INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT: F 2022(696)

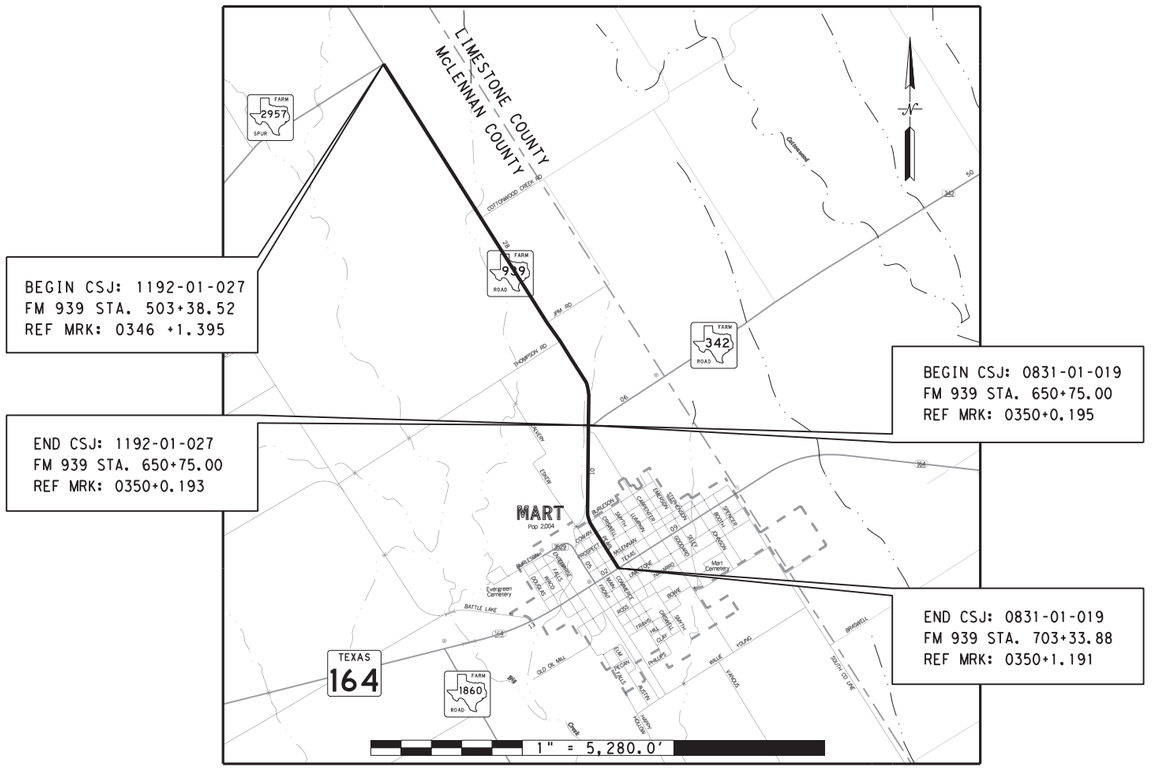
McLENNAN COUNTY

FM 939

	CSJ 0831-01-019		CSJ 1192-01-027		PROJECT NET	
ROADWAY:	FT= 5,258.88	MI.= 0.996	FT= 14,611.48	MI.= 2.767	FT= 19,870.88	MI.= 3.763
BRIDGE:	FT= 0.00	MI.= 0.000	FT= 125.00	MI.= 0.024	FT= 125.00	MI.= 0.024
TOTAL:	FT= 5,258.88	MI.= 0.996	FT= 14,736.48	MI.= 2.791	FT= 19,995.36	MI.= 3.787

CSJ 0831-01-019 LIMITS: FROM: FM 2957 TO: FM 342
CSJ 1192-01-027 LIMITS: FROM: FM 342 TO: FM 164

FOR THE CONSTRUCTION OF REHABILITATION OF EXISTING ROAD
CONSISTING OF REHAB AND WIDEN ROADWAY



BEGIN CSJ: 1192-01-027
FM 939 STA. 503+38.52
REF MRK: 0346 +1.395

END CSJ: 1192-01-027
FM 939 STA. 650+75.00
REF MRK: 0350+0.193

BEGIN CSJ: 0831-01-019
FM 939 STA. 650+75.00
REF MRK: 0350+0.195

END CSJ: 0831-01-019
FM 939 STA. 703+33.88
REF MRK: 0350+1.191

EXCEPTIONS: NONE
EQUATIONS: NONE
RR CROSSINGS: NONE

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

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	F 2022(696)		FM 939
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	WACO	McLENNAN	1
CHECK	CONTROL	SECTION	JOB	
	0831	01	019, ETC	

DESIGN SPEED = 40 MPH

YEAR	ADT
2022	1,290
2042	14,180

Texas Department of Transportation

Recommended for Letting 8/2/2022
, P.E.
Area Engineer

Recommended for Letting 08/02/2022
Director of Transportation Planning & Development

Approved for Letting 8/3/2022
DocuSigned by: Stanley Swiatek B69BD796D0584C9...
District Engineer

SHEET NO	DESCRIPTION
	GENERAL
1	TITLE SHEET
2	INDEX OF SHEETS
3	PROJECT LAYOUT
4-5	EXISTING TYPICAL SECTIONS
6-7	PROPOSED TYPICAL SECTIONS
8, 8A-8G	GENERAL NOTES
9, 9A-9C	ESTIMATE & QUANTITY
10-13	CONSOLIDATED SUMMARIES
	TRAFFIC CONTROL PLAN
14	SEQUENCE OF CONSTRUCTION
15	SEQUENCE OF WORK
16-17	REMOVE & REPLACE SIGNS
18	CTB LAYOUT FOR BRIDGE CONSTRUCTION
19	CRASH CUSHION SUMMARY SHEET
	TRAFFIC CONTROL PLAN STANDARDS
* 20-31	BC (1)-21 THRU BC (12)-21
* 32	SSCB (5) - 10
* 33-35	TCP 1-(1)-18 THRU TCP(3)-18
* 36	TCP 1-(6)-18
* 37-39	TCP 2-(1)-18 THRU TCP 1-(3)-18
* 40-41	TCP 2-(7)-18 THRU TCP 2-(8)-18
* 42	TCP (3-1)-13
* 43	TCP (3-3)-13
* 44	OMIT
* 45	TCP (3-4)-14
* 46	WZ (RS)-22
* 47	WZ (STPM) -13
* 48	WZ (UL)-13
* 49	ABSORB (M) - 19
* 50	SLED - 19
	ROADWAY DETAILS
51	GEOMETRIC DATA SHEET
52-72	ROADWAY PLAN AND PROFILE
73	BRIDGE MILLING DETAIL SHEET
74	DRIVEWAY DETAILS
75	INTERSECTION DETAILS
76	MAILBOX TURNOUT DETAILS
77	MANHOLE ADJUSTMENT DETAIL
78	WATER VALVE BOX ADJUSTMENT DETAIL
	ROADWAY STANDARDS
* 79	BED-14
* 80	CCCG-21
* 81	GF (31)-19
* 82	GF (31) MS-19
* 83-84	GF (31) TR TL3-20
* 85	SGT (11S) 31-18
* 86	SGT (12S) 31-18
* 87	SGT (15) 31-20
	DRAINAGE DETAILS
88	DRAINAGE AREA MAP
89	DRAINAGE CALCULATIONS
90-100	CULVERT LAYOUT
101	DRAINAGE DETAILS
102	BCS

SHEET NO	DESCRIPTION
	DRAINAGE DETAILS STANDARDS
* 103	CRR
* 104	ECD
* 105	MC-MD
* 106-107	MC-6-16
* 108	FW-S
* 109	PW
* 110	SCC-MD
* 111-112	SCC-3 & 4
* 113-114	SCC-5 & 6
* 115-116	SCC-7
* 117-118	SCC-8
* 119-121	SCC-10
122-123	SCC-10 (MOD)
* 124-126	SETB-FW-0
* 127-128	SETP-CD
* 129	PSET-SC
	BRIDGE
131-132	LAYOUT & DETAILS FOR ABUTMENT AND APPROACH ROADWAY REPAIR
133	RETROFIT TRAFFIC RAIL LAYOUT
134-136	RETROFIT TRAFFIC RAIL DETAILS
137	LAYOUT & DETAILS FOR CLEANING AND SEALING EXPANSION JOINTS
	BRIDGE STANDARDS
* 138-139	CSAB
* 140-141	SRR
	TRIFFIC
142-152	PAV MRKRS & SIGNS
153-154	SMALL SIGN DATA SHEET
155	SMALL SIGN DETAILS
	TRAFFIC STANDARDS
* 156-161	D&OM (1)-20 THRU D&OM (6)-20
* 162	D & OM (VIA)-20
* 163-166	PM (1)-20 THRU PM(4)-20
* 167	RS (3)-13
* 168	SMD (GEN)-08
* 169-171	SMD(SLIP-1)-08 THRU SMD(SLIP-3)-08
* 172	SMD(TWT)-08
* 173-174	TSR(3)-13 THRU TSR(4)-13
	ENVIRONMENTAL ISSUES
175	SW3P
176	EPIC
177-187	SW3P LAYOUT
	ENVIRONMENTAL ISSUES STANDARDS
* 188	EC (1) - 16
* 189	EC (2) - 16
* 190	EC (3) - 16
* 191-200	TA - BMP (WACO DISTRICT STANDARDS)

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

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

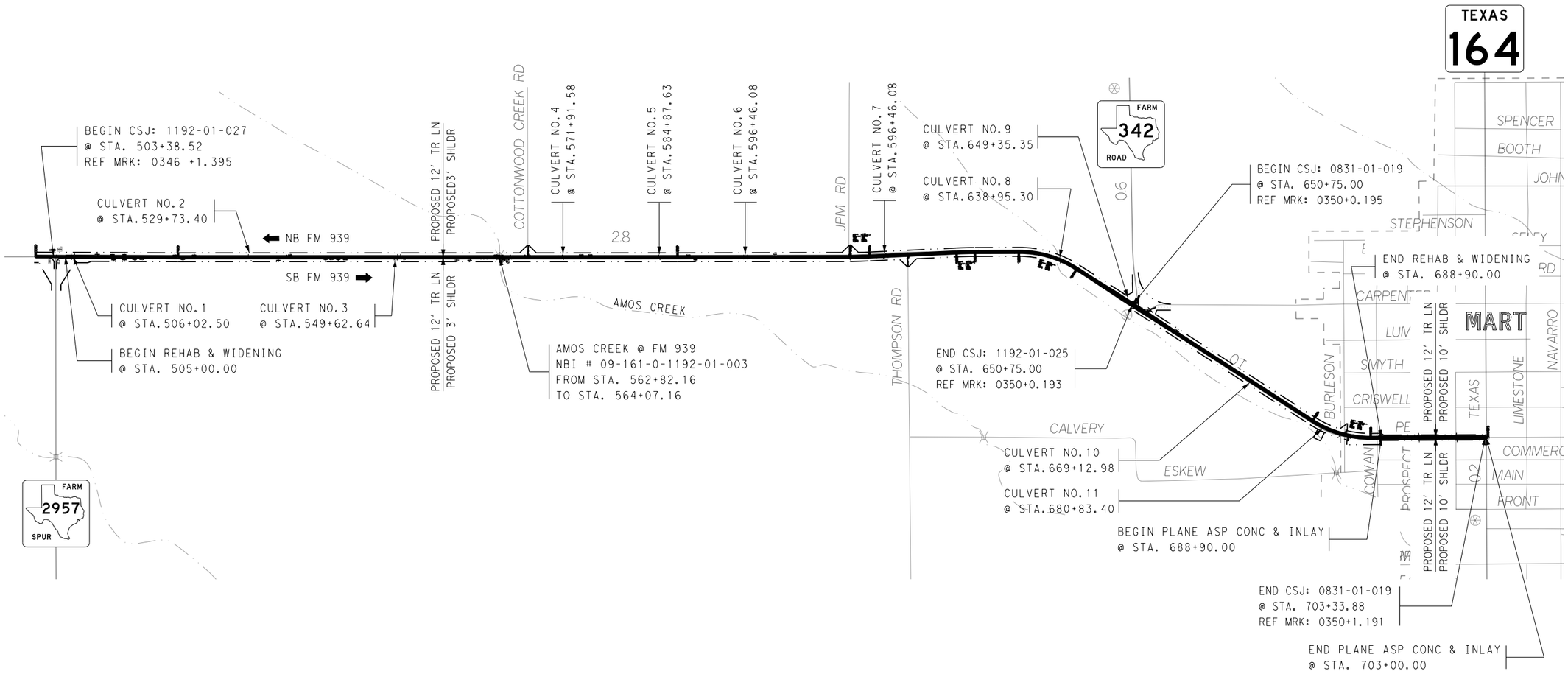
Bradley Mayes 4/26/2022
SIGNATURE OF REGISTRANT & DATE

© 2022 Texas Department of Transportation

INDEX OF SHEETS

SHEET 1 OF 1

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		2



STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022

SIGNATURE OF REGISTRANT & DATE

PROJECT LAYOUT

CSJ: 0831-01-019
CSJ: 1192-01-027

SCALE: 1" = 1500' HORIZ. FEET

SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		3

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4/14/2022
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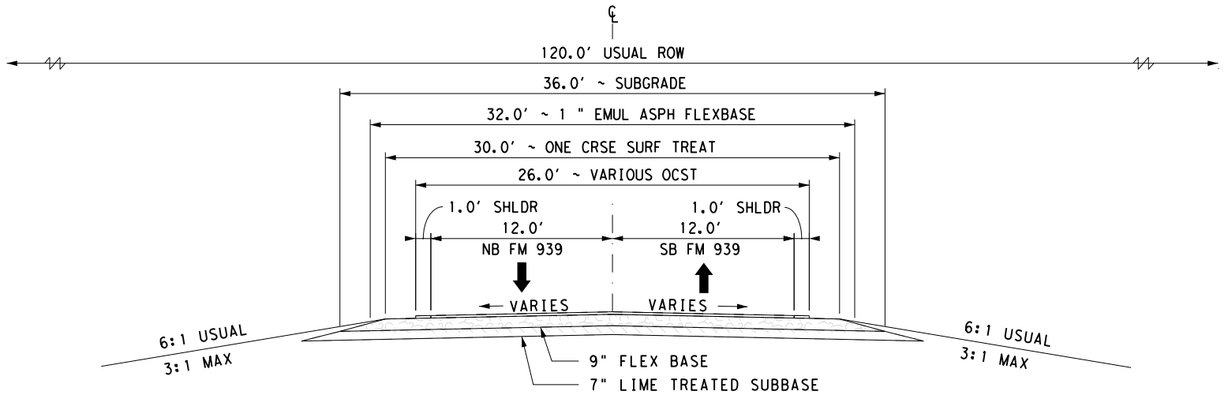
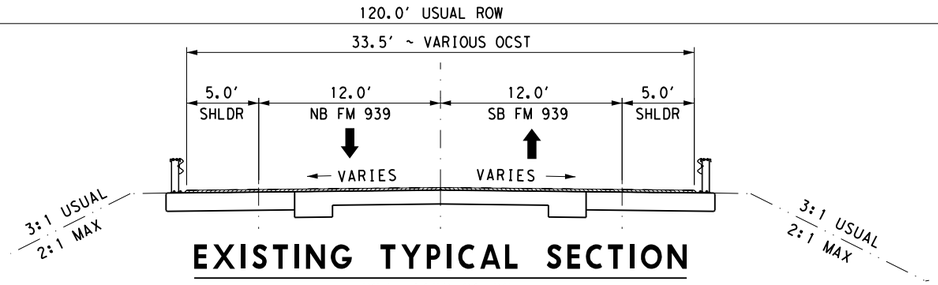


EXISTING TYPICAL SECTION

CSJ: 1192-01-027
FROM STA. 505+00.00 TO STA. 562+82.16
FROM STA. 564+07.16 TO STA. 643+90.00
CSJ: 0831-01-019
FROM STA. 656+89.00 TO STA. 688+90.00



EXISTING TYPICAL SECTION

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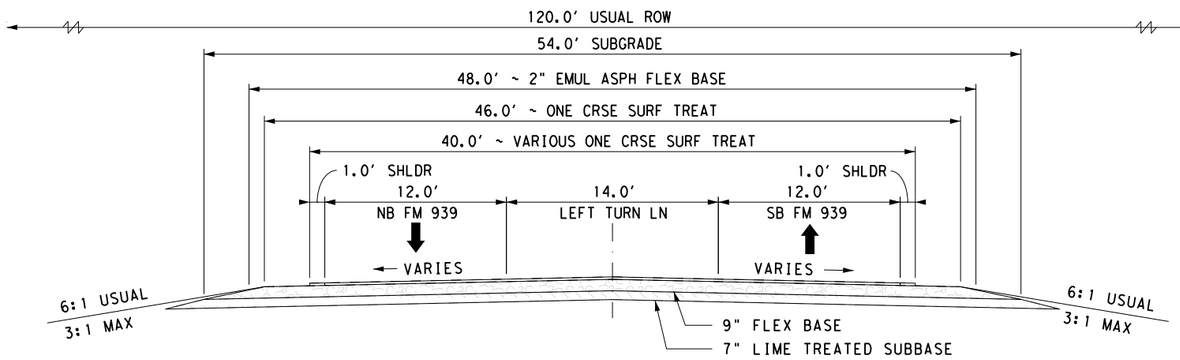
FROM STA. 562+82.16 TO STA. 564+07.16
AMOS CREEK ~ NBI NO. 09-161-0-1192-01-003



EXISTING TYPICAL SECTION

CSJ: 1192-01-027
FROM STA. 643+90.00 TO STA. 648+10.00 (TRANSITION)
FROM STA. 648+10.00 TO STA. 650+75.00
CSJ: 0831-01-019
FROM STA. 650+75.00 TO STA. 652+69.00
FROM STA. 652+69.00 TO STA. 656+89.00 (TRANSITION)

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

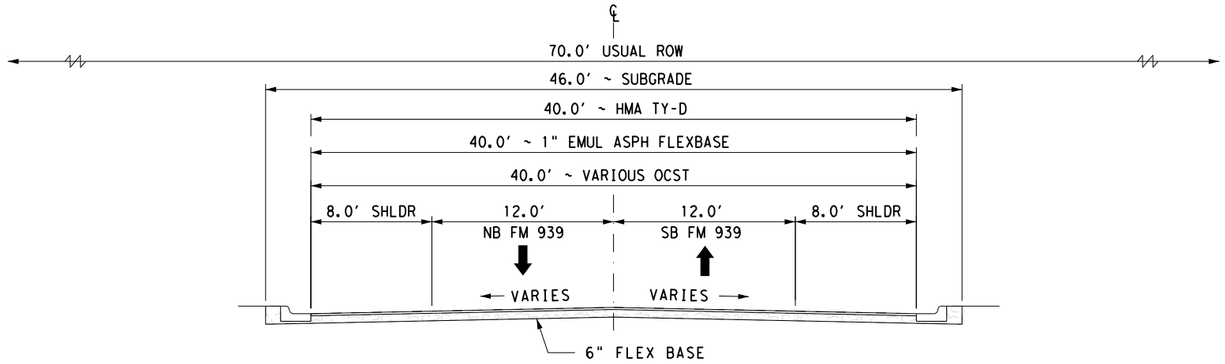
Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

EXISTING TYPICAL SECTIONS

FROM STA. 505+00.00 TO STA. 688+90.00

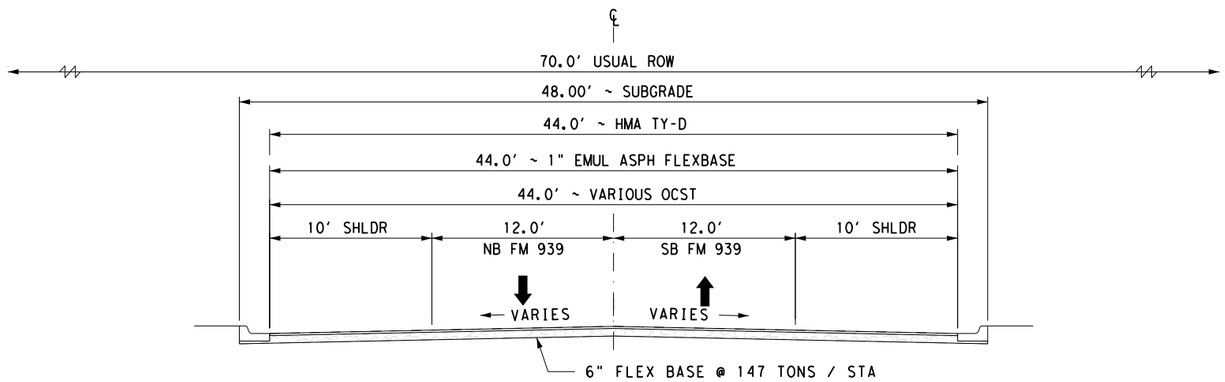
NO SCALE SHEET 1 OF 2

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		4



EXISTING TYPICAL SECTIONS

CSJ: 0831-01-019
FROM STA. 688+90.00 TO STA. 698+83.00



EXISTING TYPICAL SECTIONS

CSJ: 0831-01-019
FROM STA. 698+83.00 TO STA. 703+00.00

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

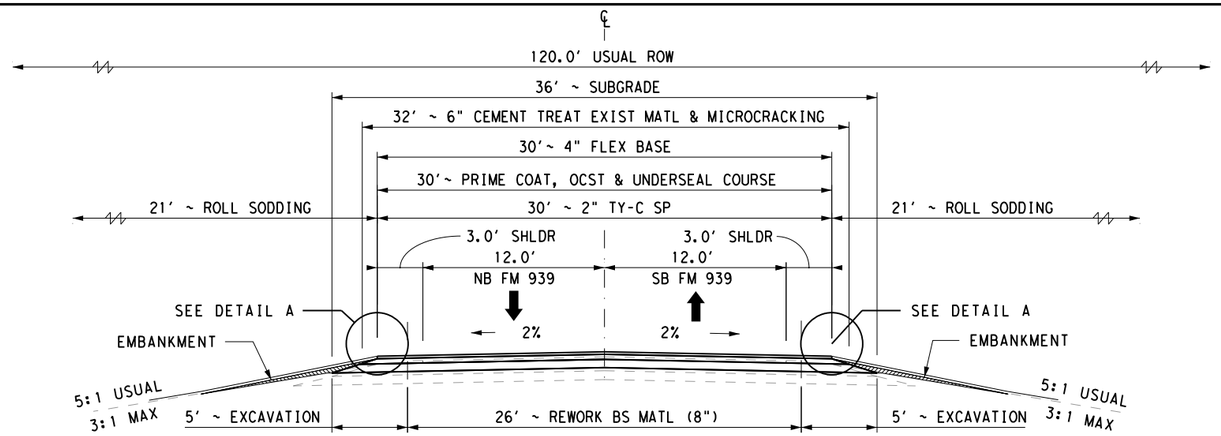
Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

EXISTING TYPICAL SECTIONS

FROM STA. 688+90.00 TO STA. 703+00.00

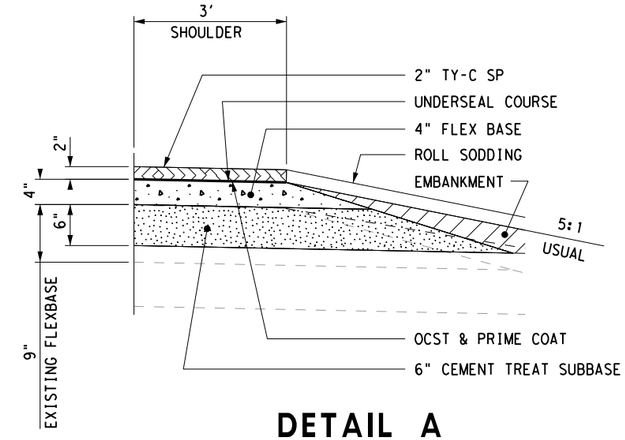
NO SCALE SHEET 2 OF 2

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		5

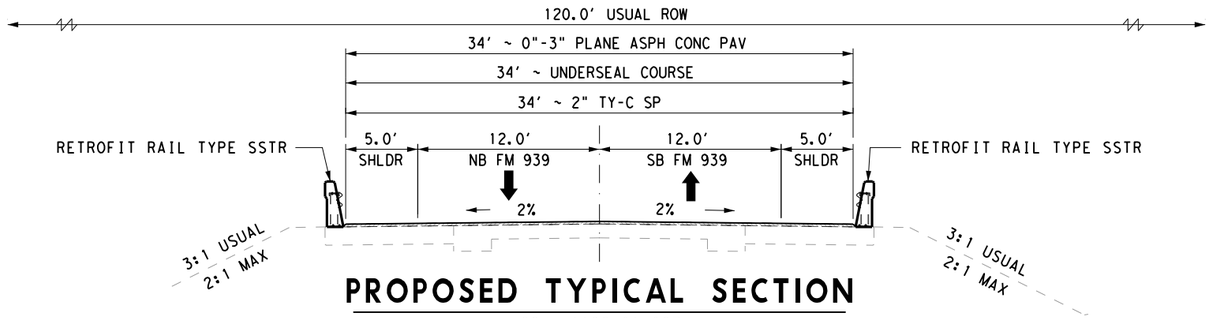


PROPOSED TYPICAL SECTION

CSJ: 1192-01-027
FROM STA. 505+00.00 TO STA. 562+82.16
FROM STA. 564+07.16 TO STA. 643+90.00
CSJ: 0831-01-019
FROM STA. 656+89.00 TO STA. 688+90.00

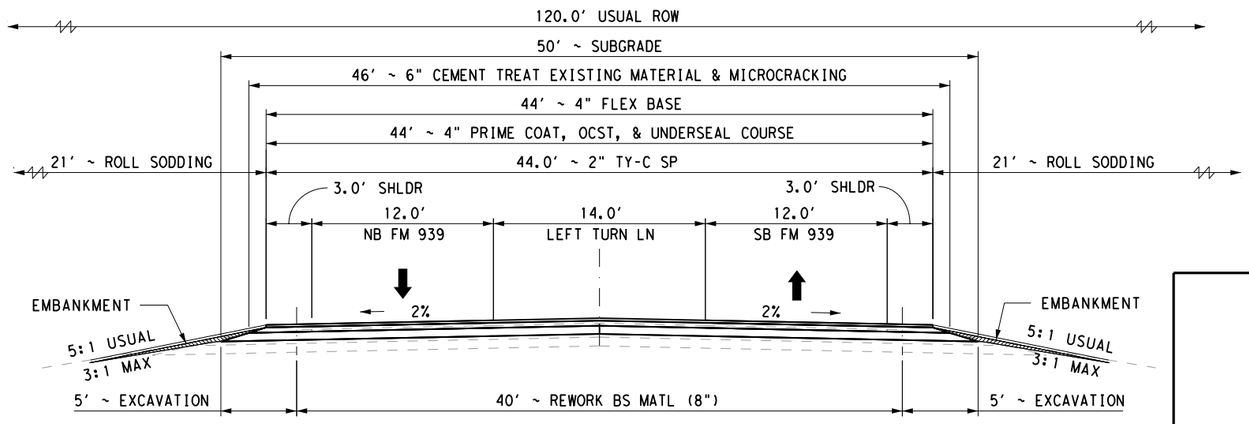


DETAIL A



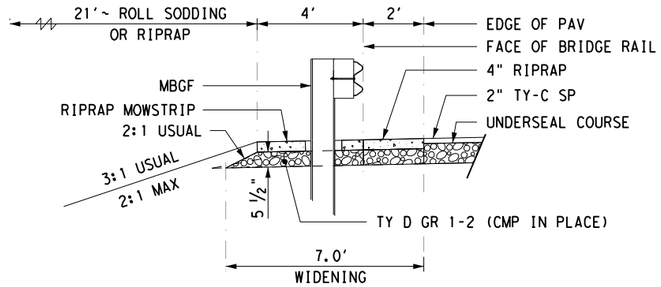
PROPOSED TYPICAL SECTION

CSJ: 1192-01-027
FROM STA. 562+82.16 TO STA. 564+07.16
AMOS CREEK ~ NBI NO. 09-161-0-1192-01-003



PROPOSED TYPICAL SECTION

CSJ: 1192-01-027
FROM STA. 643+90.00 TO STA. 648+10.00 (TRANSITION)
FROM STA. 648+10.00 TO STA. 650+75.00
CSJ: 0831-01-019
FROM STA. 650+75.00 TO STA. 652+69.00
FROM STA. 652+69.00 TO STA. 656+89.00 (TRANSITION)



MBGF DETAIL

FROM STA: 561+10.00 TO STA: 562+57.53 (LT)
FROM STA: 563+95.63 TO STA: 566+68.43 (LT)
FROM STA: 560+08.74 TO STA: 562+93.78 (RT)
FROM STA: 564+31.78 TO STA: 565+79.33 (RT)

ALL MBGF DETAILS ON THE RIGHT SIDE (RT) OF THE ROADBED WILL BE MIRROR IMAGE OF WHAT IS SHOWN.

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

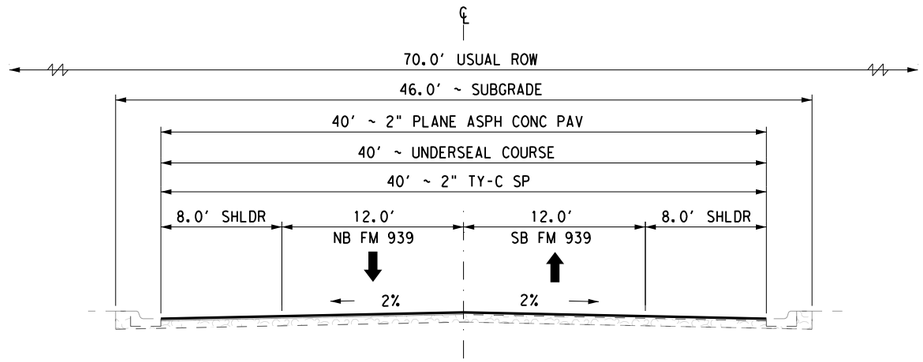
PROPOSED TYPICAL SECTIONS

FROM STA. 505+00.00 TO STA. 688+90.00

NO SCALE

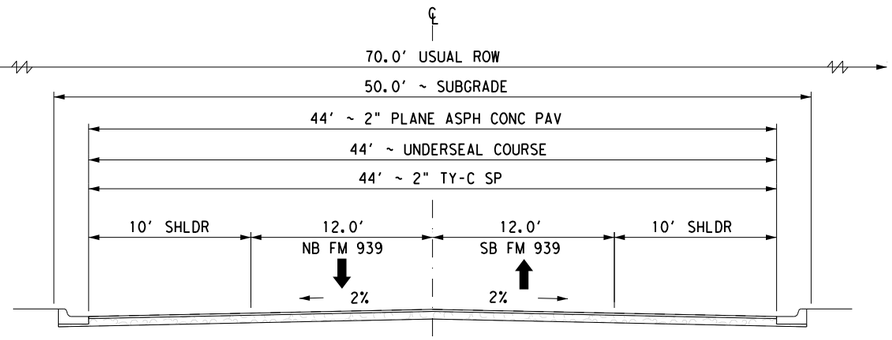
SHEET 1 OF 2

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		6



PROPOSED TYPICAL SECTIONS

CSJ: 0831-01-019
FROM STA. 688+90.00 TO STA. 698+83.00



PROPOSED TYPICAL SECTIONS

CSJ: 0831-01-019
FROM STA. 698+83.00 TO STA. 703+00.00

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

PROPOSED TYPICAL SECTIONS

FROM STA. 688+90.00 TO STA. 703+00.00

NO SCALE SHEET 2 OF 2

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		7

Table 1: Basis of Estimate for Erosion Control Items

Item	Description	Rate	Basis	Quantities
*166	FERTILIZER			
	FERTILIZER (20-10-10) (PERMANENT)	300 LBS / AC	17.1 AC	2.6 TON
168	VEGETATIVE WATERING			
	(3 APPLICATIONS - PERM)	13,100 GAL/AC/APP	17.1 AC	224.0 MG

Table 2: Basis of Estimate for Base Work

Item	Description	Rate	Basis	Quantities
247	FLEXIBLE BASE			
	FL BS (CMP IN PLC)(TYD GR1-2)(FNAL POS)	138 LB/CF	191,700 CF	7,100 CY *13,277 TON
	FL BS(RDWY DEL)(TY D GR 1-2)(FNAL POS)	138 LB/CF	48,114 CF	1,782 CY *3,320 TON
275	CEMENT TREATMENT (ROAD-MIXED)			
	CEMENT TREATMENT (ROAD-MIXED) (6")	3.0 LB / SY / IN (EST'D @ 3%)	69,843 SY	637 TON
310	PRIME COAT			
	PRIME COAT (MC-30 OR AE-P)	0.20 GAL / SY	62,330 SY	12,466 GAL

* FOR CONTRACTOR'S INFORMATION ONLY

Table 3: Basis of Estimate for Seal Coats

Item	Description	Rate	Basis	Quantities
316	SEAL COAT			
	FIRST COURSE			
	ASPH (CRS-2)	0.45 GAL / SY	62,330 SY	27,997 GAL
	AGGR (TY-D GR-4 OR TY-L GR-4)	1 CY / 135 SY	62,330 SY	472 CY

Table 4: Basis of Estimate for Asphalt Pavements

Item	Description	Rate	Basis	Quantities
3077	SUPERPAVE MIXTURES			
	TY-C PG 70-22	110 LB / SY / IN	68,905 SY	7,590 TON

Table 5: Basis of Estimate for Interlayer Material

Item	Description	Rate	Basis	Quantities
3085	UNDERSEAL COURSE	0.25 GAL / SY	68,905 SY	17,241 GAL
	FOR CONTRACTORS INFORMATION			
	SPRAY APPLIED MEMBRANE	0.25 GAL / SY	68,905 SY	17,241GAL
	TRAIL	0.20 GAL / SY	68,905 SY	13,781 GAL
	ASPH (AC-15P, AC-20XP, AC10-2TR, AC-12-5TR)	0.25 GAL / SY	68,905 SY	17,241 GAL
	AGGR (TY-PD GR-5 OR TY-PL GR-5) (SAC-B)	1 CY / 150 SY	68,905 SY	459 CY

GENERAL

The construction, operation and maintenance of the proposed project will be consistent with the state implementation plan as prepared by the Texas Commission on Environmental Quality.

The disturbed area for this project, as shown on the plans is 17.1 acres. However, the Total Disturbed Area (TDA) will establish the required authorization for storm water discharges. The TDA of this project will be determined by the sum of the disturbed area in all project locations in the contract, and all disturbed area on all Project-Specific Locations (PSL) located in the project limits and/or within 1 mile of the project limits. The department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction site as shown on the plans, according to the TDA of the project. The contractor will obtain any required authorization from the TCEQ for the discharge of storm water from any PSL for construction support activities on or off of the project row according to the TDA of the project. When the TDA for the project exceeds 1 acre, provide a copy of the appropriate application of permit (NOI, or Construction Site Notice) to the engineer, for any PSL located in the project limits or within 1 mile of the project limits. Follow the directives and adhere to all requirements set forth in the TCEQ, Texas Pollution Discharge Elimination System, Construction General Permit (TPDES, CGP).

There is a high probability that an environmentally sensitive area could be encountered on the contractor designated Project-Specific Locations (PSL) for this project (haul roads, equipment staging areas, borrow pits, disposal sites, field offices, storage areas, parking areas, etc.). Item 7.6 "Project-Specific Locations", provides a listing of regulatory agencies that may need to be contacted regarding this project.

Contractor questions on this project are to be emailed to the Waco District at the following address:

Bill Compton - Wacoprebid@txdot.gov, 254-867-2707, 100 S. Loop Dr., Waco, TX
Carmen Chau - Wacoprebid@txdot.gov, 254-867-2794, 100 S. Loop Dr., Waco, TX

Or Via phone or in person to the following individual(s):
Area Engineer's: Clayton Zacha, P.E. 254/772-2890
Assistant Area Engineer's: Jeff Jackson, P.E. 254/772-2890

All contractor questions will be reviewed by the Area Engineer or Assistant Area 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.

Paper copies of cross-sections may be produced by using the provided .pdf file located on the above FTP Website at the bidders' expense and at copying companies. This data is for non-construction purposes only and it is the responsibility of the prospective bidder to validate the enclosed data with appropriate plans, specifications and estimate for the project(s).

GENERAL NOTES

The following standard detail sheets have been modified:
SCC-10(MOD)

ITEM 5: CONTROL OF THE WORK

Submit all fabrication and shop drawings per TxDOT's online shop drawing submittal system and copy the Area Engineer on the email submittal, unless otherwise directed.

Where a precast or cast-in-place concrete element is shown in the plans, Contractor may submit a precast concrete alternate in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at:
https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design.
Acceptance or denial of an alternate is at the sole discretion of the Department. Contractor is responsible for impacts to the project schedule and cost resulting from the use of alternates.

Underground utilities owned by the Texas Department of Transportation may be present within the Right-Of-Way on this project. For signal, illumination, surveillance, and communications & control maintained by TxDOT, call the TxDOT Traffic Signal Office (254)867-2808 for locates a minimum of 48 hours in advance of excavation. For irrigation systems, call TxDOT Landscape Office (254)867-2726 for locates a minimum of 48 hours in advance of excavation. If city or town owned irrigation facilities are present, call the appropriate department of the local city or town a minimum of 48 hours in advance of excavation. The Contractor is liable for all damages when utilities are damaged due to Contractor's negligence including, but not limited to, repair or replacement at the Contractor's expense.

ITEM 6: CONTROL OF MATERIALS

References to manufacturer's trade name or catalog numbers are for the purpose of identification only and the contractor will be permitted to furnish like materials of other manufacturers provided they are of equal quality and comply with specifications for this project.

ITEM 7: LEGAL RELATIONS AND RESPONSIBILITIES

No significant traffic generator events identified.

If utilizing private property for waste disposal sites, field office sites, equipment storage sites or for any other purpose involved with this project, provide to the Engineer written proof of the property owner's approval of the use of this property. This proof may be in the form of a letter or agreement signed by the property owner or other documents acceptable to the Engineer.

Personal vehicles of the contractor's employees will not be parked within the right of way at any time including any section closed to public traffic, unless the vehicle is being utilized for construction procedures. However, the contractor's employees may park on the right of way at the sites where the contractor has his office, equipment and materials storage yard.

The contractor is alerted to the possible presence of swallows under the existing bridges or culverts. Because the migratory bird treaty act prohibits harm to swallows, their eggs or their nestlings, the contractor will not begin potentially disturbing activities on or near the bridge until the birds have abandoned any occupied nests (approximately September 1). Active nests may not be removed regardless of the date.

Prior to the swallows returning to the nests (approximately March 1), abandoned nests will be removed from the bridge. The contractor will prevent the establishment of new nests on any portion of the structure. Methods for preventing the establishment of new nests must be approved by the project Engineer. Examples of acceptable nest prevention methods are bird-deterrent netting and bird-repelling sprays and/or gels to be applied to the structure. This work will not be paid for directly but will be subsidiary to the various bid items.

The Contractor will submit detailed site-specific plans for work in each "water of the United States" designated on the EPIC sheet. These plans must be approved by the TxDOT Engineer prior to starting any work in these areas. The plans must also describe facilities and work activities adjacent the Ordinary High-Water Marks. The plan must show actual dimensions and materials for:

- Proposed construction roads and work areas leading to or in close proximity to the Ordinary High-Water Marks
- Temporary material or equipment storage areas in close proximity to the Ordinary High-Water Marks
- Locations of proposed sediment and erosion control devices
- Identification of construction equipment and construction techniques to accomplish the work

Once this drawing and supporting information is reviewed and approved by TxDOT, all construction workers should be made aware of the limits designated on the drawings by the Contractor's supervision. Work in all waters of the US will be limited to the minimum necessary required to construct the bridge, culvert or roadway fills. Work will also include all activities needed for bridge and culvert demolitions. Working or disturbing soil in the stream channel outside the limits of the work plan will not be allowed. Orange fencing will be provided and maintained to establish the TxDOT approved boundaries in which work may be conducted between the Ordinary High-Water Marks. Orange fencing will not be paid for but will be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling".

ITEM 8: PROSECUTION AND PROGRESS

This Project will be a Standard Workweek in accordance with Article 8.3.1.4.

Nighttime work is allowed in accordance with Article 8.3.3.

Meet bi-weekly or at intervals as agreed upon with the engineer to notify him or her of planned work for the upcoming 3-week period.

Critical Path Method (CPM) schedule in P6 format will be required for this project. Submit baseline schedule and obtain approval prior to beginning construction. The Estimate will be held if monthly schedule update is not submitted.

Submit the schedule in both PDF and in a base software electronic file format acceptable to TxDOT to allow for import and analysis into TxDOT's current scheduling software.

ITEM 100: PREPARING RIGHT OF WAY

The limits of preparing right of way will be measured as shown on the project layout sheets.

Remove the existing roadway delineators and object markers as shown on the plans, or as directed, during construction within the right of way. Delineator and object marker removals are subsidiary to this Item.

ITEM 105: REMOVING TREATED AND UNTREATED BASE AND ASPHALT PAVEMENT

The material removed under this item will become property of the Contractor.

ITEM 110: EXCAVATION

In a cut section, when soils are encountered at subgrade depths that are unstable and are deemed unsuitable by the Engineer, undercut this material for a minimum depth of one (1.0) foot below the maximum depth as determined and replace with a material having a plasticity index less than 25 and a liquid limit of less than 50.

ITEMS 110 & 132: EXCAVATION & EMBANKMENT

Excavation and embankment for driveways, sleeper slabs, alleys and intersections will not be paid for directly, but will be considered subsidiary to these items.

In those cases where fixed features require, the governing slopes indicated herein and on the cross sections may be varied between the limits and to the extent determined.

ITEM 132: EMBANKMENT

Excavated material from the project site has not been determined to be suitable for embankment. The bidder assumes all risk for the use of excavated materials for embankment and is expected to meet all material requirements for embankment regardless of the source.

Perform Tex-106-E (Plasticity Index) by an approved laboratory on excavated soils from sources outside right of way when used in roadway embankment. Provide the test results at no expense to the department. The engineer will sample and test soils produced by the construction project for specification requirements or material sources specified in the plans.

ITEM 150: BLADING

The limits of blading and grading operations will be to the minimum width and length necessary to accomplish the required work. The Contractor will limit the removal of permanent grass that is already established at the proper lines and grades.

ITEM 162: SODDING FOR EROSION CONTROL

Roll sod (Bermuda grass) will be cynodon dactylon Bermuda grass cut to a minimum depth (thickness) of one (1) inch. The sod will have the following characteristics: (1) uniformity; (2) good color; (3) free of weeds, weed seed, insects, and disease; (4) healthy, virile root system of dense, thickly matted roots throughout the soil of the sod; (5) adequate moisture to prevent drying out by exposure to the air and sun to the extent as to damage sod.

Prior to laying the roll sod, blade the area and rake smooth. Refer to the plans and details for areas to receive the sod. Remove one (1) in. of soil along paved edges and curb lines before laying sod and dress the slope to match all exposed edges after placing the sod.

ITEM 247: FLEXIBLE BASE

Construct uniform layer thickness of 6 inches, or less with the required density and moisture content.

Minimum PI is equal to three (3) for all grades, or a minimum Bar Linear Shrinkage of 2%.

RAP may not be incorporated into Flexbase Material

ITEM 275: CEMENT TREATMENT (ROAD-MIXED)

This material must meet a minimum seven (7) day unconfined compressive strength of 150 psi, determined by test method Tex-120-E.

Cure the cement treated material with an application of MS-2 or an approved emulsion at a rate of 0.2 gal/sy. Water curing will not be allowed.

ITEM 310: PRIME COAT

When cutback asphalt is used, a minimum curing time of seven (7) days will be required before application of Item 316, “Seal Coat”, unless otherwise approved in writing.

ITEM 354: PLANING AND TEXTURING PAVEMENT

Patch pavement cut to excessive depth by equipment failure with an approved epoxy material. Re-plane patched area to an acceptable approved ride quality. Payment for these corrections is subsidiary to this item

ITEM 400: EXCAVATION AND BACKFILL OF STRUCTURES

When placing concrete storm drain pipe on slopes of greater than 10 percent, provide cement stabilized backfill to a depth shown on the plans.

Aggregate for cement stabilized backfill will be coarse aggregates, GRADE 3, 4 or 5 and fine aggregate, as shown in Item 421, “Hydraulic Cement Concrete”. The ratio of course aggregate to sand should not contain more than sixty percent (60%) sand unless otherwise approved.

CLASS B bedding is required if rock is encountered.

ITEM 432: RIPRAP

Weep holes and granular material are required and locations will be determined prior to placement of concrete riprap at bridge abutments.

ITEM 440: REINFORCEMENT FOR CONCRETE

All ties, chairs and other appurtenances used with epoxy coated reinforcing shall be epoxy coated or non-metallic.

ITEMS 450: RAILING

Blast clean all railing and barrier wall installed as part of the project in accordance with Item 427, “Surface Finishes for Concrete”, prior to final acceptance of the project. This work will be considered subsidiary to Items 450, “Railing”.

Ensure slip formed barrier and cast-in-place barrier will be uniform in color and texture.

ITEM 451: RETROFIT RAILING

Refinish the outside face of the concrete slabs and curbs on the underpasses where railing is removed in such a manner as to leave a neat surface. Grind existing anchor bolts flush with the concrete. Paint the ends of the anchor bolts with two coats of zinc dust-zinc rich oxide paint as described under Item 450, “Railing”. This work will not be paid for directly, but will be subsidiary to Item 451, “Retrofit Railing”.

ITEM 462: CONCRETE BOX CULVERTS AND DRAINS

Joints between pre-cast concrete box culverts will be pre-formed flexible joint sealants as described in Section 464.3.3, “Jointing”.

For this contract provide cast-in-place concrete box culverts.

Reshape embankment side slopes, provide embankment as required, and add topsoil to achieve a smooth uniform finish around the installation of the safety end treatments and culvert extensions as directed. Finishing and reshaping work will be subsidiary to Items 132, “Embankment”, Item 162, “Sodding for Erosion Control”, and Item 467, “Safety End Treatment”.

Provide and install pneumatically placed concrete on the ditch bottom and side slopes between temporary terminations between old and new culverts. Pnuematically placed concrete will be placed to the height of the largest culvert on the ditch side slopes; and to a limit 10 feet outside the location of BMPs along the ditch bottom. Cement stabilized sand may be substituted for pneumatically placed concrete, with Engineer approval.

ITEM 464: REINFORCED CONCRETE PIPE

The concrete collars and the connections of pipes to existing or proposed concrete boxes or pipe will not be paid for directly but will be considered subsidiary to the various bid items.

ITEM 479: ADJUSTING MANHOLES AND INLETS

Accept ownership of inlet grates and manhole covers and properly dispose of them outside the limits of the right of way in accordance with federal, state and local regulations.

Submit a plan detailing proposed methods of handling phased construction at manholes and water valves.

Payment for the phase construction will be considered subsidiary to this item.

ITEM 496: REMOVING STRUCTURES

Salvage all existing inlet grates and manhole covers being removed.

ITEM 500: MOBILIZATION

Material On Hand (MOH) will not be used in calculating partial payments for Mobilization.

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.

Install traffic marking signs prior to sealcoat application and remove within three days after placement of traffic markings.

Access will be provided to all business and residences at all times. Where turning radii are limited during phased construction at intersections, provide all weather surfaces such as RAP or base in turning movements to accommodate and to protect the traffic from edge drop-offs. Materials, labor, maintenance and removal for these temporary accesses and radii will not be paid for directly but will be considered subsidiary to the various bid items.

A meeting between the contractor and Engineer to discuss upcoming changes in construction phasing and traffic switches is required at least fourteen (14) days prior to the phase change. Items to be discussed at this meeting include temporary signing, traffic control, pavement markings, the processes necessary for the phase change and subcontractor scheduling.

Provide written proposed lane closure information by 1:00 pm on the business day prior to the proposed closures. Do not close lanes when this requirement is not met.

When excavation is required next to a pavement lane carrying traffic and the widening is not completed by the end of the workday, backfill against the edge of the pavement with at least a 3:1 slope using an acceptable material to support vehicular traffic. Carefully remove and dispose of this material when work resumes. Backfilling pavement edges, and the materials required for the work will be subsidiary to this item.

Place barricades and signs in locations that do not obstruct the sight distance of drivers entering the highway from driveways or side streets.

The Contractor Responsible Person(s) (CRP) for Work Zone Traffic Controls will inspect and ensure any deficiencies are corrected each and every day throughout the duration of this contract.

Any misaligned or damaged traffic control devices will be repaired as soon as practical after deficiency is discovered.

In addition to providing a Contractor's Responsible Person and a phone number for emergency contact, have an employee(s) available to respond on the project for emergencies and for taking corrective measures within One (1) Hour.

ITEM 504: FIELD OFFICE

Furnish one Asphalt Mix Control Laboratory (Type D) for this project.

ITEM 506: TEMPROARY EROSION, SEDIMENTATION AND ENVIRONMENTAL CONTROLS

Take all practicable precautions to prevent debris from being discharged into the Waters of Texas or a designated wetland. Install Best Management Practices before demolition begins and maintain them during the demolition. Remove any debris or construction material that escapes containment devices and are discharged into the restricted areas, before the next rain event or within 24 hours of the discharge.

If temporary construction stream crossings are allowed under a Nationwide Permit, submit in writing for approval the type and location of each temporary stream crossing. Use temporary bridges, timber mats, or other structurally sound and non-eroding material for temporary stream crossings. A temporary culvert crossing will consist of storm sewer pipes and 4- to 8-inch nominal size rock. Temporary stream crossings must not cause more than minimal changes to the hydraulic flow characteristics of the stream, increase flooding, or cause more than minimal degradation of water quality. Remove the temporary stream crossings in their entirety and return the affected areas to their pre-existing elevation. All work and materials use for temporary construction stream crossings will not be paid for directly but are subsidiary to pertinent Items.

Provide SW3P Signs. Obtain from the Engineer a copy of the project's completed TPDES Storm Water Program Construction Site Notice and Contractor Site Notice. Laminate the sheets and bond with adhesive to 36" X 36" sign blanks. Ensure the sheets remain dry. Apply Type C Blue reflective sheeting as the background and add the text "SW3P" in 5" white lettering, centered at the top. Attach the signs to approved temporary mounts and locate at each of the project limits just inside the right of way line at a readable height or as directed by the Engineer. If the sign cannot be placed outside the clear zone, it must adhere to the TMUTCD. SW3P signs, maintenance, and reposting (for replacement or as needed to ensure readability) will be subsidiary to Item 502.

Leave all right of way areas undisturbed until actual construction is to be performed in said areas.

No soil disturbing activities will begin on any section of TxDOT ROW without adequate sedimentation controls first being installed and functioning at adjacent drainage outfalls. Begin and continuously prosecute the repairs, additions and maintenance of erosion and sedimentation control devices within seven days after the Contractor receives each Form 2118, Field Inspection and Maintenance Report, from the Engineer. Failure of the Contractor to fulfill either of the above requirements places TxDOT in potential non-compliance with permit requirements and may result in withholding estimates or stopping work or both until all environmental permit requirements are fulfilled.

Concrete Washouts are required per the CGP. The Concrete Washout Area(s) structural controls must consist of temporary berms, temporary shallow pits, and/or temporary storage tanks to prevent contaminated runoff and must be lined as to prevent contamination of underlying soil. Ensure pits properly maintained including removal of concrete as not to allow overflow. The location(s) of washout area will be approved by the Engineer. When washout pits are no longer needed, they will be removed, and area will be restored to original condition. This work, materials and labor will not be measured or paid for directly but will be subsidiary to Item 506, “Temporary Erosion, Sedimentation, and Environmental Controls.”

Cleaning and sweeping of open roadways due to material spillage or loss from Contractor equipment or tires will be the responsibility of the Contractor at no cost to TxDOT. This work will not be charged as Item 738, “Cleaning and Sweeping Highways”. Cleaning and sweeping of roadways will be completed as directed, including multiple times per day, if necessary, to maintain acceptable roadways for the traveling public and to meet environmental regulations. Construction activities will cease when material deposited on the roadway is not properly removed or when equipment is not available as needed. Adequate construction exits will be planned, constructed and maintained by the Contractor per Item 506, “Temporary Erosion, Sedimentation, and Environmental Controls”.

ITEM 510: ONE-WAY TRAFFIC CONTROL

Provide portable signals from pre-qualified manufactures on the TxDOT Work Zone Compliant List.

ITEM 512: PORTABLE TRAFFIC BARRIER

Department-furnished concrete traffic barrier units are at a TxDOT yard near the project location or other locations within fifty (50) miles of the project as directed. Barrier provided by TxDOT will be single slope or F-shape barrier. The Contractor will furnish equipment necessary to load the units at the stockpile locations.

The current location for barrier is: 4580 Bellmead Drive (US 84) as shown in plans

For designated source portable barrier, the Department will provide the connection hardware. Should adequate hardware not be available, the Contractor will acquire the hardware, provide to the Department and be reimbursed via force account.

Upon completion of the project, all barrier will remain property of the Department and stockpiled at a TxDOT yard near the project location or other locations within fifty (50) miles of the project as directed. The Contractor will furnish equipment necessary to load and unload the units at the stockpile locations. When stockpiling, separate damaged barriers from salvaged barriers as directed.

Stockpiling of portable concrete traffic barriers will not be permitted to be stockpiled (stacked) more than three (3) barriers high in any direction.

Portable concrete traffic barrier that is determined unusable will become property of contractor and will not be returned to TxDOT stockpile location. This work will be considered subsidiary to this item.

All hardware will become the property of the Department and will be returned to the TxDOT Maintenance yard within fifty (50) miles of the project as directed. Place hardware in fifty-five (55) gallon barrels with holes in bottom to allow drainage.

ITEM 540: METAL BEAM GUARD FENCE

Furnish one type of post throughout the project except as specifically noted in the plans.

Wooden block out will not be allowed.

ITEMS 542 & 544: REMOVING METAL BEAM GUARD FENCE & GUARDRAIL END TREATMENTS

W-Beam elements, steel posts and composite material blockouts will become the property of the contractor.

ITEM 544: GUARDRAIL END TREATMENTS

The use of wooden block-outs will not be allowed.

ITEM 545: CRASH CUSHON ATTENUATORS

Stockpile crash cushion attenuators at 4580 Bellmead Drive (US 84).

ITEM 560: MAILBOX ASSEMBLIES

Mailboxes will be kept in a position accessible to the carrier’s vehicle along the travel way except when performance of grading operations necessitates the moving of mailboxes. When grading operations necessitate the moving of mailboxes, the contractor will place them at a nearby location which will be accessible to the carrier’s vehicle. Mailboxes will be returned to a position accessible to the carrier’s vehicle along the travel way when grading operations are not in progress. This work will not be paid for directly, but will be subsidiary to Item 560, “Mailbox Assemblies”.

ITEM 585: RIDE QUALITY FOR PAVEMENT SURFACES

Use Surface Test Type A on all intersections and driveways.

Use Surface Test Type B pay adjustment schedule 3 on the travel lanes.

Milling will not be allowed as a corrective action for excessive deviations in the surface layer.

ITEM 644: SMALL ROADSIDE SIGN ASSEMBLIES

Bolt Clamp type will be used on Texas Triangular Slip Base System.

As practical with new construction, leave the existing sign assemblies in place until the proposed foundation, post and sign are in installed, and then remove the old sign assemblies.

Do not leave any sign foundation holes open overnight. Ensure all holes drilled are at least the minimum required depth with no loose material remaining in the hole.

Stake proposed sign locations and receive approval before installation of sign foundations.

Existing Mile Markers Signs are to be relocated to their original location(s) as they were prior to the beginning of the project.

Expanded foam foundations are not permitted.

Cut the bottom of all posts square.

For sign types which design details are not shown on these plans, fabricate according to the "STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS".

Removed material that is deemed salvageable (signs and posts) will be the property of TxDOT. Deliver salvageable material to the TxDOT Maintenance Office. Remove unsalvageable material.

The Contractor will relocate the existing double sided street name signs and furnish the post mounted brackets for the street name signs to be paid for as part of the proposed Stop Signs (R1-1). Existing street name signs will be mounted above Stop signs. If damaged while being relocated, the Contractor will furnish new double sided street name sign at their own expense.

ITEM 658: DELINEATOR AND OBJECT MARKER ASSEMBLIES

All flexible and GF2 delineators will have a tubular body.

The delineator assembly BRF Class A (D-SW) and (D-SY) are to be single delineators (Class I) attached to a flat, plastic bracket to facilitate the mounting of the delineator on top of the bridge rail at the locations shown on the plans. Submit a sample for approval before ordering materials.

ITEM 666: RETROREFLECTORIZED PAVEMENT MARKINGS

The Contractor will layout the proposed striping in accordance with TxDOT Traffic Control Plan Standards and latest version Texas Manual on Uniform Traffic Control Devices (TMUTCD) and project striping layout sheets. The Engineer will verify proposed striping layout prior to the beginning of striping operations.
The Contractor will locate the beginning and ending points of No Pass Zones.

ITEM 672: RAISED PAVEMENT MARKERS

Existing raised pavement markers to be replaced will be removed at the same time that the new markers are placed (i.e., remove and replace in one operation). Existing raised pavement markers replaced by new markers will be removed in accordance with Item 677, "Eliminating Existing Pavement Markings and Markers". Immediately fill the damaged area in the pavement due to the removal of existing markers with an approved bituminous material. This removal and backfill work will not be paid for directly, but will be subsidiary to Item 672, "Raised Pavement Markers".

ITEM 3077: SUPERPAVE MIXTURES

RAP from Contractor owned sources may be used if the RAP is fractionated.

Use aggregate that meets the Surface Aggregate Classification (SAC) requirement of ClassB.

Superpave gradations will be required to be below the reference zones shown in **Table 9** on surface mixes.

Maximum stripping of 0% is required.

ITEM 6001: PORTABLE CHANGEABLE MESSAGE SIGN

This project will require 2 "full matrix" type portable changeable message signs.

Ensure that the Contractor's Responsible Person for traffic control can revise messages within thirty (30) minutes of notification.

Supply portable changeable message sign(s) in accordance with the Traffic Control Plan standard sheets and Article 6f.55 of the Texas Manual on Uniform Traffic Control Devices for Streets and Highways Part VI.

ITEM 6185: TRUCK MOUNTED ATTENUATORS

The total number of truck mounted attenuators (TMA) required when utilizing the traffic control standards are shown in the tables below.

TCP 1 Series	Scenario		Required TMA	
(1-1)-18 / (1-2)-18			1	
(1-3)-18	A	B	1	2
(1-6)-18			1	

TCP 2 Series	Scenario		Required TMA	
(2-1)-18 / (2-2)-18	All		1	
(2-3)-18	A	B	1	2

TCP 3 Series	Scenario			Required TMA
(3-1)-13	All			2
(3-3)-14	A	B	D	2
	C			3
(3-4)-13	All			1, unless working inside a twltl, then 2.

Shadow vehicles equipped for truck mounted attenuators (TMA) for stationary operations will be paid for by the day and must be available for use at any time as determined by the Engineer.

Mobile operations will be paid for by the hour, per specifications. For mobile operations, payment will be made only while the TMA is in use.

For mobile operations requiring multiple TMA's, judgement may be applied in lower speed, urban / in town traffic environments to reduce the numbers of TMA in use where the added TMA may pose a hazard for traffic entering and exiting driveways, side streets, etc.

The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMA needed for the project for those times per plan requirements. Additional TMAs used that are not specified in the plans in which the contractor expects compensation will require prior approval from the Engineer.

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Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0831-01-019 **DISTRICT** Waco **COUNTY** McLennan
HIGHWAY FM 939

				CONTROL SECTION JOB		0831-01-019		1192-01-027		TOTAL EST.	TOTAL FINAL
				PROJECT ID		A00004849		A00004853			
				COUNTY		McLennan		McLennan			
				HIGHWAY		FM 939		FM 939			
ALT	BID CODE	DESCRIPTION		UNIT	EST.	FINAL	EST.	FINAL			
	100-6002	PREPARING ROW		STA			3.000		3.000		
	105-6045	REMOVING STAB BASE AND ASPH PAV (2"-8")		SY	2,389.000		3,564.000		5,953.000		
	110-6001	EXCAVATION (ROADWAY)		CY	591.000		1,446.000		2,037.000		
	132-6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)		CY	659.000		5,624.000		6,283.000		
	150-6001	BLADING		STA	2.000		9.000		11.000		
	162-6008	ROLL SODDING		SY	17,583.000		65,045.000		82,628.000		
	168-6001	VEGETATIVE WATERING		MG	47.000		177.000		224.000		
	247-6053	FL BS (CMP IN PLC)(TYD GR1-2)(FNAL POS)		CY	1,466.000		5,634.000		7,100.000		
	247-6483	FL BS(RDWY DEL)(TY D GR 1-2)(FNAL POS)		CY	369.000		1,413.000		1,782.000		
	251-6034	REWORK BS MTL (TY C) (8") (ORD COMP)		SY	11,146.000		42,623.000		53,769.000		
	275-6001	CEMENT		TON	132.000		505.000		637.000		
	275-6002	CEMENT TREAT (EXIST MATL) (6")		SY	14,380.000		55,463.000		69,843.000		
	310-6027	PRIME COAT(MC-30 OR AE-P)		GAL	2,555.000		9,911.000		12,466.000		
	316-6022	ASPH (CRS-2)		GAL	5,749.000		22,248.000		27,997.000		
	316-6397	AGGR(TY-D GR-4 OR TY-L GR-4)		CY	97.000		375.000		472.000		
	354-6022	PLANE ASPH CONC PAV(0" TO 3")		SY			2,199.000		2,199.000		
	354-6045	PLANE ASPH CONC PAV (2")		SY	6,619.000				6,619.000		
	400-6005	CEM STABIL BKFL		CY			86.000		86.000		
	400-6006	CUT & RESTORING PAV		SY			31.000		31.000		
	401-6001	FLOWABLE BACKFILL		CY			7.000		7.000		
	402-6001	TRENCH EXCAVATION PROTECTION		LF			23.000		23.000		
	403-6001	TEMPORARY SPL SHORING		SF	424.000		1,492.000		1,916.000		
	432-6002	RIPRAP (CONC)(5 IN)		CY			31.000		31.000		
	432-6033	RIPRAP (STONE PROTECTION)(18 IN)		CY	47.000		212.000		259.000		
	432-6045	RIPRAP (MOW STRIP)(4 IN)		CY			57.000		57.000		
	438-6002	CLEANING AND SEALING EXIST JOINTS(CL3)		LF			48.000		48.000		
	451-6024	RETROFIT RAIL (TY SSTR)		LF			276.000		276.000		
	462-6048	CONC BOX CULV (4 FT X 3 FT)(EXTEND)		LF			20.000		20.000		
	462-6051	CONC BOX CULV (5 FT X 3 FT)(EXTEND)		LF			28.000		28.000		
	462-6055	CONC BOX CULV (6 FT X 4 FT)(EXTEND)		LF	4.000				4.000		
	462-6057	CONC BOX CULV (6 FT X 6 FT)(EXTEND)		LF			40.000		40.000		
	462-6061	CONC BOX CULV (7 FT X 6 FT)(EXTEND)		LF			7.000		7.000		
	462-6063	CONC BOX CULV (8 FT X 4 FT)(EXTEND)		LF			7.000		7.000		
	462-6073	CONC BOX CULV (10 FT X 5 FT)(EXTEND)		LF	4.000		21.000		25.000		
	462-6116	CONC BOX CULV (10 FT X 3 FT)(EXTEND)		LF			4.000		4.000		
	464-6019	RC PIPE (CL IV)(30 IN)		LF			68.000		68.000		
	466-6169	WINGWALL (FW - S) (HW=8 FT)		EA			1.000		1.000		

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0831-01-019 **DISTRICT** Waco **COUNTY** McLennan
HIGHWAY FM 939

			CONTROL SECTION JOB		**0831-01-019**		**1192-01-027**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00004849**		**A00004853**			
			COUNTY		**McLennan**		**McLennan**			
			HIGHWAY		**FM 939**		**FM 939**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL		
	466-6171	WINGWALL (PW - 1) (HW=10 FT)	EA			1.000		1.000	
	466-6180	WINGWALL (PW - 1) (HW=5 FT)	EA	1.000		2.000		3.000	
	466-6182	WINGWALL (PW - 1) (HW=7 FT)	EA	1.000		2.000		3.000	
	466-6183	WINGWALL (PW - 1) (HW=8 FT)	EA			3.000		3.000	
	467-6050	SET (TY I)(S=10 FT)(HW=4FT)(4:1)(C)	EA			2.000		2.000	
	467-6146	SET (TY I)(S= 4 FT)(HW= 4 FT)(6:1) (C)	EA			1.000		1.000	
	467-6150	SET (TY I)(S= 4 FT)(HW= 5 FT)(4:1) (C)	EA			2.000		2.000	
	467-6280	SET (TY I)(S= 8 FT)(HW= 6 FT)(4:1) (C)	EA			2.000		2.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	2.000		20.000		22.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	2.000		22.000		24.000	
	467-6422	SET (TY II) (30 IN) (RCP) (6: 1) (C)	EA			2.000		2.000	
	479-6001	ADJUSTING MANHOLES	EA	2.000				2.000	
	479-6005	ADJUSTING MANHOLES (WATER VALVE BOX)	EA	1.000				1.000	
	480-6001	CLEAN EXIST CULVERTS	EA	2.000		9.000		11.000	
	496-6006	REMOV STR (HEADWALL)	EA	2.000		16.000		18.000	
	496-6007	REMOV STR (PIPE)	LF	90.000		537.900		627.900	
	496-6008	REMOV STR (BOX CULVERT)	LF	4.000		36.000		40.000	
	500-6001	MOBILIZATION	LS	0.241		0.759		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	9.000				9.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	200.000		890.000		1,090.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	200.000		890.000		1,090.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	1,200.000				1,200.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	1,200.000				1,200.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	570.000		4,190.000		4,760.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	570.000		4,190.000		4,760.000	
	510-6003	ONE-WAY TRAF CONT (PORT TRAF SIG)	MO			2.000		2.000	
	512-6013	PORT CTB (DES SOURCE)(SGL SLP)(TY 1)	LF			210.000		210.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF			210.000		210.000	
	512-6037	PORT CTB (STKPL)(SGL SLP)(TY 1)	LF			210.000		210.000	
	530-6002	INTERSECTIONS (ACP)	SY	732.000				732.000	
	530-6019	DRIVEWAYS (ACP)(TYPE 1)	SY	1,344.000		1,300.000		2,644.000	
	530-6021	DRIVEWAYS (ACP) (TYPE 2)	SY	65.000		2,264.000		2,329.000	
	530-6027	DRIVEWAYS (ACP)(TYPE 3)	SY	248.000				248.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	6,957.000		28,674.000		35,631.000	
	533-6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF	2,970.000		13,528.000		16,498.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF			362.500		362.500	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA			4.000		4.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0831-01-019 **DISTRICT** Waco **COUNTY** McLennan
HIGHWAY FM 939

				CONTROL SECTION JOB	0831-01-019		1192-01-027		TOTAL EST.	TOTAL FINAL
				PROJECT ID	A00004849		A00004853			
				COUNTY	McLennan		McLennan			
				HIGHWAY	FM 939		FM 939			
ALT	BID CODE	DESCRIPTION	UNIT		EST.	FINAL	EST.	FINAL		
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF				200.000		200.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA				4.000		4.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA				4.000		4.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA				2.000		2.000	
	545-6004	CRASH CUSH ATTEN (STKPL)	EA				2.000		2.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA				2.000		2.000	
	560-6004	MAILBOX INSTALL-S (TWG-POST) TY 2	EA				8.000		8.000	
	560-6005	MAILBOX INSTALL-D (TWG-POST) TY 2	EA				1.000		1.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA		2.000				2.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA		3.000		2.000		5.000	
	644-6017	IN SM RD SN SUP&AM TY10BWG(2)SA(P)	EA				1.000		1.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)	EA				2.000		2.000	
	644-6060	IN SM RD SN SUP&AM TYTWT(1)WS(P)	EA		22.000		12.000		34.000	
	644-6061	IN SM RD SN SUP&AM TYTWT(1)WS(T)	EA		1.000		8.000		9.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA		2.000		7.000		9.000	
	644-6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA		28.000		20.000		48.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA		5.000		25.000		30.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA				7.000		7.000	
	658-6071	INSTL DEL ASSM (D-SY)SZ (BRF)CTB (BI)	EA				4.000		4.000	
	662-6093	WK ZN PAV MRK REMOV (Y)4"(BRK)	LF		570.000		2,640.000		3,210.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF		8,376.000		11,110.000		19,486.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA		1,222.000		2,824.000		4,046.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF		234.000		100.000		334.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF		168.000		60.000		228.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF		9,832.000		31,790.000		41,622.000	
	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF		2,666.000		2,610.000		5,276.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF		6,010.000		13,110.000		19,120.000	
	672-6007	REFL PAV MRKR TY I-C	EA		12.000		6.000		18.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA		218.000		386.000		604.000	
	3077-6023	SP MIXESSP-CSAC-B PG70-22	TON		2,135.000		5,455.000		7,590.000	
	3085-6001	UNDERSEAL COURSE	GAL		4,851.000		12,390.000		17,241.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA		2.000				2.000	
	6185-6002	TMA (STATIONARY)	DAY		120.000				120.000	
	6185-6003	TMA (MOBILE OPERATION)	HR		330.000				330.000	
	7012-6001	CURB INLET SEDIMENT PROTECTION	LF		30.000				30.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS		1.000				1.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0831-01-019 **DISTRICT** Waco **COUNTY** McLennan
HIGHWAY FM 939

			CONTROL SECTION JOB	**0831-01-019**		**1192-01-027**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00004849**		**A00004853**			
			COUNTY	**McLennan**		**McLennan**			
			HIGHWAY	**FM 939**		**FM 939**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL		
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000				1.000	
1A	464-6003	RC PIPE (CL III)(18 IN)	LF	72.000		320.000		392.000	
2A	464-6005	RC PIPE (CL III)(24 IN)	LF	32.000		360.000		392.000	
2	4122-6010	THERMOPLASTIC PIPE(24 IN)(PP)(TYPE III)	LF	32.000		360.000		392.000	
1	4122-6014	THERMOPLASTIC PIPE(18 IN)(PP)(TYPE III)	LF	72.000		320.000		392.000	

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS																
LOCATION	510 6003	512 6013	512 6025	512 6037	545 6003	545 6004	545 6019	644 6076	644 6080	662 6093	662 6095	662 6111	6001 6002	6185 6002	6185 6003
	ONE-WAY TRAF CONT (PORT TRAF SIG)	PORT CTB (DES SOURCE) (SGL SLP) (TY 1)	PORT CTB (MOVE) (SGL SLP) (TY 1)	PORT CTB (STKPL) (SGL SLP) (TY 1)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (STKPL)	CRASH CUSH ATTEN (INSTL) (S) (N) (TL3)	REMOVE SM RD SN SUP&AM	RELOCATE SM RD SN SUP & AM TY TEMP	WK ZN PAV MRK REMOV (Y) 4" (BRK)	WK ZN PAV MRK REMOV (Y) 4" (SLD)	WK ZN PAV MRK SHT TERM (TAB) TY Y-2	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	MO	LF	LF	LF	EA	EA	EA	EA	EA	LF	LF	EA	EA	DAY	HR
BEGIN - 510+00										140	185	112			
STA. 510+00 - 520+00										250	690	228			
STA. 520+00 - 530+00										250	465	206			
STA. 530+00 - 540+00										250	705	230			
STA. 540+00 - 550+00										250	730	232			
STA. 550+00 - 560+00										250		158			
STA. 560+00 - 570+00	2	210	210	210	2	2	2			250	278	186			
STA. 570+00 - 580+00										250		158			
STA. 580+00 - 590+00										250		158			
STA. 590+00 - 600+00										250		158			
STA. 600+00 - 610+00										250	935	252			
STA. 610+00 - 620+00											2114	220			
STA. 620+00 - 630+00											1000	108			
STA. 630+00 - 640+00											1000	108			
STA. 640+00 - 650+75											3008	310			
CSJ 1192-01-027 SUB-TOTAL:	2	210	210	210	2	2	2	7	20	2640	11110	2824			
STA. 650+75 - 660+00										50	2860	324			
STA. 660+00 - 670+00										250	232	182			
STA. 670+00 - 680+00										250	898	248			
STA. 680+00 - 690+00										20	2020	222			
STA. 690+00 - END											2366	246			
CSJ 0831-01-019 SUB TOTAL								2	28	570	8376	1222			
PROJECT TOTALS	2	210	210	210	2	2	2	9	48	3210	19486	4046	2	120	330

SUMMARY OF ROADWAY ITEMS																			
LOCATION	100 6002	110 6001	132 6004	247 6053	247 6483	251 6034	275 6001	275 6002	310 6027	316 6022	316 6397	354 6022	354 6045	432 6002	479 6001	479 6005	3077 6023	3085 6001
	PREPARING ROW	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY B)	FL BS (CMP IN PLC) (TYD GR1-2) (FNAL POS)	FL BS (RDWY DEL) (TY D GR 1-2) (FNAL POS)	REWORK BS MTL (TY C) (8") (ORD COMP)	CEMENT	CEMENT TREAT (EXIST MATL) (6")	PRIME COAT (MC-30 OR AE-P)	ASPH (CRS-2)	AGGR (TY-D GR-4 OR TY-L GR-4)	PLANE ASPH CONC PAV (0" TO 3")	PLANE ASPH CONC PAV (2")	RIPRAP (CONC) (5 IN)	ADJUSTING MANHOLES	ADJUSTING MANHOLES (WATER VALVE BOX)	SP MIXES SP-C SAC-B PG70-22	UNDERSEAL COURSE
	STA	CY	CY	CY	CY	SY	TON	SY	GAL	GAL	CY	SY	SY	CY	EA	EA	TON	GAL
BEGIN - 510+00		50	710	192	48	1445	17	1889	334	751	13						184	417
STA. 510+00 - 520+00		119	254	388	97	2934	35	3822	676	1521	26						372	845
STA. 520+00 - 530+00		89	292	383	96	2889	34	3778	667	1501	25						367	834
STA. 530+00 - 540+00		74	282	383	96	2889	34	3778	667	1501	25						367	834
STA. 540+00 - 550+00		56	708	388	97	2934	35	3822	676	1521	26						372	845
STA. 550+00 - 560+00		95	351	388	97	2934	35	3822	676	1521	26						372	845
STA. 560+00 - 570+00	3	173	488	335	84	2529	31	3306	680	1527	26	2199					375	850
STA. 570+00 - 580+00		83	345	383	96	2889	34	3778	667	1501	25						367	834
STA. 580+00 - 590+00		108	209	383	96	2889	34	3778	667	1501	25						367	834
STA. 590+00 - 600+00		73	515	383	96	2889	34	3778	667	1501	25						367	834
STA. 600+00 - 610+00		105	199	383	96	2889	34	3778	667	1501	25						367	834
STA. 610+00 - 620+00		90	387	383	96	2889	34	3778	667	1501	25						367	834
STA. 620+00 - 630+00		94	267	383	96	2889	34	3778	667	1501	25						367	834
STA. 630+00 - 640+00		73	458	383	96	2889	34	3778	667	1501	25			31			367	834
STA. 640+00 - 650+00		147	152	454	115	3512	42	4400	792	1782	30						436	990
STA. 650+00 - 650+75		17	7	42	11	334	4	400	74	116	3						41	92
CSJ: 1192-01-027 SUB-TOTAL:	3	1446	5624	5634	1413	42623	505	55463	9911	22248	375	2199		31			5455	12390
STA. 650+75 - 660+00		198	69	359	91	2796	33	3462	627	1411	25						345	784
STA. 660+00 - 670+00		169	125	383	96	2889	34	3778	667	1501	25						367	834
STA. 670+00 - 680+00		106	181	383	96	2889	34	3778	667	1501	25						367	834
STA. 680+00 - 690+00		118	284	341	86	2572	31	3362	594	1336	22		489				381	865
STA. 690+00 - 700+00													4497			1	495	1125
700+00 - END													1633		2		180	409
CSJ: 0831-01-019 SUB-TOTAL:		591	659	1466	369	11146	132	14380	2555	5749	97		6619		2	1	2135	4851
PROJECT TOTALS	3	2037	6283	7100	1782	53769	637	69843	12466	27997	472	2199	6619	31	2	1	7590	17241

SUMMARY OF GUARD FENCE ITEMS						
LOCATION	432 6045	540 6002	540 6006	542 6001	544 6001	544 6003
	RIPRAP (MOW STRIP) (4 IN)	MTL W-BEAM GD FEN (STEEL POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	REMOVE METAL BEAM GUARD FENCE	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)
	CY	LF	EA	LF	EA	EA
NBI # 09-161-0-1192-01-003- North	28	175	2	100	2	2
NBI # 09-161-0-1192-01-003- South	29	187.5	2	100	2	2
CSJ: 1192-01-027 TOTAL	57	362.5	4	200	4	4
CSJ: 0831-01-019 TOTAL						
PROJECT TOTALS	57	362.5	4	200	4	4

SUMMARY OF BRIDGE ITEMS	NBI: 091610119201003				
LOCATION	451 6024	438 6002	400 6005	401 6001	432 6033
	RETROFIT RAIL (TY SSTR)	CLEANING AND SEALING EXIST JOINTS (CL3)	CEM STABIL BKFL	FLOWABLE BACKFILL	RIPRAP (STONE PROTECTION) (18 IN)
	LF	LF	CY	CY	CY
AMOS CREEK (NBI #09-161-0-1192-01-003)	276	48	70	7	150
PROJECT TOTALS	276	48	70	7	150

CONSOLIDATED SUMMARIES

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		10

SUMMARY OF DRAINAGE ITEMS

LOCATION	150 6001	400 6005	400 6006	402 6001	403 6001	432 6033	462 6048	462 6051	462 6055	462 6057	462 6061	462 6063	462 6073	462 6116	464 6019	466 6169	466 6171	466 6180	466 6182	466 6183	467 6050
	BLADING	CEM STABIL BKFL	CUT & RESTORING PAV	TRENCH EXCAVATION PROTECTION	TEMPORARY SPL SHORING	RIPRAP (STONE PROTECTION) (18 IN)	CONC BOX CULV (4 FT X 3 FT) (EXTEND)	CONC BOX CULV (5 FT X 3 FT) (EXTEND)	CONC BOX CULV (6 FT X 4 FT) (EXTEND)	CONC BOX CULV (6 FT X 6 FT) (EXTEND)	CONC BOX CULV (7 FT X 6 FT) (EXTEND)	CONC BOX CULV (8 FT X 4 FT) (EXTEND)	CONC BOX CULV (10 FT X 5 FT) (EXTEND)	CONC BOX CULV (10 FT X 3 FT) (EXTEND)	RC PIPE (CL IV) (30 IN)	WINGWALL (FW - S) (HW=8 FT)	WINGWALL (PW - 1) (HW=10 FT)	WINGWALL (PW - 1) (HW=5 FT)	WINGWALL (PW - 1) (HW=7 FT)	WINGWALL (PW - 1) (HW=8 FT)	SET (TY I) (S=10 FT) (HW=4 FT) (4:1) (C)
	STA	CY	SY	LF	SF	CY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA
CULVERT 1	1			8									21						2		
CULVERT 2	1					39	11													1	
CULVERT 3	1							28										2			
CULVERT 4	1					23	9														
CULVERT 5	1													4							2
CULVERT 6	1			15	594					40										2	
CULVERT 7	1											7									
CULVERT 8	1				898						7					1	1				
CULVERT 9	1	16	31												68						
CSJ: 1192-01-027 SUBTOTAL	**9**	**16**	**31**	**23**	**1492**	**62**	**20**	**28**		**40**	**7**	**7**	**21**	**4**	**68**	**1**	**1**	**2**	**2**	**3**	**2**
CULVERT 10	1				142	47			4									1			
CULVERT 11	1				282								4						1		
CSJ: 0831-01-019 SUBTOTAL	**2**				**424**	**47**			**4**				**4**					**1**	**1**		
PROJECT TOTALS	**11**	**16**	**31**	**23**	**1916**	**109**	**20**	**28**	**4**	**40**	**7**	**7**	**25**	**4**	**68**	**1**	**1**	**3**	**3**	**3**	**2**

SUMMARY OF DRAINAGE ITEMS

LOCATION	467 6146	467 6150	467 6280	467 6422	480 6001	496 6006	496 6007	496 6008
	SET (TY I) (S= 4 FT) (HW= 4 FT) (6:1) (C)	SET (TY I) (S= 4 FT) (HW= 5 FT) (4:1) (C)	SET (TY I) (S= 8 FT) (HW= 6 FT) (4:1) (C)	SET (TY II) (30 IN) (RCP) (6: 1) (C)	CLEAN EXIST CULVERTS	REMOV STR (HEADWALL)	REMOV STR (PIPE)	REMOV STR (BOX CULVERT)
	EA	EA	EA	EA	EA	EA	LF	LF
CULVERT 1					1	2		4
CULVERT 2	1				1	2		4
CULVERT 3					1	2		4
CULVERT 4		2			1	2		4
CULVERT 5					1	2		4
CULVERT 6					1	2		8
CULVERT 7			2		1	2		4
CULVERT 8					1	2		4
CULVERT 9				2	1		72.9	
CSJ: 1192-01-027 SUBTOTAL	**1**	**2**	**2**	**2**	**9**	**16**	**72.9**	**36**
CULVERT 10					1	1		2
CULVERT 11					1	1		2
CSJ: 0831-01-019 SUBTOTAL					**2**	**2**		**4**
PROJECT TOTALS	**1**	**2**	**2**	**2**	**11**	**18**	**72.9**	**40**

SUMMARY OF SIGNING ITEMS

LOCATION	644 6004	644 6007	644 6017	644 6030	644 6060	644 6061
	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	IN SM RD SN SUP&AM TY10BWG(2)SA(P)	IN SM RD SN SUP&AM TYS80(1)SA(T)	IN SM RD SN SUP&AM TYTWT(1)WS(P)	IN SM RD SN SUP&AM TYTWT(1)WS(T)
	EA	EA	EA	EA	EA	EA
BEGIN - 520+00		1			1	1
STA. 520+00 - 540+00					2	
STA. 540+00 - 560+00					1	
STA. 560+00 - 580+00				2	2	2
STA. 580+00 - 600+00						
STA. 600+00 - 620+00					2	3
STA. 620+00 - 640+00					3	1
STA. 640+00 - 650+75		1	1		1	1
CSJ 1192-01-027 SUB-TOTAL:		**2**	**1**	**2**	**12**	**8**
STA. 650+75 - 670+00		2			7	1
STA. 670+00 - 690+00	1				11	
STA. 690+00 - END	1	1			4	
CSJ 0831-01-019 SUB-TOTAL:	**2**	**3**			**22**	**1**
PROJECT TOTALS	**2**	**5**	**1**	**2**	**34**	**9**

SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION	533 6003	533 6004	658 6047	658 6062	658 6071	666 6036	666 6048	666 6303	666 6312	666 6315	672 6007	672 6009
	RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL OM ASSM (OM-2Y) (WC) GND	INSTL DEL ASSM (D-SW) SZ 1 (BRF) GF 2 (BI)	INSTL DEL ASSM (D-SY) SZ (BRF) CTB (BI)	REFL PAV MRK TY I (W) 8" (SLD) (100MIL)	REFL PAV MRK TY I (W) 24" (SLD) (100MIL)	RE PM W/RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/RET REQ TY I (Y) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
	LF	LF	EA	EA	EA	LF	LF	LF	LF	LF	EA	EA
BEGIN - 520+00	3000	1500	4					3116	390	875		30
STA. 520+00 - 540+00	4000	2000	2					4000	500	1170		39
STA. 540+00 - 560+00	4000	2000	4					7000	500	730		33
STA. 560+00 - 580+00	3860	1860	2	7	4		20	3860	470	278		30
STA. 580+00 - 600+00	4000	2000	6					4000	500			25
STA. 600+00 - 620+00	3779	1778	2				40	3779	250	3049		52
STA. 620+00 - 640+00	4000	2000	3					4000		4000		50
STA. 640+00 - 650+75	2035	390	2			100		2035		3008	6	127
CSJ 1192-01-027 SUB-TOTAL:	**28674**	**13528**	**25**	**7**	**4**	**100**	**60**	**31790**	**2610**	**13110**	**6**	**386**
STA. 650+75 - 670+00	3567	1311	2			234	48	3848	30	3092	12	130
STA. 670+00 - 690+00	3390	1659	3				60	3618	270	2918		58
STA. 690+00 - END							60	2366	2366			30
CSJ 0831-01-019 SUB-TOTAL:	**6957**	**2970**	**5**			**234**	**168**	**9832**	**2666**	**6010**	**12**	**218**
PROJECT TOTALS	**35631**	**16498**	**30**	**7**	**4**	**334**	**228**	**41622**	**5276**	**19120**	**18**	**604**

CONSOLIDATED SUMMARIES

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		11

SUMMARY OF DRIVEWAYS, INTERSECTIONS, AND TURNOUTS

LOCATION/STATION (LT/RT)		EXIST DRWY TYPE	DR/ INT	ITEM				105	247	310	316	3041	3076	ALT BID 464	ALT BID 464	467	467	496	530	530	530	530
				BID CODE				6045	(1)	(1)	(1)	(1)	(1)	6003	6005	6363	6395	6007	6002	6019	6021	6027
				WIDTH	LENGTH	R-1	R-2	REMOVING STAB BASE AND ASPH PAV (2"-8")	FL BS (CMP IN PLC) (TY D GR 4) (FINAL POS)	PRIME COAT(MC-30 OR AE-P)	AGGR (TY-D GR-5 OR TY-L GR-5)	UNDERSEAL COURSE	HMAC D-GR HMA TY-C SAC-B	RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	SET (TY II) (18 IN) (RCP) (6:1) (P)	SET (TY II) (24 IN) (RCP) (6:1) (P)	REMOV STR (PIPE)	INTERSECTIONS (ACP)	DRIVEWAYS (ACP) (TYPE 1)	DRIVEWAYS (ACP) (TYPE 2)	DRIVEWAYS (ACP) (TYPE 3)
				FT	FT	FT	FT	SY	CY	GAL	CY	GAL	TON	LF	LF	EA	EA	LF	SY	SY	SY	SY
D1-1	509+27.81	LT	ASPHALT	D	16	45	30	30	123	13.7	25	0.9	30.8	13.6		40		2	33			123	
D2-1	511+33.15	LT	GRAVEL	D	16	45	15	15	91	10.1	19	0.7	22.7	10.0		32		2	25			91	
D2-2	511+45.90	RT	GRASS	D	16	45	15	15	91	10.1	19	0.7	22.7	10.0		32		2	25			91	
D2-3	512+91.53	LT	GRASS	D	16	45	15	15	91	10.1	19	0.7	22.7	10.0	32		2		25			91	
D2-4	512+92.84	RT	GRASS	D	16	45	15	15	91	10.1	19	0.7	22.7	10.0		32		2	25			91	
D2-5	514+29.17	RT	GRAVEL	D	16	45	15	15	91	10.1	19	0.7	22.7	10.0		32		2	25			91	
D2-6	515+27.69	RT	GRAVEL	D	16	45	15	15	76	8.4	16	0.6	18.9	8.4		32		2	25			76	
D2-7	519+72.24	LT	GRAVEL	D	16	45	15	15	76	8.4	16	0.6	18.9	8.4	32		2		25			76	
D3-1	520+80.00	RT	GRASS	D	16	45	15	15	99	11.0	20	0.7	24.7	10.9	32		2					99	
D3-2	522+29.34	LT	GRAVEL	D	16	45	15	15	91	10.1	19	0.7	22.7	10.0	32		2		25			91	
D4-1	533+62.81	RT	GRASS/GRAVEL	D	16	45	15	15	91	10.1	19	0.7	22.7	10.0	32		2					91	
D4-2	535+23.27	LT	GRAVEL	D	16	45	15	15	91	10.1	19	0.7	22.7	10.0	32		2					91	
D4-3	540+00.00	RT	GRAVEL	D	16	45	15	15	91	10.1	19	0.7	22.7	10.0	32		2		56			91	
D5-1	540+77.34	RT	GRAVEL	D	16	45	15	15	76	8.4	16	0.6	18.9	8.4	32		2		25			76	
D5-2	541+69.63	RT	GRAVEL	D	16	45	15	15	97	10.8	20	0.7	24.1	10.6	32		2		25			97	
D5-3	542+63.86	RT	GRAVEL	D	16	45	15	15	76	8.4	16	0.6	18.9	8.4		32		2	25			76	
D6-1	550+56.31	RT	GRAVEL	D	16	45	15	15	76	8.4	16	0.6	18.9	8.4								76	
D6-2	557+64.48	RT	GRASS	D	16	45	30	30	123	13.7	25	0.9	30.8	13.6								123	
D6-3	559+35.94	RT	GRAVEL	D	16	45	15	15	76	8.4	16	0.6	18.9	8.4		32		2	24			76	
D7-1	567+24.22 (Big Creek Rd)	LT	ASPHALT	D	20	145	60	60	494	82.4	99	3.3	123.5	54.4							494		
D8-1	574+37.67	LT	GRAVEL	D	16	45	15	15	76	8.4	16	0.6	18.9	8.4		32		2	22			76	
D8-2	575+58.46	LT	GRAVEL	D	16	45	15	15	99	11.0	20	0.7	24.7	10.9		32		2	21			99	
D9-3	588+75.76	LT	GRAVEL	D	16	45	15	15	99	11.0	20	0.7	24.7	10.9		32		2	34			99	
D9-2	589+74.22	RT	GRASS	D	16	45	15	15	91	10.1	19	0.7	22.7	10.0	32		2					91	
D11-1	600+41.81	LT	GRAVEL	D	16	45	15	15	91	10.1	19	0.7	22.7	10.0								91	
D12-1	610+55.50 (JPM RD)	LT	ASPHALT	D	18	145	45	45	387	64.5	78	2.6	96.7	42.6							387		
D12-2	610+58.88	RT	GRAVEL	D	16	45	15	15	91	10.1	19	0.7	22.7	10.0								91	
D12-3	618+24.90 (THOMPSON RD)	RT	GRAVEL	D	20	145	45	45	419	69.8	84	2.8	104.7	46.1							419		
1192-01-027 TOTAL								**3564**	**467.9**	**731**	**25.9**	**889.4**	**392.4**	**320**	**360**	**20**	**22**	**465**		**1300**	**2264**	
D16-1	650+75.93 (FM 342)	LT	ASPHALT	INT	20	145	87	98	732	122.0	147	4.9	183.0	80.5						732			
D16-2	652+60 (CARPENTER ST)	LT	ASPHALT	D	20	130	130	50	752	125.3	151	5.1	187.9	82.7	72		2		65		752		
D16-3	657+30	LT	GRAVEL	D	16	30	15	15	65	7.2	13	0.5	16.1	7.1		32		2	25			65	
D19-1	684+15 (BURELSON AVE)	LT	ASPHALT	D	20	45	52	64	263	43.7			65.6	28.9							263		
D19-2	684+37 (E BURLESON AVE)	RT	ASPHALT	D	20	45	40	43	183	30.4			45.6	20.1							183		
D19-3	688+71 (COWAN ST)	LT	ASPHALT	D	25	20	25	10	73	12.2			18.3	8.1							73		
D19-4	688+73 (E COWAN ST)	RT	ASPHALT	D	25	20	25	10	73	12.2			18.3	8.1							73		
D20-1	694+96 (PROSPECT AVE)	LT	ASPHALT	D	25	20	10	10	61				15.1	6.7									61
D20-2	694+96 (E PROSPECT AVE)	RT	ASPHALT	D	25	20	10	10	61				15.1	6.7									61
D20-3	699+50 (MCLENNON AVE)	LT	ASPHALT	D	26	20	10	10	63				15.7	6.9									63
D20-4	699+50 (E MCLENNON AVE)	RT	ASPHALT	D	26	20	10	10	63				15.7	6.9									63
0831-01-019 TOTAL								**2389**	**353.0**	**311**	**10.5**	**596.4**	**262.7**	**72**	**32**	**2**	**2**	**90**	**732**	**1344**	**65**	**248**
PROJECT TOTAL								**5953**	**820.9**	**1042**	**36.4**	**1485.8**	**655.1**	**392**	**392**	**22**	**24**	**555**	**732**	**2644**	**2329**	**248**

(1) - FOR CONTRACTORS INFORMATION ONLY

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	162 6008	168 6001	506 6002	506 6011	506 6020	506 6024	506 6038	506 6039	7012 6001
	ROLL SODDING	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	CURB INLET SEDIMENT PROTECTION
	SY	MG	LF	LF	SY	SY	LF	LF	LF
BEGIN - 520+00	7486		30	30			785	785	
STA. 520+00 - 540+00	9227		170	170			250	250	
STA. 540+00 - 560+00	9631		60	60			415	415	
STA. 560+00 - 580+00	8016		190	190			1720	1720	
STA. 580+00 - 600+00	9465		110	110			480	480	
STA. 600+00 - 620+00	9074		130	130			290	290	
STA. 620+00 - 640+00	9228		160	160			290	290	
STA. 640+00 - 650+75	4848		100	100			160	160	
CSJ: 1192-01-027 SUB-TOTAL	**65045**	**177**	**890**	**890**			**4190**	**4190**	
STA. 650+75 - 670+00	9248		100	100			240	240	
STA. 670+00 - 690+00	8335		100	100			330	330	
STA. 690+00 - END									30
CSJ: 0831-01-019 SUB-TOTAL	**17583**	**47**	**200**	**200**			**570**	**570**	**30**
PROJECT TOTALS	**82628**	**224**	**1090**	**1090**	**•1200**	**•1200**	**4760**	**4760**	**30**

• TO BE PLACED AS DIRECTED.

CONSOLIDATED SUMMARIES

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		12

SUMMARY OF DRIVEWAYS, INTERSECTIONS, AND TURNOUTS

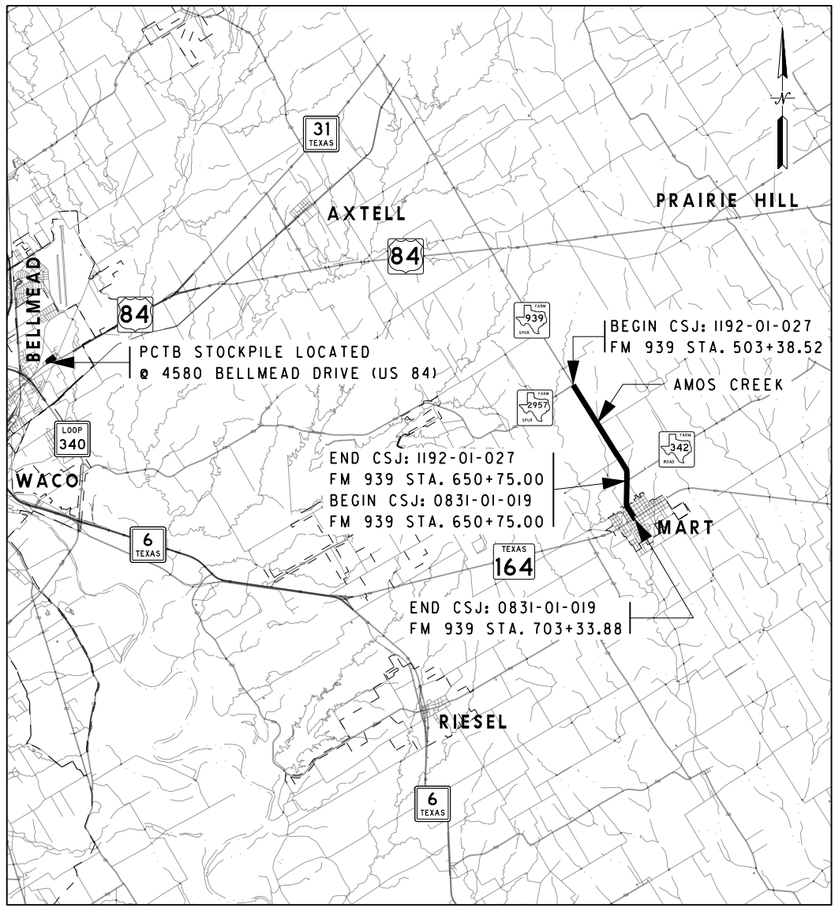
BASE BID

LOCATION/STATION (LT/RT)		EXIST DRWY TYPE	DR/ INT	ITEM BID CODE WIDTH	LENGTH	R-1	R-2	560 6004 MAILBOX INSTALL-S (TWG-POST) TY 2	560 6005 MAILBOX INSTALL-D (TWG-POST) TY 2	4122 6010 THERMOPLASTIC PIPE(24 IN)(PP)(TYPE III)	4122 6014 THERMOPLASTIC PIPE(18 IN)(PP)(TYPE III)
				FT	FT	FT	FT	EA	EA	LF	LF
D1-1	509+27.81	LT	ASPHALT	D	16	45	30	30			40	
D2-1	511+33.15	LT	GRAVEL	D	16	45	15	15			32	
D2-2	511+45.90	RT	GRASS	D	16	45	15	15			32	
D2-3	512+91.53	LT	GRASS	D	16	45	15	15				32
D2-4	512+92.84	RT	GRASS	D	16	45	15	15			32	
D2-5	514+29.17	RT	GRAVEL	D	16	45	15	15			32	
D2-6	515+27.69	RT	GRAVEL	D	16	45	15	15	1		32	
D2-7	519+72.24	LT	GRAVEL	D	16	45	15	15	1			32
D3-1	520+80.00	RT	GRASS	D	16	45	15	15				32
D3-2	522+29.34	LT	GRAVEL	D	16	45	15	15				32
D4-1	533+62.81	RT	GRASS/GRAVEL	D	16	45	15	15				32
D4-2	535+23.27	LT	GRAVEL	D	16	45	15	15				32
D4-3	540+00.00	RT	GRAVEL	D	16	45	15	15				32
D5-1	540+77.34	RT	GRAVEL	D	16	45	15	15	1			32
D5-2	541+69.63	RT	GRAVEL	D	16	45	15	15				32
D5-3	542+63.86	RT	GRAVEL	D	16	45	15	15	1		32	
D6-1	550+56.31	RT	GRAVEL	D	16	45	15	15	1			
D6-2	557+64.48	RT	GRASS	D	16	45	30	30				
D6-3	559+35.94	RT	GRAVEL	D	16	45	15	15		1	32	
D7-1	567+24.22 (Big Creek Rd)	LT	ASPHALT	D	20	145	60	60				
D8-1	574+37.67	LT	GRAVEL	D	16	45	15	15	1		32	
D8-2	575+58.46	LT	GRAVEL	D	16	45	15	15	1		32	
D9-3	588+75.76	LT	GRAVEL	D	16	45	15	15	1		32	
D9-2	589+74.22	RT	GRASS	D	16	45	15	15				32
D11-1	600+41.81	LT	GRAVEL	D	16	45	15	15				
D12-1	610+55.50 (JPM RD)	LT	ASPHALT	D	18	145	45	45				
D12-2	610+58.88	RT	GRAVEL	D	16	45	15	15				
D12-3	618+24.90 (THOMPSON RD)	RT	GRAVEL	D	20	145	45	45				
1192-01-027 TOTAL									8	1	360	320
D16-1	650+75.93 (FM 342)	LT	ASPHALT	INT	20	145	87	98				
D16-2	652+60 (CARPENTER ST)	LT	ASPHALT	D	20	130	130	50				72
D16-3	657+30	LT	GRAVEL	D	16	30	15	15			32	
D19-1	684+15 (BURELSON AVE)	LT	ASPHALT	D	20	45	52	64				
D19-2	684+37 (E BURLESON AVE)	RT	ASPHALT	D	20	45	40	43				
D19-3	688+71 (COWAN ST)	LT	ASPHALT	D	25	20	25	10				
D19-4	688+73 (E COWAN ST)	RT	ASPHALT	D	25	20	25	10				
D20-1	694+96 (PROSPECT AVE)	LT	ASPHALT	D	25	20	10	10				
D20-2	694+96 (E PROSPECT AVE)	RT	ASPHALT	D	25	20	10	10				
D20-3	699+50 (MCLENNON AVE)	LT	ASPHALT	D	26	20	10	10				
D20-4	699+50 (E MCLENNON AVE)	RT	ASPHALT	D	26	20	10	10				
0831-01-019 TOTAL											32	72
PROJECT TOTAL									8	1	392	392

(1) - FOR CONTRACTORS INFORMATION ONLY

CONSOLIDATED SUMMARIES

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		13



VICINITY MAP

SCALE: 1" = 20,000 '

NOTES:

1. ALL TRAFFIC CONTROL DEVICES WILL CONFORM WITH THE TEXAS "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" (TMUTCD), AND WILL BE MAINTAINED AS DIRECTED. ADDITIONAL GUIDELINES FOR TRAFFIC CONTROL DEVICES MAY BE FOUND IN THE TMUTCD.
2. FOR CHANNELING DEVICE PLACEMENT AND SPACING FOR ALL PHASES, REFER TO THE TCP STANDARDS.
3. SEE BC STANDARD SHEETS FOR REQUIRED PROJECT LIMITS AND CROSSROAD SIGNGING

GENERAL

A. INSTALL ALL SIGNS, BARRICADES AND TRAFFIC CONTROL DEVICES AS SHOWN AND IN ACCORDANCE WITH THE STANDARD BC SHEETS AND AS DIRECTED.

B. ADDITIONAL SIGNS, BARRICADES OR TRAFFIC CONTROL DEVICES OTHER THAN THOSE SPECIFIED MAY BE REQUIRED FOR THE SAFE MOVEMENT OF TRAFFIC THROUGH THE PROJECT. PAYMENT FOR ALL SUCH SIGNS, BARRICADES OR TRAFFIC CONTROL DEVICES WILL BE CONSIDERED SUBSIDIARY TO THE ITEM "BARRICADES, SIGNS AND TRAFFIC HANDLING".

C. WORK SITES SHOULD BE CAREFULLY MONITORED TO ENSURE THAT TRAFFIC CONTROL MEASURES ARE OPERATING EFFECTIVELY AND THAT ALL DEVICES USED ARE CLEARLY VISIBLE, CLEAN AND IN GOOD REPAIR.

D. THE CONTRACTOR WILL PROVIDE SAFE ACCESS TO AND FROM ALL PRIVATE PROPERTY AT ALL TIMES AND IN ALL WEATHER CONDITIONS.

E. THE CONTRACTOR WILL BE REQUIRED TO SUBMIT A DETAILED SCHEDULE OF WORK PRIOR TO THE BEGINNING OF CONSTRUCTION WHICH GENERALLY CONFORMS TO THE SEQUENCE SHOWN ON THE TCP SEQUENCE OF OPERATION BELOW.

F. COMPLETE ALL WORK ON PROJECT AS SHOWN ON THE VARIOUS PLAN SHEETS AND IN COMPLIANCE WITH THE GENERAL NOTES OF THIS CONTRACT.

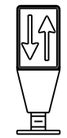
G. ANY REQUEST TO ALTER THE SEQUENCE OF OPERATION OR TRAFFIC CONTROL PLAN WILL BE SUBMITTED TO THE ENGINEER FOR WRITTEN APPROVAL.

SEQUENCE OF CONSTRUCTION

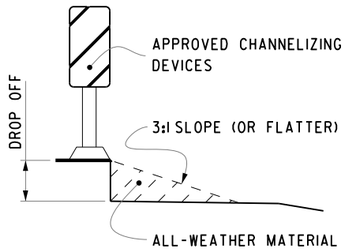
A. THIS PROJECT CONSISTS OF TWO SEPARATE WORK AREAS AS DEFINED BY CSJ 1192-01-027, FROM FM 2957 TO FM 342 AND BY CSJ 0831-01-019, FROM FM 342 TO STATE HIGHWAY 164

B. THE CONTRACTOR WILL BE REQUIRED TO SUBMIT A DETAILED SCHEDULE OF WORK TO THE AREA ENGINEER PRIOR TO THE BEGINNING OF CONSTRUCTION, WHICH GENERALLY CONFORMS TO THE FOLLOWING SEQUENCE:

1. SET PROJECT BARRICADES.
2. INSTALL REQUIRED TEMPORARY EROSION CONTROL DEVICES AS DIRECTED.
3. CONSTRUCT PROPOSED CULVERTS, CULVERT EXTENSIONS, AND END TREATMENTS.
4. COMPLETE EACH ROADWAY SECTION BEFORE MOVING TO THE NEXT SECTION. LIMIT SECTIONS TO 1.5 MILE MAXIMUM PER TRAVEL LANE OR AS DIRECTED. EACH ROADWAY SECTION WILL GENERALLY FOLLOW THE STEPS LISTED BELOW.
   - A. REMOVE EXISTING VEGETATION FROM PAVEMENT EDGE AND WINDROW CLOSE TO ROW LINE.
   - B. WIDEN PROPOSED SHOULDER AS SHOWN.
   - C. RECLAIM EXISTING MATERIAL AND SPREAD EVENLY OVER NEW SUBGRADE.
   - D. CEMENT TREAT EXISTING MATERIAL & MICROCRACK
   - E. CONSTRUCT NEW FLEXBASE, PRIME COAT, AND ONE COURSE SURFACE TREATMENT (OCST).
   - F. CONSTRUCT DRIVEWAYS AND INTERSECTIONS
   - G. PLACE TEMPORARY PAVEMENT MARKINGS.
5. PLACE PTCB AND TEMPORARY PORTABLE TRAFFIC SIGNAL IN ACCORDANCE WITH TCP (2-8B) AT N.B.I: 09-161-0-1192-01-003 FOR MULTIPLE DAY CLOSURES.
6. REMOVE EXISTING BRIDGE RAIL AND CONSTRUCT BRIDGE RAIL RETROFIT
7. INSTALL MBGF AND MOWSTRIP
8. WHEN FULL ROADWAY CONSTRUCTION IS COMPLETED, CONSTRUCT UNDERSEAL AND TY-C SP OVER FULL WIDTH OF ROADWAY, DRIVEWAYS, AND INTERSECTION.
9. PLACE TEMPORARY WORK ZONE TABS
10. PLACE PERMANENT PAVEMENT MARKING.
11. INSTALL EMBANKMENT ON PAVEMENT EDGES AS NECESSARY
12. PLACE PERMANENT SOD.
13. COMPLETE ALL OTHER WORK AS SHOWN IN THE PLANS
14. CLEAN UP PROJECT AND REMOVE TEMPORARY EROSION CONTROL DEVICES AND PROJECT BARRICADES.



2 WAY VERTICAL PANELS WILL BE REQUIRED TO SIMULATE CENTERLINE.



PAV EDGE DROP-OFF DETAIL

1. LESS THAN 2 INCHES: CW 8-11 SIGNS ARE REQUIRED.
2. GREATER THAN 2 INCHES BUT LESS THAN 24 INCHES: VERTICAL PANELS AND EITHER CW 8-9a OR CW 8-11 SIGNS ARE REQUIRED.
3. GREATER THAN 24 INCHES: POSITIVE BARRIER REQUIRED.
4. THE SAFETY SLOPE WILL BE CONSTRUCTED WITH AN ALL- WEATHER MATERIAL SUCH AS RAP, WHICH IS CLEAN AND FREE OF DEBRIS AND LARGE ROCKS.

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

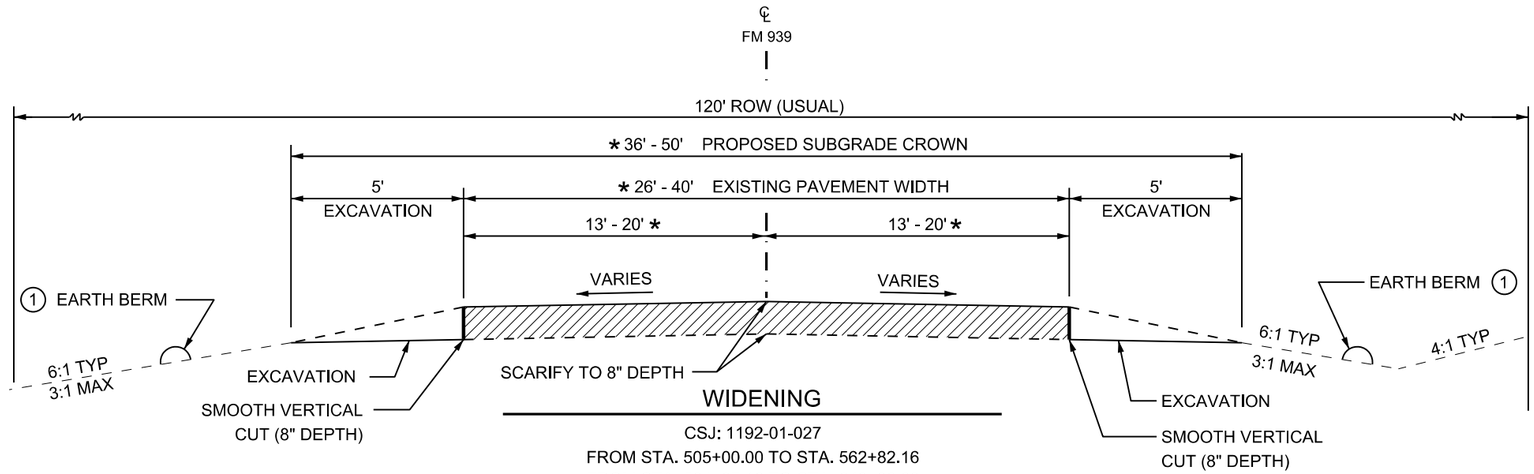
Bradley Mayes 7/6/2022

SIGNATURE OF REGISTRANT & DATE

SEQUENCE OF CONSTRUCTION

SCALE: AS SHOWN SHEET 1 OF 1

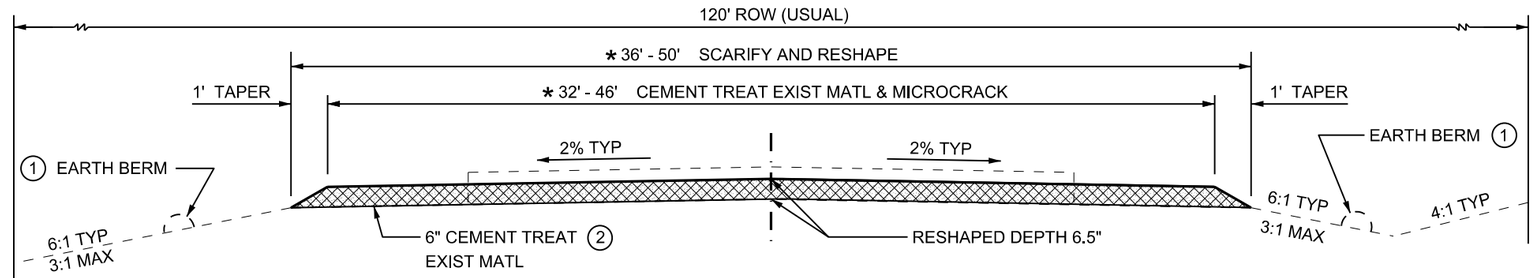
CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		14



WIDENING

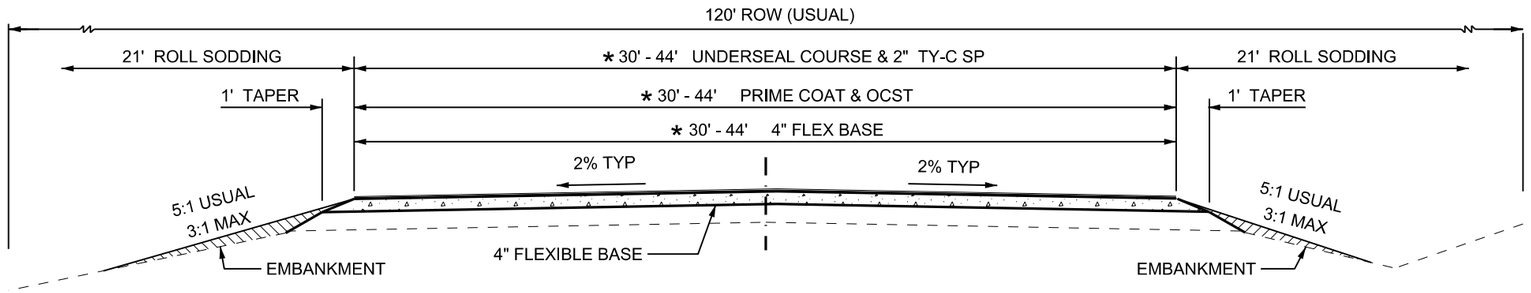
CSJ: 1192-01-027
FROM STA. 505+00.00 TO STA. 562+82.16
FROM STA. 564+07.16 TO STA. 643+90.00
* FROM STA. 643+90.00 TO STA. 648+10.00 (TRANSITION TO)
* FROM STA. 643+90.00 TO STA. 650+75.00 (LEFT TURN LN)

CSJ: 0831-01-019
* FROM STA. 650+75.00 TO STA. 652+69.00 (LEFT TURN LN)
* FROM STA. 652+69.00 TO STA. 656+89.00 (TRANSITION FROM)
FROM STA. 656+89.00 TO STA. 688+90.00



SCARIFY, RESHAPE, AND CEMENT TREAT BASE COURSE

STATIONS AS SHOWN ABOVE



4" FLEX BASE, PRIME, OCST, UNDERSEAL COURSE, & OVERLAY

STATIONS AS SHOWN ABOVE

NOTES:

1. EXISTING TOPSOIL SHALL BE REMOVED TO A DEPTH OF 4" AND WINROWED OUTSIDE OF THE WORK AREA CREATING A BERM, AND THEN RETURNED TO SLOPES UPON COMPLETION OF ROADWAY WIDENING.
2. MICROCRACKING WILL BE REQUIRED

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

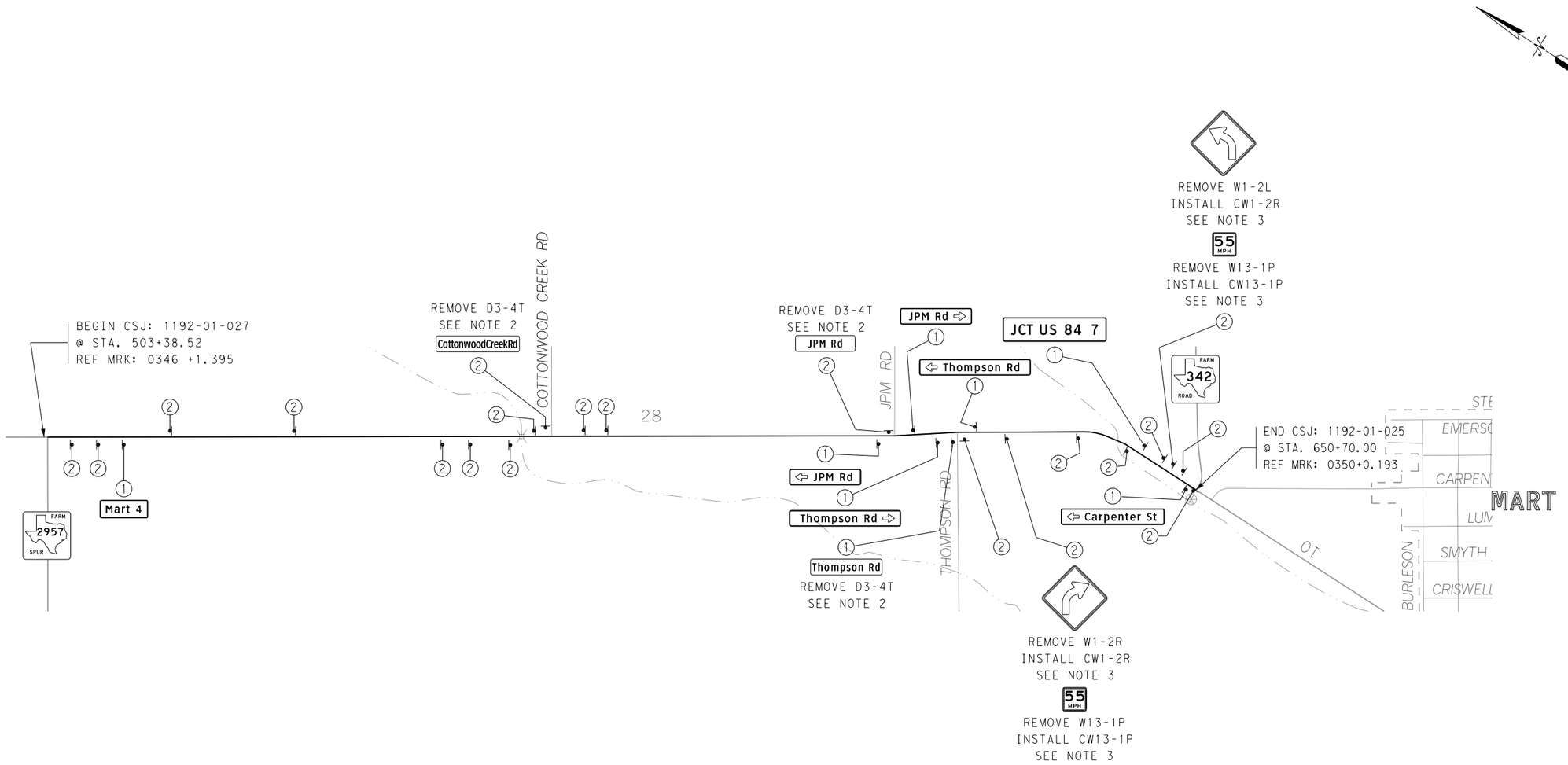
Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

SEQUENCE OF WORK

NO SCALE

SHEET 1 OF 1

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		15



	ITEM	DESCRIPTION	UNIT
(1)	644 6076	REMOVE SM RD SN SUP&AM	7 EA
(2)	644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	20 EA

NOTES:

1. EXISTING SIGNS MAY REMAIN IN PLACE, DURING CONSTRUCTION IF APPROVED BY THE ENGINEER. IF APPROVED, THESE SIGNS AND POST WILL BE REMOVED AFTER THE PROPSED SIGN IS INSTALLED.
2. REMOVE BRACKET AND GUIDE SIGN. ANY DAMAGE TO THE BRACKET ANd OR SIGN WILL BE REPLACED AT THE CONTRACTOR'S EXPENCE. THESE SIGNS WILL REMAIN PROPERTY OF THE COUNTY AND THE CITY OF MART.DELIEVER THE BRACKET AND SIGN TO THE AREA ENGINEER.
3. THESE SIGNS WILL BE CONSIDERED AS PART OF ITEM 502.

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022

SIGNATURE OF REGISTRANT & DATE

REMOVE & REPLACE SIGNS

FROM STA. 503+38.52 TO STA. 650+75.00
CSJ: 1192-01-027

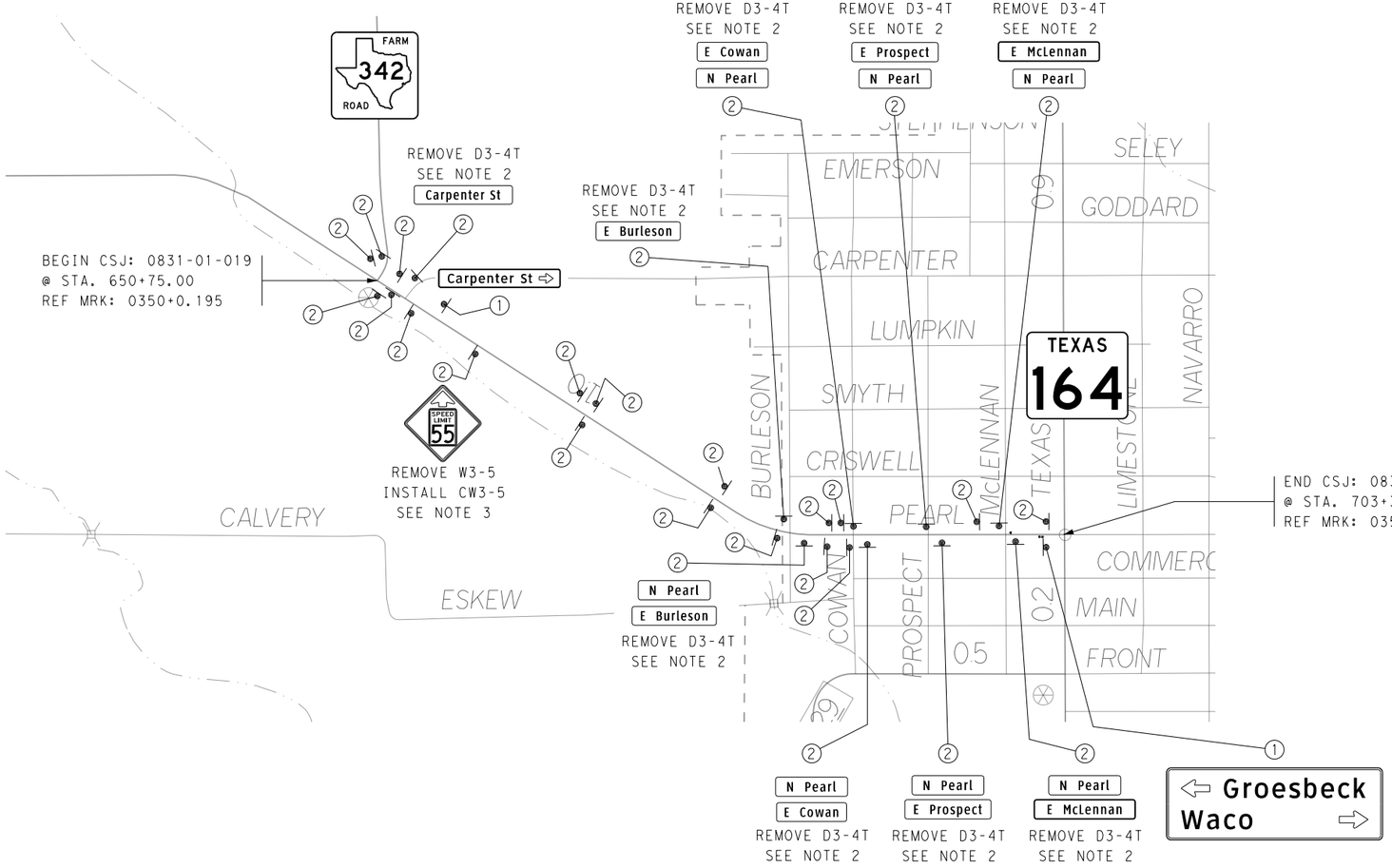
SCALE: 1" = 1500' HORIZ. FEET

SHEET 1 OF 2

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		16

NODE pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\08310101 9\4 - Design\Plan Set\2. TCP\Plan Sheets\REMOVE AND REPLACE EXISTING SIGNS.dgn
7/6/2022
8:46:37 AM

NOTES:



	ITEM	DESCRIPTION	UNIT
(1)	644 6076	REMOVE SM RD SN SUP&AM	2 EA
(2)	644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	28 EA

NOTES:

1. EXISTING SIGNS MAY REMAIN IN PLACE, DURING CONSTRUCTION IF APPROVED BY THE ENGINEER. IF APPROVED, THESE SIGNS AND POST WILL BE REMOVED AFTER THE PROPSED SIGN IS INSTALLED.
2. REMOVE BRACKET AND GUIDE SIGN. ANY DAMAGE TO THE BRACKET ANd OR SIGN WILL BE REPLACED AT THE CONTRACTOR'S EXPENCE. THESE SIGNS WILL REMAIN PROPERTY OF THE COUNTY AND THE CITY OF MART. DELIEVER THE BRACKET AND SIGN TO THE AREA ENGINEER.
3. THESE SIGNS WILL BE CONSIDERED AS PART OF ITEM 502.

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

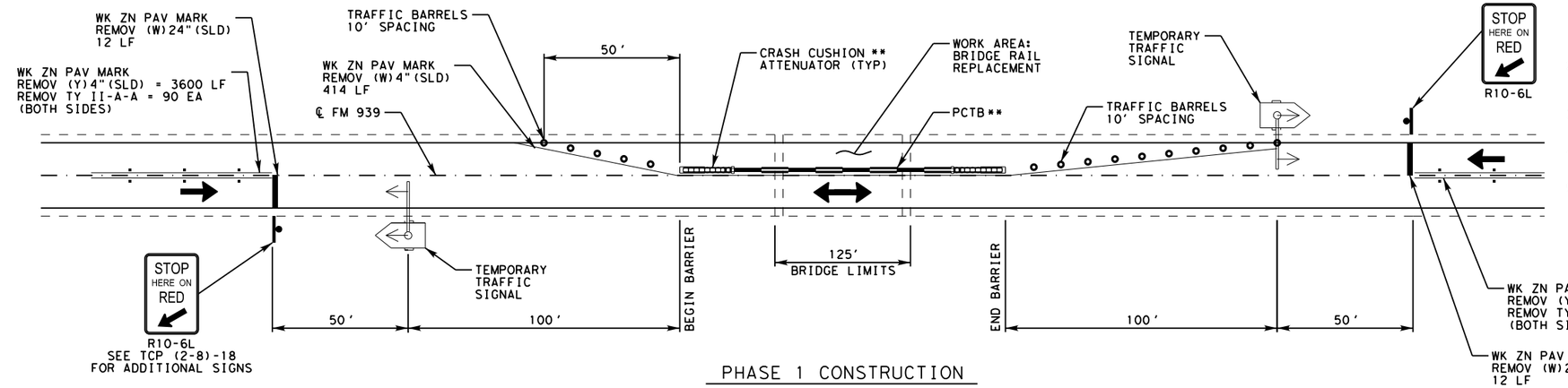
REMOVE & REPLACE SIGNS

FROM STA. 650+75.00 TO STA. 703+33.88
CSJ: 0831-01-019

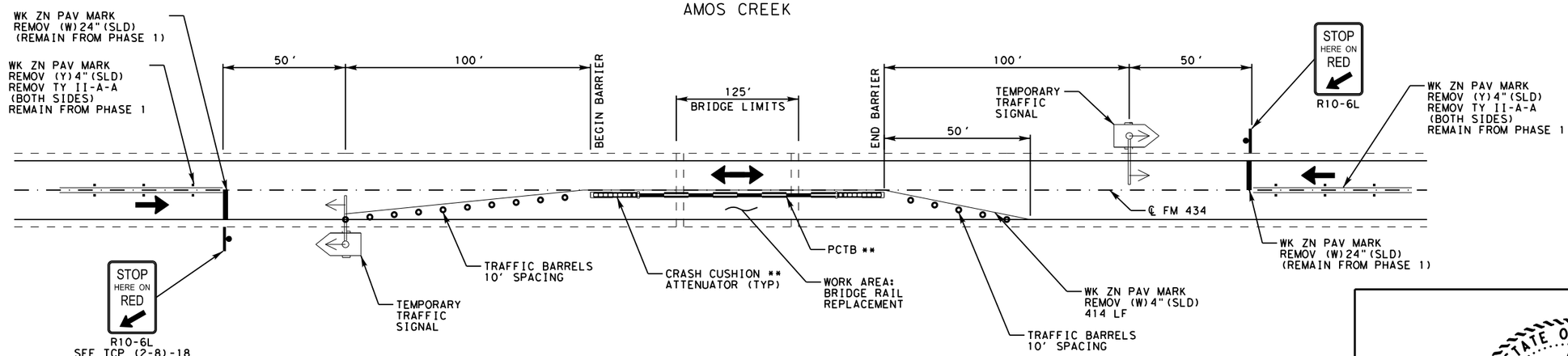
SCALE: 1" = 1000' HORIZ. FEET

SHEET 2 OF 2

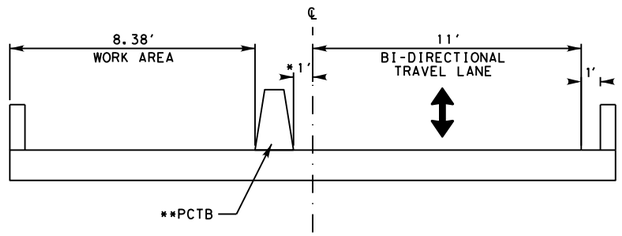
CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		17



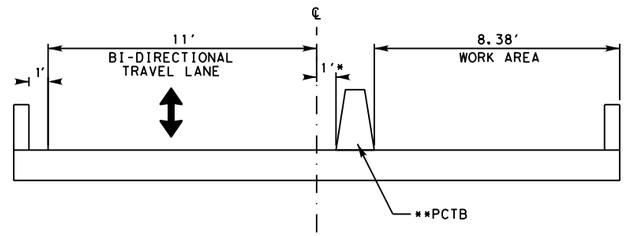
PHASE 1 CONSTRUCTION
FM 939
AMOS CREEK



PHASE 2 CONSTRUCTION
FM 939
AMOS CREEK



TCP TYPICAL SECTION PHASE 1
PCTB PLACEMENT (LEFT SIDE REPLACEMENT)



TCP TYPICAL SECTION PHASE 2
PCTB PLACEMENT (RIGHT SIDE REPLACEMENT)

* PCTB OFFSET DISTANCE MAY BE CHANGED AS DIRECTED
** PCTB/CRASH CUSHIONS WILL BE PLACED TO PROTECT AREA OF WING AND BRIDGE RAIL REMOVAL AS DIRECTED

NOTES:

1. ALL WARNING SIGNS, BARRICADES AND CHANNELING DEVICES SHALL BE PLACED IN ACCORDANCE WITH THE "TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES" OR AS DIRECTED BY THE ENGINEER TO MEET LOCAL CONDITIONS.
2. PORTABLE TRAFFIC SIGNALS WILL BE REQUIRED AND WILL BE PAID FOR BY ITEM 510. REFER TO TCP(2-8b)-18 FOR ADDITIONAL DETAILS.
3. PCTB WILL BE INPLACE PRIOR TO REMOVING BRIDGE RAIL.
4. BARRIER WILL BE PINNED IF PLACED WITHIN 2 FT OF A DROP-OFF OR PAVEMENT EDGE.
5. SEE TCP(2-8b)-18 FOR ADDITIONAL SIGNING, BARRICADES, AND PAVEMENT MARKING REQUIREMENTS.

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

CTB LAYOUT FOR BRIDGE CONSTRUCTION

FROM STA. 543+40.00 TO STA. 583+80.00
CSJ: 1192-01-027

SCALE: 1" = 100.0' HORIZ. FEET

SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		AT

LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE / RESET MOVE/ RESET	MOVE / RESET FROM LOC. #	L N	L W	R N	R W	S N	S W
1	1	AT	AMOS CREEK	562+39.66	TL-3	BI	N/A	N/A	PCTB	24"	42"	26' 0"	1								1	
2	1	AT	AMOS CREEK	564+49.66	TL-3	BI	N/A	N/A	PCTB	24"	42"	26' 0"	1								1	
3	2	AT	AMOS CREEK	562+39.66	TL-3	BI	N/A	N/A	PCTB	24"	42"	26' 0"		1	1	1					1	
4	2	AT	AMOS CREEK	564+49.66	TL-3	BI	N/A	N/A	PCTB	24"	42"	26' 0"		1	1	2					1	
												TOTALS	2	2	2							

LEGEND:

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

FOR DEFINITIONS SEE THE "CRASH CUSHION CATEGORIZATION CHART.PDF" AT THE DESIGN DIVISION (ROADWAY STANDARDS) WEBSITE. USE QUICK LINKS TO ACCESS ATTENUATORS / CRASH CUSHIONS SECTION.

http://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/rdwylse.htm

CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:	CK:
© TxDOT 2022	CONT: 0831	SECT: 01	JOB: 019, ETC.
REVISIONS	HIGHWAY: FM 939	DIST: WACO	COUNTY: MCLENNAN
	FEDERAL AID PROJECT: SEE TITLE SHEET	SHEET NO.: 19	

DATE: 4/14/2022 4:13:22 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\0831019\4 - Design\Plan Set\2. TCP\Standards\bc-21 (5).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

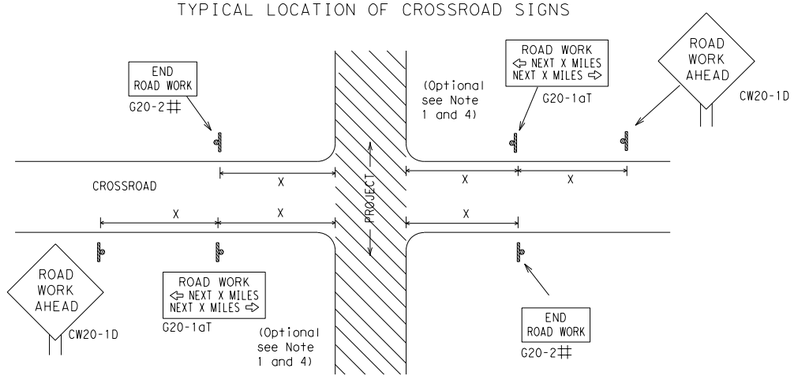
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13	0831	01	019, ETC.	FM 939
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21	WAC	MCLENNAN		20

DATE: 4/14/2022 4:13:22 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\0831010194 - Design\Plan Set 2. TCP\Standards\bc-21(1).dgn

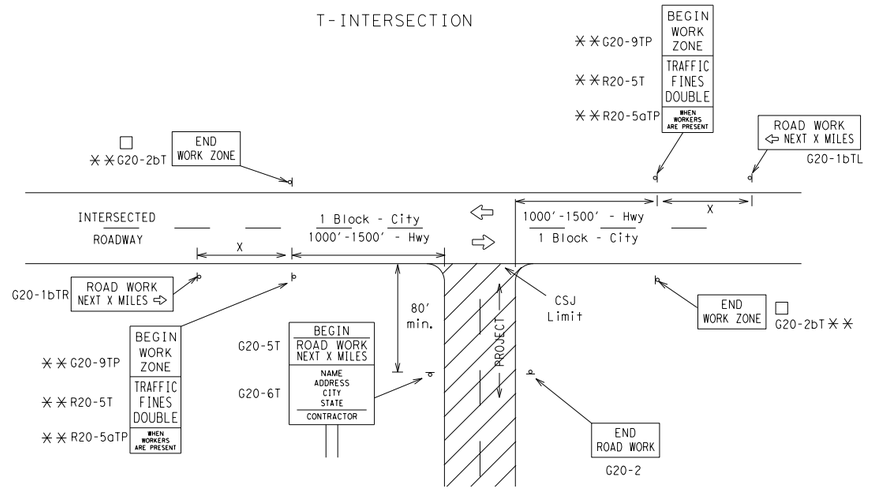
TYPICAL LOCATION OF CROSSROAD SIGNS



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]

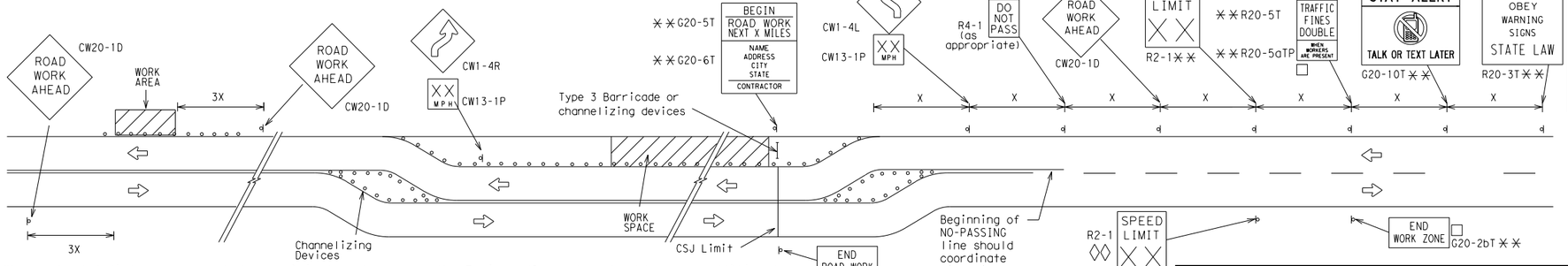
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

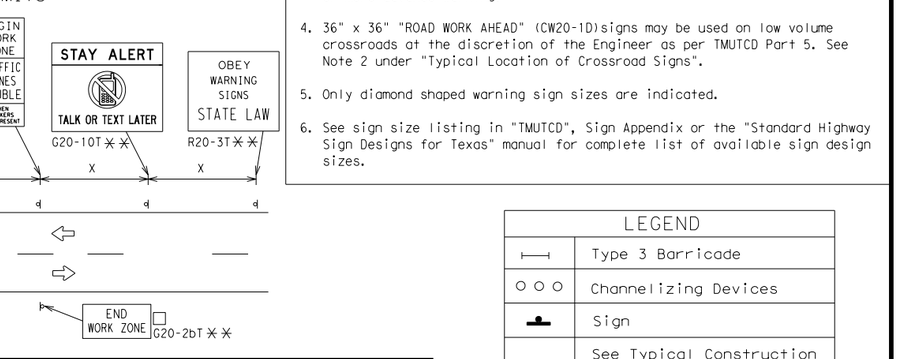
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may 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

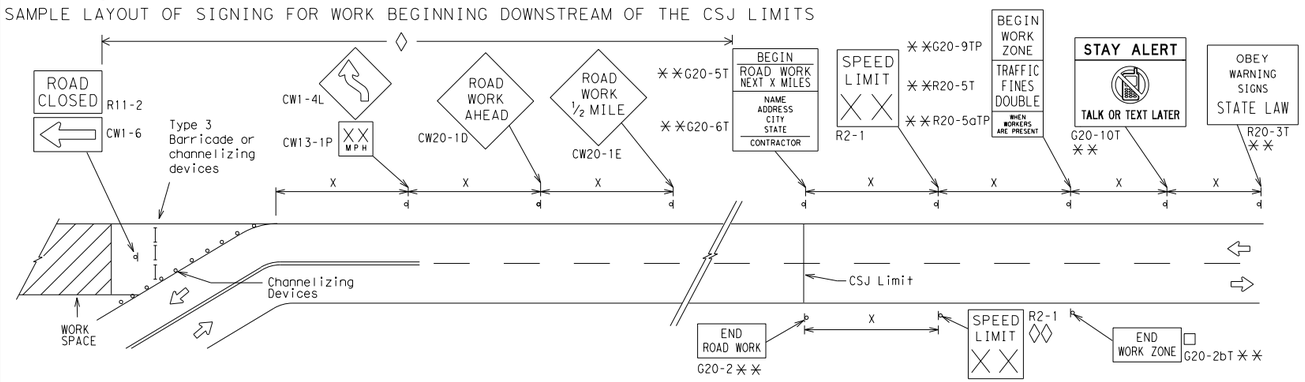


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WAC	MCLENNAN		21

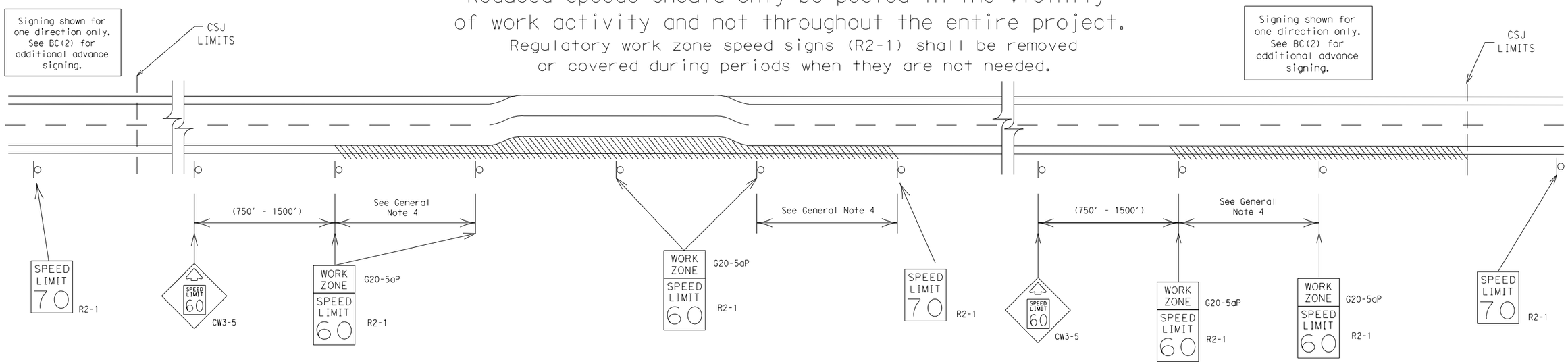
DATE: 4/14/2022 4:13:23 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\0831019019 - Designs\bc-21 (1).dgn

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WAC	MCLENNAN		22

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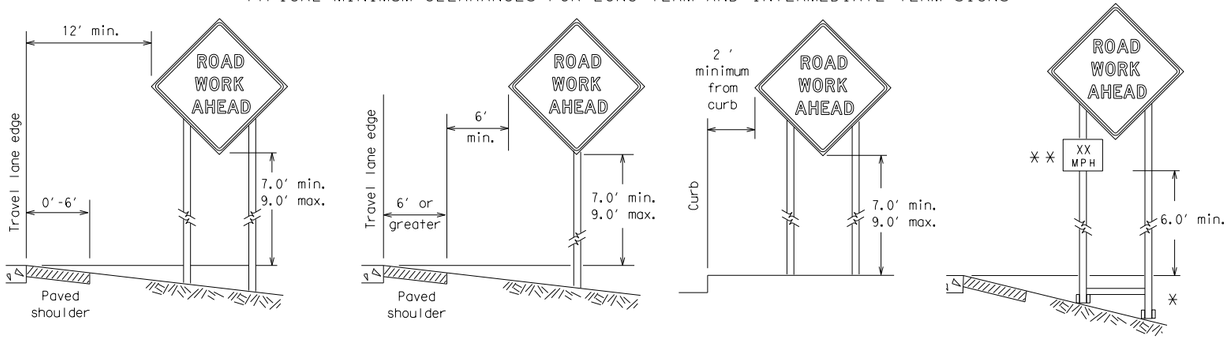
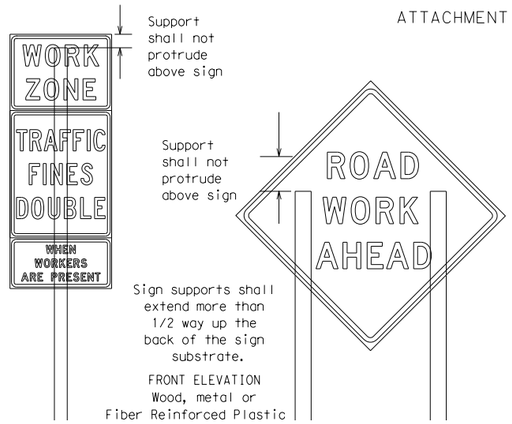
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

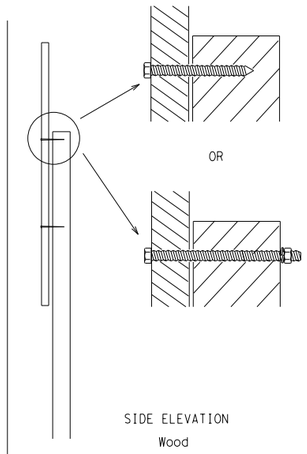


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ 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





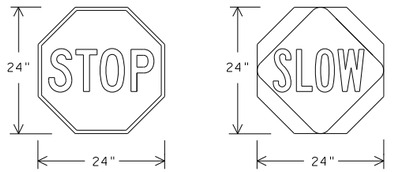
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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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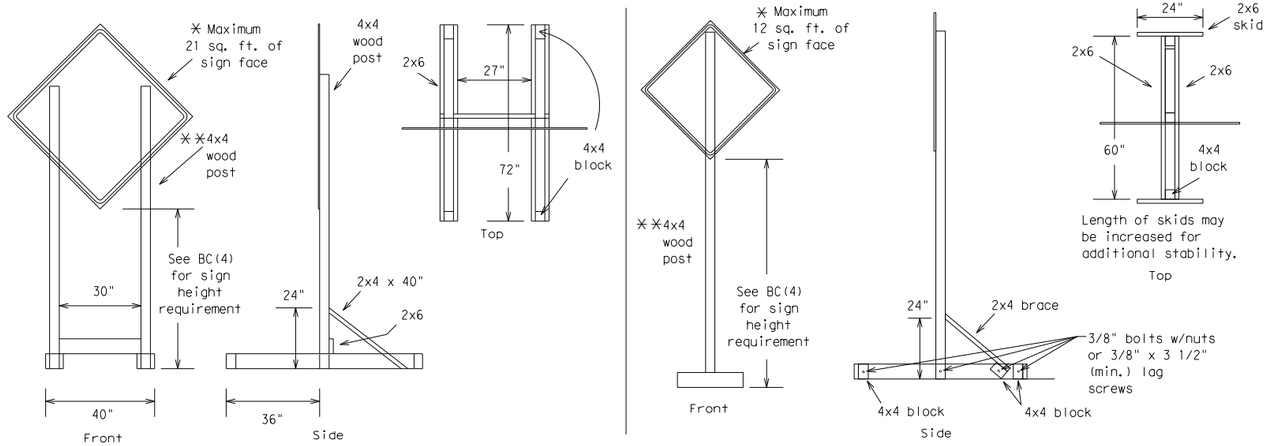
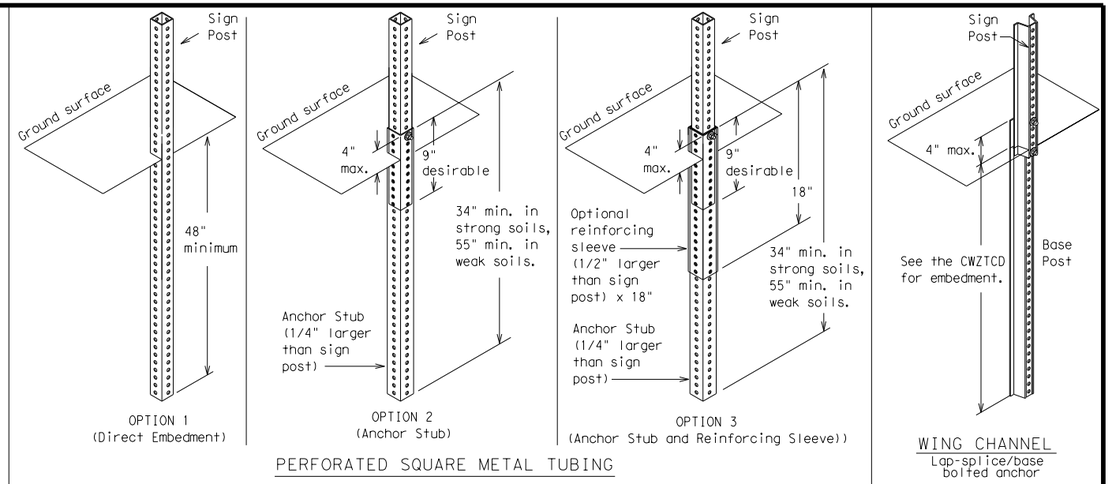


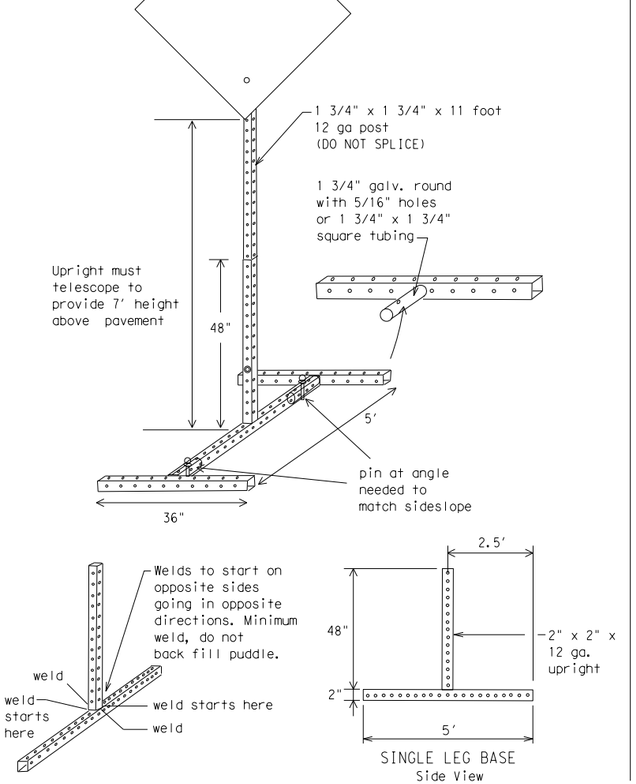
SKID MOUNTED WOOD SIGN SUPPORTS

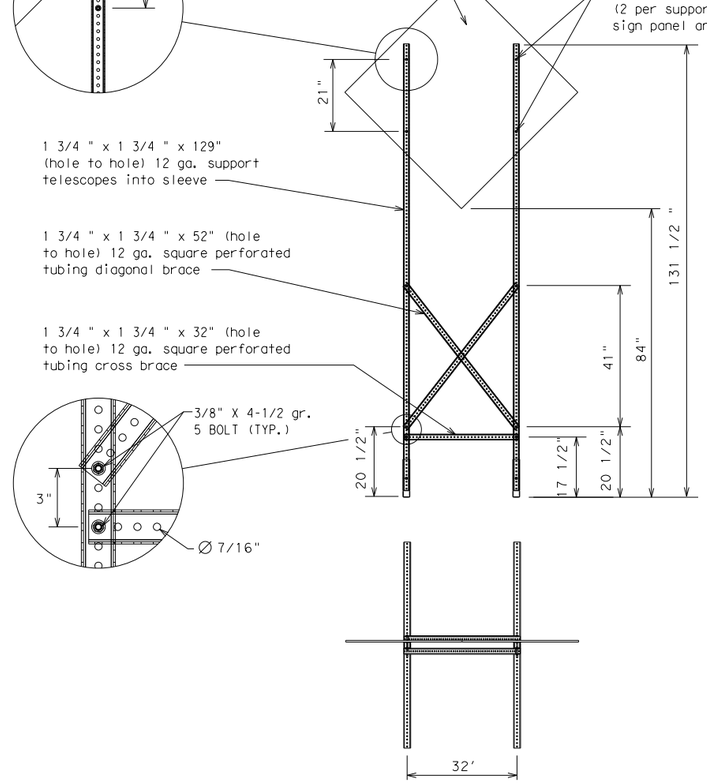
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

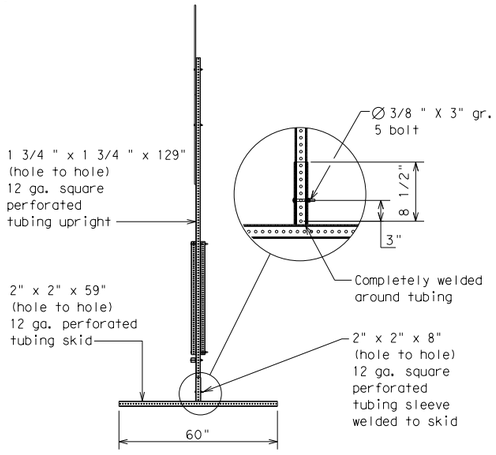


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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9-07 8-14	DIST	COUNTY		SHEET NO.
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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 *	

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

Location List

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

Warning List

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

** Advance Notice List

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WAC	MCLENNAN		25

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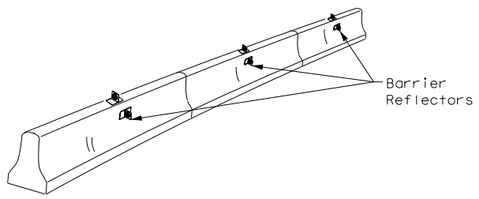
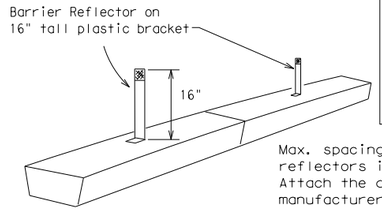
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



CONCRETE TRAFFIC BARRIER (CTB)

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

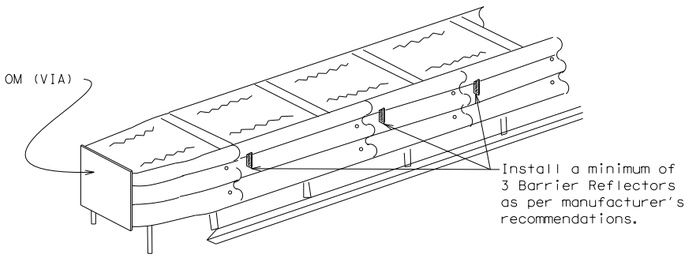


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

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.

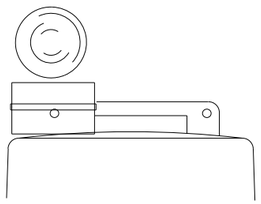


DELINEATION OF END TREATMENTS

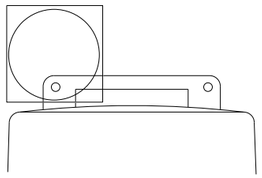
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

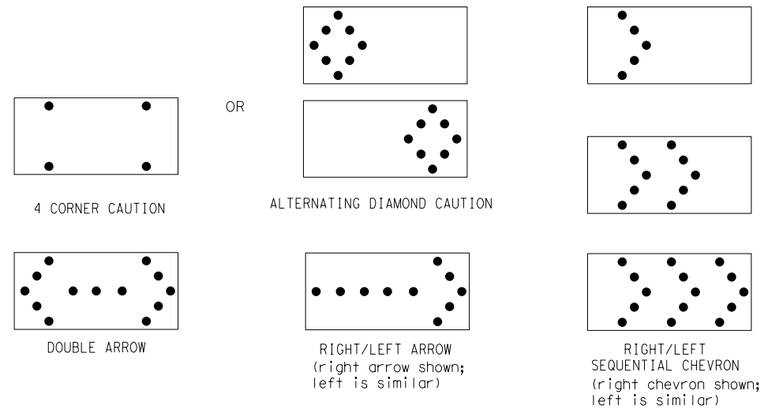
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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:



4 CORNER CAUTION

ALTERNATING DIAMOND CAUTION

DOUBLE ARROW

RIGHT/LEFT ARROW
(right arrow shown;
left is similar)

RIGHT/LEFT
SEQUENTIAL CHEVRON
(right chevron shown;
left is similar)

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
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
9-07 8-14 7-13 5-21	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		26

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

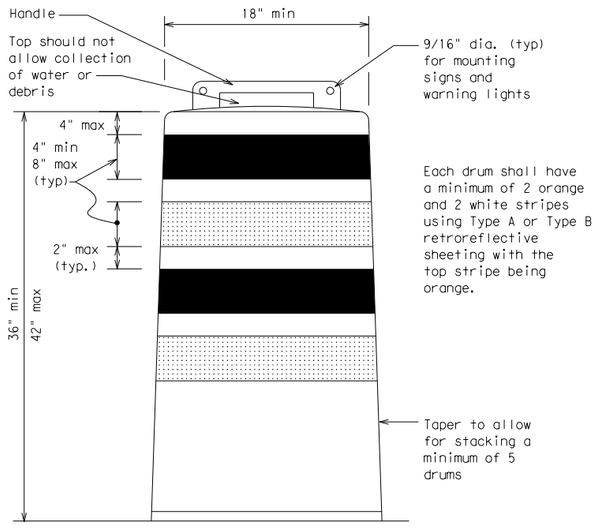
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

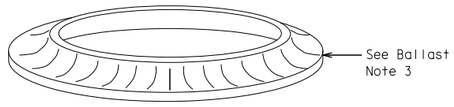
RETROREFLECTIVE SHEETING

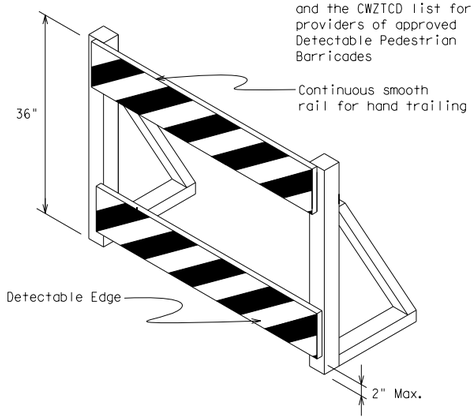
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

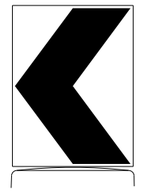




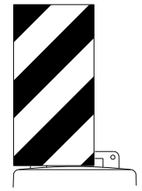


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	WAC	MCLENNAN		27
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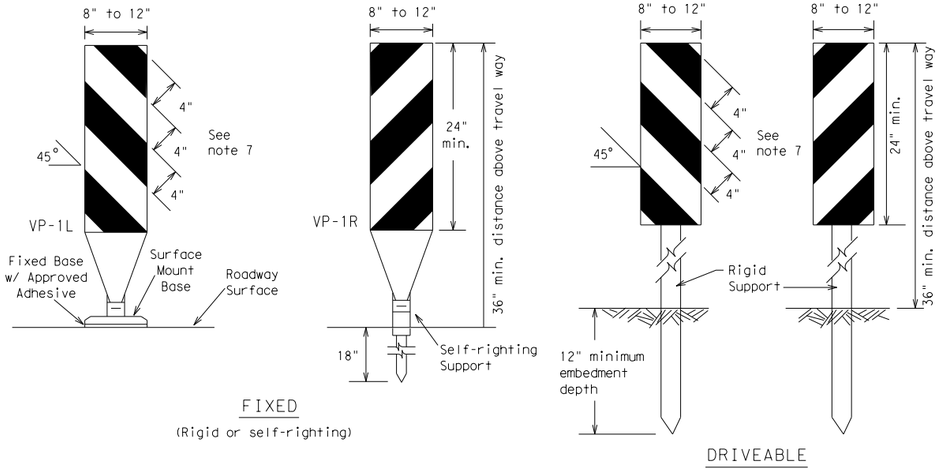
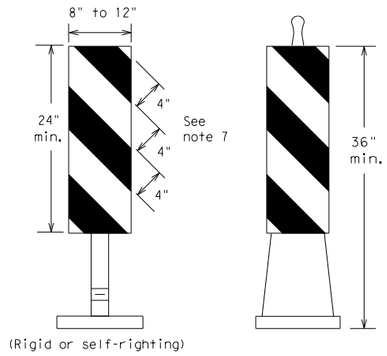


FIXED
(Rigid or self-righting)

DRIVEABLE

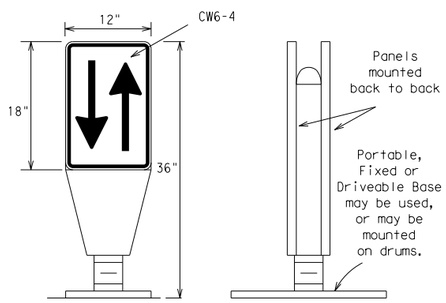


(Rigid or self-righting)

PORTABLE

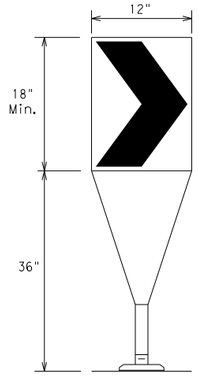
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is 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)



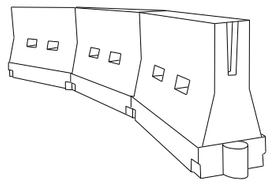
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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7-13 5-21	WAC	MCLENNAN		28

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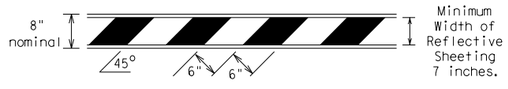
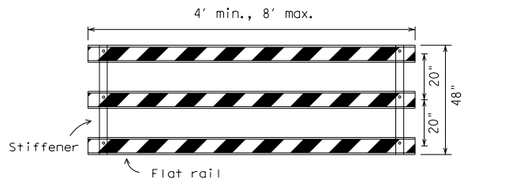
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



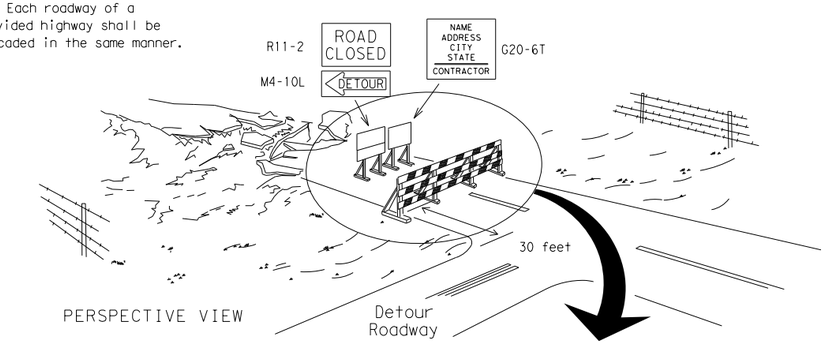
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

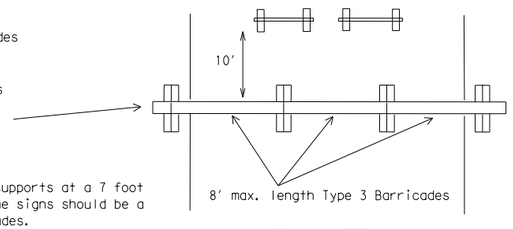
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.

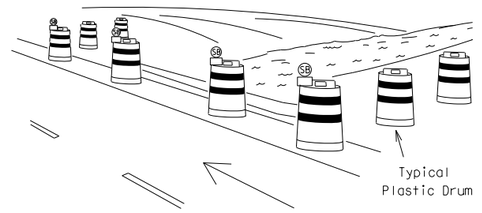
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

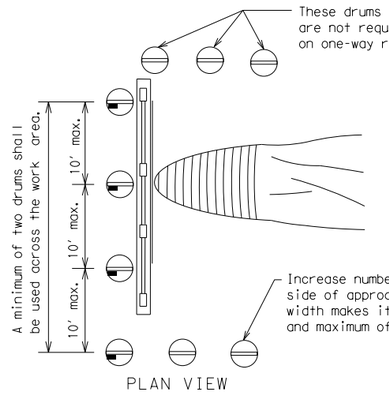
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

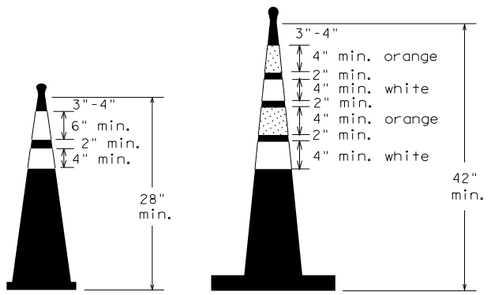
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



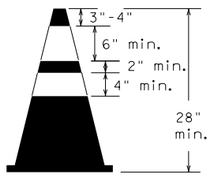
PLAN VIEW

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

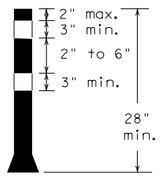
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

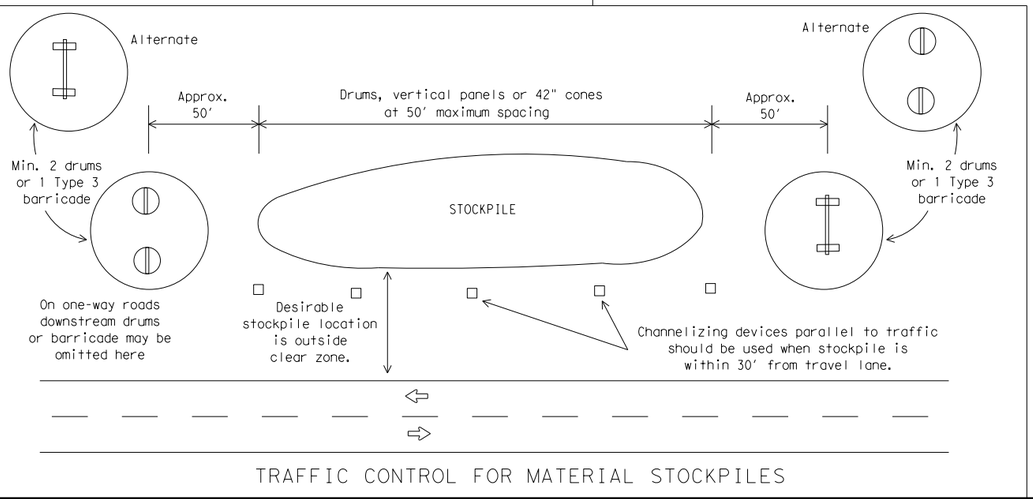


Tubular Marker

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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		29

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.

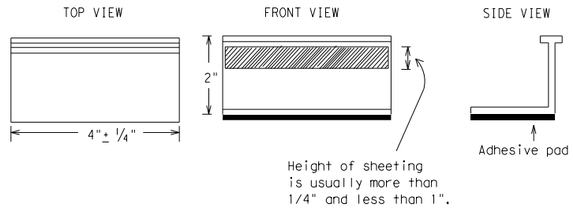
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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
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	WAC	MCLENNAN		30

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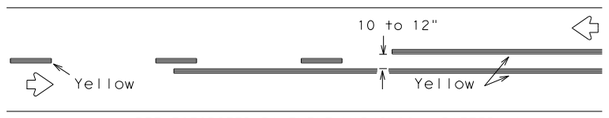
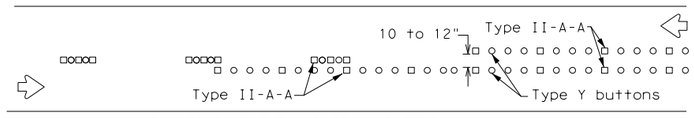
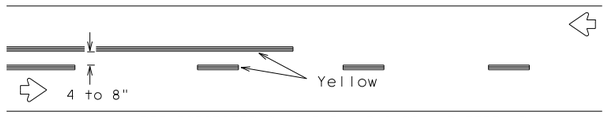
PAVEMENT MARKING PATTERNS



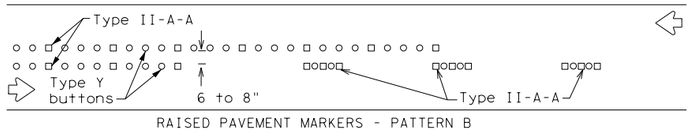
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



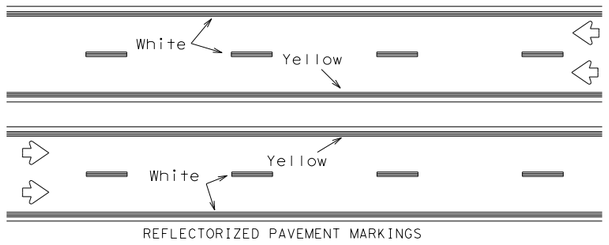
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



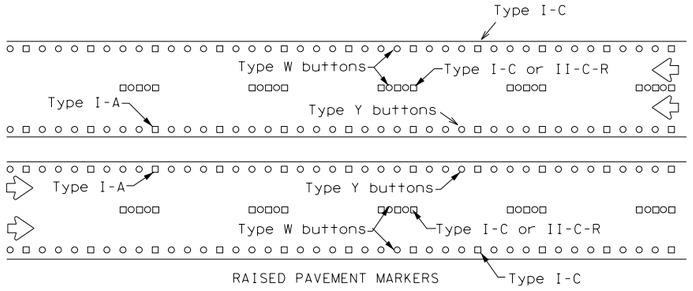
RAISED PAVEMENT MARKERS - PATTERN B

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

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



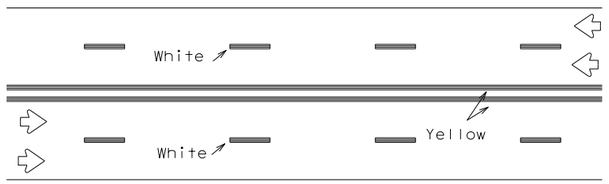
REFLECTORIZED PAVEMENT MARKINGS



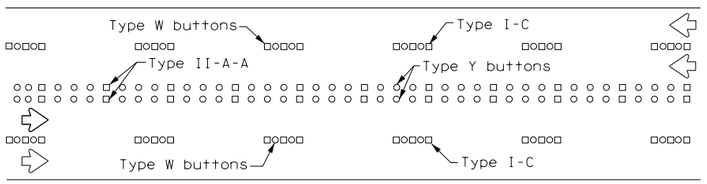
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



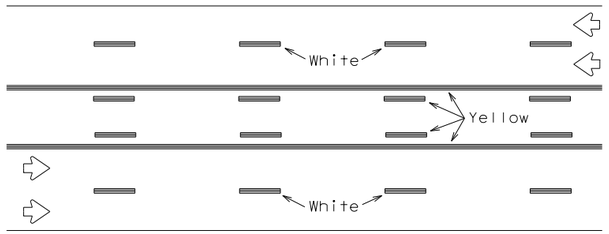
REFLECTORIZED PAVEMENT MARKINGS



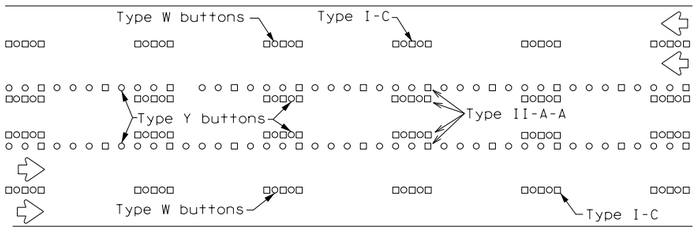
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

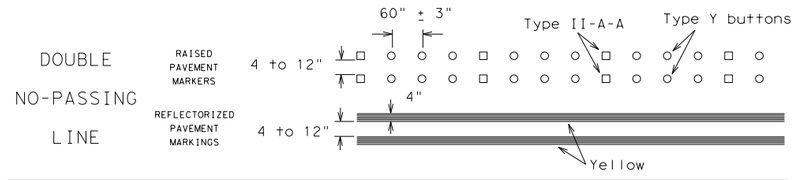
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

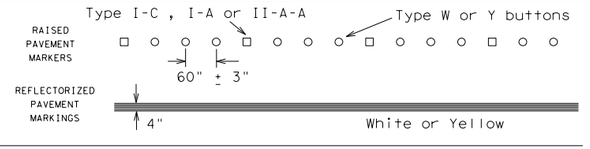
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

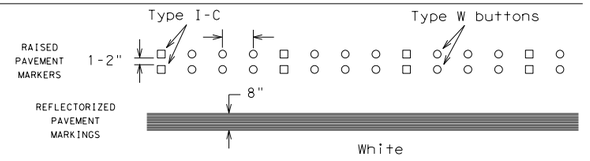


EDGE LINE OR SINGLE NO-PASSING LINE



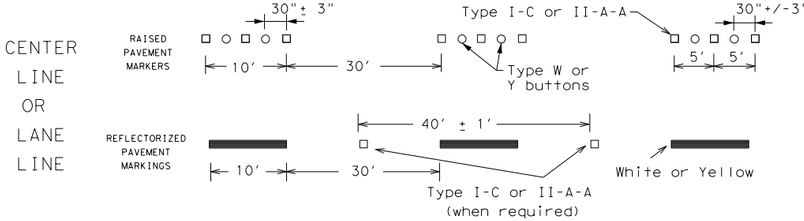
WIDE LINE

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

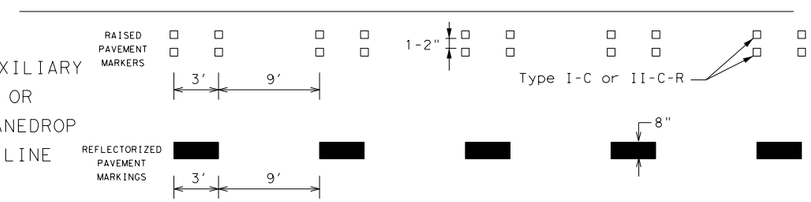


BROKEN LINES

CENTER LINE OR LANE LINE

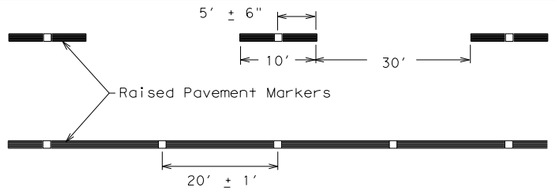


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

SHEET 12 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		31

106

DATE: 4/14/2022
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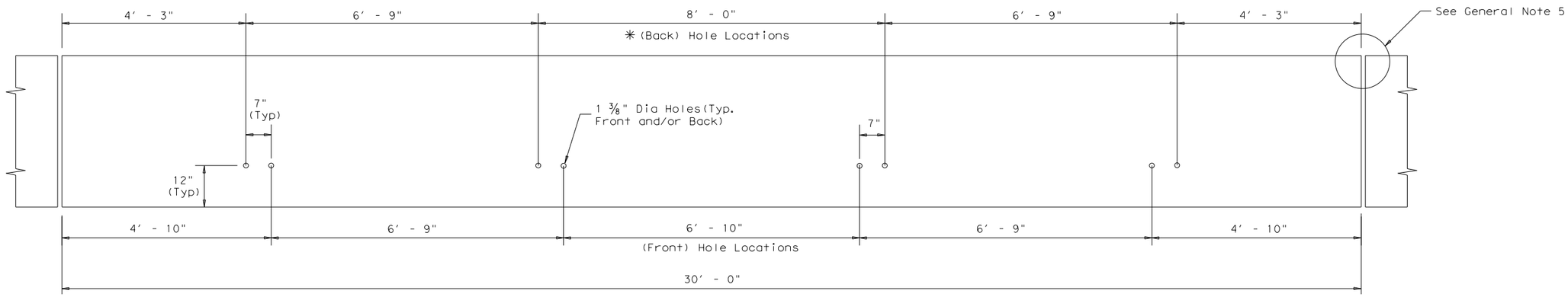
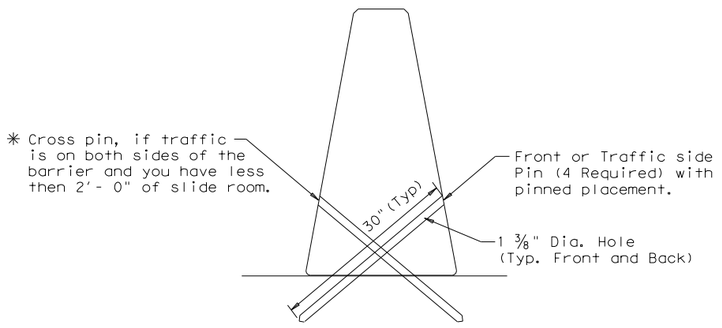


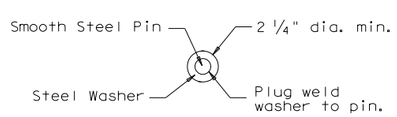
DETAIL 1

Precast SSCB(42")
Showing hole locations

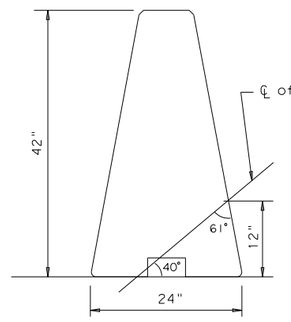


DETAIL 2

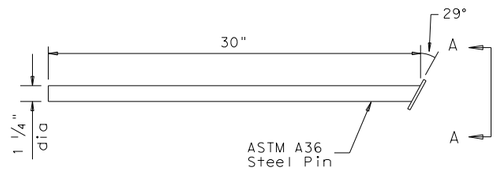
Placement on (ACP)
Asphalt Conc. Pavement
or Treated Base Material
(30" Pin required)



VIEW A-A

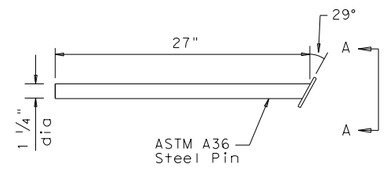


HOLE LOCATION DETAIL



(30") PIN DETAIL

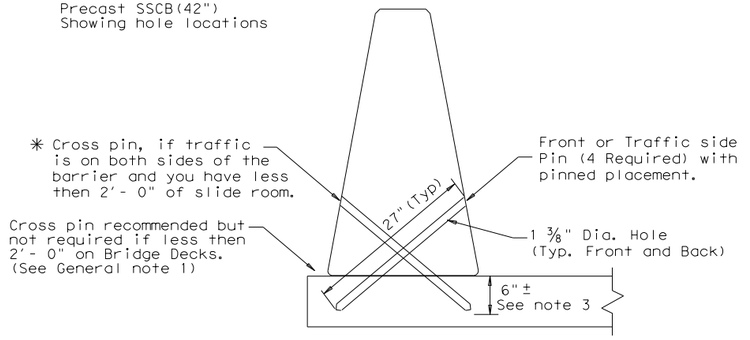
See Detail 2



(27") PIN DETAIL

See Detail 3

Note:
Steel washer welded to pin at 29° angle so that the washer is flush with barrier surface. (See View A-A)

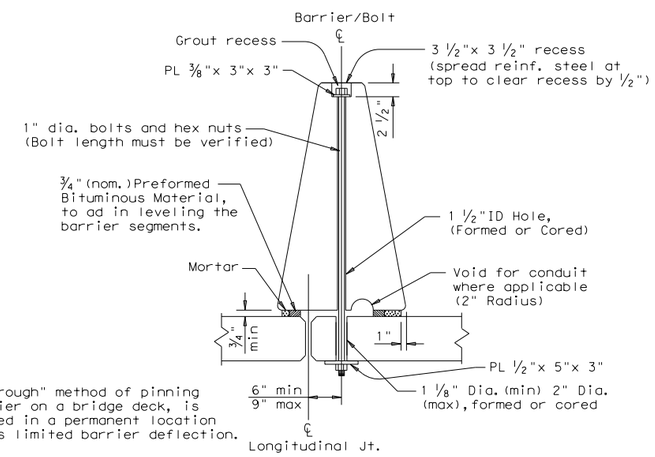


DETAIL 3

Bridge Deck or CRCP
(27" Pin required).

CORE DRILLING EXISTING BARRIER

Core drilling existing concrete barrier is permitted. Holes shall be drilled with coring or masonry drilling type equipment. Percussion (star) drilling shall not be used. A special drill bit (to cut through existing reinforcing) will likely be required. Spalls in the concrete exceeding ½" shall be patched.



Note:
The "Bolt Through" method of pinning precast barrier on a bridge deck, is primarily used in a permanent location that requires limited barrier deflection.

PRECAST SSCB (BOLT THROUGH) PLACEMENT OVER LONGITUDINAL EXPANSION JOINT

For bolt through locations, use the (Front) hole locations shown on Detail 1.

GENERAL NOTES

1. These details provide a method of laterally restraining precast concrete barrier to limit deflections under normally expected passenger vehicle impacts. These details are intended for use in work zones, primarily on bridge decks, or pavement where temporary barrier must be placed less then 2 ft. from the longitudinal edge of the deck or dropoff and parallel to the direction of travel. Other applications of these details are acceptable as directed by the Engineer.
2. Each precast concrete barrier section shall have a minimum of four or total of eight 1 ⅜in. ID holes formed or cored through the barrier. The center lines of the holes are shown in the hole location detail. If rebar is encountered, the entry point may be shifted 2" plus or minus longitudinally along the barrier. The eight holes are spaced along the length of the barrier as shown in Detail 1.
3. The drilling of the travel surface is accomplished by placing the pre-drilled barrier section on the travel surface in the desired position. Then the hole is drilled with the bit passing though the hole in the barrier. The bit is to be inserted into the hole in the barrier so that the travel surface is drilled to a point which is slightly more than the pin length.
4. Note that steel washers have been welded to the top of the steel pins to aid in the removal of the pins, when the barrier is removed.
5. See SSCB(2) standard sheet for reinforcement requirements and joint connection types.
6. The forming or coring of holes in the barrier, drilling of holes in bridge deck or pavement, fabrication and materials for the 1 ¼in. pins, installation of pins, and any repair to the barrier shall be considered as subsidiary to the barrier bid items.
7. The barrier and travel surface will be repaired as directed by the Engineer in accordance with Item 429, "Concrete Structure Repair."
8. All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
9. Weight of barrier is approx. 700 lbs per foot.

Texas Department of Transportation

Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1) PINNED PLACEMENT

SSCB(5)-10

FILE: sscb510.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
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	WAC	MCLENNAN		32

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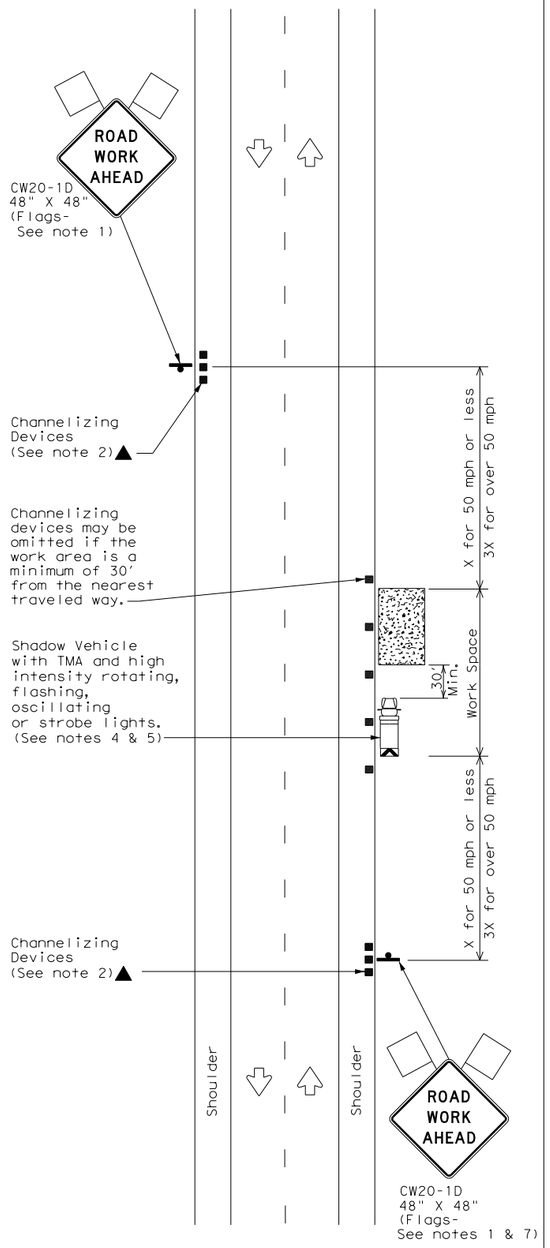
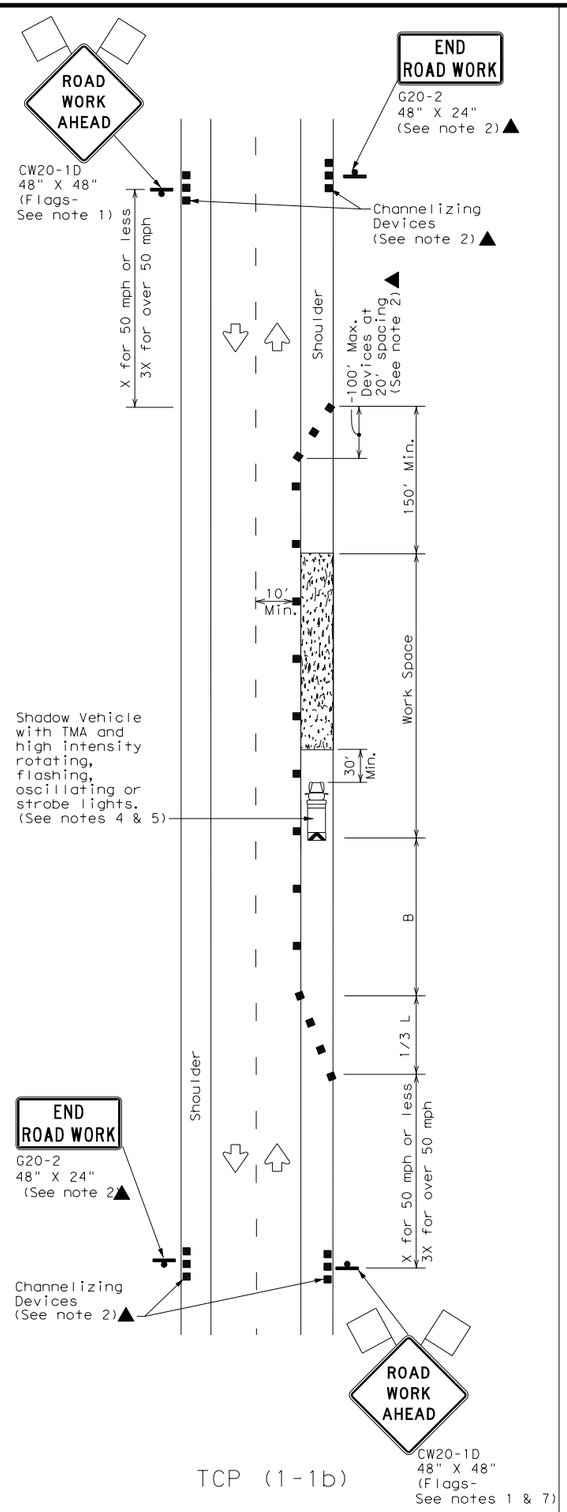


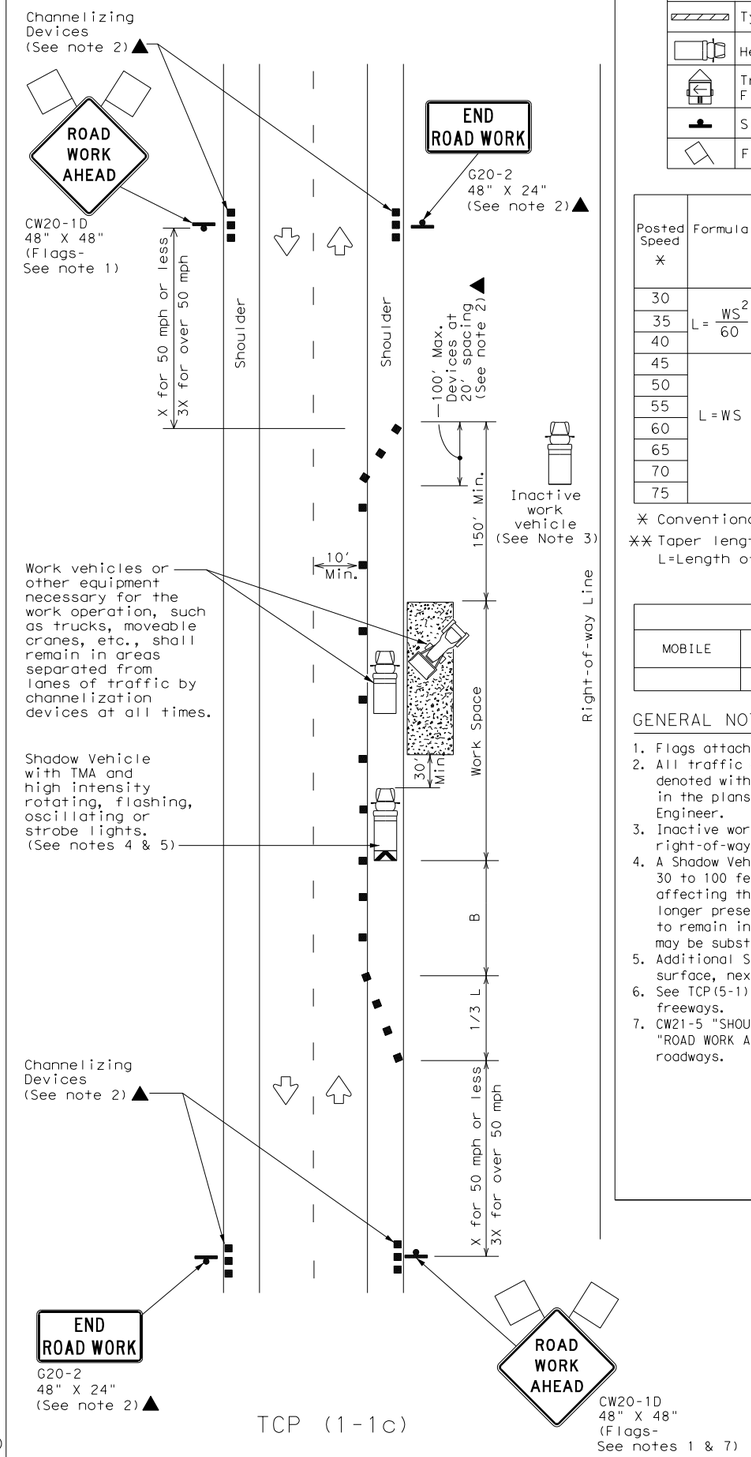
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. 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(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98	0831	01	019, ETC.	FM 939
8-95 2-12	DIST	COUNTY		SHEET NO.
1-97 2-18	WAC	MCLENNAN		33

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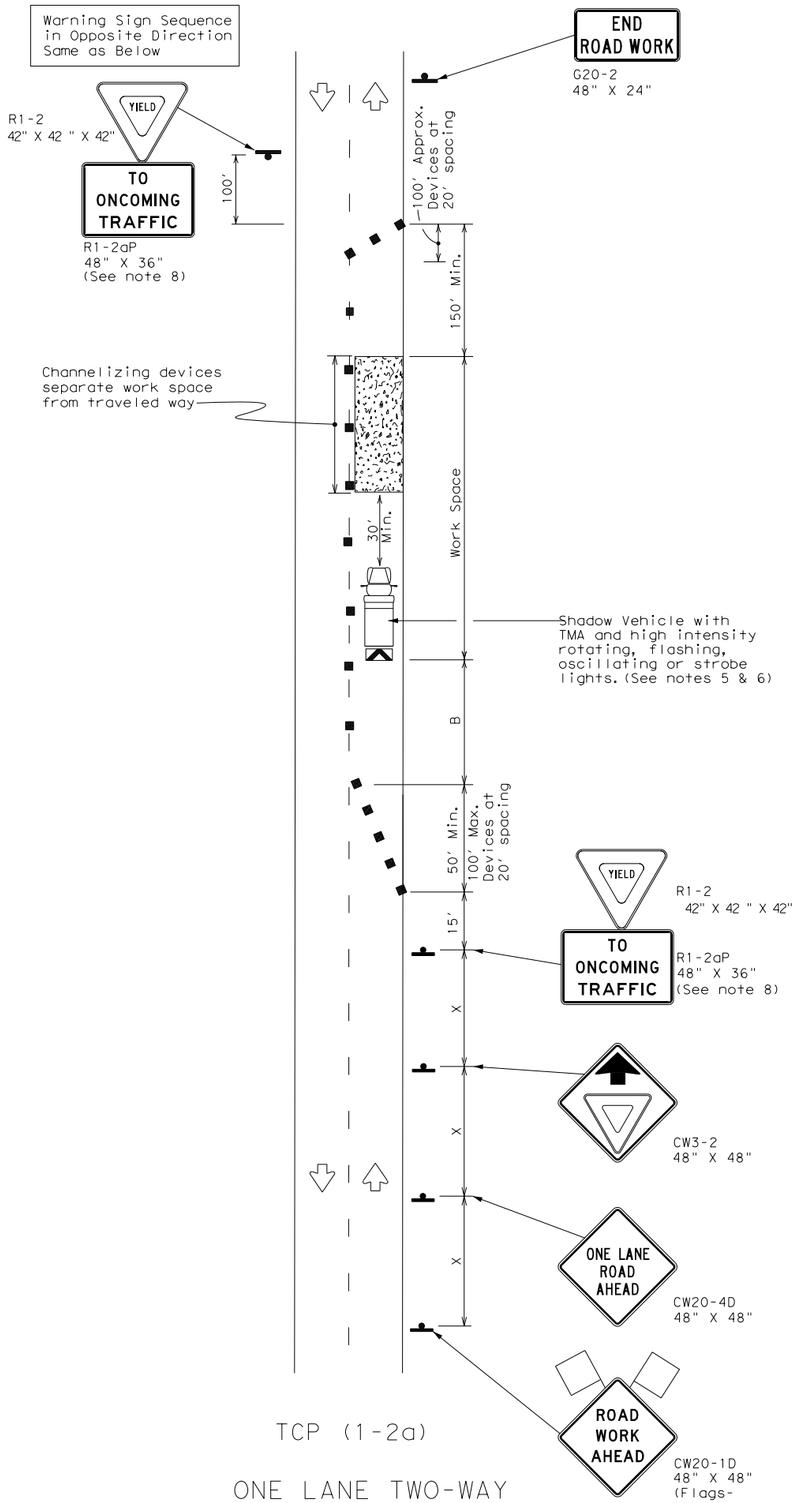
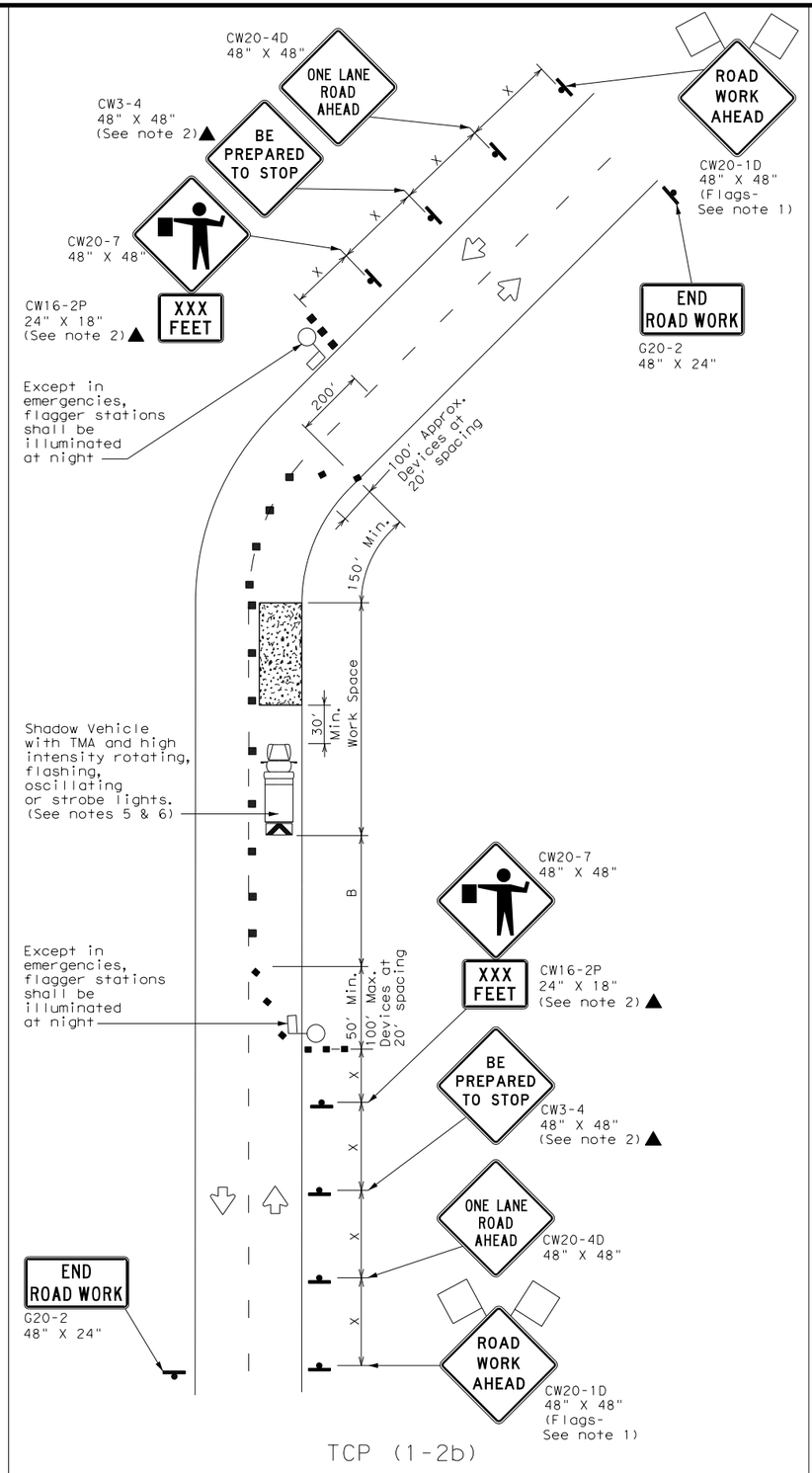


TCP (1-2a)

ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See note 7)



TCP (1-2b)

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	PCMS	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 CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
4. Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
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 off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-2a)

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

TCP (1-2b)

9. Flaggers should use two-way radios or other methods of communication to control traffic.
10. Length of work space should be based on the ability of flaggers to communicate.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
12. Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
13. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	0831	01	019, ETC.	FM 939
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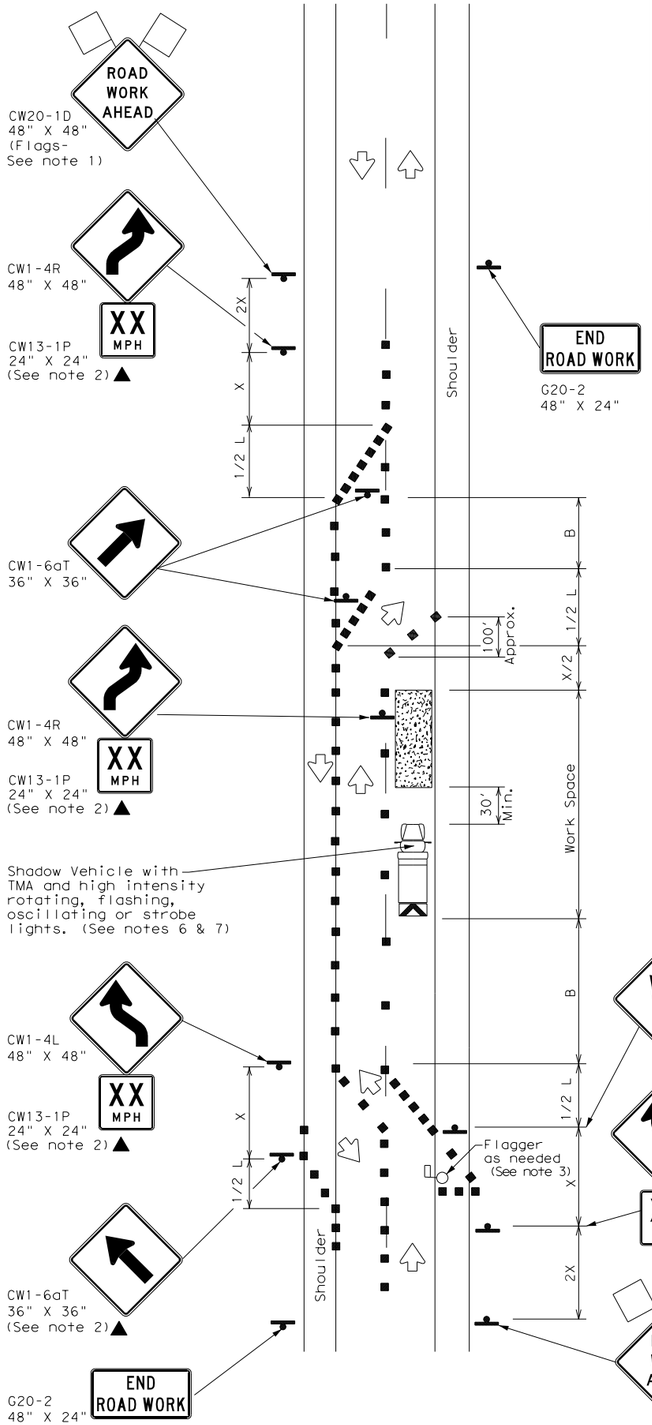
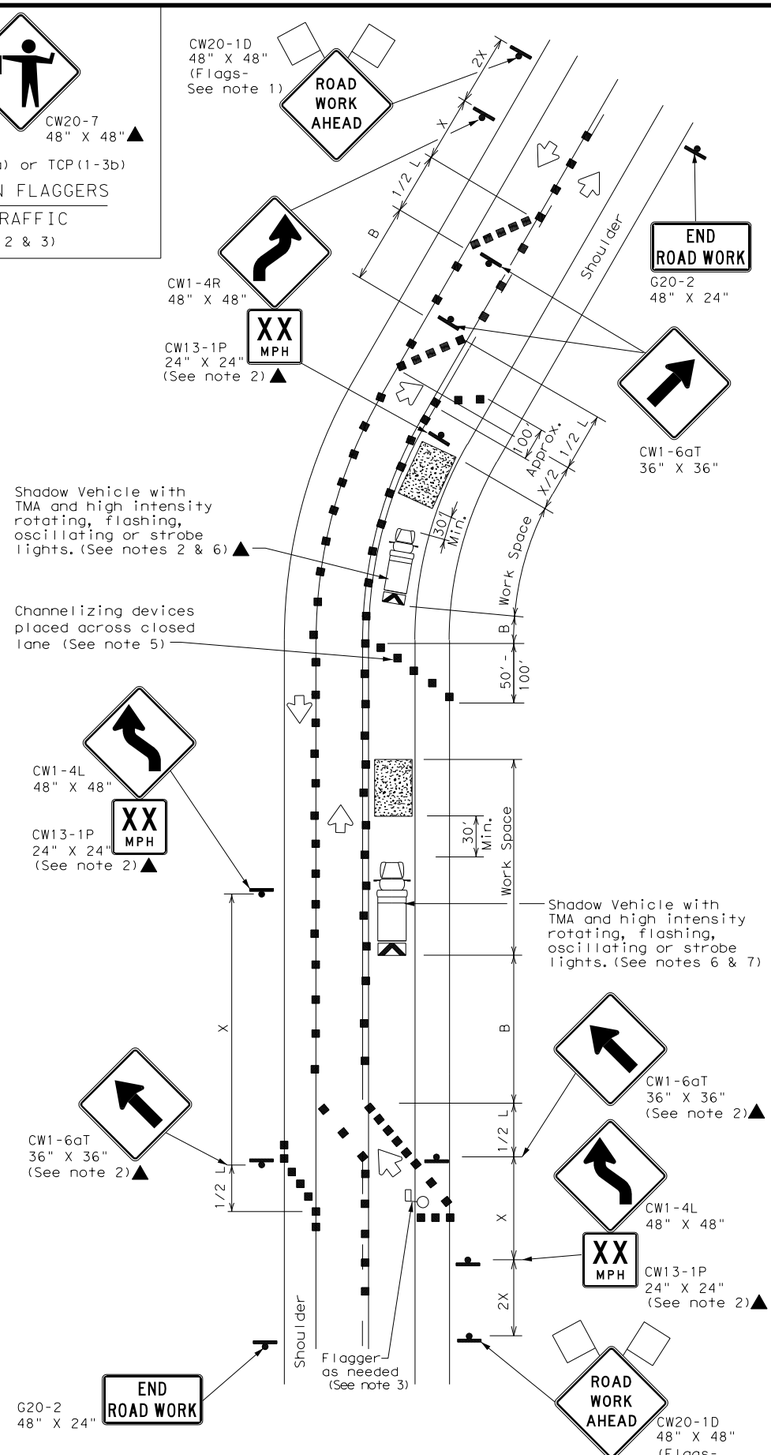


TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW

For either TCP(1-3a) or TCP(1-3b)

USE ONLY WHEN FLAGGERS
CONTROL TRAFFIC
(See Notes 2 & 3)



TCP (1-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
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 wider work spaces.
8. 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 speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device 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
TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

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8-95 2-12	WAC	MCLENNAN		35
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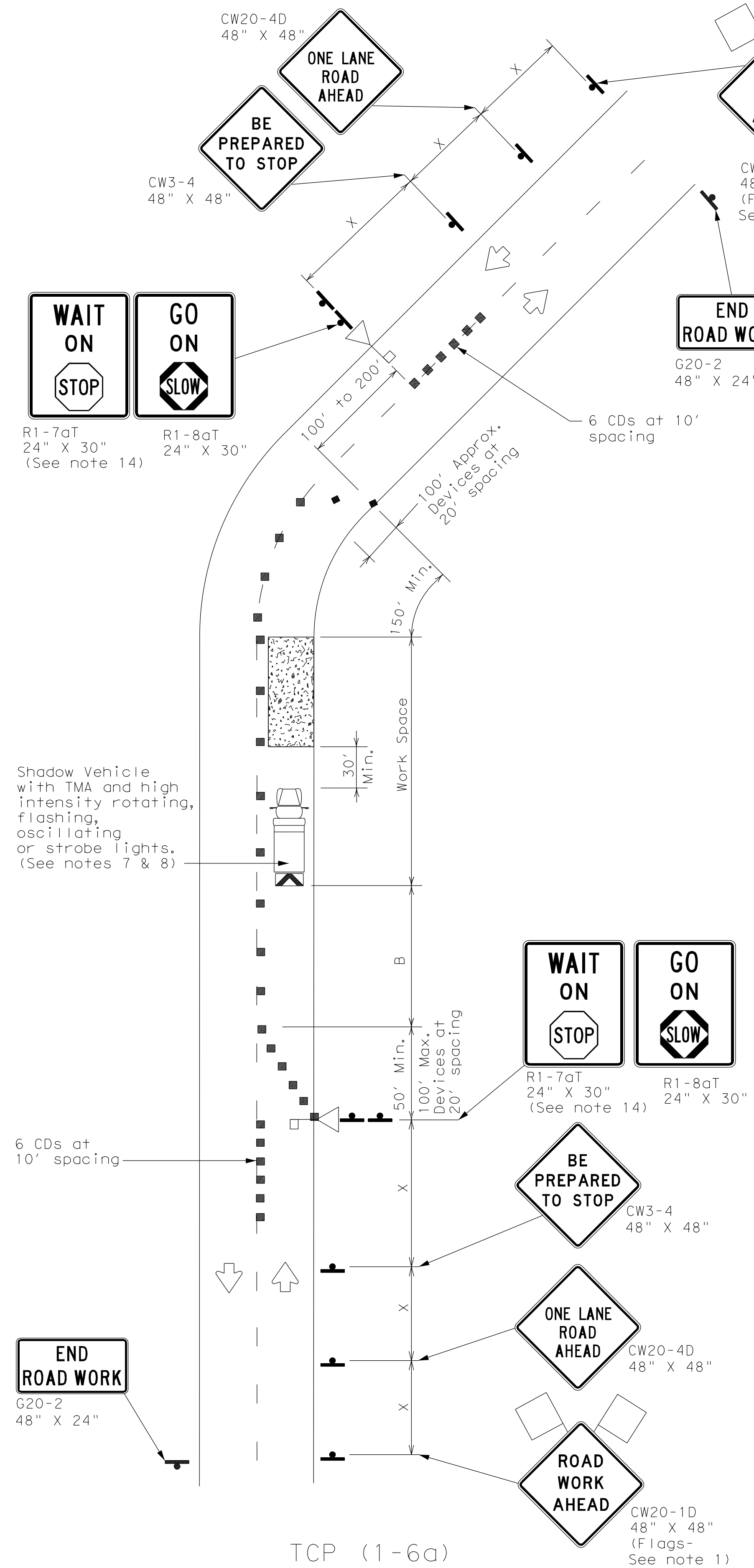
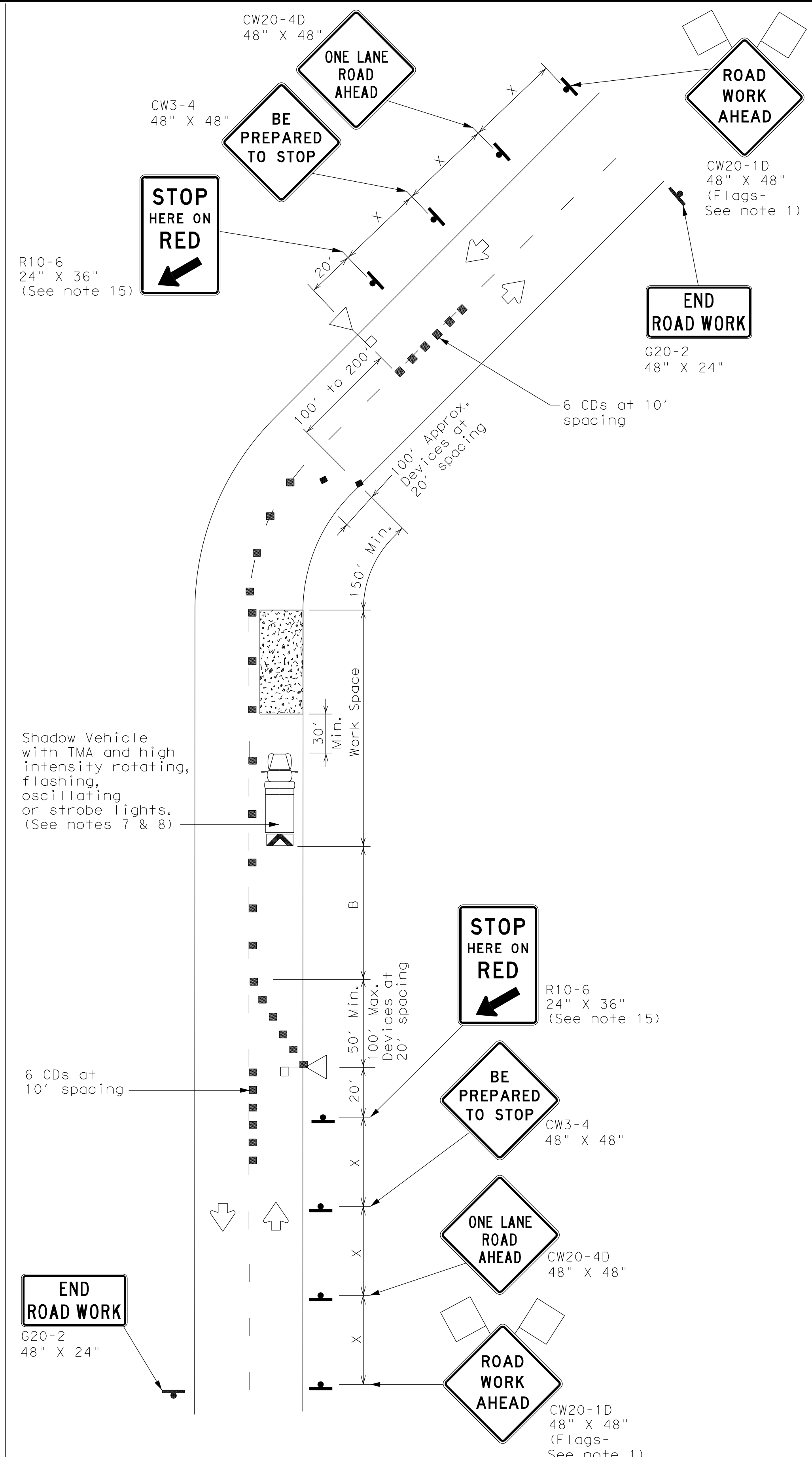


TCP (1-6a)

ONE LANE TWO-WAY CONTROL WITH STOP/SLOW AFADs



TCP (1-6b)

ONE LANE TWO-WAY CONTROL WITH RED/YELLOW LENS AFADs

LEGEND

	Type 3 Barricade		Channelizing Devices (CDs)
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Automated Flagger Assistance Device (AFAD)		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	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. AFADs shall only be used in situations where there is one lane of approaching traffic in the direction to be controlled.
3. Adequate stopping sight distance must be provided to each AFAD location for approaching traffic. (See table above).
4. Each AFAD shall be operated by a qualified/certified flagger. Flaggers operating AFADs shall not leave them unattended while they are in use.
5. One flagger may operate two AFADs only when the flagger has an unobstructed view of both AFADs and of the approaching traffic in both directions.
6. When pilot cars are used, a flagger controlling traffic shall be located on each approach. AFADs shall not be operated by the pilot car operator.
7. All AFADs shall be equipped with gate arms with an orange or fluorescent red-orange flag attached to the end of the gate arm. The flag shall be a minimum of 16" square.
8. 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.
9. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
10. Flaggers should use two-way radios or other methods of communication to control traffic.
11. Length of work space should be based on the ability of flaggers to communicate.
12. 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 AFAD.
13. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
14. The R1-7aT "WAIT ON STOP" sign and the R1-8aT "GO ON SLOW" sign shall be installed at the AFAD location on separate supports or they may be fabricated as one 48" x 30" sign. They shall not obscure the face of the STOP/SLOW AFAD.
15. The R10-6 "STOP HERE ON RED" arrow sign shall be offset so as not to obscure the lenses of the AFAD.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN AUTOMATED FLAGGER ASSISTANCE DEVICES (AFADS)

TCP(1-6)-18

FILE: tcp1-6-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
2-18	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		36

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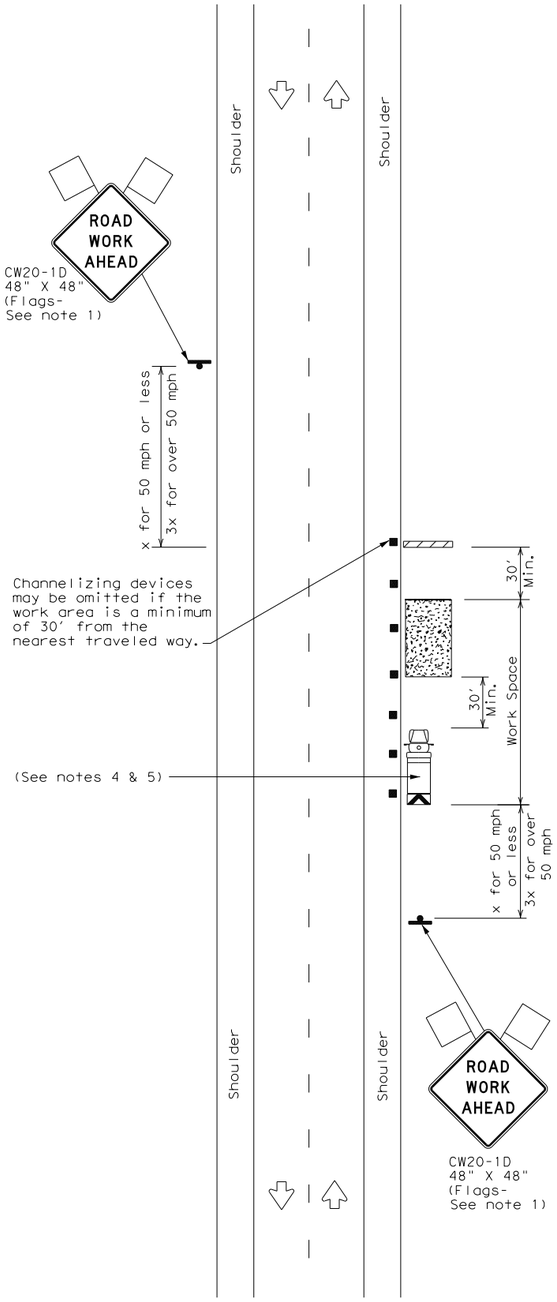
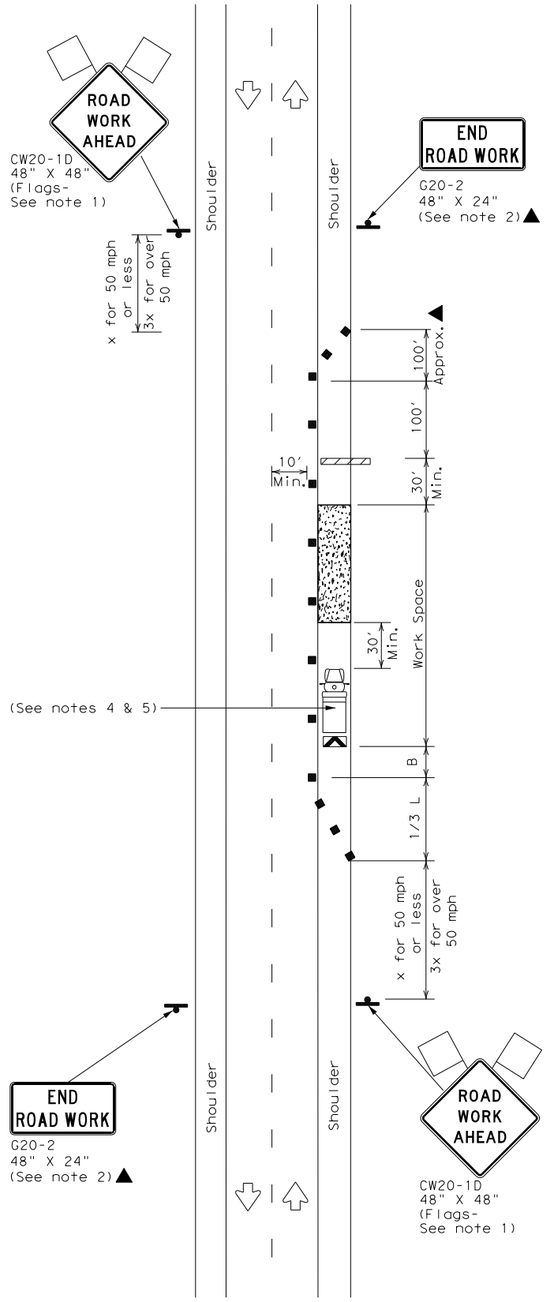


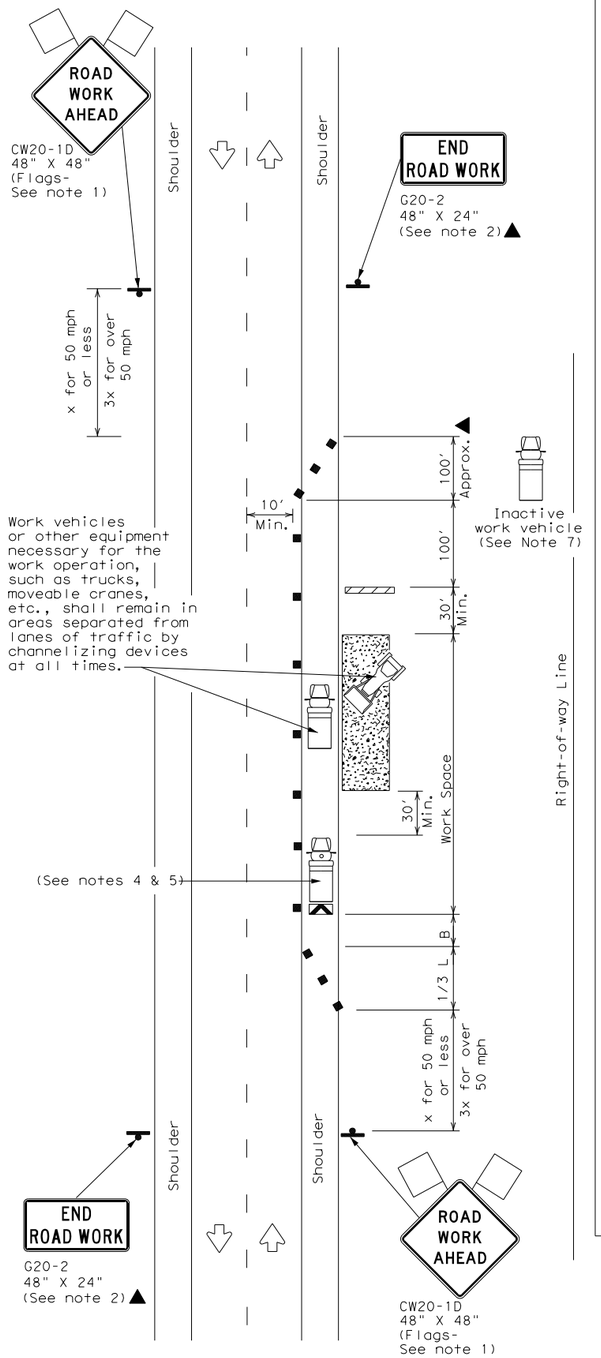
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0831	01	019, ETC.	FM 939
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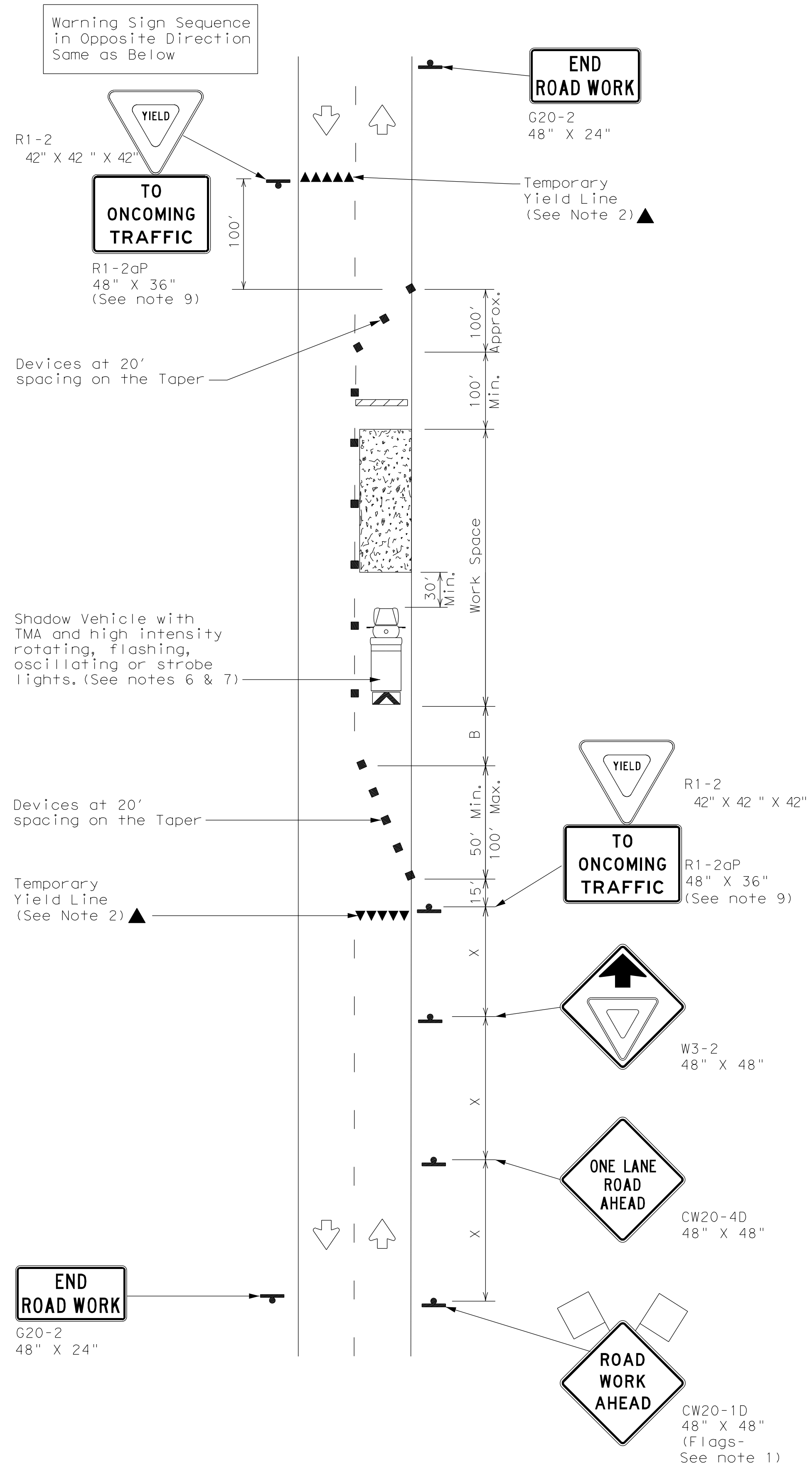
	WAC	MCLENNAN		37



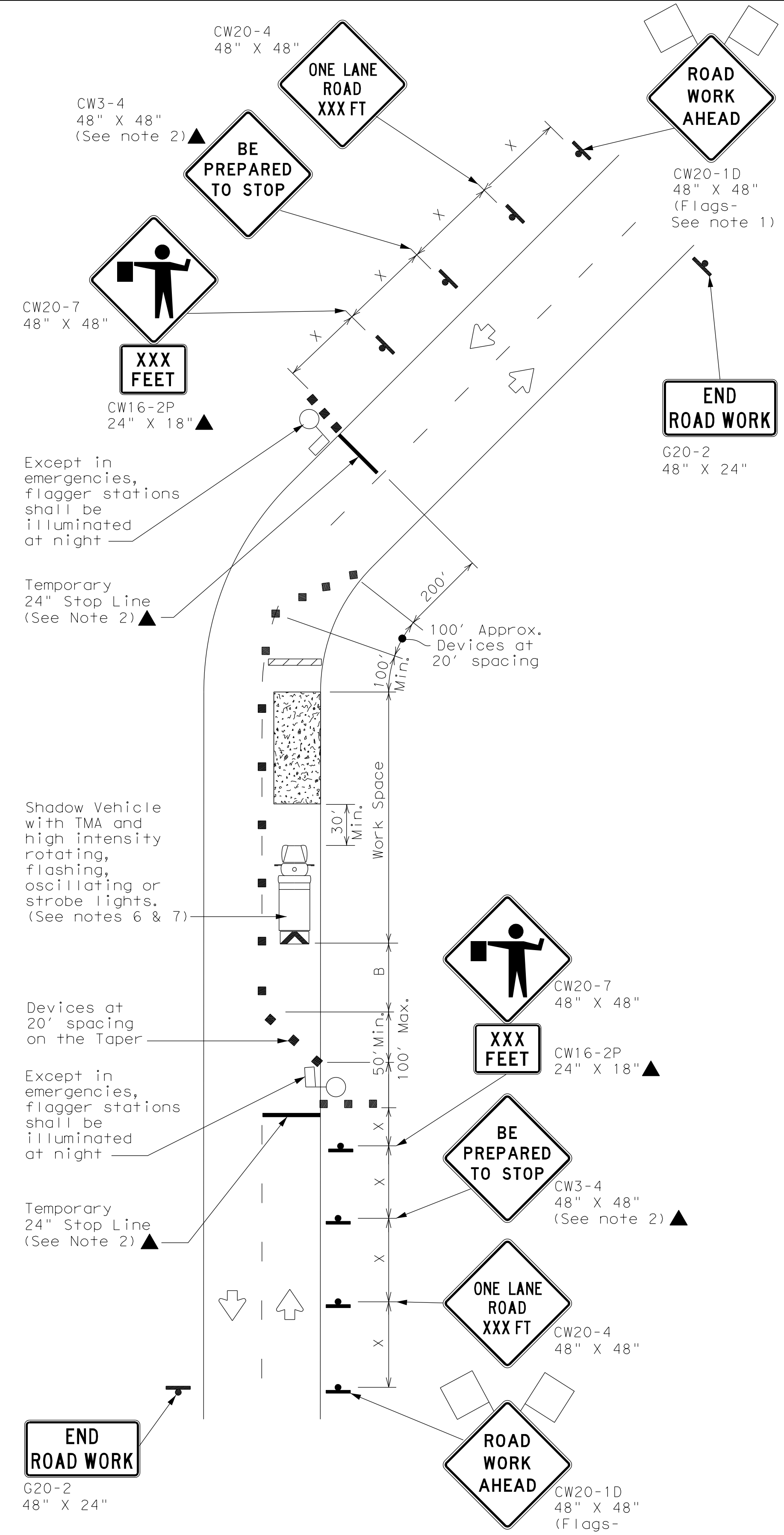
TCP (2-2a)

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		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed ⚹	Formula	Minimum Desirable Taper Lengths ⚹⚹			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	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 8-95 3-03 1-97 2-12 4-98 2-18		0831	01	019, ETC.	FM 939
		DIST		COUNTY	SHEET NO.
		WAC		MCLENNAN	38

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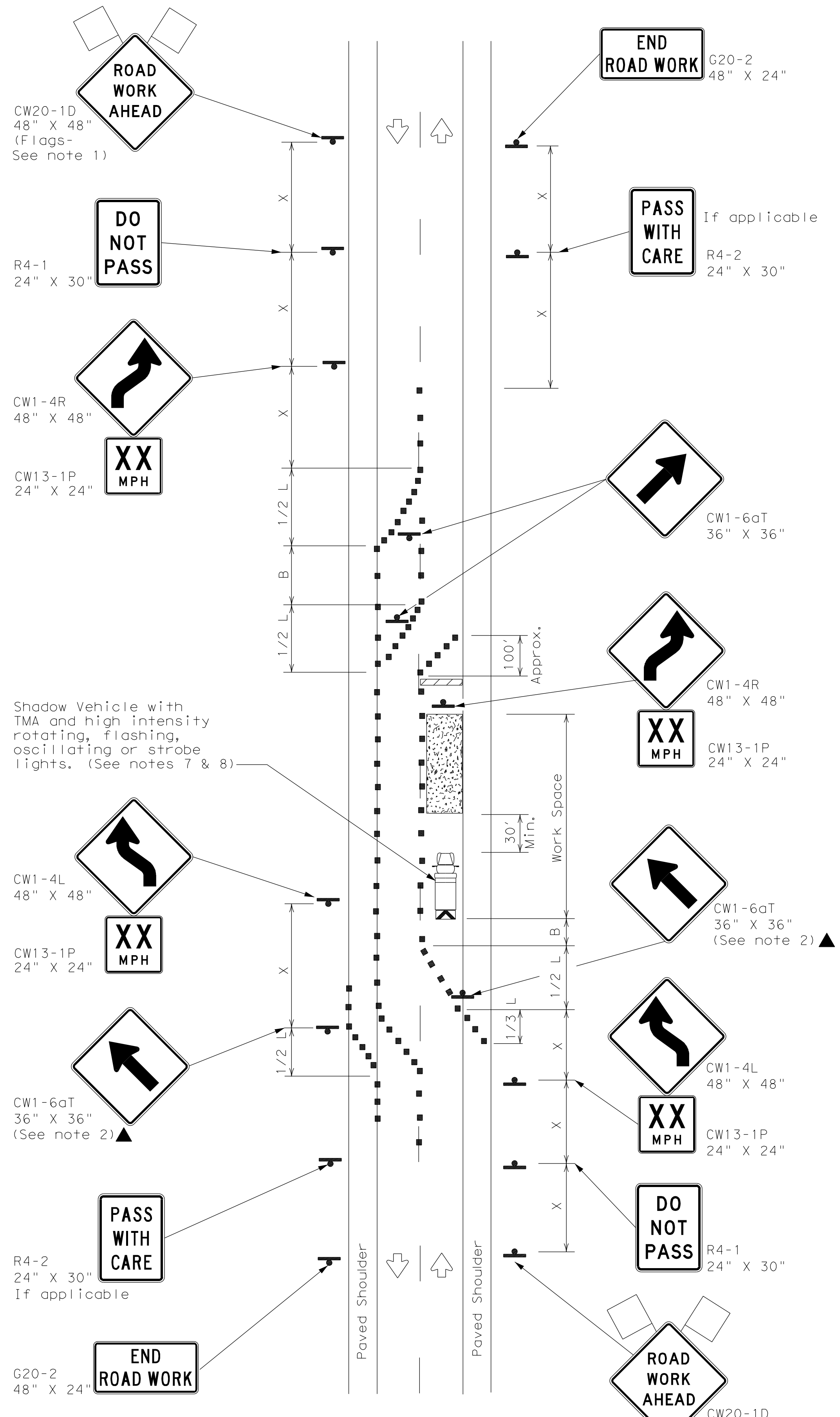
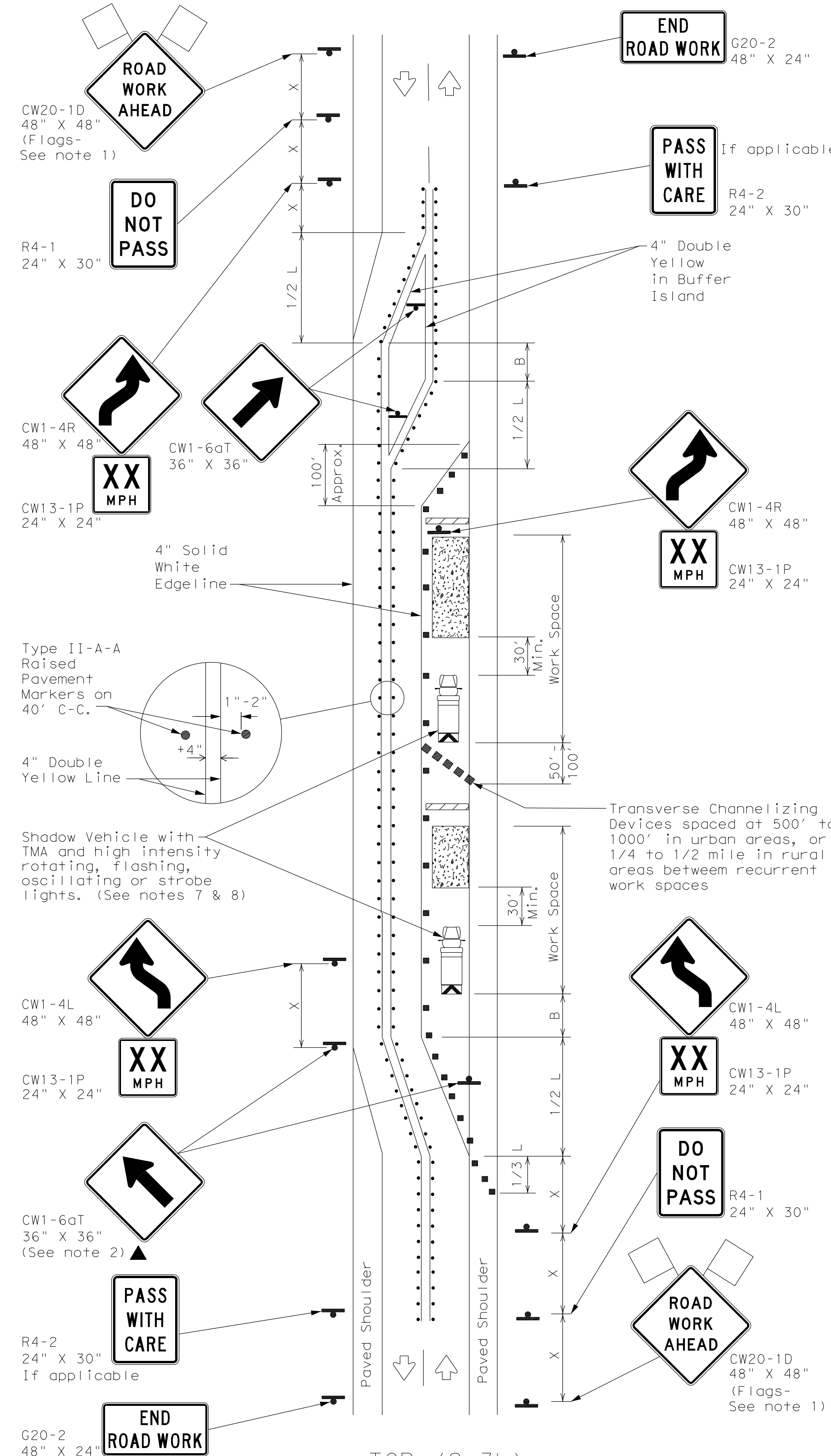


TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



TCP (2-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND

	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Raised Pavement Markers Ty II-AA
	Sign		Traffic Flow
	Flag		Flagger

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

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY TCP(2-3b)ONLY
			✓	✓

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. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. 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.
8. 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 (2-3a)

9. Conflicting pavement markings shall be removed for long-term projects. 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 device spacing is intended for the area of the conflicting markings, not the entire work zone.

Texas Department of Transportation | Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0831	01	019, ETC.	FM 939
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	WAC	MCLENNAN		39

163

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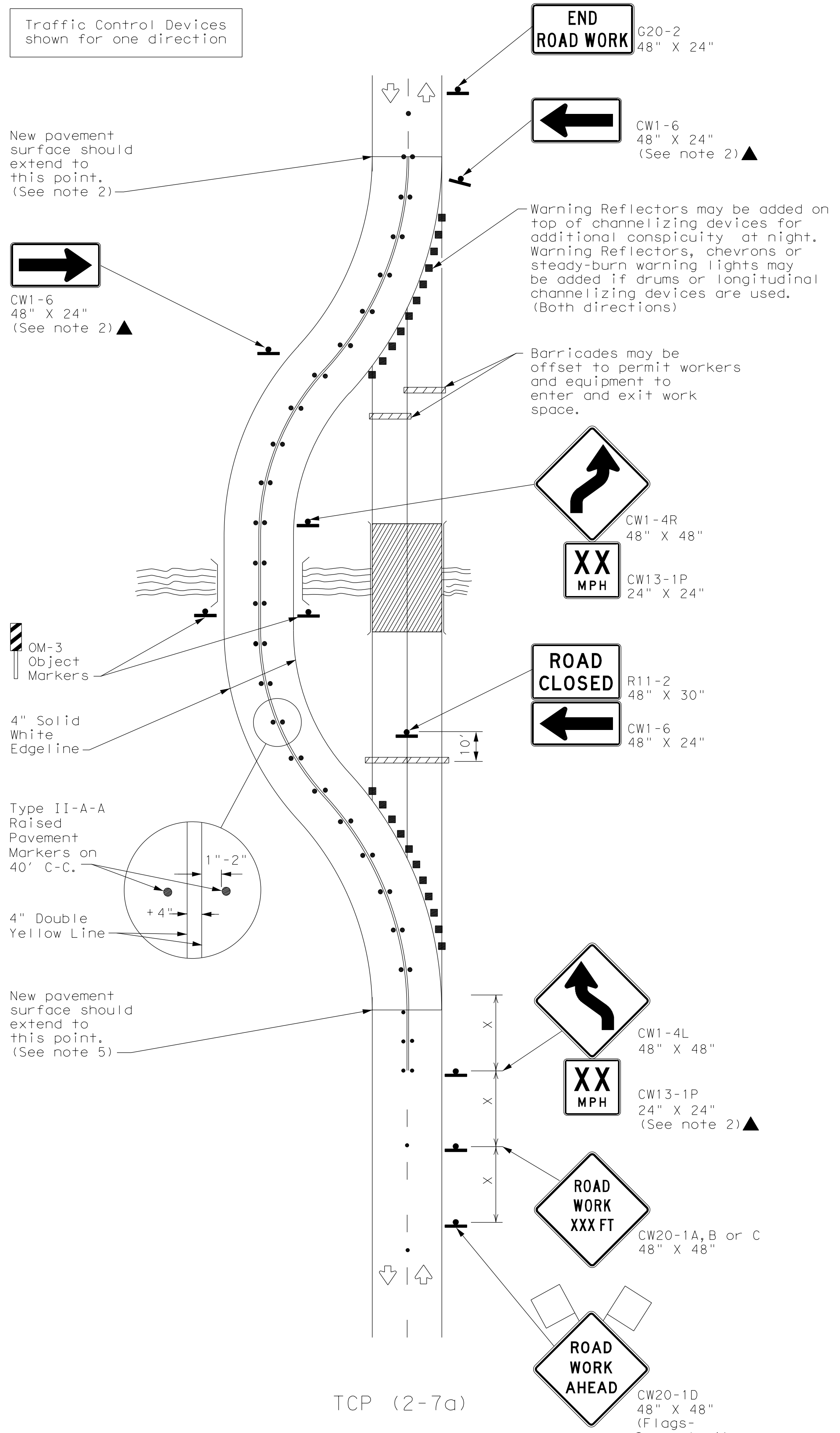
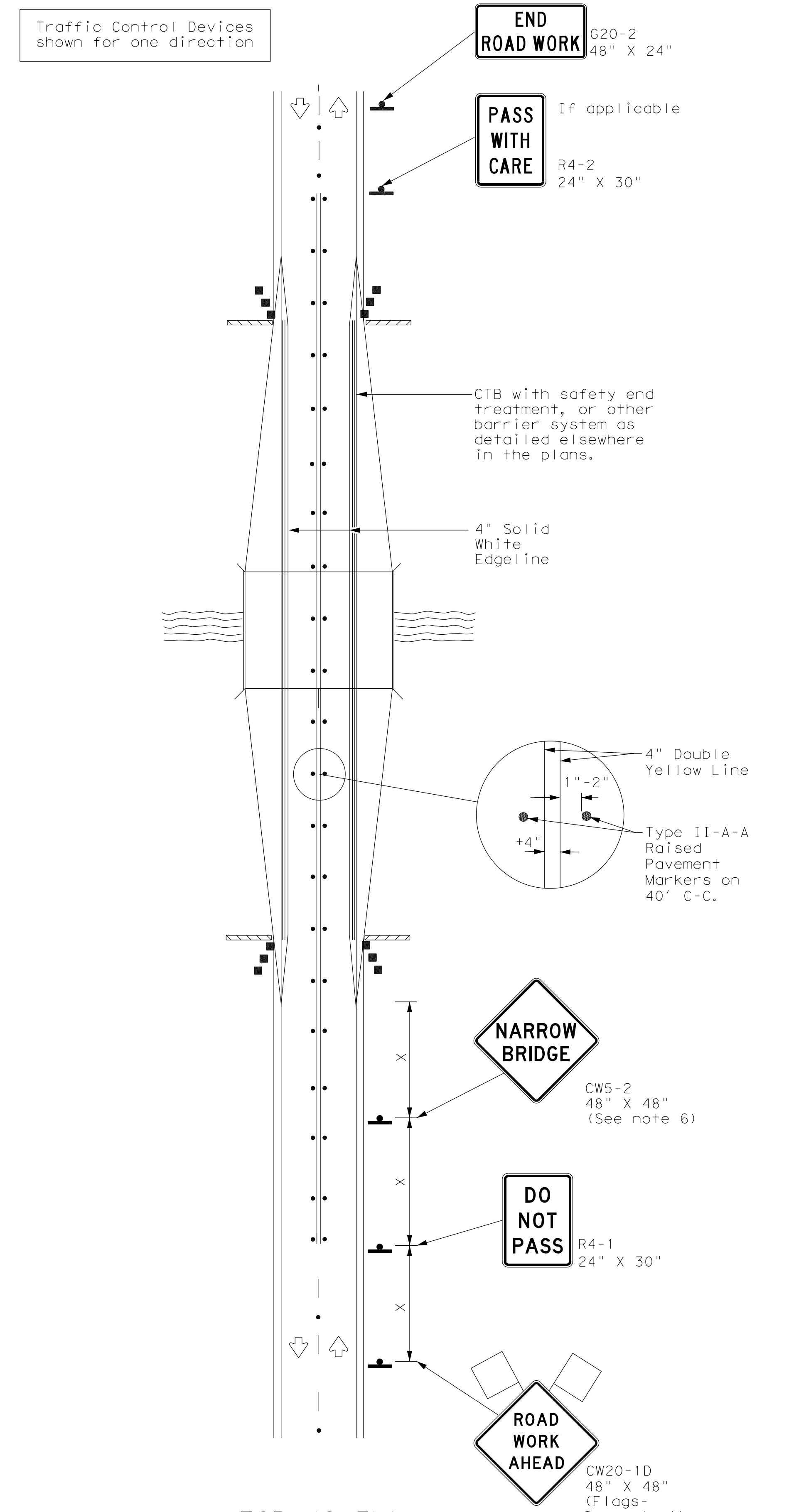


TCP (2-7a)

ROADWAY DIVERSION



TCP (2-7b)

BRIDGE WIDENING

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Raised Pavement Markers Ty II-AA
	Sign		Traffic Flow
	Flag		Flagger

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

✱ Conventional Roads Only

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

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

GENERAL NOTES

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.

TCP (2-7a)

3. Raised pavement markers shall be placed 40 feet c-c on centerline throughout project.
4. Roadway diversion design requirements should be based on posted speed limit or prevailing speed.
5. New pavement surface should be extended across existing roadway edge to a point where existing pavement markings left in place during project do not conflict with construction area pavement marking.

TCP (2-7b)

6. The CW5-2 "Narrow Bridge" sign may be omitted if lane and shoulder widths are maintained.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN DIVERSIONS AND NARROW BRIDGES

TCP(2-7)-18

FILE: tcp2-7-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0831	01	019, ETC.	FM 939
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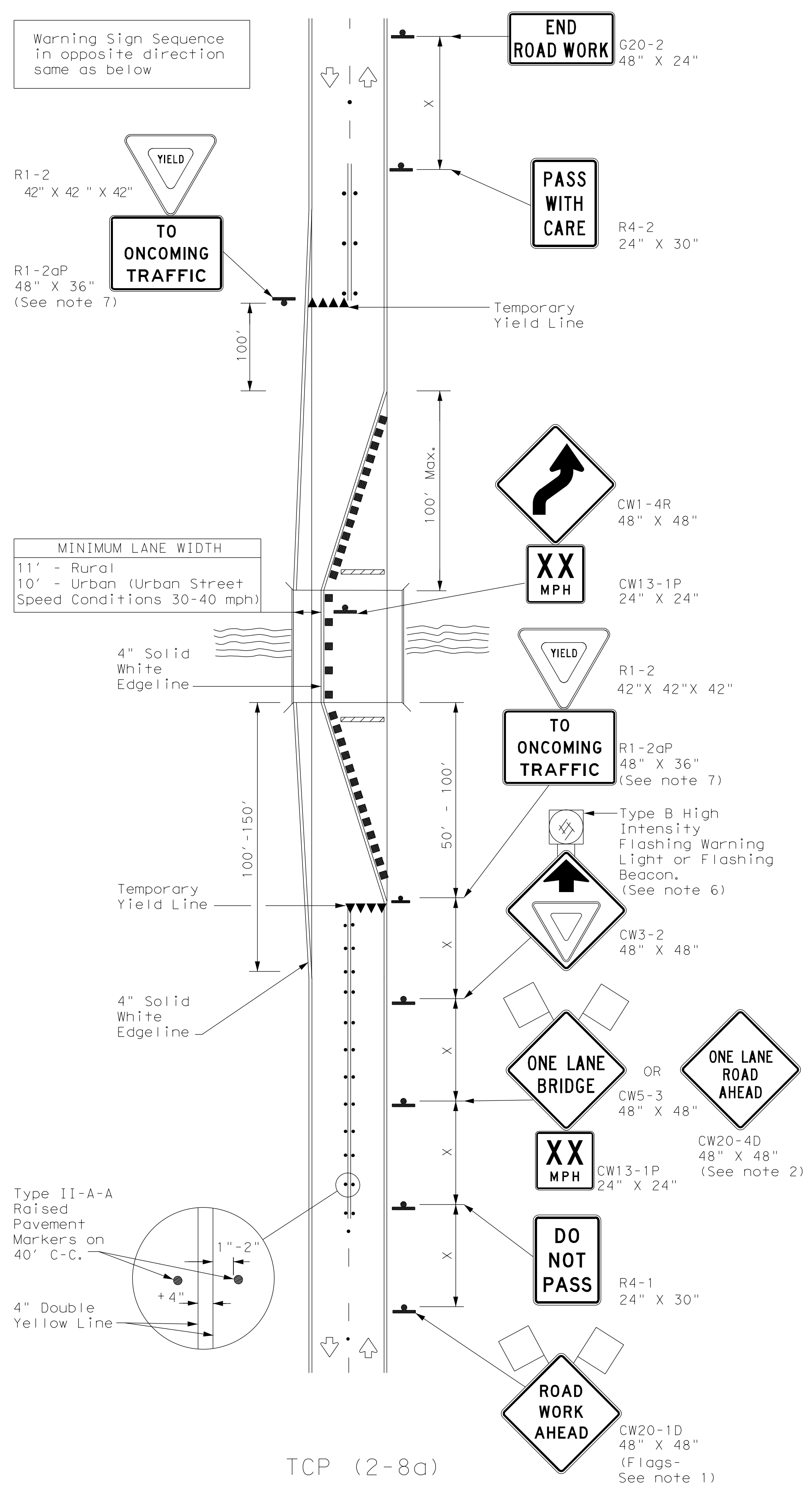
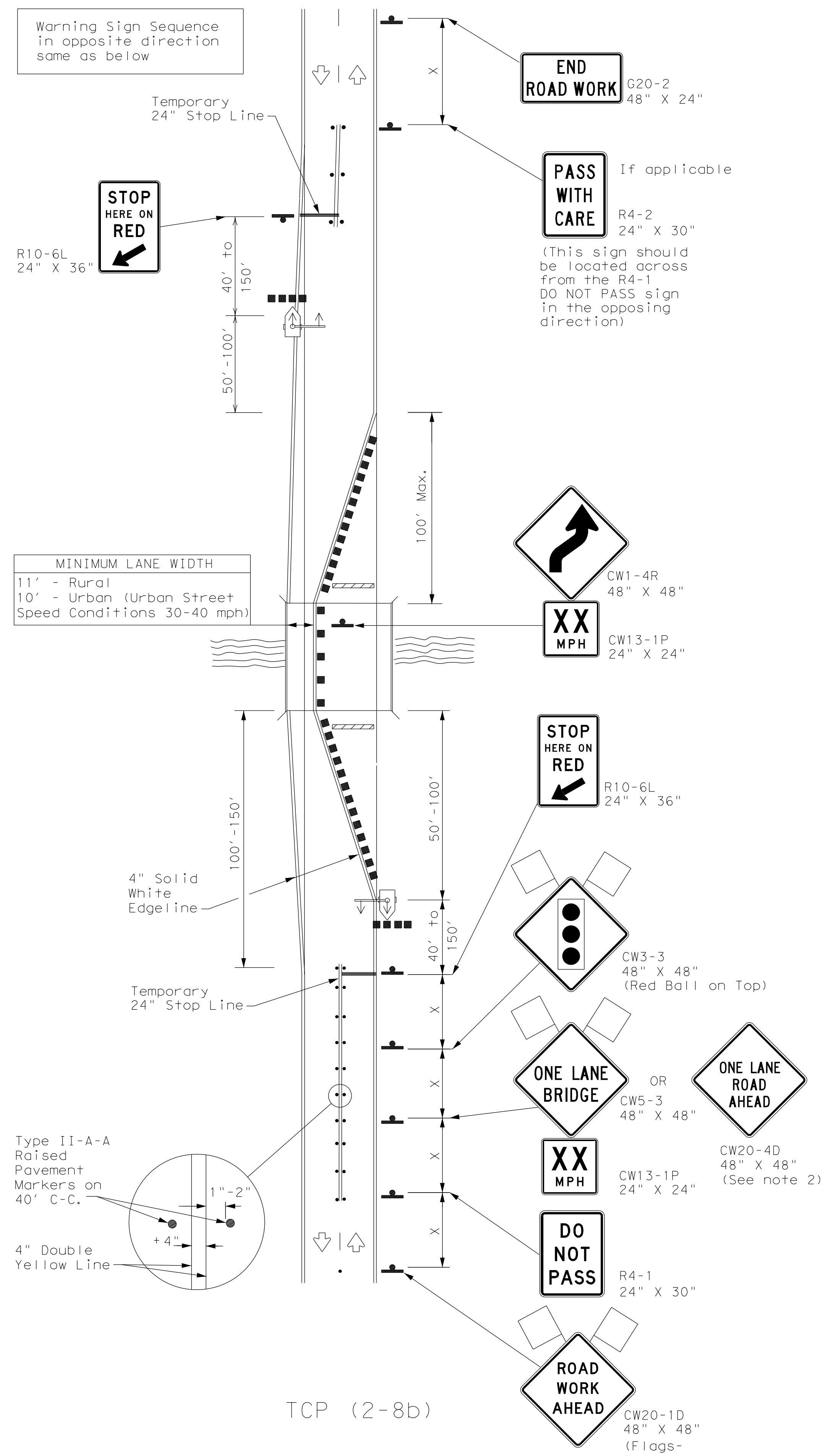


TCP (2-8a)

ONE LANE TWO-WAY

TRAFFIC CONTROL WITH YIELD SIGNS

(Less Than 2000 ADT-See Note 5)



TCP (2-8b)

ONE LANE TWO-WAY

TRAFFIC CONTROL WITH TRAFFIC SIGNAL

LEGEND

	Type 3 Barricade		Channelizing Devices
	Sign		Traffic Flow
	Flag		Flagger
	Raised Pavement Markers Ty II-AA		Temporary or Portable Traffic Signal

Posted Speed ⁎	Formula	Minimum Desirable Taper Lengths ⁎⁎			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	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. When this TCP is used at a location which does not involve a bridge, a 48" x 48" CW20-4D "ONE LANE ROAD AHEAD" signs should be used in lieu of the CW5-3 "ONE LANE BRIDGE" signs. The CW13-1P Advisory Speed Plaque is required with either warning sign.
3. Raised pavement markers shall be placed 40 feet c-c on centerline between DO NOT PASS signs and stop or yield lines.
4. For intermediate term situations, when it is not feasible to remove and restore pavement markings, the channelization must be made dominant by using a very close spacing. This is especially important in locations of conflicting information, such as where traffic is directed over a double yellow centerline. In such locations a maximum channelizing device spacing of 20 feet is recommended. The 20 foot channelizing device spacing recommendation is intended for the area of conflicting information and not the entire work zone.

TCP (2-8a)

5. Traffic control by CW3-2 "YIELD AHEAD" symbol signs for one lane two-way traffic control operations should be limited to work spaces less than 400 feet long and roadways with less than 2000 ADT. Otherwise, portable traffic signals should be used.
6. If power is available, a flashing beacon should be attached to the CW3-2 "YIELD AHEAD" symbol sign for emphasis.
7. The R1-2 "YIELD" and R1-2aP "TO ONCOMING TRAFFIC" signs and other regulatory signs shall be installed at 7 foot minimum mounting height.

TCP (2-8b)

8. A list of approved Portable Traffic Signals can be found in the "Compliant Work Zone Traffic Control Devices" list.
9. Portable traffic signals should be located to provide adequate stopping sight distance for approaching motorist (See table above).

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LONG TERM ONE-LANE TWO-WAY CONTROL

TCP(2-8)-18

FILE: tcp2-8-18.dgn	DN:	CK:	DW:	CK:
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REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		41

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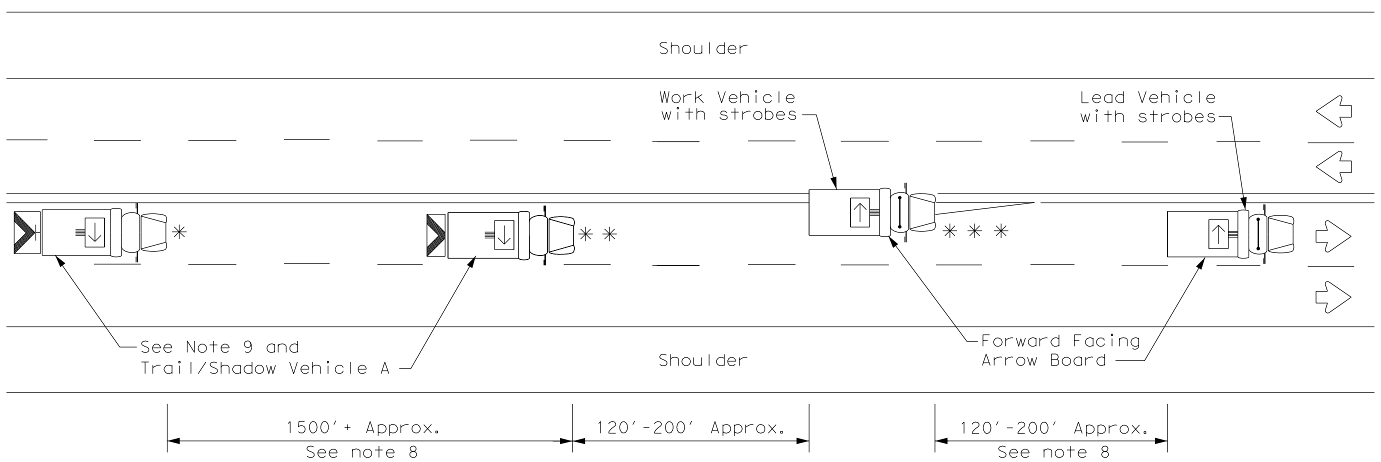
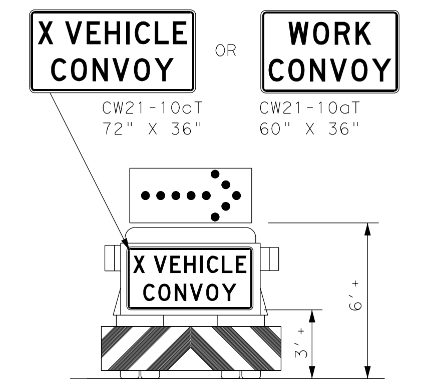


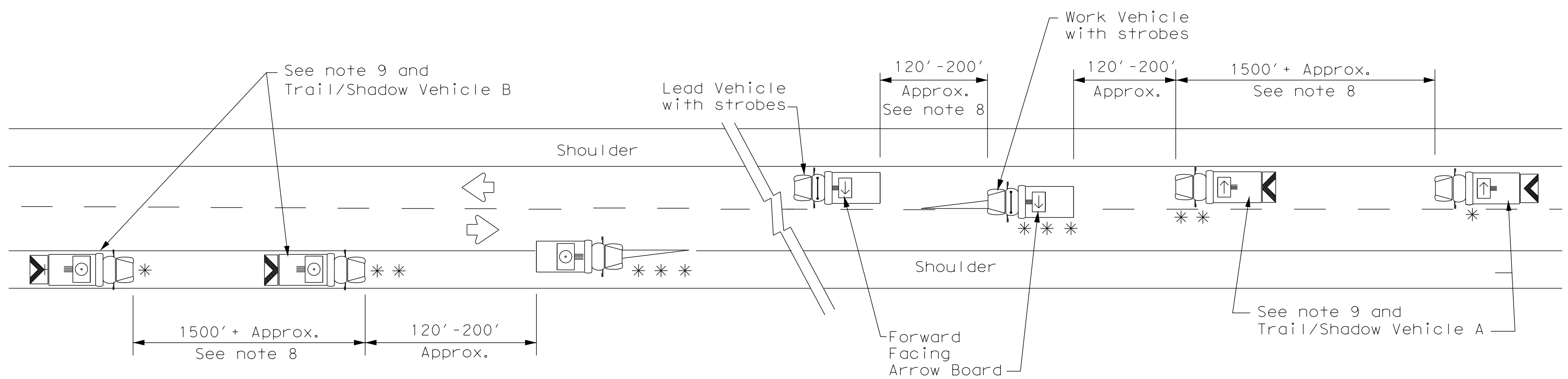
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

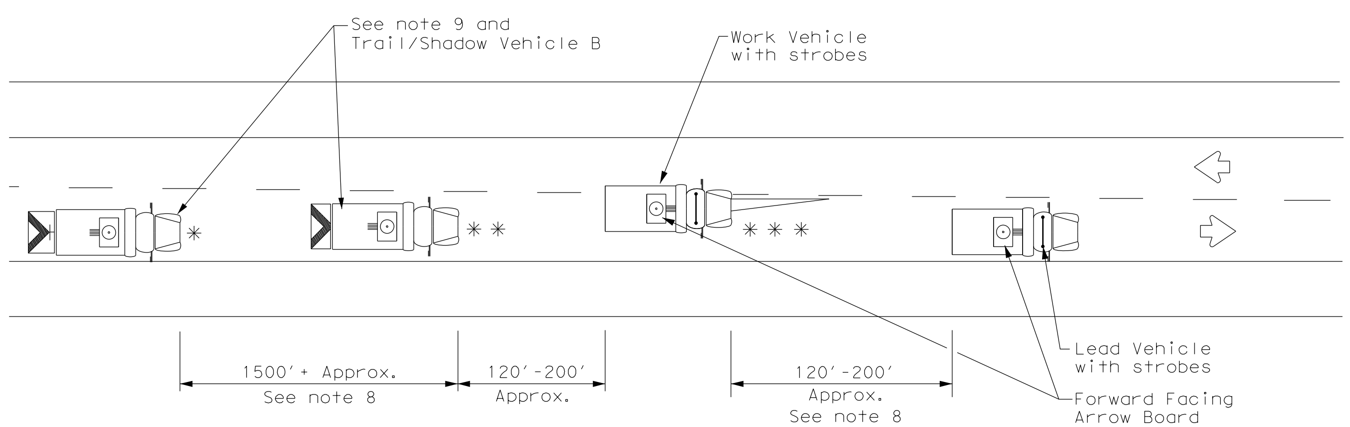


WORK ON SHOULDER

WORK ON TRAVEL LANE

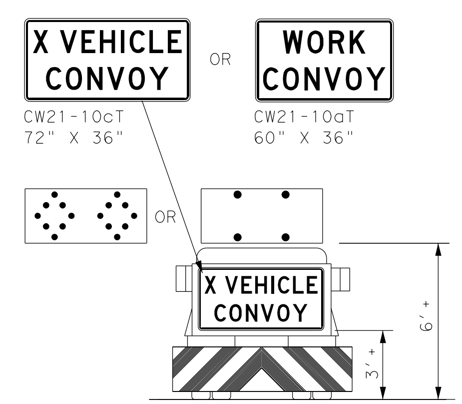
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display

LEGEND

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

TYPICAL USAGE

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

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.

2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.

3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.

4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.

5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.

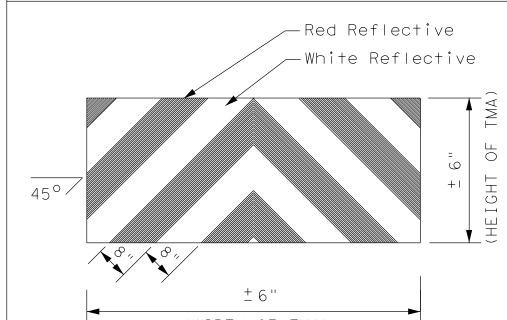
6. Each vehicle shall have two-way radio communication capability.

7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.

8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.

9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.

10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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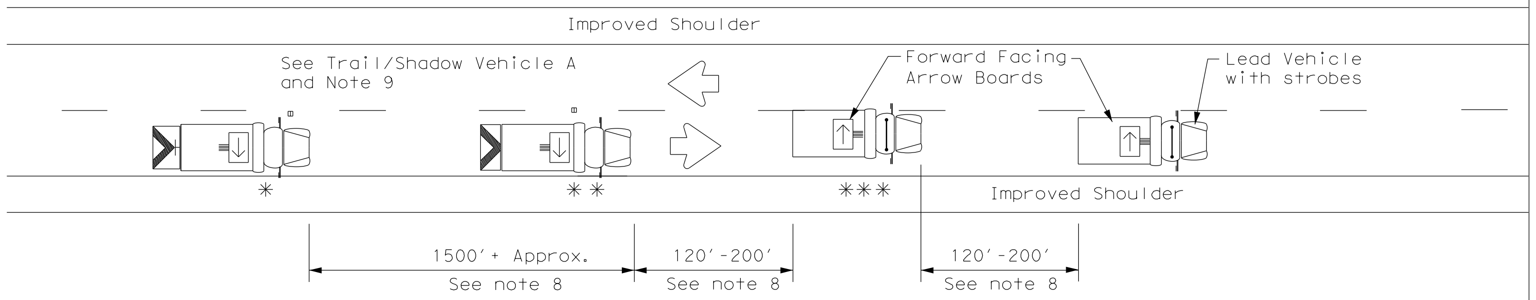
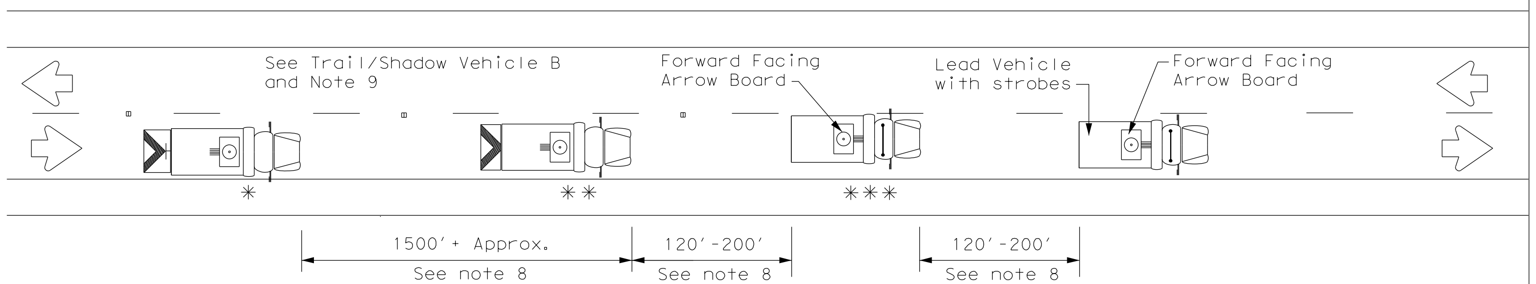


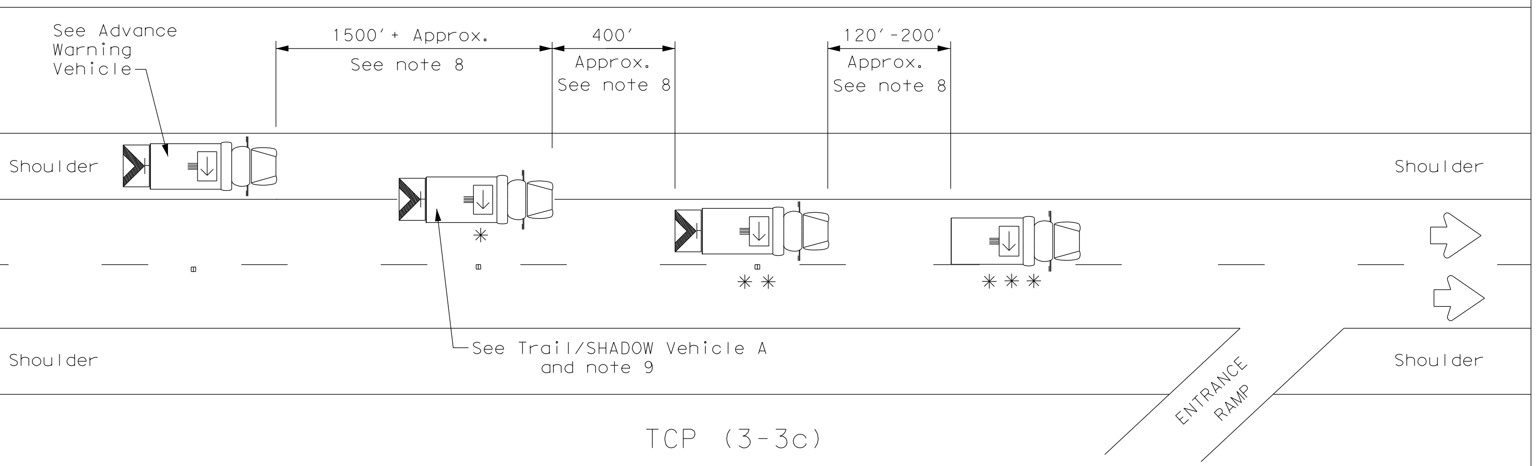
TCP (3-3a)

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



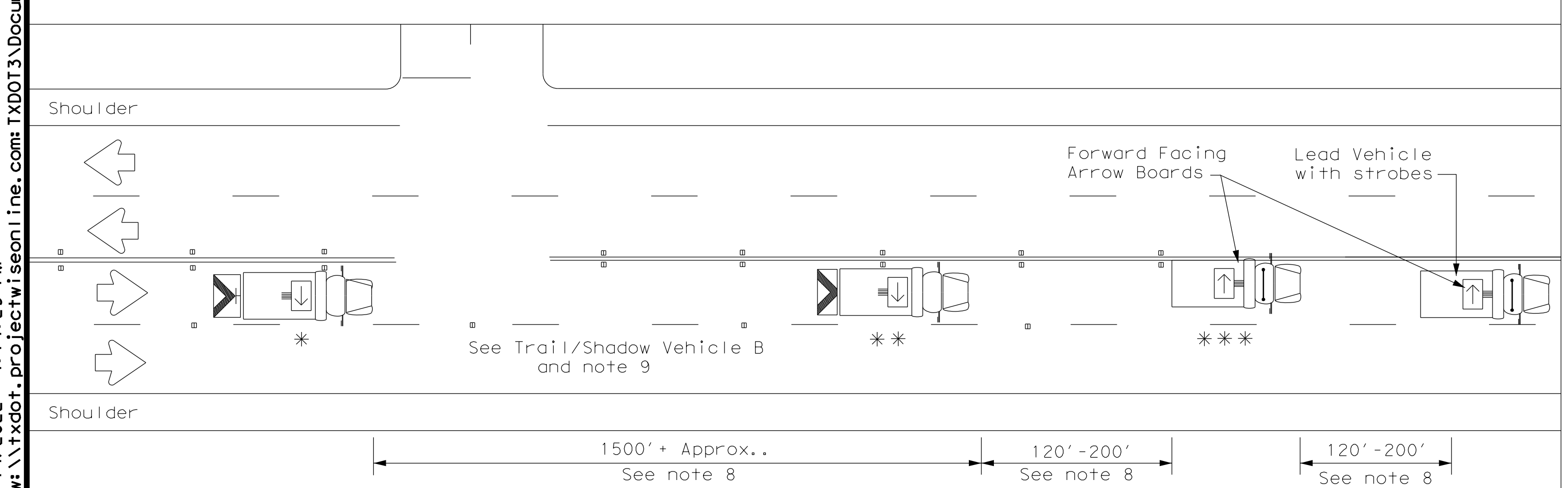
TCP (3-3b)

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



TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



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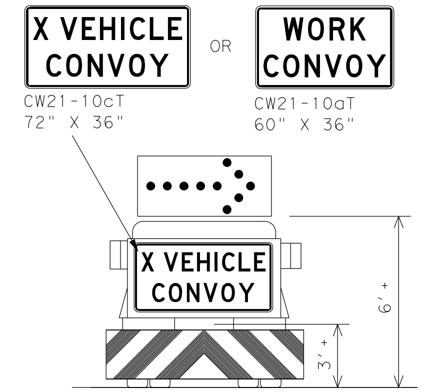
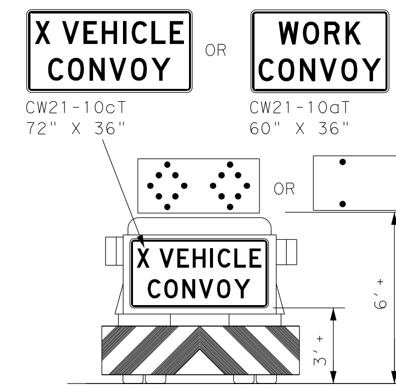


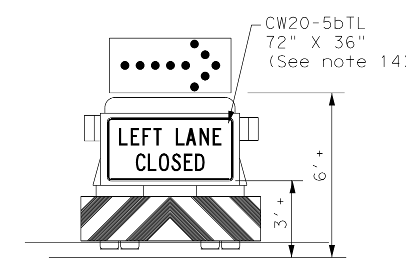
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

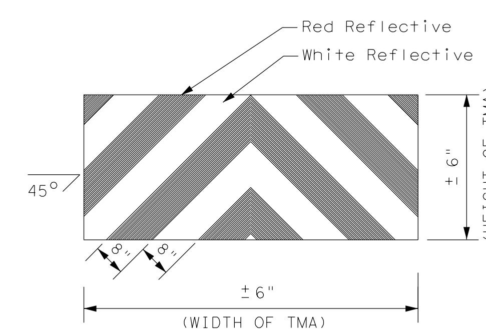


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING
VEHICLE



STRIPING FOR TMA

LEGEND

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 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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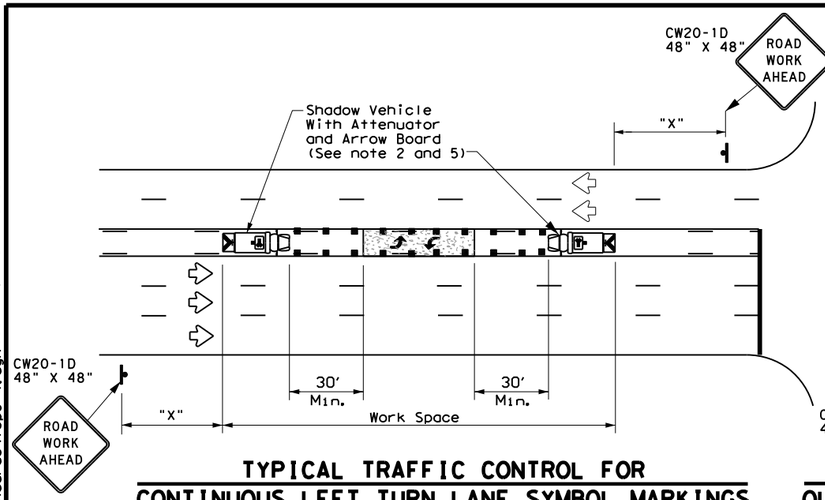
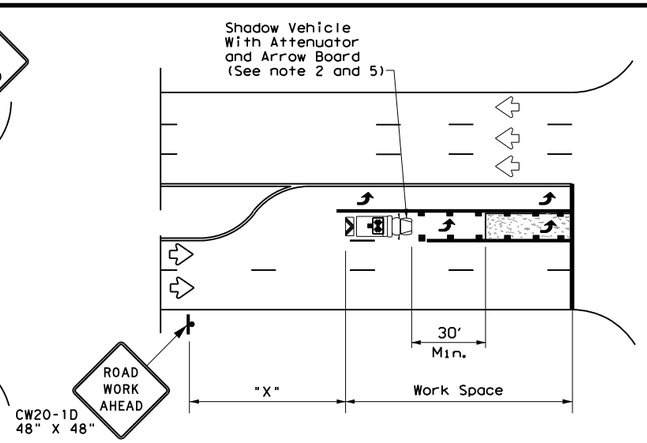
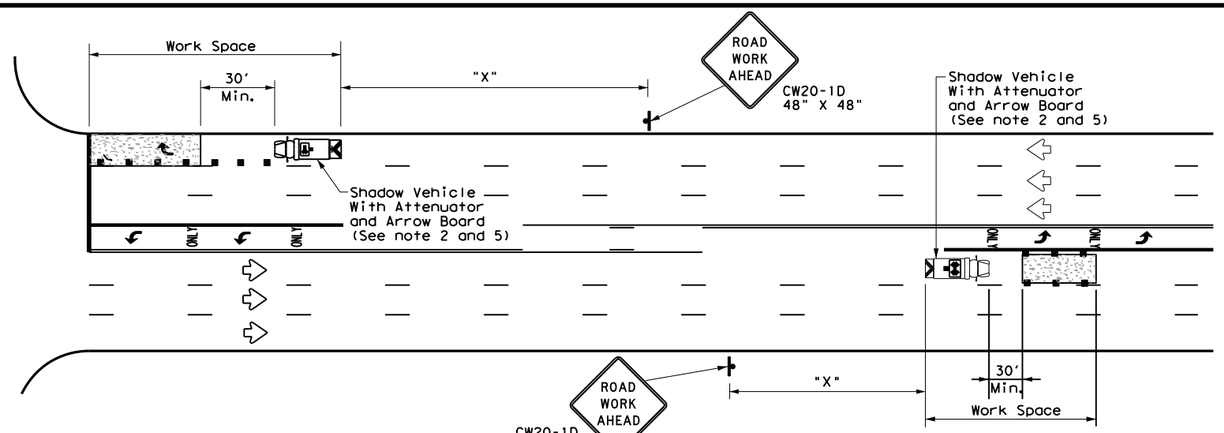


TYPICAL TRAFFIC CONTROL FOR CONTINUOUS LEFT TURN LANE SYMBOL MARKINGS

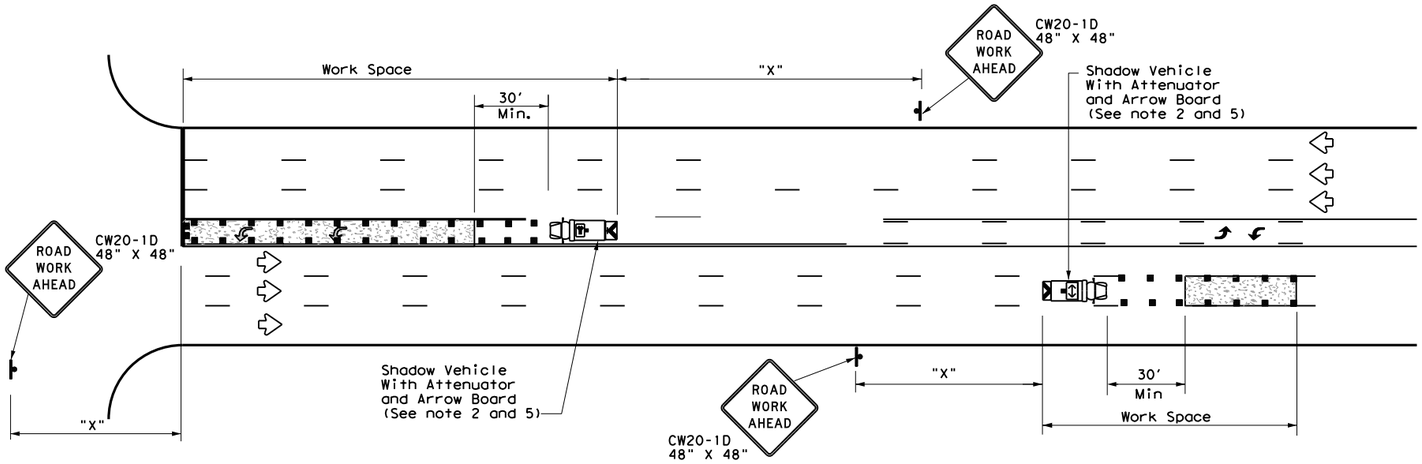


TYPICAL TRAFFIC CONTROL FOR OUTSIDE DUAL LEFT TURN LANE SYMBOL MARKINGS



TYPICAL TRAFFIC CONTROL FOR OUTSIDE LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR INSIDE LANE MARKINGS



TYPICAL TRAFFIC CONTROL FOR LEFT TURN LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR CENTER LANE MARKINGS

LEGEND

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

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

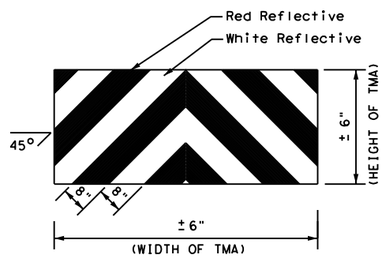
* Conventional Roads Only

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS FOR ISOLATED WORK AREAS UNDIVIDED HIGHWAYS

TCP(3-4)-13

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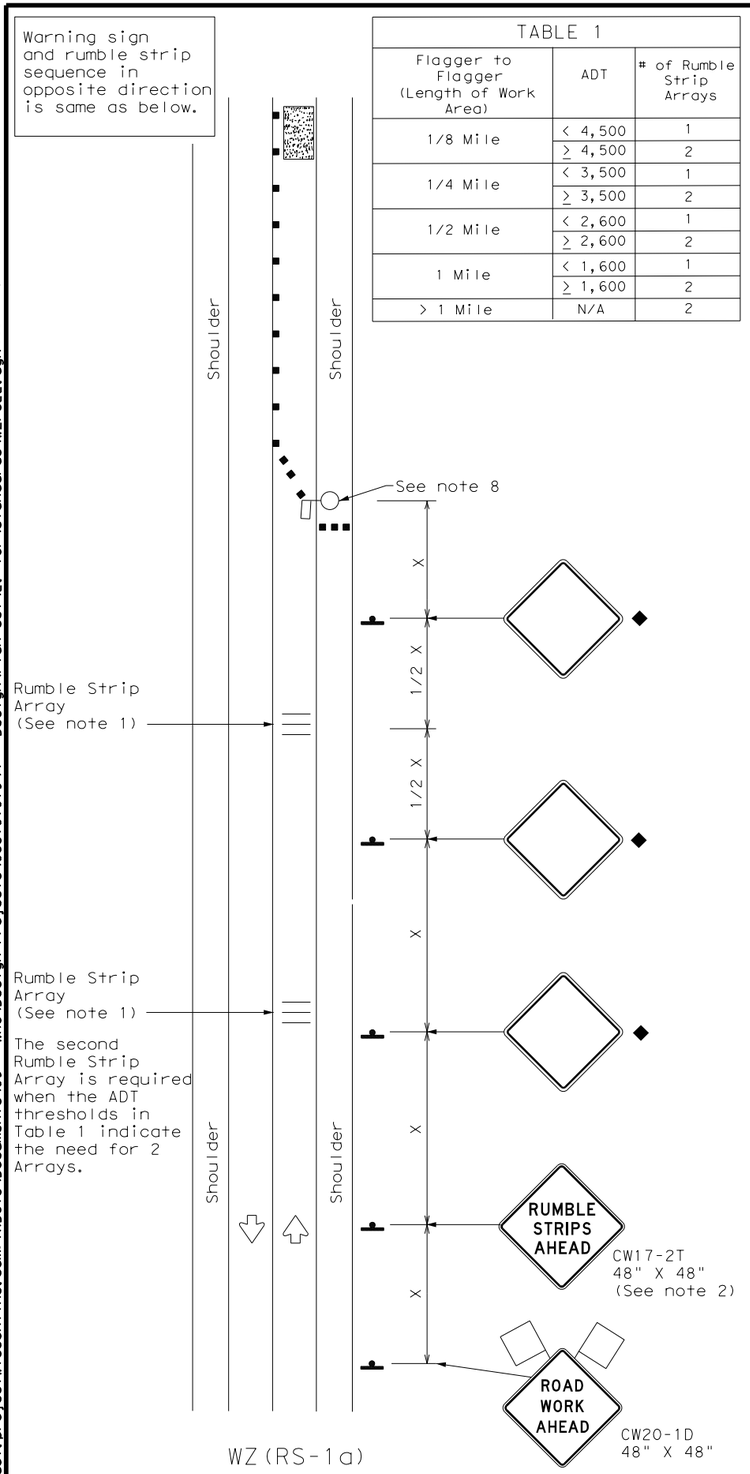
Warning sign and rumble strip sequence in opposite direction is same as below.

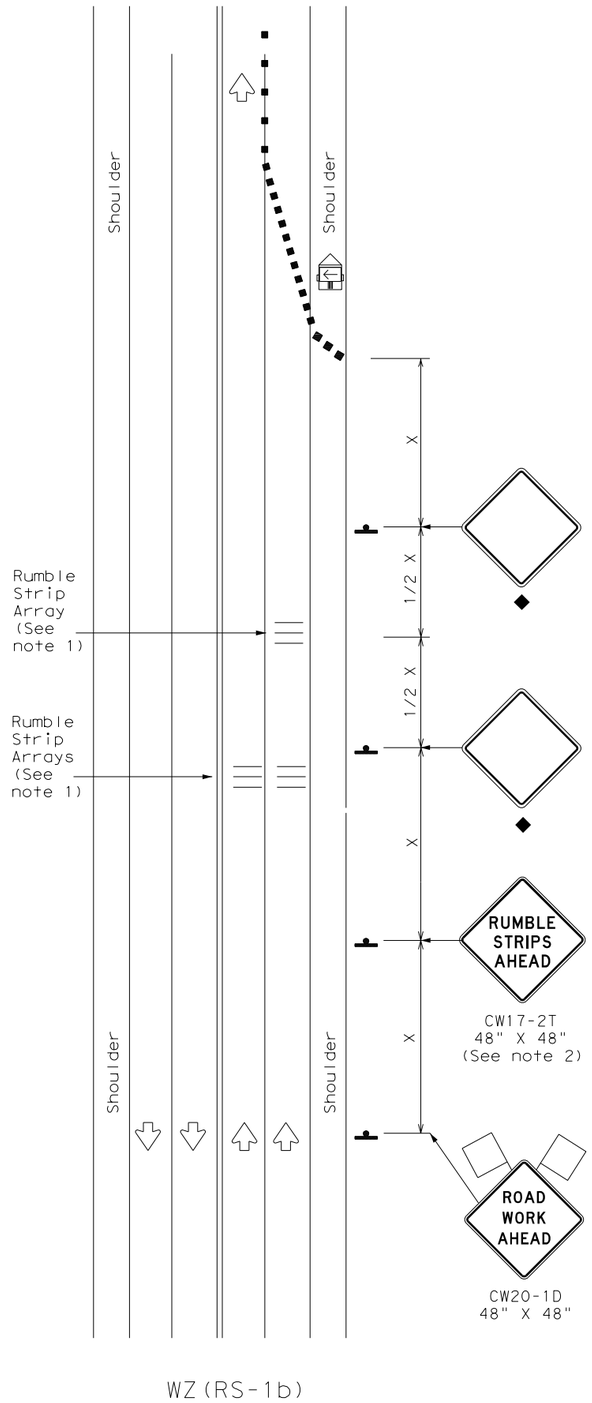
TABLE 1

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

LEGEND

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

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

* Conventional Roads Only

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

TYPICAL USAGE

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

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

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

TABLE 2

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

Texas Department of Transportation — Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

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117

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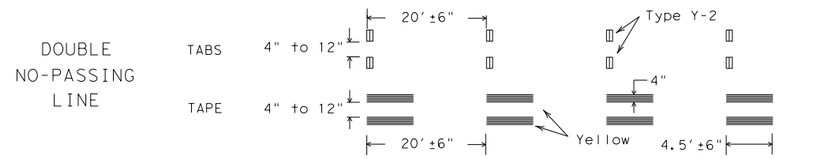
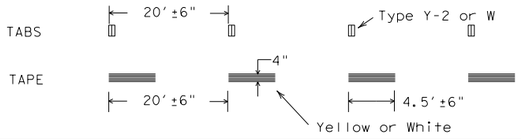
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

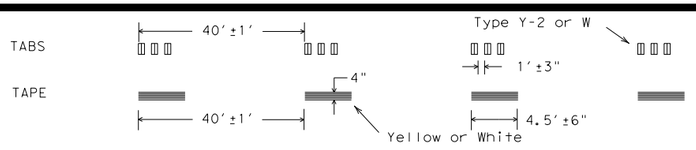


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



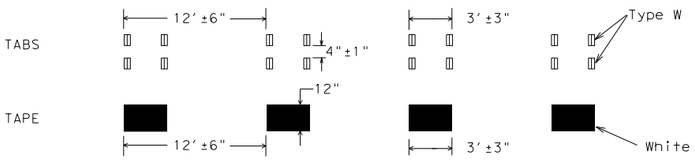
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

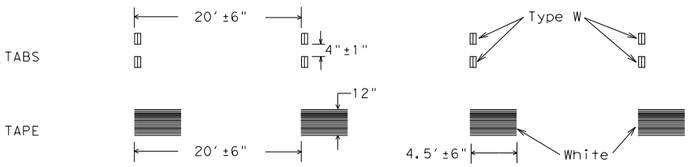


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



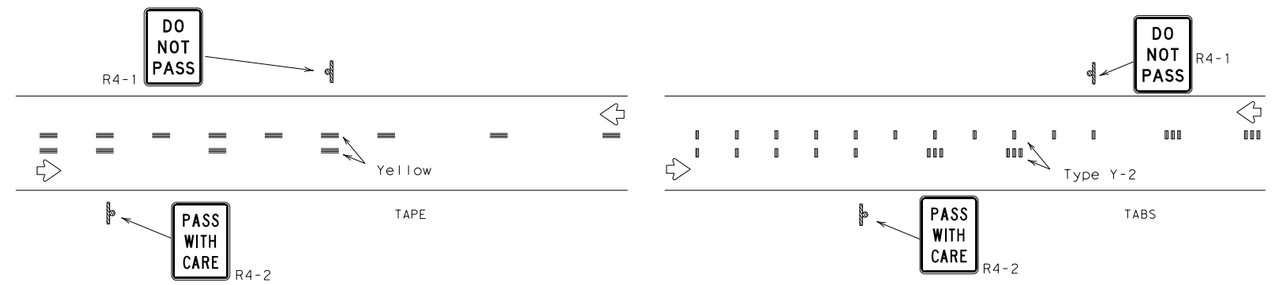
NOTES:

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

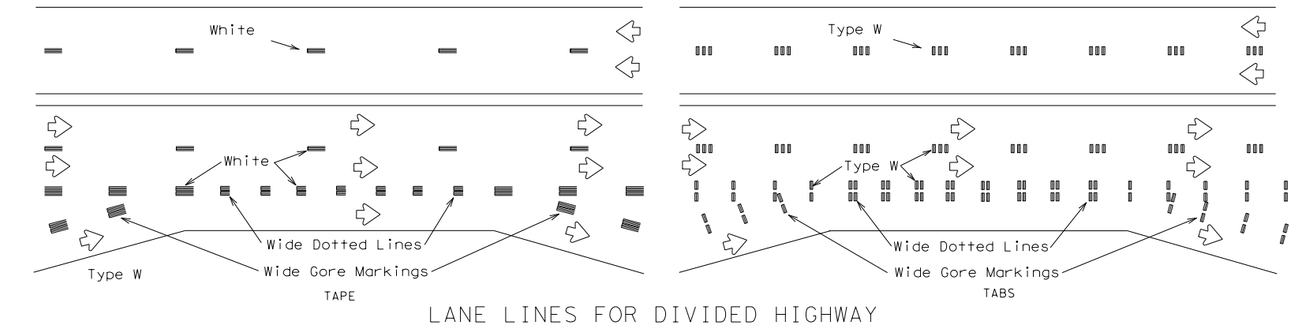
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

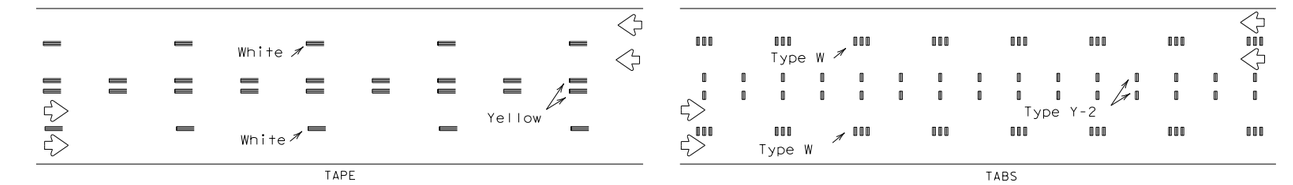
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



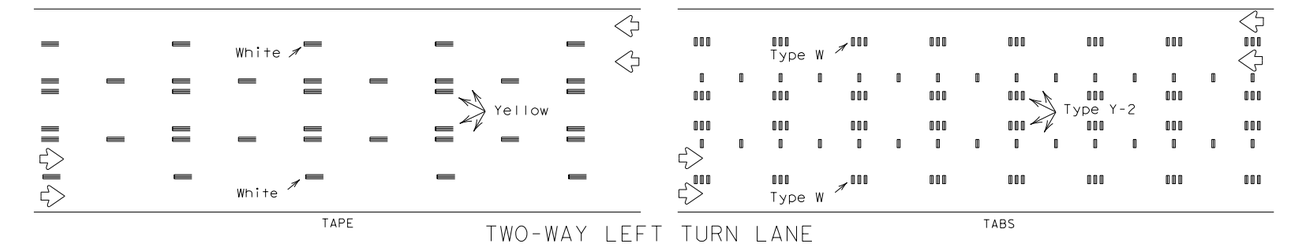
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



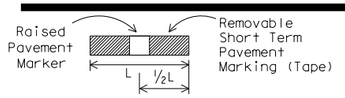
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

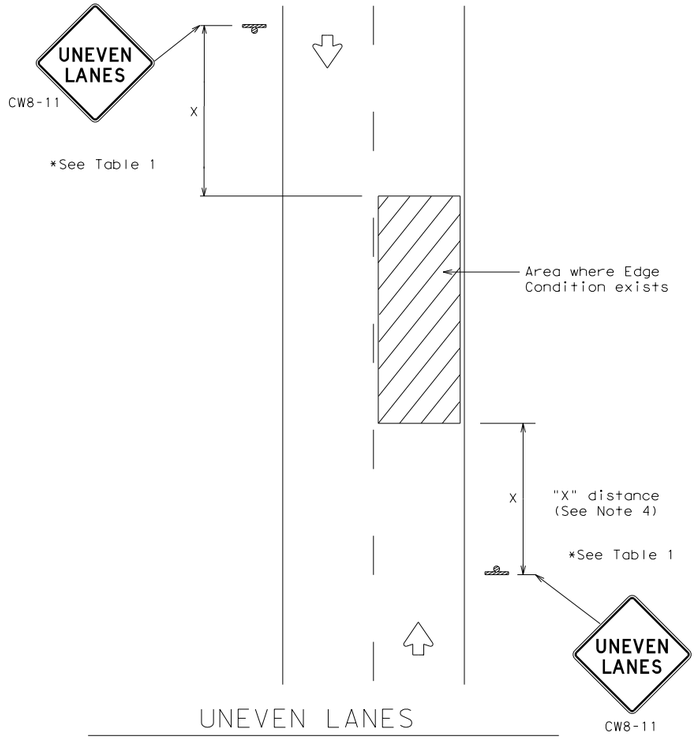
WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

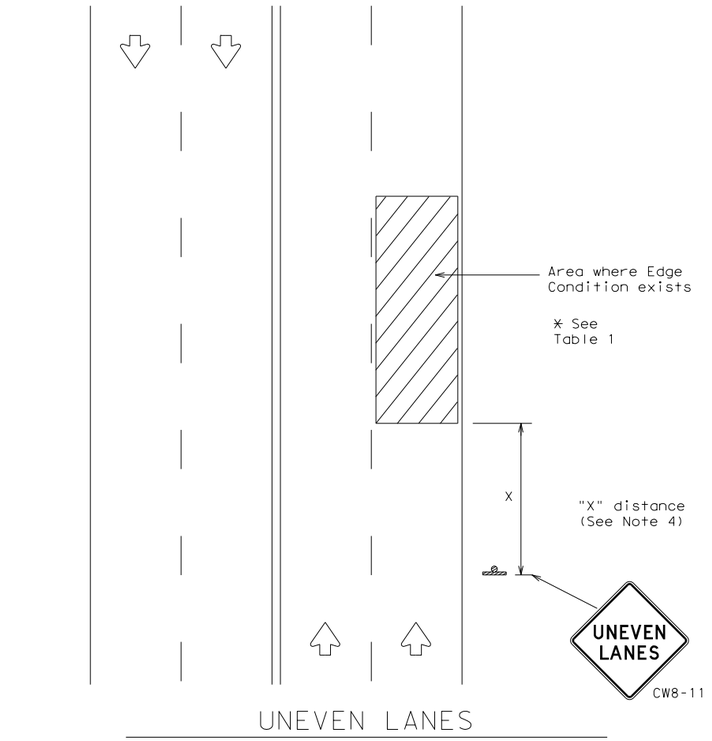
FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		0831	01	019, ETC.	FM 939
1-97		DIST	COUNTY		SHEET NO.
3-03		WAC	MCLENNAN		47
7-13					

111

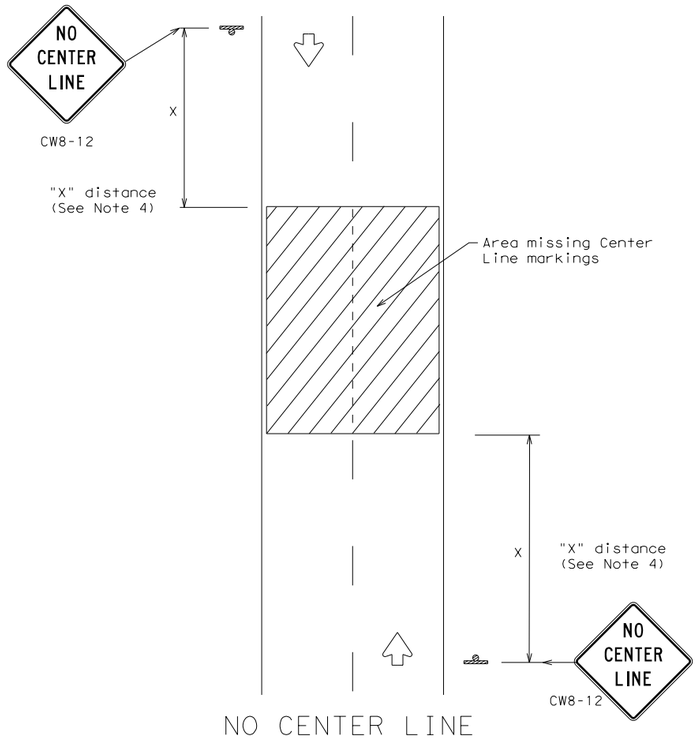
DATE: 4/15/2022 12:43:34 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\WZ(UL)-13 Signing for Uneven Lanes.dgn



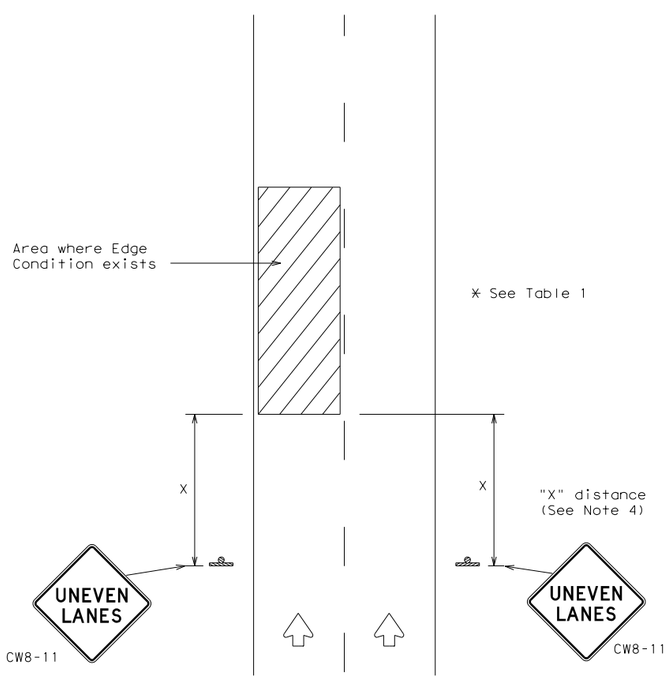
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

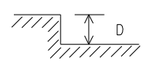
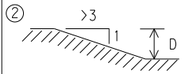
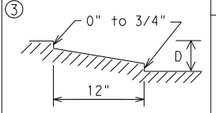
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

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

TABLE 1

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

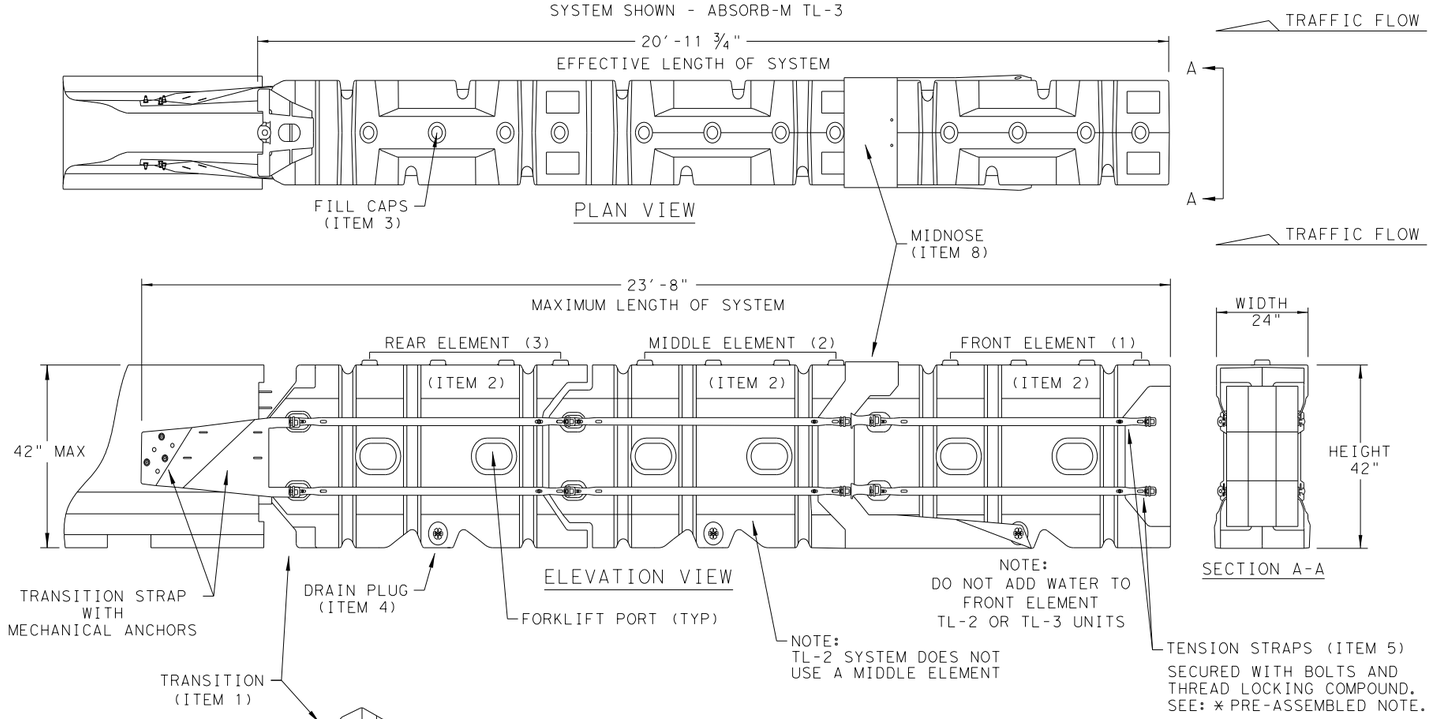
SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
8-95 2-98 7-13 1-97 3-03	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		48

DATE: 4/15/2022
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\083101019\4 - Design\Plan Set\2. TCP\Standards\absorbm19 (1).dgn

SYSTEM SHOWN - ABSORB-M TL-3



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

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

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

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

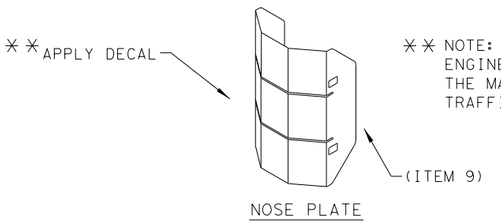
GENERAL NOTES

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

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

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE



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

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

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

SACRIFICIAL

Texas Department of Transportation — Design Division Standard

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

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		49

DATE: 4/15/2022
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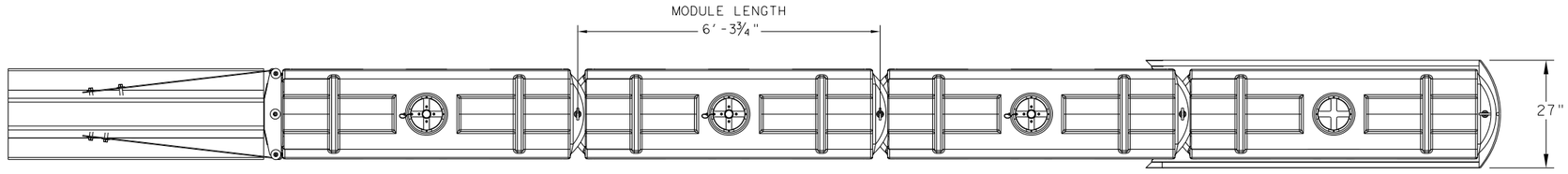
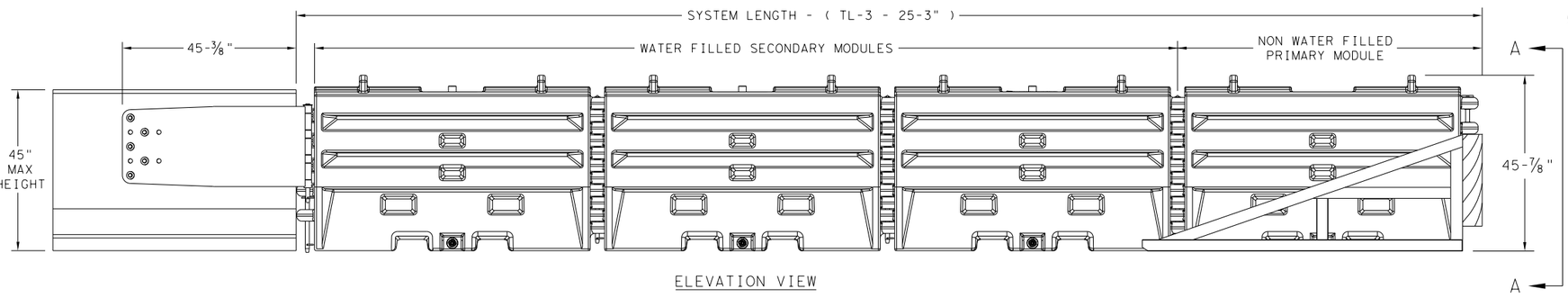


PLAN VIEW



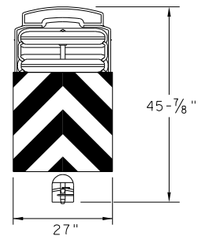
ELEVATION VIEW

GENERAL NOTES

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

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

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

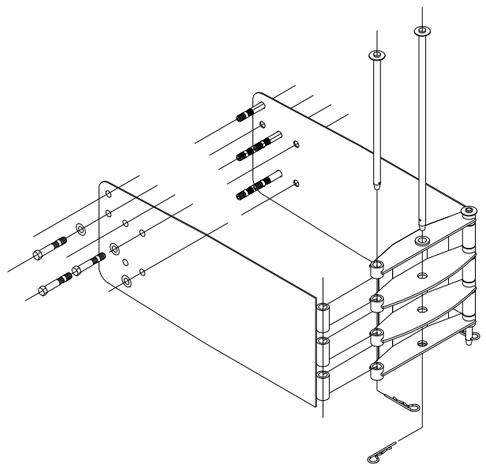


SECTION A-A

NOSE SHEETING PANEL DELINEATION

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

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



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

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

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

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

SACRIFICIAL

Texas Department of Transportation

Design Division Standard

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

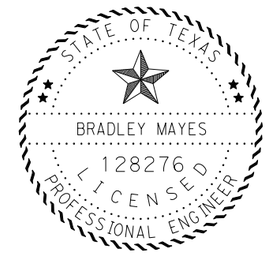
FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
©TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		50

Alignment Name: FM939HA
Alignment Description:
Alignment Style: Geom_Centerline

		Station	Northing	Easting
			Element: Linear	
POB	( )	501+00.0000 R1	10560964.4810	3378739.3419
PI	( )	520+14.0533 R1	10559340.0649	3379751.7018
			Tangential Direction:	S 31.93 E
			Tangential Length:	1914.0533
			Element: Linear	
PI	( )	520+14.0533 R1	10559340.0649	3379751.7018
PI	( )	587+31.9233 R1	10553654.2161	3383329.5363
			Tangential Direction:	S 32.18 E
			Tangential Length:	6717.8700
			Element: Linear	
PI	( )	587+31.9233 R1	10553654.2161	3383329.5363
PC	( )	610+57.6545 R1	10551687.6419	3384571.1529
			Tangential Direction:	S 32.27 E
			Tangential Length:	2325.7312
			Element: Circular	
PC	( )	610+57.6545 R1	10551687.6419	3384571.1529
PI	( )	611+87.4137 R1	10551577.9211	3384640.4262
		CC ( )	10547446.4504	3389415.9446
PT	( )	613+17.1286 R1	10551471.4488	3384714.5958
			Radius:	5729.6000
			Delta: 2.59	Left
			Degree of Curvature (Arc):	1.00
			Length:	259.4741
			Tangent:	129.7592
			Chord:	259.4519
			Middle Ordinate:	1.4688
			External:	1.4692
			Tangent Direction:	S 32.27 E
			Radial Direction:	S 57.73 W
			Chord Direction:	S 33.56 E
			Radial Direction:	S 55.14 W
			Tangent Direction:	S 34.86 E
			Element: Linear	
PT	( )	613+17.1286 R1	10551471.4488	3384714.5958
PC	( )	624+84.8731 R1	10550513.2713	3385382.0708
			Tangential Direction:	S 34.86 E
			Tangential Length:	1167.7445
			Element: Circular	
PC	( )	624+84.8731 R1	10550513.2713	3385382.0708
PI	( )	626+09.4446 R1	10550411.0557	3385453.2751
		CC ( )	10547238.2697	3380680.7219
PT	( )	627+33.9769 R1	10550305.8420	3385519.9695
			Radius:	5729.6000
			Delta: 2.49	Right
			Degree of Curvature (Arc):	1.00
			Length:	249.1038
			Tangent:	124.5715
			Chord:	249.0842
			Middle Ordinate:	1.3537
			External:	1.3540
			Tangent Direction:	S 34.86 E
			Radial Direction:	S 55.14 W
			Chord Direction:	S 33.62 E
			Radial Direction:	S 57.63 W
			Tangent Direction:	S 32.37 E
			Element: Linear	
PT	( )	627+33.9769 R1	10550305.8420	3385519.9695
PC	( )	633+23.4305 R1	10549807.9867	3385835.5572
			Tangential Direction:	S 32.37 E
			Tangential Length:	589.4535
			Element: Circular	
PC	( )	633+23.4305 R1	10549807.9867	3385835.5572
PI	( )	637+47.9642 R1	10549449.4235	3386062.8484
		CC ( )	10547041.0937	3384625.7453
PT	( )	641+48.8703 R1	10549024.9169	3386058.0539
			Radius:	1432.4000
			Delta: 33.02	Right
			Degree of Curvature (Arc):	4.00
			Length:	825.4399
			Tangent:	424.5337
			Chord:	814.0659
			Middle Ordinate:	59.0486
			External:	61.5875
			Tangent Direction:	S 32.37 E
			Radial Direction:	S 57.63 W
			Chord Direction:	S 15.86 E
			Radial Direction:	N 89.35 W
			Tangent Direction:	S 0.65 W
			Element: Linear	
PT	( )	641+48.8703 R1	10549024.9169	3386058.0539
PC	( )	679+19.2730 R1	10545254.7546	3386015.4729
			Tangential Direction:	S 0.65 W
			Tangential Length:	3770.4027
			Element: Circular	
PC	( )	679+19.2730 R1	10545254.7546	3386015.4729
PI	( )	683+45.0086 R1	10544829.0462	3386010.6649
		CC ( )	10545238.5778	3387447.7816
PT	( )	687+46.9220 R1	10544469.8198	3386239.1539
			Radius:	1432.4000
			Delta: 33.11	Left
			Degree of Curvature (Arc):	4.00
			Length:	827.6490
			Tangent:	425.7356
			Chord:	816.1837
			Middle Ordinate:	59.3629
			External:	61.9295
			Tangent Direction:	S 0.65 W
			Radial Direction:	N 89.35 W
			Chord Direction:	S 15.91 E
			Radial Direction:	S 57.54 W
			Tangent Direction:	S 32.46 E
			Element: Linear	
PT	( )	687+46.9220 R1	10544469.8198	3386239.1539
POE	( )	703+24.7282 R1	10543138.5016	3387085.9502
			Tangential Direction:	S 32.46 E
			Tangential Length:	1577.8061

Vertical Alignment: FM939VA
Vertical Description:
Vertical Style: Geom_Centerline

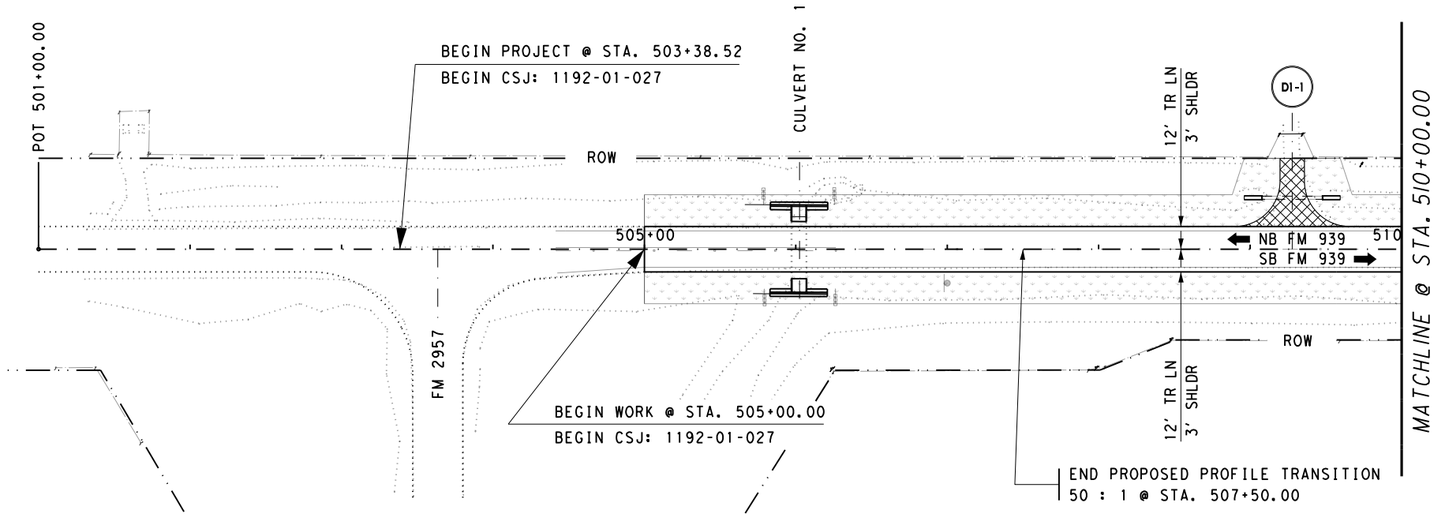
	Station	Elevation
	Element: Linear	
POB	501+27.8824 R1	560.8202
PVC	501+98.3003 R1	560.2774
	Tangent Grade:	-0.7708%
	Tangent Length:	70.4178
	Element: Symmetrical Parabola	
PVC	501+98.3003 R1	560.2774
PVI	504+48.3003 R1	558.3504
PVT	504+98.3003 R1	559.7636
VLOW	504+86.7616 R1	559.1657
	Length:	500.0000
	Entrance Grade:	-0.7708%
	Exit Grade:	0.5653%
	r = (g2 - g1) / L:	0.2672
	K = l / (g2 - g1):	374.2379
	Middle Ordinate:	0.8350
	Element: Linear	
PVT	506+98.3003 R1	559.7636
PVI	514+84.9300 R1	564.2100
	Tangent Grade:	0.5653%
	Tangent Length:	786.6297
	Element: Linear	
PVI	514+84.9300 R1	564.2100
PVC	517+09.9300 R1	567.5486
	Tangent Grade:	1.4838%
	Tangent Length:	225.0000
	Element: Symmetrical Parabola	
PVC	517+09.9300 R1	567.5486
PVI	520+09.9300 R1	572.0000
PVT	523+09.9300 R1	569.3158
VHIGH	520+84.2282 R1	570.3255
	Length:	600.0000
	Entrance Grade:	1.4838%
	Exit Grade:	-0.8947%
	r = (g2 - g1) / L:	-0.3964
	K = l / (g2 - g1):	252.2549
	Middle Ordinate:	-1.7839
	Element: Linear	
PVT	523+09.9300 R1	569.3158
PVC	528+09.9300 R1	564.8421
	Tangent Grade:	-0.8947%
	Tangent Length:	500.0000
	Element: Symmetrical Parabola	
PVC	528+09.9300 R1	564.8421
PVI	529+59.9300 R1	563.5000
PVT	531+09.9300 R1	564.9211
VLOW	529+55.6443 R1	564.1902
	Length:	300.0000
	Entrance Grade:	-0.8947%
	Exit Grade:	0.9474%
	r = (g2 - g1) / L:	0.6140
	K = l / (g2 - g1):	162.8571
	Middle Ordinate:	0.6908
	Element: Linear	
PVT	531+09.9300 R1	564.9211
PVC	533+36.1978 R1	567.0646
	Tangent Grade:	0.9474%
	Tangent Length:	226.2678
	Element: Symmetrical Parabola	
PVC	533+36.1978 R1	567.0646
PVI	534+36.1978 R1	568.0120
PVT	535+36.1978 R1	567.7865
VHIGH	534+97.7414 R1	567.8298
	Length:	200.0000
	Entrance Grade:	0.9474%
	Exit Grade:	-0.2255%
	r = (g2 - g1) / L:	-0.5864
	K = l / (g2 - g1):	170.5182
	Middle Ordinate:	-0.2932
	Element: Linear	
PVT	535+36.1978 R1	567.7865
PVC	537+84.9300 R1	567.2255
	Tangent Grade:	-0.2255%
	Tangent Length:	248.7322
	Element: Symmetrical Parabola	
PVC	537+84.9300 R1	567.2255
PVI	538+84.9300 R1	567.0000
PVT	539+84.9300 R1	565.9091
	Length:	200.0000
	Entrance Grade:	-0.2255%
	Exit Grade:	-1.0909%
	r = (g2 - g1) / L:	-0.4327
	K = l / (g2 - g1):	231.1117
	Middle Ordinate:	-0.2163
	Element: Linear	
PVT	539+84.9300 R1	565.9091
PVI	541+59.9300 R1	564.0000
	Tangent Grade:	-1.0909%
	Tangent Length:	175.0000
	Element: Linear	
PVI	541+59.9300 R1	564.0000
PVI	548+84.9300 R1	553.0000
	Tangent Grade:	-1.5172%
	Tangent Length:	725.0000
	Element: Linear	
PVI	548+84.9300 R1	553.0000
PVC	553+09.9300 R1	545.5200
	Tangent Grade:	-1.7600%
	Tangent Length:	425.0000
	Element: Symmetrical Parabola	
PVC	553+09.9300 R1	545.5200
PVI	555+09.9300 R1	542.0000
PVT	557+09.9300 R1	542.3789
VLOW	556+71.0531 R1	542.3421
	Length:	400.0000
	Entrance Grade:	-1.7600%
	Exit Grade:	0.1895%
	r = (g2 - g1) / L:	0.4874
	K = l / (g2 - g1):	205.1836
	Middle Ordinate:	0.9747
	Element: Linear	
PVT	557+09.9300 R1	542.3789
PVC	559+09.9300 R1	542.7579
	Tangent Grade:	0.1895%
	Tangent Length:	200.0000
	Element: Symmetrical Parabola	
PVC	559+09.9300 R1	542.7579
PVI	559+66.0341 R1	542.8642
PVRC	560+22.1383 R1	543.4743
	Length:	112.2083
	Entrance Grade:	0.1895%
	Exit Grade:	1.0875%
	r = (g2 - g1) / L:	0.8004
	K = l / (g2 - g1):	124.9452
	Middle Ordinate:	0.1260
	Element: Symmetrical Parabola	
PVRC	560+22.1383 R1	543.4743
PVI	560+97.1384 R1	544.2900
PVT	561+72.1385 R1	544.2900
VHIGH	561+72.1385 R1	544.2900
	Length:	150.0002
	Entrance Grade:	1.0875%
	Exit Grade:	0.0000%
	r = (g2 - g1) / L:	-0.7250
	K = l / (g2 - g1):	137.9270
	Middle Ordinate:	-0.2039
	Element: Linear	
PVT	561+72.1385 R1	544.2900
PVC	564+09.9300 R1	544.2900
	Tangent Grade:	0.0000%
	Tangent Length:	237.7915
	Element: Symmetrical Parabola	
PVC	564+09.9300 R1	544.2900
PVI	564+84.9300 R1	544.2900
PVT	565+59.9300 R1	543.6450
	Length:	150.0000
	Entrance Grade:	0.0000%
	Exit Grade:	-0.8600%
	r = (g2 - g1) / L:	-0.5733
	K = l / (g2 - g1):	174.4186
	Middle Ordinate:	-0.1613
	Element: Linear	
PVT	565+59.9300 R1	543.6450
PVC	565+84.9300 R1	543.4300
	Tangent Grade:	-0.8600%
	Tangent Length:	25.0000
	Element: Symmetrical Parabola	
PVC	565+84.9300 R1	543.4300
PVI	566+34.9300 R1	543.0000
PVT	566+84.9300 R1	542.8782
	Length:	100.0000
	Entrance Grade:	-0.8600%
	Exit Grade:	-0.2436%
	r = (g2 - g1) / L:	0.6164
	K = l / (g2 - g1):	162.2419
	Middle Ordinate:	0.0770
	Element: Linear	
PVT	566+84.9300 R1	542.8782
PVI	582+84.9300 R1	538.9800
	Tangent Grade:	-0.2436%
	Tangent Length:	1600.0000
	Element: Linear	
PVI	582+84.9300 R1	538.9800
PVI	584+84.9300 R1	538.9800
	Tangent Grade:	0.0000%
	Tangent Length:	200.0000
	Element: Linear	
PVI	584+84.9300 R1	538.9800
PVI	587+84.9300 R1	538.1300
	Tangent Grade:	-0.2833%
	Tangent Length:	300.0000
	Element: Linear	
PVI	587+84.9300 R1	538.1300
PVC	593+84.9300 R1	537.4871
	Tangent Grade:	-0.1071%
	Tangent Length:	600.0000
	Element: Symmetrical Parabola	
PVC	593+84.9300 R1	537.4871
PVI	594+84.9300 R1	537.3800
PVT	595+84.9300 R1	537.7040
VLOW	594+34.6318 R1	537.4605
	Length:	200.0000
	Entrance Grade:	-0.1071%
	Exit Grade:	0.3240%
	r = (g2 - g1) / L:	0.2156
	K = l / (g2 - g1):	463.8834
	Middle Ordinate:	0.1078
	Element: Linear	
PVT	595+84.9300 R1	537.7040
PVC	598+84.9300 R1	538.6760
	Tangent Grade:	0.3240%
	Tangent Length:	300.0000
	Element: Symmetrical Parabola	
PVC	598+84.9300 R1	538.6760
PVI	599+84.9300 R1	539.0000
PVT	600+84.9300 R1	540.8571
	Length:	200.0000
	Entrance Grade:	0.3240%
	Exit Grade:	1.8571%
	r = (g2 - g1) / L:	0.7666
	K = l / (g2 - g1):	130.4510
	Middle Ordinate:	0.3833
	Element: Linear	
PVT	600+84.9300 R1	540.8571
PVI	603+34.9300 R1	545.5000
	Tangent Grade:	1.8571%
	Tangent Length:	250.0000
	Element: Linear	
PVI	603+34.9300 R1	545.5000
PVC	606+34.9300 R1	553.4091
	Tangent Grade:	2.6364%
	Tangent Length:	300.0000
	Element: Symmetrical Parabola	
PVC	606+34.9300 R1	553.4091
PVI	608+84.9300 R1	560.0000
PVT	611+34.9300 R1	559.0000
VHIGH	610+69.0617 R1	559.1317
	Length:	500.0000
	Entrance Grade:	2.6364%
	Exit Grade:	-0.4000%
	r = (g2 - g1) / L:	-0.6073
	K = l / (g2 - g1):	164.6707
	Middle Ordinate:	-1.8977
	Element: Linear	
PVT	611+34.9300 R1	559.0000
PVC	612+84.9300 R1	558.4000
	Tangent Grade:	-0.4000%
	Tangent Length:	150.0000
	Element: Symmetrical Parabola	
PVC	612+84.9300 R1	558.4000
PVI	613+84.9300 R1	558.0000
PVT	614+84.9300 R1	558.0000
	Length:	200.0000
	Entrance Grade:	-0.4000%
	Exit Grade:	0.0000%
	r = (g2 - g1) / L:	0.2000
	K = l / (g2 - g1):	500.0000
	Middle Ordinate:	0.1000
	Element: Linear	
PVT	614+84.9300 R1	558.0000
PVC	616+34.9300 R1	558.0000
	Tangent Grade:	0.0000%
	Tangent Length:	150.0000
	Element: Symmetrical Parabola	
PVC	616+34.9300 R1	558.0000
PVI	617+34.9300 R1	558.0000
PVT	618+34.9300 R1	558.3077
	Length:	200.0000
	Entrance Grade:	0.0000%
	Exit Grade:	0.3077%
	r = (g2 - g1) / L:	0.1538
	K = l / (g2 - g1):	650.0000
	Middle Ordinate:	0.0769
	Element: Linear	
PVT	618+34.9300 R1	558.3077
PVC	621+84.9300 R1	559.3846
	Tangent Grade:	0.3077%
	Tangent Length:	350.0000
	Element: Symmetrical Parabola	
PVC	621+84.9300 R1	559.3846
PVI	623+84.9300 R1	560.0000
PVT	625+84.9300 R1	557.9844
VHIGH	622+78.4909 R1	559.5286
	Length:	400.0000
	Entrance Grade:	0.3077%
	Exit Grade:	-1.0078%
	r = (g2 - g1) / L:	-0.3289
	K = l / (g2 - g1):	304.0730
	Middle Ordinate:	-0.6577
	Element: Linear	
PVT	625+84.9300 R1	557.9844
PVC	633+38.7300 R1	550.3878
	Tangent Grade:	-1.0078%
	Tangent Length:	753.8000
	Element: Symmetrical Parabola	
PVC	633+38.7300 R1	550.3878
PVI	634+38.7300 R1	549.3800
PVT	635+38.7300 R1	548.7333
	Length:	200.0000
	Entrance Grade:	-1.0078%
	Exit Grade:	-0.6467%
	r = (g2 - g1) / L:	0.1806
	K = l / (g2 - g1):	553.8407
	Middle Ordinate:	0.0903
	Element: Linear	
PVT	635+38.7300 R1	548.7333
PVC	639+38.7300 R1	546.1467
	Tangent Grade:	-0.6467%
	Tangent Length:	400.0000
	Element: Symmetrical Parabola	
PVC	639+38.7300 R1	546.1467
PVI	640+38.7300 R1	545.5000
PVT	641+38.7300 R1	544.3333
	Length:	200.0000
	Entrance Grade:	-0.6467%
	Exit Grade:	-1.1667%
	r = (g2 - g1) / L:	-0.2600
	K = l / (g2 - g1):	384.6154
	Middle Ordinate:	-0.1300
	Element: Linear	
PVT	641+38.7300 R1	544.3333
PVC	645+38.7300 R1	539.6667
	Tangent Grade:	-1.1667%
	Tangent Length:	400.0000
	Element: Symmetrical Parabola	
PVC	645+38.7300 R1	539.6667
PVI	646+38.7300 R1	538.5000
PVT	647+38.7300 R1	538.4130
	Length:	200.0000
	Entrance Grade:	-1.1667%
	Exit Grade:	-0.0870%
	r = (g2 - g1) / L:	0.5399
	K = l / (g2 - g1):	185.2349
	Middle Ordinate:	0.2699
	Element: Linear	
PVT	647+38.7300 R1	538.4130
PVC	651+13.7300 R1	538.0870
	Tangent Grade:	-0.0870%
	Tangent Length:	375.0000
	Element: Symmetrical Parabola	
PVC	651+13.7300 R1	538.0870
PVI	652+13.7300 R1	538.0000
PVT	653+13.7300 R1	537.1200
	Length:	200.0000
	Entrance Grade:	-0.0870%
	Exit Grade:	-0.8800%
	r = (g2 - g1) / L:	-0.3965
	K = l / (g2 - g1):	252.1930
	Middle Ordinate:	-0.1983
	Element: Linear	
PVT	653+13.7300 R1	537.1200
PVI	658+38.7300 R1	532.5000
	Tangent Grade:	-0.8800%
	Tangent Length:	525.0000
	Element: Linear	
PVI	658+38.7300 R1	532.5000
PVC	665+38.7300 R1	526.8125
	Tangent Grade:	-0.8125%
	Tangent Length:	700.0000
	Element: Symmetrical Parabola	
PVC	665+38.7300 R1	526.8125
PVI	666+38.7300 R1	526.0000
PVT	667+38.7300 R1	526.0000
	Length:	200.0000
	Entrance Grade:	-0.8125%
	Exit Grade:	0.0000%
	r = (g2 - g1) / L:	0.4063
	K = l / (g2 - g1):	246.1538
	Middle Ordinate:	0.2031
	Element: Linear	
PVT	667+38.7300 R1	526.0000
PVC	669+38.7300 R1	526.0000
	Tangent Grade:	0.0000%
	Tangent Length:	200.0000
	Element: Symmetrical Parabola	
PVC	669+38.7300 R1	526.0000
PVI	670+38.7300 R1	526.0000
PVT	671+38.7300 R1	525.6667
	Length:	200.0000
	Entrance Grade:	0.0000%
	Exit Grade:	-0.3333%
	r = (g2 - g1) / L:	-0.1667
	K = l / (g2 - g1):	600.0000
	Middle Ordinate:	-0.0833
	Element: Linear	
PVT	671+38.7300 R1	525.6667
PVC	676+13.7300 R1	524.0833
	Tangent Grade:	-0.3333%
	Tangent Length:	475.0000
	Element: Symmetrical Parabola	
PVC	676+13.7300 R1	524.0833
PVI	677+13.7300 R1	523.7500
PVT	678+13.7300 R1	523.8245
VLOW	677+77.2040 R1	523.8109
	Length:	200.0000
	Entrance Grade:	-0.3333%
	Exit Grade:	0.0745%
	r = (g2 - g1) / L:	0.2039
	K = l / (g2 - g1):	490.4221
	Middle Ordinate:	0.1020
	Element: Linear	
PVT	678+13.7300 R1	523.8245
PVC	686+20.7300 R1	524.4255
	Tangent Grade:	0.0745%
	Tangent Length:	807.0000
	Element: Symmetrical Parabola	
PVC	686+20.7300 R1	524.4255
PVI	687+20.7300 R1	524.5000
PVT	688+20.7300 R1	526.3117
	Length:	200.0000
	Entrance Grade:	0.0745%
	Exit Grade:	1.8117%
	r = (g2 - g1) / L:	0.9086
	K = l / (g2 - g1):	110.0384
	Middle Ordinate:	0.4543
	Element: Linear	
PVT	688+20.7300 R1	526.3117
PVC	693+63.3000 R1	536.1412
	Tangent Grade:	1.8117%
	Tangent Length:	542.5700
	Element: Symmetrical Parabola	
PVC	693+63.3000 R1	536.1412
PVI	694+38.3000 R1	537.5000
PVT	695+13.3000 R1	537.0725
VHIGH	694+77.3995 R1	537.1748
	Length:	150.0000
	Entrance Grade:	1.8117%
	Exit Grade:	-0.5700%
	r = (g2 - g1) / L:	-1.5878
	K = l / (g2 - g1):	62.9803
	Middle Ordinate:	-0.4466
	Element: Linear	
PVT	695+13.3000 R1	537.0725
PVC	695+38.7300 R1	536.9275
	Tangent Grade:	-0.5700%
	Tangent Length:	25.4300
	Element: Symmetrical Parabola	
PVC	695+38.7300 R1	536.9275
PVI	696+13.7300 R1	536.5000
PVT	696+88.7300 R1	535.0612
	Length:	150.0000
	Entrance Grade:	-0.5700%
	Exit Grade:	-1.9184%
	r = (g2 - g1) / L:	-0.8989
	K = l / (g2 - g1):	111.2434
	Middle Ordinate:	-0.2528
	Element: Linear	
PVT	696+88.7300 R1	535.0612
PVC	698+84.4519 R1	531.3064
	Tangent Grade:	-1.9184%
	Tangent Length:	195.7219
	Element: Symmetrical Parabola	
PVC	698+84.4519 R1	531.3064
PVI	699+59.4519 R1	529.8676
PVT	700+34.4519 R1	528.7859
	Length:	150.0000
	Entrance Grade:	-1.9184%
	Exit Grade:	-1.4423%
	r = (g2 - g1) / L:	0.3174
	K = l / (g2 - g1):	315.0489
	Middle Ordinate:	0.0893
	Element: Linear	
PVT	700+34.4519 R1	528.7859
PVC	702+64.3134 R1	525.4706
	Tangent Grade:	-1.4423%
	Tangent Length:	229.8615
	Element: Symmetrical Parabola	
PVC	702+64.3134 R1	525.4706
PVI	702+89.3134 R1	525.1100
PVT	703+14.3134 R1	525.3293
VLOW	702+95.4008 R1	525.2464
	Length:	50.0000
	Entrance Grade:	-1.4423%
	Exit Grade:	0.8775%
	r = (g2 - g1) / L:	4.6395
	K = l / (g2 - g1):	21.5539
	Middle Ordinate:	0.1450
	Element: Linear	
PVT	703+14.3134 R1	525.3293
POE	703+24.7282 R1	525.4207
	Tangent Grade:	0.8775%
	Tangent Length:	10.4148

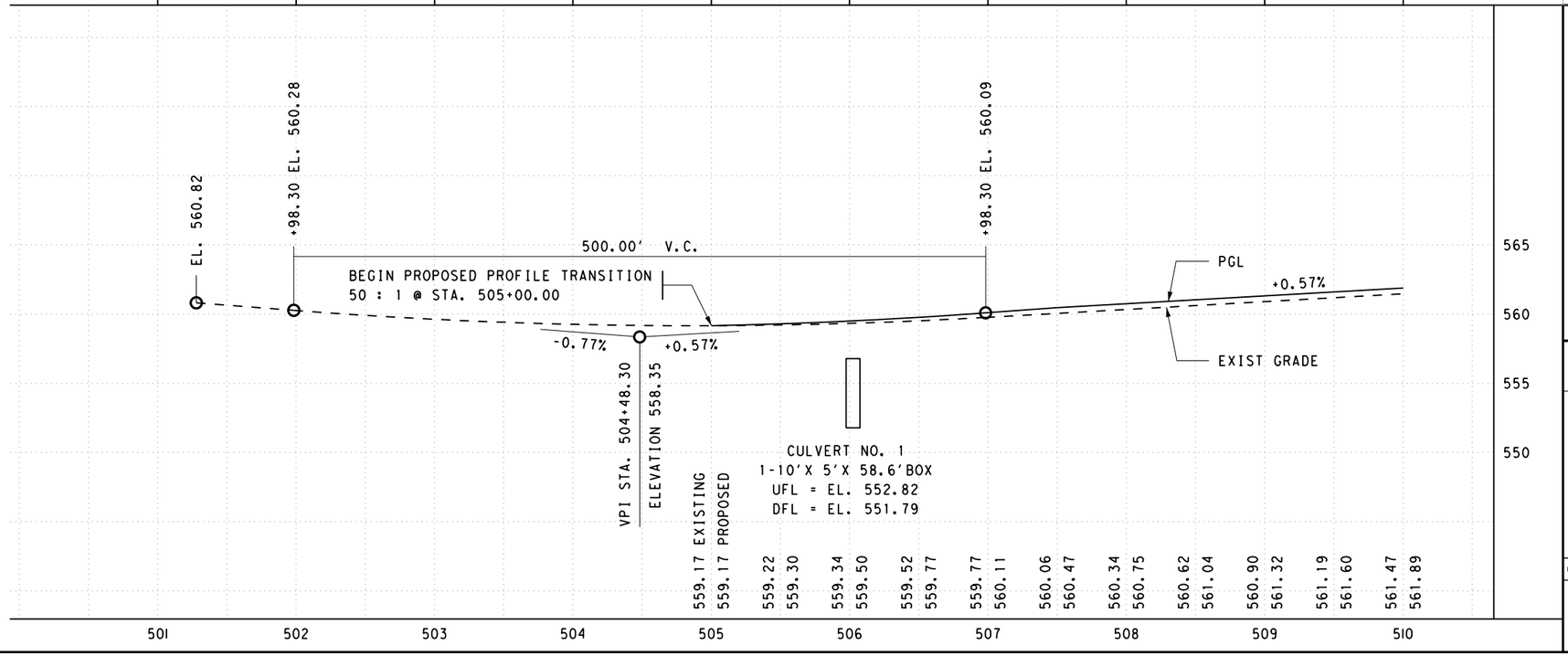


Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

GEOMETRIC DATA SHEET

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		51





					14	11	8	9	8		
					226	253	80	83	68		

ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	50 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	710 CY

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022

SIGNATURE OF REGISTRANT & DATE

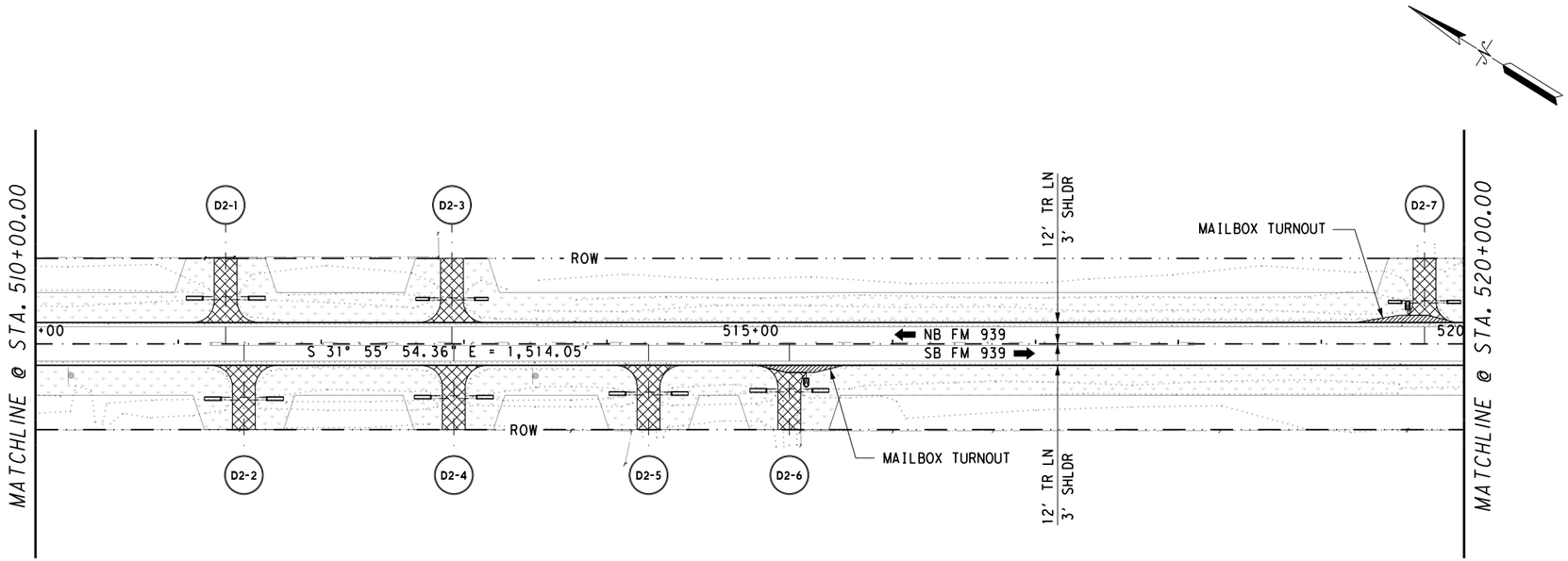
ROADWAY PLAN & PROFILE

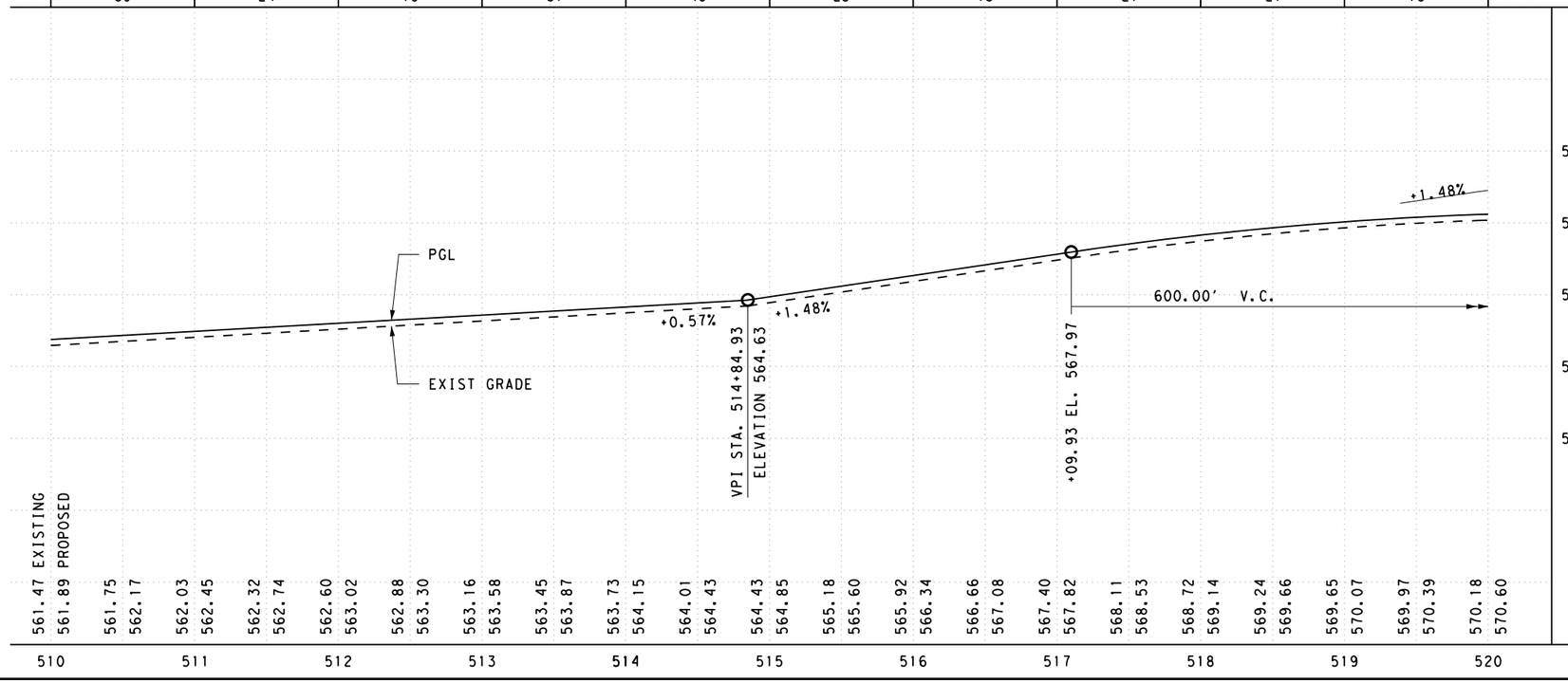
FROM STA. 505+00.00 TO STA. 510+00.00
1192-01-027

SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

SHEET 1 OF 21

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		52





ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	119 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	254 CY

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

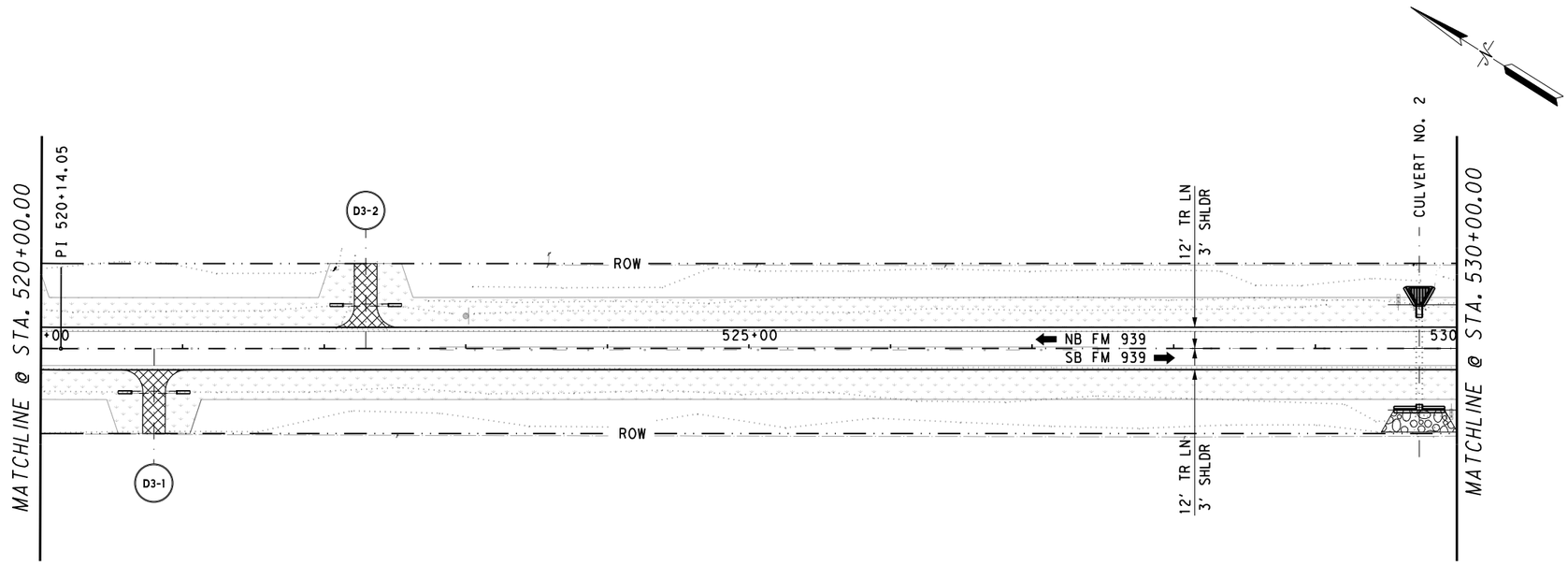
ROADWAY PLAN & PROFILE

FROM STA. 510+00.00 TO STA. 520+00.00
1192-01-027

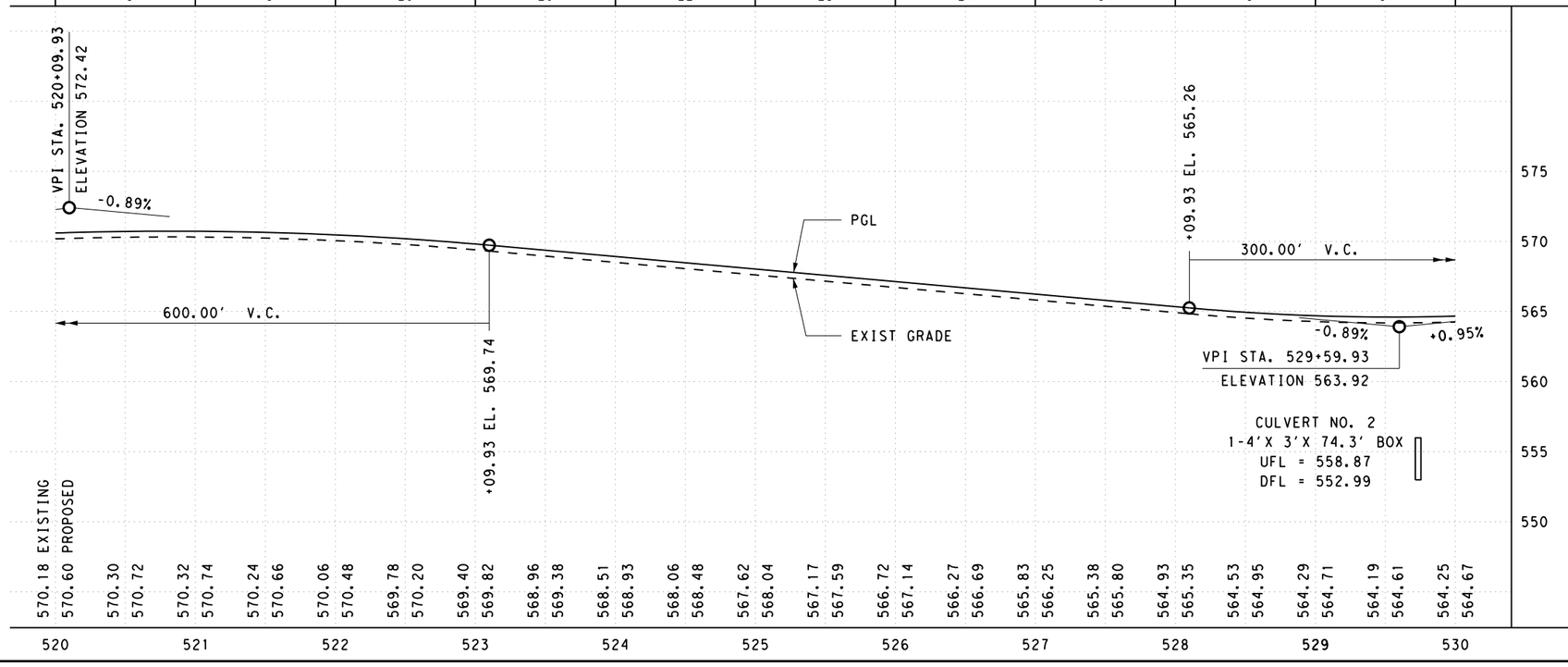
SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

SHEET 2 OF 21

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		53



ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	89 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	292 CY



STATE OF TEXAS
BRADLEY MAYES
128276
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Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

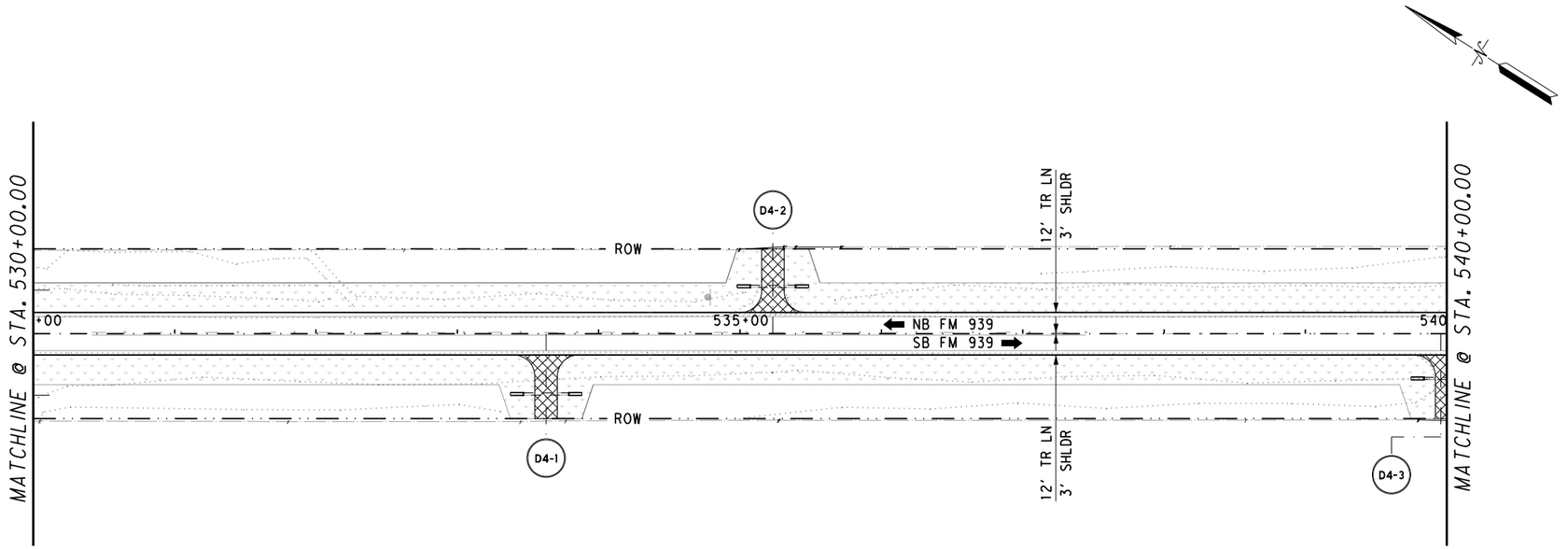
ROADWAY PLAN & PROFILE

FROM STA. 520+00.00 TO STA. 530+00.00
1192-01-027

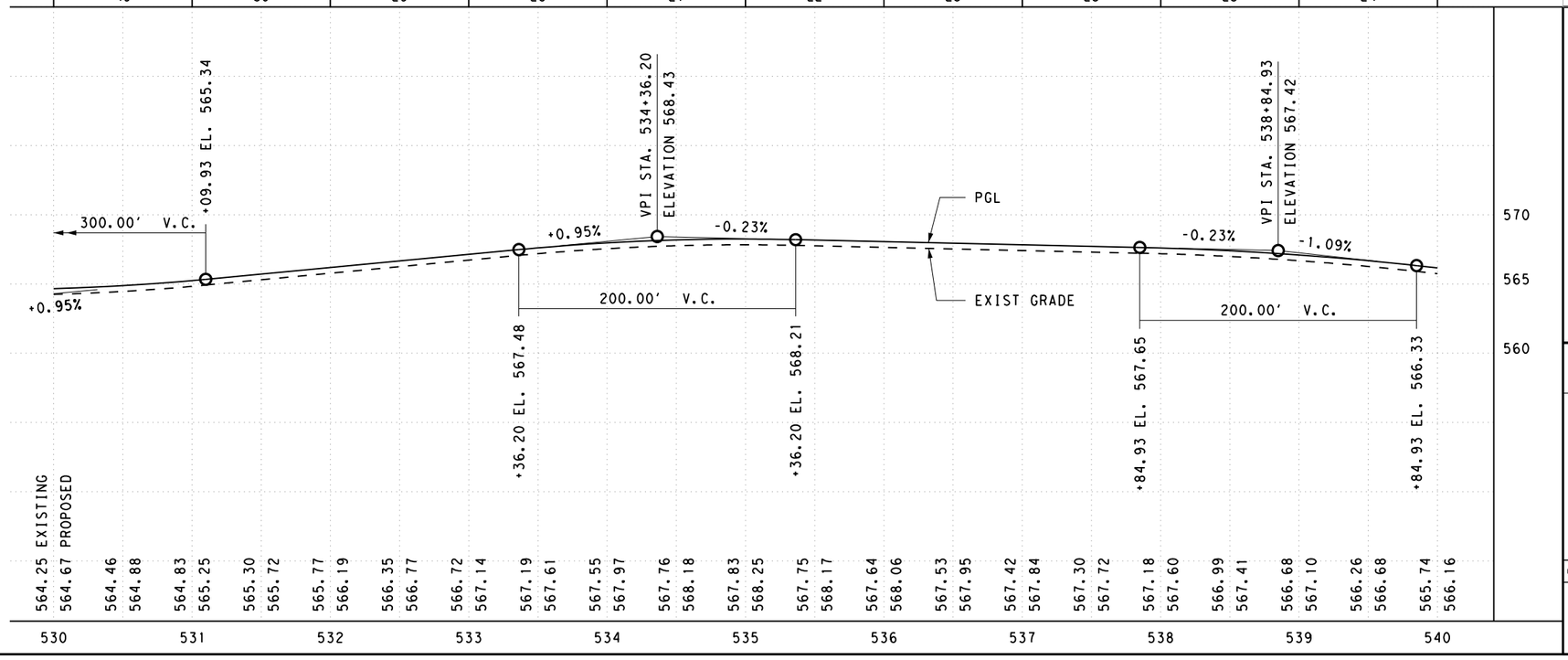
SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

SHEET 3 OF 21

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		54



ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	74 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	282 CY



STATE OF TEXAS
BRADLEY MAYES
128276
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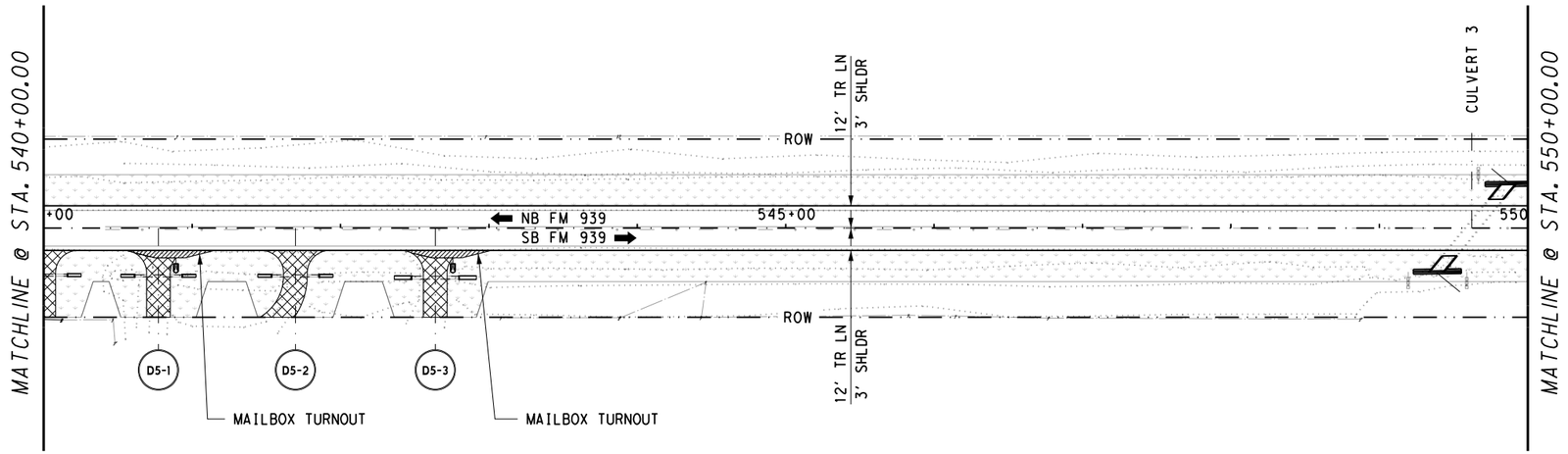
Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

ROADWAY PLAN & PROFILE

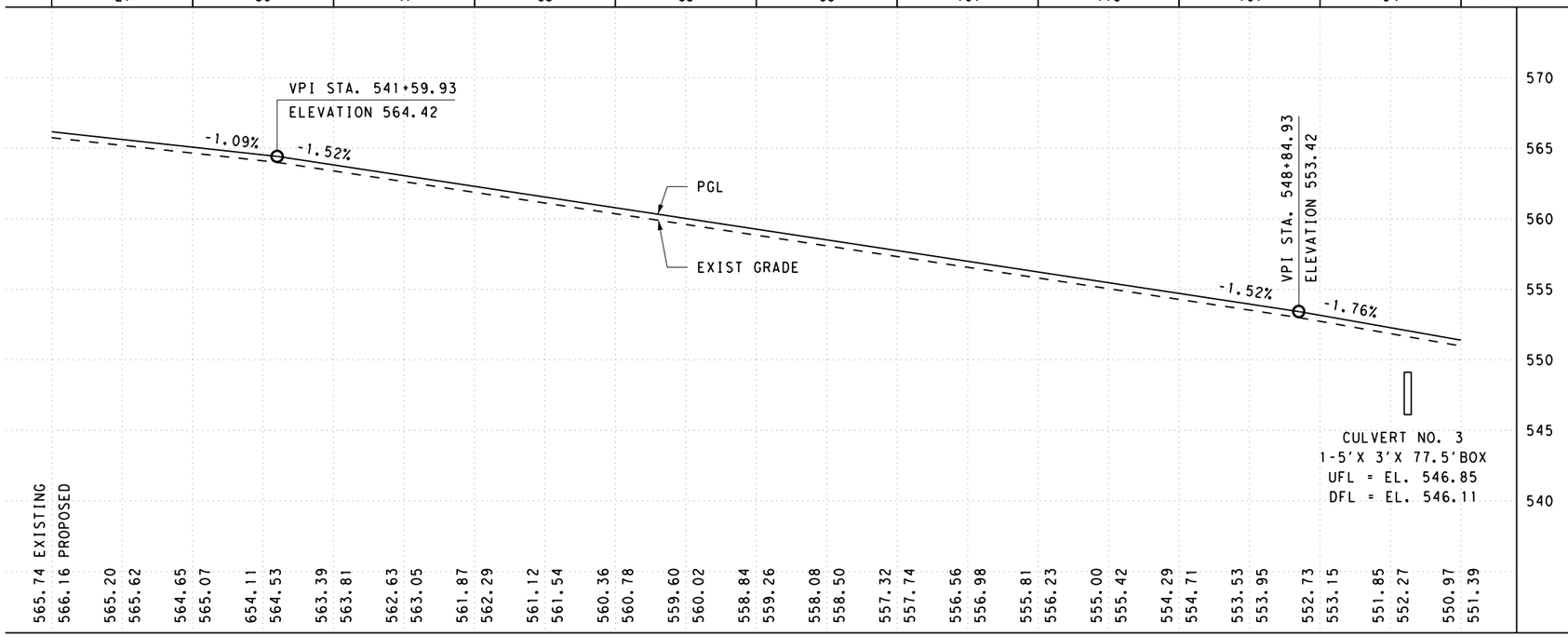
FROM STA. 530+00.00 TO STA. 540+00.00
1192-01-027

SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		55



	11	10	6	4	5	5	4	3	3	5	
	21	30	47	63	65	68	101	118	101	94	



ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	56 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	708 CY

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022

SIGNATURE OF REGISTRANT & DATE

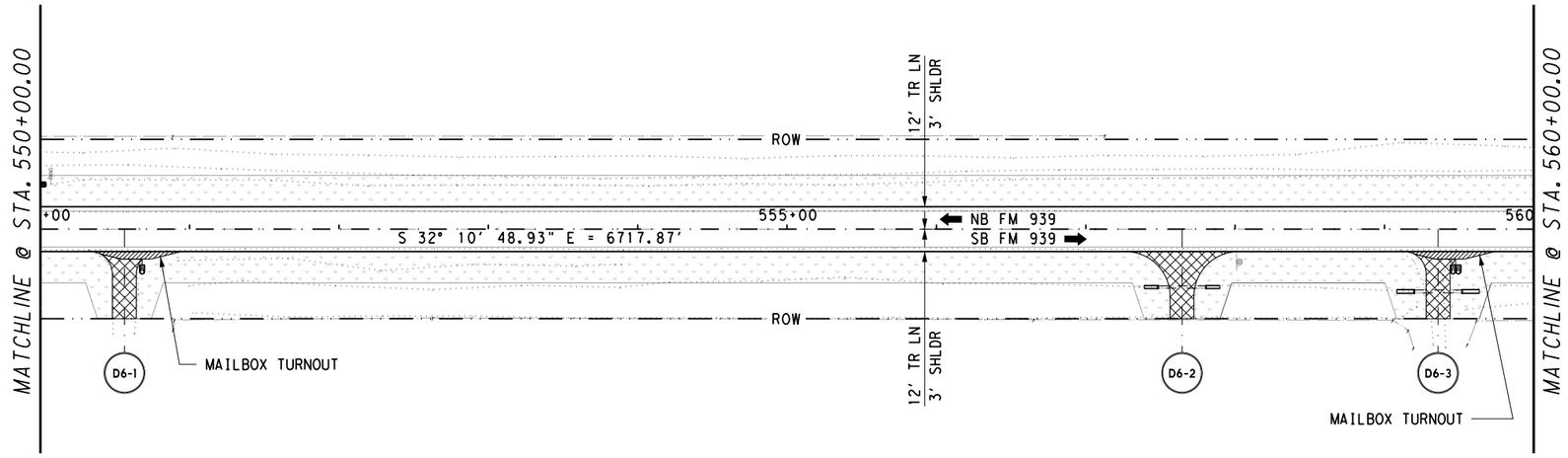
ROADWAY PLAN & PROFILE

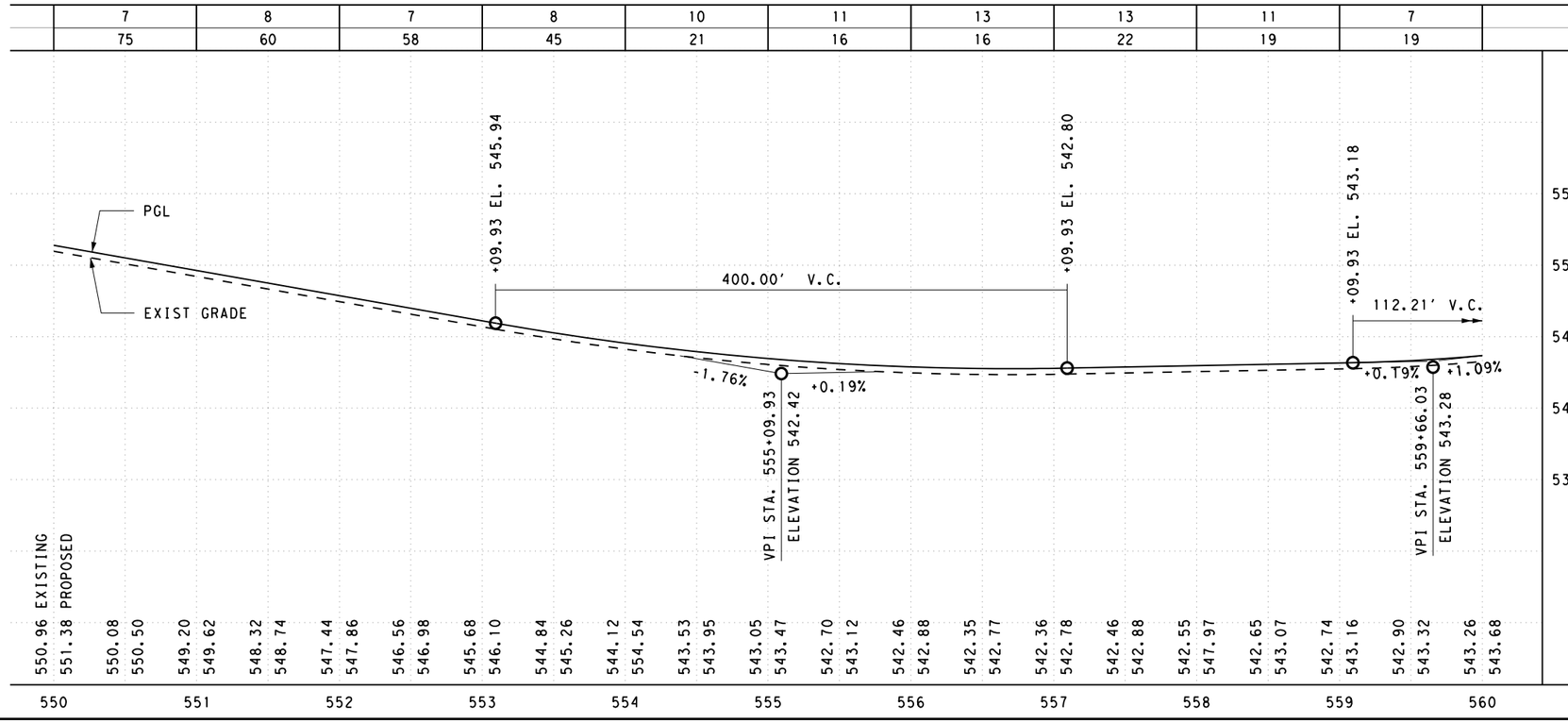
FROM STA. 540+00.00 TO STA. 550+00.00
1192-01-027

SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

SHEET 5 OF 21

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		56





ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	95 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	351 CY

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

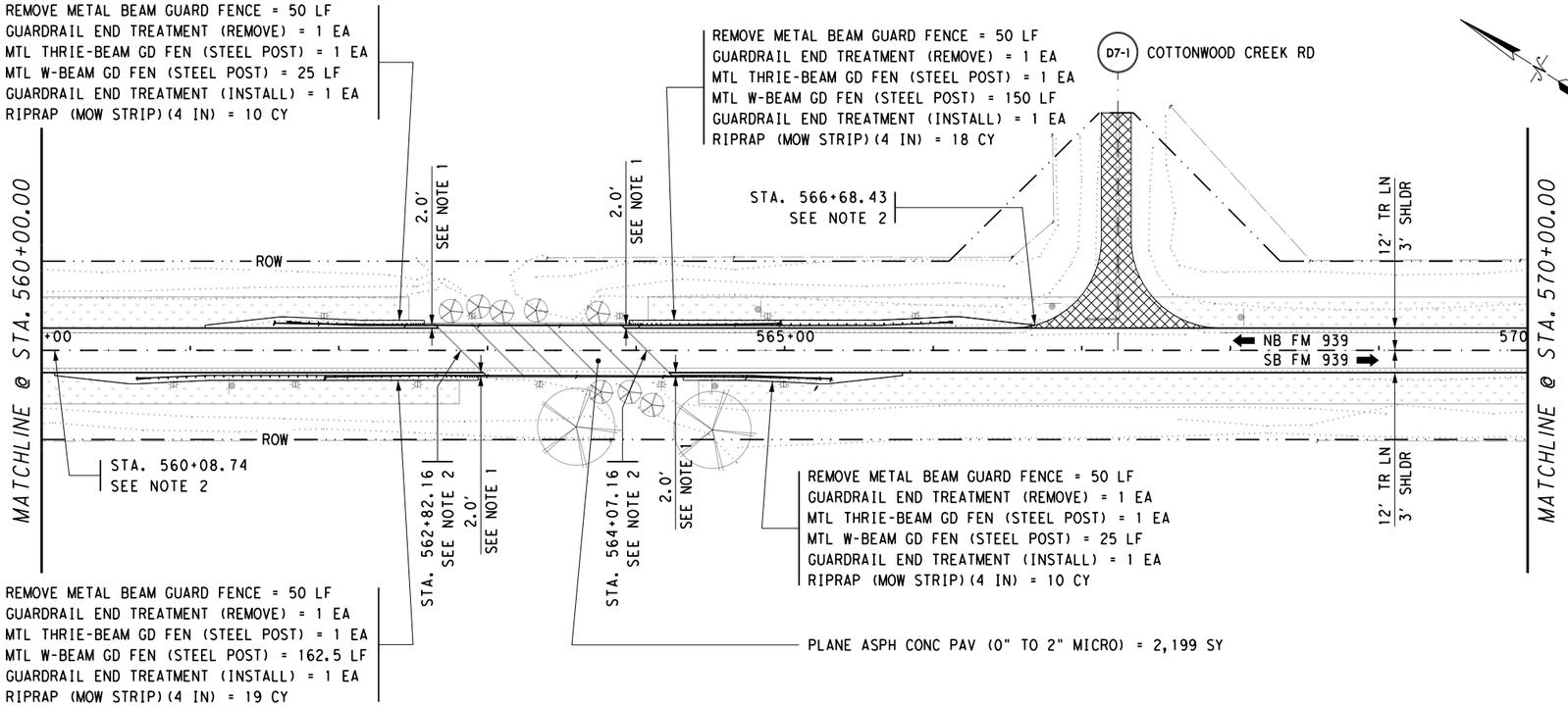
ROADWAY PLAN & PROFILE

FROM STA. 550+00.00 TO STA. 560+00.00
1192-01-027

SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

SHEET 6 OF 21

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		57



NOTES:

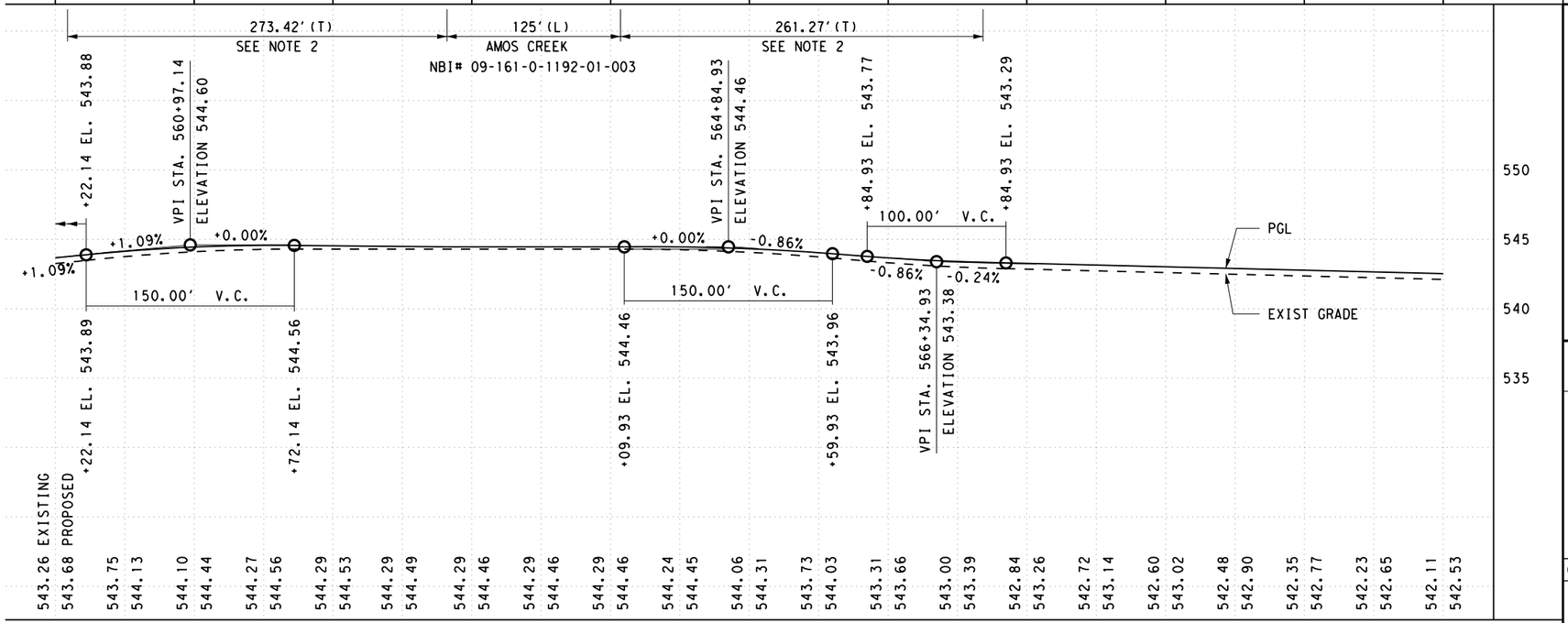
1. TWO FEET (2.0') WILL BE ADDED TO THE MOWSTRIP ALONG THE EDGE OF PAVEMENT.
2. SEE BRIDGE MILLING DETAIL

ITEM	DESCRIPTION	UNIT
100 6002	PREPARING ROW	3 STA
432 6045	RIPRAP (MOW STRIP)(4 IN)	57 SY
354 6022	PLANE ASPH CONC PAV (0" TO 3")	2,199 SY
540 6002	MTL W-BEAM GD FEN (STEEL POST)	362.5 LF
540 6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	4 EA
542 6001	REMOVE METAL BEAM GUARD FENCE	200 LF
544 6001	GUARDRAIL END TREATMENT (INSTALL)	4 EA
544 6003	GUARDRAIL END TREATMENT (REMOVE)	4 EA
110 6001	EXCAVATION (ROADWAY)	173 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	488 CY

(SEE NOTE 3)

PREPARING ROW = 3 STA.

	6	12	17	63	39	9	8	8	5	6	
	29	20	175	23	26	45	51	40	43	36	



Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

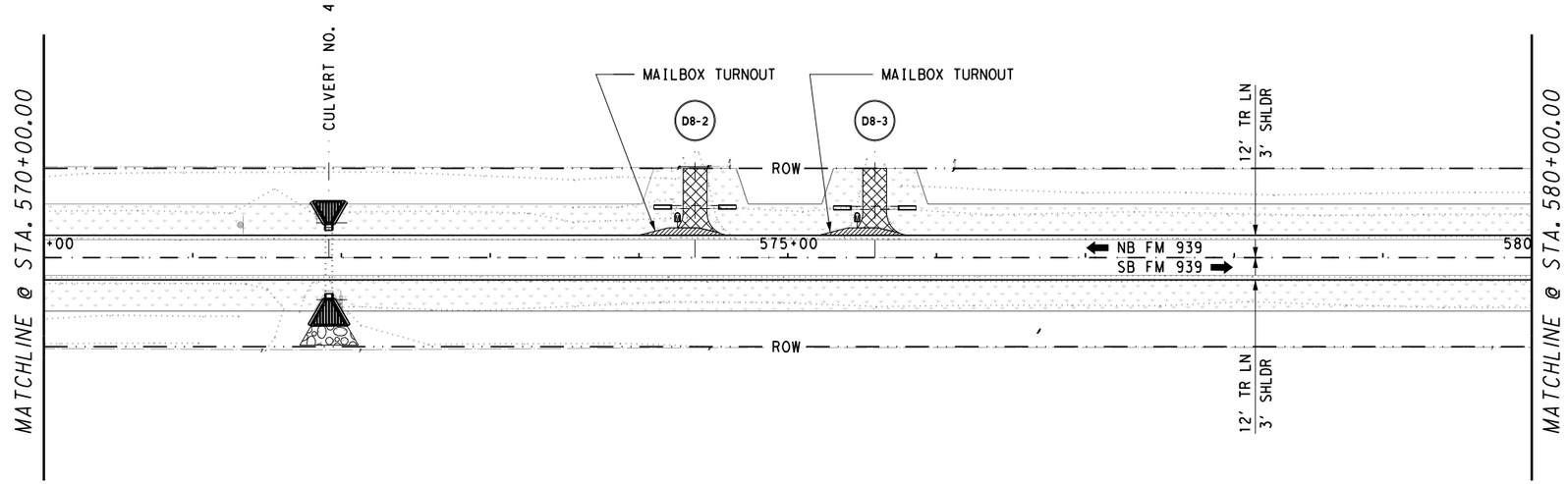
ROADWAY PLAN & PROFILE

FROM STA. 560+00.00 TO STA. 570+00.00
1192-01-027

SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

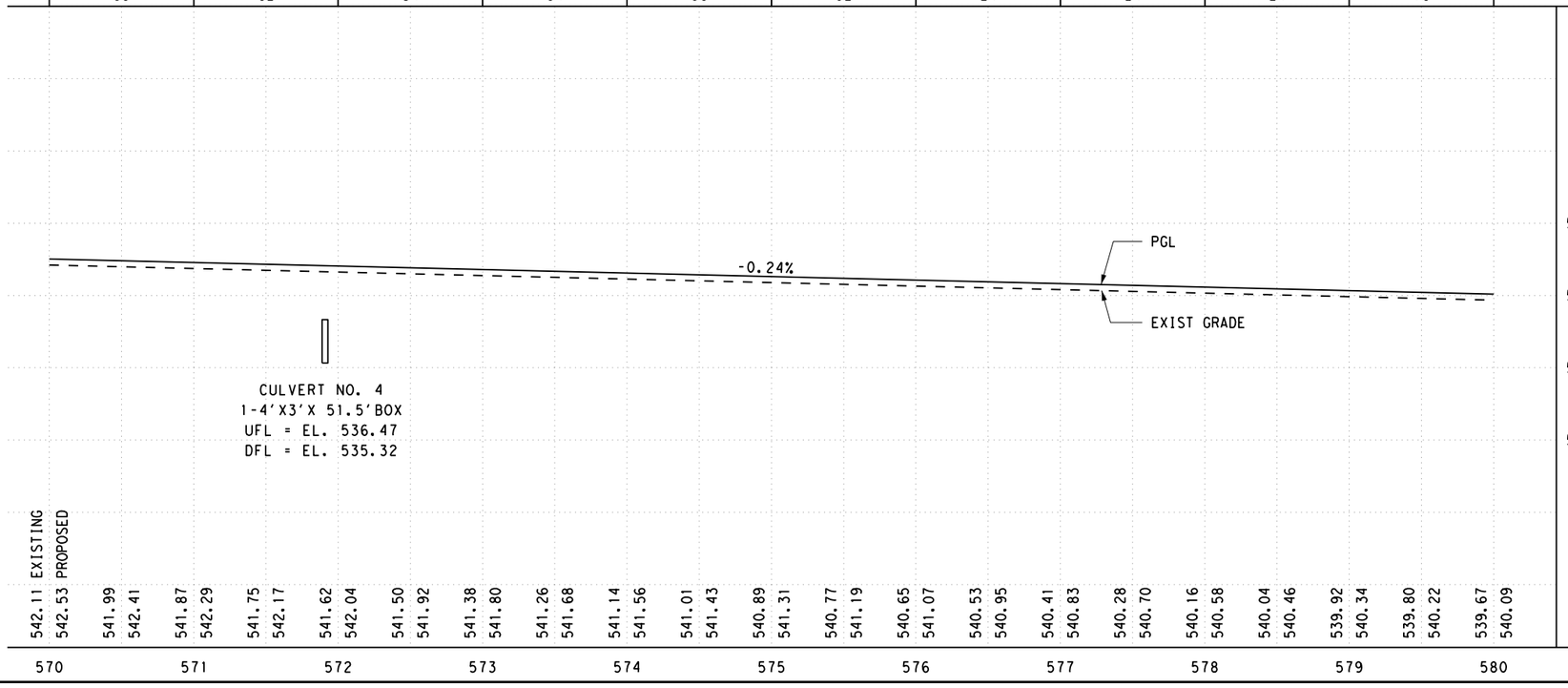
SHEET 7 OF 21

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		58



6	6	6	8	8	9	11	9	9	11	
39	62	54	34	36	32	24	24	24	16	

ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	83 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	345 CY



STATE OF TEXAS
BRADLEY MAYES
128276
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PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022

SIGNATURE OF REGISTRANT & DATE

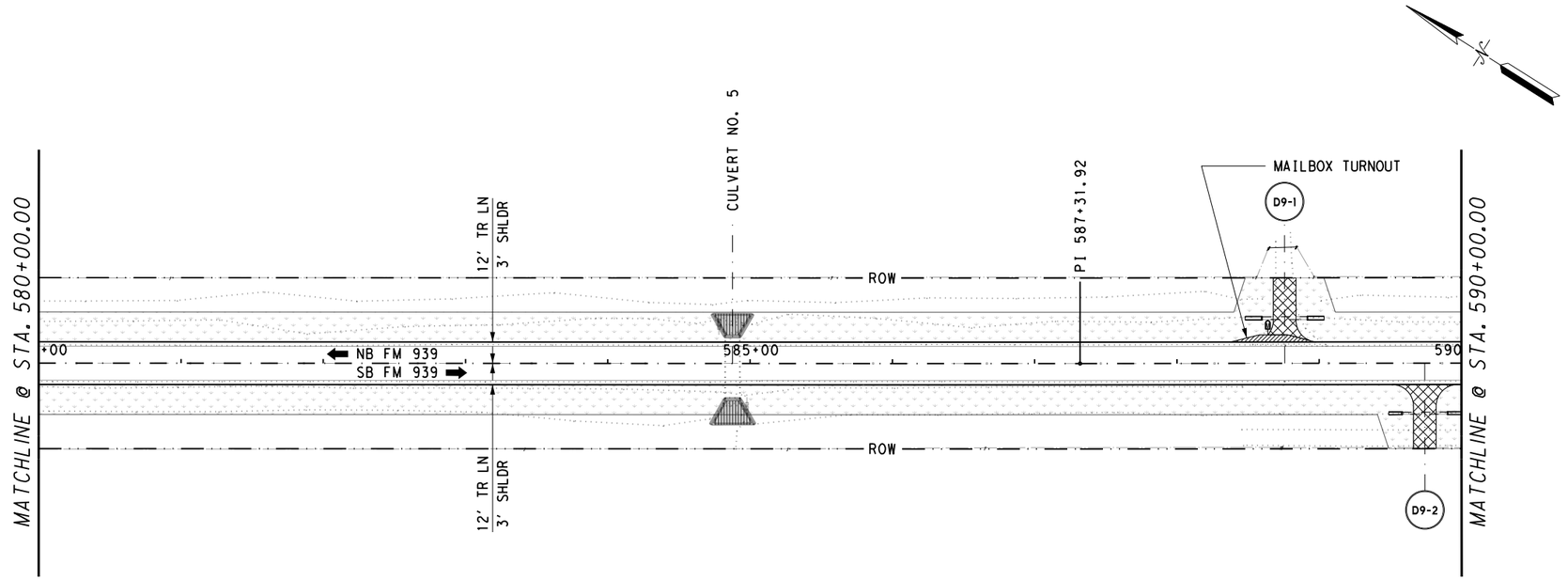
ROADWAY PLAN & PROFILE

FROM STA. 570+00.00 TO STA. 580+00.00
1192-01-027

SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

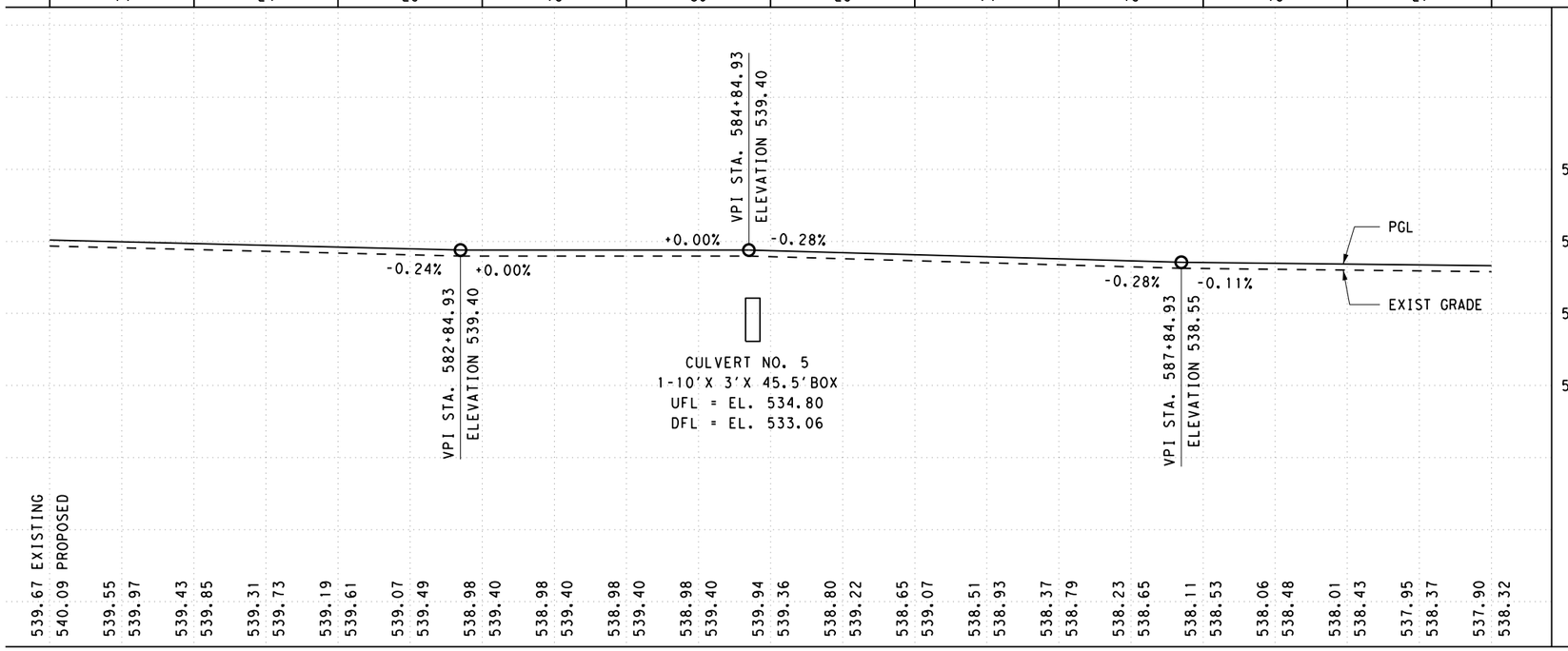
SHEET 8 OF 21

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		59



11	9	8	11	9	10	14	14	13	9	
14	24	26	18	30	26	14	18	18	21	

ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	108 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	209 CY



STATE OF TEXAS
BRADLEY MAYES
128276
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PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

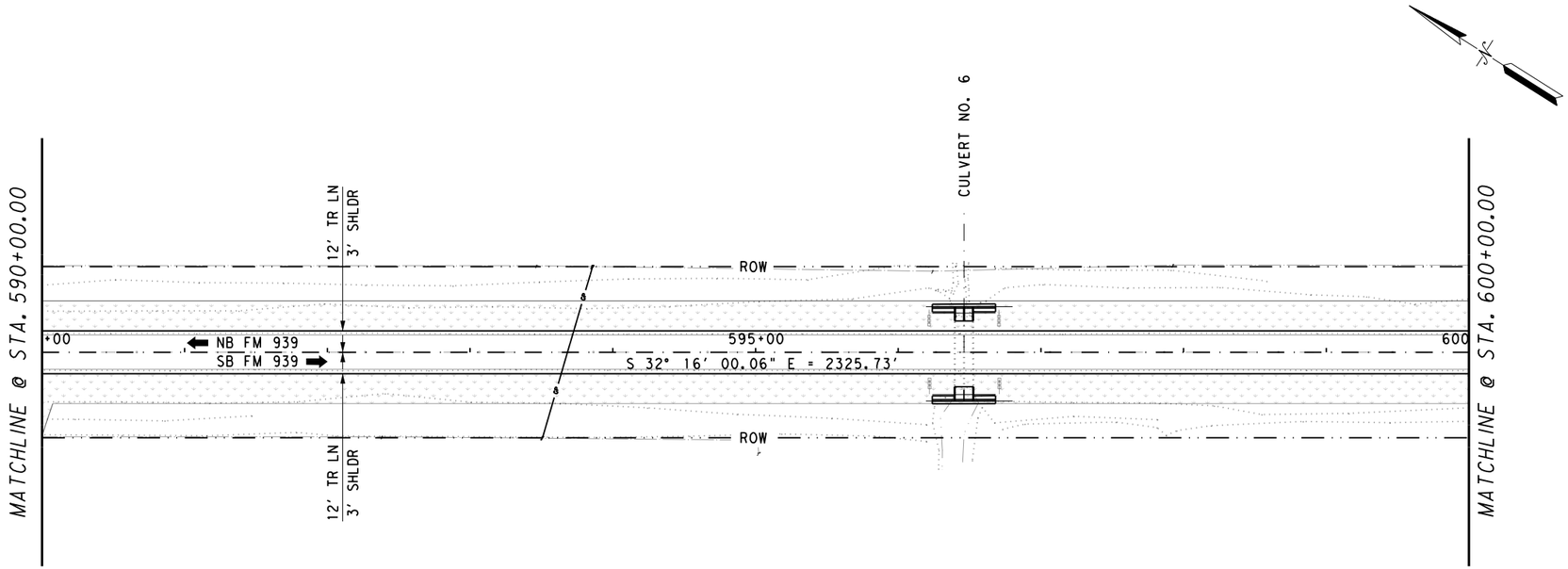
ROADWAY PLAN & PROFILE

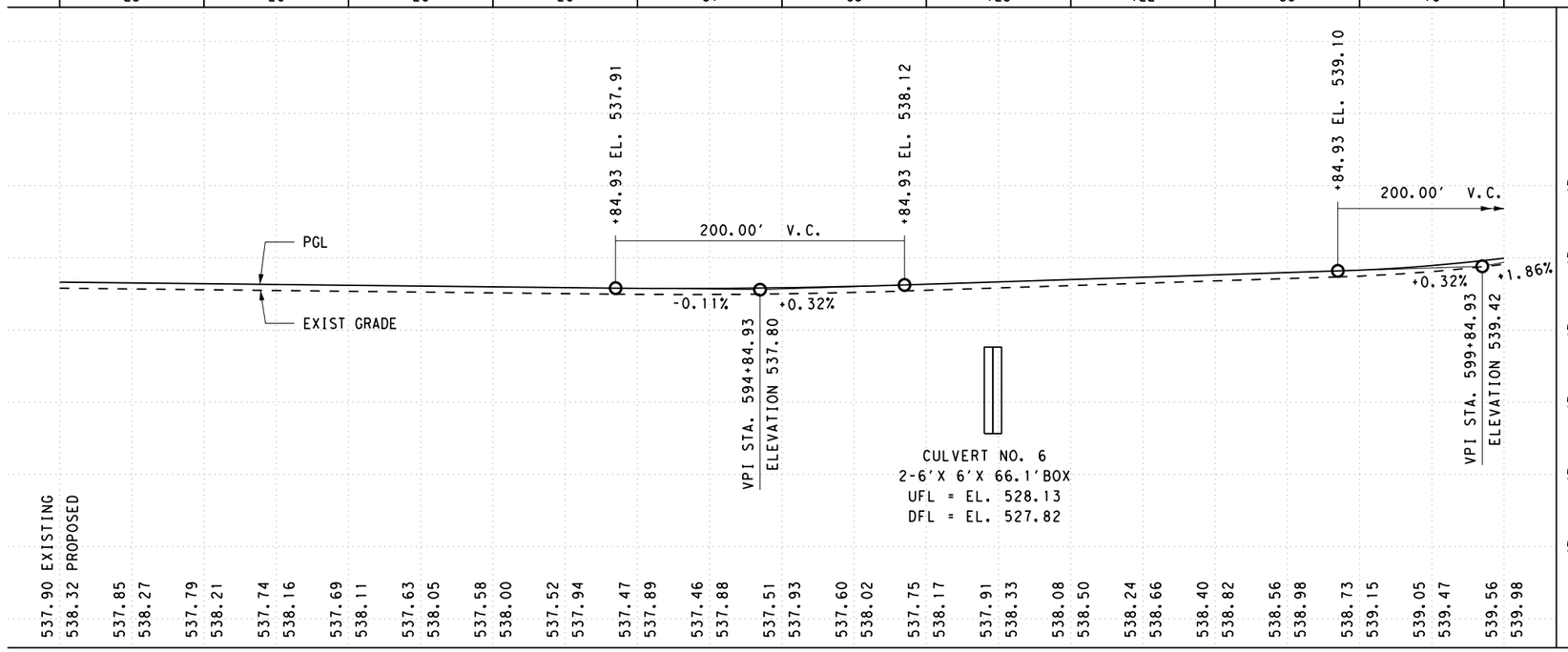
FROM STA. 580+00.00 TO STA. 580+00.00
1192-01-027

SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

SHEET 9 OF 21

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		60





ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	73 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	515 CY

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
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Bradley Mayes 7/6/2022
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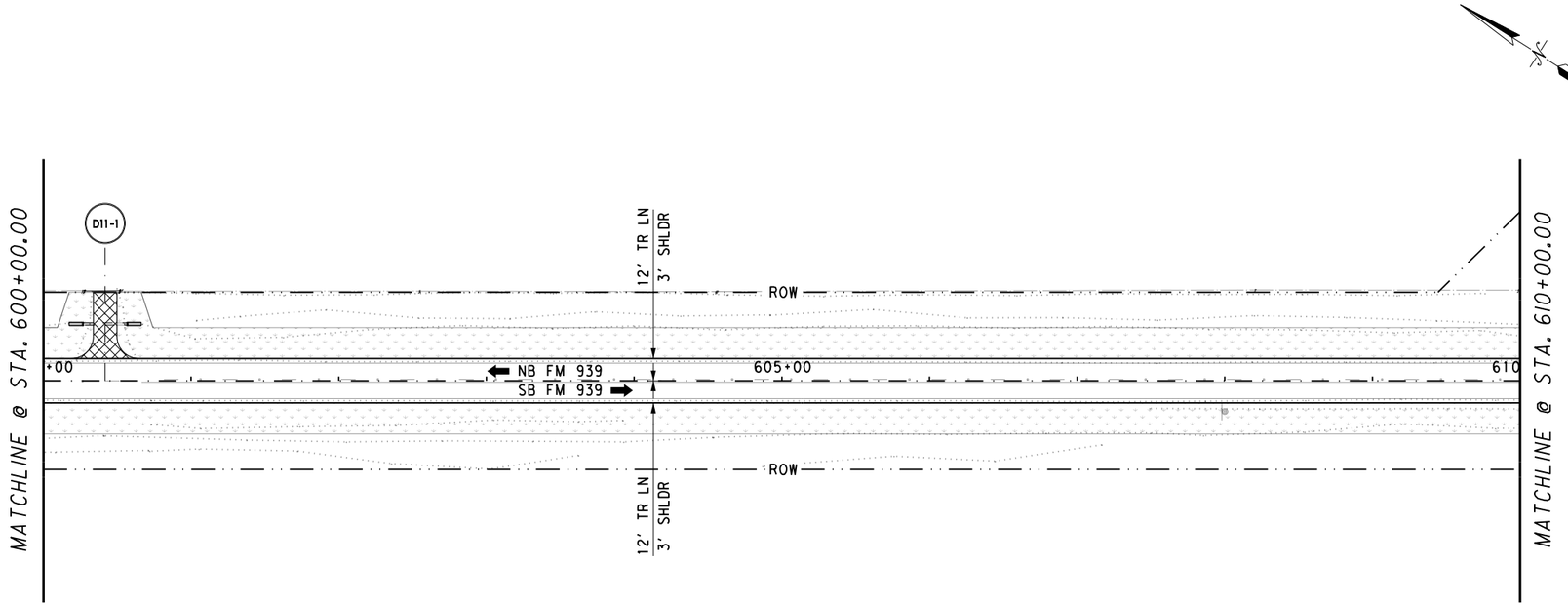
ROADWAY PLAN & PROFILE

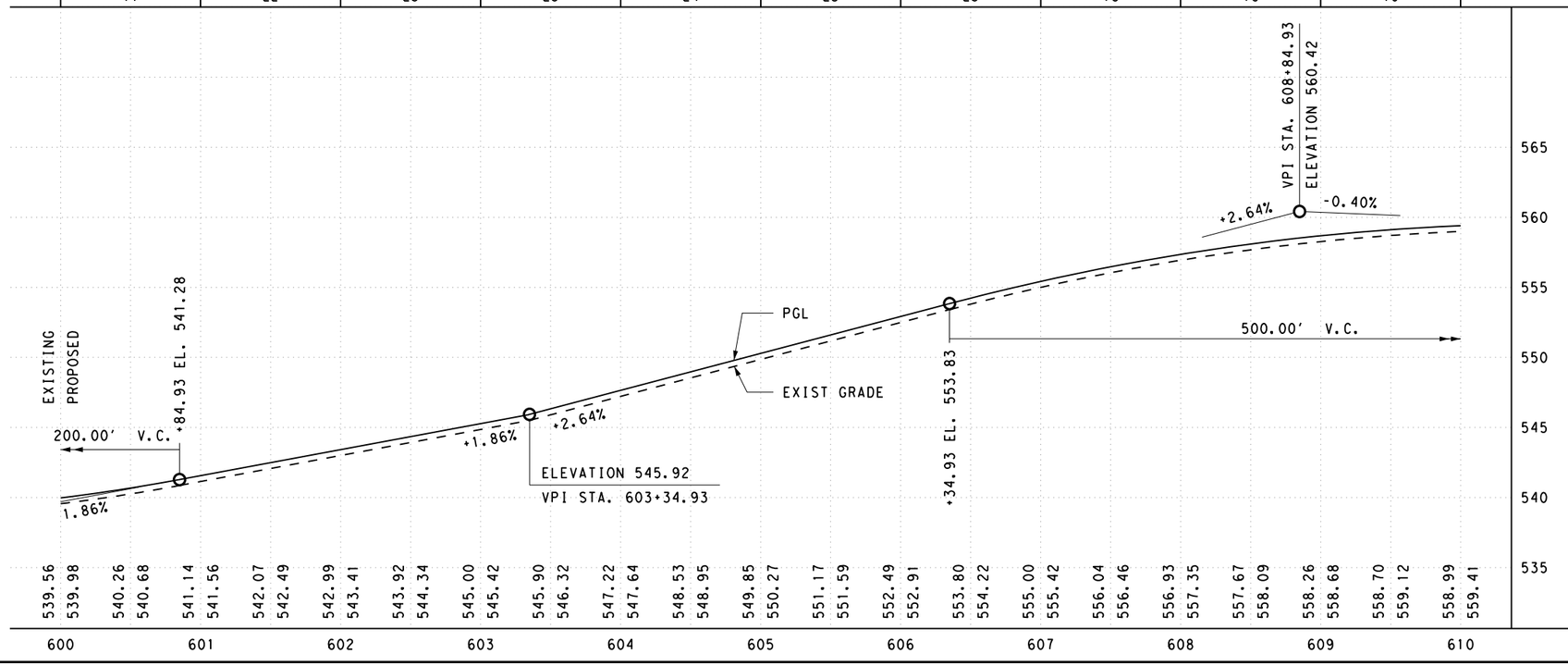
FROM STA. 590+00.00 TO STA. 600+00.00
1192-01-027

SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

SHEET 10 OF 21

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		61





	13	11	9	7	7	6	7	11	14	20	
	17	22	23	23	24	25	23	16	16	10	

ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	105 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	199 CY

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

ROADWAY PLAN & PROFILE

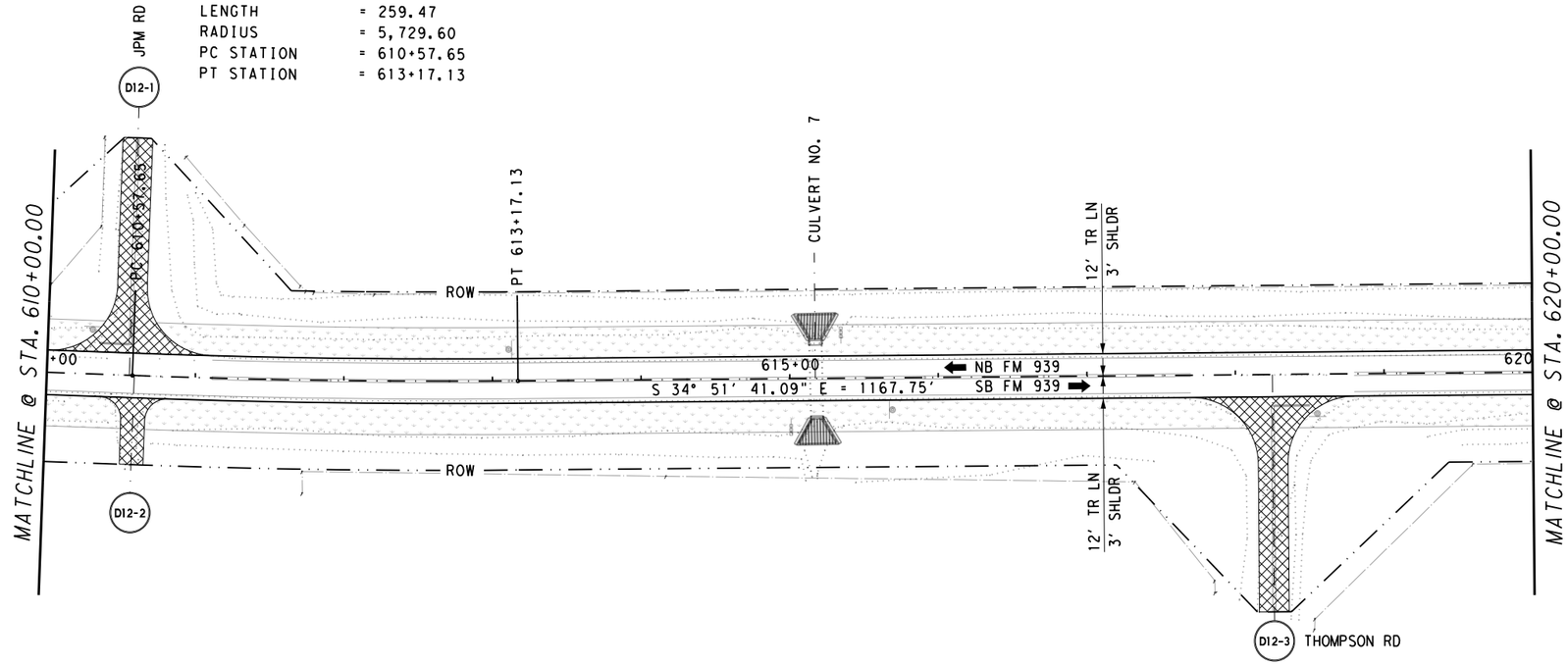
FROM STA. 600+00.00 TO STA. 610+00.00
1192-01-027

SCALE: FEET
1" = 100.0' HORIZ.
1" = 10.0' VERTICAL

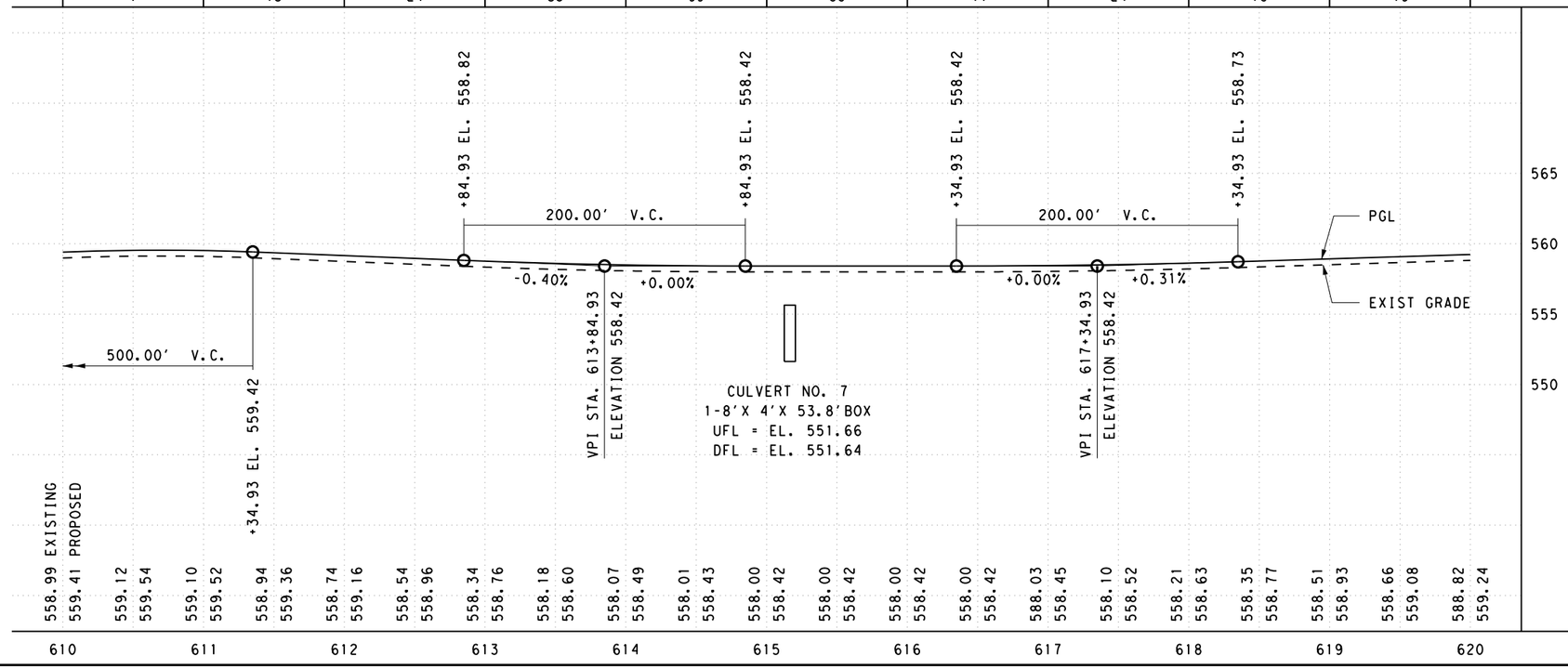
SHEET 11 OF 21

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		62

PI STATION = 611+87.41
DELTA = 2° 35' 41.03" (LT)
DEGREE OF CURVE = 0° 59' 59.99"
TANGENT = 129.76
LENGTH = 259.47
RADIUS = 5,729.60
PC STATION = 610+57.65
PT STATION = 613+17.13



ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	90 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	387 CY



	21	14	10	7	5	5	5	8	9	6	
	7	15	24	53	99	86	44	24	16	19	
558.99 EXISTING	559.12	559.10	558.94	558.74	558.54	558.34	558.18	558.07	558.01	558.00	558.00
559.41 PROPOSED	559.54	559.52	559.36	559.16	558.96	558.76	558.60	558.49	558.43	558.42	558.42
610	611		612		613		614		615		616

	5	5	8	9	6						
	44	24	16	19							
558.00	558.00	588.03	558.10	558.21	558.35	558.51	558.66	588.82			
558.42	558.42	558.45	558.52	558.63	558.77	558.93	559.08	559.24			
616	617		618		619		620				

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

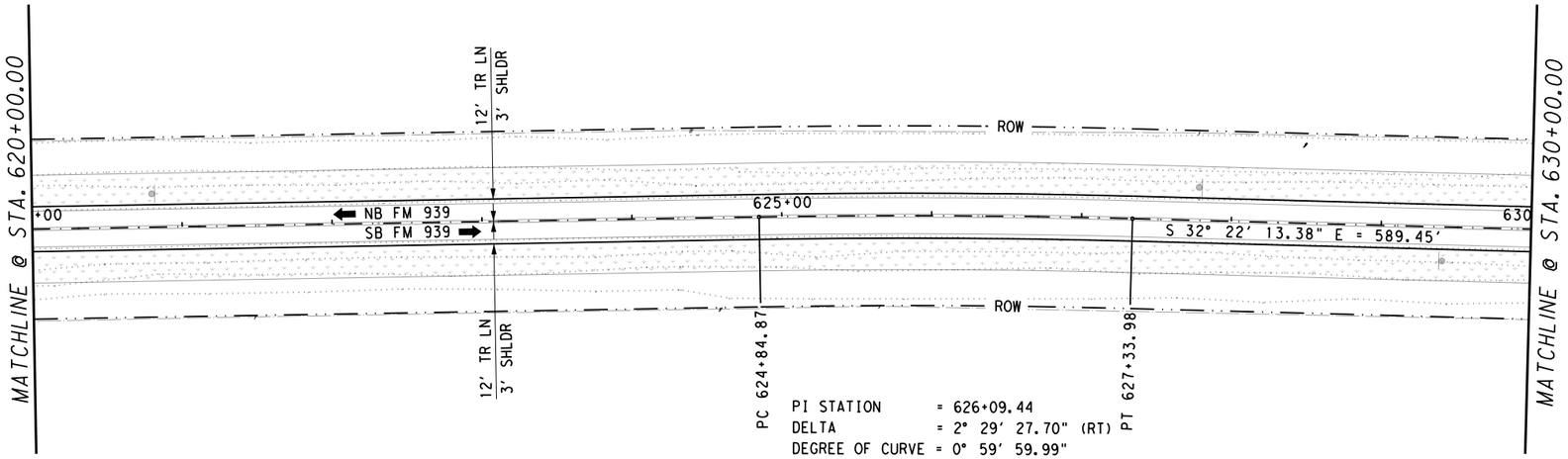
ROADWAY PLAN & PROFILE

FROM STA. 610+00.00 TO STA. 620+00.00
1192-01-027

SCALE: FEET
1" = 100.0' HORIZ.
1" = 10.0' VERTICAL

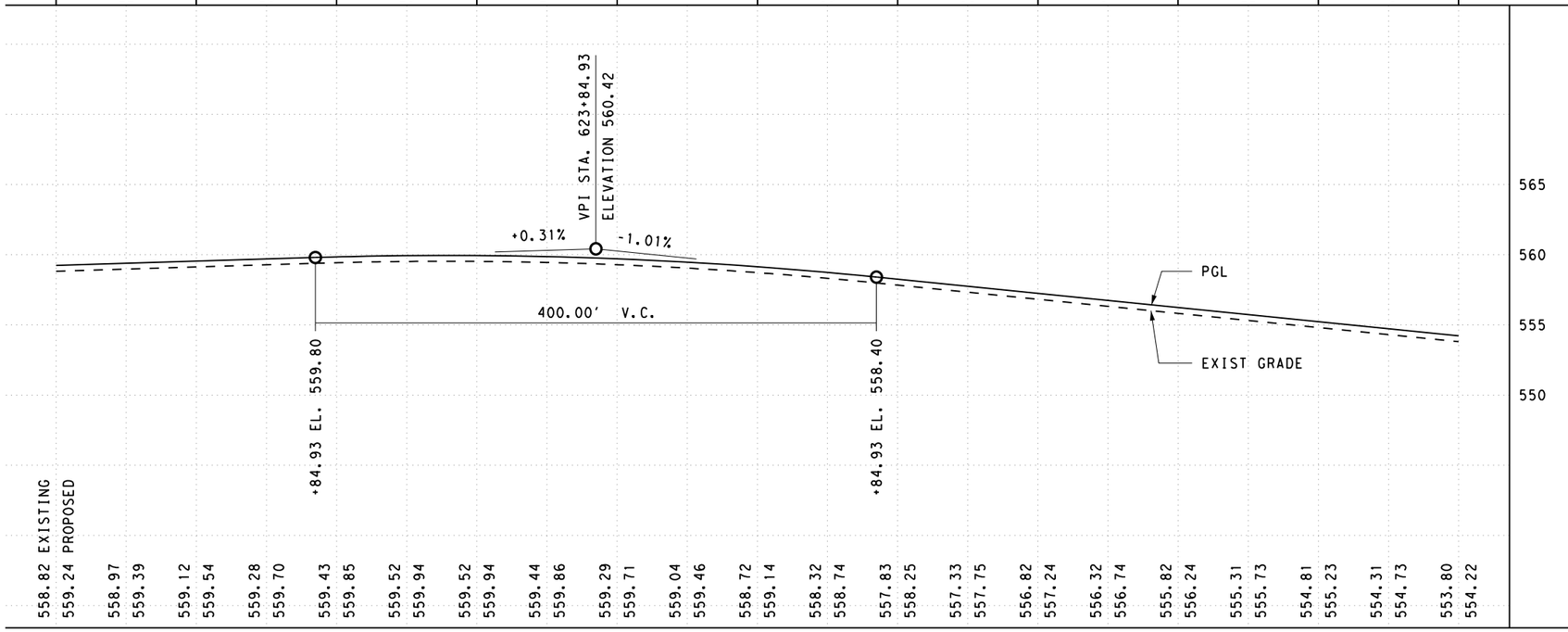
SHEET 12 OF 21

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		63



PI STATION = 626+09.44
DELTA = 2° 29' 27.70" (RT)
DEGREE OF CURVE = 0° 59' 59.99"
TANGENT = 124.57
LENGTH = 249.10
RADIUS = 5,729.60
PC STATION = 624+84.87
PT STATION = 627+33.98

	7	9	10	10	11	3	2	10	17	15	
	22	26	29	24	17	39	36	34	22	18	



ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	94 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	267 CY

STATE OF TEXAS
BRADLEY MAYES
128276
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Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

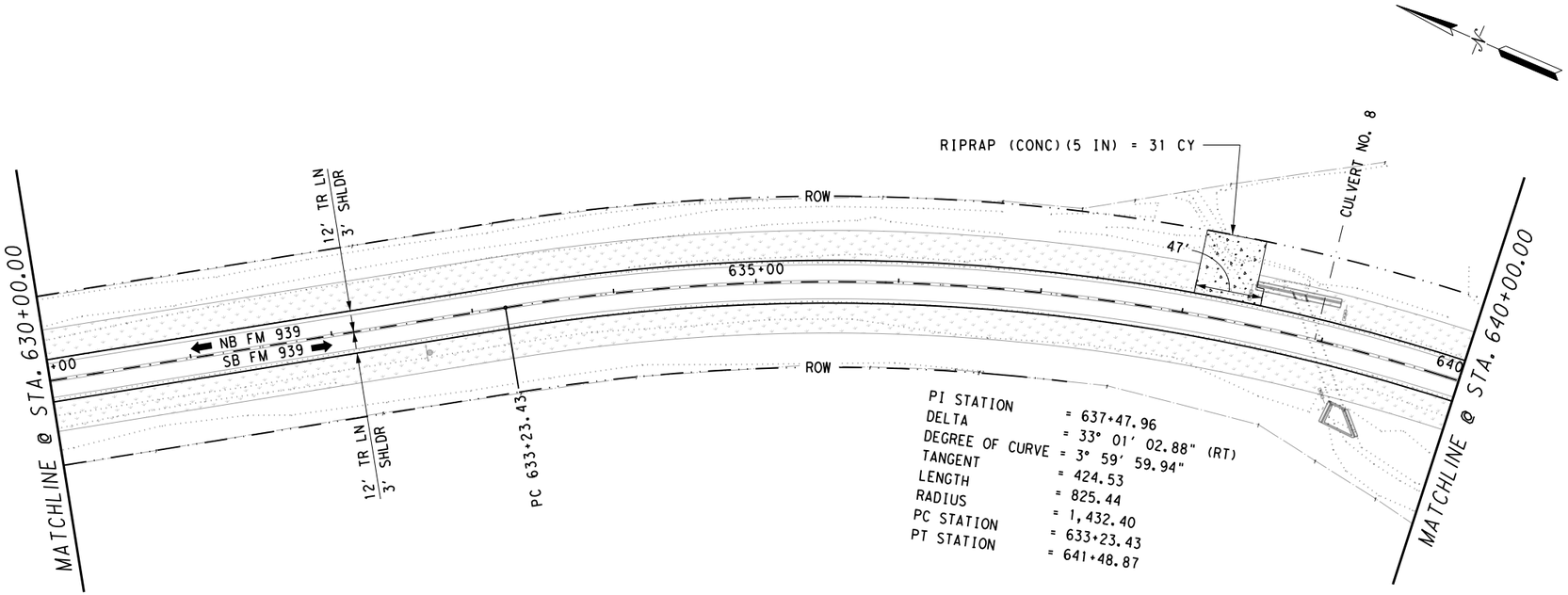
ROADWAY PLAN & PROFILE

FROM STA. 520+00.00 TO STA. 630+00.00
1192-01-027

SCALE: FEET
1" = 100.0' HORIZ.
1" = 10.0' VERTICAL

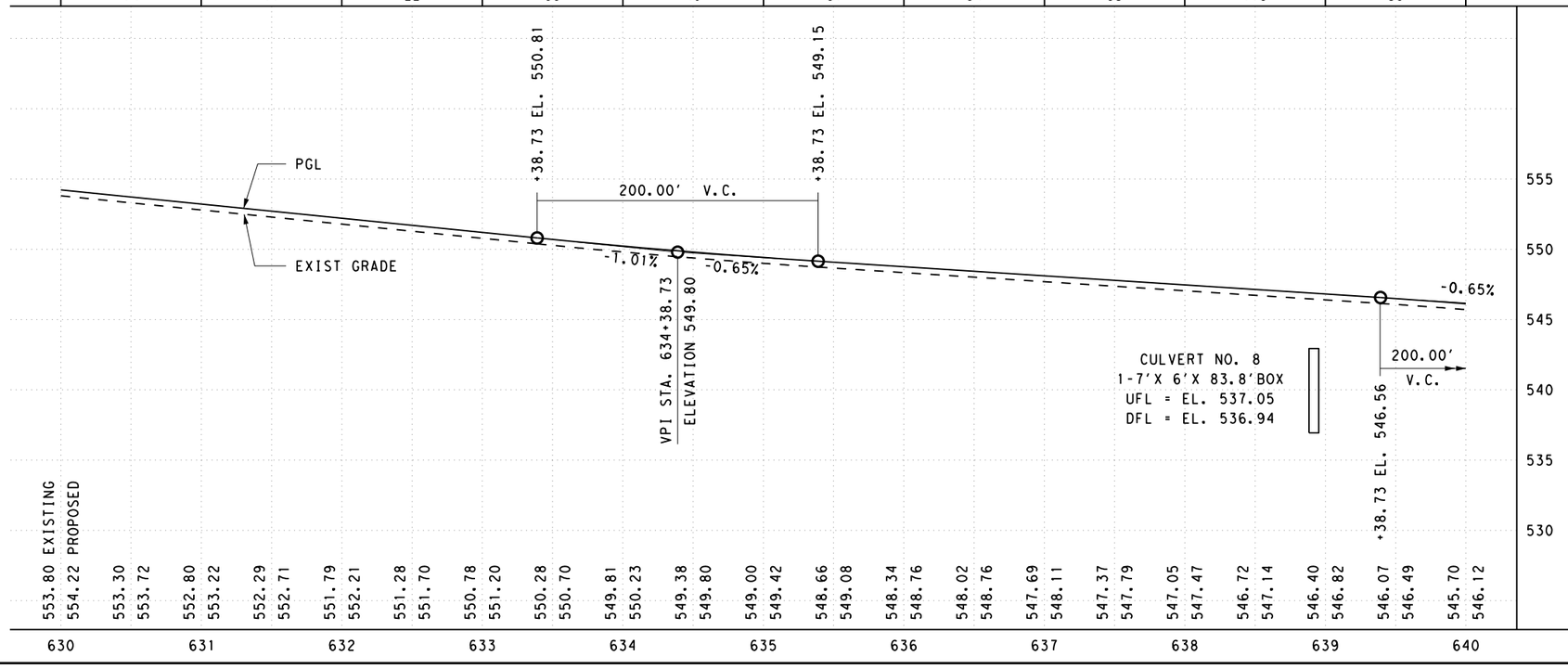
SHEET 13 OF 21

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		64



	15	12	9	6	5	6	3	1	6	10		
	14	17	22	33	40	31	34	95	119	53		

ITEM	DESCRIPTION	UNIT
432 6002	RIPRAP (CONC)(5 IN)	31 CY
110 6001	EXCAVATION (ROADWAY)	73 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	458 CY



STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

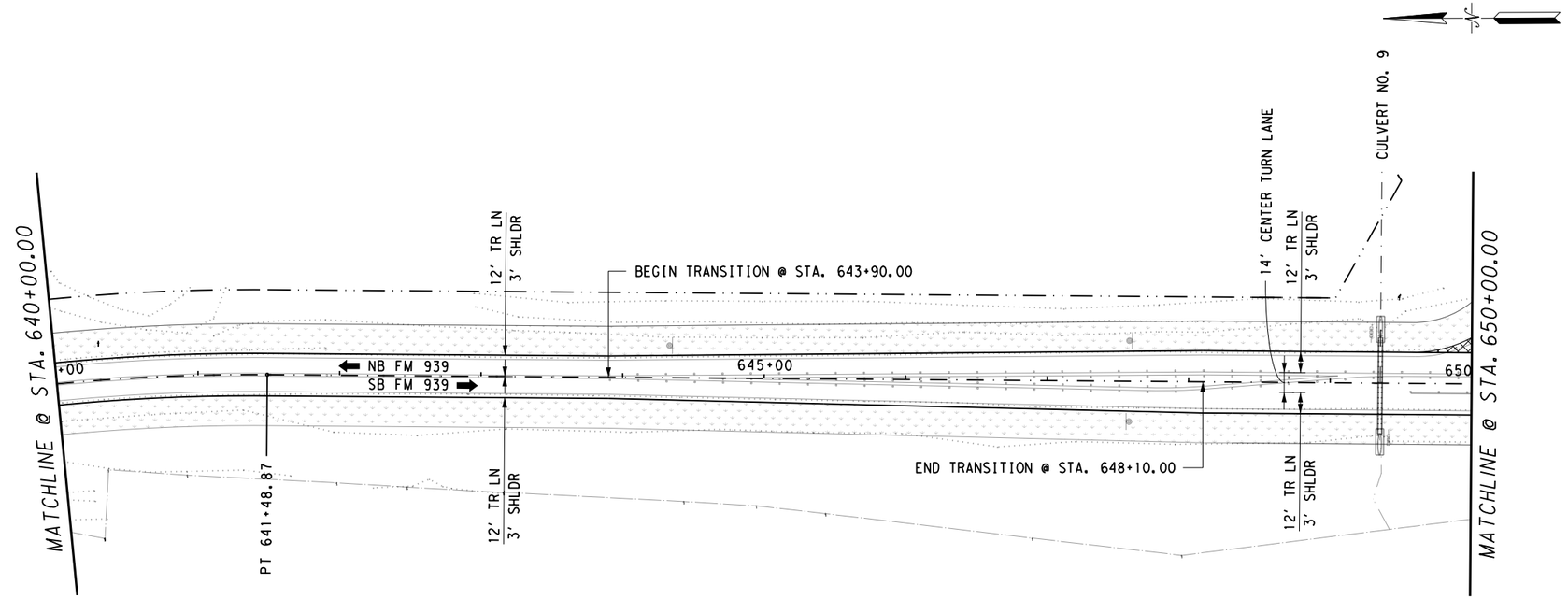
ROADWAY PLAN & PROFILE

FROM STA. 630+00.00 TO STA. 640+00.00
1192-01-027

SCALE: FEET
1" = 100.0' HORIZ.
1" = 10.0' VERTICAL

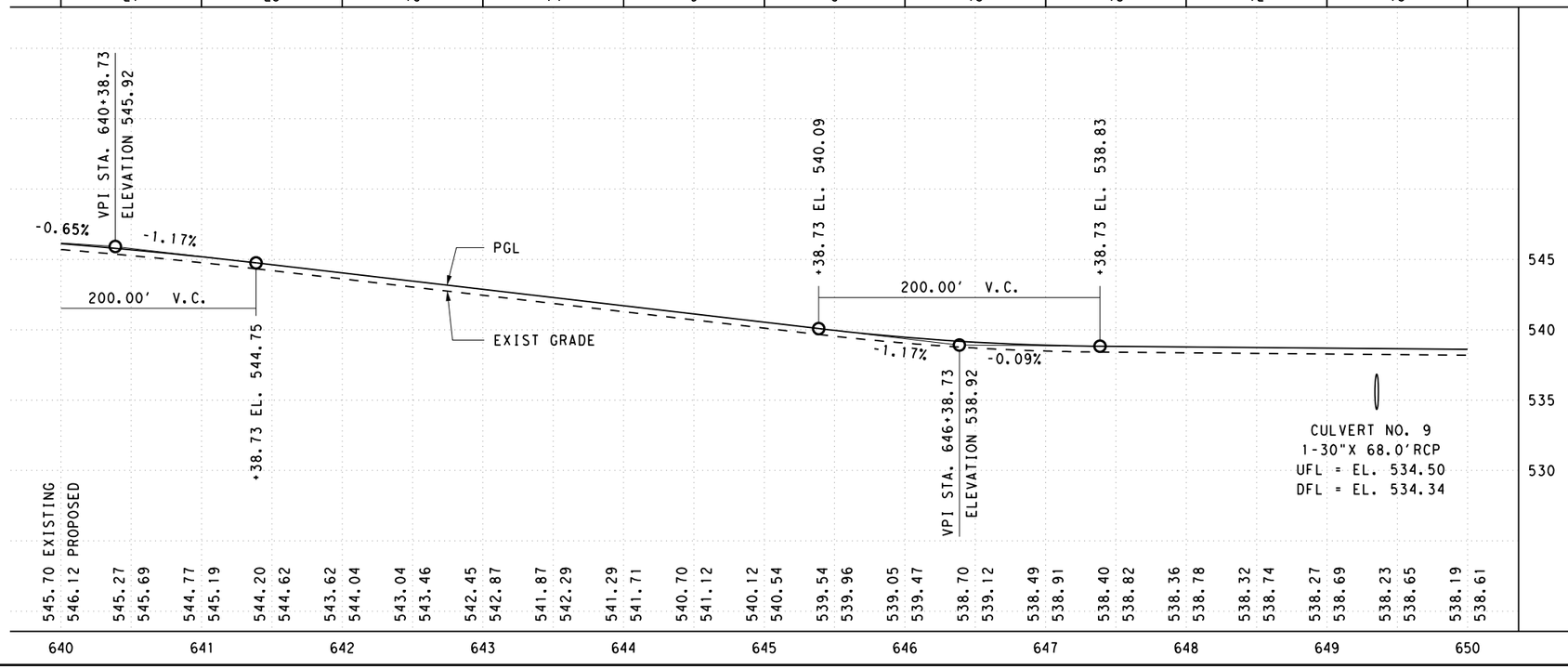
SHEET 14 OF 21

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		65



	8	7	9	13	17	22	23	16	14	18	
	27	23	18	14	9	8	13	15	12	13	

ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	147 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	152 CY



STATE OF TEXAS
BRADLEY MAYES
128276
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Bradley Mayes 7/6/2022

SIGNATURE OF REGISTRANT & DATE

ROADWAY PLAN & PROFILE

FROM STA. 640+00.00 TO STA. 650+00.00
1192-01-027

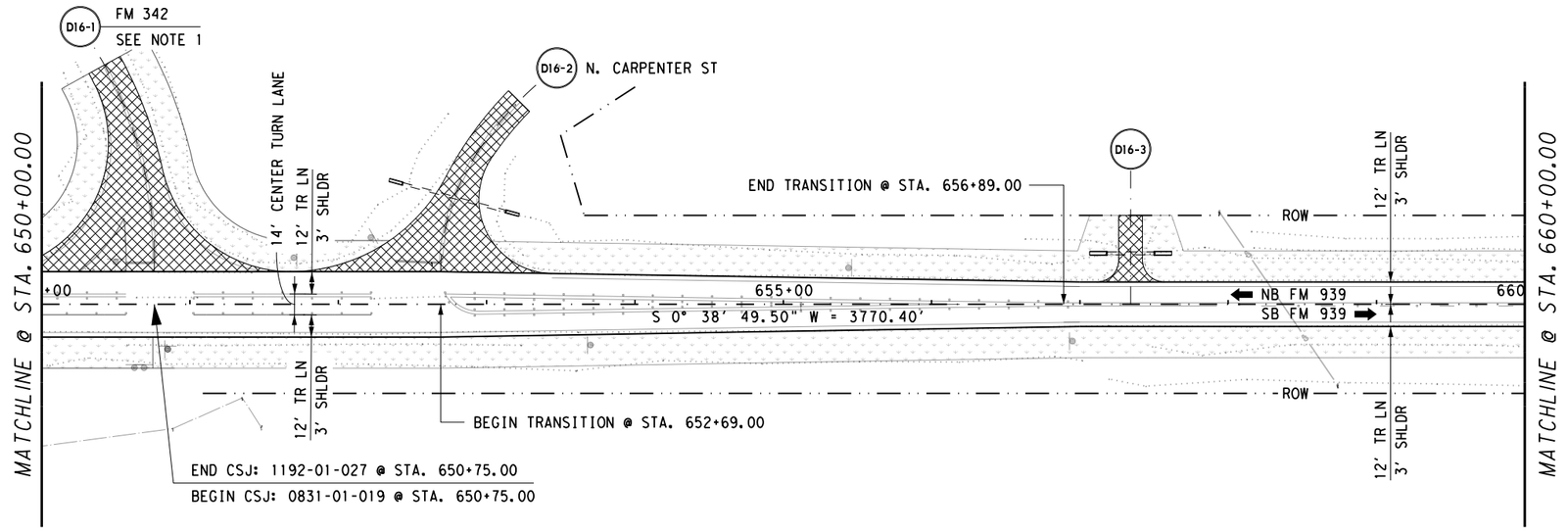
SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

SHEET 15 OF 21

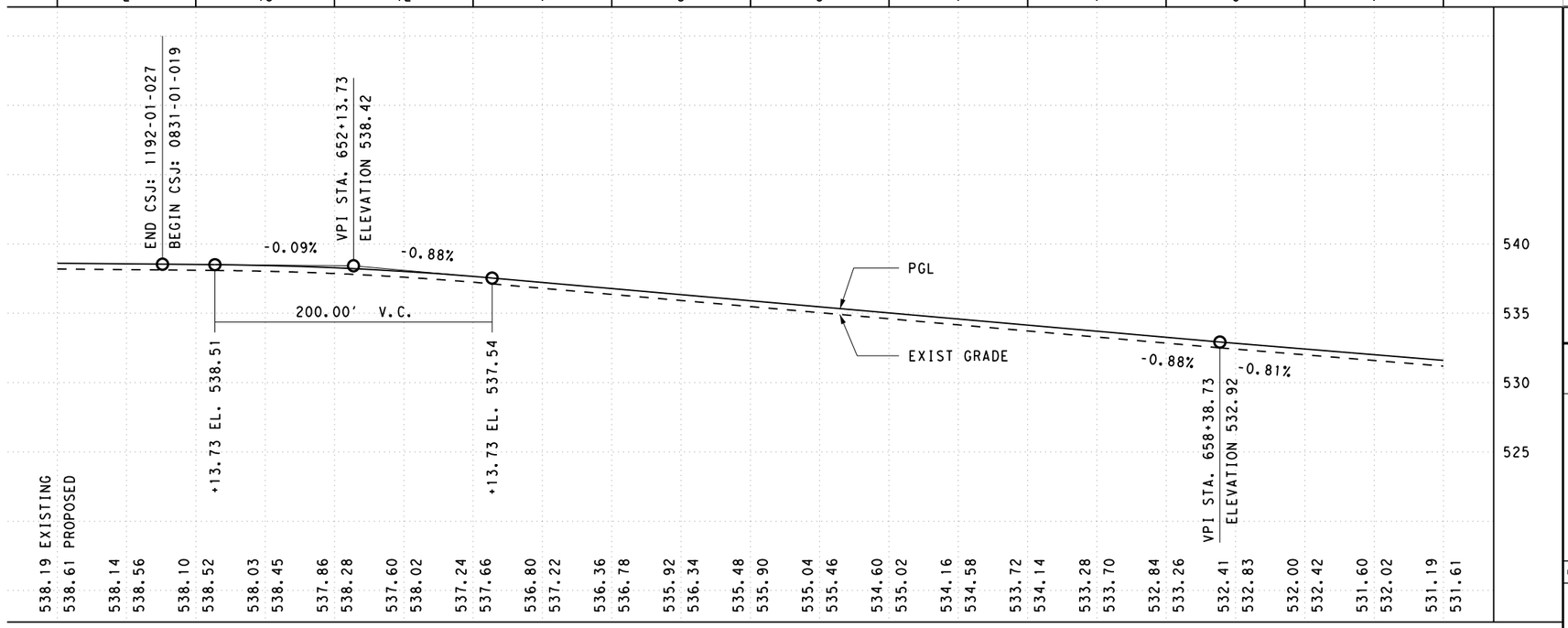
CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		66

NOTES:

1. THE INTERSECTION OF FM 342 (D16-1) WILL BE PAID UNDER CSJ: 0831-01-019



												ITEM	DESCRIPTION	UNIT
													CSJ: 1192-01-027	
	17											110 6001	EXCAVATION (ROADWAY)	17 CY
	7											132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	7 CY
													CSJ: 0831-01-019	
	6	22	22	21	22	22	19	21	22	21		110 6001	EXCAVATION (ROADWAY)	198 CY
	2	13	12	7	5	5	7	7	6	7		132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	69 CY



STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

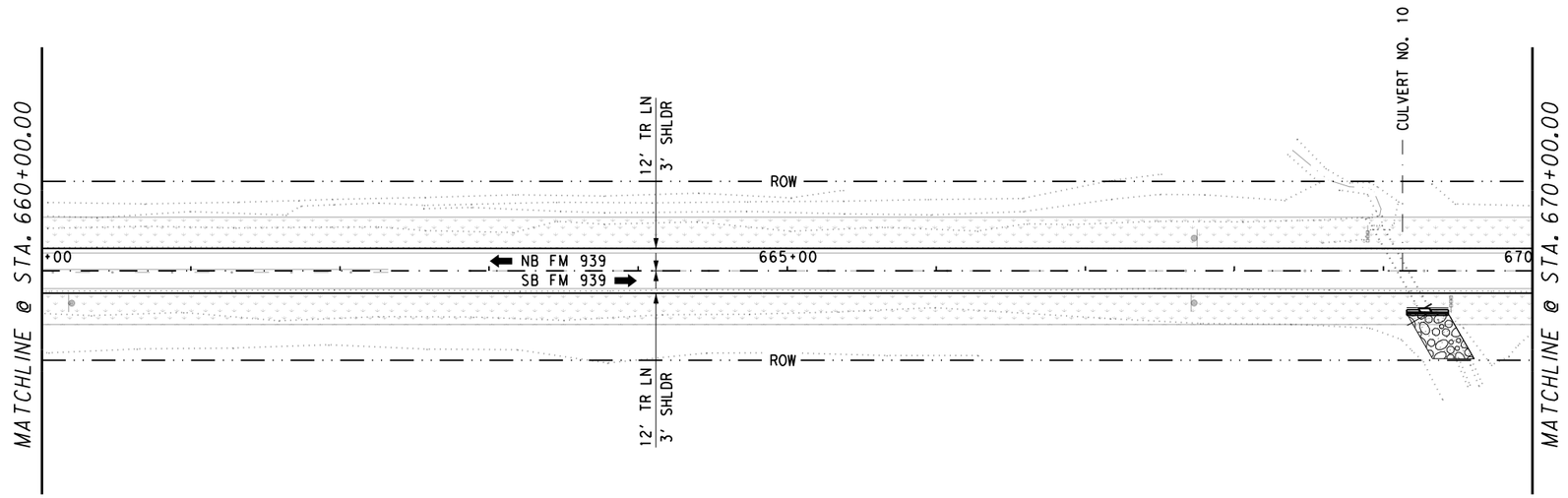
ROADWAY PLAN & PROFILE

FROM STA. 650+00.00 TO STA. 660+00.00
1192-01-027 & 0831-01-019

SCALE: FEET
1" = 100.0' HORIZ.
1" = 10.0' VERTICAL

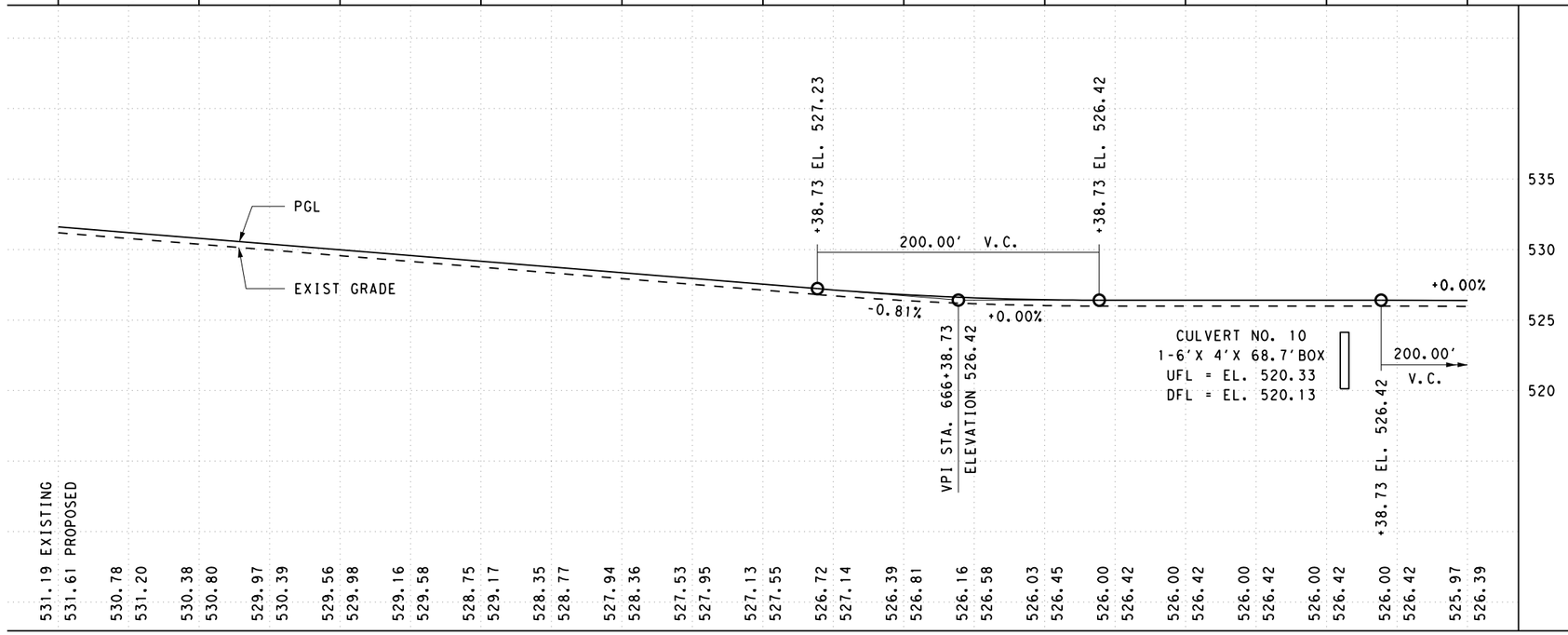
SHEET 16 OF 21

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		67



	19	19	19	17	16	16	15	14	17	17	
	13	15	12	13	14	13	13	12	9	11	

ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	169 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	125 CY



STATE OF TEXAS
BRADLEY MAYES
128276
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PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

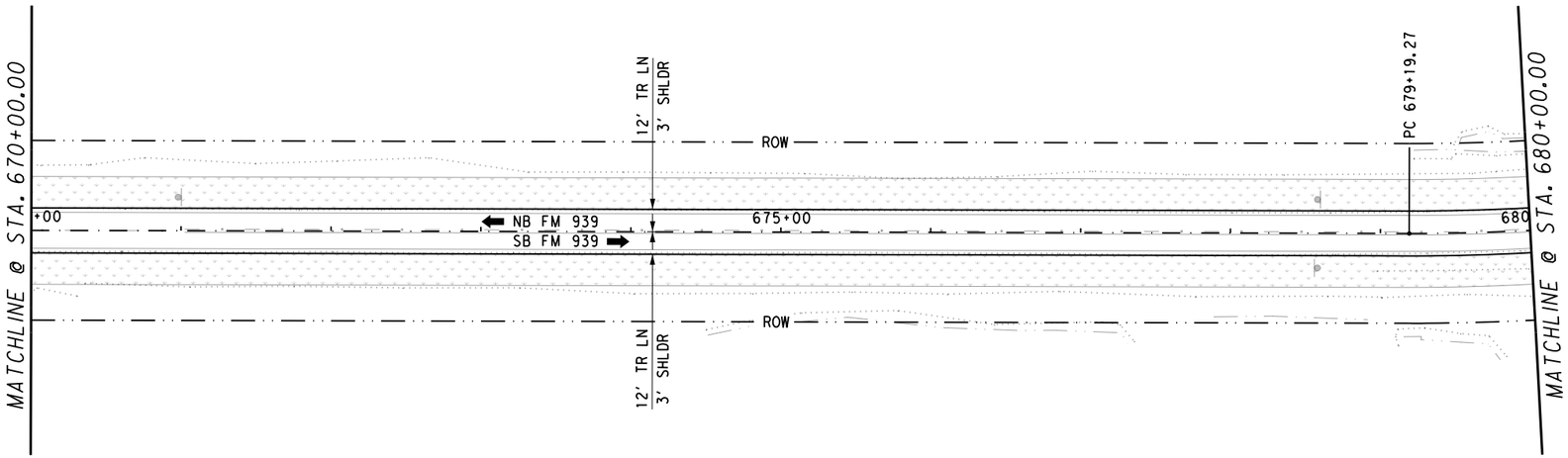
ROADWAY PLAN & PROFILE

FROM STA. 660+00.00 TO STA. 670+00.00
0831-01-019

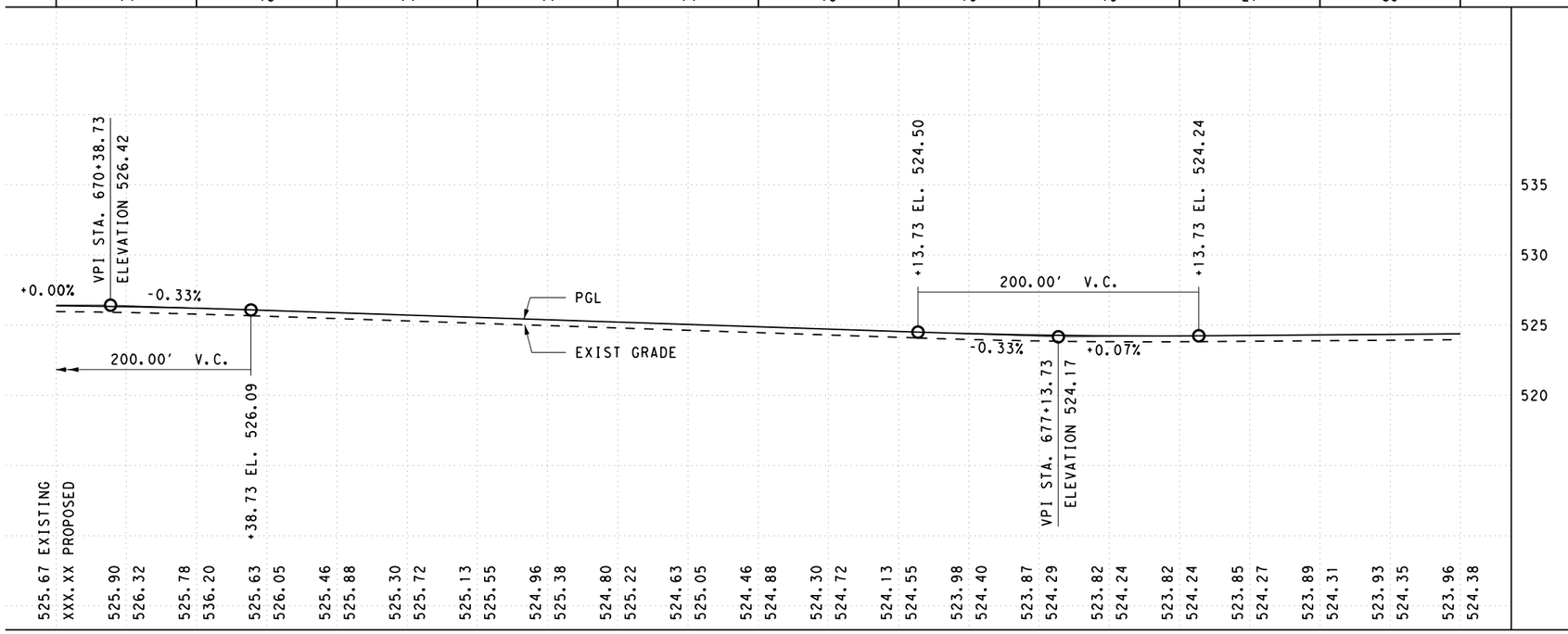
SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

SHEET 17 OF 21

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		68



	13	11	11	13	12	9	9	9	8	11	
	14	15	14	11	14	18	19	19	27	30	



ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	106 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	181 CY

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
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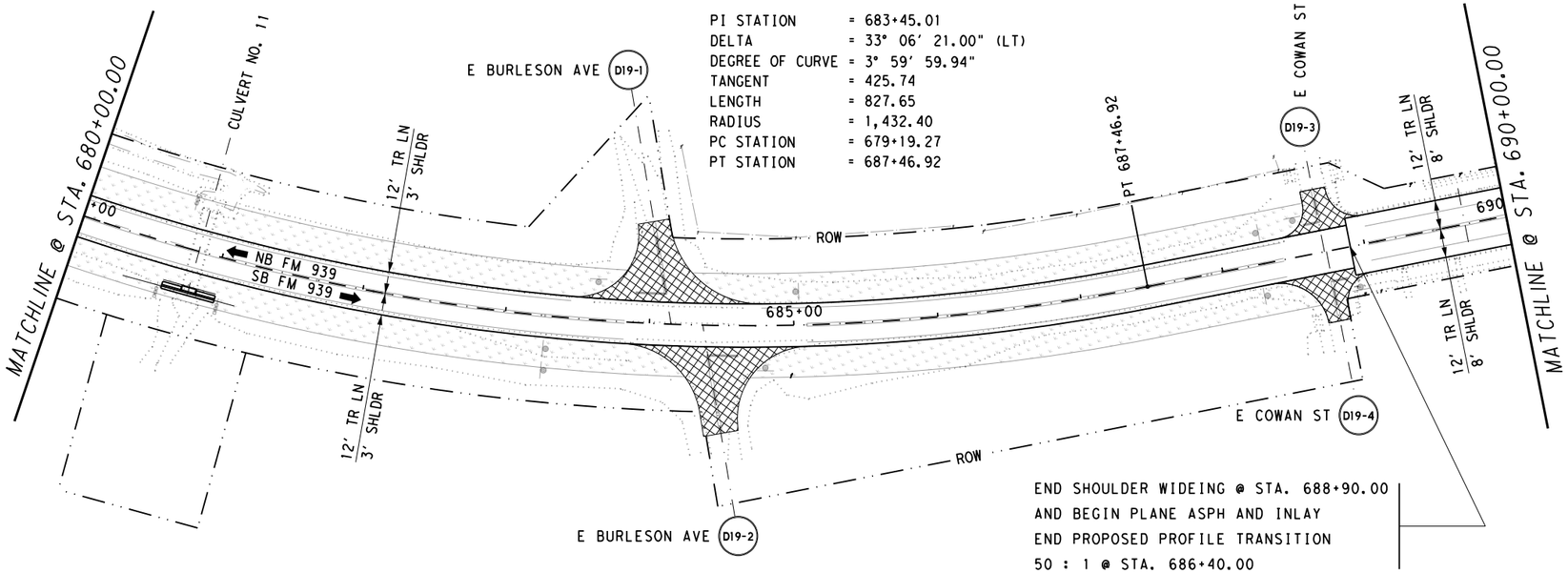
ROADWAY PLAN & PROFILE

FROM STA. 670+00.00 TO STA. 680+00.00
0831-01-019

SCALE: FEET
1" = 100.0' HORIZ.
1" = 10.0' VERTICAL

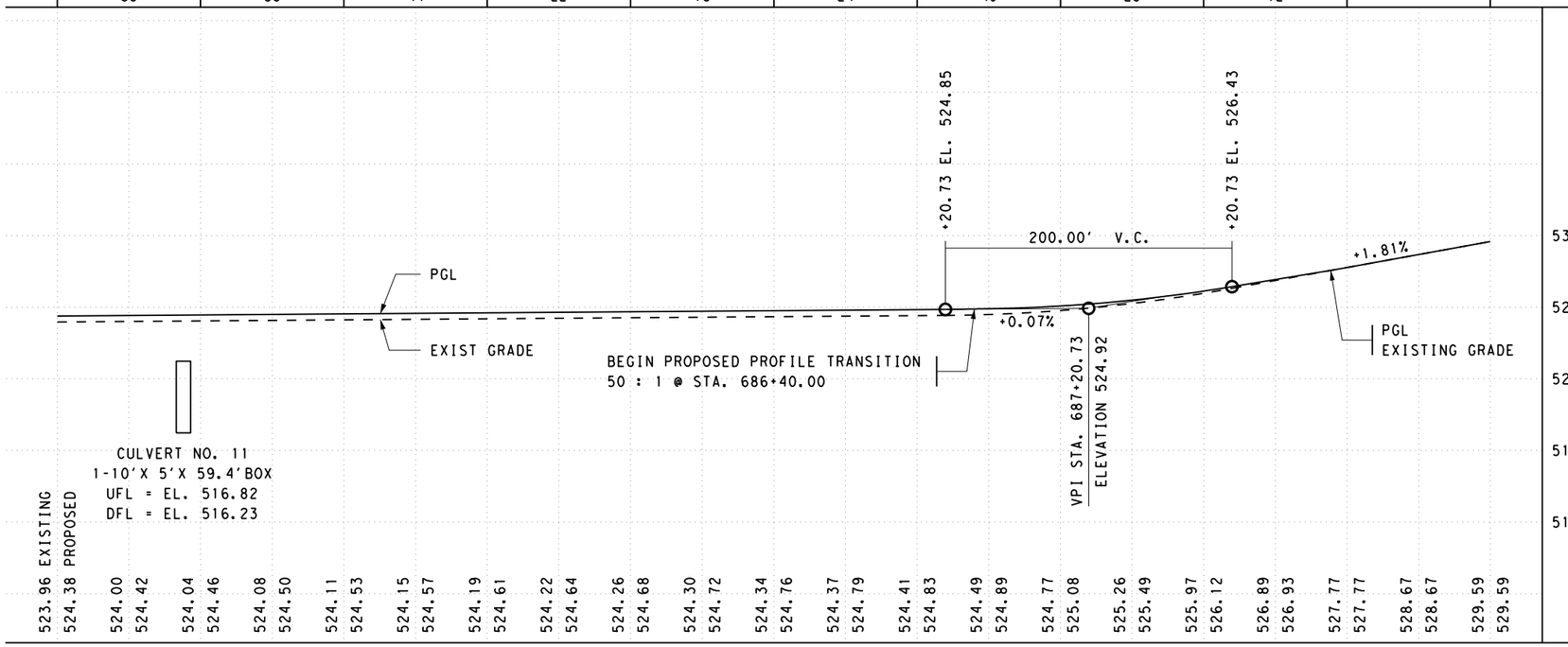
SHEET 18 OF 21

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		69



	16	12	12	15	13	11	11	12	16	
	38	58	44	22	18	24	40	28	12	

ITEM	DESCRIPTION	UNIT
110 6001	EXCAVATION (ROADWAY)	118 CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	284 CY



STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

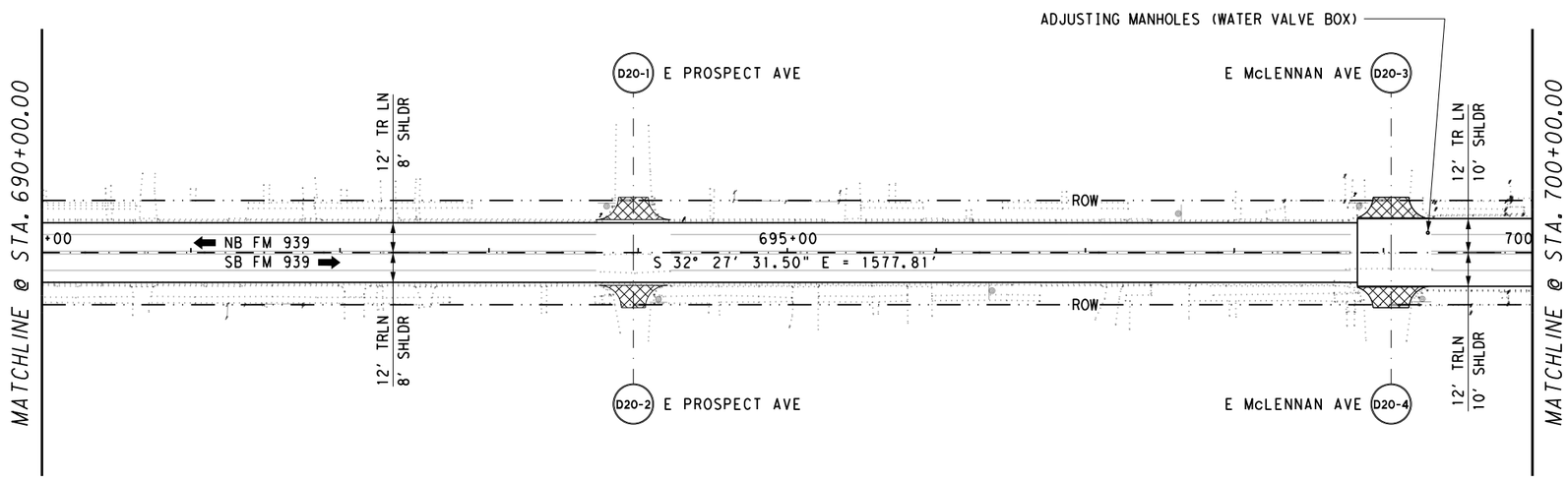
Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

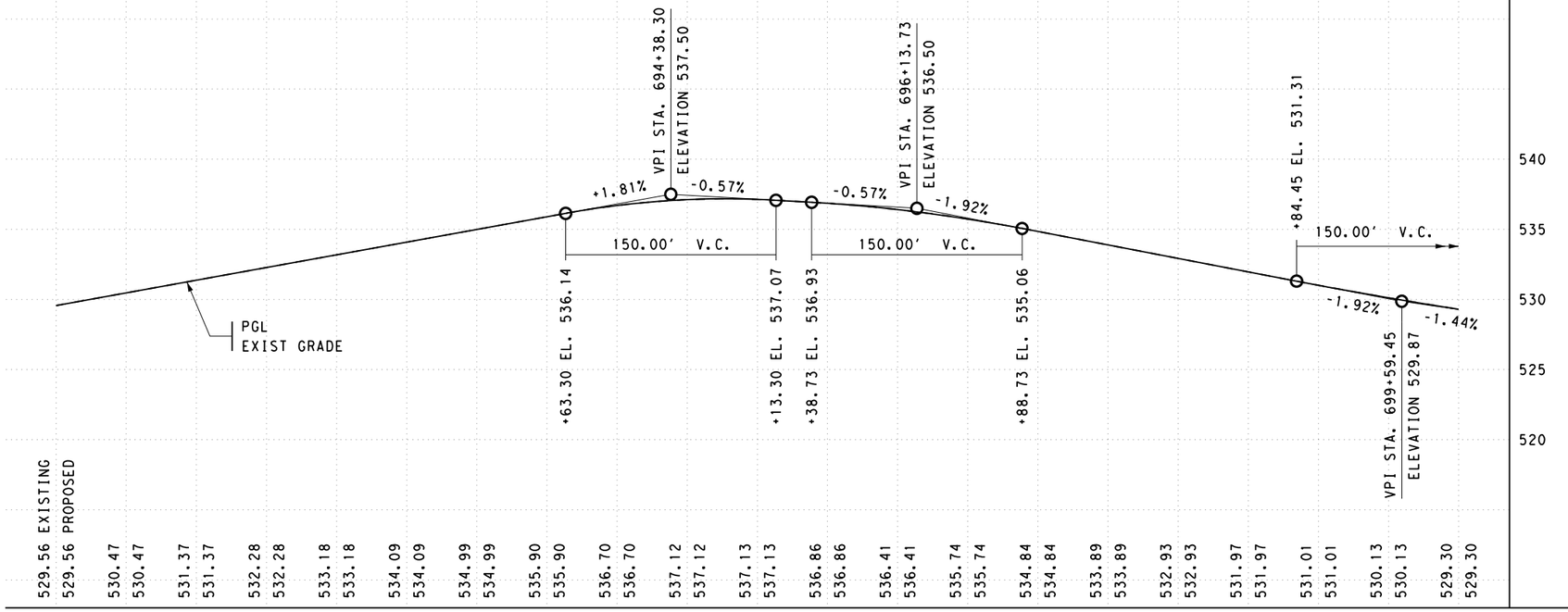
ROADWAY PLAN & PROFILE

FROM STA. 680+00.00 TO STA. 690+00.00
0831-01-019

SCALE: FEET
1" =100.0' HORIZ.
1" =10.0' VERTICAL

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		70





ITEM	DESCRIPTION	UNIT
479 6005	ADJUSTING MANHOLES (WATER VALVE BOX)	1 EA
110 6001	EXCAVATION (ROADWAY)	
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

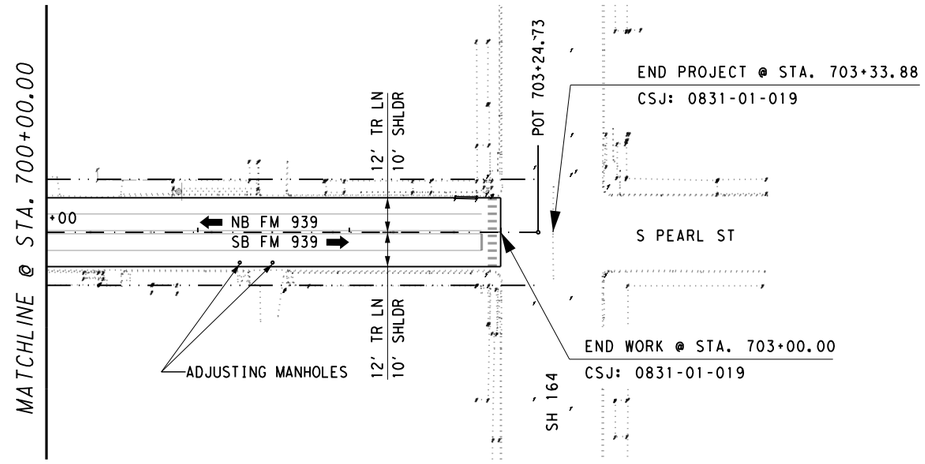
ROADWAY PLAN & PROFILE

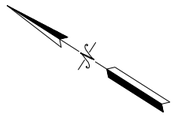
FROM STA. 690+00.00 TO STA. 700+00.00
0831-01-019

SCALE: FEET
1" = 100.0' HORIZ.
1" = 10.0' VERTICAL

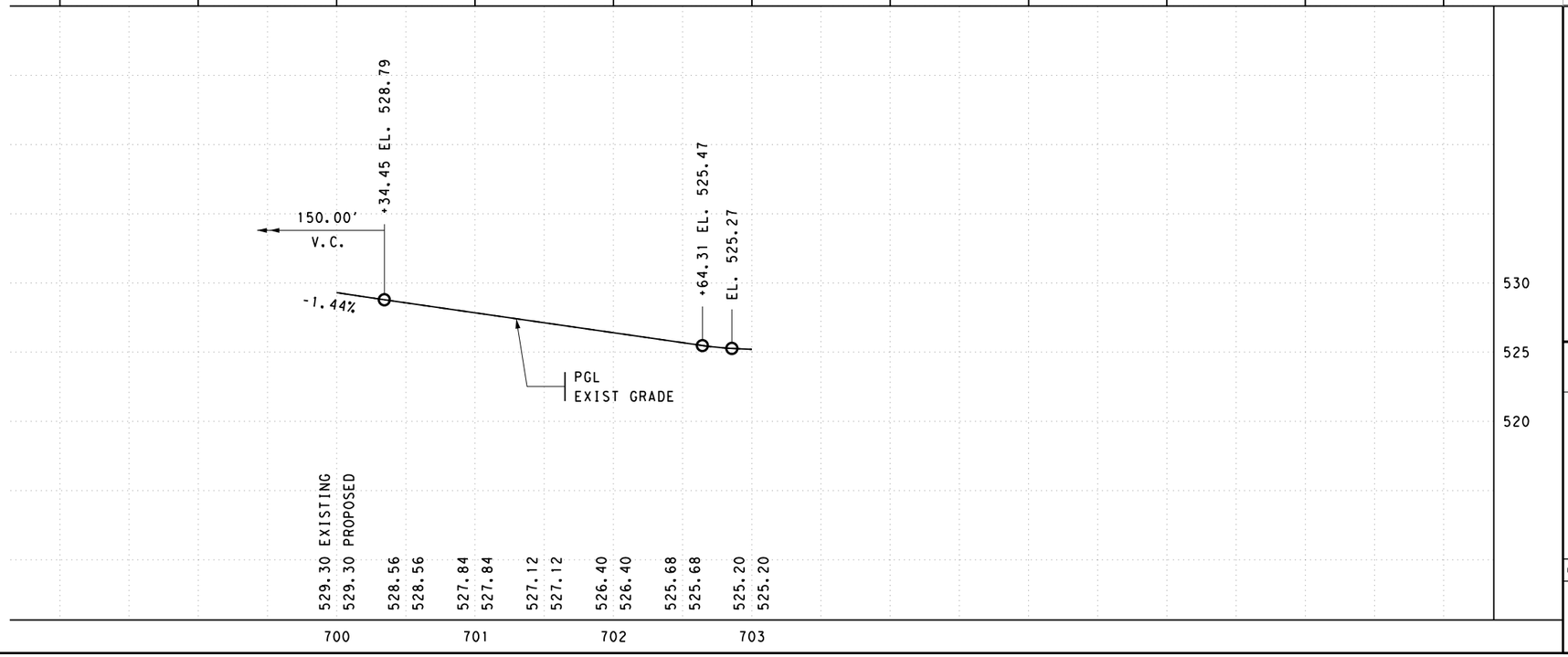
SHEET 20 OF 21

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		71





ITEM	DESCRIPTION	UNIT
479 6001	ADJUSTING MANHOLES	2 EA
110 6001	EXCAVATION (ROADWAY)	
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	



STATE OF TEXAS
BRADLEY MAYES
128276
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Bradley Mayes 4/15/2022

SIGNATURE OF REGISTRANT & DATE

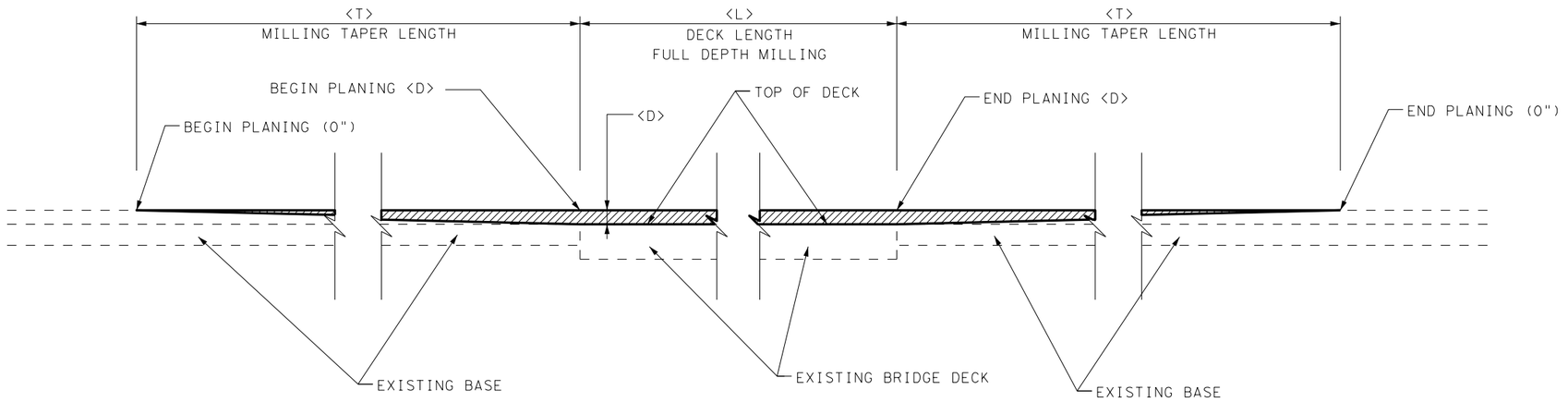
ROADWAY PLAN & PROFILE

FROM STA. 700+00.00 TO STA. 703+33.88
0831-01-019

SCALE: FEET
1" = 100.0' HORIZ.
1" = 10.0' VERTICAL

SHEET 21 OF 21

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		72



MILLING DETAIL

BRIDGE NAME	LIMITS (STA)	<D> (IN)	<T> (FT)	<L> (FT)	PLANE ASPH CONC PAV (0"-3") SY
09-161-0-1192-01-003	FROM 560+08.74 TO 566+68.43	3"	534.69'	125.0'	2,199 SY

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

BRIDGE MILLING DETAIL SHEET

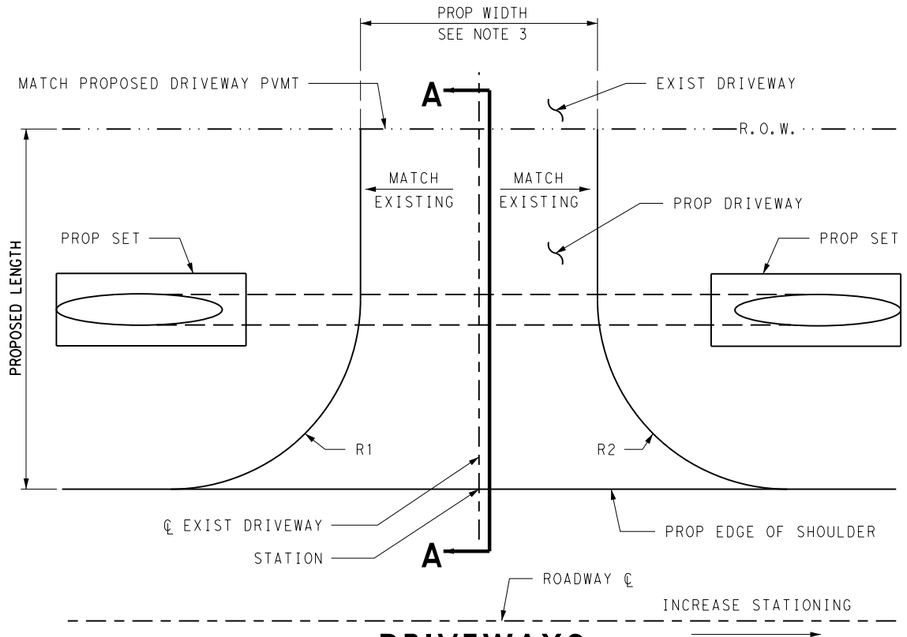
FROM STA. 560+08.74 TO STA. 566+68.43
CSJ: 1192-01-027

SCALE: 1" = NONE HORIZ. FEET

SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		73

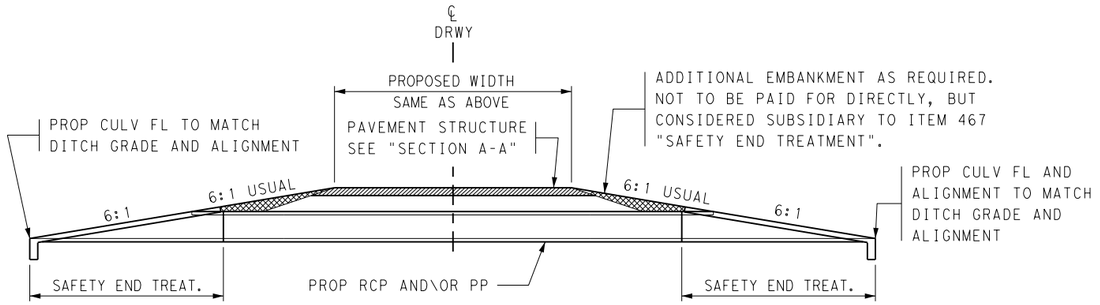
NODE pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\08310101 9\4 - Design\Plan Set\3. Roadway\Plan Sheets\000 BRIDGE MILLING DETAIL
7/6/2022
8:47:27 AM



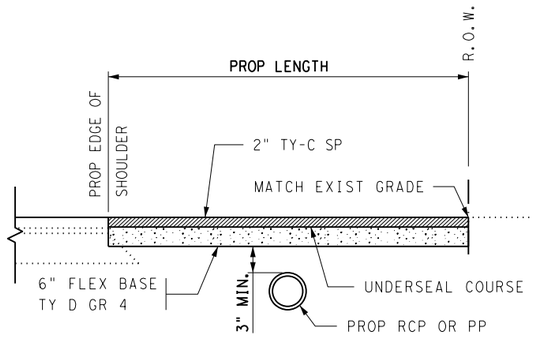
DRIVEWAYS

DRIVEWAYS WILL CONSIST OF: BLADING AND RESHAPING THE SUBGRADE, WORKING DITCH SLOPES UPSTREAM AND DOWNSTREAM TO ALLOW POSITIVE DRAINAGE OF ADJACENT DITCHES, PROVIDING ADDITIONAL EMBANKMENT NECESSARY TO ACHIEVE PROPER SUBGRADE WIDTH, PLACEMENT OF 4" OR 6" FLEX BASE, UNDERSEAL COURSE AND 2" TY C ACP AS SHOWN VIA SECTION A-A. SEE SECTION A-A FOR DETAILS. ALL WORK IS CONSIDERED SUBSIDIARY TO ITEM 530.

REMOVAL OF 6" TO 8" OF EXISTING DRIVEWAY WILL BE MEASURED AND PAID IN ACCORDANCE WITH ITEM 105.

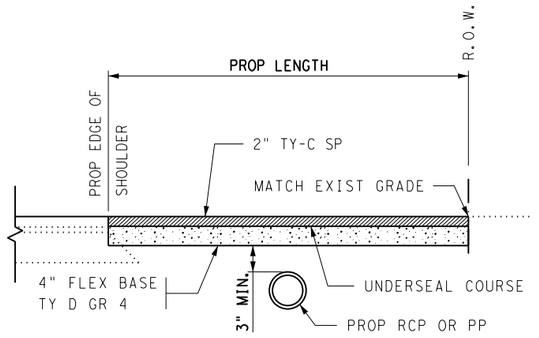


DRIVEWAY TYPICAL SECTION



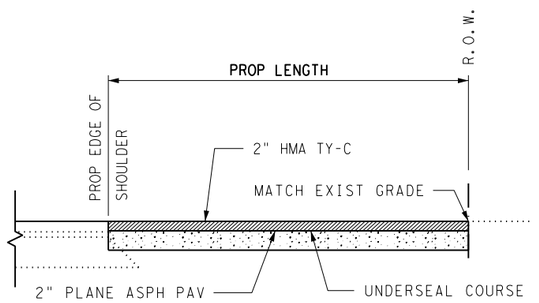
SECTION A-A

DRIVEWAYS (ACP)(TYPE 1)
LOCAL ROADS



SECTION A-A

DRIVEWAYS (ACP)(TYPE 2)
DRIVEWAYS



SECTION A-A

DRIVEWAYS (ACP)(TYPE 3)
PLAN ACP PAV AND OVERLAY

NOTES:

1. SAW CUT JOINT AT LIMIT OF ROW LINE ON DRIVEWAYS WITH AN EXISTING CONCRETE OR ASPHALT SURFACE
2. SEE PLAN LAYOUTS AND DRIVEWAY QUANTITIES FOR ADDITIONAL DETAILS & DIMENSIONS.
3. MINIMUM DRIVEWAY WIDTH IS 16′ FOR DRIVEWAY RECONSTRUCTION. MINIMUM LOCAL ROAD WIDTH IS 24′ FOR RECONSTRUCTION. IF EXISTING DRIVEWAY WIDTH AT ROW LINE IS LESS THAN 16′, THEN TAPER THE PROPOSED WIDTH 5′ FROM ROW TO EXISTING WIDTH AT ROW.
4. FINAL PAVEMENT SURFACE FOR DRIVEWAY WILL BE CONSTRUCTED WITH FINAL ROADWAY SURFACE. ALL WORK WILL BE PAID UNDER ITEM 530.
5. ADDITIONAL GRADING OF DITCHES ADJACENT TO DRIVEWAY PIPE MAY BE REQUIRED TO PLACE PIPE AT PROPER DEPTH BELOW PROPOSED DRIVEWAY AND MAINTAIN POSITIVE DRAINAGE.
6. ADDITIONAL GRADING OF DITCHES ADJACENT TO DRIVEWAY PIPE MAY BE REQUIRED TO PLACE PIPE AT PROPER DEPTH BELOW PROPOSED DRIVEWAY AND MAINTAIN POSITIVE DRAINAGE.
7. REMOVAL OF EXISTING CONCRETE, ASPHALT AND GRAVEL DRIVEWAY IS SUBSIDIARY TO ITEM 530.

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022
SIGNATURE OF REGISTRANT & DATE

DRIVEWAY DETAILS

NO SCALE SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		74

NODE pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\083101019\4 - Design\Plan Set\3. Roadway\Plan Sheets\000 DRIVEWAY DETAIL.dgn
7/6/2022
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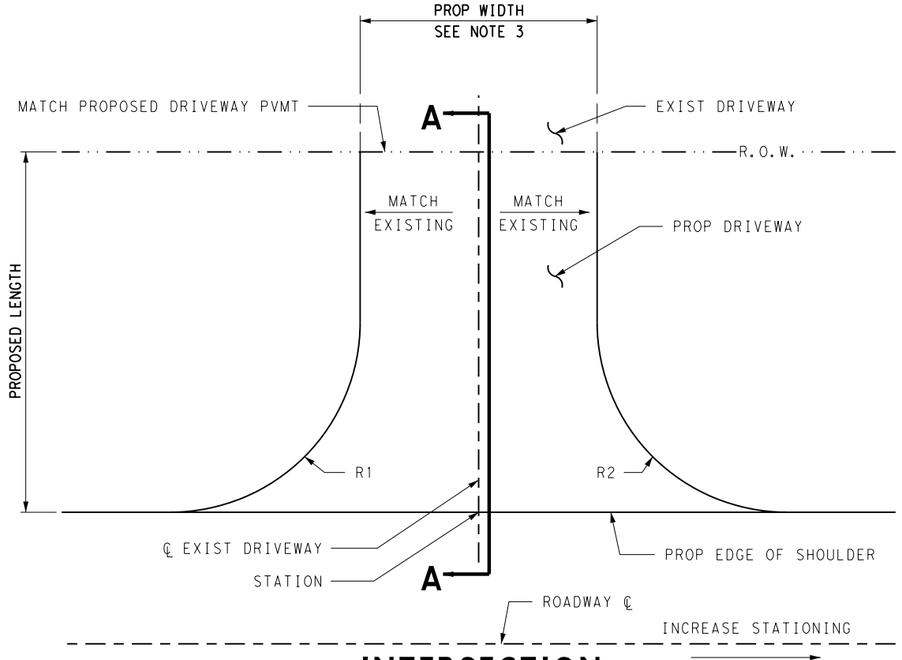
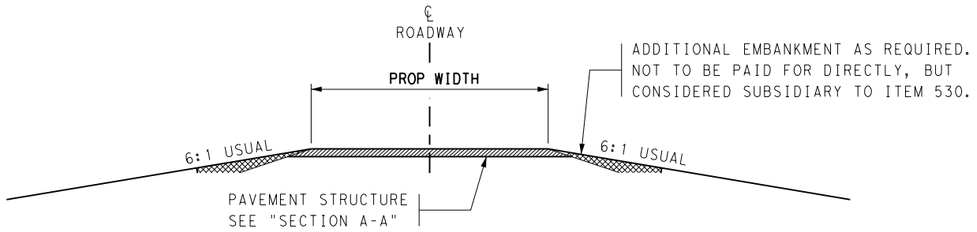


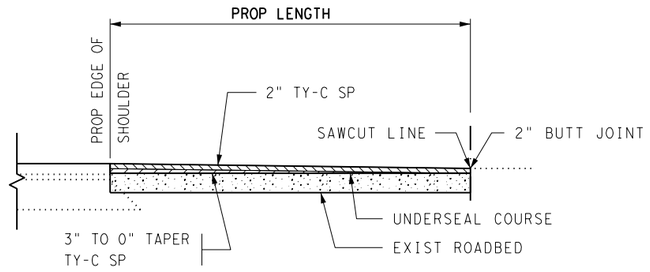
INTERSECTION

INTERSECTIONS WILL CONSIST OF: BLADING AND RESHAPING THE SUBGRADE, WORKING DITCH SLOPES UPSTREAM AND DOWNSTREAM TO ALLOW POSITIVE DRAINAGE OF ADJACENT DITCHES, PROVIDING ADDITIONAL EMBANKMENT NECESSARY TO ACHIEVE PROPER SUBGRADE WIDTH, PLACEMENT 5" TY C ACP. SEE SECTION A-A FOR DETAILS. ALL WORK IS CONSIDERED SUBSIDIARY TO ITEM 530.

REMOVAL OF 6" TO 8" OF EXISTING DRIVEWAY WILL BE MEASURED AND PAID IN ACCORDANCE WITH ITEM 105.



INTERSECTION TYPICAL SECTION

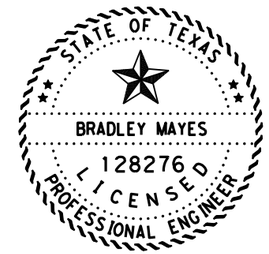


SECTION A-A

INTERSECTIONS (ACP)

NOTES:

1. SAW CUT JOINT AT LIMIT OF PAY LINE ON INTERSECTION WITH AN EXISTING CONCRETE OR ASPHALT SURFACE.
2. SEE PLAN LAYOUTS AND INTERSECTION QUANTITIES FOR ADDITIONAL DETAILS & DIMENSIONS.
3. MINIMUM INTERSECTION WIDTH IS 24' FOR INTERSECTION RECONSTRUCTION. MATCH EXISTING WIDTH FOR INTERSECTION THAT IS TO BE RESURFACED.
4. FINAL PAVEMENT COURSE FOR INTERSECTIONS WILL BE CONSTRUCTED WITH FINAL ROADWAY SURFACE. ALL WORK WILL BE PAID UNDER ITEM 530.
5 ADDITIONAL GRADING OF DITCHES ADJACENT TO INTERSECTION PIPE MAY BE REQUIRED TO PLACE PIPE AT PROPER DEPTH BELOW PROPOSED DRIVEWAY AND MAINTAIN POSITIVE DRAINAGE.



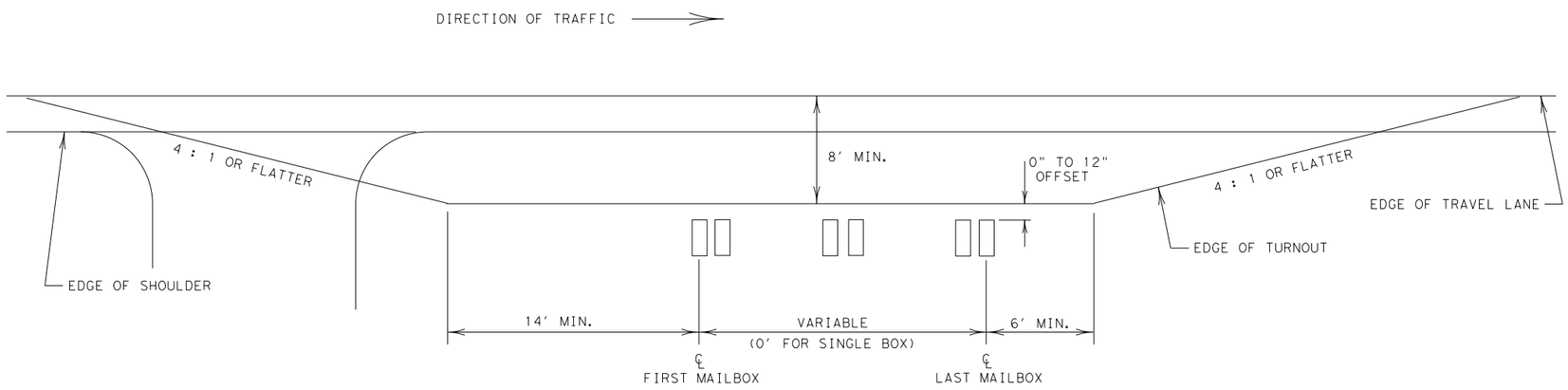
Bradley Mayes 7/6/2022

SIGNATURE OF REGISTRANT & DATE

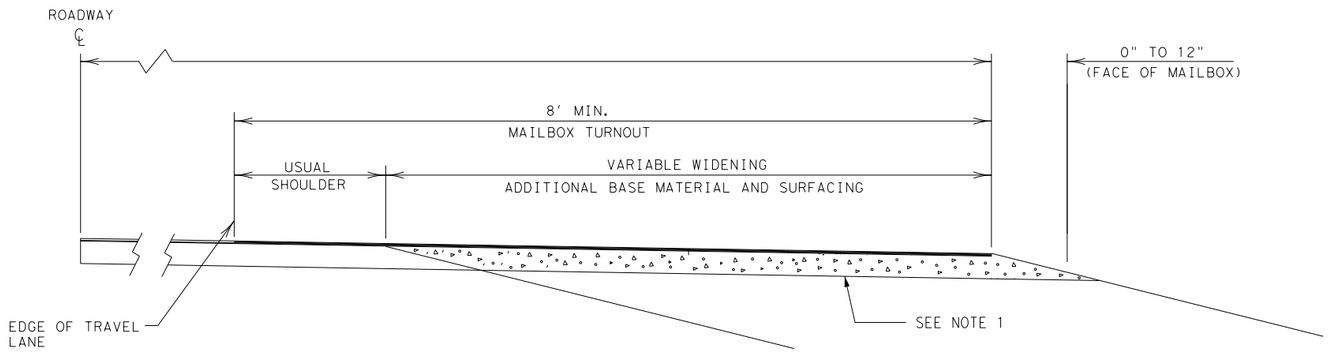
INTERSECTION DETAILS

NO SCALE SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		75



PLAN



TYPICAL SECTION

NOTES:

1. USE THE PROPOSED ROADWAY PAVEMENT STRUCTURE TO BE PAID FOR UNDER THE ROADWAY ITEMS.

STATE OF TEXAS
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128276
LICENSED
PROFESSIONAL ENGINEER

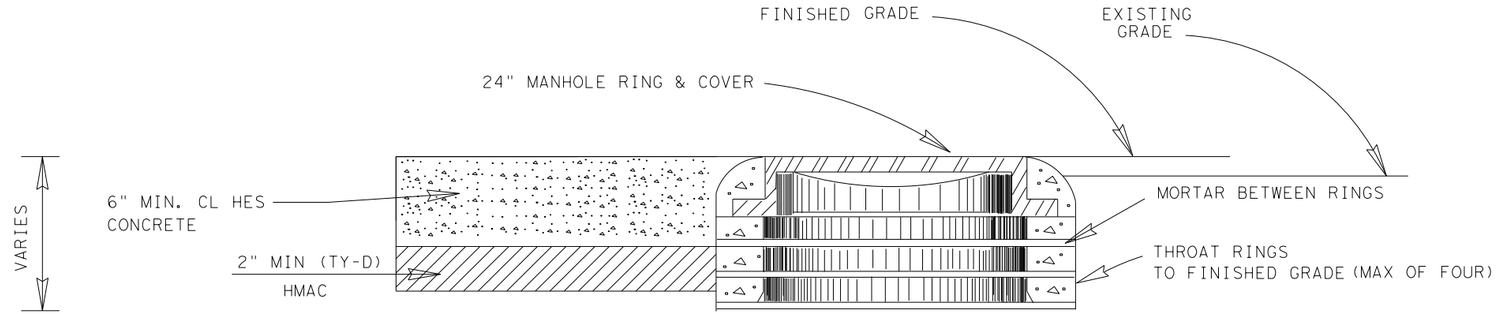
Bradley Mayes 4/15/2022

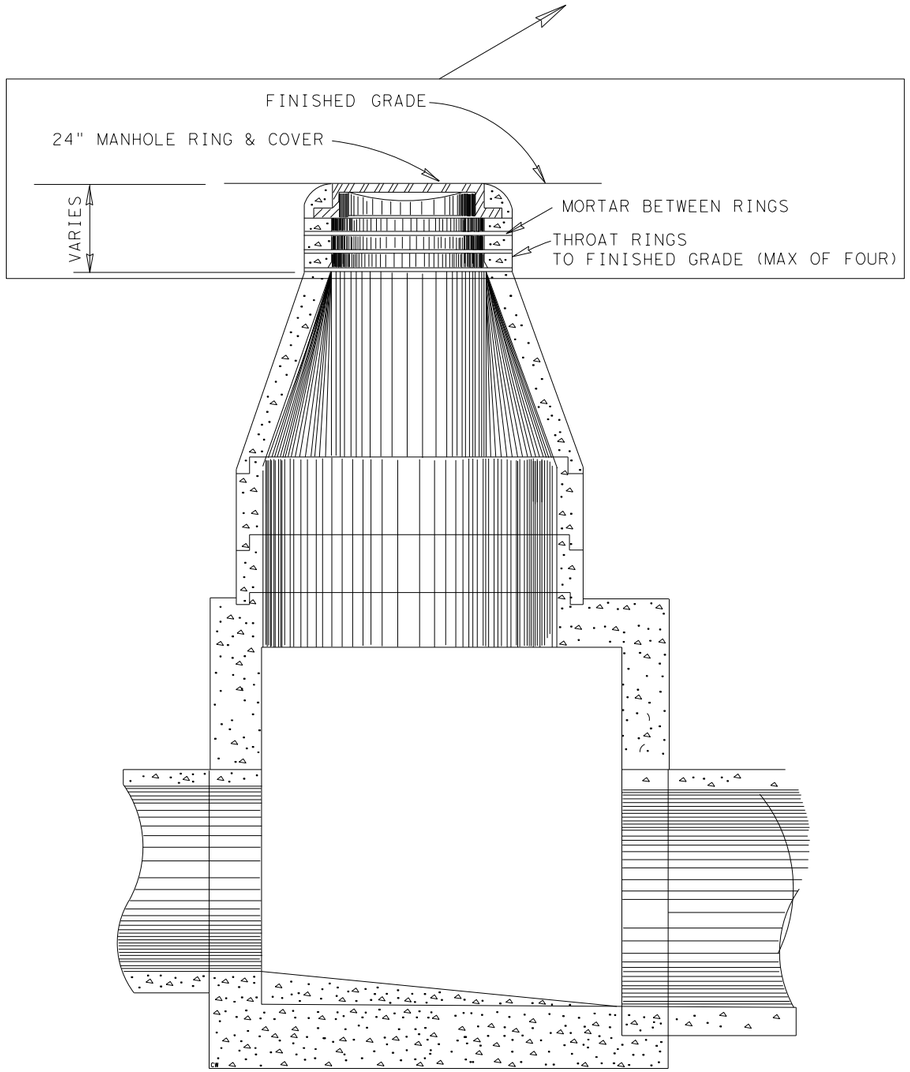
SIGNATURE OF REGISTRANT & DATE

MAILBOX TURNOUT DETAILS

SCALE: AS NOTED SHEET 1 OF 1

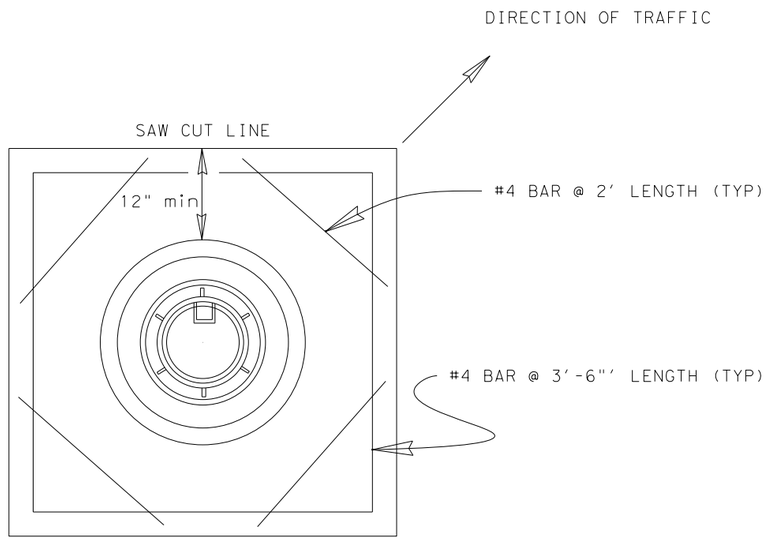
CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		76





ADD OR REMOVE RINGS AND MORTAR AS REQUIRED
TO BRING COVER FLUSH WITH FINISHED ROAD SURFACE
SAW CUT AREA TO BE REMOVED TO PROVIDE SMOOTH
CLEAN REPAIR JOINT

TYPICAL REPAIR QUANTITIES
CL HES CONCRETE = 0.25 CY
TY-D HMAC = 0.15 TONS
#4 REBAR = 14.7 LBS



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PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022
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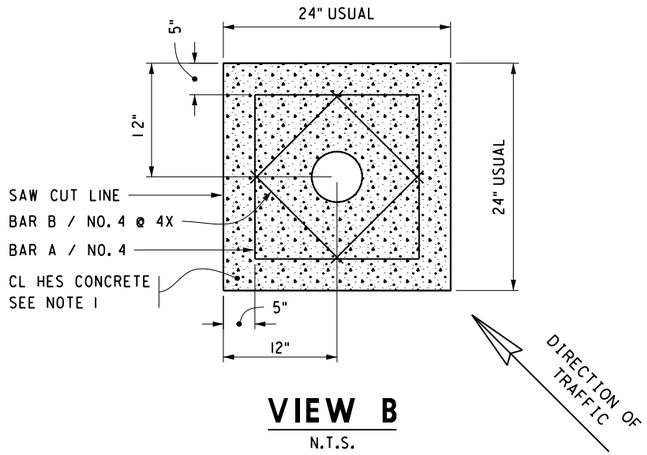
MANHOLE ADJUSTMENT DETAIL

SCALE: FEET
1" = NONE HORIZ.
SHEET 1 OF 1

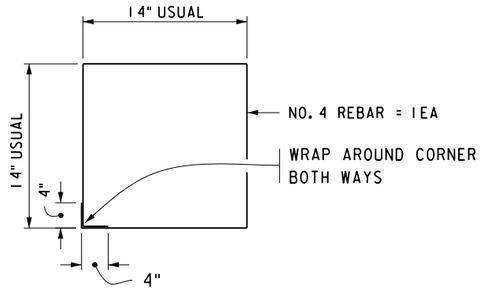
CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		77

NOTES:

(1) CL HES CONCRETE WILL NOT BE PAID FOR DIRECTLY BUT WILL BE CONSIDERED SUBSIDIARY TO ITEM 479-6005 ADJUSTING MANHOLES (WATER VALVE BOX).

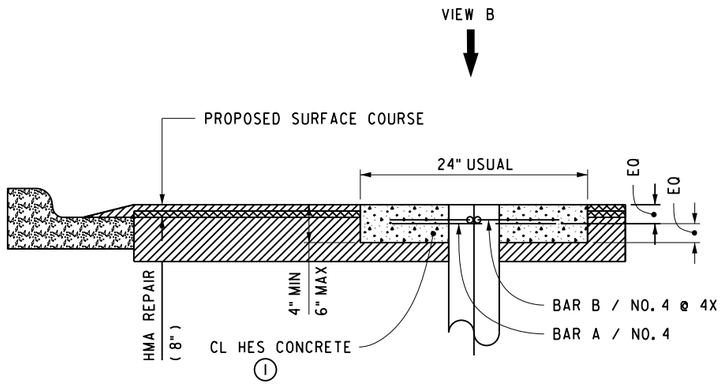


VIEW B
N.T.S.

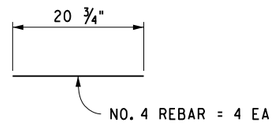


BAR A DETAIL
N.T.S.

104" L = 5.8 LB
SEE NOTE 1

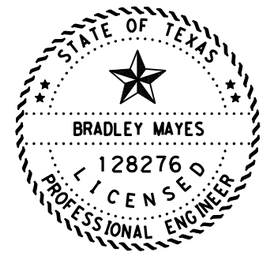


SECTION A
N.T.S.



BAR B DETAIL
N.T.S.

20 3/4" L = 1.2 LB
SEE NOTE 1



Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

WATER VALVE BOX ADJUSTMENT DETAIL

SHEET 1 OF 1

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		78

DATE: 4/15/2022 12:46:00 PM
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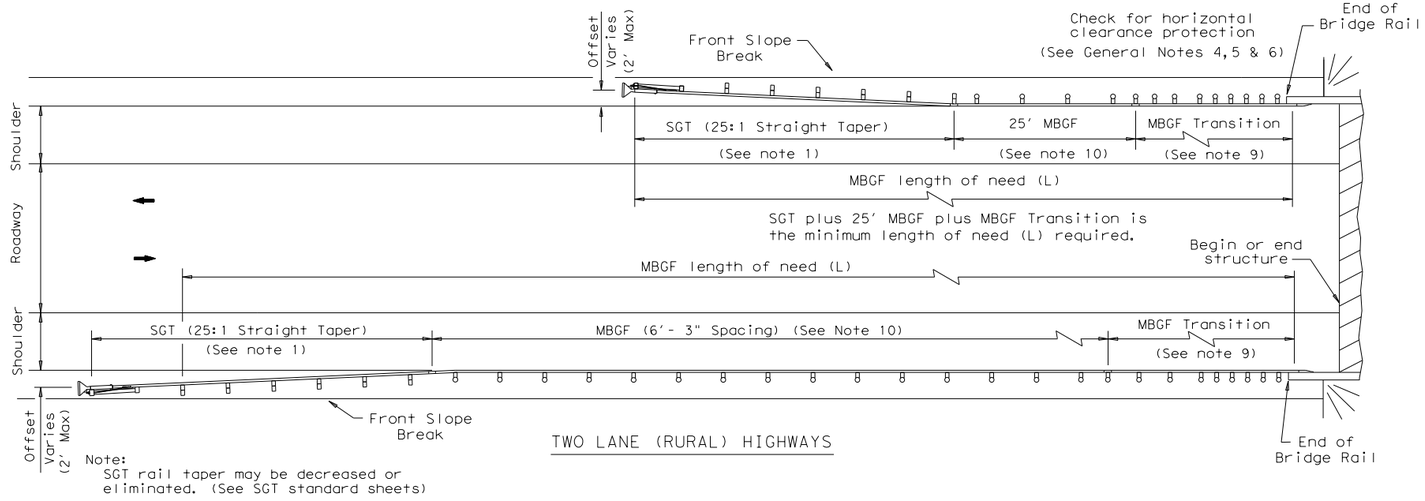
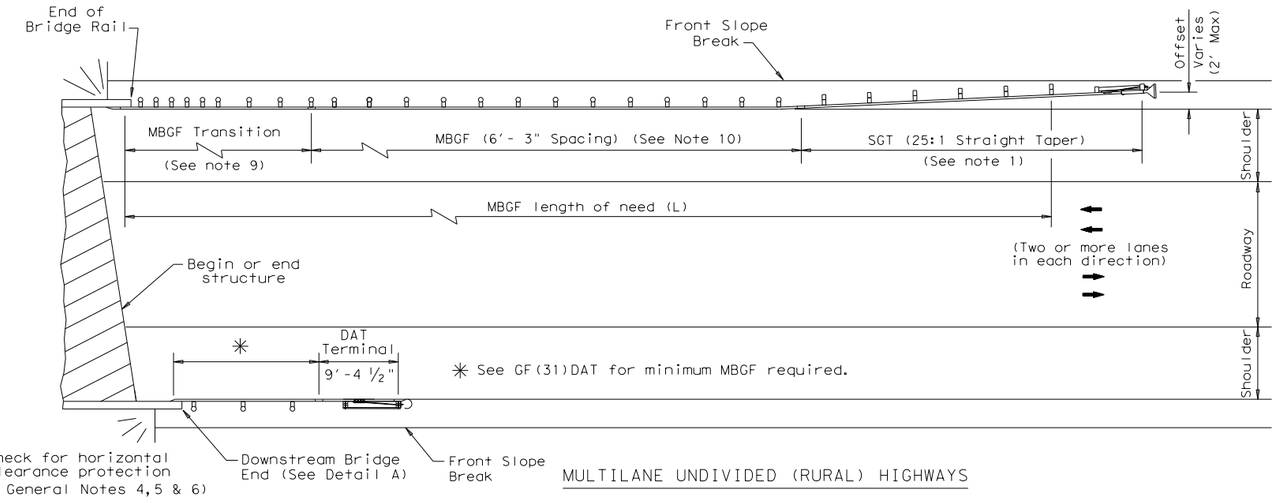
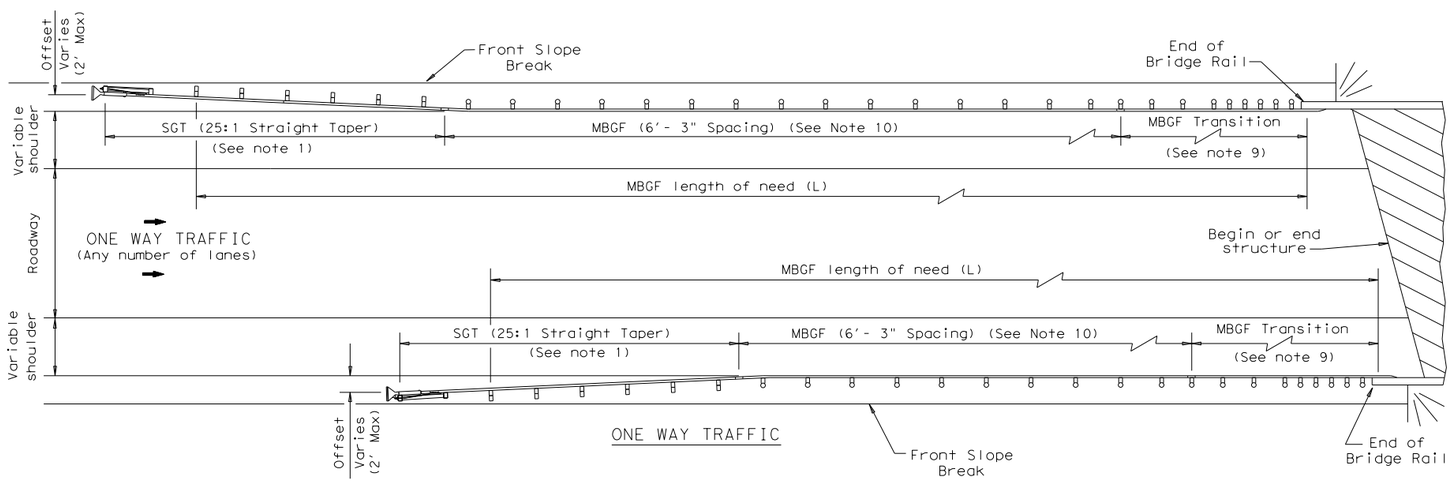


TWO LANE (RURAL) HIGHWAYS

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



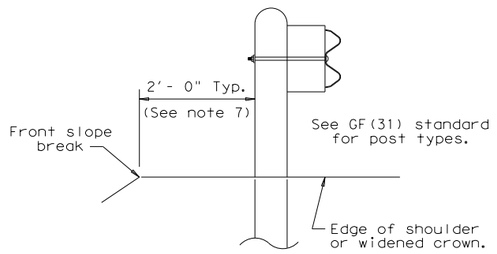
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



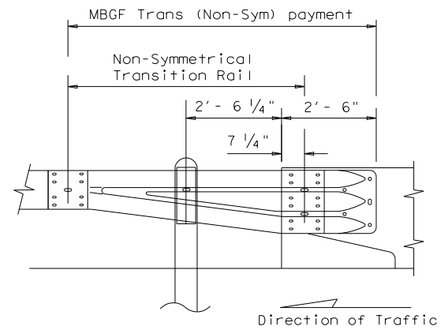
ONE WAY TRAFFIC

GENERAL NOTES

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



TYPICAL CROSS SECTION AT MBGF



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

DETAIL A
Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		79

DATE: 4/15/2022
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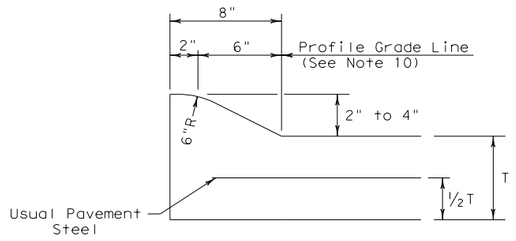
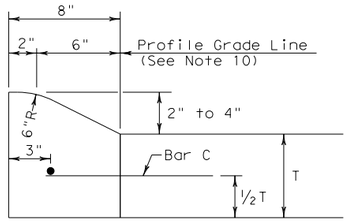


TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



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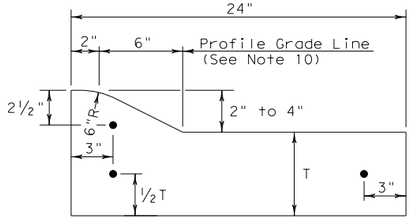
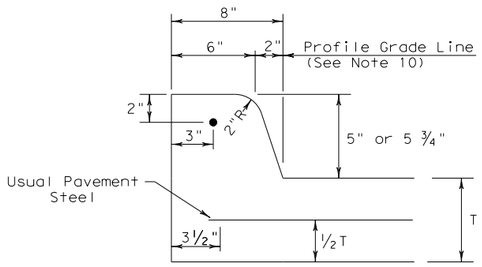
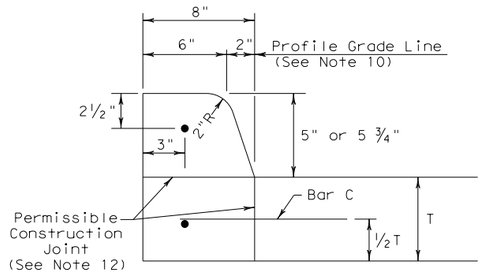
2" - 4" HEIGHT



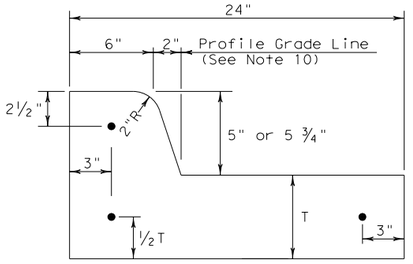
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



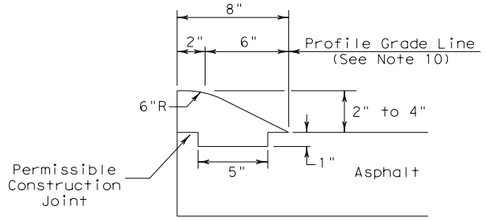
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



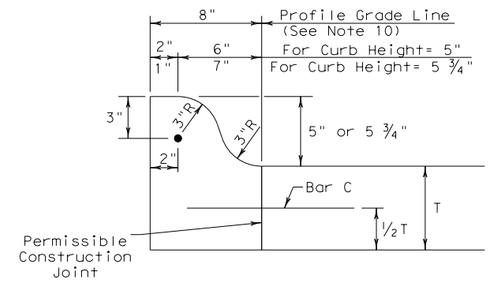
TYPE II CURB
5" - 5 ¾" HEIGHT



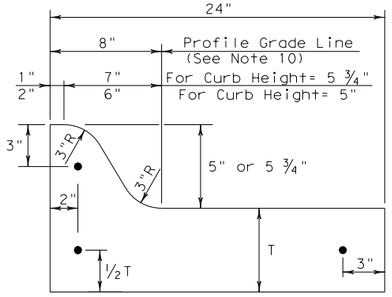
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



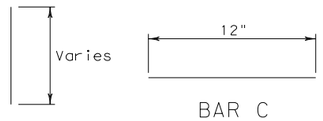
TYPE III CURB (KEYED)
2" - 4" HEIGHT



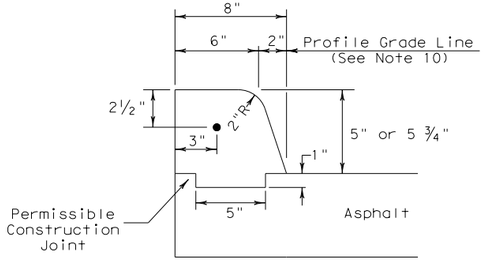
TYPE IIa CURB
5" - 5 ¾" HEIGHT



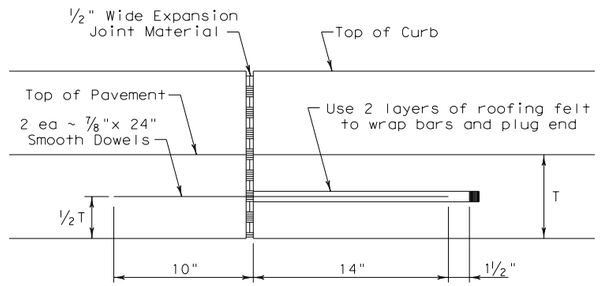
TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT



BAR B BAR C

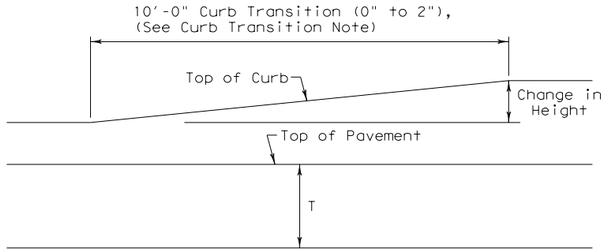


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

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



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-21

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: SS	CK: KM
©TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		80

DATE: 4/15/2022
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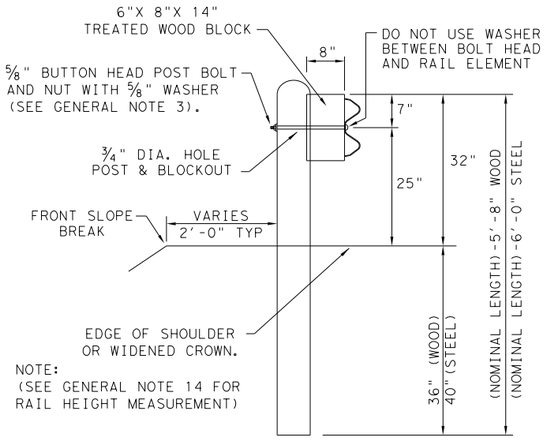
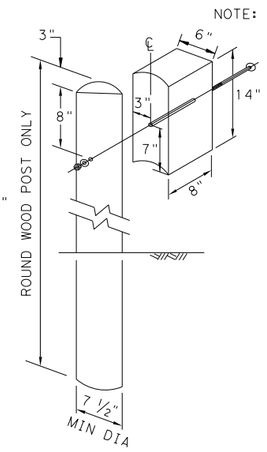
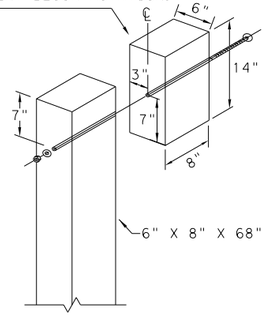


TYPICAL POST PLACEMENT

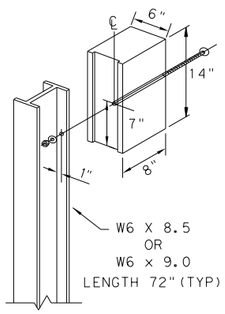


WOOD BLOCK TO ROUND WOOD POST

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

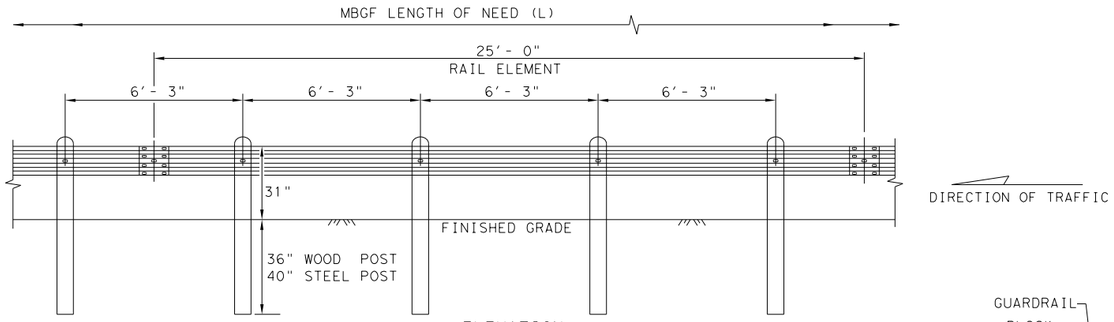


WOOD BLOCK TO RECTANGULAR WOOD POST



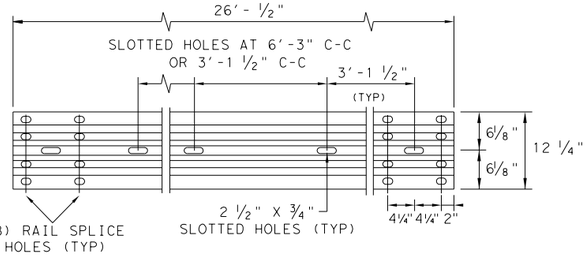
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



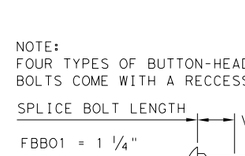
ELEVATION MID-SPAN RAIL SPLICE

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



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

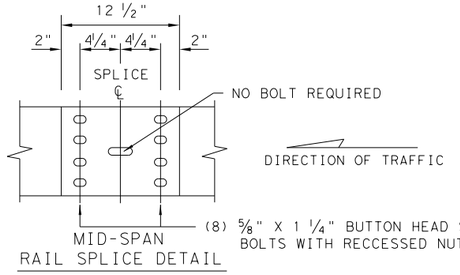
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



BUTTON HEAD BOLT

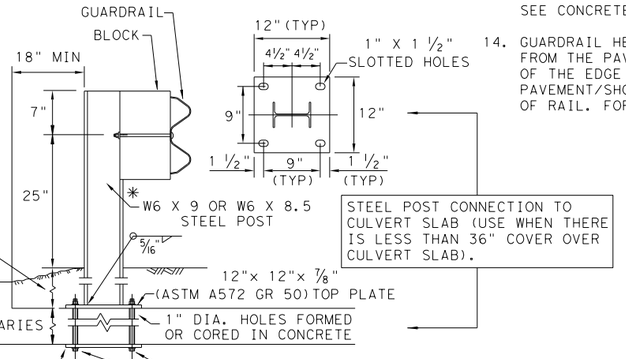
NOTE: FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECCESSED NUT.

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



MID-SPAN RAIL SPLICE DETAIL

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



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

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

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

GENERAL NOTES

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

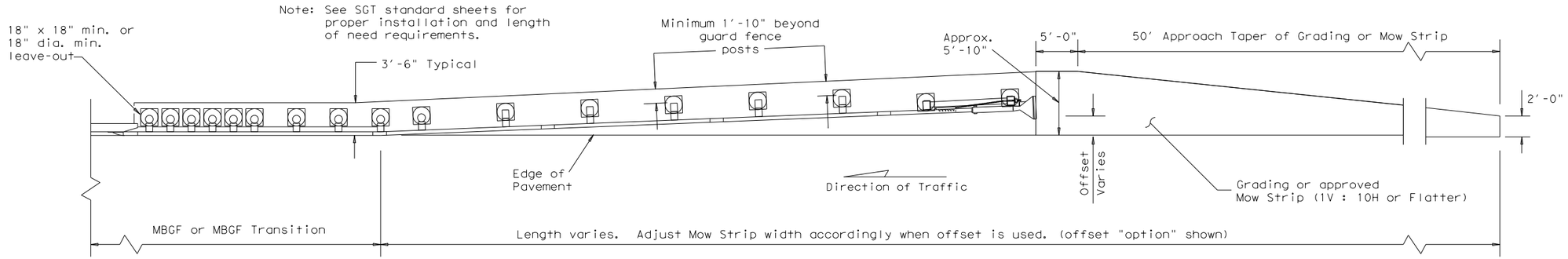
Texas Department of Transportation

Design Division Standard

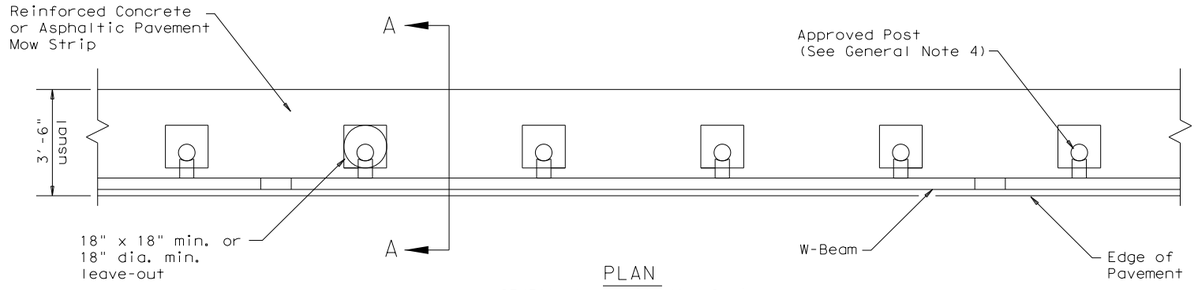
METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		81

DATE: 4/15/2022
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\083101019\4 - Design\Plan Set\3. Roadway\Standards\gf31ms19.dgn

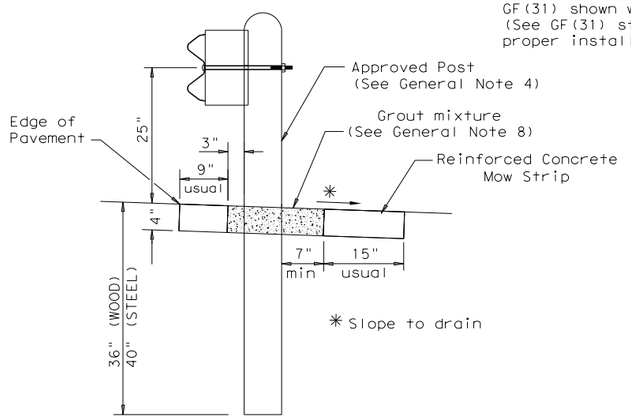


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



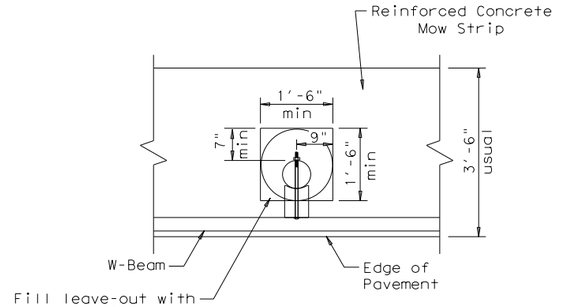
PLAN

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



SECTION A-A

Typical



MOW STRIP DETAIL

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

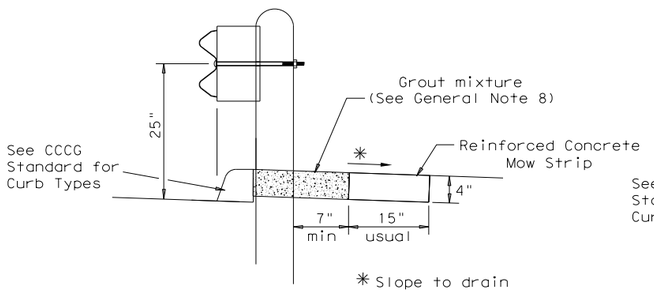
Note: Site Condition(s)

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

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

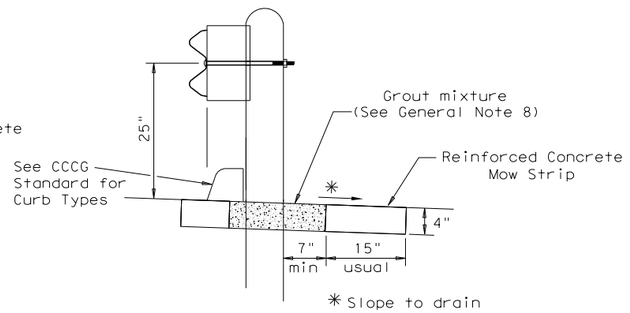
GENERAL NOTES

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



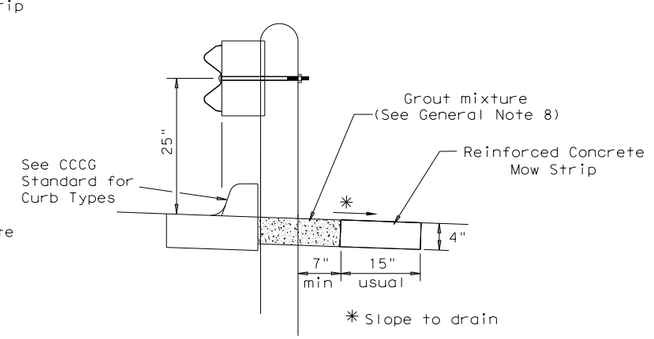
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Texas Department of Transportation

Design Division Standard

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

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		82

DATE: 4/15/2022
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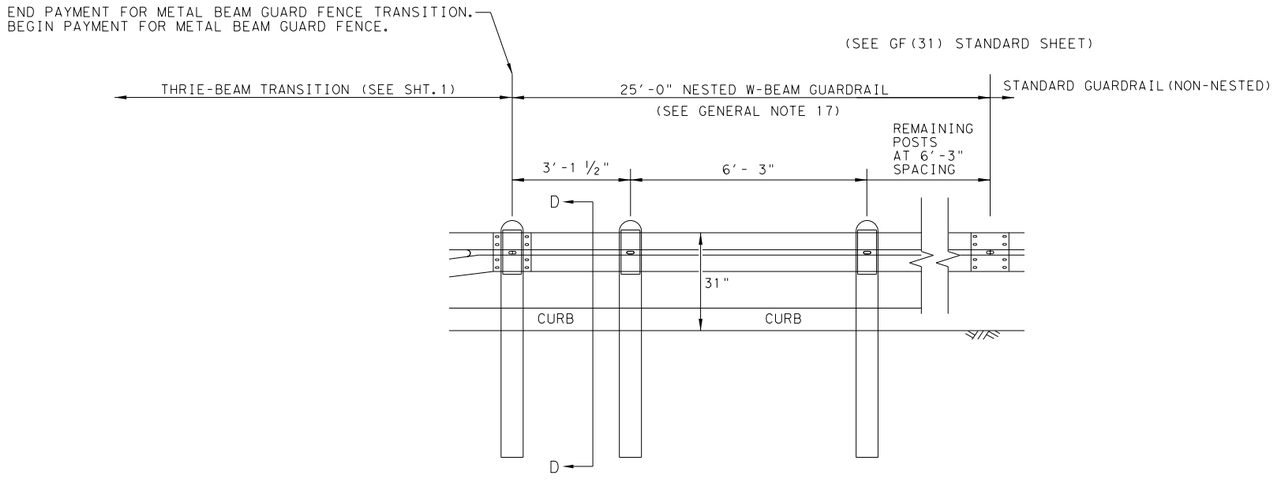
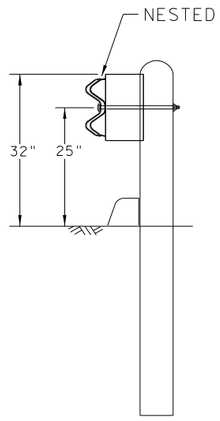
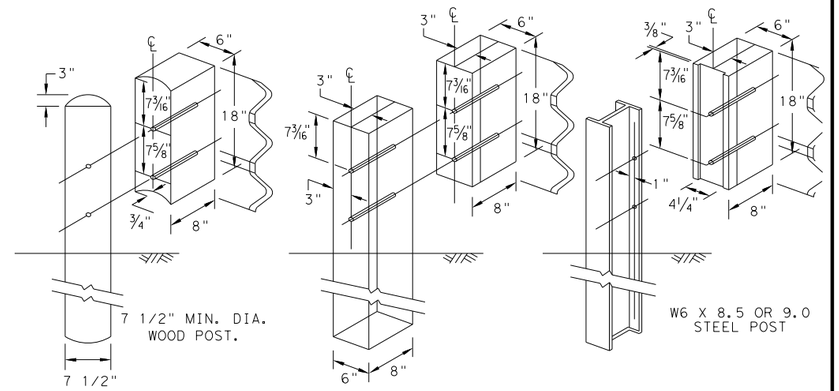
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0831	01	019, ETC.	FM 939	
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DATE: 4/15/2022
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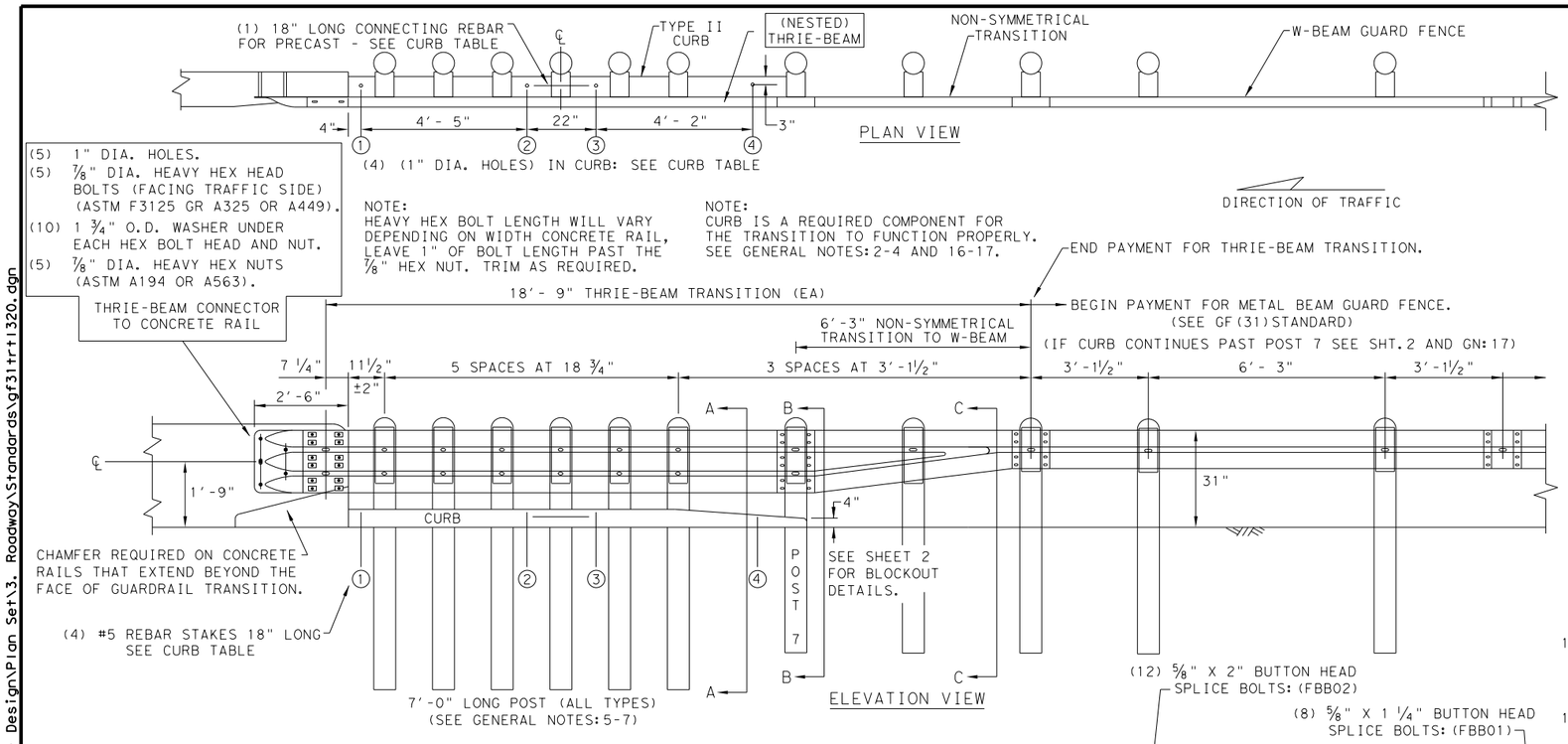


GENERAL NOTES

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

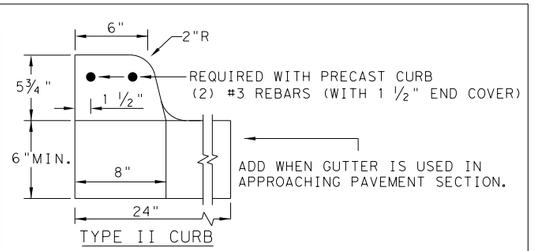
THRIE-BEAM TERMINAL - CURB TABLE

PRECAST CURB FULL LENGTH EQUALS 12'- 2"
THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.

CURB (1) LENGTH 5'- 8"
CURB (2) LENGTH 6'- 6"
TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7

CONNECTING PRECAST CURB SECTIONS (1) & (2):
FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB END.
USE (1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS.

SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *:
FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND 1/2" BELOW TOP OF CURB.
FILL HOLES WITH APPROVED GROUT MIXTURE.



TYPE II CURB

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

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

TYPE II CURB DETAILS

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
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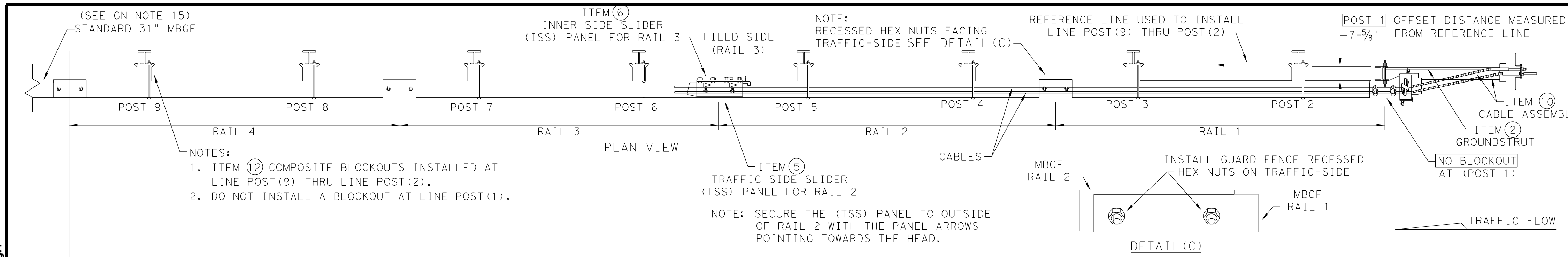

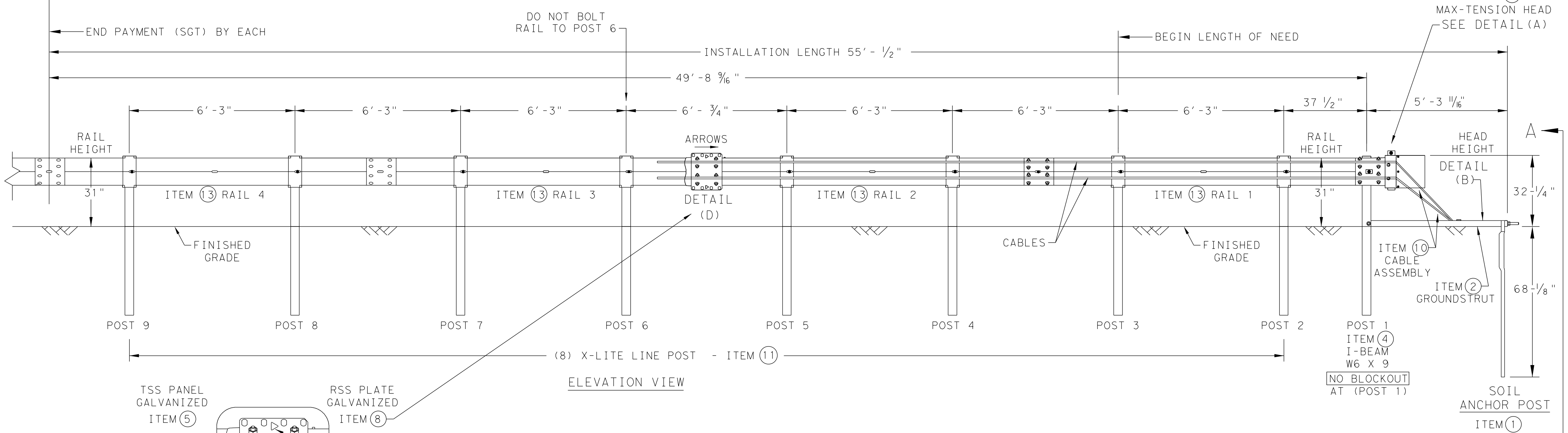

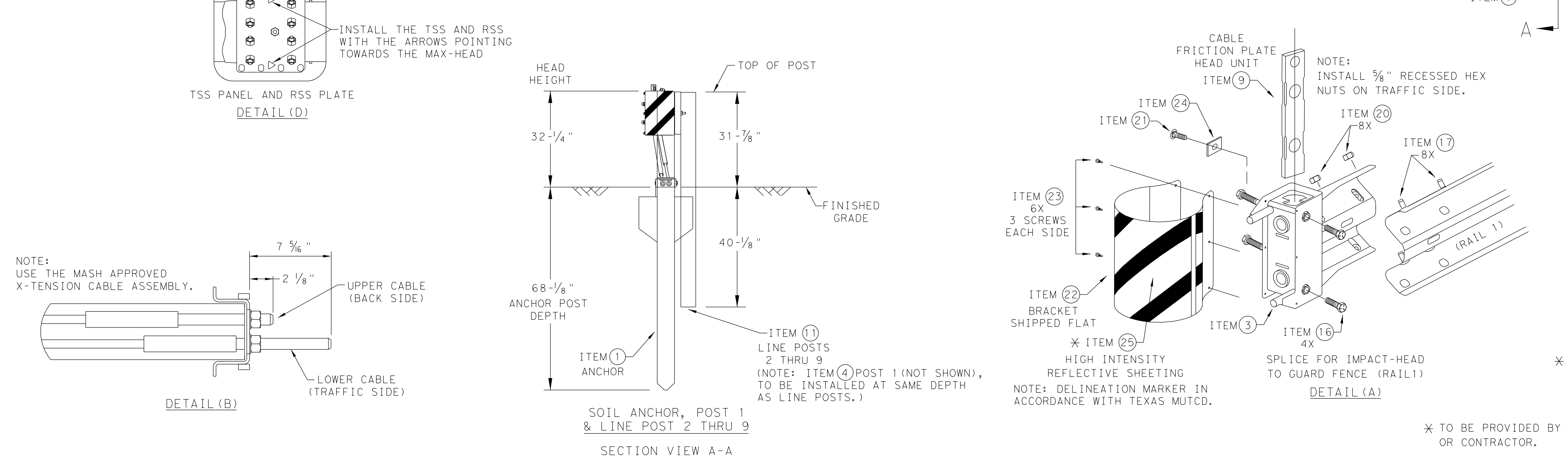

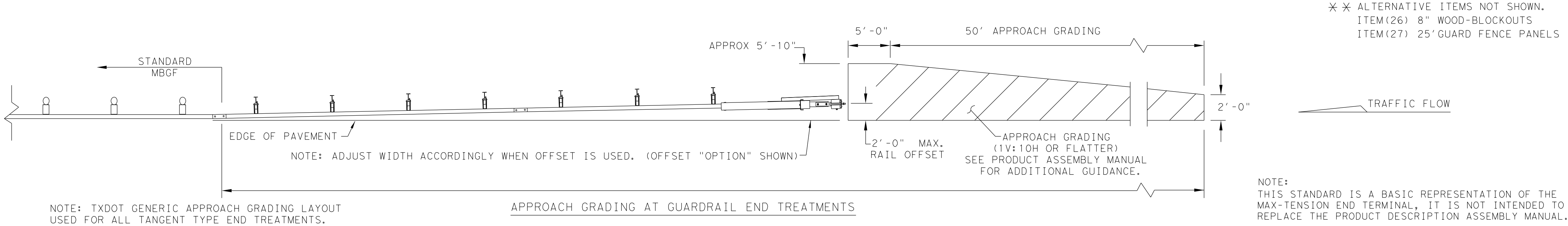

GENERAL NOTES

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

	ITEM#	PART NUMBER	DESCRIPTION	QTY
	1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
	2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
	3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
	4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
	5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
	6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
	7	BSI-1610066-00	TOOTH - GEOMET	1
	8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
	9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
	10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
	11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
	12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
	13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
	14	BSI-1102027-00	X-LITE SQUARE WASHER	1
	15	BSI-2001886	5/8" X 7" THREAD BOLT HH (GR.5)GEOMET	1
	16	BSI-2001885	3/4" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
	17	4001115	5/8" X 1 1/4" GUARD FENCE BOLTS (GR.2)MGAL	48
	18	2001840	5/8" X 10" GUARD FENCE BOLTS MGAL	8
	19	2001636	5/8" WASHER F436 STRUCTURAL MGAL	2
	20	4001116	5/8" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
	21	BSI-2001888	5/8" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
	22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
	23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
	24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
*	25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
**	26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
**	27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL, 8-SPACE, 12GA.	2
	28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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

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

Texas Department of Transportation — Design Division Standard

MAX-TENSION END TERMINAL MASH - TL-3

SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST		COUNTY	SHEET NO.
	WAC		MCLENNAN	85

DATE: 4/15/2022
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DATE: 4/15/2022
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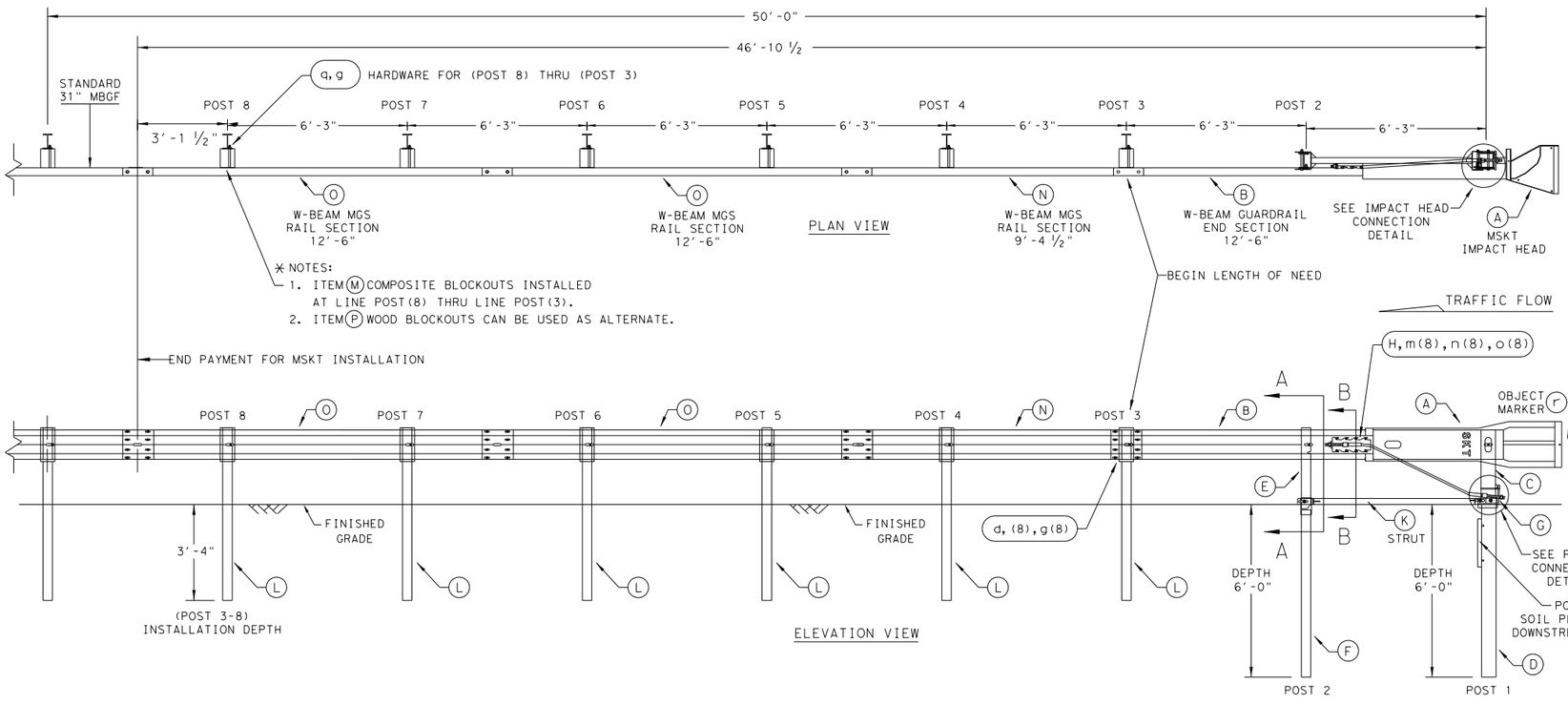


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.

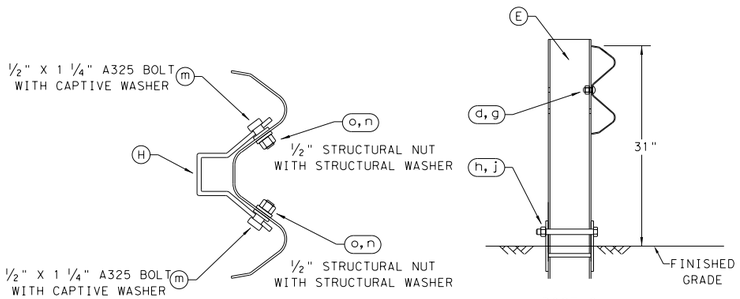
GENERAL NOTES

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

SEE NOTES: ✳

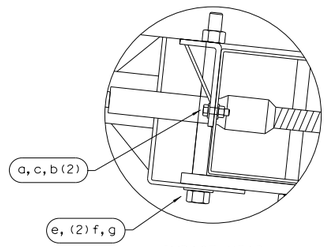
ALTERNATIVE ITEMS NOT SHOWN. ✳✳
✳ ITEM(P) 8" WOOD-BLOCKOUT
✳✳ ITEM(Q) 25'GUARD FENCE PANEL

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

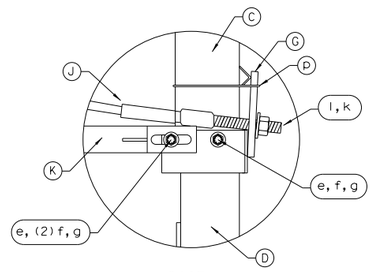


SECTION B-B
ANCHOR BRACKET

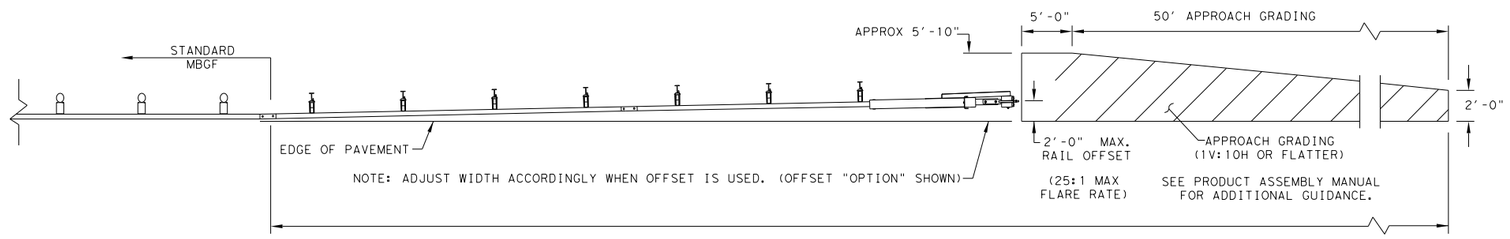
POST 2
SECTION A-A



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	0831	01	019, ETC.	FM 939	
	DIST	COUNTY		SHEET NO.	
	WAC	MCLENNAN		86	

DATE: 4/15/2022
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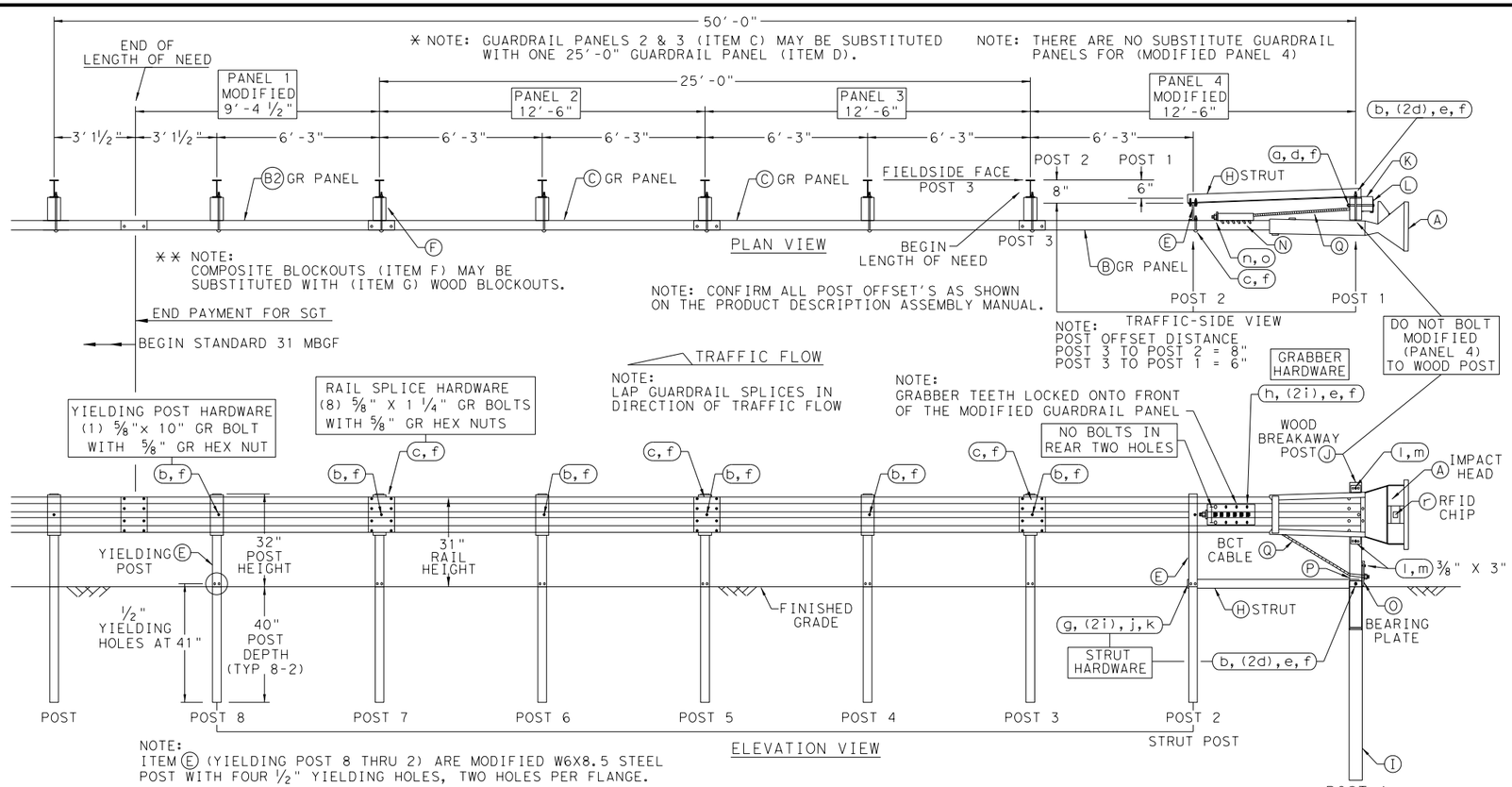
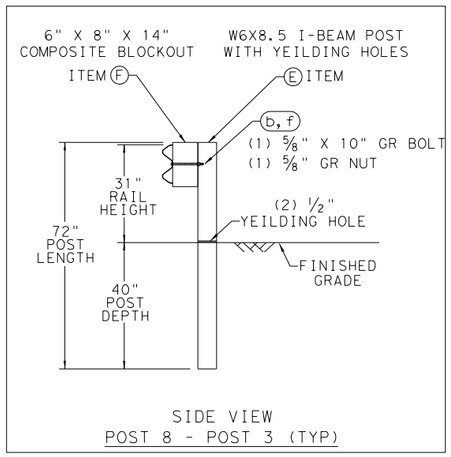


GENERAL NOTES

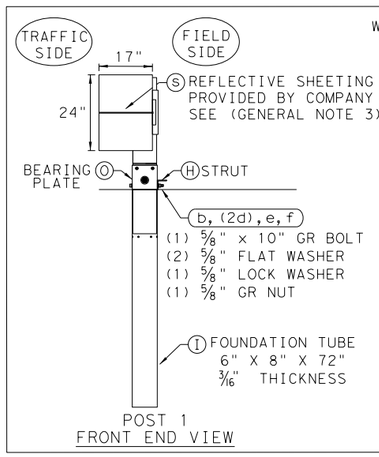
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

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

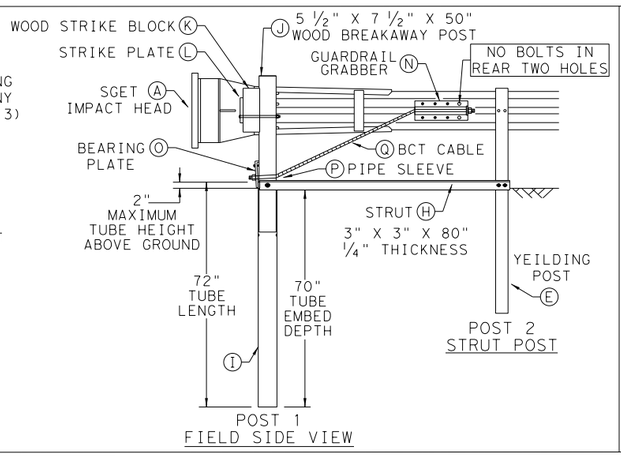
ALTERNATIVE ITEMS
NOTE: SEE PLAN VIEW
* D
** G



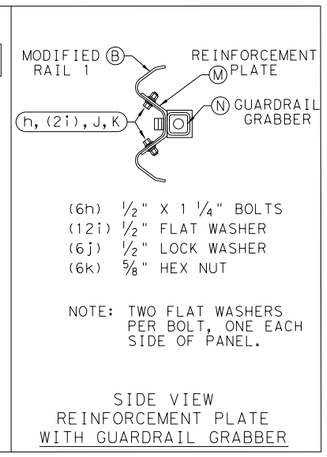
SIDE VIEW
POST 8 - POST 3 (TYP)



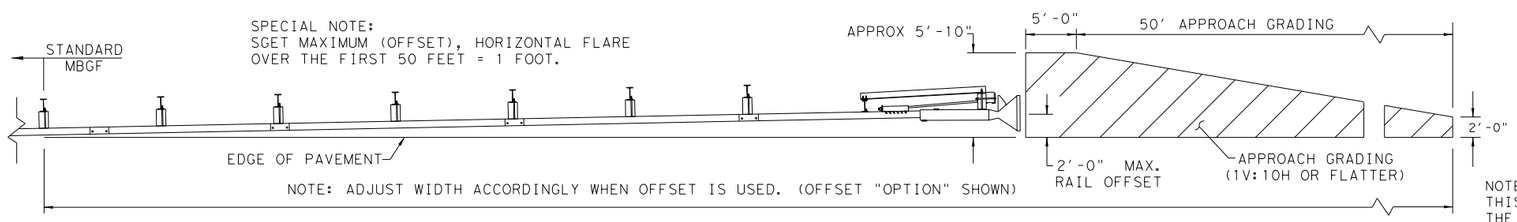
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



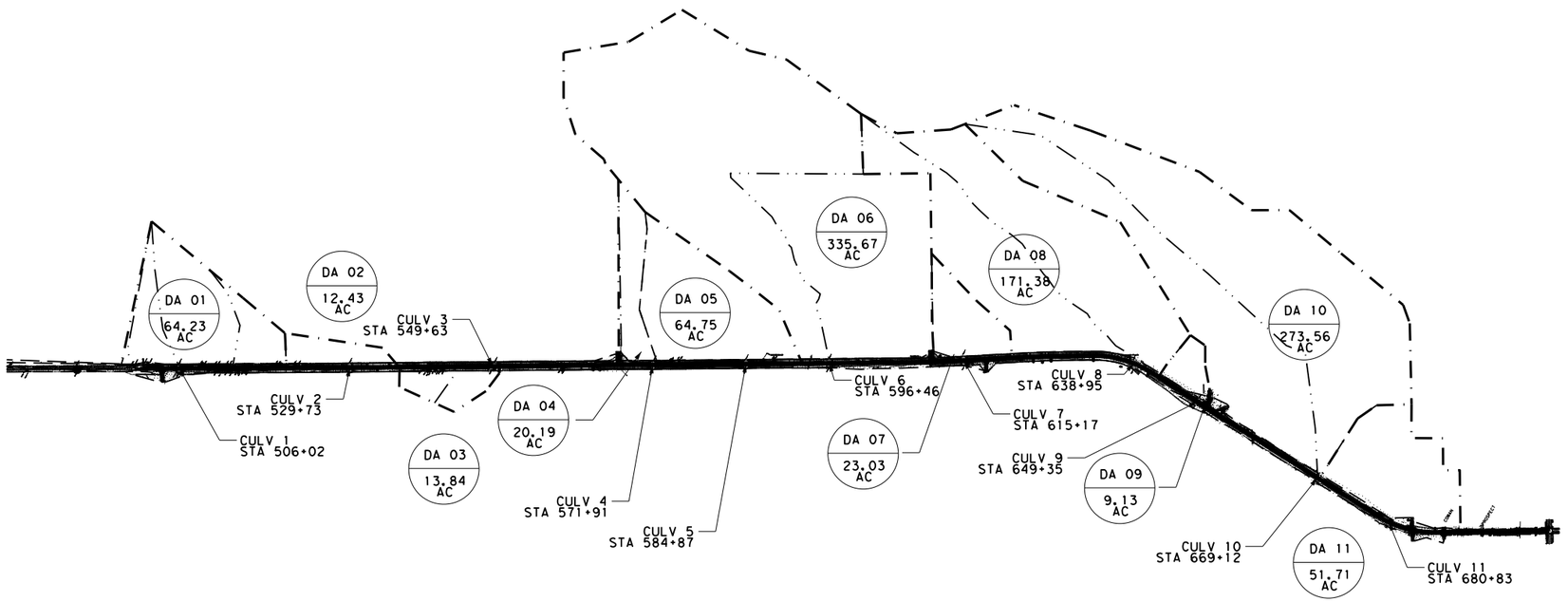
APPROACH GRADING AT GUARDRAIL END TREATMENTS

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	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		87



0 500 1000 2000

SCALE: 1 = 2000'

DRAINAGE AREA BOUNDARY

TIME OF CONCENTRATION FLOW PATH

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes

4/15/2022

Texas Department of Transportation

FM 939

DRAINAGE AREA MAP

FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	DQ

						Rational Method					SCS Method (Balanced Storm)					
							Intensity (in/hr)		Runoff (cfs)						Runoff (cfs)	
Drainage Area	Drainage Structure	Proposed Structure	Station	Drainage Area (ac)	Time of Concentration	Runoff Coefficient	10-Yr	100-Yr	10-Yr	100-Yr	UNADJUSTED CN	CN	Rainfall Depth (10-Yr) (in)	Rainfall Depth (100-Yr) (in)	10-Yr	100-Yr
DA 01	CULVERT 1	1-10'x5'x58.6' BOX	506+02	64	1.03	0.36	2.6	4.2	59.1	96.5						
DA 02	CULVERT 2	1-4'x3'x74.3' BOX	529+73	12	0.74	0.35	3.2	5.2	13.8	22.5						
DA 03	CULVERT 3	1-5'x3'x77.5' BOX	549+63	14	0.51	0.34	3.9	6.4	18.6	30.0						
DA 04	CULVERT 4	1-4'x3'x51.5' BOX	571+91	20	0.83	0.38	3.0	4.8	22.7	37.0						
DA 05	CULVERT 5	1-10'x3'x45.5' BOX	584+87	65	0.89	0.37	2.8	4.6	67.7	110.4						
DA 06	CULVERT 6	2-6'x6'x66.1' BOX	596+46	336	1.34						84	74	3.16	6.74	442.1	859.4
DA 07	CULVERT 7	1-8'x4'x53.8' BOX	615+17	23	0.80	0.37	3.0	4.9	25.7	41.8						
DA 08	CULVERT 8	1-7'x6'x83.8' BOX	638+95	171	1.20	0.34	2.3	3.8	134.7	220.4						
DA 09	CULVERT 9	1-30"x68' RCP	649+35	9	0.59	0.36	3.6	5.9	11.9	19.3						
DA 10	CULVERT 10	1-6'x4'x68.7' BOX	669+12	274	1.55						78	68	2.60	5.96	262.9	564.1
DA 11	CULVERT 11	1-10'x5'x59.4' BOX	680+83	52	0.87	0.36	2.9	4.7	52.9	63.2						

SCS Method output was calculated using HEC-HMS Version 4.2.

(HY 8 V7.50 USED FOR CULVERT STRUCTURES)					OUTLET CHANNEL					CULVERT ANALYSIS			
LOCATION/STATION	FREQ. (YR)	Q (CFS)	EXIST HW (ELEV)	ALLOW HW (ELEV)	W (FT)	SS	MANNINGS "n"	TW (ELEV)	STRUCTURE DATA	AVG. SLOPE (FT/FT)	HW (ELEV)	VEL. OUT (FPS)	REMARKS
CULVERT 1 - 506+02	10	59	554.39	555.39	14	3:1	0.035	553.61	1-10'x5'x58.6' BOX	0.018	554.55	3.25	
	100	97	555.06	556.06				554.16			555.22	4.08	
CULVERT 2 - 529+73	10	14	559.35	560.35	4.5	3:1	0.035	554.32	1-4'x3'x74.3' BOX	0.079	559.91	13.58	18 IN STONE PROTECTION
	100	23	559.75	560.75				554.67			560.31	14.36	18 IN STONE PROTECTION
CULVERT 3 - 549+63	10	19	547.90	548.90	5.5	3:1	0.035	547.66	1-5'x3'x77.5' BOX	0.010	548.02	2.40	
	100	30	548.34	549.34				548.05			548.46	3.10	
CULVERT 4 - 571+91	10	23	537.84	538.84	4.5	3:1	0.035	536.91	1-4'x3'x51.5' BOX	0.022	538.00	9.53	18 IN STONE PROTECTION
	100	37	538.44	539.44				537.34			538.60	10.75	18 IN STONE PROTECTION
CULVERT 5 - 584+87	10	68	535.81	536.81	11.5	3:1	0.035	535.12	1-10'x3'x45.5' BOX	0.022	535.82	3.32	
	100	110	536.48	537.48				535.73			536.49	4.16	
CULVERT 6 - 596+46	10	442	534.01	535.01	14.5	3:1	0.035	532.89	2-6'x6'x66.1' BOX	0.005	534.01	7.27	
	100	859	537.74	538.74				534.77			537.78	11.94	
CULVERT 7 - 615+17	10	26	553.14	554.14	9.5	3:1	0.035	553.02	1-8'x4'x53.8' BOX	0.000	553.14	2.33	
	100	42	553.60	554.60				553.42			553.61	2.93	
CULVERT 8 - 638+95	10	135	540.98	541.98	8.5	3:1	0.035	540.27	1-7'x6'x83.8' BOX	0.001	540.98	5.78	
	100	220	542.31	543.31				541.14			541.14	7.50	
CULVERT 9 - 649+35	10	12	536.63	537.63	4	3:1	0.035	535.62	1-30"x68' RCP	0.002	536.36	4.70	
	100	19	537.60	538.60				535.96			536.98	5.75	
CULVERT 10 - 669+12	10	263	526.81	527.81	7.5	3:1	0.035	523.09	1-6'x4'x68.7' BOX	0.003	526.81	11.22	18 IN STONE PROTECTION
	100	564	527.78	528.78				524.35			527.78	12.58	18 IN STONE PROTECTION
CULVERT 11 - 680+83	10	53	518.59	519.59	11.5	3:1	0.035	518.40	1-10'x5'x59.4' BOX	0.005	518.59	2.83	
	100	63	519.23	520.23				518.94			519.23	3.57	

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED PROFESSIONAL ENGINEER

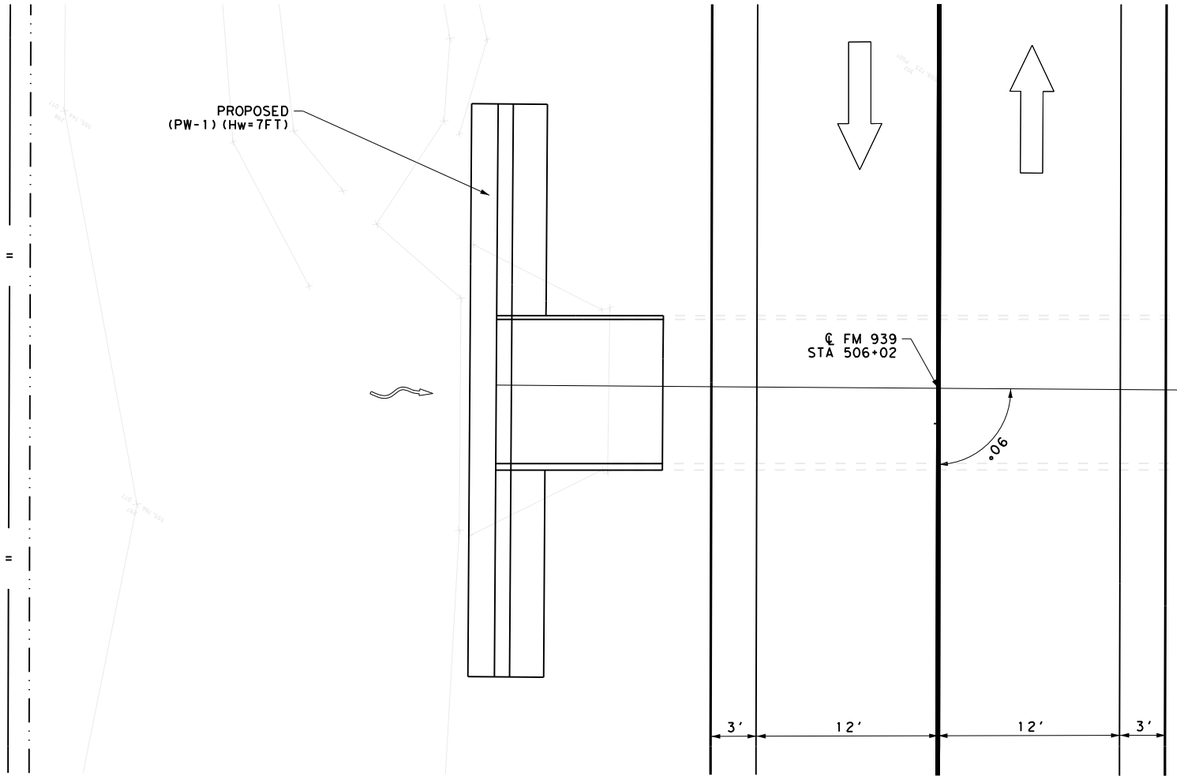
Bradley Mayes 4/15/2022

Texas Department of Transportation

FM 939

DRAINAGE CALCULATIONS

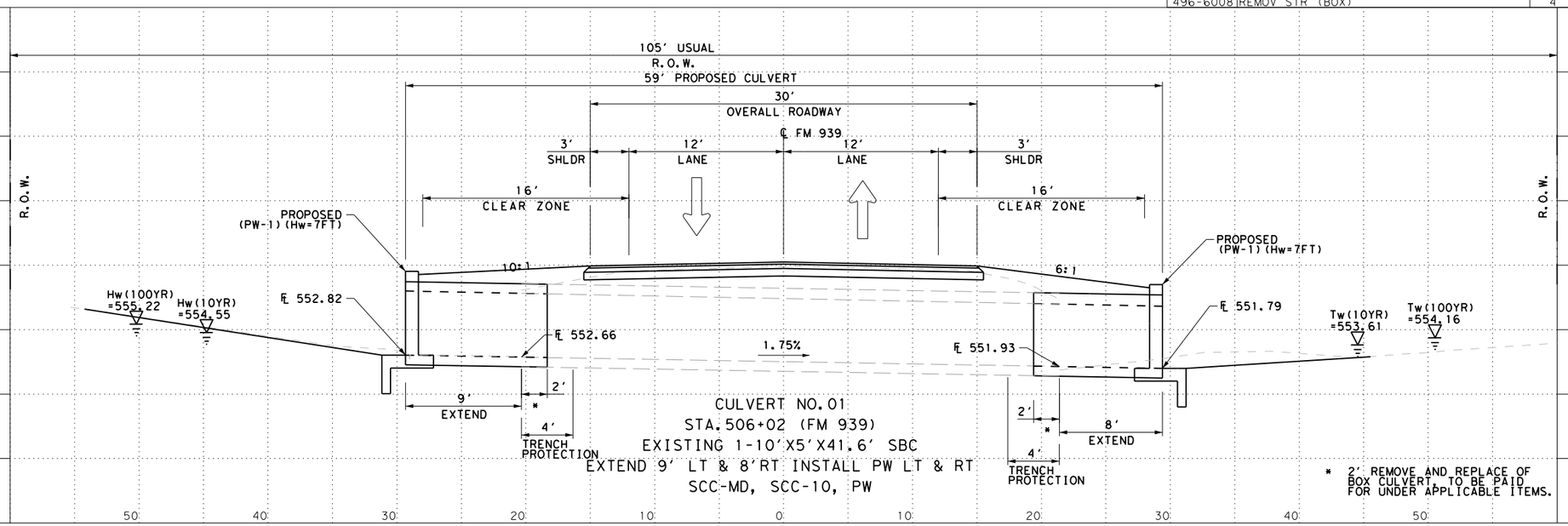
FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	89



NOTES:

CULVERT AND CHANNEL SHALL BE GRADED TO DRAIN. CHANNEL GRADING WORK IS PAID FOR VIA ITEM 150.

QUANTITIES			
ITEM	DESCRIPTION	TOTAL	UNIT
150-6001	BLADING	1	STA
402-6001	TRENCH EXCAVATION PROTECTION	8	LF
462-6073	CONC BOX CULV (10 FT X 5 FT)(EXTEND)	21	LF
466-6182	WINGWALL (PW-1)(HW=7 FT)	2	EA
480-6001	CLEAN EXIST CULVERTS	1	EA
496-6006	REMOV STR (HEADWALL)	2	EA
496-6008	REMOV STR (BOX)	4	LF



CULVERT NO.01
STA.506+02 (FM 939)
EXISTING 1-10'X5'X41.6' SBC
EXTEND 9' LT & 8'RT INSTALL PW LT & RT
SCC-MD, SCC-10, PW

* 2' REMOVE AND REPLACE OF BOX CULVERT, TO BE PAID FOR UNDER APPLICABLE ITEMS.

CULVERT HYDRAULIC DATA						
CULVERT 22						
FREQ (YRS)	Q (CFS)	TW ELEV	L (FT)	S (FT/FT)	VOUT (FPS)	HW ELEV
10	59.1	553.61	58.6	0.018	3.25	554.55
100	96.5	554.16	58.6	0.018	4.08	555.22

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Bradley Mayes 4/15/2022

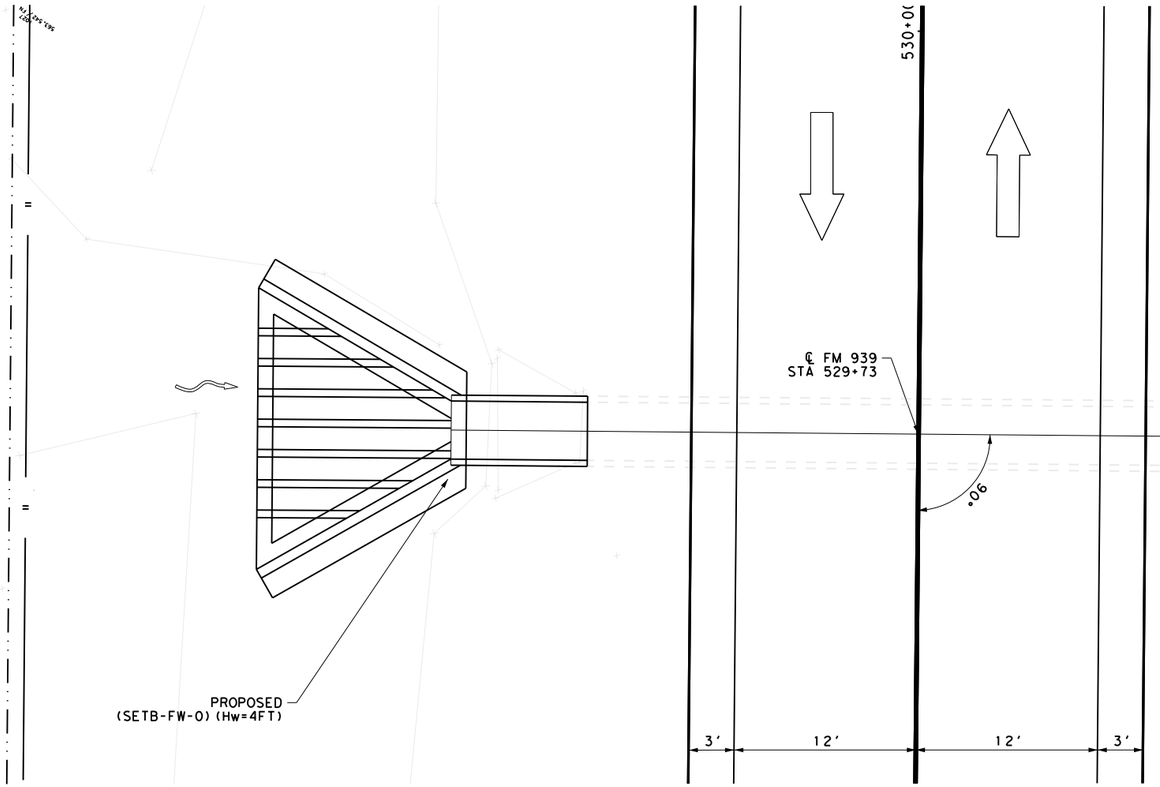
Texas Department of Transportation

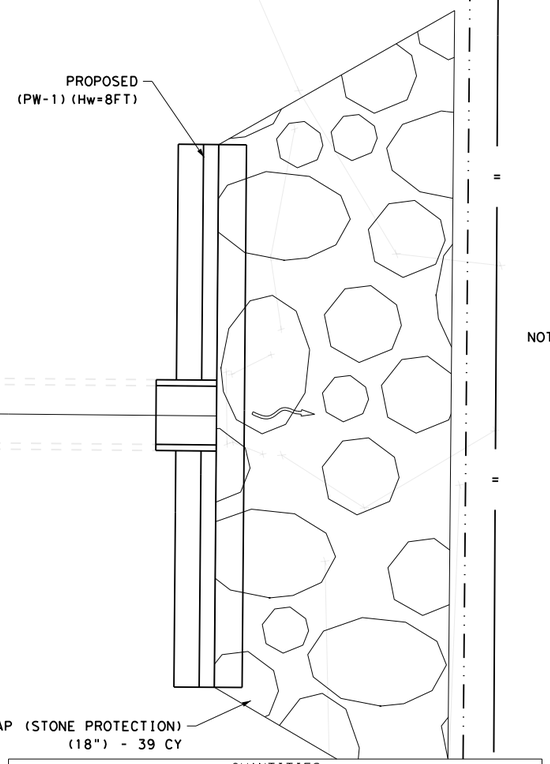
CULVERT LAYOUT

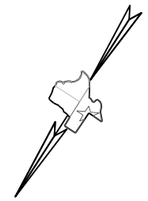
SCALE: FEET
1" = 10' HORIZ.
1" = 10' VERTICAL

SHEET 1 OF 11

FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	90





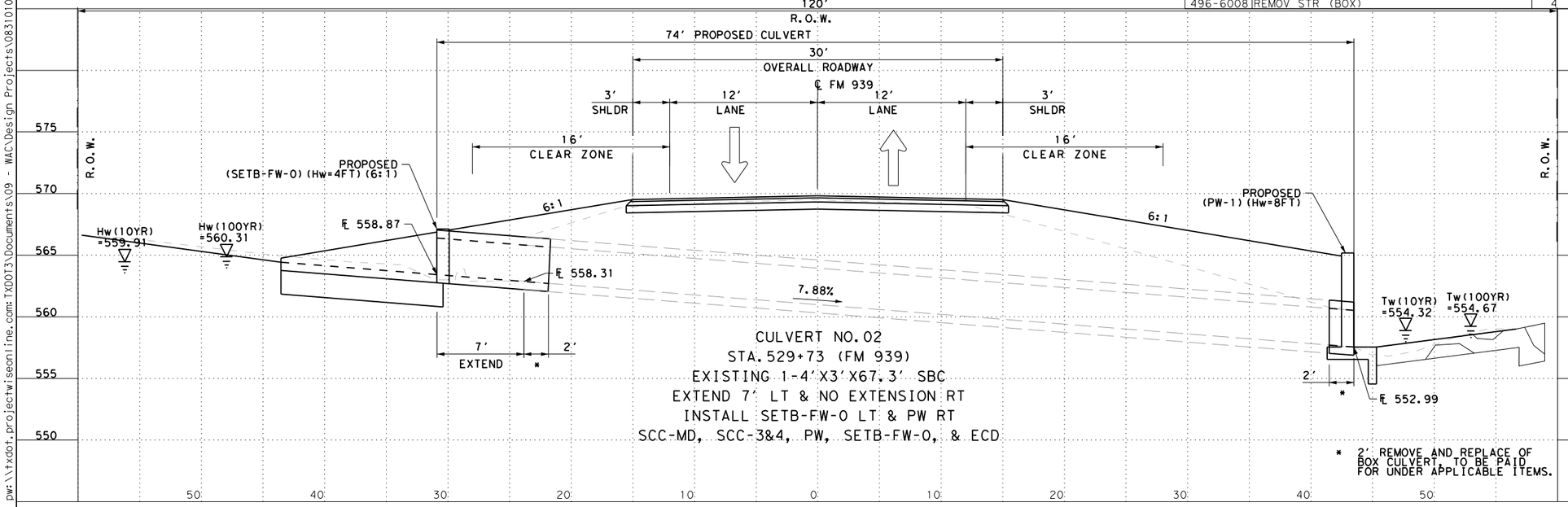


NOTES:

CULVERT AND CHANNEL SHALL BE GRADED TO DRAIN. CHANNEL GRADING WORK IS PAID FOR VIA ITEM 150.

QUANTITIES

ITEM	DESCRIPTION	TOTAL	UNIT
150-6001	BLADING	1	STA
432-6033	RIPRAP (STONE PROTECTION)(18 IN)	39	CY
462-6048	CONC BOX CULV (4 FT X 3 FT)(EXTEND)	11	LF
466-6183	WINGWALL (PW-1)(HW=8 FT)	1	EA
467-6146	SET (TY I)(S= 4 FT)(HW= 4 FT)(6:1)(C)	1	EA
480-6001	CLEAN EXIST CULVERTS	1	EA
496-6006	REMOV STR (HEADWALL)	2	EA
496-6008	REMOV STR (BOX)	4	LF



CULVERT NO.02
STA.529+73 (FM 939)
EXISTING 1-4'X3'X67.3' SBC
EXTEND 7' LT & NO EXTENSION RT
INSTALL SETB-FW-0 LT & PW RT
SCC-MD, SCC-3&4, PW, SETB-FW-0, & ECD

* 2' REMOVE AND REPLACE OF BOX CULVERT, TO BE PAID FOR UNDER APPLICABLE ITEMS.

CULVERT HYDRAULIC DATA

CULVERT

FREQ (YRS)	Q (CFS)	TW ELEV	L (FT)	S (FT/FT)	VOUT (FPS)	HW ELEV
10	13.8	554.32	74.3	0.079	13.58	559.91
100	22.5	554.67	74.3	0.079	14.36	560.31

STATE OF TEXAS
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Bradley Mayes

4/15/2022

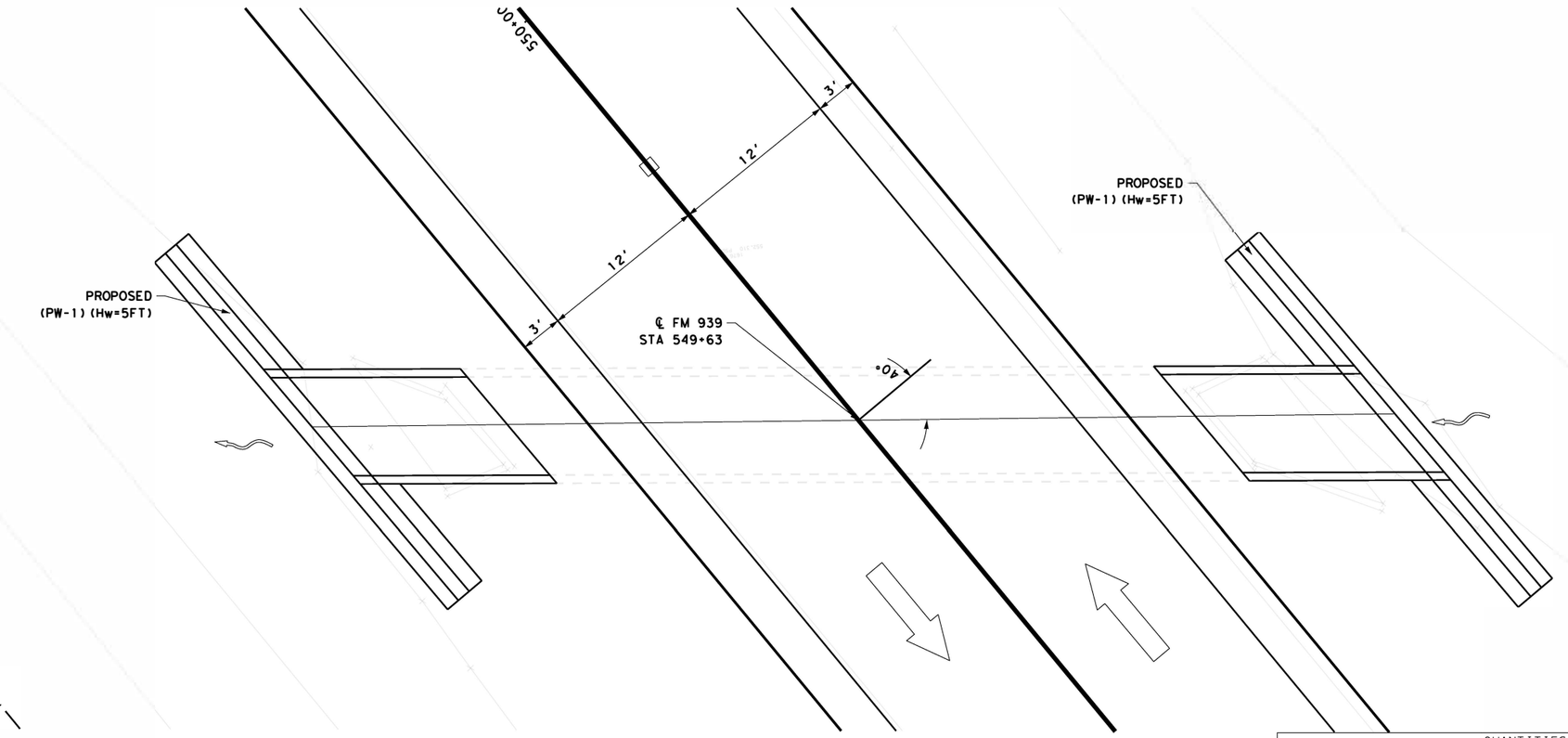
Texas Department of Transportation

CULVERT LAYOUT

SCALE: FEET
1" = 10' HORIZ.
1" = 10' VERTICAL

SHEET 2 OF 11

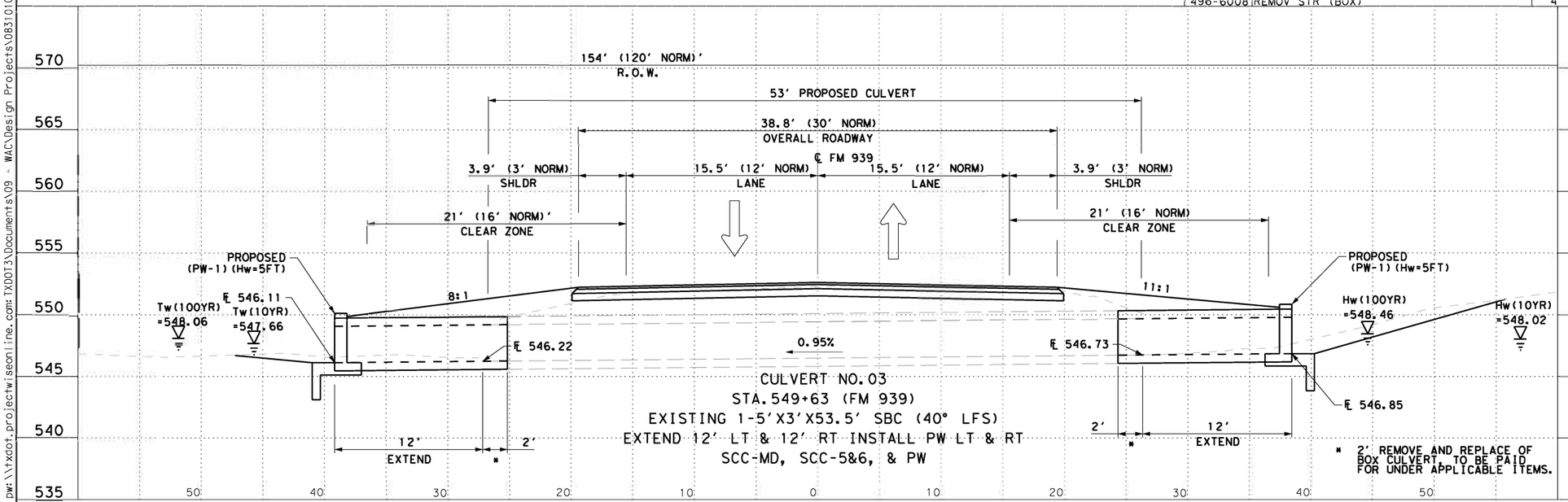
FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	91



NOTES:

CULVERT AND CHANNEL SHALL BE GRADED TO DRAIN. CHANNEL GRADING WORK IS PAID FOR VIA ITEM 150.

QUANTITIES			
ITEM	DESCRIPTION	TOTAL	UNIT
150-6001	BLADING	1	STA
462-6051	CONC BOX CULV (5 FT X 3 FT) (EXTEND)	28	LF
466-6180	WINGWALL (PW-1) (HW=5 FT)	2	EA
480-6001	CLEAN EXIST CULVERTS	1	EA
496-6006	REMOV STR (HEADWALL)	2	EA
496-6008	REMOV STR (BOX)	4	LF



CULVERT NO. 03
STA. 549+63 (FM 939)
EXISTING 1-5'X3'X53.5' SBC (40° LFS)
EXTEND 12' LT & 12' RT INSTALL PW LT & RT
SCC-MD, SCC-5&6, & PW

* 2' REMOVE AND REPLACE OF BOX CULVERT, TO BE PAID FOR UNDER APPLICABLE ITEMS.

CULVERT HYDRAULIC DATA						
CULVERT						
FREQ	Q	TW	L	S	VOUT	HW
(YRS)	(CFS)	ELEV	(FT)	(FT/FT)	(FPS)	ELEV
10	18.6	547.66	77.5	0.010	2.40	548.02
100	30.0	548.05	77.5	0.010	3.10	548.46

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Bradley Mayes 4/15/2022

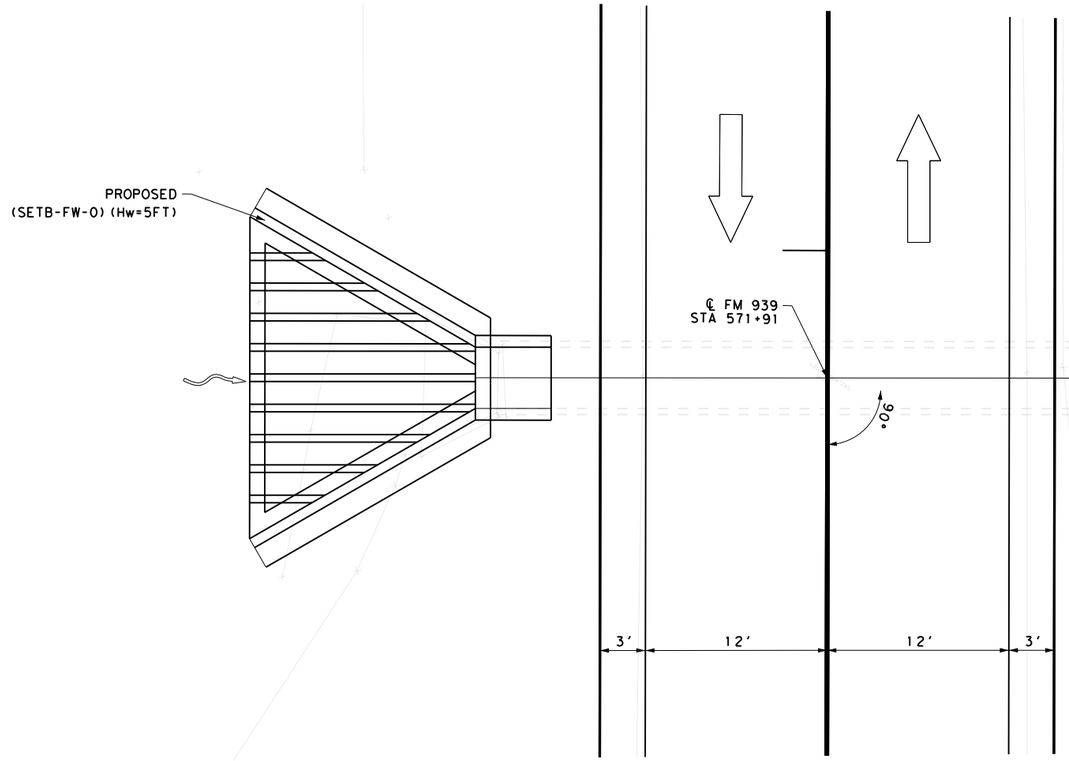
Texas Department of Transportation

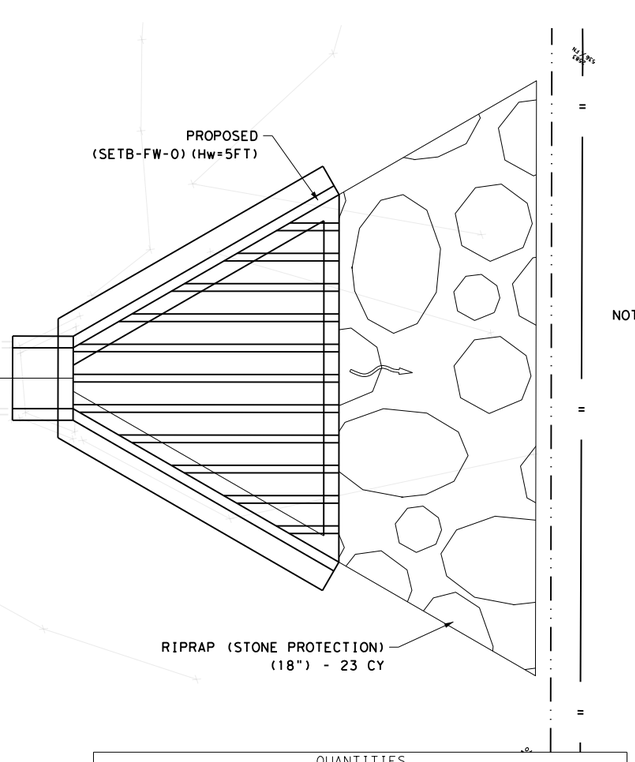
CULVERT LAYOUT

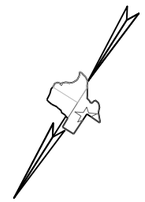
SCALE: FEET
1" = 10' HORIZ.
1" = 10' VERTICAL

SHEET 3 OF 11

FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	92



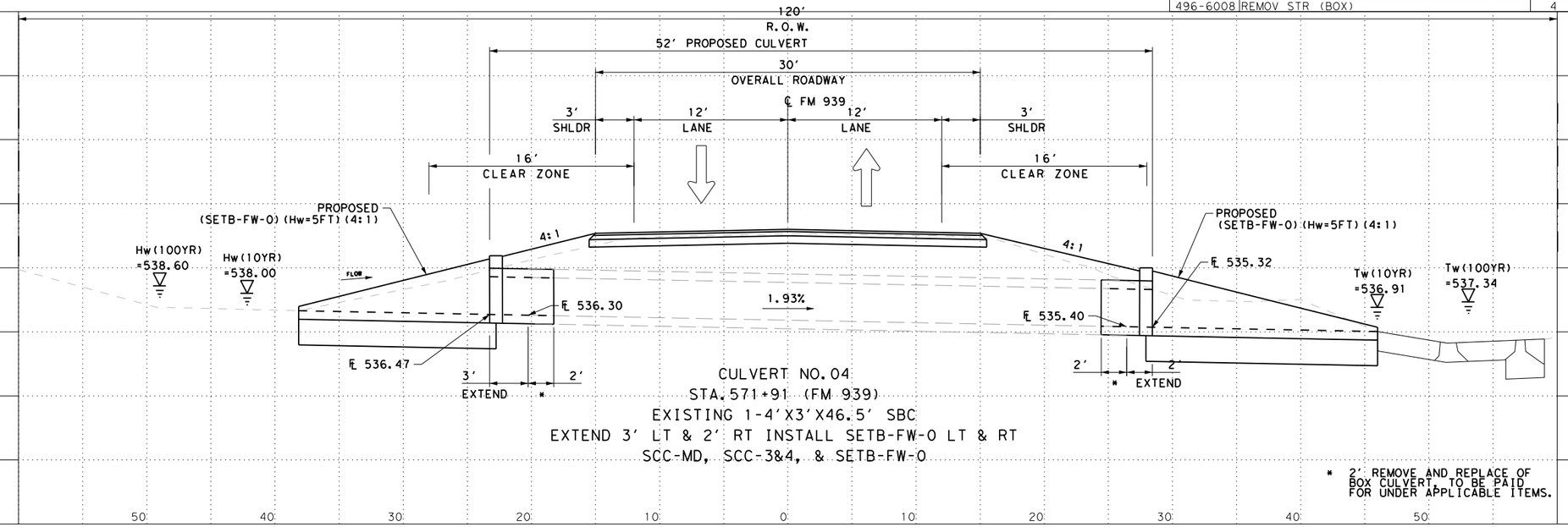




NOTES:

CULVERT AND CHANNEL SHALL BE GRADED TO DRAIN. CHANNEL GRADING WORK IS PAID FOR VIA ITEM 150.

QUANTITIES			
ITEM	DESCRIPTION	TOTAL	UNIT
150-6001	BLADING	1	STA
432-6033	RIPRAP (STONE PROTECTION)(18 IN)	23	CY
462-6048	CONC BOX CULV (4 FT X 3 FT)(EXTEND)	9	LF
467-6150	SET (TY I)(S= 4 FT)(HW= 5 FT)(4:1) (C)	2	EA
480-6001	CLEAN EXIST CULVERTS	1	EA
496-6006	REMOV STR (HEADWALL)	2	EA
496-6008	REMOV STR (BOX)	4	LF



CULVERT NO.04
STA.571+91 (FM 939)
EXISTING 1-4′X3′X46.5′ SBC
EXTEND 3′ LT & 2′ RT INSTALL SETB-FW-0 LT & RT
SCC-MD, SCC-3&4, & SETB-FW-0

* 2′ REMOVE AND REPLACE OF BOX CULVERT, TO BE PAID FOR UNDER APPLICABLE ITEMS.

CULVERT HYDRAULIC DATA						
CULVERT						
FREQ	Q	TW	L	S	VOUT	HW
(YRS)	(CFS)	ELEV	(FT)	(FT/FT)	(FPS)	ELEV
10	22.7	536.91	51.5	0.022	9.53	538.00
100	37.0	537.34	51.5	0.022	10.75	538.60

STATE OF TEXAS
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Bradley Mayes 7/6/2022

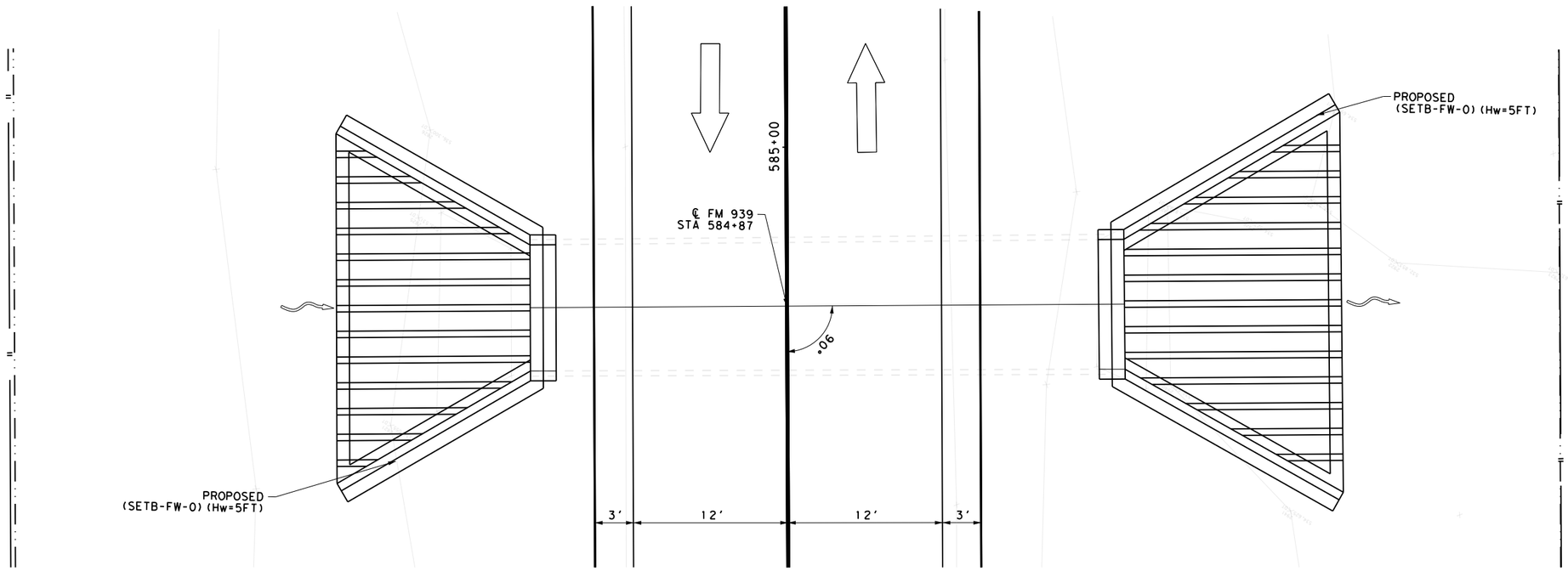
Texas Department of Transportation

CULVERT LAYOUT

SCALE: FEET
1" = 10′ HORIZ.
1" = 10′ VERTICAL

SHEET 4 OF 11

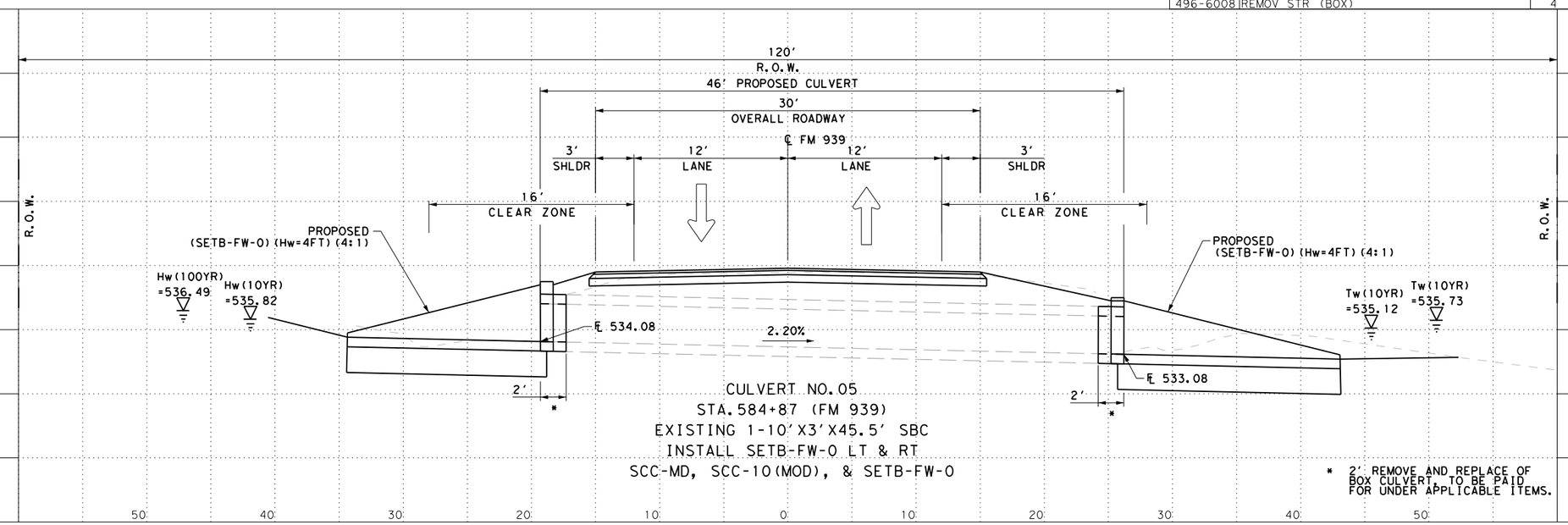
FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	93



NOTES:

CULVERT AND CHANNEL SHALL BE GRADED TO DRAIN. CHANNEL GRADING WORK IS PAID FOR VIA ITEM 150.

QUANTITIES			
ITEM	DESCRIPTION	TOTAL	UNIT
150-6001	BLADING	1	STA
462-6116	CONC BOX CULV (10 FT X 3 FT)(EXTEND)	4	LF
467-6050	SET (TY I)(S=10 FT)(HW=4FT)(4:1)(C)	2	EA
480-6001	CLEAN EXIST CULVERTS	1	EA
496-6006	REMOV STR (HEADWALL)	2	EA
496-6008	REMOV STR (BOX)	4	LF



CULVERT NO.05
STA.584+87 (FM 939)
EXISTING 1-10′X3′X45.5′ SBC
INSTALL SETB-FW-0 LT & RT
SCC-MD, SCC-10(MOD), & SETB-FW-0

* 2′ REMOVE AND REPLACE OF BOX CULVERT, TO BE PAID FOR UNDER APPLICABLE ITEMS.

CULVERT HYDRAULIC DATA						
CULVERT						
FREQ	Q	TW	L	S	VOUT	HW
(YRS)	(CFS)	ELEV	(FT)	(FT/FT)	(FPS)	ELEV
10	67.7	535.12	45.5	0.022	3.32	535.82
100	110.4	535.73	45.5	0.022	4.16	536.49

STATE OF TEXAS
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Bradley Mayes 4/15/2022

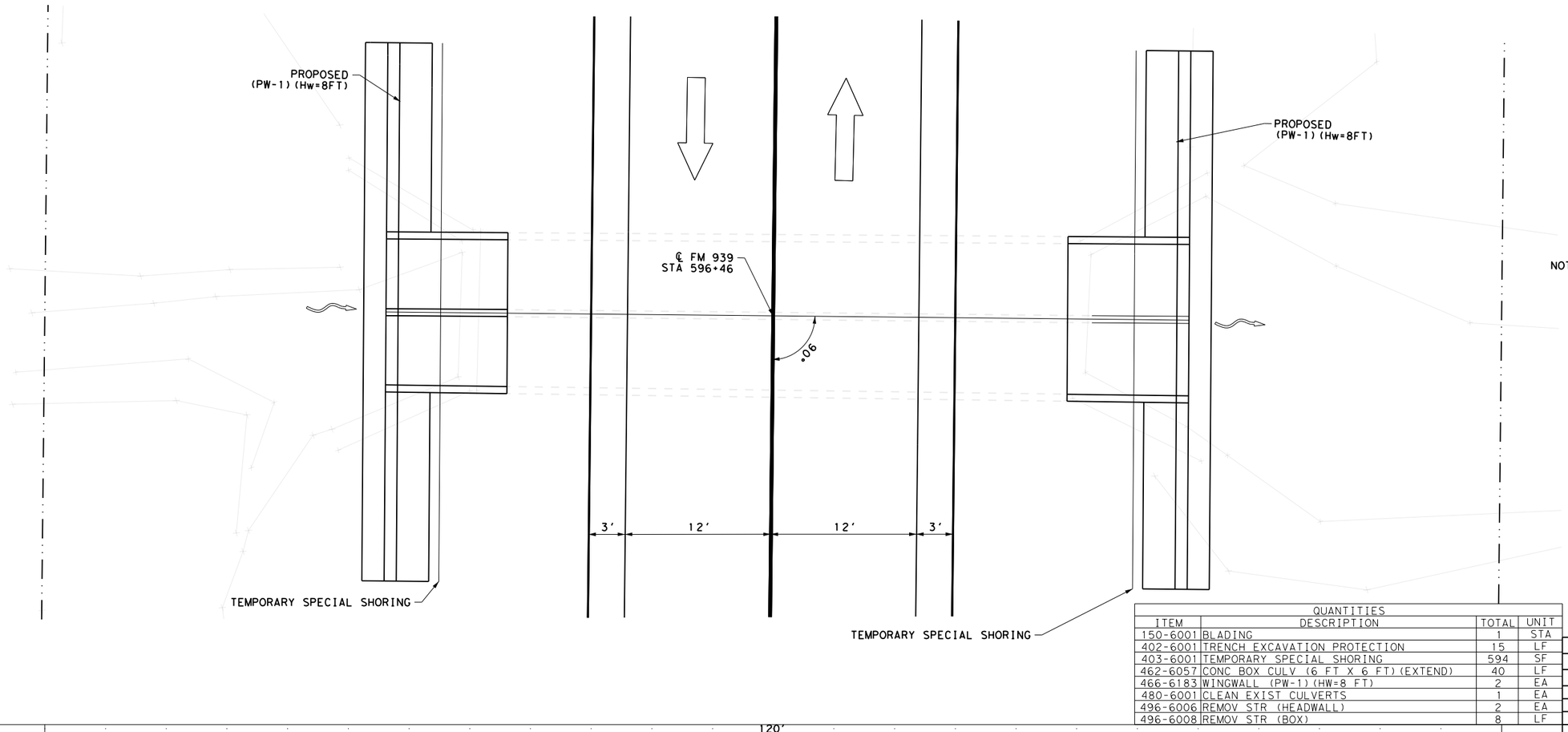
Texas Department of Transportation

CULVERT LAYOUT

SCALE: FEET
1" = 10′ HORIZ.
1" = 10′ VERTICAL

SHEET 5 OF 11

FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	94



NOTES:

CULVERT AND CHANNEL SHALL BE GRADED TO DRAIN. CHANNEL GRADING WORK IS PAID FOR VIA ITEM 150.

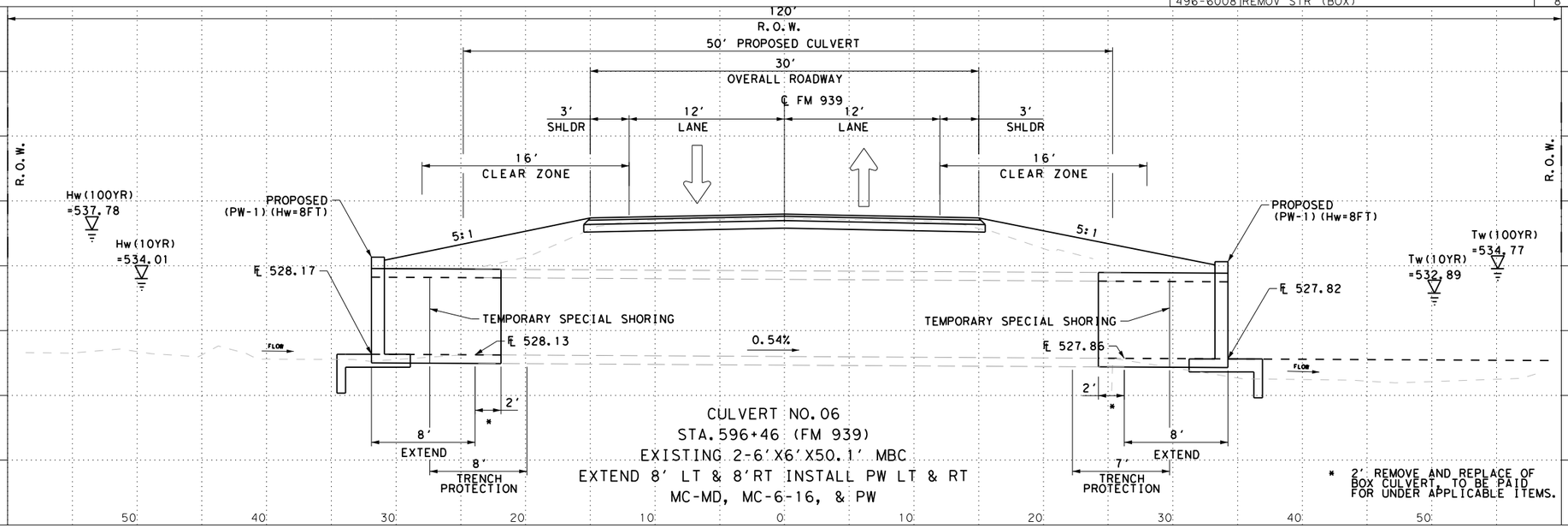
QUANTITIES

ITEM	DESCRIPTION	TOTAL	UNIT
150-6001	BLADING	1	STA
402-6001	TRENCH EXCAVATION PROTECTION	15	LF
403-6001	TEMPORARY SPECIAL SHORING	594	SF
462-6057	CONC BOX CULV (6 FT X 6 FT)(EXTEND)	40	LF
466-6183	WINGWALL (PW-1)(HW=8 FT)	2	EA
480-6001	CLEAN EXIST CULVERTS	1	EA
496-6006	REMOV STR (HEADWALL)	2	EA
496-6008	REMOV STR (BOX)	8	LF

CULVERT HYDRAULIC DATA

CULVERT

FREQ	Q	TW	L	S	VOUT	HW
(YRS)	(CFS)	ELEV	(FT)	(FT/FT)	(FPS)	ELEV
10	442.1	532.89	66.1	0.005	7.27	534.01
100	859.4	534.77	66.1	0.005	11.94	537.78



CULVERT NO. 06
STA. 596+46 (FM 939)
EXISTING 2-6'X6'X50.1' MBC
EXTEND 8' LT & 8'RT INSTALL PW LT & RT
MC-MD, MC-6-16, & PW

* 2' REMOVE AND REPLACE OF BOX CULVERT, TO BE PAID FOR UNDER APPLICABLE ITEMS.

STATE OF TEXAS
BRADLEY MAYES
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Bradley Mayes 4/15/2022

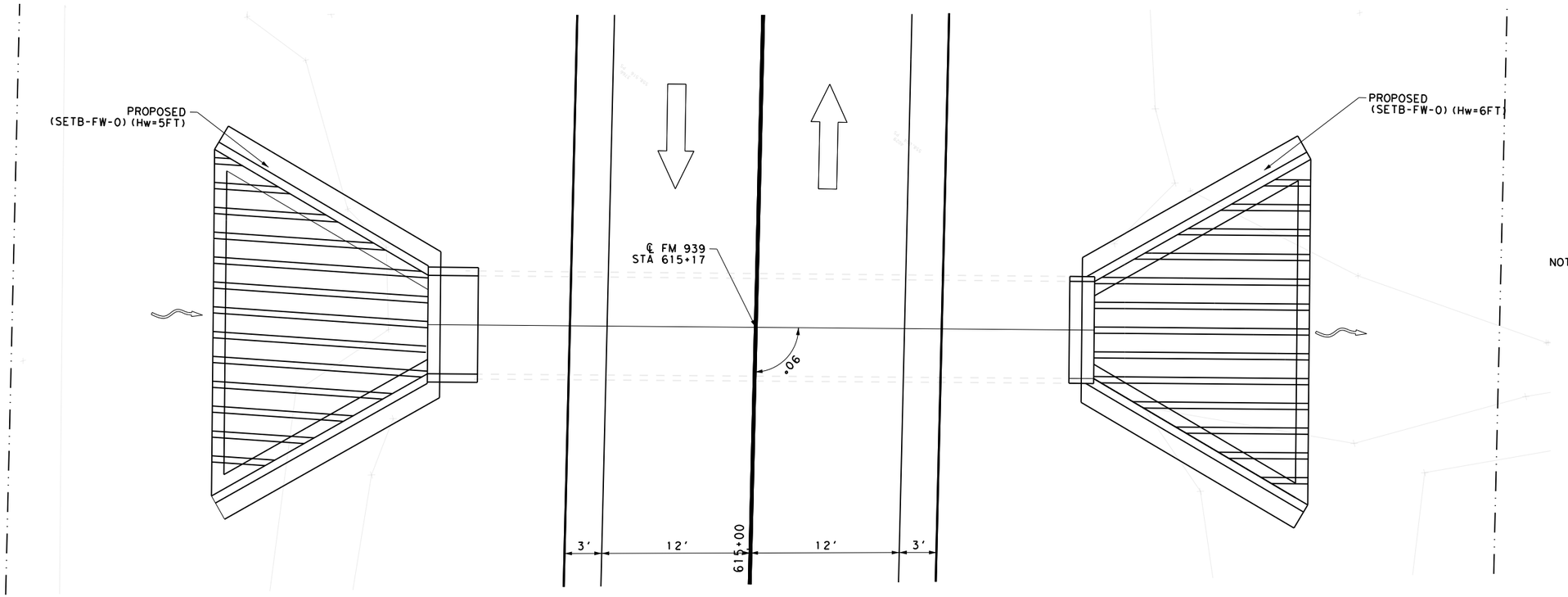
Texas Department of Transportation

CULVERT LAYOUT

SCALE: FEET
1" = 10' HORIZ.
1" = 10' VERTICAL

SHEET 6 OF 11

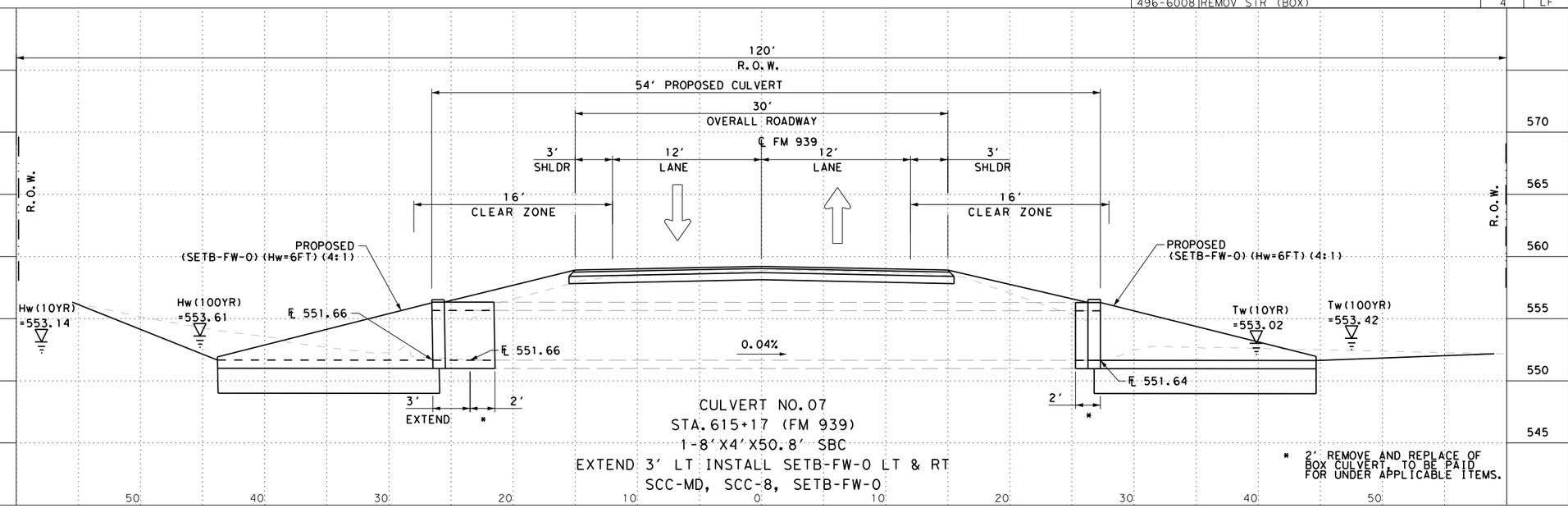
FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	95



NOTES:

CULVERT AND CHANNEL SHALL BE GRADED TO DRAIN. CHANNEL GRADING WORK IS PAID FOR VIA ITEM 150.

QUANTITIES			
ITEM	DESCRIPTION	TOTAL	UNIT
150-6001	BLADING	1	STA
462-6063	CONC BOX CULV (8 FT X 4 FT)(EXTEND)	7	LF
467-6280	SET (TY I)(S= 8 FT)(HW= 6 FT)(4:1) (C)	2	EA
480-6001	CLEAN EXIST CULVERTS	1	EA
496-6006	REMOV STR (HEADWALL)	2	EA
496-6008	REMOV STR (BOX)	4	LF



CULVERT NO.07
STA.615+17 (FM 939)
1-8'X4'X50.8' SBC
EXTEND 3' LT INSTALL SETB-FW-0 LT & RT
SCC-MD, SCC-8, SETB-FW-0

* 2' REMOVE AND REPLACE OF BOX CULVERT, TO BE PAID FOR UNDER APPLICABLE ITEMS.

CULVERT HYDRAULIC DATA						
CULVERT						
FREQ	Q	TW	L	S	VOUT	HW
(YRS)	(CFS)	ELEV	(FT)	(FT/FT)	(FPS)	ELEV
10	25.7	553.02	53.8	0.000	2.33	553.14
100	41.8	553.42	53.8	0.000	2.93	553.61

STATE OF TEXAS
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LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022

Texas Department of Transportation

CULVERT LAYOUT

SCALE: FEET
1" = 10' HORIZ.
1" = 10' VERTICAL

SHEET 7 OF 11

FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	96

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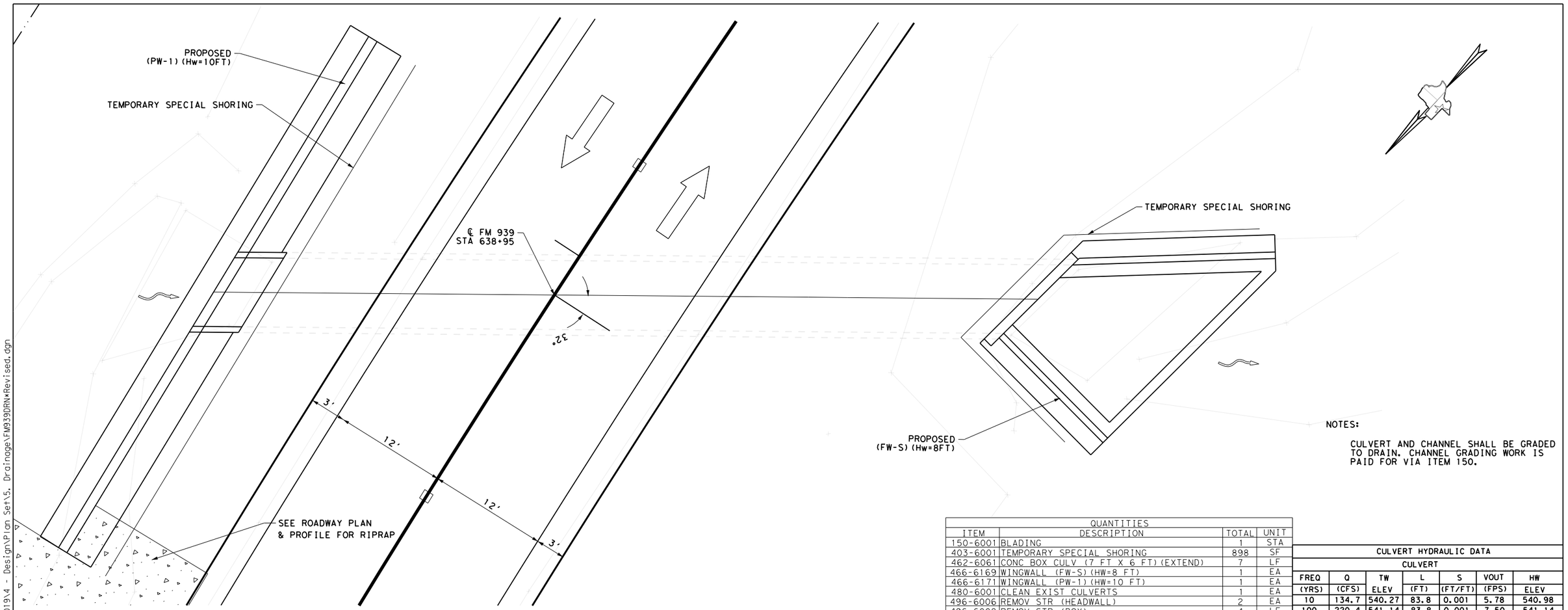
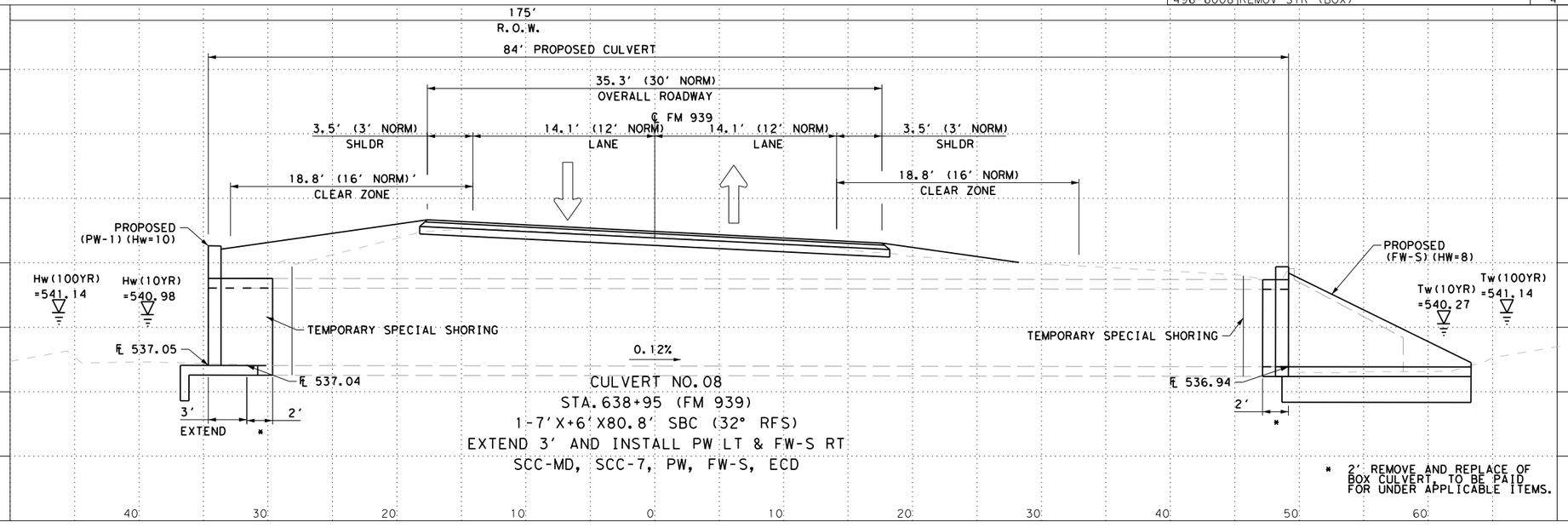


NOTES:

CULVERT AND CHANNEL SHALL BE GRADED TO DRAIN. CHANNEL GRADING WORK IS PAID FOR VIA ITEM 150.

QUANTITIES			
ITEM	DESCRIPTION	TOTAL	UNIT
150-6001	BLADING	1	STA
403-6001	TEMPORARY SPECIAL SHORING	898	SF
462-6061	CONC BOX CULV (7 FT X 6 FT)(EXTEND)	7	LF
466-6169	WINGWALL (FW-S)(HW=8 FT)	1	EA
466-6171	WINGWALL (PW-1)(HW=10 FT)	1	EA
480-6001	CLEAN EXIST CULVERTS	1	EA
496-6006	REMOV STR (HEADWALL)	2	EA
496-6008	REMOV STR (BOX)	4	LF

CULVERT HYDRAULIC DATA						
CULVERT						
FREQ	Q	TW	L	S	VOUT	HW
(YRS)	(CFS)	ELEV	(FT)	(FT/FT)	(FPS)	ELEV
10	134.7	540.27	83.8	0.001	5.78	540.98
100	220.4	541.14	83.8	0.001	7.50	541.14



* 2' REMOVE AND REPLACE OF BOX CULVERT, TO BE PAID FOR UNDER APPLICABLE ITEMS.

STATE OF TEXAS
BRADLEY MAYES
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PROFESSIONAL ENGINEER

Bradley Mayes 7/6/2022

Texas Department of Transportation

CULVERT LAYOUT

SCALE: FEET
1" = 10' HORIZ.
1" = 10' VERTICAL

SHEET 8 OF 11

FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	97

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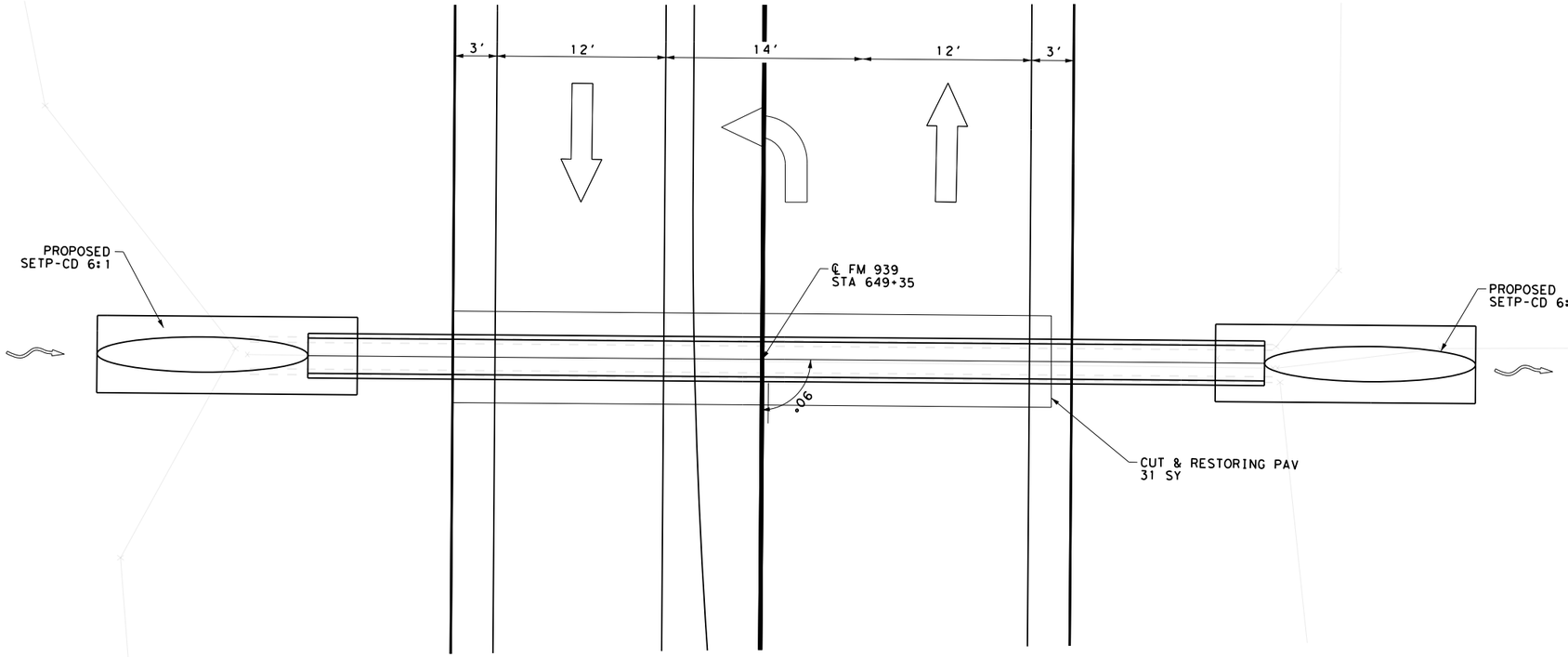
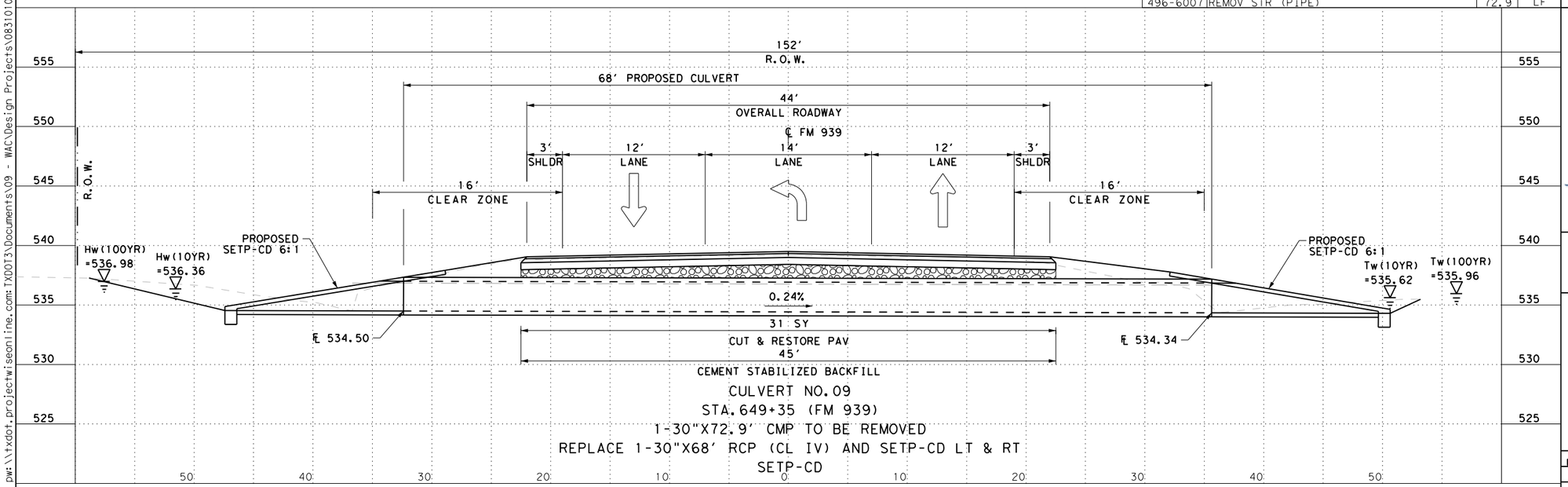


NOTES:

CULVERT AND CHANNEL SHALL BE GRADED TO DRAIN. CHANNEL GRADING WORK IS PAID FOR VIA ITEM 150.

QUANTITIES			
ITEM	DESCRIPTION	TOTAL	UNIT
150-6001	BLADING	1	STA
400-6005	CEM STABIL BKFL	16	CY
400-6006	CUT & RESTORING PAV	31	SY
464-6019	RC PIPE (CL IV)(30 IN)	68	LF
467-6422	SET (TY II) (30 IN) (RCP) (6: 1) (C)	2	EA
480-6001	CLEAN EXIST CULVERTS	1	EA
496-6007	REMOV STR (PIPE)	72.9	LF



CULVERT NO.09
STA.649+35 (FM 939)
1-30"X72.9' CMP TO BE REMOVED
REPLACE 1-30"X68' RCP (CL IV) AND SETP-CD LT & RT
SETP-CD

CULVERT HYDRAULIC DATA						
CULVERT						
FREQ	Q	TW	L	S	VOUT	HW
(YRS)	(CFS)	ELEV	(FT)	(FT/FT)	(FPS)	ELEV
10	11.9	535.62	68.0	0.002	4.70	536.36
100	19.3	535.96	68.0	0.002	5.75	536.98

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BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022

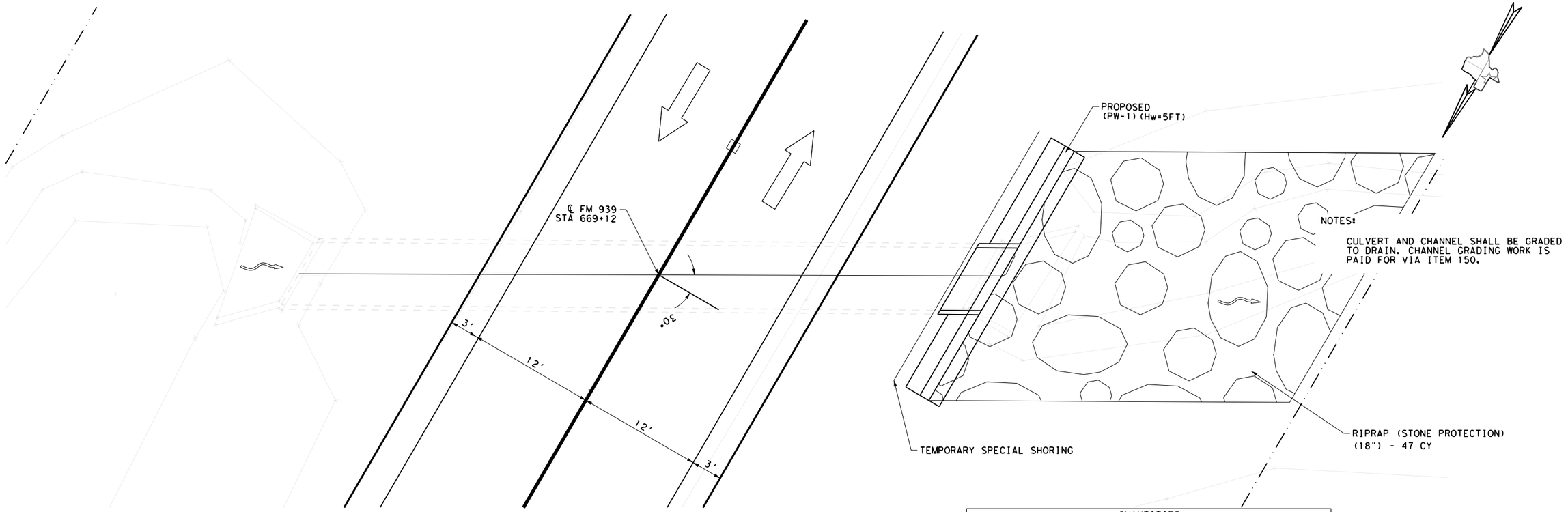
Texas Department of Transportation

CULVERT LAYOUT

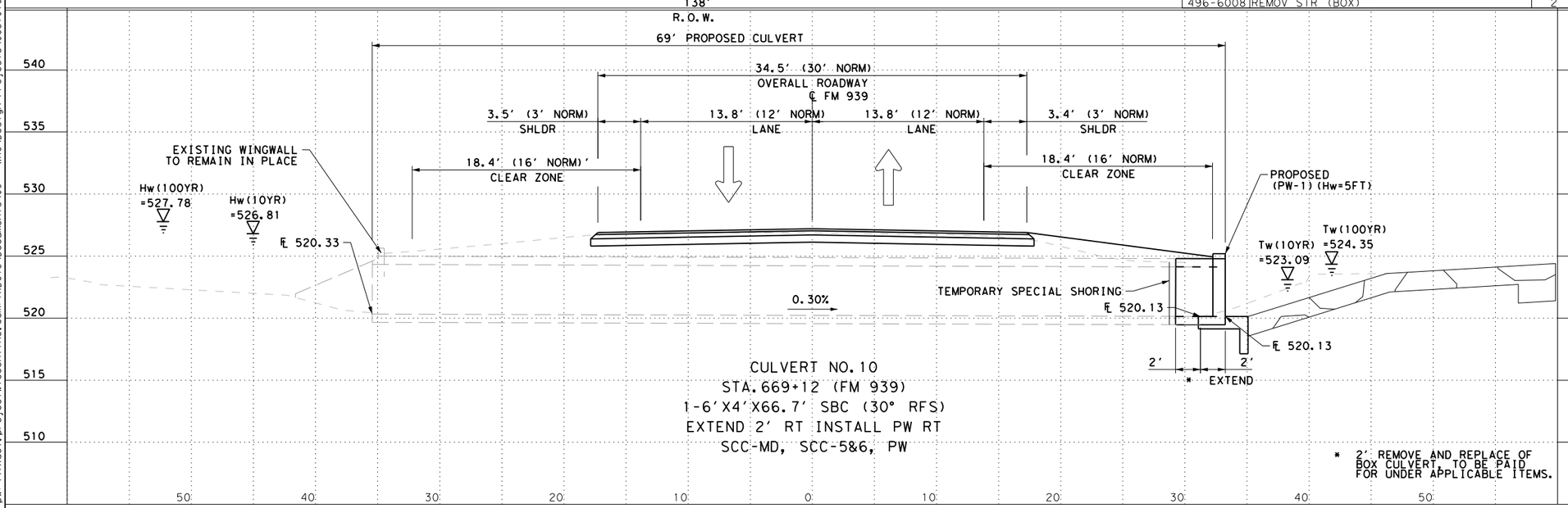
SCALE: FEET
1" = 10' HORIZ.
1" = 10' VERTICAL

SHEET 9 OF 11

FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	98



QUANTITIES			
ITEM	DESCRIPTION	TOTAL	UNIT
150-6001	BLADING	1	STA
403-6001	TEMPORARY SPECIAL SHORING	142	SF
432-6033	RIPRAP (STONE PROTECTION)(18 IN)	47	CY
462-6055	CONC BOX CULV (6 FT X 4 FT)(EXTEND)	4	LF
466-6180	WINGWALL (PW-1)(HW=5 FT)	1	EA
480-6001	CLEAN EXIST CULVERTS	1	EA
496-6006	REMOV STR (HEADWALL)	1	EA
496-6008	REMOV STR (BOX)	2	LF



CULVERT NO. 10
STA. 669+12 (FM 939)
1-6'X4'X66.7' SBC (30° RFS)
EXTEND 2' RT INSTALL PW RT
SCC-MD, SCC-5&6, PW

* 2' REMOVE AND REPLACE OF BOX CULVERT, TO BE PAID FOR UNDER APPLICABLE ITEMS.

CULVERT HYDRAULIC DATA						
CULVERT						
FREQ	Q	TW	L	S	VOUT	HW
(YRS)	(CFS)	ELEV	(FT)	(FT/FT)	(FPS)	ELEV
10	262.9	523.09	68.7	0.003	11.22	526.81
100	564.1	524.35	68.7	0.003	12.58	527.78

STATE OF TEXAS
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Bradley Mayes 7/6/2022

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CULVERT LAYOUT

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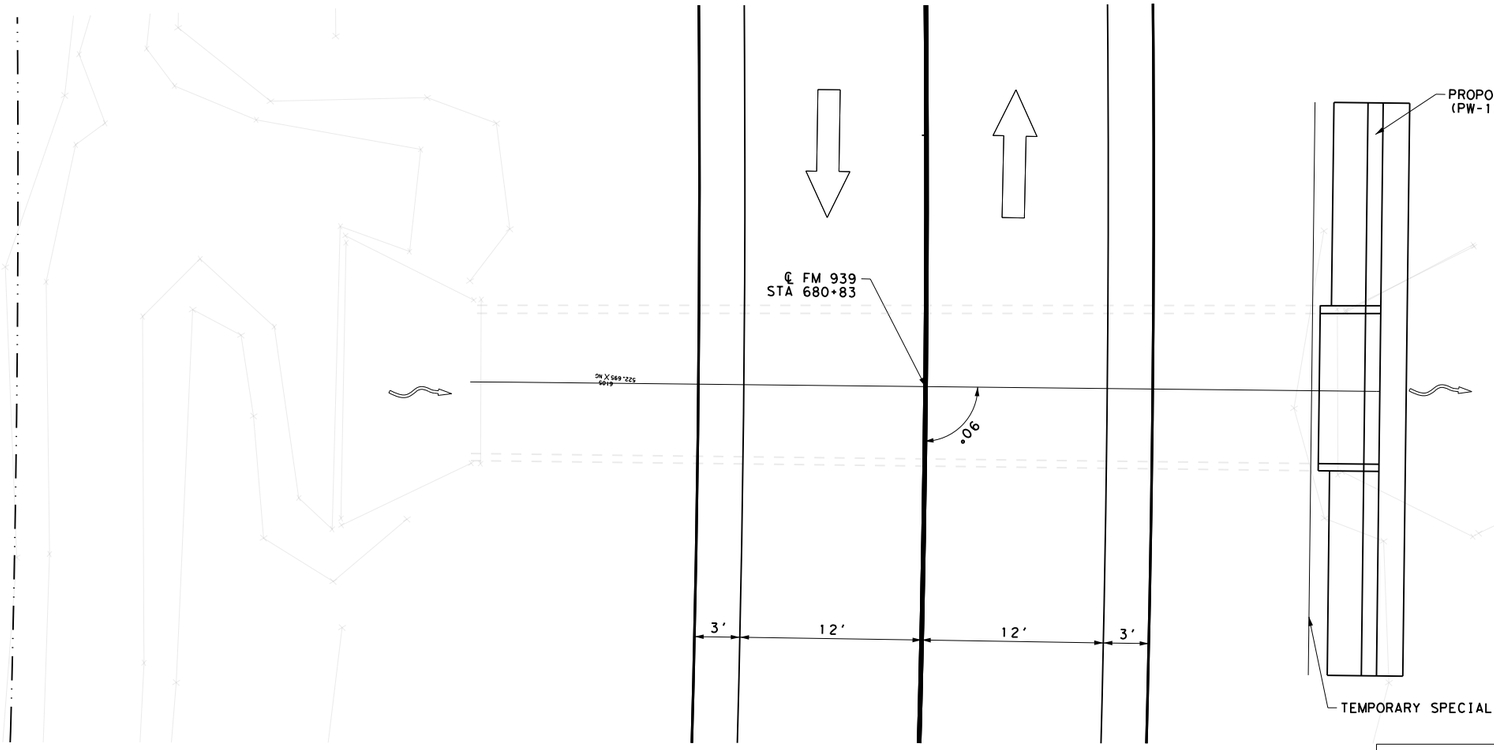
1" = 10' HORIZ.
1" = 10' VERTICAL

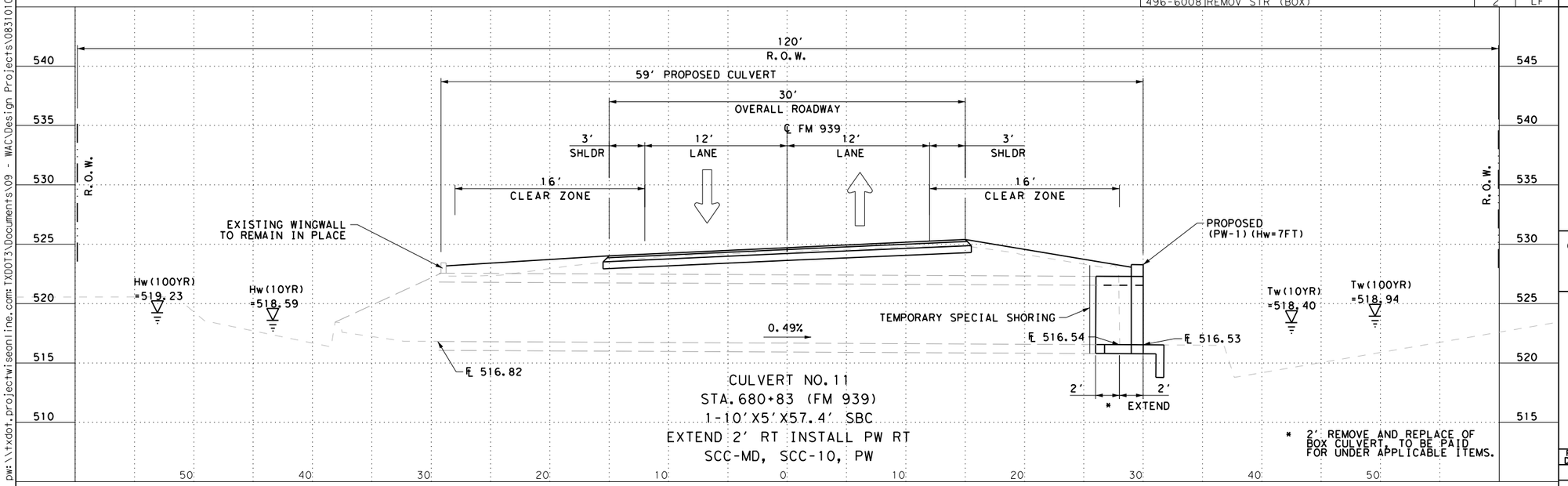
FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	99



NOTES:

CULVERT AND CHANNEL SHALL BE GRADED TO DRAIN. CHANNEL GRADING WORK IS PAID FOR VIA ITEM 150.

QUANTITIES			
ITEM	DESCRIPTION	TOTAL	UNIT
150-6001	BLADING	1	STA
403-6001	TEMPORARY SPECIAL SHORING	282	SF
462-6073	CONC BOX CULV (10 FT X 5 FT)(EXTEND)	4	LF
466-6182	WINGWALL (PW-1)(HW=7 FT)	1	EA
480-6001	CLEAN EXIST CULVERTS	1	EA
496-6006	REMOV STR (HEADWALL)	1	EA
496-6008	REMOV STR (BOX)	2	LF



CULVERT NO. 11
STA. 680+83 (FM 939)
1-10'X5'X57.4' SBC
EXTEND 2' RT INSTALL PW RT
SCC-MD, SCC-10, PW

* 2' REMOVE AND REPLACE OF BOX CULVERT, TO BE PAID FOR UNDER APPLICABLE ITEMS.

CULVERT HYDRAULIC DATA						
CULVERT						
FREQ	Q	TW	L	S	VOUT	HW
(YRS)	(CFS)	ELEV	(FT)	(FT/FT)	(FPS)	ELEV
10	52.9	518.40	59.4	0.005	2.83	518.59
100	63.2	518.94	59.4	0.005	3.57	519.23

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Bradley Mayes 4/15/2022

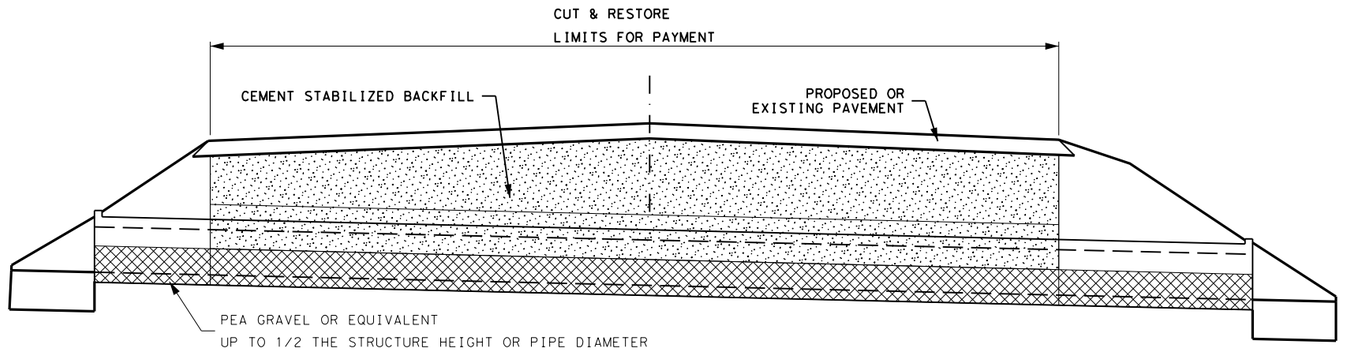
Texas Department of Transportation

CULVERT LAYOUT

SCALE: FEET
1" = 10' HORIZ.
1" = 10' VERTICAL

SHEET 11 OF 11

FED. RD DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS				FM 939
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
WAC	MCLENNAN	0831	01	019, ETC.	100



CEMENT STABILIZED BACKFILL DETAIL

SCALE: N.T.S.

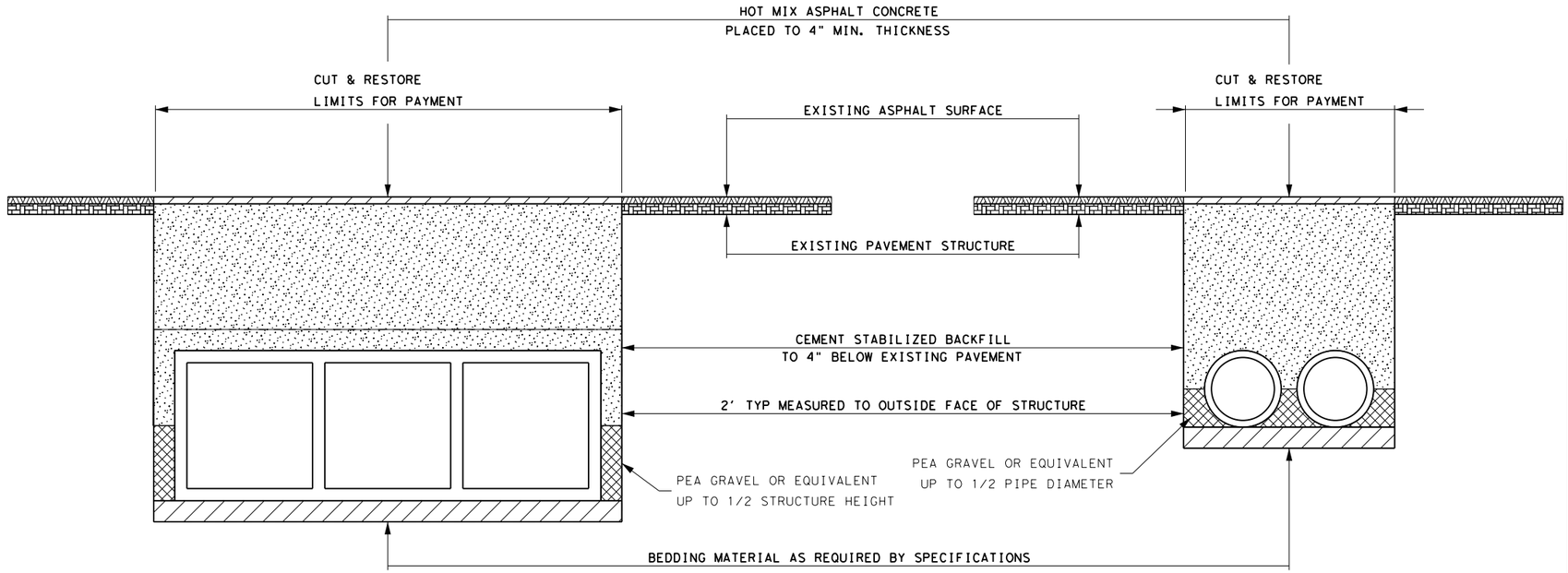
GENERAL NOTES:

1. SAW CUT EXISTING PAVEMENT ON BOTH SIDES OF CULVERT TO PROVIDE A SMOOTH, EVEN EDGE FOR PAVEMENT REPAIR. SAW CUTTING WILL BE SUBSIDIARY TO CULVERT ITEMS.

2. PAYMENT FOR CEMENT STABILIZED BACKFILL WILL BE AS ITEM 400-6005 "CEM STABIL BKFL" BY THE C.Y.

3. PAYMENT FOR PAVEMENT REPAIR WILL BE AS ITEM 400-6008 "CUT & RESTORE ASPH PAVING" BY THE S.Y. OR ITEM 0361-6083 "FULL-DEPTH REPAIR CRCP (7"-8")HES BY THE S.Y.

4. PEA GRAVEL OR EQUIVALENT WILL BE CONSIDERED SUBSIDIARY TO STRUCTURE. GRAVEL WILL BE ALONG THE ENTIRE LENGTH OF STRUCTURE.



SECTION OF CEMENT STABILIZED BACKFILL DETAIL

SCALE: N.T.S.

(DETAIL ILLUSTRATES CULVERT PLACEMENT UNDER TRAFFIC / EXISTING PAVEMENT)

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022

SIGNATURE OF REGISTRANT & DATE

DRAINAGE DETAILS

(CEMENT STABILIZED BACKFILL)

SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	MCLENNAN		101

Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)		Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw Height of Wingwall (1) (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
CULVERT NO. 1 (STA 506+02)	**Both**	**1 ~ 10 x 5**	**7**	SCC-10	**PW-1**	**0**	**2:1**	8	7	**1.000**	6.667	N/A	N/A	13.333	11.167	N/A	0.0	0.8	25.2	356
CULVERT NO. 2 (STA 529+73)	**Lt**	**1 ~ 4 x 3**	**5.18**	SCC-3&4	**SETB-FW-0**	**0**	**6:1**	8	7	**0.250**	3.667	20.000	11.547	23.094	N/A	27.094	3.9	0.0	8.5	N/A
CULVERT NO. 2 (STA 529+73)	**Rt**	**1 ~ 4 x 3**	**7.632**	SCC-3&4	**PW-1**	**0**	**2:1**	8	7	**4.000**	7.667	N/A	N/A	15.333	5.167	N/A	0.0	0.8	15.2	235
CULVERT NO. 3 (STA 549+63)	**Both**	**1 ~ 5 x 3**	**5.02**	SCC-5&6	**PW-1**	**45**	**2:1**	8	7	**0.500**	4.167	N/A	N/A	11.785	8.721	N/A	0.0	0.4	14.6	196
CULVERT NO. 4 (STA 571+91)	**Both**	**1 ~ 4 x 3**	**5.418**	SCC-3&4	**SETB-FW-0**	**0**	**4:1**	8	7	**1.000**	4.417	16.333	9.430	18.860	N/A	22.860	5.0	0.4	15.4	N/A
CULVERT NO. 5 (STA 584+87)	**Both**	**1 ~ 10 x 3**	**4.946**	SCC-10(MOD)	**SETB-FW-0**	**0**	**4:1**	9	7	**1.000**	4.75	17.667	10.200	20.400	11.167	30.400	7.2	0.8	16.1	N/A
CULVERT NO. 6 (STA 596+46)	**Both**	**2 ~ 6 x 6**	**8.731**	MC-6-16	**PW-1**	**0**	**2:1**	9	7	**0.889**	7.646	N/A	N/A	15.292	13.750	N/A	0.0	1.0	32.0	468
CULVERT NO. 7 (STA 615+17)	**Lt**	**1 ~ 8 x 4**	**5.551**	SCC-8	**SETB-FW-0**	**0**	**4:1**	8	7	**0.250**	4.667	17.333	10.007	20.015	N/A	28.015	3.8	0.1	8.8	N/A
CULVERT NO. 7 (STA 615+17)	**Rt**	**1 ~ 8 x 4**	**5**	SCC-8	**SETB-SW-0**	**0**	**4:1**	8	7	**0.250**	4.667	N/A	N/A	17.333	N/A	8.000	1.5	0.1	6.4	N/A
CULVERT NO. 8 (STA 638+95)	**Lt**	**1 ~ 7 x 6**	**9.425**	SCC-7	**PW-1**	**30**	**2:1**	8	7	**2.500**	9.167	N/A	N/A	21.170	9.430	N/A	0.0	0.9	25.1	388
CULVERT NO. 8 (STA 638+95)	**Rt**	**1 ~ 7 x 6**	**9.425**	SCC-7	**FW-S**	**30**	**2:1**	8	7	**1.000**	7.417	14.167	14.167	20.035	9.430	N/A	0.0	0.3	8.3	133
CULVERT NO. 10 (STA 669+12)	**Rt**	**1 ~ 6 x 4**	**4.973**	SCC-5&6	**PW-1**	**30**	**2:1**	8	7	**0.333**	5.000	N/A	N/A	11.547	8.275	N/A	0.0	0.1	7.9	115
CULVERT NO. 11 (STA 680+83)	**Rt**	**1 ~ 10 x 5**	**6.898**	SCC-10	**PW-1**	**0**	**2:1**	8	7	**1.000**	6.667	N/A	N/A	13.333	11.167	N/A	0.0	0.4	12.6	178

NOTES:
Skew = 0° on SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standard sheets;
30° maximum for safety end treatment

SL:1 = Horizontal : 1 Vertical
- Side slope at culvert for flared or straight wingwalls.
- Channel slope for parallel wingwalls.
- Slope must be 3:1 or flatter for safety end treatments.

T = Box culvert top slab thickness. Dimension can be found on the applicable box culvert standard sheet.

U = Box culvert wall thickness. Dimension can be found on the applicable box culvert standard sheet.

C = Curb height

See applicable wing or end treatment standard sheets for calculations of Hw, A, B, Lw, Ltw, Atw, and Total Wingwall Area.

Hw = Height of wingwall

A = Distance from face of curb to end of wingwall (not applicable to parallel or straight wingwalls)

B = Offset of end of wingwall (not applicable to parallel or straight wingwalls)

Lw = Length of longest wingwall.

Ltw = Length of culvert toewall (not applicable when using riprap apron)

Atw = Length of anchor toewall (applicable to safety end treatment only)
Total Wingwall Area = Wingwall area in sq. ft. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

(1) Round the wall heights shown to the nearest foot for bidding purposes.

(2) Concrete volume shown is for box culvert curb only. For curbs using the Box Culvert Rail Mounting Details (RAC) standard sheet quantities shown must be increased by a factor of 2.25. If Class S concrete is required for the top slab of the culvert, also provide Class S concrete for the curb. Curb concrete is considered part of the Box Culvert for payment.

(3) Concrete volume shown is total of wings, footings, culvert toewall (if any), anchor toewalls (if any) and wingwall toewalls. Riprap aprons, culverts, and curb quantities are not included.

(4) Regardless of the type of culvert shown on this sheet, the Contractor has the option of furnishing cast-in-place or precast culverts unless otherwise shown elsewhere on the plans. If the Contractor elects to provide culverts of a different type than those shown on this sheet, it is the Contractor's responsibility to make the necessary adjustments to the dimensions and quantities shown.

SPECIAL NOTE:

This sheet is a supplement to the box culvert standards. It is to be filled out by the culvert specifier and provides dimensions for the construction of the box culvert wingwalls and safety end treatments.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		102

DATE: 4/15/2022 12:49:36 PM
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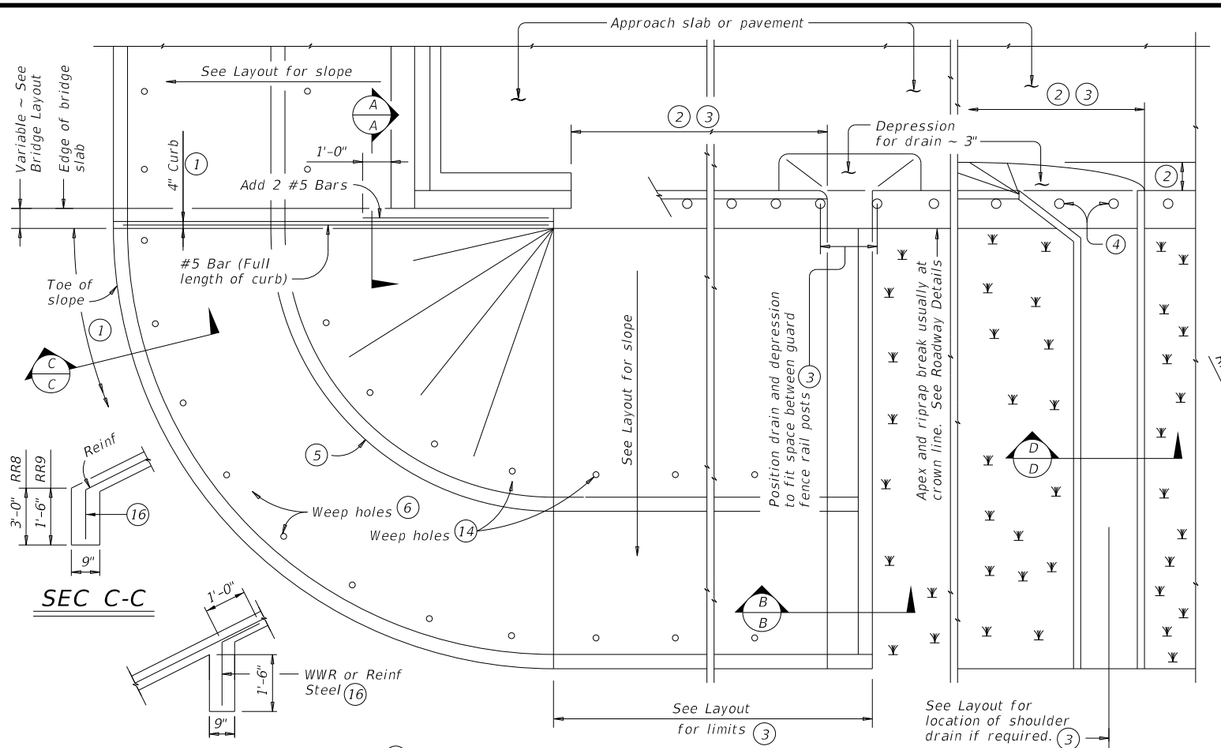
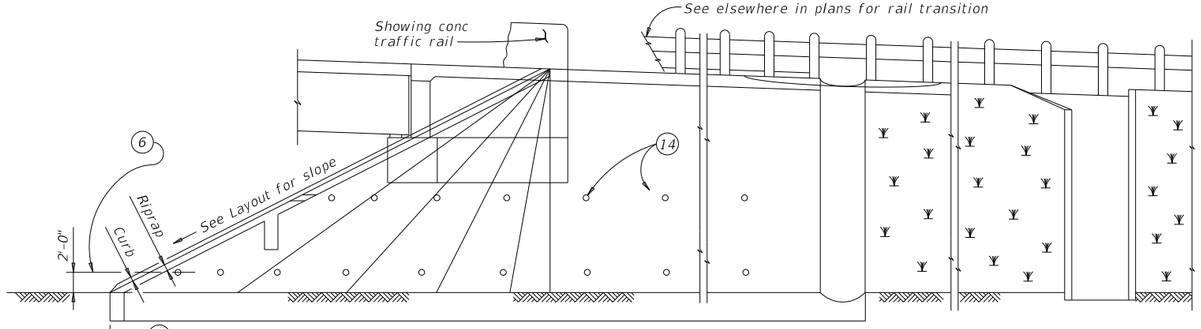


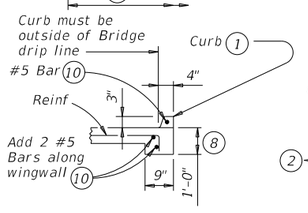
PLAN

SEC C-C

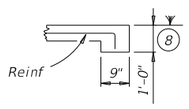
INTERMEDIATE TOEWALL



ELEVATION

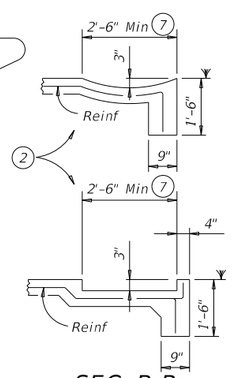


SEC A-A



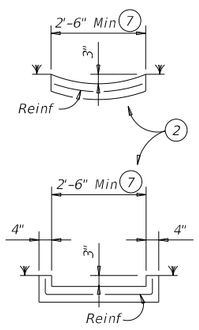
SEC B-B

(No drain)



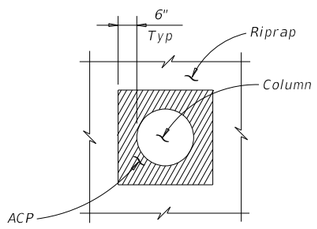
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

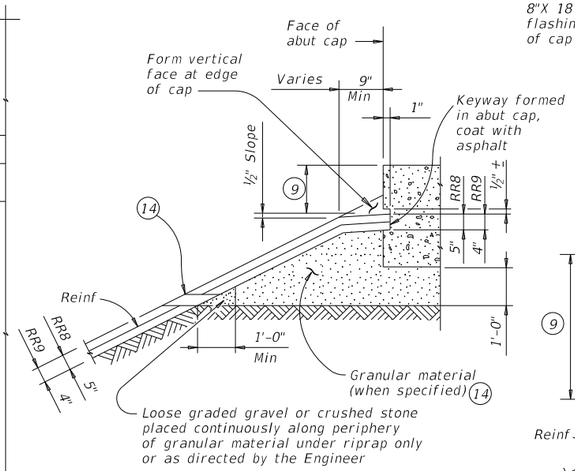
(Shoulder drain)



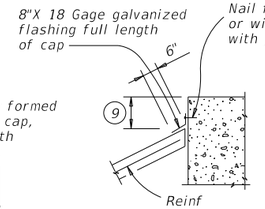
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

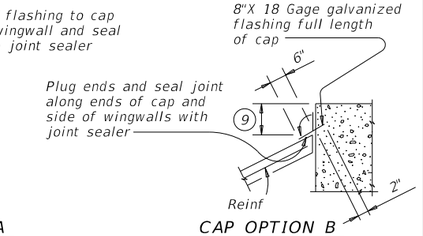
(As directed by the Engineer)



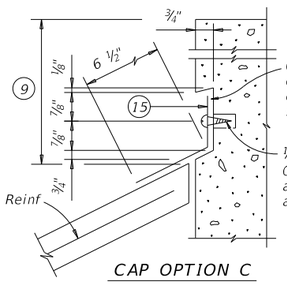
SHOWING KEYWAY OPTION



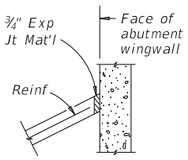
CAP OPTION A



CAP OPTION B

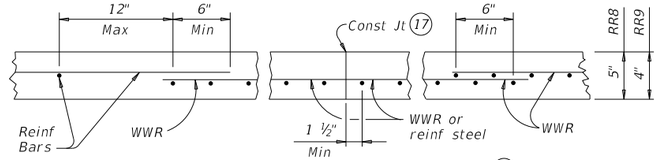


CAP OPTION C



SECT THRU RIPRAP AT WINGWALL (12)

SECTIONS THRU RIPRAP AT CAP (11)



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.
17. WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

GENERAL NOTES:

Provide Class "B" concrete (f'c = 2,000 psi) unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.

Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.

Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.

Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

Texas Department of Transportation

Bridge Division Standard

CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

FILE: crrstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		103

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

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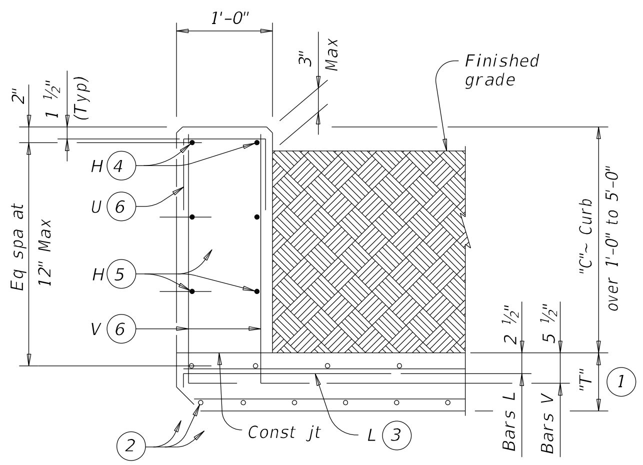
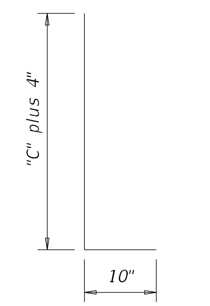
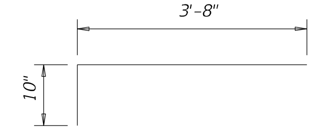


TYPICAL SECTION

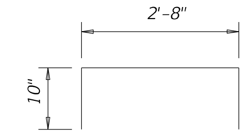
Used for curbs over 1'-0" to 5'-0"



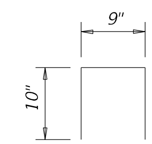
BARS V (#5) ⑥
Spaced at 12" Max



BARS L (#5) ③
Spaced at 12" Max



OPTIONAL
BARS L (#5) ③⑦
Spaced at 12" Max



BARS U (#4) ⑥
Spaced at 12" Max

1. "T" is equal to the culvert top slab thickness. For precast boxes with slabs less than 8" thick, see SCP-MD standard for additional details.
2. Adjust normal culvert slab bars as necessary to clear obstructions.
3. Place bars L as shown. Tilt hook as necessary to maintain cover.
4. Place normal culvert curb bars H(#4) as shown. Adjust as necessary to clear obstructions.
5. Additional bars H(#4) as required to maintain 12" Max spacing.
6. Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" Max. Adjust length of bars V as necessary to maintain clear cover.
7. Optional bars L are to be used only for precast box culverts with 3'-0" closure pour.
8. Quantities shown are for Contractor's information only. Quantities are per linear foot of curb length. The value in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).

TABLE OF ESTIMATED CURB QUANTITIES ⑧

Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'-0"	0.037	10.4
1'-6"	0.056	14.5
2'-0"	0.074	15.6
2'-6"	0.093	18.0
3'-0"	0.111	19.0
3'-6"	0.130	21.3
4'-0"	0.148	22.4
4'-6"	0.167	24.8
5'-0"	0.185	25.9

CONSTRUCTION NOTES:

Adjust reinforcing steel as necessary to provide 1 ¼" cover.
For vehicle safety, top of the curb must not project more than 3" above the finished grade.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class "C" concrete (f'c = 3,600 psi) minimum for curbs.
Provide bar laps, where required, as follows:

- Uncoated or galvanized ~ #4 = 1'-8" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
These extended curb details have sufficient strength to allow for future retrofit of Type T631 or T631LS railing. These details are suitable for use with PR11, PR22 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T631 or T631LS railing, use the T631-CM standard.
This Curb is considered as part of the Box Culvert for payment.

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

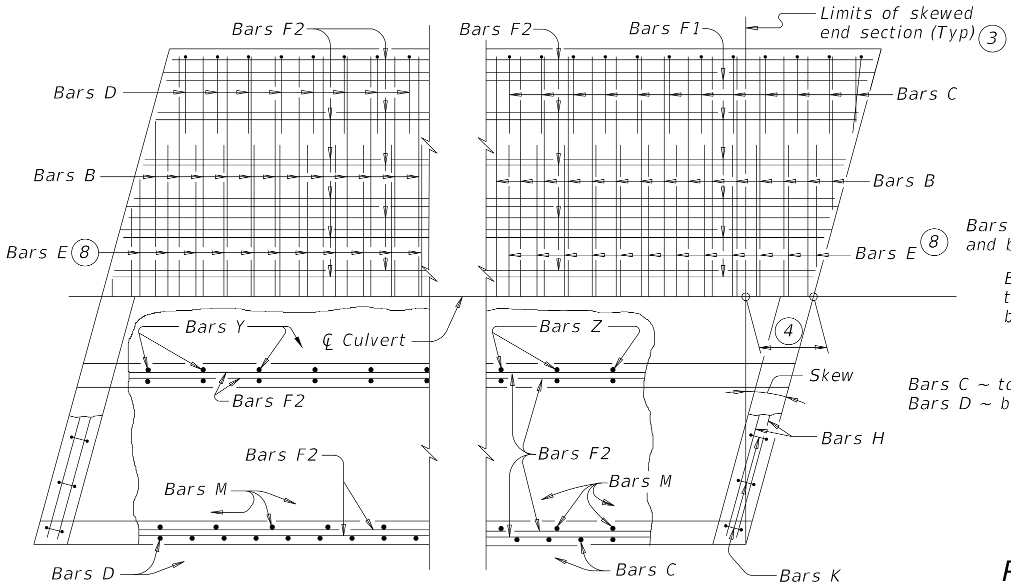
Texas Department of Transportation — Bridge Division Standard

EXTENDED CURB DETAILS

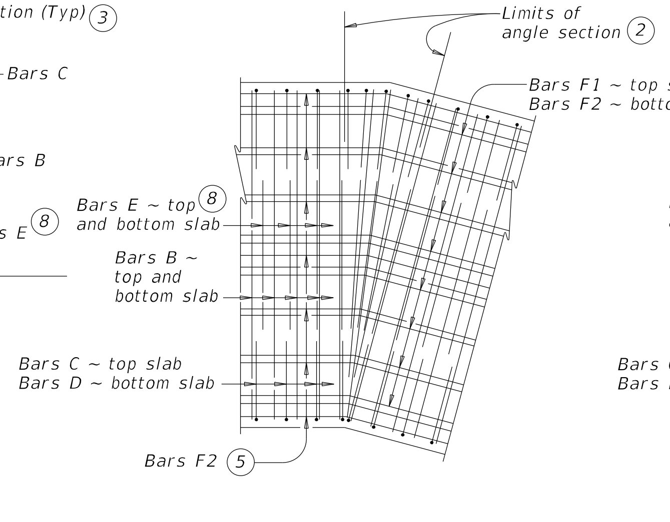
FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

ECD

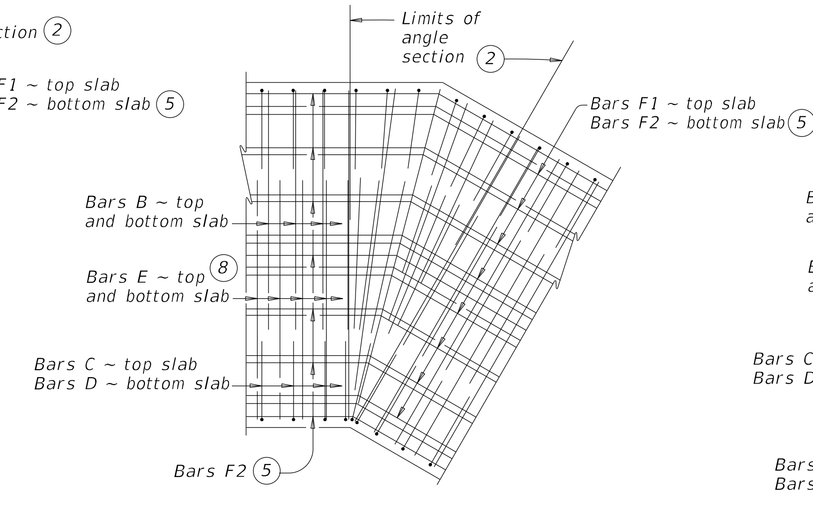
FILE: ecdstde1-20.dgn	DN: GAF	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST		COUNTY	SHEET NO.
	WAC		MCLENNAN	104



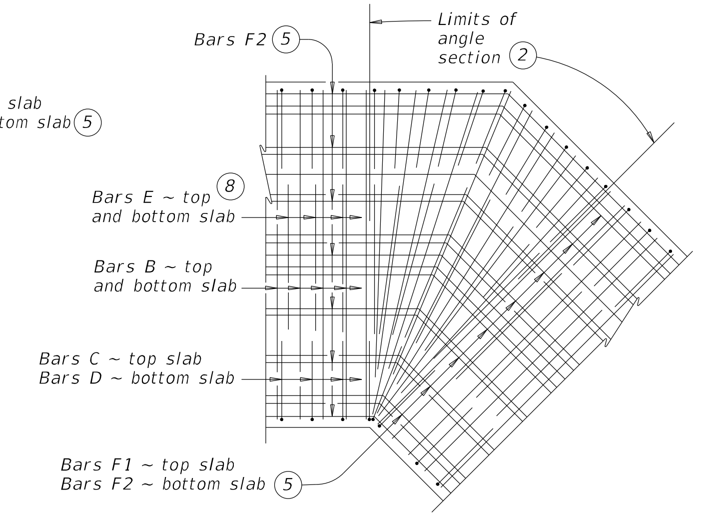
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



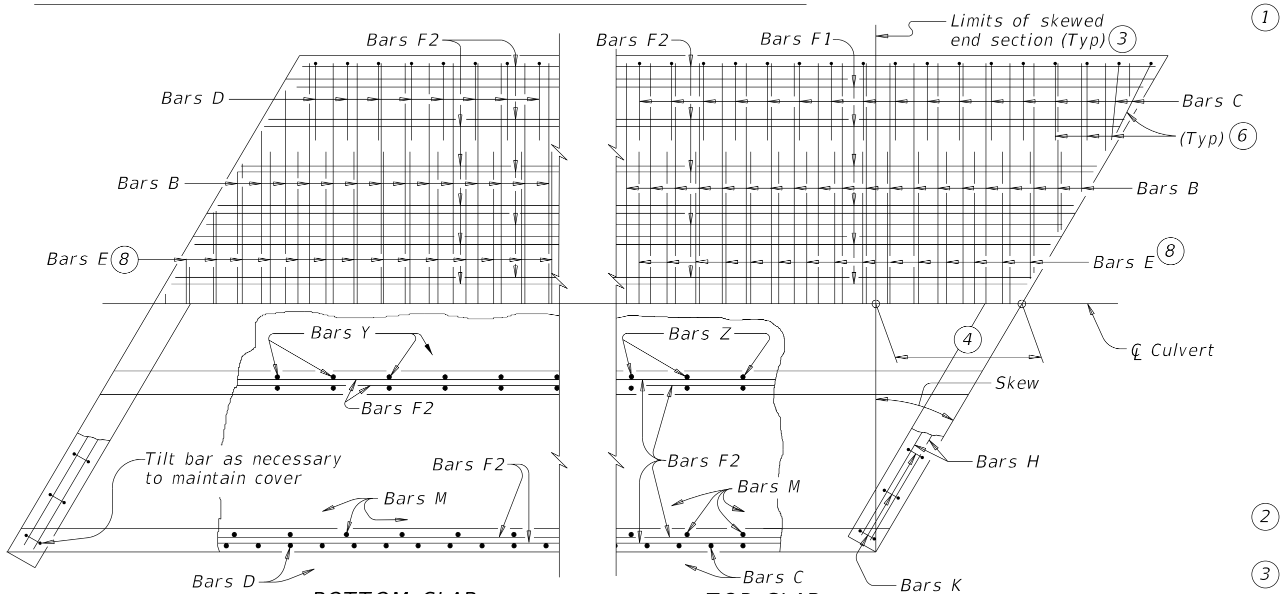
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



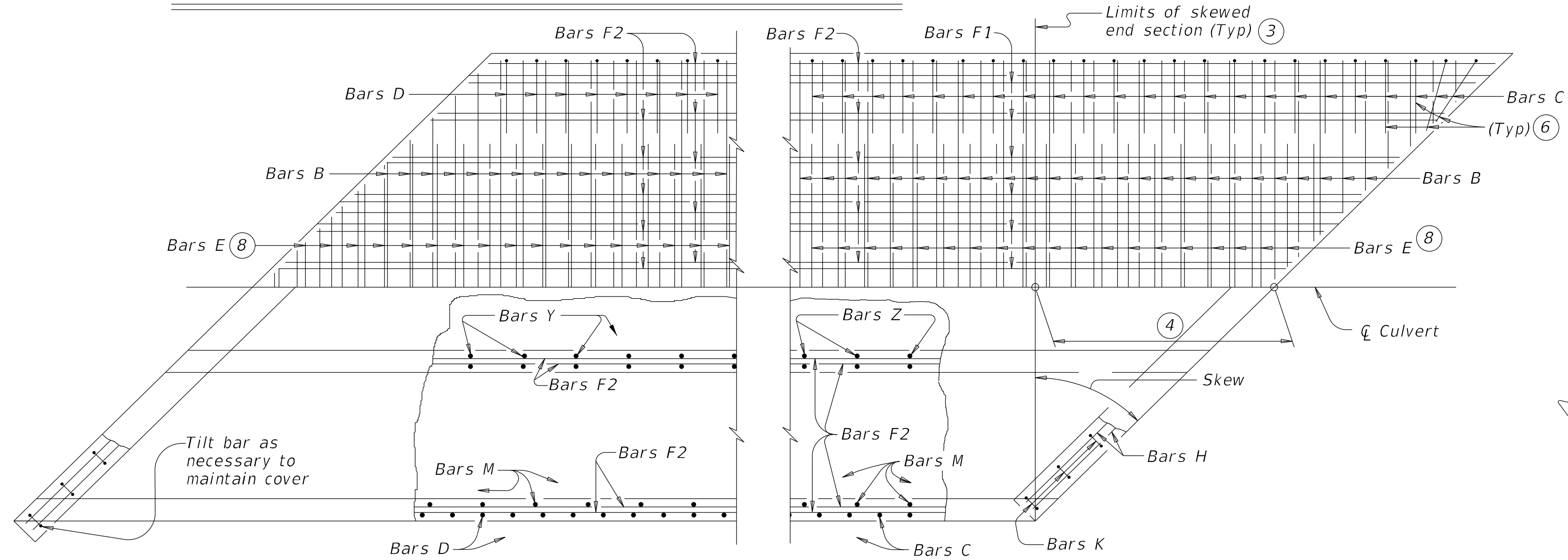
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.
For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, Class C, D, E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.
Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

(2) When the spacing between Bars B or Bars E becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B and Bars E will vary in the skewed end sections.

(4) [One half of overall width] x [tangent of the skew angle]

(5) Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

(6) When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

(7) At the Contractor's option, for skews of 15° or less, place Bars B, C, D, and E parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B and Bars E shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets to accommodate the skew.

(8) Extend Bars E as shown on the MC standard sheet for direct traffic culverts.

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

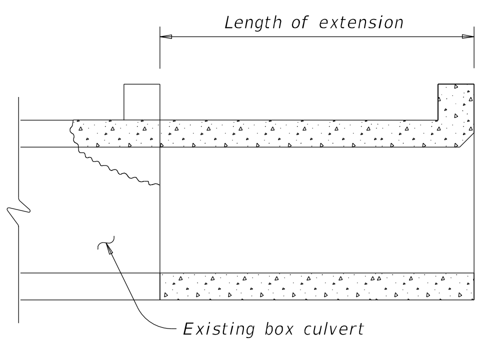
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for details of straight sections of culvert.
For skewed sections and angle sections, refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.
For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.



LENGTHENING DETAIL (1)

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

MC-MD

FILE: mc-mdste-20.dgn		DN: TxDOT		CK: TxDOT	DW: TxDOT		CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB		HIGHWAY	
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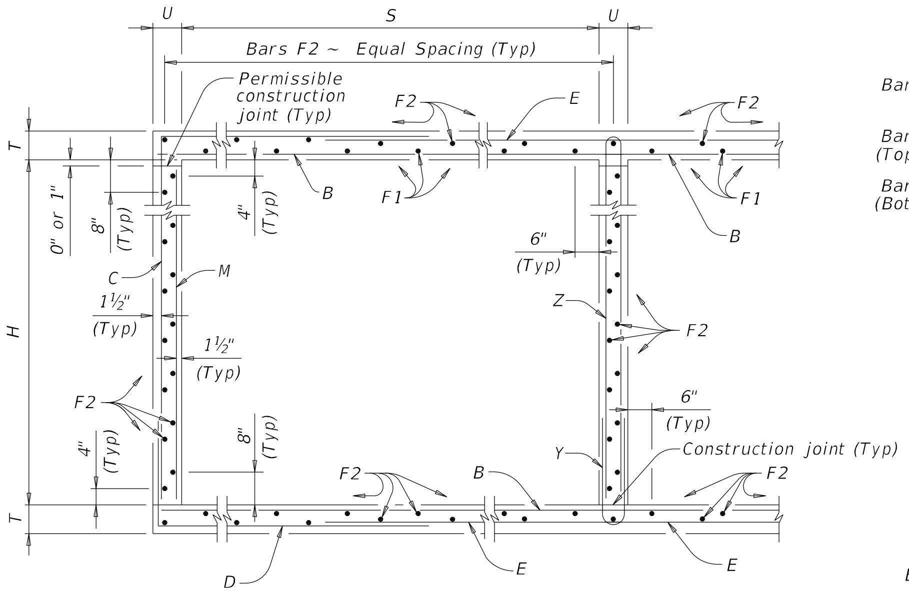
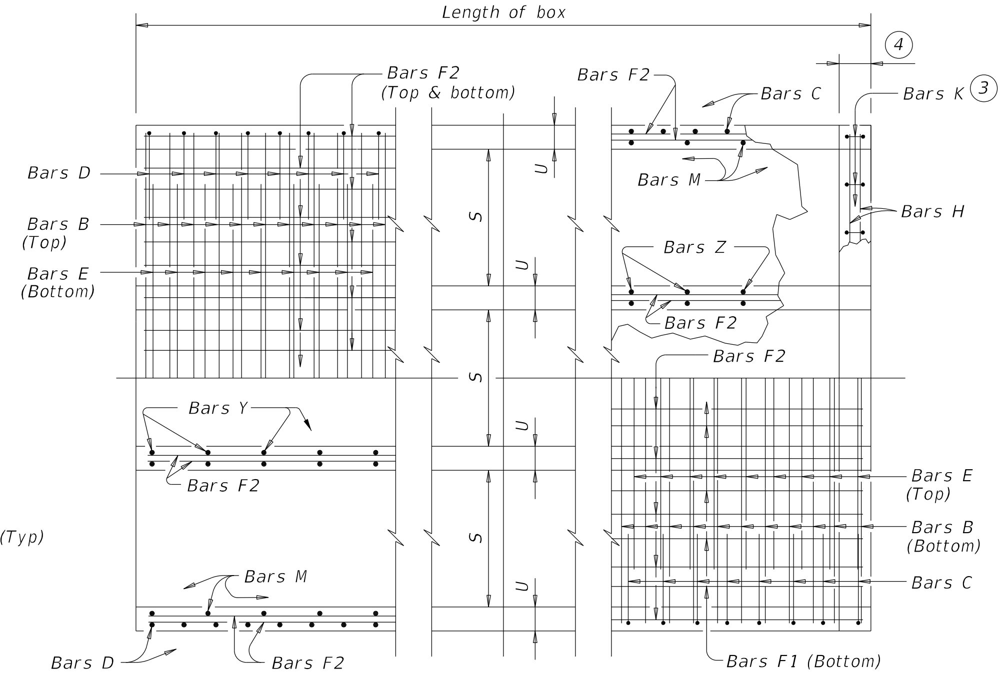
		DIST		COUNTY		SHEET NO.	
		WAC		MCLENNAN		105	



TYPICAL SECTION



BOTTOM SLAB

TOP SLAB

PART PLANS

1 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2 For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

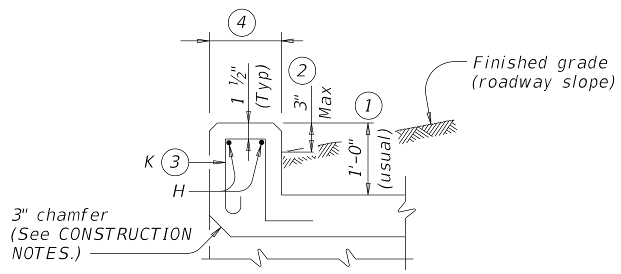
Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3 For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).



SECTION THRU CURB

TABLE OF BAR DIMENSIONS

H	"X"	"Y"
2'-0"	2'-7 ½"	4'-1"
3'-0"	3'-7 ½"	4'-1"
4'-0"	4'-7 ½"	4'-1"
5'-0"	5'-7 ½"	4'-1"
6'-0"	6'-7 ½"	4'-1"

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

MATERIAL NOTES:

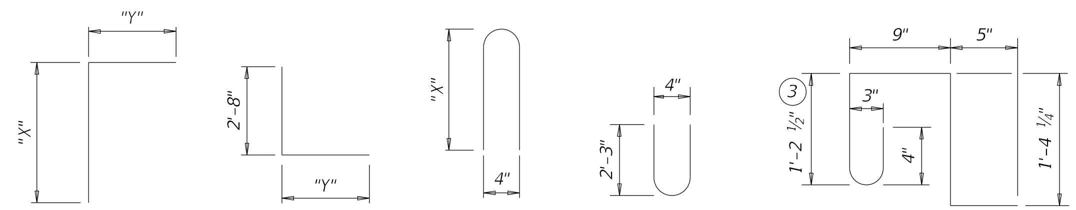
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

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



BARS C BARS D BARS Z BARS Y BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
6'-0" SPAN
0' TO 16' FILL

MC-6-16

FILE: mc616ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST		COUNTY	SHEET NO.
	WAC		MCLENNAN	106

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BILLS OF REINFORCING STEEL (For Box Length = 40 feet)

NUMBER OF SPANS	SECTION DIMENSIONS				Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4								Bars H 4 ~ #4		Bars K		QUANTITIES					
													Bars C		Bars D																						Bars Y		Bars Z								Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	Length	Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	Length	Wt	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	6' – 0"	2' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	44	18"	39' – 9"	1,168	108	9"	2' – 0"	144	54	9"	4' – 9"	171	5' – 5"	195	13' – 6"	36	30	84	0.894	182.4	1.0	120	36.8	7,414
3	6' – 0"	2' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	63	18"	39' – 9"	1,673	108	9"	2' – 0"	144	108	9"	4' – 9"	343	5' – 5"	391	20' – 1"	54	44	122	1.302	260.9	1.5	176	53.6	10,611
4	6' – 0"	2' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	82	18"	39' – 9"	2,177	108	9"	2' – 0"	144	162	9"	4' – 9"	514	5' – 5"	586	26' – 8"	71	56	156	1.711	339.4	2.0	227	70.4	13,801
5	6' – 0"	2' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	101	18"	39' – 9"	2,682	108	9"	2' – 0"	144	216	9"	4' – 9"	685	5' – 5"	782	33' – 3"	89	70	195	2.120	417.9	2.5	284	87.3	16,999
6	6' – 0"	2' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	120	18"	39' – 9"	3,186	108	9"	2' – 0"	144	270	9"	4' – 9"	857	5' – 5"	977	39' – 10"	106	82	228	2.529	496.4	3.0	334	104.1	20,189
2	6' – 0"	3' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	50	18"	39' – 9"	1,328	108	9"	3' – 0"	216	54	9"	4' – 9"	171	7' – 5"	268	13' – 6"	36	30	84	0.958	192.8	1.0	120	39.3	7,832
3	6' – 0"	3' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	71	18"	39' – 9"	1,885	108	9"	3' – 0"	216	108	9"	4' – 9"	343	7' – 5"	535	20' – 1"	54	44	122	1.389	274.4	1.5	176	57.1	11,152
4	6' – 0"	3' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	92	18"	39' – 9"	2,443	108	9"	3' – 0"	216	162	9"	4' – 9"	514	7' – 5"	803	26' – 8"	71	56	156	1.819	356.1	2.0	227	74.7	14,469
5	6' – 0"	3' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	113	18"	39' – 9"	3,000	108	9"	3' – 0"	216	216	9"	4' – 9"	685	7' – 5"	1,070	33' – 3"	89	70	195	2.250	437.7	2.5	284	92.5	17,790
6	6' – 0"	3' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	134	18"	39' – 9"	3,558	108	9"	3' – 0"	216	270	9"	4' – 9"	857	7' – 5"	1,338	39' – 10"	106	82	228	2.681	519.3	3.0	334	110.2	21,107
2	6' – 0"	4' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	50	18"	39' – 9"	1,328	108	9"	4' – 0"	289	54	9"	4' – 9"	171	9' – 5"	340	13' – 6"	36	30	84	1.023	199.2	1.0	120	41.9	8,089
3	6' – 0"	4' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	71	18"	39' – 9"	1,885	108	9"	4' – 0"	289	108	9"	4' – 9"	343	9' – 5"	679	20' – 1"	54	44	122	1.475	282.6	1.5	176	60.5	11,481
4	6' – 0"	4' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	92	18"	39' – 9"	2,443	108	9"	4' – 0"	289	162	9"	4' – 9"	514	9' – 5"	1,019	26' – 8"	71	56	156	1.927	366.1	2.0	227	79.1	14,870
5	6' – 0"	4' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	113	18"	39' – 9"	3,000	108	9"	4' – 0"	289	216	9"	4' – 9"	685	9' – 5"	1,359	33' – 3"	89	70	195	2.380	449.5	2.5	284	97.7	18,264
6	6' – 0"	4' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	134	18"	39' – 9"	3,558	108	9"	4' – 0"	289	270	9"	4' – 9"	857	9' – 5"	1,698	39' – 10"	106	82	228	2.832	533.0	3.0	334	116.2	21,652
2	6' – 0"	5' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	56	18"	39' – 9"	1,487	108	9"	5' – 0"	361	54	9"	4' – 9"	171	11' – 5"	412	13' – 6"	36	30	84	1.088	209.6	1.0	120	44.5	8,505
3	6' – 0"	5' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	79	18"	39' – 9"	2,098	108	9"	5' – 0"	361	108	9"	4' – 9"	343	11' – 5"	824	20' – 1"	54	44	122	1.562	296.2	1.5	176	64.0	12,024
4	6' – 0"	5' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	102	18"	39' – 9"	2,708	108	9"	5' – 0"	361	162	9"	4' – 9"	514	11' – 5"	1,235	26' – 8"	71	56	156	2.035	382.7	2.0	227	83.4	15,536
5	6' – 0"	5' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	125	18"	39' – 9"	3,319	108	9"	5' – 0"	361	216	9"	4' – 9"	685	11' – 5"	1,647	33' – 3"	89	70	195	2.509	469.3	2.5	284	102.8	19,056
6	6' – 0"	5' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	148	18"	39' – 9"	3,930	108	9"	5' – 0"	361	270	9"	4' – 9"	857	11' – 5"	2,059	39' – 10"	106	82	228	2.983	555.9	3.0	334	122.3	22,570
2	6' – 0"	6' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	62	18"	39' – 9"	1,646	108	9"	6' – 0"	433	54	9"	4' – 9"	171	13' – 5"	484	13' – 6"	36	30	84	1.153	220.0	1.0	120	47.1	8,921
3	6' – 0"	6' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	87	18"	39' – 9"	2,310	108	9"	6' – 0"	433	108	9"	4' – 9"	343	13' – 5"	968	20' – 1"	54	44	122	1.648	309.7	1.5	176	67.4	12,565
4	6' – 0"	6' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	112	18"	39' – 9"	2,974	108	9"	6' – 0"	433	162	9"	4' – 9"	514	13' – 5"	1,452	26' – 8"	71	56	156	2.144	399.4	2.0	227	87.7	16,204
5	6' – 0"	6' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	137	18"	39' – 9"	3,638	108	9"	6' – 0"	433	216	9"	4' – 9"	685	13' – 5"	1,936	33' – 3"	89	70	195	2.639	489.1	2.5	284	108.0	19,849
6	6' – 0"	6' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	162	18"	39' – 9"	4,302	108	9"	6' – 0"	433	270	9"	4' – 9"	857	13' – 5"	2,420	39' – 10"	106	82	228	3.134	578.9	3.0	334	128.3	23,488

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS
CAST-IN-PLACE
6'-0" SPAN
0' TO 16' FILL

MC-6-16

FILE: mc616ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		107

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing length (2~wings) (3)	
Maximum Wingwall Height Hw	W	X	Y	Z	Bars J1 Size	Bars J1 Spa	Bars J2 Size	Bars J2 Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'-8"	1'-9"	1'-3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'-2"	2'-0"	1'-6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'-8"	2'-3"	1'-9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'-2"	2'-6"	2'-0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'-8"	2'-9"	2'-3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'-2"	3'-0"	2'-6"	9"	#7	6"	#5	6"	162.29	0.721
13'-0"	6'-8"	3'-3"	2'-9"	11"	#7	6"	#5	6"	178.80	0.856
14'-0"	7'-2"	3'-6"	3'-0"	1'-0"	#8	6"	#5	6"	216.78	0.959
15'-0"	7'-8"	4'-0"	3'-0"	1'-1"	#9	6"	#6	6"	283.06	1.068
16'-0"	8'-2"	4'-6"	3'-0"	1'-3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING
(2~wings)

Bar	Size	No.	Spa
DL	#5	~	1'-0"
DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RS	#5	3	~
RL	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

WING DIMENSION FORMULAS:

(All values are in feet.)

Hw = H + T + C – 0.250'
A = (Hw – 0.333')(Sc)
B = (A) [tanget (θ + 15°)]
Lw = (A) ÷ [cosine (θ + 15°)]

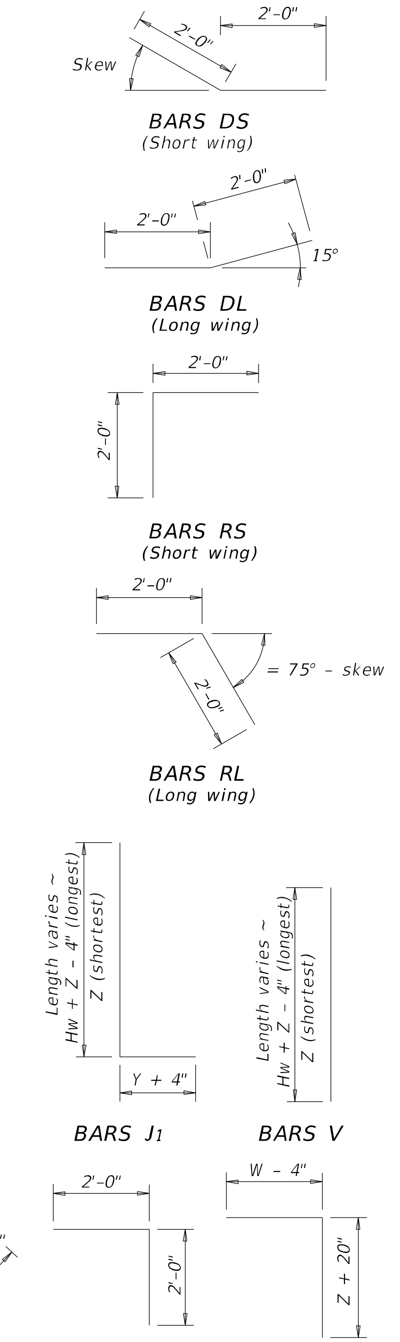
For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine θ

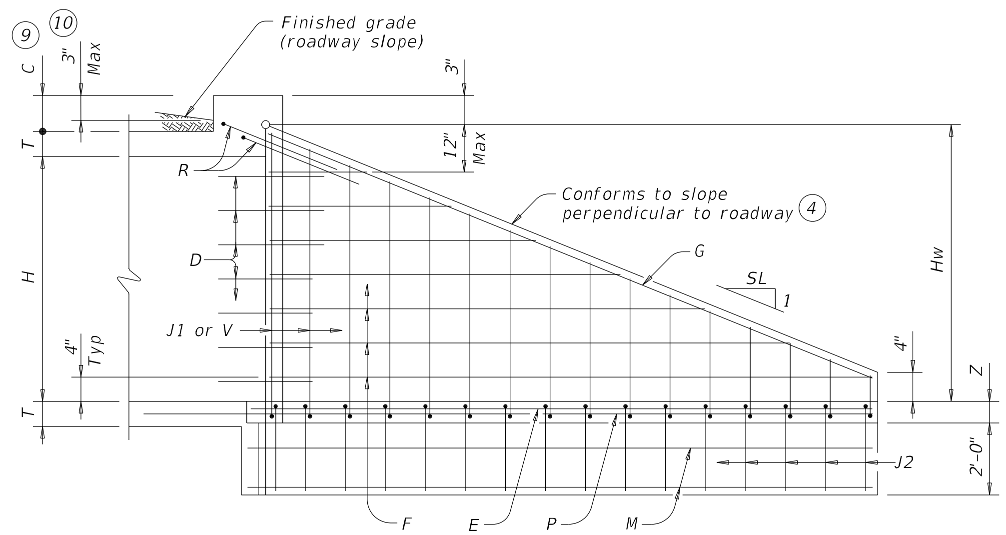
For precast culverts:
Ltw = [(N) (2U + S) + (N – 1) (0.5')] ÷ cosine θ

Total wingwall area (two wings ~ SF) = 0.5 (Hw + 0.333') (Lw + A)

Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
A = Length of short wingwalls
Lw = Length of long wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
θ = Culvert skew

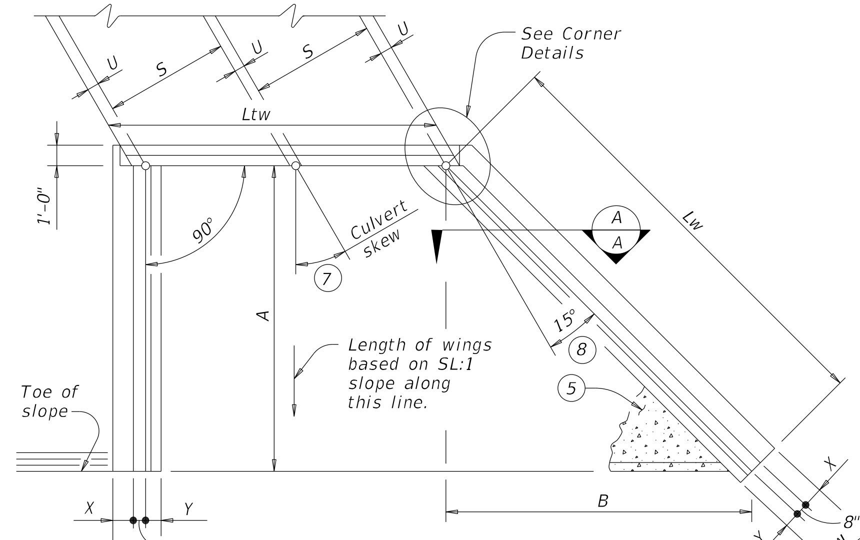
See applicable box culvert standard sheet for H, S, T, and U values.





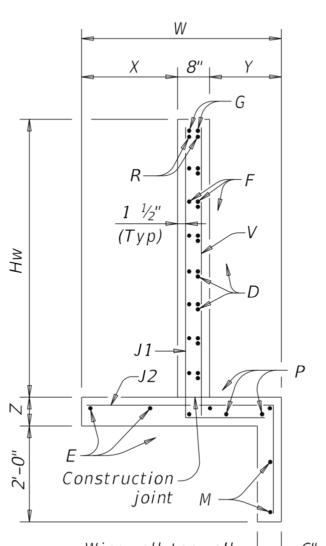
INSIDE ELEVATION

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

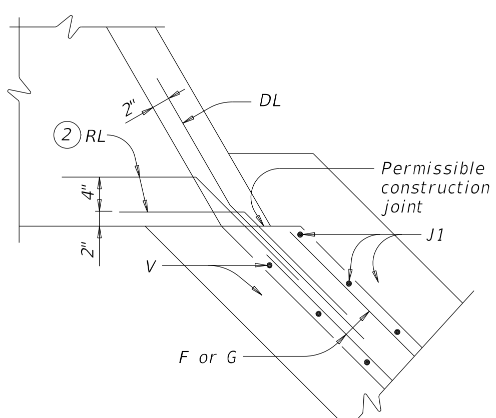


PLAN

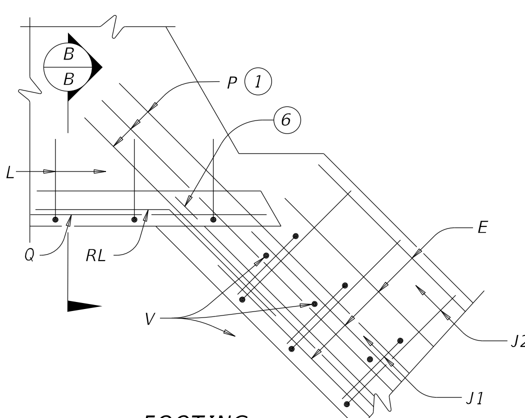
(Showing dimensions and 30° skew.)



SECTION A-A



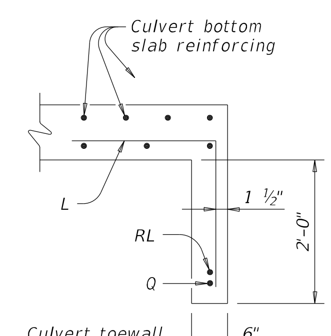
WINGWALL



FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and culvert toewall reinforcing not shown for clarity.)



SECTION B-B (5)

(1) Extend Bars P 3'-0" minimum into bottom slab of box culvert.

(2) Adjust as necessary to maintain 1 1#2" clear cover and 4" minimum between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by 0.5 x (A + Lw).

(4) Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.

(6) At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.

(7) Applicable values of skew are: 15°, 30°, and 45°.

(8) Typical wingwall angle for all skews.

(9) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

(10) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

MATERIAL NOTES:

Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
In riprap concrete, synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

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

Texas Department of Transportation — Bridge Division Standard

CONCRETE WINGWALLS WITH FLARED WINGS FOR SKEWED BOX CULVERTS

FW-S

FILE: fw-sstde-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 0831	SECT 01	JOB 019, ETC.	HIGHWAY FM 939
REVISIONS	DIST WAC	COUNTY MCLENNAN		SHEET NO. 108

DATE: 4/15/2022 12:50:03 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\0831010194\Design\Plan Set\5. Drainage\Standards\fw-sstde-20.dgn

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

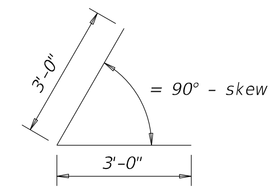
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) ④		Estimated Quantities per ft of Toewall (1~toewall)	
Maximum Wingwall Height Hw	W	X	Y	Z	Bars J1 Size	Bars J1 Spa	Bars J2 Size	Bars J2 Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	48.64	0.406	6.85	0.071
2'-9"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.31	0.424	6.85	0.071
3'-0"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.98	0.444	6.85	0.071
3'-3"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.32	0.462	6.85	0.071
3'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.98	0.480	6.85	0.071
4'-0"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	55.77	0.532	6.85	0.071
4'-6"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	59.77	0.568	6.85	0.071
5'-0"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	63.45	0.632	6.96	0.075
5'-6"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	67.46	0.668	6.96	0.075
6'-0"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	80.67	0.730	7.07	0.078
6'-6"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	85.05	0.768	7.07	0.078
7'-0"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	92.15	0.864	8.07	0.093
7'-6"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	96.54	0.902	8.07	0.093
8'-0"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'-6"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'-6"	6'-0"	2'-10"	2'-2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'-6"	6'-5"	3'-0"	2'-5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'-6"	7'-2"	3'-6"	2'-8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'-6"	7'-8"	3'-9"	2'-11"	1'-0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'-6"	8'-2"	4'-0"	3'-2"	1'-2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'-6"	8'-10"	4'-5"	3'-5"	1'-4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'-6"	9'-6"	4'-10"	3'-8"	1'-6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'-0"	9'-11"	5'-0"	3'-11"	1'-7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING
(2~wings)

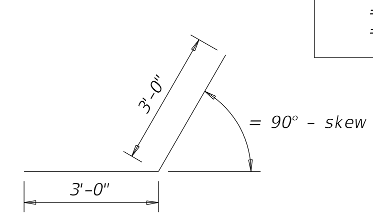
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

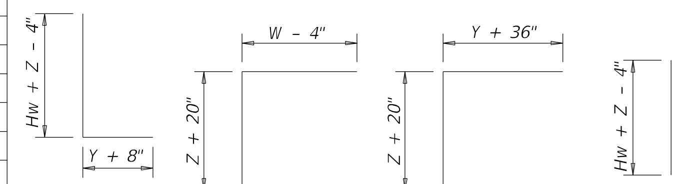
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION FORMULAS:

(All values are in feet.)

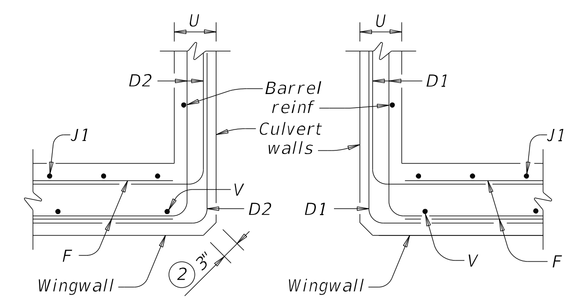
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw < 4'

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

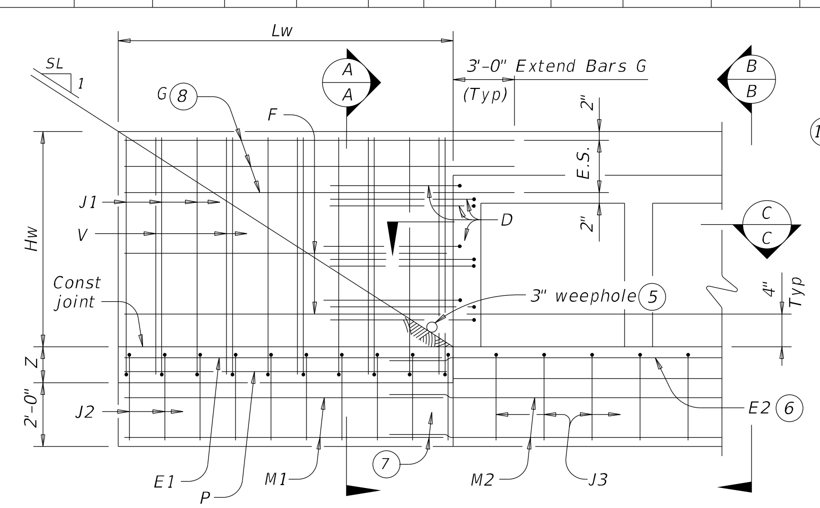
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw < 4'

Hw = Height of wingwall
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
SL:1 = Channel slope ratio. (horizontal: 1 vertical, usual value is 2:1)
θ = Culvert skew

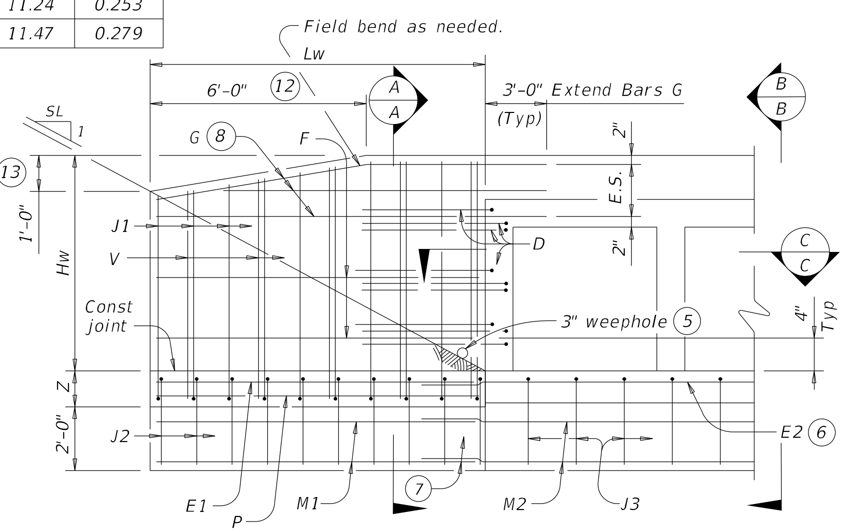
See applicable box culvert standard sheet for S, H, T, and U values.



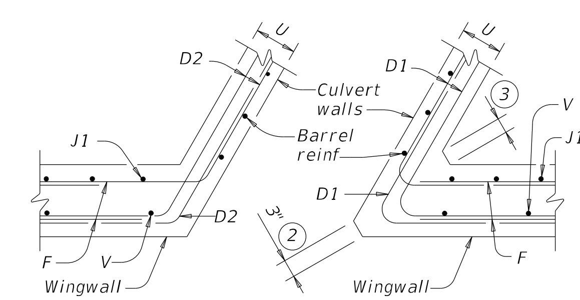
SECTION C-C - PW-1



PARTIAL ELEVATION - PW-1



PARTIAL ELEVATION - PW-2



SECTION C-C - PW-2

1 Skew = 0°

2 At discharge end, chamfer may be ¾" minimum.

3 For 15° skew ~ 1"
For 30° skew ~ 2"
For 45° skew ~ 3"

4 Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.

5 Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.

6 Extend Bars E2 1'-6" minimum into the wingwall footing.

7 Lap Bars M1 1'-6" minimum with Bars M2.

8 Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.

9 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

10 For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

11 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elswhere in the plans.

12 3'-0" for Hw < 4'.

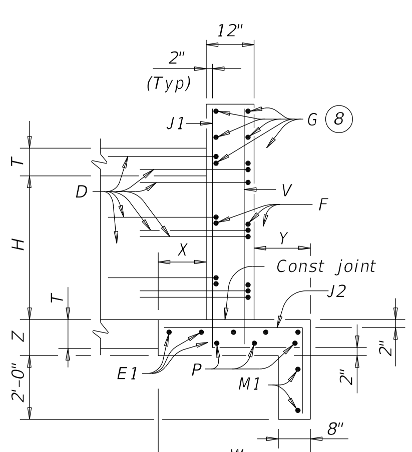
13 6" for Hw < 4'.

DESIGNER NOTES:
Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW-2 can only be used for applications without a railing mounted to the wingwall.

MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforing steel if required elsewhere in the plans.

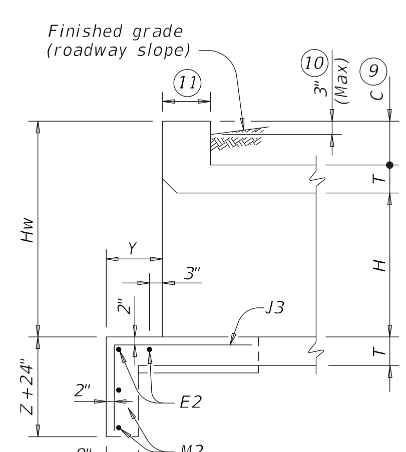
GENERAL NOTES:
Designed in accordance with AASHTO LRFD Bridge Design Specifications.
Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for wingwall type and additional dimensions and information.
Quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

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



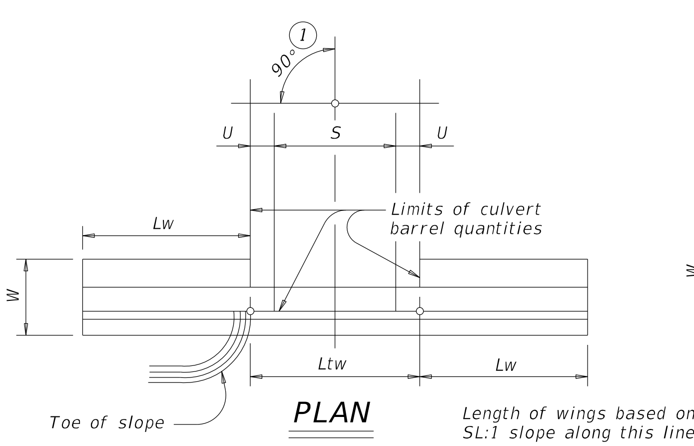
SECTION A-A

(Showing wing reinforcement.)



SECTION B-B

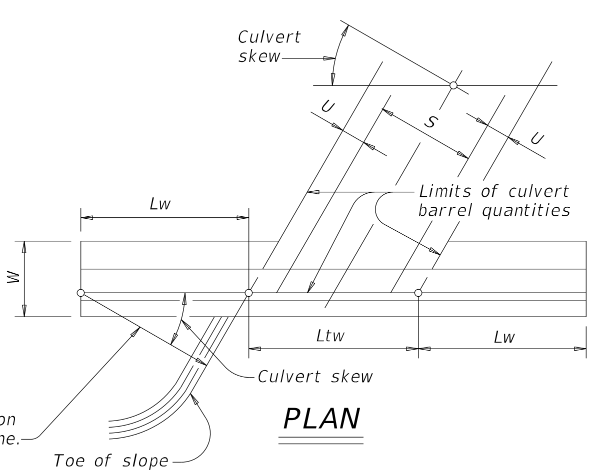
(Showing wing reinforcement.)



PLAN

Length of wings based on SL:1 slope along this line.

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS

(Showing 30° skew.)

Texas Department of Transportation | Bridge Division Standard

CONCRETE WINGWALLS WITH PARALLEL WINGS FOR BOX CULVERTS TYPES PW-1 AND PW-2

PW

FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 0831	SECT 01	JOB 019, ETC.	HIGHWAY FM 939
REVISIONS	DIST WAC	COUNTY MCLENNAN		SHEET NO. 109

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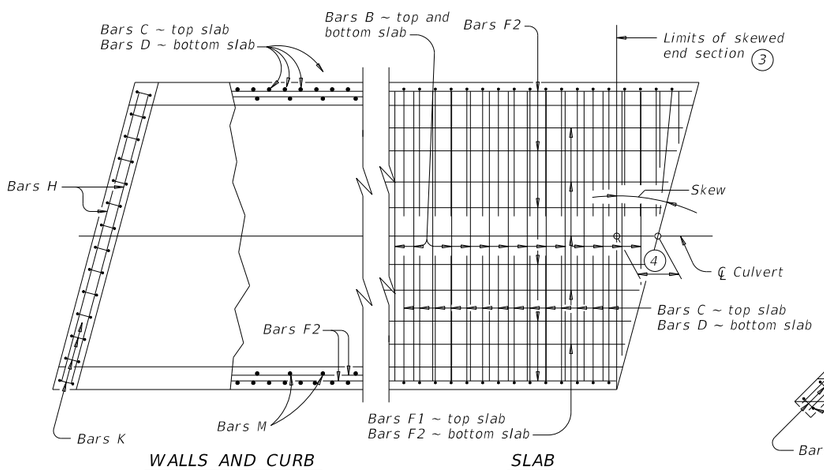
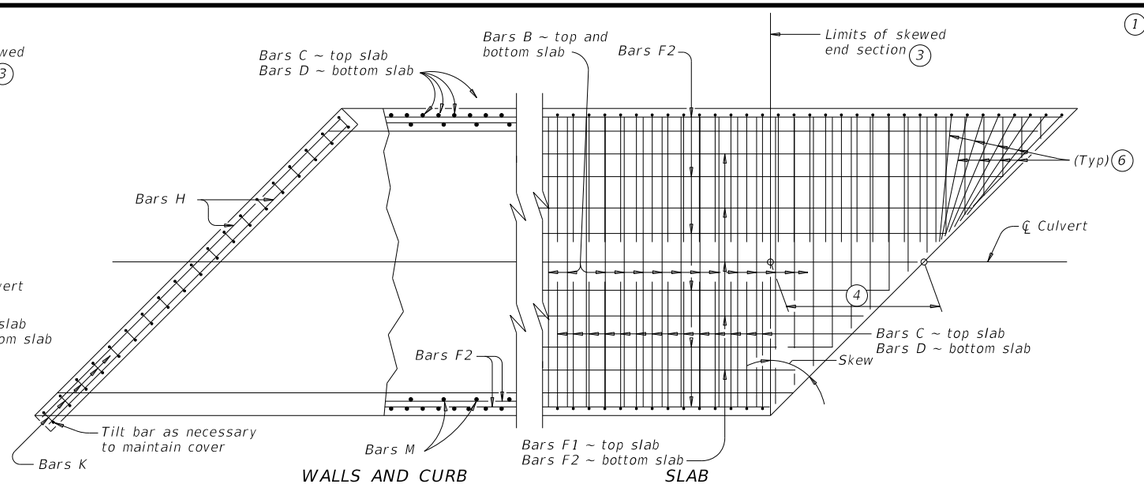
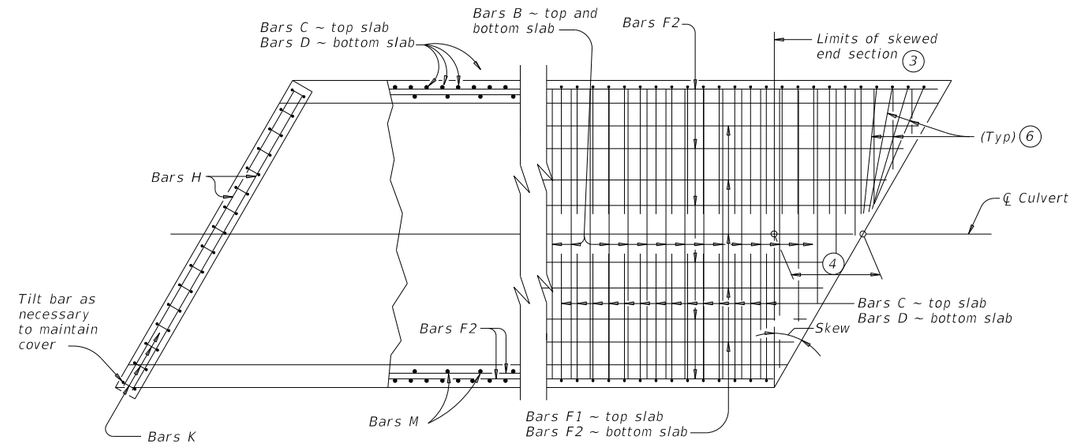


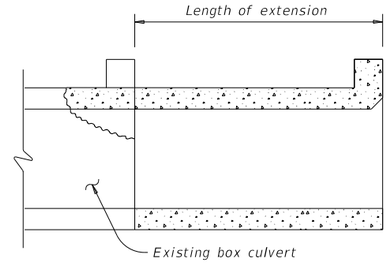
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



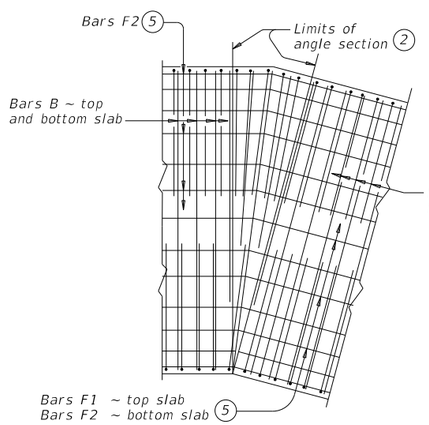
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



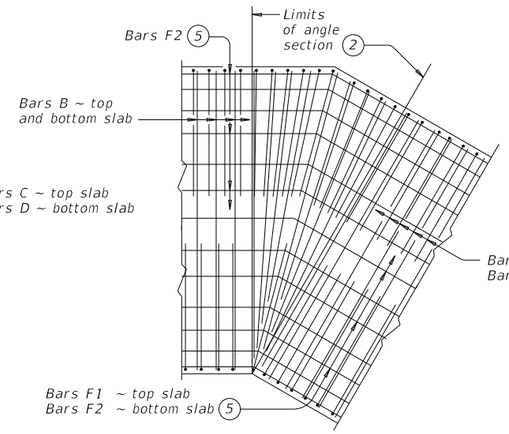
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



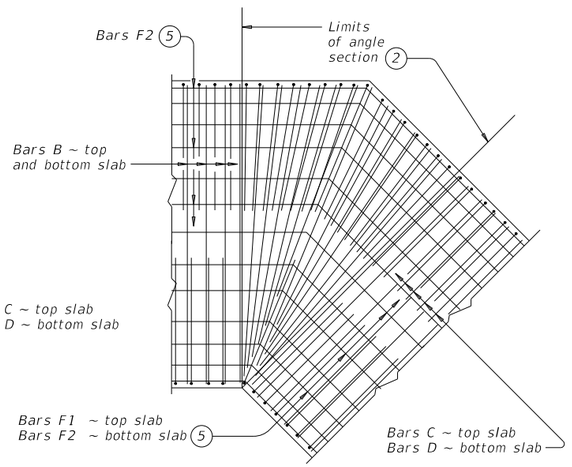
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars in the existing longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, C, D , E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

(2) When the spacing between Bars B becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B vary in the skewed end sections.

(4) [One half of overall width] x [tangent of the skew angle]

(5) Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

(6) When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

(7) At the Contractor's option, for skews of 15° or less, place Bars B, C, and D parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B shown on the Single Box Culverts Cast-In-Place (SCC) standards sheets to accommodate the skew.

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions:
provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.

For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.

For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

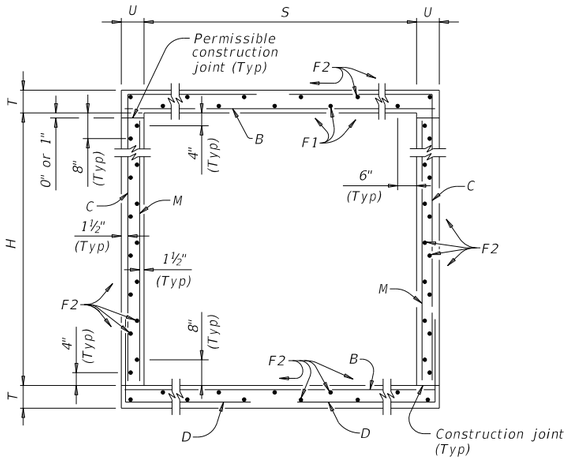
Texas Department of Transportation

Bridge Division Standard

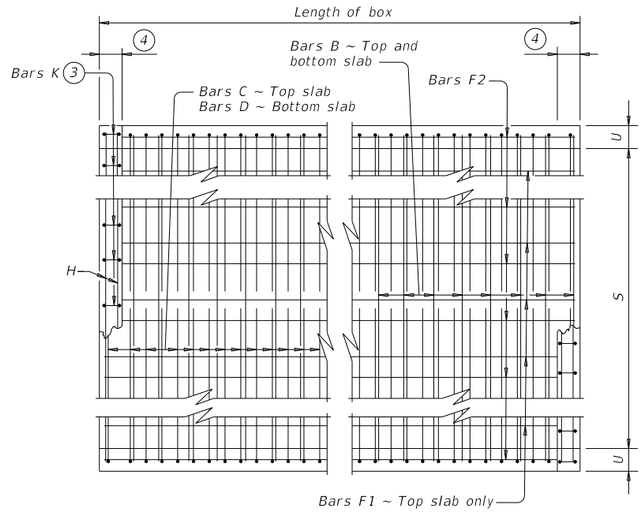
SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

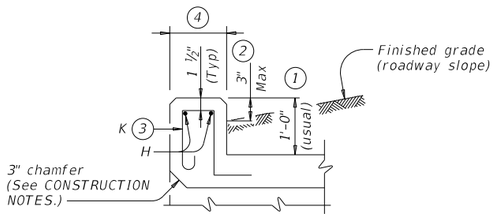
FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		110



TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.

Chamfer the bottom edge of the top slab 3" at the entrance.

Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:

- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:

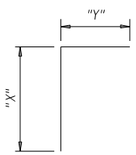
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min

GENERAL NOTES:

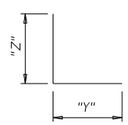
Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.

See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

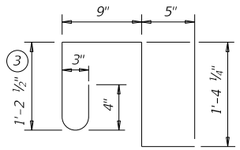
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-3 & 4

FILE: scc34ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		111

SECTION DIMENSIONS				FILL HEIGHT (5)	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
3' – 0"	2' – 0"	8"	7"	30'	108	#5	9"	3' – 11"	441	108	#4	9"	5' – 4"	385	2' – 6"	2' – 10"	108	#4	9"	5' – 1"	367	2' – 10"	2' – 3"	108	9"	2' – 0"	144	3	39' – 9"	80	19	39' – 9"	505	3' – 11"	10	10	28	0.292	48.1	0.3	38	12.0	1,960
3' – 0"	3' – 0"	8"	7"	30'	108	#5	9"	3' – 11"	441	108	#4	9"	6' – 4"	457	3' – 6"	2' – 10"	108	#4	9"	5' – 1"	367	2' – 10"	2' – 3"	108	9"	3' – 0"	216	3	39' – 9"	80	23	39' – 9"	611	3' – 11"	10	10	28	0.335	54.3	0.3	38	13.7	2,210
4' – 0"	2' – 0"	8"	7"	30'	108	#5	9"	4' – 11"	554	162	#4	6"	5' – 8"	613	2' – 6"	3' – 2"	162	#4	6"	5' – 5"	586	3' – 2"	2' – 3"	108	9"	2' – 0"	144	3	39' – 9"	80	21	39' – 9"	558	4' – 11"	13	12	33	0.342	63.4	0.4	46	14.1	2,581
4' – 0"	3' – 0"	8"	7"	30'	108	#5	9"	4' – 11"	554	162	#4	6"	6' – 8"	721	3' – 6"	3' – 2"	162	#4	6"	5' – 5"	586	3' – 2"	2' – 3"	108	9"	3' – 0"	216	3	39' – 9"	80	25	39' – 9"	664	4' – 11"	13	12	33	0.385	70.5	0.4	46	15.8	2,867
4' – 0"	4' – 0"	8"	7"	30'	108	#5	9"	4' – 11"	554	162	#4	6"	7' – 8"	830	4' – 6"	3' – 2"	162	#4	6"	5' – 5"	586	3' – 2"	2' – 3"	108	9"	4' – 0"	289	3	39' – 9"	80	25	39' – 9"	664	4' – 11"	13	12	33	0.428	75.1	0.4	46	17.5	3,049

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

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HL93 LOADING SHEET 2 OF 2

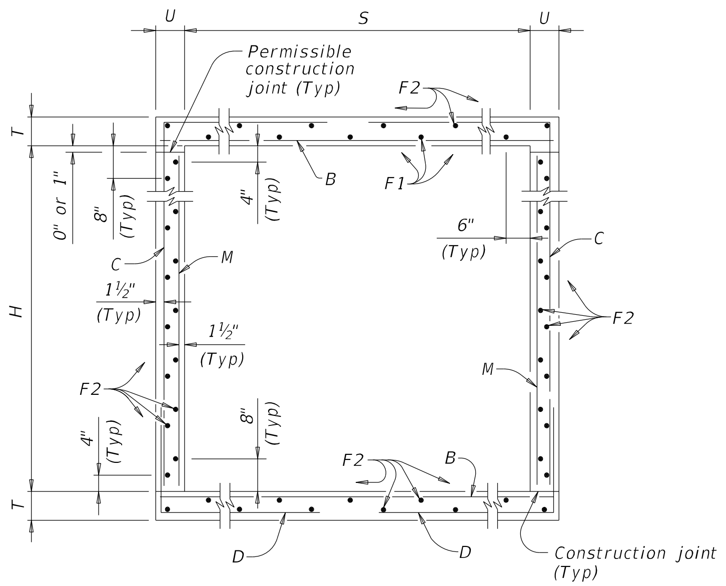
Texas Department of Transportation

Bridge Division Standard

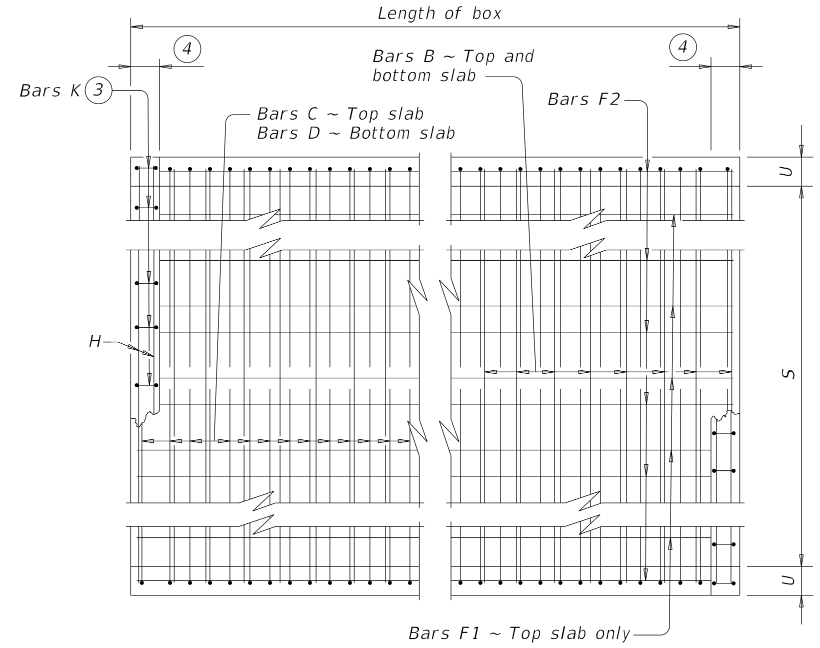
SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-3 & 4

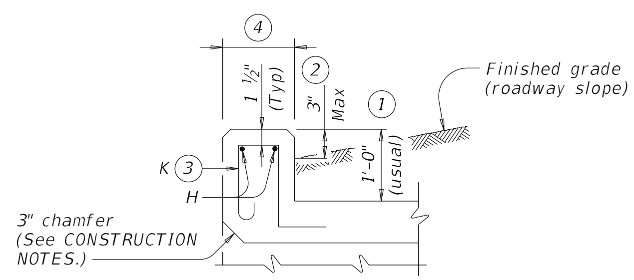
FILE: scc34ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		112



TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

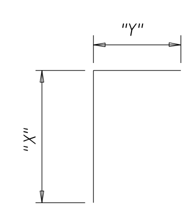
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

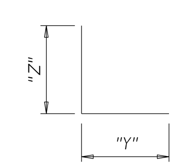
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

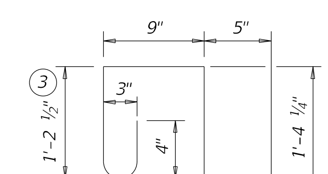
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL

SCC-5 & 6

FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT		
©TxDOT February 2020	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0831	01	019, ETC.		FM 939	
04/2021 Updated X values.	DIST		COUNTY		SHEET NO.	
	WAC		MCLENNAN		113	

SECTION DIMENSIONS				⑤ FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																										QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
5' – 0"	2' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	6' – 3"	704	2' – 6"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	2' – 0"	144	4	39' – 9"	106	22	39' – 9"	584	5' – 11"	16	14	39	0.391	80.5	0.5	55	16.1	3,276
5' – 0"	2' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	6' – 4"	713	2' – 7"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	2' – 0"	144	4	39' – 9"	106	22	39' – 9"	584	5' – 11"	16	14	39	0.429	81.0	0.5	55	17.6	3,294
5' – 0"	3' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	7' – 3"	817	3' – 6"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	3' – 0"	216	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.434	87.8	0.5	55	17.8	3,567
5' – 0"	3' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	7' – 4"	826	3' – 7"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	3' – 0"	216	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.472	88.3	0.5	55	19.3	3,585
5' – 0"	4' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	8' – 3"	929	4' – 6"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	4' – 0"	289	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.477	92.4	0.5	55	19.5	3,752
5' – 0"	4' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	8' – 4"	939	4' – 7"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	4' – 0"	289	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.515	92.9	0.5	55	21.1	3,771
5' – 0"	5' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	9' – 3"	1,042	5' – 6"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	5' – 0"	361	4	39' – 9"	106	30	39' – 9"	797	5' – 11"	16	14	39	0.521	99.7	0.5	55	21.3	4,044
5' – 0"	5' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	9' – 4"	1,051	5' – 7"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	5' – 0"	361	4	39' – 9"	106	30	39' – 9"	797	5' – 11"	16	14	39	0.559	100.2	0.5	55	22.8	4,062
6' – 0"	2' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	6' – 7"	742	2' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	2' – 0"	144	5	39' – 9"	133	25	39' – 9"	664	6' – 11"	18	16	45	0.440	89.1	0.5	63	18.1	3,628
6' – 0"	2' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	6' – 8"	1,126	2' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	2' – 0"	144	5	39' – 9"	133	25	39' – 9"	664	6' – 11"	18	16	45	0.485	108.6	0.5	63	19.9	4,407
6' – 0"	2' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	6' – 10"	1,155	2' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	2' – 0"	110	5	39' – 9"	133	25	39' – 9"	664	7' – 1"	19	18	50	0.551	109.9	0.5	69	22.6	4,463
6' – 0"	3' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	7' – 7"	854	3' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	3' – 0"	216	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.484	96.4	0.5	63	19.9	3,918
6' – 0"	3' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	7' – 8"	1,295	3' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	3' – 0"	216	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.528	117.3	0.5	63	21.6	4,754
6' – 0"	3' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	7' – 10"	1,324	3' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	3' – 0"	164	5	39' – 9"	133	29	39' – 9"	770	7' – 1"	19	18	50	0.601	118.1	0.5	69	24.6	4,792
6' – 0"	4' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	8' – 7"	967	4' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	4' – 0"	289	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.527	101.0	0.5	63	21.6	4,104
6' – 0"	4' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	8' – 8"	1,464	4' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	4' – 0"	289	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.571	123.3	0.5	63	23.4	4,996
6' – 0"	4' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	8' – 10"	1,493	4' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	4' – 0"	219	5	39' – 9"	133	29	39' – 9"	770	7' – 1"	19	18	50	0.650	123.7	0.5	69	26.5	5,016
6' – 0"	5' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	9' – 7"	1,080	5' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	5' – 0"	361	5	39' – 9"	133	33	39' – 9"	876	6' – 11"	18	16	45	0.570	108.3	0.5	63	23.3	4,395
6' – 0"	5' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	9' – 8"	1,633	5' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	5' – 0"	361	5	39' – 9"	133	33	39' – 9"	876	6' – 11"	18	16	45	0.614	132.0	0.5	63	25.1	5,343
6' – 0"	5' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	9' – 10"	1,661	5' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	5' – 0"	274	5	39' – 9"	133	33	39' – 9"	876	7' – 1"	19	18	50	0.700	131.9	0.5	69	28.5	5,345
6' – 0"	6' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	10' – 7"	1,192	6' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	6' – 0"	433	5	39' – 9"	133	37	39' – 9"	982	6' – 11"	18	16	45	0.613	115.6	0.5	63	25.0	4,685
6' – 0"	6' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	10' – 8"	1,802	6' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	6' – 0"	433	5	39' – 9"	133	37	39' – 9"	982	6' – 11"	18	16	45	0.657	140.7	0.5	63	26.8	5,690
6' – 0"	6' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	10' – 10"	1,830	6' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	6' – 0"	329	5	39' – 9"	133	37	39' – 9"	982	7' – 1"	19	18	50	0.749	140.2	0.5	69	30.5	5,675

⑤ For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-5 & 6

FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		114

DATE: 4/15/2022 12:50:29 PM
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DATE: 4/15/2022 12:50:34 PM
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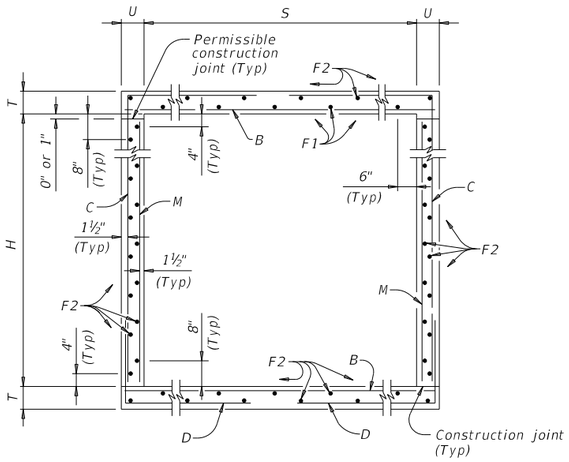
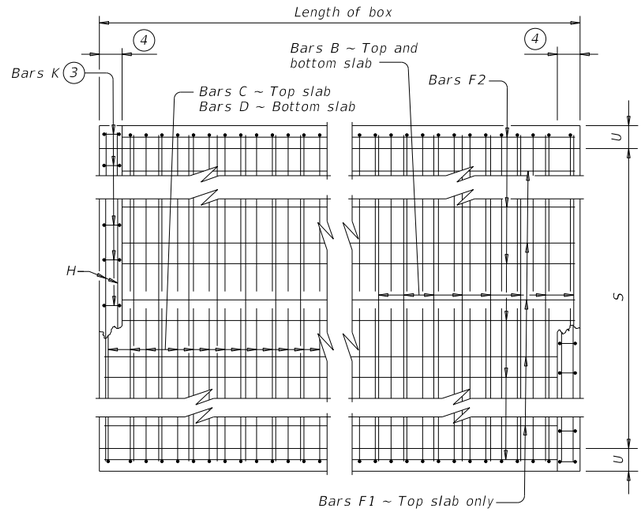
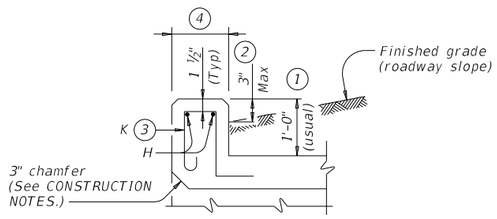


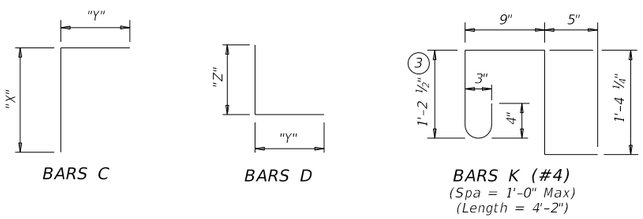
TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB



BARS C

BARS D

BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-7

FILE: scc07ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		115

SECTION DIMENSIONS				FILL HEIGHT (5)	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
7' – 0"	3' – 0"	8"	7"	16'	108	#6	9"	7' – 11"	1,284	162	#5	6"	8' – 11"	1,507	4' – 6"	4' – 5"	162	#5	6"	7' – 1"	1,197	4' – 5"	2' – 8"	108	9"	3' – 0"	216	5	39' – 9"	133	31	39' – 9"	823	7' – 11"	21	18	50	0.533	124.8	0.6	71	21.9	5,062
7' – 0"	3' – 0"	9"	7"	20'	108	#6	9"	7' – 11"	1,284	162	#5	6"	8' – 0"	1,352	3' – 7"	4' – 5"	162	#5	6"	7' – 2"	1,211	4' – 5"	2' – 9"	108	9"	3' – 0"	216	5	39' – 9"	133	31	39' – 9"	823	7' – 11"	21	18	50	0.583	125.5	0.6	71	23.9	5,090
7' – 0"	3' – 0"	10"	8"	23'	108	#6	9"	8' – 1"	1,311	162	#5	6"	8' – 2"	1,380	3' – 8"	4' – 6"	162	#5	6"	7' – 4"	1,239	4' – 6"	2' – 10"	82	12"	3' – 0"	164	5	39' – 9"	133	31	39' – 9"	823	8' – 1"	22	20	56	0.663	126.3	0.6	78	27.1	5,128
7' – 0"	3' – 0"	11"	8"	30'	108	#6	9"	8' – 1"	1,311	162	#5	6"	8' – 3"	1,394	3' – 9"	4' – 6"	162	#5	6"	7' – 5"	1,253	4' – 6"	2' – 11"	82	12"	3' – 0"	164	5	39' – 9"	133	31	39' – 9"	823	8' – 1"	22	20	56	0.714	127.0	0.6	78	29.2	5,156
7' – 0"	4' – 0"	8"	7"	16'	108	#6	9"	7' – 11"	1,284	162	#5	6"	8' – 11"	1,507	4' – 6"	4' – 5"	162	#5	6"	7' – 1"	1,197	4' – 5"	2' – 8"	108	9"	4' – 0"	289	5	39' – 9"	133	31	39' – 9"	823	7' – 11"	21	18	50	0.576	130.8	0.6	71	23.6	5,304
7' – 0"	4' – 0"	9"	7"	20'	108	#6	9"	7' – 11"	1,284	162	#5	6"	9' – 0"	1,521	4' – 7"	4' – 5"	162	#5	6"	7' – 2"	1,211	4' – 5"	2' – 9"	108	9"	4' – 0"	289	5	39' – 9"	133	31	39' – 9"	823	7' – 11"	21	18	50	0.627	131.5	0.6	71	25.7	5,332
7' – 0"	4' – 0"	10"	8"	23'	108	#6	9"	8' – 1"	1,311	162	#5	6"	9' – 2"	1,549	4' – 8"	4' – 6"	162	#5	6"	7' – 4"	1,239	4' – 6"	2' – 10"	82	12"	4' – 0"	219	5	39' – 9"	133	31	39' – 9"	823	8' – 1"	22	20	56	0.712	131.9	0.6	78	29.1	5,352
7' – 0"	4' – 0"	11"	8"	30'	162	#6	6"	8' – 1"	1,967	162	#5	6"	9' – 3"	1,563	4' – 9"	4' – 6"	162	#5	6"	7' – 5"	1,253	4' – 6"	2' – 11"	82	12"	4' – 0"	219	5	39' – 9"	133	31	39' – 9"	823	8' – 1"	22	20	56	0.763	149.0	0.6	78	31.1	6,036
7' – 0"	5' – 0"	8"	7"	16'	108	#6	9"	7' – 11"	1,284	162	#5	6"	9' – 11"	1,676	5' – 6"	4' – 5"	162	#5	6"	7' – 1"	1,197	4' – 5"	2' – 8"	108	9"	5' – 0"	361	5	39' – 9"	133	35	39' – 9"	929	7' – 11"	21	18	50	0.619	139.5	0.6	71	25.4	5,651
7' – 0"	5' – 0"	9"	7"	20'	108	#6	9"	7' – 11"	1,284	162	#5	6"	10' – 0"	1,690	5' – 7"	4' – 5"	162	#5	6"	7' – 2"	1,211	4' – 5"	2' – 9"	108	9"	5' – 0"	361	5	39' – 9"	133	35	39' – 9"	929	7' – 11"	21	18	50	0.670	140.2	0.6	71	27.4	5,679
7' – 0"	5' – 0"	10"	8"	23'	108	#6	9"	8' – 1"	1,311	162	#5	6"	10' – 2"	1,718	5' – 8"	4' – 6"	162	#5	6"	7' – 4"	1,239	4' – 6"	2' – 10"	82	12"	5' – 0"	274	5	39' – 9"	133	35	39' – 9"	929	8' – 1"	22	20	56	0.761	140.1	0.6	78	31.1	5,682
7' – 0"	5' – 0"	11"	8"	30'	162	#6	6"	8' – 1"	1,967	162	#5	6"	10' – 3"	1,732	5' – 9"	4' – 6"	162	#5	6"	7' – 5"	1,253	4' – 6"	2' – 11"	82	12"	5' – 0"	274	5	39' – 9"	133	35	39' – 9"	929	8' – 1"	22	20	56	0.813	157.2	0.6	78	33.1	6,366
7' – 0"	6' – 0"	8"	7"	16'	108	#6	9"	7' – 11"	1,284	162	#5	6"	10' – 11"	1,845	6' – 6"	4' – 5"	162	#5	6"	7' – 1"	1,197	4' – 5"	2' – 8"	108	9"	6' – 0"	433	5	39' – 9"	133	39	39' – 9"	1,036	7' – 11"	21	18	50	0.663	148.2	0.6	71	27.1	5,999
7' – 0"	6' – 0"	9"	7"	20'	108	#6	9"	7' – 11"	1,284	162	#5	6"	11' – 0"	1,859	6' – 7"	4' – 5"	162	#5	6"	7' – 2"	1,211	4' – 5"	2' – 9"	108	9"	6' – 0"	433	5	39' – 9"	133	39	39' – 9"	1,036	7' – 11"	21	18	50	0.713	148.9	0.6	71	29.1	6,027
7' – 0"	6' – 0"	10"	8"	23'	108	#6	9"	8' – 1"	1,311	162	#5	6"	11' – 2"	1,887	6' – 8"	4' – 6"	162	#5	6"	7' – 4"	1,239	4' – 6"	2' – 10"	82	12"	6' – 0"	329	5	39' – 9"	133	39	39' – 9"	1,036	8' – 1"	22	20	56	0.811	148.4	0.6	78	33.1	6,013
7' – 0"	6' – 0"	11"	8"	30'	162	#6	6"	8' – 1"	1,967	162	#5	6"	11' – 3"	1,901	6' – 9"	4' – 6"	162	#5	6"	7' – 5"	1,253	4' – 6"	2' – 11"	82	12"	6' – 0"	329	5	39' – 9"	133	39	39' – 9"	1,036	8' – 1"	22	20	56	0.862	165.5	0.6	78	35.1	6,697
7' – 0"	7' – 0"	8"	7"	16'	108	#6	9"	7' – 11"	1,284	162	#5	6"	11' – 11"	2,014	7' – 6"	4' – 5"	162	#5	6"	7' – 1"	1,197	4' – 5"	2' – 8"	108	9"	7' – 0"	505	5	39' – 9"	133	39	39' – 9"	1,036	7' – 11"	21	18	50	0.706	154.2	0.6	71	28.8	6,240
7' – 0"	7' – 0"	9"	7"	20'	108	#6	9"	7' – 11"	1,284	162	#5	6"	12' – 0"	2,028	7' – 7"	4' – 5"	162	#5	6"	7' – 2"	1,211	4' – 5"	2' – 9"	108	9"	7' – 0"	505	5	39' – 9"	133	39	39' – 9"	1,036	7' – 11"	21	18	50	0.756	154.9	0.6	71	30.8	6,268
7' – 0"	7' – 0"	10"	8"	23'	108	#6	9"	8' – 1"	1,311	162	#5	6"	12' – 2"	2,056	7' – 8"	4' – 6"	162	#5	6"	7' – 4"	1,239	4' – 6"	2' – 10"	108	9"	7' – 0"	505	5	39' – 9"	133	39	39' – 9"	1,036	8' – 1"	22	20	56	0.860	157.0	0.6	78	35.0	6,358
7' – 0"	7' – 0"	11"	8"	30'	162	#6	6"	8' – 1"	1,967	162	#5	6"	12' – 3"	2,070	7' – 9"	4' – 6"	162	#5	6"	7' – 5"	1,253	4' – 6"	2' – 11"	108	9"	7' – 0"	505	5	39' – 9"	133	39	39' – 9"	1,036	8' – 1"	22	20	56	0.912	174.1	0.6	78	37.1	7,042

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-7

FILE: scc07ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		116

DATE: 4/15/2022 12:50:35 PM
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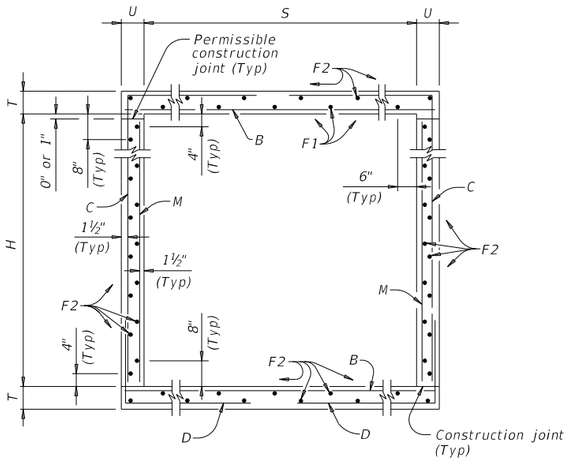
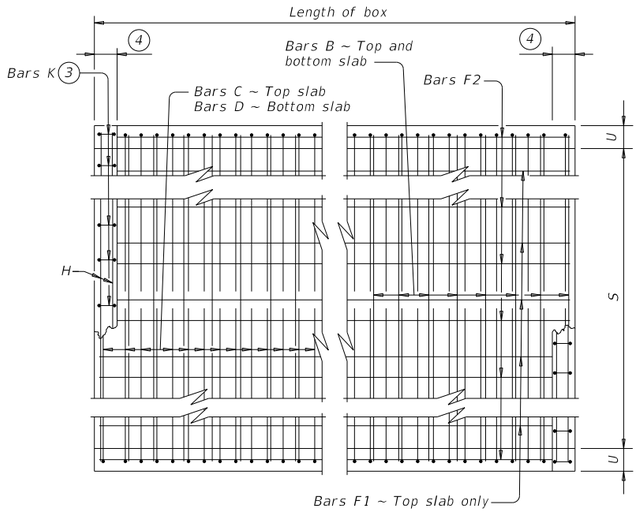
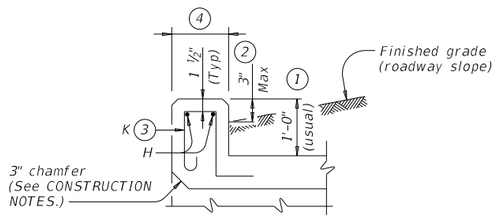


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

(1) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

(2) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(3) For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

(4) 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

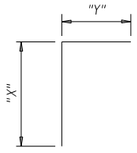
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'_c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'_c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

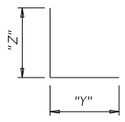
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

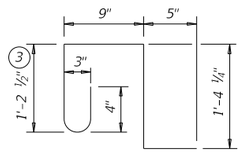
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-8

FILE: scc08ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		117

SECTION DIMENSIONS				FILL HEIGHT (5)	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4			Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
8' – 0"	3' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	8' – 8"	1,406	3' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.582	153.5	0.7	80	24.0	6,219
8' – 0"	3' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	8' – 8"	1,406	3' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.582	153.5	0.7	80	24.0	6,219
8' – 0"	3' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	8' – 10"	1,433	3' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	3' – 0"	164	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.724	154.5	0.7	85	29.6	6,266
8' – 0"	3' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	8' – 11"	1,446	3' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	3' – 0"	164	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.782	155.2	0.7	85	32.0	6,293
8' – 0"	3' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	9' – 2"	1,487	3' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	9' – 3"	25	22	61	0.929	159.6	0.7	86	37.9	6,468
8' – 0"	4' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	9' – 8"	1,568	4' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.626	159.4	0.7	80	25.7	6,454
8' – 0"	4' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	9' – 8"	1,568	4' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.626	159.4	0.7	80	25.7	6,454
8' – 0"	4' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	9' – 10"	1,595	4' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	4' – 0"	219	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.774	160.0	0.7	85	31.6	6,483
8' – 0"	4' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	9' – 11"	1,609	4' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	4' – 0"	219	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.831	160.7	0.7	85	33.9	6,511
8' – 0"	4' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	10' – 2"	1,649	4' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	9' – 3"	25	22	61	0.985	165.4	0.7	86	40.1	6,703
8' – 0"	5' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	10' – 8"	1,730	5' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	8' – 11"	24	20	56	0.669	167.9	0.7	80	27.4	6,794
8' – 0"	5' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	10' – 8"	1,730	5' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	8' – 11"	24	20	56	0.669	167.9	0.7	80	27.4	6,794
8' – 0"	5' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	10' – 10"	1,757	5' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	5' – 0"	274	6	39' – 9"	159	36	39' – 9"	956	9' – 1"	24	22	61	0.823	168.0	0.7	85	33.6	6,806
8' – 0"	5' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	10' – 11"	1,771	5' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	5' – 0"	274	6	39' – 9"	159	36	39' – 9"	956	9' – 1"	24	22	61	0.881	168.7	0.7	85	35.9	6,834
8' – 0"	5' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	11' – 2"	1,811	5' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	9' – 3"	25	22	61	1.040	173.9	0.7	86	42.3	7,043
8' – 0"	6' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	11' – 8"	1,893	6' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.712	176.4	0.7	80	29.2	7,135
8' – 0"	6' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	11' – 8"	1,893	6' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.712	176.4	0.7	80	29.2	7,135
8' – 0"	6' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	11' – 10"	1,920	6' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	6' – 0"	329	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.872	176.1	0.7	85	35.6	7,130
8' – 0"	6' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	11' – 11"	1,933	6' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	6' – 0"	329	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.930	176.8	0.7	85	37.9	7,157
8' – 0"	6' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	12' – 2"	1,974	6' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	9' – 3"	25	22	61	1.096	182.5	0.7	86	44.5	7,384
8' – 0"	7' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	12' – 8"	2,055	7' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.755	182.2	0.7	80	30.9	7,369
8' – 0"	7' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	162	#6	6"	12' – 8"	3,082	7' – 6"	5' – 2"	162	#6	6"	8' – 3"	2,007	5' – 2"	3' – 1"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.755	224.6	0.7	80	30.9	9,065
8' – 0"	7' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	162	#6	6"	12' – 10"	3,123	7' – 8"	5' – 2"	162	#6	6"	8' – 5"	2,048	5' – 2"	3' – 3"	82	12"	7' – 0"	383	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.922	224.6	0.7	85	37.6	9,070
8' – 0"	7' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	162	#6	6"	12' – 11"	3,143	7' – 9"	5' – 2"	162	#6	6"	8' – 6"	2,068	5' – 2"	3' – 4"	82	12"	7' – 0"	383	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.979	225.6	0.7	85	39.8	9,110
8' – 0"	7' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	162	#6	6"	13' – 2"	3,204	7' – 11"	5' – 3"	162	#6	6"	8' – 9"	2,129	5' – 3"	3' – 6"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	9' – 3"	25	22	61	1.151	232.8	0.7	86	46.7	9,396
8' – 0"	8' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	13' – 8"	2,217	8' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	8' – 11"	24	20	56	0.798	190.7	0.7	80	32.6	7,709
8' – 0"	8' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	162	#6	6"	13' – 8"	3,325	8' – 6"	5' – 2"	162	#6	6"	8' – 3"	2,007	5' – 2"	3' – 1"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	8' – 11"	24	20	56	0.798	235.2	0.7	80	32.6	9,486
8' – 0"	8' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	162	#6	6"	13' – 10"	3,366	8' – 8"	5' – 2"	162	#6	6"	8' – 5"	2,048	5' – 2"	3' – 3"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	9' – 1"	24	22	61	0.971	238.2	0.7	85	39.5	9,613
8' – 0"	8' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	162	#6	6"	13' – 11"	3,386	8' – 9"	5' – 2"	162	#6	6"	8' – 6"	2,068	5' – 2"	3' – 4"	162	6"	8' – 0"	866	6	39' – 9"	159	44	39' – 9"	1,168	9' – 1"	24	22	61	1.029	246.4	0.7	85	41.8	9,942
8' – 0"	8' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	162	#6	6"	14' – 2"	3,447	8' – 11"	5' – 3"	162	#6	6"	8' – 9"	2,129	5' – 3"	3' – 6"	162	6"	8' – 0"	866	6	39' – 9"	159	44	39' – 9"	1,168	9' – 3"	25	22	61	1.207	250.5	0.7	86	49.0	10,106

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-8

FILE: scc08ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		118

DATE: 4/15/2022 12:50:42 PM
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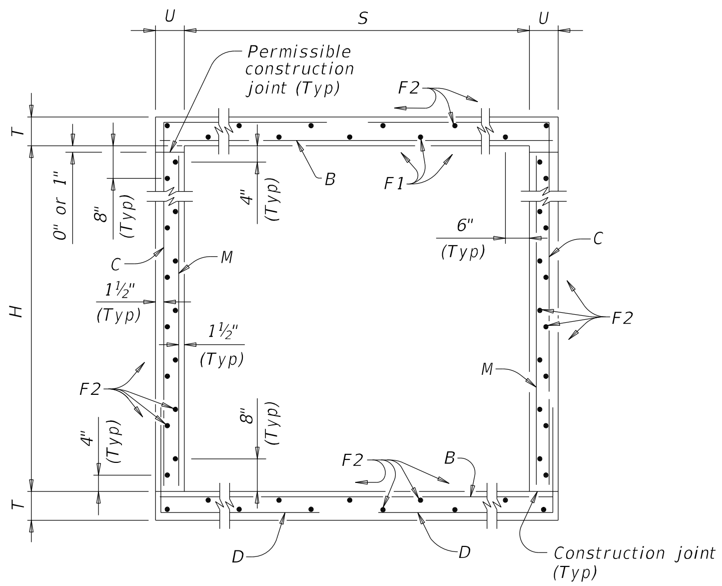
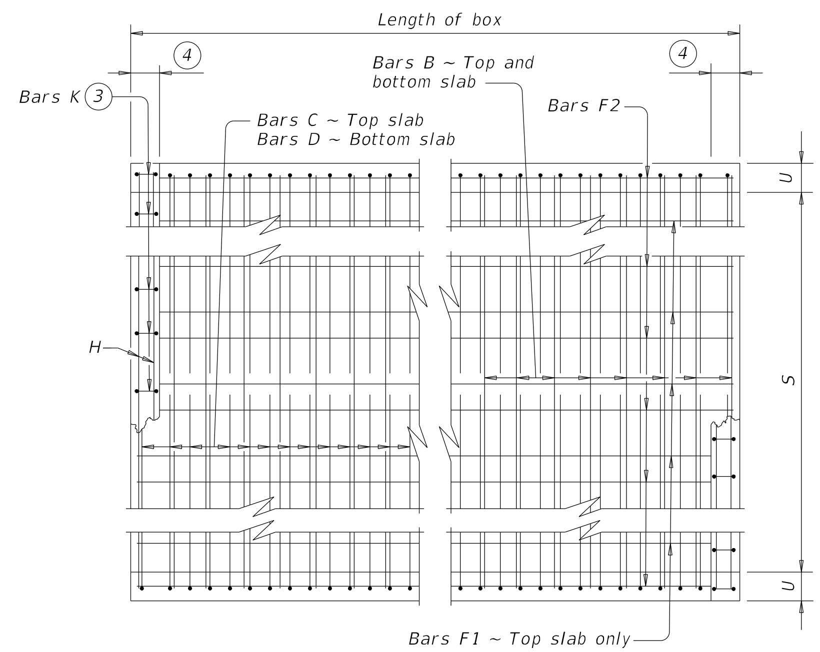
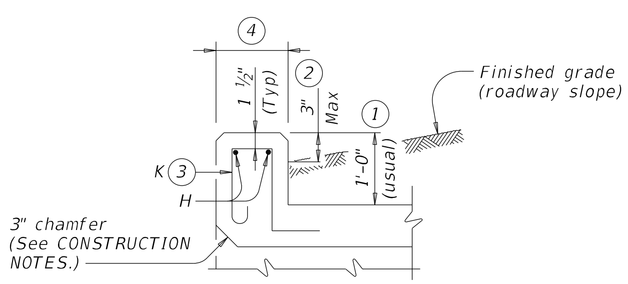


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

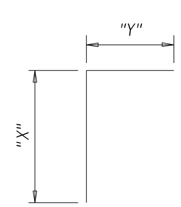
CONSTRUCTION NOTES:
Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

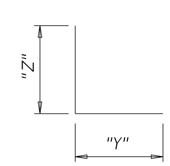
Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min
- Uncoated or galvanized ~ #7 = 3'-3" Min

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

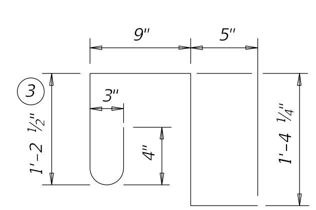
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING

Texas Department of Transportation
Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-10

FILE: scc10ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
04/2021 Updated X values.	DIST		COUNTY	SHEET NO.
	WAC		MCLENNAN	119

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SECTION DIMENSIONS				FILL HEIGHT (5)	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																														QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Wt	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
10' – 0"	4' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	10' – 4"	2,514	4' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	4' – 0"	289	7	39' – 9"	186	37	39' – 9"	982	10' – 11"	29	24	67	0.724	219.9	0.8	96	29.8	8,893
10' – 0"	4' – 0"	9"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	10' – 5"	2,535	4' – 7"	5' – 10"	162	#6	6"	9' – 0"	2,190	5' – 10"	3' – 2"	108	9"	4' – 0"	289	7	39' – 9"	186	37	39' – 9"	982	10' – 11"	29	24	67	0.793	221.0	0.8	96	32.5	8,934
10' – 0"	4' – 0"	10"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	10' – 7"	2,575	4' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	82	12"	4' – 0"	219	7	39' – 9"	186	37	39' – 9"	982	11' – 1"	30	26	72	0.897	222.2	0.8	102	36.7	8,991
10' – 0"	4' – 0"	11"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	10' – 8"	2,595	4' – 9"	5' – 11"	162	#6	6"	9' – 3"	2,251	5' – 11"	3' – 4"	82	12"	4' – 0"	219	7	39' – 9"	186	37	39' – 9"	982	11' – 1"	30	26	72	0.967	223.3	0.8	102	39.5	9,032
10' – 0"	4' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	10' – 10"	2,636	4' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	108	9"	4' – 0"	289	7	39' – 9"	186	37	39' – 9"	982	11' – 3"	30	26	72	1.074	228.0	0.8	102	43.8	9,223
10' – 0"	4' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	10' – 11"	2,656	4' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	108	9"	4' – 0"	289	7	39' – 9"	186	37	39' – 9"	982	11' – 5"	31	26	72	1.183	230.1	0.9	103	48.2	9,306
10' – 0"	4' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	11' – 1"	2,697	5' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	108	9"	4' – 0"	289	7	39' – 9"	186	37	39' – 9"	982	11' – 7"	31	26	72	1.294	233.1	0.9	103	52.6	9,428
10' – 0"	4' – 0"	15"	12"	30'	162	#6	6"	11' – 9"	2,859	162	#6	6"	11' – 3"	2,737	5' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	108	9"	4' – 0"	289	7	39' – 9"	186	37	39' – 9"	982	11' – 9"	31	26	72	1.407	236.2	0.9	103	57.2	9,549
10' – 0"	5' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	11' – 4"	2,758	5' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	5' – 0"	361	7	39' – 9"	186	41	39' – 9"	1,089	10' – 11"	29	24	67	0.767	230.5	0.8	96	31.5	9,316
10' – 0"	5' – 0"	9"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	11' – 5"	2,778	5' – 7"	5' – 10"	162	#6	6"	9' – 0"	2,190	5' – 10"	3' – 2"	108	9"	5' – 0"	361	7	39' – 9"	186	41	39' – 9"	1,089	10' – 11"	29	24	67	0.836	231.5	0.8	96	34.3	9,356
10' – 0"	5' – 0"	10"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	11' – 7"	2,819	5' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	82	12"	5' – 0"	274	7	39' – 9"	186	41	39' – 9"	1,089	11' – 1"	30	26	72	0.947	232.4	0.8	102	38.7	9,397
10' – 0"	5' – 0"	11"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	11' – 8"	2,839	5' – 9"	5' – 11"	162	#6	6"	9' – 3"	2,251	5' – 11"	3' – 4"	82	12"	5' – 0"	274	7	39' – 9"	186	41	39' – 9"	1,089	11' – 1"	30	26	72	1.016	233.4	0.8	102	41.5	9,438
10' – 0"	5' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	11' – 10"	2,879	5' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	108	9"	5' – 0"	361	7	39' – 9"	186	41	39' – 9"	1,089	11' – 3"	30	26	72	1.130	238.6	0.8	102	46.0	9,645
10' – 0"	5' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	11' – 11"	2,900	5' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	108	9"	5' – 0"	361	7	39' – 9"	186	41	39' – 9"	1,089	11' – 5"	31	26	72	1.245	240.7	0.9	103	50.7	9,729
10' – 0"	5' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	12' – 1"	2,940	6' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	108	9"	5' – 0"	361	7	39' – 9"	186	41	39' – 9"	1,089	11' – 7"	31	26	72	1.362	243.7	0.9	103	55.4	9,850
10' – 0"	5' – 0"	15"	12"	30'	162	#7	6"	11' – 9"	3,891	162	#6	6"	12' – 3"	2,981	6' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	108	9"	5' – 0"	361	7	39' – 9"	186	41	39' – 9"	1,089	11' – 9"	31	26	72	1.481	272.5	0.9	103	60.1	11,004
10' – 0"	6' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	12' – 4"	3,001	6' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	6' – 0"	433	7	39' – 9"	186	45	39' – 9"	1,195	10' – 11"	29	24	67	0.811	241.0	0.8	96	33.3	9,737
10' – 0"	6' – 0"	9"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	12' – 6"	3,042	6' – 7"	5' – 11"	162	#6	6"	9' – 1"	2,210	5' – 11"	3' – 2"	82	12"	6' – 0"	329	7	39' – 9"	186	45	39' – 9"	1,195	11' – 1"	30	26	72	0.926	241.5	0.8	102	37.9	9,761
10' – 0"	6' – 0"	10"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	12' – 7"	3,062	6' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	82	12"	6' – 0"	329	7	39' – 9"	186	45	39' – 9"	1,195	11' – 1"	30	26	72	0.996	242.5	0.8	102	40.7	9,801
10' – 0"	6' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	12' – 10"	3,123	6' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	108	9"	6' – 0"	433	7	39' – 9"	186	45	39' – 9"	1,195	11' – 3"	30	26	72	1.185	249.1	0.8	102	48.2	10,067
10' – 0"	6' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	12' – 11"	3,143	6' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	108	9"	6' – 0"	433	7	39' – 9"	186	45	39' – 9"	1,195	11' – 5"	31	26	72	1.307	251.2	0.9	103	53.1	10,150
10' – 0"	6' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	13' – 1"	3,183	7' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	108	9"	6' – 0"	433	7	39' – 9"	186	45	39' – 9"	1,195	11' – 7"	31	26	72	1.430	254.2	0.9	103	58.1	10,271
10' – 0"	6' – 0"	15"	12"	30'	162	#7	6"	11' – 9"	3,891	162	#6	6"	13' – 3"	3,224	7' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	108	9"	6' – 0"	433	7	39' – 9"	186	45	39' – 9"	1,195	11' – 9"	31	26	72	1.556	283.1	0.9	103	63.1	11,425
10' – 0"	7' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	13' – 4"	3,244	7' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	7' – 0"	505	7	39' – 9"	186	45	39' – 9"	1,195	10' – 11"	29	24	67	0.854	248.9	0.8	96	35.0	10,052
10' – 0"	7' – 0"	8"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	13' – 4"	3,244	7' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	7' – 0"	505	7	39' – 9"	186	45	39' – 9"	1,195	10' – 11"	29	24	67	0.854	248.9	0.8	96	35.0	10,052
10' – 0"	7' – 0"	9"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	13' – 6"	3,285	7' – 7"	5' – 11"	162	#6	6"	9' – 1"	2,210	5' – 11"	3' – 2"	82	12"	7' – 0"	383	7	39' – 9"	186	45	39' – 9"	1,195	11' – 1"	30	26	72	0.975	248.9	0.8	102	39.8	10,058
10' – 0"	7' – 0"	10"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	13' – 7"	3,305	7' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	82	12"	7' – 0"	383	7	39' – 9"	186	45	39' – 9"	1,195	11' – 1"	30	26	72	1.045	249.9	0.8	102	42.6	10,098
10' – 0"	7' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	13' – 10"	3,366	7' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	108	9"	7' – 0"	505	7	39' – 9"	186	45	39' – 9"	1,195	11' – 3"	30	26	72	1.241	257.0	0.8	102	50.5	10,382
10' – 0"	7' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	13' – 11"	3,386	7' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	108	9"	7' – 0"	505	7	39' – 9"	186	45	39' – 9"	1,195	11' – 5"	31	26	72	1.368	259.1	0.9	103	55.6	10,465
10' – 0"	7' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	14' – 1"	3,427	8' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	108	9"	7' – 0"	505	7	39' – 9"	186	45	39' – 9"	1,195	11' – 7"	31	26	72	1.498	262.1	0.9	103	60.8	10,587
10' – 0"	7' – 0"	15"	12"	30'	162	#7	6"	11' – 9"	3,891	162	#6	6"	14' – 3"	3,467	8' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	108	9"	7' – 0"	505	7	39' – 9"	186	45	39' – 9"	1,195	11' – 9"	31	26	72	1.630	290.9	0.9	103	66.1	11,740
10' – 0"	8' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	14' – 4"	3,488	8' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	8' – 0"	577	7	39' – 9"	186	49	39' – 9"	1,301	10' – 11"	29	24	67	0.897	259.5	0.8	96	36.7	10,474
10' – 0"	8' – 0"	8"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	14' – 4"	3,488	8' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	8' – 0"	577	7	39' – 9"	186	49	39' – 9"	1,301	10' – 11"	29	24	67	0.897	259.5	0.8	96	36.7	10,474
10' – 0"	8' – 0"	9"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	14' – 6"	3,528	8' – 7"	5' – 11"	162	#6	6"	9' – 1"	2,210	5' – 11"	3' – 2"	82	12"	8' – 0"	438	7	39' – 9"	186	49	39' – 9"	1,301	11' – 1"	30	26	72	1.025	259.0	0.8	102	41.8	10,462
10' – 0"	8' – 0"	10"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	14' – 7"	3,548	8' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	82	12"	8' – 0"	438	7	39' – 9"	186	49	39' – 9"	1,301	11' – 1"	30	26	72	1.095	260.0	0.8	102	44.6	10,502
10' – 0"	8' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	14' – 10"	3,609	8' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	108	9"	8' – 0"	577	7	39' – 9"	186	49	39' – 9"	1,301	11' – 3"	30	26	72	1.296	267.5	0.8	102	52.7	10,803
10' – 0"	8' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	14' – 11"	3,630	8' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	108	9"	8' – 0"	577	7	39' – 9"	186	49	39' – 9"	1,301	11' – 5"	31	26	72	1.430	269.6	0.9	103	58.1	10,887
10' – 0"	8' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	15' – 1"	3,670	9' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	108	9"	8' – 0"	577	7	39' – 9"	186	49	39' – 9"	1,301	11' – 7"	31	26	72	1.566	272.6	0.9	103	63.5	11,008
10' – 0"	8' – 0"	15"	12"	30'	162	#7	6"	11' – 9"	3,891	162	#6	6"	15' – 3"	3,711	9' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	108	9"	8' – 0"	577	7	39' – 9"	186	49	39' – 9"	1,301	11' – 9"	31	26	72	1.704	301.5	0.9	103	69.0	12,162

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-10

FILE: scc10ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		120

DATE: 4/15/2022 12:50:49 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\0891010904 for Projects\Standards\scc10ste-21.dgn

SECTION DIMENSIONS				(5) FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	" X "	" Y "	No.	Size	Spa	Length	Wt	" Y "	" Z "	No.	Spa	Length	Wt	No.	Length	Wt	No.	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
10' – 0"	9' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	15' – 4"	3,731	9' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	9' – 0"	649	7	39' – 9"	186	53	39' – 9"	1,407	10' – 11"	29	24	67	0.940	270.0	0.8	96	38.4	10,895
10' – 0"	9' – 0"	8"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	15' – 4"	3,731	9' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	9' – 0"	649	7	39' – 9"	186	53	39' – 9"	1,407	10' – 11"	29	24	67	0.940	270.0	0.8	96	38.4	10,895
10' – 0"	9' – 0"	9"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	15' – 6"	3,772	9' – 7"	5' – 11"	162	#6	6"	9' – 1"	2,210	5' – 11"	3' – 2"	108	9"	9' – 0"	649	7	39' – 9"	186	53	39' – 9"	1,407	11' – 1"	30	26	72	1.074	273.0	0.8	102	43.8	11,023
10' – 0"	9' – 0"	10"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	15' – 7"	3,792	9' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	162	6"	9' – 0"	974	7	39' – 9"	186	53	39' – 9"	1,407	11' – 1"	30	26	72	1.144	282.2	0.8	102	46.6	11,388
10' – 0"	9' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	15' – 10"	3,853	9' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	162	6"	9' – 0"	974	7	39' – 9"	186	53	39' – 9"	1,407	11' – 3"	30	26	72	1.352	286.2	0.8	102	54.9	11,550
10' – 0"	9' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	15' – 11"	3,873	9' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	162	6"	9' – 0"	974	7	39' – 9"	186	53	39' – 9"	1,407	11' – 5"	31	26	72	1.492	288.3	0.9	103	60.5	11,633
10' – 0"	9' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	16' – 1"	3,913	10' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	162	6"	9' – 0"	974	7	39' – 9"	186	53	39' – 9"	1,407	11' – 7"	31	26	72	1.634	291.3	0.9	103	66.2	11,754
10' – 0"	9' – 0"	15"	12"	30'	162	#7	6"	11' – 9"	3,891	162	#6	6"	16' – 3"	3,954	10' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	162	6"	9' – 0"	974	7	39' – 9"	186	53	39' – 9"	1,407	11' – 9"	31	26	72	1.778	320.1	0.9	103	72.0	12,908
10' – 0"	10' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	16' – 4"	3,974	10' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	10' – 11"	29	24	67	0.984	286.9	0.8	96	40.2	11,571
10' – 0"	10' – 0"	8"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	16' – 4"	3,974	10' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	10' – 11"	29	24	67	0.984	286.9	0.8	96	40.2	11,571
10' – 0"	10' – 0"	9"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	16' – 6"	4,015	10' – 7"	5' – 11"	162	#6	6"	9' – 1"	2,210	5' – 11"	3' – 2"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	11' – 1"	30	26	72	1.123	289.9	0.8	102	45.8	11,699
10' – 0"	10' – 0"	10"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	16' – 7"	4,035	10' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	11' – 1"	30	26	72	1.193	290.9	0.8	102	48.6	11,739
10' – 0"	10' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	16' – 10"	4,096	10' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	11' – 3"	30	26	72	1.407	295.0	0.8	102	57.1	11,901
10' – 0"	10' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	16' – 11"	4,116	10' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	11' – 5"	31	26	72	1.553	297.0	0.9	103	63.0	11,984
10' – 0"	10' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	17' – 1"	4,157	11' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	11' – 7"	31	26	72	1.702	300.1	0.9	103	69.0	12,106
10' – 0"	10' – 0"	15"	12"	30'	162	#7	6"	11' – 9"	3,891	162	#6	6"	17' – 3"	4,197	11' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	11' – 9"	31	26	72	1.852	328.9	0.9	103	75.0	13,259

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE

0' TO 30' FILL

SCC-10

FILE: scc10ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		121

DATE: 4/15/2022 12:50:51 PM
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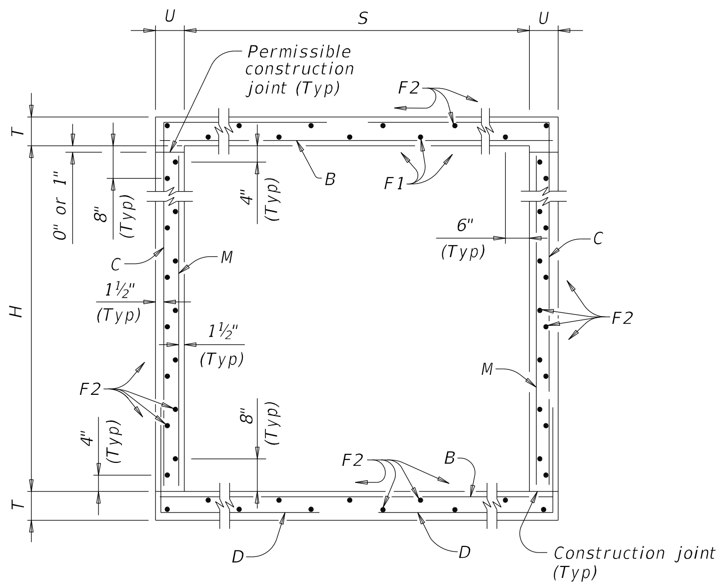
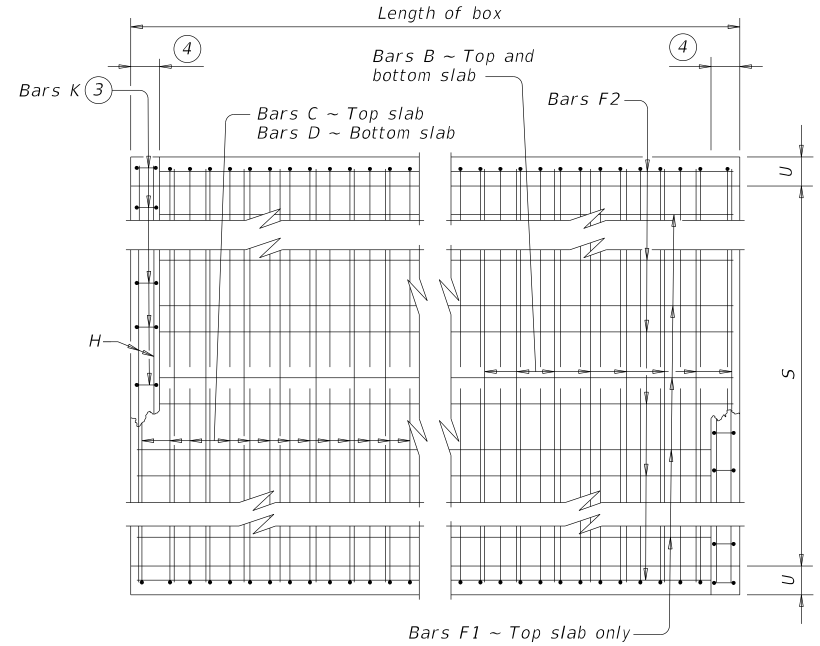
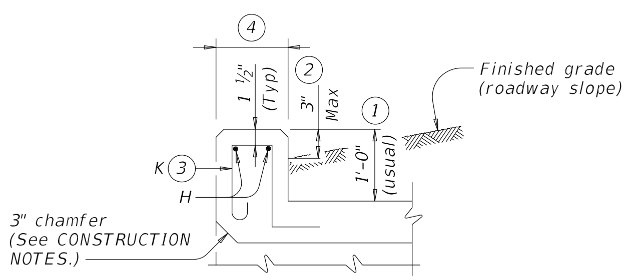


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

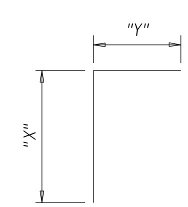
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min
- Uncoated or galvanized ~ #7 = 3'-3" Min

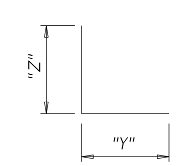
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

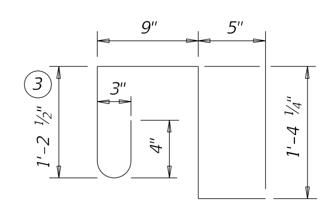
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

4/15/2022
SIGNATURE OF REGISTRANT & DATE

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL

SCC-10(MOD)

FILE: scc10ste-21.dgn	DN: TBE		CK: BMP	DW: TxDOT	CK: TxDOT	
©TxDOT February 2020	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0831	01	019, ETC.		FM 939	
04/2021 Updated X values.	DIST		COUNTY		SHEET NO.	
	WAC		MCLENNAN		122	

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FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\0831010194\Design\Plan Set\5. Bridge\Standards\SCC-10(MOD)_10x3 BOX.dgn

SECTION DIMENSIONS				(5) FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	" X "	" Y "	No.	Size	Spa	Length	Wt	" Y "	" Z "	No.	Spa	Length	Wt	No.	Length	Wt	No.	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
10' - 0"	3' - 0"	9"	8"	5'	194	#6	5"	11' - 1"	3,230	194	#5	5"	8' - 10"	1,787	3' - 7"	5' - 3"	194	#5	5"	7' - 0"	1,416	5' - 3"	1' - 9"	56	18"	3' - 0"	112	7	39' - 9"	186	41	39' - 9"	1,089	11' - 1"	30	26	74	0.760	184.3	0.8	104	31.2	7,476

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-10(MOD)

FILE:	scc10ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		0831	01	019, ETC.	FM 939
04/2021 Updated X values.		DIST	COUNTY		SHEET NO.
		WAC	MCLENNAN		123

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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing length (Two~Wings) (3)	
					Bars J1		Bars J2			
Maximum Wingwall Height Hw (9)	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'- 8"	1'- 9"	1'- 3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'- 2"	2'- 0"	1'- 6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'- 8"	2'- 3"	1'- 9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'- 2"	2'- 6"	2'- 0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'- 8"	2'- 9"	2'- 3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'- 2"	3'- 0"	2'- 6"	9"	#7	6"	#5	6"	162.29	0.721

TABLE OF WING WALL REINFORCING (Two~Wings)

Bar	Size	No.	Spa
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

TABLE OF ESTIMATED ANCHOR TOEWALL QUANTITIES

Bar	Size	No.	Spa
K	#4	~	1'-0"
N	#5	6	~
OL	#4	6	~
Reinf (Lb/Ft)			9.82
Conc (CY/Ft)			0.074

(1) Extend Bars P 3'-0" Min into bottom slab of box culvert.

(2) Adjust to fit as necessary to maintain 1 1#2" clear cover and 4" Min between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by Lw.

(4) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, extend construction joints or grooved joints, oriented in the direction of flow, across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B is not required.

(6) At Contractor's option, end the culvert toewall flush with wingwall toewall. Adjust reinforcing as needed.

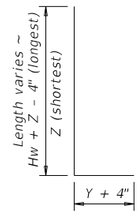
(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extend Curb Details (ECD) standard sheet.

(8) For vehicle safety, reduce curb heights, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

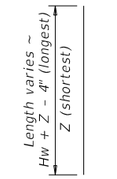
(9) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

TABLE OF MAXIMUM WING HEIGHTS (9)

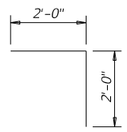
Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"



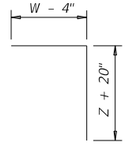
BARS J1



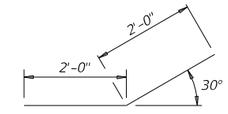
BARS V



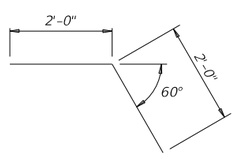
BARS L



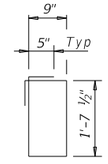
BARS J2



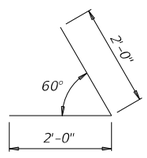
BARS D



BARS R



BARS K
(Length = 5'-5")



BARS OL

WING DIMENSION CALCULATIONS:

Hw = H + T + C - 0.250' (9)
A = (Hw - 0.333') (SL)
B = (A) (tan (30°))
Lw = (A) ÷ cos (30°))

For cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)
For precast culverts:
Ltw = (N) (2U + S) + (N - 1) (0.500')

Lc = (Ltw) - (2U)
Atw = (Lc) + (2B)
Total Wingwall Area (two wings ~ SF) = (Hw + 0.333') (Lw)

Hw = Height of wingwall (feet)
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)

See applicable box culvert standard for H, S, T, and U values.
See Table of Maximum Wall Heights for limits on Hw.

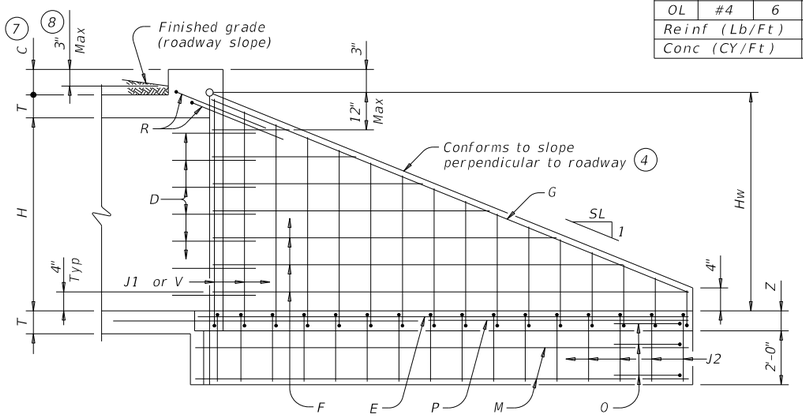
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
Provide Class "C" concrete (f`c = 3,600 psi).
Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".
Provide pipe runners and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts and nuts.
Provide ASTM A36 steel plates.
Galvanize all steel components, except reinforcing unless required elsewhere in the plans, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".
For optional adhesive anchors, install adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing adhesive, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Provide anchorage rods that are clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

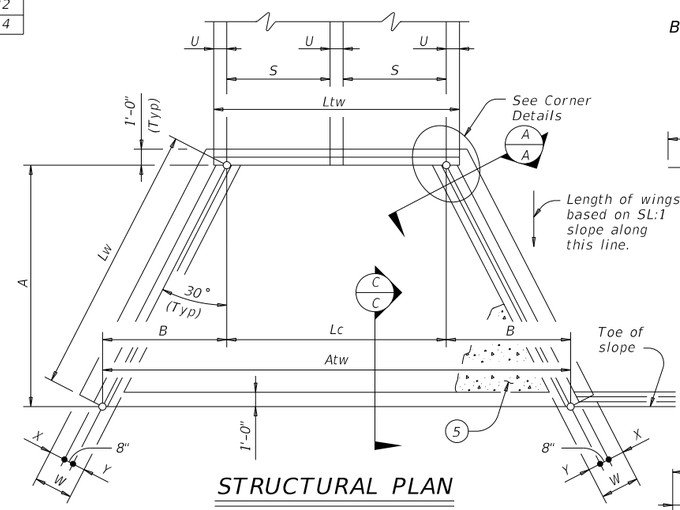
Designed according to AASHTO LRFD Bridge Design Specifications.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
All bolts, nuts, washers, brackets, angles, and pipe runners are considered parts of the safety end treatment for payment.
The quantities for pipe runners, reinforcing steel, and concrete, resulting from the formulas given herein are for Contractor's information only.
See the Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.

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



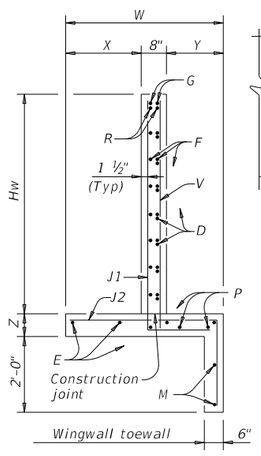
INSIDE ELEVATION OF WINGWALL

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

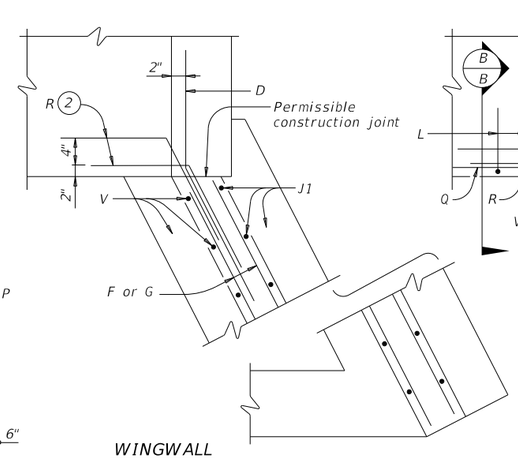


STRUCTURAL PLAN

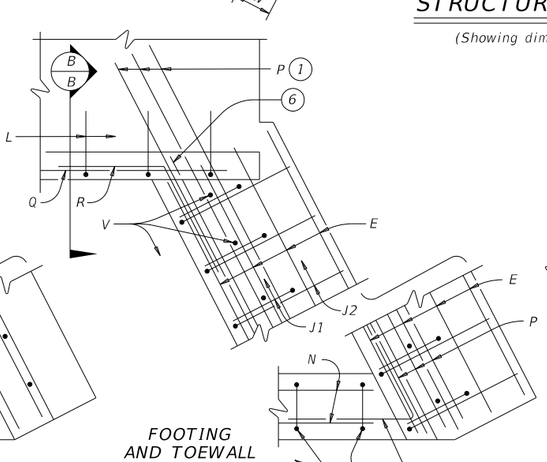
(Showing dimensions.)



SECTION A-A



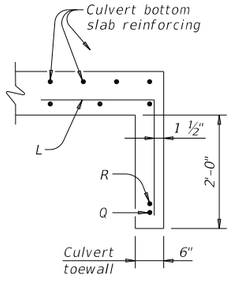
WINGWALL



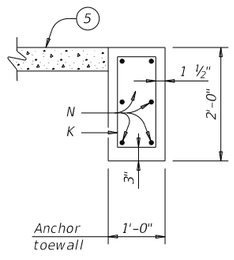
FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and culvert toewall reinforcing not shown for clarity.)



SECTION B-B (5)



SECTION C-C

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	WAC	MCLENNAN		124

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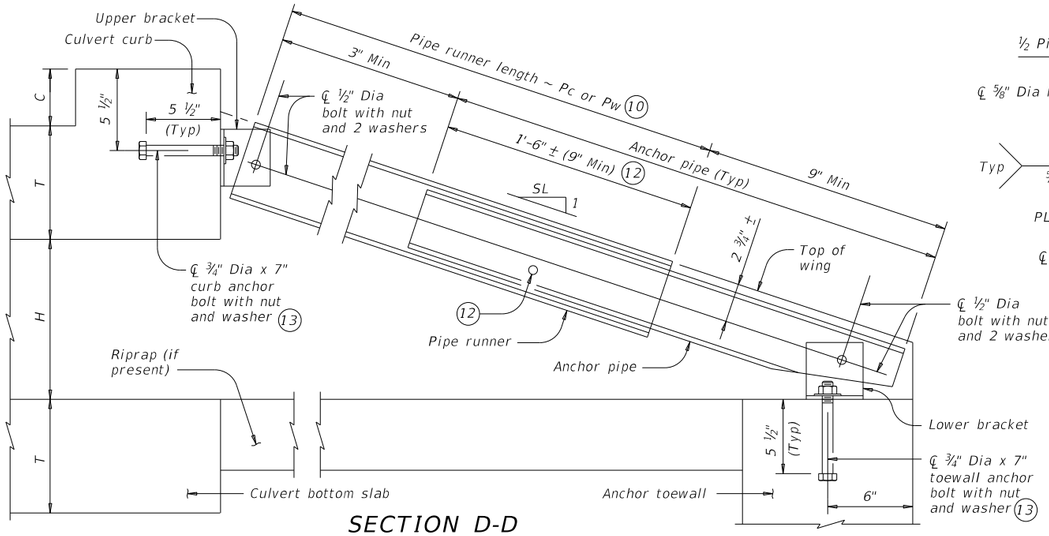
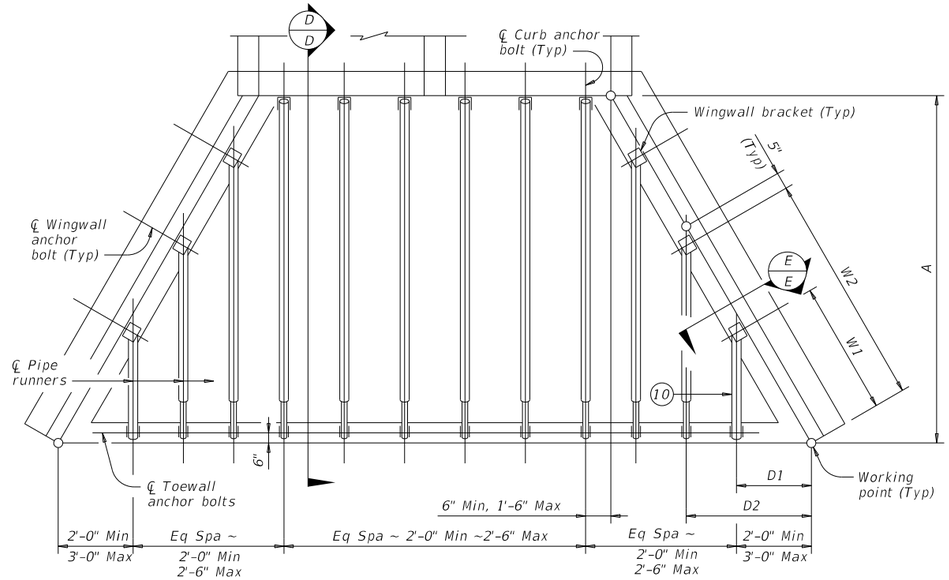
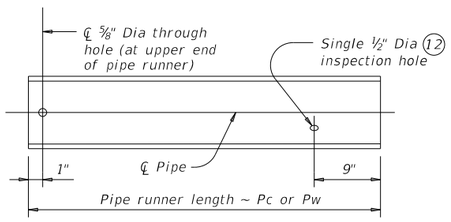


SECTION D-D

(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)

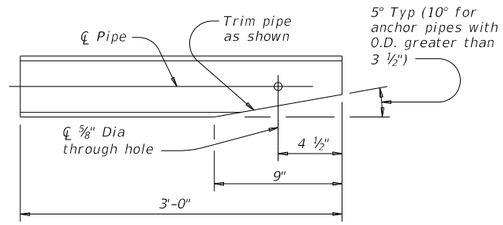


PIPE RUNNER PLAN

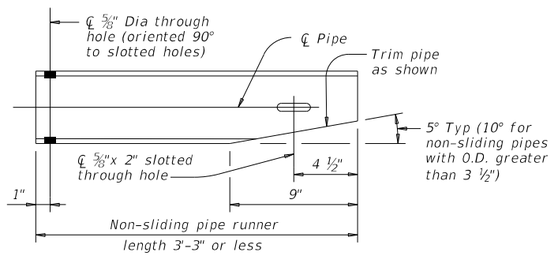


Note: Pipe diameter required for curb pipe runner is also used for wingwall pipe runner.

PIPE RUNNER DETAILS

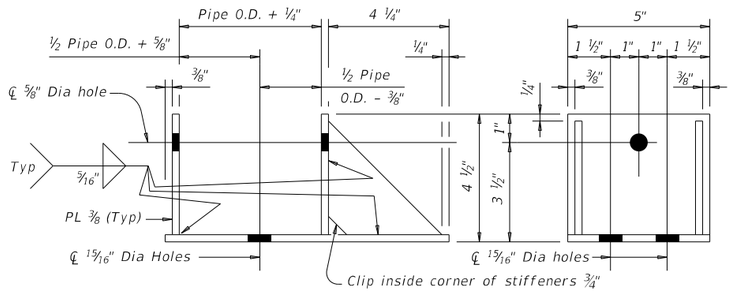


ANCHOR PIPE DETAILS

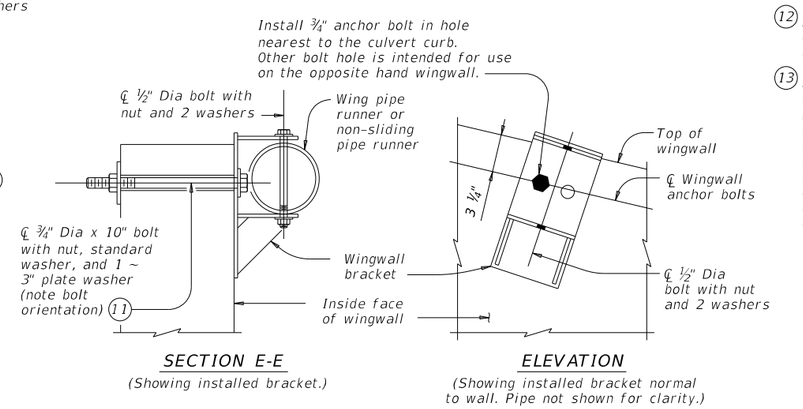


Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

NON-SLIDING PIPE RUNNER DETAILS



ELEVATION SIDE VIEW

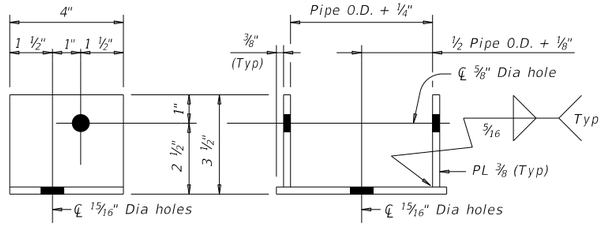


SECTION E-E
(Showing installed bracket.)

ELEVATION
(Showing installed bracket normal to wall. Pipe not shown for clarity.)

Note: Match wingwall bracket to the upper curb bracket size.

WINGWALL BRACKET DETAILS



SIDE VIEW ELEVATION

Note: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, to the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER SIZES

Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(10) If pipe runner length (Pw) is 1'-9" or less replace the normal pipe runner and anchor pipe with a single non-sliding pipe runner. See Non-Sliding Pipe Runner Details for additional information.

(11) At Contractor's option, ⅞" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(12) After installation of pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

(13) At Contractor's option, an adhesive anchor may be used. Provide ¾" Dia adhesive anchors that meet the requirements of ASTM A307 Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 ½". Provide anchor adhesive 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.

PIPE RUNNER DIMENSION CALCULATIONS:

Wn = (2.000) (Dn) - (0.416')
Pwn = (Dn) (K2) - (2.063')
Pw1 Non-Sliding Pipe Runner (If required) = (D1) (K2) - (0.563')
Pc = (A) (K1) - (1.688')

Wn = Distance from working point to centerline anchor bolt measured along bottom inside face of wing (feet)
Dn = Distance from working point to centerline pipe runner measured along outside face of anchor toewall (feet)
Pw = Wingwall pipe runner length (feet)
Pc = Curb pipe runner length (feet)
K = Constant values for use in formulas

Slope SL:1	K1		K2
3:1	~ 1.054	~	1.826
4:1	~ 1.031	~	1.785
6:1	~ 1.014	~	1.756

n = Wing pipe runner number

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
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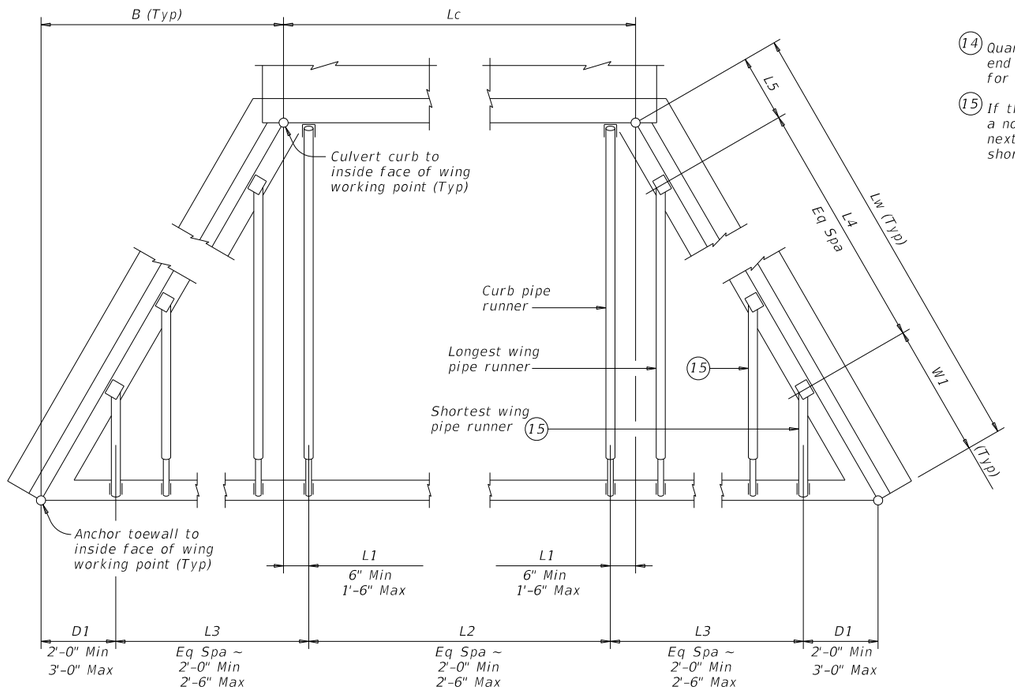
REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		125

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (14)	Lc	L1	L2			D1	L3			W1	L4			L5	Curb Pipe Runner (Pc)		Longest Wing Pipe Runner (Pw)	Shortest Wing Pipe Runner (Pw)	Non-Sliding Wing Pipe Runner (if applicable)	Curb, Wing, and/or Non-Sliding Pipe Runners		3'-0" Anchor Pipe	
			No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No.	Length				Size (3",4" or 5")	Total Length (14)	Size (2",3" or 4")	Total Length (14)
	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)			(Ft)	(Ft)			(Ft)	(Ft)		(Ft)	(Ft)	(Ft)	(Ft)		(Ft)		(Ft)
CULVERT NO. 2 (STA 529+73)(LT)	4.000	1.000	1	2.000	2.000	3.000	4	2.387	9.547	5.583	3	4.774	14.321	3.190	2	18.583	15.771	3.208	N/A	4"	113.083	3"	30.000
CULVERT NO. 4 (STA 571+91)(BOTH)	4.000	1.000	1	2.000	2.000	3.000	3	2.477	7.430	5.583	2	4.953	9.907	3.370	2	15.146	12.125	3.292	N/A	4"	153.083	3"	48.000
CULVERT NO. 5 (STA 584+87)(BOTH)	10.000	0.500	4	2.250	9.000	3.000	3	2.310	6.930	5.583	2	4.620	9.240	4.037	4	15.146	11.546	3.292	N/A	4"	179.875	3"	54.000
CULVERT NO. 7 (STA 584+87)(LT)	8.000	0.500	3	2.333	7.000	2.000	4	2.127	8.507	3.583	3	4.254	12.761	3.670	4	16.188	12.896	5.313	3.000	4"	125.375	3"	30.000
CULVERT NO. 7 (STA 584+87)(RT)	8.000	0.500	3	2.333	7.000	2.000	4	2.127	8.507	3.583	3	4.254	12.761	3.670	4	16.188	12.896	5.313	3.000	4"	125.375	3"	30.000



PIPE RUNNER LAYOUT

(14) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(15) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner as the shortest.

SPECIAL NOTE:

This tabular sheet is to be filled out by the culvert specifier and provides information for the construction details and quantities of pipe runners.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, all dimensions must be verified by the Contractor in the field prior to fabrication of the safety end treatment components.

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

SHEET 3 OF 3

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
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	WAC	MCLENNAN		126

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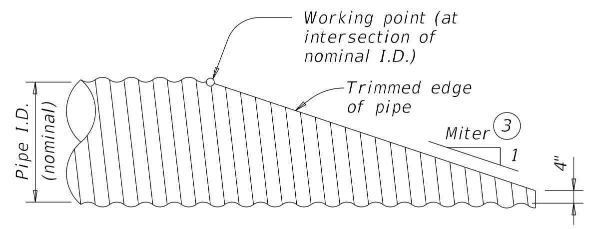
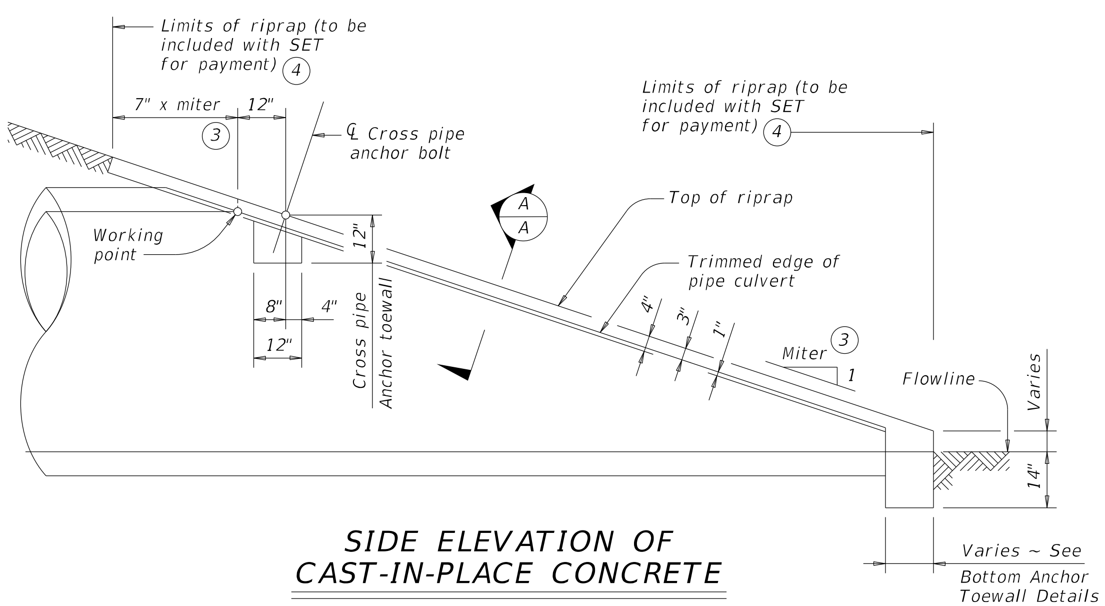


NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

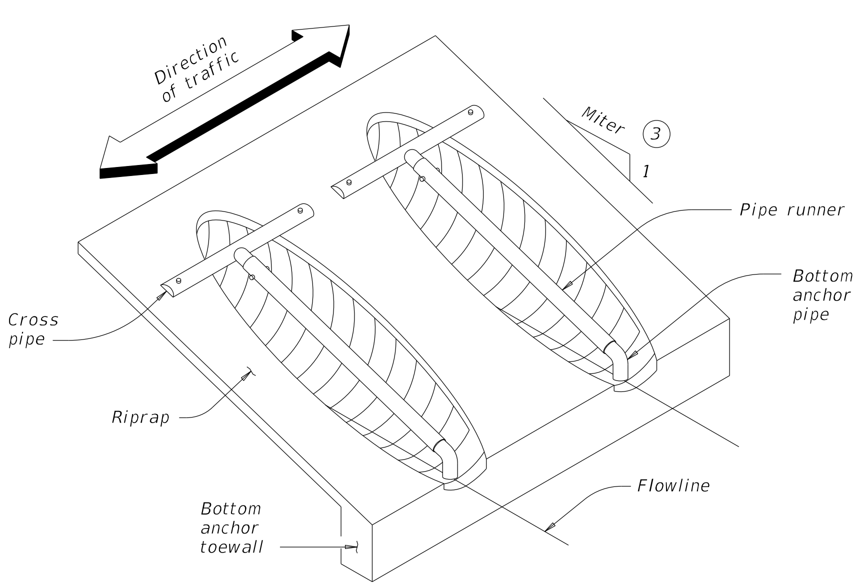
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

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



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS ① ②

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

TYPICAL PIPE CULVERT MITERS ③

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

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED ②

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

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS ①

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

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) ⑤

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

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

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

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

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

③ Miter = slope of mitered end of pipe culvert.

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

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

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Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA PIPE CULVERTS TYPE II ~ CROSS DRAINAGE

SETP-CD

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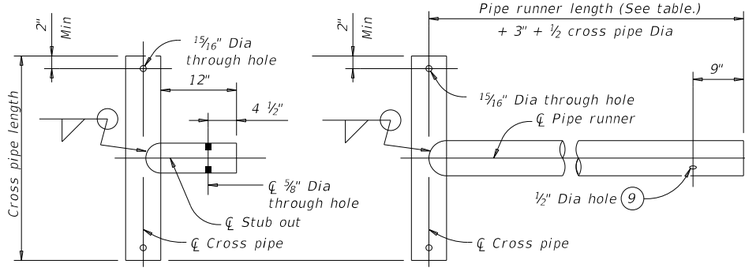
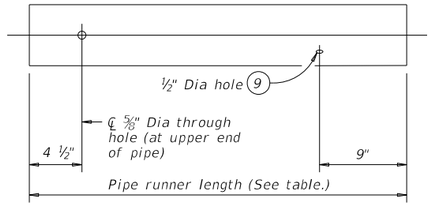


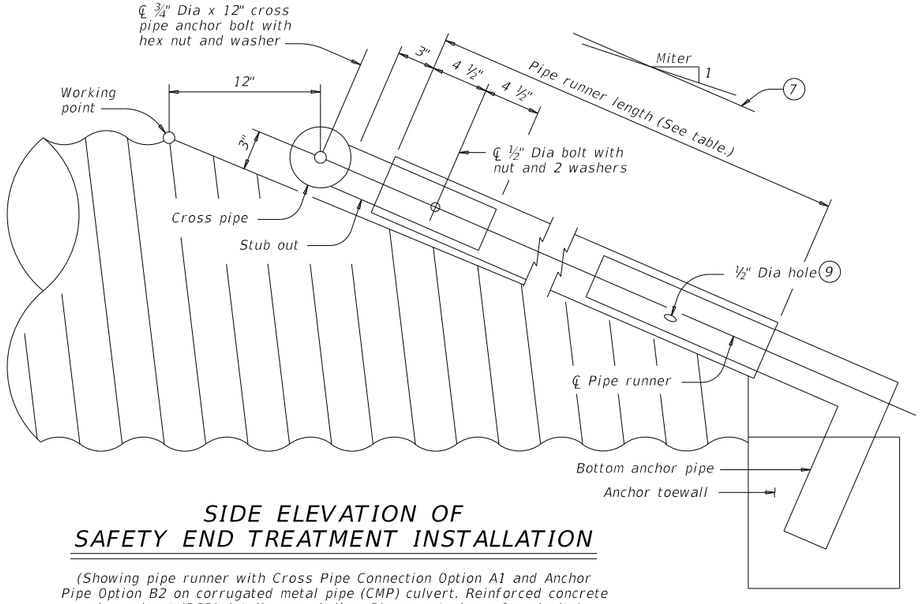
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



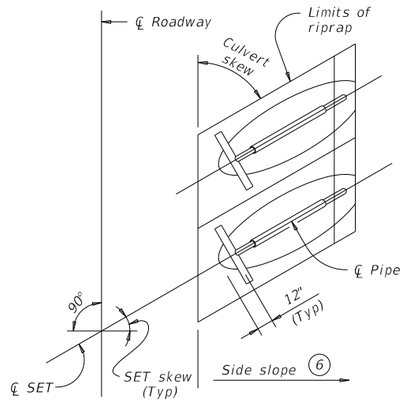
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

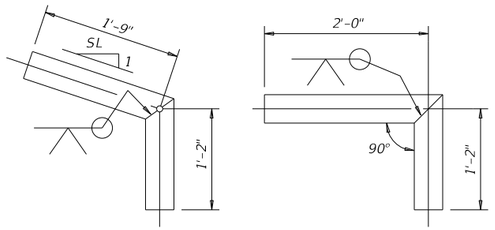


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

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

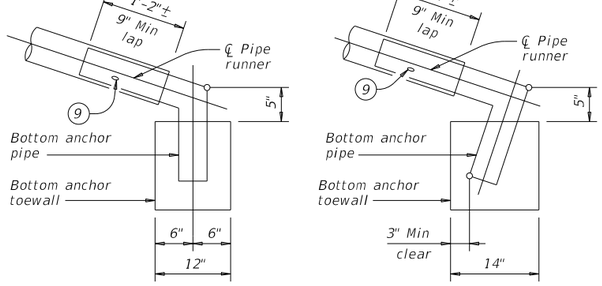


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

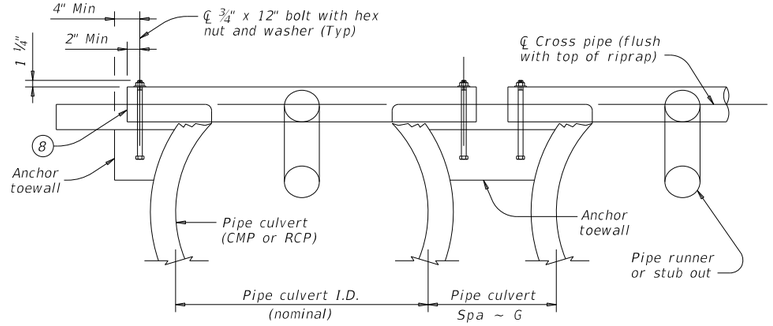
BOTTOM ANCHOR PIPE DETAILS (10)



OPTION B1 OPTION B2

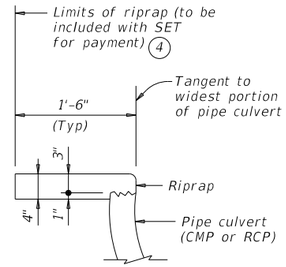
BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL

SECTION A-A



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

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

(6) Recommended values of side slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.

(8) Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1/2" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MATERIAL NOTES:

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

Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

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

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.

Payment for riprap and toewall is included in the price bid for each safety end treatment.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		128

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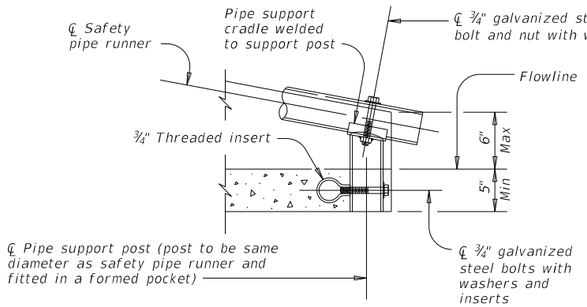
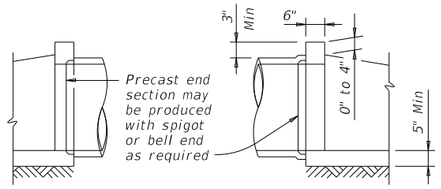
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe		Multiple Pipes	
						Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' – 11"	≤ 45°	No	≤ 45°	No
				4:1	3' – 6"				
				6:1	4' – 9"				
15"	2 ¼"	1.30"	20.50"	3:1	3' – 8"	≤ 45°	No	≤ 45°	No
				4:1	4' – 7"				
				6:1	6' – 5"				
18"	2 ½"	1.60"	24.00"	3:1	4' – 6"	≤ 45°	No	≤ 45°	No
				4:1	5' – 8"				
				6:1	8' – 0"				
24"	3"	1.95"	31.00"	3:1	6' – 2"	≤ 45°	No	= 30°	No
				4:1	7' – 10"			> 30°	Yes
				6:1	11' – 3"				
30"	3 ½"	2.65"	38.50"	3:1	7' – 10"	= 15°	No	= 15°	No
				4:1	10' – 1"	> 15°	Yes	> 15°	Yes
				6:1	14' – 8"				
36"	4"	2.75"	45.50"	3:1	9' – 5"	= 0°	No	≥ 0°	Yes
				4:1	12' – 3"	> 0°	Yes		
				6:1	17' – 11"				
42"	4 ½"	2.7"	52.50"	3:1	11' – 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' – 5"				
				6:1	21' – 2"				



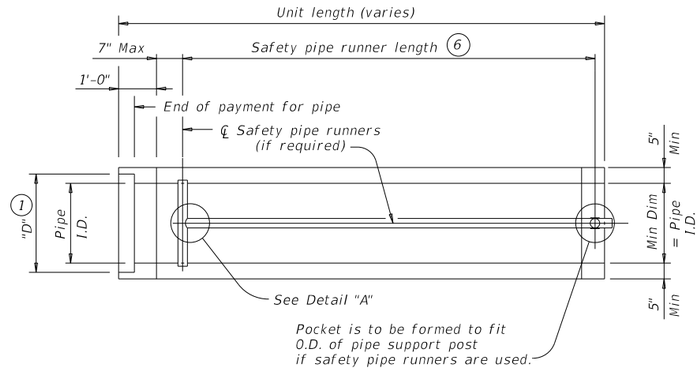
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



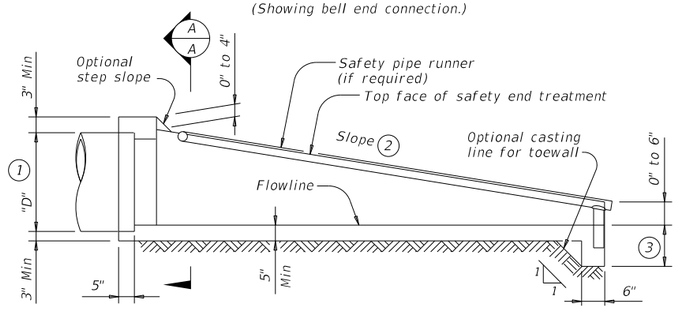
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



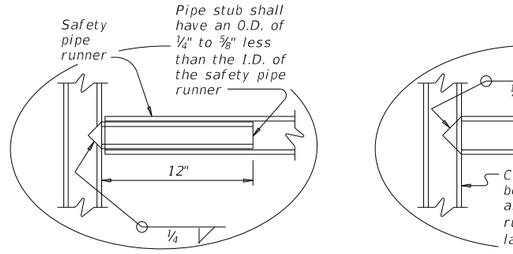
PLAN

(Showing bell end connection.)



LONGITUDINAL ELEVATION

(Showing bell end connection.)

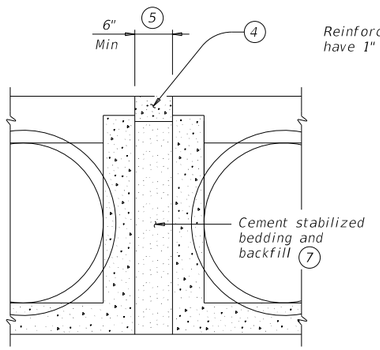


OPTION A

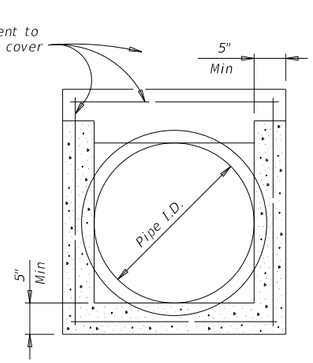
DETAIL A

(If required)

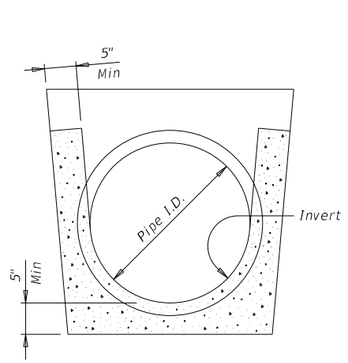
OPTION B



MULTIPLE PIPE INSTALLATION

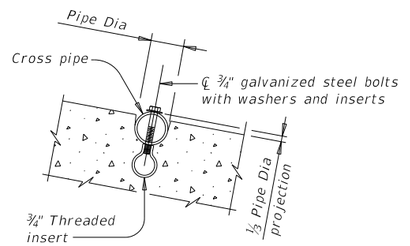


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

SAFETY PIPE RUNNER DIMENSIONS

Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' – 2"	3" STD	3.500"	3.068"
15' – 6"	3 ½" STD	4.000"	3.548"
20' – 10"	4" STD	4.500"	4.026"
35' – 4"	5" STD	5.563"	5.047"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Measured along slope.

(7) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(8) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

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

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

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

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" – D12 x D12 or 5"x5" – D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor, the next larger size of safety end treatment may be furnished as long as the "D" dimension cast is that of the required size of pipe.

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

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

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

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation — Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

FILE: psetscss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		129

DATE: 4/15/2022 12:51:28 PM
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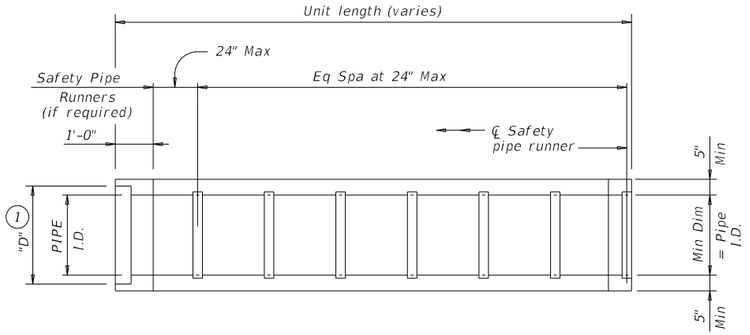
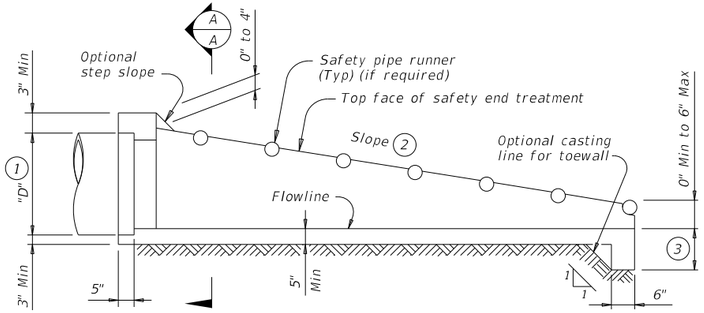


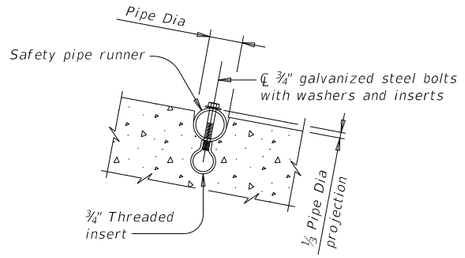
PLAN

(Showing bell end connection.)



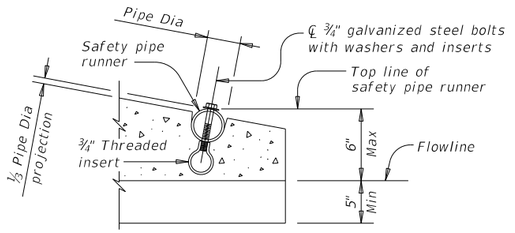
LONGITUDINAL ELEVATION

(Showing bell end connection.)

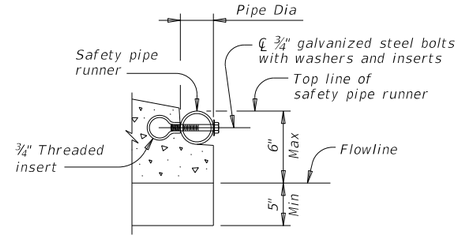


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



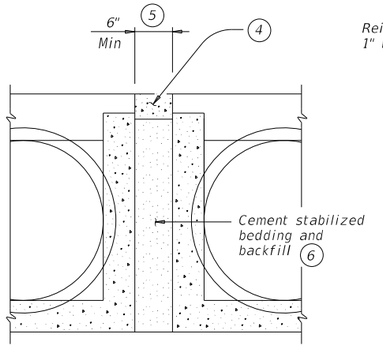
OPTION A



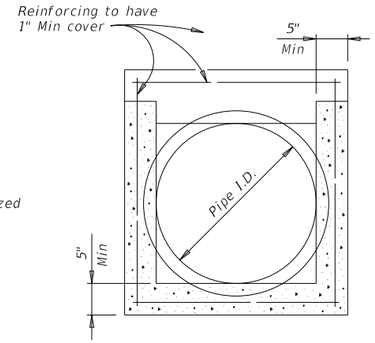
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

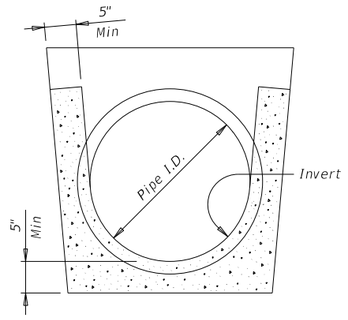
(If required)



MULTIPLE PIPE INSTALLATION

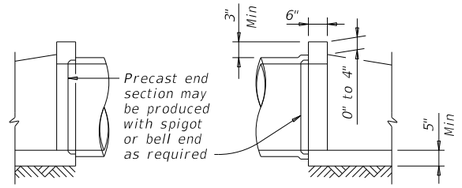


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment.)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (7)	"D" (1)	Slope	Min Length	Pipe Runners Required		Required Pipe Runner Size		
						Single Pipe	Multiple Pipe	Nominal Dia.	O.D.	I.D.
12"	2"	1.15"	17.00"	6:1	4' – 9"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
15"	2 ¼"	1.30"	20.50"	6:1	6' – 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	1.60"	24.00"	6:1	8' – 0"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31.00"	6:1	11' – 3"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
30"	3 ½"	2.65"	38.50"	6:1	14' – 8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17' – 11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	2.7"	52.50"	6:1	21' – 2"	Yes	Yes	4" STD	4.500"	4.026"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(7) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

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

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

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

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" – D12 x D12 or 5"x5" – D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

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

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464, "Reinforced Concrete Pipe". Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

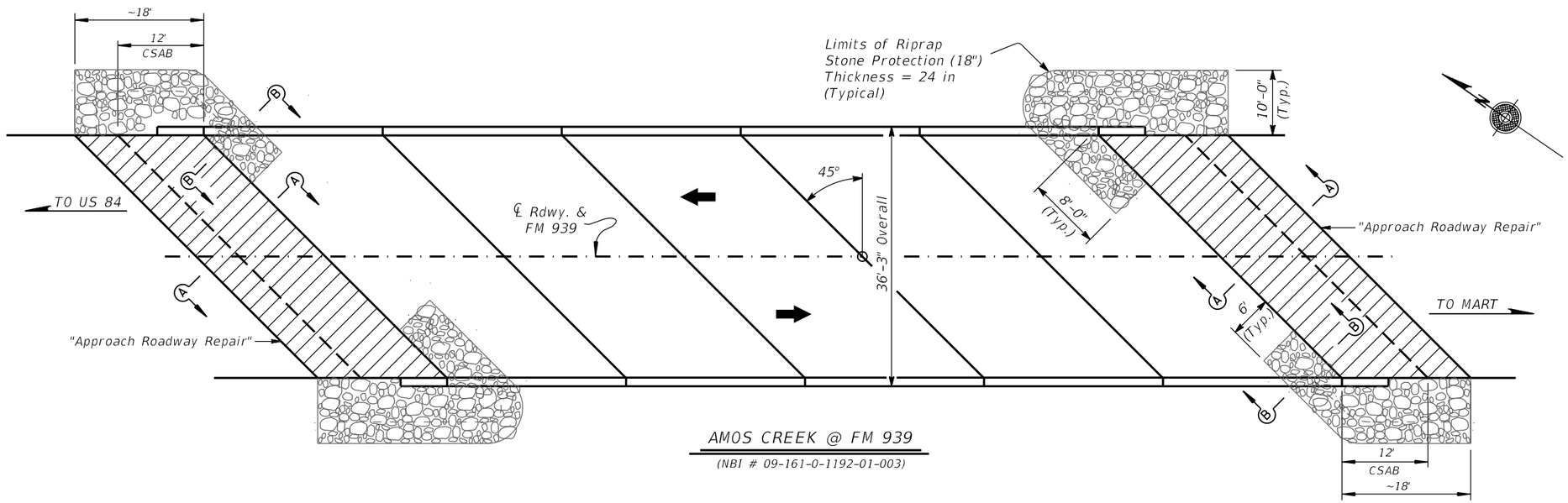
Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

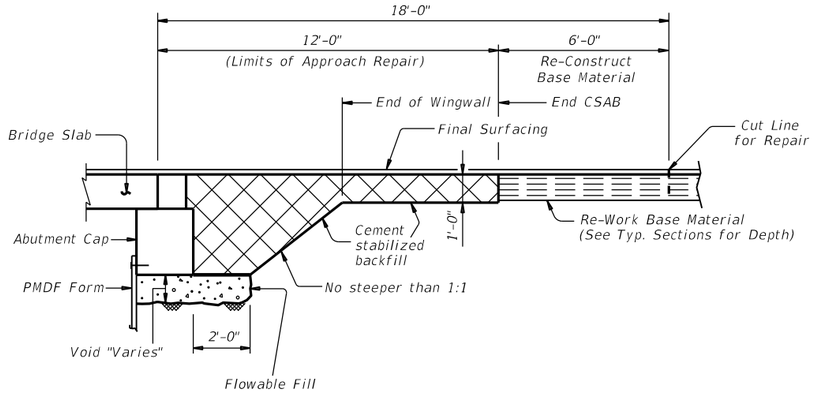
FILE: psetspss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		130



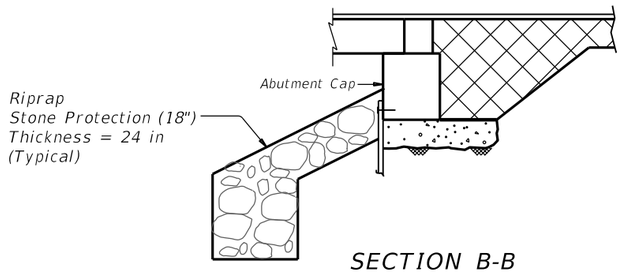
AMOS CREEK @ FM 939

(NBI # 09-161-0-1192-01-003)

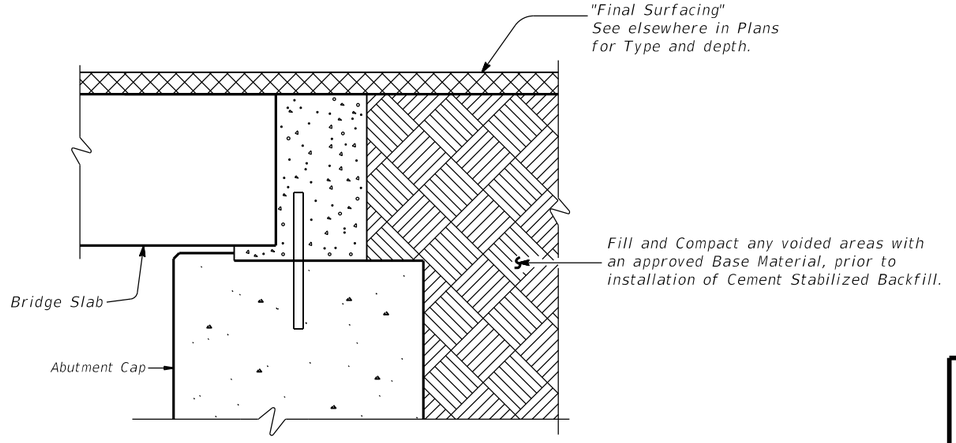
FM 939 OVER AMOS CREEK
125'-0" OVERALL LENGTH
(5 @ 25'-0") CONCRETE SLAB SPANS
34'-0" ROADWAY 45 Degree RFS



SECTION A-A



SECTION B-B



END OF BRIDGE LOCATIONS

SECTION THRU ABUTMENT

(APPROACH ROADWAY REPAIR)

STATE OF TEXAS
PAUL F. CEPAK
85408
LICENSED
PROFESSIONAL ENGINEER

Paul F. Cepak, P.E.

04/14/2022

SHEET 1 OF 2 SHEETS

Texas Department of Transportation
© 2022

LAYOUT & DETAILS FOR ABUTMENT AND APPROACH ROADWAY REPAIR

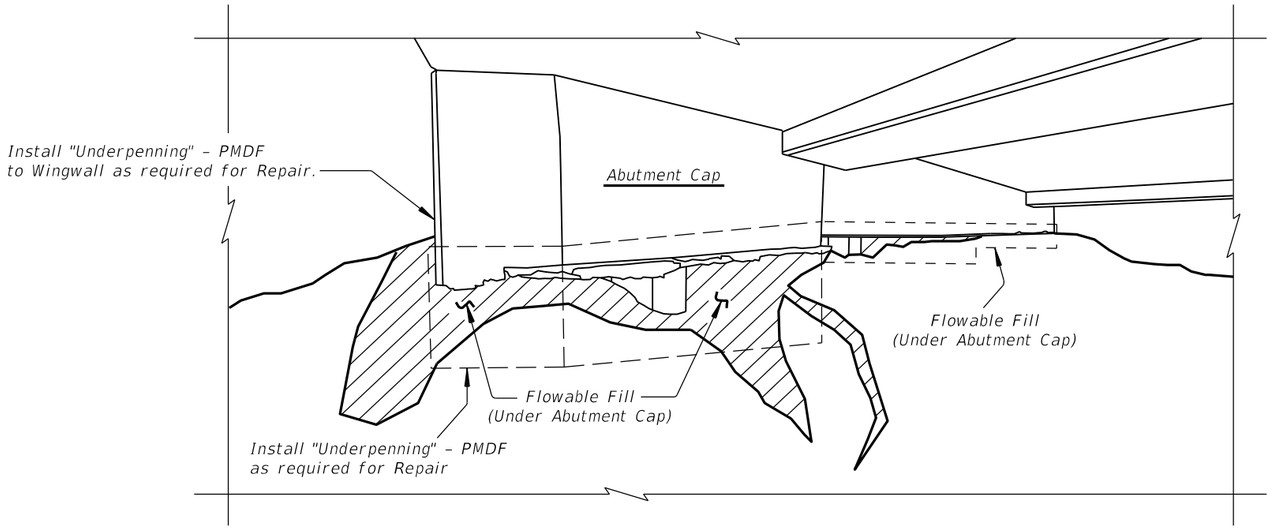
(FM 939 OVER AMOS CREEK)

(STR# 003)

FILE: AMOSAPPRREP.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT		
ORIG DATE: JUNE 2021	DIST	FED REG	FEDERAL AID PROJECT •			SHEET
REVISIONS	WACO	6				130
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MCLENNAN		0831	01	019	FM 939

ETC.

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 21 31 41 51 61 71 81 91 02 12 22 32 42 52 62 72 82 92 03 13 23 33 43 53 63 73 83 93 04 14 24 34 44 54 64 74 84 94 05 15 25 35 45 55 65 75 85 95 06 16 26 36
ACC:



ELEVATION

SHOWING LIMITS OF EROSION HOLE UNDER SOUTHEAST ABUTMENT CAP
NOTE: NORTHWEST ABUTMENT ~ SIMILAR W/MINOR EROSION

GENERAL NOTES:

All Materials and Labor required for installing Cement Stabilized Backfill, shall be included in the price bid per CY for Item 400, CEM STABIL BKFIL.

All Materials and Labor required for filling voids below Abutment Caps with Flowable Fill, including forming and installation, shall be included in the price bid per CY for Item 401, FLOWABLE BACKFILL.

All Materials and Labor required for installing Riprap Stone Protection shall be included in the price bid per CY for Item 432, RIPRAP (STONE PROTECTION) (18 IN).

Re-working Base material and compaction will be subsidiary to various bid items.

ESTIMATED QUANTITIES

ITEM	0400-6005	0401-6001	0432-6033
FM 939 OVER AMOS CREEK	CEM STABIL BKFL	FLOWABLE BACKFILL	RIPRAP (STONE PROTECTION) (18 IN)
	C.Y.	C.Y.	C.Y.
NORTWEST ABUTMENT	35.0	3.0	75.0
SOUTHEAST ABUTMENT	35.0	4.0	75.0
TOTAL	70.0	7.0	150.0

STATE OF TEXAS
PAUL F. CEPAK
85408
LICENSED
PROFESSIONAL ENGINEER

Paul F. Cepak, P.E.

04/14/2022

SHEET 2 OF 2 SHEETS

LAYOUT & DETAILS FOR ABUTMENT AND APPROACH ROADWAY REPAIR

(FM 939 OVER AMOS CREEK)

(STR# 003)

FILE: AMOSAPPRREP.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT
ORIG DATE: JUNE 2021	DIST	FED REG	FEDERAL AID PROJECT	SHEET
REVISIONS	WACO	6		131
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	MCLENNAN	0831	01	019	FM 939

ETC.

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
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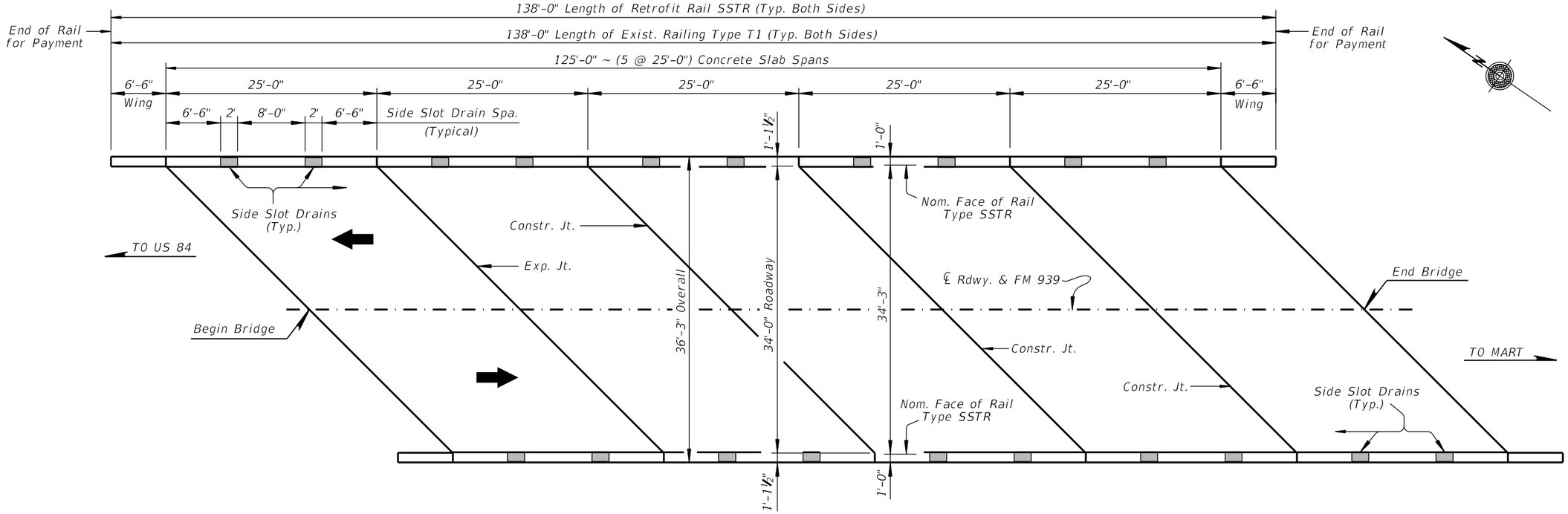
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC:



AMOS CREEK @ FM 939

(NBI # 09-161-0-1192-01-003)

Note:
Existing Structure has Historically proven to be Hydraulically adequate. There has been no overtopping of the bridge in the last 25 years.

Note:
See Standards GF(31)TRTL3-20, GF(31)-19 and BED-14 for additional Details not shown.

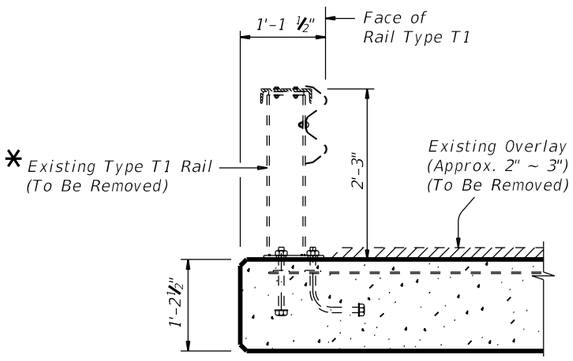
FM 939 OVER AMOS CREEK
125'-0" OVERALL LENGTH
(5 @ 25'-0") CONCRETE SLAB SPANS
34'-0" ROADWAY 45 Degree RFS

NOTE:
Stockpile all Bridge Rail and Posts that are deemed salvageable at sites on the Right of Way as Directed by the Engineer. Existing Rail and Posts will become property of the state.

ESTIMATED QUANTITIES

ITEM	0451-6024	* EXISTING RAIL (REMOVAL)
LOCATION	RETROFIT RAIL (TY SSTR)	
	L.F.	L.F.
FM 939 @ AMOS CREEK	276.0	276.0
TOTAL	276.0	276.0

* FOR CONTRACTORS INFORMATION ONLY



SECTION THRU EXISTING RAIL
(SHOWING TYPE T1 RAIL - TO BE REMOVED)

STATE OF TEXAS
PAUL F. CEPAK
85408
LICENSED
PROFESSIONAL ENGINEER

Paul F. Cepak, P.E.

04/14/2022

GENERAL NOTES:

Use of these retrofit details will result in a railing acceptable for the MASH Test Level TL-4 criteria indicated on SSTR Rail Standard.

Removal and replacement of backfill, subgrade, and asphalt or concrete pavement necessary for this installation is considered subsidiary to the retrofit railing.

Rail anchorage details shown, have been modified for this select structure type.

Payment for retrofit rail will be as per Item 451, "Retrofit Rail (Ty SSTR)".

Removal of Existing Rail is included in the Unit Bid Price per LF for Retrofit Rail (TY SSTR).

Shop drawings will not be required for this rail.

Average weight of Railing with no Overlay is 376 PLF.

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC:

Texas Department of Transportation

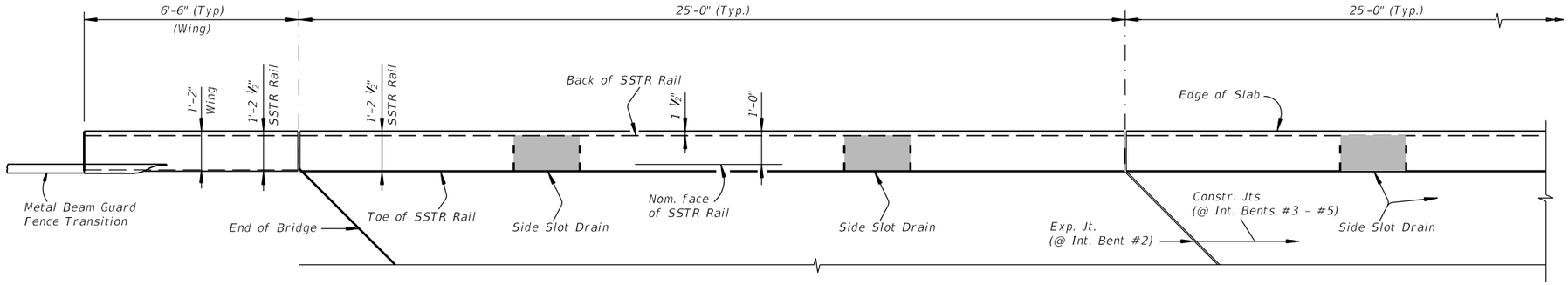
RETROFIT TRAFFIC RAIL LAYOUT

(FM 939 @ AMOS CREEK)

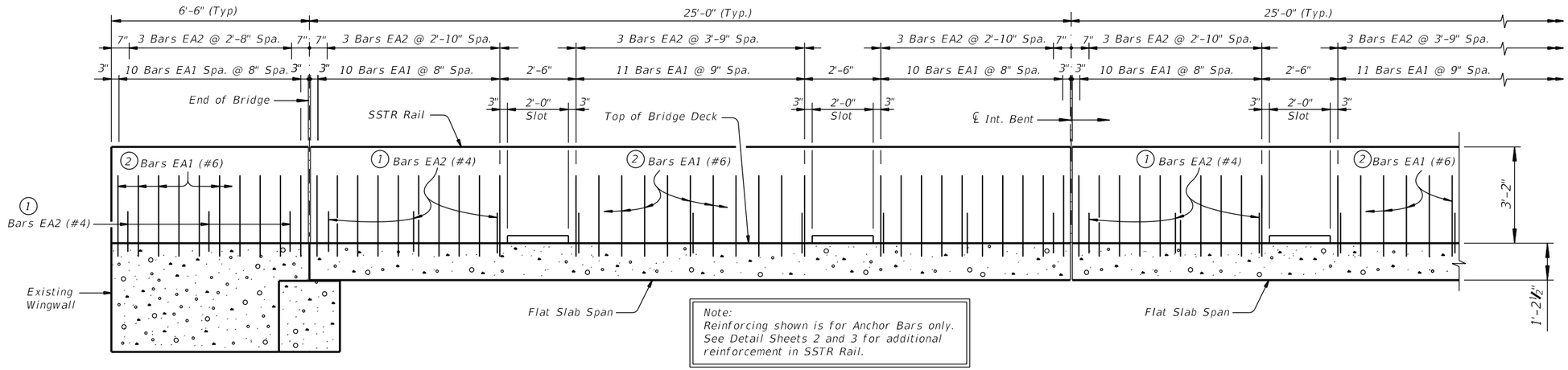
(STR.#003) TYPE SSTR

FILE: AMOSRETRO.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT
ORIG DATE: DEC 2016	DIST	FED REG	FEDERAL AID PROJECT •	SHEET
REVISIONS	WACO	6		132
	COUNTY		CONTROL SECT JOB	HIGHWAY
	MCLENNAN		0831 01 019	FM 939

Etc.



PART PLAN
FM 939 OVER AMOS CREEK



Note:
Reinforcing shown is for Anchor Bars only. See Detail Sheets 2 and 3 for additional reinforcement in SSTR Rail.

PART ELEVATION
FM 939 OVER AMOS CREEK

SEE RETROFIT TRAFFIC RAIL DETAILS SHEETS 2 & 3, FOR CORRESPONDING SECTIONS AND NOTES.

(1) Embed secondary (#4) anchor bars 1'-4" in length with a Type III Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 10 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) anchor bars spaced longitudinally along rail at 4 ft Max (Spaced 3" longitudinally from outside edge and edge of side slot drains).

(2) Embed (#6) anchor bars with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 5 ¼". 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".

STATE OF TEXAS
PAUL F. CEPAK
85408
LICENSED
PROFESSIONAL ENGINEER

Paul F. Cepak, P.E.
04/14/2022

SHEET 1 OF 3 SHEETS

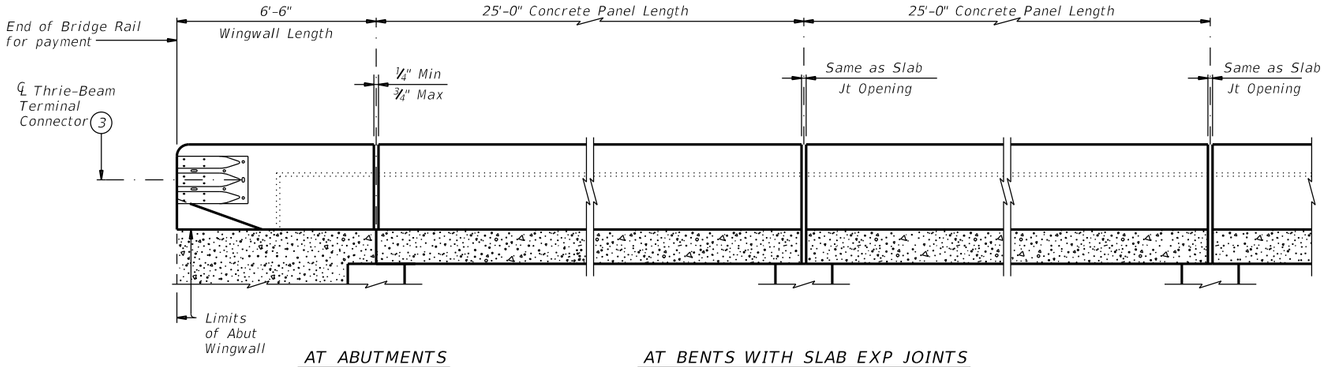
Texas Department of Transportation

RETROFIT TRAFFIC RAIL DETAILS
(FM 939 @ AMOS CREEK)

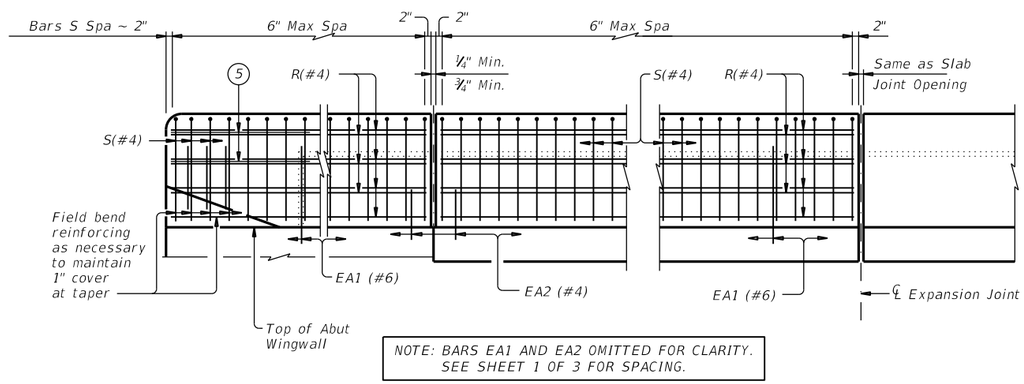
(STR.#003) TYPE SSTR

FILE: AMOSRETRO.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT				
ORIG DATE: DEC 2016	DIST	FED REG	FEDERAL AID PROJECT •					SHEET
REVISIONS	WACO	6						133
	COUNTY				CONTROL	SECT	JOB	HIGHWAY
	MCLENNAN				0831	01	019	FM 939

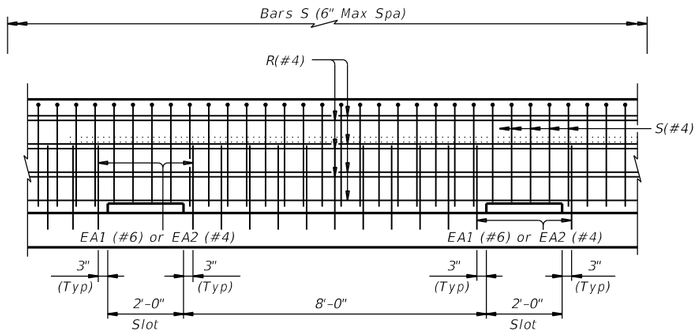
Etc.



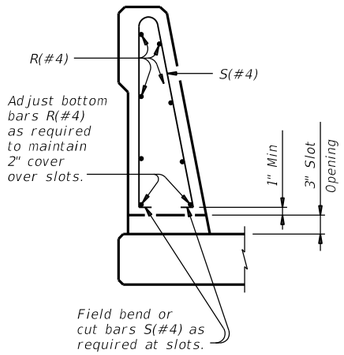
ROADWAY ELEVATION OF RAIL



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



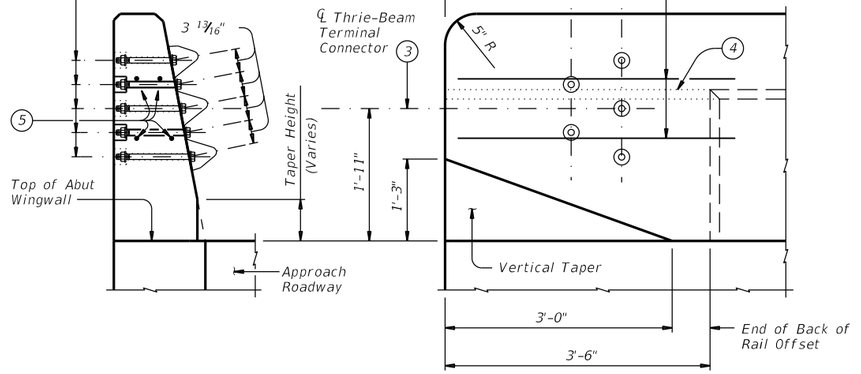
SIDE SLOT DRAIN DETAIL



SECTION THRU SIDE SLOT DRAIN

℄ 5 ~ ⅞" Dia A325 Bolts with two 1 ¾" O.D. washers. Place washer under each head and nut. Tighten the 5 Terminal Connection Bolts in a well distributed pattern so to prevent damage or distortion of the Thrie-Beam Connection and the MBGF Transition. Cut bolts off after installation so as to extend no more than ¾" beyond nut. Paint ends of cut-off bolts with Zinc-rich paint.

℄ 5 ~ 1" Dia holes and 2 ½" Dia x 2" deep recesses. Form or core holes and recesses. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes and recesses.



TERMINAL CONNECTION DETAILS

(3) 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.

(4) Back of rail offset may, with Engineer's approval, be continued to the end of the railing.

(5) Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required.

(6) Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail.

STATE OF TEXAS
PAUL F. CEPAK
85408
LICENSED
PROFESSIONAL ENGINEER

Paul F. Cepak, P.E.

04/14/2022

SHEET 2 OF 3 SHEETS

Texas Department of Transportation

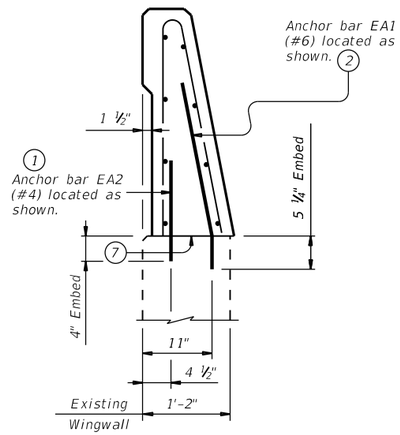
RETROFIT TRAFFIC RAIL DETAILS

(FM 939 @ AMOS CREEK)

(STR.#003) TYPE SSTR

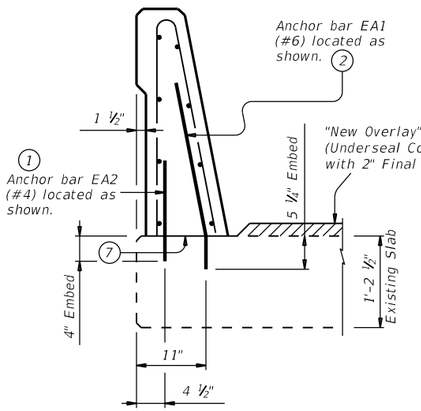
FILE: AMOSRETRO.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT					
ORIG DATE: DEC 2016	DIST	FED REG	FEDERAL AID PROJECT						SHEET
REVISIONS	WACO	6							134
	COUNTY				CONTROL	SECT	JOB	HIGHWAY	
	MCLENNAN				0831	01	019	FM939	

Etc.



SSTR RAIL

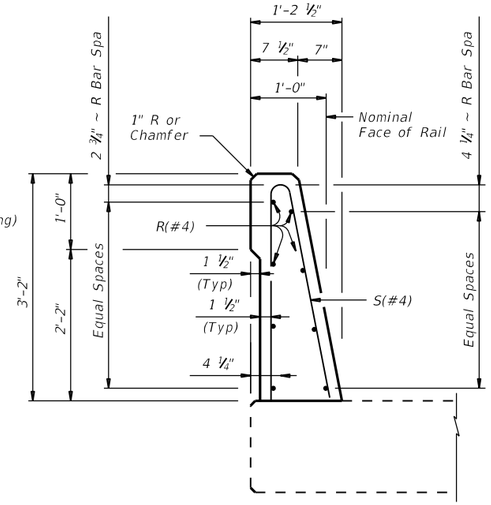
(SHOWING RETROFIT REINFORCING AT WING)



SSTR RAIL

SECTION THRU RAIL

(SHOWING RETROFIT REINFORCING ON BRIDGE DECK)



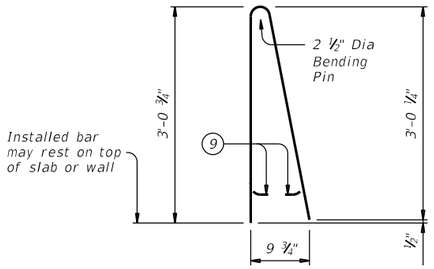
ON BRIDGE SLAB

(SHOWING SSTR RAIL REINFORCING)

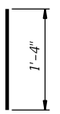
(1) Embed secondary (#4) anchor bars 1'-4" in length with a Type III Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 10 kips. Submit signed and sealed calculations or the manufacturer's 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) anchor bars spaced longitudinally along rail at 4 ft Max (Spaced 3" longitudinally from outside edge and edge of side slot drains).

(2) Embed (#6) anchor bars with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 5 ¼". 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".

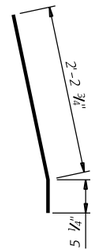
(7) Do not cast rails or parapet walls on top of overlays/seal coats.



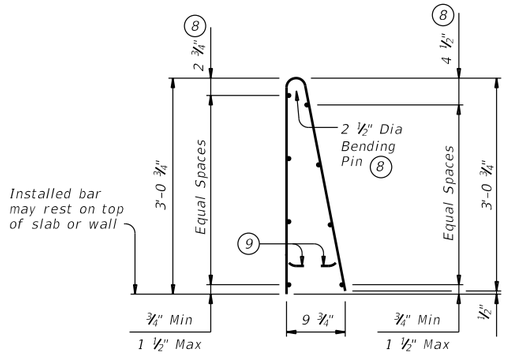
BARS S (#4)



ANCHOR
BAR EA2 (#4)
(Slab & Wing)



ANCHOR
BAR EA1 (#6)
(Slab & Wing)



OPTIONAL WELDED WIRE
REINFORCEMENT (WWR)

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

(8) No longitudinal wires may be within upper bend.

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

CONSTRUCTION NOTES:

Field verify dimensions before commencing work and ordering materials.

By adding additional anchorage, welding can be performed at a minimum spacing of 3 ft between the cage and additional anchorage. By satisfying additional anchorage requirements slip forming is allowed. Do not weld to the required anchorage.

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.

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

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

The back of railing must be vertical unless otherwise shown in the plans or approved by the Engineer.

MATERIAL NOTES:

Galvanize all steel components except reinforcing unless otherwise shown in plans.

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

Provide Grade 60 reinforcing steel.

(#6) and (#4) anchor bars used for the epoxied anchorage system must not be epoxy coated within the required embedment.

Deformed WWR (ASTM A1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.

Provide Bar laps, where required, as follows:

Uncoated ~ #4 = 1'-7"

Epoxy coated ~ #4 = 2'-5"

Cover dimensions are clear dimensions, unless noted otherwise.

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

STATE OF TEXAS
PAUL F. CEPAK
85408
LICENSED
PROFESSIONAL ENGINEER

Paul F. Cepak, P.E.

04/14/2022

SHEET 3 OF 3 SHEETS

Texas Department of Transportation

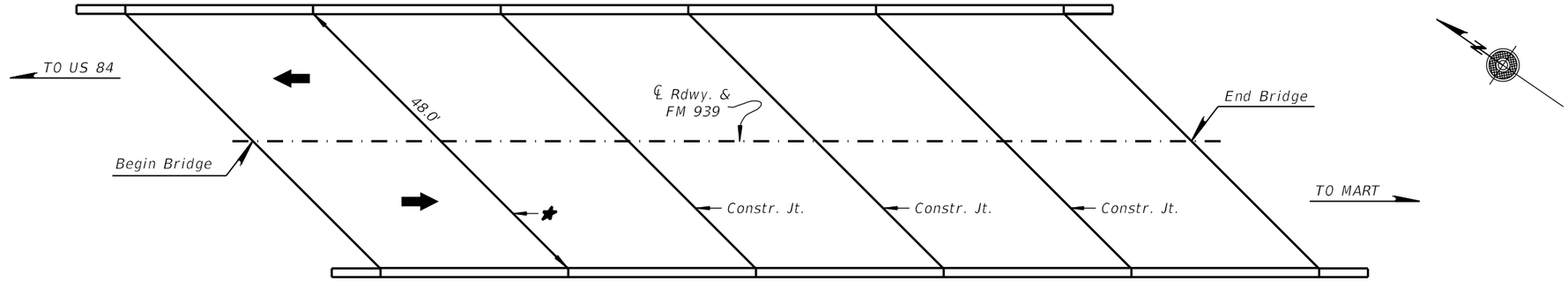
RETROFIT TRAFFIC RAIL DETAILS

(FM 939 @ AMOS CREEK)

(STR.#003) TYPE SSTR

FILE: AMOSRETRO.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT			
ORIG DATE: DEC 2016	DIST	FED REG	FEDERAL AID PROJECT •				SHEET
REVISIONS	WACO	6					135
	COUNTY			CONTROL	SECT	JOB	HIGHWAY
	MCLENNAN			0831	01	019	FM 939

Etc.

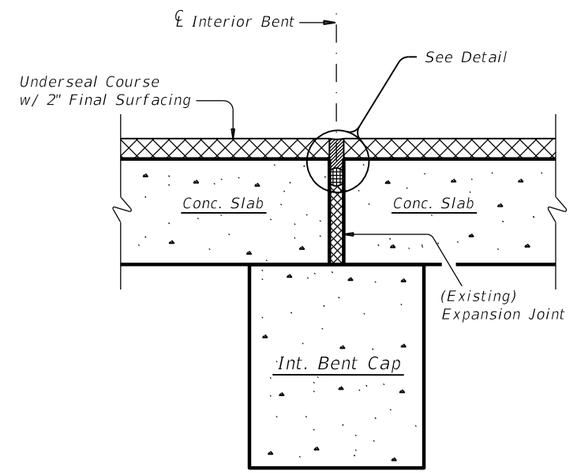


AMOS CREEK @ FM 939

(NBI # 09-161-0-1192-01-003)

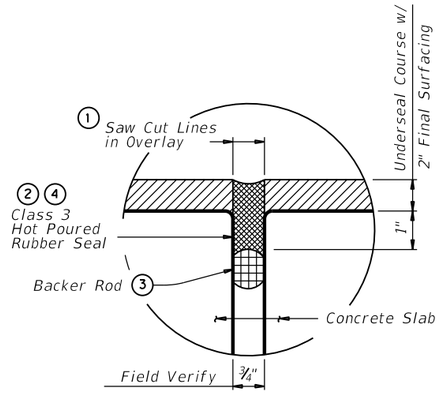
★ Denotes Location for Cleaning and Sealing Expansion Joints.

FM 939 OVER AMOS CREEK
125'-0" OVERALL LENGTH
(5 @ 25'-0") CONCRETE SLAB SPANS
34'-0" ROADWAY 45 Degree RFS



INTERIOR BENT LOCATIONS

SECTION THRU PREMOLDED EXPANSION JOINT



DETAIL

PROCEDURE FOR CLEANING AND SEALING EXISTING CONCRETE JOINT WITH HOT POURED RUBBER SEAL:

1. *Saw cut through the asphalt at the centerline of joint. Make multiple saw cuts to create a ½" minimum joint opening or match the existing joint opening. Clean joint opening of all old expansion materials/devices, bituminous materials, dirt, grease and all other deleterious materials in accordance with Item 438, "Cleaning and Sealing Joints."*
2. *Obtain approval of cleaned joint prior to proceeding with joint sealing operation.*
3. *Place backer rod into joint opening 1" below the top of concrete. Backer rod must be of the type that can handle the heat and be compatible with the hot poured rubber seal. The backer rod must be 25% larger than the joint opening.*
4. *Seal the joint opening with a Class 3, "Hot Poured Rubber." Seal flush to the top of the asphaltic concrete pavement.*
   Prepare joint and seal in accordance with Item 438 "Cleaning and Sealing Joints."

ESTIMATED QUANTITIES

ITEM	438-6002
LOCATION	CLEANING AND SEALING EXIST JOINTS (CL 3)
	L.F.
STR. #003 FM 939 OVER AMOS CREEK	48.0
TOTAL	48.0

STATE OF TEXAS
PAUL F. CEPAK
85408
LICENSED
PROFESSIONAL ENGINEER

Paul F. Cepak, P.E.

04/14/2022

Texas Department of Transportation

LAYOUT & DETAILS FOR CLEANING AND SEALING EXPANSION JOINTS

(FM 939 OVER AMOS CREEK)

(STR# 003)

FILE: AMOSJTREP.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT
ORIG DATE: DEC. 2016	DIST	FED REG	FEDERAL AID PROJECT	SHEET
REVISIONS	WACO	6		136
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	MCLENNAN	0831	01	019	FM 939

Etc.

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC:

DATE: 4/15/2022 12:51:59 PM
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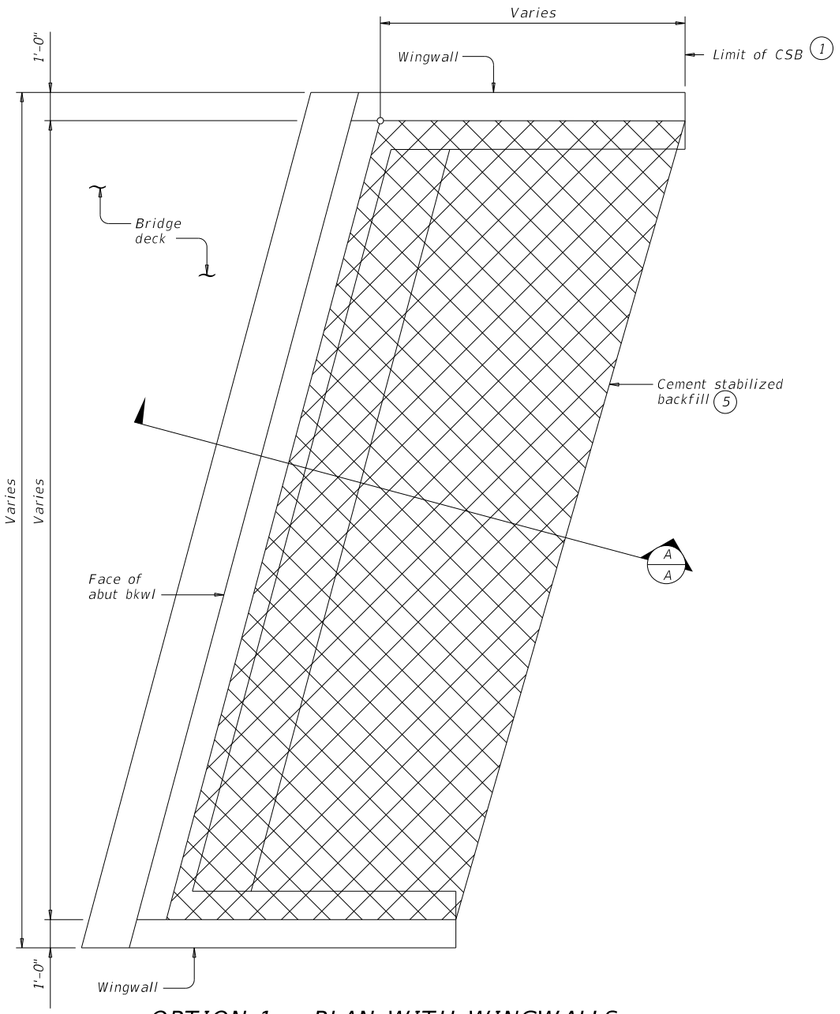
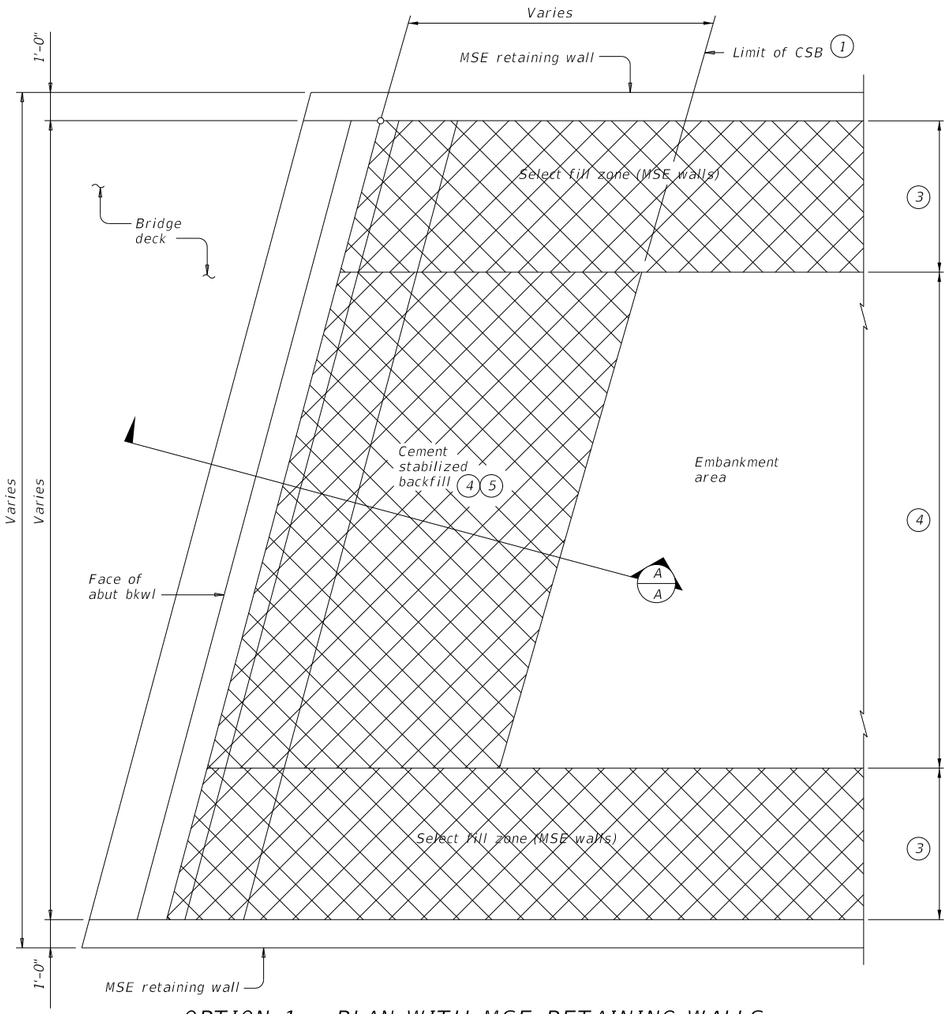


OPTION 1 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 1 ~ PLAN WITH MSE RETAINING WALLS

1. Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.
2. Bench backfill as shown with 12" (approximate) bench depths.
3. Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.
4. When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.
5. If shown in the plans flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
   a). If flowable backfill is to be placed over MSE backfill then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
   b). Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

GENERAL NOTES:

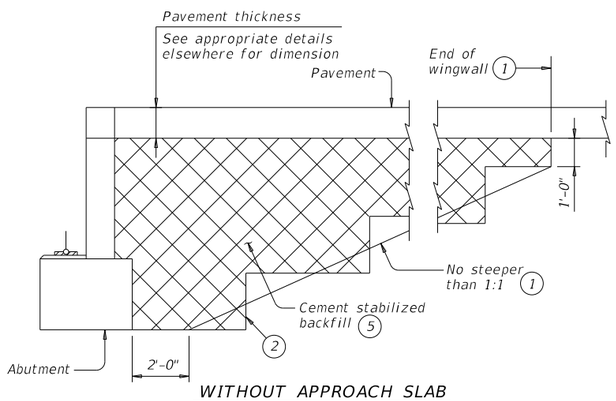
See the Bridge Layout for selected Option. Option 2 is intended for new construction requiring high plasticity embankment fill with a plasticity index (PI) greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays. Option 1 is intended for construction only requiring PI controlled embankment fill or excavation in competent soils/rocks in order to construct the abutment.

Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.

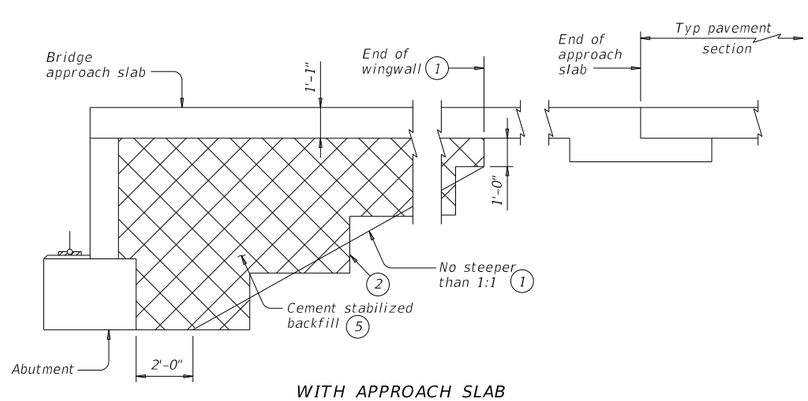
If required elsewhere in the plans, provide Flowable Backfill meeting the requirements of Item 401, "Flowable Backfill", to the limits shown at bridge abutments.

Details are drawn showing left forward skew. See Bridge Layout for actual skew direction.

These details do not apply when Concrete Block retaining walls are used in lieu of wingwalls.



WITHOUT APPROACH SLAB



WITH APPROACH SLAB

(Showing BAS-C, BAS-A similar.)

SECTION A-A

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
02-20: Added Option 2.	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		138

DATE: 4/15/2022 12:52:00 PM
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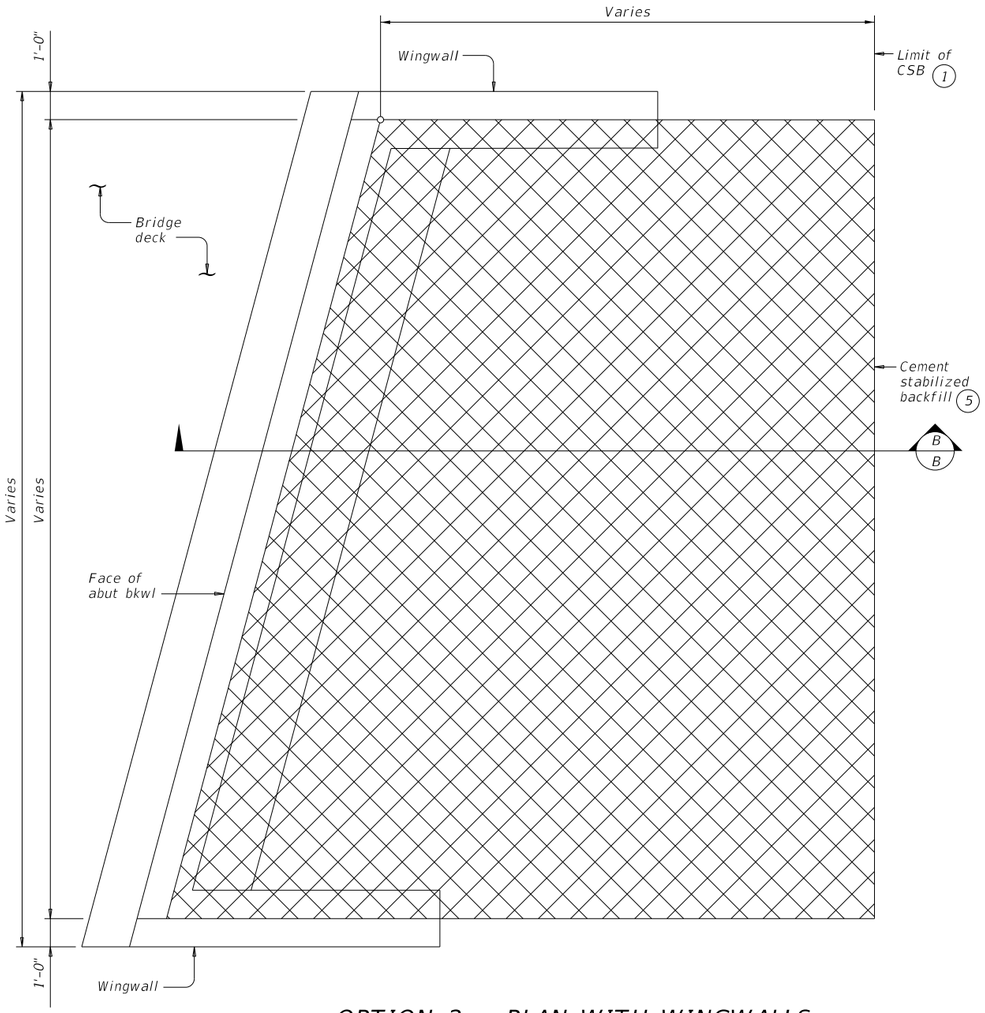
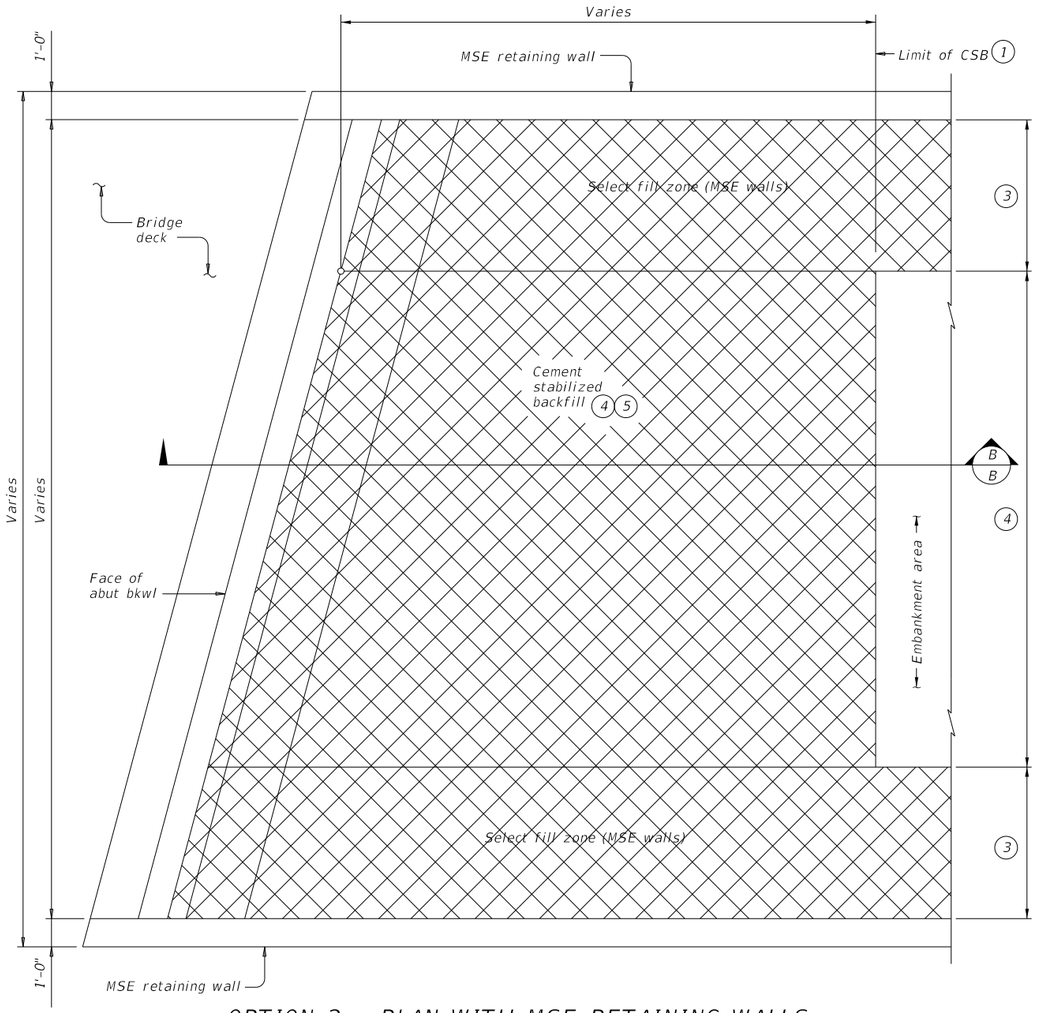


OPTION 2 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 2 ~ PLAN WITH MSE RETAINING WALLS

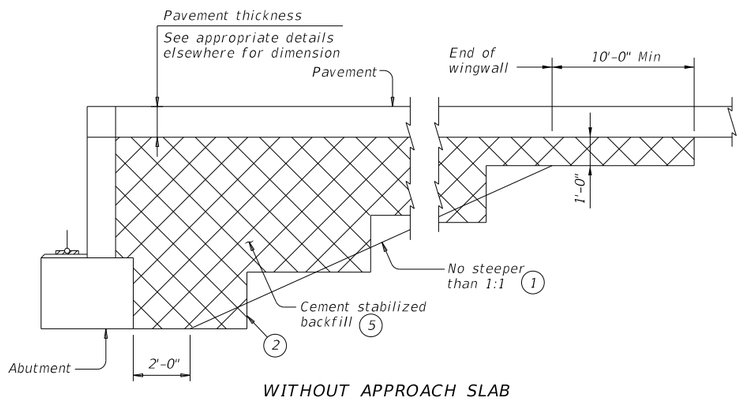
(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

(2) Bench backfill as shown with 12" (approximate) bench depths.

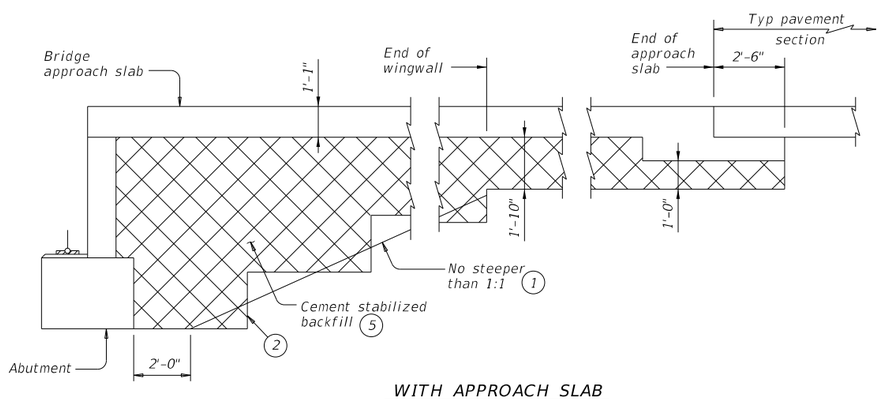
(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(5) If shown in the plans flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
a). If flowable backfill is to be placed over MSE backfill then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
b). Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).



WITHOUT APPROACH SLAB



WITH APPROACH SLAB
(Showing BAS-C, BAS-A similar.)

SECTION B-B

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
02-20: Added Option 2.	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		139

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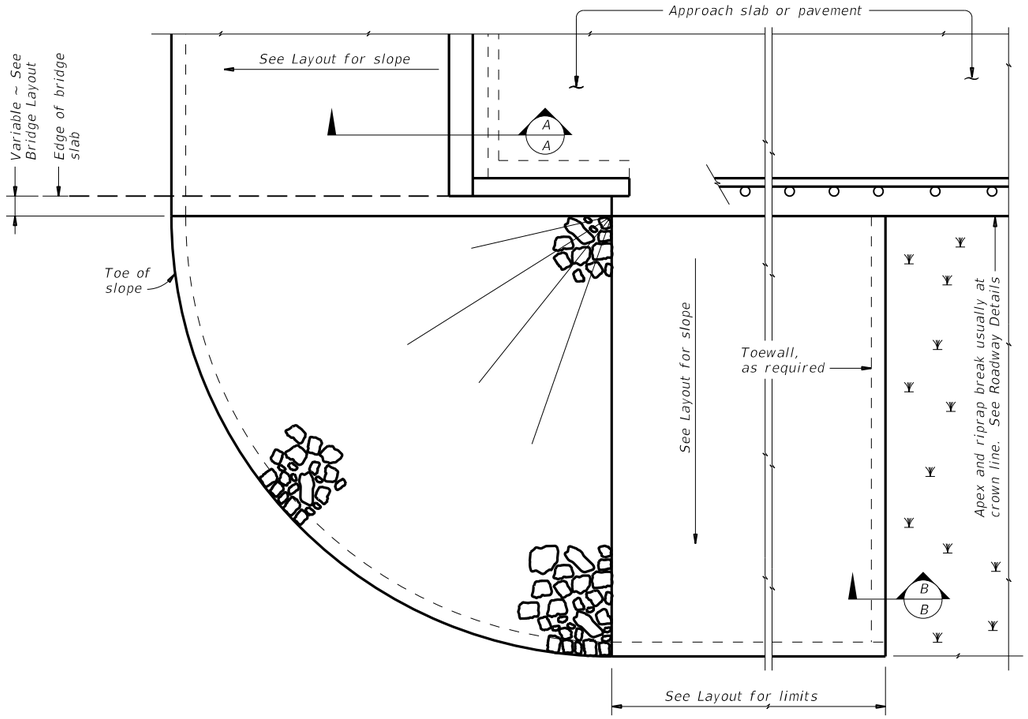
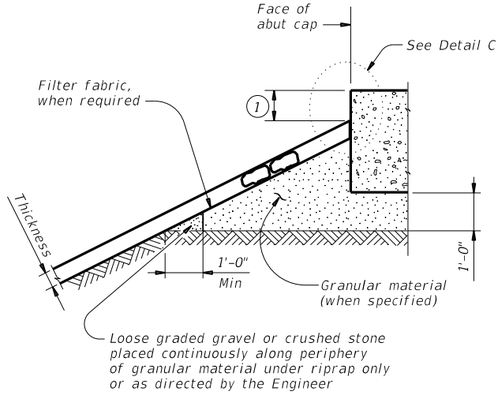
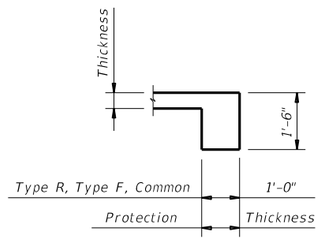


PLAN

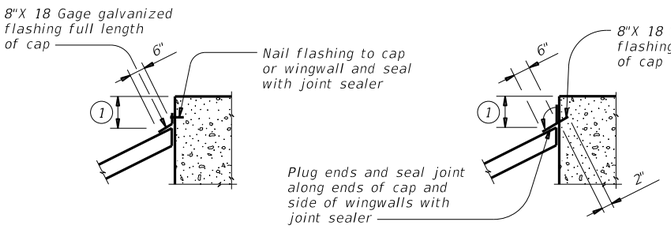


SECTION A-A AT CAP



SECTION B-B

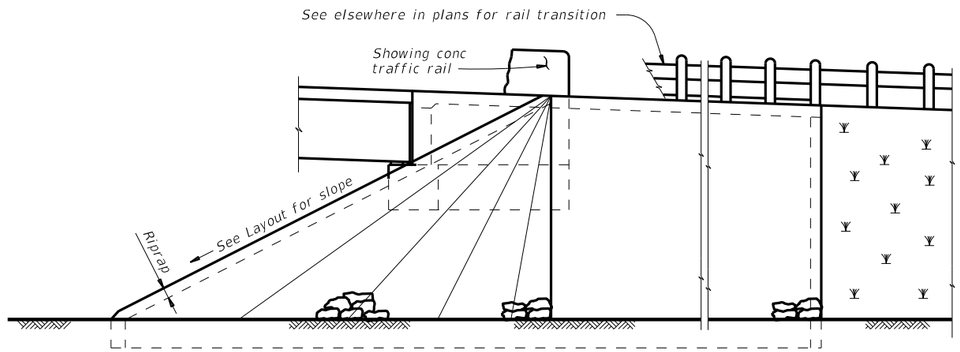
Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A

CAP OPTION B

DETAIL C



ELEVATION

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
See elsewhere in plans for locations and details of shoulder drains.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
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REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
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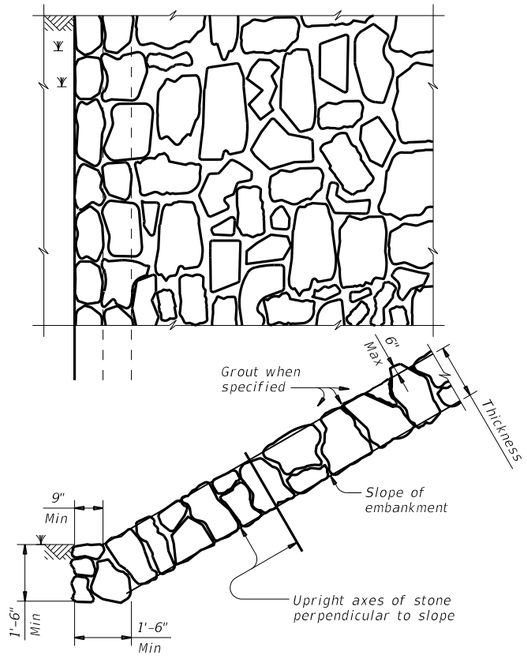


FIGURE 1 ~ TYPE R STONE RIPRAP
dry or grouted

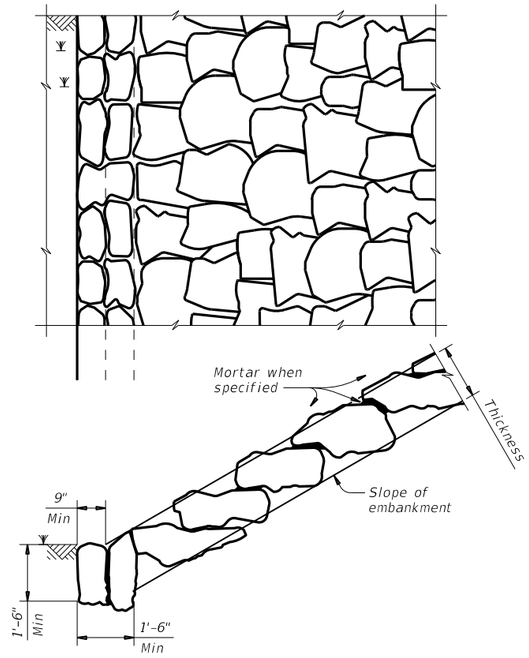


FIGURE 2 ~ TYPE F STONE RIPRAP
dry or mortared

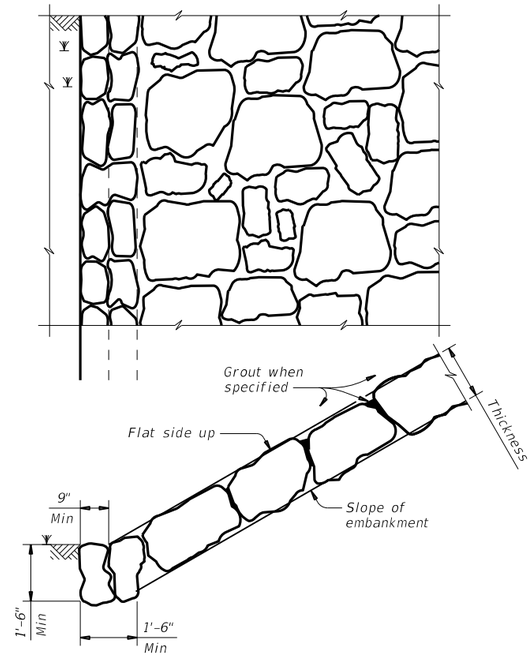


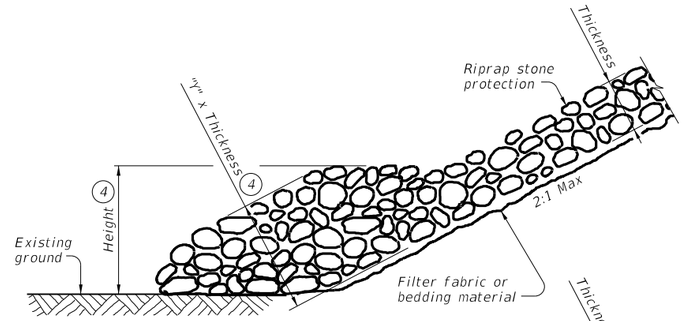
FIGURE 3 ~ TYPE F STONE RIPRAP
grouted

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

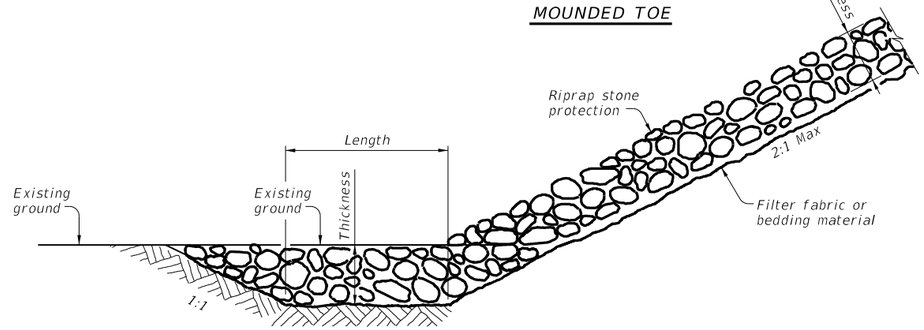
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(4) "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.

(5) List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)

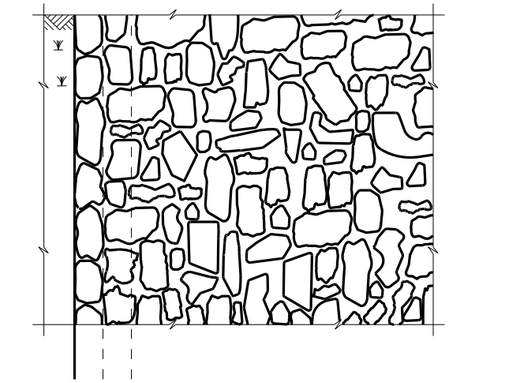


FIGURE 4 ~ COMMON STONE RIPRAP
dry or grouted

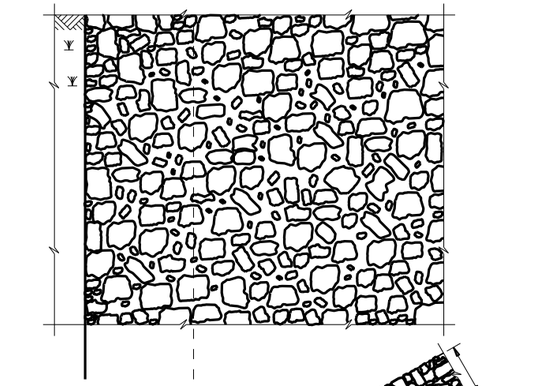


FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
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	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
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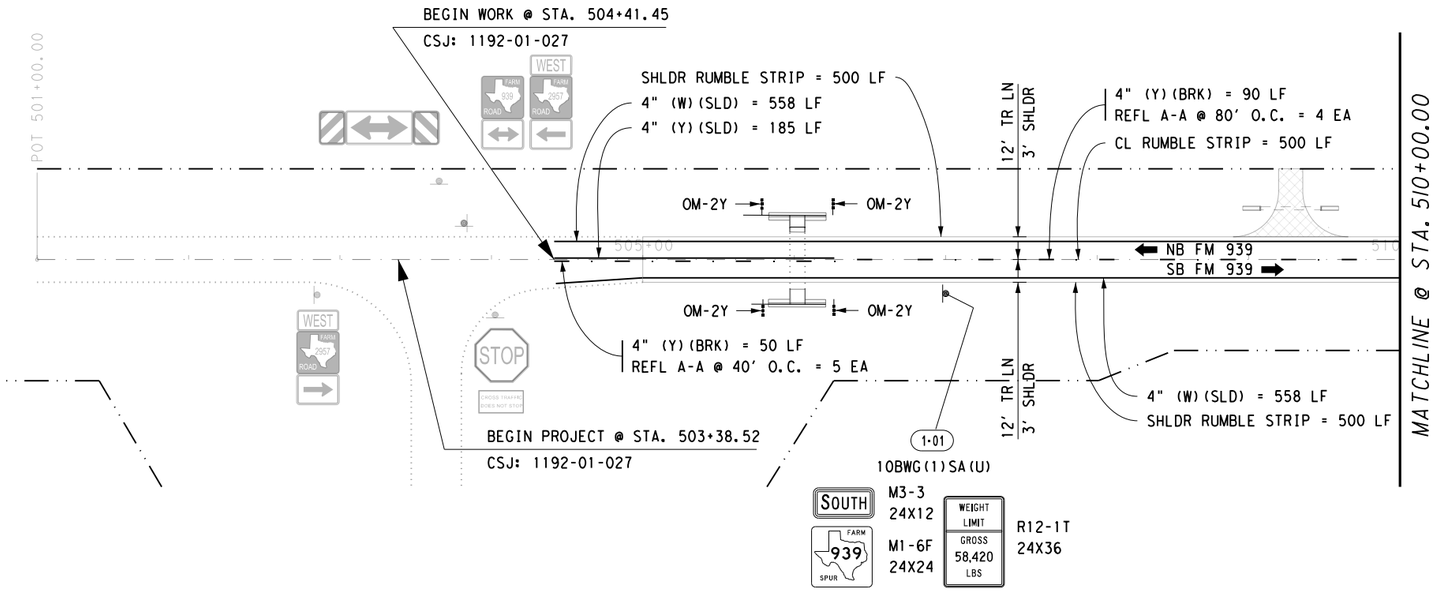

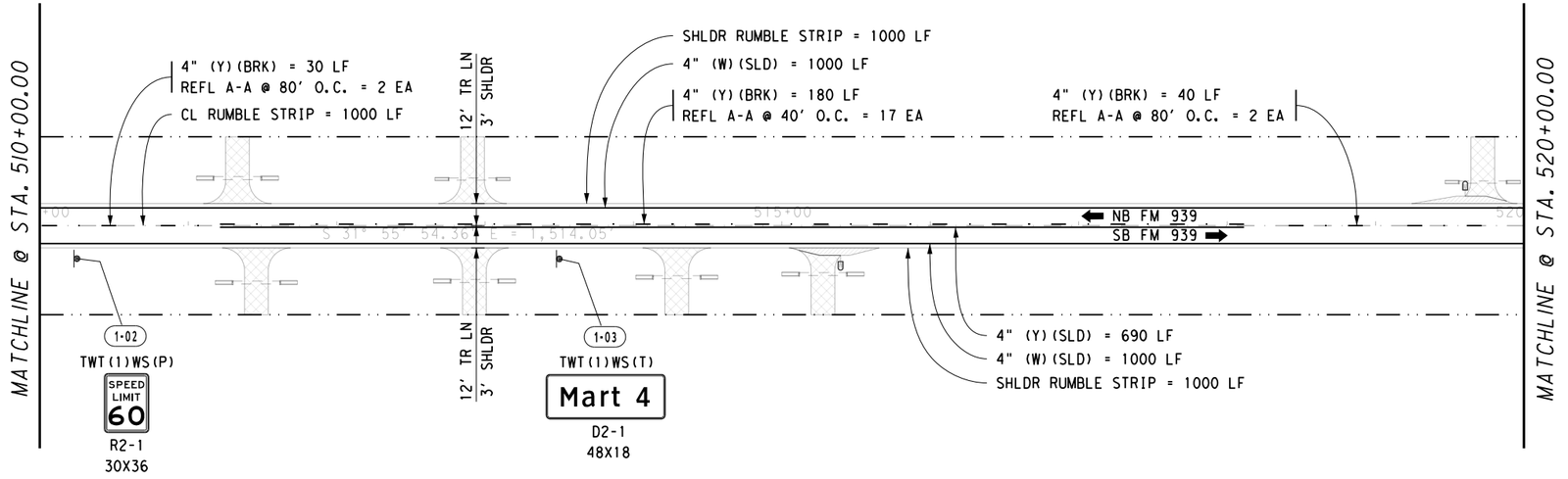

ITEM	DESCRIPTION	UNIT
533 6003	RUMBLE STRIPS (SHOULDER) ASPHALT	3000 LF
563 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	1500 LF
644 6007	IN SM RD SN SUP&AM TY 10BWG(1)SA(U)	1 EA
644 6060	IN SM RD SN SUP&AM TY TWT(1) WS(P)	1 EA
644 6061	IN SM RD SN SUP&AM TY TWT(1) WS(T)	1 EA
658 6047	INSTL OM ASSM (OM-2Y)(WC) GND	4 EA
666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	3116 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	390 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	875 LF
672 6009	REFL PAV MRKR TY II-A-A	30 EA

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Bradley Mayes 4/15/2022
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SHEET 1 OF 11

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
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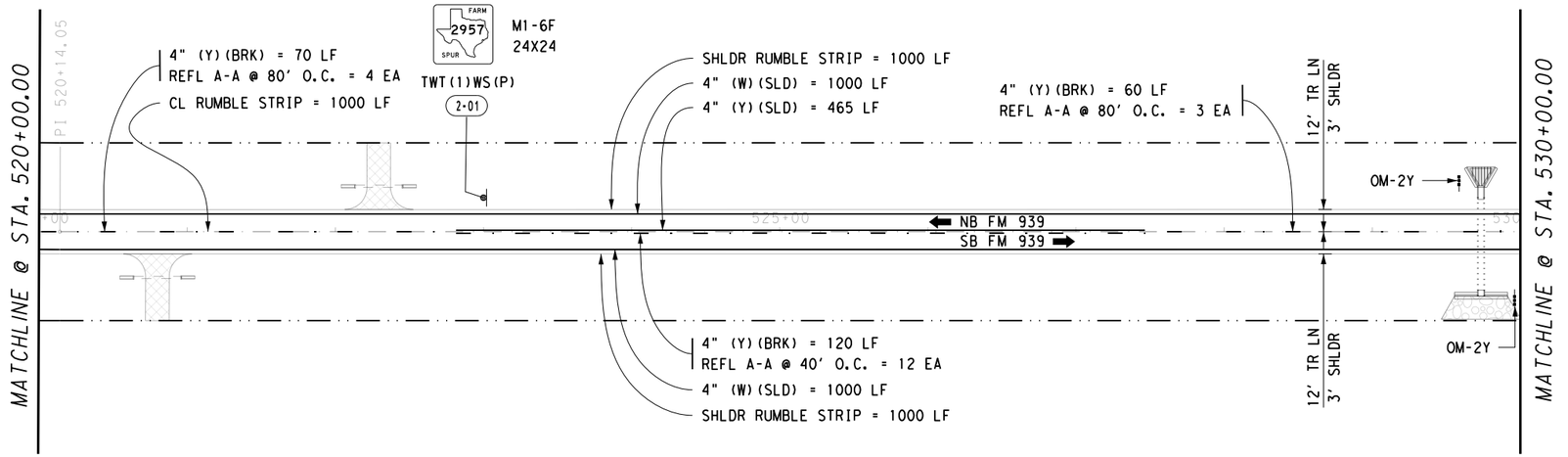
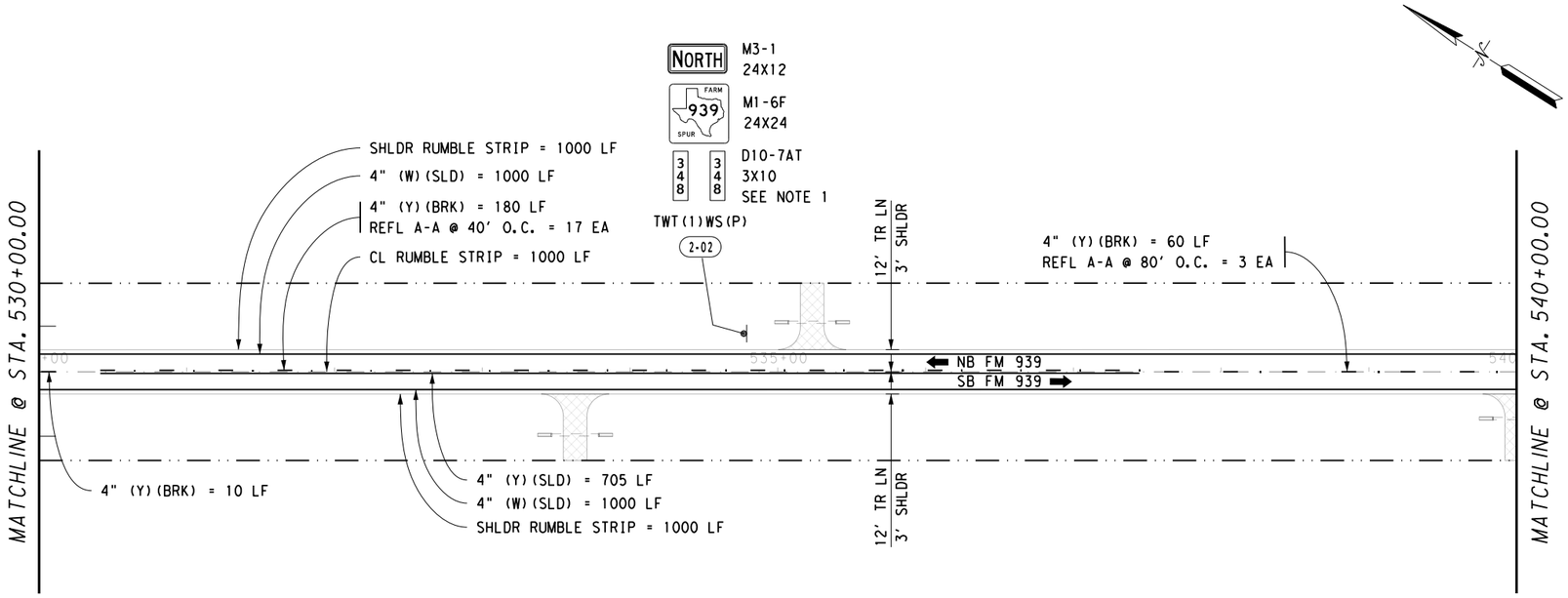
NOTES:

1. D10-7AT WILL BE INSTALLED BACK TO BACK.





ITEM	DESCRIPTION	UNIT
533 6003	RUMBLE STRIPS (SHOULDER) ASPHALT	4,000 LF
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	2,000 LF
644 6060	IN SM RD SN SUP&AM TY TWT (1) WS (P)	2 EA
658 6047	INSTL OM ASSM (OM-2Y)(WC) GND	2 EA
666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	4,000 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	500 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	1,170 LF
672 6009	REFL PAV MRKR TY II-A-A	39 EA

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SHEET 2 OF 11

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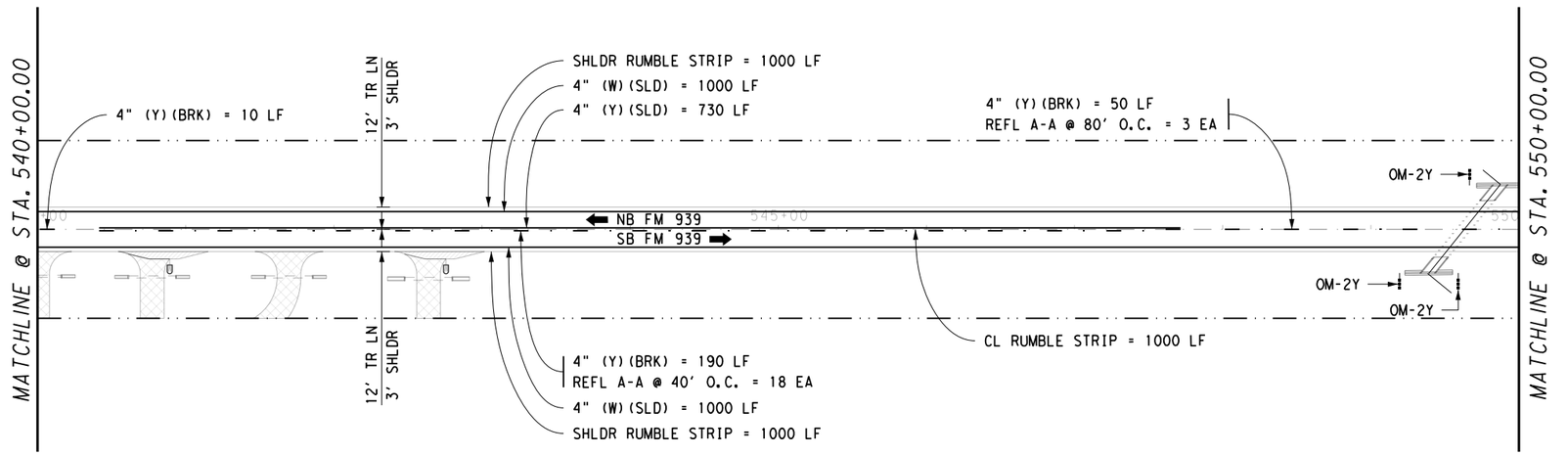

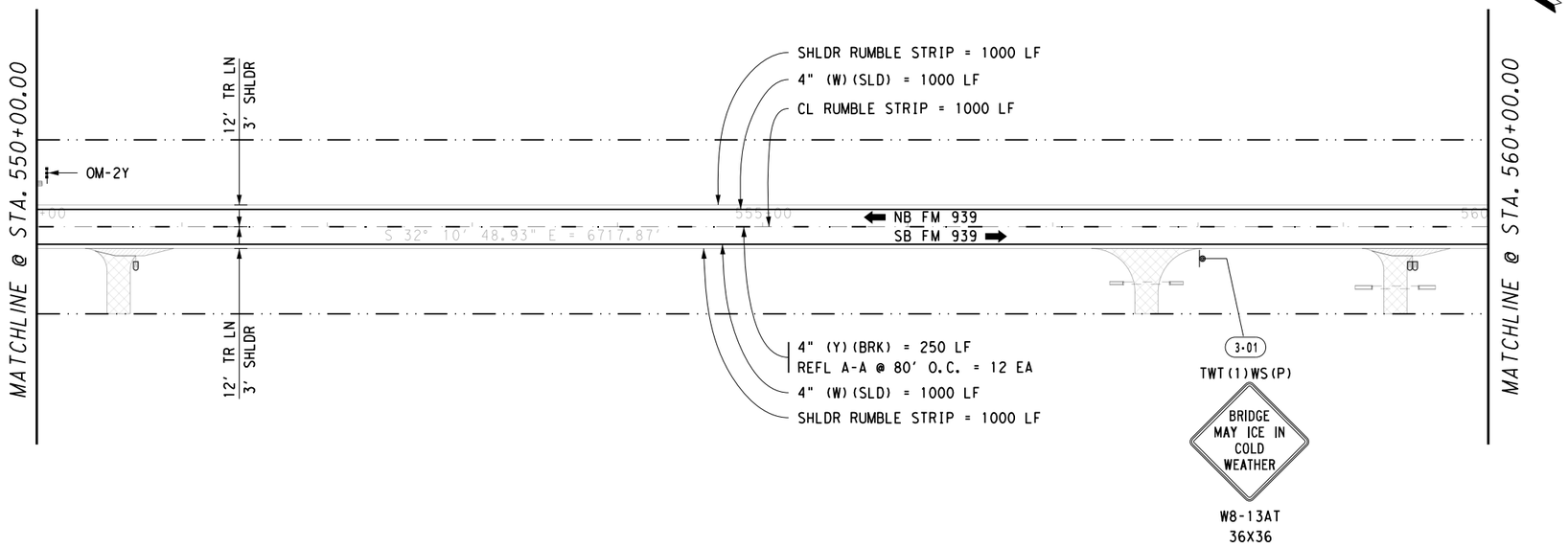

ITEM	DESCRIPTION	UNIT
533 6003	RUMBLE STRIPS (SHOULDER) ASPHALT	4,000 LF
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	2,000 LF
644 6060	IN SM RD SN SUP&AM TY TWT (1) WS (P)	1 EA
658 6047	INSTL OM ASSM (OM-2Y)(WC) GND	4 EA
666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	4,000 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	500 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	730 LF
672 6009	REFL PAV MRKR TY II-A-A	33 EA

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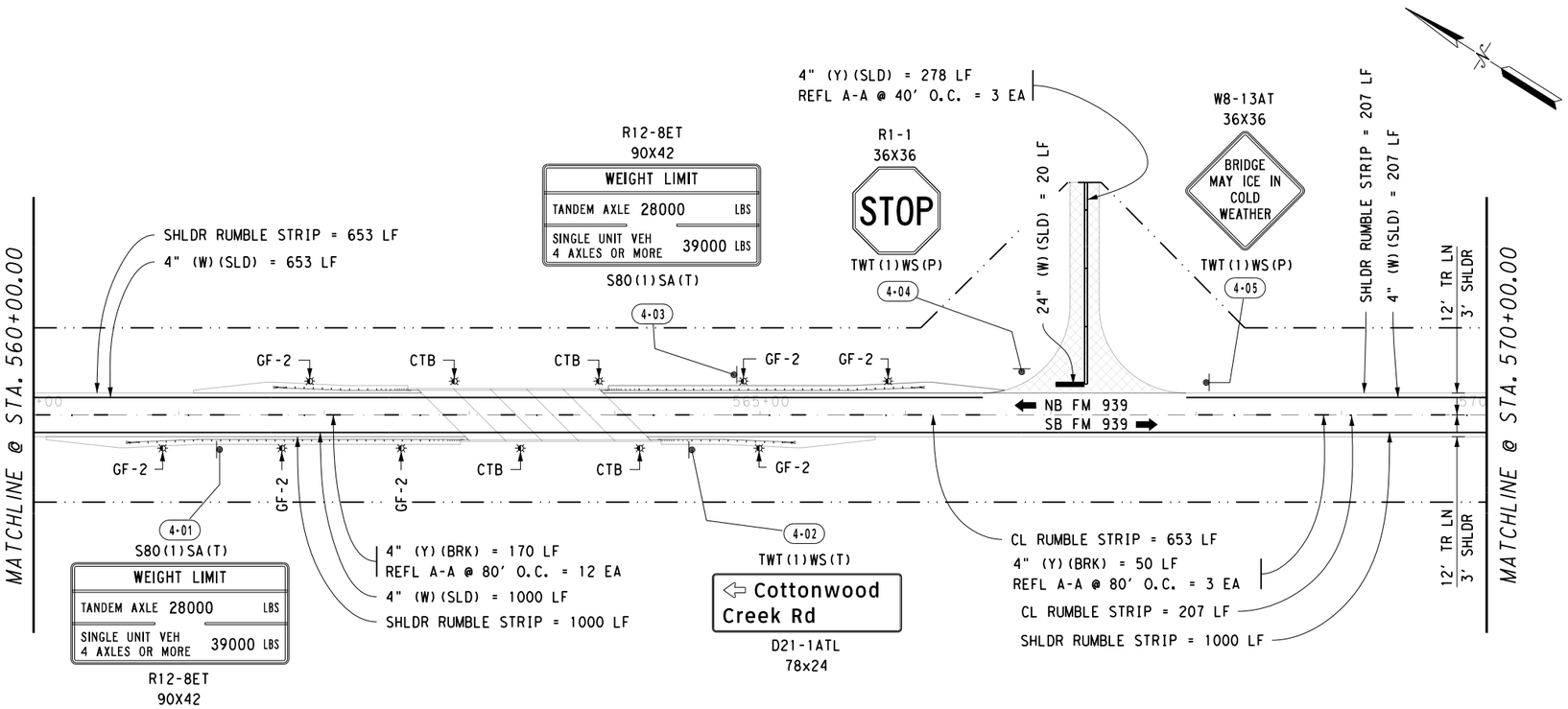

ITEM	DESCRIPTION	UNIT
533 6003	RUMBLE STRIPS (SHOULDER) ASPHALT	3,860 LF
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	1,860 LF
644 6030	IN SM RD SN SUP&AM TY S80(1) SA (T)	2 EA
644 6060	IN SM RD SN SUP&AM TY TWT (1) WS (P)	2 EA
644 6061	IN SM RD SN SUP&AM TY TWT (1) WS (T)	2 EA
658 6047	INSTL OM ASSM (OM-2Y)(WC) GND	2 EA
658 6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	7 EA
658 6071	INSTL DEL ASSM (D-SY)SZ (BRF)CTB (BI)	4 EA
666 6048	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	20 LF
666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	3,860 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	470 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	278 LF
672 6009	REFL PAV MRKR TY II-A-A	30 EA

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SHEET 4 OF 11

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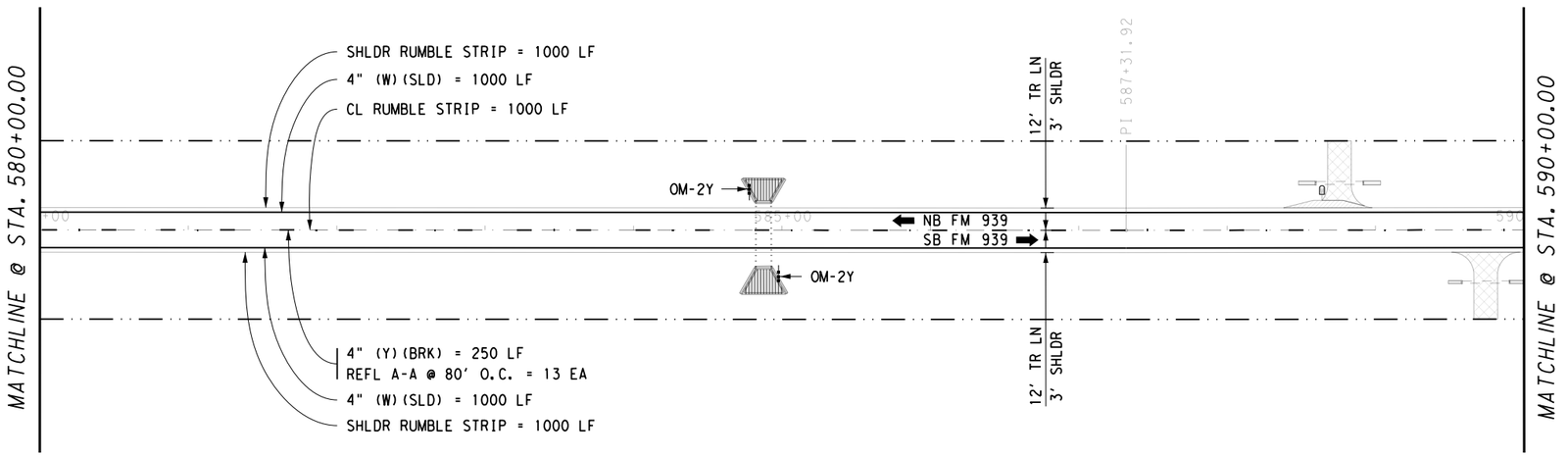

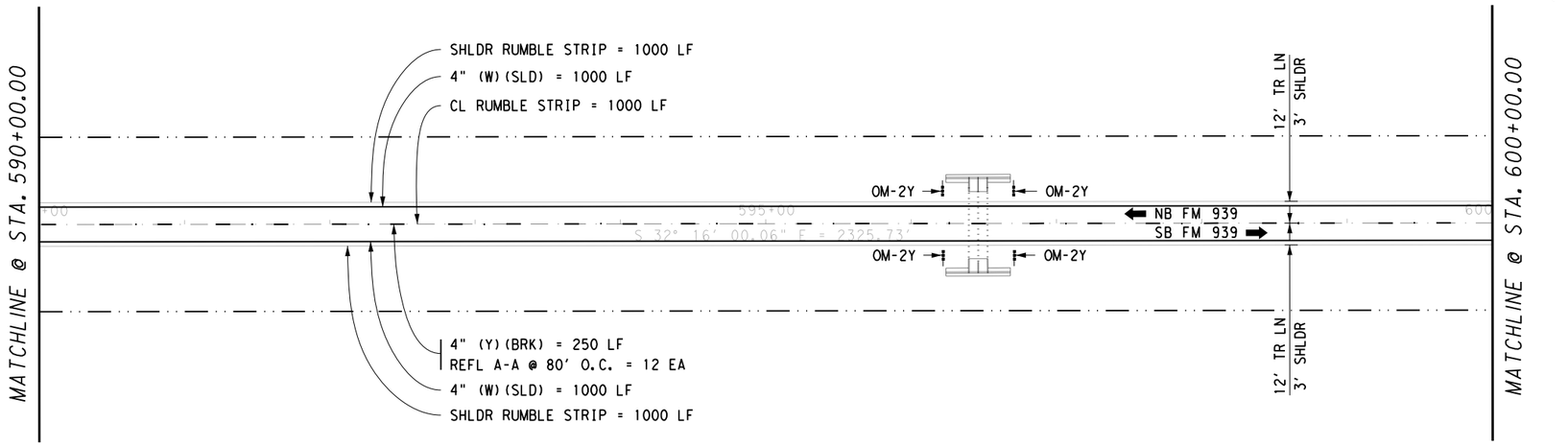

ITEM	DESCRIPTION	UNIT
533 6003	RUMBLE STRIPS (SHOULDER) ASPHALT	4,000 LF
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	2,000 LF
658 6047	INSTL OM ASSM (OM-2Y)(WC) GND	6 EA
666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	4,000 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	500 LF
672 6009	REFL PAV MRKR TY II-A-A	25 EA

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SHEET 5 OF 11

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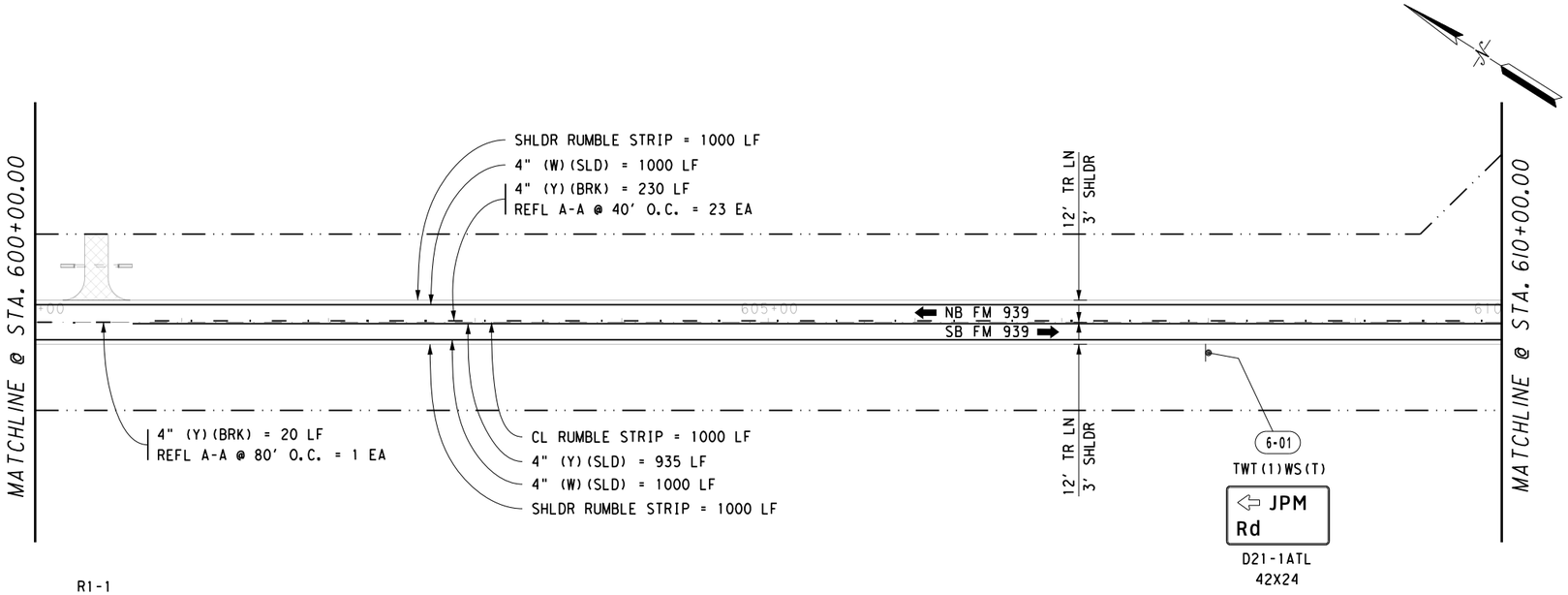

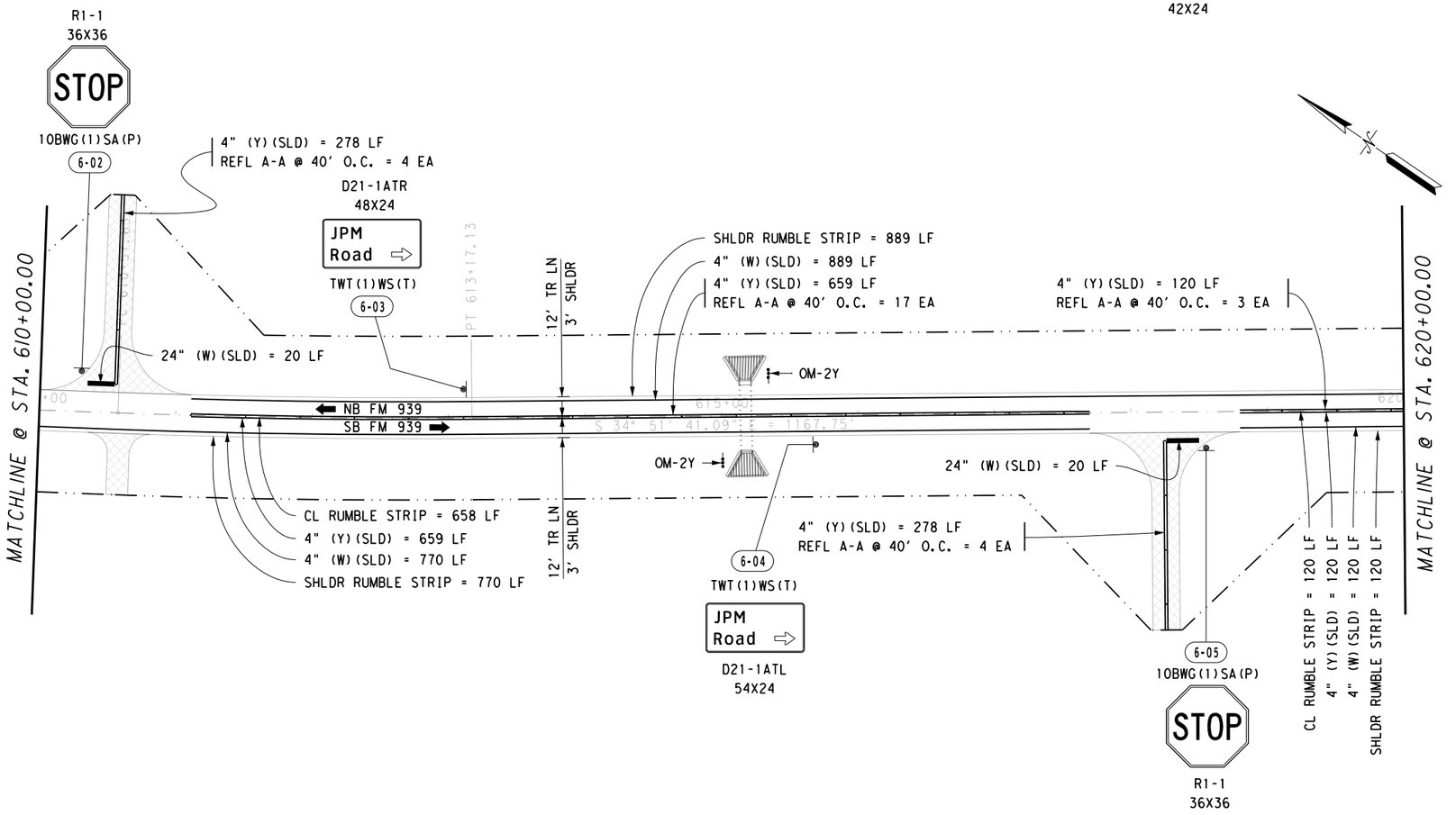

ITEM	DESCRIPTION	UNIT
533 6003	RUMBLE STRIPS (SHOULDER) ASPHALT	3,779 LF
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	1,778 LF
644 6060	IN SM RD SN SUP&AM TY TWT (1) WS (P)	2 EA
644 6061	IN SM RD SN SUP&AM TY TWT (1) WS (T)	3 EA
658 6047	INSTL OM ASSM (OM-2Y)(WC) GND	2 EA
666 6048	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	40 LF
666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	3,779 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	250 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	3,049 LF
672 6009	REFL PAV MRKR TY II-A-A	52 EA

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SHEET 6 OF 11

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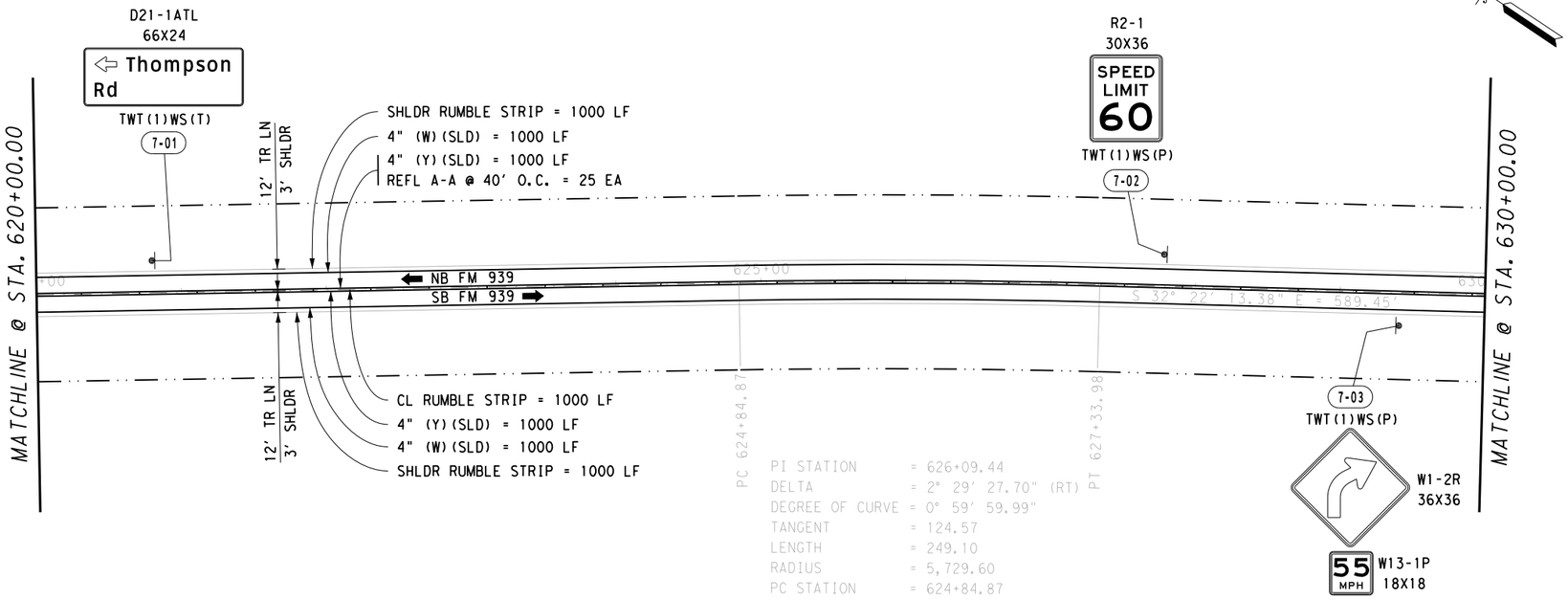

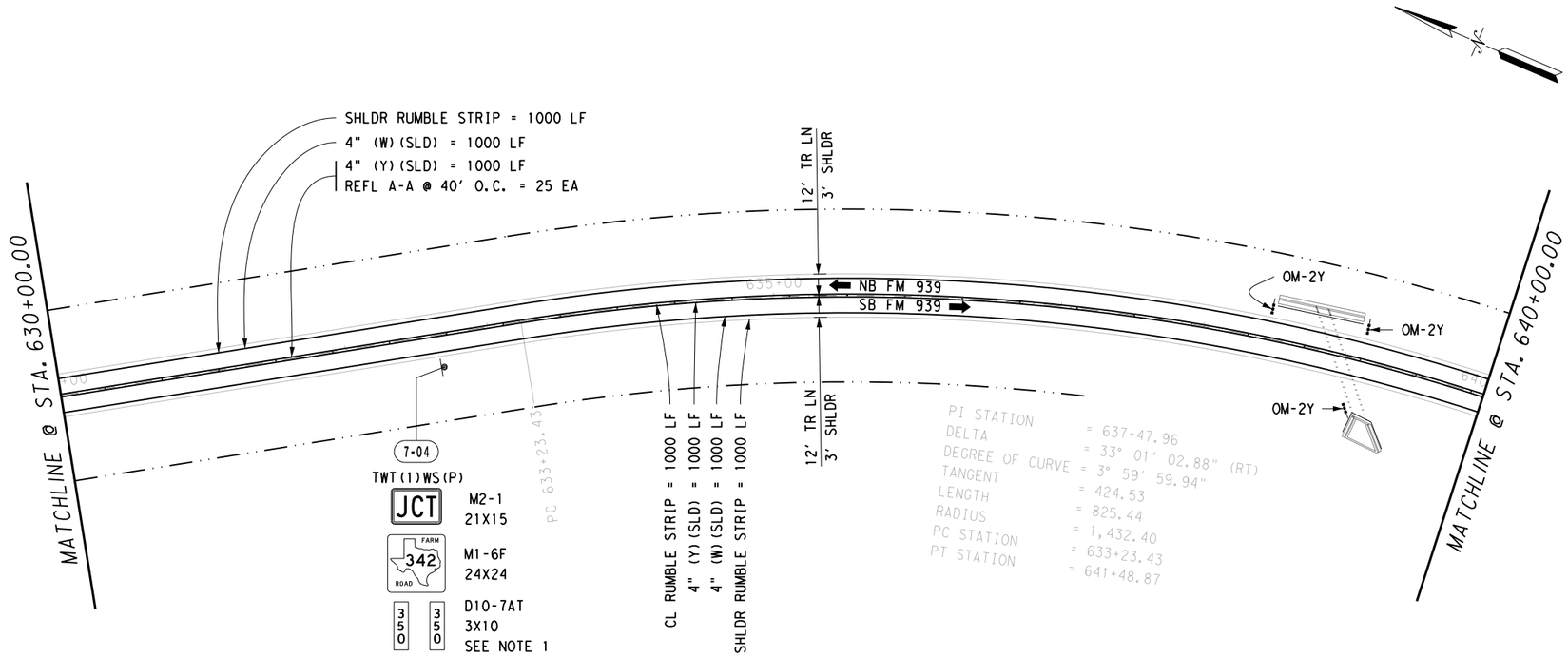

NOTES:

1. D10-7AT WILL BE INSTALLED BACK TO BACK

ITEM	DESCRIPTION	UNIT
533 6003	RUMBLE STRIPS (SHOULDER) ASPHALT	4,000 LF
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	2,000 LF
644 6060	IN SM RD SN SUP&AM TY TWT (1) WS (P)	3 EA
644 6061	IN SM RD SN SUP&AM TY TWT (1) WS (T)	1 EA
658 6047	INSTL OM ASSM (OM-2Y)(WC) GND	3 EA
666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	4,000 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	4,000 LF
672 6009	REFL PAV MRKR TY II-A-A	50 EA

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SHEET 7 OF 11

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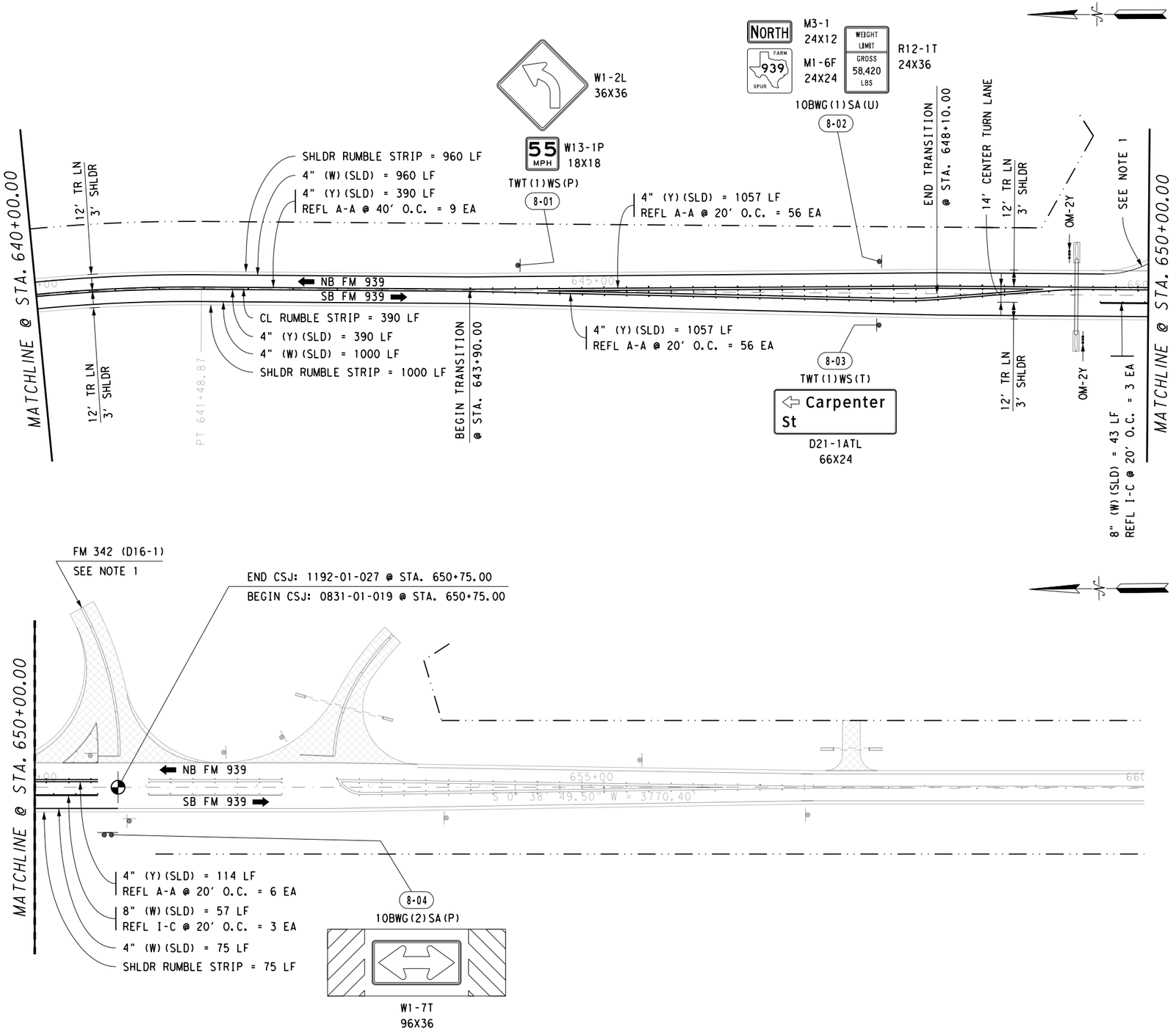

NOTES:

1. THE INTERSECTION OF FM 342 (D16-1) WILL BE PAID UNDER CSJ: 0831-01-019

ITEM	DESCRIPTION	UNIT
533 6003	RUMBLE STRIPS (SHOULDER) ASPHALT	2,035 LF
563 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	390 LF
644 6007	IN SM RD SN SUP&AM TY 10BWG(1)SA(U)	1 EA
644 6017	IN SM RD SN SUP&AM TY 10BWG(2)SA(P)	1 EA
644 6060	IN SM RD SN SUP&AM TY TWT(1) WS(P)	2 EA
644 6061	IN SM RD SN SUP&AM TY TWT(1) WS(T)	1 EA
658 6047	INSTL OM ASSM (OM-2Y)(WC) GND	2 EA
666 6036	REFL PAV MRK TY I (W)8"(SLD) (100MIL)	100 LF
666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	2,035 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	3,008 LF
672 6007	REFL PAV MRKR TY I-C	6 EA
672 6009	REFL PAV MRKR TY II-A-A	127 EA

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

PAV MRKRS & SIGNS

FROM STA. 640+00.00 TO STA. 650+75.00
CSJ: 1192-01-027

SCALE: 1" = 100.0' HORIZ. FEET

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		149

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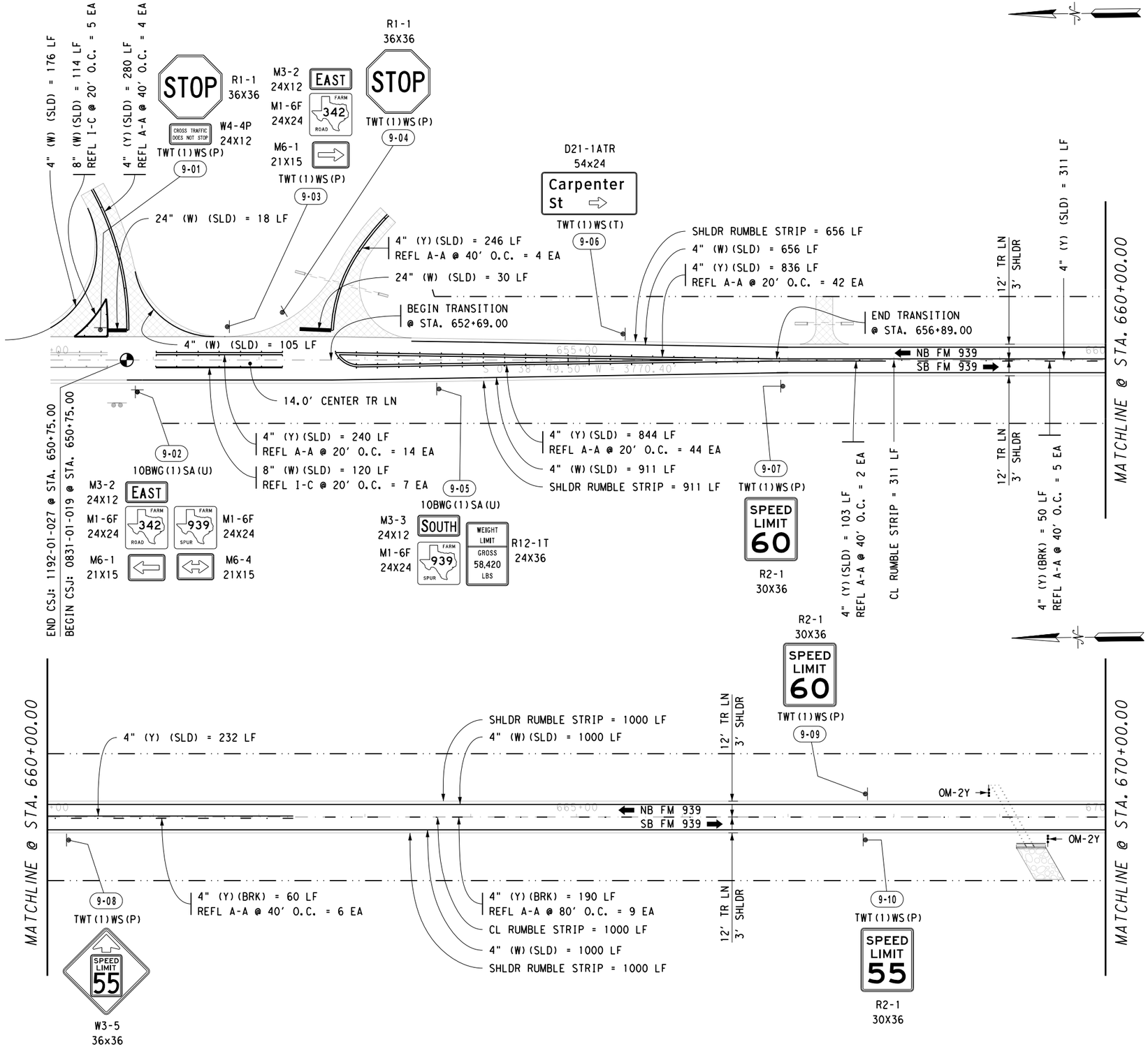

ITEM	DESCRIPTION	UNIT
533 6003	RUMBLE STRIPS (SHOULDER) ASPHALT	3,567 LF
563 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	1,311 LF
644 6007	IN SM RD SN SUP&AM TY 10BWG(1)SA(U)	2 EA
644 6060	IN SM RD SN SUP&AM TY TWT(1) WS(P)	7 EA
644 6061	IN SM RD SN SUP&AM TY TWT(1) WS(T)	1 EA
658 6047	INSTL OM ASSM (OM-2Y)(WC) GND	2 EA
666 6036	REFL PAV MRK TY I (W)8"(SLD) (100MIL)	234 LF
666 6048	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	48 LF
666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	3,848 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	300 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	3,092 LF
672 6007	REFL PAV MRKR TY I-C	12 EA
672 6009	REFL PAV MRKR TY II-A-A	130 EA

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

PAV MRKRS & SIGNS

FROM STA. 650+75.00 TO STA. 670+00.00
CSJ: 0831-01-019

SCALE: 1" = 100.0' HORIZ. FEET

SHEET 9 OF 11

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		150

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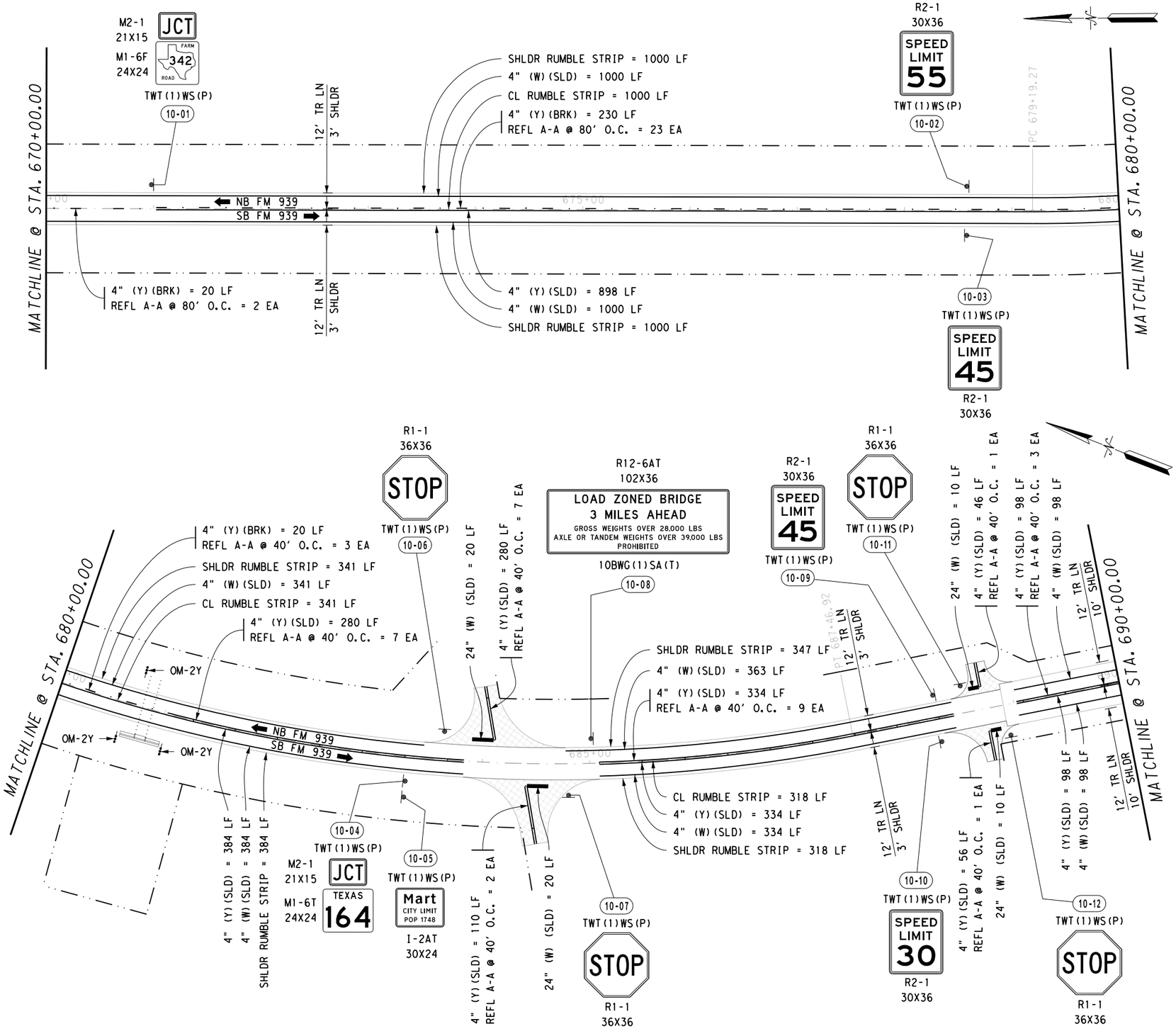

ITEM	DESCRIPTION	UNIT
533 6003	RUMBLE STRIPS (SHOULDER) ASPHALT	3,390 LF
563 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	1,659 LF
644 6004	IN SM RD SN SUP&AM TY 10BWG(1)SA(T)	1 EA
644 6060	IN SM RD SN SUP&AM TY TWT(1) WS(P)	11 EA
658 6047	INSTL OM ASSM (OM-2Y)(WC) GND	3 EA
666 6048	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	60 LF
666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	3,618 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	270 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	2,918 LF
672 6009	REFL PAV MRKR TY II-A-A	58 EA

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

PAV MRKRS & SIGNS

FROM STA. 670+00.00 TO STA. 690+00.00
CSJ: 0831-01-019

SCALE: 1" = 100.0' HORIZ. FEET

SHEET 10 OF 11

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		151

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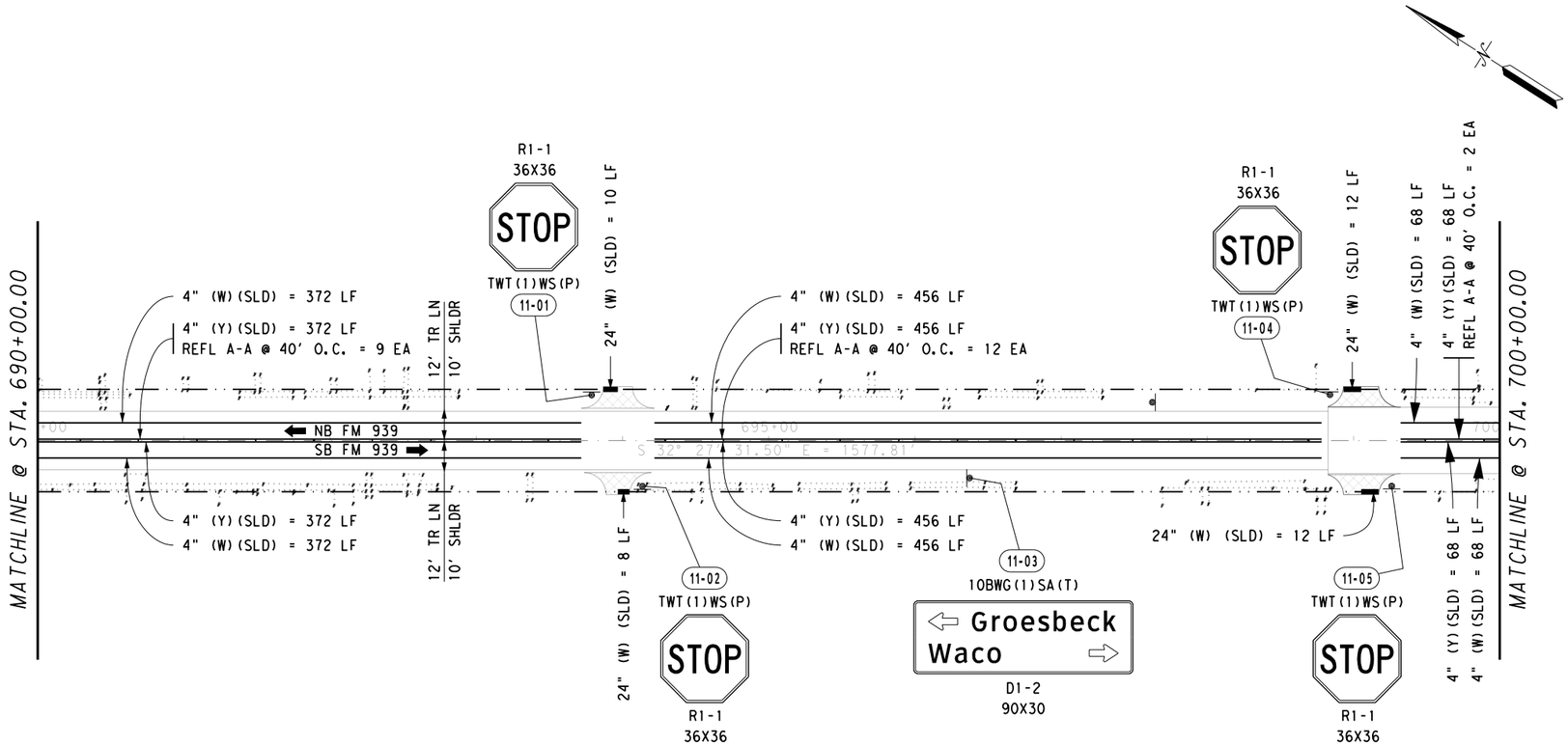

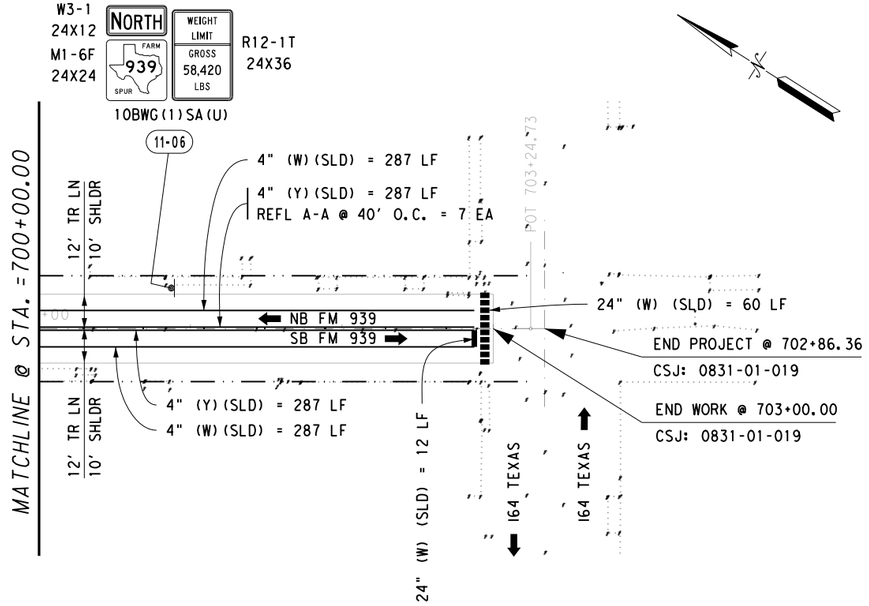

ITEM	DESCRIPTION	UNIT
644 6004	IN SM RD SN SUP&AM TY 10BWG(1)SA(T)	1 EA
644 6007	IN SM RD SN SUP&AM TY 10BWG(1)SA(U)	1 EA
644 6060	IN SM RD SN SUP&AM TY TWT(1) WS(P)	4 EA
666 6048	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	114 LF
666 6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	2,366 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	2,366 LF
672 6009	REFL PAV MRKR TY II-A-A	30 EA

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022

SIGNATURE OF REGISTRANT & DATE

PAV MRKRS & SIGNS

FROM STA. 690+00 TO STA. 703+27.73
CSJ: 0831-01-019

SCALE: 1" = 100.0' HORIZ. FEET

SHEET 11 OF 11

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		152

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4/15/2022
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PROPOSED SMALL SIGN DATA SHEET

SHEET	SIGN	STATION (FOR CONTRACTOR INFO ONLY)		ID	LEGEND OR TYPE	SIGN WIDTH (IN)	SIGN HEIGHT (IN)	SIGN AREA (SF)	SIGN AREA (TOTAL) (SF)	PANEL	POST SIZE	NO. OF POST	ANCHOR TYPE	SIGN MOUNT	644 6004 INS SM RD SN SUP&AM TY 10BWG (1) SA (T) EA	644 6007 IN SM RD SN SUP&AM TY 10BWG (1) SA (U) EA	644 6017 IN SM RD SN SUP&AM TY 10BWG (2) SA (P) EA	644 6030 IN SM RD SN SUP&AM TY S80 (1) SA (T) EA	644 6060 IN SM RD SN SUP&AM TY TWT (1) WS (P) EA	644 6061 IN SM RD SN SUP&AM TY TWT (1) WS (T) EA
1	01	507+00.00	RT	M3-3	SOUTH	24	12	2.0	12.0	TY A	10 BWG	1	SA	U		1				
				M1-6F	FM 939	24	24	4.0												
				R12-1T	WEIGHT LIMIT 58,420 LBS	24	36	6.0												
1	02	510+25.00	RT	R2-1	SPEED LIMIT 60	30	36	7.5	7.5	TY A	TWT	1	WS	P					1	
1	03	513+50.00	RT	D-1	MART 4	48	18	6.0	6.0	TY A	TWT	1	WS	T						1
														SHEET 1 OF 11:		1			1	1
2	01	523+00.00	LT	M2-1	JCT	21	15	2.2	6.2	TY A	TWT	1	WS	P					1	
				M1-6F	FM 2957	24	24	4.0												
2	02	534+77.00	LT	M3-1	NORTH	24	12	2.0	6.2	TY A	TWT	1	WS	P					1	
				M1-6F	FM 939	24	24	4.0												
				D10-7AT	348	3	10	0.2												
				D10-7AT	348	3	10	0.2												
														SHEET 2 OF 11:					2	
3	01	558+03.00	RT	W8-13AT	BRIDGE MAY ICE IN COLD WEATHER	36	36	9.0	9.0	TY A	TWT	1	WS	P					1	
														SHEET 3 OF 11:					1	
4	01	561+28.00	RT	R12-8ET	WEIGHT LIMIT BRIDGE	90	42	26.3	26.3	TY A	S 80	1	SA	T				1		
4	02	564+53.00	RT	D21-1TL	<-- COTTONWOOD CREEK RD	78	24	13.0	13.0	TY A	TWT	1	WS	T						1
4	03	564+82.00	LT	R12-8ET	WEIGHT LIMIT BRIDGE	90	42	26.3	26.3	TY A	S 80	1	SA	T				1		
4	04	566+80.00	LT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P					1	
4	05	568+07.00	LT	W8-13AT	BRIDGE MAY ICE IN COLD WEATHER	36	36	9.0	9.0	TY A	TWT	1	WS	P					1	
4	06	571+32.00	LT	D21-1TL	COTTONWOOD CREEK ROAD --->	72	24	12.0	12.0	TY A	TWT	1	WS	T						1
														SHEET 4 OF 11:				2	2	2
														SHEET 5 OF 11:						
6	01	608+00.00	RT	D21-1TL	<--- JPM RD	42	24	7.0	7.0	TY A	TWT	1	WS	T						1
6	02	610+30.00	LT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P					1	
6	03	613+11.00	LT	D21-1TR	JPM ROAD --->	48	24	8.0	8.0	TY A	TWT	1	WS	T						1
6	04	615+69.00	RT	D21-1TL	THOMPSON ROAD --->	54	24	9.0	9.0	TY A	TWT	1	WS	T						1
6	05	618+55.00	RT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P					1	
														SHEET 6 OF 11:					2	3
7	01	620+80.00	LT	D21-1TL	<--- THOMPSON RD	66	24	11.0	11.0	TY A	TWT	1	WS	T						1
7	02	627+78.00	LT	R2-1	SPEED LIMIT 60	30	36	7.5	7.5	TY A	TWT	1	WS	P					1	
7	03	629+41.00	RT	W1-2R	CRUVE WARNING ARROW	36	36	9.0	11.3	TY A	TWT	1	WS	P					1	
				W13-1P	55 MPH PLAQUE	18	18	2.3												
7	04	632+66.00	RT	M2-1	JCT	21	15	2.2	6.4	TY A	TWT	1	WS	P					1	
				M1-6F	FM 342	24	24	4.0												
				D10-7AT	350	3	10	0.2												
				D10-7AT	350	3	10	0.2												
														SHEET 7 OF 11:					3	1
8	01	644+33.00	LT	W1-2L	CRUVE WARNING ARROW	36	36	9.0	11.3	TY A	TWT	1	WS	P					1	
				W13-1P	55 MPH PLAQUE	18	18	2.3												
8	02	647+58.00	LT	M3-1	NORTH	24	12	2.0	12.0	TY A	10 BWG	1	SA	U		1				
				M1-6F	FM 939	24	24	4.0												
				R12-1T	WEIGHT LIMIT 58,420 LBS	24	36	6.0												
8	03	647+58.00	RT	D21-1TL	<-- CARPENTER ST	66	24	11.0	11.0	TY A	TWT	1	WS	T						1
8	04	650+66.00	RT	W1-7T	<<---->>	96	36	24.0	24.0	TY A	10 BWG	2	SA	P			1			
														SHEET 8 OF 11:		1	1		1	1
														CSJ 1192-01-027 SUB-TOTAL:		2	1	2	12	8

SMALL SIGN DATA SHEET

FROM STA. 505+00.00 TO STA. 650+75.00
CSJ: 1192-01-027

SHEET 1 OF 2

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		153

PROPOSED SMALL SIGN DATA SHEET

SHEET	SIGN	STATION (FOR CONTRACTOR INFO ONLY)		ID	LEGEND OR TYPE	SIGN WIDTH (IN)	SIGN HEIGHT (IN)	SIGN AREA (SF)	SIGN AREA (TOTAL) (SF)	PANEL	POST SIZE	NO. OF POST	ANCHOR TYPE	SIGN MOUNT	644 6004 INS SM RD SN SUP&AM TY 10BWG (1) SA (T) EA	644 6007 IN SM RD SN SUP&AM TY 10BWG (1) SA (U) EA	644 6017 IN SM RD SN SUP&AM TY 10BWG (2) SA (P) EA	644 6030 IN SM RD SN SUP&AM TY S80 (1) SA (T) EA	644 6060 IN SM RD SN SUP&AM TY TWT (1) WS (P) EA	644 6061 IN SM RD SN SUP&AM TY TWT (1) WS (T) EA
9	01	650+50.00	LT	R1-1	STOP	36	36	7.5	9.5	TY A	TWT	1	WS	P					1	
				W4-4P	CROSS TRAFFIC DOES NOT STOP	24	12	2.0												
9	02	650+85.00	RT	M3-2	EAST	24	12	2.0	14.4	TY A	10 BWG	1	SA	U		1				
				M1-6F	FM 342	24	24	4.0												
				M6-1	<---	21	15	2.2												
				M1-6F	FM 939	24	24	4.0												
				M6-4	<--->	21	15	2.2												
9	03	651+70.00	LT	M3-2	EAST	24	12	2.0	8.2	TY A	TWT	1	WS	P					1	
				M1-6F	FM 342	24	24	4.0												
				M6-1	--- >	21	15	2.2												
9	04	652+22.00	LT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P					1	
9	05	653+70.00	RT	M3-3	SOUTH	24	12	2.0	12.0	TY A	10 BWG	1	SA	U		1				
				M1-6F	FM 939	24	24	4.0												
				R12-1T	WEIGHT LIMIT 58,420 LBS	24	36	6.0												
9	06	655+44.00	LT	D21-1TR	CARPENTER ST --- >	54	24	9.0	9.0	TY A	TWT	1	WS	T						1
9	07	655+95.00	RT	R2-1	SPEED LIMIT 60	30	36	7.5	7.5	TY A	TWT	1	WS	P					1	
9	08	660+20.00	RT	W3-5	WARING SPEED LIMIT 55	36	36	9.0	9.0	TY A	TWT	1	WS	P					1	
9	09	667+73.00	LT	R2-1	SPEED LIMIT 60	30	36	7.5	7.5	TY A	TWT	1	WS	P					1	
9	10	667+73.00	RT	R2-1	SPEED LIMIT 55	30	36	7.5	7.5	TY A	TWT	1	WS	P					1	
													SHEET 9 OF 11:			2			7	1
10	01	670+98.00	LT	M2-1	JCT	21	15	2.2	6.2	TY A	TWT	1	WS	P					1	
				M1-6F	FM 342	24	24	4.0												
10	02	678+58.00	LT	R2-1	SPEED LIMIT 55	30	36	7.5	7.5	TY A	TWT	1	WS	P					1	
10	03	678+58.00	RT	R2-1	SPEED LIMIT 45	30	36	7.5	7.5	TY A	TWT	1	WS	P					1	
10	04	683+30.00	RT	M2-1	JCT	21	15	2.2	6.2	TY A	TWT	1	WS	P					1	
				M1-6T	164 TEXAS	24	24	4.0												
10	05	683+30.00	RT	I-2AT	MART CITY LIMITS	30	34	7.1	7.1	TY A	TWT	1	WS	P					1	
10	06	683+63.00	LT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P					1	
10	07	684+80.00	RT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P					1	
10	08	685+02.00	LT	R12-6AT	LOAD ZONE BRIDGE	102	36	25.5	25.5	TY A	10 BWG	1	SA	T	1					
10	09	688+27.00	LT	R2-1	SPEED LIMIT 45	30	36	7.5	7.5	TY A	TWT	1	WS	P					1	
10	10	688+27.00	RT	R2-1	SPEED LIMIT 30	30	36	7.5	7.5	TY A	TWT	1	WS	P					1	
10	11	688+54.00	LT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P					1	
10	12	688+92.00	RT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P					1	
													SHEET 11 OF 10:		1				11	
11	01	693+79.00	LT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P					1	
11	02	694+14.00	RT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P					1	
11	03	696+38.00	RT	D1-2	< --- GROESBECK	90	30	18.8	18.8	TY A	10 BWG	1	SA	T	1					
					WACO --- >															
11	04	698+84.00	LT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P					1	
11	05	689+26.00	RT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P					1	
11	06	700+87.00	LT	W3-1	NORTH	24	12	2.0	12.0	TY A	10 BWG	1	SA	U		1				
				M1-6F	FM 696	24	24	4.0												
				R12-1T	WEIGHT LIMIT 58,420 LBS	24	36	6.0												
													SHEET 11 OF 11:		1	1			4	
													CSJ 0831-01-019 SUB-TOTAL:		2	3	0	0	22	1
													PROJEC		2	5	1	2	34	9

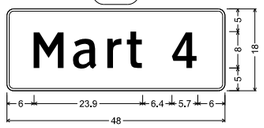
SMALL SIGN DATA SHEET

FROM STA. 505+00.00 TO STA. 650+75.00
CSJ: 1192-01-027

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		154

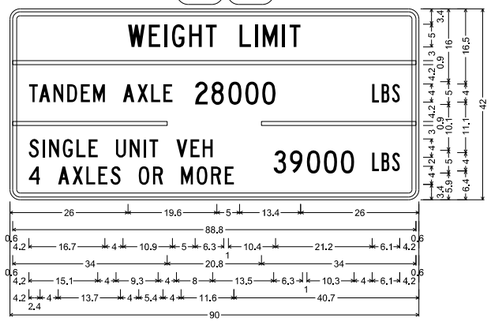
CSJ: 1192-01-027

1-03



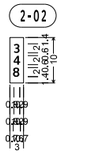
D2-1 8in:
1,5" Radius, 0,5" Border, White on, Green;
"Mart", ClearviewHwy-3-W;
"4", ClearviewHwy-3-W;

4-01 4-03



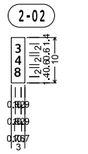
R12-8eT_90x42:
2,3" Radius, 0,9" Border, 0,6" Indent, Black on, White:
"WEIGHT LIMIT", C: "TANDEM AXLE", C: "28 000", C: "LBS", B:
"SINGLE UNIT VEH", C: "4 AXLES OR MORE", C: "39 000", C: "LBS", B:

2-02



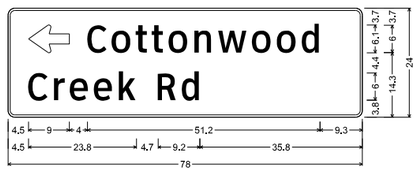
D10-7aT 3in:
No border, White on, Green;
"3", ClearviewHwy-4-W;
"5", ClearviewHwy-4-W;
"0", ClearviewHwy-4-W;

2-02



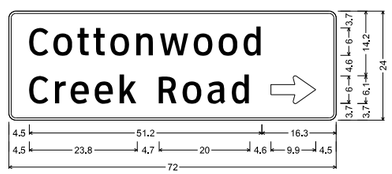
D10-7aT 3in:
No border, White on, Green;
"3", ClearviewHwy-4-W;
"5", ClearviewHwy-4-W;
"0", ClearviewHwy-4-W;

4-02



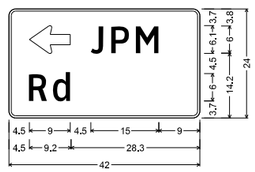
D21-1aTL_VARx24:
1,5" Radius, 0,5" Border, White on, Green;
Standard Arrow Custom 9.0" X 6.1" 180"; "Cottonwood", ClearviewHwy-3-W;
"Creek Rd", ClearviewHwy-3-W;

4-06



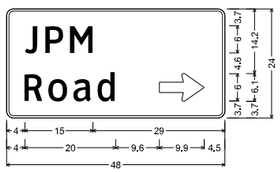
D21-1aTR_VARx24:
1,5" Radius, 0,5" Border, White on, Green;
"Cottonwood", ClearviewHwy-3-W; "Creek Road", ClearviewHwy-3-W;
Standard Arrow Custom 9.9" X 6.1" 0";

6-01



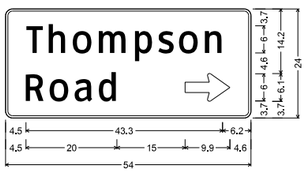
D21-1aTL_VARx24:
1.5" Radius, 0.5" Border, White on, Green;
Standard Arrow Custom 9,0" X 6,1" 180";
"JPM", ClearviewHwy-3-W;
"Rd", ClearviewHwy-3-W;

6-03



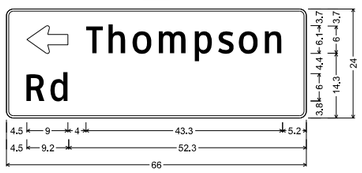
D21-1aTR_VARx24:
1.5" Radius, 0.5" Border, White on, Green;
"JPM", ClearviewHwy-3-W;
"Road", ClearviewHwy-3-W;
Standard Arrow Custom 9.9" X 6.1" 0";

6-04



D21-1aTR_VARx24:
1.5" Radius, 0.5" Border, White on, Green;
"Thompson", ClearviewHwy-3-W;
"Road", ClearviewHwy-3-W;
Standard Arrow Custom 9.9" X 6.1" 0";

7-01



D21-1aTL_VARx24:
1.5" Radius, 0.5" Border, White on, Green;
Standard Arrow Custom 9,0" X 6,1" 180";
"Thompson", ClearviewHwy-3-W; "Rd", ClearviewHwy-3-W;

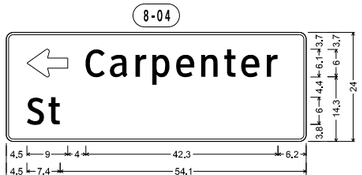
7-06

D10-7aT 3in:
No border, White on, Green;
"3", ClearviewHwy-4-W;
"5", ClearviewHwy-4-W;
"0", ClearviewHwy-4-W;

7-06

D10-7aT 3in:
No border, White on, Green;
"3", ClearviewHwy-4-W;
"5", ClearviewHwy-4-W;
"0", ClearviewHwy-4-W;

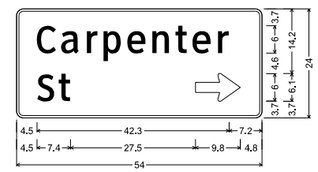
8-04



D21-1aTL_VARx24:
1.5" Radius, 0,5" Border, White on, Green;
Standard Arrow Custom 9,0" X 6,1" 180";
"Carpenter", ClearviewHwy-3-W; "St", ClearviewHwy-3-W;

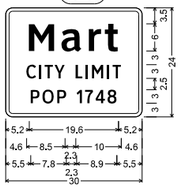
CSJ: 0831-01-019

9-06



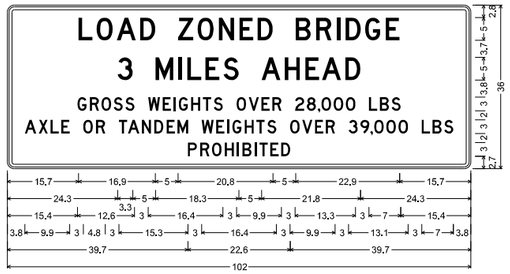
D21-1aTR_VARx24:
1.5" Radius, 0.5" Border, White on, Green;
"Carpenter", ClearviewHwy-3-W;
"St", ClearviewHwy-3-W;
Standard Arrow Custom 9.9" X 6.1" 0";

10-05



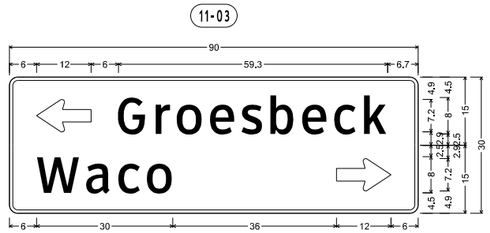
I-2aT 6in:
1.5" Radius, 0.8" Border, White on, Green;
"Mart", ClearviewHwy-5-W-R;
"CITY LIMIT", ClearviewHwy-3-W;
"POP 1748", ClearviewHwy-3-W;

10-08



R12-6aT_VARx36:
1.5" Radius, 0.6" Border, 0.4" Indent, Black on, White:
"LOAD ZONED BRIDGE", D: "3 MILES AHEAD", D: "GROSS WEIGHTS OVER 28,000 LBS", D:
"AXLE OR TANDEM WEIGHTS OVER 39,000 LBS", D: "PROHIBITED", D:

11-03



D1-2 8in LT-RT:

1.9" Radius, 0.8" Border, White on, Green:
Standard Arrow Custom 12,0" X 7,1" 180"; "Groesbeck", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on, Green:
"Waco", ClearviewHwy-3-W; Standard Arrow Custom 12.0" X 7.1" 0";

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

SMALL SIGN DETAILS

CSJ: 1192-01-027
CSJ: 0831-01-019

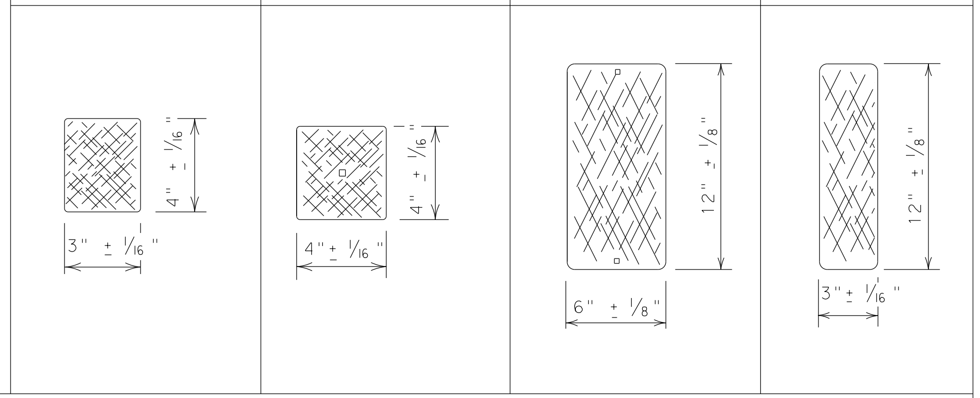
SCALE: 1" = NONE HORIZ. FEET

SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		155

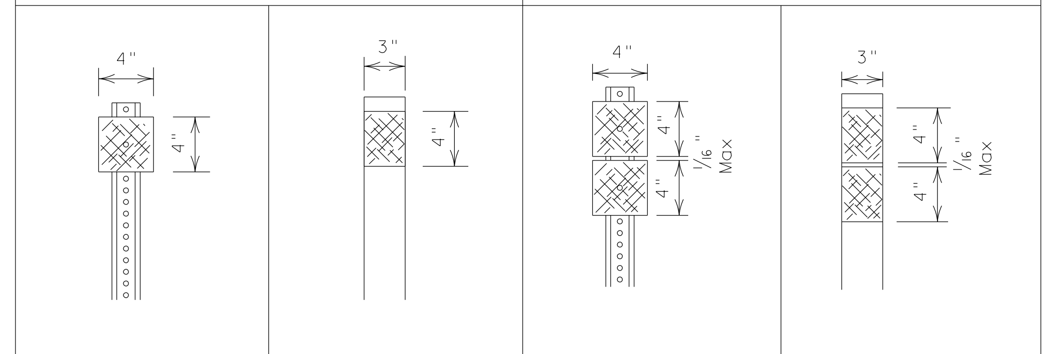
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE	3" ± 1/16" x 4" ± 1/16"	4" ± 1/16" x 4" ± 1/16"	6" ± 1/8" x 12" ± 1/8"	3" ± 1/16" x 12" ± 1/8"
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

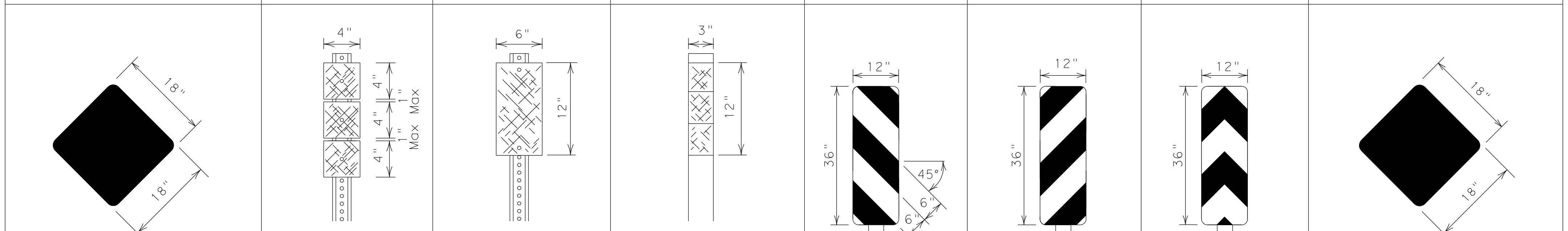
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

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

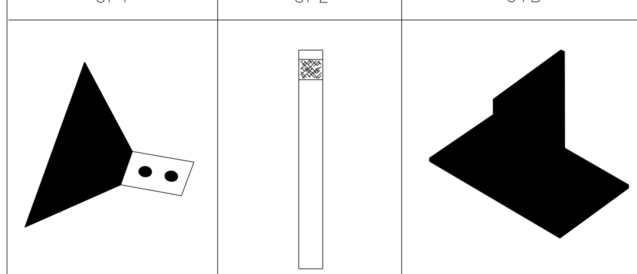
OBJECT MARKERS

	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

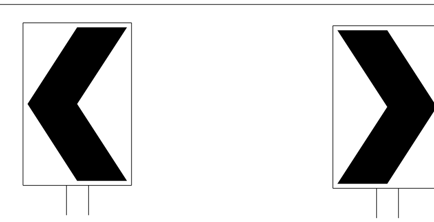


BARRIER REFLECTORS (BRF)

	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.		



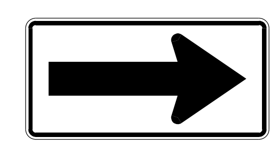
CHEVRONS



W1-8

DEVICE	W1-8			
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

ONE DIRECTION LARGE ARROW



W1-6

DEVICE	W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

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).

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

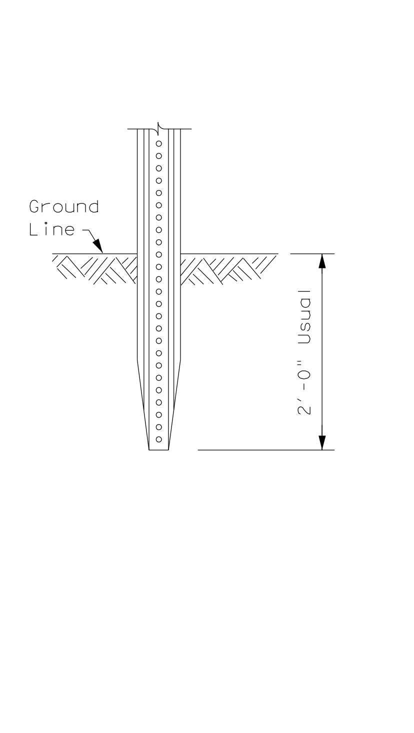
FILE: doml-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
10-09 3-15 4-10 7-20	DIST		COUNTY	SHEET NO.
	WAC		MCLENNAN	156

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

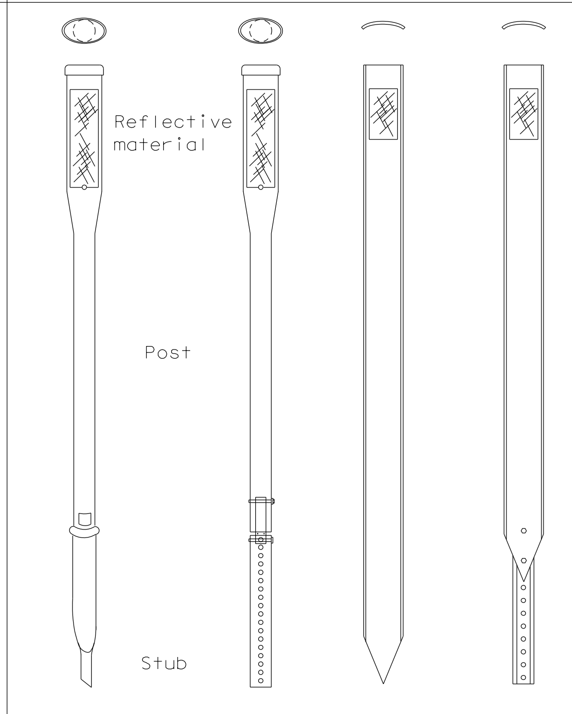


NOTES

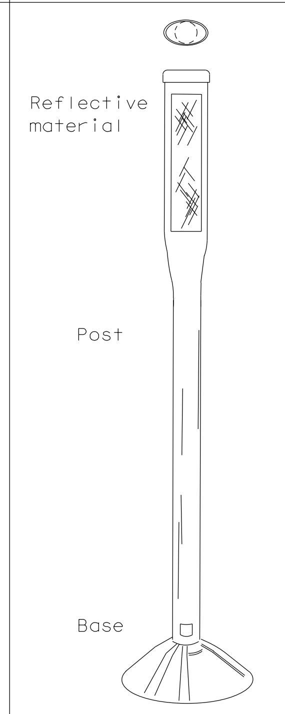
1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

FLEXIBLE POSTS (YFLX, WFLX)

GND | SRF



EMBEDDED



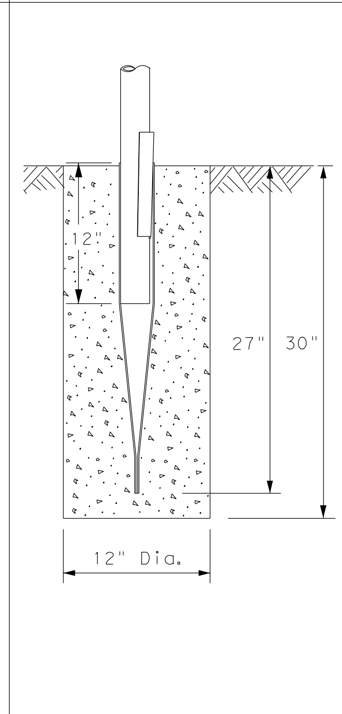
SURFACE MOUNT

NOTES

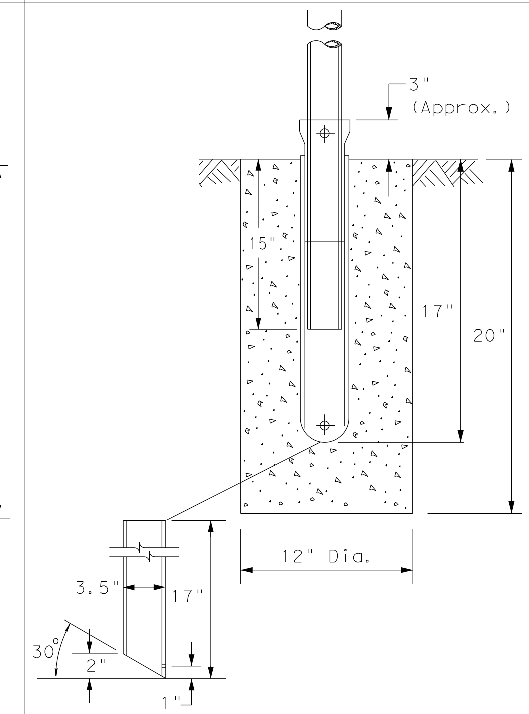
1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline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

WEDGE ANCHOR SYSTEMS

WAS | WAP



STEEL



PLASTIC

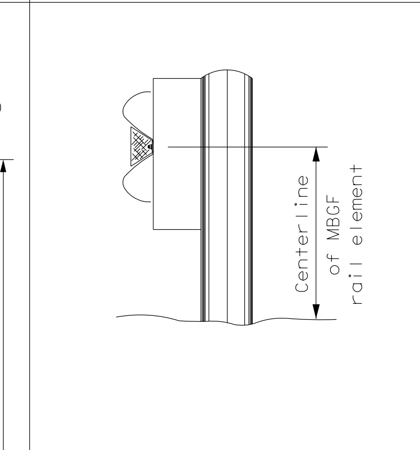
NOTE

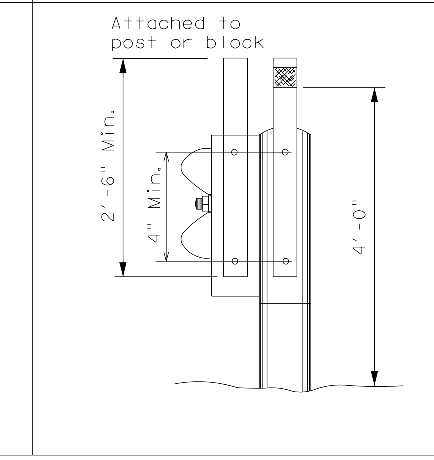
1. Install per manufacturer's recommendations.

TYPE OF BARRIER MOUNTS

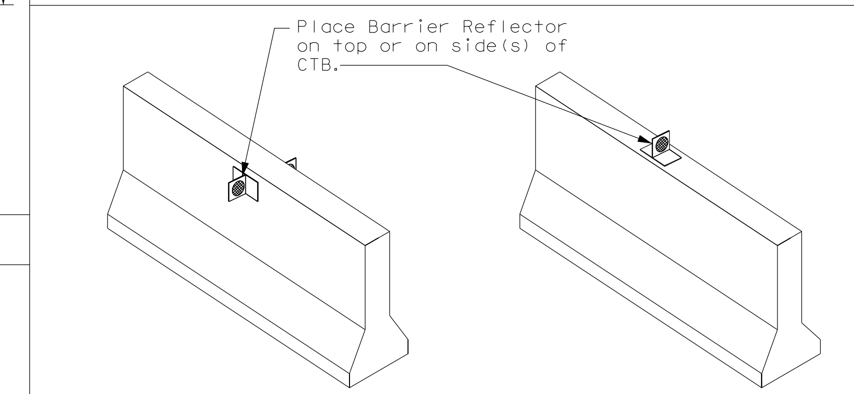
GUARD FENCE ATTACHMENT

GF1 | GF2





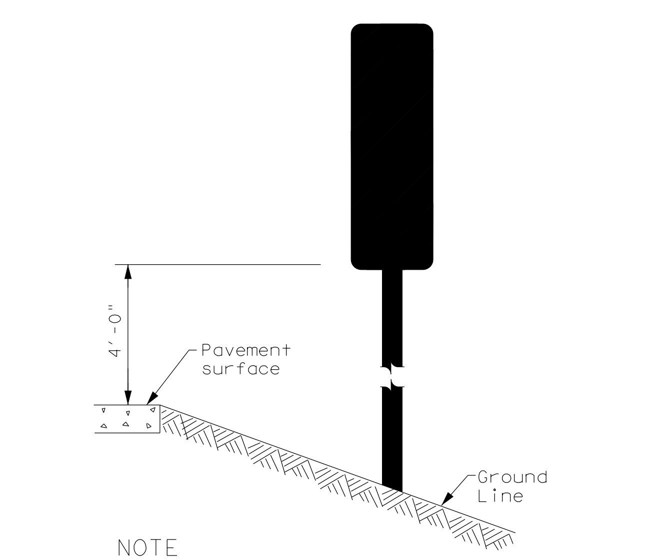
CONCRETE TRAFFIC BARRIER (CTB)



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.

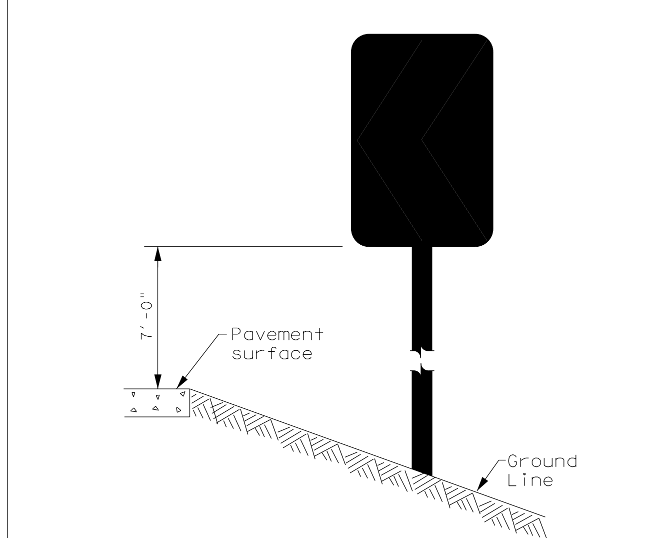
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

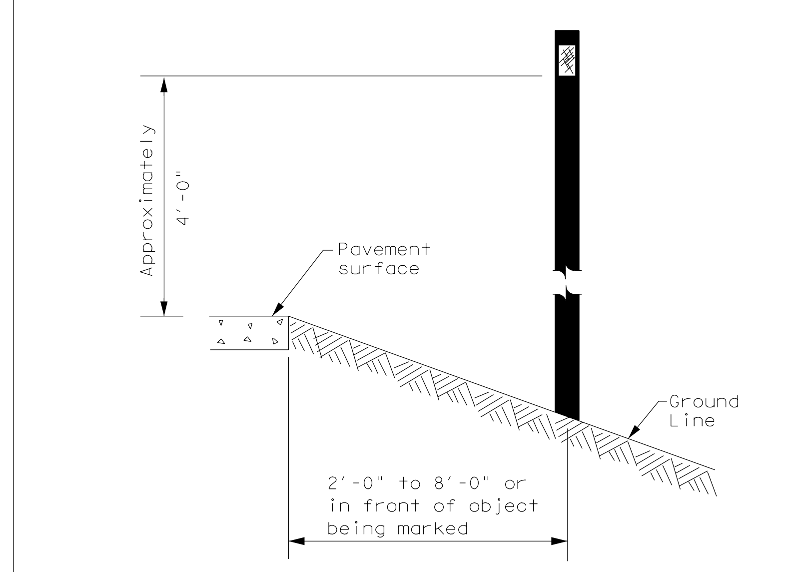
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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	0831	01	019, ETC.	FM 939
10-09 3-15	DIST		COUNTY	SHEET NO.
4-10 7-20	WAC		MCLENNAN	157

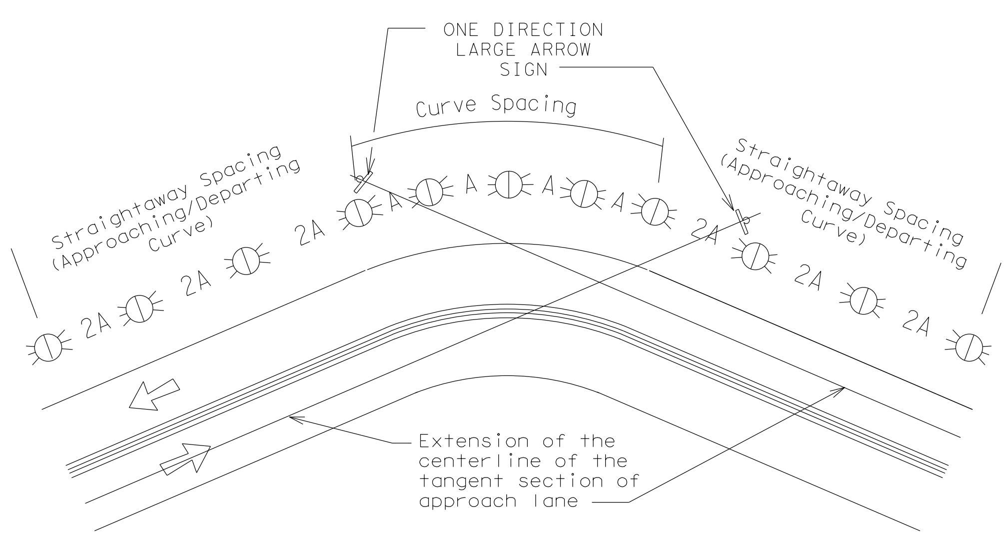
20B

DATE: 4/15/2022 12:53:13 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\...

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 Advisory Speed: 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

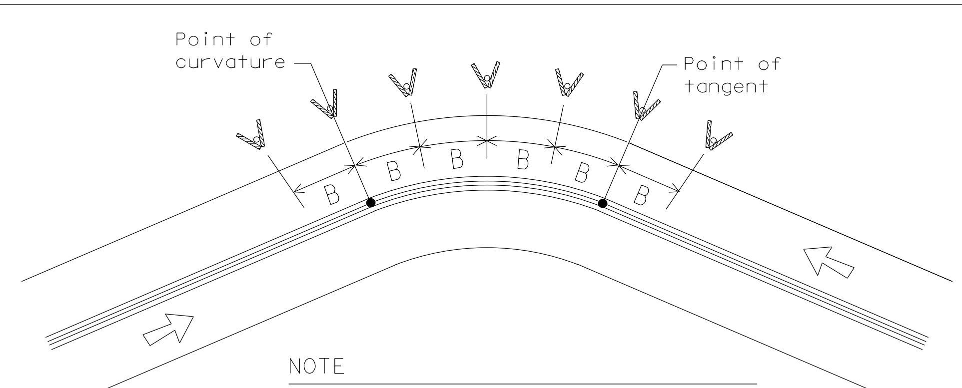
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



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	Radius of Curve (FEET)	Spacing in Curve (FEET)	Spacing in Straightaway (FEET)	Chevron Spacing in Curve (FEET)
		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

Symbol	Meaning
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

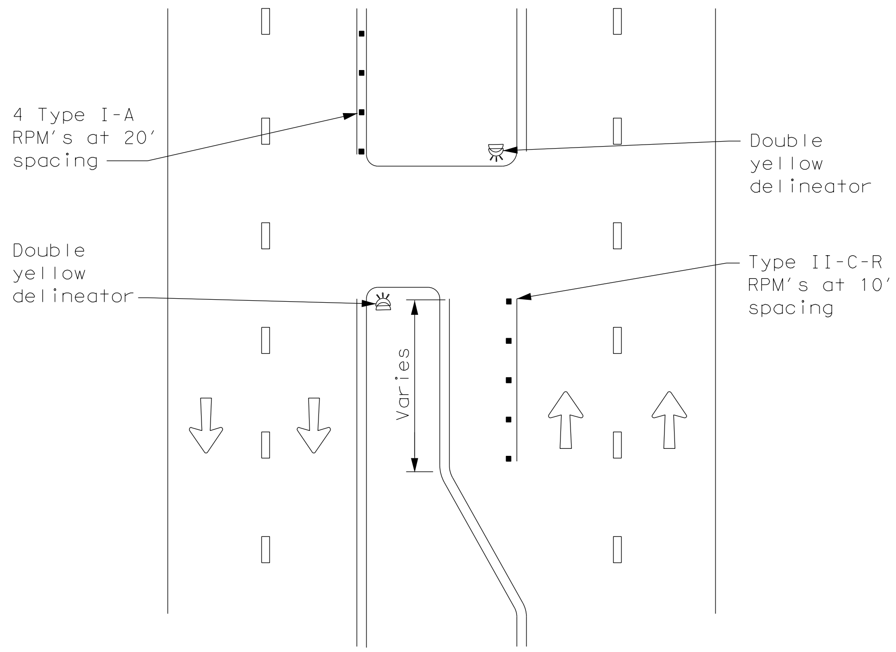
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dam3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT 0831	SECT 01	JOB 019, ETC.	HIGHWAY FM 939
REVISIONS 3-15 8-15 8-15 7-20	DIST WAC	COUNTY MCLENNAN		SHEET NO. 158

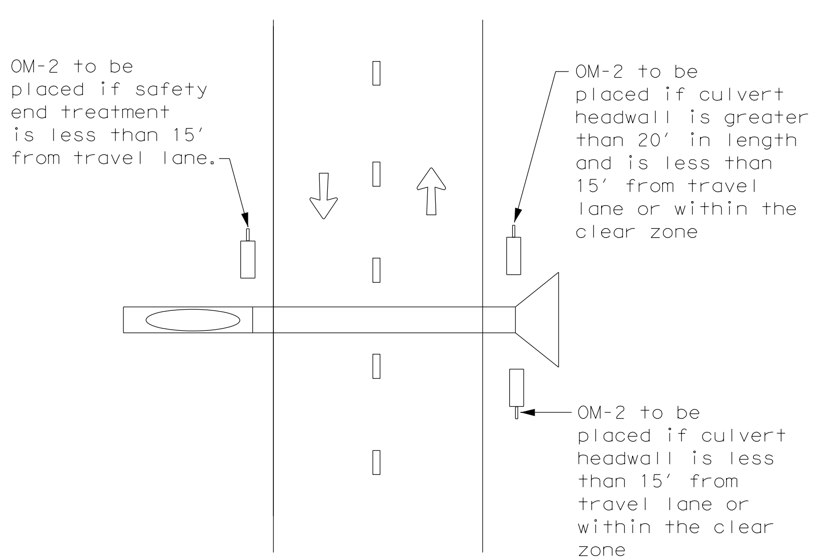
20C

CROSSOVERS



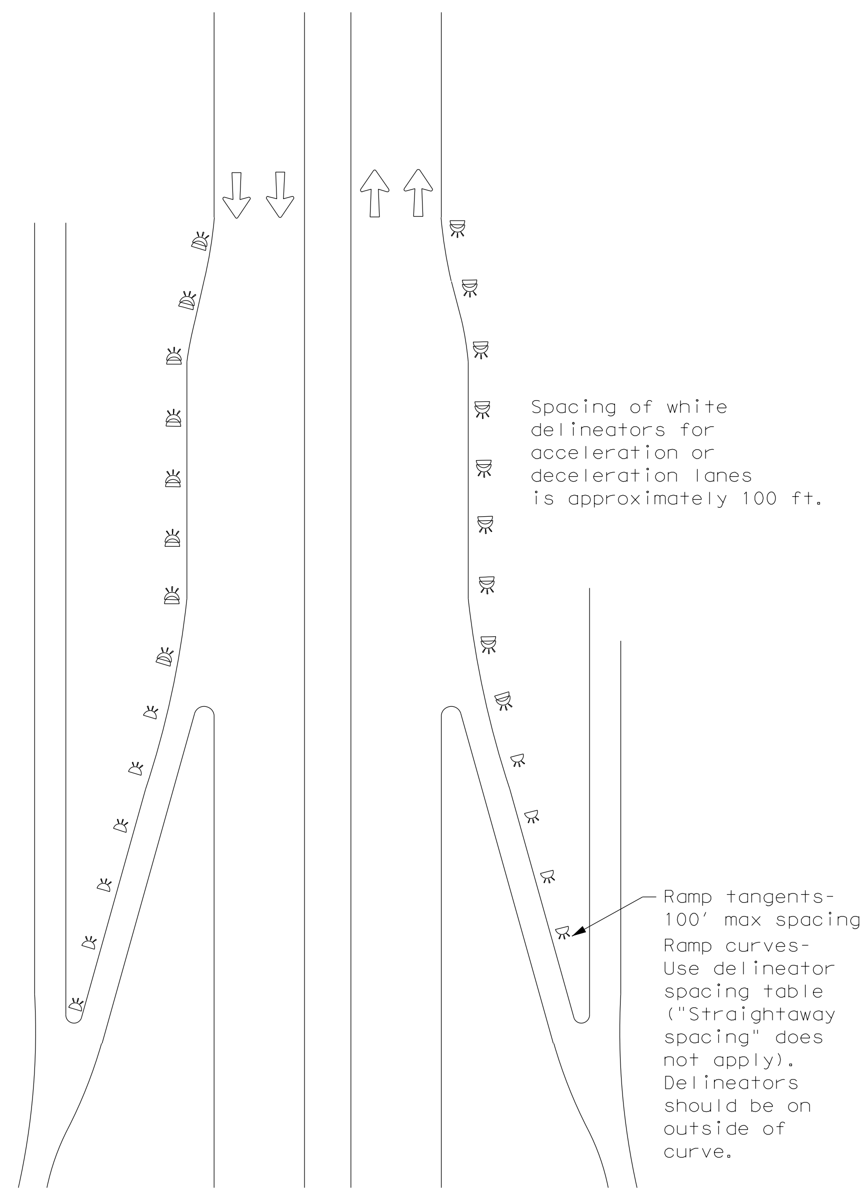
DETAIL 1

FOR CULVERTS WITHOUT MBGF



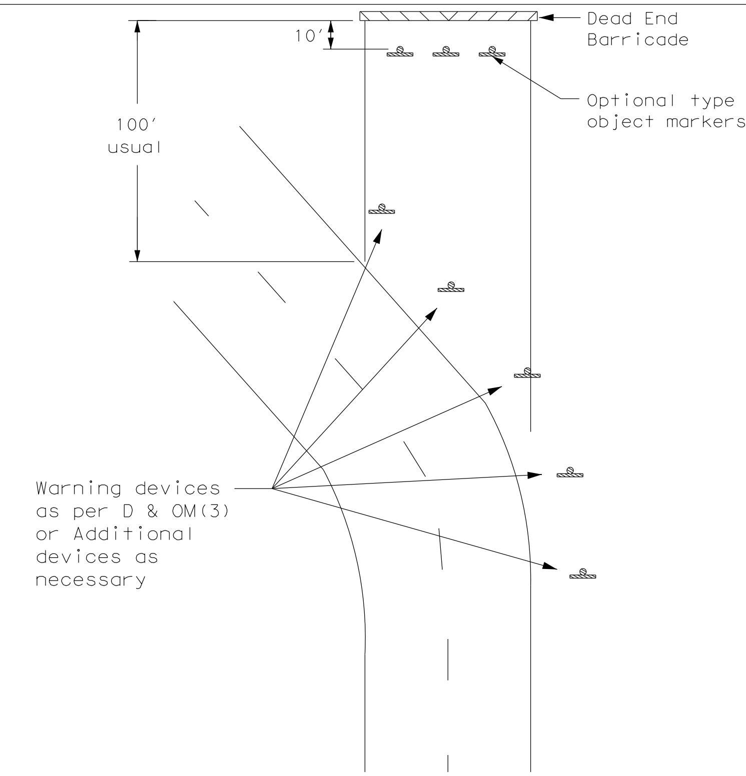
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



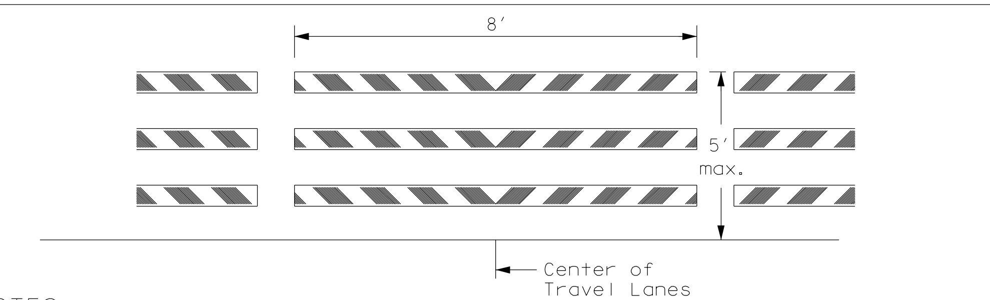
DETAIL 3

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 3-15 7-20	0831	01	019, ETC.	FM 939
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	WAC		MCLENNAN	159

20D

DATE: 4/15/2022 12:53:26 PM
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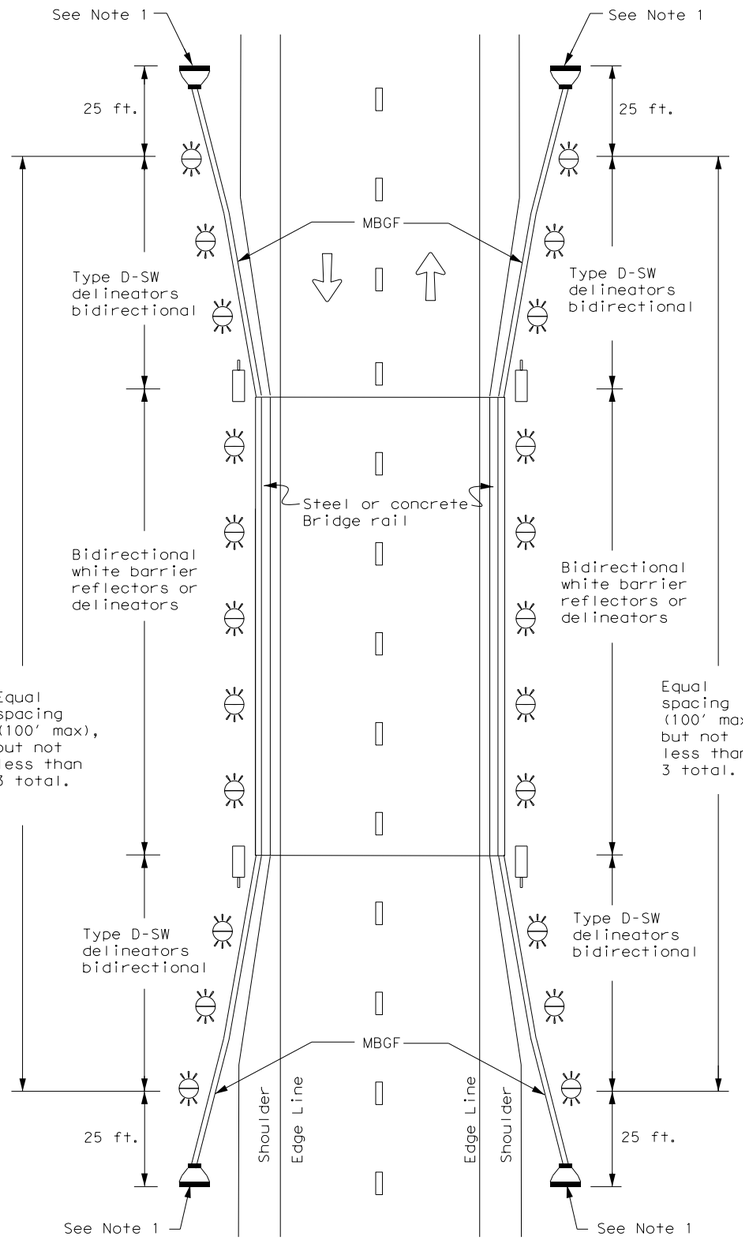
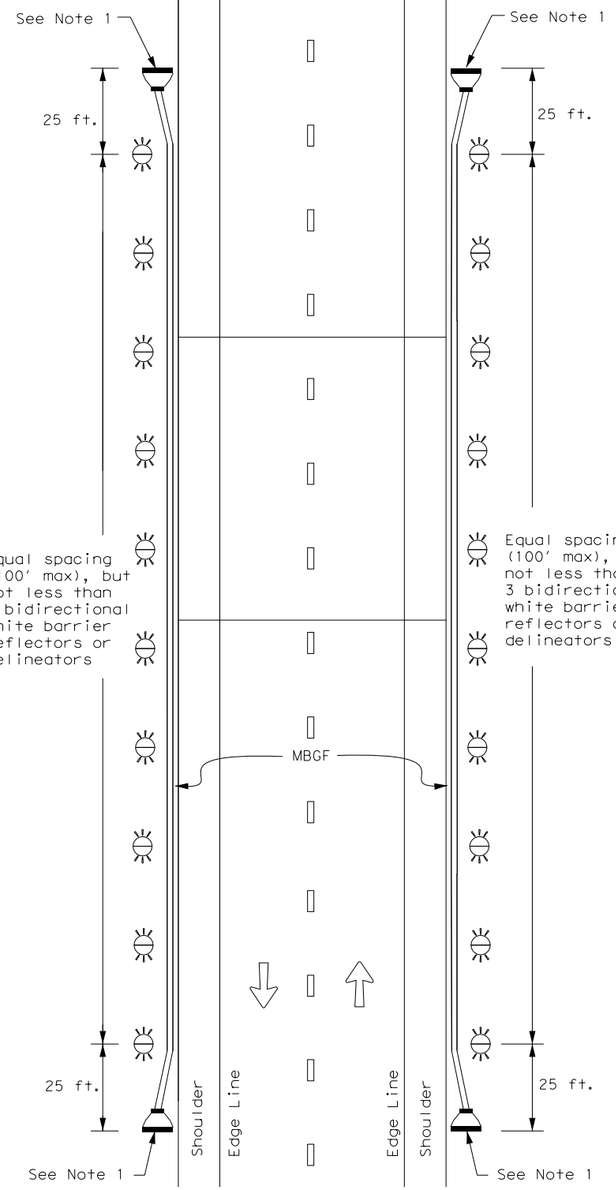
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

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

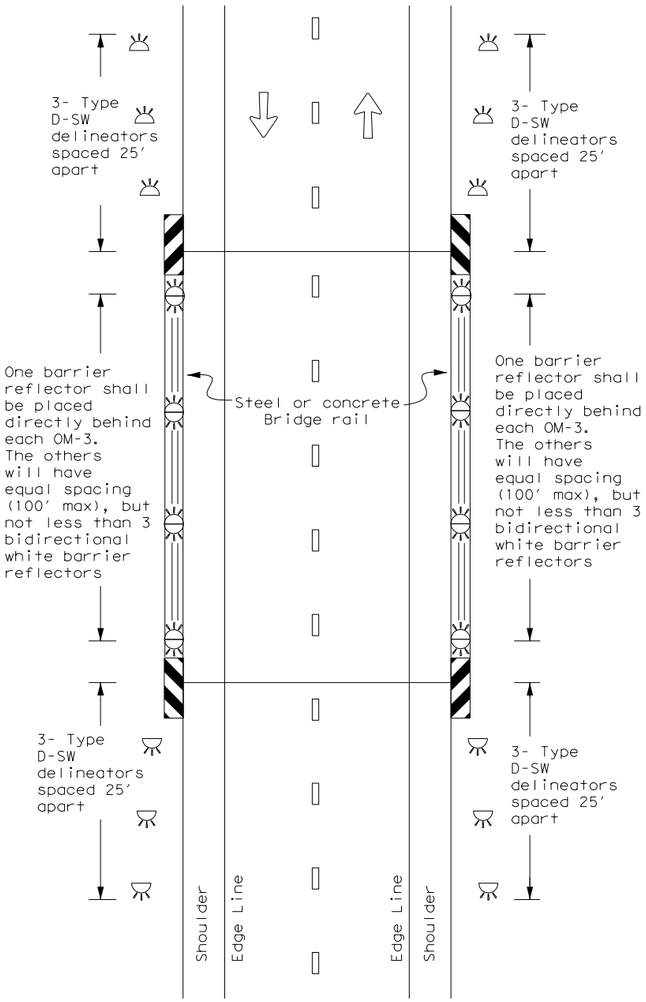
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

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

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



LEGEND

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
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	WAC	MCLENNAN		160

20E

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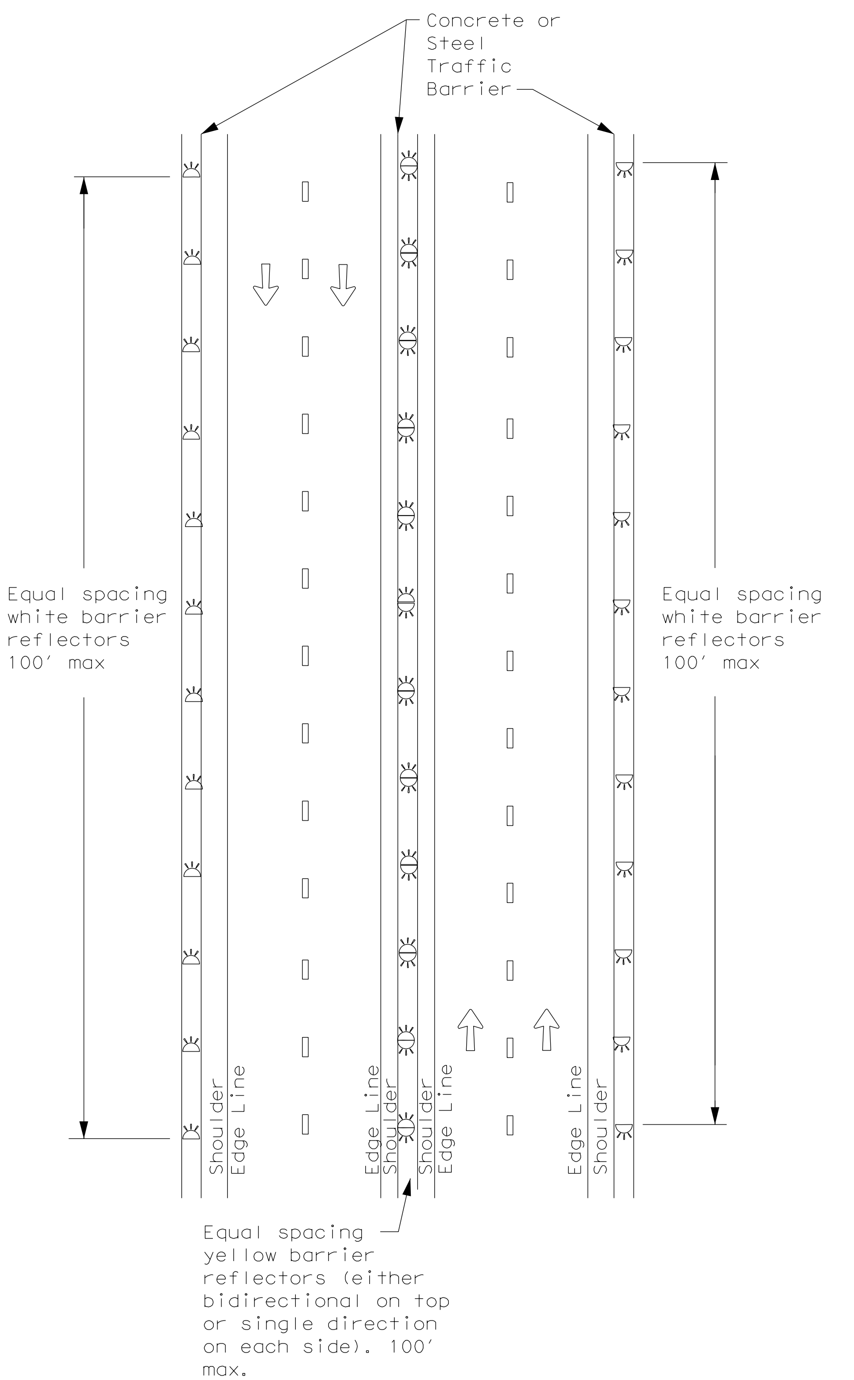
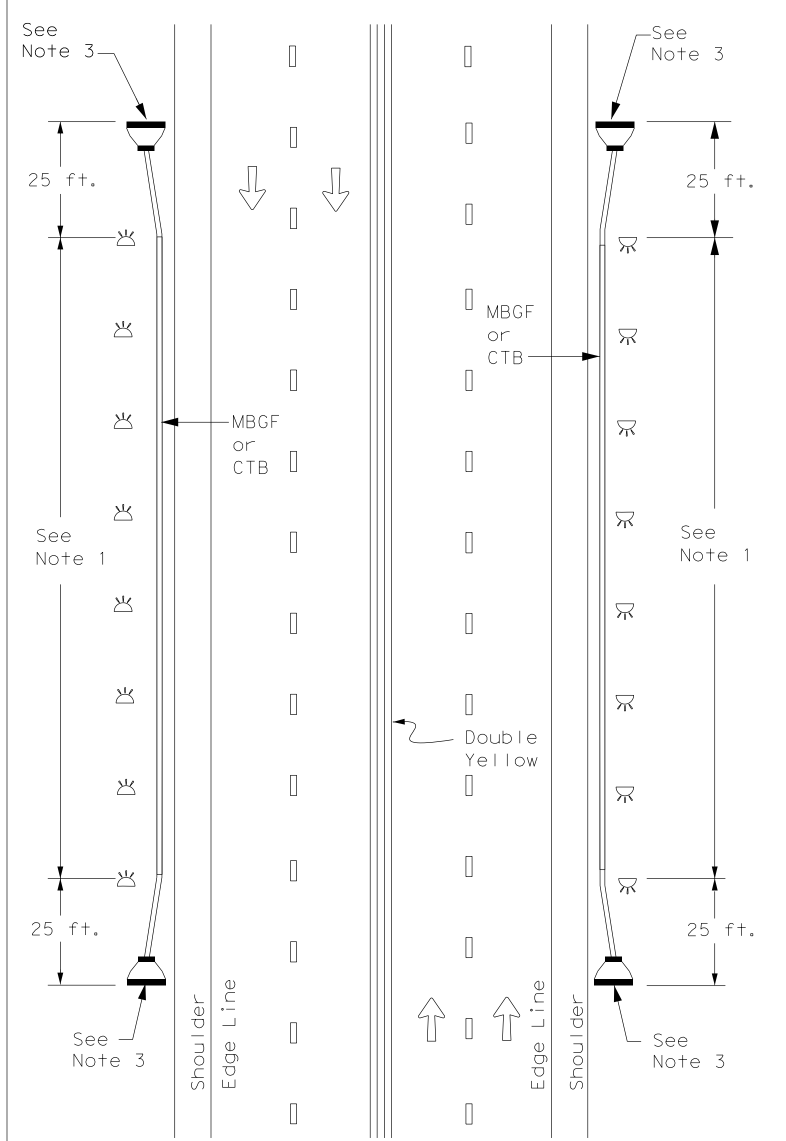
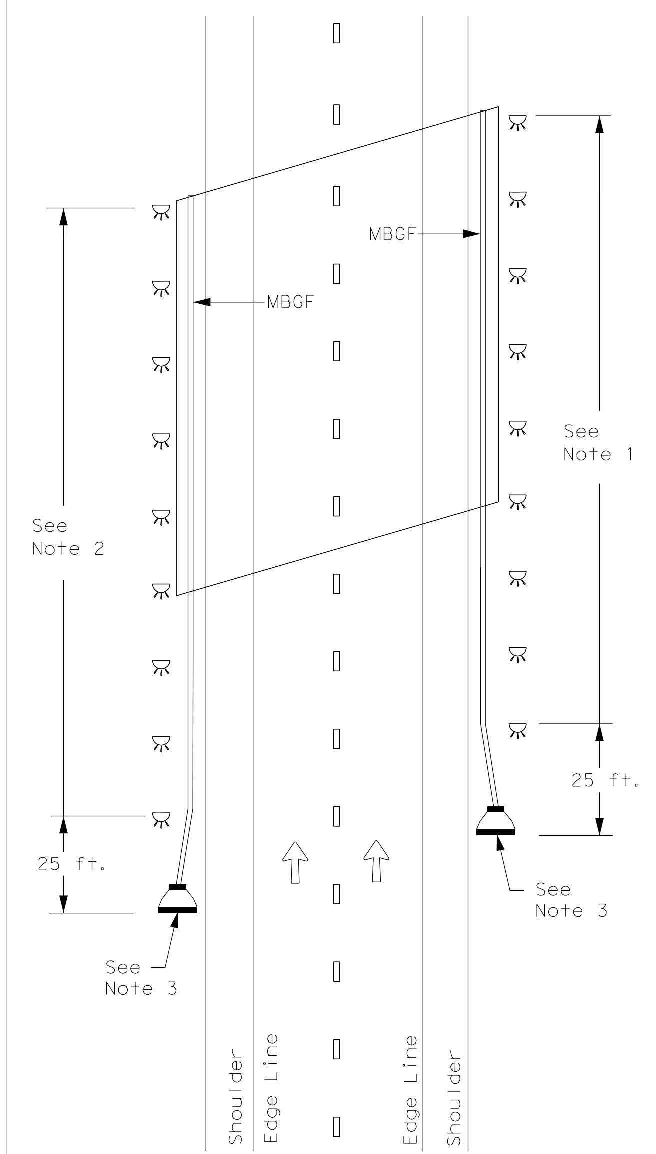
CONTINUOUS CONCRETE OR STEEL BARRIER



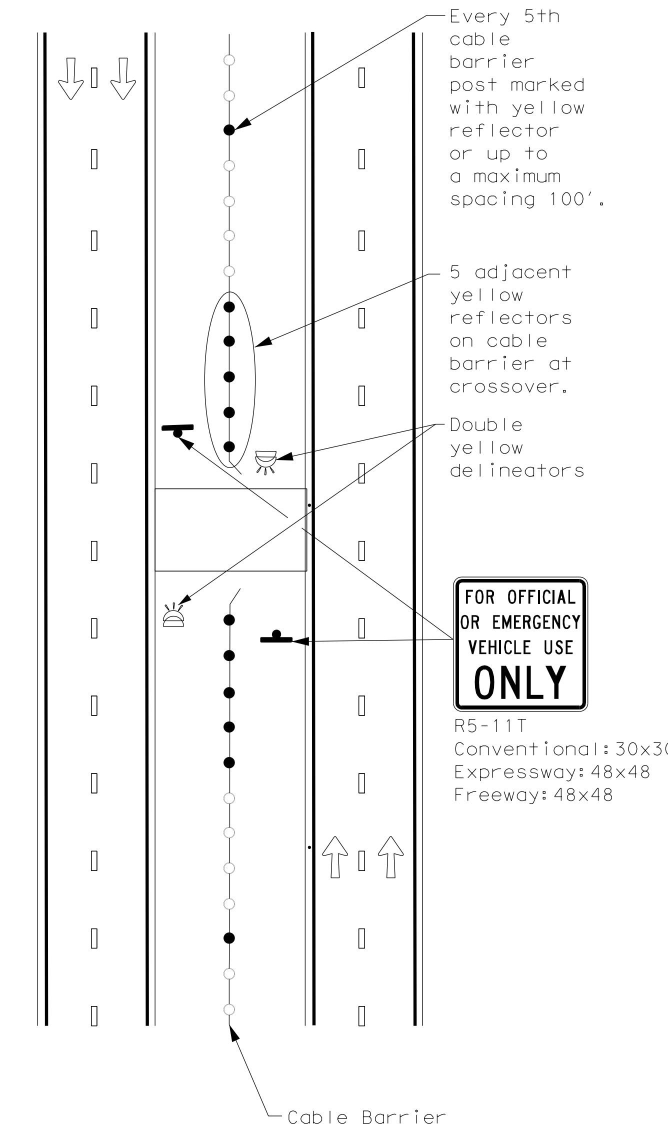
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100' max.)
2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

LEGEND

Symbol	Description
	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
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
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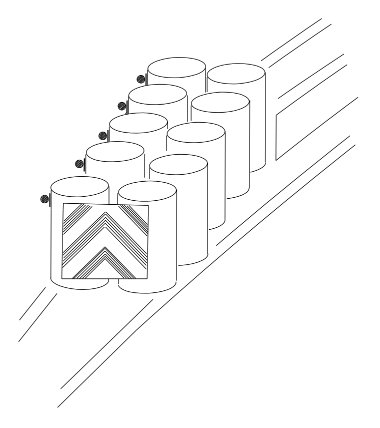
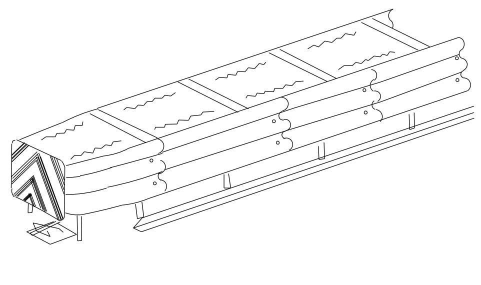
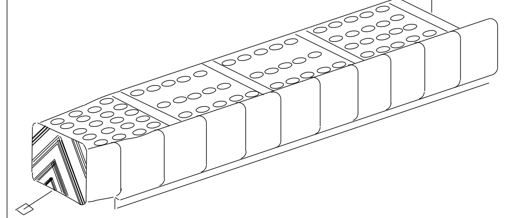
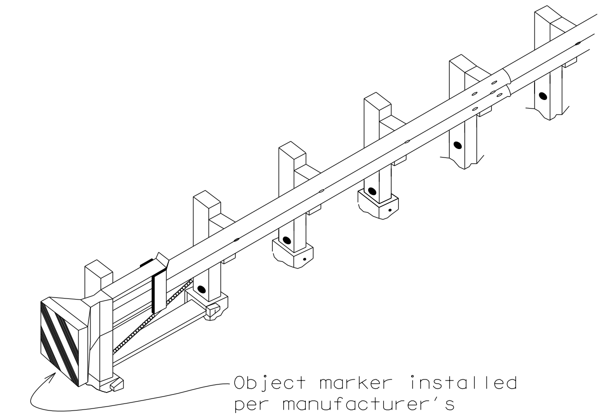
	WAC		MCLENNAN	161

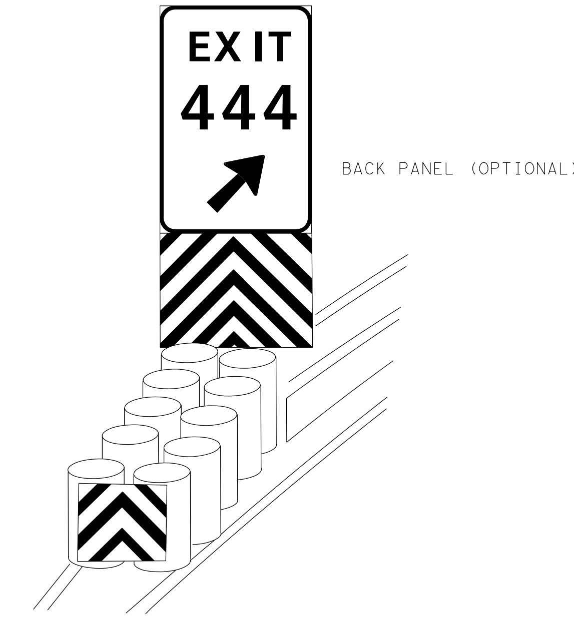
20F

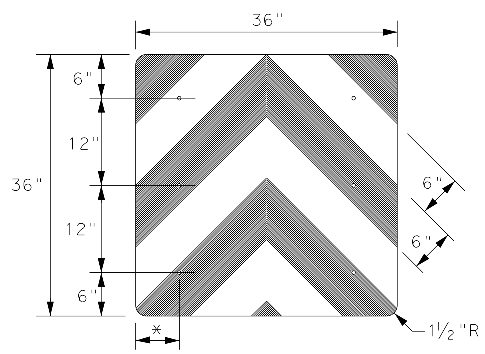


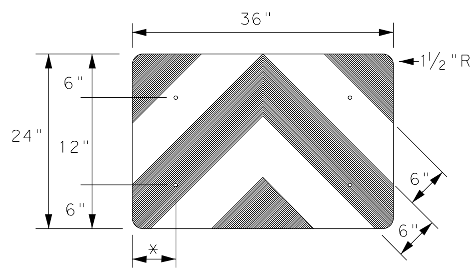




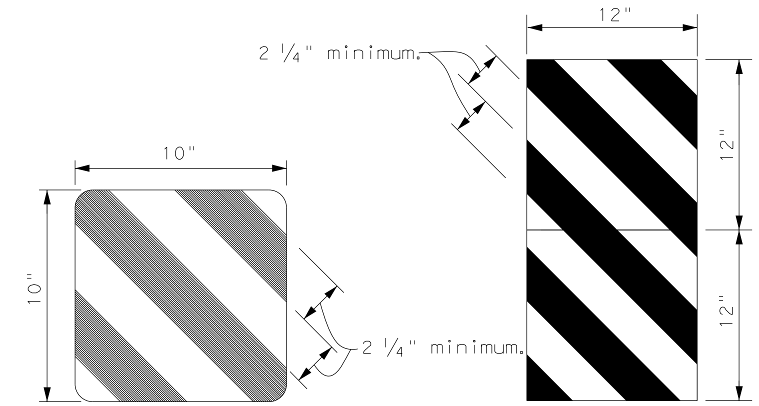




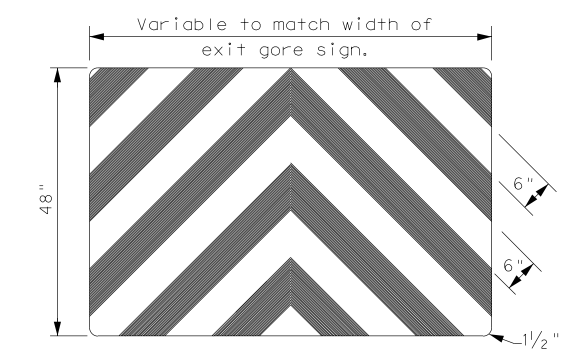


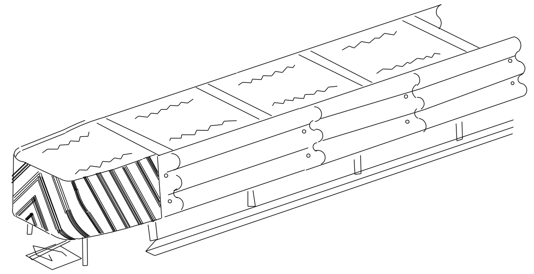


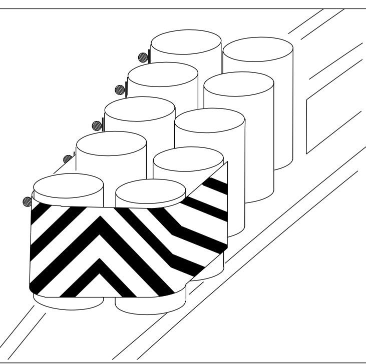
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

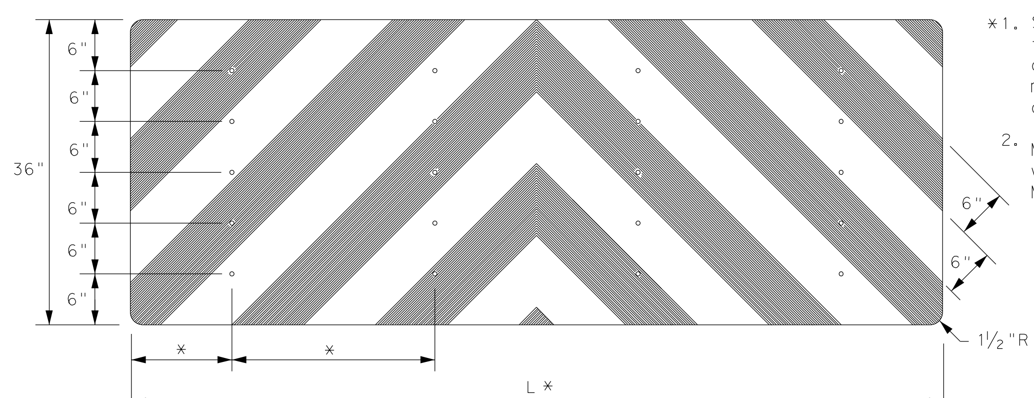


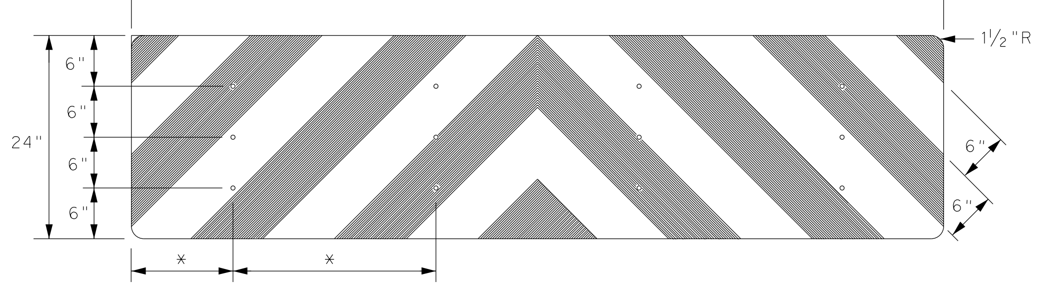
OBJECT MARKERS SMALLER THAN 3 FT²











NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 8-04 8-95 3-15 4-98 7-20	0831	01	019, ETC.	FM 939
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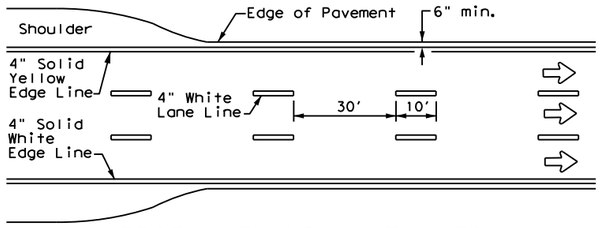
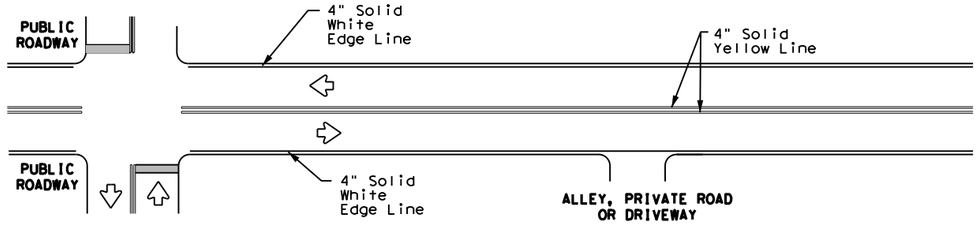
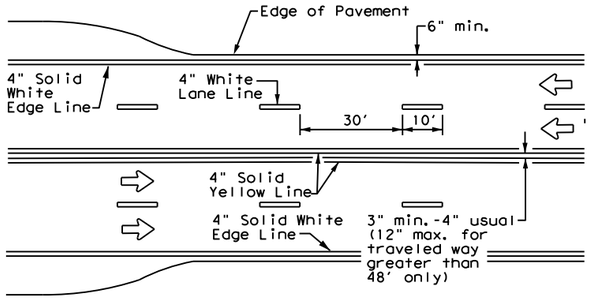


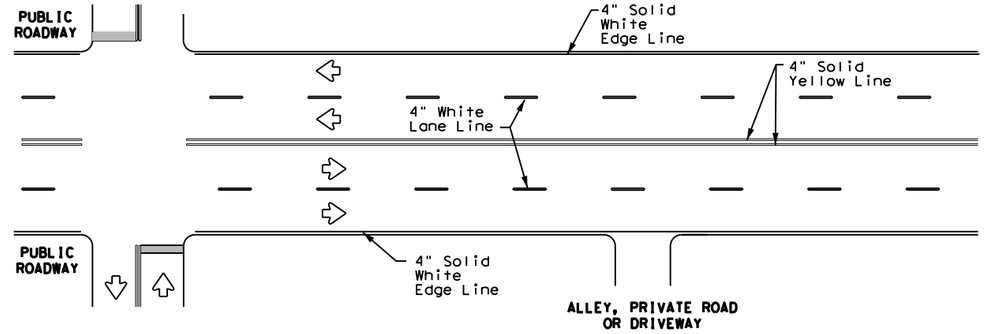
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



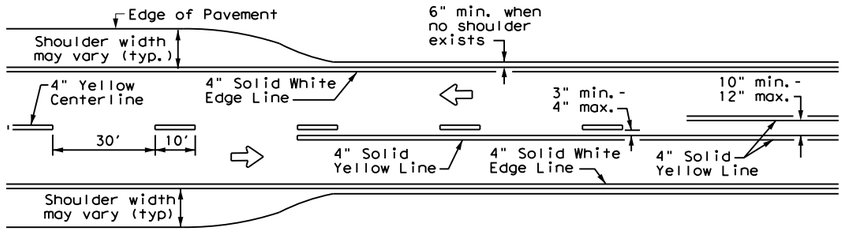
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



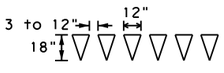
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



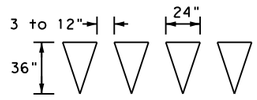
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

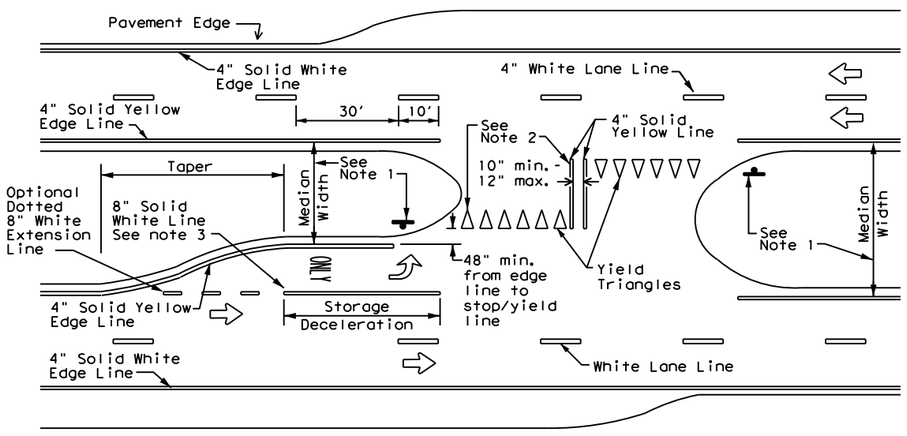


For posted speed on road being marked equal to or less than 40 MPH.



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.

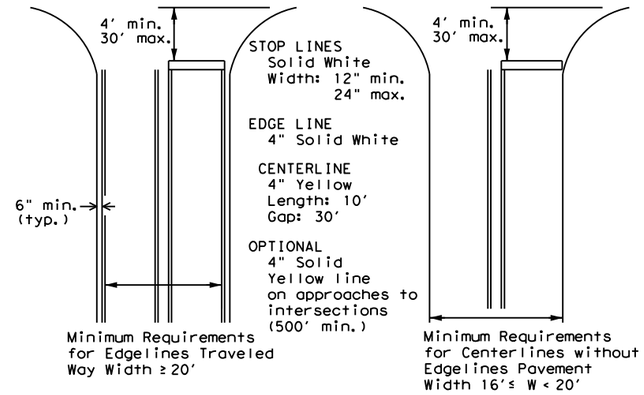
GENERAL NOTES

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

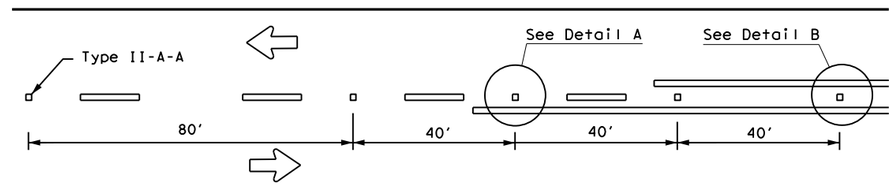
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

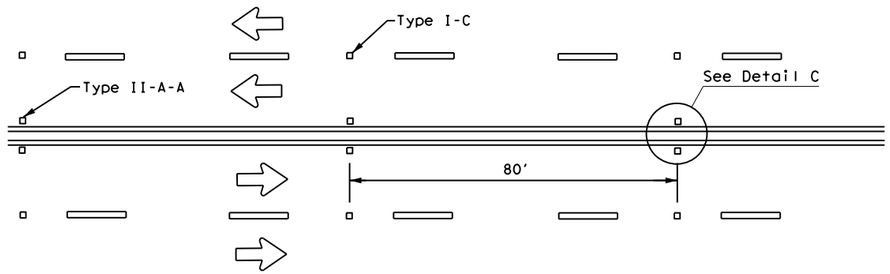
FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0831	01	019, ETC.	FM 939
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	WAC	MCLENNAN		163

22A

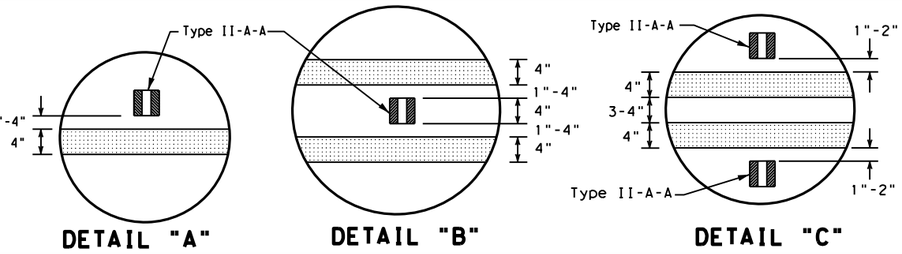
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



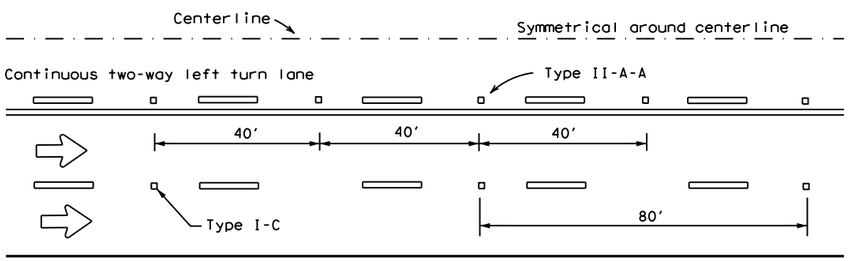
CENTERLINE FOR ALL TWO LANE ROADWAYS



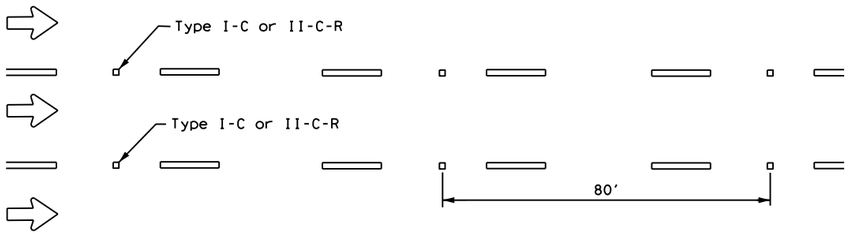
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

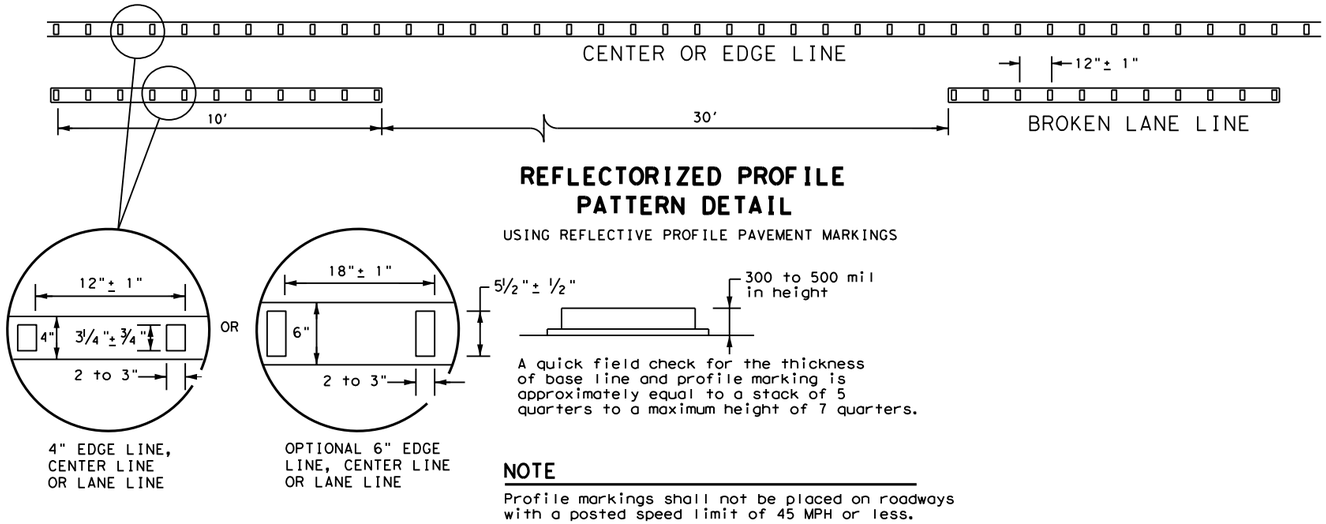


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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

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.

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

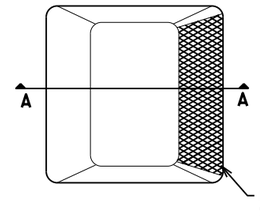
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

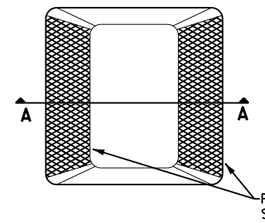
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

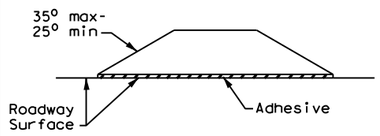
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



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 5-00 2-12 8-00 6-20	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		164

22B

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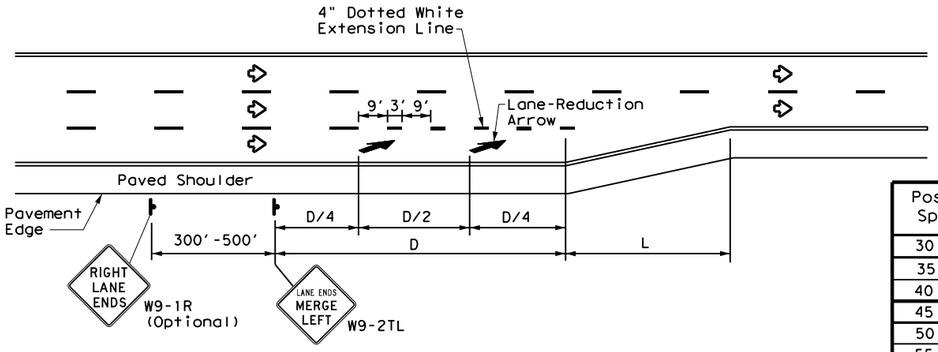
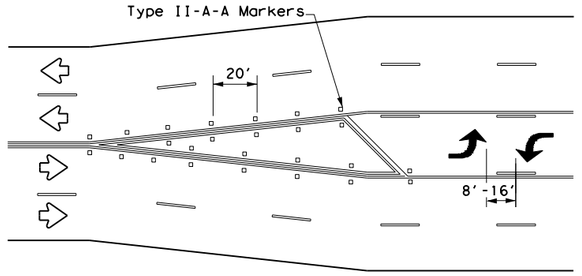


LANE REDUCTION

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

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.



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

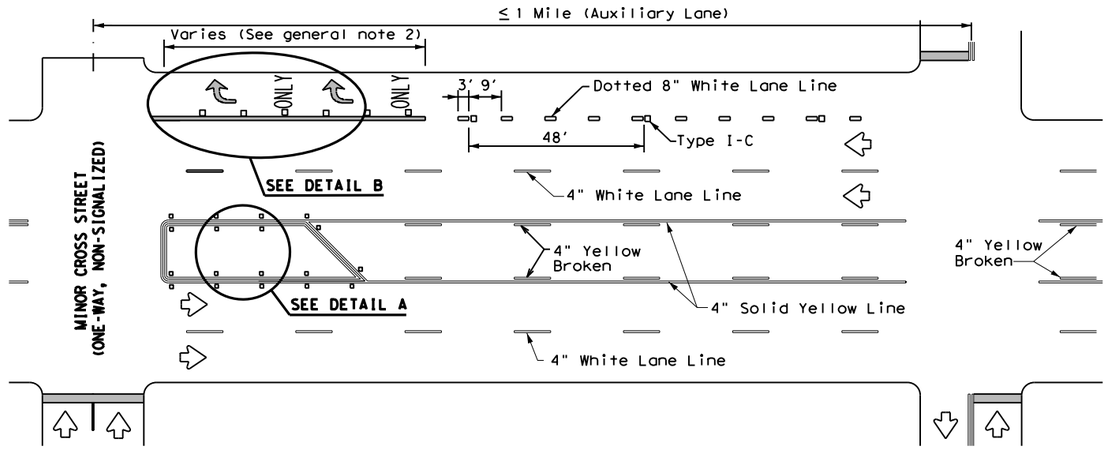
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

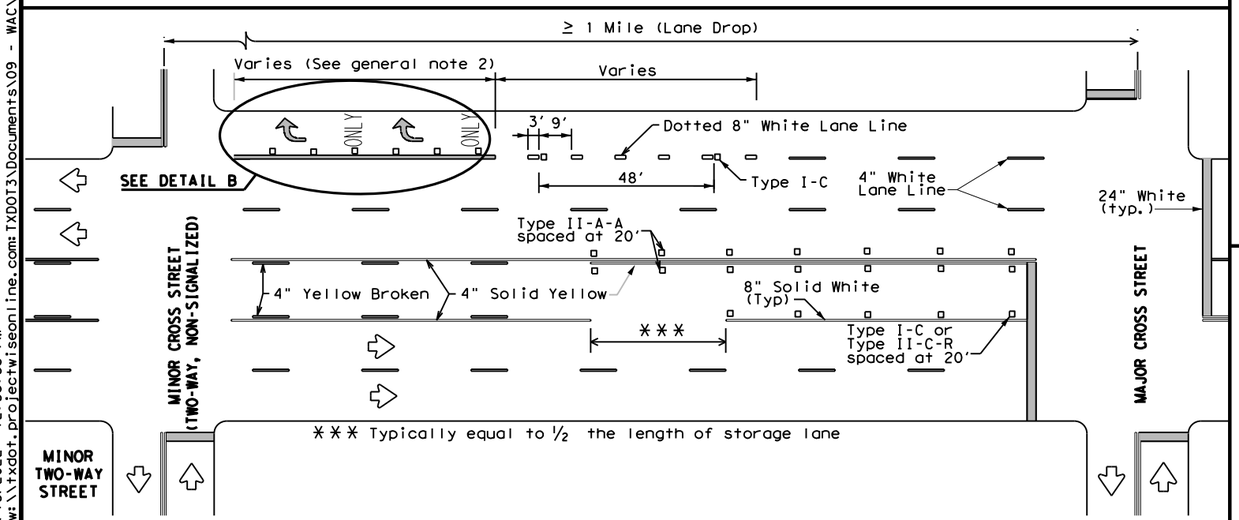
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

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

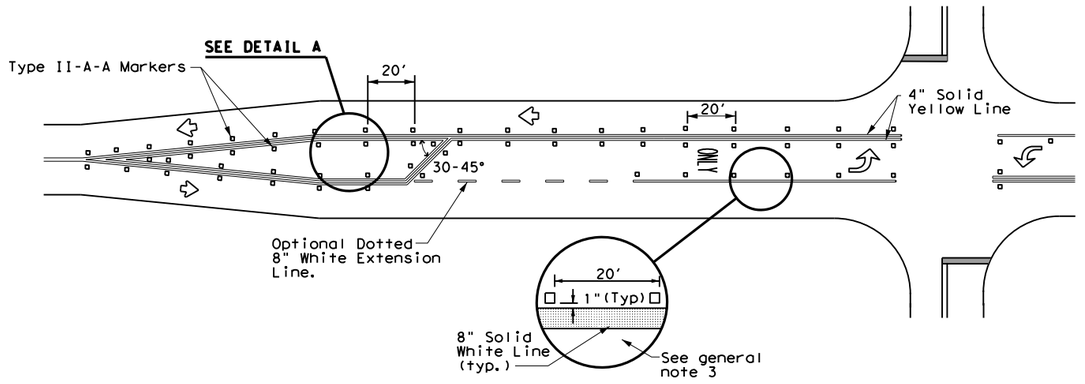
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



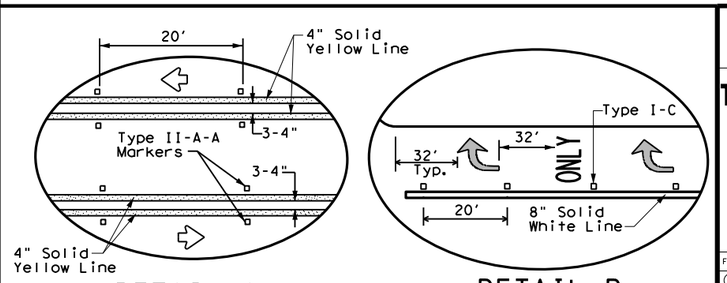
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



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



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



Texas Department of Transportation

Traffic Safety Division Standard

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

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
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5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	WAC	MCLENNAN		165
3-03 6-20				

220

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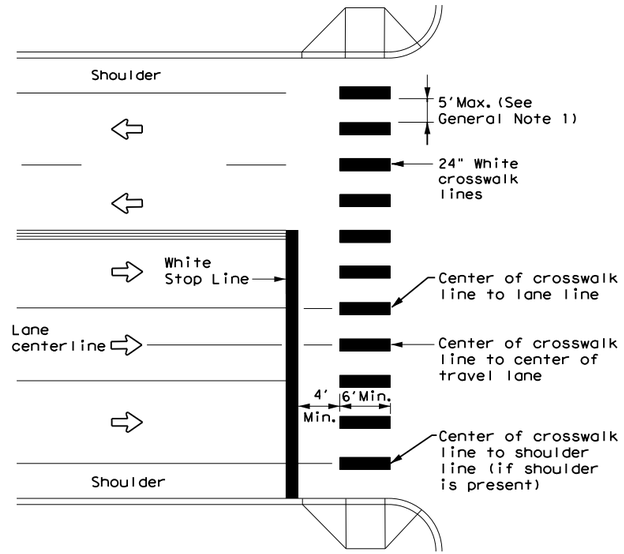


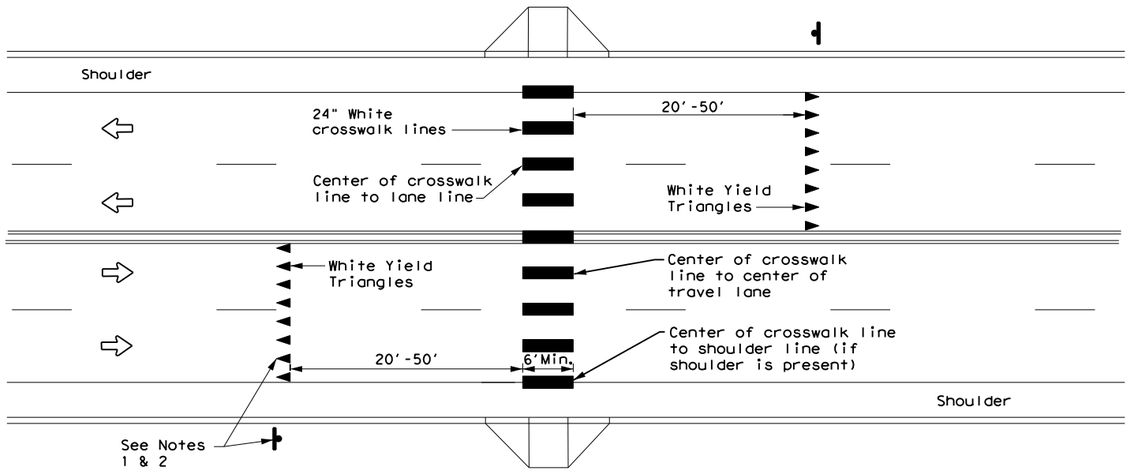
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar/Yield Triangles and Crosswalk shall be approved by the Engineer in the field.

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

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



UNSIGNALIZED MID BLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES

1. Use yield triangles with "Yield Here to Pedestrians" signs at unsignalized mid block crosswalks.
2. Use stop bars with "Stop Here on Red" signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

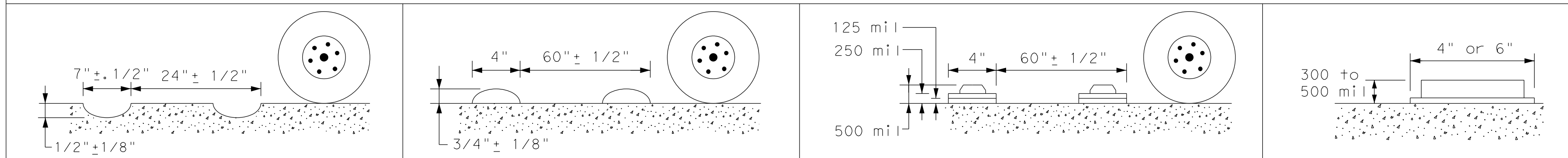
CROSSWALK PAVEMENT MARKINGS

PM(4)-20

FILE: pm4-20.dgn	DN:	CK:	DW:	CK:
© TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		166

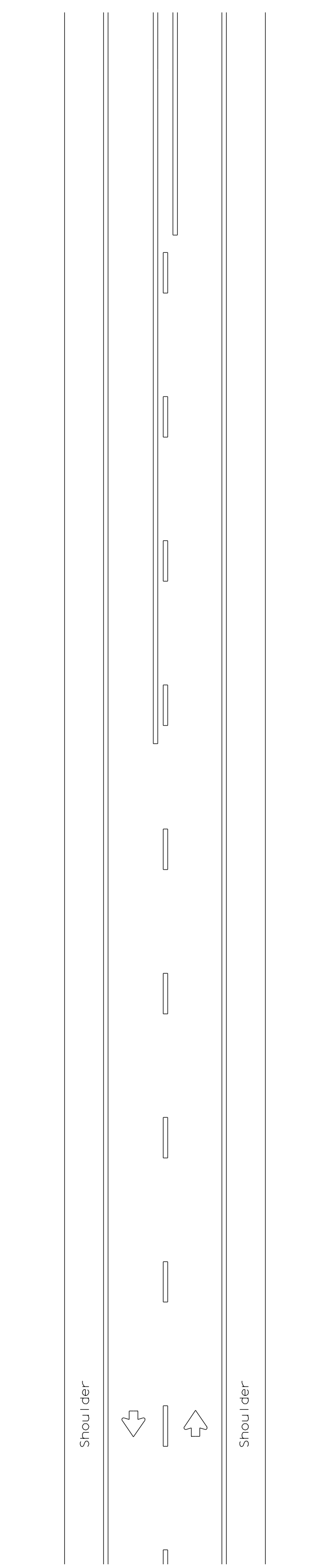
22D

CENTERLINE RUMBLE STRIPS

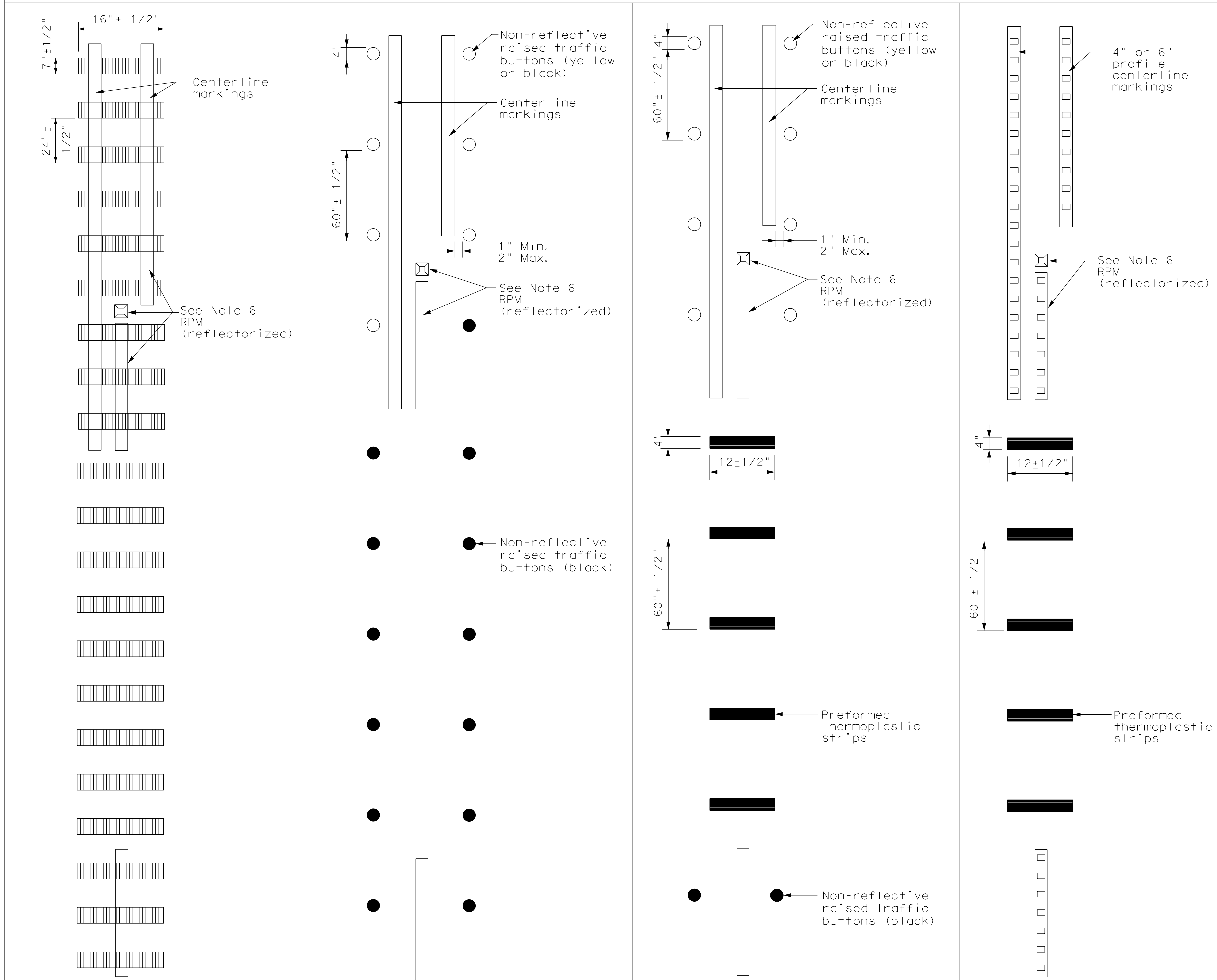


MILLED RUMBLE STRIPS | RAISED TRAFFIC BUTTONS | PREFORMED THERMOPLASTIC STRIPS | PROFILE MARKINGS

PROFILE VIEW



TWO LANE TWO-WAY ROADWAYS



PLAN VIEW
OPTION 1
MILLED CENTERLINE RUMBLE STRIPS

PLAN VIEW
OPTION 2
RAISED CENTERLINE RUMBLE STRIPS

PLAN VIEW
OPTION 3
RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS

PLAN VIEW
OPTION 4
PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

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

12. See standard sheet RS(4).

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Texas Department of Transportation®
Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST		COUNTY	SHEET NO.
	WAC		MCLENNAN	167

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

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

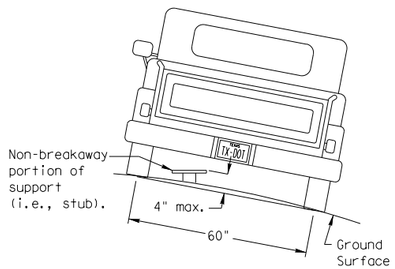
Number of Posts (1 or 2)

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

Sign Mounting Designation
- P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
- T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
- U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))

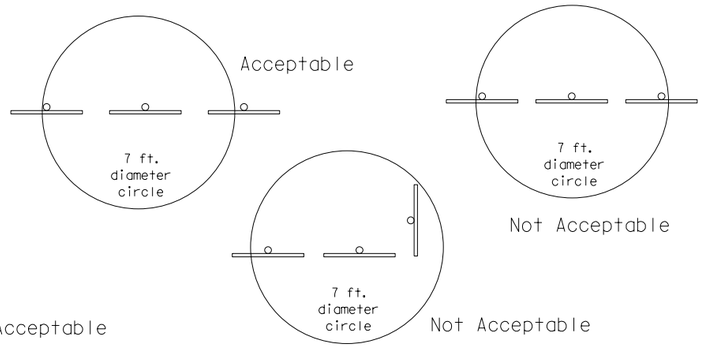
IF REQUIRED
- 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
- BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
- WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
- EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



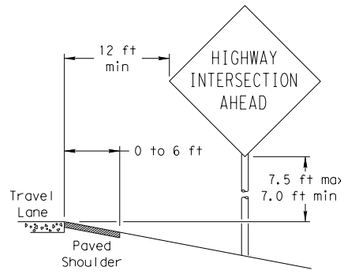
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

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



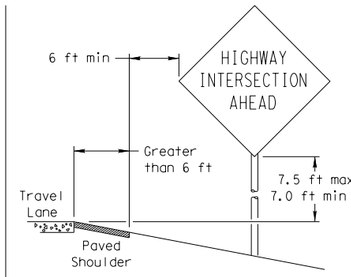
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

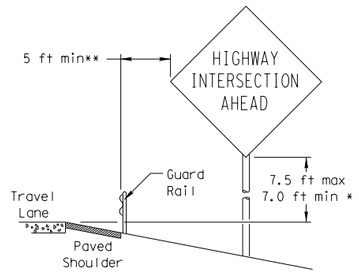
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



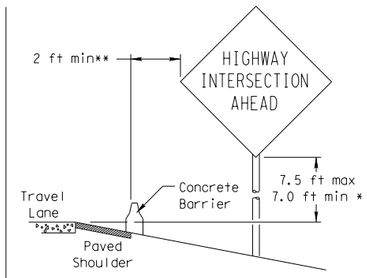
GREATER THAN 6 FT. WIDE

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.

BEHIND BARRIER



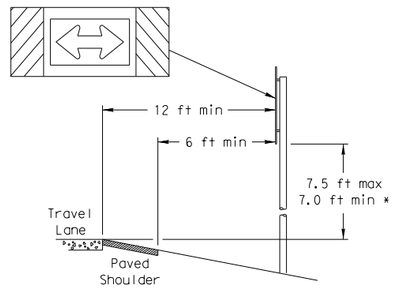
BEHIND GUARDRAIL



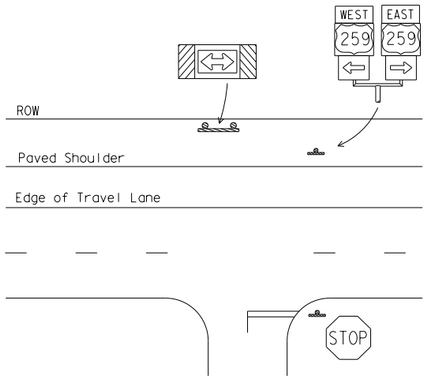
BEHIND CONCRETE BARRIER

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

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.



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

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

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

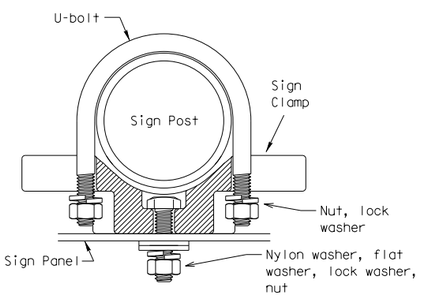
The maximum values may be increased when directed by the Engineer.

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

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

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

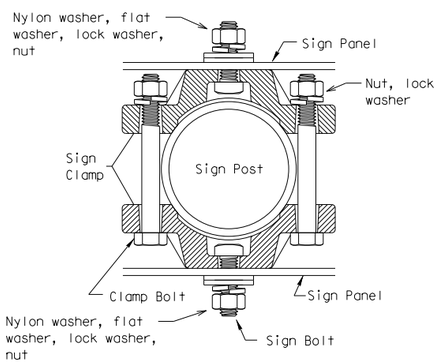


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

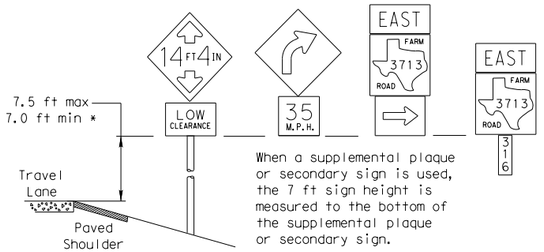
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



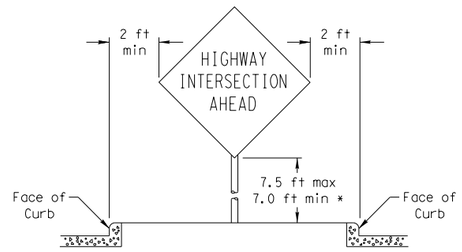
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



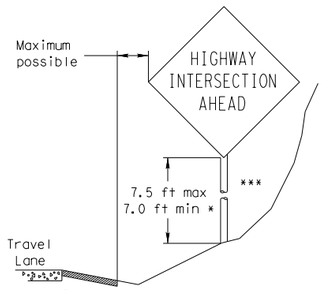
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

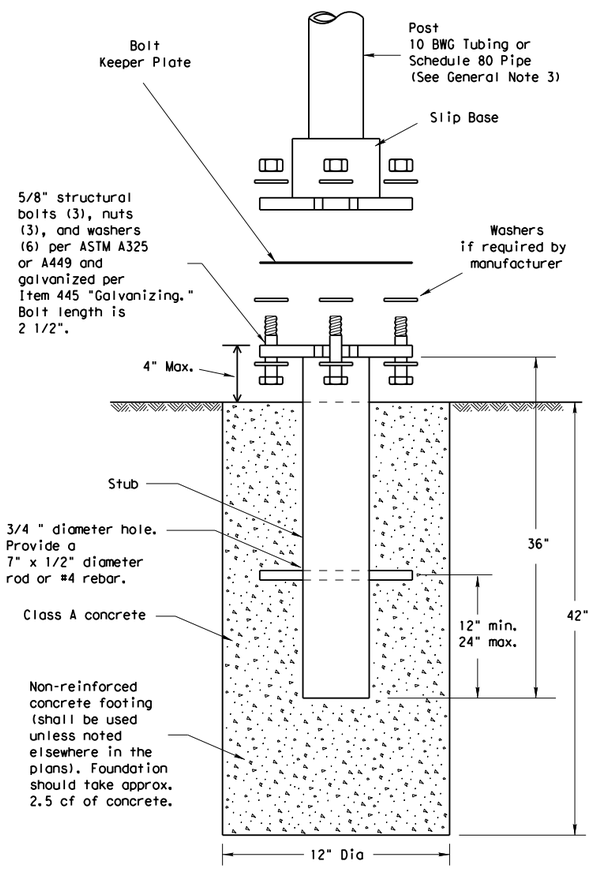
SMD(GEN)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		168

DATE: 4/15/2022 8:08:18 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\083101019\4 - Design\Plan Set\8. Traffic\Standards\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.

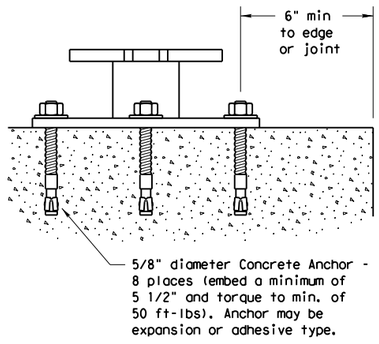
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0831	01	019, ETC.	FM 939

DIST	COUNTY	SHEET NO.
WAC	MCLENNAN	169

DATE: 4/15/2022 8:09:57 PM
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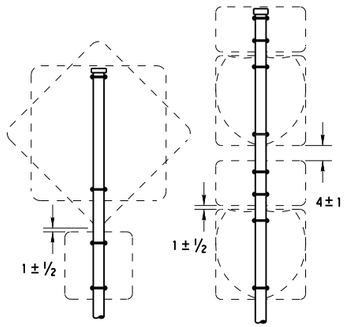
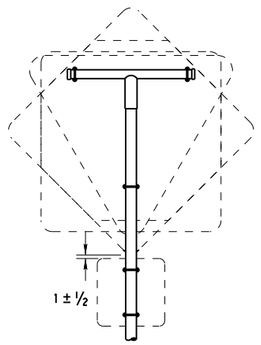


SM RD SGN ASSM TY XXXXX(1)XX(P)



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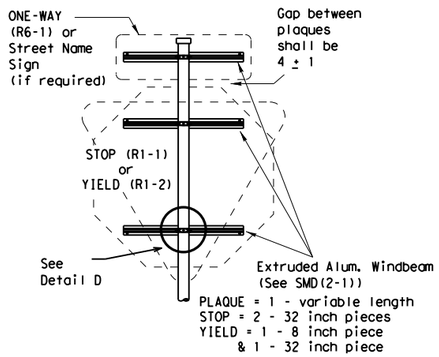

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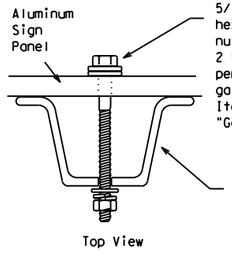

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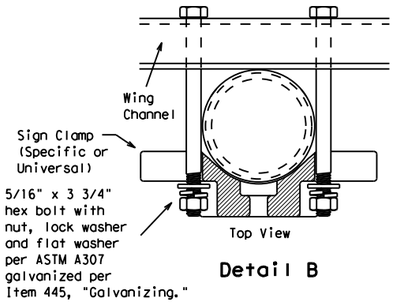
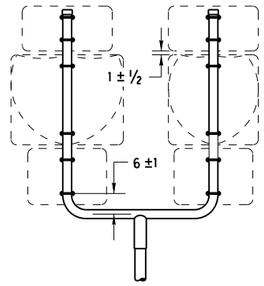


Detail B



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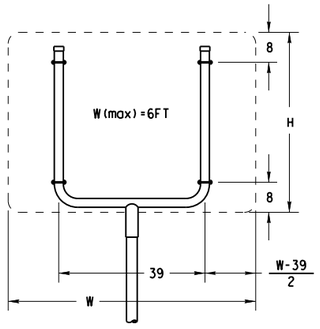

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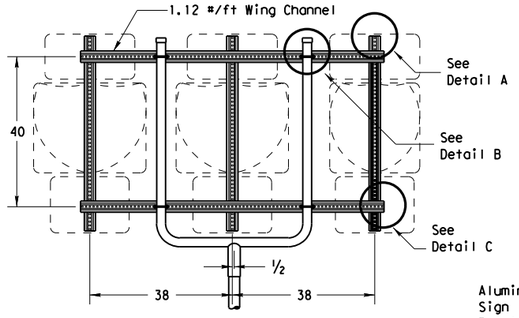
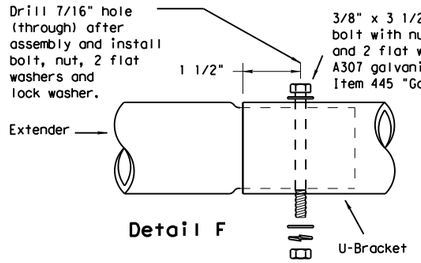
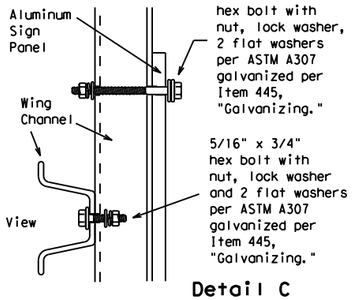


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

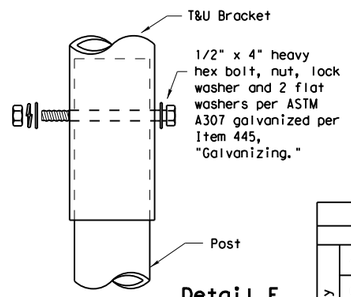


Detail F

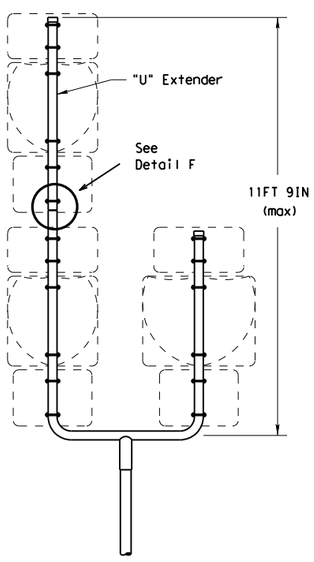
Splices shall only be allowed behind the sign substrate.



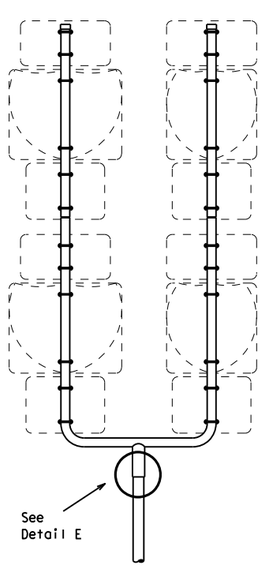
Detail C



Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)



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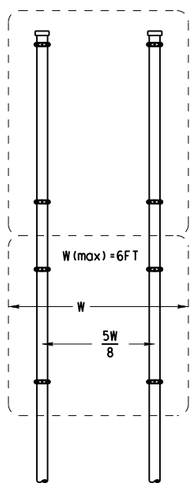
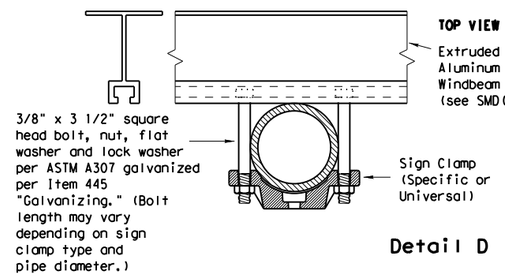
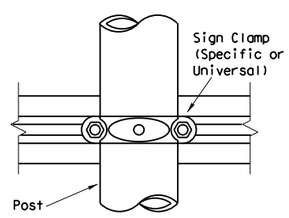


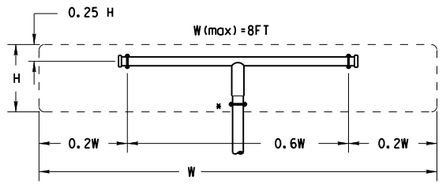
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW





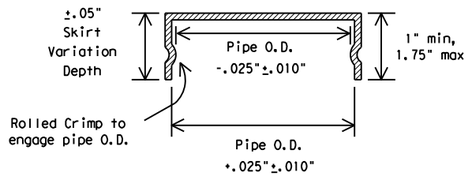
Detail D



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

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

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
0831	01	019, ETC.	FM 939

DIST	COUNTY	SHEET NO.
WAC	MCLENNAN	170

9-08 REVISIONS

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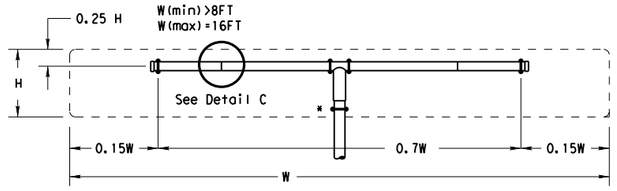
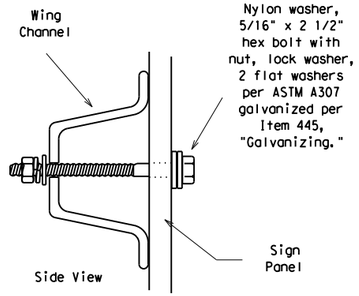
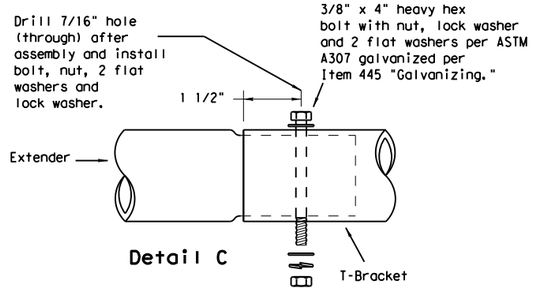


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



Detail B



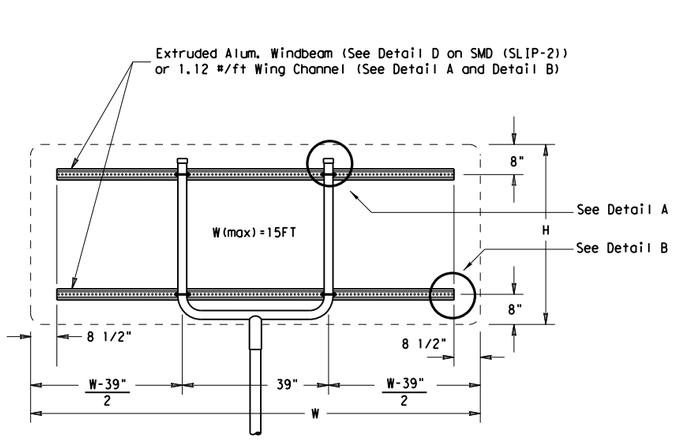
Detail C

Splices shall only be allowed behind the sign substrate.

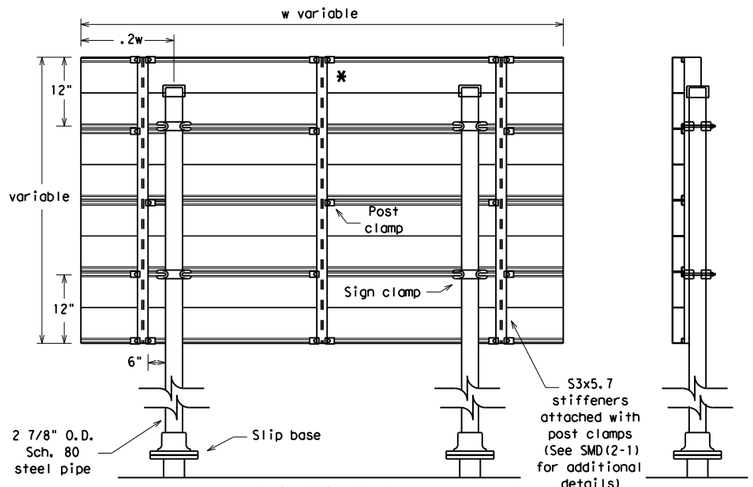
GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. 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.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. 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.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. 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.
6. 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.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. 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."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.



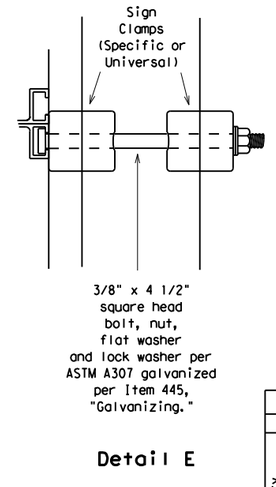
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



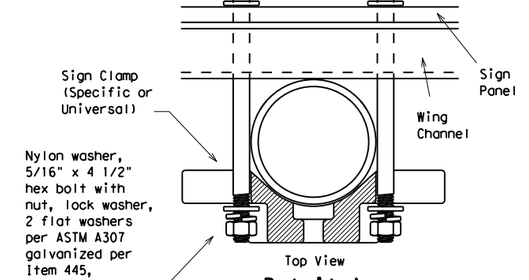
Typical Sign Mount

SM RD SGN ASSM TY S80(2)XX(P-EXAL)

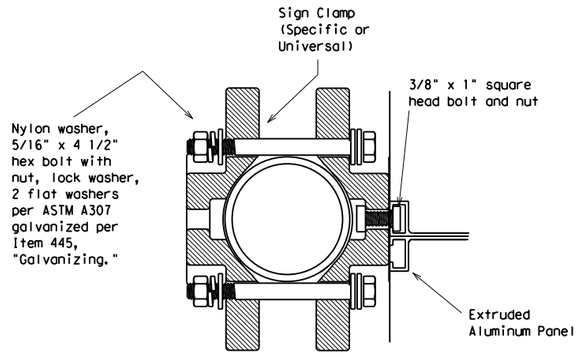
* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



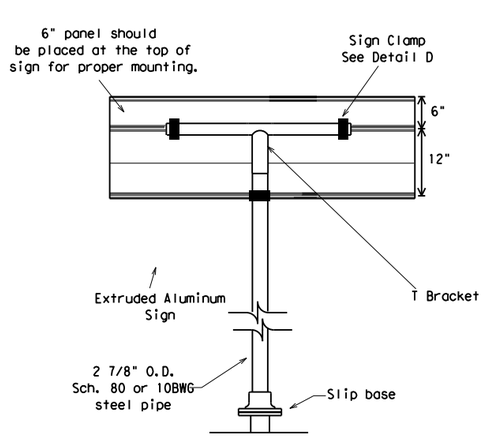
Detail E



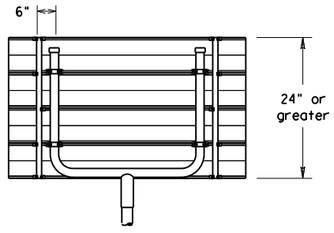
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
0831	01	019, ETC.	FM 939

DIST	COUNTY	SHEET NO.
WAC	MCLENNAN	171

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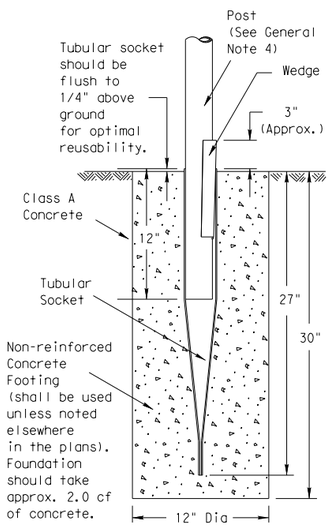
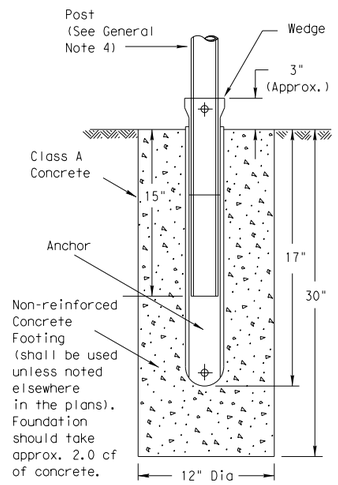
Wedge Anchor Steel System



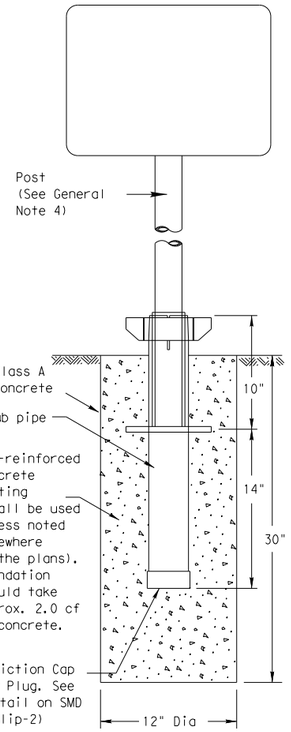
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

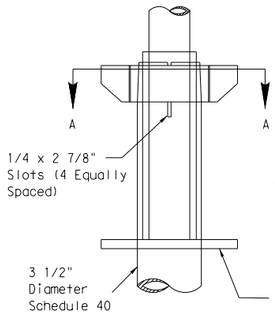


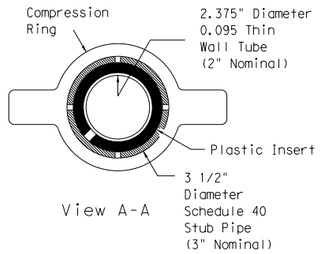
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post



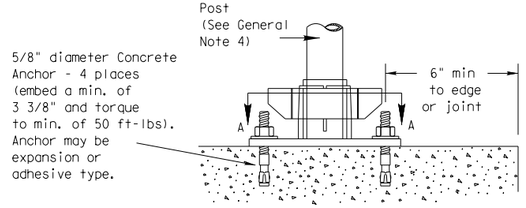
SM RD SGN ASSM TY TWT(X)UA(P)



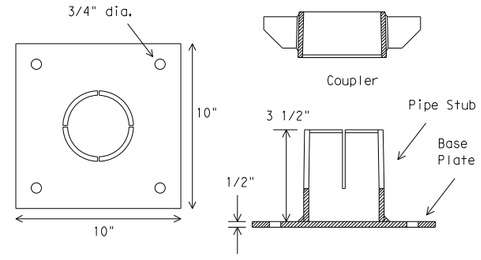


View A-A

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.

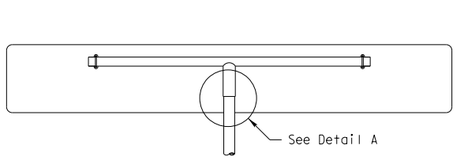


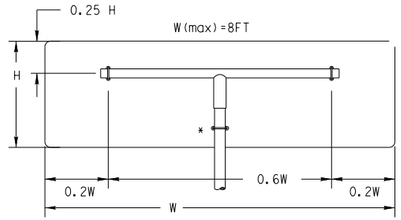
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized 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.



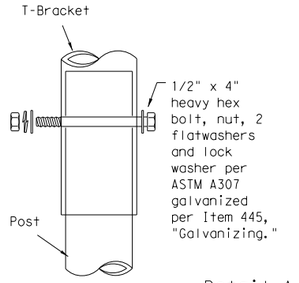
SM RD SGN ASSM TY TWT(X)UB(P)

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

9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
0831	01	019, ETC.	FM 939
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		172

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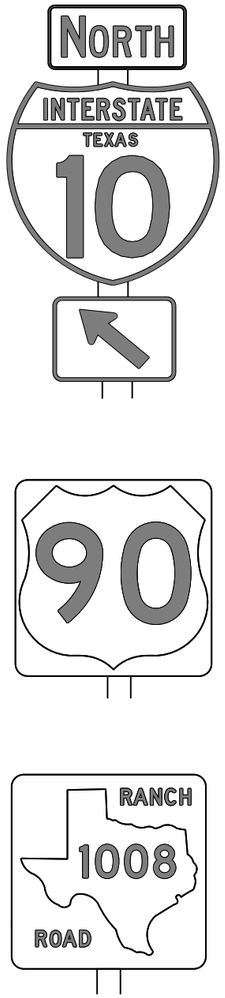
REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

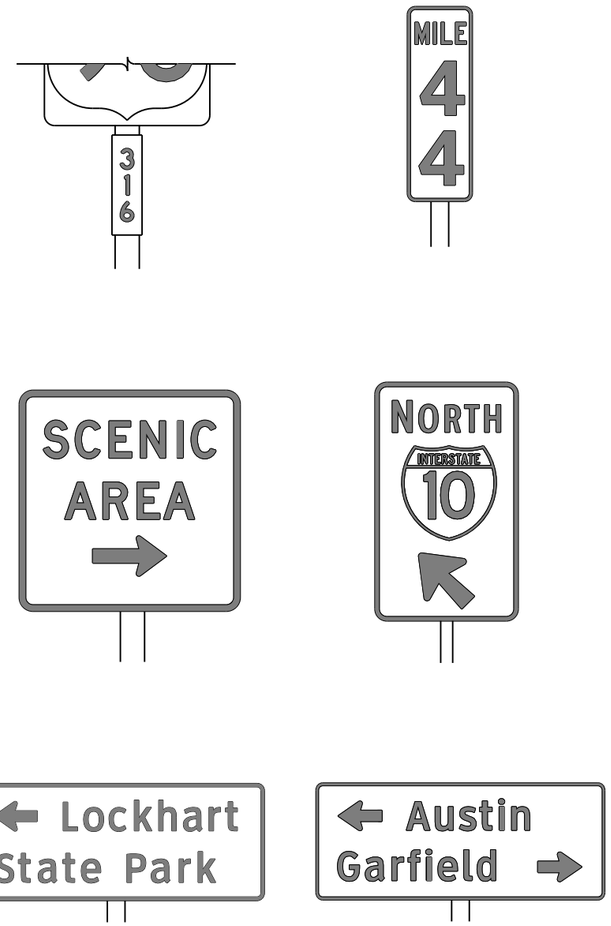
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

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

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



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

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

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

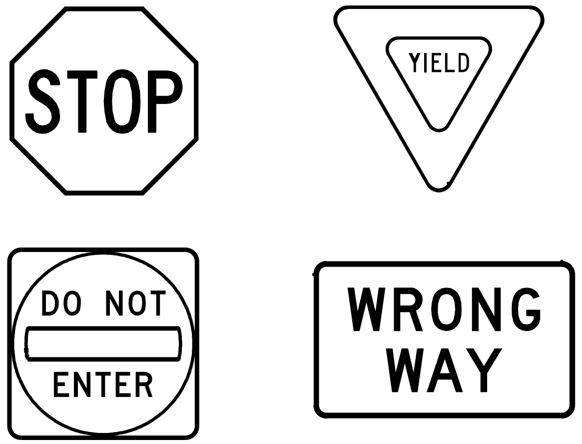
Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	WAC	MCLENNAN		173

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS
(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

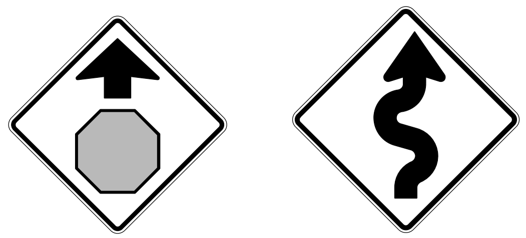
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS
(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

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

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

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

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

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

GENERAL NOTES

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

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-03 7-13 9-08	0831	01	019, ETC.	FM 939
	DIST		COUNTY	SHEET NO.
	WAC		MCLENNAN	174

4

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SITE DESCRIPTION

PROJECT LIMITS:

1192-01-027: From Sta. 503+38.52 To Sta. 650+75.00
0831-01-019: From Sta. 650+75.00 To Sta. 703+33.88

LOCATION MAPS:

Refer to the Title Sheet for project location map

PROJECT DESCRIPTION:

CSJ 0831-01-019,ETC :

For the construction of rehabilitation of existing road consisting of rehab and widen roadway

MAJOR SOIL DISTURBING ACTIVITIES:

CSJ 0831-01-019,ETC :

The major soil disturbing activities for this project will consist of excavation, embankment, grading and construction of proposed culvert and roadway.

TOTAL PROJECT AREA:	54.54 AC
TOTAL AREA TO BE DISTURBED:	17.10 AC

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

CSJ 0831-01-019,ETC :

The predominant soil types are Ferris clay, Ferris-Heiden complex, Heiden clay, and Houston black clay. It consists of gently sloping, clayey soils. Moderately drained to well drained soils.

NAME OF RECEIVING WATERS:

CSJ 0831-01-019,ETC :

The water flows into Amos Creek, Salt creek, Tradinghouse creek, Ultimately drains into the Brazos river with in segment 1242.

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

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

OTHER: TXR 150000, Part III, Section G, 2 Stabilization of disturbed areas must, at a minimum, be initiated immediately whenever any clearing, grading, excavating, or other earth disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and Will not resume for a period exceeding 14 calendar days. Temporary stabilization must be completed no more than 14 calendar days after initiation of soil stabilization measures, and final stabilization must be achieved prior to termination of permit coverage.

STRUCTURAL PRACTICES: (Select T = Temporary or P = Permanent, As Applicable)

T	SILT FENCES	T	TIMBER MATTING AT CONSTRUCTION EXIT
	HAY BALES		CHANNEL LINERS
T	SANDBAG OR ROCK BERMS		SEDIMENT TRAPS
	DIVERSION, INTERCEPTOR, OR PERIMETER DIKES		SEDIMENT BASINS
	DIVERSION, INTERCEPTOR, OR PERIMETER SWALES		STORM INLET SEDIMENT TRAP
	DIVERSION DIKE AND SWALE COMBINATIONS	P	STONE OUTLET STRUCTURES
	PIPE SLOPE DRAINS		CURBS AND GUTTERS
	PAVED FLUMES		STORM SEWERS
	ROCK BEDDING AT CONSTRUCTION EXIT		VELOCITY CONTROL DEVICES

OTHER:

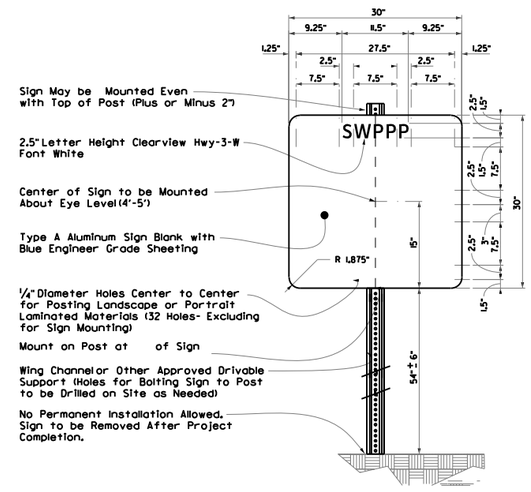
NARRATIVE-SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

The order of activities Will be as follows:
1. Preserve existing vegetative cover as much as possible.
2. Install temporary sediment control fencing, rock berms and other items as shown on plans prior to any soil disturbing activities.
3. Remove existing bridge, construct proposed culvert and roadway and perform any necessary excavation, embankment and grading.
4. Place soil retention blankets and temporary/permanent seeding as shown in the plans and as directed by the engineer.

STORM WATER MANAGEMENT:

An integral part of the SWPPP for this project includes the EPIC Sheet, Item 506, Waco District Waters of the US Notes, Waco District Typical Applications for Best Management Practices, Form 2118 TxDOT inspection forms, Contractor daily inspection forms, miscellaneous general notes on environmental requirements, TxDOT EC Standards, 2014 Standard Specifications, TxDOT roadway design drawings, SWPPP design and working BMP drawings, Site Manager Data Base, EMS Stage Gate Inspections and the Waco District environmental folders. The requirements of the TxDOT EMS Will be fully implemented including training requirements for Contractors and TxDOT staff.

STORM WATER POLLUTION PREVENTION PLAN PERMIT POSTING



OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE:

All erosion and sediment best management practices (BMPs) Will be maintained in good working order per the environmental notes, details and standards included as part of the project plans and contract documents. BMP repairs Will be made at the earliest possible date, but no later than seven calendar days after the inspection report has been completed and immediately after the ground has dried sufficiently to allow equipment access. BMPs damaged by the Contractor Will be repaired or replaced immediately. The installation and repair of BMPs at creeks and outfalls Will be given priority.

INSPECTION:

TxDOT Form 2118 inspections to support TXR150000 and 404 permits Will be conducted on a seven day interval on the same day of the week, until permits are terminated. The Contractor Will provide daily BMP inspection reports on work days. Stage Gate Inspections and other BMP inspections Will be conducted by the District and Area Office Staff based on requirements of the TxDOT Environmental Management System (EMS).

WASTE MATERIALS:

Any waste materials generated during construction Will be disposed of in accordance with existing federal, state, and local laws.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):

At a minimum, any products in the following categories are considered to be hazardous: Fuels, Lubricating products, Asphalt products, or Concrete curing compounds and any additives. In the event of a spill which may be hazardous, clean-up Will be done in accordance with federal, state, and local regulations. The Contractor Will maintain a list of all chemicals and wastes required for the project; including chemicals used by sub-contractors, and Will implement written spill prevention and clean-up plans.

SANITARY WASTE:

Sanitary waste from portable units Will be collected by a licensed sanitary waste management contractor.

OFF SITE VEHICLE TRACKING:

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

REMARKS:

Disposal areas, stockpiles,and haul roads Will be constructed in a manner that Will minimize and control the amount of sediment that may enter receiving waters. Disposal areas Will not be located in any wetland, waterbody or streambed. Construction staging area and vehicle maintenance area Will be constructed by the contractor in a manner to minimize the runoff pollutants.

Furnish one SW3P permit posting sign and sign support as detailed on the SW3P Sheet. Install this sign in a location selected by the Engineer. The sign and support should be removed upon completion of the project and is the property of the Contractor. The purchase of the sign and support, installation, relocation(s) if determined necessary by the Engineer and removal at project end Will be subsidiary to Item 506.

SEDIMENTATION BASINS:

Since the area disturbed is less than 10 acres, per outfall location, a sedimentation basin is not required.

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 04/29/2022
SIGNATURE OF REGISTRANT & DATE

WACO DISTRICT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	CONT	SECT	JOB	HIGHWAY
6	TEXAS	0831	01	019, ETC.	FM 939
		DIST	COUNTY		SHEET NO.
SCALE:		WAC	MCLENNAN		175

DATE:
FILE:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. Project will disturb more than 5 acres, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required

☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1. Waters of the US are at Stations:
   -571+91
   -615+17
   -649+32
   -669+10
   -680+80

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☒ Temporary Vegetation	☒ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☒ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☒ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☐ No Action Required ☒ Required Action

Action No.

1. SEE STATEMENT ABOVE

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ Required Action

Action No.

1. Vegetation clearing within the project limits/drainge areas must be completed during the non-nesting season September 15 - March 1.

☐ No Action Required ☒ Required Action

Action No.

1. Comply with Migratory Bird Treaty Act (MBTA)

2. Plains Spotted Skunk: Contractors will be advised of potential occurence in the project area, and to avoid harming the species if encountered, and to avoed unnecessary impacts to dens

3. SEE STATEMENT BELOW

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

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

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☒ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1.

VII. OTHER ENVIRONMENTAL ISSUES

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

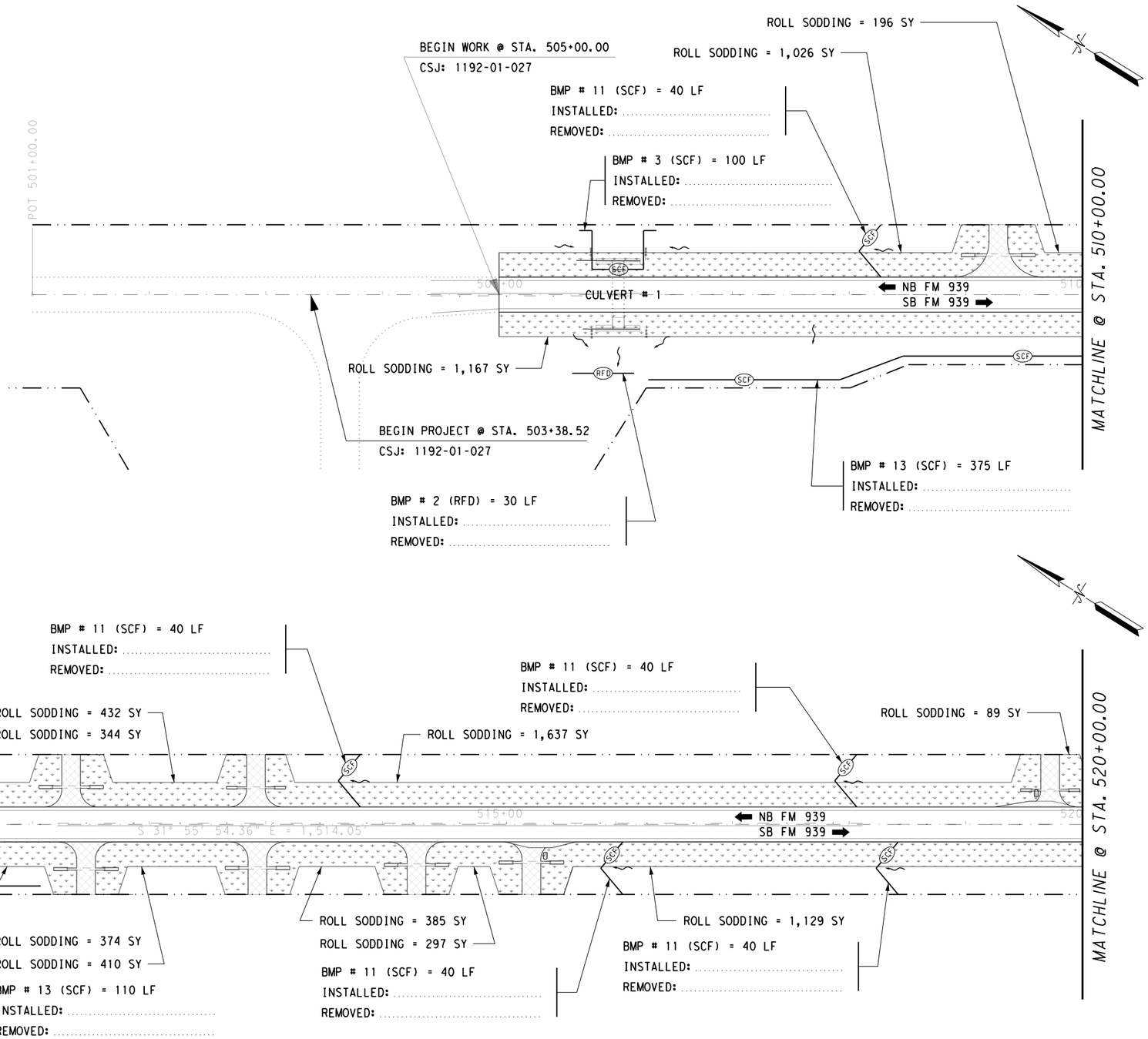
Texas Department of Transportation

Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-12-2011 (DS) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	0831	01	019,ETC	FM 939
	DIST	COUNTY		SHEET NO.
	WACO	McLENNAN		176



ITEM	DESCRIPTION	UNIT
162 6008	ROLL SODDING	7486 SY
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	30 LF
506 6001	ROCK FILTER DAMS (REMOVE)	30 LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	785 LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	785 LF

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022

SIGNATURE OF REGISTRANT & DATE

SW3P LAYOUT

FROM STA. 505+00.00 TO STA. 520+00.00
CSJ: 1192-01-027

SCALE: FEET
1" = 100.0' HORIZ.

SHEET 1 OF 11

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		177

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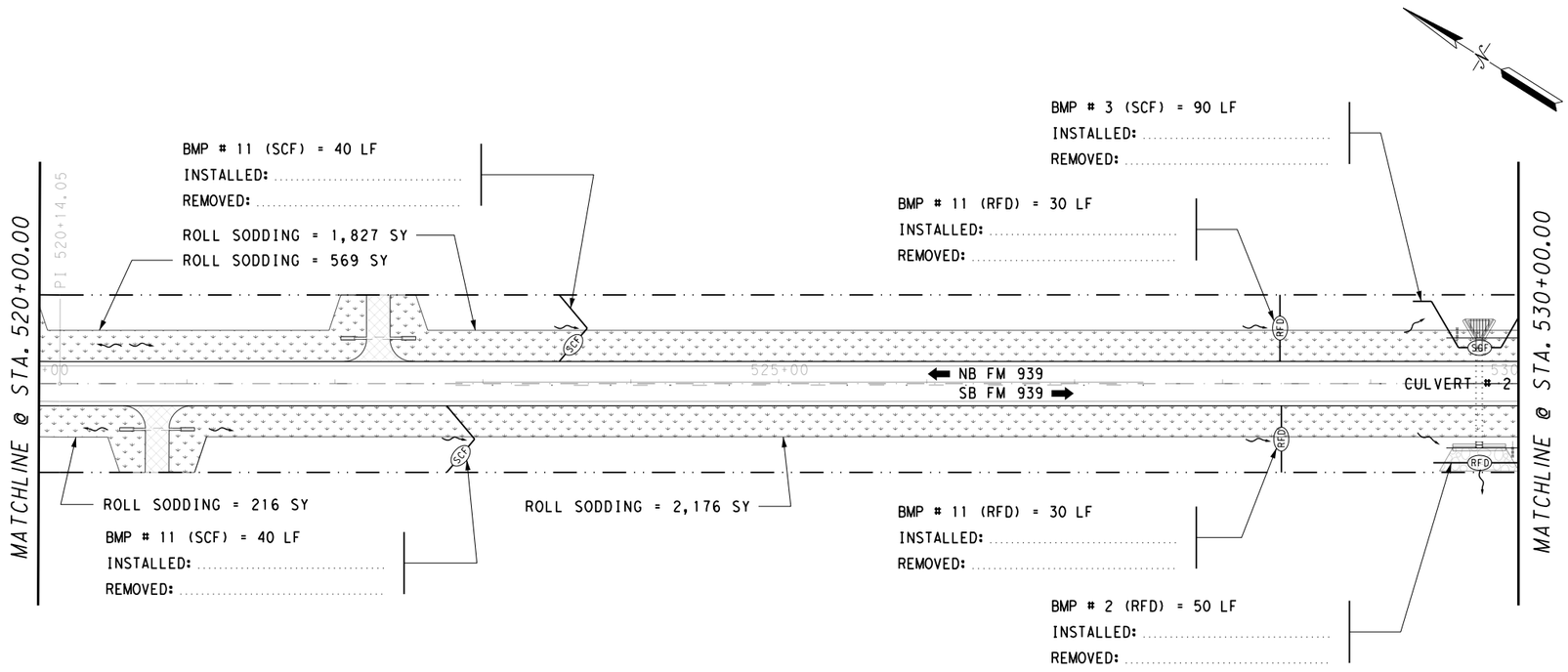
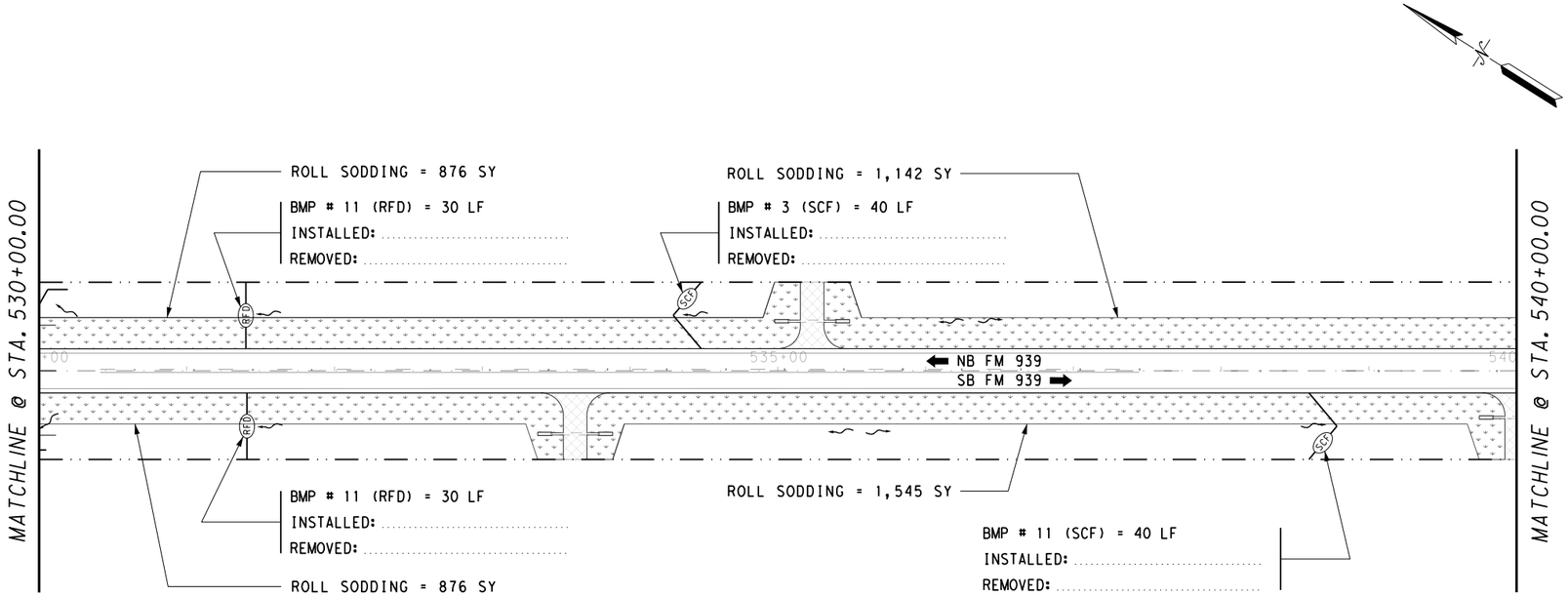




ITEM	DESCRIPTION	UNIT
162 6008	ROLL SODDING	9,227 SY
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	170 LF
506 6001	ROCK FILTER DAMS (REMOVE)	170 LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	250 LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	250 LF

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

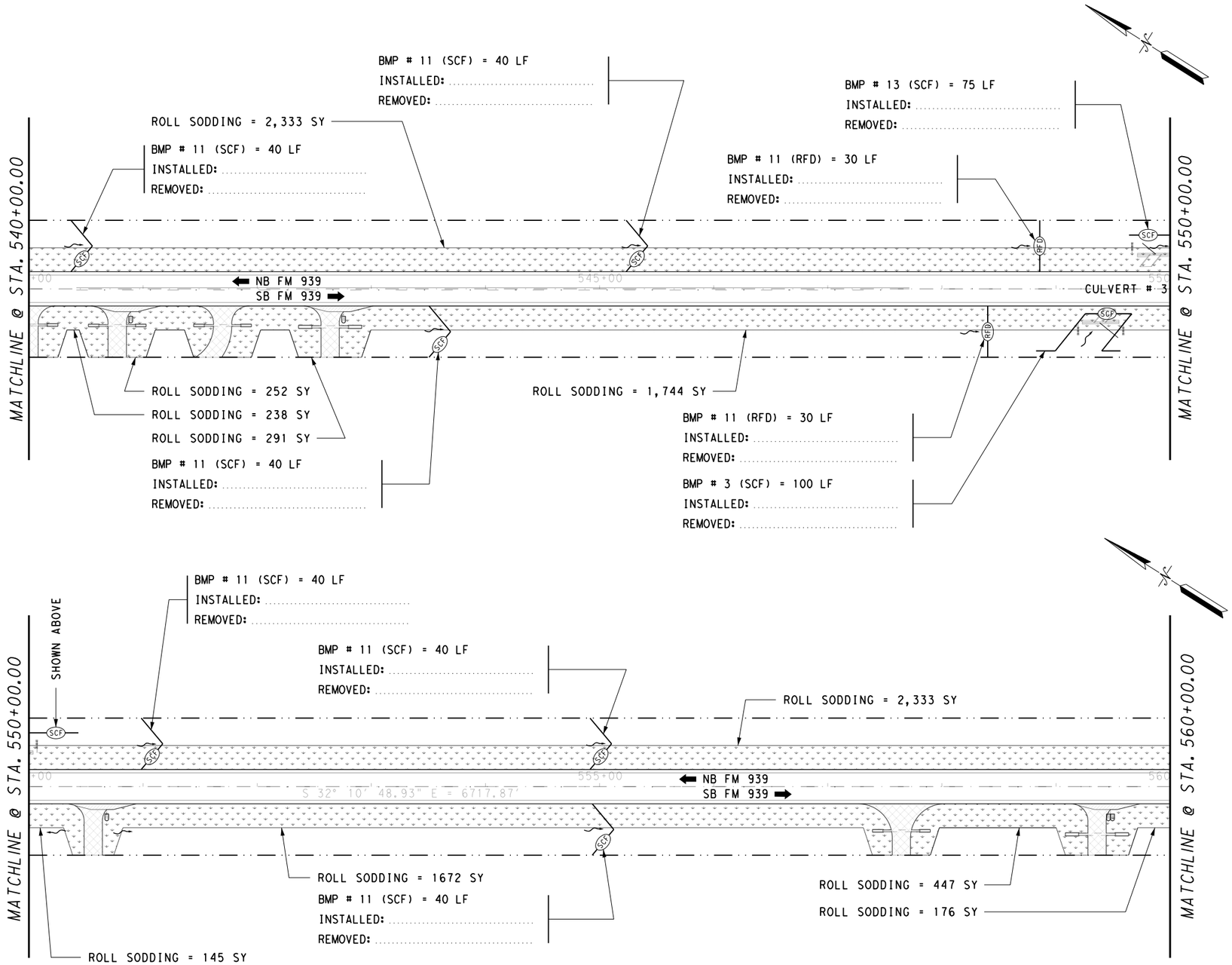
Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

SW3P LAYOUT

FROM STA. 520+00.00 TO STA. 540+00.00
CSJ: 1192-01-027

SCALE: FEET
1" = 100.0' HORIZ.

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		178



ITEM	DESCRIPTION	UNIT
162 6008	ROLL SODDING	9,631 SY
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	60 LF
506 6001	ROCK FILTER DAMS (REMOVE)	60 LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	415 LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	415 LF

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022

SIGNATURE OF REGISTRANT & DATE

SW3P LAYOUT

FROM STA. 540+00.00 TO STA. 560+00.00
CSJ: 1192-01-027

SCALE: 1" = 100.0' HORIZ. FEET

SHEET 3 OF 11

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		179

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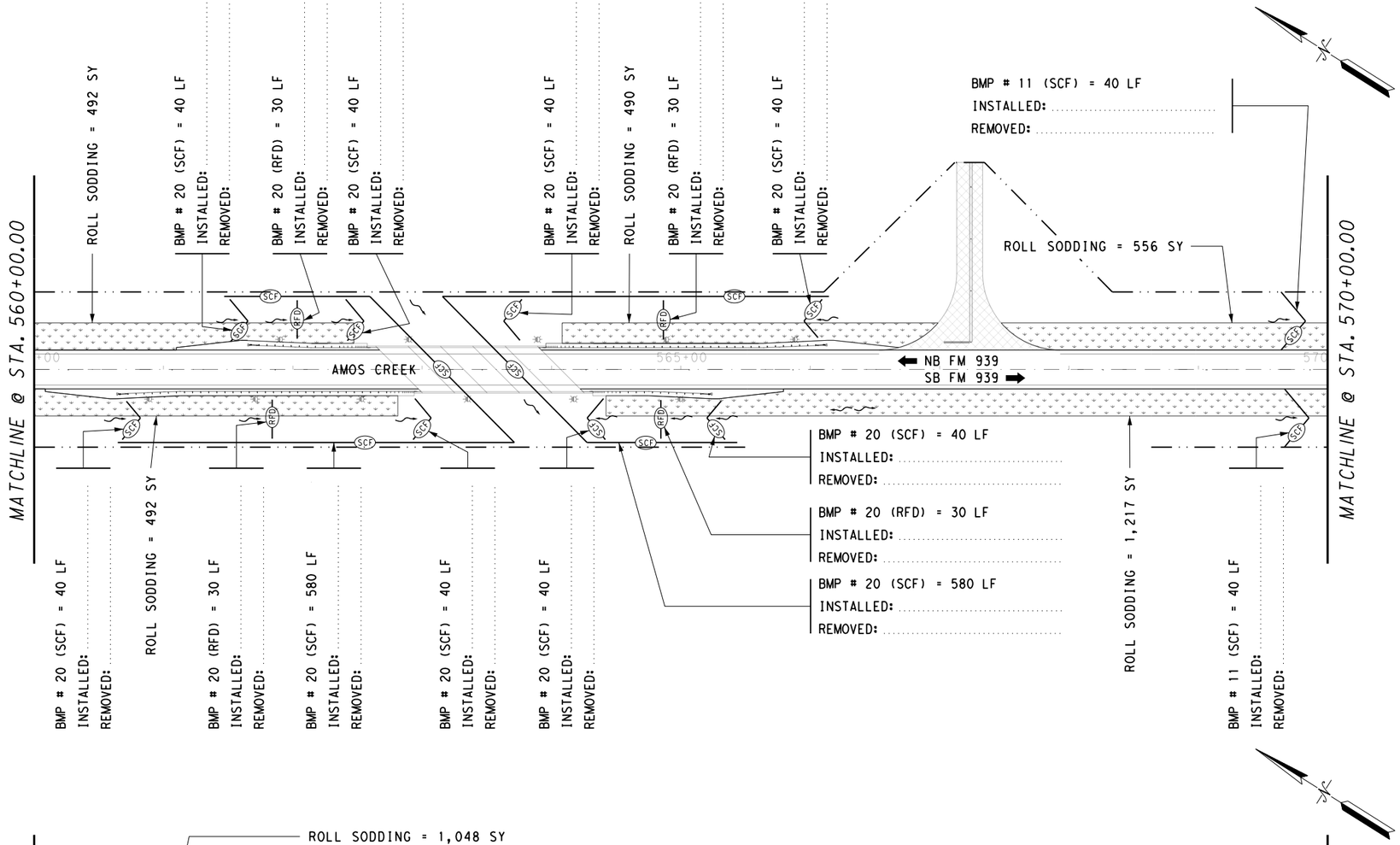

ITEM	DESCRIPTION	UNIT
162 6008	ROLL SODDING	8,016 SY
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	190 LF
506 6001	ROCK FILTER DAMS (REMOVE)	190 LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	1,720 LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	1,720 LF

STATE OF TEXAS
BRADLEY MAYES
128276
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Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

SW3P LAYOUT

FROM STA. 560+00.00 TO STA. 580+00.00
CSJ: 1192-01-027

SCALE: 1" = 100.0' HORIZ. FEET

SHEET 4 OF 11

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		180

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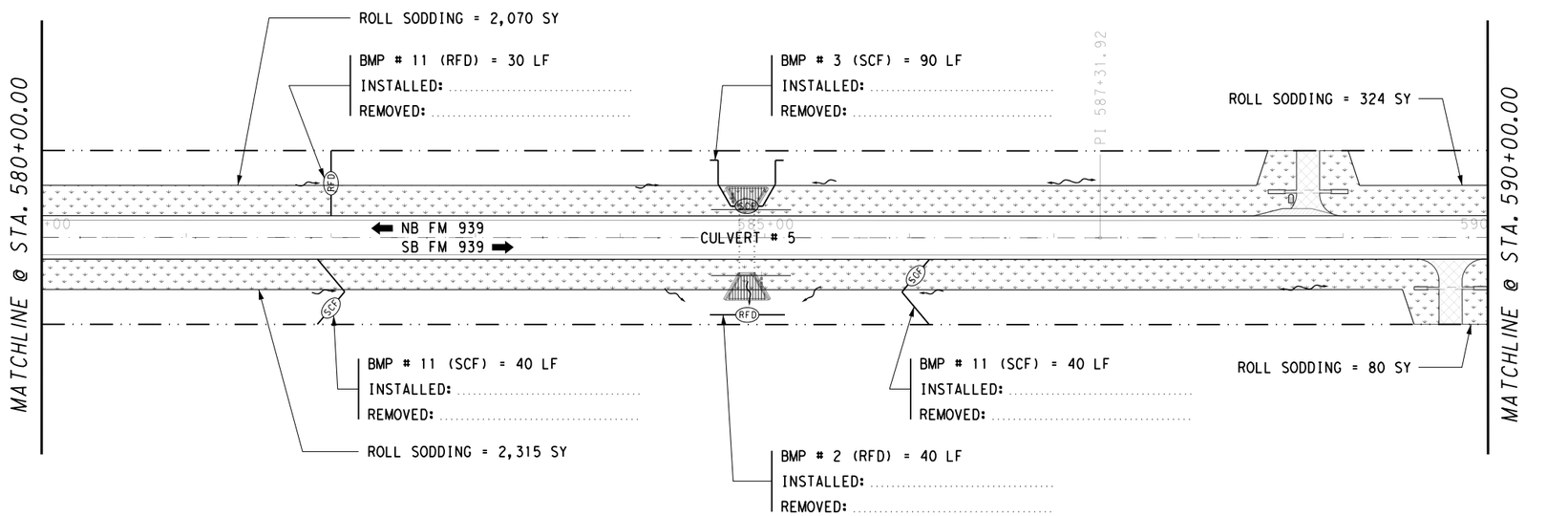
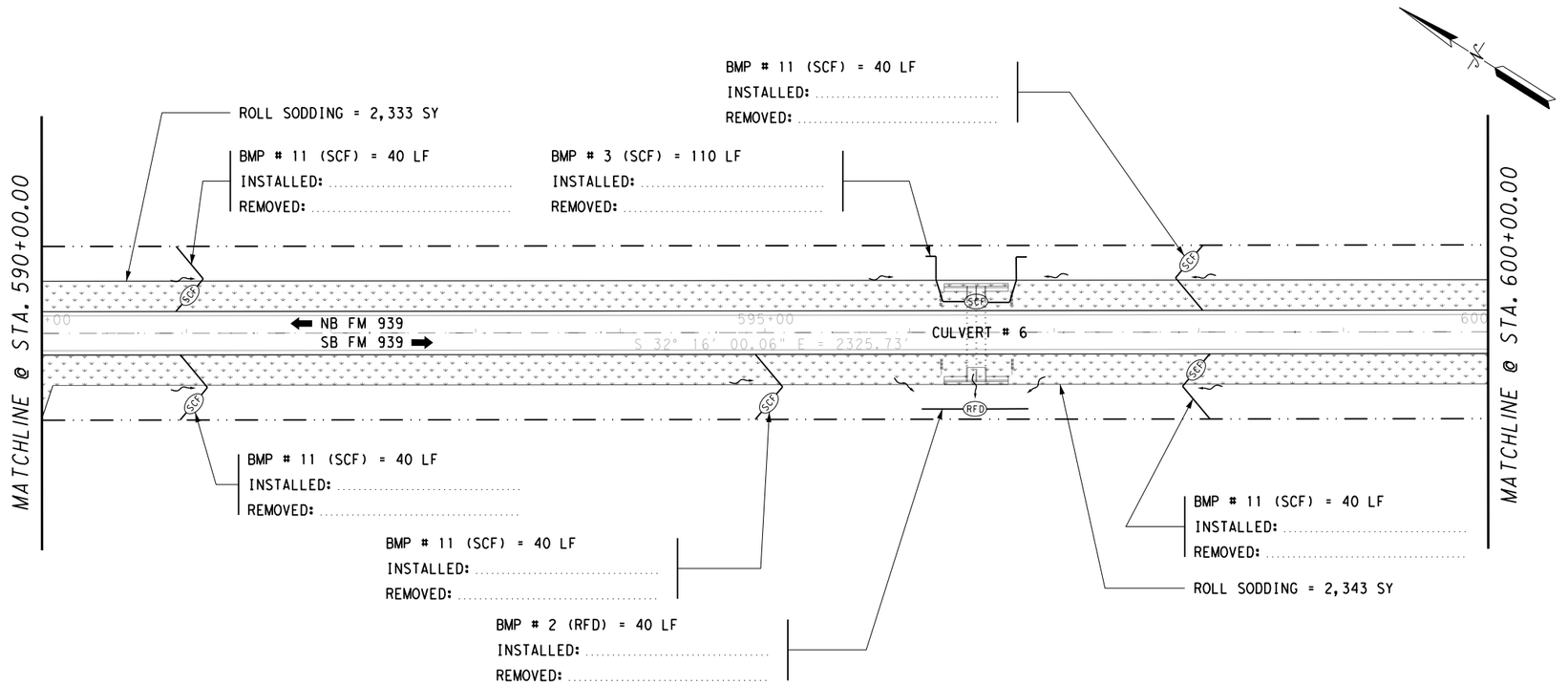




ITEM	DESCRIPTION	UNIT
162 6008	ROLL SODDING	9,465 SY
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	110 LF
506 6001	ROCK FILTER DAMS (REMOVE)	110 LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	480 LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	480 LF

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

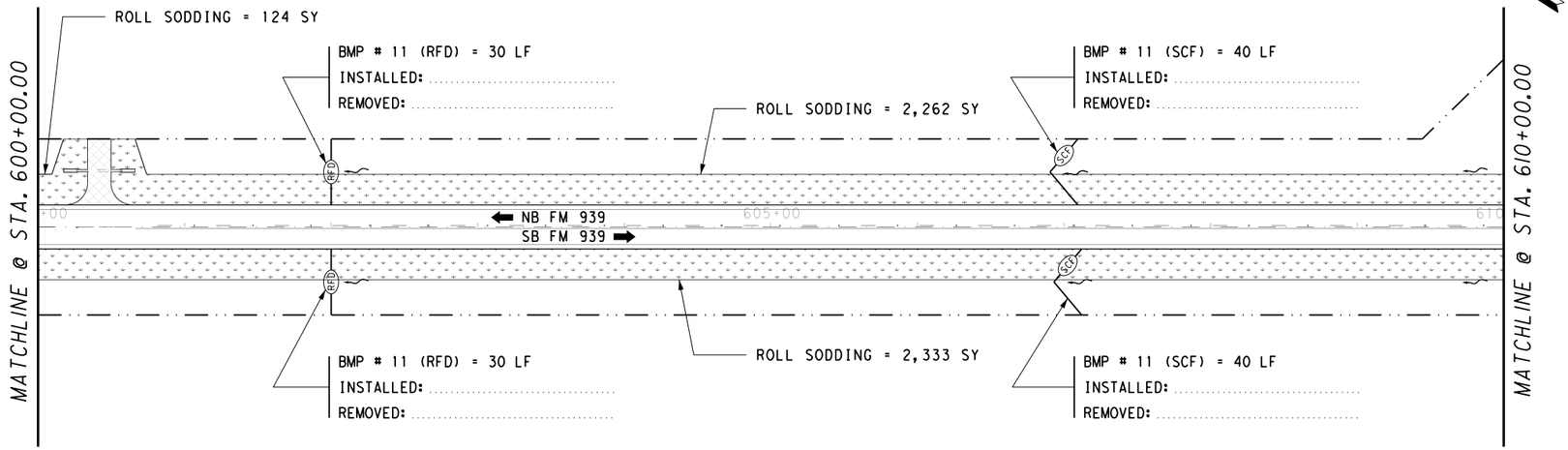
Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

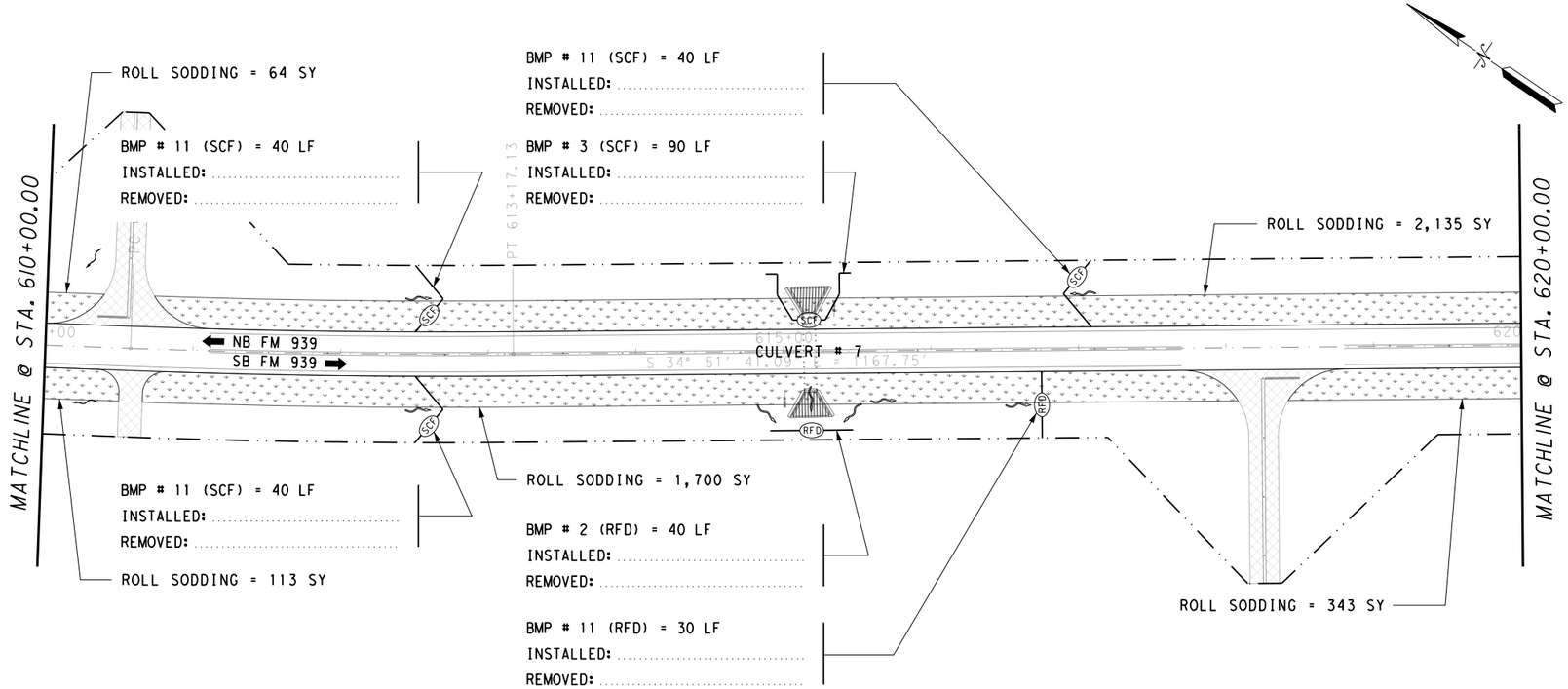
SW3P LAYOUT

FROM STA. 580+00.00 TO STA. 600+00.00
CSJ: 1192-01-027

SCALE: FEET
1" = 100.0' HORIZ.

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		181





ITEM	DESCRIPTION	UNIT
162 6008	ROLL SODDING	9,074 SY
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	130 LF
506 6001	ROCK FILTER DAMS (REMOVE)	130 LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	290 LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	290 LF

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

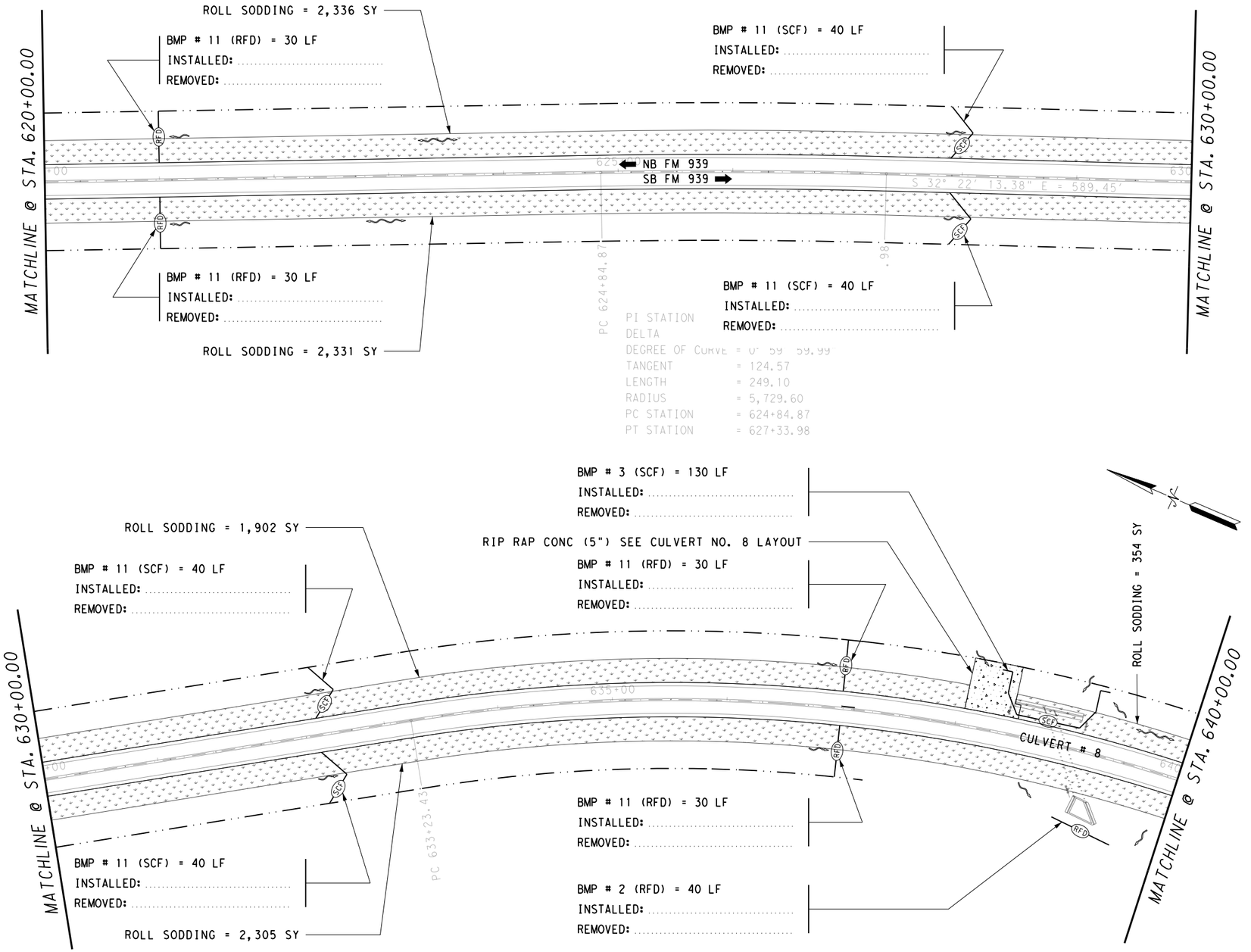
Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

SW3P LAYOUT

FROM STA. 600+00.00 TO STA. 620+00.00
CSJ: 1192-01-027

SCALE: FEET
1" = 100.0' HORIZ.

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		182



ITEM	DESCRIPTION	UNIT
162 6008	ROLL SODDING	9,228 SY
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	160 LF
506 6001	ROCK FILTER DAMS (REMOVE)	160 LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	290 LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	290 LF

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022

SIGNATURE OF REGISTRANT & DATE

SW3P LAYOUT

FROM STA. 620+00.00 TO STA. 640+00.00
CSJ: 1192-01-027

SCALE: FEET
1" = 100.0' HORIZ.

SHEET 7 OF 11

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
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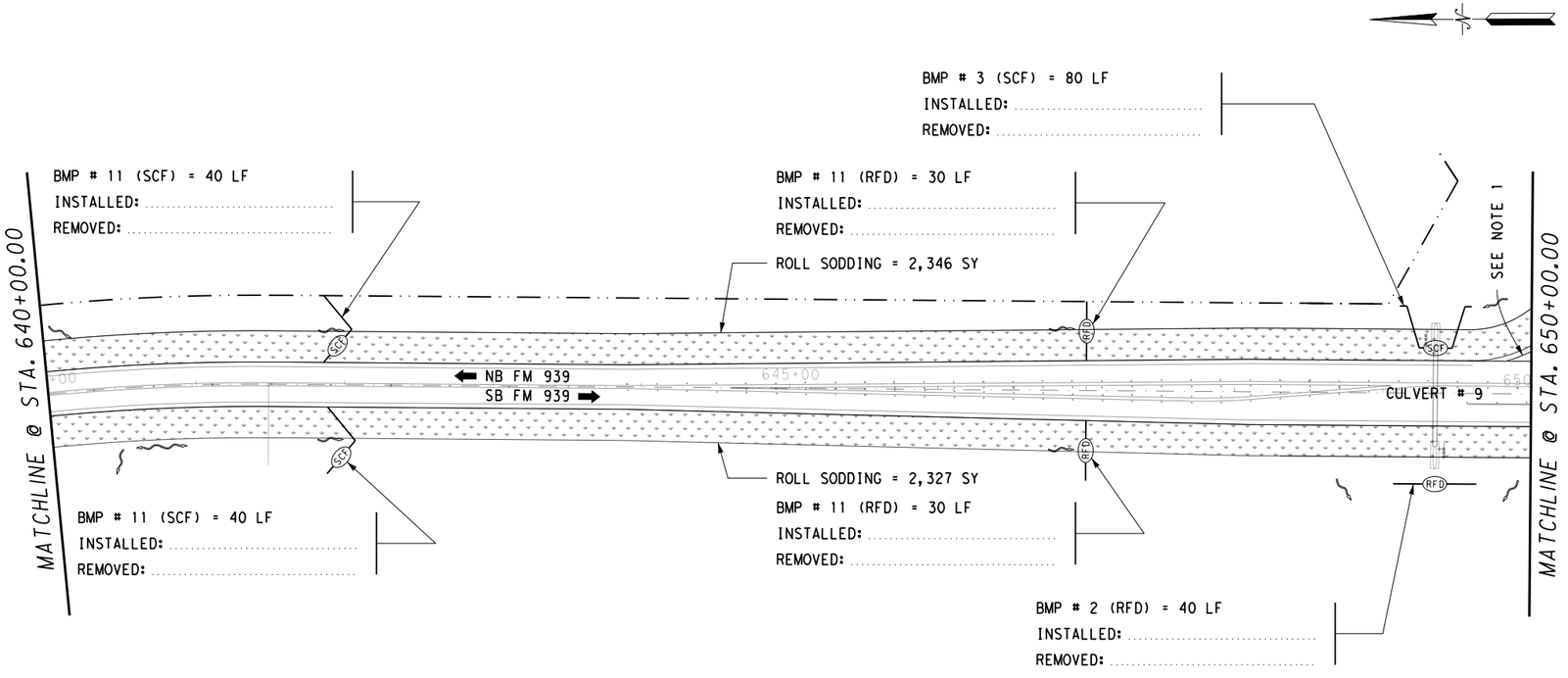

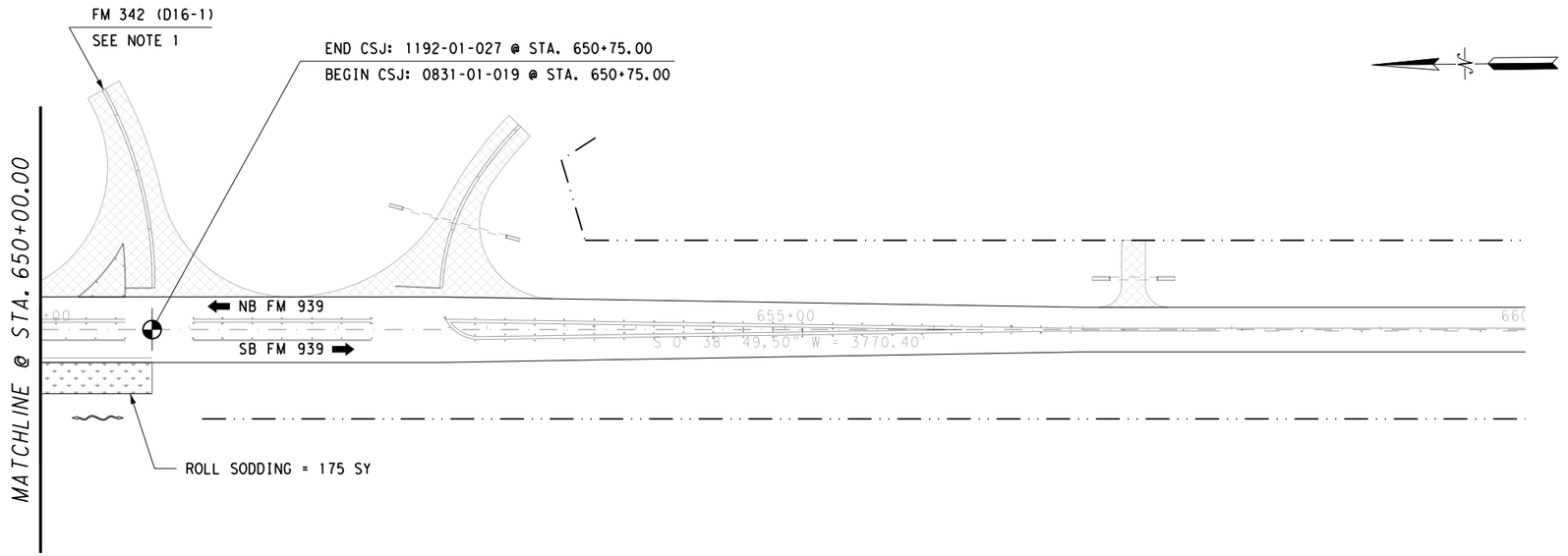

NOTES:

1. THE INTERSECTION OF FM 342 (D16-1) WILL BE PAID UNDER CSJ: 0831-01-019

ITEM	DESCRIPTION	UNIT
162 6008	ROLL SODDING	4,848 SY
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	100 LF
506 6001	ROCK FILTER DAMS (REMOVE)	100 LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	160 LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	160 LF

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

SW3P LAYOUT

FROM STA. 640+00.00 TO STA. 650+75.00
CSJ: 1192-01-027

SCALE: FEET
1" = 100.0' HORIZ.

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		184

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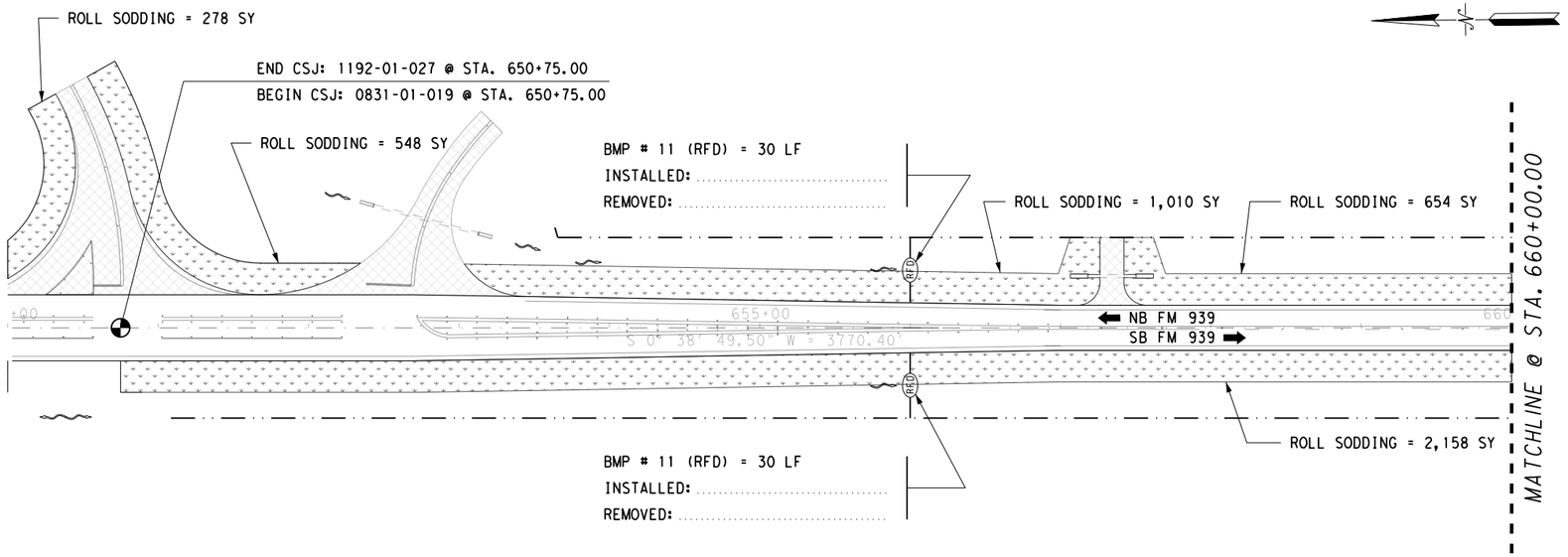

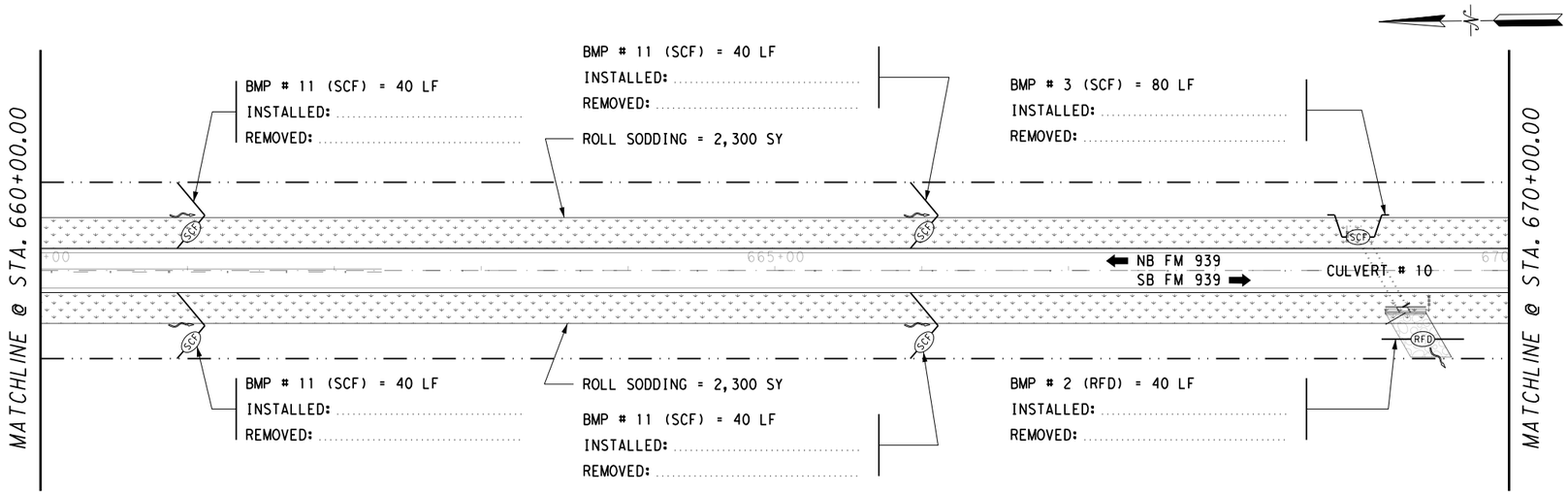

NOTES:

ITEM	DESCRIPTION	UNIT
162 6008	ROLL SODDING	9,248 SY
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	100 LF
506 6001	ROCK FILTER DAMS (REMOVE)	100 LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	240 LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	240 LF

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022

SIGNATURE OF REGISTRANT & DATE

SW3P LAYOUT

FROM STA. 650+75.00 TO STA. 670+00.00
CSJ: 0831-01-019

SCALE: FEET
1" = 100.0' HORIZ.

SHEET 9 OF 11

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		185

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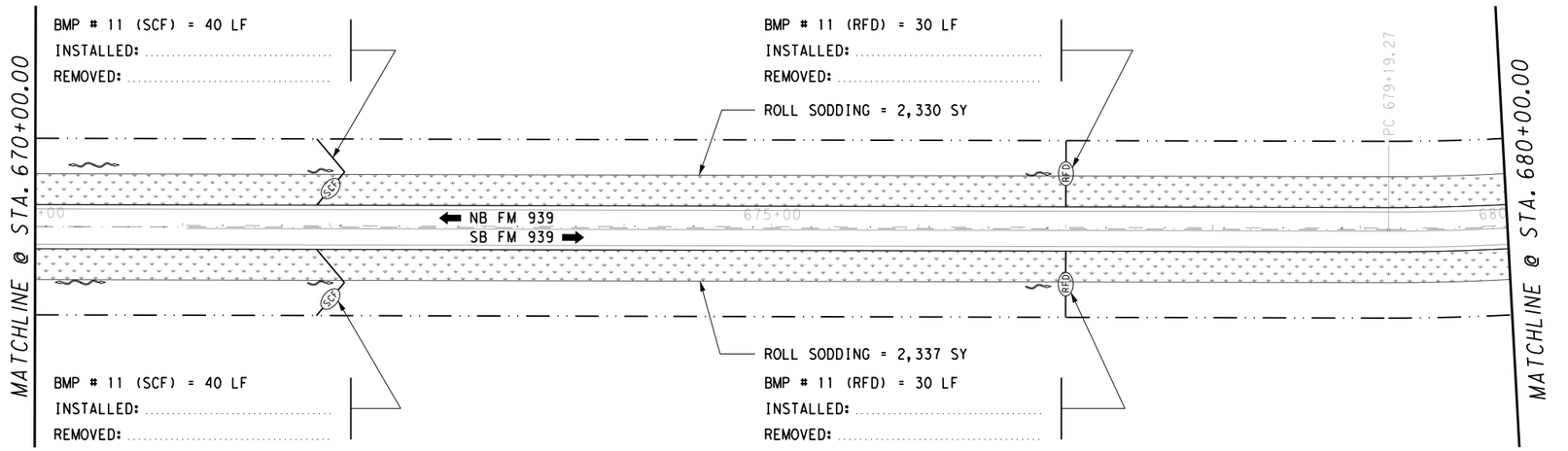

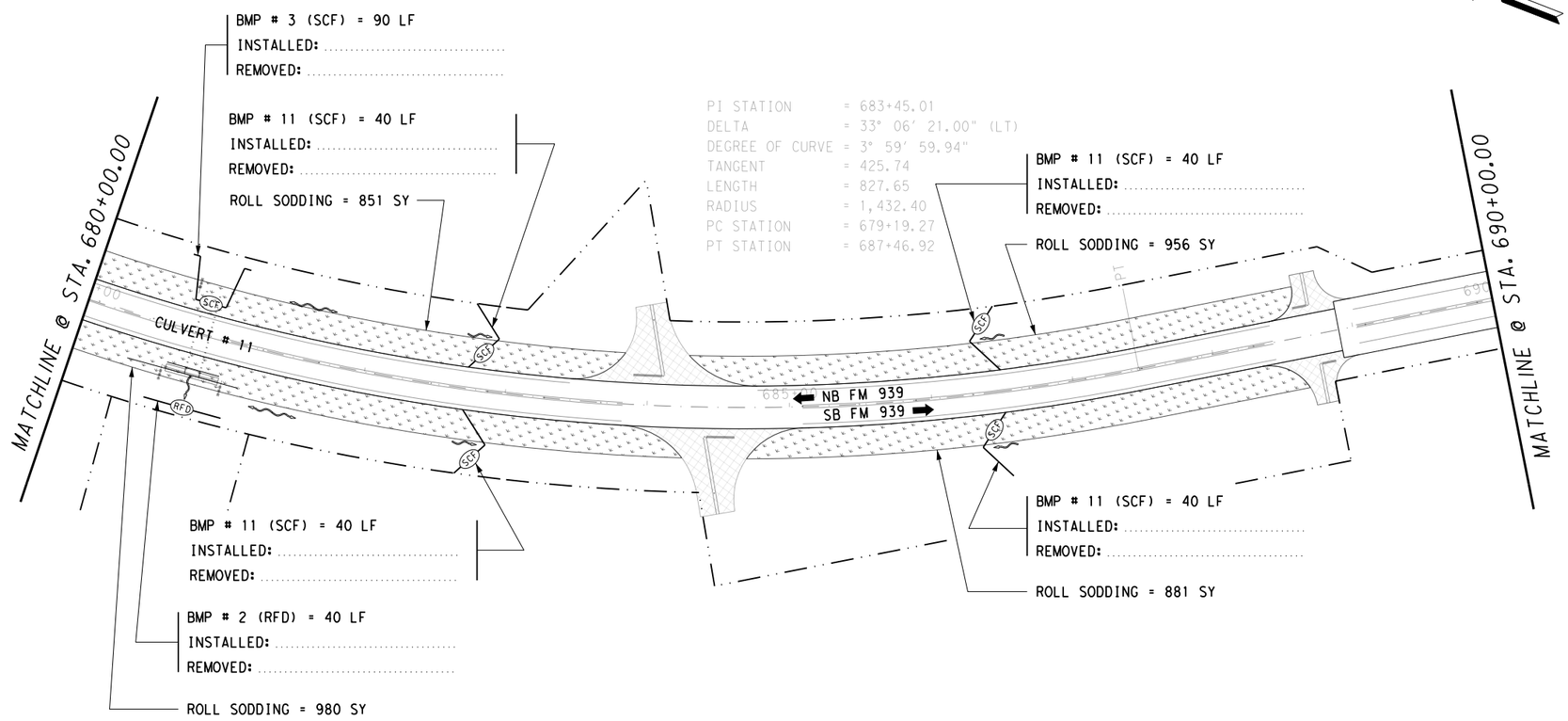

ITEM	DESCRIPTION	UNIT
162 6008	ROLL SODDING	8,335 SY
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	100 LF
506 6001	ROCK FILTER DAMS (REMOVE)	100 LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	330 LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	330 LF

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022
SIGNATURE OF REGISTRANT & DATE

SW3P LAYOUT

FROM STA. 670+00.00 TO STA. 690+00.00
CSJ: 0831-01-019

SCALE: 1" = FEET HORIZ.

SHEET 10 OF 11

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		186

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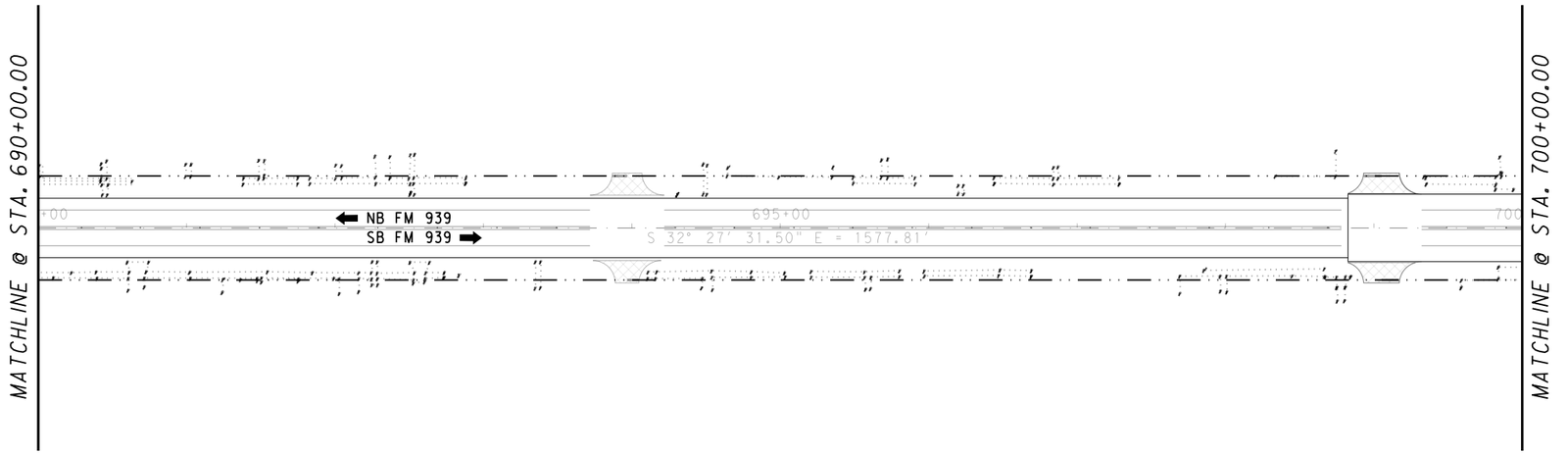
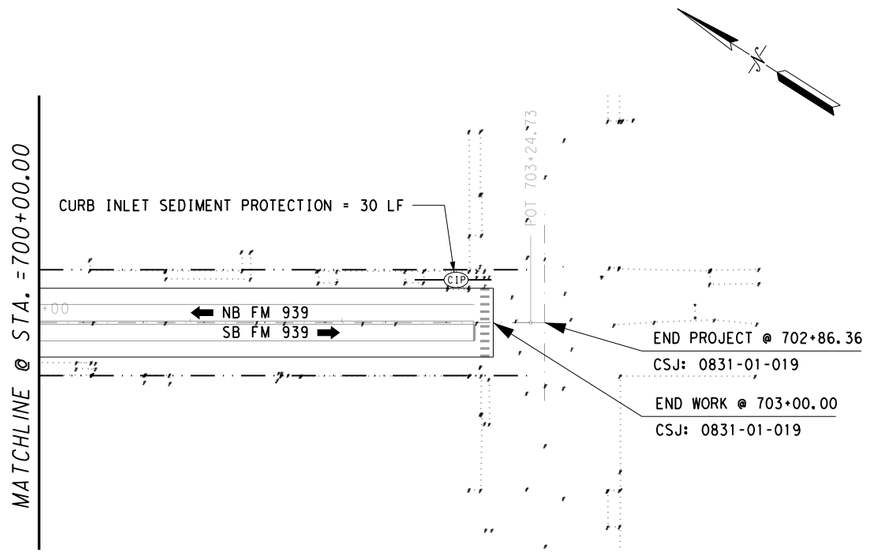




ITEM	DESCRIPTION	UNIT
7012 6001	CURB INLET SEDIMENT PROTECTION	30 LF

STATE OF TEXAS
BRADLEY MAYES
128276
LICENSED
PROFESSIONAL ENGINEER

Bradley Mayes 4/15/2022

SIGNATURE OF REGISTRANT & DATE

SW3P LAYOUT

FROM STA. 690+00 TO STA. 703+27.73
CSJ:0831-01-019

SCALE: 1" = 100.0' HORIZ. FEET

SHEET 11 OF 11

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	0831	01	019, ETC.	FM 939
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WAC	MCLENNAN		187

4' minimum steel or wood posts spaced at 6' to 8'.
Softwood posts shall be 3" minimum in diameter or nominal 2" x 4".
Hardwood posts shall have a minimum cross section of 1.5" x 1.5"

Connect the ends of the successive reinforcement sheets or rolls a minimum of 6 times with hog rings.

Fasten fabric to the top strand of the wire using hog rings or cord at a maximum spacing of 15".

Attach the wire mesh and fabric on end posts using 4 evenly spaced staples for wooden posts (or 4 T-Clips or sewn vertical pockets for steel posts).

Galvanized welded wire mesh (W.W.M.) (12.5 GA. SWG Min.) with a maximum opening size of 2"x 4"or Woven Mesh (W.M.)(See woven mesh option detail)

Woven filter fabric

FLOW

FLOW

2"

90°

A

A

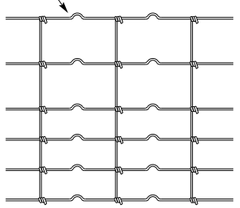
Place 4" to 6" of fabric against the trench side and approximently 2" across the trench bottom in the upstream direction.

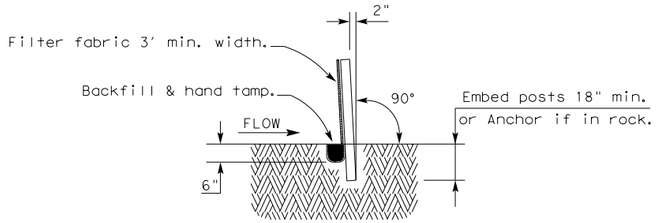
Minimum trench size shall be 6" square. Backfill and hand tamp.

TEMPORARY SEDIMENT CONTROL FENCE

SCF

Top of Fence





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.

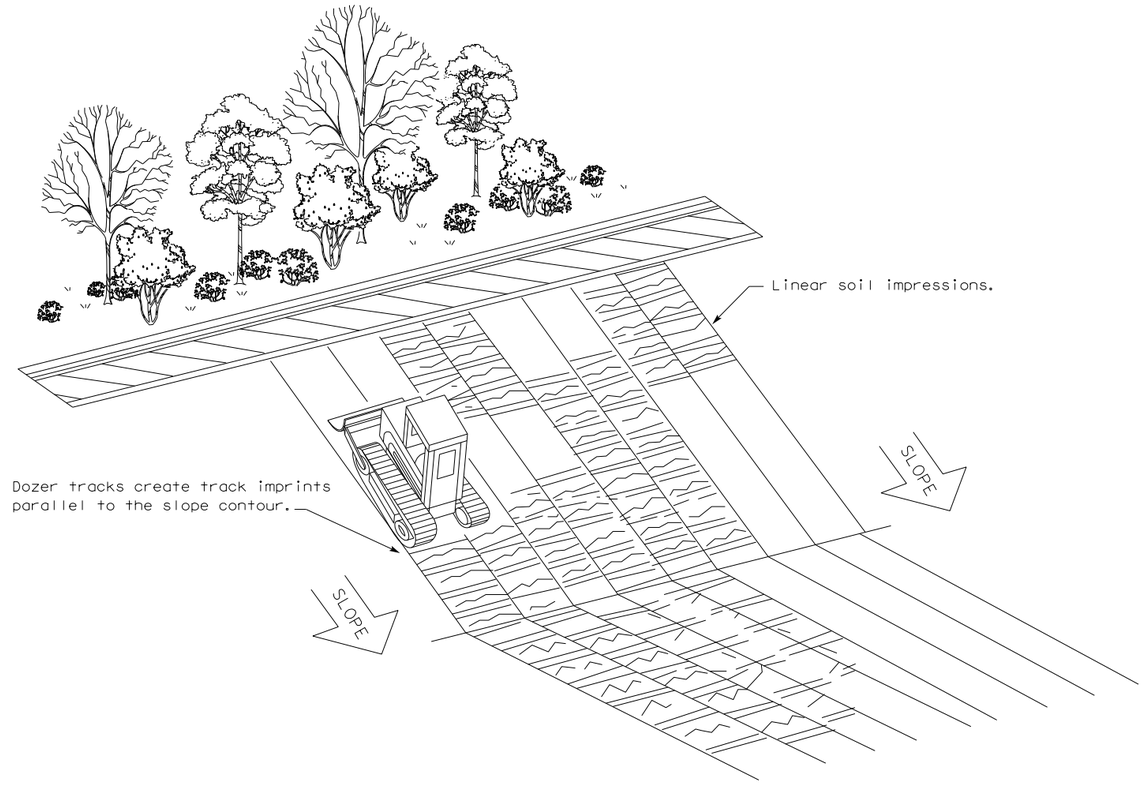
LEGEND

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	0831	01	019, ETC.		FM 939		
	DIST	COUNTY					SHEET NO.
	WAC	MCLENNAN					188

4/15/2022
dwillis@txdot.projectwiseonline.com:TXDOT3\Documents\09 - WAC\Design Projects\083101019\4 - Design\Plan Set\9. Environmental\Standards\ec116.dgn

DATE: 4/15/2022
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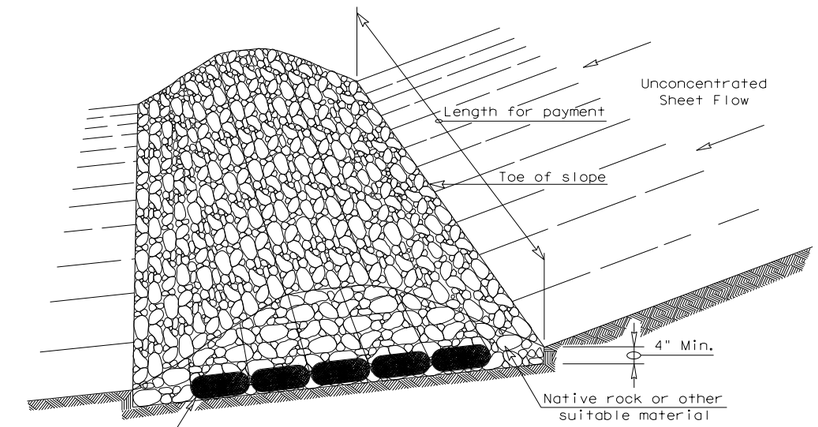
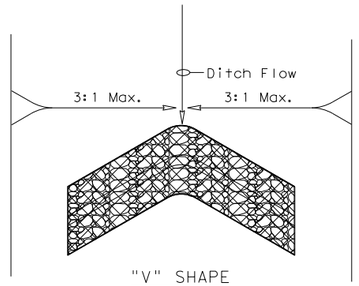
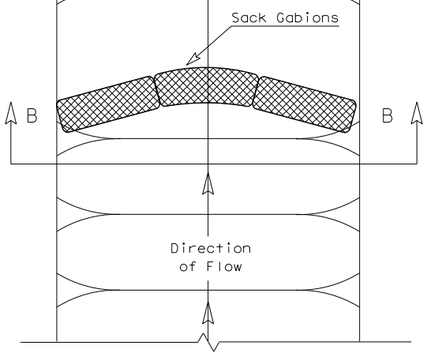


FILTER DAM AT TOE OF SLOPE

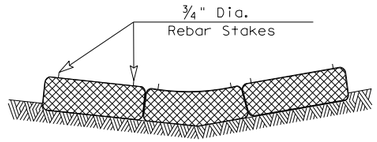
RFD1



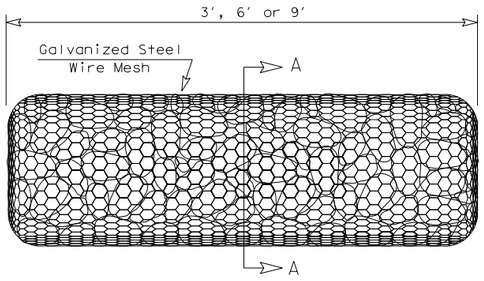
"V" SHAPE
PLAN VIEW



PLAN VIEW

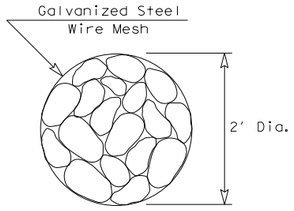


SECTION B-B

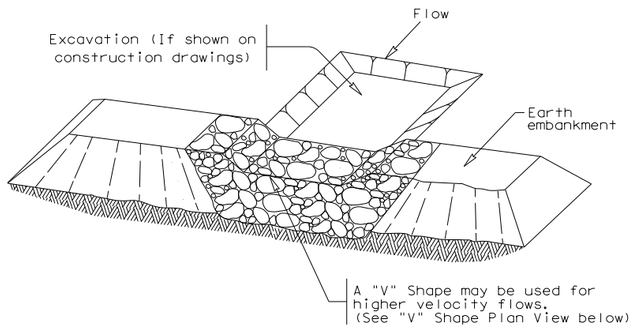


TYPE 4 (SACK GABIONS)

RFD4

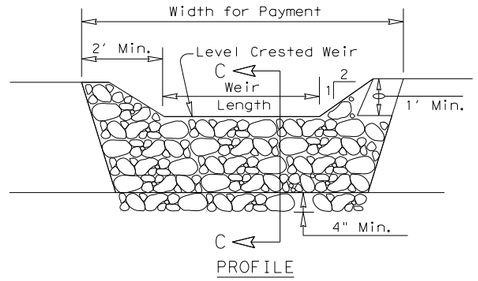


SECTION A-A

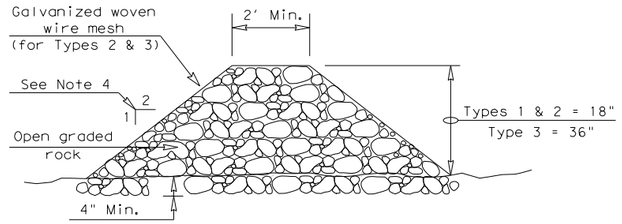


FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2



PROFILE



SECTION C-C

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

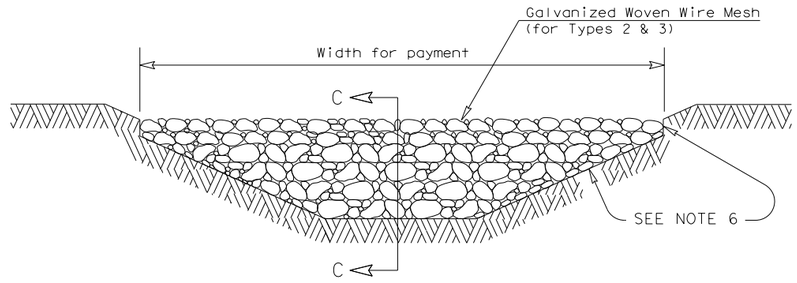
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3
Type 4 Rock Filter Dam — RFD4

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		189

DATE: 4/15/2022
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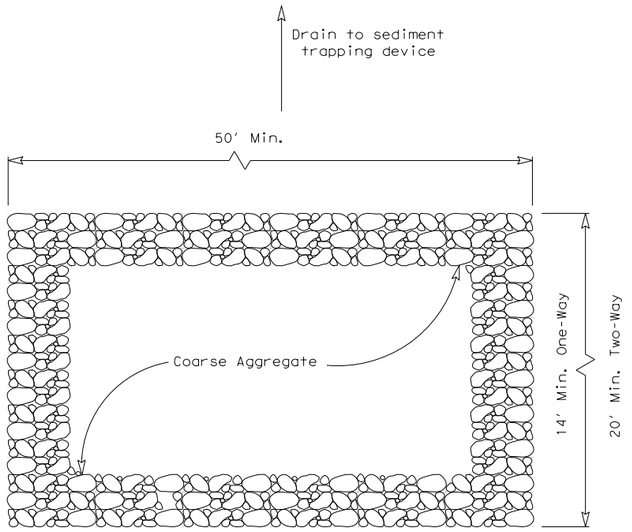
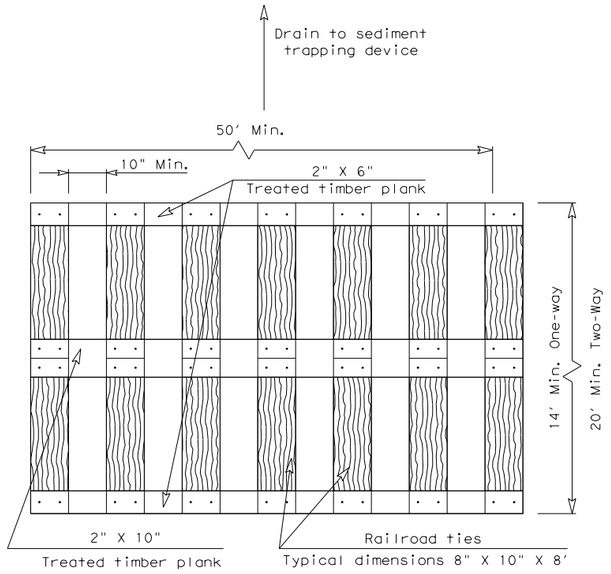


PLAN VIEW



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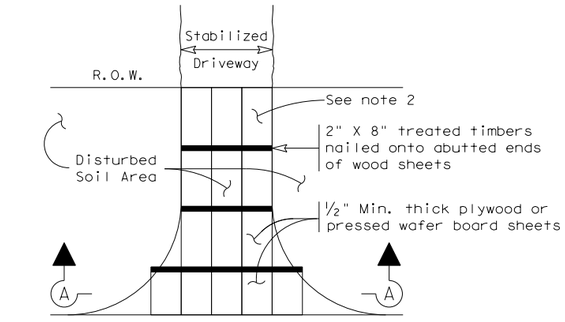

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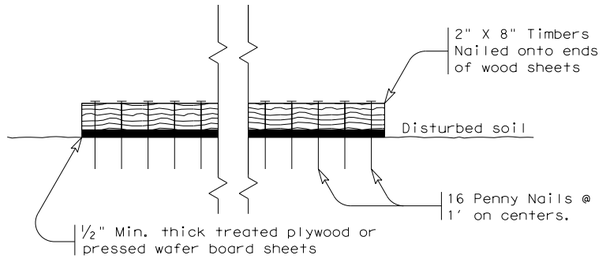
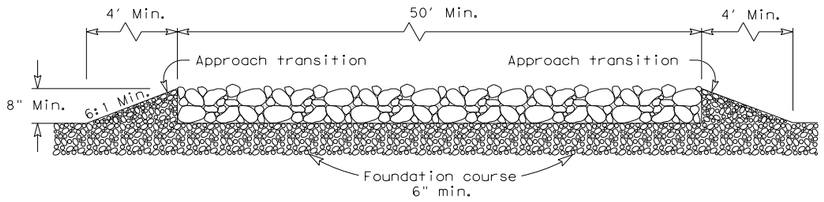


SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

SHORT TERM



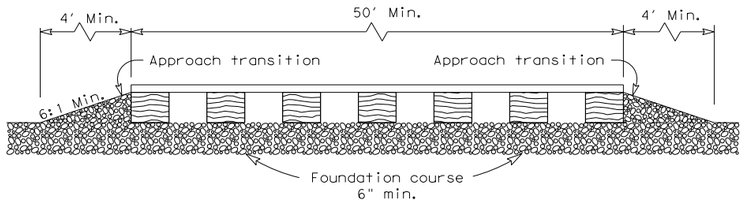
ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50′.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50′.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0831	01	019, ETC.	FM 939
	DIST	COUNTY		SHEET NO.
	WAC	MCLENNAN		190

BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

1. Prior to TxDOT allowing the Contractor to start construction, the Contractor will provide the required storm water and 404 permit documentation and support activities, including but not limited to the following:

   - Provide a list of all chemicals, construction and waste products that will be generated, stored or brought upon TxDOT ROW. The list includes expected construction debris, sanitary wastes, construction chemicals and petroleum products used or generated by the Contractor and sub-contractors. Along with the list, the Contractor will supply a spill prevention plan and clean up procedures that will include each of these chemical products or generated waste.

   - Provide in the construction schedule the necessary line items that will comply with the schedule and planning requirements of the storm water permit.

   - Post the TxDOT storm water permit and any Contractor permits, per permit requirements.

   - Provide copies of storm water permits for Contractor PSL(s). As new PSL(s) may be obtained for the project, provide copies of new or amended permits to TxDOT. The Contractor will not disturb soil without the proper permits.

   - Provide scale drawings of off ROW PSL's within one mile of the project, for field offices, borrow sources, plant sites or other uses.

   - Provide permit information on any Contractor batch plants or concrete crushing plants to be located at a Contractor PSL(s) within one mile of the project limits or boundaries. Copies of the air and water permits are to be provided to TxDOT before materials will be used on the project. No asphalt or concrete batch plants or concrete crushing plants will be located on TxDOT ROW.

   - Provide a letter indicating a Contractor Responsible Person for environmental compliance (CRP) for the project, and maintain a CRP throughout the project duration.

   - Provide all environmental documentation including certification of compliance and EMS training documents/certificates prior to starting work. The Contractor is to provide daily BMP inspection reports that document all field BMPs needing repair or replacement. The Contractor is to clearly document specific BMPs needing repair and location each work day. The Contractor is encouraged to be proactive in fixing BMPs without TxDOT direction.

   - Provide documentation required for Waters of the US, Note #3 and submittals for Item 496 bridge removal. Bridge removal methods submitted will follow all Waters of the US note requirements. The Contractor is not to start construction within the Ordinary High Water Marks of any stream until receiving approval for stream channel construction methods from TxDOT.

   - Provide a written procedure for managing all chemicals and construction items placed in vertical containment structures. Also, provide methods to be used for the treatment, disposal, collection or release of storm water.

   - Provide an estimated date by letter, for the submittal of marked up bridge drawings, indicating cut locations for any structural steel requiring cutting or torching of steel, coated with lead containing paints.

2. Place and maintain trash cans and portable sanitary facilities at locations where there is active construction. Worker generated trash and construction debris will be kept from being transported by storm water and will be collected daily from the ground and routinely hauled from the work area.

3. Contractor will provide TxDOT copies of all correspondence with MS4s, TCEQ, EPA, DSHS and Corps of Engineers regarding activities on this project.

4. Contractor to conduct storm water inspections and develop SWPPP documents to support Contractor permits obtained for the project including PSL(s).

5. Contractor will maintain written documentation of locations of all portable sanitary facilities. The Contractor is required to document the location and disposition of all spills and cleanups from portable sanitary facilities.

6. Contractor will not store chemicals on TxDOT ROW, unless chemicals are stored following all environmental and safety regulations. Fuels for construction equipment will not be stored on TxDOT ROW.

7. The Contractor will store fuels and bulk chemicals on Contractor PSL(s) using a secondary containment method, such as double lined tanks and/or free standing containment reservoirs made of plastic or steel designed to hold bulk chemicals or drums.

8. The Contractor will not remove sediment controls without the prior approval of TxDOT, except for a sediment control that may back up water and cause safety or traffic problems.

SCALE = NTS SHEET 1 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

FILE: BMPLAYOUTS.dgn	DN:		CK:	DW:		CK:
© TxDOT 2009	CONT	SECT	JOB		HIGHWAY	
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DEC 2013	DIST	COUNTY				SHEET NO.
FEB 2015	WAC	MCLENNAN				191

BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

9. Any sediment controls removed by the Contractor must be re-installed before the next rainfall event or by the end of day, as approved in advance.

10. Vegetative buffer strips may be used in place of temporary sediment controls such as silt fences and rock filter dams. The amount of disturbed soil area will be limited to 1/3 of an acre or less for a minimum of 50 feet of grassed ditch and 2/3 of an acre of disturbed soil for a minimum of 100 feet of grassed ditch.

11. Construction equipment found to be leaking oil, fuel or coolant will be immediately stopped, the leaking fluid collected and the equipment fixed. Equipment continuing to leak will be removed from the project at no cost to TxDOT. Leaking fluids from equipment will be collected and removed from the project or PSL.

12. Earth berms or mounds typically used to stockpile topsoil and used in place of boundary silt fence will be seeded upon being constructed. Long term use of earth berms or mounds will not be continued without establishing grass on the control.

13. The Contractor will inform TxDOT of new areas where soil will be disturbed to facilitate planning for new sediment controls. Areas of vegetated soil will not be disturbed by the Contractor, unless adequate sediment controls can be installed before the next rainfall event. The Contractor will assist TxDOT in keeping an accurate set of working SWPPP drawings that show the locations of all temporary sediment and erosion controls.

14. The Contractor will maintain an adequate amount of temporary sediment controls on hand at the field office or project staging area for critical SWPPP maintenance, including silt fence (minimum of 200 feet) and rock / fabric for rock filter dams (minimum for 100 feet of Type III dams).

    The requirement for BMP rock quantities on hand is waived for small projects for on and off system bridge installations. The Contractor having a BMP Subcontractor does not eliminate the requirement for the Contractor to have the required silt fence and rock on hand, typically stored at the Contractor PSL.

15. Failure of a sub-contractor to complete storm water work on time will require the Contractor to start storm water sediment control work immediately and complete the work with high priority, or be subject to stop work on the entire project.

16. Earth materials on roads as a result of soil tracking will not be allowed to be transported off ROW in storm water. Soil or rock material found on roadways deposited from Contractor equipment will be removed daily.

17. Unless approved, completed concrete curb inlets will not be blocked by sediment controls. The contractor will frequently sweep the completed or partially completed roadway to keep sediment out of drainage pipes.

18. The Contractor will be responsible for proper dust control and will route construction traffic in a manner that minimizes dust generation.

19. Water for dust control will contain no pollutants, but may be non-potable from upland stock ponds. No quantity of water to be used for construction purposes may be taken from a 404 stream, prior to the proper authorizations or permits being obtained by the Contractor.

20. Contractor is to direct workers and sub-contractors to use portable sanitary facilities provided by the Contractor and not to trespass off ROW.

21. Contractor will provide written verification to TxDOT that earth borrow pits and disposal sources meet environmental and regulatory requirements, prior to use. Excavations will meet all OSHA requirements and the current safety guidelines established for TxDOT Quarries and Pits.

22. Boundary silt fences that are terminated down slope, with one end being at the lowest elevation, will be installed with an L - hook to contain sediment. Boundary silt fences that are installed on flat ground will have L-hooks on both ends.

23. Rock filter dams across ditches will be constructed where the rock filter dam ends are embedded within the ditch side slopes and ditch bottom. The top center elevation of the rock filter dam will be at least 6 inches lower than the elevations on the rock filter dam ends.

24. Silt fence will be constructed in a U or V pattern across ditch lines and up the ditch side slope to keep storm water from flowing around the ends of the silt fence. Small silt fences that do not adequately span the ditch and allows storm water around the end(s) will not be used. Where there is adequate space, large U pattern silt fences are preferred to facilitate sediment collection and sediment removal with equipment.

25. Sediment controls (RFDs or silt fences) will be located along road ditches as marked on the SWPPP drawings. Modifications to the sediment control spacing will be adjusted during the project based on sediment control effectiveness. The installation and maintenance of sediment controls at or near outfalls, where storm water leaves TxDOT ROW, takes persistent over ditch line sediment controls.

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

FILE: BMPLAYOUTS.dgn	DN:		CK:	DW:		CK:
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REVISIONS	0831	01	019, ETC.		FM 939	
DEC 2013	DIST		COUNTY		SHEET NO.	
FEB 2015	WAC		MCLENNAN		192	

BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

26. Storm water draining sheet flow over disturbed soil sloped towards the ROW property line, will be intercepted by a boundary silt fence typically installed with L-shaped ends.

27. For ditch grading and shoulder up work, the Contractor is limited during good weather to remove up to one mile (limited to five acres of disturbed soil) of ditch line sediment controls; on one side of the roadway. Outfall controls cannot be removed during this activity. Ditch line controls must be replaced upon completion of work and before the next rain event.

28. Sediment controls damaged by the Contractor, as defined by permit, must be fixed or replaced immediately upon discovery.

29. Notches in silt fences are not typically allowed. Specific silt fences that back up water onto lanes of traffic may be notched if approved.

30. For silt fence maintenance, the Contractor will leave approximately 4 inches of deposited sediment up stream of silt fences and not over excavate around silt fences or rock filter dams.

31. The Contractor will inform TxDOT of new construction areas and where soil is planned to be disturbed. Sediment controls will be installed at outfalls prior to the Contractor beginning soil disturbing activities up slope from the outfall.

32. Water from concrete saw cutting, concrete grinding and concrete coring activities; or fine materials from concrete chipping and salvage will not be allowed to enter storm drains or enter streams.

33. Storm water containing suspended sediment and turbidity needing to be removed from excavations or low areas will be pumped or gravity drained through vegetated buffer strips (50 foot minimum) or placed in ditches with temporary sediment controls, prior to the water being discharged into a stream.

34. Uncontaminated water from natural groundwater seepage, springs, foundations and drains that does not contain suspended sediment or any pollutants may be discharged without storm water controls.

35. Lime or cement if spilled in ditches or outside the defined limits of application is considered a pollutant and will be excavated and removed the same day, to avoid contaminating streams.

36. If located along the project ROW, RAP stockpiles will be located where there is a minimum 100 feet of vegetative buffer strip before storm water will reach a stream. RAP will not be used as a construction material within the Ordinary High Water Marks of a stream channel of a 404 designated stream.

37. If allowed on the project, concrete truck wash out areas will have adequate volume to allow 12 inch freeboard for rain and will be lined with 6 mils of plastic. No concrete will be stored higher than the 12 inch freeboard. Cleaning of truck chutes and equipment does not constitute concrete truck wash out and this activity may be completed at the concrete placement location. Wash out areas will not be located closer than 50 ft from down slope inlets or stream channels.

38. For outfalls near stock ponds closer than 50 foot from disturbed soil at the ROW line, redundant sediment controls will be provided, typically a combination of rock filter dam and a silt fence constructed in line of the flow.

39. Earth stockpiles will utilize silt fence sediment controls, positioned on the low end of the stockpile drainage area with L-hooks or silt fence installed around the entire stockpile.

40. Sediment controls including rock filter dams and silt fences will not be installed across any 404 streams. Sediment controls at 404 streams will be positioned to limit sediment entering the stream from the banks and around structures/culverts, and will allow free flow of storm water to pass through the ROW without being dammed by any sediment controls. Remove loose materials from stream channels prior to each rain event.

41. Sediment controls for non-404 streams may be constructed across the drainage channel in unlimited locations. It is appropriate to use sediment control details typically used for 404 streams for non-404 streams when flow velocities are high. Remove loose material from stream channels prior to each rain event.

42. Incomplete drainage pipe installation across the roadway does not remove the requirement for having sediment controls around the ends of the pipe. To stay within permit requirements, sediment controls should be installed over and around the terminated end and along each side of the banks as soon as construction on the pipe has been completed. Remove loose material from stream channels prior to each rain event.

43. Safety end / headwall construction temporarily will require the removal of part of the sediment control placed over and around the pipe end. Retain in place as much functioning sediment control as possible. Replace the silt fence over and around the top of the pipe, immediately upon concrete placement and form removal. Do not remove culvert sediment controls that cannot be replaced before the next rain event. Sediment control at the ends of culverts must be in place and available for any rain event until the disturbed soil areas are re-vegetated.

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Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

44. Between the Ordinary High Water Marks of a 404 stream channel, the Contractor will disturb only the minimum amount of stream channel that is necessary to complete the work.

45. Rock riprap for erosion control does not replace the requirements to maintain sediment control until vegetation is re-established. Replace sediment controls immediately after installing erosion rock.

46. At the direction of TxDOT, sediment deposited into existing and new culverts will be removed subsidiary to Item 506. Sediment to be removed is either pre-existing material before construction starts or sediment generated as a part of this project.

47. Provide treated 2X4 cross bracing for rectangular inlet silt fence, subsidiary to Item 506.

48. Loose or granular earth materials will not be used to repair silt fence undercuts. Silt fence undercut repairs will be conducted with well compacted soils or the silt fence will be reset in a nearby location.

49. Silt fence steel T posts of approximately 1.25 pounds per foot are allowed at a spacing of 8 feet or less. Silt fence steel T posts between approximately 1.25 pounds per foot and 0.85 pounds per foot are allowed for T post spacing of 5 feet or less.

50. Silt fence to be used to slow the flow of storm water down slopes will be positioned approximately horizontal (on the contour) with L hooks on the ends and limited to approximately 200 feet in length. Multiple sections and levels of silt fence may be required in addition to temporary / permanent erosion control flumes.

51. Soil retention blankets will be installed rolled down the slope with the small dimension side embedded at the top of slope, unless recommended otherwise by the manufacturer. Excess grass, rocks, trash, debris or clods will be removed before seeding and installing soil retention blankets. All installations will be by the manufacturer recommendations. Contractor equipment, including tractor mowers will be kept off areas with soil retention blankets until the grass is established.

SCALE = NTS SHEET 4 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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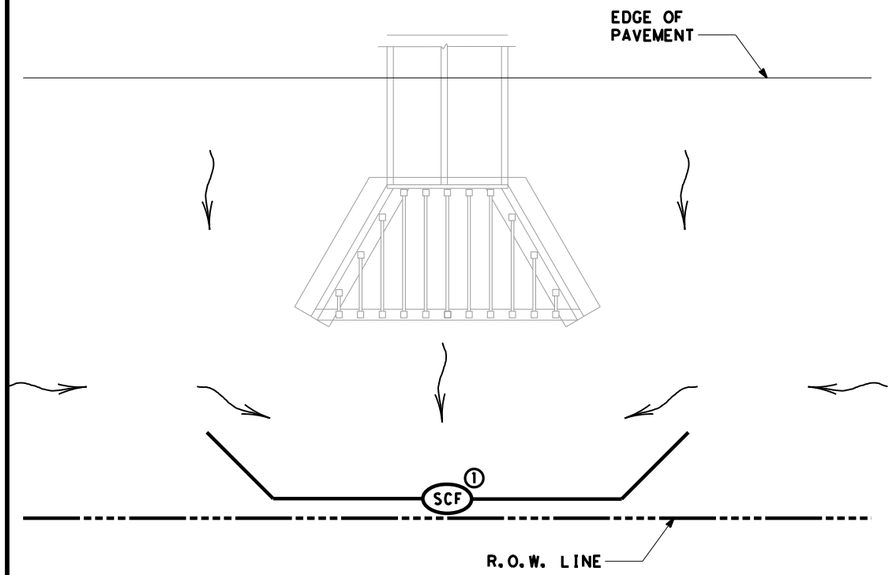
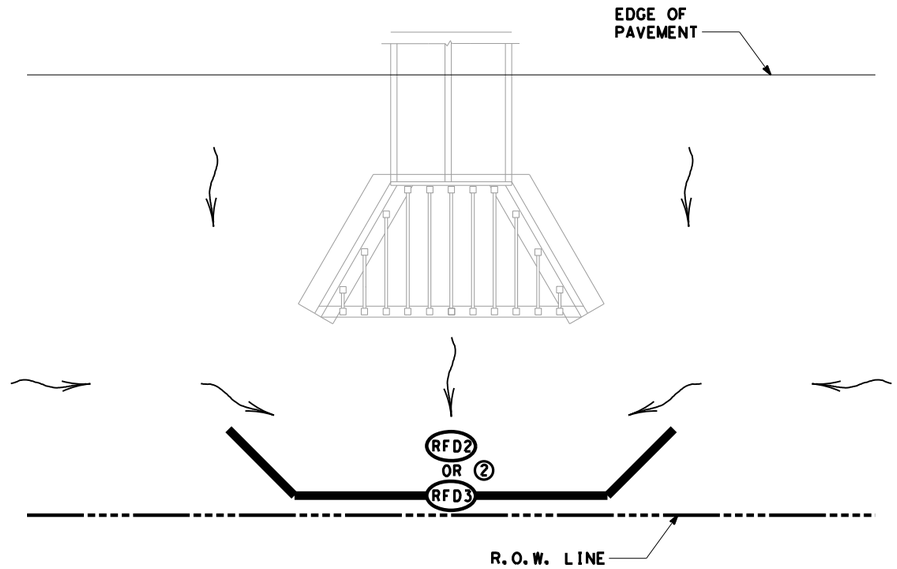


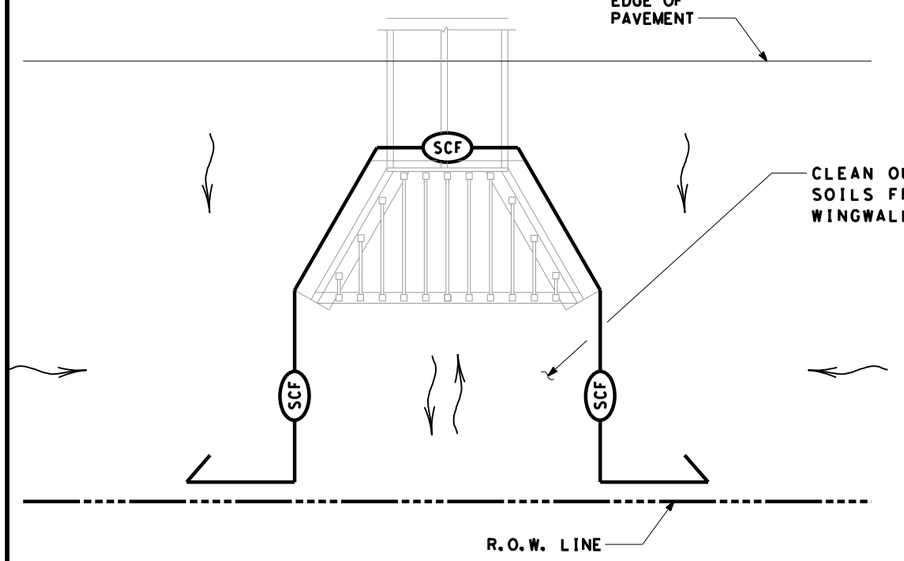
BEST MANAGEMENT PRACTICE (BMP) #1

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



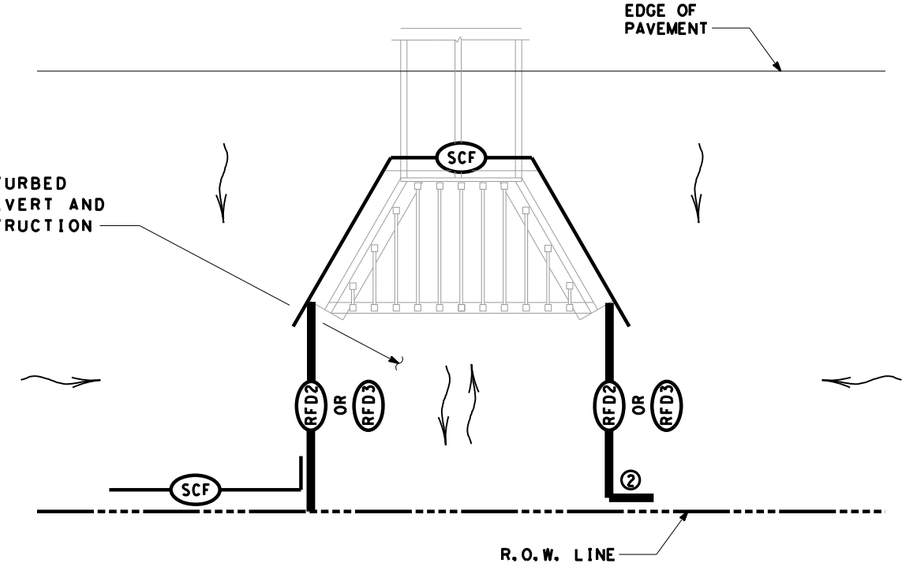
BEST MANAGEMENT PRACTICE (BMP) #2

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #3

FOR 404 OR NON-404 STREAMS ~ SEDIMENT CONTROL AT EXIT OR ENTRANCE OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #4

FOR 404 OR NON-404 STREAMS ~ SEDIMENT CONTROL AT EXIT OR ENTRANCE OF CULVERT

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

NOTES:

1. EXTEND SILT FENCE SO STORM WATER DOES NOT GO AROUND THE ENDS. USE L-HOOKS ON ENDS AS REQUIRED.
2. EXTEND ROCK FILTER DAM SO STORM WATER DOES NOT GO AROUND THE ENDS.

SCALE = NTS SHEET 5 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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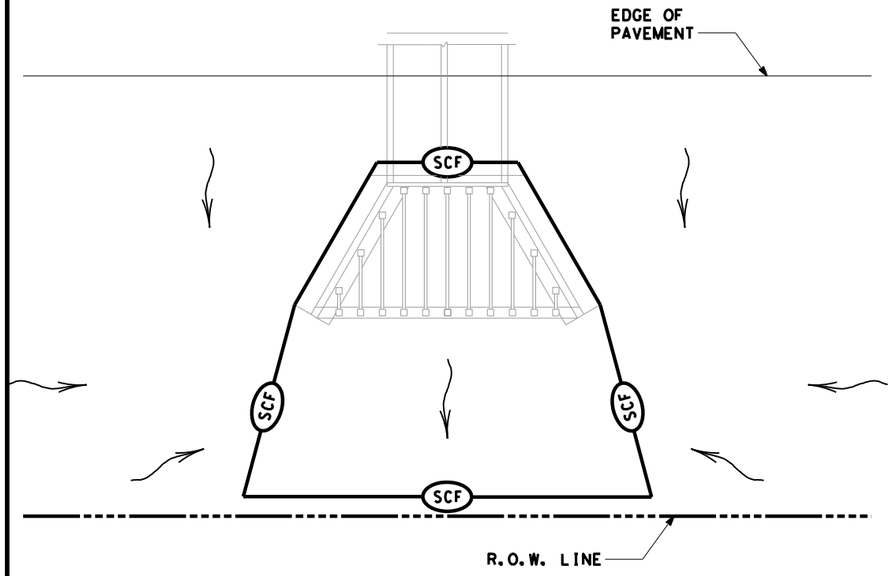
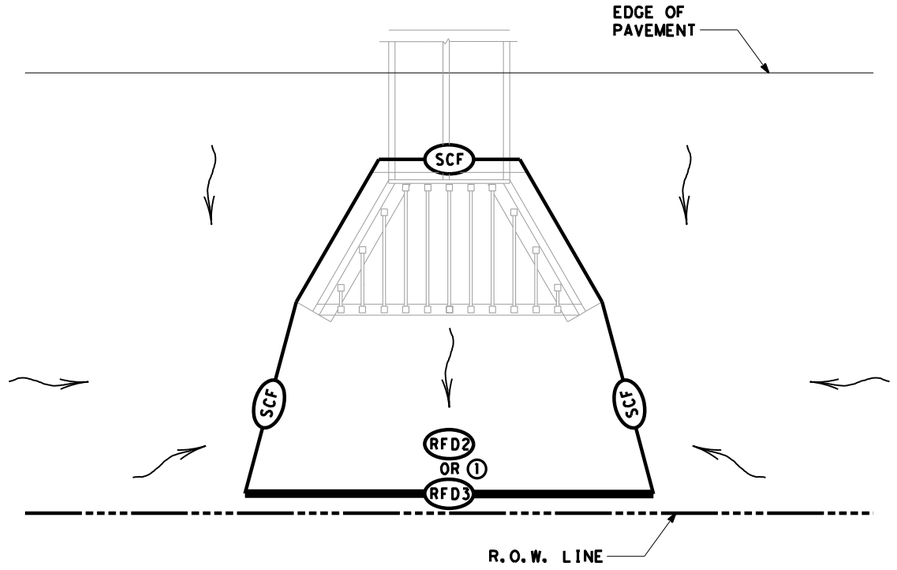


BEST MANAGEMENT PRACTICE (BMP) #5

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #6

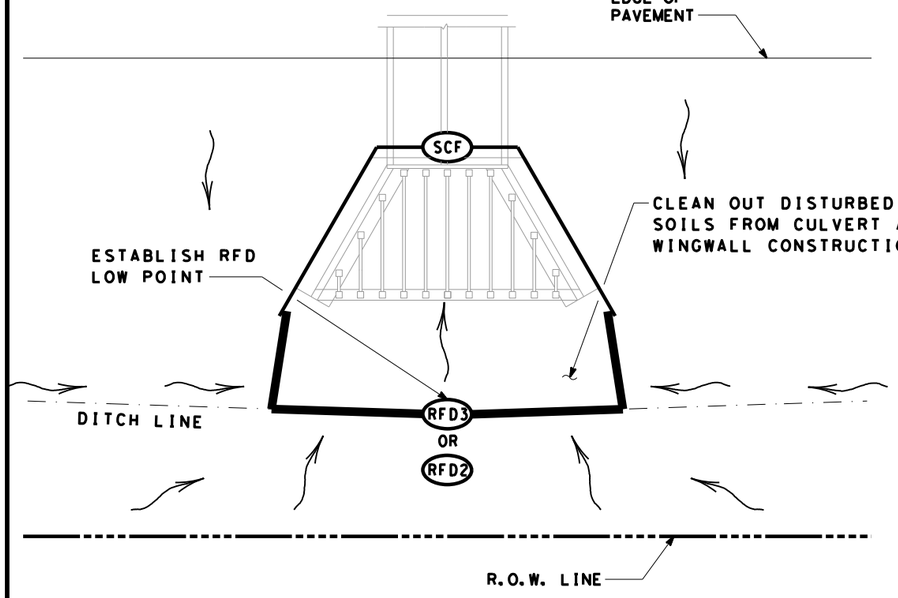
FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

NOTES:

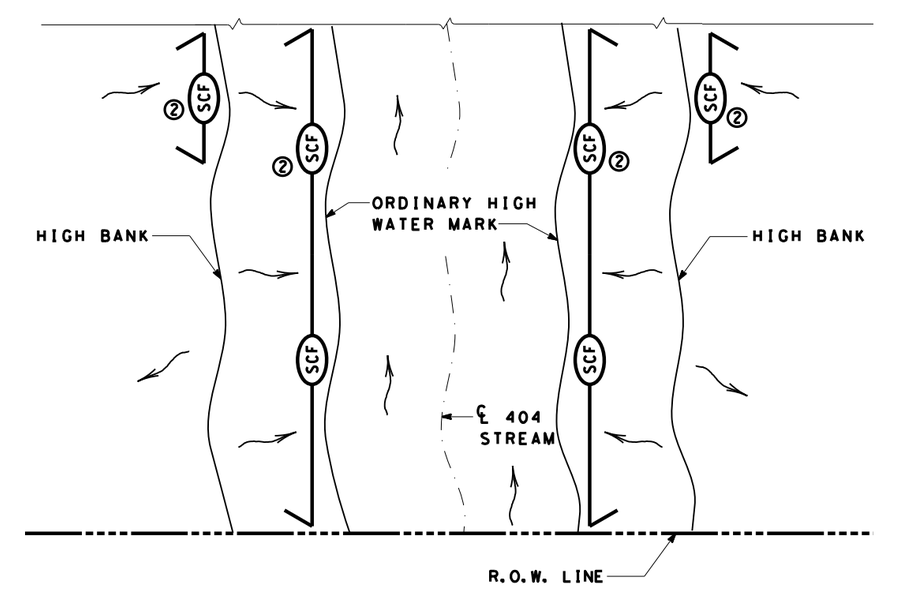
① PROVIDE OVERLAP OF SILT FENCE WITH ROCK FILTER DAM.

② USE SILT FENCE L-HOOKS ON ENDS TO BLOCK STORM WATER SEDIMENT



BEST MANAGEMENT PRACTICE (BMP) #7

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT ENTRANCE OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #8

FOR 404 STREAMS ~ SEDIMENT CONTROL DURING PROJECT CLEARING AND GRUBBING

SCALE = NTS SHEET 6 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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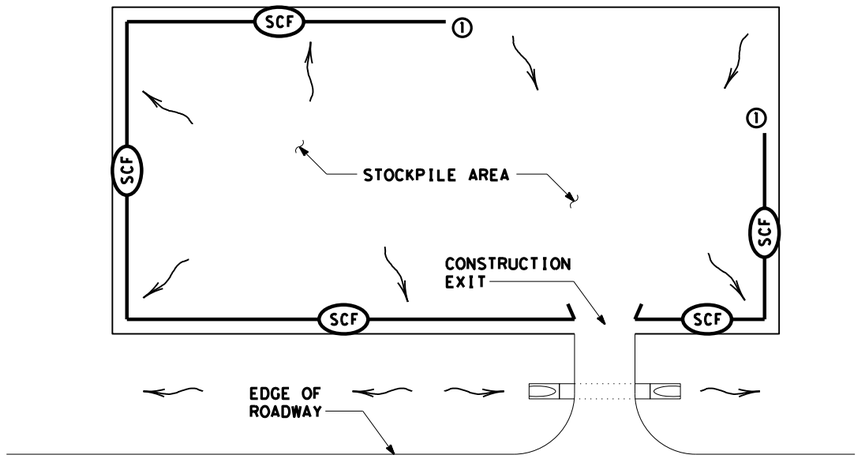
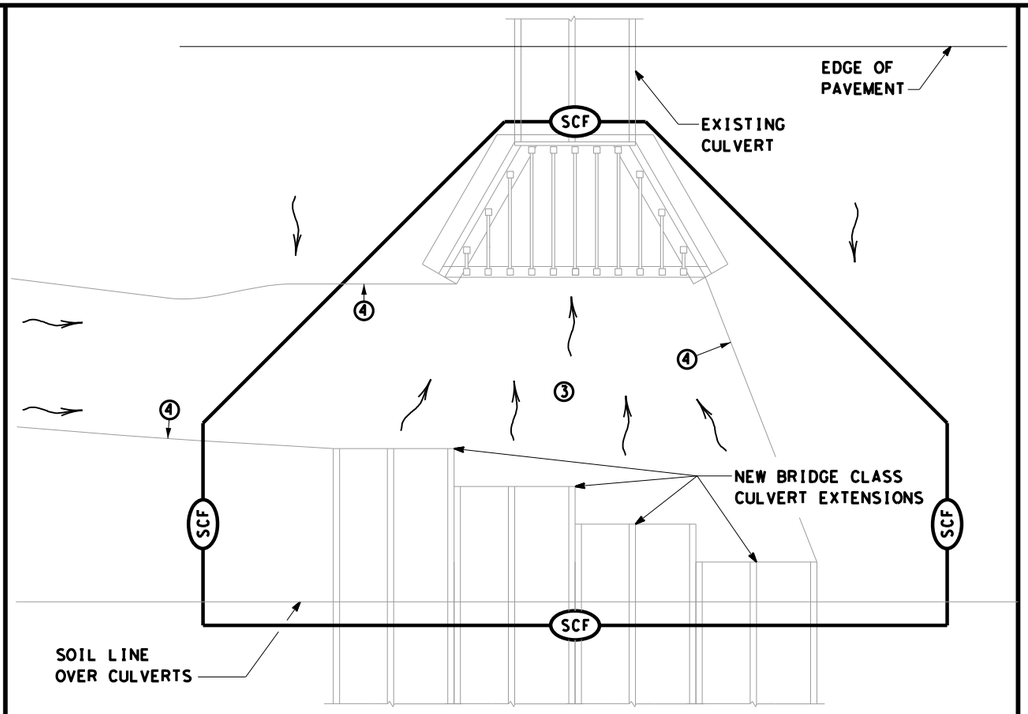


BEST MANAGEMENT PRACTICE (BMP) #9

STOCKPILE SEDIMENT CONTROL



BEST MANAGEMENT PRACTICE (BMP) #10

FOR 404 OR NON-404 STREAMS ONLY ~
SEDIMENT CONTROL AT PHASED CONSTRUCTION OF BRIDGE CLASS CULVERTS

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

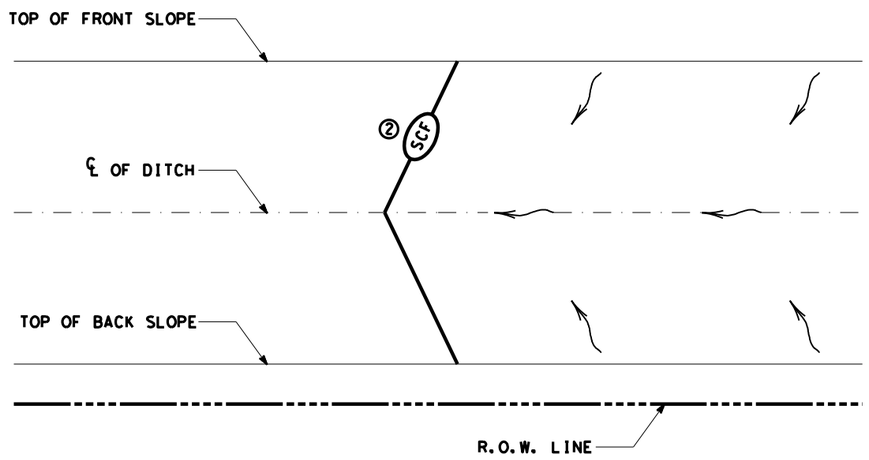
NOTES:

① START SEDIMENT CONTROL AT LOCATION SO ALL STORM WATER WITH SEDIMENT IS COLLECTED

② ROCK FILTER DAMS OR EARTH/GRASSED EMBANKMENTS CAN BE SUBSTITUTED AS DIRECTED.

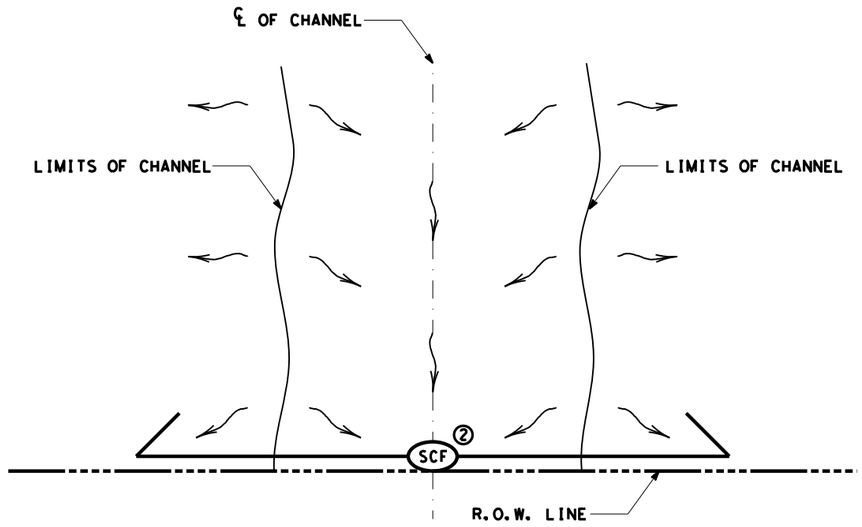
③ PROVIDE A SMOOTH TRANSITION FROM THE INVERT ELEVATIONS BETWEEN CULVERTS. REMOVE LOOSE SOIL FROM EXCAVATED AREA BETWEEN CULVERTS.

④ PROVIDE AND INSTALL PNEUMATICALLY PLACED CONCRETE ON THE DITCH BOTTOM AND SIDE SLOPES BETWEEN TEMPORARY TERMINATIONS BETWEEN OLD AND NEW CULVERTS. PNEUMATICALLY PLACED CONCRETE WILL BE PLACED TO THE HEIGHT OF THE LARGEST CULVERT ON THE DITCH SIDE SLOPES; AND TO A LIMIT 10 FEET OUTSIDE THE LOCATION OF BMPS ALONG THE DITCH BOTTOM. CEMENT STABILIZED SAND MAY BE SUBSTITUTED FOR PNEUMATICALLY PLACED CONCRETE, IN AREAS WHERE INSTALLATION WORKS AND AT THE OPTION OF TXDOT.



BEST MANAGEMENT PRACTICE (BMP) #11

BOUNDRY SEDIMENT CONTROL ~ BOTH ENDS OF CONTROL TERMINATED UP SLOPE



BEST MANAGEMENT PRACTICE (BMP) #12

BOUNDRY SEDIMENT CONTROL ~ BOTH ENDS OF CONTROL TERMINATED DOWN SLOPE

SCALE = NTS SHEET 7 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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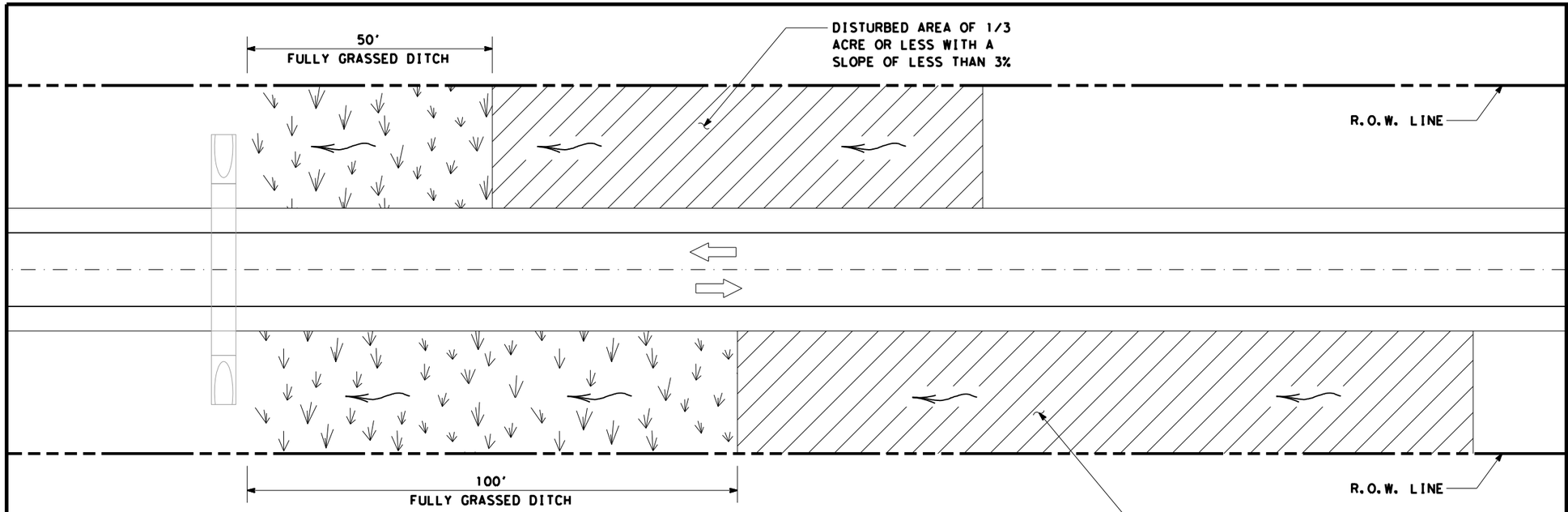
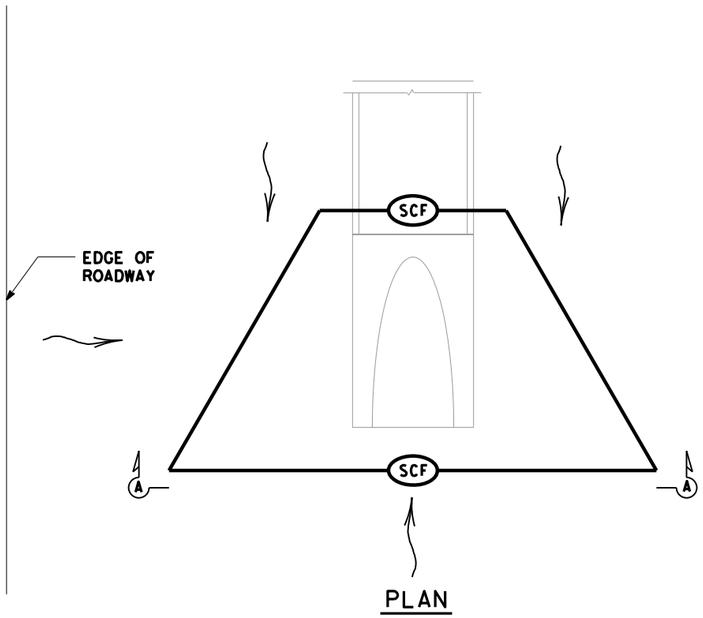
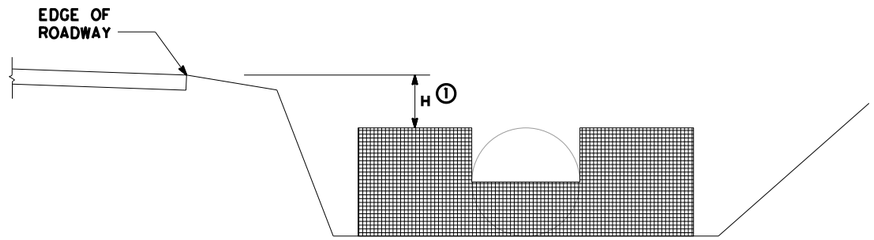


BEST MANAGEMENT PRACTICE (BMP) #13

USE OF VEGETATIVE BUFFERS IN PLACE OF TEMPORARY SEDIMENT CONTROLS SUCH AS SILT FENCE AND ROCK FILTER DAMS



PLAN



VIEW A-A

BEST MANAGEMENT PRACTICE (BMP) #14

NON-404 STREAMS AND DITCHES ONLY - SEDIMENT CONTROL AT PARALLEL DRAINAGE STRUCTURE ENTRANCE ②

	FULLY GRASSED DITCH
	DISTURBED AREA
	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE

① FOR H DIMENSIONS LESS THAN 1.5' SILT FENCE MAY NEED TO BE NOTCHED AS SHOWN IN VIEW A-A. ADD EXTRA POSTS AT NOTCH.

② BMP #14 MAY BE USED AT CROSS DRAINAGE STRUCTURES AS DIRECTED.

SCALE = NTS SHEET 8 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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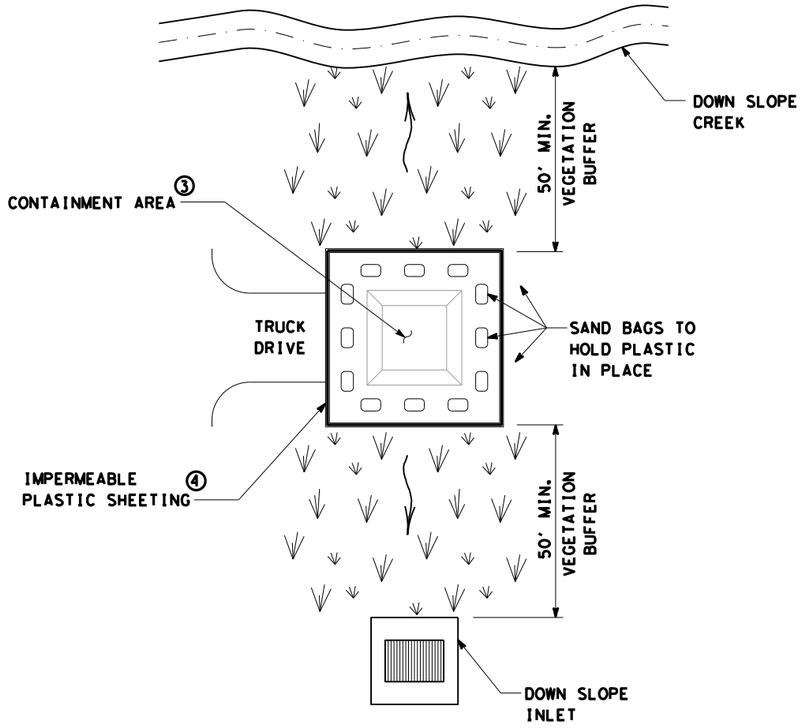
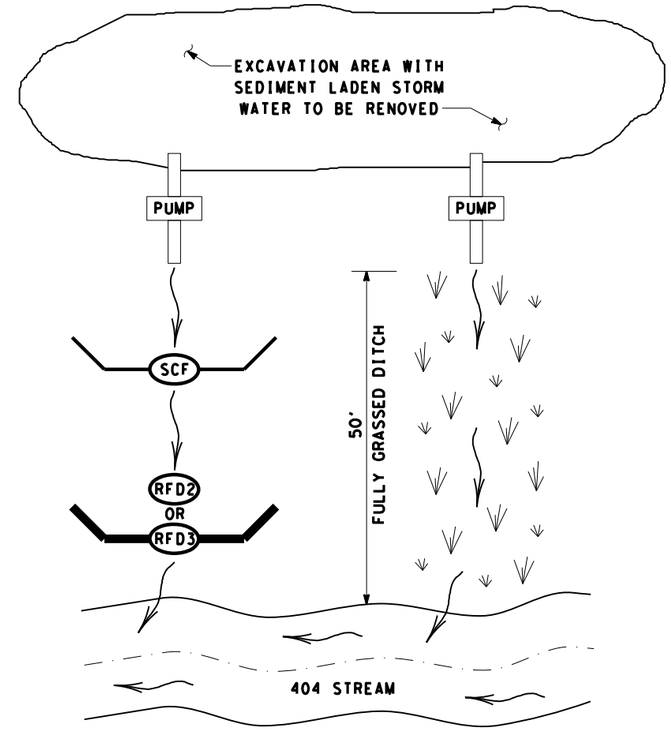


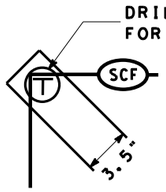
BEST MANAGEMENT PRACTICE (BMP) #15

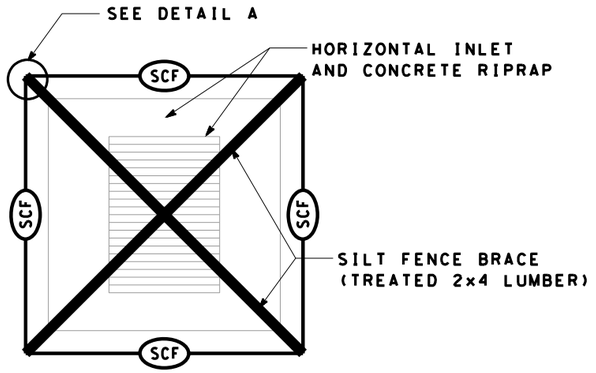
CONCRETE TRUCK WASHOUT AREA



BEST MANAGEMENT PRACTICE (BMP) #16

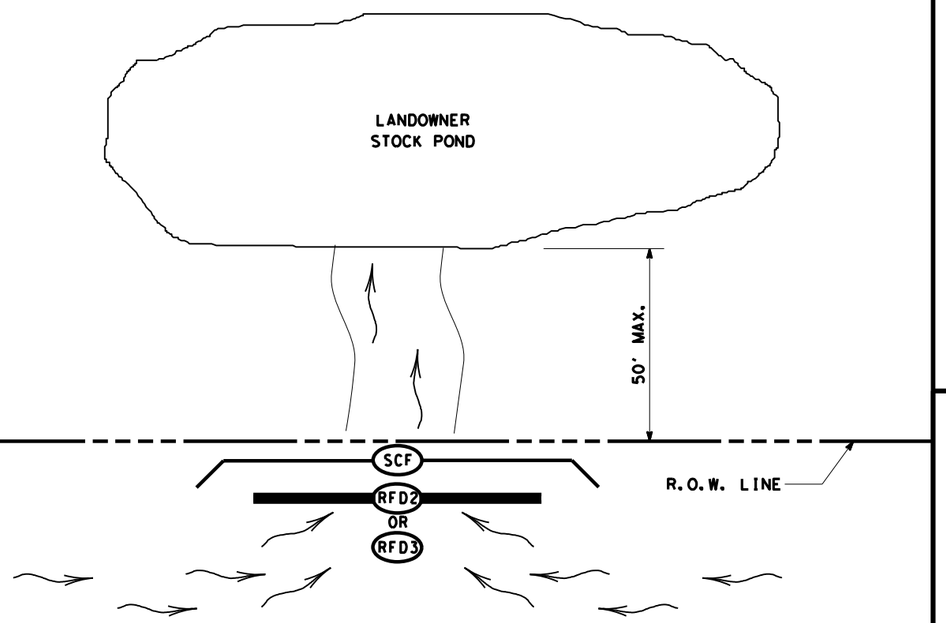
PUMPED STORM WATER SEDIMENT CONTROLS ①





BEST MANAGEMENT PRACTICE (BMP) #17

HORIZONTAL INLET SEDIMENT CONTROL



BEST MANAGEMENT PRACTICE (BMP) #18

LANDOWNER STOCKPOND SEDIMENT CONTROL ②

	FULLY GRASSED DITCH
	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)

① PUMPED STROM WATER FROM AN EXCAVATION AREA SHOULD BE DISCHARGED IN A 50' VEGETATIVE BARRIER OR THROUGH TWO TEMPORARY SEDIMENT CONTROLS BEFORE ENTERING A 404 STREAM.

② FOR LANDOWNER STOCKPONDS WITHIN 50' OF THE RIGHT OF WAY LINE, PROVIDE REDUNDANT SEDIMENT CONTROLS AT THE CONVEYANCE OF THE POND. MINIMUM OF TWO SEDIMENT CONTROLS.

③ WHEN CONTAINMENT AREA REACHES 1' FREEBOARD, DISCONTINUE WASHOUT PLACEMENT AND REMOVE MATERIAL UPON SOLIDIFICATION.

④ EACH TIME SOLIDIFIED MATERIAL IS REMOVED REPLACE PLASTIC SHEETING.

SCALE = NTS SHEET 9 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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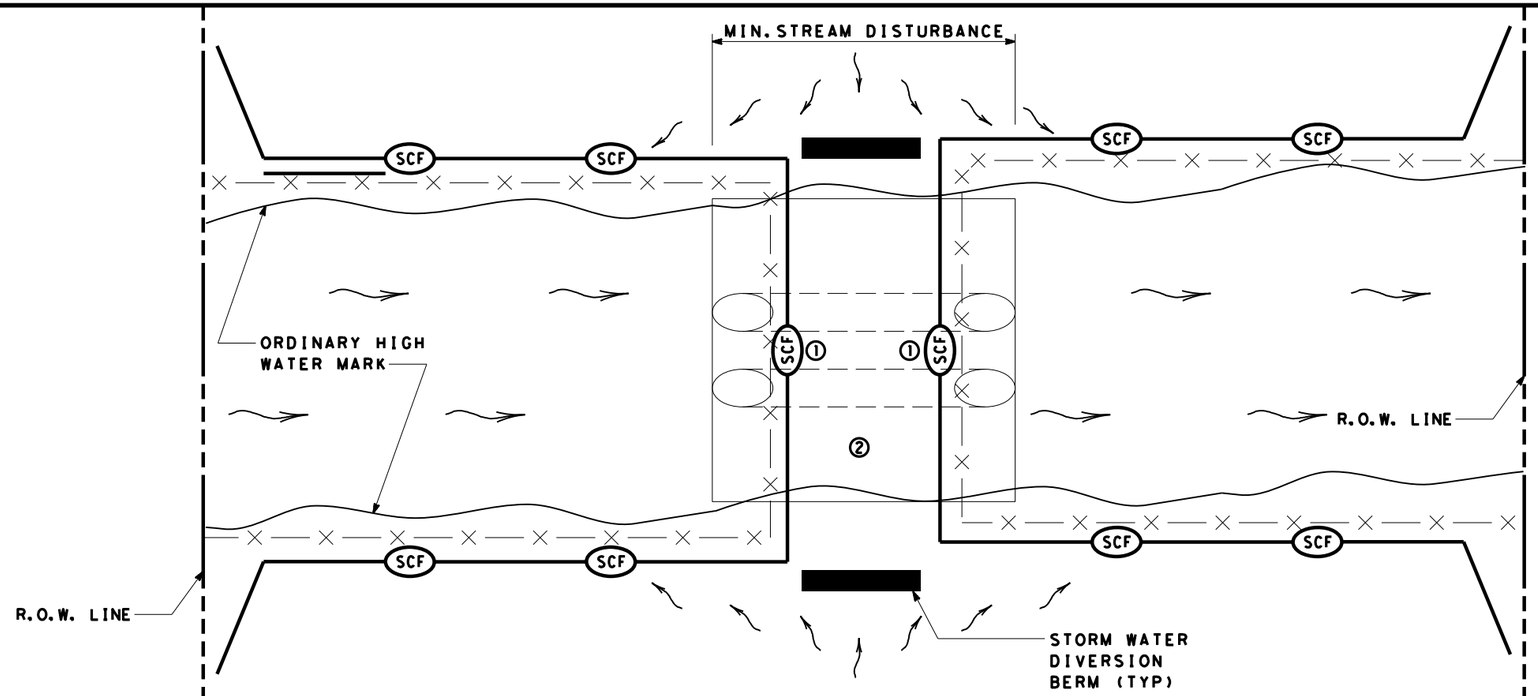


BEST MANAGEMENT PRACTICE (BMP) #19

TYPICAL 404 STREAM CROSSING (SEDIMENT CONTROL AT CROSSING)

	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE
RFD	ROCK FILTER DAM
× — ×	SECURITY FENCING

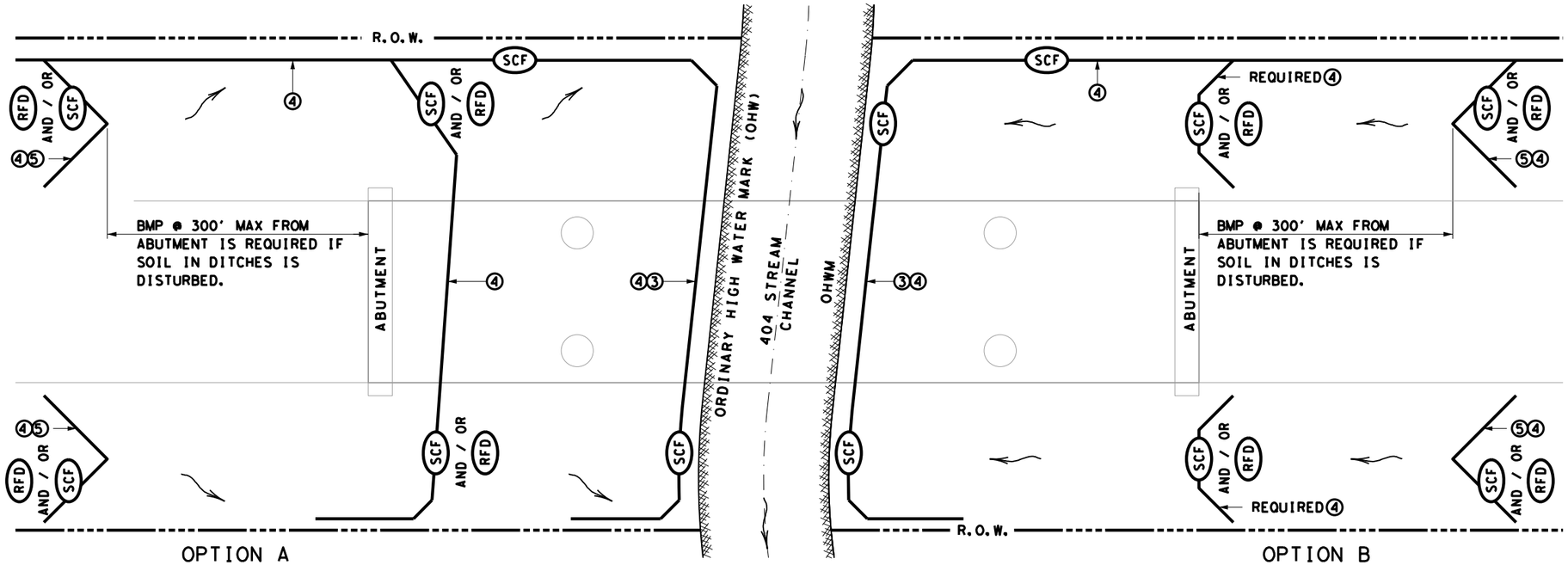
① HAY BALES MAY BE SUBSTITUTED FOR SILT FENCE OVER THE STREAM CROSSING.

② CROSSING WILL BE AS PER REQUIREMENTS OF THE WATERS OF THE US GENERAL NOTES.

③ INSTALL SILT FENCE SLIGHTLY UP FROM OHW MARK FROM R.O.W. TO R.O.W.

④ USE SILT FENCE L-HOOKS ON LEVEL OR DOWN SLOPING ENDS TO BLOCK STORM WATER SEDIMENT

⑤ INSTALL LARGE V OR U SHAPED BMP'S FROM ABUTMENT AS SHOWN. IF THERE IS STEEP DITCH CONDITIONS DECREASE SPACING AND CONSIDER RFD'S. ADD ADDITIONAL BMP'S IF GRADE IS STEEP OR IF FLOW IS HIGH.



BEST MANAGEMENT PRACTICE (BMP) #20

FOR 404 STREAMS ~ BMP'S AT BRIDGES

SCALE = NTS SHEET 10 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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