STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO. F 2021(853)

NET LENGTH OF ROADWAY	= 25,706.46	FT	=	4.869 MI
NET LENGTH OF BRIDGE	= 448.47	FT	=	0.085 MI
NET LENGTH OF PROJECT	= 26,154.93	FT	=	4.954 MI

FM 3438
TAYLOR COUNTY

LIMITS: FROM IH 20 SFR TO NEAR US 277

FOR THE CONSTRUCTION OF: AN OVERLAY

CONSISTING OF: MILL AND OVERLAY, CONCRETE PAVEMENT, AND SEAL COAT

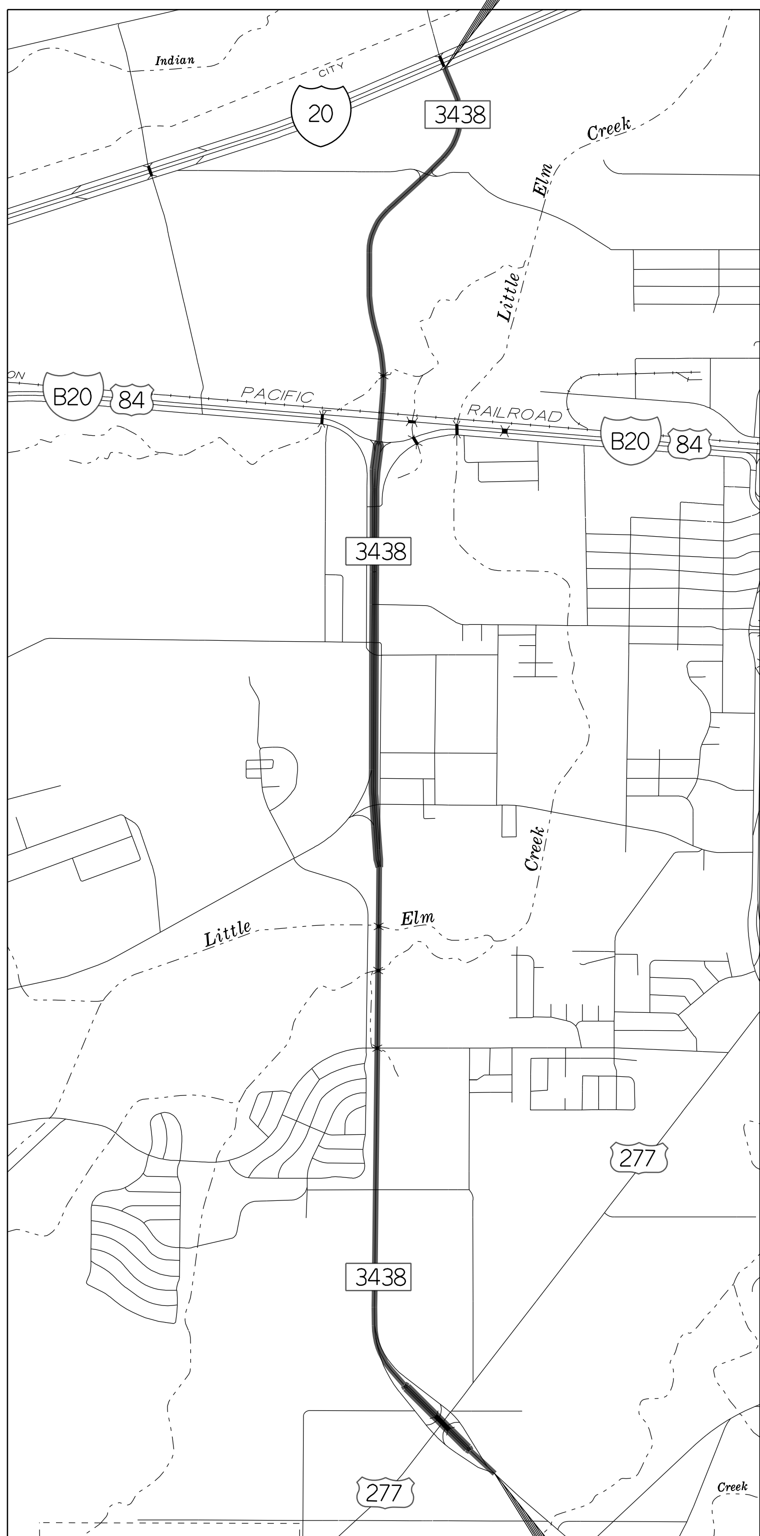
DESIGN SPEED = 45 mph
CURRENT A.D.T. (2019) = 12,639 vpd
PROJECTED A.D.T. (2039) = 17,690 vpd
FUNCTIONAL CLASS = PRINCIPAL ARTERIAL
EXISTING NBI# = 08-221-0-2270-01-002
08-221-0-0407-06-001

PROJECT NO.			SHEET NO.
F 2021(853)			1
STATE	DISTRICT	COUNTY	
TEXAS	ABL	TAYLOR	
CONTROL	SECTION	JOB	HIGHWAY NO.
2270	01	023	FM 3438

INDEX OF SHEETS

SEE SHEET 2

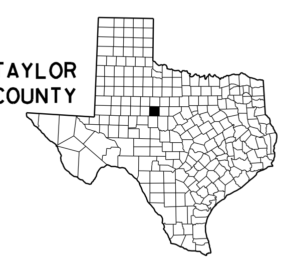
BEGIN PROJECT
CSJ: 2270-01-023
REF MRK: 290-0.031
STA 103+50.00

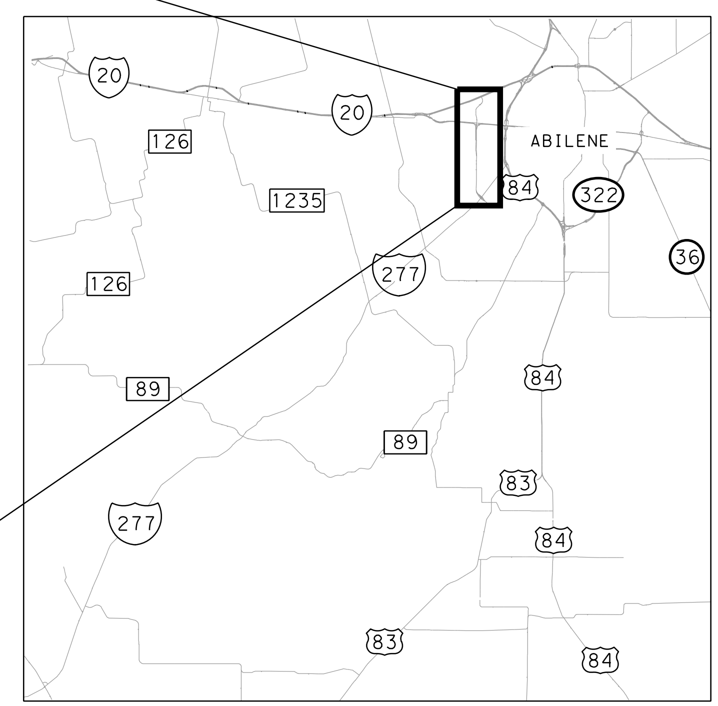


NTS PROJECT VICINITY MAP

END PROJECT
CSJ: 2270-01-023
REF MRK: 294+0.955
STA 365+04.93

TAYLOR COUNTY





NTS

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: UPRR

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

100% SUBMITTAL

FINAL PLANS

LETTING DATE: AUGUST 2021
DATE CONTRACTOR BEGAN WORK: ____
DATE WORK WAS COMPLETED: ____
DATE WORK WAS ACCEPTED: ____
FINAL CONTRACT COST: $ ____
CONTRACTOR : ____

CERTIFICATION FOR FINAL PLANS

THIS PROJECT WAS BUILT ACCORDING TO THE PLANS AND SPECIFICATIONS. THESE FINAL PLANS REFLECT THE WORK DONE AND THE QUANTITIES SHOWN THEREON AND ON THE FINAL ESTIMATE ARE THE FINAL QUANTITIES.

AREA ENGINEER DATE

THE DISTRICT TRAFFIC SAFETY COMMITTEE HAS REVIEWED THE TRAFFIC CONTROL PLAN OR THIS PROJECT AND IT IS IN COMPLIANCE WITH CURRENT TRAFFIC CONTROL STANDARDS

DocuSigned by: Casey L. McGee, P.E. 5/28/2021
COMMITTEE CHAIRMAN DATE

Texas Department of Transportation

PREPARED BY:
IDCUS
Planners | Engineers | Construction Managers

SUBMITTED FOR LETTING: 5/26/2021
CHARLES M. SHINE, P.E.
IDCUS PROJECT MANAGER

RECOMMENDED FOR LETTING: 6/1/2021
DocuSigned by: Paul N. Norman, P.E.
PAUL N. NORMAN, P.E.
AREA ENGINEER

CONCURRENCE: 5/28/2021
DocuSigned by: Robert Hanna
ROBERT HANNA
CITY MANAGER, CITY OF ABILENE

RECOMMENDED FOR LETTING: 6/1/2021
DocuSigned by: Michael Haithcock
MICHAEL A. HAITHCOCK, P.E.
DIRECTOR OF T P & D

RECOMMENDED FOR LETTING: 5/28/2021
DocuSigned by: SCOTT DARROW
SCOTT E. DARROW, P.E.
TxDOT PROJECT MANAGER

APPROVED FOR LETTING: 6/1/2021
DocuSigned by: Thomas G. Allbritton, P.E.
THOMAS G. ALLBRITTON, P.E.
DISTRICT ENGINEER

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STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED
PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ON THIS SHEET WITH A # HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

(NAME) , P.E. 5/26/2021 DATE

INDEX OF SHEETS

 Texas Department of Transportation

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 3438
STATE	COUNTY		SHEET NO.
TEXAS	TAYLOR		2
DISTRICT	CONTROL	SECTION	JOB
ABL	2270	01	023

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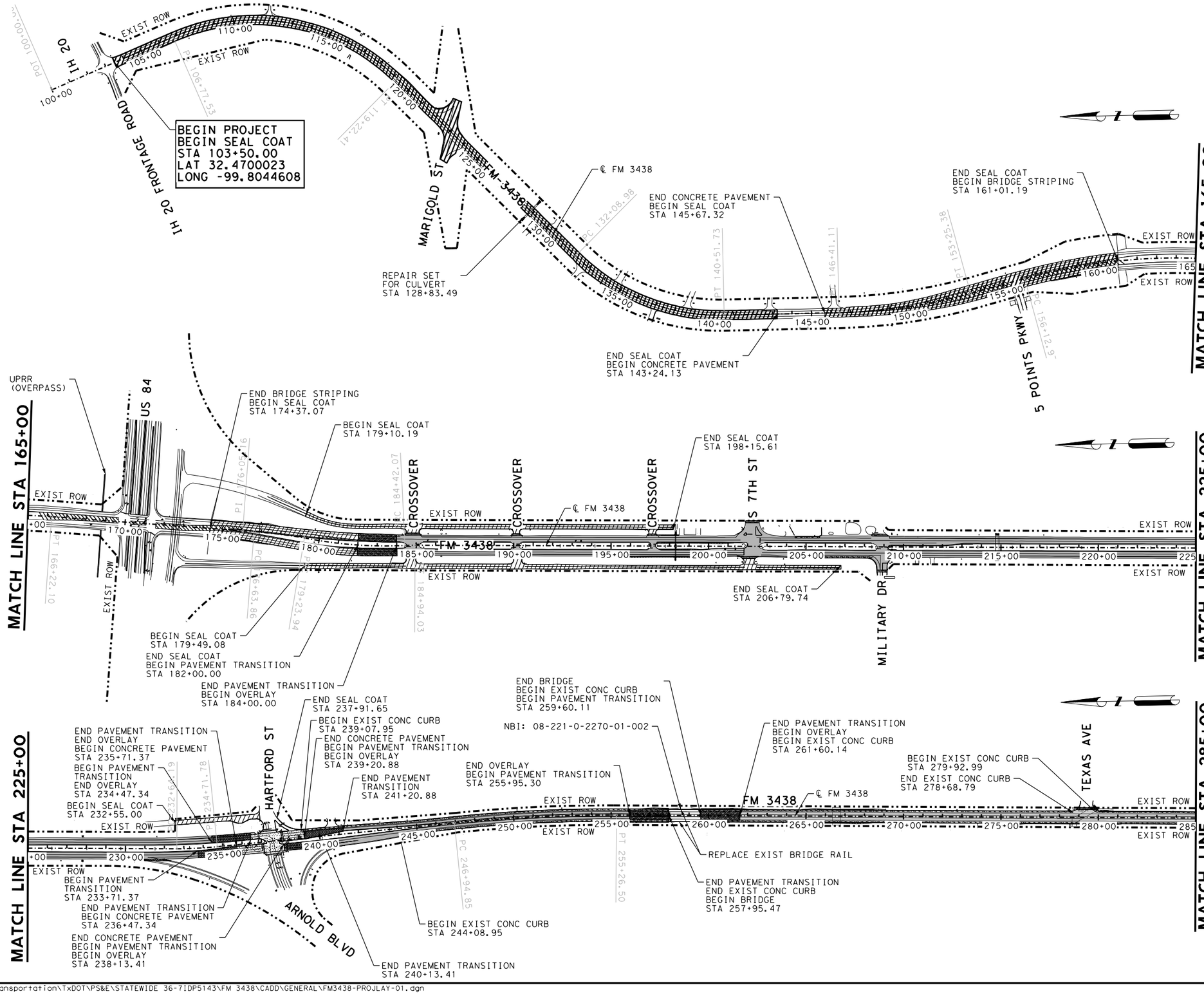

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION
- OVERLAY (2")
- PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT

NOTE

1. SEE TRANSITION & MILL DETAILS FOR MORE INFORMATION.
2. BACKFILL PAVEMENT EDGES BETWEEN STA 182+00.00 TO STA 204+43.00 & STA 332+13.00 TO STA 365+04.93
3. RAP MATERIAL PROVIDED BY STATE FOR BACKFILLING EDGES NOT PAID FOR DIRECTLY BUT SUBSIDIARY TO VARIOUS BID ITEMS.

0′ 250′ 500′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

IDCUS
PLANNERS + ENGINEERS + MANAGERS
IDCUS, Inc.
8632 Fredericksburg Rd., Suite 200
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T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

PROJECT LAYOUT

BEGIN PROJECT TO STA 285+00

SHEET 1 OF 2

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	3

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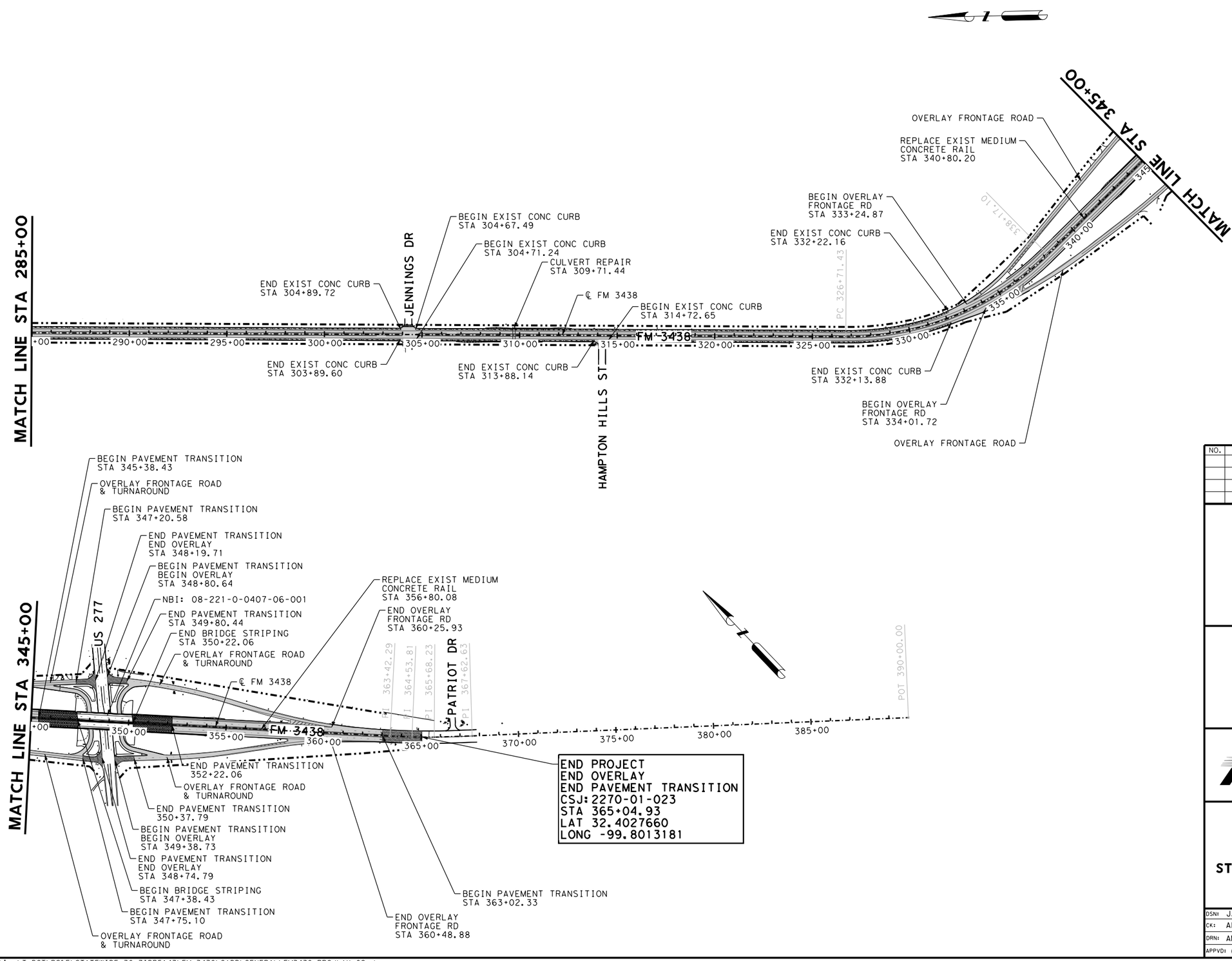

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION
- OVERLAY (2")
- PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY
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- PROP CONC PAVEMENT

NOTE

1. SEE TRANSITION & MILL DETAILS FOR MORE INFORMATION.
2. BACKFILL PAVEMENT EDGES BETWEEN STA 182+00.00 TO STA 204+43.00 & STA 332+13.00 TO STA 365+04.93
3. RAP MATERIAL PROVIDED BY STATE FOR BACKFILLING EDGES NOT PAID FOR DIRECTLY BUT SUBSIDIARY TO VARIOUS BID ITEMS.

0′ 250′ 500′
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FM 3438

PROJECT LAYOUT

STA 285+00.00 TO END PROJECT

SHEET 2 OF 2

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	4

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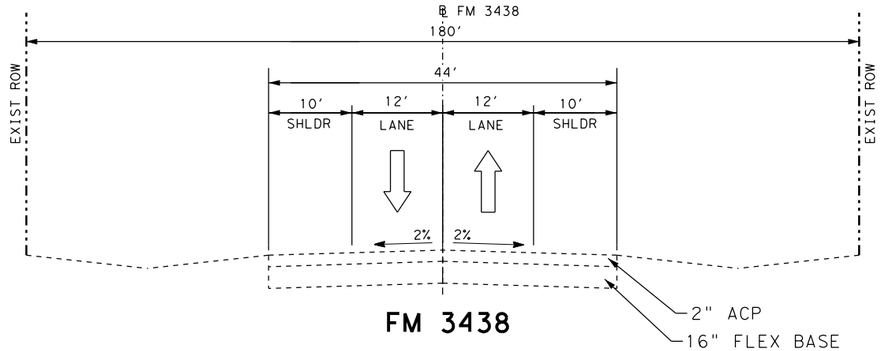
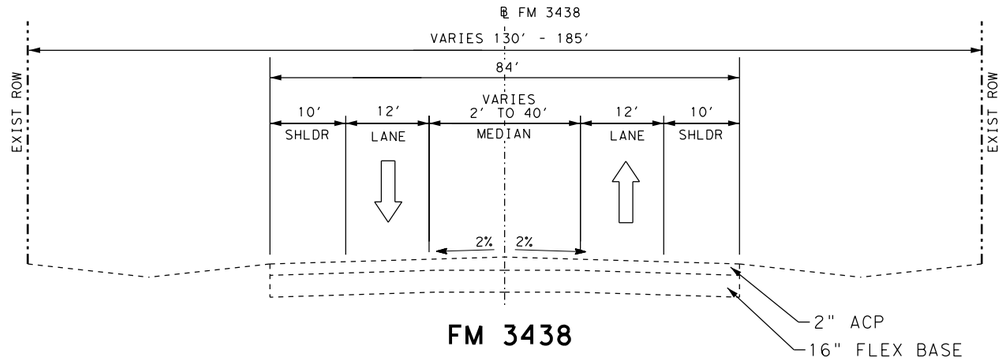


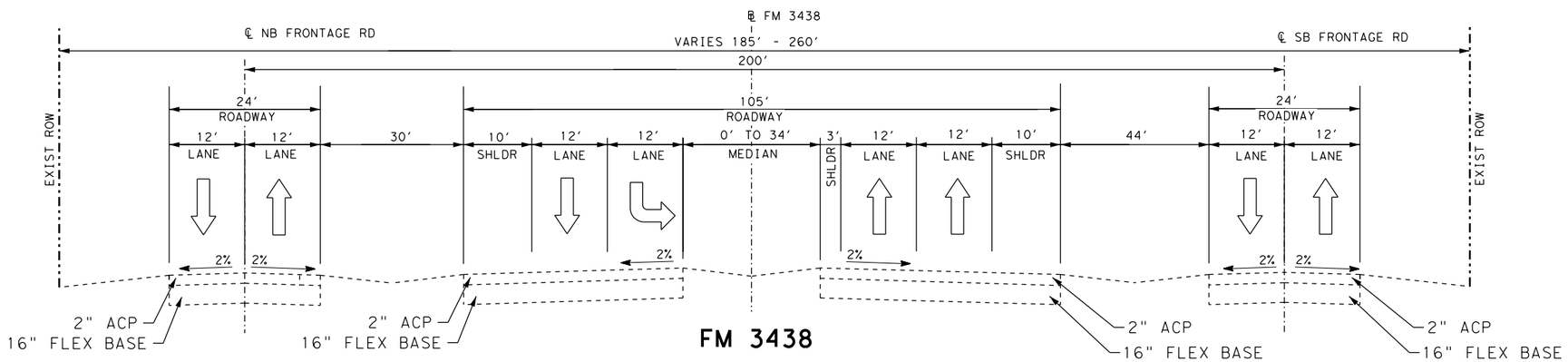
FM 3438

EXISTING TYPICAL SECTION
STA 103+50.00 TO STA 147+66.00



FM 3438

EXISTING TYPICAL SECTION
STA 147+66.00 TO STA 179+10.00



FM 3438

EXISTING TYPICAL SECTION
STA 179+10.00 TO STA 190+00.00

LEGEND

- EXIST PAVEMENT
- PROP PAVEMENT
- TRAFFIC FLOW

NOTE:
MATCH EXISTING CROSS SLOPE.

SCALE: NTS

NO.	DESCRIPTION	DATE

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5/26/2021

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FM 3438

EXISTING TYPICAL SECTIONS

SHEET 1 OF 3

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	5

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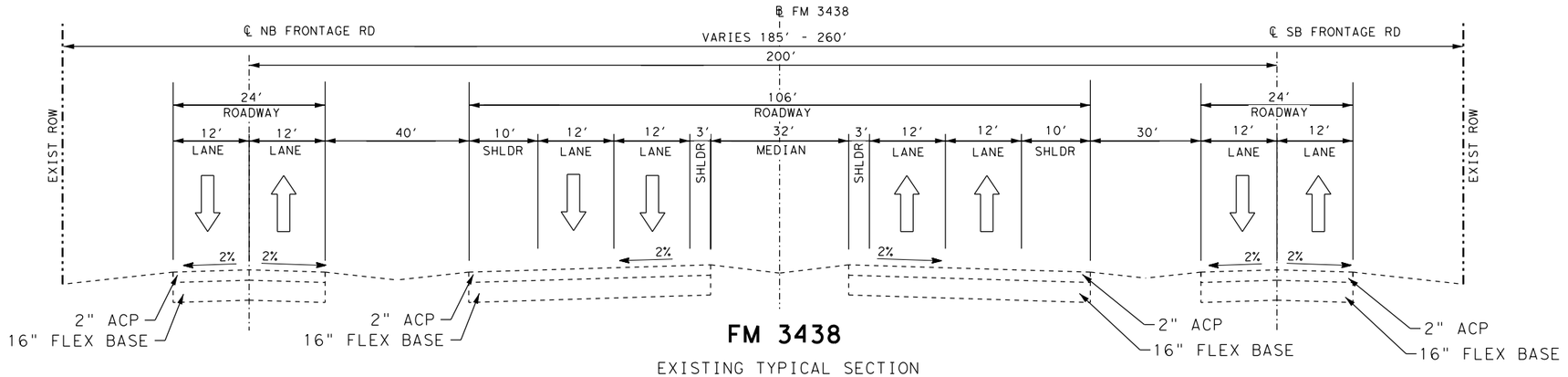
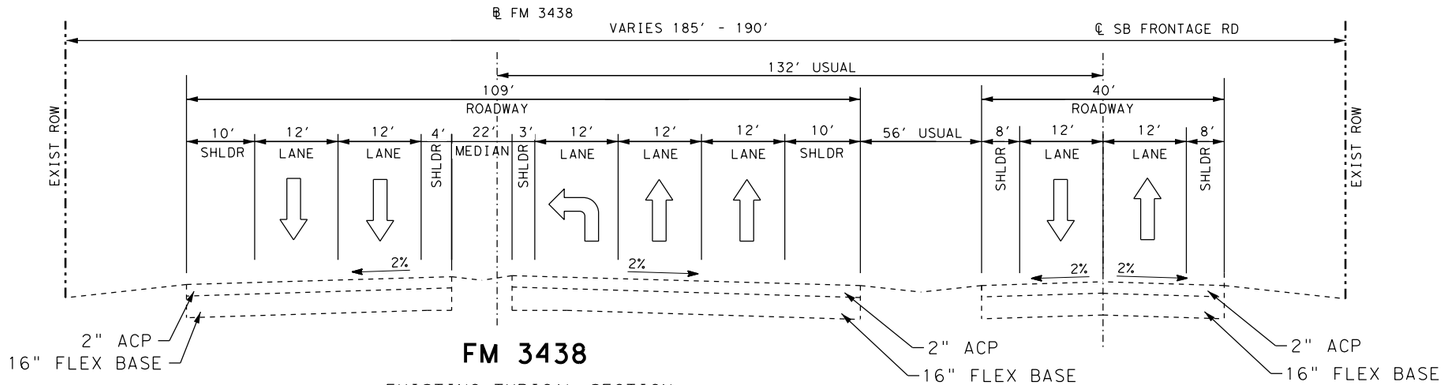


FM 3438

EXISTING TYPICAL SECTION
STA 190+00.00 TO STA 220+00.00



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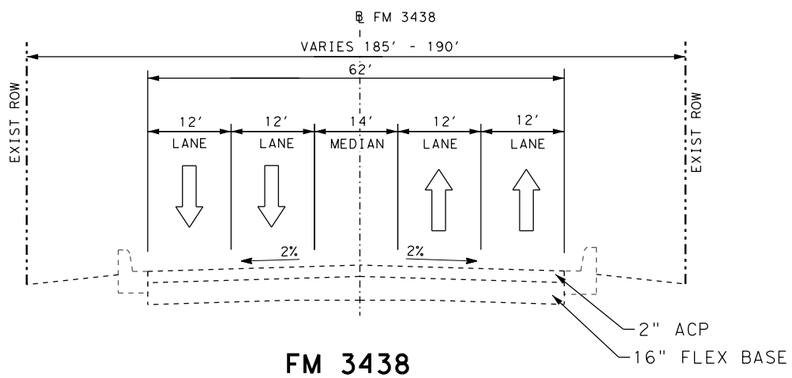
EXISTING TYPICAL SECTION
STA 220+00.00 TO STA 246+00.00



FM 3438

EXISTING TYPICAL SECTION
STA 246+00.00 TO STA 250+00.00

LEGEND

- EXIST PAVEMENT
- PROP PAVEMENT
- TRAFFIC FLOW

NOTE:
MATCH EXISTING CROSS SLOPE.

SCALE: NTS

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EXISTING TYPICAL SECTIONS

SHEET 2 OF 3

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	6

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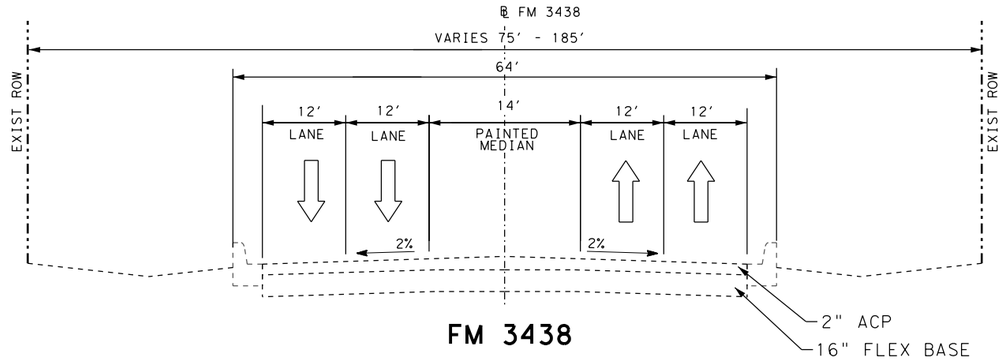
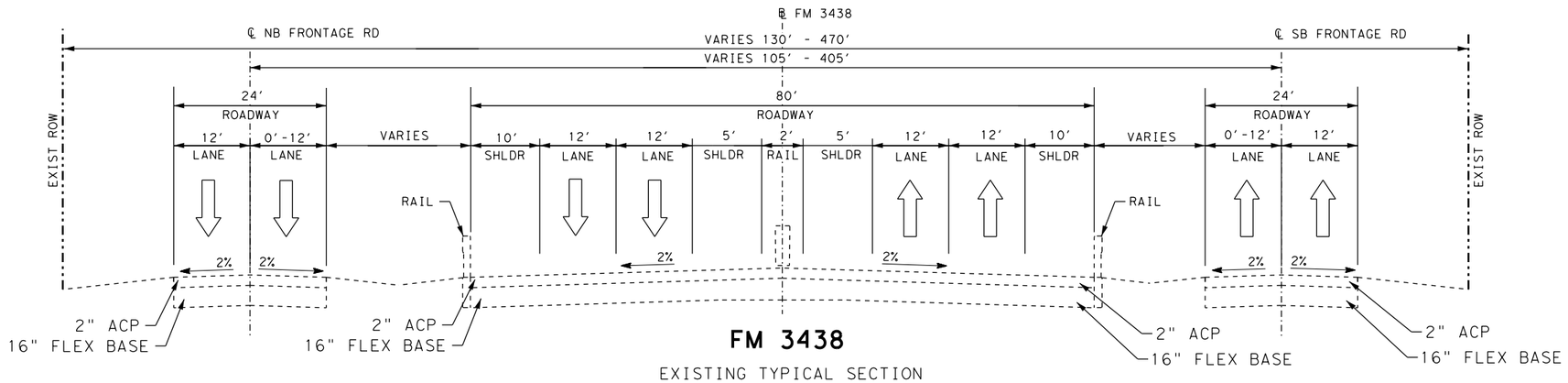


FM 3438

EXISTING TYPICAL SECTION
STA 250+00.00 TO STA 330+00.00
STA 362+00.00 TO STA 365+04.93



FM 3438

EXISTING TYPICAL SECTION
STA 330+00.00 TO STA 362+00.00

LEGEND

------- EXIST PAVEMENT

——— PROP PAVEMENT

⇨ TRAFFIC FLOW

NOTE:
MATCH EXISTING CROSS SLOPE.

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EXISTING TYPICAL SECTIONS

SHEET 3 OF 3

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	7

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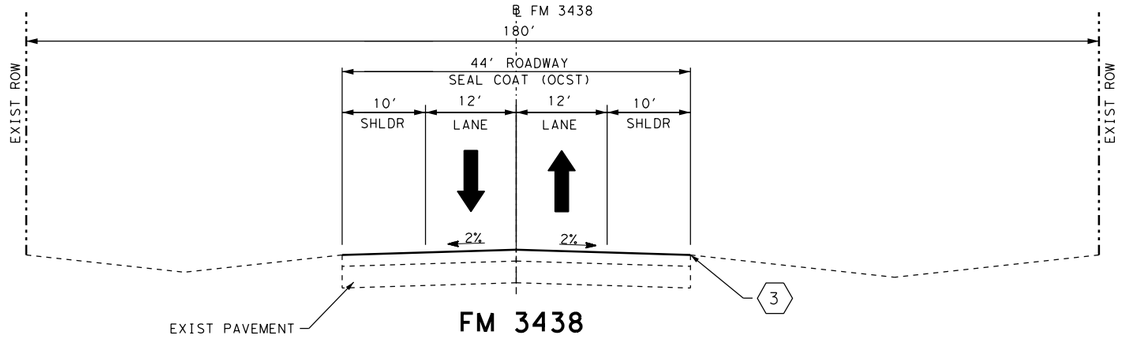
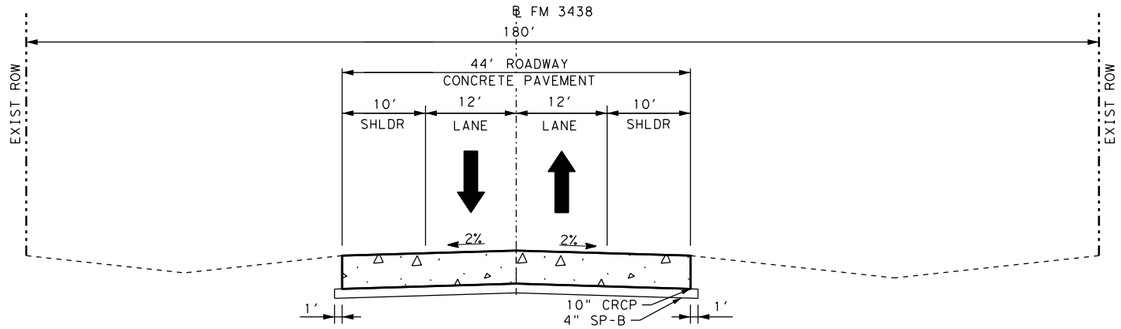


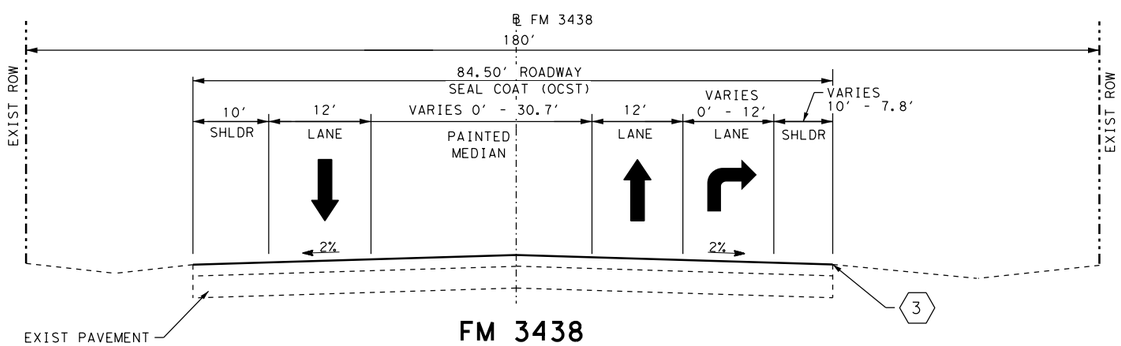
FM 3438

PROPOSED TYPICAL SECTION
STA 103+50.00 TO STA 143+24.13
STA 145+67.32 TO STA 147+66.63



FM 3438

PROPOSED TYPICAL SECTION
STA 143+24.13 TO STA 145+67.32



FM 3438

PROPOSED TYPICAL SECTION
STA 147+66.63 TO STA 161+01.19

LEGEND

1 — 2" SP-D
2 — MILL 0" - 2"
3 — SEAL COAT (OCST)

EXIST PAVEMENT
PROP PAVEMENT
PROP CONC PAVEMENT
TRAFFIC FLOW

NOTE:

1. PAVEMENT REPAIRS SHALL CONSIST OF MILL & FILL 4" OF SP-B. (SEE PAVEMENT REPAIR DETAIL).
2. PAVEMENT REPAIR AREA TO BE DETERMINED BY ENGINEER.
3. BACKFILL PAVEMENT EDGES TO BE SUBSIDAIRY TO THE BID ITEMS.

SCALE: NTS

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

5/26/2021

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PROPOSED TYPICAL SECTIONS

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	8

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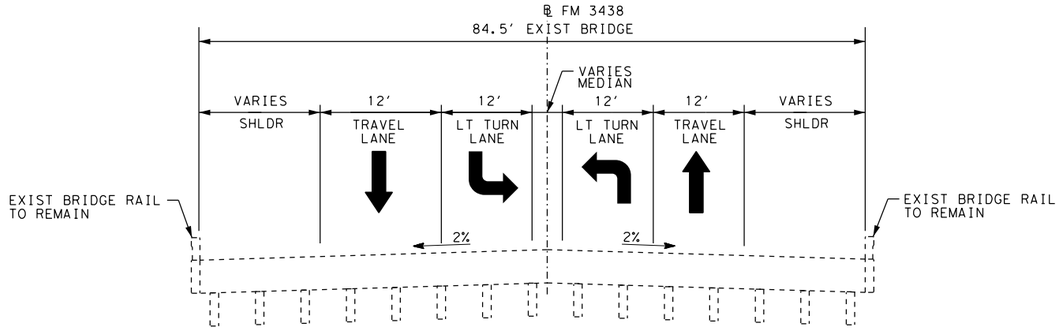
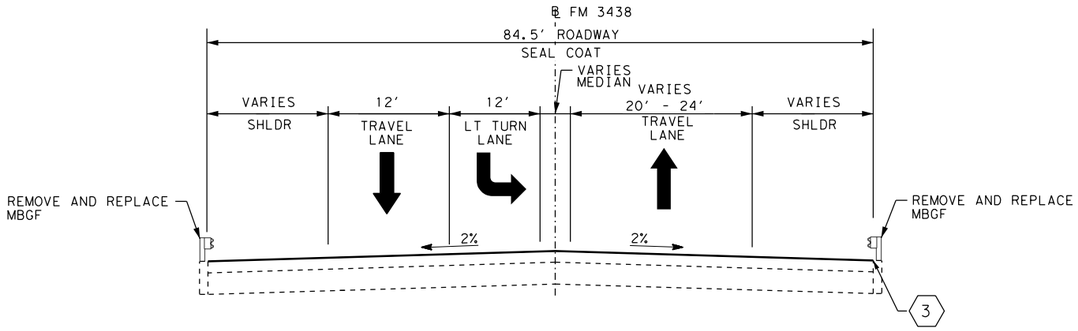


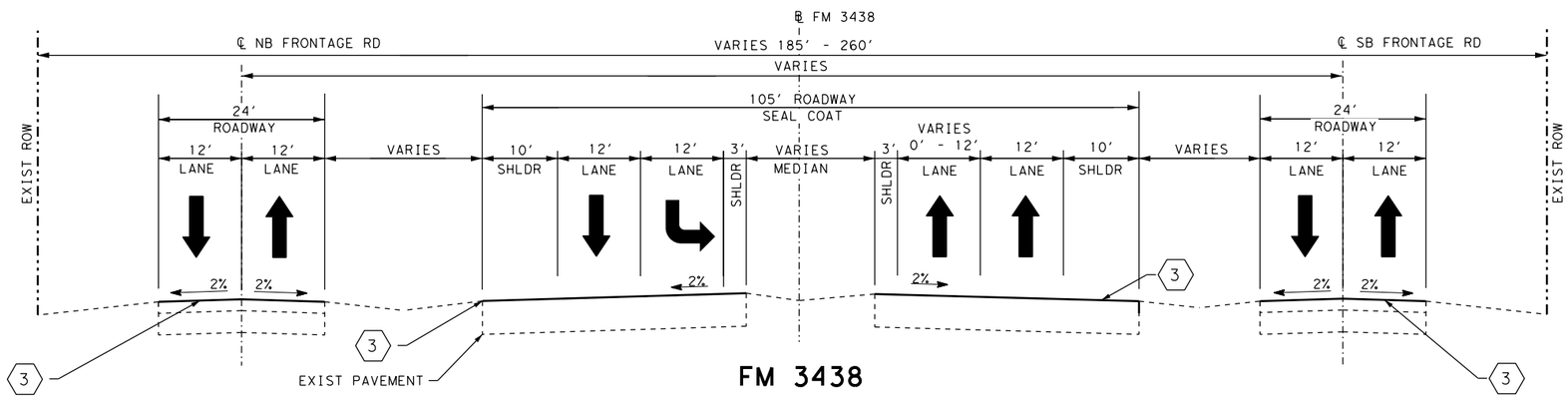
FM 3438

PROPOSED TYPICAL SECTION
STA 161+01.19 TO STA 174+37.07



FM 3438

PROPOSED TYPICAL SECTION
STA 174+37.07 TO STA 175+34.10



FM 3438

LT FR
STA 179+10.19 TO STA 182+00.00

PROPOSED TYPICAL SECTION
STA 175+34.10 TO STA 182+00.00

RT FR
STA 179+49.08 TO STA 182+00.00

LEGEND

- (1) 2" SP-D
- (2) MILL 0" - 2"
- (3) SEAL COAT (OCST)
- EXIST PAVEMENT
- PROP PAVEMENT
- PROP CONC PAVEMENT
- TRAFFIC FLOW

NOTE:

1. PAVEMENT REPAIRS SHALL CONSIST OF MILL & FILL 4" OF SP-B. (SEE PAVEMENT REPAIR DETAIL).
2. PAVEMENT REPAIR AREA TO BE DETERMINED BY ENGINEER.
3. BACKFILL PAVEMENT EDGES TO BE SUBSIDAIRY TO THE BID ITEMS.

SCALE: NTS

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

5/26/2021

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PLANNERS + ENGINEERS + MANAGERS
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San Antonio, Texas 78240
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T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

PROPOSED TYPICAL SECTIONS

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	9

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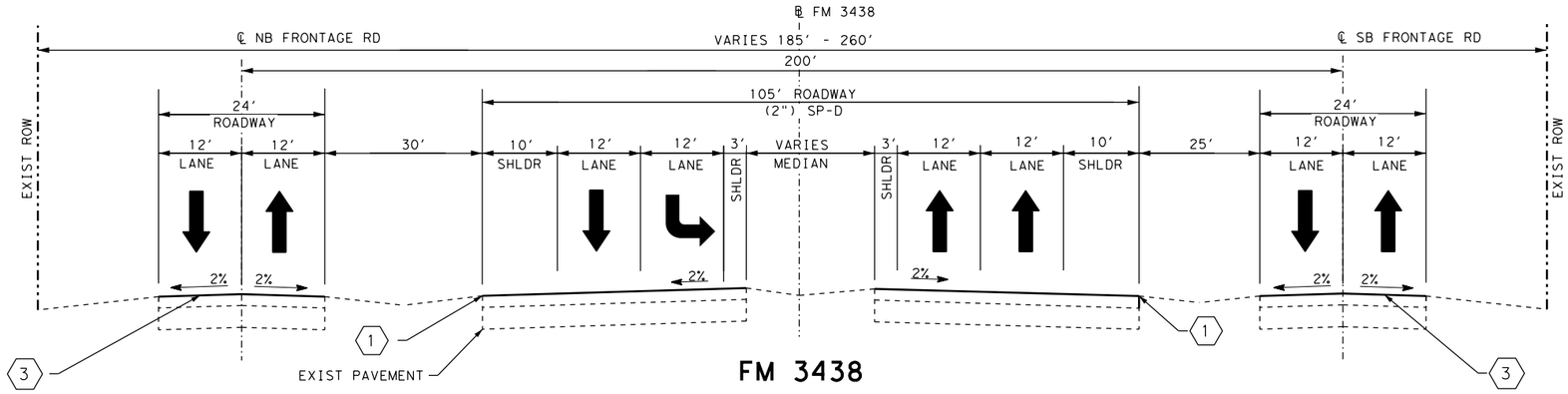


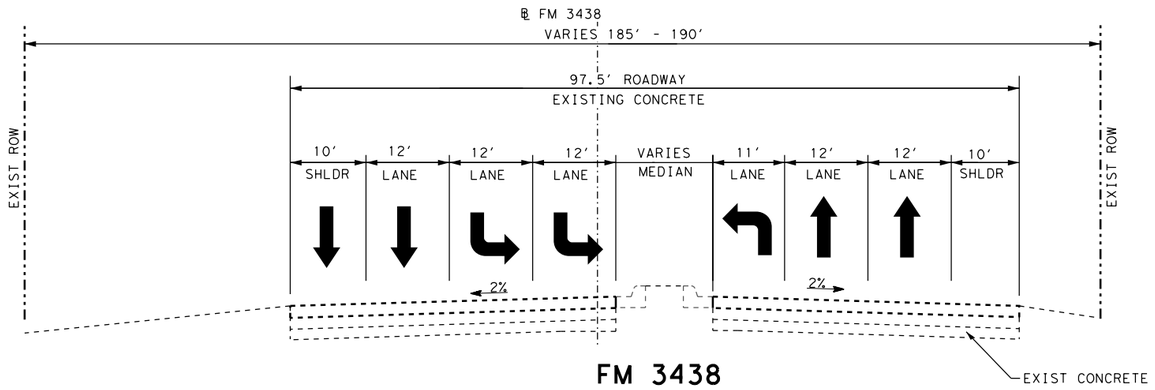
FM 3438

PROPOSED TYPICAL SECTION

LT FR
STA 182+00.00 TO STA 198+15.61

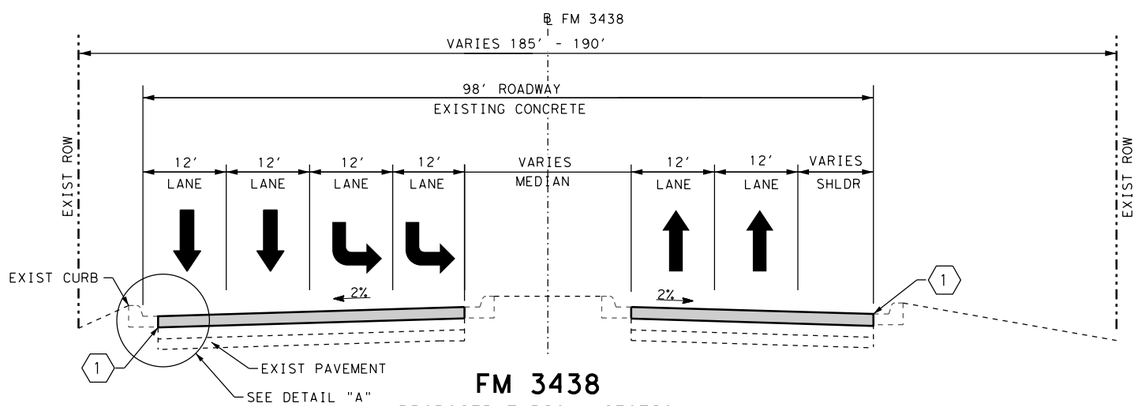
STA 182+00.00 RT TO STA 235+71.37 RT
STA 182+00.00 LT TO STA 236+47.34 LT
MILL STA 182+00.00 RT TO STA 184+00.00 RT
MILL STA 233+71.37 RT TO STA 235+71.37 RT
MILL STA 182+00.00 LT TO STA 184+00.00 LT
MILL STA 234+47.34 LT TO STA 236+47.34 LT

RT FR
STA 182+00.00 TO STA 206+79.74



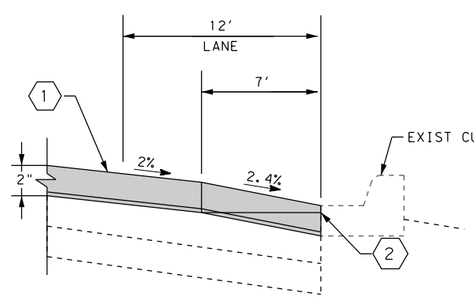
FM 3438

PROPOSED TYPICAL SECTION
STA 235+71.37 RT TO STA 238+13.41 RT
STA 236+47.34 LT TO STA 239+20.88 LT



FM 3438

PROPOSED TYPICAL SECTION
STA 238+13.41 RT TO STA 246+22.49 RT
STA 239+20.88 LT TO STA 246+22.49 LT
MILL STA 239+20.88 LT TO STA 241+20.88 LT
MILL STA 238+13.41 RT TO STA 240+13.41 RT



DETAIL "A"
NTS

LEGEND

1. 2" SP-D
2. MILL 0" - 2"
3. SEAL COAT (OCST)

EXIST PAVEMENT
PROP PAVEMENT
PROP CONC PAVEMENT
TRAFFIC FLOW

NOTE:

1. PAVEMENT REPAIRS SHALL CONSIST OF MILL & FILL 4" OF SP-B. (SEE PAVEMENT REPAIR DETAIL).
2. PAVEMENT REPAIR AREA TO BE DETERMINED BY ENGINEER.
3. BACKFILL PAVEMENT EDGES TO BE SUBSIDAIRY TO THE BID ITEMS.

SCALE: NTS

NO.	DESCRIPTION	DATE

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LICENSED PROFESSIONAL ENGINEER
5/26/2021

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FM 3438

PROPOSED TYPICAL SECTIONS

SHEET 3 OF 5

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	10

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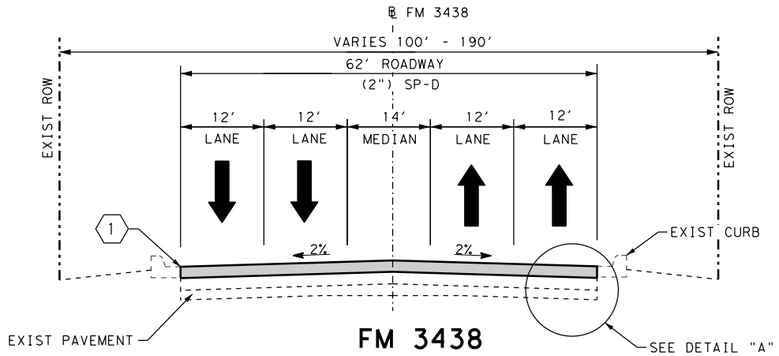
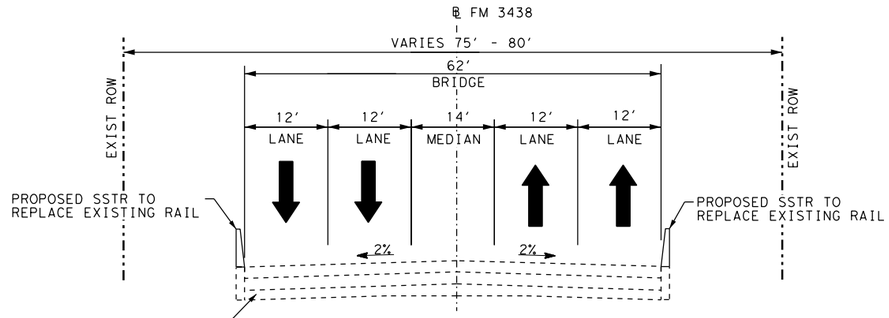


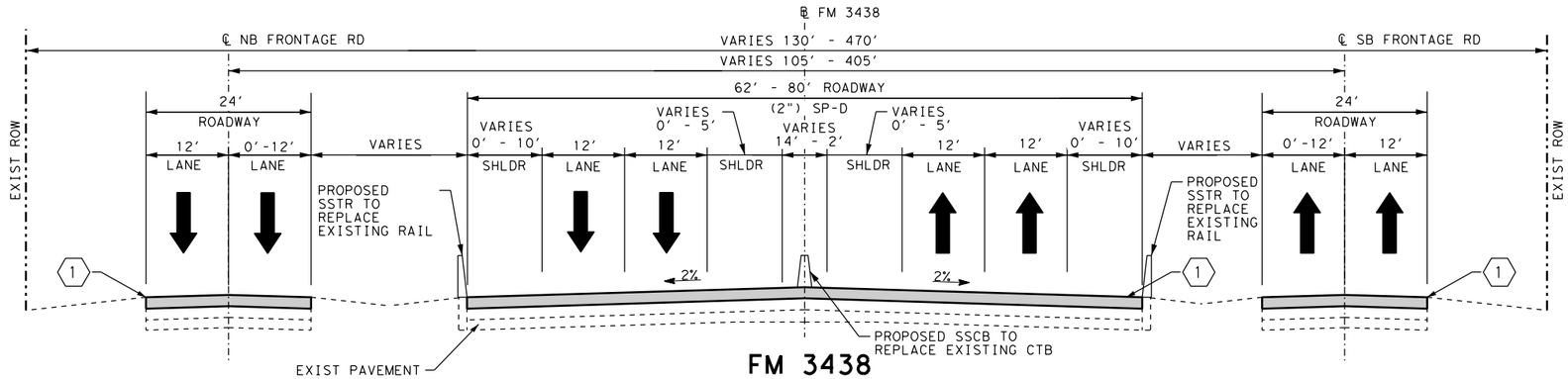
FM 3438

PROPOSED TYPICAL SECTION
STA 246+22.49 TO STA 257+95.47
STA 259+60.11 TO STA 330+68.00
MILL STA 255+95.30 TO STA 257+95.47
MILL STA 259+60.11 TO STA 261+60.14



FM 3438

PROPOSED TYPICAL SECTION
STA 257+95.47 TO STA 259+60.11

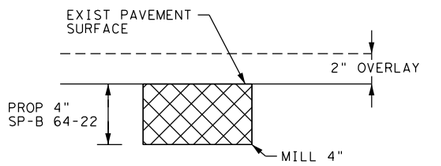


FM 3438

LT FR
STA 333+24.87 TO STA 348+19.17
MILL STA 347+20.58 TO STA 348+19.71

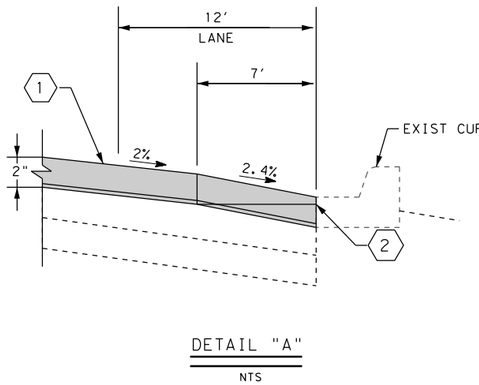
PROPOSED TYPICAL SECTION
STA 330+68.00 TO STA 347+38.43
MILL STA 345+38.43 TO STA 347+38.43

RT FR
STA 334+01.72 TO STA 348+74.79
MILL STA 347+75.10 TO STA 348+74.79



PAVEMENT REPAIR DETAIL (ITEM 351)

NTS



DETAIL "A"

NTS

LEGEND

1 — 2" SP-D
2 — MILL 0" - 2"
3 — SEAL COAT (OCST)

EXIST PAVEMENT
PROP PAVEMENT
PROP CONC PAVEMENT
TRAFFIC FLOW

NOTE:

1. PAVEMENT REPAIRS SHALL CONSIST OF MILL & FILL 4" OF SUPERPAVE MIXTURES SP-B. (SEE PAVEMENT REPAIR DETAIL).
2. PAVEMENT REPAIR AREA TO BE DETERMINED BY ENGINEER.
3. BACKFILL PAVEMENT EDGES TO BE SUBSIDAIRY TO THE BID ITEMS.

SCALE: NTS

NO.	DESCRIPTION	DATE

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87609
LICENSED PROFESSIONAL ENGINEER

5/26/2021

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FM 3438

PROPOSED TYPICAL SECTIONS

SHEET 4 OF 5

DSN: JA	FED. RD. DIV. NO:	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	11

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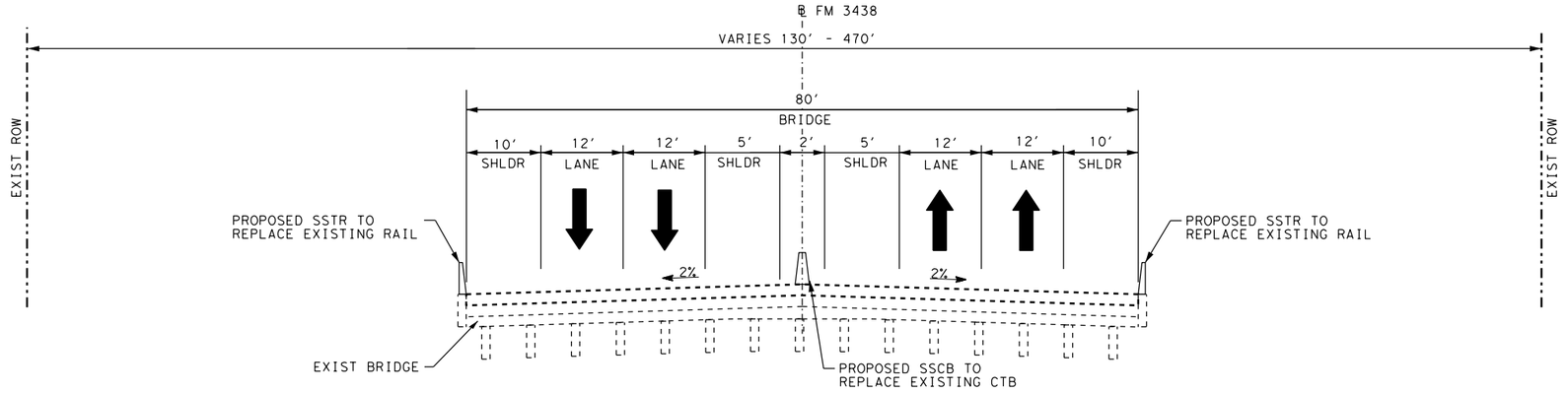
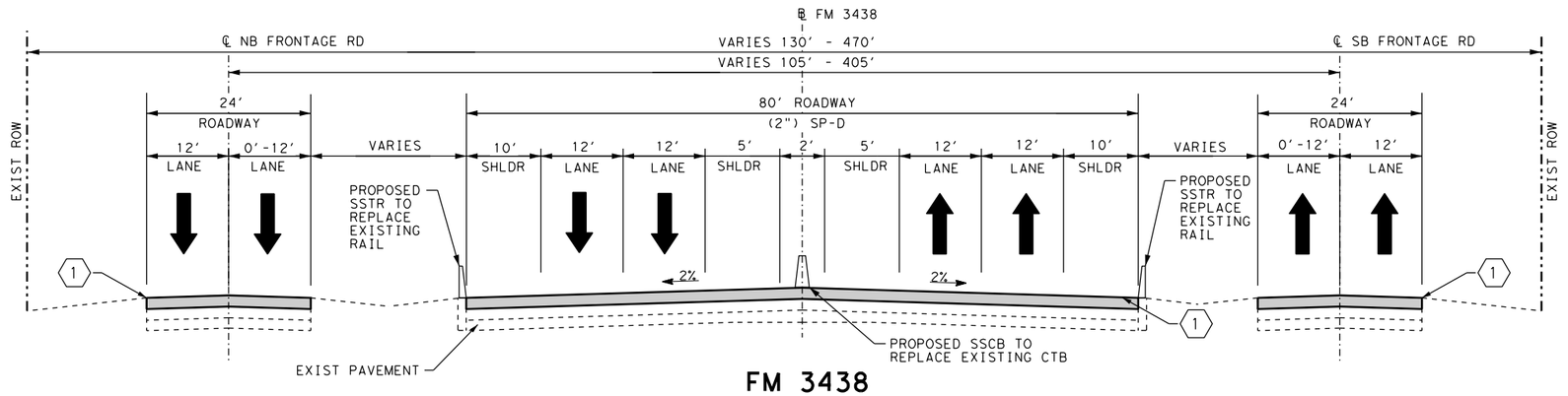


FM 3438

PROPOSED TYPICAL SECTION
STA 347+38.43 TO STA 350+22.06

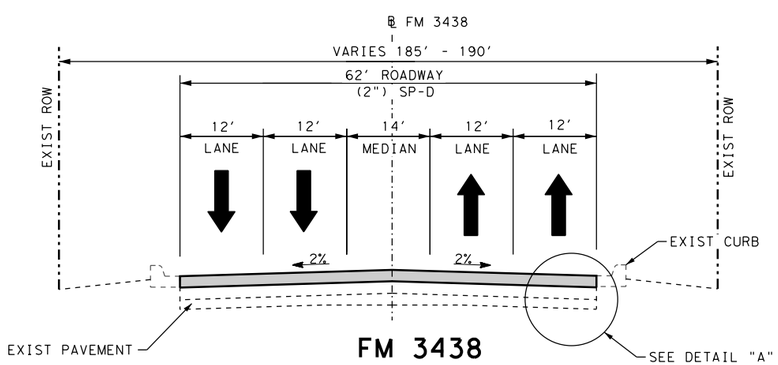


FM 3438

LT FR
STA 348+80.36 TO STA 360+25.93
MILL STA 348+80.64 TO STA 349+80.44

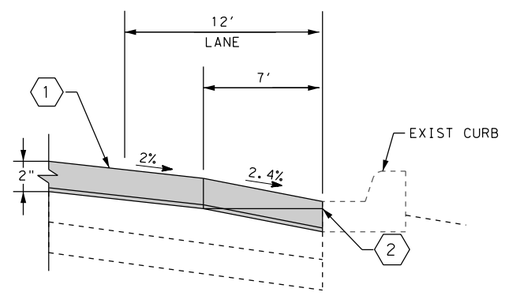
PROPOSED TYPICAL SECTION
STA 350+22.06 TO STA 363+02.33
MILL STA 350+22.06 TO STA 352+22.06

RT FR
STA 349+38.73 TO STA 360+48.88
MILL STA 349+38.73 TO STA 350+37.79



FM 3438

PROPOSED TYPICAL SECTION
STA 363+02.33 TO STA 365+04.93



DETAIL "A"
NTS

LEGEND

1. 2" SP-D
2. MILL 0" - 2"
3. SEAL COAT (OCST)

EXIST PAVEMENT
PROP PAVEMENT
PROP CONC PAVEMENT
TRAFFIC FLOW

NOTE:

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FM 3438

PROPOSED TYPICAL SECTIONS

SHEET 5 OF 5

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	12

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Project Number: See Title Sheet
Control: 2270
County: Taylor
Highway: FM 3438

ABILENE DISTRICT GENERAL NOTES
2014 SPECIFICATIONS

General

I. **UNION PACIFIC RAILROAD COMPANY**
Protection of Fiber Optic Cable Systems
Fiber optic cable systems may be buried on the railroad's property. Protection of the fiber optic cable systems is of extreme importance since any break could disrupt service to users resulting in business interruption and loss of revenue and profits. The State and/or its Contractor shall telephone the railroad during normal business hours (7:00 A.M. to 9:00 P.M., Central time, Monday through Friday, except holidays) at 1-800-336-9193 (also a 24-hour, seven-day number for emergency calls) to determine if fiber optic cable is buried on the railroad's premises to be used by the State. If it is, the State and/or its Contractor will telephone the telecommunications company (ies) involved, arrange for a cable locator and make arrangements for relocation or other protection of the fiber optic cable prior to beginning any work on the railroad's premises.

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

Paul Norman, P.E.: Paul.Norman@txdot.gov
Chad Carter, P.E.: Chad.W.Carter@txdot.gov
(Abilene Area Office)

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

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

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

Failure to make necessary corrections to SW3P based on SW3P inspections will be cause for withholding the monthly estimate until such corrections have been made.

Failure to make necessary corrections to traffic control items based on barricade inspections will be cause for withholding the monthly estimate until such corrections have been made.

Project Number: See Title Sheet
Control: 2270
County: Taylor
Highway: FM 3438

Provide ingress/egress to the adjacent properties in areas under construction. Phased construction of driveways and streets shall be required to provide uninterrupted access to adjacent properties. Coordinate work with the property owners before beginning any construction in the vicinity of the drive.

Cut neat, straight lines with vertical faces along pavement edges or along joints between existing asphalt or concrete pavement and new pavement perpendicular or parallel to the direction of traffic by methods described in applicable bid items, or as directed. Provide clean edges or joints without jagged appearance or chunks broken out. This work is considered subsidiary to various bid items.

Environmental

Endangered and Protected Species
1. Migratory Birds
   a. **Bird nesting season is typically 15Feb through 15Sep annually.**
   b. The Contractor will avoid disturbing, destroying, removing, or relocating migratory birds and active nests found in trees, culverts, bridges, on the ground, or anywhere they are encountered.
   c. Perform all tree trimming and other vegetation clearing activities during the non-breeding season (typically 15Sep-15Feb annually). Perform any inactive nest removal and bird exclusion methods to prevent birds from establishing nests. Phasing of work during construction may be necessary to stay in compliance.
   d. When active nests are unexpectedly encountered on-site during construction, the Contractor will stop work and immediately notify the Engineer. Take measures to avoid disturbance of these birds, their occupied nest, eggs, and/or young, in accordance with the Migratory Bird Treaty Act, Texas Parks and Wildlife Code, and TxDOT policy.
   e. The Engineer will notify the Contractor when work may resume.
   f. The Contractor should be prepared to prevent migratory birds from building nests by utilizing nest prevention methods, such as bird-deterrent netting and bird-repelling sprays and/or gels, between 15Feb and 15Sep. The Contractor can discuss other preventative measures with the Engineer and/or District Environmental Staff.

Best Management Practices
1. Bird BMPs
   a. Not disturbing, destroying, or removing active nests, including ground nesting birds, during the nesting season;
   b. Avoiding the removal of unoccupied, inactive nests, as practicable;
   c. Preventing the establishment of active nests during the nesting season on TxDOT owned and operated facilities and structures proposed for replacement or repair;

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SCALE: NTS

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STATE OF TEXAS
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5/26/2021

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Texas Department of Transportation

FM 3438
GENERAL NOTES

SHEET 1 OF 6

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	13

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d. Not collecting, capturing, relocating, or transporting birds, eggs, young, or active nests without a permit.

Item 5, "Control of Work"
Use Method C for construction surveying.

All known utilities are identified in the plans, including the crossing of power lines. Use this information to identify potential issues with power poles and power lines prior to bidding. Make necessary arrangements with utility owners regarding temporary protections such as bracing power poles, and de-energizing power lines. The Department will not reimburse the cost of such temporary protections to the Contractor, unless the Engineer determines that inadequate information was available at the time the project was bid. **"Call Before You Dig" "Call 811"**

"Provide notification to the District Signal Shop by telephone at 325-676-6974 and by email at Juan.Salgado@txdot.gov when planning drilling or excavation work in areas where existing TxDOT underground utilities exist." Visual evidence of TxDOT underground utilities in the area include illumination poles, ground boxes, flashing beacons, traffic signals, etc. This notification must be provided 48 hours in advance of performing the work.

Drilled shaft locations or excavation areas must be staked prior to the notification so that the underground utilities can be located in relationship to the proposed work. Preserve and document the marked utility locations to prevent unnecessary secondary notifications. Notify the Engineer of conflicts between proposed work and underground utilities.

Obtain approval from the Engineer of staked locations for illumination foundations, pull boxes, and power source prior to construction.

Item 7, "Legal Relations and Responsibilities"

The total area disturbed for this project is **0.26** acres. The disturbed area in this project, all project locations in the Contract, and the Contractor project specific locations (PSLs), within 1 mile of the project limits, for the Contract will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer and to the government that operates a separate storm sewer system.

Provide one SW3P Notification Board for this project. Notification Boards are to be placed at locations within the right-of-way but outside the clear zone as directed by the Engineer. Consider this work to be subsidiary to the various bid items of the contract.

Project Number: See Title Sheet
Control: 2270
County: Taylor
Highway: FM 3438

Hard hats are required at all times during construction when construction personnel are in TxDOT Right-of-Way.

No significant traffic generator events identified.

Item 8 "Prosecution and Progress"
Each contract awarded by the Department stands on its own and as such, is separate from other contracts. A Contractor awarded multiple contracts must be capable and sufficiently staffed to concurrently process and/or execute all contracts at the same time.

The Contractor is hereby authorized to begin work prior to the expiration of the number of calendar days provided in the Special Provision to Item 8, Article 8.1. Notify the Engineer in writing of the date to begin work. Time charges will commence when work begins or on the expiration of the number of calendar days provided, whichever occurs first.

Maintain and submit a project schedule monthly. Submit to the Engineer the updated project schedule no later than the 25th calendar day of the following month.

Coordinate and update the work schedule with the project inspector daily. Give a minimum of 24 hours of notice to project inspector if work requiring inspection or testing is to be performed. Failure to do so may cause that work to be delayed or postponed if TxDOT personnel are not available. Work performed without suitable inspection, as determined by the Engineer, may be ordered removed and replaced at Contractor's expense.

Prepare the progress schedule as a Critical Path Method (CPM).

Item 9, "Measurement and Payment"
The progress payment period shall end on the 25th of each month, unless directed by the Area Office Engineer. Material on Hand (MOH) is due two business days before estimate cut off.

Item 134, "Backfilling"
Backfill pavement edges no later than 2 weeks after the construction of the final surface.

The state will furnish RAP material for backfilling pavement edges. RAP stockpiled at 0.48 miles west of FM 707 between Eastbound I20 main lanes and I20 frontage Road approx. 4.5 miles from the project limits. All RAP will be hauled by the Contractor to the project site and will be paid for under Item 134.

Item 204, "Sprinkling for Dust Control"
Sprinkle for dust control as directed. Payment for this item will be subsidiary to the various bid items.

SCALE: NTS

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FM 3438

GENERAL NOTES

SHEET 2 OF 6

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	14

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Item 216, "Proof Rolling"
Perform proof rolling only as directed. Payment for this item will be made only when proof rolling is performed as directed.

Item 316, "Surface Treatments"
The Engineer must authorize work if the wind exceeds 20 mph.

Seal driveways, mailbox turnouts, and intersections prior to sealing the roadway, unless otherwise approved.

Provide pre-coat aggregate with **PG 64-22** or as approved by the Engineer.

Cover or protect any sealed expansion joints or rail on bridges and any railroad tracks encountered on this project, as directed by the Engineer. Clean any of these items not properly protected. This work will not be paid for directly but will be considered subsidiary to Item 316.

Remove excess aggregate from the curb and gutter sections, bridge rail, intersections, and other areas as directed. After final rolling, remove any loose aggregate from the paved surface. This work is subsidiary to the various bid items.

Item 320, "Equipment for Hot Mix Asphalt Materials"
Use of a motor grader is allowed for spot repair of asphalt base.

Item 351, "Flexible Pavement Structure Repair"
The quantity shown in the plans for pavement structure repair is estimated. The Engineer will determine specific locations to be repaired. Unless otherwise shown in the plans, multiple locations throughout the project will be repaired, and may vary significantly in length and width.

Item 354, "Planing and Texturing Pavement"
Retain ownership of excess RAP and remove the unused material from the project site upon completion of the paving work.

Item 421, "Hydraulic Cement Concrete"
Use a cement meeting the requirements of Ty II when Mix Design Option 7 is selected for cast in place concrete.

Class C fly ash and Type I cement will not be allowed for any mix unless approved by the Engineer.

As a minimum, curing facility includes concrete curing tank, heater and a concrete recording thermometer. Provide a recorder with the capability to chart temperatures for 24 hours, 7 days and 30 day periods of time.

Project Number: See Title Sheet
Control: 2270
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Air Entrainment requirements are waived with exception to bridge deck concrete, and rails, top slabs of direct traffic culverts and approach slabs. Air Entrainment is required for all slip formed concrete (bridge rail, concrete traffic barrier, pavement, etc.).

Item 429, "Concrete Structure Repair"
Areas to be repaired at each location shall be marked in the field by the Engineer.

Areas to be repaired at each location shall be repaired in accordance with the Department's Concrete Repair Manual. The Contractor must prepare and submit formal procedures outlining repair plans and which proprietary implementation so the Engineer has sufficient time to review. The Engineer must approve in writing any procedures that differ from those in the Concrete Repair Manual or materials that are not included in one of TxDOT's MPLS materials they plan to utilize. Submit the package a minimum of two weeks prior to.

For Vertical and Overhead repairs use preapproved Type C Repair Material. For Deck repairs use preapproved Type B Ultra-Rapid Extended Repair Material.

Item 432, "Riprap"
Provide tooled contraction joints at a maximum spacing of 25 feet and ½" fiber board every 150 feet when constructing cable median barrier mow strips. The depth for tooled joints shall be sufficient to ensure cracking at the joints. The depth for fiber board joints shall be the full depth of the mow strip.

Provide structural fiber reinforced or conventionally reinforced concrete for formed M.B.G.F. concrete mow strip.

Meet the following requirements when using structural fiber reinforcement:

- If slip forming, use an approved method that ensures adequate concrete consolidation. Sprinkle and consolidate the subgrade before the concrete is placed. Finish the surface with a wood float or broom finish as approved. Immediately after finishing operation, cure the riprap according to Item 420, "Concrete Structures".

Item 502, "Barricades, Signs and Traffic Handling"
Mobile traffic control in accordance with TPC 3 series will be required for placement of short duration, short term, intermediate term, and long-term traffic control.

Provide the Engineer with written notification seven (7) days in advance of major traffic changes. A major traffic change is defined as the temporary (greater than one day) or permanent relocation of traffic lanes typically in an urban setting. The notice will, at a minimum, include the expected date, time and scope of the traffic change. The Department will utilize the information provided to inform the traveling public of the changes. Failure to provide advance notice, or to provide accurate information, will result in delaying the work until such time that the public has been notified.

SCALE: NTS

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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6/17/2021

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Texas Department of Transportation

FM 3438

GENERAL NOTES

SHEET 3 OF 6

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	15

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Additional signs, barricades and traffic handling may be necessary to complete the work shown herein and will be provided by the contractor as required and will be considered subsidiary to this item.

Provide separate attenuators for each work area within a common lane closure as approved or directed by the Engineer.

In sections where traffic is restricted to one lane, two-way traffic, flaggers stationed at each end of that section will control operations with two-way communication devices.

Relocate existing roadside signs to temporary supports as approved by the engineer.

All safety appurtenances such as signs, delineators, object markers and route markers will be in place prior to opening each phase of the construction to traffic, unless otherwise directed.

During construction on all underpass structures erect and maintain accurate clearance signs in accordance with the "Texas Manual on Uniform Traffic Control Device for Streets and Highways". The mounting method for the temporary clearance sign is subject to approval of the Engineer. Temporary clearance signs are considered subsidiary to the various bid items.
Movement of construction equipment and haul trucks will be prohibited from crossing the median unless specifically authorized by the Engineer. Ingress and egress to main lanes will be at entrance and exit ramps.

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.

The Contractor's person responsible for TCP compliance must be available by local telephone and have a response time within 45 minutes.

Work will not be allowed on both sides of the roadbed at the same time unless approved by the Engineer..

Equip all work vehicles within 30 feet of the traveled way with a functioning amber strobe light or rotating beacon visible from all directions.

Repair barricades within the timeline shown on the barricade inspection report. Failure to comply will cease all work until barricades are repaired to the satisfaction of the Department.

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Replace all damaged traffic control devices immediately. Remove any damaged traffic control devices from the project within 24 hours.

Conflicting guide signs shall be covered as approved by the Engineer.

Pilot car is subsidiary to item 502.

Work within STA 143+24.13 To STA 145+67.32 will be coordinated with adjacent property owners and will begin when approved by the Engineer.

Item 504, "Field Office for Laboratory"

Field Laboratory:
Furnish a "Type D" structure for the asphalt mix control laboratory for the Engineer's exclusive use. In addition to the requirements of Item 504, furniture and equipment to be furnished by the Contractor shall include*:*

- eye wash station
- first-aid kit
- two fire extinguishers
- Provide internet connectivity for use by TxDOT lab testing personnel at all laboratory structures on this project.

Item 506, "Temporary Erosion, Sedimentation, and Environmental Controls"
On site concrete washout shall not be allowed on this project.

Item 512, "Portable Concrete Traffic Barrier
The state will furnish the portable concrete traffic barrier (PCTB) sections stockpiled at 0.4 miles South of BI 20 along the Southbound lanes of SL 322 approx. 8.0 miles from the project limits. All PCTB sections will be hauled by the Contractor to the project site. Upon completion, all PCTB sections will be returned to their original location. Make arrangements at the storage sites for the loading and unloading of the PCTB.

Contractor to provide connection hardware. Quick Bolt SSCB joint installation shall be used.
Item 514, "Permanent Concrete Traffic Barrier"
Use Class "C" concrete with air entrainment for Permanent Concrete Traffic Barrier.

Item 530, "Intersections, Driveways, and Turnouts"
Excavation and embankment necessary to construct the intersections and driveways according to the details shown elsewhere shall be considered subsidiary to this item.

Item 540, "Metal Beam Guard Fence"
Steel posts for metal beam guard fence may be field cut to proper rail height with a power saw when approved by the engineer.

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Texas Department of Transportation

FM 3438

GENERAL NOTES

SHEET 4 OF 6

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	16

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Core drill 1 ¼ diameter holes through existing slab. Percussion or impact drilling is not permitted. Patch spalls, when directed by the engineer, in accordance with item 429, "Concrete Structure Repair", at the contractor's expense.

Item 585, "Ride Quality for Pavement Surfaces"
The Engineer reserves the right to prohibit corrective work and assess the penalty for each occurrence of localized roughness per Article 585.3.4.2.3.2.

Use pay adjustment schedule 2 (two) for Ride Quality bonus/penalty calculation. Applies only for overlay areas within STA 182+00 to STA 365+04.93

Item 644, "Small Roadside Sign Supports and Assemblies"
Use the latest edition of the "Standard Highway Sign Designs for Texas" for Sign types for which design details are not shown on the plans.

Sign placement shall be in accordance with the latest edition of the TMUTCD & TxDOT's Sign Crew Field Book located at the following addresses.
TMUTCD - https://www.txdot.gov/business/resources/signage/tmutcd.html
TxDOT's Sign Crew Field Book - http://onlinemanuals.txdot.gov/txdotmanuals/sfb/index.htm

Before final sign installation, stake all sign locations for approval by the engineer.

All triangle slip base small sign mounts installed under this item shall utilize clamp type bases.

Remove entire small sign foundation.

Item 658, "Delineator and Object Marker Assemblies"
Delineators and object marker assemblies will use winged channel posts. The winged channel posts will be 1.12 lb/ft and 6.5 ft in length.

All MBGF delineation shall be GF2 mounted on posts.

Use minimum 2 inch long lag screws with washers to attach flexible GF2 barrier reflectors to wooden post. For steel posts, use an approved adhesive, or other method approved by Engineer.

Concrete Barrier Reflectors shall be equivalent to Shure-tite CTB "Cup Mount" Delineator (8"). Attach delineators to concrete rail with concrete anchors as approved by the Engineer.

Item 662, "Work Zone Pavement Markings"
Place work zone pavement markings (flexible tabs) prior to the seal coat operation.

Dispose of tabs and paper in an approved trash receptacle. (Reference Standard **SW3P**, waste material)

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Use traffic paint for non-removable work zone pavement markings.

Item 666, "Retro reflectorized Pavement Markings"
Provide a complete system of thermoplastic pavement markings at locations indicated on the plans and as directed by the engineer. The plans are intended to show typical conditions, which can be extended to similar conditions throughout this project as approved or directed.

Establish a true and correct alignment with a method approved by the Engineer. This work will be considered subsidiary.

Item 672, "Raised Pavement Markers"
Provide a complete system of raised pavement markers at locations indicated on the plans and as directed by the engineer. The plans are intended to show typical conditions, which can be extended to similar conditions throughout this project as approved or directed.

Bituminous adhesive shall be used on this project.

Item 677, "Eliminating Existing Pavement Markings and Markers"
Remove the existing raised pavement markings (RPMs) and profile pavement markings as the work progresses, or as directed by the Engineer. Water blasting shall be used on concrete surfaces only. Removal methods shall be approved by the Engineer. Properly dispose of materials removed. Removal of existing profile pavement markings will be paid for directly. Removal of RPMs will not be paid for directly but will be subsidiary to the pertinent bid items.

Item 3077, "Superpave Mixtures"
Furnish aggregate for final surfaces with a minimum surface aggregate classification of "**B**".

Provide an SP-D Fine Mixture with a minimum design VMA of 17.0% and a minimum plant-produced VMA of 16.5%.

The Engineer reserves the right to test all sources even if the source is listed in the Bituminous Source Rated Quality Catalog.

Provide the testing lab samples to calibrate the ignition oven no later than five **(5)** working days prior to mix design verification.

Meet the minimum Hamburg Wheel Test requirements shown below:

- PG 70 – 10,000 passes

Paving operations will not be allowed to begin until TxDOT has tested and obtained passing Hamburg results on the trial batch.

A maximum of 0.50% anti-stripping agent will be allowed for each specified mix type.

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FM 3438

GENERAL NOTES

SHEET 5 OF 6

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	17

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Dilution of tack coat is not allowed.

Do not exceed a laydown width of 16' per pass.

Substitute Binders will not be allowed unless RAP or RAS is used in the production of the mixture.

RAS will not be allowed in surface mixes.
A warm mix additive will be required for hotmix hauls over 50 miles.

Unless otherwise directed by the engineer, a warm mix additive will be required when paving during November 1st through March 15th.

The maximum allowable dust / asphalt ratio that will be allowed is 0.6 to 1.2.

The use of a tapered longitudinal joint will be required for pavement thicker than 2 inches.

Use a self-propelled, wheel-mounted material transfer vehicle (MTV) capable of receiving hot mix from the haul trucks separate from the paver on this project. Minimum requirements for the MTV are a storage capacity of approximately 25 tons, a pivoting discharge conveyor, and a means of completely remixing the ACP prior to placement.

Provide PG 64-22 tack coat at a rate of 0.15 gal/sy.

The Contractor will be required to tack 100% of the surfaces with uniform coverage prior to the subsequent lift. The type and grade of tack will be approved by the Engineer prior to use.

Tack all vertical joints unless otherwise directed.

Cement and kiln dust will not be allowed to be used as mineral fillers.

Shoulders shall not be placed prior to adjoining main lanes.

Final surface of driveway shall not be placed prior to adjoining surface.

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Control: 2270
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Item 6185, "Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)"

BASIS OF ESTIMATE FOR STATIONARY TMAs				
		TMA (Stationary)		
Phase	Standard	Required	Additional	TOTAL
4	TCP(1-2)18	1	0	1
4	TCP(1-4)18	1	0	1
4	TCP(1-5)18	1	0	1
1	TCP(2-5)-18	1	0	1
1	TCP(2-6)-18	1	0	1
2	TCP(2-5)-18	1	0	1
2	TCP(2-6)-18	1	0	1
Basis of Estimate for Mobile TMAs				
		TMA (Mobile)		
Phase	Standard	Required	Additional	TOTAL
4	TCP(3-1)	2	0	2
4	TCP(3-2)	3	0	3
4	TCP(3-3)	3	0	3

The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project. The Contractor must get approval from the Engineer for any changes in the number of TMA as shown in the plans.

If a TMA is used for both mobile and stationary traffic control on the same day, it will be paid for as stationary for that day.

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GENERAL NOTES

SHEET 6 OF 6

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	18

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QUANTITY SHEET

CONTROLLING PROJECT ID 2270-01-023 **DISTRICT** Abilene **COUNTY** Taylor
HIGHWAY FM 3438

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2270-01-023**			
		PROJECT ID		**A00059891**			
		COUNTY		**Taylor**			
		HIGHWAY		**FM 3438**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	104-6009	REMOVING CONC (RIPRAP)	SY	16.000		16.000	
	104-6054	REMOVING CONCRETE(MOW STRIP)	LF	707.000		707.000	
	105-6019	REMOVING STAB BASE & ASPH PAV(14")	SY	486.000		486.000	
	134-6001	BACKFILL (TY A)	STA	93.000		93.000	
	316-6017	ASPH (AC-20-5TR)	GAL	20,297.000		20,297.000	
	316-6224	AGGR(TY-PB GR-4 SAC-B)	CY	451.000		451.000	
	351-6013	FLEXIBLE PAVEMENT STRUCTURE REPAIR(4")	SY	5,500.000		5,500.000	
	354-6021	PLANE ASPH CONC PAV(0" TO 2")	SY	27,230.000		27,230.000	
	360-6004	CONC PVMT (CONT REINF - CRCP) (10")	SY	1,251.000		1,251.000	
	429-6002	CONC STR REPAIR (EPOXY MORTAR)	SF	12.000		12.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	252.100		252.100	
	438-6001	CLEANING AND SEALING EXISTING JOINTS	LF	692.000		692.000	
	451-6024	RETROFIT RAIL (TY SSTR)	LF	898.000		898.000	
	467-6004	SET (REPLACE PIPE RUNNER)	EA	2.000		2.000	
	467-6211	SET (TY I)(S= 6 FT)(HW= 4 FT)(3:1) (C)	EA	4.000		4.000	
	467-6556	SET (TY II) (DES 5) (CMP) (3: 1) (C)	EA	2.000		2.000	
	467-6559	SET (TY II) (DES 5) (CMP) (6: 1) (C)	EA	2.000		2.000	
	496-6099	REMOVE STR (RAIL)	LF	1,599.000		1,599.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	8.000		8.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	808.000		808.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	808.000		808.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	780.000		780.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	780.000		780.000	
	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	4,240.000		4,240.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF	4,240.000		4,240.000	
	512-6037	PORT CTB (STKPL)(SGL SLP)(TY 1)	LF	4,240.000		4,240.000	
	514-6001	PERM CTB (SGL SLOPE) (TY 1) (42)	LF	1,599.000		1,599.000	
	530-6004	DRIVEWAYS (CONC)	SY	9.000		9.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	3,012.500		3,012.500	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	11.000		11.000	
	540-6020	MTL W - BEAM GD FEN (LOW FILL CULVERT)	LF	150.000		150.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	2,487.500		2,487.500	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	17.000		17.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	10.000		10.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	4.000		4.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 2270-01-023 **DISTRICT** Abilene **COUNTY** Taylor
HIGHWAY FM 3438

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2270-01-023**			
		PROJECT ID		**A00059891**			
		COUNTY		**Taylor**			
		HIGHWAY		**FM 3438**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	545-6007	CRASH CUSH ATTEN (INSTL)(L)(N)(TL3)	EA	2.000		2.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	4.000		4.000	
	636-6001	ALUMINUM SIGNS (TY A)	SF	360.500		360.500	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	165.000		165.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	22.000		22.000	
	644-6027	IN SM RD SN SUP&AM TYS80(1)SA(P)	EA	16.000		16.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA	18.000		18.000	
	644-6087	IN SRSS & AM (RAIL)(130 MPH)(P MOUNT)	EA	5.000		5.000	
	647-6001	INSTALL LRSS (STRUCT STEEL)	LB	394.000		394.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	56.000		56.000	
	658-6065	INSTL DEL ASSM (D-SY)SZ 1(BRF)GF2(BR)	EA	9.000		9.000	
	658-6069	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BR)	EA	10.000		10.000	
	658-6071	INSTL DEL ASSM (D-SY)SZ (BRF)CTB (BI)	EA	15.000		15.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF	38,970.000		38,970.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	42,610.000		42,610.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	116.000		116.000	
	662-6110	WK ZN PAV MRK SHT TERM (TAB)TY Y	EA	240.000		240.000	
	666-6006	REFL PAV MRK TY I (W)4"(DOT)(100MIL)	LF	244.000		244.000	
	666-6030	REFL PAV MRK TY I (W)8"(DOT)(100MIL)	LF	169.000		169.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	7,449.000		7,449.000	
	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	416.000		416.000	
	666-6138	REFL PAV MRK TY I (Y)8"(SLD)(100MIL)	LF	820.000		820.000	
	666-6168	REFL PAV MRK TY II (W) 4" (DOT)	LF	122.000		122.000	
	666-6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	2,184.000		2,184.000	
	666-6182	REFL PAV MRK TY II (W) 24" (SLD)	LF	1,605.000		1,605.000	
	666-6184	REFL PAV MRK TY II (W) (ARROW)	EA	17.000		17.000	
	666-6192	REFL PAV MRK TY II (W) (WORD)	EA	12.000		12.000	
	666-6211	REFL PAV MRK TY II (Y) 8" (SLD)	LF	40.000		40.000	
	666-6214	REFL PAV MRK TY II (Y) 24" (SLD)	LF	675.000		675.000	
	666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	10,069.000		10,069.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	59,784.000		59,784.000	
	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	5,448.000		5,448.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	79,322.000		79,322.000	
	668-6076	PREFAB PAV MRK TY C (W) (24") (SLD)	LF	2,112.000		2,112.000	
	668-6077	PREFAB PAV MRK TY C (W) (ARROW)	EA	40.000		40.000	
	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	37.000		37.000	
	668-6091	PREFAB PAV MRK TY C (W) (18")(YLD TRI)	EA	94.000		94.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 2270-01-023 **DISTRICT** Abilene **COUNTY** Taylor
HIGHWAY FM 3438

						TOTAL EST.	TOTAL FINAL
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		PROJECT ID		**A00059891**			
		COUNTY		**Taylor**			
		HIGHWAY		**FM 3438**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	668-6108	PREFAB PAV MRK TY C (Y) (24") (SLD)	LF	4,623.000		4,623.000	
	672-6007	REFL PAV MRKR TY I-C	EA	347.000		347.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	1,398.000		1,398.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA	991.000		991.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	44,072.000		44,072.000	
	677-6003	ELIM EXT PAV MRK & MRKS (8")	LF	2,248.000		2,248.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	1,359.000		1,359.000	
	677-6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	20.000		20.000	
	677-6012	ELIM EXT PAV MRK & MRKS (WORD)	EA	12.000		12.000	
	3077-6001	SP MIXESSP-BPG64-22	TON	286.000		286.000	
	3077-6053	SP MIXESSP-DSAC-B PG70-22	TON	15,420.000		15,420.000	
	3077-6075	TACK COAT	GAL	21,029.000		21,029.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	4.000		4.000	
	6048-6009	RE PM W/RET REQ TY II (W)4"(BRK)	LF	280.000		280.000	
	6048-6010	RE PM W/RET REQ TY II (W)4"(SLD)	LF	2,769.000		2,769.000	
	6048-6014	RE PM W/RET REQ TY II (Y)4"(SLD)	LF	4,188.000		4,188.000	
	6185-6002	TMA (STATIONARY)	DAY	406.000		406.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	24.000		24.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

SUMMARY OF ROADWAY QUANTITIES

PLAN VIEW LAYOUT	STATION TO STATION			LENGTH (FT)	AVG WIDTH (FT)	104	104	105	134	316	316	3077	3077	3077	351
						6009	6054	6019	6001	6017	6224	6001	6053	6075	6013
						REMOVING CONC (RIPRAP)	REMOVING CONCRETE(MOW STRIP)	REMOVING STAB BASE & ASPH PAV(14")	BACKFILL (TY A)	ASPH (AC-20-5TR)	AGGR(TY-PB GR-4 SAC-B)	SUPERPAVE MIXTURES SP-B 64-22	SUPERPAVE MIXTURES SP-D SAC-B PG70-22	TACK COAT	FLEXIBLE PAVEMENT STRUCTURE REPAIR(4")
SHEET NUMBER	BEGIN STATION		END STATION			SY	LF	SY	STA	GAL	CY	TON	TON	GAL	SY
1	103+50.00	TO	120+00.00	1650	44					3061	68				
2	120+00.00	TO	140+00.00	2000	44					4518	100				
3	140+00.00	TO	160+00.00	2000	84		150	486		4705	105	286			
4	160+00.00	TO	179+00.00	1900	84		95			1778	40				
5	179+00.00	TO	199+00.00	2000	84	16	462		17	4962	110		1459	1989	550
6	199+00.00	TO	218+00.00	1900	106				19	822	18		310	423	550
7	218+00.00	TO	236+50.00	1850	109				18	395	9		1734	2365	550
8	236+50.00	TO	256+00.00	1950	86				6	56	1		1482	2021	550
9	256+00.00	TO	276+00.00	2000	64								1496	2040	550
10	276+00.00	TO	296+00.00	2000	64								1542	2102	550
11	296+00.00	TO	316+00.00	2000	64								1561	2129	550
12	316+00.00	TO	336+00.00	2000	64				4				1672	2281	550
13	336+00.00	TO	356+00.00	2000	80				20				3114	4247	550
14	356+00.00	TO	365+04.93	904.93	72				9				1050	1432	550
					TOTAL:	16	707	486	93	20297	451	286	15420	21029	5500

SUMMARY OF ROADWAY QUANTITIES (CONTINUED)

PLAN VIEW LAYOUT	STATION TO STATION			LENGTH (FT)	AVG WIDTH (FT)	354	360	429	432	467	467	467
						6021	6004	6002	6045	6004	6211	6556
						PLANE ASPH CONC PAV(0" TO 2")	CONC PVMT (CONT REINF - CRCP) (10")	CONC STR REPAIR (EPOXY MORTAR)	RIPRAP (MOW STRIP)(4 IN)	SET (REPLACE PIPE RUNNER)	SET (TY I)(S= 6 FT)(HW= 4 FT)(3:1) (C)	SET (TY II) (DES 5) (CMP) (3: 1) (C)
SHEET NUMBER	BEGIN STATION		END STATION			SY	SY	SF	CY	EA	EA	EA
1	103+50.00	TO	120+00.00	1650	44							
2	120+00.00	TO	140+00.00	2000	44			12		2		
3	140+00.00	TO	160+00.00	2000	84		1251		15.5			
4	160+00.00	TO	179+00.00	1900	84				37.1			
5	179+00.00	TO	199+00.00	2000	84	1702						2
6	199+00.00	TO	218+00.00	1900	106	347						
7	218+00.00	TO	236+50.00	1850	109	1677						
8	236+50.00	TO	256+00.00	1950	86	3649			1.4			
9	256+00.00	TO	276+00.00	2000	64	4954			86.1			
10	276+00.00	TO	296+00.00	2000	64	3021			24.1			
11	296+00.00	TO	316+00.00	2000	64	2931					4	
12	316+00.00	TO	336+00.00	2000	64	2518						
13	336+00.00	TO	356+00.00	2000	80	5047			87.9			
14	356+00.00	TO	365+04.93	904.93	72	1384						
					TOTAL:	27230	1251	12	252.1	2	4	2

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Texas Department of Transportation

FM 3438

QUANTITY SUMMARY

SHEET 1 OF 7

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	22

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PLAN VIEW LAYOUT	STATION TO STATION			LENGTH (FT)	AVG WIDTH (FT)	SUMMARY OF ROADWAY QUANTITIES (CONTINUED)									
						467	496	514	530	540	540	540	542	545	544
						6559	6099	6001	6004	6001	6006	6020	6001	6007	6001
						SET (TY II) (DES 5) (CMP) (6: 1) (C)	REMOVE STR (RAIL)	PERM CTB (SGL SLOPE) (TY 1) (42)	DRIVEWAYS (CONC)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	MTL W- BEAM GD FEN (LOW FILL CULVERT)	REMOVE METAL BEAM GUARD FENCE	CRASH CUSH ATTEN (INSTL)(L)(N)(TL3)	GUARDRAIL END TREATMENT (INSTALL)
SHEET NUMBER	BEGIN STATION		END STATION			EA	LF	LF	SY	LF	EA	LF	LF	EA	EA
1	103+50.00	TO	120+00.00	1650	44										
2	120+00.00	TO	140+00.00	2000	44										
3	140+00.00	TO	160+00.00	2000	84					147.0					1
4	160+00.00	TO	179+00.00	1900	84					490.5	3		612.5		2
5	179+00.00	TO	199+00.00	2000	84	2									
6	199+00.00	TO	218+00.00	1900	106										
7	218+00.00	TO	236+50.00	1850	109										
8	236+50.00	TO	256+00.00	1950	86										
9	256+00.00	TO	276+00.00	2000	64				9	550.0	4	100	387.5		8
10	276+00.00	TO	296+00.00	2000	64					337.5		50			2
11	296+00.00	TO	316+00.00	2000	64										
12	316+00.00	TO	336+00.00	2000	64										
13	336+00.00	TO	356+00.00	2000	80		1235	1235		1487.5	4		1487.5	1	4
14	356+00.00	TO	365+04.93	904.93	72		80	80						1	
					TOTAL:	2	1315	1315	9	3012.5	11	150	2487.5	2	17

BASIS OF ESTIMATE

ITEM	DESCRIPTION	RATE	AREA(SY)	QUANTITY	UNIT
316 6017	ASPH (AC-20-5TR)	EST @ 0.36 GAL/SY	56380	20297	GAL
316 6224	AGGR (TY-PB GR-4 SAC-B)	EST @ 1 CY/125 SY	56380	451	CY
3077 6001	SUPERPAVE MIXTURES SP-B PG64-22	EST @ 440 LBS/SY	1302	286	TON
3077 6053	SUPERPAVE MIXTURES SP-D SAC-B PG70-22	EST @ 220 LBS/SY	140190	15420	TON
3077 6075	TACK COAT	EST @ 0.15 GAL/SY	140190	21029	GAL

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FM 3438

QUANTITY SUMMARY

SHEET 2 OF 7

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	23

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SUMMARY OF PAVEMENT MARKING QUANTITIES

PAVEMENT MARKING LAYOUT	STATION TO STATION			666 6006	666 6030	666 6036	666 6042	666 6168	666 6178	666 6182	666 6184	666 6192	666 6211
				REFL PAV MRK TY I (W)4"(DOT)(100MIL)	REFL PAV MRK TY I (W)8"(DOT)(100MIL)	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	REFL PAV MRK TY II (W) 4" (DOT)	REFL PAV MRK TY II (W) 8" (SLD)	REFL PAV MRK TY II (W) 24" (SLD)	REFL PAV MRK TY II (W) (ARROW)	REFL PAV MRK TY II (W) (WORD)	REFL PAV MRK TY II (Y) 8" (SLD)
SHEET NUMBER	BEGIN STATION		END STATION	LF	LF	LF	LF	LF	LF	LF	EA	EA	LF
1	103+50.00	TO	120+00.00										
2	120+00.00	TO	140+00.00										
3	140+00.00	TO	160+00.00			374							
4	160+00.00	TO	179+00.00			1707			1707	876	17	12	40
5	179+00.00	TO	199+00.00		169	592							
6	199+00.00	TO	218+00.00			743							
7	218+00.00	TO	236+50.00			322			79				
8	236+50.00	TO	256+00.00	244		645		122	398	729			
9	256+00.00	TO	276+00.00			161							
10	276+00.00	TO	296+00.00			264							
11	296+00.00	TO	316+00.00										
12	316+00.00	TO	336+00.00			944	187						
13	336+00.00	TO	356+00.00			612	50						
14	356+00.00	TO	365+04.93			1085	179						
			TOTAL	244	169	7449	416	122	2184	1605	17	12	40

SUMMARY OF PAVEMENT MARKING QUANTITIES (CONTINUED)

PAVEMENT MARKING LAYOUT	STATION TO STATION			666 6214	666 6300	666 6303	666 6312	666 6315	666 6138	668 6076	668 6077
				REFL PAV MRK TY II (Y) 24" (SLD)	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	REFL PAV MRK TY I (Y)8"(SLD)(100MIL)	PREFAB PAV MRK TY C (W) (24") (SLD)	PREFAB PAV MRK TY C (W) (ARROW)
SHEET NUMBER	BEGIN STATION		END STATION	LF	LF	LF	LF	LF	LF	LF	EA
1	103+50.00	TO	120+00.00			4439	125	3804		23	
2	120+00.00	TO	140+00.00			4430	519	2097		29	
3	140+00.00	TO	160+00.00			3783		6298		20	4
4	160+00.00	TO	179+00.00	662	260	6800		10302	40	886	20
5	179+00.00	TO	199+00.00		421	3733		11565		99	4
6	199+00.00	TO	218+00.00		929	3642		5219		179	4
7	218+00.00	TO	236+50.00		926	3700		4460			
8	236+50.00	TO	256+00.00	13	930	3312	387	4903		729	6
9	256+00.00	TO	276+00.00		1040	4000	1162	4002			1
10	276+00.00	TO	296+00.00		1050	3858	998	4012		11	1
11	296+00.00	TO	316+00.00		1336	3731	1218	3648		69	
12	316+00.00	TO	336+00.00		1030	4006	957	5140	3		
13	336+00.00	TO	356+00.00		1675	8753		10254	554	67	
14	356+00.00	TO	365+04.93		472	1597	82	3618	223		
			TOTAL	675	10069	59784	5448	79322	820	2112	40

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FM 3438

QUANTITY SUMMARY

DSN: JA	FED. RD. DIV. NO. 6	STATE TEXAS	PROJECT NO. SEE TITLE SHEET			HIGHWAY NO. FM 3438
CK: AR						
DRN: AM	STATE DISTRICT ABL	COUNTY TAYLOR	CONTROL NO. 2270	SECTION NO. 01	JOB NO. 023	SHEET NO. 24
APPVD: CS						

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PAVEMENT MARKING LAYOUT	STATION TO STATION			SUMMARY OF PAVEMENT MARKING QUANTITIES (CONTINUED)									
				668	668	668	672	672	672	677	677	677	677
				6085	6091	6108	6007	6009	6010	6001	6003	6007	6008
				PREFAB PAV MRK TY C (W) (WORD)	PREFAB PAV MRK TY C (W) (18")(YLD TRI)	PREFAB PAV MRK TY C (Y) (24") (SLD)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	REFL PAV MRKR TY II-C-R	ELIM EXT PAV MRK & MRKS (4")	ELIM EXT PAV MRK & MRKS (8")	ELIM EXT PAV MRK & MRKS (24")	ELIM EXT PAV MRK & MRKS (ARROW)
SHEET NUMBER	BEGIN STATION		END STATION	EA	EA	LF	EA	EA	EA	LF	LF	LF	EA
1	103+50.00	TO	120+00.00					35					
2	120+00.00	TO	140+00.00		10			53					
3	140+00.00	TO	160+00.00	4		2139	34	261	2	9120			
4	160+00.00	TO	179+00.00	18		948	78	338	18	726	1707	630	14
5	179+00.00	TO	199+00.00	4	34	86	30	85	54	3456			
6	199+00.00	TO	218+00.00	4	21		46	26	94	2932			
7	218+00.00	TO	236+50.00	1			18		96	3150	143		
8	236+50.00	TO	256+00.00	4	5	234	27	71	92	3520	398	729	6
9	256+00.00	TO	276+00.00	1			8	97	104	4000			
10	276+00.00	TO	296+00.00	1	4	104	14	118	104	3714			
11	296+00.00	TO	316+00.00					94	104	3644			
12	316+00.00	TO	336+00.00			270	47	104	104	4000			
13	336+00.00	TO	356+00.00		16	373	2	57	171	4000			
14	356+00.00	TO	365+04.93		4	469	43	59	48	1810			
			TOTAL	37	94	4623	347	1398	991	44072	2248	1359	20

PAVEMENT MARKING LAYOUT	STATION TO STATION			SUMMARY OF PAVEMENT MARKING QUANTITIES (CONTINUED)			
				677	6048	6048	6048
				6012	6009	6010	6014
				ELIM EXT PAV MRK & MRKS (WORD)	RE PM W/RET REQ TY II (W)4"(BRK)	RE PM W/RET REQ TY II (W)4"(SLD)	RE PM W/RET REQ TY II (Y)4"(SLD)
SHEET NUMBER	BEGIN STATION		END STATION	EA	LF	LF	LF
1	103+50.00	TO	120+00.00				
2	120+00.00	TO	140+00.00				
3	140+00.00	TO	160+00.00			485	485
4	160+00.00	TO	179+00.00	7	120	1792	3015
5	179+00.00	TO	199+00.00				
6	199+00.00	TO	218+00.00				
7	218+00.00	TO	236+50.00	1	20	79	79
8	236+50.00	TO	256+00.00	4	60	85	281
9	256+00.00	TO	276+00.00		80	328	328
10	276+00.00	TO	296+00.00				
11	296+00.00	TO	316+00.00				
12	316+00.00	TO	336+00.00				
13	336+00.00	TO	356+00.00				
14	356+00.00	TO	365+04.93				
			TOTAL	12	280	2769	4188

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Texas Department of Transportation

FM 3438

QUANTITY SUMMARY

SHEET 4 OF 7

DSN: JA	FED. RD. DIV. NO. 6	STATE TEXAS	PROJECT NO. SEE TITLE SHEET			HIGHWAY NO. FM 3438
CK: AR						
DRN: AM	STATE DISTRICT ABL	COUNTY TAYLOR	CONTROL NO. 2270	SECTION NO. 01	JOB NO. 023	SHEET NO. 25
APPVD: CS						

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SUMMARY OF SIGNING QUANTITIES											
ROADWAY DETAIL	STATION TO STATION			636	644	644	644	644	644	647	658
				6001	6001	6004	6027	6033	6087	6001	6062
				ALUMINUM SIGNS (TY A)	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	IN SM RD SN SUP&AM TYS80(1)SA(P)	IN SM RD SN SUP&AM TYS80(1)SA(U)	IN SRSS & AM (RAIL)(130 MPH)(P MOUNT)	INSTALL LRSS (STRUCT STEEL)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
SHEET NUMBER	BEGIN STATION		END STATION	SF	EA	EA	EA	EA	EA	LB	EA
1	103+50.00	TO	120+00.00		6		1	2			
2	120+00.00	TO	140+00.00		10						
3	140+00.00	TO	160+00.00		10						3
4	160+00.00	TO	179+00.00	253.0	5				5		8
5	179+00.00	TO	199+00.00		37	1	11	2			9
6	199+00.00	TO	218+00.00	1.5	23		4	4			4
7	218+00.00	TO	236+50.00		5						
8	236+50.00	TO	256+00.00	50.0	11	1		6			
9	256+00.00	TO	276+00.00		2						6
10	276+00.00	TO	296+00.00		6	1					6
11	296+00.00	TO	316+00.00		7						
12	316+00.00	TO	336+00.00		5			1			
13	336+00.00	TO	356+00.00	56.0	32	13		2		196.9	20
14	356+00.00	TO	365+04.93		6	6		1		196.9	
			TOTAL:	360.5	165	22	16	18	5	394	56

SUMMARY OF SIGNING QUANTITIES (CONTINUED)							
ROADWAY DETAIL	STATION TO STATION			658	658	658	
				6065	6069	6071	
				INSTL DEL ASSM (D-SY)SZ 1(BRF)GF2(BR)	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BR)	INSTL DEL ASSM (D-SY)SZ (BRF)CTB (BI)	
SHEET NUMBER	BEGIN STATION		END STATION	EA	EA	EA	
1	103+50.00	TO	120+00.00				
2	120+00.00	TO	140+00.00				
3	140+00.00	TO	160+00.00				
4	160+00.00	TO	179+00.00	3			
5	179+00.00	TO	199+00.00				
6	199+00.00	TO	218+00.00				
7	218+00.00	TO	236+50.00				
8	236+50.00	TO	256+00.00				
9	256+00.00	TO	276+00.00	2	4		
10	276+00.00	TO	296+00.00				
11	296+00.00	TO	316+00.00				
12	316+00.00	TO	336+00.00				
13	336+00.00	TO	356+00.00	4	6	15	
14	356+00.00	TO	365+04.93				
			TOTAL:	9	10	15	

NO.	DESCRIPTION	DATE

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FM 3438

QUANTITY SUMMARY

SHEET 5 OF 7

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	26

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SUMMARY OF SW3P QUANTITIES

ROADWAY DETAIL	STATION TO STATION			506	506	506	506
				6038	6039	6041	6043
				TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
SHEET NUMBER	BEGIN STATION		END STATION	LF	LF	LF	LF
1	103+50.00	TO	120+00.00				
2	120+00.00	TO	140+00.00			75	75
3	140+00.00	TO	160+00.00	808	808	45	45
4	160+00.00	TO	179+00.00				
5	179+00.00	TO	199+00.00			160	160
6	199+00.00	TO	218+00.00			80	80
7	218+00.00	TO	236+50.00			40	40
8	236+50.00	TO	256+00.00				
9	256+00.00	TO	276+00.00			180	180
10	276+00.00	TO	296+00.00			80	80
11	296+00.00	TO	316+00.00			40	40
12	316+00.00	TO	336+00.00			80	80
13	336+00.00	TO	356+00.00				
14	356+00.00	TO	365+04.93				
			TOTAL:	808	808	780	780

SUMMARY OF TCP QUANTITIES

ROADWAY DETAIL	STATION TO STATION			502	510	512	512	512	545	545	545	662
				6001	6003	6013	6025	6037	6019	6003	6005	6004
				BARRICADES, SIGNS AND TRAFFIC HANDLING	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 (INSTL)(S)(N)(TL3)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	WK ZN PAV MRK NON-REMOV (W)4"(SLD)
SHEET NUMBER	BEGIN STATION		END STATION	MO	MO	LF	LF	LF	EA	EA	EA	LF
1	103+50.00	TO	120+00.00									
2	120+00.00	TO	140+00.00									
3	140+00.00	TO	160+00.00		2	280	280	280	2	2		1160
4	160+00.00	TO	179+00.00									
5	179+00.00	TO	199+00.00									4000
6	199+00.00	TO	218+00.00									4000
7	218+00.00	TO	236+50.00									4000
8	236+50.00	TO	256+00.00									4000
9	256+00.00	TO	276+00.00			900	900	900	2	2		4000
10	276+00.00	TO	296+00.00									4000
11	296+00.00	TO	316+00.00									4000
12	316+00.00	TO	336+00.00									4000
13	336+00.00	TO	356+00.00			3060	3060	3060		6	4	4000
14	356+00.00	TO	365+04.93									1810
			TOTAL:	8	2	4240	4240	4240	4	10	4	38970

NO.	DESCRIPTION	DATE

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PLANNERS + ENGINEERS + MANAGERS
IDCUS, Inc.
8632 Fredericksburg Rd., Suite 200
San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

Texas Department of Transportation

FM 3438

QUANTITY SUMMARY

SHEET 6 OF 7

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	27

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ROADWAY DETAIL	STATION TO STATION			SUMMARY OF TCP QUANTITIES (CONTINUED)					
				662	662	662	6001	6185	6185
				6034	6109	6110	6002	6002	6005
				WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY W	WK ZN PAV MRK SHT TERM (TAB)TY Y	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
SHEET NUMBER	BEGIN STATION		END STATION	LF	EA	EA	EA	DAY	DAY
1	103+50.00	TO	120+00.00						
2	120+00.00	TO	140+00.00						
3	140+00.00	TO	160+00.00	4800	116	240			
4	160+00.00	TO	179+00.00						
5	179+00.00	TO	199+00.00	4000					
6	199+00.00	TO	218+00.00	4000					
7	218+00.00	TO	236+50.00	4000					
8	236+50.00	TO	256+00.00	4000					
9	256+00.00	TO	276+00.00	4000					
10	276+00.00	TO	296+00.00	4000					
11	296+00.00	TO	316+00.00	4000					
12	316+00.00	TO	336+00.00	4000					
13	336+00.00	TO	356+00.00	4000					
14	356+00.00	TO	365+04.93	1810					
			TOTAL:	42610	116	240	4	406	24

NO.	DESCRIPTION	DATE

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Texas Department of Transportation

FM 3438

QUANTITY SUMMARY

SHEET 7 OF 7

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	28

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SUMMARY OF BRIDGES

CSJ	PLAN PROFILE SHEET	BRIDGE NBI #		DESIGN		BRIDGE LOCATION	STATION		LENGTH	CLEAR RDWY WIDTH	LOADING	451 6024 RETROFIT RAIL (TY SSTR)	496 6099 REMOVE STR (RAIL)	514 6001 PERM CTB (SGL SLOPE) (TY 1)(42)	438 6001 CLEANING & SEALING EXISTING JOINTS
		EXISTING	PROPOSED	EXISTING	PROPOSED		BEGIN	END	FT	FT		LF	LF	LF	LF
2270-01-023	N/A	08-221-0-2270-01-002	N/A	N/A	RETROFIT BRIDGE RAIL	LITTLE ELM CREEK	257+95.30	259+60.14	164.84	62	HS20	*330			372
2270-01-023	N/A	08-221-0-0407-06-001	N/A	N/A	RETROFIT BRIDGE RAIL	US 277	347+38.43	350+22.06	283.63	80	HS20	*568	**284	284	320
											TOTAL	898	284	284	692

* REMOVAL OF EXISTING BRIDGE RAIL IS SUBSIDIARY TO ITEM 451

** REMOVAL OF EXISTING CTB RAIL WITHIN BRIDGE LIMITS

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5/26/2021

BRIDGE SUMMARY

Texas Department of Transportation

NO SCALE SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 3438
STATE	COUNTY		SHEET NO.
TEXAS	TAYLOR		29
DISTRICT	CONTROL	SECTION	JOB
ABL	2270	01	023

DATE: 5/26/2021
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\GENERAL\ccss.dgn

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									
															MOVE / RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE/ RESET	FROM LOC. #	N	W	N	W	N	W
1	PH1-S1		FM 3438- ROADWAY WORK (CONC PAV)	142+94, 1′ LT	TL-3	BI	ACP+BASE	16"	PCTB	24′	42′	100′	1								1	
2	PH1-S1		FM 3438- ROADWAY WORK (CONC PAV)	145+75, 1′ LT	TL-3	BI	ACP+BASE	16"	PCTB	24′	42′	100′	1								1	
3	PH1-S1		FM 3438- ROADWAY WORK	256+46, 17′ RT	TL-3	BI	ACP+BASE	16"	PCTB	24′	42′	100′	1								1	
4	PH1-S1		FM 3438- ROADWAY WORK	260+23, 17′ RT	TL-3	BI	ACP+BASE	16"	PCTB	24′	42′	100′	1								1	
5	PH1-S2		FM 3438- ROADWAY WORK (CONC PAV)	142+94, 1′ RT	TL-3	BI	ACP+BASE	16"	PCTB	24′	42′	100′			1	1					1	
6	PH1-S2		FM 3438- ROADWAY WORK (CONC PAV)	145+75, 1′ RT	TL-3	BI	ACP+BASE	16"	PCTB	24′	42′	100′			1	2					1	
7	PH1-S2		FM 3438- ROADWAY WORK	257+44, 17′ LT	TL-3	BI	ACP+BASE	16"	PCTB	24′	42′	100′			1	3					1	
8	PH1-S2		FM 3438- ROADWAY WORK	261+07, 17′ LT	TL-3	BI	ACP+BASE	16"	PCTB	24′	42′	100′			1	4					1	
9	PH1-S3		FM 3438- ROADWAY WORK	347+40, 17′ RT	TL-3	UNI	ACP+BASE	16"	PCTB	24′	42′	100′			1	5					1	
10	PH1-S3		FM 3438- ROADWAY WORK	350+22, 17′ LT	TL-3	UNI	ACP+BASE	16"	PCTB	24′	42′	100′			1	6					1	
11	PH1-S4		FM 3438- ROADWAY WORK	340+51, 20′ RT	TL-3	UNI	ACP+BASE	16"	PCTB	24′	42′	100′		1	1	9					1	
12	PH1-S4		FM 3438- ROADWAY WORK	340+51, 20′ LT	TL-3	BI	ACP+BASE	16"	PCTB	24′	42′	100′		1	1	10					1	
13	PH1-S4		FM 3438- ROADWAY WORK	356+80, 20′ RT	TL-3	BI	ACP+BASE	16"	PCTB	24′	42′	100′		1	1	11					1	
14	PH1-S4		FM 3438- ROADWAY WORK	356+80, 20′ RT	TL-3	UNI	ACP+BASE	16"	PCTB	24′	42′	100′		1	1	12					1	
15	PH1-S4 PERMANENT		FM 3438- ROADWAY WORK	340+51, 0′	TL-3	UNI	ACP+BASE	16"	CTB	24′	42′	100′	1				1					
16	PH1-S4 PERMANENT		FM 3438- ROADWAY WORK	356+80, 0′	TL-3	UNI	ACP+BASE	16"	CTB	24′	42′	100′	1				1					
												SUBTOTAL	6	4	10							

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

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

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED
PROFESSIONAL ENGINEER
5/26/2021

CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:		CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		
	ABL	TAYLOR		
	FEDERAL AID PROJECT			SHEET NO.
				30

TCP SEQUENCE OF WORK

GENERAL NOTES:

1. WORK ZONE PAVEMENT MARKINGS (TABS) SHALL BE INSTALLED IMMEDIATELY AFTER MILLING ACTIVITIES AS WELL AS IMMEDIATELY AFTER SURFACE TREATMENT AND FINAL SURFACE BUT WILL ONLY BE ALLOWED TO FUNCTION AS TRAFFIC MARKINGS FOR A MAXIMUM OF 14 DAYS.
2. WITHIN 14 DAYS, TYPE 2 WORK ZONE PAVEMENT MARKINGS (ITEM 662) SHALL BE PLACED ON SURFACE AND MAINTAINED UNTIL PERMANENT PAVEMENT MARKINGS ARE INSTALLED.
3. AT NO TIME SHALL ANY CROSS STREET OR DRIVEWAY ACCESS BE PREVENTED.
4. ROADWAY DRAINAGE MUST BE MAINTAINED AT ALL TIMES.
5. INSTALL SW3P DEVICES AS SHOWN IN THE PLANS.

ROADWAY WORK SHALL BE COMPLETED IN THE FOLLOWING PHASES OF CONSTRUCTION:

PHASE 1 - STEP 1 (CONSTRUCT CONC PAVEMENT FM 3438 NBML - HALF SECTION AND REPLACE NBML SSTR AT LITTLE ELM CREEK)

USING ONE-LANE 2-WAY TRAFFIC CONTROL (PORT SIGNAL CONTROL OPERATIONS) SWITCH FM 3438 NBML TRAFFIC TO EXISTING FM 3438 SBML.

PLACE SSCB AND CCA AS SHOWN IN THE PLANS.

CONSTRUCT FM 3438 NBML CONC PAVEMENT AND ALLOW TO CURE.

CLOSE NB OUTSIDE LANE AT LITTLE ELM CREEK.

REMOVE EXISTING BRIDGE RAIL AND REPLACE WITH SSTR.

REMOVE AND REPLACE GUARD FENCE.

PHASE 1 - STEP 2 (CONSTRUCT CONC PAVEMENT FM 3438 SBML - HALF SECTION AND SBML SSTR AT LITTLE ELM)

USING FLAGGING OPERATIONS MOVE AND RESET SSCB/CCA AS SHOWN IN THE PLANS. USING ONE-LANE 2-WAY TRAFFIC CONTROL (PORT SIGNAL CONTROL OPERATIONS) SWITCH TRAFFIC TO FM 3438 NBML TO COMPLETE FM 3438 SBML.

CONSTRUCT FM 3438 SBML CONC PAVEMENT AND ALLOW TO CURE.

CLOSE SB OUTSIDE LANE AT LITTLE ELM CREEK.

REMOVE EXISTING BRIDGE RAIL AND REPLACE WITH SSTR

REMOVE AND REPLACE GUARD FENCE

REMOVE PORTABLE SIGNAL SETUP AND OPEN FM 3438 NBML/SBML TO TRAFFIC.

SET REPAIRS CAN BE DONE AT THIS TIME WITH SHOULDER CLOSURE.

PHASE 1 - STEP 3 (REMOVE AND REPLACE EXISTING BRIDGE RAIL AT US 277 BRIDGE).

CLOSE NB/SB OUTSIDE LANES ON FM 3438 AT US 277

AS SHOWN ON PLANS AND ON TCP(2-6)-18.

REMOVE EXISTING BRIDGE RAIL AND REPLACE WITH SSTR.

REMOVE AND REPLACE GUARD FENCE.

PHASE 1 - STEP 4 (REMOVE AND REPLACE SSCB AT US 277 BRIDGE).

CLOSE NB/SB INSIDE LANES ON FM 3438 AT US 277

AS SHOWN ON PLANS AND ON TCP(2-6)-18.

REMOVE EXISTING SSCB AND REPLACE.

FINISH INSTALLING ALL ADDITIONAL GUARD FENCE

USING TCP(2-5)-18 AND TCP(2-6)-18.

PHASE 2 - STEP 1 (PERFORM PAVEMENT SPOT REPAIR ALONG FM 3438 NB/SB OUTSIDE LANES AND SHOULDERS AND OVERLAY) USING CHANNELIZING DEVICES CLOSE FM 3438 OUTSIDE SOUTHBOUND MAINLANES AND SHOULDERS USING TCP(2-5a)AND TCP(2-6)-18

PERFORM PAVEMENT SPOT REPAIR ALONG FM 3438 NB/SB OUTSIDE MAINLANES AND SHOULDERS.

PLACE OVERLAY. PLACE TABS DAILY.

PHASE 2 - STEP 2 (PERFORM PAVEMENT SPOT REPAIR ALONG FM 3438 NB/SB INSIDE LANES AND SHOULDERS AND OVERLAY)

USING CHANNELIZING DEVICES CLOSE FM 3438 INSIDE NB/SB MAINLANES AND SHOULDERS USING TCP(2-5a)AND TCP(2-6)-18

PERFORM PAVEMENT SPOT REPAIR ALONG FM 3438 NB/SB INSIDE MAINLANES AND SHOULDERS.

PLACE OVERLAY. PLACE TABS DAILY.

PHASE 2 - STEP 3 PLACE OVERLAY ON INSIDE HALF SECTION OF FM 3438 RAMPS TO US 277

USING CHANNELIZING DEVICES CLOSE INSIDE HALF SECTION OF FM 3438 RAMPS & KEEP TRAFFIC ON OUTSIDE HALF SECTION OF RAMPS.

PLACE OVERLAY ON INSIDE HALF SECTION OF RAMPS AS PER TCP(2-5a).

PHASE 2 - STEP 4 PLACE OVERLAY ON OUTSIDE HALF SECTION OF FM 3438 RAMPS TO US 277

USING CHANNELIZING DEVICES CLOSE OUTSIDE HALF SECTION OF FM 3438 RAMPS & KEEP TRAFFIC ON INSIDE HALF SECTION OF RAMPS.

PLACE OVERLAY ON OUTSIDE HALF SECTION OF RAMPS AS PER TCP(2-5a).

PHASE 3 - STEP 1 (PLACE SEAL COAT ALONG FM 3438 SBML AT THE NORTH END OF THE PROJECT)

USING TCP (PILOT VEHICLE OPERATION) SWITCH FM 3438 SBML TRAFFIC TO EXISTING FM 3438 NBML AND PLACE SEAL COAT ALONG FM 3438 SBML.

PHASE 4 CAN BE COMPLETED SIMULTANEAOUSLY WITH THIS PHASE.

PHASE 3 - STEP 2 (PLACE SEAL COAT ALONG FM 3438 NBML AT THE NORTH END OF THE PROJECT)

USING TCP (PILOT VEHICLE OPERATION) SWITCH FM 3438 NBML TRAFFIC TO EXISTING FM 3438 SBML AND PLACE SEAL COAT ALONG FM 3438 NBML.

PHASE 4 CAN BE COMPLETED SIMULTANEAOUSLY WITH THIS PHASE.

PHASE 4 - STEP 1 (PLACE SEAL COAT ALONG FM 3438 EAST/WEST FRONTAGE ROADS OUTSIDE LANES) USING CHANNELIZING DEVICES CLOSE FM 3438 EAST/WEST FRONTAGE ROADS OUTSIDE LANES AND CONFIGURE ONE-LANE TWO-WAY TRAFFIC USING INSIDE LANES OF FM 3438 EAST/WEST FRONTAGE ROADS USING TCP (1-2)-18.

PLACE SEAL COAT.

PHASE 4 - STEP 2 (PLACE SEAL COAT ALONG FM 3438 EAST/WEST FRONTAGE ROADS INSIDE LANES; INSTALL SIGNS AND PAVEMENT MARKINGS).

USING CHANNELIZING DEVICES CLOSE FM 3438 EAST/WEST FRONTAGE ROADS INSIDE LANES AND CONFIGURE ONE-LANE TWO-WAY TRAFFIC USING OUTSIDE LANES OF FM 3438 EAST/WEST FRONTAGE ROAD.

USING TCP (1-2)-18 PLACE SEAL COAT.

INSTALL SIGNS AND PAVEMENT MARKINGS.

PHASE 5 - FINAL CLEANUP & PROJECT ACCEPTANCE

PERFORM FINAL CLEAN UP.

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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Texas Department of Transportation

FM 3438

TRAFFIC CONTROL PLAN SEQUENCE OF WORK

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	31

5/26/2021 10:22:46 AM

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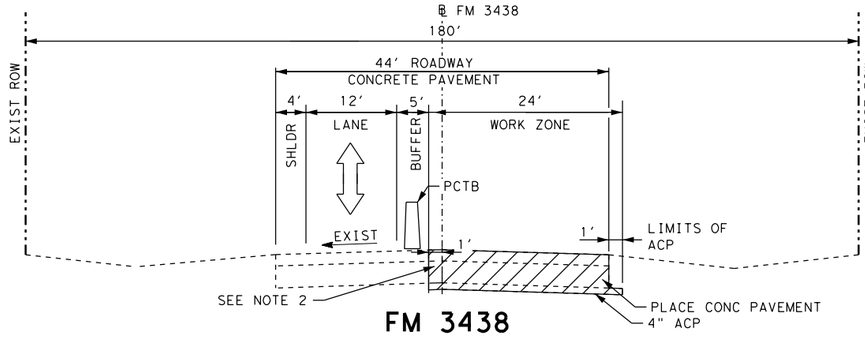
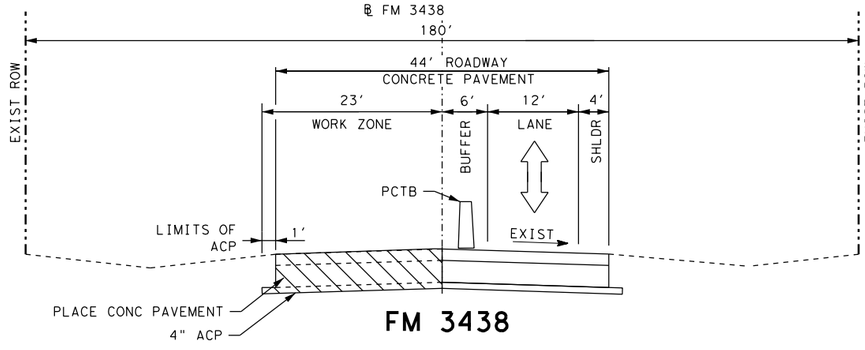


FM 3438

TCP TYPICAL SECTION PHASE 1 - STEP 1
STA 143+24.13 TO STA 145+67.32



FM 3438

TCP TYPICAL SECTION PHASE 1 - STEP 2
STA 143+24.13 TO STA 145+67.32

LEGEND

- EXIST PAVEMENT
- PROP PAVEMENT
- TRAFFIC FLOW
- ONE WAY TRAFFIC CONTROL
- WORK ZONE

NOTES:

1. PORTABLE TRAFFIC SIGNALS SHALL BE PRESENT TO DIRECT TRAFFIC FOR ONE LANE TWO WAY TRAFFIC OPERATIONS. REFER TO TCP (2-8)-18 DETAIL STANDARD (2-8b) FOR MORE DETAILS.
2. MULTI PIECE TIE BARS TO BE USED. SEE STANDARD CRCP(1)-20 FOR DETAILS.

SCALE: NTS

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

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Texas Department of Transportation

FM 3438

TCP
TYPICAL SECTIONS
PHASE 1

SHEET 1 OF 3

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	32

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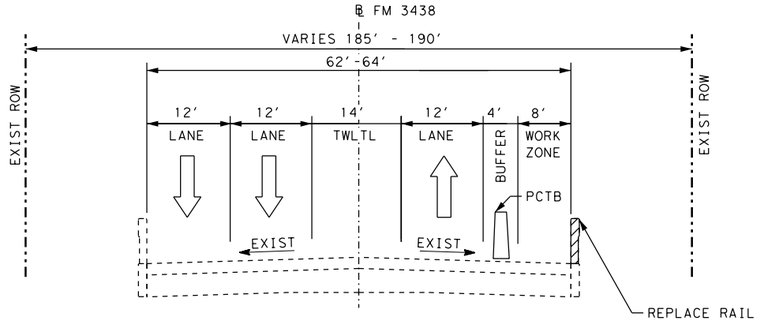
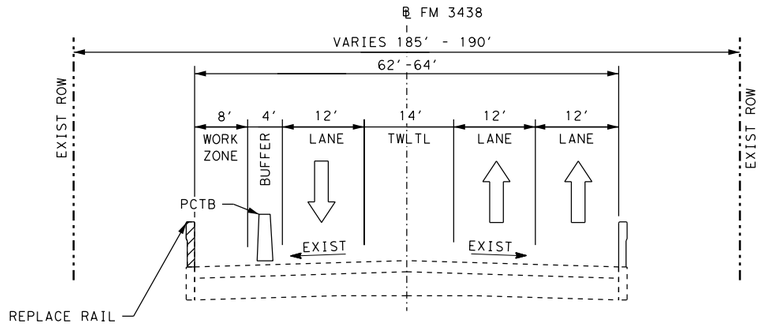


FM 3438
(LITTLE ELM CREEK BRIDGE)

TCP TYPICAL SECTION PHASE 1 - STEP 1
STA 256+95.47 TO STA 265+00.11



FM 3438
(LITTLE ELM CREEK BRIDGE)

TCP TYPICAL SECTION PHASE 1 - STEP 2
STA 252+55.47 TO STA 260+60.11

LEGEND

- EXIST PAVEMENT
- PROP PAVEMENT
- TRAFFIC FLOW
- ONE WAY TRAFFIC CONTROL
- CHANNELIZING DEVICE

SCALE: NTS

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

5/26/2021

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FM 3438

TCP
TYPICAL SECTIONS
PHASE 1

SHEET 2 OF 3

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	33

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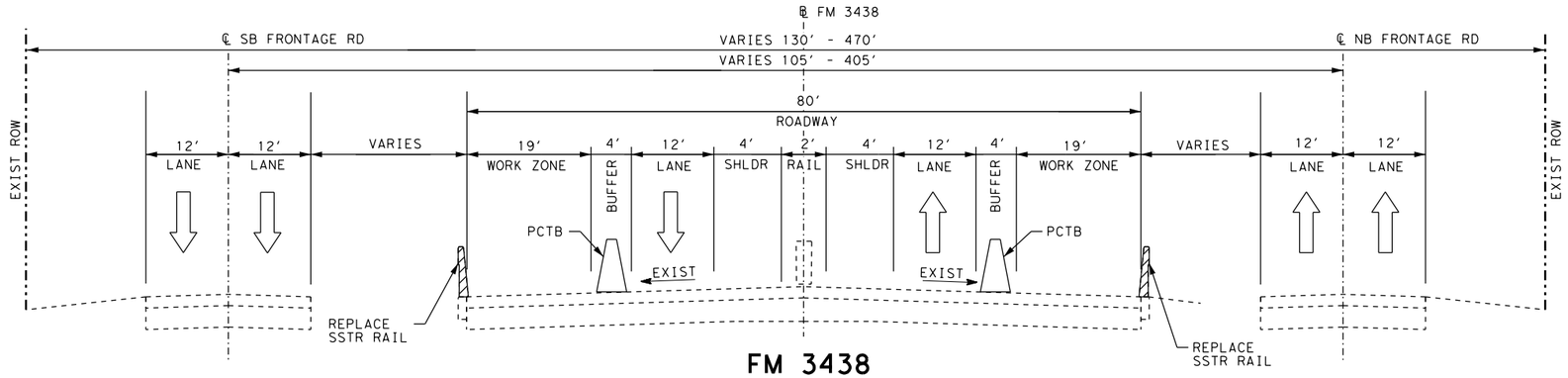
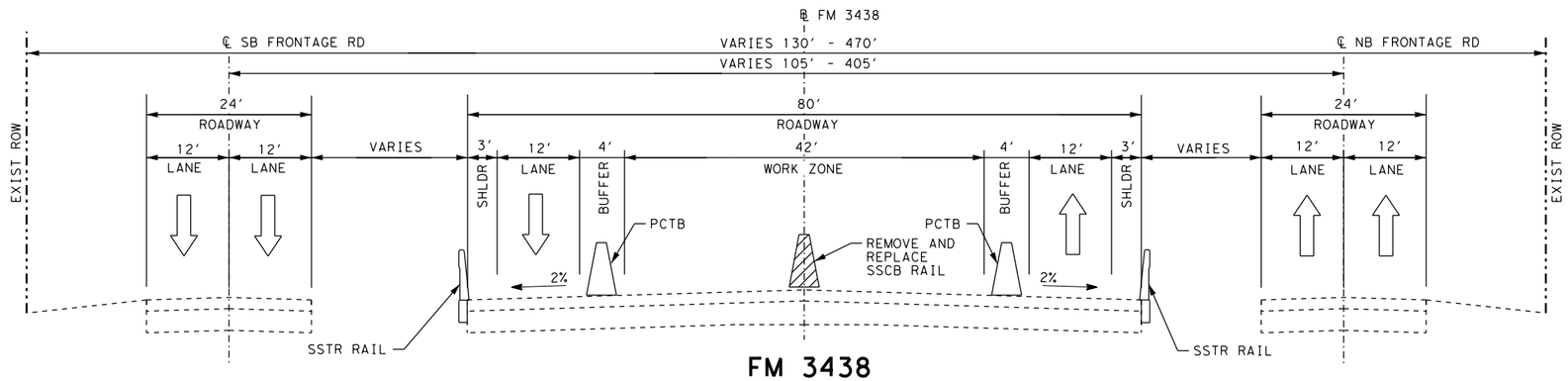


FM 3438
(US 277 BRIDGE)

TCP TYPICAL SECTION PHASE 1 - STEP 3
STA 340+50.93 TO STA 357+13.00



FM 3438
(US 277 BRIDGE)

TCP TYPICAL SECTION PHASE 1 - STEP 4
STA 340+50.93 TO STA 357+12.81

LEGEND

- EXIST PAVEMENT
- PROP PAVEMENT
- TRAFFIC FLOW
- ONE WAY TRAFFIC CONTROL
- CHANNELIZING DEVICE

SCALE: NTS

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED
PROFESSIONAL ENGINEER
5/26/2021

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T.B.P.E.FIRM REGISTRATION NO. F-6825

Texas Department of Transportation

FM 3438

TCP
TYPICAL SECTIONS
PHASE 1

SHEET 3 OF 3

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	34

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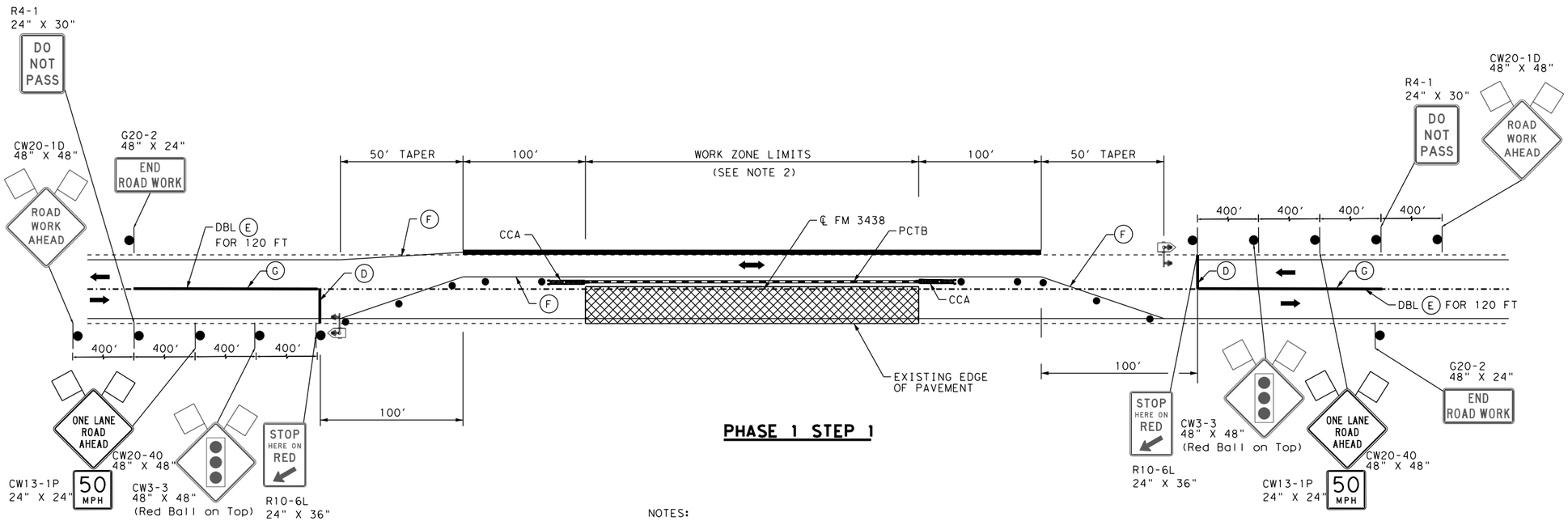
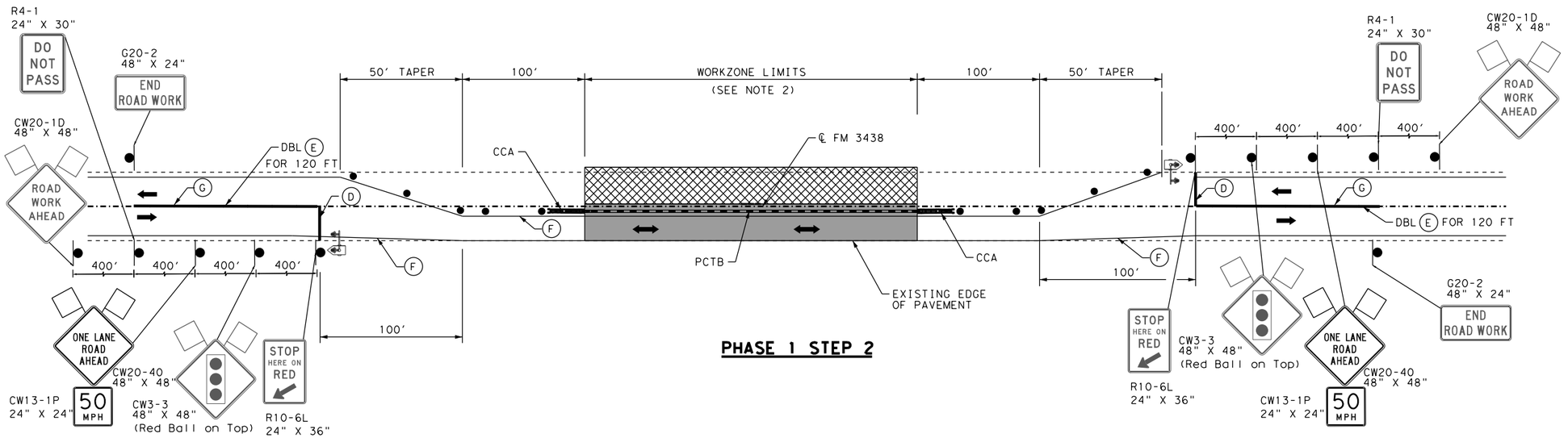


PHASE 1 STEP 1

NOTES:

1. INSTALL SIGNS AND TRAFFIC CONTROL DEVICES IN ACCORDANCE WITH TXDOT STANDARD TCP(2-8b)-18.
2. ACCESS TO DRIVEWAYS MUST BE MAINTAINED AT ALL TIMES.
3. 3:1 TAPER WEDGE SHALL BE CONSTRUCTED AT THE END OF EACH WORK DAY.
4. PORTABLE TRAFFIC SIGNALS TO BE PAID FOR UNDER ITEM 510.



PHASE 1 STEP 2

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- TRAFFIC DIRECTION
- PHASE CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- PCTB
- CCA
- TEMP PAVEMENT
- CHEVERON
- CHANNELIZING DEVICE
- PORTABLE TRAFFIC SIGNAL
- (A) WRK ZN PAV MARK NON-REMOV (Y) 4" (SLD)
- (B) WRK ZN PAV MARK NON-REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MARK NON-REMOV (W) 8" (SLD)
- (D) WRK ZN PAV MARK REMOV (W) 24" (SLD)
- (E) WRK ZN PAV MARK REMOV (Y) 4" (SLD)
- (F) WRK ZN PAV MARK REMOV (W) 4" (SLD)
- (G) TY II A-A

SCALE: NTS

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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5/26/2021

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FM 3438

TRAFFIC CONTROL PLAN
PHASE 1
STEP 1 AND STEP 2 LAYOUTS AT CONCRETE SECTION

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	35

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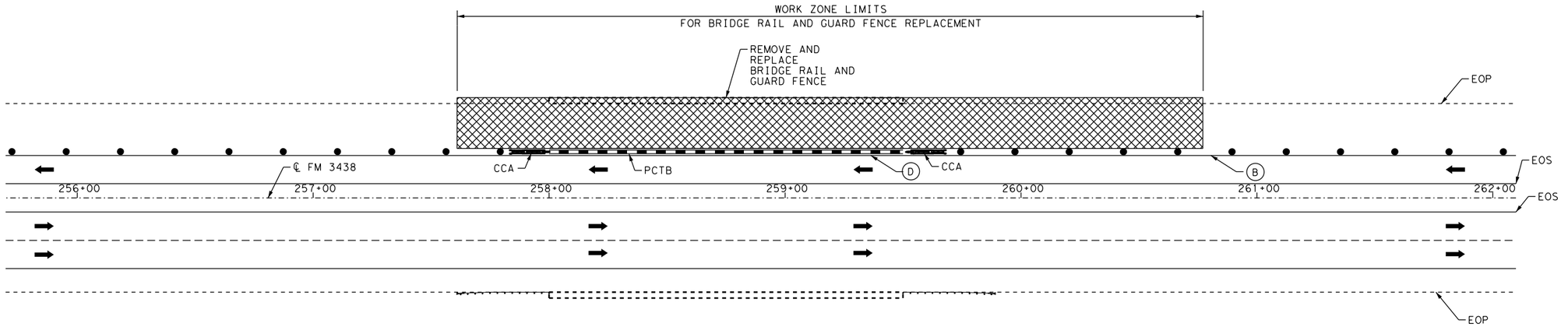
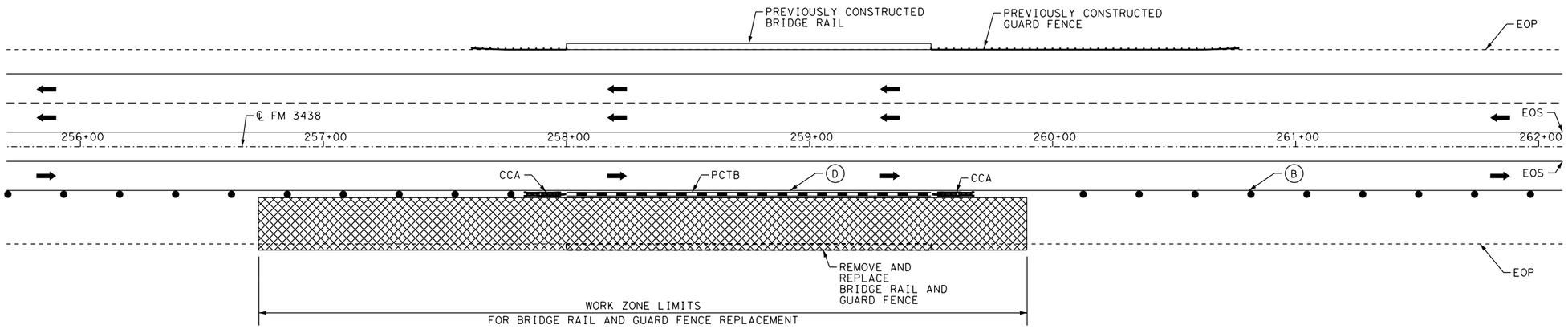


PHASE 1 STEP 1



PHASE 1 STEP 2

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- TRAFFIC DIRECTION
- PHASE CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- PCTB
- CCA
- CHEVERON
- CHANNELIZING DEVICE
- PORTABLE TRAFFIC SIGNAL
- (A) WRK ZN PAV MARK NON-REMOV (Y) 4" (SLD)
- (B) WRK ZN PAV MARK NON-REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MARK REMOV (Y) 4" (SLD)
- (D) WRK ZN PAV MARK REMOV (W) 4" (SLD)
- (E) TY II C-R

NOTES:

1. INSTALL SIGNS AND TRAFFIC CONTROL DEVICES IN ACCORDANCE WITH TXDOT STANDARD TCP(1-4)-18, TCP(1-5)-18, TCP(2-5a)-18, AND TCP(2-6a)-18.
2. ACCESS TO DRIVEWAYS MUST BE MAINTAINED AT ALL TIMES.
3. 3:1 TAPER WEDGE SHALL BE CONSTRUCTED AT THE END OF EACH WORK DAY.

SCALE: NTS

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED
PROFESSIONAL ENGINEER
5/26/2021

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FM 3438

TRAFFIC CONTROL PLAN
PHASE 1
STEP 1 AND STEP 2 LAYOUTS AT LITTLE ELM CREEK

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	36

5/26/2021 10:22:51 AM

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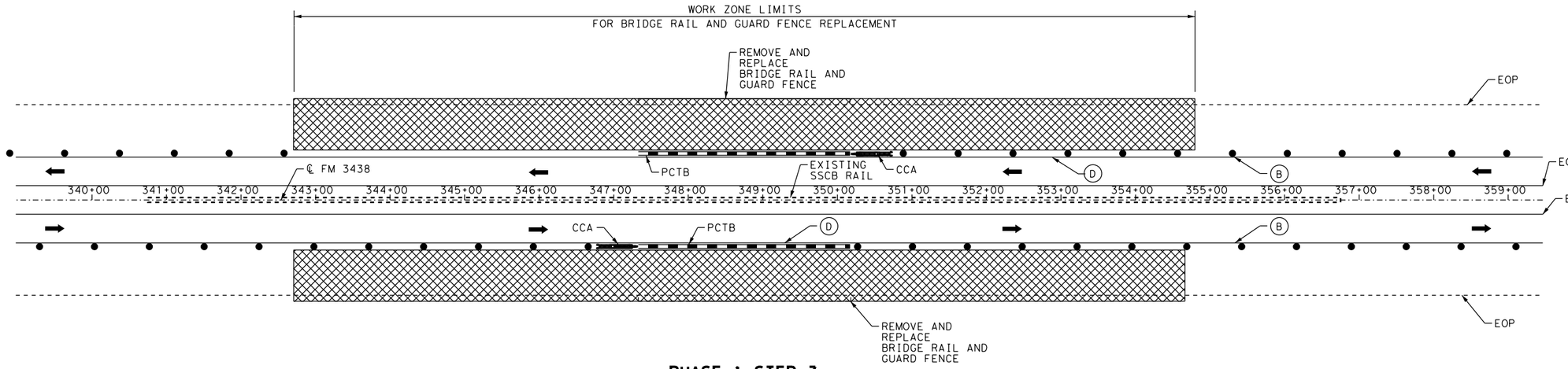


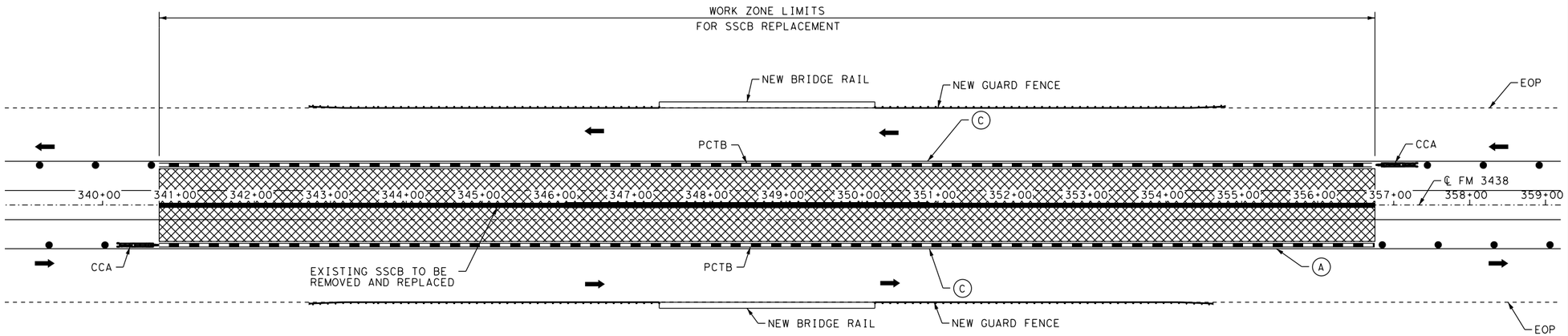
PHASE 1 STEP 3

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- TRAFFIC DIRECTION
- PHASE CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- PCTB
- CCA
- CHEVERON
- CHANNELIZING DEVICE
- PORTABLE TRAFFIC SIGNAL
- (A) WRK ZN PAV MARK NON-REMOV (Y) 4" (SLD)
- (B) WRK ZN PAV MARK NON-REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MARK REMOV (Y) 4" (SLD)
- (D) WRK ZN PAV MARK REMOV (W) 4" (SLD)
- (E) TY II C-R

NOTES:

1. INSTALL SIGNS AND TRAFFIC CONTROL DEVICES IN ACCORDANCE WITH TXDOT STANDARD TCP(1-4)-18, TCP(1-5)-18, TCP(2-5a)-18, AND TCP(2-6a)-18.
2. ACCESS TO DRIVEWAYS MUST BE MAINTAINED AT ALL TIMES.
3. 3:1 TAPER WEDGE SHALL BE CONSTRUCTED AT THE END OF EACH WORK DAY.



PHASE 1 STEP 4

SCALE: NTS

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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FM 3438

TRAFFIC CONTROL PLAN
PHASE 1
STEP 3 AND STEP 4 LAYOUTS AT US 277

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	37

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DATE: 5/26/2021
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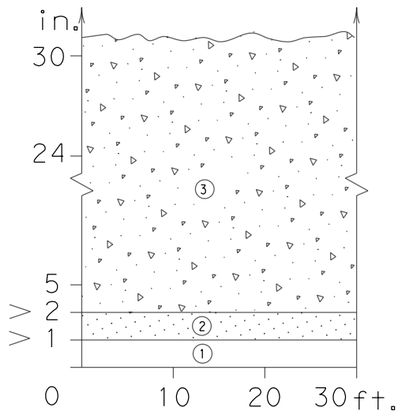
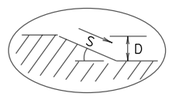
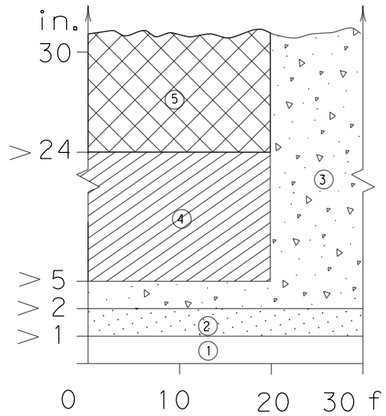
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet

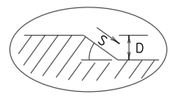


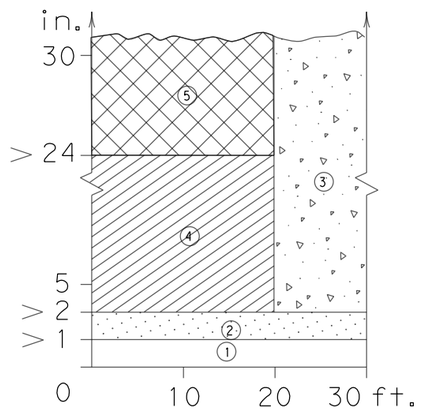
Edge Condition I
S = (3:1) (or flatter)



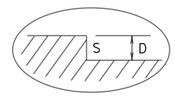


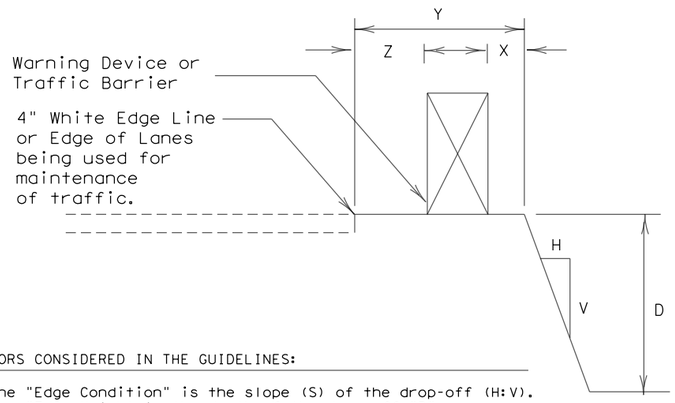
Edge Condition II
S = ((2.99):1) to (1:1)





Edge Condition III
S is steeper than (1:1)





FACTORS CONSIDERED IN THE GUIDELINES:

1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height is the depth of the drop-off "D".

2. Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.

3. In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.

4. The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.

5. If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

Zone	Treatment Types Guidelines:
①	No treatment.
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a "Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	CW 8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge fill may be provided to change the edge slope to that of the preferable Edge Condition I.
⑤	Check indications (Figure-1) for positive barrier. Where positive barrier is not indicated, the treatment shown above for Zone- 4 may be used after consideration of other applicable factors.

Edge Condition Notes:

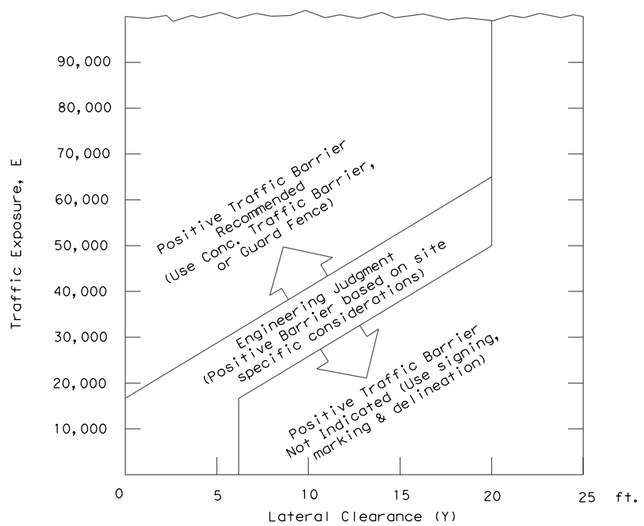
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exeeds 24 inches, the possibility for rollover is greater in most vehicles.

3. Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.

4. Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 (▨)



1 E = ADT x T
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.

2 Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.

3 An approved end treatment should be provided for any positive barrier end located within a lateral offset of 20 feet from the edge of the travel lane.

These guidelines apply to temporary traffic control areas or work zones where continuous pavement edges or drop-offs exists parallel and adjacent to a lane used by traffic. The edge conditions may be present between shoulders and travel lanes, between adjacent or opposing travel lanes, or at intermediate points across the width of the paved surface. Due to the variability in construction operations, tolerances in the variables may be allowed by the engineer. These guidelines do not apply to short term operations. These guidelines do not constitute a rigid standard or policy; rather, they are guidance to be used in conjunction with engineering judgement. These guidelines may be updated on the Design Division's on-line manuals.

Engineer's Seal

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

Date 5/26/2021

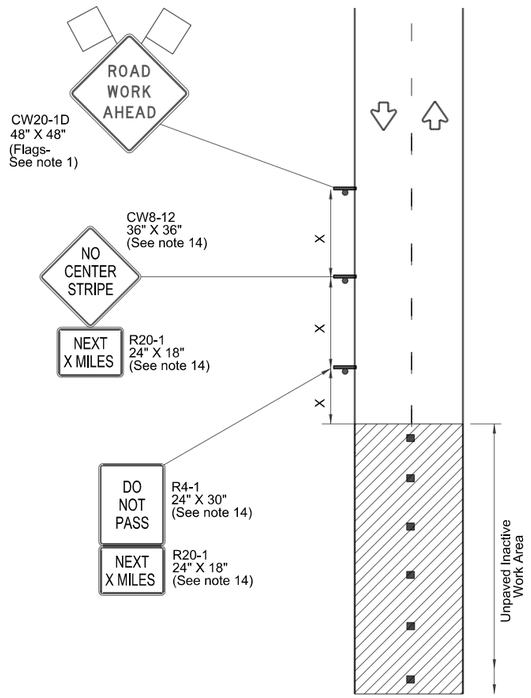
Texas Department of Transportation
Traffic Operations Division

TREATMENT FOR VARIOUS EDGE CONDITIONS

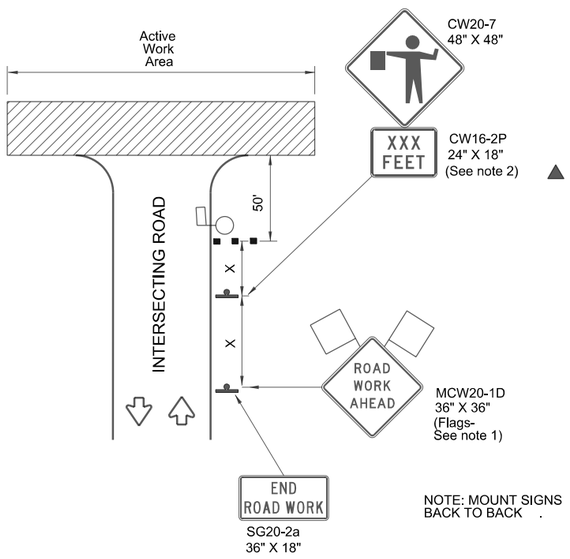
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
03-01	2270	01	023	FM 3438
08-01 correct typos	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		38

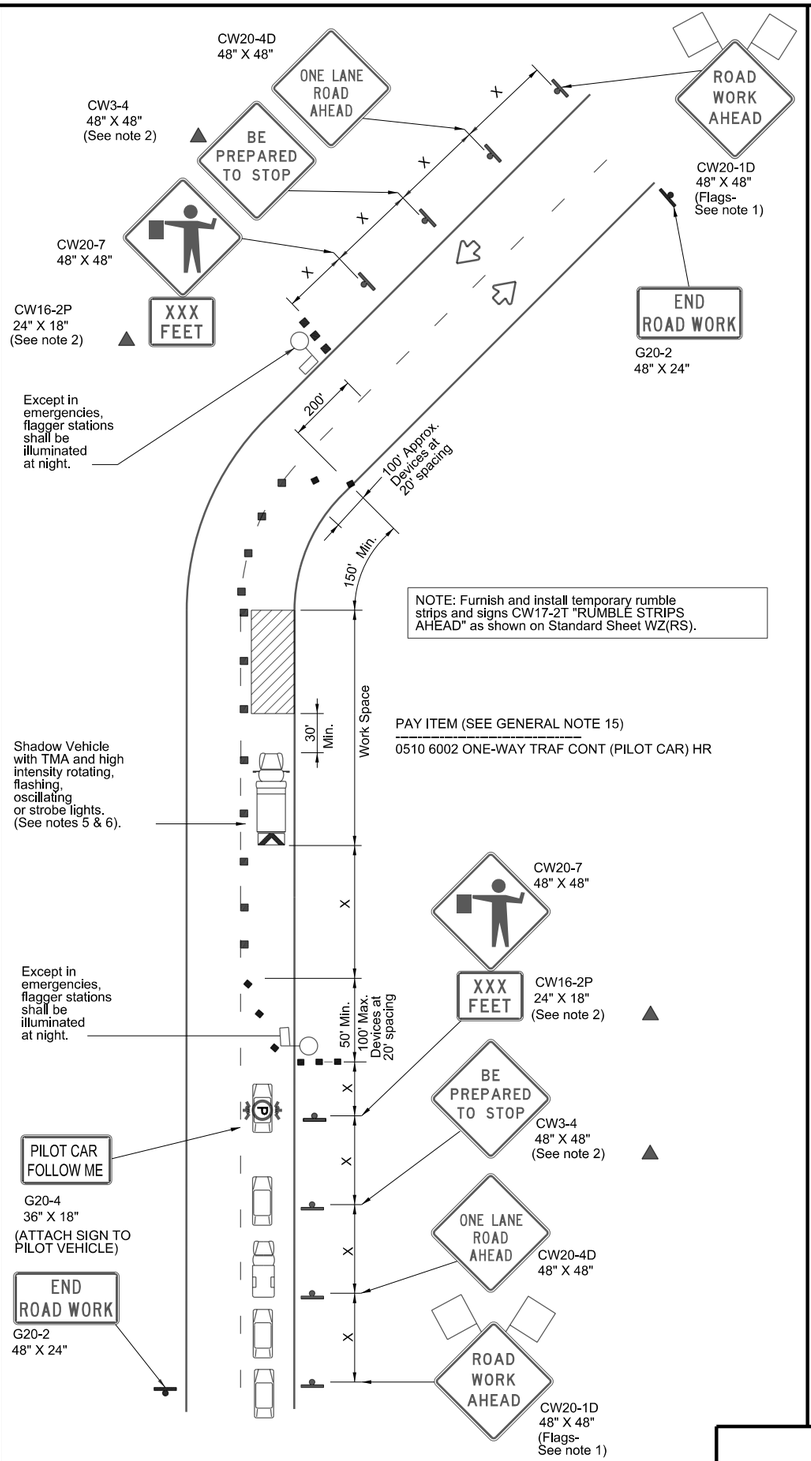
Warning Sign Sequence in opposite direction same as below.



UNPAVED INACTIVE WORK AREA



INTERSECTING STATE HIGHWAY OR COUNTY ROAD WITHIN ACTIVE WORK AREA



ONE LANE TWO-WAY CONTROL WITH PILOT CAR

LEGEND

	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Pilot Vehicle
	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 shall 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.
7. Flaggers shall hold traffic until the pilot vehicle is prepared to lead traffic through the work area.
8. Pilot vehicle shall have the name of the Contractor prominently displayed and shall utilize flashing light bar.
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.
14. Place additional signs at State Highway and County Road intersections. Place additional signs every mile to the end of the unpaved area.
15. Unless otherwise shown on the plans, the work performed and materials furnished in accordance with this Item will not be paid for directly but will be subsidiary to pertinent items.
16. Perform all work in accordance with Item 510, "One-Way Traffic Control".

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED
PROFESSIONAL ENGINEER
5/26/2021

Texas Department of Transportation | Abilene District

TRAFFIC CONTROL PLAN PILOT VEHICLE OPERATION

SHEET 1 OF 1 NOT TO SCALE

REVISIONS 8-17

CONT	SECT	JOB	HIGHWAY
2270	01	023	FM 3438
DIST	COUNTY		SHEET NO.
ABL	TAYLOR		39

DATE: 5/26/2021 10:22:55 AM
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\STANDARDS\TCP STANDARDS\01 bc-14.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. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

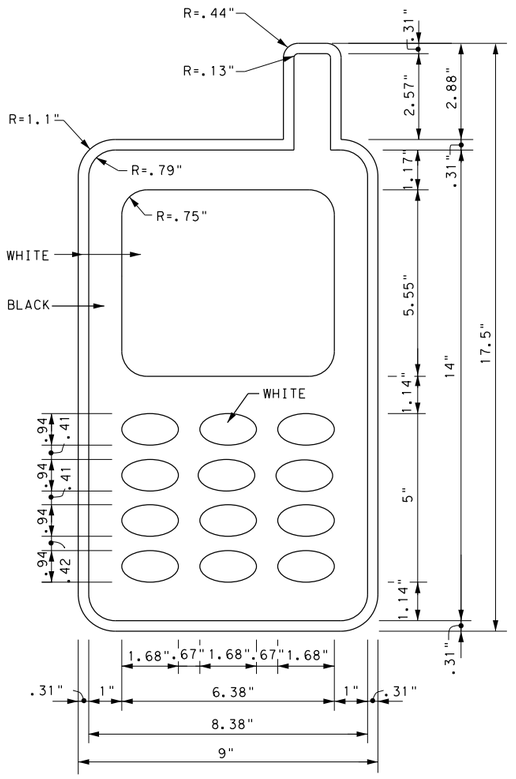
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

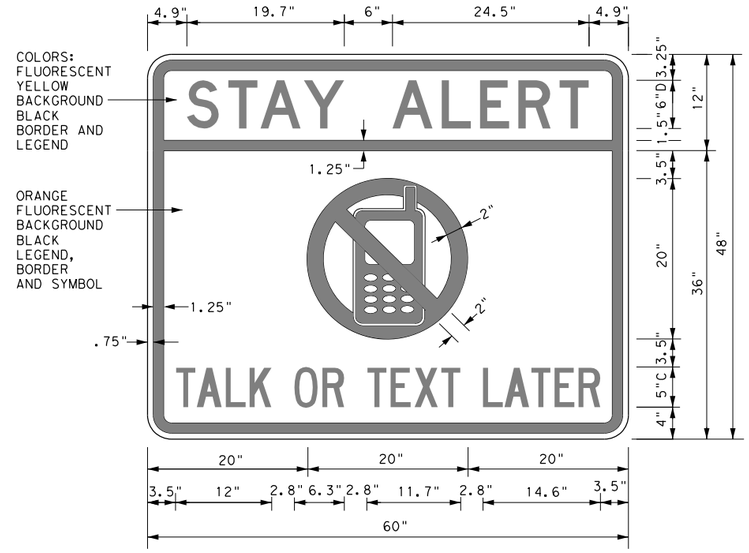
12. The Engineer has the final decision on the location of all traffic control devices.

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 APPAREL 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.





3.0" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[STAY ALERT] Font: D
3.0" Radius, 1.25" Border, 0.75" Indent, Black on Orange;
[TALK OR TEXT LATER] Font: C specified length;

SIGN DETAIL (G20-10T)

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	ABL	TAYLOR		40

DATE: 5/26/2021 10:22:56 AM
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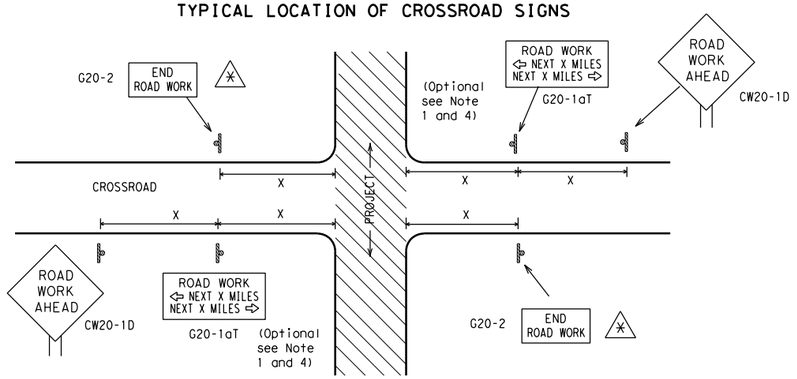
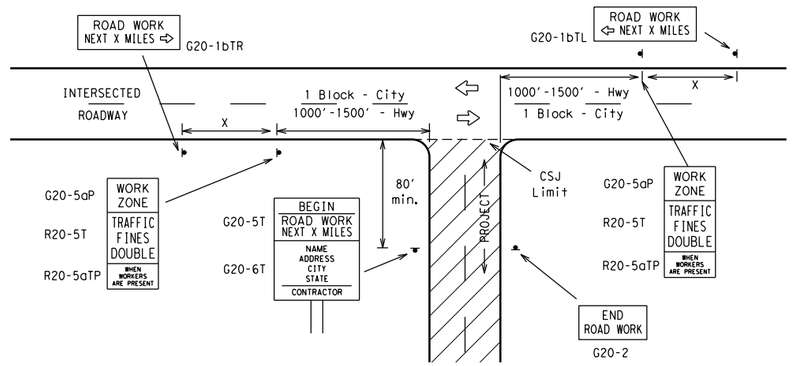
TYPICAL LOCATION OF CROSSROAD SIGNS



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

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume. 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]

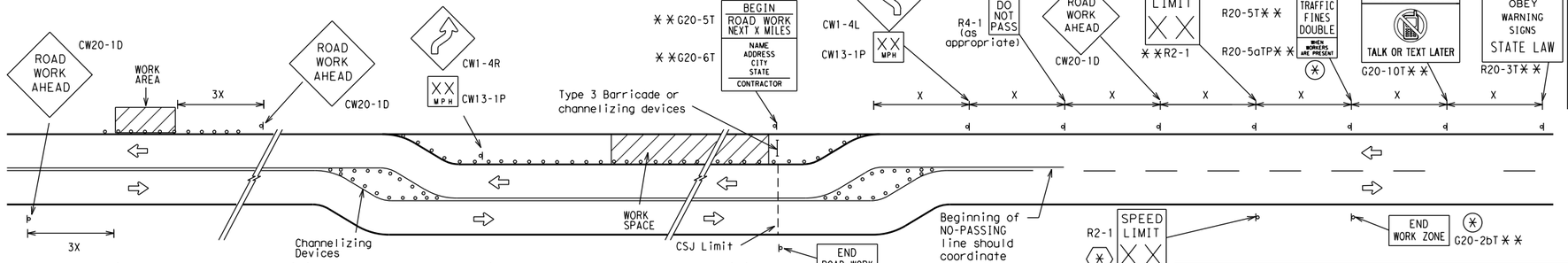
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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. 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.

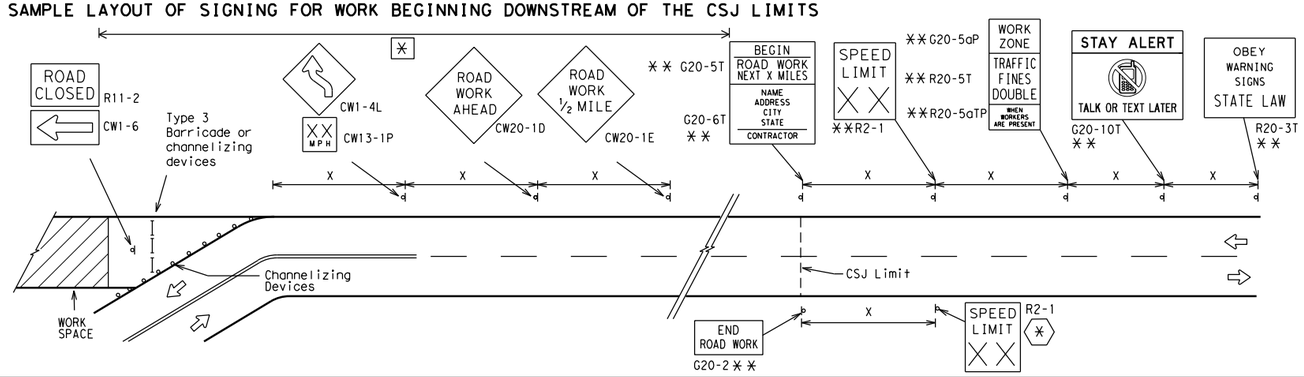
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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.

✳✳ Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

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

(✳) Contractor will install a regulatory speed limit sign at the end of the work zone.

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	ABL	TAYLOR		41

DATE: 5/26/2021 10:22:56 AM
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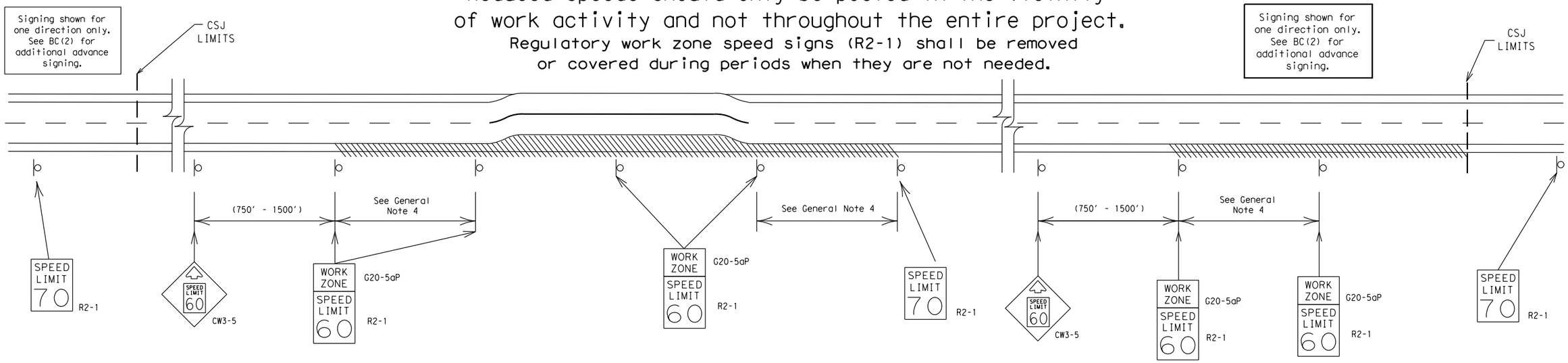
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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 Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		42

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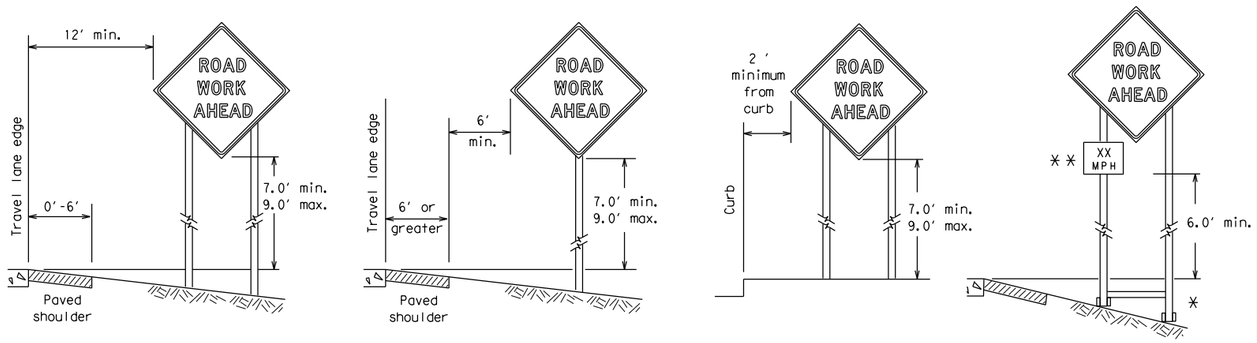
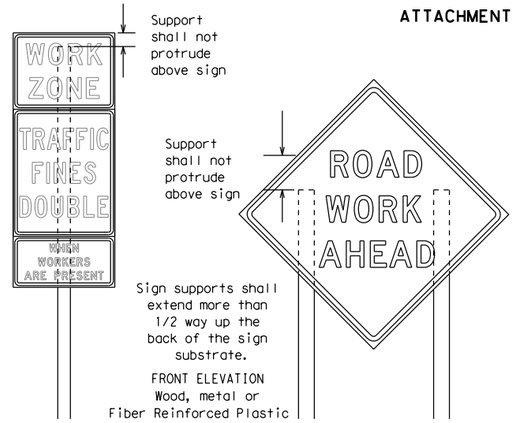
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



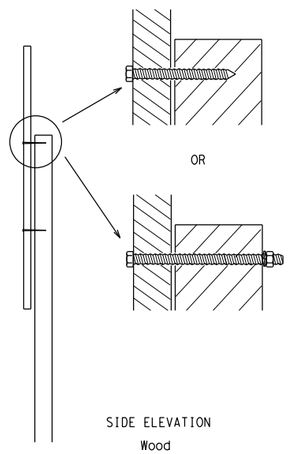
⚹ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS



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

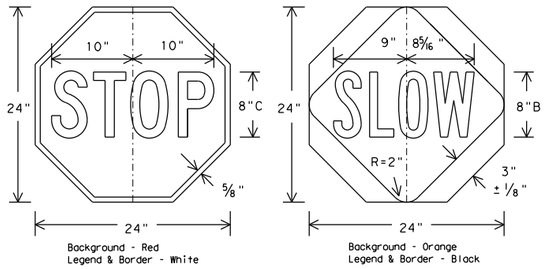


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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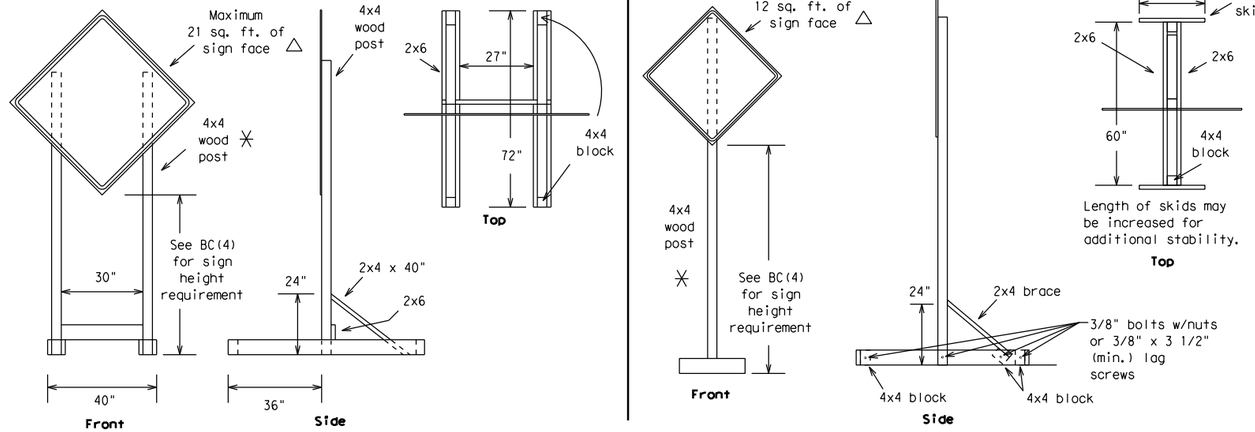
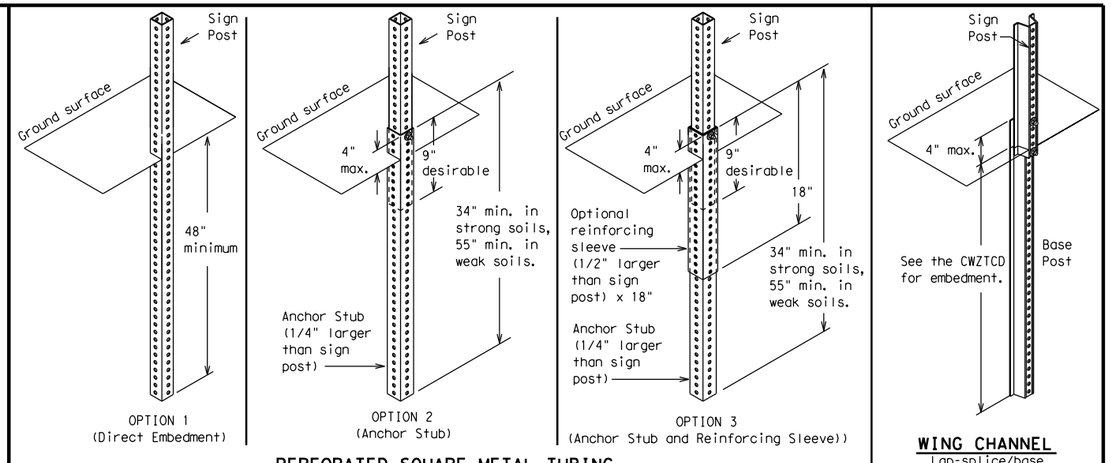


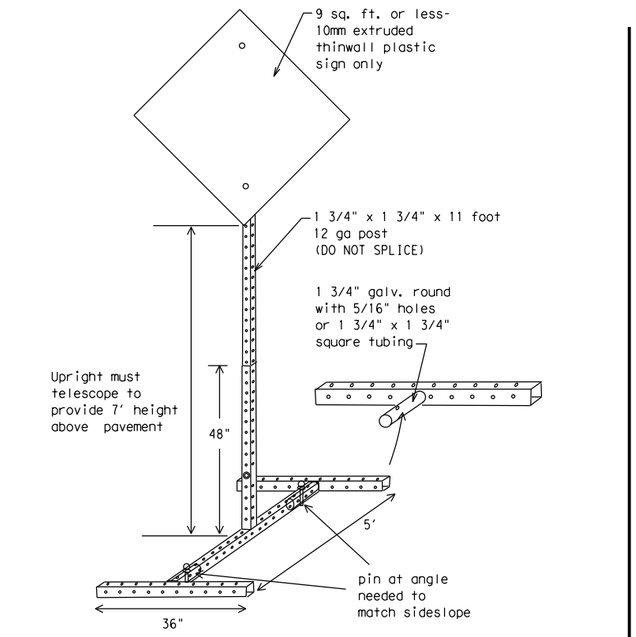
SKID MOUNTED WOOD SIGN SUPPORTS

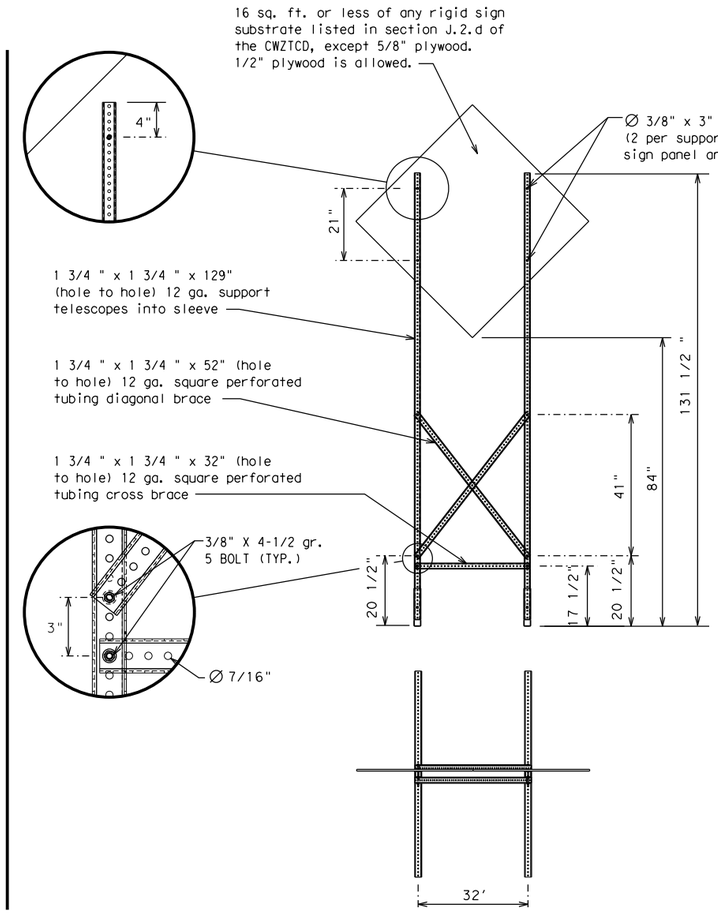
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

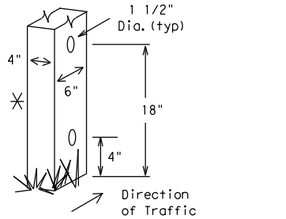


GROUND MOUNTED SIGN SUPPORTS

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.

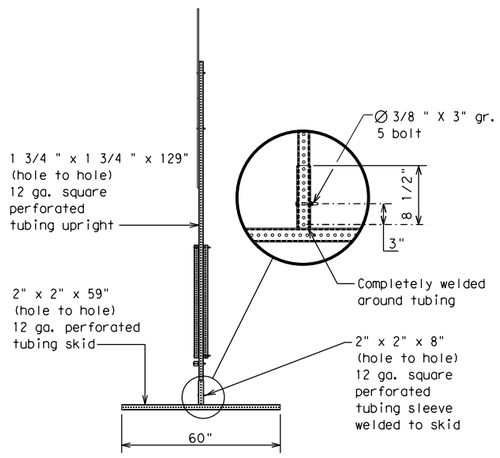






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND 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 Operations Division Standard

SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

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7-13	ABL	TAYLOR		45

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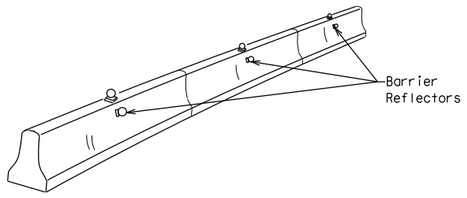
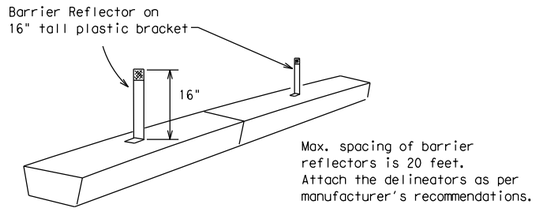
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

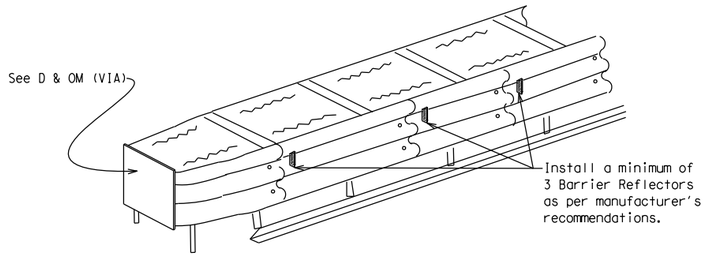


CONCRETE TRAFFIC BARRIER (CTB)

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.



LOW PROFILE CONCRETE BARRIER (LPCB)

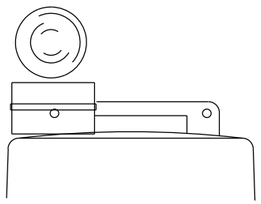


DELINEATION OF END TREATMENTS

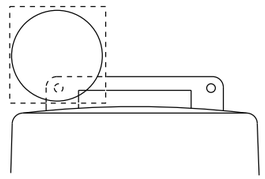
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

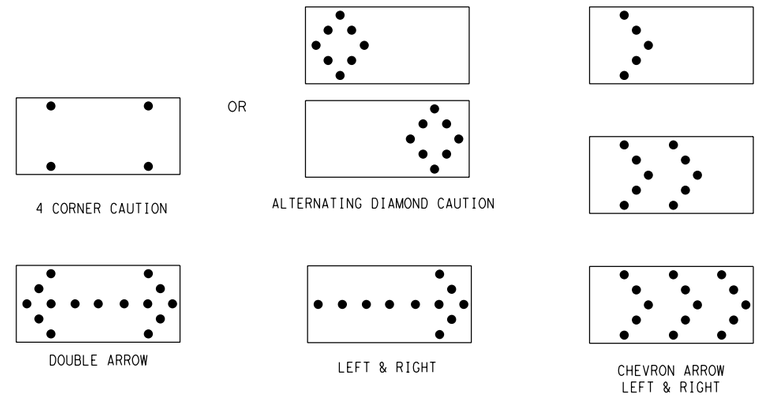
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

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

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or 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 Operations Division Standard

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

BC(7)-14

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7-13	ABL	TAYLOR		46

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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:

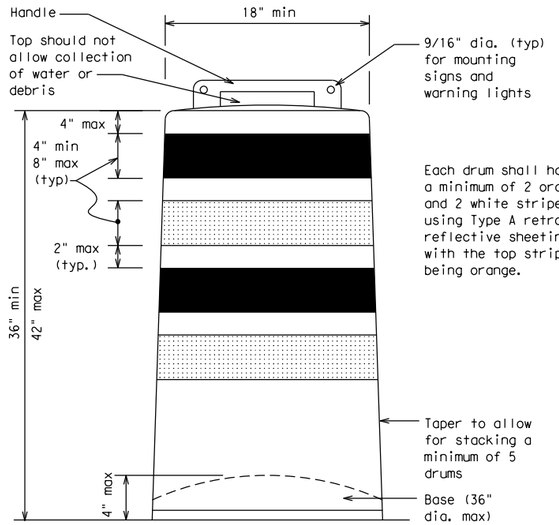
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

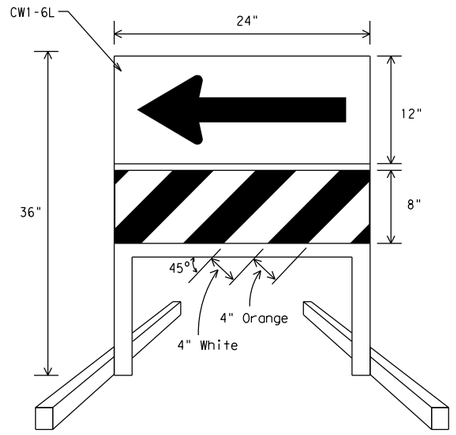
RETROREFLECTIVE SHEETING

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 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.





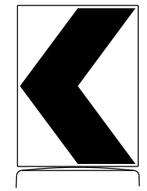
DIRECTION INDICATOR BARRICADE

1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

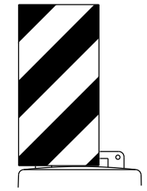
This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

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.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
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 for Buildings and Facilities (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 may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



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 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 Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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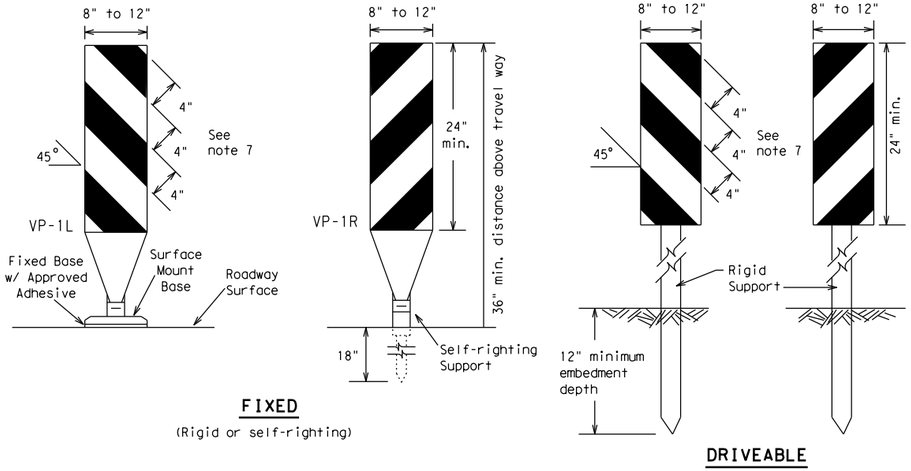
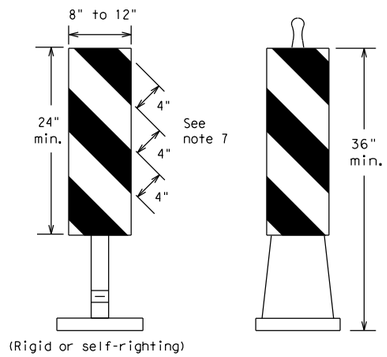


FIXED
(Rigid or self-righting)

DRIVEABLE

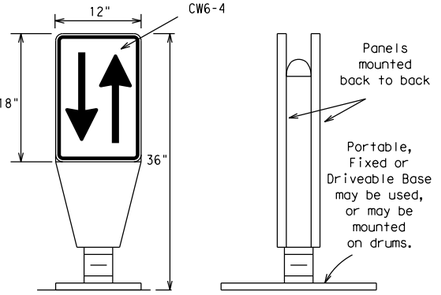


(Rigid or self-righting)

PORTABLE

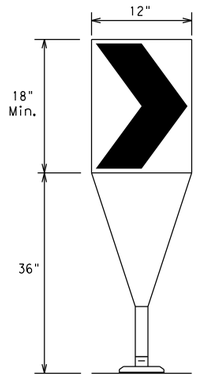
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of 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 conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



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

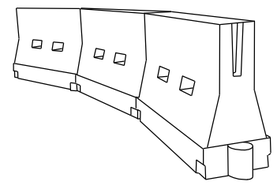
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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

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

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10) placed 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 NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

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

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

GENERAL NOTES

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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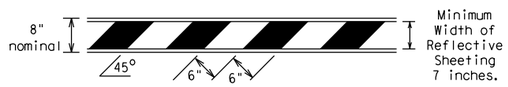
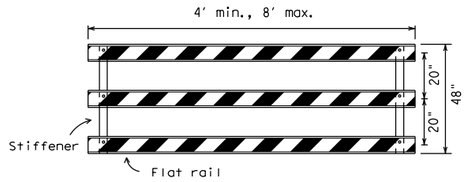
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



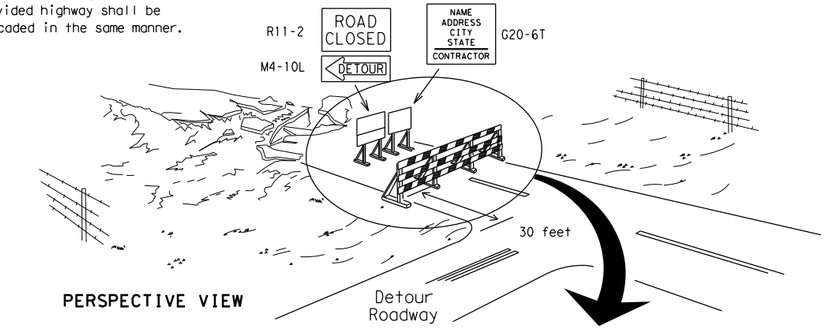
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

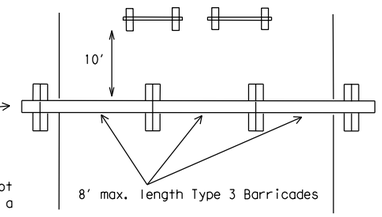
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

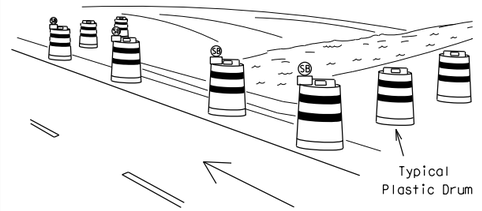
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

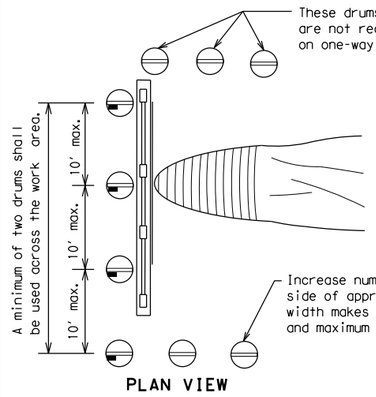
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

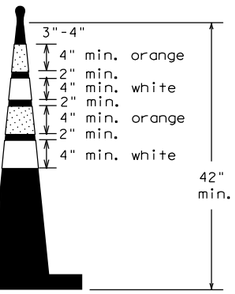
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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.



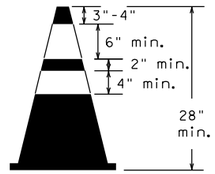
PLAN VIEW

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

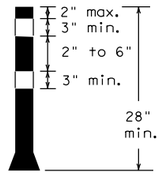
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

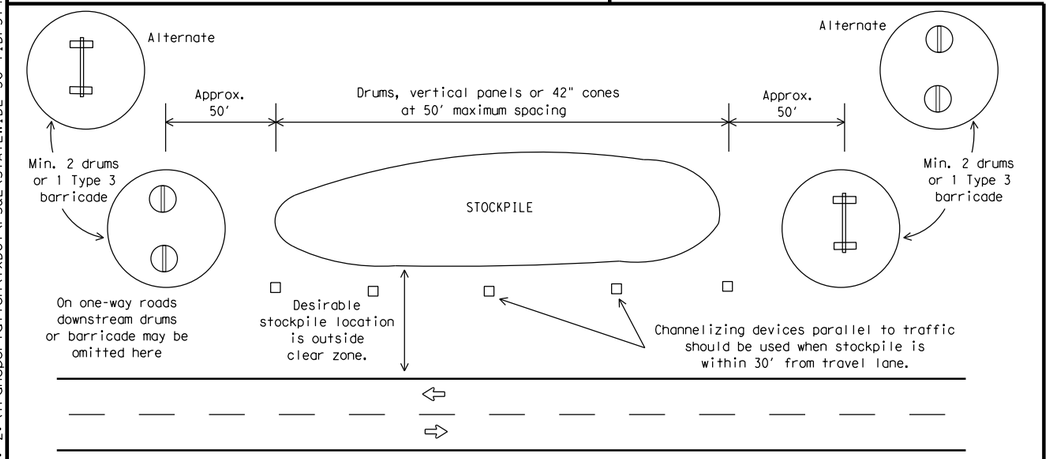


Tubular Marker

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

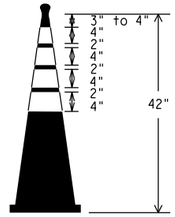
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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 used at night shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



EDGELINE CHANNELIZER

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		49

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

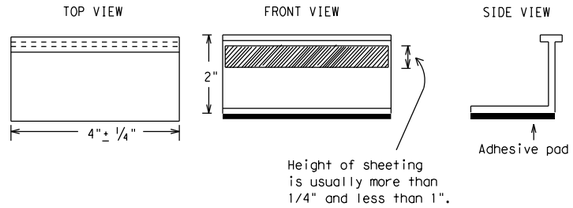
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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1-02 7-13	ABL	TAYLOR		50
11-02 8-14				

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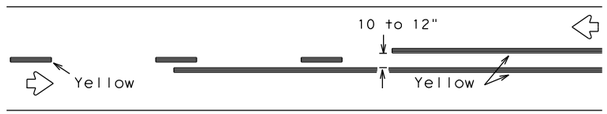
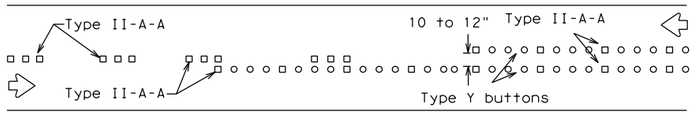
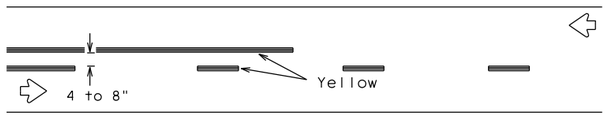
PAVEMENT MARKING PATTERNS



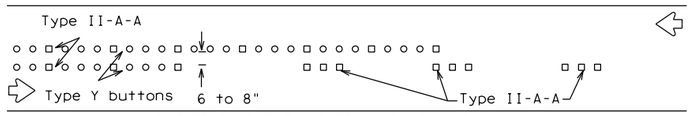
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



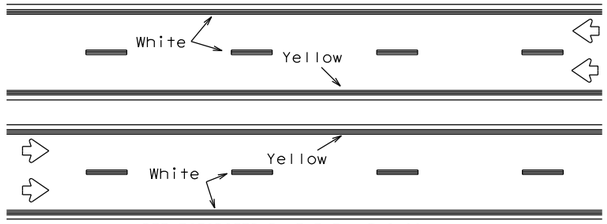
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



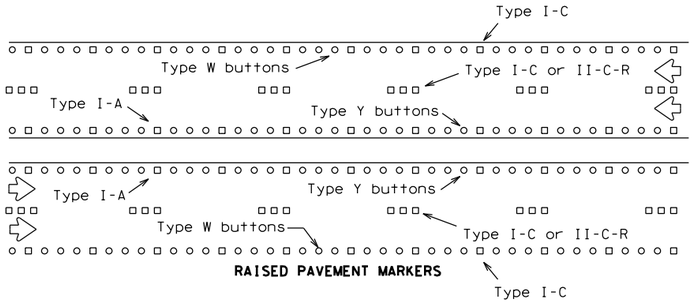
RAISED PAVEMENT MARKERS - PATTERN B

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

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



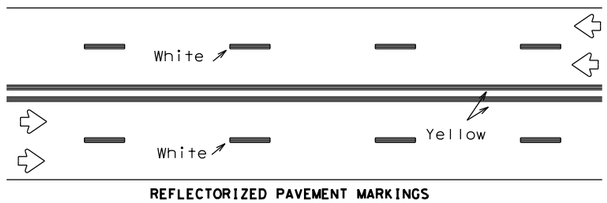
REFLECTORIZED PAVEMENT MARKINGS



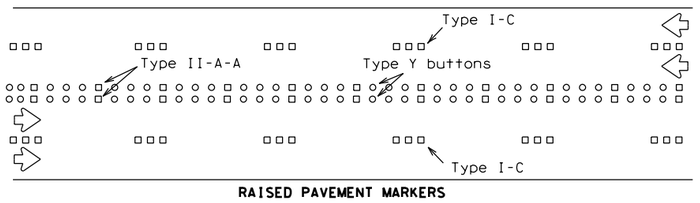
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



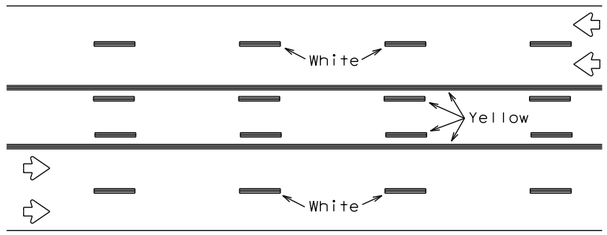
REFLECTORIZED PAVEMENT MARKINGS



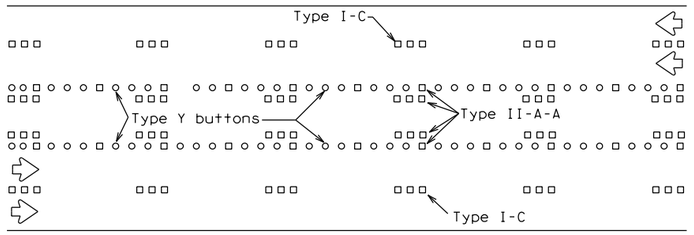
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

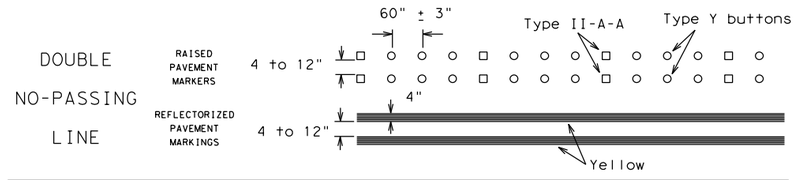
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

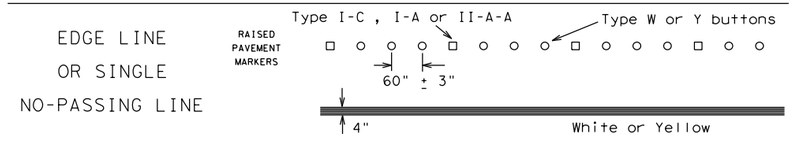
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

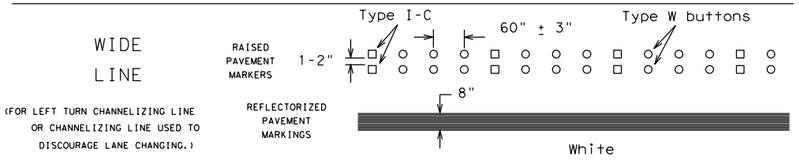


EDGE LINE OR SINGLE NO-PASSING LINE



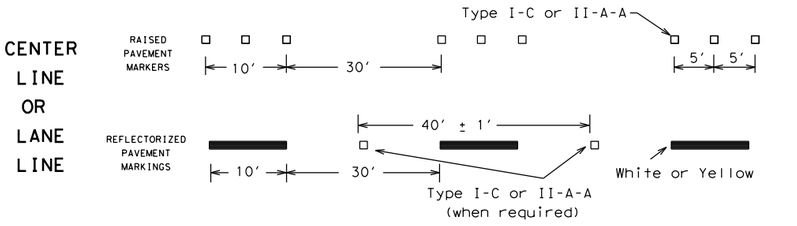
WIDE LINE

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

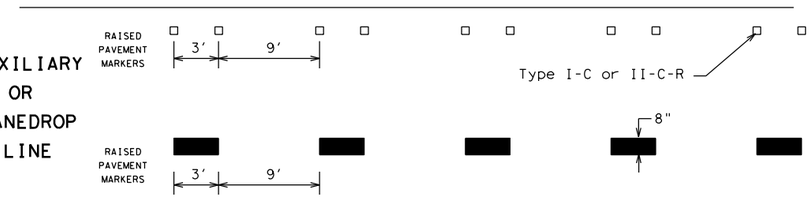


BROKEN LINES

CENTER LINE OR LANE LINE

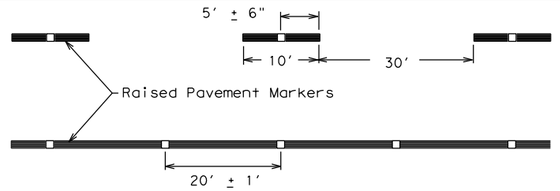


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

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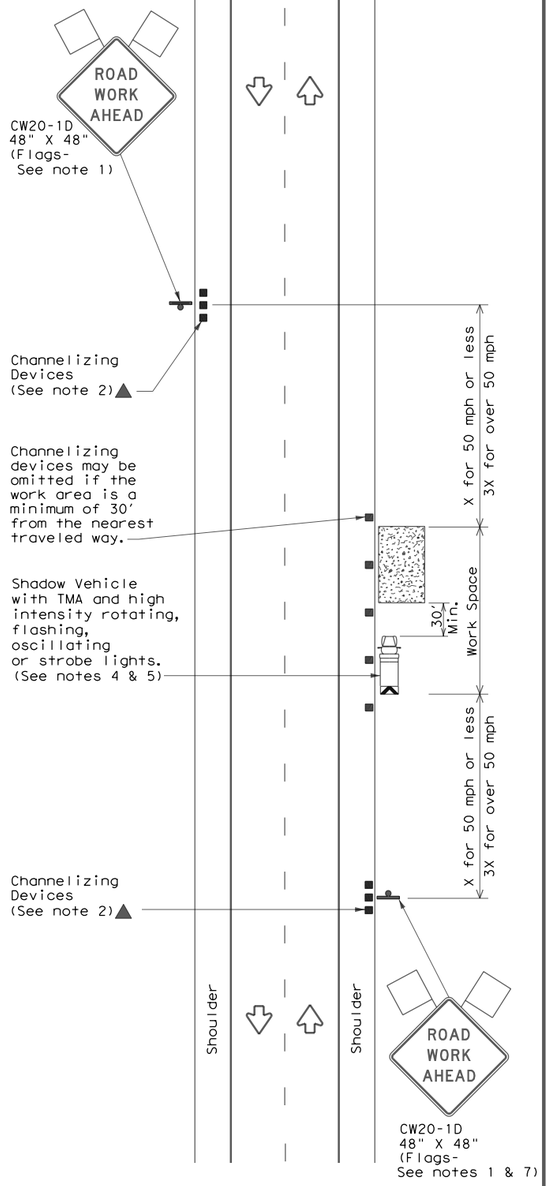
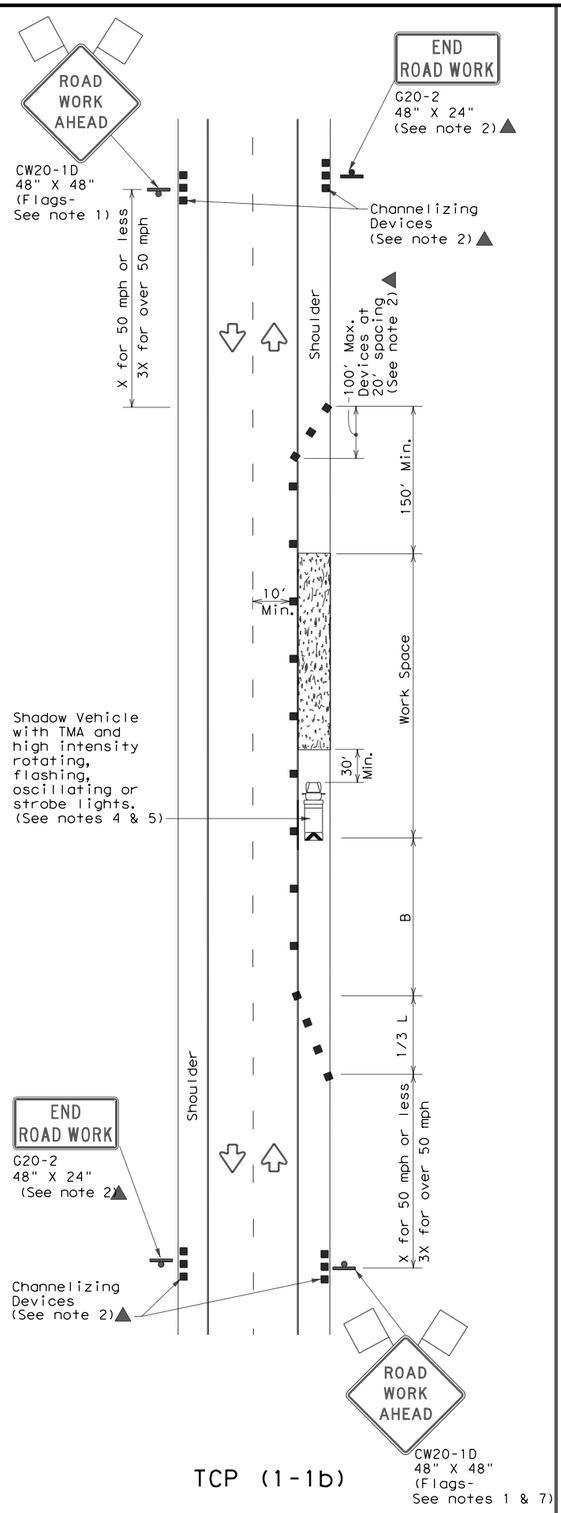


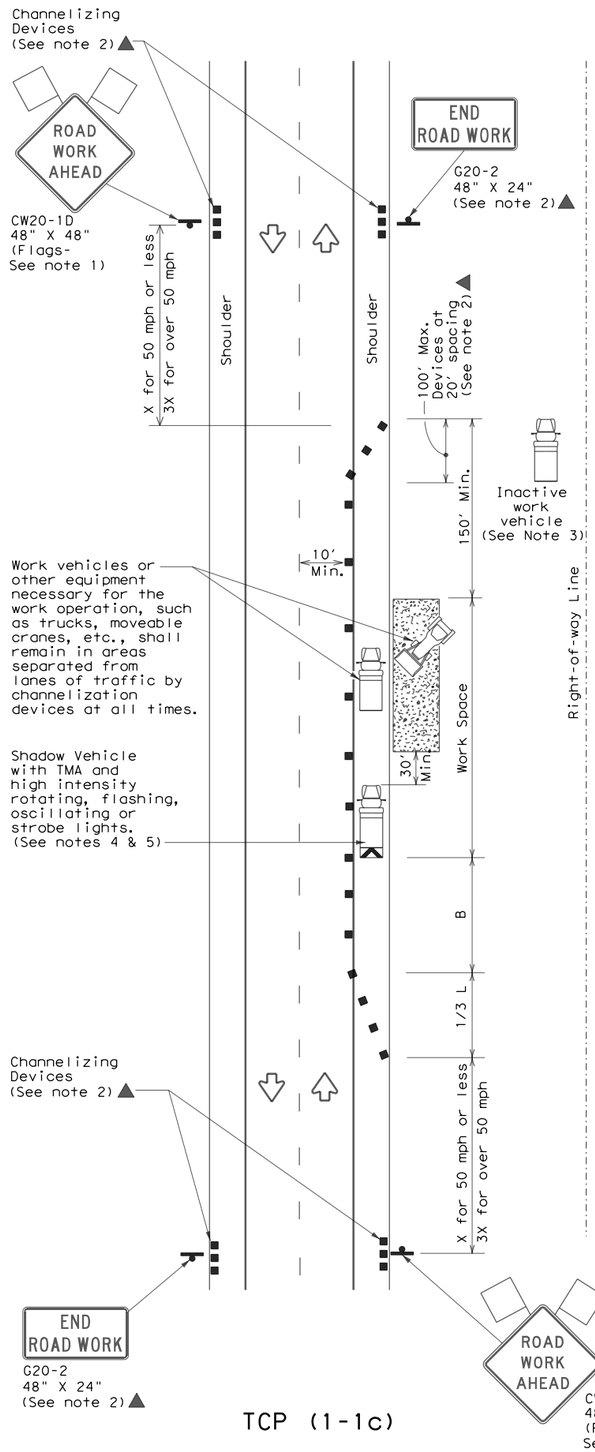
TCP (1-1a)

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

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2-94 4-98	DIST	COUNTY		SHEET NO.
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1-97 2-18				

151

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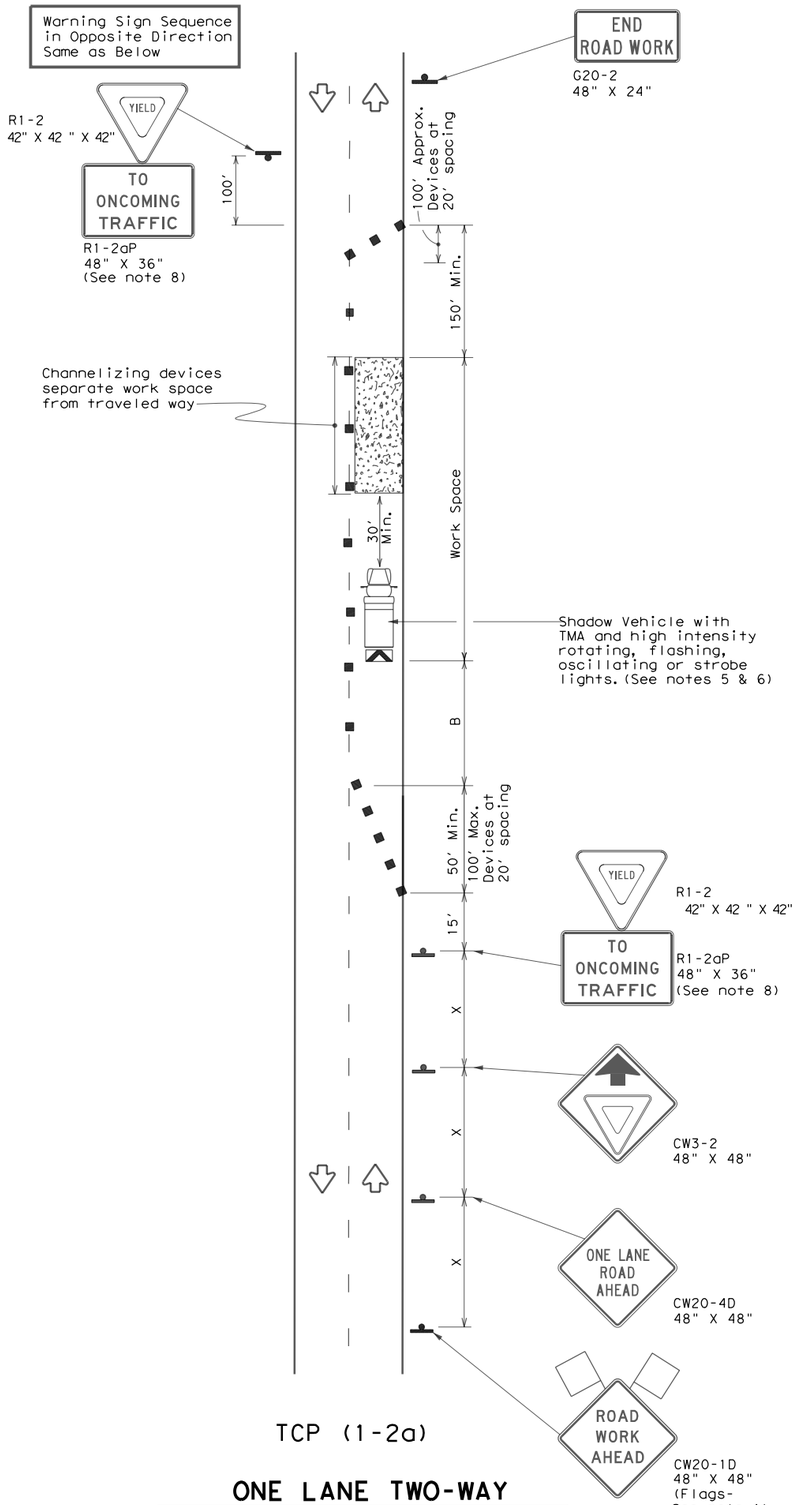
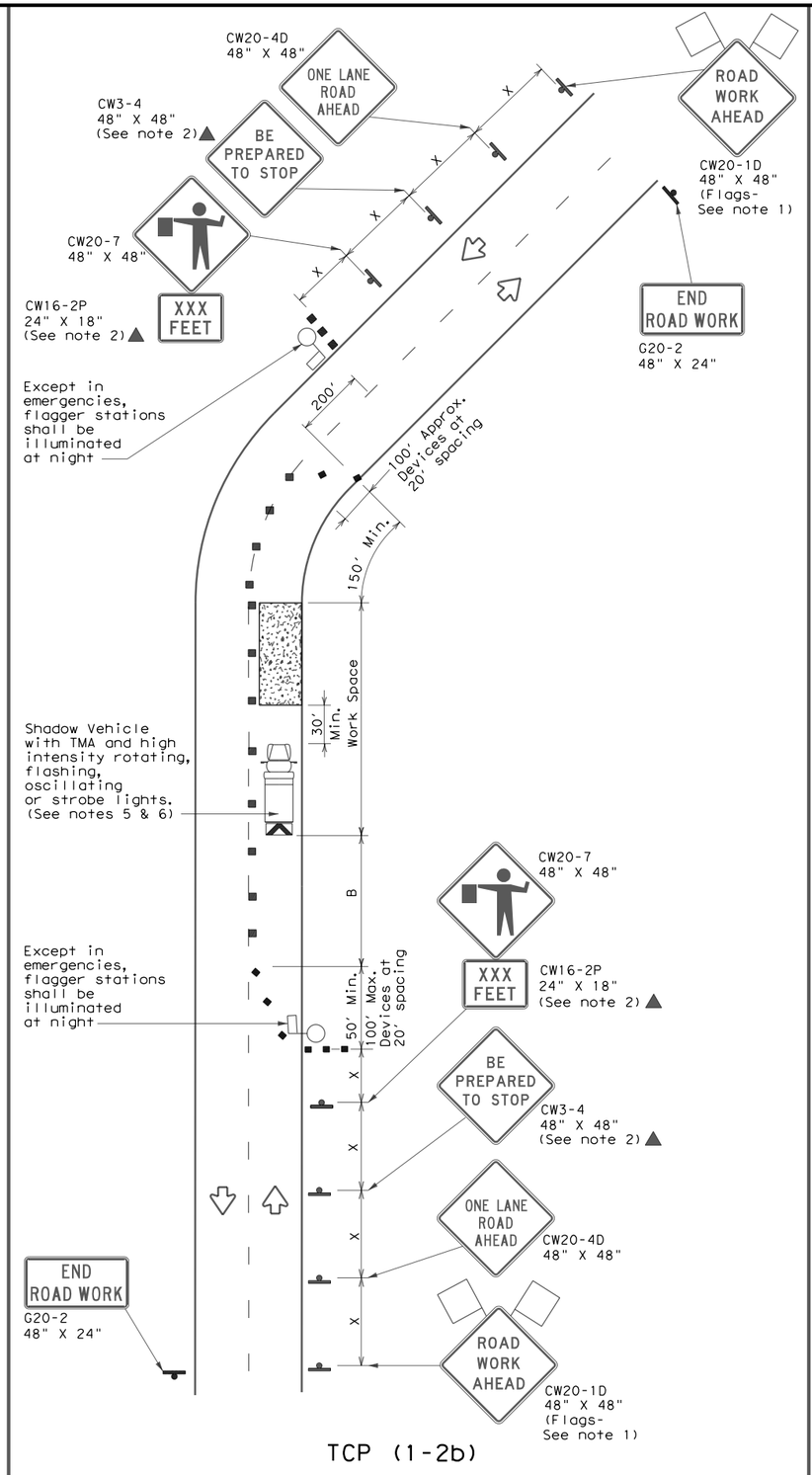


TCP (1-2a)

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "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	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		53

DATE: 5/26/2021 10:23:00 AM
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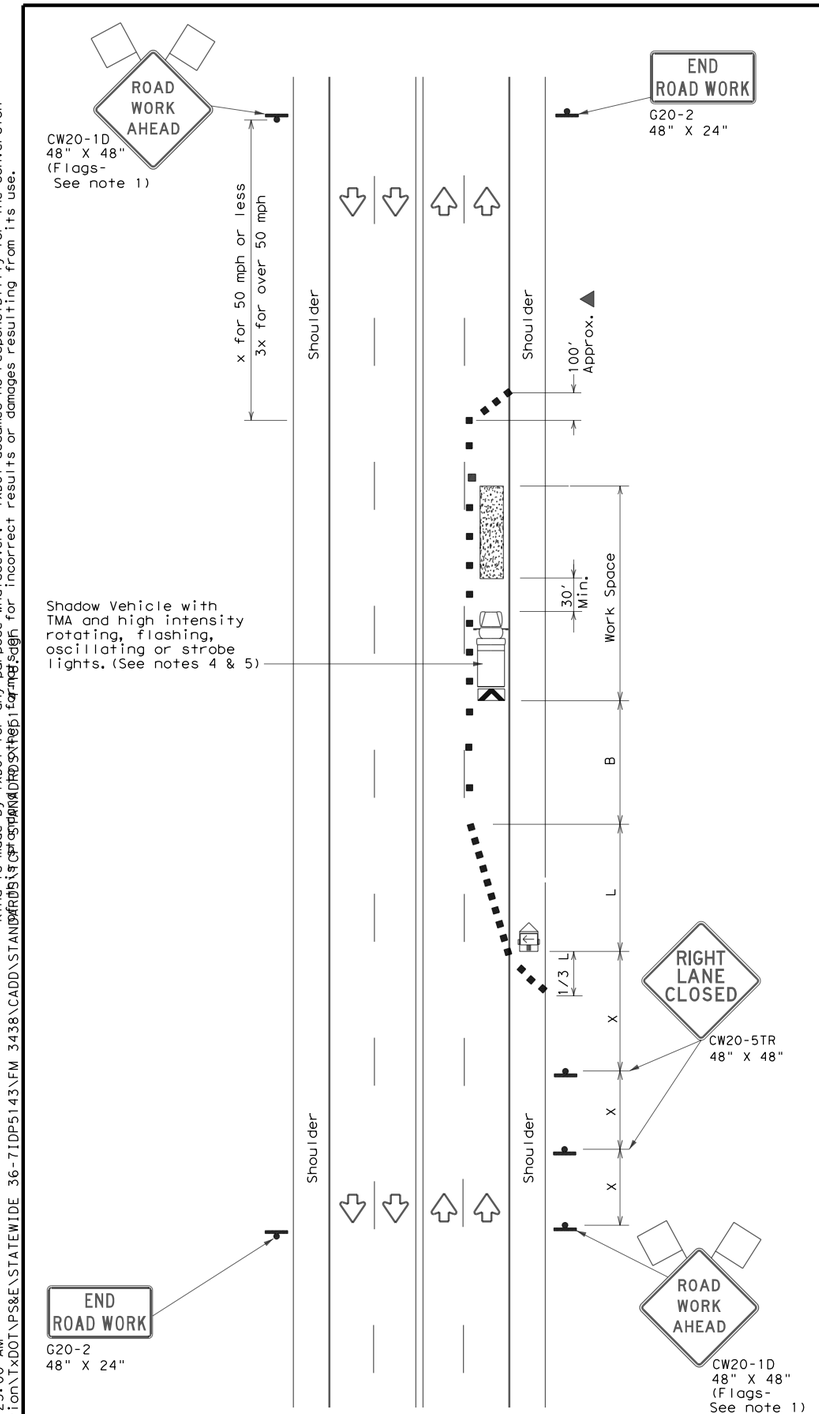
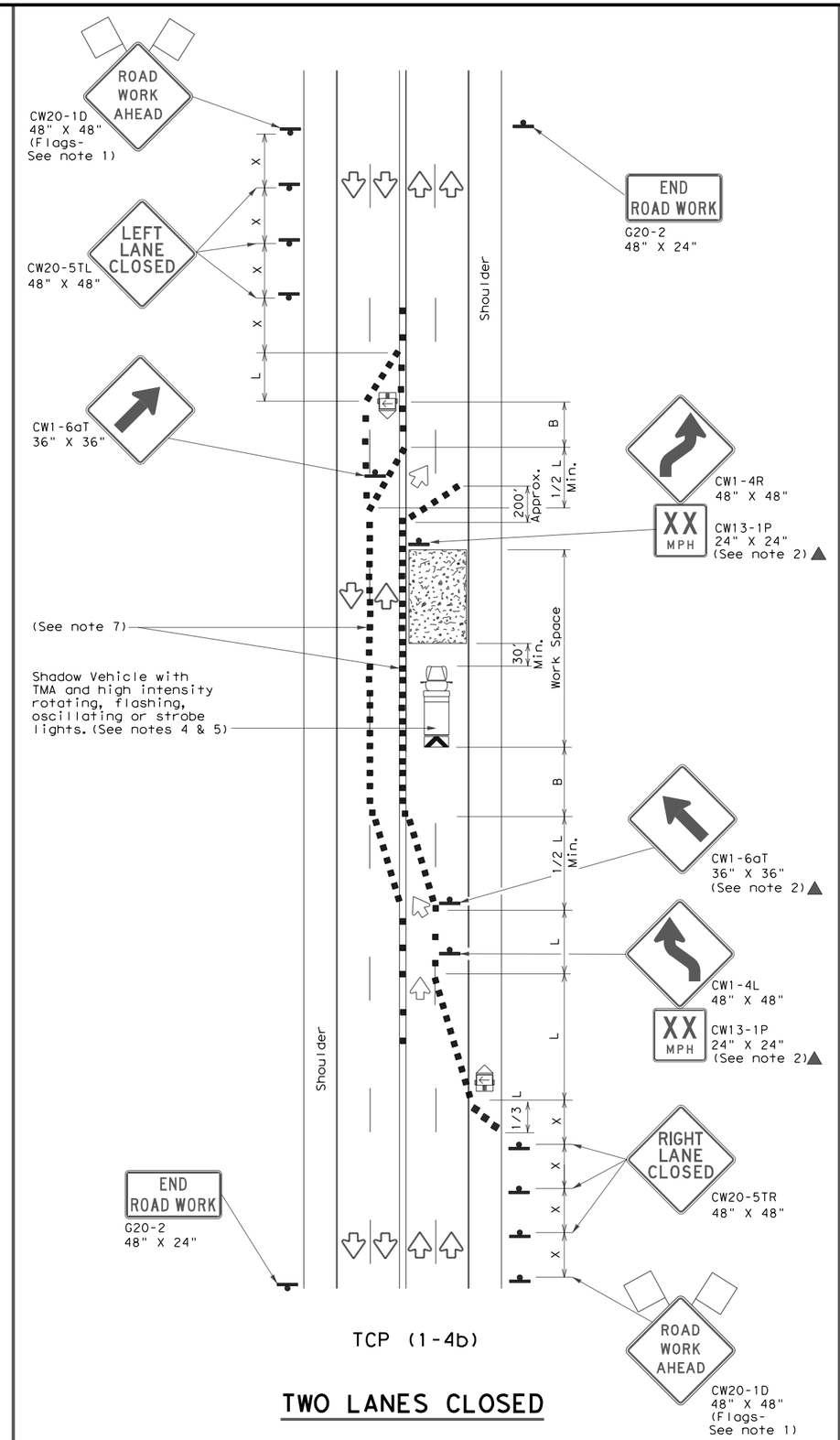


TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
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.

TCP (1-4a)

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

TCP (1-4b)

7. 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 1/2S where S is the speed in mph. This tighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(1-4)-18

FILE: tcp1-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	ABL	TAYLOR		54
1-97 2-18				

DATE: 5/26/2021 10:23:00 AM
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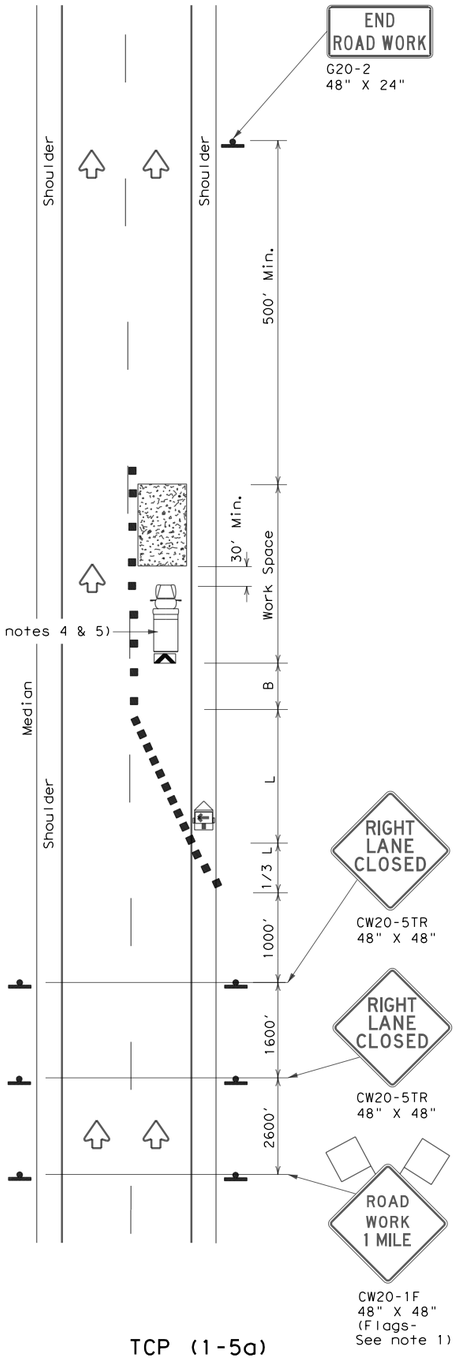
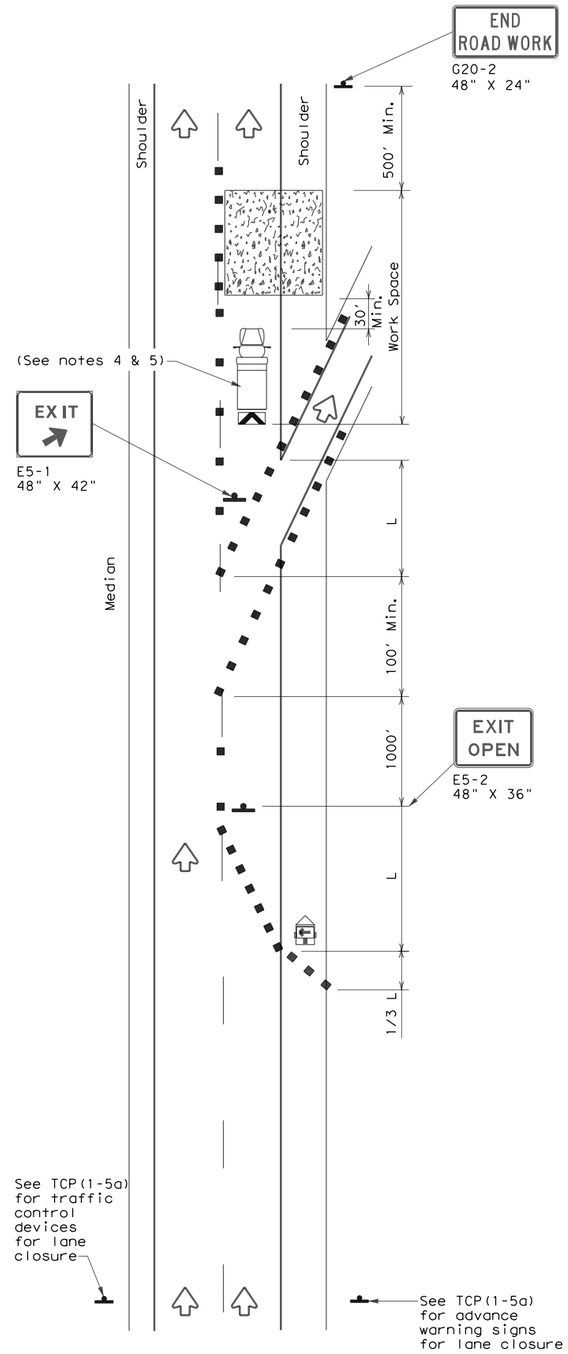


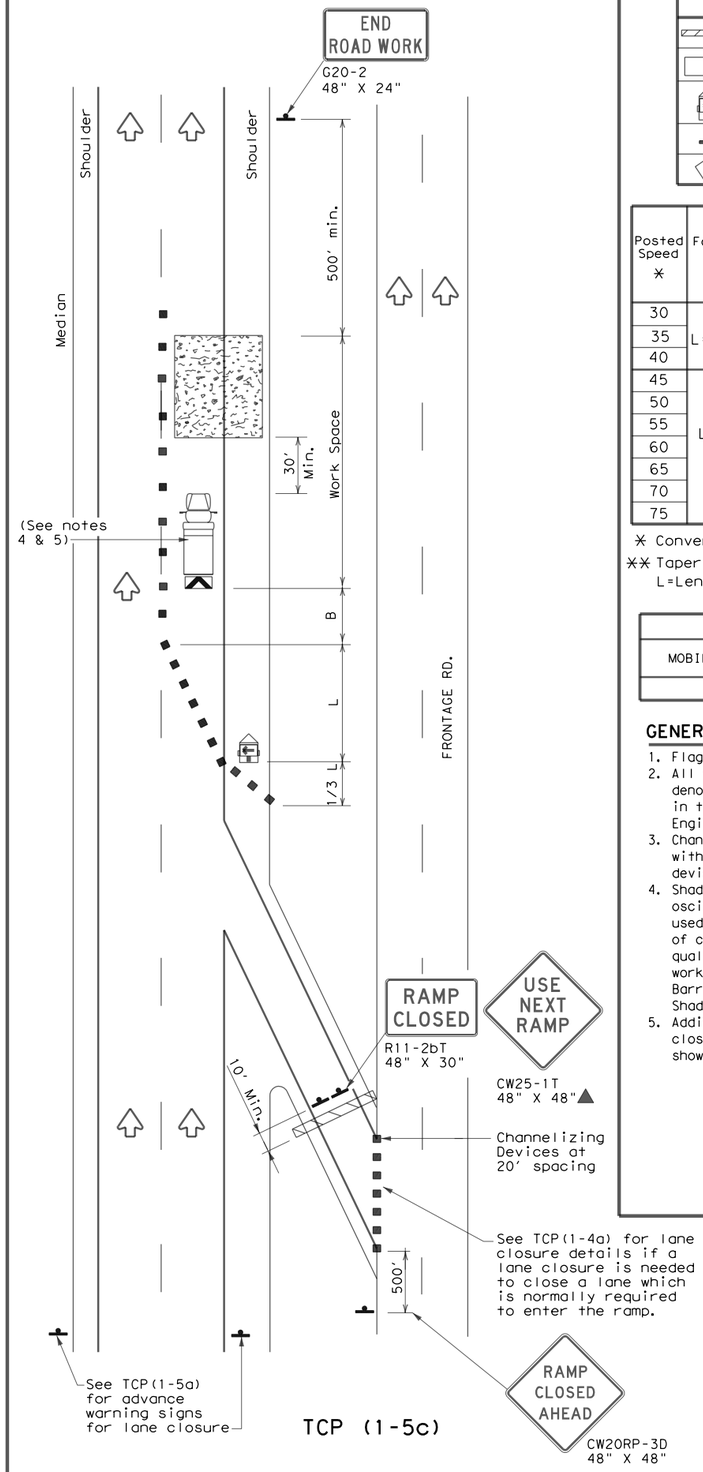
TCP (1-5a)

ONE LANE CLOSURE



TCP (1-5b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (1-5c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

TCP(1-5)-18

FILE: tcp1-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-18	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		55

DATE: 5/26/2021 10:23:01 AM
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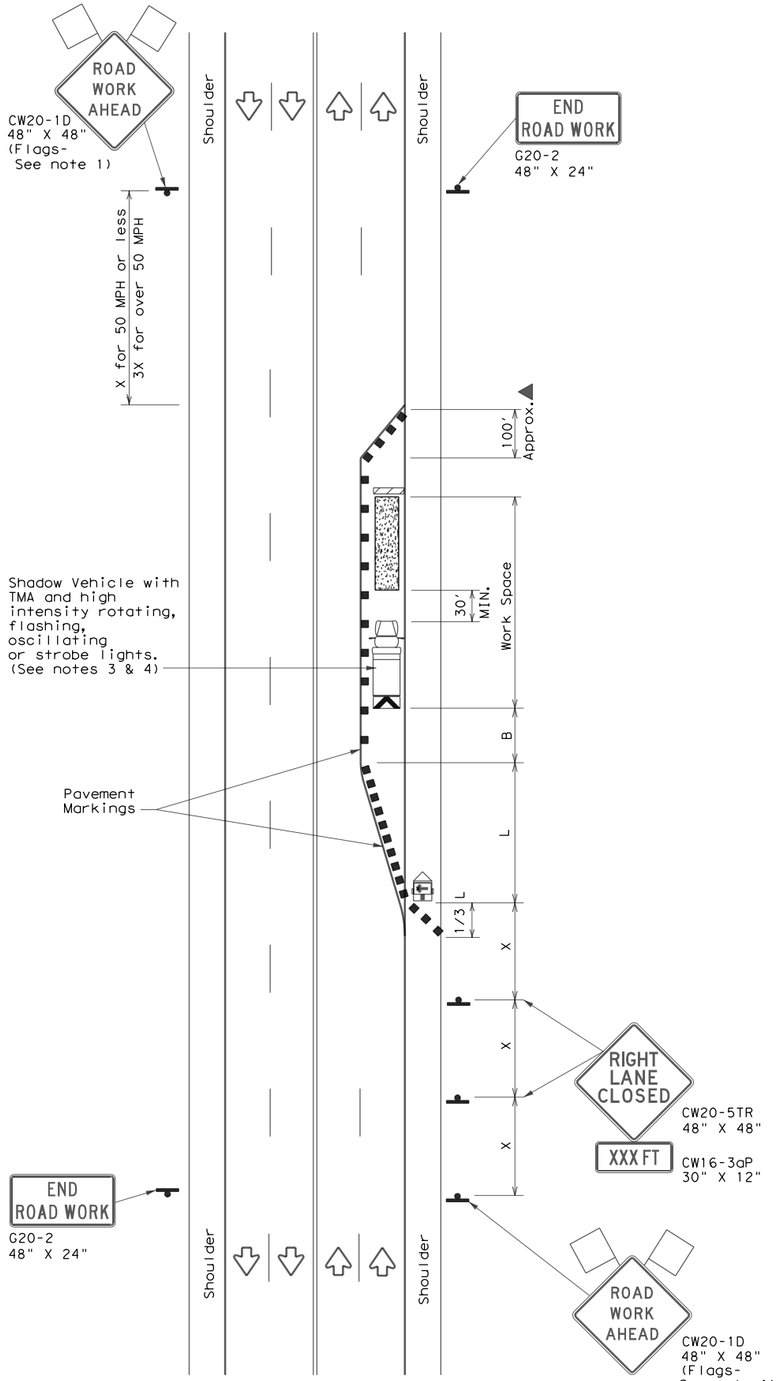
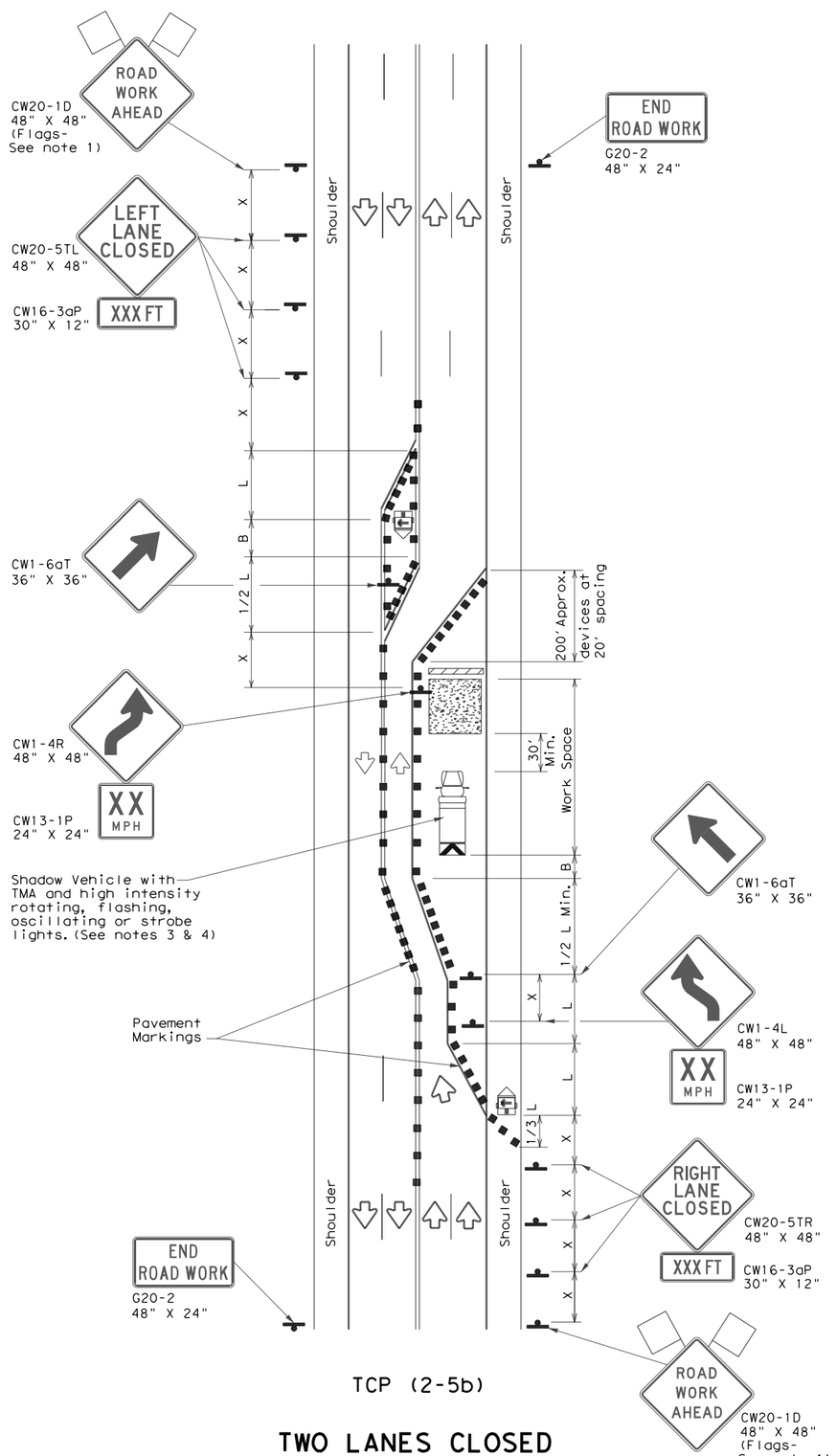


TCP (2-5a)

ONE LANE CLOSED



TCP (2-5b)

TWO LANES CLOSED

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			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.
3. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew eposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substitutued for the Shadow Vehicle and TMA.
4. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.
5. The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

TCP (2-5a)

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

TCP (2-5b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LONG TERM LANE CLOSURES MULTILANE CONVENTIONAL RDS.

TCP(2-5)-18

FILE: tcp2-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 2-12	2270	01	023	FM 3438
1-97 3-03	DIST	COUNTY		SHEET NO.
4-98 2-18	ABL	TAYLOR		56

165

DATE: 5/26/2021 10:23:02 AM
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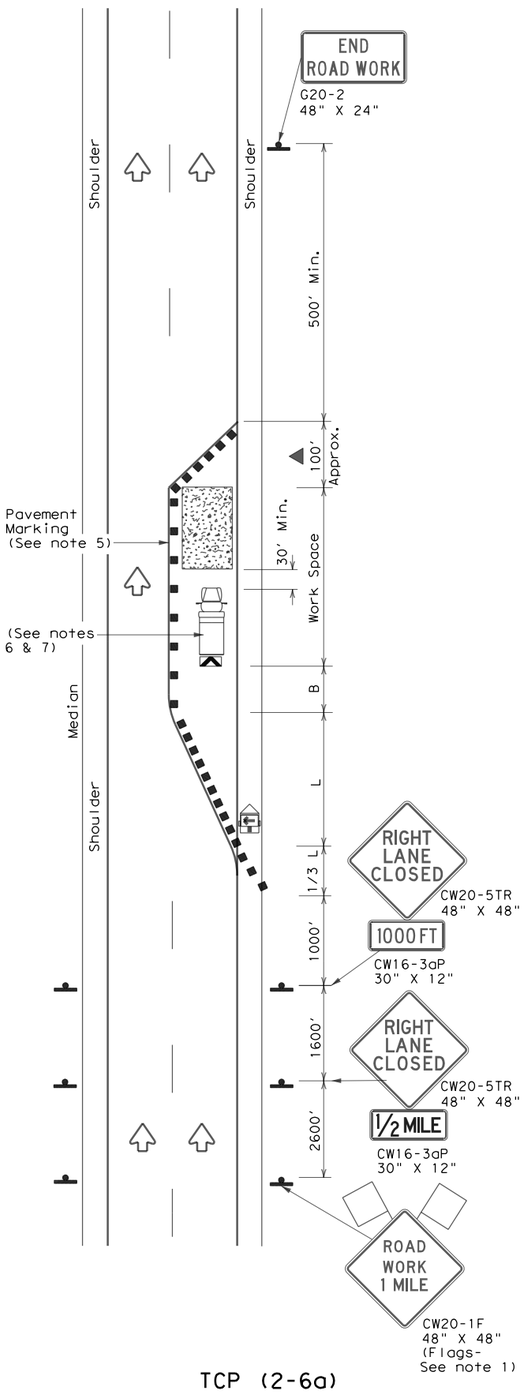
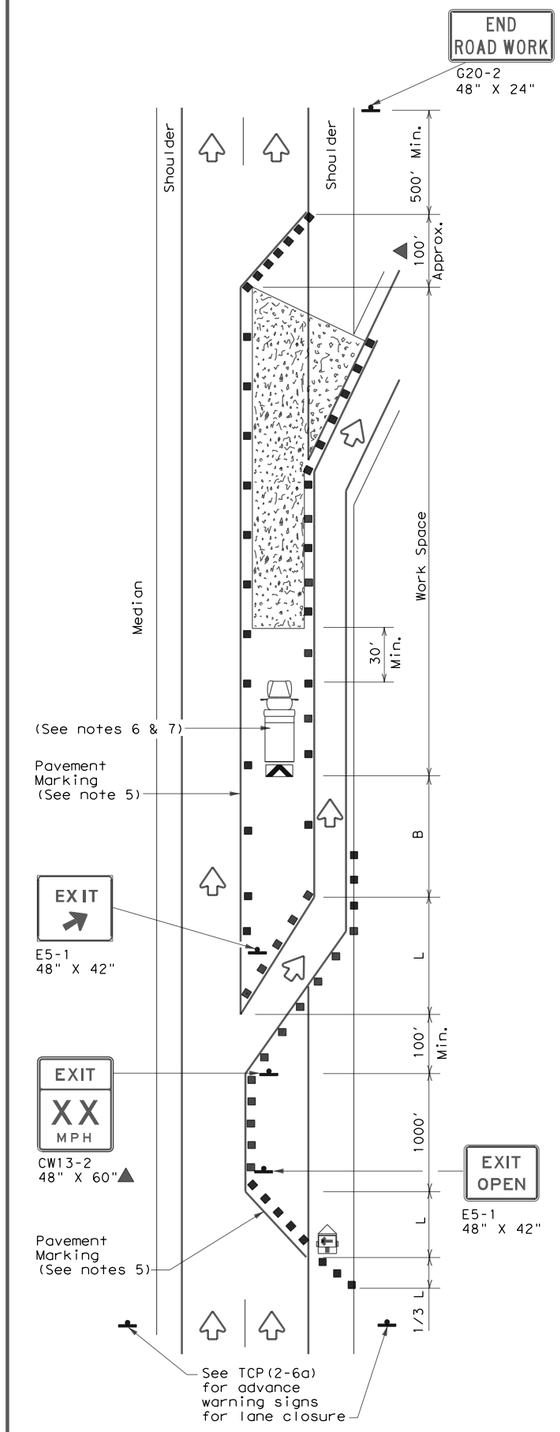


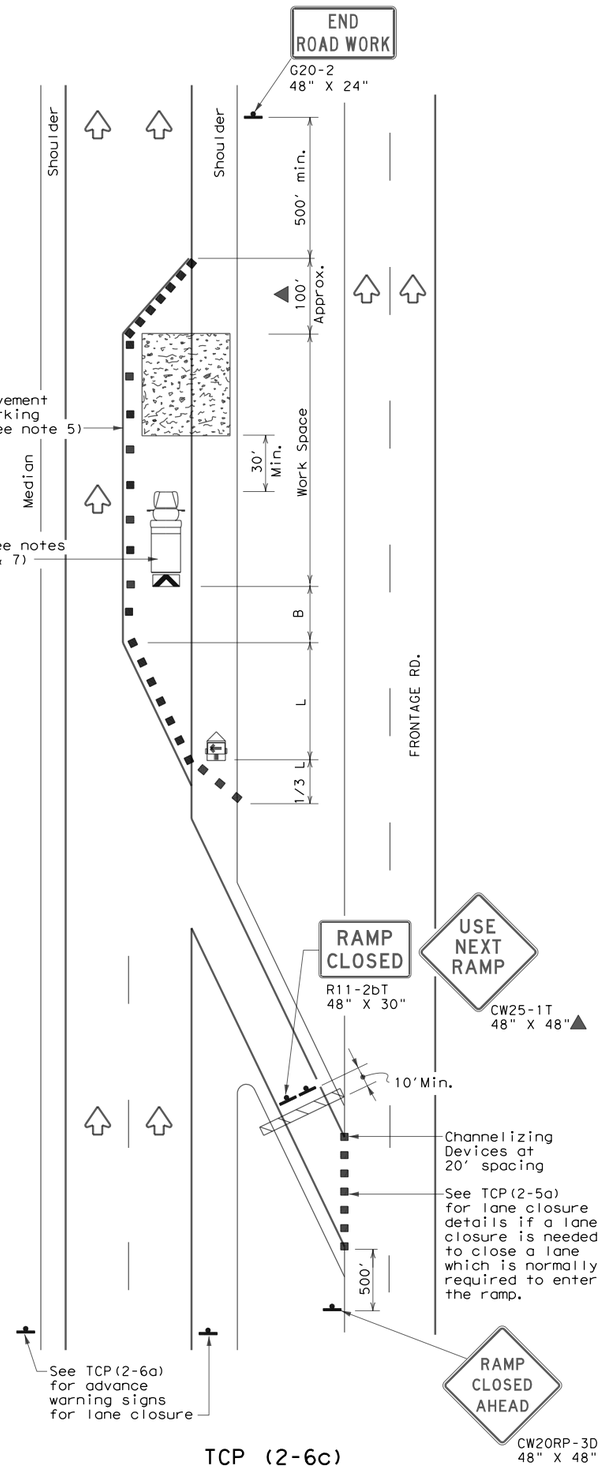
TCP (2-6a)

ONE LANE CLOSURE



TCP (2-6b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (2-6c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP(2-6)-18

FILE: tcp2-6-18.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	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		57

DATE: 5/26/2021 10:23:02 AM
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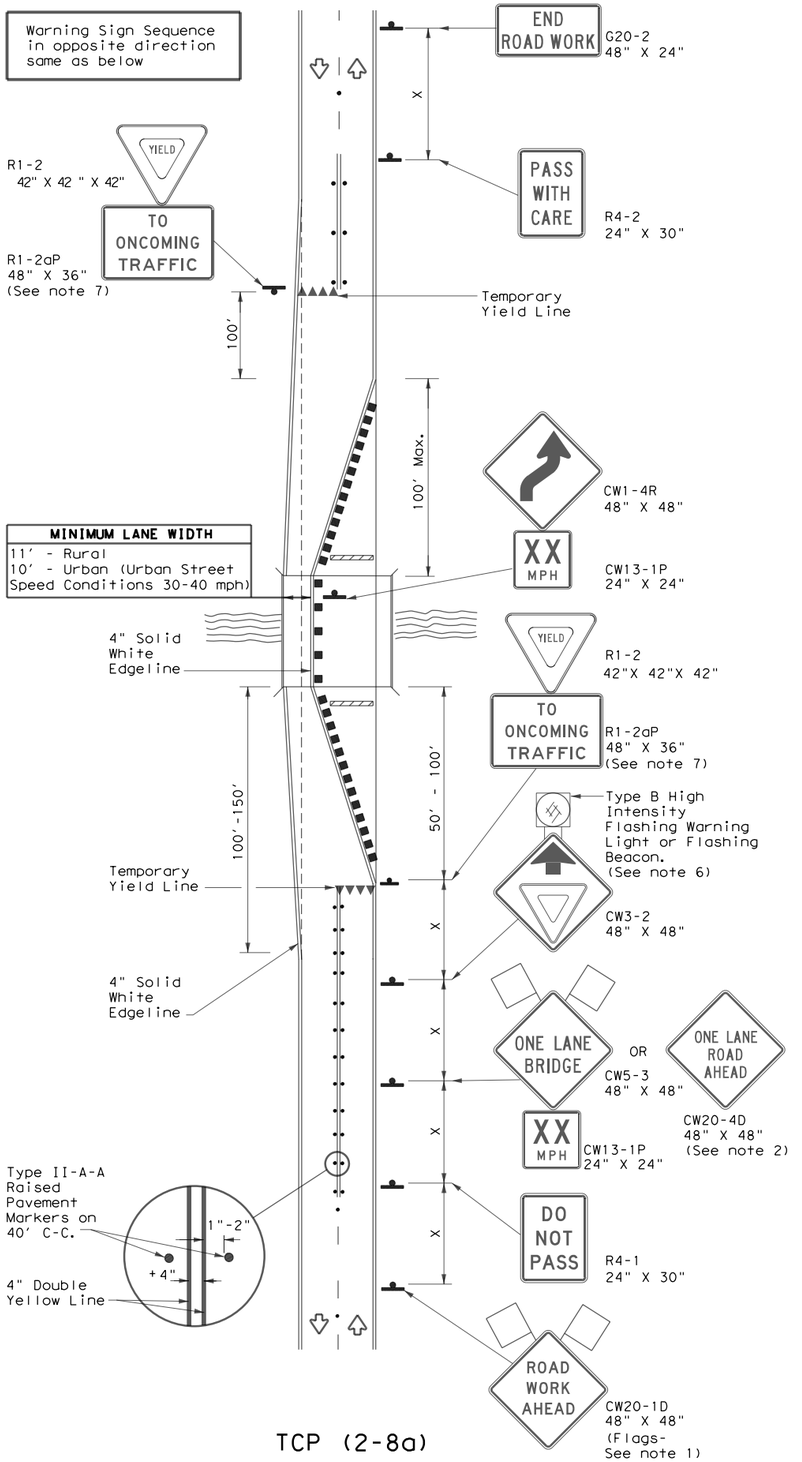
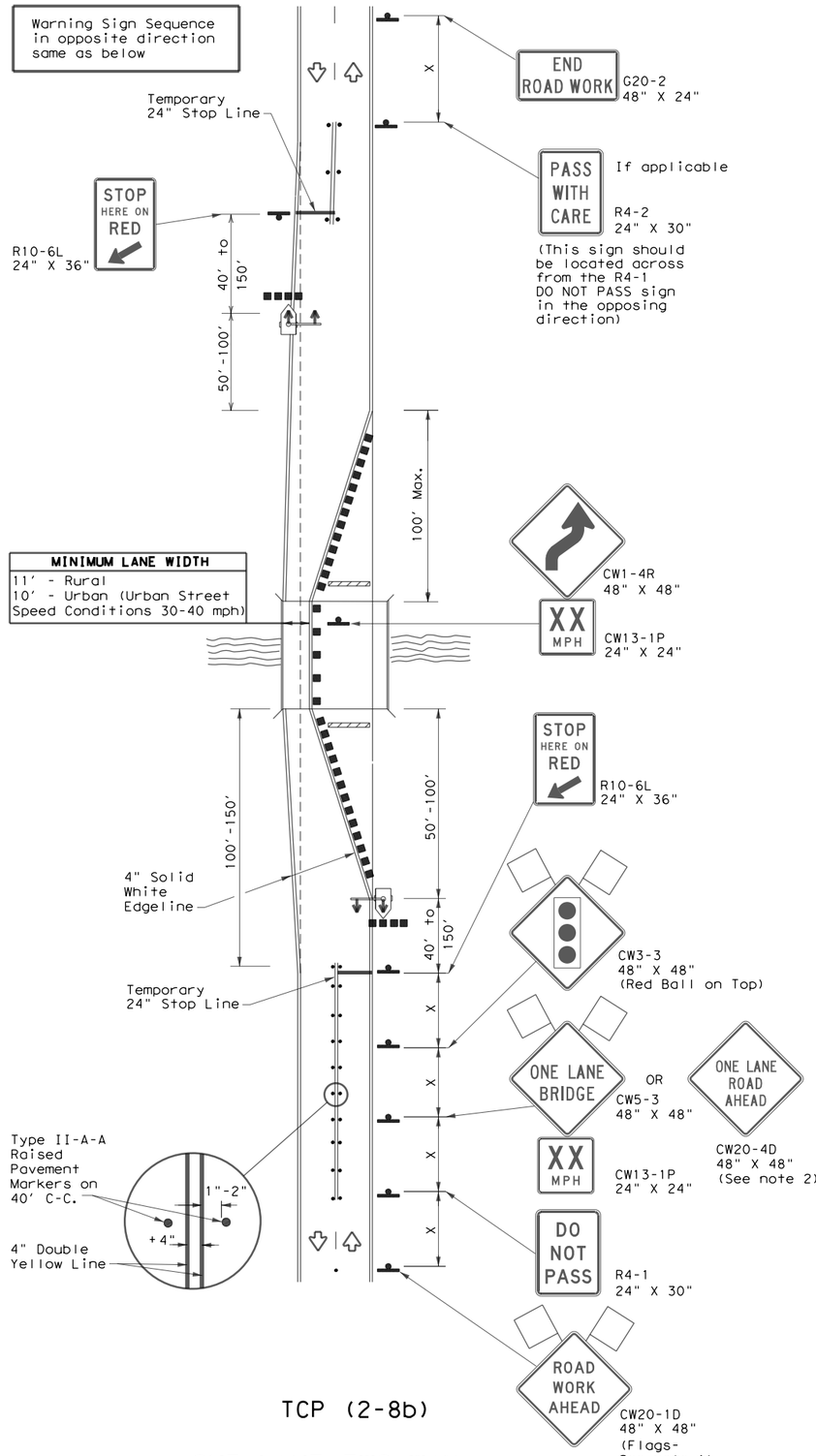


TCP (2-8a)

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 ** 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. 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:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	ABL	TAYLOR		58
4-98 2-18				

DATE: 5/26/2021 10:23:03 AM
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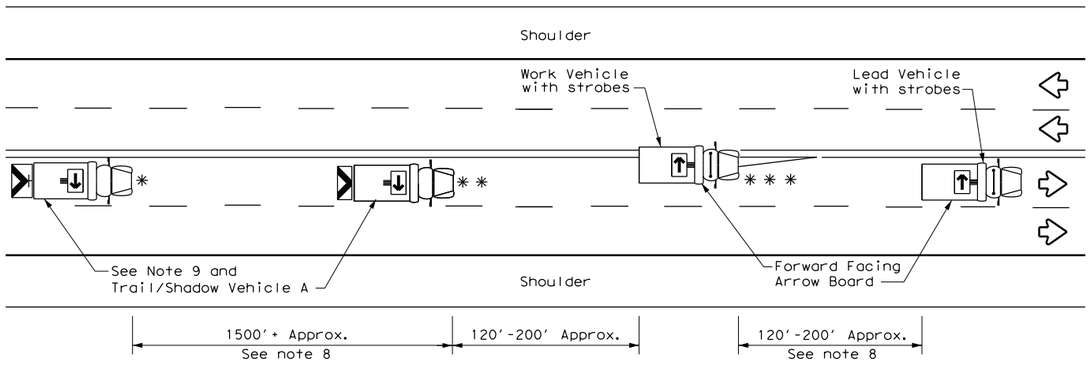
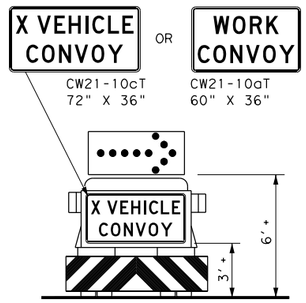


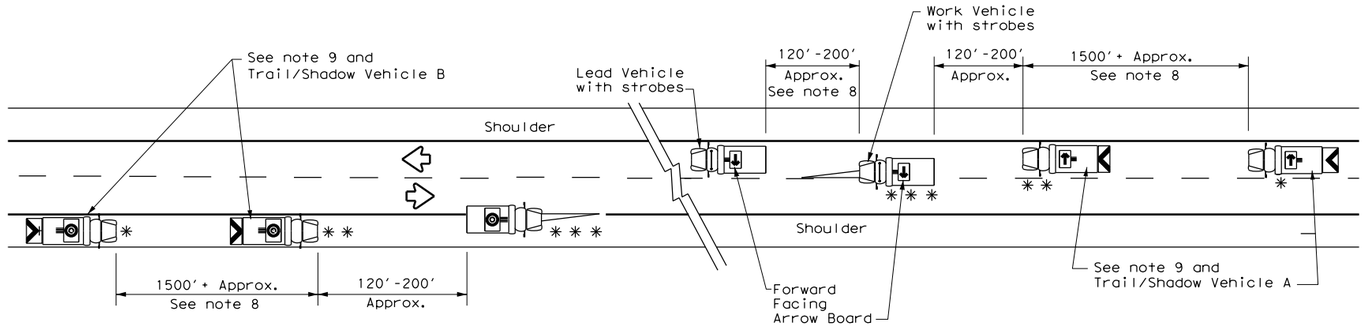
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

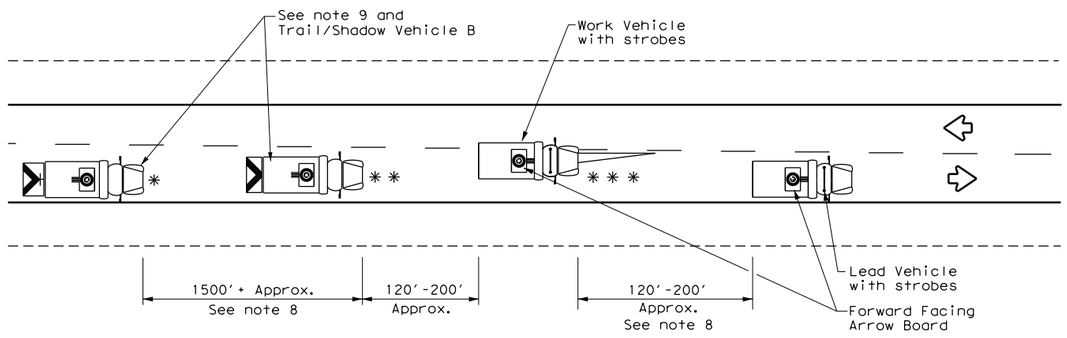


WORK ON SHOULDER

WORK ON TRAVEL LANE

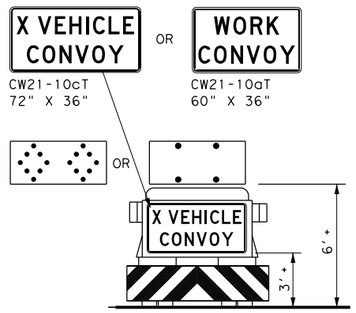
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

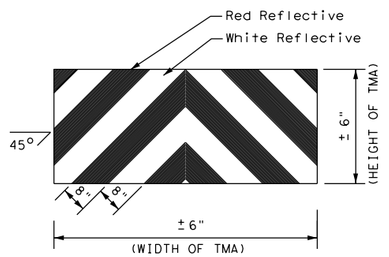
with Flashing Arrow Board in CAUTION display

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

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	2270	01	023	FM 3438
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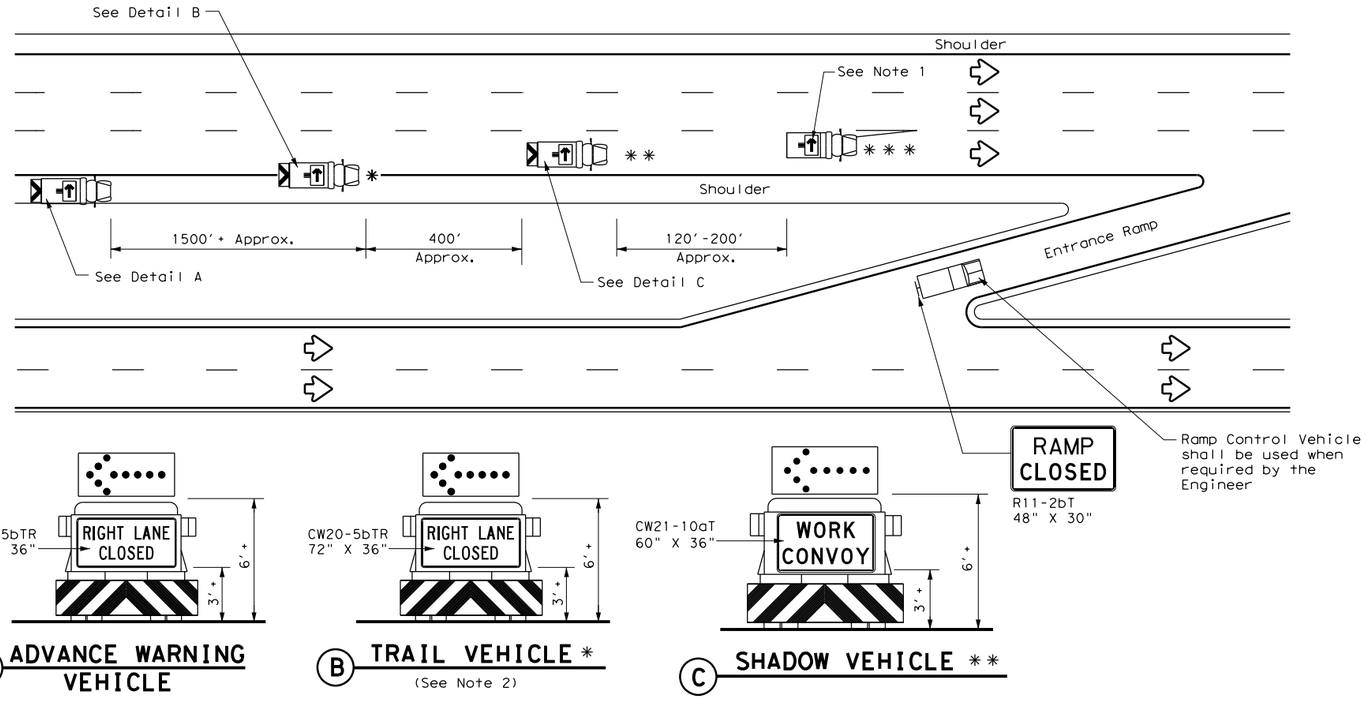
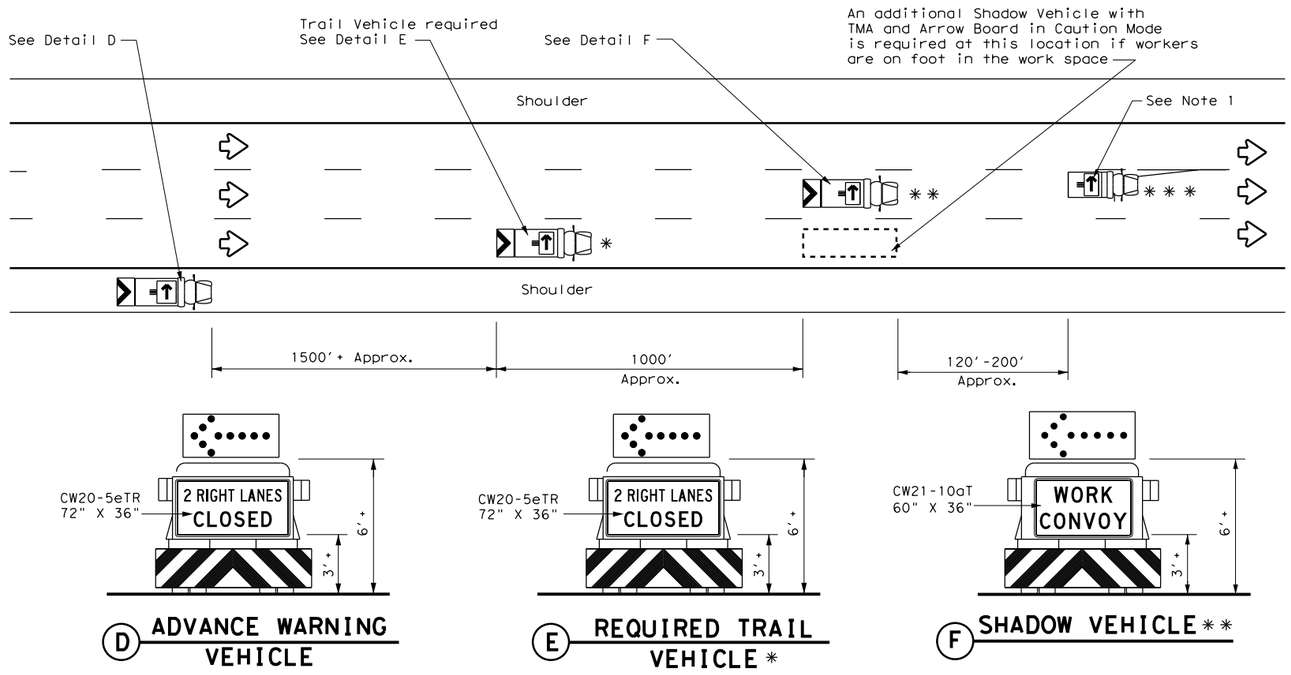


RIGHT LANE CLOSURE ON DIVIDED HIGHWAY - TCP(3-2a)



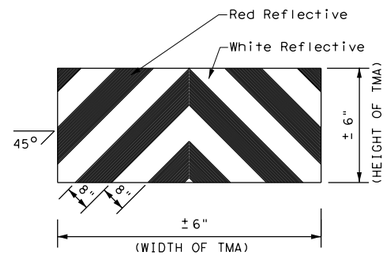
INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP(3-2b)

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS

TCP(3-2)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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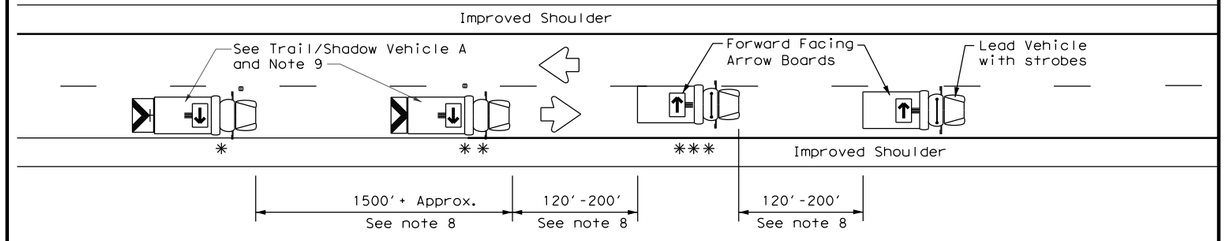
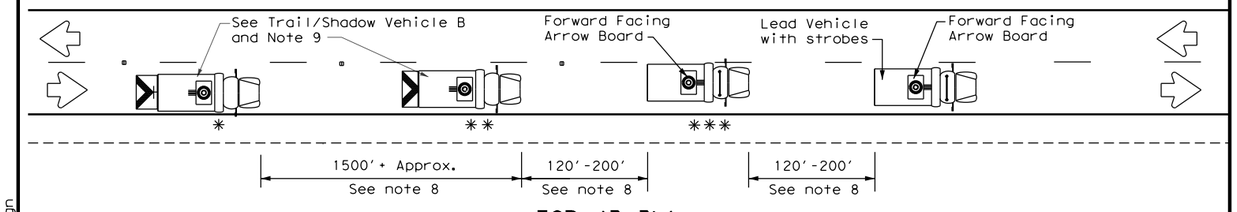
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	ABL	TAYLOR		60
1-97				



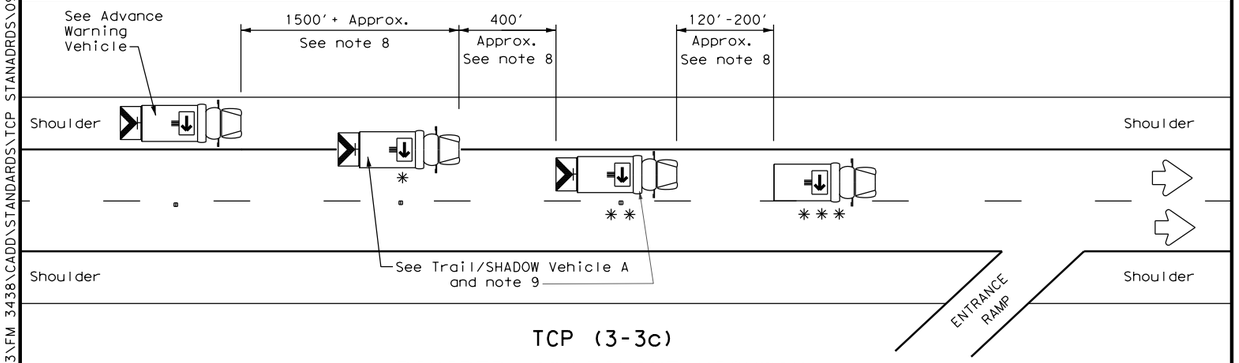
TCP (3-3a)

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



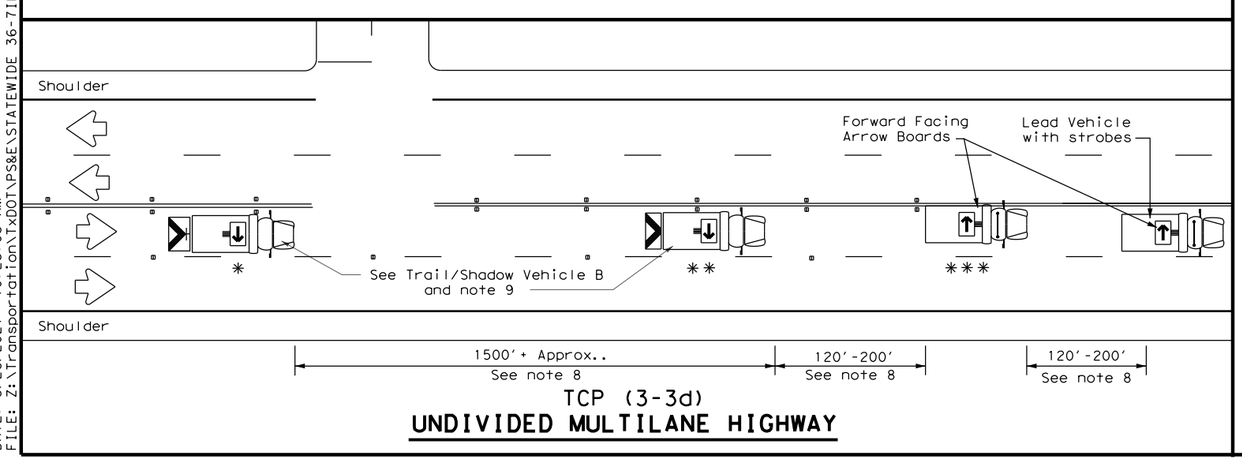
TCP (3-3b)

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



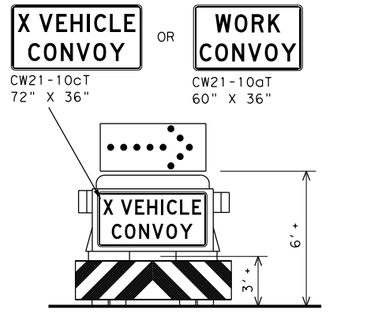
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



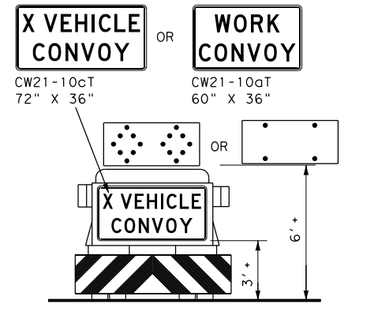
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



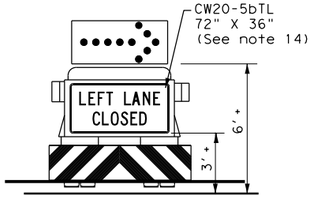
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

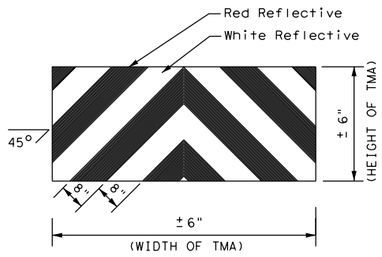


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	ABL	TAYLOR		61
1-97 7-14				

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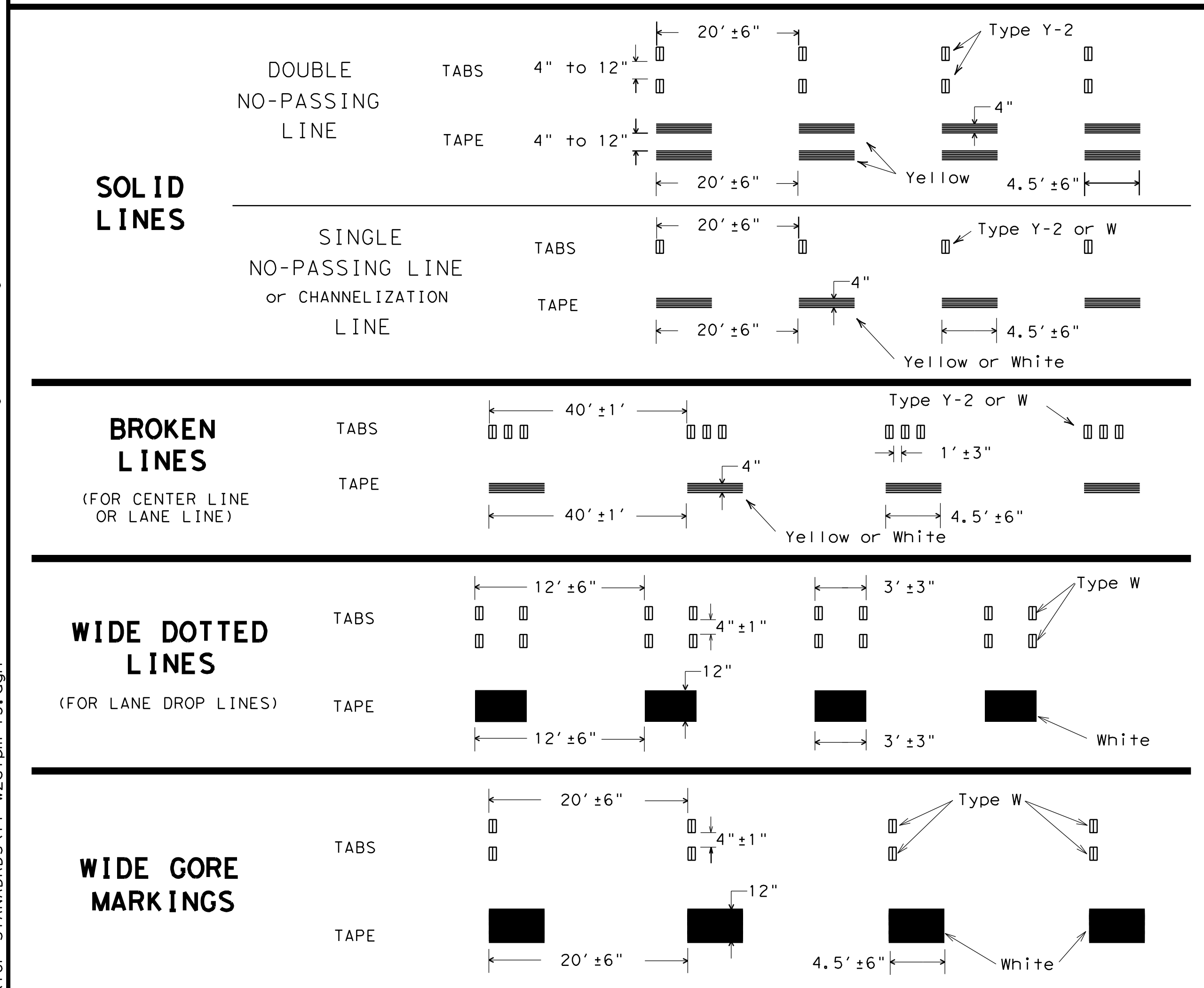
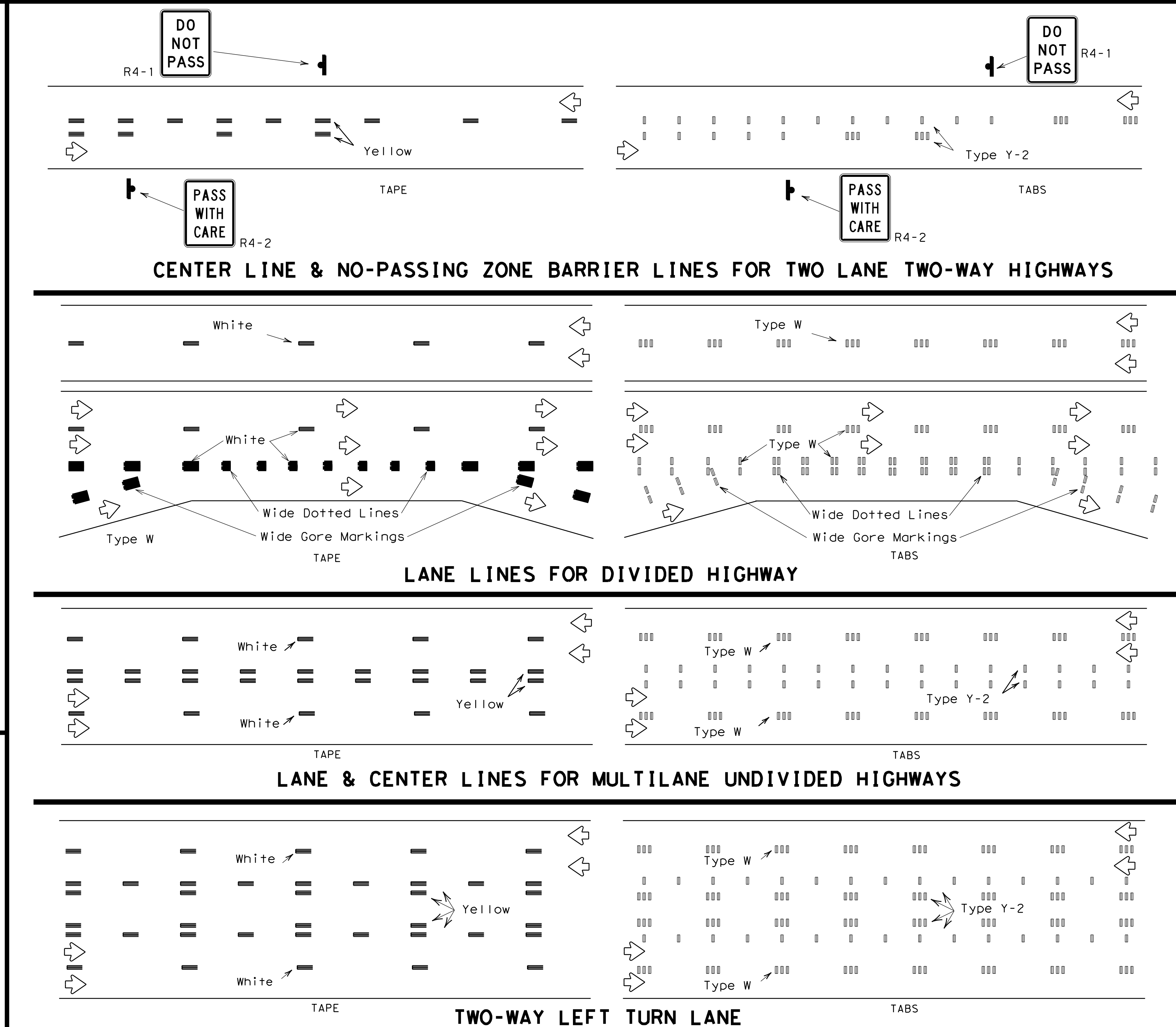
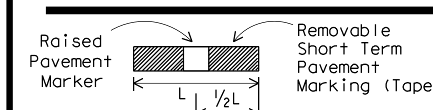
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS





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

NOTES:

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

TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation — Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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1-97 3-03 7-13		DIST		COUNTY	SHEET NO.
		ABL		TAYLOR	62

111

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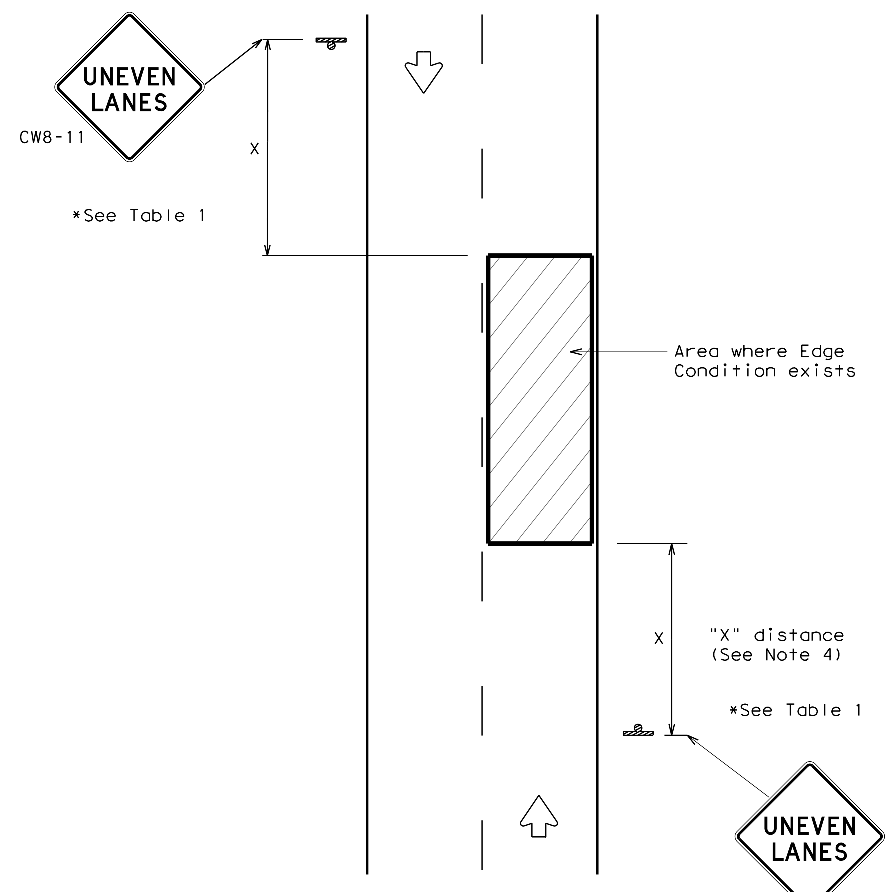
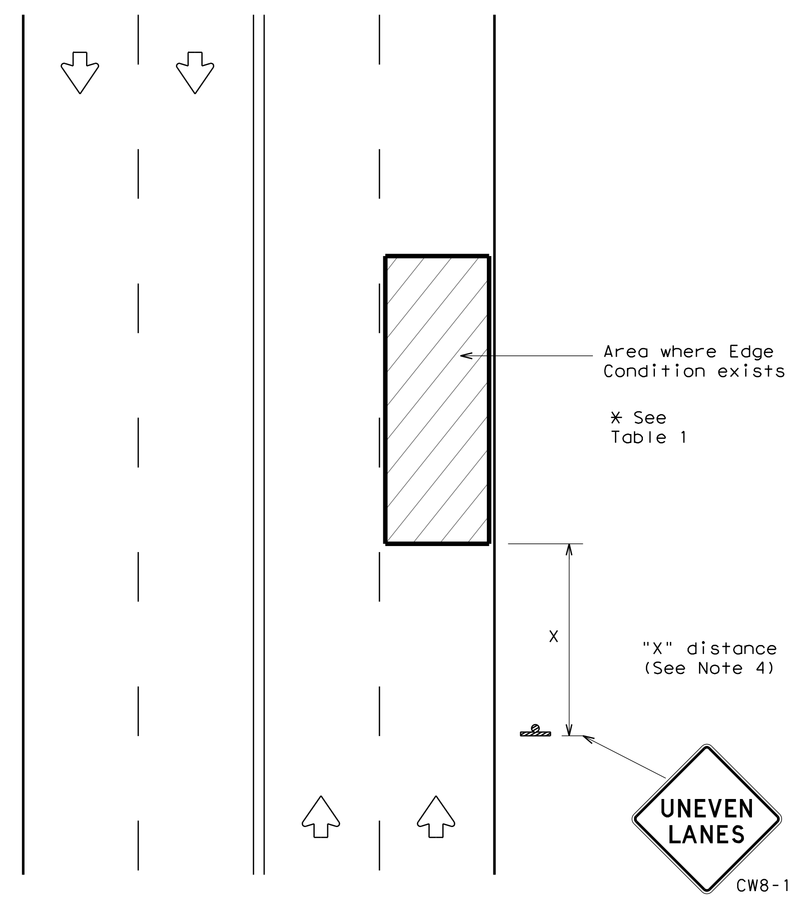
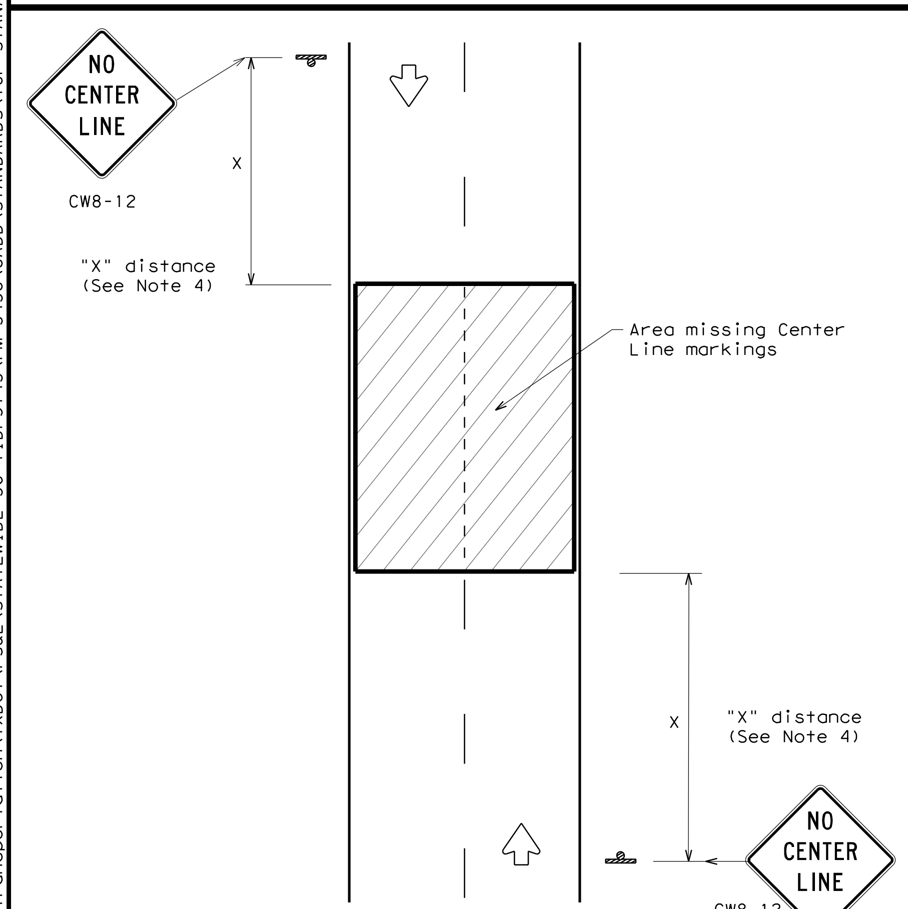


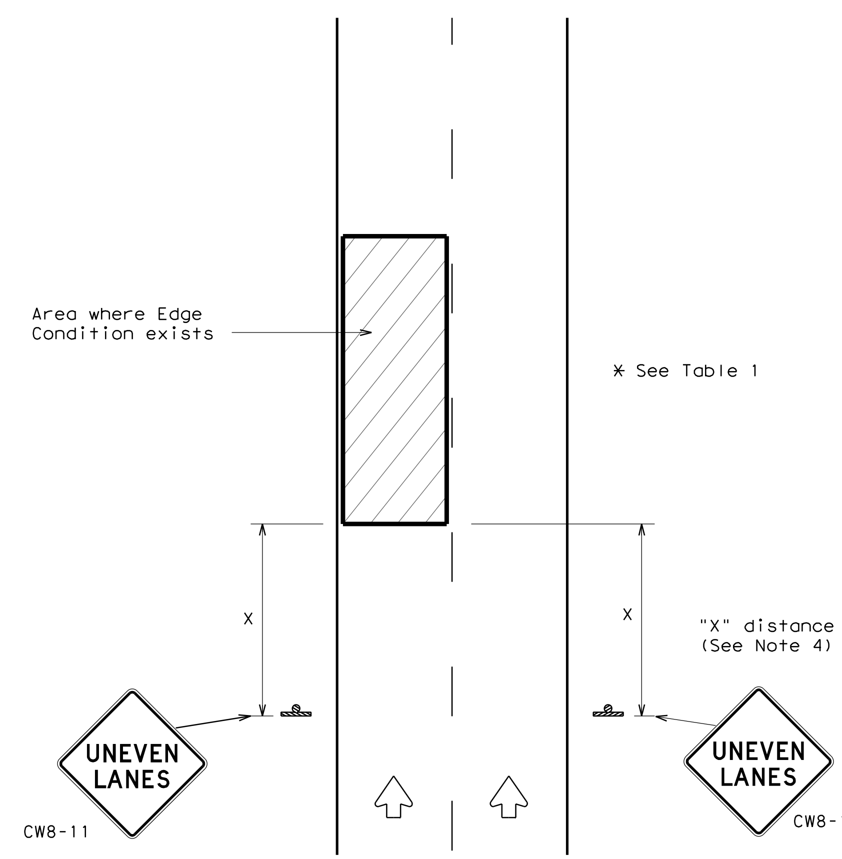
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

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

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

GENERAL NOTES

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

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① (D)	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 (>3, 1, D)	Less than or equal to 3"	Sign: CW8-11
③ (0" to 3/4", D, 12") 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	2270	01	023	FM 3438
8-95 2-98 7-13 1-97 3-03	DIST		COUNTY	SHEET NO.
	ABL		TAYLOR	63

112

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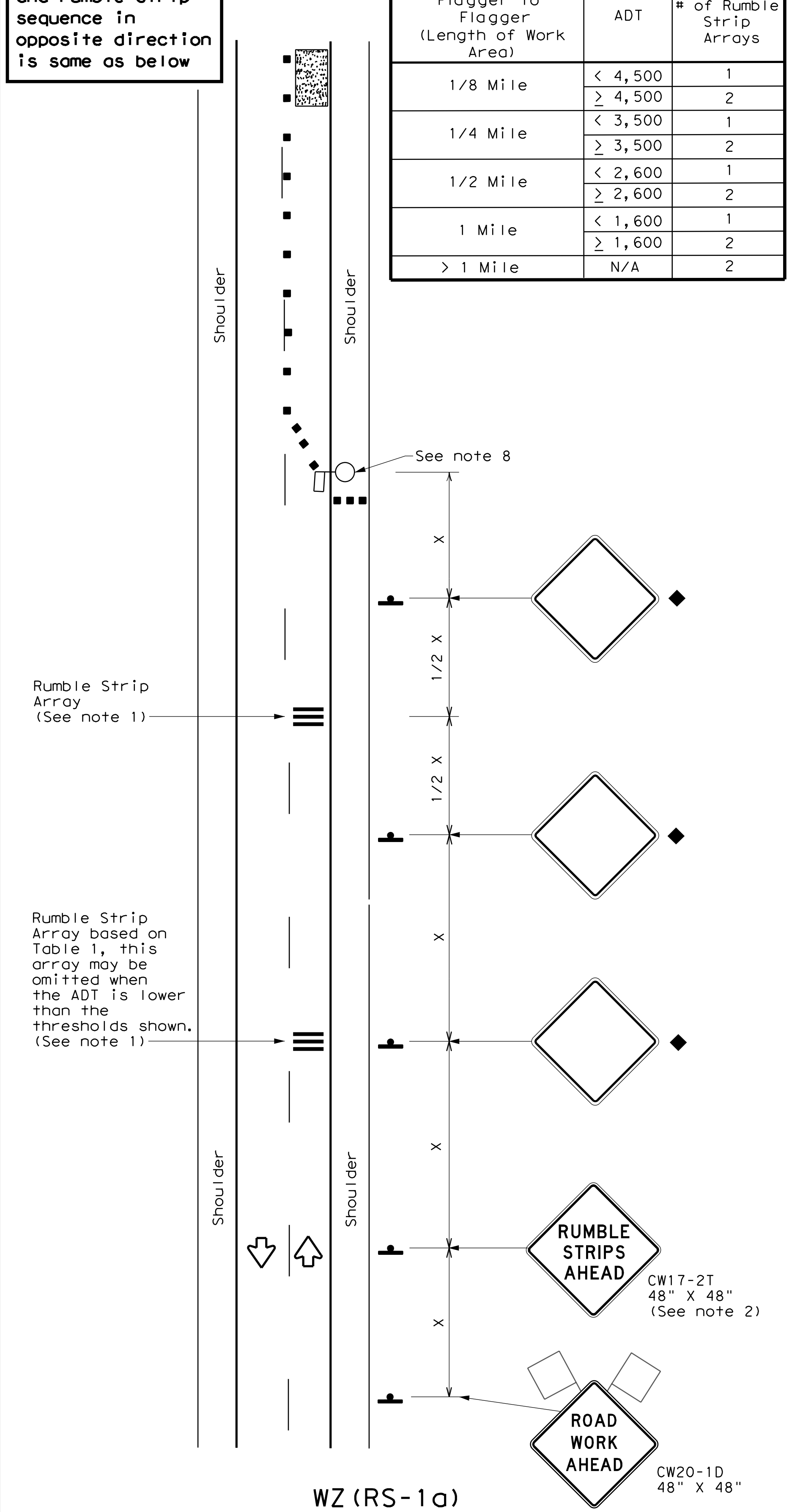
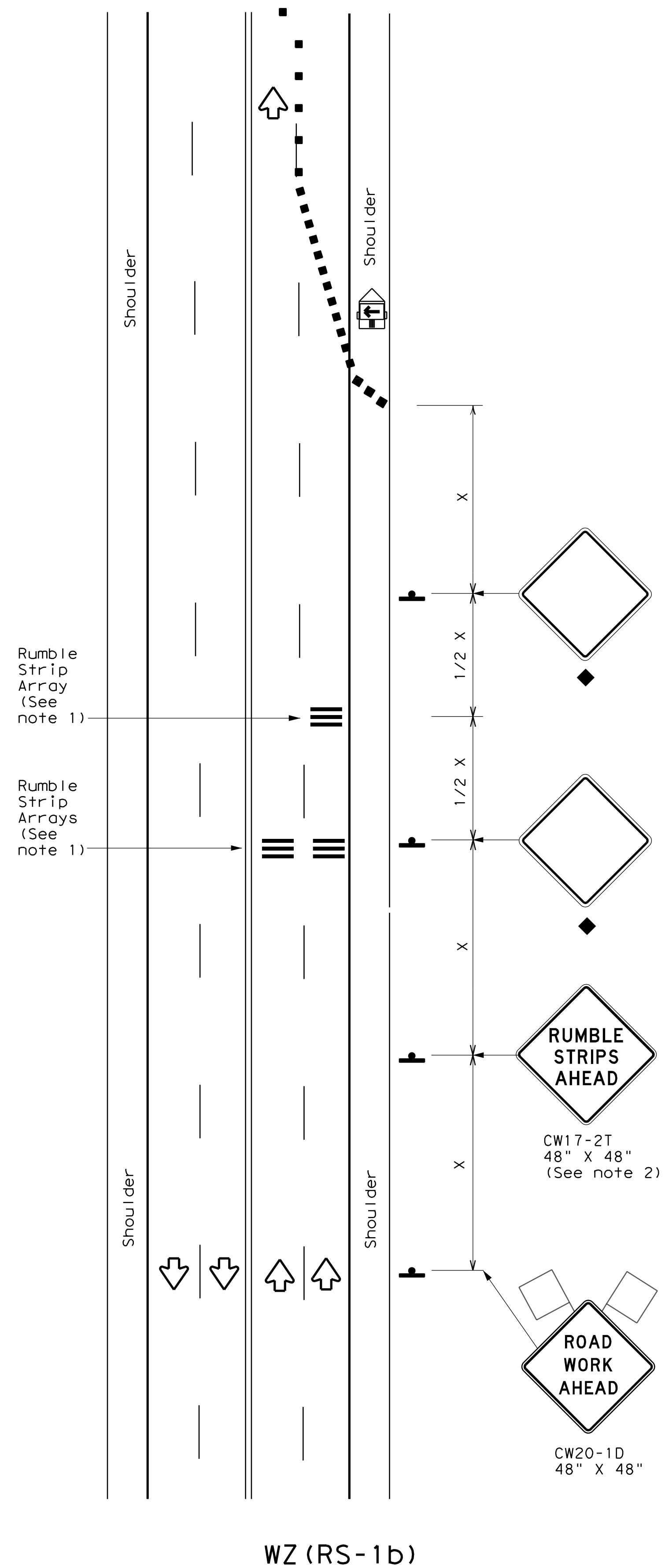
Warning sign and rumble strip sequence in opposite direction is same as below

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)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

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. Removal of the Temporary Rumble Strips should be accomplished before removing the advance 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 AFAD or a portable traffic signal.
9. Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment.

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

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

TABLE 2	
Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'

Texas Department of Transportation
Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2012	CONT 2270	SECT 01	JOB 023	HIGHWAY FM 3438
REVISIONS 2-14 4-16	DIST ABL		COUNTY TAYLOR	SHEET NO. 64

118

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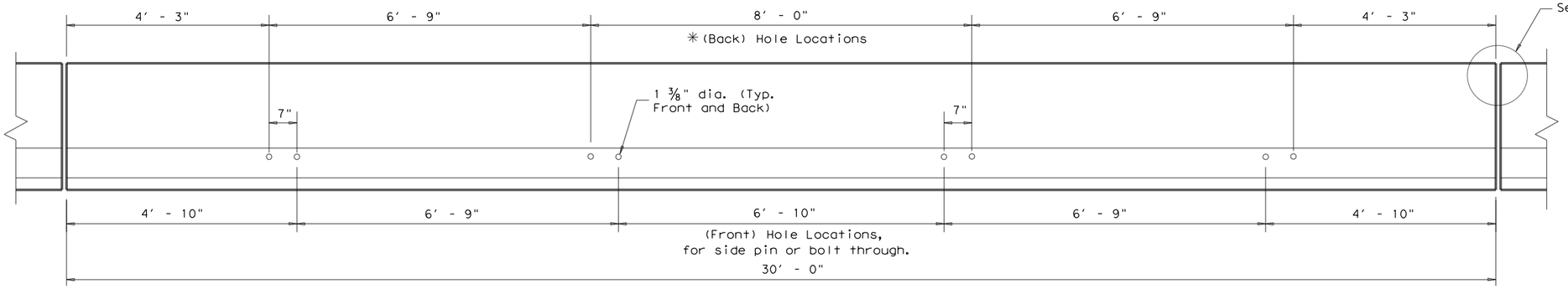
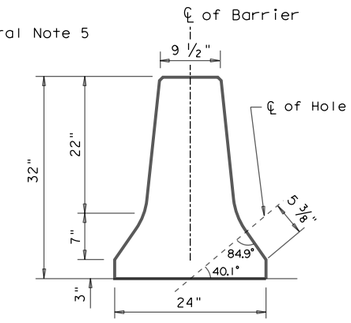
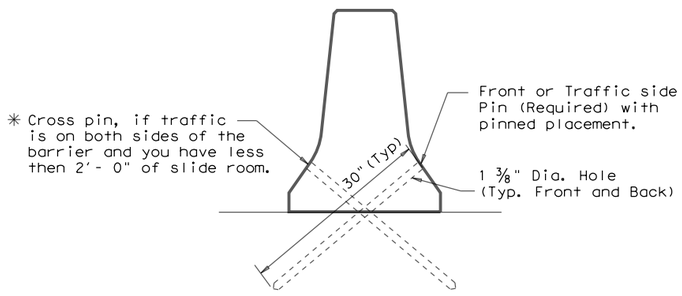


DETAIL 1

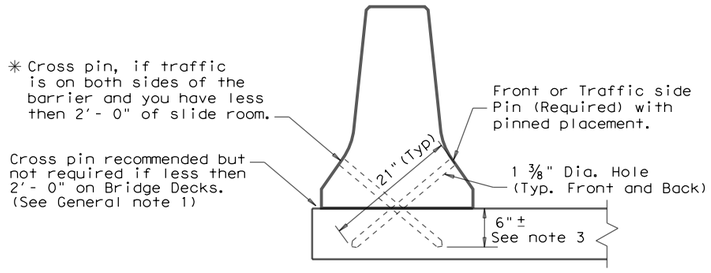


HOLE LOCATION DETAIL



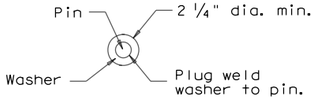
DETAIL 2

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

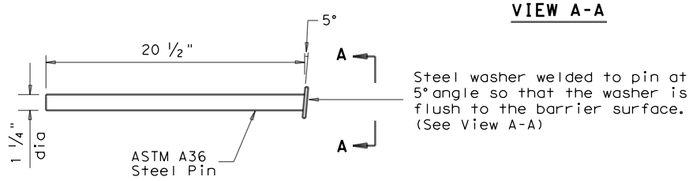


DETAIL 3

Bridge Deck or CRCP
(21" pin required)

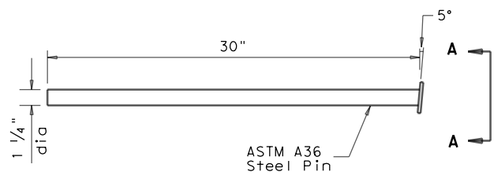


VIEW A-A



(21") PIN DETAIL

See Detail 3

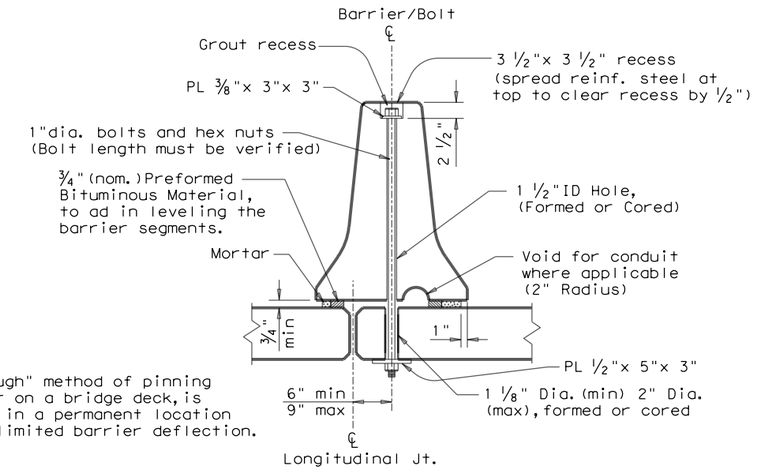


(30") PIN DETAIL

See Detail 2

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 CSB (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 ⅜" 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 CSB(1) standard sheets 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 ¼" 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. Provide galvanized bolts, nuts, and plate washers. All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
9. Weight of barrier is approx. 440 lbs per foot.

Texas Department of Transportation

Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER
(TYPE 1)
PINNED PLACEMENT

CSB(7)-10

FILE: csb710.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
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	ABL	TAYLOR		65

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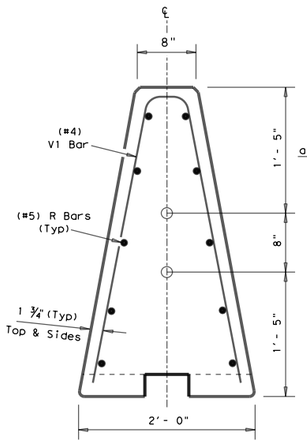
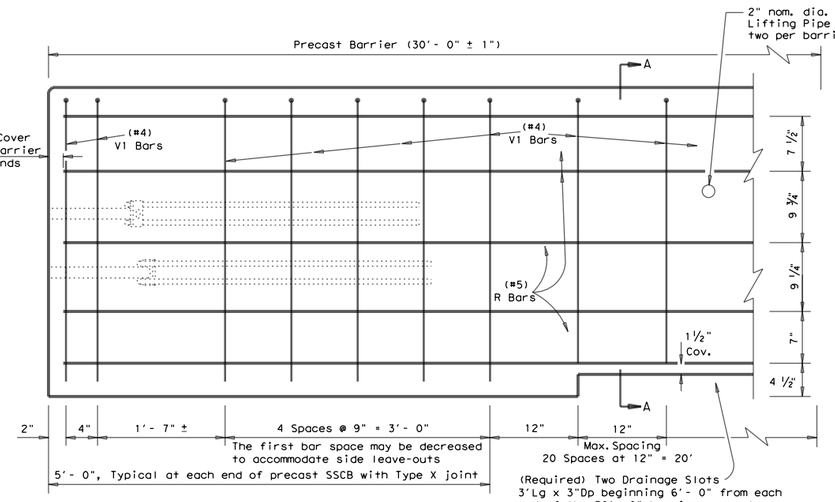


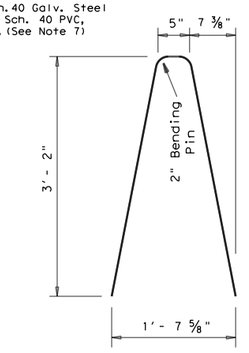
End View
Precast Barrier

Pipe locations for Joint
Type X connection



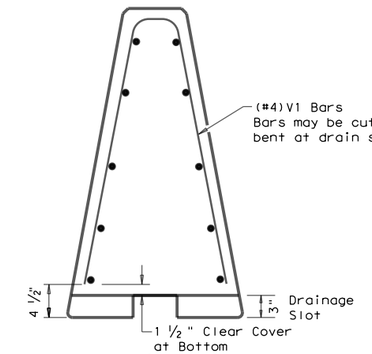
Reinforcement for Precast (SSCB)
Single Slope Concrete Barrier (Type 1)

Showing reinforcement for Joint Connection (Type X)



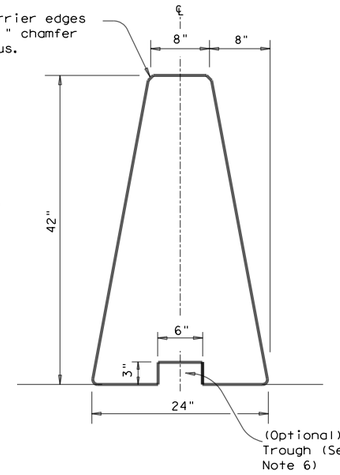
V1 Bar
#4 Rebar

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



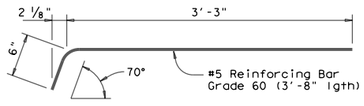
Section A-A
Steel Placement at
(Required) Drainage Slots

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



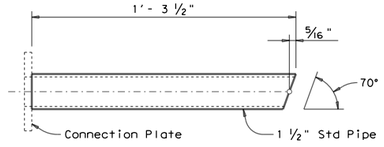
Single Slope Concrete Traffic Barrier

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



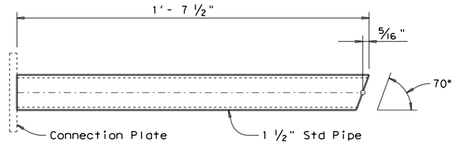
DEFORMED BAR ANCHOR DETAILS

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



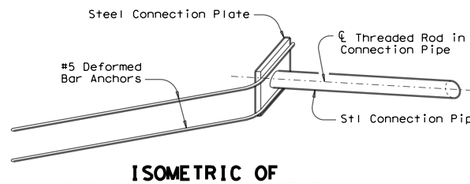
UPPER CONNECTION PIPE DETAILS

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



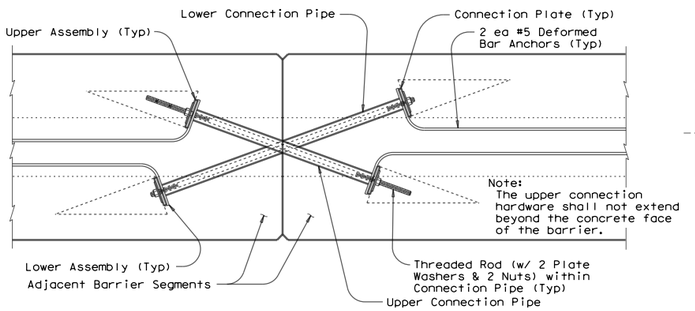
LOWER CONNECTION PIPE DETAILS

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



ISOMETRIC OF
TYPICAL WELDED ASSEMBLY

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



TYPE X JOINT INSTALLATION DETAIL

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

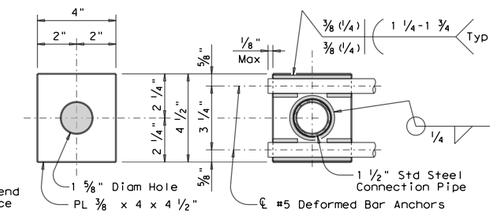
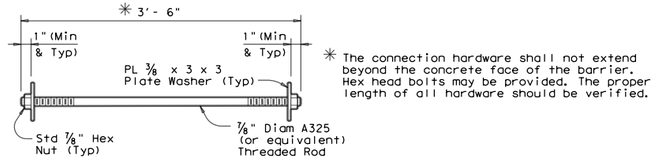


PLATE DIMENSIONS
WELDING DETAILS
CONNECTION PLATE DETAILS

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



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

CONNECTION BOLT OR
THREADED ROD DETAIL

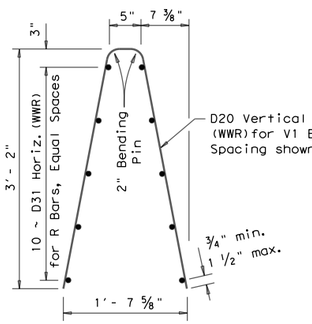
Two (2) Threaded Rods (Or Equivalent
Hex Hd. Bolts)
(w/ Two (2) PL ⅜ x 3 x 3
Plate Washers & Two (2) Std Hex Nuts)
required per Joint.

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

General Notes

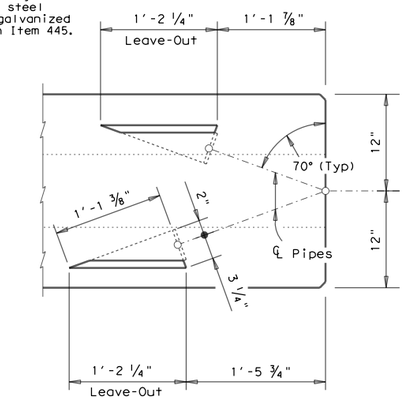
1. Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
4. All precast barrier edges shall have a ¾" chamfer or a tooled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

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



(WWR) General Notes

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



BARRIER PLAN AT JOINT

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)

SSCB(2)-10

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©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
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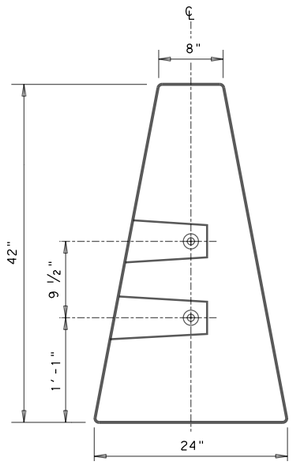
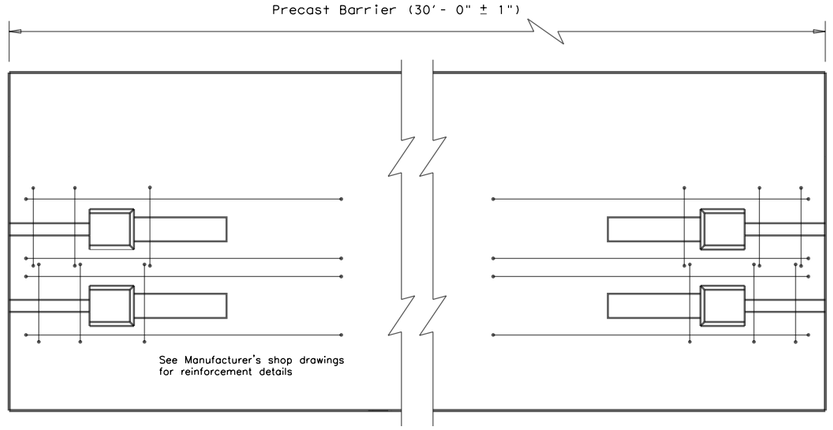
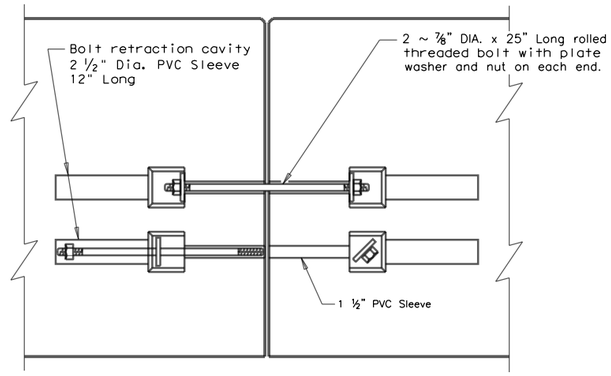


END VIEW
"QUICK-BOLT" POCKET LOCATIONS

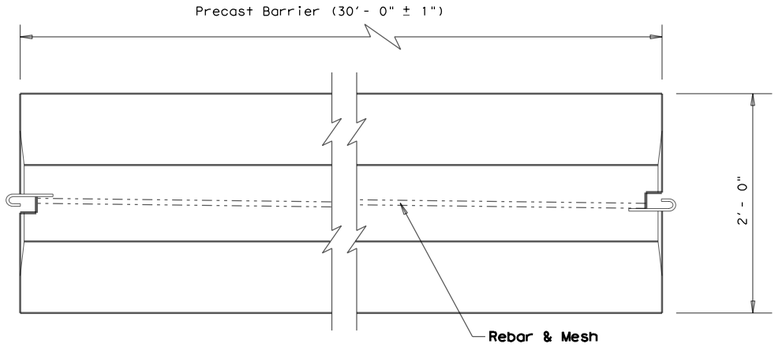


ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details

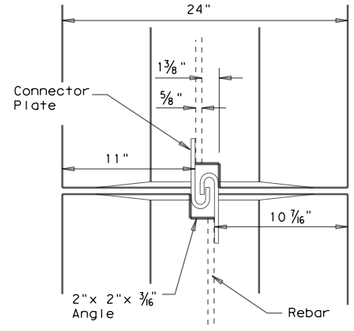


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

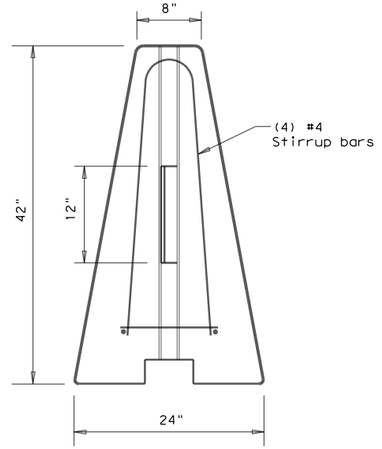
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



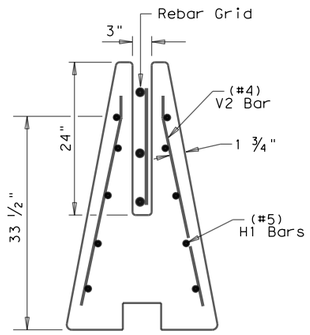
END VIEW

Proprietary Joint Connections (SSCB)

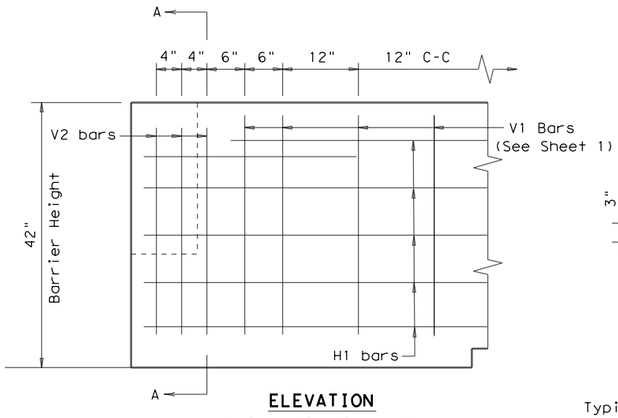
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

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

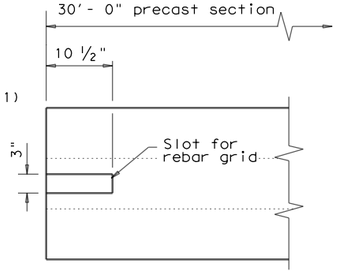
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



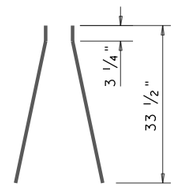
SECTION A-A
Showing (Type R) Rebar Grid



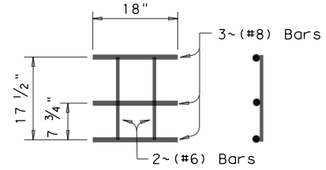
ELEVATION
V1 Bars (See Sheet 1)



TOP VIEW
JOINT CONNECTION
Typical at both ends of barrier segment



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



WELDED REBAR GRID

Joint Connection (Type R)

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)

SSCB(2)-10

FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		67

DATE: 5/26/2021 10:23:06 AM
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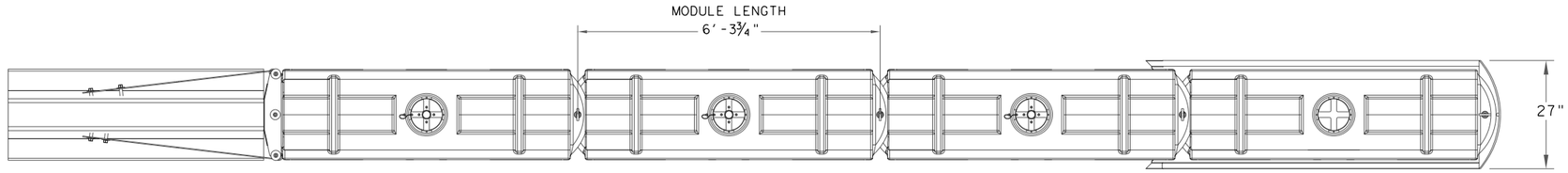
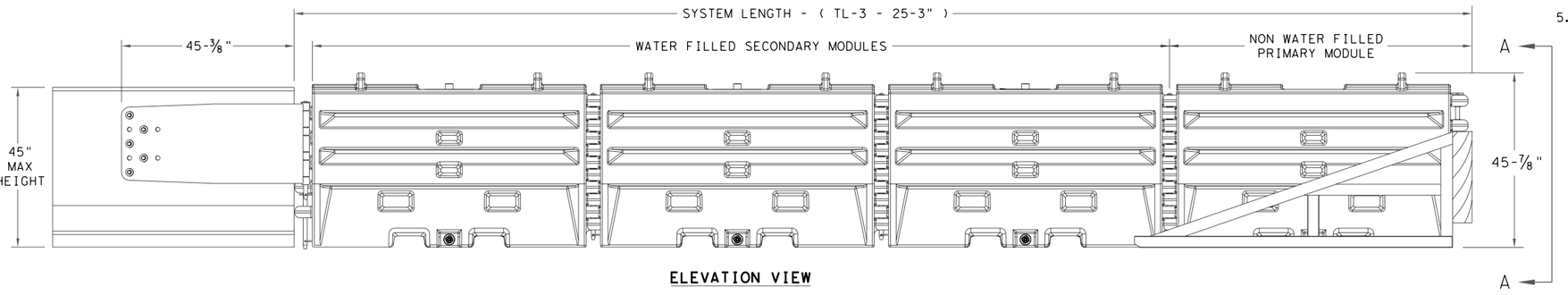


PLAN VIEW

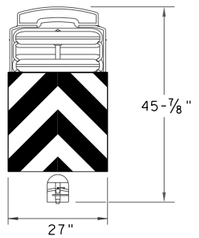


ELEVATION VIEW

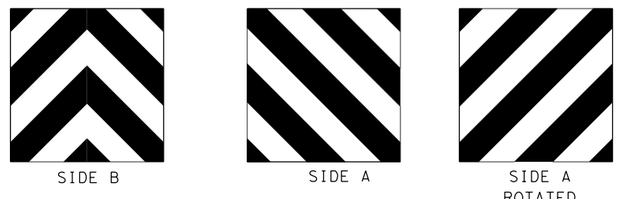
GENERAL NOTES

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

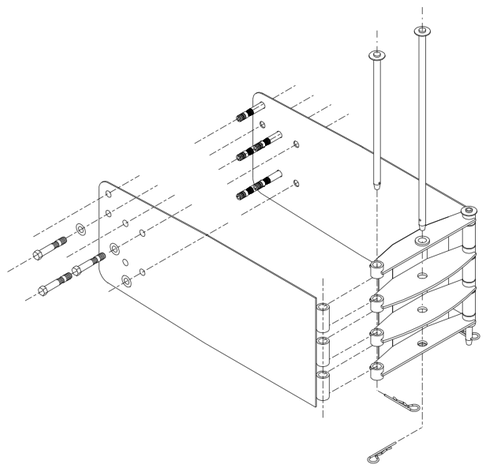


NOSE SHEETING PANEL DELINEATION

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	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		68

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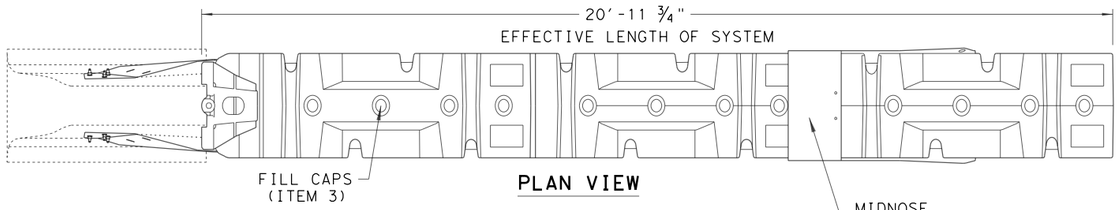
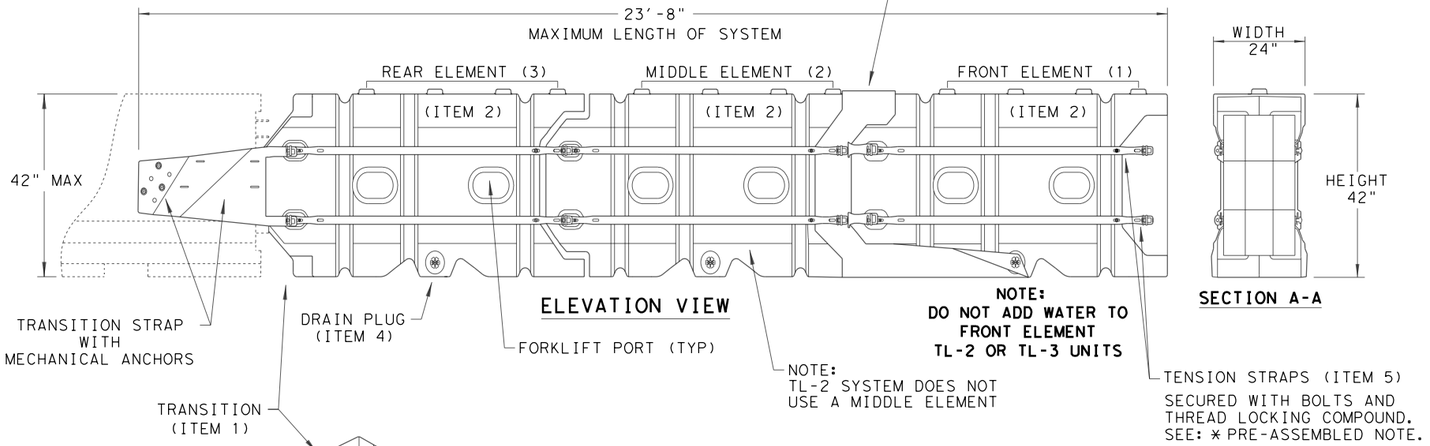
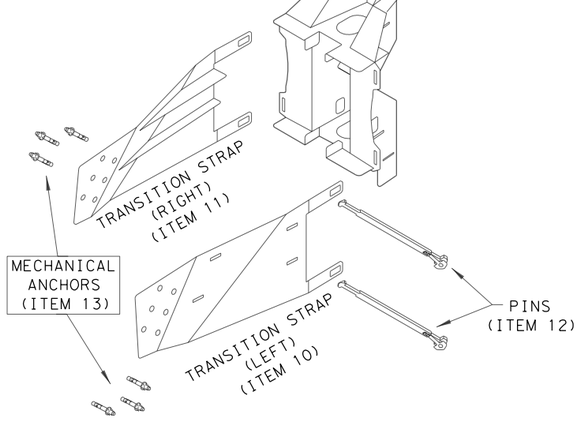
SYSTEM SHOWN - ABSORB-M TL-3







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

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

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

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

GENERAL NOTES

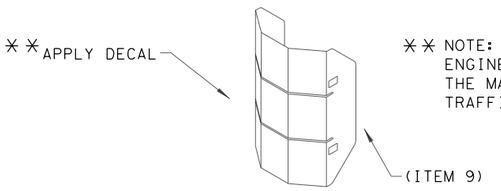
1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. THE ABSORB-M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

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

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE

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



NOSE PLATE

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

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

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

SACRIFICIAL

Texas Department of Transportation — Design Division Standard

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

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		69

Chain FM3438 NEW contains:
FM01 CUR FM3438 NEW-1 CUR FM3438 NEW-2 CUR FM3438 NEW-3 CUR FM3438 NEW-4 FM02 - CUR FM3438 NEW-5 CUR FM3438 NEW-6 CUR FM3438 NEW-7 CUR FM3438 NEW-8 CUR FM3438 - NEW-9 CUR FM3438 NEW-10 FM03 FM04 FM05 FM06 FM07

Beginning chain FM3438 NEW description

Point FM01 X 1,566,182.5230 Y 6,857,797.5724 Sta 100+00.00

Course from FM01 to PC FM3438 NEW-1 S 22° 16′ 49.01" E Dist 677.5320

Curve Data

Curve FM3438 NEW-1

P.I.	Station	113+85.97	X	1,566,707.9979	Y	6,856,515.0752
	Delta =	68° 19′ 13.33" (RT)				
	Degree =	5° 29′ 17.17"				
	Tangent =	708.4416				
	Length =	1,244.8817				
	Radius =	1,044.0000				
	External =	217.6757				
	Long Chord =	1,172.4297				
	Mid. Ord. =	180.1203				
P.C.	Station	106+77.53	X	1,566,439.4009	Y	6,857,170.6247
P.T.	Station	119+22.41	X	1,566,198.0434	Y	6,856,023.3069
C.C.			X	1,565,473.3457	Y	6,856,774.8049
	Back =	S 22° 16′ 49.01" E				
	Ahead =	S 46° 02′ 24.32" W				
	Chord Bear =	S 11° 52′ 47.65" W				

Course from PT FM3438 NEW-1 to PC FM3438 NEW-2 S 46° 02′ 24.32" W Dist 1,286.5621

Curve Data

Curve FM3438 NEW-2

P.I.	Station	136+54.53	X	1,564,951.2185	Y	6,854,820.9469
	Delta =	45° 59′ 13.41" (LT)				
	Degree =	5° 27′ 24.27"				
	Tangent =	445.5586				
	Length =	842.7569				
	Radius =	1,050.0000				
	External =	90.6237				
	Long Chord =	820.3171				
	Mid. Ord. =	83.4236				
P.C.	Station	132+08.98	X	1,565,271.9430	Y	6,855,130.2336
P.T.	Station	140+51.73	X	1,564,950.8061	Y	6,854,375.3884
C.C.			X	1,566,000.8056	Y	6,854,374.4166
	Back =	S 46° 02′ 24.32" W				
	Ahead =	S 0° 03′ 10.91" W				
	Chord Bear =	S 23° 02′ 47.61" W				

Course from PT FM3438 NEW-2 to PC FM3438 NEW-3 S 0° 03′ 10.91" W Dist 589.3792

Curve Data

Curve FM3438 NEW-3

P.I.	Station	149+85.01	X	1,564,949.9423	Y	6,853,442.1090
	Delta =	14° 12′ 36.66" (LT)				
	Degree =	2° 04′ 36.07"				
	Tangent =	343.9006				
	Length =	684.2720				
	Radius =	2,759.0000				
	External =	21.3505				
	Long Chord =	682.5196				
	Mid. Ord. =	21.1865				
P.C.	Station	146+41.11	X	1,564,950.2606	Y	6,853,786.0095
P.T.	Station	153+25.38	X	1,565,034.0543	Y	6,853,108.6531
C.C.			X	1,567,709.2594	Y	6,853,783.4559
	Back =	S 0° 03′ 10.91" W				
	Ahead =	S 14° 09′ 25.76" E				
	Chord Bear =	S 7° 03′ 07.43" E				

Course from PT FM3438 NEW-3 to PC FM3438 NEW-4 S 14° 09′ 25.76" E Dist 287.5876

Curve Data

Curve FM3438 NEW-4

P.I.	Station	161+22.54	X	1,565,229.0252	Y	6,852,335.7057
	Delta =	19° 39′ 10.48" (RT)				
	Degree =	1° 56′ 51.04"				
	Tangent =	509.5707				
	Length =	1,009.1295				
	Radius =	2,942.0000				
	External =	43.8041				
	Long Chord =	1,004.1898				
	Mid. Ord. =	43.1615				
P.C.	Station	156+12.97	X	1,565,104.3932	Y	6,852,829.8000
P.T.	Station	166+22.10	X	1,565,180.2226	Y	6,851,828.4774
C.C.			X	1,562,251.7461	Y	6,852,110.2386
	Back =	S 14° 09′ 25.76" E				
	Ahead =	S 5° 29′ 44.72" W				
	Chord Bear =	S 4° 19′ 50.52" E				

Course from PT FM3438_NEW-4 to FM02 S 5° 29′ 44.72" W Dist 983.0583

Point FM02 X 1,565,086.0731 Y 6,850,849.9379 Sta 176+05.16

Course from FM02 to PC FM3438_NEW-5 S 5° 29′ 26.99" W Dist 58.7011

Curve Data

Curve FM3438_NEW-5

P.I.	Station	177+93.98	X	1,565,067.0592	Y	6,850,662.0776
	Delta =	4° 58′ 20.46" (RT)				
	Degree =	1° 54′ 42.75"				
	Tangent =	130.1202				
	Length =	260.0770				
	Radius =	2,996.8359				
	External =	2.8235				
	Long Chord =	259.9954				
	Mid. Ord. =	2.8209				
P.C.	Station	176+63.86	X	1,565,080.4562	Y	6,850,791.5062
P.T.	Station	179+23.94	X	1,565,042.4944	Y	6,850,534.2972
C.C.			X	1,562,099.5468	Y	6,851,100.0574
	Back =	S 5° 54′ 34.51" W				
	Ahead =	S 10° 52′ 54.97" W				
	Chord Bear =	S 8° 23′ 44.74" W				

Curve Data

Curve FM3438_NEW-6

P.I.	Station	181+84.33	X	1,564,985.4222	Y	6,850,280.2347
	Delta =	14° 10′ 26.08" (LT)				
	Degree =	2° 44′ 08.14"				
	Tangent =	260.3939				
	Length =	518.1291				
	Radius =	2,094.4544				
	External =	16.1247				
	Long Chord =	516.8089				
	Mid. Ord. =	16.0015				
P.C.	Station	179+23.94	X	1,565,042.4944	Y	6,850,534.2972
P.T.	Station	184+42.07	X	1,564,992.2987	Y	6,850,019.9317
C.C.			X	1,567,086.0227	Y	6,850,075.2424
	Back =	S 12° 39′ 38.37" W				
	Ahead =	S 1° 30′ 47.71" E				
	Chord Bear =	S 5° 34′ 25.33" W				

Curve Data

Curve FM3438_NEW-7

P.I.	Station	184+68.05	X	1,564,992.9850	Y	6,849,993.9527
	Delta =	2° 58′ 38.45" (RT)				
	Degree =	5° 43′ 46.48"				
	Tangent =	25.9881				
	Length =	51.9645				
	Radius =	1,000.0000				
	External =	0.3376				
	Long Chord =	51.9587				
	Mid. Ord. =	0.3375				
P.C.	Station	184+42.07	X	1,564,992.2987	Y	6,850,019.9317
P.T.	Station	184+94.03	X	1,564,992.3210	Y	6,849,967.9730
C.C.			X	1,563,992.6475	Y	6,849,993.5235
	Back =	S 1° 30′ 47.71" E				
	Ahead =	S 1° 27′ 50.74" W				
	Chord Bear =	S 0° 01′ 28.49" E				

Course from PT FM3438_NEW-7 to PC FM3438_NEW-8 S 1° 27′ 50.74" W Dist 4,770.1555

Curve Data

Curve FM3438_NEW-8

P.I.	Station	233+68.08	X	1,564,867.7867	Y	6,845,095.5164
	Delta =	5° 56′ 50.09" (LT)				
	Degree =	2° 51′ 53.24"				
	Tangent =	103.8923				
	Length =	207.5981				
	Radius =	2,000.0000				
	External =	2.6966				
	Long Chord =	207.5049				
	Mid. Ord. =	2.6930				
P.C.	Station	232+64.19	X	1,564,870.4412	Y	6,845,199.3749
P.T.	Station	234+71.78	X	1,564,875.9076	Y	6,844,991.9420
C.C.			X	1,566,869.7883	Y	6,845,148.2739
	Back =	S 1° 27′ 50.74" W				
	Ahead =	S 4° 28′ 59.35" E				
	Chord Bear =	S 1° 30′ 34.31" E				

Course from PT FM3438_NEW-8 to PC FM3438_NEW-9 S 4° 28′ 59.35" E Dist 1,223.0638

Curve Data

Curve FM3438_NEW-9

P.I.	Station	251+11.06	X	1,565,004.0428	Y	6,843,357.6861
	Delta =	6° 01′ 29.19" (RT)				
	Degree =	0° 43′ 27.98"				
	Tangent =	416.2077				
	Length =	831.6483				
	Radius =	7,909.0000				
	External =	10.9438				
	Long Chord =	831.2653				
	Mid. Ord. =	10.9287				
P.C.	Station	246+94.85	X	1,564,971.5095	Y	6,843,772.6203
P.T.	Station	255+26.50	X	1,564,992.8455	Y	6,842,941.6290
C.C.			X	1,557,086.7082	Y	6,843,154.4058
	Back =	S 4° 28′ 59.35" E				
	Ahead =	S 1° 32′ 29.84" W				
	Chord Bear =	S 1° 28′ 14.76" E				

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

IDCUS
PLANNERS + ENGINEERS + MANAGERS
IDCUS, Inc.
8632 Fredericksburg Rd., Suite 200
San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

Texas Department of Transportation

FM 3438

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 2

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	70

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Course from PT FM3438_NEW-9 to PC FM3438_NEW-10 S 1° 32′ 29.84" W Dist 7,144.9307

Curve Data

Curve FM3438_NEW-10

P.I.	Station	332+75.45	X	1,564,784.3745	Y	6,835,195.4794
	Delta	=	44° 52′ 05.45" (LT)			
	Degree	=	3° 54′ 58.76"			
	Tangent	=	604.0237			
	Length	=	1,145.6716			
	Radius	=	1,463.0000			
	External	=	119.7867			
	Long Chord	=	1,116.6213			
	Mid. Ord.	=	110.7211			
P.C.	Station	326+71.43	X	1,564,800.6246	Y	6,835,799.2844
P.T.	Station	338+17.10	X	1,565,198.8287	Y	6,834,756.0795
C.C.			X	1,566,263.0950	Y	6,835,759.9252
	Back	= S	1° 32′ 29.84" W			
	Ahead	= S	43° 19′ 35.62" E			
	Chord Bear	= S	20° 53′ 32.89" E			

Course from PT FM3438_NEW-10 to FM03 S 43° 19′ 35.62" E Dist 2,525.1898

Point FM03 X 1,566,931.5020 Y 6,832,919.1181 Sta 363+42.29

Course from FM03 to FM04 S 43° 51′ 22.41" E Dist 111.5251

Point FM04 X 1,567,008.7723 Y 6,832,838.6995 Sta 364+53.81

Course from FM04 to FM05 S 45° 55′ 08.38" E Dist 114.4208

Point FM05 X 1,567,090.9673 Y 6,832,759.0998 Sta 365+68.23

Course from FM05 to FM06 S 48° 02′ 07.85" E Dist 194.3944

Point FM06 X 1,567,235.5111 Y 6,832,629.1141 Sta 367+62.63

Course from FM06 to FM07 S 48° 40′ 56.13" E Dist 2,237.3700

Point FM07 X 1,568,915.9096 Y 6,831,151.9257 Sta 390+00.00

==========

Ending chain FM3438_NEW description

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

5/26/2021

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San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

Texas Department of Transportation

FM 3438

HORIZONTAL ALIGNMENT DATA

SHEET 2 OF 2

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	71

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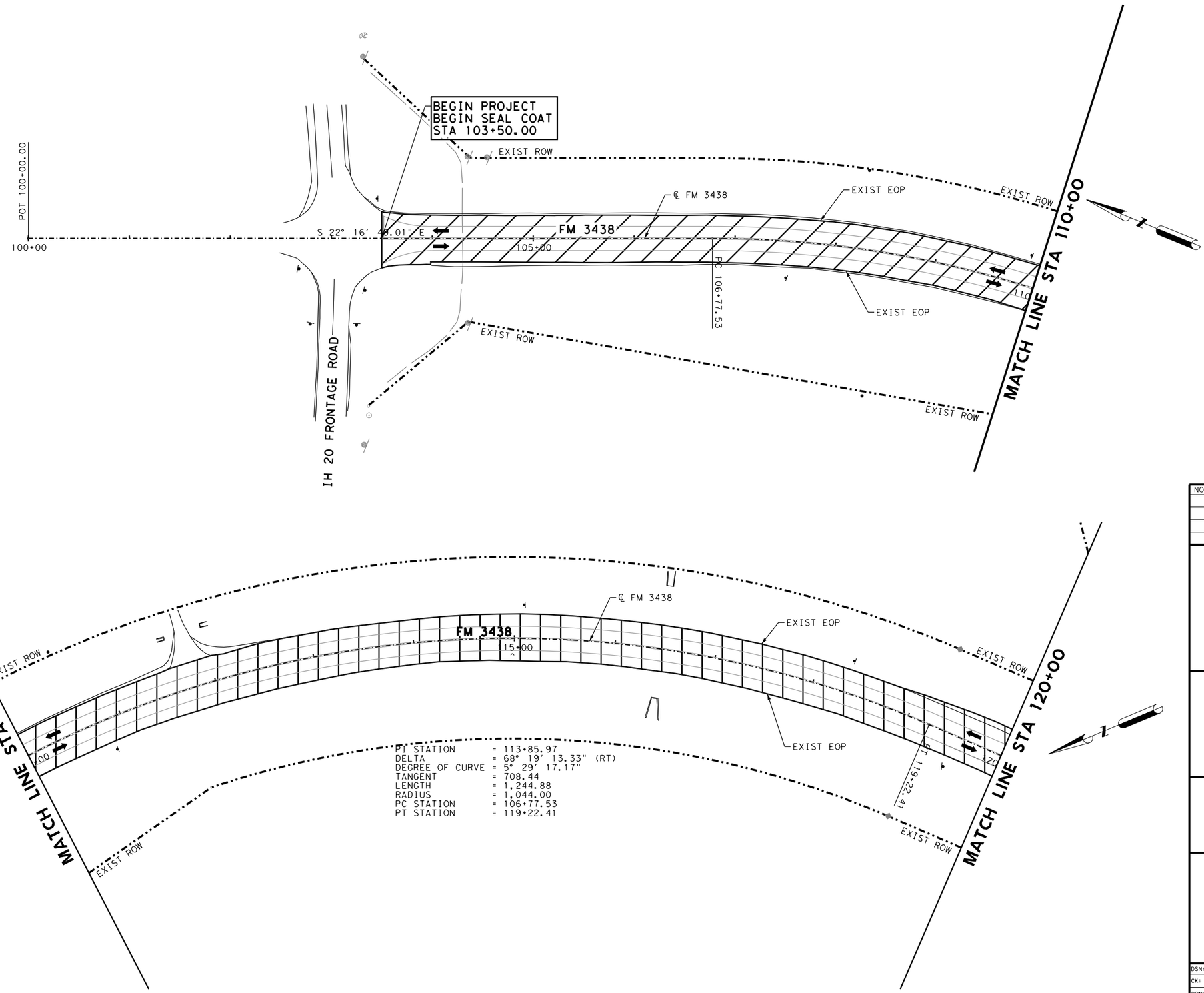

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

1. SEE "PAVEMENT TRANSITION DETAILS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.

0′ 50′ 100′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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5/26/2021

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FM 3438

PLAN VIEW LAYOUT

BEGIN PROJECT TO STA 120+00

SHEET 1 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	72

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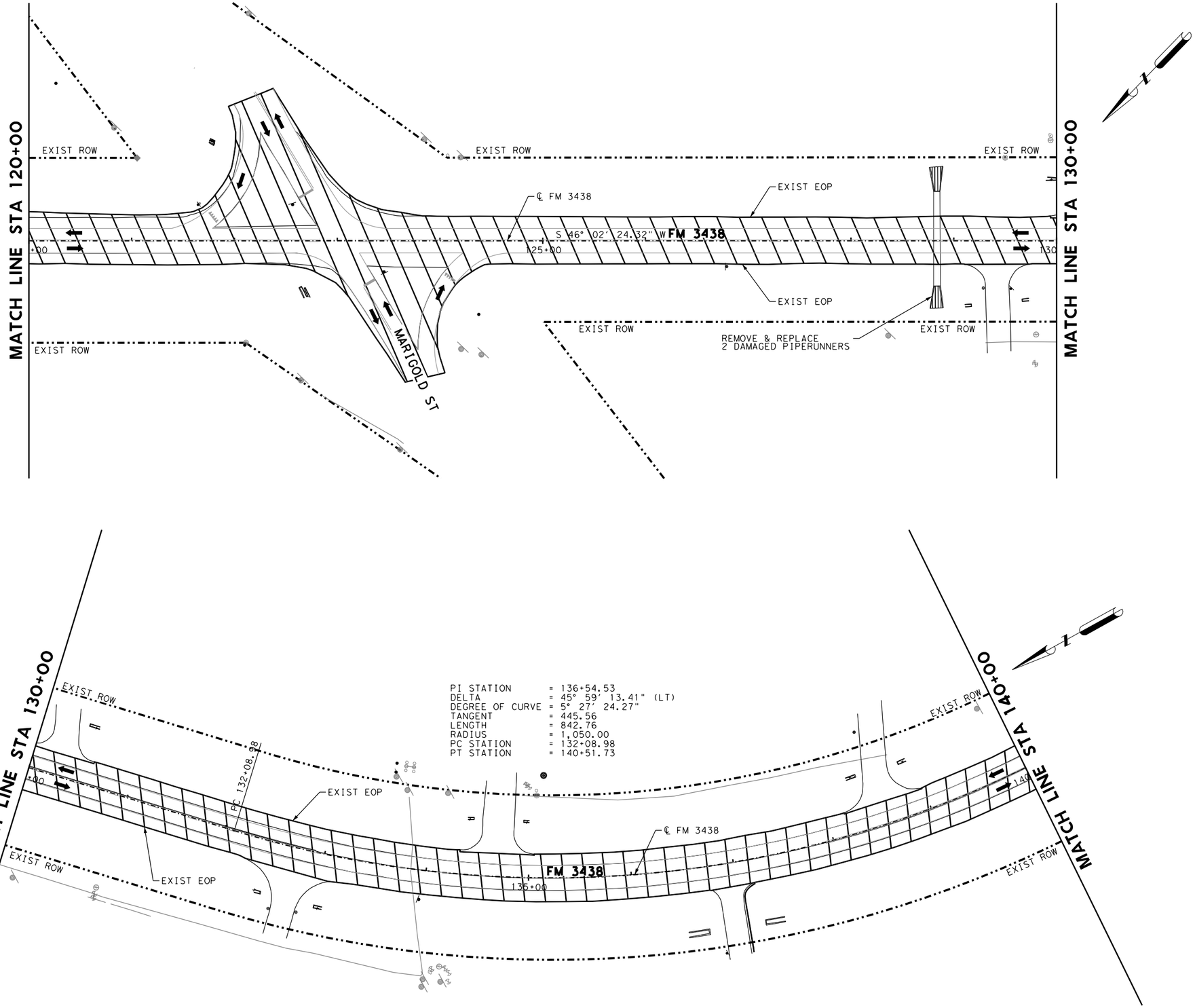

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

1. SEE "PAVEMENT TRANSITION DETAILS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.

0′ 50′ 100′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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5/26/2021

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FM 3438

PLAN VIEW LAYOUT

STA 120+00 TO STA 140+00

SHEET 2 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	73

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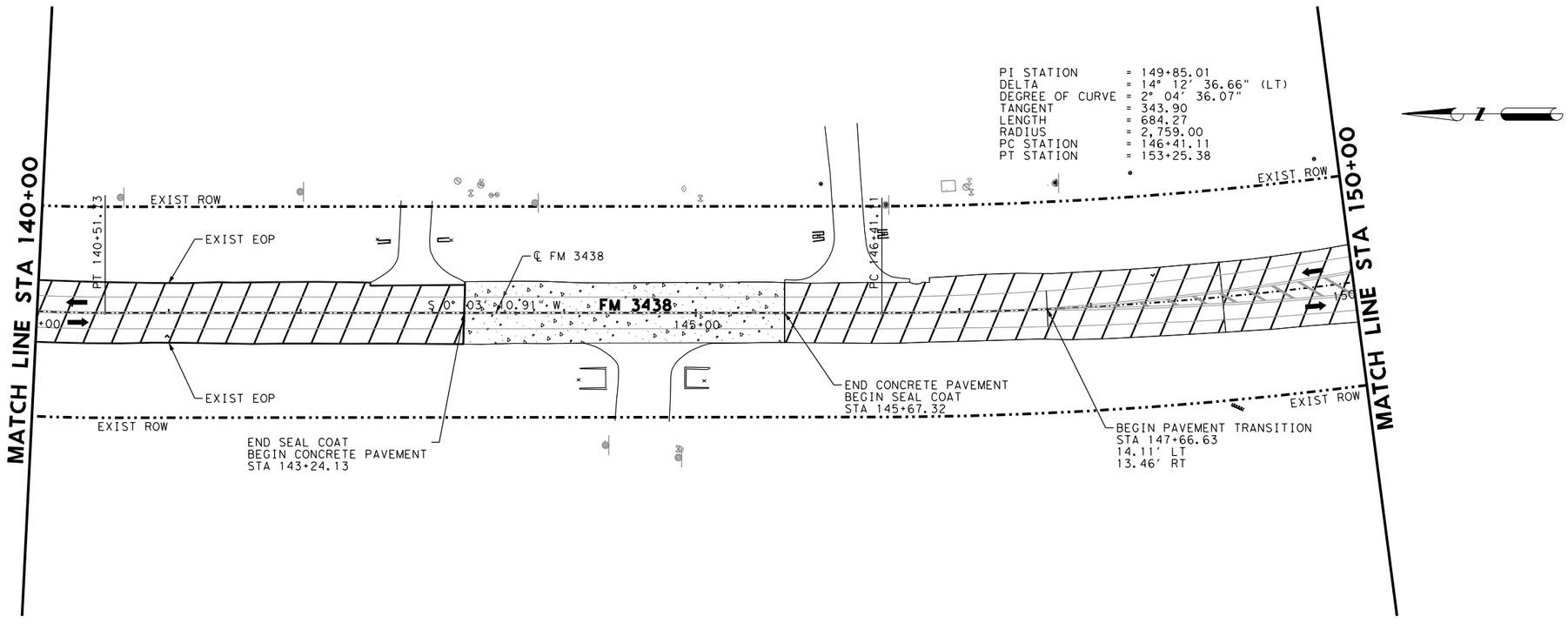

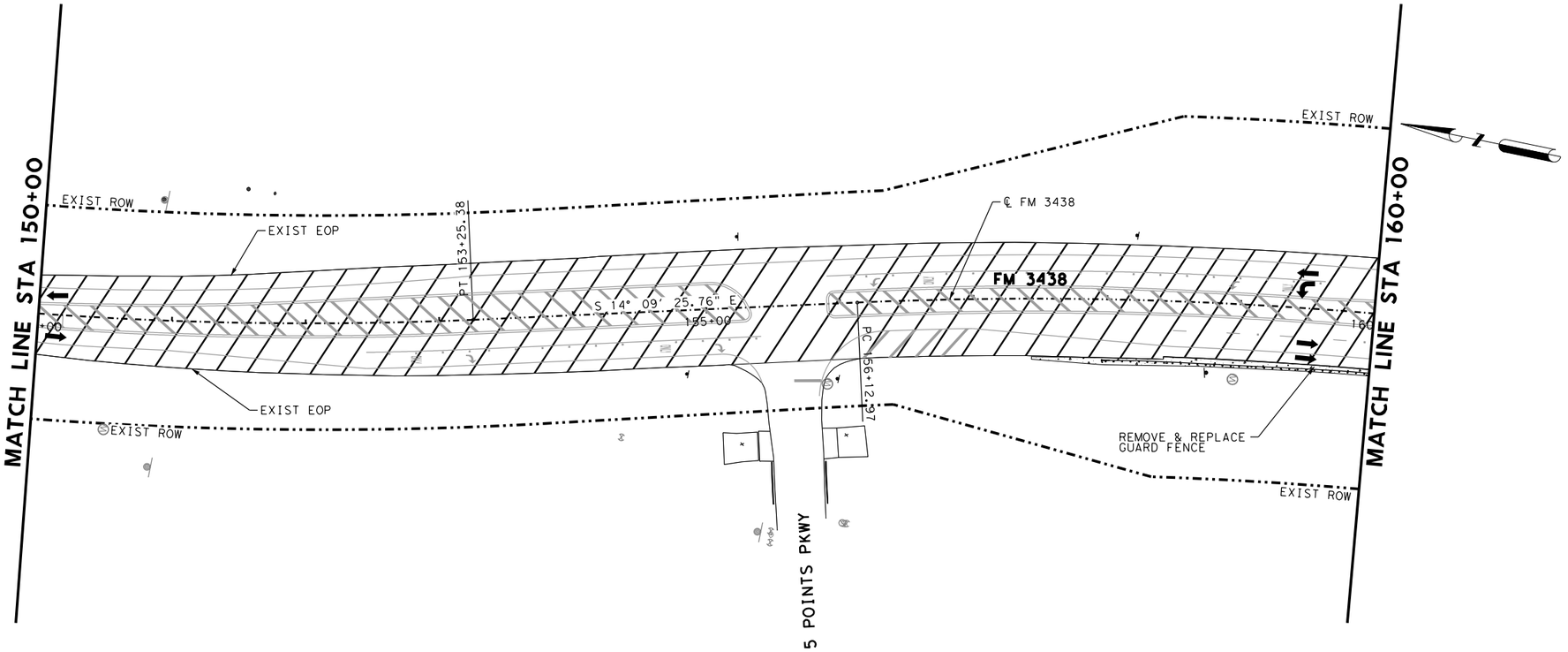

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

1. SEE "PAVEMENT TRANSITION DETAILS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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FM 3438

PLAN VIEW LAYOUT

STA 140+00 TO STA 160+00

SHEET 3 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	74

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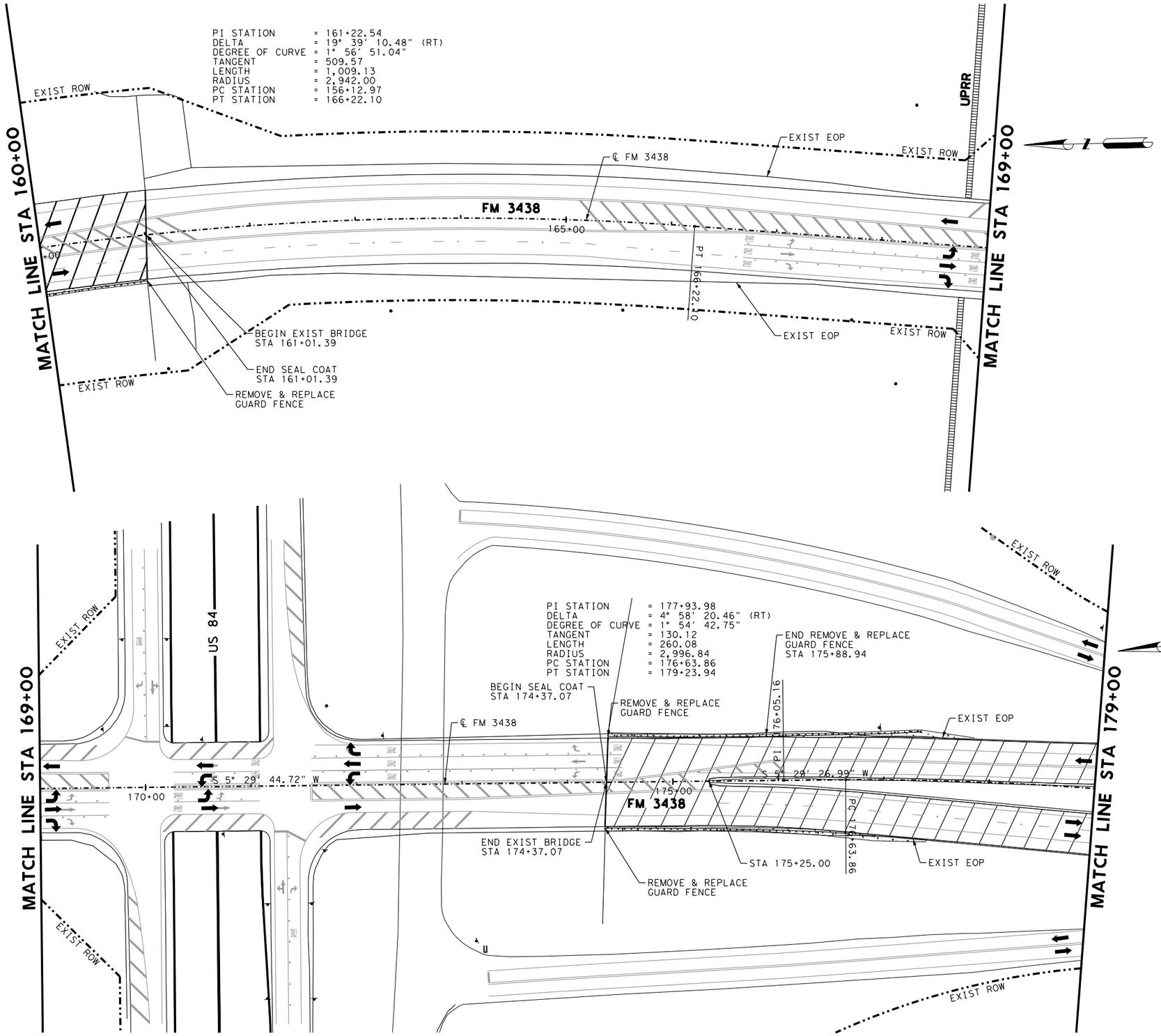

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

1. SEE "PAVEMENT TRANSITION DETAILS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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5/26/2021

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FM 3438

PLAN VIEW LAYOUT

STA 160+00 TO STA 179+00

SHEET 4 OF 14

DSN: JA	FED. RD. DIV. NO:	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	75

5/26/2021 10:24:10 AM

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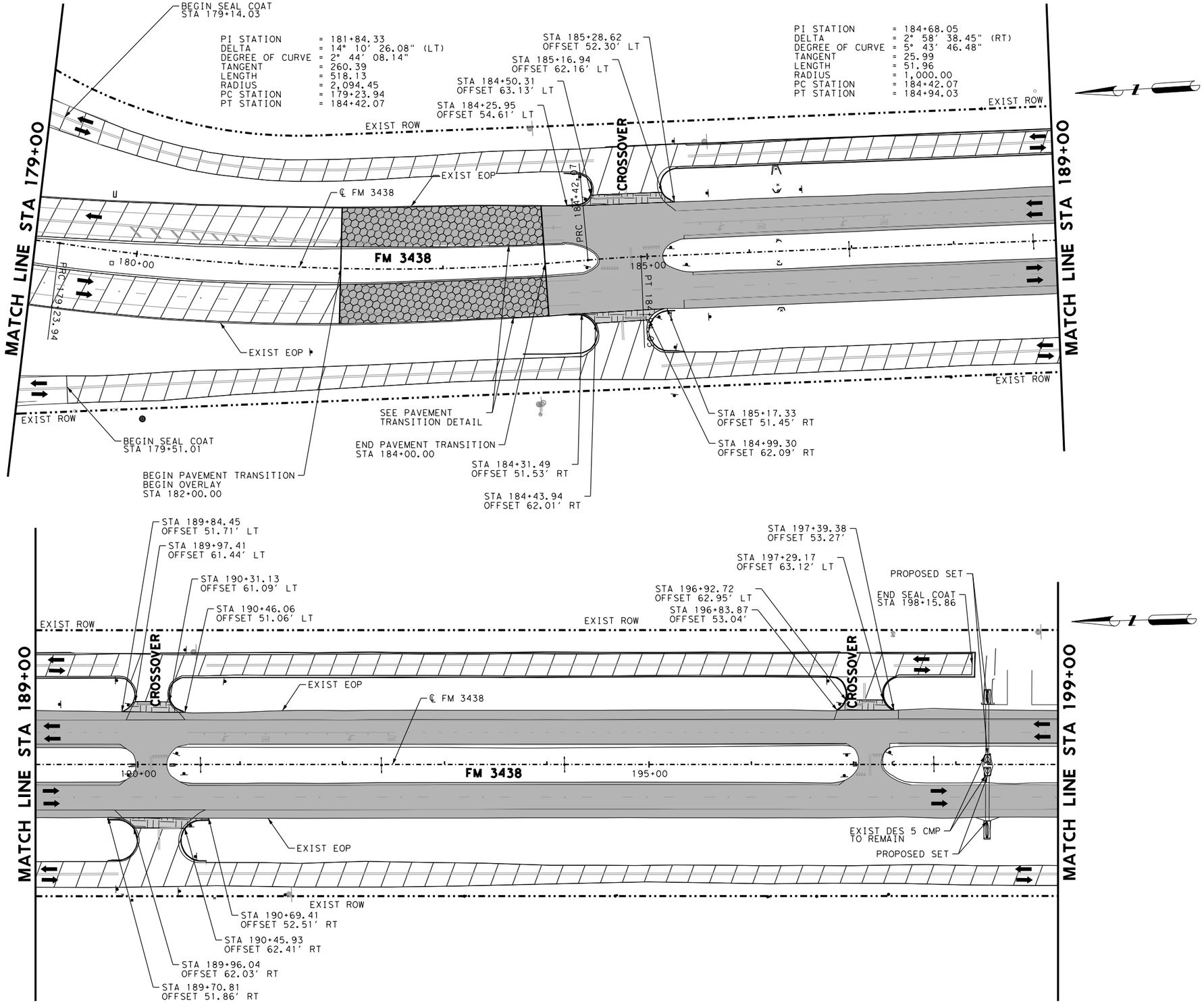

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

1. SEE "PAVEMENT TRANSITION DETAILS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
4. BACKFILL PAVEMENT EDGES.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

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5/26/2021

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Texas Department of Transportation

FM 3438

PLAN VIEW LAYOUT

STA 179+00 TO STA 199+00

SHEET 5 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	76

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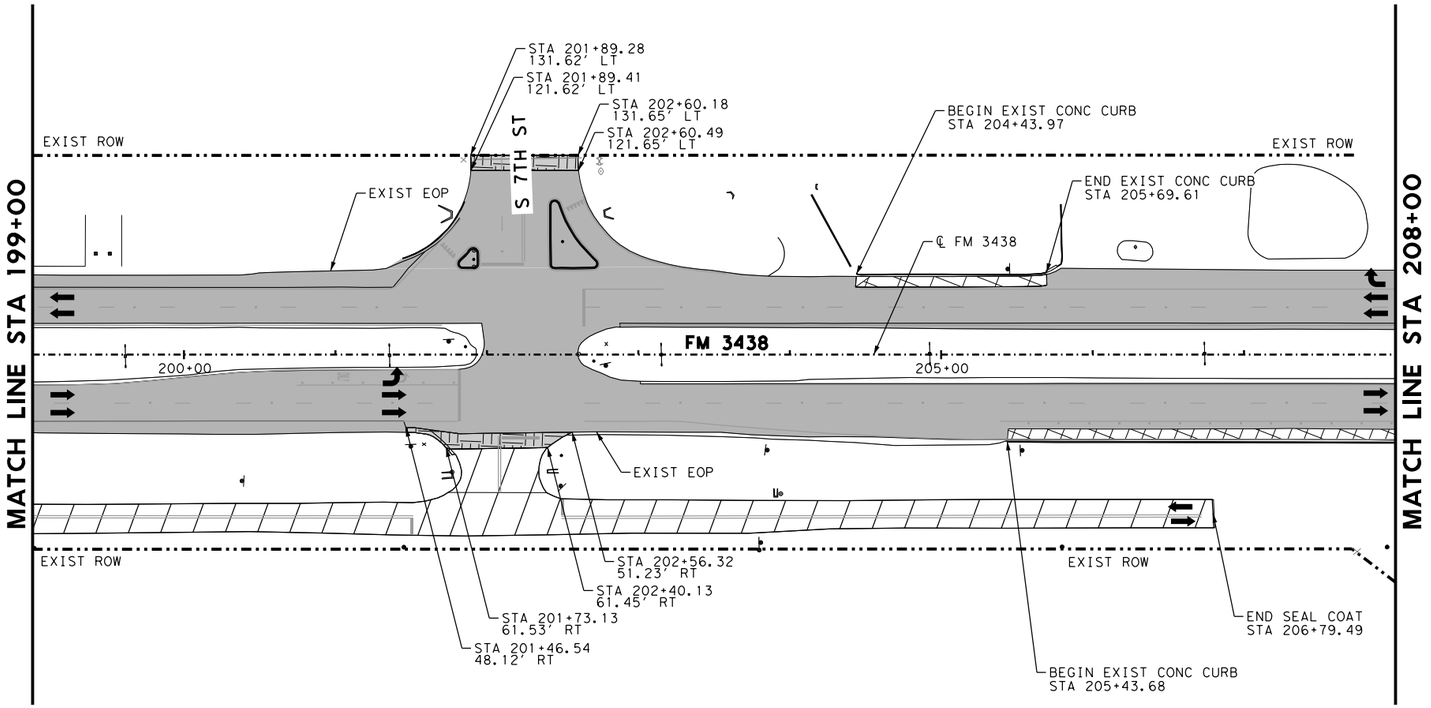

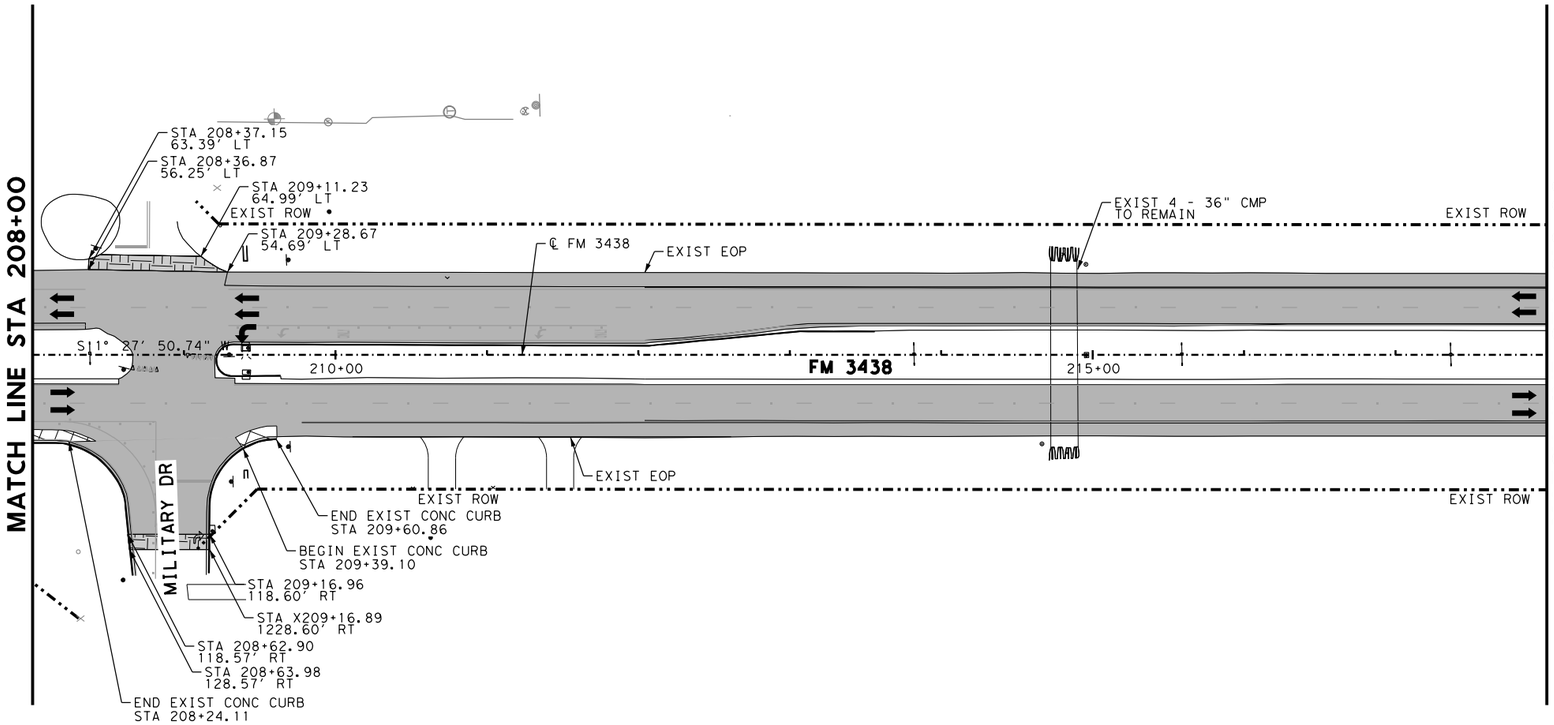

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

1. SEE "PAVEMENT TRANSITION DETAILS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
4. BACKFILL PAVEMENT EDGES.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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Texas Department of Transportation

FM 3438

PLAN VIEW LAYOUT

STA 199+00 TO STA 218+00

SHEET 6 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	77

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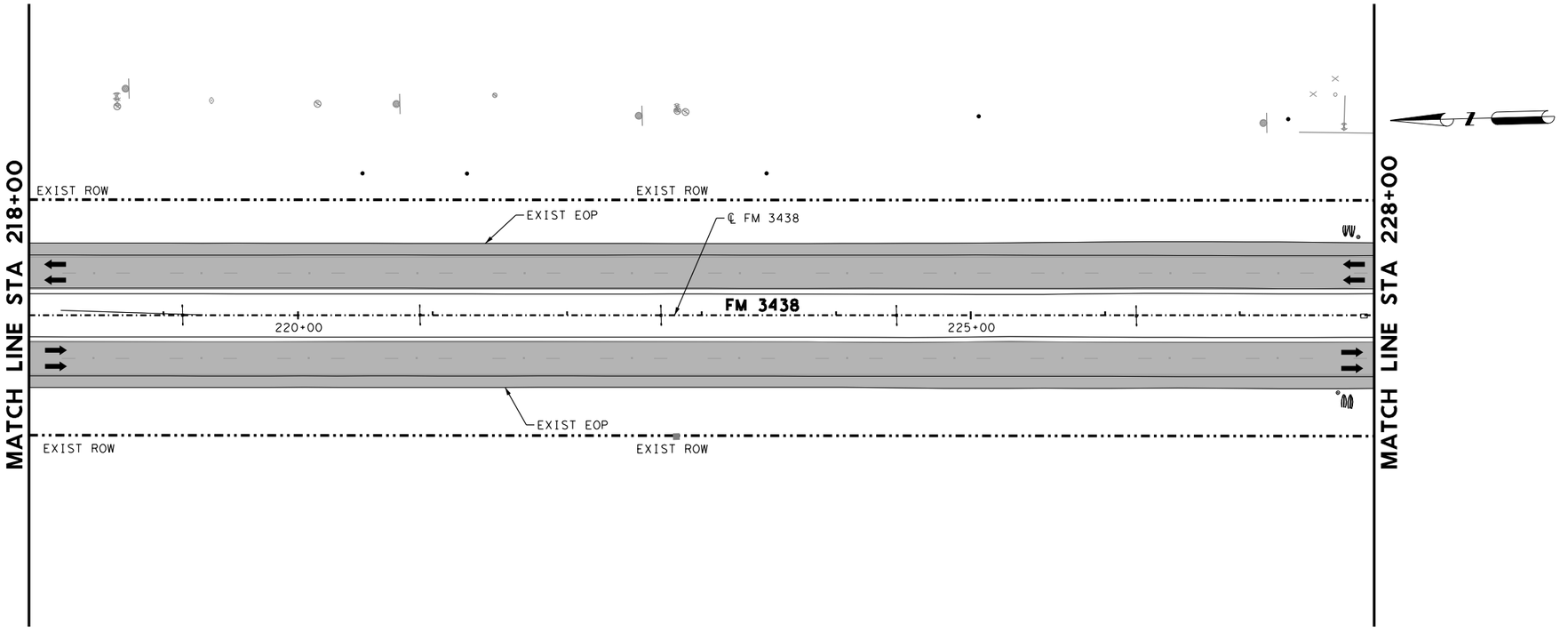

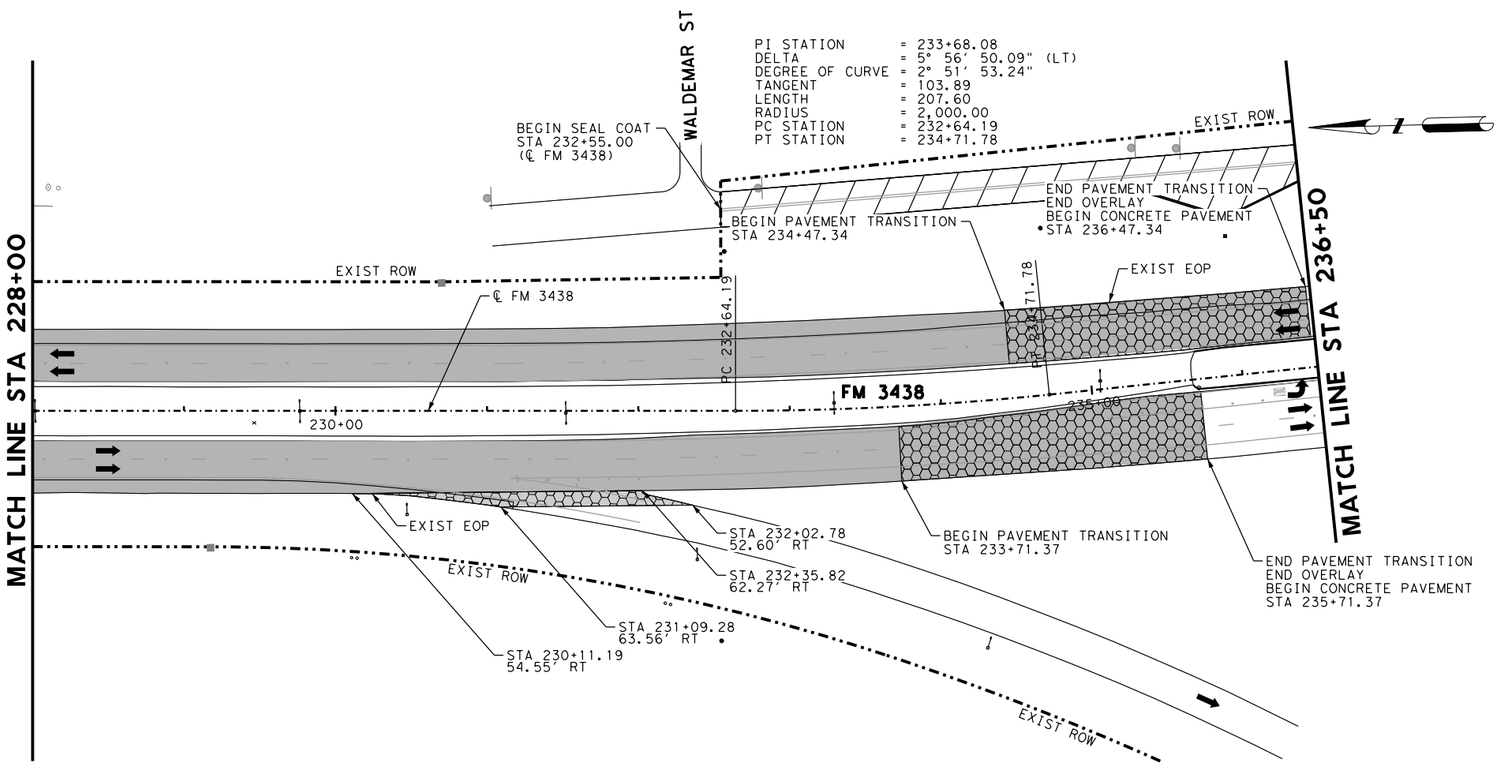

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

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2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
4. BACKFILL PAVEMENT EDGES.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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FM 3438

PLAN VIEW LAYOUT

STA 218+00 TO STA 236+50

SHEET 7 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	78

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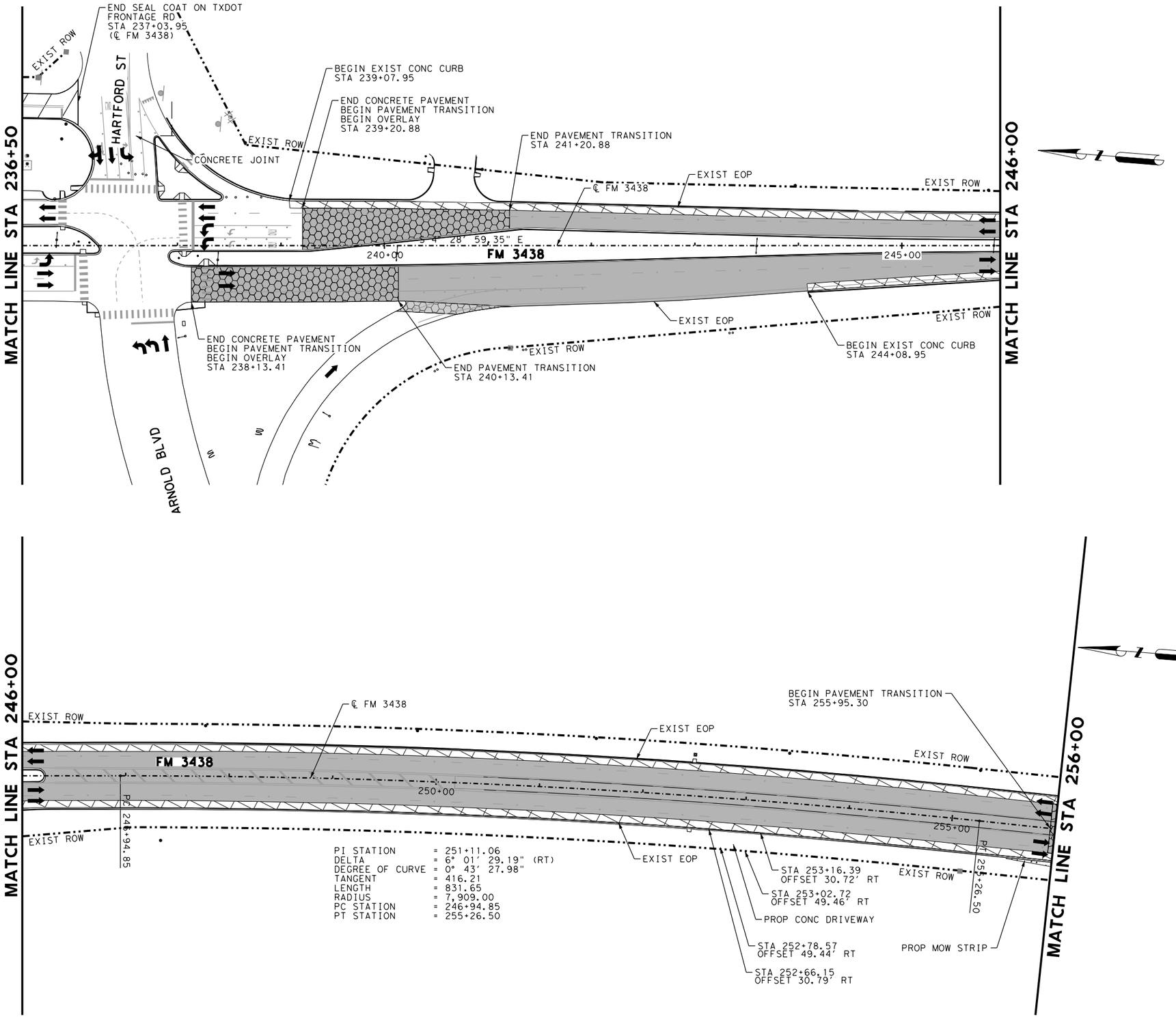

PI STATION = 251+11.06
DELTA = 6° 01' 29.19" (RT)
DEGREE OF CURVE = 0° 43' 27.98"
TANGENT = 416.21
LENGTH = 831.65
RADIUS = 7,909.00
PC STATION = 246+94.85
PT STATION = 255+26.50

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
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- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

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2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
4. BACKFILL PAVEMENT EDGES.

0′ 50′ 100′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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FM 3438

PLAN VIEW LAYOUT

STA 236+50 TO STA 256+00

SHEET 8 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	79

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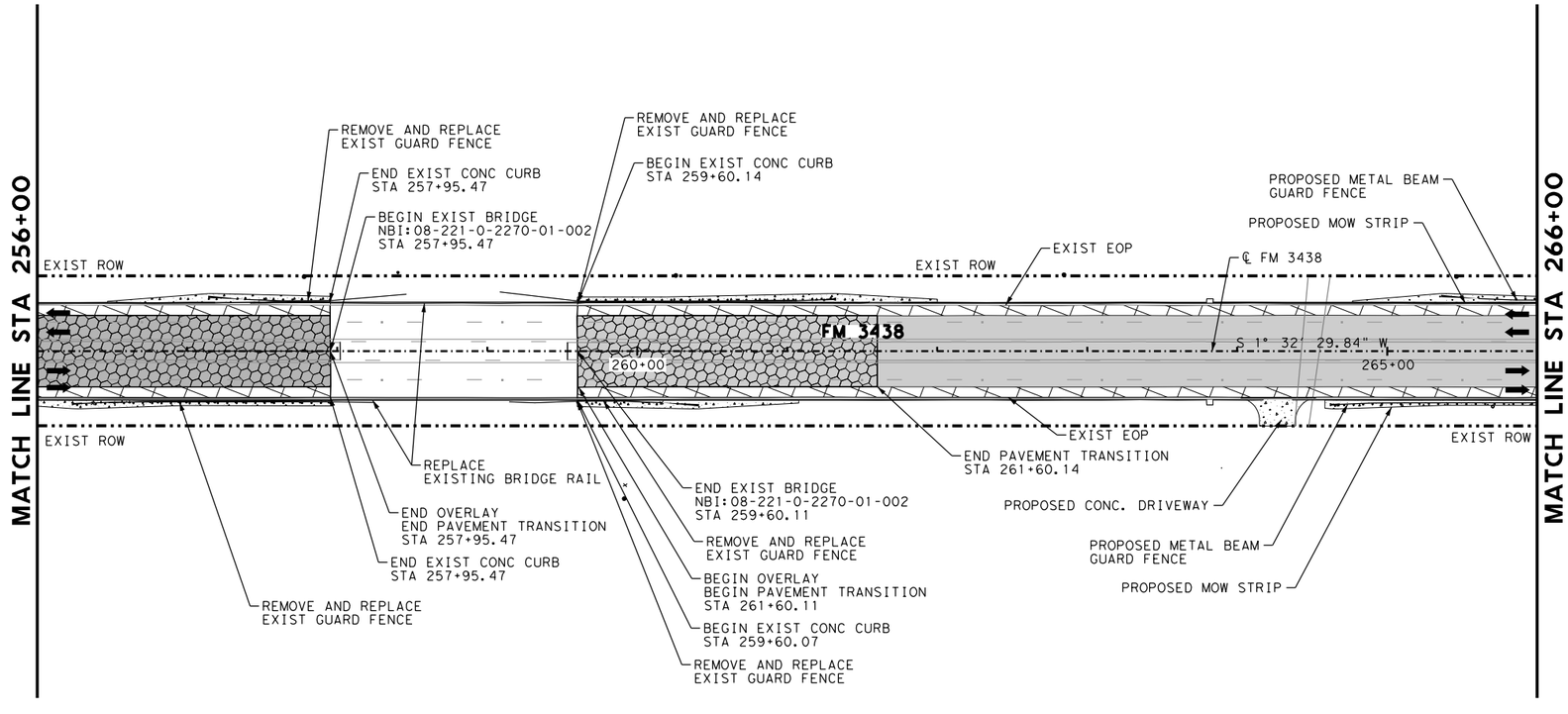

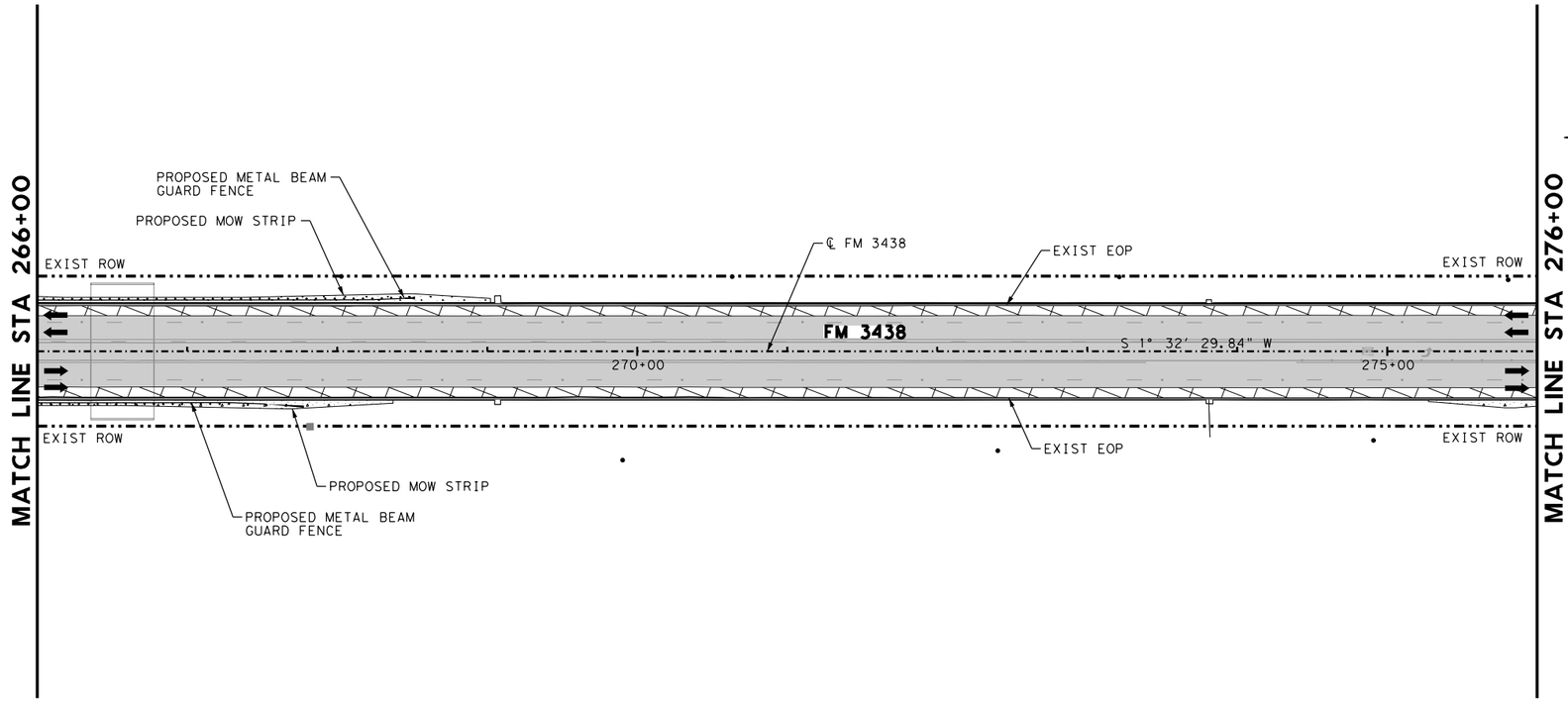

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

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2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.

0′ 50′ 100′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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FM 3438

PLAN VIEW LAYOUT

STA 256+00 TO STA 276+00

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	80

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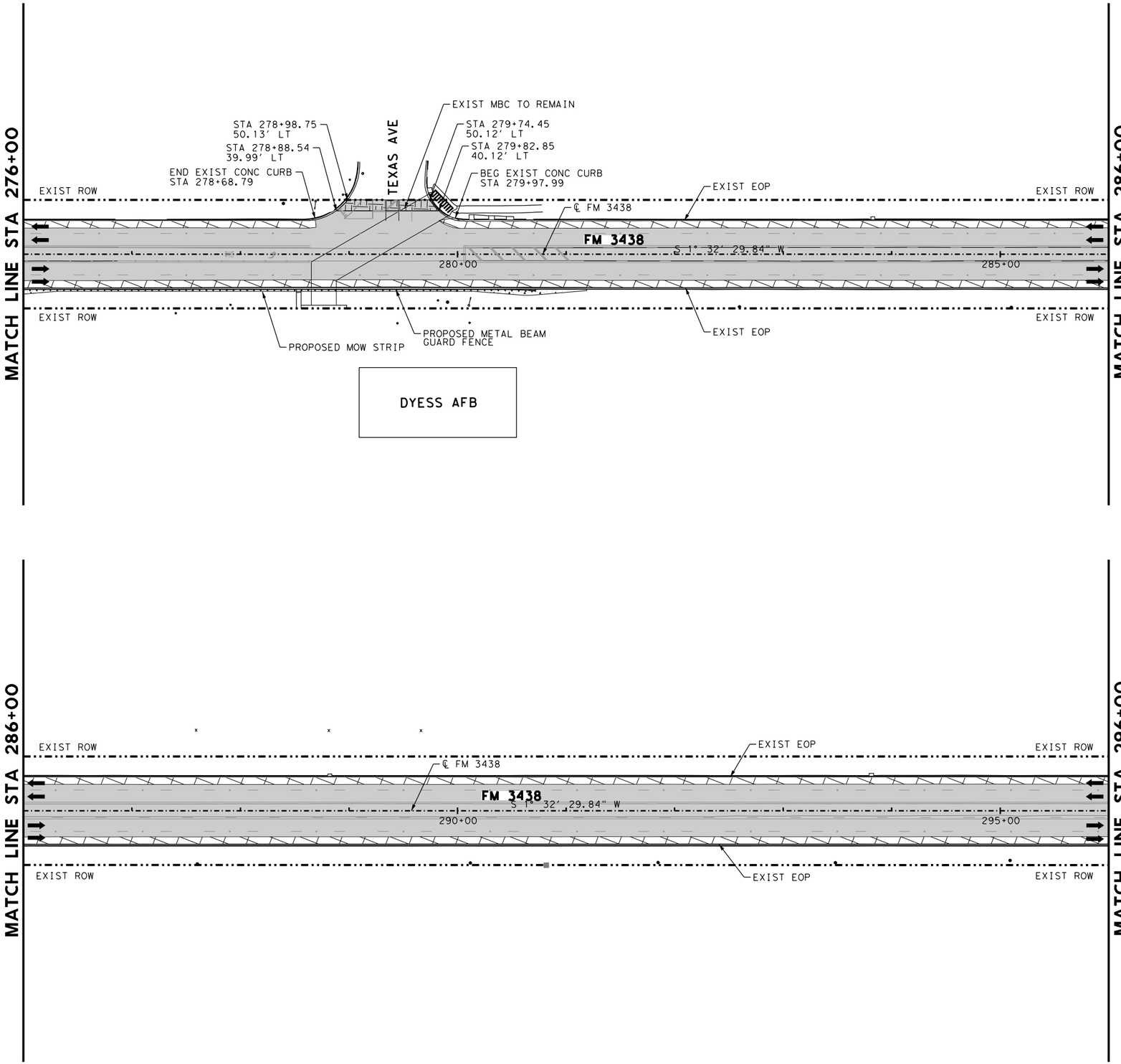

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
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NOTE:

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3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

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JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

IDCUS
PLANNERS • ENGINEERS • MANAGERS
IDCUS, Inc.
8632 Fredericksburg Rd., Suite 200
San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

PLAN VIEW LAYOUT

STA 276+00 TO STA 296+00

SHEET 10 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	81

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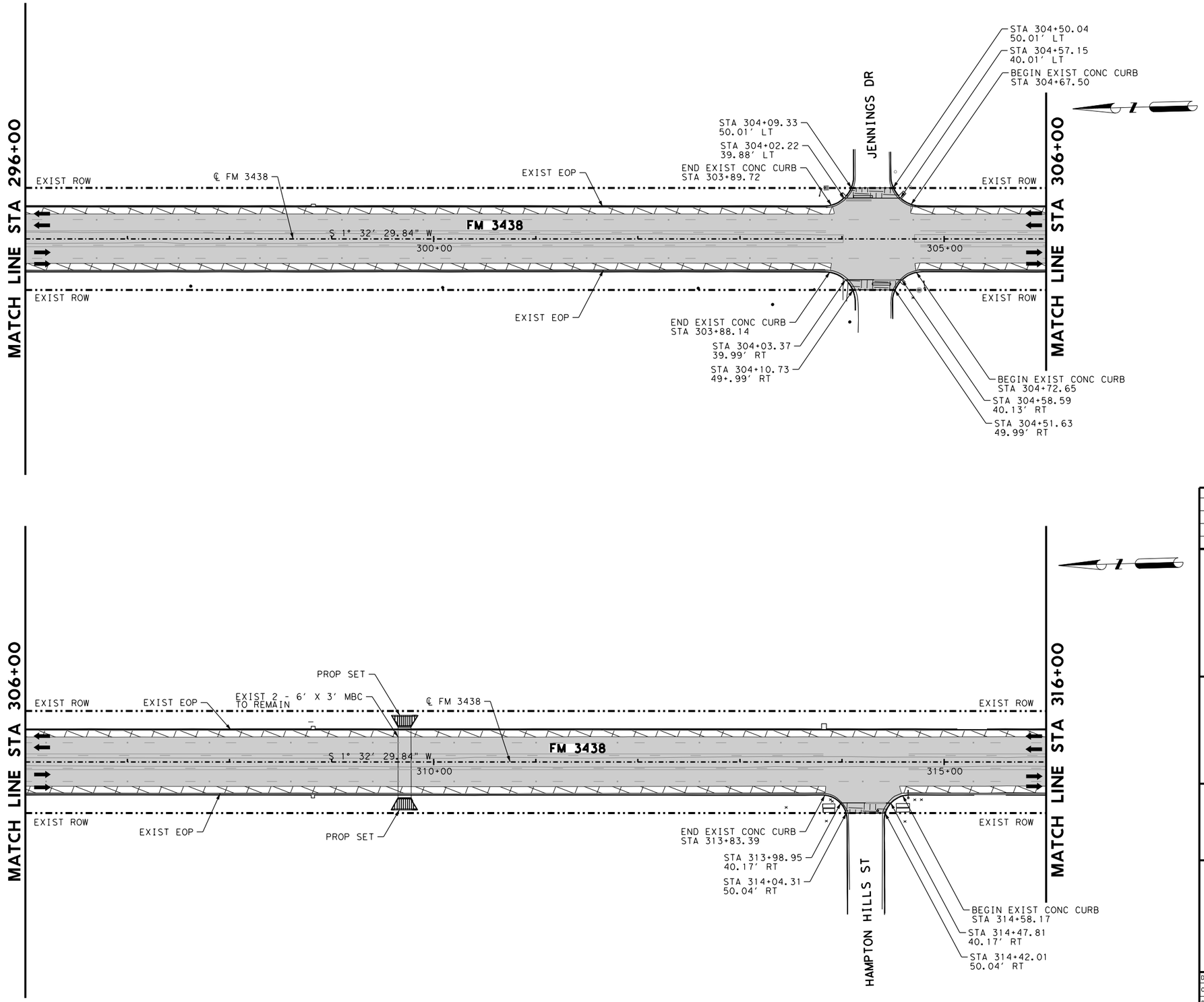

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

1. SEE "PAVEMENT TRANSITION DETAILS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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5/26/2021

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FM 3438

PLAN VIEW LAYOUT

STA 296+00 TO STA 316+00

SHEET 11 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	82

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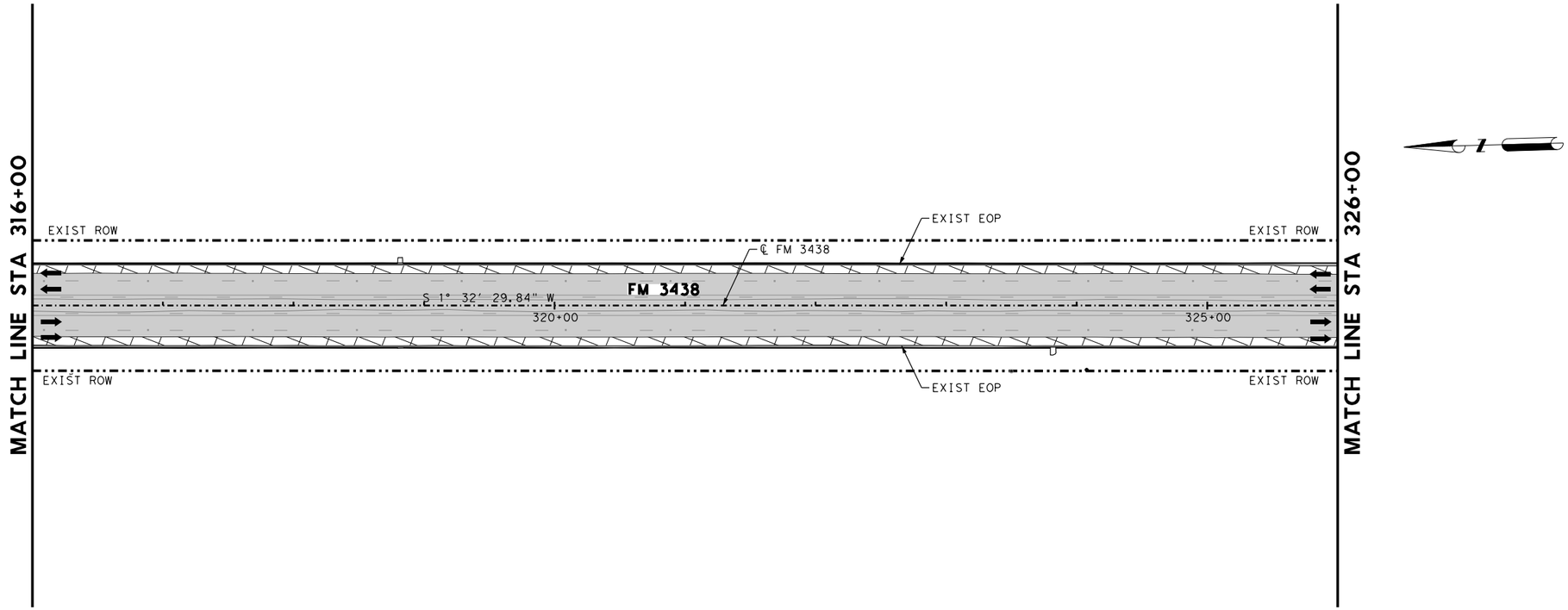

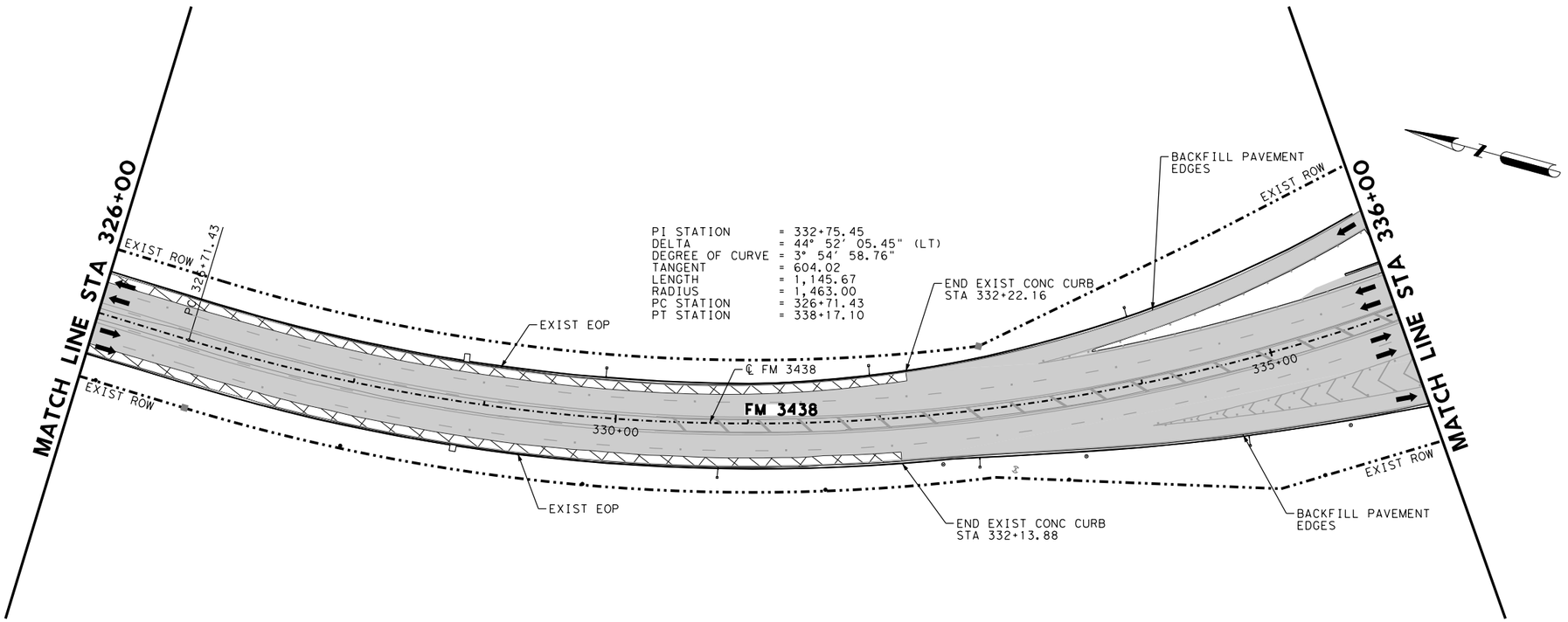

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

1. SEE "PAVEMENT TRANSITION DETAILS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
4. BACKFILL PAVEMENT EDGES

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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5/26/2021

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FM 3438

PLAN VIEW LAYOUT

STA 316+00 TO STA 336+00

SHEET 12 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	83

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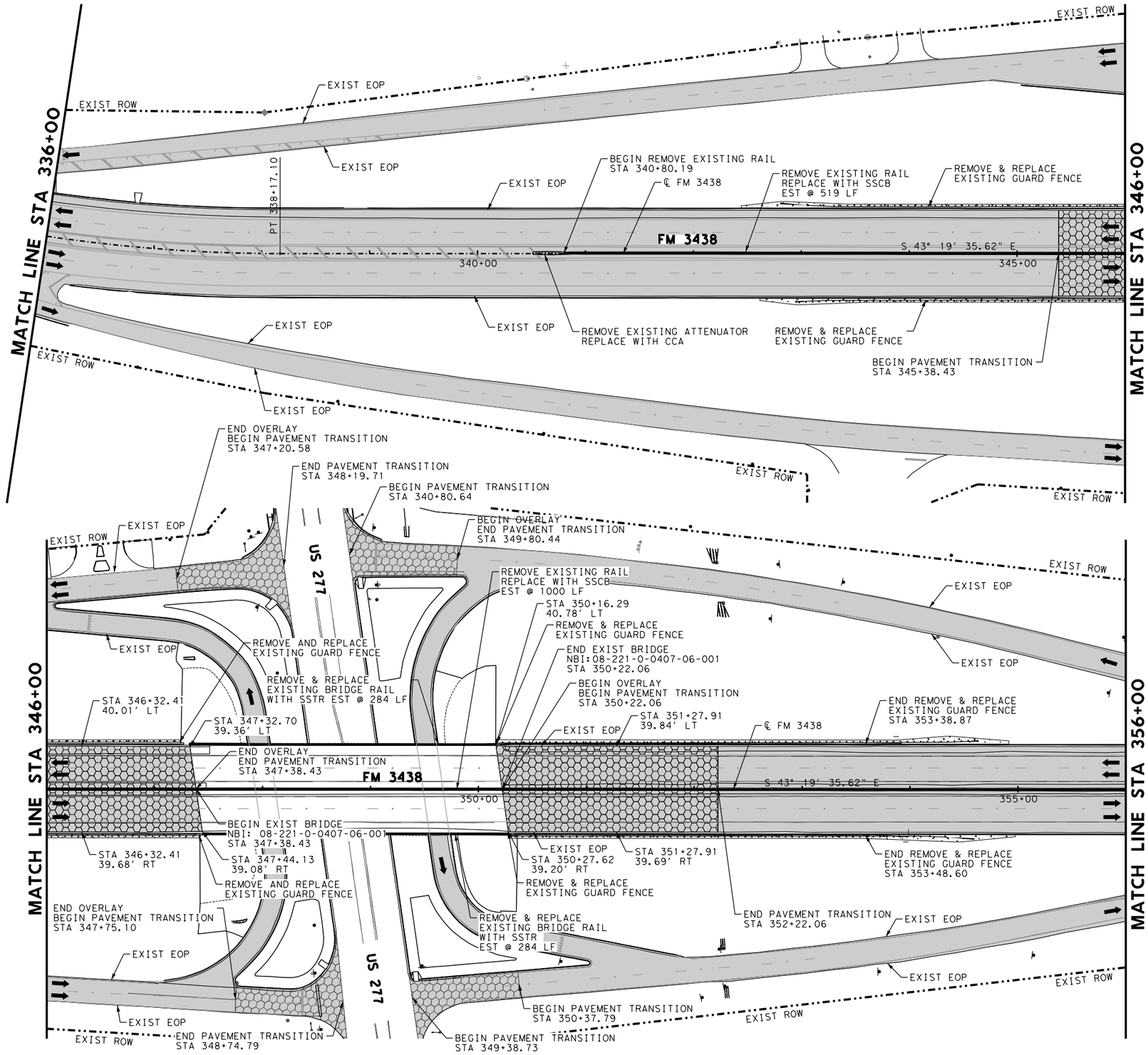

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

1. SEE "PAVEMENT TRANSITION DETAILS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
4. BACKFILL PAVEMENT EDGES

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

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5/26/2021

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PLAN VIEW LAYOUT

STA 336+00 TO STA 356+00

SHEET 13 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	84

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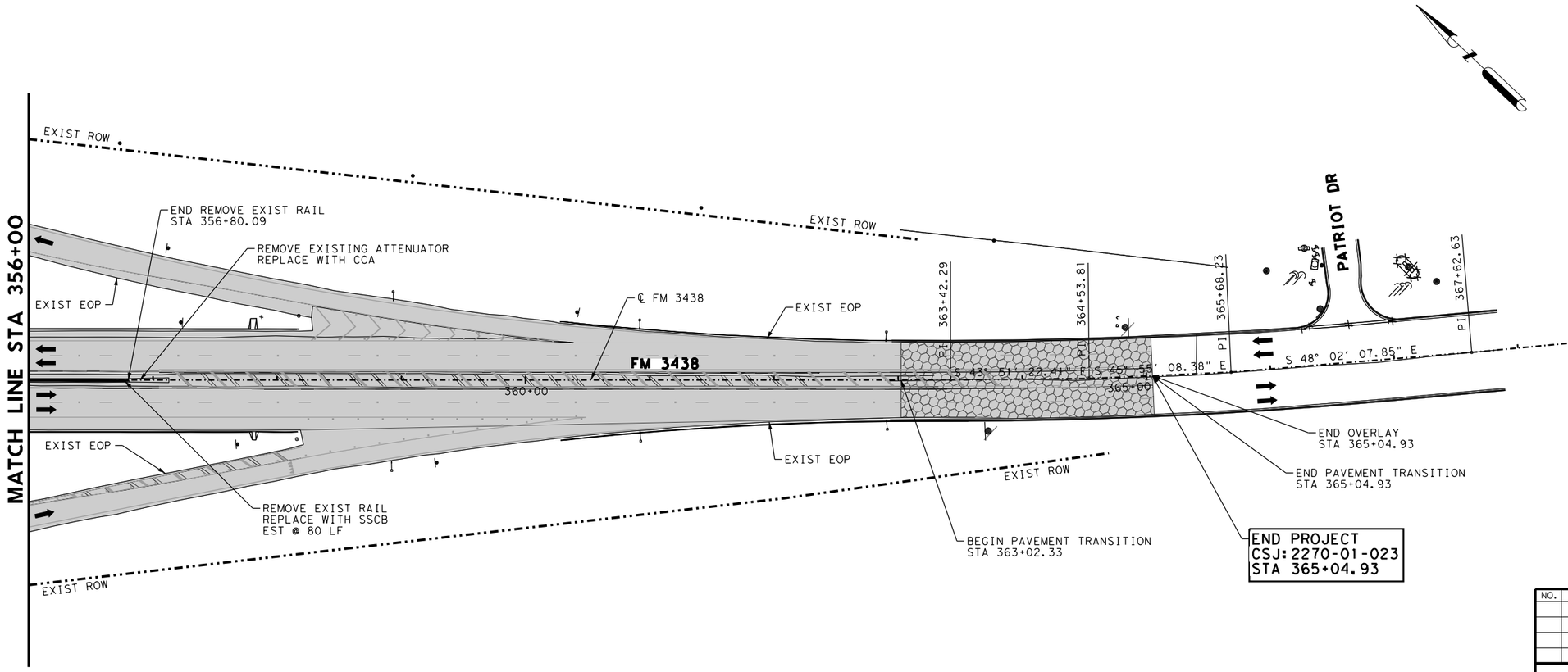

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION & OVERLAY
- OVERLAY (2")
- TURNOUT PAVEMENT TRANSITION W/OVERLAY
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP

NOTE:

1. SEE "PAVEMENT TRANSITION DETAILS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE "GUARD FENCE LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
3. SEE "CULVERT LAYOUT" SHEETS FOR ADDITIONAL INFORMATION.
4. BACKFILL PAVEMENT EDGES

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

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5/26/2021

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Texas Department of Transportation

FM 3438

PLAN VIEW LAYOUT

STA 356+00 TO END PROJECT

SHEET 14 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	85

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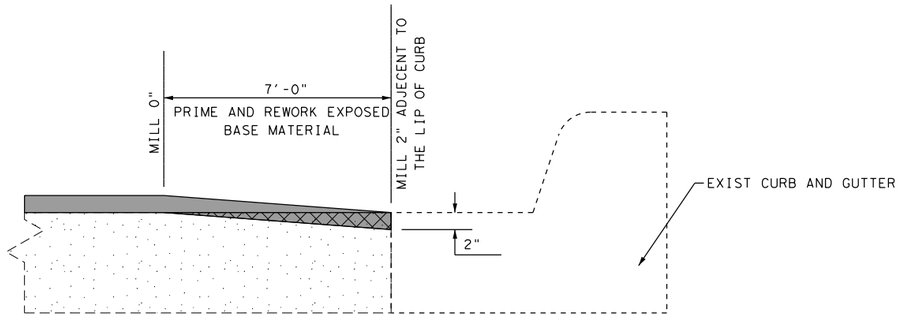
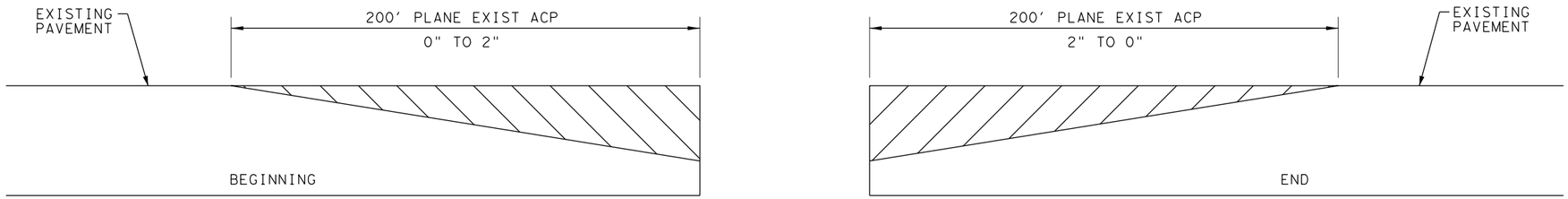


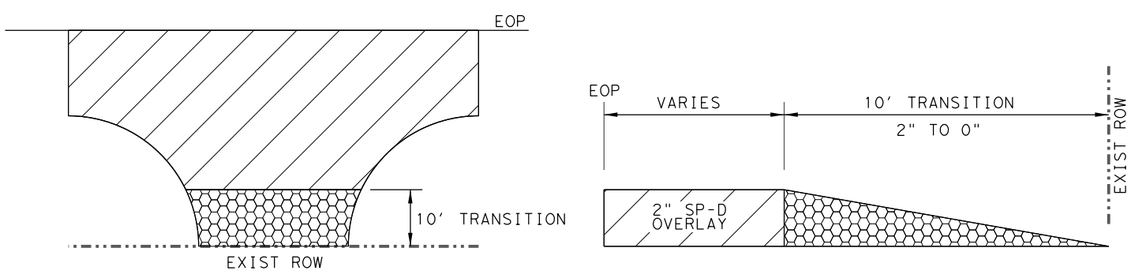
MILLING DETAIL ADJACENT TO LIP OF GUTTER

NTS



PAVEMENT TRANSITION DETAIL

NTS



INTERSECTION TRANSITION DETAIL

NTS

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

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PAVEMENT TRANSITION DETAILS

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	86

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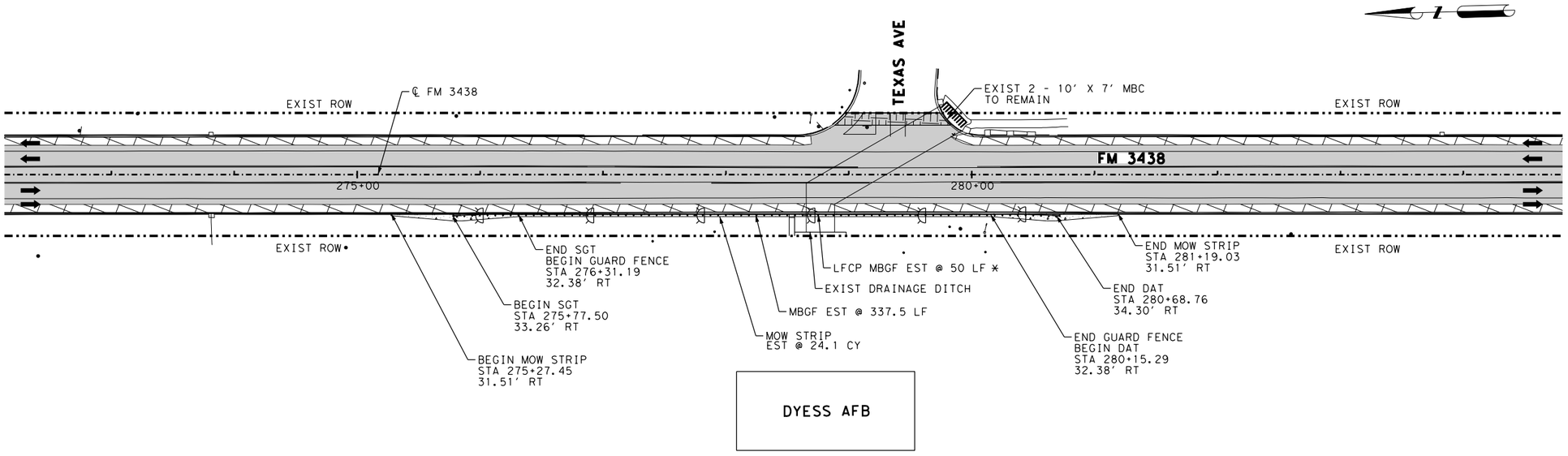
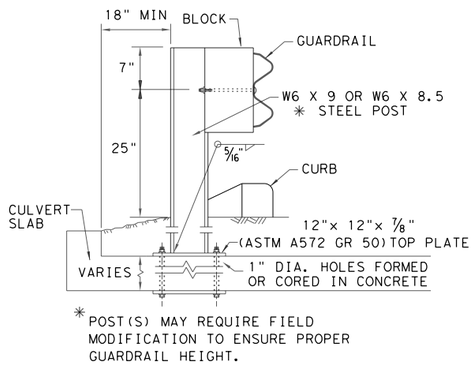
LEGEND

PROP FEATURE
EXIST FEATURE
EXIST ROW
PAVEMENT TRANSITION
OVERLAY (2")
MILL & OVERLAY (2")
SEAL COAT
TRAFFIC DIRECTION
PROP CONC PAVEMENT
MBGF / MOW STRIP
OM ASSM (OM-2X)(FLX)GND
DEL ASSM (D-SW)SZ 1(BRF)GF2
DEL ASSM (D-SY)SZ (BRF)CTB (BI)



0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE



*LOW FILL CULVERT POST (LFCP)

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GUARD FENCE LAYOUT

CULVERT AT STA 227+56.00

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	87

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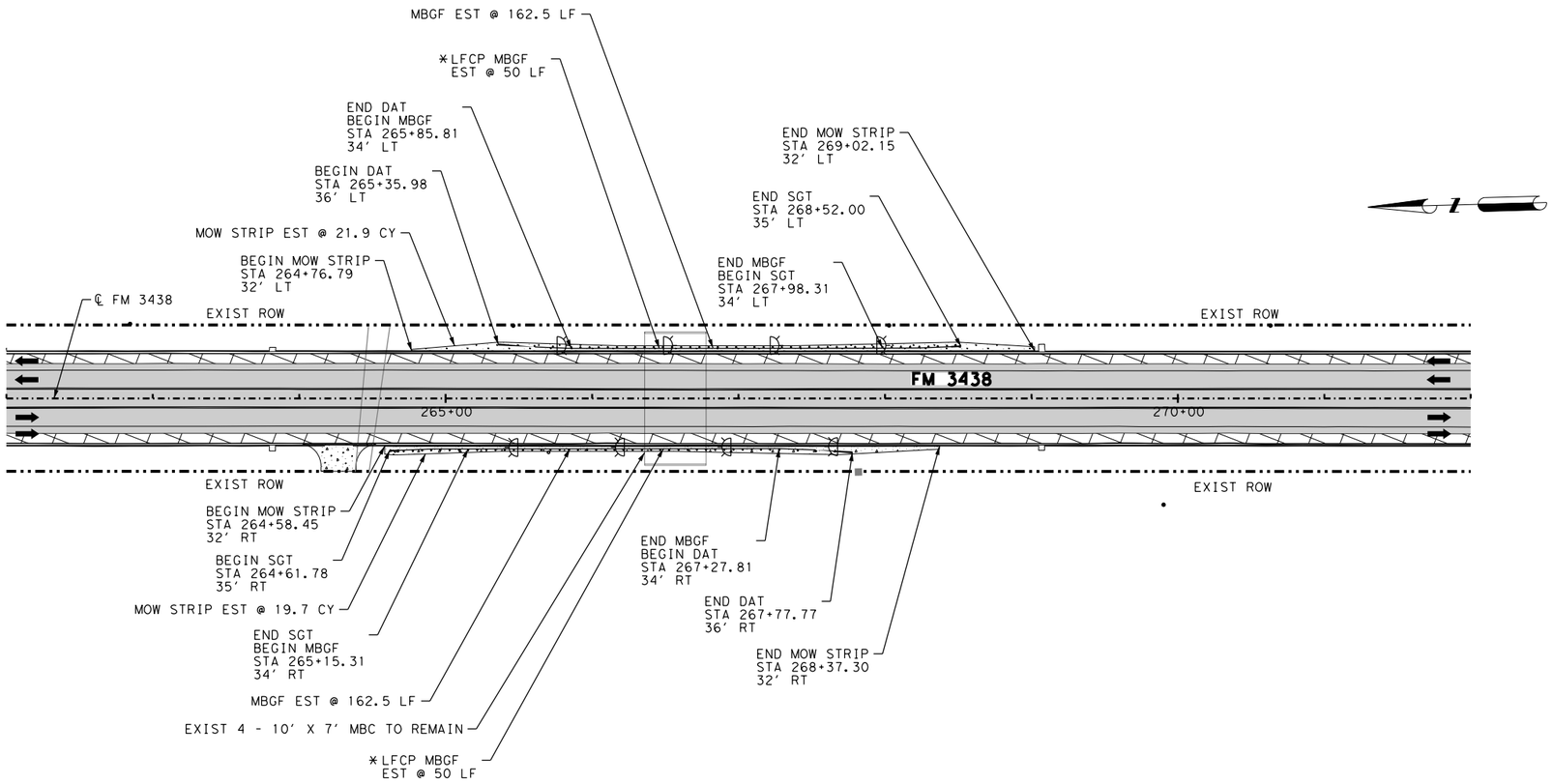

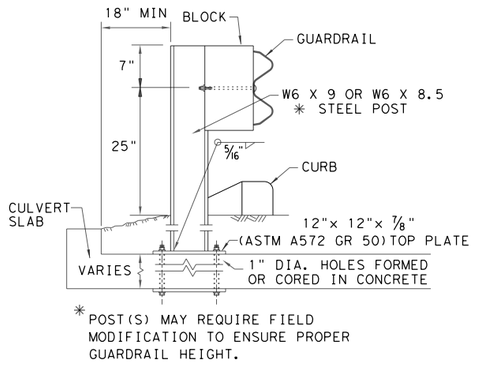

*LOW FILL CULVERT POST (LFCP)

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION
- OVERLAY (2")
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP
- OM ASSM (OM-2X)(FLX)GND
- DEL ASSM (D-SW)SZ 1(BRF)GF2
- DEL ASSM (D-SY)SZ (BRF)CTB (BI)

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

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GUARD FENCE LAYOUT

CULVERT AT STA 266+58.00

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	88

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DATE: 5/26/2021
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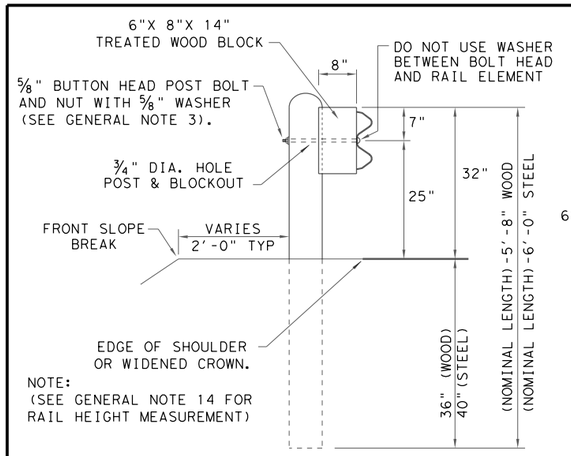
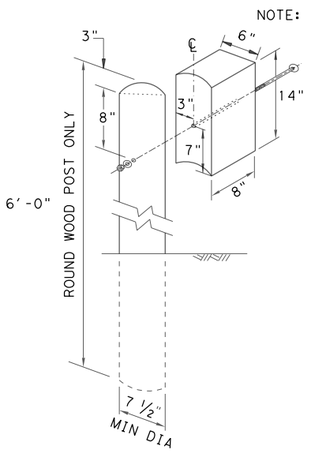
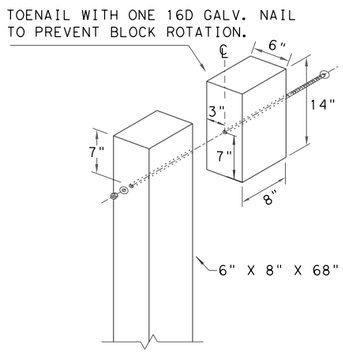


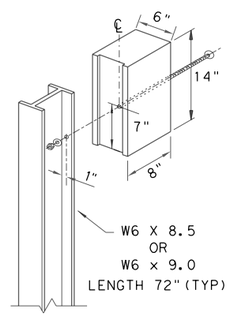
TYPICAL POST PLACEMENT



WOOD BLOCK TO ROUND WOOD POST

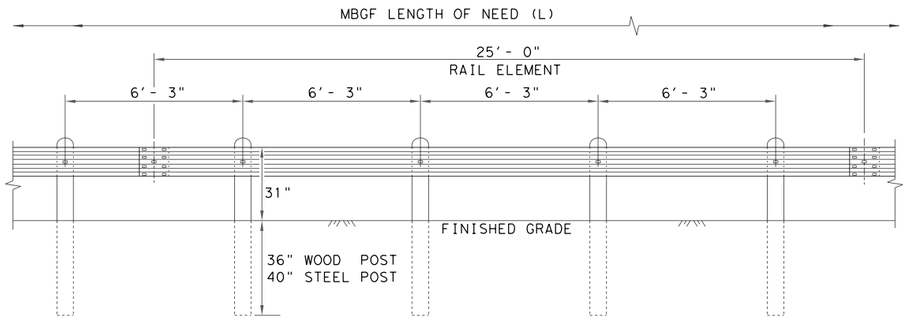


WOOD BLOCK TO RECTANGULAR WOOD POST



ROUTED WOOD BLOCK TO I-BEAM STEEL POST

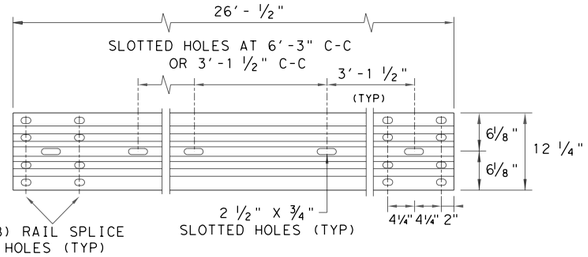
NOTE: ✳✳ "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



DIRECTION OF TRAFFIC

ELEVATION
MID-SPAN RAIL SPLICE

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



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

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

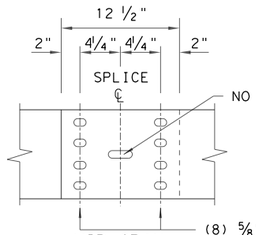
NOTE:
FOUR TYPES OF BUTTON-HEAD GUARD RAIL
BOLTS COME WITH A RECCESSED NUT.

SPLICE BOLT LENGTH
FBBO1 = 1 ¼"
FBBO2 = 2"
VARIES
⅝"

POST & BLOCK LENGTH
FBBO3 = 10"
FBBO4 = 18"

BUTTON HEAD BOLT

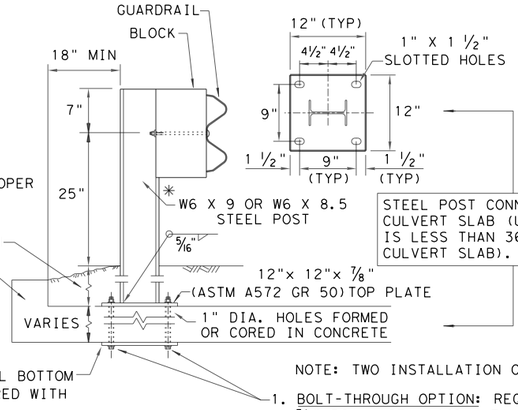
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



DIRECTION OF TRAFFIC

MID-SPAN RAIL SPLICE DETAIL

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



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

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

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. ⅞" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
   NOTE: BOLT LENGTH = SLAB PLUS 2 ¼" MIN.

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

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

GENERAL NOTES

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

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

Texas Department of Transportation — Design Division Standard

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

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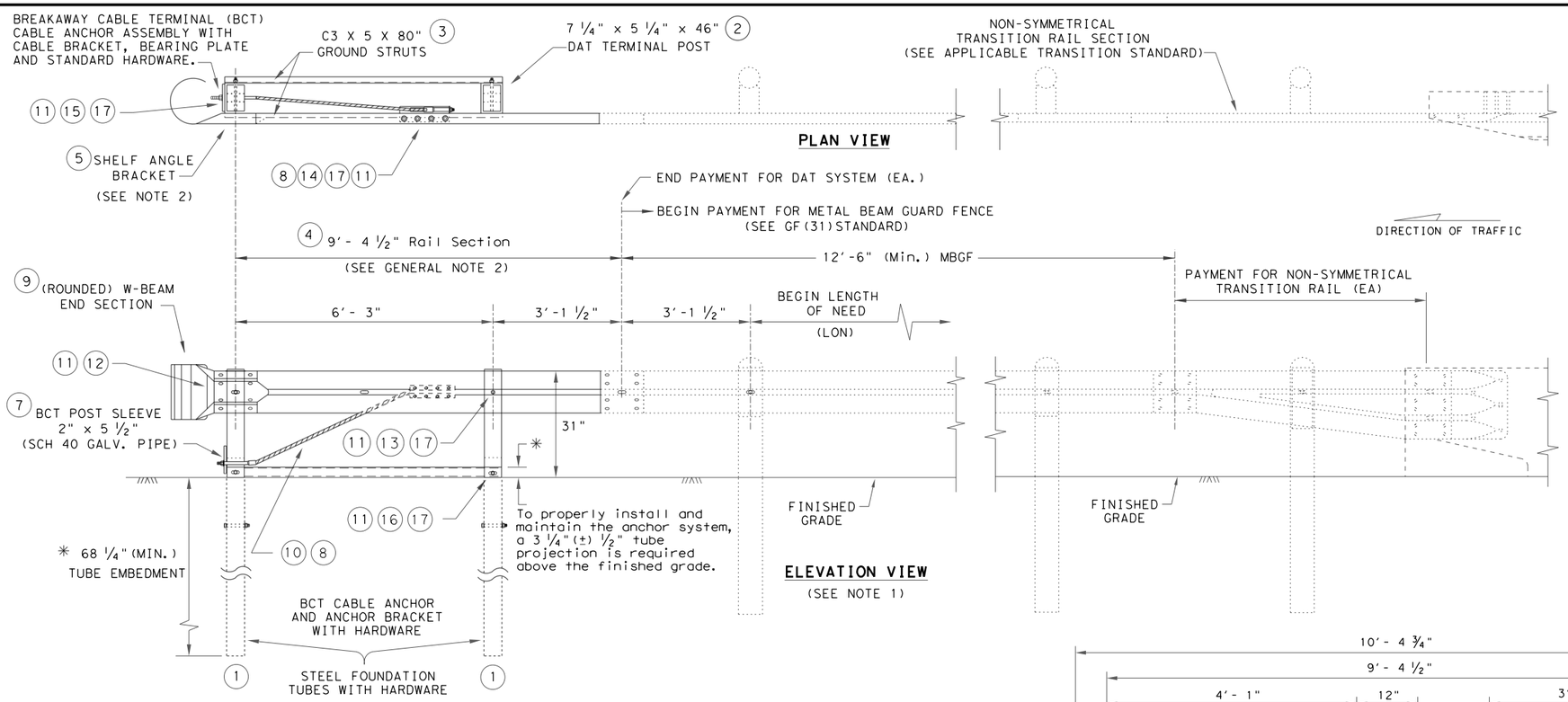


DOWNSTREAM ANCHOR TERMINAL (DAT)

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

GENERAL NOTES

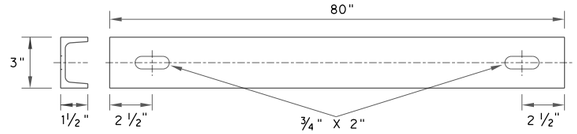
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN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

MOW STRIP INSTALLATION

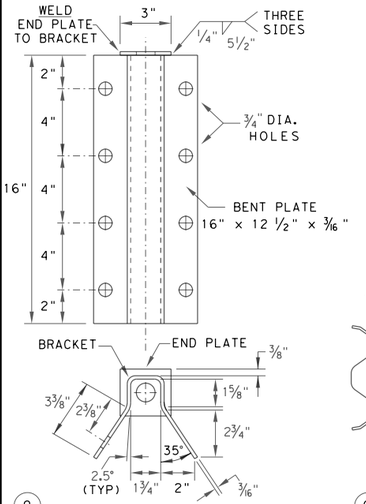
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

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

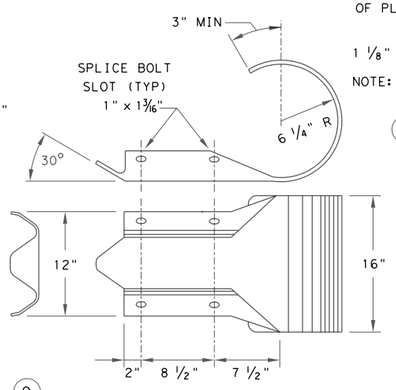
(4) TERMINAL RAIL ELEMENT FOR DAT



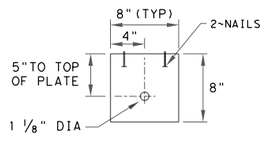
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



(8) GUARDRAIL ANCHOR BRACKET

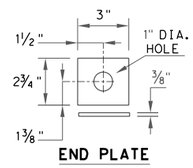


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

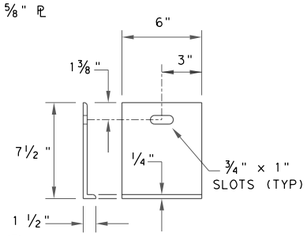


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

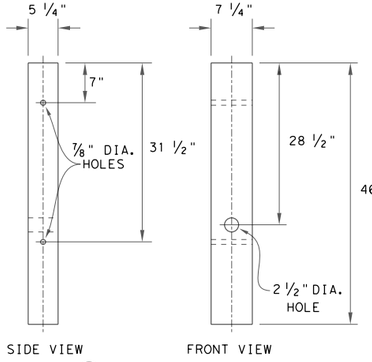
(6) BEARING PLATE
8"x 8"x 5/8" PL



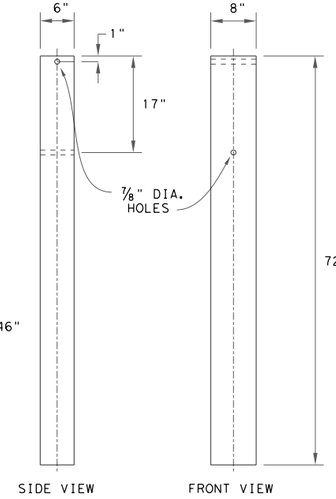
END PLATE



(5) SHELF ANGLE BRACKET



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



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

Texas Department of Transportation

Design Division Standard

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

GF(31)DAT-19

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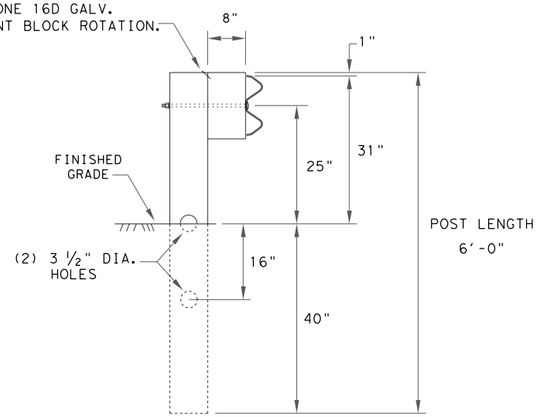
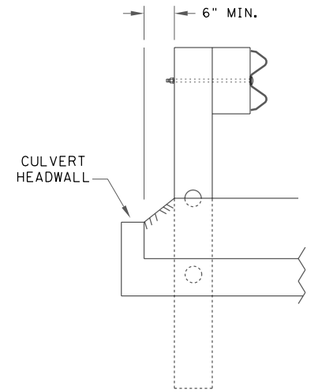
NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.



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

(6) CRT REQUIRED
SEE ELEVATION DETAIL FOR LOCATIONS



LATERAL OFFSET BETWEEN THE GUARDRAIL AND THE CULVERT HEADWALL

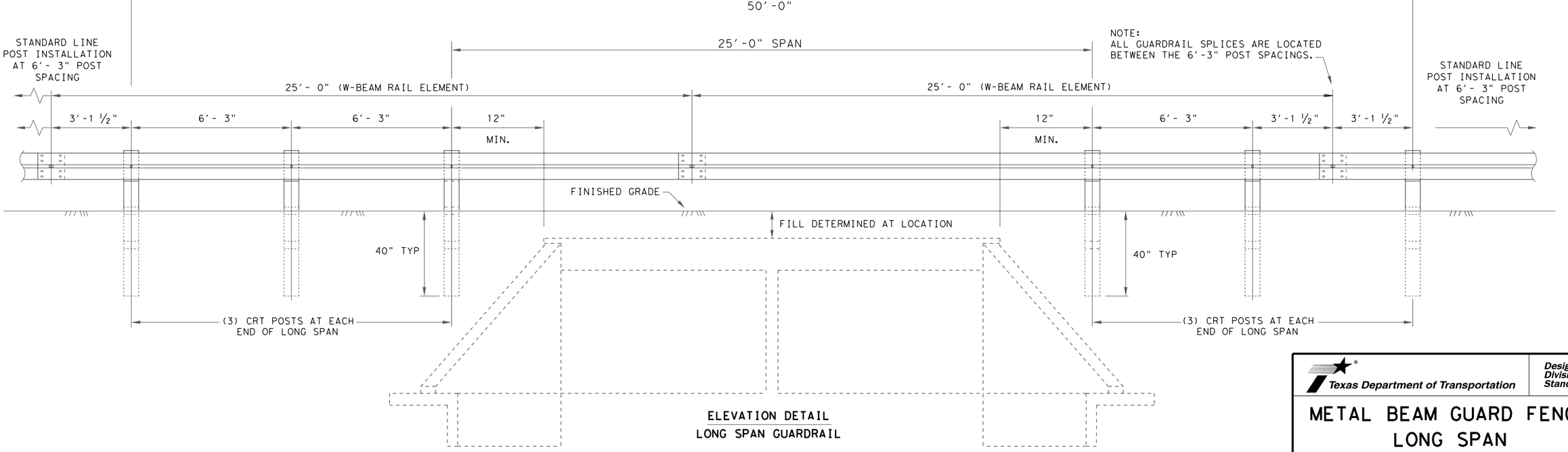
GENERAL NOTES

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

DIRECTION OF TRAFFIC

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

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



ELEVATION DETAIL
LONG SPAN GUARDRAIL

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE LONG SPAN TL-3 MASH COMPLIANT

GF(31)LS-19

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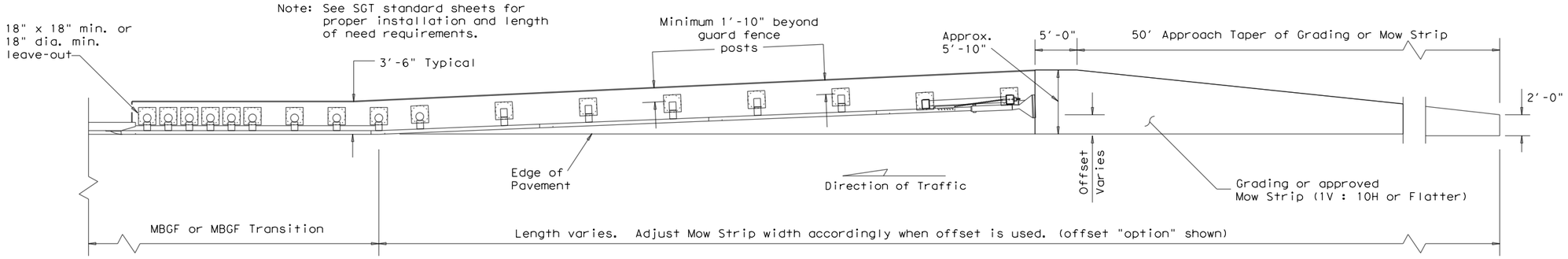
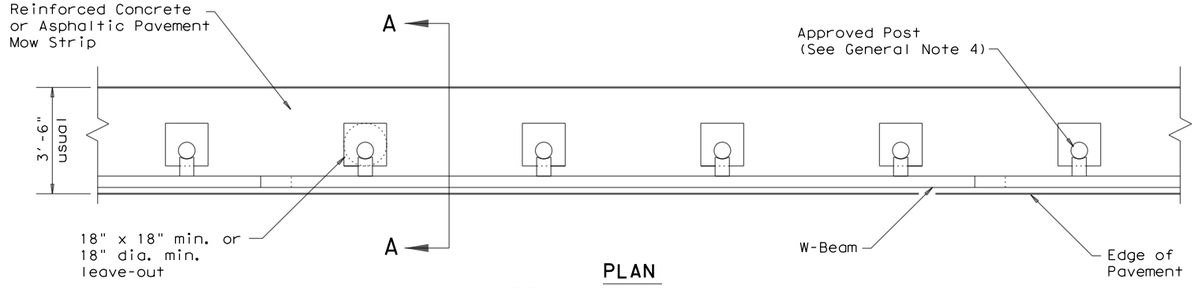
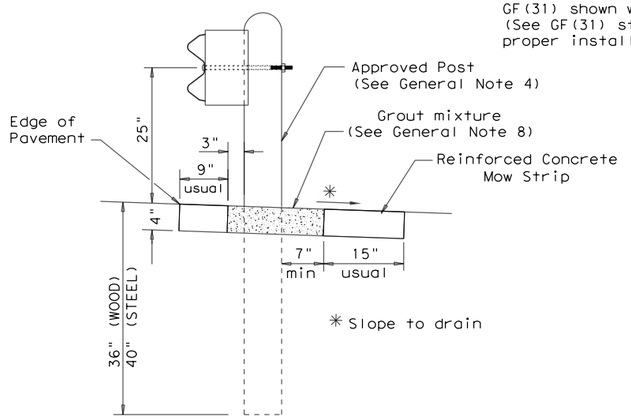


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



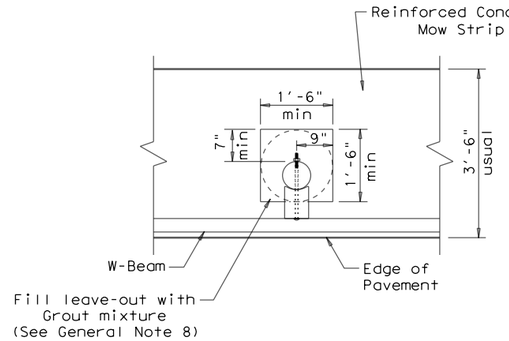
PLAN

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



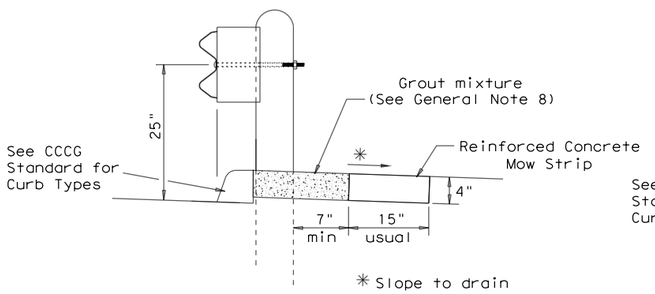
SECTION A-A

Typical



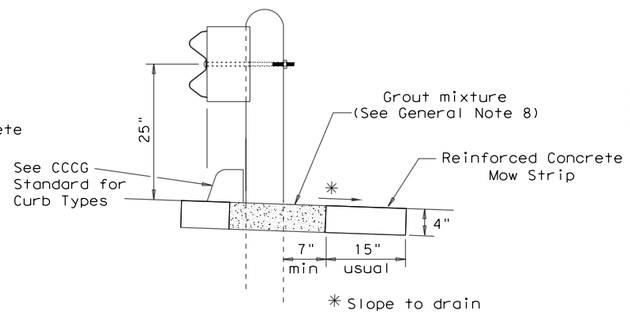
MOW STRIP DETAIL

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



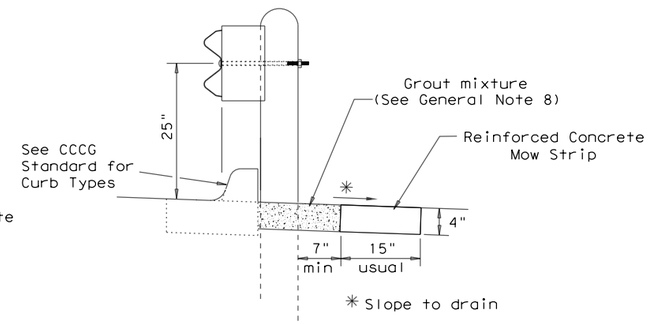
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

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

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

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

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

GF(31)MS-19

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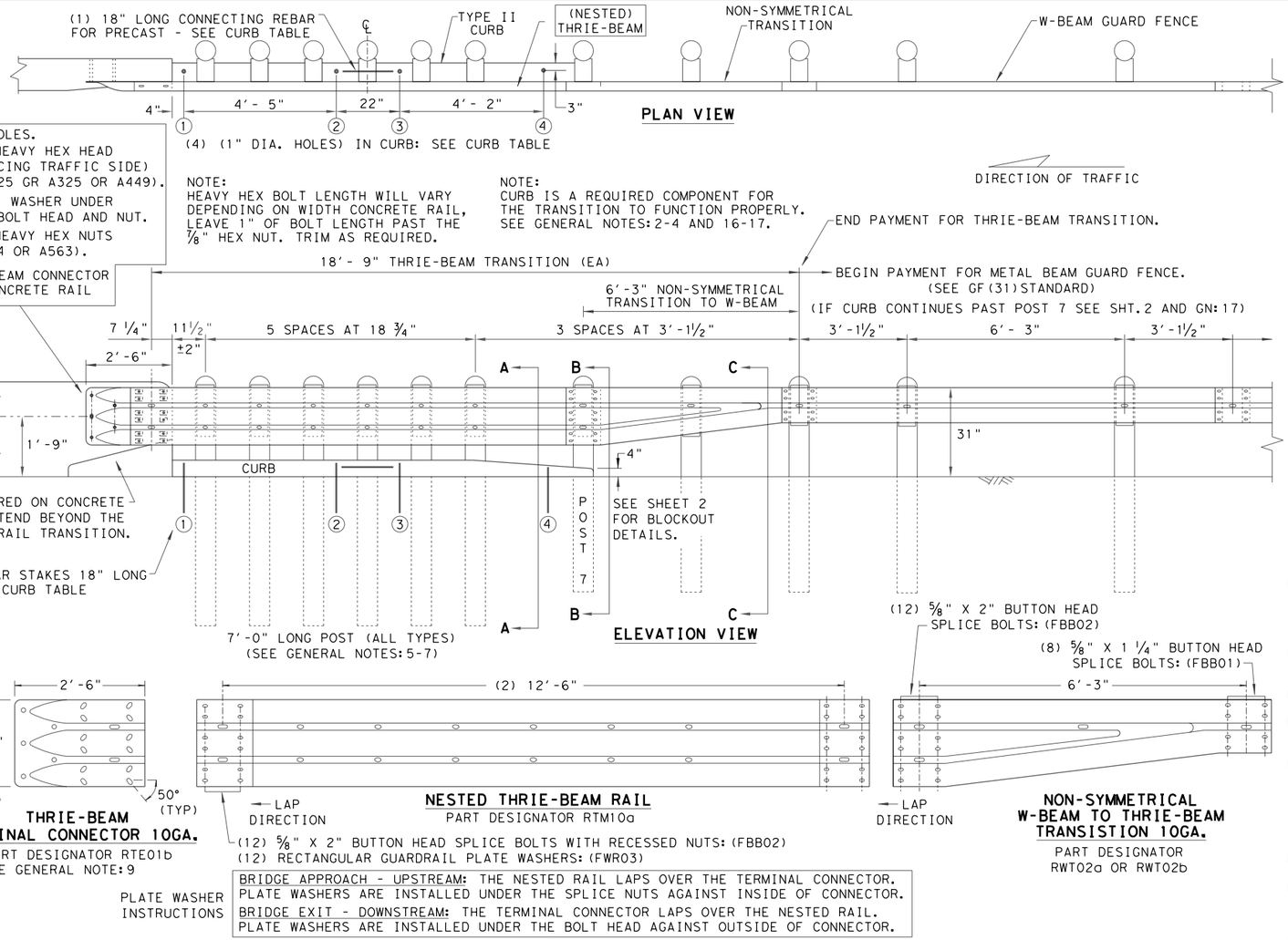
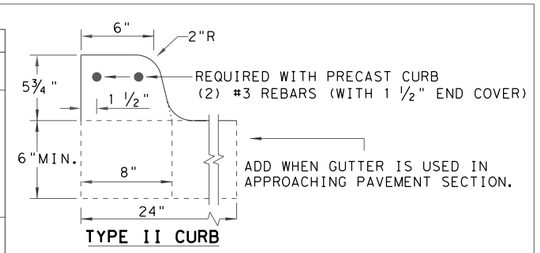


THRIE-BEAM TERMINAL - CURB TABLE
PRECAST CURB FULL LENGTH EQUALS 12'- 2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.
CURB (1) LENGTH 5'- 8" CURB (2) LENGTH 6'- 6" TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7 CONNECTING PRECAST CURB SECTIONS (1) & (2): FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB 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

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.

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31tr+1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG		
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY		
REVISIONS	2270	01	023	FM 3438		
	DIST	COUNTY		SHEET NO.		
	ABL	TAYLOR		93		

DATE: 5/26/2021
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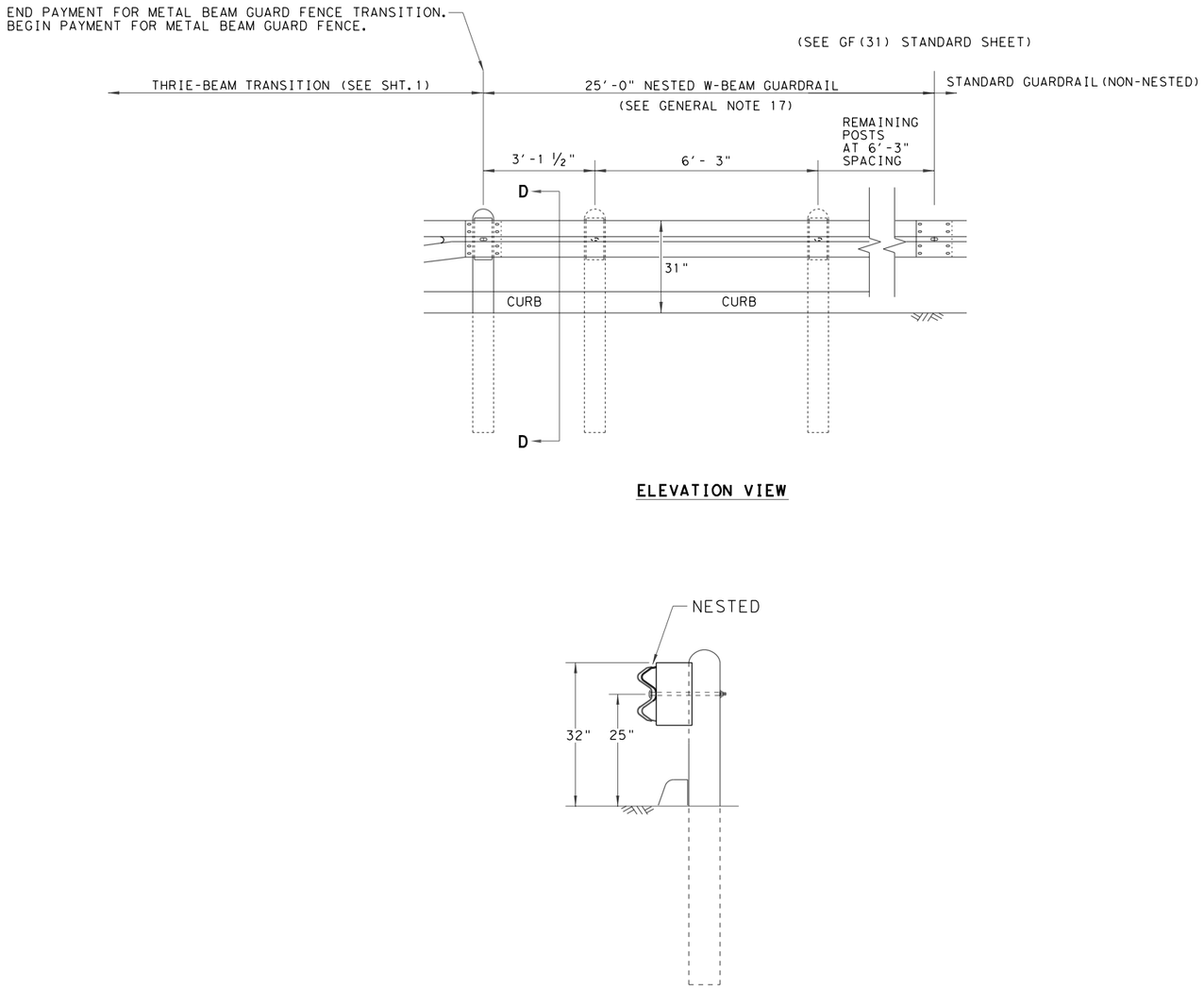
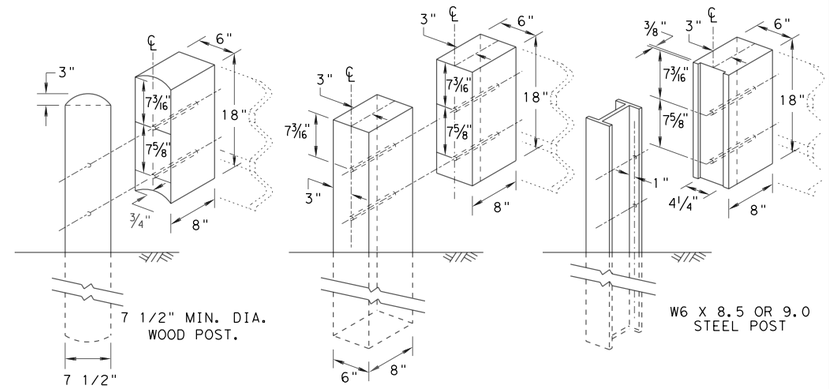
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



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: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2270	01	023	FM 3438	
	DIST	COUNTY		SHEET NO.	
	ABL	TAYLOR		94	

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FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7\DP5143\FM 3438\CADD\STANDARDS\ROADWAY STANDARDS\06 sgt10s3116.dgn

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

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

LINE AT THE BACK OF POST #2 THRU #8

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

ANGLE STRUT PN: 15202G
ANCHOR PADDLE PN: 15204A
16"

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

DO NOT BOLT ANCHOR RAIL TO - POST (2)
SEE DETAIL 1

PLAN VIEW

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

TRAFFIC FLOW

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

BEGIN STANDARD MBGF
END PAYMENT FOR SGT

6¼" 3'-1 ½" 6'-3" 6'-3"
ANCHOR RAIL WITH SLOTS - (THREADED THRU HEAD)
SEE SoftStop MANUAL FOR COMPLETE DETAILS

MIDDLE SLOT CUTOUT (1) 1 ¾" X 6'-10 ¼"
OUTSIDE SLOTS CUTOUT (2)½" X 6'-9 ⅝"

MBGF LAPPED IN DIRECTION OF TRAFFIC FLOW

25'-0" DOWNSTREAM W-BEAM GUARDRAIL PN: 61G
SoftStop ANCHOR RAIL (12GA) PN: 15215G
SoftStop FACE SEE GN(3) & NOTE: B

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

ANCHOR PADDLE PN: 15204A
END OF ANCHOR RAIL PN: 15215G
SEE NOTE: A

SEE NOTE: C

POST 32" HEIGHT
31" RAIL HEIGHT
RAIL 25'-0" PN: 61G
RAIL 25'-0" PN: 15215G
31" RAIL HEIGHT

DO NOT BOLT ANCHOR RAIL TO POST(2)
SEE DETAIL 2

13/16" DIA. YIELDING HOLES
13/16" DIA. YIELDING HOLES
SEE DETAIL 3

(8) ⅝"x 1- ¼" GR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G
POST 40" DEPTH (TYP 1-8)
(8) ⅝"x 1- ¼" HGR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(2) 6'-0" (SYTP) PN: 15000G POST(1) 4'-9 ½" SYTP PN: 15203G POST(0) 6'-5 ⅜" PN: 15205A

6'-1⅜"

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

ELEVATION VIEW

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

B B A A

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6
4" X 7 ½" X 14" BLOCKOUT COMPOSITE PN: 6777B

6" X 8" X 14" BLOCKOUT WOOD PN: 4076B
NOTE: DO NOT BOLT ANCHOR RAIL TO POST(2)
8" 6" 14"
⅝" HGR NUT PN: 3340G
⅝" X 10" HGR POST BOLT PN: 3500G
13/16" DIAMETER YIELDING HOLES LOCATED IN FLANGES
FINISHED GRADE
(HOLES APROXIMATELY CENTERED AT FINISHED GRADE)

ISOMETRIC VIEW POST(1 & 2)

W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

(1) ⅝" x 1 ¾" HEX HD BOLT PN 3391G
ANGLE STRUT PN: 15202G
(2) ⅝" WASHERS PN 4372G
(1) ⅝" HGR HEX NUT PN 3340G

DETAIL 1

SHOWN AT POST(1) NEAR GROUND

(1) ⅝" HEX NUT
(2) ⅝" ROUND WASHERS PN: 3240G
(1) ⅝" x 1- ½" HEX HD BOLT-GR-5 PN: 105286

DETAIL 2

SHOWN AT POST(1)

ANCHOR KEEPER PLATE (24 GA) PN: 15207G
ANCHOR PLATE WASHER ½" THICK PN: 15206G
1" ROUND WASHER F463 PN: 4902G
(2) ⅝" x 2 ½" HEX HD BOLT GR-5 PN: 105285G
ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6
(2) ⅝" ROUND WASHER (WIDE) PN: 3240G
1" NUT PN: 3908G SHALL BE SECURELY TIGHTENED AFTER FINAL ASSEMBLY, BUT NOT DEFORMING THE KEEPER PLATE.

6" X 8" X 14" BLOCKOUT WOOD
W-BEAM RAIL 25'-0"
⅝" X 10" HGR POST BOLT PN: 3500G
⅝" HGR NUT PN: 3340G
POST 32" HEIGHT
31" RAIL HEIGHT
40"
LINE POST (3, 4, 5, 6, 7 & 8)
FINISHED GRADE

SECTION VIEW B-B

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

6" X 8" X 14" BLOCKOUT WOOD
W-BEAM RAIL 25'-0"
⅝" X 10" HGR POST BOLT PN: 3500G
⅝" HGR NUT PN: 3340G
POST 32" HEIGHT
31" RAIL HEIGHT
40"
POST(2)
FINISHED GRADE

SECTION VIEW A-A

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

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

POST 17"- ½" HEIGHT
4'- 9 ½"
13/16" DIA. YIELDING HOLES
40"
POST(1)

FRONT VIEW POST(1)

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

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

ANCHOR PADDLE PN: 15204A
(2) ⅝" HEX NUT A563 GR. DH PN: 3245G
W-BEAM FLATTENED (4 PLIES)
ANGLE STRUT PN: 15202G
SEE NOTE: A
(2) ¾" x 2 ½" HEX BOLT (TYP) PN: 3717G
(4) ¾" FLAT WASHER (TYP) PN: 3701G
(2) ¾" HEX NUT (TYP) PN: 3704G
(2) ANCHOR POST ANGLE PN: 15201G
6'- 1 ⅜" POST DEPTH

DETAIL 3 AT POST(0)

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

TRAFFIC FLOW

APPROX 5'-10" 5'-0" 50' APPROACH GRADING 2'-0"
STANDARD MBGF
EDGE OF PAVEMENT
NOTE: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)
2'-0" MAX. RAIL OFFSET
APPROACH GRADING (1V:10H OR FLATTER) SEE PRODUCT ASSEMBLY MANUAL FOR ADDITIONAL GUIDANCE.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374. 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN: 620237B
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
7. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
8. POSTS SHALL NOT BE SET IN CONCRETE.
9. IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
10. DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

NOTE: A	THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-¾" MIN. TO 4" MAX. ABOVE FINISHED GRADE.
NOTE: B	PART PN: 5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN: 5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)
NOTE: C	W-BEAM SPLICE LOCATED BETWEEN LINE POST(4) AND LINE POST(5) GUARDRAIL PANEL 25'-0" PN: 61G ANCHOR RAIL 25'-0" PN: 15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'- 0")
15205A	1	POST #0 - ANCHOR POST (6'- 5 ⅜")
15203G	1	POST #1 - (SYTP) (4'- 9 ½")
15000G	1	POST #2 - (SYTP) (6'- 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 x 8.5) (6'- 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (4" x 7 ½" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (½" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT
		HARDWARE
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR. DH
3717G	2	¾" x 2 ½" HEX BOLT A325
3701G	4	¾" ROUND WASHER F436
3704G	2	¾" HEAVY HEX NUT A563 GR. DH
3360G	16	⅝" x 1 ¼" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	⅝" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	⅝" x 10" HGR POST BOLT A307
3391G	1	⅝" x 1 ¾" HEX HD BOLT A325
4489G	1	⅝" x 9" HEX HD BOLT A325
4372G	4	⅝" WASHER F436
105285G	2	⅝" x 2 ½" HEX HD BOLT GR-5
105286G	1	⅝" x 1 ½" HEX HD BOLT GR-5
3240G	6	⅝" ROUND WASHER (WIDE)
3245G	3	⅝" HEX NUT A563 GR. DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE: B

Texas Department of Transportation

Design Division Standard

TRINITY HIGHWAY
SOFTSTOP END TERMINAL
MASH - TL-3
SGT(10S)31-16

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
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	ABL	TAYLOR		95

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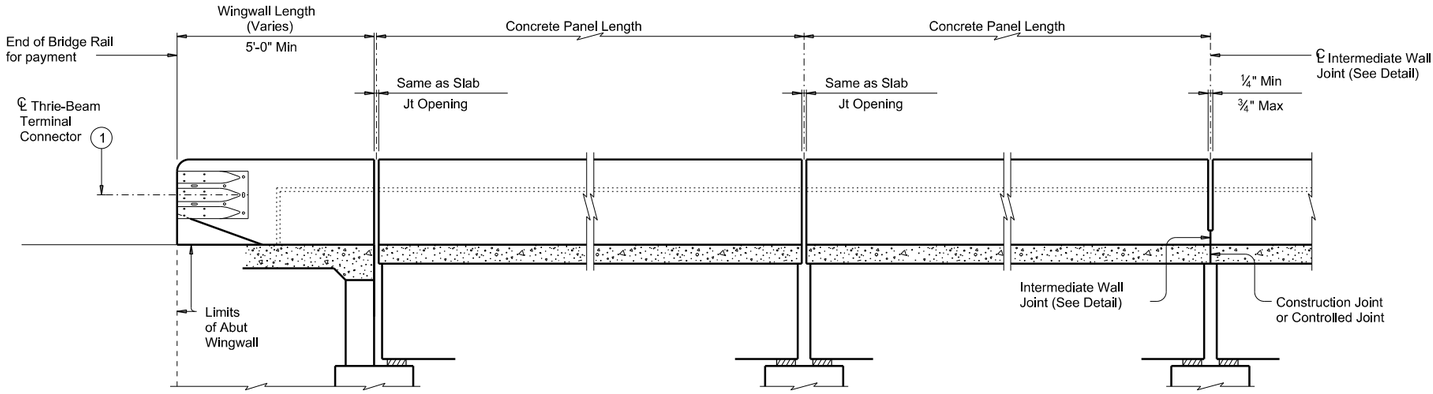
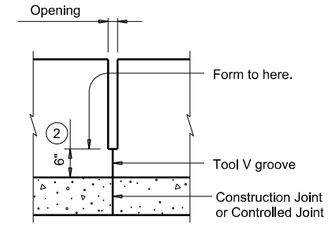


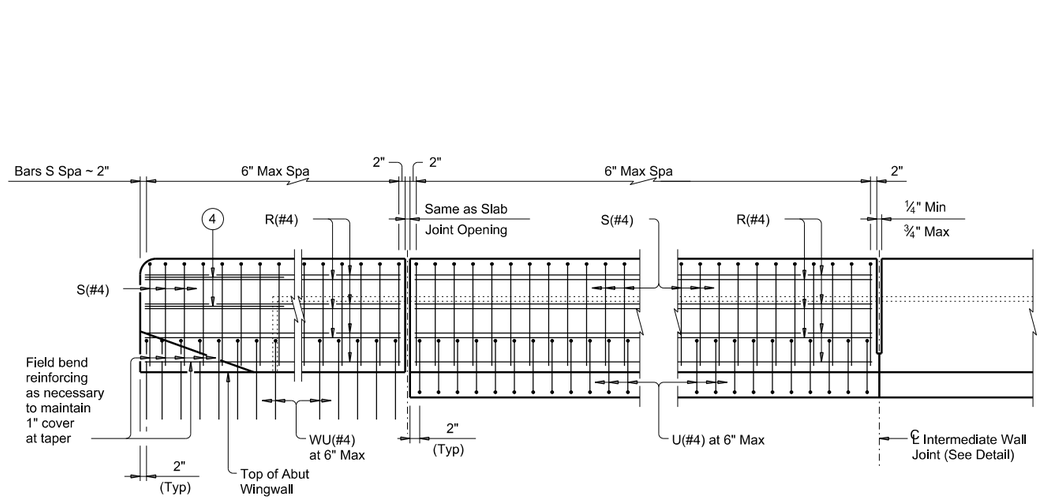
AT ABUTMENTS | AT BENTS WITH SLAB EXP JOINTS | AT BENTS WITHOUT SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL

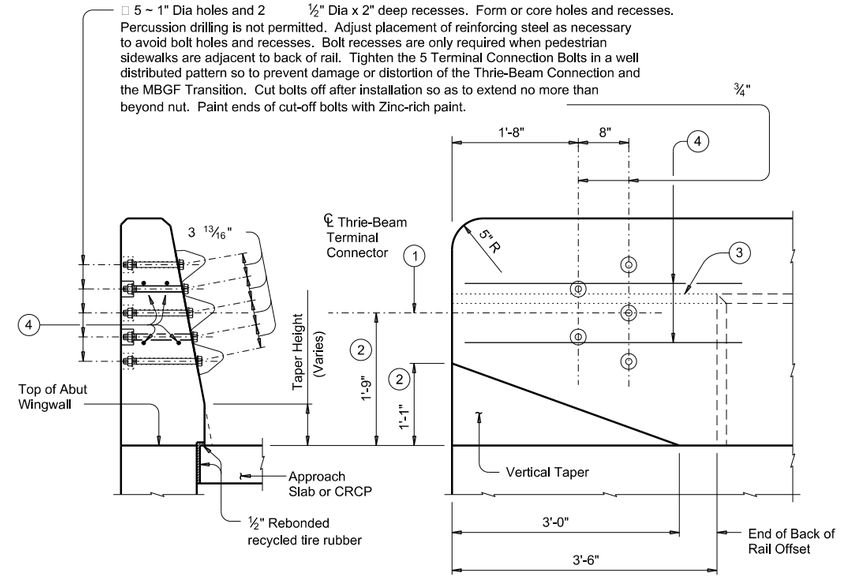


INTERMEDIATE WALL JOINT DETAIL

Provide at all interior bents without slab expansion joints.

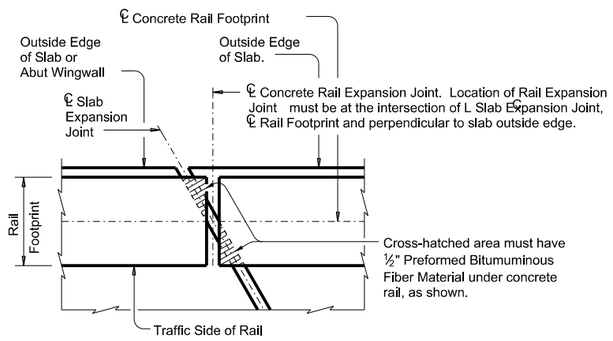


ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



SECTION | ELEVATION

TERMINAL CONNECTION DETAILS



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

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

Texas Department of Transportation | Bridge Division Standard

TRAFFIC RAIL
SINGLE SLOPE

TYPE SSTR

FILE: rlstd014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
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REVISIONS	2270	01	023	FM 3438
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	ABL	TAYLOR		96

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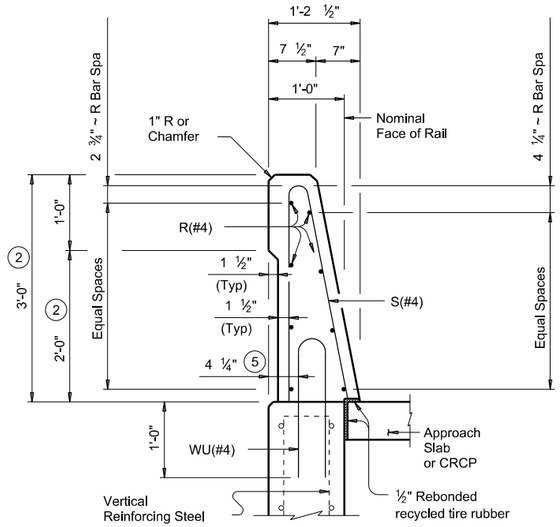
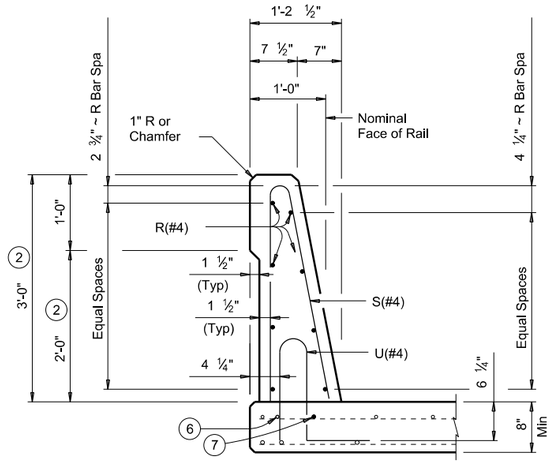


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB

SECTIONS THRU RAIL

(2) Increase 2" for structures with Overlay.

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

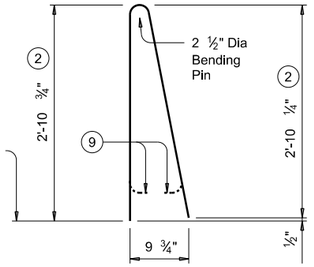
(6) As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars must be furnished at the Contractor's expense.

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

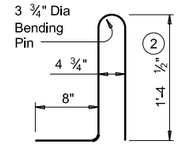
(8) No longitudinal wires may be within upper bend.

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

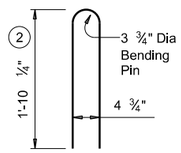
(10) Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greator to side slot drain.



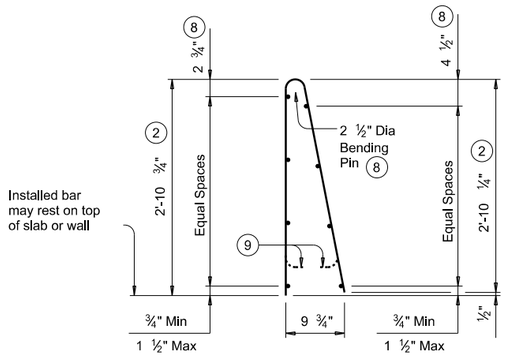
BARS S (#4)



BARS U (#4)

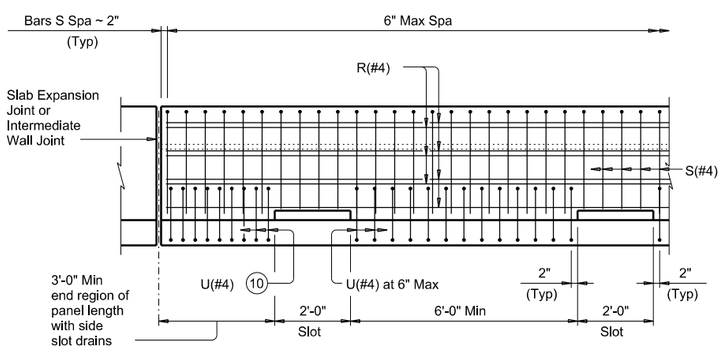


BARS WU (#4)



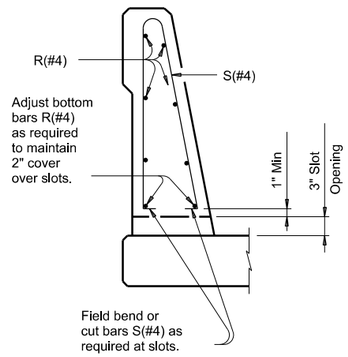
OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

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



OPTIONAL SIDE SLOT DRAIN DETAIL

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



SECTION THRU OPTIONAL SIDE SLOT DRAIN

CONSTRUCTION NOTES:

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

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

The back of railing must be vertical unless otherwise shown in the plans or approved by the Engineer.

MATERIAL NOTES:

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

Provide Grade 60 reinforcing steel.

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

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM 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 or galvanized ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:

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

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

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

Shop drawings will not be required for this rail.

Average weight of railing with no overlay is 376 plf.

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

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL SINGLE SLOPE

TYPE SSTR

FILE: rlstd014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		97

DATE: 5/26/2021
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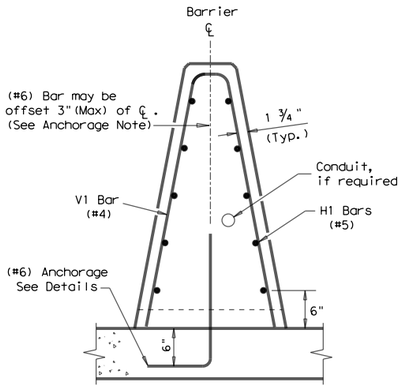
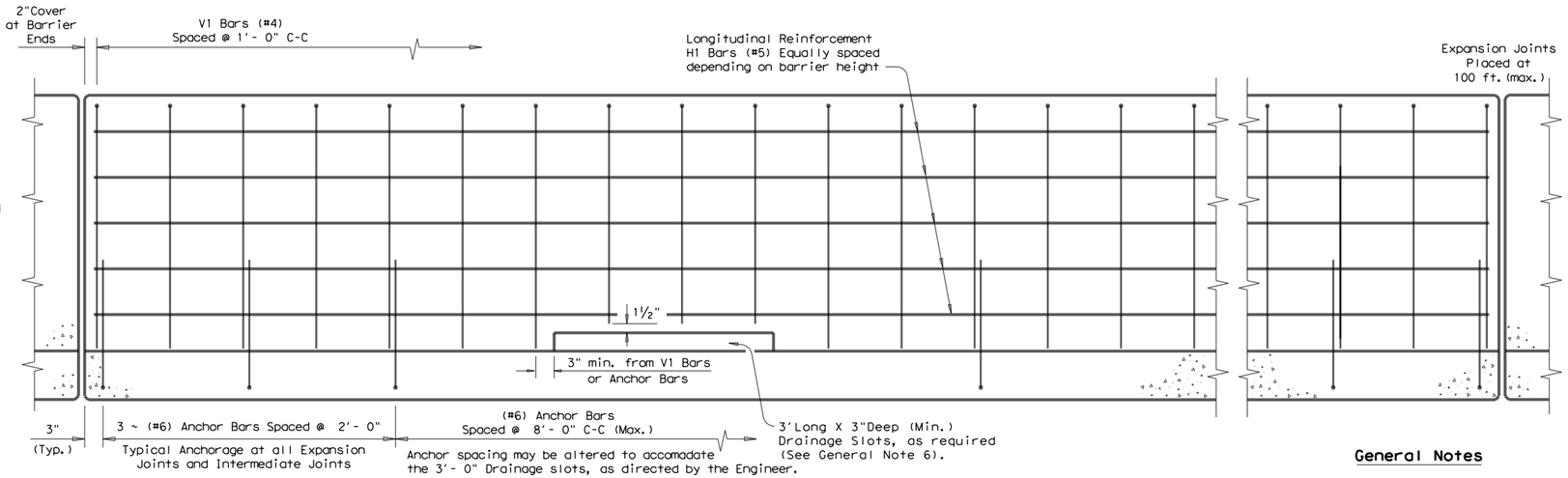


END VIEW

CAST-IN-PLACE (CIP) BARRIER

Barrier is Symmetrical About the Center Line

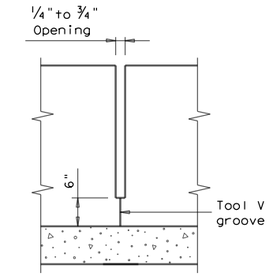


ELEVATION VIEW

Cast-in-Place (SSCB) on Bridge Decks or Continuously Reinforced Concrete Pavement (CRCP) (Showing Reinforcement and Anchor Placement)

Note:
Reinforcement around the drainage slots may be cut or bent to accommodate the edge and top clearances.

The bottom of the reinforcement cage may rest on the top of the Concrete Bridge Deck or CRCP.



INTERMEDIATE JOINT DETAIL

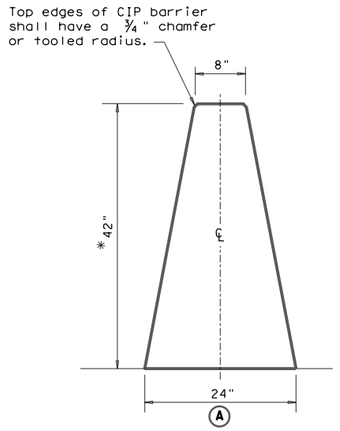
Place at all Bent ℄'s, without expansion joints and spaced at 33 ft. (max), 10 ft. (min).

EXPANSION JOINT PLACEMENT

Place at all transverse joints or 100 ft. (max.), 10 ft. (min).

General Notes

1. Concrete shall be Class C. Unless otherwise specified in the plans.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
   If the bridge slab requires epoxy "coated" reinforcement, the barrier and/or anchorage may require the same, if shown elsewhere in the plans.
3. These details cover barrier per Item 514, "Permanent Concrete Traffic Barrier".
4. Anchorage: The "Optional" Anchor system shall be embedded 6" into fresh concrete or using a Type III, Class C Epoxy anchorage system. Follow the manufacturer's directions for installing the expoxied anchor bars. All anchorage shown is the minimum required, and considered subsidiary to the bid item.
5. Top edges of CIP barrier shall have a ¾" chamfer or tooled radius.
6. Drainage slot locations (12'- 0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer. Drainage slot heights on the SSCB may be increased to a maximum of 5 inches, without geometric changes to the barrier face.
7. Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchor bars. The reinforcement cage may rest on the top of the finished grade.
8. For locations where lighting is required, see the SSCB(4) sheet for the proper reinforcement and anchorage.



*Barrier height (IN.)	Dimensions (IN.)		
	Ⓐ	Ⓑ	Ⓒ
42	24	40 ¼	20 ½
48	26 ¼	46 ¼	22 ¾
54	28 ½	52 ¼	25 1/16

*(SSCB)(42") Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.

SINGLE SLOPE CONCRETE BARRIER

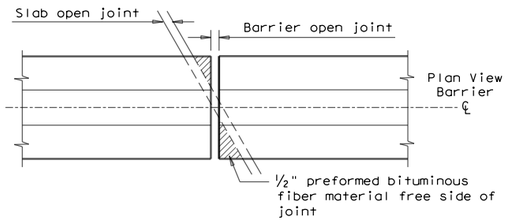
(SSCB)(42")

BARRIER PLACEMENT OVER (CRCP) JOINTS

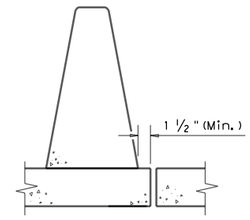
Barrier may be cast over a "Longitudinal" CRCP joint.

CRCP Joints (with or without tiebars): Two layers of 30 lb roofing felt or ½" preformed bituminous fiber material.

Barrier Anchorage Note: Anchorage must be located at least 3" from a longitudinal joint.

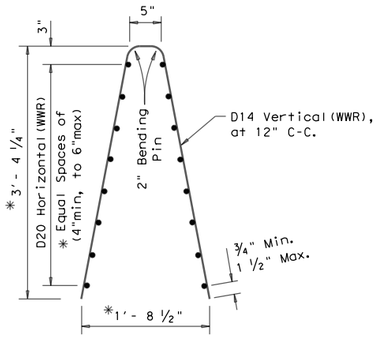


BARRIER OVER TRANSVERSE OPEN JOINT



MINIMUM EDGE DISTANCE FROM LONGITUDINAL JOINT

Barrier placement over a longitudinal bridge joint is not recommended.



Welded Wire Reinforcement (WWR) Option for Bars V1 and H1

(WWR) General Notes

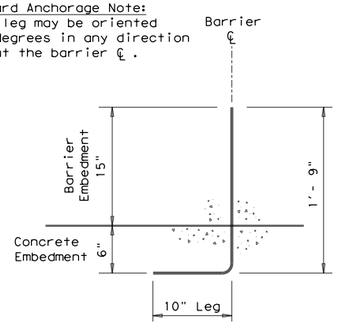
1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut and bent to accommodate the drainage slots, as directed by the Engineer.
3. Welded wire spilce locations shall have a "minimum" splice lap length of 12".
4. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".

Cast-In-Place (CIP) or Slip-Formed (SSCB)

Cast-in-Place barrier may be connected to precast SSCB. Joint connection "Types" may be used in Cast-in-Place barrier, to match the precast barrier connection. (See required connection "Type" elsewhere in the plans)

The weight of Cast-in-Place (SSCB)42" is approx. 717 lbs per ft.

Standard Anchorage Note:
10" leg may be oriented 90 degrees in any direction about the barrier ℄.

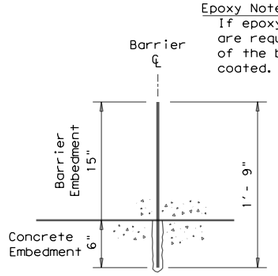


STANDARD ANCHORAGE

(#6) Bar

Concrete Pavement / Bridge Deck Anchorage:
Cast-in-Place or Slip-Formed Barrier
(See General Notes 2)

Epoxy Note:
If epoxy coated anchor bars are required, the lower 6" of the bars must not be epoxy coated.

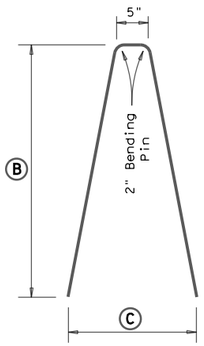


"OPTIONAL" ANCHORAGE

(#6) Bar

Fresh insertion method or Type III, Class C Epoxy Method

Concrete Pavement / Bridge Deck Anchorage:
Cast-in-Place or Slip-Formed Barrier
(See General Notes 2 & 4)



V1 Bar

(#4) Bar

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

CAST-IN-PLACE
(TYPE 1)
(BRIDGE DECK OR CRCP)

SSCB(1)-16

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	ABL	TAYLOR		98

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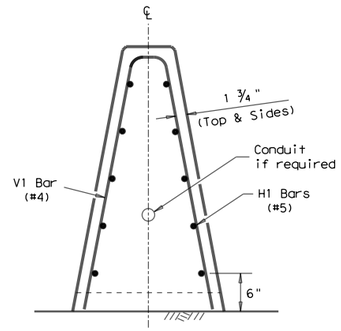
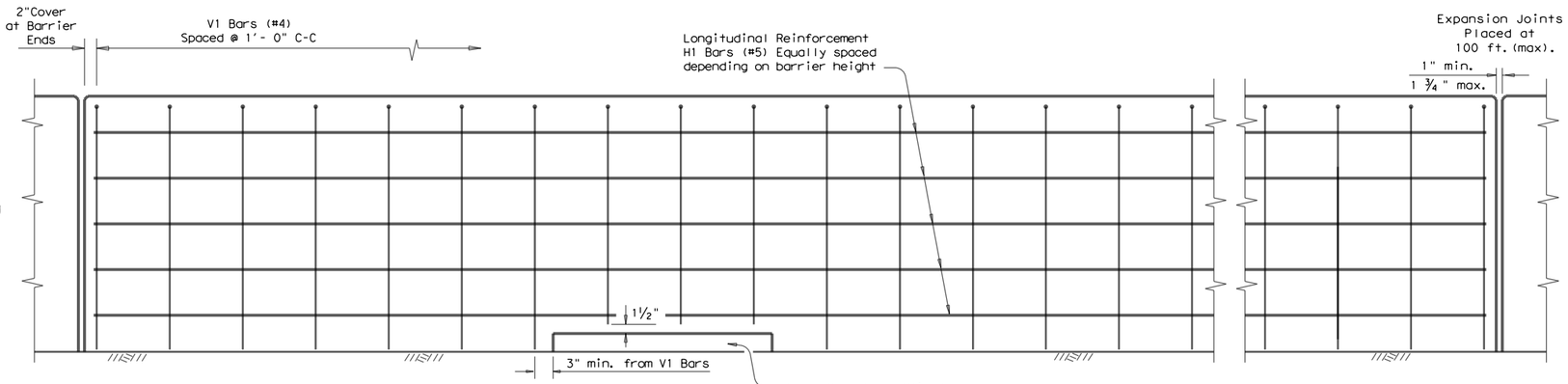


END VIEW

CAST-IN-PLACE (CIP) BARRIER

Barrier is Symmetrical About the Center Line

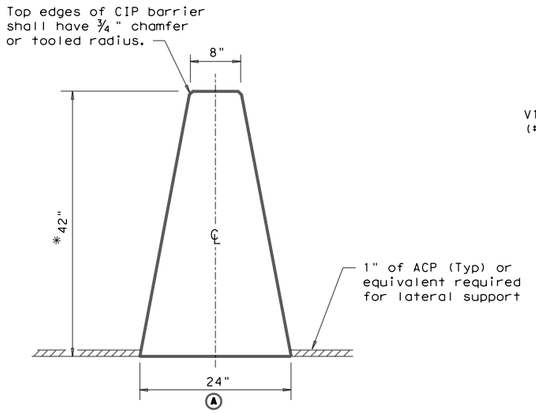


Note:
Bottom of reinforcement cage may rest on top of the finished grade.

Reinforcement around the drainage slots may be cut or bent to accommodate the edge and top clearances.

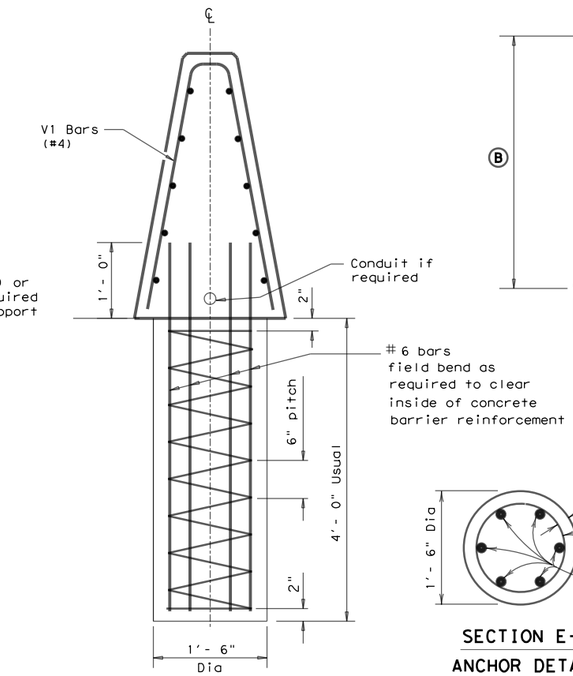
ELEVATION VIEW

Cast-in-Place (SSCB)(Type 2)on Roadway



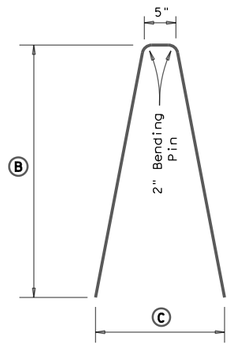
SINGLE SLOPE CONCRETE BARRIER

(SSCB)(42")



SECTION D-D

ANCHOR DETAIL

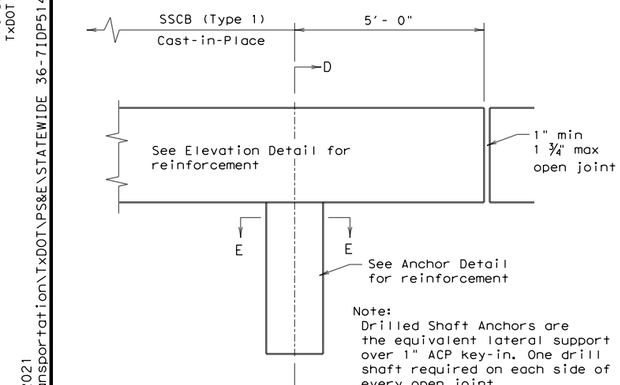


V1 Bar

#4 Rebar

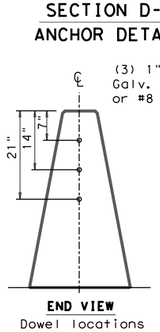
BARRIER HEIGHT (IN.)	* DIMENSIONS (IN.)		
	Ⓐ	Ⓑ	Ⓒ
42	24	40 ¼	20 ½
48	26 ¼	46 ¼	22 ¾
54	28 ½	52 ¼	25 ⁹⁄₁₆

*(SSCB)(42") Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.



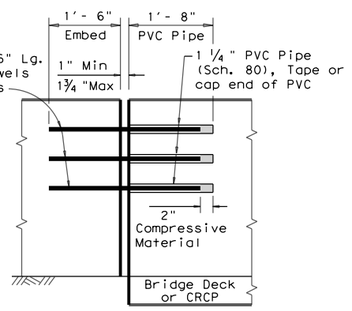
ELEVATION

ANCHOR LOCATION



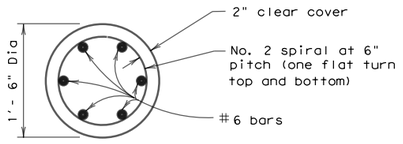
END VIEW

Dowel locations



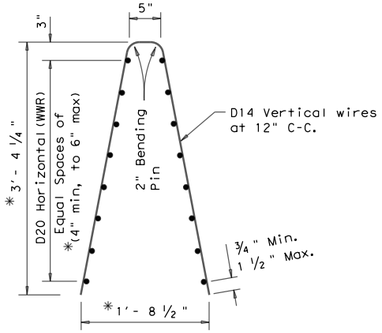
EXPANSION JOINT (Dowel Connection)

Dowels may be used, as directed by the Engineer, in locations where the barrier could be laterally displaced.



SECTION E-E

ANCHOR DETAIL



Welded Wire Reinforcement (WWR) Option for Bars V1 and H1

(WWR) General Notes

1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut and bent to accommodate the drainage slots, as directed by the Engineer.
3. Weled wire spilce locations shall have a "minimum" splice lap length of 12".
4. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".

GENERAL NOTES

1. Concrete shall be Class C. Unless otherwise specified in the plans.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. These details cover barrier per Item 514,"Permanent Concrete Traffic Barrier".
4. The Anchorage shown is considered subsidiary to the bid item.
5. Top edges of CIP barrier shall have a ¾" chamfer or tooled radius.
6. Drainage slot locations (12'- 0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer. Drainage slot heights on the SSCB may be increased to a maximum of 5 inches, without geometric changes to the barrier face.
7. Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchorage.
8. For locations where lighting is required, see the SSCB(4) sheet for the proper reinforcement and anchorage.

Cast-In-Place (CIP) or Slip-Formed (SSCB)

Cast-in-Place barrier may be connected to precast SSCB. Joint connection "Types" may be used in Cast-in-Place barrier, to match the precast barrier connection. (See required connection "Type" elsewhere in the plans)

The weight of Cast-in-Place (SSCB)42" is approx. 717 lbs per ft.

Texas Department of Transportation

Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

CAST-IN-PLACE
(TYPE 1)
(FLEXIBLE PAVEMENT)

SSCB(1F)-10

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	ABL	TAYLOR		99

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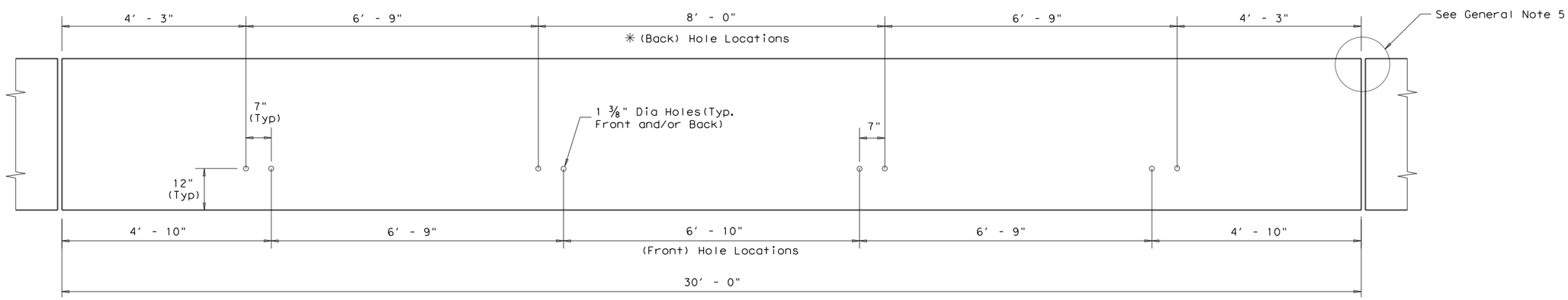
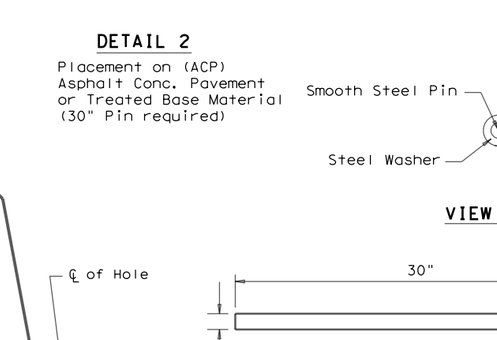


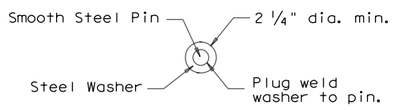
DETAIL 1

Precast SSCB(42")
Showing hole locations

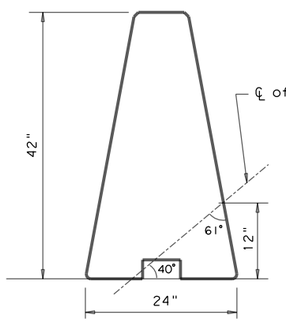


DETAIL 2

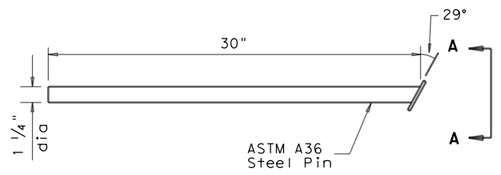
Placement on (ACP)
Asphalt Conc. Pavement
or Treated Base Material
(30" Pin required)



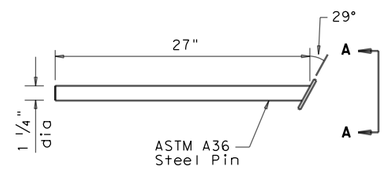
VIEW A-A



HOLE LOCATION DETAIL



(30") PIN DETAIL
See Detail 2

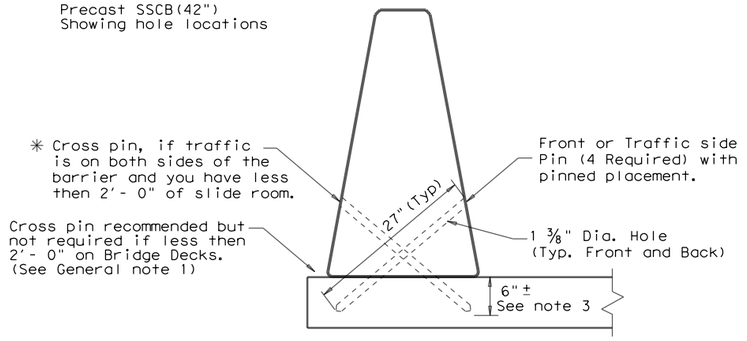


(27") PIN DETAIL
See Detail 3

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

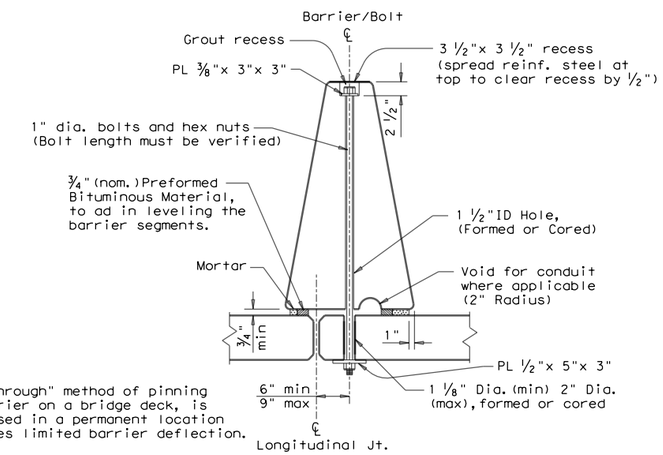
DETAIL 3

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

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	ABL	TAYLOR		100

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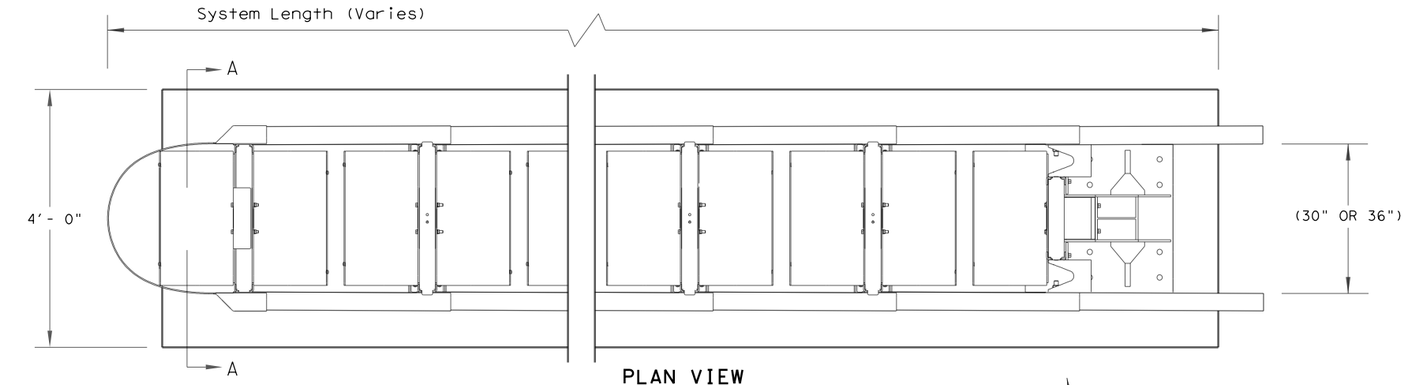
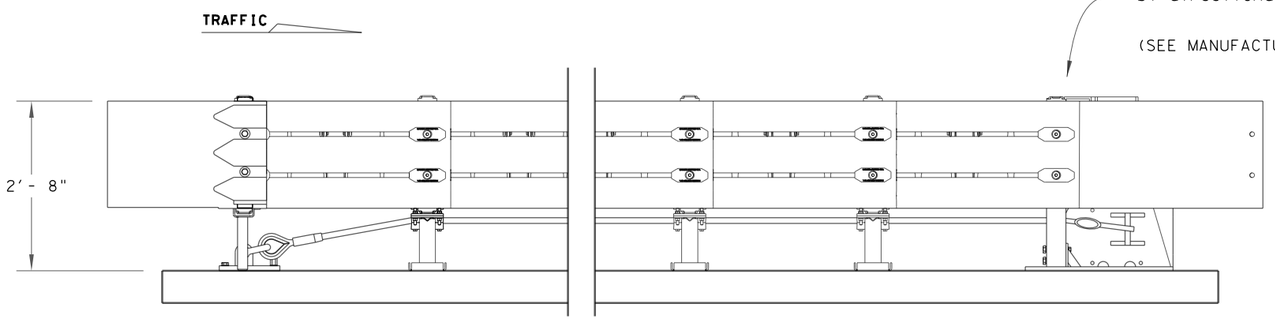


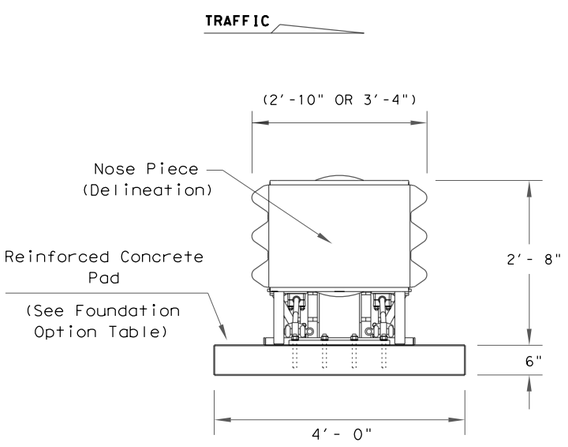
PLAN VIEW

Attachments and transitions to various barrier shapes, barrier railings and bi-directional traffic flows are available.

(SEE MANUFACTURER'S PRODUCT MANUAL)



ELEVATION VIEW



SECTION A-A

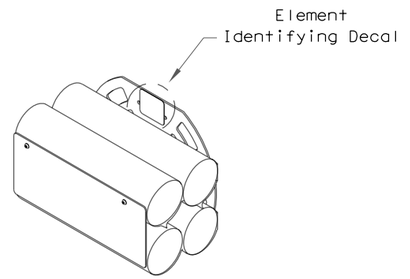
Nose Piece delineation orientation, is shown elsewhere on the plans.

TRANSITION OPTIONS
Vertical Wall
Concrete Traffic Barriers
W-Beam Guardrail
Thrie Beam Guardrail

For bi-directional transition panel and end shoe details. (See manufacturer's product manual.)

FOUNDATION OPTIONS
6" Reinforced Concrete
8" Unreinforced Concrete
Asphalt over Concrete with Minimum 6" Embedment in Concrete
6" Asphalt over 6" Compact Subbase
8" Minimum Asphalt

For steel placement in concrete foundations. (See manufacturer's product manual)



ENERGY ABSORBING ELEMENTS (EAE)

BACKUP SUPPORT OPTIONS
Compact (Stand Alone)
Flush Mount
PCB (Concrete Barrier)

TAU-II-R (NARROW) SYSTEM LENGTHS			
BACKSTOP	TL-2	TL-3	70 mph
PCB	13'-7"	27'-10"	30'-7"
Flush Mount	14'-0"	28'-3"	31'-0"
Compact	15'-3"	29'-6"	32'-3"

Backup and Transition types are shown elsewhere on the plans, (i.e. Attenuator location details or in the general notes).

Note: System lengths are ± 2"

GENERAL NOTES

1. For specific information regarding installation and technical guidance of the system, contact: Lindsay Transportation Solutions - Barrier Systems, Inc. at (707) 374-6800. 180 River Road, Rio Vista, CA 94571
2. For bi-directional traffic, appropriate transition panels will be required.
3. Additional details for the backup support option, transition options and foundation option will be shown on the manufacturer's shop drawings furnished to the Engineer.
4. Concrete shall be class "S" with a minimum compressive strength of 4,000 psi.
5. Maximum permissible cross-slope is 8%.
6. The installation area should be free from curbs, elevated objects, or depressions.
7. The TAU-II-R system should be approximately parallel with the barrier or center of merging barriers.
8. Refer to Universal TAU-II-R configuration chart for specific systems configuration number and location of each type of energy absorbing element.
9. 30-inch (30") model shown, also available in 36-inch (36") configuration.

BILL OF MATERIAL

PRODUCT CODE	QTY	DESCRIPTION
B030704	1	Front Support
B030703	TBD	Mid Support
TBD	1	Backstop Assembly (See Table)
TBD	1	Front Cable Anchor
TBD	1	Nose Assembly
B010202	TBD	Sliding Panel
B010659	2	End Panel
K001003	1	Slider Assembly Kit
BSI-1202006-KT	TBD	TAU-II-R Slider Kit
BSI-1107131-KT	TBD	TAU-II-R EAE Mounting Hw Kit
BSI-1012069-00	TBD	Energy Absorbing Element, Type 1
BSI-1012070-00	TBD	Energy Absorbing Element, Type 2
BSI-1012071-00	TBD	Energy Absorbing Element, Type 3
BSI-1110009-00	TBD	Energy Absorbing Element, Type 3N
TBD	TBD	Cable Assembly
K001004	TBD	Cable Guide Kit
K001005	2	Front Support Leg Kit
B010651	4	Pipe Panel Mount
TBD	1	Anchoring Package

(TBD) = To Be Determined, depending on Backup Type and System Length.

(See manufacturer's product manual for details)

LOW MAINTENANCE

Texas Department of Transportation

Design Division Standard

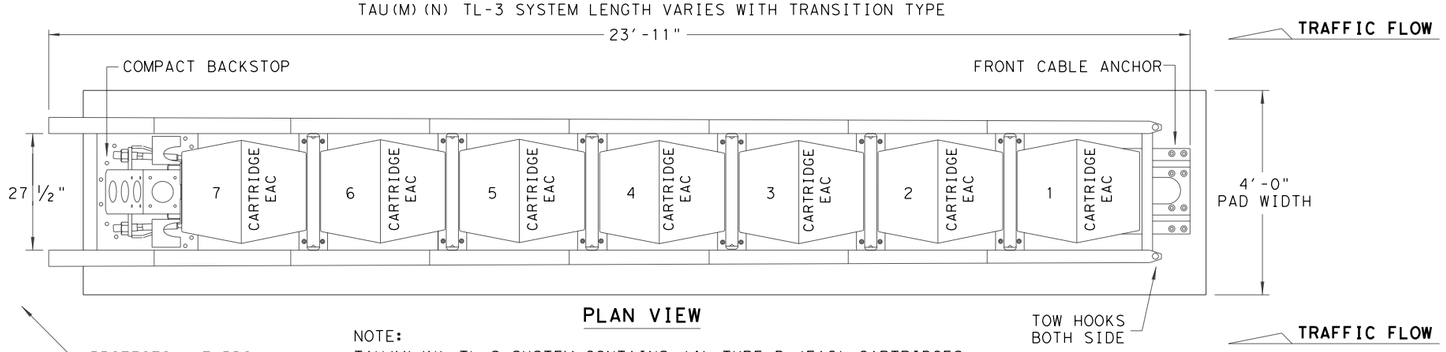
LTS-BARRIER SYSTEMS CRASH CUSHION (R-NARROW)

TAU-II-R(N)-16

FILE: tauiirn16.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL
©TxDOT: January 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
REVISED 06,2013 (VP)	DIST	COUNTY		SHEET NO.
REVISED 03,2016 (VP)	ABL	TAYLOR		101

DATE: 5/26/2021
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\STANDARDS\2D\taumn19.dgn

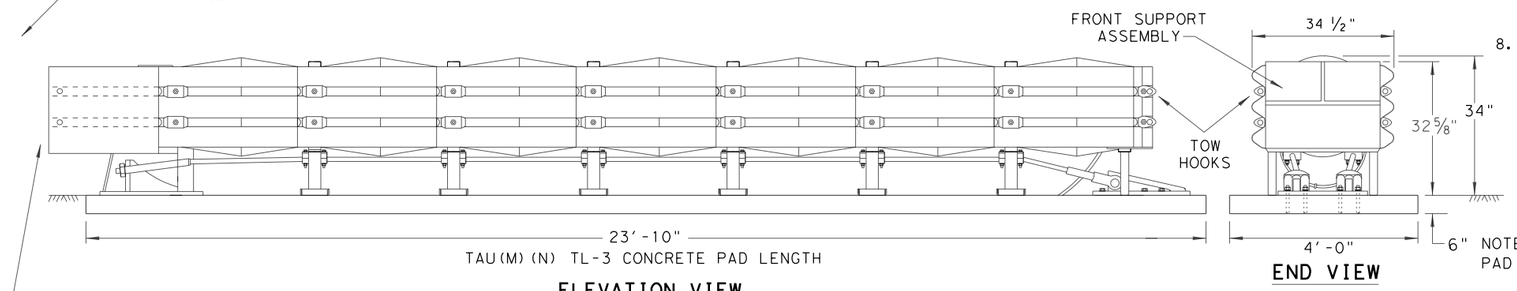
TAU(M)(N) TL-3 SYSTEM LENGTH VARIES WITH TRANSITION TYPE



PLAN VIEW

PROTECTS HAZARDS UP TO 30" WIDTH

NOTE:
TAU(M)(N) TL-2 SYSTEM CONTAINS (4) TYPE B (EAC) CARTRIDGES. INSTALLED ON ROADWAYS WITH MAXIMUM SPEEDS OF 45 MPH.



ELEVATION VIEW

END VIEW

NOTE:
PAD THICKNESS VARIES - SEE FOUNDATION OPTIONS

NOTES:
TRANSITIONS AND ATTACHMENTS TO VARIOUS BARRIER SHAPES, RAILINGS AND BI-DIRECTIONAL TRAFFIC FLOWS ARE AVAILABLE. SEE MANUFACTURER'S INSTALLATION INSTRUCTIONS MANUAL FOR ADDITIONAL TRANSITION DETAILS.

NOTE:
CONCRETE FOUNDATION PAD LENGTH VARIES WITH TL-3 AND TL-2 SYSTEMS, SEE SYSTEM & FOUNDATION LENGTH TABLE.

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. REFER TO THE LATEST (LTS) INSTALLATION INSTRUCTION MANUAL FOR IMPORATANT SAFETY MESSAGES, COMPLETE SYSTEM ASSEMBLY, AND ANCHOR INSTALLATION REQUIREMENTS FOR THE NINE (9) DIFFERENT SITE TRANSITIONS.
3. INSTALLATION DETAILS FOR THE COMPACT BACKSTOP, FRONT CABLE ANCHOR AND FOUNDATION OPTIONS ARE SHOWN ON THE INSTALLATION INSTRUCTION MANUAL FURNISHED TO THE ENGINEER.
4. CONCRETE SHALL BE CLASS "S" WITH A MINIMUM COMPRESSIVE STRENGTH OF 4,000 P.S.I.
5. IF THE CROSS-SLOPES VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%
6. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
7. THE TAU(M)(N) SYSTEM SHOULD BE APPROXIMATELY PARALLEL WITH THE BARRIER OR CENTER LINE OF MERGING BARRIERS.
8. THIS DRAWING REPRESENTS THE UNIVERSAL TAU(M)(N) TL-3 SYSTEM, A RE-DIRECTIVE NON-GATING CRASH CUSHION THAT CAN PROTECT HAZARDS UP TO 30-INCHES IN WIDTH. ALSO AVAILABLE IN TL-2 CONFIGURATION.

BILL OF MATERIALS FOR TAU(M)(N) TL-3 & TL-2 SYSTEMS		QUANTITIES	
PART NUMBER	PART DESCRIPTION	TL-3 SYSTEM	TL-2 SYSTEM
BSI-1708019-00	SLIDING PANEL GALVANIZED TAU(M)(N)	14	8
BSI-1708030-00	END PANEL, THRIE BEAM, GALV, TAU(M)(N)	2	2
BSI-1706001-00	CABLE ASSEMBLY, 7 BAY, TAU(M)(N)	2	-
BSI-1805036-00	CABLE ASSEMBLY, 4 BAY, TAU(M)(N)	-	2
BSI-1708018-00	FRONT CABLE ANCHOR	1	1
BSI-1707034-00	COMPACT BACKSTOP	1	1
B030703	MIDDLE SUPPORT ASSEMBLY	6	3
B030704	FRONT SUPPORT	1	1
B010722	ENERGY ABSORBING CARTRIDGE, TYPE B	7	4
K001005	TAU-II FRONT SUPPORT LEG KIT	1	1
BSI-1709083-KT	TETHER KIT (INCLUDES ALL HARDWARE)	1	1
BSI-1809041-KT	SLIDER KIT (INCLUDES ALL HARDWARE)	7	4
BSI-1808033-KT	CABLE GUIDE KIT (INCLUDES ALL HARDWARE)	6	3
BSI-1809040-KT	TOW HOOK KIT (INCLUDES ALL HARDWARE)	1	1
BSI-1808034-KT	DELINEATION BRACKET KIT(INCLUDES ALL HARDWARE)	1	1
BSI-1808035-KT	END PANEL MOUNT KIT (INCLUDES ALL HARDWARE)	1	1
BSI-1808036-KT	CONCRETE ANCHORING KIT	1	1
⁂ SEE NOTE	HIGH REFLECTIVE DECAL	1	1
ECN 3883	INSTALLATION AND INSTRUCTIONS MANUAL	1	1

NOTES:
UPGRADE KITS ARE AVAILABLE TO RETROFIT EXISTING NCHRP 350 TAU-II SYSTEMS TO MASH COMPLIANT SYSTEMS. SEE MANUFACTURER'S PRODUCT INFORMATION.

THE TAU(M)(N) UNIDIRECTIONAL SYSTEM IS FREE STANDING AND IS NOT REQUIRED TO BE CONNECTED TO THE HAZARD.

TRANSITIONS TO GUARD FENCE, BRIDGE RAILS AND ROADSIDE BARRIERS SHALL BE IN ACCORDANCE WITH TxDOT'S POLICY.

FOUNDATION OPTIONS
6" REINFORCED CONCRETE
8" UNREINFORCED CONCRETE
ASPHALT OVER CONCRETE WITH MINIMUM 6" EMBEDMENT IN CONCRETE
⁂ 6" ASPHALT OVER 6" COMPACT SUBBASE
⁂ 8" MINIMUM ASPHALT

SYSTEM & FOUNDATION LENGTH TABLE	
SYSTEM LENGTH	FOUNDATION LENGTH
TL-2 = 15′-5"	TL-2 = 15′-4"
TL-3 = 23′-11"	TL-3 = 23′-10"

⁂ NOTE:
REQUIRES AN ASPHALT ANCHORAGE PACKAGE: INCLUDES ADDITIONAL BRACES FOR THE FRONT CABLE ANCHOR AND THE COMPACT BACKSTOP, AND ASPHALT HARDWARE KIT. THE TL-3 ASPHALT CONFIGURATION ALSO REQUIRES NESTED SLIDER PANELS AND SHIMS AT THE LAST TWO BAYS. SEE MANUFACTURER'S INSTALLATION INSTRUCTION MANUAL FOR DETAILS.

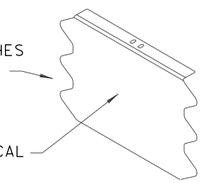
NOTE:
SEE MANUFACTURER'S INSTALLATION INSTRUCTION MANUAL FOR FOUNDATION SPECIFICATIONS THAT INCLUDE, STONE AGGREGATE MIX, COMPRESSION STRENGTH, STEEL SIZE, ANCHOR SIZE, AND EMBEDMENT DEPTH.

TRANSITION OPTIONS	
USE THE COMPACT BACKSTOP	VERTICAL WALL
	CONCRETE TRAFFIC BARRIERS
	W-BEAM GUARDRAIL
	THRIE BEAM GUARDRAIL

NOTE:
FOR BI-DIRECTIONAL TRANSITION PANELS AND BRIDGE RAIL END SHOE DETAILS. SEE MANUFACTURER'S INSTALLATION INSTRUCTIONS MANUAL.

⁂⁂ NOTE:
ENGINEER OR CONTRACTOR SHALL COORDINATE WITH THE MANUFACTURER FOR THE CORRECT DECAL PER TRAFFIC FLOW, LEFT, RIGHT OR BOTH-SIDES.

NOTE:
DELINEATION BRACKET ATTACHES TO FRONT SUPPORT ASSEMBLY.



DELINEATION BRACKET

NOTE:
APPLY A HIGH REFLECTIVE DECAL TO THE DELINEATION BRACKET. 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 UNIVERSAL TAU(M)(N) SYSTEM, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTION MANUAL.

REUSABLE

Texas Department of Transportation — Design Division Standard

LINDSAY TRANSPORTATION SOLUTIONS

UNIVERSAL CRASH CUSHION (MASH TL-3 & TL-2)

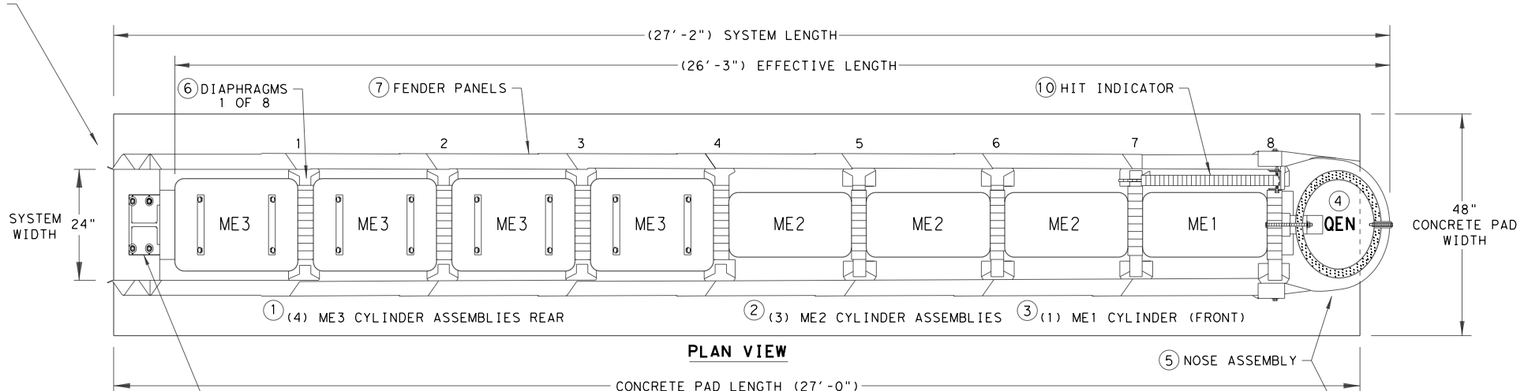
TAU(M)(N)-19

FILE: taumn19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
©TxDOT: APRIL 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		102

DATE: 5/26/2021
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7\DP5143\FM 3438\CADD\STANDARDS\2D\qgelitem10n20.dgn

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

QUADGUARD EITE M10 24" WIDE (8 BAY) SYSTEM



PLAN VIEW

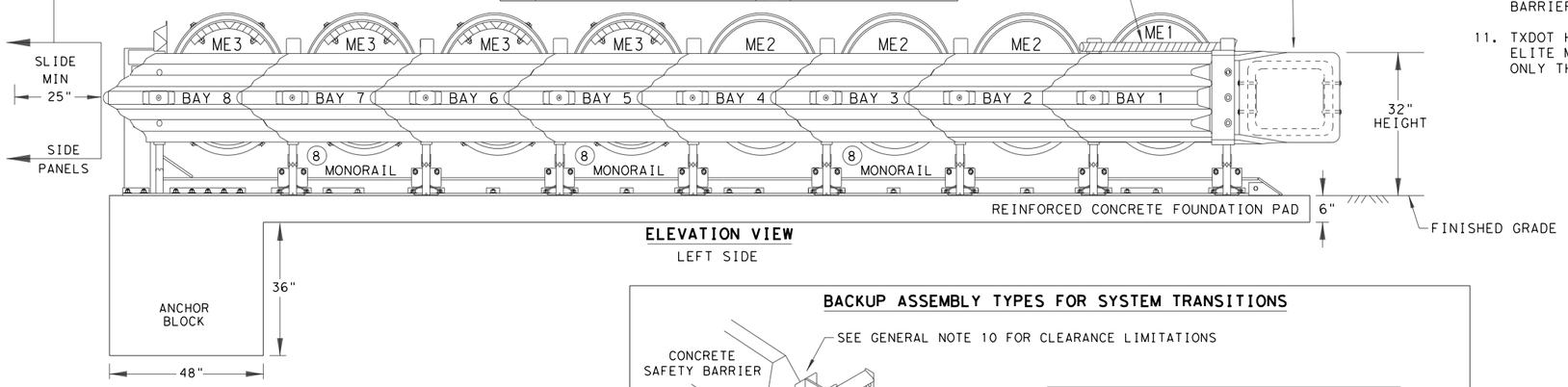
KEY		KEY	
1	ME3 CYLINDER ASSEMBLIES	6	DIAPHRAGMS
2	ME2 CYLINDER ASSEMBLIES	7	FENDER PANELS
3	ME1 CYLINDER ASSEMBLY	8	MONORAILS
4	QEN CYLINDER	9	TYPE OF BACKUP
5	NOSE BELT ASSEMBLY	10	HIT INDICATOR

9 SHOWN WITH TENSION STRUT BACKUP ASSEMBLY

4 QEN CYLINDER INSTALLED INSIDE OF NOSE BELT ASSEMBLY 5

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

NOTE:
HIT INDICATOR WILL RAISE UPON IMPACT.



ELEVATION VIEW
LEFT SIDE

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

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

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

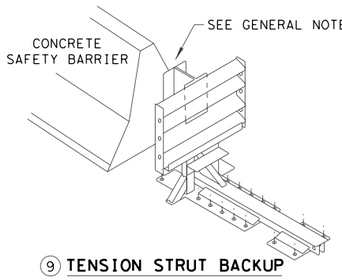
8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.

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

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

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

BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS

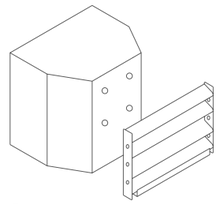


9 TENSION STRUT BACKUP

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

NOTE:
TRANSITION ASSEMBLIES FOR THE QUADGUARD ELITE M10 TO THRIE-BEAM OR W-BEAM FENCE REQUIRES I-BEAM POSTS:

10 (W6X9) I-BEAM POSTS.
POST 1 THRU 4 (84" LONG)
POST 5 THRU 10 (72" LONG)



9 CONCRETE BACKUP

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

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

GENERAL NOTES

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

FOUNDATION & ANCHORING REQUIREMENTS FOUNDATION TYPES: A, B, C, & D	
FOUNDATION TYPE: A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 ½" - APPROVED ADHESIVE
FOUNDATION TYPE: B	ASPHALT OVER P.C.C.
FOUNDATION:	3" MIN. (A.C.) OVER 3" MIN. (P.C.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½"
FOUNDATION TYPE: C	ASPHALT OVER SUBBASE
FOUNDATION:	6" MIN. (A.C.) OVER 6" MIN. (C.S.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE
FOUNDATION TYPE: D	ASPHALT ONLY
FOUNDATION:	8" MIN. (A.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE

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

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

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

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

LOW MAINTENANCE

Texas Department of Transportation
Design Division Standard

TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD ELITE M10 (MASH TL-3)

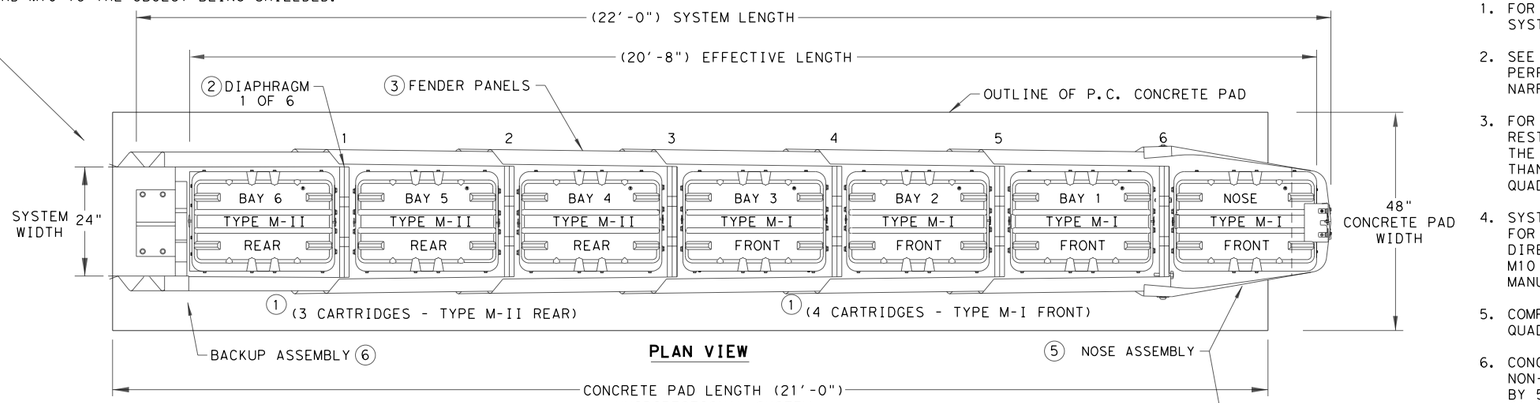
QGELITE(M10)(N)-20

FILE: qgelitem10n20.dgn	DN: TxDOT	CK: KM	DW: VP	CK: AG
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		103

DATE: 5/26/2021
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\STANDARDS\2D\qguardm10n20.dgn

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

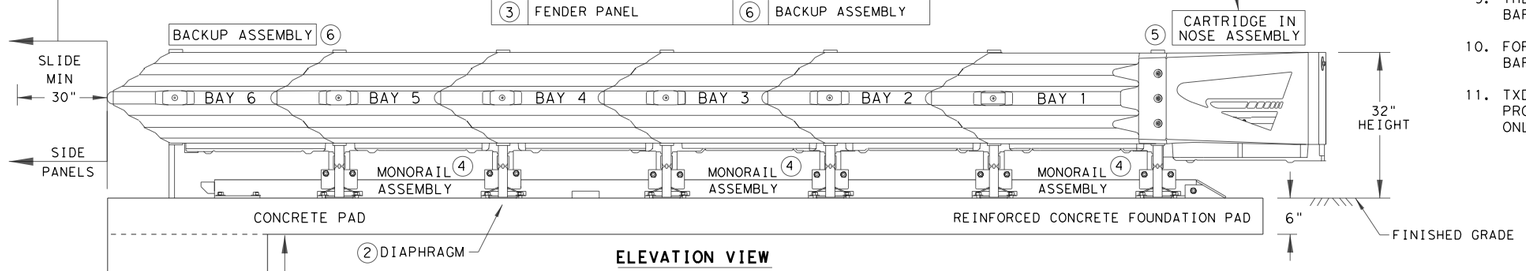
QUADGUARD M10 24" WIDE 6-BAY SYSTEM



PLAN VIEW

KEY		KEY	
1	QUADGUARD CARTRIDGE	4	MONORAILS
2	DIAPHRAGM	5	NOSE ASSEMBLY
3	FENDER PANEL	6	BACKUP ASSEMBLY

NOTE:
PROVISION SHALL BE MADE FOR REAR FENDER SIDE PANELS TO SLIDE REARWARD UPON IMPACT, 30" MIN.



ELEVATION VIEW
LEFT SIDE

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

A MANUFACTURER'S DRAWING PACKAGE UNIQUE AND SPECIFIC FOR THE QUADGUARD M10 (N) INSTALATION AND DETAILED INFORMATION REGARDING THE TYPE OF BACKUP ASSEMBLY FOR THE REQUIRED TRANSITION WILL BE PROVIDED TO THE ENGINEER AND INSTALLER.

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

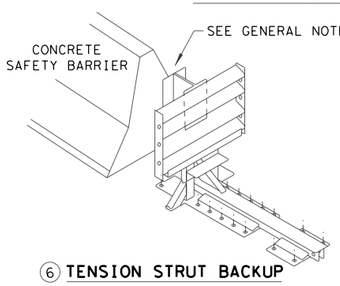
8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.

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

NOTE:
THE QUADGUARD M10 24" WIDE 6-BAY - NARROW SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 3.

TL-3 MODEL #	QM10024	CYLINDER TYPES IN BAYS		
BAYS	6	TYPE-MII	TYPE-MI	TYPE-MI
DIAPHRAGMS	6	3	3	1
WIDTH	24"	REAR	FRONT	NOSE

BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS

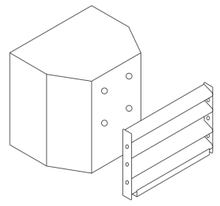


6 TENSION STRUT BACKUP

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

NOTE:
TRANSITION ASSEMBLIES FOR THE QUADGUARD M10 TO THRIE-BEAM OR W-BEAM FENCE REQUIRES I-BEAM POSTS:

10 (W6X9) I-BEAM POSTS.
POST 1 THRU 4 (84" LONG)
POST 5 THRU 10 (72" LONG)



6 CONCRETE BACKUP

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

GENERAL NOTES

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

FOUNDATION & ANCHORING REQUIREMENTS FOUNDATION TYPES: A, B, C, & D	
FOUNDATION TYPE: A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 ½" - APPROVED ADHESIVE
FOUNDATION TYPE: B	ASPHALT OVER P.C.C.
FOUNDATION:	3" MIN. (A.C.) OVER 3" MIN. (P.C.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½"
FOUNDATION TYPE: C	ASPHALT OVER SUBBASE
FOUNDATION:	6" MIN. (A.C.) OVER 6" MIN. (C.S.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE
FOUNDATION TYPE: D	ASPHALT ONLY
FOUNDATION:	8" MIN. (A.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 ½" - APPROVED ADHESIVE

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

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

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

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

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

REUSABLE

Texas Department of Transportation — Design Division Standard

TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD M10 (MASH TL-3 NARROW-24"ONLY)

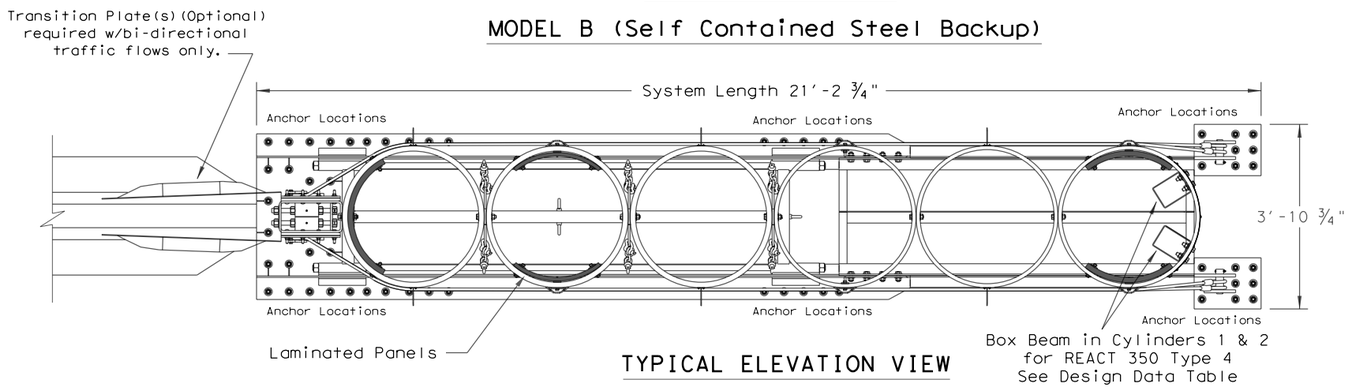
QGUARD(M10)(N)-20

FILE: qguardm10n20.dgn	DN:TxDOT	CK:KM	DW:VP	CK:AG
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		104

DATE: 5/26/2021
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\STANDARDS\2D\reactn16.dgn

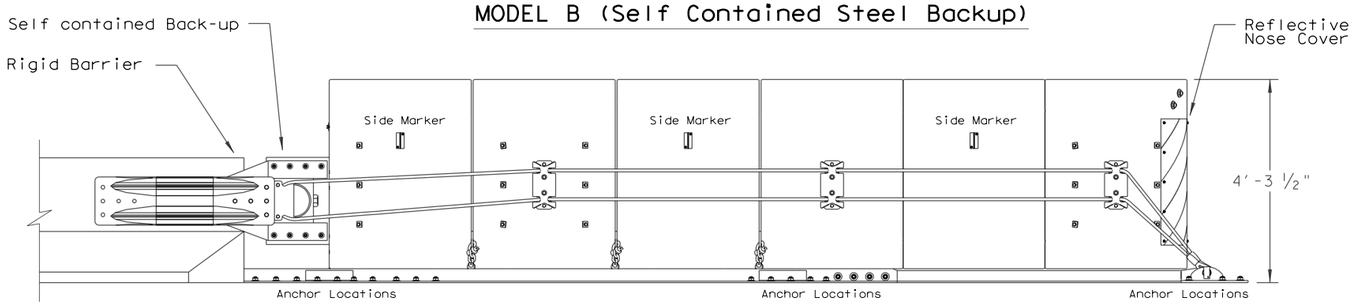
TYPICAL PLAN VIEW

MODEL B (Self Contained Steel Backup)



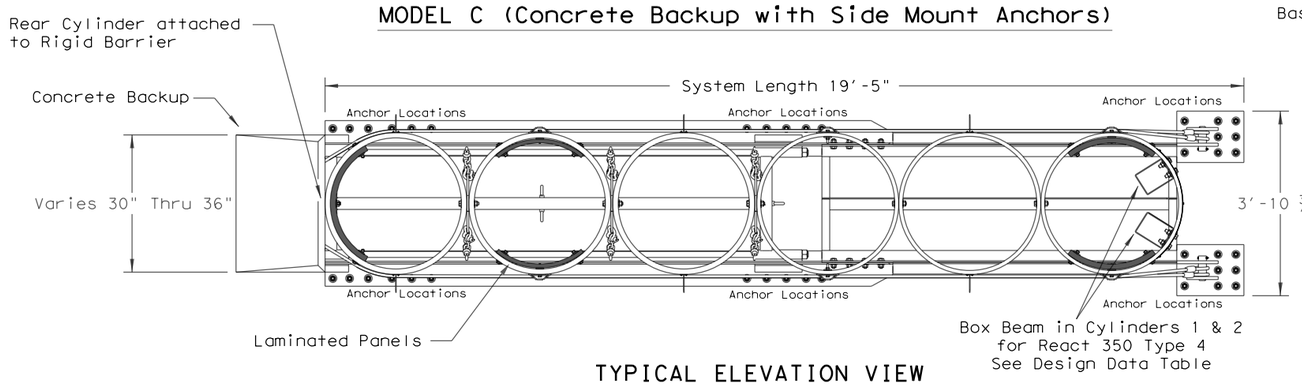
TYPICAL ELEVATION VIEW

MODEL B (Self Contained Steel Backup)



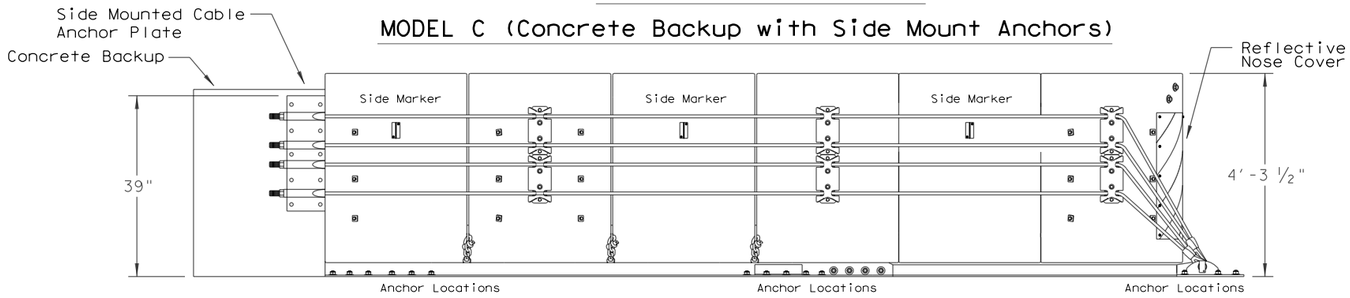
TYPICAL PLAN VIEW

MODEL C (Concrete Backup with Side Mount Anchors)



TYPICAL ELEVATION VIEW

MODEL C (Concrete Backup with Side Mount Anchors)

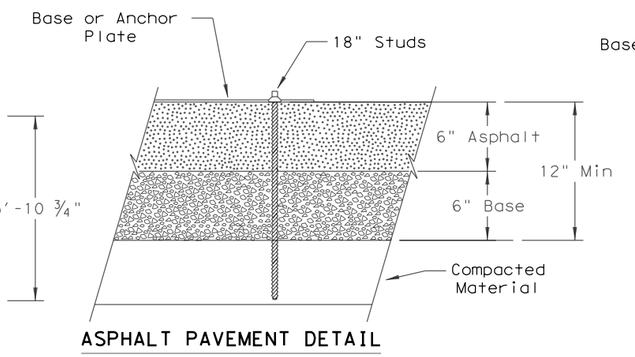


GENERAL NOTES

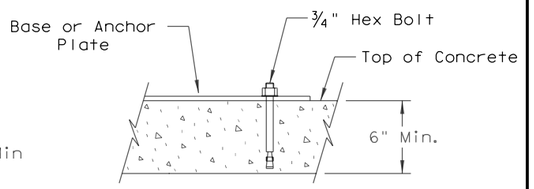
1. For specific information regarding installation and technical guidance of the system, contact: Trinity Highway - Energy Absorption at 1(888)323-6374. 70 W. Madison St. Suite 2350. Chicago, IL 60602
2. The nose of the REACT 350 shall be clad with a plastic wrap with standard delineation adhered to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

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

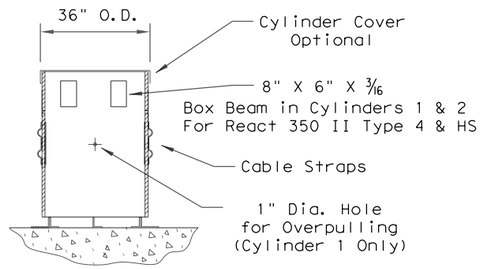
FOUNDATION AND ANCHORAGE TABLE FOR REACT 350 AND REACT 350 II			
FOUNDATION TYPE		MINIMUM THICKNESS	ANCHORAGE
A	CONCRETE PAD OR ROADWAY	6"	MP-3 WITH 7" STUDS [5.5" EMBEDMENT]
B	ASPHALT OVER CONCRETE PAVEMENT	6" CONCRETE PAVEMENT	ANCHOR LENGTH REQUIRED IS 7" STUD PLUS ASPHALT THICKNESS
C	ASPHALT OVER BASE	6" ACP + 6" BASE	MP-3 WITH 18" STUDS [16.5" EMBEDMENT]
D	ASPHALT ONLY	8"	MP-3 WITH 18" STUDS [16.5" EMBEDMENT]



ASPHALT PAVEMENT DETAIL



CONCRETE PAVEMENT DETAIL



TYPICAL CYLINDER

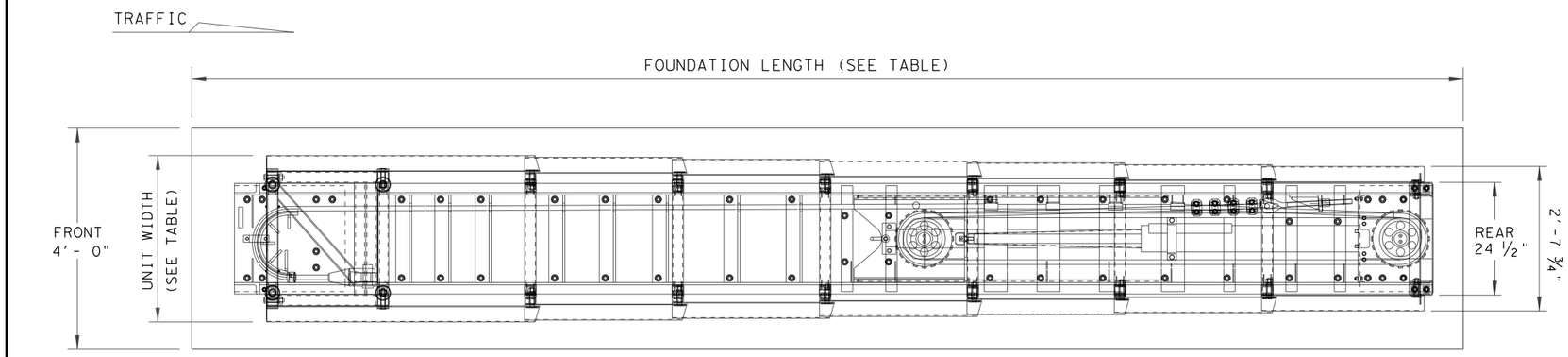
LOW MAINTENANCE

Texas Department of Transportation

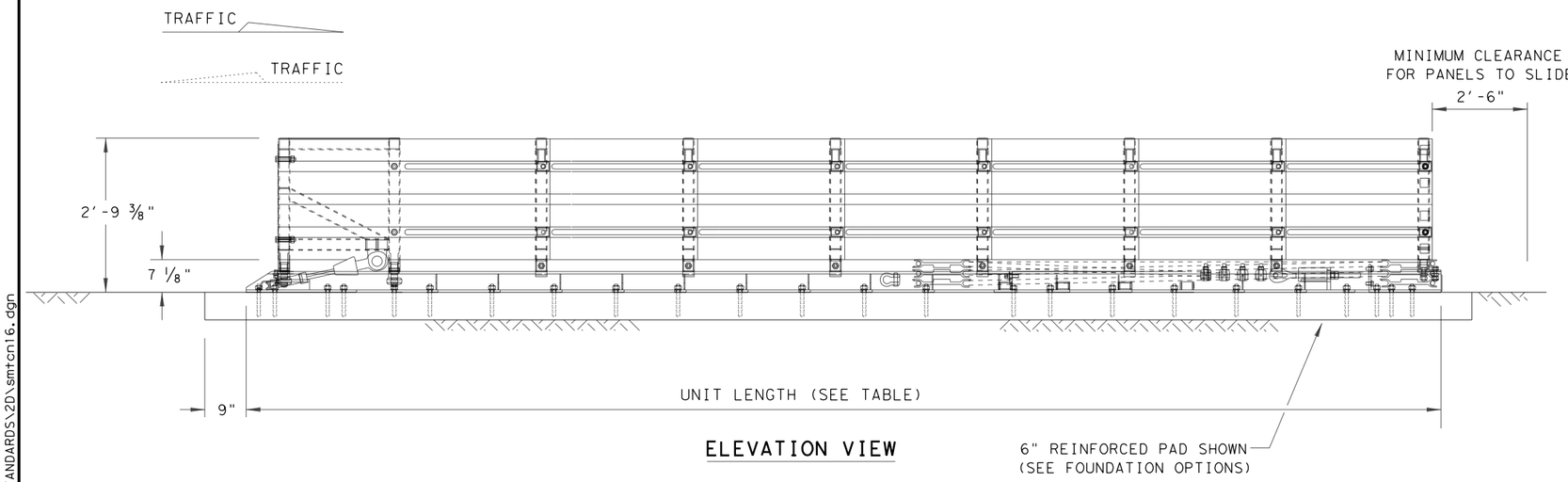
Design Division Standard

TRINITY HIGHWAY ENERGY ABSORPTION
(REACT 350 NARROW)
(REACT 350 II NARROW)
REACT(N)-16

FILE: reactn16.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
REVISED 06,2013 (VP)	DIST	COUNTY		SHEET NO.
REVISED 03,2016 (VP)	ABL	TAYLOR		105



PLAN VIEW



ELEVATION VIEW

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: WORK AREA PROTECTION, CORP. AT (800) 327-4417, OR (630) 377-9100.
2. FOR BI-DIRECTIONAL TRAFFIC, APPROPRIATE TRANSITION PANELS WILL BE REQUIRED.
3. ADDITIONAL DETAILS FOR THE TRANSITION OPTION AND FOUNDATION OPTION WILL BE SHOWN ON THE MANUFACTURER'S SHOP DRAWINGS FURNISHED TO THE ENGINEER.
4. CONCRETE SHALL BE CLASS "S" WITH A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI.
5. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
6. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
7. THE SCI100GM & SCI70GM SYSTEMS SHOULD BE APPROXIMATELY PARALLEL WITH THE BARRIER OR CENTERLINE OF MERGING BARRIERS.

NOTE:
FOR ATTACHMENT AND TRANSITIONS TO OTHER SHAPES, BARRIERS, RAILINGS AND BI-DIRECTIONAL TRAFFIC FLOWS ARE AVAILABLE. (SEE MANUFACTURER'S PRODUCT MANUAL)

NOTE:
SIDE PANELS CAN TRAVEL 30" BEYOND THE LAST TERMINAL BRACE AT THE REAR OF THE CUSHION. ALL OBJECTS THAT MAY INTERFERE WITH THIS MOTION CAN AFFECT PERFORMANCE OF AND MAY CAUSE UNDUE DAMAGE TO THE CRASH CUSHION.

MODEL	TEST LEVEL	UNIT LENGTH (approx.)	UNIT WIDTH	FOUNDATION LENGTH	OBSTACLE WIDTH
SCI70GM	TL-2	13′-6"	2′-10 ⅝"	15′- 6 ¼"	24"to 36"
SCI100GM	TL-3	21′-6"	3′-1 ½"	23′- 0"	24"to 36"

SYSTEM AND PAD LENGTHS VARY DEPENDING ON BACKUP TYPE.

FOUNDATION OPTIONS
6" REINFORCED CONCRETE (5 ½" ANCHOR EMBEDMENT)
8" UNREINFORCED CONCRETE (5 ½" ANCHOR EMBEDMENT)
3" MIN. ASPHALT OVER 3" MIN. CONCRETE (16 ½" ANCHOR EMBED.)
6" ASPHALT OVER 6" COMPACT SUBBASE (16 ½" ANCHOR EMBED.)
8" MINIMUM ASPHALT (16 ½" ANCHOR EMBEDMENT)

FOR STEEL PLACEMENT IN CONCRETE FOUNDATIONS, SEE MANUFACTURER'S PRODUCT MANUAL.

TRANSITION OPTIONS
CONCRETE VERTICAL WALL
CONCRETE TRAFFIC BARRIERS
GUARDRAIL (W-BEAM)
GUARDRAIL (THRIE-BEAM)

TRANSITION TYPES ARE SHOWN ELSEWHERE ON THE PLANS (I.E. ATTENUATOR LOCATION DETAILS OR IN THE GENERAL NOTES).

FOR BI-DIRECTIONAL TRANSITION PANEL AND END SHOE DETAILS, SEE MANUFACTURER'S PRODUCT MANUAL.

LOW MAINTENANCE

Texas Department of Transportation

Design Division Standard

WORK AREA PROTECTION CORP (SMART-NARROW)

SMTC(N)-16

FILE: smtcn16.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
©TxDOT: February 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED 06, 2013 (VP) REVISED 03, 2016 (VP)	2270	01	023	FM 3438
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	ABL	TAYLOR		106

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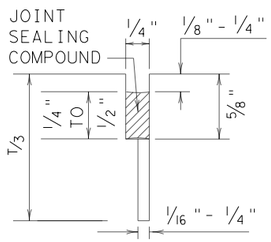
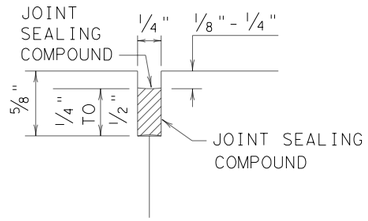
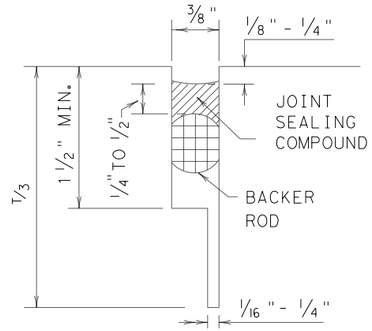
METHOD B: JOINT SEALING COMPOUND



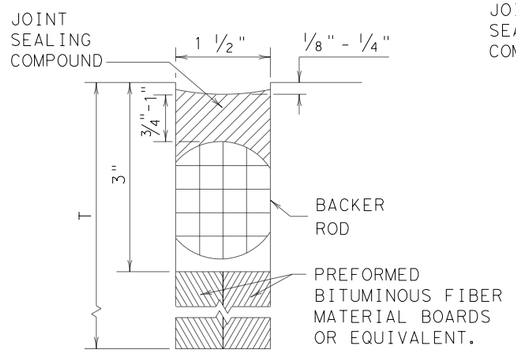
LONGITUDINAL SAWED
CONTRACTION JOINT



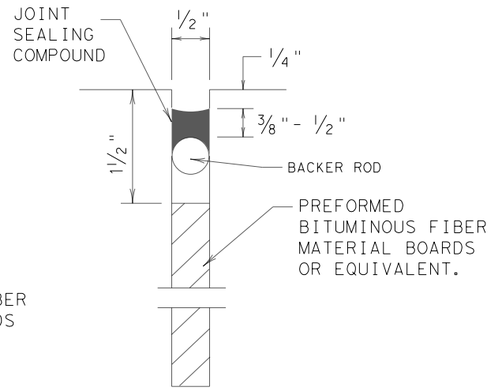
LONGITUDINAL OR TRANSVERSE
CONSTRUCTION JOINT



TRANSVERSE SAWED
CONTRACTION JOINT

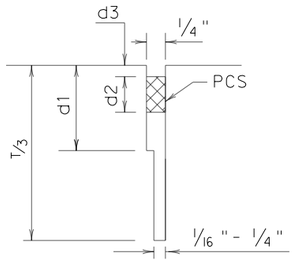


TRANSVERSE FORMED
EXPANSION JOINT

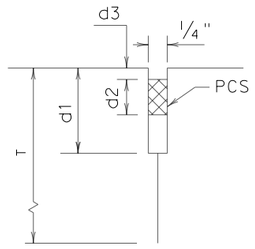


FORMED
ISOLATION JOINT

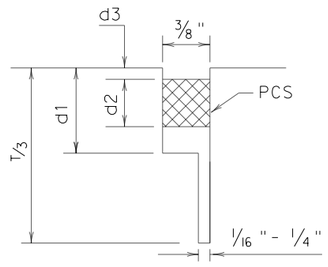
METHOD A: PREFORMED COMPRESSION SEALS (PCS)(DMS-6310 CLASS 6)



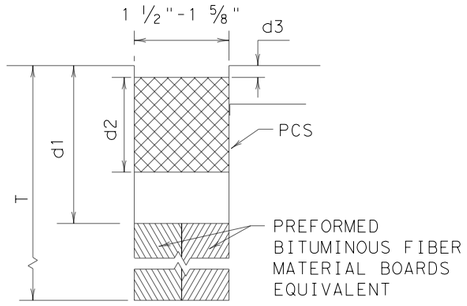
LONGITUDINAL SAWED
CONTRACTION JOINT



LONGITUDINAL
CONSTRUCTION JOINT



TRANSVERSE SAWED
CONTRACTION JOINT



TRANSVERSE FORMED
EXPANSION JOINT

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
2. THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
3. THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
4. DIMENSIONS d1, d2, AND d3 SHOWN IN METHOD A SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
5. REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
6. FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
7. FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4,5,7,OR 8 FOR MAINTAINING EXISTING JOINTS.
8. THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS" OR ITEM 713 "CLEANING AND SEALING JOINTS AND CRACKS (CONCRETE PAVEMENT)".
9. ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A PAVEMENT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, CURB AND GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LIGHTING STRUCTURES.

Texas Department of Transportation | Design Division Standard

CONCRETE PAVING DETAILS

JOINT SEALS

JS-14

FILE: js14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
©TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		107

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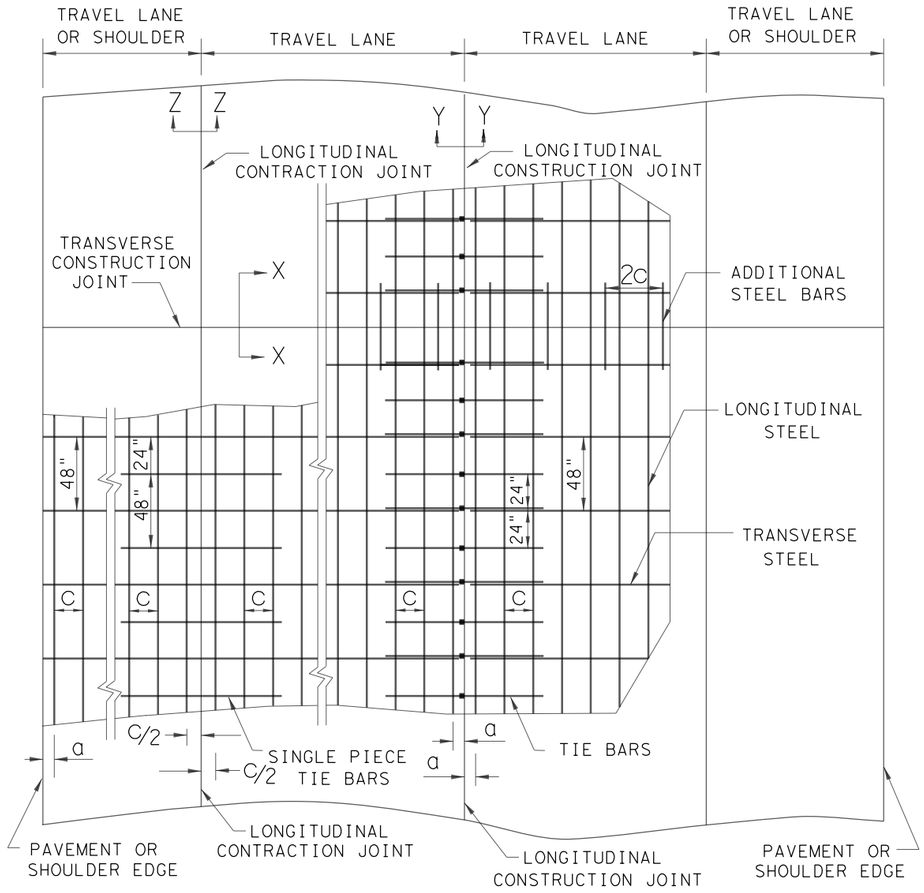
TABLE NO. 1 LONGITUDINAL STEEL

SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING C (IN.)	SPACING a (IN.)	SPACING 2 X C (IN.)	LENGTH L (IN.)
7.0	#5	6.5	3 TO 4	13	50
7.5	#5	6.0	3 TO 4	12	50
8.0	#6	9.0	3 TO 4	18	50
8.5	#6	8.5	3 TO 4	17	50
9.0	#6	8.0	3 TO 4	16	50
9.5	#6	7.5	3 TO 4	15	50
10.0	#6	7.0	3 TO 4	14	50
10.5	#6	6.75	3 TO 4	13.5	50
11.0	#6	6.5	3 TO 4	13	50
11.5	#6	6.25	3 TO 4	12.5	50
12.0	#6	6.0	3 TO 4	12	50
12.5	#6	5.75	3 TO 4	11.5	50
13.0	#6	5.5	3 TO 4	11	50

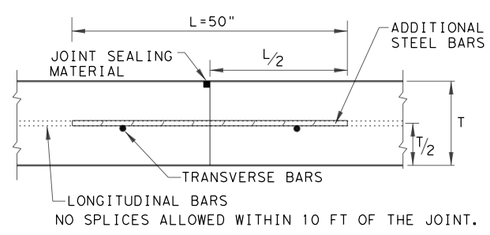
TABLE NO. 2 TRANSVERSE STEEL AND TIE BARS

SLAB THICKNESS (IN.)	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z)		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Y-Y)	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
7.0 - 7.5	#5	48	#5	48	#5	24
8.0 - 13.0	#5	48	#6	48	#6	24



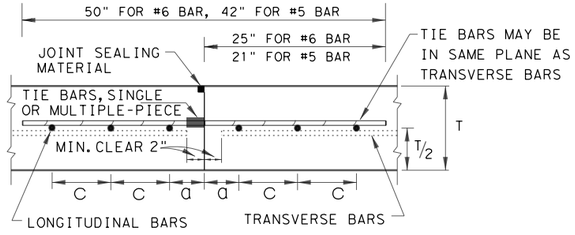
TYPICAL PAVEMENT LAYOUT

PLAN VIEW (NOT TO SCALE)



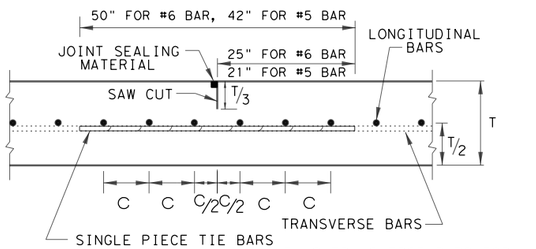
TRANSVERSE CONSTRUCTION JOINT

SECTION X - X



LONGITUDINAL CONSTRUCTION JOINT

SECTION Y - Y



LONGITUDINAL CONTRACTION JOINT

SECTION Z - Z

GENERAL NOTES

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

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

ONE LAYER STEEL BAR PLACEMENT T - 7 to 13 INCHES

CRCP(1)-20

FILE: crcp120.dgn	DN: TxDOT	CK:KM	DW: AN	CK:VP
© TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 10/10/2011 ADD GN #12 04/09/2013 REMOVE 6" AND 6.5" ADD CTE REQUIREMENTS 05/05/2017 CoTE AS RATED 4.3	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		108

DATE: 5/26/2021 10:27:10 AM
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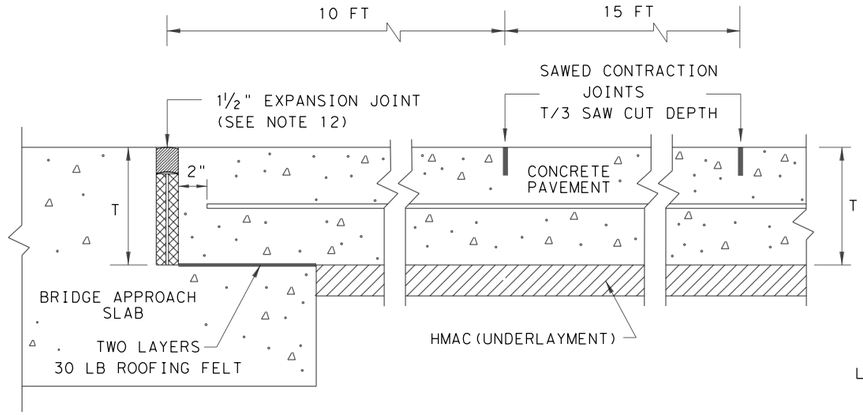
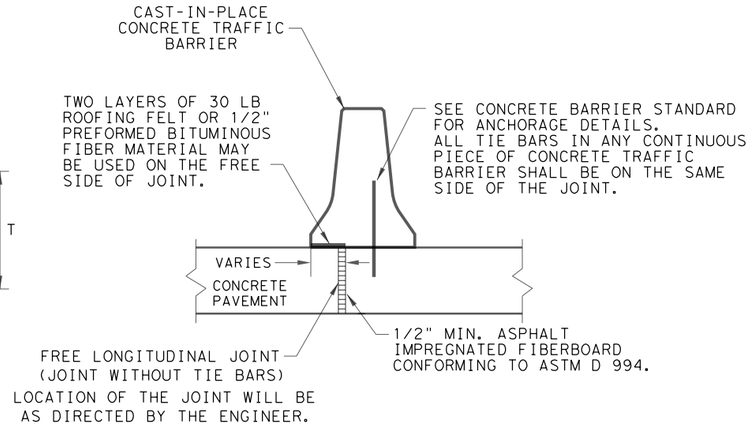
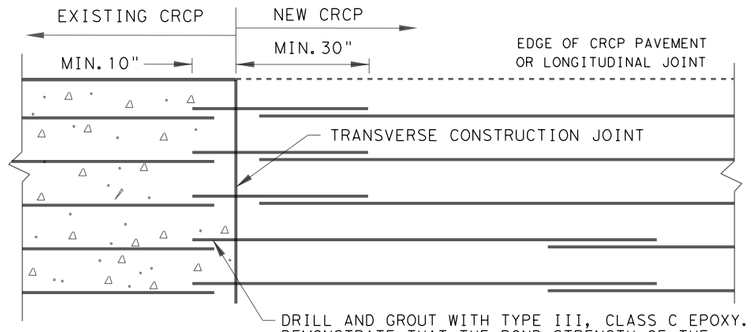


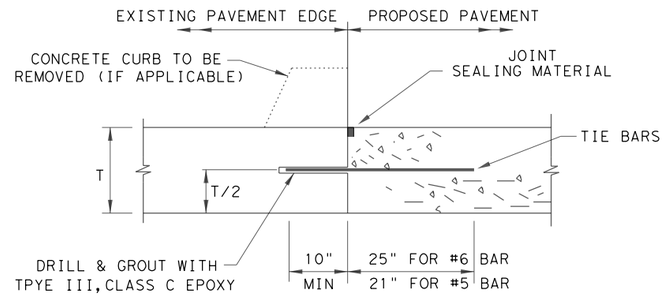
TRANSVERSE EXPANSION JOINT DETAIL
AT BRIDGE APPROACH



FREE LONGITUDINAL JOINT DETAIL

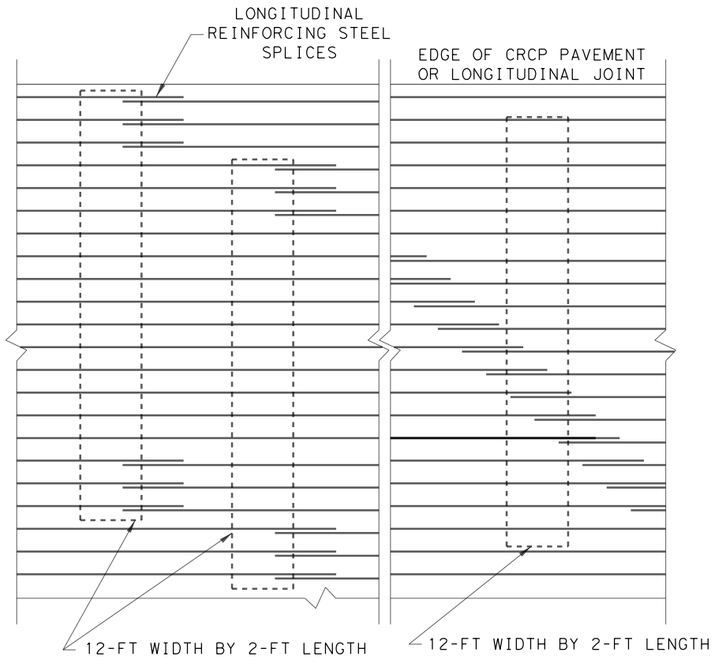


OPTION A: DRILL AND EPOXY
PLAN VIEW (NOT TO SCALE)



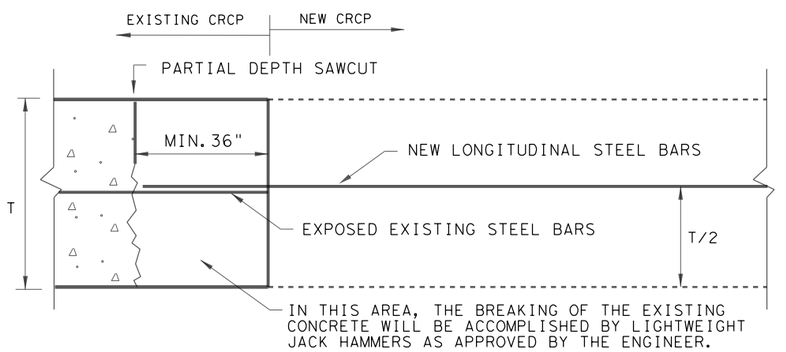
1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIRMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 TIE BARS FOR 8" AND THICKER SLABS, USE #5 TIE BARS FOR LESS THAN 8" THICK SLABS.

LONGITUDINAL WIDENING JOINT DETAIL



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

EXAMPLES OF LAP CONFIGURATION
PLAN VIEW (NOT TO SCALE)



OPTION B: BREAKBACK AND LAP

TRANSVERSE TIE JOINT DETAIL
EXISTING CRCP TO NEW CRCP

SHEET 2 OF 2

Texas Department of Transportation

Design Division Standard

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

ONE LAYER STEEL BAR PLACEMENT
T - 7 to 13 INCHES

CRCP(1)-20

FILE: crcp120.dgn	DN: TxDOT	CK: KM	DW: AN	CK: VP
© TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 03/16/2020 REMOVED TABLE 1A	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		109

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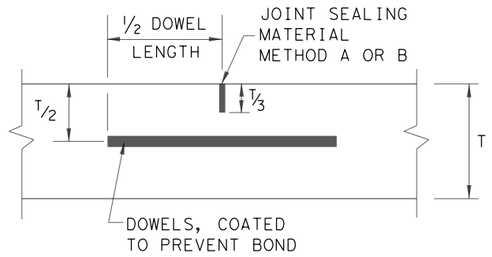
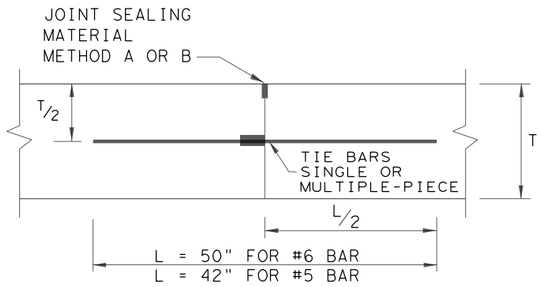
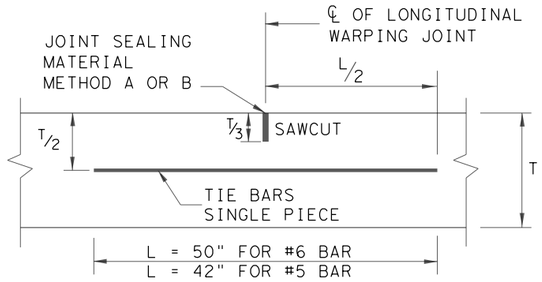


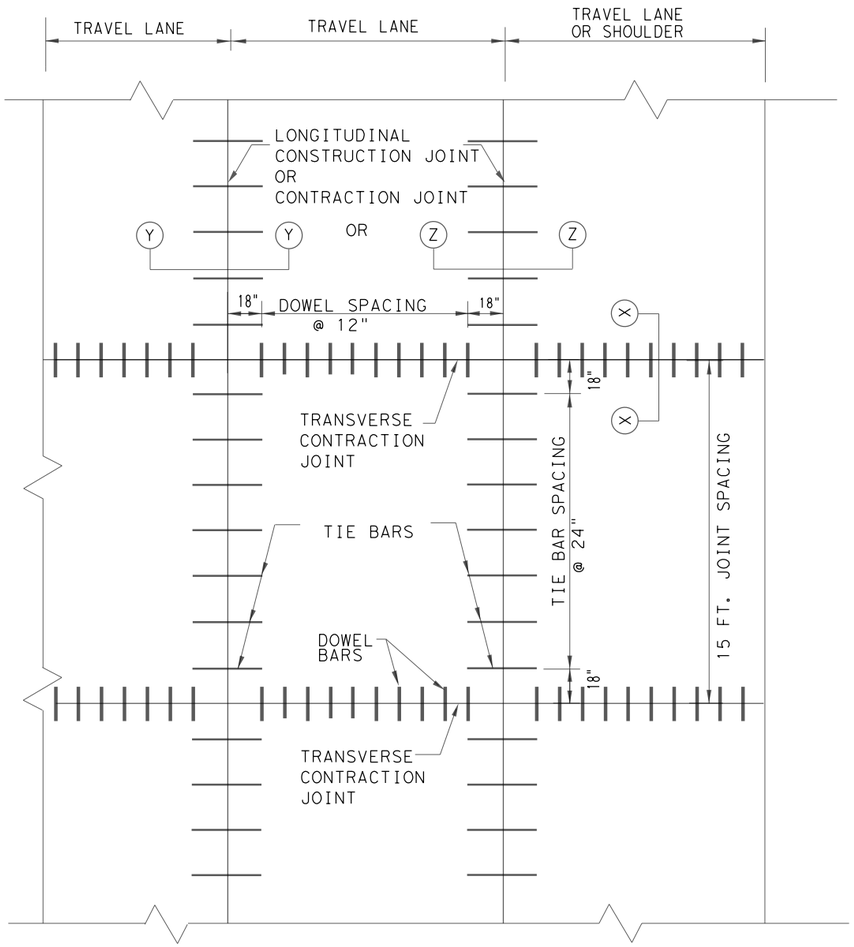
TRANSVERSE CONTRACTION JOINT
SECTION X-X



LONGITUDINAL CONSTRUCTION JOINT
SECTION Y-Y



LONGITUDINAL CONTRACTION JOINT
SECTION Z-Z



TYPICAL PAVEMENT LAYOUT
PLAN VIEW (NOT TO SCALE)

GENERAL NOTES

1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND LOAD TRANSFER DEVICES REFER TO THE GOVERNING SPECIFICATION FOR "CONCRETE PAVEMENT".
3. THE SPACING BETWEEN TRANSVERSE CONTRACTION JOINTS SHALL BE 15 FT. UNLESS OTHERWISE SHOWN IN THE PLANS.
4. TRANSVERSE CONSTRUCTION JOINTS MAY BE FORMED BY USE OF METAL OR WOOD FORMS EQUAL IN DEPTH TO THE DEPTH OF PAVEMENT, OR BY METHODS APPROVED BY THE ENGINEER.
5. USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL THE FORMED JOINTS.
6. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
7. THE JOINT BETWEEN OUTSIDE LANE AND SHOULDER SHALL BE A LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) UNLESS OTHERWISE SHOWN IN THE PLANS. THE SAW CUT DEPTH FOR THE LONGITUDIANL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLABTHICKNESS (T/3).
8. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
9. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
10. WHEN AN MONOLITHIIC CURB IS SPECIFIED, THE JOINT IN THE CURB SHALL COINCIDE WITH PAVEMENT JOINTS AND MAY BE FORMED BY ANY MEANS APPROVED BY THE ENGINEER.
11. DOWEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1/4 IN. HORIZONTALLY AND VERTICALLY UNLESS OTHERWISE SPECIFIED. WHERE DOWEL BAR BASKETS ARE USED, REMOVE THE SHIPPING WIRES.
12. THE DETAIL FOR JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."

TABLE NO. 1 DOWELS (SMOOTH BARS)		
SLAB THICKNESS T (IN.)	BAR DIA. AND LENGTH	AVERAGE SPACING (IN.)
6 to 7.5	1" X 18"	12
8 to 10	1 1/4" X 18"	12
>= 10.5	1 1/2" X 18"	12

TABLE NO. 2 TIE BARS (DEFORMED BARS)		
SLAB THICKNESS T (IN.)	BAR SIZE	AVERAGE SPACING (IN.)
6 to 7.5	#5	24
>= 8	#6	24

Texas Department of Transportation — Design Division Standard

CONCRETE PAVEMENT DETAILS
CONTRACTION DESIGN
T-6 to 12 INCHES

CPCD-14

FILE: cpcd14.dgn	DN: TxDOT	DW: HC	DW: HC	CK: AN
© TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		110

DATE: 5/26/2021 10:27:11 AM
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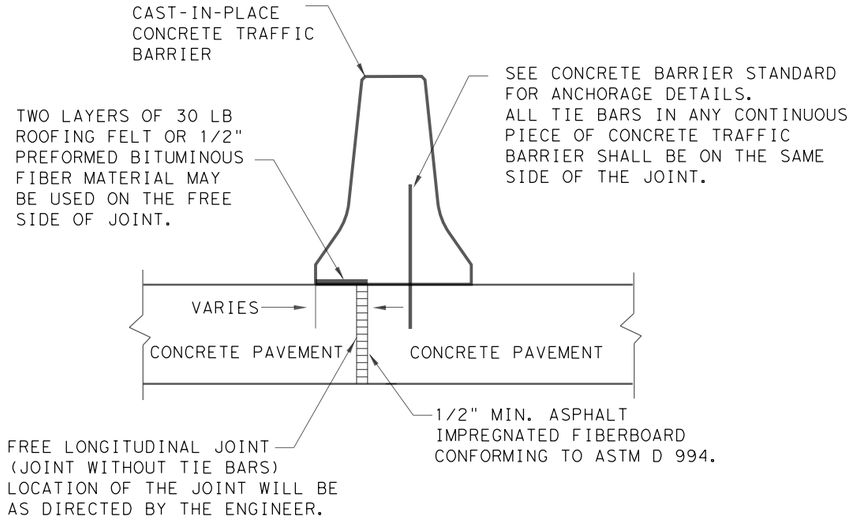
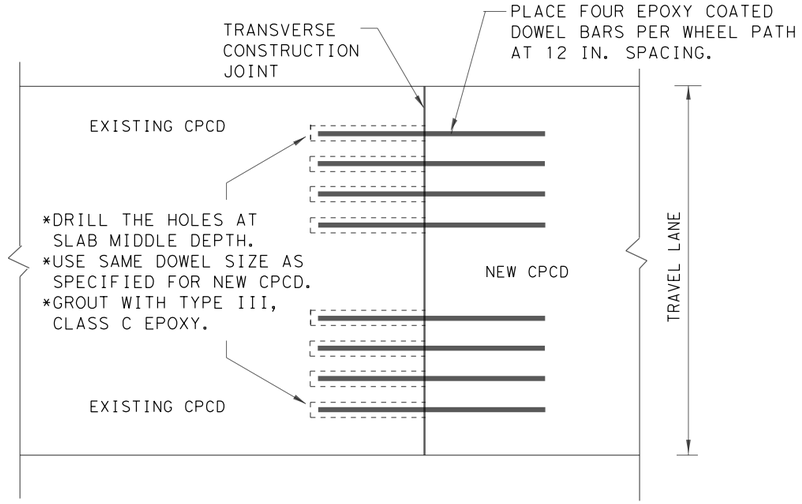
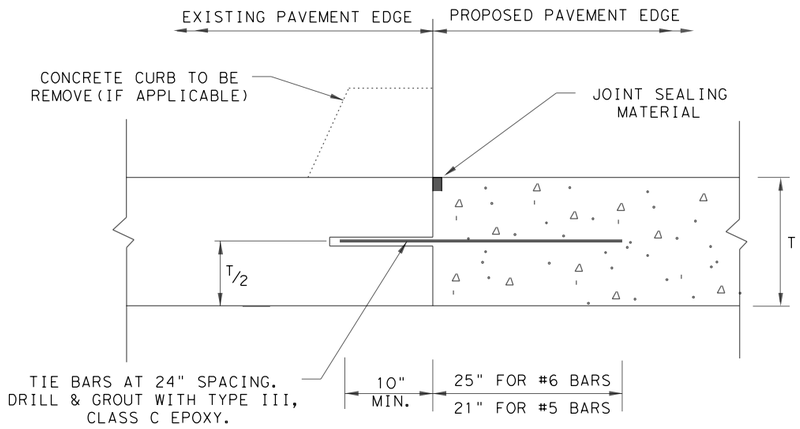


FREE LONGITUDINAL JOINT DETAIL



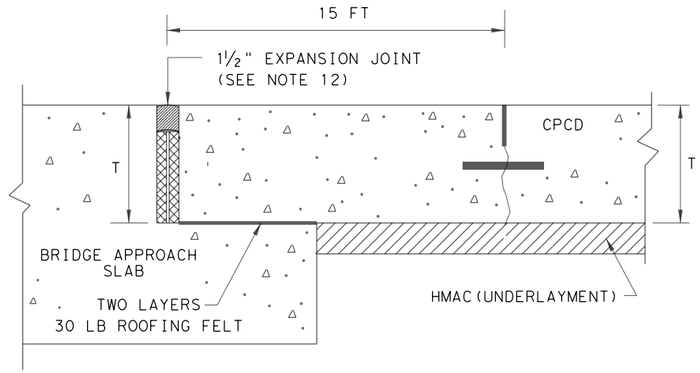
TRANSVERSE JOINT DETAIL
EXISTING CPCD TO NEW CPCD

PLAN VIEW (NOT TO SCALE)



1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 BARS FOR 8" AND THICKER SLABS, USE #5 BARS FOR LESS THAN 8" THICK SLABS.
3. THE TRANSVERSE JOINTS OF PROPOSED PAVEMENT SHALL COINCIDE WITH EXISTING PAVEMENT JOINTS UNLESS OTHERWISE SHOWN ON THE PLANS.

LONGITUDINAL WIDENING JOINT DETAIL



TRANSVERSE EXPANSION JOINT DETAIL
AT BRIDGE APPROACH

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

CONCRETE PAVEMENT DETAILS
CONTRACTION DESIGN
T-6 to 12 INCHES

CPCD-14

FILE: cpcd14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
© TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		111

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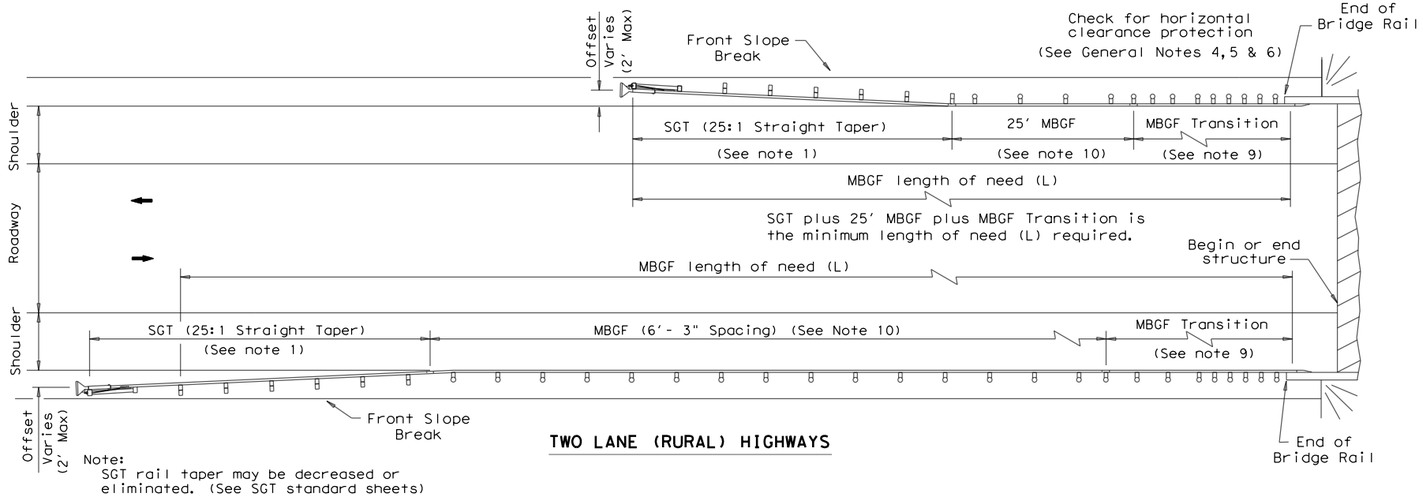
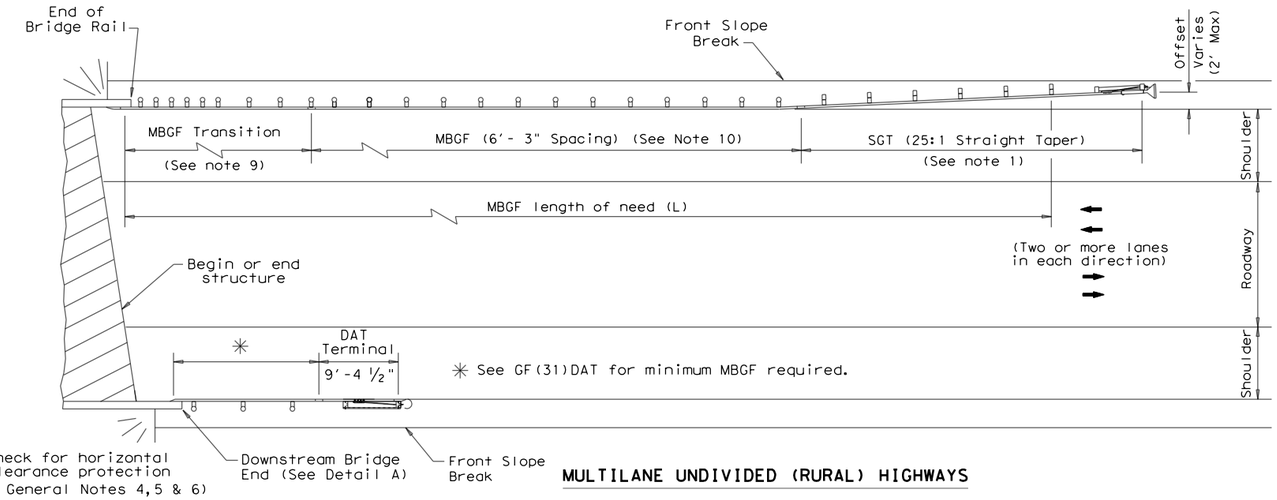
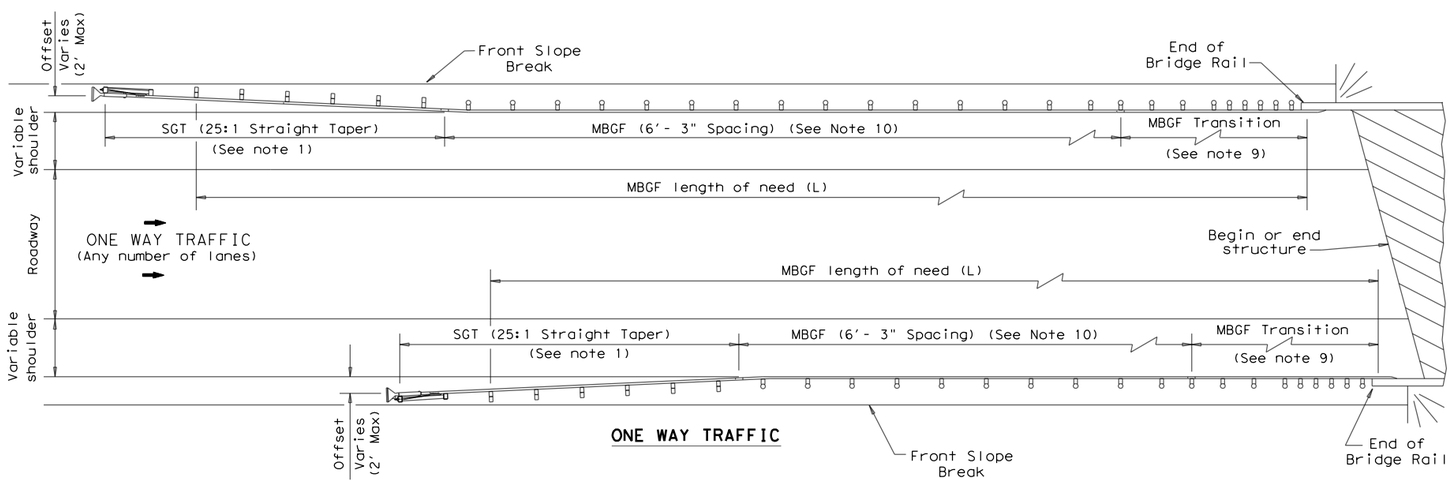


TWO LANE (RURAL) HIGHWAYS

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



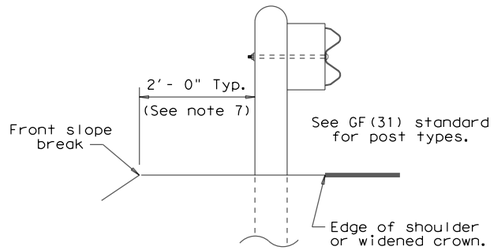
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



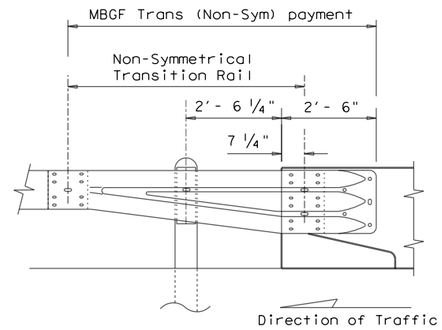
ONE WAY TRAFFIC

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

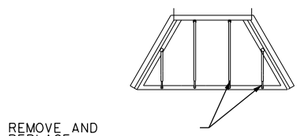
Design Division Standard

BRIDGE END DETAILS

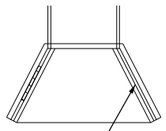
(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

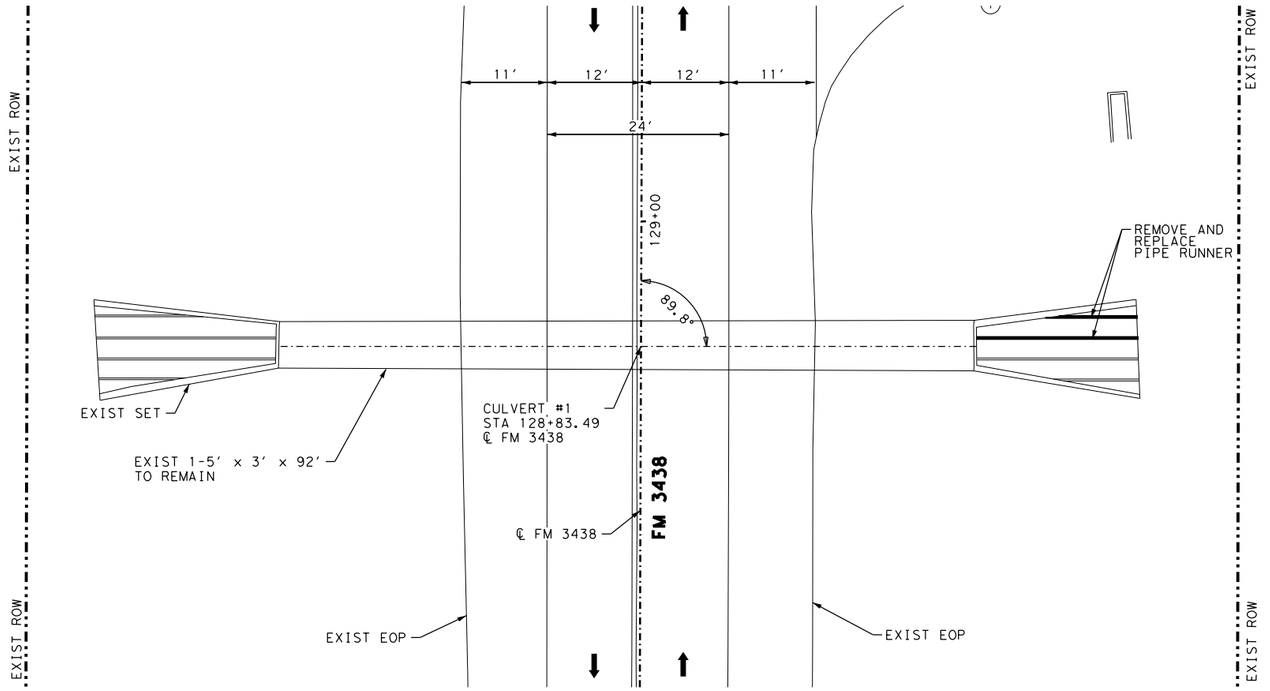
FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
©TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		112

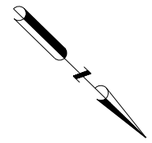


REMOVE AND
REPLACE
PIPE RUNNER
SHORT PIPE
RUNNER = 3.208'
LONGEST WING
PIPE RUNNER = 21.708'



CONCRETE REPAIRS
7'-9" X 1'-6" FOR
A TOTAL 11.6 SF





LEGEND

PROP FEATURE
EXIST FEATURE
EXIST ROW
TRAFFIC DIRECTION

NOTE:

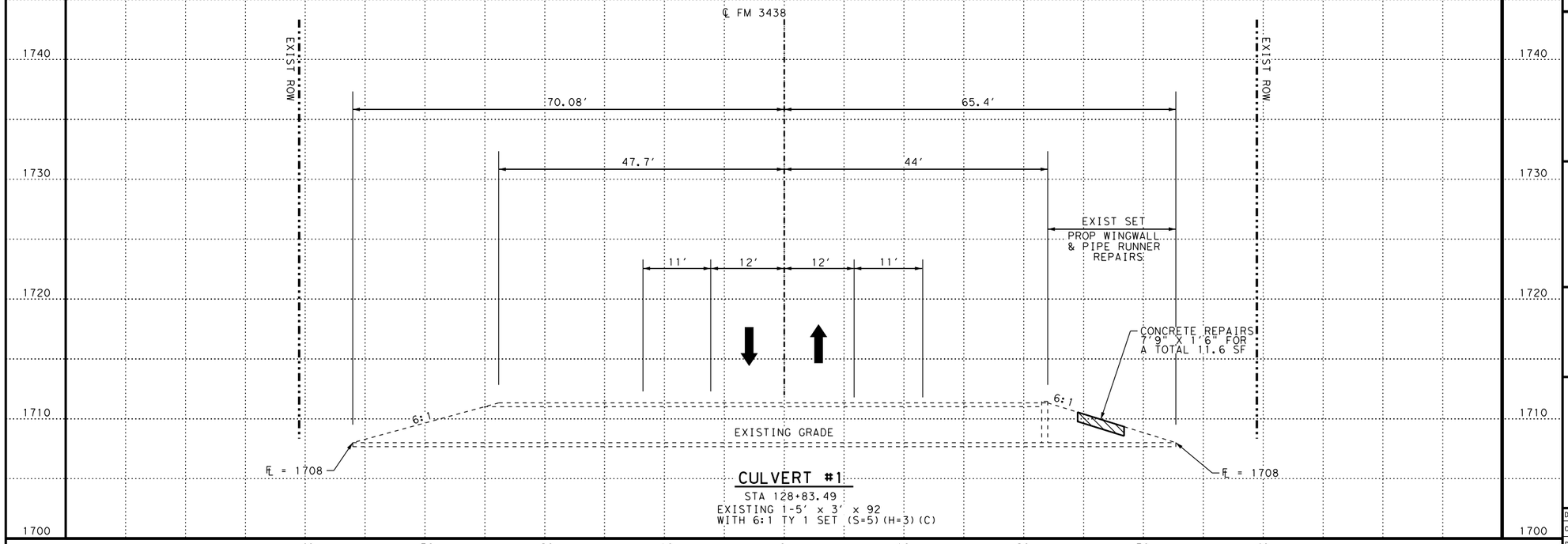
NO ADVERSE EFFECTS DOWNSTREAM WERE DETERMINED DUE TO NO CHANGES ON CULVERTS WITHIN ROW.

FIELD MEASURE PIPE RUNNER BEFORE ORDERING MATERIAL.

REPAIR WINGWALL AS DIRECTED BY ENGINEER.

SUMMARY OF QUANTITIES	
429	467
CONC STR REPAIR (EPOXY MORTAR)	SET (REPLACE PIPE RUNNER)
SF	EA
12	2

HORZ 0' 10' 20'
VERT 0' 5' 10'
SCALE IN FEET



CULVERT #1
STA 128+83.49
EXISTING 1-5' x 3' x 92
WITH 6:1 TY 1 SET (S=5)(H=3)(C)

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

IDCUS
PLANNERS • ENGINEERS • MANAGERS
IDCUS, Inc.
8632 Fredericksburg Rd., Suite 200
San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

CULVERT LAYOUT

CULVERT AT STA 128+83.49

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	113

5/26/2021 10:27:18 AM

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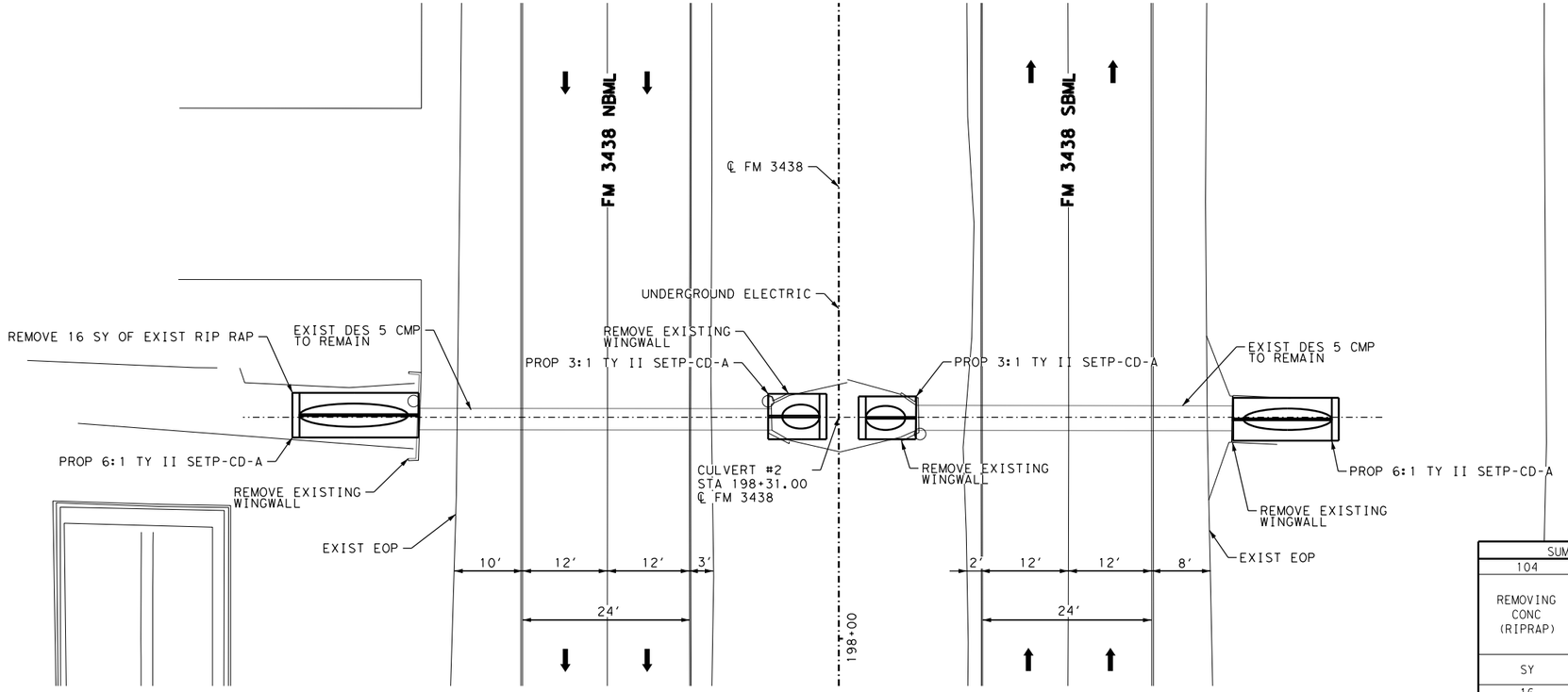


LEGEND

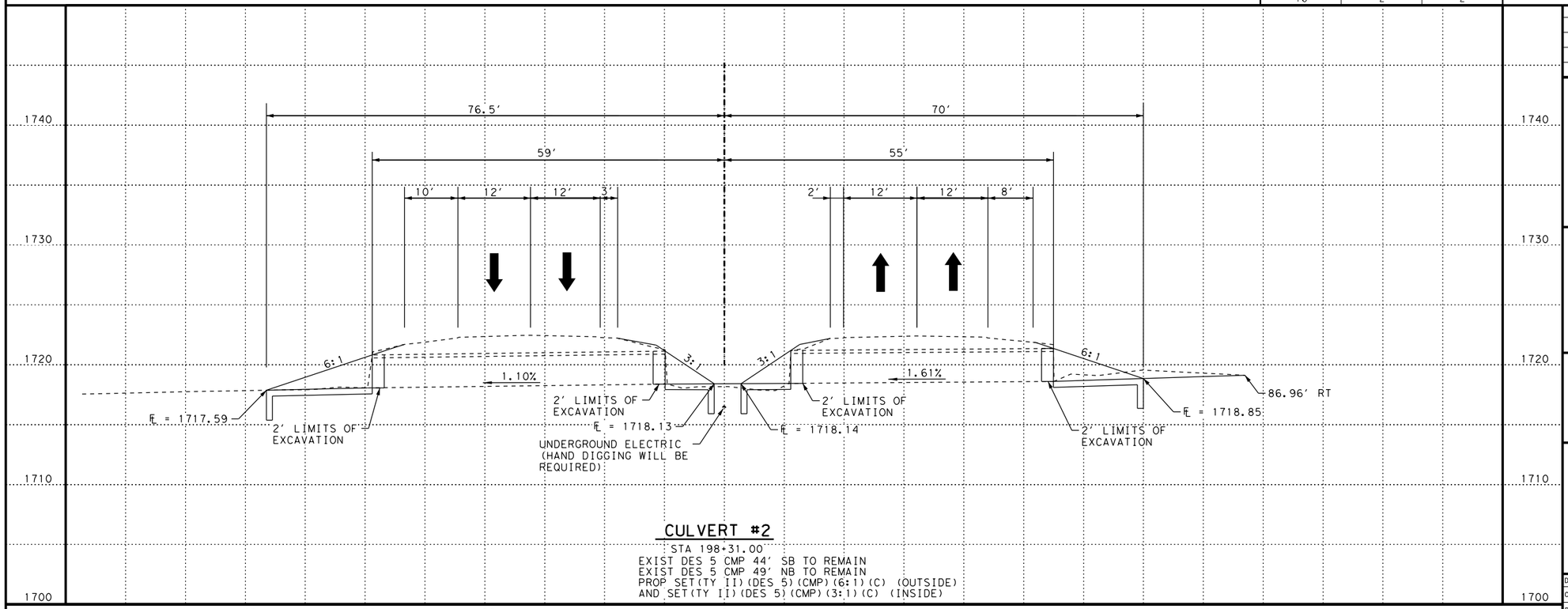
PROP FEATURE
EXIST FEATURE
EXIST ROW
TRAFFIC DIRECTION

NOTE:

1. NO ADVERSE EFFECTS DOWNSTREAM WERE DETERMINED DUE TO NO CHANGES ON CULVERTS WITHIN ROW.
2. REPAIR WINGWALL AS DIRECTED BY ENGINEER.
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL DIMENSIONS PRIOR TO ORDERING MATERIALS, CAREFULLY REMOVING HEADWALLS AND NOT DAMAGING EXISTING CMP. ANY DAMAGE TO EXISTING CMP WILL NOT BE PAID FOR DIRECTLY AND WILL BE AT CONTRACTOR'S EXPENSE.
4. THE CONTRACTOR WILL BE RESPOSIBLE TO REPAIR ANY DAMAGE TO GALVANIZED COATING IN ACCORDANCE WITH SECTION 445.3.5, "REPAIR". THIS WORK WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE SUBSIDIARY TO THE BID ITEM 496.

SUMMARY OF QUANTITIES		
104	467	467
REMOVING CONC (RIPRAP)	SET(TY II) (DES 5)(CMP) (3:1)(C)	SET(TY II) (DES 5)(CMP) (6:1)(C)
SY	EA	EA
16	2	2

HORZ 0′ 10′ 20′
VERT 0′ 5′ 10′
SCALE IN FEET



CULVERT #2

STA 198+31.00
EXIST DES 5 CMP 44′ SB TO REMAIN
EXIST DES 5 CMP 49′ NB TO REMAIN
PROP SET(TY II)(DES 5)(CMP)(6:1)(C) (OUTSIDE)
AND SET(TY II)(DES 5)(CMP)(3:1)(C) (INSIDE)

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

IDCUS
PLANNERS + ENGINEERS + MANAGERS
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San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

CULVERT LAYOUT

CULVERT AT STA 198+31.00

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	114

5/26/2021 10:27:24 AM

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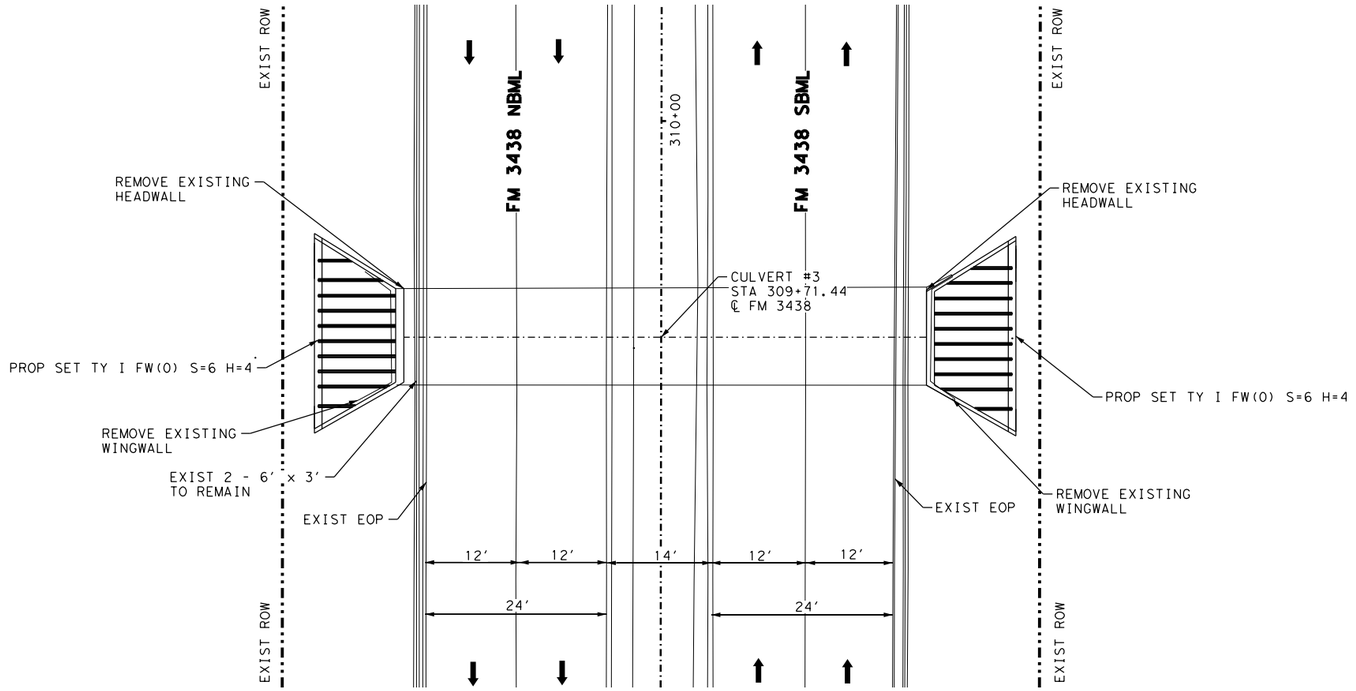


LEGEND

PROP FEATURE

EXIST FEATURE

EXIST ROW

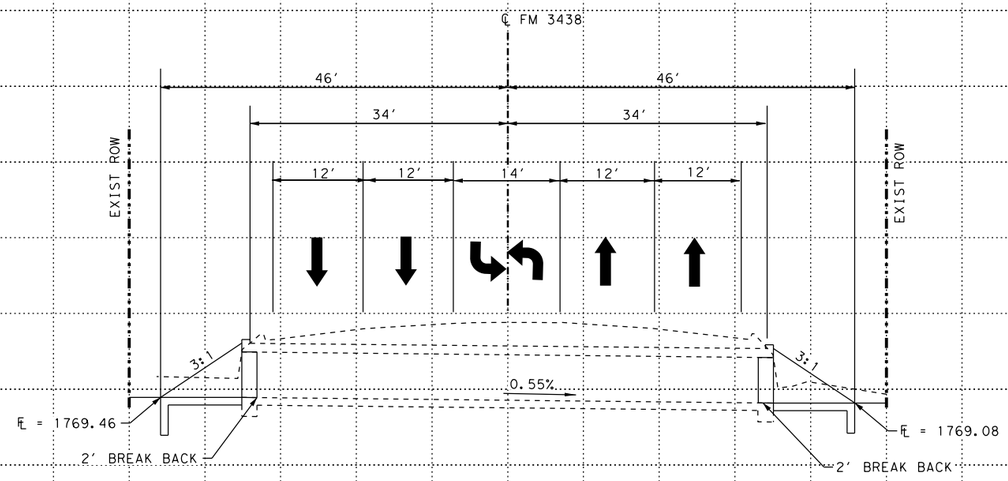
TRAFFIC DIRECTION

NOTE:

1. THE WORK REQUIRED TO CONNECT TO EXISTING BOX CULVERT, BREAK BACK, REMOVING, AND DISPOSING SHALL NOT BE PAID DIRECTLY BUT CONSIDERED SUBSIDIARY TO BID ITEM 467
2. BREAK BACK AND REPLACE EXISTING CULVERT IN ACCORDANCE WITH SECTION 420.4.8 "EXTENDING EXISTING SUBSTRUCTURE".

SUMMARY OF QUANTITIES
467
SET(TY II) (DES 5)(CMP) (3:1)(C)
EA
4

HORZ 0′ 10′ 20′
VERT 0′ 5′ 10′
SCALE IN FEET



CULVERT #3

STA 309+71.44

EXIST 2 - 6′ X 3′ X 66′ MBC TO REMAIN
PROP SET(TY I)(S=6 FT)(HW=4 FT)(3:1)(C)

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

IDCUS
PLANNERS • ENGINEERS • MANAGERS
IDCUS, Inc.
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T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

CULVERT LAYOUT

CULVERT AT STA 309+71.44

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	115

5/26/2021 10:27:30 AM

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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)	
Maximum Wingwall Height Hw (9)	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

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"

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.

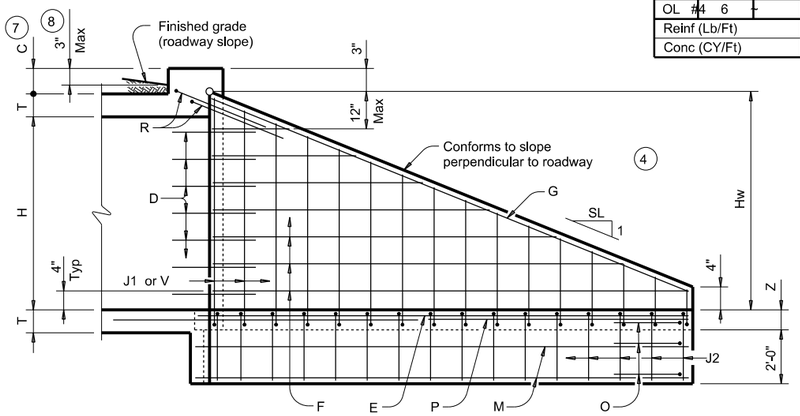
MATERIAL NOTES:

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:

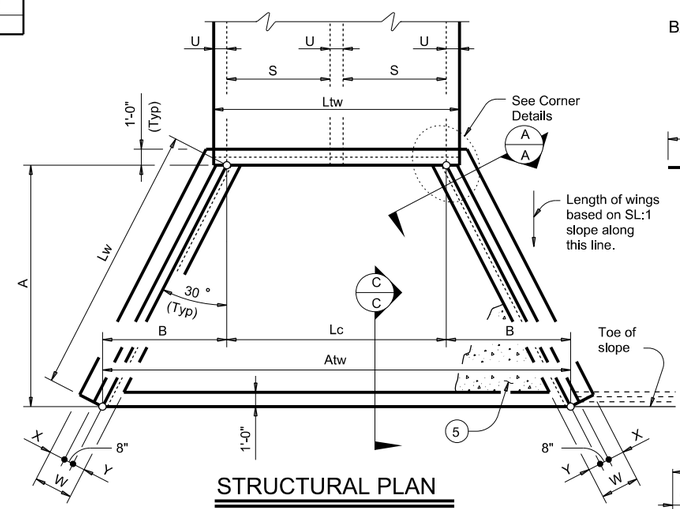
Designed according to AASHTO LRFD Bridge Design Specifications.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Pipe runners are designed for a traversing 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.



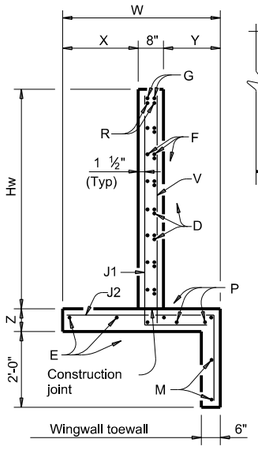
INSIDE ELEVATION OF WINGWALL

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

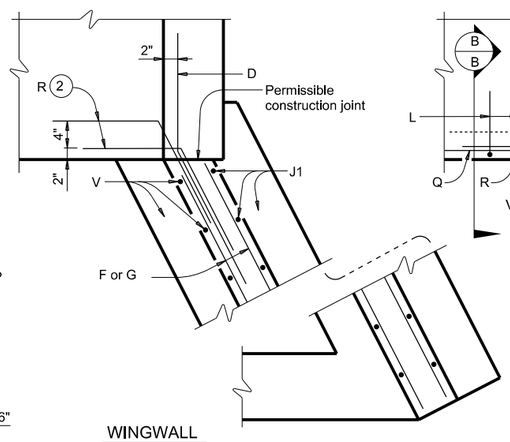


STRUCTURAL PLAN

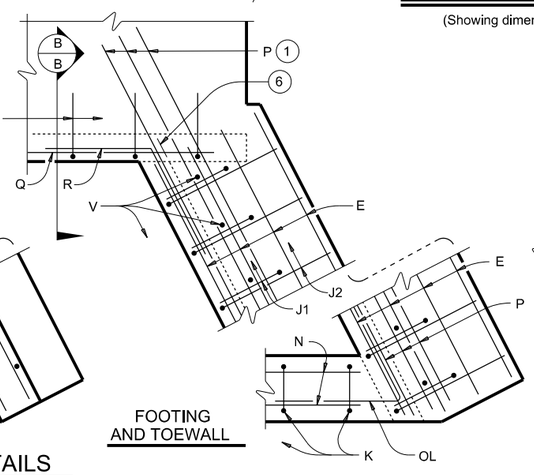
(Showing dimensions.)



SECTION A-A

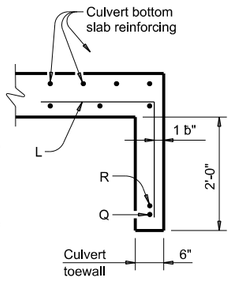


WINGWALL

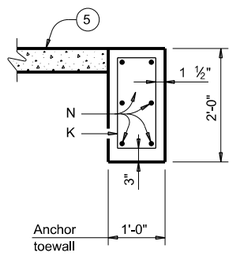


CORNER DETAILS

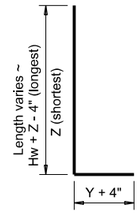
(Culvert and culvert toewall reinforcing not shown for clarity.)



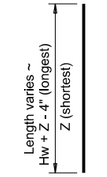
SECTION B-B (5)



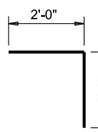
SECTION C-C



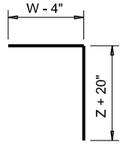
BARS J1



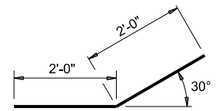
BARS V



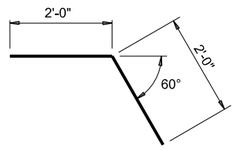
BARS L



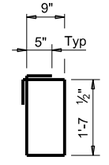
BARS J2



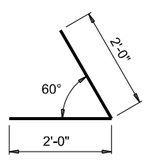
BARS D



BARS R



BARS K
(Length = 5'-5")



BARS OL

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:	seltbf0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		2270	01	023	FM 3438
		DIST	COUNTY		SHEET NO.
		ABL	TAYLOR		116

DATE: 5/26/2021 10:27:31 AM
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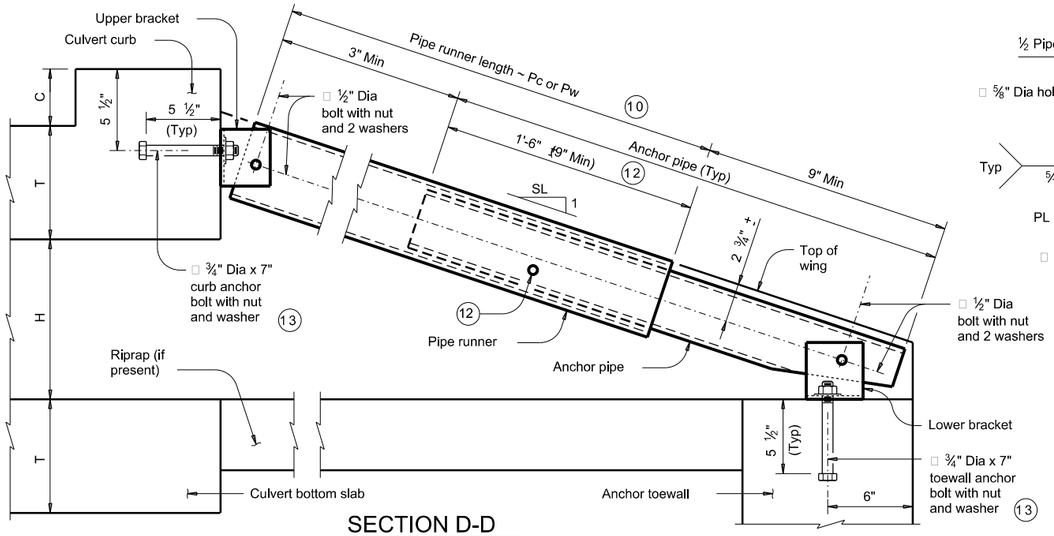
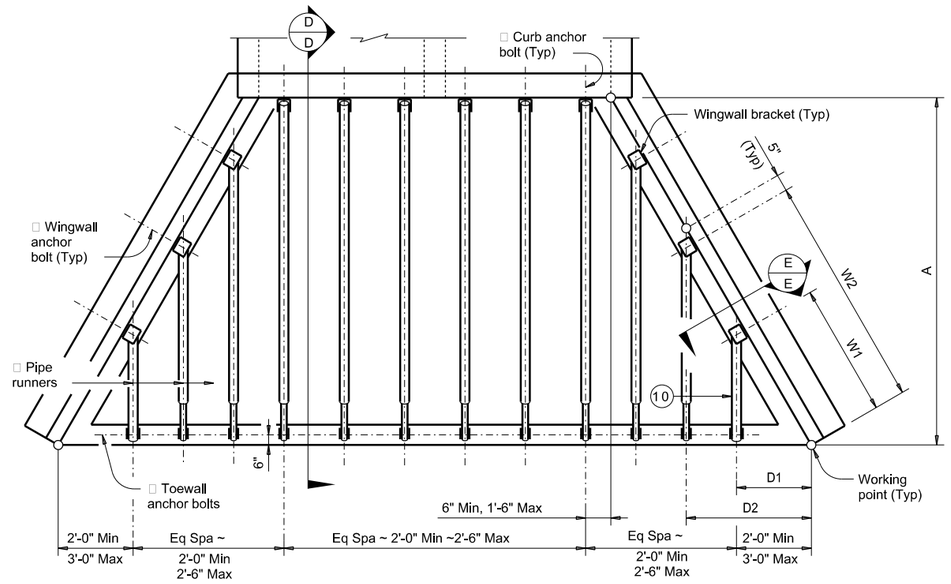
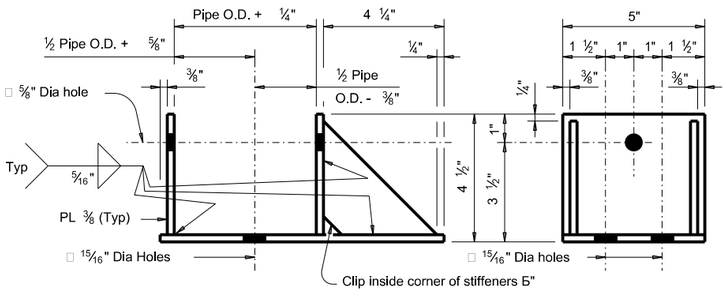


SECTION D-D

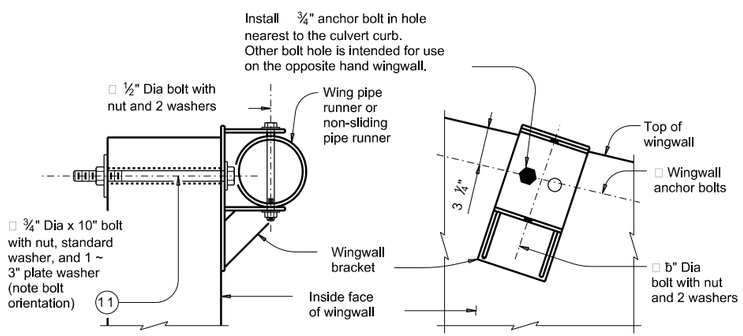
(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)



PIPE RUNNER PLAN



ELEVATION SIDE VIEW

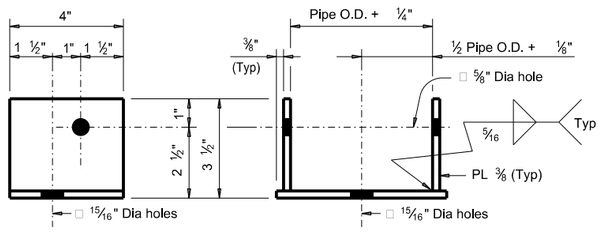


SECTION E-E
(Showing installed bracket.)

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 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"

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER SIZES

(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 b" 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 b". 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.

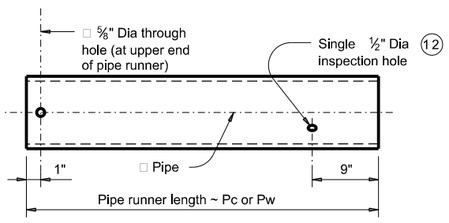
PIPE RUNNER DIMENSION CALCULATIONS:

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

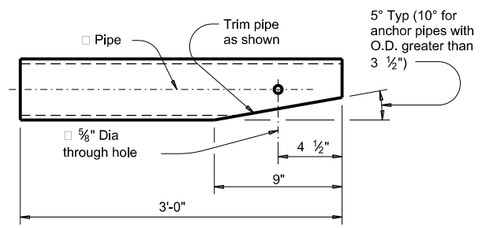
Slope SL:	K1	K2
3:1	~ 1.054 ~	1.826
4:1	~ 1.031 ~	1.785
6:1	~ 1.014 ~	1.756

n = Wing pipe runner number

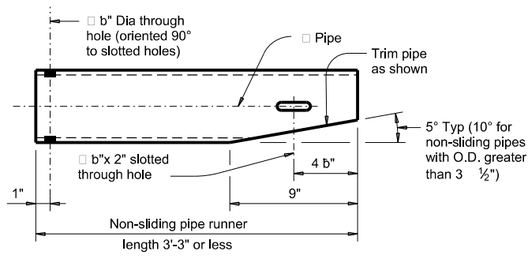


Note: Pipe diameter required for curb pipe runner is also used for wingwall pipe runner.

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

SHEET 2 OF 3

Texas Department of Transportation

Bridge Division Standard

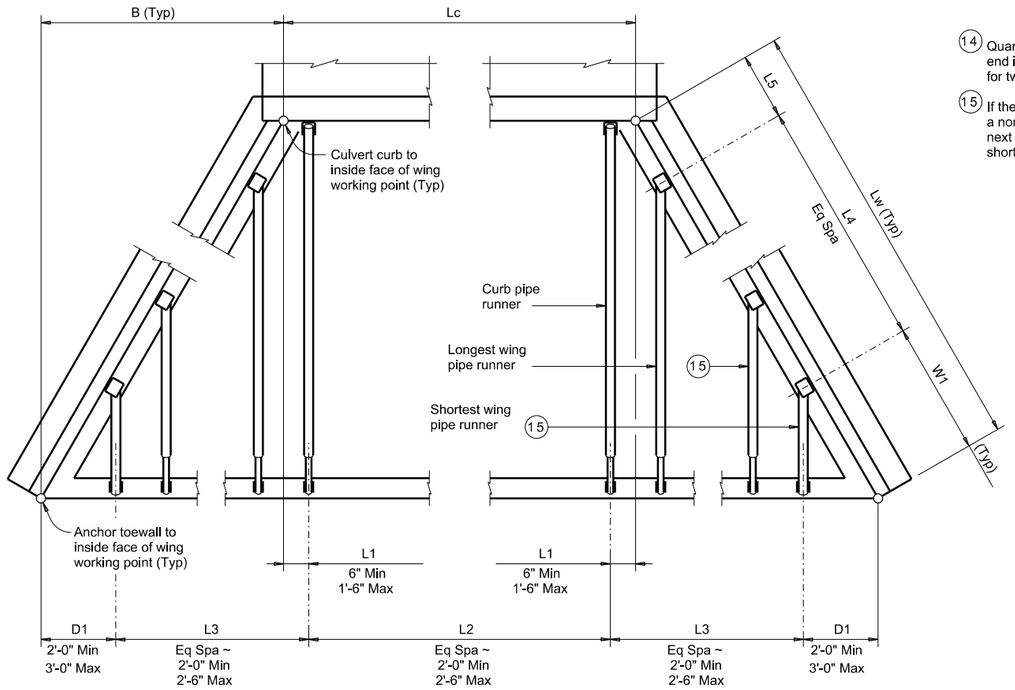
SAFETY END TREATMENT WITH FLARED WINGS

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
REVISIONS		2270	01	023	FM 3438
		DIST	COUNTY		SHEET NO.
		ABL	TAYLOR		117

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)				
✳128+83.49	5.00	0.500	2	2.000	4.000	3.000	5	2.329	11.645	5.583	4	4.658	18.632	4.075	3	23.146	21.708	3.208	N/A	5"	183.292	4"	39.000
309+71.44	12.583	0.500	2	6.000	12.000	3.000	2	2.358	4.717	5.583	1	4.717	4.717	4.134	3	11.479	7.729	3.417	N/A	4"	113.458	3"	42.000



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.

NOTE:

1. CONTRACTOR TO VERIFY PIPE RUNNER DIMENSIONS BEFORE MANUFACTURING.
✳2. VALUES PROVIDED FOR CONTRACTOR INFORMATION FOR REPLACEMENT OF TWO PIPE RUNNERS ONLY ON ONE END OF SET
3. SEE CULVERT LAYOUT SHEET FOR ADDITIONAL INFORMATION.

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.

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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

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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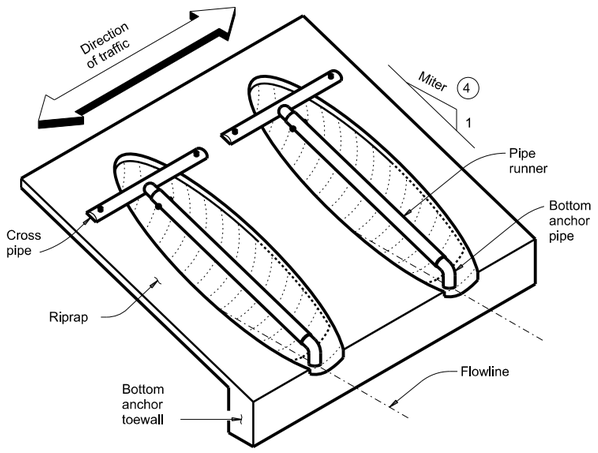
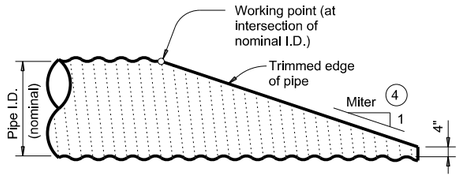
		ABL	TAYLOR		118



ISOMETRIC VIEW OF TYPICAL INSTALLATION

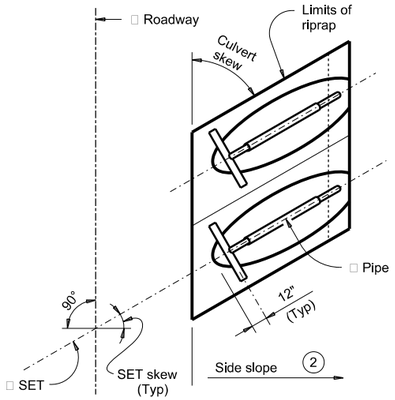
(Showing installation with no skew.)



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 (CMP) culvert are similar.)



PLAN OF SKEWED INSTALLATION

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1) (3)

Corrugated Metal Pipe (CMP) Culverts

Design	Pipe Culvert Span	Pipe Culvert Rise	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
1	17"	13"	1' - 0"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	21"	15"	1' - 2"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	28"	20"	1' - 5"	3' - 9"	N/A	N/A	3' - 5"	4' - 7"	N/A	N/A	4' - 11"	6' - 5"	N/A	N/A	7' - 11"	10' - 2"
4	35"	24"	1' - 8"	4' - 4"	3' - 10"	4' - 0"	4' - 7"	6' - 0"	5' - 5"	5' - 8"	6' - 6"	8' - 4"	8' - 8"	9' - 1"	10' - 3"	12' - 11"
5	42"	29"	1' - 11"	4' - 11"	5' - 1"	5' - 4"	6' - 1"	7' - 10"	7' - 2"	7' - 5"	8' - 6"	10' - 9"	11' - 2"	11' - 8"	13' - 2"	16' - 6"
6	49"	33"	2' - 2"	5' - 6"	6' - 2"	6' - 5"	7' - 4"	N/A	8' - 6"	8' - 10"	10' - 0"	N/A	13' - 3"	13' - 9"	15' - 6"	N/A
7	57"	38"	2' - 5"	6' - 2"	7' - 6"	7' - 9"	N/A	N/A	10' - 2"	10' - 7"	N/A	N/A	15' - 9"	16' - 4"	N/A	N/A

Reinforced Concrete Pipe (RCP) Culverts

Design	Pipe Culvert Span	Pipe Culvert Rise	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
1	22"	13 ½"	1' - 0"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	26"	15 ½"	1' - 2"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	28 ½"	18"	1' - 5"	3' - 9 ½"	N/A	N/A	2' - 10"	3' - 10"	N/A	N/A	4' - 2"	5' - 5"	N/A	N/A	6' - 9"	8' - 9"
4	36 ¼"	22 ½"	1' - 8"	4' - 5 ¼"	3' - 5"	3' - 7"	4' - 2"	5' - 6"	4' - 11"	5' - 1"	5' - 11"	7' - 7"	7' - 11"	8' - 3"	9' - 5"	11' - 11"
5	43 ¾"	26 b"	1' - 11"	4' - 0 ¾"	4' - 6"	4' - 8"	5' - 5"	6' - 11"	6' - 4"	6' - 7"	7' - 6"	9' - 7"	10' - 0"	10' - 5"	11' - 9"	14' - 10"
6	51 Ð"	31 Ð"	2' - 2"	5' - 8"	5' - 9"	6' - 0"	6' - 10"	N/A	7' - 11"	8' - 3"	9' - 4"	N/A	12' - 4"	12' - 10"	14' - 6"	N/A
7	58 ½"	36"	2' - 5"	6' - 3 ½"	6' - 11"	7' - 3"	N/A	N/A	9' - 6"	9' - 11"	N/A	N/A	14' - 9"	15' - 4"	N/A	N/A

TYPICAL PIPE CULVERT MITERS (4)

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

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"

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (3)

Design	Single Pipe Culvert	Multiple Pipe Culverts
1 and 2	Skews thru 45°	Skews thru 45°
3	Skews thru 35°	Skews thru 10°
4	Normal (no skew)	Always required
5 thru 7	Always required	Always required

(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 Runners Lengths table.

(2) Recommended values of 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.

(3) 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 Design 1 through 5 culvert pipe sizes, the skew must not exceed 45°.
For Design 6 culvert pipes, the skew must not exceed 30°.
For Design 7 culvert pipes, the skew must not exceed 15°.

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".

(4) Miter = slope of mitered end of pipe culvert.

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 that meet 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.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Payment for riprap and toewall is included in the price bid for each safety end treatment.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 7
ARCH PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD-A

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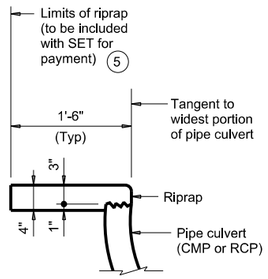
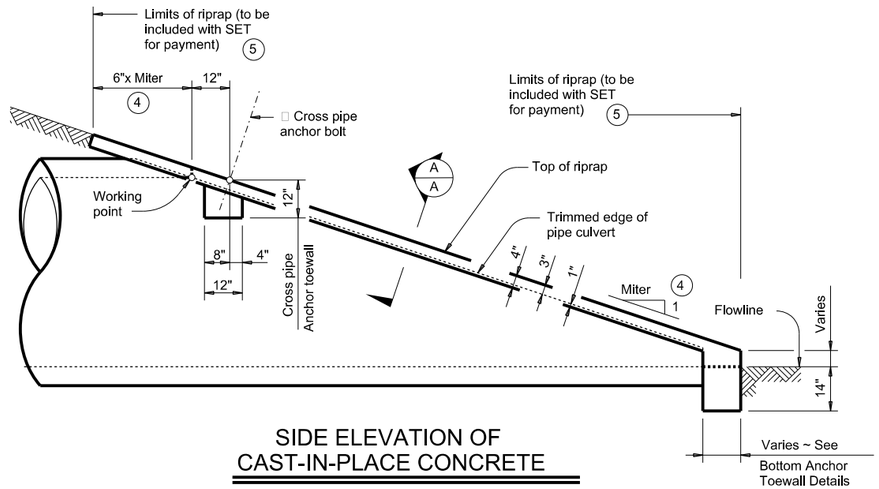


SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A



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.)

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) 6

FOR BOTH CORRUGATED METAL PIPE CULVERTS AND CONCRETE PIPE CULVERTS

Design	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
1	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
2	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	1.0
3	0.6	0.6	0.7	0.8	0.7	0.7	0.8	0.9	0.9	1.0	1.0	1.2
4	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.0	1.1	1.1	1.2	1.4
5	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.2	1.3	1.3	1.4	1.7
6	0.9	1.0	1.0	N/A	1.1	1.1	1.2	N/A	1.4	1.5	1.6	N/A
7	1.0	1.1	N/A	N/A	1.3	1.3	N/A	N/A	1.7	1.7	N/A	N/A

4 Miter = slope of mitered end of pipe culvert.

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

6 Quantities shown are for one end of one pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 7
ARCH PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD-A

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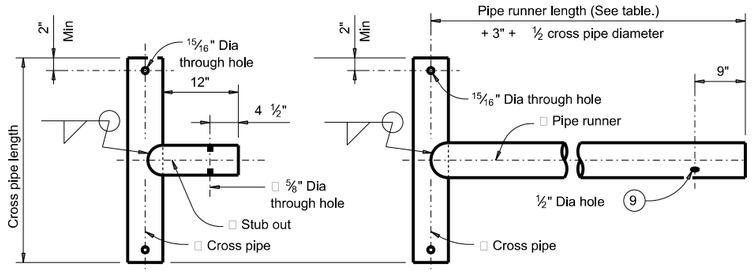
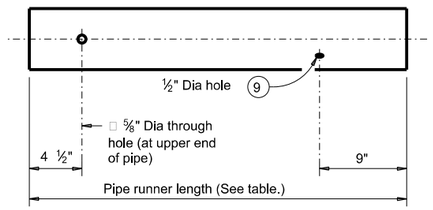


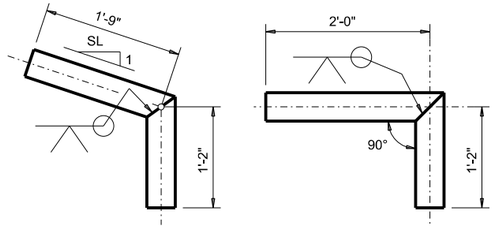
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



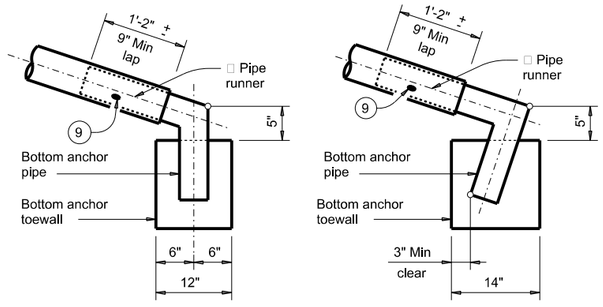
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS



OPTION B1 OPTION B2

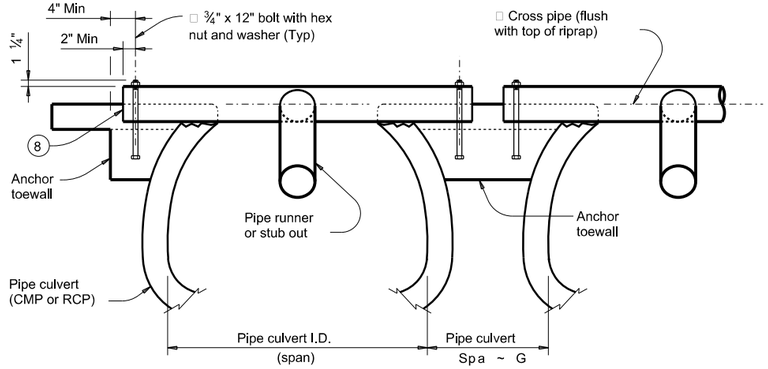
BOTTOM ANCHOR PIPE DETAILS (10)



OPTION B1 OPTION B2

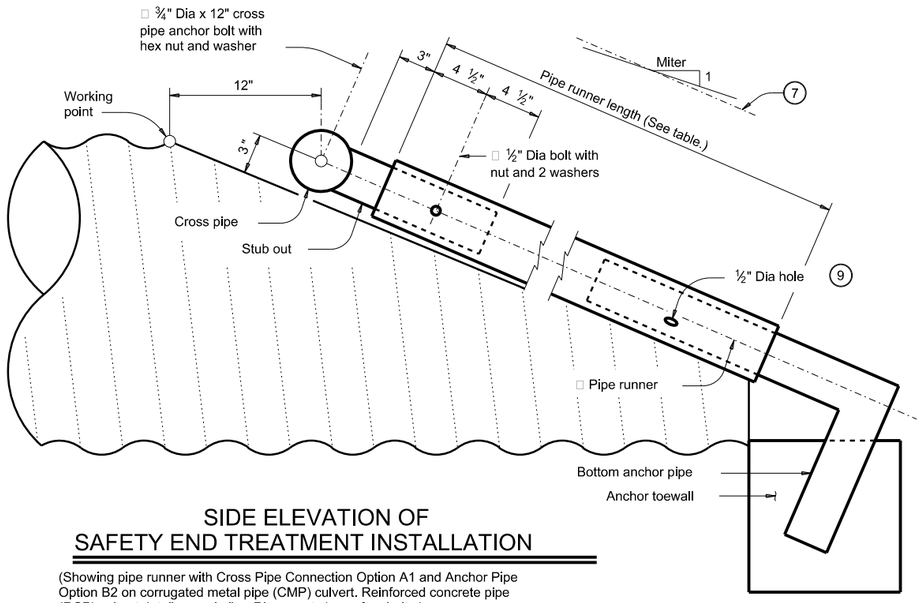
BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL

SECTION A-A



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 (RCP) culvert details are similar. Riprap not shown for clarity.)

(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.

SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 7
ARCH PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

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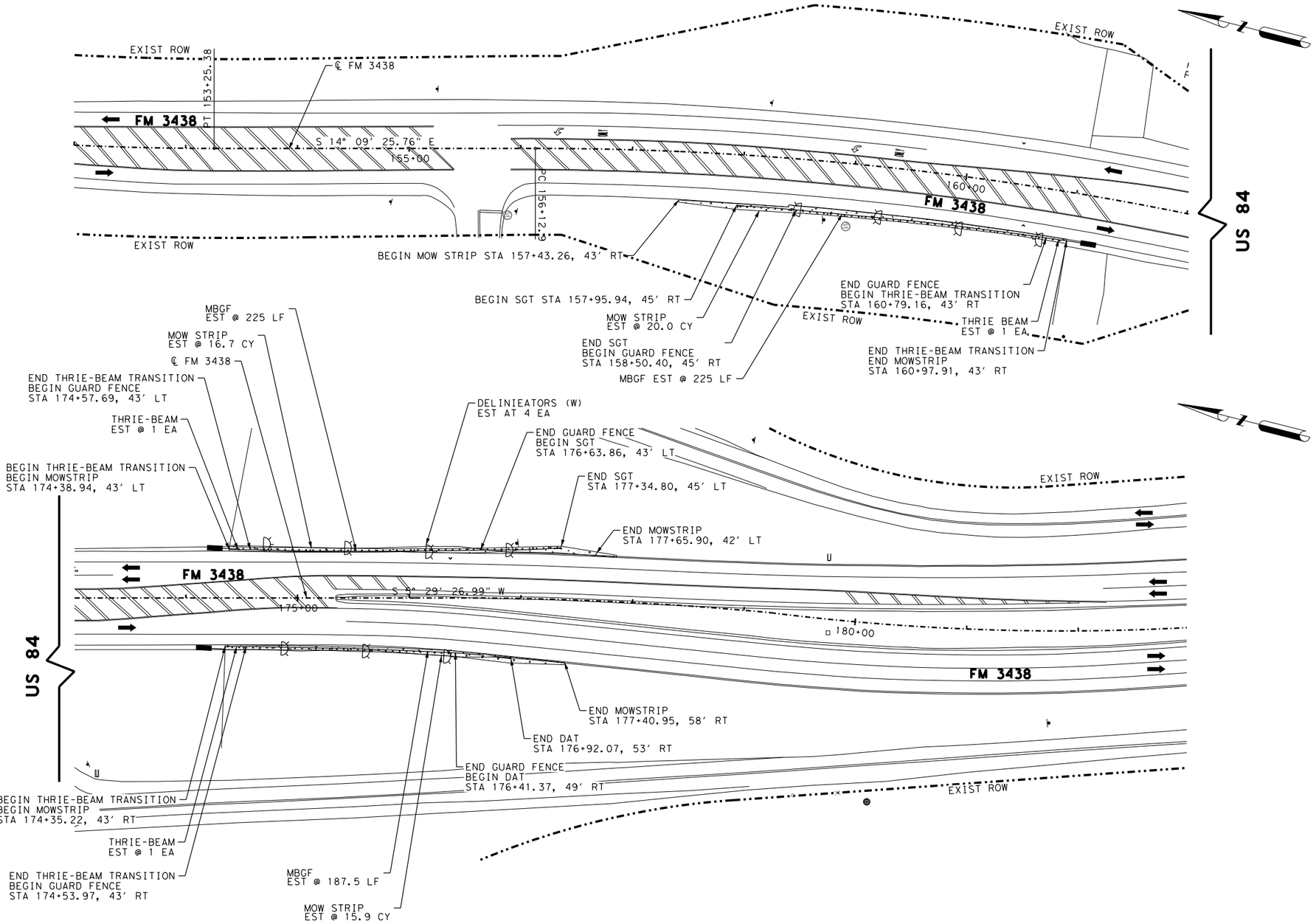

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION
- OVERLAY (2")
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP
- OM ASSM (OM-2X)(FLX)GND
- DEL ASSM (D-SW)SZ 1(BRF)GF2
- DEL ASSM (D-SY)SZ (BRF)CTB (BI)

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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Texas Department of Transportation

FM 3438

GUARD FENCE LAYOUT

BRIDGE AT US 84

SHEET 1 OF 1

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CK: AR	8	TEXAS	SEE TITLE SHEET				FM 3438
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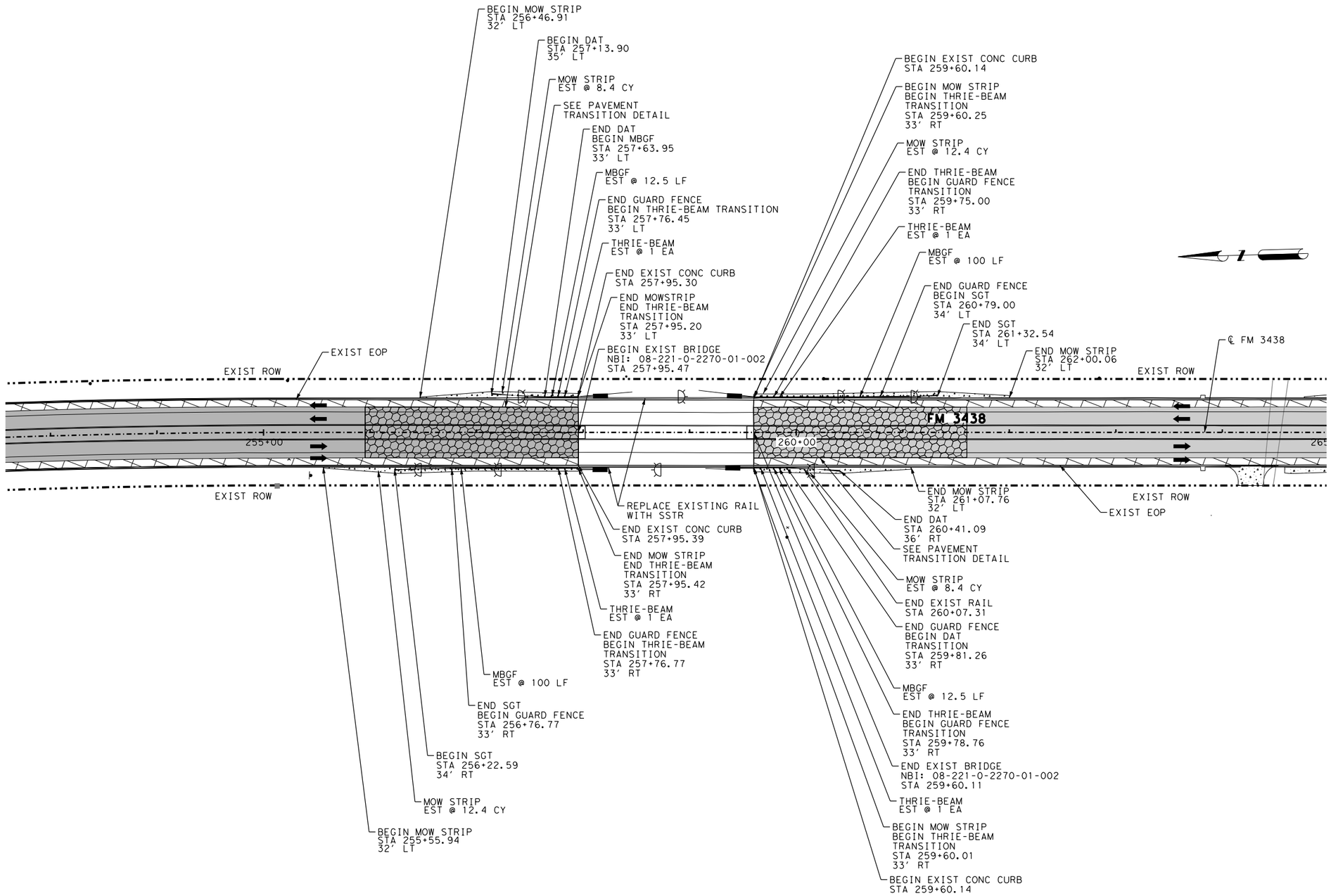

LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION
- OVERLAY (2")
- MILL & OVERLAY (2")
- SEAL COAT
- TRAFFIC DIRECTION
- PROP CONC PAVEMENT
- MBGF / MOW STRIP
- OM ASSM (OM-2X)(FLX)GND
- DEL ASSM (D-SW)SZ 1(BRF)GF2
- DEL ASSM (D-SY)SZ (BRF)CTB (BI)

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
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5/26/2021

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GUARD FENCE LAYOUT

BRIDGE AT LITTLE ELM CREEK

SHEET 1 OF 1

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LEGEND

- PROP FEATURE
- EXIST FEATURE
- EXIST ROW
- PAVEMENT TRANSITION
- OVERLAY (2")
- MILL & OVERLAY (2")
- SEAL COAT
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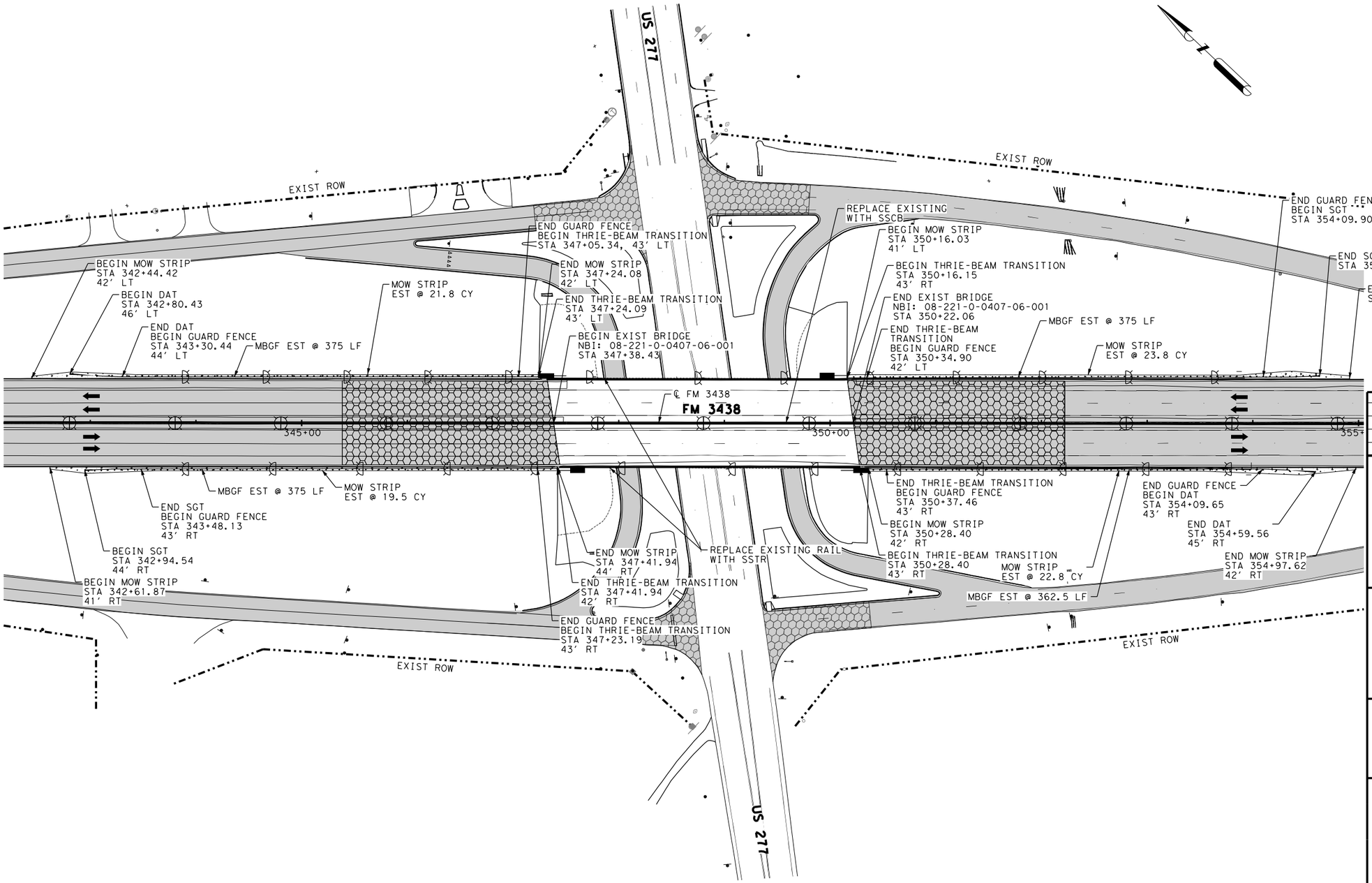
- OM ASSM (OM-2X)(FLX)GND
- DEL ASSM (D-SW)SZ 1(BRF)GF2
- DEL ASSM (D-SY)SZ (BRF)CTB (BI)



0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED
PROFESSIONAL ENGINEER
5/26/2021

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San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

Texas Department of Transportation

FM 3438

GUARD FENCE LAYOUT

BRIDGE AT US 277

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	124

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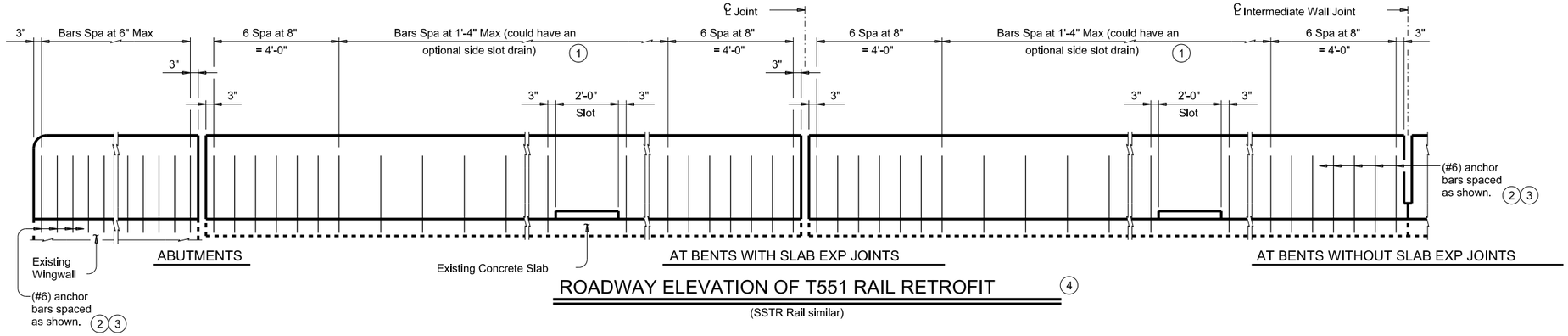
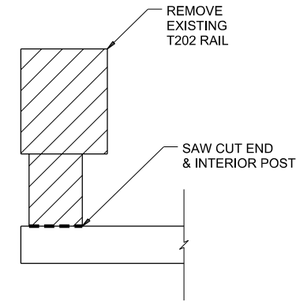
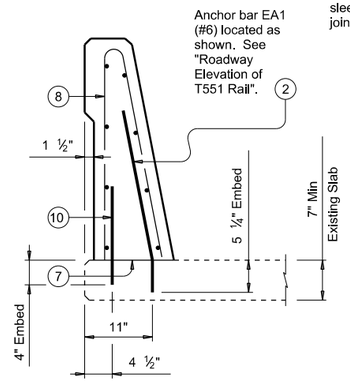


ROADWAY ELEVATION OF T551 RAIL RETROFIT 4

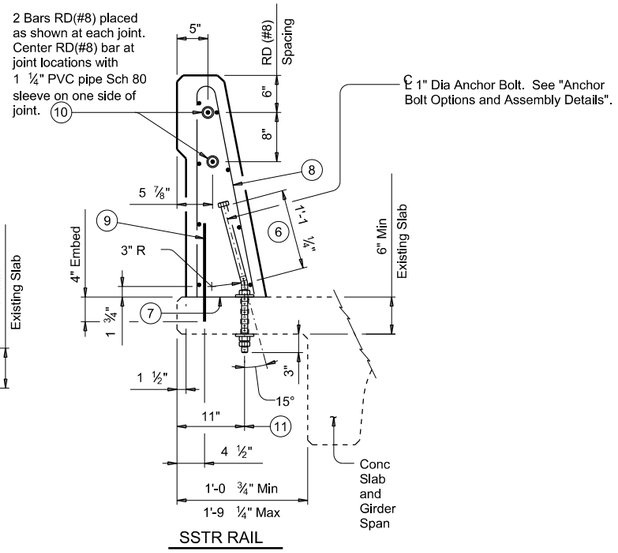
(SSTR Rail similar)



EXISTING RAIL REMOVAL DETAIL



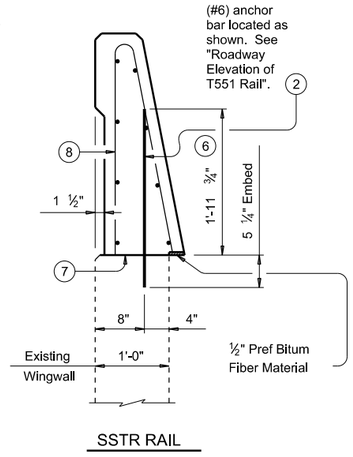
SSTR RAIL



SSTR RAIL

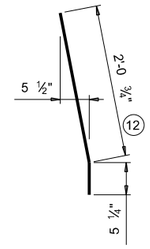
SSTR RAIL ON CONCRETE SLABS 5

Rail retrofits on existing Traffic Rail Foundations (TRF) are similar.



SSTR RAIL

SSTR RAIL ON WINGWALLS USING EPOXY ANCHOR BARS 5



ANCHOR BAR EA1 (#6)

NOTES:

1. WHEN SIDE SLOT DRAINS ARE USED, PROVIDE 8'-0" MIN CLEAR SPACING BETWEEN DRAIN SLOTS.
2. EMBED (#6) ANCHOR BARS WITH A TYPE III, CLASS C, D, E, OR F ANCHOR ADHESIVE. MINIMUM ADHESIVE ANCHOR EMBEDMENT DEPTH IS 5¼". 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 ACCORDANCE WITH ITEM 450, "RAILING".
3. SEE T551 OR SSTR RAIL SECTIONS IN "RAIL RETROFIT SECTION ON WINGWALLS USING EPOXY ANCHOR BAR'S AND/OR "RAIL RETROFIT SECTION ON CONCRETE SLBS USING EPOXY ANCHOR BAR'S.
4. SHOWING SPACING OF (#6) ANCHOR BAR EPOXY ANCHORED IN A RAIL RETROFIT CONDITION. SECONDARY (#4) ANCHOR BAR EPOXY ANCHORED IN A RAIL RETROFIT NOT SHOWN FOR CLARITY. REINFORCING STEEL AND TERMINAL CONNECTIONS NOT SHOWN FOR CLARITY. SEE APPROPRIATE RAIL STANDARD FOR DETAILS AND NOTES NOT SHOWN.
5. SHOWING LOCATION OR LOCATIONS OF ANCHOR BARS IN A RAIL RETROFIT CONDITION. SEE APPROPRIATE RAIL STANDARD FOR DETAILS AND NOTES NOT SHOWN.
6. INCREASE BY AMOUNT OF EXISTING OVERLAY/SEAL COAT THICKNESS, NOT TO EXCEED 2". IF THICKNESS OF EXISTING OVERLAY/SEAL COAT IS GREATER THAN 2" AT TOE OF RAIL, TAPER OVERLAY AT A 1:10 OR FLATTER SLOPE OVER SHOULDER WIDTH TO A THICKNESS OF 2" OR LESS AT TOE OF RAIL.
7. DO NOT CAST RAILS OR PARAPET WALLS ON TOP OF OVERLAYS/SEAL COATS.
8. SEE APPROPRIATE RAIL STANDARD FOR REINFORCING STEEL. MODIFY LENGTH OF VERTICAL REINFORCING BARS AS REQUIRED TO FIT EXISTING STRUCTURE. LONGITUDINAL REINFORCING BARS MAY BE REMOVED ONLY IF THEIR POSITION PUTS THEM IN CONFLICT WITH UN-REMOVRD PORTIONS OF EXISTING STRUCTURE.
9. EMBED SECONDARY (#4) ANCHOR BARS 1'-4" IN LENGTH WITH 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 MANUFACTER'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).
10. SEE "BAR RD (38) ASSEMBLY DETAIL".
11. ℄ 1 1/16" TO 1¼" DIA HOLES. CORE DRILL HOLES THROUGH EXISTING DECK (PERCUSSION DRILLING NOT PERMITTED). CONCRETE SPALLS IN THE BOTTOM OF THE DECK EXCEEDING½" FROM EDGE OF HOLE WILL BE PATCHED IN ACCORDANCE WITH ITEM 429, "CONCRETE STRUCTURE REPAIR" AT THE CONTRACTOR'S EXPENSE.
12. ℄ 1" DIA ANCHOR BOLT SPACED LONGITUDINALLY ALONG RAIL AT 20" MAX (SPACED 6" LONGITUDINALLY FROM OUTSIDE EDGE AND EDGE OF SIDE SLOT DRAINS).

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JEROME A. QUINTERO
49648
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5/26/2021

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Texas Department of Transportation

FM 3438

RETROFIT SSTR CONCRETE RAIL C-RAIL-R(MOD)

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	125

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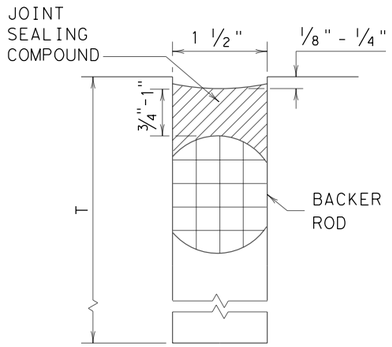
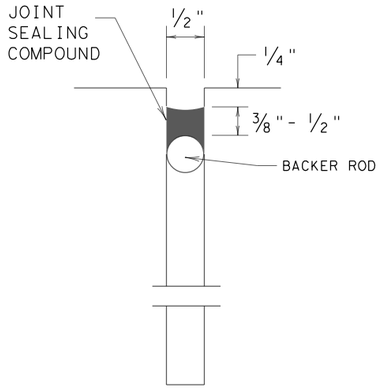
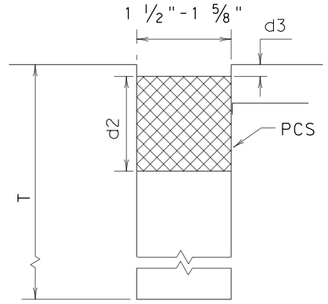


TRANSVERSE FORMED
EXPANSION JOINT



FORMED
ISOLATION JOINT

METHOD B: JOINT SEALING COMPOUND



TRANSVERSE FORMED
EXPANSION JOINT

METHOD A: PREFORMED COMPRESSION SEALS (PCS) (DMS-6310 CLASS 6)

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
2. THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
3. THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
4. DIMENSIONS d2, AND d3 SHOWN IN METHOD "A" SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
5. REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
6. FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
7. FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4, 5, 7, OR 8 FOR MAINTAINING EXISTING JOINTS.
8. THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS".
9. ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A PAVEMENT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, CURB AND GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LIGHTING STRUCTURES.

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JEROME A. QUINTERO
49648
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PROFESSIONAL ENGINEER
5/26/2021
P.E.

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Texas Department of Transportation

FM 3438

BRIDGE JOINT SEALER

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	126

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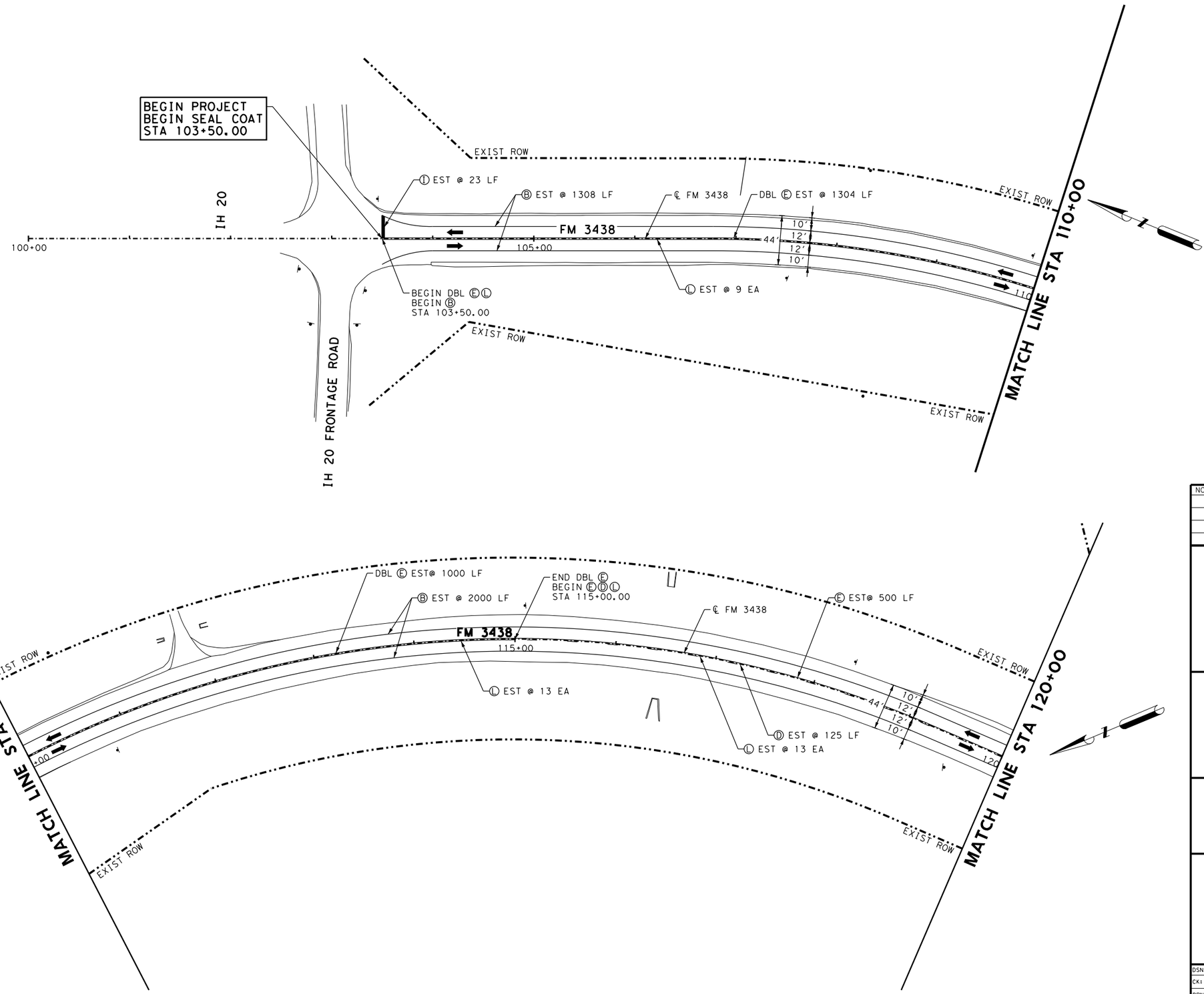

LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)
- (B) REFL PAV MRK TY I (W) 4" (SLD)
- (C) REFL PAV MRK TY I (W) 4" (DOTTED)
- (D) REFL PAV MRK TY I (Y) 4" (BRK)
- (E) REFL PAV MRK TY I (Y) 4" (SLD)
- (F) REFL PAV MRK TY I (W) 8" (SLD)
- (G) REFL PAV MRK TY I (Y) 8" (SLD)
- (H) REFL PAV MRK TY I (W) 12" (SLD)
- (I) PREFAB PAV MRK TY C (W) 24" (SLD)
- (J) PREFAB PAV MRK TY C (Y) 24" (SLD)
- (K) PREFAB YIELD TRIANGES TY C (W) 18"
- (L) REFL PAV MRKR TY II-A-A
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRK TY II-C-R
- (P) PREFAB PAV MRK TY C (W) (ARROW)
- (R) PREFAB PAV MRK TY C (W) WORD
- (S) REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

PAVEMENT MARKING LAYOUT

BEGIN PROJECT TO STA 120+00

SHEET 1 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	127

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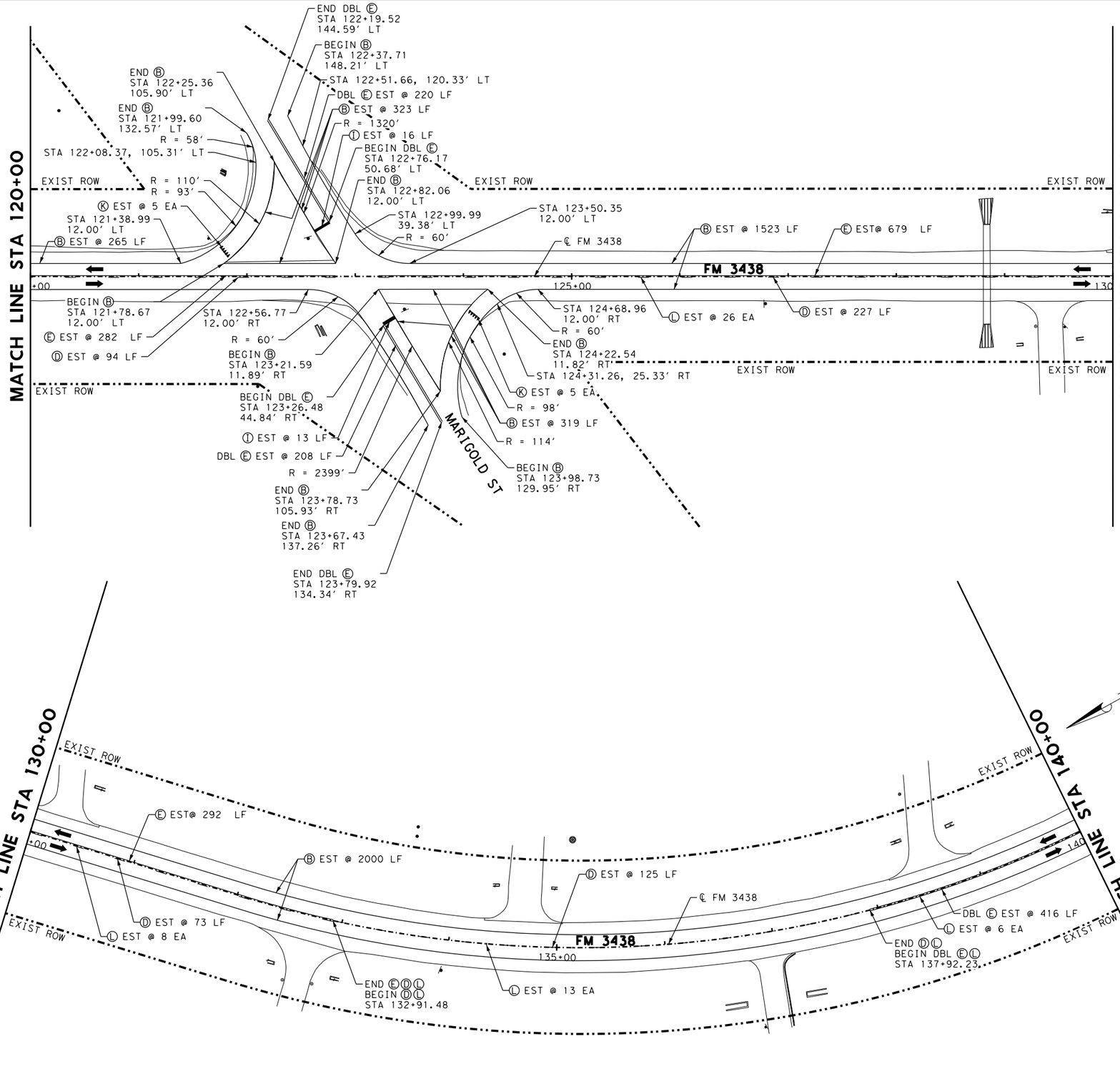

LEGEND

Ⓐ	REFL PAV MRK TY I (W) 4" (BRK)
Ⓑ	REFL PAV MRK TY I (W) 4" (SLD)
Ⓒ	REFL PAV MRK TY I (W) 4" (DOTTED)
Ⓓ	REFL PAV MRK TY I (Y) 4" (BRK)
Ⓔ	REFL PAV MRK TY I (Y) 4" (SLD)
Ⓕ	REFL PAV MRK TY I (W) 8" (SLD)
Ⓖ	REFL PAV MRK TY I (Y) 8" (SLD)
Ⓗ	REFL PAV MRK TY I (W) 12" (SLD)
Ⓘ	PREFAB PAV MRK TY C (W) 24" (SLD)
Ⓙ	PREFAB PAV MRK TY C (Y) 24" (SLD)
Ⓚ	PREFAB YIELD TRIANGES TY C (W) 18"
Ⓛ	REFL PAV MRKR TY II-A-A
Ⓜ	REFL PAV MRKR TY I-C
Ⓝ	REFL PAV MRK TY II-C-R
Ⓟ	PREFAB PAV MRK TY C (W) (ARROW)
Ⓡ	PREFAB PAV MRK TY C (W) WORD
Ⓢ	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

5/26/2021

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FM 3438

PAVEMENT MARKING LAYOUT

STA 120+00 TO STA 140+00

SHEET 2 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	128

5/26/2021 10:28:26 AM

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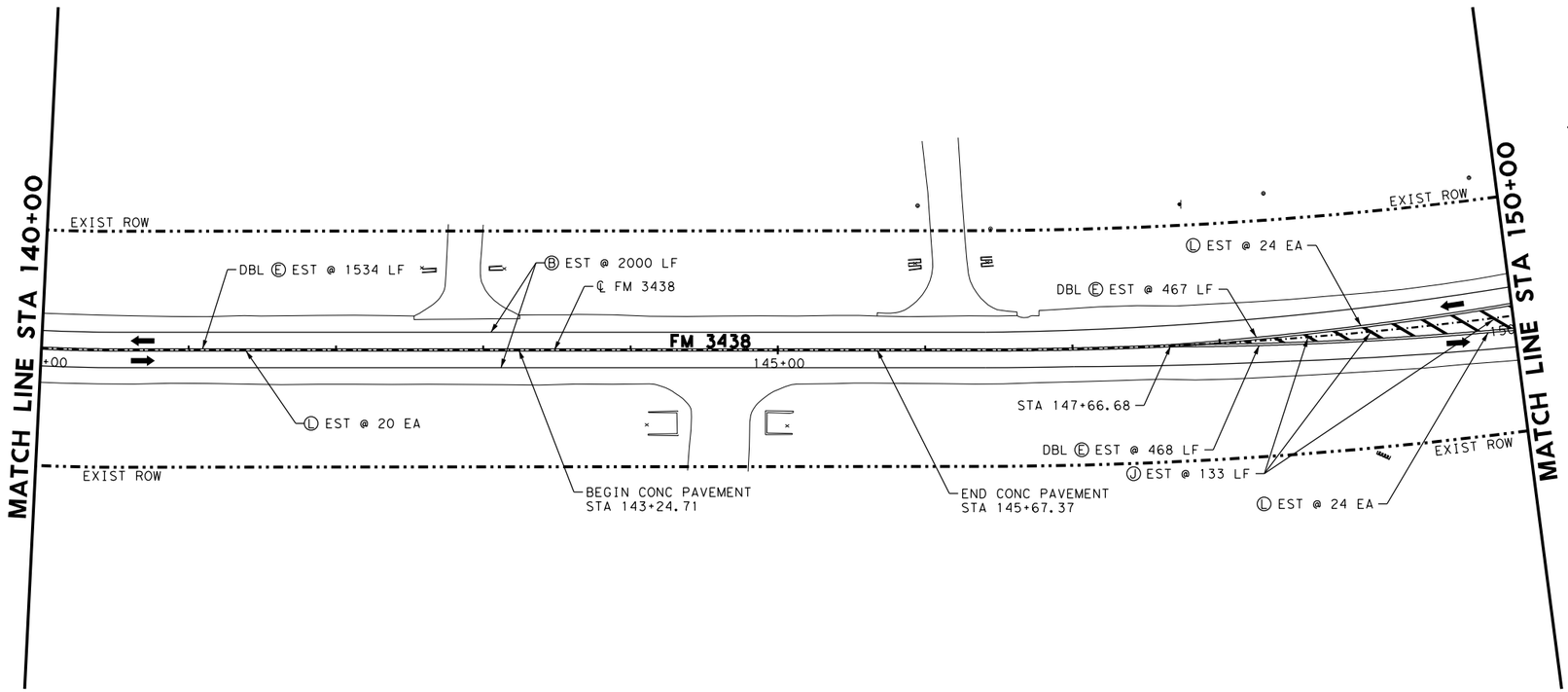

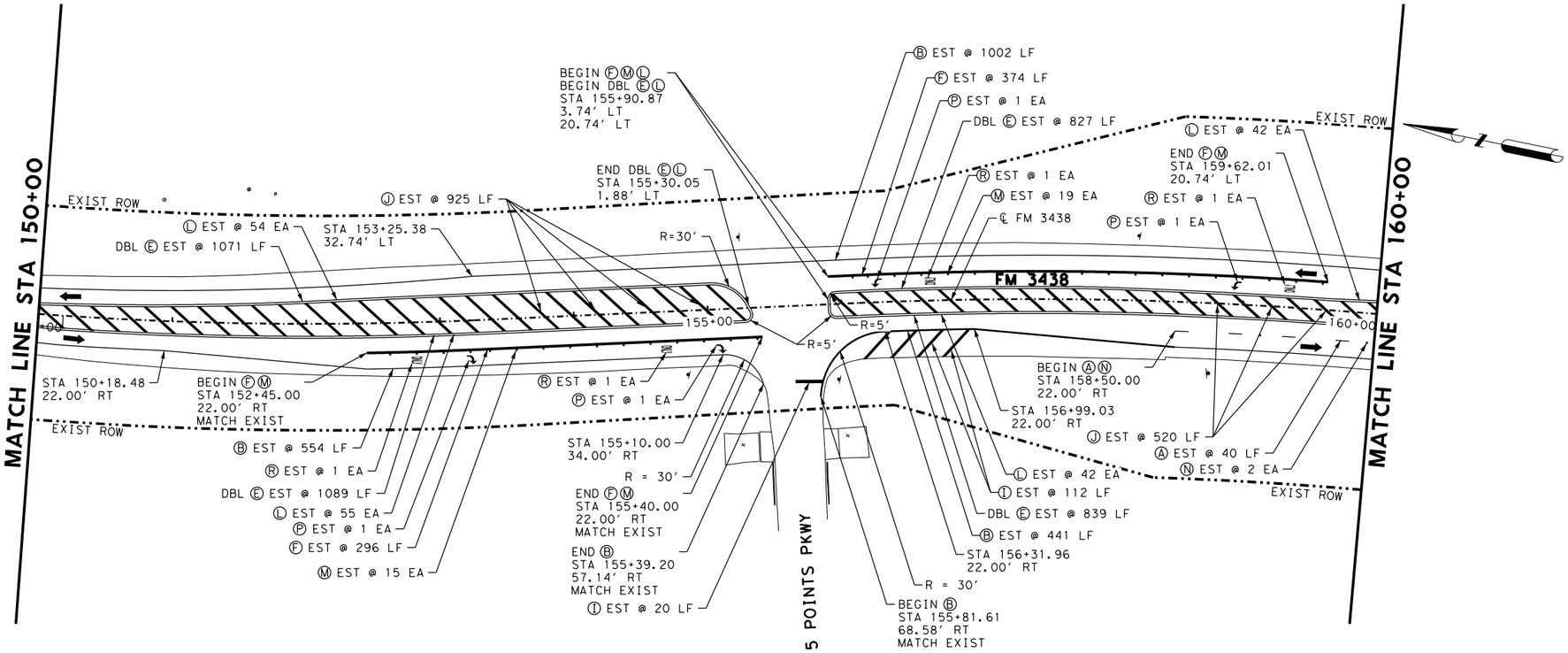

LEGEND

Ⓐ	REFL PAV MRK TY I (W) 4" (BRK)
Ⓑ	REFL PAV MRK TY I (W) 4" (SLD)
Ⓒ	REFL PAV MRK TY I (W) 4" (DOTTED)
Ⓓ	REFL PAV MRK TY I (Y) 4" (BRK)
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Ⓕ	REFL PAV MRK TY I (W) 8" (SLD)
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Ⓘ	PREFAB PAV MRK TY C (W) 24" (SLD)
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Ⓢ	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

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FM 3438

PAVEMENT MARKING LAYOUT

STA 140+00 TO STA 160+00

SHEET 3 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	129

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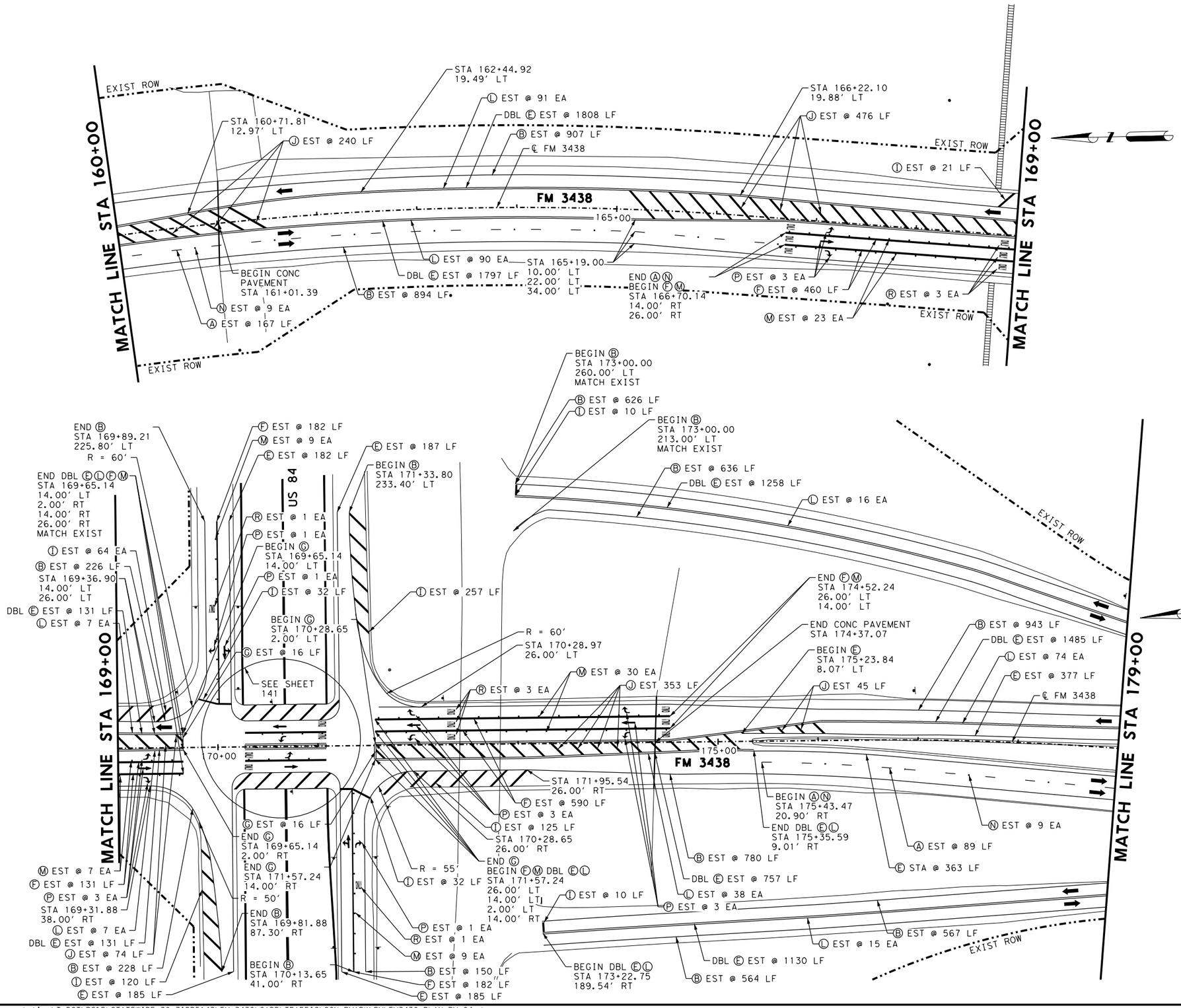

LEGEND

A	REFL PAV MRK TY I (W) 4" (BRK)
B	REFL PAV MRK TY I (W) 4" (SLD)
C	REFL PAV MRK TY I (W) 4" (DOTTED)
D	REFL PAV MRK TY I (Y) 4" (BRK)
E	REFL PAV MRK TY I (Y) 4" (SLD)
F	REFL PAV MRK TY I (W) 8" (SLD)
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S	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

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FM 3438

PAVEMENT MARKING LAYOUT

STA 160+00 TO STA 179+00

SHEET 4 OF 14

DSN: JA	FED. RD. DIV. NO:	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	130

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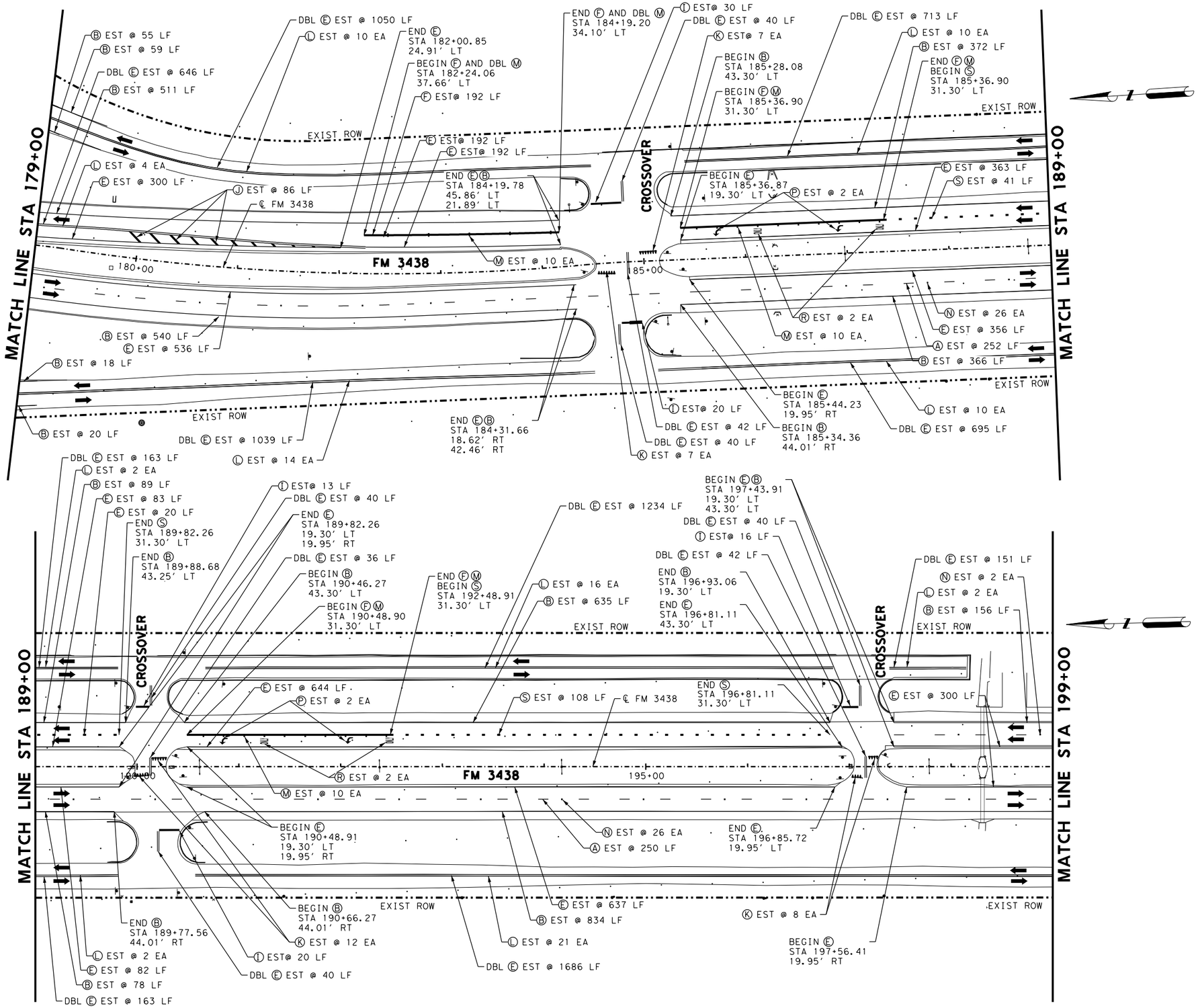

LEGEND

Ⓐ	REFL PAV MRK TY I (W) 4" (BRK)
Ⓑ	REFL PAV MRK TY I (W) 4" (SLD)
Ⓒ	REFL PAV MRK TY I (W) 4" (DOTTED)
Ⓓ	REFL PAV MRK TY I (Y) 4" (BRK)
Ⓔ	REFL PAV MRK TY I (Y) 4" (SLD)
Ⓕ	REFL PAV MRK TY I (W) 8" (SLD)
Ⓖ	REFL PAV MRK TY I (Y) 8" (SLD)
Ⓗ	REFL PAV MRK TY I (W) 12" (SLD)
Ⓘ	PREFAB PAV MRK TY C (W) 24" (SLD)
Ⓙ	PREFAB PAV MRK TY C (Y) 24" (SLD)
Ⓚ	PREFAB YIELD TRIANGES TY C (W) 18"
Ⓛ	REFL PAV MRKR TY II-A-A
Ⓜ	REFL PAV MRKR TY I-C
Ⓝ	REFL PAV MRK TY II-C-R
Ⓟ	PREFAB PAV MRK TY C (W) (ARROW)
Ⓡ	PREFAB PAV MRK TY C (W) WORD
Ⓢ	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0′ 50′ 100′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

IDCUS
PLANNERS + ENGINEERS + MANAGERS
IDCUS, Inc.
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(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

PAVEMENT MARKING LAYOUT

STA 179+00 TO STA 199+00

SHEET 5 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	131

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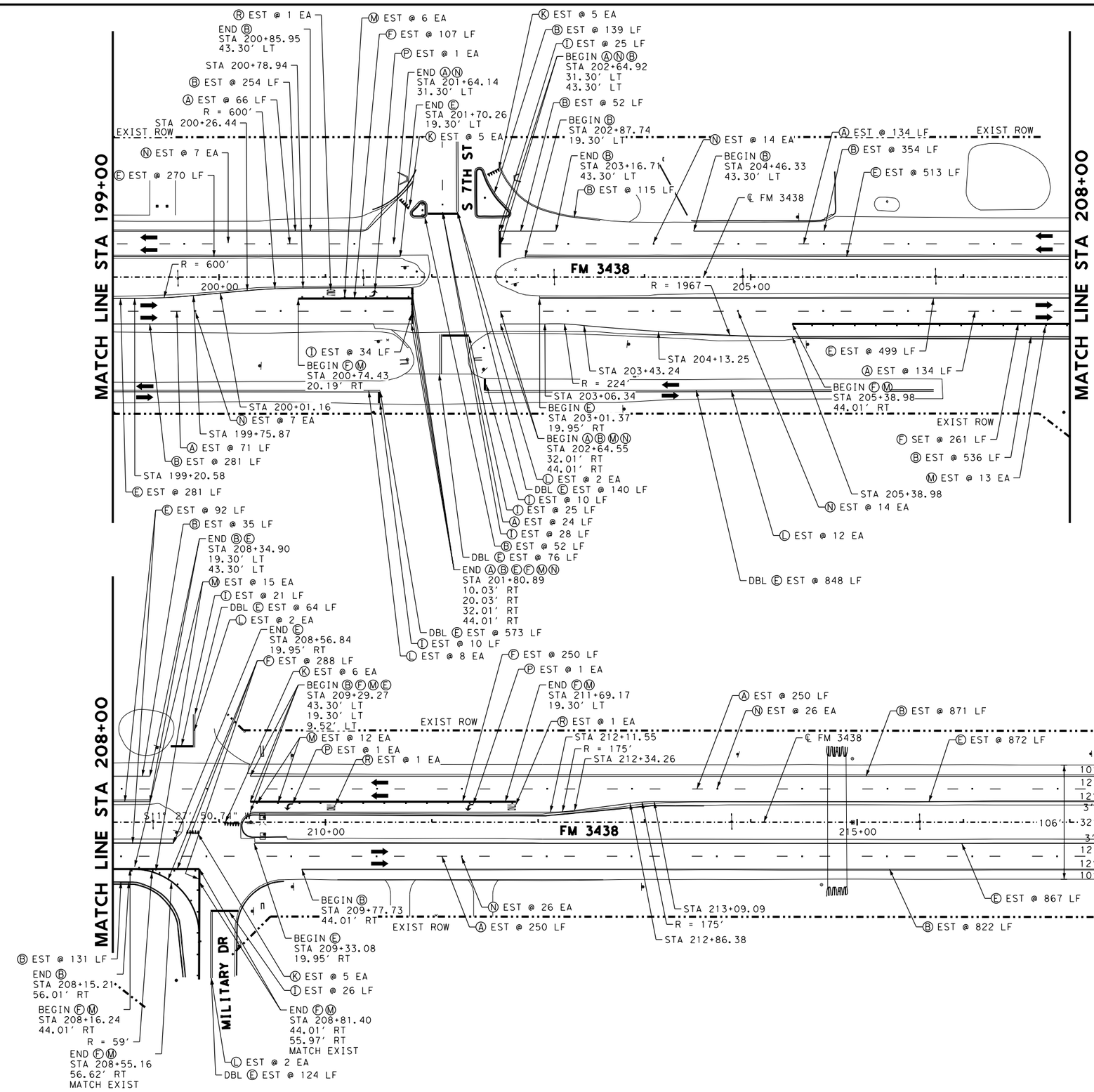

LEGEND

Ⓐ	REFL PAV MRK TY I (W) 4" (BRK)
Ⓑ	REFL PAV MRK TY I (W) 4" (SLD)
Ⓒ	REFL PAV MRK TY I (W) 4" (DOTTED)
Ⓓ	REFL PAV MRK TY I (Y) 4" (BRK)
Ⓔ	REFL PAV MRK TY I (Y) 4" (SLD)
Ⓕ	REFL PAV MRK TY I (W) 8" (SLD)
Ⓖ	REFL PAV MRK TY I (Y) 8" (SLD)
Ⓗ	REFL PAV MRK TY I (W) 12" (SLD)
Ⓘ	PREFAB PAV MRK TY C (W) 24" (SLD)
Ⓙ	PREFAB PAV MRK TY C (Y) 24" (SLD)
Ⓚ	PREFAB YIELD TRIANGES TY C (W) 18"
Ⓛ	REFL PAV MRKR TY II-A-A
Ⓜ	REFL PAV MRKR TY I-C
Ⓝ	REFL PAV MRK TY II-C-R
Ⓟ	PREFAB PAV MRK TY C (W) (ARROW)
Ⓡ	PREFAB PAV MRK TY C (W) WORD
Ⓢ	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

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T.B.P.E.FIRM REGISTRATION NO. F-6825

Texas Department of Transportation

FM 3438

PAVEMENT MARKING LAYOUT

STA 199+00 TO STA 218+00

SHEET 6 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	132

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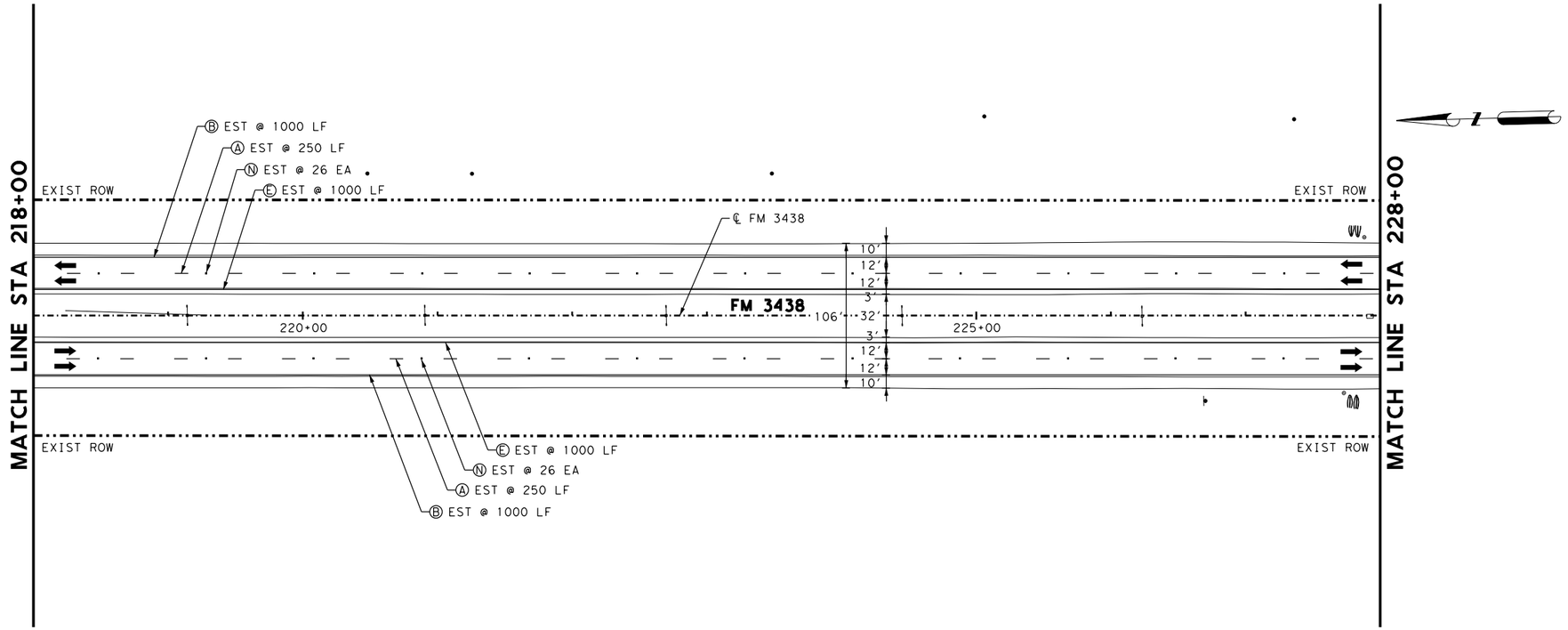

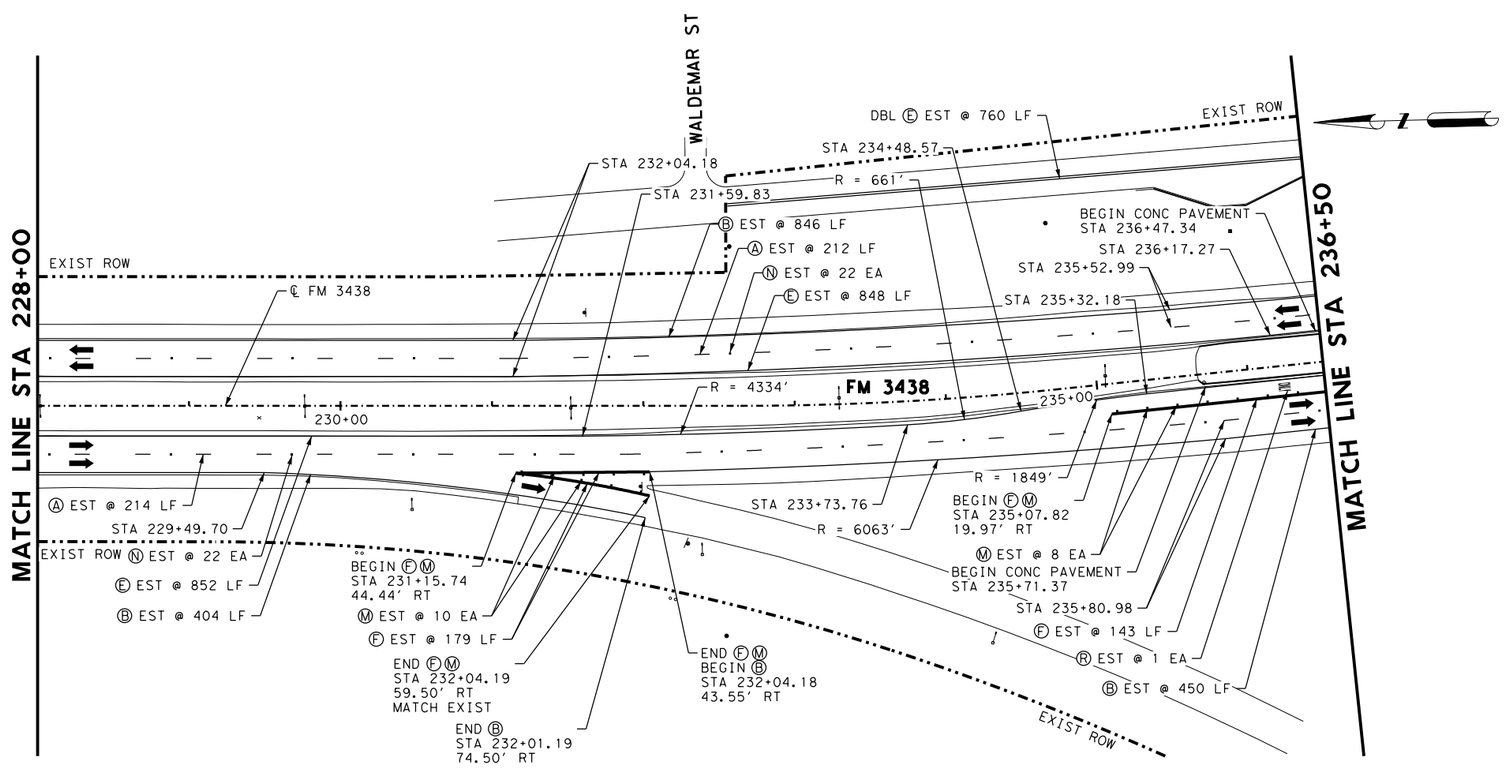

LEGEND

Ⓐ	REFL PAV MRK TY I (W) 4" (BRK)
Ⓑ	REFL PAV MRK TY I (W) 4" (SLD)
Ⓒ	REFL PAV MRK TY I (W) 4" (DOTTED)
Ⓓ	REFL PAV MRK TY I (Y) 4" (BRK)
Ⓔ	REFL PAV MRK TY I (Y) 4" (SLD)
Ⓕ	REFL PAV MRK TY I (W) 8" (SLD)
Ⓖ	REFL PAV MRK TY I (Y) 8" (SLD)
Ⓗ	REFL PAV MRK TY I (W) 12" (SLD)
Ⓘ	PREFAB PAV MRK TY C (W) 24" (SLD)
Ⓙ	PREFAB PAV MRK TY C (Y) 24" (SLD)
Ⓚ	PREFAB YIELD TRIANGES TY C (W) 18"
Ⓛ	REFL PAV MRKR TY II-A-A
Ⓜ	REFL PAV MRKR TY I-C
Ⓝ	REFL PAV MRK TY II-C-R
Ⓟ	PREFAB PAV MRK TY C (W) (ARROW)
Ⓡ	PREFAB PAV MRK TY C (W) WORD
Ⓢ	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

PAVEMENT MARKING LAYOUT

STA 218+00 TO STA 236+50

SHEET 7 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	133

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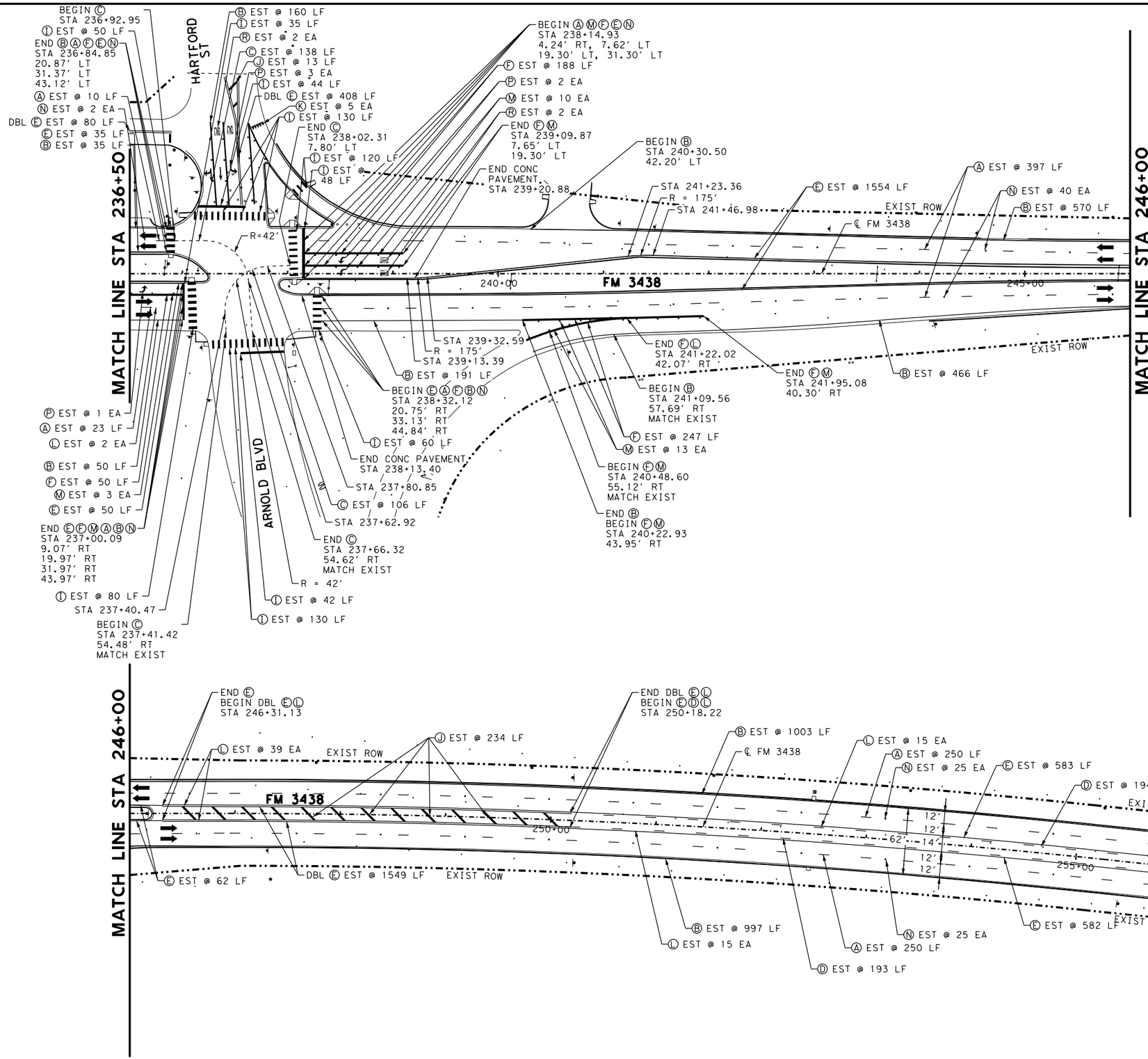

LEGEND

Ⓐ	REFL PAV MRK TY I (W) 4" (BRK)
Ⓑ	REFL PAV MRK TY I (W) 4" (SLD)
Ⓒ	REFL PAV MRK TY I (W) 4" (DOTTED)
Ⓓ	REFL PAV MRK TY I (Y) 4" (BRK)
Ⓔ	REFL PAV MRK TY I (Y) 4" (SLD)
Ⓕ	REFL PAV MRK TY I (W) 8" (SLD)
Ⓖ	REFL PAV MRK TY I (Y) 8" (SLD)
Ⓗ	REFL PAV MRK TY I (W) 12" (SLD)
Ⓘ	PREFAB PAV MRK TY C (W) 24" (SLD)
Ⓙ	PREFAB PAV MRK TY C (Y) 24" (SLD)
Ⓚ	PREFAB YIELD TRIANGES TY C (W) 18"
Ⓛ	REFL PAV MRKR TY II-A-A
Ⓜ	REFL PAV MRKR TY I-C
Ⓝ	REFL PAV MRK TY II-C-R
Ⓟ	PREFAB PAV MRK TY C (W) (ARROW)
Ⓡ	PREFAB PAV MRK TY C (W) WORD
Ⓢ	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

5/26/2021

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T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

PAVEMENT MARKING LAYOUT

STA 236+50 TO STA 256+00

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	134

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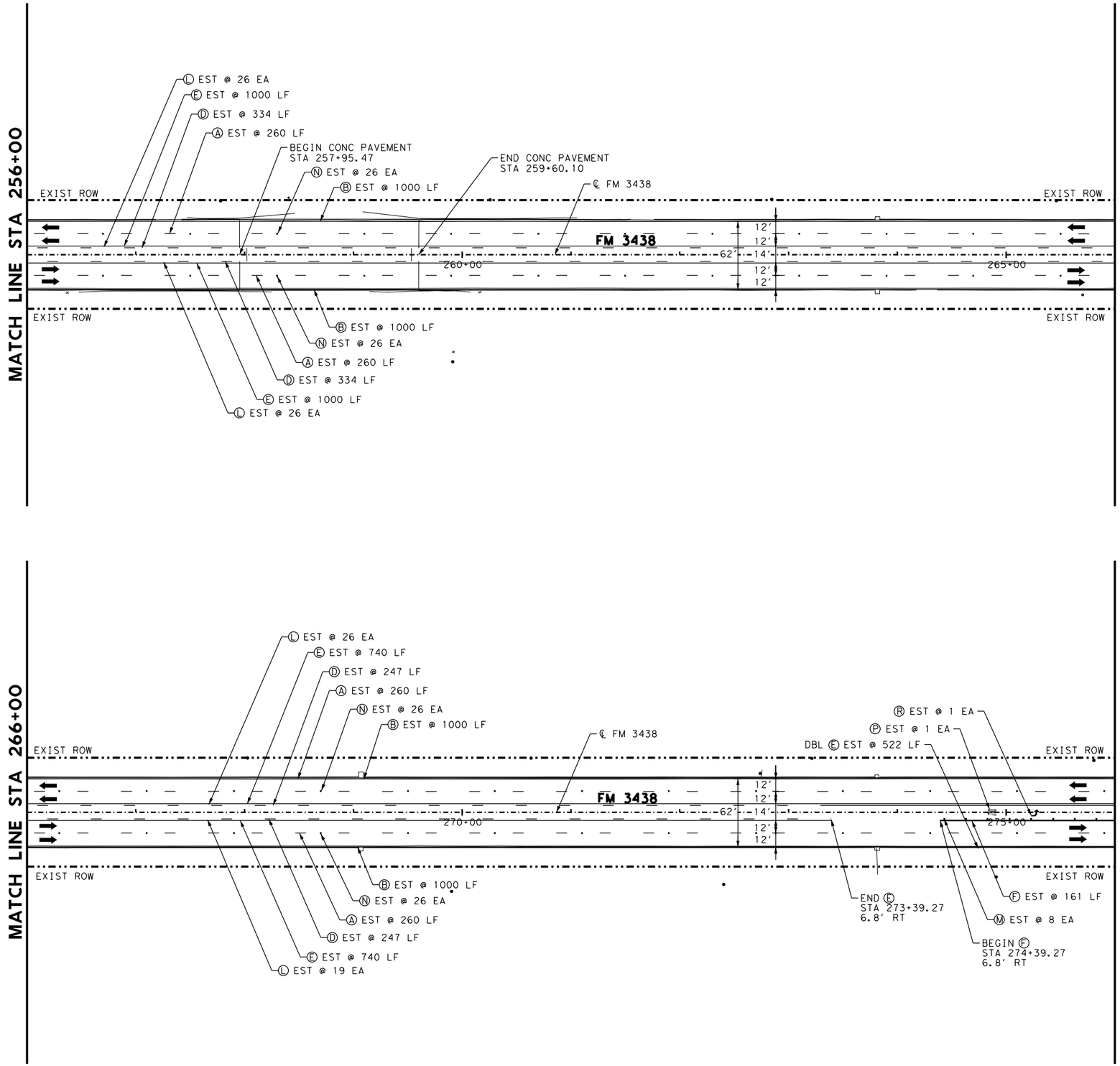

LEGEND

A	REFL PAV MRK TY I (W) 4" (BRK)
B	REFL PAV MRK TY I (W) 4" (SLD)
C	REFL PAV MRK TY I (W) 4" (DOTTED)
D	REFL PAV MRK TY I (Y) 4" (BRK)
E	REFL PAV MRK TY I (Y) 4" (SLD)
F	REFL PAV MRK TY I (W) 8" (SLD)
G	REFL PAV MRK TY I (Y) 8" (SLD)
H	REFL PAV MRK TY I (W) 12" (SLD)
I	PREFAB PAV MRK TY C (W) 24" (SLD)
J	PREFAB PAV MRK TY C (Y) 24" (SLD)
K	PREFAB YIELD TRIANGES TY C (W) 18"
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY I-C
N	REFL PAV MRK TY II-C-R
P	PREFAB PAV MRK TY C (W) (ARROW)
R	PREFAB PAV MRK TY C (W) WORD
S	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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PLANNERS + ENGINEERS + MANAGERS
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T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

PAVEMENT MARKING LAYOUT

STA 256+00 TO STA 276+00

SHEET 9 OF 14

DSN: JA	FED. RD. DIV. NO. 8	STATE TEXAS	PROJECT NO. SEE TITLE SHEET			HIGHWAY NO. FM 3438
CK: AR						
DRN: AM	STATE DISTRICT ABL	COUNTY TAYLOR	CONTROL NO. 2270	SECTION NO. 01	JOB NO. 023	SHEET NO. 135
APPVD: CS						

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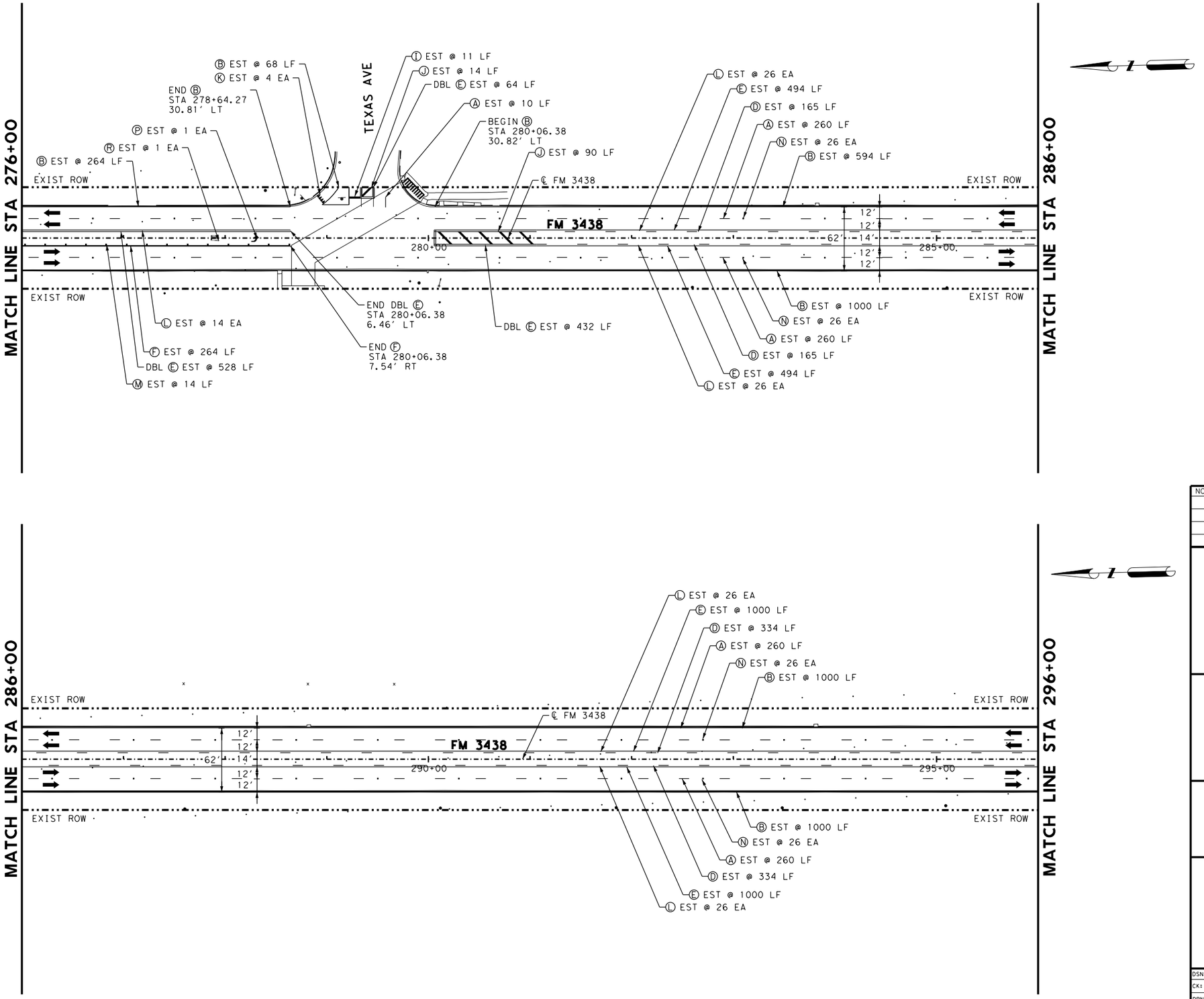

LEGEND

A	REFL PAV MRK TY I (W) 4" (BRK)
B	REFL PAV MRK TY I (W) 4" (SLD)
C	REFL PAV MRK TY I (W) 4" (DOTTED)
D	REFL PAV MRK TY I (Y) 4" (BRK)
E	REFL PAV MRK TY I (Y) 4" (SLD)
F	REFL PAV MRK TY I (W) 8" (SLD)
G	REFL PAV MRK TY I (Y) 8" (SLD)
H	REFL PAV MRK TY I (W) 12" (SLD)
I	PREFAB PAV MRK TY C (W) 24" (SLD)
J	PREFAB PAV MRK TY C (Y) 24" (SLD)
K	PREFAB YIELD TRIANGES TY C (W) 18"
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY I-C
N	REFL PAV MRK TY II-C-R
P	PREFAB PAV MRK TY C (W) (ARROW)
R	PREFAB PAV MRK TY C (W) WORD
S	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

PAVEMENT MARKING LAYOUT

STA 276+00 TO STA 296+00

SHEET 10 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	136

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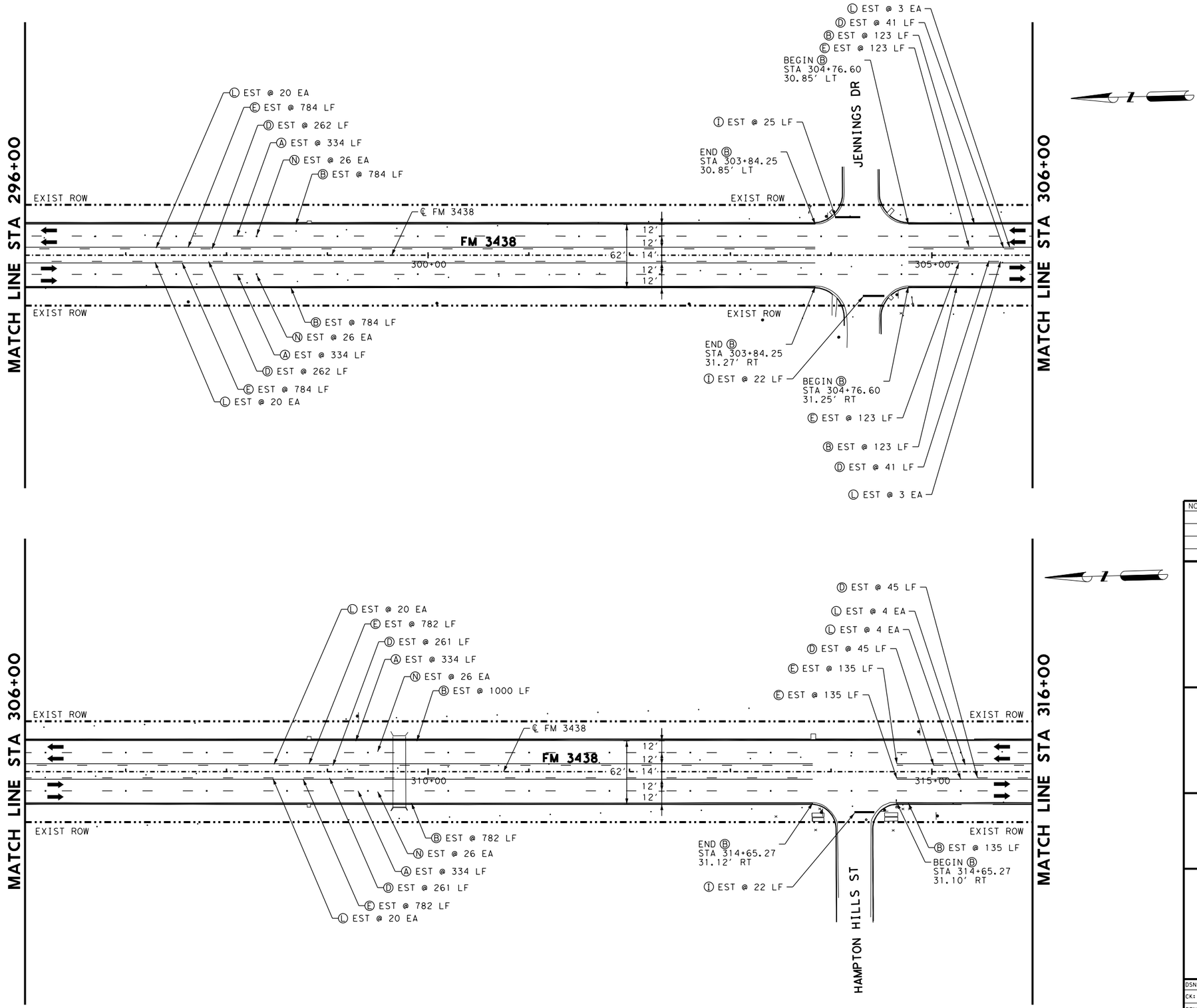

LEGEND

Ⓐ	REFL PAV MRK TY I (W) 4" (BRK)
Ⓑ	REFL PAV MRK TY I (W) 4" (SLD)
Ⓒ	REFL PAV MRK TY I (W) 4" (DOTTED)
Ⓓ	REFL PAV MRK TY I (Y) 4" (BRK)
Ⓔ	REFL PAV MRK TY I (Y) 4" (SLD)
Ⓕ	REFL PAV MRK TY I (W) 8" (SLD)
Ⓖ	REFL PAV MRK TY I (Y) 8" (SLD)
Ⓗ	REFL PAV MRK TY I (W) 12" (SLD)
Ⓘ	PREFAB PAV MRK TY C (W) 24" (SLD)
Ⓙ	PREFAB PAV MRK TY C (Y) 24" (SLD)
Ⓚ	PREFAB YIELD TRIANGES TY C (W) 18"
Ⓛ	REFL PAV MRKR TY II-A-A
Ⓜ	REFL PAV MRKR TY I-C
Ⓝ	REFL PAV MRK TY II-C-R
Ⓟ	PREFAB PAV MRK TY C (W) (ARROW)
Ⓡ	PREFAB PAV MRK TY C (W) WORD
Ⓢ	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

PAVEMENT MARKING LAYOUT

STA 296+00 TO STA 316+00

SHEET 11 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	137

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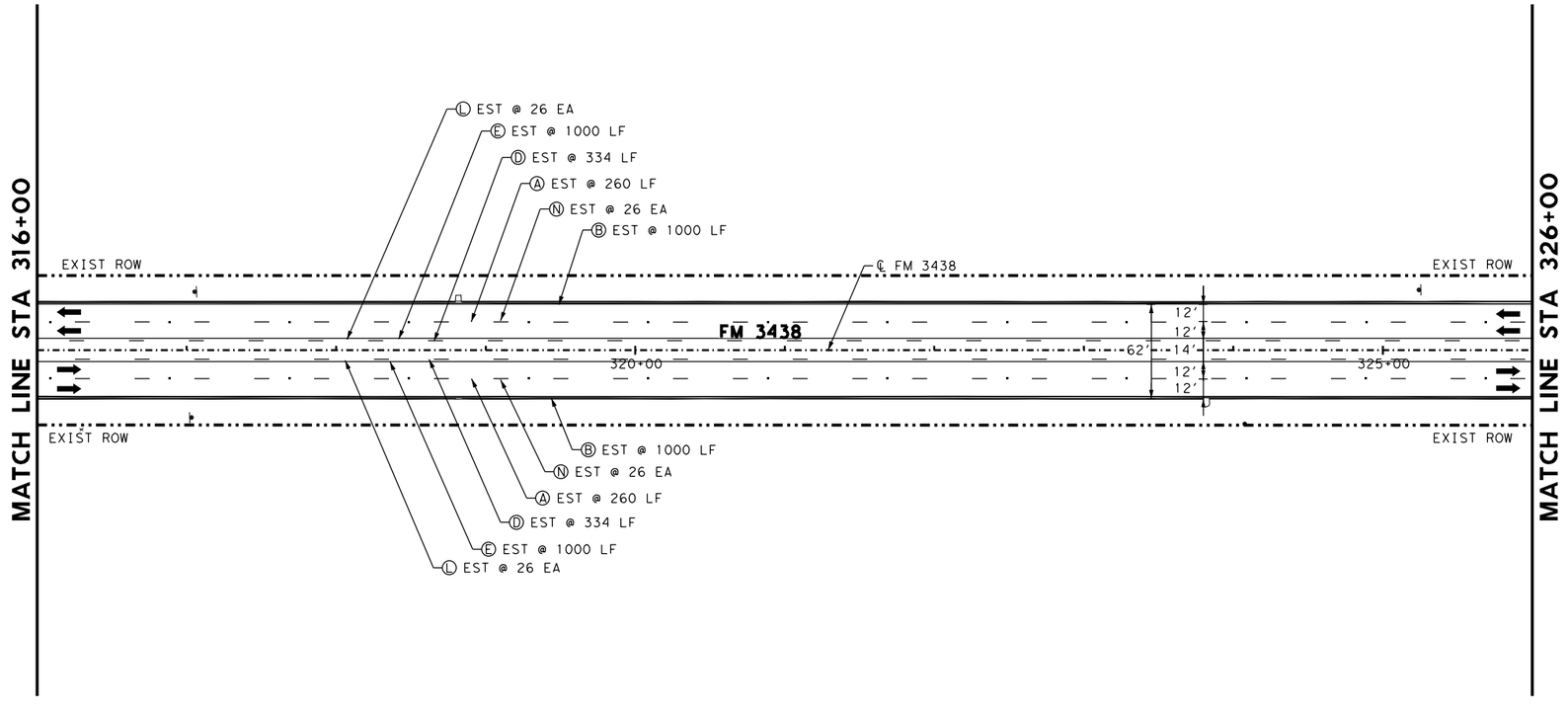

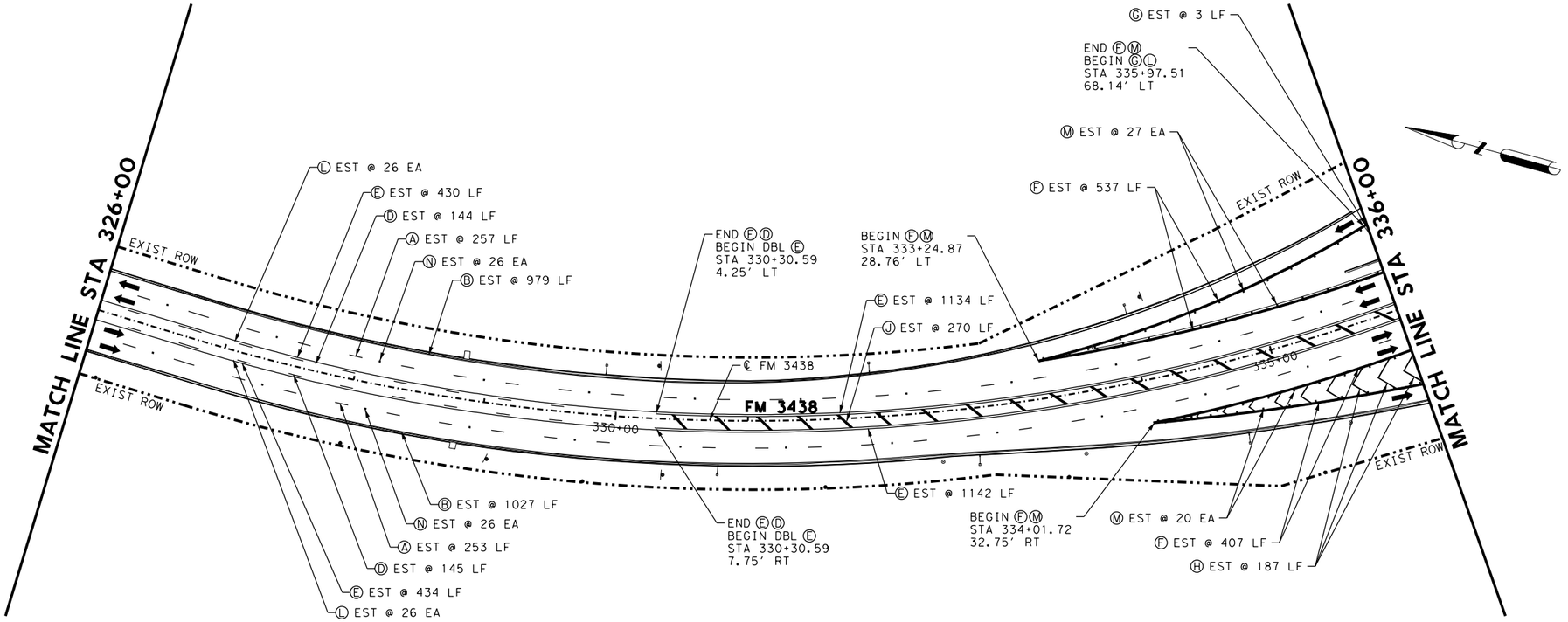

LEGEND

Ⓐ	REFL PAV MRK TY I (W) 4" (BRK)
Ⓑ	REFL PAV MRK TY I (W) 4" (SLD)
Ⓒ	REFL PAV MRK TY I (W) 4" (DOTTED)
Ⓓ	REFL PAV MRK TY I (Y) 4" (BRK)
Ⓔ	REFL PAV MRK TY I (Y) 4" (SLD)
Ⓕ	REFL PAV MRK TY I (W) 8" (SLD)
Ⓖ	REFL PAV MRK TY I (Y) 8" (SLD)
Ⓗ	REFL PAV MRK TY I (W) 12" (SLD)
Ⓘ	PREFAB PAV MRK TY C (W) 24" (SLD)
Ⓙ	PREFAB PAV MRK TY C (Y) 24" (SLD)
Ⓚ	PREFAB YIELD TRIANGES TY C (W) 18"
Ⓛ	REFL PAV MRKR TY II-A-A
Ⓜ	REFL PAV MRKR TY I-C
Ⓝ	REFL PAV MRK TY II-C-R
Ⓟ	PREFAB PAV MRK TY C (W) (ARROW)
Ⓡ	PREFAB PAV MRK TY C (W) WORD
Ⓢ	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

PAVEMENT MARKING LAYOUT

STA 316+00 TO STA 336+00

SHEET 12 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	138

5/26/2021 10:30:14 AM

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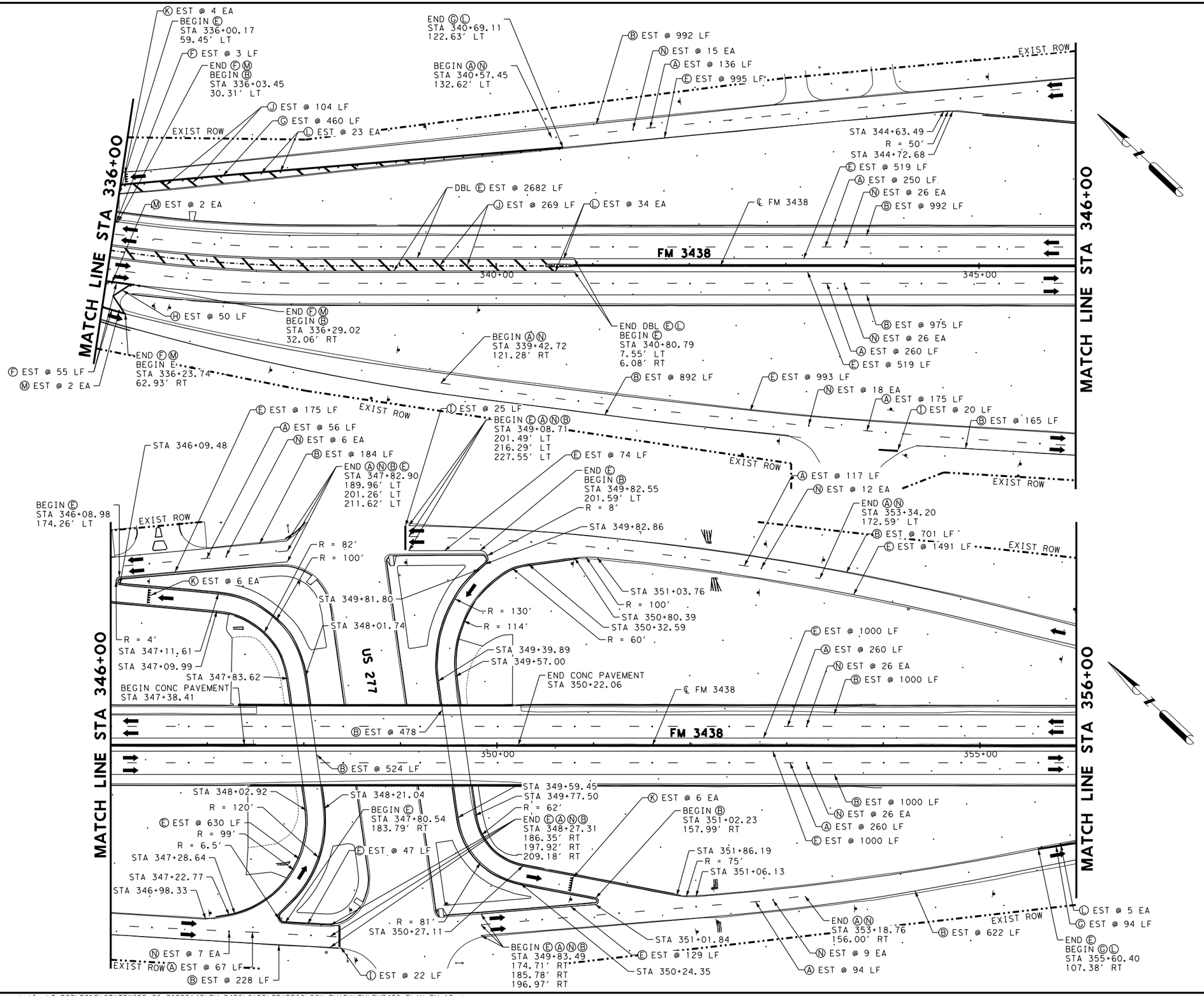

LEGEND

A	REFL PAV MRK TY I (W) 4" (BRK)
B	REFL PAV MRK TY I (W) 4" (SLD)
C	REFL PAV MRK TY I (W) 4" (DOTTED)
D	REFL PAV MRK TY I (Y) 4" (BRK)
E	REFL PAV MRK TY I (Y) 4" (SLD)
F	REFL PAV MRK TY I (W) 8" (SLD)
G	REFL PAV MRK TY I (Y) 8" (SLD)
H	REFL PAV MRK TY I (W) 12" (SLD)
I	PREFAB PAV MRK TY C (W) 24" (SLD)
J	PREFAB PAV MRK TY C (Y) 24" (SLD)
K	PREFAB YIELD TRIANGES TY C (W) 18"
L	REFL PAV MRKR TY II-A-A
M	REFL PAV MRKR TY I-C
N	REFL PAV MRK TY II-C-R
P	PREFAB PAV MRK TY C (W) (ARROW)
R	PREFAB PAV MRK TY C (W) WORD
S	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

5/26/2021

IDCUS
PLANNERS • ENGINEERS • MANAGERS
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8632 Fredericksburg Rd., Suite 200
San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

Texas Department of Transportation

FM 3438

PAVEMENT MARKING LAYOUT

STA 336+00 TO STA 356+00

SHEET 13 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	139

5/26/2021 10:30:26 AM

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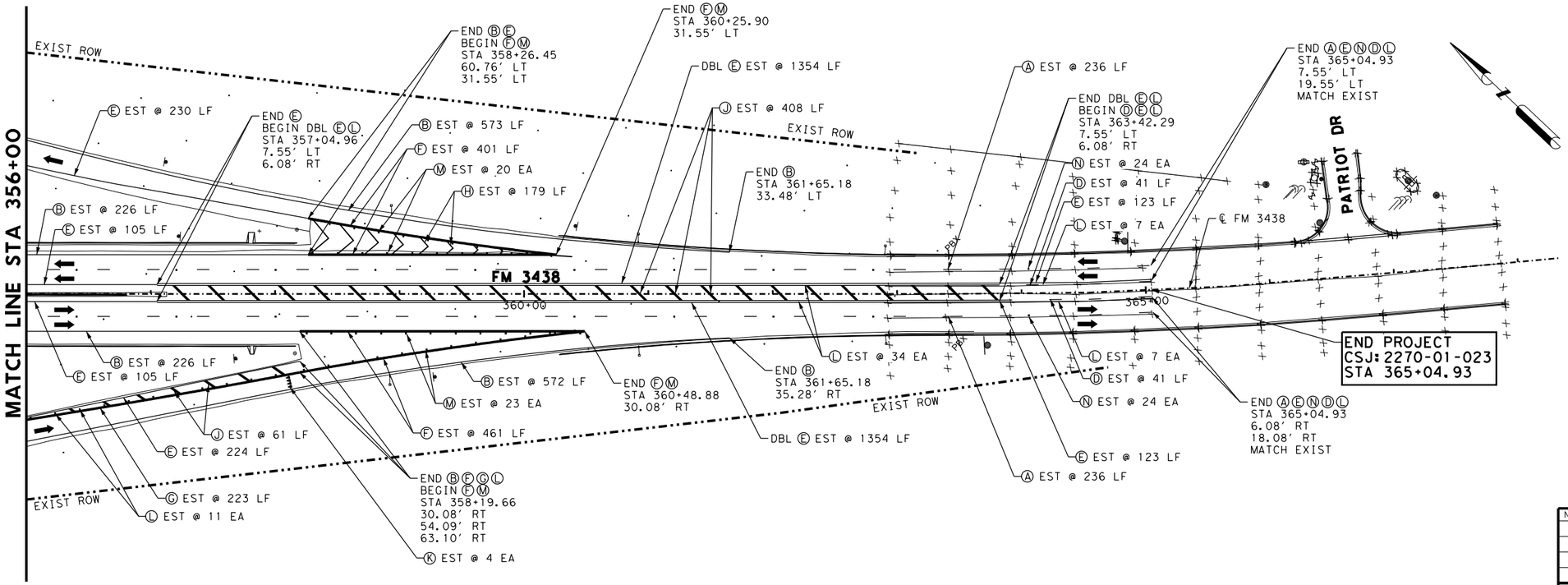

LEGEND

(A)	REFL PAV MRK TY I (W) 4" (BRK)
(B)	REFL PAV MRK TY I (W) 4" (SLD)
(C)	REFL PAV MRK TY I (W) 4" (DOTTED)
(D)	REFL PAV MRK TY I (Y) 4" (BRK)
(E)	REFL PAV MRK TY I (Y) 4" (SLD)
(F)	REFL PAV MRK TY I (W) 8" (SLD)
(G)	REFL PAV MRK TY I (Y) 8" (SLD)
(H)	REFL PAV MRK TY I (W) 12" (SLD)
(I)	PREFAB PAV MRK TY C (W) 24" (SLD)
(J)	PREFAB PAV MRK TY C (Y) 24" (SLD)
(K)	PREFAB YIELD TRIANGES TY C (W) 18"
(L)	REFL PAV MRKR TY II-A-A
(M)	REFL PAV MRKR TY I-C
(N)	REFL PAV MRK TY II-C-R
(P)	PREFAB PAV MRK TY C (W) (ARROW)
(R)	PREFAB PAV MRK TY C (W) WORD
(S)	REFL PAV MRK TY I (W)8"(DOT)

NOTE:

1. USE BOTH REFL PAV MRK TY I AND TY II ON CONC PAV AREAS.

0' 50' 100'
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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5/26/2021

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Texas Department of Transportation

FM 3438

PAVEMENT MARKING LAYOUT

STA 356+00 TO END PROJECT

SHEET 14 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	140

5/26/2021 10:30:32 AM

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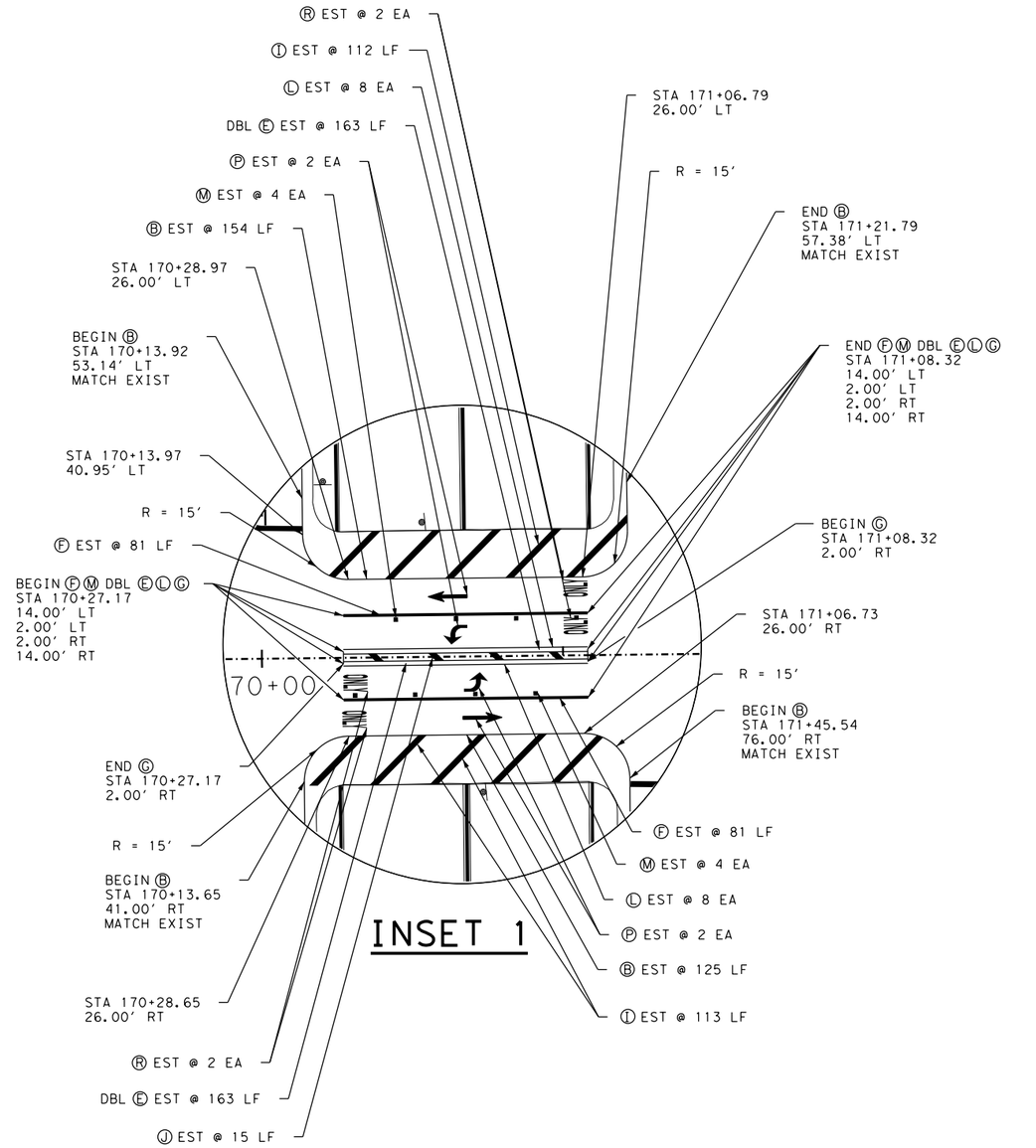

LEGEND

(A)	REFL PAV MRK TY I (W) 4" (BRK)
(B)	REFL PAV MRK TY I (W) 4" (SLD)
(C)	REFL PAV MRK TY I (W) 4" (DOTTED)
(D)	REFL PAV MRK TY I (Y) 4" (BRK)
(E)	REFL PAV MRK TY I (Y) 4" (SLD)
(F)	REFL PAV MRK TY I (W) 8" (SLD)
(G)	REFL PAV MRK TY I (Y) 8" (SLD)
(H)	REFL PAV MRK TY I (W) 12" (SLD)
(I)	PREFAB PAV MRK TY C (W) 24" (SLD)
(J)	PREFAB PAV MRK TY C (Y) 24" (SLD)
(K)	PREFAB YIELD TRIANGES TY C (W) 18"
(L)	REFL PAV MRKR TY II-A-A
(M)	REFL PAV MRKR TY I-C
(N)	REFL PAV MRK TY II-C-R
(P)	PREFAB PAV MRK TY C (W) (ARROW)
(R)	PREFAB PAV MRK TY C (W) WORD
(S)	REFL PAV MRK TY I (W)8"(DOT)

0′ 25′ 50′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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5/26/2021

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FM 3438

PAVEMENT MARKING DETAIL

SHEET 1 OF 1

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	141

5/26/2021 10:30:38 AM

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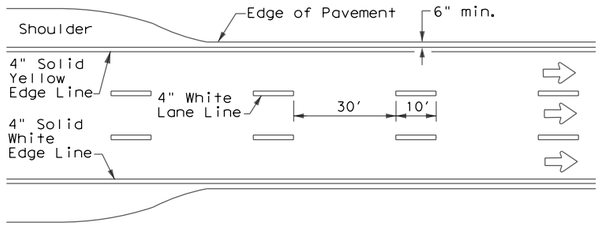
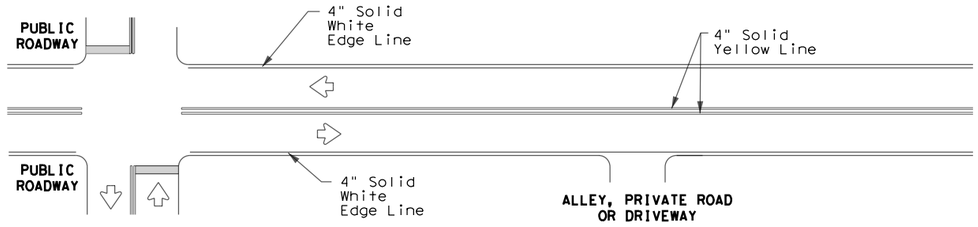
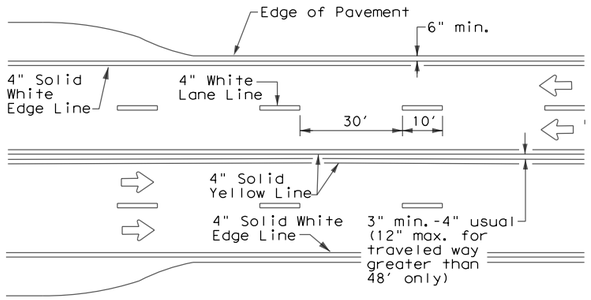


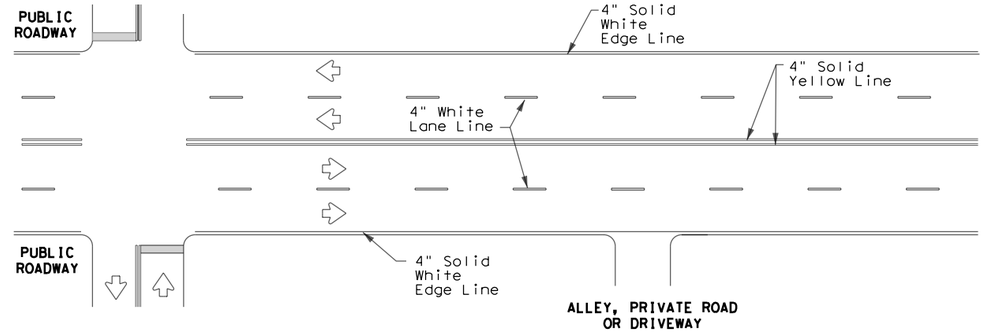
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



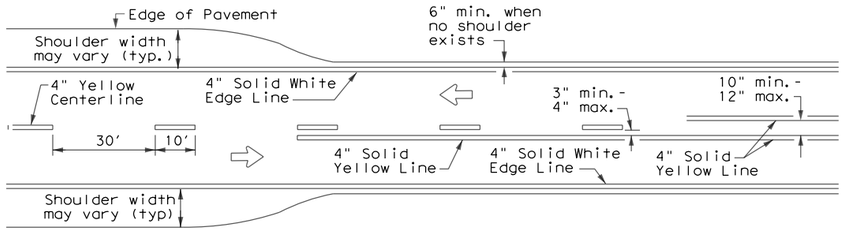
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



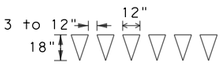
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



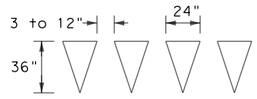
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

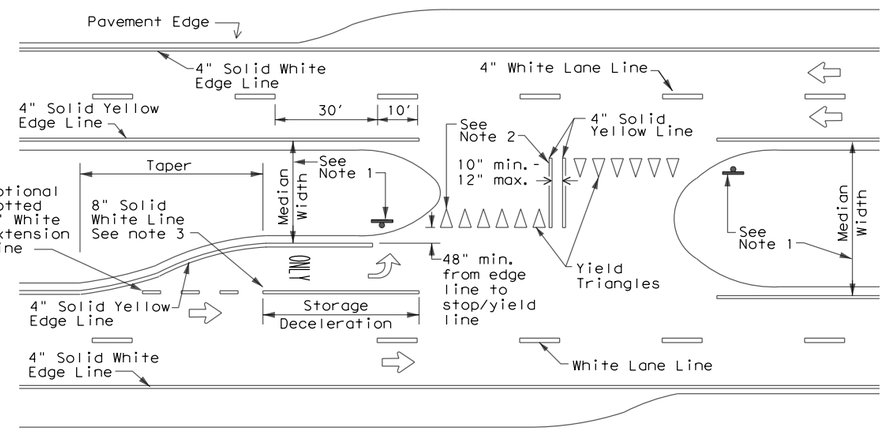


For posted speed on road being marked equal to or less than 40 MPH.



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.

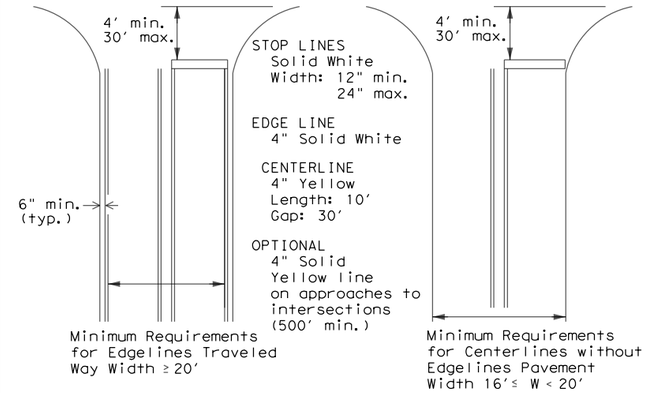
GENERAL NOTES

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

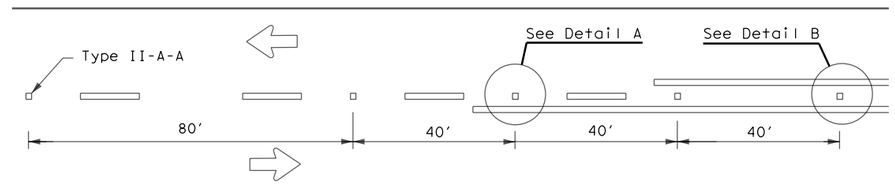
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

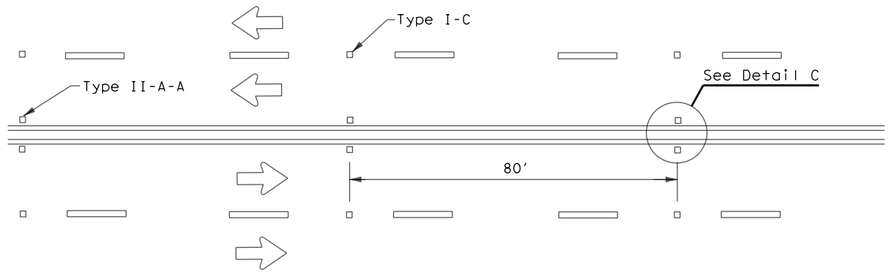
FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	2270	01	023	FM 3438
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	ABL	TAYLOR		142

22A

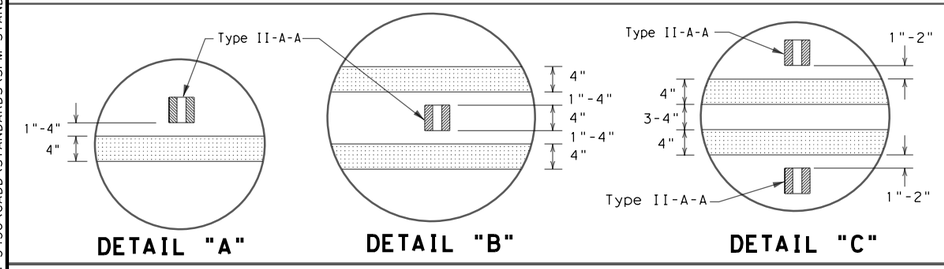
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



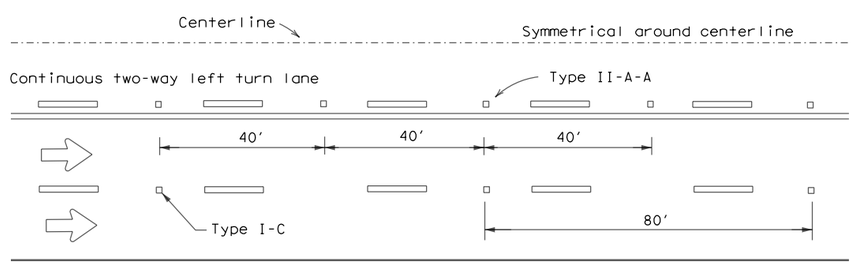
CENTERLINE FOR ALL TWO LANE ROADWAYS



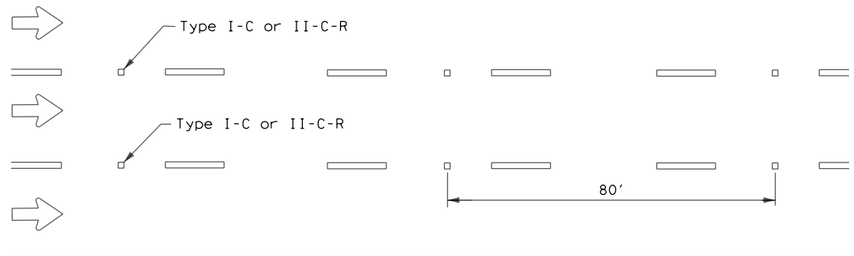
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

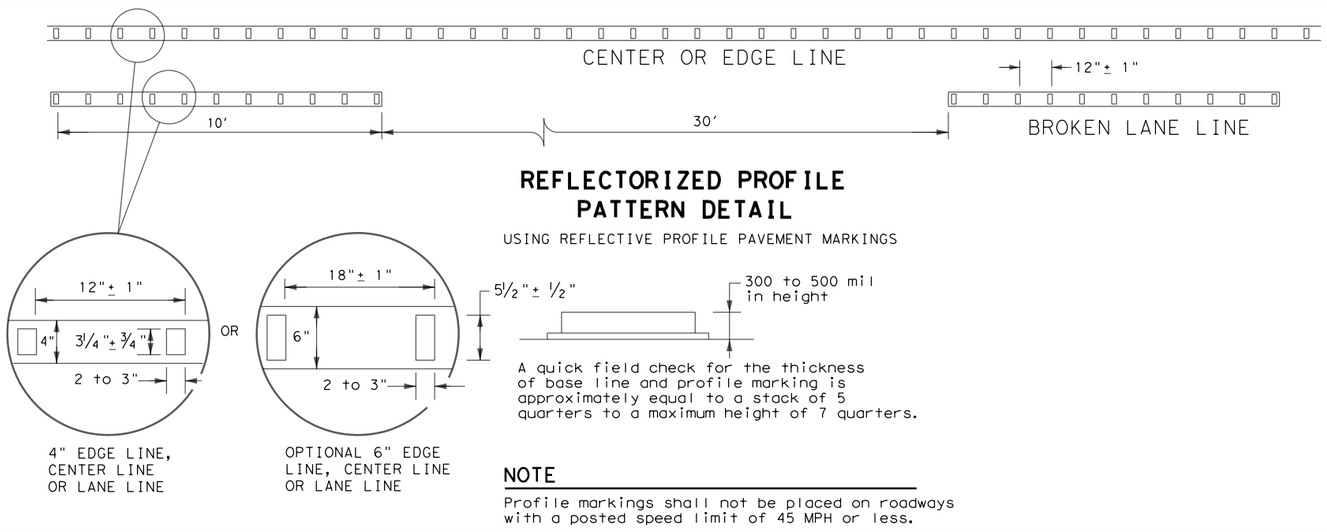


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

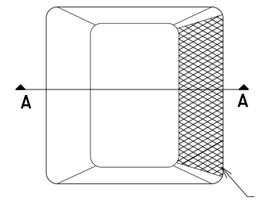
A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE

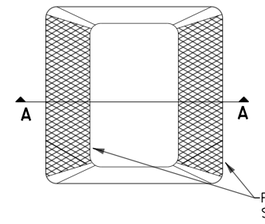
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

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

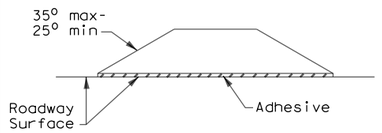
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

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.

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	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		143

22B

DATE: 5/26/2021 10:30:39 AM
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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE (FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10 BWG, S80 = Sch 80)	POSTS (1 or 2)	ANCHOR TYPE (UA=Universal Conc, UB=Universal Bolt, SA=Slipbase-Conc, SB=Slipbase-Bolt, WS=Wedge Steel, WP=Wedge Plastic)	MOUNTING DESIGNATION: PREFABRICATED (P = "Plain", T = "T", U = "U")	MOUNTING DESIGNATION: 1EXT or 2EXT = # of Ext (BM = Extruded Wind Beam, WC = 1.12 #/ft Wing Channel, EXAL= Extruded Alum Sign Panels)	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE (TY N, TY S)
1	01	R6-1L	ONE WAY	54" X 18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54" X 18"	X							
		R1-1	STOP	36" X36"	X							
		W4-4P	CROSS TRAFFIC DOES NOT STOP (plaque)	24" X 12"	X							
	02	W3-1	STOP AHEAD	30" X30"	X		10BWG	1	SA	P		
	03	M3-2	EAST	24" X 12"	X		S80	1	SA	U		
		M1-1	IH 20	24" X 24"	X							
		M6-1L	ARROW LEFT	21" X 15"	x							
		M3-3	SOUTH	24" X 12"	X							
		M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X							
		M6-3	ARROW UP	21" X 15"	x							
	04	M3-3	SOUTH	24" X 12"	X		10 BWG	1	SA	P		
		M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X							
		D10-7aT	290	10 "X 3"	X							
	05	M2-1	JCT	21" X 15"	X		10BWG	1	SA	P		
		M1-1	IH 20	24" X 24"	X							
	06	M3-1	NORTH	24" X 12"	X		10BWG	1	SA	P		
		M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X							
	07	R2-1	SPEED LIMIT 50	30" X 36"	X		10BWG	1	SA	P		
	08	W11-10	TRUCK (symbol)	36" X 36"	X		10BWG	1	SA	P		
	09	D14-4T	ADOPT A	48" X 48"	X		S80	1	SA	U		
			HIGHWAY									
			NEXT 2 MILES									
			FEDEX									
			GROUND									
			VOLUNTEERS									
		CW21-aT	FOLD DOWN SIGN	36" X 36"	X							
2	01	R1-2	YIELD	48" X48"X 48"	X		10BWG	1	SA	P		
	02	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
	03	SALVAGE & REUSE	N ARNOLD				10BWG	1	SA	P		
			MARIGOLD									
		M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X							
		M6-4	ARROW HORIZONTAL DOUBLE-HEADED	21"X 15"	X							
	04	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
	05	R1-2	YIELD	48" X48"X 48"	X		10BWG	1	SA	P		
	06	R2-1	SPEED LIMIT 50	30" X 36"	X		10BWG	1	SA	P		
	07	R5-1	DO NOT ENTER	36" X 36"	X		10BWG	1	SA	P		
	08	M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X		10BWG	1	SA	P		
		M6-4	ARROW HORIZONTAL DOUBLE-HEADED	21" X 15"	X							
	09	M3-3	SOUTH	24" X 12"	X		10BWG	1	SA	P		
		M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X							
		M6-3	ARROW UP	21" X 15"	X							

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

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

http://www.txdot.gov/

NOTE:

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

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 1 OF 13

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
4-16	DIST	COUNTY		SHEET NO.
8-16	ABL	TAYLOR		144

18

DATE: 5/26/2021 10:30:40 AM
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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
2	10	R5-1	DO NOT ENTER	36" X 36"	X		10BWG	1	SA	P		
3	01	R2-1	SPEED LIMIT 50	30" X 36"	X		10BWG	1	SA	P		
	02	SALVAGE & REUSE	N ARNOLD FIVE POINTS				10BWG	1	SA	P		
		R1-1	STOP	36"X36"	X							
	03	R2-1	SPEED LIMIT 40	30"X36"	X		10BWG	1	SA	P		
	04	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36" X 36"	X		10BWG	1	SA	P		
	05	R19-8T	FASTEN SAFETY BELTS STATE LAW	30" X 30"	X		10BWG	1	SA	P		
	06	W1-7T	TWO DIRECTION LARGE ARROW	96" X 36"	X		10BWG	2	SA	P		
	07	R3-8 LS	ADVANCE INTERSECTION LANE CONTROL	36" X 30"	X		10BWG	1	SA	P		
	08	R3-5R	MANDATORY MOVEMENT LANE CONTROL	30" X 36"	X		10BWG	1	SA	P		
	09	M2-1	JCT	21" X 15"	X		10BWG	1	SA	P		
		M1-3	BUSINESS 20	24" X 24"	X							
		M1-4	U.S. ROUTE SIGN (84)	24" X 24"	X							
4	01	M3-2	EAST	24"X 12"	X							
		M1-3	BUSINESS 20	24" X 24"	X							
		M1-4	U.S. ROUTE SIGN (84)	24"X 24"	X							
		M5-1L	ADVANCE TURN ARROW	21"X 15"	X							
		M3-4	WEST	24"X 12"	X							
		M1-3	BUSINESS 20	24" X 24"	X							
		M1-4	U.S. ROUTE SIGN (84)	24"X 24"	X							
		M6-1R	ARROW RIGHT	21"X 15"	X							
	02	R1-1	STOP	36" X 36"	X							
		W4-4P	CROSS TRAFFIC DOES NOT STOP (plaque)	24" X 12"	X							
	03	R1-1	STOP	36" X 36"	X							
		W4-4P	CROSS TRAFFIC DOES NOT STOP (plaque)	24" X 12"	X							
	04	M3-4	WEST	24"X 12"	X							
		M1-3	BUSINESS 20	24" X 24"	X							
		M1-4	U.S. ROUTE SIGN (84)	24"X 24"	X							
		M6-1L	ARROW LEFT	21"X 15"	X							
	05	R3-5R	MANDATORY MOVEMENT LANE CONTROL	30"X36"	X							
		R5-1a	WRONG WAY	42" X 30"	X							
	06	R3-6L	OPTIONAL MOVEMENT LANE CONTROL	30"X36"	X							
		R5-1a	WRONG WAY	42" X 30"	X							
	07	M3-3	SOUTH	24"X12"	X							
		M1-6F	TEXAS FARM ROAD 3438	24"X24"	X							
		M6-1L	ARROW LEFT	21"X15"	X							
		M3-1	NORTH	24"X12"	X							
		M1-6F	TEXAS FARM ROAD 3438	24"X24"	X							
		M6-1R	ARROW RIGHT	21"X15"	X							

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

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
4-16	DIST	COUNTY		SHEET NO.
8-16	ABL	TAYLOR		145

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE: FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10 BWG, S80 = Sch 80	POSTS: 1 or 2	ANCHOR TYPE: UA=Universal Conc, UB=Universal Bolt, SA=Slipbase-Conc, SB=Slipbase-Bolt, WS=Wedge Steel, WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED (P = "Plain", T = "T", U = "U")	MOUNTING DESIGNATION: 1EXT or 2EXT = # of Ext, BM = Extruded Wind Beam, WC = 1.12 #/ft Wing Channel, EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE: TY N, TY S
4	08	M3-3	SOUTH	24"X12"	X							
		M1-6F	TEXAS FARM ROAD 3438	24"X24"	X							
		M6-1L	ARROW LEFT	21"X15"	X							
		M3-1	NORTH	24"X12"	X							
		M1-6F	TEXAS FARM ROAD 3438	24"X24"	X							
		M6-1R	ARROW RIGHT	21"X15"	X							
	09	M3-2	EAST	24"X 12"	X							
		M1-3	BUSINESS 20	24" X 24"	X							
		M1-4	U.S. ROUTE SIGN (84)	24"X 24"	X							
		M6-1L	ARROW LEFT	21"X 15"	X							
	10	R1-1	STOP	36" X 36"	X							
		W4-4P	CROSS TRAFFIC DOES NOT STOP (plaque)	24" X 12"	X							
	11	R1-1	STOP	36" X 36"	X							
		W4-4P	CROSS TRAFFIC DOES NOT STOP (plaque)	24" X 12"	X							
	12	R3-6L	OPTIONAL MOVEMENT LANE CONTROL	30"X36"	X							
		R5-1a	WRONG WAY	42" X 30"	X							
	13	R3-5R	MANDATORY MOVEMENT LANE CONTROL	30"X36"	X							
		R5-1a	WRONG WAY	42" X 30"	X							
	14	M3-1	NORTH	24"X12"	X							
		M1-6F	TEXAS FARM ROAD 3438	24"X24"	X							
		M6-1L	ARROW LEFT	21"X15"	X							
		M3-3	SOUTH	24"X12"	X							
		M1-6F	TEXAS FARM ROAD 3438	24"X24"	X							
		M6-1R	ARROW RIGHT	21"X15"	X							
	15	M3-1	NORTH	24"X12"	X							
		M1-6F	TEXAS FARM ROAD 3438	24"X24"	X							
		M6-1L	ARROW LEFT	21"X15"	X							
		M3-3	SOUTH	24"X12"	X							
		M1-6F	TEXAS FARM ROAD 3438	24"X24"	X							
		M6-1R	ARROW RIGHT	21"X15"	X							
	16	M3-4	WEST	24"X12"	X							
		M1-3	BUSINESS 20	24" X 24"	X							
		M1-4	U.S. ROUTE SIGN (84)	24"X24"	X							
		M5-1L	ADVANCE TURN ARROW	21"X15"	X							
		M3-2	EAST	24"X12"	X							
		M1-3	BUSINESS 20	24" X 24"	X							
		M1-4	U.S. ROUTE SIGN (84)	24"X24"	X							
		M6-1R	ARROW RIGHT	21"X15"	X							
	17	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36"X36"	X		10BWG	1	SA	P		
	18	R3-8b	LANE CONTROL SIGN	48"X30"	X		RAIL					
	19	R3-8b	LANE CONTROL SIGN	48"X30"	X		10BWG	1	SA	P		
	20	R5-1	DO NOT ENTER	36" X 36"	X		RAIL	1		P		
	21	R5-1	DO NOT ENTER	36" X 36"	X		RAIL	1		P		
	22	R5-1	DO NOT ENTER	36" X 36"	X		RAIL	1		P		

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 3 OF 13

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
4-16	DIST	COUNTY		SHEET NO.
8-16	ABL	TAYLOR		146

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DATE: 5/26/2021 10:30:40 AM
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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
4	23	R5-1	DO NOT ENTER	36" X 36"	X		RAIL	1		P		
	24	R4-7	KEEP RIGHT	24" X 30"	X		10BWG	1	SA	P		
	25	M3-3	SOUTH	24" X 12"	X		10BWG	1	SA	P		
		M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X							
		M6-3	ARROW UP	21" X 15"	X							
	26	R2-1	SPEED LIMIT 50	30" X 36"	X		10BWG	1	SA	P		
5	01	R6-1L	ONE WAY	54"X18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54"X18"	X							
		R1-1	STOP	36" X 36"	X							
	02	M2-1	JCT	21" X 15"	X		10BWG	1	SA	P		
		M1-3	BUSINESS 20	24" X 24"	X							
		M1-4	U.S. ROUTE SIGN (84)	24" X 24"	X							
	03	R6-1L	ONE WAY	54"X18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54"18"	X							
		R1-2	YIELD	48"X48"X48"	X							
	04	R6-1L	ONE WAY	54"X18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54"18"	X							
		R1-2	YIELD	48"X48"X48"	X							
	05	R6-1L	ONE WAY	54"X18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54"18"	X							
		R1-1	STOP	36"X36"	X							
	06	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES FEDEX GROUND VOLUNTEERS	48" X 48"	X		S80	1	SA	U		
		CW21-aT	FOLD DOWN SIGN	36" X 36"	X							
	07	R2-1	SPEED LIMIT 40	30"X36"	X		10BWG	1	SA	P		
	08	R6-1L	ONE WAY	54"X18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54"18"	X							
		R1-1	STOP	36"X36"	X							
	09	R2-1	SPEED LIMIT 40	30"X36"	X		10BWG	1	SA	P		
	10	R6-1L	ONE WAY	54"X18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54"X18"	X							
		R1-1	STOP	36" X 36"	X							
	11	M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X		10BWG	1	SA	P		
	12	R6-1L	ONE WAY	54"X18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54"18"	X							
		R1-2	YIELD	48"X48"X48"	X							
	13	R6-1L	ONE WAY	54"X18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54"18"	X							
		R1-2	YIELD	48"X48"X48"	X							

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 4 OF 13

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
4-16	DIST	COUNTY		SHEET NO.
8-16	ABL	TAYLOR		147

18

DATE: 5/26/2021 10:30:41 AM
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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
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5	14	R6-1L	ONE WAY	54"X18"	X		10BWG	1	SA	P		
		R1-2	YIELD	48"X48"X48"								
					X							
	15	R6-1L	ONE WAY	54"X18"	X		10BWG	1	SA	T		
		R6-1R	ONE WAY	54"18"	X							
		R1-2	YIELD	48"X48"X48"	X							
	16	R6-1L	ONE WAY	54" X 18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54" X 18"	X							
		R1-1	STOP	36" X 36"	X							
	17	R6-1L	ONE WAY	54" X 18"	X		10BWG	1	SA	P		
	18	R3-5bP	LEFT LANE PLAQUE	30"X12"	X		S80	1	SA	P		
		R3-5L	LEFT ARROW, WORD "ONLY"	30"X36"								
	19	R3-7L	LEFT LANE MUST TURN LEFT	36"X36"	X		10BWG	1	SA	P		
	20	R3-5bP	LEFT LANE PLAQUE	30"X12"	X		S80	1	SA	P		
		R3-5L	LEFT ARROW, WORD "ONLY"	30"X36"								
	21	R3-7L	LEFT LANE MUST TURN LEFT	36"X36"	X		10BWG	1	SA	P		
	22	W4-1aTR	THRU TRAFFIC MERGE RIGHT	36"X36"	X		10BWG	1	SA	P		
	23	W4-1aTR	THRU TRAFFIC MERGE RIGHT	36"X36"	X		10BWG	1	SA	P		
	24	W9-2R	LANE ENDS MERGE RIGHT	36"X36"	X		10BWG	1	SA	P		
	25	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	26	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	27	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	28	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	29	W4-1aTR	THRU TRAFFIC MERGE RIGHT	36"X36"	X		10BWG	1	SA	P		
	30	W4-1aTR	THRU TRAFFIC MERGE RIGHT	36"X36"	X		10BWG	1	SA	P		
	31	W4-1aTR	THRU TRAFFIC MERGE RIGHT	36"X36"	X		10BWG	1	SA	P		
	32	W4-1aTR	THRU TRAFFIC MERGE RIGHT	36"X36"	X		10BWG	1	SA	P		
	33	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	34	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	35	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	36	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	37	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	38	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	39	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	40	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 5 OF 13

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		2270	01	023	FM 3438
4-16		DIST	COUNTY		SHEET NO.
8-16		ABL	TAYLOR		148

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5	41	W4-1aTR	THRU	36"X36"	X		10BWG	1	SA	P		
			TRAFFIC									
			MERGE									
			RIGHT									
	42	W4-1aTR	THRU	36"X36"	X		10BWG	1	SA	P		
			TRAFFIC									
			MERGE									
			RIGHT									
	43	D14-4T	ADOPT A	48" X 48"	X		S80	1	SA	U		
			HIGHWAY									
			NEXT 2 MILES									
			FEDEX									
			GROUND									
			VOLUNTEERS									
		CW21-aT	FOLD DOWN SIGN	36" X 36"	X							
	44	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
	45	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
	46	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
	47	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
	48	W14-1	DEAD	36" X 36"	X		10BWG	1	SA	P		
			END									
	49	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
	50	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
	51	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
6	01	R1-2	YIELD	48"X48"X48"	X		10BWG	1	SA	P		
	02	SALVAGE & REUSE	S 7TH ST				10BWG	1	SA	P		
			ARNOLD									
		R3-7	LEFT LANE MUST TURN LEFT	36" X 36"	X							
	03	R10-3	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	04	R2-1	SPEED LIMIT 40	30" X 36"	X		10BWG	1	SA	P		
	05	R6-1L	ONE WAY	54" X 18"	X		10BWG	1	SA	P		
		R6-1R	ONE WAY	54" X 18"	X							
	06	R3-5L	MANDATORY MOVEMENT LANE CONTROL	30" X 36"	X		10BWG	1	SA	P		
		R3-6L	OPTIONAL MOVEMENT LANE CONTROL	30" X 36"	X							
	07	R10-5L	LEFT ON GREEN ARROW ONLY	30" X 36"	X		10BWG	1	SA	P		
	08	R6-1L	ONE WAY	54" X 18"	X		10BWG	1	SA	P		
		R6-1R	ONE WAY	54" X 18"	X							
	09	R10-3	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	10	R6-1L	ONE WAY	54" X 18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54" X 18"	X							
		R1-1	STOP	36" X 36"								

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

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

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NOTE:

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 6 OF 13

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
4-16	DIST	COUNTY		SHEET NO.
8-16	ABL	TAYLOR		149

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DATE: 5/26/2021 10:30:41 AM
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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE (FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10 BWG, S80 = Sch 80)	POSTS (1 or 2)	ANCHOR TYPE (UA=Universal Conc, UB=Universal Bolt, SA=Slipbase-Conc, SB=Slipbase-Bolt, WS=Wedge Steel, WP=Wedge Plastic)	MOUNTING DESIGNATION: PREFABRICATED (P = "Plain", T = "T", U = "U")	MOUNTING DESIGNATION: 1EXT or 2EXT = # of Ext, BM = Extruded Wind Beam, WC = 1.12 #/ft Wing Channel, EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE (TY N, TY S)
6	11	M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X		10BWG	1	SA	P		
		D10-7aT	REFERENCE MARKER 292	10" X 3"	X							
	12	R6-1L	ONE WAY	54" X 18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54" X 18"	X							
		R1-2	YIELD	48"X48"X48"	X							
	13	R6-1L	ONE WAY	54" X 18"	X		S80	1	SA	P		
		R6-1R	ONE WAY	54" X 18"	X							
		R1-2	YIELD	48"X48"X48"	X							
	14	SALVAGE &	ARNOLD				S80	1	SA	P		
		REUSE	MILITARY DRIVE									
		R6-1L	ONE WAY	54" X 18"	X							
		R6-1R	ONE WAY	54" X 18"	X							
		R1-1	STOP	36"X36"	X							
	15	M1-6F	TEXAS FARM ROAD 3438	24"X24"	X		10BWG	1	SA	P		
		D10-7aT	MILE MARKER 292	10"X3"	X							
		R5-1	DO NOT ENTER	36"X36"	X							
	16	R2-1	SPEED LIMIT 45	30"X36"	X		10BWG	1	SA	P		
	17	D1-3	Dyess AFB	84"x36"	X		S80	1	SA	U		
			Deliveries Use									
			Military Drive ARROW RIGHT									
	18	D1-3	Dyess AFB	72"X42"	X		S80	1	SA	U		
			ARROW UP Main Gate									
			Truck Gate ARROW RIGHT									
	19	D1-1	Dyess AFB	78"x30"	X		S80	1	SA	U		
			LEFT ARROW Truck Gate									
	20	D1-3	LEFT ARROW Dyess AFB	72"X36"	X		S80	1	SA	U		
			Deliveries Use									
			Military Drive									
	21	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	22	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	23	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	24	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	25	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	26	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	27	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	28	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	29	R6-1R	ONE WAY	54" X 18"	X		10BWG	1	SA	P		
	30	D1-1	LEFT ARROW Dyess AFB	72" X 12"	X		10BWG	1	SA	P		
	31	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

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FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS		2270	01	023	FM 3438
4-16		DIST	COUNTY		SHEET NO.
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DATE: 5/26/2021 10:30:42 AM
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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
6	32	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
	33	W14-1	DEAD END	36" X 36"	X		10BWG	1	SA	P		
7	1	D1-1	Dyess AFB TILTED ARROW	66"X12"	X		10BWG	1	SA	P		
	2	R2-1	SPEED LIMIT 45	30"X36"	X		10BWG	1	SA	P		
	3	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	4	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	5	M3-3	NORTH	24" X 12"	X		10BWG	1	SA	P		
		M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X							
8	01	R10-3b	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	02	R10-3b	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	03	R10-3b	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	04	R10-3b	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	05	R10-3b	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	06	R10-3b	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	07	R10-5L	LEFT ON GREEN ARROW ONLY	30" X 36"	X							
	08	R4-7	KEEP RIGHT	24" X 30"	X		10BWG	1	SA	P		
	09	R10-10L	LEFT TURN SIGNAL	30" X 36"	X							
		R4-7	KEEP RIGHT	24" X 30"	X							
		R10-5L	LEFT ON GREEN ARROW ONLY	30" X 36"	X							
	10	R10-3b	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	11	R10-3b	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	12	R10-3b	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	13	R10-3b	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	14	R10-3b	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X							
	15	R10-3b	PUSH BUTTON FOR PEDESTRIAN SIGN	9" X 12"	X		10BWG	1	SA	T		
	16	R1-2	YIELD	48"X48"X48"	X		10BWG	1	SA	P		
	17	M3-3	SOUTH	24" X 12"	X		10BWG	1	SA	P		
		M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X							
	18	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES 7TH FORCE SUPPORT SQUADRON	48" X 48"	X		S80	1	SA	U		
		CW21-aT	FOLD DOWN SIGN	36" X 36"	X							

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

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FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	2270	01	023	FM 3438
4-16 8-16	DIST	COUNTY		SHEET NO.
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DATE: 5/26/2021 10:30:42 AM
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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE: FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS: 1 or 2	ANCHOR TYPE: UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
8	19	R3-9b	TWO-WAY LEFT TURN ONLY	24" X 36"	X		10BWG	1	SA	P		
		R4-7	KEEP RIGHT	24" X 30"	X							
	20	R2-1	SPEED LIMIT 50	30"X36"	X		10BWG	1	SA	P		
	21	D14-4T	ADOPT A	48" X 48"	X		S80	1	SA	U		
			HIGHWAY									
			NEXT 2 MILES									
			7TH FORCE									
			CONTRACTING									
			SQUADRON									
		CW21-aT	FOLD DOWN SIGN	36" X 36"	X							
	22	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36"X36"	X		10BWG	1	SA	P		
	23	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	24	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	25	D1-2	Arnold Blvd	96"x24"	X							
			Dub Wright Blvd									
	26	D1-2	Dub Wright Blvd	96"x24"	X							
			Arnold Blvd									
	27	D2-1	Hartford St	54"x12"	X							
	28	D2-1	Hartford St	54"x12"	X							
	29	D1-3	Dyess AFB	84"x36"	X		S80	1	SA	U		
			Deliveries Use									
			Military Drive ARROW RIGHT									
	30	D1-3	Dyess AFB	72"X42"	X		S80	1	SA	U		
			ARROW UP Main Gate									
			Truck Gate ARROW RIGHT									
	31	M3-3	SOUTH	24"X12"	X		S80	1	SA	U		
		M1-6F	TEXAS FARM ROAD 3438	24"X24"	X							
		M6-1L	ARROW LEFT	21"X15"	X							
	32	M3-1	NORTH	24"X12"	X		S80	1	SA	U		
		M1-6F	TEXAS FARM ROAD 3438	24"X24"	X							
		M6-1L	ARROW LEFT	21"X15"	X							
	33	R3-9b	TWO-WAY LEFT TURN ONLY	24" X 36"	X		10BWG	1	SA	P		
		R3-9dP	END	30" X 12"	X							
	34	R3-9b	TWO-WAY LEFT TURN ONLY	24" X 36"	X		10BWG	1	SA	P		
		R3-9cP	BEGIN	30" X 12"	X							
	35	R6-1R	ONE WAY	54" X 18"	X		10BWG	1	SA	P		
	36		VETERANS				10BWG	1	SA	P		
			HARTFORD									
		R1-1	STOP	36" X 36"	X							
9	01	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36"X36"	X		10BWG	1	SA	P		
	02	R2-1	SPEED LIMIT 50	30"X36"	X		10BWG	1	SA	P		

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

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

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FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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8-16	ABL	TAYLOR		152

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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
10	01	R1-2	YIELD	48"X48"X48"	X		10BWG	1	SA	T		
	02	R1-1	STOP	36"X36"	X		10BWG	1	SA	P		
	03	R2-1	SPEED LIMIT 50	30"X36"	X		10BWG	1	SA	P		
	04	R3-9b	TWO-WAY LEFT TURN ONLY	24" X 36"	X		10BWG	1	SA	P		
		R3-9dP	END	30" X 12"	X							
	05	R3-9b	TWO-WAY LEFT TURN ONLY	24" X 36"	X		10BWG	1	SA	P		
		R3-9cP	BEGIN	30" X 12"	X							
	06	W1-7T	TWO DIRECTION LARGE ARROW	96" X 36"	X		10BWG	2	SA	P		
11	01	SALVAGE & REUSE	DUB WRIGHT JENNINGS				10BWG	1	SA	P		
		R1-1	STOP	36" X 36"	X							
	02	SALVAGE & REUSE	JENNINGS DUB WRIGHT				10BWG	1	SA	P		
		R1-1	STOP	36" X 36"	X							
	03	M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X		10BWG	1	SA	P		
	04	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
	05	M2-1	JCT	21" X 15"	X		10BWG	1	SA	P		
		M1-4	U.S. ROUTE SIGN (277)	30" X 24"	X							
	06	W1-7T	TWO DIRECTION LARGE ARROW	96" X 36"	X		10BWG	2	SA	P		
12	01	R2-1	SPEED LIMIT 50	30" X 36"	X		10BWG	1	SA	P		
	02	D14-4T	ADOPT A	48" X 48"	X		S80	1	SA	U		
			HIGHWAY									
			NEXT 2 MILES									
			7TH FORCE									
			CONTRACTING									
			SQUADRON									
		CW21-aT	FOLD DOWN SIGN	36" X 36"	X							
	03	R2-1	SPEED LIMIT 55	30" X 36"	X		10BWG	1	SA	P		
	04	R3-9b	TWO-WAY LEFT TURN ONLY	24" X 36"	X		10BWG	1	SA	P		
		R3-9cP	BEGIN	30" X 12"	X							
	05	M1-4	U.S. ROUTE SIGN (277)	30" X 24"	X		10BWG	1	SA	P		
		M6-2R	DIRECTIONAL ARROW	21"X 15"	X							
	06	R3-9b	TWO-WAY LEFT TURN ONLY	24" X 36"	X		10BWG	1	SA	P		
		R3-9dP	END	30" X 12"	X							
13	01	W4-1	MERGE	36" X 36"	X		10BWG	1	SA	P		
		R5-1A	WRONG WAY	42"X30"	X							
	02	W3-2	YIELD AHEAD	30"X30"	X		10BWG	1	SA	P		
	03	W9-1L	LANE ENDS MERGE RIGHT	36"X36"	X		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
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SUMMARY OF SMALL SIGNS

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FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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4-16	DIST	COUNTY		SHEET NO.
8-16	ABL	TAYLOR		153

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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE: FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10 BWG, S80 = Sch 80	POSTS: 1 or 2	ANCHOR TYPE: UA=Universal Conc, UB=Universal Bolt, SA=Slipbase-Conc, SB=Slipbase-Bolt, WS=Wedge Steel, WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED: P = "Plain", T = "T", U = "U"	MOUNTING DESIGNATION: 1EXT or 2EXT = # of Ext, BM = Extruded Wind Beam, WC = 1.12 #/ft Wing Channel, EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE: TY N, TY S
13	04	W3-1	STOP AHEAD	30"X30"	X		10BWG	1	SA	P		
	05	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36"X36"	X		10BWG	1	SA	P		
	06	W3-1	STOP AHEAD	30"X30"	X		10BWG	1	SA	P		
	07	D1-3	Abilene ARROW LEFT(SYMBOL)	96"X42"	X		10 BWG	2	SA	P		
			Bronte ARROW RIGHT (SYMBOL)									
			San Angelo ARROW RIGHT (SYMBOL)									
	08	R6-1R	ONE WAY	54"X18"	X		10BWG	1	SA	T		
	09	SALVAGE & REUSE	BUTTERFIELD				10BWG	1	SA	P		
			DUB WRIGHT									
		R1-1	STOP	36'X36"	X							
	10	R3-8MK	MULTIPLE OPTIONAL MOVEMENT LANE CONTROL	36"X30"	X		10BWG	1	SA	P		
	11	R3-8MK	MULTIPLE OPTIONAL MOVEMENT LANE CONTROL	36"X30"	X		10BWG	1	SA	P		
	12	R1-2	YIELD	48"X48"X48"	X		10BWG	1	SA	T		
		R5-1A	WRONG WAY	42"X30"	X							
	13	M1-4	U.S. ROUTE SIGN (277)	30"X24"	X		10BWG	1	SA	T		
		M6-4	ARROW HORIZONTAL DOUBLE-HEADED	21"X15"	X							
	14	R1-1	STOP	36"X36"	X		10BWG	1	SA	P		
	15	R1-1	STOP	36"X36"	X		10BWG	1	SA	T		
	16	D13-1TL	TURNAROUND	66"X24"	X		S80	1	SA	U		
			ARROW									
		W12-2a	LOW CLEARENCE	66"X12"	X							
	17	R3-8MK	MULTIPLE OPTIONAL MOVEMENT LANE CONTROL	36"X30"	X		10BWG	1	SA	P		
	18	R3-8MK	MULTIPLE OPTIONAL MOVEMENT LANE CONTROL	36"X30"	X		10BWG	1	SA	P		
	19	W3-1	STOP AHEAD	36"X36"	X		10BWG	1	SA	P		
	20	W3-1	STOP AHEAD	36"X36"	X		10BWG	1	SA	P		
	21	D13-1TL	TURNAROUND	66"X24"	X		S80	1	SA	U		
			ARROW									
		W12-2a	LOW CLEARANCE	66"X12"	X							
	22	R1-1	STOP	36"X36"	X		10BWG	1	SA	P		
	23	R1-1	STOP	36"X36"	X		10BWG	1	SA	P		
	24	R1-2	YIELD	48"X48"X48"	X		10BWG	1	SA	P		
	25	W4-2L	LANE ENDS MERGE RIGHT	36"X36"	X		10BWG	1	SA	P		
	26	W4-2L	LANE ENDS MERGE RIGHT	36"X36"	X		10BWG	1	SA	P		
	27	W3-2	YIELD AHEAD	30"X30"	X		10BWG	1	SA	T		

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

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

http://www.txdot.gov/

NOTE:

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

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 11 OF 13

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
4-16	DIST	COUNTY		SHEET NO.
8-16	ABL	TAYLOR		154

18

DATE: 5/26/2021 10:30:43 AM
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7\DP5143\FM 3438\CADD\TRAFFIC\SGN_PMARK\SIGNING\FM3438_SUM_SS_11.dgn

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
13	28	D1-3	Bronte ARROW LEFT (SYMBOL)	96"X42"	X		10 BWG	2	SA	P		
			San Angelo ARROW LEFT (SYMBOL)									
			Abilene ARROW RIGHT (SYMBOL)									
	29	R1-2	YIELD	48"X48"X48"	X		10BWG	1	SA	T		
	30	R1-2	YIELD	48"X48"X48"	X		10BWG	1	SA	T		
	31	R5-1A	WRONG WAY	42"X30"	X		10BWG	1	SA	T		
	32	R5-1A	WRONG WAY	42"X30"	X		10BWG	1	SA	T		
	33	W12-2a	LOW CLEARANCE	84"X24"	X							
	34	W12-2a	LOW CLEARANCE	84"X24"	X							
	35	W12-2a	LOW CLEARANCE	84"X24"	X							
	36	W12-2a	LOW CLEARANCE	84"X24"	X							
	37	R5-1A	WRONG WAY	42"X30"	X		10BWG	1	SA	T		
	38	R5-1A	WRONG WAY	42"X30"	X		10BWG	1	SA	T		
	39	R5-1	DO NOT ENTER	36" X 36"	X		10 BWG	1	SA	P		
	40	R5-1	DO NOT ENTER	36" X 36"	X		10 BWG	1	SA	P		
	41	R5-1	DO NOT ENTER	36" X 36"	X		10 BWG	1	SA	P		
	42	R5-1	DO NOT ENTER	36" X 36"	X		10 BWG	1	SA	P		
	43	M1-4	U.S. ROUTE SIGN (277)	30"X24"	X		10BWG	1	SA	T		
		M6-4	ARROW HORIZONTAL DOUBLE-HEADED	21"X15"	X							
	44	R5-1A	WRONG WAY	42"X30"	X		10BWG	1	SA	T		
	45	W9-2L	LANE ENDS MERGE RIGHT	36"X36"	X		10BWG	1	SA	P		
	46	R6-1L	ONE WAY	54"X18"	X		10BWG	1	SA	P		
		R6-1R	ONE WAY	54"18"	X							
	47	R6-1L	ONE WAY	54"X18"	X		10BWG	1	SA	P		
		R6-1R	ONE WAY	54"18"	X							
	48	R6-1L	ONE WAY	54"X18"	X		10BWG	1	SA	P		
		R6-1R	ONE WAY	54"18"	X							
	49	R6-1L	ONE WAY	54"X18"	X		10BWG	1	SA	P		
		R6-1R	ONE WAY	54"18"	X							
14	01	W8-13aT	WATCH FOR ICE ON BRIDGE	36" X 36"	X		10BWG	1	SA	P		
	02	M1-4	U.S. ROUTE SIGN (277)	30" X 24"	X		10BWG	1	SA	T		
		M6-2R	DIAGONAL ARROW POINTING UP AND TO THE RIGHT	21"X 15"	X							
	03	W4-1	MERGE	36" X 36"	X		10BWG	1	SA	P		

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

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NOTE:

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

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 12 OF 13

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
4-16	DIST	COUNTY		SHEET NO.
8-16	ABL	TAYLOR		155

18

DATE: 5/26/2021 10:30:43 AM
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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
14	04	M3-1	NORTH	24" X 12"	X		S80	1	SA	U		
		M1-6F	TEXAS FARM ROAD 3438	24" X 24"	X							
		M2-1	JCT	21" X 15"	X							
		M1-4	U.S. ROUTE SIGN (277)	30" X 24"	X							
	05	R3-9b	TWO-WAY LEFT TURN ONLY	24" X 36"	X		10BWG	1	SA	P		
		R3-9cP	BEGIN	30" X 12"	X							
	06	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	07	R5-1	DO NOT ENTER	36"X36"	X		10BWG	1	SA	P		
	08	R1-2	YIELD	48"X48"X48"	X		10BWG	1	SA	T		
	09	R1-2	YIELD	48"X48"X48"	X		10BWG	1	SA	T		
	10	R5-1A	WRONG WAY	42"X30"	X		10BWG	1	SA	T		
	11	R5-1A	WRONG WAY	42"X30"	X		10BWG	1	SA	T		
	12	R3-9b	TWO-WAY LEFT TURN ONLY	24" X 36"	X		10BWG	1	SA	P		

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

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

http://www.txdot.gov/

NOTE:

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

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 13 OF 13

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
4-16	DIST	COUNTY		SHEET NO.
8-16	ABL	TAYLOR		156

18

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SUMMARY OF LARGE SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN BACK-GROUND COLOR	SIGN TEXT	SIGN DIMENSIONS	PLAQUES, & OTHER ATTACHMENTS: DIRECT APPLY	PLAQUES, & OTHER ATTACHMENTS: ⁎ ALUMINUM (TYPE A)	BACKGROUND SUBSTRATE (SQ FT): GROUND MOUNT (TYPE G)	BACKGROUND SUBSTRATE (SQ FT): OVERHEAD (TYPE O)	TYPE OF MOUNT	"X" DIMENSION ◒ post ①	"X" DIMENSION ◒ post ②	"X" DIMENSION ◒ post ③	GALVANIZED STRUCTURAL STEEL: SIZE	GALVANIZED STRUCTURAL STEEL: LINEAR FEET post ①	GALVANIZED STRUCTURAL STEEL: LINEAR FEET post ②	GALVANIZED STRUCTURAL STEEL: LINEAR FEET post ③	GALVANIZED STRUCTURAL STEEL: TOTAL WEIGHT LBS.	DRILLED SHAFT: NON-REINF 12"ϕ	DRILLED SHAFT: LINEAR FEET REINFORCED 24"ϕ	DRILLED SHAFT: LINEAR FEET REINFORCED 30"ϕ	DRILLED SHAFT: LINEAR FEET REINFORCED 36"ϕ
13	1	GREEN	EXIT ↗	6'0" x 5'0"			30		220	0.1	0.3		S3X5.7	12.3	12.1		196.9	8'			
14	1	GREEN	EXIT ↗	6'0" x 5'0"			30		220	0.1	0.3		S3X5.7	12.3	12.1		196.9	8'			
			PAGE TOTALS				60						PAGE TOTALS				393.8	16'			

◒ The "X" dimension is the elevation difference at the post between the ground and the edge of pavement or top of curb.

Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.

The post lengths listed here are approximations, The corrected post lengths will be furnished by the Contractor after the stud posts are placed.

Tower heights shall be verified with the Engineer before fabrication.

⁎ This column is for aluminum Type A and not direct apply. Direct apply is subsidiary to the sign.

SIGN TYPE

SIGN TYPE 1 3 0
- 1 — Wind Design Zone
- 3 — No. of Posts
- 0 — Series No.
  - 0 Aluminum/Fiberglass
  - 1 Aluminum
  - 2 Fiberglass

See sheet SMD(8W1)

SUMMARY OF LARGE SIGNS

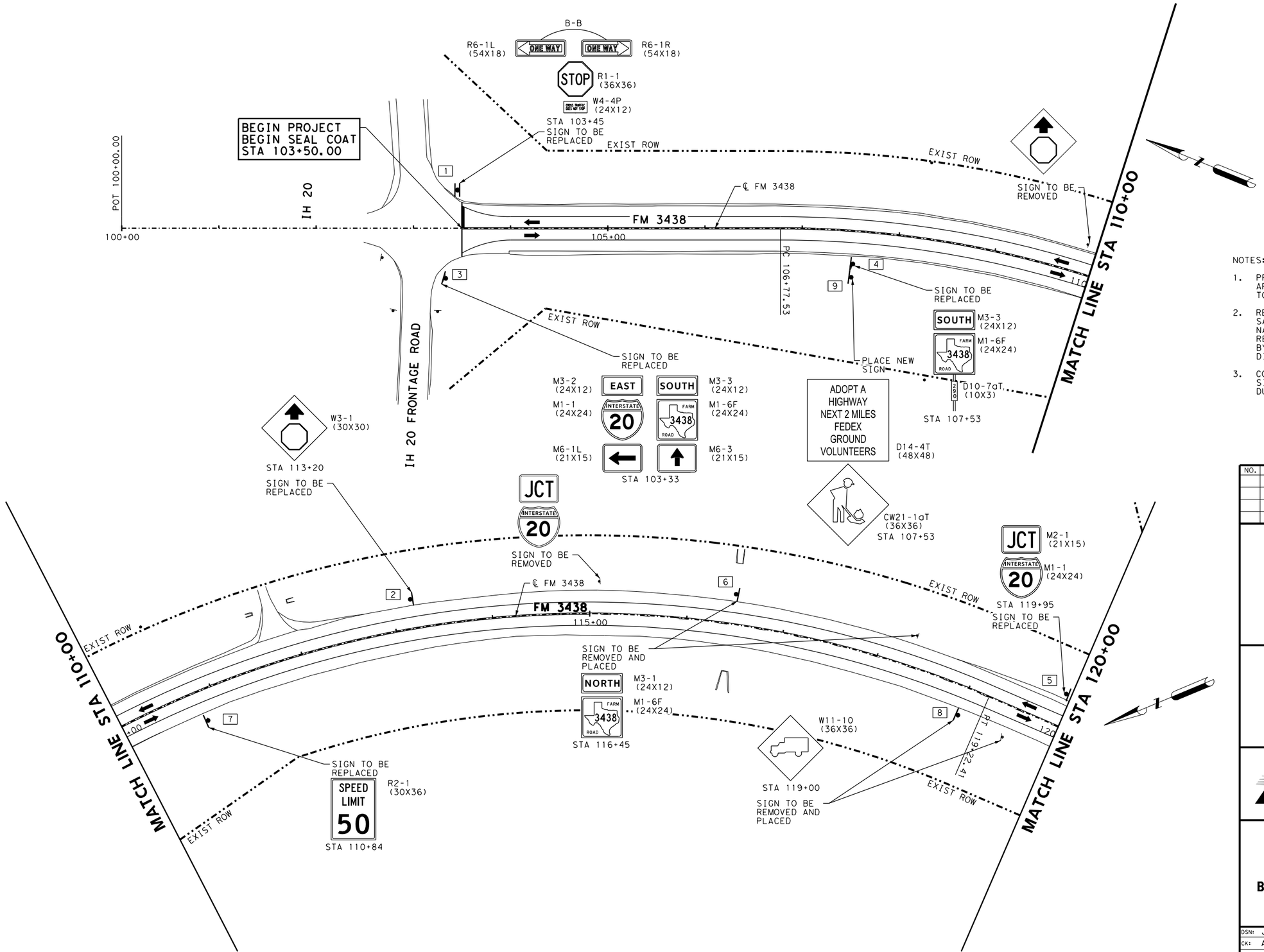
SOLS

DN.:-TxDOT
CK.:-TxDOT
DW.:-TxDOT
CK.:-TxDOT

REVISIONS
11-93
8-95
5-01
1-04
9-08

CONT	SECT	JOB	HIGHWAY
2270	01	023	FM 3438

DIST	COUNTY	SHEET NO.
ABL	TAYLOR	157



LEGEND

- PROPOSED SIGN
- PROPOSED SIGN BACK TO BACK
- DIRECTION TRAFFIC FLOW
- [X] SMALL SIGN NUMBER
- ⚠ LARGE SIGN NUMBER

NOTES:

1. PROPOSED SIGN LOCATIONS ARE APPROXIMATE. FINAL LOCATIONS TO BE DETERMINED BY THE ENGINEER.
2. REMOVE STREET NAME SIGNS, STORE THEM SAFELY, AND REINSTALL THE EXISTING STREET NAME SIGNS ON NEW SIGN SUPPORTS. HARDWARE REQUIRED TO MOUNT SIGN SHALL BE APPROVED BY THE ENGINEER AND WILL NOT BE PAID DIRECTLY BUT WILL BE SUBSIDIARY TO ITEM 644.
3. CONTRACTOR IS RESPONSIBLE FOR REPLACING SIGNS AT THEIR COST THAT ARE DAMAGED DURING REMOVAL, STORAGE, OR REINSTALLATION.

0′ 50′ 100′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

IDCUS
PLANNERS • ENGINEERS • MANAGERS
IDCUS, Inc.
8632 Fredericksburg Rd., Suite 200
San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

Texas Department of Transportation

FM 3438

SIGNING LAYOUT

BEGIN PROJECT TO STA 120+00

SHEET 1 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	158

5/26/2021 10:30:58 AM

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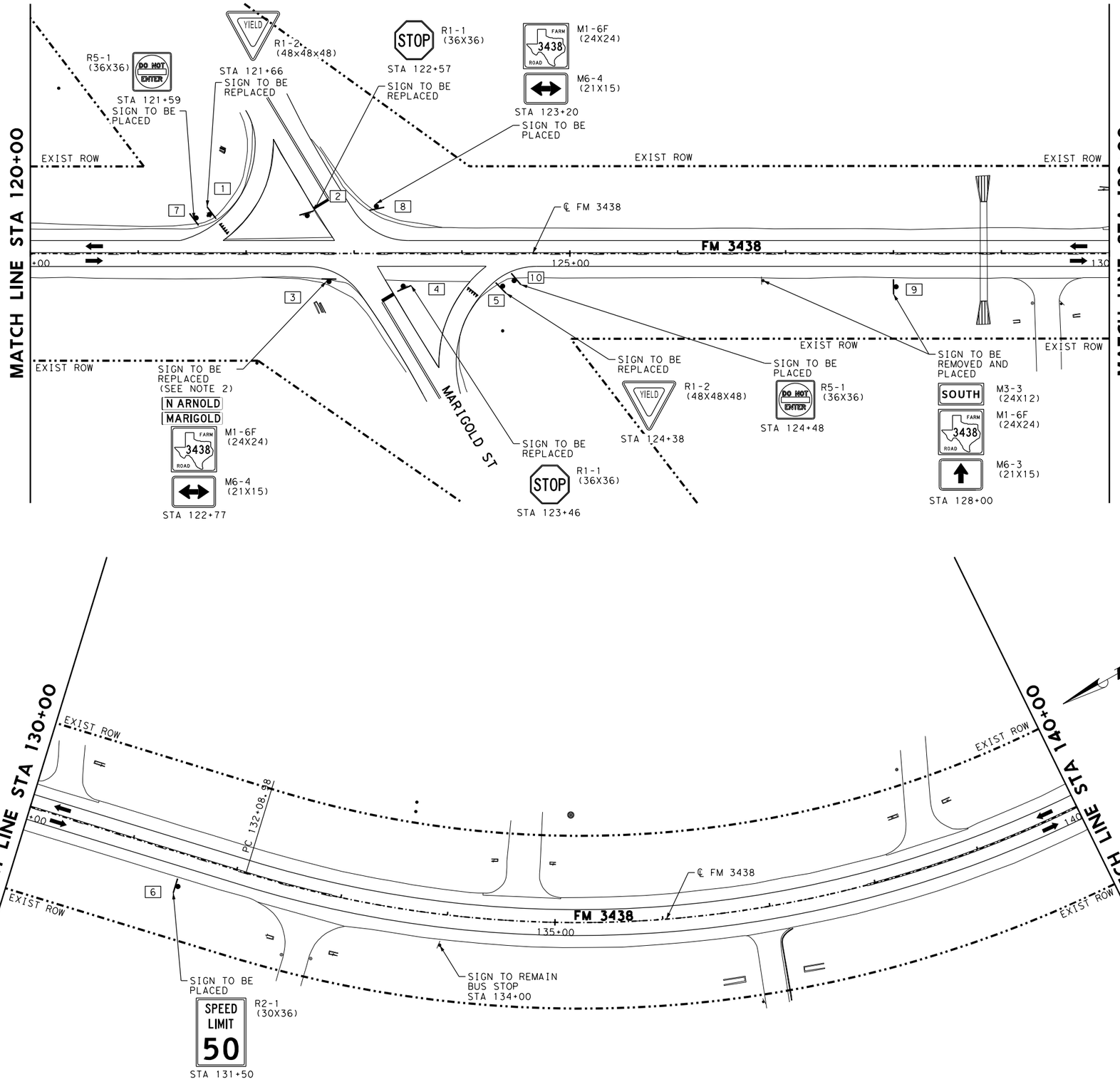

LEGEND

- PROPOSED SIGN
- PROPOSED SIGN BACK TO BACK
- DIRECTION TRAFFIC FLOW
- [X] SMALL SIGN NUMBER
- ⟨X⟩ LARGE SIGN NUMBER

NOTES:

1. PROPOSED SIGN LOCATIONS ARE APPROXIMATE. FINAL LOCATIONS TO BE DETERMINED BY THE ENGINEER.
2. REMOVE STREET NAME SIGNS, STORE THEM SAFELY, AND REINSTALL THE EXISTING STREET NAME SIGNS ON NEW SIGN SUPPORTS. HARDWARE REQUIRED TO MOUNT SIGN SHALL BE APPROVED BY THE ENGINEER AND WILL NOT BE PAID DIRECTLY BUT WILL BE SUBSIDIARY TO ITEM 644.
3. CONTRACTOR IS RESPONSIBLE FOR REPLACING SIGNS AT THEIR COST THAT ARE DAMAGED DURING REMOVAL, STORAGE, OR REINSTALLATION.

0′ 50′ 100′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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SIGNING LAYOUT

STA 120+00 TO STA 140+00

SHEET 2 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	159

5/26/2021 10:31:11 AM

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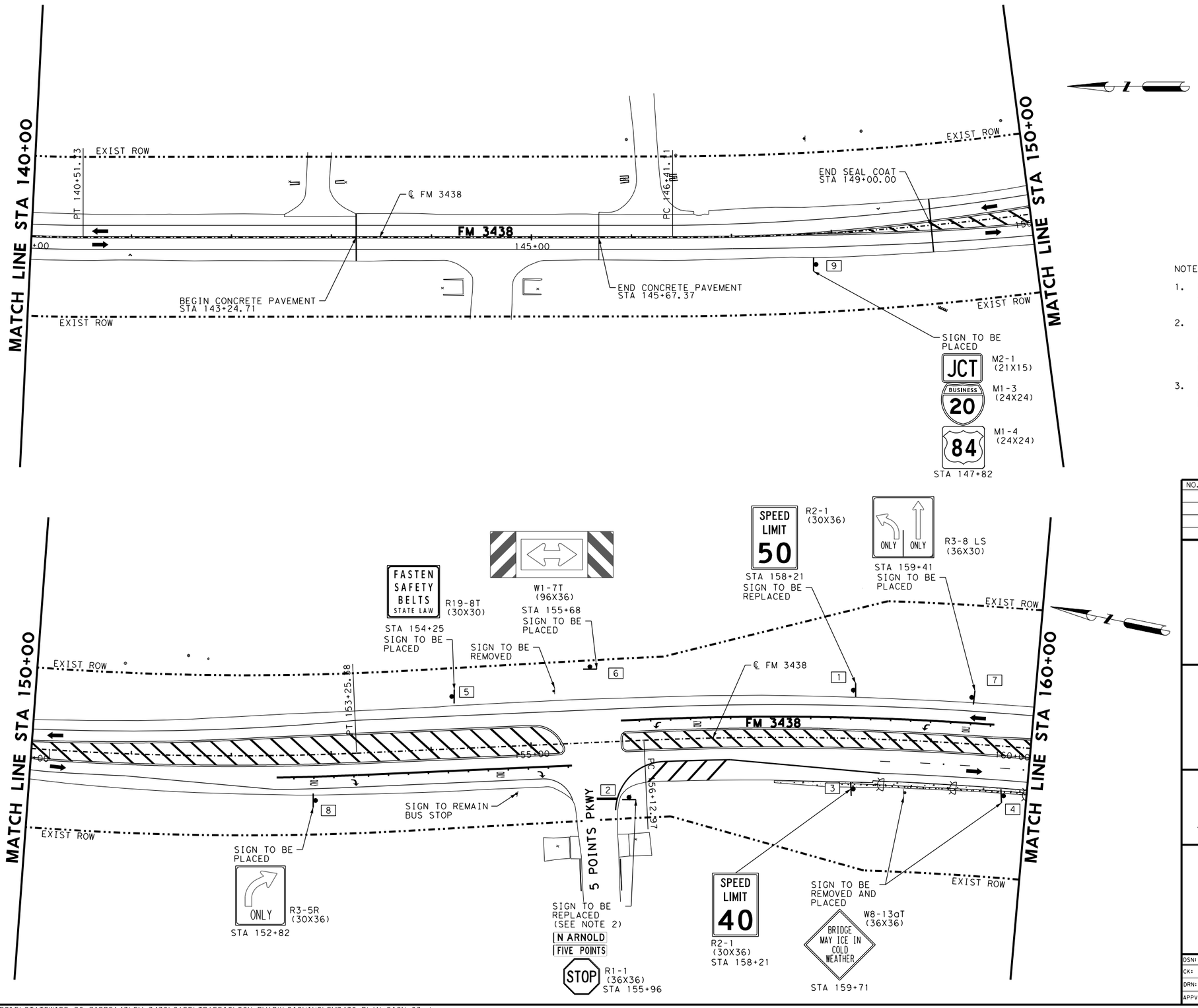

LEGEND

- PROPOSED SIGN
- PROPOSED SIGN BACK TO BACK
- DIRECTION TRAFFIC FLOW
- [X] SMALL SIGN NUMBER
- (X) LARGE SIGN NUMBER

NOTES:

1. PROPOSED SIGN LOCATIONS ARE APPROXIMATE. FINAL LOCATIONS TO BE DETERMINED BY THE ENGINEER.
2. REMOVE STREET NAME SIGNS, STORE THEM SAFELY, AND REINSTALL THE EXISTING STREET NAME SIGNS ON NEW SIGN SUPPORTS. HARDWARE REQUIRED TO MOUNT SIGN SHALL BE APPROVED BY THE ENGINEER AND WILL NOT BE PAID DIRECTLY BUT WILL BE SUBSIDIARY TO ITEM 644.
3. CONTRACTOR IS RESPONSIBLE FOR REPLACING SIGNS AT THEIR COST THAT ARE DAMAGED DURING REMOVAL, STORAGE, OR REINSTALLATION.

0′ 50′ 100′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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FM 3438

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STA 140+00 TO STA 160+00

SHEET 3 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	160

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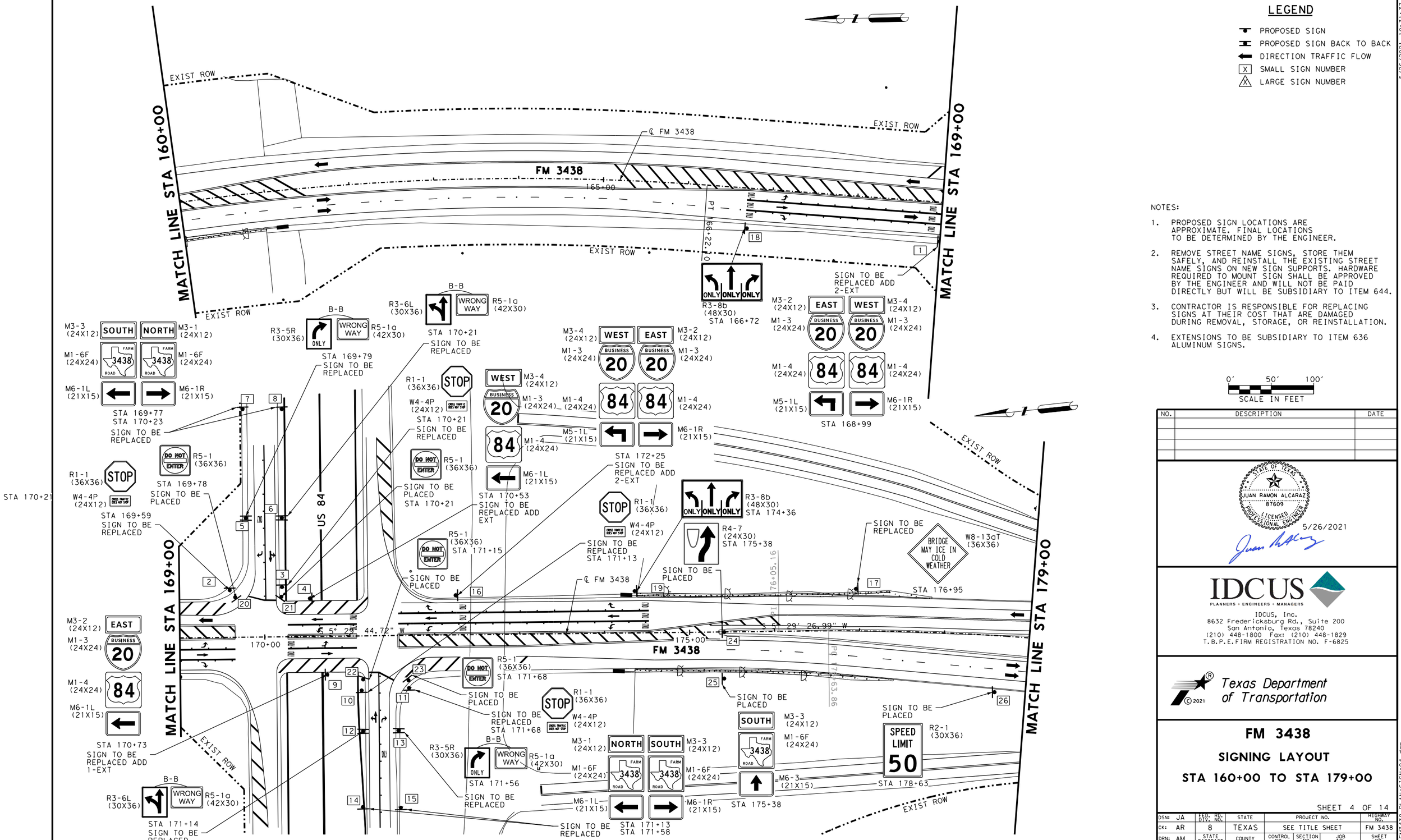

LEGEND

- PROPOSED SIGN
- PROPOSED SIGN BACK TO BACK
- DIRECTION TRAFFIC FLOW
- X SMALL SIGN NUMBER
- X LARGE SIGN NUMBER

NOTES:

1. PROPOSED SIGN LOCATIONS ARE APPROXIMATE. FINAL LOCATIONS TO BE DETERMINED BY THE ENGINEER.
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3. CONTRACTOR IS RESPONSIBLE FOR REPLACING SIGNS AT THEIR COST THAT ARE DAMAGED DURING REMOVAL, STORAGE, OR REINSTALLATION.
4. EXTENSIONS TO BE SUBSIDIARY TO ITEM 636 ALUMINUM SIGNS.

0′ 50′ 100′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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FM 3438

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STA 160+00 TO STA 179+00

SHEET 4 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	161

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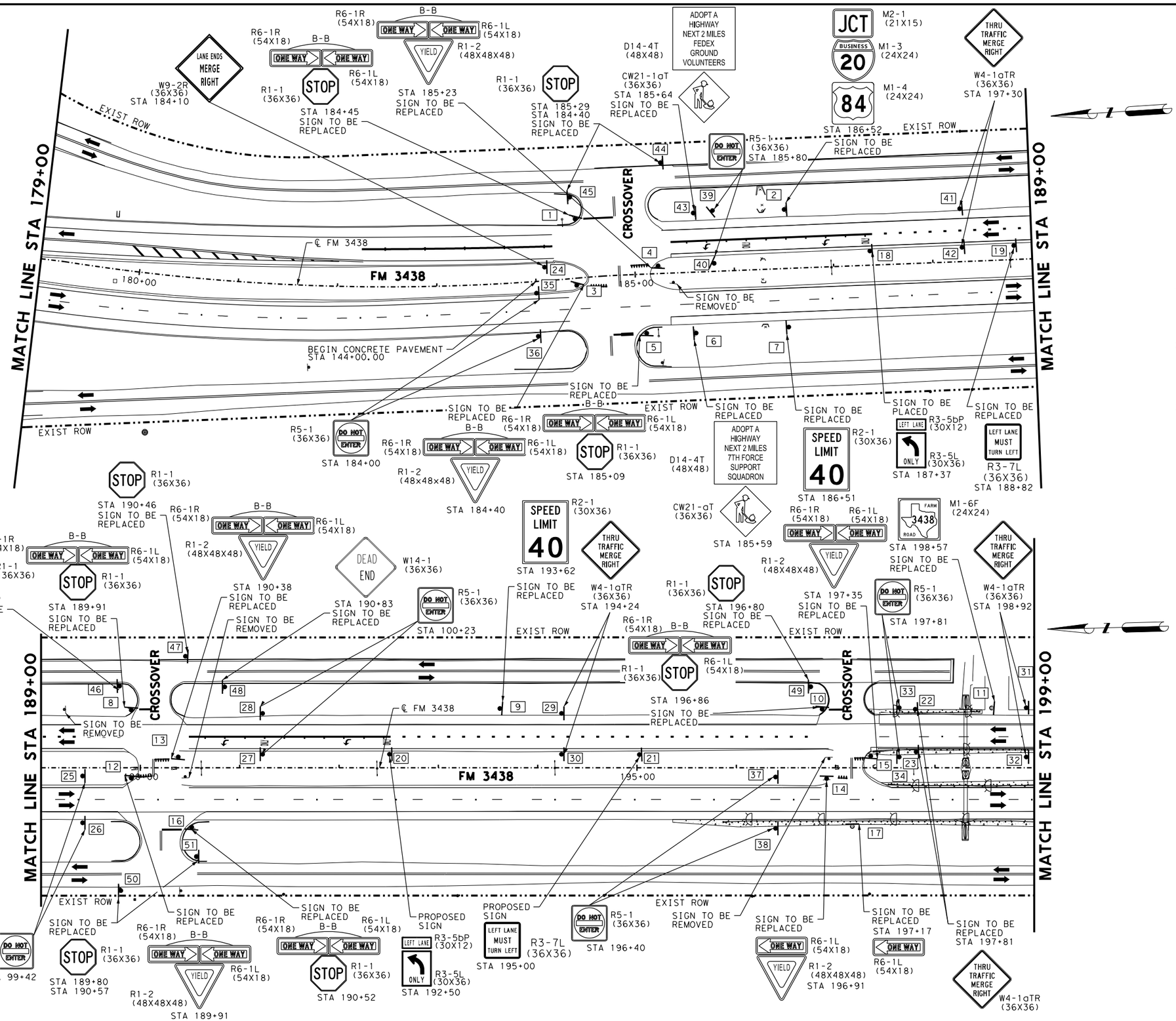

LEGEND

- PROPOSED SIGN
- PROPOSED SIGN BACK TO BACK
- DIRECTION TRAFFIC FLOW
- X SMALL SIGN NUMBER
- XX LARGE SIGN NUMBER

NOTES:

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3. CONTRACTOR IS RESPONSIBLE FOR REPLACING SIGNS AT THEIR COST THAT ARE DAMAGED DURING REMOVAL, STORAGE, OR REINSTALLATION.

0′ 50′ 100′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

SIGNING LAYOUT

STA 179+00 TO STA 199+00

SHEET 5 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	162

5/26/2021 10:31:49 AM

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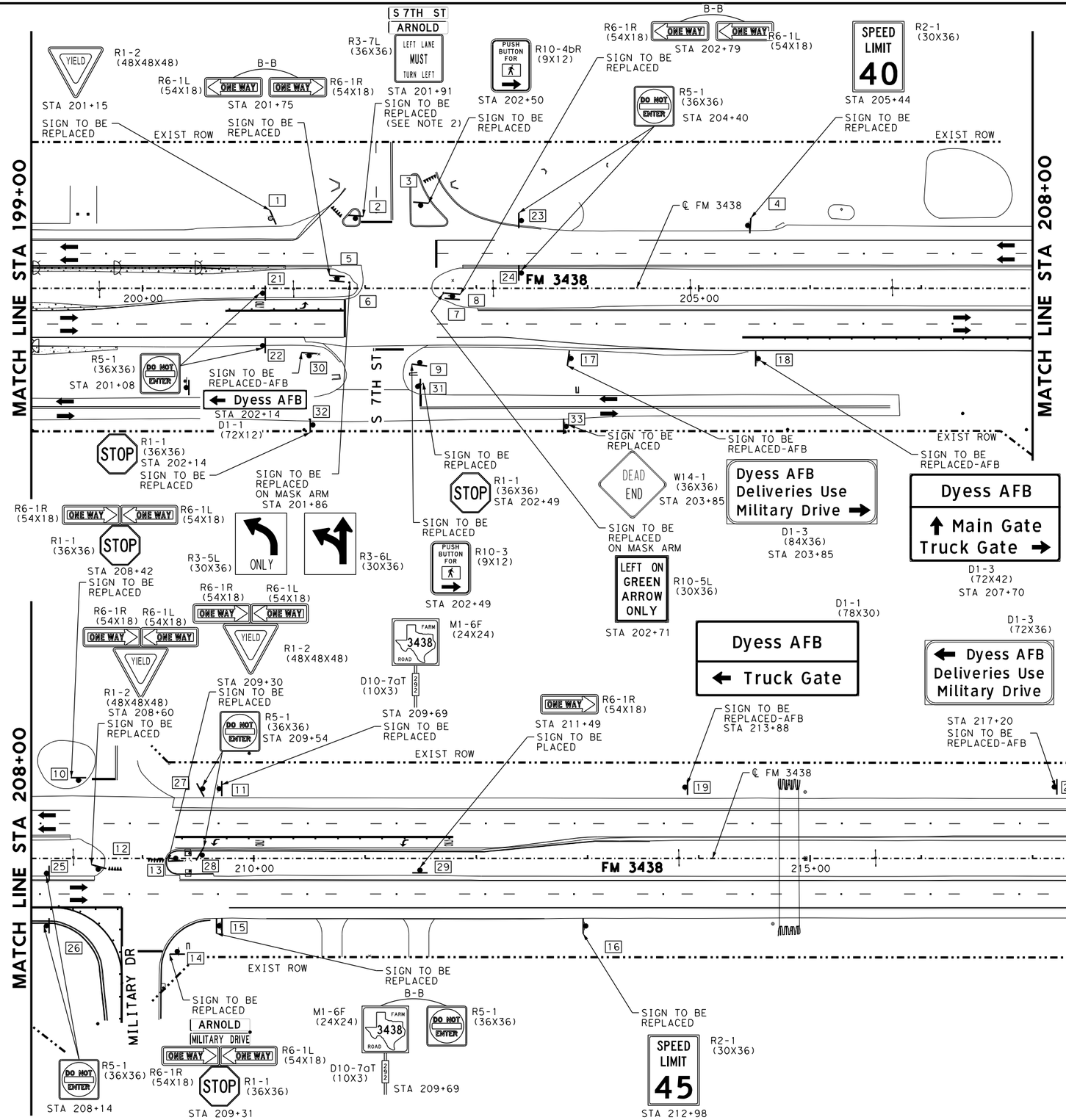

LEGEND

- PROPOSED SIGN
- PROPOSED SIGN BACK TO BACK
- DIRECTION TRAFFIC FLOW
- [X] SMALL SIGN NUMBER
- ⟨X⟩ LARGE SIGN NUMBER

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0′ 50′ 100′
SCALE IN FEET

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FM 3438

SIGNING LAYOUT

STA 199+00 TO STA 218+00

SHEET 6 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	163

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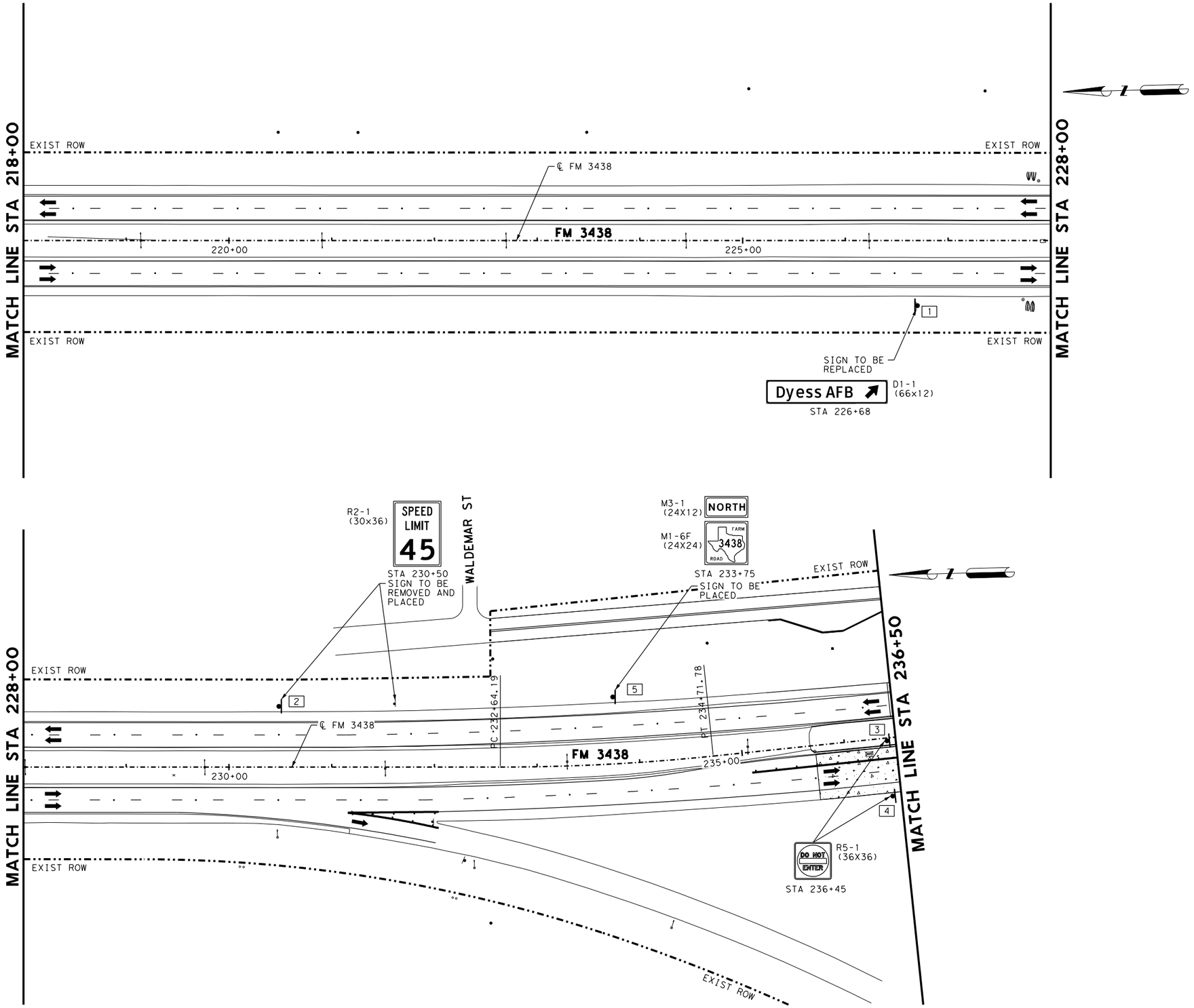

LEGEND

- PROPOSED SIGN
- PROPOSED SIGN BACK TO BACK
- DIRECTION TRAFFIC FLOW
- X SMALL SIGN NUMBER
- X LARGE SIGN NUMBER

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SCALE IN FEET

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STATE OF TEXAS
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Texas Department of Transportation

FM 3438

SIGNING LAYOUT

STA 218+00 TO STA 236+50

SHEET 7 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	164

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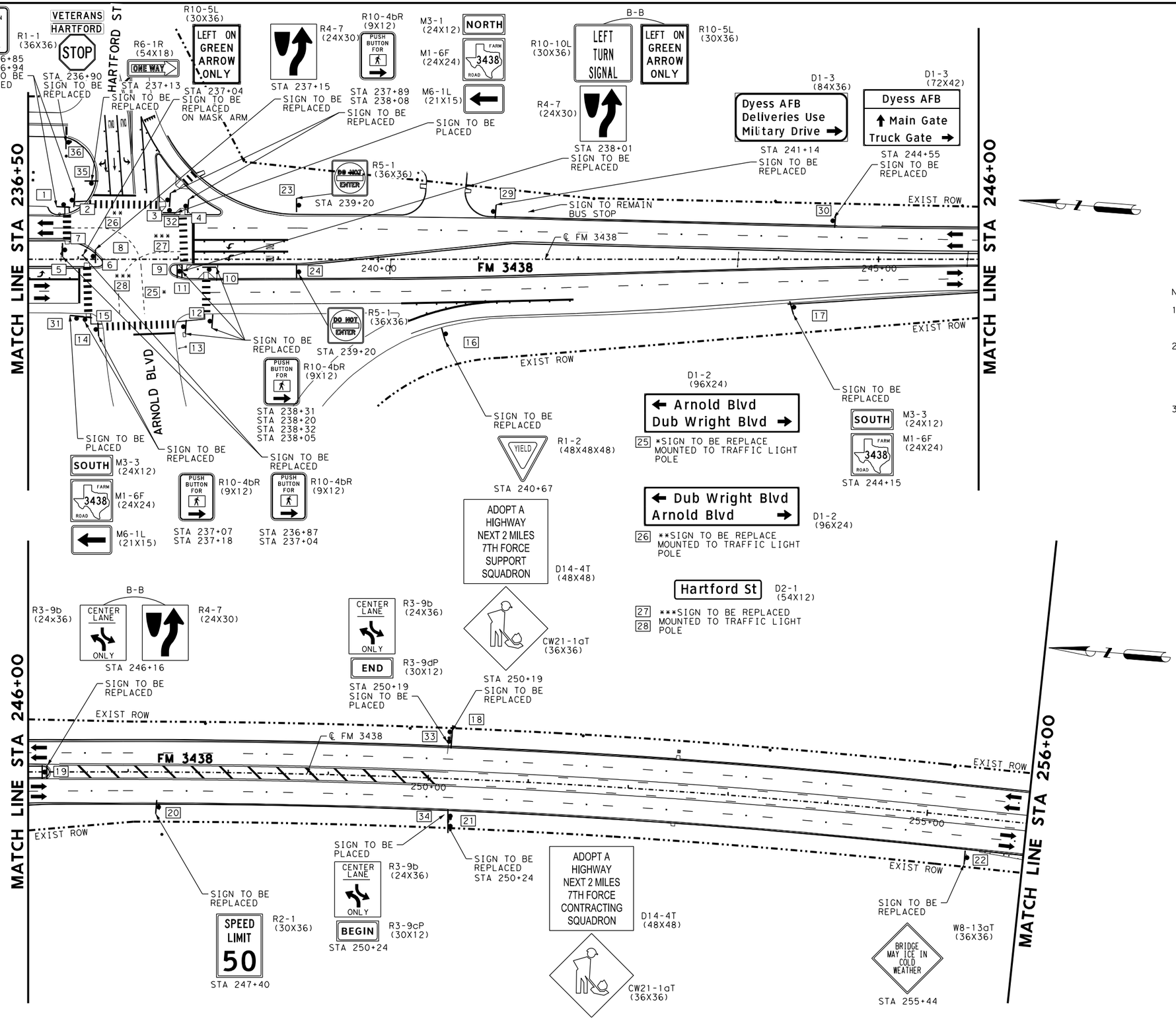

LEGEND

- PROPOSED SIGN
- PROPOSED SIGN BACK TO BACK
- DIRECTION TRAFFIC FLOW
- X — SMALL SIGN NUMBER
- X — LARGE SIGN NUMBER

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FM 3438

SIGNING LAYOUT

STA 236+50 TO STA 256+00

SHEET 8 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	165

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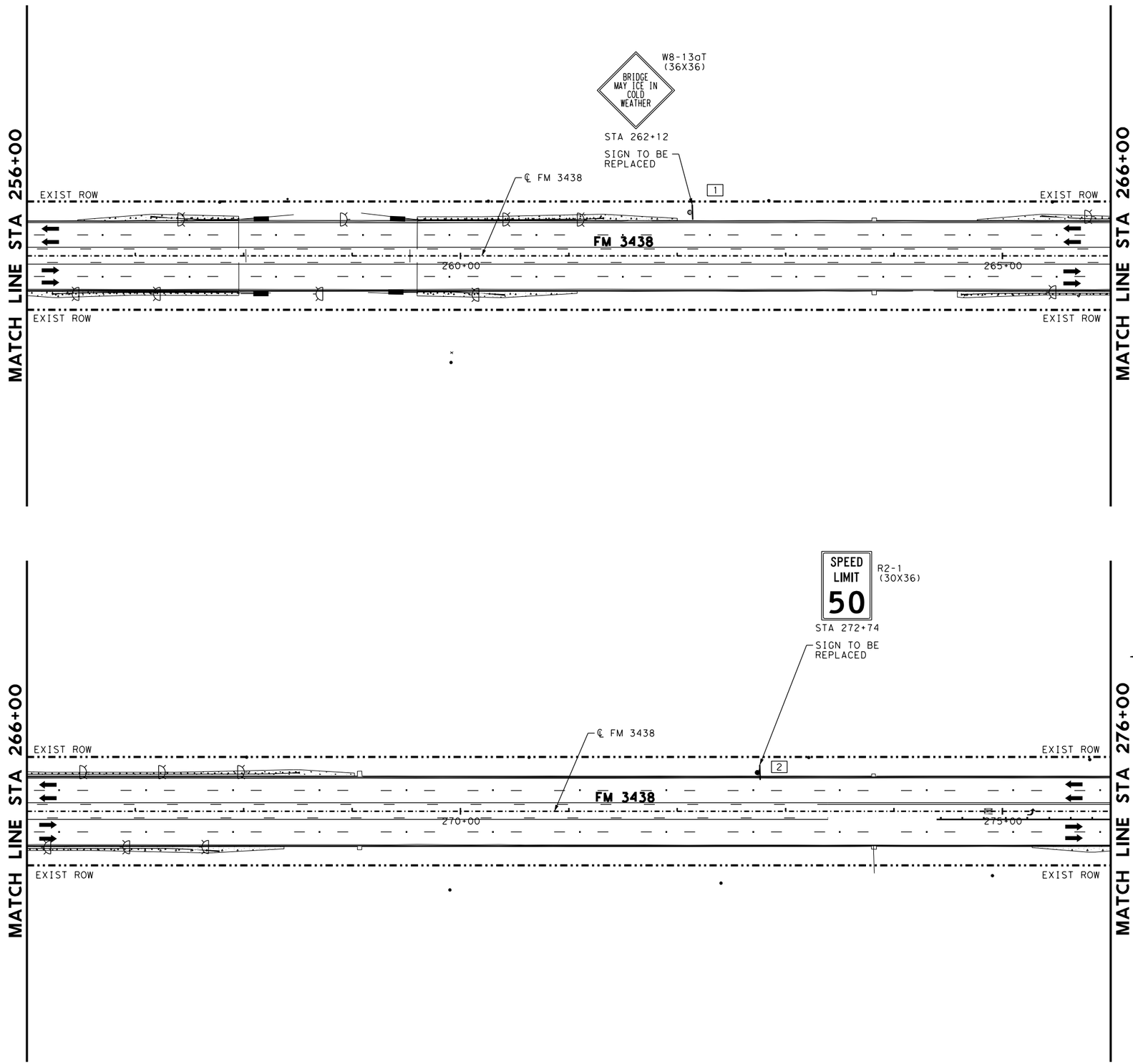

LEGEND

- PROPOSED SIGN
- PROPOSED SIGN BACK TO BACK
- DIRECTION TRAFFIC FLOW
- [X] SMALL SIGN NUMBER
- ⚠ LARGE SIGN NUMBER

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Texas Department of Transportation

FM 3438
SIGNING LAYOUT
STA 256+00 TO STA 276+00

SHEET 9 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	166

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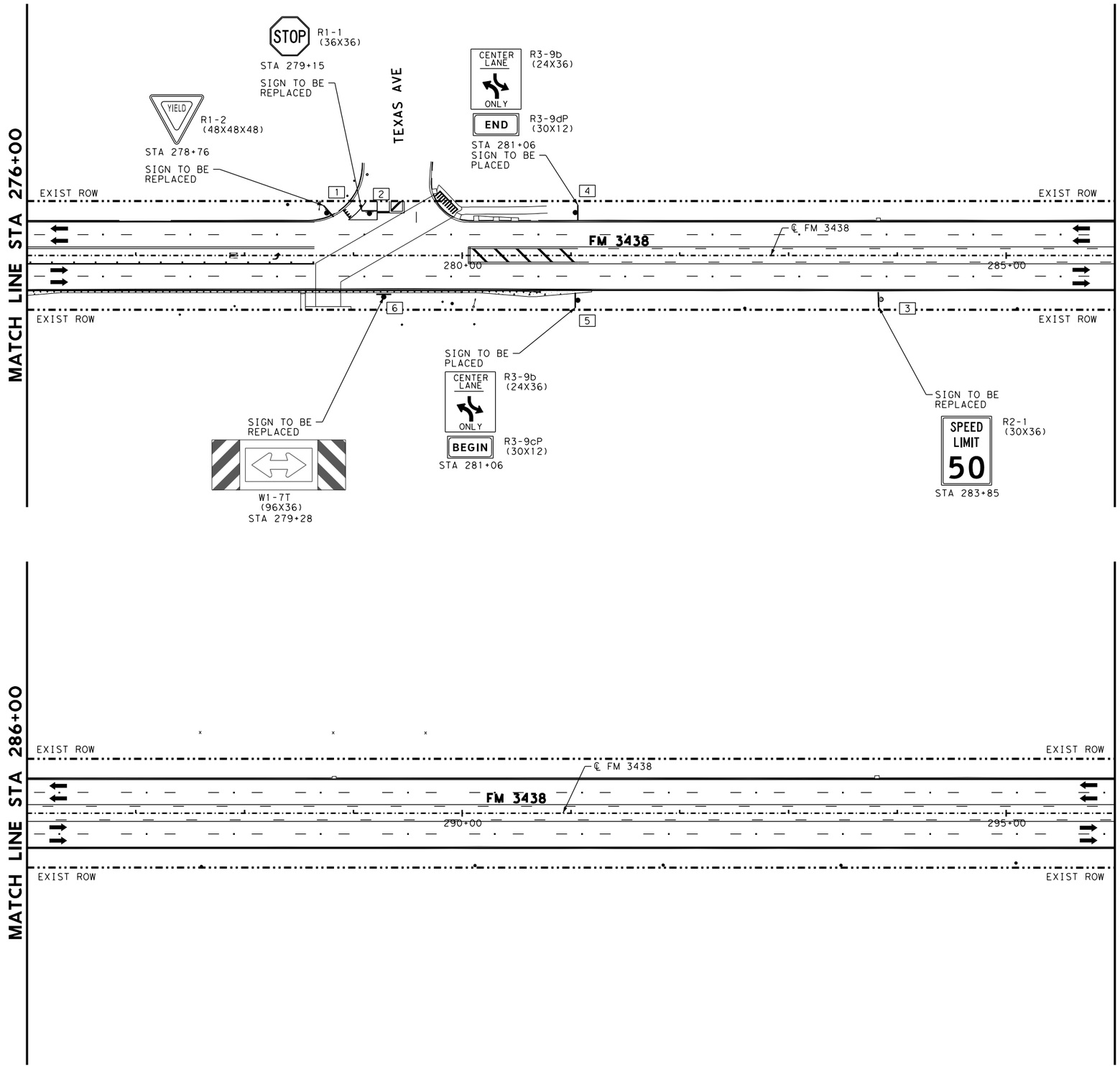

LEGEND

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FM 3438

SIGNING LAYOUT

STA 276+00 TO STA 296+00

SHEET 10 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	167

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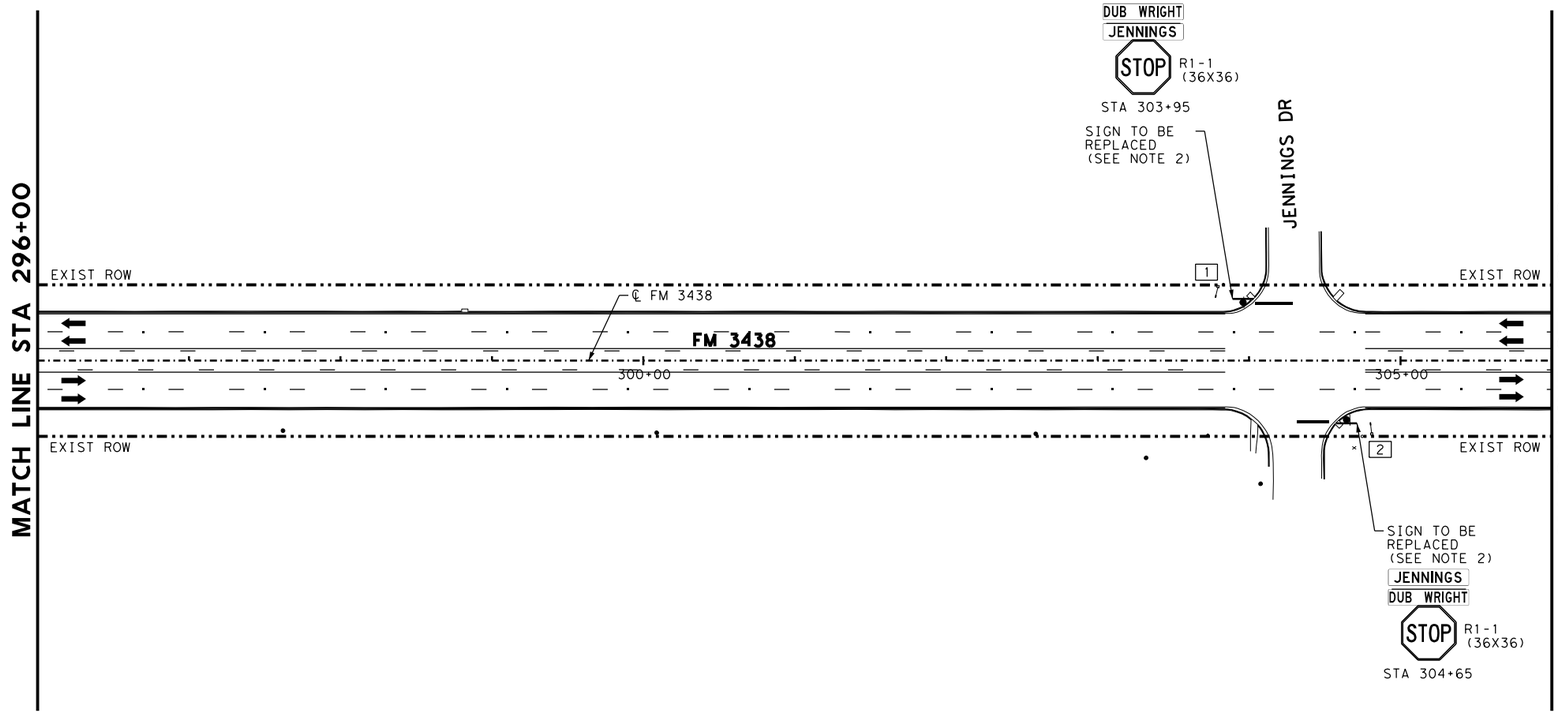

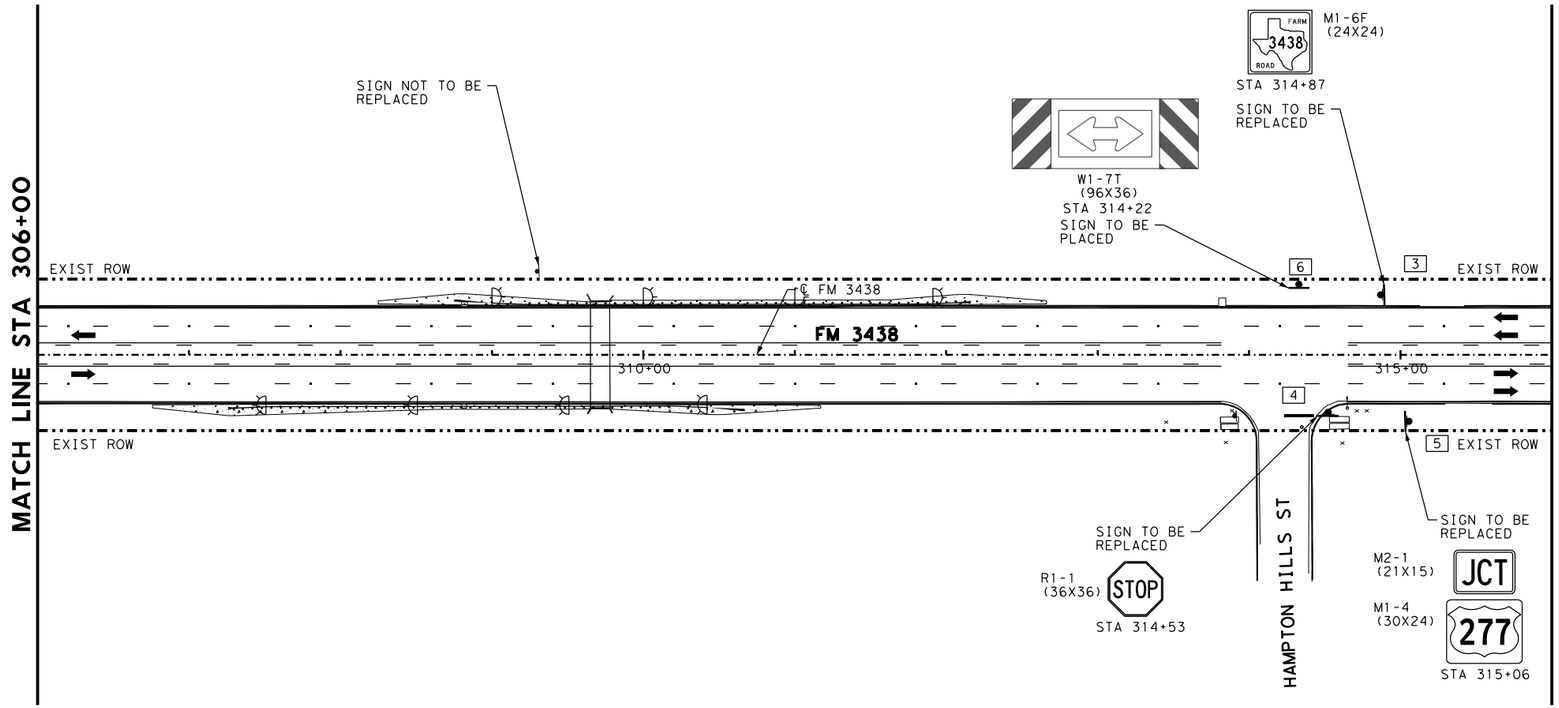

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FM 3438

SIGNING LAYOUT

STA 296+00 TO STA 316+00

SHEET 11 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	168

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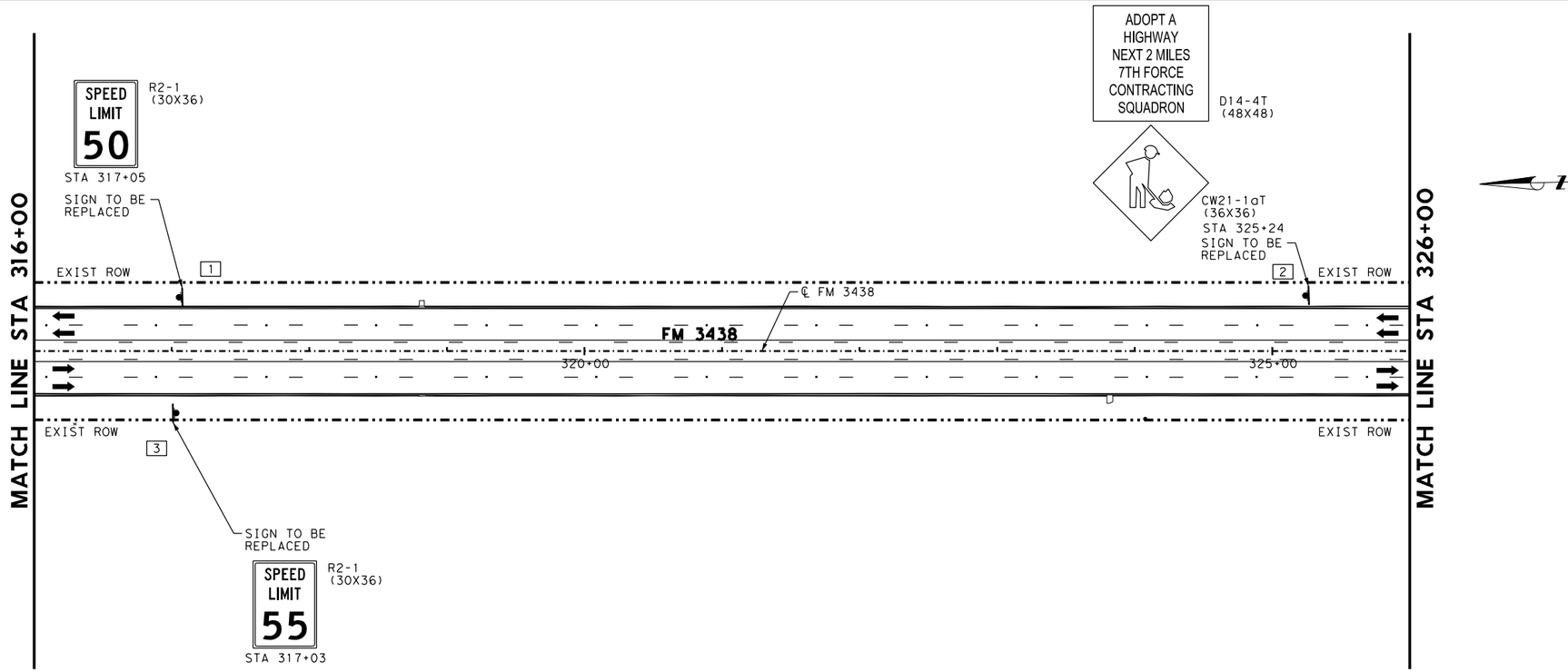

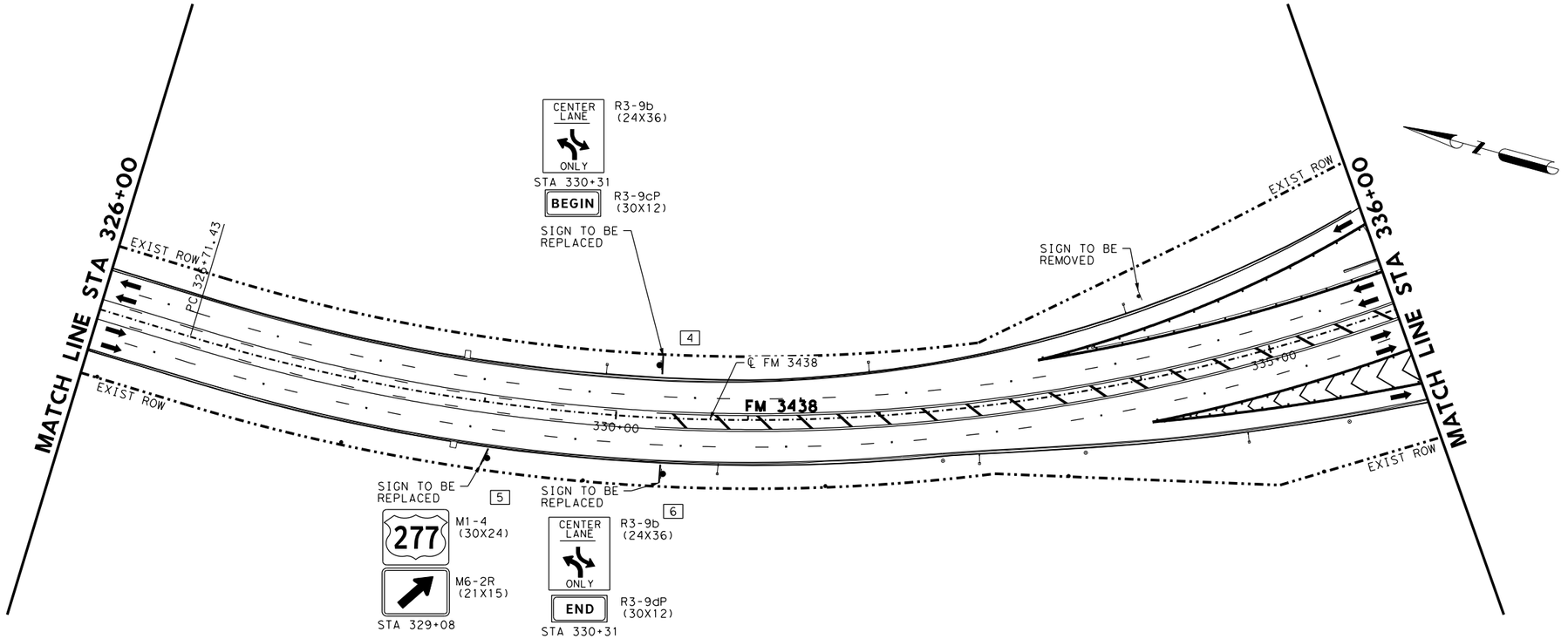

LEGEND

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FM 3438

SIGNING LAYOUT

STA 316+00 TO STA 336+00

SHEET 12 OF 14

DSN: JA	FED. RD. DIV. NO. 6	STATE TEXAS	PROJECT NO. SEE TITLE SHEET			HIGHWAY NO. FM 3438
CK: AR						
DRN: AM	STATE DISTRICT ABL	COUNTY TAYLOR	CONTROL NO. 2270	SECTION NO. 01	JOB NO. 023	SHEET NO. 169
APPVD: CS						

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MATCH LINE STA 336+00

MATCH LINE STA 346+00

MATCH LINE STA 346+00

MATCH LINE STA 356+00

EXIST ROW

PT 338+17.10

FM 3438

℄ FM 3438

340+00

345+00

350+00

355+00

US 277

R1-2 (48X48X48) YIELD — STA 336+11 SIGN TO BE PLACED

R5-1A (42X30) WRONG WAY — STA 337+29 SIGN TO BE PLACED

B-B

W4-1 (36X36) — R5-1A (42X30) WRONG WAY — STA 337+38 SIGN TO BE PLACED

W3-2 (30X30) — STA 339+26 SIGN TO BE REPLACED

SIGN NOT TO BE REPLACED

W3-1 (30X30) — STA 339+82 SIGN TO BE REPLACED

W8-13aT (36X36) BRIDGE MAY ICE IN COLD WEATHER

W9-2L (36X36) LANE ENDS MERGE RIGHT — SIGN TO BE REPLACED

STA 341+89

STA 338+99 SIGN TO BE REPLACED

SIGN TO BE REPLACED

W3-1 (30X30) — STA 338+88

EXIT E5-1 (72X60) — STA 336+67

Abilene / Bronte / San Angelo — D1-3 (96X42) — STA 342+10 SIGN TO BE REPLACED

R6-1R (54X18) ONE WAY — STA 342+10 SIGN TO BE REPLACED

R3-MK (36X30) — STA 345+44 STA 345+43 SIGN TO BE REPLACED

M1-4 (30X24) 277 — M6-4 (21X15) — STA 347+95

R6-1R (54X18) B-B R6-1L (54X18) ONE WAY ONE WAY — SIGN TO BE PLACED STA 347+96 STA 349+06

SIGN TO BE PLACED

R1-1 (36X36) STOP — STA 348+46 STA 348+52 SIGN TO BE REPLACED

R5-1 (36X36) DO NOT ENTER — STA 348+12 SIGN TO BE PLACED

SIGN TO BE REMOVED

SIGN TO BE REPLACED STA 349+03 — SIGN TO BE PLACED STA 349+53 — SIGN NOT TO BE REPLACED

SIGN TO BE REMOVED

BUTTERFIELD DUB WRIGHT — SIGN TO BE REPLACED (SEE NOTE 2) STA 344+24

R1-1 (36X36) STOP

Bronte / San Angelo / Abilene — D1-3 (96X42)

W3-1 (30X30) — STA 354+20 SIGN TO BE REPLACED — STA 355+98 SIGN TO BE REPLACED

TURNAROUND D13-1TL (66X24) — 17 FT 2 IN W12-2a (66X12) — STA 349+75

WRONG WAY R5-1A (42X30) — STA 351+19 STA 351+24

17 FT 1 IN W12-2a (84X24) — STA 348+61 SIGN TO BE REPLACED

17 FT 2 IN W12-2a (84X24) — STA 349+54 SIGN TO BE REPLACED

R3-8MK (36X30) — STA 352+78 STA 352+70

W3-1 (30X30) — STA 355+84 SIGN TO BE REPLACED

R1-2 (48X48X48) YIELD — STA 346+39

W12-2a (84X24) 16 FT 8 IN — STA 348+10

TURNAROUND D13-1TL (66X24) — 16 FT 8 IN W12-2a (66X12) — STA 347+86

WRONG WAY R5-1A (42X30) — STA 346+33 STA 346+37

R6-1R (54X18) B-B R6-1L (54X18) ONE WAY ONE WAY — SIGN TO BE PLACED STA 348+42

17 FT 1 IN W12-2a (84X24) — STA 349+05 SIGN TO BE REPLACED

R1-2 (48X48X48) YIELD — STA 350+76 SIGN TO BE REPLACED

LANE ENDS MERGE RIGHT W9-2L (36X36) — STA 351+93 STA 352+07

W3-2 (30X30) — STA 355+14 SIGN TO BE REPLACED

M1-4 (30X24) — 277 — M6-4 (21X15) — STA 349+49 SIGN TO BE PLACED EXISTING SIGN TO REMAIN. US 277 REBECCA

EXIST ROW

LEGEND

- PROPOSED SIGN
- PROPOSED SIGN BACK TO BACK
- DIRECTION TRAFFIC FLOW
- [X] SMALL SIGN NUMBER
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STATE OF TEXAS — JUAN RAMON ALCARAZ — 87609 — LICENSED PROFESSIONAL ENGINEER

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FM 3438

SIGNING LAYOUT

STA 336+00 TO STA 356+00

SHEET 13 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	170

5/26/2021 10:33:31 AM

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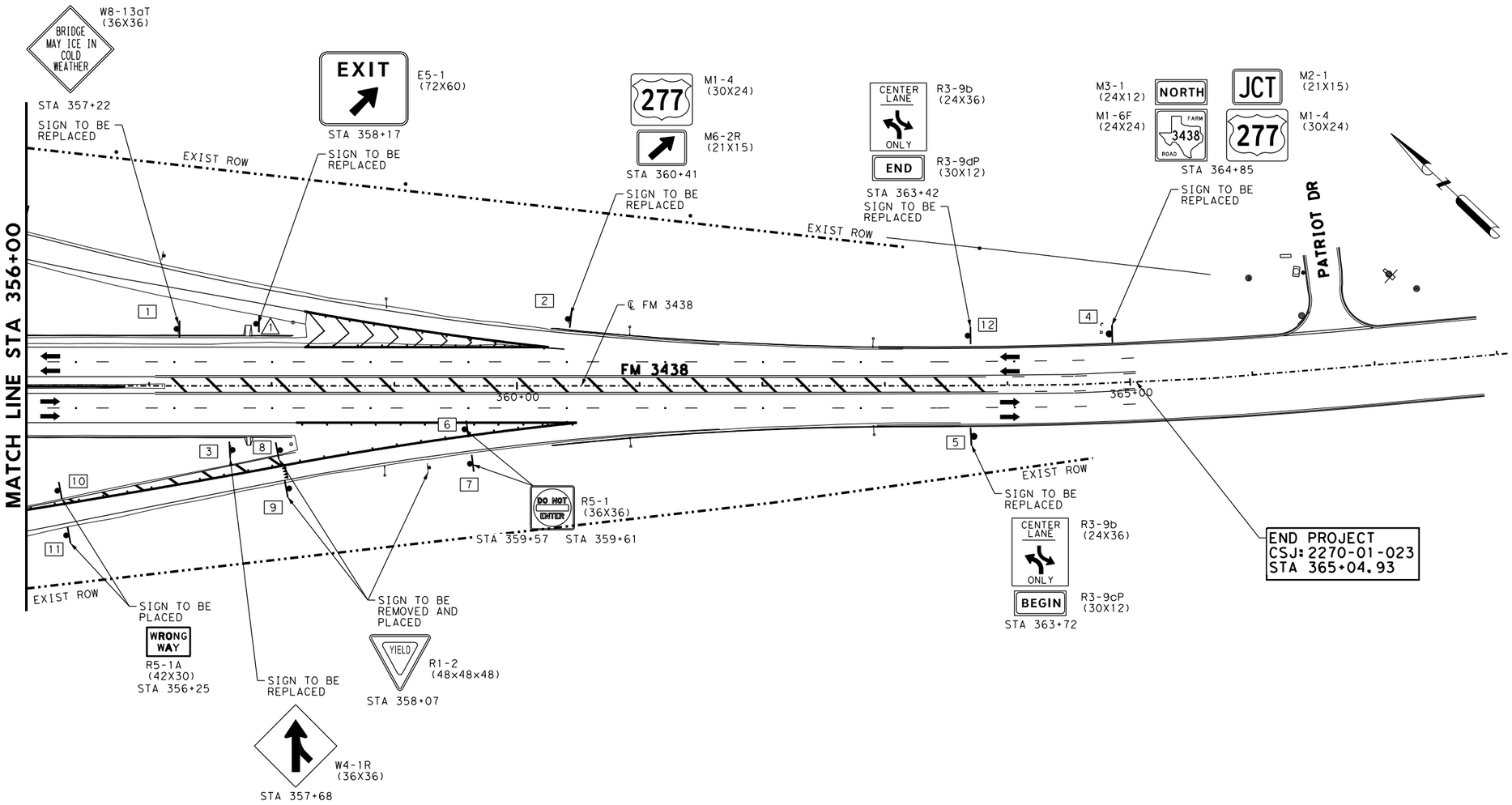

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NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

IDCUS
PLANNERS + ENGINEERS + MANAGERS
IDCUS, Inc.
8632 Fredericksburg Rd., Suite 200
San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

SIGNING LAYOUT

STA 356+00 TO END PROJECT

SHEET 14 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	171

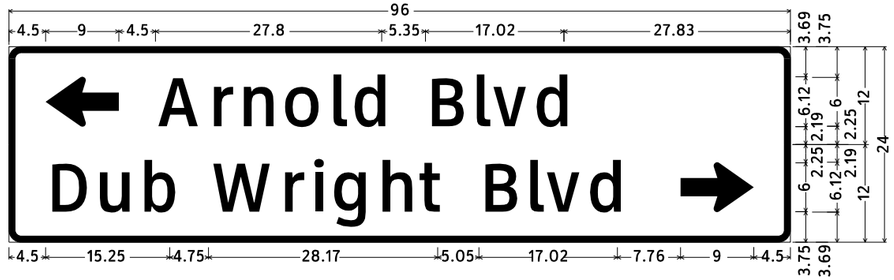
5/26/2021 10:33:38 AM

Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\TRAFFIC\SGN*PMARK\SIGNING\FM3438-PLAN*SIGN*14.dgn

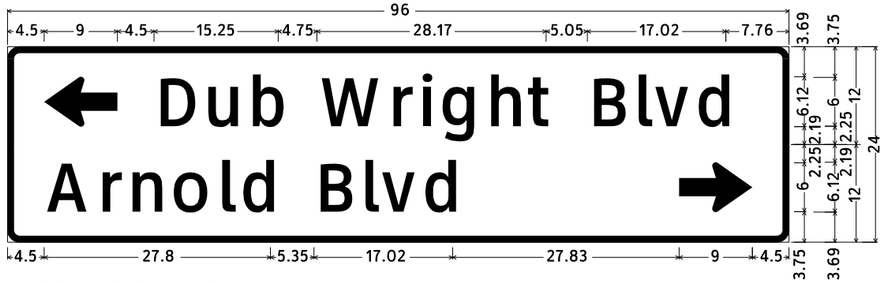
...\FM3438-PLAN*SIGN*14.dgn

Identifier : D1-3 8in LT-RT-RT;
2.25" Radius, 0.75" Border, White on Green;
Standard Arrow Custom 12.00" X 7.13" 180{; [Abilene] ClearviewHwy-3-W;
2.25" Radius, 0.75" Border, White on Green;
[Bronte] ClearviewHwy-3-W; Standard Arrow Custom 12.00" X 7.13" 0{;
2.25" Radius, 0.75" Border, White on Green;
[San Angelo] ClearviewHwy-3-W; Standard Arrow Custom 12.00" X 7.13" 0{;

Identifier : D1-3 8in LT-LT-RT;
2.25" Radius, 0.75" Border, White on Green;
Standard Arrow Custom 12.00" X 7.13" 180{; [Bronte] ClearviewHwy-3-W;
2.25" Radius, 0.75" Border, White on Green;
Standard Arrow Custom 12.00" X 7.13" 180{; [San Angelo] ClearviewHwy-3-W;
2.25" Radius, 0.75" Border, White on Green;
[Abilene] ClearviewHwy-3-W; Standard Arrow Custom 12.00" X 7.13" 0{;



Identifier : D21-2T_VARx24;
1.50" Radius, 0.75" Border, White on Green;
Standard Arrow Custom 9.00" X 6.13" 180{; [Arnold Blvd] ClearviewHwy-3-W;
1.50" Radius, 0.75" Border, White on Green;
[Dub Wright Blvd] ClearviewHwy-3-W; Standard Arrow Custom 9.00" X 6.13" 0{;



Identifier : D21-2T_VARx24;
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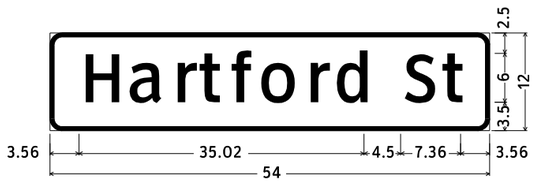
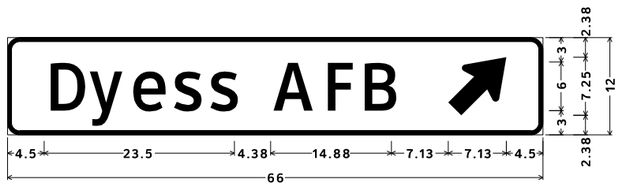
Standard Arrow Custom 9.00" X 6.13" 180{; [Dub Wright Blvd] ClearviewHwy-3-W;
1.50" Radius, 0.75" Border, White on Green;
[Arnold Blvd] ClearviewHwy-3-W; Standard Arrow Custom 9.00" X 6.13" 0{;



Identifier : D3-1G(3) 6in (Principal legend with descending strokes);
1.50" Radius, 0.50" Border, White on Green;
[Hartford] ClearviewHwy-3-W; [St] ClearviewHwy-3-W;



Identifier : D1-1 6in 45 RT;
1.50" Radius, 0.50" Border, White on Green;
[Dyess AFB] ClearviewHwy-3-W; Standard Arrow Custom 9.00" X 6.13" 45{;

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T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

SIGN DETAILS

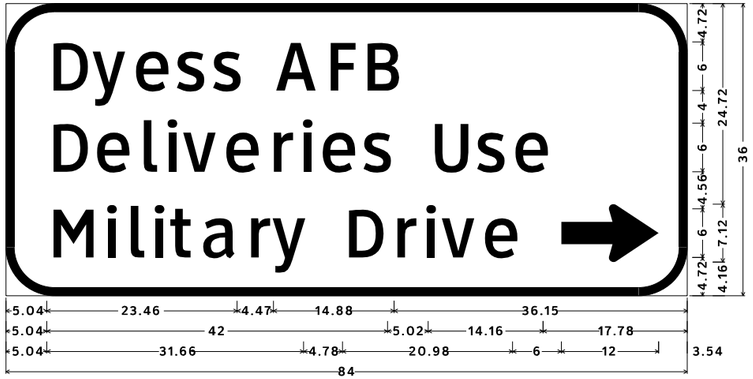
SHEET 1 OF 4

DSN: JA	DIST. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	172

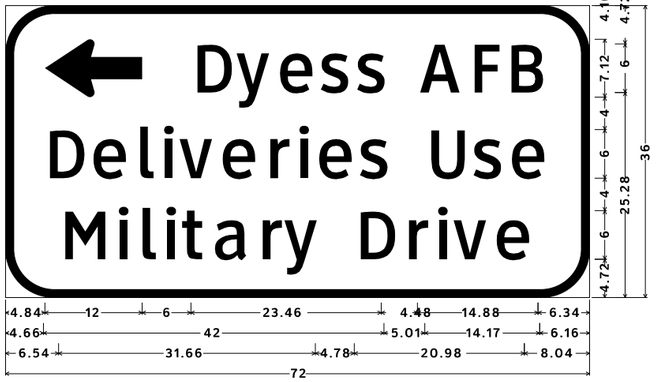
5/26/2021 10:33:41 AM

...\SIGNING\FM3438*DET-SGN-01.dgn

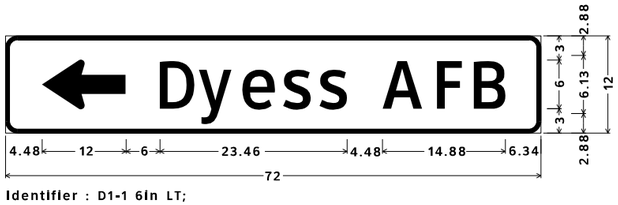
Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\TRAFFIC\SGN*PMARK\SIGNING\FM3438*DET-SGN-01.dgn



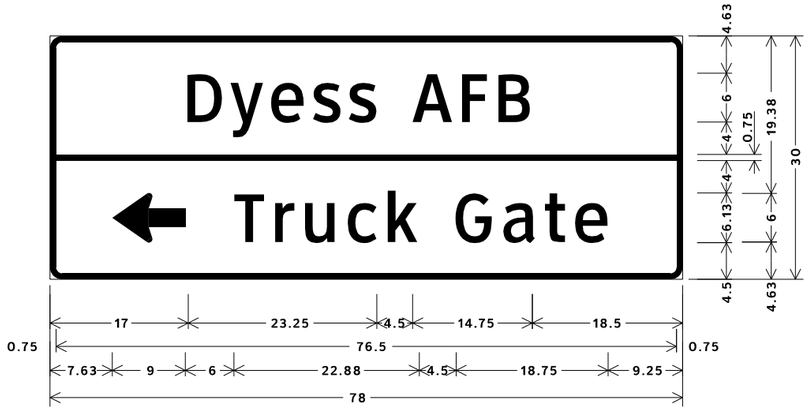
Identifier : D1-3 6in RT;
6.00" Radius, 1.00" Border, White on Green;
[Dyess AFB] ClearviewHwy-3-W; [Deliveries Use] ClearviewHwy-3-W; [Military Drive] ClearviewHwy-3-W;
Standard Arrow Custom 12.00" X 7.13" 0{;



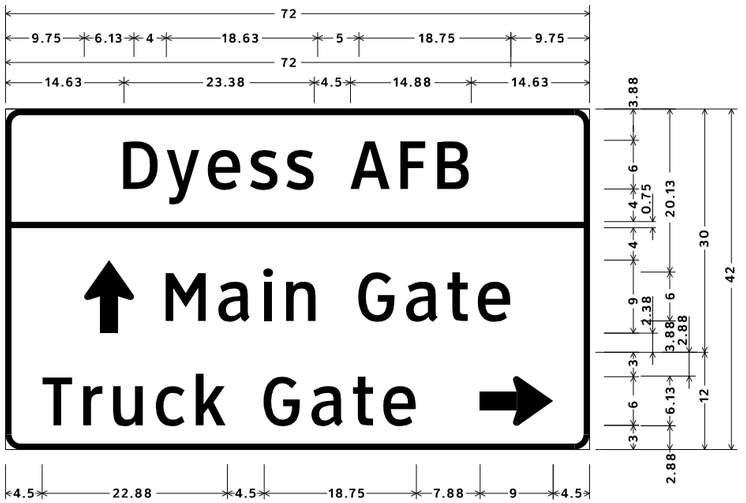
Identifier : D1-3 6in LT;
6.00" Radius, 1.00" Border, White on Green;
Standard Arrow Custom 12.00" X 7.13" 180{; [Dyess AFB] ClearviewHwy-3-W;
[Deliveries Use] ClearviewHwy-3-W; [Military Drive] ClearviewHwy-3-W;



Identifier : D1-1 6in LT;
1.50" Radius, 0.50" Border, White on Green;
[Dyess AFB] ClearviewHwy-3-W; Standard Arrow Custom 12.00" X 6.13" 180{;



Identifier : D1-1 6in LT◇;
1.50" Radius, 0.75" Border, White on Green;
[Dyess AFB] ClearviewHwy-3-W 95} spacing;
Standard Arrow Custom 9.00" X 6.13" 180{;
[Truck Gate] ClearviewHwy-3-W;



Identifier : D1-2 6in UP-RT;
1.88" Radius, 0.75" Border, White on Green;
[Dyess AFB] ClearviewHwy-3-W;
Standard Arrow Custom 9.00" X 6.13" 90{;
[Main Gate] ClearviewHwy-3-W;
1.88" Radius, 0.75" Border, White on Green;
[Truck Gate] ClearviewHwy-3-W;
Standard Arrow Custom 9.00" X 6.13" 0{;

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5/26/2021

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FM 3438

SIGN DETAILS

SHEET 2 OF 4

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	173

5/26/2021 10:33:42 AM

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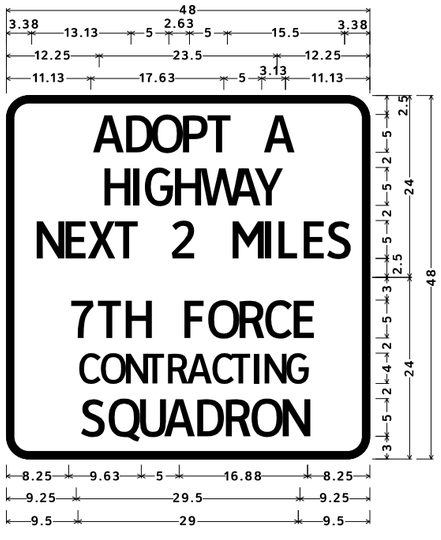
Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\TRAFFIC\SGN*PMARK\SIGNING\FM3438*DET-SGN-01.dgn

Identifier : D14-4T-3_48x48;
3.00" Radius, 1.00" Border, White on Blue;
[ADOPT A] C; [HIGHWAY] C; [NEXT 2 MILES] C;
3.00" Radius, 1.00" Border, White on Blue;
[FEDEX] C; [GROUND] C; [VOLUNTEERS] C;

Identifier : D14-4T-3_48x48;
3.00" Radius, 1.00" Border, White on Blue;
[ADOPT A] C; [HIGHWAY] C; [NEXT 2 MILES] C;
3.00" Radius, 1.00" Border, White on Blue;
[7TH FORCE] C; [CONTRACTING] C; [SQUADRON] C;



Identifier : D14-4T-3_48x48;
3.00" Radius, 1.00" Border, White on Blue;
[ADOPT A] C; [HIGHWAY] C; [NEXT 2 MILES] C;
3.00" Radius, 1.00" Border, White on Blue;
[7TH FORCE] C; [CONTRACTING] C; [SQUADRON] C;

NO.	DESCRIPTION	DATE

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T.B.P.E.FIRM REGISTRATION NO. F-6825

Texas Department of Transportation

FM 3438

SIGN DETAILS

SHEET 3 OF 4

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	174

5/26/2021 10:33:44 AM

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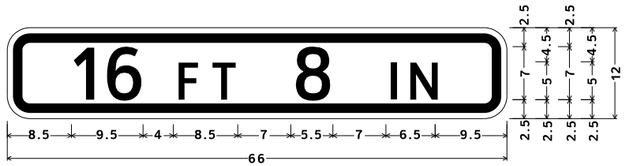
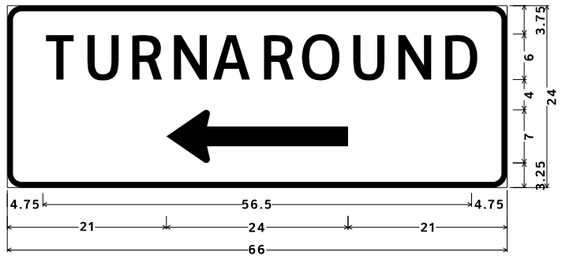
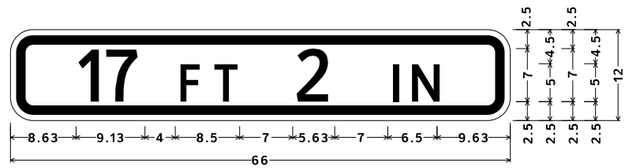


Identifier : W12-2a_66x12◇;
3.00" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[16] E; [FT] E specified length; [8] E; [IN] E specified length;

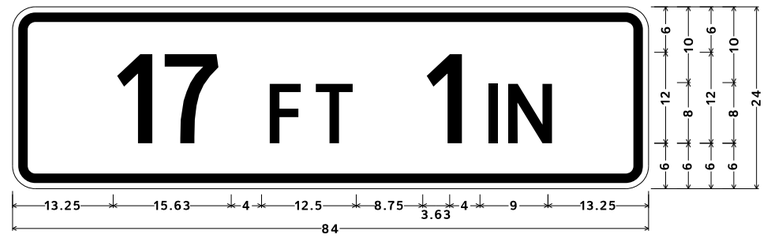


Identifier : D13-1TL_66x24◇;
0.75" Border, White on Green;
[TURNAROUND] ClearviewHwy-3-W;
Standard Arrow Custom 24.00" X 7.00" 180{;

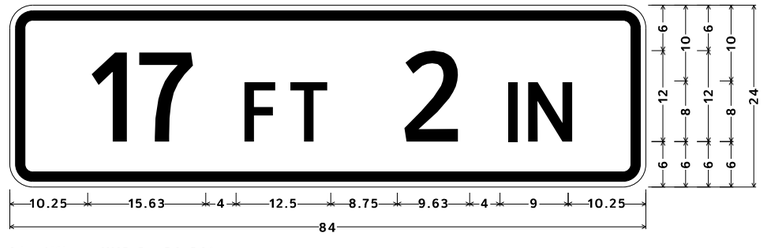
Identifier : W12-2a_84x24◇;
3.00" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[16] E; [FT] E specified length; [8] E; [IN] E specified length;



Identifier : W12-2a_66x12◇;
3.00" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[17] E; [FT] E specified length; [2] E; [IN] E specified length;



Identifier : W12-2a_84x24◇;
3.00" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[17] E; [FT] E specified length; [1] E; [IN] E specified length;



Identifier : W12-2a_84x24◇;
3.00" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[17] E; [FT] E specified length; [2] E; [IN] E specified length;

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Texas Department of Transportation

FM 3438

SIGN DETAILS

SHEET 4 OF 4

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	175

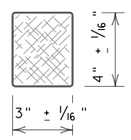
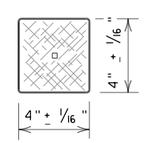
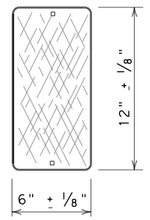
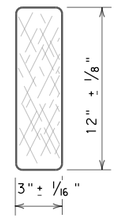
5/26/2021 10:33:46 AM

...\SIGNING\FM3438*DET-SGN-01.dgn

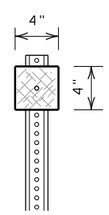
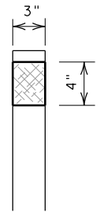
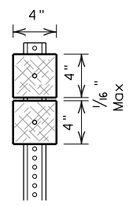
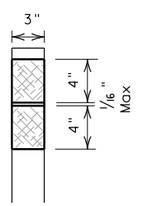
Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\TRAFFIC\SGN*PMARK\SIGNING\FM3438*DET-SGN-01.dgn

DATE: 5/26/2021 10:33:46 AM
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\STANDARDS\DAM1-20.dgn

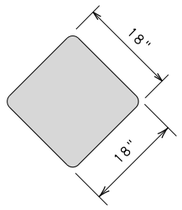
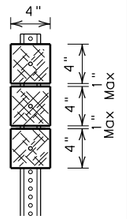
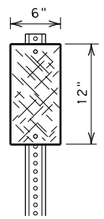
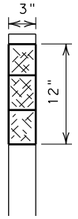
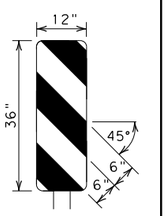
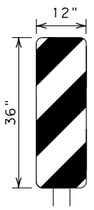
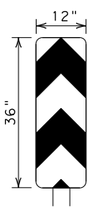
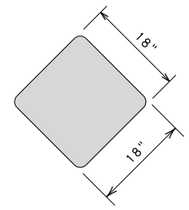
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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

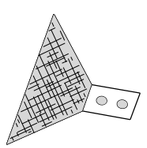
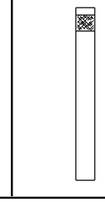
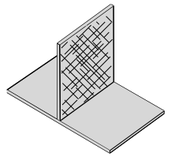
DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

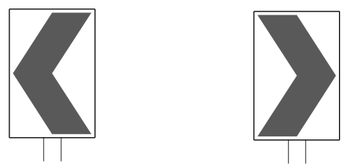
OBJECT MARKERS

	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

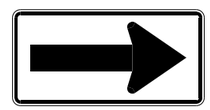
BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
NOTE	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE	 W1-8			
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	
NOTE	1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies). 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).			

ONE DIRECTION LARGE ARROW

DEVICE	 W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

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

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

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©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
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10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ABL	TAYLOR		176

20A

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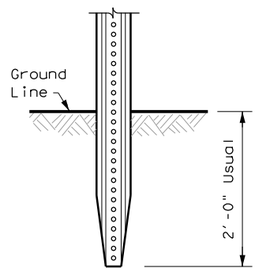
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7\DP5143\FM 3438\CADD\STANDARDS\FM STANDARD SHEETS\dom2-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

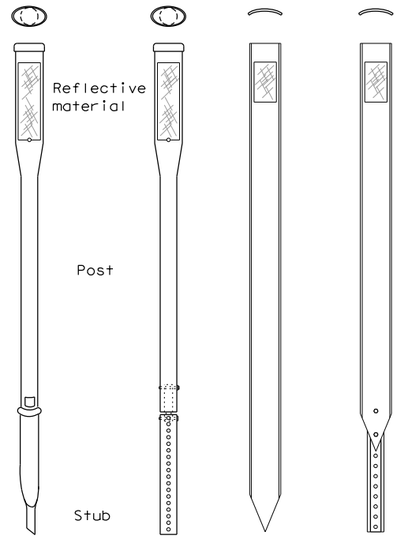


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

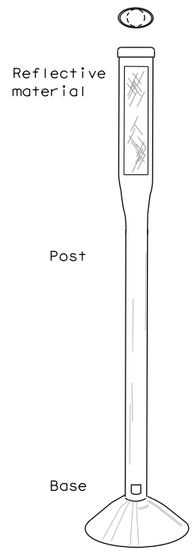
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



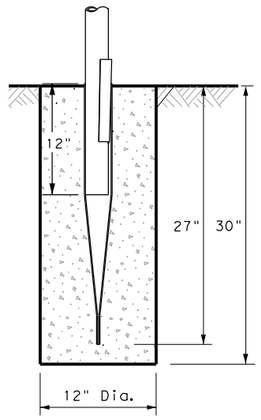
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

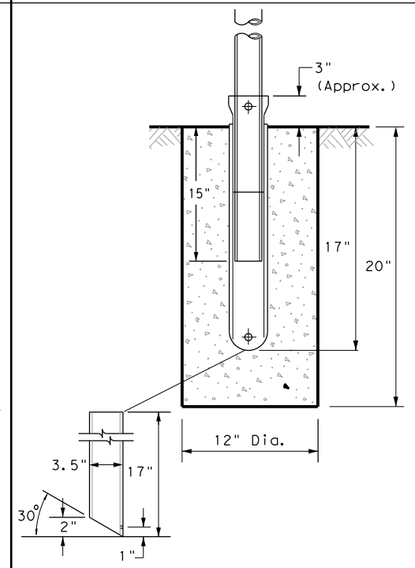
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

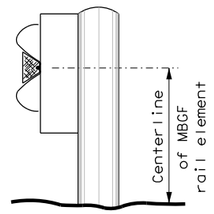
NOTE

1. Install per manufacturer's recommendations.

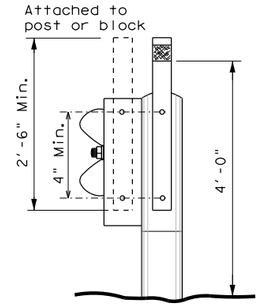
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

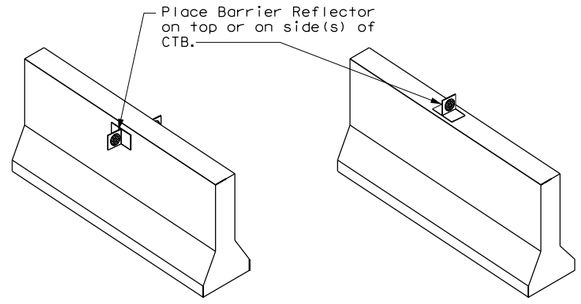
GF1



GF2



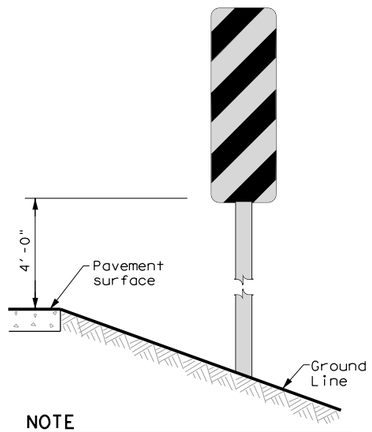
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

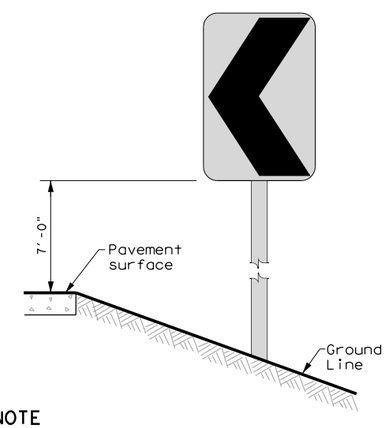
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

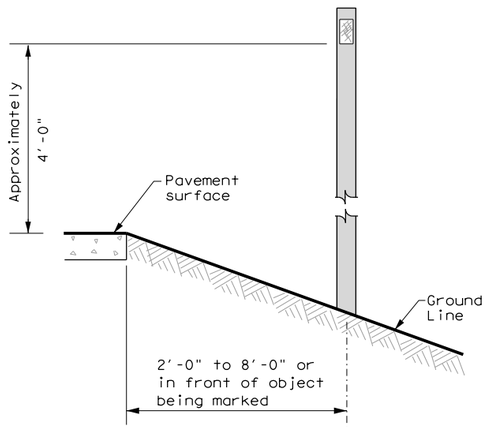
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
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4-10 7-20	ABL	TAYLOR		177

20B

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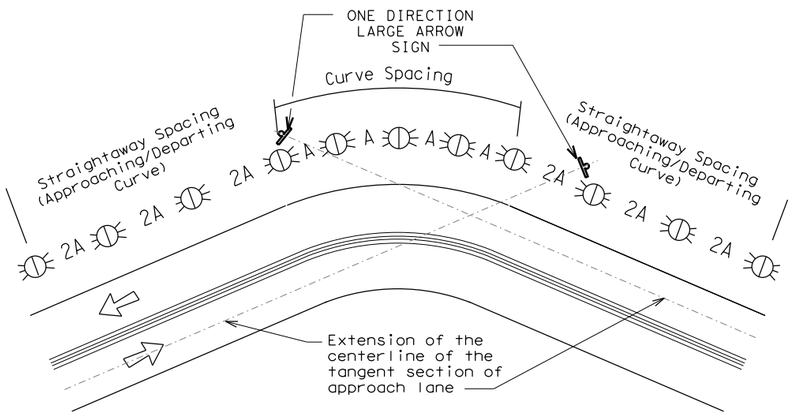
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

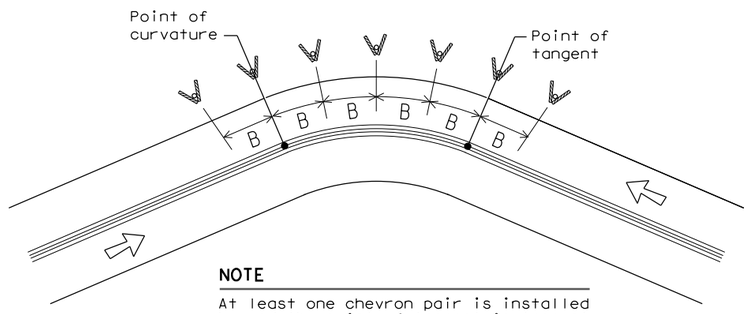
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

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

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

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3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	ABL	TAYLOR		178

DATE: 5/26/2021 10:33:47 AM
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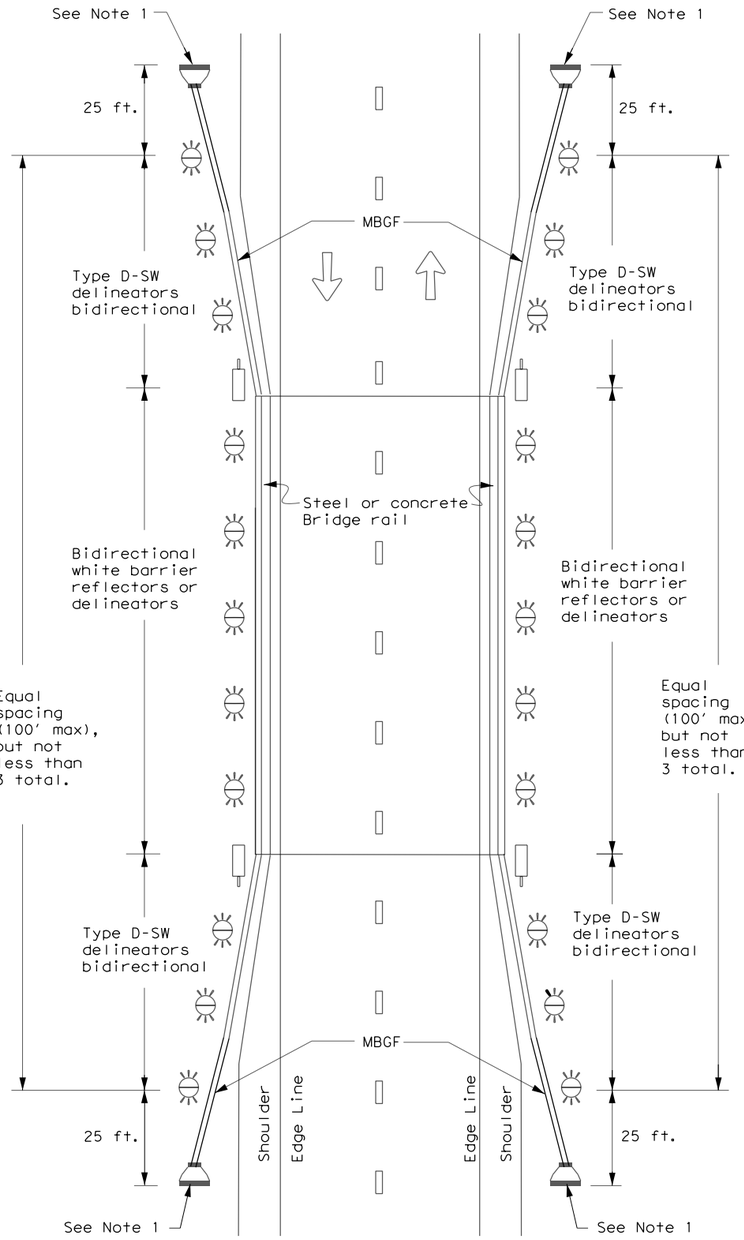
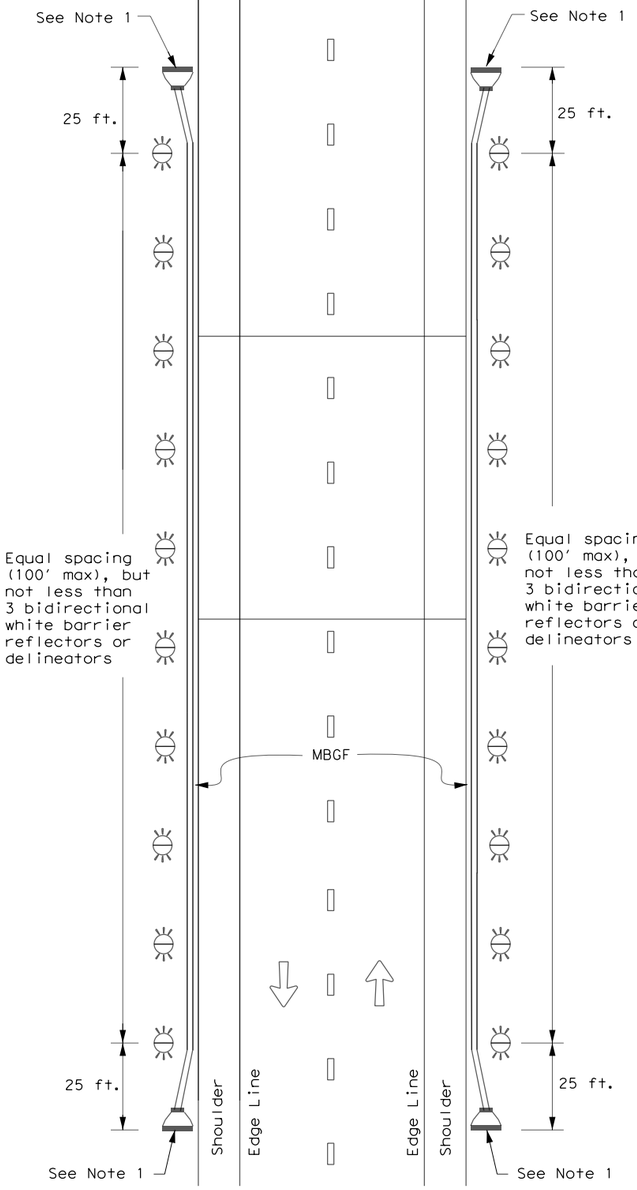
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

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

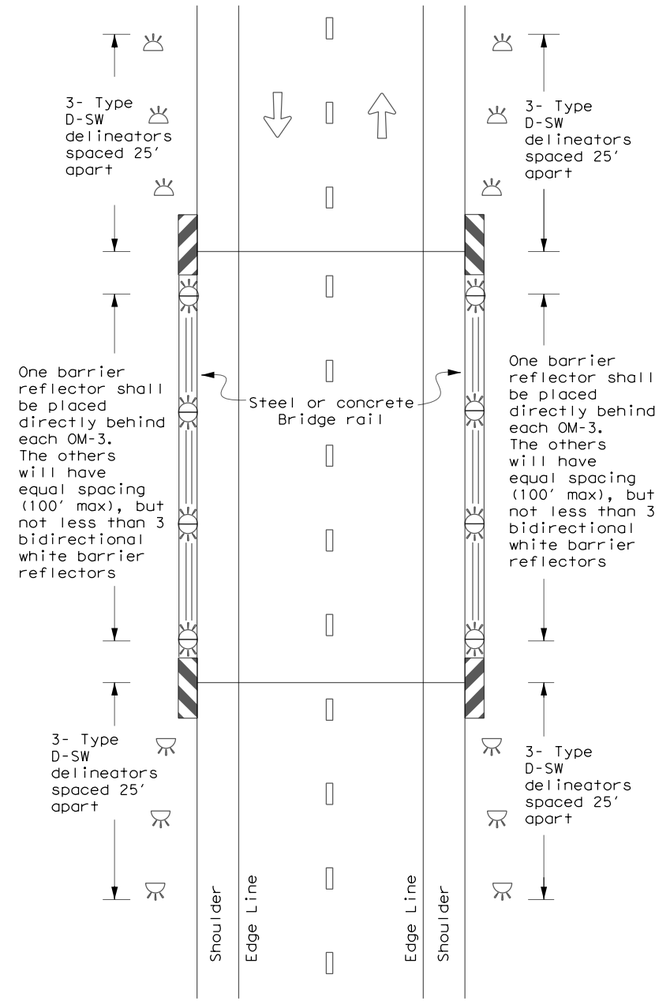
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

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

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

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20E

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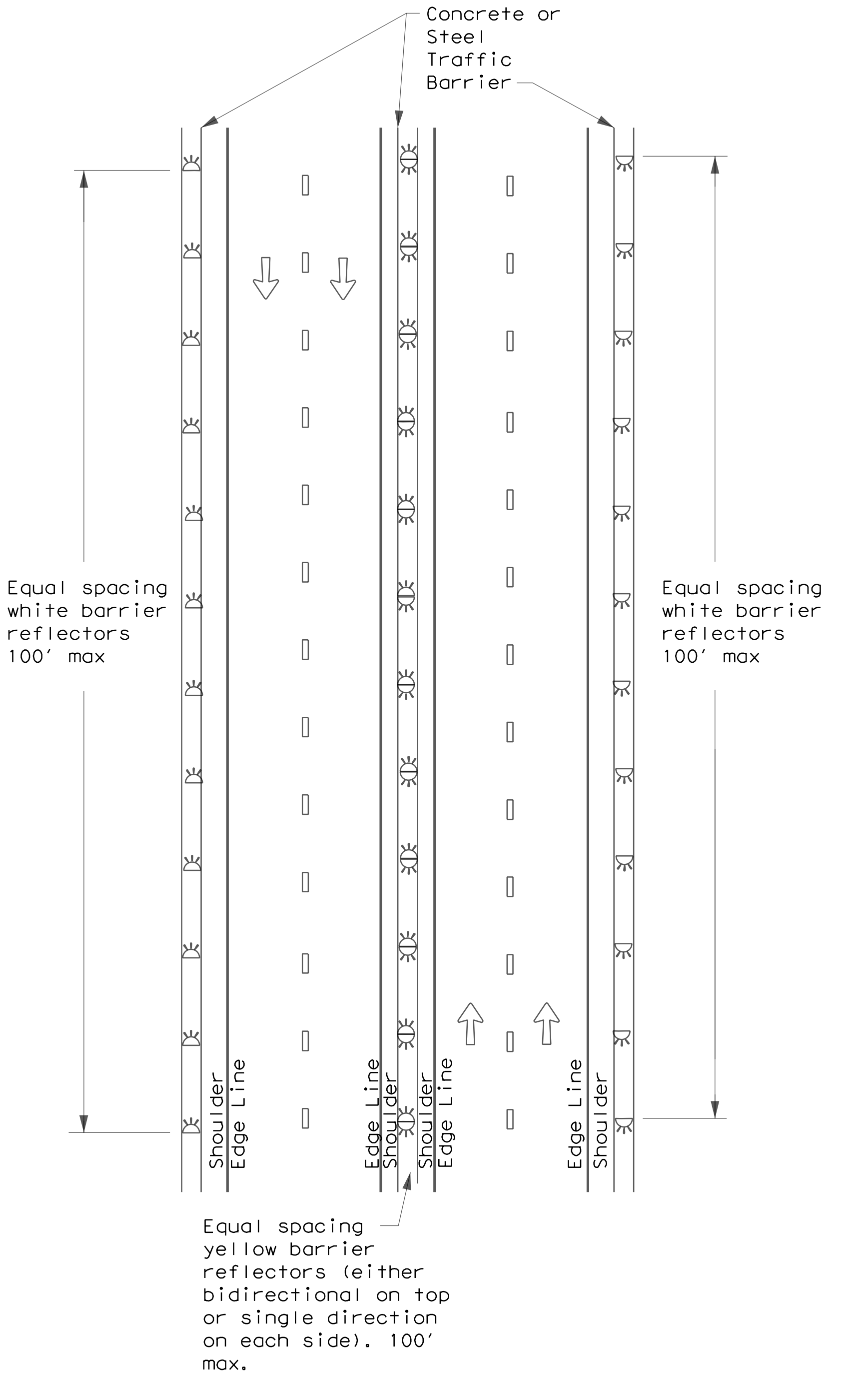
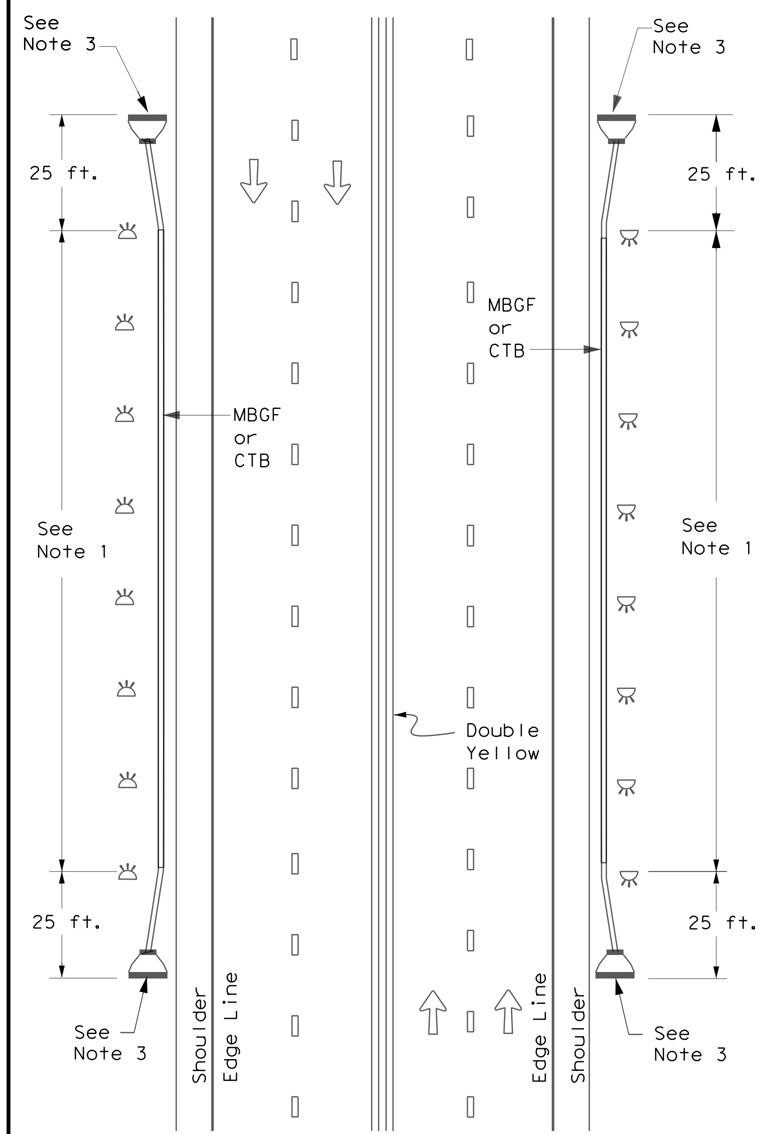
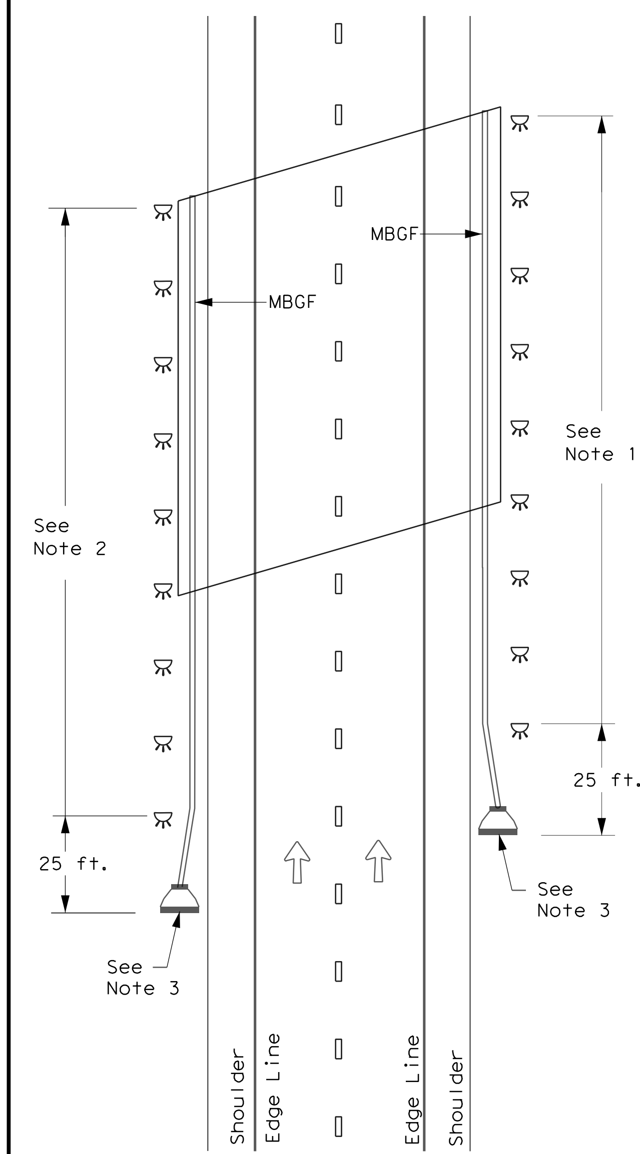
CONTINUOUS CONCRETE OR STEEL BARRIER



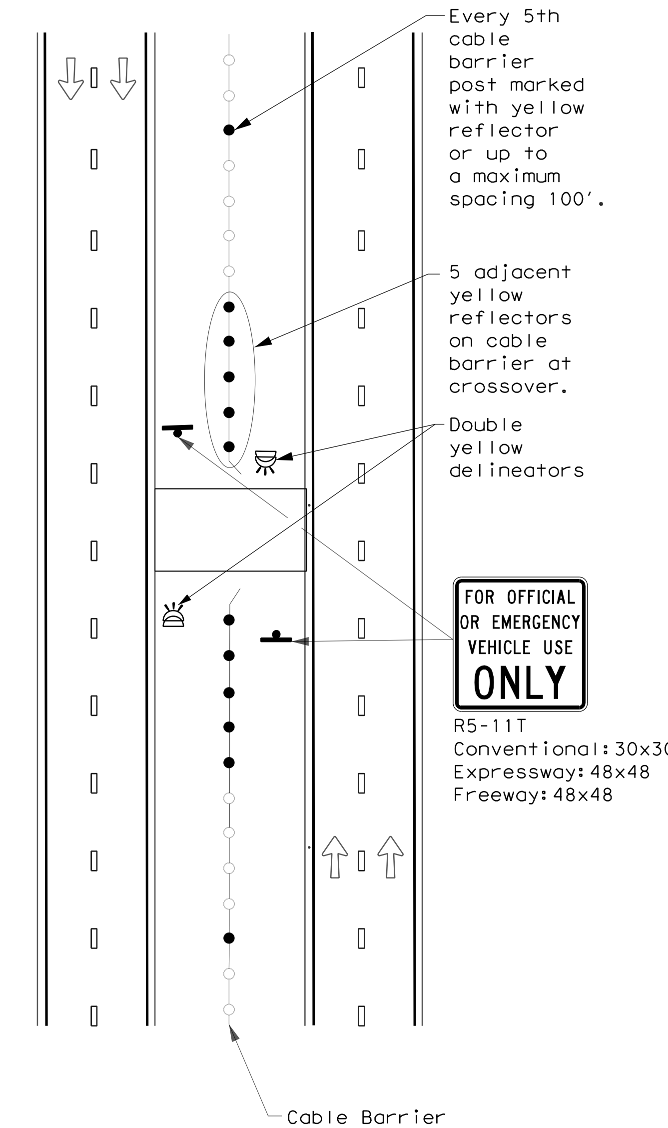
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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)	Bidirectional Delineator
(symbol)	Delineator
(symbol)	OM-3
(symbol)	OM-2
(symbol)	Terminal End
(symbol)	Traffic Flow

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

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© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
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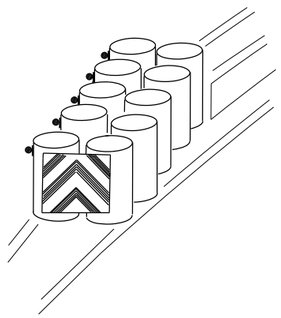
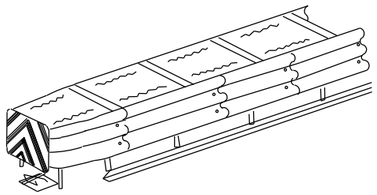
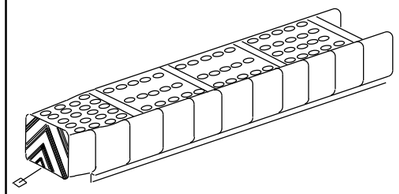
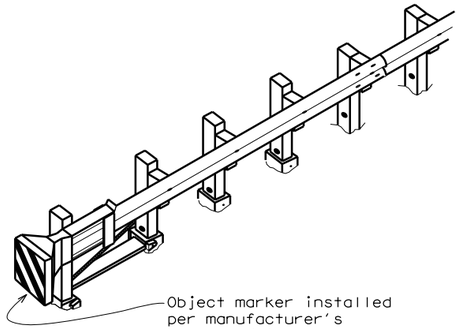
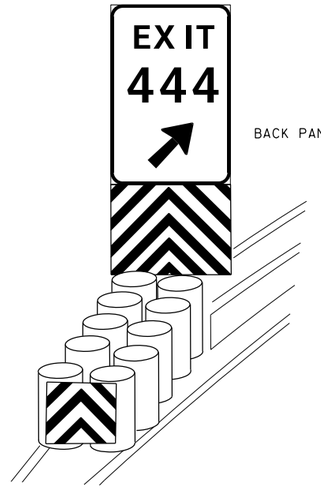
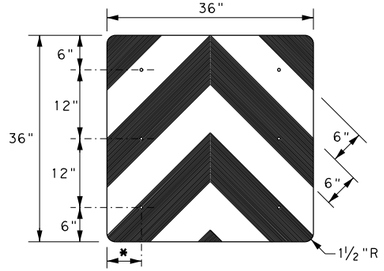


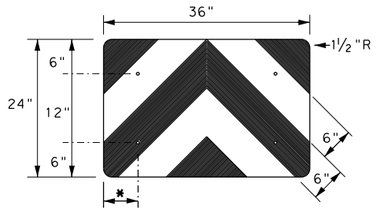




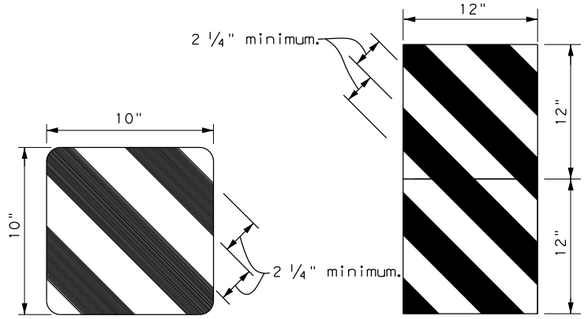




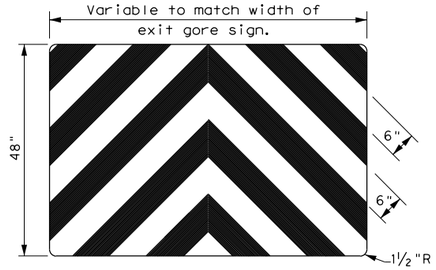


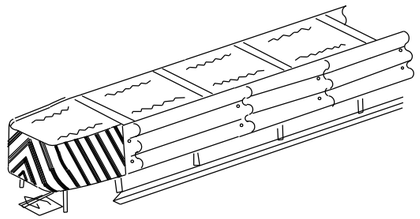


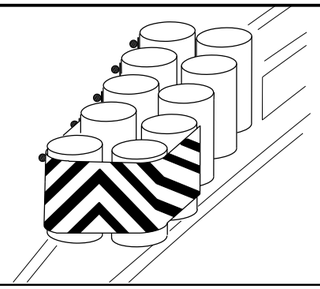
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

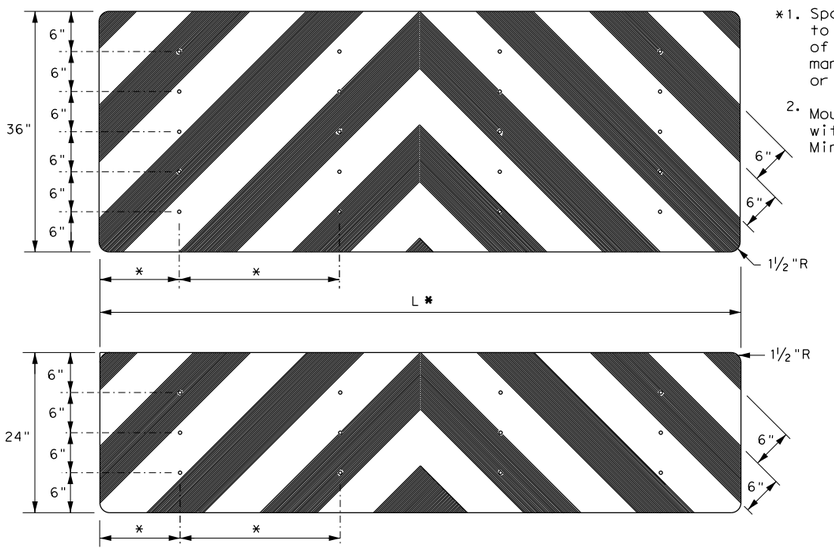


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	ABL	TAYLOR		181
4-98 7-20				
20G				

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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)

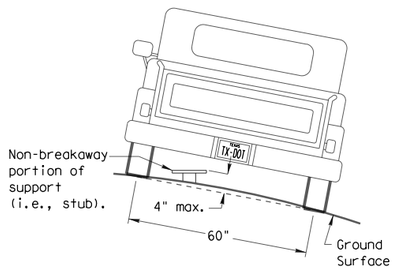
Anchor Type

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-1))

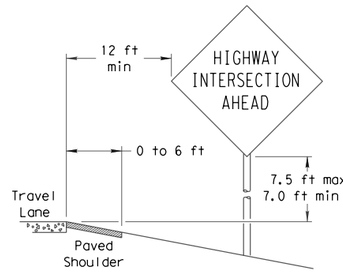
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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

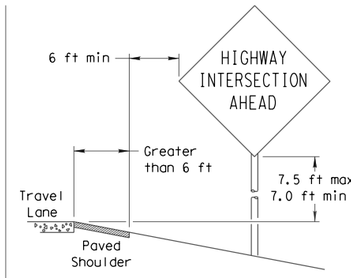
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

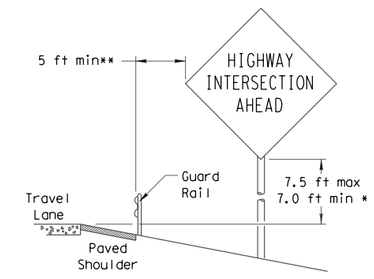
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



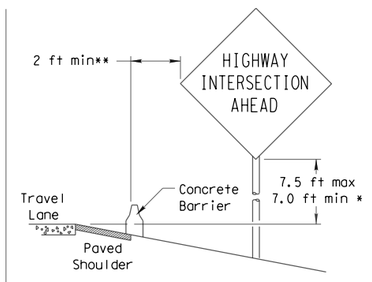
GREATER THAN 6 FT. WIDE

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

BEHIND BARRIER



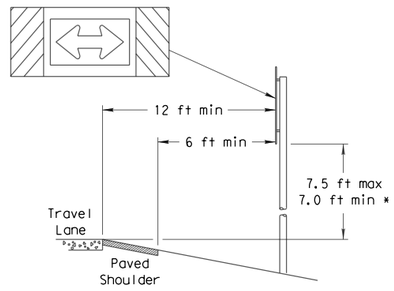
BEHIND GUARDRAIL



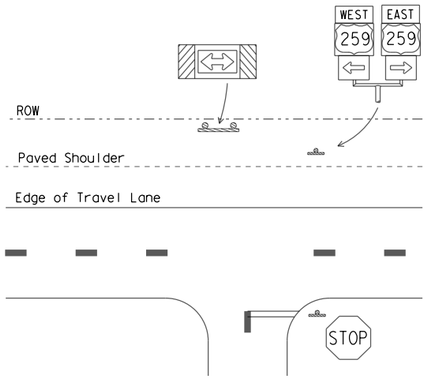
BEHIND CONCRETE BARRIER

**BEHIND GUARDRAIL and BEHIND CONCRETE BARRIER

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

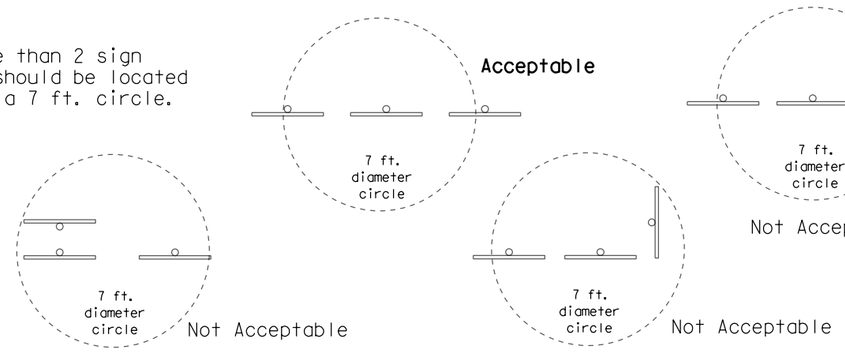
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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.

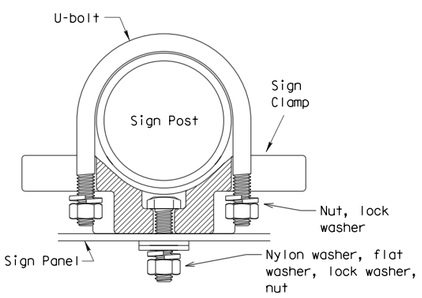
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

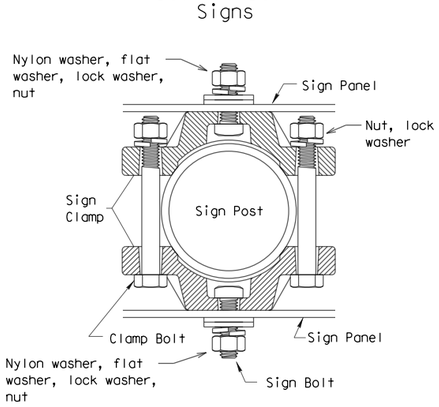


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

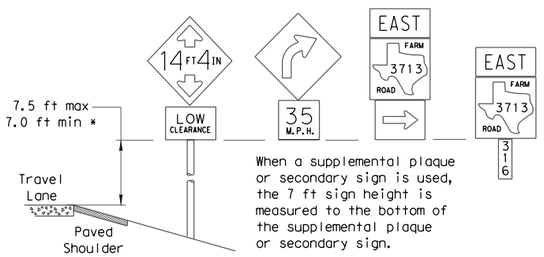
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



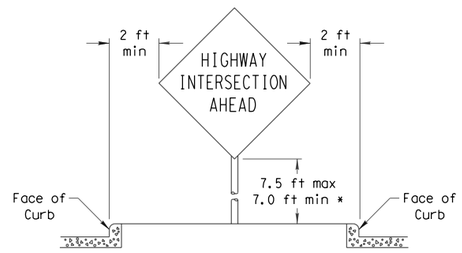
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



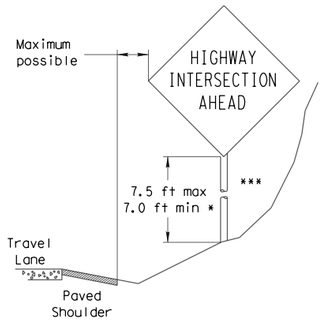
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
2270	01	023	FM 3438

DIST	COUNTY	SHEET NO.
ABL	TAYLOR	182

9-08 REVISIONS

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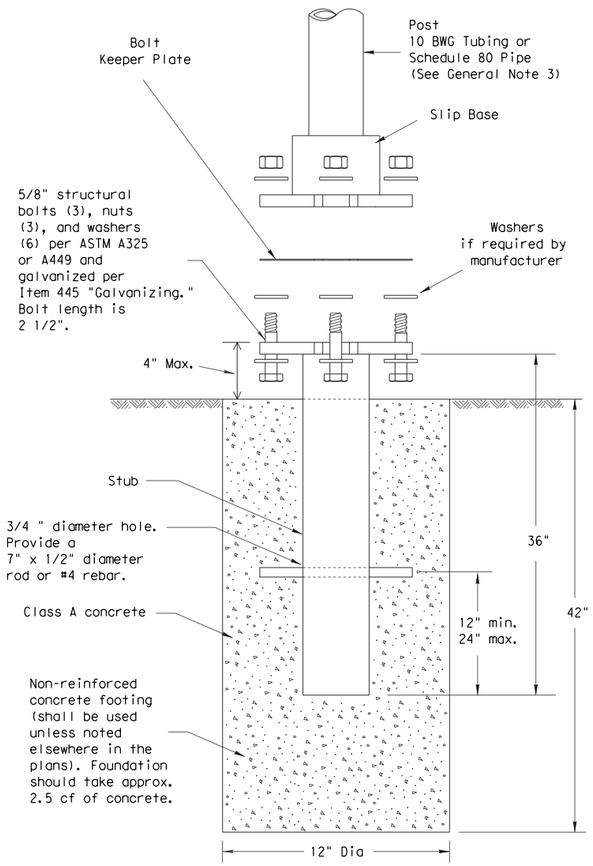
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

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

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

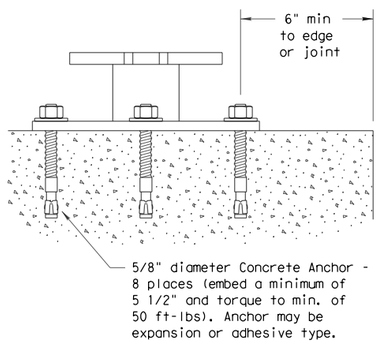
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

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

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

CONCRETE ANCHOR



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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

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2270	01	023	FM 3438

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ABL	TAYLOR	183

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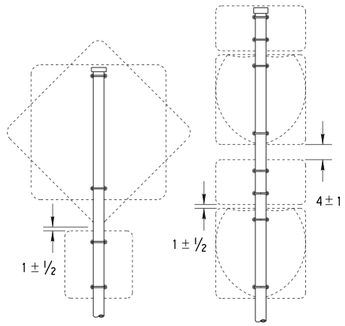

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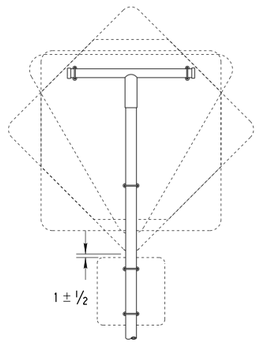

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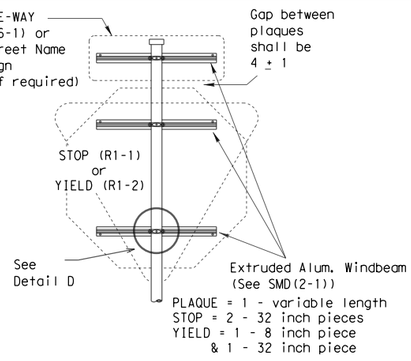

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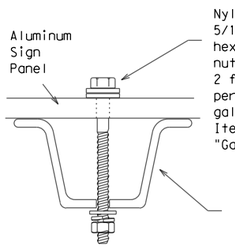
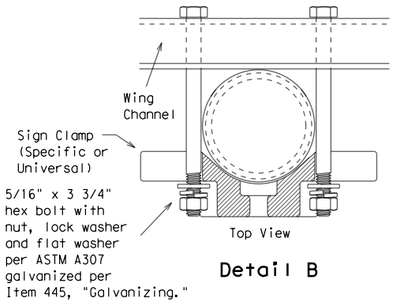


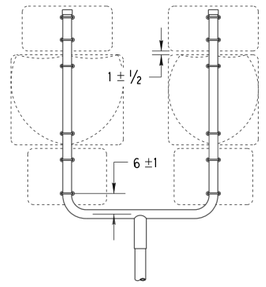
Top View

Detail A



Top View

Detail B



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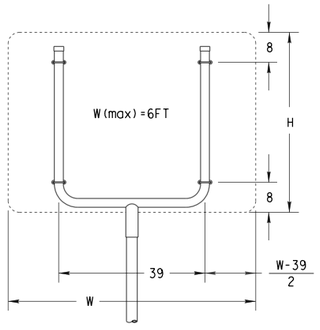

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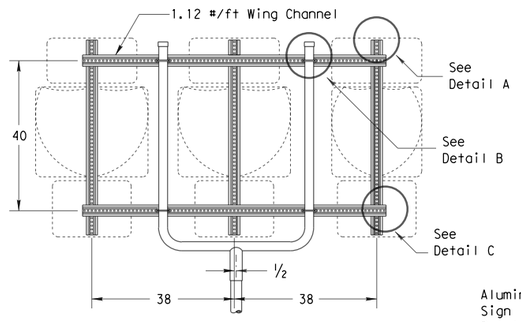

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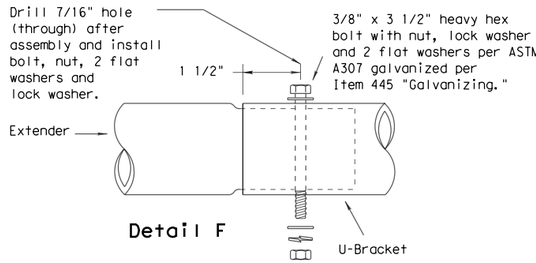
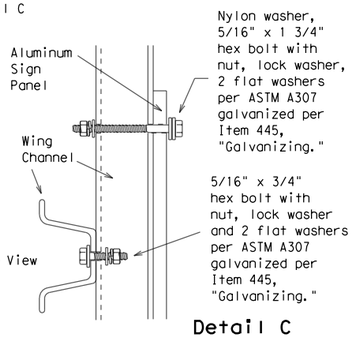
(See Note 11)

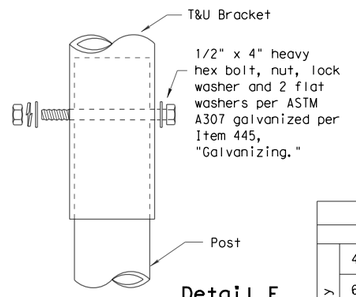


Detail F

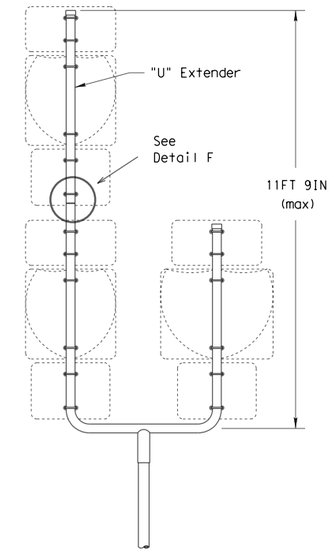
Splices shall only be allowed behind the sign substrate.



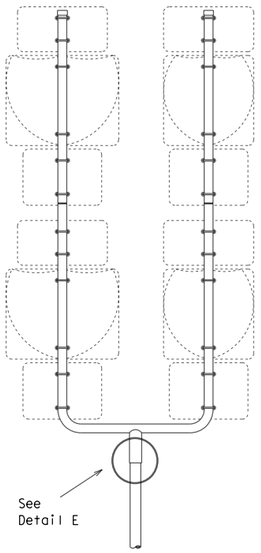
Detail C



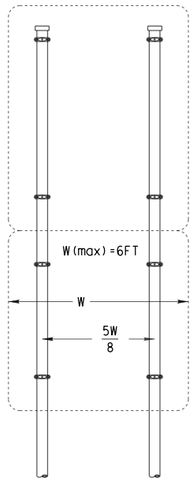
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

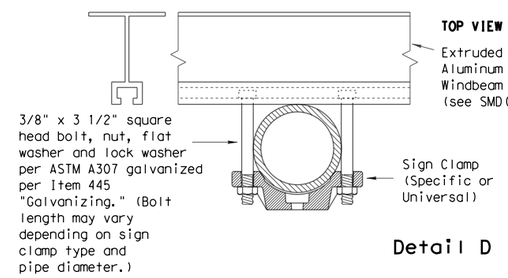


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

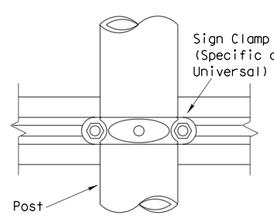


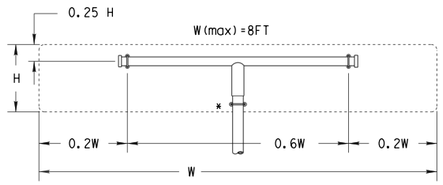
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

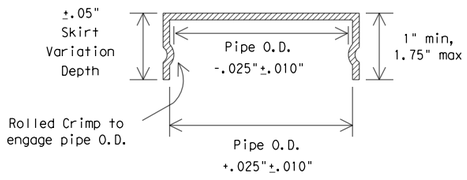




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

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

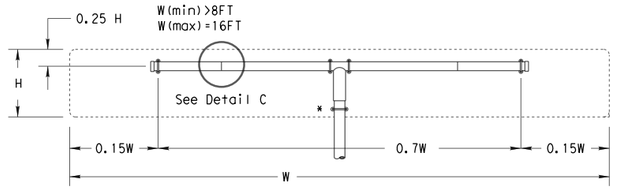
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

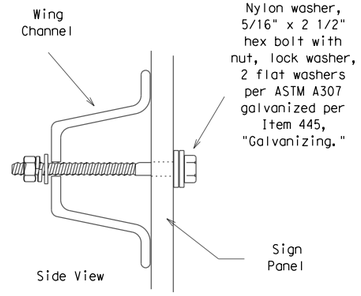
REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		184

26C

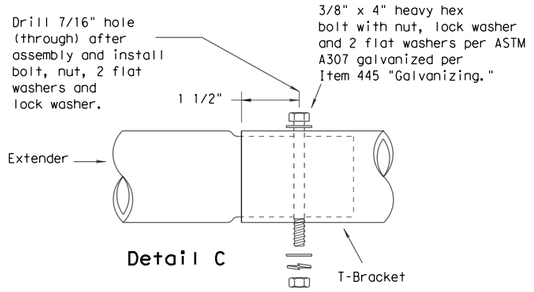
DATE: 5/26/2021 10:33:50 AM
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\STANDARDS\SPM STANDARDS\11 smds3.dgn



SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



Detail B



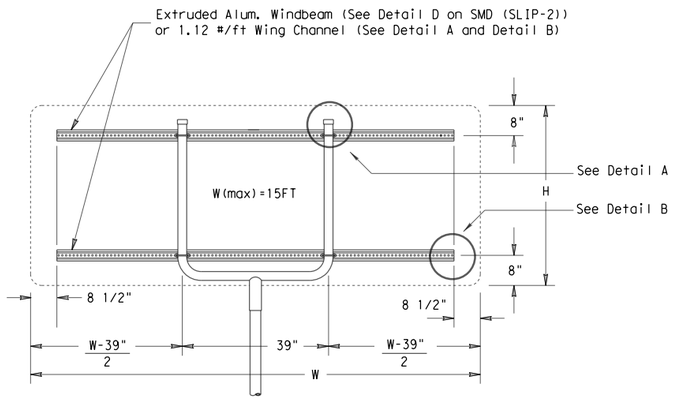
Detail C

Splices shall only be allowed behind the sign substrate.

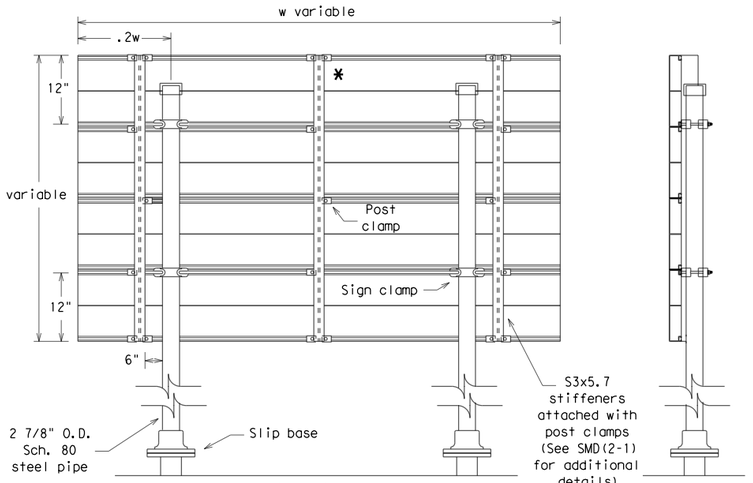
GENERAL NOTES:

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

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



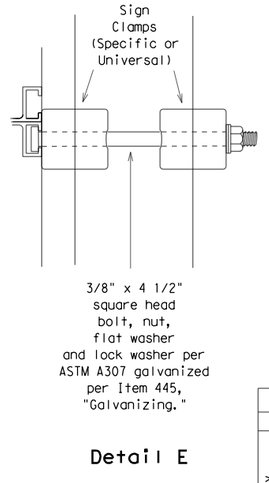
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



Typical Sign Mount

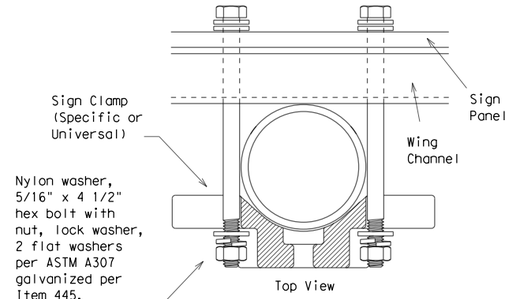
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

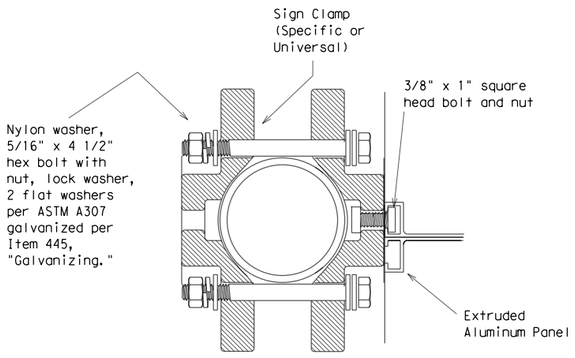


See Detail E
for clamp installation

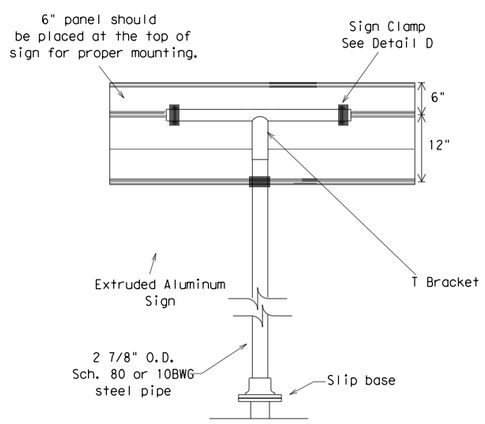
Detail E



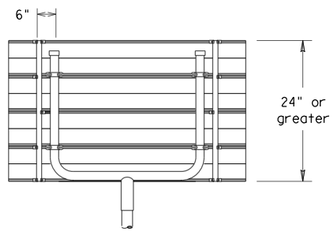
Detail A



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

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

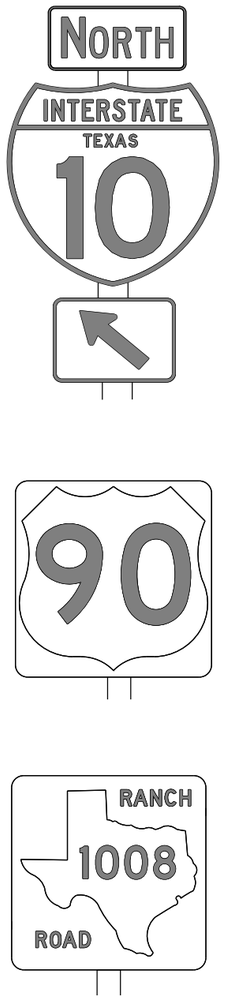
REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
2270	01	023	FM 3438
DIST	COUNTY		SHEET NO.
ABL	TAYLOR		185

DATE: 5/26/2021 10:33:51 AM
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\STANDARDS\SPM STANDARDS\12 tsr3-13.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

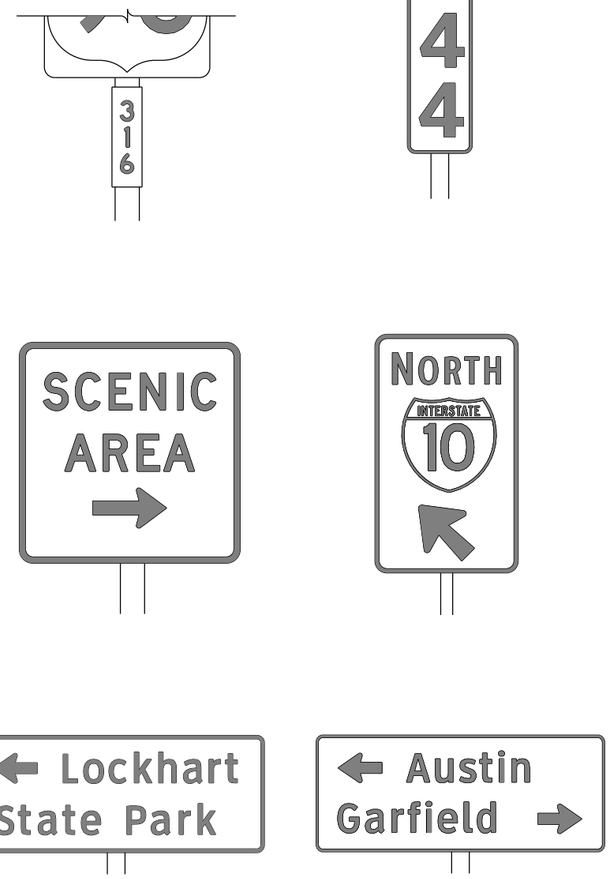
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

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

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



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

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

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	ABL	TAYLOR		186

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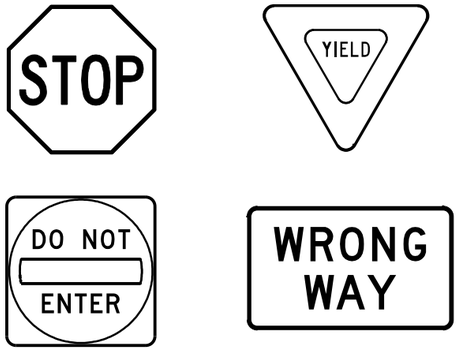
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7\DP5143\FM 3438\CADD\STANDARDS\SPM STANDARDS\13 tsr4-13.dgn

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

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



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

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

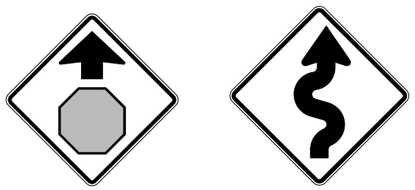
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

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

TYPICAL EXAMPLES

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

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

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

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

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

GENERAL NOTES

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

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

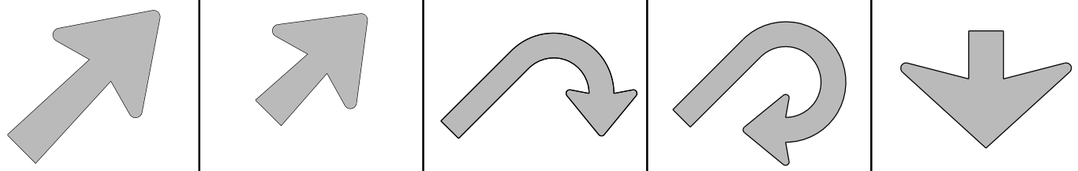
TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	ABL	TAYLOR		187

DATE: 5/26/2021 10:33:51 AM
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7\DP5143\FM 3438\CADD\STANDARDS\SPM STANDARDS\14 tsr5-13.dgn

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



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

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

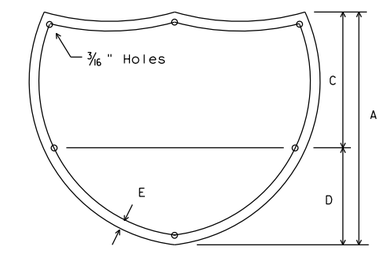
NOTE

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

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

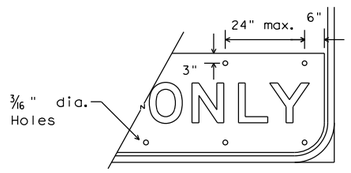
http://www.txdot.gov/

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

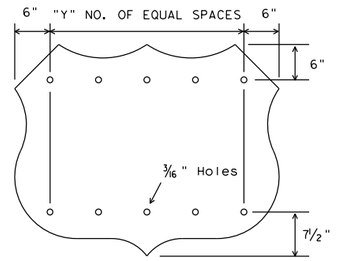


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	11/2
48	28	20	13/4

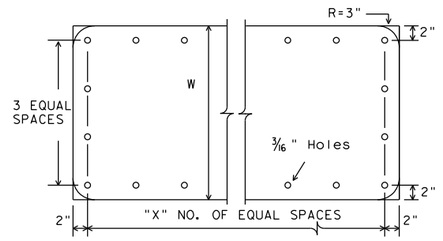


EXIT ONLY PANEL



U.S. ROUTE MARKERS

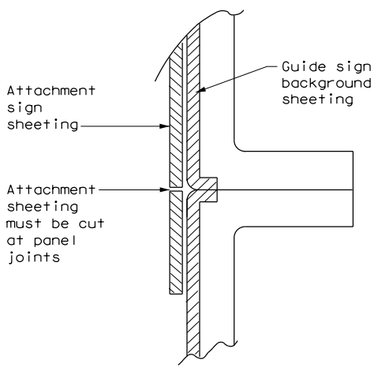
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

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

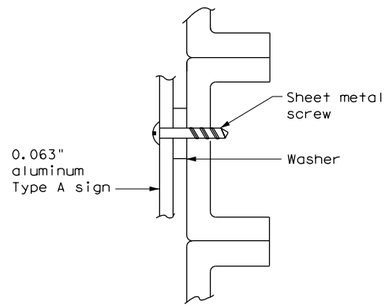
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



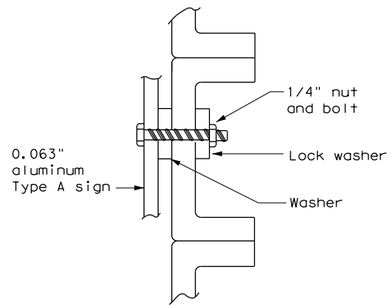
DIRECT APPLIED ATTACHMENT

NOTE:

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



SCREW ATTACHMENT



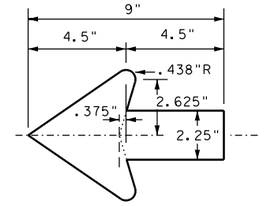
NUT/BOLT ATTACHMENT

NOTE:

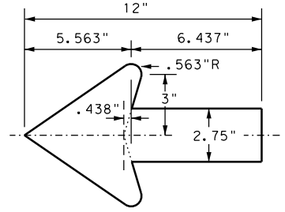
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

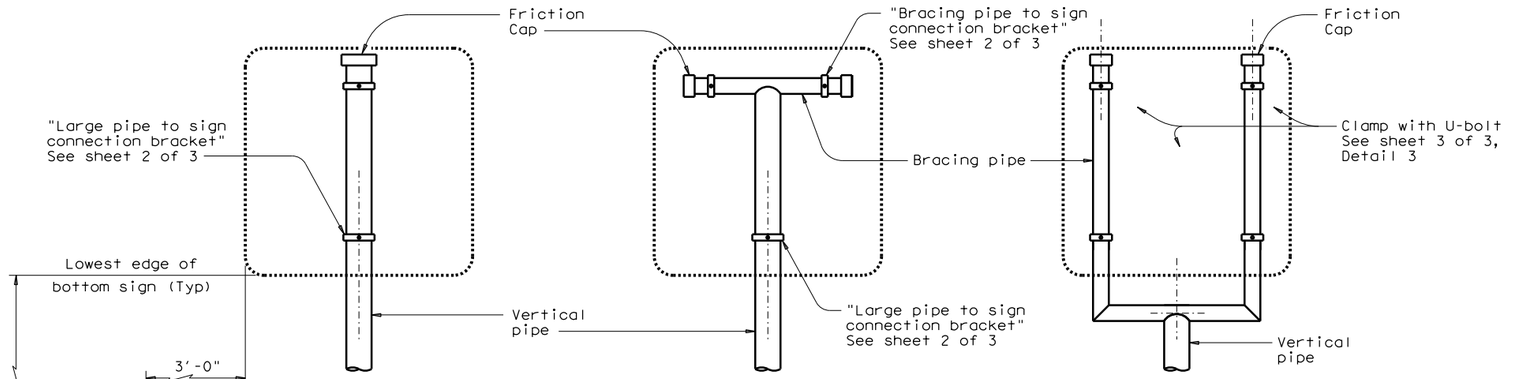
Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

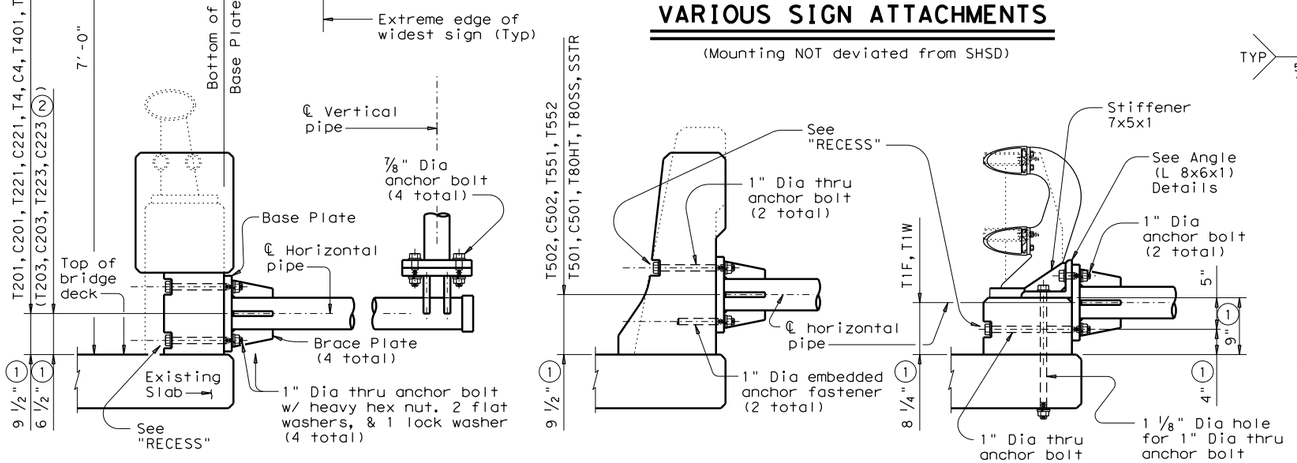
FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	ABL	TAYLOR		188

DATE: 5/26/2021 10:33:52 AM
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-71DP5143\FM 3438\CADD\STANDARDS\FM STANDARDS\smdbr-14.dgn

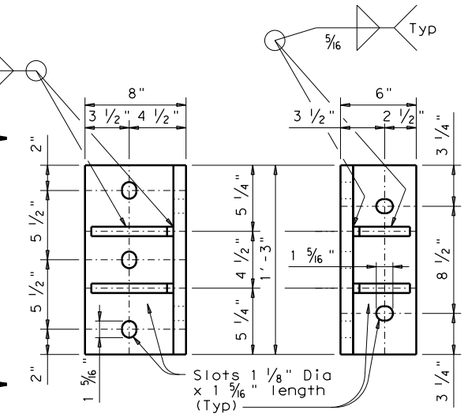


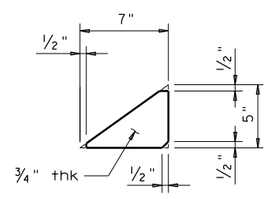
VARIOUS SIGN ATTACHMENTS

(Mounting NOT deviated from SHSD)



LONGITUDINAL SECTION THROUGH RAILING & SIGN MOUNT



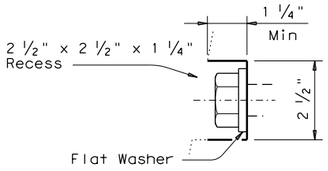


STIFFENER

ANGLE (L 8x6x1) DETAILS

1 Increase 2" for structure with overlay.

2 Attached at ℄ post.



RECESS

PIPE SIZE AND THICKNESS			
Pipe Placement / Design Wind Speed	Horizontal	Vertical	Bracing
90 mph	5" X-Strong (.375")	4" X-Strong (.337")	2 1/2" Standard (.203")
130 mph	6" X-Strong (.432")	5" X-Strong (.375")	3" X-Strong (.300")

GENERAL NOTES:

Design conforms to 2013 AASHTO Standard Specifications for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design 3-second gust wind speeds of 90 mph and 130 mph with a 1.14 gust factor, and a wind importance factor of 1.0 (50-year mean recurrence interval) for the supporting structures. For mounting connection between sign panel and pipe, wind importance factors of 0.71 and 0.54, for 90 mph and 130 mph winds, respectively, are applied to adjust the wind speeds to a 10-year mean recurrence interval.

See standard sheet WV & IZ(LTS2013) for the boundaries of each design wind zone. All mounting shall be based on 130 mph wind speed design except when located in 90 mph wind zone. Maximum panel area is 30 sq. ft. Maximum design height is 50 ft, with design height defined as the distance between natural ground (average elevation of surrounding terrain) and the center of sign(s) at the mounting location.

Material for pipe shall be ASTM A53 Grade B, or A501. Structural steel plates shall be ASTM A36, A572 Grade 50, or A588. Bolts used to connect pipe and mounting bracket, and wind beam to sign panel shall be ASTM A307. Anchor bolts shall be ASTM A325 or A193 B7. Each anchor bolt shall be provided with 2 flat washers, 1 lock washer, and 1 heavy hex nut. All parts shall be galvanized in accordance with Standard Specifications Item 445, "Galvanizing".

Attach horizontal pipe at least 2'-0" from the edge of any nearby drain slot.

Contractor shall verify applicable field dimensions before fabrication. Holes drilled through the railing parapet wall shall be drilled with rotary (coring or masonry drill) type equipment. Percussion (star) drilling shall not be allowed. Anchorage for pipe attached to rail shall be placed using an anchoring system approved by the engineer. Installation of anchor fasteners including hole depth, diameter and material shall be in accordance with the manufacturers' recommendation.

Each embedded anchor fastener shall resist an allowable design loading (after applying the reduction factors of bolt spacing and bolt edge distance) of:

	130 mph	90 mph
Tension	12.5 kips	7.5 kips
Shear	9.0 kips	5.0 kips

Each anchoring system shall provide a capacity to resist the required tension and shear acting simultaneously.

For sign connection to mounting, shop drill holes on sign blank in accordance with the current Standard Highway Sign Designs for Texas (SHSD). Additional hole(s) needed to meet a stipulated-type mounting may be field drilled. For multi-sign or back-to-back signs mounting, the engineer shall determine the proper type which ensures each individual mounting meets requirements.

Refer to Standard sheets SMD(GEN), SMD(SLIP-2 and SMD(2-1) for details not covered here.

Texas Department of Transportation

Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

SMD(BR-1)-14

FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		189

DATE: 5/26/2021 10:33:52 AM
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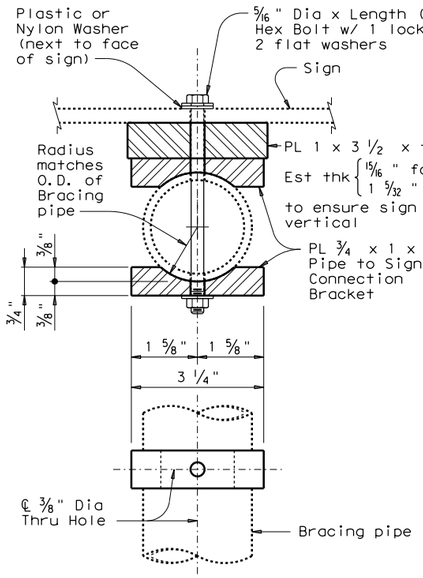
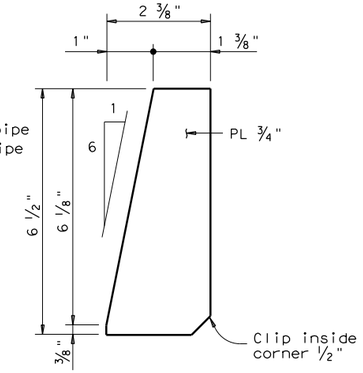
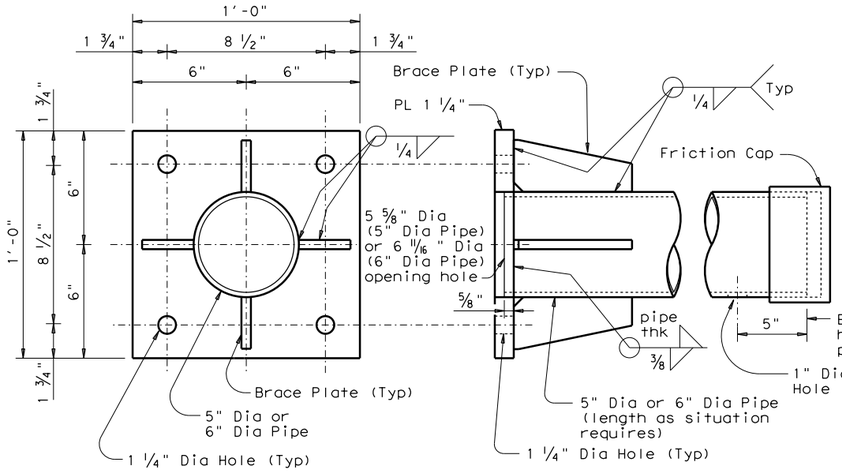


BRACING PIPE TO SIGN CONNECTION BRACKET DETAILS

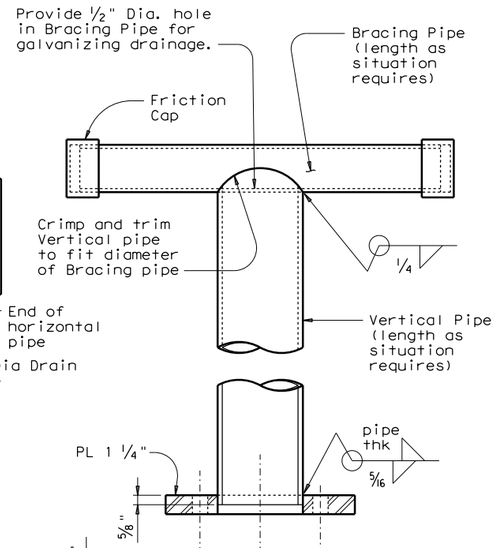
(Showing T Mounting)



BRACE PLATE DETAILS

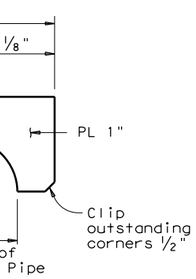


BASE PLATE DETAILS

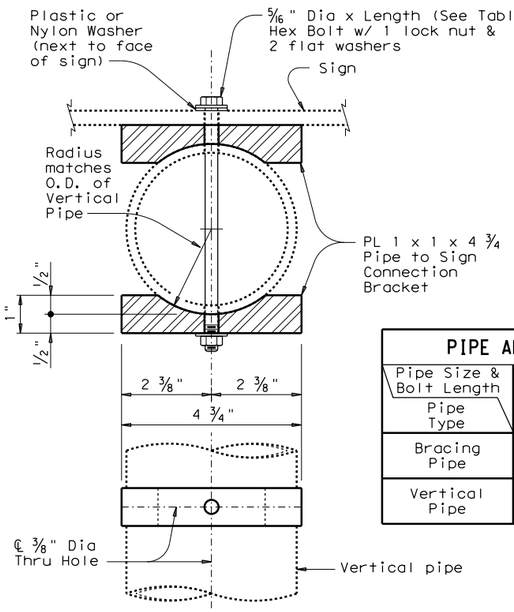


SIGN POLE & POLE BASE PLATE DETAILS

(Showing only T Mounting)



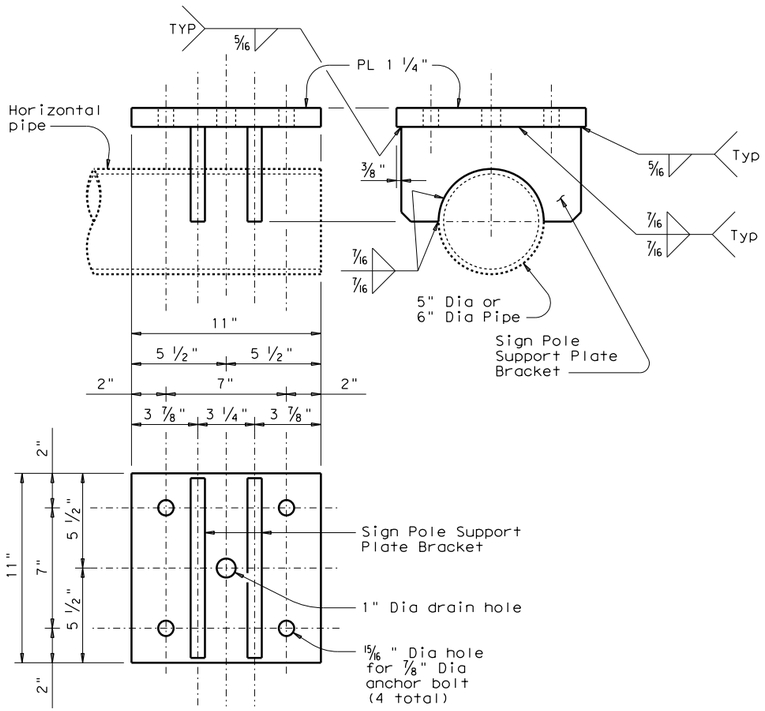
SIGN POLE SUPPORT PLATE BRACKET DETAILS



LARGE PIPE TO SIGN CONNECTION BRACKET DETAILS

(Showing P or T Mounting)

PIPE AND BOLT SPECIFICATIONS		
Pipe Size & Bolt Length / Pipe Type	Nominal Pipe Dia (in.)	Bolt Length (in.)
Bracing Pipe	2 1/2	6
	3	7
Vertical Pipe	4	7
	5	8



SIGN POLE SUPPORT PLATE DETAILS

Texas Department of Transportation

Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

SMD(BR-2)-14

FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		190

26H

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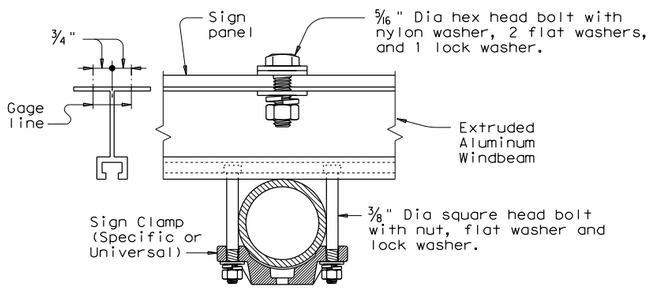
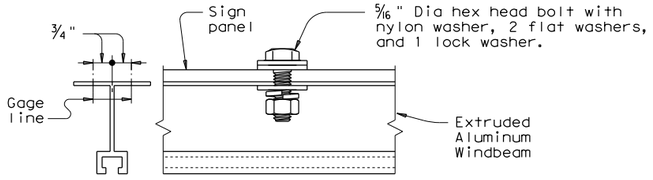
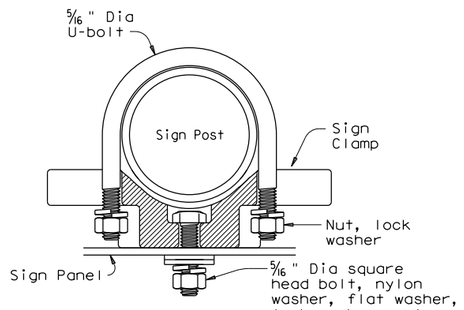


DETAIL 1



DETAIL 2

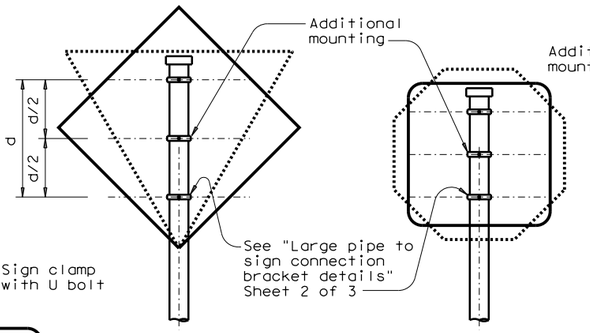


DETAIL 3

SIGN SHAPE	SQUARE			HORIZONTAL RECTANGLE			VERTICAL RECTANGLE			DIAMOND			OCTAGON			EQUILATERAL TRIANGLE			INTERSTATE SHIELD	PENTAGON (SCHOOL)	
Type of Sign Mounting on SHSD / Design Wind Speed	P	T	U	P	T	U	P	T	U	P	T	U	P	T	U	P	T	U	P	P	T
90 mph					(Type 23) 60"x48"	(Type 3) 72"x36" 78"x36" (Type 23) 72"x30" 84"x24"		(Type 2) 36"x48" (Type 32) 36"x60" 36"x72" 42"x60" 48"x54" 48"x60" 48"x72" (Type 3) 48"x84"			(Type 3) 60"x60"									(Type Special) 45"x36"		
130 mph	(Type 1) 30"x30" 36"x36"	(Type 3) 48"x48"		(Type 1) 36"x24" 36"x30"	(Type 23) 48"x42" 54"x42" 60"x30" 66"x36" 84"x24" (Type 3) 60"x48"	(Type 3) 72"x36" 78"x36" (Type 23) 72"x30" 84"x24"	(Type 1) 30"x36" 30"x42"	(Type 3) 36"x48" 36"x60" 36"x72" 42"x60" 48"x54" 48"x60" (Type 4) 48"x72" 48"x84"	(Type 3) 48"x60"	(Type 1) 36"x36"	(Type 3) 48"x48" 60"x60"					(Type 1) 48"x48"			(Type Special) 36"x36" 45"x36"		

Notes:
1. Drill holes in addition to the hole pattern of the Standard Highway Sign Designs for Texas (SHSD) at specified locations to meet a stipulated-type mounting indicated in the parenthesis ( ).
2. "Blank" in the above table indicates all other signs excluded from stipulated mounting shall be mounted in accordance with SHSD.

(1) In lieu of welding, the Fabricator may bend bracing pipe elbows if the following conditions are met:
a. Spacing between vertical bracing pipes is equal to or greater than 2'-6".
b. Bending radius is 12".
c. The distance between the lowest clamp and centerline of horizontal bent pipe is 13" max.



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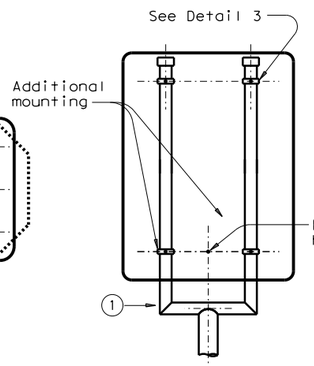

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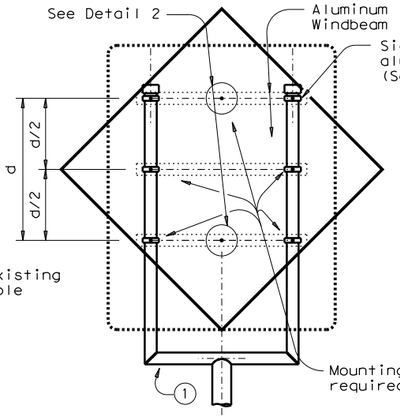

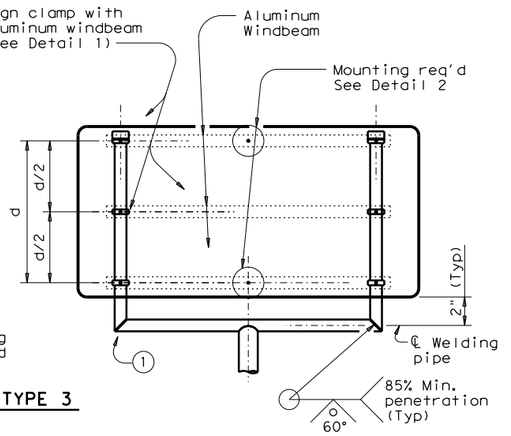

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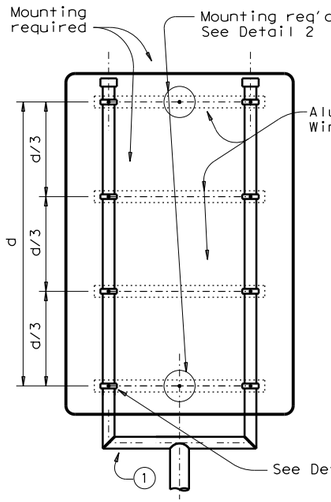

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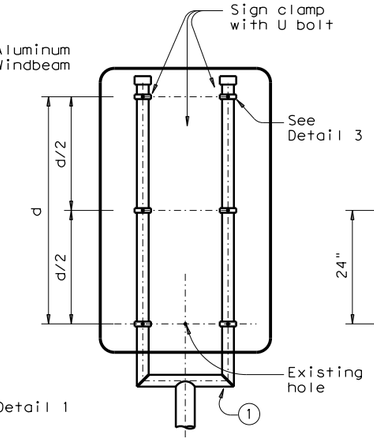

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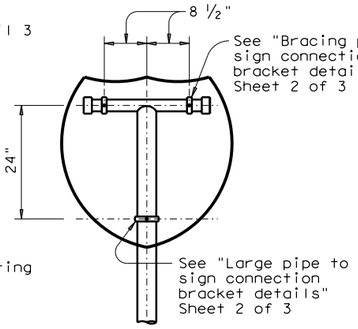

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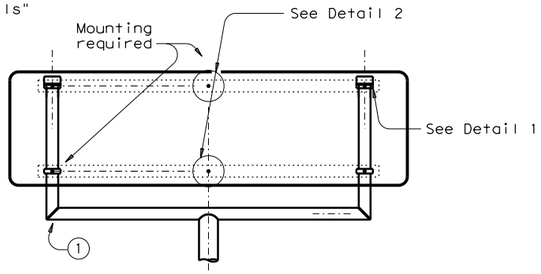


TYPE 23

SHEET 3 OF 3

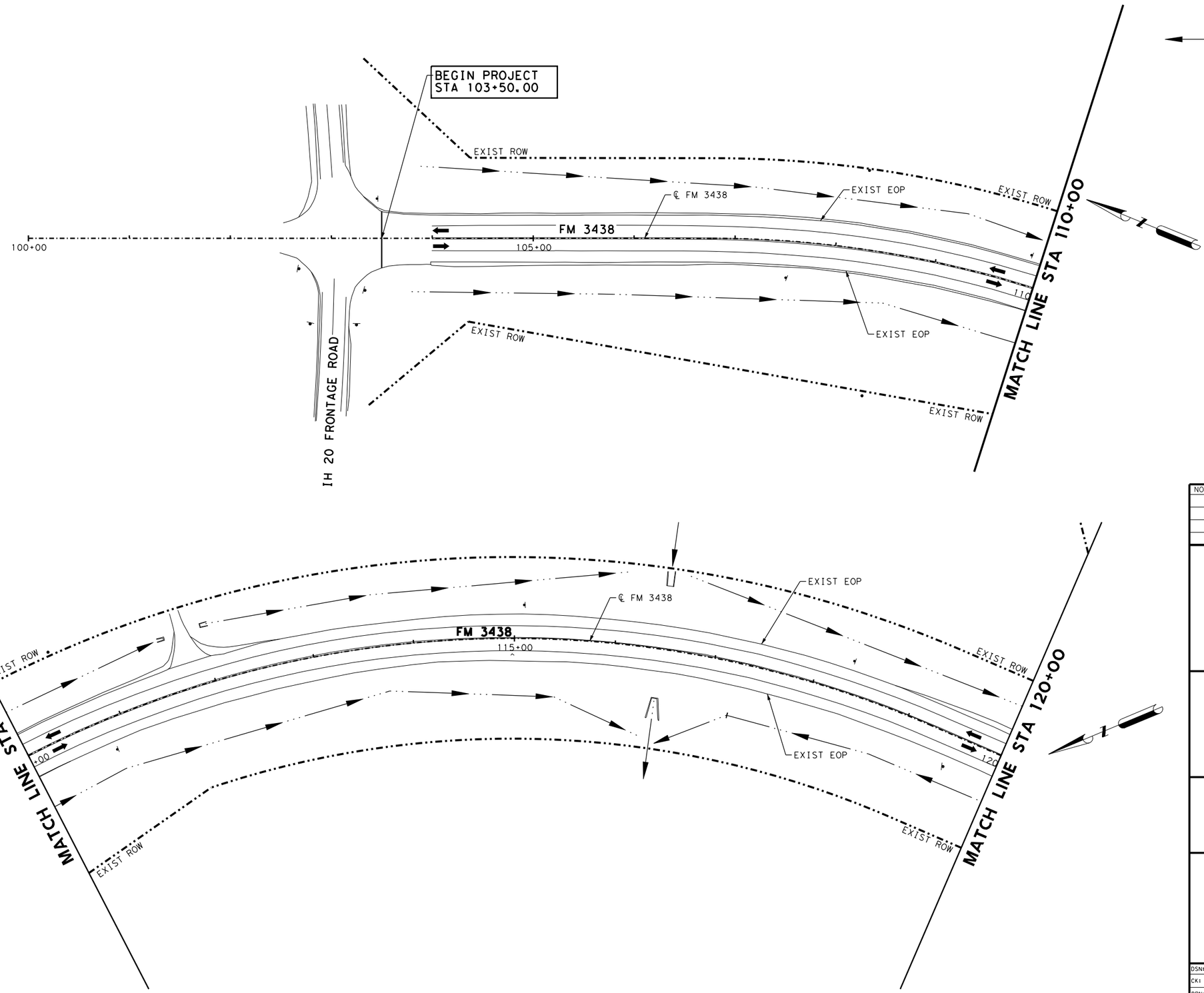
Texas Department of Transportation | Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

SMD(BR-3)-14

FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		191

26J



LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED
PROFESSIONAL ENGINEER

5/26/2021

IDCUS
PLANNERS + ENGINEERS + MANAGERS
IDCUS, Inc.
8632 Fredericksburg Rd., Suite 200
San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

SW3P LAYOUT

BEGIN PROJECT TO STA 120+00

SHEET 1 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	192

5/26/2021 10:34:04 AM

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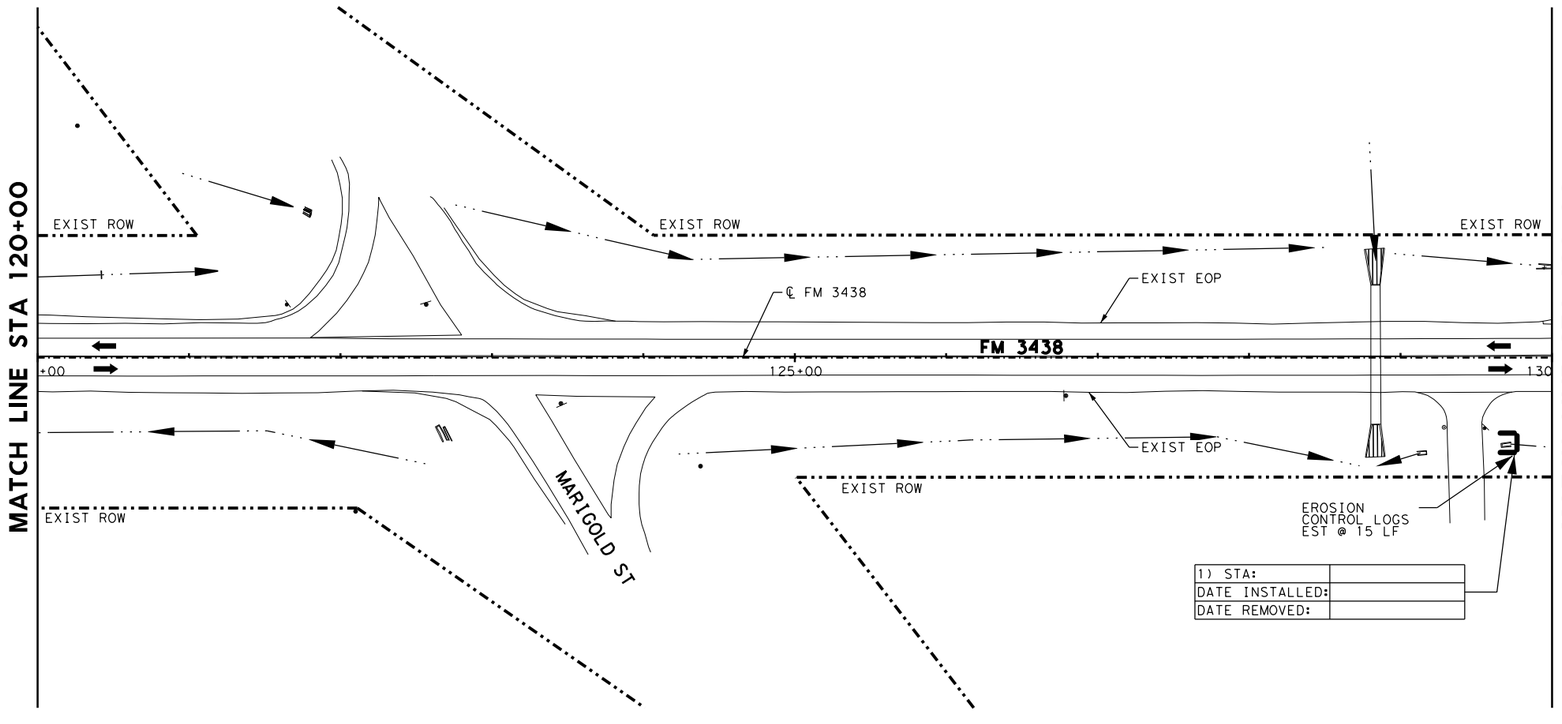

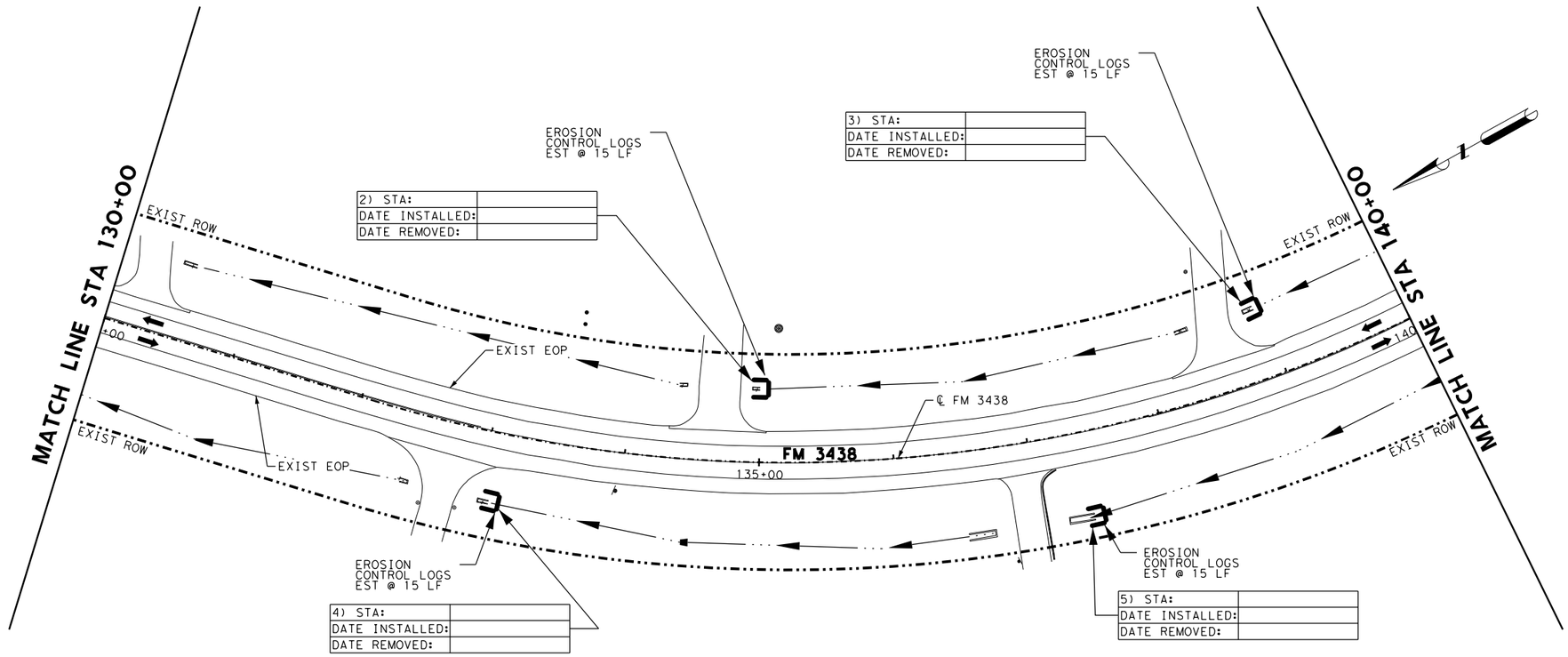

LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

5/26/2021

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IDCUS, Inc.
8632 Fredericksburg Rd., Suite 200
San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
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Texas Department of Transportation

FM 3438

SW3P LAYOUT

STA 120+00 TO STA 140+00

SHEET 2 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	193

5/26/2021 10:34:14 AM

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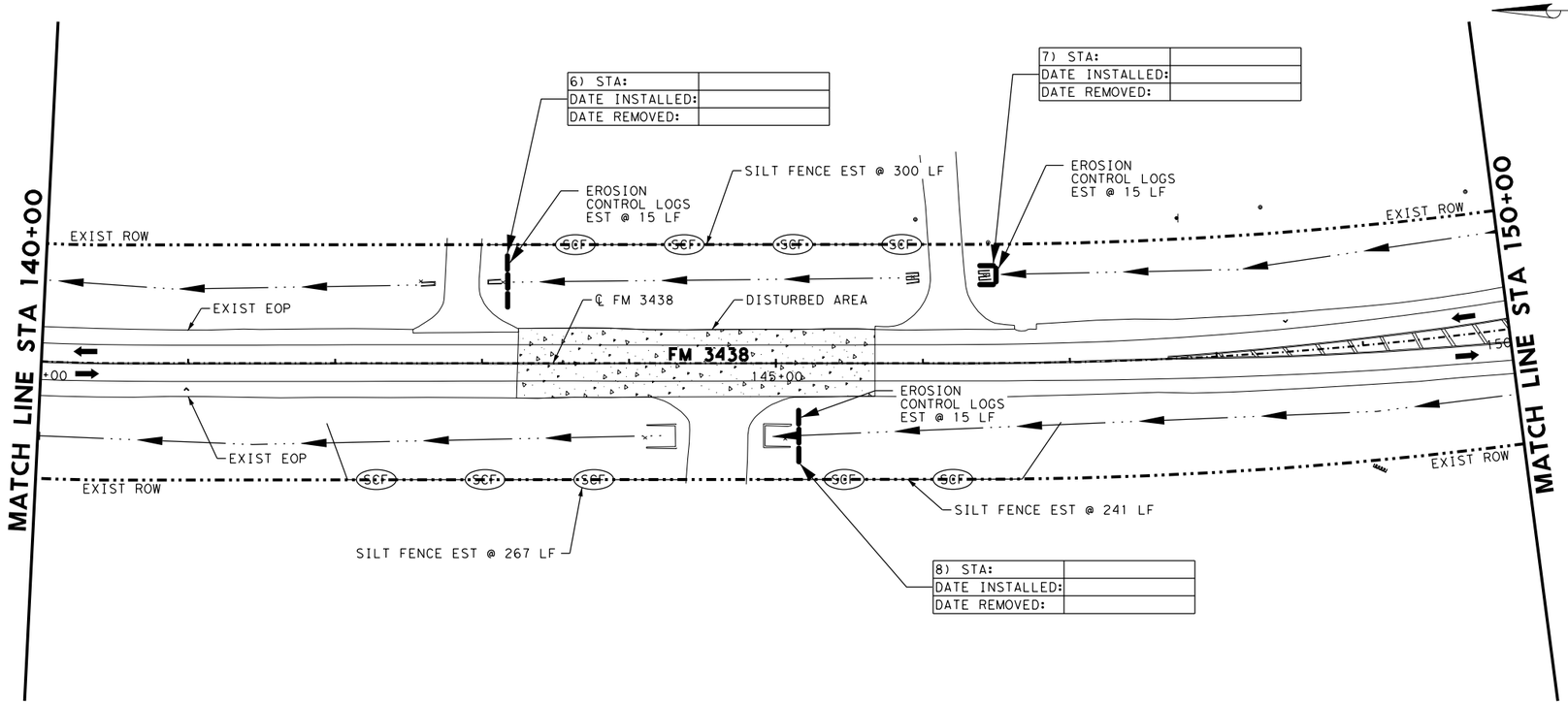

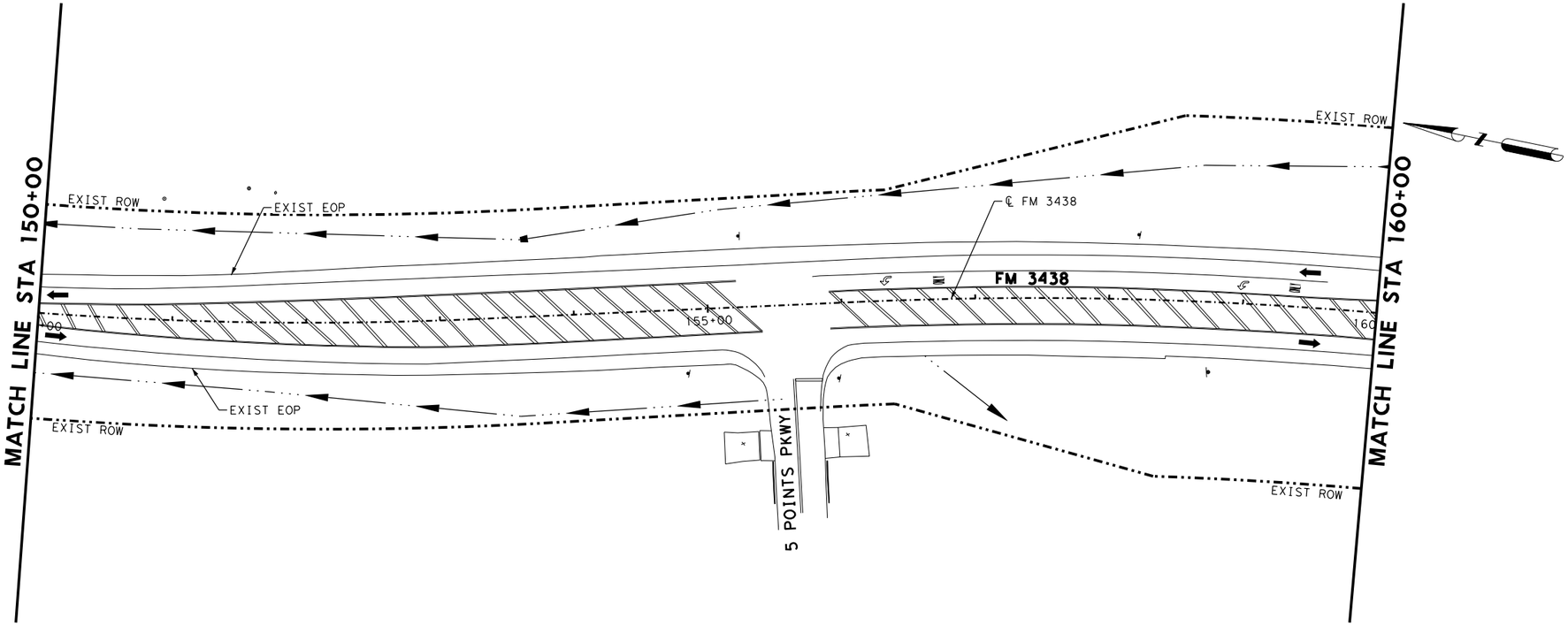

LEGEND

- EROSION CONTROL LOGS
- WATER FLOW LINES
- SCF — SILT FENCE

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.

0′ 50′ 100′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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PLANNERS + ENGINEERS + MANAGERS
IDCUS, Inc.
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San Antonio, Texas 78240
(210) 448-1800 Fax: (210) 448-1829
T.B.P.E.FIRM REGISTRATION NO. F-6825

FM 3438

SW3P LAYOUT

STA 140+00 TO STA 160+00

SHEET 3 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	194

5/26/2021 10:34:25 AM

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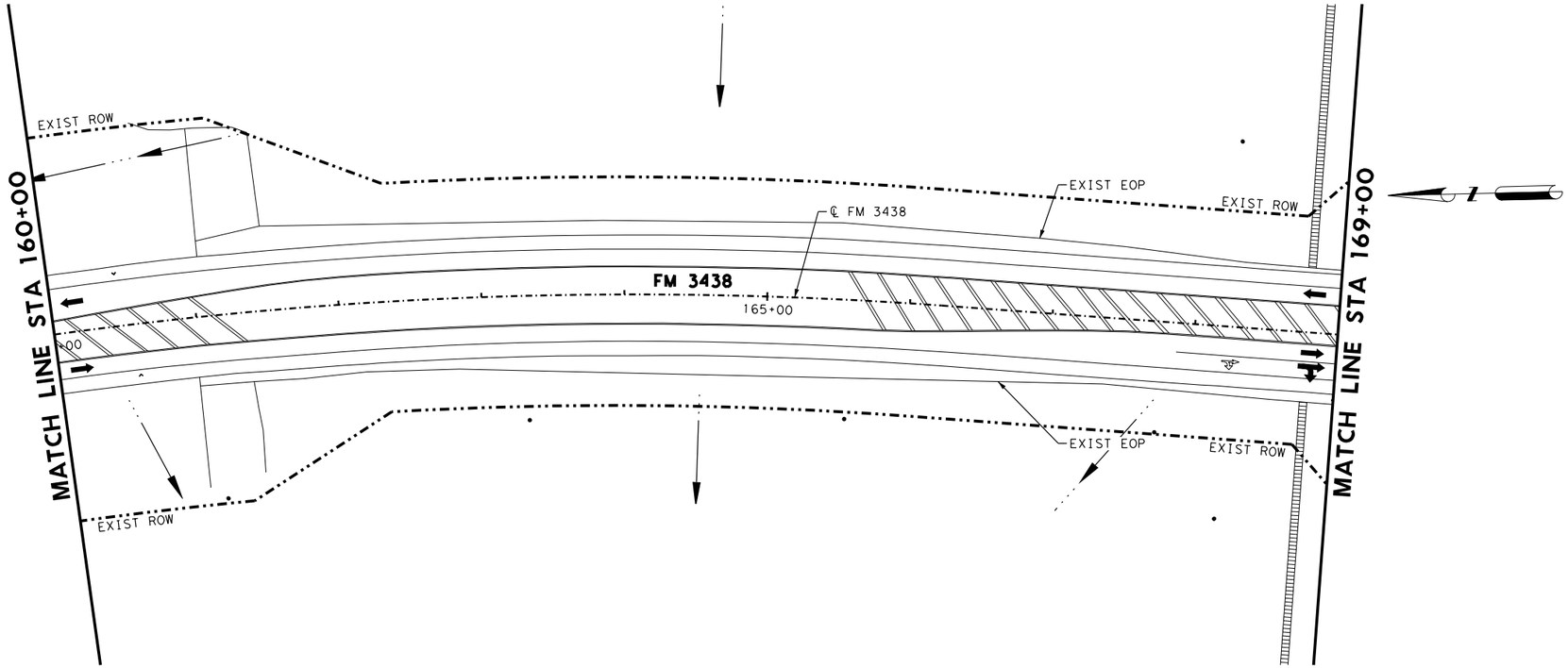

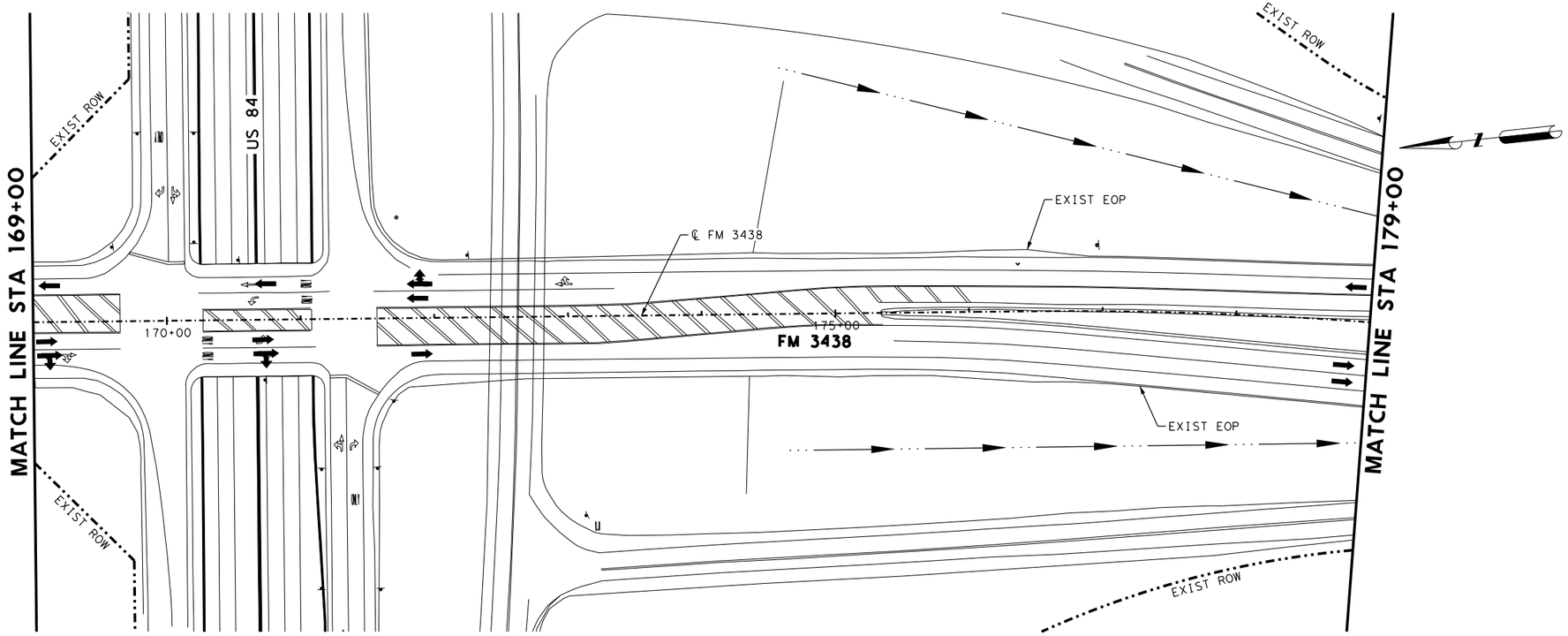

LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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Texas Department of Transportation

FM 3438

SW3P LAYOUT

STA 160+00 TO STA 179+00

SHEET 4 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	195

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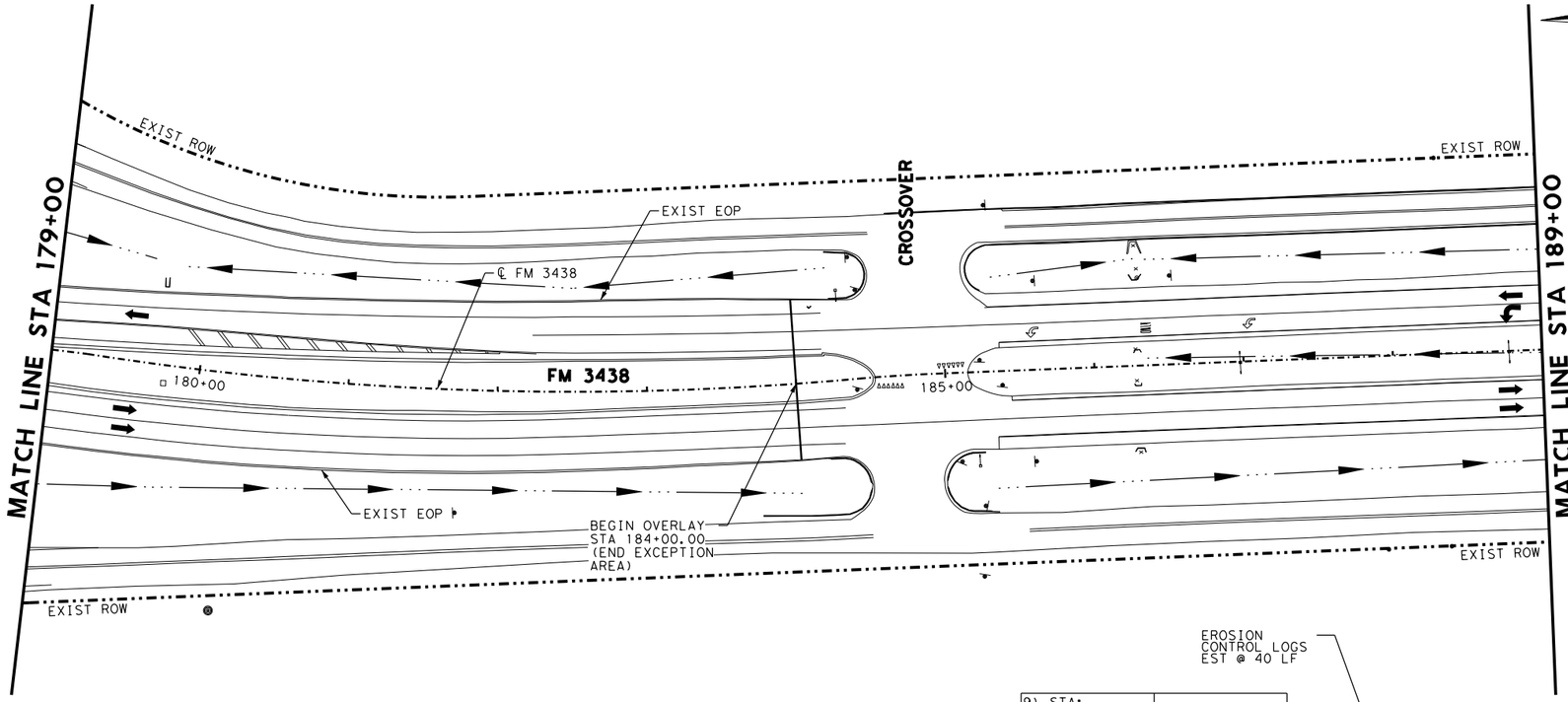
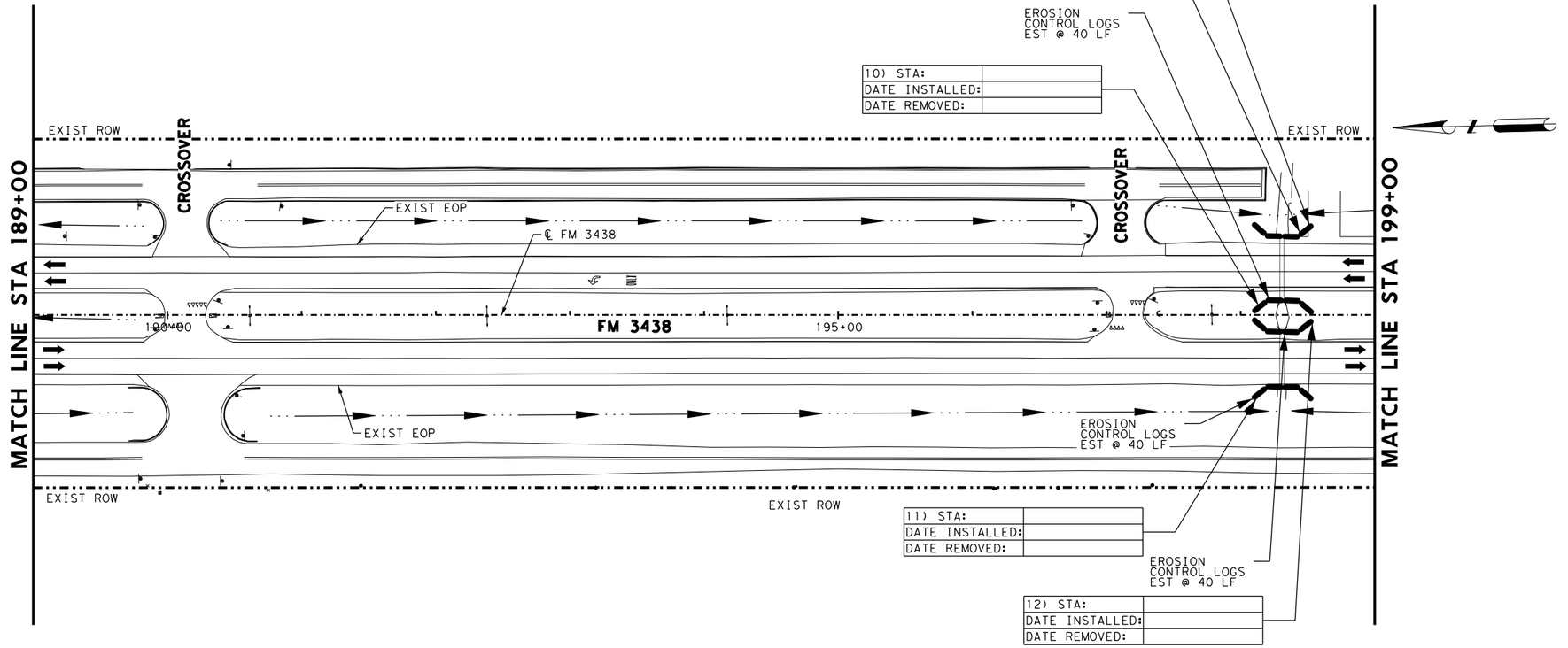




9) STA:	
DATE INSTALLED:	
DATE REMOVED:	

10) STA:	
DATE INSTALLED:	
DATE REMOVED:	

11) STA:	
DATE INSTALLED:	
DATE REMOVED:	

12) STA:	
DATE INSTALLED:	
DATE REMOVED:	

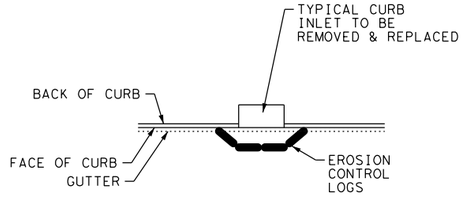
LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.



TYPICAL EROSION CONTROL LOG PLACEMENT

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
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LICENSED
PROFESSIONAL ENGINEER

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FM 3438

SW3P LAYOUT

STA 179+00 TO STA 199+00

SHEET 5 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	196

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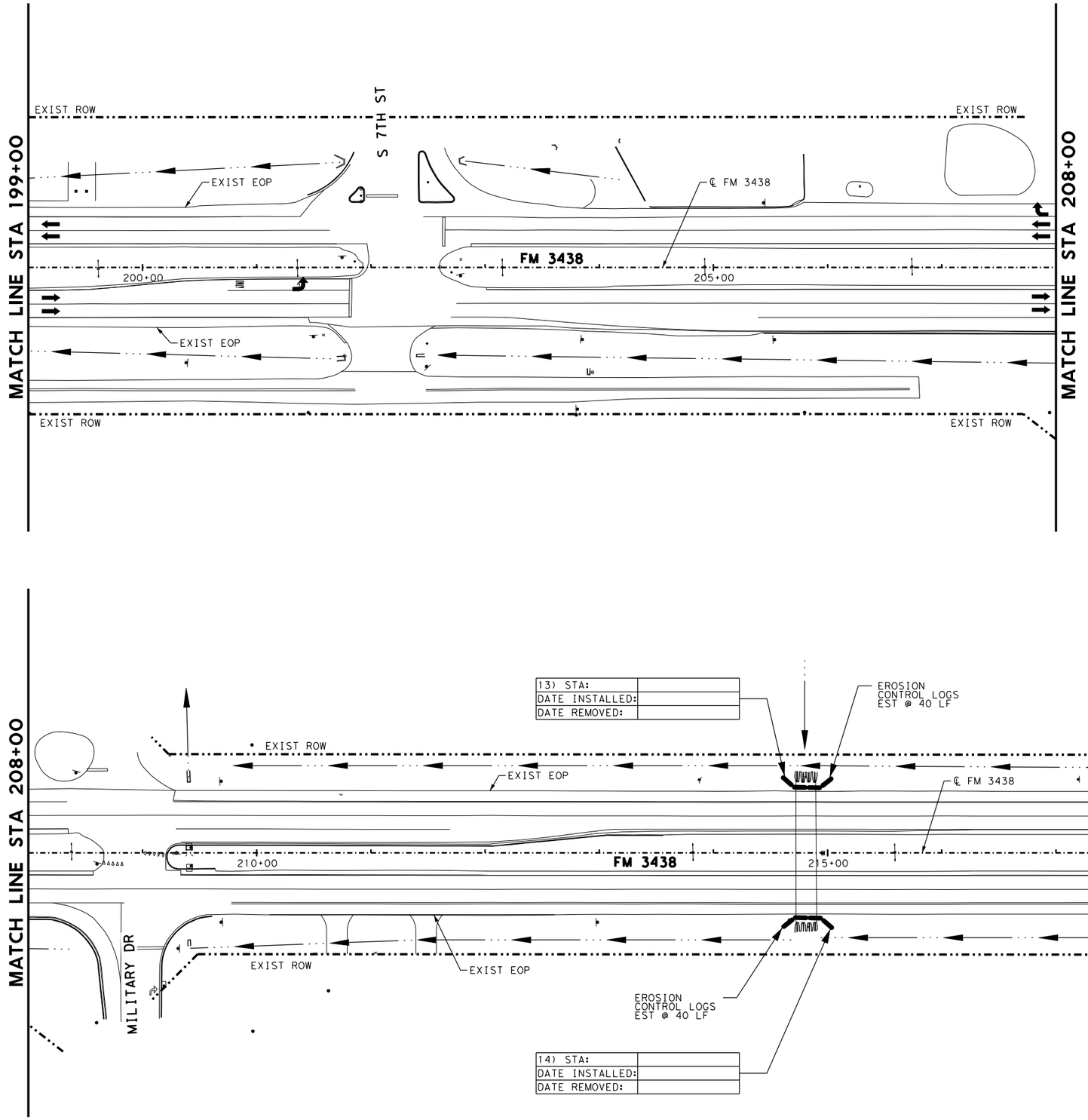


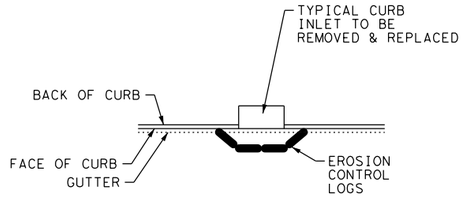
LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.



TYPICAL EROSION CONTROL LOG PLACEMENT

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
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FM 3438

SW3P LAYOUT

STA 199+00 TO STA 218+00

SHEET 6 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	197

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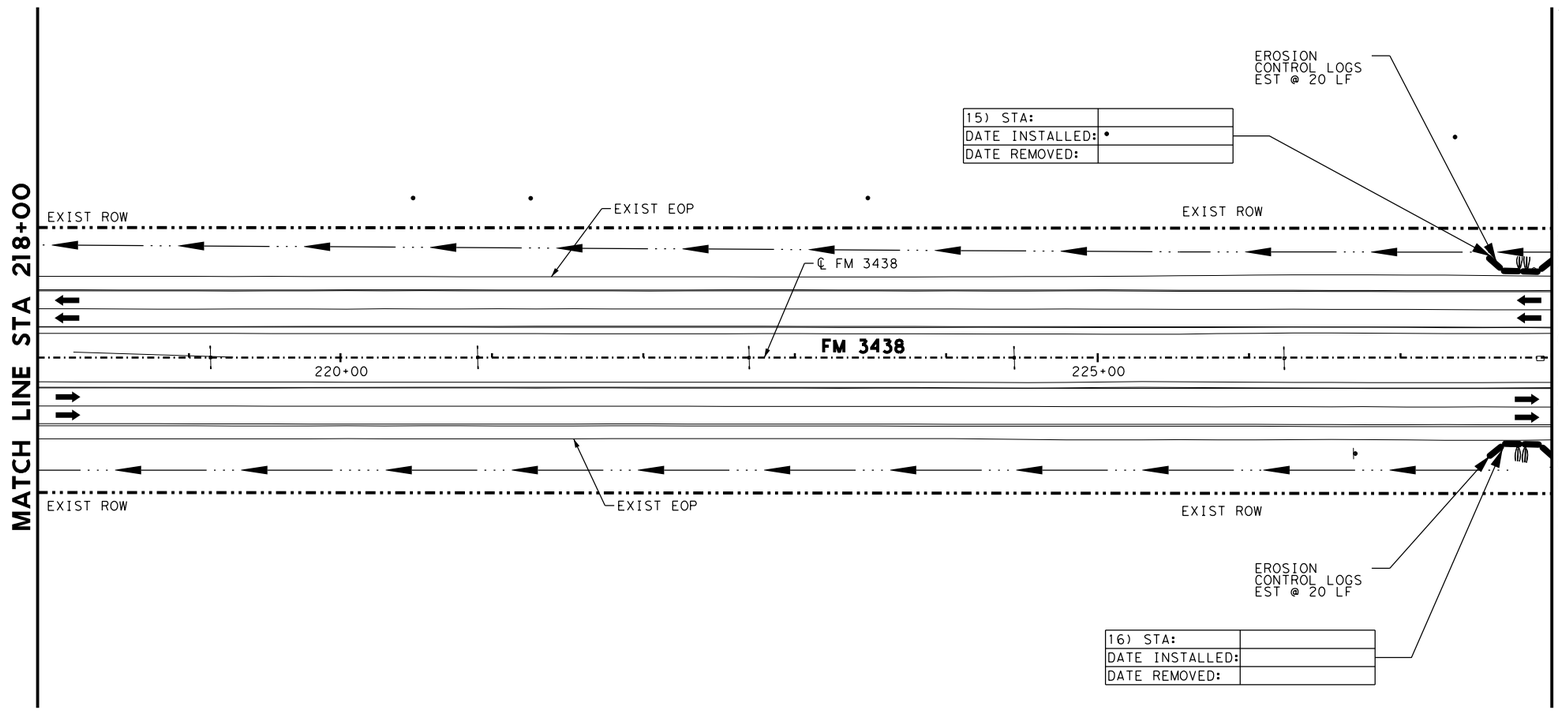
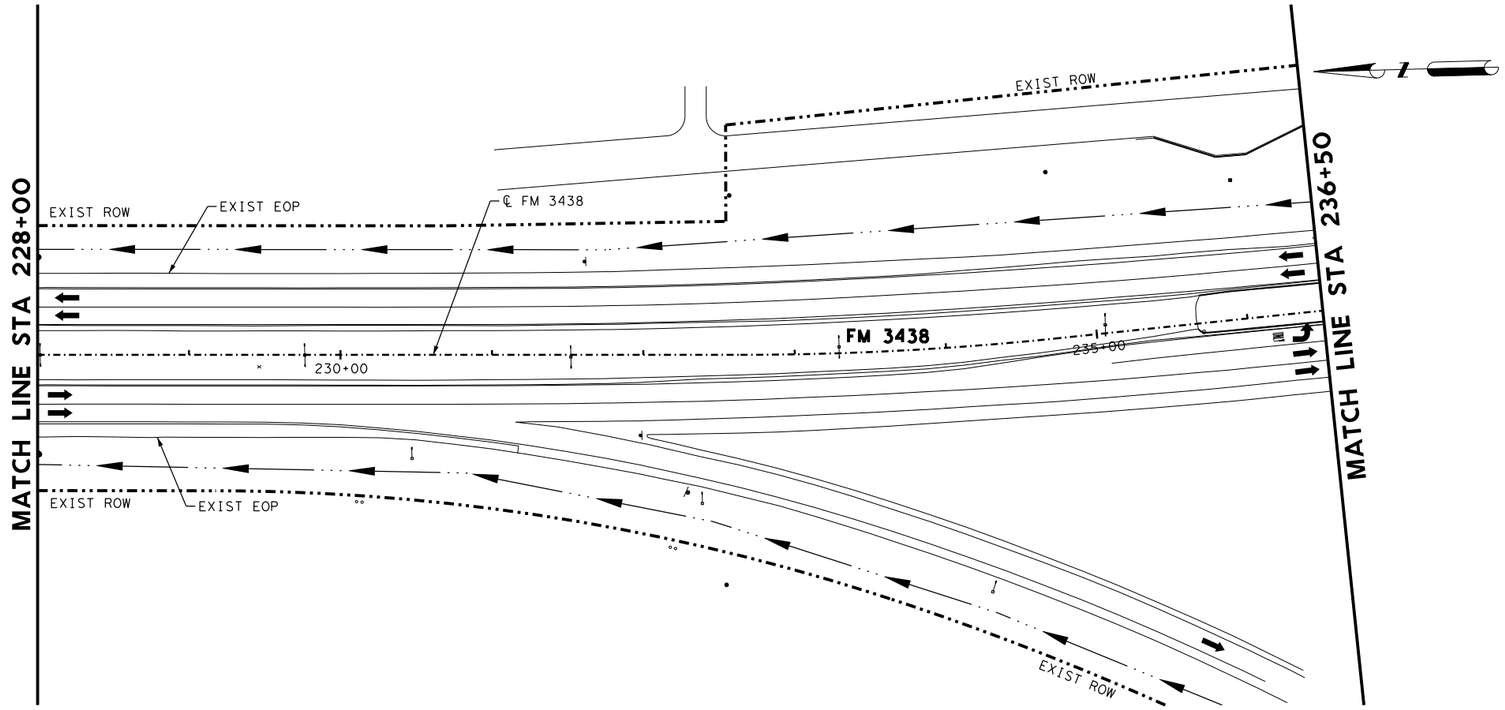




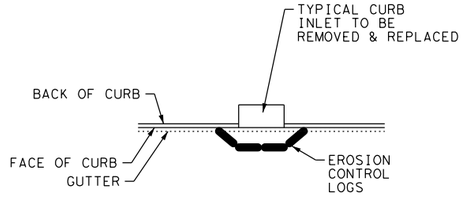
LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.



TYPICAL EROSION CONTROL LOG PLACEMENT

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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FM 3438

SW3P LAYOUT

STA 218+00 TO STA 236+50

SHEET 7 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	198

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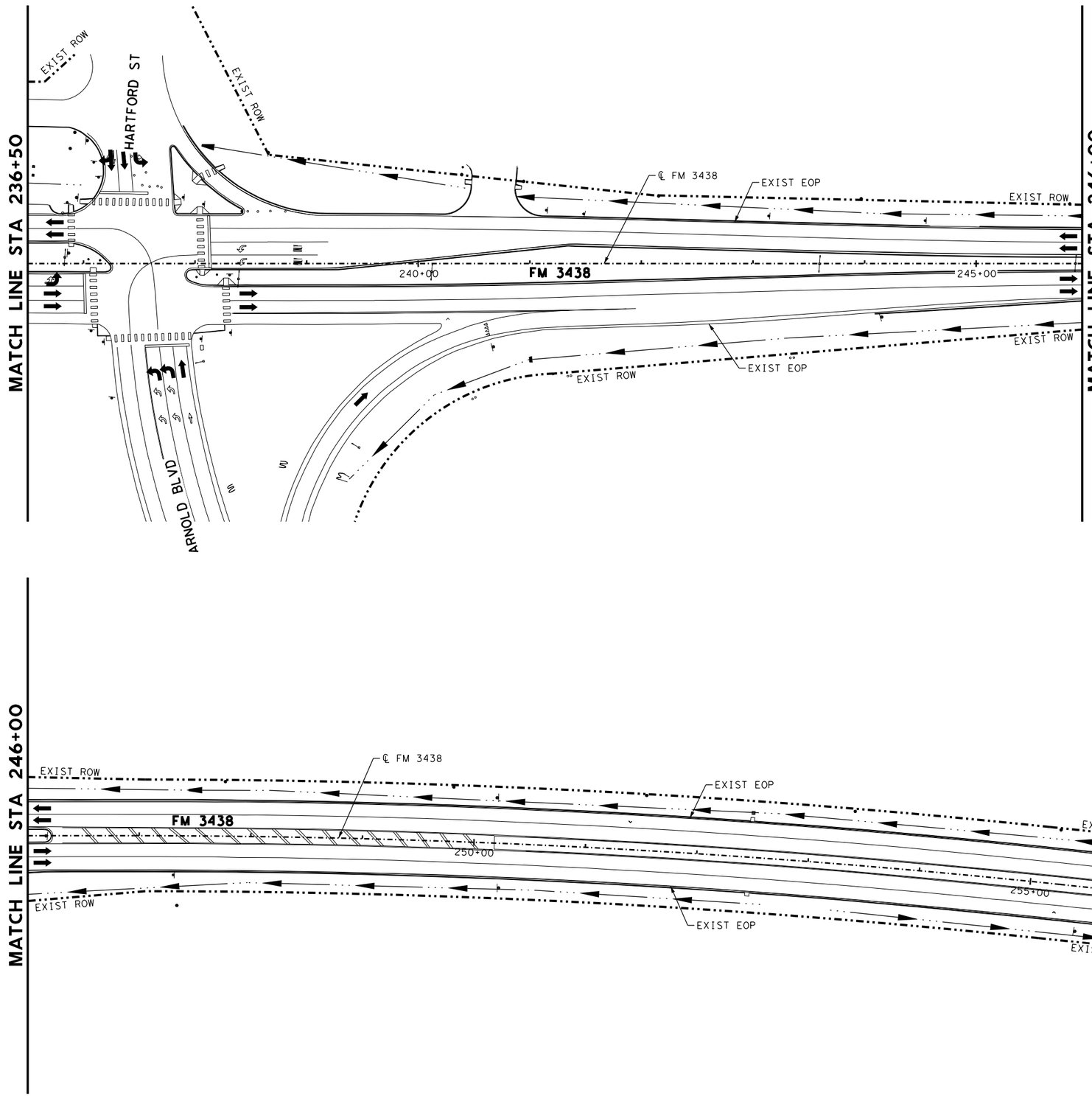

LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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FM 3438

SW3P LAYOUT

STA 236+50 TO STA 256+00

SHEET 8 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	199

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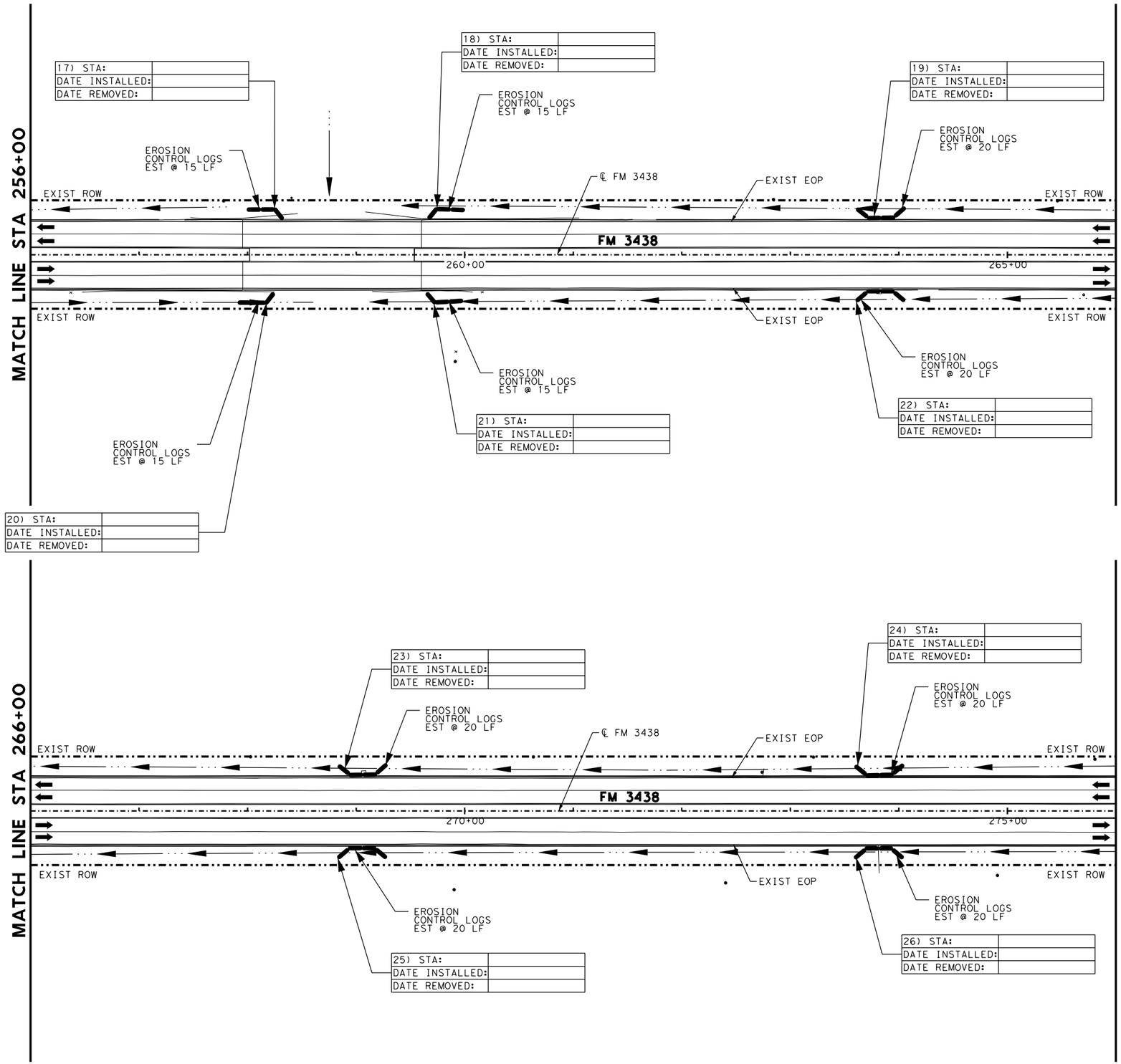


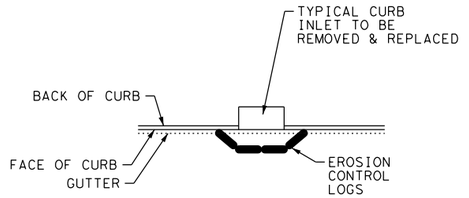
LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.



TYPICAL EROSION CONTROL LOG PLACEMENT

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
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Texas Department of Transportation

FM 3438

SW3P LAYOUT

STA 256+00 TO STA 276+00

SHEET 9 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	200

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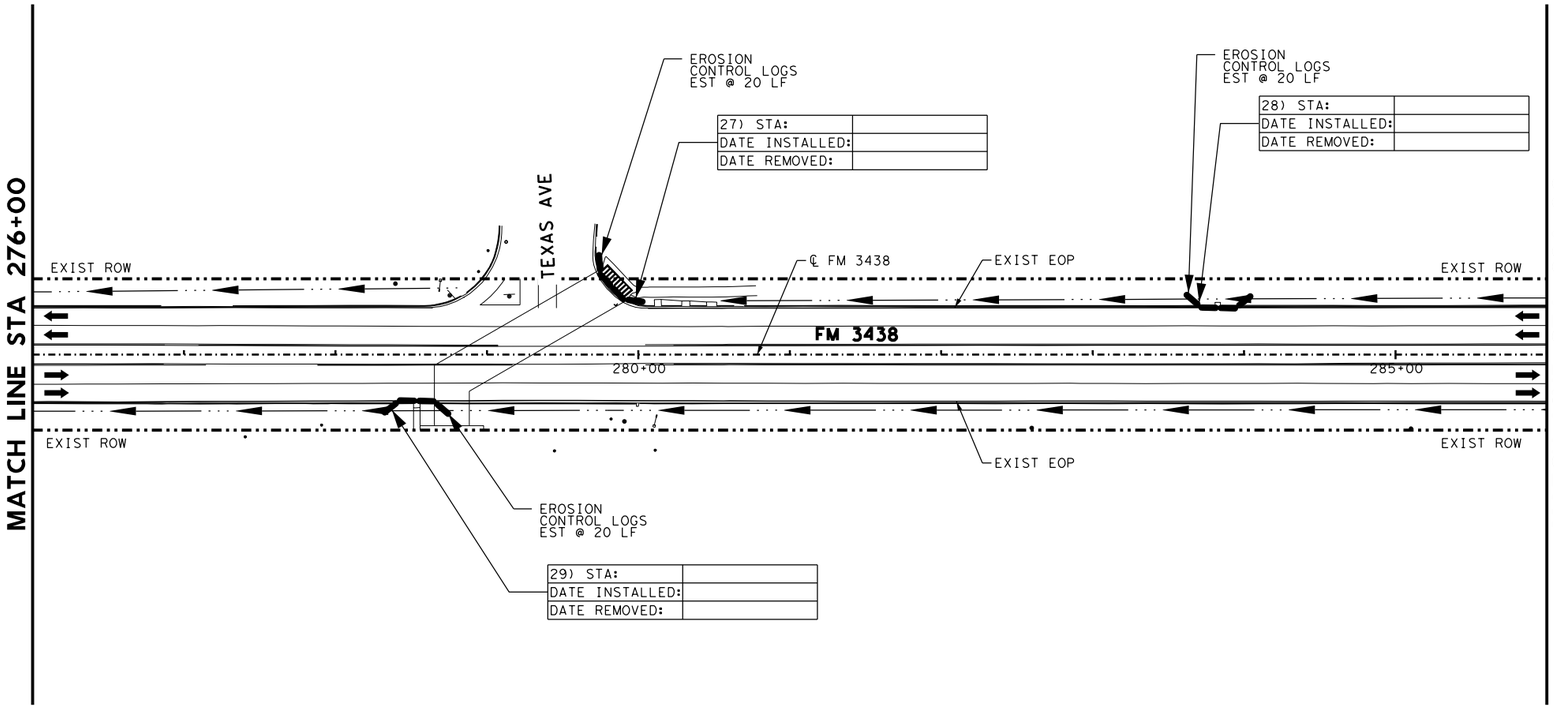
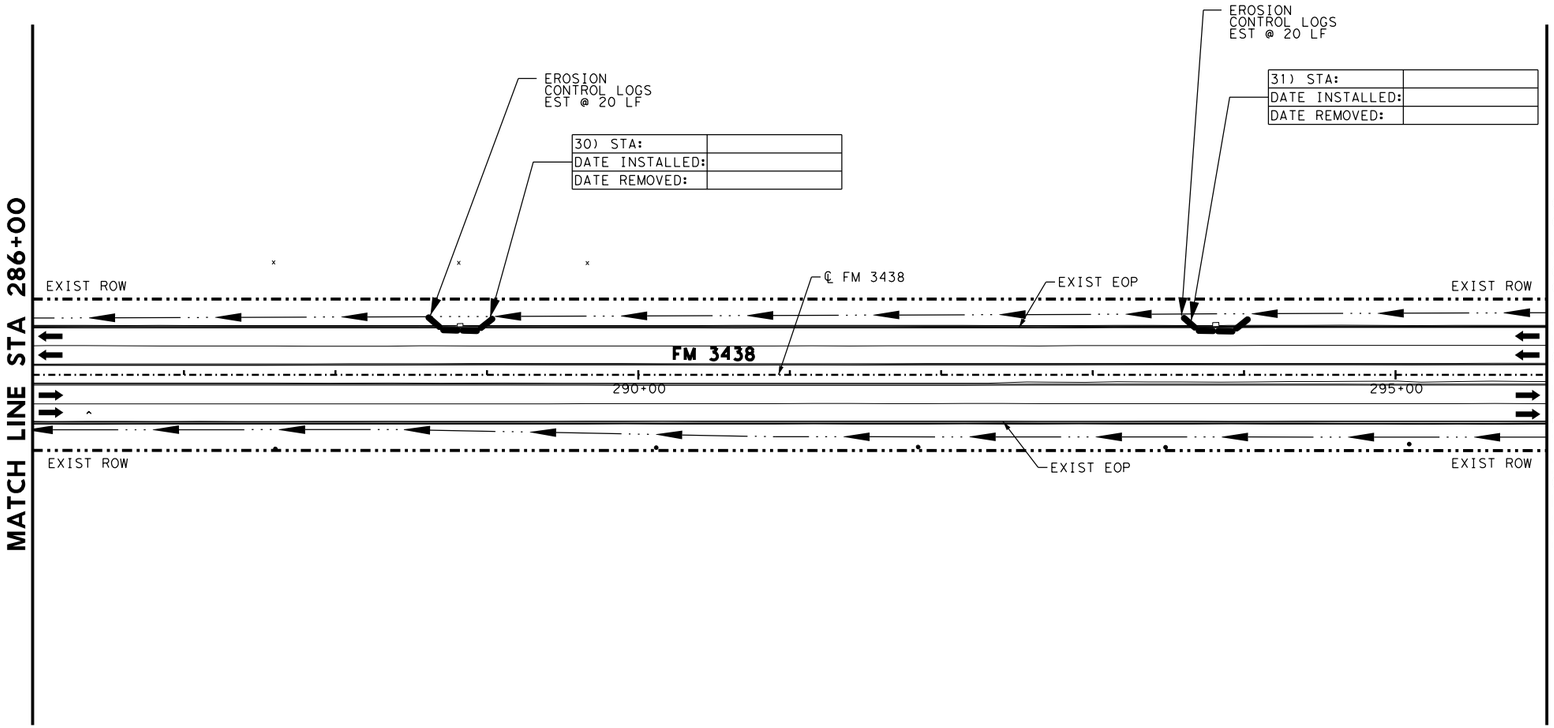




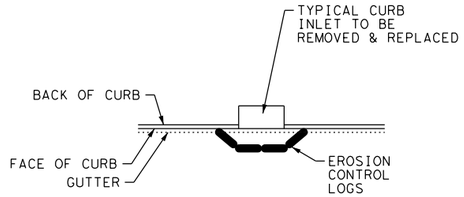
LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.



TYPICAL EROSION CONTROL LOG PLACEMENT

0′ 50′ 100′
SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

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FM 3438

SW3P LAYOUT

STA 276+00 TO STA 296+00

SHEET 10 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	201

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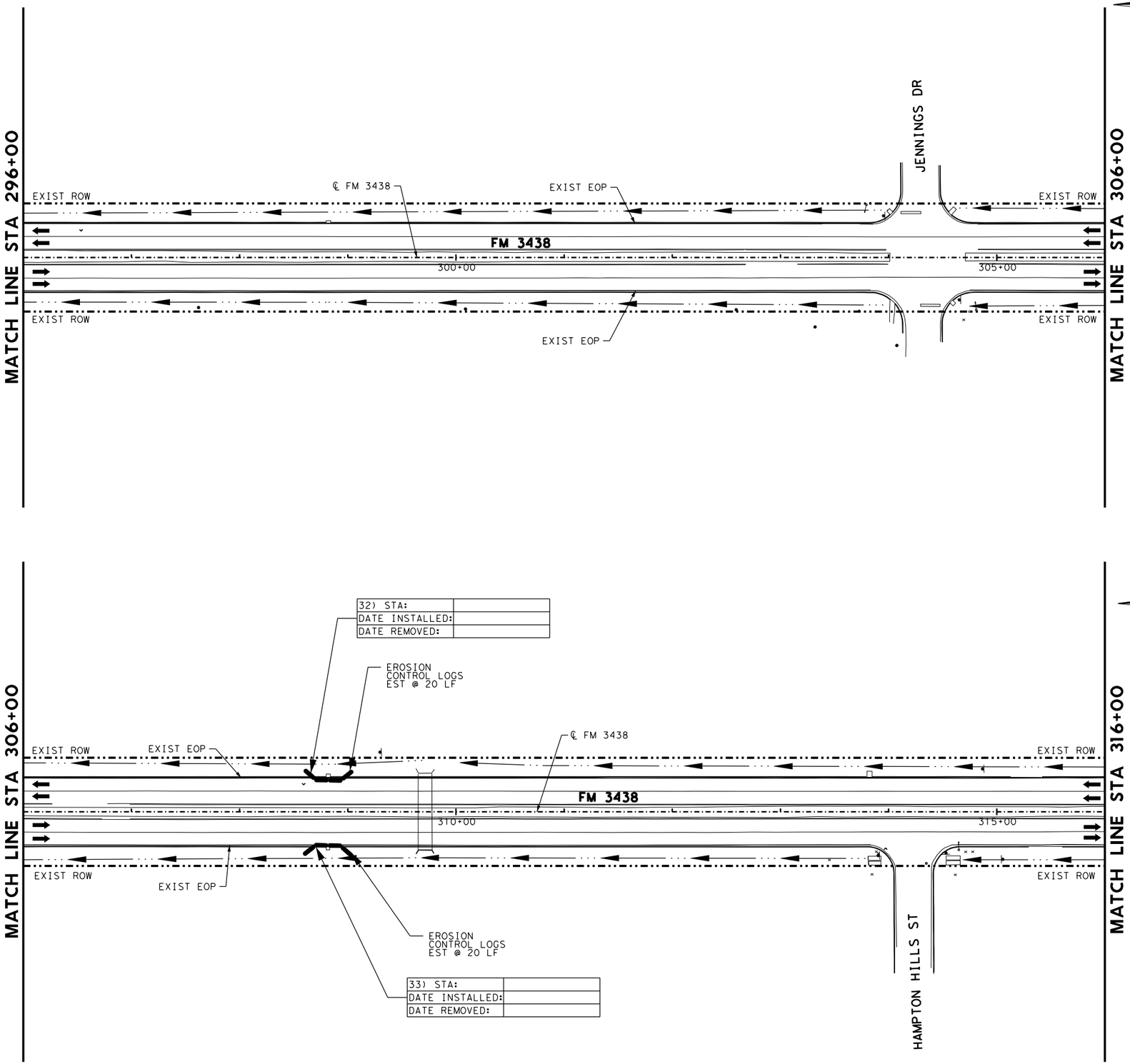

LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

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FM 3438

SW3P LAYOUT

STA 296+00 TO STA 316+00

SHEET 11 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	202

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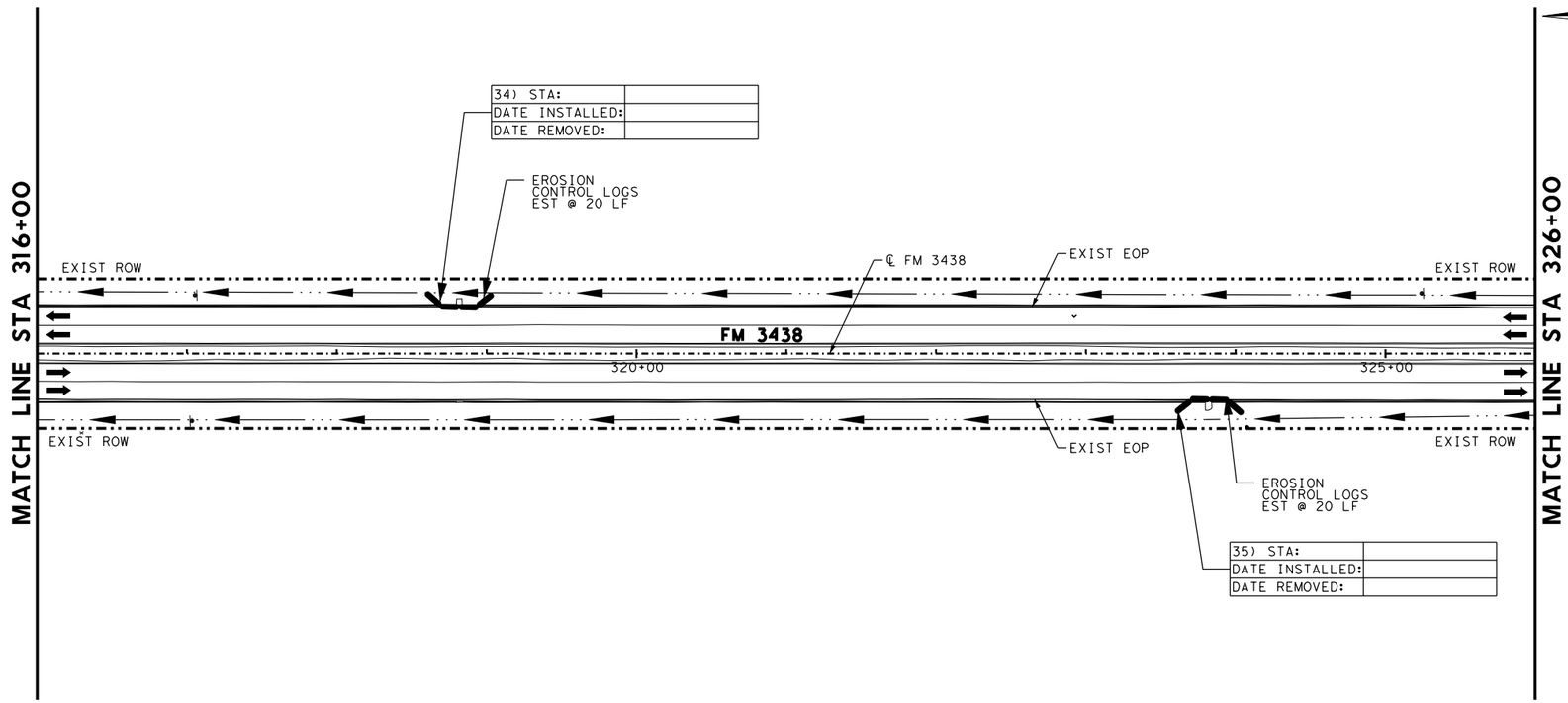

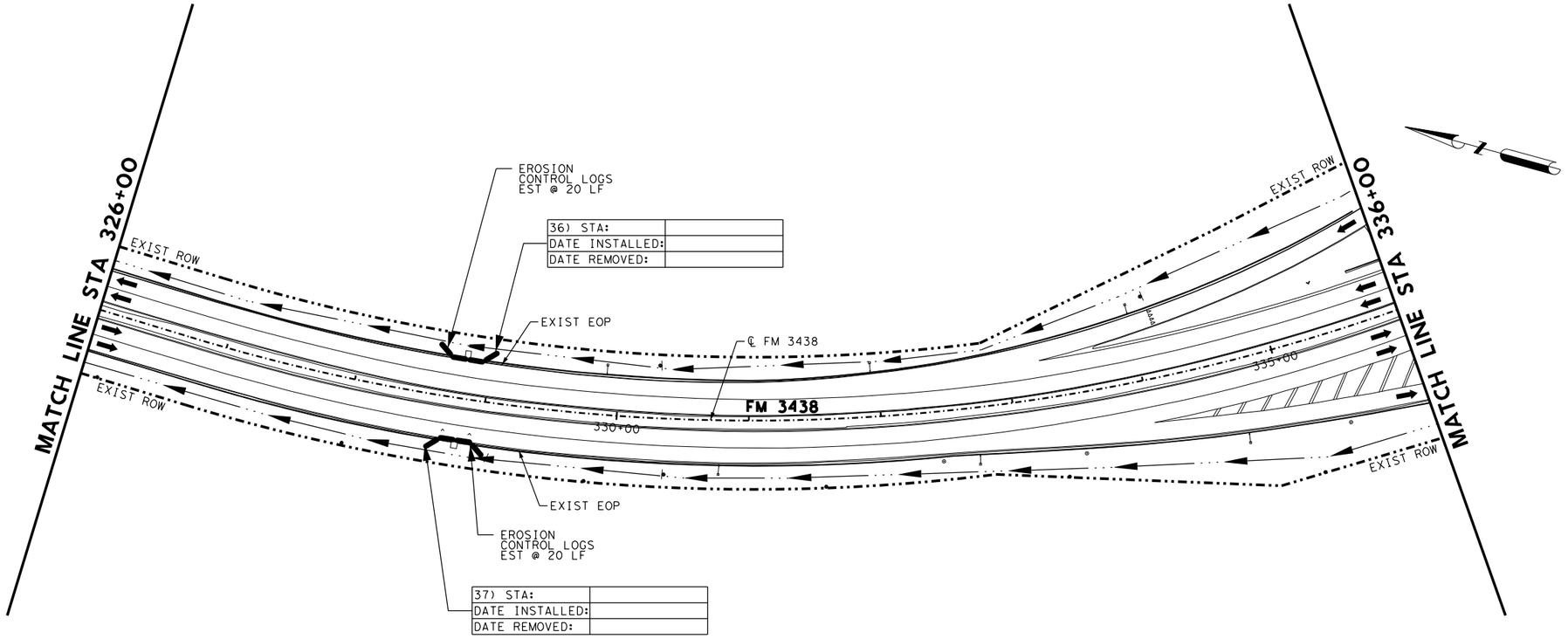

LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
JUAN RAMON ALCARAZ
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FM 3438

SW3P LAYOUT

STA 316+00 TO STA 336+00

SHEET 12 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	203

5/26/2021 10:36:02 AM

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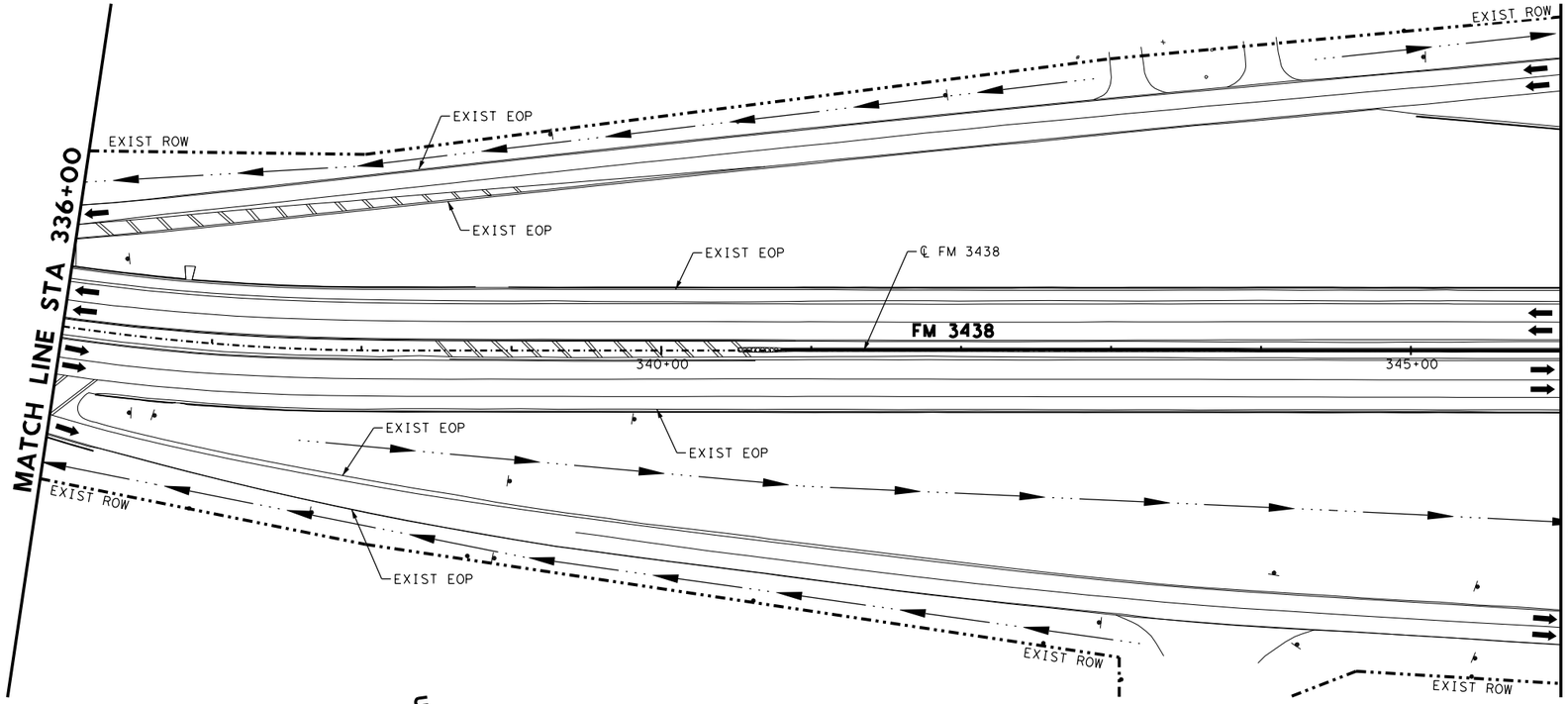

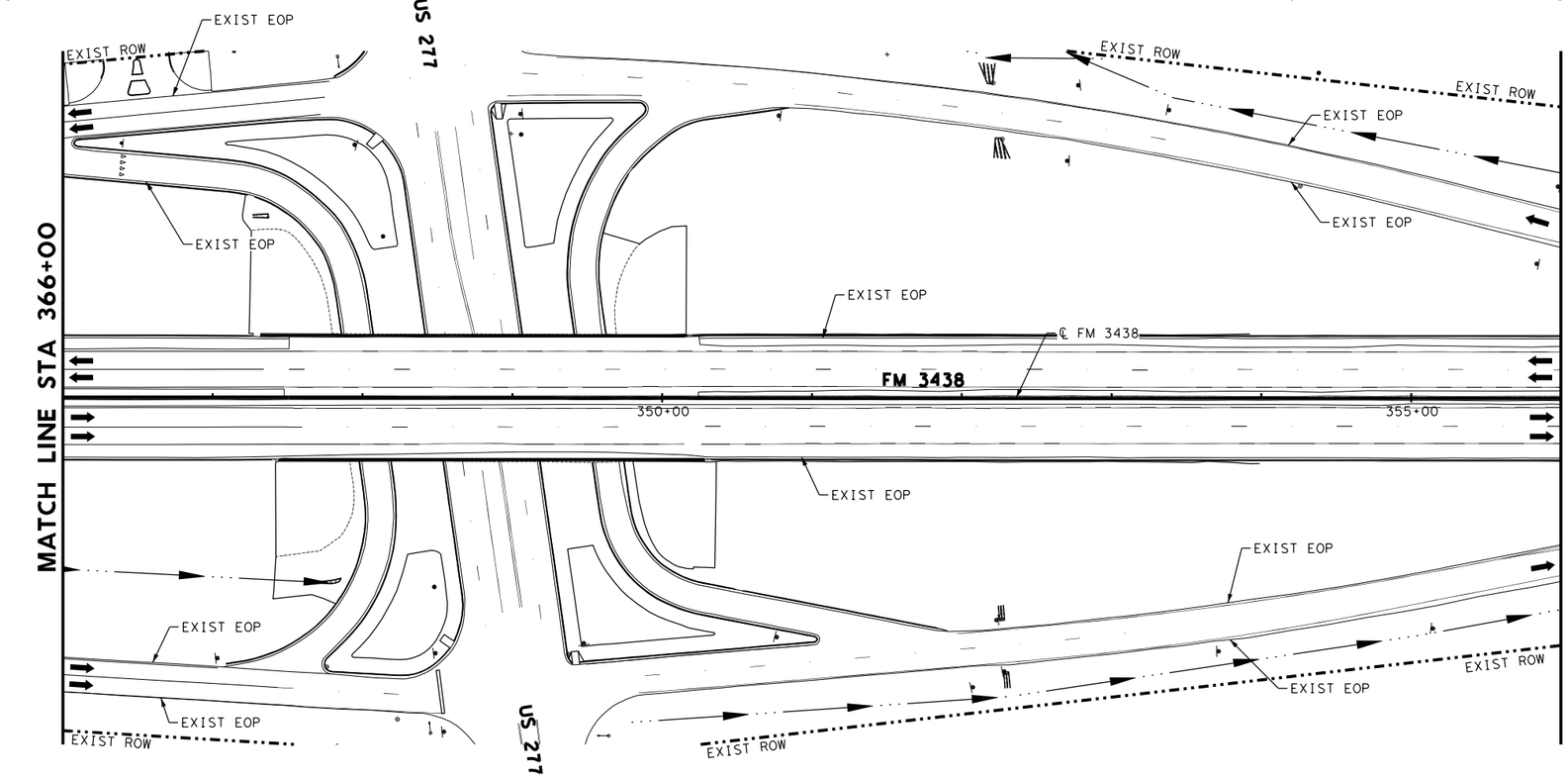

LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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Texas Department of Transportation

FM 3438

SW3P LAYOUT

STA 336+00 TO STA 356+00

SHEET 13 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	204

5/26/2021 10:36:19 AM

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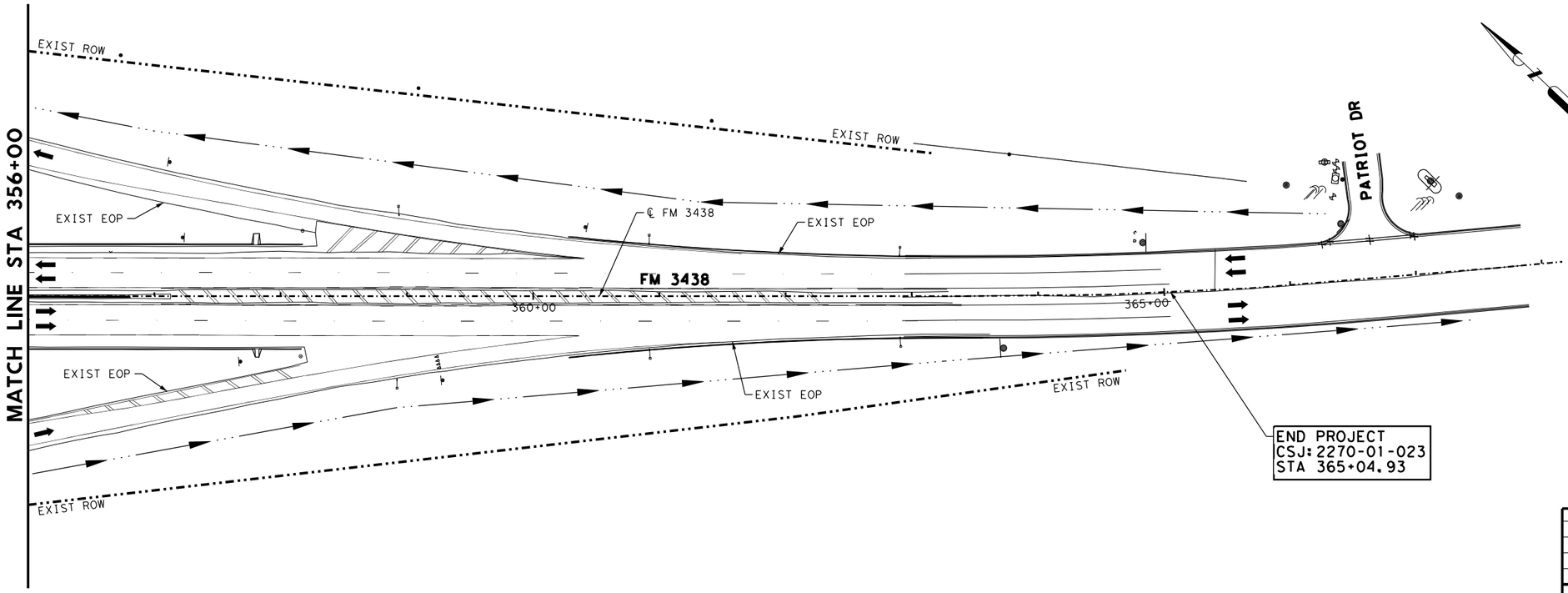

LEGEND

EROSION CONTROL LOGS

WATER FLOW LINES

NOTES:

1. CONCRETE WASHOUT WILL NOT BE ALLOWED ON THE PROJECT.

0′ 50′ 100′

SCALE IN FEET

NO.	DESCRIPTION	DATE

STATE OF TEXAS
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PROFESSIONAL ENGINEER

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Texas Department of Transportation

FM 3438

SW3P LAYOUT

STA 356+00 TO END PROJECT

SHEET 14 OF 14

DSN: JA	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: AR	8	TEXAS	SEE TITLE SHEET			FM 3438
DRN: AM	STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
APPVD: CS	ABL	TAYLOR	2270	01	023	205

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SITE DESCRIPTION

PROJECT LIMITS:
THE PROJECT LIMITS SHOWN ON THE TITLE SHEET AND LIMITS OF TXDOT RIGHT OF WAY SHALL ALSO BE THE LIMITS OF COVERAGE OF THE SW3P.

PROJECT LOCATION MAPS: TITLE SHEET

DRAINAGE PATTERNS: SW3P SITE PLAN

APPROX. SLOPES ANTICIPATED AFTER MAJOR GRADING AND AREAS OF SOIL DISTURBANCE: TYPICAL SECTIONS

MAJOR CONTROLS AND LOCATIONS OF STABILIZATION PRACTICES: SW3P SITE PLAN

PROJECT SPECIFIC LOCATIONS: TO BE SPECIFIED BY PROJECT FIELD OFFICE AND LOCATED IN THE PROJECT SW3P FILE.

SURFACE WATERS AND DISCHARGE LOCATIONS:
DRAINAGE AND CULVERT LAYOUT SHEETS

TYPICAL AREAS WHICH WILL NOT BE DISTURBED: SW3P SITE PLAN

ENDANGERED SPECIES, DESIGNATED CRITICAL HABITAT AND HISTORIC PROPERTY: EPIC SHEET

ESTIMATED START DATES AND DURATION OF ACTIVITIES IN THE INTENDED SCHEDULE/SEQUENCE OF EARTH-DISTURBING ACTIVITIES: CONTRACT TIME ESTIMATE

NATURE OF ACTIVITY:
REHABILITATION OF EXISTING ROADWAY

MAJOR SOIL DISTURBING ACTIVITIES:
EMBANKMENT

TOTAL PROJECT AREA:
134.07 ACRES

TOTAL AREA TO BE DISTURBED (AT EACH SITE):
0.26 ACRES

WEIGHTED RUNOFF COEFFICIENT BEFORE CONSTRUCTION:
NA

WEIGHTED RUNOFF COEFFICIENT AFTER CONSTRUCTION:
NA

EXISTING CONDITION OF SOIL & VEGETATIVE COVER:
The areas predominate soil is Windblown cover sand which consists of shale, sandstone, siltstone, limestone, and gravel.

% OF EXISTING VEGETATIVE COVER:
70%

NAME OF RECEIVING WATERS:
STORM WATER WILL FLOW INTO NEARBY DITCHES INTO LITTLE ELM CREEK, AND EVENTUALLY INTO BIG ELM CREEK WHICH FLOWS INTO LAKE FORT PHANTOM HILL. SEGMENT ID #1236A.

EROSION AND SEDIMENT CONTROLS

USE "T" OR "P" IN THE BLANKS BELOW IF APPLICABLE (T= TEMPORARY, P= PERMANENT)

SOIL STABILIZATION PRACTICES:

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

OTHER:

DISTURBED AREAS ON WHICH CONSTRUCTION ACTIVITY HAS CEASED (TEMPORARILY OR PERMANENTLY) SHALL BE STABILIZED WITHIN 14 DAYS UNLESS ACTIVITIES ARE SCHEDULED TO RESUME WITHIN 14 DAYS.

FOR CONSTRUCTION PROJECTS, THIS DISTRICT OF THE TEXAS DEPARTMENT OF TRANSPORTATION USES SITEMANAGER, A COMPUTER BASED CONSTRUCTION RECORD-KEEPING SYSTEM, AS PART OF RECORD FOR PROJECT WORK INCLUDING ENVIRONMENTAL RELATED ACTIVITIES. DOCUMENTATION DESCRIBING MAJOR GRADING ACTIVITES, TEMPORARY OR PERMANENT CESSATION OF CONSTRUCTION AND STABILIZATION MEASURE IS PART OF THIS SYSTEM AND IS INCORPORATED BY REFERENCE INTO THIS SW3P.

STRUCTURAL PRACTICES:

	CHANNEL LINERS		DIVERSION DIKE AND SWALE COMBINATIONS
	CURBS AND GUTTERS		DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
	HAY BALES		DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
	PAVED FLUMES		ROCK BEDDING AT CONSTRUCTION EXIT
	PIPE SLOPE DRAINS		STONE OUTLET STRUCTURES
	STORM SEWERS		STORM INLET SEDIMENT TRAP
	SEDIMENT BASINS	T	TEMPORARY EROSION CONTROL LOGS (BIOLOGS)
	SEDIMENT TRAPS		TIMBER MATTING AT CONSTRUCTION EXIT
T	SILT FENCES		VEGETATIVE FILTER STRIPS
	ROCK FILTER DAMS		VELOCITY CONTROL DEVICES
T	EROSION CONTROL LOGS		LINED CONCRETE WASHOUT

OFFSITE VEHICLE TRACKING CONTROLS:

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

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

THE ORDER OF ACTIVITIES WILL BE AS FOLLOWS:

PHASE 1:
INSTALL EROSION CONTROL LOGS
INSTALL SILT FENCE

PHASE 5:
REMOVE EROSION CONTROL LOGS
AND SILT FENCE

STORM WATER MANAGEMENT:
NA

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

5/26/2021

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE:
ALL EROSION AND SEDIMENT CONTROLS WILL BE MAINTAINED IN GOOD WORKING ORDER. IF A REPAIR IS NECESSARY, IT WILL BE DONE AT THE EARLIEST DATE POSSIBLE, BUT NO LATER THAN 7 CALENDAR DAYS AFTER THE SURROUNDING EXPOSED GROUND HAS DRIED SUFFICIENTLY TO PREVENT FURTHER DAMAGE FROM HEAVY EQUIPMENT. THE AREAS ADJACENT TO CREEKS AND DRAINAGE WAYS SHALL HAVE PRIORITY FOLLOWED BY DEVICES PROTECTING STORM SEWER INLETS.

INSPECTION:
AN INSPECTION WILL BE PERFORMED BY A TXDOT INSPECTOR EVERY 7 DAYS. AN INSPECTION AND MAINTENANCE REPORT WILL BE MADE PER EACH INSPECTION. BASED ON THE INSPECTION RESULTS, THE CONTROLS SHALL BE REVISED PER THE INSPECTION REPORT.

WASTE MATERIALS:
ALL WASTE MATERIALS WILL BE COLLECTED AND STORED IN A SECURELY LIDDED METAL DUMPSTER. THE DUMPSTER WILL MEET ALL STATE AND LOCAL CITY SOLID WASTE MANAGEMENT REGULATIONS. ALL TRASH AND CONSTRUCTION DEBRIS FROM THE SITE WILL BE DEPOSITED IN THE DUMPSTER. THE DUMPSTER WILL BE EMPTIED AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION AND THE TRASH WILL BE HAULED TO A PERMITTED LANDFILL. NO CONSTRUCTION WASTE MATERIAL WILL BE BURIED ON SITE. CONSTRUCTION DEBRIS AND LITTER SHOULD BE PICKED UP ON A DAILY BASIS UNLESS OTHERWISE DIRECTED BY THE ENGINEER. WASTE AND DIRT PILES SHOULD BE REMOVED ON A WEEKLY BASIS.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):
NO LONG TERM WATER QUALITY IMPACTS ARE EXPECTED AS A RESULT OF THE PROPOSED PROJECT. SEE THE NEXT PLAN SHEET FOR A LIST OF POTENTIAL POLLUTANTS. IN THE EVENT OF A MAJOR SPILL, NOTIFY THE TXDOT ENGINEER IMMEDIATELY. ALL PERSONNEL WILL BE INSTRUCTED IN THE PROCEDURES FOR SPILL HANDLING AND DISPOSING OF ANY HAZARDOUS MATERIALS THEY WILL BE USING. ALL SPILLS, INCLUDING THOSE OF LESS THAN 25 GALLONS SHALL BE CLEANED IMMEDIATELY AND ANY CONTAMINATED SOIL SHALL BE IMMEDIATELY REMOVED FROM THE SITE AND BE DISPOSED OF PROPERLY. DESIGNATED AREAS SHALL BE DETERMINED BY THE AREA ENGINEER FOR SPOILS DISPOSAL AND MATERIAL STORAGE. THESE AREAS SHALL BE PROTECTED FROM RUN-ON AND RUN-OFF. MATERIALS RESULTING FROM THE DESTRUCTION OF EXISTING ROADS AND BEING REMOVED AND/OR DISPOSED OF BY THE CONTRACTOR WILL BE DONE SO IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL LAWS, ORDINANCES AND REGULATIONS AND WITH THE APPROVAL OF THE PROJECT ENGINEER. ANY CHANGES TO AMBIENT WATER QUALITY DURING CONSTRUCTION OF THE PROPOSED PROJECT SHALL BE PROHIBITED AND MAY RESULT IN ADDITIONAL WATER QUALITY CONTROL MEASURES, WHICH SHALL BE MITIGATED AS SOON AS POSSIBLE AND SHALL BE REPORTED TO THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) WITHIN 24 HOURS OF BECOMING AWARE OF IMPACTS.

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

REMARKS:
CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS SHALL BE CONSTRUCTED BY THE CONTRACTOR IN A MANNER TO MINIMIZE THE RUNOFF OF POLLUTANTS.
ALL WATERWAYS SHALL BE CLEARED AS SOON AS PRACTICABLE OF TEMPORARY EMBANKMENT, TEMPORARY BRIDGES, MATTING, FALSEWORK PILING, DEBRIS OR OTHER OBSTRUCTIONS PLACED DURING CONSTRUCTION OPERATIONS THAT ARE NOT PART OF THE FINISHED WORK. DISPOSAL AREAS, STOCKPILES, AND HAUL ROADS SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE AND CONTROL THE AMOUNT OF SEDIMENT THAT MAY ENTER RECEIVING WATERS. DISPOSAL AREAS SHALL NOT BE LOCATED IN ANY WETLAND, WATER BODY OR STREAMBED.

Texas Department of Transportation

NO SCALE

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 3438
STATE	COUNTY		SHEET NO.
TEXAS	TAYLOR		206
DISTRICT	CONTROL	SECTION	JOB
ABL	2270	01	023

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LIST OF POTENTIAL POLLUTANTS

POTENTIAL POLLUTANT	RELATED SOURCE	CONTROLS
CEMENTATEOUS MATERIAL AND CEMENTATEOUS AGGREGATES (BROKEN CONCRETE)	REMOVAL OF CONCRETE RIPRAP, CULVERT COMPONENTS, BRIDGE COMPONENTS, ETC.	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
MILLED ASPHALTIC CEMENT PAVEMENT (MILLINGS)	OBLITERATION OF ABANDONED ROAD AND PLANING OF ASPHALT	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
VIRGIN ASPHALTIC MATERIAL INCLUSIVE OF PRIME OILS, PRECOAT AGGREGATES, AND HOT MIX BITUMINOUS MIXTURES	APPLICATIONS OF PRIME COATS, SEAL COAT, AND PAVING OPERATIONS	THIS MATERIAL SHALL BE APPLIED AT APPROPRIATE RATES FOR CONSTRUCTION PURPOSES WHICH WILL PRECLUDE THESE MATERIALS FROM ENTERING RUNOFF. IN THE EVENT OF ANY UNINTENDED DISCHARGE, CONTROLS TO CONTAIN RUNOFF WILL BE IMMEDIATELY PLACED AND TCEQ WILL BE IMMEDIATELY NOTIFIED.
CONCRETE, REBAR, WIRE, WIRE FABRIC LUMBER, NAILS, STYROFOAM BLOCK, FIBERBOARD, CURING COMPOUND AND LINSEED OIL	CONSTRUCTION OF CONCRETE BRIDGE COMPONENTS SUCH AS DRILLED SHAFTS, CULVERTS, ABUTMENTS, BENTS, REINFORCED CONCRETE SLABS, RAIL, INLET, CONCRETE TRAFFIC BARRIERS, CURB AND GUTTER, RIPRAP AND SIGN FOUNDATIONS	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF. ANY TEMPORARY FILLS MUST BE REMOVED IN THEIR ENTIRETY AND THE AFFECTED AREAS RETURNED TO THEIR PREEXISTING CONDITION/ELEVATION.
MASONRY CONCRETE BLOCK, GEOGRID FABRIC, CARDBOARD, AND PLASTIC RAP	CONSTRUCTION OF MODULAR RETAINING WALL SYSTEMS	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
WOOD POSTS, STEEL POSTS, BARRELS, CONES, SIGN BOARDS (ALUMINUM AND PLYBOARD), FASTENERS, NUTS, BOLTS, AND WASHERS	PLACEMENT AND/OR REMOVAL OF BARRICADES, SIGNS AND TRAFFIC CONTROL DEVICES	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
WOOD POST, STEEL POST, STEEL FASTENERS, NUTS, BOLTS, AND WASHERS	CONSTRUCTION OF METAL BEAM GUARD FENCE	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
STRUCTURAL STEEL I-BEAM, SIGN BOARDS, AND CONCRETE FOUNDATIONS	REMOVAL OF ROADSIDE SIGN ASSEMBLIES LARGE AND SMALL	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
THERMOPLASTIC PAINT, GLASS BEADS, REFLECTIVE TABS, AND RAISED REFLECTIVE PAVEMENT MARKERS	APPLICATION OF PAVEMENT MARKINGS/MARKERS	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
PETROLEUM PRODUCTS (SMALL QUANTITIES INTRODUCED BY CONTRACTOR)	EQUIPMENT FAILURE, MAINTENANCE AND REPAIR	ALL EQUIPMENT AND VEHICLE MAINTENANCE SHALL BE PERFORMED IN A DESIGNATED AREA WITH APPROPRIATE MEASURES FOR CONTAINMENT AND PROPER DISPOSAL OF ALL WASTE MATERIALS INCLUDING HYDRAULIC OIL AND OTHER LIQUIDS IN ACCORDANCE STATE AND LOCAL WASTE MANAGEMENT REGULATIONS. ALL MATERIAL STORED PRIOR TO DISPOSAL SHALL BE CONTAINED IN A CONTAINER WITH A SECURE COVER MEETING ALL STATE AND LOCAL WASTE MANAGEMENT REGULATIONS.
ELIGIBLE NON-STORM WATER DISCHARGES INCLUDING BUT NOT LIMITED TO NON-POTABLE WATER AND NON-STORM WATER DISCHARGE	MOISTURE APPLICATIONS FOR DUST CONTROL, DENSITY, VEGETATION WATERING, NON-DETERGENT VEHICLE WASHING, AND AIR CONDITIONING CONDENSATE	THIS MATERIAL SHALL BE APPLIED AT APPROPRIATE RATES FOR CONSTRUCTION PURPOSES WHICH WILL PRECLUDE THESE MATERIALS FROM ENTERING RUNOFF. IN THE EVENT OF ANY UNINTENDED DISCHARGE, CONTROLS TO CONTAIN RUNOFF WILL BE IMMEDIATELY PLACED AND THE NON-POTABLE WATER WILL BE RECOVERED AND PROPERLY STORED FOR REUSE.
SURVEY STAKE, FLAGGING TAPE AND PAINT	SURVEY STAKING, ALIGNMENT ESTABLISHMENT	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
WASTEWATER	WASHOUT AND CLEANOUT OF STUCCO, PAINT, FORM RELEASE OILS, CURING COMPOUNDS AND OTHER CONSTRUCTION MATERIALS	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
SOAPS AND SOLVENTS	VEHICLE AND EQUIPMENT WASHING	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
UNSUITABLE FILL MATERIAL	EXCAVATION - ROADWAY, SPECIAL AND EROSION CONTROL	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

5/26/2021

Texas Department of Transportation

NO SCALE

SHEET 2 OF 2

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

REV. DATE: 02/27/2014

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 3438
STATE	COUNTY		SHEET NO.
TEXAS	TAYLOR		207
DISTRICT	CONTROL	SECTION	JOB
ABL	2270	01	023

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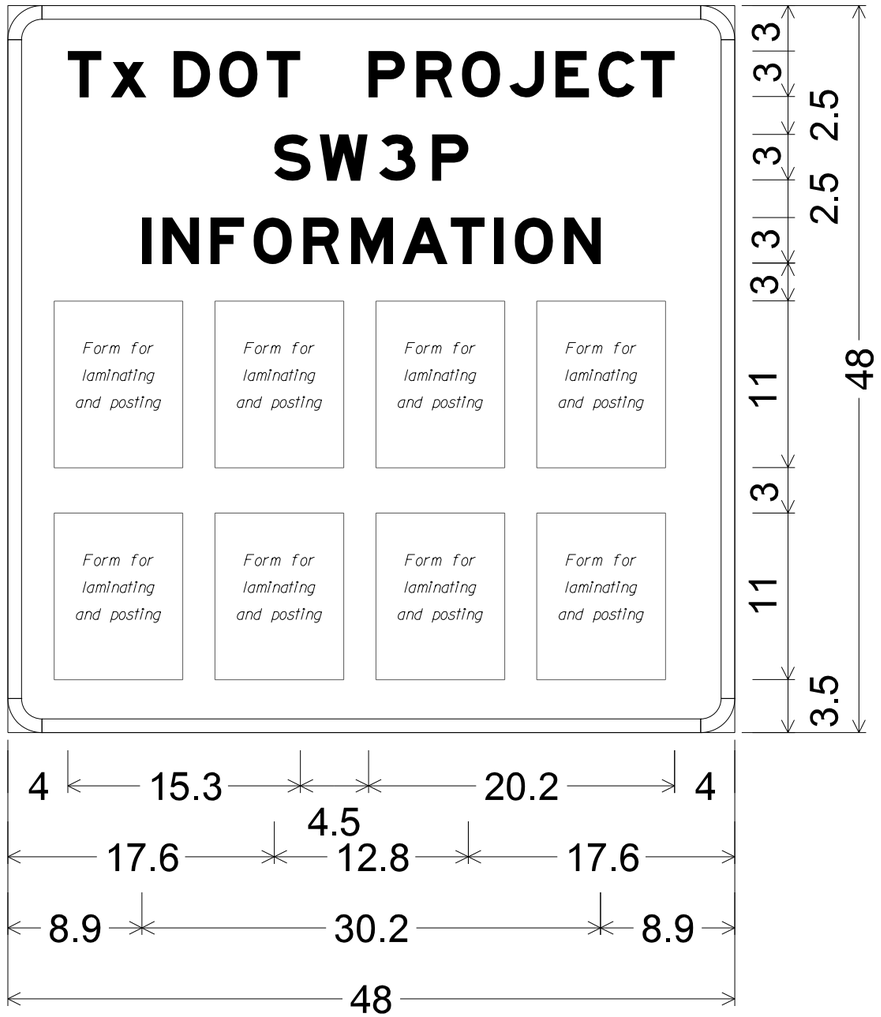

2.3" Radius, 0.9" Border, White on Blue;
[TxDOT PROJECT] E Mod;
[SW3P] E Mod;
[INFORMATION] E Mod;

NOTE:

The Forms needed for laminating and posting to the SW3P Notification Board will be provided by the Engineer. The total number of forms may vary. Notification Boards are to be constructed from Plywood, ½ or ⅝-inch thick, in accordance with TxDOT Departmental Material Specification (DMS)-7100. 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 sign will be placed at a location within the right-of-way but outside the clear zone as directed by the Engineer. This work will not be paid for directly, but will be considered subsidiary to other items.

STATE OF TEXAS
JUAN RAMON ALCARAZ
87609
LICENSED PROFESSIONAL ENGINEER

5/26/2021

SW3P NOTIFICATION BOARD DETAIL

Texas Department of Transportation

NO SCALE SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 3438
STATE	COUNTY		SHEET NO.
TEXAS	TAYLOR		
DISTRICT	CONTROL	SECTION	JOB
ABL	2270	01	023

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I. STORM WATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Storm water 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.

☐ No Action Required ☒ Required Action

Action No.

1. The project disturbs less than one acre of surface area. The contractor is responsible for the PSL as defined in the Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (2014 Edition, Section 7.6., Page 44). The total disturbed acreage is the combined acreage to be disturbed on the project and the contractors PSL.
2. Prevent storm water pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
3. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
4. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
5. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATER BODIES 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. N/A

2.

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	☐ Sedimentation Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw & Hay Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost & Mulch
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☐ Sand Filter Systems
☐ Temporary Erosion Control Logs (BIOLOGS)	☐ Temporary Erosion Control Logs (BIOLOGS)	☐ Temporary Erosion Control Logs (BIOLOGS)
☒ Preservation of Natural Resources	☐ Sediment Traps	☐ Permanent Vegetation (Planting, Sodding, or Seeding)
☐ Construction Exits	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ Required Action

Action No.

1. Comply with EO13112 on use of native vegetation.

2.

3.

4.

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

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.

☐ No Action Required ☒ Required Action

Action No.

1. Comply with MBTA regulations.

2.

3.

4.

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 Storm water Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☒ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

FM 3438 ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC

NO SCALE SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.			HIGHWAY NO.
6	SEE TITLE SHEET			FM 3438
STATE	COUNTY			SHEET NO.
TEXAS	TAYLOR			209
DISTRICT	CONTROL	SECTION	JOB	
ABL	2270	01	023	

PREPARED BY (NAME OF DESIGNER)
DATE: 5/26/2021
FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\

DATE: 5/26/2021
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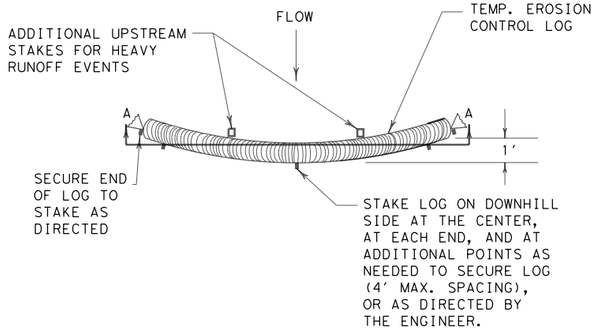
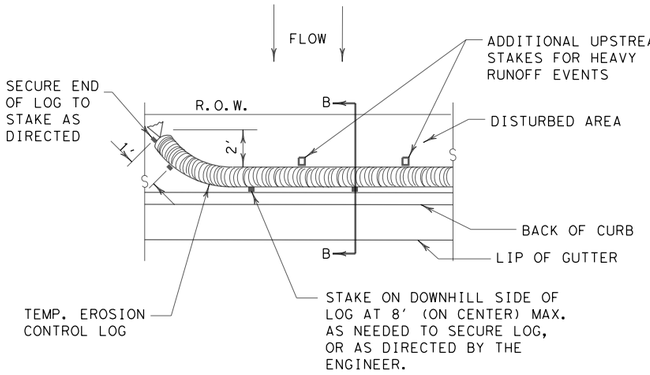


PLAN VIEW



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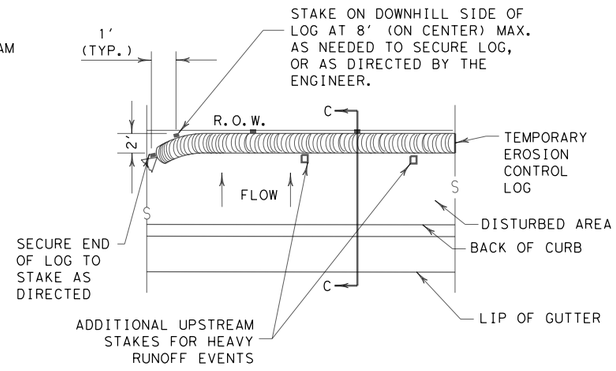
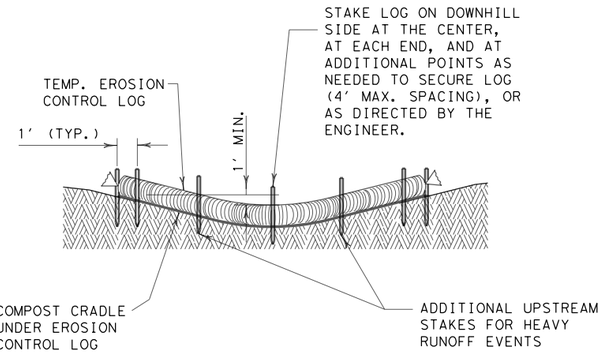


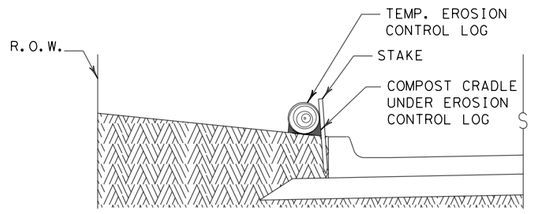
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

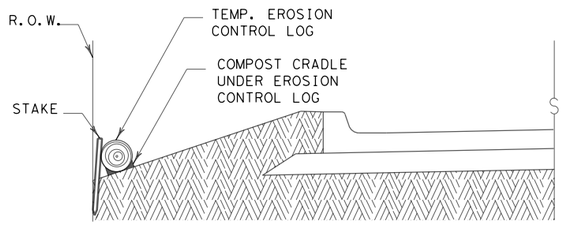
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

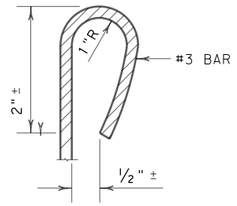
CL-BOC



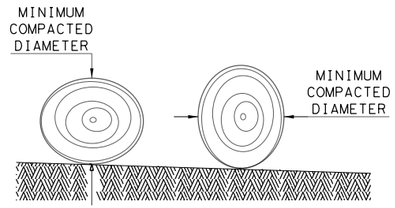
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

GENERAL NOTES:

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

LEGEND

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

SEDIMENT BASIN & TRAP USAGE GUIDELINES

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

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

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

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

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

Texas Department of Transportation | Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916		DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016		CONT	SECT	JOB		HIGHWAY	
REVISIONS		2270	01	023		FM 3438	
		DIST		COUNTY			SHEET NO.
		ABL		TAYLOR			210

DATE: 5/26/2021
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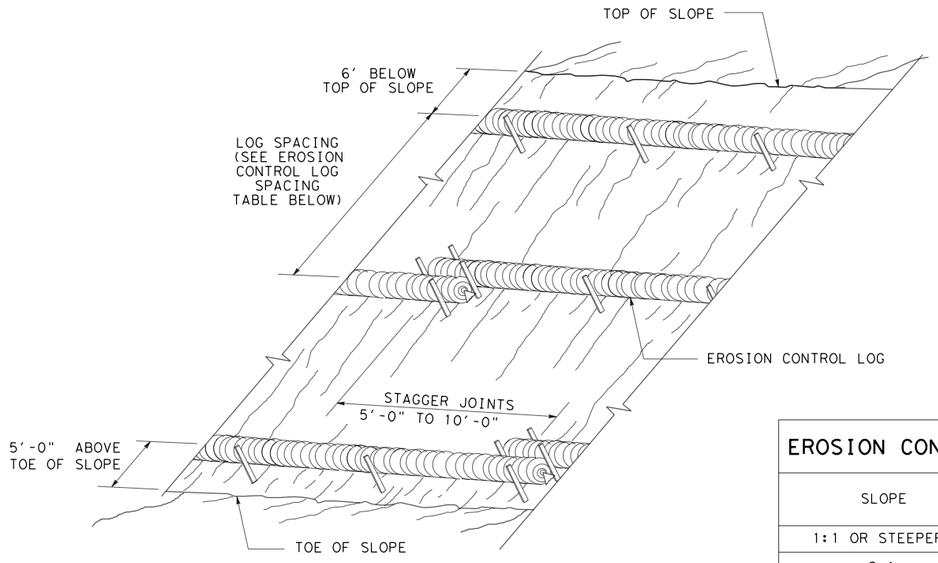
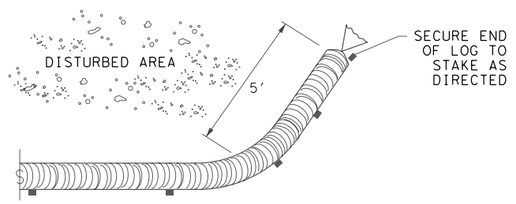


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

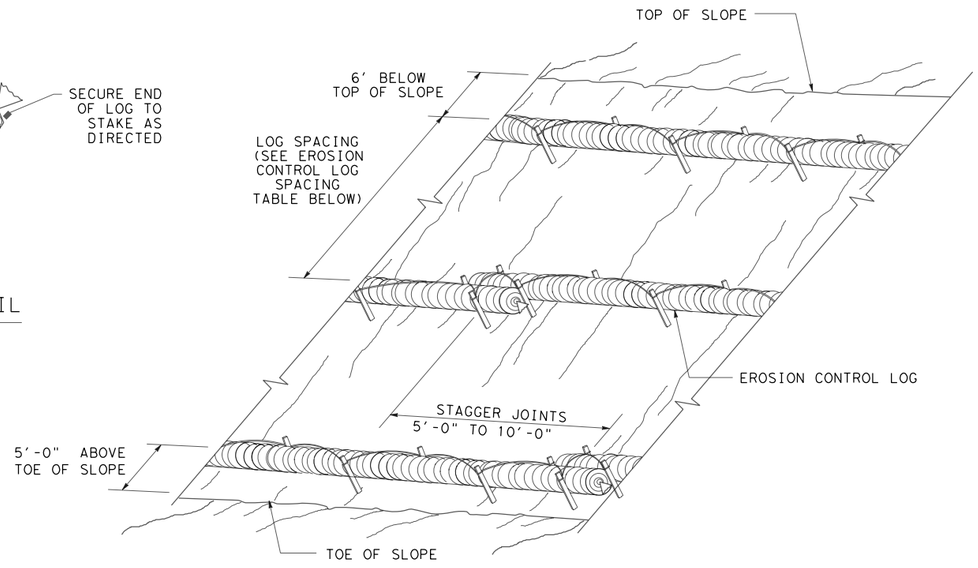
CL-SST



END SECTION RAP DETAIL

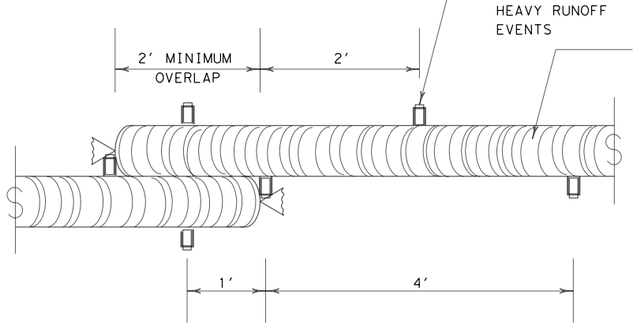
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

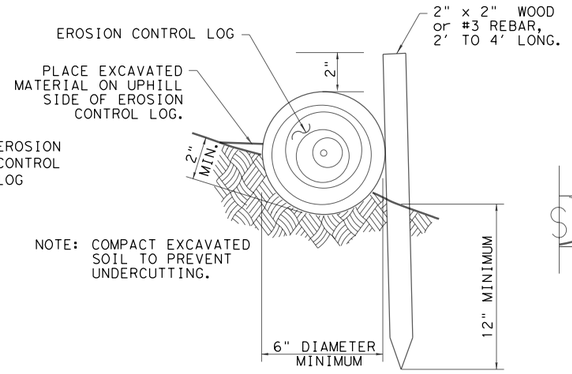
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

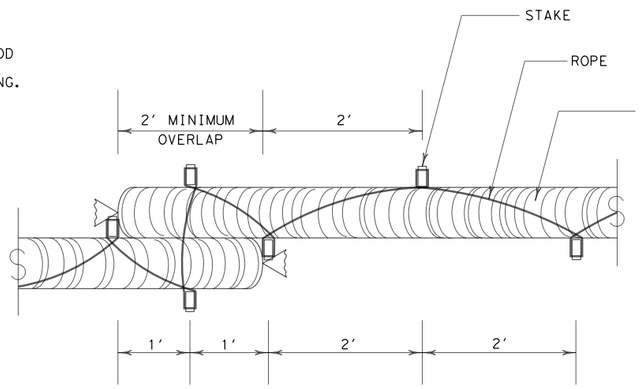




STAKE AND TRENCHING ANCHORING DETAIL

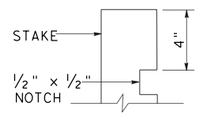
CL-SST

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

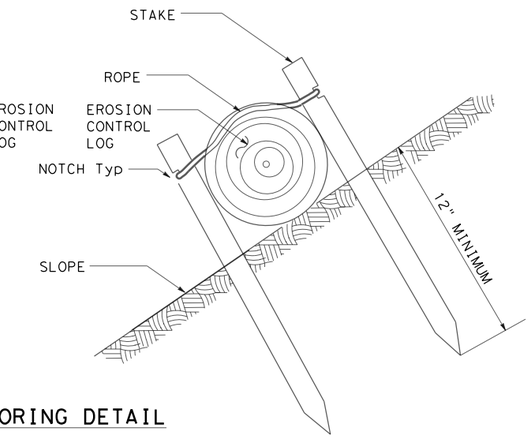


STAKE AND LASHING ANCHORING DETAIL

CL-SSL



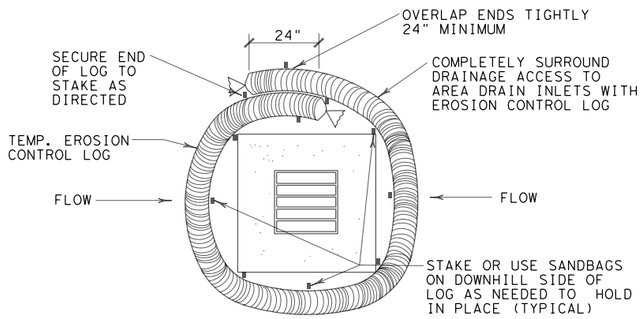
STAKE NOTCH DETAIL



Texas Department of Transportation — Design Division Standard

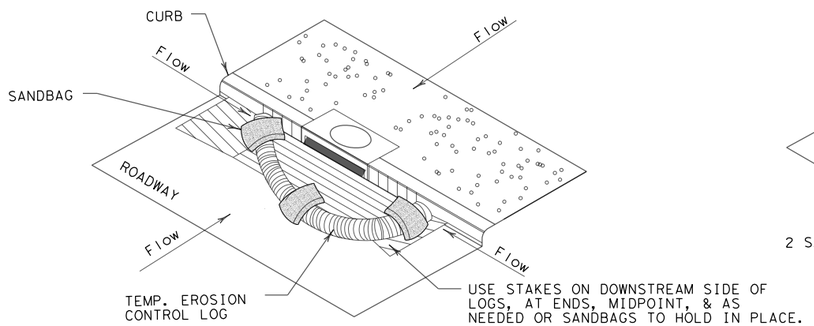
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		211



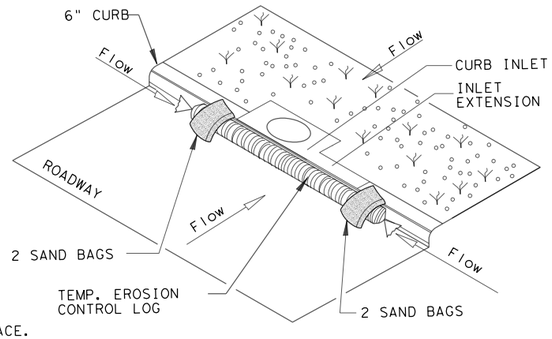
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

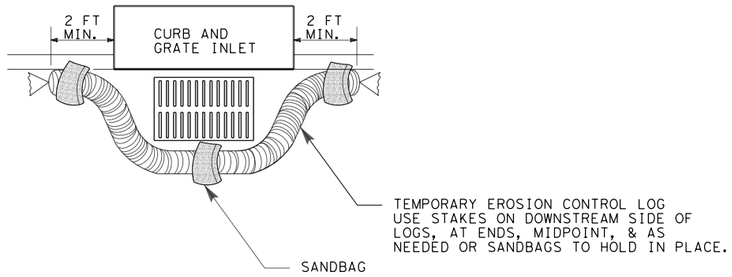
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

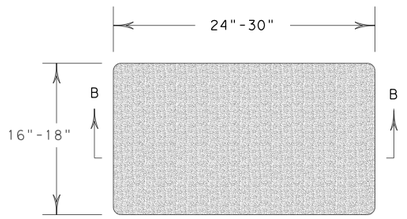
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

Texas Department of Transportation | Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	2270	01	023		FM 3438		
	DIST	COUNTY			SHEET NO.		
	ABL	TAYLOR			212		

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FILE: Z:\Transportation\TxDOT\PS&E\STATEWIDE 36-7IDP5143\FM 3438\CADD\STANDARDS\RR Scope of Work.dgn

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

DOT #: 924245U
Crossing Type: Highway Underpass
RR Company Owning Track at Crossing: UPRR
Operating RR Company at Track: UPRR
RR MP: 410.94
RR Subdivision: Baird
City: Abilene
County: Taylor
CSJ at this Crossing: 2270-01-023
Highway/Roadway name crossing the railroad: FM 3438
# of regularly scheduled trains per day at this crossing: 22
# of switching movements per day at this crossing: 1
% of estimated contract cost of work within railroad ROW: <1%

Scope of Work at this Crossing to Be Performed by State Contractor:

Work is limited to removal and replacement of pavement markings on the bridge deck above the railroad right-of-way

Scope of Work at this Crossing to Be Performed by Railroad Company:

None

** Choose: Highway Overpass, Highway Underpass, At Grade, Pedestrian, or Closed/Abandoned

II. OTHER PROJECT WORK WITHIN RAILROAD RIGHTS-OF-WAY (ROW)

None

III. FLAGGING & INSPECTION

of Days of Railroad Flagging Expected: 0

On this project, night or weekend flagging is:

☐ Expected
☒ Not Expected

Flagging services will be provided by:

☐ Railroad Company: TxDOT will pay flagging invoices
☐ Outside Party: Contractor will pay flagging invoices, to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30 day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

☐ UPRR - UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
☐ BNSF - BNSF.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
☐ KCS - KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
- Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☐ OTHERS _____

Contractor must incorporate Construction Inspection into anticipated construction schedule.

☒ Not Required

☐ Required: Contact Information for Construction Inspection:

IV. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

On this project, construction work to be performed by a railroad company is:

☐ Required
☒ Not Required

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

V. RAILROAD INSURANCE REQUIREMENTS

Railroad reference number shall be provided by TxDOT CST or DO.

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies must be issued for and on behalf of the Railroad. Where more than one Railroad Company is operating on the same right of way or where several Railroad Companies are involved and operate on their own separate rights of way, provide separate insurance policies in the name of each Railroad Company.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000 combined single limit
Railroad Protective Liability	
☐ Not Required	
☒ Non - Bridge Projects	$2,000,000 / $6,000,000
☐ Bridge Projects	$5,000,000 / $10,000,000
☐ Other	

VI. CONTRACTOR'S RIGHT OF ENTRY (ROE) AGREEMENT

On this project, an ROE agreement is:

☒ Not Required
☐ Required: TxDOT CST to assist in obtaining with the UPRR (see Item 5, Article 8.3)
☐ Required: Contractor to obtain (see Item 5, Article 8.4)
With the following railroad companies: _____

To view previously approved ROE Agreement templates agreed upon between the State and Railroad, see:

http://www.txdot.gov/inside-txdot/division/rail/samples.html

Approved ROE Agreement templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed ROE agreement between the Contractor and the Railroad if required on project.

VII. RAILROAD COORDINATION MEETING

On this project, a Railroad Coordination Meeting is:

☒ Not Required
☐ Required

See Item 5, Article 8.1 for more details.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are required to maintain the same insurance coverage as required of the Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
Call UPRR Railway
Railroad Emergency Line at 888-877-7267
Location: DOT 924245U
RR Milepost 410.94
Subdivision Baird

Texas Department of Transportation | Rail Division

RAILROAD SCOPE OF WORK

PROJECT SPECIFIC DETAILS

FILE: RR Scope of Work.dgn	DN: TxDOT	CK:	DW:	CK:	
©TxDOT June 2014	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2270	01	023	FM 3438	
3/2020	DIST	COUNTY		SHEET NO.	
	ABL	TAYLOR		213	

PART 1 - GENERAL

1.01 DESCRIPTION

This project includes construction work within the right of way and/or properties of the Railroad and adjacent to its tracks, wire lines and other facilities. These sheets describe the minimum special requirements for coordination with the Railroad when working upon, over or under Railroad Right of Way or when impacting current or future Railroad operations. Coordinate with the Railroad while performing the work outlined herein, and afford the same cooperation with the Railroad as with TxDOT. Complete all submittals and work in accordance with TxDOT Standard Specifications, Railroad Guidelines and AREMA recommendations as modified by these minimum special requirements or as directed in writing by the Railroad Designated Representative.

For purposes of this project, the Railroad Designated Representative is the person or persons designated by the Railroad Manager of Industry and Public Projects to handle specific tasks related to the project.

1.02 REQUEST FOR INFORMATION / CLARIFICATION

Submit Requests for Information ("RFI") involving work within any Railroad Right of Way to the TxDOT Engineer. The TxDOT Engineer will submit the RFI to the Railroad Designated Representative for review and approval for RFI's corresponding to work within Railroad Right of Way. Allow six (6) weeks total time for review and approval, which includes four (4) weeks for review and approval by the Railroad.

1.03 PLANS / SPECIFICATIONS

TxDOT has received written Railroad approval of the plans and specifications for this project. Any revisions or changes in the plans after award of the Contract must have the approval of TxDOT and the Railroad.

PART 2 - UTILITIES AND FIBER OPTIC

Construct all utility installations in accordance with current AREMA recommendations, Railroad, TxDOT and owning utility specifications and requirements. Railroad general guidelines can be found on the Railroad website or by contacting the Railroad Designated Representative.

PART 3 - CONSTRUCTION

3.01 GENERAL

A. Perform all work in compliance with all applicable Railroad, Federal Railroad Administration (FRA), and TxDOT rules and regulations. Arrange and conduct work in a manner that does not endanger or interfere with the safe operation of the tracks and property of the Railroad and the traffic moving on such tracks, or the wires, signals and other property of the Railroad, its tenants or licensees, at or in the vicinity of the Work. The safe operation of railroad train movements takes precedence over any work to be performed by the Contractor. The Contractor is responsible for train delay cost and lost revenue claims due to any delays or interruption of train operations resulting from Contractor's construction or other activities.

B. Construction activities within 15 feet of the operational tracks will only be allowed if absolutely necessary and the Railroad's Designated Representative grants approval. Construction activities within 15 feet of the operational track(s) preferably allow the tracks to stay operational. In such cases, coordination and approval by the Railroad Track Manager is required with regard to schedule, flagging, and slow orders. See Sections 3.07 and 3.08 for additional information.

C. Provide track protection for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail. When not in use, keep Contractor machinery and materials at least 50 feet from the Railroad's nearest track.

D. Vehicular crossings of railroad track are allowed only at existing crossings, or haul road crossings developed with Railroad approval.

E. The Contractor is also advised that new railroad facilities within the project may be built by the Railroad. If applicable, these facilities are delineated in the plans. Be aware of the limits of responsibilities and coordinate efforts with the Railroad and TxDOT.

F. Railroad requirements do not allow work within 50 feet of track centers when a train passes the work site and all personnel must clear the area within 50 feet of the track centerline and secure all equipment. Additional allowances may be pursued as outlined in 3.02 and 3.03.

G. All permanent clearances shall be verified before project closing.

3.02 RAILROAD OPERATIONS

A. Trains and/or equipment are expected on any track, at any time, in either direction. Become familiar with the train schedules in this location and structure bid assuming intermittent track windows in this period, as defined in Paragraph B that follows.

B. All railroad tracks within and adjacent to the contract site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. Coordinate and schedule the work so that construction activities do not interfere with railroad operations.

C. Coordinate work windows with TxDOT and the Railroad's Designated Representative. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:

1. Conditional Work Window: A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and/or adjacent to the railroad tracks within 25 feet of the nearest track, a railroad flag person will be required. At the direction of the railroad flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the Railroad Designated Representative, from the tracks). Conditional Work Windows are available for the Project.

2. Absolute Work Window: An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame, the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window, the railroad tracks and/or signals must be completely operational for train operations and all Railroad, Public Utilities Commission (PUC) and FRA requirements, codes and regulations for operational tracks must be satisfied. In the situation where the operating tracks and/or signals have been affected, the Railroad will perform inspections of the work prior to placing that track back into service. Railroad flag persons will be required for construction activities requiring an Absolute Work Window. Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for Railroad review.

3.03 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES

A. Do not perform any work within Railroad Right of Way without a valid executed Right of Entry Agreement if required on this project.

B. Give advance notice to the Railroad as required in the "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over Railroad Right of Way and observe the Railroad's rules and regulations with respect thereto.

C. Perform all work upon Railroad Right of Way in a manner to avoid interference with or endanger the operations of the Railroad. Whenever work may affect the operations or safety of trains, submit the work method to the Railroad Designated Representative for approval. Approval does not relieve the Contractor from liability. Do not commence any work which requires flagging service or inspection service until the flagging protection required by the Railroad is available at the job site. See Section 3.15 for railroad flagging requirements.

D. Make requests in writing for both Absolute and Conditional Work Windows, at least 30 days in advance of any work. Include in the written request:
1. Exactly what the work entails.
2. The days and hours that work will be performed.
3. The exact location of work, and proximity to the tracks.
4. The type of window requested and the amount of time requested.
5. The designated contact person.

Provide a written confirmation notice to the Railroad at least 48 hours before commencing work in connection with approved work windows when work is within 25 feet of nearest rail. Perform all work in accordance with previously approved work plans.

E. Make provisions to protect operations and property of the Railroad should a condition arising from, or in connection with the work, require immediate and unusual action. If in the judgment of the Railroad Designated Representative such provisions are insufficient, the Railroad Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at the Contractor's expense and without cost to the Railroad or TxDOT. The Railroad or TxDOT shall have the right to order the Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of the Railroad Designated Representative, the Contractor's operations could endanger railroad operations. In the event of such an order, immediately notify TxDOT of the order.

3.04 INSURANCE

Do not begin work upon or over Railroad Right of Way until furnishing the Railroad with the insurance policies, binders, certificates and endorsements required by the "Contractor's Right of Entry Agreement", and until the Railroad Designated Representative has advised TxDOT that such insurance is in accordance with the Agreement.

3.05 RAILROAD SAFETY ORIENTATION

A. Complete the railroad course "Orientation for Contractor's Safety", and maintain current registration prior to working on railroad property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

"UPRR, BNSF, KCS/TEXMEX will not accept on-track safety training certificates from other railroads. Refer to Railroad specific contractor right of entry for training information."

B. Know and follow the "Contractor's Right of Entry Agreement" EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

3.06 COOPERATION

The Railroad will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of Railroad Right of Way in performing the work.

3.07 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES

Abide by the following minimum temporary clearances during the course of construction:
A. 15' - 0" (BNSF)(UPRR)and 14'-0" (KCS) horizontal from centerline of track
B. 22' (KCS) and 21' - 6" (UPRR & BNSF) vertically above top of rail.

For construction clearance less than listed above, obtain local Railroad Operating Unit review and approval.

3.08 APPROVAL OF REDUCED CLEARANCES

A. Maintain minimum track clearances during construction as specified in Section 3.07.

B. Submit any proposed infringement on the specified minimum clearances to the Railroad Designated Representative through TxDOT at least 30 days in advance of the work. Do not proceed with such infringement without written approval by the Railroad Designated Representative.

C. Do not commence work involving an approved infringement without receiving written assurance from the Railroad Designated Representative that arrangements have been made for any necessary flagging service.

Texas Department of Transportation | Rail Division

RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

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REVISIONS March 2020	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		214

DATE: 5/26/2021 10:36:31 AM
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3.09 MAINTENANCE OF RAILROAD FACILITIES

A. Maintain all ditches and drainage structures free of silt or other obstructions resulting from Contractor's operations. Repair eroded areas and any other damage within Railroad Right of Way and repair any other damage to the property of the Railroad, or its tenants.

B. Perform all such maintenance and repair of damages due to the Contractors's operations at Contractor's expense.

C. Submit a proposed method of erosion control for review by the Railroad prior to beginning any grading on the project site. Comply with all applicable local, state and federal regulations when developing and implementing such erosion control.

3.10 SITE INSPECTIONS BY RAILROAD's DESIGNATED REPRESENTATIVE

A. In addition to the office reviews of construction submittals, site inspections may be performed by the Railroad Designated Representative at significant points during construction, including the following if applicable:
   1. Pre-construction meetings.
   2. Pile driving/drilling of caissons or drilled shafts.
   3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.
   4. Erection of precast concrete or steel bridge superstructure.
   5. Placement of waterproofing (prior to placing ballast on bridge deck).
   6. Completion of the bridge structure.

B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by the Railroad.

C. Provide a detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to TxDOT for submittal to the Railroad Designated Representative for review prior to commencement of work. Include the anticipated dates when the above listed events will occur. Update this schedule for the above listed events as necessary and each month at a minimum to allow the Railroad to schedule site inspections.

3.11 RAILROAD REPRESENTATIVES

Railroad representatives, conductors, flag person or watch person will be provided by the Railroad at expense of TxDOT to protect Railroad facilities, property and movements of its trains or engines. In general, the Railroad will furnish such personnel or other protective services as follows:

A. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from nearest rail of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.

B. For any excavation below elevation of track subgrade if, in the opinion of the Railroad Designated Representative, track or other railroad facilities may be subject to settlement or movement.

C. During any clearing, grubbing, excavation or grading in proximity to railroad facilities, which, in the opinion of the Railroad Designated Representative, may endanger railroad facilities or operations.

D. During any Contractor's operations when, in the opinion of the Railroad Designated Representative, railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.

E. Arrange with the Railroad Designated Representative to provide the adequate number of flag persons to accomplish the work.

3.12 COMMUNICATIONS AND SIGNAL LINES

If required, the Railroad will rearrange its communications and signal lines, its grade crossing warning devices, train signals and tracks, and facilities that are in use and maintained by the Railroad's forces in connection with its operation at expense of TxDOT. This work by the Railroad will be done by its own forces and it is not a part of the Work under this Contract.

3.13 TRAFFIC CONTROL

Coordinate any operations that control traffic across or around railroad facilities with the Railroad Designated Representative.

3.14 CONSTRUCTION EXCAVATIONS AND BORING ACTIVITIES UNDER TRACK

A. Take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of TxDOT, OSHA, AREMA and Railroad "Guidelines for Temporary Shoring".

B. The project plans indicate whether there are fiber optic lines or other such telecommunications systems that require consideration. Regardless, contact the necessary call center to determine if such cable systems are present:

   UPRR 1-800-336-9193
   7:00 AM to 9:00 PM CST Monday-Friday except holidays,
   staffed 24 hrs/day for emergencies
   48 hrs notice required

   BNSF 1-800-533-2891
   24 hour number
   5 working days notice required

   KCS 1-800-344-8377
   Texas One Call, a 24 hour number
   48 hrs notice required, excluding weekends and holidays

   If a telecommunications system is buried anywhere on or near railroad property, coordinate with TxDOT, the Railroad and the Telecommunication Company(ies) to arrange for relocation or protective measures prior to beginning work on or near railroad property. Refer to the project General Notes for additional information.

C. Projects involving a boring or jack and bore operation under track such as drainage pipes or culverts and utilities require an installation plan reviewed and approved by the Railroad and TxDOT prior to proceeding with such construction. A railroad inspector and contractor assisted monitoring of ground and track movement is required to maintain safe passage of rail traffic. Stop installation and do not allow passage of trains if movements in excess of 1/4 inch vertical or horizontal is detected in the tracks. Immediately repair the damage to the satisfaction of TxDOT and the Railroad before proceeding.

3.15 RAILROAD FLAGGING

Per the Right of Entry Agreement for flagging, notify the Railroad Representative at least 10 working days in advance of Contractor's work and at least 30 working days in advance of any Contractor's work in which any person or equipment will be within 25 feet of nearest rail or as specified in the Contractor Right of Entry (CROE).

3.16 CLEANING OF RIGHT-OF-WAY

When work is complete, remove all tools, implements, and other materials brought into Railroad Right of Way and leave the right of Way in a clean and presentable condition to the satisfaction of TxDOT and the Railroad.

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RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

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REVISIONS March 2020	2270	01	023	FM 3438
	DIST	COUNTY		SHEET NO.
	ABL	TAYLOR		215