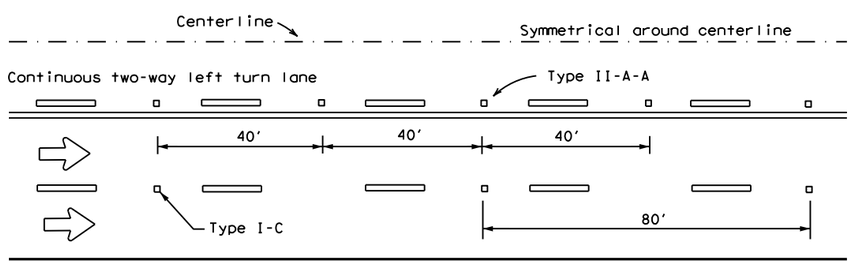
CENTERLINE FOR ALL TWO LANE ROADWAYS



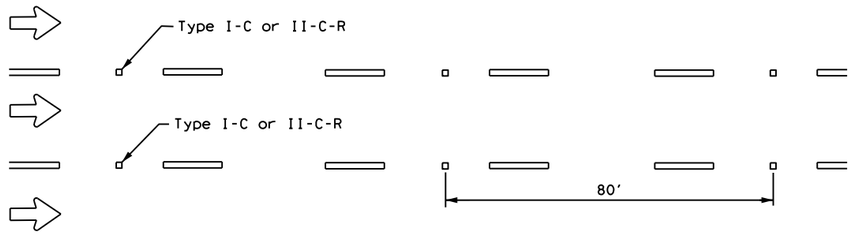
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

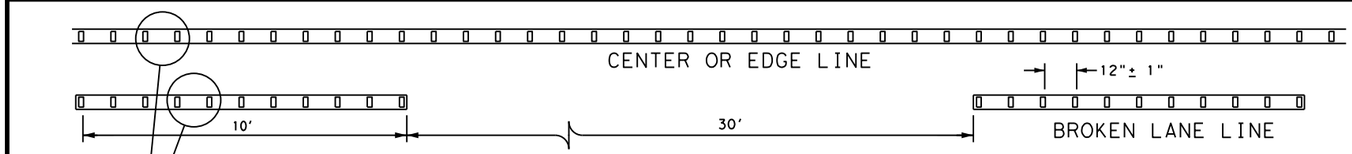


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



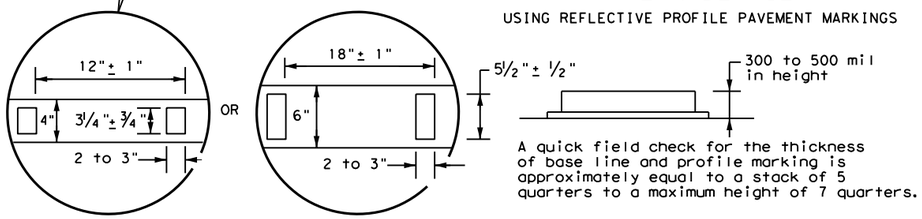
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE

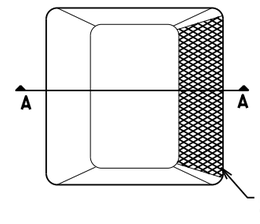
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

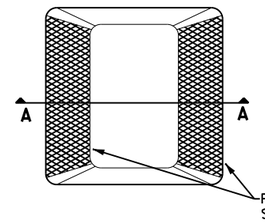
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

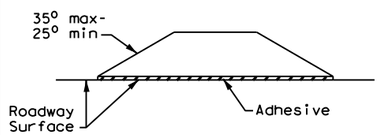
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

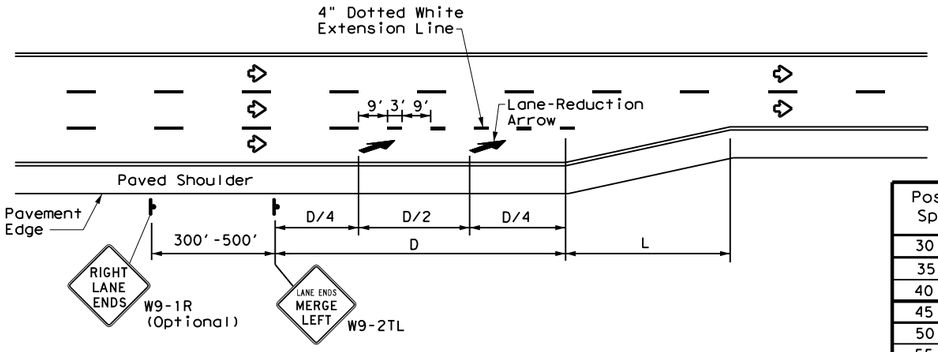
Traffic Safety Division Standard

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

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10	0143	08	098	US 87
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	YKM	DE WITT		87

22B

DATE: 05/06/2022 05:27 AM
FILE: DOCUMENT NAME

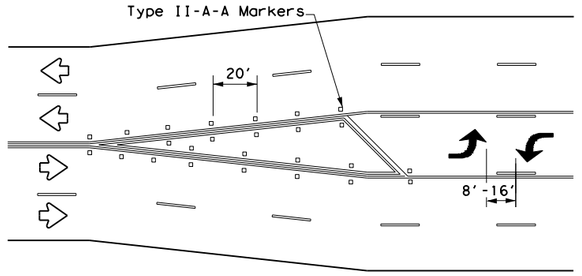


LANE REDUCTION

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

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.



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

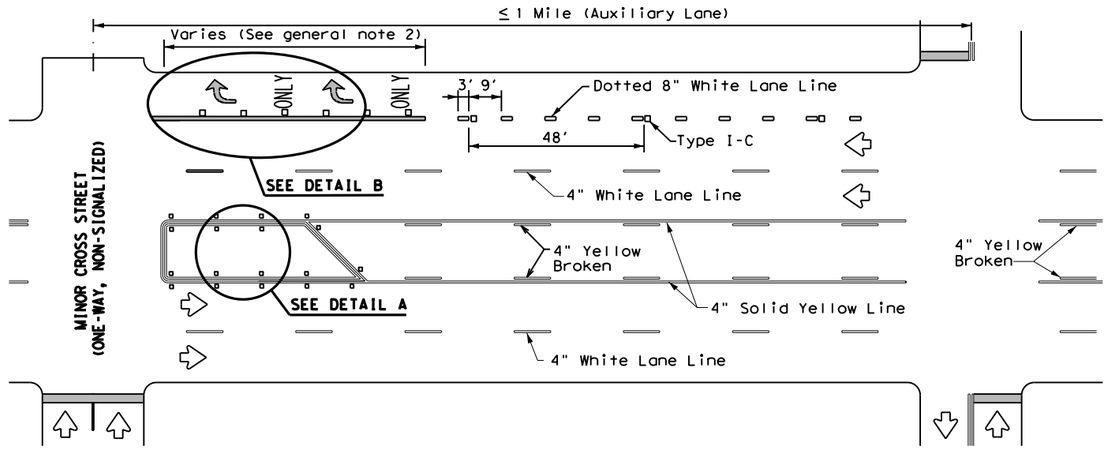
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

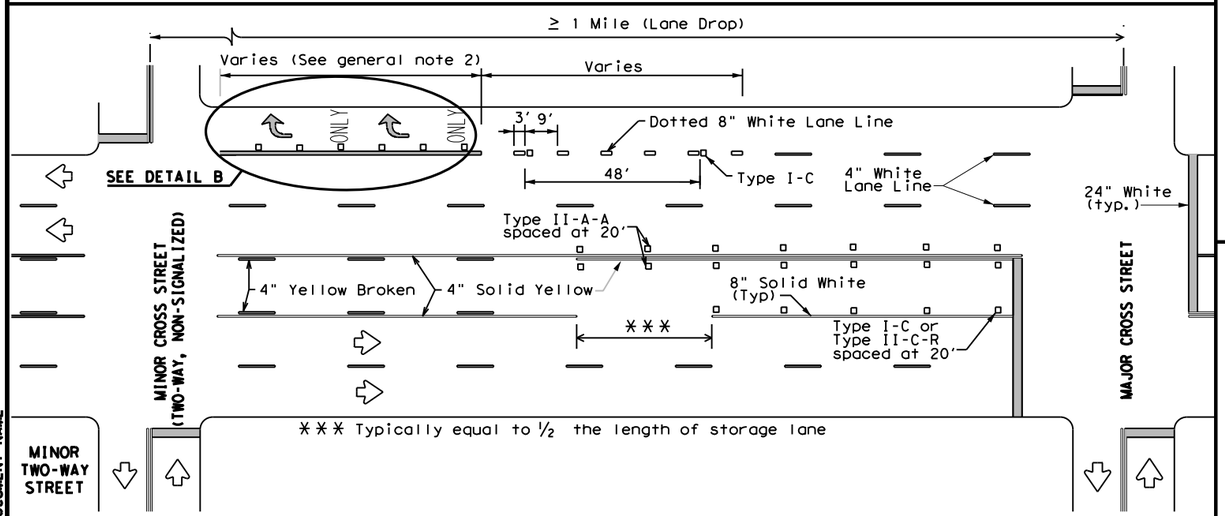
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

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

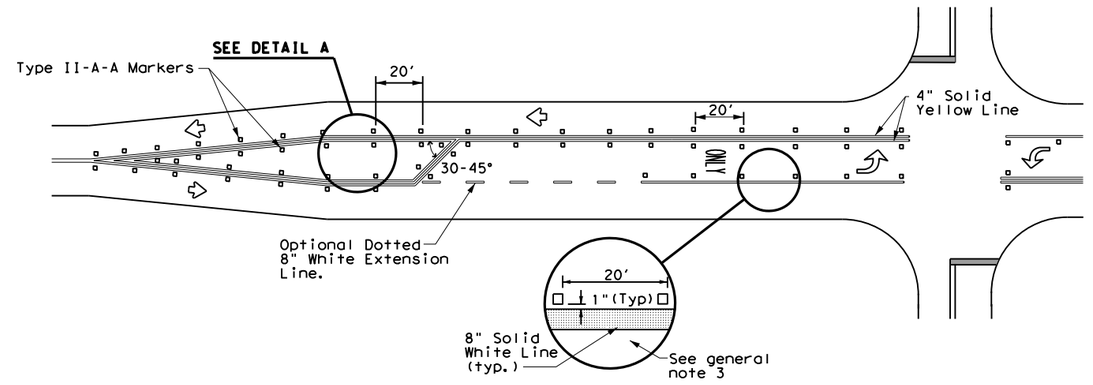
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



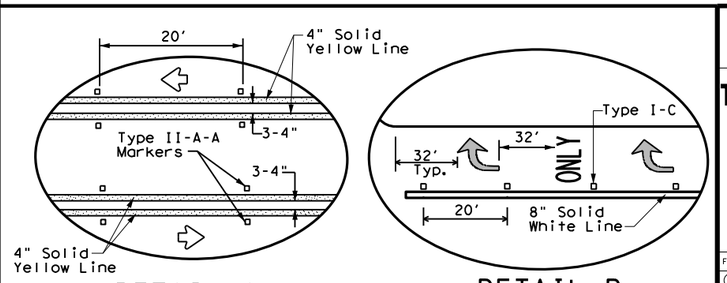
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



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



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

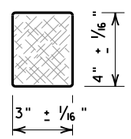
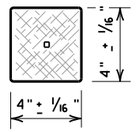
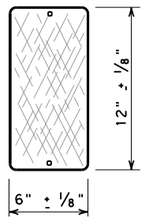
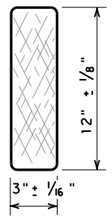
PM(3)-20

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	YKM	DE WITT		88
3-03 6-20				

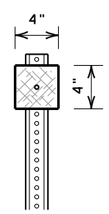
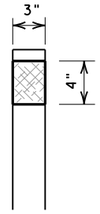
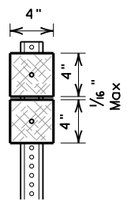
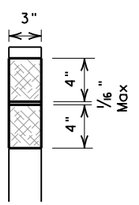
220

DATE: 05/06/2022 05:27 AM
FILE: DOCUMENT NAME

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

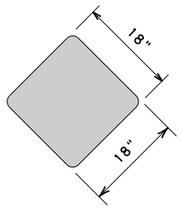
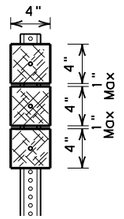
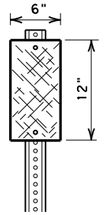
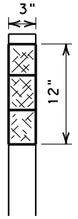
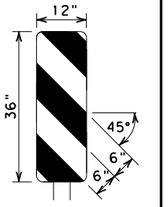
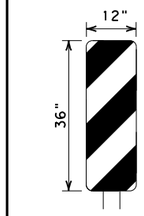
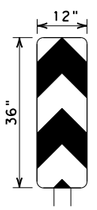
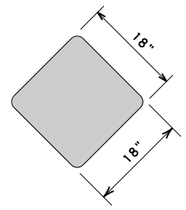
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

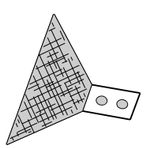
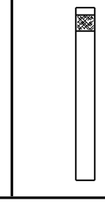
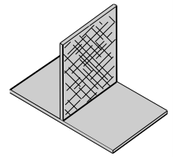
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

DEPARTMENTAL MATERIAL SPECIFICATIONS

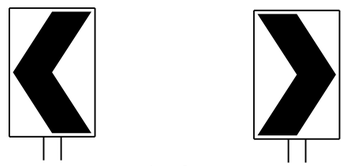
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE

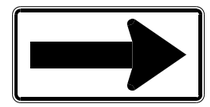


SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE



SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	YKM	DE WITT		89

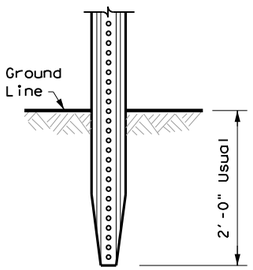
20A

DATE: 01/23/2022 11:42 PM
FILE: DOCUMENT NAME

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

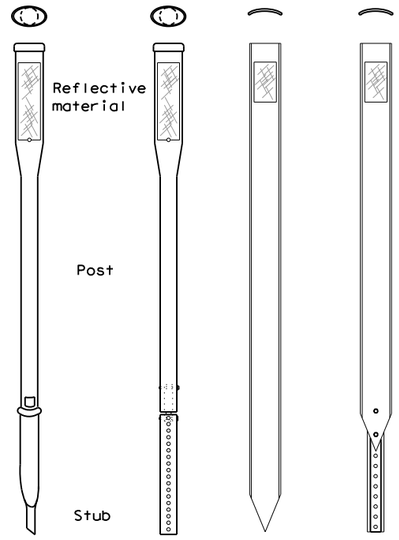


NOTES

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

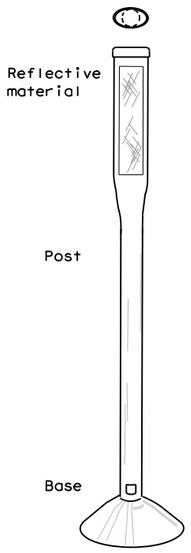
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



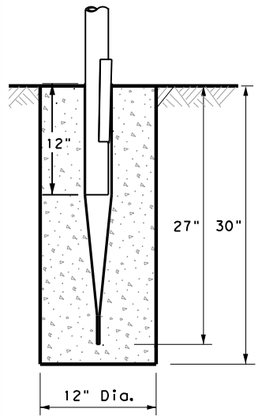
SURFACE MOUNT

NOTES

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

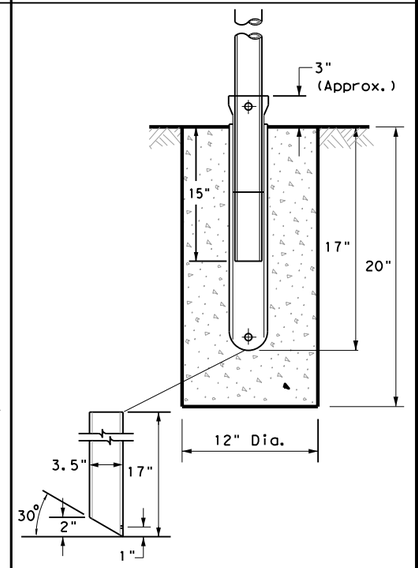
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

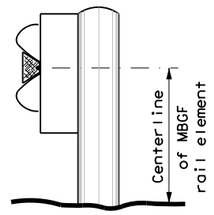
NOTE

1. Install per manufacturer's recommendations.

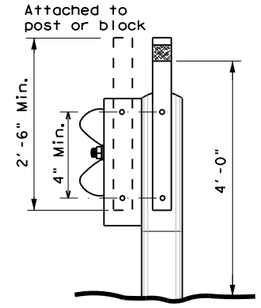
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

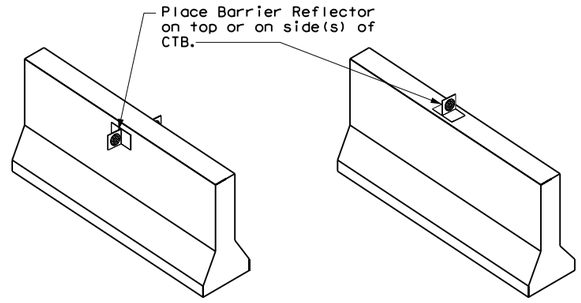
GF1



GF2



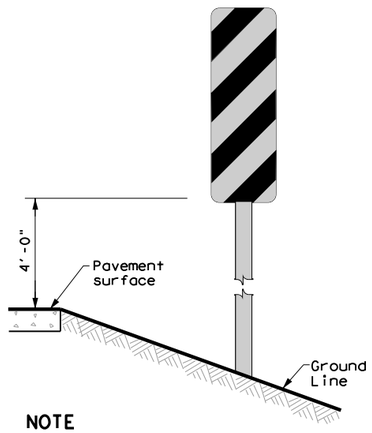
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

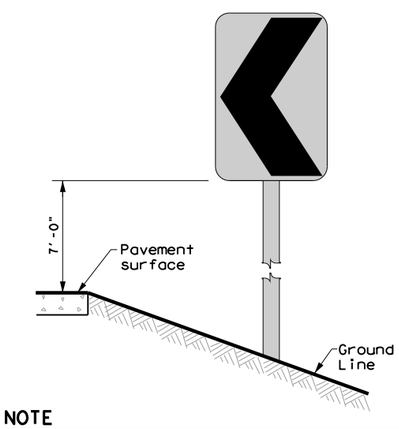
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

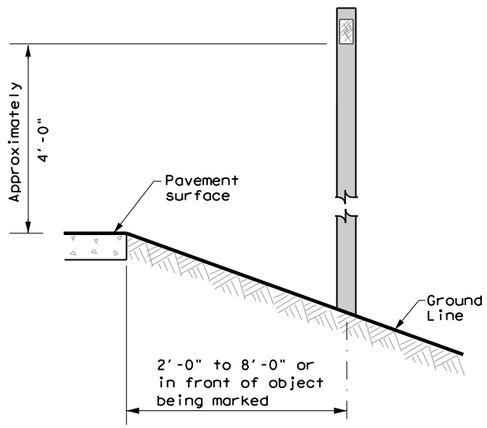
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	YKM	DE WITT		91

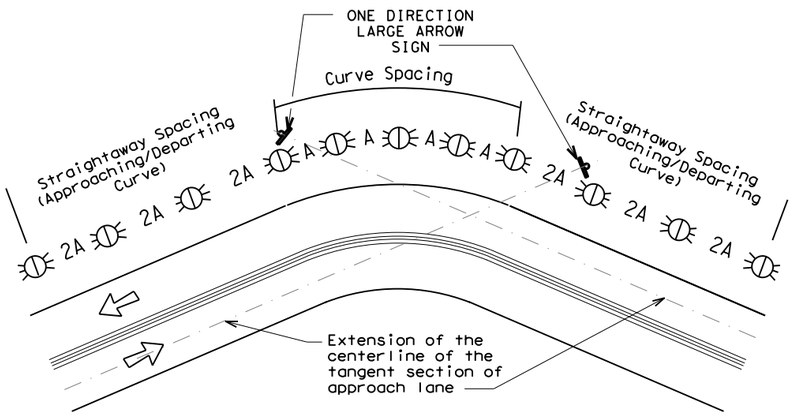
20B

DATE: 12/15/2021 11:25 PM
FILE: DOCUMENT NAME

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

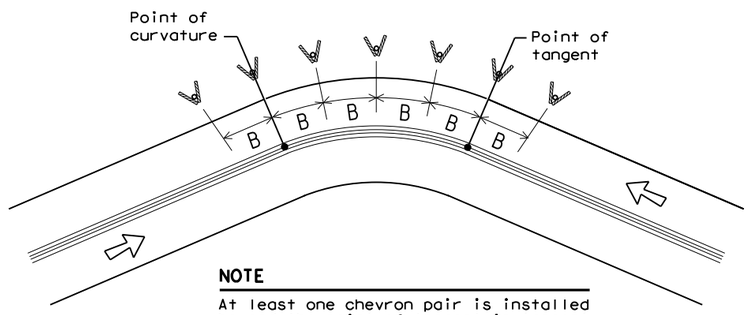
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

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

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

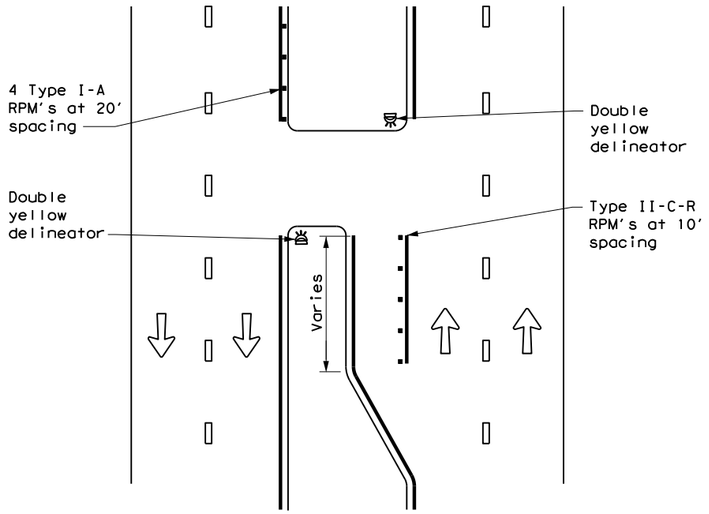
D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	YKM	DE WITT		92

20C

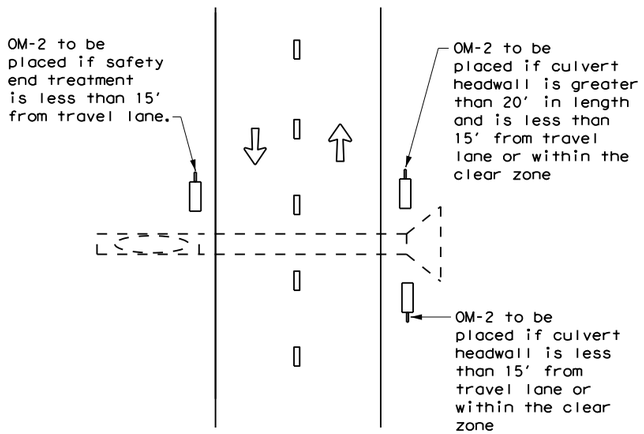
DATE: 12/15/2021 11:25 PM
FILE: DOCUMENT NAME

CROSSOVERS



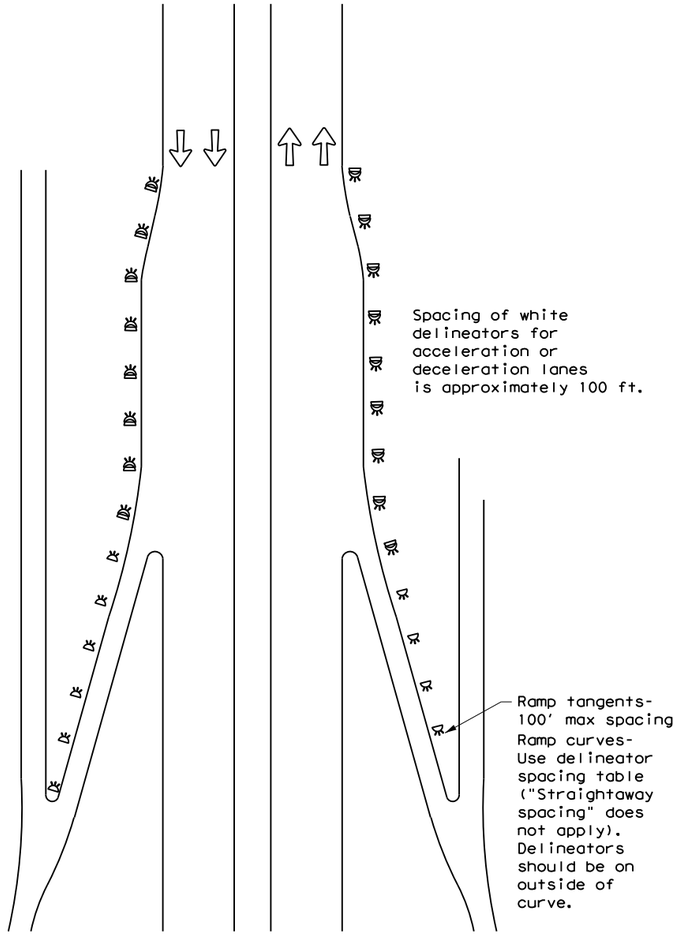
DETAIL 1

FOR CULVERTS WITHOUT MBGF



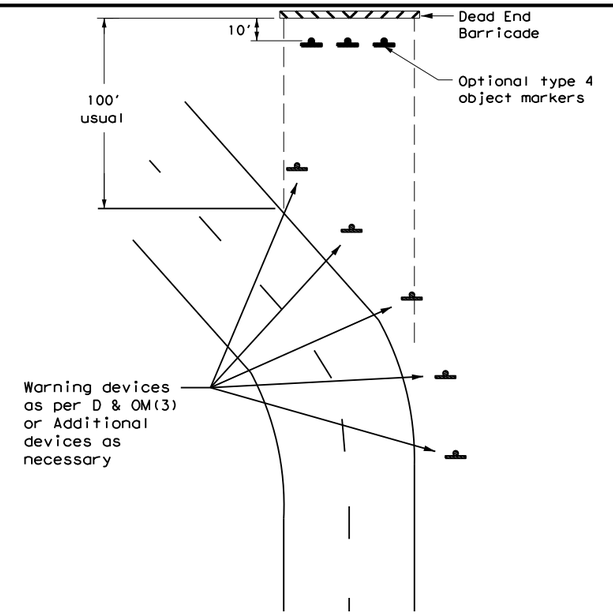
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



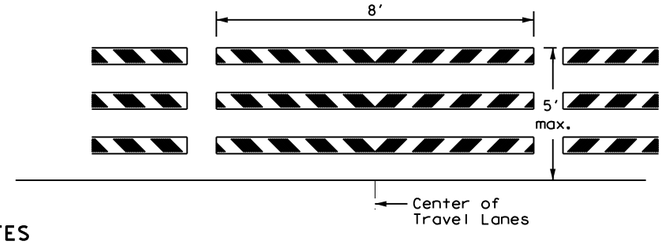
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

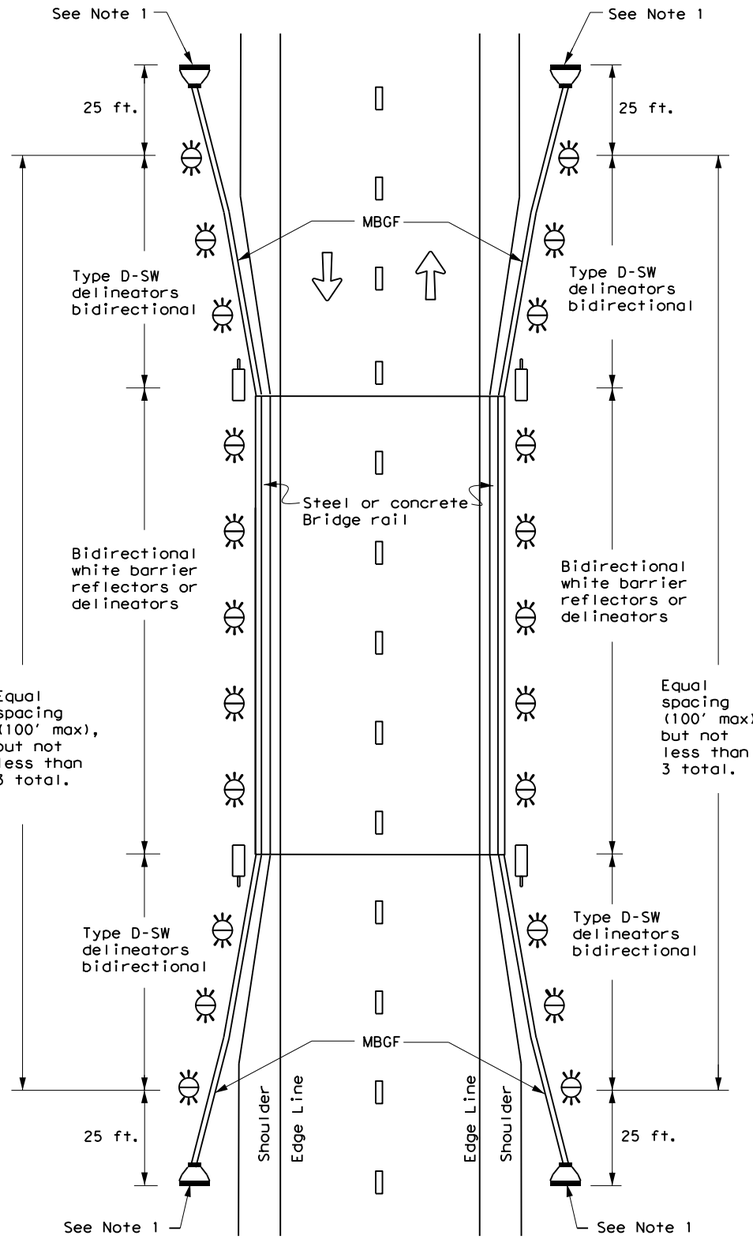
FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
3-15	DIST	COUNTY		SHEET NO.
7-20	YKM	DE WITT		93

20D

DATE: 01/24/2022 12:01 AM
FILE: DOCUMENT NAME

DATE: 12/15/2021 11:25 PM
FILE: DOCUMENT NAME

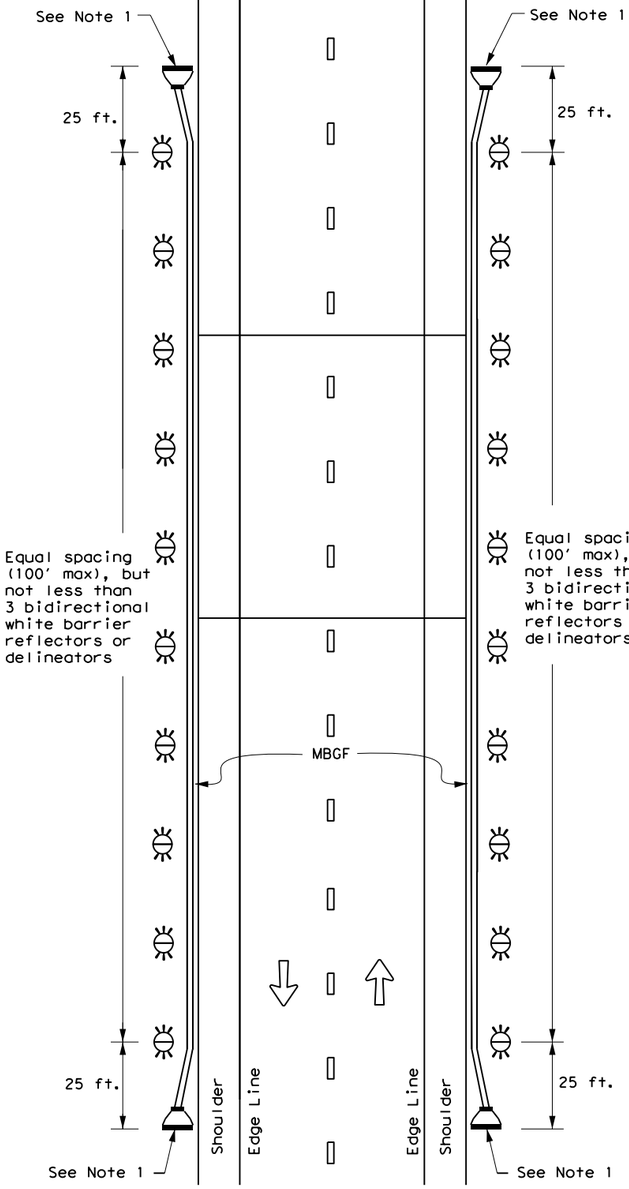
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

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

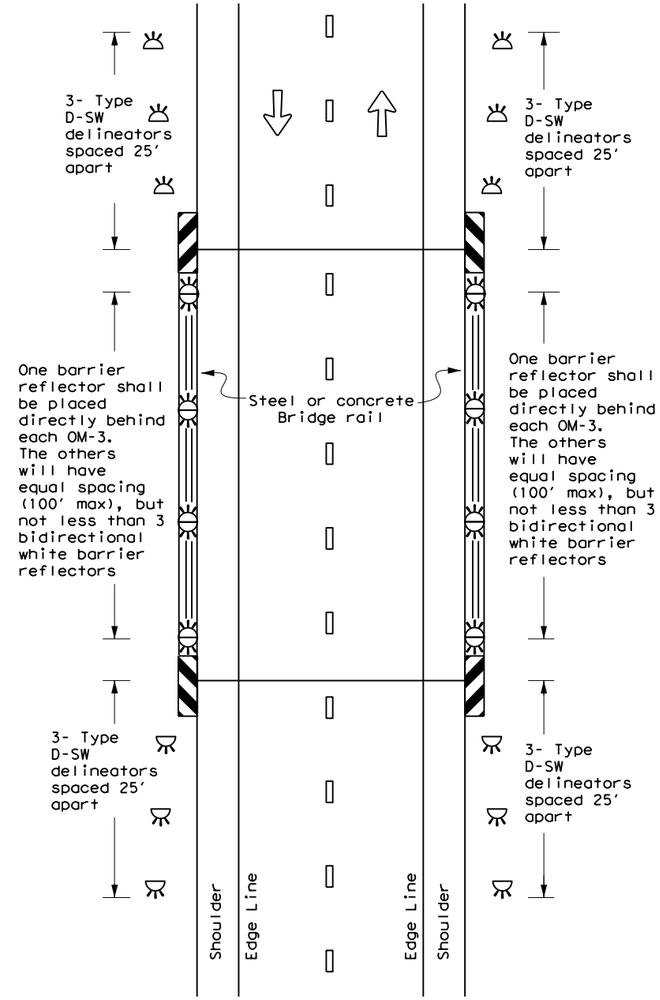
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

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

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



LEGEND

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

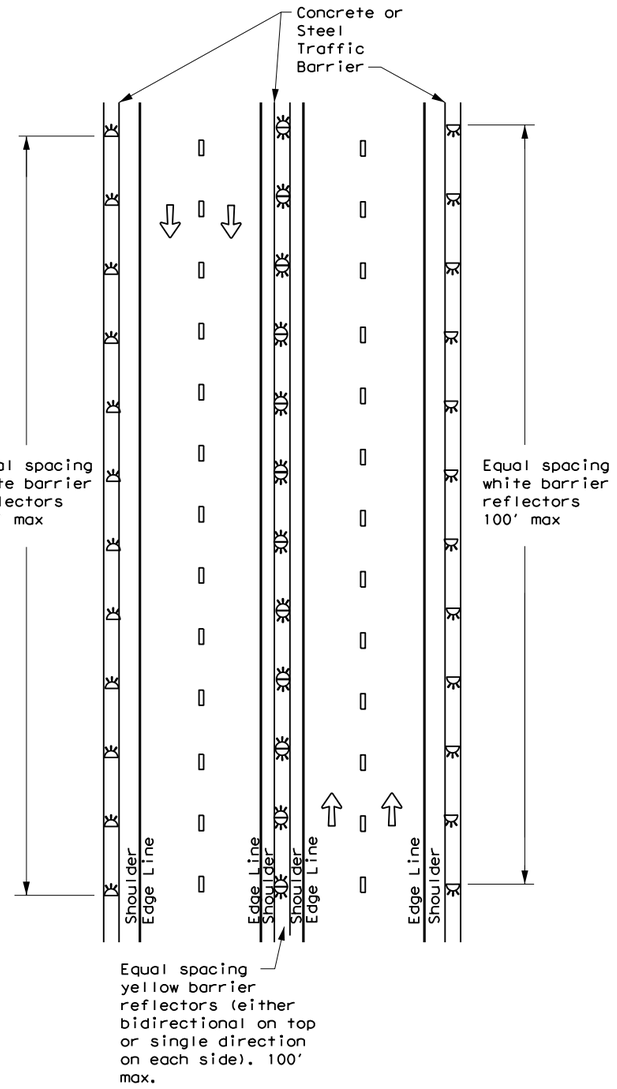
D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
7-20	DIST	COUNTY		SHEET NO.
	YKM	DE WITT		94

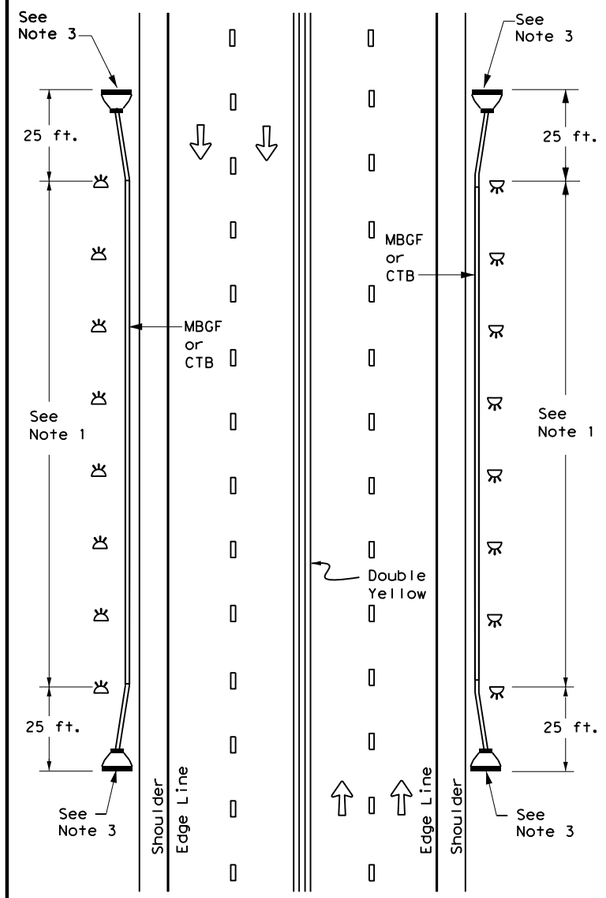
20E

DATE: 01/24/2022 12:07 AM
FILE: DOCUMENT NAME

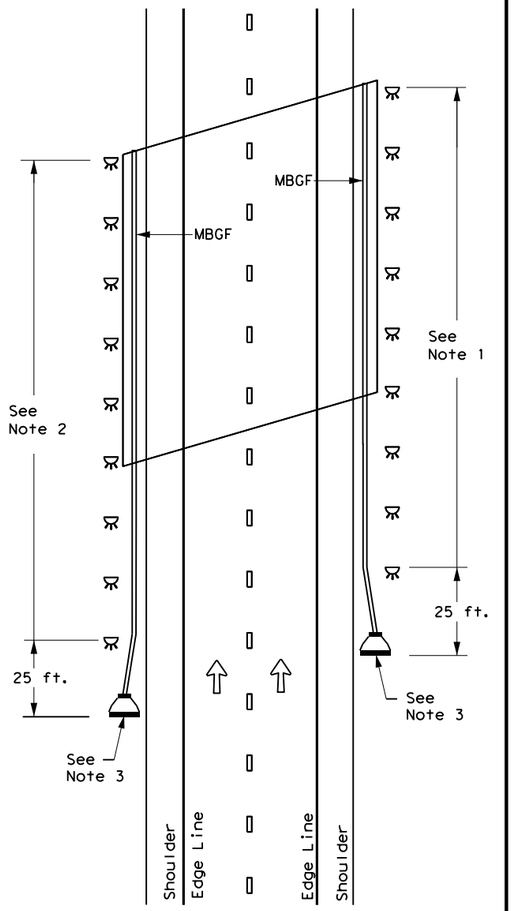
CONTINUOUS CONCRETE OR STEEL BARRIER



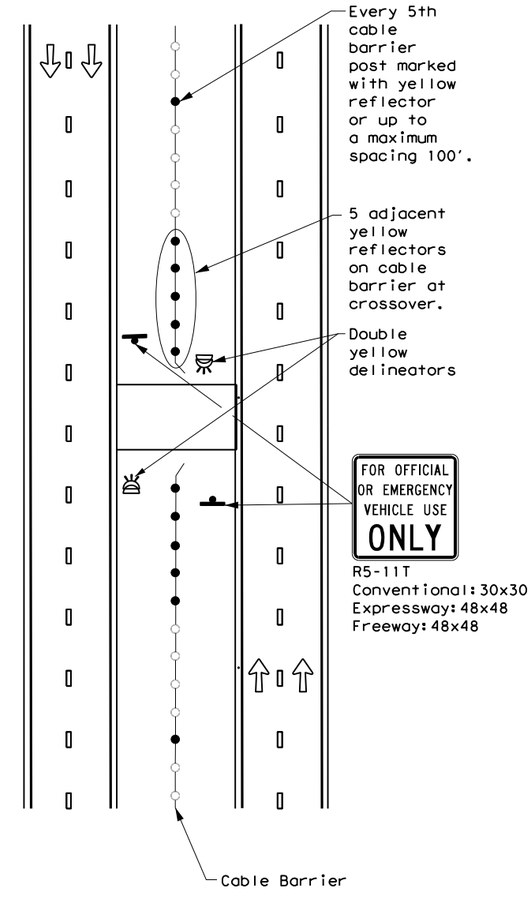
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100′ max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100′ max.)
2. Equal spacing (100′ max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3)in front of the terminal end.

LEGEND

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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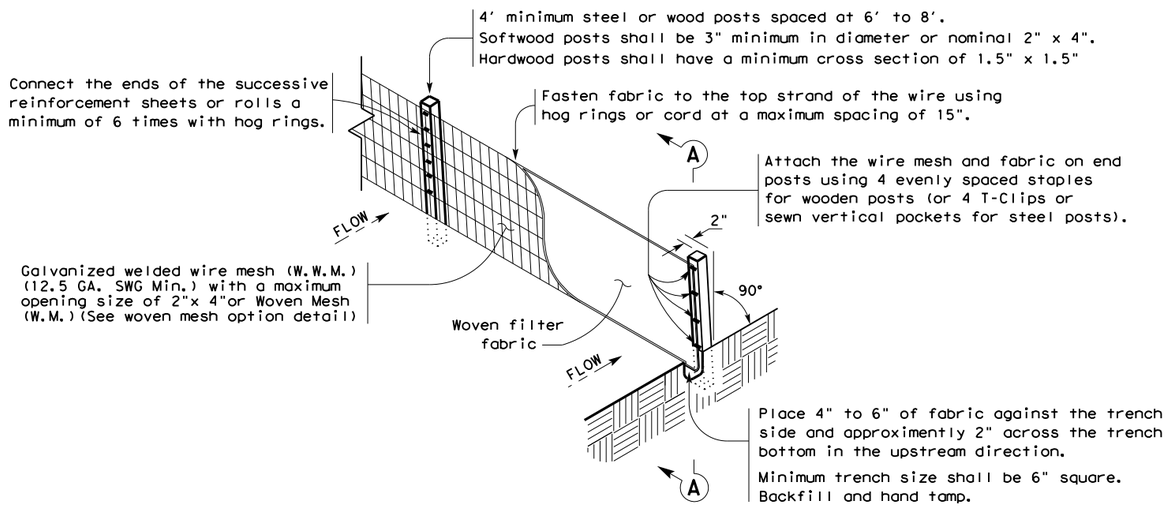
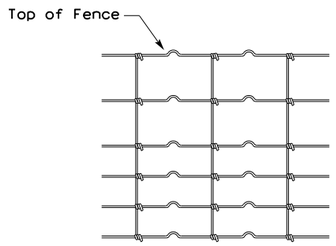
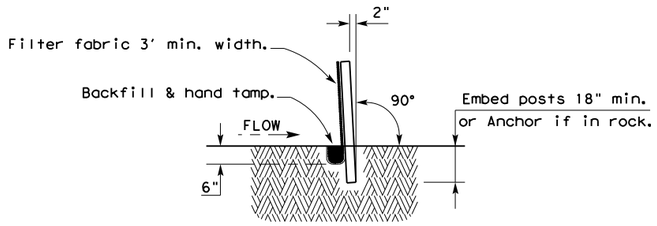
7-20	DIST	COUNTY		SHEET NO.
	YKM	DE WITT		95



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

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

SEDIMENT CONTROL FENCE USAGE GUIDELINES

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

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

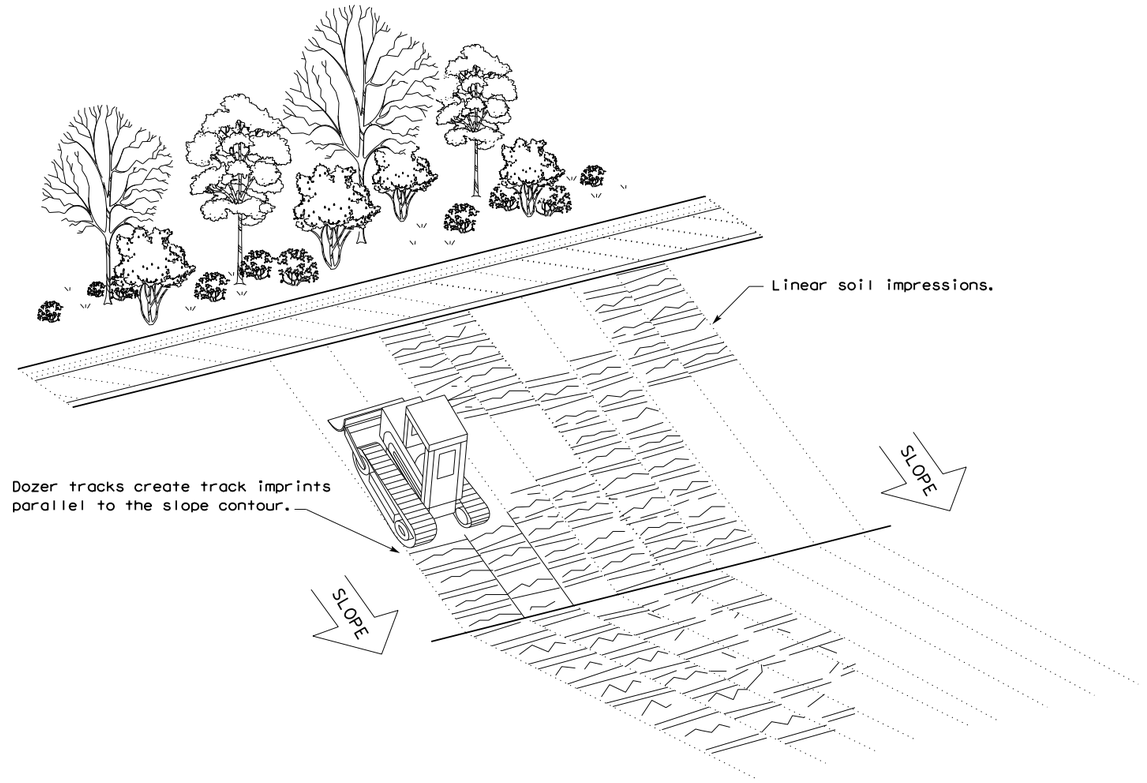
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

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



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
	DIST	COUNTY		SHEET NO.
	YKM	DEWITT		96

I. STORMWATER POLLUTION PREVENTION

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is 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. If applicable list MS4 operator that may receive discharges from this project. MS4 operator should be notified prior to construction activities.

- [x] Prevent stormwater pollution erosion and sedimentation in accordance with TPDES Permit TXR 150000.
- [x] Comply with the SW3P and revise when necessary to control pollution or as 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.
- [ ] When Contractor project specific locations (PSL) increase disturbed soil area to 5 acres or more, sumbit Notice of Intent (NOI) to TCEQ and Engineer.
- [ ] MS4 Operator(s):

No Additional Comments

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS

United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.

- [ ] No USACE Permit Required
- [x] Work is authorized by the USACE under a Nationwide Permit 3a without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set.
- [ ] Work is authorized by the USACE under a Nationwide Permit 3a with a Pre-Construction Notification (PCN). The project specific permit issued by the USACE is included in the plan set.
- [ ] Work is authorized by the USACE under a Individual Permit (IP). The project specific permit issued by the USACE is included in the plan set.
- [ ] Work would be authorized by the USACE. The project specific permit issued by the USACE or Nationwide Permit will be provided to the contractor.

United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.

- [ ] No United States Coast Guard (USCG) Coordination Required
- [ ] United States Coast Guard (USCG) Permit
- [x] United States Coast Guard (USCG) Exemption

Best Management Practices

Erosion	Sedimentation	Post Construction TSS
[x] Temporary Vegetation	[x] Silt Fence	[x] Vegetative Filter Strip
[ ] Mulch	[ ] Rock Filter Dam	[ ] Vegetation Lined Ditches
[ ] Sodding	[ ] Sand Bag Berm	[ ] Grassy Swales

No Additional Comments

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 area and contact the Engineer immediately.

Additional Comments

As-built documents indicate that the Relief Bridge once had a bronze “Works Progress Administration 1935-1937” plaque. If a plaque is uncovered and/or discovered during construction, the contractor shall protect in place until discussed with the Area Engineer. If it’s determined that the existing plaque location is in an area slated for repair and cannot be salvaged in place, the contractor shall remove the plaque intact and make it available to the DeWitt County Historical Commission.
These notes shall be reviewed with the contractor at the pre-construction meeting.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications 162, 164, 192, 193, 506, 730, 751, and 752 in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.

Additional Comments

-Minimize the amount of vegetation proposed for clearing. Removal of native vegetation, particularly mature native trees and scrubs, will be avoided to the greatest extent possible.
-The use of any non-native plant species in re-vegetation will be discouraged.
-Avoid vegetation clearing activities during the nesting season, March through August.

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

If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.

The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to October 1). If removal of structures or vegetation is necessary during the nesting season, the Contractor shall conduct a bird survey no more than 3 days in advance of the clearing/demolish start date. All bird surveys shall be conducted by a Field Biologist and adhere to the guidance document “Avoiding Migratory Birds and Handling Potential Violations” found in the TxDOT Environmental Compliance Toolkits at the time of the survey. (See below for Field Biologist and Ornithologist qualifications)

Additional Comments

Freshwater Mussels
1. Contractor shall take extra care to prevent any materials from falling into the river.
2. The contractor cannot begin work until YKM District Environmental provides Notice to Proceed. Notice to Proceed cannot be issued until the district has received written concurrence from the U.S. Fish and Wildlife Service that the voluntary conservation measures of the BE will prevent adverse effects to the freshwater mussels or their critical habitat. YKM District Environmental can provide Notice to Proceed for work at least 500 feet away from the water after January 2, 2023.

Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor’s degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

Refer to TxDOT Standard Specifications in the event potentially contaminated materials are observed, such as dead or distressed vegetation, trash disposal areas, drums, canisters, barrels, leaching or seepage of substances, unusual smells or odors, or stained soil, cease work in the area and contact the Engineer immediately.

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structutres not including box culverts)? Yes [x] No [ ]

Are results of the asbestos inspection positive (is asbestos present)? Yes [ ] No [x]

TxDOT is still required to notify DSHS 14 working days prior to any scheduled demolition.

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.

Additional Comments

Lead paint on steel rails, beams and trestle components.

VII. ADDITIONAL ENVIRONMENTAL COMMENTS & ISSUES

Comments:
Notify the United State Coast Guard (USCG) for any temporary closures or alterations to navigability 60 days in advance of channel closure.

Notify the TxDOT Engineer immediately if any vessel makes contact with a TxDOT bridge.

The contractor's attention is directed to the fact that discharges of permanent or temporary fill material into the waters of the United States, including jurisdictional wetlands, as necessary for construction, will require specific approval of the USACE under Section 404 of the Clean Water Act.

TxDOT will obtain the appropriate permit(s), Nationwide or Individual, when necessary as dictated by the proposed actions for the project and it's potential to affect USACE jurisdictional areas. The contractor may review the permitted plans at the office of the Area Engineer in charge of construction. TxDOT will hold the contractor responsible for following all conditions of the approved permit. If the contractor cannot work within the limits of the permit(s), then it becomes the contractor's entire responsibility to consult with the USACE pertaining to the need for changes or amendments to the conditions of the exiting permit(s) as originally obtained by the department.

Particular importance is stressed on the fact that nay impacts to USACE jurisdictional waters of the United States, including jurisdictional wetlands, be the minimum necessary to complete the proposed work. The contractor shall maintain near normal flow of any jurisdictional waters of the United States at all times during construction. If the contractor needs further explanation of the conditions of the permit, including means of compliance, they may contact the Yoakum District Environmental Coordinator.

Version 2.1

Texas Department of Transportation | TxDOT Yoakum District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0143	08	098	US 87
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	YKM	DEWITT		97

DATE: Jun 22, 2022
FILE: