FED.RD. DIV.NO.	STATE PROJECT NO.		SHEET NO.
6	C 2304-2-44		1
STATE	DIST.	COUNTY	
TEXAS	WACO	BELL	
CONT.	SECT.	JOB	HIGHWAY NO.
2304	02	044	FM 2410

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SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

STATE PROJECT NUMBER C 2304-2-44

BELL COUNTY

FM 2410

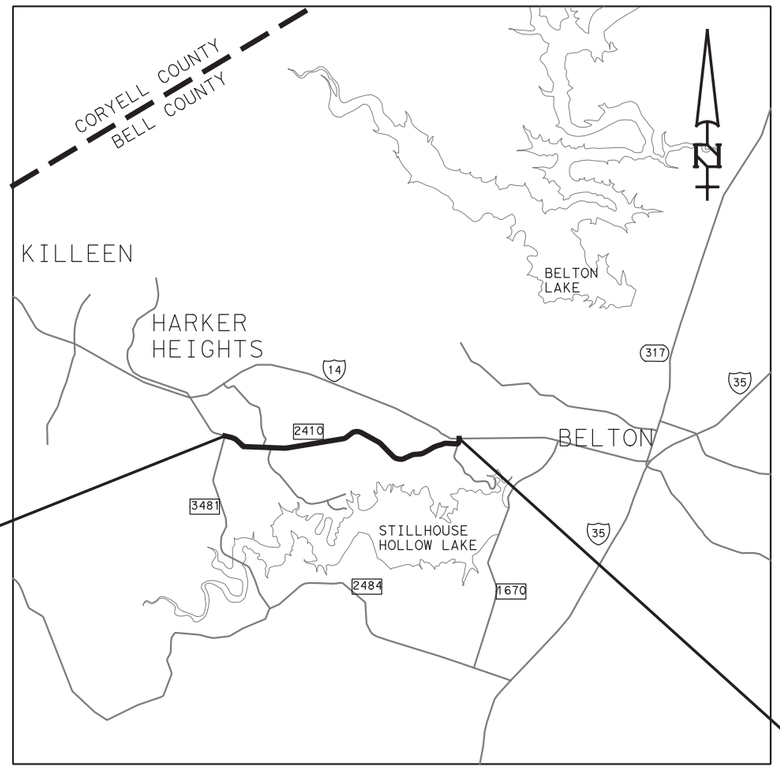
DESIGN SPEED = 40 MPH (FM 2410)

2023 ADT = 5,100
2043 ADT = 7,700

TOTAL LENGTH OF PROJECT =				
	ROADWAY	= 35,443.26 FT.	=	6.713 MI.
	BRIDGE	= 0.00 FT.	=	0.000 MI.
	TOTAL	= 35,443.26 FT.	=	6.713 MI.

CSJ 2304-02-044
LIMITS: FROM FM 3481 TO IH 14

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



VICINITY MAP

BEGIN PROJECT
CSJ 2304-02-044
STA 236+53.15
MP=8.409
TRM=542+0.256

END PROJECT
CSJ 2304-02-044
STA 590+96.41
MP=15.065
TRM=548+0.919

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSING: NONE

2 2 0 2 4
HORIZONTAL SCALE: 1" = 4 MI.

NOTE:
SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION , NOVEMBER 1, 2014, AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, PROVISIONS FOR ALL STATE CONSTRUCTION PROJECTS. (SP000-008)

FIRM REGISTRATION NO. F-230
tnp
teague nall & perkins

SUBMITTED FOR LETTING 12/15/2022
Daniel P. McCullough P.E.
DANIEL P. McCULLOUGH, P.E.

Texas Department of Transportation
© 2023

RECOMMENDED FOR LETTING 12/15/2022
DocuSigned by:
Stephen Michael Vasley P.E.
8597DEC5B49C452..
AREA ENGINEER

RECOMMENDED FOR LETTING 12/19/2022
Victor Henkel P.E.
DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 12/19/2022
DocuSigned by:
Stanley Swiatek
B69BD7960D564C9..
DISTRICT ENGINEER

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DATE: 12/15/2022 9:29:37 AM kkhatri

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20 - 24	TYPICAL SECTIONS
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26, 26A-26C	ESTIMATE & QUANTITY
27, 27A - 27F	SUMMARY OF QUANTITIES
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JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
1/5/2023

* THE STANDARD SHEETS SPECIFICALLY INDENTIFIED HAVE BEEN SELECTED BY ME OR UNDER MY REPSONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT

JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
1/5/2023

** THE STANDARD SHEETS SPECIFICALLY INDENTIFIED HAVE BEEN SELECTED BY ME OR UNDER MY REPSONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT

SAHAS SHRESTHA
116045
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
01/04/2023

*** THE STANDARD SHEETS SPECIFICALLY INDENTIFIED HAVE BEEN SELECTED BY ME OR UNDER MY REPSONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

INDEX OF SHEETS

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	2
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RJ				

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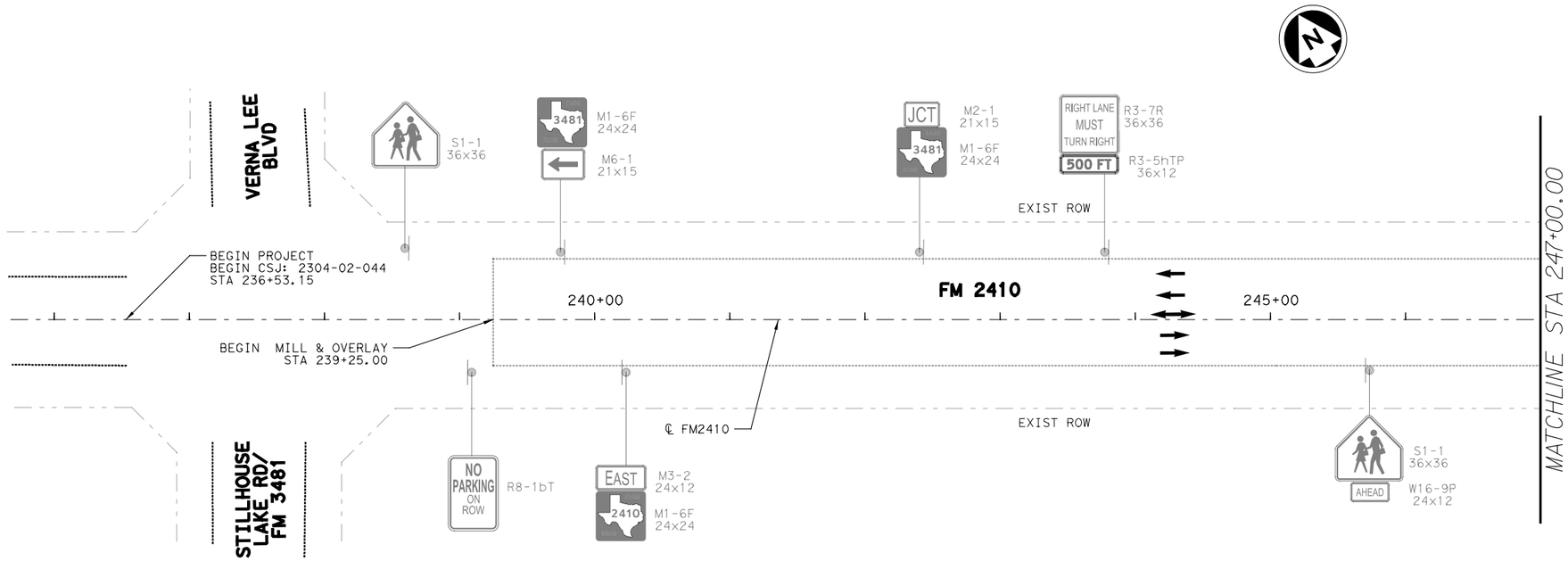

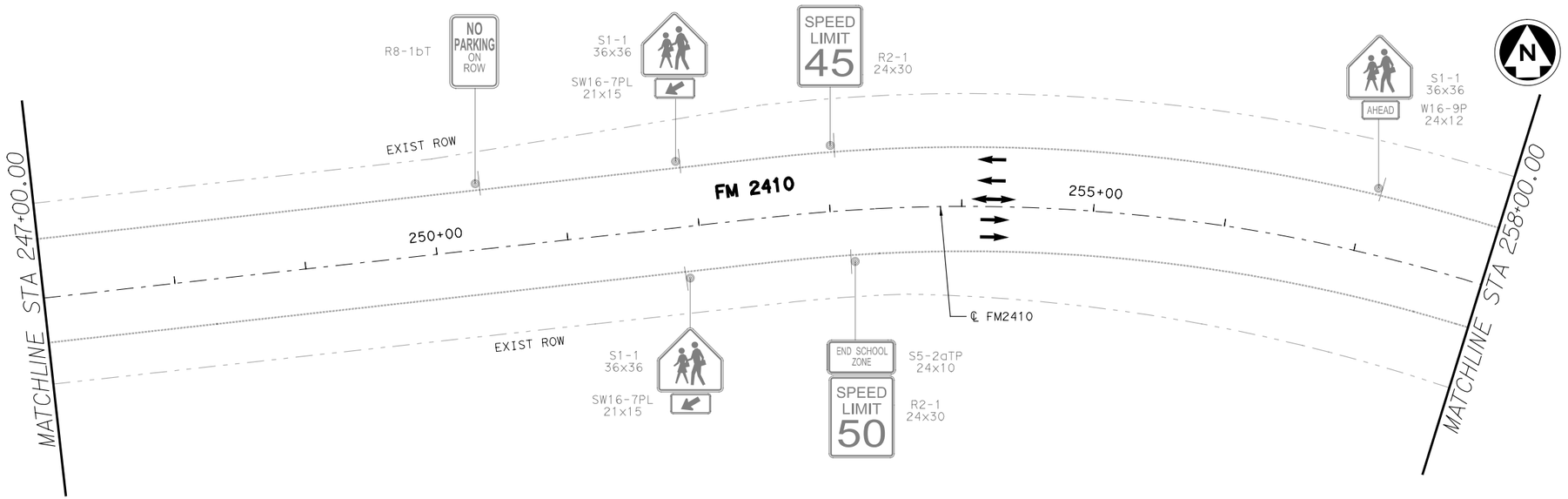

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

NOTE:
EXISTING SIGNS ARE TO BE REMOVED AND REPLACED, UNLESS OTHERWISE NOTED.

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◎ LOCATION AND SPACINGS OF DRUMS TO COMPLY WITH D&OM(3)-20. FOR TEMPORARY, INSTALL ORANGE CHEVRONS CWI-8 SUBSIDIARY TO ITEM 502 ON DRUMS.

DISCLAIMER:

BASE TOPO INFORMATION HAS NOT BEEN SURVEYED AND IS BASED ON SATELLITE IMAGERY FROM BEGIN PROJECT TO STA 258+33.00. BASE TOPO IS APPROXIMATE. CONTRACTOR TO FIELD VERIFY WITHIN THIS LIMIT.

STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED
PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

EXISTING PROJECT LAYOUT

BEGIN PROJECT TO STA 258+00.00

(SHEET 1 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	3
RS				
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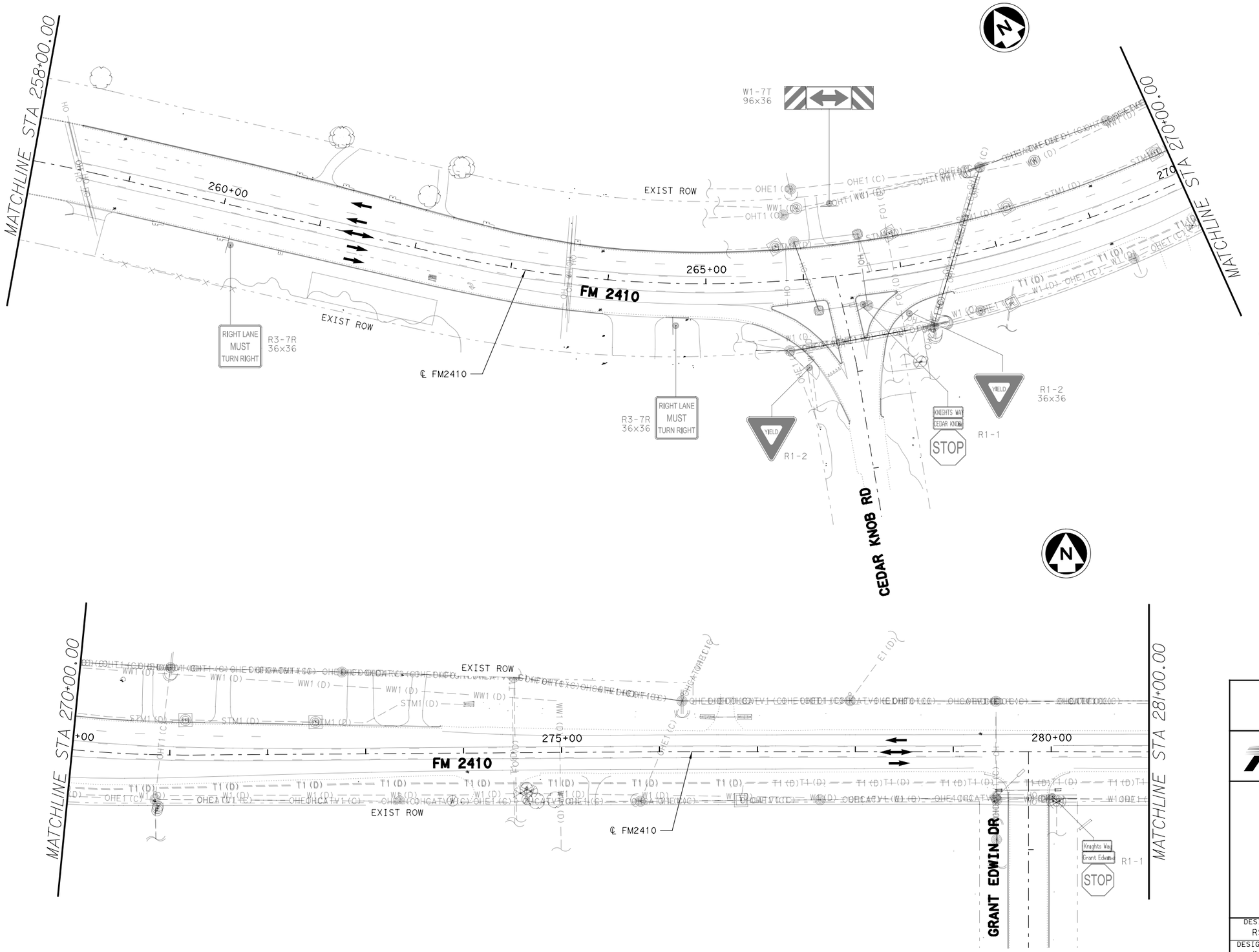

50 25 0 50 100

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STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

EXISTING PROJECT LAYOUT

STA 258+00.00 TO STA 281+00.00

(SHEET 2 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
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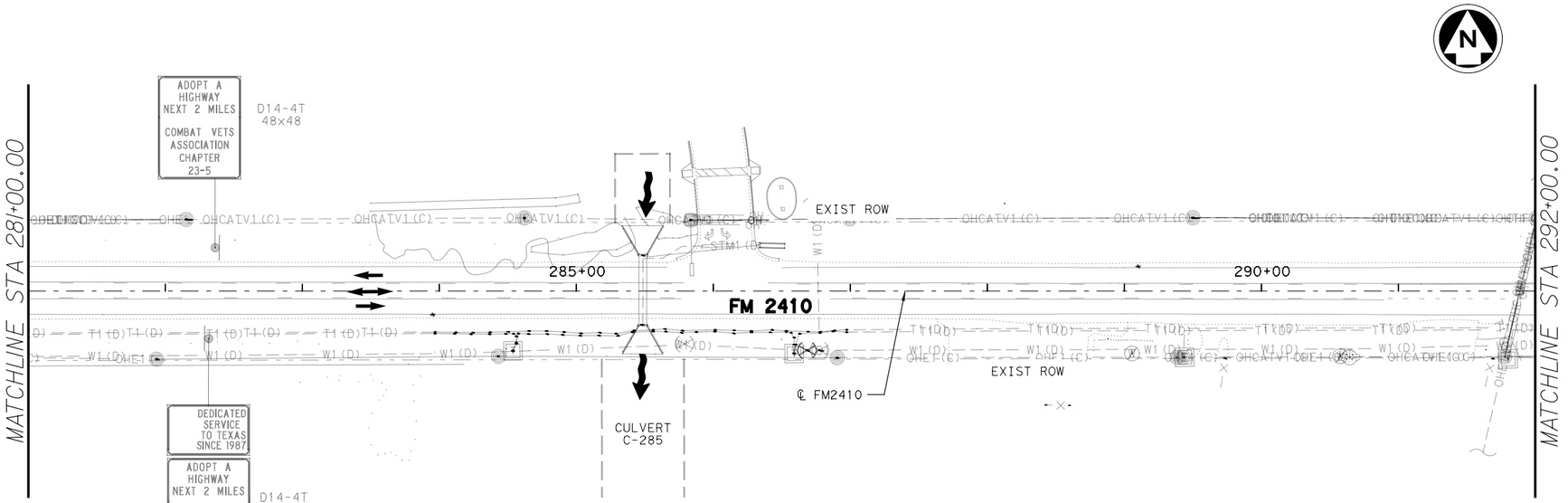

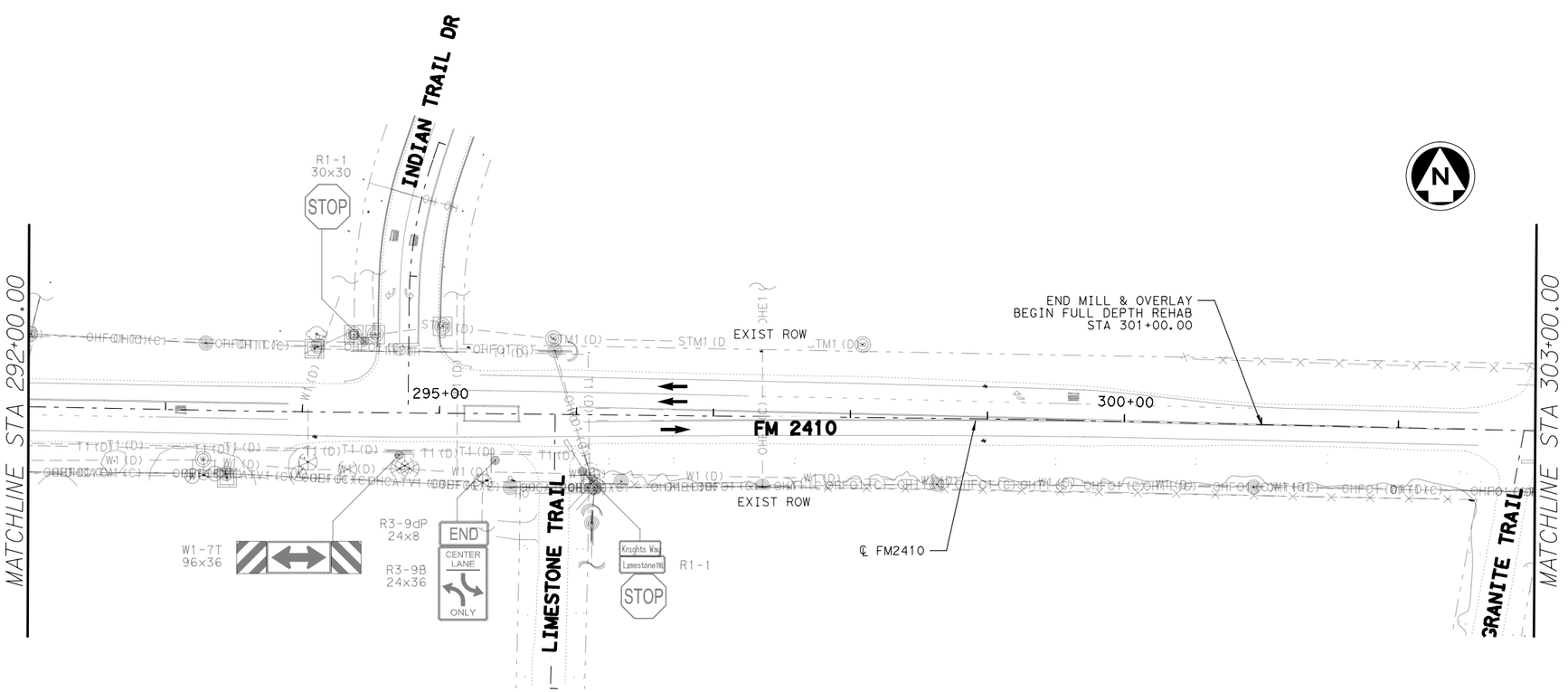

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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1/4/2023

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FM 2410

EXISTING PROJECT LAYOUT

STA 281+00.00 TO STA 303+00.00

(SHEET 3 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
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GRAPHICS	CONTROL	SECTION	JOB	
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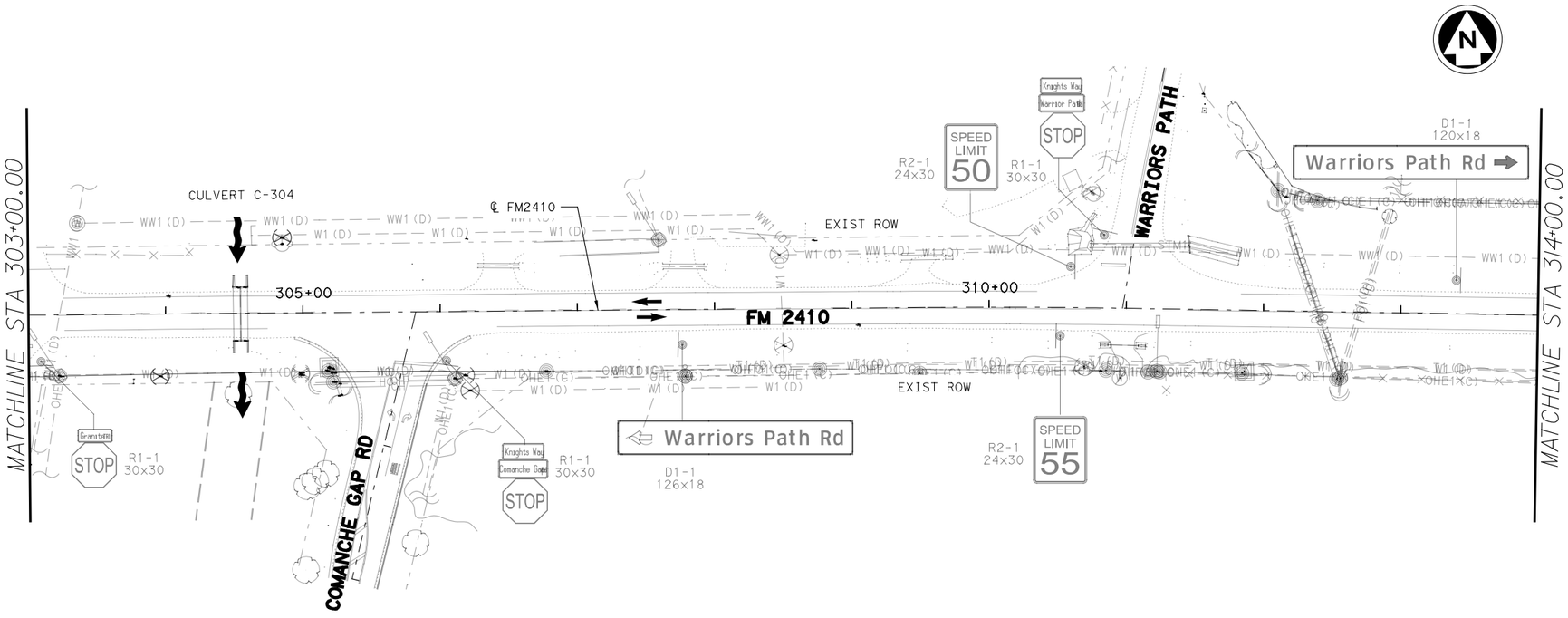

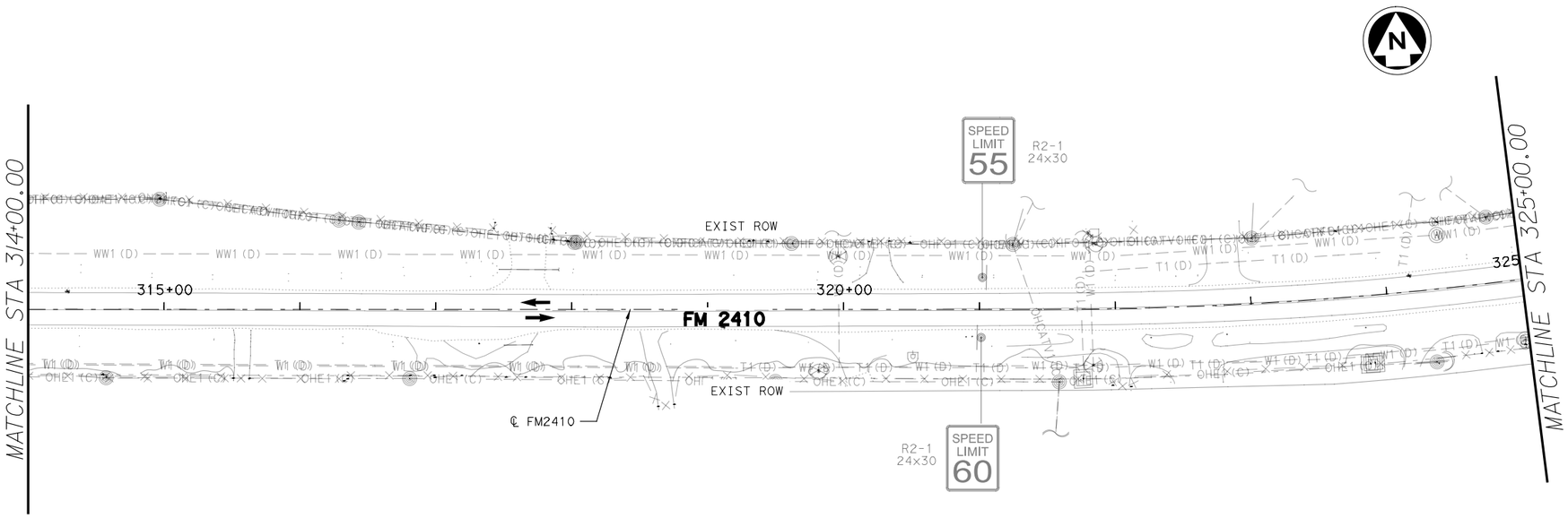

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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STATE OF TEXAS
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1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

EXISTING PROJECT LAYOUT

STA 303+00.00 TO STA 325+00.00

(SHEET 4 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	6
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GRPH CHECK	2304	02	044	
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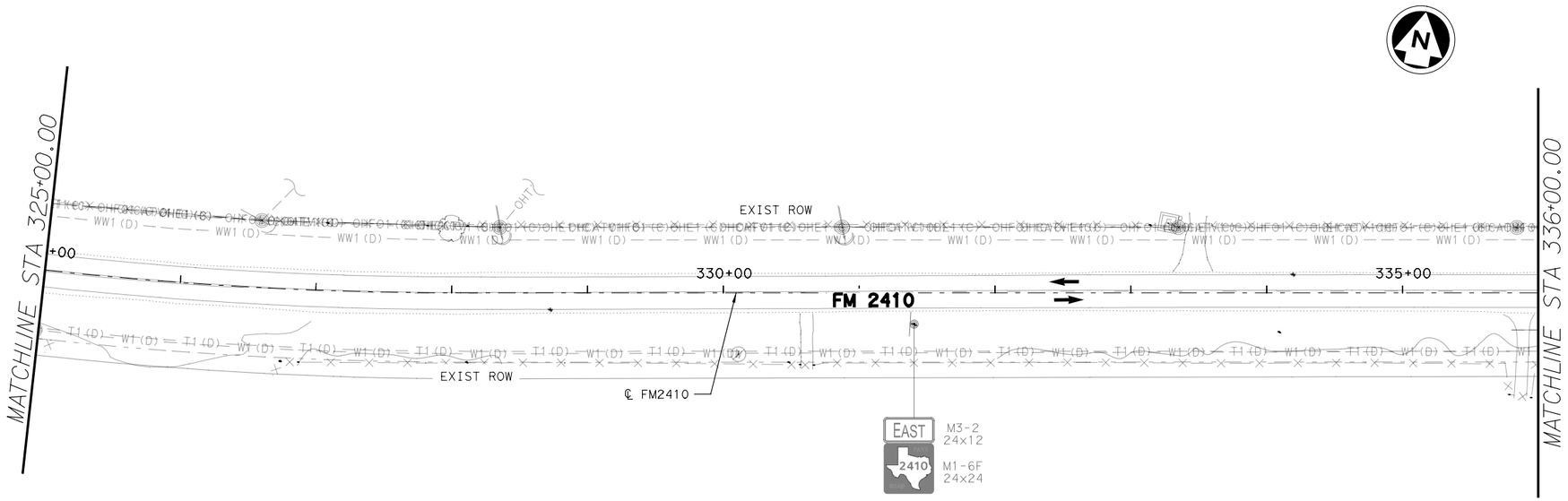

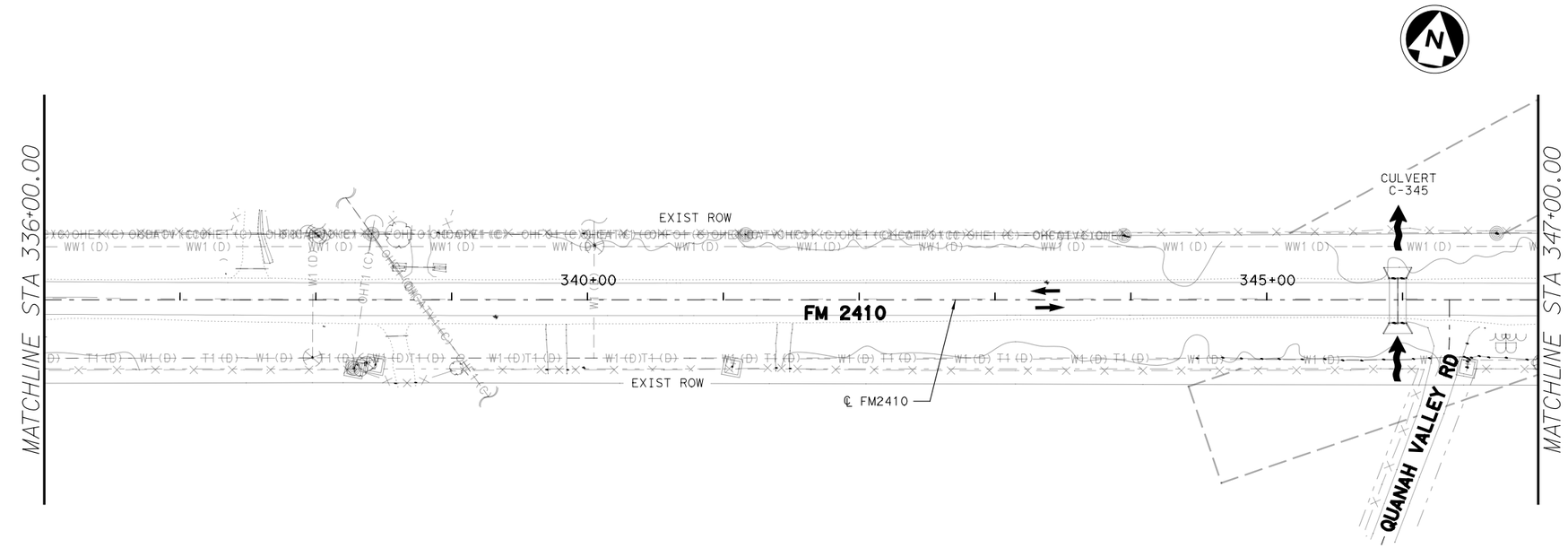

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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◎ LOCATION AND SPACINGS OF DRUMS TO COMPLY WITH D&OM(3)-20. FOR TEMPORARY, INSTALL ORANGE CHEVRONS CWI-8 SUBSIDIARY TO ITEM 502 ON DRUMS.

STATE OF TEXAS
JASMINE M. PANSURIYA
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LICENSED
PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation
© 2023

FM 2410

EXISTING PROJECT LAYOUT

STA 325+00.00 TO STA 347+00.00

(SHEET 5 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
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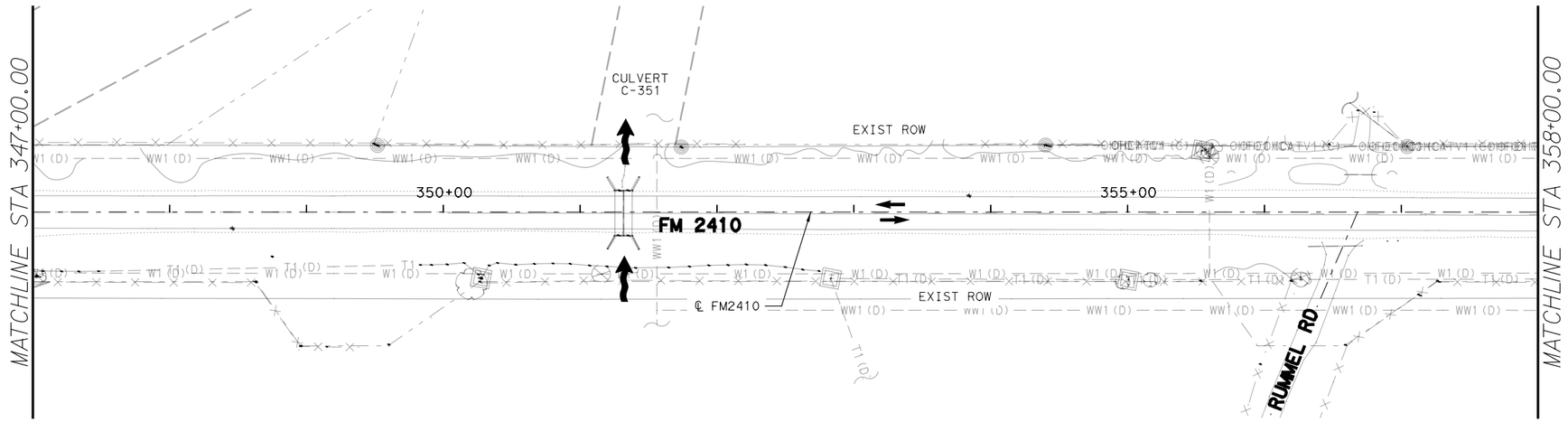

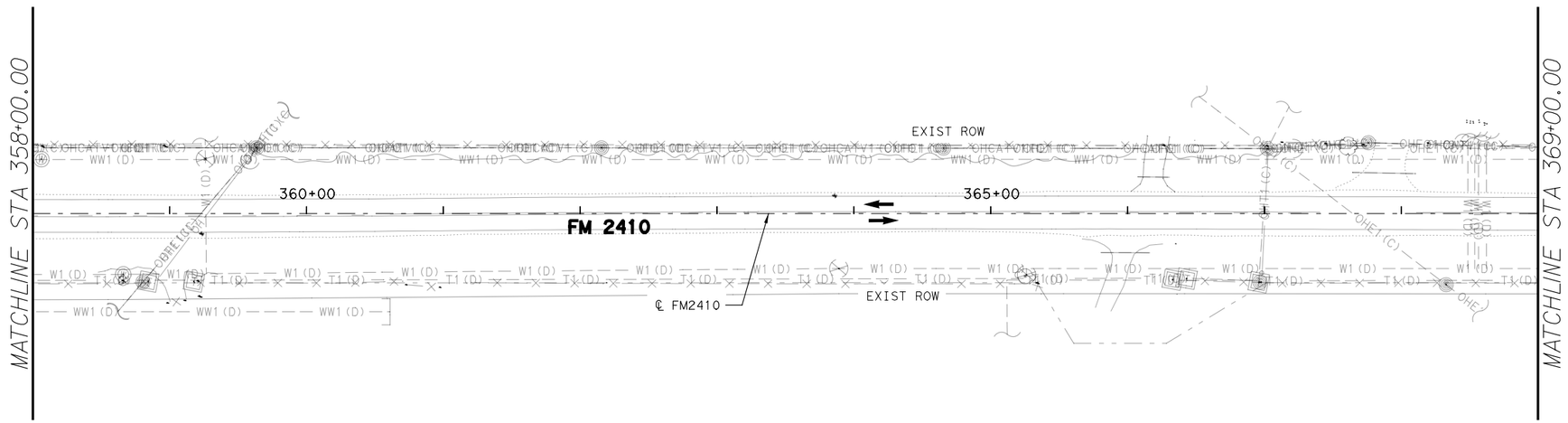

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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STATE OF TEXAS
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132941
LICENSED
PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

EXISTING PROJECT LAYOUT

STA 347+00.00 TO STA 369+00.00

(SHEET 6 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	8
RS				
GRPH CHECK	2304	02	044	
JMP				

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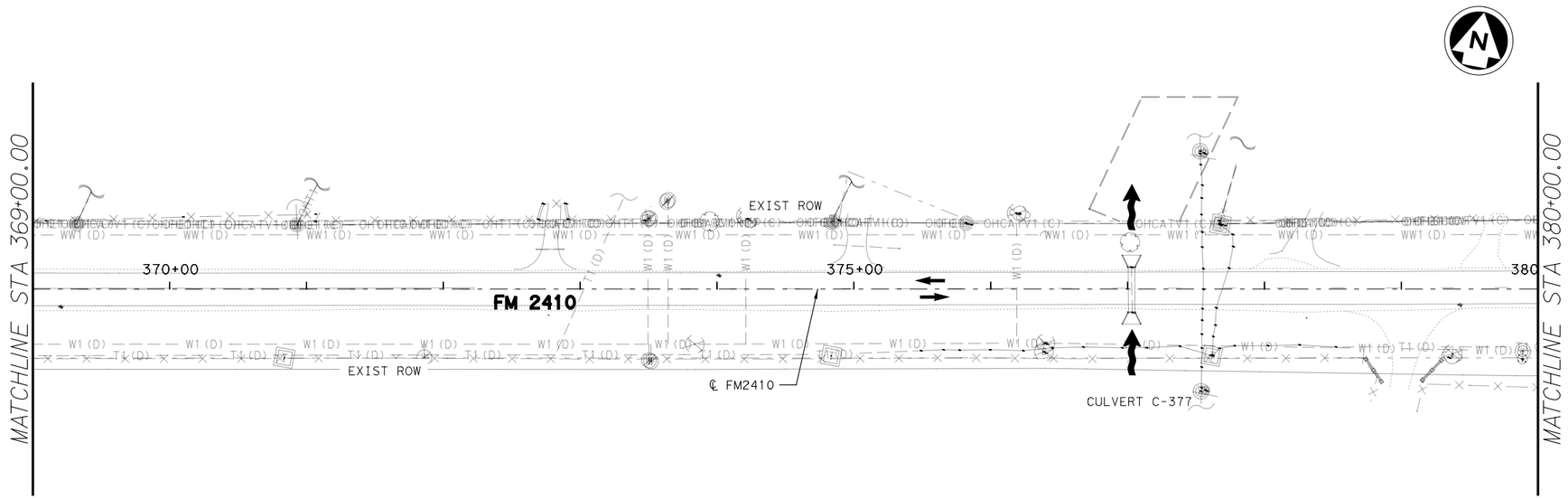

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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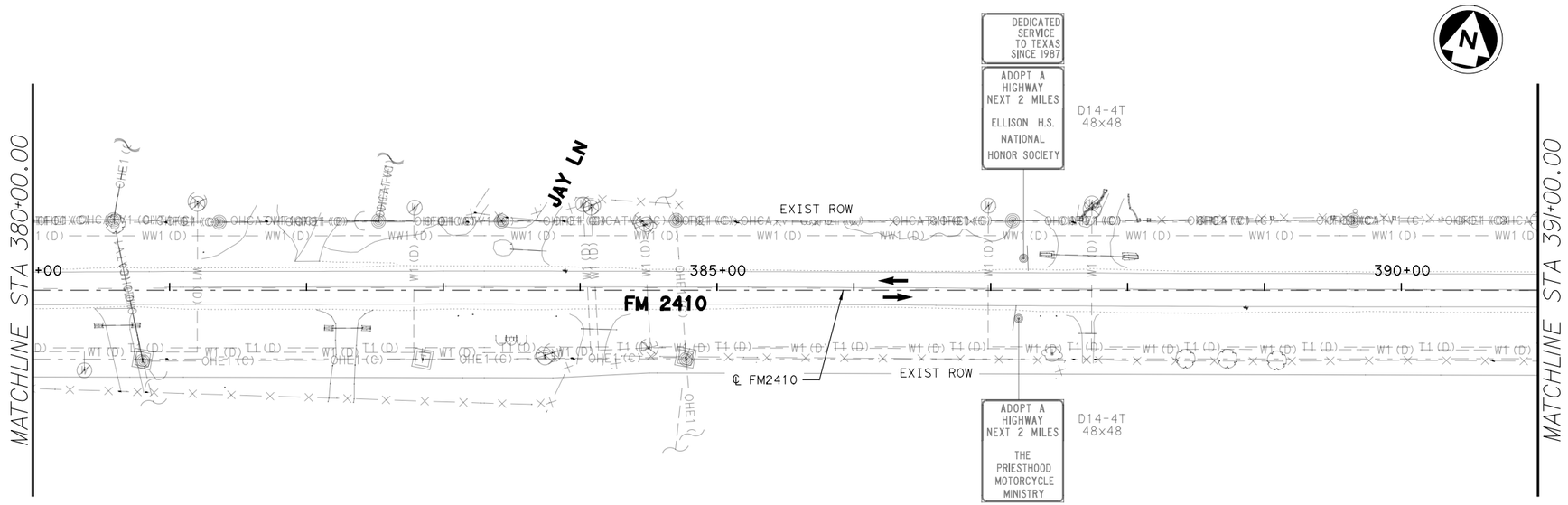
◎ LOCATION AND SPACINGS OF DRUMS TO COMPLY WITH D&OM(3)-20. FOR TEMPORARY, INSTALL ORANGE CHEVRONS CWI-8 SUBSIDIARY TO ITEM 502 ON DRUMS.



STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

EXISTING PROJECT LAYOUT

STA 369+00.00 TO STA 391+00.00

(SHEET 7 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	9
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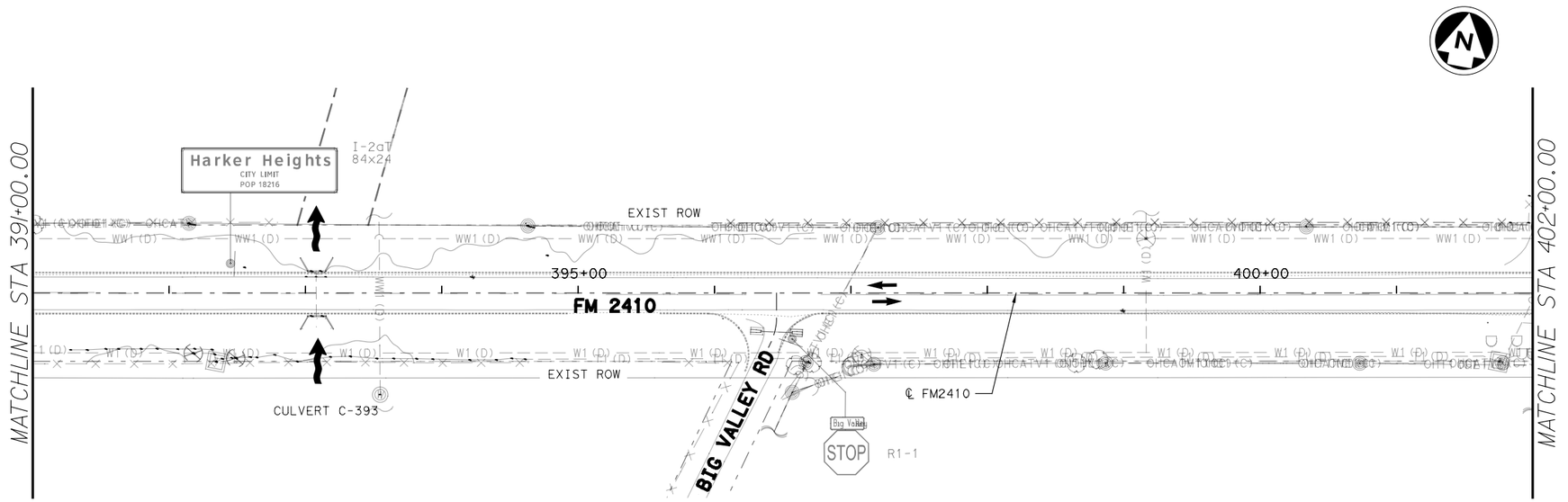

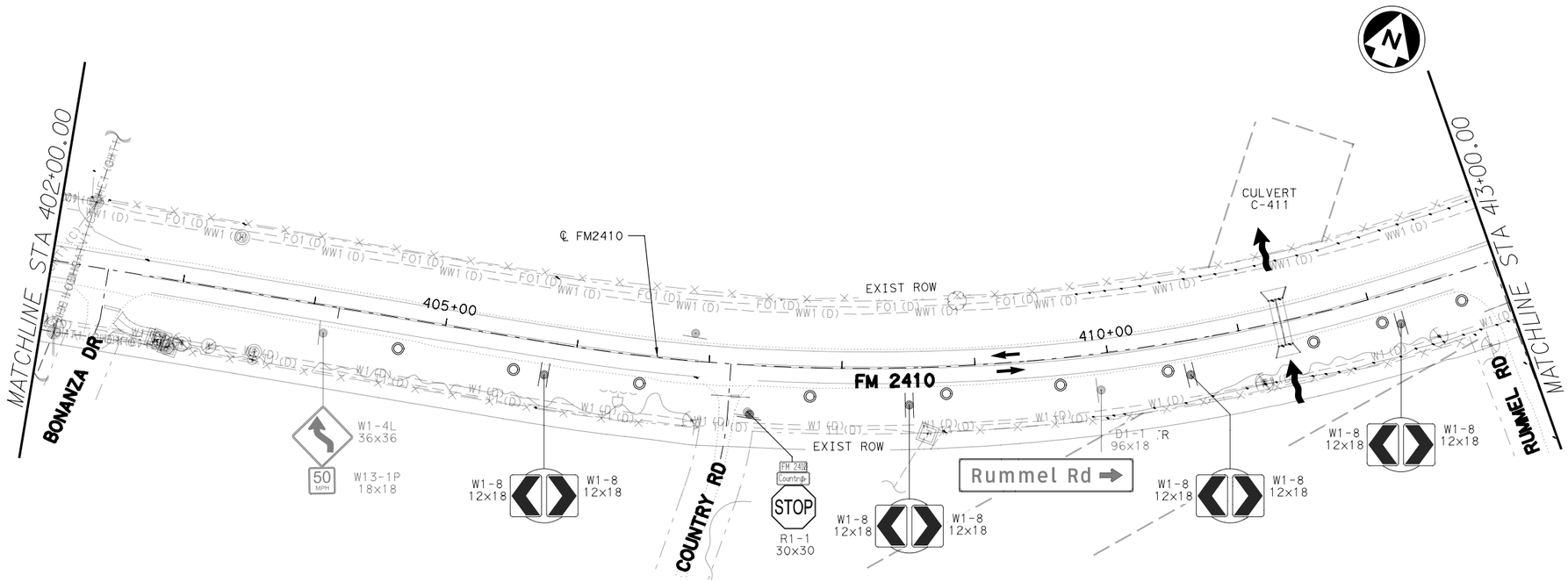

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED
PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

EXISTING PROJECT LAYOUT

STA 391+00.00 TO STA 413+00.00

(SHEET 8 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
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JMP				

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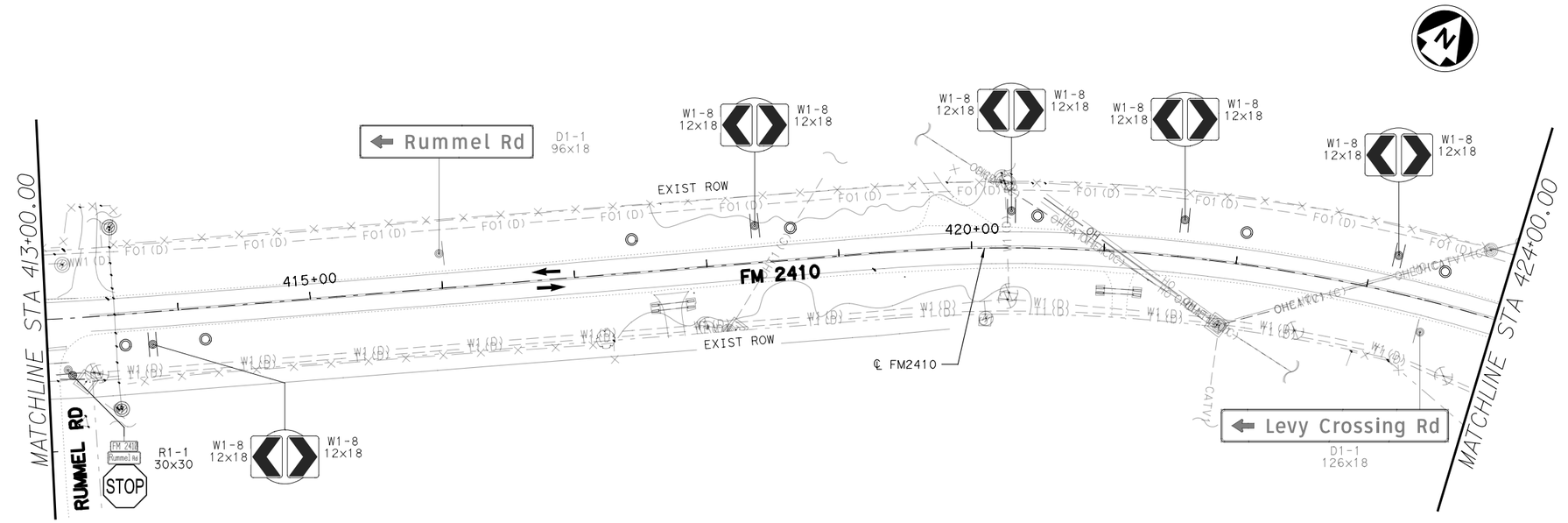

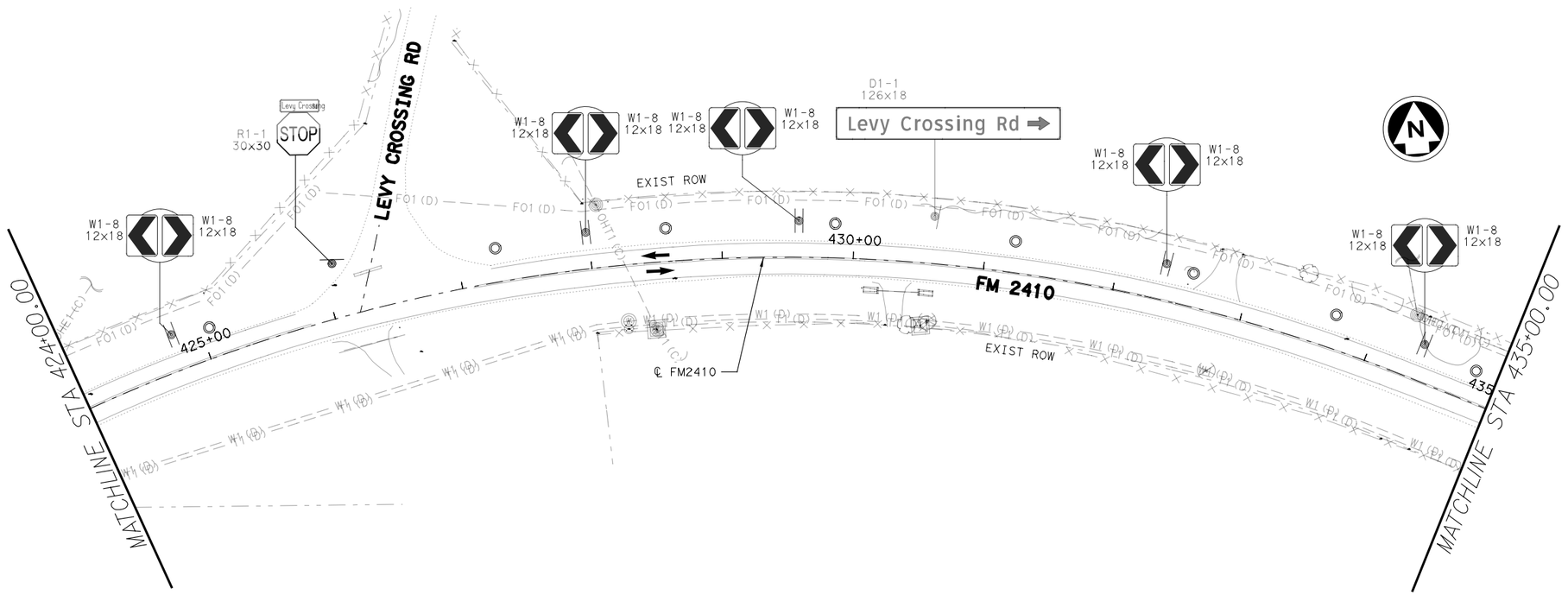

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

NOTE:
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◎ LOCATION AND SPACINGS OF DRUMS TO COMPLY WITH D&OM(3)-20. FOR TEMPORARY, INSTALL ORANGE CHEVRONS CWI-8 SUBSIDIARY TO ITEM 502 ON DRUMS.

STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation
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FM 2410

EXISTING PROJECT LAYOUT

STA 413+00.00 TO STA 435+00.00

(SHEET 9 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	11
RS				
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTHON*EXISTING*09.dgn
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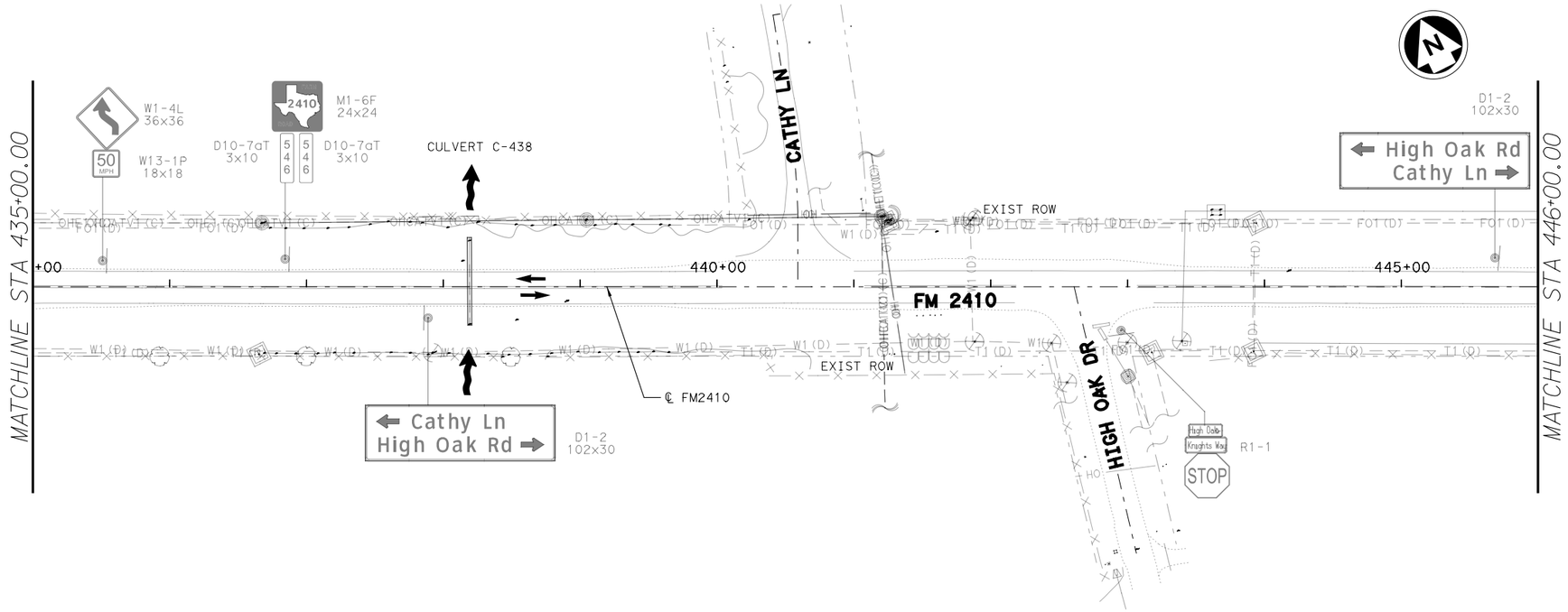

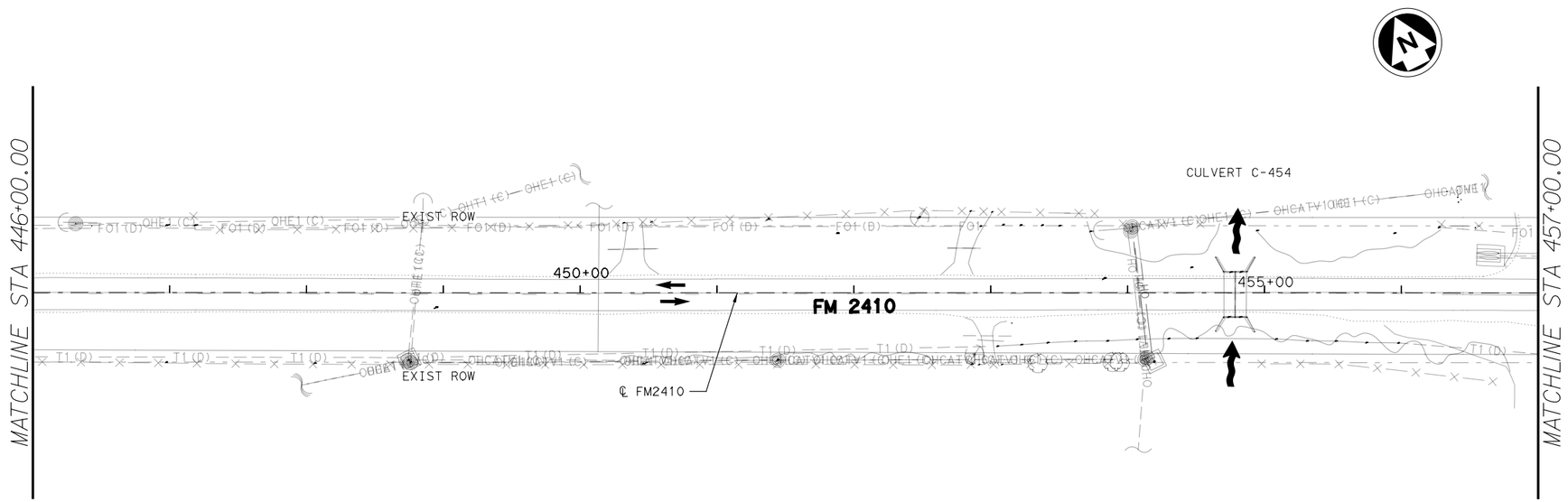

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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Texas Department of Transportation

FM 2410

EXISTING PROJECT LAYOUT

STA 435+00.00 TO STA 457+00.00

(SHEET 10 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	12
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

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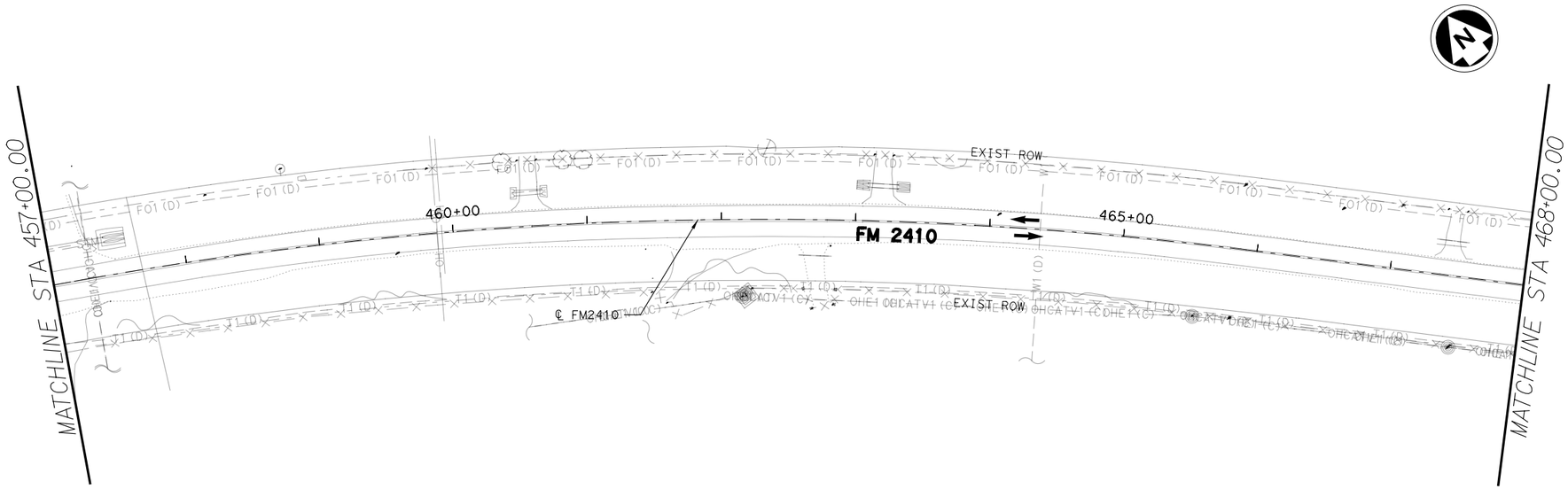

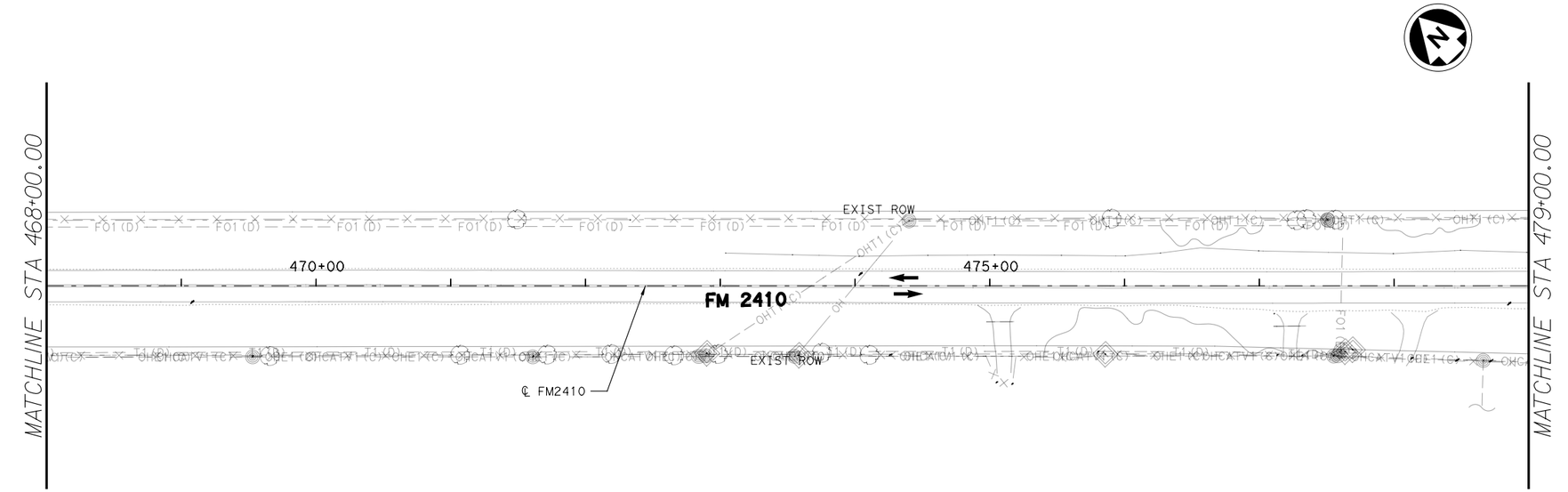

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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FM 2410

EXISTING PROJECT LAYOUT

STA 457+00.00 TO STA 479+00.00

(SHEET 11 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	13
RS				
GRPH CHECK	2304	02	044	
JMP				

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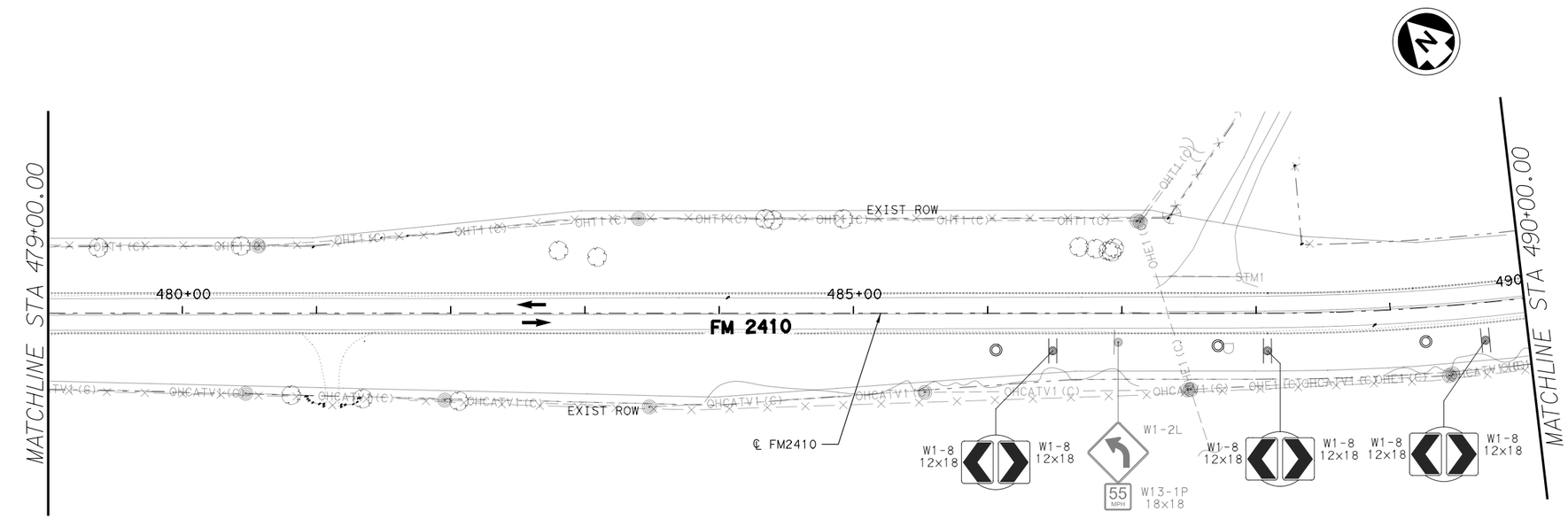

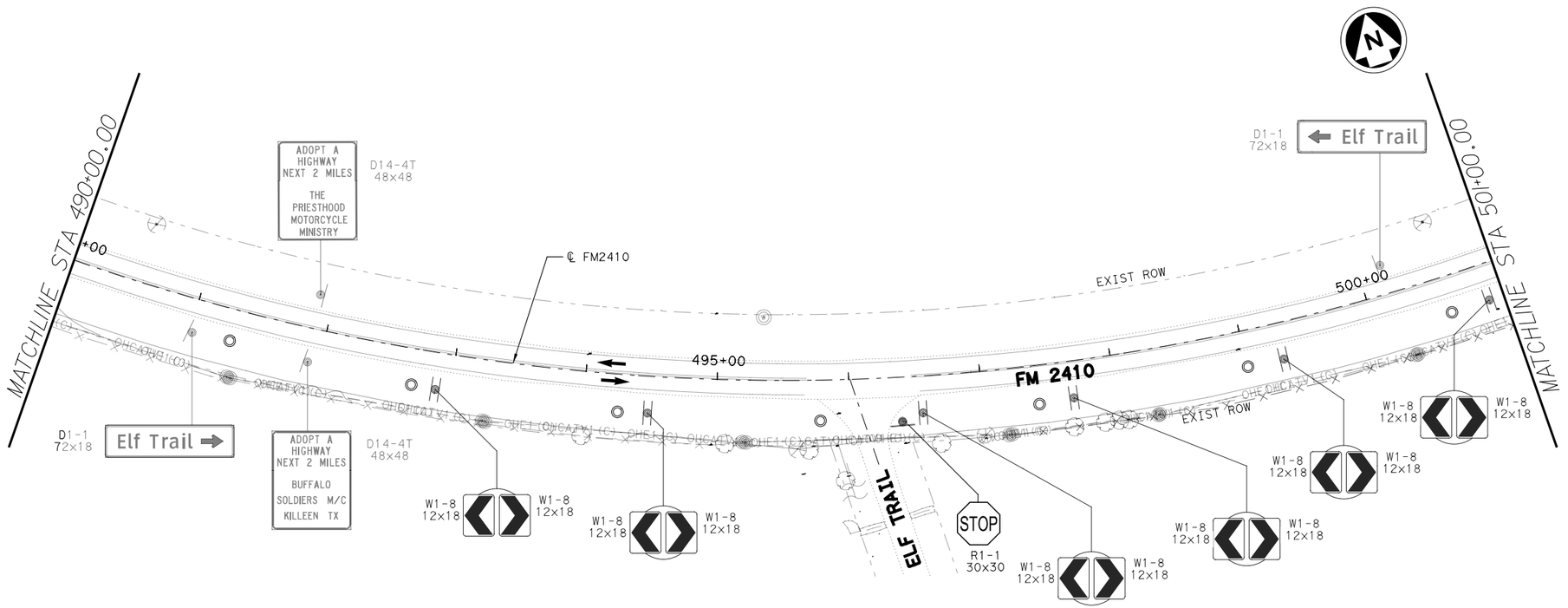

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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1/4/2023

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Texas Department of Transportation

FM 2410

EXISTING PROJECT LAYOUT

STA 479+00.00 TO STA 501+00.00

(SHEET 12 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	14
RS				
GRPH CHECK	2304	02	044	
JMP				

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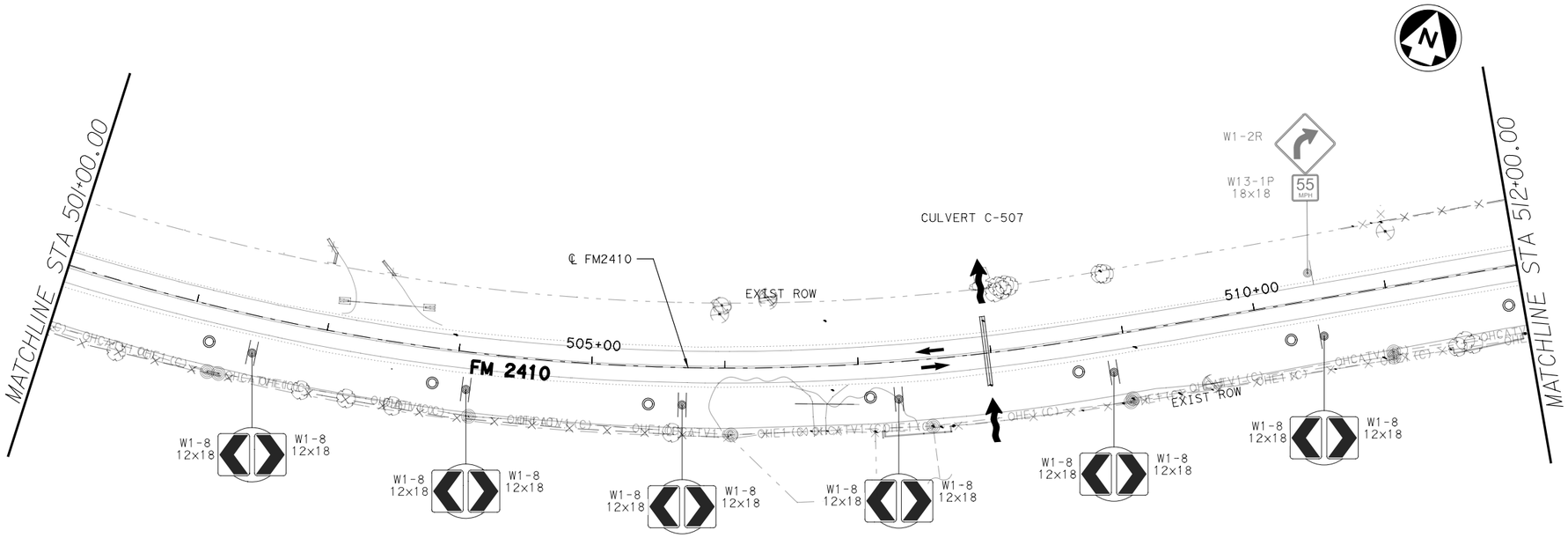

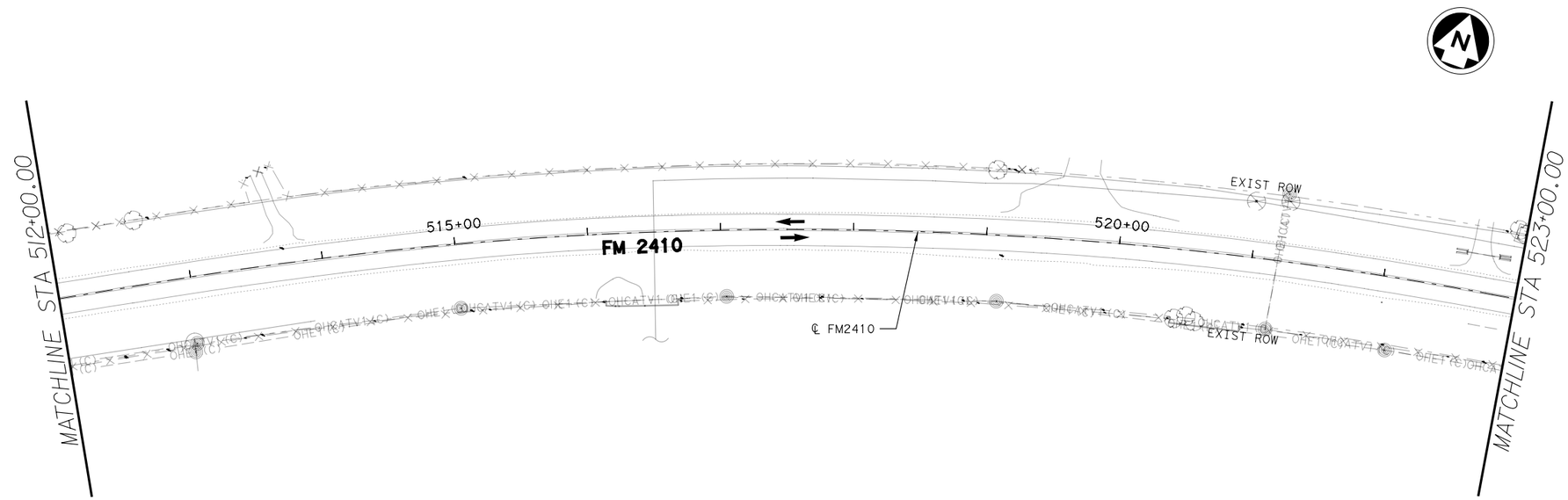

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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FM 2410

EXISTING PROJECT LAYOUT

STA 501+00.00 TO STA 523+00.00

(SHEET 13 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	15
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

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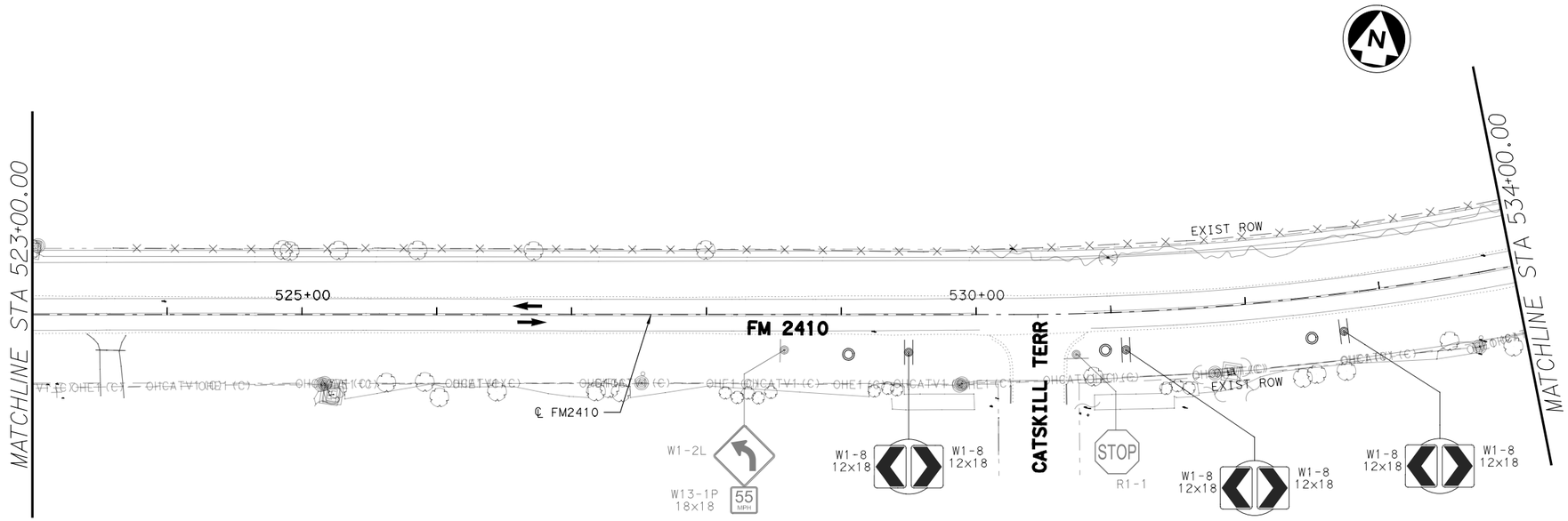

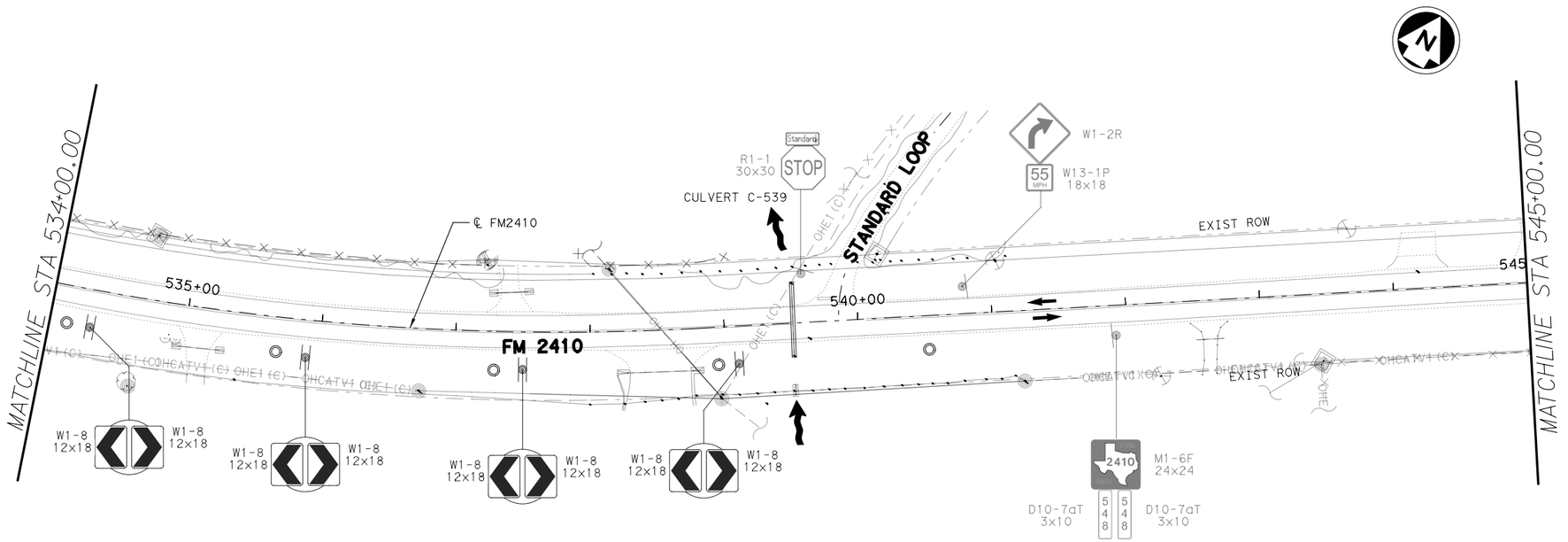

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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EXISTING PROJECT LAYOUT

STA 523+00.00 TO STA 545+00.00

(SHEET 14 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	16
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

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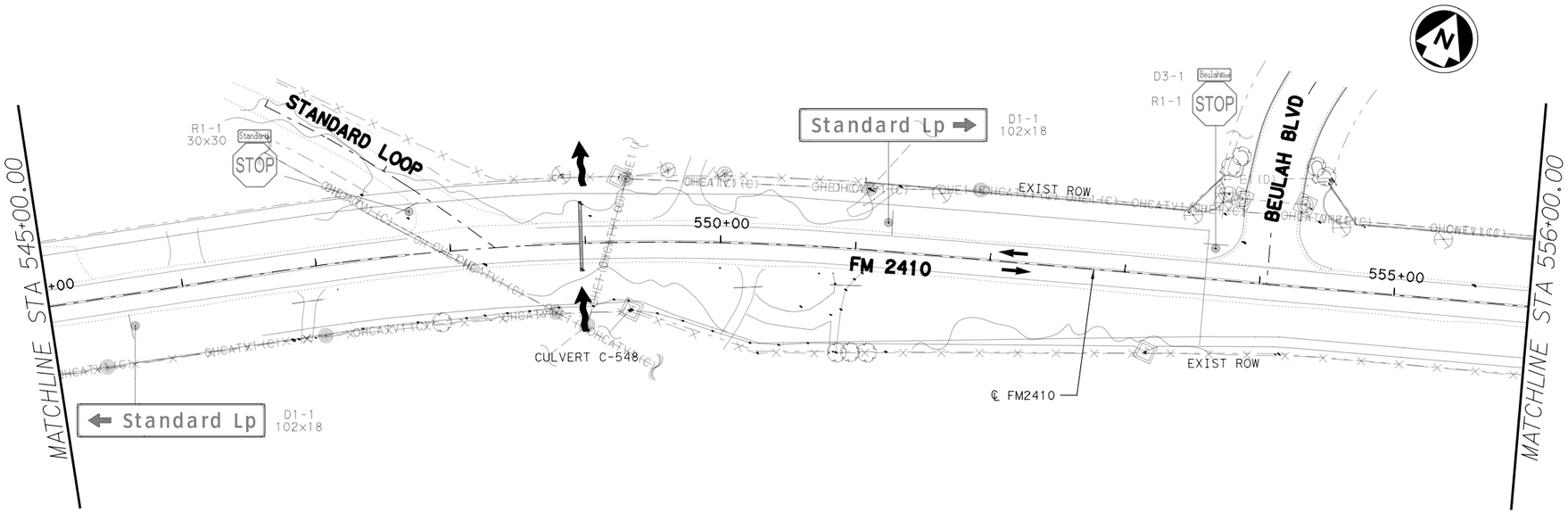

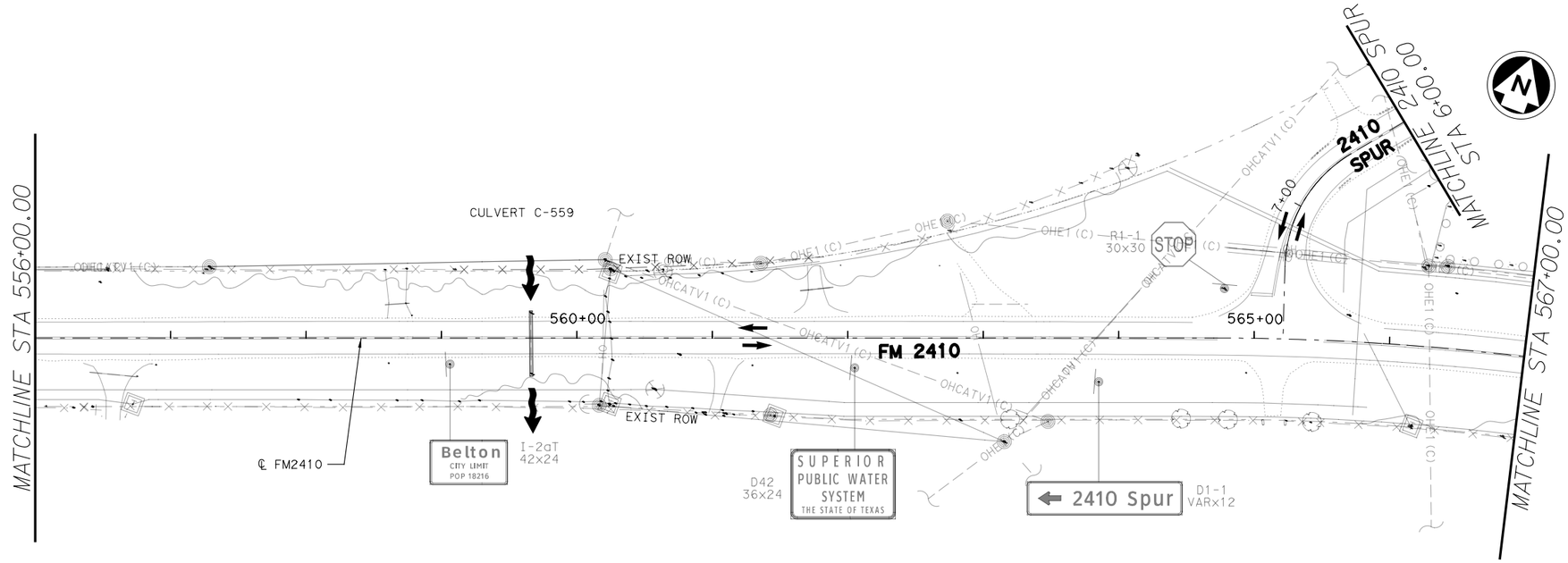

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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1/4/2023

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FM 2410

EXISTING PROJECT LAYOUT

STA 545+00.00 TO STA 567+00.00

(SHEET 15 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	17
RS				
GRPH CHECK	2304	02	044	
JMP				

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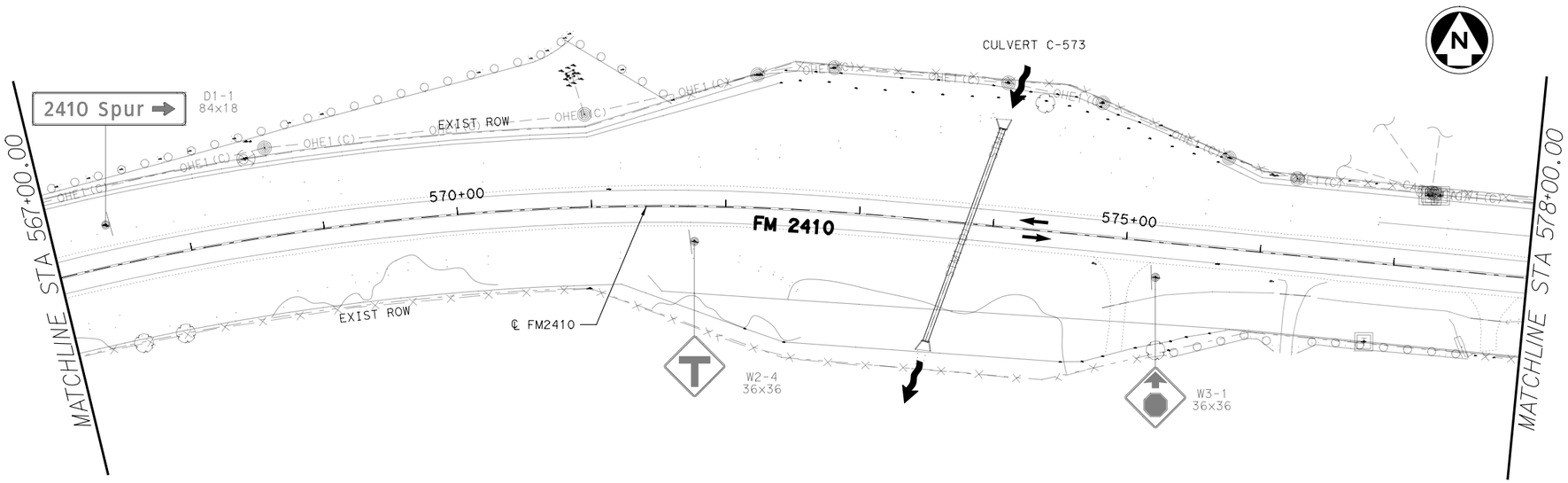

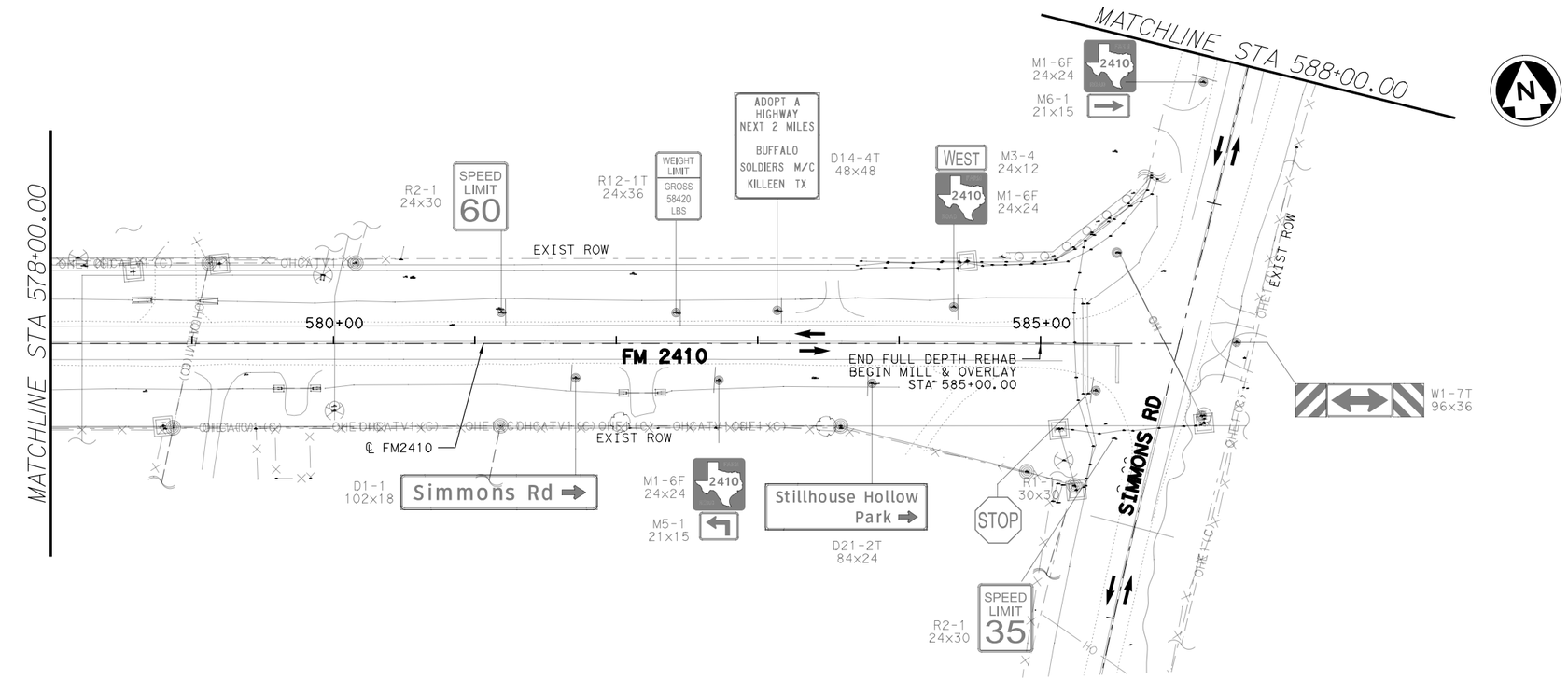

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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EXISTING PROJECT LAYOUT

STA 567+00.00 TO STA 588+00.00

(SHEET 16 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	18
RS				
GRPH CHECK	2304	02	044	
JMP				

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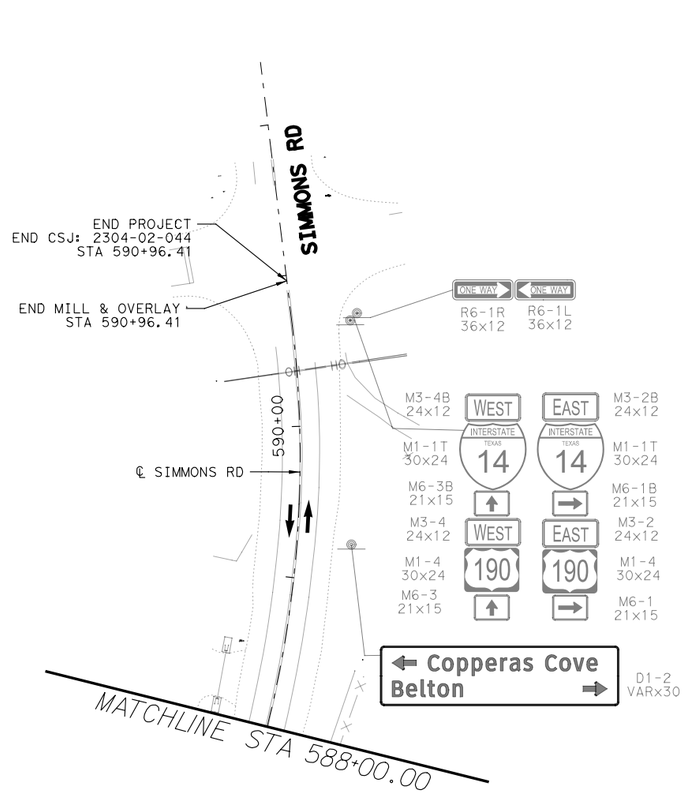

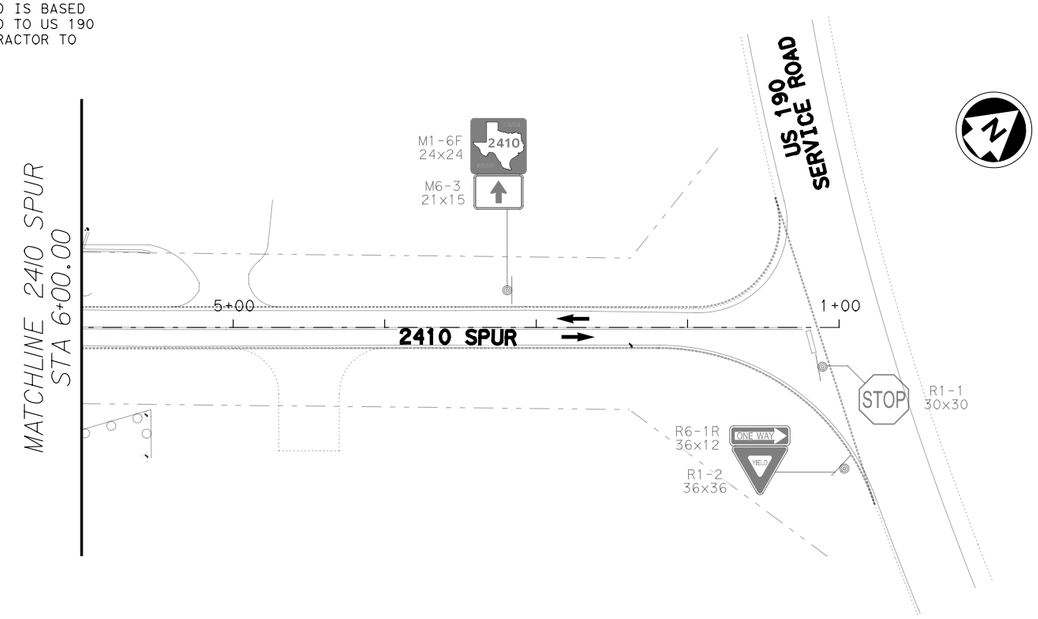

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

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DISCLAIMER:

BASE TOPO INFORMATION HAS NOT BEEN SURVEYED AND IS BASED ON SATELLITE IMAGERY FROM 2410 SPUR STA 4+50.00 TO US 190 SERVICE ROAD. BASE TOPO IS APPROXIMATE. CONTRACTOR TO FIELD VERIFY WITHIN THIS LIMIT.

STATE OF TEXAS
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FM 2410

EXISTING PROJECT LAYOUT

STA 588+00.00 TO END PROJECT
2410 SPUR STA 6+00.00 TO MATCH EXISTING

(SHEET 17 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	19
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

FILE: FM2410*OTHON*EXISTING*17.dgn
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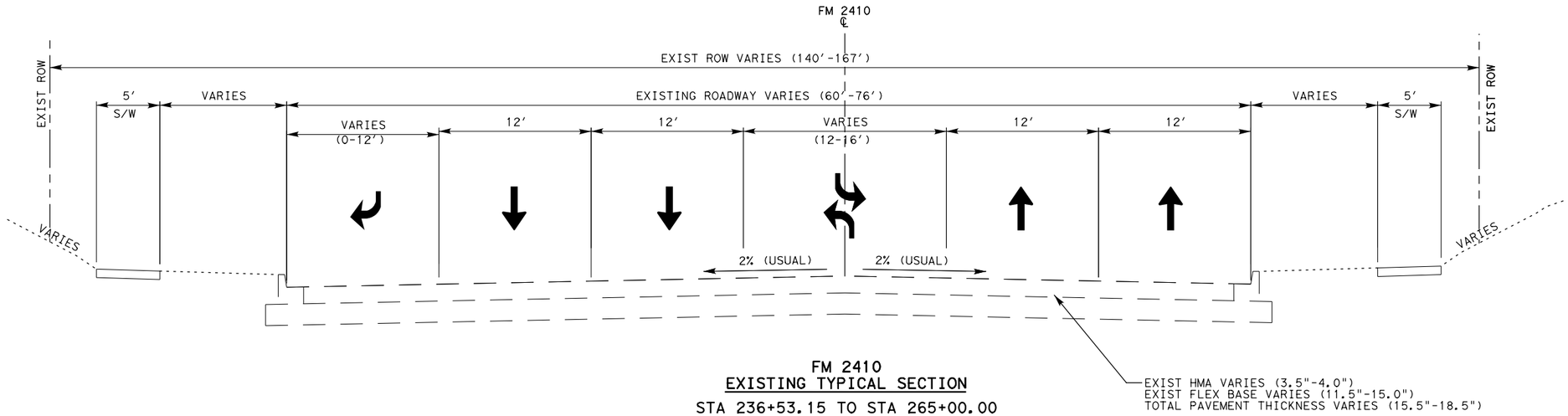
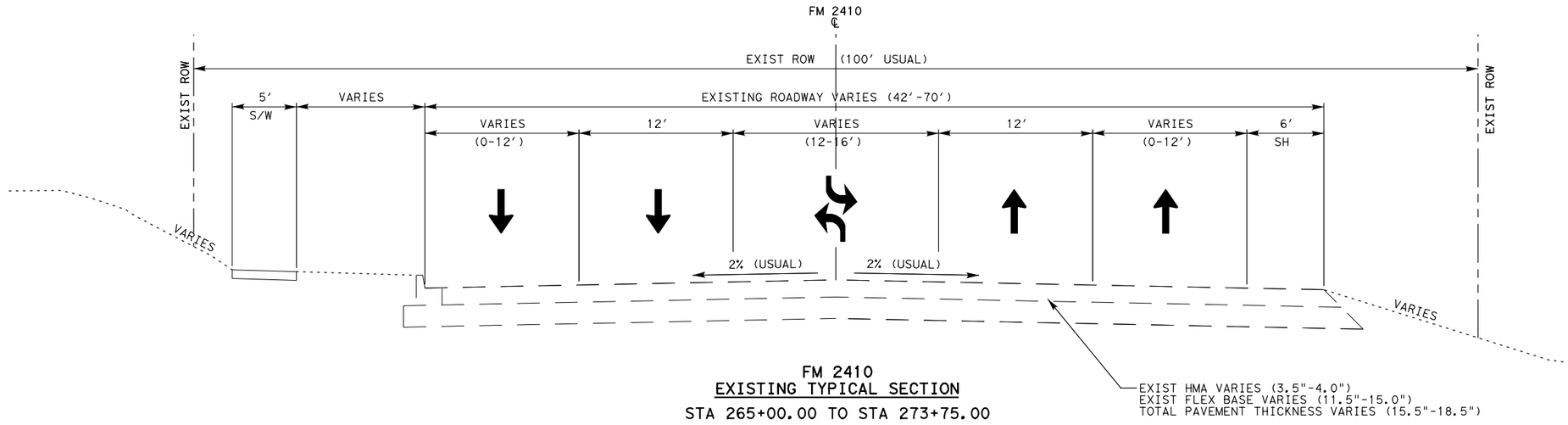


FM 2410
EXISTING TYPICAL SECTION
STA 236+53.15 TO STA 265+00.00



FM 2410
EXISTING TYPICAL SECTION
STA 265+00.00 TO STA 273+75.00

5 2.5 0 5 10
HORIZONTAL SCALE: 1" = 10′

STATE OF TEXAS
RYAN MICHAEL JONES
110010
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

TYPICAL SECTIONS

STA 236+53.15 TO STA 273+75.00

(SHEET 1 OF 4)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	20
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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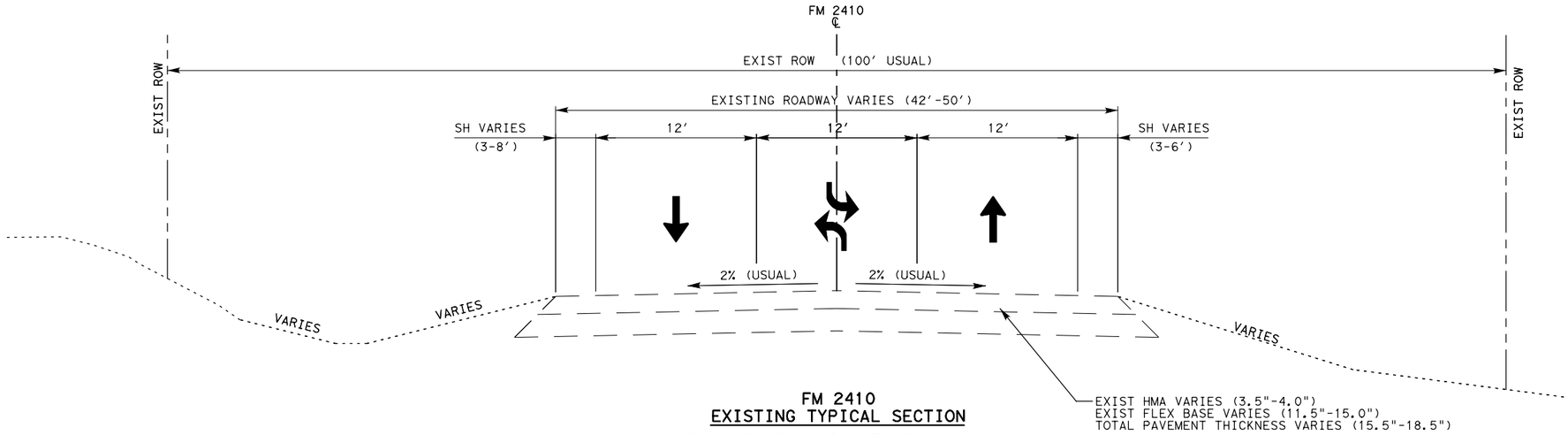
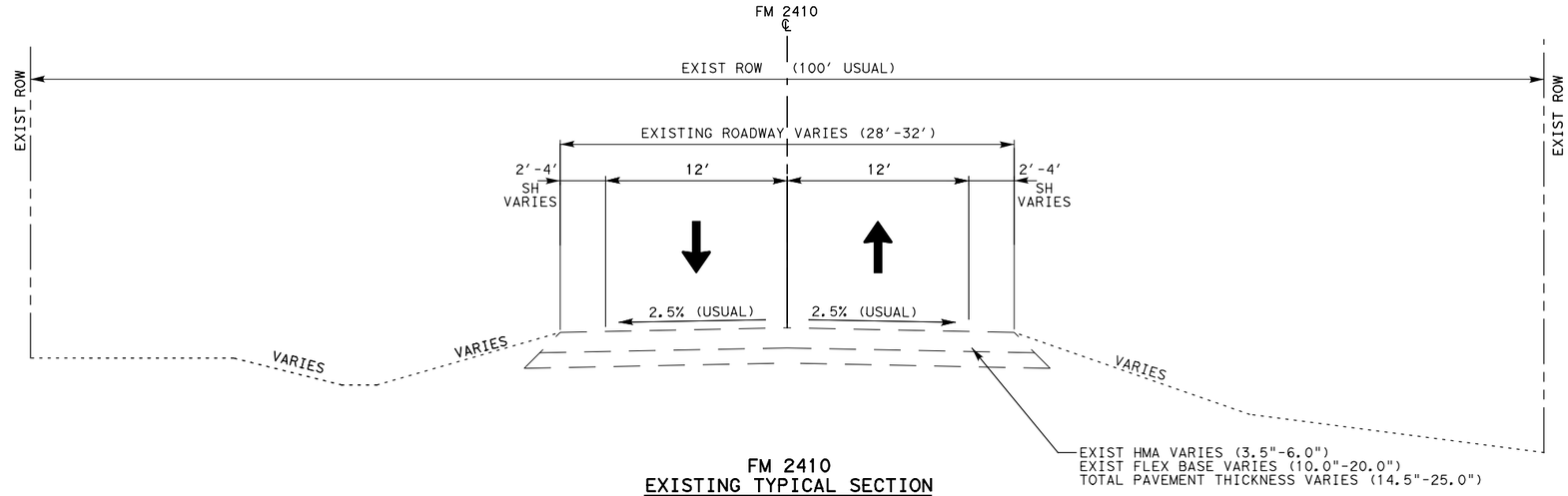


FM 2410
EXISTING TYPICAL SECTION
STA 273+75.00 TO STA 301+00.00



FM 2410
EXISTING TYPICAL SECTION
STA 301+00.00 TO STA 590+96.41

5 2.5 0 5 10
HORIZONTAL SCALE: 1" = 10′

STATE OF TEXAS
RYAN MICHAEL JONES
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LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

FM 2410

TYPICAL SECTIONS
STA 273+75.00 TO STA 590+96.41

(SHEET 2 OF 4)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	21
JP				
GRPH CHECK	2304	02	044	
RJ				

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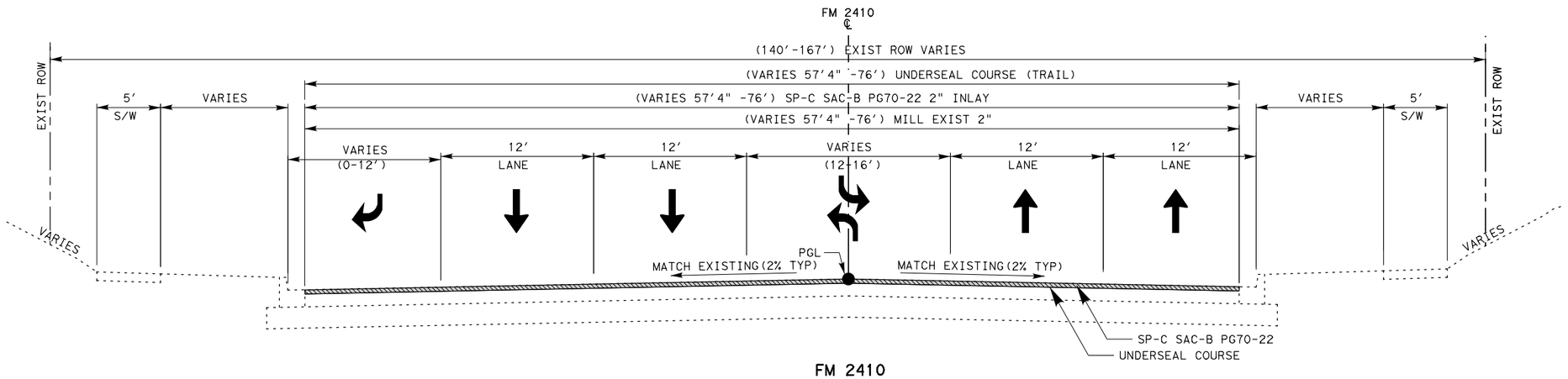
DATE: 1/5/2023 1:16:19 PM mchowdhury

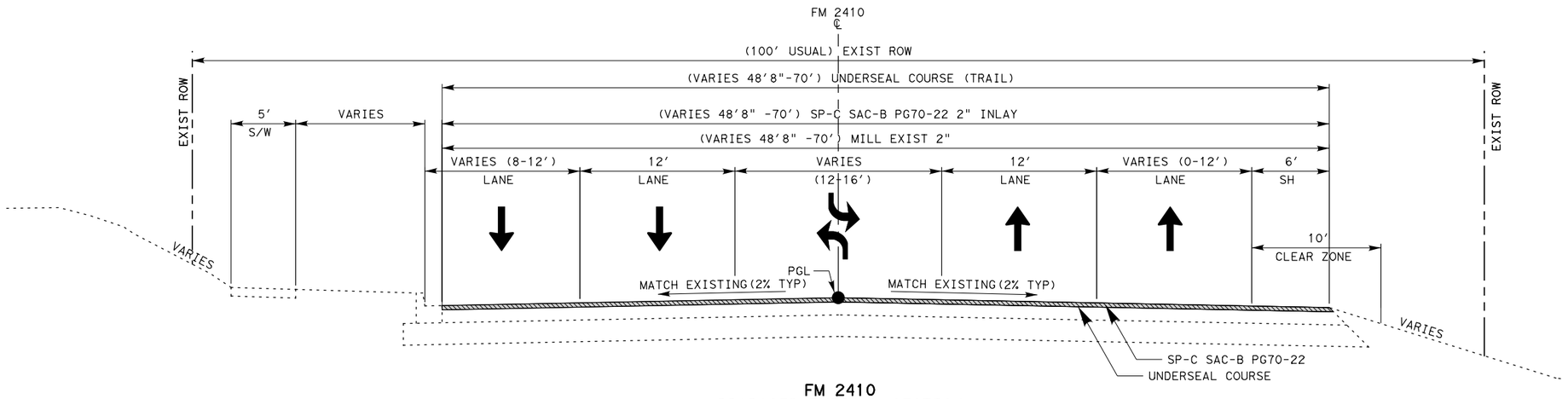
5 2.5 0 5 10

HORIZONTAL SCALE: 1" = 10'



FM 2410
PROPOSED TYPICAL SECTION
STA 236+53.15 TO STA 267+49.45

* STA 236+53.15 TO 239+25 (NO PROPOSED WORK)
STA 239+25 TO STA 258+75 (78')
STA 258+75 TO STA 264+00 (TRANS. 78'-65')
STA 264+00 TO STA 267+49.45 (65')



FM 2410
PROPOSED TYPICAL SECTION
STA 267+49.45 TO STA 276+62.50

STA 267+49.45 TO STA 276+62.50 (TRANS. 66'-42')

STATE OF TEXAS
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TYPICAL SECTIONS
STA 236+53.15 TO STA 273+75.00

(SHEET 3 OF 4)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	22
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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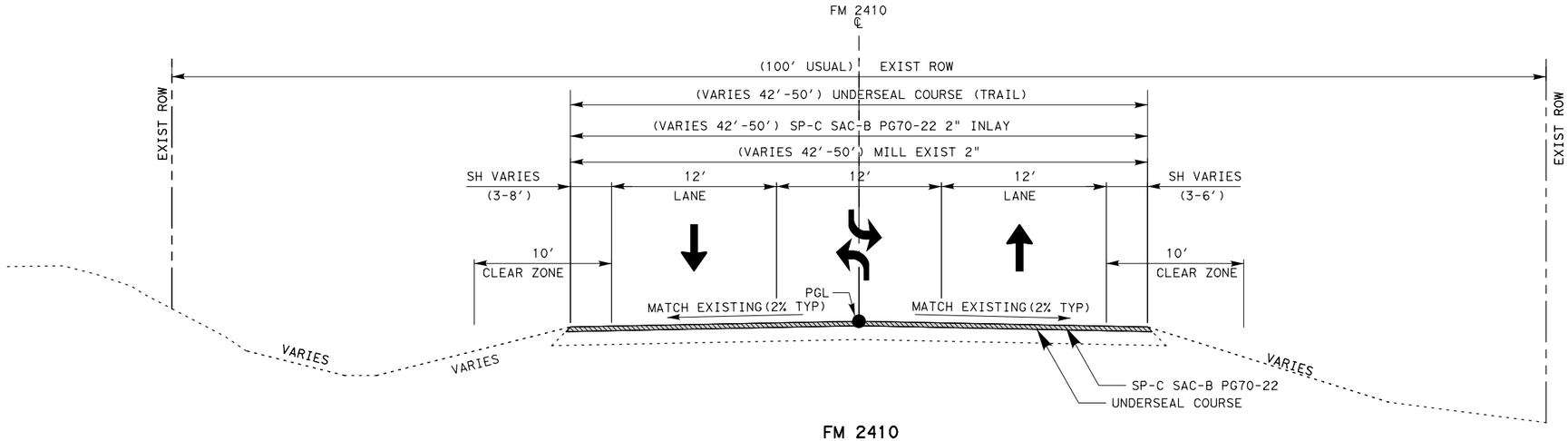
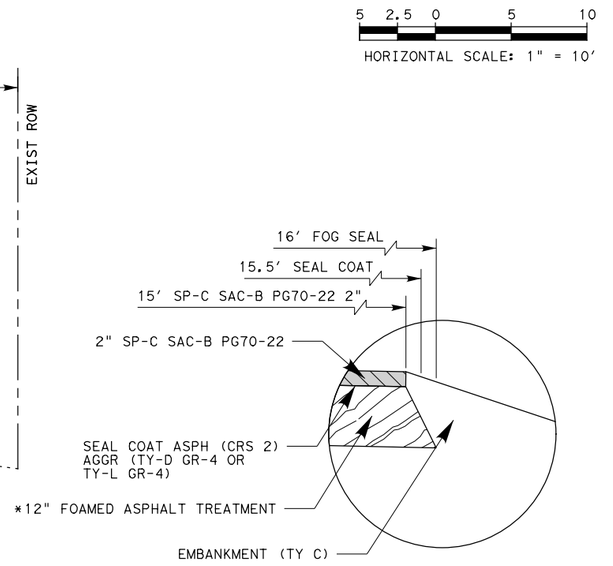
DATE: 1/5/2023 1:16:23 PM mchowdhury



FM 2410
PROPOSED TYPICAL SECTION
STA 276+62.50 TO STA 301+00.00

STA 276+62.50 TO STA 293+76.66 (42′)
* STA 293+76.66 TO STA 295+26.20 (TRANS. 42′-51′)
STA 295+26.20 TO STA 297+92.88 (51′)
STA 297+92.88 TO 301+00.00 (TRANS. 51′-30′)

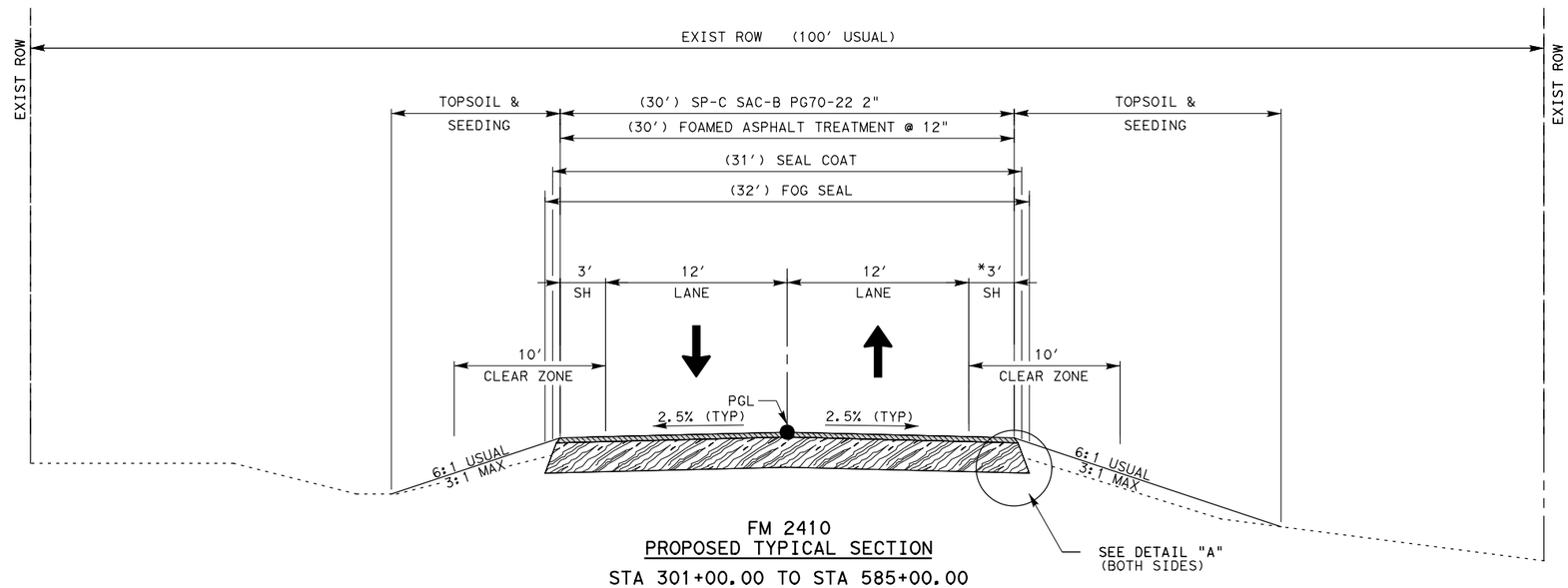


DETAIL "A"
(TO BE APPLIED LT AND RT)

NOTE: PROOF ROLL LOCATIONS WHERE ADDITIONAL EMBANKMENT IS REQUIRED FOR ROADWAY SUBGRADE.

* FLEXBASE NEEDED FOR ROADWAY WIDENING WILL BE TY D GR 3 (ITEM 247-6509)

5 2.5 0 5 10
HORIZONTAL SCALE: 1" = 10′



FM 2410
PROPOSED TYPICAL SECTION
STA 301+00.00 TO STA 585+00.00

* STA 339+50 TO STA 441+00 TRANSISTION SHOULDER FROM 3′ TO 10′
STA 441+00 TO STA 442+50 10′ SHOULDER
STA 442+50 TO STA 585+00 3′ SHOULDER

STATE OF TEXAS
RYAN MICHAEL JONES
110010
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation
© 2023

FM 2410

TYPICAL SECTIONS
STA 273+75.00 TO STA 585+00.00

(SHEET 4 OF 4)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	23
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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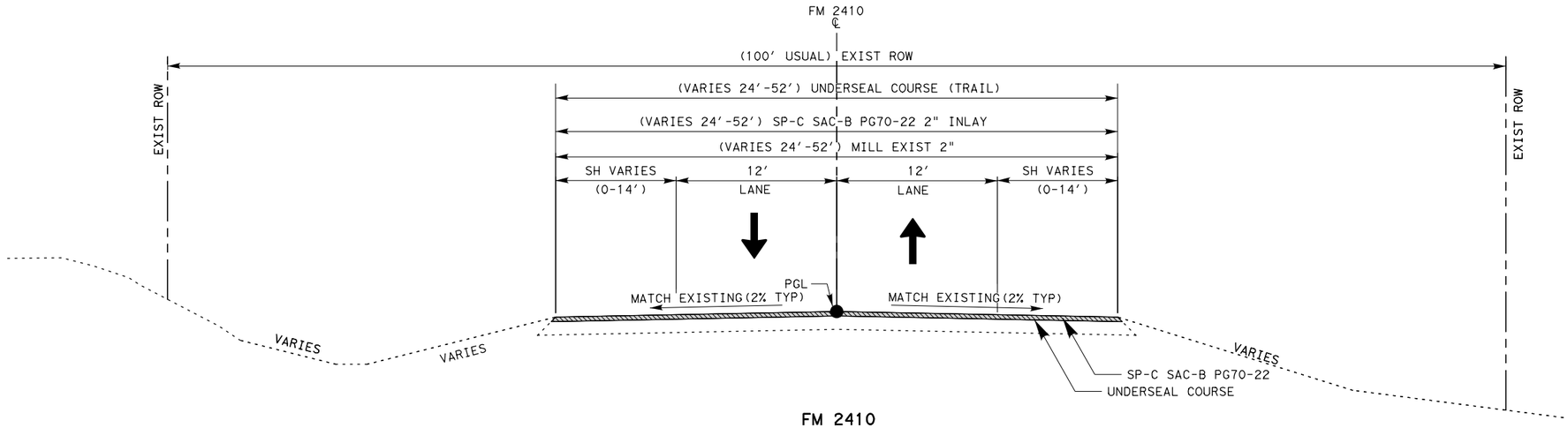
5 2.5 0 5 10

HORIZONTAL SCALE: 1" = 10'



FM 2410
PROPOSED TYPICAL SECTION
STA 585+00.00 TO STA 590+96.41
2410 SPUR STA 1+69.81 TO STA 7+85.65

STA 1+69.81 TO STA 2+18.20 (TRANS. 34.5'-30')

* STA 2+18.20 TO 2+75.40 (30')

STA 2+75.40 TO STA 3+00.40 (TRANS. 30'-27')

STA 3+00.40 TO 6+80.90 (27')

* STA 586+70.00 TO STA 588+20.00 (TRANS. 40'-48')

STA 588+20.00 TO 590+96.41 (48')

STATE OF TEXAS
RYAN MICHAEL JONES
110010
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

TYPICAL SECTIONS

STA 585+00.00 TO STA 590+96.41

(SHEET 5 OF 5)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS JP	CONTROL	SECTION	JOB	24
GRPH CHECK	2304	02	044	
RJ				

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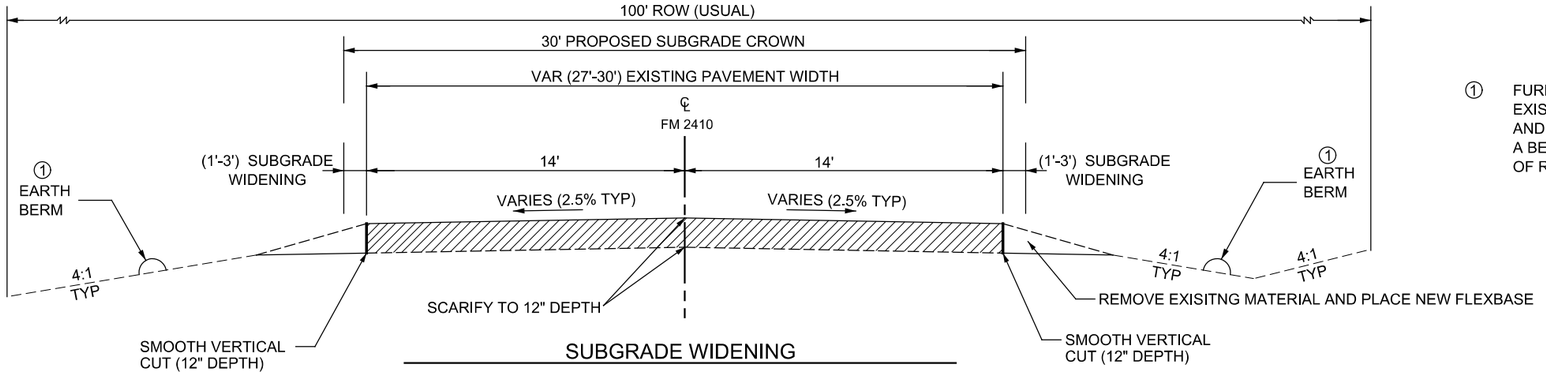
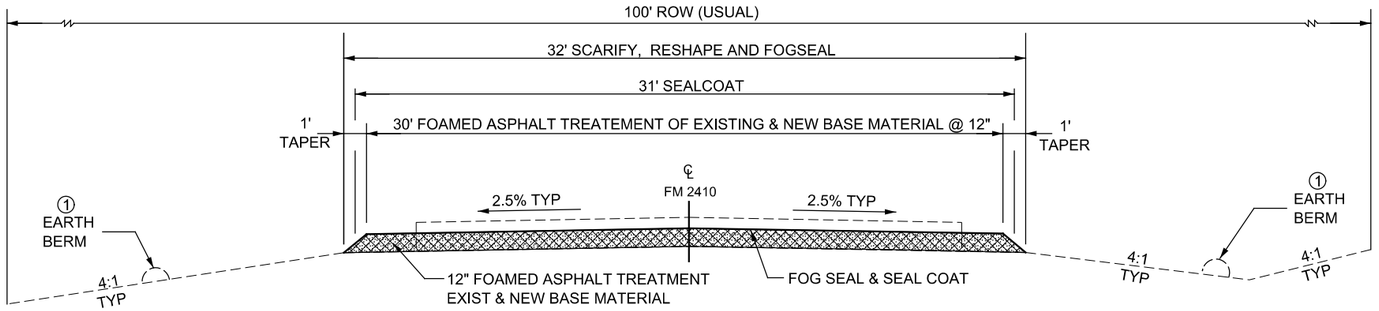
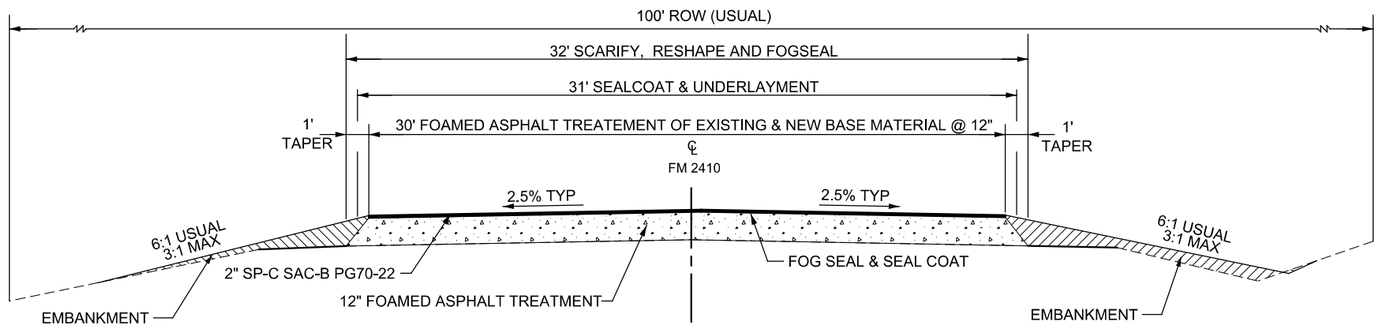


SUBGRADE WIDENING



SCARIFY AND RESHAPE BASE COURSE



FOAMED ASPHALT TREATMENT, FOG SEAL & SEAL COAT,
2" SP-C OVERLAY, SUBGRADE WIDENING, BACKFILL

① FURNISHING AND PLACING TOPSOIL (4").
EXISTING TOPSOIL SHALL BE REMOVED TO A DEPTH OF 4" AND WINROWED OUTSIDE OF THE WORK AREA CREATING A BERM, AND THEN RETURNED TO SLOPES UPON COMPLETION OF ROADWAY WIDENING.

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

SEQUENCE OF CONSTRUCTION TYPICAL SECTIONS

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JB	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	24A
GRAPHICS	CONTROL	SECTION	JOB	
JB	2304	02	044	
GRPH CHECK				
RJ				

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BASIS OF ESTIMATE TABLES

Table 1: Basis of Estimate for Erosion Control Items

Item	Description	Rate	Basis	Quantities
*166	FERTILIZER			
	FERTILIZER (20-10-10) (PERMANENT)	300 LBS / AC	46.3 AC	6.9 TON
	FERTILIZER (20-10-10) (TEMPORARY)	300 LBS / AC	46.3 AC	6.9 TON
168	VEGETATIVE WATERING			
	(3 APPLICATIONS - PERM)	13,100 GAL/AC/APP	46.3 AC	1820 MG
	(3 APPLICATIONS - TEMP)	13,100 GAL/AC/APP	46.3 AC	1820 MG

* For Contractor's Information Only

Table 2: Basis of Estimate for Base Work

Item	Description	Rate	Basis	Quantities
216	**PROOF ROLLING**			
	PROOF ROLLING	4 HR /ROADBED-MILE	6.7 ROADBED-MILE	27 HR
247	**FLEXIBLE BASE**			
	(TY D GR 3 FNAL POS)	138 LB/CF	40,446 CF	1,498 CY *2,791 TON
315**	**FOG SEAL**			
	FOG SEAL (SS-1)	0.10 GAL / SY	105,066 SY	10,507 GAL

** Rate provided is desired final emulsified product rate not inclusive of mix water

Table 3: Basis of Estimate for Foamed Asphalt Treatment

Item	Description	Rate	Basis	Quantities
3088	**FULL DEPTH RECLAMATION USING FOAMED ASPHALT (ROAD-MIXED)**			
	CEMENT	0.98 LB / SY / IN	98,801 SY	581 TON
	ASPHALT BINDER	2.25 LB / SY / IN	98,801 SY	1,334 TON

Table 4: Basis of Estimate for Seal Coats (Construction Projects)

Item	Description	Rate	Basis	Quantities
316	ASPH (CRS-2)	0.45 GAL / SY	101,848 SY	45,831 GAL
	AGGR (TY D GR 4 OR TY L GR 4)	1 CY / 135 SY	101,848 SY	754 CY

Table 5: Basis of Estimate for Asphalt Pavements

Item	Description	Rate	Basis	Quantities
3077	**SUPERPAVE MIXTURES**			
	SP-C PG 70-22	110 LB / SY / IN	147,327 SY	16,206 TON

Table 6: Basis of Estimate for Underseal Course Material

Item	Description	Rate	Basis	Quantities
3085	TRAIL	0.20 GAL / SY	48,530 SY	9,706 GAL

Table 7: Basis of Estimate for Roadside Maintenance

Item	Description	Rate	Basis	Quantities
730	ROADSIDE MOWING	46.3 AC / CYCLE	2 CYC / YR	138.9 AC

GENERAL

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

The disturbed area for this project, as shown on the plans is 46.3 acres. However, the Total Disturbed Area (TDA) will establish the required authorization for storm water discharges. The TDA of this project will be determined by the sum of the disturbed area in all project locations in the contract, and all disturbed area on all Project-Specific Locations (PSL) located in the project limits and/or within 1 mile of the project limits. The department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction site as shown on the plans, according to the TDA of the project. The Contractor will obtain any required authorization from the TCEQ for the discharge of storm water from any PSL for construction support activities on or off of the project row according to the TDA of the project. When the TDA for the project exceeds 1 acre, provide a copy of the appropriate application of permit (NOI, or Construction Site Notice) to the Engineer, for any PSL located in the project limits or within 1 mile of the project limits. Follow the directives and adhere to all requirements set forth in the TCEQ, Texas Pollution Discharge Elimination System, Construction General Permit (TPDES, CGP).

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

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

Bill Compton - Wacoprebid@txdot.gov, 254-867-2770, 100 S. Loop Dr., Waco, TX
Carmen Chau - Wacoprebid@txdot.gov, 254-867-2794, 100 S. Loop Dr., Waco, TX

Or Via phone or in person to the following individual(s):
Area Engineer’s: Stephen Kasberg 254-939-3778
Assistant Area Engineer’s: Brian Douglas 254-939-3778

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

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.

For Q&A’s on Proposals navigate to:
https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors.
Use the dashboard to navigate to the project you are interested in by scrolling or filtering the dashboard using the controls on the left. Hover over the blue hyperlink for the project you want to view the Q&A for and click on the link in the window that pops up.

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

GENERAL NOTES

ITEM 5: CONTROL OF THE WORK

Provide the Engineer with a weekly work schedule of planned activities including anticipated quantities of materials to be placed daily (CY of each concrete placement, tons of HMAC to be placed daily, etc.). Schedules will be provided for the following week as part of each week’s project meetings or by 5PM on Thursday as approved by the Engineer. Failure to provide notifications are required here may be deemed as insufficient notice per item 5.10.

Provide the Engineer Daily by 3PM the planned activities for the following day including location, quantities of materials to be placed, etc. in a format acceptable to the Engineer.

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

Where a precast or cast-in-place concrete element is shown in the plans, Contractor may submit a precast concrete alternate in accordance with “Standard Operating Procedure for Alternate Precast Proposal Submission” found online at:

https://www.txdot.gov/inside-txdot/forms-publications/consultants-Contractors/publications/bridge.html#design.

Acceptance or denial of an alternate is at the sole discretion of the Department. Contractor is responsible for impacts to the project schedule and cost resulting from the use of alternates.

Place survey monuments, provided by the department, at points indicated and as detailed in the plans or as directed. Furnish surface coordinates and the elevation of the set monument and an azimuth from the monument to some prominent physical feature, preferably another survey monument on the project. This work will not be paid for directly, but will be considered subsidiary to the various bid items.

Underground utilities owned by the Texas Department of Transportation may be present within the Right-Of-Way on this project. For signal, illumination, surveillance, and communications & control maintained by TxDOT, call the TxDOT Traffic Signal Office (254)867-2808 for locates a minimum of 48 hours in advance of excavation. For irrigation systems, call TxDOT Landscape Office (254)867-2726 for locates a minimum of 48 hours in advance of excavation. If city or

town owned irrigation facilities are present, call the appropriate department of the local city or town a minimum of 48 hours in advance of excavation. The Contractor is liable for all damages when utilities are damaged due to Contractor's negligence including, but not limited to, repair or replacement at the Contractor's expense.

ITEM 6: CONTROL OF MATERIALS

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

ITEM 7: LEGAL RELATIONS AND RESPONSIBILITIES

No significant traffic generator events identified.

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

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

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

Prior to the swallows returning to the nests (approximately March 1), abandoned nests will be removed from the bridge. The Contractor will prevent the establishment of new nests on any portion of the structure. Methods for preventing the establishment of new nests must be approved by the Engineer. Examples of acceptable nest prevention methods are bird-deterrent netting and bird-repelling sprays and/or gels to be applied to the structure. This work will not be paid for directly, but will be subsidiary to the various bid items. No relief or compensation will be considered for project delays due the Contractors in attention / in action to preventing nesting or for nesting already underway at the commencement of work.

Notify the Engineer in writing a minimum of 7 days in advance of opening any bridge structure to public use, to allow the Engineer an opportunity to conduct a safety assessment prior to opening.

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

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

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

Law Enforcement Personnel.
As approved by the Engineer, provide uniformed off duty police officers and squad cars during the following activities:

- Lane closures on controlled access facilities or 4 lane divided facilities with speed limits above 55mph,
- ramp closures,
- Roadway Closures,
- Support of phase construction traffic switches,
- nighttime work, or
- other situations that indicate a need for additional traffic control to protect the traveling public or the construction workforce.

Law Enforcement Personnel must have jurisdictional authority to act in the area of the project.

Law Enforcement Personnel will be paid when use is approved by the Engineer. The Contractor retains the right to have law enforcement personnel on sight at their own cost and discretion when note approved by the Engineer.

Submit charge summary and invoices using the Department form 318. Provide documentation such as payroll, log sheets with signatures and badge number, or invoices from the government entity providing the officers for reimbursement.

Patrol vehicles must be clearly marked to correspond with the officer's agency and equipped with appropriate lights to identify them as law enforcement. For patrol vehicles not owned by a law enforcement agency, markings will be retroreflective and legible from 100 ft. from both sides

and the rear of the vehicle. Lights will be high intensity and visible from all angles. Windows / Windshields may not be blocked.

No payment will be made for law enforcement personnel needed for moving equipment or payment for drive time to/from the event site. A minimum number of hours is not guaranteed. Payment is for work performed.

Cancel law enforcement personnel when the event is canceled. Cancellation, minimums or “show up” fees will not be paid when cancellation is made 12 hours prior to beginning of the event. Failure to cancel within 12 hours will not be cause for payment for cancellation, minimums, or "show up" time. Payment of actual “show up” time to the event site due to cancellation will be on a case by case basis at a maximum of 2 hours per officer.

ITEM 8: PROSECUTION AND PROGRESS

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

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

For this project, provide a Bar Chart progress schedule.

ITEM 100: PREPARING RIGHT OF WAY

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

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

Remove all trees within the right of way within station limits designated for Preparing Right of Way unless designated for preservation or as directed by the Engineer.

Trees to be removed near gas lines shall be cut and ground 1’ below grade.

Preserve trees within temporary construction easements in accordance with Article 100.2., unless otherwise directed.

Prune trees designated for preservation as directed. All work required in preserving and pruning
trees will be included in the price bid for Item 100, “Preparing Right Of Way”.

The removal of any existing fence will not be paid for directly, but will be considered subsidiary to the bid Item 100, “Preparing Right Of Way”.

All trees and brush removed each day will be disposed of within the same day of removal unless otherwise approved. If removed vegetation is burned, ashes from burned vegetation will not be placed or allowed to be transported by storm water into any stream. Burn locations, if approved, will be no closer than 300 feet from a stream. Earth berms must be used around burn areas to keep ash in place.

The Contractor is prohibited from removing grass vegetation throughout the entire project limits and then ceasing construction for long periods, typically over three weeks. The Contractor schedule will be developed based on staged vegetation removal, limiting disturbed soil to no more than 25 percent at one time, unless otherwise approved. Should the Contractor not be able to adequately control sediment and erosion for areas disturbed, TxDOT will substantially reduce the size of areas that the Contractor may disturb soil. Should the project be evaluated to have sediment control problems as a result of the Contractor disturbing excessive amounts of soil, the Contractor will be required to immediately re-vegetate (seed and water) those disturbed areas at no cost to TxDOT.

The following five (5) notes apply to All Oak Tree Species:

1. To avoid the spread of Oak Wilt or other disease, all species of oak trees that are damaged or cut (branches, roots and/or stumps) for any reason during this contract, must be treated with a commercial wound dressing within 20 minutes of causing the damage or cut.

2. To prevent the spread of infection from tree to tree when pruning oak trees (all species), the Contractor must disinfect all pruning tools with a solution of 70% isopropyl alcohol after all cutting is complete on each oak tree.

3. Potentially dangerous trees or limbs will be removed as soon as possible.

4. The Engineer can stop all Work operations if the dressing, cut and removal requirements are not followed.

5. Pruning shall be in accordance with ANSI A300 pruning standard.

The Contractor will be responsible for leaving the project site clean and neat in appearance upon completion and before final acceptance by the Engineer.

Wood chips may be left on the right of way no deeper than two (2) inches outside of city limits. Do not trespass on private property while performing work on this contract. Do not cut or damage timber outside the right-of-way lines.

Remove all fallen parts of trees, damaged limbs, and dead limbs. This work will not be paid for directly but will be considered subsidiary to this item.

ITEMS 110 & 132: EXCAVATION & EMBANKMENT

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

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

The Contractor may modify side slopes from those shown in the cross section as needed to allow grades to match / tie into fixed features. In no case should slope be modified beyond the maximum grades shown on the typical section and approved by the Engineer. Additionally slope adjustments will not be allowed simply to reduce work quantities.

ITEM 132: EMBANKMENT

The Ty C embankment material for this project must meet the following requirements:

Properties	Test Method	Specification Limits
LIQUID LIMITS	TEX-104-E	≤ 55
PLASTICITY INDEX (PI)	TEX-106-E	10 ≤ PI ≤ 30

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

Type C Embankment will consist of suitable earthen material such as rock, loam, clay or other materials that will form a stable embankment. Shale will not be allowed. Deleterious materials material will be removed.

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

ITEM 160: TOPSOIL

Salvage the existing topsoil from the cut/fill areas. Topsoil not stored in small windrows will be stockpiled in locations with heights no greater than four (4) feet and dumped loose from Contractor equipment. The Contractor will minimize topsoil compaction and limit equipment being driven over stockpiled topsoil.

Avoid topsoil areas that have invasive plant species. Contain / separate topsoil from areas with identified invasive species into separate windrows / piles. Mark topsoil from invasive species areas accordingly and track and return materials to only their original areas or dispose of such materials accordingly. Invasive species will include Giant Cane,

Additional Topsoil will come from approved sources outside of the ROW. Topsoil must come from a location within six (6) inches of the natural ground surface to ensure it contains nutrients and is not sterile soil. Off ROW topsoil will contain a minimum organic content of three & one-half (3.5%) percent, based on soil test results.

ITEM 164: SEEDING FOR EROSION CONTROL

Temporary seeding mixtures (cool and warm) will also include three (3) lbs of Bermuda grass seed per acre, with all seeds being planted concurrently.

Contractor will mow or disc wheat and or oats in spring prior to vegetation going to seed.

Permanent seed mixes for both urban and rural projects including sand or clay soils in the Waco District will be bid and installed to include a minimum of one & one-half (1.5) pounds per acre Green Sprangletop seed and four (4) pounds per acre Bermudagrass seed, with other seed types also being included and quantities remaining unchanged.

ITEM 247: FLEXIBLE BASE

Construct uniform layer thickness of 6 inches, or less with the required density and moisture content. Construction no layers less than 3 inches in thickness.

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

RAP may be incorporated into flexbase material and used for roadway widening. Max 50% RAP by volume.

ITEM 302: AGGREGATES FOR SURFACE TREATMENTS

Material produced by test method TEX-217-F Part II, passing No. 40 sieve, is restricted to no more than 1% by weight.

ITEM 316: SEAL COAT

Rates of application and quantities shown on the plans of surface treatment are for estimating purposes only. It will be the Contractor's responsibility to verify all quantities prior to ordering and delivering materials. The asphalt rates will be adjusted as necessary to fit existing field conditions as agreed, upon by the Contractor's designated project superintendent and the Department's designated project manager.

For each project, intersections, ramps, and crossovers will be resurfaced prior to resurfacing the roadway unless otherwise authorized. It is TxDOT's intent to seal from edge of pavement to edge of pavement including all transitions and widenings, regardless of plan width, unless otherwise directed.

Protect all existing bridges, curbs, and other exposed concrete surfaces within the limits of these projects from asphalt materials by any method that is approved. Remove any excessive asphalt materials deposited on these surfaces at the Contractor's expense in a manner approved.

For this contract, wind velocities in excess of 20 mph will be construed as inclement weather and work will be suspended. Wind velocities will be determined at the nearest airport to the area.

All surface material will be broomed using a vacuum broom within city limit sections and a rotary broom in all other sections. Vacuum sweeping will be paid per pertinent bid items.

Stockpile sites for material will be approved and will be located as far as possible from the travel way and in no instance closer than 30 FT measured from pavement edge unless otherwise authorized. They will be kept clear of improved abutting property and, in general, locations at intersections will be avoided in order that sight distance will not be impaired. The Contractor will notify the Engineer at least 5 days prior to stockpiling of materials closer than 30 FT from the pavement edge provided that adequate barricades and warning signs and devices are provided by the Contractor and approved.

Stockpile sites for material will be leveled and cleared of all vegetation prior to materials being stockpiled. Stockpile sites will be kept clear of debris and vegetative growth in a manner approved.

Stockpile locations will be cleared. Sites will be re-vegetated prior to partial acceptance of individual projects. This work will not be paid for directly, but will be considered subsidiary to the various bid items of the contract.

A water truck will be made available at all times for wetting uncoated aggregate stockpiles as directed. This work will not be paid for directly but will be considered subsidiary to the other contract items.

Repairs to flushing pavement will be made by the Contractor on a new seal coat “Before” going to the next road on the contract. The patching will be completed “Before” leaving each reference.

During application of the surface treatment, if existing conditions warrant, the lane widths, transitions, and intersection areas may be varied as directed.

Use medium pneumatic rollers meeting the requirements of Item 210, “Rolling”. Utilize an asphalt distributor capable of providing a transversely varied asphalt rate. The Engineer will select the pavements where the transversely varied asphalt rate is required.

When a transversely varied rate is required, the asphalt rate outside of the wheel paths will be between 22 and 32% higher than the asphalt rate applied in the wheel paths. Provide calibration documents to the Engineer that include a description of the spray bar(s) and nozzles that will be used and the percentage difference in asphalt rate achieved by each tested spray bar and nozzle arrangement. The nozzles proposed for use will be clearly stamped or marked from the factory identifying the manufacturer.

Unless otherwise approved, seal coat will not be exposed to traffic for more than five (5) calendar day before application of HMAC.

ITEM 320: EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT

Use a self-propelled wheel mounted MTV capable of receiving mix from the haul trucks, separate from the paver. It will have a minimum storage capacity of approximately 25 tons. It will be equipped with a pivoting discharge conveyor and will completely and thoroughly remix the

material prior to placement. The effectiveness of the MTV’s remixing ability is subject to the approval of the Engineer. In addition, the paver will have a surge storage insert with a minimum capacity of 20 tons.

ITEM 351: FLEXIBLE PAVEMENT STRUCTURE REPAIR

For this project, a laydown machine will be required during the construction & placement of this item.

Locations and Quantities will vary as directed. The minimum area to be repaired will be five (5) SY.

ITEM 354: PLANING AND TEXTURING PAVEMENT

Saw existing asphalt along neat lines where portions are to be left in place temporarily or permanently. Sawing is not paid for directly but is subsidiary to this item.

To remove dirt and debris, and assure reclaimable material is not contaminated per the specification, blade or otherwise make a neat cut along the existing pavement edge to a depth approx. 1” below the milling limits. This work will be required prior to milling operation and is subsidiary to this item.

Take possession of recycled asphalt pavement from the project and recycle the material.

Stockpile materials in uniform piles up to 15 feet in height unless otherwise instructed. Furnish adequate equipment at the stockpile to keep and leave the materials in a neat and orderly manner.

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

ITEM 400: EXCAVATION AND BACKFILL OF STRUCTURES

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

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

CLASS B bedding is required for all storm drain installations. In areas requiring Cement Stabilized Backfill, CSB will be used in lieu of Class B materials for bedding.

ITEM 421: HYDRAULIC CEMENT CONCRETE

Furnish mix designs to the Engineer in a format compatible to the latest version of the Department’s Construction Management System (Site Manager). Mix Design templates will be provided by the Engineer.

Provide sulfate resistant concrete for box culverts and all drilled shafts.

Supply the Engineer with a list of certified personnel and copies of their current ACI certificates before beginning production and when personnel changes are made. Supply hard copies of calibration reports for testing equipment when required by the Engineer.

ITEM 427: SURFACE FINISHES FOR CONCRETE

Apply a rub finish to all Surface Area I within 30 days after form removal unless otherwise shown on a plan Aesthetic Detail Sheets.

ITEM 440: REINFORCEMENT FOR CONCRETE

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

Fiber Reinforced Concrete (FRC) can be used as a substitute for Non-Structural Class Reinforced Concrete in Mow-Strips for MBGF and Sidewalks. FRC may also be used for other Non-Structural Class Reinforced Concrete Items as approved by the Engineer.

ITEM 462: CONCRETE BOX CULVERTS AND DRAINS

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

For this contract the Contractor may use either pre-cast or cast in place culvert construction.

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

ITEM 466: HEADWALLS AND WINGWALLS

Reshape embankment side slopes, provide embankment as required, and add topsoil to achieve a smooth uniform finish around the installation of the safety end treatments and culvert extensions as directed. Finishing and reshaping work will be subsidiary to this item. If such work extends beyond localized efforts within 10’ of the headwall / wingwall, additional work will be paid by as agreed with the Engineer.

ITEM 467: SAFETY END TREATMENTS

Reshape embankment side slopes, provide embankment as required, and add topsoil to achieve a smooth uniform finish around the installation of the safety end treatments and culvert extensions as directed. Finishing and reshaping work will be subsidiary to this item. If such work extends beyond localized efforts within 10’ of the headwall / wingwall, additional work will be paid by as agreed with the Engineer.

ITEM 500: MOBILIZATION

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

ITEM 502: BARRICADES, SIGNS, AND TRAFFIC HANDLING

The Contractor Force Account “Safety Contingency” that has been established for this project is intended to be utilized for work zone enhancements, to improve the effectiveness of the Traffic Control Plan, that could not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the Engineer and the Contractor’s Responsible Person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

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

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

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

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

Place Barricade / long term traffic control signs with driven post / sleeve mount options for all projects with more than 9 months of project barricades. e in ground mount for project limits signs / long term signs. Upon sign removal, pull sleeve or drive to below ground line.

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

Provide rectangular shape (CW12-2P) Temporary Clearance Signs on all bridges where the existing vertical clearance has changed. Install Signs to the satisfaction of the Engineer prior to opening to traffic. Plywood sign blanks will have minimum dimensions of 84" X 12". Work performed and materials are subsidiary to this item.

The Contractor Responsible Person(s) (CRP) for Work Zone Traffic Controls will inspect and ensure any deficiencies are corrected each and every day throughout the duration of this contract. Any misaligned or damaged traffic control devices will be repaired as soon as practical after deficiency is discovered.

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

At locations where new traffic signals are being installed and no existing traffic signals are in place, install temporary "SIGNAL AHEAD" signs (W3-3, 36X36). Place the signs when the new signal is turned on flash mode and remain until the barricades are removed or as approved. Payment for the supply and installation of the temporary signs will be subsidiary to Item 502, "Barricades, Signs and Traffic Handling".

Short Term Lane Closure Allowances:
Provide written proposed lane closure information 24 hours minimum in advance prior to the proposed closures. Do not close lanes when this requirement is not met.

Limit lane closures along FM 2410 to the hours between 9:00 am and 3:30 pm. Work in other areas of the project is not restricted to this time frame.

Traffic Control Plans with Lane Closures causing backups of 20 minutes or greater in duration will be modified to reduce delays to less than 20 minutes.

Lane Closure and Pilot Car Operations will be implemented to prevent conflicts with activities including school drop-off / dismissal, large employer shift changes, etc.

Lane Closures and Pilot Car Operations will not be allowed in nighttime work hours without approval of the Engineer.

ITEM 504: FIELD OFFICE

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

ITEM 506: TEMPROARY EROSION, SEDIMENTATION AND ENVIRONMENTAL CONTROLS

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

If temporary construction stream crossings are allowed under a Nationwide Permit, submit in writing for approval the type and location of each temporary stream crossing. Use temporary bridges, timber mats, or other structurally sound and non-eroding material for temporary stream crossings. A temporary culvert crossing will consist of storm sewer pipes and 4- to 8-inch nominal size rock. Temporary stream crossings must not cause more than minimal changes to the hydraulic flow characteristics of the stream, increase flooding, or cause more than minimal

degradation of water quality. Remove the temporary stream crossings in their entirety and return the affected areas to their pre-existing elevation. All work and materials use for temporary construction stream crossings will not be paid for directly but are subsidiary to pertinent Items.

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

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

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

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

ITEM 508: CONSTRUCTING DETOURS

Testing of materials used in the construction of a temporary detour may be waived when approved by the Engineer.

ITEM 510: ONE-WAY TRAFFIC CONTROL

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

ITEM 512: PORTABLE TRAFFIC BARRIER

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

The current locations for barrier are: FM 439 yard.

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

Upon completion of the project, all barrier deemed still acceptable by the Engineer will remain property of the Department and stockpiled at a TxDOT yard near the project location or other locations within fifty (50) miles of the project as directed. The Contractor will furnish equipment necessary to load and unload the units at the stockpile locations. Stockpiled portable concrete traffic barriers will not be permitted to be stacked more than three (3) barriers high in any direction.

When stockpiling, separate unacceptable barriers from acceptable barriers as directed. This work will not be paid for directly but will be considered subsidiary to the stockpile item.

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

ITEM 530: INTERSECTIONS, DRIVEWAYS AND TURNOUTS

Removal of existing asphalt and concrete driveways is subsidiary to Item 530.

Provide Class “HES” concrete for concrete intersections and driveways listed or shown on the plans.

ITEM 540: METAL BEAM GUARD FENCE

Furnish steel posts throughout the project except as specifically noted in the plans.

Wooden block outs will not be allowed.

ITEM 544: GUARDRAIL END TREATMENTS

Wooden block outs will not be allowed.

W-Beam elements, steel posts, and composite material block-outs deemed salvageable will remain the property of the State and will be dismantled and returned to the TxDOT Maintenance yard within fifty (50) miles of project as directed. All other guard fence, and SGT’s deemed non-salvageable will become the property of the Contractor.

ITEM 545: CRASH CUSHON ATTENUATORS

Stockpile crash cushion attenuators at Temple Yard.

ITEM 560: MAILBOX ASSEMBLIES

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

ITEM 585: RIDE QUALITY FOR PAVEMENT SURFACES

Use Surface Test Type A on all intersections and driveways.

Use Surface Test Type B pay adjustment schedule 2 on the travel lanes.

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

ITEM 636: SIGNS

Verify all dimensions at the actual proposed sign location in order to maintain dimensions as shown on the Sign Mounting Details.

Stake the location of the new signs a minimum of 7 days in advance of anticipated installation. The Engineer will review and approve the final installation locations.

For freeway sections, keep the advance guide sign or the exit direction sign for an exit in place at all times, unless written approval is given. Replace any signs that have been removed before the end of the workday, unless written approval is given.

ITEM 644: SMALL ROADSIDE SIGN ASSEMBLIES

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

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

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

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

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

Expanded foam foundations are not permitted.

Cut the bottom of all posts square.

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

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

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

ITEM 658: DELINEATOR AND OBJECT MARKER ASSEMBLIES

All flexible and GF2 delineators will have a tubular body.

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

ITEM 662: WORK ZONE PAVEMENT MARKINGS

Paint and beads may be used for non-removable pavement markings.

ITEM 666: RETROREFLECTORIZED PAVEMENT MARKINGS

The Contractor will layout the proposed striping in accordance with TxDOT Traffic Control Plan Standards and latest version Texas Manual on Uniform Traffic Control Devices (TMUTCD) and project striping layout sheets. The Engineer will verify proposed striping layout prior to the beginning of striping operations.

The Contractor will locate the beginning and ending points of No Pass Zones.

ITEM 668: PREFABRICATED PAVEMENT MARKINGS

Use Type C prefabricated pavement markings.

ITEM 672: RAISED PAVEMENT MARKERS

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

ITEM 677: ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS

Water blasting method will be used on all final pavement surfaces for removal of temporary or permanent pavement markings.

The following are considered acceptable Pavement Marking Removal methods on this project for non-final pavement surfaces:

Provide 2’ wide strip seals
Water blasting
Mechanical Method

ITEM 730: ROADSIDE MOWING

Throughout the course of the project, when in the opinion of the Engineer, tall grass and weeds affect the safety of the public by restricting visibility, interfere with normal traffic flow or appear unsightly, the Contractor will be required to mow same. Final cleanup will include mowing of grass and weeds. This work will be paid by the acre.

Mowing cycles will coincide with adjoining construction projects and adjoining segments maintained by contracted maintenance.

At the discretion of the Engineer, mow non-paved areas within the project prior to placement of permanent vegetation. The Contractor will plan and schedule to perform the full width mowing cycle work under this Item as follows:

RURAL AREAS
- At least two (2) times per year
- June 1 to July 15 and late October to late November

ITEM 738: CLEANING AND SWEEPING HIGHWAYS

For sweeping operations, a vacuum pickup type broom will be utilized.

Regular sweeping of dirt or mud due to construction operations from the travel ways will not be paid for directly but will be subsidiary to the various bid items.

ITEM 3077: SUPERPAVE MIXTURES

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

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

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

Maximum stripping of 0% is required.

The number of design gyrations (N_{des}) for this project is 50.

ITEM 3096: ASPHLATS, OILS, AND EMULSIONS

Latex additives or modifiers will not be allowed on this project.

ITEM 6001: PORTABLE CHANGEABLE MESSAGE SIGN

This project will require “full matrix” type portable changeable message signs.

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

Furnish 2 portable changeable message signs. The portable changeable message sign(s) will be used for all lane closures and freeway closures as shown on the traffic control plan standard sheets.

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

ITEM 6185: TRUCK MOUNTED ATTENUATORS

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

TCP 1 Series	Scenario	Required TMA
(1-1)-18	All	1
(1-2)-18	All	1
(1-4)-18	All	1

TCP 2 Series	Scenario	Required TMA
(2-1)-18	All	1
(2-2)-18	All	1
(2-4)-18	All	1

TCP 3 Series	Scenario			Required TMA
(3-1)-13	All			2
(3-3)-14	A	B	D	2
	C			3

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

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

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

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

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2304-02-044 **DISTRICT** Waco **COUNTY** Bell
HIGHWAY FM 2410

			CONTROL SECTION JOB		**2304-02-044**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00004796**		
			COUNTY		**Bell**		
			HIGHWAY		**FM 2410**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	152.000		152.000	
	110-6001	EXCAVATION (ROADWAY)	CY	746.000		746.000	
	112-6001	SUBGRADE WIDENING (ORD COMP)	STA	284.000		284.000	
	132-6005	EMBANKMENT (FINAL)(ORD COMP)(TY C)	CY	8,751.000		8,751.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	223,979.000		223,979.000	
	164-6035	DRILL SEEDING (PERM) (RURAL) (CLAY)	SY	223,979.000		223,979.000	
	164-6041	DRILL SEEDING (TEMP) (WARM)	SY	111,990.000		111,990.000	
	164-6043	DRILL SEEDING (TEMP) (COOL)	SY	111,990.000		111,990.000	
	168-6001	VEGETATIVE WATERING	MG	3,690.000		3,690.000	
	169-6004	SOIL RETENTION BLANKETS (CL 1) (TY D)	SY	9,766.000		9,766.000	
	216-6001	PROOF ROLLING	HR	54.000		54.000	
	247-6509	FL BS (RDWY DEL)(TY D GR 3)(FINAL POS)	CY	1,498.000		1,498.000	
	315-6001	FOG SEAL (SS-1)	GAL	10,507.000		10,507.000	
	316-6022	ASPH (CRS-2)	GAL	45,831.000		45,831.000	
	316-6397	AGGR(TY-D GR-4 OR TY-L GR-4)	CY	754.000		754.000	
	351-6011	FLEXIBLE PAVEMENT STRUCTURE REPAIR(18")	SY	2,000.000		2,000.000	
	354-6045	PLANE ASPH CONC PAV (2")	SY	48,528.000		48,528.000	
	400-6005	CEM STABIL BKFL	CY	150.000		150.000	
	400-6006	CUT & RESTORING PAV	SY	126.000		126.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	201.000		201.000	
	403-6001	TEMPORARY SPL SHORING	SF	3,180.000		3,180.000	
	432-6033	RIPRAP (STONE PROTECTION)(18 IN)	CY	532.000		532.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	8.000		8.000	
	462-6052	CONC BOX CULV (5 FT X 4 FT)(EXTEND)	LF	64.000		64.000	
	462-6053	CONC BOX CULV (5 FT X 5 FT)(EXTEND)	LF	18.000		18.000	
	462-6055	CONC BOX CULV (6 FT X 4 FT)(EXTEND)	LF	28.000		28.000	
	462-6056	CONC BOX CULV (6 FT X 5 FT)(EXTEND)	LF	64.000		64.000	
	462-6065	CONC BOX CULV (8 FT X 6 FT)(EXTEND)	LF	36.000		36.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	120.000		120.000	
	464-6009	RC PIPE (CL III)(42 IN)	LF	54.000		54.000	
	464-6018	RC PIPE (CL IV)(24 IN)	LF	132.000		132.000	
	466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	2.000		2.000	
	466-6102	HEADWALL (CH - PW - 0) (DIA= 42 IN)	EA	1.000		1.000	
	466-6152	WINGWALL (FW - 0) (HW=5 FT)	EA	1.000		1.000	
	466-6180	WINGWALL (PW - 1) (HW=5 FT)	EA	2.000		2.000	
	466-6181	WINGWALL (PW - 1) (HW=6 FT)	EA	2.000		2.000	
	466-6182	WINGWALL (PW - 1) (HW=7 FT)	EA	4.000		4.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2304-02-044 **DISTRICT** Waco **COUNTY** Bell
HIGHWAY FM 2410

			CONTROL SECTION JOB		**2304-02-044**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00004796**		
			COUNTY		**Bell**		
			HIGHWAY		**FM 2410**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	466-6183	WINGWALL (PW - 1) (HW=8 FT)	EA	2.000		2.000	
	467-6182	SET (TY I)(S= 5 FT)(HW= 5 FT)(4:1) (C)	EA	6.000		6.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	70.000		70.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	8.000		8.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	90.000		90.000	
	467-6448	SET (TY II) (36 IN) (RCP) (3: 1) (C)	EA	2.000		2.000	
	467-6461	SET (TY II) (42 IN) (RCP) (3: 1) (C)	EA	1.000		1.000	
	467-6474	SET (TY II) (48 IN) (RCP) (3: 1) (C)	EA	1.000		1.000	
	467-6477	SET (TY II) (48 IN) (RCP) (4: 1) (C)	EA	1.000		1.000	
	480-6001	CLEAN EXIST CULVERTS	EA	9.000		9.000	
	496-6004	REMOV STR (SET)	EA	54.000		54.000	
	496-6005	REMOV STR (WINGWALL)	EA	16.000		16.000	
	496-6007	REMOV STR (PIPE)	LF	2,590.000		2,590.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	10.000		10.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	5,424.000		5,424.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	5,424.000		5,424.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	17,275.000		17,275.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	17,275.000		17,275.000	
	508-6001	CONSTRUCTING DETOURS	SY	2,950.000		2,950.000	
	510-6003	ONE-WAY TRAF CONT (PORT TRAF SIG)	MO	4.000		4.000	
	512-6013	PORT CTB (DES SOURCE)(SGL SLP)(TY 1)	LF	240.000		240.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF	2,880.000		2,880.000	
	512-6037	PORT CTB (STKPL)(SGL SLP)(TY 1)	LF	240.000		240.000	
	530-6004	DRIVEWAYS (CONC)	SY	644.000		644.000	
	530-6005	DRIVEWAYS (ACP)	SY	9,607.000		9,607.000	
	530-6008	TURNOUTS (ACP)	SY	967.000		967.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	75.000		75.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	2.000		2.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	26.000		26.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	2.000		2.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	2.000		2.000	
	560-6007	MAILBOX INSTALL-S (WC-POST) TY 3	EA	39.000		39.000	
	560-6008	MAILBOX INSTALL-D (WC-POST) TY 3	EA	11.000		11.000	
	560-6013	MAILBOX INSTALL-M (TWW-POST) TY 4	EA	14.000		14.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	110.000		110.000	
	644-6002	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	EA	14.000		14.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2304-02-044 **DISTRICT** Waco **COUNTY** Bell
HIGHWAY FM 2410

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2304-02-044**			
		PROJECT ID		**A00004796**			
		COUNTY		**Bell**			
		HIGHWAY		**FM 2410**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	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	2.000		2.000	
	644-6031	IN SM RD SN SUP&AM TYS80(1)SA(T-2EXT)	EA	6.000		6.000	
	644-6032	IN SM RD SN SUP&AM TYS80(1)SA(T-EXAL)	EA	3.000		3.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA	1.000		1.000	
	644-6035	IN SM RD SN SUP&AM TYS80(1)SA(U-2EXT)	EA	1.000		1.000	
	644-6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	87.000		87.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	3.000		3.000	
	658-6073	INSTL OM ASSM (OM-2Y)(WC)GND(BI)	EA	60.000		60.000	
	662-6001	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	LF	1,290.000		1,290.000	
	662-6003	WK ZN PAV MRK NON-REMOV (W)4"(LNDP)	LF	55.000		55.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF	65,842.000		65,842.000	
	662-6010	WK ZN PAV MRK NON-REMOV (W)8"(DOT)	LF	683.000		683.000	
	662-6012	WK ZN PAV MRK NON-REMOV (W)8"(SLD)	LF	1,284.000		1,284.000	
	662-6016	WK ZN PAV MRK NON-REMOV (W)24"(SLD)	LF	344.000		344.000	
	662-6017	WK ZN PAV MRK NON-REMOV (W)(ARROW)	EA	27.000		27.000	
	662-6029	WK ZN PAV MRK NON-REMOV(W)(WORD)	EA	12.000		12.000	
	662-6031	WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)	EA	5.000		5.000	
	662-6032	WK ZN PAV MRK NON-REMOV (Y)4"(BRK)	LF	2,362.000		2,362.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	73,072.000		73,072.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	700.000		700.000	
	666-6021	REFL PAV MRK TY I (W)6"(LNDP)(100MIL)	LF	55.000		55.000	
	666-6030	REFL PAV MRK TY I (W)8"(DOT)(100MIL)	LF	683.000		683.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	1,248.000		1,248.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	344.000		344.000	
	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	LF	1,291.000		1,291.000	
	666-6343	REF PROF PAV MRK TY I(W)6"(SLD)(100MIL)	LF	65,442.000		65,442.000	
	666-6346	REF PROF PAV MRK TY I(Y)6"(BRK)(100MIL)	LF	3,821.000		3,821.000	
	666-6347	REF PROF PAV MRK TY I(Y)6"(SLD)(100MIL)	LF	60,688.000		60,688.000	
	668-6077	PREFAB PAV MRK TY C (W) (ARROW)	EA	27.000		27.000	
	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	12.000		12.000	
	668-6092	PREFAB PAV MRK TY C (W) (36")(YLD TRI)	EA	5.000		5.000	
	672-6007	REFL PAV MRKR TY I-C	EA	191.000		191.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	1,228.000		1,228.000	
	730-6002	FULL - WIDTH MOWING	AC	138.900		138.900	
	3077-6023	SP MIXESSP-CSAC-B PG70-22	TON	16,206.000		16,206.000	
	3085-6001	UNDERSEAL COURSE	GAL	9,706.000		9,706.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2304-02-044 **DISTRICT** Waco **COUNTY** Bell
HIGHWAY FM 2410

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2304-02-044**			
		PROJECT ID		**A00004796**			
		COUNTY		**Bell**			
		HIGHWAY		**FM 2410**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	3088-6001	CEMENT	TON	581.000		581.000	
	3088-6002	ASPHALT BINDER (PG 64-22)	TON	1,334.000		1,334.000	
	3088-6006	FOAMED ASPHALT TREAT (12")(DC)	SY	98,801.000		98,801.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	4.000		4.000	
	6185-6002	TMA (STATIONARY)	DAY	370.000		370.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	300.000		300.000	
	08	CONTRACTOR FORCE ACCOUNT EROSION CONTROL MAINTENANCE (NON-PARTICIPATING)	LS	1.000		1.000	
		CONTRACTOR FORCE ACCOUNT SAFETY CONTINGENCY (NON-PARTICIPATING)	LS	1.000		1.000	
1A	464-6003	RC PIPE (CL III)(18 IN)	LF	1,688.000		1,688.000	
2	464-6005	RC PIPE (CL III)(24 IN)	LF	100.000		100.000	
	4122-6005	THERMO PIPE(24")(HDPE)(TY S)(CSB)	LF	2,056.000		2,056.000	
2A	464-6005	RC PIPE (CL III)(24 IN)	LF	2,156.000		2,156.000	
1	4122-6004	THERMO PIPE(18")(HDPE)(TY S)(CSB)	LF	1,688.000		1,688.000	

SUMMARY OF ROADWAY ITEMS	*					**					***								
LOCATION	100 6002	110 6001	112 6001	132 6005	216 6001	247 6509	315 6001	316 6022	316 6397	351 6011	354 6045	432 6045	540 6002	544 6001	3077 6023	3085 6001	3088 6001	3088 6002	3088 6006
	PREPARING ROW	EXCAVATION (ROADWAY)	SUBGRADE WIDENING (ORD COMP)	EMBANKMENT (FINAL) (ORD COMP) (TY C)	PROOF ROLLING	FL BS (RDWY DEL) (TY D GR 3) (FNAL POS)	FOG SEAL (SS-1)	ASPH (CRS-2)	AGGR (TY-D GR-4 OR TY-L GR-4)	FLEXIBLE PAVEMENT STRUCTURE REPAIR (18")	PLANE ASPH CONC PAV (2")	RIPRAP (MOW STRIP) (4 IN)	MTL W-BEAM GD FEN (STEEL POST)	GUARDRAIL END TREATMENT (INSTALL)	SP MIXES SP-C SAC-B PG70-22	UNDERSEAL COURSE	CEMENT	ASPHALT BINDER (PG 64-22)	FOAMED ASPHALT TREAT (12") (DC)
	STA	CY	STA	CY	HR	CY	GAL	GAL	CY	SY	SY	CY	LF	EA	TON	GAL	TON	TON	SY
PLAN LAYOUT (1 OF 35)	0	0		0							659				72	132			
PLAN LAYOUT (2 OF 35)	0	0		0							8779				966	1756			
PLAN LAYOUT (3 OF 35)	0	0		0							8794				967	1759			
PLAN LAYOUT (4 OF 35)	0	0		0							8478				933	1696			
PLAN LAYOUT (5 OF 35)	0	0		0							6035				664	1207			
PLAN LAYOUT (6 OF 35)	5.5	0		0							5133				565	1027			
PLAN LAYOUT (7 OF 35)	3.5	21	3.00	37			121	530	9		4843	4	30	1	658	969	7	15	1141
PLAN LAYOUT (8 OF 35)	1	14	10.00	30		9	454	1989	33			4	45	1	473		25	58	4301
PLAN LAYOUT (9 OF 35)	0	30	11.00	168		22	391	1705	28						403		22	50	3667
PLAN LAYOUT (10 OF 35)	4.5	4	11.00	101		47	391	1705	28						403		22	50	3667
PLAN LAYOUT (11 OF 35)	11	14	11.00	250		27	406	1772	29						419		22	51	3813
PLAN LAYOUT (12 OF 35)	11	32	11.00	274		11	406	1771	29						419		22	51	3810
PLAN LAYOUT (13 OF 35)	9.5	8	11.00	127		35	391	1705	28						403		22	50	3667
PLAN LAYOUT (14 OF 35)	8.5	128	11.00	673		47	391	1705	28						403		22	50	3667
PLAN LAYOUT (15 OF 35)	3.5	46	11.00	68		59	391	1705	28						403		22	50	3667
PLAN LAYOUT (16 OF 35)	8	54	11.00	580		75	407	1775	29						420		22	52	3820
PLAN LAYOUT (17 OF 35)	5.5	30	12.00	431		77	466	2035	34						482		26	59	4383
PLAN LAYOUT (18 OF 35)	2	64	10.00	274		78	356	1550	26						367		20	45	3333
PLAN LAYOUT (19 OF 35)	7	28	11.00	286		78	445	1942	32						460		25	56	4183
PLAN LAYOUT (20 OF 35)	6	3	11.00	274		57	431	1881	31						446		24	55	4052
PLAN LAYOUT (21 OF 35)	4.5	61	11.00	835		107	391	1705	28						403		22	50	3667
PLAN LAYOUT (22 OF 35)	11	33	11.00	756		115	391	1705	28						403		22	50	3667
PLAN LAYOUT (23 OF 35)	11	13	11.00	392		137	391	1705	28						403		22	50	3667
PLAN LAYOUT (24 OF 35)	11	6	11.00	577		79	391	1705	28						403		22	50	3667
PLAN LAYOUT (25 OF 35)	4	0	11.00	262		80	410	1790	29						424		23	52	3852
PLAN LAYOUT (26 OF 35)	1	4	11.00	583		35	391	1705	28						403		22	50	3667
PLAN LAYOUT (27 OF 35)	0	0	11.00	198		65	391	1705	28						403		22	50	3667
PLAN LAYOUT (28 OF 35)	11	2	11.00	203		104	391	1705	28						422		23	52	3834
PLAN LAYOUT (29 OF 35)	3	2	11.00	225		97	407	1774	29						420		22	52	3818
PLAN LAYOUT (30 OF 35)	4.5	0	11.00	369		29	432	1885	31						447		24	55	4062
PLAN LAYOUT (31 OF 35)	4.5	75	11.00	47		21	429	1875	31		106				456	21	24	55	4040
PLAN LAYOUT (32 OF 35)	0	16	11.00	728			391	1705	28						403		22	50	3667
PLAN LAYOUT (33 OF 35)	0	58	7.00	3		7	252	1098	18		2253				507	451	14	32	2360
PLAN LAYOUT (34 OF 35)	0	0		0							1270				140	254			
PLAN LAYOUT (35 OF 35)	0	0		0							2178				240	436			
PROJECT TOTALS	**152**	**746**	**284**	**8751**	**54**	**1498**	**10507**	**45831**	**754**	**2000**	**48528**	**8**	**75**	**2**	**16206**	**9706**	**581**	**1334**	**98801**

* STATIONS FOR TREE TRIMMING WILL BE PAID AS PREP ROW. SEE PLAN AND PROFILE LAYOUT SHEETS FOR TREE TRIMMING STATIONS.
** ADDITIONAL FLEX BASE WIDENING TO MEET THE ROADWAY WIDTH & DEPTH SPECIFIED IN THE TYPICAL SECTIONS FOR FOAMED ASPHALT TREATMENT.
*** AS DIRECTED BY ENGINEER.

FILE: P:\MSGP\TXD18248\06-FM#2410\PROD\#SHEETS\QTY#RDWY01.dgn
DATE: 1/5/2023 1:16:41 PM mchowdhury

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

SUMMARY OF QUANTITIES

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	27
JP				
GRPH CHECK	2304	02	044	
RJ				

SUMMARY OF DRIVEWAYS, INTERSECTIONS, AND TURNOUTS

LOCATION/STATION			EXIST DRWY TYPE	DRIVEWAY				* * ALT	* * ALT									* * BASE	* * BASE	*	*	*
ITEM								464	464	467	467	496	496	530	530	530	560	560	560	4122	4122	247	340	3077
BID CODE								6003	6005	6363	6395	6004	6007	6004	6005	6008	6007	6008	6013	6004	6005			
				DRIVEWAY				RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	SET (TY II) (18 IN) (RCP) (6:1) (P)	SET (TY II) (24 IN) (RCP) (6:1) (P)	REMOV STR (SET)	REMOV STR (PIPE)	DRIVEWAYS (CONCRETE)	DRIVEWAYS (ACP)	TURNOUTS (ACP)	MAILBOX INSTALL-S(WC-POST) TY3	MAILBOX INSTALL-D (WC-POST) TY 3	MAILBOX INSTALL-M(TWW-POST) TY4	THERMO PIPE (18") (HDPE) (TY S) (CSB)	THERMO PIPE (24") (HDPE) (TY S) (CSB)	FL BS (RDWY DEL) (TY D GR3) FNAL POS)	PRIME COAT (MC-30 OR AE-P)	SP MIXES SP-C SAC-B PG70-22
	(LT/RT)			WIDTH	LENGTH	R1	R2	LF	LF	EA	EA	EA	LF	SY	SY	SY	EA	EA	EA	LF	LF	CY	GAL	TON
1	303+04.39	LT	ASPHALT	16.0	34.0	35	35	40		2			41		118					40		13	24	0.4
2	306+42.36	LT	ASPHALT	24.0	35.5	20	20		72		4		60		113						72	13	23	0.3
3	307+77.13	LT	ASPHALT	16.0	36.0	25	25		72		4		60		93						72	10	19	0.3
4	309+51.28	LT	ASPHALT	16.0	37.0	25	25		72		4		56		95						72	11	19	0.3
5	310+97.19	LT	ASPHALT	WARRIORS SUNDOWN PATH					144		4	4	146								144			
6	311+06.57	RT	GRAVEL	16.0	33.5	15	15		64		2	2	22		72	19		1			64	10	18	0.3
7	315+58.37	RT	GRAVEL	16.0	33.5	15	15		32		2				70						32	8	14	0.2
8	317+13.26	RT	GRAVEL	30.0	34.5	30	30		88		2		21		157	14	1				88	19	34	0.5
9	317+67.32	LT	ASPHALT	28.0	38.0	15	15	40		2			44		130					40		14	26	0.4
10	318+65.62	RT	GRAVEL	17.0	36.0	15	15								77							9	15	0.2
11	320+10.06	RT	ASPHALT	20.0	36.0	35	35								138	18	1		1			17	31	0.5
12	320+27.33	LT	GRAVEL	16.0	34.0	25	25								91							10	18	0.3
13	322+06.12	RT	GRAVEL	16.0	36.0	15	15								75	16		1				10	18	0.3
14	322+56.11	RT	GRAVEL	34.0	36.0	15	15								146	16	1					18	32	0.5
15	322+79.92	LT	CONCRETE	24.0	34.0	20	20							110										
16	324+15.32	RT	GRAVEL	16.0	36.0	15	15								74	16		1				10	18	0.3
17	324+70.11	RT	GRAVEL	16.0	36.0	15	15								74							8	15	0.2
18	330+61.57	RT	GRAVEL	16.0	36.0	15	15	32		2					75					32		8	15	0.2
19	333+49.16	LT	GRAVEL	16.0	34.0	15	15								72							8	14	0.2
20	335+88.16	RT	GRAVEL	16.0	36.0	15	15	32		2			21		74					32		8	15	0.2
21	337+51.90	LT	ASPHALT	16.0	34.0	15	15	56		2			24		71	16	1			56		10	17	0.3
22	338+65.11	RT	ASPHALT	16.0	36.0	15	15	56		2			16		78	16	1			56		10	19	0.3
23	338+77.07	LT	ASPHALT	16.0	34.0	15	15	32		2		2	22		71					32		8	14	0.2
24	339+77.78	RT	GRAVEL	16.0	36.0	15	15	32		2					75					32		8	15	0.2
25	341+43.66	RT	GRAVEL	16.0	36.0	15	15	32		2					75					32		8	15	0.2
26	346+34.49	RT	GRAVEL	QUANAH VALLEY DR												24	2		1			3	5	0.1
27	356+08.68	LT	GRAVEL	16.0	34.5	35	20	64		2					100	15	1			64		13	23	0.4
28	356+70.54	LT	GRAVEL	16.0	34.5	20	20	56		2			24		80	15	1			56		11	19	0.3
29	356+68.13	RT	GRAVEL	RUMMEL RD (W)				80		2			40			18			1	80		2	4	0.1
30	359+02.28	RT	GRAVEL	16.0	35.5	15	15								74							8	15	0.2
31	366+09.87	RT	GRAVEL	17.0	37.5	25	25	64		2			36		110	15	1			64		14	25	0.4
32	366+15.88	LT	GRAVEL	16.0	34.5	15	15	32		2			23		73					32		8	15	0.2
33	367+84.26	LT	ASPHALT	26.0	34.5	25	25		48		2		46		134						48	15	27	0.4
34	372+73.85	LT	GRAVEL	16.0	34.5	15	15		32		2		21		73	22	1				32	11	19	0.3
35	375+02.73	LT	GRAVEL	18.0	34.5	20	20								88							10	18	0.3
36	378+34.71	LT	ASPHALT	17.0	37.0	20	20								95							11	19	0.3
37	379+02.89	RT	ASPHALT	20.0	35.0	35	35								137	15		1				17	30	0.5
38	379+70.62	LT	ASPHALT	17.0	36.5	15	15								80							9	16	0.2
39	380+68.33	RT	ASPHALT	16.0	36.0	15	15	32		2		2	22		76					32		8	15	0.2
40	381+68.08	LT	GRAVEL	22.0	35.0	35	35								143	15	1					18	32	0.5
41	382+28.31	RT	CONCRETE	16.0	35.0	15	15	32		2		2	22	73						32				
42	383+33.05	LT	GRAVEL	18.0	38.0	35	15								93							10	19	0.3
43	383+74.42	LT	CONCRETE	18.0	38.0	35	15						26	92										
44	384+09.04	RT	GRAVEL	20.0	36.0	15	15	104		2			26		92	41	1		2	104		15	27	0.4
45	387+66.73	LT	GRAVEL	50.0	35.0	15	15		64		2	2	53		204						64	23	41	0.6
46	387+71.01	RT	GRAVEL	16.0	35.0	15	15	56		2			13		73	16		1		56		10	18	0.3
47	396+45.46	RT	ASPHALT	BIG VALLEY RD				80		2		2	23			18			1	80		2	4	0.1
48	402+06.05	LT	GRAVEL	16.0	35.0	35	35								121	36	1	1	3			17	31	0.5
49	407+16.46	RT	ASPHALT	COUNTRY DR				16		2						25	1		1	16		3	5	0.1
50	412+98.23	RT	GRAVEL	RUMMEL RD (E)					88		4		36								88			
51	413+36.92	LT	GRAVEL	16.0	36.5	20	20								86							10	17	0.3
52	417+73.12	RT	CONCRETE	16.0	34.5	15	15		112		4	4	44	72		16	1				112	2	3	0.0
53	419+73.16	LT	ASPHALT	18.0	40.0	20	20								95	22	1					13	23	0.4
54	421+14.45	RT	ASPHALT	16.0	34.5	15	15		96		4	4	46		73	16	1				96	10	18	0.3
55	426+33.87	RT	GRAVEL	16.0	36.0	15	15	56		2			46		79	16	1			56		11	19	0.3
56	430+34.96	RT	GRAVEL	16.0	34.5	15	15	56		2		2	32		72	16	1			56		10	18	0.3
57	432+82.08	LT	CONCRETE	16.0	35.0	15	15							72		21	1					2	4	0.1
58	442+60.98	RT	ASPHALT	HIGH OAK DR												37			3			4	7	0.1
59	450+39.74	LT	GRAVEL	16.0	34.0	15	15	32		2			37		71					32		8	14	0.2
60	452+87.07	LT	GRAVEL	16.0	36.0	15	15		32		2		24		78						32	9	16	0.2
61	453+07.69	RT	GRAVEL	16.0	36.5	15	15		56		2		19		77	16	1				56	10	19	0.3
62	456+89.62	RT	GRAVEL	48.0	36.0	35	35								251	15	1					30	53	0.8
63	457+04.69	LT	GRAVEL	36.0	34.0	25	25		144		4	4	142		165						144	18	33	0.5

* FOR CONTRACTOR INFORMATION ONLY TO USE IN DETERMINING THE MATERIALS REQUIRED FOR DRIVEWAY AND TURNOUT QUANTITIES.

* * ALTERNATE TO ITEM 4122 IS ITEM 464

NOTE: REMOVAL OF EXISTING ASPHALT AND CONCRETE DRIVEWAY IS SUBSIDIARY TO ITEM 530.

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FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation
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FM 2410

SUMMARY OF QUANTITIES

(SHEET 1 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	27A
JP				
GRPH CHECK	2304	02	044	
RJ				

SUMMARY OF DRIVEWAYS, INTERSECTIONS, AND TURNOUTS

LOCATION/STATION			EXIST DRWY TYPE	ITEM				* * ALT 464	* * ALT 464	467	467	496	496	530	530	530	560	560	560	* * BASE 4122	* * BASE 4122	* 247	* 340	* 3077
				BID CODE				6003	6005	6363	6395	6004	6007	6004	6005	6008	6007	6008	6013	6004	6005			
				DRIVEWAY				RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	SET (TY II) (18 IN) (RCP) (6:1) (P)	SET (TY II) (24 IN) (RCP) (6:1) (P)	REMOV STR (SET)	REMOV STR (PIPE)	DRIVEWAYS (CONCRETE)	DRIVEWAYS (ACP)	TURNOUTS (ACP)	MAILBOX INSTALL-S(WC-POST) TY3	MAILBOX INSTALL-D (WC-POST) TY 3	MAILBOX INSTALL-M(TWW-POST) TY4	THERMO PIPE (18") (HDPE) (TYS) (CSB)	THERMO PIPE (24") (HDPE) (TYS) (CSB)	FL BS (RDWY DEL) (TY D GR3) FNAL POS)	PRIME COAT (MC-30 OR AE-P)	SP MIXES SP-C SAC-B PG70-22
	(LT/RT)			WIDTH	LENGTH	R1	R2	LF	LF	EA	EA	EA	LF	SY	SY	SY	EA	EA	EA	LF	LF	CY	GAL	TON
64	460+58.01	LT	GRAVEL	16.0	33.5	15	15		64		4	4	42		70						64	8	14	0.2
65	461+60.55	RT	GRAVEL	23.0	36.5	15	15		56		2				103	15	1				56	13	24	0.4
66	462+72.79	RT	ASPHALT	16.0	36.5	15	15		56		2		24		77	16	1				56	10	19	0.3
67	463+20.03	LT	GRAVEL	16.0	33.5	15	15		64		4	4	44		70						64	8	14	0.2
68	467+45.10	LT	GRAVEL	16.0	33.5	15	15		64		4		44		70						64	8	14	0.2
69	475+10.37	RT	GRAVEL	16.0	35.5	15	15	32		2			20		74					32		8	15	0.2
70	477+22.87	RT	GRAVEL	16.0	37.0	15	15	32		2			24		77	16	1			32		10	19	0.3
71	478+09.12	RT	GRAVEL	16.0	40.0	15	15								84							9	17	0.3
72	481+11.21	RT	ASPHALT	16.0	46.5	25	25								113	15	1					14	26	0.4
73	487+72.10	LT	GRAVEL	32.0	52.5	30	30		64		2		72		220	22	1				64	27	48	0.7
74	503+25.55	LT	GRAVEL	38.0	40.0	20	20	64		2		2	58		180	22	1			64		22	40	0.6
75	506+69.78	RT	GRAVEL	16.0	35.5	20	20		32		2		44		82						32	9	16	0.3
76	513+65.59	LT	GRAVEL	16.0	35.0	15	15								74							8	15	0.2
77	519+68.82	LT	GRAVEL	30.0	34.0	35	35								170							19	34	0.5
78	522+68.40	LT	GRAVEL	16.0	34.0	15	15	32		2		2	25		71	22		1		32		10	19	0.3
79	523+58.70	RT	GRAVEL	16.0	36.0	15	15	32		2			22		75					32		8	15	0.2
80	535+11.94	RT	ASPHALT	16.0	36.0	20	20		56		2	2	30		83	15		1			56	11	20	0.3
81	537+42.18	LT	ASPHALT	16.0	34.0	15	15	32		2		2	23		72					32		8	14	0.2
82	538+51.50	RT	CONCRETE	52.0	36.0	20	20		64		2	2	48	225							64			
83	542+60.81	RT	GRAVEL	16.0	36.0	15	15	32		2			20		75					32		8	15	0.2
84	544+22.64	LT	GRAVEL	28.0	33.5	20	20								124							14	25	0.4
85	545+11.18	LT	GRAVEL	28.0	33.5	20	20								123							14	25	0.4
86	546+04.75	LT	GRAVEL	24.0	33.5	15	15								100							11	20	0.3
87	546+87.17	RT	GRAVEL	16.0	37.5	15	15	56		2			24		79	16	1			56		11	19	0.3
88	549+79.15	LT	GRAVEL	16.0	34.0	35	35								117							13	23	0.4
89	550+09.56	RT	GRAVEL	16.0	61.5	15	15		56		2		21		122	16		1			56	15	28	0.4
90	550+78.91	RT	GRAVEL	16.0	64.5	15	15		56		2		24		127	16	1				56	16	29	0.4
91	556+57.94	RT	GRAVEL	16.0	35.5	20	20	64		2			35		82	21			1	64		11	21	0.3
92	558+66.52	LT	GRAVEL	16.0	34.5	15	15	32		2			18		71	22		1		32		10	19	0.3
93	561+03.24	RT	GRAVEL	16.0	41.0	15	15								86	15	1					11	20	0.3
94	561+75.11	LT	GRAVEL	16.0	45.0	15	15	32		2			24		90					32		10	18	0.3
95	562+73.11	LT	GRAVEL	17.0	75.5	15	15								142	22	1					18	33	0.5
96	565+15.07	RT	ASPHALT	16.0	45.0	30	30								124	15	1					15	28	0.4
97	574+98.31	RT	GRAVEL	16.0	78.0	20	20		8		2				158	15	1				8	19	35	0.5
98	576+26.33	RT	GRAVEL	16.0	45.0	15	15		56		2		22		91	16	1				56	12	21	0.3
99	576+73.36	LT	GRAVEL	24.0	45.0	15	15		32		2				130						32	14	26	0.4
100	577+75.97	RT	GRAVEL	16.0	45.0	20	20				2				99							11	20	0.3
101	578+88.28	LT	ASPHALT	30.0	45.0	20	20		48		2	2	34		169						48	19	34	0.5
102	579+16.58	RT	GRAVEL	16.0	46.0	20	20	68		1			30		101	15	1			68		13	23	0.4
103	579+73.52	RT	GRAVEL	16.0	45.0	20	20	68		1		2	22		99	16	1			68		13	23	0.4
104	582+18.59	RT	GRAVEL	16.0	45.0	20	20		32		2	2	22		99						32	11	20	0.3
105	583+51.94	LT	GRAVEL	16.0	45.0	25	25		32		2		40		111	22		1			32	15	27	0.4
106	584+13.68	RT	ASPHALT	18.0	71.0	5	15								143	16	1					18	32	0.5
107	584+58.05	RT	GRAVEL	18.0	69.0	35	5								173							19	35	0.5
CSJ: 2304-02-044 OVERALL TOTAL								1688	2056	70	90	54	2190	644	9607	967	39	11	14	1688	2056	1175	2115	32.3

* FOR CONTRACTOR INFORMATION ONLY TO USE IN DETERMINING THE MATERIALS REQUIRED FOR DRIVEWAY AND TURNOUT QUANTITIES.

* * ALTERNATE TO ITEM 4122 IS ITEM 464

NOTE: REMOVAL OF EXISTING ASPHALT AND CONCRETE DRIVEWAY IS SUBSIDIARY TO ITEM 530.

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FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

SUMMARY OF QUANTITIES

(SHEET 2 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	27B
JP				
GRPH CHECK	2304	02	044	
RJ				

SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION	666 6021	666 6030	666 6036	666 6048	666 6306	666 6343	666 6346	666 6347	668 6077
	REFL PAV MRK TY I (W)6"(LNDP)(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)24"(SLD)(100MIL)	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	REF PROF PAV MRK TY I(W)6"(SLD)(100MIL)	REF PROF PAV MRK TY I(Y)6"(BRK)(100MIL)	REF PROF PAV MRK TY I(Y)6"(SLD)(100MIL)	PREFAB PAV MRK TY C (W) (ARROW)
	LF	LF	LF	LF	LF	LF	LF	LF	EA
SHEET 01		354	243		955		844	3636	9
SHEET 02	55	125	594	28	336	3346	834	4852	9
SHEET 03		204	411	46		4284	184	5794	9
SHEET 04				15		4252		3830	
SHEET 05				14		4326	495	1300	
SHEET 06				12		4322	319	2672	
SHEET 07						4400	476	2150	
SHEET 08				36		4203	190	3245	
SHEET 09				34		4222		4072	
SHEET 10				24		4222	279	2929	
SHEET 11						4400		4400	
SHEET 12				12		4300	200	3434	
SHEET 13						4400		4400	
SHEET 14				18		4222		4114	
SHEET 15				58		4473		4176	
SHEET 16				33		4290		4146	
SHEET 17				14		1780		1538	
PROJECT TOTALS	55	683	1248	344	1291	65442	3821	60688	27

SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION	668 6085	668 6092	672 6007	672 6009
	PREFAB PAV MRK TY C (W) (WORD)	PREFAB PAV MRK TY C (W) (36")(YLD TRI)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
	EA	EA	EA	EA
SHEET 01	3		95	99
SHEET 02	4	5	55	162
SHEET 03	5		41	266
SHEET 04				49
SHEET 05				42
SHEET 06				51
SHEET 07				52
SHEET 08				53
SHEET 09				52
SHEET 10				56
SHEET 11				55
SHEET 12				54
SHEET 13				55
SHEET 14				53
SHEET 15				55
SHEET 16				53
SHEET 17				21
PROJECT TOTALS	12	5	191	1228

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OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SUMMARY OF QUANTITIES

(SHEET 1 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	27C
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

SUMMARY OF SIGNING ITEMS

LOCATION	644 6001	644 6002	644 6004	644 6027	644 6031	644 6032	644 6033	644 6035	644 6080	658 6062	658 6073
	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	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(T-2EXT)	IN SM RD SN SUP&AM TYS80(1)SA(T-EXAL)	IN SM RD SN SUP&AM TYS80(1)SA(U)	IN SM RD SN SUP&AM TYS80(1)SA(U-2EXT)	RELOCATE SM RD SN SUP & AM TY TEMP	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	INSTL OM ASSM (OM-2Y)(WC)GND(BI)
	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
SHEET 01	8	3		1					12		
SHEET 02	6	6	2	1		1			7		
SHEET 03	4	4	2			1			6		4
SHEET 04	6		2						8	3	4
SHEET 05	4								1		4
SHEET 06	4										4
SHEET 07	2		2						2		4
SHEET 08	11		2						5		11
SHEET 09	12		3						4		1
SHEET 10	7				2				5		8
SHEET 11											
SHEET 12	13		4						6		
SHEET 13	7								1		4
SHEET 14	11								4		4
SHEET 15	2		2		2		1		6		8
SHEET 16	10		3		1	1			14		4
SHEET 17	3	1			1			1	6		
PROJECT TOTALS	110	14	22	2	6	3	1	1	87	3	60

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	508 6001	512 6013	512 6025	512 6037	545 6003	545 6005	545 6019	662 6001
	CONSTRUCTING DETOURS	PORT CTB (DES SOURCE)(SGL SLP)(TY 1)	PORT CTB (MOVE)(SGL SLP)(TY 1)	PORT CTB (STKPL)(SGL SLP)(TY 1)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	WK ZN PAV MRK NON-REMOV (W)4"(BRK)
	SY	LF	LF	LF	EA	EA	EA	LF
CULVERT REPLACEMENT(S)/EXTENSION(S)	2950	240	2880	240	26	2	2	
PHASE 1 - FULL DEPTH RECONSTRUCTION								
PHASE 2 - FULL DEPTH RECONSTRUCTION								
MILL/OVERLAY OPERATION								1290
PROJECT TOTALS	2950	240	2880	240	26	2	2	1290

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	662 6003	662 6004	662 6010	662 6012	662 6016	662 6017	662 6029	662 6031
	WK ZN PAV MRK NON-REMOV (W)4"(LNDP)	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	WK ZN PAV MRK NON-REMOV (W)8"(DOT)	WK ZN PAV MRK NON-REMOV (W)8"(SLD)	WK ZN PAV MRK NON-REMOV (W)24"(SLD)	WK ZN PAV MRK NON-REMOV (W)(ARROW)	WK ZN PAV MRK NON-REMOV(W)(WORD)	WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
	LF	LF	LF	LF	LF	EA	EA	EA
CULVERT REPLACEMENT(S)/EXTENSION(S)		400						
PHASE 1 - FULL DEPTH RECONSTRUCTION		25675			107			
PHASE 2 - FULL DEPTH RECONSTRUCTION		25675			113			
MILL/OVERLAY OPERATION	55	14092	683	1284	124	27	12	5
PROJECT TOTALS	55	65842	683	1284	344	27	12	5

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	662 6032	662 6034	662 6111	6001 6002	510 6003	6185 6002	6185 6003
	WK ZN PAV MRK NON-REMOV (Y)4"(BRK)	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	PORTABLE CHANGEABLE MESSAGE SIGN	ONE-WAY TRAF CONT (PORT TRAF SIG)	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	LF	LF	EA	EA	MO	DAY	HR
CULVERT REPLACEMENT(S)/EXTENSION(S)	500	700			4	70	
PHASE 1 - FULL DEPTH RECONSTRUCTION		55200	100			150	
PHASE 2 - FULL DEPTH RECONSTRUCTION			100			150	
MILL/OVERLAY OPERATION	1862	17172	500	4			300
PROJECT TOTALS	2362	73072	700	4	4	370	300

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OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SUMMARY OF QUANTITIES

(SHEET 2 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	27D
RS				
GRPH CHECK	2304	02	044	
JMP				

SUMMARY OF CULVERT CROSSING QUANTITIES

DRAINAGE STRUCTURE ID	400 6005 CEM STABIL BKFL	400 6006 CUT & RESTORING PAV	402 6001 TRENCH EXCAVATION PROTECTION	403 6001 TEMPORARY SPL SHORING	432 6033 RIPRAP (STONE PROTECTION) (18 IN)	462 6052 CONC BOX CULV (5 FT X 4 FT) (EXTEND)	462 6053 CONC BOX CULV (5 FT X 5 FT) (EXTEND)	462 6055 CONC BOX CULV (6 FT X 4 FT) (EXTEND)	462 6056 CONC BOX CULV (6 FT X 5 FT) (EXTEND)	462 6065 CONC BOX CULV (8 FT X 6 FT) (EXTEND)	464 6005 RC PIPE (CL III) (24 IN)	464 6008 RC PIPE (CL III) (36 IN)	464 6009 RC PIPE (CL III) (42 IN)	464 6018 RC PIPE (CL IV) (24 IN)	466 6101 HEADWALL (CH - PW - O) (DIA= 36 IN)	466 6102 HEADWALL (CH - PW - O) (DIA= 42 IN)	466 6152 WINGWALL (FW - O) (HW=5 FT)
	CY	SY	LF	SF	CY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA
C-285																	
C-304				405		32											
C-345				405				28									1
C-351				465	94				32								
C-377				480	72		18										
C-393				480	90				32								
C-411				405	11	32											
C-438	24	19	47		52							64			2		
C-454				540	164					36							
C-507	28	21	46		7								54			1	
C-539	24	19	42		7							56					
C-548	17	15	37		13						54						
C-559	17	15	29		17						46						
C-573					5												
C-585	40	37												132			
PROJECT TOTALS	150	126	201	3,180	532	64	18	28	64	36	100	120	54	132	2	1	1

SUMMARY OF CULVERT CROSSING QUANTITIES

DRAINAGE STRUCTURE ID	466 6180 WINGWALL (PW - 1) (HW=5 FT)	466 6181 WINGWALL (PW - 1) (HW=6 FT)	466 6182 WINGWALL (PW - 1) (HW=7 FT)	466 6183 WINGWALL (PW - 1) (HW=8 FT)	467 6182 SET (TY I) (S=5 FT) (HW=5 FT) (4:1) (C)	467 6390 SET (TY II) (24 IN) (RCP) (4: 1) (C)	467 6448 SET (TY II) (36 IN) (RCP) (3: 1) (C)	467 6461 SET (TY II) (42 IN) (RCP) (3: 1) (C)	467 6474 SET (TY II) (48 IN) (RCP) (3: 1) (C)	467 6477 SET (TY II) (48 IN) (RCP) (4: 1) (C)	480 6001 CLEAN EXIST CULVERTS	496 6005 REMOV STR (WINGWALL)	496 6007 REMOV STR (PIPE)
	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	LF
C-285											1		
C-304	1				2						1	2	
C-345	1										1	2	
C-351			2								1	2	
C-377		2									1	2	
C-393			2								1	2	
C-411					4						1	2	
C-438													64
C-454				2							1	2	
C-507								1					52
C-539							2						56
C-548						2							51
C-559						2							48
C-573									1	1	1	2	
C-585						4							129
PROJECT TOTALS	2	2	4	2	6	8	2	1	1	1	9	16	400

I.S. ENGINEERS, LLC
FIRM REGISTRATION NO. F-11657
7670 WOODWAY DRIVE
SUITE 320
HOUSTON, TEXAS 77063

FM 2410

SUMMARY OF QUANTITIES

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	27E
GRAPHICS	CONTROL	SECTION	JOB	
TW	2304	02	044	
GRPH CHECK				
SRS				

FILENAME: L:\Waco District\FM 932*FM 2410\CADD\Sheets\07 Drainage Details\FM 2410*Culvert Quantities*01.dgn
DRAWING DATE: 01/04/2023

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	160 6003	164 6035	164 6041	164 6043	168 6001	169 6004	506 6002	506 6011	506 6038	506 6039	730 6002
	FURNISHING AND PLACING TOPSOIL (4")	DRILL SEEDING (PERM) (RURAL) (CLAY)	DRILL SEEDING (TEMP) (WARM)	DRILL SEEDING (TEMP) (COOL)	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 1) (TY D)	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	FULL - WIDTH MOWING
	SY	SY	SY	SY	MG	SY	LF	LF	LF	LF	AC
PLAN LAYOUT (1 OF 17)											
PLAN LAYOUT (2 OF 17)											
PLAN LAYOUT (3 OF 17)											
PLAN LAYOUT (4 OF 17)	9936	9936	4968	4968		759	309	309	455	455	
PLAN LAYOUT (5 OF 17)	16475	16475	8238	8238			280	280	450	450	
PLAN LAYOUT (6 OF 17)	16177	16177	8089	8089		1354	595	595	1475	1475	
PLAN LAYOUT (7 OF 17)	16057	16057	8029	8029		780	420	420	1795	1795	
PLAN LAYOUT (8 OF 17)	15986	15986	7993	7993		780	350	350	1295	1295	
PLAN LAYOUT (9 OF 17)	16236	16236	8118	8118		800	490	490	2300	2300	
PLAN LAYOUT (10 OF 17)	17075	17075	8538	8538		780	340	340	1690	1690	
PLAN LAYOUT (11 OF 17)	16009	16009	8005	8005		760	350	350	1135	1135	
PLAN LAYOUT (12 OF 17)	18852	18852	9426	9426			390	390	1945	1945	
PLAN LAYOUT (13 OF 17)	16669	16669	8335	8335		780	350	350	855	855	
PLAN LAYOUT (14 OF 17)	16456	16456	8228	8228			350	350	1445	1445	
PLAN LAYOUT (15 OF 17)	15784	15784	7892	7892		1330	430	430	820	820	
PLAN LAYOUT (16 OF 17)	24672	24672	12336	12336		783	540	540	1555	1555	
PLAN LAYOUT (17 OF 17)	7595	7595	3798	3798		860	230	230	60	60	
PROJECT TOTALS	**223979**	**223979**	**111990**	**111990**	**3690**	**9766**	**5424**	**5424**	**17275**	**17275**	**138.90**

FILE: P:\MSGP\TXD18248\06-FM*2410\PROD*SHEETS\QTY*ESS.dgn
DATE: 1/5/2023 1:31:00 PM mohowdhury

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

SUMMARY OF QUANTITIES

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	27F
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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LOC NO.	TCP PHASE	CULVERT PROFILES 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
1A	STAGE 1	1 OF 8	SE OF CULVERT C-304	304+50.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED	X								X	
1B	STAGE 1	1 OF 8	SW OF CULVERT C-304	304+50.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED	X								X	
1C	STAGE 2	1 OF 8	NE OF CULVERT C-304	304+50.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	1A					X	
1D	STAGE 2	1 OF 8	NW OF CULVERT C-304	304+50.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	1B					X	
2A	STAGE 1	2 OF 8	NE OF CULVERT C-345	345+90.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	1C					X	
2B	STAGE 1	2 OF 8	NW OF CULVERT C-345	345+90.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	1D					X	
2C	STAGE 2	2 OF 8	SE OF CULVERT C-345	345+90.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	2A					X	
2D	STAGE 2	2 OF 8	SW OF CULVERT C-345	345+90.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	2B					X	
3A	STAGE 1	2 OF 8	NE OF CULVERT C-351	351+30.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	2C					X	
3B	STAGE 1	2 OF 8	NW OF CULVERT C-351	351+30.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	2D					X	
3C	STAGE 2	2 OF 8	SE OF CULVERT C-351	351+30.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	3A					X	
3D	STAGE 2	2	SW OF CULVERT C-351	351+30.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	3B					X	
4A	STAGE 1	3 OF 8	SE OF CULVERT C-377	377+00.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	3C					X	
4B	STAGE 1	3 OF 8	SW OF CULVERT C-377	377+00.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	3D					X	
4C	STAGE 2	3 OF 8	NE OF CULVERT C-377	377+00.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	4A					X	
4D	STAGE 2	3 OF 8	NW OF CULVERT C-377	377+00.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	4B					X	
5A	STAGE 1	3 OF 8	SE OF CULVERT C-393	393+10.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	4C					X	
5B	STAGE 1	3 OF 8	SW OF CULVERT C-393	393+10.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	4D					X	
5C	STAGE 2	3 OF 8	NE OF CULVERT C-393	393+10.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	5A					X	
5D	STAGE 2	3 OF 8	NW OF CULVERT C-393	393+10.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	5B					X	
6A	STAGE 1	4 OF 8	NE OF CULVERT C-411	411+30.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	5C					X	
6B	STAGE 1	4 OF 8	NW OF CULVERT C-411	411+30.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	5D					X	
6C	STAGE 2	4 OF 8	SE OF CULVERT C-411	411+30.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	6A					X	
6D	STAGE 2	4 OF 8	SW OF CULVERT C-411	411+30.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	6B					X	
												TOTALS	2		22							

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

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

CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:	CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY	
	WACO	BELL	
	FEDERAL AID PROJECT		SHEET NO.
			28

LOC NO.	TCP PHASE	CULVERT PROFILES SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE / RESET		L	L	R	R	S	S
															MOVE/ RESET	FROM LOC. #	N	W	N	W	N	W
7A	STAGE 1	5 OF 8	NE OF CULVERT C-454	454+75.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	6C					X	
7B	STAGE 1	5 OF 8	NW OF CULVERT C-454	454+75.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED			X	6D					X	
7C	STAGE 2	5 OF 8	SE OF CULVERT C-454	454+75.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED		X	X	7A					X	
7D	STAGE 2	5 OF 8	SW OF CULVERT C-454	454+75.00	TL-3	BI	TEMP PVMT	10"	SINGLE SLOPE CONCRETE BARRIER	24"	42"	AS NEEDED		X	X	7B					X	
												TOTALS		2	4							
												PROJECT TOTALS	2	2	26							

LEGEND:

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

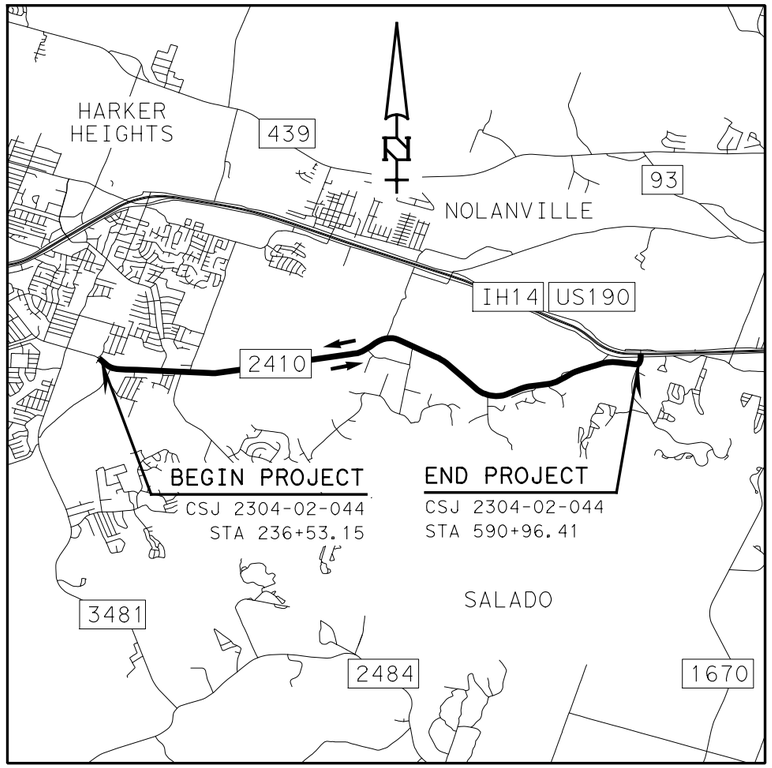
FOR DEFINITIONS SEE THE "CRASH CUSHION CATEGORIZATION CHART.PDF" AT THE DESIGN DIVISION (ROADWAY STANDARDS) WEBSITE. USE QUICK LINKS TO ACCESS ATTENUATORS / CRASH CUSHIONS SECTION.

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

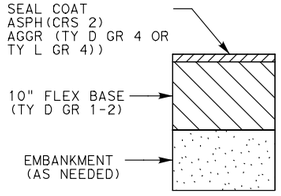
CRASH CUSHION SUMMARY SHEET

2 OF 2

FILE: ccss.dgn	DN: TxDOT	CK:	CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		
	WACO	BELL		
	FEDERAL AID PROJECT		SHEET NO.	
			29	



VICINITY MAP
NTS



DETOUR PAVEMENT SECTION

GENERAL

1. INSTALL ALL SIGNS, BARRICADES AND TRAFFIC CONTROL DEVICES IN ACCORDANCE WITH THE STANDARD BC SHEETS AND AS DIRECTED.
2. ADDITIONAL SIGNS, BARRICADES OR TRAFFIC CONTROL DEVICES OTHER THAN THOSE SPECIFIED MAY BE REQUIRED FOR THE SAFE MOVEMENT OF TRAFFIC THROUGH THE PROJECT. PAYMENT FOR ALL SUCH SIGNS, BARRICADES OF TRAFFIC CONTROL DEVICES WILL BE CONSIDERED SUBSIDIARY TO THE ITEM "BARRICADES, SIGNS AND TRAFFIC HANDLING."
3. WORK SITES SHOULD BE CAREFULLY MONITORED TO ENSURE THAT TRAFFIC CONTROL MEASURES ARE OPERATING EFFECTIVELY AND THAT ALL DEVICES USED ARE CLEARLY VISIBLE, CLEAN AND IN GOOD REPAIR.
4. THE CONTRACTOR WILL PROVIDE SAFE ACCESS TO AND FROM ALL PRIVATE PROPERTY AT ALL TIMES AND IN ALL WEATHER CONDITIONS.
5. THE CONTRACTOR WILL BE REQUIRED TO SUBMIT A DETAILED SCHEDULE OF WORK PRIOR TO THE BEGINNING OF CONSTRUCTION WHICH GENERALLY CONFORMS TO THE SEQUENCE SHOWN ON THE TCP SEQUENCE OF CONSTRUCTION BELOW.
6. COMPLETE ALL WORK ON PROJECT AS SHOWN ON THE VARIOUS PLAN SHEETS AND IN COMPLIANCE WITH THE GENERAL NOTES OF THIS CONTRACT.
7. ANY REQUEST TO ALTER THE SEQUENCE OF CONSTRUCTION OR TRAFFIC CONTROL PLAN WILL BE SUBMITTED TO THE ENGINEER FOR THEIR WRITTEN APPROVAL.
8. VERTICAL LONGITUDINAL TAPERS BETWEEN THE WORK AREA AND NON-WORK AREA WILL BE PROVIDED AT ALL TIMES FOR VEHICULAR SAFETY. TAPERS WILL HAVE A RATE OF 1" VERTICAL:50' HORIZONTAL. ALL WORK AND MATERIAL IS SUBSIDIARY TO ITEM 502.
9. MOVE SIGNS TO TEMPORARY MOUNTS ONLY FOR AREAS THAT ARE BEING CONSTRUCTED. EXISTING SIGNS ARE TO REMAIN IN PLACE AS LONG AS CONSTRUCTION HAS NOT BEGUN IN THAT AREA.
10. MULTIPLE DAY CLOSURES OF ONE LANE MAY BE REQUIRED FOR CULVERT REPLACEMENTS, AND CULVERT EXTENSIONS.
11. LANE CLOSURE REQUESTS SHALL BE PROVIDED BY 1:00PM ON THE BUSINESS DAY PRIOR TO THE PROPOSED LANE CLOSURE. CONTRACTOR SHALL NOT CLOSE LANE(S) IF THIS REQUIREMENT IS NOT MET.
12. CONTRACTOR SHALL INFORM AND COORDINATE WITH THE KILLEEN INDEPENDENT SCHOOL DISTRICT AND THE LOCAL BUSINESSES FOR LANE CLOSURE(S).

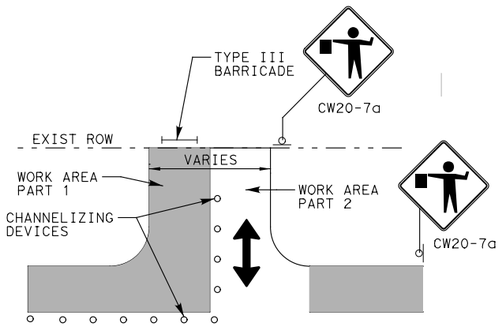
SEQUENCE OF CONSTRUCTION

A. SCHEDULE PROPOSED WORK IN ONLY ONE WORK AREA LIMITED UPTO TWO MILE SECTION AT A TIME. THERE WILL BE NO WORK PERFORMED IN MORE THAN ONE WORK AREA AT A TIME.

B. FINISH PROPOSED WORK IN EACH WORK AREA BEFORE PROCEEDING TO PERFORM WORK IN ANOTHER WORK AREA. AT A MINIMUM, ALL SAFETY END TREATMENTS FOR SIDE ROAD AND CROSS DRAINAGE CULVERTS AND MBGF ITEMS WILL BE COMPLETE AND IN PLACE. OBTAIN APPROVAL BEFORE PROCEEDING TO BEGIN WORK IN ANOTHER WORK AREA.

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

1. INSTALL PROJECT LIMIT SIGNING AND BARRICADES PRIOR TO ANY OTHER WORK.
2. INSTALL REQUIRED TEMPORARY EROSION CONTROL DEVICES AS DIRECTED BY ENGINEER.
3. REPLACE OR EXTEND CROSS DRAINAGE STRUCTURES PER STAGE CONSTRUCTION. USE TXDOT STANDARD TCP(1-2)-18 WITH FLAGGERS FOR SMALL CULVERT CONSTRUCTION.
4. REPLACE OR EXTEND CROSS DRAINAGE STRUCTURES USING TXDOT STANDARD TCP(1-2)-18 AND CULVERT PHASING STAGE CONSTRUCTION WITH FLAGGERS FOR SMALL CULVERT CONSTRUCTION. REFER TO DRAINAGE PLANS FOR LOCATIONS OF CULVERT(S). REFER TO CULVERT PHASING STAGE CONSTRUCTION PLANS FOR INFORMATION ON APPLICABLE CULVERT LOCATION(S) WHERE PARTIAL CULVERT REPLACEMENT IS EXPECTED TO BE COMPLETED MORE THAN A DAY.
5. CLOSE HALF OF ROADWAY USING DAYTIME ONE LANE TWO WAY TRAFFIC CONTROL WITH TEMPORARY TRAFFIC SIGNAL. OBLITERATE HALF OF THE EXISTING ROADWAY. RECONSTRUCT HALF OF THE ROADWAY WITH CEMENT FOAMED ASPHALT PAVEMENT AND FOG SEAL DAILY. SEAL COAT TWICE A WEEK. REOPEN ROADWAY TO TWO LANES AT THE END OF THE WORK DAY. CONTRACTOR SHALL COMPLETE ONE DIRECTION ENTIRELY PRIOR TO STARTING ROADWAY WORK ON OPPOSITE DIRECTION.
6. PLACE NON-REMOVABLE WORK ZONE STRIPING AFTER SEAL COAT IS APPLIED. THE CONTRACTOR MAY USE OPPOSING TRAFFIC LANE DIVIDERS (OLTD).
7. PLACE HMAC OVERLAY ONE LANE AT A TIME FOR LENGTH OF PROJECT USING DAYTIME LANE CLOSURES. PLACE WORK ZONE TABS PRIOR TO REOPENING ROADWAY.
8. MILL EXISTING PAVEMENT LIMITS SHOWN IN PHASE 4 UNDER THE TRAFFIC CONTROL TYPICAL SECTIONS. HMAC OVERLAY SHALL BE PLACED WITHIN 48 HOURS AFTER MILLING.
9. PLACE PERMANENT PAVEMENT MARKINGS AND PERMANENT SIGNS.
10. COMPLETE ALL OTHER WORK AS SHOWN ON THE PLANS.
11. CLEAN UP PROJECT, REMOVE TEMPORARY EROSION CONTROL DEVICES AND PROJECT BARRICADES.



TYPICAL DRIVEWAY/SIDE STREET CONSTRUCTION

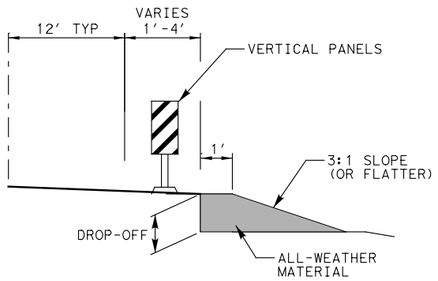
ADVANCED SIGNING

G20-1 W/ PLAQUE OR G20-5T	48X26	BEGIN ROAD WORK NEXT 7 MILES
	48X24	BEGIN ROAD WORK NEXT 7 MILES
G20-5aP W/ PLAQUE OR R2-1	24X18	WORK ZONE
	24X30	SPEED LIMIT
CW3-5	36X36	REDUCED SPEED LIMIT AHEAD
G20-6T	48X30	NAME, ADDRESS, CITY, STATE, CONTRACTOR
G20-10T	60X48	STAY ALERT TALK OR TEXT LATER
G20-9T	36X30	BEGIN WORK ZONE
G20-2bT	36X18	END WORK ZONE
R20-3T	48X42	OBEY WARNING SIGNS STATE LAW
G20-1a	72X36	ROAD WORK NEXT X MILES
CW20-1D	48X48	ROAD WORK AHEAD
R20-5T	36X36	TRAFFIC FINES DOUBLE
R20-5aTP PLAQUE	36X18	WHEN WORKERS ARE PRESENT
G20-2	48X24	END ROAD WORK

1. SIGNS G20-1 WITH PLAQUE OR G20-5T, G20-6T, G20-10T, G20-2a, G20-2bT, CW20-1D, R20-3T, R20-5T, G20-9T AND R20-5aTP PLAQUE WILL BE REQUIRED AT PROJECT LIMITS.
2. CW20-1D AND G20-2 WILL BE REQUIRED AT ALL CROSSROADS.
3. G20-1a WILL BE REQUIRED AT ALL MAJOR CROSSROADS.

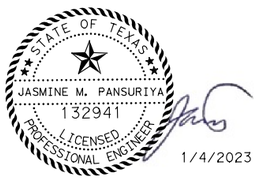
NOTES

1. ALL TRAFFIC CONTROL DEVICES WILL CONFORM WITH THE TEXAS "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" (TMUTCD), AND WILL BE MAINTAINED. ADDITIONAL GUIDELINES FOR TRAFFIC CONTROL DEVICES MAY BE FOUND IN THE TMUTCD.
2. FOR CHANNELING DEVICE PLACEMENT AND SPACING FOR ALL PHASES, REFER TO THE TCP STANDARDS.
3. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ACCESS AND SIGNING FOR SIDE STREETS AND DRIVEWAYS.



PAV EDGE DROP-OFF DETAIL

1. LESS THAN 2 INCHES: CW8-11 SIGNS ARE REQUIRED.
2. GREATER THAN 2 INCHES: VERTICAL PANELS AND EITHER CW8-9a OR CW8-11 SIGNS ARE REQUIRED.
3. THE SAFETY SLOPE WILL BE CONSTRUCTED WITH AN ALL-WEATHER MATERIAL SUCH AS RAP, WHICH IS CLEAN AND FREE OF DEBRIS AND LARGE ROCKS.



OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation
© 2023

FM 2410

TRAFFIC CONTROL PLAN SEQUENCE OF CONSTRUCTION

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	30
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

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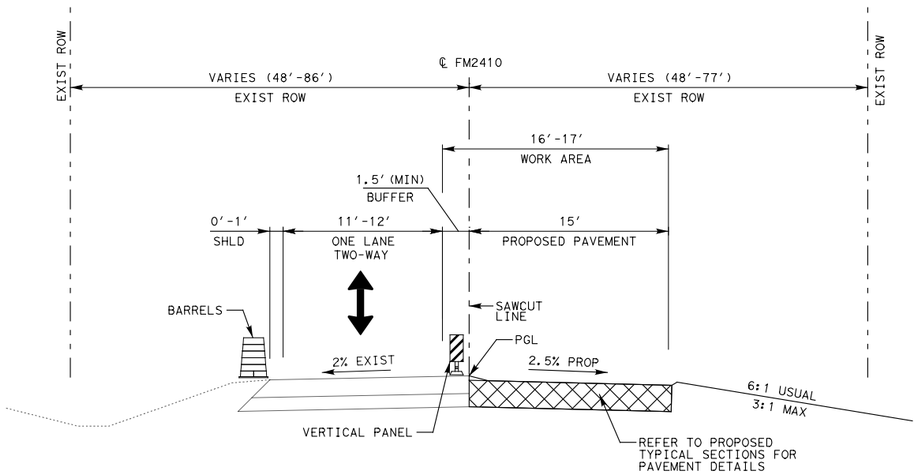
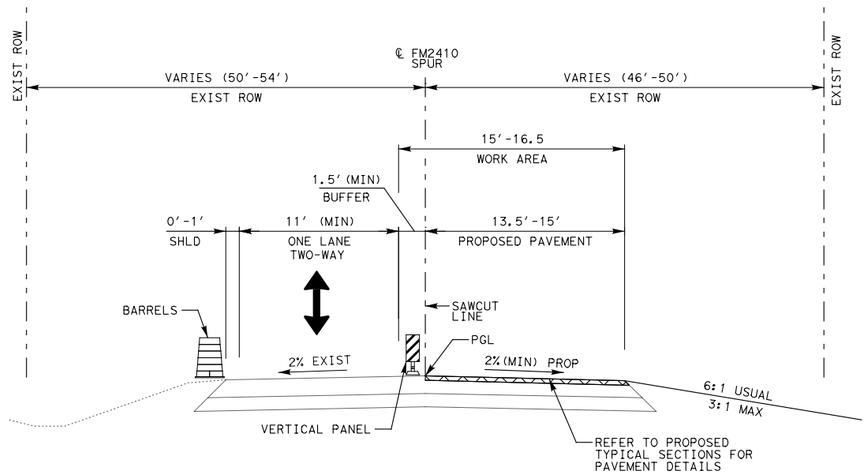


FM 2410
PHASE 1 - EASTBOUND RECONSTRUCTION

FM 2410 STA 301+00.00 TO STA 585+00.00

SCALE: N.T.S.



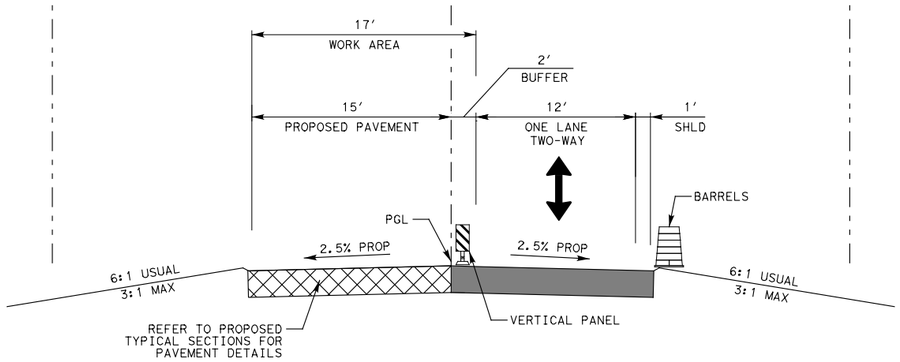
FM 2410 SPUR
PHASE 3A - SOUTHBOUND RECONSTRUCTION

FM 2410 SPUR STA 1+14.35 TO STA 7+30.19

SCALE: N.T.S.

LEGEND

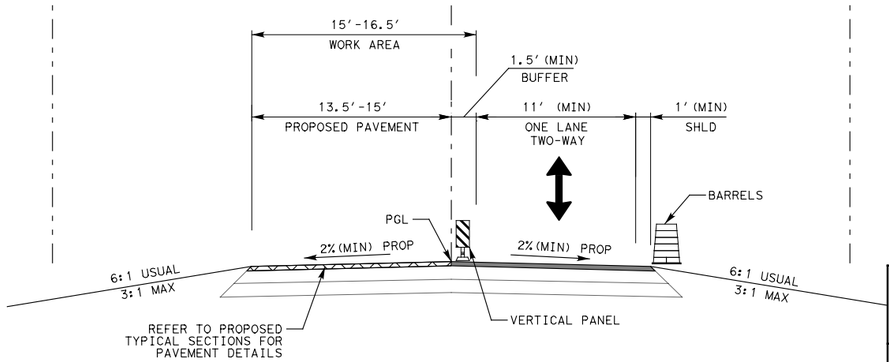
- DIRECTION OF TRAFFIC
- PERMANENT CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTION PREVIOUS PHASE



FM 2410
PHASE 2 - WESTBOUND RECONSTRUCTION

FM 2410 STA 301+00.00 TO STA 585+00.00

SCALE: N.T.S.



FM 2410 SPUR
PHASE 3B - NORTHBOUND RECONSTRUCTION

FM 2410 SPUR STA 1+14.35 TO STA 7+30.19

SCALE: N.T.S.

PHASE 4 - MILL AND OVERLAY

MILL AND OVERLAY OPERATION SHALL BE PERFORMED IN ACCORDANCE WITH TXDOT STANDARD TCP(1-1)-18, TCP(1-2)-18, TCP(1-4)-18, TCP(2-1)-18, TCP(2-2)-18, TCP(2-4)-18 AS APPLICABLE.

LIMITS OF MILL: FM 2410 STA 239+25.00 - STA 301+00.00 (MILLING OPERATION CAN BE INDEPENDENT OF THE PAVEMENT RECONSTRUCTION. HMAC OVERLAY SHALL BE PLACED WITHIN 48 HOURS AFTER FOAM TREATMENT.)

FM 2410 STA 585+00.00 - STA 590+96.41 (MILLING OPERATION CAN BE INDEPENDENT OF THE PAVEMENT RECONSTRUCTION. HMAC OVERLAY SHALL BE PLACED WITHIN 48 HOURS AFTER FOAM TREATMENT.)

LIMITS OF OVERLAY: FM 2410 STA 239+25.00 - STA 590+96.41
FM 2410 SPUR STA 1+14.35 - STA 7+30.19

STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED
PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

TRAFFIC CONTROL TYPICAL SECTIONS

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	31
RS	2304	02	044	
GRPH CHECK				
JMP				

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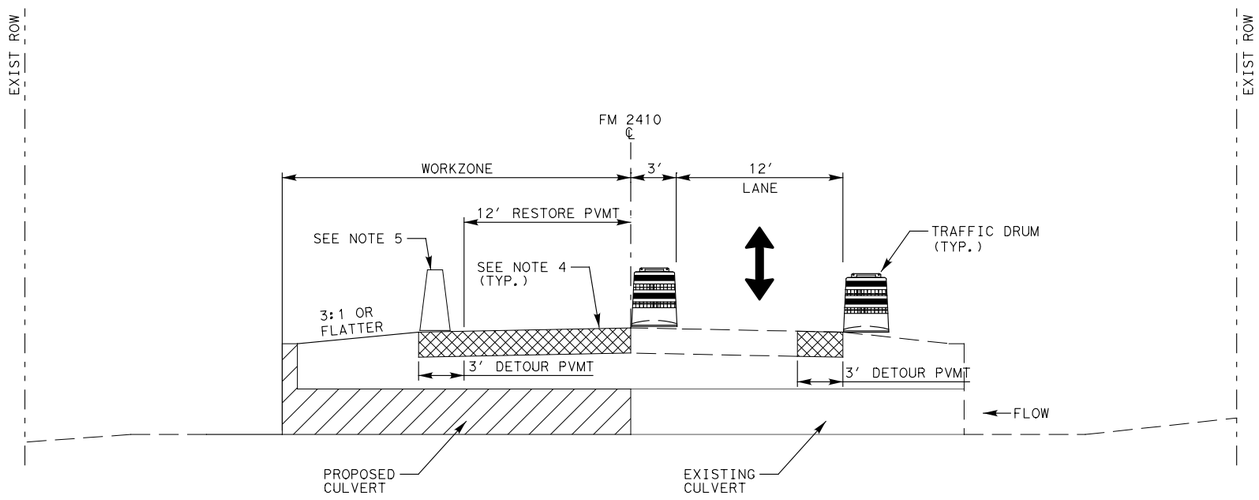
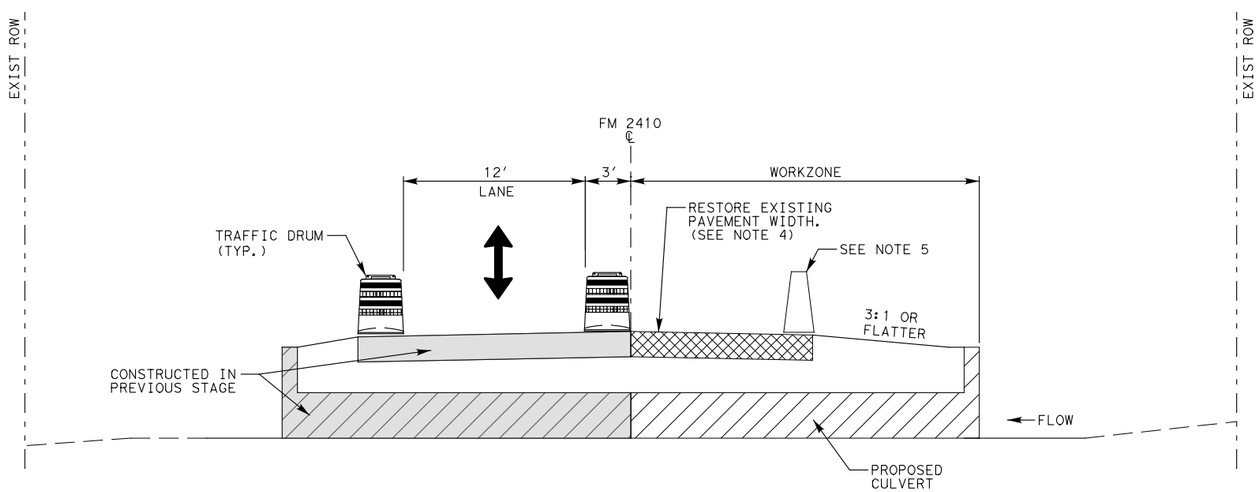


FM 2410
TYPICAL SECTION - STAGE 1 CONSTRUCTION
(DOWNSTREAM)
SCALE: N.T.S.



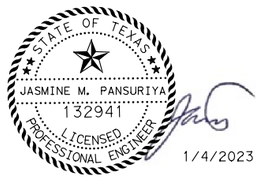
FM 2410
TYPICAL SECTION - STAGE 2 CONSTRUCTION
(UPSTREAM)
SCALE: N.T.S.

LEGEND

- DIRECTION OF TRAFFIC
- RESTORE/DETOUR PAVEMENT THIS PHASE
- RESTORED/DETOUR PAVEMENT PREVIOUS PHASE
- CONSTRUCT PARTIAL CULVERT THIS PHASE
- CONSTRUCTED PARTIAL CULVERT PREVIOUS PHASE

NOTES:

1. SEE ROADWAY PLANS FOR PROPOSED SIDE SLOPES.
2. SEE CULVERT PLANS FOR CULVERT AND WINGWALL DETAILS.
3. SEE DRAINAGE PLANS FOR LOCATIONS OF CULVERT REPLACEMENT(S) AND EXTENSION(S).
4. REFER TO SEQUENCE OF CONSTRUCTION FOR DETOUR AND RESTORE PAVEMENT SECTION INFORMATION.
5. PLACE CONCRETE BARRIERS AND CRASH CUSHIONS PRIOR TO OPENING THE ROADWAY WHEN STAGED REPLACEMENT WORK IS EXPECTED MORE THAN ONE (1) WORKING DAY.



OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

CULVERT PHASING STAGE CONSTRUCTION

SHEET (1 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	32
GRAPHICS	CONTROL	SECTION	JOB	
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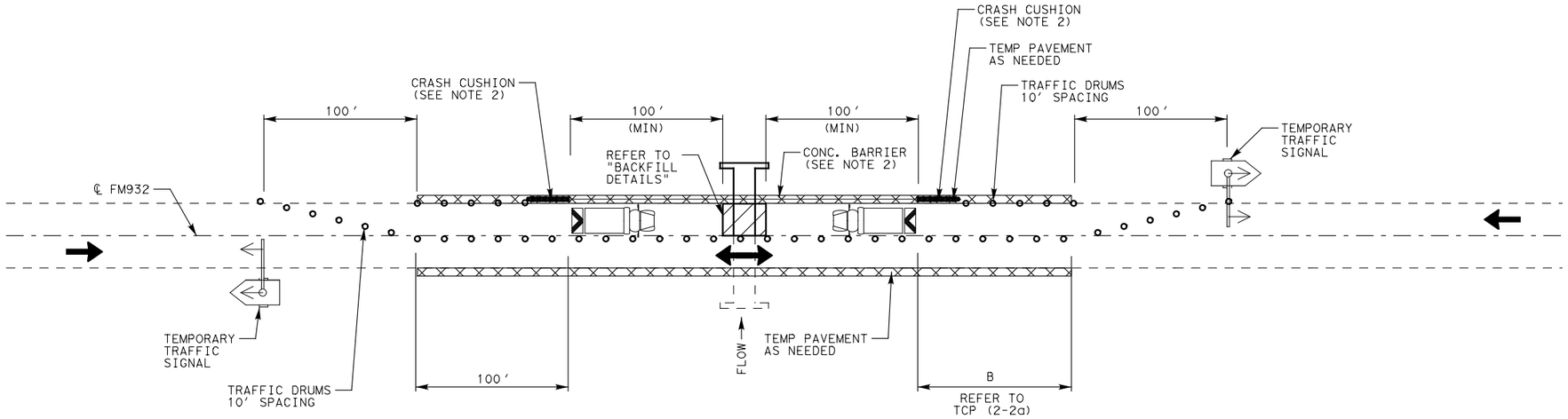


STAGE 1 CONSTRUCTION (DOWNSTREAM)

SCALE: N.T.S.

APPLICABLE LOCATION(S) FOR CONCRETE BARRIER PLACEMENT ALONG SHOULDERS (SEE NOTE 2)

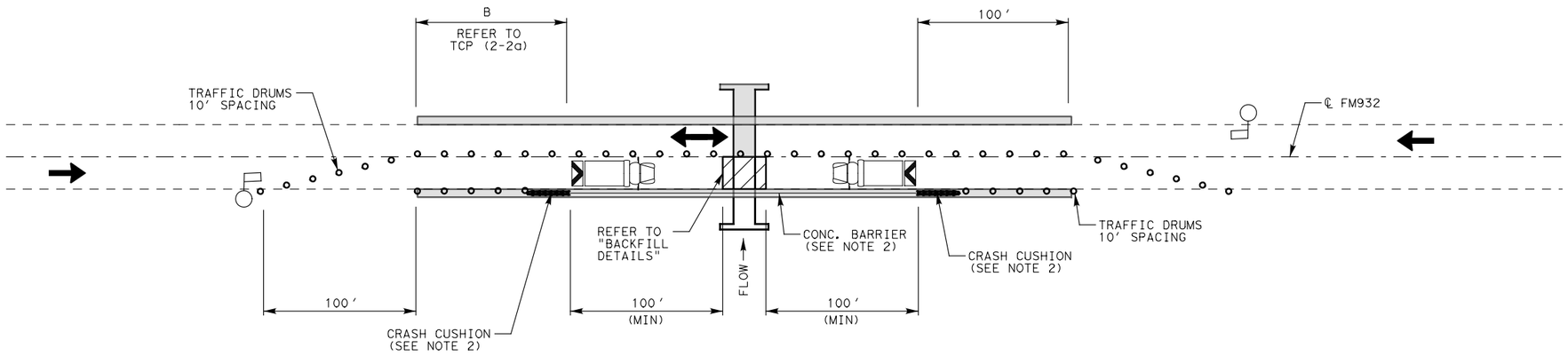
CULVERT C-304
CULVERT C-345
CULVERT C-351
CULVERT C-377
CULVERT C-393
CULVERT C-411
CULVERT C-454

NOTES:

1. ALL WARNING SIGNS, BARRICADES AND CHANNELING DEVICES SHALL BE PLACED IN ACCORDANCE WITH THE "TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES" OR AS DIRECTED BY THE ENGINEER TO MEET LOCAL CONDITIONS AND IN ACCORDANCE WITH TCP(2-2a).
2. PLACE CONCRETE BARRIERS AND CRASH CUSHIONS PRIOR TO OPENING THE ROADWAY WHEN STAGED REPLACEMENT WORK IS EXPECTED MORE THAN ONE (1) WORKING DAY.
3. THE CONTRACTOR SHALL CONSTRUCT ONE CULVERT AT A TIME UNLESS APPROVED BY THE ENGINEER.
4. REFER TO DRAINAGE PLANS FOR DETAILS AND INFORMATION FOR CULVERT REPLACEMENT(S) AND EXTENSION(S).
5. STAGE 1 CULVERT CONSTRUCTION SHALL BE COMPLETED PRIOR TO STARTING STAGE 2.

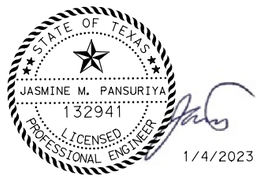
LEGEND

- CONSTRUCT PARTIAL CULVERT THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- CRASH CUSHION
- CONCRETE SAFETY BARRIER
- CHANNELIZING DEVICES
- FLAGGER
- HEAVY WORK VEHICLE WITH TRUCK MOUNTED ATTENUATOR



STAGE 2 CONSTRUCTION (UPSTREAM)

SCALE: N.T.S.



OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

CULVERT PHASING STAGE CONSTRUCTION

(SHEET 2 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	33
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

FILE: FM2410*TCP*CULVERT* PLN.dgn
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

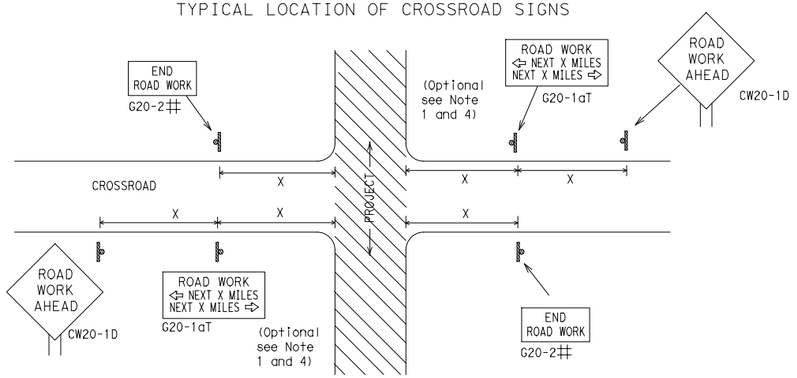
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		34

DATE: 11/1/2022 7:42:11 PM
FILE: bc-21.dgn

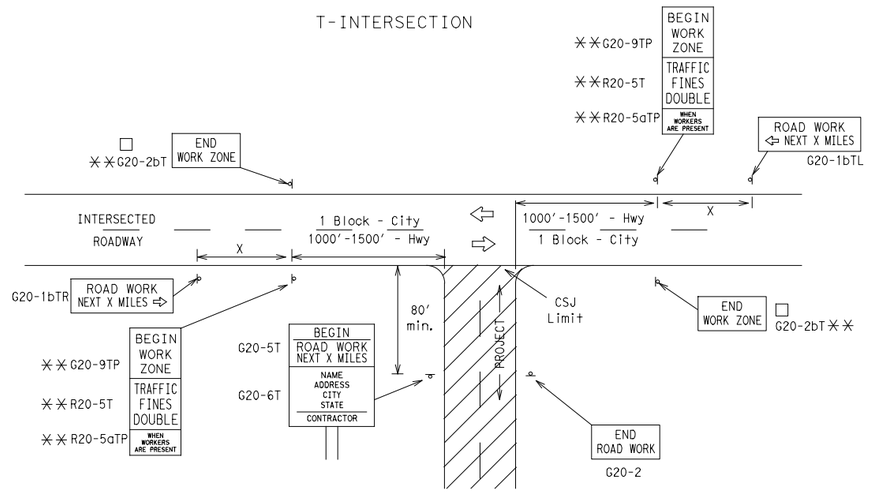
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

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

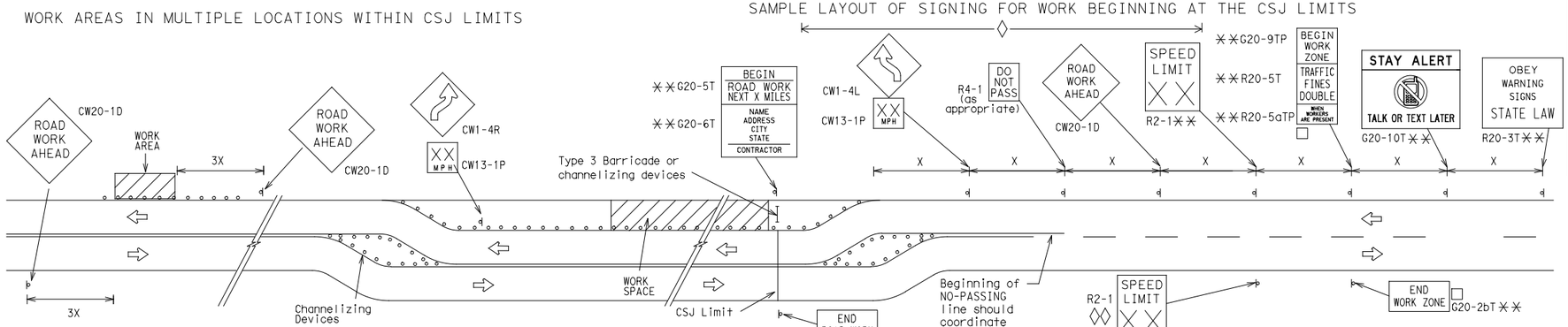
△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

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

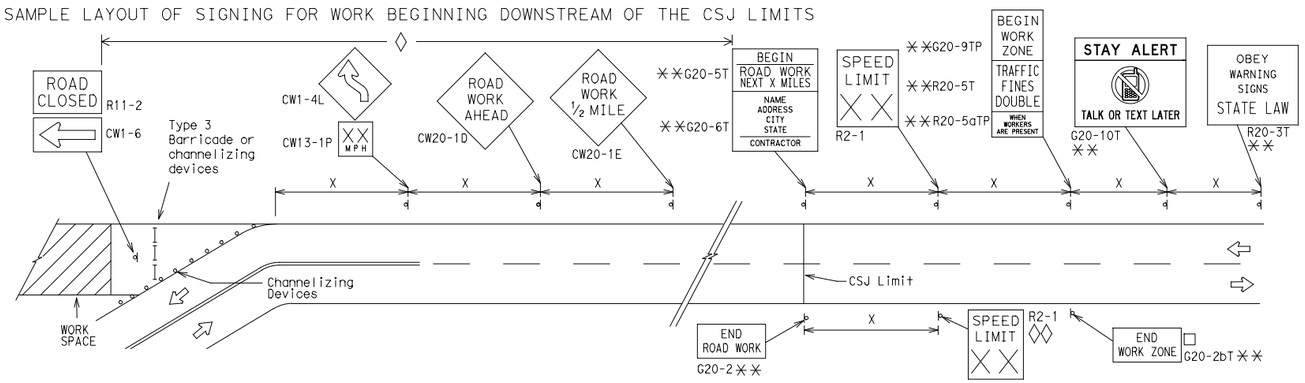
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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

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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WACO	BELL		35

DATE: 11/1/2022 7:42:11 PM
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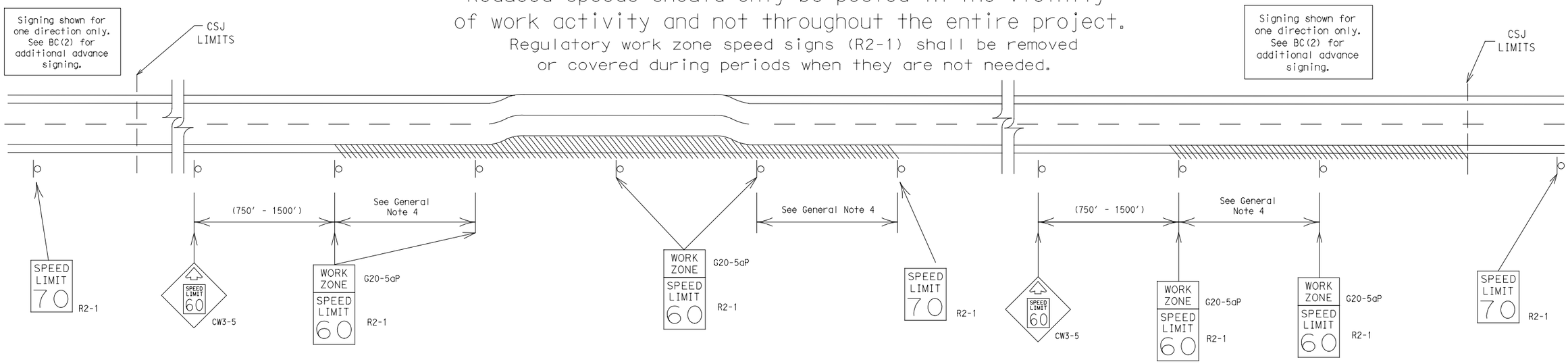
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13 5-21	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		36

DATE: 11/1/2022 7:42:12 PM
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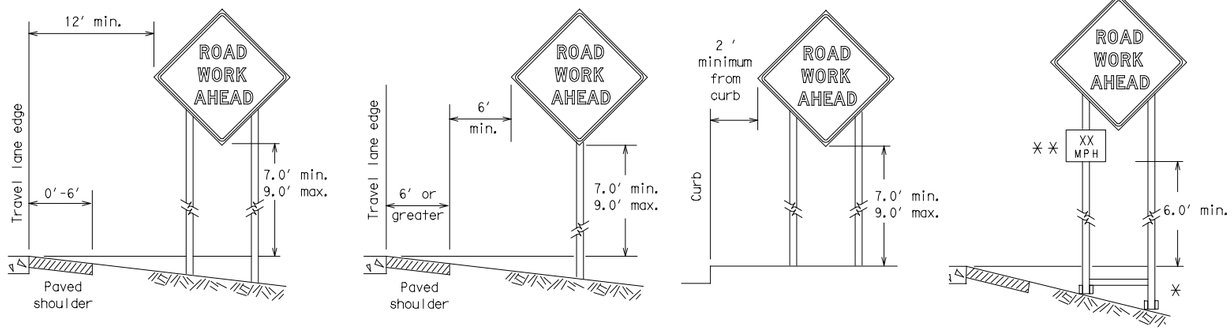
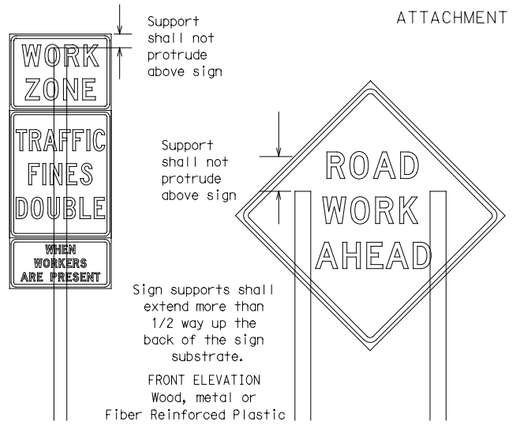
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

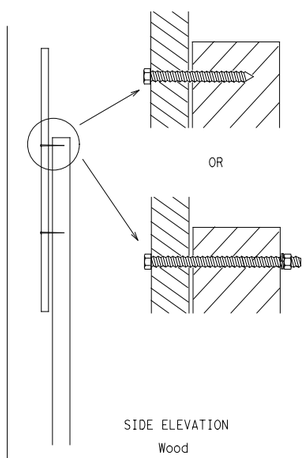


⚹ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





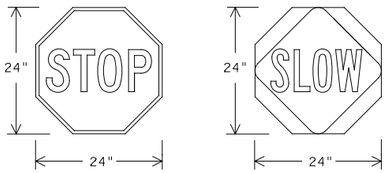
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

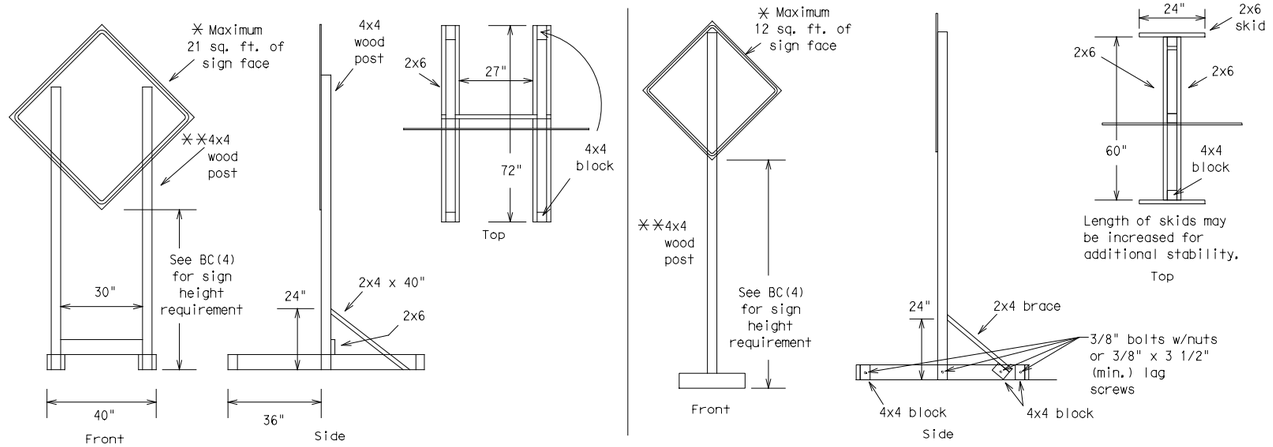
Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

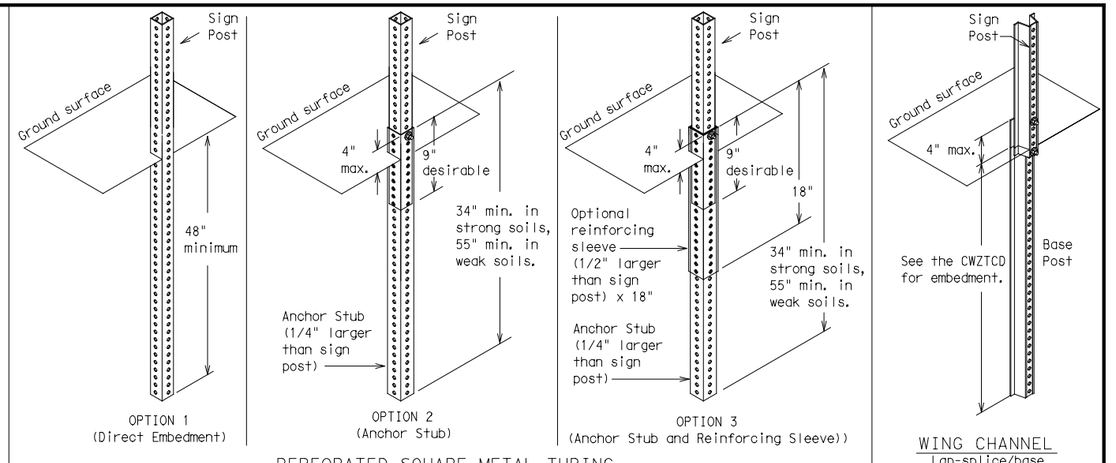
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WACO	BELL		37

DATE: 11/1/2022 7:42:12 PM
FILE: bc-21.dgn



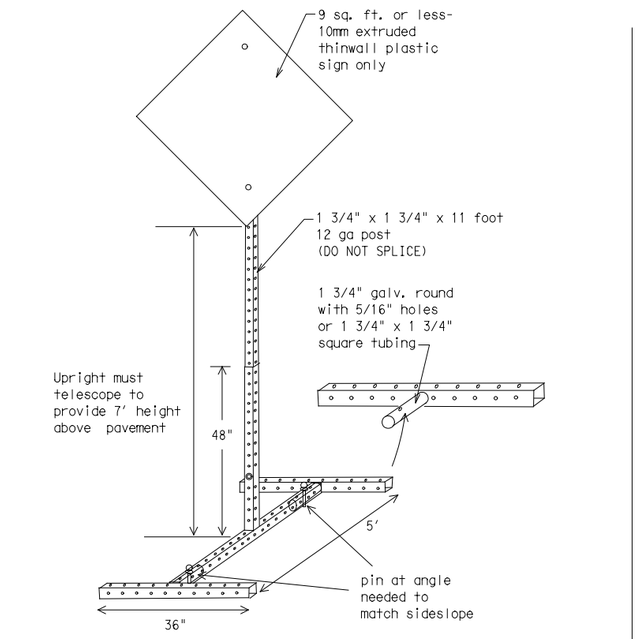
SKID MOUNTED WOOD SIGN SUPPORTS

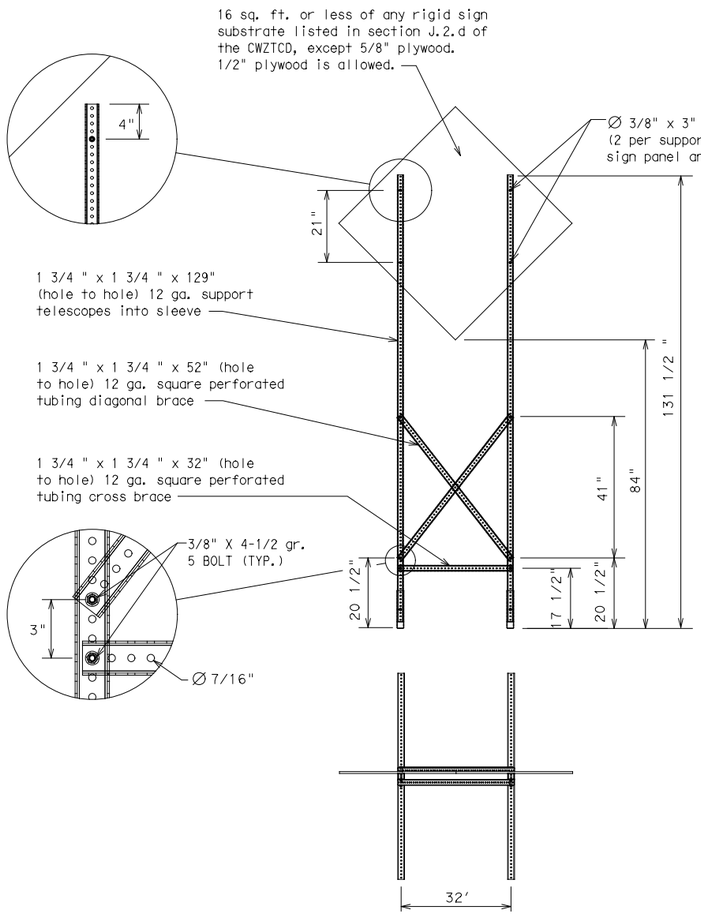
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

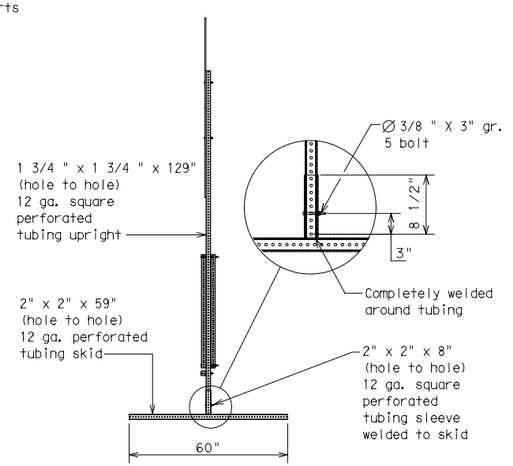


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

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BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WACO	BELL		38

DATE: 11/1/2022 7:42:12 PM
FILE: bc-21.dgn

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 *

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WACO	BELL		39

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DATE: 11/1/2022 7:42:13 PM
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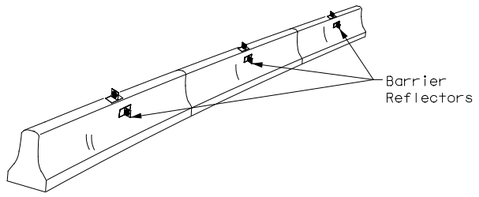
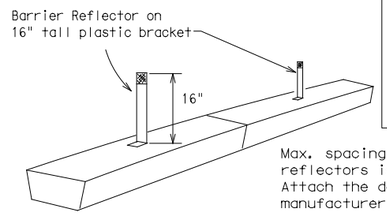
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



CONCRETE TRAFFIC BARRIER (CTB)

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

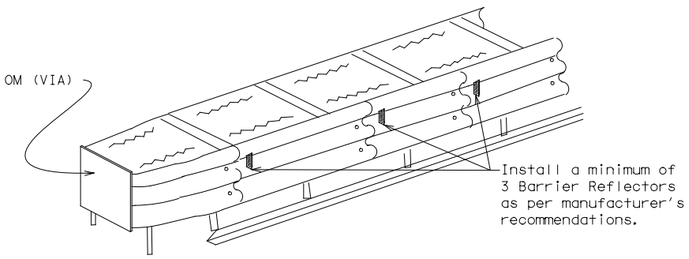


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

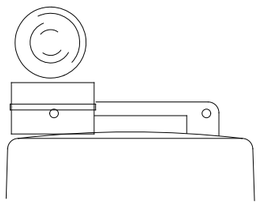


DELINEATION OF END TREATMENTS

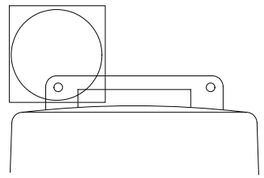
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

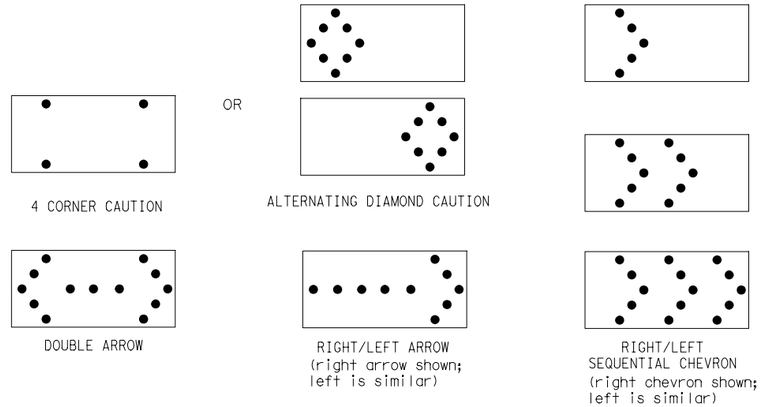
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



4 CORNER CAUTION

ALTERNATING DIAMOND CAUTION

DOUBLE ARROW

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

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

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

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

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

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

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Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WACO	BELL		40

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

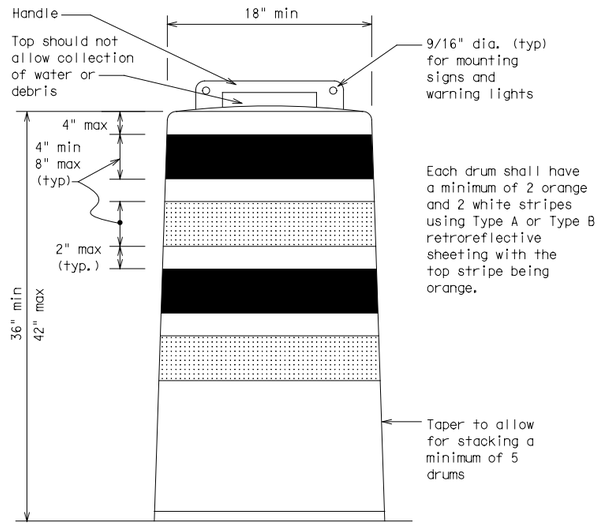
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

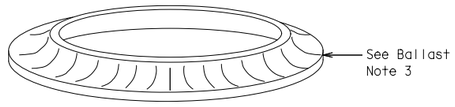
RETROREFLECTIVE SHEETING

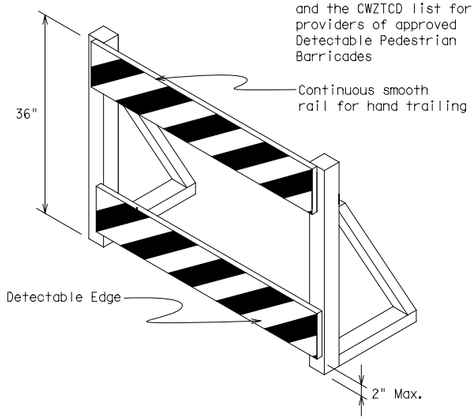
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

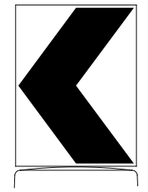




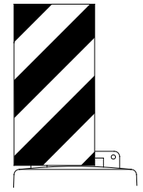


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	2304	02	044	FM 2410
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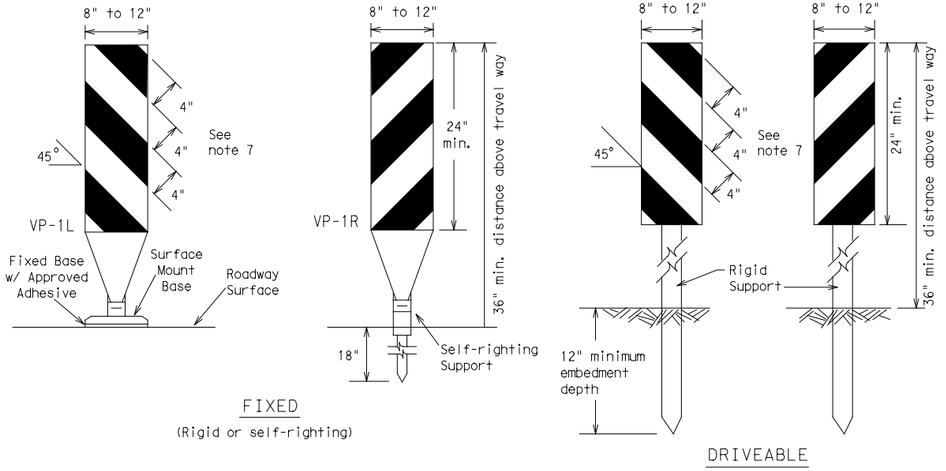
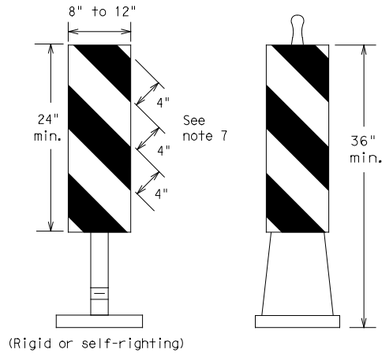


FIXED

(Rigid or self-righting)

DRIVEABLE

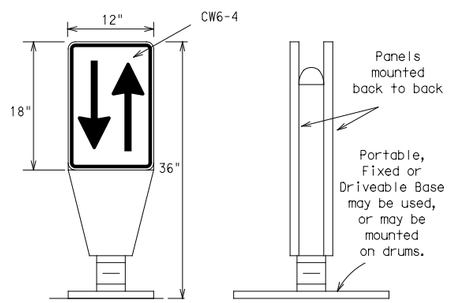


(Rigid or self-righting)

PORTABLE

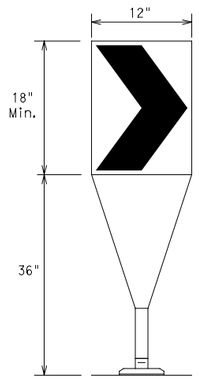
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



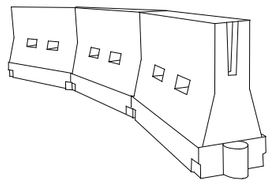
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

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Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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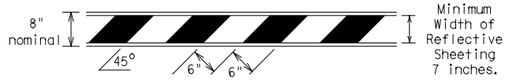
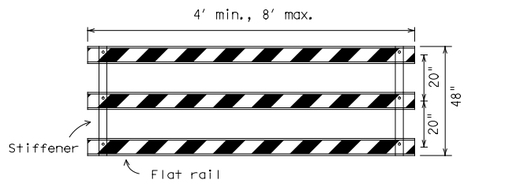
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



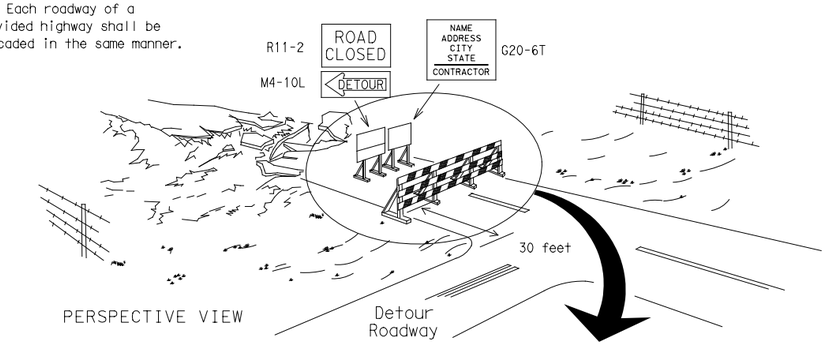
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

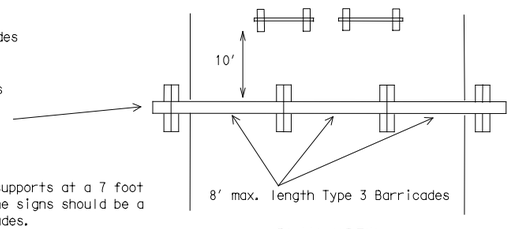
TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

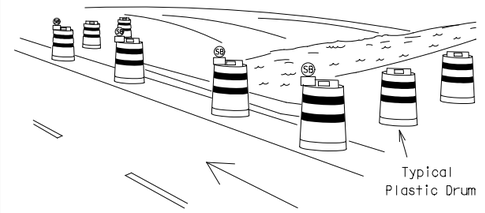
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

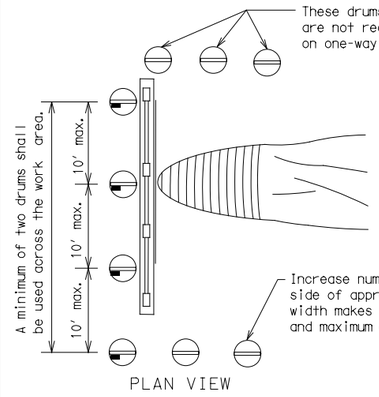
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

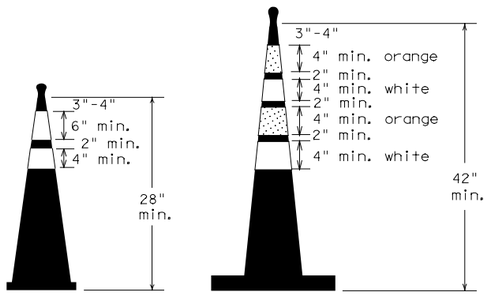
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



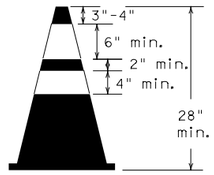
PLAN VIEW

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

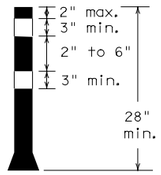
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

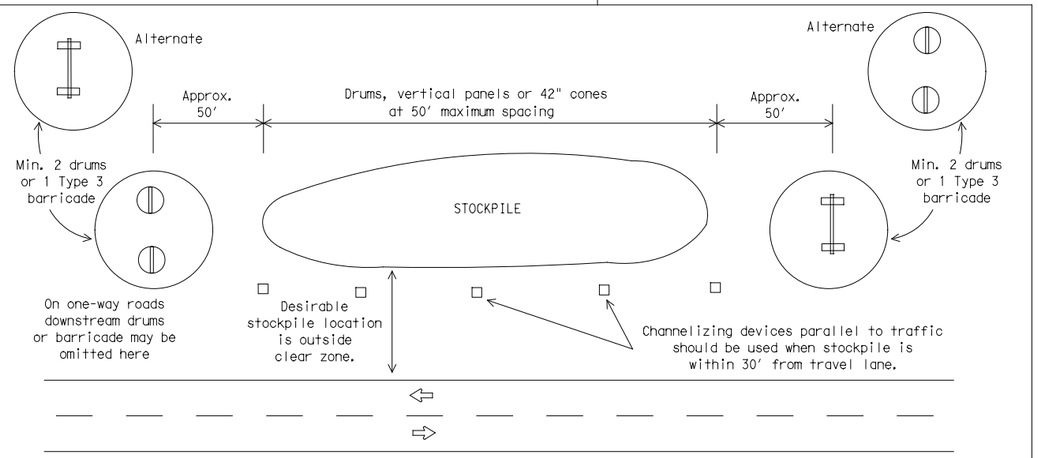


Tubular Marker

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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WACO	BELL		43

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

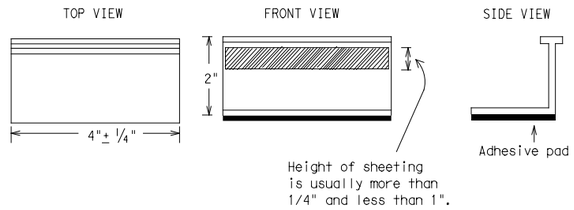
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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1-02 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14	WACO	BELL		44

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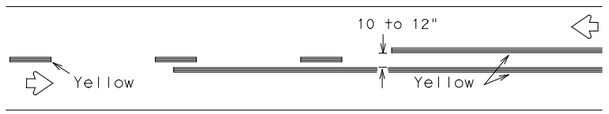
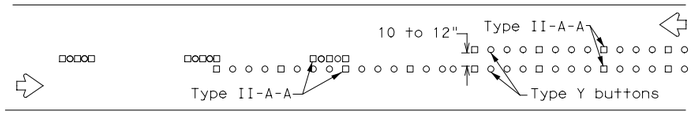
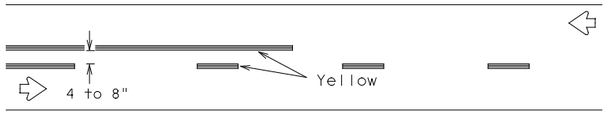
PAVEMENT MARKING PATTERNS



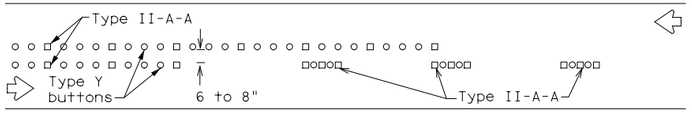
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



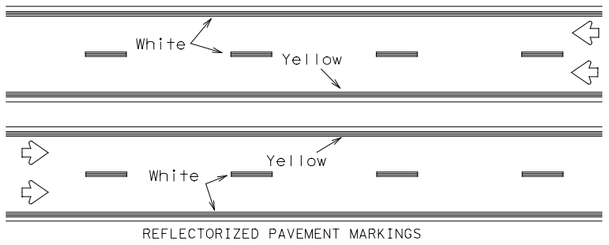
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



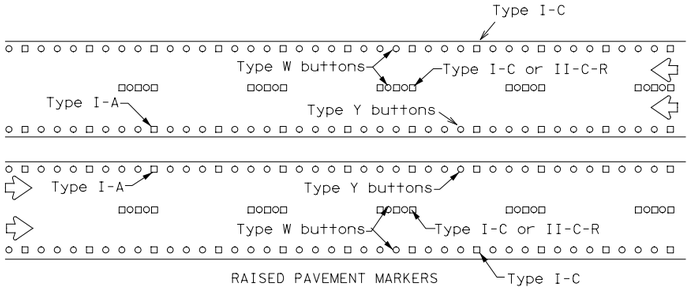
RAISED PAVEMENT MARKERS - PATTERN B

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



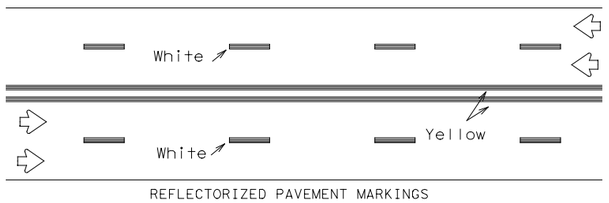
REFLECTORIZED PAVEMENT MARKINGS



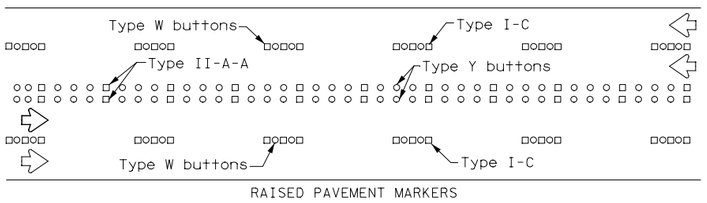
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



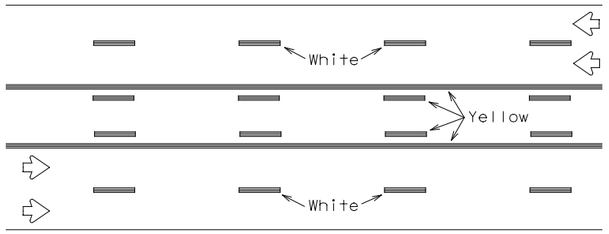
REFLECTORIZED PAVEMENT MARKINGS



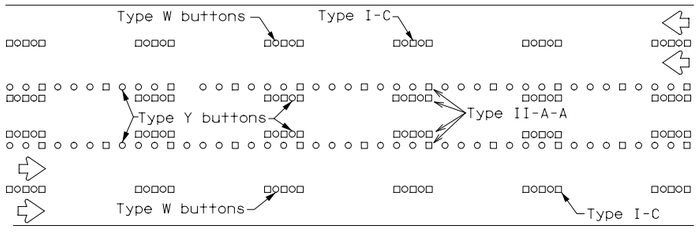
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



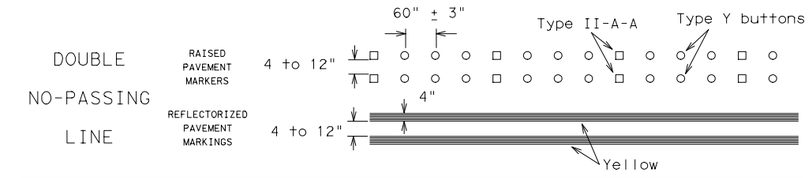
RAISED PAVEMENT MARKERS

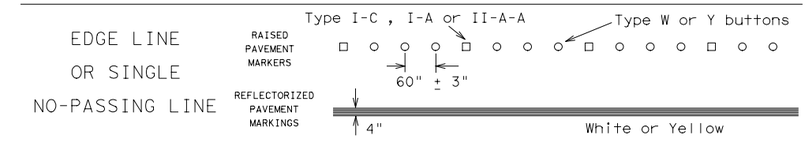
Prefabricated markings may be substituted for reflectorized pavement markings.

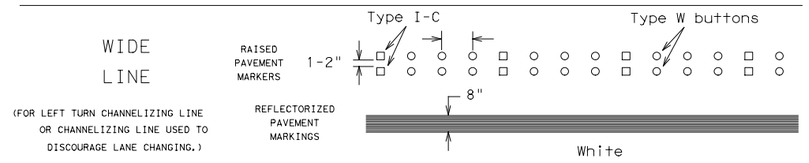
TWO-WAY LEFT TURN LANE

STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

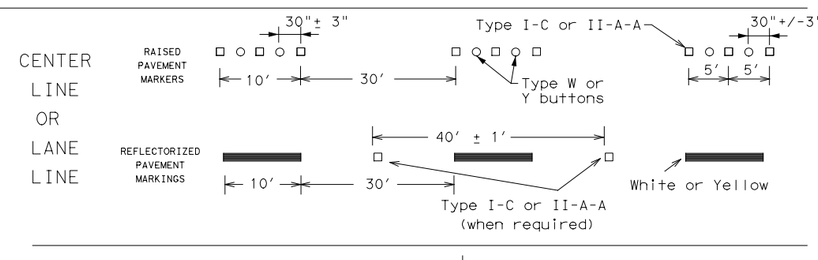
SOLID LINES





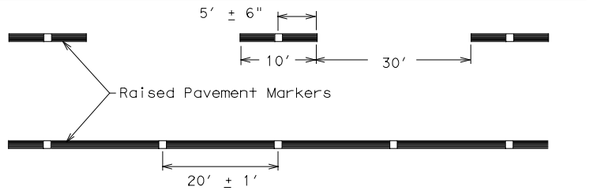


BROKEN LINES



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	2304	02	044	FM 2410
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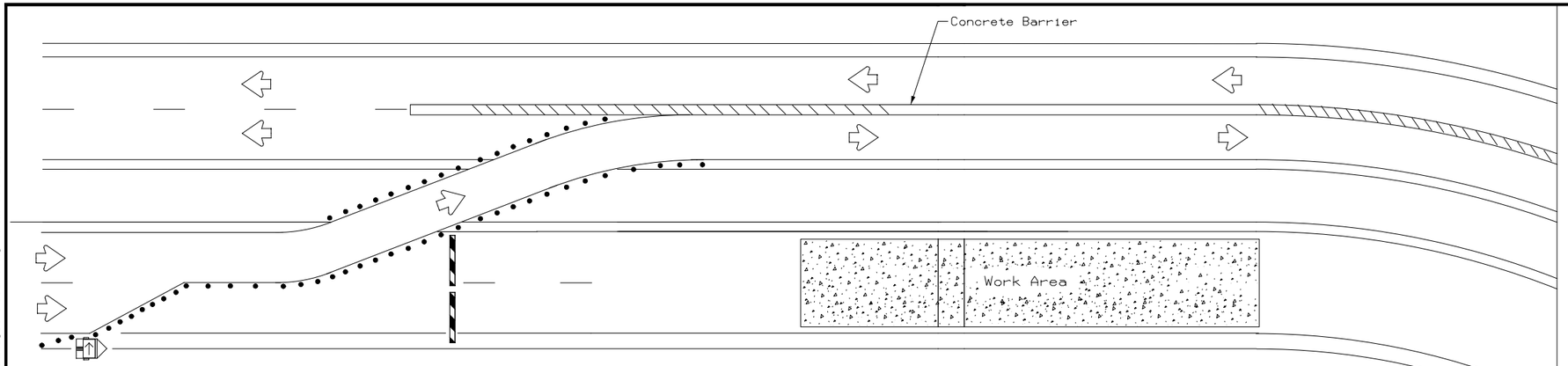


NOTES:

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

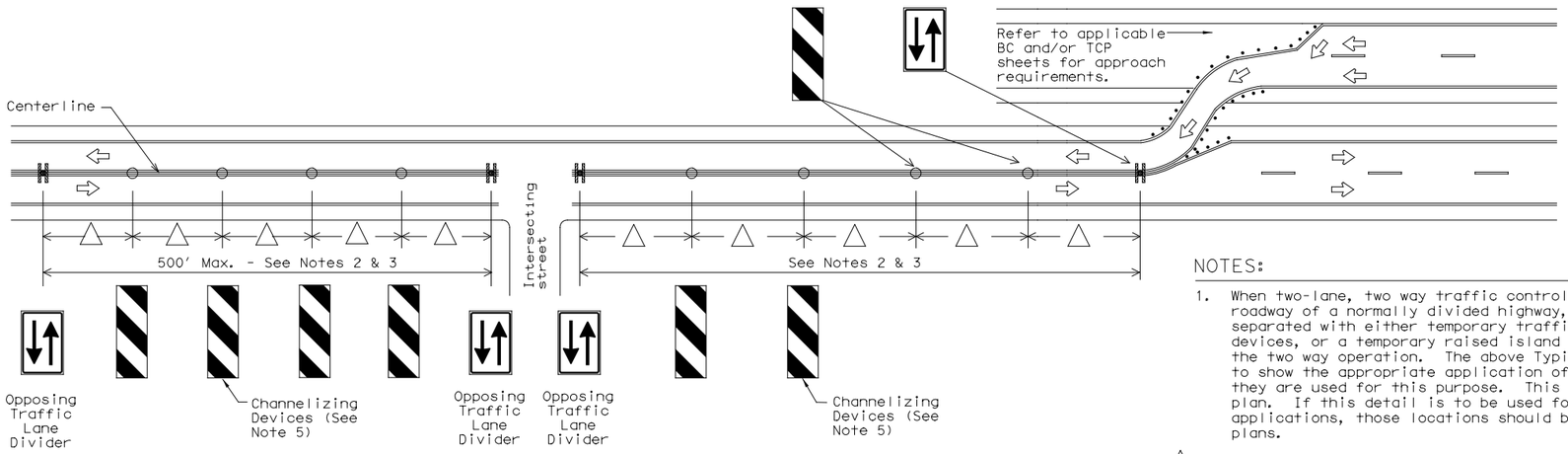
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

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

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

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

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



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

NOTES:

1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.

△2. Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100′.

3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
5. Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 2-17 3-03 7-13	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		46

110

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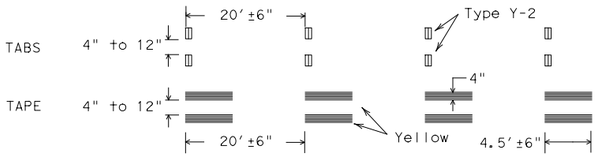
FILE: wzstpm-13.dgn

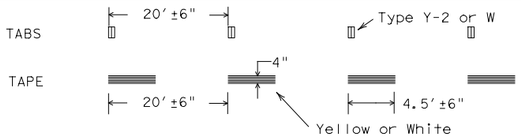
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

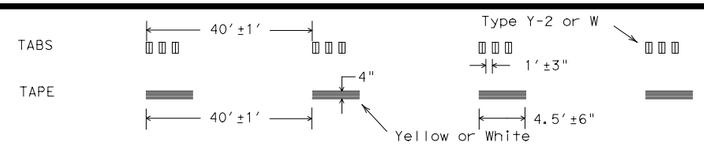


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



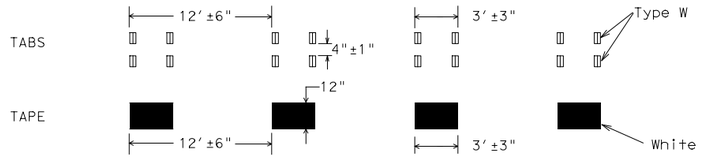
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

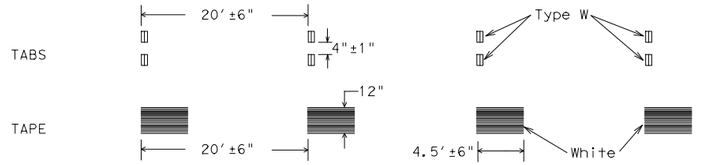


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



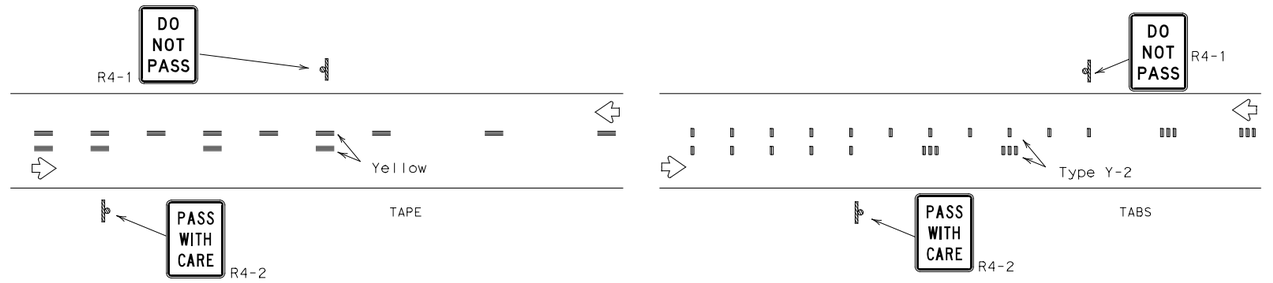
NOTES:

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

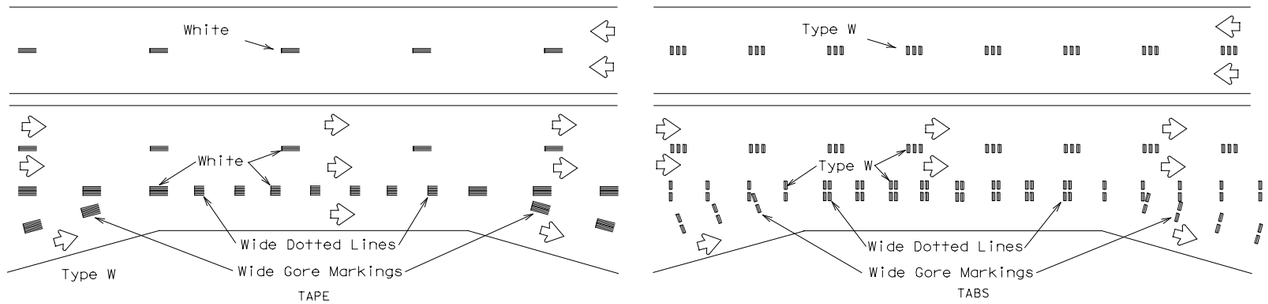
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

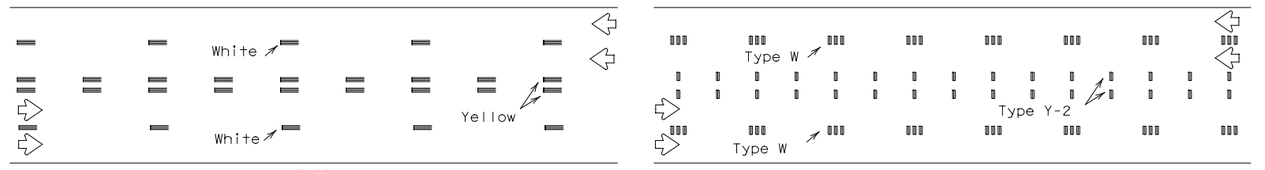
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



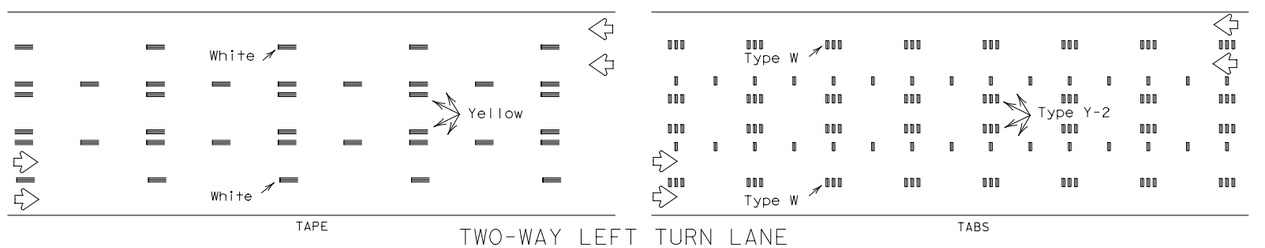
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



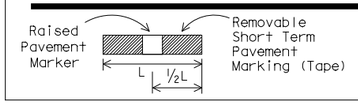
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ (STPM) -13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		2304	02	044	FM 2410
1-97		DIST	COUNTY		SHEET NO.
3-03		WACO	BELL		47
7-13					

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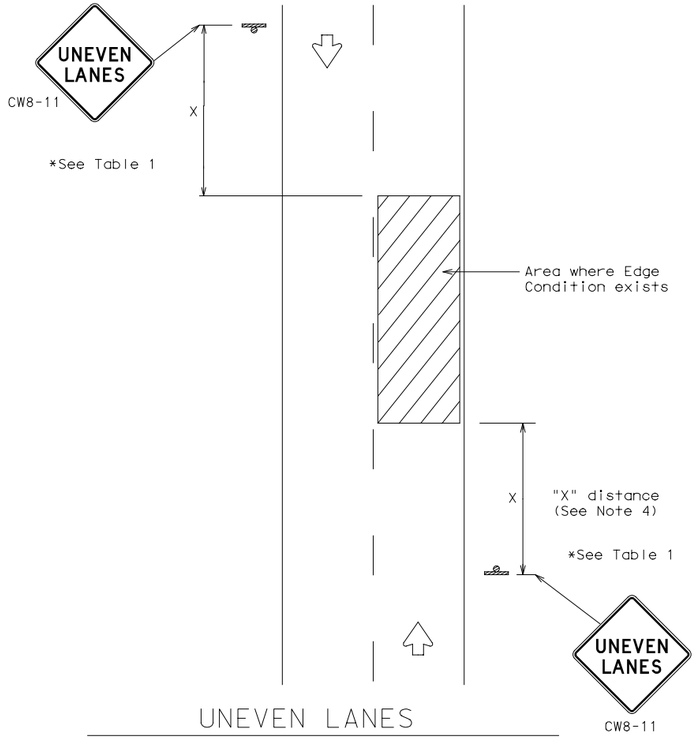
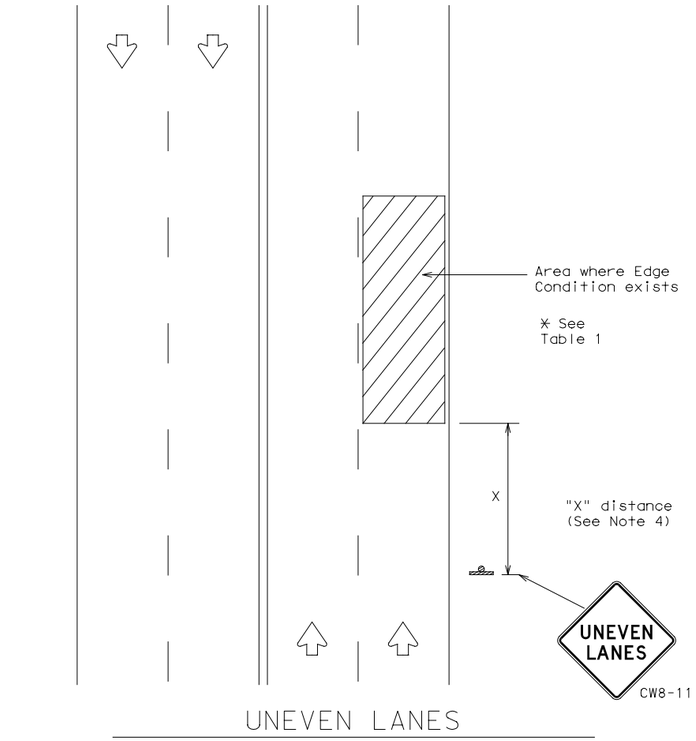
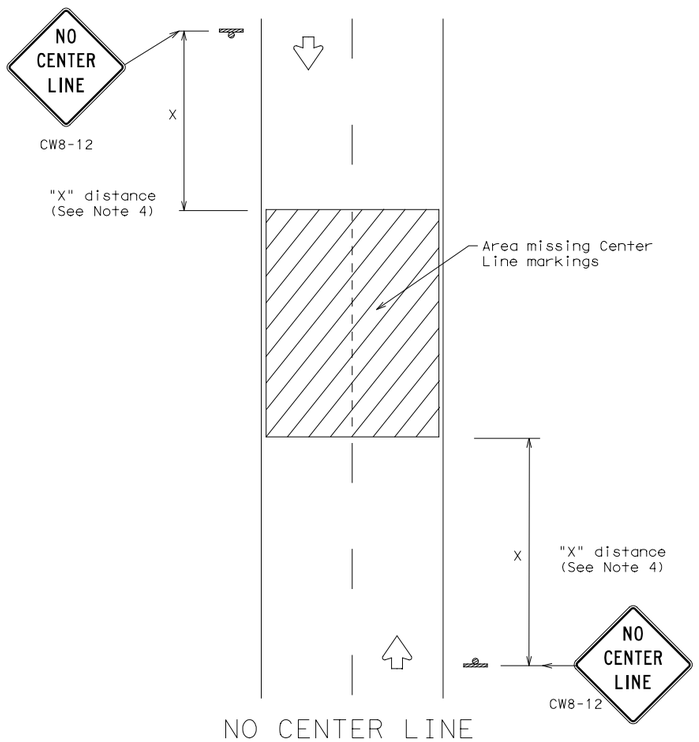


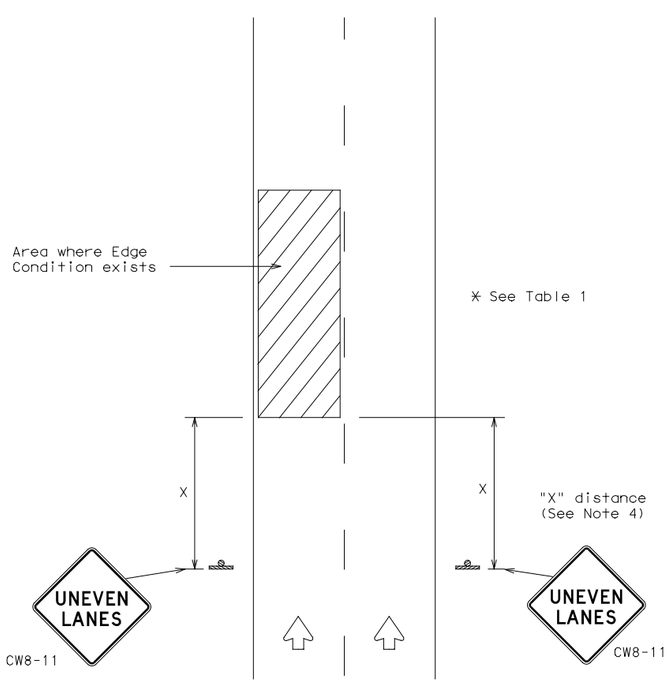
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

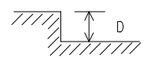
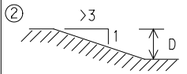
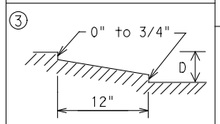
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

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

TABLE 1

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	WACO	BELL		48

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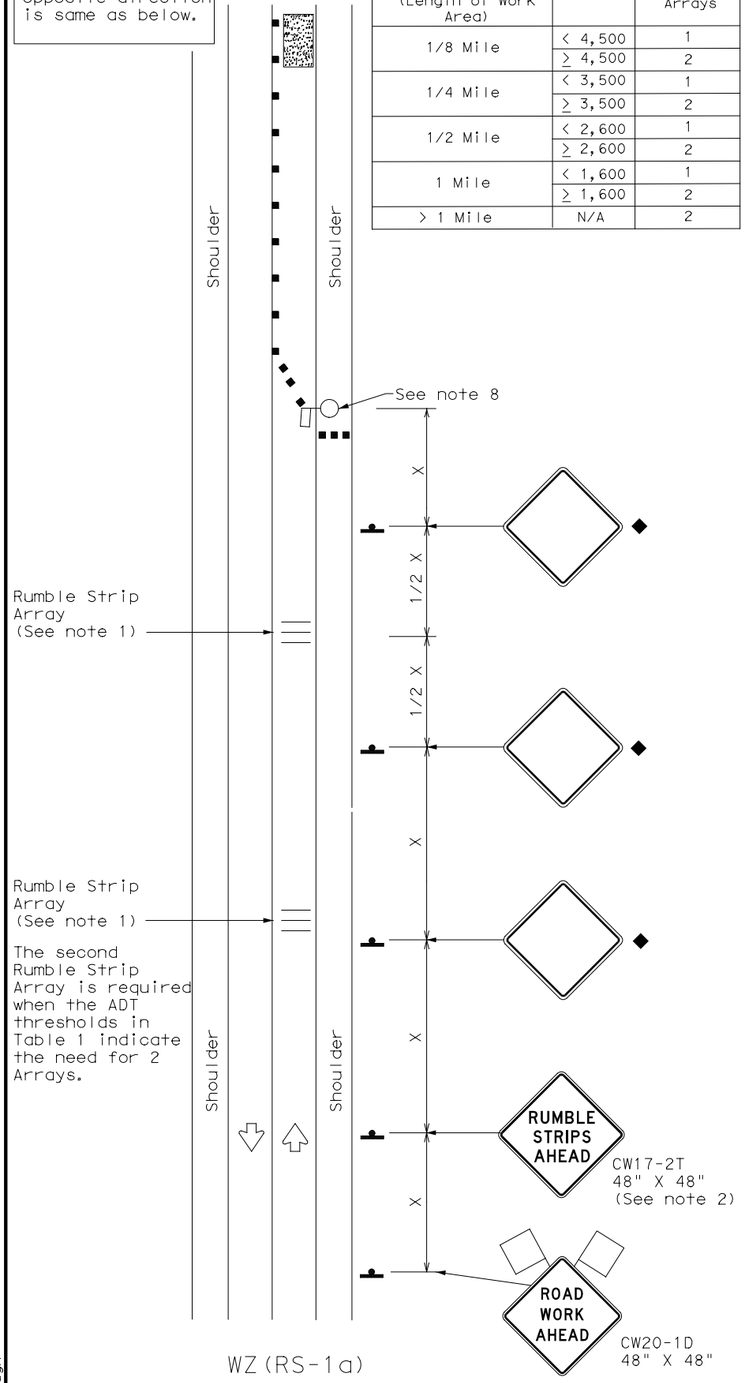
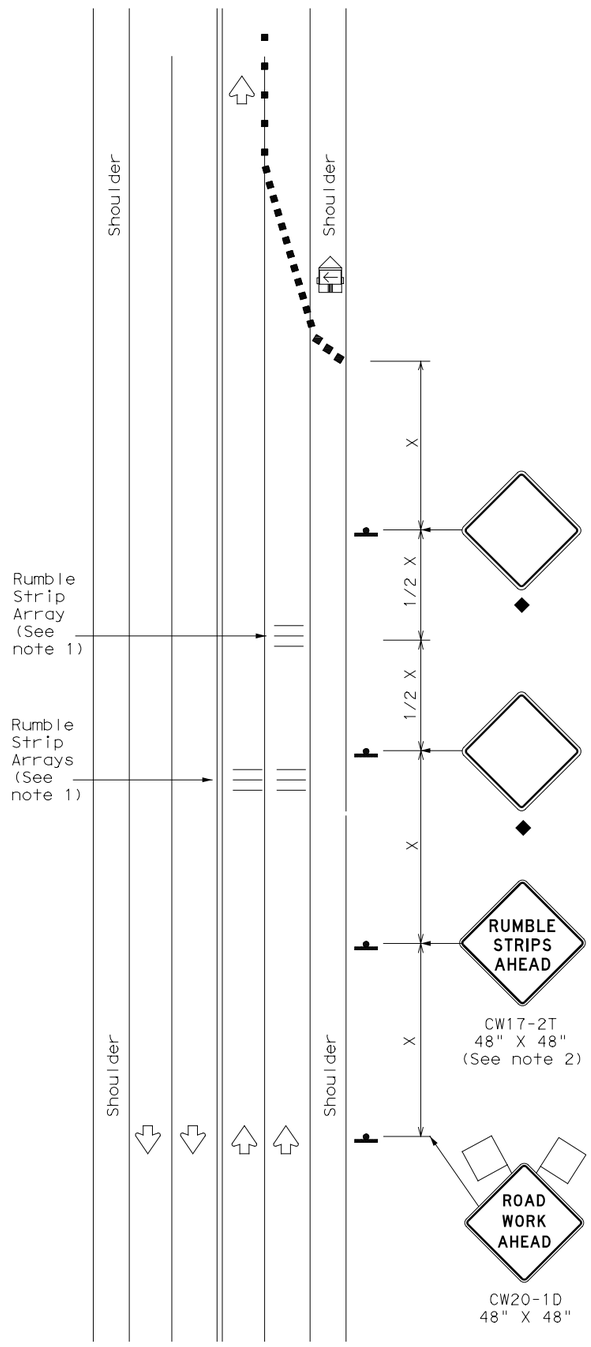
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		49

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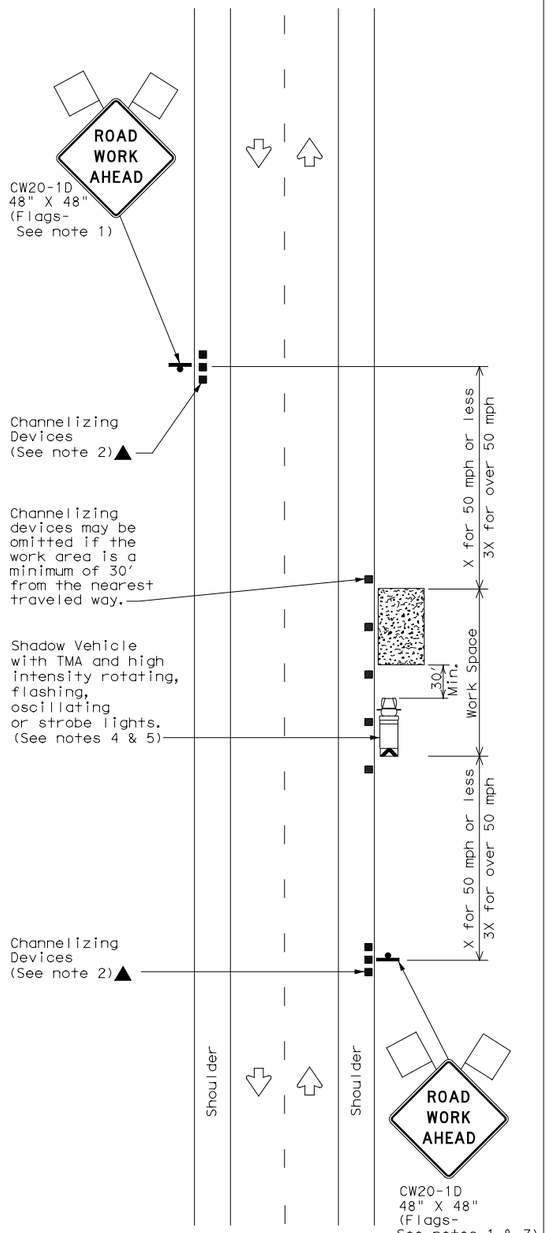
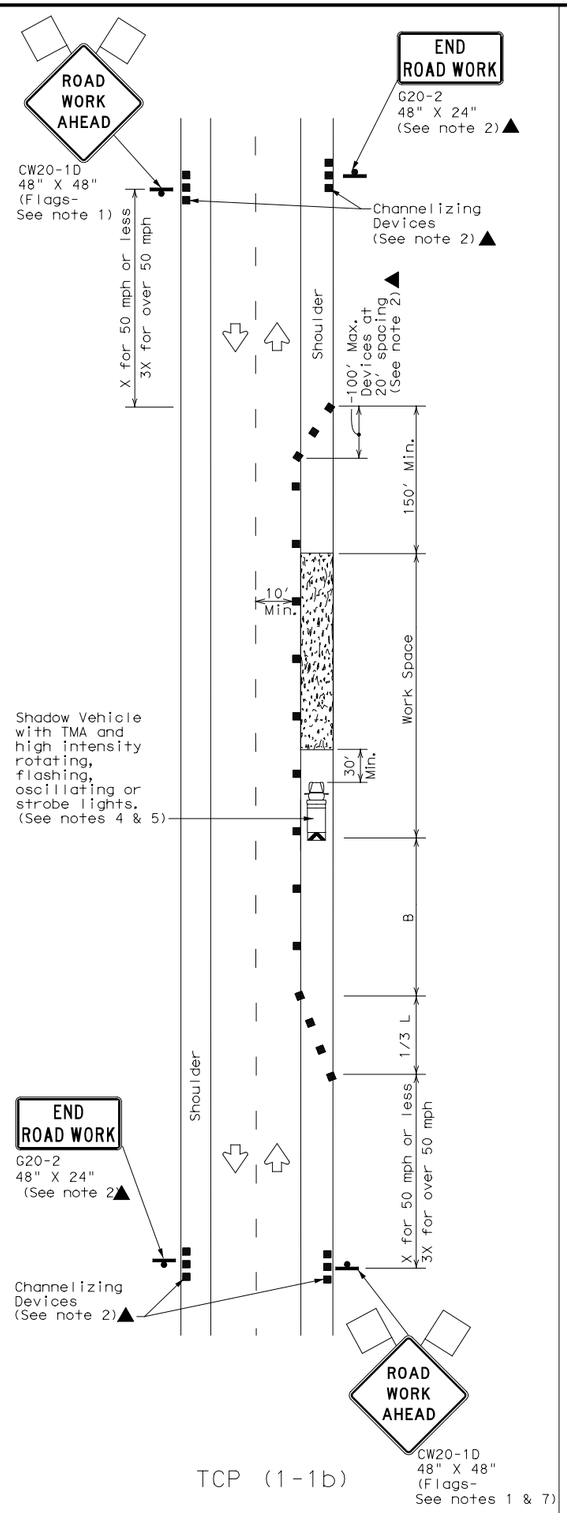


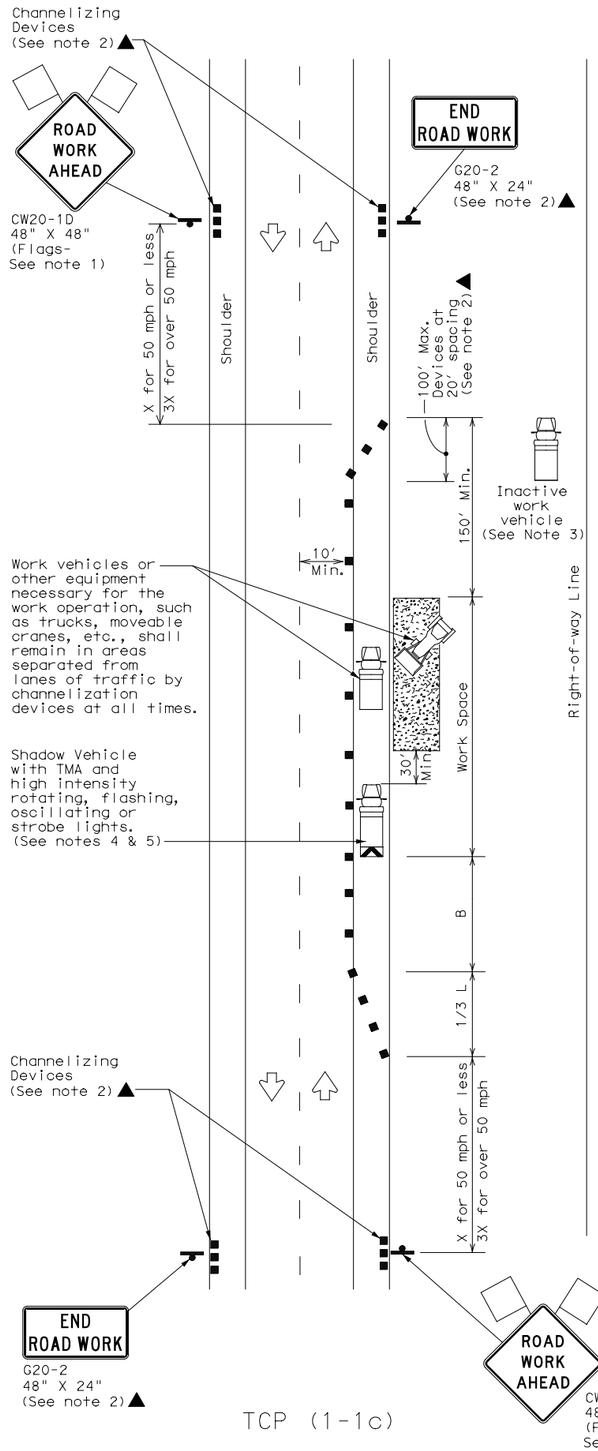
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	WACO	BELL		50
1-97 2-18				

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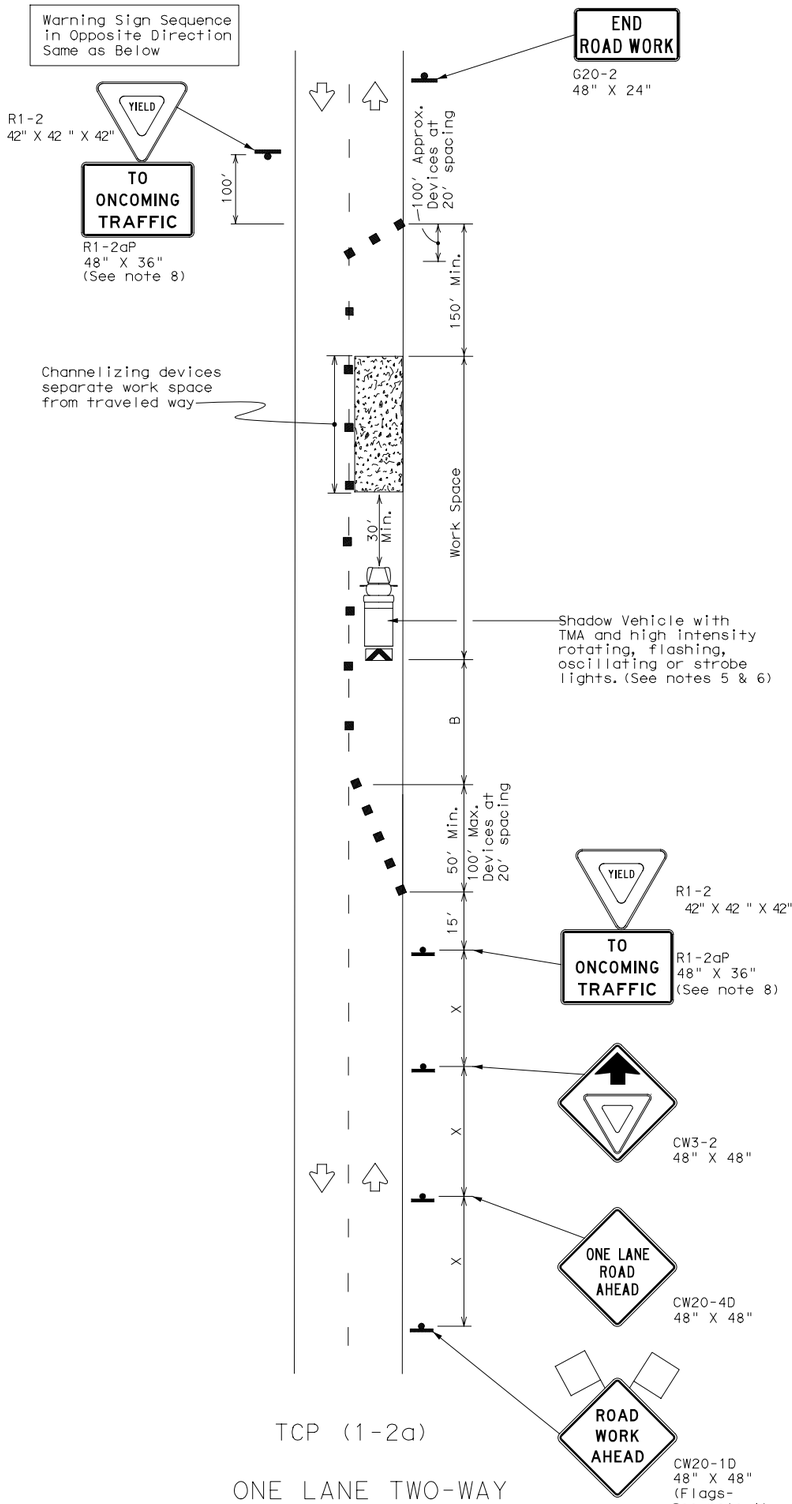
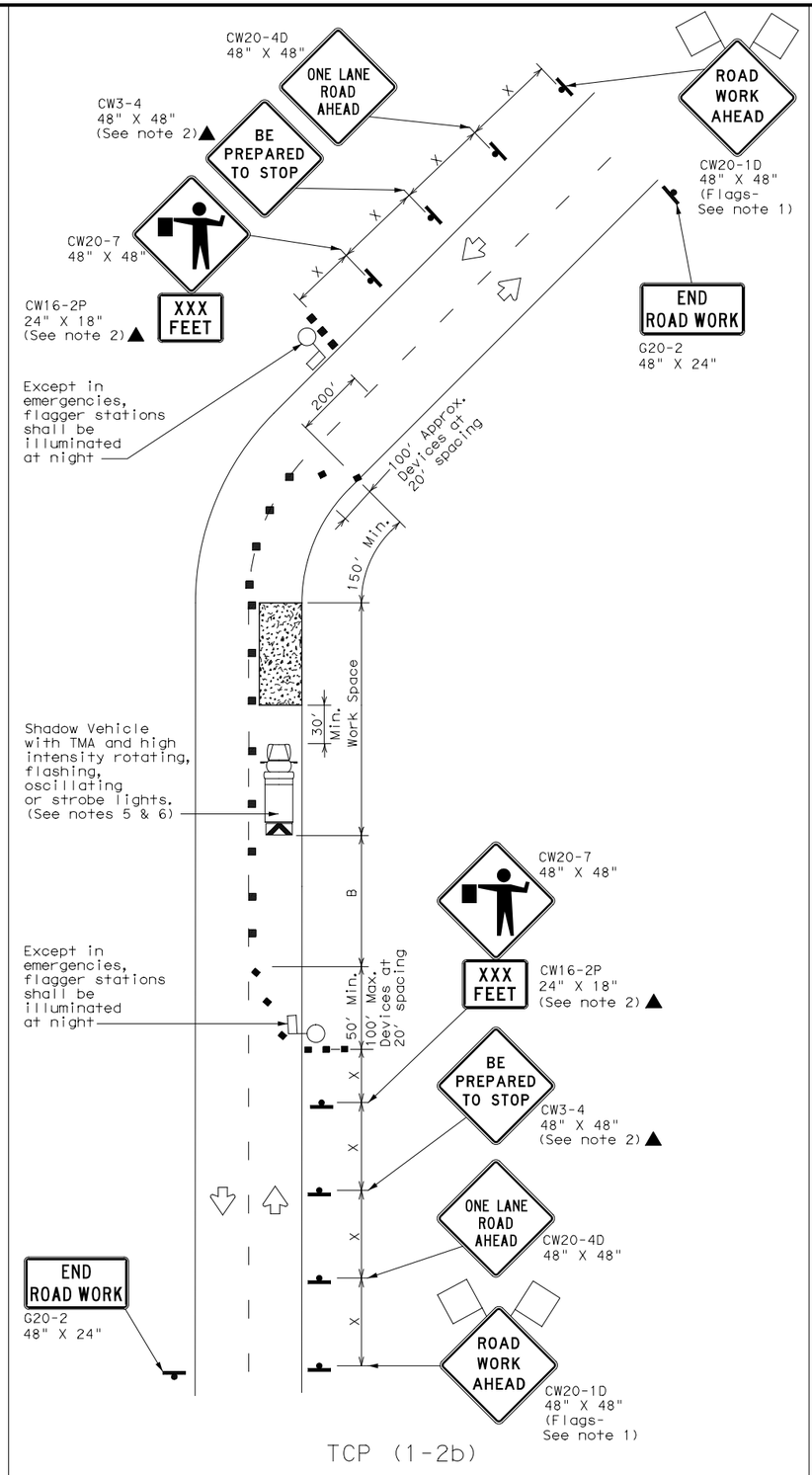


TCP (1-2a)

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	ON:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98	2304	02	044	FM 2410
2-94 2-12	DIST	COUNTY		SHEET NO.
1-97 2-18	WACO	BELL		51

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DATE: 11/1/2022 7:42:17 PM
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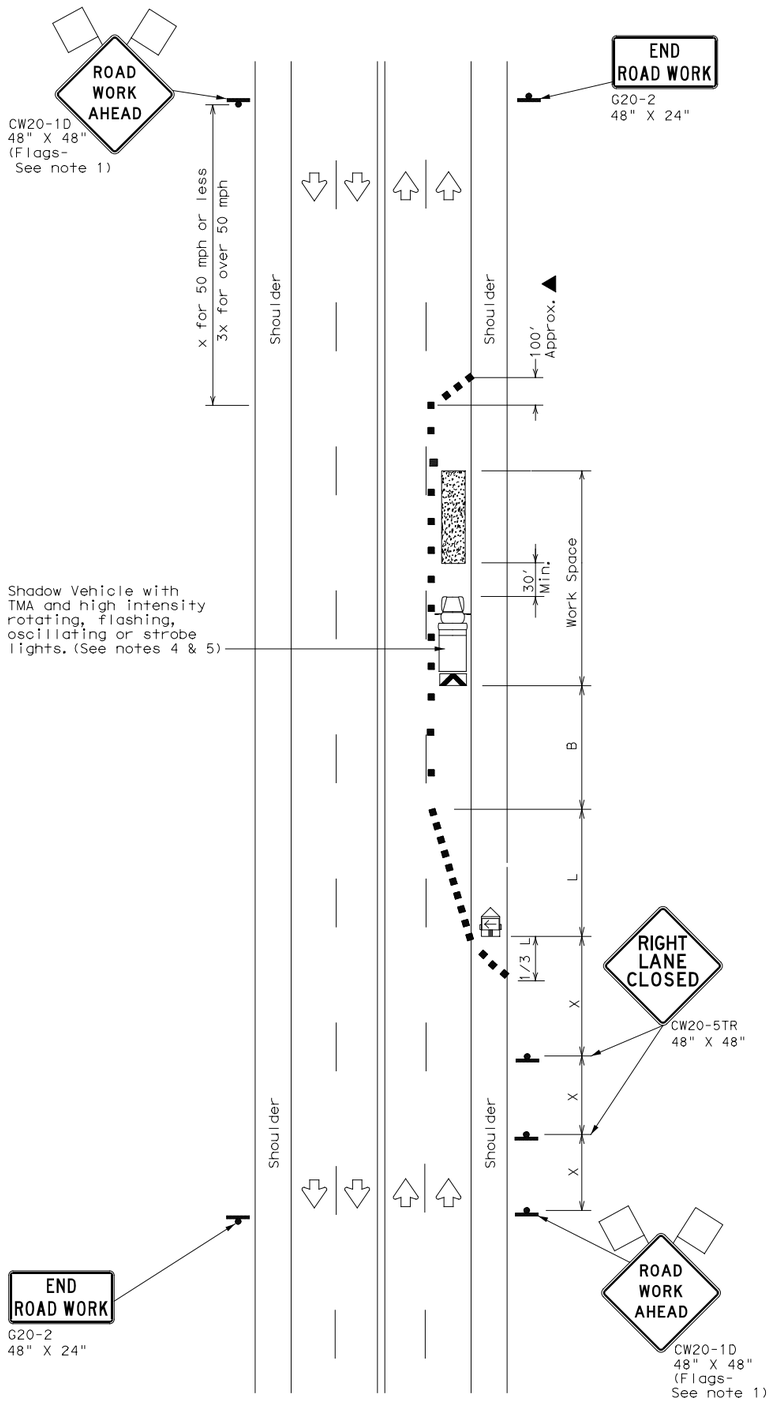
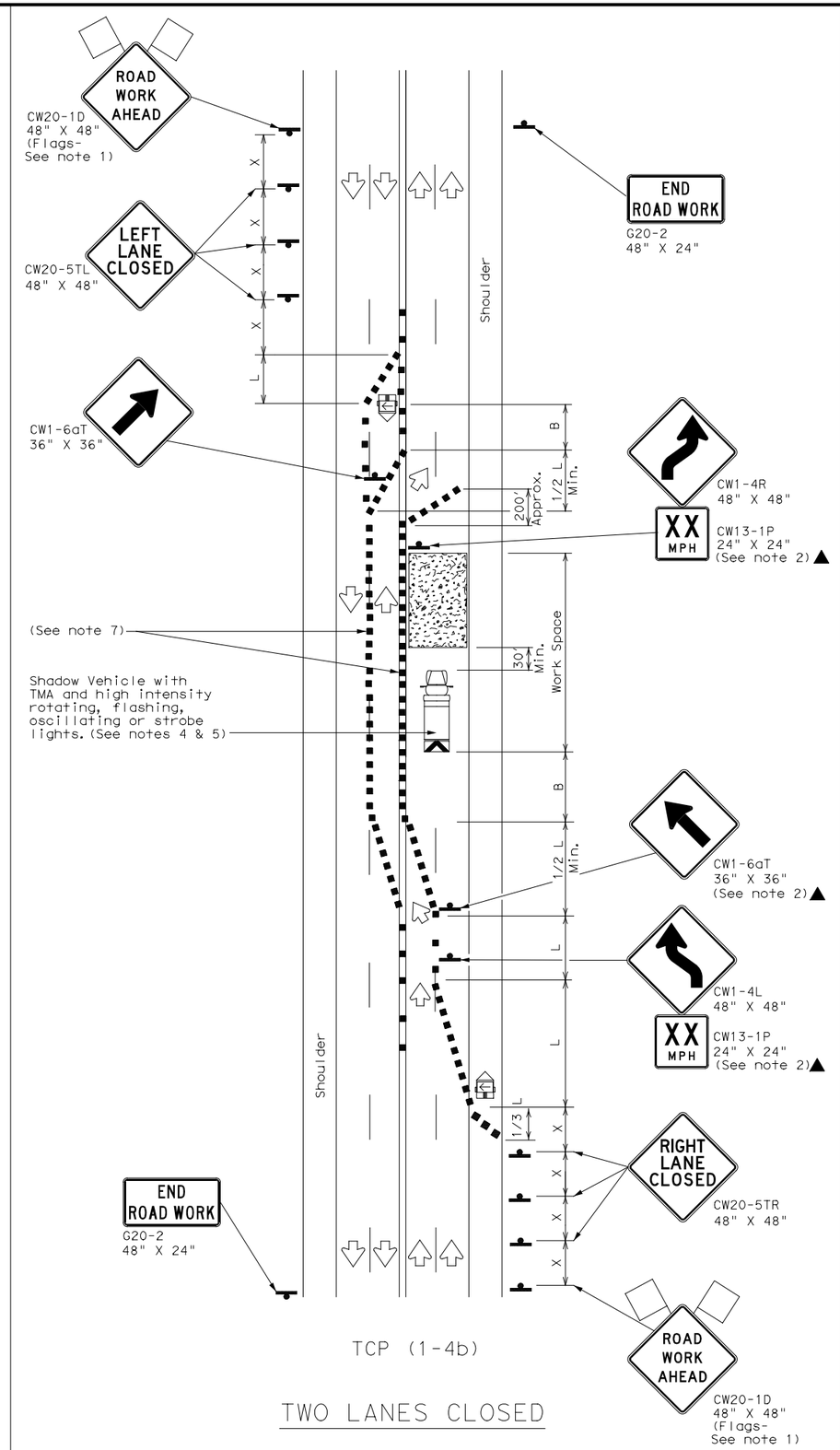


TCP (1-4a)

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.

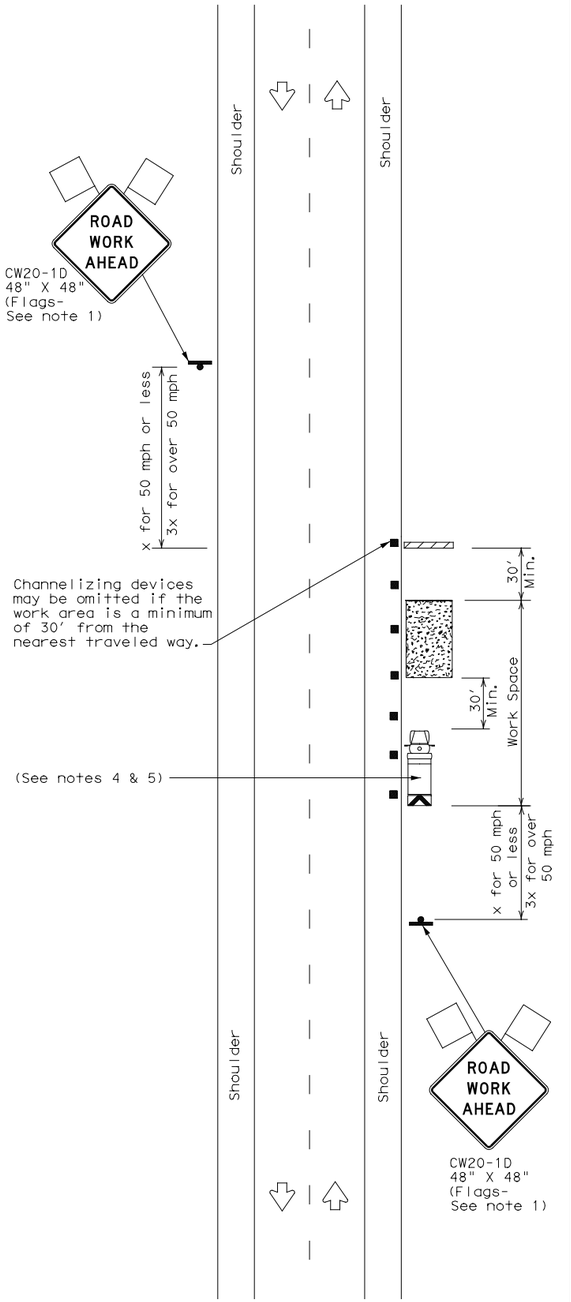
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

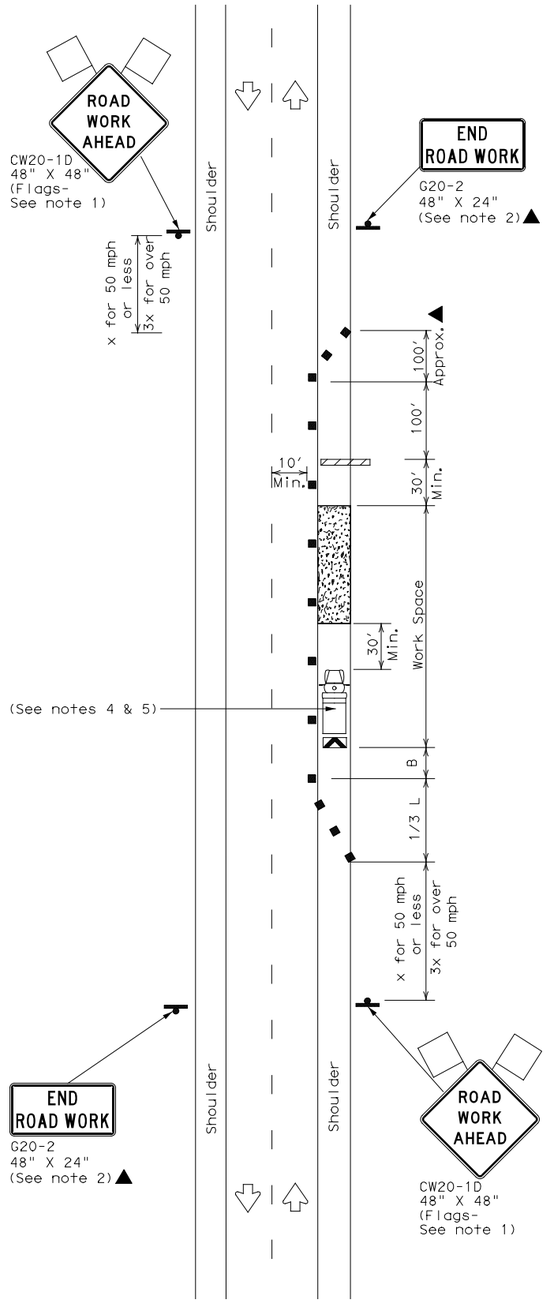
TCP (1-4)-18

FILE: tcp1-4-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	WACO	BELL		52
1-97 2-18				



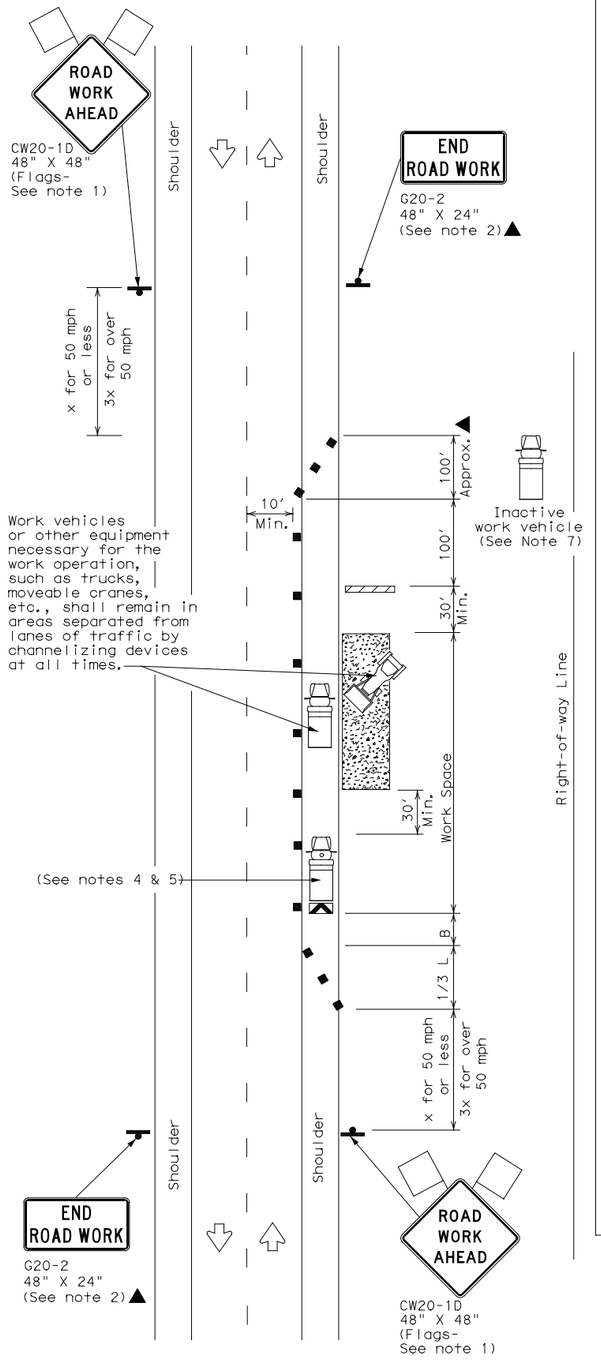
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	WACO	BELL		53
1-97 2-18				

161

DATE: 11/1/2022 7:42:17 PM
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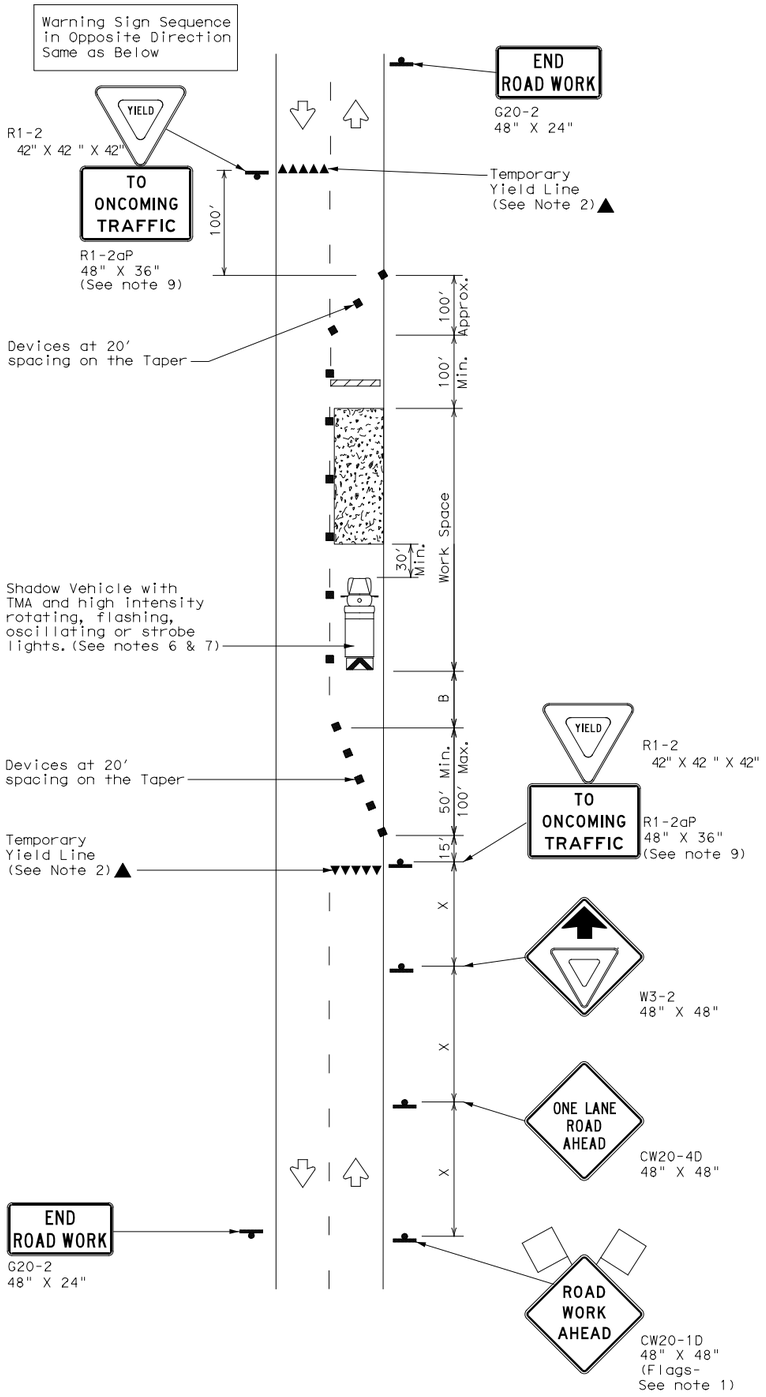
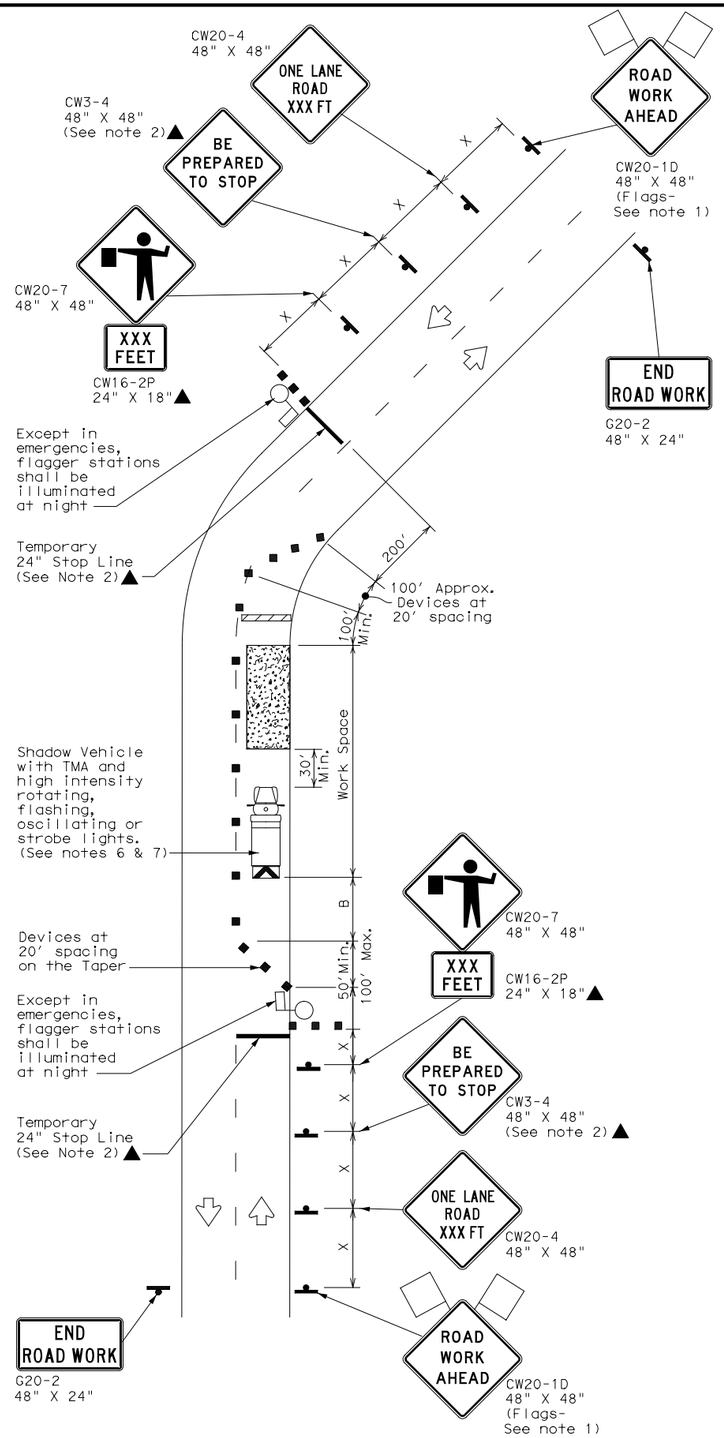


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP (2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	2304	02	044	FM 2410
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	WACO	BELL		54

DATE: 11/1/2022 7:42:18 PM
FILE: tcp2-2-18.dgn

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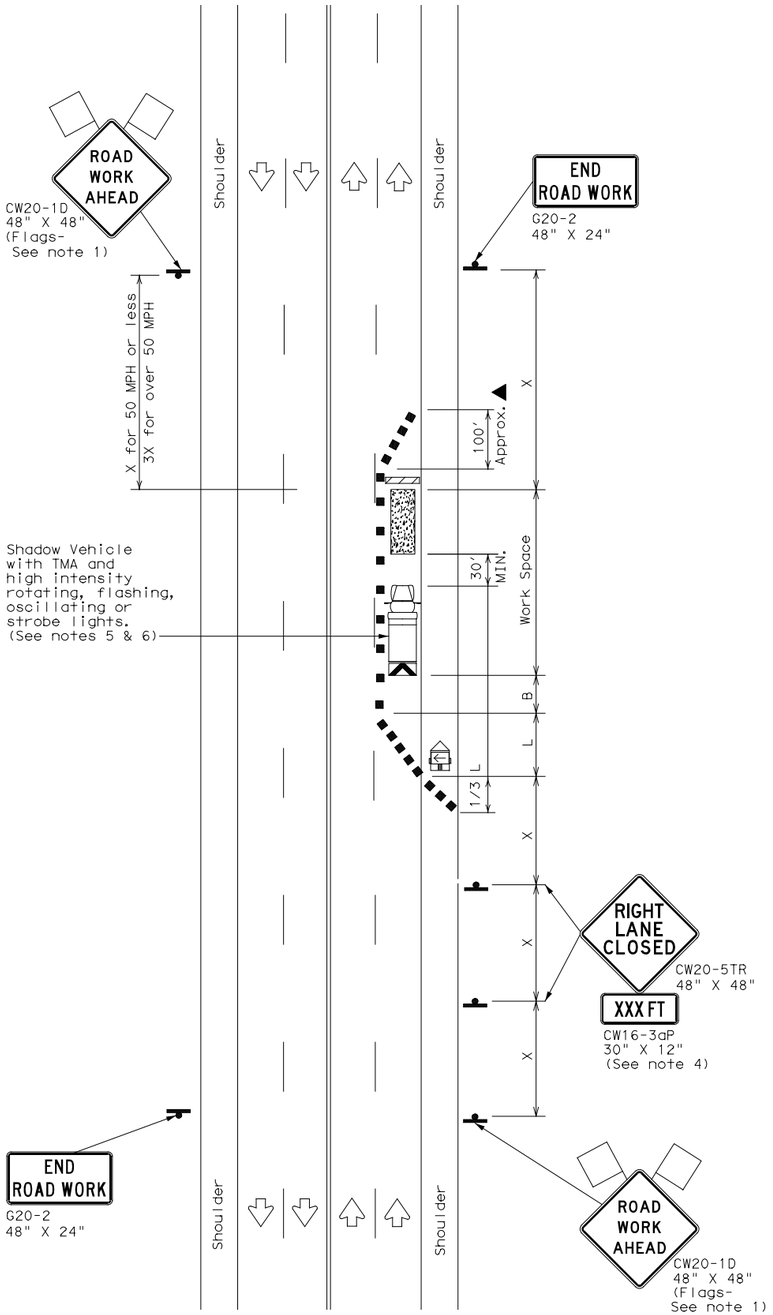
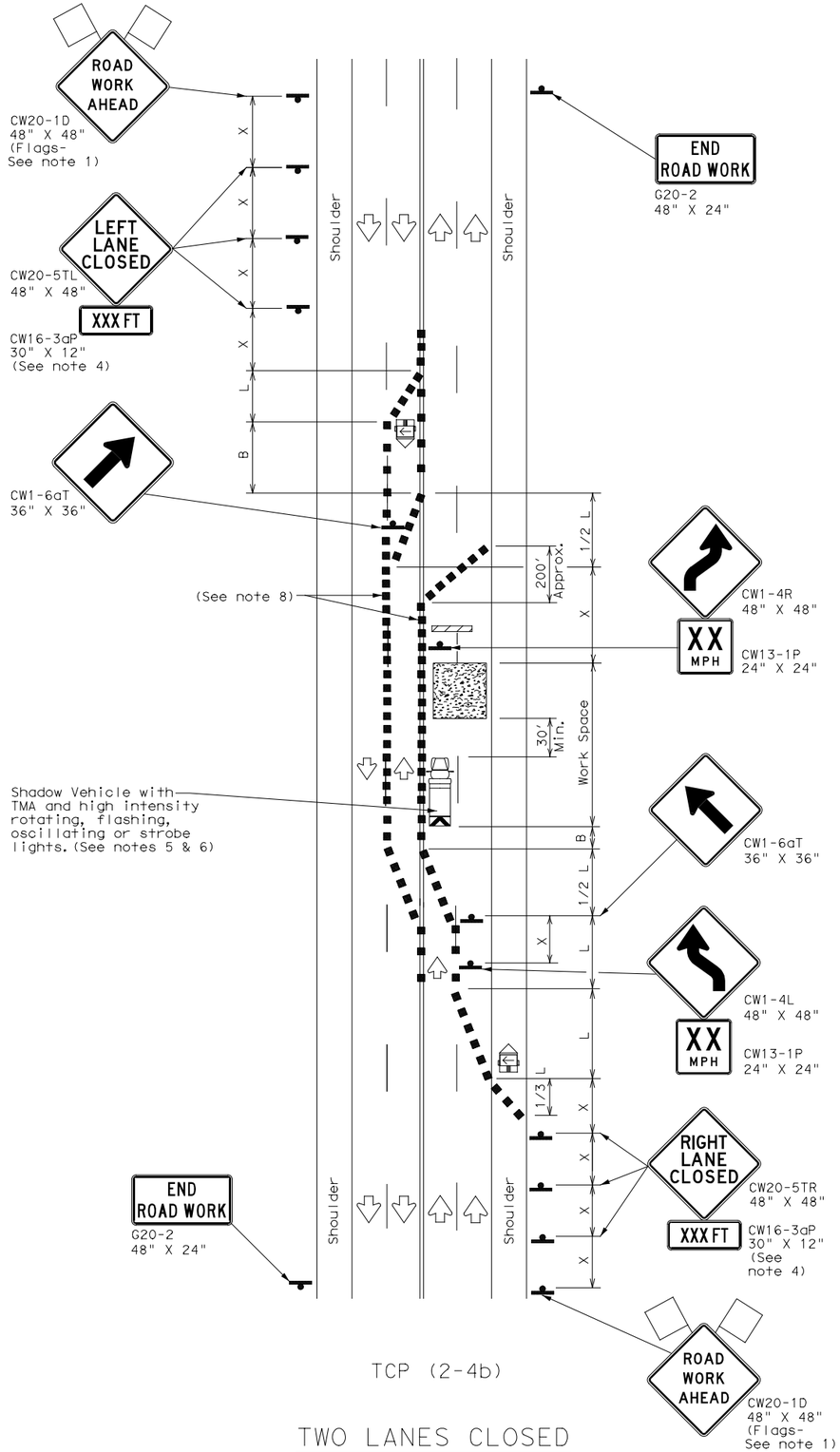


TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-4a)

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

TCP (2-4b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP (2-4)-18

FILE: tcp2-4-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	WACO	BELL		55
4-98 2-18				

DATE: 11/1/2022 7:42:18 PM
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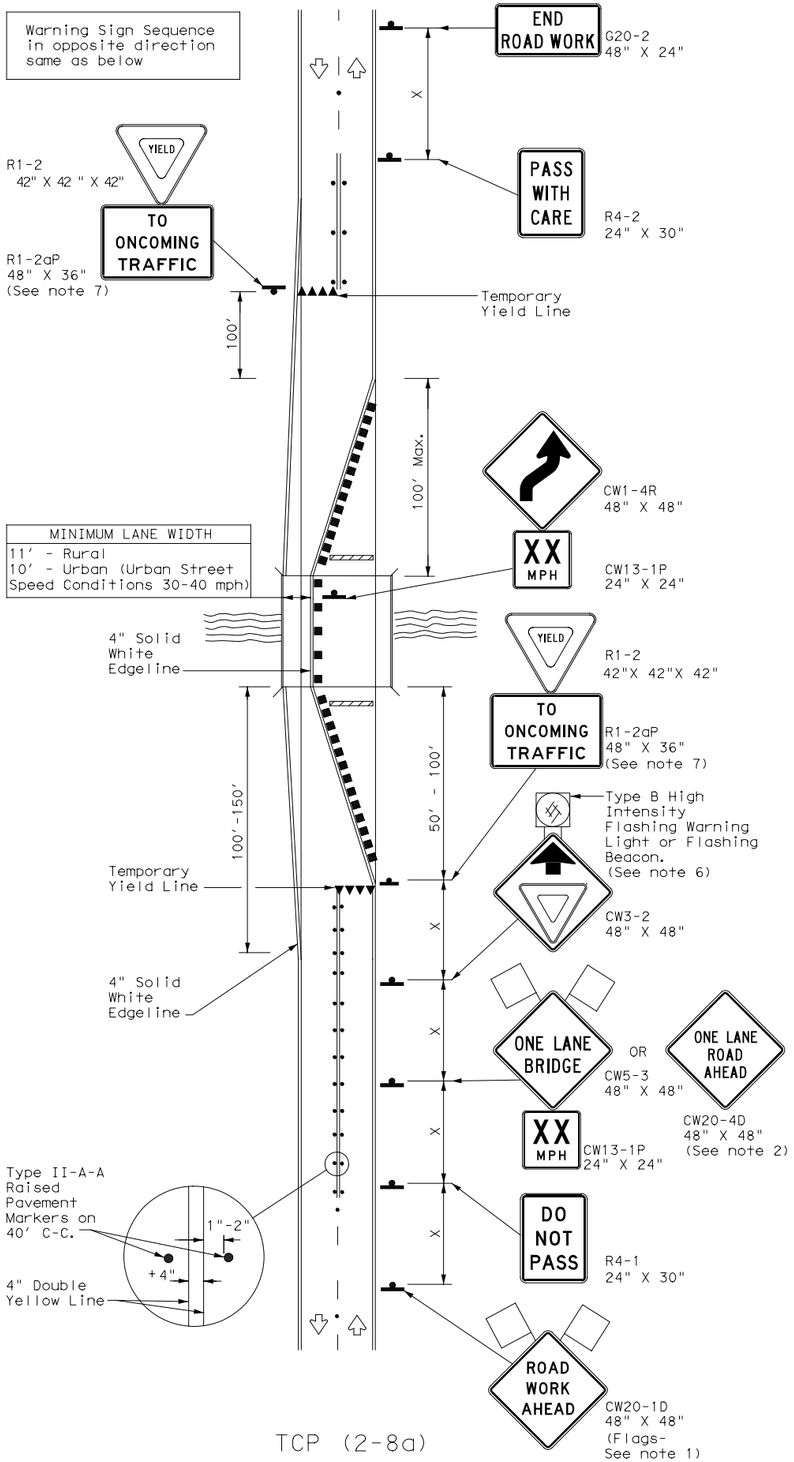
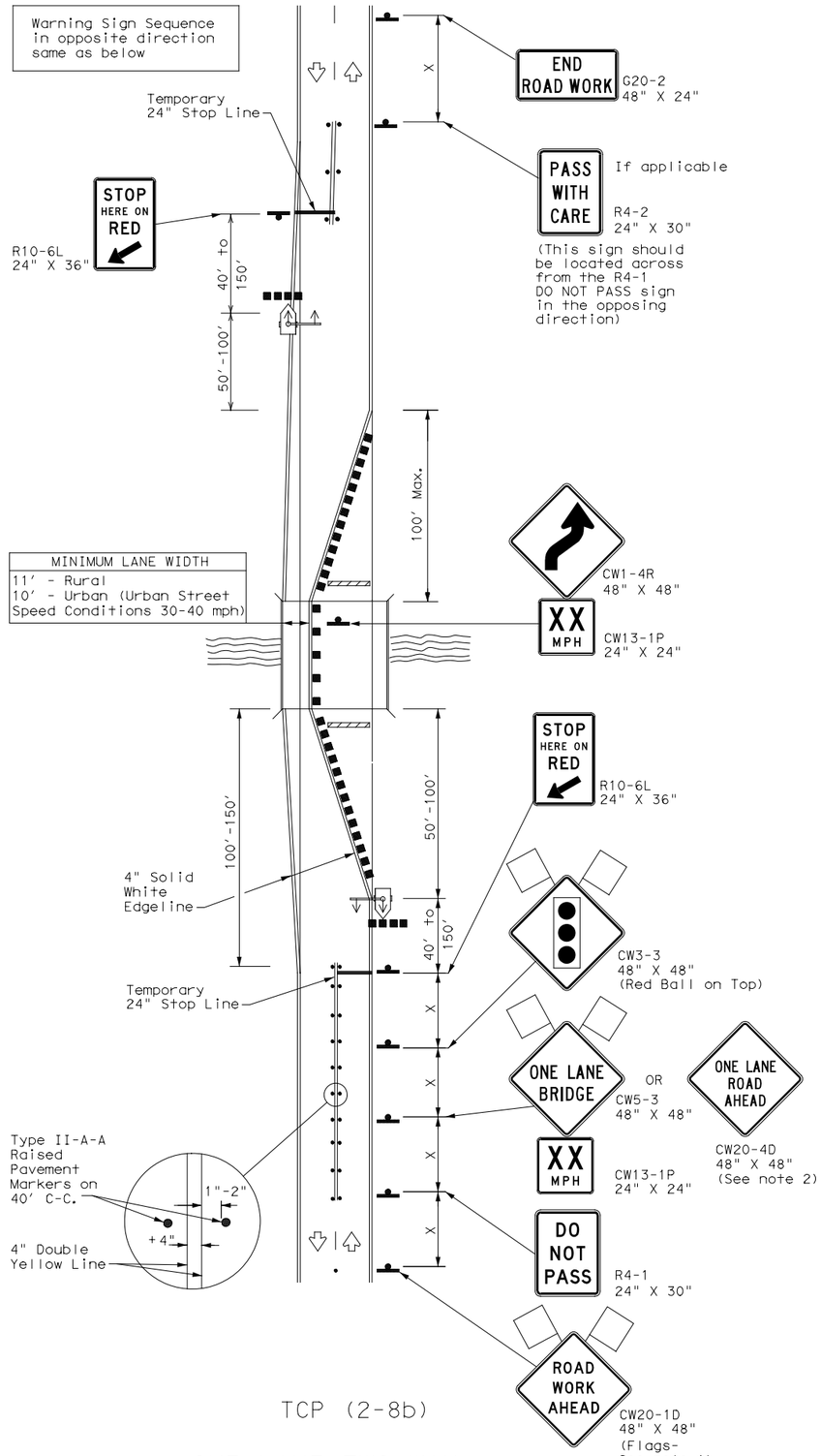


TCP (2-8a)

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	2304	02	044	FM 2410
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	WACO	BELL		56
4-98 2-18				

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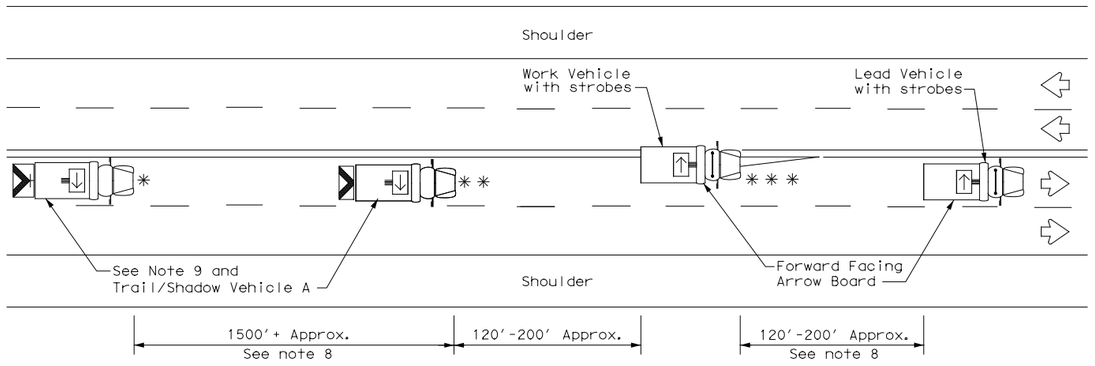
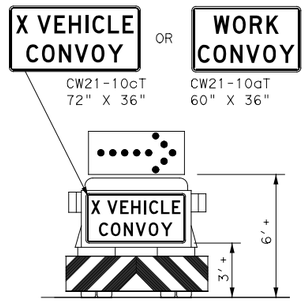


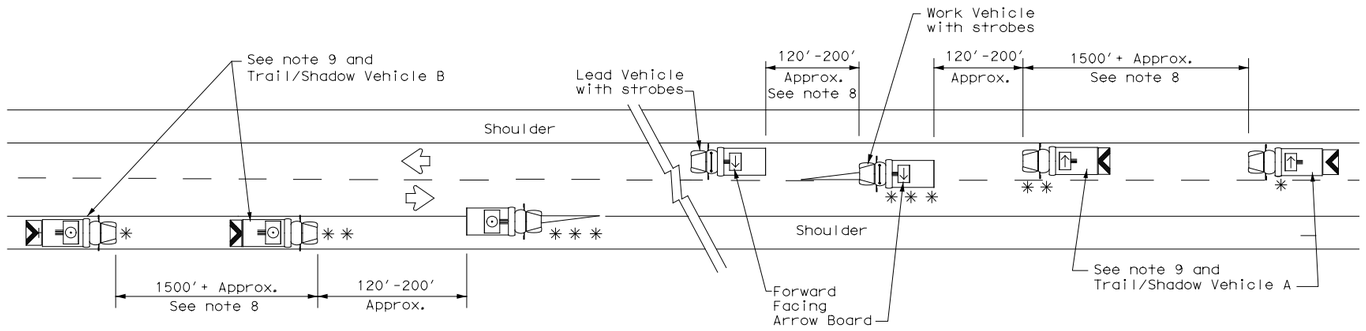
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

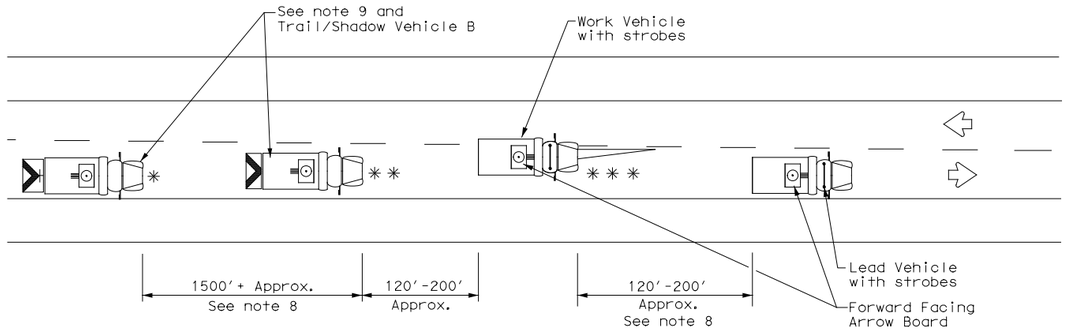


WORK ON SHOULDER

WORK ON TRAVEL LANE

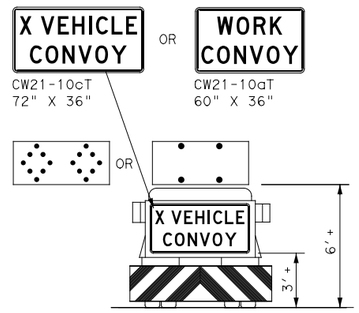
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

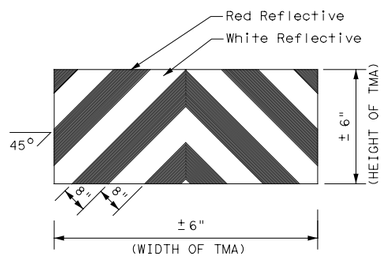
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP (3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	2304	02	044	FM 2410
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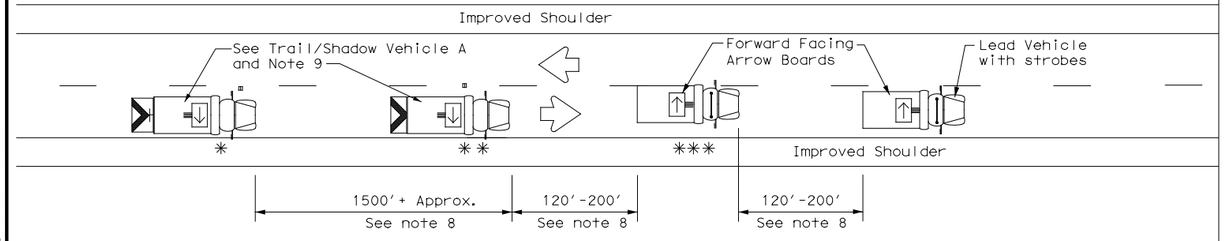
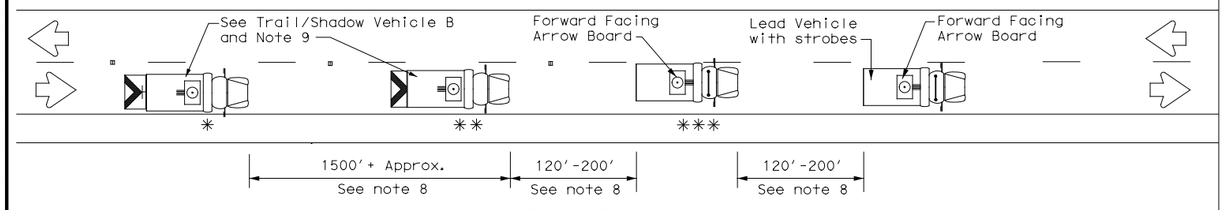


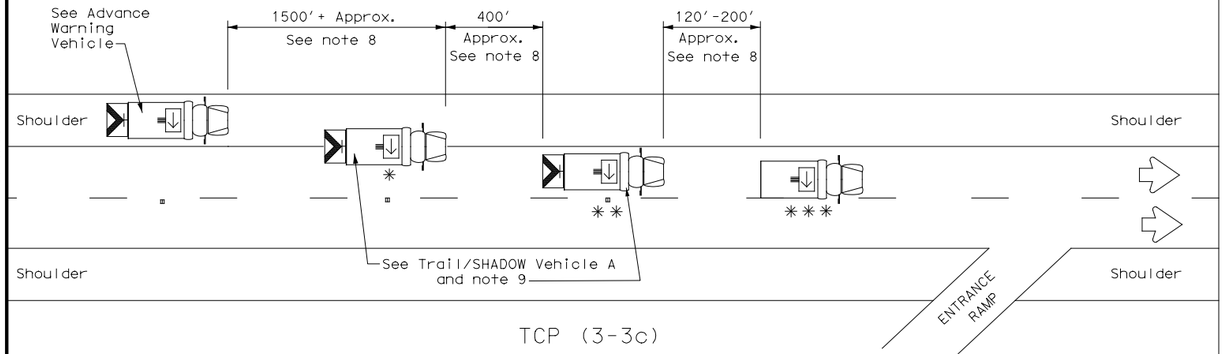
TCP (3-3a)

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



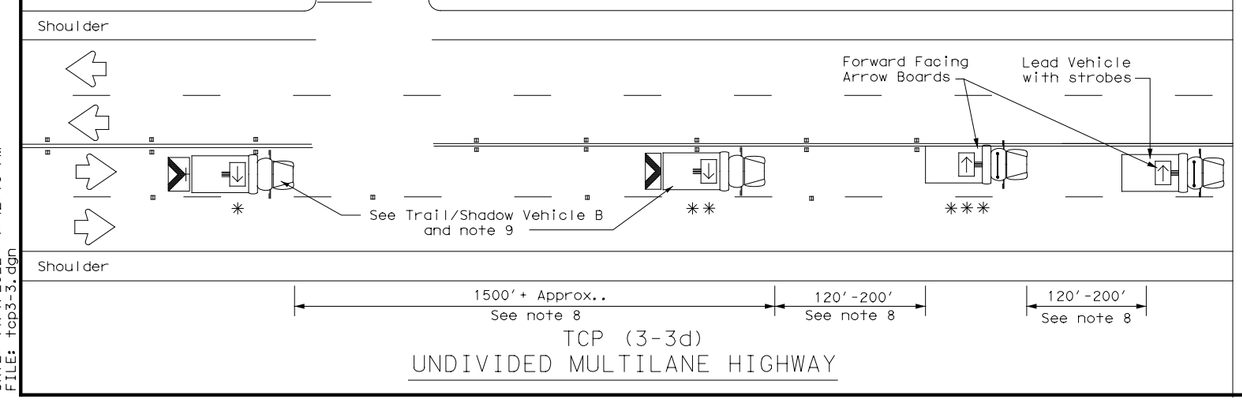
TCP (3-3b)

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



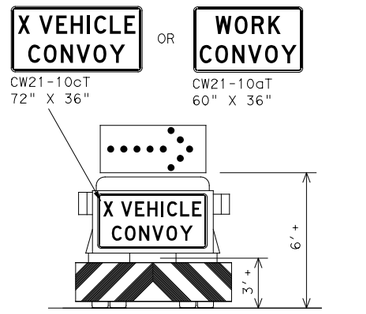
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



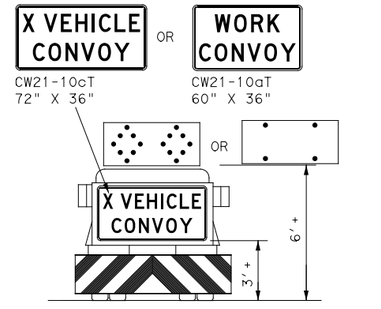
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



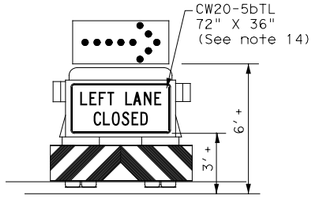
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

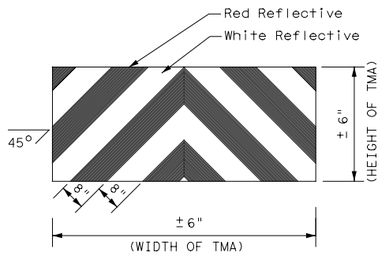


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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177

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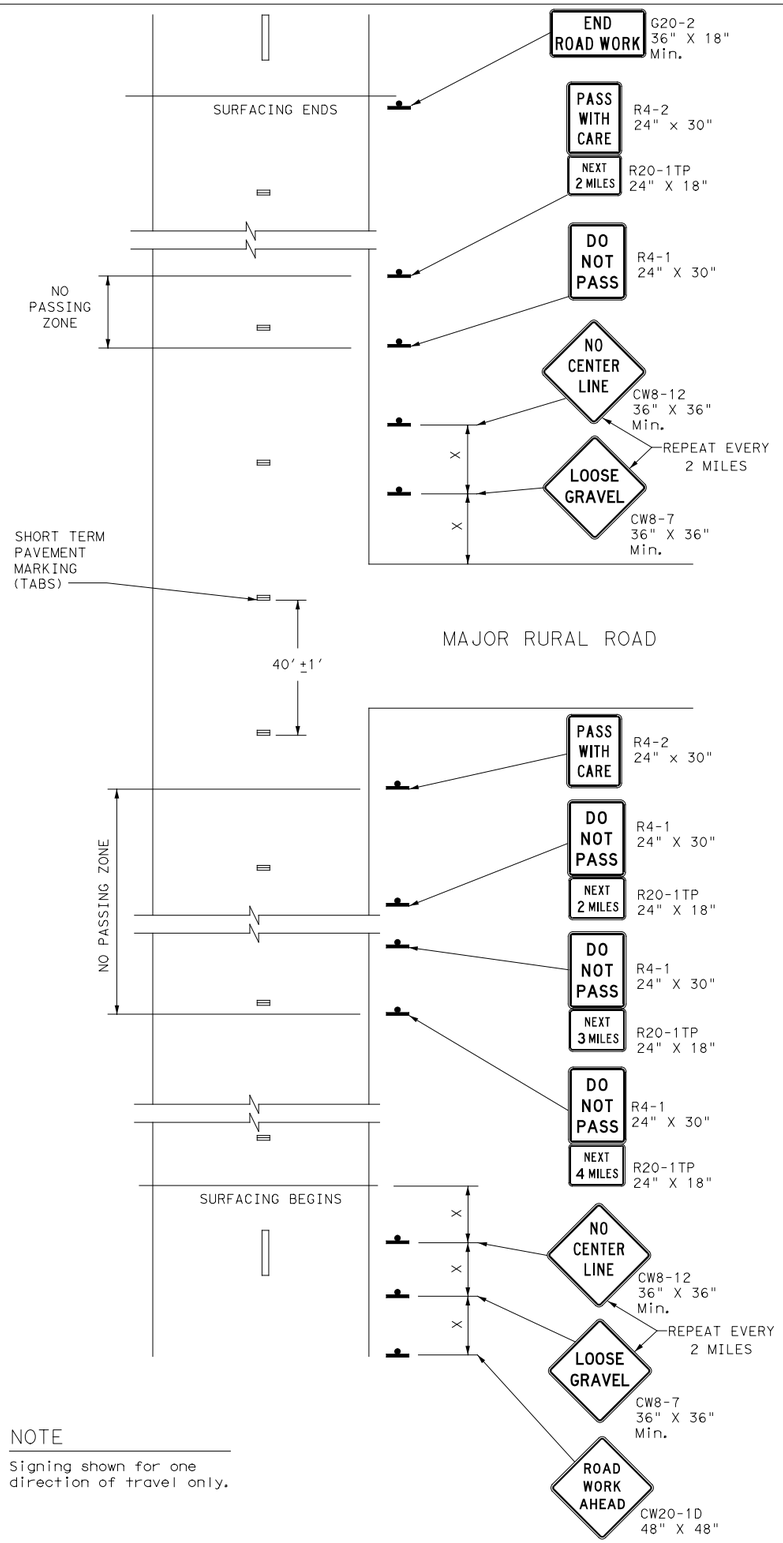
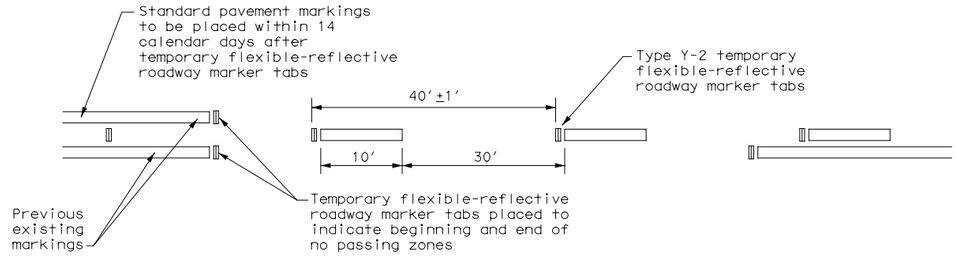


NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

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

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

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

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

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

"NO CENTER LINE" SIGN (CW8-12)

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

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

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

"LOOSE GRAVEL" SIGN (CW8-7)

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

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

PAVEMENT MARKINGS

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

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

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

COORDINATION OF SIGN LOCATIONS

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

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

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

* Conventional Roads Only

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

FILE: tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
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4-92 4-98	DIST	COUNTY		SHEET NO.
1-97 7-13	WACO	BELL		59

210

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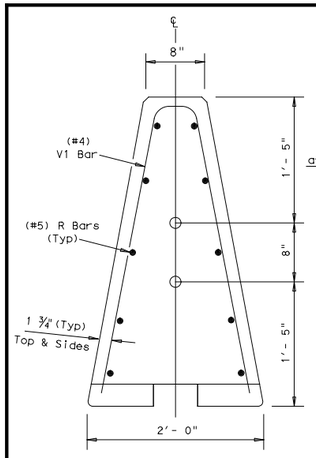
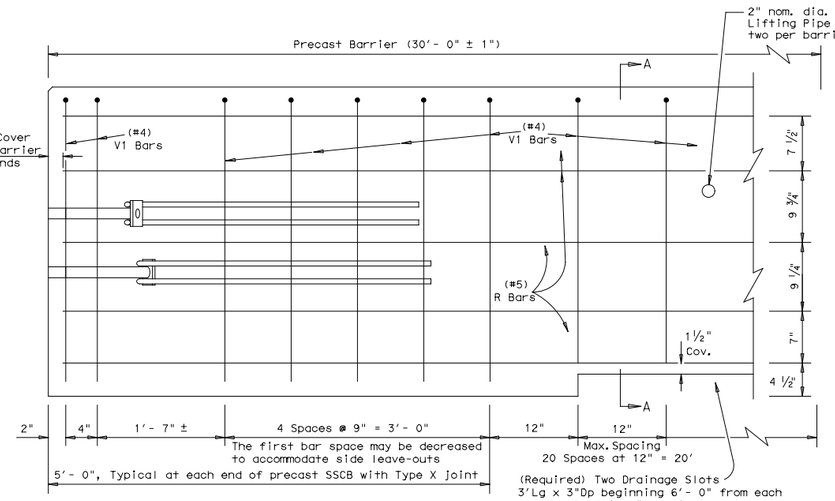


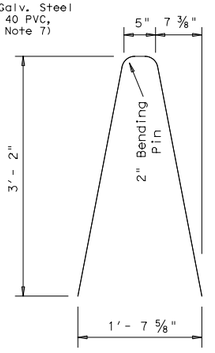
End View
Precast Barrier

Pipe locations for Joint Type X connection



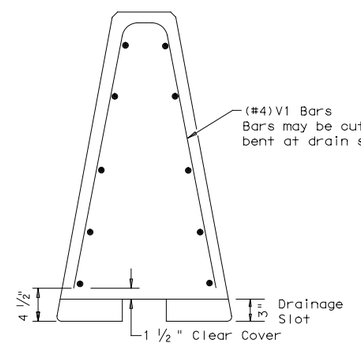
Reinforcement for Precast (SSCB)
Single Slope Concrete Barrier (Type 1)

Showing reinforcement for Joint Connection (Type X)

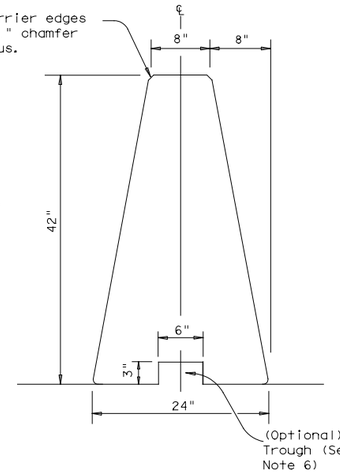


V1 Bar
#4 Rebar

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

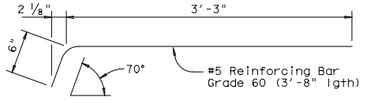


Section A-A
Steel Placement at (Required) Drainage Slots



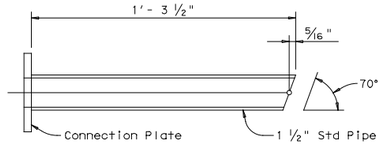
Single Slope Concrete Traffic Barrier

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



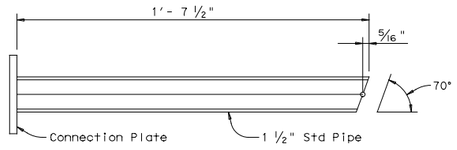
DEFORMED BAR ANCHOR DETAILS

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



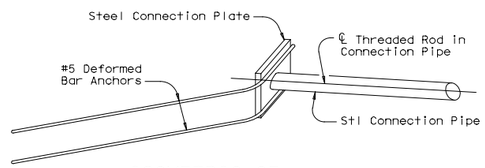
UPPER CONNECTION PIPE DETAILS

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



LOWER CONNECTION PIPE DETAILS

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

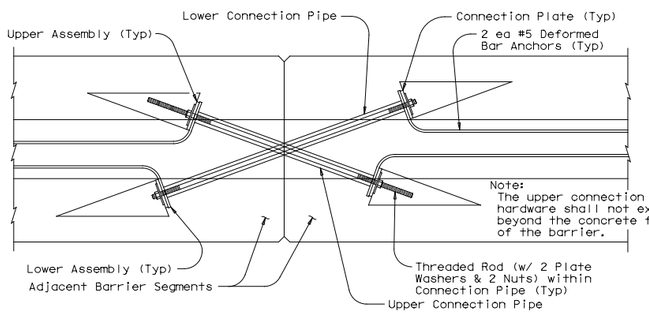


ISOMETRIC OF
TYPICAL WELDED ASSEMBLY

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

General Notes

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



TYPE X JOINT INSTALLATION DETAIL

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

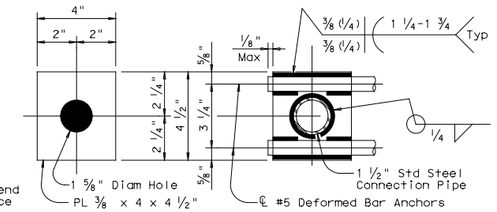
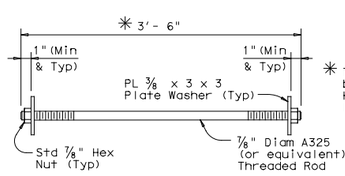


PLATE DIMENSIONS | WELDING DETAILS

CONNECTION PLATE DETAILS

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

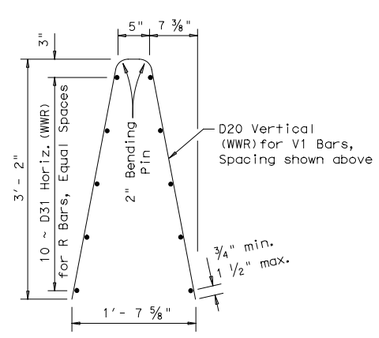


CONNECTION BOLT OR
THREADED ROD DETAIL

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

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

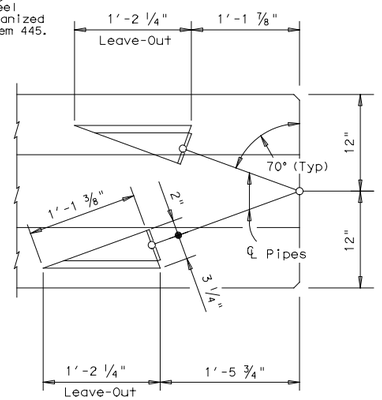
Weight of one precast 30 ft. (SSCB) segment = Approx. 10.5 Tons or 717 lbs per ft.



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

(WWR) General Notes

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



BARRIER PLAN AT JOINT

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1)

SSCB(2)-10

FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
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	WACO	BELL		60

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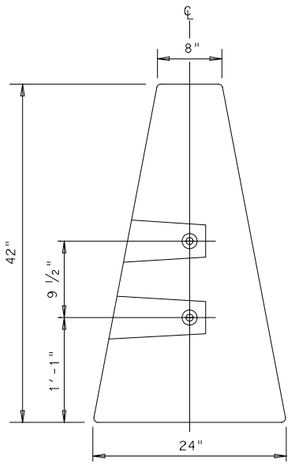
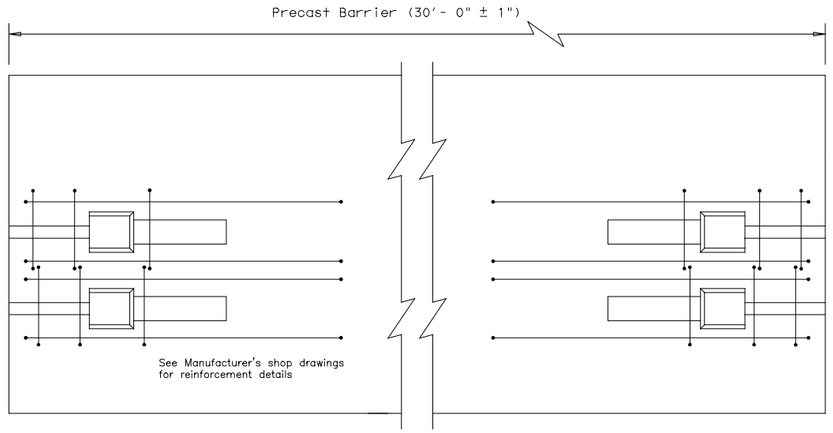
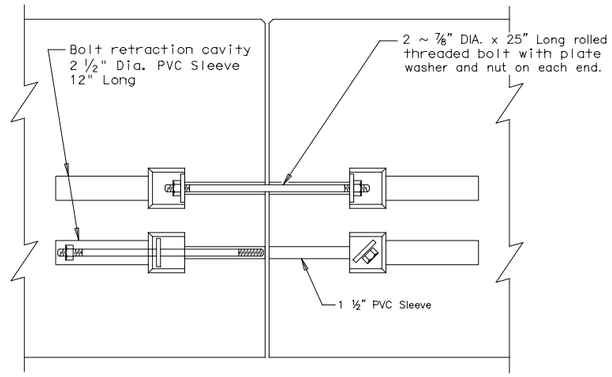


END VIEW
"QUICK-BOLT" POCKET LOCATIONS

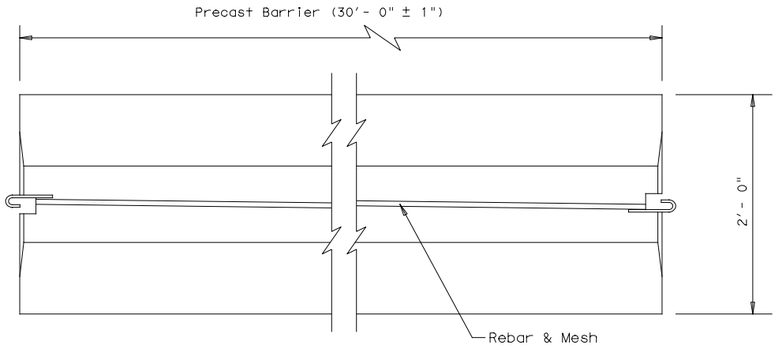


ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details

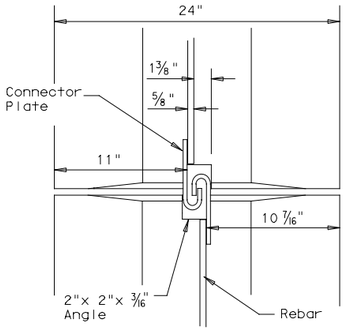


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

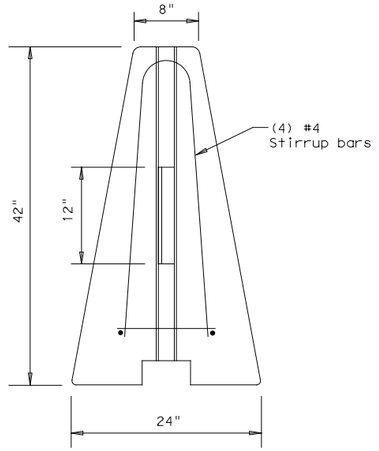
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



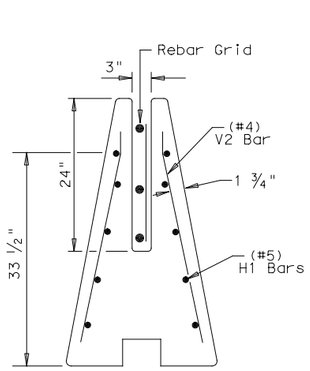
END VIEW

Proprietary Joint Connections (SSCB)

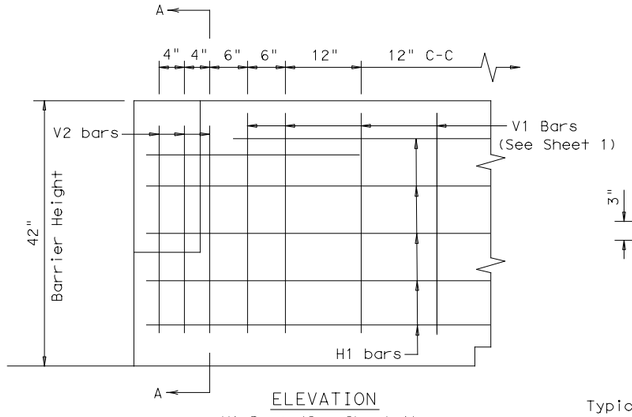
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

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

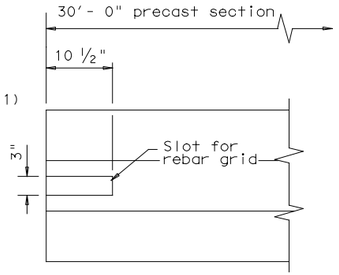
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



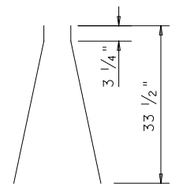
SECTION A-A
Showing (Type R) Rebar Grid



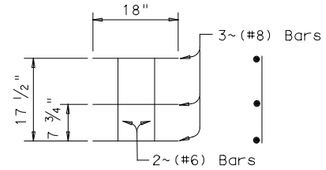
ELEVATION
V1 Bars (See Sheet 1)



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
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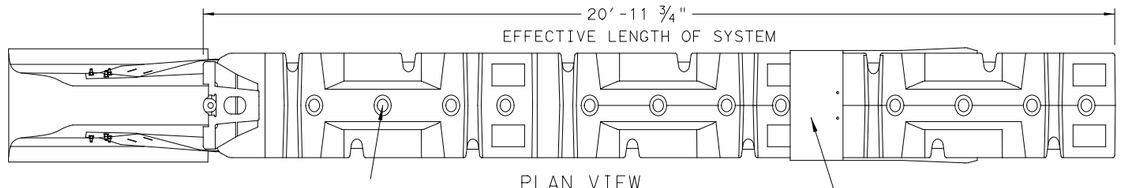
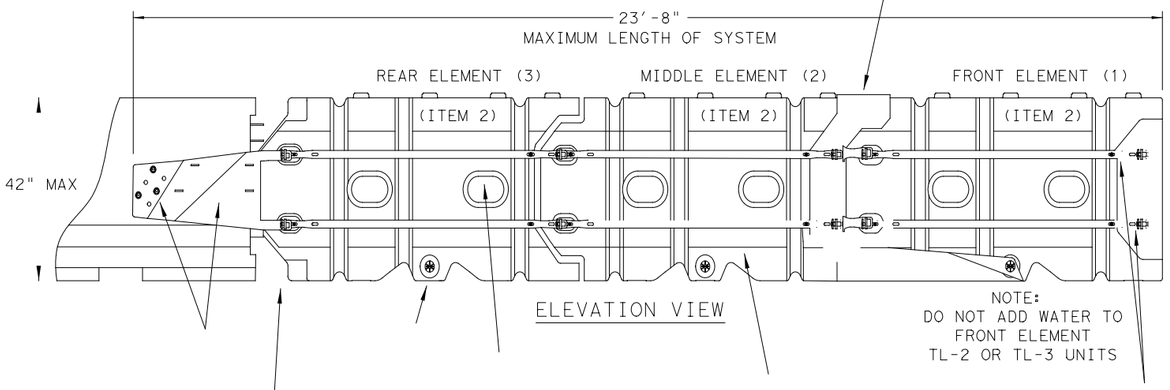
	DIST	COUNTY		SHEET NO.
	WACO	BELL		60A

DATE: 11/1/2022
FILE: sscb210.dgn

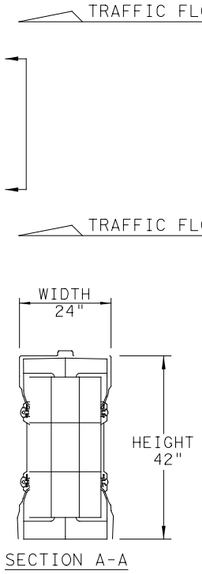
SYSTEM SHOWN - ABSORB-M TL-3



PLAN VIEW



ELEVATION VIEW



SECTION A-A

*

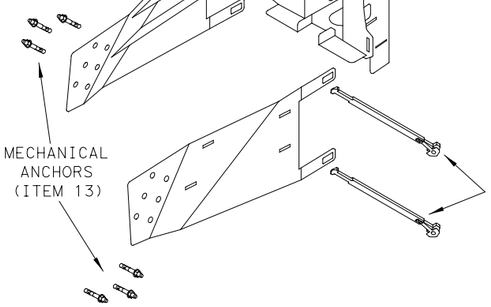
TEST LEVEL	NUMBER OF ELEMENTS	EFFECTIVE LENGTH	MAXIMUM LENGTH
TL-2	2	14'- 7 3/4"	17'- 4"
TL-3	3	20'- 11 3/4"	23'- 8"

GENERAL NOTES

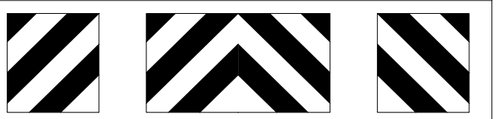
1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. THE ABSORB-M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

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

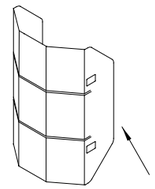
* COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY



DELINEATION DECAL PLACEMENT GUIDE



** APPLY DECAL



NOSE PLATE

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

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

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

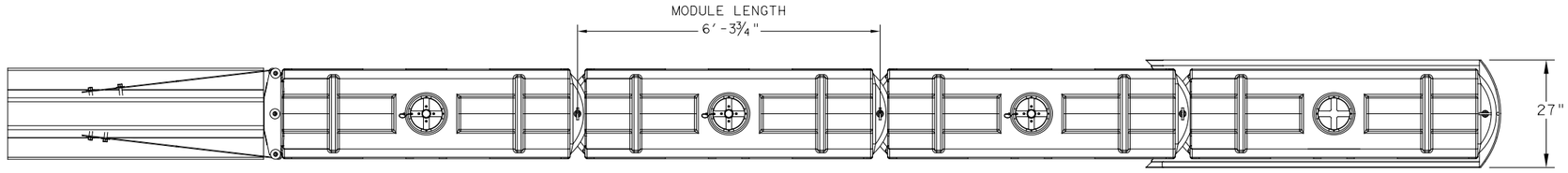
SACRIFICIAL

Texas Department of Transportation — Design Division Standard

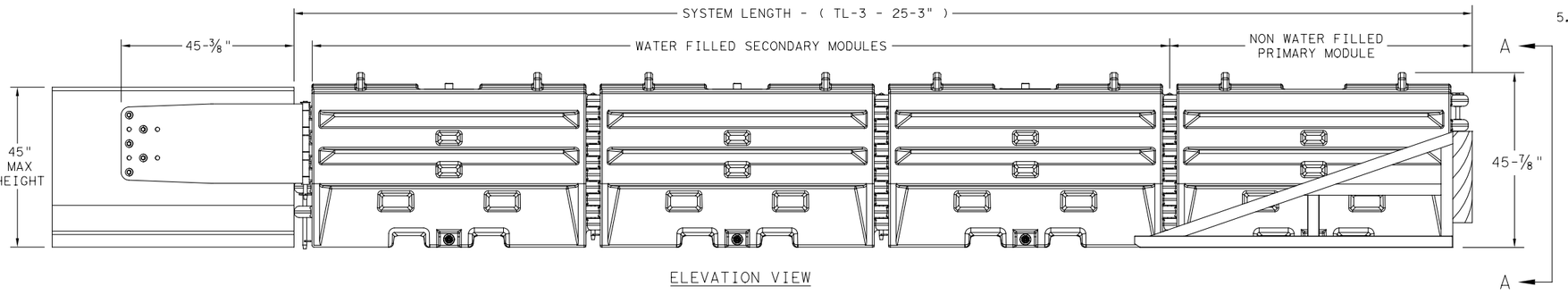
LINDSAY TRANSPORTATION SOLUTIONS
CRASH CUSHION
(MASH TL-3 & TL-2)
TEMPORARY - WORK ZONE
ABSORB(M)-19

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		60B

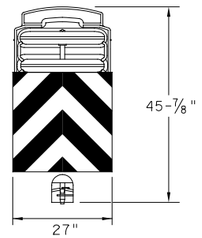
DATE: 11/1/2022
FILE: absorbm19.dgn



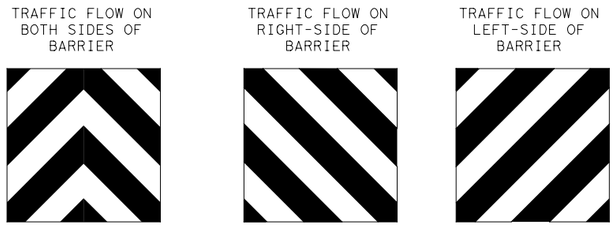
PLAN VIEW



ELEVATION VIEW



SECTION A-A



NOSE SHEETING PANEL DELINEATION

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

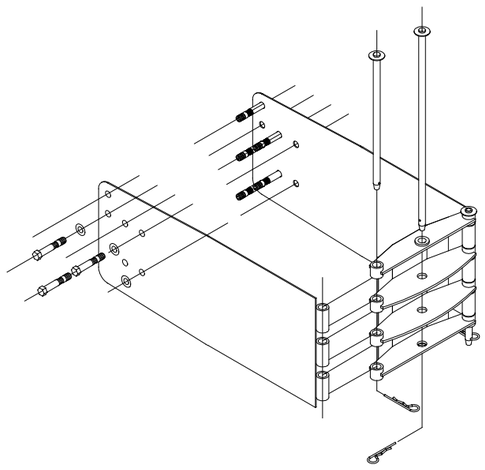
TEST LEVEL	NUMBER OF SECONDARY MODULES	SYSTEM LENGTH
TL-3	3	25′ 3"

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

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	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		60C

DATE: 11/1/2022
FILE: sled19.dgn

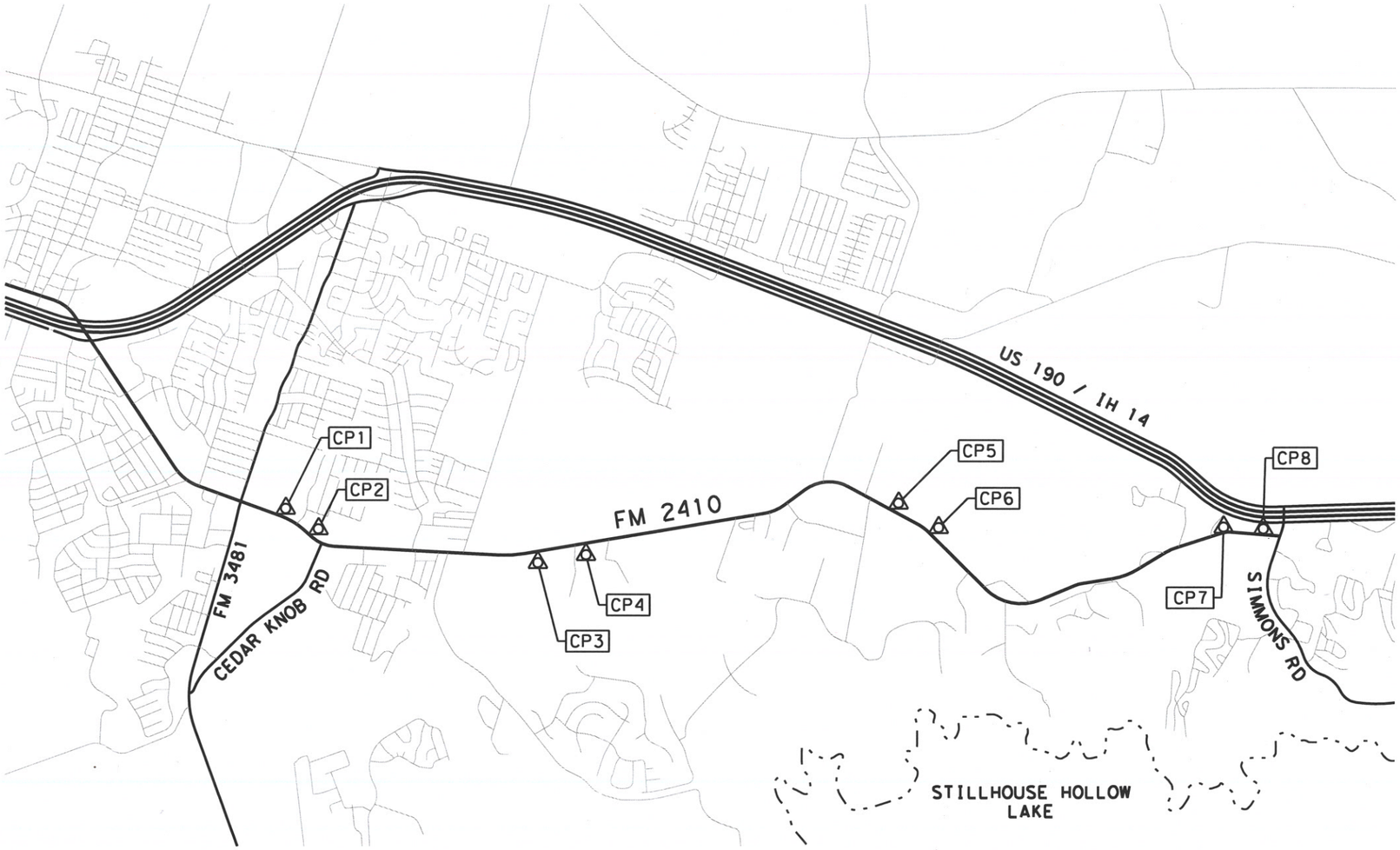
CONTROL POINT	SURFACE COORDINATES		GRID COORDINATES		LATITUDE	LONGITUDE	ELEVATION	DESCRIPTION
	NORTHING	EASTING	NORTHING	EASTING				
CP1	10,358,886.450	3,137,144.811	10,357,643.530	3,136,768.399	31°03'18.75565"	97°38'59.17278"	775.722	SET TxDOT 3-1/4" ALUMINUM DISK IN CONCRETE
CP2	10,358,063.140	3,138,089.698	10,356,820.320	3,137,713.172	31°03'10.38407"	97°38'48.54212"	800.830	SET TxDOT 3-1/4" ALUMINUM DISK IN CONCRETE
CP3	10,357,893.150	3,145,075.466	10,356,650.350	3,144,698.102	31°03'07.02571"	97°37'28.30737"	761.299	SET TxDOT 3-1/4" ALUMINUM DISK IN CONCRETE
CP4	10,358,163.160	3,146,516.072	10,356,920.330	3,146,138.535	31°03'09.34978"	97°37'11.67602"	733.697	SET TxDOT 3-1/4" ALUMINUM DISK IN CONCRETE
CP5	10,359,427.130	3,156,229.935	10,358,184.150	3,155,851.233	31°03'19.49727"	97°35'19.68444"	691.107	SET TxDOT 3-1/4" ALUMINUM DISK IN CONCRETE
CP6	10,358,633.440	3,157,474,507	10,357,390.550	3,157,095.656	31°03'11.34041"	97°35'05.60664"	715.881	SET TxDOT 3-1/4" ALUMINUM DISK IN CONCRETE
CP7	10,359,023.010	3,166,201.467	10,357,780.080	3,165,821.568	31°03'13.05028"	97°33'25.20353"	822.116	SET TxDOT 3-1/4" ALUMINUM DISK IN CONCRETE
CP8	10,359,022.900	3,167,616.967	10,357,779.970	3,167,236.899	31°03'12.69931"	97°33'08.93638"	825.815	SET TxDOT 3-1/4" ALUMINUM DISK IN CONCRETE

NOTES:

1. ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983 TEXAS CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD83) 2010 ADJUSTMENT, EPOCH 2010 (GEOID 12A). ALL DISTANCES AND COORDINATES ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00012
2. ALL HORIZONTAL CONTROL OF THIS PROJECT WAS ESTABLISHED BY TxDOT VIRTUAL REFERENCE SYSTEM NETWORK (BELTON), BASED ON THREE AVERAGED 180 EPOCH OBSERVATIONS
3. UNIT OF MEASURE IS U.S. SURVEY FOOT
4. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), BASED ON THREE 180 EPOCH OBSERVATIONS UTILIZING THE TxDOT VIRTUAL REFERENCE SYSTEM NETWORK (BELTON)
5. FIELD SURVEYS WERE PERFORMED DURING JUNE 2019

N

NOT TO SCALE



STATE OF TEXAS
REGISTERED
CHRISTOPHER R. FREEMAN
5701
PROFESSIONAL LAND SURVEYOR
8-29-22

CHRISTOPHER R. FREEMAN - R.P.L.S. NO. 5701

LINA T. RAMEY & ASSOCIATES, INC.
3320 BELT LINE ROAD
FARMERS BRANCH, TX 75234 - 214-979-1144
FIRM REGISTRATION NO. F-782
TBPELS REGISTRATION NO. 10140700

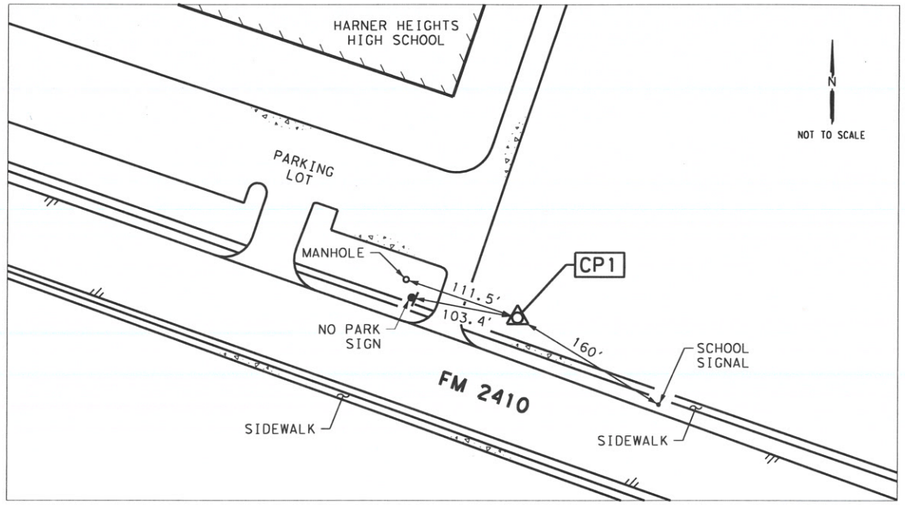
Texas Department of Transportation

FM 2410

SURVEY CONTROL INDEX

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CF	6			FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
ME	TEXAS	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	61
AS	2304	02	044	
GRPH CHECK				
JC				

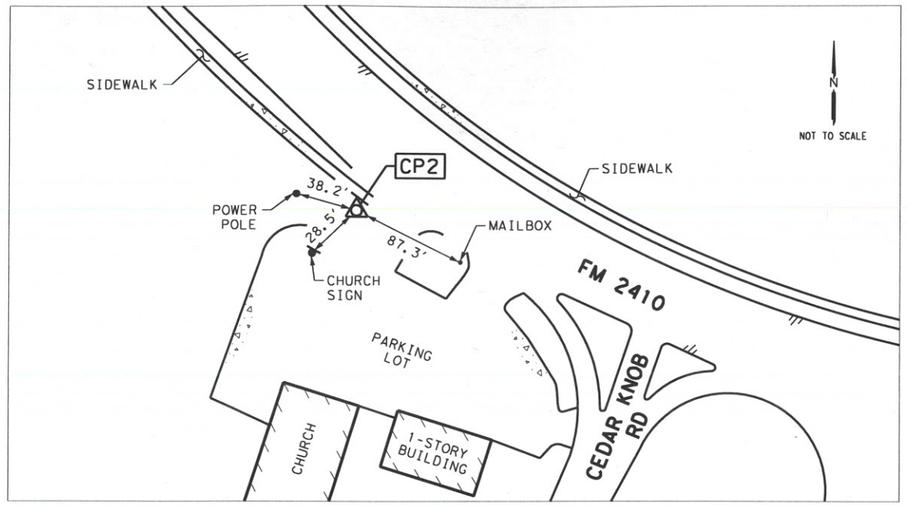
8/26/2022 O:*(137) TN&P\18.137.02 Waco FM Rehabilitation Project\FM-2410\Control\FM-2410 CONTROL INDEX SHEET.dgn



CONTROL POINT: CP1

CP# CP1 IS A TxDOT 3-1/4" DISK SET IN CONCRETE. LOCATED ON THE NORTH SIDE OF FM 2410
+/- 1,405' EAST OF THE INTERSECTION OF FM 3481 AND FM 2410

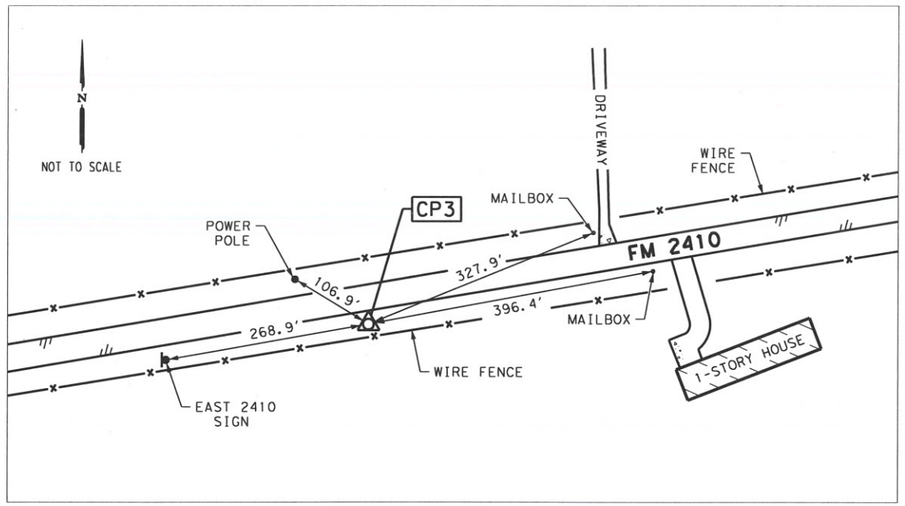
SURFACE COORDINATES:		GRID COORDINATES:			
NORTHING:	10,358,886.450	NORTHING:	10,357,643.530	LATITUDE:	31°03'18.75565"
EASTING:	3,137,144.811	EASTING:	3,136,768.399	LONGITUDE:	97°38'59.17278"
ELEVATION:	775.722	ELEVATION:	775.722		



CONTROL POINT: CP2

CP# CP2 IS A TxDOT 3-1/4" ALUMINUM DISK SET IN CONCRETE. LOCATED ON THE SOUTH SIDE OF FM 2410
+/- 2,640' EAST OF THE INTERSECTION OF FM 3481 AND FM 2410

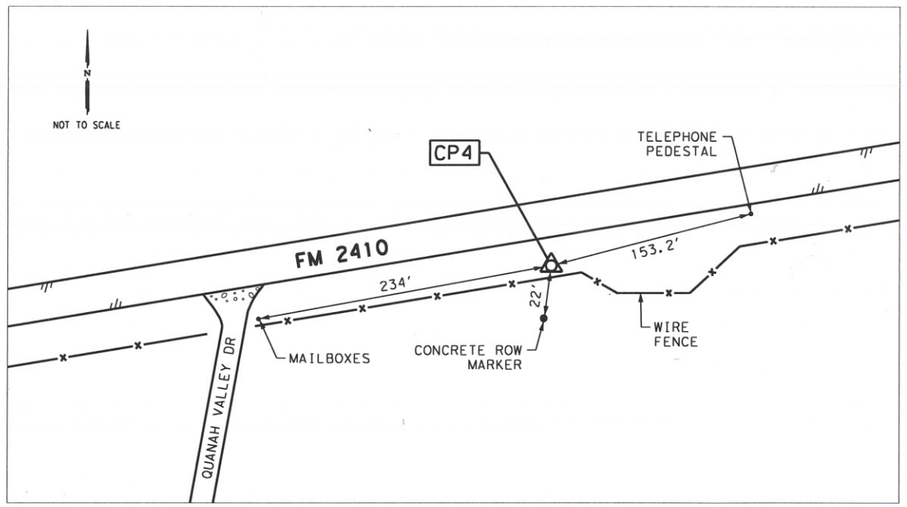
SURFACE COORDINATES:		GRID COORDINATES:			
NORTHING:	10,358,063.140	NORTHING:	10,356,820.320	LATITUDE:	31°03'10.38407"
EASTING:	3,138,089.698	EASTING:	3,137,713.172	LONGITUDE:	97°38'48.54212"
ELEVATION:	800.830	ELEVATION:	800.830		



CONTROL POINT: CP3

CP# CP3 IS A TxDOT 3-1/4" ALUMINUM DISK SET IN CONCRETE. LOCATED ON THE SOUTH SIDE OF FM 2410
+/- 1.8 MILES EAST OF THE INTERSECTION OF FM 3481 AND FM 2410

SURFACE COORDINATES:		GRID COORDINATES:			
NORTHING:	10,357,893.150	NORTHING:	10,356,650.350	LATITUDE:	31°03'07.02571"
EASTING:	3,145,075.466	EASTING:	3,144,698.102	LONGITUDE:	97°37'28.30737"
ELEVATION:	761.299	ELEVATION:	761.299		



CONTROL POINT: CP4

CP# CP4 IS A TxDOT 3-1/4" ALUMINUM DISK SET IN CONCRETE. LOCATED ON THE SOUTH SIDE OF FM 2410
+/- 2.1 MILES EAST OF THE INTERSECTION OF FM 3481 AND FM 2410

SURFACE COORDINATES:		GRID COORDINATES:			
NORTHING:	10,358,163.160	NORTHING:	10,356,920.330	LATITUDE:	31°03'09.34978"
EASTING:	3,146,516.072	EASTING:	3,146,138.535	LONGITUDE:	97°37'11.67602"
ELEVATION:	733.697	ELEVATION:	733.697		

NOTES:

1. ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983 TEXAS CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD83) 2010 ADJUSTMENT, EPOCH 2010 (GEOID 12A). ALL DISTANCES AND COORDINATES ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00012
2. ALL HORIZONTAL CONTROL OF THIS PROJECT WAS ESTABLISHED BY TxDOT VIRTUAL REFERENCE SYSTEM NETWORK (BELTON), BASED ON THREE AVERAGED 180 EPOCH OBSERVATIONS
3. UNIT OF MEASURE IS U.S. SURVEY FOOT
4. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), BASED ON THREE 180 EPOCH OBSERVATIONS UTILIZING THE TxDOT VIRTUAL REFERENCE SYSTEM NETWORK (BELTON)
5. FIELD SURVEYS WERE PERFORMED DURING JUNE 2019

STATE OF TEXAS
REGISTERED
CHRISTOPHER R. FREEMAN
5701
PROFESSIONAL
LAND SURVEYOR
4-29-22

CHRISTOPHER R. FREEMAN - R.P.L.S. NO. 5701

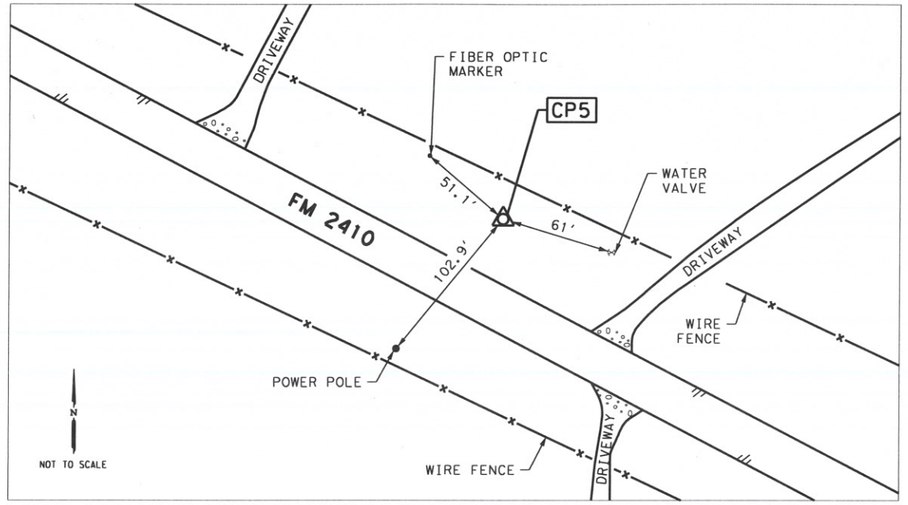
LINA T. RAMEY & ASSOCIATES, INC.
3320 BELT LINE ROAD
FARMERS BRANCH, TX 75234 - 214-979-1144
FIRM REGISTRATION NO. F-782
TBPELS REGISTRATION NO. 10140700

Texas Department of Transportation

FM 2410

SURVEY CONTROL DATA

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CF	6			FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
ME	TEXAS	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	62
AS	2304	02	044	
GRPH CHECK				
JC				



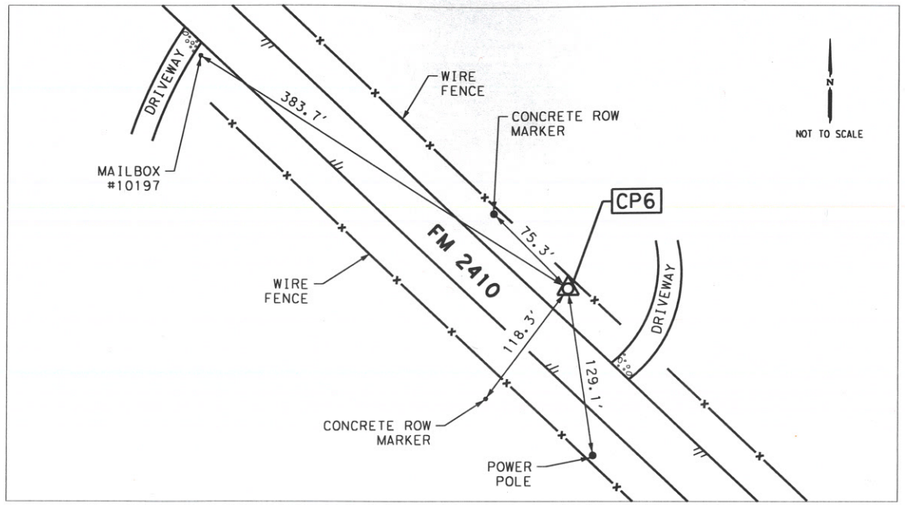
CONTROL POINT: CP5

CP# CP5 IS A TxDOT 3-1/4" ALUMINUM DISK SET IN CONCRETE. LOCATED ON THE NORTH SIDE OF FM 2410, +/- 2.5 MILES WEST OF THE INTERSECTION OF SIMMONS RD AND FM 2410

SURFACE COORDINATES:
NORTHING: 10,359,427.130
EASTING: 3,156,229.935
ELEVATION: 691.107

GRID COORDINATES:
NORTHING: 10,358,184.150
EASTING: 3,155,851.233
ELEVATION: 691.107

LATITUDE: 31°03'19.49727"
LONGITUDE: 97°35'19.68444"



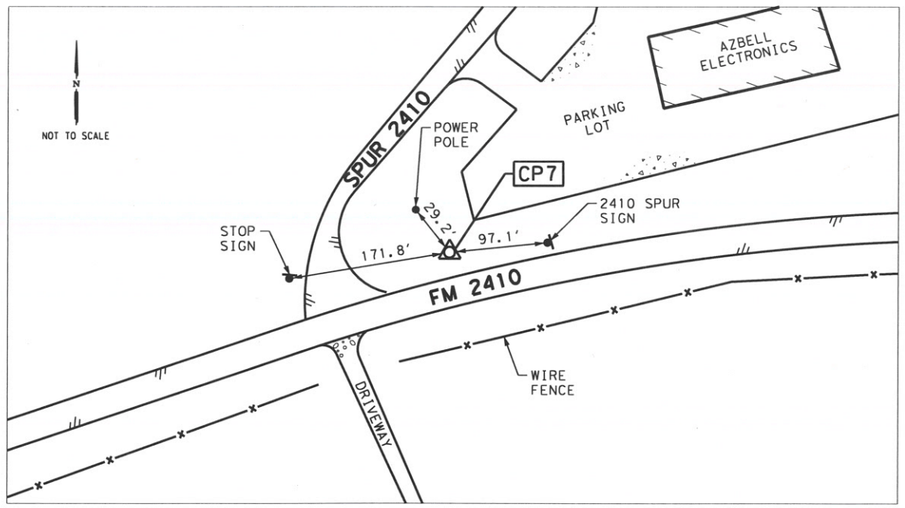
CONTROL POINT: CP6

CP# CP6 IS A TxDOT 3-1/4" ALUMINUM DISK SET IN CONCRETE. LOCATED ON THE NORTH SIDE OF FM 2410, +/- 2.3 MILES WEST OF THE INTERSECTION OF SIMMONS RD AND FM 2410

SURFACE COORDINATES:
NORTHING: 10,358,633.440
EASTING: 3,157,474.507
ELEVATION: 715.881

GRID COORDINATES:
NORTHING: 10,357,390.550
EASTING: 3,157,095.656
ELEVATION: 715.881

LATITUDE: 31°03'11.34041"
LONGITUDE: 97°35'05.60664"



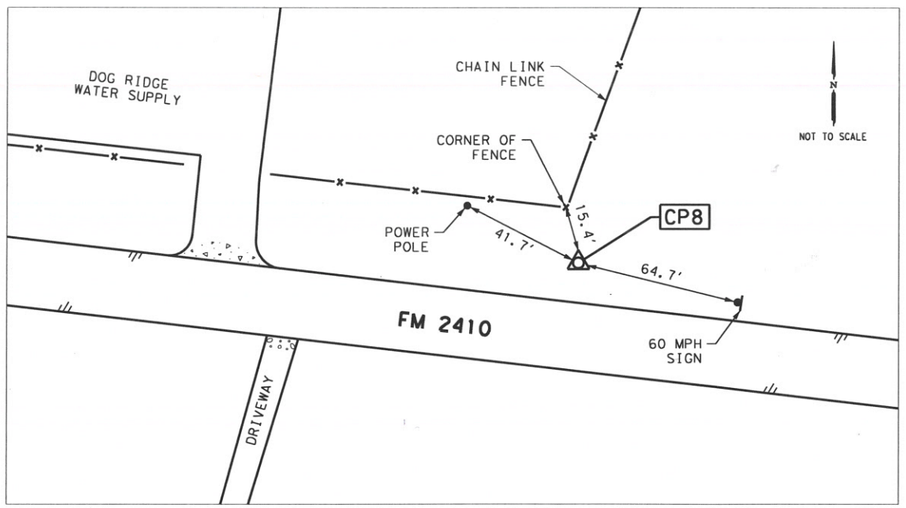
CONTROL POINT: CP7

CP# CP7 IS A TxDOT 3-1/4" ALUMINUM DISK SET IN CONCRETE. LOCATED ON THE NORTH SIDE OF FM 2410, +/- 1,946.7' WEST OF THE INTERSECTION OF SIMMONS RD AND FM 2410

SURFACE COORDINATES:
NORTHING: 10,359,023.010
EASTING: 3,166,201.467
ELEVATION: 822.116

GRID COORDINATES:
NORTHING: 10,357,780.080
EASTING: 3,165,821.568
ELEVATION: 822.116

LATITUDE: 31°03'13.05028"
LONGITUDE: 97°33'25.20353"



CONTROL POINT: CP8

CP# CP8 IS A TxDOT 3-1/4" ALUMINUM DISK SET IN CONCRETE. LOCATED ON THE NORTH SIDE OF FM 2410, +/- 532.5' WEST OF THE INTERSECTION OF SIMMONS RD AND FM 2410

SURFACE COORDINATES:
NORTHING: 10,359,022.900
EASTING: 3,167,616.967
ELEVATION: 825.815

GRID COORDINATES:
NORTHING: 10,357,779.970
EASTING: 3,167,236.899
ELEVATION: 825.815

LATITUDE: 31°03'12.69931"
LONGITUDE: 97°33'08.93638"

NOTES:

1. ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983 TEXAS CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD83) 2010 ADJUSTMENT, EPOCH 2010 (GEOID 12A). ALL DISTANCES AND COORDINATES ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00012
2. ALL HORIZONTAL CONTROL OF THIS PROJECT WAS ESTABLISHED BY TxDOT VIRTUAL REFERENCE SYSTEM NETWORK (BELTON), BASED ON THREE AVERAGED 180 EPOCH OBSERVATIONS
3. UNIT OF MEASURE IS U.S. SURVEY FOOT
4. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), BASED ON THREE 180 EPOCH OBSERVATIONS UTILIZING THE TxDOT VIRTUAL REFERENCE SYSTEM NETWORK (BELTON)
5. FIELD SURVEYS WERE PERFORMED DURING JUNE 2019

STATE OF TEXAS
REGISTERED
CHRISTOPHER R. FREEMAN
5701
PROFESSIONAL
LAND SURVEYOR
8-29-22

CHRISTOPHER R. FREEMAN - R.P.L.S. NO. 5701

LINA T. RAMEY & ASSOCIATES, INC.
3320 BELT LINE ROAD
FARMERS BRANCH, TX 75234 - 214-979-1144
FIRM REGISTRATION NO. F-782
TBPELS REGISTRATION NO. 10140700

Texas Department of Transportation

FM 2410
SUVERY CONTROL DATA

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CF	6			FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
ME	TEXAS	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	63
AS	2304	02	044	
GRPH CHECK				
JC				

PROPOSED FM 2410 - HORIZONTAL ALIGNMENT

Chain M-FM2410PC contains:
M0004 CUR M-FM2410PC1 CUR M-FM2410PC2 CUR M-FM2410PC3 CUR M-FM2410PC4 CUR M-FM-2410PC5 CUR M-FM2410PC6 CUR M-FM2410PC7 CUR M-FM2410PC8 CUR M-FM2410PC9 CUR M-F-M2410PC10 CUR M-FM2410PC11 CUR M-FM2410PC12 CUR M-FM2410PC13 CUR M-FM2410PC14 C-UR M-FM2410PC15 M0005 CUR M-FM2410PC16 M0006

Beginning chain M-FM2410PC description

Point M0004 N 10,359,339.8993 E 3,135,441.0360 Sta 234+00.00

Course from M0004 to PC M-FM2410PC1 S 72° 26′ 41.51" E Dist 1,856.1716

Curve M-FM2410PC1						
P.I. Station	255+66.56	N	10,358,686.4139	E	3,137,506.6935	
Delta =	26° 24′ 24.21"	(RT)				
Degree =	4° 19′ 50.69"					
Tangent =	310.3888					
Length =	609.7499					
Radius =	1,323.0000					
External =	35.9224					
Long Chord =	604.3676					
Mid. Ord. =	34.9728					
P.C. Station	252+56.17	N	10,358,780.0344	E	3,137,210.7604	
P.T. Station	258+65.92	N	10,358,470.9484	E	3,137,730.1120	
C.C.		N	10,357,518.6503	E	3,136,811.7126	
Back = S	72° 26′ 41.51" E					
Ahead = S	46° 02′ 17.29" E					
Chord Bear = S	59° 14′ 29.40" E					

Course from PT M-FM2410PC1 to PC M-FM2410PC2 S 46° 02′ 17.29" E Dist 359.6085

Curve M-FM2410PC2						
P.I. Station	266+97.12	N	10,357,893.9444	E	3,138,328.4135	
Delta =	43° 14′ 11.89"	(LT)				
Degree =	4° 48′ 53.18"					
Tangent =	471.5945					
Length =	897.9998					
Radius =	1,190.0000					
External =	90.0396					
Long Chord =	876.8439					
Mid. Ord. =	83.7061					
P.C. Station	262+25.53	N	10,358,221.3156	E	3,137,988.9589	
P.T. Station	271+23.53	N	10,357,887.9753	E	3,138,799.9702	
C.C.		N	10,359,077.8800	E	3,138,815.0324	
Back = S	46° 02′ 17.29" E					
Ahead = S	89° 16′ 29.18" E					
Chord Bear = S	67° 39′ 23.24" E					

Course from PT M-FM2410PC2 to PC M-FM2410PC3 S 89° 16′ 29.18" E Dist 467.1470

Curve M-FM2410PC3						
P.I. Station	276+11.93	N	10,357,881.7935	E	3,139,288.3270	
Delta =	0° 25′ 29.92"	(RT)				
Degree =	1° 00′ 00.00"					
Tangent =	21.2489					
Length =	42.4976					
Radius =	5,729.5780					
External =	0.0394					
Long Chord =	42.4975					
Mid. Ord. =	0.0394					
P.C. Station	275+90.68	N	10,357,882.0625	E	3,139,267.0798	
P.T. Station	276+33.17	N	10,357,881.3670	E	3,139,309.5716	
C.C.		N	10,352,152.9434	E	3,139,194.5590	
Back = S	89° 16′ 29.18" E					
Ahead = S	88° 50′ 59.27" E					
Chord Bear = S	89° 03′ 44.22" E					

Course from PT M-FM2410PC3 to PC M-FM2410PC4 S 88° 50′ 59.27" E Dist 1,705.5358

Curve M-FM2410PC4						
P.I. Station	293+66.68	N	10,357,846.5696	E	3,141,042.7231	
Delta =	0° 33′ 33.46"	(LT)				
Degree =	1° 00′ 00.00"					
Tangent =	27.9649					
Length =	55.9294					
Radius =	5,729.5780					
External =	0.0682					
Long Chord =	55.9292					
Mid. Ord. =	0.0682					
P.C. Station	293+38.71	N	10,357,847.1309	E	3,141,014.7638	
P.T. Station	293+94.64	N	10,357,846.2811	E	3,141,070.6865	
C.C.		N	10,363,575.5544	E	3,141,129.7765	
Back = S	88° 50′ 59.27" E					
Ahead = S	89° 24′ 32.72" E					
Chord Bear = S	89° 07′ 45.99" E					

Course from PT M-FM2410PC4 to PC M-FM2410PC5 S 89° 24′ 32.72" E Dist 492.9490

PROPOSED FM 2410 (cont.) - HORIZONTAL ALIGNMENT

Curve M-FM2410PC5						
P.I. Station	299+22.35	N	10,357,840.8388	E	3,141,598.3704	
Delta =	0° 41′ 42.90"	(RT)				
Degree =	1° 00′ 00.00"					
Tangent =	34.7629					
Length =	69.5250					
Radius =	5,729.5780					
External =	0.1055					
Long Chord =	69.5246					
Mid. Ord. =	0.1055					
P.C. Station	298+87.59	N	10,357,841.1973	E	3,141,563.6093	
P.T. Station	299+57.11	N	10,357,840.0585	E	3,141,633.1246	
C.C.		N	10,352,111.9240	E	3,141,504.5193	
Back = S	89° 24′ 32.72" E					
Ahead = S	88° 42′ 49.82" E					
Chord Bear = S	89° 03′ 41.27" E					

Course from PT M-FM2410PC5 to PC M-FM2410PC6 S 88° 42′ 49.82" E Dist 998.1192

Curve M-FM2410PC6						
P.I. Station	310+26.99	N	10,357,816.0441	E	3,142,702.7345	
Delta =	1° 26′ 06.47"	(RT)				
Degree =	1° 00′ 00.00"					
Tangent =	71.7602					
Length =	143.5129					
Radius =	5,729.5780					
External =	0.4494					
Long Chord =	143.5092					
Mid. Ord. =	0.4493					
P.C. Station	309+55.23	N	10,357,817.6549	E	3,142,630.9923	
P.T. Station	310+98.75	N	10,357,812.6371	E	3,142,774.4138	
C.C.		N	10,352,089.5204	E	3,142,502.3871	
Back = S	88° 42′ 49.82" E					
Ahead = S	87° 16′ 43.36" E					
Chord Bear = S	87° 59′ 46.59" E					

Course from PT M-FM2410PC6 to PC M-FM2410PC7 S 87° 16′ 43.36" E Dist 1,048.8296

Curve M-FM2410PC7						
P.I. Station	324+78.55	N	10,357,747.1275	E	3,144,152.6589	
Delta =	13° 28′ 57.47"	(LT)				
Degree =	2° 02′ 46.60"					
Tangent =	330.9715					
Length =	658.8857					
Radius =	2,800.0000					
External =	19.4932					
Long Chord =	657.3665					
Mid. Ord. =	19.3585					
P.C. Station	321+47.58	N	10,357,762.8412	E	3,143,822.0606	
P.T. Station	328+06.46	N	10,357,808.9260	E	3,144,477.8097	
C.C.		N	10,360,559.6837	E	3,143,954.9979	
Back = S	87° 16′ 43.36" E					
Ahead = N	79° 14′ 19.17" E					
Chord Bear = N	85° 58′ 47.91" E					

Course from PT M-FM2410PC7 to PC M-FM2410PC8 N 79° 14′ 19.17" E Dist 7,772.5308

Curve M-FM2410PC8						
P.I. Station	409+72.43	N	10,359,333.6640	E	3,152,500.1699	
Delta =	30° 43′ 32.75"	(LT)				
Degree =	4° 00′ 03.97"					
Tangent =	393.4406					
Length =	767.9325					
Radius =	1,432.0000					
External =	53.0655					
Long Chord =	758.7638					
Mid. Ord. =	51.1693					
P.C. Station	405+78.99	N	10,359,260.2014	E	3,152,113.6485	
P.T. Station	413+46.92	N	10,359,594.2993	E	3,152,794.8981	
C.C.		N	10,360,667.0175	E	3,151,846.2676	
Back = N	79° 14′ 19.17" E					
Ahead = N	48° 30′ 46.42" E					
Chord Bear = N	63° 52′ 32.79" E					

Course from PT M-FM2410PC8 to PC M-FM2410PC9 N 48° 30′ 46.42" E Dist 576.2427

Curve M-FM2410PC9						
P.I. Station	427+83.68	N	10,360,546.0809	E	3,153,871.1795	
Delta =	67° 49′ 26.49"	(RT)				
Degree =	4° 28′ 34.44"					
Tangent =	860.5139					
Length =	1,515.2033					
Radius =	1,280.0000					
External =	262.3632					
Long Chord =	1,428.2730					
Mid. Ord. =	217.7340					
P.C. Station	419+23.17	N	10,359,976.0322	E	3,153,226.5643	
P.T. Station	434+38.37	N	10,360,164.3150	E	3,154,642.3727	
C.C.		N	10,359,017.1780	E	3,154,074.5022	
Back = N	48° 30′ 46.42" E					
Ahead = S	63° 39′ 47.09" E					
Chord Bear = N	82° 25′ 29.67" E					

Course from PT M-FM2410PC9 to PC M-FM2410PC10 S 63° 39′ 47.09" E Dist 2,277.1230

STATE OF TEXAS
RYAN MICHAEL JONES
110010
LICENSED
PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

HORIZONTAL ALIGNMENT DATA

(SHEET 1 OF 5)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	64
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

FILE: P:\MSGP\TXD18248\06-FM#2410\PROD\#SHEETS\GAD01.dgn
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PROPOSED FM 2410 (cont.) - HORIZONTAL ALIGNMENT

			Curve Data *----------*			
Curve M-FM2410PC10						
P.I. Station		461+57.04	N	10,358,958.1824	E	3,157,078.8427
Delta	=	17° 31′ 42.81"	(RT)			
Degree	=	2° 00′ 01.98"				
Tangent	=	441.5425				
Length	=	876.1866				
Radius	=	2,864.0000				
External	=	33.8364				
Long Chord	=	872.7737				
Mid. Ord.	=	33.4413				
P.C. Station		457+15.49	N	10,359,154.0721	E	3,156,683.1320
P.T. Station		465+91.68	N	10,358,652.2077	E	3,157,397.1810
C.C.			N	10,356,587.3532	E	3,155,412.5219
Back	= S 63° 39′ 47.09" E					
Ahead	= S 46° 08′ 04.28" E					
Chord Bear	= S 54° 53′ 55.68" E					

Course from PT M-FM2410PC10 to PC M-FM2410PC11 S 46° 08′ 04.28" E Dist 2,216.8311

			Curve Data *----------*			
Curve M-FM2410PC11						
P.I. Station		500+12.37	N	10,356,281.7820	E	3,159,863.3900
Delta	=	72° 39′ 42.63"	(LT)			
Degree	=	3° 30′ 00.17"				
Tangent	=	1,203.8567				
Length	=	2,076.0244				
Radius	=	1,637.0000				
External	=	395.0039				
Long Chord	=	1,939.6748				
Mid. Ord.	=	318.2186				
P.C. Station		488+08.51	N	10,357,116.0157	E	3,158,995.4470
P.T. Station		508+84.54	N	10,356,861.6775	E	3,160,918.3745
C.C.			N	10,358,296.2416	E	3,160,129.8349
Back	= S 46° 08′ 04.28" E					
Ahead	= N 61° 12′ 13.10" E					
Chord Bear	= S 82° 27′ 55.59" E					

Course from PT M-FM2410PC11 to PC M-FM2410PC12 N 61° 12′ 13.10" E Dist 398.0073

			Curve Data *----------*			
Curve M-FM2410PC12						
P.I. Station		517+87.64	N	10,357,296.7003	E	3,161,709.7973
Delta	=	20° 00′ 13.28"	(RT)			
Degree	=	2° 00′ 01.98"				
Tangent	=	505.0956				
Length	=	999.9090				
Radius	=	2,864.0000				
External	=	44.1983				
Long Chord	=	994.8384				
Mid. Ord.	=	43.5266				
P.C. Station		512+82.54	N	10,357,053.3968	E	3,161,267.1632
P.T. Station		522+82.45	N	10,357,373.9090	E	3,162,208.9569
C.C.			N	10,354,543.5669	E	3,162,646.7464
Back	= N 61° 12′ 13.10" E					
Ahead	= N 81° 12′ 26.38" E					
Chord Bear	= N 71° 12′ 19.74" E					

Course from PT M-FM2410PC12 to PC M-FM2410PC13 N 81° 12′ 26.38" E Dist 745.6624

			Curve Data *----------*			
Curve M-FM2410PC13						
P.I. Station		534+61.51	N	10,357,554.1385	E	3,163,374.1543
Delta	=	25° 34′ 07.01"	(LT)			
Degree	=	2° 59′ 59.20"				
Tangent	=	433.3913				
Length	=	852.3500				
Radius	=	1,910.0000				
External	=	48.5525				
Long Chord	=	845.2950				
Mid. Ord.	=	47.3489				
P.C. Station		530+28.11	N	10,357,487.8905	E	3,162,945.8563
P.T. Station		538+80.46	N	10,357,798.7486	E	3,163,731.9166
C.C.			N	10,359,375.4441	E	3,162,653.8947
Back	= N 81° 12′ 26.38" E					
Ahead	= N 55° 38′ 19.37" E					
Chord Bear	= N 68° 25′ 22.87" E					

Course from PT M-FM2410PC13 to PC M-FM2410PC14 N 55° 38′ 19.37" E Dist 787.2548

PROPOSED FM 2410 (cont.) - HORIZONTAL ALIGNMENT

			Curve Data *----------*			
Curve M-FM2410PC14						
P.I. Station		548+96.81	N	10,358,372.3826	E	3,164,570.9035
Delta	=	13° 40′ 44.38"	(RT)			
Degree	=	2° 59′ 59.20"				
Tangent	=	229.0892				
Length	=	456.0000				
Radius	=	1,910.0000				
External	=	13.6896				
Long Chord	=	454.9178				
Mid. Ord.	=	13.5922				
P.C. Station		546+67.72	N	10,358,243.0825	E	3,164,381.7915
P.T. Station		551+23.72	N	10,358,453.2937	E	3,164,785.2287
C.C.			N	10,356,666.3870	E	3,165,459.8134
Back	= N 55° 38′ 19.37" E					
Ahead	= N 69° 19′ 03.74" E					
Chord Bear	= N 62° 28′ 41.55" E					

Course from PT M-FM2410PC14 to PC M-FM2410PC15 N 69° 19′ 03.74" E Dist 1,346.5185

			Curve Data *----------*			
Curve M-FM2410PC15						
P.I. Station		569+12.13	N	10,359,084.9337	E	3,166,458.3790
Delta	=	26° 03′ 10.82"	(RT)			
Degree	=	2° 59′ 59.20"				
Tangent	=	441.8889				
Length	=	868.4974				
Radius	=	1,910.0000				
External	=	50.4504				
Long Chord	=	861.0346				
Mid. Ord.	=	49.1521				
P.C. Station		564+70.24	N	10,358,928.8648	E	3,166,044.9684
P.T. Station		573+38.73	N	10,359,043.5731	E	3,166,898.3280
C.C.			N	10,357,141.9581	E	3,166,719.5532
Back	= N 69° 19′ 03.74" E					
Ahead	= S 84° 37′ 45.44" E					
Chord Bear	= N 82° 20′ 39.15" E					

Course from PT M-FM2410PC15 to M0005 S 84° 37′ 45.44" E Dist 1,259.1975

Point M0005 N 10,358,925.7130 E 3,168,151.9975 Sta 585+97.93

Course from M0005 to PC M-FM2410PC16 N 19° 22′ 22.98" E Dist 202.6445

			Curve Data *----------*			
Curve M-FM2410PC16						
P.I. Station		589+35.10	N	10,359,243.7923	E	3,168,263.8427
Delta	=	20° 52′ 58.27"	(LT)			
Degree	=	7° 50′ 55.45"				
Tangent	=	134.5257				
Length	=	266.0664				
Radius	=	730.0000				
External	=	12.2918				
Long Chord	=	264.5962				
Mid. Ord.	=	12.0883				
P.C. Station		588+00.58	N	10,359,116.8836	E	3,168,219.2182
P.T. Station		590+66.64	N	10,359,378.2713	E	3,168,260.2983
C.C.			N	10,359,359.0373	E	3,167,530.5517
Back	= N 19° 22′ 22.98" E					
Ahead	= N 1° 30′ 35.29" W					
Chord Bear	= N 8° 55′ 53.84" E					

Course from PT M-FM2410PC16 to M0006 N 1° 30′ 35.29" W Dist 174.9247

Point M0006 N 10,359,553.1353 E 3,168,255.6893 Sta 592+41.57

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Ending chain M-FM2410PC description

STATE OF TEXAS
RYAN MICHAEL JONES
110010
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation
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FM 2410

HORIZONTAL ALIGNMENT DATA

(SHEET 2 OF 5)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	65
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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PROPOSED FM 2410 SIDESTREET- HORIZONTAL ALIGNMENT

CEDAR KNOB RD

Point CK0001 N 10,357,993.8413 E 3,138,324.1555 Sta 1+00.00

Course from CK0001 to CK0002 S 17° 24′ 33.47" W Dist 91.5468

Point CK0002 N 10,357,906.4881 E 3,138,296.7651 Sta 1+91.55

Course from CK0002 to CK0003 S 21° 28′ 20.97" W Dist 158.4532

Point CK0003 N 10,357,759.0326 E 3,138,238.7626 Sta 3+50.00

GRANT EDWIN DR

Point GE0001 N 10,357,874.4668 E 3,139,653.2460 Sta 1+00.00

Course from GE0001 to GE0002 S 1° 09′ 00.73" W Dist 200.0000

Point GE0002 N 10,357,674.5071 E 3,139,649.2313 Sta 3+00.00

INDIAN TRAIL

Point IT0001 N 10,358,042.8120 E 3,141,175.5516 Sta 1+00.00

Course from IT0001 to PC INDIAN_TR1 S 18° 47′ 34.09" W Dist 13.4834

Curve Data

Curve INDIAN_TR1					
P.I. Station	1+65.41	N	10,357,980.8861	E	3,141,154.4790
Delta =	18° 12′ 06.81" (LT)				
Degree =	17° 40′ 27.93"				
Tangent =	51.9296				
Length =	102.9843				
Radius =	324.1734				
External =	4.1330				
Long Chord =	102.5518				
Mid. Ord. =	4.0810				
P.C. Station	1+13.48	N	10,358,030.0474	E	3,141,171.2080
P.T. Station	2+16.47	N	10,357,928.9592	E	3,141,153.9434
C.C.		N	10,357,925.6160	E	3,141,478.0995
Back = S	18° 47′ 34.09" W				
Ahead = S	0° 35′ 27.28" W				
Chord Bear = S	9° 41′ 30.68" W				

Course from PT INDIAN_TR1 to IT0002 S 0° 35′ 27.28" W Dist 83.5323

Point IT0002 N 10,357,845.4313 E 3,141,153.0819 Sta 3+00.00

LIMESTONE TRAIL

Point LS0001 N 10,357,844.3246 E 3,141,260.3908 Sta 1+00.00

Course from LS0001 to LS0002 S 0° 35′ 27.28" W Dist 100.3164

Point LS0002 N 10,357,744.0136 E 3,141,259.3562 Sta 2+00.32

Course from LS0002 to LS0003 S 1° 21′ 59.12" W Dist 99.6837

Point LS0003 N 10,357,644.3583 E 3,141,256.9791 Sta 3+00.00

GRANITE TRAIL

Point GT0001 N 10,357,832.5474 E 3,141,967.6711 Sta 1+00.00

Course from GT0001 to GT0002 S 10° 20′ 32.29" W Dist 200.0000

Point GT0002 N 10,357,635.7969 E 3,141,931.7654 Sta 3+00.00

COMANCHE GAP RD

Point CG0001 N 10,357,826.0265 E 3,142,258.1177 Sta 1+00.00

Course from CG0001 to CG0002 S 15° 11′ 47.58" W Dist 200.0000

Point CG0002 N 10,357,633.0200 E 3,142,205.6915 Sta 3+00.00

WARRIORS SUNDOWN PATH

Point WP0001 N 10,358,008.4505 E 3,142,813.8765 Sta 1+00.00

Course from WP0001 to WP0002 S 13° 59′ 19.11" W Dist 12.9606

Point WP0002 N 10,357,995.8743 E 3,142,810.7435 Sta 1+12.96

Course from WP0002 to WP0003 S 11° 41′ 02.94" W Dist 187.0394

Point WP0003 N 10,357,812.7106 E 3,142,772.8650 Sta 3+00.00

QUANAH VALLEY DR

Point QV0001 N 10,358,150.2536 E 3,146,273.6940 Sta 1+00.00

Course from QV0001 to PC QUANAH_VALLEY1 S 10° 45′ 40.83" E Dist 29.0341

Curve Data

Curve QUANAH_VALLEY1					
P.I. Station	1+47.21	N	10,358,103.8740	E	3,146,282.5090
Delta =	20° 36′ 10.73" (RT)				
Degree =	57° 17′ 44.81"				
Tangent =	18.1758				
Length =	35.9590				
Radius =	100.0000				
External =	1.6384				
Long Chord =	35.7656				
Mid. Ord. =	1.6120				
P.C. Station	1+29.03	N	10,358,121.7301	E	3,146,279.1152
P.T. Station	1+64.99	N	10,358,085.9657	E	3,146,279.4023
C.C.		N	10,358,103.0583	E	3,146,180.8739
Back = S	10° 45′ 40.83" E				
Ahead = S	9° 50′ 29.89" W				
Chord Bear = S	0° 27′ 35.47" E				

Course from PT QUANAH_VALLEY1 to QV0002 S 9° 50′ 29.89" W Dist 135.0069

Point QV0002 N 10,357,952.9456 E 3,146,256.3261 Sta 3+00.00

RUMMEL RD (W)

Point RW0001 N 10,358,343.2530 E 3,147,289.1541 Sta 1+00.00

Course from RW0001 to RW0002 S 12° 29′ 01.65" W Dist 200.0000

Point RW0002 N 10,358,147.9816 E 3,147,245.9214 Sta 3+00.00

BIG VALLEY LN

Point BV0001 N 10,359,085.8934 E 3,151,196.5327 Sta 1+00.00

Course from BV0001 to PC BIG_VALLEY1 S 10° 45′ 40.83" E Dist 18.3488

Curve Data

Curve BIG_VALLEY1					
P.I. Station	1+27.38	N	10,359,058.9919	E	3,151,201.6457
Delta =	25° 27′ 15.03" (RT)				
Degree =	143° 14′ 22.02"				
Tangent =	9.0343				
Length =	17.7704				
Radius =	40.0000				
External =	1.0075				
Long Chord =	17.6246				
Mid. Ord. =	0.9828				
P.C. Station	1+18.35	N	10,359,067.8673	E	3,151,199.9588
P.T. Station	1+36.12	N	10,359,050.2531	E	3,151,199.3542
C.C.		N	10,359,060.3986	E	3,151,160.6623
Back = S	10° 45′ 40.83" E				
Ahead = S	14° 41′ 34.20" W				
Chord Bear = S	1° 57′ 56.68" W				

Course from PT BIG_VALLEY1 to BV0002 S 14° 41′ 34.20" W Dist 163.8809

Point BV0002 N 10,358,891.7312 E 3,151,157.7880 Sta 3+00.00

BONANZA DR

Point BD0001 N 10,359,197.4525 E 3,151,783.4973 Sta 1+00.00

Course from BD0001 to PC BONANZA_DR1 S 10° 45′ 40.83" E Dist 35.0772

Curve Data

Curve BONANZA_DR1					
P.I. Station	1+38.55	N	10,359,159.5826	E	3,151,790.6949
Delta =	13° 11′ 52.57" (RT)				
Degree =	190° 59′ 09.35"				
Tangent =	3.4706				
Length =	6.9104				
Radius =	30.0000				
External =	0.2001				
Long Chord =	6.8952				
Mid. Ord. =	0.1988				
P.C. Station	1+35.08	N	10,359,162.9922	E	3,151,790.0469
P.T. Station	1+41.99	N	10,359,156.1152	E	3,151,790.5473
C.C.		N	10,359,157.3906	E	3,151,760.5744
Back = S	10° 45′ 40.83" E				
Ahead = S	2° 26′ 11.74" W				
Chord Bear = S	4° 09′ 44.55" E				

Course from PT BONANZA_DR1 to BD0002 S 2° 26′ 11.74" W Dist 58.0124

Point BD0002 N 10,359,098.1553 E 3,151,788.0810 Sta 2+00.00

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

HORIZONTAL ALIGNMENT DATA

(SHEET 3 OF 5)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	66
GRAPHICS JP	CONTROL	SECTION	JOB	
GRPH CHECK	2304	02	044	
RJ				

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PROPOSED FM 2410 SIDESTREET- HORIZONTAL ALIGNMENT

COUNTRY DR

Point CD0001 N 10,359,292.3077 E 3,152,247.2626 Sta 1+00.00

Course from CD0001 to PC COUNTRY_DR1 S 16° 15′ 41.99" E Dist 34.4447

Curve COUNTRY_DR1					
		Curve Data			
P.I. Station	1+66.13	N	10,359,228.8274	E	3,152,265.7795
Delta =	15° 20′ 49.51" (RT)				
Degree =	24° 22′ 01.47"				
Tangent =	31.6811				
Length =	62.9829				
Radius =	235.1361				
External =	2.1247				
Long Chord =	62.7948				
Mid. Ord. =	2.1057				
P.C. Station	1+34.44	N	10,359,259.2410	E	3,152,256.9080
P.T. Station	1+97.43	N	10,359,197.1503	E	3,152,266.2851
C.C.		N	10,359,193.3971	E	3,152,031.1790
Back = S	16° 15′ 41.99" E				
Ahead = S	0° 54′ 52.48" E				
Chord Bear = S	8° 35′ 17.23" E				

Course from PT COUNTRY_DR1 to CD0002 S 0° 54′ 52.48" E Dist 102.5724

Point CD0002 N 10,359,094.5910 E 3,152,267.9224 Sta 3+00.00

RUMMEL RD (E)

Point RE0001 N 10,359,562.6696 E 3,152,757.8814 Sta 1+00.00

Course from RE0001 to RE0002 S 39° 32′ 20.01" E Dist 54.0230

Point RE0002 N 10,359,521.0074 E 3,152,792.2726 Sta 1+54.02

Course from RE0002 to RE0003 S 40° 51′ 48.78" E Dist 145.9770

Point RE0003 N 10,359,410.6094 E 3,152,887.7795 Sta 3+00.00

LEVY CROSSING RD

Point LC0001 N 10,360,468.2473 E 3,153,902.4568 Sta 1+00.00

Course from LC0001 to LC0002 S 16° 32′ 39.19" W Dist 200.0000

Point LC0002 N 10,360,276.5273 E 3,153,845.5057 Sta 3+00.00

CATHY LN

Point CL0001 N 10,360,075.0744 E 3,155,270.6434 Sta 1+00.00

Course from CL0001 to PC CATHY_LN1 S 17° 31′ 54.77" W Dist 81.5141

Curve CATHY_LN1					
		Curve Data			
P.I. Station	2+17.86	N	10,359,962.6870	E	3,155,235.1390
Delta =	8° 48′ 18.14" (RT)				
Degree =	12° 08′ 09.60"				
Tangent =	36.3481				
Length =	72.5530				
Radius =	472.1142				
External =	1.3972				
Long Chord =	72.4817				
Mid. Ord. =	1.3930				
P.C. Station	1+81.51	N	10,359,997.3467	E	3,155,246.0884
P.T. Station	2+54.07	N	10,359,930.1119	E	3,155,219.0132
C.C.		N	10,360,139.5647	E	3,154,795.9041
Back = S	17° 31′ 54.77" W				
Ahead = S	26° 20′ 12.91" W				
Chord Bear = S	21° 56′ 03.84" W				

Course from PT CATHY_LN1 to CL0002 S 26° 20′ 12.91" W Dist 45.9329

Point CL0002 N 10,359,888.9468 E 3,155,198.6351 Sta 3+00.00

HIGH OAK DR

Point HO0001 N 10,359,799.3671 E 3,155,379.5923 Sta 1+00.00

Course from HO0001 to HO0002 S 13° 11′ 55.76" W Dist 200.0000

Point HO0002 N 10,359,604.6503 E 3,155,333.9261 Sta 3+00.00

ELF TRAIL

Point ET0001 N 10,356,723.6578 E 3,159,675.1379 Sta 1+00.00

Course from ET0001 to ET0002 S 0° 54′ 47.49" E Dist 200.0000

Point ET0002 N 10,356,523.6832 E 3,159,678.3254 Sta 3+00.00

CATSKILL TERRACE

Point CT0001 N 10,357,490.6879 E 3,162,963.4010 Sta 1+00.00

Course from CT0001 to CT0002 S 9° 19′ 32.25" E Dist 120.0000

Point CT0002 N 10,357,372.2739 E 3,162,982.8464 Sta 2+20.00

STANDARD LOOP (W)

Curve STANDARD_W1					
		Curve Data			
P.I. Station	1+73.33	N	10,357,982.0513	E	3,163,799.2865
Delta =	13° 22′ 06.36" (LT)				
Degree =	9° 09′ 23.26"				
Tangent =	73.3330				
Length =	146.0000				
Radius =	625.7416				
External =	4.2824				
Long Chord =	145.6691				
Mid. Ord. =	4.2533				
P.C. Station	1+00.00	N	10,358,053.9962	E	3,163,813.4872
P.T. Station	2+46.00	N	10,357,908.7725	E	3,163,802.1052
C.C.		N	10,357,932.8240	E	3,164,427.3844
Back = S	11° 09′ 56.24" W				
Ahead = S	2° 12′ 10.12" E				
Chord Bear = S	4° 28′ 53.06" W				

Curve STANDARD_W2					
		Curve Data			
P.I. Station	2+73.73	N	10,357,881.0611	E	3,163,803.1712
Delta =	32° 09′ 30.51" (LT)				
Degree =	59° 33′ 09.83"				
Tangent =	27.7319				
Length =	54.0000				
Radius =	96.2102				
External =	3.9170				
Long Chord =	53.2940				
Mid. Ord. =	3.7638				
P.C. Station	2+46.00	N	10,357,908.7725	E	3,163,802.1052
P.T. Station	3+00.00	N	10,357,858.1686	E	3,163,818.8233
C.C.		N	10,357,912.4705	E	3,163,898.2443
Back = S	2° 12′ 10.12" E				
Ahead = S	34° 21′ 40.63" E				
Chord Bear = S	18° 16′ 55.38" E				

STANDARD LOOP (E)

Curve STANDARD_E1					
		Curve Data			
P.I. Station	2+00.35	N	10,358,350.9648	E	3,164,423.7994
Delta =	11° 47′ 14.53" (RT)				
Degree =	5° 53′ 37.27"				
Tangent =	100.3542				
Length =	200.0000				
Radius =	972.1554				
External =	5.1660				
Long Chord =	199.6475				
Mid. Ord. =	5.1387				
P.C. Station	1+00.00	N	10,358,351.1311	E	3,164,323.4453
P.T. Station	3+00.00	N	10,358,330.3017	E	3,164,522.0033
C.C.		N	10,357,378.9770	E	3,164,321.8347
Back = S	89° 54′ 18.26" E				
Ahead = S	78° 07′ 03.73" E				
Chord Bear = S	84° 00′ 40.99" E				

BEULAH BLVD

Curve BEULAH_BLVD1					
		Curve Data			
P.I. Station	1+74.80	N	10,358,675.5773	E	3,165,002.3696
Delta =	39° 46′ 17.84" (LT)				
Degree =	27° 42′ 28.83"				
Tangent =	74.7969				
Length =	143.5384				
Radius =	206.7842				
External =	13.1119				
Long Chord =	140.6739				
Mid. Ord. =	12.3300				
P.C. Station	1+00.00	N	10,358,746.2611	E	3,165,026.8314
P.T. Station	2+43.54	N	10,358,605.6008	E	3,165,028.7869
C.C.		N	10,358,678.6341	E	3,165,222.2445
Back = S	19° 05′ 21.58" W				
Ahead = S	20° 40′ 56.26" E				
Chord Bear = S	0° 47′ 47.34" E				

Course from PT BEULAH_BLVD1 to BB0002 S 20° 40′ 56.26" E Dist 56.4702

Point BB0002 N 10,358,552.7700 E 3,165,048.7313 Sta 3+00.01

STATE OF TEXAS
RYAN MICHAEL JONES
110010
LICENSED
PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

HORIZONTAL ALIGNMENT DATA

(SHEET 4 OF 5)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	67
GRAPHICS JP	CONTROL	SECTION	JOB	
GRPH CHECK	2304	02	044	
RJ				

FILE: P:\MSGP\TXD18248\06-FM#2410\PROD\#SHEETS\GAD04.dgn
DATE: 1/5/2023 1:18:50 PM mchowdhury

PROPOSED FM 2410 SIDESTREET- HORIZONTAL ALIGNMENT

2410 SPUR

Point SPUR0001 N 10,359,128.0284 E 3,166,120.3121 Sta 1+00.00

Course from SPUR0001 to PC 2410_SPUR1 S 38° 48′ 21.71" W Dist 45.9631

		Curve Data				
Curve 2410_SPUR1						
P.I. Station		1+98.90	N	10,359,050.9594	E	3,166,058.3337
Delta	= 57° 54′ 37.97"	(LT)				
Degree	= 59° 53′ 10.55"					
Tangent	= 52.9356					
Length	= 96.7009					
Radius	= 95.6743					
External	= 13.6680					
Long Chord	= 92.6370					
Mid. Ord.	= 11.9595					
P.C. Station		1+45.96	N	10,359,092.2106	E	3,166,091.5076
P.T. Station		2+42.66	N	10,359,000.9394	E	3,166,075.6591
C.C.			N	10,359,032.2529	E	3,166,166.0640
Back	= S 38° 48′ 21.71" W					
Ahead	= S 19° 06′ 16.26" E					
Chord Bear	= S 9° 51′ 02.72" W					

Course from PT 2410_SPUR1 to SPUR0002 S 19° 06′ 16.26" E Dist 57.3360

Point SPUR0002 N 10,358,946.7613 E 3,166,094.4247 Sta 3+00.00

SIMMONS RD

Point S0001 N 10,358,925.7130 E 3,168,151.9975 Sta 1+00.00

Course from S0001 to PC SIMMONS1 S 19° 22′ 22.98" W Dist 31.8940

		Curve Data				
Curve SIMMONS1						
P.I. Station		2+56.65	N	10,358,777.9372	E	3,168,100.0355
Delta	= 2° 15′ 29.06"	(LT)				
Degree	= 0° 54′ 18.53"					
Tangent	= 124.7513					
Length	= 249.4703					
Radius	= 6,330.0000					
External	= 1.2292					
Long Chord	= 249.4542					
Mid. Ord.	= 1.2289					
P.C. Station		1+31.89	N	10,358,895.6249	E	3,168,141.4177
P.T. Station		3+81.36	N	10,358,658.7104	E	3,168,063.3224
C.C.			N	10,356,795.8536	E	3,174,113.0055
Back	= S 19° 22′ 22.98" W					
Ahead	= S 17° 06′ 53.92" W					
Chord Bear	= S 18° 14′ 38.45" W					

Course from PT SIMMONS1 to S0002 N 72° 53′ 06.07" W Dist 2.0000

Point S0002 N 10,358,659.2989 E 3,168,061.4110 Sta 3+83.36

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

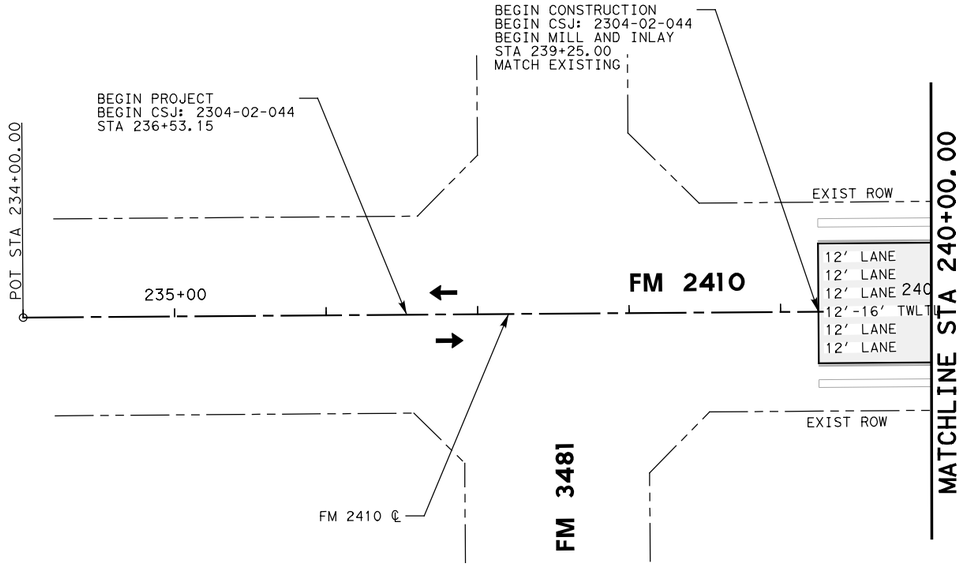
FM 2410

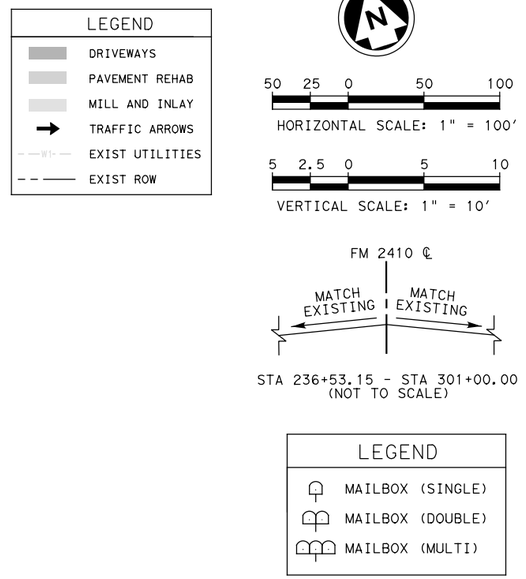
HORIZONTAL ALIGNMENT DATA

(SHEET 5 OF 5)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS JP	CONTROL	SECTION	JOB	68
GRPH CHECK	2304	02	044	
RJ				

FILE: P:\MSGP\TXD18248\06-FM*2410\PROD*SHEETS\GAD05.dgn
DATE: 1/5/2023 1:18:53 PM mchowdhury

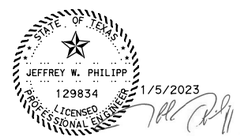




NOTE: THE DIMESNIONS ARE FROM LIP OF GUTTER TO LIP OF GUTTER

STA 239+25.00 to	SECTION TOTALS			
STA 240+00.00	ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0		CY	EXCAVATION (RDWY)
0	0		CY	EMBANKMENT
0	0		STA	PREPARING R.O.W.

PROFILE INTENTIONALLY LEFT BLANK



FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

FM 2410

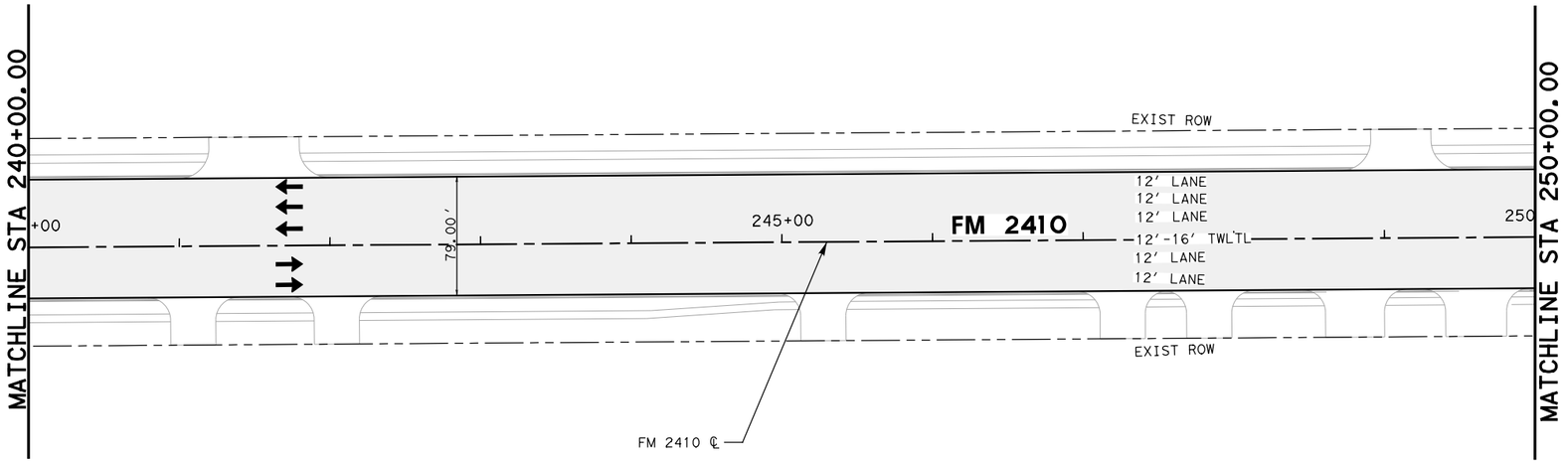
PLAN AND PROFILE LAYOUT

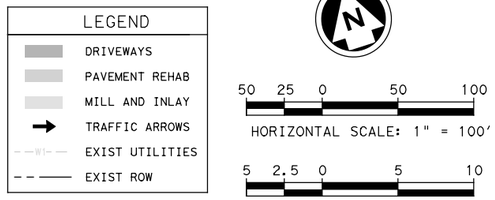
STA 236+53.15 TO STA 240+00.00

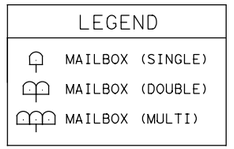
(SHEET 1 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	69
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

FILE: P:\MSGP\TXD18248\06-FM#2410\PROD*SHEETS\RPM01.dgn
DATE: 1/5/2023 1:19:06 PM mchowdhury







NOTE: THE DIMESNIONS ARE FROM LIP OF GUTTER TO LIP OF GUTTER

STA 240+00.00 to STA 241+00.00	STA 241+00.00 to STA 242+00.00	STA 242+00.00 to STA 243+00.00	STA 243+00.00 to STA 244+00.00	STA 244+00.00 to STA 245+00.00	STA 245+00.00 to STA 246+00.00	STA 246+00.00 to STA 247+00.00	STA 247+00.00 to STA 248+00.00	STA 248+00.00 to STA 249+00.00	STA 249+00.00 to STA 250+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	0	0	0	0	0		CY	EXCAVATION (RDWY)
0	0	0	0	0	0	0	0	0	0	0		CY	EMBANKMENT
0	0	0	0	0	0	0	0	0	0	0		STA	PREPARING R.O.W.

PROFILE INTENTIONALLY LEFT BLANK

STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

FM 2410

PLAN AND PROFILE LAYOUT

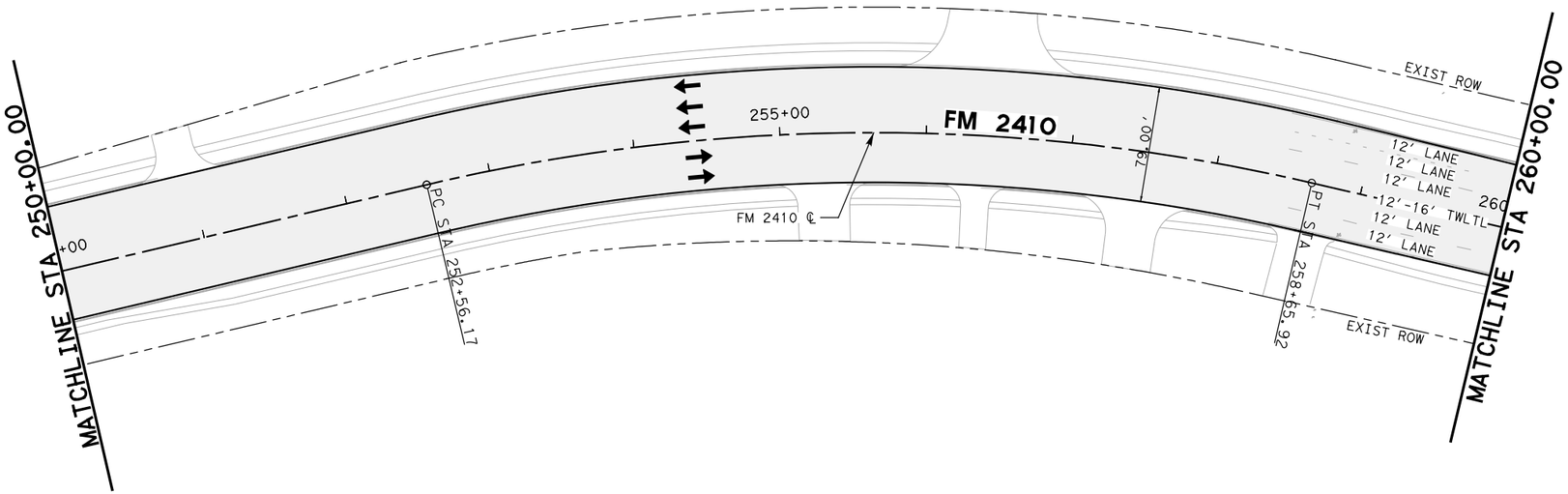
STA 240+00.00 TO STA 250+00.00

(SHEET 2 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	70
JP				
GRPH CHECK	2304	02	044	
RJ				

FILE: P:\MSGP\TXD18248\06-FM#2410\PROD*SHEETS\RPM02.dgn
DATE: 1/5/2023 1:19:10 PM mchowdhury

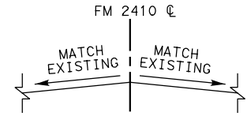
PI Station = 255+66.56
Delta = 26° 24' 24.21" (RT)
Degree of Curve = 4° 19' 50.69"
Tangent = 310.3888
Length = 609.7499
Radius = 1,323.0000
PC Station = 252+56.17
PT Station = 258+65.92



LEGEND
- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

50 25 0 50 100
HORIZONTAL SCALE: 1" = 100'

5 2.5 0 5 10
VERTICAL SCALE: 1" = 10'

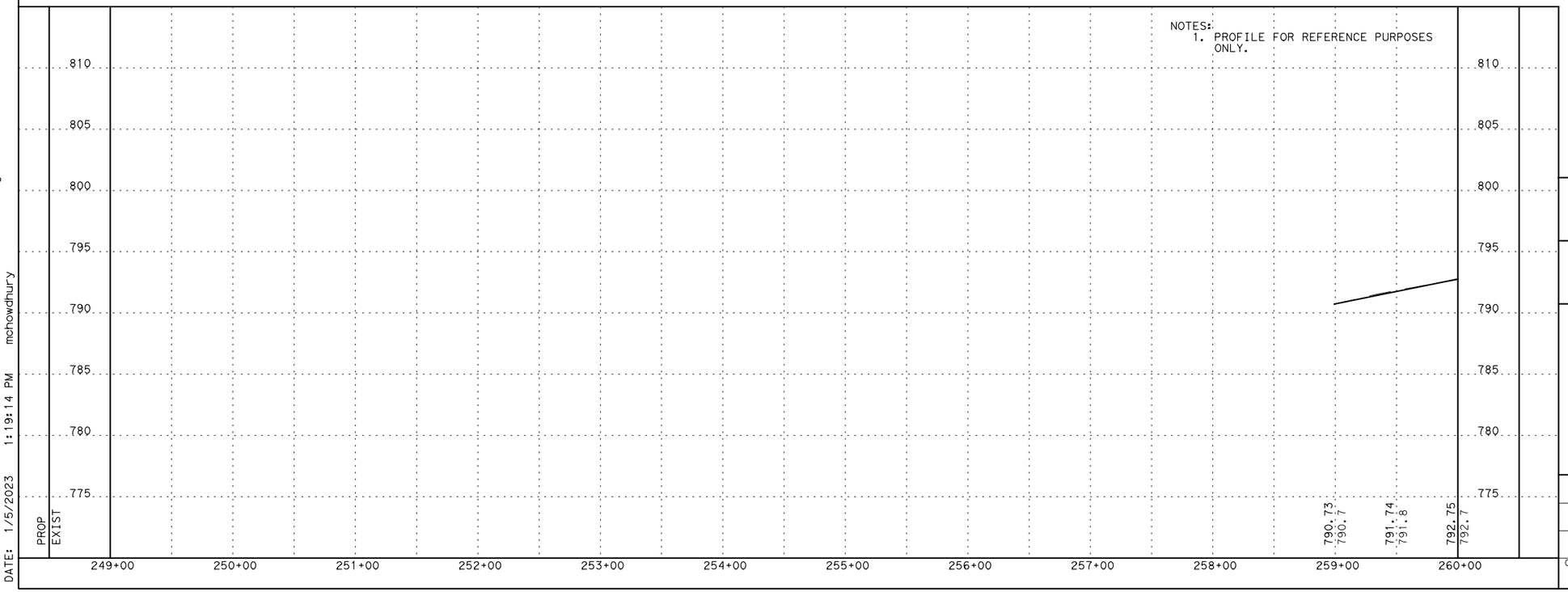


STA 236+53.15 - STA 301+00.00
(NOT TO SCALE)

LEGEND
- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

NOTE: THE DIMESNIONS ARE FROM LIP OF GUTTER TO LIP OF GUTTER

STA 250+00.00 to STA 251+00.00	STA 251+00.00 to STA 252+00.00	STA 252+00.00 to STA 253+00.00	STA 253+00.00 to STA 254+00.00	STA 254+00.00 to STA 255+00.00	STA 255+00.00 to STA 256+00.00	STA 256+00.00 to STA 257+00.00	STA 257+00.00 to STA 258+00.00	STA 258+00.00 to STA 259+00.00	STA 259+00.00 to STA 260+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	0	0	0	0	0		CY	EXCAVATION (RDWY)
0	0	0	0	0	0	0	0	0	0	0		CY	EMBANKMENT
0	0	0	0	0	0	0	0	0	0	0		STA	PREPARING R.O.W.



STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

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PLAN AND PROFILE LAYOUT

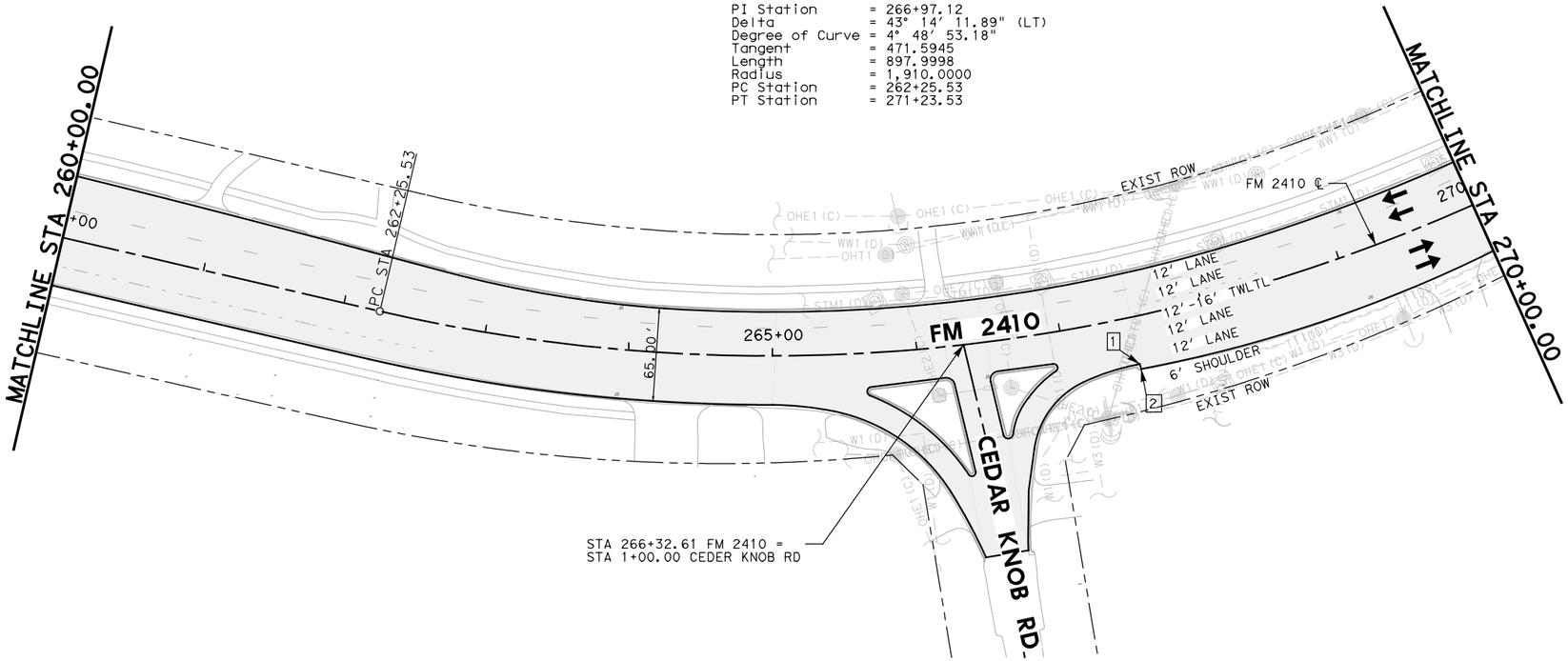
STA 250+00.00 TO STA 260+00.00

(SHEET 3 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	71
GRAPHICS JP	CONTROL	SECTION	JOB	
GRPH CHECK RJ	2304	02	044	

FILE: P:\MSGP\TXD18248\06-FM#2410\PROD*SHEETS\RPM03.dgn
DATE: 1/5/2023 1:19:14 PM mchowdhury

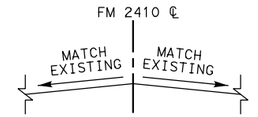
PI Station = 266+97.12
Delta = 43° 14′ 11.89" (LT)
Degree of Curve = 4° 48′ 53.18"
Tangent = 471.5945
Length = 897.9998
Radius = 1,910.0000
PC Station = 262+25.53
PT Station = 271+23.53



LEGEND
DRIVEWAYS
PAVEMENT REHAB
MILL AND INLAY
TRAFFIC ARROWS
EXIST UTILITIES
EXIST ROW

50 25 0 50 100
HORIZONTAL SCALE: 1" = 100′

5 2.5 0 5 10
VERTICAL SCALE: 1" = 10′



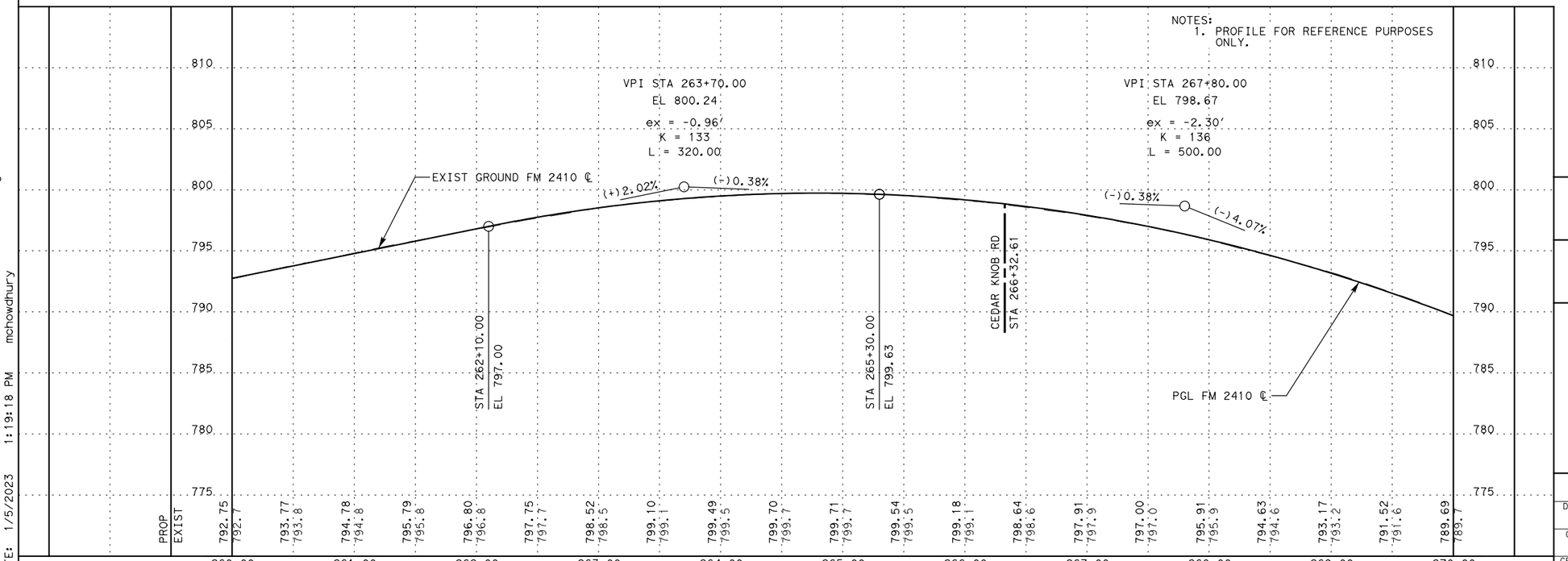
STA 236+53.15 - STA 301+00.00
(NOT TO SCALE)

POINT DATA		
#	STATION	OFFSET
1	267+49.45	33.00 RT
2	267+49.45	36.50 RT

LEGEND
MAILBOX (SINGLE)
MAILBOX (DOUBLE)
MAILBOX (MULTI)

NOTE: THE DIMESNIONS ARE FROM LIP OF GUTTER TO LIP OF GUTTER

STA 260+00.00 to STA 261+00.00	STA 261+00.00 to STA 262+00.00	STA 262+00.00 to STA 263+00.00	STA 263+00.00 to STA 264+00.00	STA 264+00.00 to STA 265+00.00	STA 265+00.00 to STA 266+00.00	STA 266+00.00 to STA 267+00.00	STA 267+00.00 to STA 268+00.00	STA 268+00.00 to STA 269+00.00	STA 269+00.00 to STA 270+00.00	SECTION TOTALS			
										ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	0	0	0	0	0		CY	EXCAVATION (RDWY)
0	0	0	0	0	0	0	0	0	0	0		CY	EMBANKMENT
0	0	0	0	0	0	0	0	0	0	0		STA	PREPARING R.O.W.



STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

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PLAN AND PROFILE LAYOUT

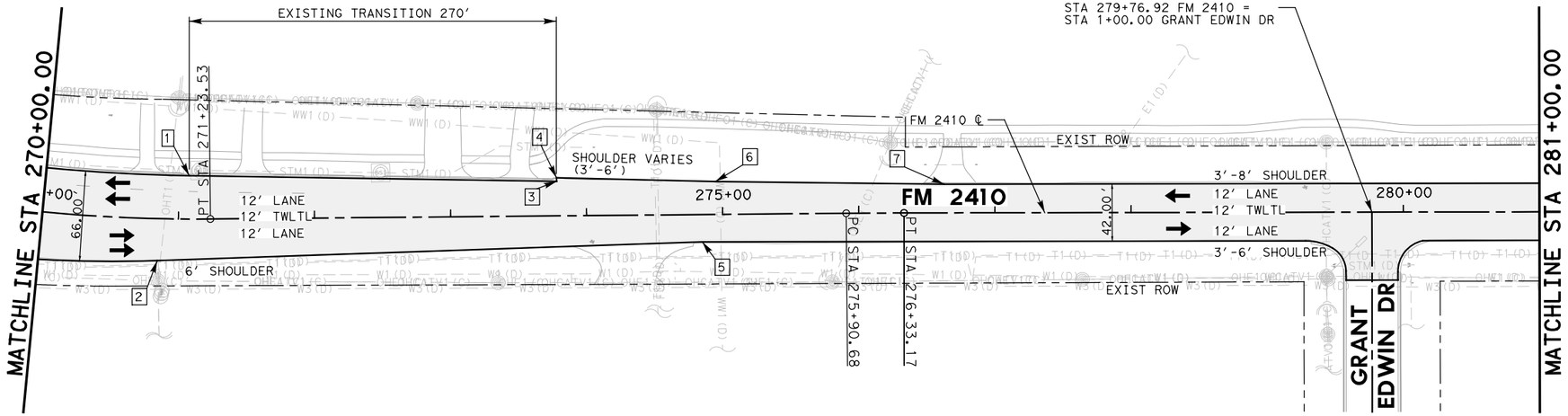
STA 260+00.00 TO STA 270+00.00

(SHEET 4 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	72
JP				
GRPH CHECK	2304	02	044	
RJ				

FILE: P:\MSGP\TXD18248\06-FM#2410\PROD*SHEETS\RPM04.dgn
DATE: 1/5/2023 1:19:18 PM mchowdhury

PI Station = 276+11.93
Delta = 0° 25' 29.92" (RT)
Degree of Curve = 1° 00' 00.00"
Tangent = 42.4976
Length = 5,729.5780
Radius = 5,729.5780
PC Station = 275+90.68
PT Station = 276+33.17



STA 270+00.00 to STA 271+00.00	STA 271+00.00 to STA 272+00.00	STA 272+00.00 to STA 273+00.00	STA 273+00.00 to STA 274+00.00	STA 274+00.00 to STA 275+00.00	STA 275+00.00 to STA 276+00.00	STA 276+00.00 to STA 277+00.00	STA 277+00.00 to STA 278+00.00	STA 278+00.00 to STA 279+00.00	STA 279+00.00 to STA 280+00.00	STA 280+00.00 to STA 281+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	0	0	0	0	0	0		CY	EXCAVATION (RDWY)
0	0	0	0	0	0	0	0	0	0	0	0		CY	EMBANKMENT
0	0	0	0	0	0	0	0	0	0	0	0		STA	PREPARING R.O.W.

LEGEND
- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

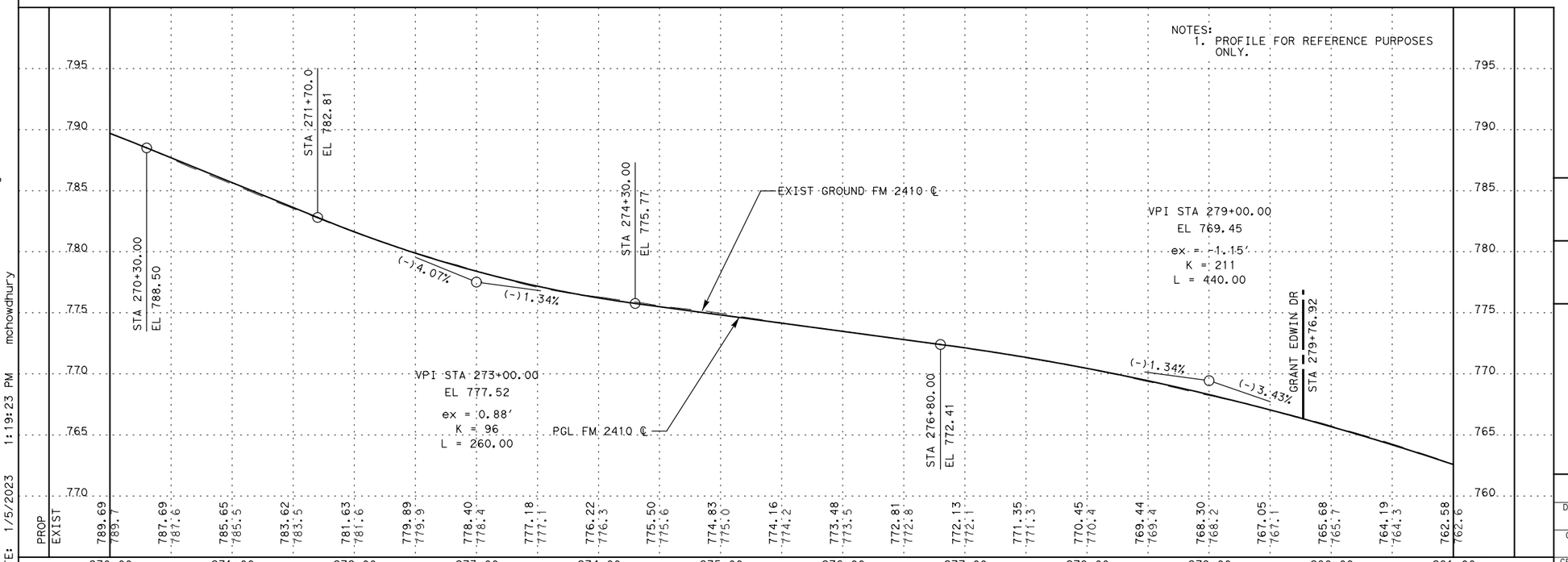
50 25 0 50 100
HORIZONTAL SCALE: 1" = 100'

5 2.5 0 5 10
VERTICAL SCALE: 1" = 10'

FM 2410 ℄
MATCH EXISTING | MATCH EXISTING
STA 236+53.15 - STA 301+00.00
(NOT TO SCALE)

POINT DATA		
#	STATION	OFFSET
1	271+07.93	31.91 LT
2	270+85.28	30.84 RT
3	273+75.00	25.40 LT
4	273+75.00	28.00 LT
5	274+84.82	21.00 RT
6	274+94.81	24.14 LT
7	276+62.50	21.00 LT

LEGEND
- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)



STATE OF TEXAS
JEFFREY W. PHILIPP
129834
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1/5/2023

FIRM REGISTRATION NO. F-230

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PLAN AND PROFILE LAYOUT

STA 270+00.00 TO STA 281+00.00

(SHEET 5 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	73
JP				
GRPH CHECK	2304	02	044	
RJ				

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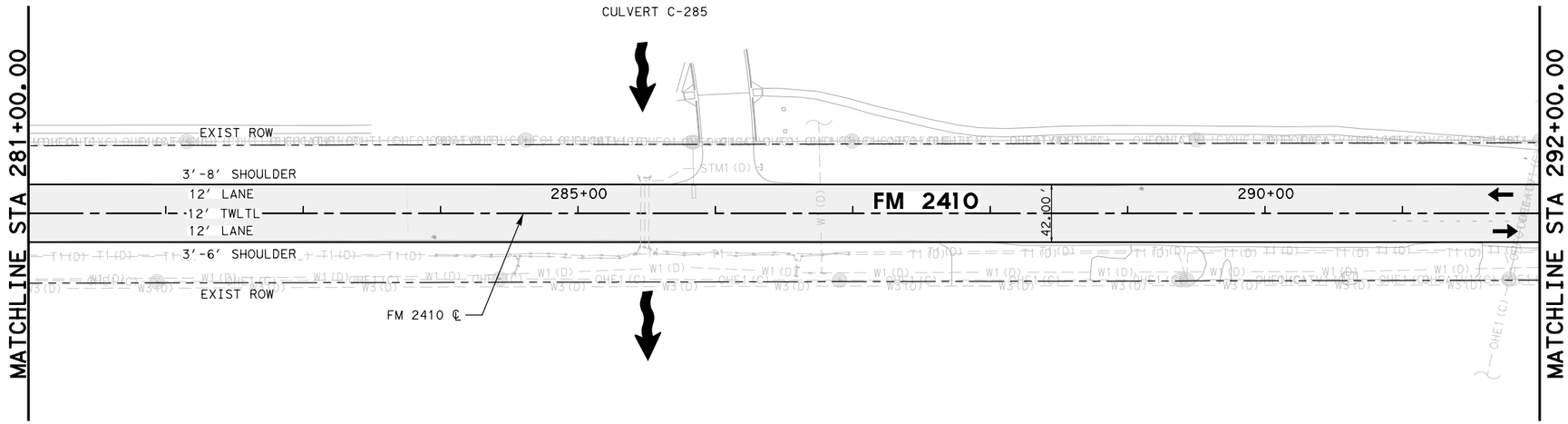
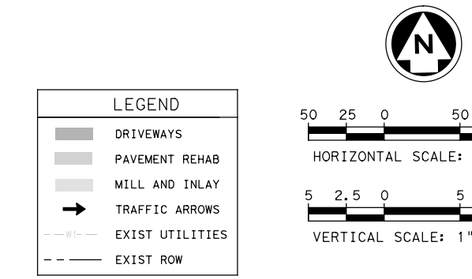
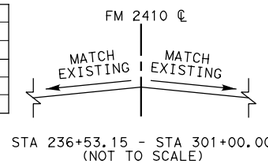
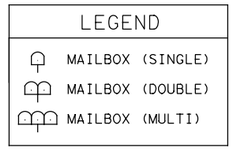
DATE: 1/5/2023 1:19:23 PM mchowdhury



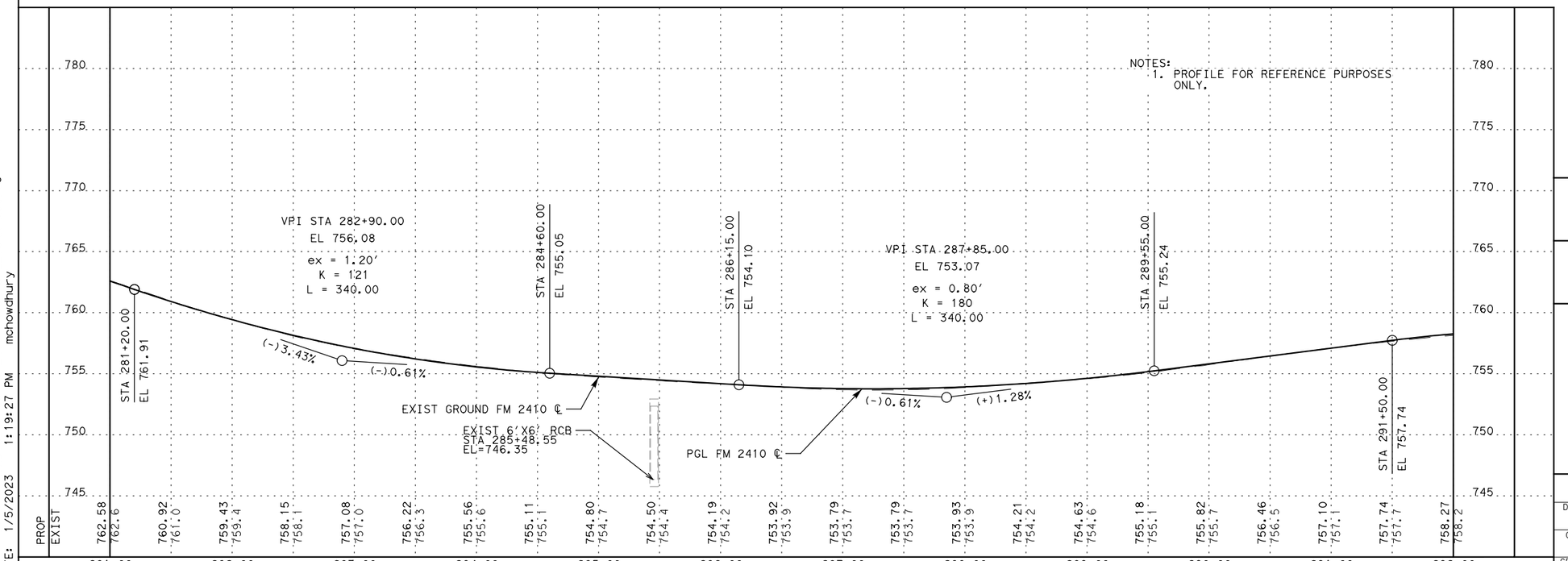


TREE TRIMMING - (RT)		
TYPE	FROM	TO
LIGHT	283+50	286+50
TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	281+00	283+50





STA 281+00.00 to STA 282+00.00	STA 282+00.00 to STA 283+00.00	STA 283+00.00 to STA 284+00.00	STA 284+00.00 to STA 285+00.00	STA 285+00.00 to STA 286+00.00	STA 286+00.00 to STA 287+00.00	STA 287+00.00 to STA 288+00.00	STA 288+00.00 to STA 289+00.00	STA 289+00.00 to STA 290+00.00	STA 290+00.00 to STA 291+00.00	STA 291+00.00 to STA 292+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	0	0	0	0	0	0		CY	EXCAVATION (RDWY)
0	0	0	0	0	0	0	0	0	0	0	0		CY	EMBANKMENT
1	1	1	1	1	0.5	0	0	0	0	0	5.5		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:19:27 PM mchowdhury

JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
1/5/2023

FIRM REGISTRATION NO. F-230

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FM 2410

PLAN AND PROFILE LAYOUT

STA 281+00.00 TO STA 292+00.00

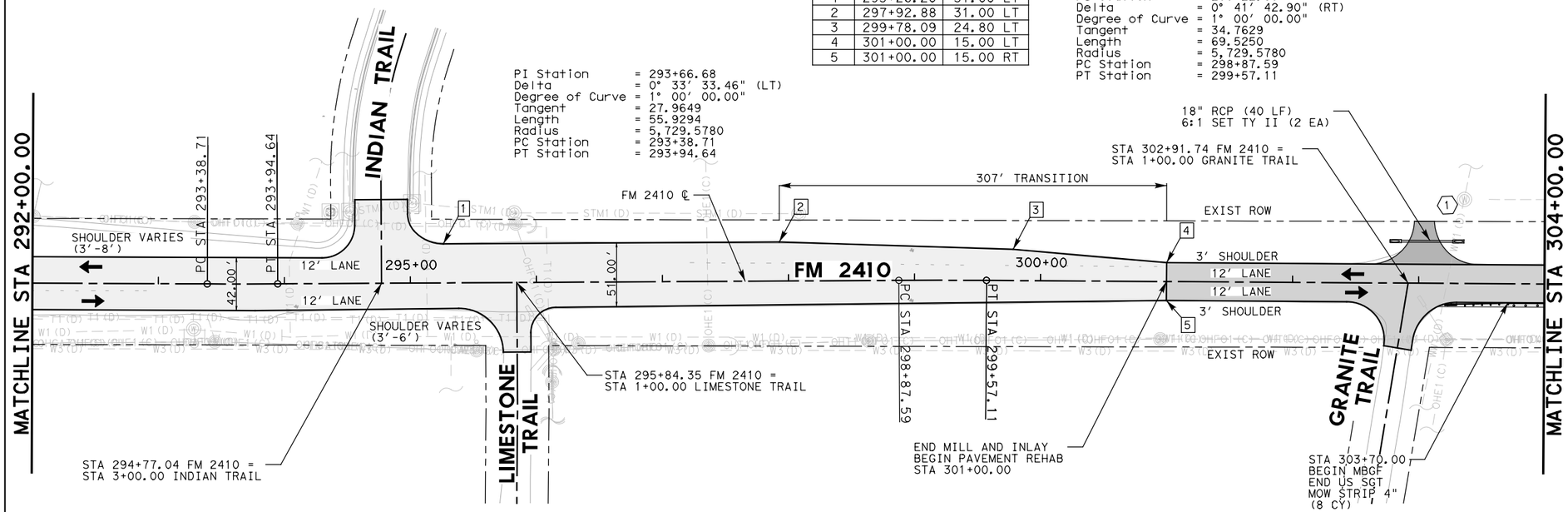
(SHEET 6 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	74
JP				
GRPH CHECK	2304	02	044	
RJ				

POINT DATA		
#	STATION	OFFSET
1	295+26.20	31.00 LT
2	297+92.88	31.00 LT
3	299+78.09	24.80 LT
4	301+00.00	15.00 LT
5	301+00.00	15.00 RT

PI Station = 293+66.68
Delta = 0° 33' 33.46" (LT)
Degree of Curve = 1° 00' 00.00"
Tangent = 27.9649
Length = 55.9294
Radius = 5,729.5780
PC Station = 293+38.71
PT Station = 293+94.64

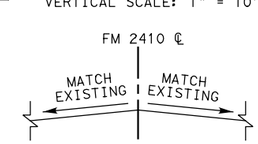
PI Station = 299+22.35
Delta = 0° 41' 42.90" (RT)
Degree of Curve = 1° 00' 00.00"
Tangent = 34.7629
Length = 69.5250
Radius = 5,729.5780
PC Station = 298+87.59
PT Station = 299+57.11



LEGEND
- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

50 25 0 50 100
HORIZONTAL SCALE: 1" = 100'

5 2.5 0 5 10
VERTICAL SCALE: 1" = 10'

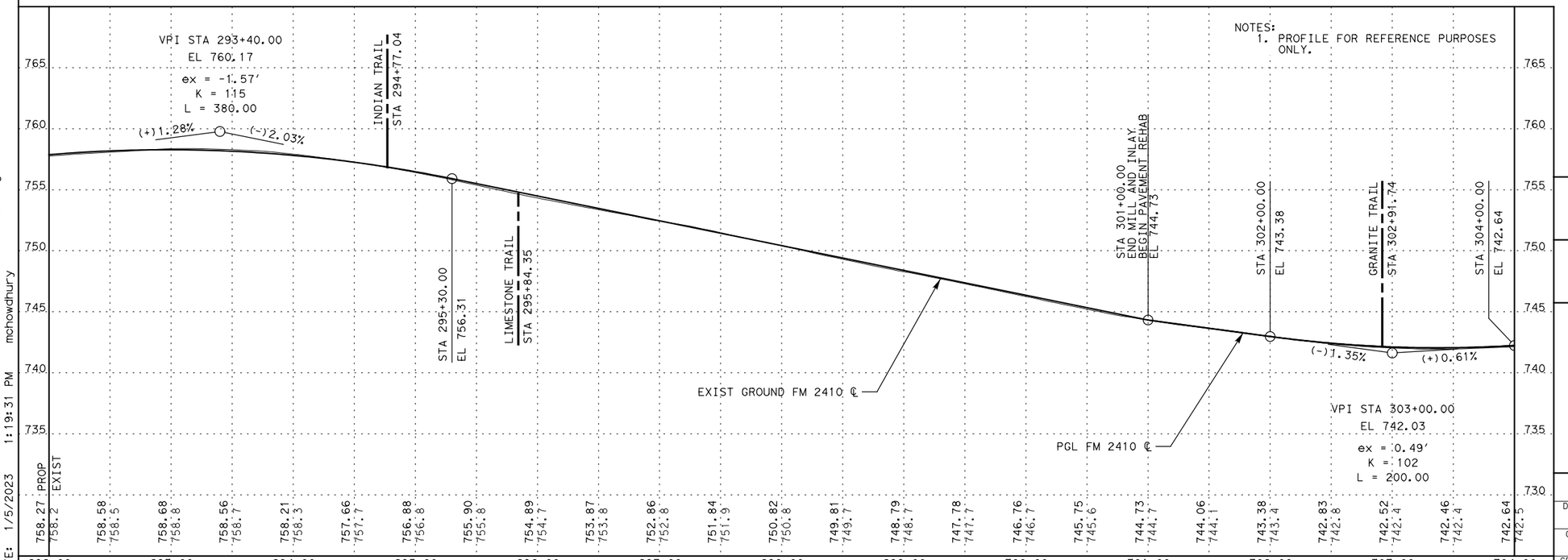


STA 236+53.15 - STA 301+00.00
(NOT TO SCALE)

LEGEND
- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	297+80	300+80

STA 292+00.00 to STA 293+00.00	STA 293+00.00 to STA 294+00.00	STA 294+00.00 to STA 295+00.00	STA 295+00.00 to STA 296+00.00	STA 296+00.00 to STA 297+00.00	STA 297+00.00 to STA 298+00.00	STA 298+00.00 to STA 299+00.00	STA 299+00.00 to STA 300+00.00	STA 300+00.00 to STA 301+00.00	STA 301+00.00 to STA 302+00.00	STA 302+00.00 to STA 303+00.00	STA 303+00.00 to STA 304+00.00	SECTION TOTALS			
												ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	0	0	0	1	10	10	21		CY	EXCAVATION (RDWY)
0	0	0	0	0	0	0	0	0	1	18	18	37		CY	EMBANKMENT
0	0	0	0	0	0.5	1	1	1	0	0	0	3.5		STA	PREPARING R.O.W.



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FIRM REGISTRATION NO. F-230
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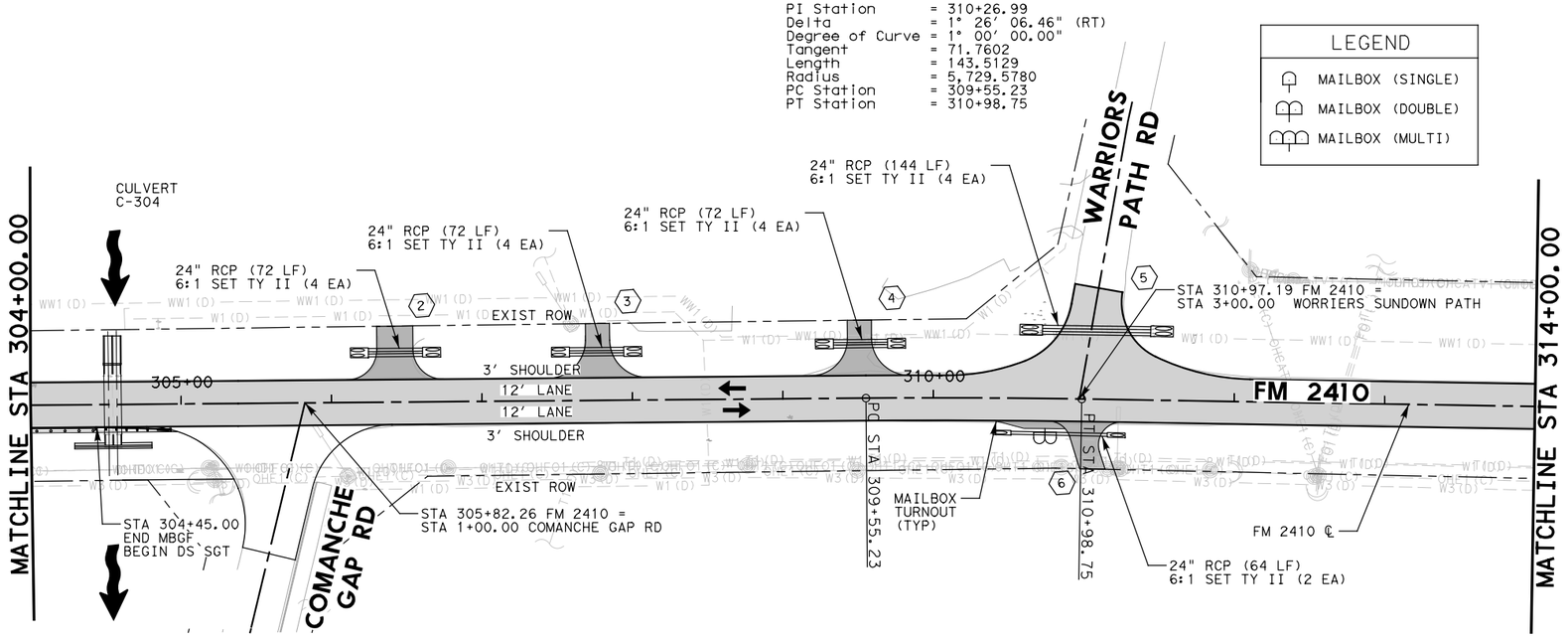
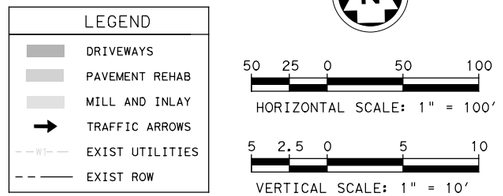
PLAN AND PROFILE LAYOUT

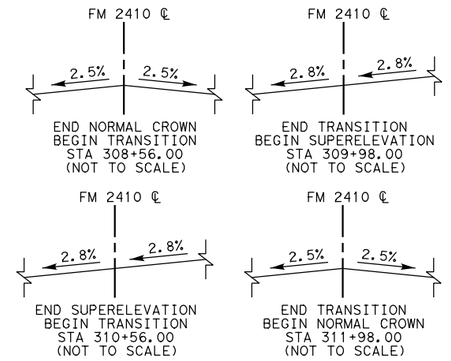
STA 292+00.00 TO STA 304+00.00

(SHEET 7 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	75
JP				
GRPH CHECK	2304	02	044	
RJ				

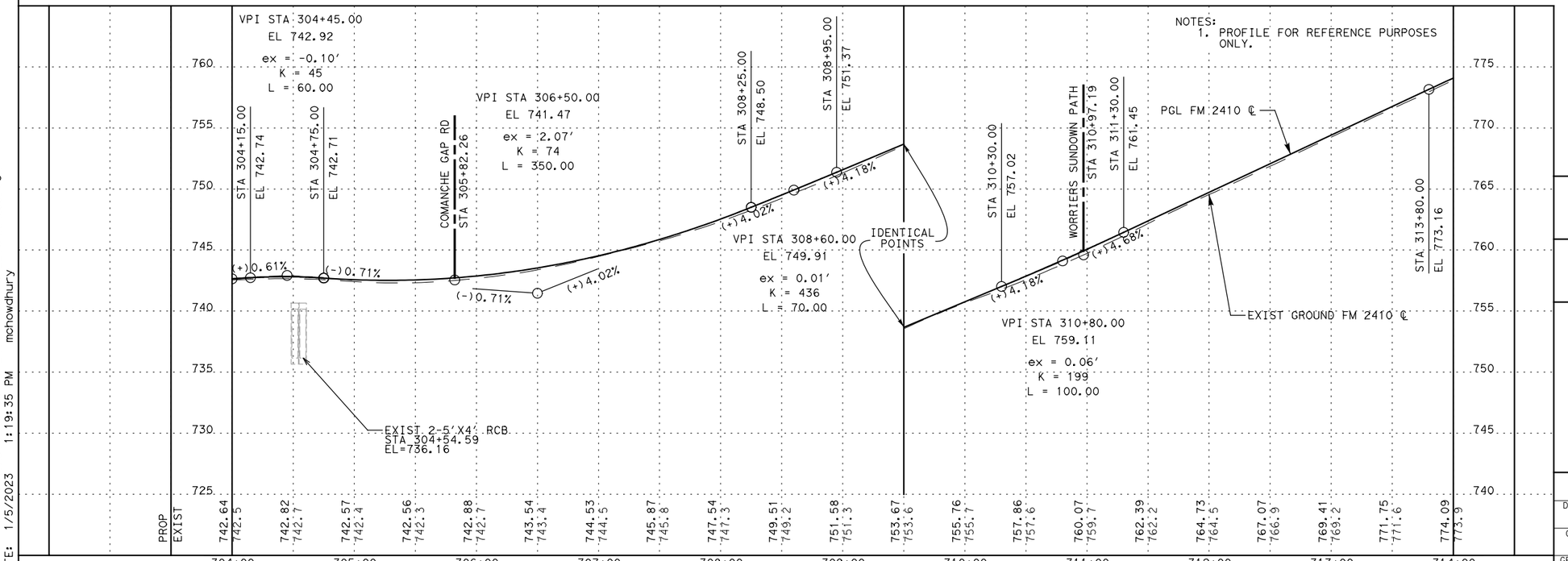






TREE TRIMMING - (RT)		
TYPE	FROM	TO
LIGHT	304+50	305+50

STA 304+00.00 to STA 305+00.00	STA 305+00.00 to STA 306+00.00	STA 306+00.00 to STA 307+00.00	STA 307+00.00 to STA 308+00.00	STA 308+00.00 to STA 309+00.00	STA 309+00.00 to STA 310+00.00	STA 310+00.00 to STA 311+00.00	STA 311+00.00 to STA 312+00.00	STA 312+00.00 to STA 313+00.00	STA 313+00.00 to STA 314+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	7	7	0	0	14		CY	EXCAVATION (RDWY)
0	0	1	1	2	3	3	3	6	11	30		CY	EMBANKMENT
0.5	0.5	0	0	0	0	0	0	0	0	1		STA	PREPARING R.O.W.



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PLAN AND PROFILE LAYOUT

STA 304+00.00 TO STA 314+00.00

(SHEET 8 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	76
JP				
GRPH CHECK	2304	02	044	
RJ				

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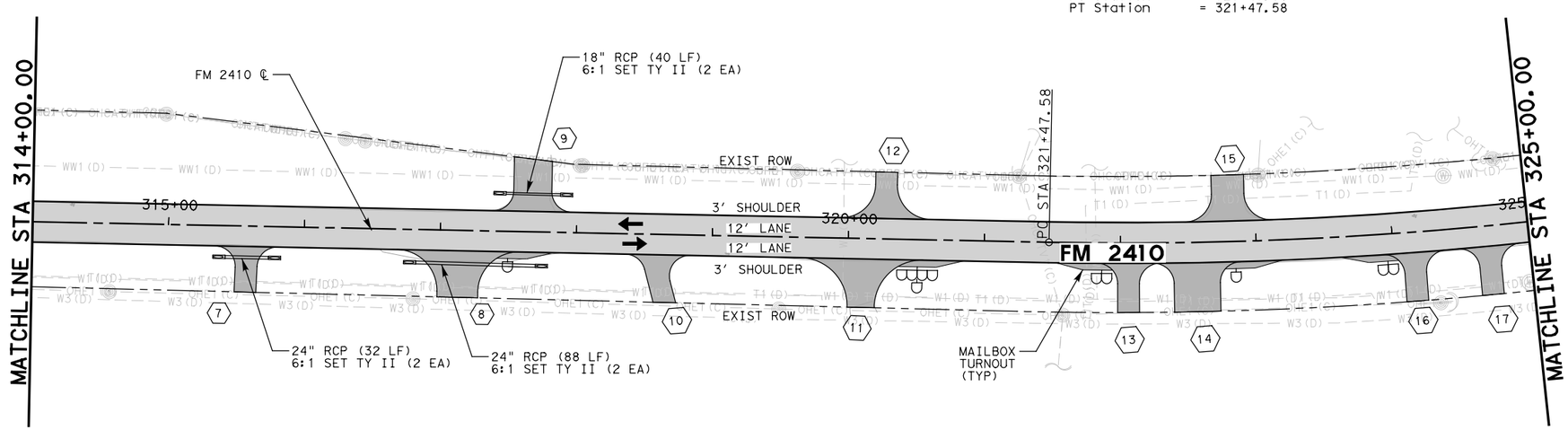
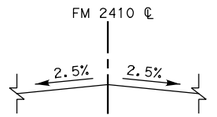


PI Station = 324+78.55
Delta = 13° 28′ 57.47" (LT)
Degree of Curve = 2° 02′ 46.60"
Tangent = 330.9715
Length = 658.8857
Radius = 2,800.0000
PC Station = 321+47.58
PT Station = 321+47.58

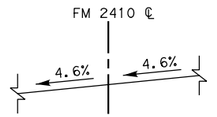
LEGEND
- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

50 25 0 50 100
HORIZONTAL SCALE: 1" = 100′

5 2.5 0 5 10
VERTICAL SCALE: 1" = 10′



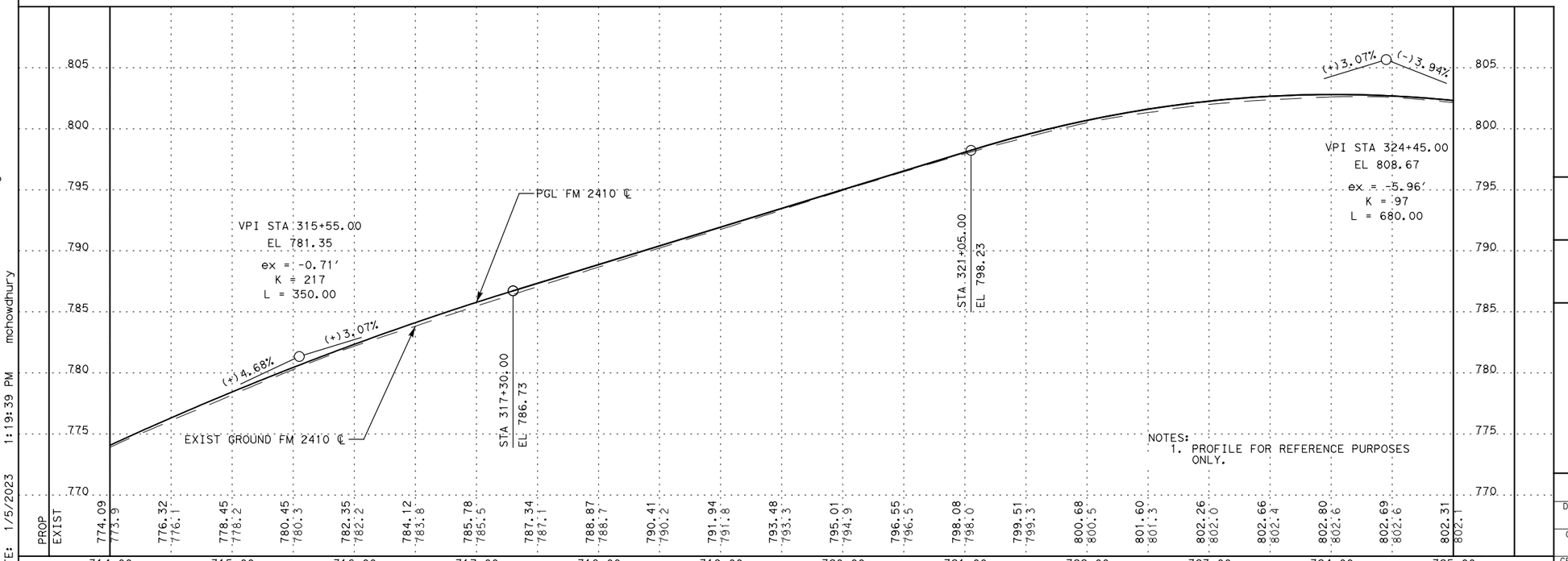
END NORMAL CROWN
BEGIN TRANSITION
STA 320+14.00
(NOT TO SCALE)



END TRANSITION
BEGIN SUPERELEVATION
STA 322+04.00
(NOT TO SCALE)

LEGEND
- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

STA 314+00.00 to STA 315+00.00	STA 315+00.00 to STA 316+00.00	STA 316+00.00 to STA 317+00.00	STA 317+00.00 to STA 318+00.00	STA 318+00.00 to STA 319+00.00	STA 319+00.00 to STA 320+00.00	STA 320+00.00 to STA 321+00.00	STA 321+00.00 to STA 322+00.00	STA 322+00.00 to STA 323+00.00	STA 323+00.00 to STA 324+00.00	STA 324+00.00 to STA 325+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	7	7	0	2	2	4	6	2	0	30		CY	EXCAVATION (RDWY)
14	12	17	13	4	5	1	37	48	12	5	168		CY	EMBANKMENT
0	0	0	0	0	0	0	0	0	0	0	0		STA	PREPARING R.O.W.



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STATE OF TEXAS
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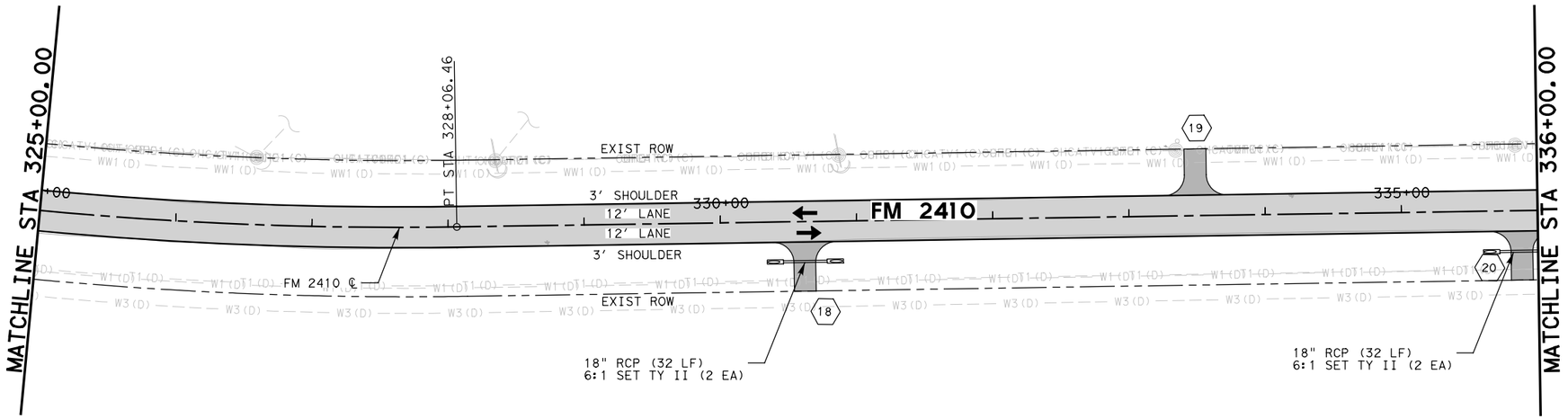
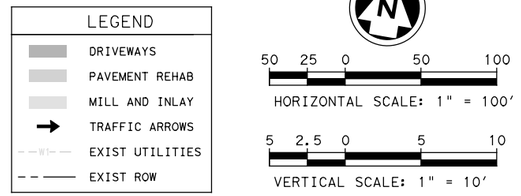
PLAN AND PROFILE LAYOUT

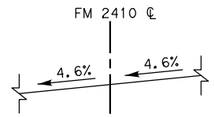
STA 314+00.00 TO STA 325+00.00

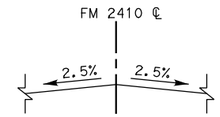
(SHEET 9 OF 35)

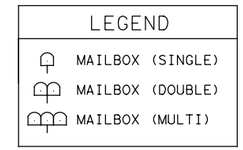
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS JP	CONTROL	SECTION	JOB	77
GRPH CHECK	2304	02	044	
RJ				





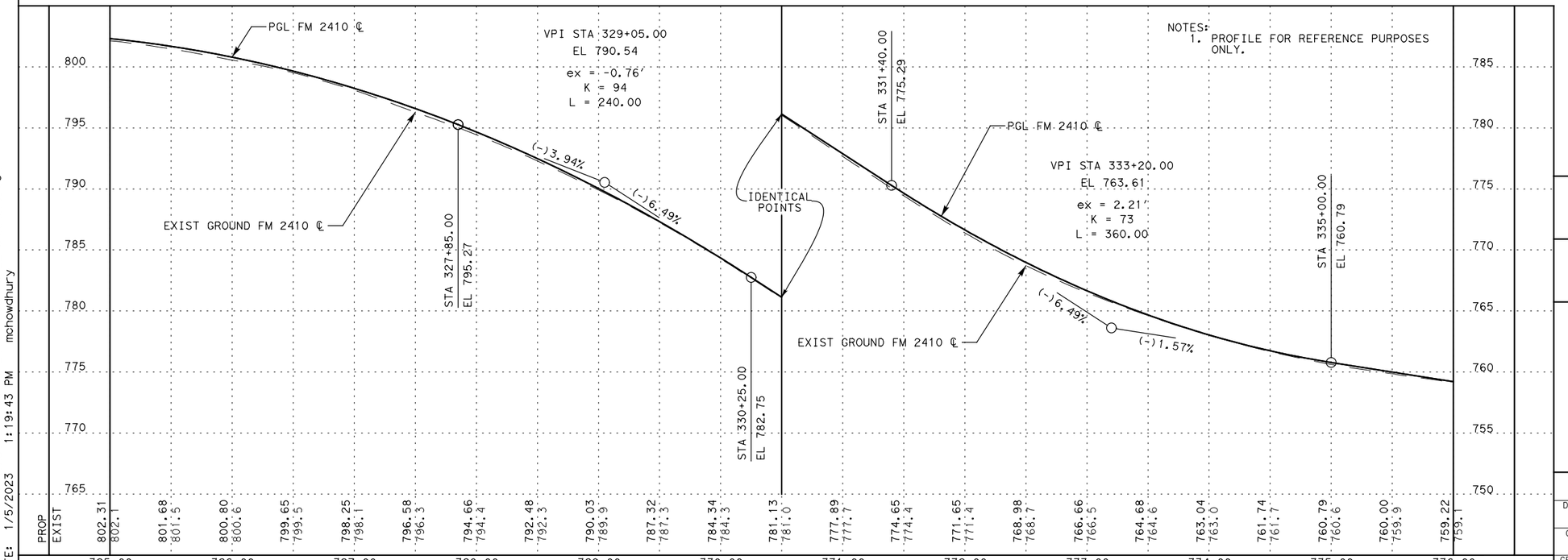






TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	325+00	326+00
LIGHT	330+00	333+50

STA 325+00.00 to STA 326+00.00	STA 326+00.00 to STA 327+00.00	STA 327+00.00 to STA 328+00.00	STA 328+00.00 to STA 329+00.00	STA 329+00.00 to STA 330+00.00	STA 330+00.00 to STA 331+00.00	STA 331+00.00 to STA 332+00.00	STA 332+00.00 to STA 333+00.00	STA 333+00.00 to STA 334+00.00	STA 334+00.00 to STA 335+00.00	STA 335+00.00 to STA 336+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	0	0	2	2	0	4		CY	EXCAVATION (RDWY)
15	16	11	14	14	7	8	10	3	1	2	101		CY	EMBANKMENT
1	0	0	0	0	1	1	1	0.5	0	0	4.5		STA	PREPARING R.O.W.



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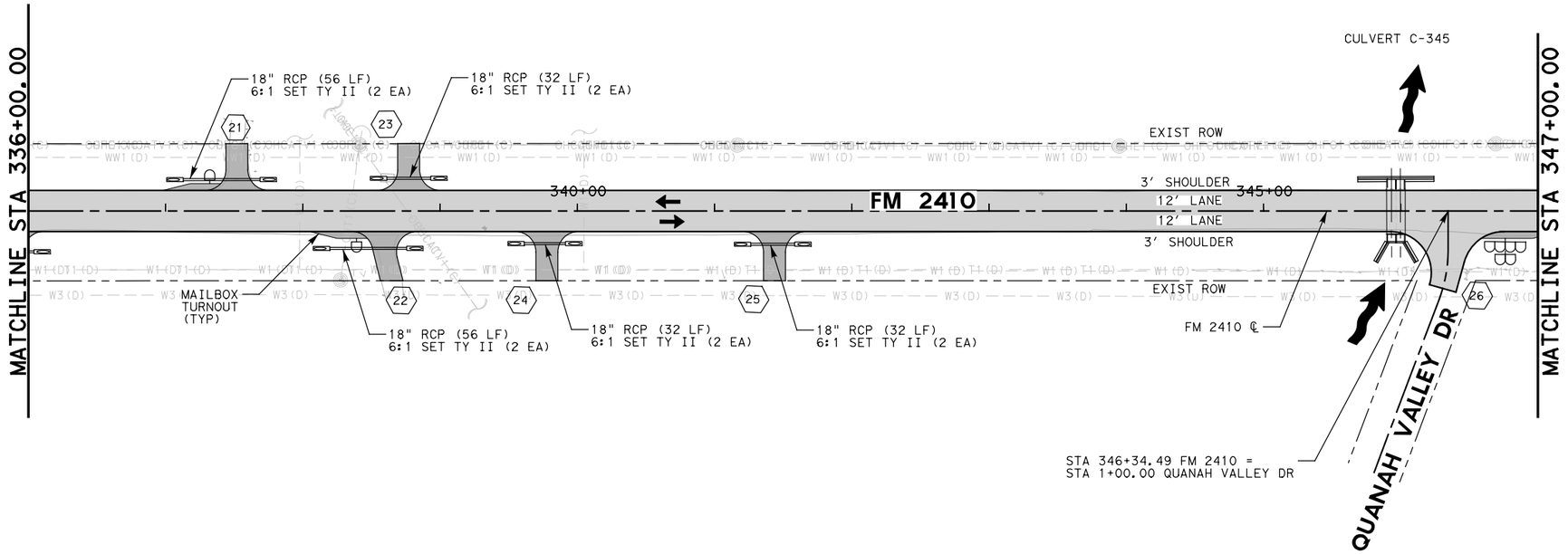
PLAN AND PROFILE LAYOUT

STA 325+00.00 TO STA 336+00.00

(SHEET 10 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	78
JP				
GRPH CHECK	2304	02	044	
RJ				



LEGEND

- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

5 2.5 0 5 10

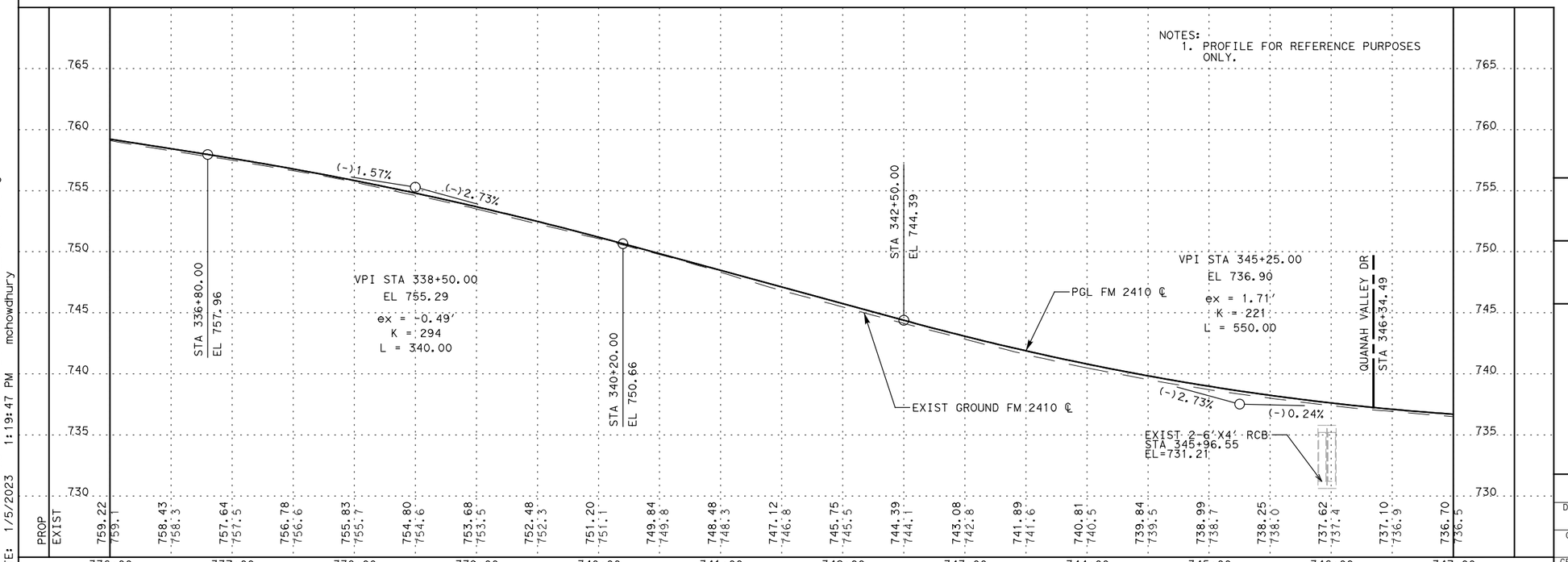
VERTICAL SCALE: 1" = 10'

TREE TRIMMING - (RT)		
TYPE	FROM	TO
LIGHT	341+50	346+00
TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	336+00	347+00

LEGEND

- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

STA 336+00.00 to STA 337+00.00	STA 337+00.00 to STA 338+00.00	STA 338+00.00 to STA 339+00.00	STA 339+00.00 to STA 340+00.00	STA 340+00.00 to STA 341+00.00	STA 341+00.00 to STA 342+00.00	STA 342+00.00 to STA 343+00.00	STA 343+00.00 to STA 344+00.00	STA 344+00.00 to STA 345+00.00	STA 345+00.00 to STA 346+00.00	STA 346+00.00 to STA 347+00.00	SECTION TOTALS			
											ESTIMATED	FINAL	UNIT	DESCRIPTION
2	2	0	0	0	0	0	0	0	0	10	14		CY	EXCAVATION (RDWY)
1	6	6	3	8	9	8	13	20	94	82	250		CY	EMBANKMENT
1	1	1	1	1	1	1	1	1	1	1	11		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:19:47 PM mchowdhury

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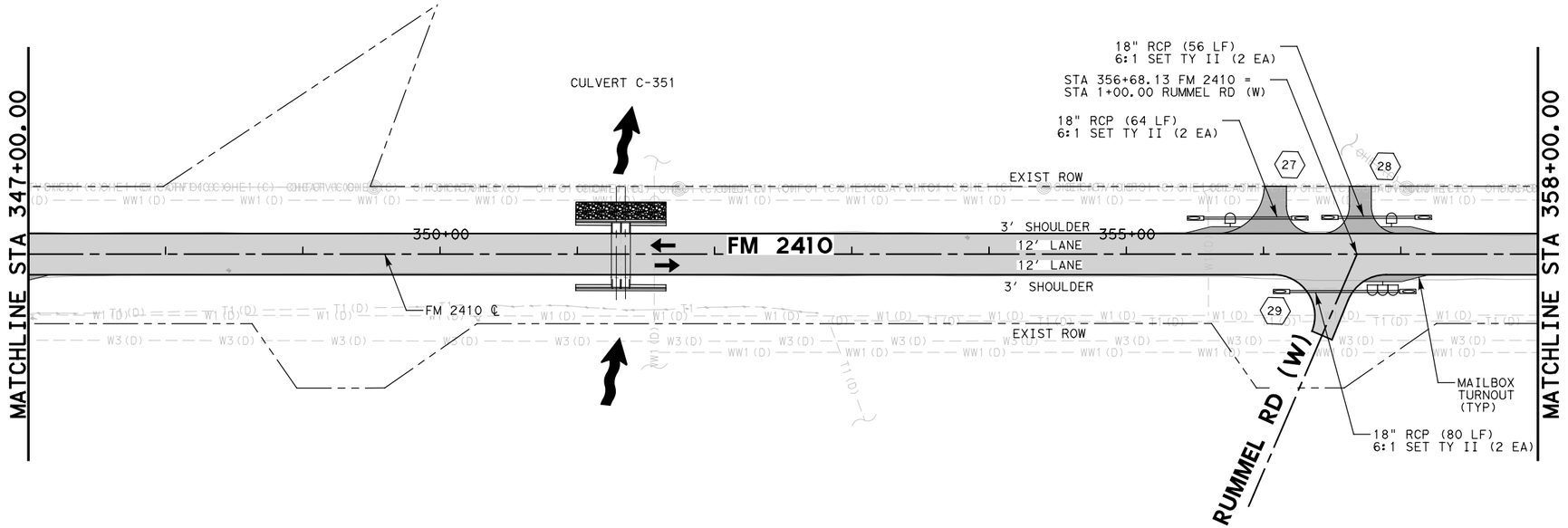
PLAN AND PROFILE LAYOUT

STA 336+00.00 TO STA 347+00.00

(SHEET 11 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	79
JP				
GRPH CHECK	2304	02	044	
RJ				



LEGEND

- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

N

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100′

5 2.5 0 5 10

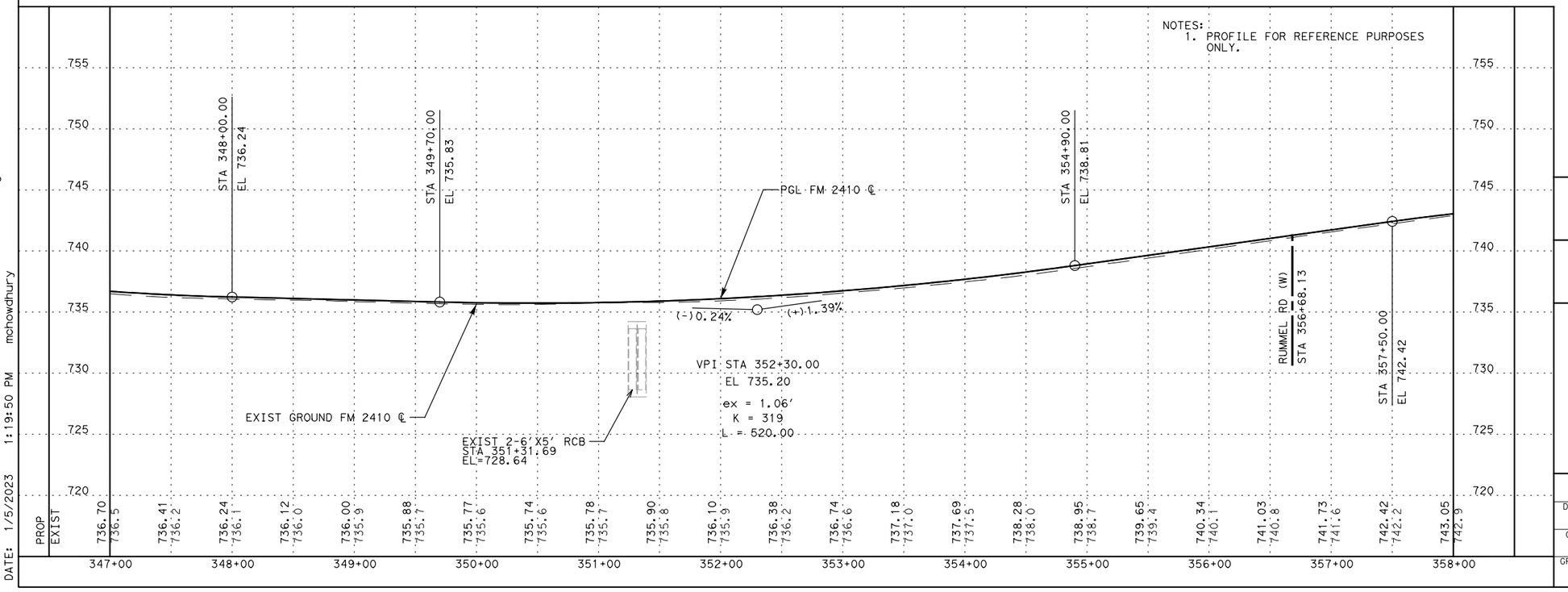
VERTICAL SCALE: 1" = 10′

TREE TRIMMING - (RT)		
TYPE	FROM	TO
LIGHT	347+00	358+00
TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	347+00	358+00

LEGEND

- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

STA 347+00.00 to STA 348+00.00	STA 348+00.00 to STA 349+00.00	STA 349+00.00 to STA 350+00.00	STA 350+00.00 to STA 351+00.00	STA 351+00.00 to STA 352+00.00	STA 352+00.00 to STA 353+00.00	STA 353+00.00 to STA 354+00.00	STA 354+00.00 to STA 355+00.00	STA 355+00.00 to STA 356+00.00	STA 356+00.00 to STA 357+00.00	STA 357+00.00 to STA 358+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
10	0	0	0	0	0	0	0	0	11	11	32		CY	EXCAVATION (RDWY)
3	7	12	53	74	41	25	19	8	14	18	274		CY	EMBANKMENT
1	1	1	1	1	1	1	1	1	1	1	11		STA	PREPARING R.O.W.



JEFFREY W. PHILIPP
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1/5/2023

FIRM REGISTRATION NO. F-230

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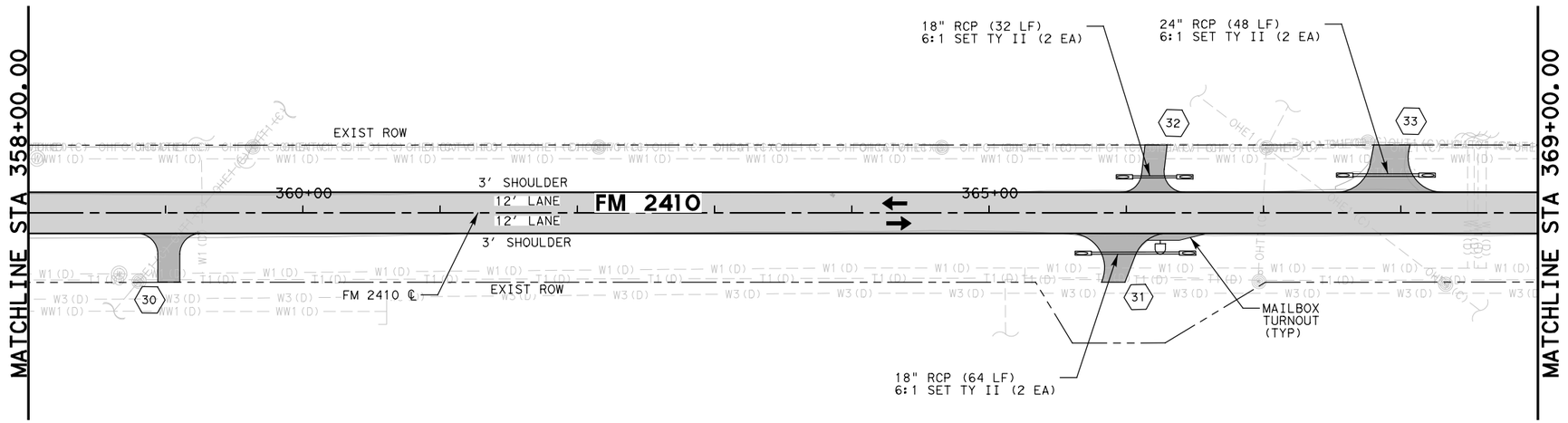
PLAN AND PROFILE LAYOUT

STA 347+00.00 TO STA 358+00.00

(SHEET 12 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	
JP				80
GRPH CHECK	2304	02	044	
RJ				

FILE: P:\MSGP\TXD18248\06-FM#2410\PROD*SHEETS\RPM12.dgn
DATE: 1/5/2023 1:19:50 PM mchowdhury



LEGEND

- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

5 2.5 0 5 10

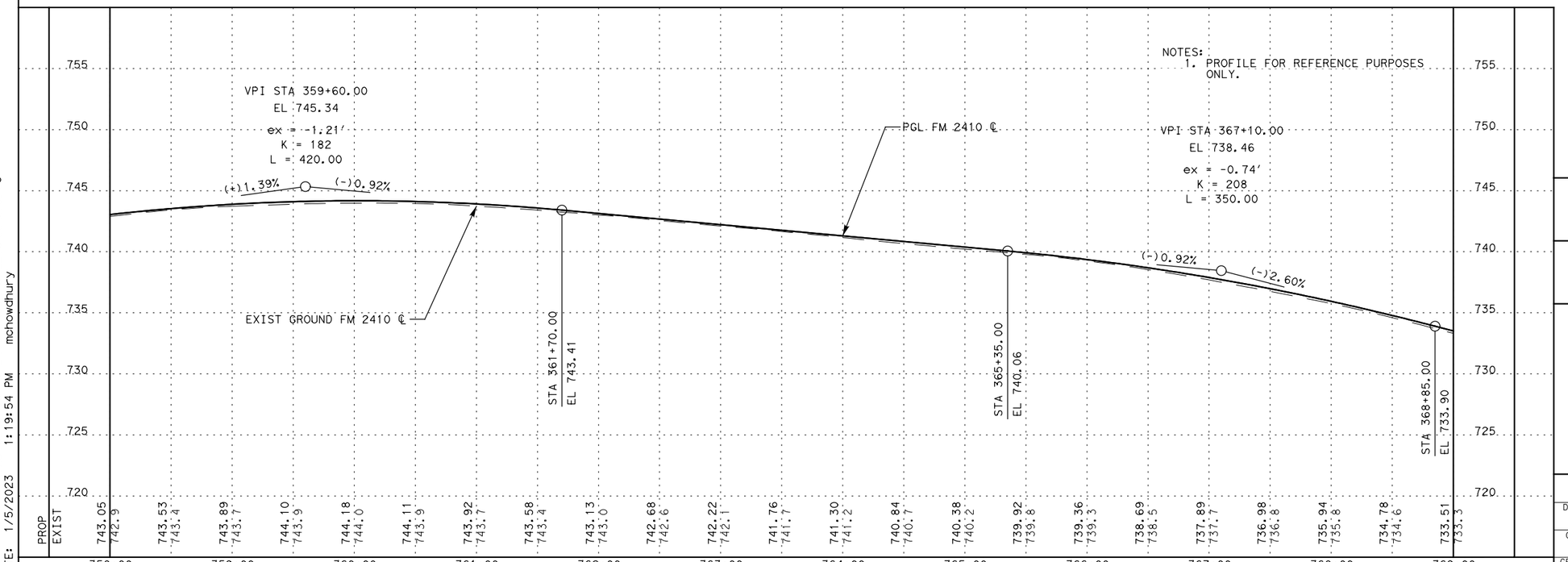
VERTICAL SCALE: 1" = 10'

TREE TRIMMING - (RT)		
TYPE	FROM	TO
LIGHT	358+00	366+50
TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	358+00	367+50

LEGEND

- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

STA 358+00.00 to STA 359+00.00	STA 359+00.00 to STA 360+00.00	STA 360+00.00 to STA 361+00.00	STA 361+00.00 to STA 362+00.00	STA 362+00.00 to STA 363+00.00	STA 363+00.00 to STA 364+00.00	STA 364+00.00 to STA 365+00.00	STA 365+00.00 to STA 366+00.00	STA 366+00.00 to STA 367+00.00	STA 367+00.00 to STA 368+00.00	STA 368+00.00 to STA 369+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
2	2	0	0	0	1	2	1	0	0	0	8		CY	EXCAVATION (RDWY)
34	32	7	11	10	7	5	4	3	7	7	127		CY	EMBANKMENT
1	1	1	1	1	1	1	1	1	0.5	0	9.5		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:19:54 PM mchowdhury

STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

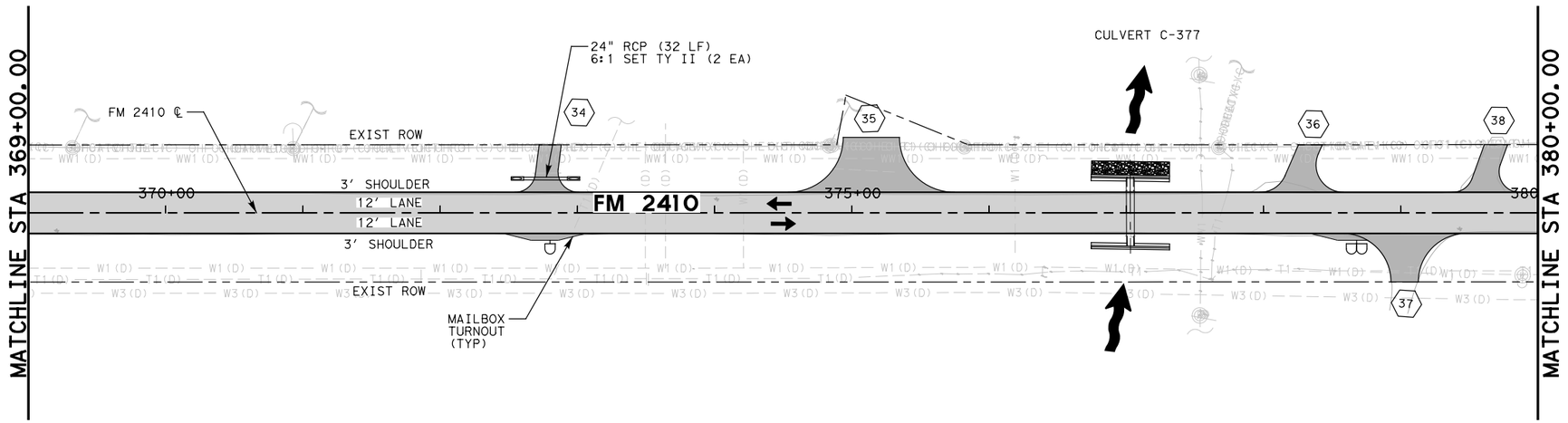
FM 2410

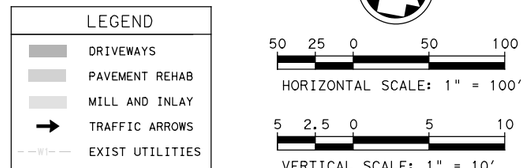
PLAN AND PROFILE LAYOUT

STA 358+00.00 TO STA 369+00.00

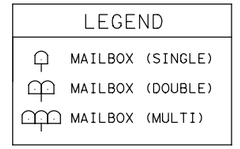
(SHEET 13 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	81
JP				
GRPH CHECK	2304	02	044	
RJ				

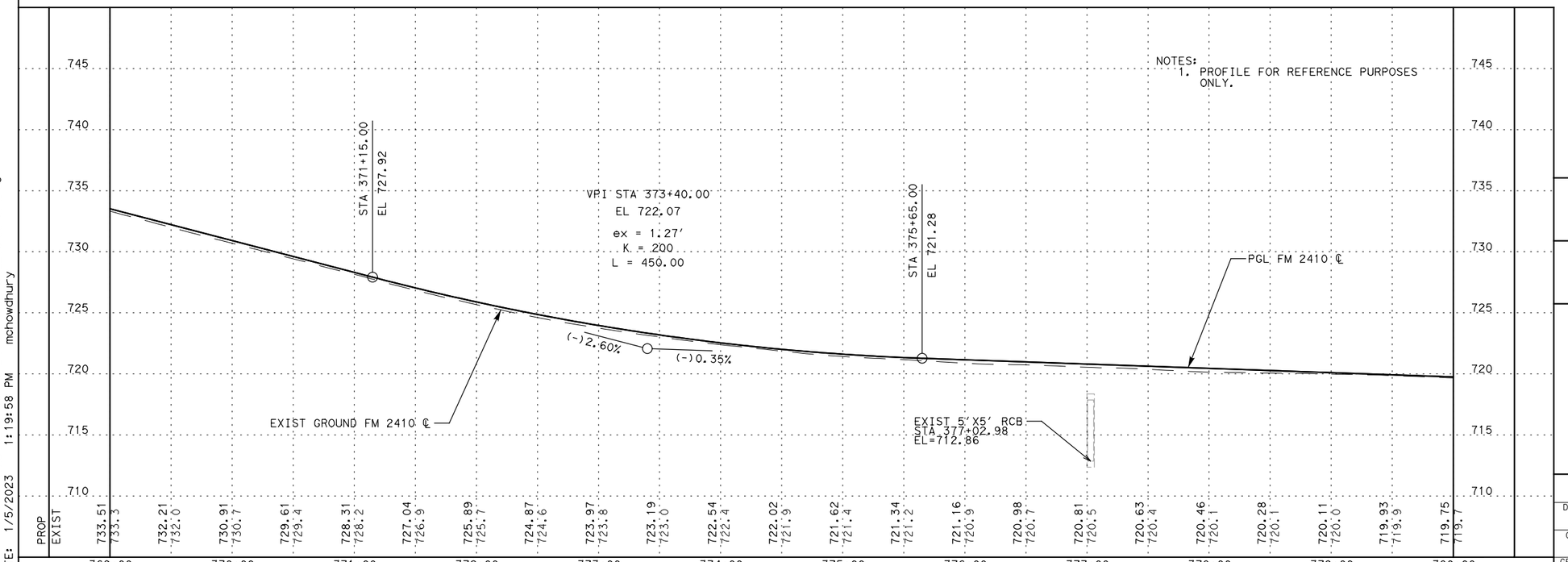




TREE TRIMMING - (RT)		
TYPE	FROM	TO
HEAVY	369+00	373+00
LIGHT	375+50	380+00



STA 369+00.00 to STA 370+00.00	STA 370+00.00 to STA 371+00.00	STA 371+00.00 to STA 372+00.00	STA 372+00.00 to STA 373+00.00	STA 373+00.00 to STA 374+00.00	STA 374+00.00 to STA 375+00.00	STA 375+00.00 to STA 376+00.00	STA 376+00.00 to STA 377+00.00	STA 377+00.00 to STA 378+00.00	STA 378+00.00 to STA 379+00.00	STA 379+00.00 to STA 380+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	24	24	0	0	40	40	128		CY	EXCAVATION (RDWY)
8	12	12	15	19	11	20	290	278	7	1	673		CY	EMBANKMENT
1	1	1	1	0	0	0.5	1	1	1	1	8.5		STA	PREPARING R.O.W.



FIRM REGISTRATION NO. F-230
tnp

FM 2410

PLAN AND PROFILE LAYOUT

STA 369+00.00 TO STA 380+00.00

(SHEET 14 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	82
JP				
GRPH CHECK	2304	02	044	
RJ				

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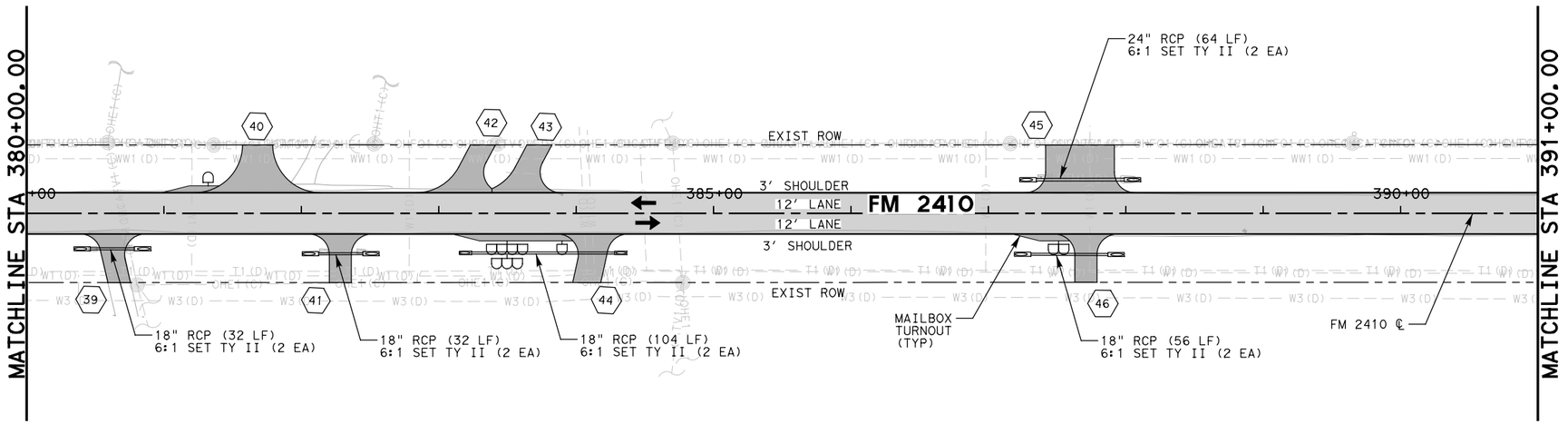
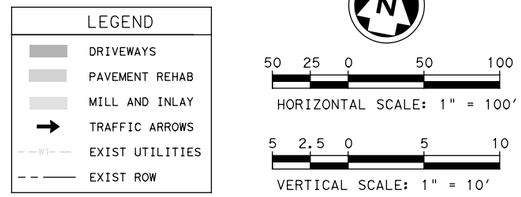
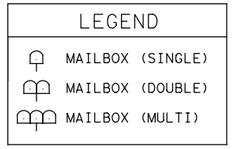
DATE: 1/5/2023 1:19:58 PM mchowdhury

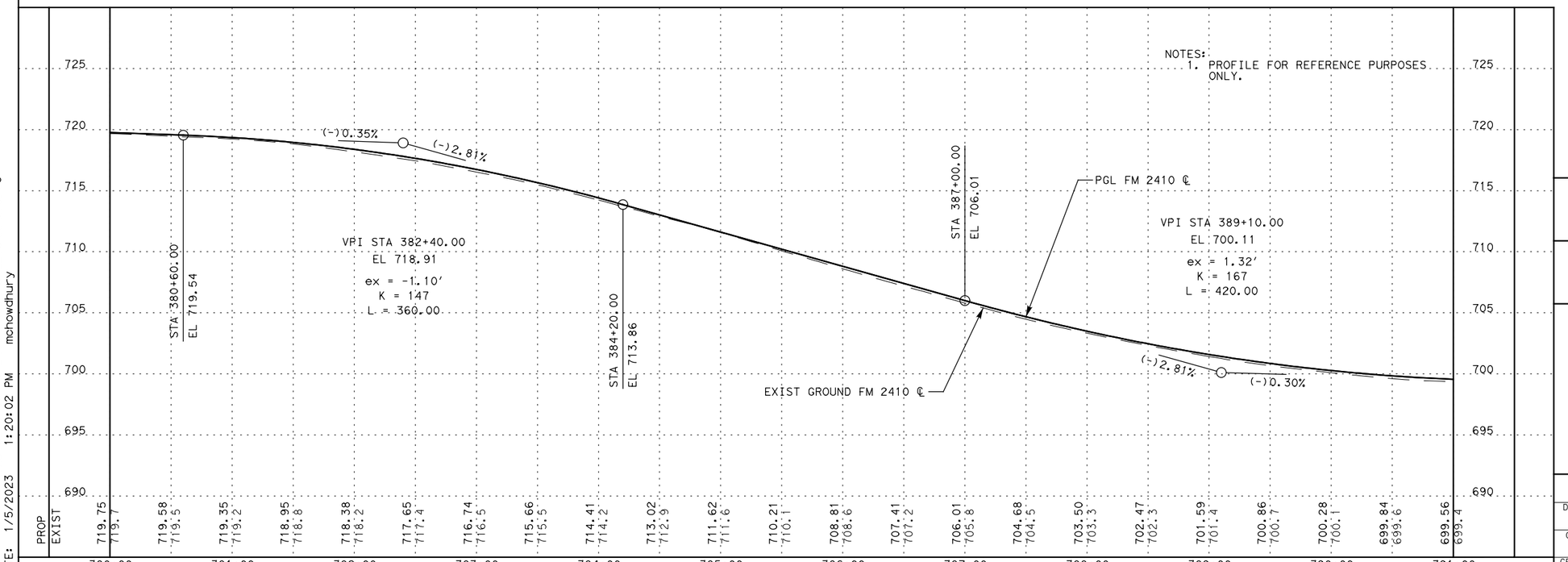




TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	387+50	391+00



STA 380+00.00 to STA 381+00.00	STA 381+00.00 to STA 382+00.00	STA 382+00.00 to STA 383+00.00	STA 383+00.00 to STA 384+00.00	STA 384+00.00 to STA 385+00.00	STA 385+00.00 to STA 386+00.00	STA 386+00.00 to STA 387+00.00	STA 387+00.00 to STA 388+00.00	STA 388+00.00 to STA 389+00.00	STA 389+00.00 to STA 390+00.00	STA 390+00.00 to STA 391+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
2	2	0	17	21	4	0	0	0	0	0	46		CY	EXCAVATION (RDWY)
2	2	3	12	9	1	1	4	9	10	15	68		CY	EMBANKMENT
0	0	0	0	0	0	0	0.5	1	1	1	3.5		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:20:02 PM mchowdhury

STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

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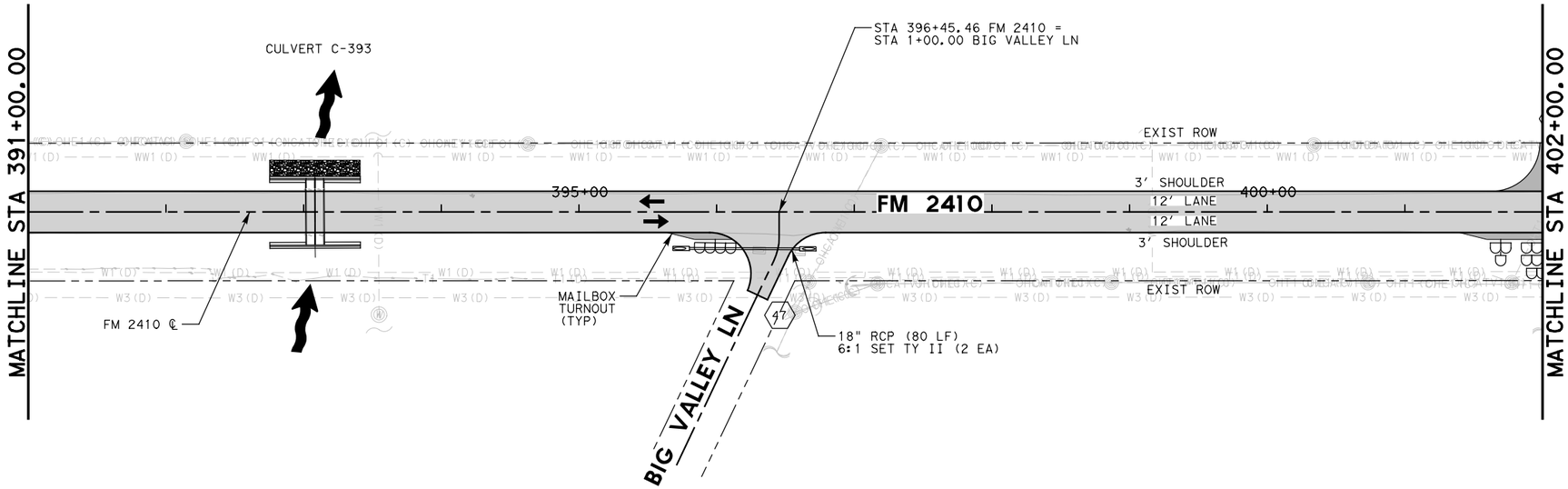
PLAN AND PROFILE LAYOUT

STA 380+00.00 TO STA 391+00.00

(SHEET 15 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	83
JP				
GRPH CHECK	2304	02	044	
RJ				



LEGEND

- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

5 2.5 0 5 10

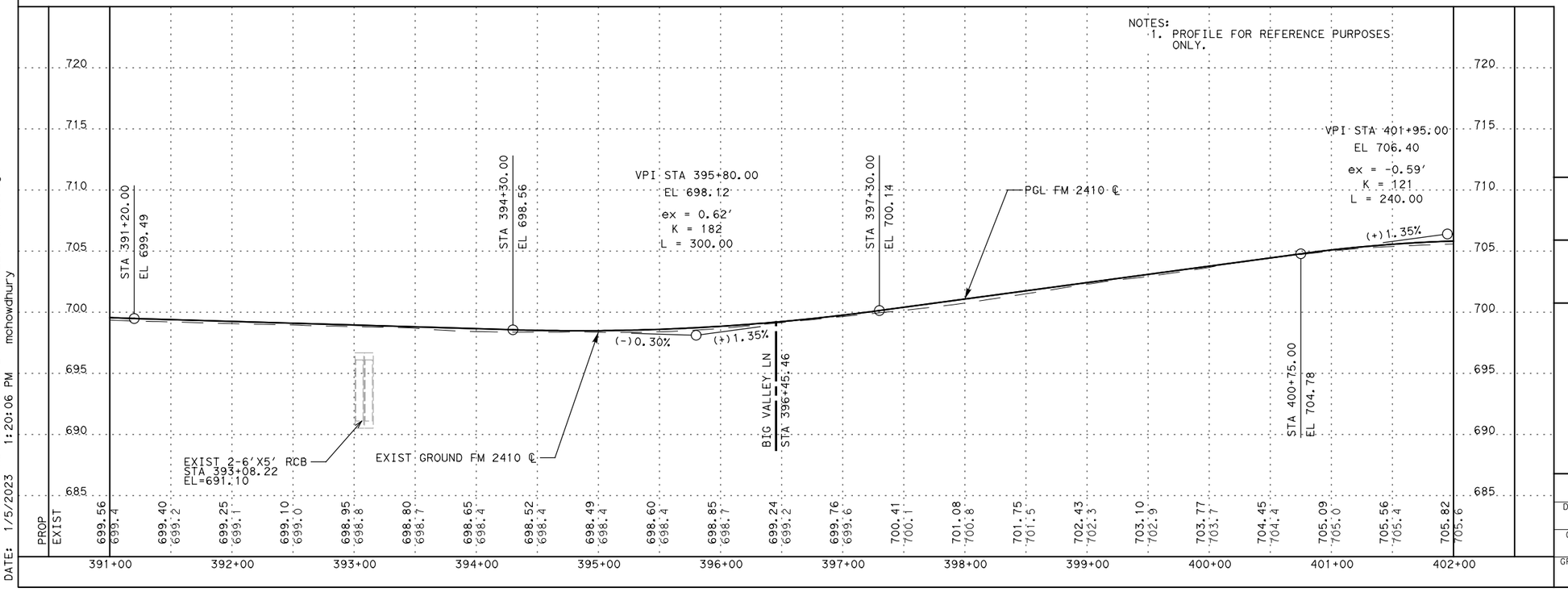
VERTICAL SCALE: 1" = 10'

TREE TRIMMING - (RT)		
TYPE	FROM	TO
LIGHT	391+00	395+95
TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	391+00	399+00

LEGEND

- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

STA 391+00.00 to STA 392+00.00	STA 392+00.00 to STA 393+00.00	STA 393+00.00 to STA 394+00.00	STA 394+00.00 to STA 395+00.00	STA 395+00.00 to STA 396+00.00	STA 396+00.00 to STA 397+00.00	STA 397+00.00 to STA 398+00.00	STA 398+00.00 to STA 399+00.00	STA 399+00.00 to STA 400+00.00	STA 400+00.00 to STA 401+00.00	STA 401+00.00 to STA 402+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	11	11	0	0	1	1	30	54		CY	EXCAVATION (RDWY)
24	206	221	34	14	18	16	15	14	11	7	580		CY	EMBANKMENT
1	1	1	1	1	1	1	1	0	0	0	8		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:20:06 PM mchowdhury

STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

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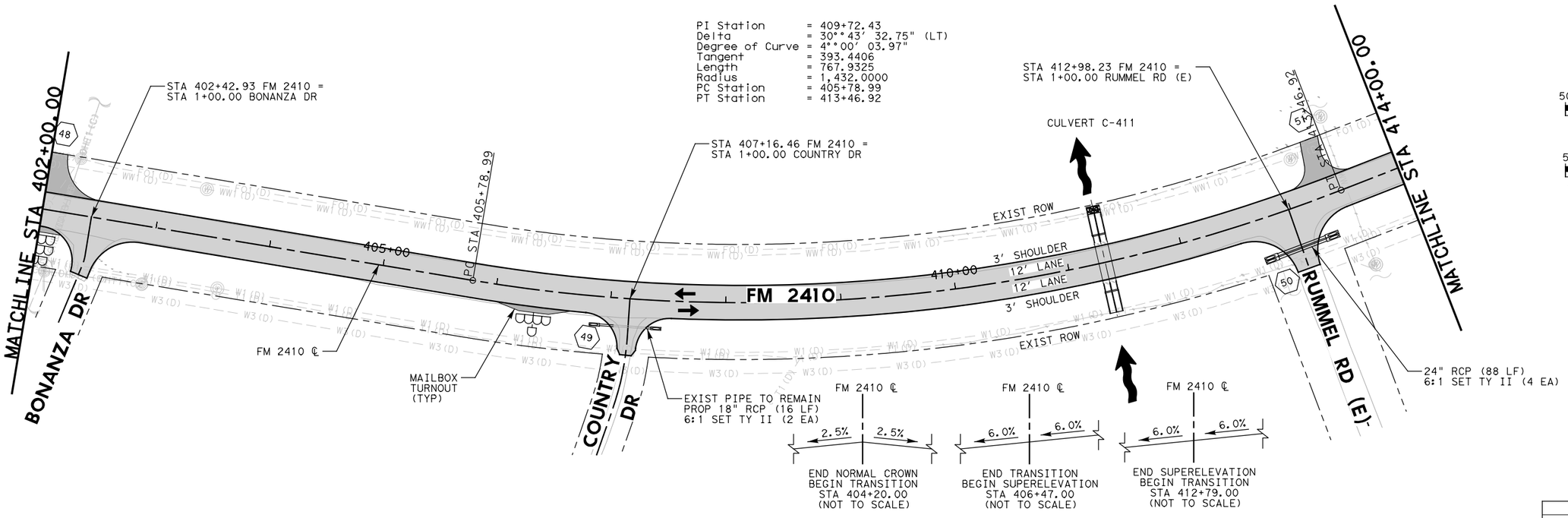
PLAN AND PROFILE LAYOUT

STA 391+00.00 TO STA 402+00.00

(SHEET 16 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	
JP				84
GRPH CHECK	2304	02	044	
RJ				



HORIZONTAL SCALE: 1" = 100'

VERTICAL SCALE: 1" = 10'

LEGEND

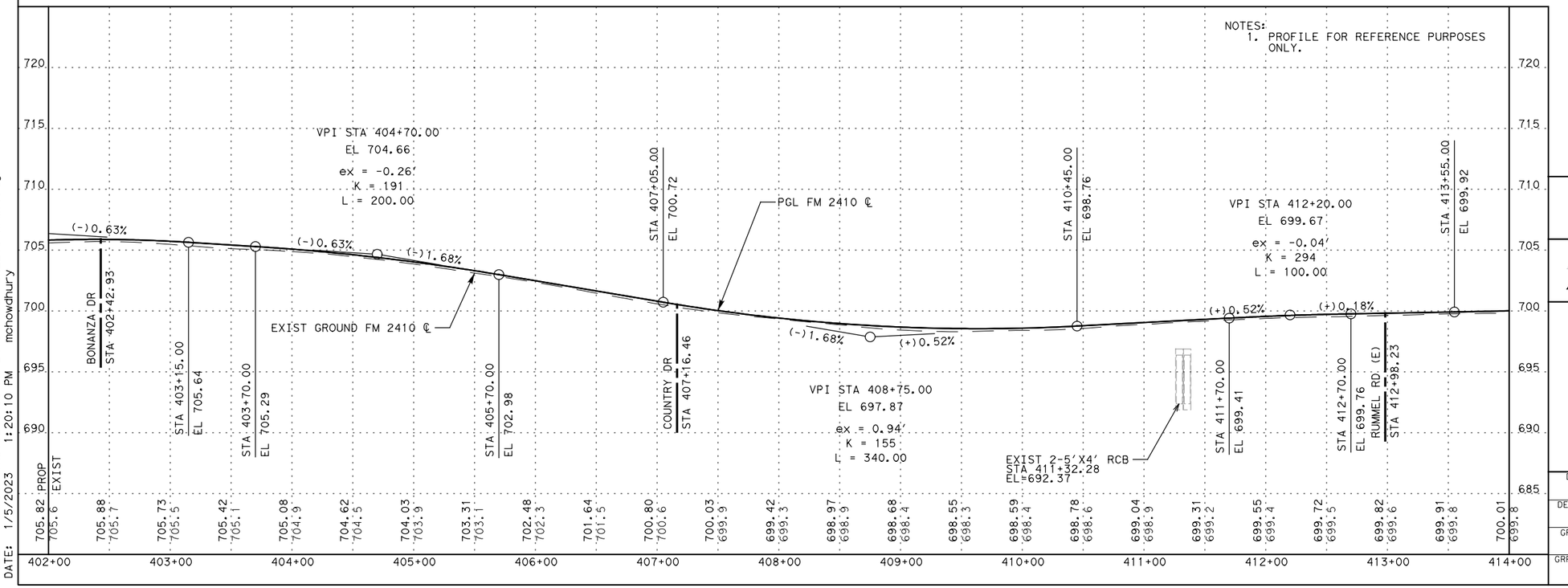
- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

LEGEND

- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

STA 402+00.00 to STA 403+00.00	STA 403+00.00 to STA 404+00.00	STA 404+00.00 to STA 405+00.00	STA 405+00.00 to STA 406+00.00	STA 406+00.00 to STA 407+00.00	STA 407+00.00 to STA 408+00.00	STA 408+00.00 to STA 409+00.00	STA 409+00.00 to STA 410+00.00	STA 410+00.00 to STA 411+00.00	STA 411+00.00 to STA 412+00.00	STA 412+00.00 to STA 413+00.00	STA 413+00.00 to STA 414+00.00	SECTION TOTALS			
												ESTIMATED	FINAL	UNIT	DESCRIPTION
30	0	0	0	0	0	0	0	0	0	0	0	30		CY	EXCAVATION (RDWY)
7	13	13	15	18	20	25	25	74	133	73	15	431		CY	EMBANKMENT
1	1	1	0.5	0	0	0	0	0.5	1	0.5	0	5.5		STA	PREPARING R.O.W.

TREE TRIMMING - (RT)		
TYPE	FROM	TO
HEAVY	410+50	412+50
TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	402+00	405+50



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DATE: 1/5/2023 1:20:10 PM mchowdhury

STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

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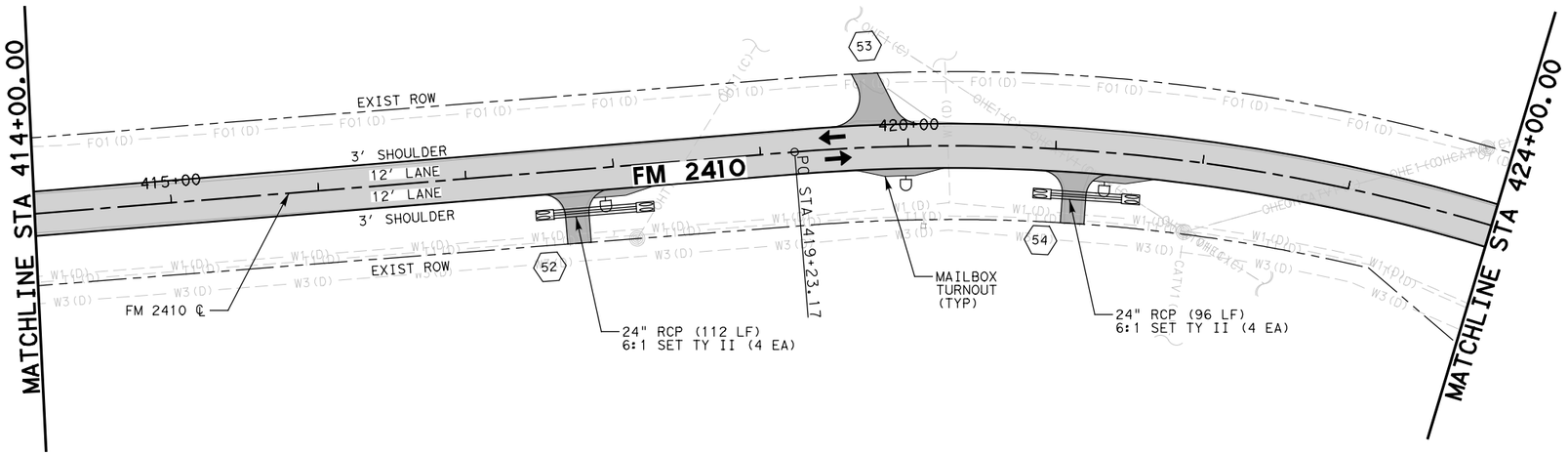
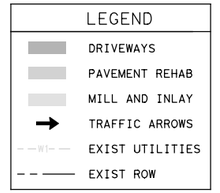
PLAN AND PROFILE LAYOUT

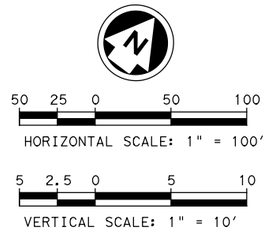
STA 402+00.00 TO STA 414+00.00

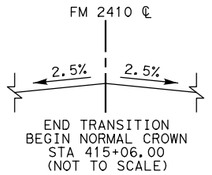
(SHEET 17 OF 35)

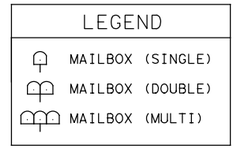
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	85
GRAPHICS	CONTROL	SECTION	JOB	
JP				
GRPH CHECK	2304	02	044	
RJ				

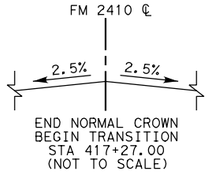


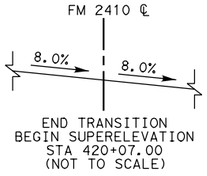






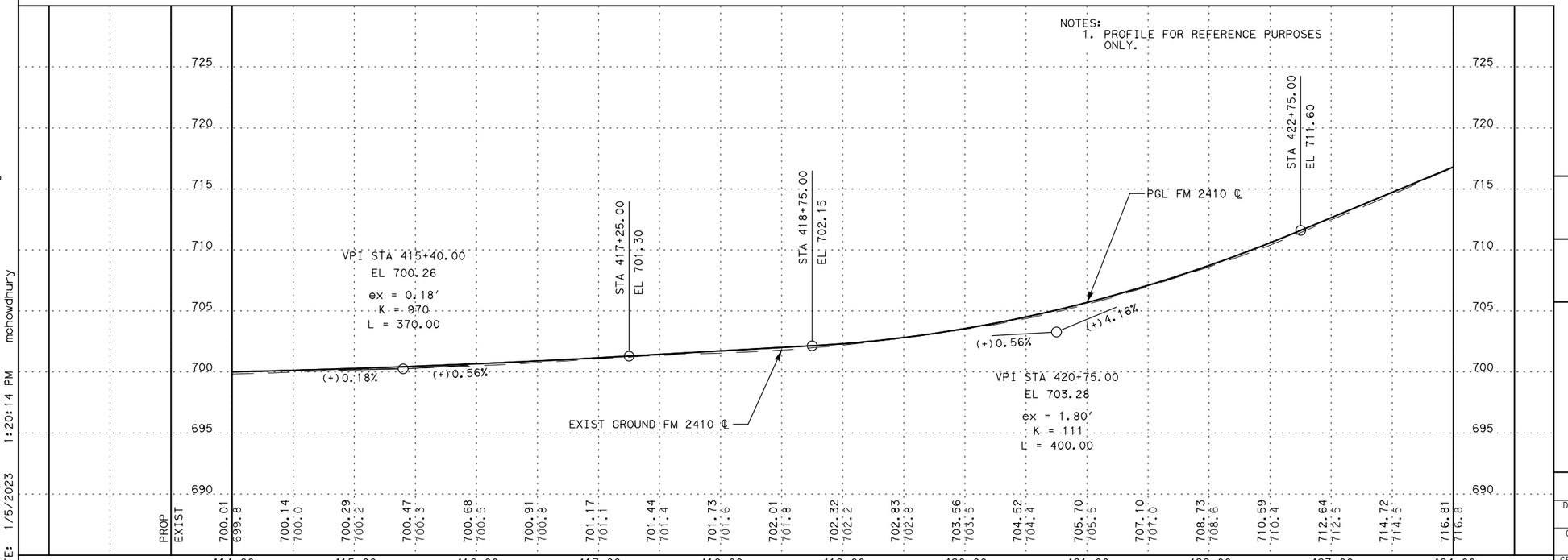






STA 414+00.00 to STA 415+00.00	STA 415+00.00 to STA 416+00.00	STA 416+00.00 to STA 417+00.00	STA 417+00.00 to STA 418+00.00	STA 418+00.00 to STA 419+00.00	STA 419+00.00 to STA 420+00.00	STA 420+00.00 to STA 421+00.00	STA 421+00.00 to STA 422+00.00	STA 422+00.00 to STA 423+00.00	STA 423+00.00 to STA 424+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
1	1	0	6	13	24	18	0	0	1	64		CY	EXCAVATION (RDWY)
23	15	11	16	46	51	31	24	27	30	274		CY	EMBANKMENT
0	0	0	0.5	1	0.5	0	0	0	0	2		STA	PREPARING R.O.W.

TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	417+50	419+50



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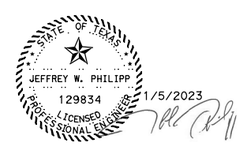
DATE: 1/5/2023 1:20:14 PM mchowdhury



FIRM REGISTRATION NO. F-230

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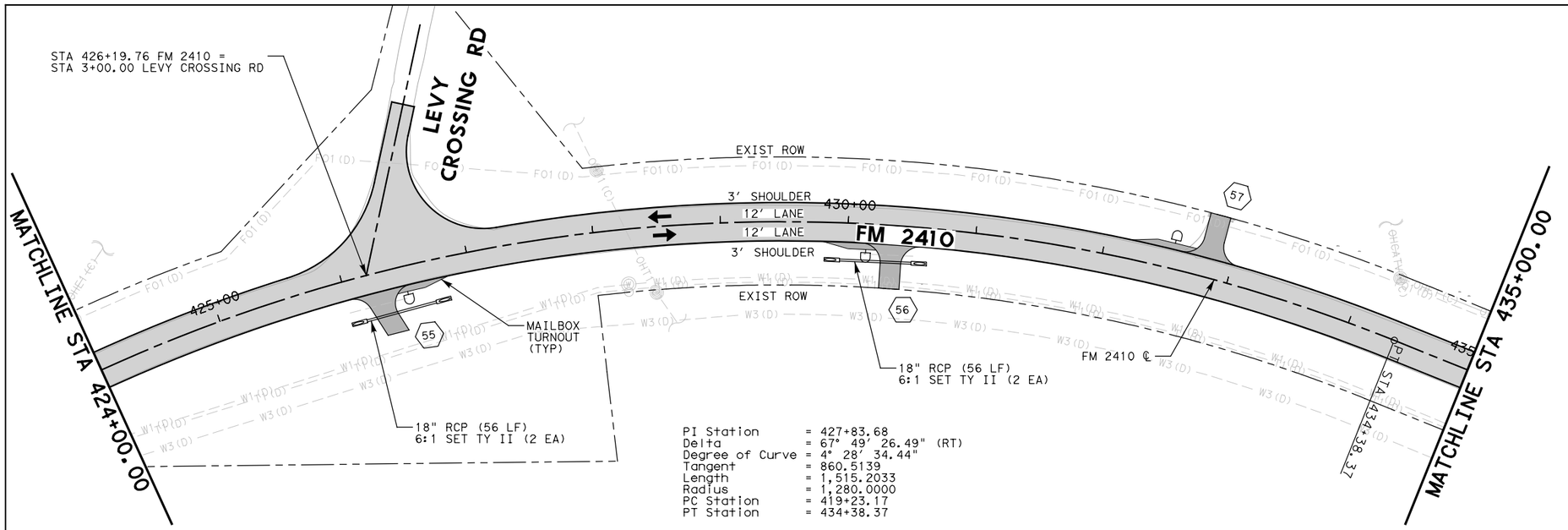
PLAN AND PROFILE LAYOUT

STA 414+00.00 TO STA 424+00.00

(SHEET 18 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	86
JP				
GRPH CHECK	2304	02	044	
RJ				

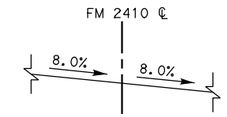


PI Station = 427+83.68
Delta = 67° 49' 26.49" (RT)
Degree of Curve = 4° 28' 34.44"
Tangent = 860.5139
Length = 1,515.2033
Radius = 1,280.0000
PC Station = 419+23.17
PT Station = 434+38.37

LEGEND
- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

50 25 0 50 100
HORIZONTAL SCALE: 1" = 100'

5 2.5 0 5 10
VERTICAL SCALE: 1" = 10'

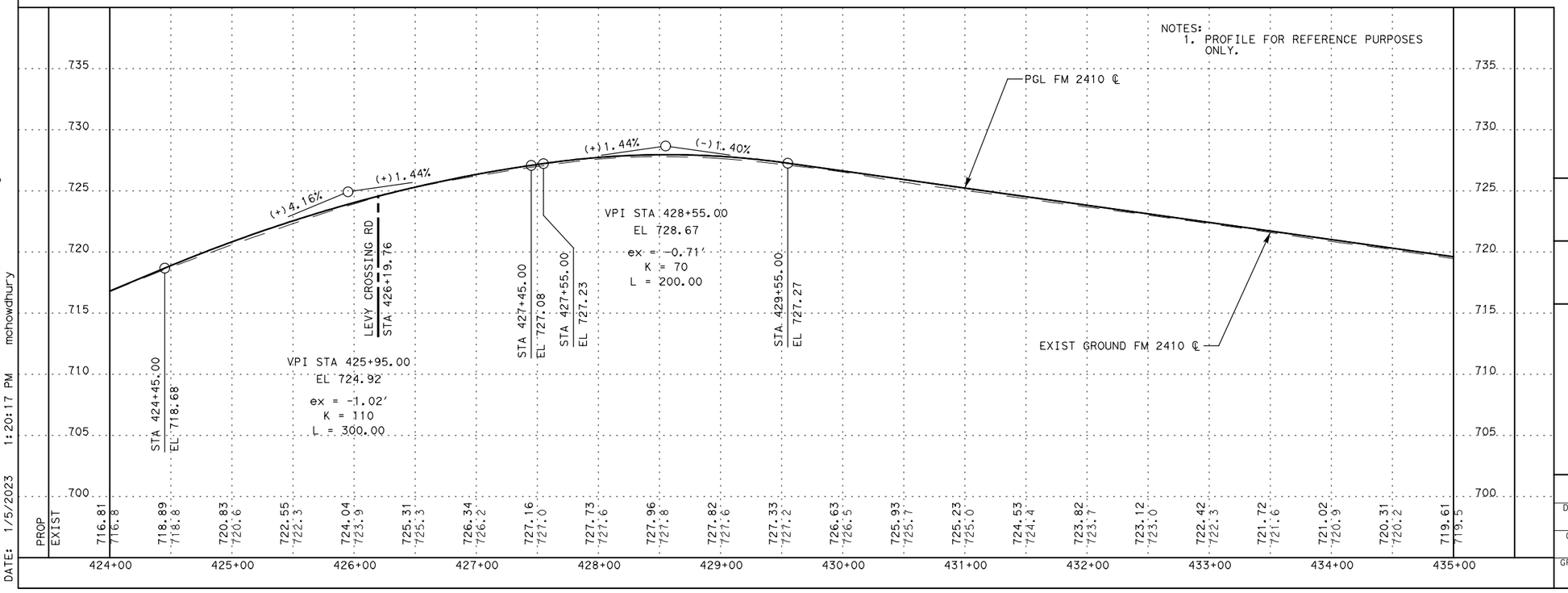


END SUPERELEVATION
BEGIN TRANSITION
STA 433+54.00
(NOT TO SCALE)

LEGEND
- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

STA 424+00.00 to STA 425+00.00	STA 425+00.00 to STA 426+00.00	STA 426+00.00 to STA 427+00.00	STA 427+00.00 to STA 428+00.00	STA 428+00.00 to STA 429+00.00	STA 429+00.00 to STA 430+00.00	STA 430+00.00 to STA 431+00.00	STA 431+00.00 to STA 432+00.00	STA 432+00.00 to STA 433+00.00	STA 433+00.00 to STA 434+00.00	STA 434+00.00 to STA 435+00.00	SECTION TOTALS			
											ESTIMATED	FINAL	UNIT	DESCRIPTION
1	0	0	0	0	12	12	0	0	1	2	28		CY	EXCAVATION (RDWY)
25	14	3	14	36	43	34	34	34	31	18	286		CY	EMBANKMENT
0	0	0	0	1	1	1	1	1	1	1	7		STA	PREPARING R.O.W.

TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	428+00	432+00
HEAVY	432+00	435+00



STATE OF TEXAS
JEFFREY W. PHILIPP
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1/5/2023

FIRM REGISTRATION NO. F-230

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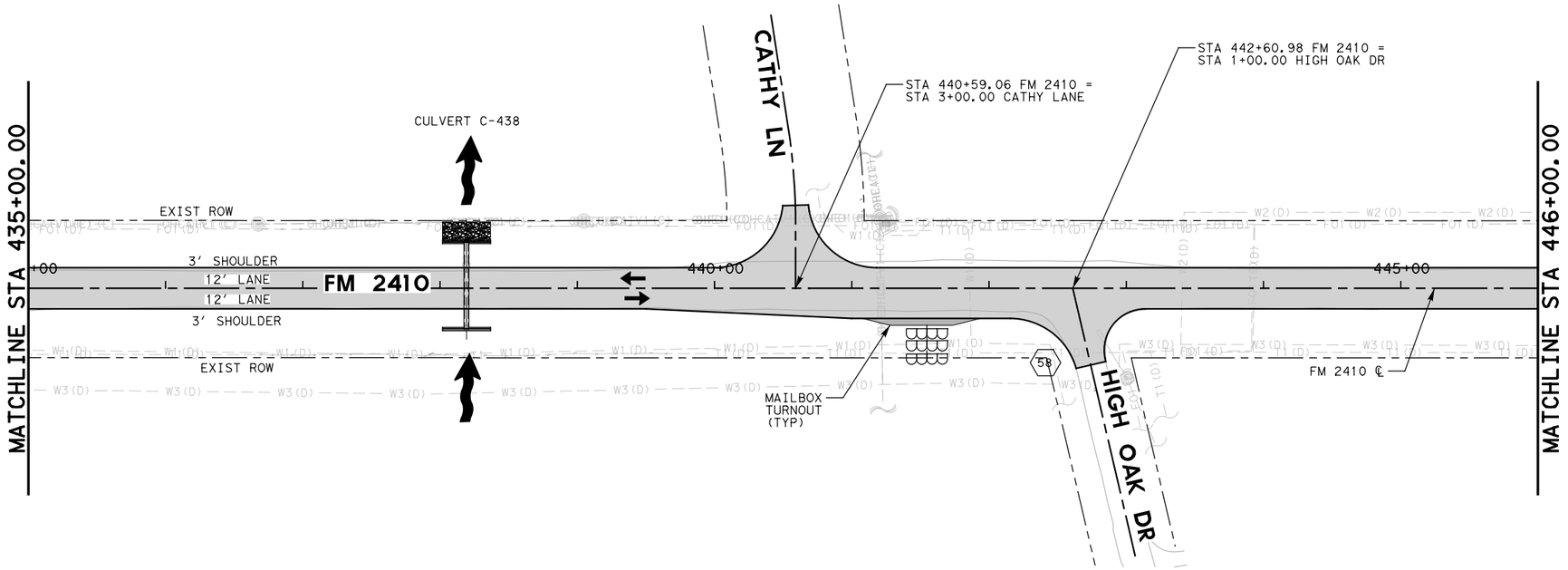
PLAN AND PROFILE LAYOUT

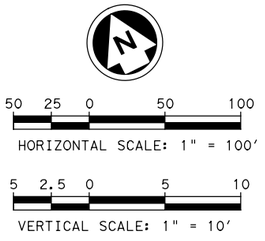
STA 424+00.00 TO STA 435+00.00

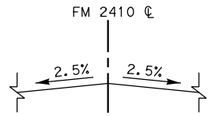
(SHEET 19 OF 35)

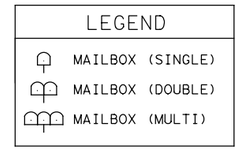
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	87
JP				
GRPH CHECK	2304	02	044	
RJ				

FILE: P:\MSGP\TXD18248\06-FM*2410\PROD*SHEETS\RPM19.dgn
DATE: 1/5/2023 1:20:17 PM mchowdhury



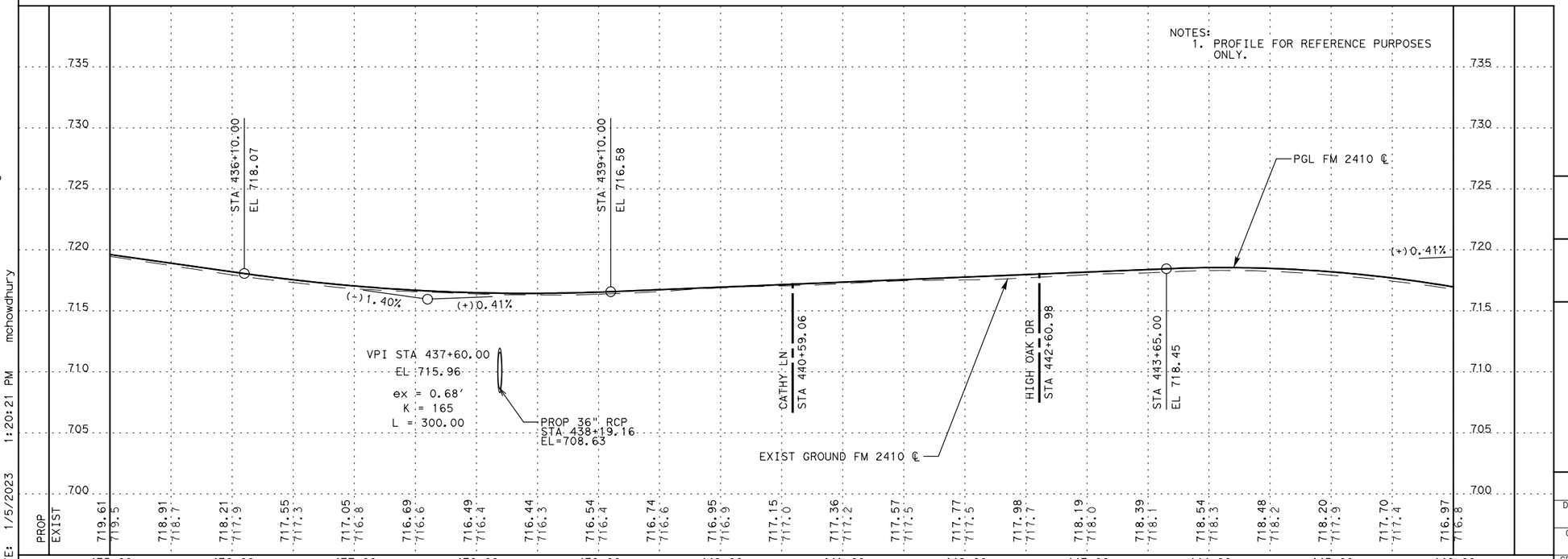






STA 435+00.00 to STA 436+00.00	STA 436+00.00 to STA 437+00.00	STA 437+00.00 to STA 438+00.00	STA 438+00.00 to STA 439+00.00	STA 439+00.00 to STA 440+00.00	STA 440+00.00 to STA 441+00.00	STA 441+00.00 to STA 442+00.00	STA 442+00.00 to STA 443+00.00	STA 443+00.00 to STA 444+00.00	STA 444+00.00 to STA 445+00.00	STA 445+00.00 to STA 446+00.00	SECTION TOTALS			
											ESTIMATED	FINAL	UNIT	DESCRIPTION
1	0	0	0	1	1	0	0	0	0	0	3		CY	EXCAVATION (RDWY)
11	17	79	88	19	1	5	8	10	18	18	274		CY	EMBANKMENT
1	1	1	1	1	0	0	0	0	0	1	6		STA	PREPARING R.O.W.

TREE TRIMMING - (LT)		
TYPE	FROM	TO
HEAVY	435+00	440+00
LIGHT	445+00	446+00



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DATE: 1/5/2023 1:20:21 PM mchowdhury

JEFFREY W. PHILIPP
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STATE OF TEXAS
1/5/2023

FIRM REGISTRATION NO. F-230

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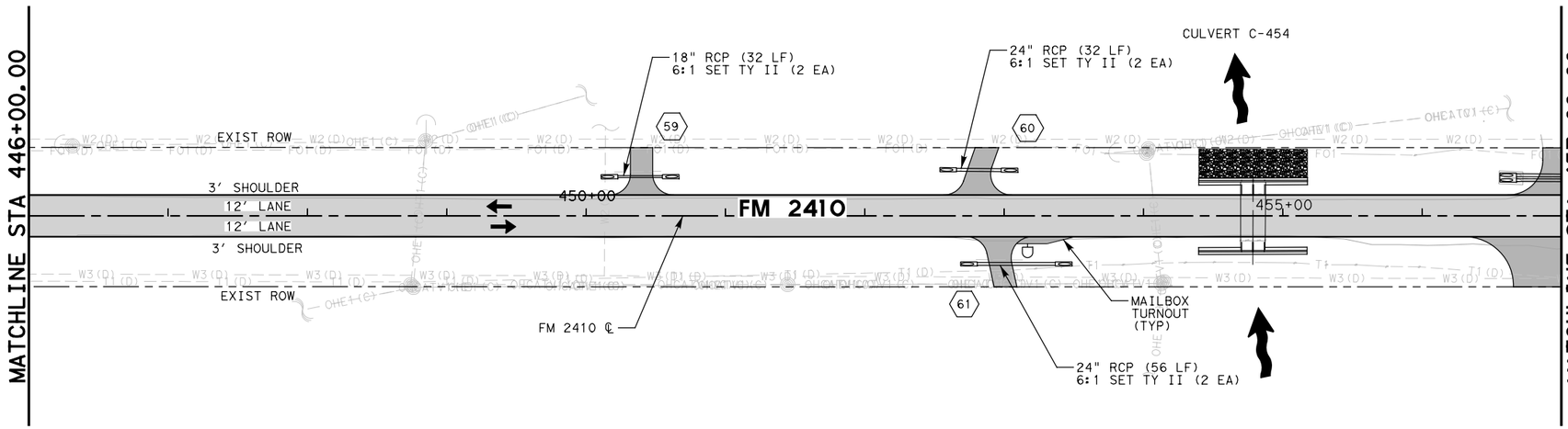
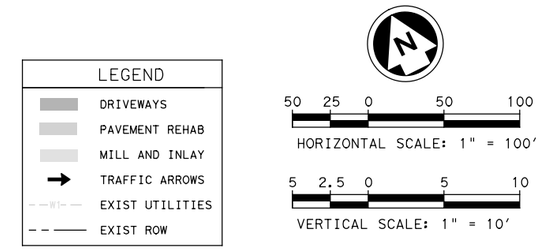
PLAN AND PROFILE LAYOUT

STA 435+00.00 TO STA 446+00.00

(SHEET 20 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	88
JP				
GRPH CHECK	2304	02	044	
RJ				

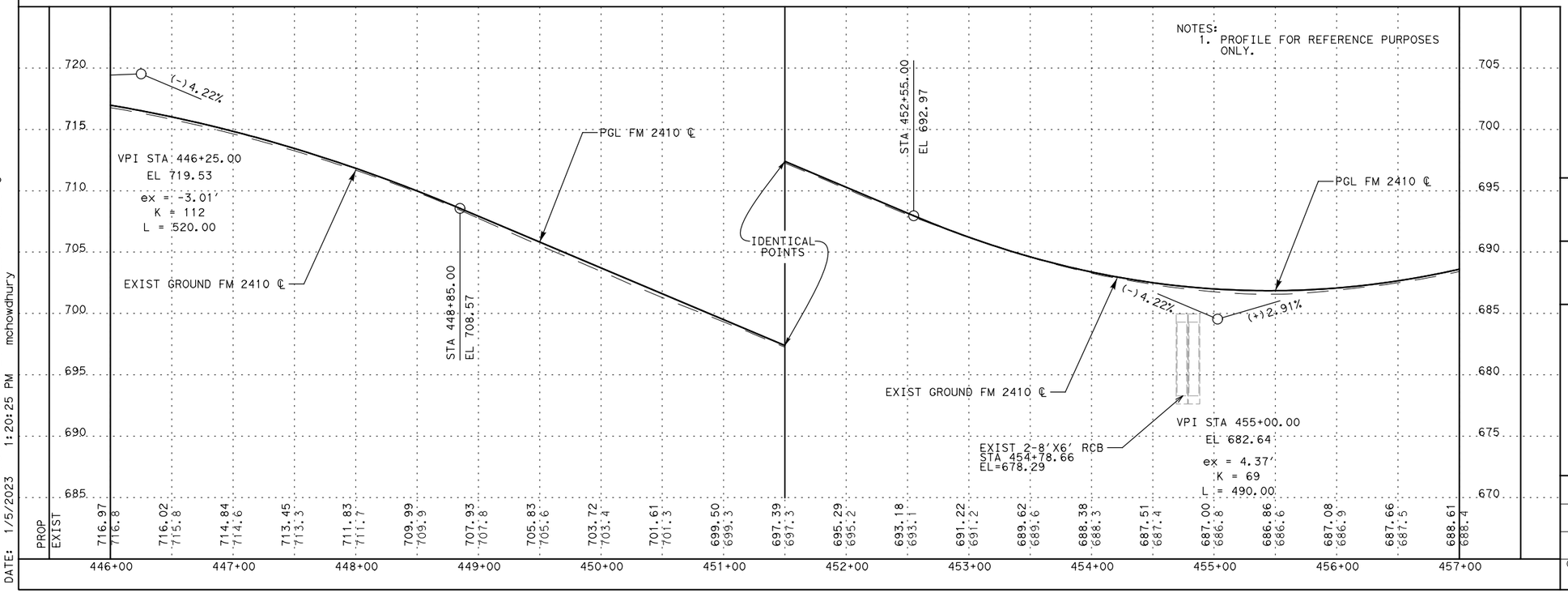




TREE TRIMMING - (RT)		
TYPE	FROM	TO
LIGHT	453+50	457+00
TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	446+00	447+00
HEAVY	453+50	457+00

LEGEND
- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

STA 446+00.00 to STA 447+00.00	STA 447+00.00 to STA 448+00.00	STA 448+00.00 to STA 449+00.00	STA 449+00.00 to STA 450+00.00	STA 450+00.00 to STA 451+00.00	STA 451+00.00 to STA 452+00.00	STA 452+00.00 to STA 453+00.00	STA 453+00.00 to STA 454+00.00	STA 454+00.00 to STA 455+00.00	STA 455+00.00 to STA 456+00.00	STA 456+00.00 to STA 457+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	19	19	0	0	23	61		CY	EXCAVATION (RDWY)
13	9	12	28	64	94	56	48	240	215	56	835		CY	EMBANKMENT
1	0	0	0	0	0	0	0.5	1	1	1	4.5		STA	PREPARING R.O.W.



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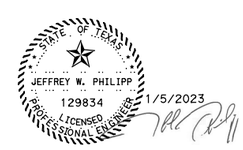
DATE: 1/5/2023 1:20:25 PM mchowdhury



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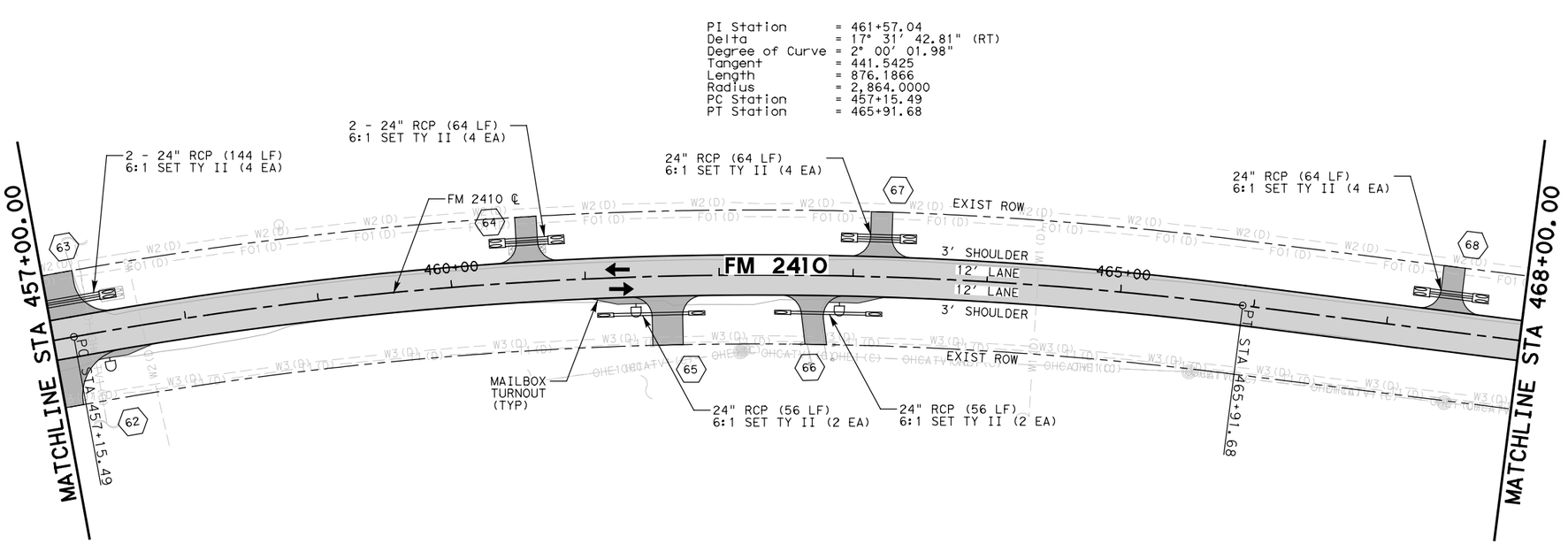
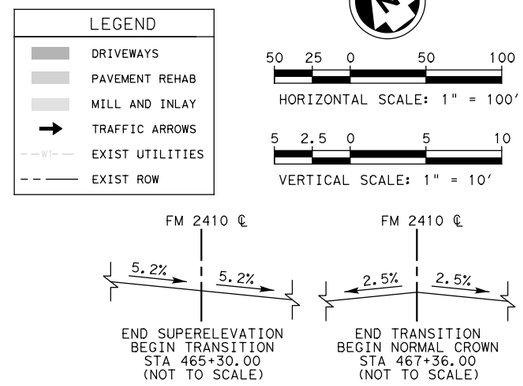
PLAN AND PROFILE LAYOUT

STA 446+00.00 TO STA 457+00.00

(SHEET 21 OF 35)

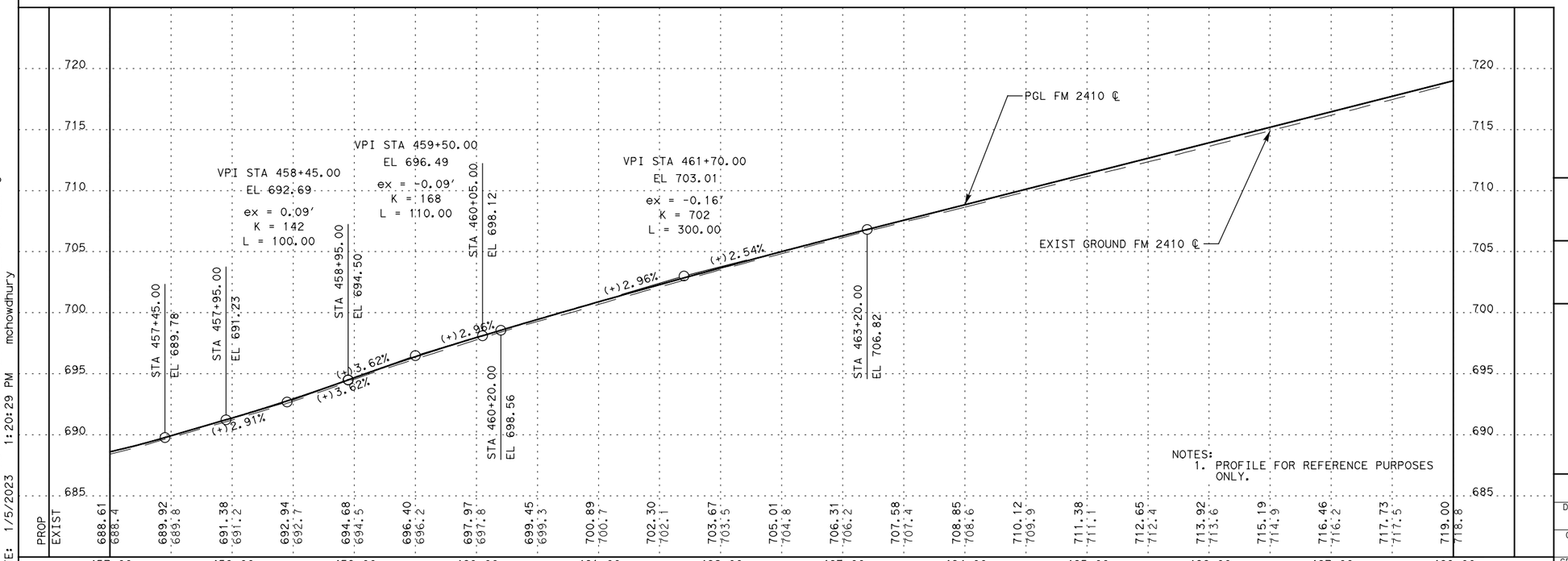
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	89
JP				
GRPH CHECK	2304	02	044	
RJ				





TREE TRIMMING - (RT)		
TYPE	FROM	TO
LIGHT	457+00	459+00
HEAVY	464+00	468+00
TREE TRIMMING - (LT)		
TYPE	FROM	TO
HEAVY	457+00	459+00

STA 457+00.00 to STA 458+00.00	STA 458+00.00 to STA 459+00.00	STA 459+00.00 to STA 460+00.00	STA 460+00.00 to STA 461+00.00	STA 461+00.00 to STA 462+00.00	STA 462+00.00 to STA 463+00.00	STA 463+00.00 to STA 464+00.00	STA 464+00.00 to STA 465+00.00	STA 465+00.00 to STA 466+00.00	STA 466+00.00 to STA 467+00.00	STA 467+00.00 to STA 468+00.00	SECTION TOTALS			
											ESTIMATED	FINAL	UNIT	DESCRIPTION
23	0	0	0	0	5	5	0	0	0	0	33		CY	EXCAVATION (RDWY)
97	118	94	51	30	36	49	68	86	77	50	756		CY	EMBANKMENT
1	1	1	1	1	1	1	1	1	1	1	11		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:20:29 PM mchowdhury

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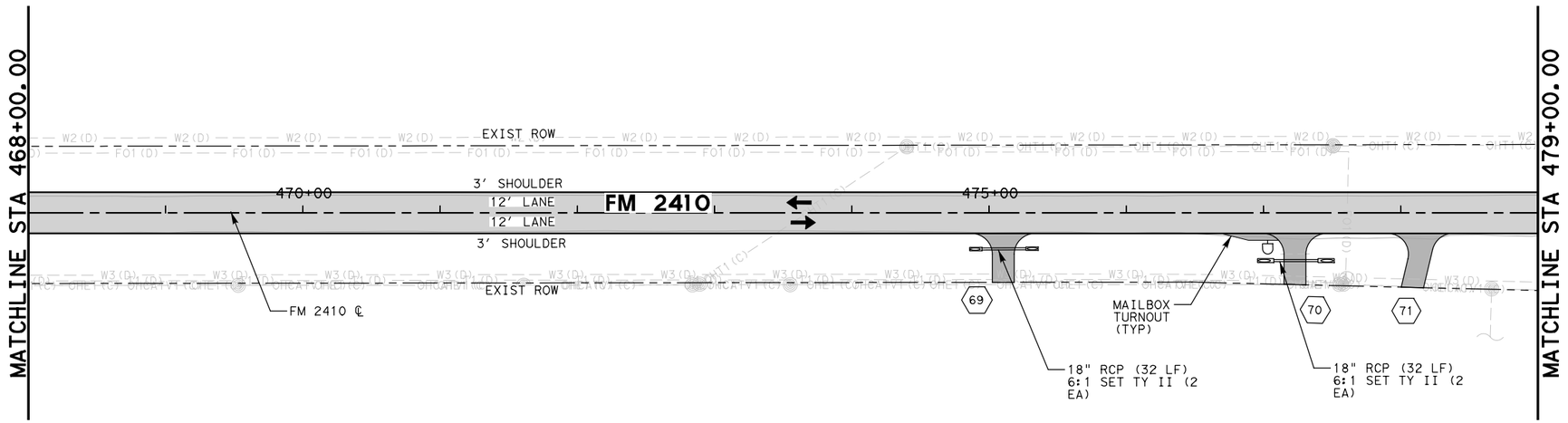
PLAN AND PROFILE LAYOUT

STA 457+00.00 TO STA 468+00.00

(SHEET 22 OF 35)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	90
JP				
GRPH CHECK	2304	02	044	
RJ				



LEGEND

- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

5 2.5 0 5 10

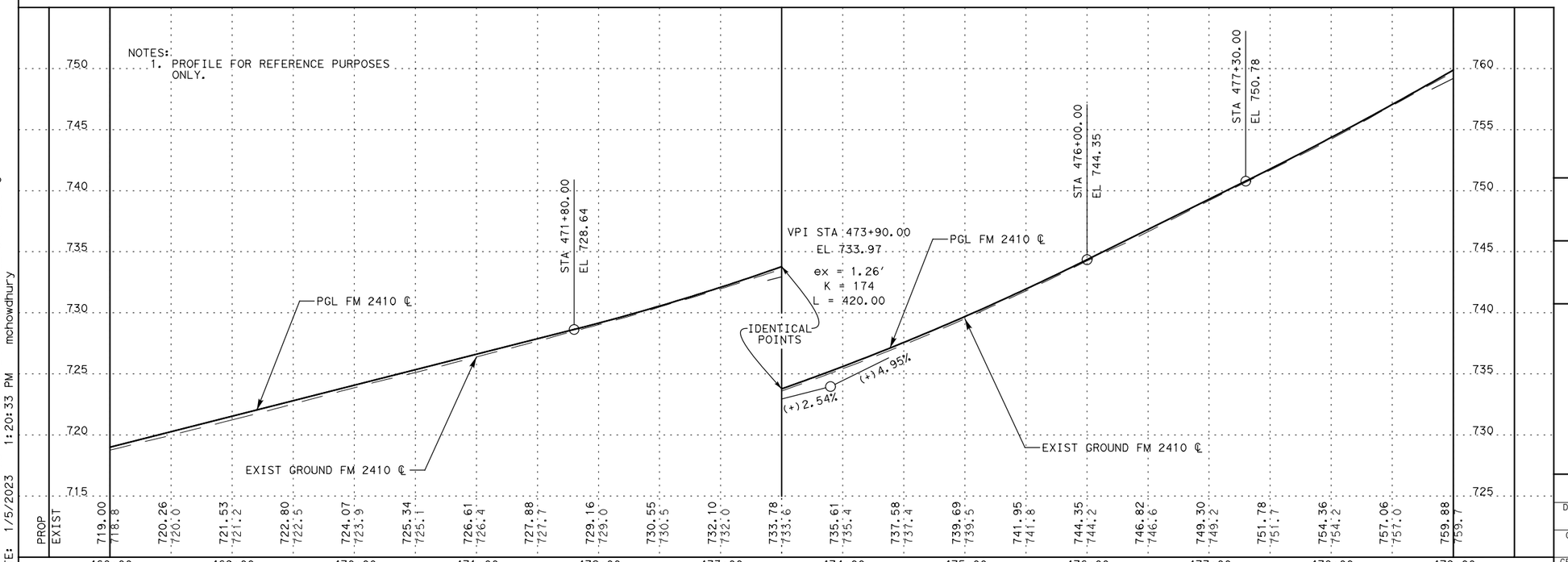
VERTICAL SCALE: 1" = 10'

TREE TRIMMING - (RT)		
TYPE	FROM	TO
LIGHT	468+00	476+50
HEAVY	476+50	477+00
TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	468+00	479+00

LEGEND

- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

STA 468+00.00 to STA 469+00.00	STA 469+00.00 to STA 470+00.00	STA 470+00.00 to STA 471+00.00	STA 471+00.00 to STA 472+00.00	STA 472+00.00 to STA 473+00.00	STA 473+00.00 to STA 474+00.00	STA 474+00.00 to STA 475+00.00	STA 475+00.00 to STA 476+00.00	STA 476+00.00 to STA 477+00.00	STA 477+00.00 to STA 478+00.00	STA 478+00.00 to STA 479+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	1	1	0	0	6	5	0	13		CY	EXCAVATION (RDWY)
33	23	21	25	22	23	31	46	74	62	32	392		CY	EMBANKMENT
1	1	1	1	1	1	1	1	1	1	1	11		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:20:33 PM mchowdhury

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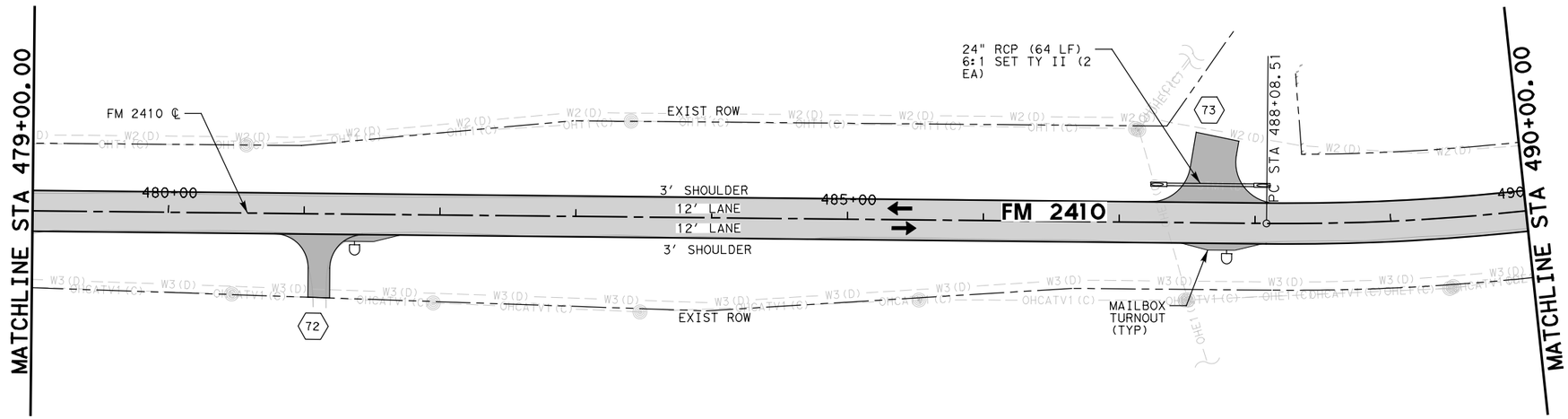
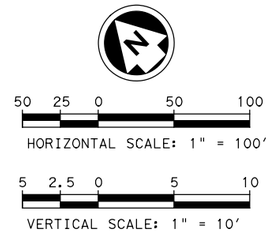
PLAN AND PROFILE LAYOUT

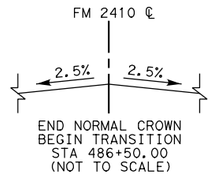
STA 468+00.00 TO STA 479+00.00

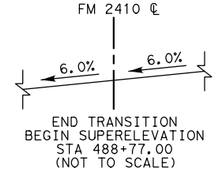
(SHEET 23 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	91
JP				
GRPH CHECK	2304	02	044	
RJ				







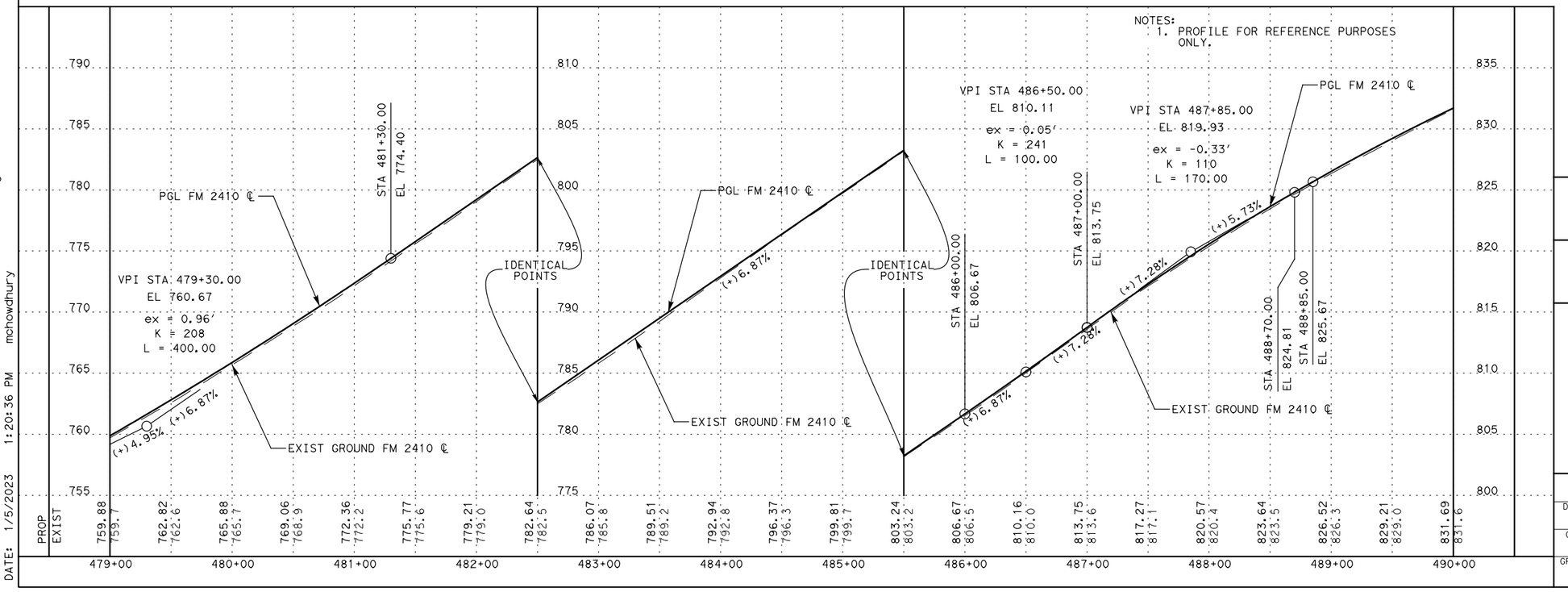


TREE TRIMMING - (RT)		
TYPE	FROM	TO
HEAVY	484+00	490+00
TREE TRIMMING - (LT)		
TYPE	FROM	TO
LIGHT	479+00	487+00

LEGEND

- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

STA 479+00.00 to STA 480+00.00	STA 480+00.00 to STA 481+00.00	STA 481+00.00 to STA 482+00.00	STA 482+00.00 to STA 483+00.00	STA 483+00.00 to STA 484+00.00	STA 484+00.00 to STA 485+00.00	STA 485+00.00 to STA 486+00.00	STA 486+00.00 to STA 487+00.00	STA 487+00.00 to STA 488+00.00	STA 488+00.00 to STA 489+00.00	STA 489+00.00 to STA 490+00.00	SECTION TOTALS			
											ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	0	3	3	0	0	6		CY	EXCAVATION (RDWY)
51	36	85	101	23	103	101	5	12	29	31	577		CY	EMBANKMENT
1	1	1	1	1	1	1	1	1	1	1	11		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:20:36 PM mchowdhury

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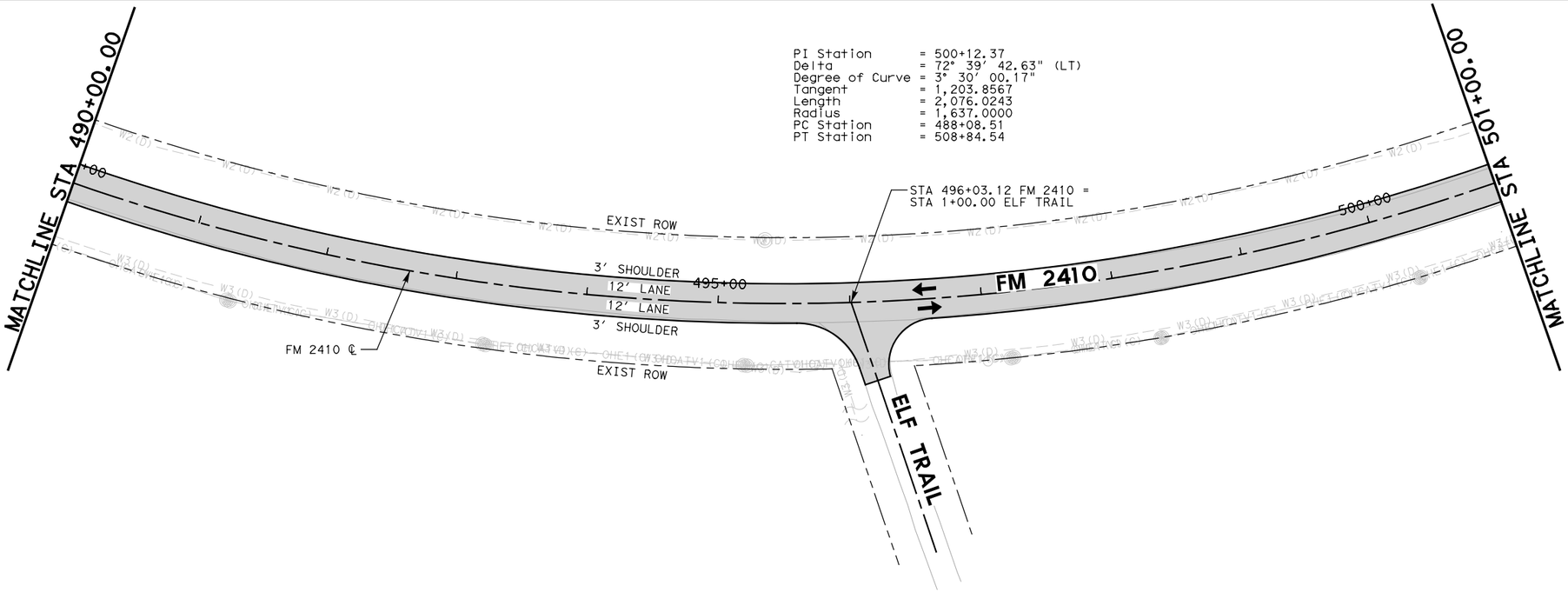
PLAN AND PROFILE LAYOUT

STA 479+00.00 TO STA 490+00.00

(SHEET 24 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	92
JP				
GRPH CHECK	2304	02	044	
RJ				



LEGEND

- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

50 25 0 50 100

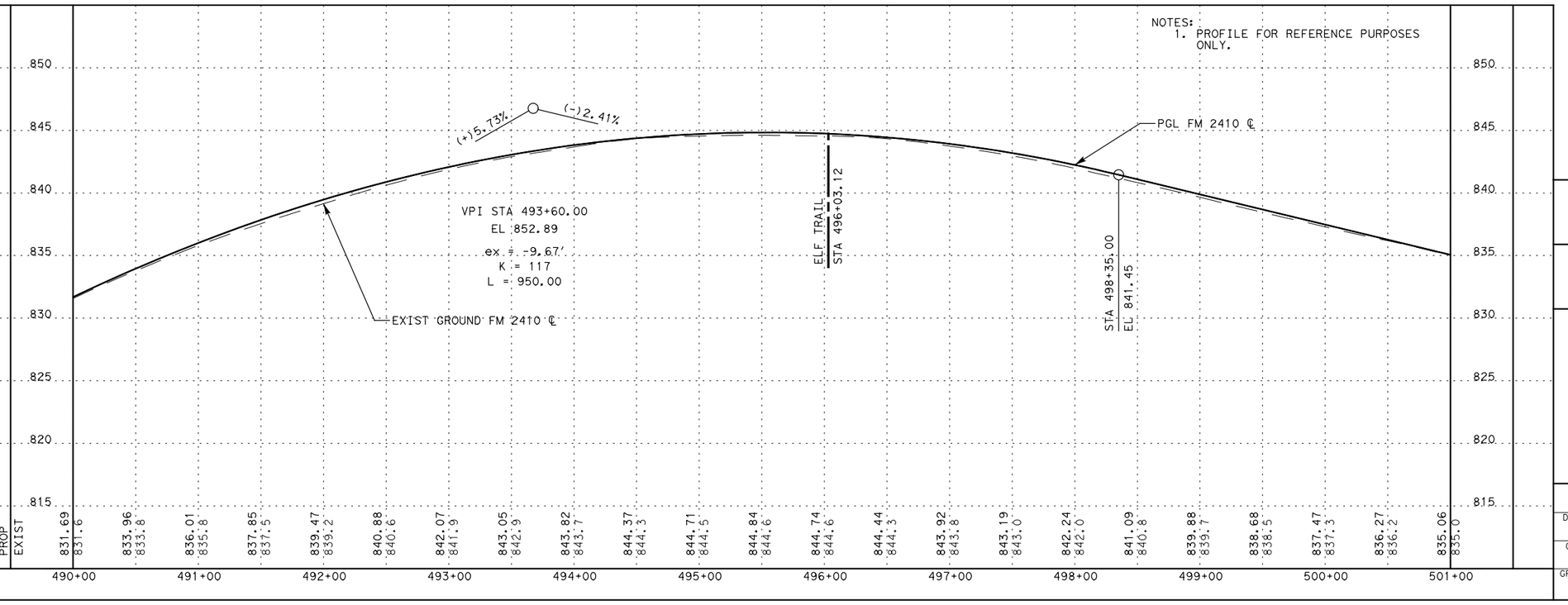
HORIZONTAL SCALE: 1" = 100'

5 2.5 0 5 10

VERTICAL SCALE: 1" = 10'

TREE TRIMMING - (RT)		
TYPE	FROM	TO
LIGHT	494+00	498+00

STA 490+00.00 to STA 491+00.00	STA 491+00.00 to STA 492+00.00	STA 492+00.00 to STA 493+00.00	STA 493+00.00 to STA 494+00.00	STA 494+00.00 to STA 495+00.00	STA 495+00.00 to STA 496+00.00	STA 496+00.00 to STA 497+00.00	STA 497+00.00 to STA 498+00.00	STA 498+00.00 to STA 499+00.00	STA 499+00.00 to STA 500+00.00	STA 500+00.00 to STA 501+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	0	0	0	0	0	0		CY	EXCAVATION (RDWY)
27	33	36	26	19	16	16	25	26	18	20	262		CY	EMBANKMENT
0	0	0	0	1	1	1	1	0	0	0	4		STA	PREPARING R.O.W.



JEFFREY W. PHILIPP
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FIRM REGISTRATION NO. F-230

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PLAN AND PROFILE LAYOUT

STA 490+00.00 TO STA 501+00.00

(SHEET 25 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	93
JP				
GRPH CHECK	2304	02	044	
RJ				

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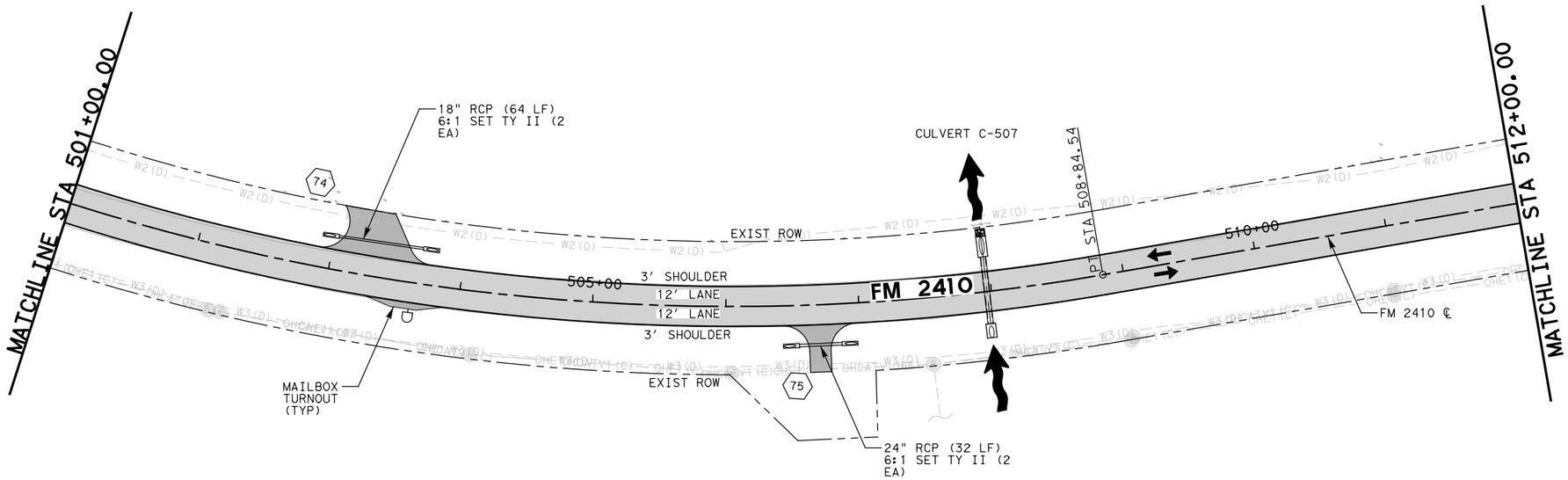
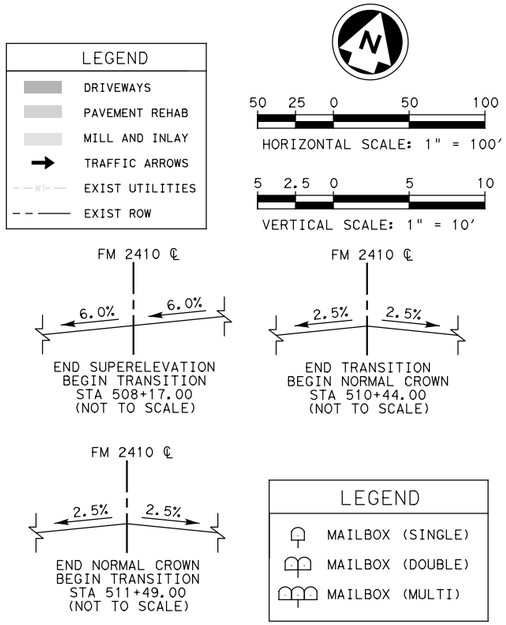
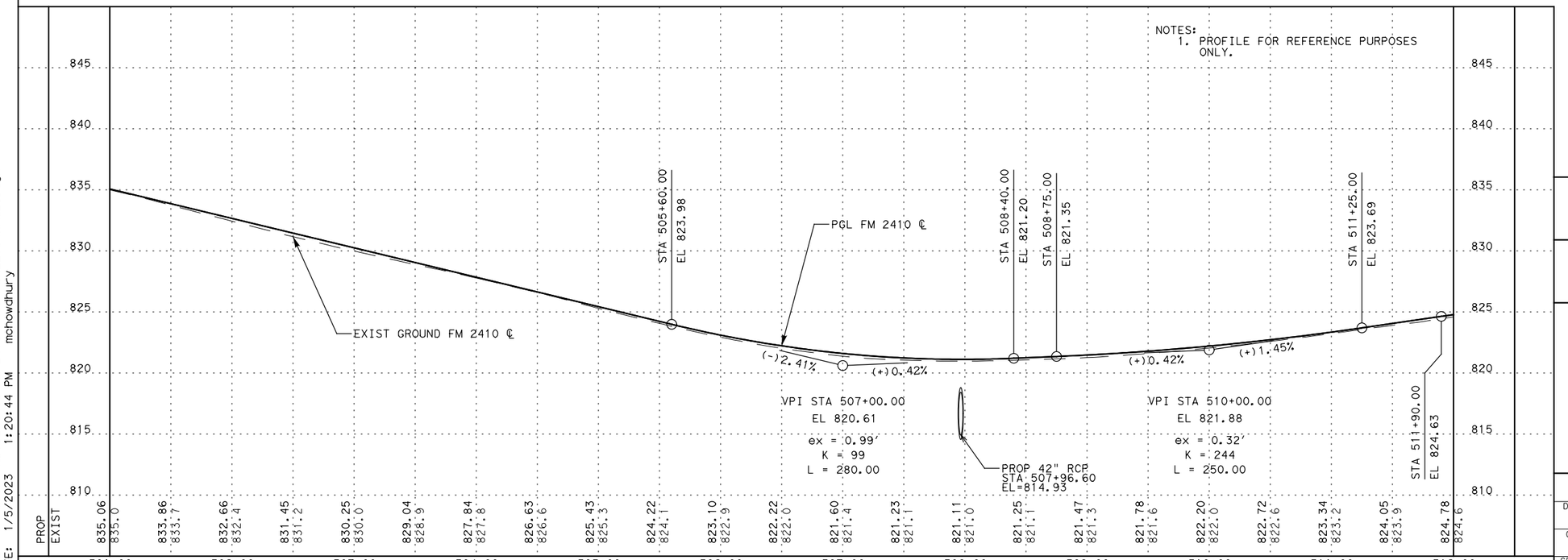
DATE: 1/5/2023 1:20:40 PM mchowdhury





STA 501+00.00 to STA 502+00.00	STA 502+00.00 to STA 503+00.00	STA 503+00.00 to STA 504+00.00	STA 504+00.00 to STA 505+00.00	STA 505+00.00 to STA 506+00.00	STA 506+00.00 to STA 507+00.00	STA 507+00.00 to STA 508+00.00	STA 508+00.00 to STA 509+00.00	STA 509+00.00 to STA 510+00.00	STA 510+00.00 to STA 511+00.00	STA 511+00.00 to STA 512+00.00	SECTION TOTALS			
											ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	1	1	0	0	0	0	1	1	0	4		CY	EXCAVATION (RDWY)
24	15	7	10	23	24	192	220	46	15	7	583		CY	EMBANKMENT
0	0	0	0	0	0	0	1	0	0	0	1		STA	PREPARING R.O.W.

TREE TRIMMING - (LT)		
TYPE	FROM	TO
HEAVY	508+00	509+00



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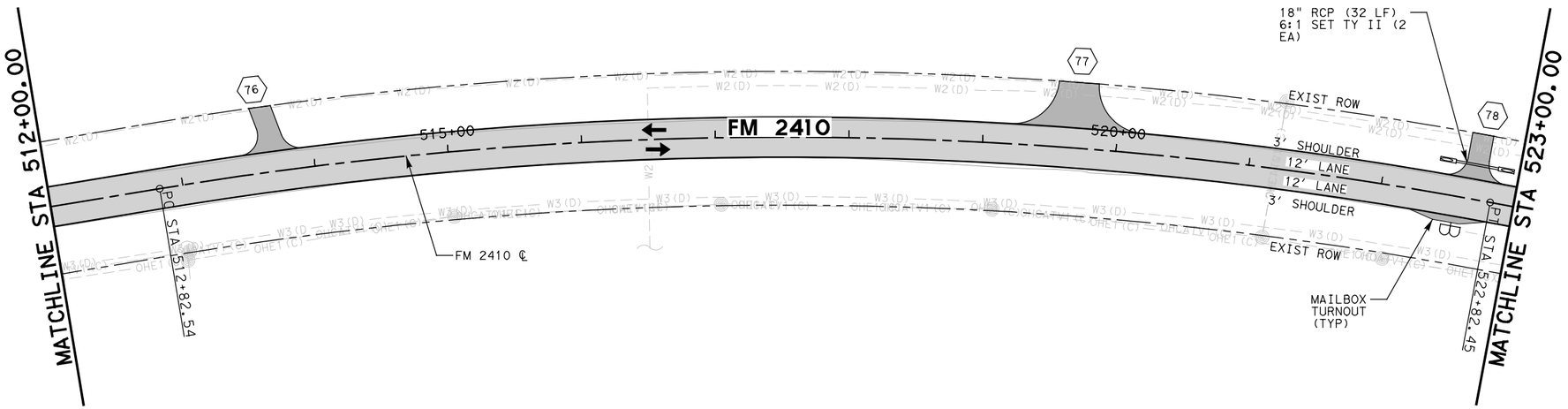
PLAN AND PROFILE LAYOUT

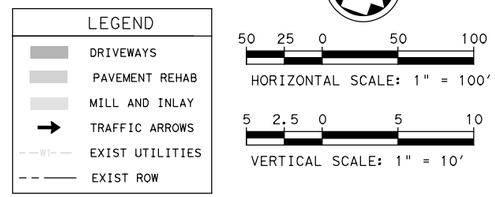
STA 501+00.00 TO STA 512+00.00

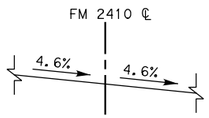
(SHEET 26 OF 35)

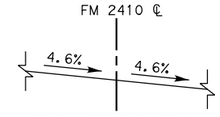
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	94
JP				
GRPH CHECK	2304	02	044	
RJ				

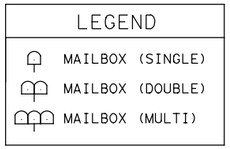
PI Station = 517+87.64
Delta = 20° 00′ 13.28" (RT)
Degree of Curve = 2° 00′ 01.98"
Tangent = 505.0956
Length = 999.9090
Radius = 2,864.0000
PC Station = 512+82.54
PT Station = 522+82.45



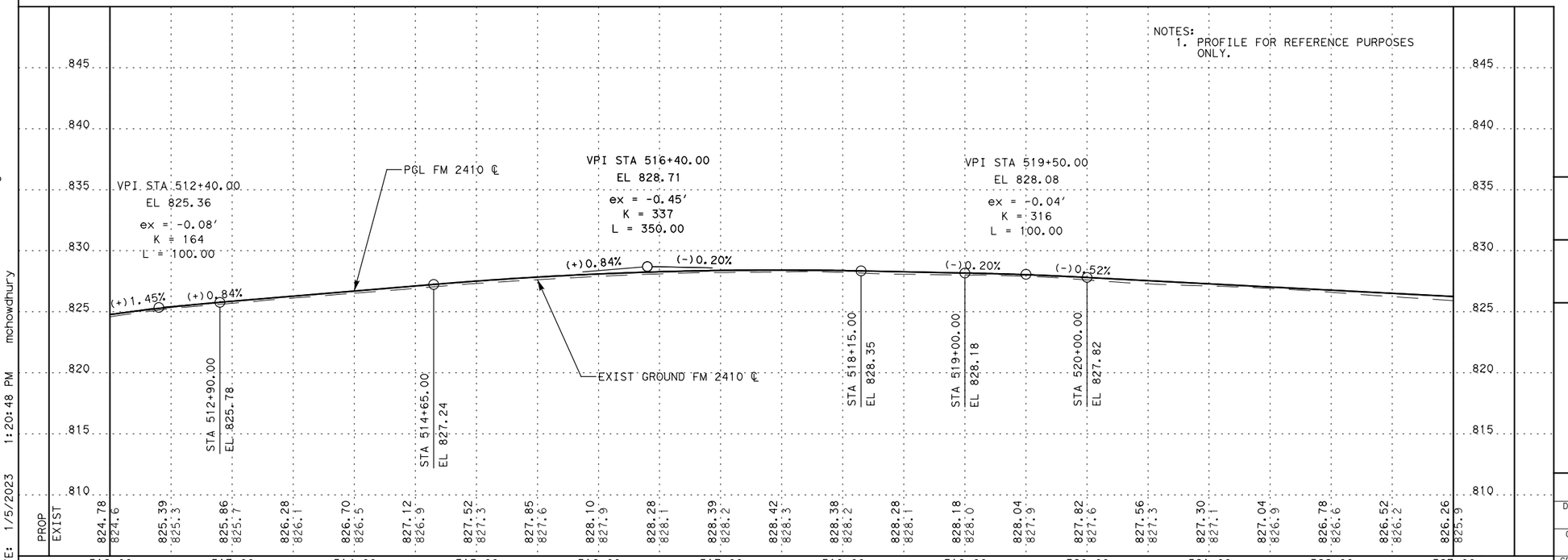








STA 512+00.00 to STA 513+00.00	STA 513+00.00 to STA 514+00.00	STA 514+00.00 to STA 515+00.00	STA 515+00.00 to STA 516+00.00	STA 516+00.00 to STA 517+00.00	STA 517+00.00 to STA 518+00.00	STA 518+00.00 to STA 519+00.00	STA 519+00.00 to STA 520+00.00	STA 520+00.00 to STA 521+00.00	STA 521+00.00 to STA 522+00.00	STA 522+00.00 to STA 523+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	0	0	0	0	0	0		CY	EXCAVATION (RDWY)
11	11	17	24	25	19	12	16	19	19	25	198		CY	EMBANKMENT
0	0	0	0	0	0	0	0	0	0	0	0		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:20:48 PM mchowdhury

JEFFREY W. PHILIPP
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1/5/2023

FIRM REGISTRATION NO. F-230

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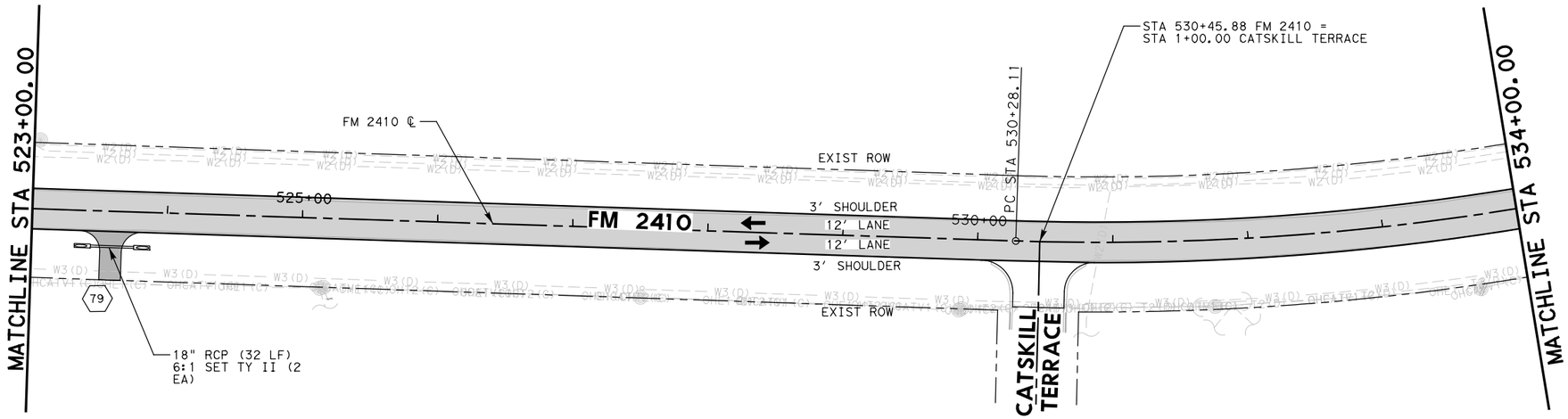
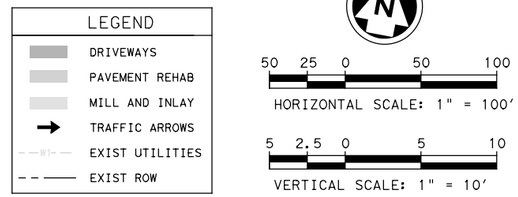
PLAN AND PROFILE LAYOUT

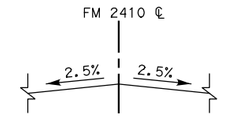
STA 512+00.00 TO STA 523+00.00

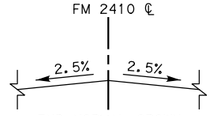
(SHEET 27 OF 35)

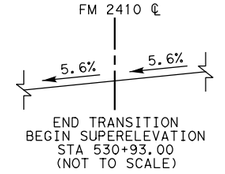
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	95
JP				
GRPH CHECK	2304	02	044	
RJ				





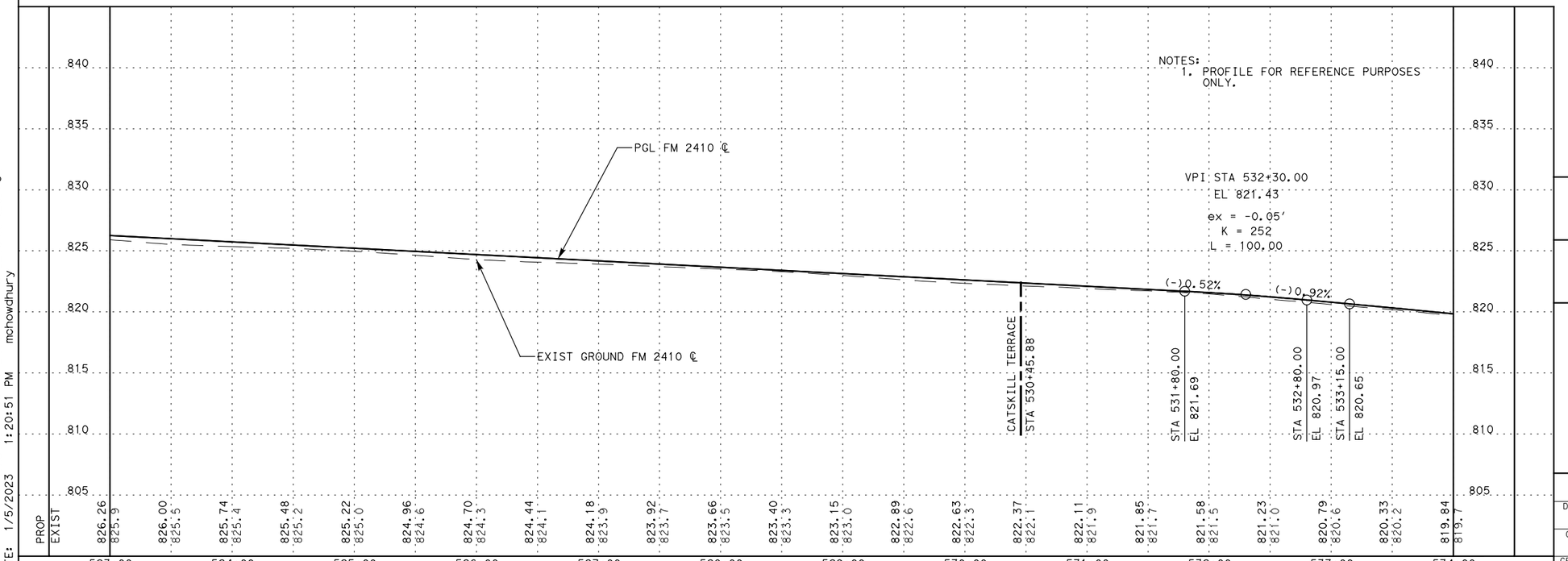






TREE TRIMMING - (LT)		
TYPE	FROM	TO
HEAVY	523+00	534+00

STA 523+00.00 to STA 524+00.00	STA 524+00.00 to STA 525+00.00	STA 525+00.00 to STA 526+00.00	STA 526+00.00 to STA 527+00.00	STA 527+00.00 to STA 528+00.00	STA 528+00.00 to STA 529+00.00	STA 529+00.00 to STA 530+00.00	STA 530+00.00 to STA 531+00.00	STA 531+00.00 to STA 532+00.00	STA 532+00.00 to STA 533+00.00	STA 533+00.00 to STA 534+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	1	1	0	0	0	0	2		CY	EXCAVATION (RDWY)
26	22	21	24	19	12	12	12	16	20	19	203		CY	EMBANKMENT
1	1	1	1	1	1	1	1	1	1	1	11		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:20:51 PM mchowdhury

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FIRM REGISTRATION NO. F-230

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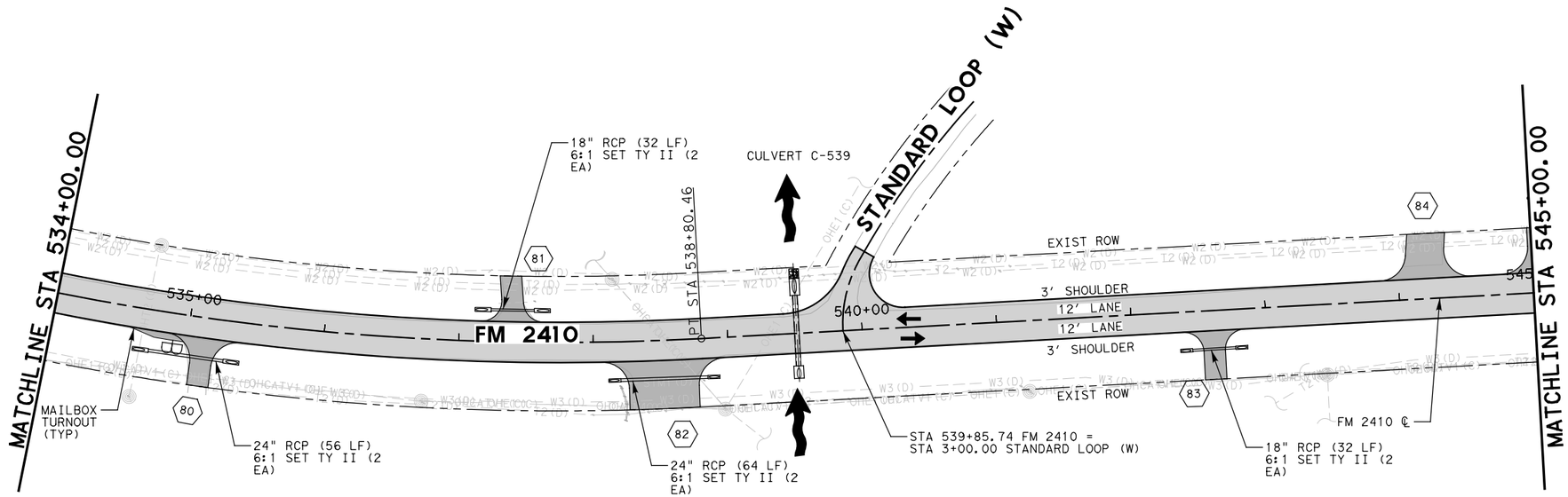
PLAN AND PROFILE LAYOUT

STA 523+00.00 TO STA 534+00.00

(SHEET 28 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	96
JP				
GRPH CHECK	2304	02	044	
RJ				



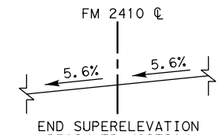
STA 534+00.00 to STA 535+00.00	STA 535+00.00 to STA 536+00.00	STA 536+00.00 to STA 537+00.00	STA 537+00.00 to STA 538+00.00	STA 538+00.00 to STA 539+00.00	STA 539+00.00 to STA 540+00.00	STA 540+00.00 to STA 541+00.00	STA 541+00.00 to STA 542+00.00	STA 542+00.00 to STA 543+00.00	STA 543+00.00 to STA 544+00.00	STA 544+00.00 to STA 545+00.00	SECTION TOTALS			
											ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	1	1	0	0	0	0	2		CY	EXCAVATION (RDWY)
14	13	19	28	28	11	14	21	16	15	46	225		CY	EMBANKMENT
1	1	1	0	0	0	0	0	0	0	0	3		STA	PREPARING R.O.W.

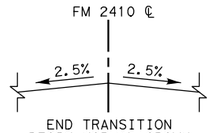
LEGEND

- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

50 25 0 50 100
HORIZONTAL SCALE: 1" = 100'

5 2.5 0 5 10
VERTICAL SCALE: 1" = 10'

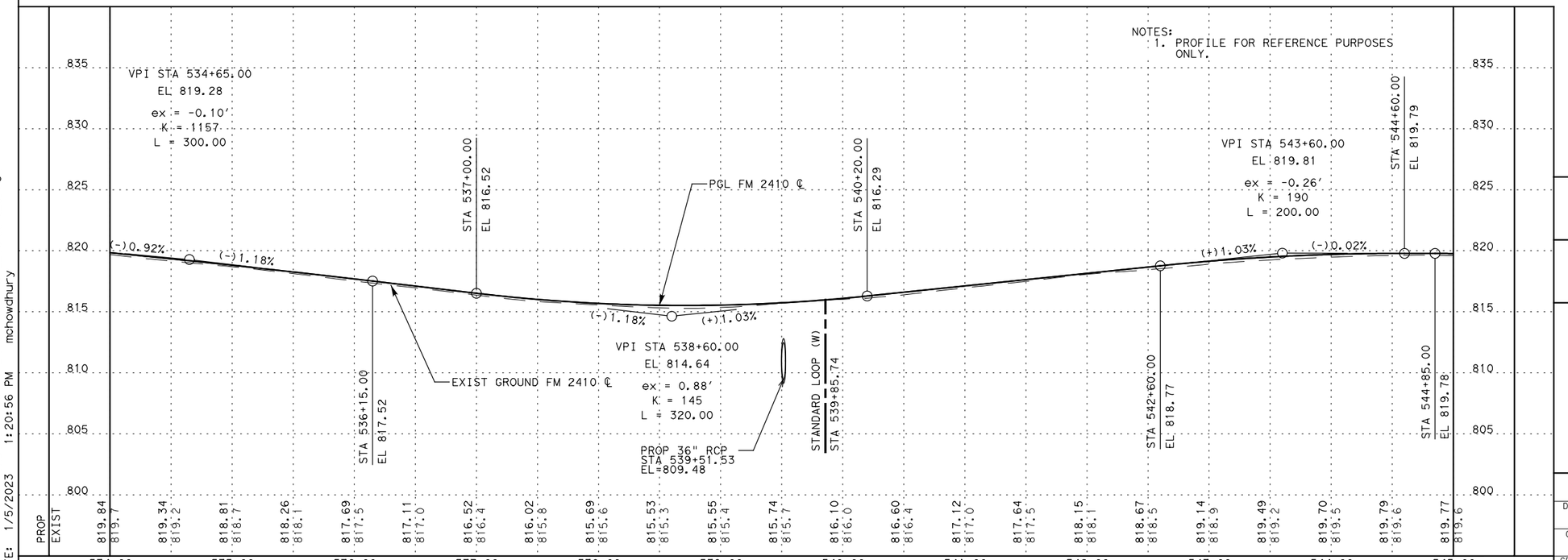




LEGEND

- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

TREE TRIMMING - (LT)		
TYPE	FROM	TO
HEAVY	534+00	537+00



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DATE: 1/5/2023 1:20:56 PM mchowdhury

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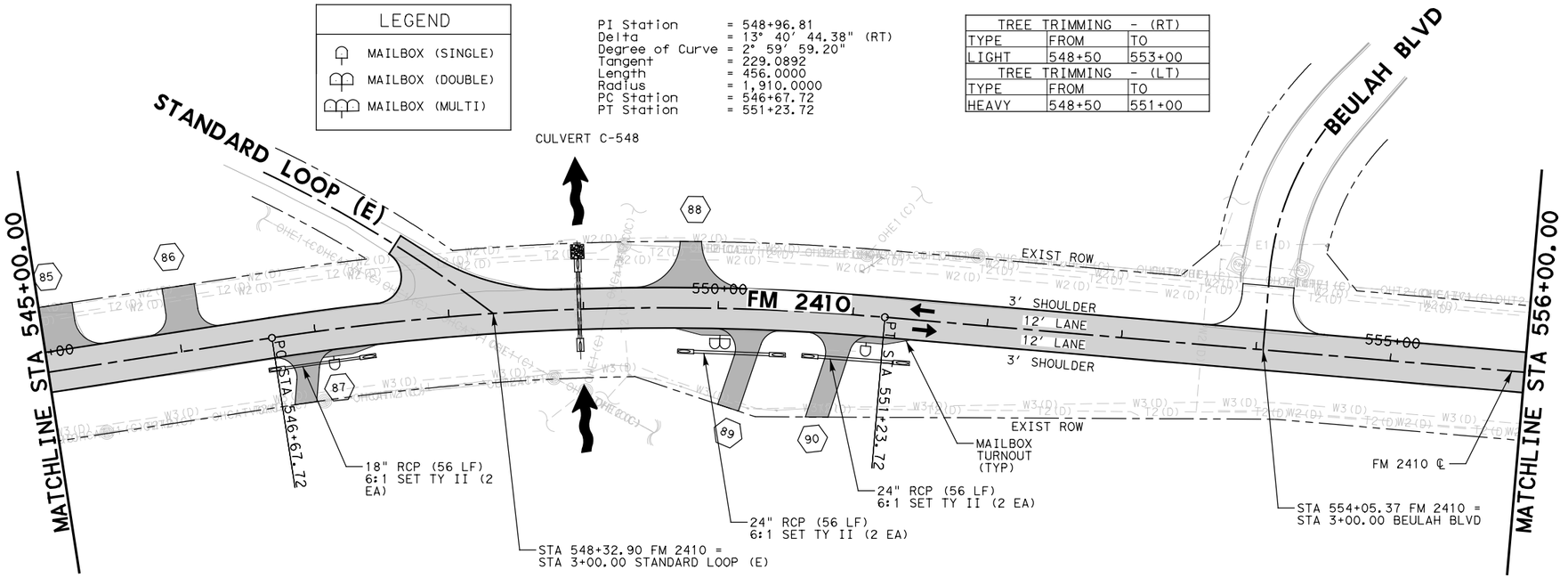
PLAN AND PROFILE LAYOUT

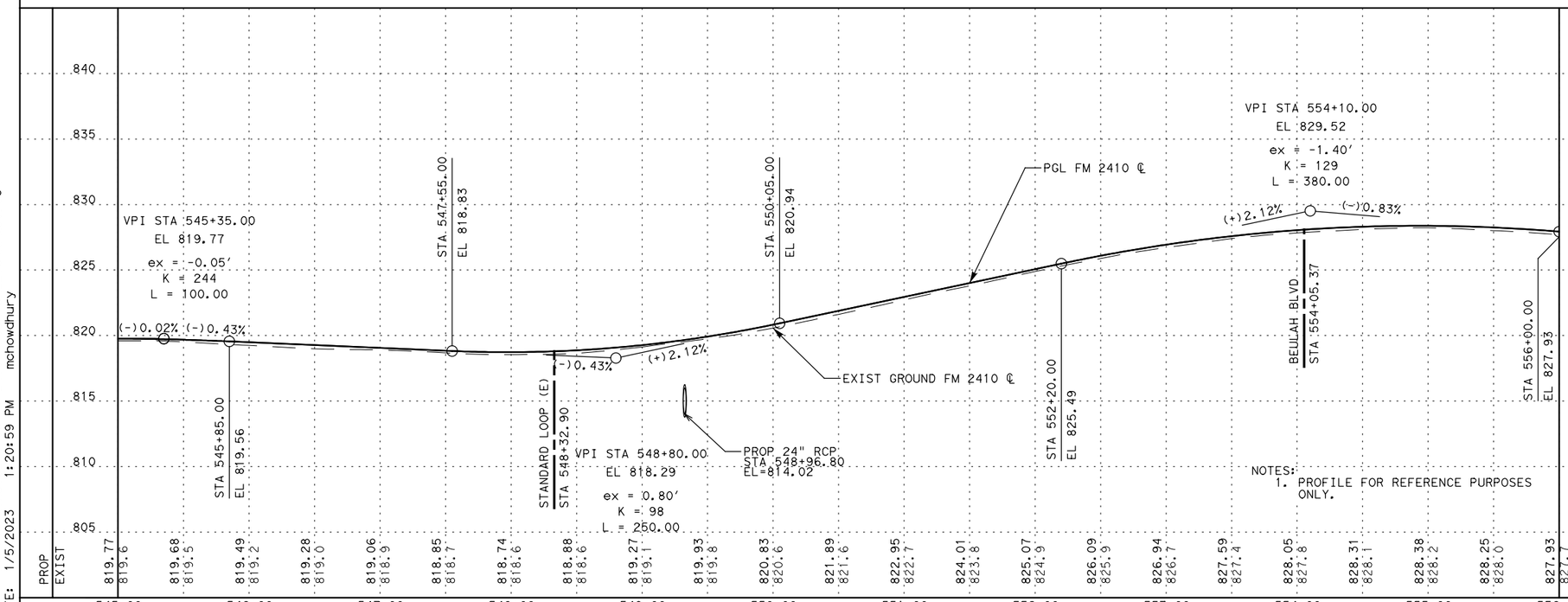
STA 534+00.00 TO STA 545+00.00

(SHEET 29 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	97
JP				
GRPH CHECK	2304	02	044	
RJ				



STA 545+00.00 to STA 546+00.00	STA 546+00.00 to STA 547+00.00	STA 547+00.00 to STA 548+00.00	STA 548+00.00 to STA 549+00.00	STA 549+00.00 to STA 550+00.00	STA 550+00.00 to STA 551+00.00	STA 551+00.00 to STA 552+00.00	STA 552+00.00 to STA 553+00.00	STA 553+00.00 to STA 554+00.00	STA 554+00.00 to STA 555+00.00	STA 555+00.00 to STA 556+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	0	0	0	0	0	0		CY	EXCAVATION (RDWY)
123	99	17	22	29	16	19	19	10	5	10	369		CY	EMBANKMENT
0	0	0	0.5	1	1	1	1	0	0	0	4.5		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:20:59 PM mchowdhury

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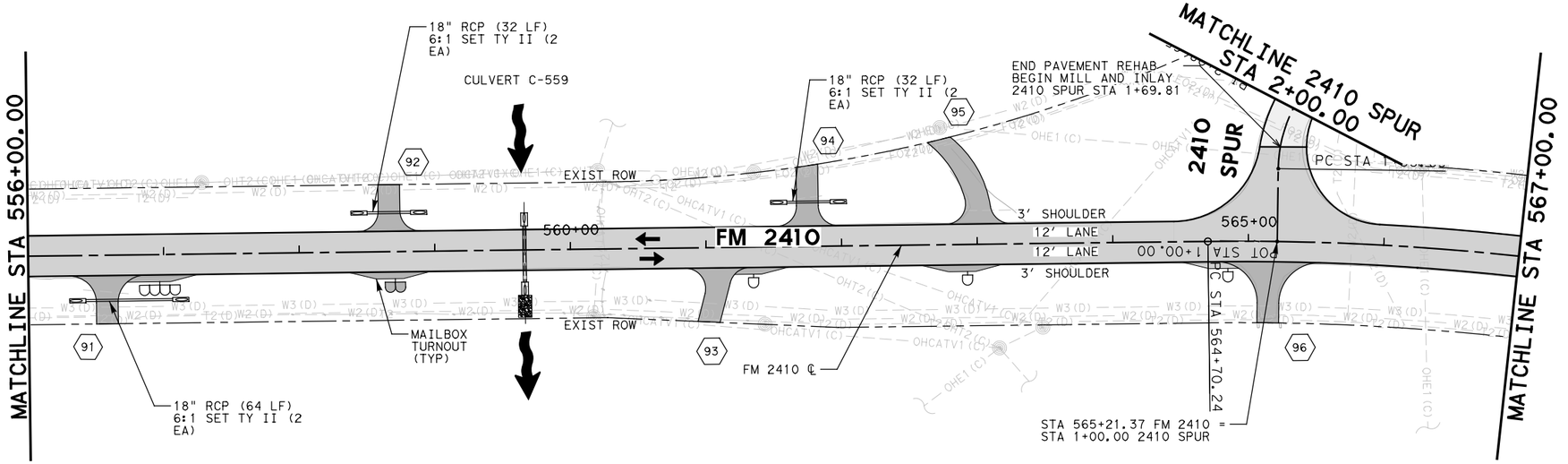
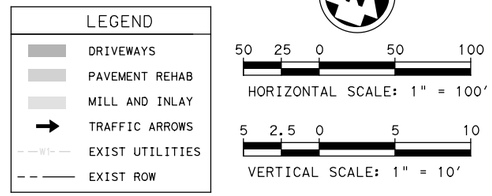
PLAN AND PROFILE LAYOUT

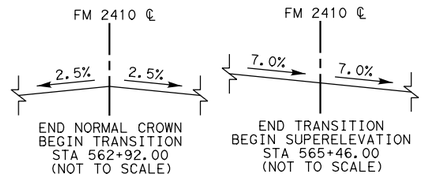
STA 545+00.00 TO STA 556+00.00

(SHEET 30 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	98
JP				
GRPH CHECK	2304	02	044	
RJ				





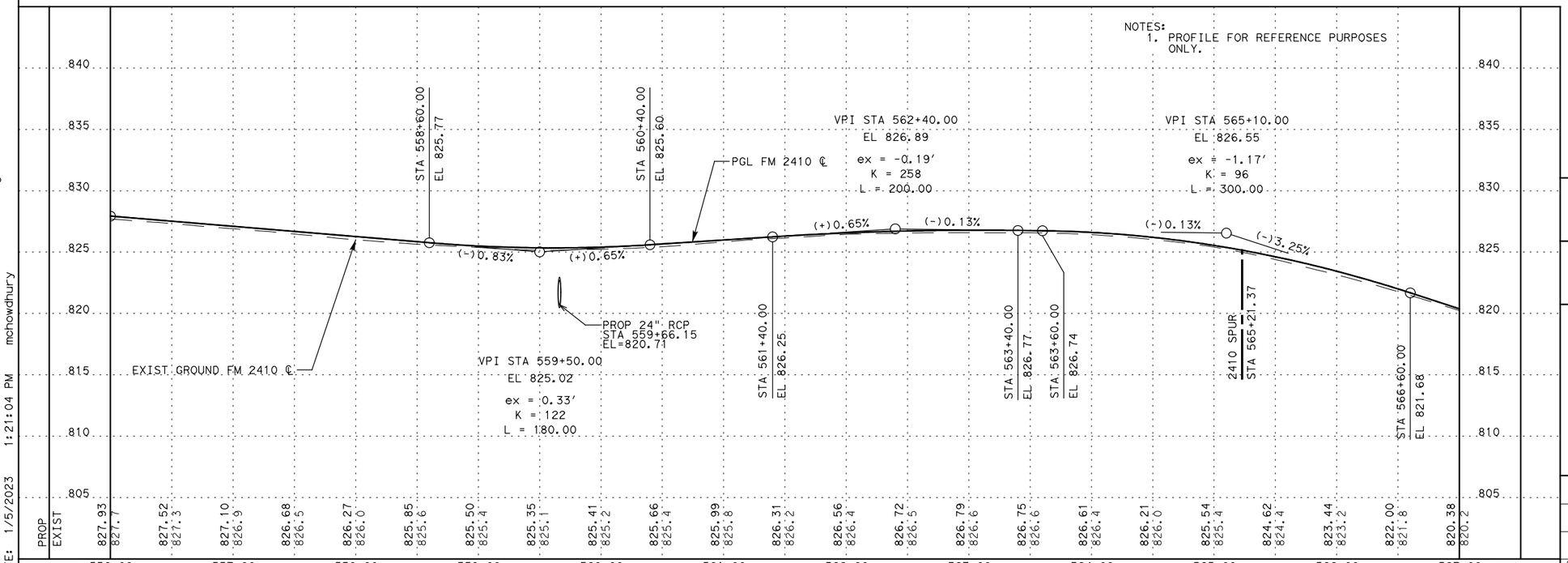


TREE TRIMMING - (RT)		
TYPE	FROM	TO
LIGHT	557+00	560+00
TREE TRIMMING - (LT)		
TYPE	FROM	TO
HEAVY	559+00	561+50

LEGEND

- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

STA 556+00.00 to STA 557+00.00	STA 557+00.00 to STA 558+00.00	STA 558+00.00 to STA 559+00.00	STA 559+00.00 to STA 560+00.00	STA 560+00.00 to STA 561+00.00	STA 561+00.00 to STA 562+00.00	STA 562+00.00 to STA 563+00.00	STA 563+00.00 to STA 564+00.00	STA 564+00.00 to STA 565+00.00	STA 565+00.00 to STA 566+00.00	STA 566+00.00 to STA 567+00.00	SECTION TOTALS			
											ESTIMATED	FINAL	UNIT	DESCRIPTION
9	9	0	0	9	12	14	13	5	4	0	75		CY	EXCAVATION (RDWY)
12	7	3	8	10	3	0	0	0	2	2	47		CY	EMBANKMENT
0	1	1	1	1	0.5	0	0	0	0	0	4.5		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:21:04 PM mchowdhury

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1/5/2023

FIRM REGISTRATION NO. F-230

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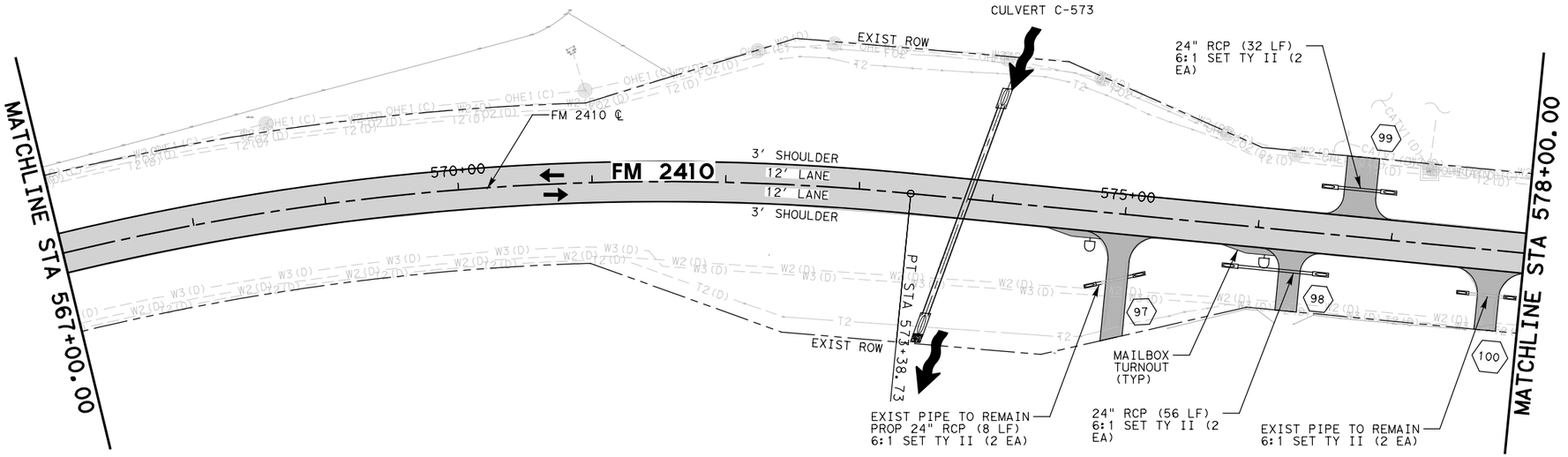
PLAN AND PROFILE LAYOUT

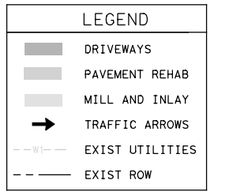
STA 556+00.00 TO STA 567+00.00

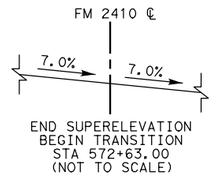
(SHEET 31 OF 35)

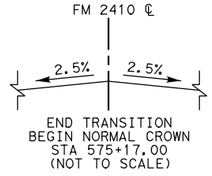
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	99
JP				
GRPH CHECK	2304	02	044	
RJ				

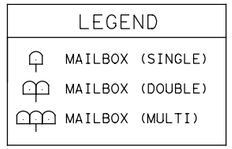
PI Station = 569+12.13
Delta = 26° 03′ 10.82" (RT)
Degree of Curve = 2° 59′ 59.20"
Tangent = 441.8889
Length = 868.4975
Radius = 1,910.0000
PC Station = 564+70.24
PT Station = 573+38.73



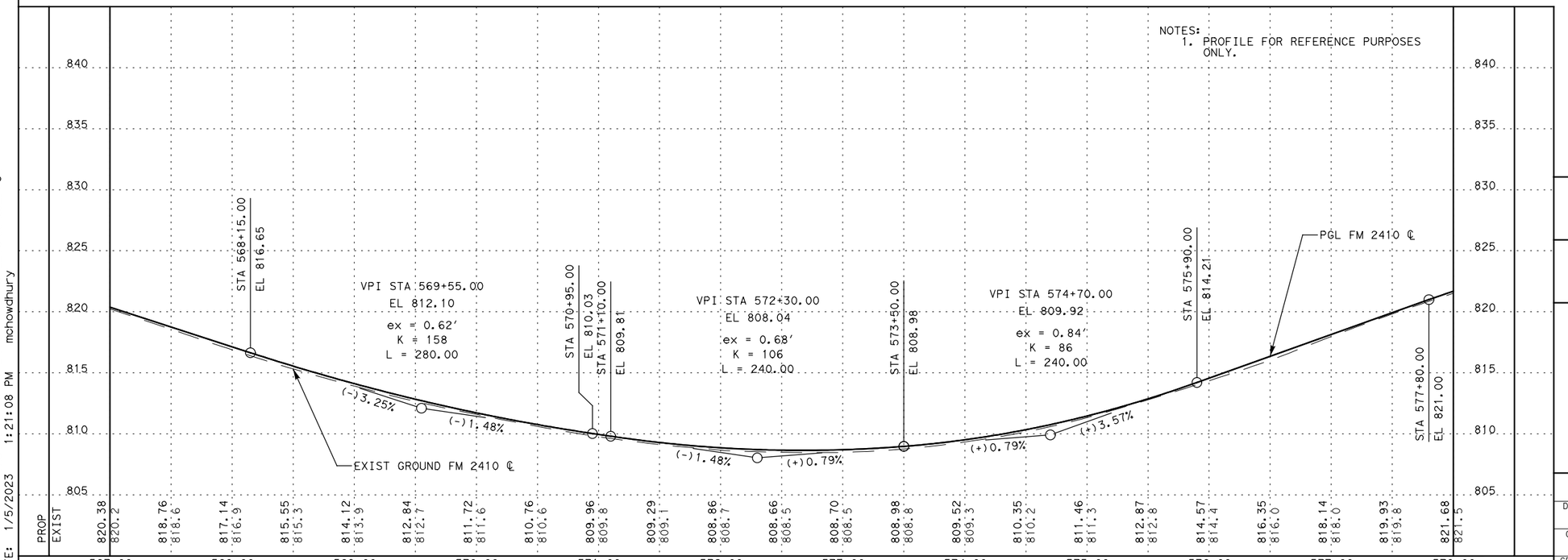








STA 567+00.00 to STA 568+00.00	STA 568+00.00 to STA 569+00.00	STA 569+00.00 to STA 570+00.00	STA 570+00.00 to STA 571+00.00	STA 571+00.00 to STA 572+00.00	STA 572+00.00 to STA 573+00.00	STA 573+00.00 to STA 574+00.00	STA 574+00.00 to STA 575+00.00	STA 575+00.00 to STA 576+00.00	STA 576+00.00 to STA 577+00.00	STA 577+00.00 to STA 578+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0	0	0	0	0	1	8	7	0	16		CY	EXCAVATION (RDWY)
2	3	1	1	1	2	2	354	357	4	1	728		CY	EMBANKMENT
0	0	0	0	0	0	0	0	0	0	0	0		STA	PREPARING R.O.W.



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DATE: 1/5/2023 1:21:08 PM mchowdhury

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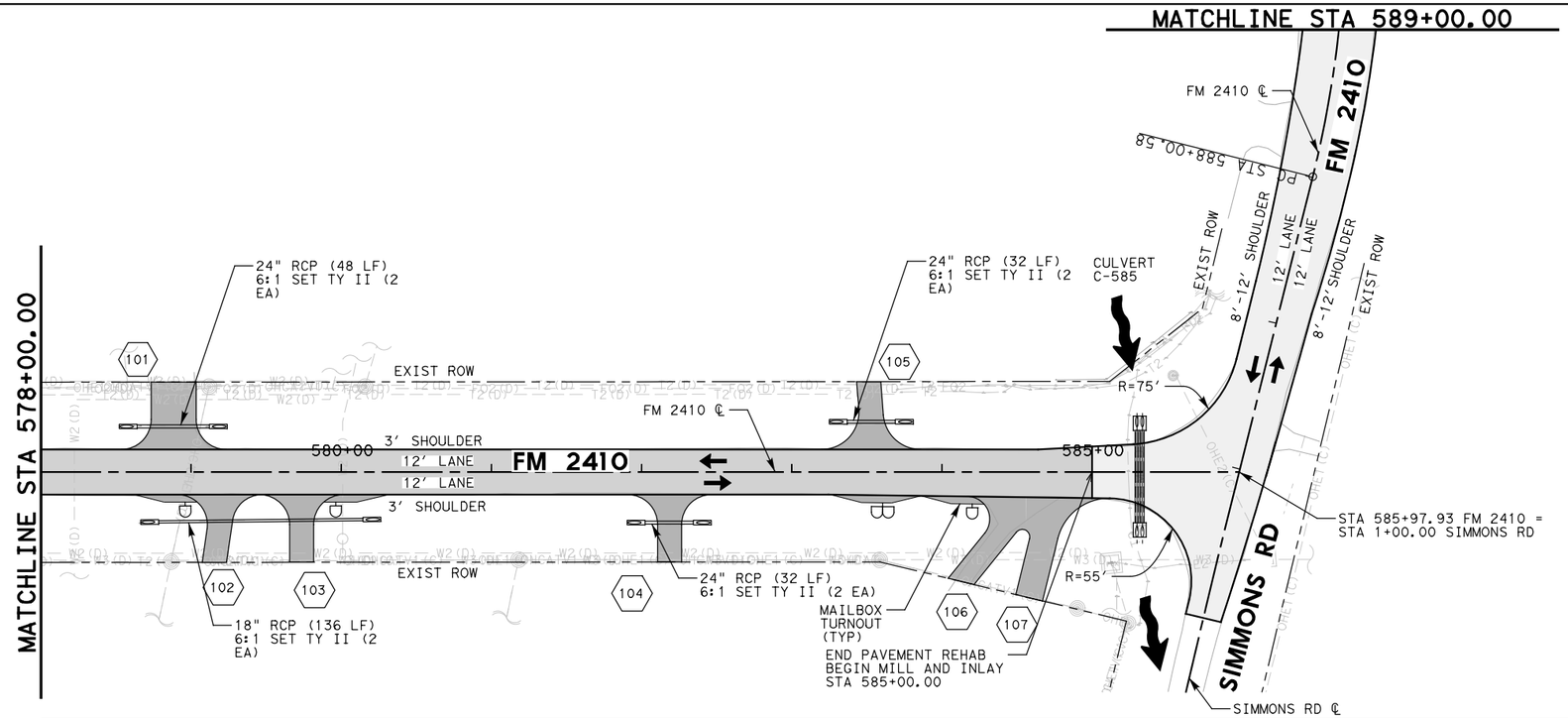
PLAN AND PROFILE LAYOUT

STA 567+00.00 TO STA 578+00.00

(SHEET 32 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	100
JP				
GRPH CHECK	2304	02	044	
RJ				

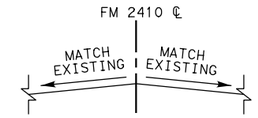


NOTES:
1. PROFILE FOR REFERENCE PURPOSES ONLY.

LEGEND
- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

50 25 0 50 100
HORIZONTAL SCALE: 1" = 100'

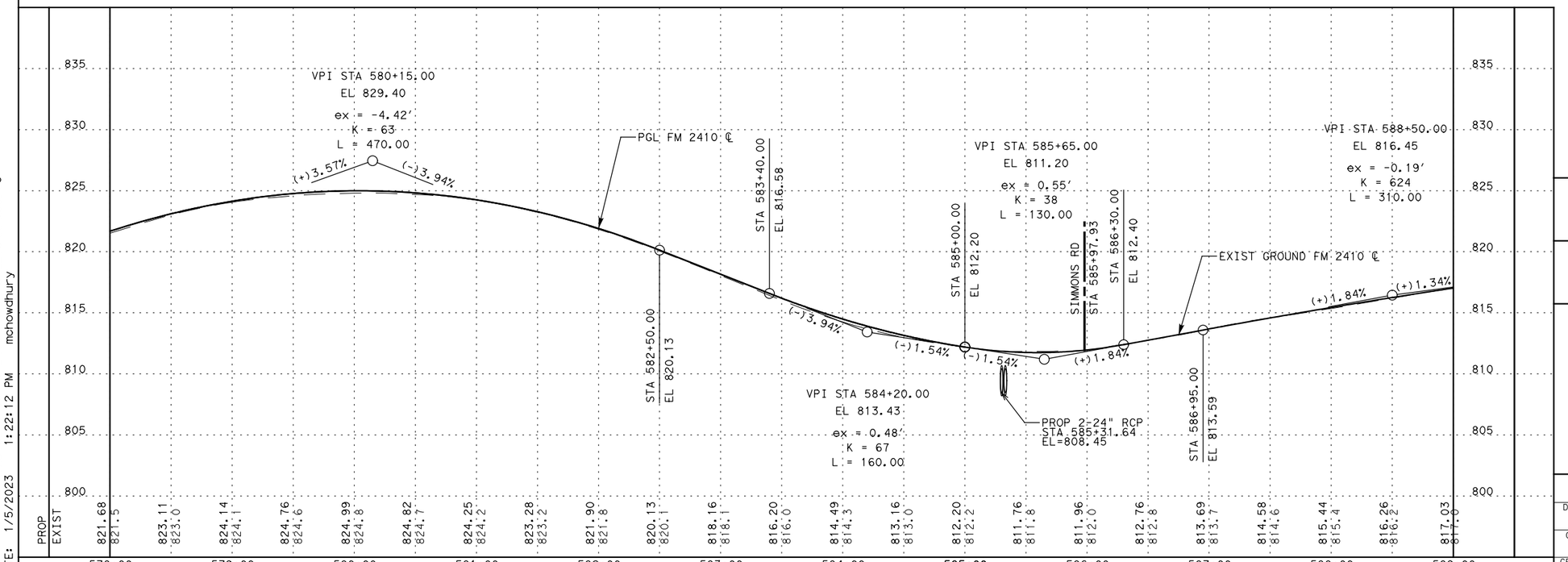
5 2.5 0 5 10
VERTICAL SCALE: 1" = 10'



STA 585+00.00 - STA 590+96.41
(NOT TO SCALE)

LEGEND
- MAILBOX (SINGLE)
- MAILBOX (DOUBLE)
- MAILBOX (MULTI)

STA 578+00.00 to STA 579+00.00	STA 579+00.00 to STA 580+00.00	STA 580+00.00 to STA 581+00.00	STA 581+00.00 to STA 582+00.00	STA 582+00.00 to STA 583+00.00	STA 583+00.00 to STA 584+00.00	STA 584+00.00 to STA 585+00.00	STA 585+00.00 to STA 586+00.00	STA 586+00.00 to STA 587+00.00	STA 587+00.00 to STA 588+00.00	STA 588+00.00 to STA 589+00.00	SECTION TOTALS ESTIMATED	FINAL	UNIT	DESCRIPTION
1	13	16	12	7	0	9	0	0	0	0	58		CY	EXCAVATION (RDWY)
0	1	1	0	0	1	0	0	0	0	0	3		CY	EMBANKMENT
0	0	0	0	0	0	0	0	0	0	0	0		STA	PREPARING R.O.W.



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JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230
tnp
Texas Department of Transportation

FM 2410

PLAN AND PROFILE LAYOUT

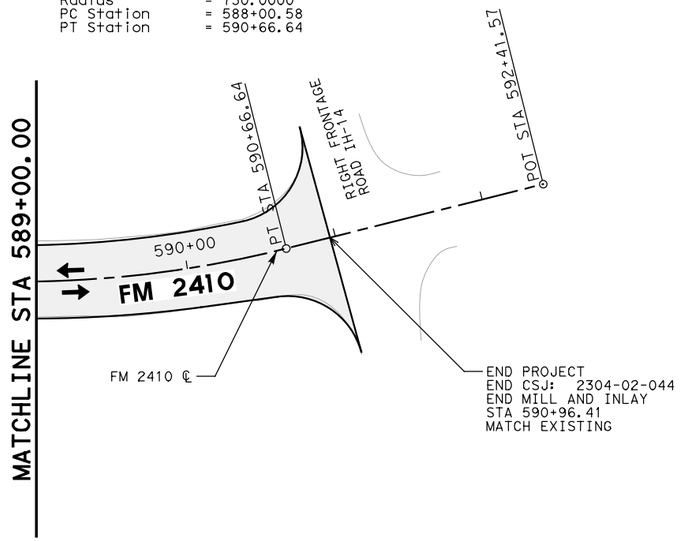
STA 578+00.00 TO STA 589+00.00

(SHEET 33 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	101
JP				
GRPH CHECK	2304	02	044	
RJ				

FILE: P:\MSGP\TXD18248\06-FM#2410\PROD*SHEETS\RPM33.dgn
DATE: 1/5/2023 1:22:12 PM mchowdhury

PI Station = 589+35.10
Delta = 20° 52′ 58.27" (LT)
Degree of Curve = 7° 50′ 55.45"
Tangent = 134.5257
Length = 266.0664
Radius = 730.0000
PC Station = 588+00.58
PT Station = 590+66.64



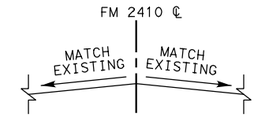
STA 589+00.00 to	STA 590+00.00 to	SECTION TOTALS			
STA 590+00.00	STA 590+96.41	ESTIMATED	FINAL	UNIT	DESCRIPTION
0	0	0		CY	EXCAVATION (RDWY)
0	0	0		CY	EMBANKMENT
0	0	0		STA	PREPARING R.O.W.

NOTES:
1. PROFILE FOR REFERENCE PURPOSES ONLY.

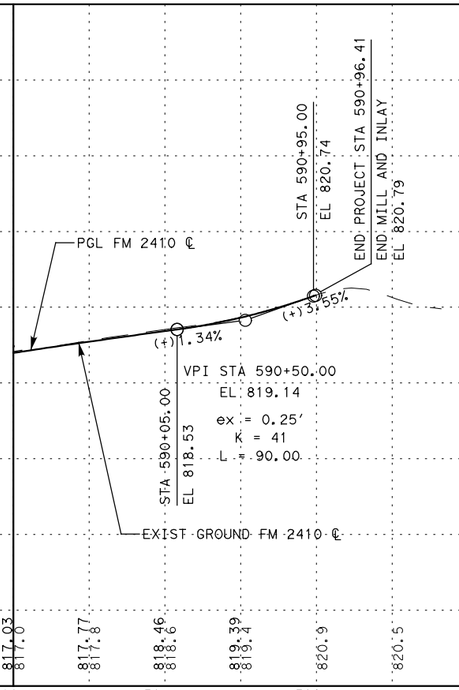
LEGEND
- DRIVEWAYS
- PAVEMENT REHAB
- MILL AND INLAY
- TRAFFIC ARROWS
- EXIST UTILITIES
- EXIST ROW

50 25 0 50 100
HORIZONTAL SCALE: 1" = 100′

5 2.5 0 5 10
VERTICAL SCALE: 1" = 10′



STA 585+00.00 - STA 590+96.41
(NOT TO SCALE)



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JEFFREY W. PHILIPP
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STATE OF TEXAS
1/5/2023

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

FM 2410

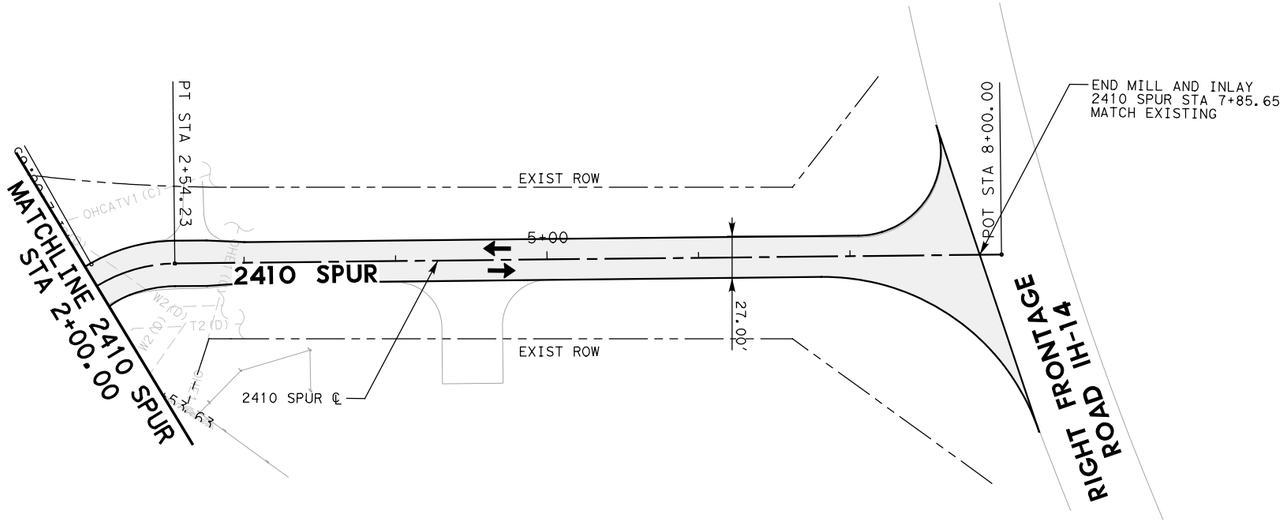
PLAN AND PROFILE LAYOUT

STA 589+00.00 TO STA 590+96.41

(SHEET 34 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	102
JP				
GRPH CHECK	2304	02	044	
RJ				

NOTES:
1. PROFILE FOR REFERENCE PURPOSES ONLY.



LEGEND	
	DRIVEWAYS
	PAVEMENT REHAB
	MILL AND INLAY
→	TRAFFIC ARROWS
W	EXIST UTILITIES
	EXIST ROW

50 25 0 50 100
HORIZONTAL SCALE: 1" = 100'

5 2.5 0 5 10
VERTICAL SCALE: 1" = 10'

PROFILE INTENTIONALLY LEFT BLANK

STATE OF TEXAS
JEFFREY W. PHILIPP
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1/5/2023

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FM 2410

PLAN AND PROFILE LAYOUT
2410 SPUR

(SHEET 35 OF 35)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	103
JP				
GRPH CHECK	2304	02	044	
RJ				

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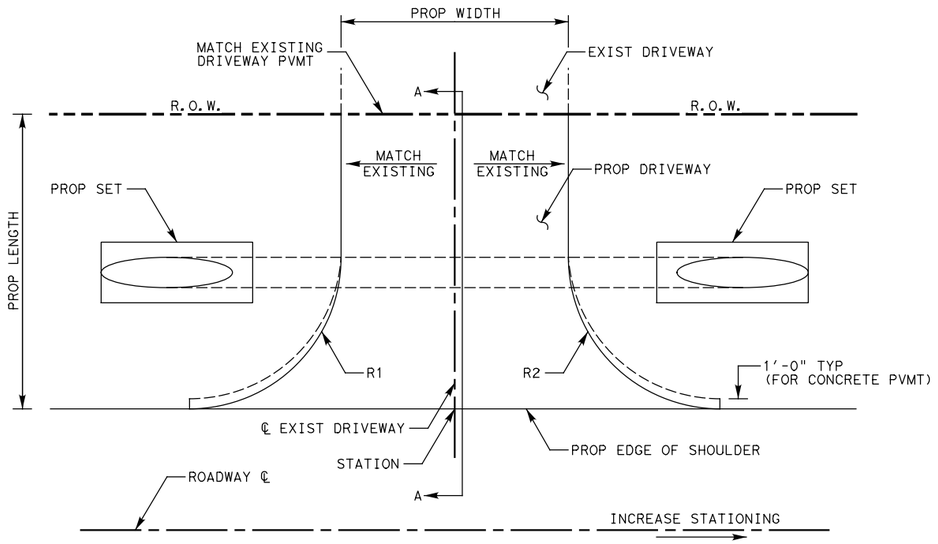
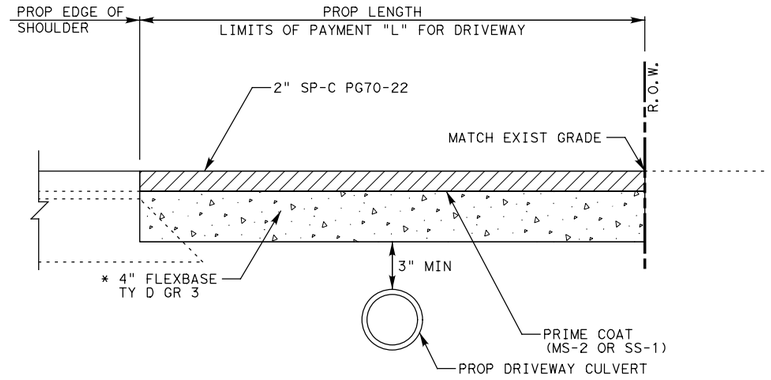
DATE: 1/5/2023 1:22:20 PM mchowdhury



DRIVEWAYS

(NOT TO SCALE)

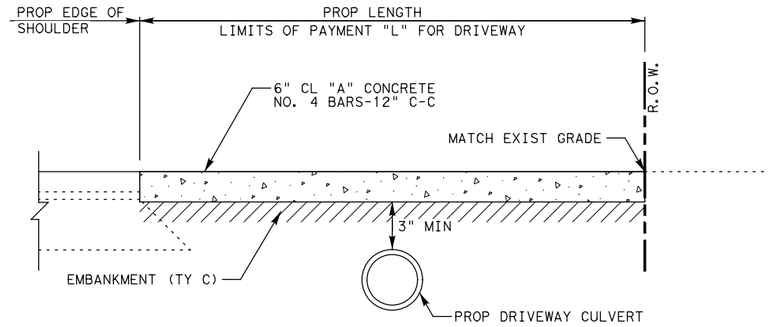
DRIVEWAYS WILL CONSIST OF: BLADING AND RESHAPING THE SUBGRADE, WORKING DITCH SLOPES UPSTREAM AND DOWNSTREAM TO ALLOW POSITIVE DRAINAGE OF ADJACENT DITCHES, PROVIDING ADDITIONAL EMBANKMENT NECESSARY TO ACHIEVE PROPER SUBGRADE WIDTH, PLACEMENT OF 4" FLEX BASE, PRIME, AND 2" SP-C PG70-22 OR EMBANKMENT (TY B) AND 6" CL "A" CONCRETE. SEE SECTION A-A FOR DETAILS. ALL WORK IS CONSIDERED SUBSIDIARY TO ITEM 530.



SECTION A-A

(ASPHALT)

(NOT TO SCALE)



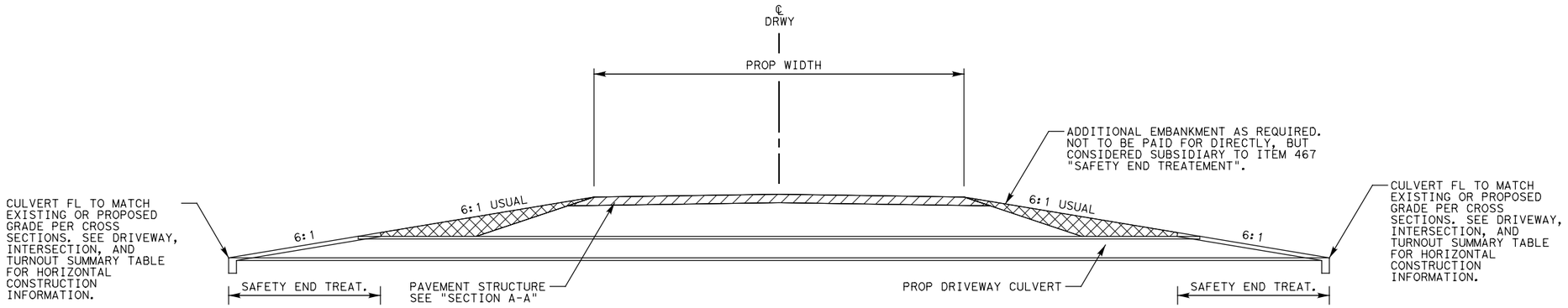
SECTION A-A

(CONCRETE)

(NOT TO SCALE)

NOTES:

1. SAW CUT JOINT AT LIMIT OF ROW LINE ON DRIVEWAYS WITH AN EXISTING CONCRETE OR ASPHALT SURFACE.
2. SEE PLANS LAYOUTS AND DRIVEWAY QUANITITIES FOR ADDITIONAL DETAILS & DIMENSIONS.
3. MINIMUM DRIVEWAY WIDTH IS 16' FOR DRIVEWAY RECONSTRUCTION.
4. 2" SP-C PG70-22 FOR DRIVEWAY WILL BE CONSTRUCTED WITH FINAL ROADWAY SURFACE. ALL WORK WILL BE PAID UNDER ITEM 530.
5. ADDITIONAL GRADING OF DITCHES ADJACENT TO DRIVEWAY PIPE MAY BE REQUIRED TO PLACE PIPE AT PROPER DEPTH BELOW PROPOSED DRIVEWAY AND MAINTAIN POSITIVE DRAINAGE.
6. REMOVAL OF EXISTING ASPHALT AND CONCRETE DRIVEWAY IS SUBSIDIARY TO ITEM 530.



DRIVEWAY TYPICAL SECTION

(NOT TO SCALE)

STATE OF TEXAS
RYAN MICHAEL JONES
110010
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1/5/2023

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

FM 2410

DRIVEWAY DETAILS

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	104
JP				
GRPH CHECK	2304	02	044	
RJ				

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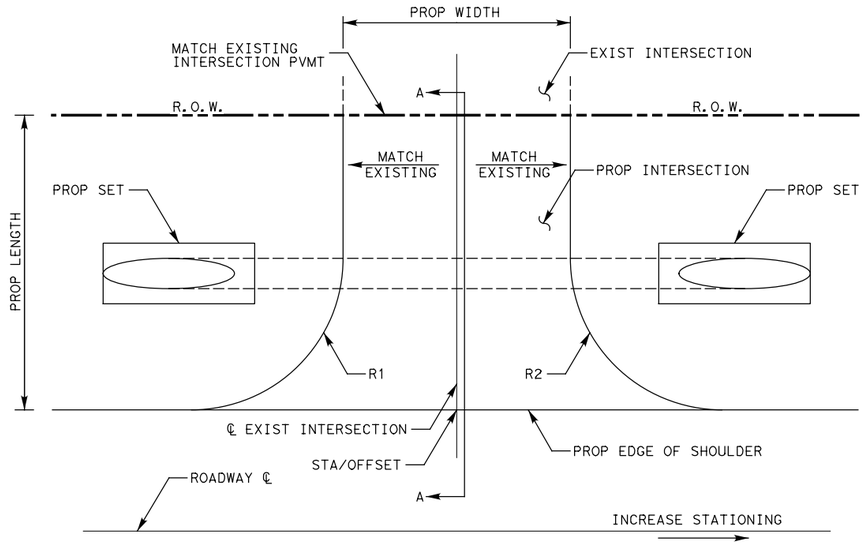
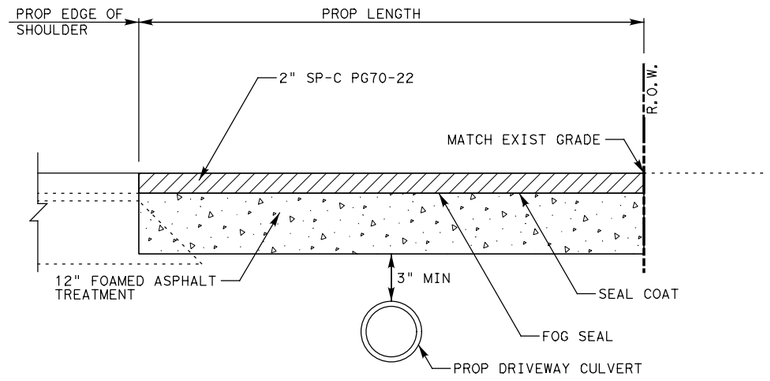


INTERSECTION

(NOT TO SCALE)

INTERSECTIONS WILL CONSIST OF: BLADING AND RESHAPING THE SUBGRADE, WORKING DITCH SLOPES UPSTREAM AND DOWNSTREAM TO ALLOW POSITIVE DRAINAGE OF ADJACENT DITCHES, PROVIDING ADDITIONAL EMBANKMENT NECESSARY TO ACHIEVE PROPER SUBGRADE WIDTH, 12" FOAMED ASPHALT, SEAL COAT, FOG SEAL, AND 2" SP-C PG70-22. SEE SECTION A-A FOR DETAILS. ALL WORK IS CONSIDERED SUBSIDIARY TO ITEM 530.

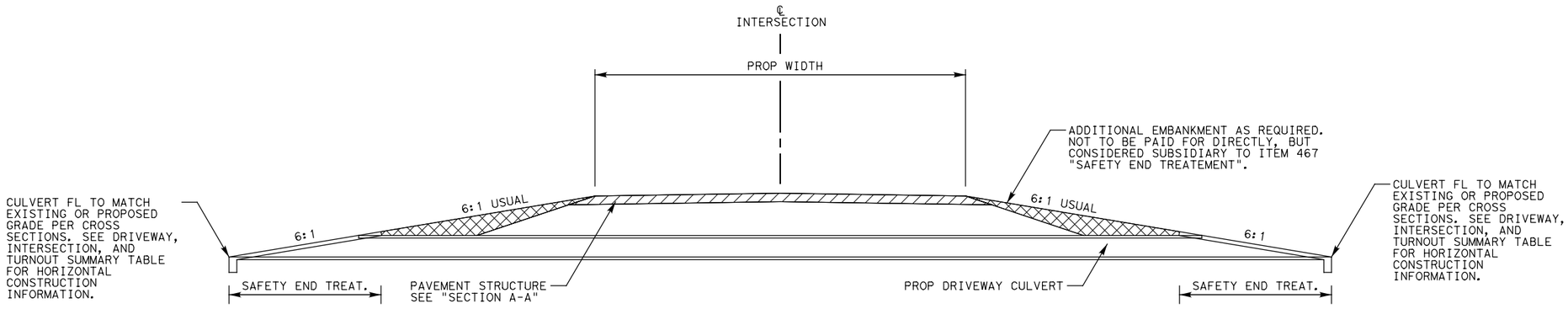


SECTION A-A

(NOT TO SCALE)

NOTES:

1. SAW CUT JOINT AT LIMIT OF PAY LINE ON INTERSECTION WITH AN EXISTING ASPHALT SURFACE.
2. SEE PLANS LAYOUTS FOR ADDITIONAL DETAILS & DIMENSIONS.
3. MINIMUM INTERSECTION WIDTH IS 16′ FOR INTERSECTION RECONSTRUCTION.
4. 2" SP-C PG70-22 FOR INTERSECTION WILL BE CONSTRUCTED WITH FINAL ROADWAY SURFACE.
5. ADDITIONAL GRADING OF DITCHES ADJACENT TO INTERSECTION PIPE MAY BE REQUIRED TO PLACE PIPE AT PROPER DEPTH BELOW PROPOSED DRIVEWAY AND MAINTAIN POSITIVE DRAINAGE.



INTERSECTION TYPICAL SECTION

(NOT TO SCALE)

FIRM REGISTRATION NO. F-230

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FM 2410

INTERSECTION DETAILS

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	105
JP				
GRPH CHECK	2304	02	044	
RJ				

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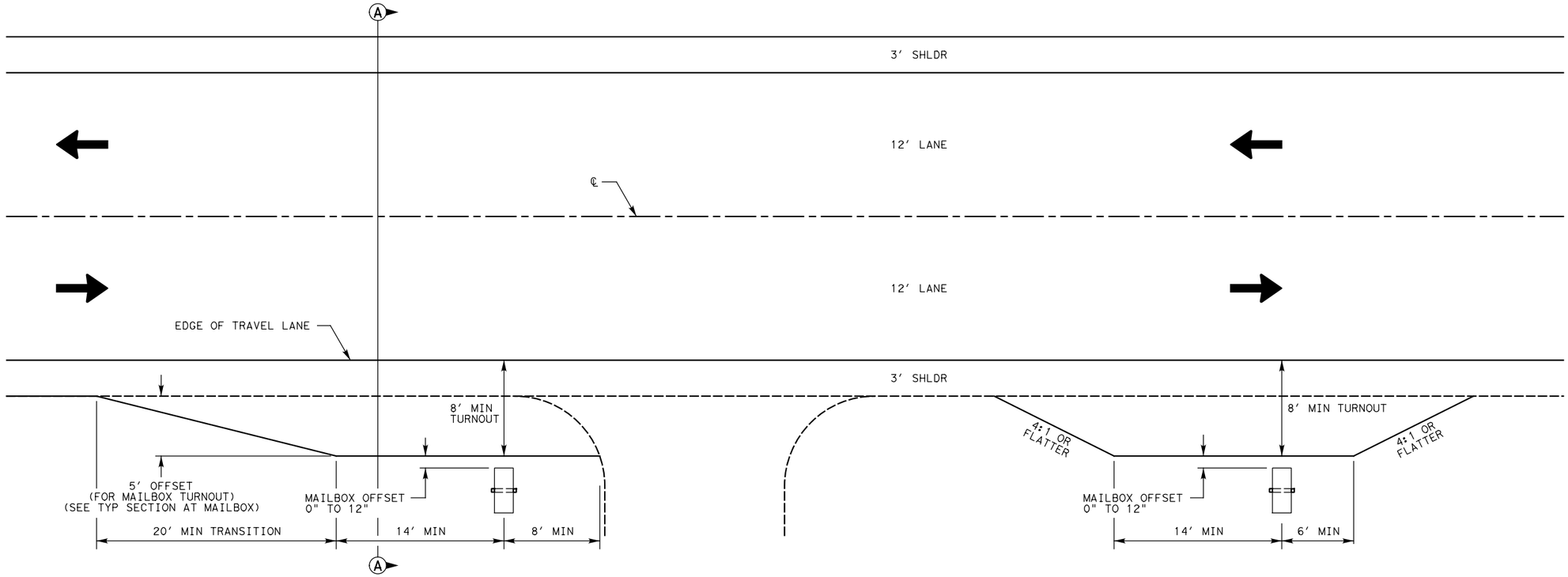
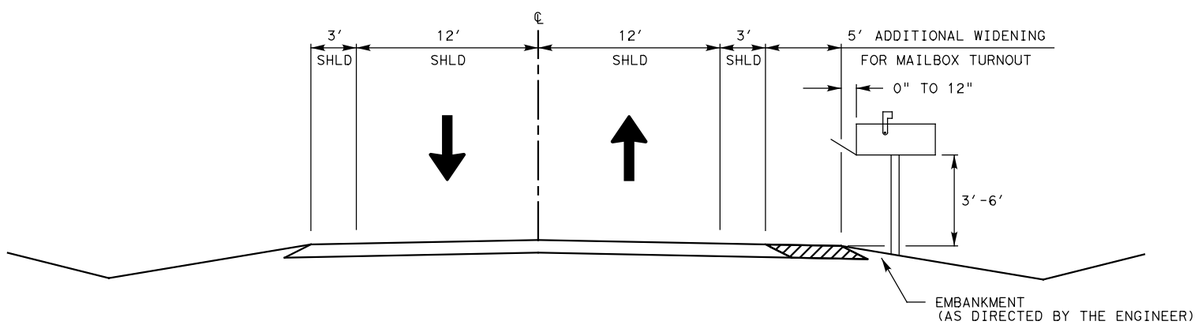


TYPICAL MAILBOX TURNOUT DETAIL
NTS

NOTE:
USE THE FM 2410 PROPOSED DRIVEWAY PAVEMENT SECTION SHOWN ON THE DRIVEWAY DETAIL SHEET FOR ALL PROPOSED MAILBOX TURNOUTS.



SECTION A-A
NTS

STATE OF TEXAS
RYAN MICHAEL JONES
110010
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

FM 2410

MAILBOX TURNOUT DETAILS

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	106
JP				
GRPH CHECK	2304	02	044	
RJ				

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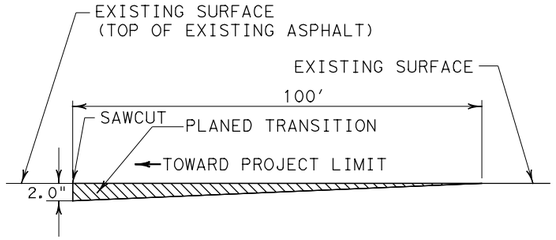

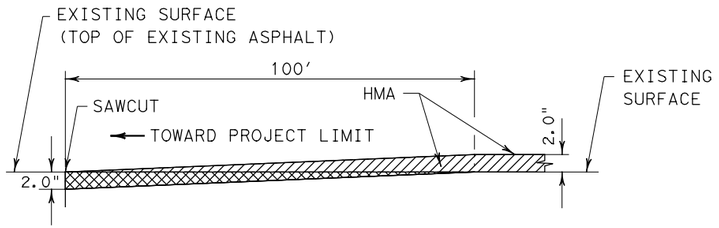

PLANE TRANSITION DETAIL
(PLANE PAV 0-2.0")

STATE OF TEXAS
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1/5/2023

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

FM 2410

MISCELLANEOUS ROADWAY DETAILS

(SHEET 1 OF 1)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	107
JP				
GRPH CHECK	2304	02	044	
RJ				

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DATE: 1/5/2023 1:22:31 PM mchowdhury

DATE: 1/5/2023 1:22:34 PM
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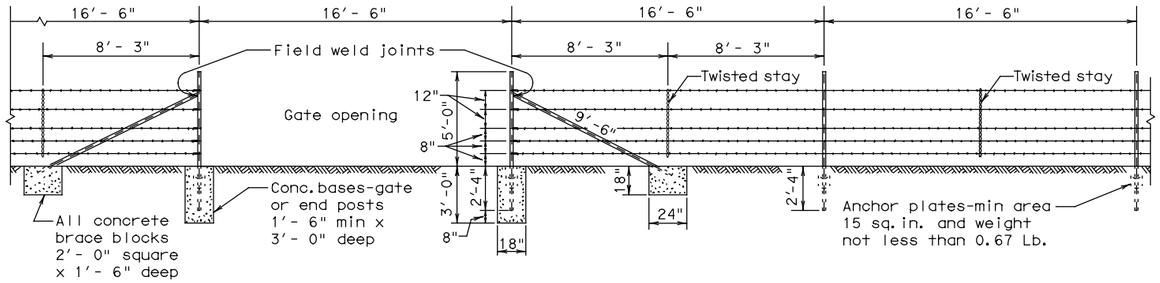
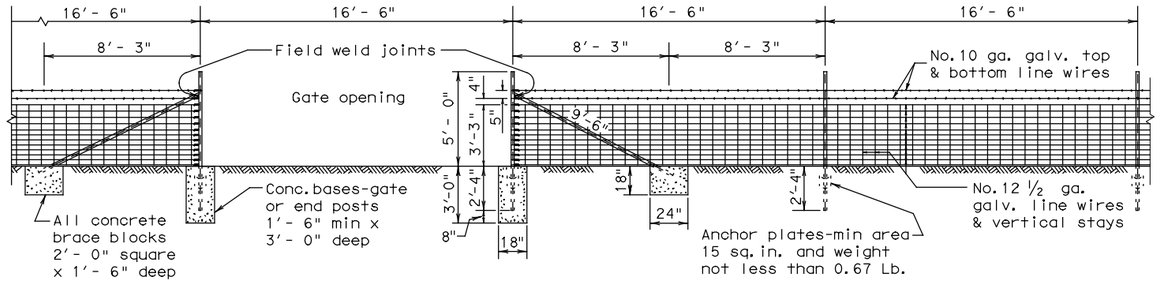
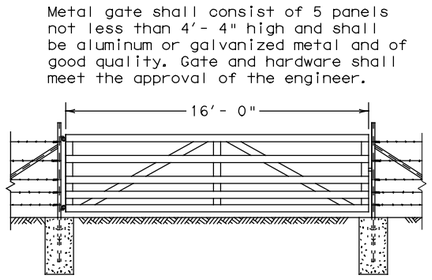


SECTION GALVANIZED BARBED WIRE FENCE WITH METAL POSTS
BRACING DETAIL USED AT ENDS AND GATES
TYPE "C" FENCE
(See General Note 8)

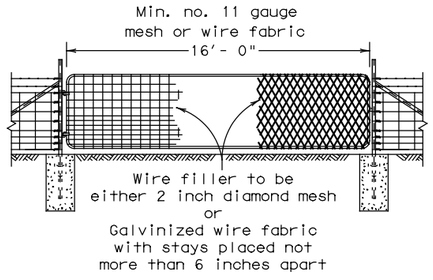
Note:
For Steel pipe and T-Post requirements. (See General Notes 6 & 7)



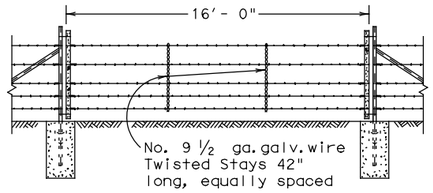
SECTION GALVANIZED WOVEN WIRE FENCE WITH METAL POSTS
BRACING DETAIL USED AT ENDS AND GATES
TYPE "D" FENCE
(See General Note 8)



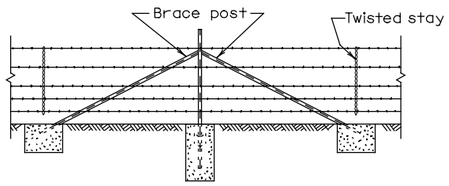
DETAIL TYPE 1 GATE



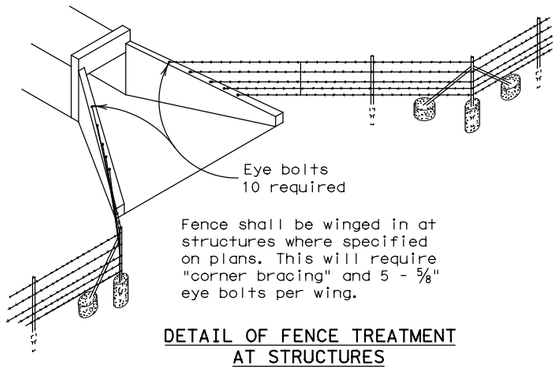
DETAIL TYPE 2 GATE



DETAIL TYPE 3 GATE

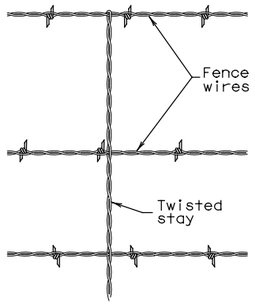


CORNER OR PULL POST ASSEMBLY

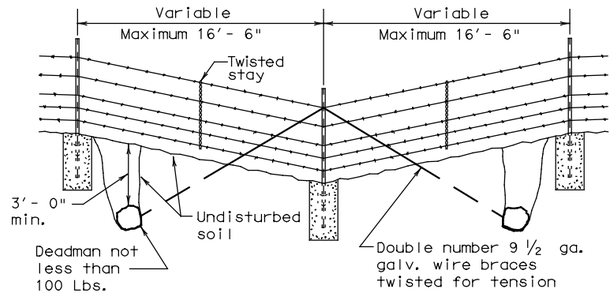


Fence shall be winged in at structures where specified on plans. This will require "corner bracing" and 5 - ⅝" eye bolts per wing.

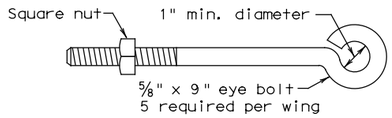
DETAIL OF FENCE TREATMENT AT STRUCTURES



DETAIL OF STAY
(Barbed Wire Fence)



DETAIL OF FENCE SAG



DETAIL OF EYE BOLT

GENERAL NOTES

1. Any high point which interferes with the placing of wire mesh shall be excavated to provide a 2 inch clearance.
2. Latches for Type 1 and Type 2 gates shall be good commercial quality and design latch of the spring, fork or chain type. All latches shall be suitable to the gate and shall be approved by the Engineer.
3. Hinges for Type 2 gates shall be a commercial design approved by the Engineer suitable for post and gate.
4. Concrete shall be of the design and consistency approved by the Engineer and shall contain not less than 4 sacks of cement per cubic yard. Concrete footings are to be crowned at the top to shed water.
5. Steel anchor plates shall be of a design and thickness sufficient to prevent turning of the post in firm soil.
6. Steel pipe end posts, corner and pull posts shall be a minimum of 2" Std. pipe (2.375" O.D., 0.154" wall thickness) with a 1¼" Std. pipe brace (1.660" O.D., 0.140" wall thickness), with a 2"x2"x1/4" angle, or other as approved by the Engineer. Fasteners for securing barbed wire or woven wire fence to metal posts shall be a minimum of 11 gauge galvanized steel wire. Tubular posts shall be fitted with water malleable iron caps.
7. If Steel pipe is used for posts and braces, use standard pipe in accordance with ASTM A 53, Class B or A 501. For T-Posts use steel that meets ASTM A 702. Metal line posts shall be not less than 6'-6" in length and shall weigh not less than (1.33 lbs./lin.ft.). These Items shall be in accordance with Item 552, "Wire Fence."
8. Barbed Wire shall be in accordance with ASTM A 121, Class 1 Design designation 12-2-4-1 4R or 12-2-5-1 4R, or as approved by the Engineer.

   Woven Wire Fence (Type D) shall be in accordance with ASTM A 116, Class 1 No. 12-1/2 Grade 60 (See Table 1 ASTM A 116) to the height and design shown on the plans, or as approved by the Engineer.
9. The location of gates and corner posts will be as indicated elsewhere in these plans.

Texas Department of Transportation

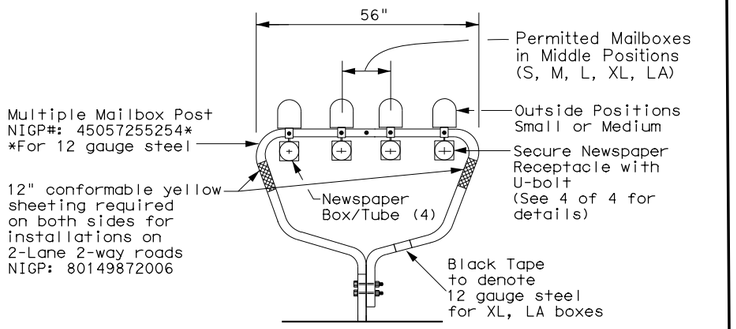
Design Division Standard

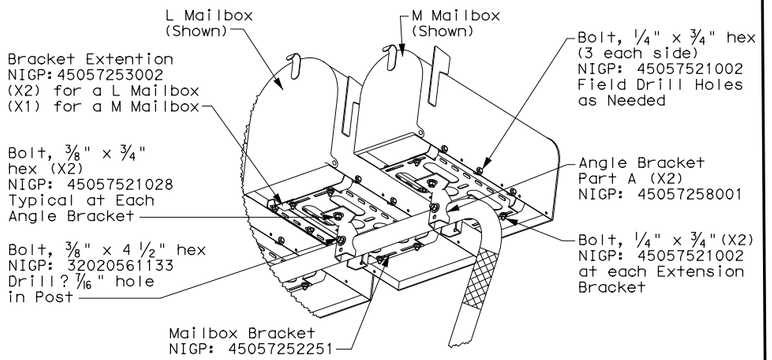
BARBED WIRE AND WOVEN WIRE FENCE
(STEEL POSTS)
WF(2)-10

FILE: wf210.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
© TxDOT 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		108

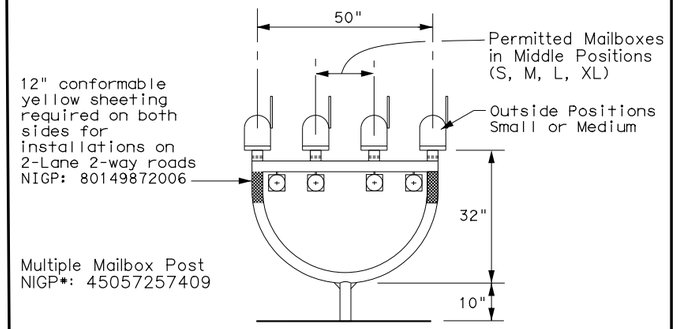
DATE: 1/5/2023 1:22:37 PM
FILE: P:\MSGP\TXD18248\06-FM_2410\PROD_SHEETS\STANDARDS\Roadway\mb-21(1).dgn

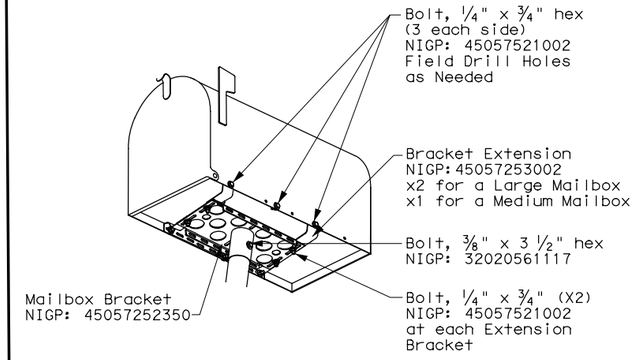
TYPE 1 - MULTIPLE





TYPE 4 - MULTIPLE





MAILBOX SIZES

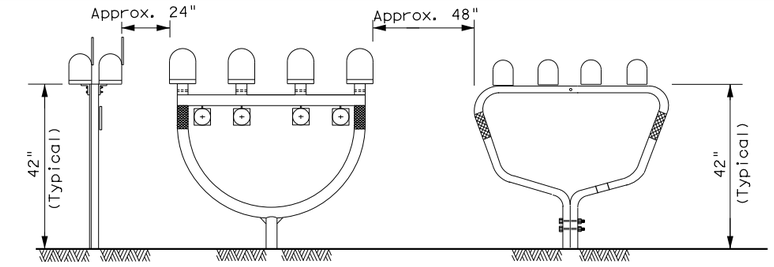
MAILBOX SIZE	TYPICAL DIMENSIONS			MAX ** WEIGHT
	LENGTH	WIDTH	HEIGHT	
SMALL	19 1/2"	6"	7"	6 LBS
MEDIUM	22 1/2" *	8" *	11 1/2" *	8 LBS
LARGE	23 1/2"	11 1/2"	13 1/2"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 1/2"	15"	23 LBS

* See Note 1.
** Excluding Molded Plastic on 4 X 4 Post

GENERAL NOTES:

1. Dimensions shown (length, width, and height) are typical, not maximums. However, anytime a medium size mailbox is mounted on a single/double mount or on the outside position on a multi mount, the dimensions shown are maximums.
2. Mailboxes shall be made of light weight sheet metal or light weight plastic. Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.

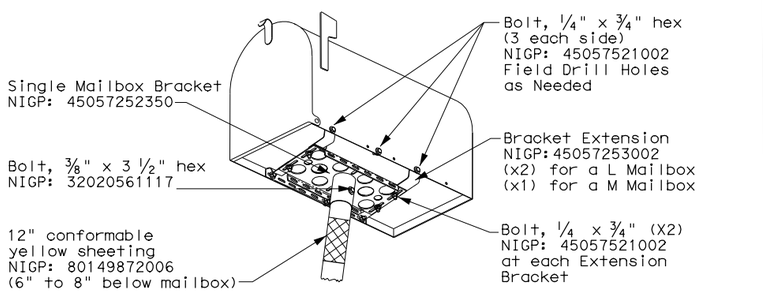
TYPICAL INSTALLATION MEASUREMENTS

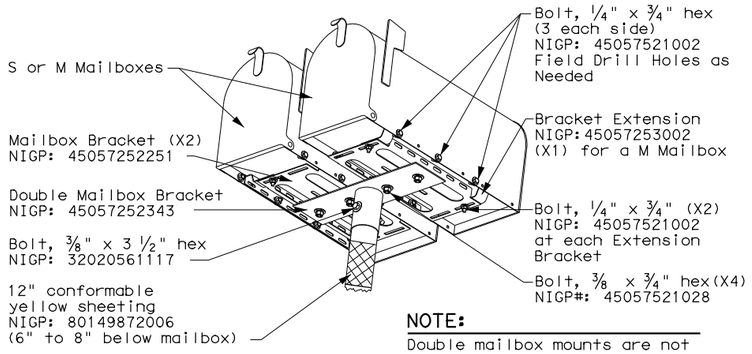


NOTE:

Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Design Standard sheets PED-Pedestrian Facilities Curb Ramps.

TYPE 2 and 4 - SINGLE/DOUBLE

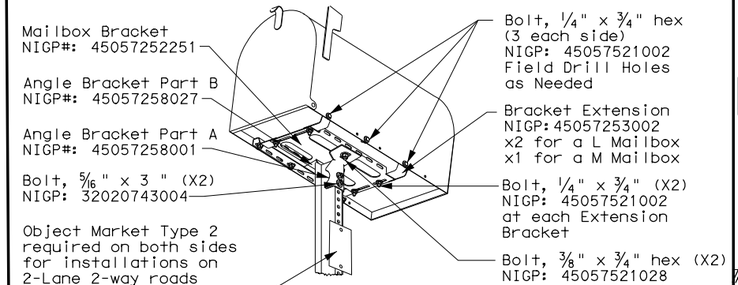


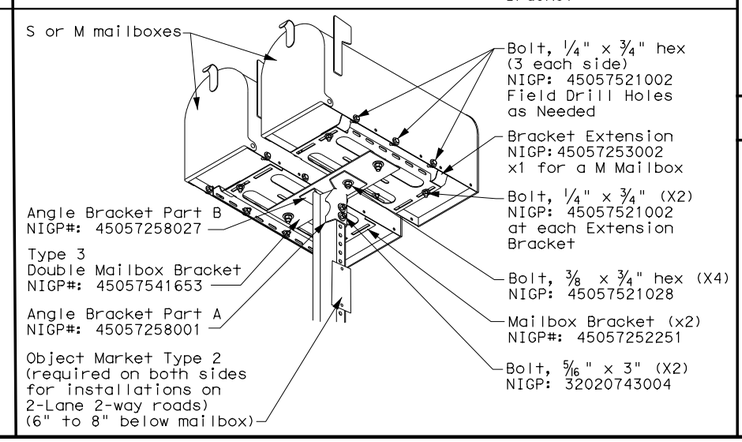


NOTE:

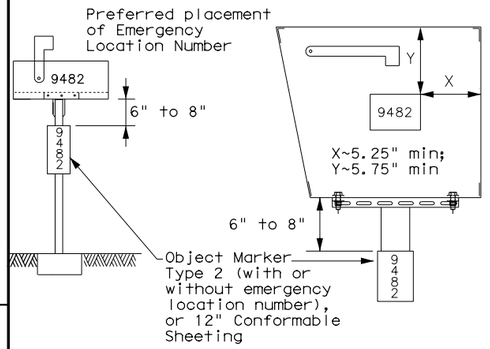
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

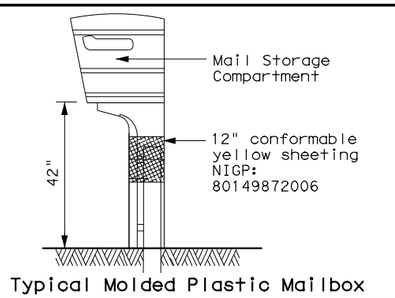


NOTES:

1. Location numbers are provided by homeowner. Minimum size 1" height.
2. Location number is typically placed on the mailbox in a contrasting color.
3. Black numbers may be placed on the Type 2 object marker if the numbers cannot be placed on the mailbox.
4. Alternatively, a green or blue plate with white numbers attached may be mounted below the object marker. Other contrasting color configuration, as approved, may be used.
5. See 3 of 4 for Foundation details.
6. See 4 of 4 for Hardware details.

SHEET 1 OF 4

TYPE 5



Typical Molded Plastic Mailbox

Texas Department of Transportation — Maintenance Division Standard

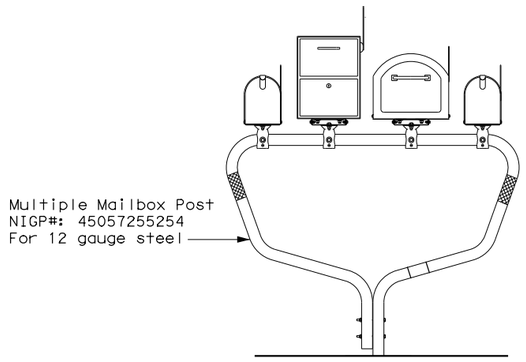
MAILBOX MOUNTING AND ASSEMBLY

MB(1)-21

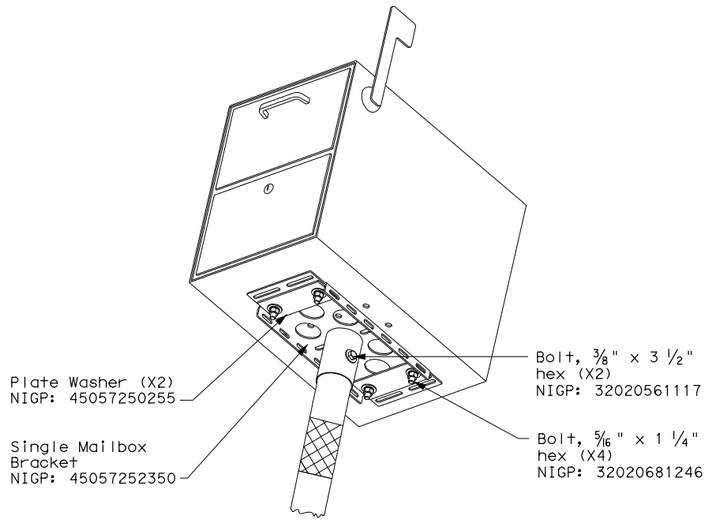
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		109

DATE: 1/5/2023 1:22:38 PM
FILE: P:\MSGP\TXDOT8248\06-FM_2410\PROD_SHEETS\STANDARDS\Roadway\mb-21(1).dgn

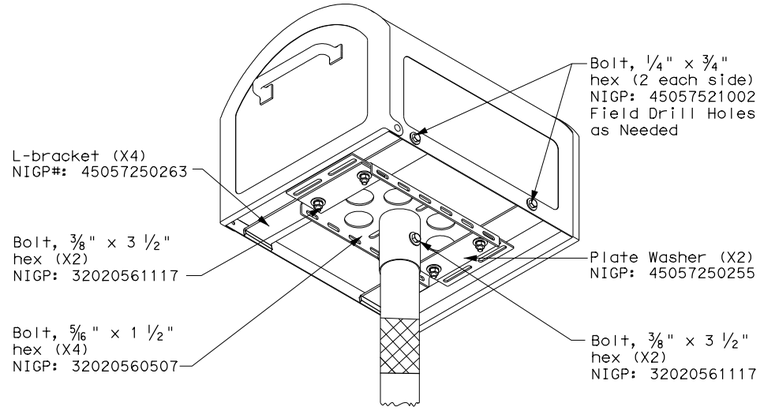
TYPE 1- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX

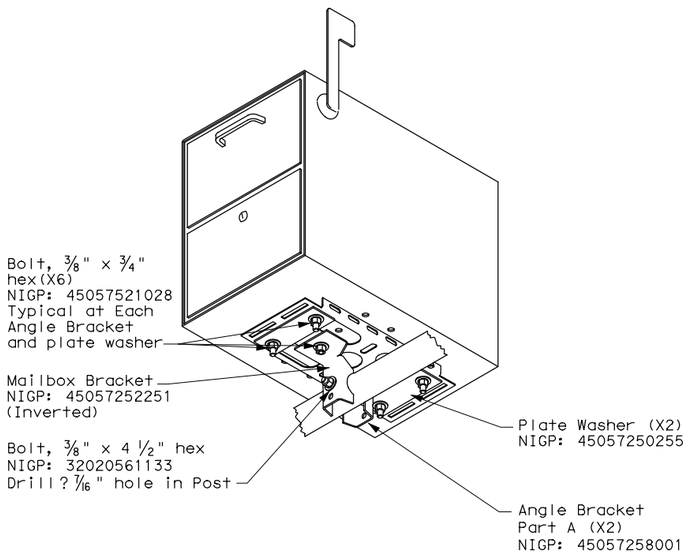


TYPE 2/4 - SINGLE XL MAILBOX

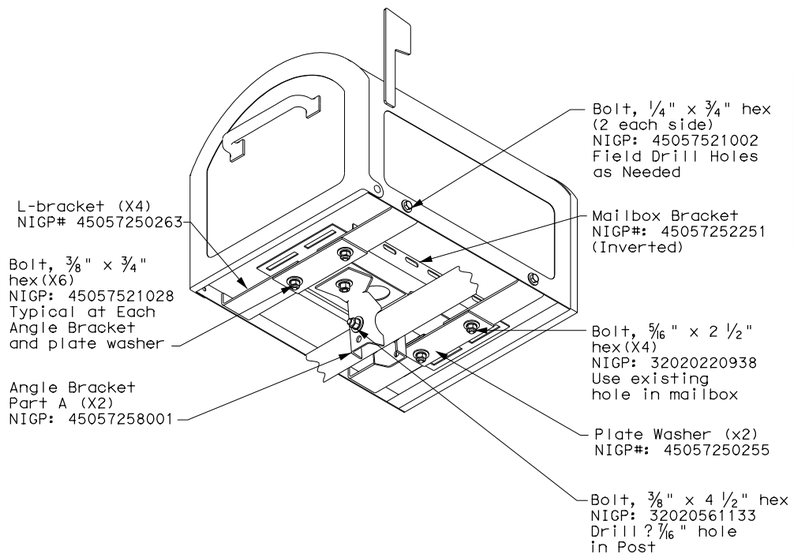


NOTE:
Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

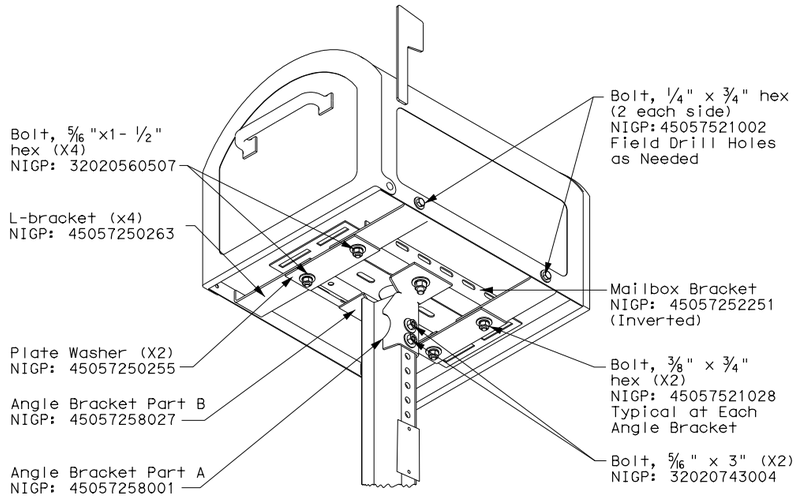
TYPE 1 MULTI - LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI - XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



Texas Department of Transportation — Maintenance Division Standard

XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

MB(2)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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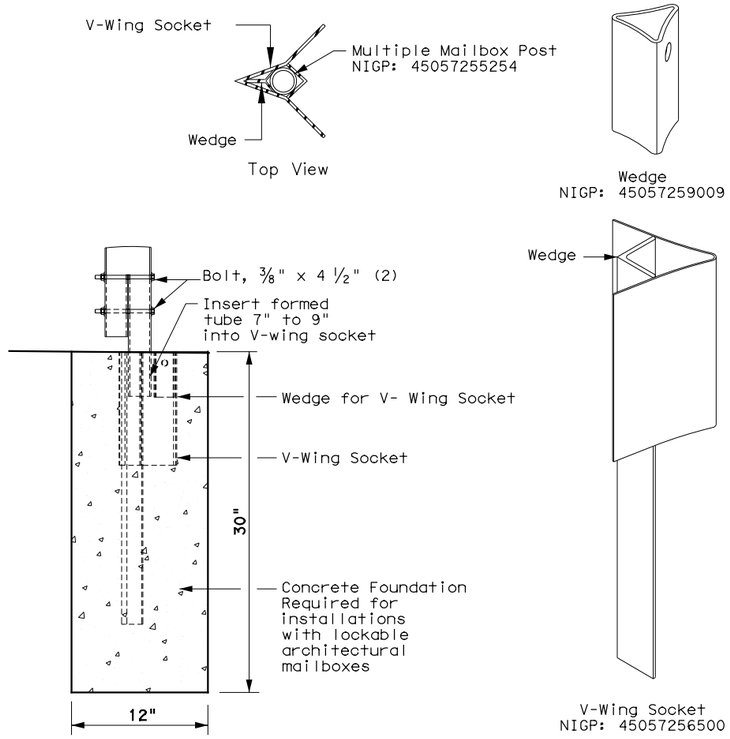
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		110

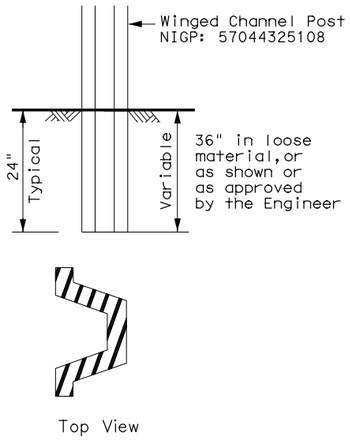
DATE: 1/5/2023 1:22:38 PM
FILE: P:\MSGP\TXDT8248\06-FM_2410\PROD_SHEETS\STANDARDS\Roadway\mb-21(1).dgn

TYPE 1 - SUPPORT/FOUNDATION

Thin Wall Tube w/ V-LOC Anchorage



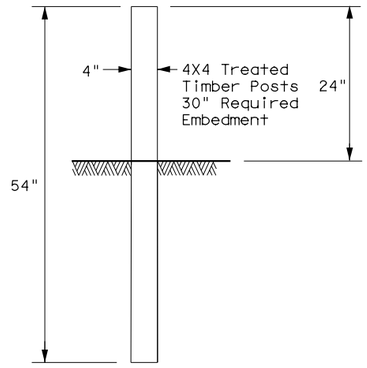
TYPE 3 - SUPPORT/FOUNDATION



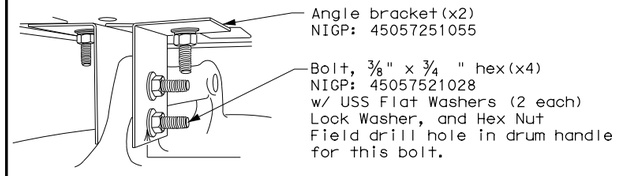
NOTES:

1. Attach Object Marker (OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



TYPE 6 - TEMPORARY MAILBOX SUPPORT



Plastic Drum NIGP: 55093383655
Rubber Collar NIGP: 55093387102

NOTES:

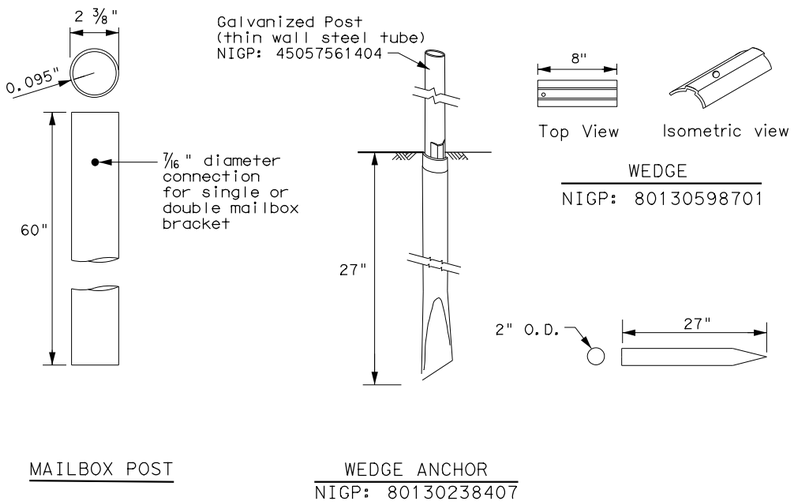
1. Place on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
2. Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

GENERAL NOTES:

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition, only on Type 1, Type 2, and Type 4

TYPE 2 - SUPPORT/FOUNDATION

Thin Wall Steel Tube w/Wedge Anchor System

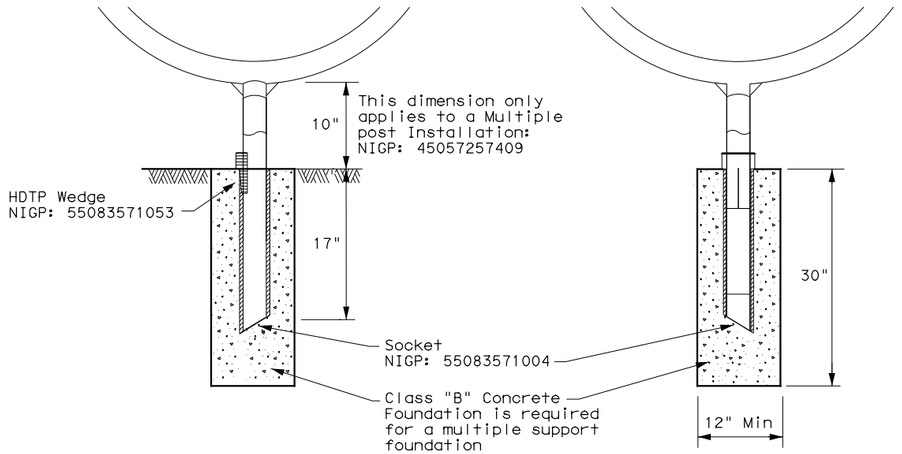


MAILBOX POST

WEDGE ANCHOR
NIGP: 80130238407

TYPE 4 - SUPPORT/FOUNDATION

Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



SHEET 3 OF 4

Texas Department of Transportation

Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB(3)-21

FILE: MB-21.dgn	DN:	CK:	DW:	CK:
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REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		111

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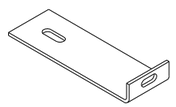
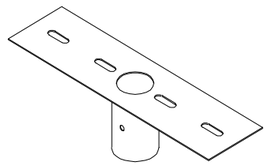
DATE: 1/5/2023 1:22:39 PM
FILE: P:\MSGPTXD18248\06-FM_2410\PROD_SHEETS\STANDARDS\Roadway\mb-21(1).dgn

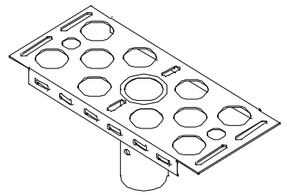
TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP *	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: SS, SM, MM	S, M, L, XL, or LA	SS, SM, or MM	Outside Position: S or M Inside Position: S, M, L, or XL	Molded Plastic	S, or M
Mailbox Post NIGP *	45057255254 (Galvanized Multiple)	45057561404 (Thin Walled Gavanize)	57044325108 (Wing Channel Post)	45057561107 (Thin walled white powder coated) 45057561057 (Recycled Rubber Post: S or M only)	45057561107 (Thin Walled White Powder Coated)	45057257409 (White Powder Coated Multiple)	4x4 Timber	Construction Barrel
Post and Mailbox Hardware NIGP *	45057259009 (Wedge) 45057256500 (V-Wing Socket) 45057253002 (Bracket Extension) 45057252251 (Mailbox Bracket) 45057258001 (Part A Angle Bracket x2) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	80130598701 (Wedge) 80130238407 (Wedge Anchor) 45057253002 (Bracket Extension) 45057252343 (Double MB Bracket) 45057252350 (S. Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket forXL x4)	45057541653 (Type 3 Double Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057253002 (Bracket Extension) 45057258001 (Part A Angle Bracket) 45057258027 (Part B Angle Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057252350 (Single Mailbox Bracket) 45057253002 (Bracket Extension) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252343 (Double Mount Bracket) 45057252251 (Mailbox Bracket x2)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252350 (Single Mount Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	None	45057251055 Angle Bracket (x2)
Foundation Used	Class B Concrete (Required for LA Mailboxes)	Class B Concrete (Required for LA Mailboxes)	None	Class B Concrete (not used with recycled rubber post, required for LA Mailboxes)	Class B Concrete (not required)	Class B Concrete	None	None



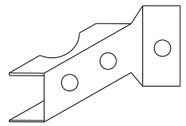
NIGP: 45057250263
L-Bracket x4 for
XL sized mailboxes



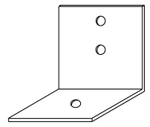
NIGP: 45057252343
Double Mailbox Bracket
For Type 2 and Type 4
double mount



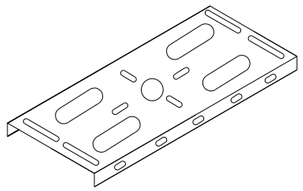
NIGP: 45057252350
Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



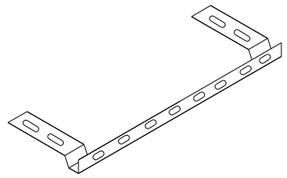
NIGP: 45057258001
Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



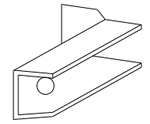
NIGP: 45057251055
Type 6 Angle Bracket
(2 per mailbox)



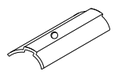
NIGP: 45057252251
Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



NIGP: 45057253002
Bracket Extension
Use 1 for a medium Mailbox
Use 2 for a Large Mailbox



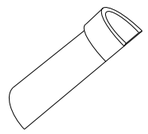
NIGP: 45057258027
Part "B" Angle Bracket
For Type 3 single
and double



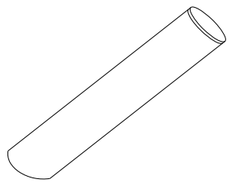
NIGP: 80130598701
Wedge for Type 2

NIGP: 45057250255
Plate Washer for Architecural
and XL Mailboxes

NIGP: 45057541653
Type 3 double mailbox bracket

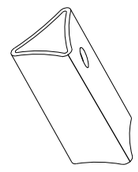


NIGP: 55083571053
Type 4 Mailbox Wedge

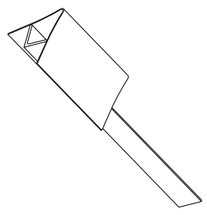


NIGP: 55083571004
Type 4 Mailbox Socket

NIGP: 80130238407
Type 2 Wedge Anchor



NIGP: 45057259009
Wedge for Type 1 V-wing Socket



NIGP: 45057256500
V-wing Socket for
Type 1 Foundation

NIGP *	OBJECT MARKERS AND CONFORMABLE SHEETING
55008311759	Type 2 OM 4"x4" (3 Needed) for Type 3 Wing Channel Post
55008312906	Type 2 OM 6"x12" (1 needed) for Type 3 Wing Channel Post
80149872006	12" Conformable Reflective Yellow Sheeting for Flexible Posts

NOTES:

1. Type 2 object marker in accordance with Traffic Engineering Standard Delineators & Object Markers.
2. A light weight receptacle for newspaper delivery can be attached to mailbox posts if the receptacle does not touch the mailbox, present a hazard to traffic or delivery of the mail, extend beyond the front of the mailbox, or display advertising, except the publication title.

BID CODES FOR CONTRACTS

MB-(X) ASSM TY (XXX) (X)

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- MP = Molded Plastic

Type of Post
- WC = Winged Channel Post
- RR = Recycled Rubber
- TWW = Thin Walled White Tubing
- TWG = Thin Walled Galvanized Tubing
- TIM = Timber

Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post

Texas Department of Transportation — Maintenance Division Standard

NIGP PARTS LIST AND COMPATIBILITY

MB(4)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		112

DATE: 1/5/2023 1:22:42 PM
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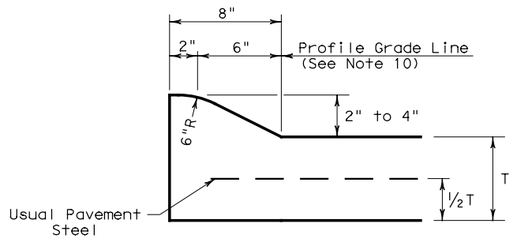
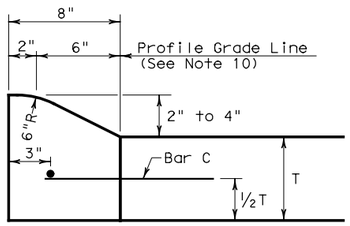
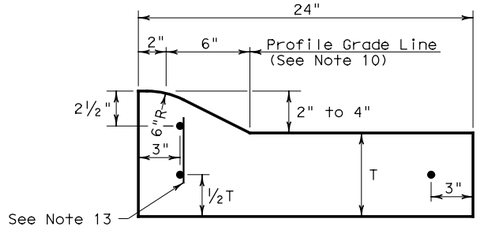


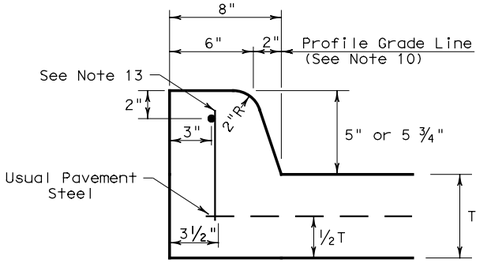
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



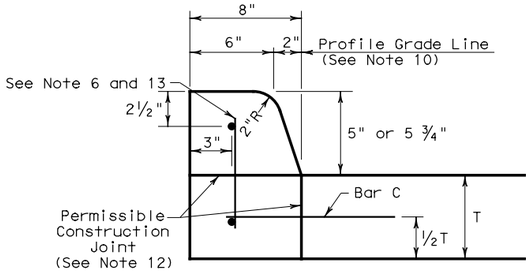
TYPE I CURB
2" - 4" HEIGHT



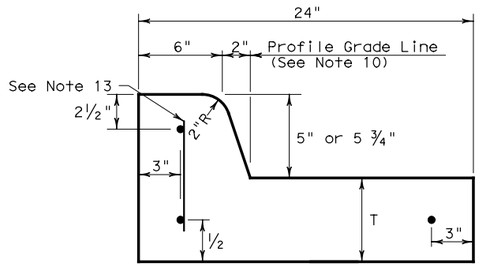
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



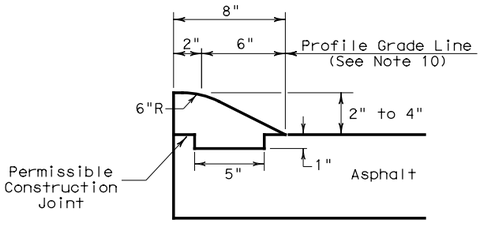
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



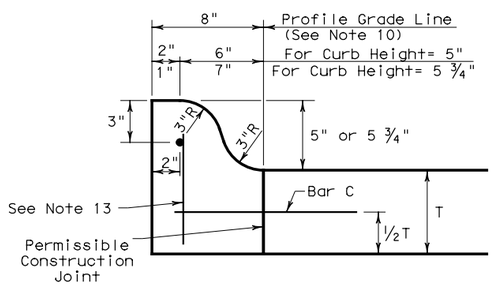
TYPE II CURB
5" - 5 ¾" HEIGHT



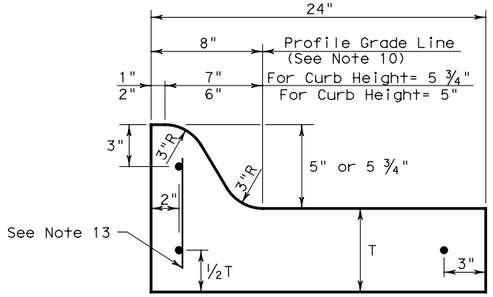
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



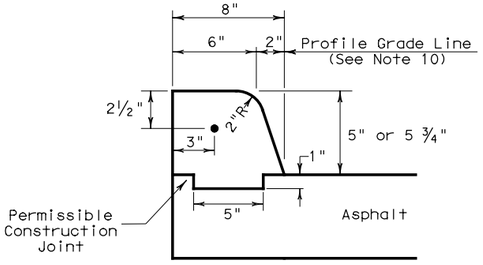
TYPE III CURB (KEYED)
2" - 4" HEIGHT



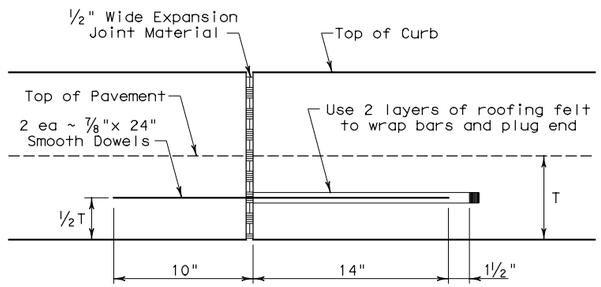
TYPE IIa CURB
5" - 5 ¾" HEIGHT



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

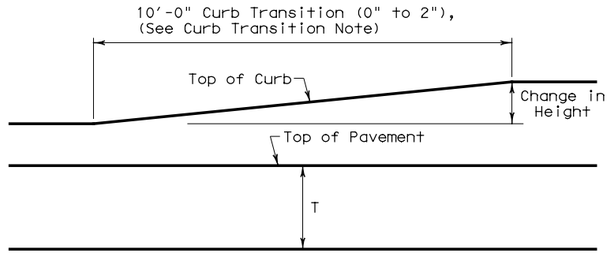


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

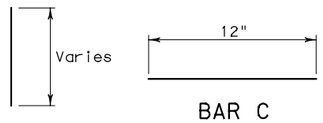
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

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



BAR B

BAR C

Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-22

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: CS	CK: KM
© TxDOT: JUNE 2022 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	WACO	BELL		113

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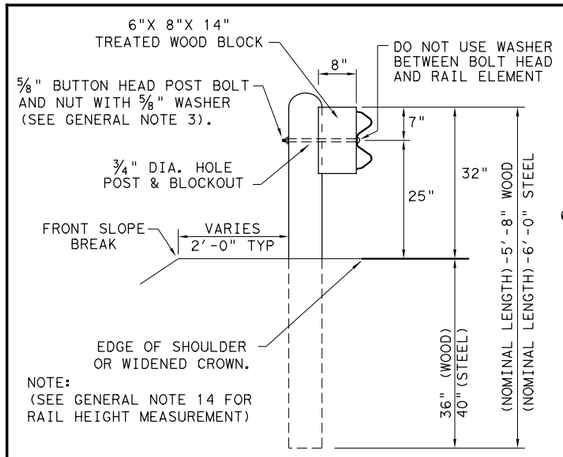
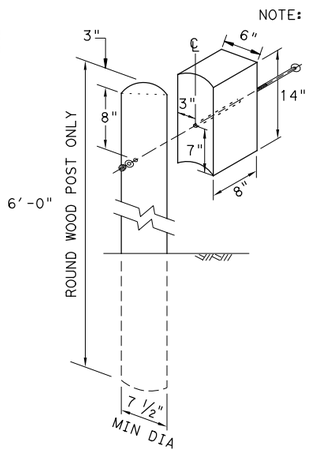
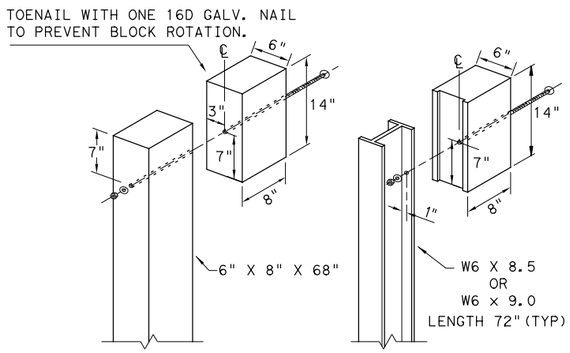


TYPICAL POST PLACEMENT



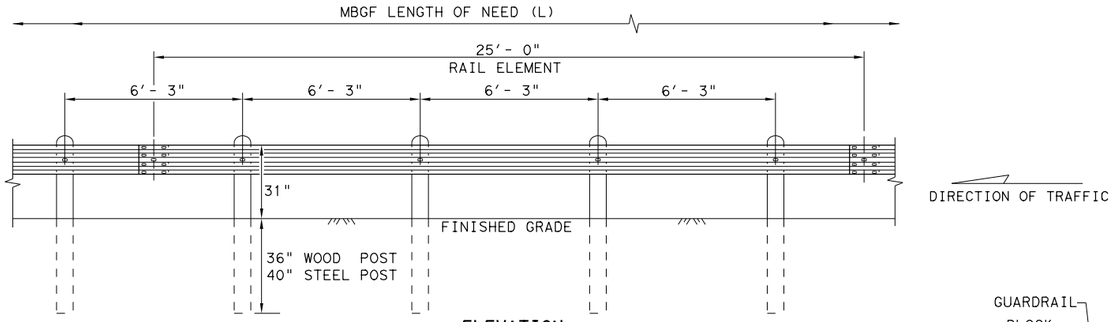
WOOD BLOCK TO
ROUND WOOD POST



WOOD BLOCK TO
RECTANGULAR WOOD POST

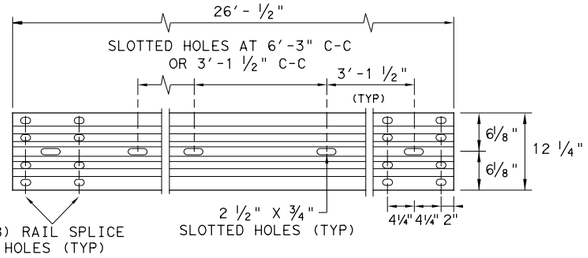
ROUTED WOOD BLOCK
TO I-BEAM STEEL POST

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



ELEVATION
MID-SPAN RAIL SPLICE

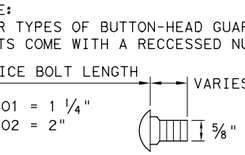
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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

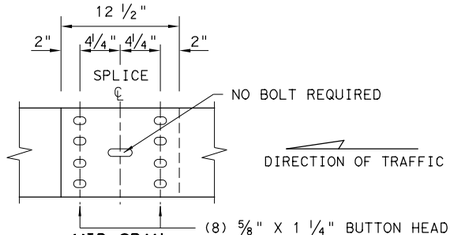
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

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



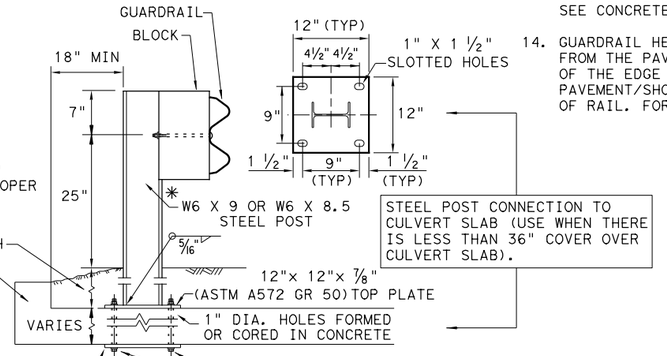
BUTTON HEAD BOLT

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



MID-SPAN
RAIL SPLICE DETAIL

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

GENERAL NOTES

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

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

Texas Department of Transportation

Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	WACO	BELL		113A

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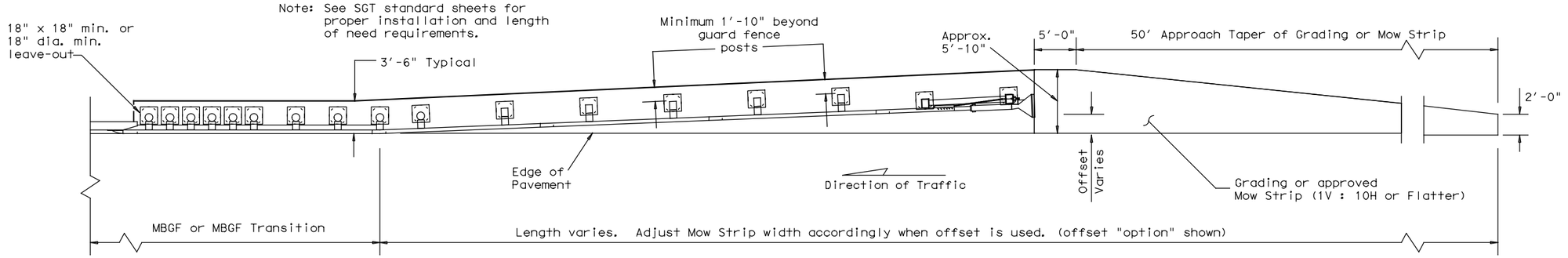
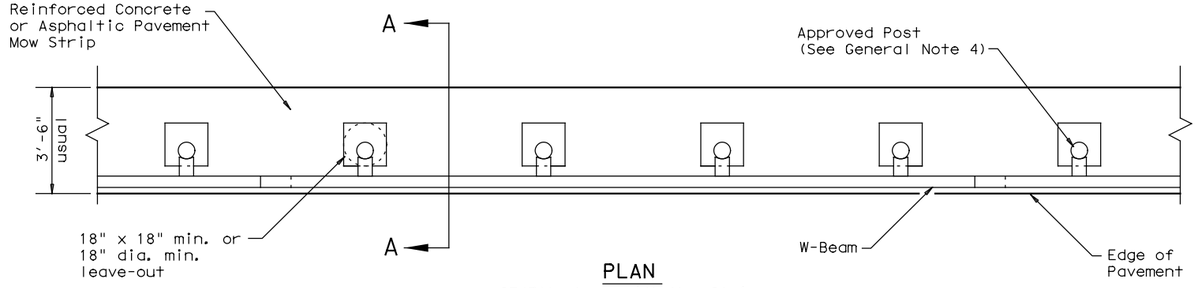
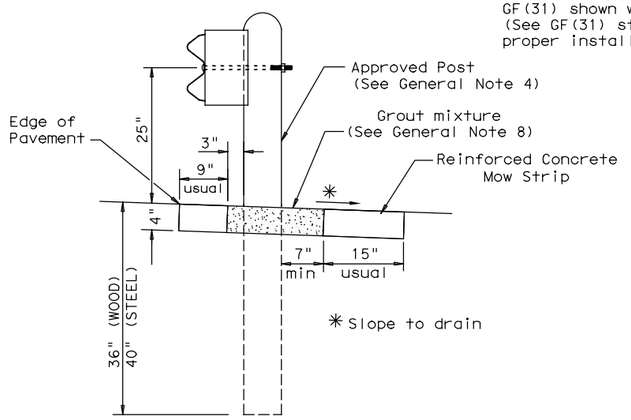


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



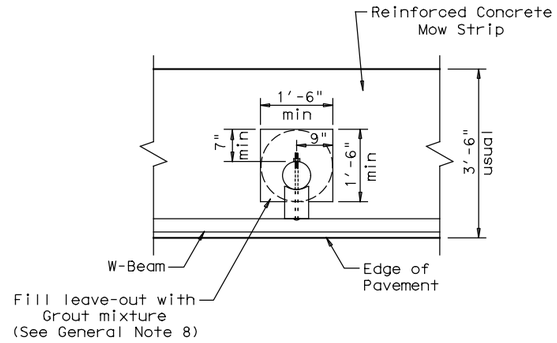
PLAN

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



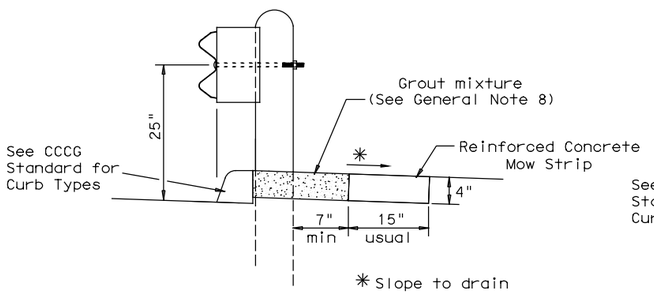
SECTION A-A

Typical



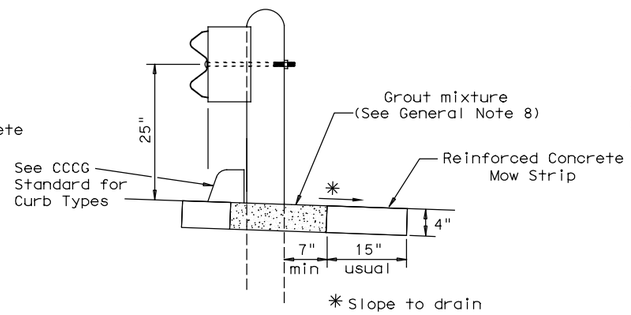
MOW STRIP DETAIL

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



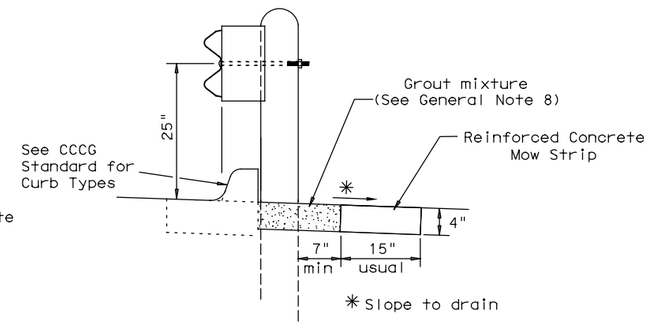
CURB OPTION (1)

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

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
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	WACO	BELL		113B

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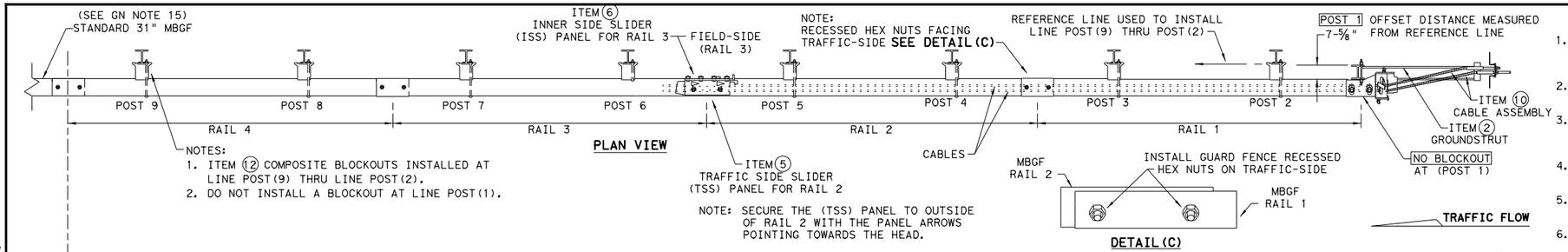
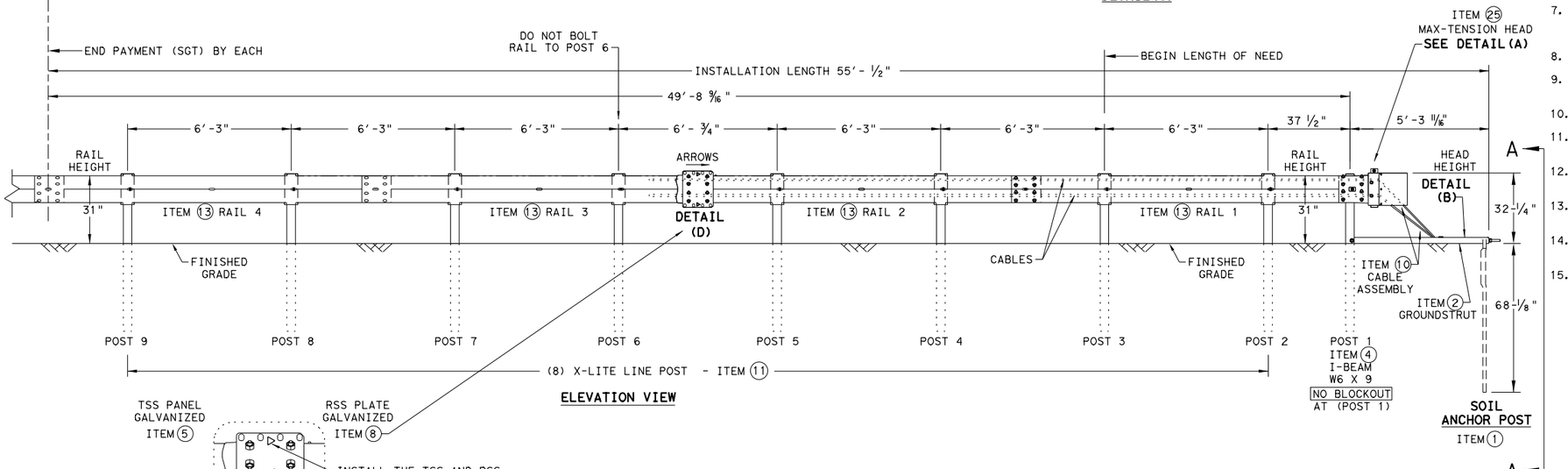


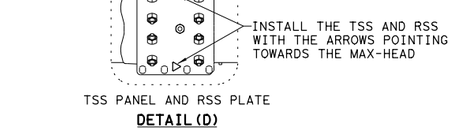
PLAN VIEW

NOTES:
1. ITEM (12) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST(9) THRU LINE POST(2).
2. DO NOT INSTALL A BLOCKOUT AT LINE POST(1).

DETAIL (C)

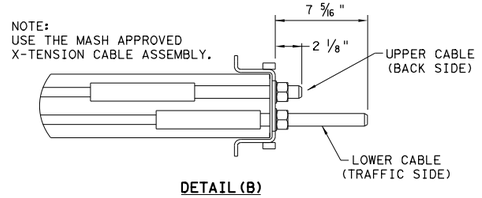


ELEVATION VIEW

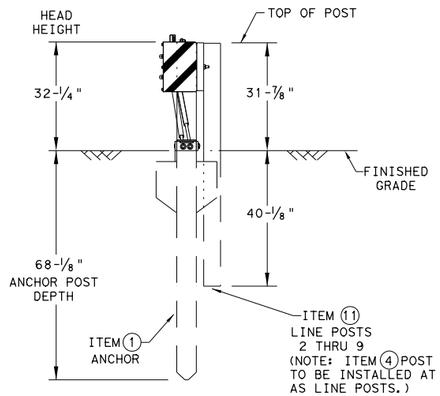


TSS PANEL AND RSS PLATE

DETAIL (D)

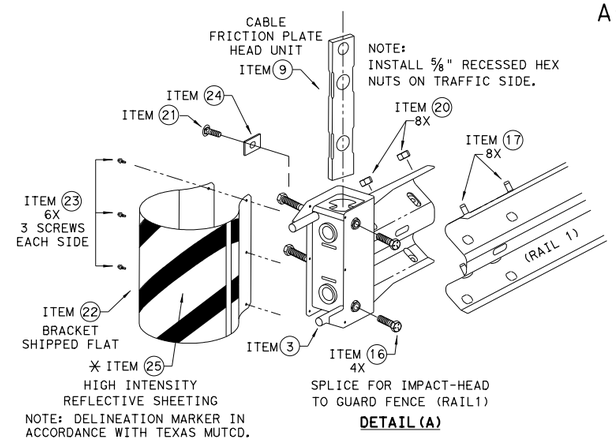


DETAIL (B)



SOIL ANCHOR, POST 1
& LINE POST 2 THRU 9

SECTION VIEW A-A



DETAIL (A)

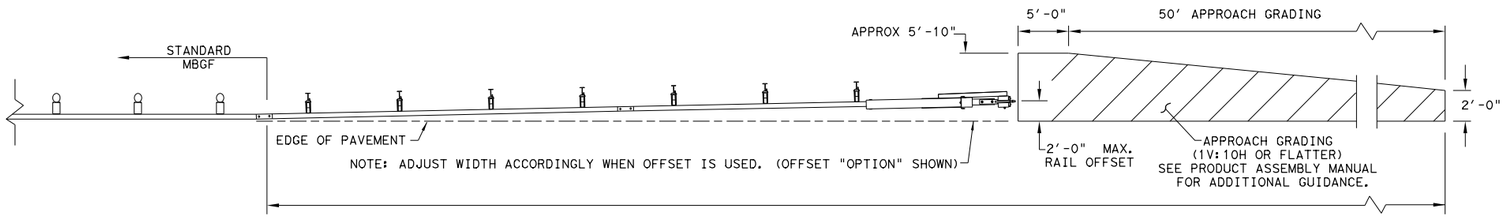
GENERAL NOTES

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

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

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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



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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

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

Texas Department of Transportation

Design Division Standard

MAX-TENSION END TERMINAL
MASH - TL-3
SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		113C

DATE: 12/13/2022 3:26:27 PM
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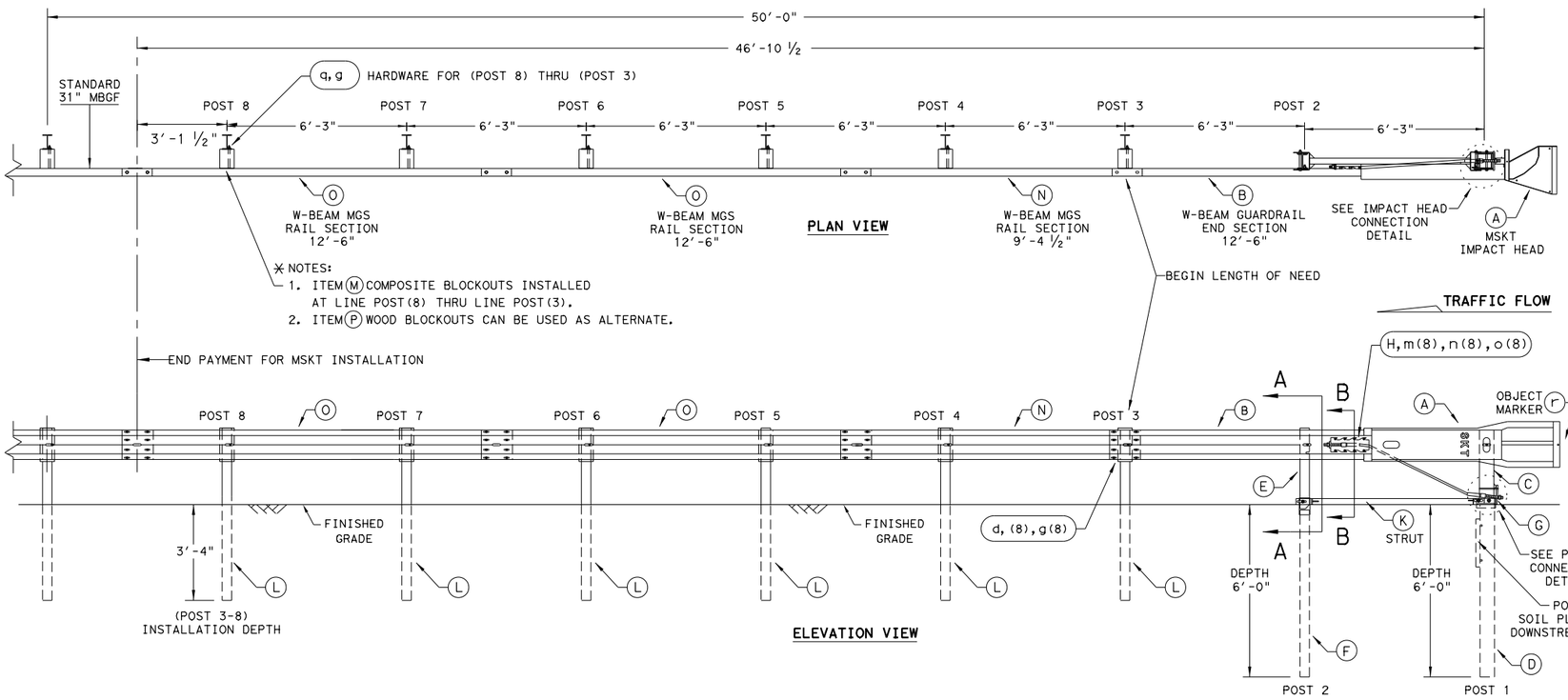
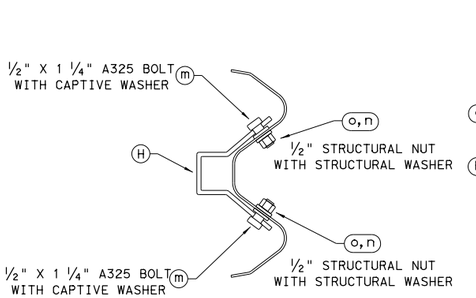
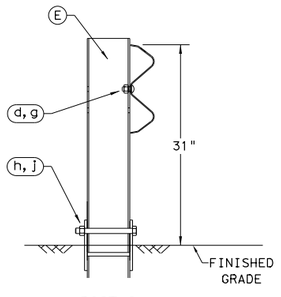


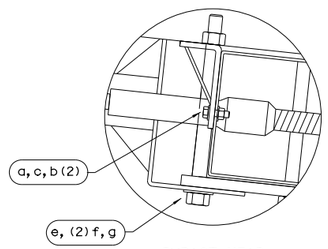
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



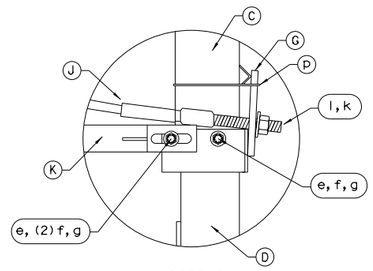
SECTION B-B
ANCHOR BRACKET



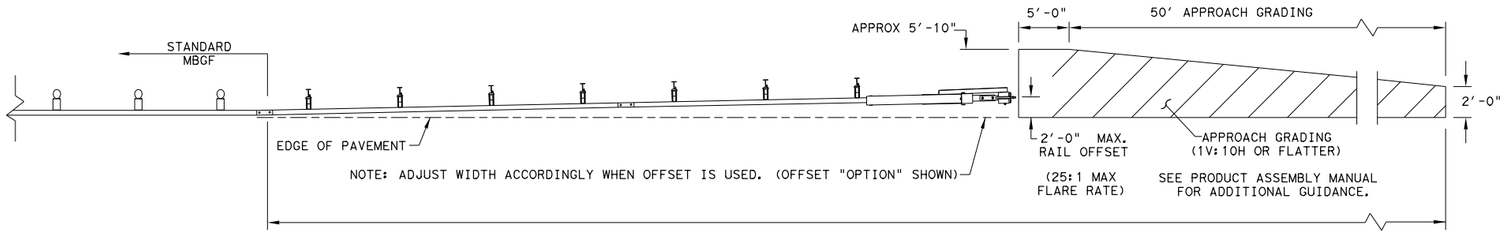
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



TRAFFIC FLOW

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

GENERAL NOTES

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

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

SEE NOTES: ✳

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

Texas Department of Transportation

Design Division Standard

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

REVISIONS

FILE: sgt12s3118.dgn	DN:TxDOT	CK:KM	DW:VP	CK:CL
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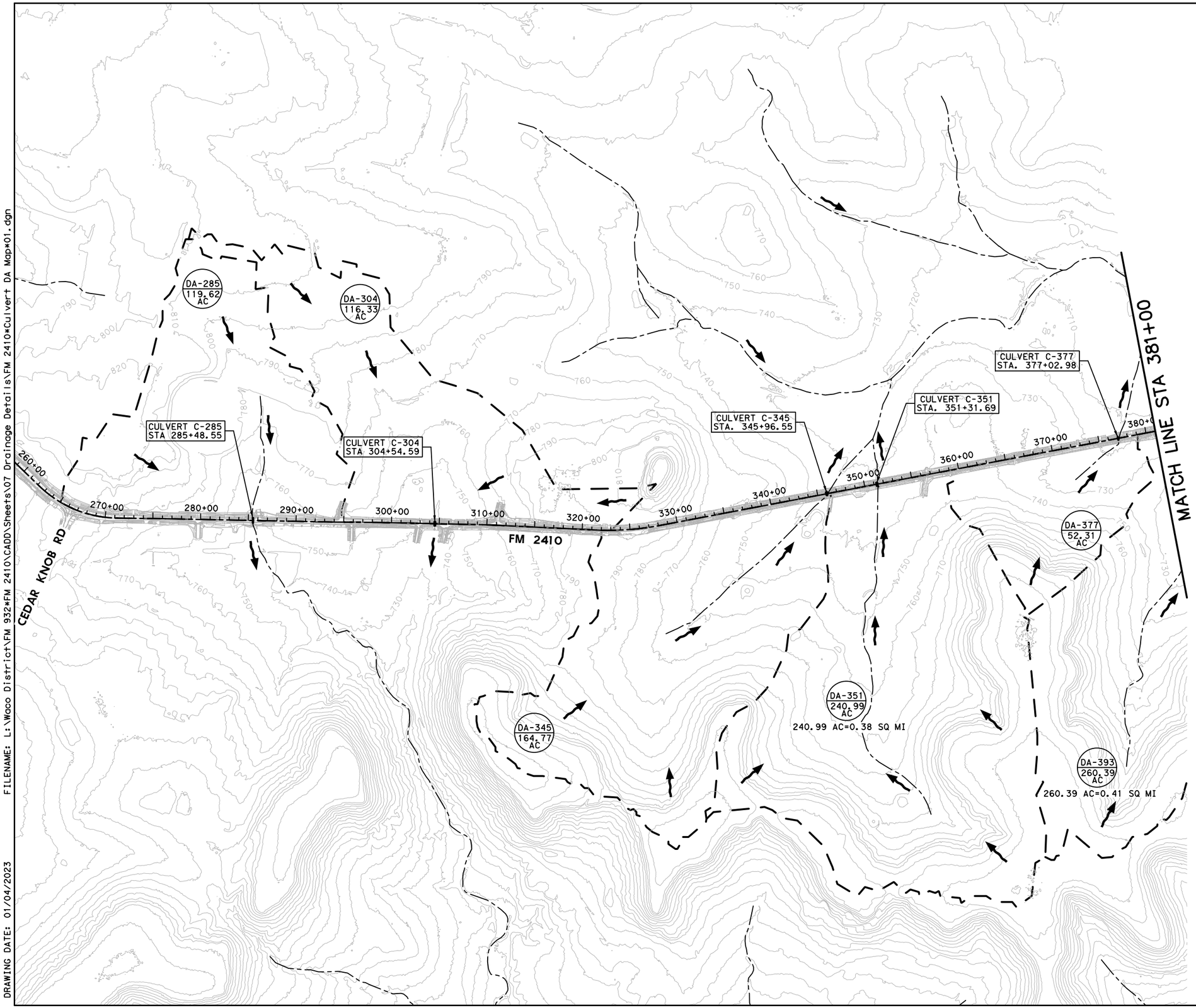
	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		113D



0′ 250′ 500′ 1000′

HORIZONTAL SCALE: 1"=1000′

LEGEND:

- DIRECTION OF FLOW
- STREAM
- DRAINAGE AREA BOUNDARY
- 10 FT CONTOURS
- DA-XXX / XX.XX AC — DRAINAGE AREA ID / ACREAGE

STATE OF TEXAS
SAHAS SHRESTHA
116045
LICENSED PROFESSIONAL ENGINEER

01/04/2023

I.S. ENGINEERS, LLC
FIRM REGISTRATION NO. F-11657
7670 WOODWAY DRIVE
SUITE 320
HOUSTON, TEXAS 77063

FM 2410

DRAINAGE AREA MAP

(SHEET 1 OF 3)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	114
GRAPHICS	CONTROL	SECTION	JOB	
TW	2304	02	044	
GRPH CHECK				
SRS				

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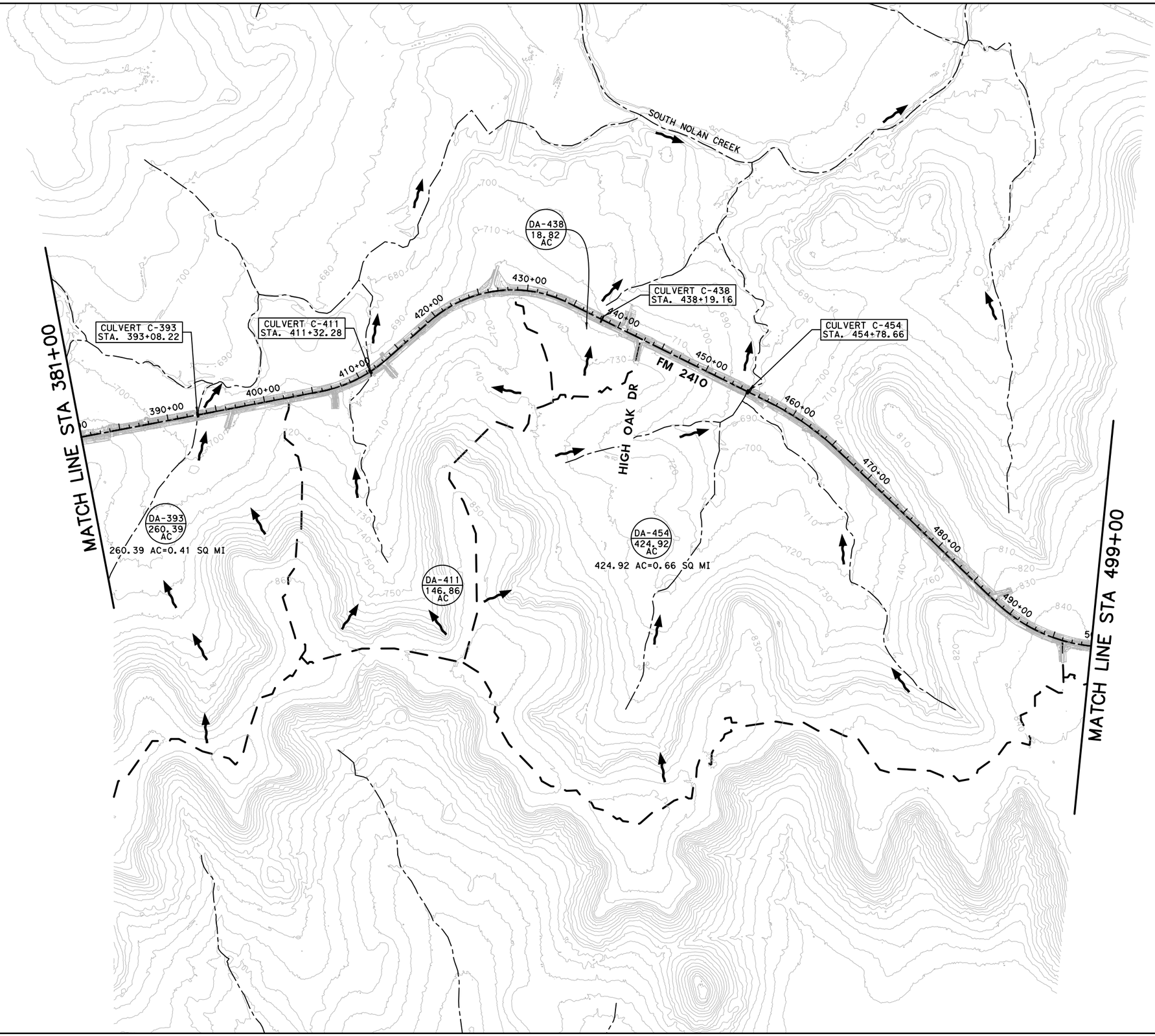

0′ 250′ 500′ 1000′
HORIZONTAL SCALE: 1"=1000′

LEGEND:

- DIRECTION OF FLOW
- STREAM
- DRAINAGE AREA BOUNDARY
- 10 FT CONTOURS
- DA-XXX / XX.XX AC — DRAINAGE AREA ID / ACREAGE

STATE OF TEXAS
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01/04/2023

I.S. ENGINEERS, LLC
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7670 WOODWAY DRIVE
SUITE 320
HOUSTON, TEXAS 77063

FM 2410

DRAINAGE AREA MAP

(SHEET 2 OF 3)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	115
GRAPHICS	CONTROL	SECTION	JOB	
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GRPH CHECK				
SRS				

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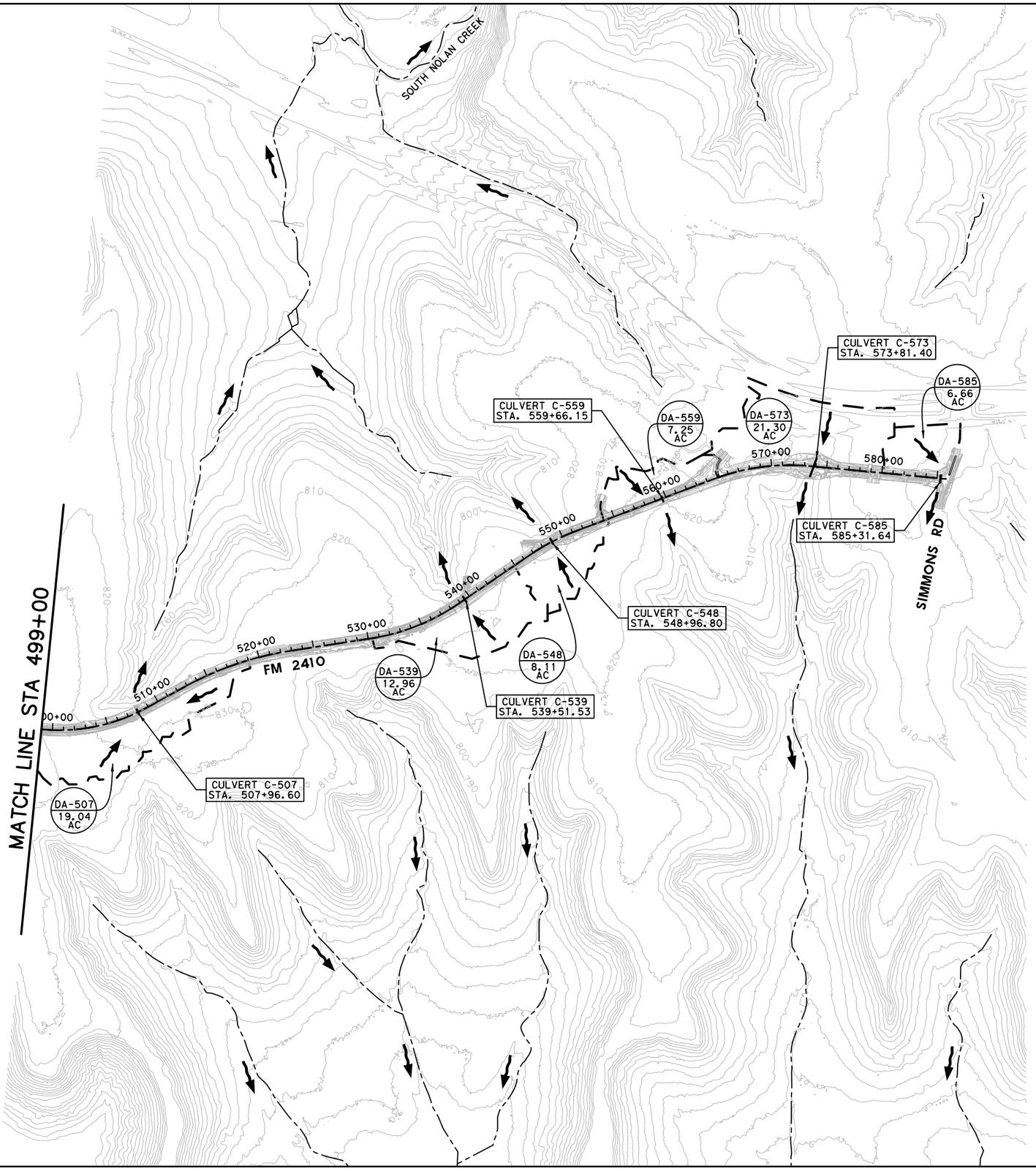

0' 250' 500' 1000'

HORIZONTAL SCALE: 1"=1000'

LEGEND:

- DIRECTION OF FLOW
- STREAM
- DRAINAGE AREA BOUNDARY
- 10 FT CONTOURS
- DA-XXX / XX.XX AC — DRAINAGE AREA ID / ACREAGE

STATE OF TEXAS
SAHAS SHRESTHA
116045
LICENSED
PROFESSIONAL ENGINEER

01/04/2023

I.S. ENGINEERS, LLC
7670 WOODWAY DRIVE
SUITE 320
HOUSTON, TEXAS 77063
FIRM REGISTRATION NO. F-11657

FM 2410

DRAINAGE AREA MAP

(SHEET 3 OF 3)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	116
GRAPHICS	CONTROL	SECTION	JOB	
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GRPH CHECK				
SRS				

DRAWING DATE: 01/04/2023 FILENAME: L:\Waco District\FM 932*FM 2410\CADD\Sheets\07 Drainage Details\FM 2410*Culvert DA Map*03.dgn

FM 2410 CULVERT CROSSING RUNOFF COMPUTATIONS (RATIONAL METHOD)											
DRAINAGE AREA ID	DRAINAGE STRUCTURE ID	EXISTING STRUCTURE	PROPOSED STRUCTURE	STATION	DRAINAGE AREA (acres)	T_c (min)	COMPOSITE 'C' VALUE	$INTENSITY_{10\text{-}YR}$ (in/hr)	$INTENSITY_{100\text{-}YR}$ (in/hr)	$Q_{10\text{-}YR}$ (cfs)	$Q_{100\text{-}YR}$ (cfs)
DA-285	C-285	6'X6' RCB	N/A	285+48.55	119.62	39	0.39	3.72	5.64	173.40	263.26
DA-304	C-304	2-5'X4' RCB	2-5'X4' RCB EXT	304+54.59	116.33	61	0.41	2.71	4.16	129.41	198.27
DA-345	C-345	2-6'X4' RCB	2-6'X4' RCB EXT	345+96.55	164.77	50	0.23	3.20	4.88	121.27	184.81
DA-377	C-377	5'X5' RCB	5'X5' RCB EXT	377+02.98	52.31	25	0.24	4.74	7.19	59.47	90.31
DA-411	C-411	2-5'X4' RCB	2-5'X4' RCB EXT	411+32.28	146.86	29	0.25	4.26	6.45	156.38	236.98
DA-438	C-438	36" CMP	36" RCP	438+19.16	18.82	18	0.25	5.57	8.49	26.22	39.93
DA-507	C-507	42" CMP	42" RCP	507+96.60	19.04	25	0.23	4.74	7.19	20.74	31.50
DA-539	C-539	36" CMP	36" RCP	539+51.53	12.96	17	0.23	5.69	8.67	16.96	25.85
DA-548	C-548	24" CMP	24" RCP	548+96.80	8.11	20	0.27	5.33	8.12	11.68	17.77
DA-559	C-559	24" CMP	24" RCP	559+66.15	7.25	15	0.27	5.93	9.04	11.61	17.70
DA-573	C-573	48" RCP	N/A	573+81.40	21.30	26	0.41	4.62	7.01	40.32	61.21
DA-585	C-585	2-24" RCP	2-24" RCP	585+31.64	6.66	17	0.41	5.69	8.67	15.54	23.68

FM 2410 CULVERT CROSSING RUNOFF COMPUTATIONS (NRCS METHOD)											
DRAINAGE AREA ID	DRAINAGE STRUCTURE ID	EXISTING STRUCTURE	PROPOSED STRUCTURE	STATION	DRAINAGE AREA (Sq Mi)	T_c (min)	LAG TIME (min)	BASE CN	USED CN	$Q_{10\text{-}YR}$ (cfs)	$Q_{100\text{-}YR}$ (cfs)
DA-351	C-351	2-6'X5' RCB	2-6'X5' RCB EXT	351+31.69	0.38	56	34	78	69	355	762
DA-393	C-393	2-6'X5' RCB	2-6'X5' RCB EXT	393+08.22	0.41	63	38	77	68	347	751
DA-454	C-454	2-8'X6' RCB	2-8'X6' RCB EXT	454+78.66	0.66	54	32	79	71	691	1424

FREQUENCY STORM PRECIPITATION DEPTH (INCH)		
DURATION	10-yr	100-yr
5 min	0.743	1.14
15 min	1.48	2.26
1 hour	2.73	4.18
2 hour	3.45	5.59
3 hour	3.90	6.54
6 hour	4.66	8.06
12 hour	5.36	9.27
24 hour	6.08	10.40

NRCS METHOD IS MODELED IN HEC-HMS VERSION 4.3
PRECIPITATION DATA IS DERIVED FROM "NOAA ATLAS 14 PRECIPITATION - REQUENCY ATLAS OF THE UNITED STATES VOLUME 11 VERSION 2.0: TEXAS"
SOILS DATA IS OBTAINED FROM NRCS WEB SOIL SURVEY UTILITY
LAND USE DATA IS OBTAINED FROM NLCD DATABASE
CN ADJUSTMENT IS BASED ON THE HAILEY AND MCGILL METHOD AS OUTLINED IN THE TXDOT HYDRAULIC MANUAL, FIGURE 4-22

STATE OF TEXAS
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01/04/2023

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7670 WOODWAY DRIVE
SUITE 320
HOUSTON, TEXAS 77063

Texas Department of Transportation

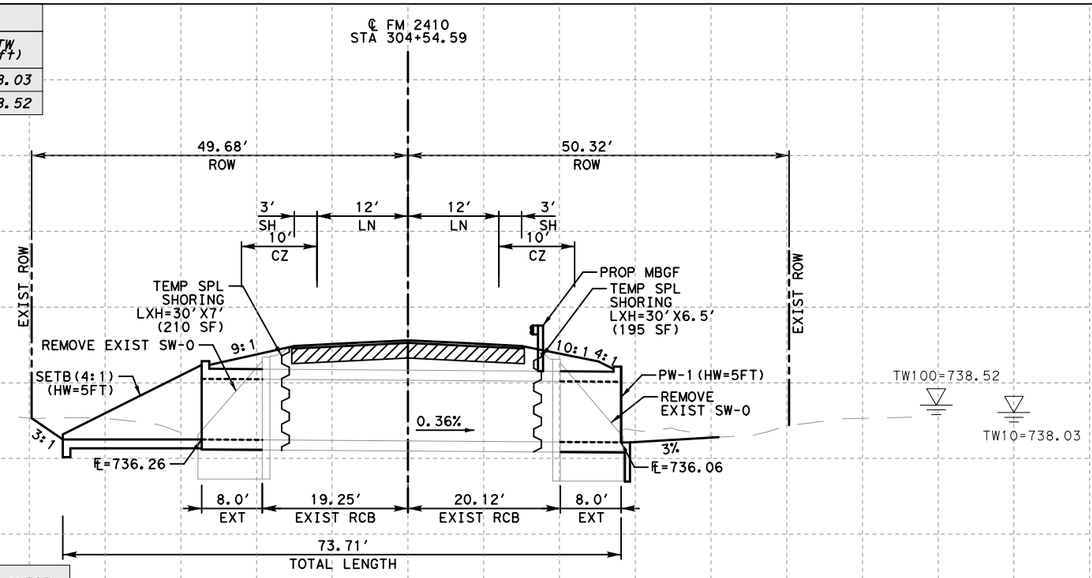
FM 2410

DRAINAGE CALCULATIONS

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	117
TW	2304	02	044	
GRPH CHECK				
SRS				

DRAWING DATE: 01/04/2023 FILENAME: L:\Waco District\FM 932*FM 2410\CADD\Sheets\07 Drainage Details\FM 2410*Culvert Runoff.dgn

CULVERT C-304 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	73.71	0.0036	129.41	6.57	739.24	738.03
100-YR			198.27	8.07	740.22	738.52

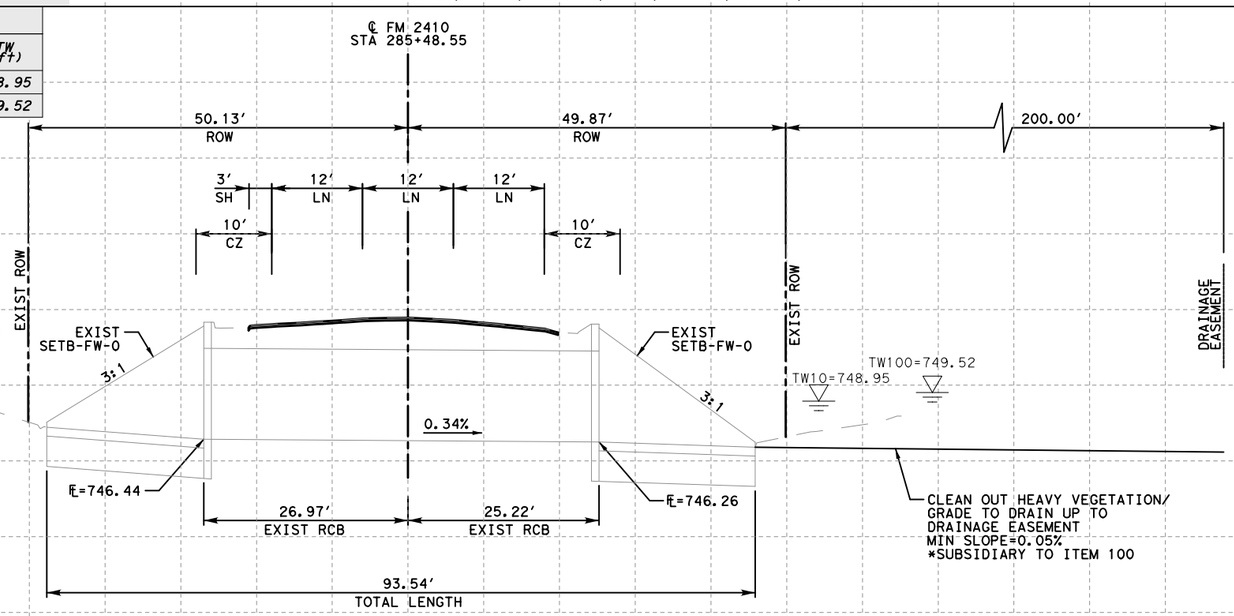


ITEM NO	DESCRIPTION	UNIT	QUANTITY
403 6001	TEMPORARY SPL SHORING	SF	405
462 6052	CONC BOX CULV (5 FT X 4 FT) (EXTEND)	LF	32
466 6180	WINGWALL (PW - 1) (HW=5 FT)	EA	1
467 6182	SET (TY I) (S= 5 FT) (HW= 5 FT) (4:1) (C)	EA	2
480 6001	CLEAN EXIST CULVERTS	EA	1
496 6005	REMOV STR (WINGWALL)	EA	2

CULVERT C-304

EXIST 2-5'X4'X39.37' RCB TO REMAIN
REMOVE EXIST SW-0 (LT) & SW-0 (RT)
EXTEND 2-5'X4'X8' RCB (LT) & 2-5'X4'X8' RCB (RT)
INSTALL SETB-CD(4:1)(LT) & PW-1(RT)
TOTAL LENGTH= 73.71'
(STANDARDS: MC-5-20, MC-MD, SETB-CD, PW-1, SCC-MD, SCP-MD, SCC-5&6 & SCP-5)

CULVERT C-285 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	93.54	0.0034	173.40	9.76	751.41	748.95
100-YR			263.26	11.22	753.01	749.52



ITEM NO	DESCRIPTION	UNIT	QUANTITY
480 6001	CLEAN EXIST CULVERTS	EA	1

CULVERT C-285

EXIST 6'X6'X52.19' RCB TO REMAIN
EXIST SETB-FW-0 (LT) & SETB-FW-0 (RT) TO REMAIN
INSTALL NONE
TOTAL LENGTH= 93.54'

HORZ 0' 10' 20'
VERT 0' 5' 10'
HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=10'

LEGEND:

EXIST GROUND

NOTES:

1. ALL RCP IS CLASS III, UNLESS OTHERWISE NOTED.
2. REFER TO TYPICAL SECTION SHEETS FOR PAVEMENT TYPE AND CROSS SLOPES.

STATE OF TEXAS
SAHAS SHRESTHA
116045
LICENSED
PROFESSIONAL ENGINEER
01/04/2023

L.S. ENGINEERS, LLC
FIRM REGISTRATION NO. F-11657
7670 WOODWAY DRIVE
SUITE 320
HOUSTON, TEXAS 77063

FM 2410

CULVERT PROFILES

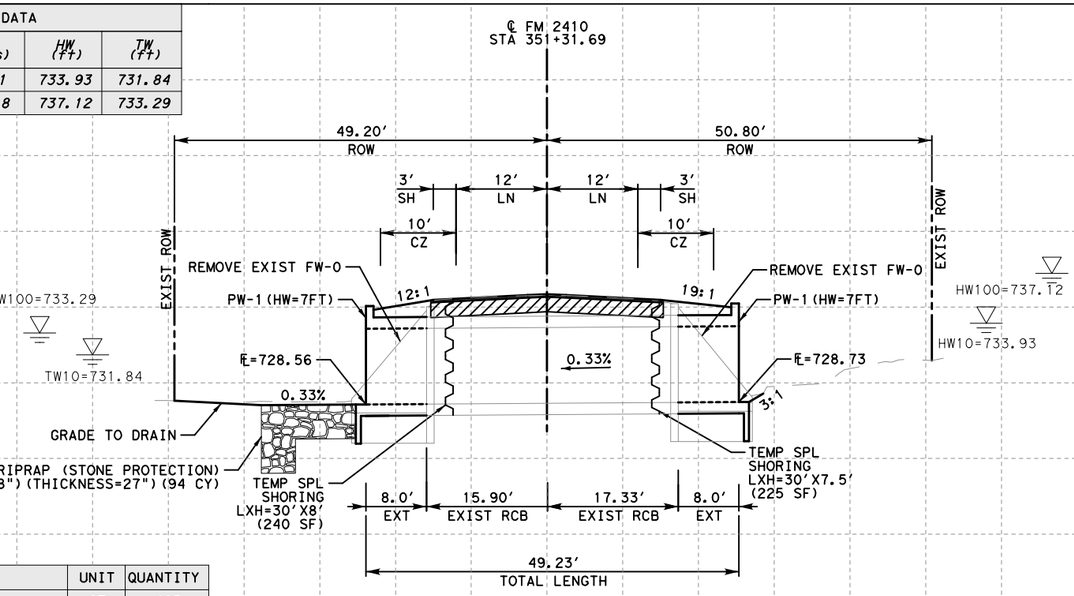
CULVERT C-285 & C-304

(SHEET 1 OF 8)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	118
TW				
GRPH CHECK	2304	02	044	
SRS				

FILENAME: L:\Waco District\FM 932+FM 2410\CADD\Sheets\07 Drainage Details\FM 2410+Culvert+Profile+01.dgn
DRAWING DATE: 01/04/2023

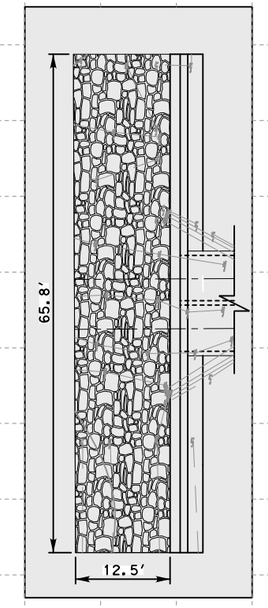
CULVERT C-351 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	49.24	0.0033	355.00	9.01	733.93	731.84
100-YR			762.00	11.18	737.12	733.29



CULVERT C-351

EXIST 2-6′X5′X33.23′ RCB TO REMAIN
REMOVE EXIST FW-0 (LT) & FW-0 (RT)
EXTEND 2-6′X5′X8′ RCB (LT) & 2-6′X5′X8′ RCB (RT)
INSTALL PW-1 (LT) & PW-1 (RT)
TOTAL LENGTH= 49.24′
(STANDARDS: MC-6-16, MC-MD, PW-1, SCC-MD, SCP-MD, SCC-5&6 & SCP-6)

ITEM NO	DESCRIPTION	UNIT	QUANTITY
403 6001	TEMPORARY SPL SHORING	SF	465
432 6033	RIPRAP (STONE PROTECTION) (18 IN)	CY	94
462 6056	CONC BOX CULV (6 FT X 5 FT) (EXTEND)	LF	32
466 6182	WINGWALL (PW - 1) (HW=7 FT)	EA	2
480 6001	CLEAN EXIST CULVERTS	EA	1
496 6005	REMOV STR (WINGWALL)	EA	2



RIPRAP DETAIL
N.T.S.

HORZ 0′ 10′ 20′
VERT 0′ 5′ 10′
HORIZONTAL SCALE: 1"=20′
VERTICAL SCALE: 1"=10′

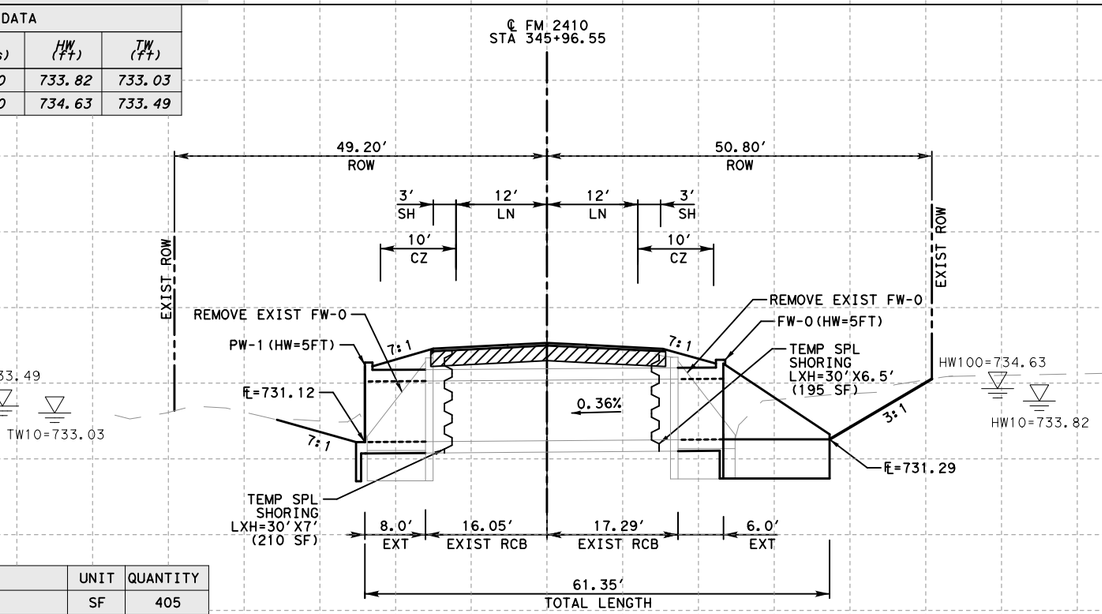
LEGEND:

EXIST GROUND

NOTES:

1. ALL RCP IS CLASS III, UNLESS OTHERWISE NOTED.
2. REFER TO TYPICAL SECTION SHEETS FOR PAVEMENT TYPE AND CROSS SLOPES.
3. REFER TO CULVERT MISCELLANEOUS DETAILS SHEET FOR RIPRAP (STONE PROTECTION) (18") TOE DETAIL.

CULVERT C-345 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	61.35	0.0036	121.27	5.30	733.82	733.03
100-YR			184.81	6.50	734.63	733.49



CULVERT C-345

EXIST 2-6′X4′X33.34′ RCB TO REMAIN
REMOVE EXIST FW-0 (LT) & FW-0 (RT)
EXTEND 2-6′X4′X8′ RCB (LT) & 2-6′X4′X6′ RCB (RT)
INSTALL PW-1 (LT) & FW-0 (RT)
TOTAL LENGTH= 61.35′
(STANDARDS: MC-6-16, MC-MD, PW-1, FW-0, SCC-MD, SCP-MD, SCC-5&6 & SCP-6)

ITEM NO	DESCRIPTION	UNIT	QUANTITY
403 6001	TEMPORARY SPL SHORING	SF	405
462 6055	CONC BOX CULV (6 FT X 4 FT) (EXTEND)	LF	28
466 6152	WINGWALL (FW - 0) (HW=5 FT)	EA	1
466 6180	WINGWALL (PW - 1) (HW=5 FT)	EA	1
480 6001	CLEAN EXIST CULVERTS	EA	1
496 6005	REMOV STR (WINGWALL)	EA	2

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
01/04/2023

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SUITE 320
HOUSTON, TEXAS 77063

FM 2410

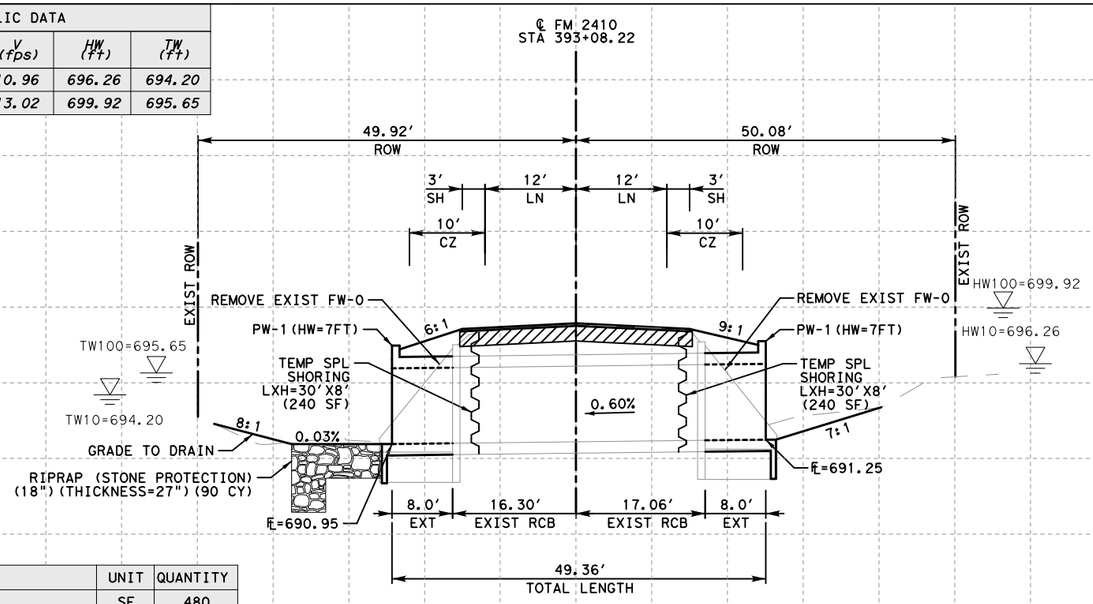
CULVERT PROFILES

CULVERT C-345 & C-351

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	119
GRAPHICS	CONTROL	SECTION	JOB	
TW	2304	02	044	
GRPH CHECK				
SRS				

FILENAME: L:\Waco District\FM 932+FM 2410\CADD\Sheets\07 Drainage Details\FM 2410+Culvert+Profile+02.dgn
DRAWING DATE: 01/04/2023

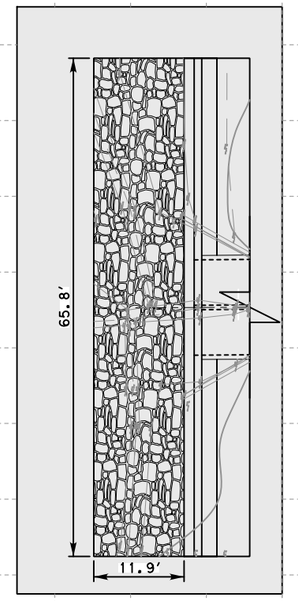
CULVERT C-393 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	49.36	0.0060	347.00	10.96	696.26	694.20
100-YR			751.00	13.02	699.92	695.65



CULVERT C-393

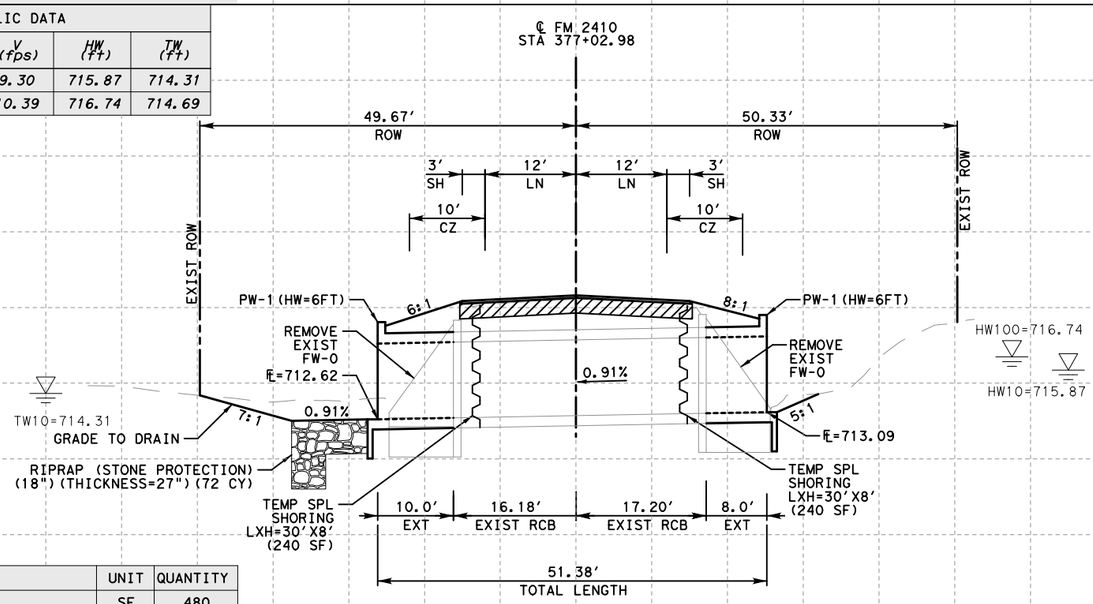
EXIST 2-6′X5′X33.36′ RCB TO REMAIN
REMOVE EXIST FW-0 (LT) & FW-0 (RT)
EXTEND 2-6′X5′X8′ RCB (LT) & 2-6′X5′X8′ RCB (RT)
INSTALL PW-1 (LT) & PW-1 (RT)
TOTAL LENGTH= 49.36′
(STANDARDS: MC-6-16, MC-MD, PW-1, SCC-MD, SCP-MD, SCC-5&6 & SCP-6)

ITEM NO	DESCRIPTION	UNIT	QUANTITY
464 6005	TEMPORARY SPL SHORING	SF	480
432 6033	RIPRAP (STONE PROTECTION) (18 IN)	CY	90
462 6056	CONC BOX CULV (6 FT X 5 FT) (EXTEND)	LF	32
466 6182	WINGWALL (PW - 1) (HW=7 FT)	EA	2
480 6001	CLEAN EXIST CULVERTS	EA	1
496 6005	REMOV STR (WINGWALL)	EA	2



RIPRAP DETAIL
N.T.S.

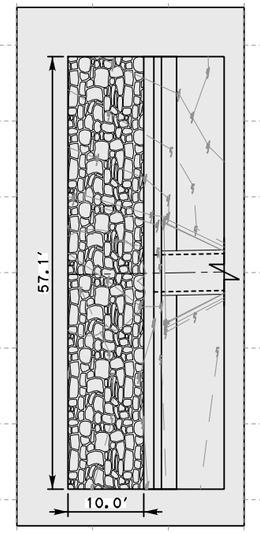
CULVERT C-377 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	51.38	0.0091	59.47	9.30	715.87	714.31
100-YR			90.31	10.39	716.74	714.69



CULVERT C-377

EXIST 5′X5′X33.38′ RCB TO REMAIN
REMOVE EXIST FW-0 (LT) & FW-0 (RT)
EXTEND 5′X5′X10′ RCB (LT) & 5′X5′X8′ RCB (RT)
INSTALL PW-1 (LT) & PW-1 (RT)
TOTAL LENGTH= 51.38′
(STANDARDS: SCC-5&6, SCC-MD, PW-1, SCP-MD & SCP-5)

ITEM NO	DESCRIPTION	UNIT	QUANTITY
403 6001	TEMPORARY SPL SHORING	SF	480
432 6033	RIPRAP (STONE PROTECTION) (18 IN)	CY	72
462 6053	CONC BOX CULV (5 FT X 5 FT) (EXTEND)	LF	18
466 6181	WINGWALL (PW - 1) (HW=6 FT)	EA	2
480 6001	CLEAN EXIST CULVERTS	EA	1
496 6005	REMOV STR (WINGWALL)	EA	2



RIPRAP DETAIL
N.T.S.

HORZ 0′ 10′ 20′
VERT 0′ 5′ 10′
HORIZONTAL SCALE: 1"=20′
VERTICAL SCALE: 1"=10′

LEGEND:

EXIST GROUND

NOTES:

1. ALL RCP IS CLASS III, UNLESS OTHERWISE NOTED.
2. REFER TO TYPICAL SECTION SHEETS FOR PAVEMENT TYPE AND CROSS SLOPES.
3. REFER TO CULVERT MISCELLANEOUS DETAILS SHEET FOR RIPRAP (STONE PROTECTION) (18") TOE DETAIL.

STATE OF TEXAS
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116045
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PROFESSIONAL ENGINEER
01/04/2023

L.S. ENGINEERS, LLC
FIRM REGISTRATION NO. F-11657
7670 WOODWAY DRIVE
SUITE 320
HOUSTON, TEXAS 77063

FM 2410

CULVERT PROFILES

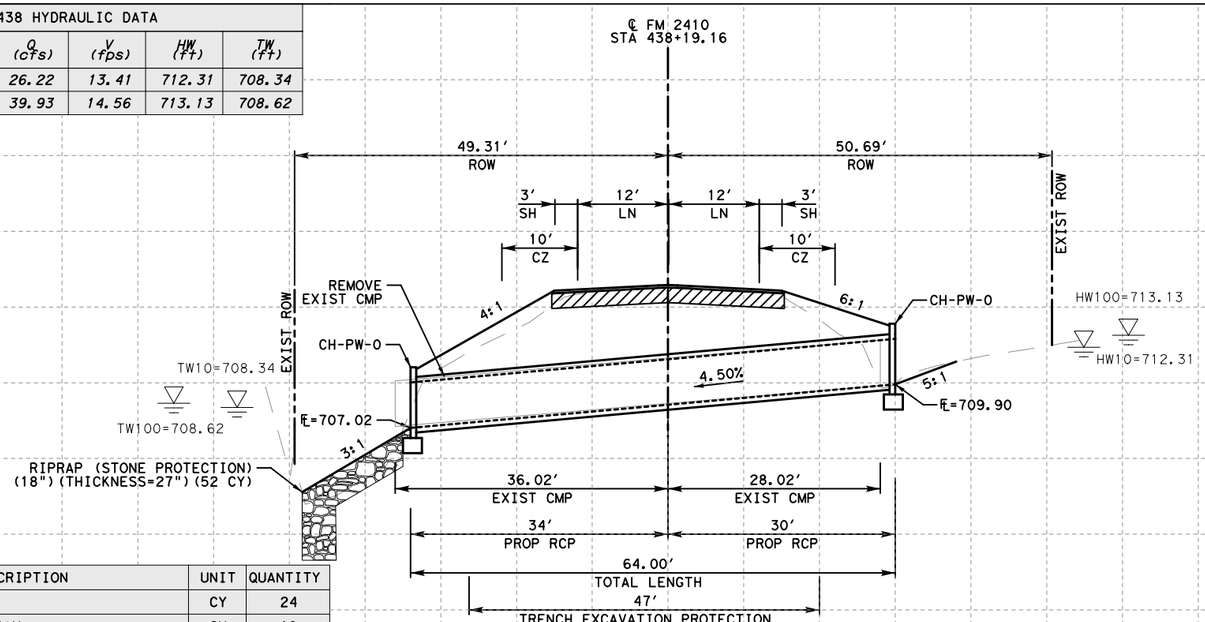
CULVERT C-377 & C-393

(SHEET 3 OF 8)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	120
GRAPHICS	CONTROL	SECTION	JOB	
TW	2304	02	044	
GRPH CHECK				
SRS				

FILENAME: L:\Waco District\FM 932+FM 2410\CADD\Sheets\07 Drainage Details\FM 2410+Culvert+Profile+03.dgn
DRAWING DATE: 01/04/2023

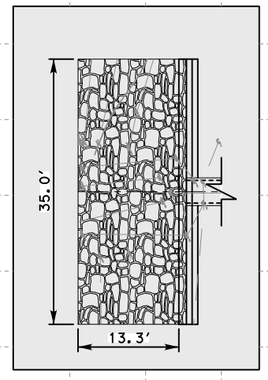
CULVERT C-438 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	64.00	0.0450	26.22	13.41	712.31	708.34
100-YR			39.93	14.56	713.13	708.62



CULVERT C-438

REMOVE EXIST 36"X64.04′ CMP
INSTALL 36"X64′ RCP
INSTALL CH-PW-0(DIA=36IN)((LT) & CH-PW-0(DIA=36IN)(RT)
TOTAL LENGTH= 64.00′
(STANDARDS: CH-PW-0)

ITEM NO	DESCRIPTION	UNIT	QUANTITY
400 6005	CEM STABIL BKFL	CY	24
400 6006	CUT & RESTORING PAV	SY	19
402 6001	TRENCH EXCAVATION PROTECTION	LF	47
432 6033	RIPRAP (STONE PROTECTION)(18 IN)	CY	52
464 6008	RC PIPE (CL III)(36 IN)	LF	64
466 6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	2
496 6007	REMOV STR (PIPE)	LF	64



RIPRAP DETAIL
N.T.S.

HORZ 0′ 10′ 20′
VERT 0′ 5′ 10′
HORIZONTAL SCALE: 1"=20′
VERTICAL SCALE: 1"=10′

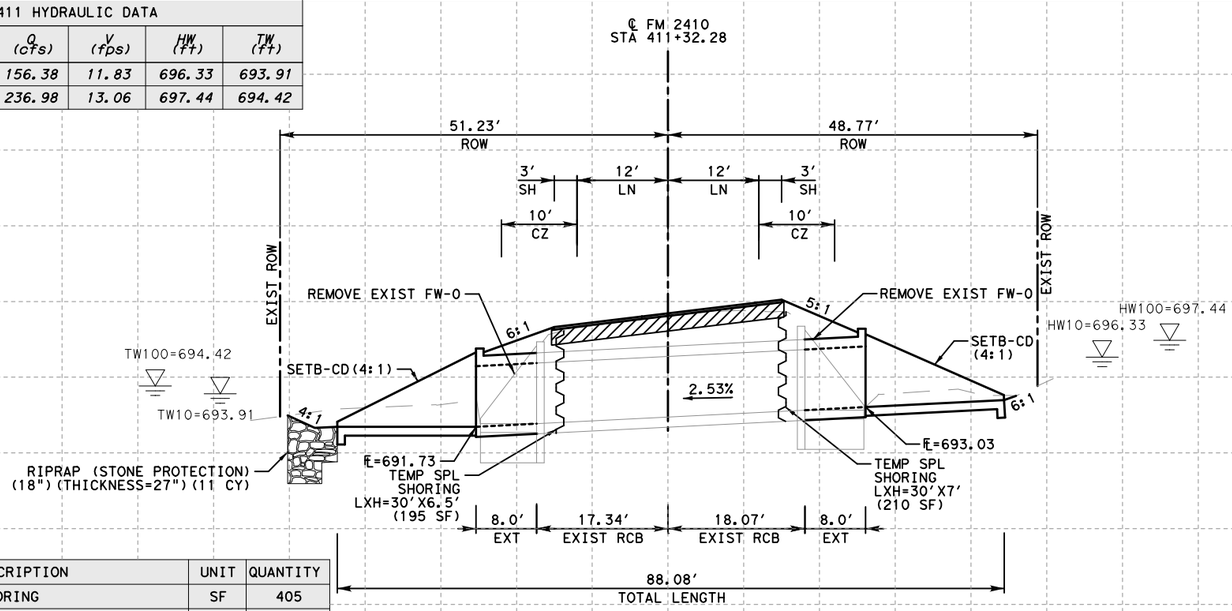
LEGEND:

EXIST GROUND

NOTES:

1. ALL RCP IS CLASS III, UNLESS OTHERWISE NOTED.
2. REFER TO TYPICAL SECTION SHEETS FOR PAVEMENT TYPE AND CROSS SLOPES.
3. REFER TO CULVERT MISCELLANEOUS DETAILS SHEET FOR RIPRAP(STONE PROTECTION)(18") TOE DETAIL.

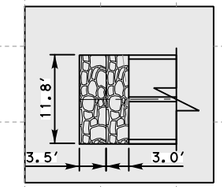
CULVERT C-411 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	88.08	0.0253	156.38	11.83	696.33	693.91
100-YR			236.98	13.06	697.44	694.42



CULVERT C-411

EXIST 2-5′X4′X35.41′ RCB TO REMAIN
REMOVE EXIST FW-0 (LT) & FW-0 (RT)
EXTEND 2-5′X4′X8′ RCB (LT) & 2-5′X4′X8′ RCB (RT)
INSTALL SETB-CD(4:1)(LT) & SETB-CD(4:1)(RT)
TOTAL LENGTH= 88.08′
(STANDARDS: MC-5-20, MC-MD, SETB-CD, SCC-MD, SCP-MD, SCC-5&6 & SCP-5)

ITEM NO	DESCRIPTION	UNIT	QUANTITY
464 6005	TEMPORARY SPL SHORING	SF	405
432 6033	RIPRAP (STONE PROTECTION)(18 IN)	CY	11
462 6052	CONC BOX CULV (5 FT X 4 FT)(EXTEND)	LF	32
467 6182	SET (TY I)(S= 5 FT)(HW= 5 FT)(4:1) (C)	EA	4
480 6001	CLEAN EXIST CULVERTS	EA	1
496 6005	REMOV STR (WINGWALL)	EA	2



RIPRAP DETAIL
N.T.S.

STATE OF TEXAS
SAHAS SHRESTHA
116045
LICENSED
PROFESSIONAL ENGINEER

01/04/2023

I.S. ENGINEERS, LLC
FIRM REGISTRATION NO. F-11657
7670 WOODWAY DRIVE
SUITE 320
HOUSTON, TEXAS 77063

FM 2410

CULVERT PROFILES

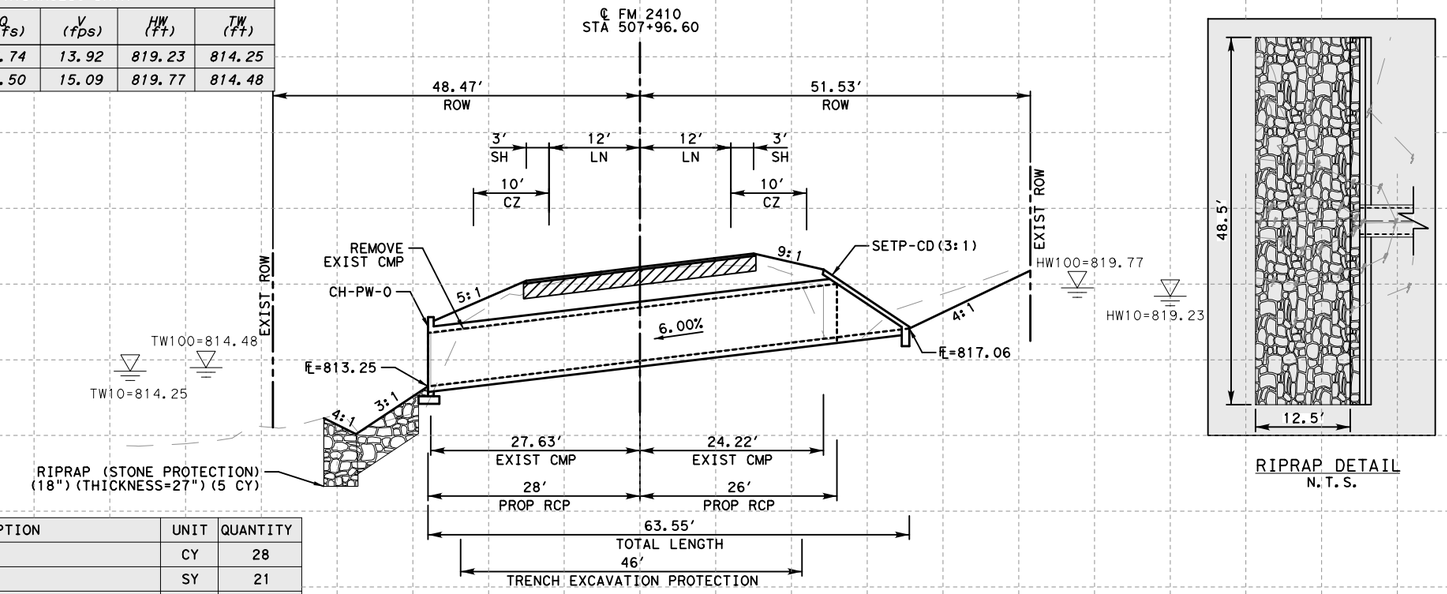
CULVERT C-411 & C-438

(SHEET 4 OF 8)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	121
TW				
GRPH CHECK	2304	02	044	
SRS				

FILENAME: L:\Waco District\FM 932*FM 2410\CADD\Sheets\07 Drainage Details\FM 2410*Culvert*Profile*04.dgn
DRAWING DATE: 01/04/2023

CULVERT C-507 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	63.55	0.0600	20.74	13.92	819.23	814.25
100-YR			31.50	15.09	819.77	814.48



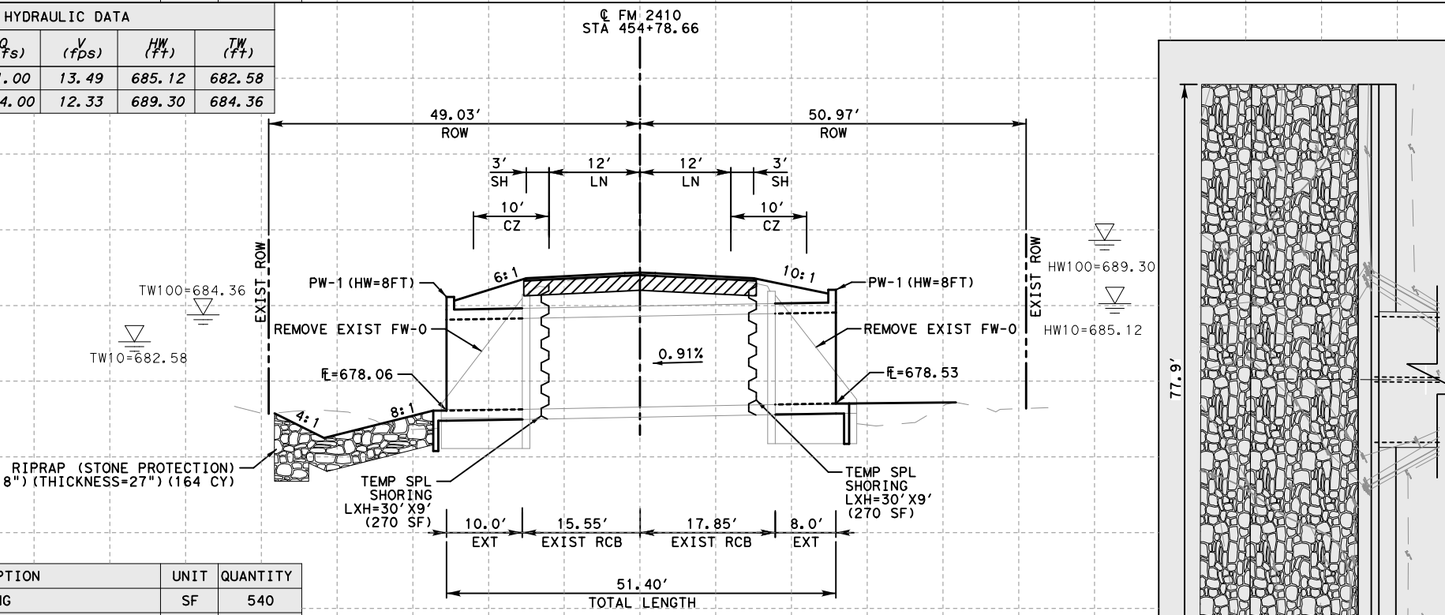
ITEM NO	DESCRIPTION	UNIT	QUANTITY
400 6005	CEM STABIL BKFL	CY	28
400 6006	CUT & RESTORING PAV	SY	21
402 6001	TRENCH EXCAVATION PROTECTION	LF	46
432 6033	RIPRAP (STONE PROTECTION) (18 IN)	CY	7
464 6009	RC PIPE (CL III) (42 IN)	LF	54
466 6102	HEADWALL (CH - PW - 0) (DIA= 42 IN)	EA	1
467 6461	SET (TY II) (42 IN) (RCP) (3: 1) (C)	EA	1
496 6007	REMOV STR (PIPE)	LF	52

CULVERT C-507

REMOVE EXIST 42"X51.85′ CMP
INSTALL 42"X54′ RCP
INSTALL CH-PW-0(DIA=42IN)(LT) & SETP-CD(3:1)(RT)
TOTAL LENGTH= 63.55′
(STANDARDS: CH-PW-0, SETP-CD)

RIPRAP DETAIL
N.T.S.

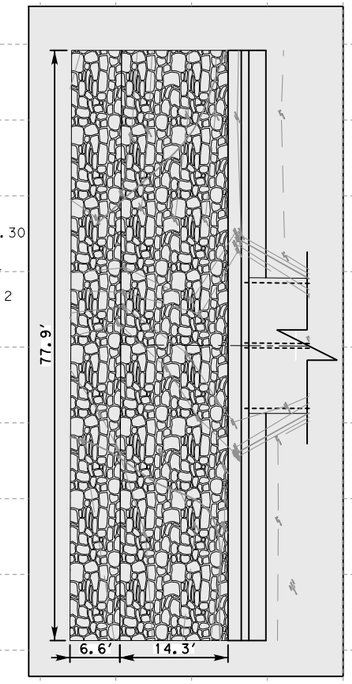
CULVERT C-454 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	51.40	0.0091	691.00	13.49	685.12	682.58
100-YR			1424.00	12.33	689.30	684.36



ITEM NO	DESCRIPTION	UNIT	QUANTITY
464 6005	TEMPORARY SPL SHORING	SF	540
432 6033	RIPRAP (STONE PROTECTION) (18 IN)	CY	164
462 6065	CONC BOX CULV (8 FT X 6 FT) (EXTEND)	LF	36
466 6183	WINGWALL (PW - 1) (HW=8 FT)	EA	2
480 6001	CLEAN EXIST CULVERTS	EA	1
496 6005	REMOV STR (WINGWALL)	EA	2

CULVERT C-454

EXIST 2-8′X6′X33.40′ RCB TO REMAIN
REMOVE EXIST FW-0 (LT) & FW-0 (RT)
EXTEND 2-8′X6′X10′ RCB (LT) & 2-8′X6′X8′ RCB (RT)
INSTALL PW-1(LT) & PW-1(RT)
TOTAL LENGTH= 51.40′
(STANDARDS: MC-8-13, MC-MD, PW-1, SCC-MD, SCP-MD, SCC-8 & SCP-8)



RIPRAP DETAIL
N.T.S.

HORZ 0′ 10′ 20′
VERT 0′ 5′ 10′
HORIZONTAL SCALE: 1"=20′
VERTICAL SCALE: 1"=10′

LEGEND:

EXIST GROUND

NOTES:

1. ALL RCP IS CLASS III, UNLESS OTHERWISE NOTED.
2. REFER TO TYPICAL SECTION SHEETS FOR PAVEMENT TYPE AND CROSS SLOPES.
3. REFER TO CULVERT MISCELLANEOUS DETAILS SHEET FOR RIPRAP (STONE PROTECTION) (18") TOE DETAIL.

STATE OF TEXAS
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01/04/2023

I.S. ENGINEERS, LLC
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7670 WOODWAY DRIVE
SUITE 320
HOUSTON, TEXAS 77063

FM 2410

CULVERT PROFILES

CULVERT C-454 & C-507

(SHEET 5 OF 8)

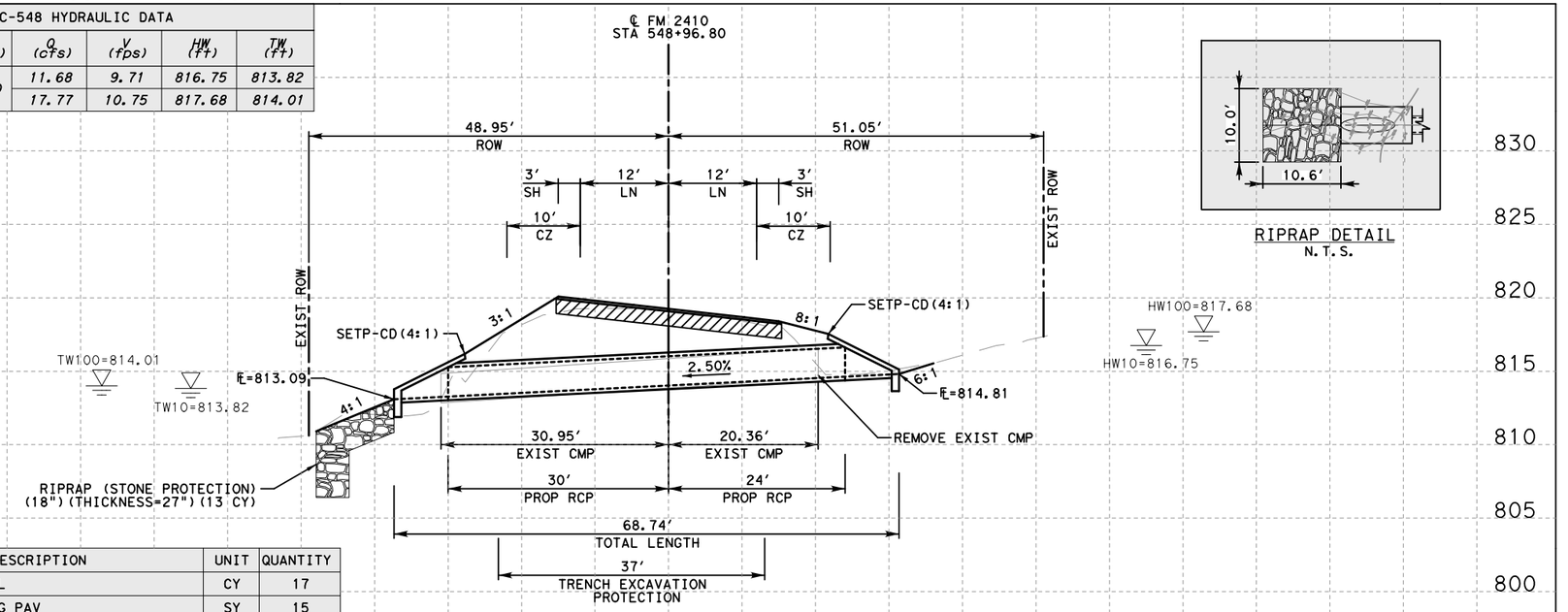
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	122
TW				
GRPH CHECK	2304	02	044	
SRS				

FILENAME: L:\Waco District\FM 932*FM 2410\CADD\Sheets\07 Drainage Details\FM 2410*Culvert*Profile*05.dgn
DRAWING DATE: 01/04/2023

FILENAME: L:\Waco District\FM 932*FM 2410\CADD\Sheets\07 Drainage Details\FM 2410*Culvert*Profile*06.dgn

DRAWING DATE: 01/04/2023

CULVERT C-548 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	68.74	0.0250	11.68	9.71	816.75	813.82
100-YR			17.77	10.75	817.68	814.01



CULVERT C-548

REMOVE EXIST 24"X51.31′ CMP
INSTALL 24"X54′ RCP
INSTALL SETP-CD(4:1)(LT) & SETP-CD(4:1)(RT)
TOTAL LENGTH= 68.74′
(STANDARDS: SETP-CD)

ITEM NO	DESCRIPTION	UNIT	QUANTITY
400 6005	CEM STABIL BKFL	CY	17
400 6006	CUT & RESTORING PAV	SY	15
402 6001	TRENCH EXCAVATION PROTECTION	LF	37
432 6033	RIPRAP (STONE PROTECTION)(18 IN)	CY	13
464 6005	RC PIPE (CL III)(24 IN)	LF	54
467 6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	2
496 6007	REMOV STR (PIPE)	LF	51

RIPRAP DETAIL
N.T.S.

HORZ 0′ 10′ 20′
VERT 0′ 5′ 10′
HORIZONTAL SCALE: 1"=20′
VERTICAL SCALE: 1"=10′

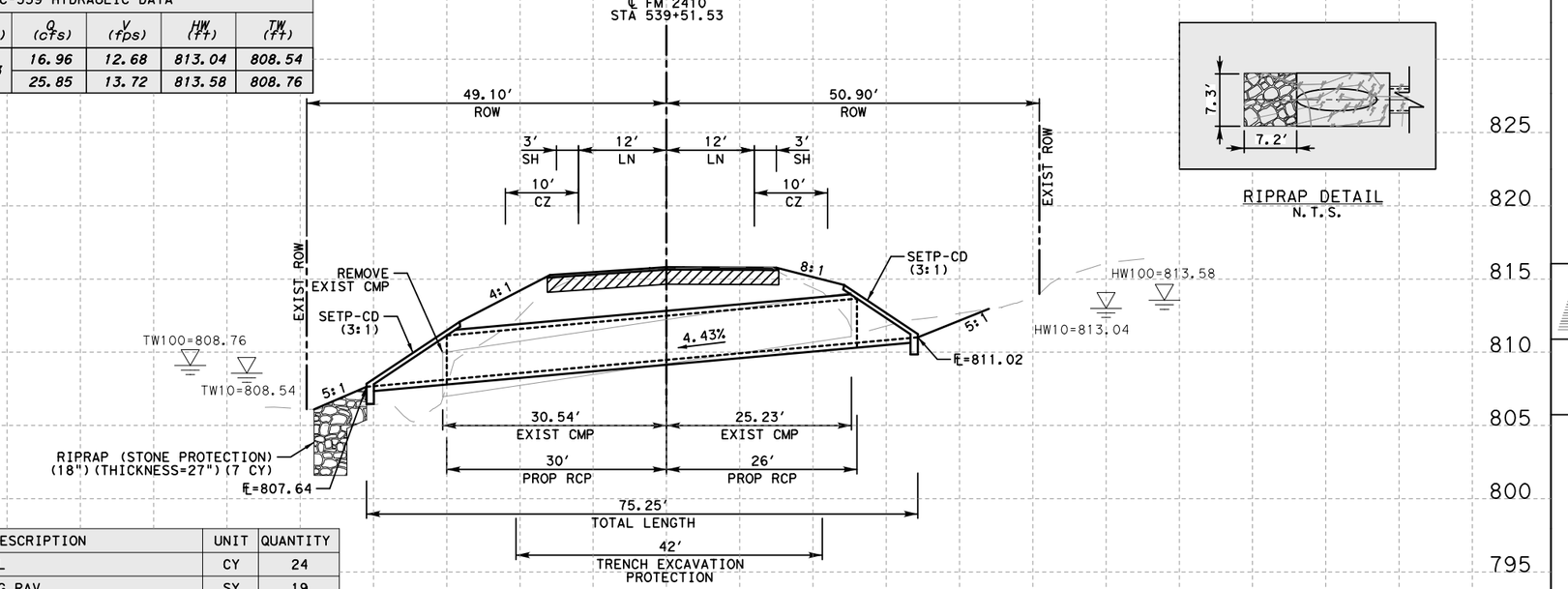
LEGEND:

EXIST GROUND

NOTES:

1. ALL RCP IS CLASS III, UNLESS OTHERWISE NOTED.
2. REFER TO TYPICAL SECTION SHEETS FOR PAVEMENT TYPE AND CROSS SLOPES.
3. REFER TO CULVERT MISCELLANEOUS DETAILS SHEET FOR RIPRAP(STONE PROTECTION)(18") TOE DETAIL.

CULVERT C-539 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	75.25	0.0443	16.96	12.68	813.04	808.54
100-YR			25.85	13.72	813.58	808.76

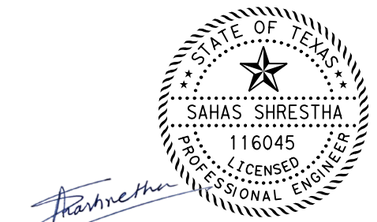


CULVERT C-539

REMOVE EXIST 36"X55.77′ CMP
INSTALL 36"X56′ RCP
INSTALL SETP-CD(3:1)(LT) & SETP-CD(3:1)(RT)
TOTAL LENGTH= 75.25′
(STANDARDS: SETP-CD)

ITEM NO	DESCRIPTION	UNIT	QUANTITY
400 6005	CEM STABIL BKFL	CY	24
400 6006	CUT & RESTORING PAV	SY	19
402 6001	TRENCH EXCAVATION PROTECTION	LF	42
432 6033	RIPRAP (STONE PROTECTION)(18 IN)	CY	7
464 6008	RC PIPE (CL III)(36 IN)	LF	56
467 6448	SET (TY II) (36 IN) (RCP) (3: 1) (C)	EA	2
496 6007	REMOV STR (PIPE)	LF	56

RIPRAP DETAIL
N.T.S.



01/04/2023

I.S. ENGINEERS, LLC
FIRM REGISTRATION NO. F-11657
7670 WOODWAY DRIVE
SUITE 320
HOUSTON, TEXAS 77063

FM 2410

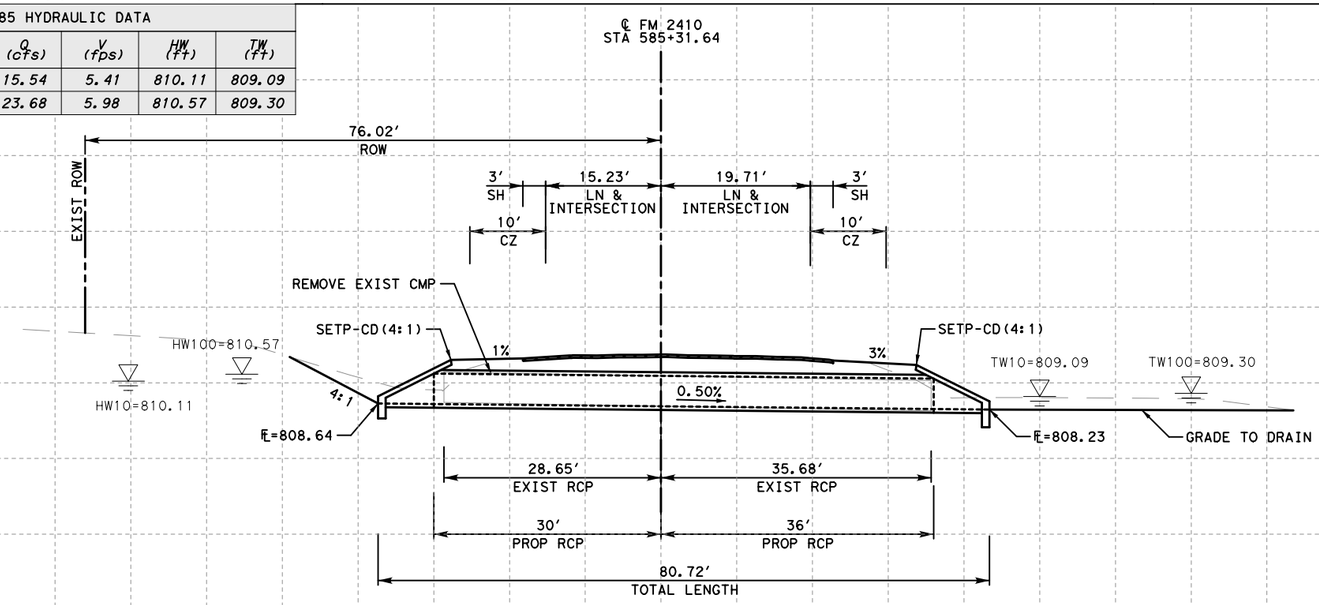
CULVERT PROFILES

CULVERT C-539 & C-548

(SHEET 6 OF 8)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	123
TW				
GRPH CHECK	2304	02	044	
SRS				

CULVERT C-585 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	80.72	0.0050	15.54	5.41	810.11	809.09
100-YR			23.68	5.98	810.57	809.30

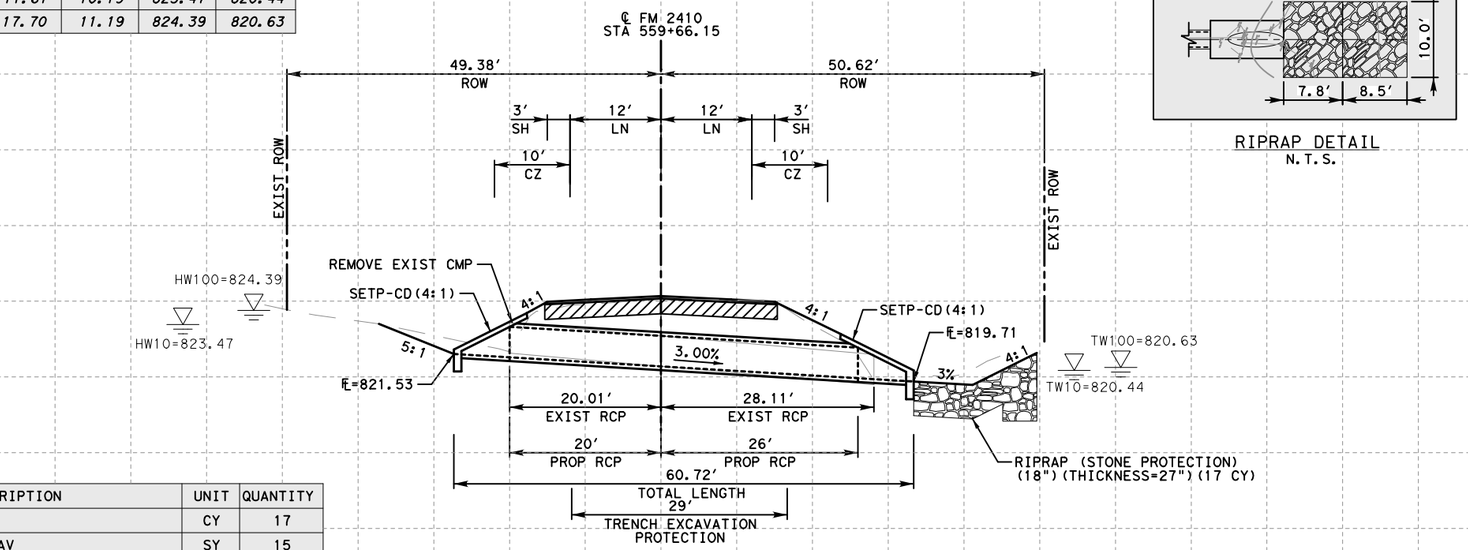


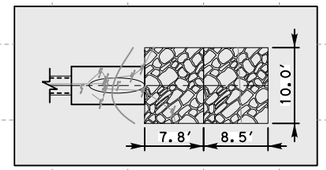
ITEM NO	DESCRIPTION	UNIT	QUANTITY
400 6005	CEM STABIL BKFL	CY	40
400 6006	CUT & RESTORING PAV	SY	37
464 6018	RC PIPE (CL IV)(24 IN)	LF	132
467 6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	4
496 6007	REMOV STR (PIPE)	LF	129

CULVERT C-585

REMOVE EXIST 2-24"X64.33′ RCP
INSTALL 2-24"X66′ RCP (CL IV)
INSTALL SETP-CD(4:1)(LT) & SETP-CD(4:1)(RT)
TOTAL LENGTH=80.72′
(STANDARDS: SETP-CD)

CULVERT C-559 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	60.72	0.0300	11.61	10.19	823.47	820.44
100-YR			17.70	11.19	824.39	820.63





RIPRAP DETAIL
N.T.S.

ITEM NO	DESCRIPTION	UNIT	QUANTITY
400 6005	CEM STABIL BKFL	CY	17
400 6006	CUT & RESTORING PAV	SY	15
402 6001	TRENCH EXCAVATION PROTECTION	LF	29
432 6033	RIPRAP (STONE PROTECTION)(18 IN)	CY	17
464 6005	RC PIPE (CL III)(24 IN)	LF	46
467 6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	2
496 6007	REMOV STR (PIPE)	LF	48

CULVERT C-559

REMOVE EXIST 24"X48.12′ CMP
INSTALL 24"X46′ RCP
INSTALL SETP-CD(4:1)(LT) & SETP-CD(4:1)(RT)
TOTAL LENGTH= 60.72′
(STANDARDS: SETP-CD)

HORZ 0′ 10′ 20′
VERT 0′ 5′ 10′
HORIZONTAL SCALE: 1"=20′
VERTICAL SCALE: 1"=10′

LEGEND:

EXIST GROUND

NOTES:

1. ALL RCP IS CLASS III, UNLESS OTHERWISE NOTED.
2. REFER TO TYPICAL SECTION SHEETS FOR PAVEMENT TYPE AND CROSS SLOPES.
3. REFER TO CULVERT MISCELLANEOUS DETAILS SHEET FOR RIPRAP(STONE PROTECTION)(18") TOE DETAIL.

01/04/2023

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SUITE 320
HOUSTON, TEXAS 77063

FM 2410

CULVERT PROFILES

CULVERT C-559 & C-585

(SHEET 7 OF 8)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	
TW	2304	02	044	124
GRPH CHECK				
SRS				

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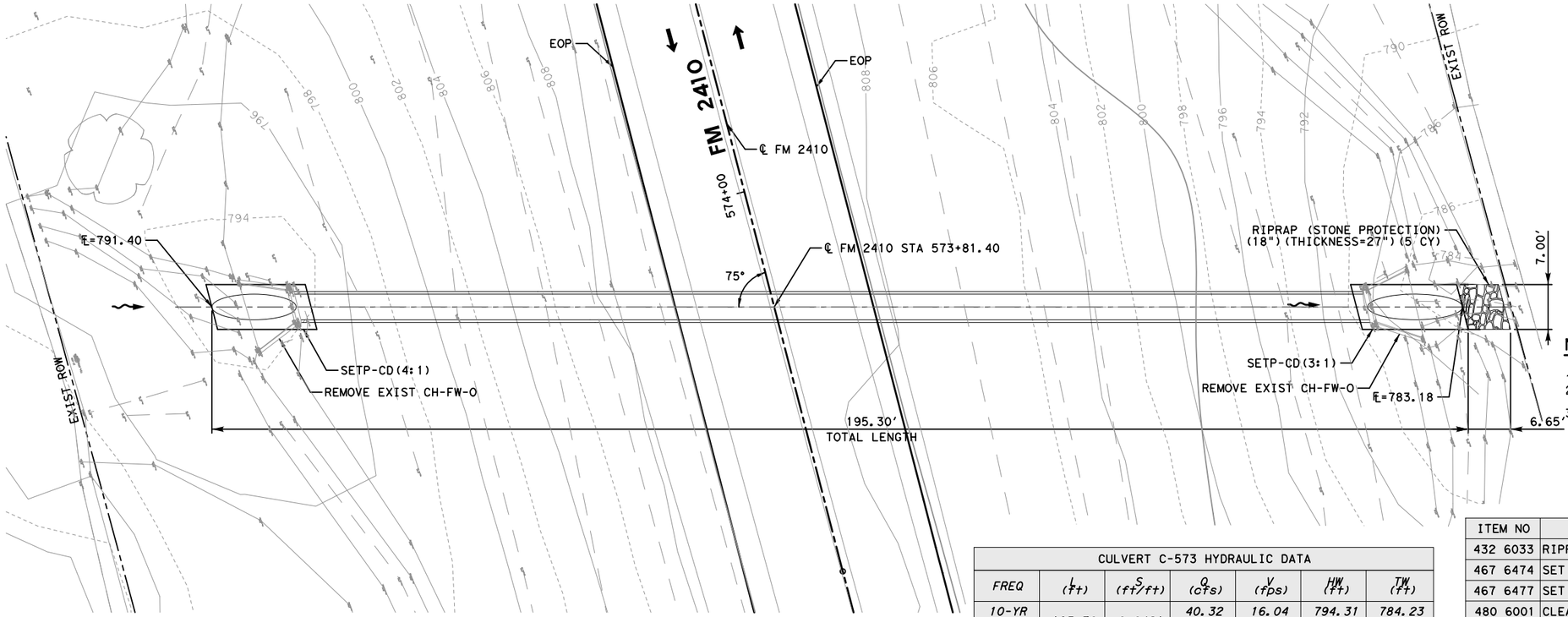
DRAWING DATE: 01/04/2023



LEGEND:

~~~ DIRECTION OF FLOW

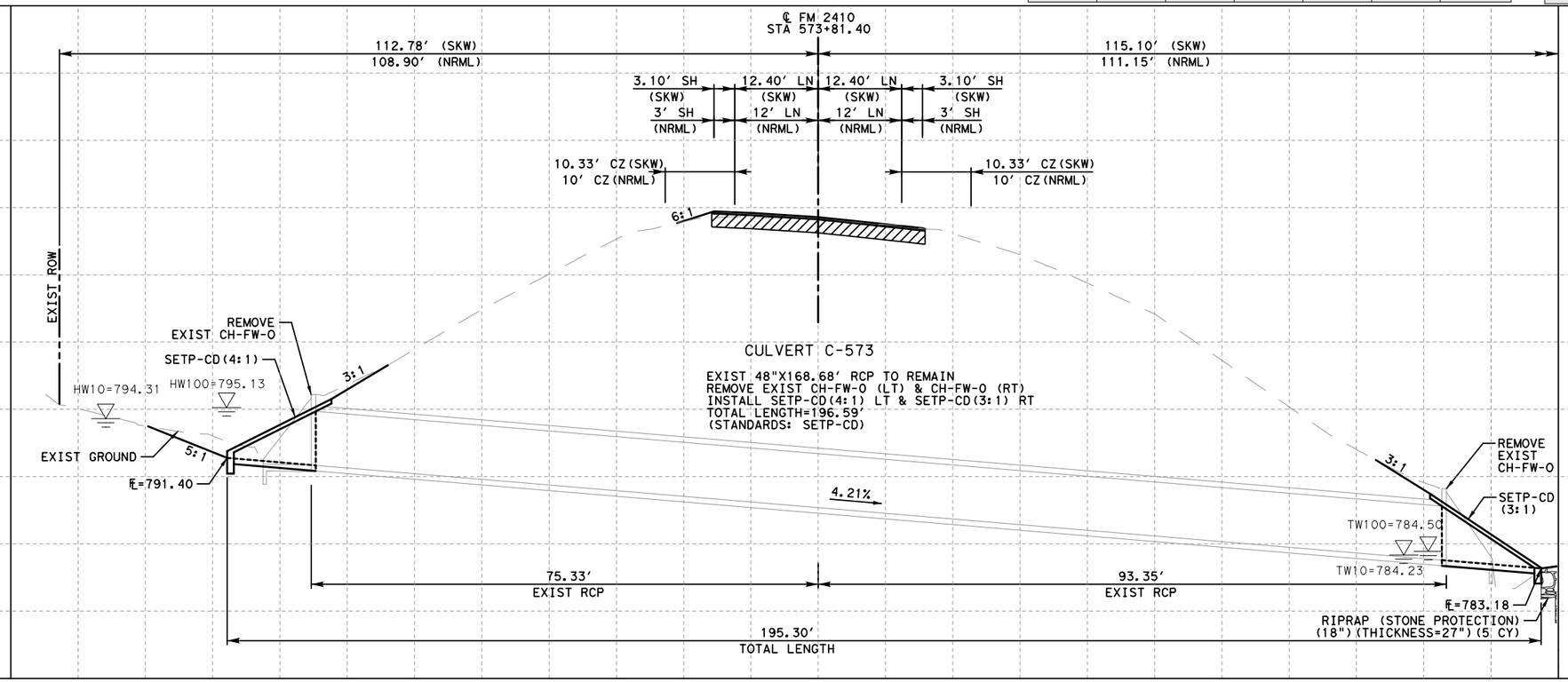
——— - - ——— EXIST ROW

NOTES:

1. ALL RCP IS CLASS III, UNLESS OTHERWISE NOTED.
2. REFER TO TYPICAL SECTION SHEETS FOR PAVEMENT TYPE AND CROSS SLOPES.
3. REFER TO CULVERT MISCELLANEOUS DETAILS SHEET FOR RIPRAP(STONE PROTECTION)(18") TOE DETAIL.

CULVERT C-573 HYDRAULIC DATA						
FREQ	L (ft)	S (ft/ft)	Q (cfs)	V (fps)	HW (ft)	TW (ft)
10-YR	195.30	0.0421	40.32	16.04	794.31	784.23
100-YR			61.21	17.87	795.13	784.50

ITEM NO	DESCRIPTION	UNIT	QUANTITY
432 6033	RIPRAP (STONE PROTECTION)(18 IN)	CY	5
467 6474	SET (TY II) (48 IN) (RCP) (3: 1) (C)	EA	1
467 6477	SET (TY II) (48 IN) (RCP) (4: 1) (C)	EA	1
480 6001	CLEAN EXIST CULVERTS	EA	1
496 6005	REMOV STR (WINGWALL)	EA	2



STATE OF TEXAS
SAHAS SHRESTHA
116045
LICENSED
PROFESSIONAL ENGINEER

01/04/2023

I.S. ENGINEERS, LLC
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SUITE 320
HOUSTON, TEXAS 77063
FIRM REGISTRATION NO. F-11657

FM 2410

CULVERT PROFILES

CULVERT C-573

(SHEET 8 OF 8)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	125
TW				
GRPH CHECK	2304	02	044	
SRS				

FILENAME: L:\Waco District\FM 932*FM 2410\CADD\Sheets\07 Drainage Details\FM 2410*Culvert*PlanProfile*C-573.dgn

DRAWING DATE: 01/04/2023
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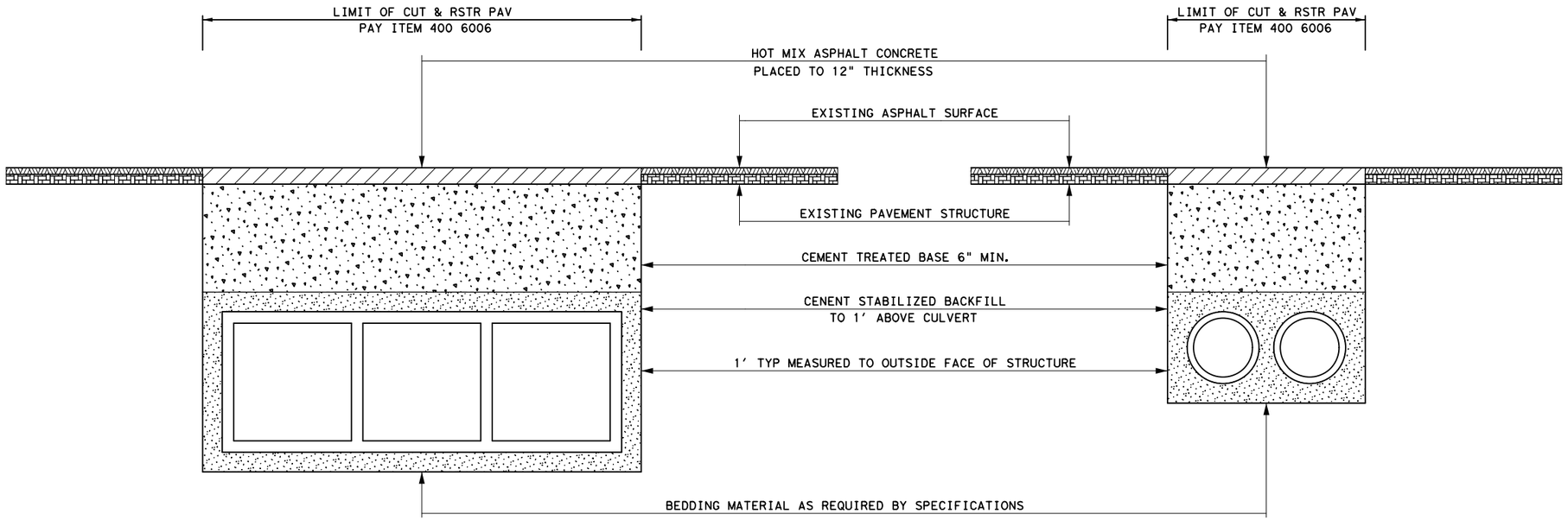
NOTES:

1. SAW CUT EXISTING PAVEMENT ON BOTH SIDES OF CULVERT TO PROVIDE A SMOOTH, EVEN EDGE FOR PAVEMENT REPAIR. SAW CUTTING WILL BE SUBSIDIARY TO CULVERT ITEMS.
2. USE CLASS IV RCP FOR AREAS WITH LIMITED DEPTH OF COVER. REFER TO CULVERT PLAN OR PROFILE SHEETS FOR CLASS IV RCP LOCATIONS.



CULVERT PLACEMENT UNDER TRAFFIC DETAIL

STATE OF TEXAS
SAHAS SHRESTHA
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PROFESSIONAL ENGINEER

01/04/2023

FIRM REGISTRATION NO. F-11657
I.S. ENGINEERS, LLC
7670 WOODWAY DRIVE
SUITE 320
HOUSTON, TEXAS 77063

Texas Department of Transportation

FM 2410

BACKFILL DETAILS

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	126
TW				
GRPH CHECK	2304	02	044	
SRS				

DRAWING DATE: 01/04/2023
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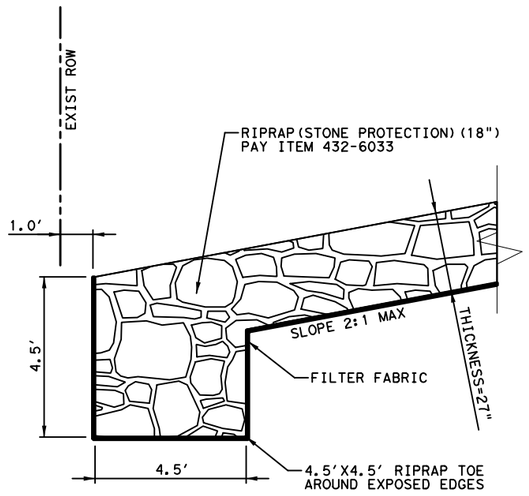
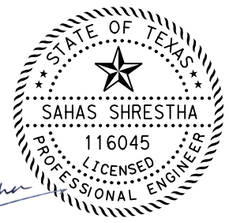


RIPRAP(STONE PROTECTION)(18") TOE DETAIL

NTS



01/04/2023

I.S. ENGINEERS, LLC
7670 WOODWAY DRIVE
SUITE 320
HOUSTON, TEXAS 77063
FIRM REGISTRATION NO. F-11657

FM 2410
CULVERT
MISCELLANEOUS DETAILS

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YH	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
SRS	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	127
TW				
GRPH CHECK	2304	02	044	
SRS				

Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" (2) Conc (Curb) (CY)	Class "C" (3) Conc (Wingwall) (CY)	Total Wingwall Area (SF)
STA 304+54.59 (Lt)	2 ~ 5'x 4'	2'	MC-5-20	SETB-CD	0°	4:1	8"	7"	0.500'	4.917'	N/A	N/A	18.333'	N/A	11.750'	0.0	0.2	8.1	N/A
STA 304+54.60 (Rt)	2 ~ 5'x 4'	2'	MC-5-20	PW-1	0°	4:1	8"	7"	0.333'	5.000'	N/A	N/A	20.000'	11.750'	N/A	0.0	0.1	13.5	200
STA 345+96.55 (Lt)	2 ~ 6'x 4'	2'	MC-6-16	PW-1	0°	4:1	9"	7"	0.500'	5.250'	N/A	N/A	21.000'	13.750'	N/A	0.0	0.3	15.1	221
STA 345+96.55 (Rt)	2 ~ 6'x 4'	2'	MC-6-16	FW-0	0°	3:1	9"	7"	0.500'	5.000'	14.000'	8.083'	16.166'	13.750'	N/A	0.0	0.3	6.1	86
STA 351+31.69 (Both)	2 ~ 6'x 5'	2'	MC-6-16	PW-1	0°	4:1	9"	7"	0.750'	6.500'	N/A	N/A	26.000'	13.750'	N/A	0.0	0.8	42.0	676
STA 377+02.98 (Both)	1 ~ 5'x 5'	2'	SCC-5&6	PW-1	0°	4:1	8"	7"	0.750'	6.417'	N/A	N/A	25.667'	6.167'	N/A	0.0	0.4	40.4	658
STA 393+08.22 (Both)	2 ~ 6'x 5'	2'	MC-6-16	PW-1	0°	4:1	9"	7"	0.750'	6.500'	N/A	N/A	26.000'	13.750'	N/A	0.0	0.8	42.0	676
STA 411+32.28 (Both)	2 ~ 5'x 4'	2'	MC-5-20	SETB-CD	0°	4:1	8"	7"	0.500'	4.917'	N/A	N/A	18.333'	N/A	11.750'	0.0	0.4	16.2	N/A
STA 454+78.66 (Both)	2 ~ 8'x 6'	2'	MC-8-13	PW-1	0°	4:1	8"	7"	0.833'	7.500'	N/A	N/A	30.000'	17.750'	N/A	0.0	1.0	57.4	900

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

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

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

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

C = Curb height

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

Hw = Height of wingwall

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

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

Lw = Length of longest wingwall.

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

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

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

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

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

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

STATE OF TEXAS
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01/04/2023

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		128

DATE: 01/04/2023 2:55:24 PM
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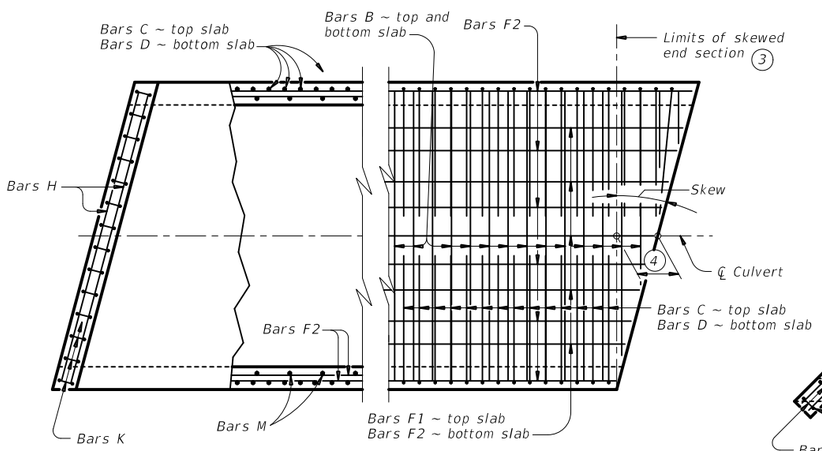
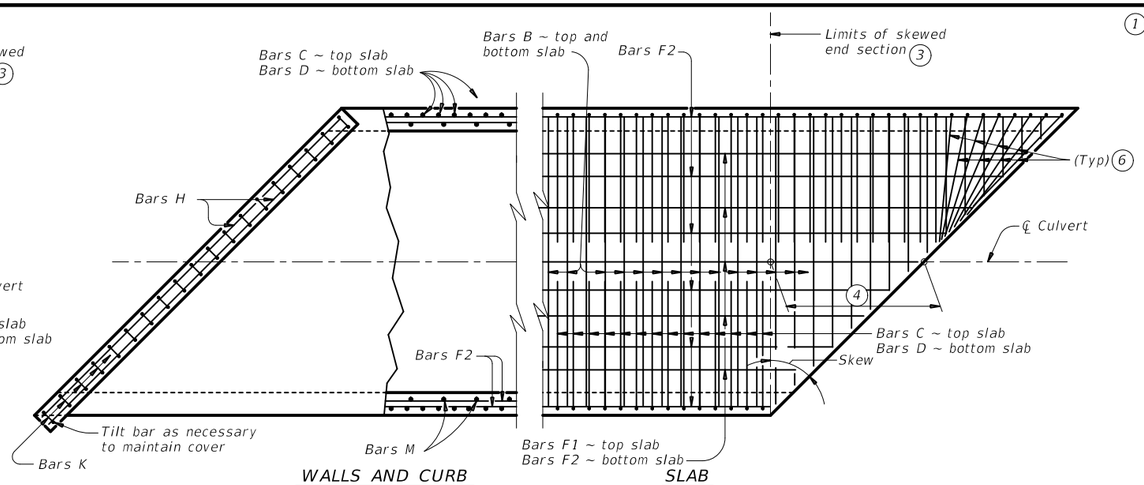
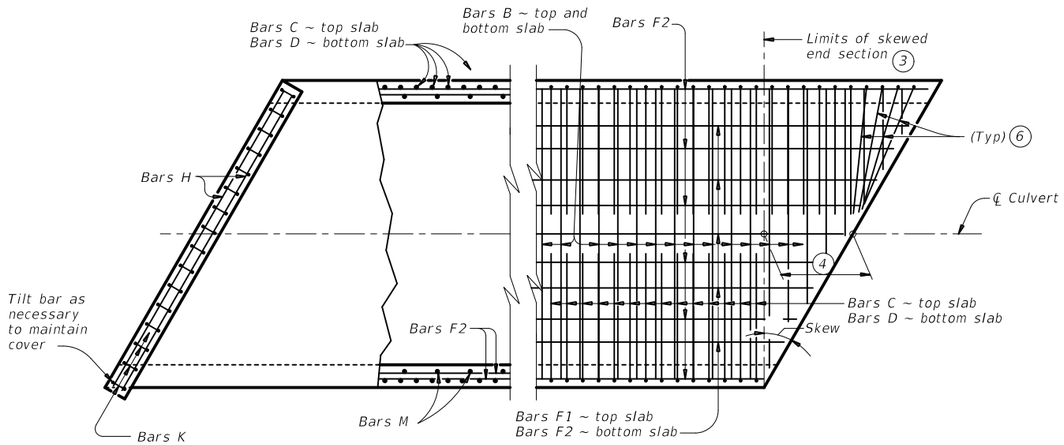


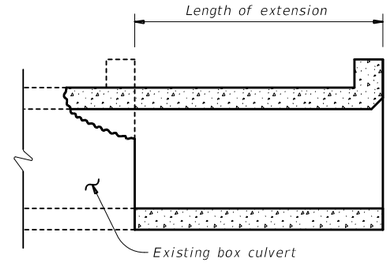
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



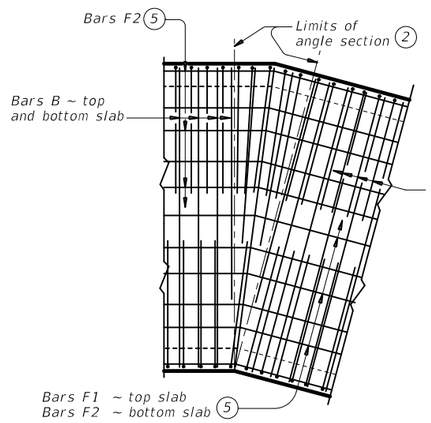
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



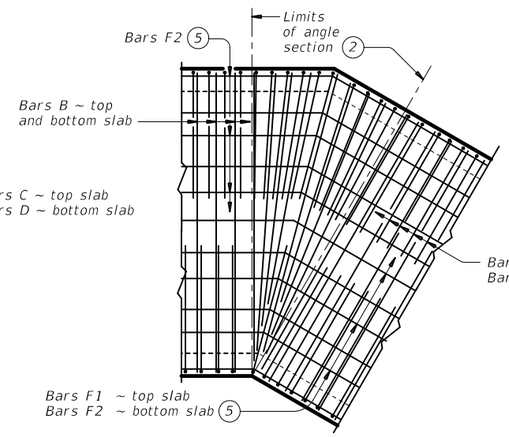
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



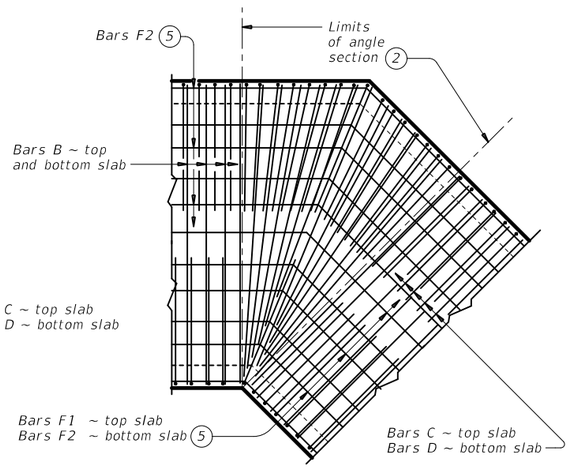
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, C, D , E, or F ancher adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.

For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.

For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		129

DATE: 9/20/2022 2:39:29 PM
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DATE: 9/20/2022 2:39:30 PM
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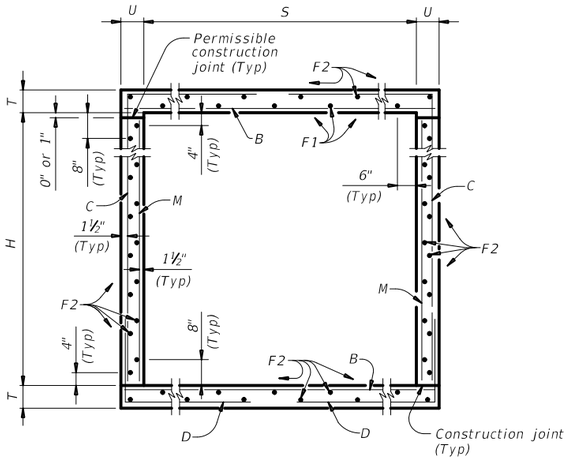
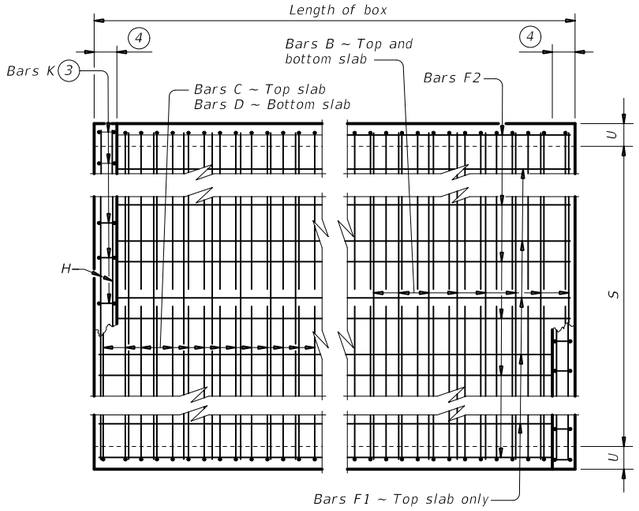
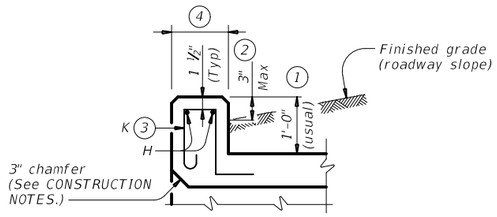


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

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

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

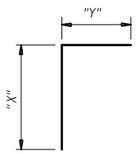
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts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

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

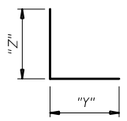
GENERAL NOTES:

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

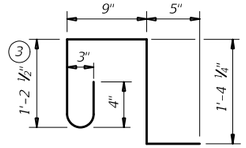
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-5 & 6

FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WACO	BELL		130

SECTION DIMENSIONS				(5) FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																								QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
5' – 0"	2' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	6' – 3"	704	2' – 6"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	2' – 0"	144	4	39' – 9"	106	22	39' – 9"	584	5' – 11"	16	14	39	0.391	80.5	0.5	55	16.1	3,276
5' – 0"	2' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	6' – 4"	713	2' – 7"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	2' – 0"	144	4	39' – 9"	106	22	39' – 9"	584	5' – 11"	16	14	39	0.429	81.0	0.5	55	17.6	3,294
5' – 0"	3' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	7' – 3"	817	3' – 6"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	3' – 0"	216	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.434	87.8	0.5	55	17.8	3,567
5' – 0"	3' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	7' – 4"	826	3' – 7"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	3' – 0"	216	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.472	88.3	0.5	55	19.3	3,585
5' – 0"	4' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	8' – 3"	929	4' – 6"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	4' – 0"	289	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.477	92.4	0.5	55	19.5	3,752
5' – 0"	4' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	8' – 4"	939	4' – 7"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	4' – 0"	289	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.515	92.9	0.5	55	21.1	3,771
5' – 0"	5' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	9' – 3"	1,042	5' – 6"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	5' – 0"	361	4	39' – 9"	106	30	39' – 9"	797	5' – 11"	16	14	39	0.521	99.7	0.5	55	21.3	4,044
5' – 0"	5' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	9' – 4"	1,051	5' – 7"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	5' – 0"	361	4	39' – 9"	106	30	39' – 9"	797	5' – 11"	16	14	39	0.559	100.2	0.5	55	22.8	4,062
6' – 0"	2' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	6' – 7"	742	2' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	2' – 0"	144	5	39' – 9"	133	25	39' – 9"	664	6' – 11"	18	16	45	0.440	89.1	0.5	63	18.1	3,628
6' – 0"	2' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	6' – 8"	1,126	2' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	2' – 0"	144	5	39' – 9"	133	25	39' – 9"	664	6' – 11"	18	16	45	0.485	108.6	0.5	63	19.9	4,407
6' – 0"	2' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	6' – 10"	1,155	2' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	2' – 0"	110	5	39' – 9"	133	25	39' – 9"	664	7' – 1"	19	18	50	0.551	109.9	0.5	69	22.6	4,463
6' – 0"	3' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	7' – 7"	854	3' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	3' – 0"	216	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.484	96.4	0.5	63	19.9	3,918
6' – 0"	3' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	7' – 8"	1,295	3' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	3' – 0"	216	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.528	117.3	0.5	63	21.6	4,754
6' – 0"	3' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	7' – 10"	1,324	3' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	3' – 0"	164	5	39' – 9"	133	29	39' – 9"	770	7' – 1"	19	18	50	0.601	118.1	0.5	69	24.6	4,792
6' – 0"	4' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	8' – 7"	967	4' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	4' – 0"	289	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.527	101.0	0.5	63	21.6	4,104
6' – 0"	4' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	8' – 8"	1,464	4' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	4' – 0"	289	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.571	123.3	0.5	63	23.4	4,996
6' – 0"	4' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	8' – 10"	1,493	4' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	4' – 0"	219	5	39' – 9"	133	29	39' – 9"	770	7' – 1"	19	18	50	0.650	123.7	0.5	69	26.5	5,016
6' – 0"	5' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	9' – 7"	1,080	5' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	5' – 0"	361	5	39' – 9"	133	33	39' – 9"	876	6' – 11"	18	16	45	0.570	108.3	0.5	63	23.3	4,395
6' – 0"	5' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	9' – 8"	1,633	5' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	5' – 0"	361	5	39' – 9"	133	33	39' – 9"	876	6' – 11"	18	16	45	0.614	132.0	0.5	63	25.1	5,343
6' – 0"	5' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	9' – 10"	1,661	5' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	5' – 0"	274	5	39' – 9"	133	33	39' – 9"	876	7' – 1"	19	18	50	0.700	131.9	0.5	69	28.5	5,345
6' – 0"	6' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	10' – 7"	1,192	6' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	6' – 0"	433	5	39' – 9"	133	37	39' – 9"	982	6' – 11"	18	16	45	0.613	115.6	0.5	63	25.0	4,685
6' – 0"	6' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	10' – 8"	1,802	6' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	6' – 0"	433	5	39' – 9"	133	37	39' – 9"	982	6' – 11"	18	16	45	0.657	140.7	0.5	63	26.8	5,690
6' – 0"	6' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	10' – 10"	1,830	6' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	6' – 0"	329	5	39' – 9"	133	37	39' – 9"	982	7' – 1"	19	18	50	0.749	140.2	0.5	69	30.5	5,675

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-5 & 6

FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
04/2021 Updated x values.	DIST	COUNTY		SHEET NO.
	WACO	BELL		131

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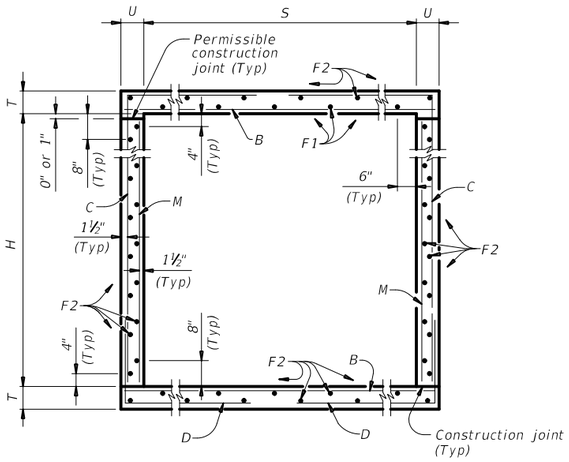
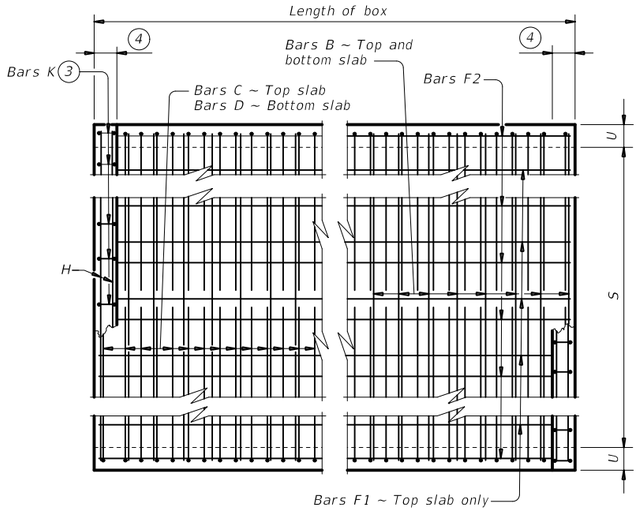
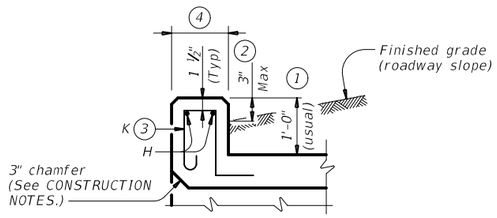


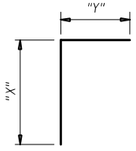
TYPICAL SECTION



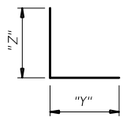
PLAN OF REINF STEEL



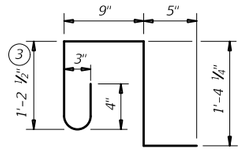
SECTION THRU CURB



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

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

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

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

GENERAL NOTES:

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

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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-8

FILE: scc08ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WACO	BELL		132

SECTION DIMENSIONS				FILL HEIGHT (5)	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
8' – 0"	3' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	8' – 8"	1,406	3' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.582	153.5	0.7	80	24.0	6,219
8' – 0"	3' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	8' – 8"	1,406	3' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.582	153.5	0.7	80	24.0	6,219
8' – 0"	3' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	8' – 10"	1,433	3' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	3' – 0"	164	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.724	154.5	0.7	85	29.6	6,266
8' – 0"	3' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	8' – 11"	1,446	3' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	3' – 0"	164	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.782	155.2	0.7	85	32.0	6,293
8' – 0"	3' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	9' – 2"	1,487	3' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	9' – 3"	25	22	61	0.929	159.6	0.7	86	37.9	6,468
8' – 0"	4' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	9' – 8"	1,568	4' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.626	159.4	0.7	80	25.7	6,454
8' – 0"	4' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	9' – 8"	1,568	4' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.626	159.4	0.7	80	25.7	6,454
8' – 0"	4' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	9' – 10"	1,595	4' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	4' – 0"	219	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.774	160.0	0.7	85	31.6	6,483
8' – 0"	4' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	9' – 11"	1,609	4' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	4' – 0"	219	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.831	160.7	0.7	85	33.9	6,511
8' – 0"	4' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	10' – 2"	1,649	4' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	9' – 3"	25	22	61	0.985	165.4	0.7	86	40.1	6,703
8' – 0"	5' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	10' – 8"	1,730	5' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	8' – 11"	24	20	56	0.669	167.9	0.7	80	27.4	6,794
8' – 0"	5' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	10' – 8"	1,730	5' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	8' – 11"	24	20	56	0.669	167.9	0.7	80	27.4	6,794
8' – 0"	5' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	10' – 10"	1,757	5' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	5' – 0"	274	6	39' – 9"	159	36	39' – 9"	956	9' – 1"	24	22	61	0.823	168.0	0.7	85	33.6	6,806
8' – 0"	5' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	10' – 11"	1,771	5' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	5' – 0"	274	6	39' – 9"	159	36	39' – 9"	956	9' – 1"	24	22	61	0.881	168.7	0.7	85	35.9	6,834
8' – 0"	5' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	11' – 2"	1,811	5' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	9' – 3"	25	22	61	1.040	173.9	0.7	86	42.3	7,043
8' – 0"	6' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	11' – 8"	1,893	6' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.712	176.4	0.7	80	29.2	7,135
8' – 0"	6' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	11' – 8"	1,893	6' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.712	176.4	0.7	80	29.2	7,135
8' – 0"	6' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	11' – 10"	1,920	6' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	6' – 0"	329	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.872	176.1	0.7	85	35.6	7,130
8' – 0"	6' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	11' – 11"	1,933	6' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	6' – 0"	329	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.930	176.8	0.7	85	37.9	7,157
8' – 0"	6' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	12' – 2"	1,974	6' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	9' – 3"	25	22	61	1.096	182.5	0.7	86	44.5	7,384
8' – 0"	7' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	12' – 8"	2,055	7' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.755	182.2	0.7	80	30.9	7,369
8' – 0"	7' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	162	#6	6"	12' – 8"	3,082	7' – 6"	5' – 2"	162	#6	6"	8' – 3"	2,007	5' – 2"	3' – 1"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.755	224.6	0.7	80	30.9	9,065
8' – 0"	7' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	162	#6	6"	12' – 10"	3,123	7' – 8"	5' – 2"	162	#6	6"	8' – 5"	2,048	5' – 2"	3' – 3"	82	12"	7' – 0"	383	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.922	224.6	0.7	85	37.6	9,070
8' – 0"	7' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	162	#6	6"	12' – 11"	3,143	7' – 9"	5' – 2"	162	#6	6"	8' – 6"	2,068	5' – 2"	3' – 4"	82	12"	7' – 0"	383	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.979	225.6	0.7	85	39.8	9,110
8' – 0"	7' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	162	#6	6"	13' – 2"	3,204	7' – 11"	5' – 3"	162	#6	6"	8' – 9"	2,129	5' – 3"	3' – 6"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	9' – 3"	25	22	61	1.151	232.8	0.7	86	46.7	9,396
8' – 0"	8' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	13' – 8"	2,217	8' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	8' – 11"	24	20	56	0.798	190.7	0.7	80	32.6	7,709
8' – 0"	8' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	162	#6	6"	13' – 8"	3,325	8' – 6"	5' – 2"	162	#6	6"	8' – 3"	2,007	5' – 2"	3' – 1"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	8' – 11"	24	20	56	0.798	235.2	0.7	80	32.6	9,486
8' – 0"	8' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	162	#6	6"	13' – 10"	3,366	8' – 8"	5' – 2"	162	#6	6"	8' – 5"	2,048	5' – 2"	3' – 3"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	9' – 1"	24	22	61	0.971	238.2	0.7	85	39.5	9,613
8' – 0"	8' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	162	#6	6"	13' – 11"	3,386	8' – 9"	5' – 2"	162	#6	6"	8' – 6"	2,068	5' – 2"	3' – 4"	162	6"	8' – 0"	866	6	39' – 9"	159	44	39' – 9"	1,168	9' – 1"	24	22	61	1.029	246.4	0.7	85	41.8	9,942
8' – 0"	8' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	162	#6	6"	14' – 2"	3,447	8' – 11"	5' – 3"	162	#6	6"	8' – 9"	2,129	5' – 3"	3' – 6"	162	6"	8' – 0"	866	6	39' – 9"	159	44	39' – 9"	1,168	9' – 3"	25	22	61	1.207	250.5	0.7	86	49.0	10,106

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-8

FILE: scc08ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT	
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2304	02	044	FM 2410	
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.	
	WACO	BELL		133	

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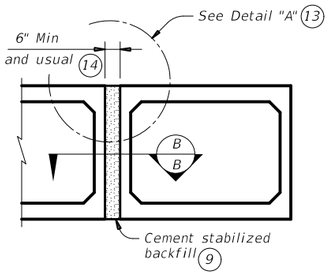
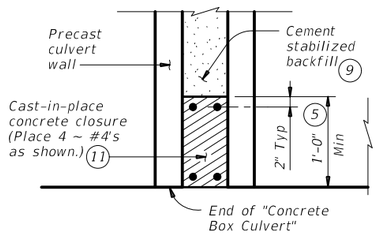
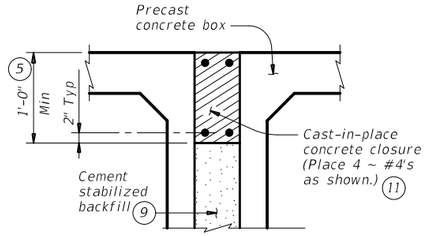


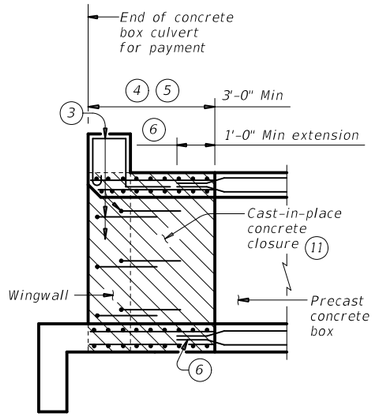
MULTIPLE UNIT PLACEMENT



SECTION B-B

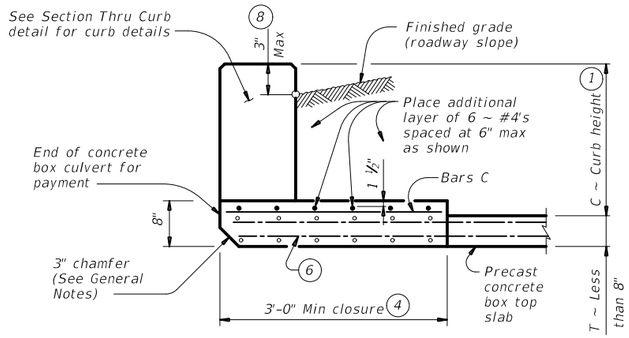


DETAIL "A" (13)

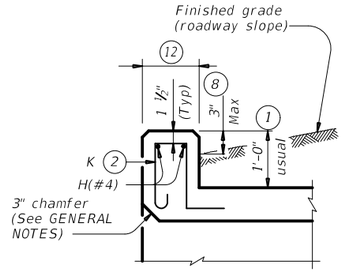


WINGWALL CONNECTION

(Also applies to safety end treatment.)

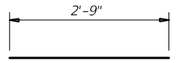


SECTION THRU TOP SLABS LESS THAN 8"



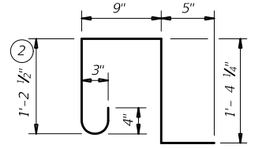
SECTION THRU CURB

QUANTITIES PER FOOT OF CURB (10)	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY



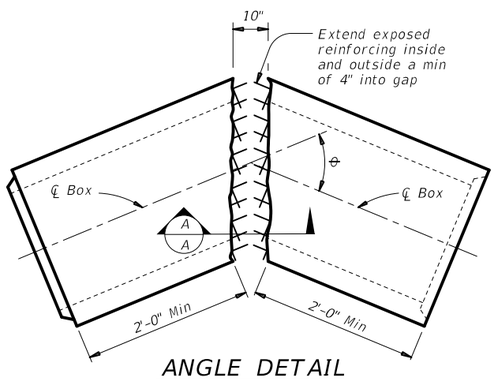
BARS C (#4)

(Spa = 1'–0" Max)

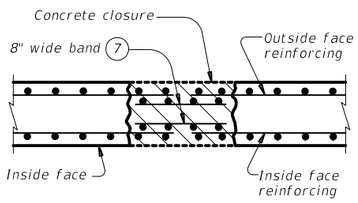


BARS K (#4)

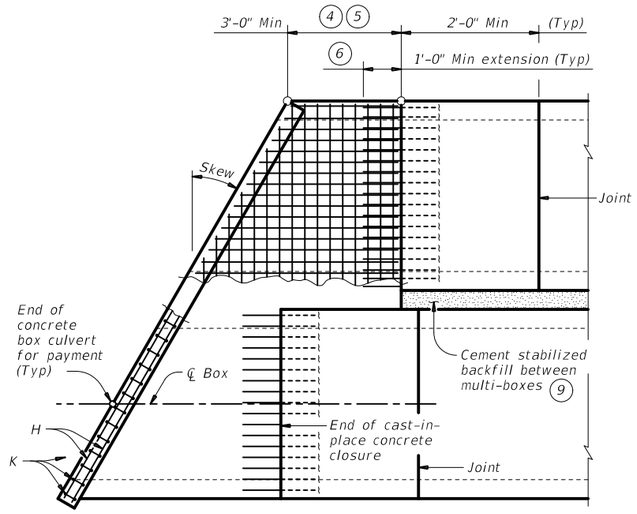
(Spa = 1'–0" Max)
(Length = 4'–2")



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

1. 0" Min to 5'–0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail, or curbs taller than 1'–0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631–CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
2. For curbs less than 1'–0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
3. Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.
4. Provide a 3'–0" Min cast–in–place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast–in–place closure flush with the inside and outside faces of the precast box section.
5. For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'–0" Min cast–in–place closure in the top slab, bottom slab, and exterior wall. See Section B–B detail when interior walls are cast full length.
6. Extend precast box reinforcing a minimum of 1'–0" into concrete closure (Typ).
7. Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.
8. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
9. Cement stabilized backfill between boxes is considered part of the box culvert for payment.
10. All curb concrete and reinforcing is considered part of the box culvert for payment.
11. Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.
12. 1'–0" typical. 2'–3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
13. For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".
14. This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement.
Provide Class C concrete (f'c = 3,600 psi) for the closures.
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bars dimensions are out–to–out of bars.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: scpmdsts-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
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DATE: 9/20/2022 2:39:35 PM
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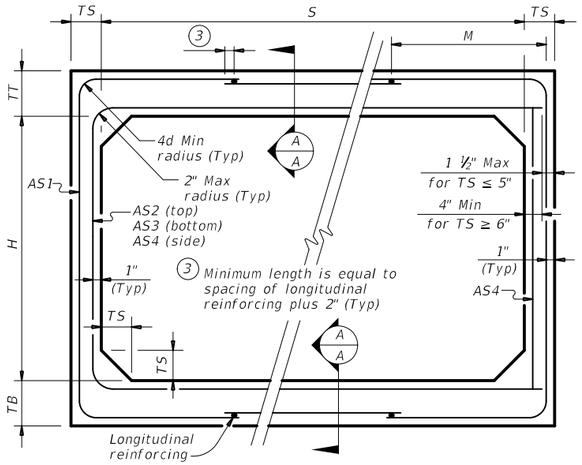
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
5	2	8	7	6	< 2	–	0.19	0.27	0.18	0.14	0.19	0.19	0.17	6.0
5	2	6	6	6	2 < 3	44	0.22	0.20	0.16	0.14	–	–	–	5.1
5	2	6	6	6	3 – 5	44	0.16	0.14	0.14	0.14	–	–	–	5.1
5	2	6	6	6	10	36	0.15	0.14	0.14	0.14	–	–	–	5.1
5	2	6	6	6	15	36	0.20	0.18	0.18	0.14	–	–	–	5.1
5	2	6	6	6	20	36	0.26	0.23	0.24	0.14	–	–	–	5.1
5	2	6	6	6	25	36	0.33	0.29	0.29	0.14	–	–	–	5.1
5	2	6	6	6	30	36	0.39	0.34	0.35	0.14	–	–	–	5.1
5	3	8	7	6	< 2	–	0.19	0.31	0.21	0.14	0.19	0.19	0.17	6.6
5	3	6	6	6	2 < 3	45	0.18	0.24	0.19	0.14	–	–	–	5.7
5	3	6	6	6	3 – 5	36	0.14	0.17	0.16	0.14	–	–	–	5.7
5	3	6	6	6	10	36	0.14	0.16	0.17	0.14	–	–	–	5.7
5	3	6	6	6	15	35	0.16	0.21	0.22	0.14	–	–	–	5.7
5	3	6	6	6	20	35	0.21	0.27	0.28	0.14	–	–	–	5.7
5	3	6	6	6	25	35	0.26	0.34	0.34	0.14	–	–	–	5.7
5	3	6	6	6	30	35	0.31	0.41	0.41	0.14	–	–	–	5.7
5	4	8	7	6	< 2	–	0.19	0.33	0.24	0.14	0.19	0.19	0.17	7.2
5	4	6	6	6	2 < 3	45	0.16	0.27	0.22	0.14	–	–	–	6.3
5	4	6	6	6	3 – 5	45	0.14	0.19	0.18	0.14	–	–	–	6.3
5	4	6	6	6	10	36	0.14	0.18	0.18	0.14	–	–	–	6.3
5	4	6	6	6	15	35	0.14	0.23	0.24	0.14	–	–	–	6.3
5	4	6	6	6	20	35	0.17	0.30	0.31	0.14	–	–	–	6.3
5	4	6	6	6	25	35	0.21	0.37	0.38	0.14	–	–	–	6.3
5	4	6	6	6	30	35	0.25	0.44	0.45	0.14	–	–	–	6.3
5	5	8	7	6	< 2	–	0.19	0.35	0.26	0.14	0.19	0.19	0.17	7.8
5	5	6	6	6	2 < 3	45	0.14	0.29	0.24	0.14	–	–	–	6.9
5	5	6	6	6	3 – 5	45	0.14	0.21	0.20	0.14	–	–	–	6.9
5	5	6	6	6	10	45	0.14	0.19	0.20	0.14	–	–	–	6.9
5	5	6	6	6	15	36	0.14	0.24	0.25	0.14	–	–	–	6.9
5	5	6	6	6	20	35	0.15	0.31	0.32	0.14	–	–	–	6.9
5	5	6	6	6	25	35	0.18	0.38	0.39	0.14	–	–	–	6.9
5	5	6	6	6	30	35	0.21	0.46	0.47	0.14	–	–	–	6.9

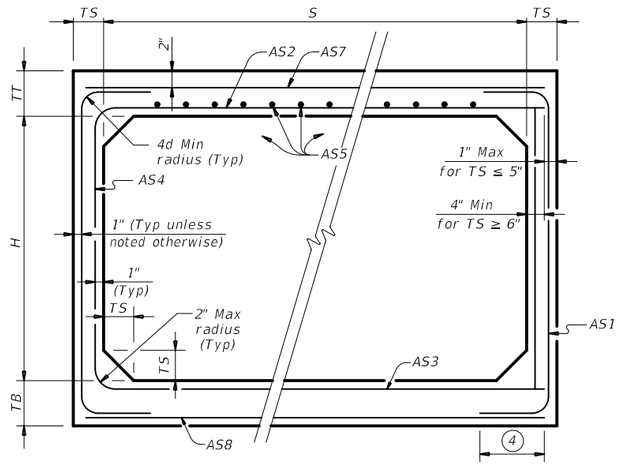
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

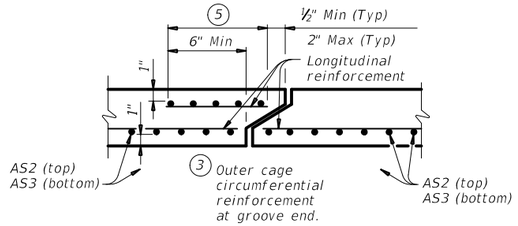
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

5'-0" SPAN

SCP-5

FILE: scp05sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	WACO	BELL		135

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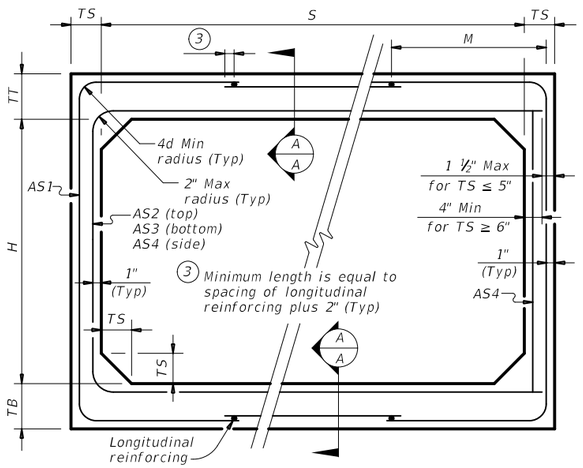
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
6	2	8	7	7	< 2	–	0.23	0.27	0.19	0.17	0.19	0.19	0.17	7.2
6	2	7	7	7	2 < 3	43	0.25	0.21	0.17	0.17	–	–	–	6.8
6	2	7	7	7	3 – 5	43	0.20	0.17	0.17	0.17	–	–	–	6.8
6	2	7	7	7	10	39	0.20	0.17	0.17	0.17	–	–	–	6.8
6	2	7	7	7	15	39	0.26	0.20	0.20	0.17	–	–	–	6.8
6	2	7	7	7	20	39	0.34	0.26	0.26	0.17	–	–	–	6.8
6	2	7	7	7	25	39	0.43	0.32	0.32	0.17	–	–	–	6.8
6	2	7	7	7	30	39	0.52	0.38	0.39	0.17	–	–	–	6.8
6	3	8	7	7	< 2	–	0.20	0.31	0.22	0.17	0.19	0.19	0.17	7.9
6	3	7	7	7	2 < 3	43	0.21	0.24	0.19	0.17	–	–	–	7.5
6	3	7	7	7	3 – 5	39	0.17	0.18	0.17	0.17	–	–	–	7.5
6	3	7	7	7	10	39	0.17	0.18	0.19	0.17	–	–	–	7.5
6	3	7	7	7	15	38	0.22	0.24	0.24	0.17	–	–	–	7.5
6	3	7	7	7	20	38	0.28	0.31	0.31	0.17	–	–	–	7.5
6	3	7	7	7	25	38	0.35	0.38	0.39	0.17	–	–	–	7.5
6	3	7	7	7	30	38	0.42	0.46	0.46	0.17	–	–	–	7.5
6	4	8	7	7	< 2	–	0.19	0.34	0.25	0.17	0.19	0.19	0.17	8.6
6	4	7	7	7	2 < 3	43	0.19	0.27	0.21	0.17	–	–	–	8.2
6	4	7	7	7	3 – 5	39	0.17	0.21	0.19	0.17	–	–	–	8.2
6	4	7	7	7	10	39	0.17	0.20	0.21	0.17	–	–	–	8.2
6	4	7	7	7	15	38	0.18	0.27	0.27	0.17	–	–	–	8.2
6	4	7	7	7	20	38	0.24	0.34	0.35	0.17	–	–	–	8.2
6	4	7	7	7	25	38	0.29	0.43	0.42	0.17	–	–	–	8.2
6	4	7	7	7	30	38	0.35	0.51	0.52	0.17	–	–	–	8.2
6	5	8	7	7	< 2	–	0.19	0.37	0.28	0.17	0.19	0.19	0.17	9.3
6	5	7	7	7	2 < 3	43	0.17	0.30	0.24	0.17	–	–	–	8.9
6	5	7	7	7	3 – 5	43	0.17	0.23	0.21	0.17	–	–	–	8.9
6	5	7	7	7	10	39	0.17	0.22	0.23	0.17	–	–	–	8.9
6	5	7	7	7	15	38	0.17	0.28	0.29	0.17	–	–	–	8.9
6	5	7	7	7	20	38	0.20	0.37	0.38	0.17	–	–	–	8.9
6	5	7	7	7	25	38	0.25	0.45	0.46	0.17	–	–	–	8.9
6	5	7	7	7	30	38	0.30	0.54	0.55	0.17	–	–	–	8.9
6	6	8	7	7	< 2	–	0.19	0.38	0.30	0.17	0.19	0.19	0.17	10
6	6	7	7	7	2 < 3	52	0.17	0.32	0.26	0.17	–	–	–	9.6
6	6	7	7	7	3 – 5	52	0.17	0.24	0.22	0.17	–	–	–	9.6
6	6	7	7	7	10	43	0.17	0.23	0.24	0.17	–	–	–	9.6
6	6	7	7	7	15	39	0.17	0.29	0.31	0.17	–	–	–	9.6
6	6	7	7	7	20	39	0.18	0.38	0.39	0.17	–	–	–	9.6
6	6	7	7	7	25	38	0.23	0.46	0.48	0.17	–	–	–	9.6
6	6	7	7	7	30	38	0.27	0.55	0.57	0.17	–	–	–	9.6

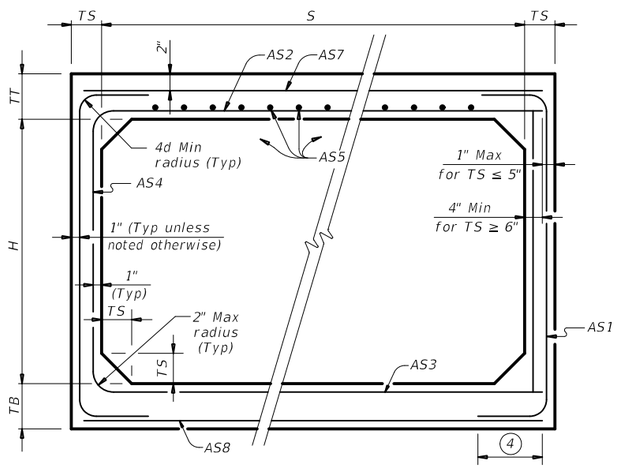
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

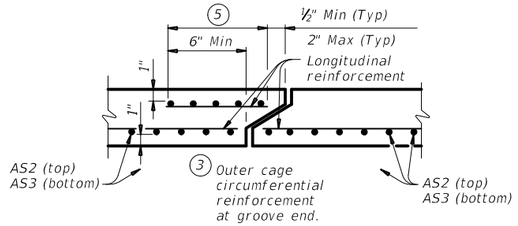
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

6'-0" SPAN

SCP-6

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©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
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DATE: 9/20/2022 2:39:36 PM
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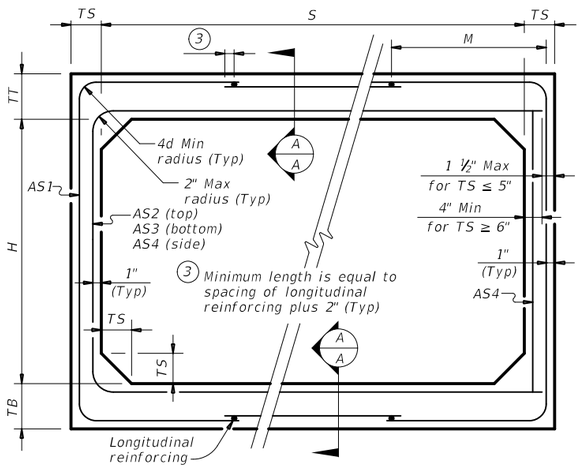
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
8	3	8	8	8	< 2	–	0.31	0.35	0.25	0.19	0.19	0.19	0.19	10.4
8	3	8	8	8	2 < 3	55	0.35	0.29	0.28	0.19	–	–	–	10.4
8	3	8	8	8	3 – 5	50	0.28	0.23	0.24	0.19	–	–	–	10.4
8	3	8	8	8	10	45	0.29	0.25	0.26	0.19	–	–	–	10.4
8	3	8	8	8	15	45	0.39	0.33	0.34	0.19	–	–	–	10.4
8	3	8	8	8	20	45	0.51	0.43	0.44	0.19	–	–	–	10.4
8	3	8	8	8	25	45	0.63	0.53	0.54	0.19	–	–	–	10.4
8	4	8	8	8	< 2	–	0.27	0.38	0.29	0.19	0.19	0.19	0.19	11.2
8	4	8	8	8	2 < 3	50	0.31	0.34	0.32	0.19	–	–	–	11.2
8	4	8	8	8	3 – 5	50	0.25	0.27	0.27	0.19	–	–	–	11.2
8	4	8	8	8	10	45	0.26	0.28	0.29	0.19	–	–	–	11.2
8	4	8	8	8	15	41	0.34	0.37	0.38	0.19	–	–	–	11.2
8	4	8	8	8	20	41	0.44	0.48	0.49	0.19	–	–	–	11.2
8	5	8	8	8	< 2	–	0.24	0.40	0.32	0.19	0.19	0.19	0.19	12.0
8	5	8	8	8	2 < 3	50	0.28	0.37	0.35	0.19	–	–	–	12.0
8	5	8	8	8	3 – 5	45	0.23	0.29	0.30	0.19	–	–	–	12.0
8	5	8	8	8	10	45	0.23	0.31	0.32	0.19	–	–	–	12.0
8	5	8	8	8	15	41	0.30	0.41	0.42	0.19	–	–	–	12.0
8	5	8	8	8	20	41	0.39	0.52	0.54	0.19	–	–	–	12.0
8	6	8	8	8	< 2	–	0.22	0.42	0.35	0.19	0.19	0.19	0.19	12.8
8	6	8	8	8	2 < 3	50	0.25	0.40	0.38	0.19	–	–	–	12.8
8	6	8	8	8	3 – 5	50	0.21	0.32	0.33	0.19	–	–	–	12.8
8	6	8	8	8	10	45	0.22	0.33	0.34	0.19	–	–	–	12.8
8	6	8	8	8	15	41	0.28	0.43	0.45	0.19	–	–	–	12.8
8	6	8	8	8	20	41	0.36	0.55	0.57	0.19	–	–	–	12.8
8	7	8	8	8	< 2	–	0.20	0.44	0.37	0.19	0.19	0.19	0.19	13.6
8	7	8	8	8	2 < 3	55	0.23	0.43	0.41	0.19	–	–	–	13.6
8	7	8	8	8	3 – 5	55	0.19	0.34	0.35	0.19	–	–	–	13.6
8	7	8	8	8	10	50	0.20	0.34	0.36	0.19	–	–	–	13.6
8	7	8	8	8	15	41	0.26	0.45	0.47	0.19	–	–	–	13.6
8	7	8	8	8	20	41	0.33	0.57	0.60	0.19	–	–	–	13.6
8	8	8	8	8	< 2	–	0.20	0.45	0.40	0.19	0.19	0.19	0.19	14.4
8	8	8	8	8	2 < 3	65	0.21	0.45	0.44	0.19	–	–	–	14.4
8	8	8	8	8	3 – 5	65	0.19	0.36	0.38	0.19	–	–	–	14.4
8	8	8	8	8	10	55	0.19	0.35	0.38	0.19	–	–	–	14.4
8	8	8	8	8	15	45	0.24	0.46	0.49	0.19	–	–	–	14.4
8	8	8	8	8	20	45	0.31	0.59	0.62	0.19	–	–	–	14.4

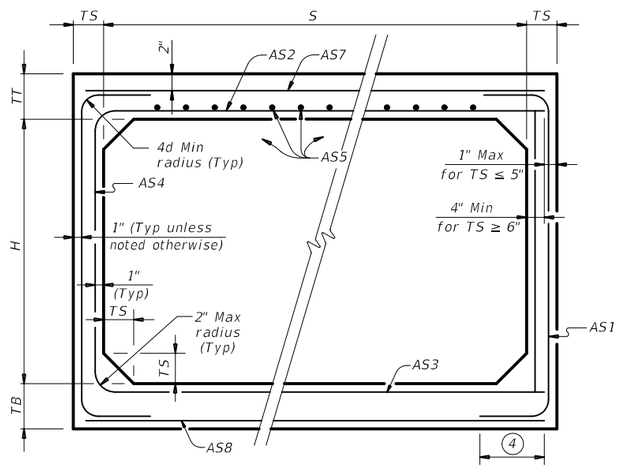
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

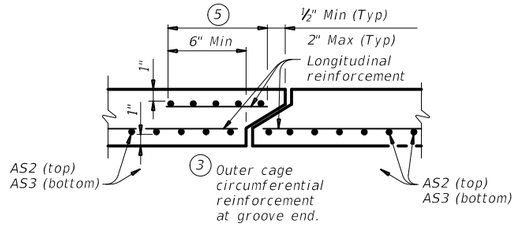
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

8'-0" SPAN

SCP-8

FILE: scp08sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		137

DATE: 9/20/2022 2:39:37 PM
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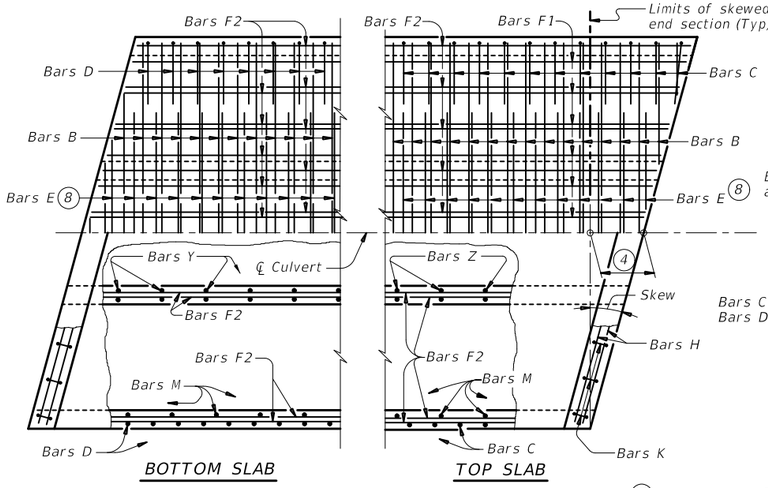
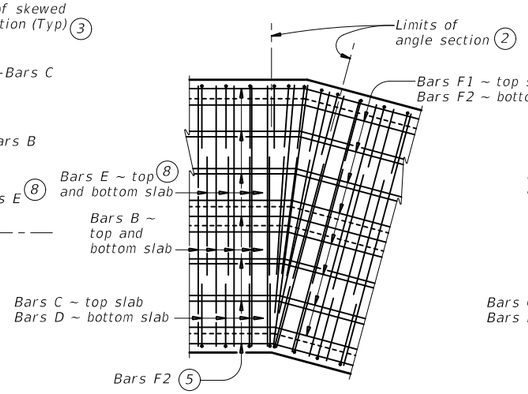
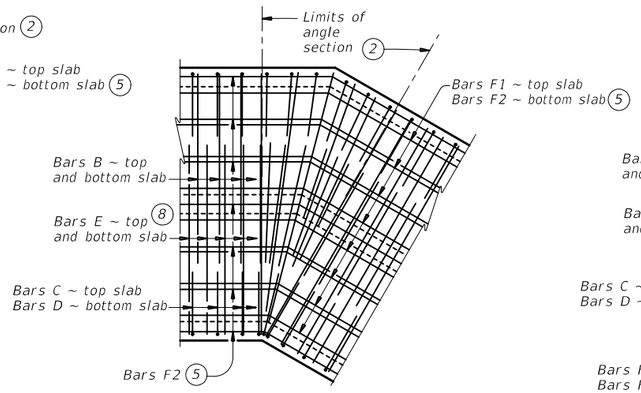


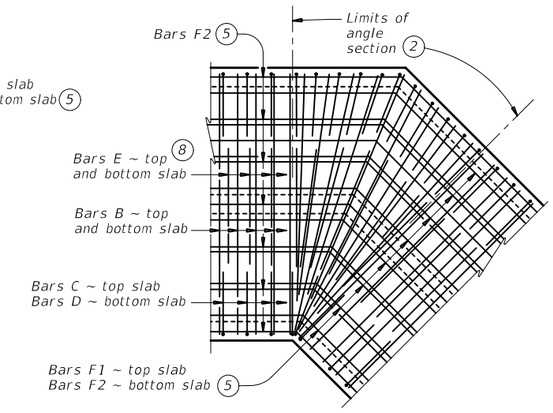
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° 7



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

PLAN OF SKEWED ENDS ~ OVER 15° TO 30°

PLAN OF SKEWED ENDS ~ OVER 30° TO 45°

1. For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.
   For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, Class C, D, E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.
   Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.
2. When the spacing between Bars B or Bars E becomes less than half of the normal spacing, cut bars to avoid conflict.
3. The length of Bars B and Bars E will vary in the skewed end sections.
4. [One half of overall width] x [tangent of the skew angle]
5. Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.
6. When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.
7. At the Contractor's option, for skews of 15° or less, place Bars B, C, D, and E parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B and Bars E shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets to accommodate the skew.
8. Extend Bars E as shown on the MC standard sheet for direct traffic culverts.

LENGTHENING DETAIL 1

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

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

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

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

MC-MD

FILE: mc-mdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		138

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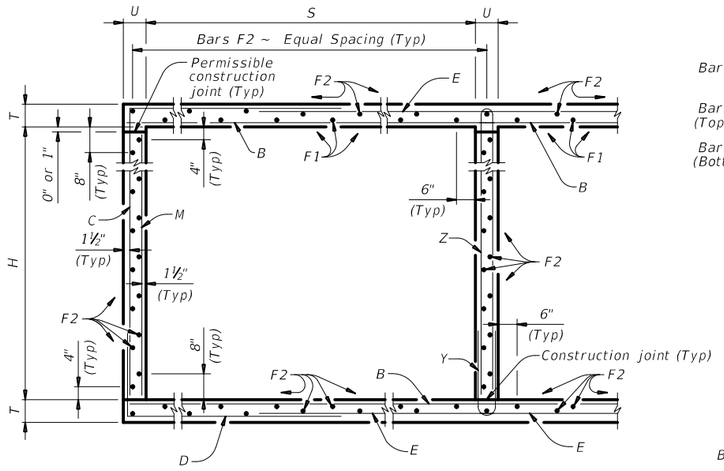
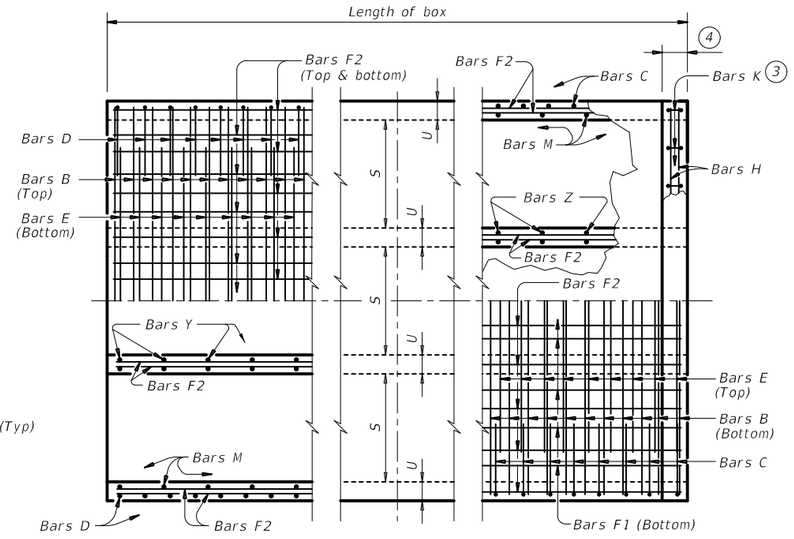


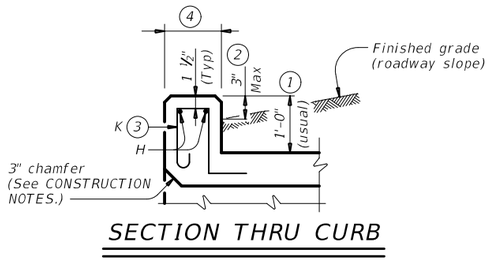
TYPICAL SECTION



BOTTOM SLAB

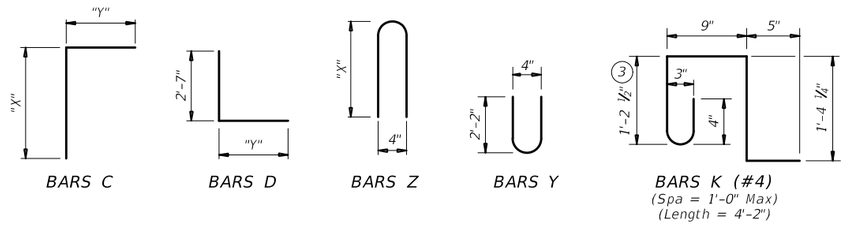
TOP SLAB

PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
2'-0"	2'-6 ½"	3'-8 ½"
3'-0"	3'-6 ½"	3'-8 ½"
4'-0"	4'-6 ½"	3'-8 ½"
5'-0"	5'-6 ½"	3'-8 ½"



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

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

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

GENERAL NOTES:

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

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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
5'-0" SPAN
0' TO 20' FILL

MC-5-20

FILE: mc520ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
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REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		139

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NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																														QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4								Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
												Bars C		Bars D																				Bars Y		Bars Z											
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	Length	Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	Length	Wt	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	5'-0"	2'-0"	8"	7"	108	#5	9"	11'-6"	1,295	108	#5	9"	6'-3"	704	6'-4"	713	108	#5	9"	8'-8"	976	8	18"	39'-9"	212	38	18"	39'-9"	1,009	108	9"	2'-0"	144	54	9"	4'-7"	165	5'-3"	189	11'-6"	31	26	72	0.710	135.2	0.9	103	29.3	5,510
3	5'-0"	2'-0"	8"	7"	108	#5	9"	17'-1"	1,924	108	#5	9"	6'-3"	704	6'-4"	713	108	#5	9"	14'-3"	1,605	12	18"	39'-9"	319	54	18"	39'-9"	1,434	108	9"	2'-0"	144	108	9"	4'-7"	331	5'-3"	379	17'-1"	46	38	106	1.029	188.8	1.3	152	42.4	7,705
4	5'-0"	2'-0"	8"	7"	108	#5	9"	22'-8"	2,553	108	#5	9"	6'-3"	704	6'-4"	713	108	#5	9"	19'-10"	2,234	16	18"	39'-9"	425	70	18"	39'-9"	1,859	108	9"	2'-0"	144	162	9"	4'-7"	496	5'-3"	568	22'-8"	61	48	134	1.348	242.4	1.7	195	55.6	9,891
5	5'-0"	2'-0"	8"	7"	108	#5	9"	28'-3"	3,182	108	#5	9"	6'-3"	704	6'-4"	713	108	#5	9"	25'-5"	2,863	20	18"	39'-9"	531	86	18"	39'-9"	2,284	108	9"	2'-0"	144	216	9"	4'-7"	661	5'-3"	758	28'-3"	75	60	167	1.667	296.0	2.1	242	68.8	12,082
6	5'-0"	2'-0"	8"	7"	108	#5	9"	33'-10"	3,811	108	#5	9"	6'-3"	704	6'-4"	713	108	#5	9"	31'-0"	3,492	24	18"	39'-9"	637	102	18"	39'-9"	2,708	108	9"	2'-0"	144	270	9"	4'-7"	827	5'-3"	947	33'-10"	90	70	195	1.986	349.6	2.5	285	82.0	14,268
2	5'-0"	3'-0"	8"	7"	108	#6	9"	11'-6"	1,865	108	#5	9"	7'-3"	817	6'-4"	713	108	#5	9"	8'-8"	976	8	18"	39'-9"	212	44	18"	39'-9"	1,168	108	9"	3'-0"	216	54	9"	4'-7"	165	7'-3"	262	11'-6"	31	26	72	0.775	159.9	0.9	103	31.9	6,497
3	5'-0"	3'-0"	8"	7"	108	#6	9"	17'-1"	2,771	108	#5	9"	7'-3"	817	6'-4"	713	108	#5	9"	14'-3"	1,605	12	18"	39'-9"	319	62	18"	39'-9"	1,646	108	9"	3'-0"	216	108	9"	4'-7"	331	7'-3"	523	17'-1"	46	38	106	1.115	223.5	1.3	152	45.9	9,093
4	5'-0"	3'-0"	8"	7"	108	#6	9"	22'-8"	3,677	108	#5	9"	7'-3"	817	6'-4"	713	108	#5	9"	19'-10"	2,234	16	18"	39'-9"	425	80	18"	39'-9"	2,124	108	9"	3'-0"	216	162	9"	4'-7"	496	7'-3"	785	22'-8"	61	48	134	1.456	287.2	1.7	195	59.9	11,682
5	5'-0"	3'-0"	8"	7"	108	#6	9"	28'-3"	4,583	108	#5	9"	7'-3"	817	6'-4"	713	108	#5	9"	25'-5"	2,863	20	18"	39'-9"	531	98	18"	39'-9"	2,602	108	9"	3'-0"	216	216	9"	4'-7"	661	7'-3"	1,046	28'-3"	75	60	167	1.796	350.8	2.1	242	73.9	14,274
6	5'-0"	3'-0"	8"	7"	108	#6	9"	33'-10"	5,488	108	#5	9"	7'-3"	817	6'-4"	713	108	#5	9"	31'-0"	3,492	24	18"	39'-9"	637	116	18"	39'-9"	3,080	108	9"	3'-0"	216	270	9"	4'-7"	827	7'-3"	1,308	33'-10"	90	70	195	2.137	414.5	2.5	285	88.0	16,863
2	5'-0"	4'-0"	8"	7"	108	#6	9"	11'-6"	1,865	108	#5	9"	8'-3"	929	6'-4"	713	108	#5	9"	8'-8"	976	8	18"	39'-9"	212	44	18"	39'-9"	1,168	108	9"	4'-0"	289	54	9"	4'-7"	165	9'-3"	334	11'-6"	31	26	72	0.840	166.3	0.9	103	34.5	6,754
3	5'-0"	4'-0"	8"	7"	108	#6	9"	17'-1"	2,771	108	#5	9"	8'-3"	929	6'-4"	713	108	#5	9"	14'-3"	1,605	12	18"	39'-9"	319	62	18"	39'-9"	1,646	108	9"	4'-0"	289	108	9"	4'-7"	331	9'-3"	667	17'-1"	46	38	106	1.202	231.8	1.3	152	49.4	9,422
4	5'-0"	4'-0"	8"	7"	108	#6	9"	22'-8"	3,677	108	#5	9"	8'-3"	929	6'-4"	713	108	#5	9"	19'-10"	2,234	16	18"	39'-9"	425	80	18"	39'-9"	2,124	108	9"	4'-0"	289	162	9"	4'-7"	496	9'-3"	1,001	22'-8"	61	48	134	1.564	297.2	1.7	195	64.3	12,083
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6	5'-0"	4'-0"	8"	7"	108	#6	9"	33'-10"	5,488	108	#5	9"	8'-3"	929	6'-4"	713	108	#5	9"	31'-0"	3,492	24	18"	39'-9"	637	116	18"	39'-9"	3,080	108	9"	4'-0"	289	270	9"	4'-7"	827	9'-3"	1,668	33'-10"	90	70	195	2.288	428.1	2.5	285	94.0	17,408
2	5'-0"	5'-0"	8"	7"	108	#6	9"	11'-6"	1,865	108	#5	9"	9'-3"	1,042	6'-4"	713	108	#5	9"	8'-8"	976	8	18"	39'-9"	212	50	18"	39'-9"	1,328	108	9"	5'-0"	361	54	9"	4'-7"	165	11'-3"	406	11'-6"	31	26	72	0.904	176.7	0.9	103	37.0	7,171
3	5'-0"	5'-0"	8"	7"	108	#6	9"	17'-1"	2,771	108	#5	9"	9'-3"	1,042	6'-4"	713	108	#5	9"	14'-3"	1,605	12	18"	39'-9"	319	70	18"	39'-9"	1,859	108	9"	5'-0"	361	108	9"	4'-7"	331	11'-3"	812	17'-1"	46	38	106	1.288	245.3	1.3	152	52.8	9,965
4	5'-0"	5'-0"	8"	7"	108	#6	9"	22'-8"	3,677	108	#5	9"	9'-3"	1,042	6'-4"	713	108	#5	9"	19'-10"	2,234	16	18"	39'-9"	425	90	18"	39'-9"	2,390	108	9"	5'-0"	361	162	9"	4'-7"	496	11'-3"	1,217	22'-8"	61	48	134	1.672	313.9	1.7	195	68.6	12,750
5	5'-0"	5'-0"	8"	7"	108	#6	9"	28'-3"	4,583	108	#5	9"	9'-3"	1,042	6'-4"	713	108	#5	9"	25'-5"	2,863	20	18"	39'-9"	531	110	18"	39'-9"	2,921	108	9"	5'-0"	361	216	9"	4'-7"	661	11'-3"	1,623	28'-3"	75	60	167	2.056	382.5	2.1	242	84.3	15,540
6	5'-0"	5'-0"	8"	7"	108	#6	9"	33'-10"	5,488	108	#5	9"	9'-3"	1,042	6'-4"	713	108	#5	9"	31'-0"	3,492	24	18"	39'-9"	637	130	18"	39'-9"	3,452	108	9"	5'-0"	361	270	9"	4'-7"	827	11'-3"	2,029	33'-10"	90	70	195	2.439	451.0	2.5	285	100.1	18,326

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS
CAST-IN-PLACE
5'-0" SPAN
0' TO 20' FILL

MC-5-20

FILE: mc520ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		140

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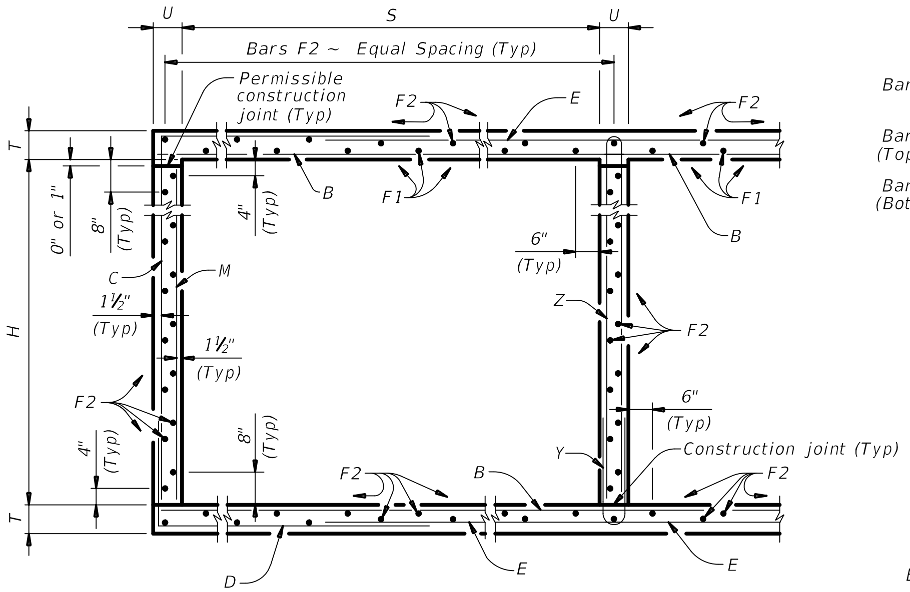
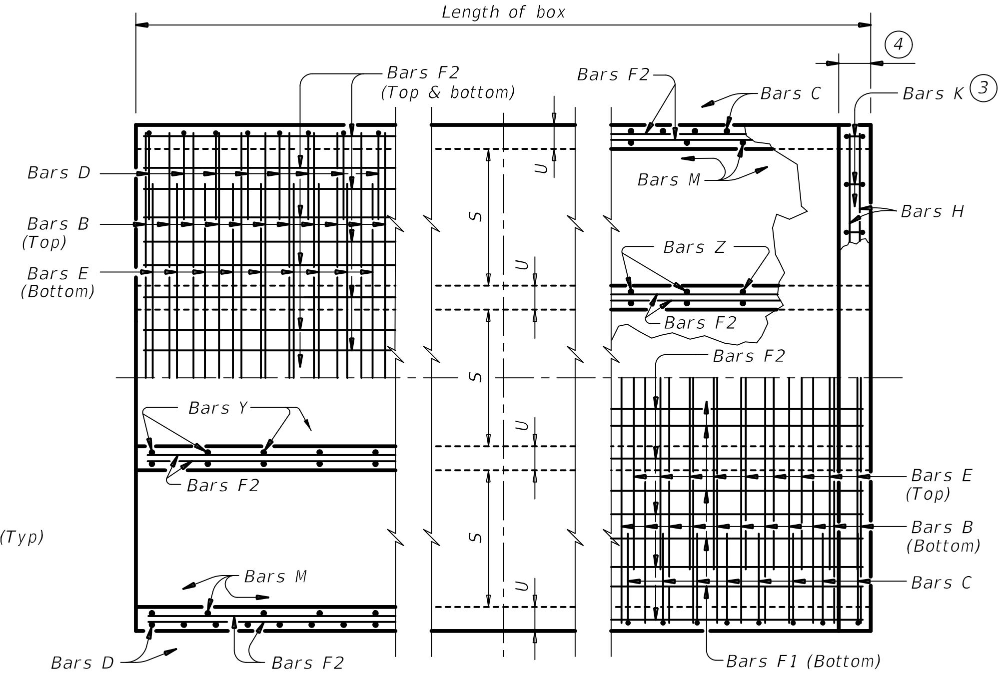


TYPICAL SECTION



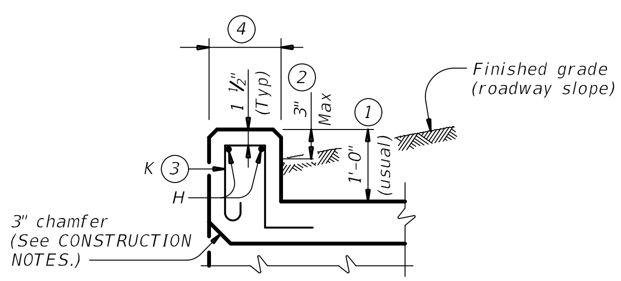
PART PLANS

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

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

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



SECTION THRU CURB

TABLE OF BAR DIMENSIONS

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

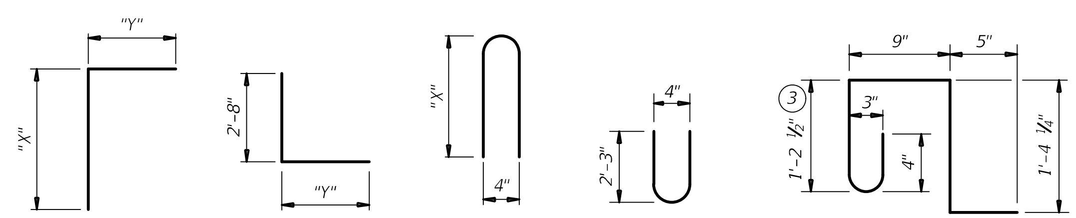
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts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

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

GENERAL NOTES:

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

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



BARS C　BARS D　BARS Z　BARS Y　BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING　SHEET 1 OF 2

Texas Department of Transportation　Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
6'-0" SPAN
0' TO 16' FILL

MC-6-16

FILE: mc616ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 2304	SECT 02	JOB 044	HIGHWAY FM 2410
REVISIONS	DIST WACO		COUNTY BELL	SHEET NO. 141

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																														QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4							Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
												Bars C		Bars D																				Bars Y		Bars Z											
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	Length	Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	6' – 0"	2' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	44	18"	39' – 9"	1,168	108	9"	2' – 0"	144	54	9"	4' – 9"	171	5' – 5"	195	13' – 6"	36	30	84	0.894	182.4	1.0	120	36.8	7,414
3	6' – 0"	2' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	63	18"	39' – 9"	1,673	108	9"	2' – 0"	144	108	9"	4' – 9"	343	5' – 5"	391	20' – 1"	54	44	122	1.302	260.9	1.5	176	53.6	10,611
4	6' – 0"	2' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	82	18"	39' – 9"	2,177	108	9"	2' – 0"	144	162	9"	4' – 9"	514	5' – 5"	586	26' – 8"	71	56	156	1.711	339.4	2.0	227	70.4	13,801
5	6' – 0"	2' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	101	18"	39' – 9"	2,682	108	9"	2' – 0"	144	216	9"	4' – 9"	685	5' – 5"	782	33' – 3"	89	70	195	2.120	417.9	2.5	284	87.3	16,999
6	6' – 0"	2' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	120	18"	39' – 9"	3,186	108	9"	2' – 0"	144	270	9"	4' – 9"	857	5' – 5"	977	39' – 10"	106	82	228	2.529	496.4	3.0	334	104.1	20,189
2	6' – 0"	3' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	50	18"	39' – 9"	1,328	108	9"	3' – 0"	216	54	9"	4' – 9"	171	7' – 5"	268	13' – 6"	36	30	84	0.958	192.8	1.0	120	39.3	7,832
3	6' – 0"	3' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	71	18"	39' – 9"	1,885	108	9"	3' – 0"	216	108	9"	4' – 9"	343	7' – 5"	535	20' – 1"	54	44	122	1.389	274.4	1.5	176	57.1	11,152
4	6' – 0"	3' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	92	18"	39' – 9"	2,443	108	9"	3' – 0"	216	162	9"	4' – 9"	514	7' – 5"	803	26' – 8"	71	56	156	1.819	356.1	2.0	227	74.7	14,469
5	6' – 0"	3' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	113	18"	39' – 9"	3,000	108	9"	3' – 0"	216	216	9"	4' – 9"	685	7' – 5"	1,070	33' – 3"	89	70	195	2.250	437.7	2.5	284	92.5	17,790
6	6' – 0"	3' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	134	18"	39' – 9"	3,558	108	9"	3' – 0"	216	270	9"	4' – 9"	857	7' – 5"	1,338	39' – 10"	106	82	228	2.681	519.3	3.0	334	110.2	21,107
2	6' – 0"	4' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	50	18"	39' – 9"	1,328	108	9"	4' – 0"	289	54	9"	4' – 9"	171	9' – 5"	340	13' – 6"	36	30	84	1.023	199.2	1.0	120	41.9	8,089
3	6' – 0"	4' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	71	18"	39' – 9"	1,885	108	9"	4' – 0"	289	108	9"	4' – 9"	343	9' – 5"	679	20' – 1"	54	44	122	1.475	282.6	1.5	176	60.5	11,481
4	6' – 0"	4' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	92	18"	39' – 9"	2,443	108	9"	4' – 0"	289	162	9"	4' – 9"	514	9' – 5"	1,019	26' – 8"	71	56	156	1.927	366.1	2.0	227	79.1	14,870
5	6' – 0"	4' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	113	18"	39' – 9"	3,000	108	9"	4' – 0"	289	216	9"	4' – 9"	685	9' – 5"	1,359	33' – 3"	89	70	195	2.380	449.5	2.5	284	97.7	18,264
6	6' – 0"	4' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	134	18"	39' – 9"	3,558	108	9"	4' – 0"	289	270	9"	4' – 9"	857	9' – 5"	1,698	39' – 10"	106	82	228	2.832	533.0	3.0	334	116.2	21,652
2	6' – 0"	5' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	56	18"	39' – 9"	1,487	108	9"	5' – 0"	361	54	9"	4' – 9"	171	11' – 5"	412	13' – 6"	36	30	84	1.088	209.6	1.0	120	44.5	8,505
3	6' – 0"	5' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	79	18"	39' – 9"	2,098	108	9"	5' – 0"	361	108	9"	4' – 9"	343	11' – 5"	824	20' – 1"	54	44	122	1.562	296.2	1.5	176	64.0	12,024
4	6' – 0"	5' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	102	18"	39' – 9"	2,708	108	9"	5' – 0"	361	162	9"	4' – 9"	514	11' – 5"	1,235	26' – 8"	71	56	156	2.035	382.7	2.0	227	83.4	15,536
5	6' – 0"	5' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	125	18"	39' – 9"	3,319	108	9"	5' – 0"	361	216	9"	4' – 9"	685	11' – 5"	1,647	33' – 3"	89	70	195	2.509	469.3	2.5	284	102.8	19,056
6	6' – 0"	5' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	148	18"	39' – 9"	3,930	108	9"	5' – 0"	361	270	9"	4' – 9"	857	11' – 5"	2,059	39' – 10"	106	82	228	2.983	555.9	3.0	334	122.3	22,570
2	6' – 0"	6' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	62	18"	39' – 9"	1,646	108	9"	6' – 0"	433	54	9"	4' – 9"	171	13' – 5"	484	13' – 6"	36	30	84	1.153	220.0	1.0	120	47.1	8,921
3	6' – 0"	6' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	87	18"	39' – 9"	2,310	108	9"	6' – 0"	433	108	9"	4' – 9"	343	13' – 5"	968	20' – 1"	54	44	122	1.648	309.7	1.5	176	67.4	12,565
4	6' – 0"	6' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	112	18"	39' – 9"	2,974	108	9"	6' – 0"	433	162	9"	4' – 9"	514	13' – 5"	1,452	26' – 8"	71	56	156	2.144	399.4	2.0	227	87.7	16,204
5	6' – 0"	6' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	137	18"	39' – 9"	3,638	108	9"	6' – 0"	433	216	9"	4' – 9"	685	13' – 5"	1,936	33' – 3"	89	70	195	2.639	489.1	2.5	284	108.0	19,849
6	6' – 0"	6' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	162	18"	39' – 9"	4,302	108	9"	6' – 0"	433	270	9"	4' – 9"	857	13' – 5"	2,420	39' – 10"	106	82	228	3.134	578.9	3.0	334	128.3	23,488

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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS
CAST-IN-PLACE
6'-0" SPAN
0' TO 16' FILL

MC-6-16

FILE: mc616ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		142

DATE: 9/20/2022 2:39:40 PM
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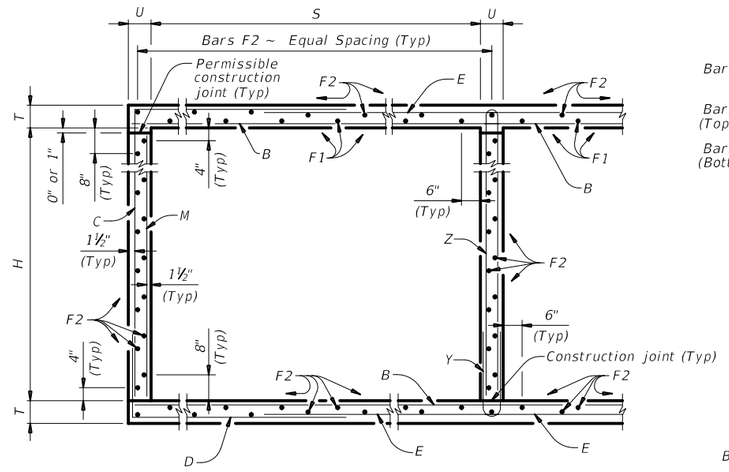
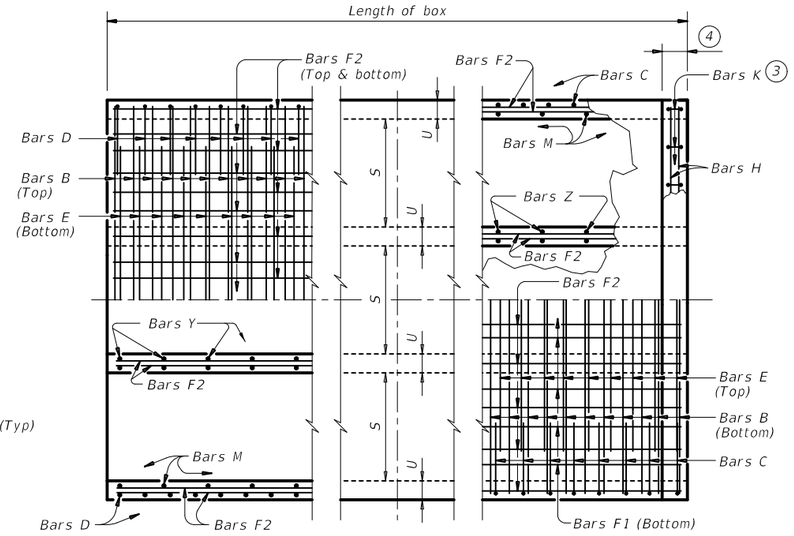
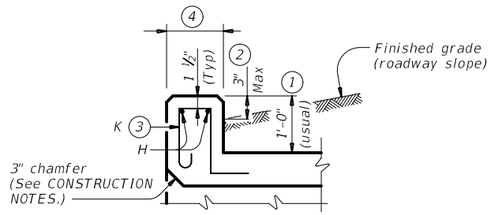


TYPICAL SECTION



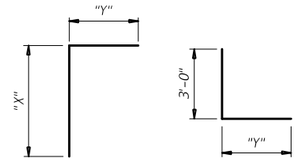
BOTTOM SLAB TOP SLAB

PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
3'-0"	3'-6 ½"	5'-1"
4'-0"	4'-6 ½"	5'-1"
5'-0"	5'-6 ½"	5'-1"
6'-0"	6'-6 ½"	5'-1"
7'-0"	7'-6 ½"	5'-1"
8'-0"	8'-6 ½"	5'-1"



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

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

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

GENERAL NOTES:

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

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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
8'-0" SPAN
0' TO 13' FILL

MC-8-13

FILE: mc813ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		143

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																														QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4								Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C Length	Bars C Wt	Bars D Length	Bars D Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y Length	Bars Y Wt	Bars Z Length	Bars Z Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	8' – 0"	3' – 0"	8"	7"	162	#6	6"	17' – 6"	4,258	108	#6	9"	8' – 8"	1,406	8' – 2"	1,325	162	#6	6"	12' – 9"	3,102	12	18"	39' – 9"	319	56	18"	39' – 9"	1,487	108	9"	3' – 0"	216	54	9"	4' – 7"	165	7' – 3"	262	17' – 6"	47	38	106	1.071	313.5	1.3	153	44.2	12,693
3	8' – 0"	3' – 0"	8"	7"	162	#6	6"	26' – 1"	6,347	108	#6	9"	8' – 8"	1,406	8' – 2"	1,325	162	#6	6"	21' – 4"	5,191	18	18"	39' – 9"	478	80	18"	39' – 9"	2,124	108	9"	3' – 0"	216	108	9"	4' – 7"	331	7' – 3"	523	26' – 1"	70	56	156	1.560	448.5	1.9	226	64.3	18,167
4	8' – 0"	3' – 0"	8"	7"	162	#6	6"	34' – 8"	8,435	108	#6	9"	8' – 8"	1,406	8' – 2"	1,325	162	#6	6"	29' – 11"	7,279	24	18"	39' – 9"	637	104	18"	39' – 9"	2,762	108	9"	3' – 0"	216	162	9"	4' – 7"	496	7' – 3"	785	34' – 8"	93	72	200	2.048	583.5	2.6	293	84.5	23,634
5	8' – 0"	3' – 0"	8"	7"	162	#6	6"	43' – 3"	10,524	108	#6	9"	8' – 8"	1,406	8' – 2"	1,325	162	#6	6"	38' – 6"	9,368	30	18"	39' – 9"	797	128	18"	39' – 9"	3,399	108	9"	3' – 0"	216	216	9"	4' – 7"	661	7' – 3"	1,046	43' – 3"	116	90	251	2.537	718.6	3.2	367	104.7	29,109
6	8' – 0"	3' – 0"	8"	7"	162	#6	6"	51' – 10"	12,612	108	#6	9"	8' – 8"	1,406	8' – 2"	1,325	162	#6	6"	47' – 1"	11,457	36	18"	39' – 9"	956	152	18"	39' – 9"	4,036	108	9"	3' – 0"	216	270	9"	4' – 7"	827	7' – 3"	1,308	51' – 10"	138	106	295	3.026	853.6	3.8	433	124.9	34,576
2	8' – 0"	4' – 0"	8"	7"	162	#6	6"	17' – 6"	4,258	108	#6	9"	9' – 8"	1,568	8' – 2"	1,325	162	#6	6"	12' – 9"	3,102	12	18"	39' – 9"	319	56	18"	39' – 9"	1,487	108	9"	4' – 0"	289	54	9"	4' – 7"	165	9' – 3"	334	17' – 6"	47	38	106	1.136	321.2	1.3	153	46.8	13,000
3	8' – 0"	4' – 0"	8"	7"	162	#6	6"	26' – 1"	6,347	108	#6	9"	9' – 8"	1,568	8' – 2"	1,325	162	#6	6"	21' – 4"	5,191	18	18"	39' – 9"	478	80	18"	39' – 9"	2,124	108	9"	4' – 0"	289	108	9"	4' – 7"	331	9' – 3"	667	26' – 1"	70	56	156	1.646	458.0	1.9	226	67.8	18,546
4	8' – 0"	4' – 0"	8"	7"	162	#6	6"	34' – 8"	8,435	108	#6	9"	9' – 8"	1,568	8' – 2"	1,325	162	#6	6"	29' – 11"	7,279	24	18"	39' – 9"	637	104	18"	39' – 9"	2,762	108	9"	4' – 0"	289	162	9"	4' – 7"	496	9' – 3"	1,001	34' – 8"	93	72	200	2.156	594.8	2.6	293	88.8	24,085
5	8' – 0"	4' – 0"	8"	7"	162	#6	6"	43' – 3"	10,524	108	#6	9"	9' – 8"	1,568	8' – 2"	1,325	162	#6	6"	38' – 6"	9,368	30	18"	39' – 9"	797	128	18"	39' – 9"	3,399	108	9"	4' – 0"	289	216	9"	4' – 7"	661	9' – 3"	1,335	43' – 3"	116	90	251	2.667	731.7	3.2	367	109.9	29,633
6	8' – 0"	4' – 0"	8"	7"	162	#6	6"	51' – 10"	12,612	108	#6	9"	9' – 8"	1,568	8' – 2"	1,325	162	#6	6"	47' – 1"	11,457	36	18"	39' – 9"	956	152	18"	39' – 9"	4,036	108	9"	4' – 0"	289	270	9"	4' – 7"	827	9' – 3"	1,668	51' – 10"	138	106	295	3.177	868.5	3.8	433	130.9	35,171
2	8' – 0"	5' – 0"	8"	7"	162	#6	6"	17' – 6"	4,258	108	#6	9"	10' – 8"	1,730	8' – 2"	1,325	162	#6	6"	12' – 9"	3,102	12	18"	39' – 9"	319	62	18"	39' – 9"	1,646	108	9"	5' – 0"	361	54	9"	4' – 7"	165	11' – 3"	406	17' – 6"	47	38	106	1.201	332.8	1.3	153	49.4	13,465
3	8' – 0"	5' – 0"	8"	7"	162	#6	6"	26' – 1"	6,347	108	#6	9"	10' – 8"	1,730	8' – 2"	1,325	162	#6	6"	21' – 4"	5,191	18	18"	39' – 9"	478	88	18"	39' – 9"	2,337	108	9"	5' – 0"	361	108	9"	4' – 7"	331	11' – 3"	812	26' – 1"	70	56	156	1.733	472.8	1.9	226	71.3	19,138
4	8' – 0"	5' – 0"	8"	7"	162	#6	6"	34' – 8"	8,435	108	#6	9"	10' – 8"	1,730	8' – 2"	1,325	162	#6	6"	29' – 11"	7,279	24	18"	39' – 9"	637	114	18"	39' – 9"	3,027	108	9"	5' – 0"	361	162	9"	4' – 7"	496	11' – 3"	1,217	34' – 8"	93	72	200	2.264	612.7	2.6	293	93.1	24,800
5	8' – 0"	5' – 0"	8"	7"	162	#6	6"	43' – 3"	10,524	108	#6	9"	10' – 8"	1,730	8' – 2"	1,325	162	#6	6"	38' – 6"	9,368	30	18"	39' – 9"	797	140	18"	39' – 9"	3,717	108	9"	5' – 0"	361	216	9"	4' – 7"	661	11' – 3"	1,623	43' – 3"	116	90	251	2.796	752.7	3.2	367	115.1	30,473
6	8' – 0"	5' – 0"	8"	7"	162	#6	6"	51' – 10"	12,612	108	#6	9"	10' – 8"	1,730	8' – 2"	1,325	162	#6	6"	47' – 1"	11,457	36	18"	39' – 9"	956	166	18"	39' – 9"	4,408	108	9"	5' – 0"	361	270	9"	4' – 7"	827	11' – 3"	2,029	51' – 10"	138	106	295	3.328	892.6	3.8	433	137.0	36,138
2	8' – 0"	6' – 0"	8"	7"	162	#6	6"	17' – 6"	4,258	108	#6	9"	11' – 8"	1,893	8' – 2"	1,325	162	#6	6"	12' – 9"	3,102	12	18"	39' – 9"	319	68	18"	39' – 9"	1,806	108	9"	6' – 0"	433	54	9"	4' – 7"	165	13' – 3"	478	17' – 6"	47	38	106	1.265	344.5	1.3	153	51.9	13,932
3	8' – 0"	6' – 0"	8"	7"	162	#6	6"	26' – 1"	6,347	108	#6	9"	11' – 8"	1,893	8' – 2"	1,325	162	#6	6"	21' – 4"	5,191	18	18"	39' – 9"	478	96	18"	39' – 9"	2,549	108	9"	6' – 0"	433	108	9"	4' – 7"	331	13' – 3"	956	26' – 1"	70	56	156	1.819	487.6	1.9	226	74.7	19,729
4	8' – 0"	6' – 0"	8"	7"	162	#6	6"	34' – 8"	8,435	108	#6	9"	11' – 8"	1,893	8' – 2"	1,325	162	#6	6"	29' – 11"	7,279	24	18"	39' – 9"	637	124	18"	39' – 9"	3,293	108	9"	6' – 0"	433	162	9"	4' – 7"	496	13' – 3"	1,434	34' – 8"	93	72	200	2.372	630.6	2.6	293	97.5	25,518
5	8' – 0"	6' – 0"	8"	7"	162	#6	6"	43' – 3"	10,524	108	#6	9"	11' – 8"	1,893	8' – 2"	1,325	162	#6	6"	38' – 6"	9,368	30	18"	39' – 9"	797	152	18"	39' – 9"	4,036	108	9"	6' – 0"	433	216	9"	4' – 7"	661	13' – 3"	1,912	43' – 3"	116	90	251	2.926	773.7	3.2	367	120.3	31,316
6	8' – 0"	6' – 0"	8"	7"	162	#6	6"	51' – 10"	12,612	108	#6	9"	11' – 8"	1,893	8' – 2"	1,325	162	#6	6"	47' – 1"	11,457	36	18"	39' – 9"	956	180	18"	39' – 9"	4,780	108	9"	6' – 0"	433	270	9"	4' – 7"	827	13' – 3"	2,390	51' – 10"	138	106	295	3.479	916.8	3.8	433	143.0	37,106
2	8' – 0"	7' – 0"	8"	7"	162	#6	6"	17' – 6"	4,258	108	#6	9"	12' – 8"	2,055	8' – 2"	1,325	162	#6	6"	12' – 9"	3,102	12	18"	39' – 9"	319	68	18"	39' – 9"	1,806	108	9"	7' – 0"	505	54	9"	4' – 7"	165	15' – 3"	550	17' – 6"	47	38	106	1.330	352.1	1.3	153	54.5	14,238
3	8' – 0"	7' – 0"	8"	7"	162	#6	6"	26' – 1"	6,347	108	#6	9"	12' – 8"	2,055	8' – 2"	1,325	162	#6	6"	21' – 4"	5,191	18	18"	39' – 9"	478	96	18"	39' – 9"	2,549	108	9"	7' – 0"	505	108	9"	4' – 7"	331	15' – 3"	1,100	26' – 1"	70	56	156	1.905	497.0	1.9	226	78.1	20,107
4	8' – 0"	7' – 0"	8"	7"	162	#6	6"	34' – 8"	8,435	108	#6	9"	12' – 8"	2,055	8' – 2"	1,325	162	#6	6"	29' – 11"	7,279	24	18"	39' – 9"	637	124	18"	39' – 9"	3,293	108	9"	7' – 0"	505	162	9"	4' – 7"	496	15' – 3"	1,650	34' – 8"	93	72	200	2.480	641.9	2.6	293	101.8	25,968
5	8' – 0"	7' – 0"	8"	7"	162	#6	6"	43' – 3"	10,524	108	#6	9"	12' – 8"	2,055	8' – 2"	1,325	162	#6	6"	38' – 6"	9,368	30	18"	39' – 9"	797	152	18"	39' – 9"	4,036	108	9"	7' – 0"	505	216	9"	4' – 7"	661	15' – 3"	2,200	43' – 3"	116	90	251	3.056	786.8	3.2	367	125.5	31,838
6	8' – 0"	7' – 0"	8"	7"	162	#6	6"	51' – 10"	12,612	108	#6	9"	12' – 8"	2,055	8' – 2"	1,325	162	#6	6"	47' – 1"	11,457	36	18"	39' – 9"	956	180	18"	39' – 9"	4,780	108	9"	7' – 0"	505	270	9"	4' – 7"	827	15' – 3"	2,750	51' – 10"	138	106	295	3.631	931.7	3.8	433	149.1	37,700
2	8' – 0"	8' – 0"	8"	7"	162	#6	6"	17' – 6"	4,258	108	#6	9"	13' – 8"	2,217	8' – 2"	1,325	162	#6	6"	12' – 9"	3,102	12	18"	39' – 9"	319	74	18"	39' – 9"	1,965	108	9"	8' – 0"	577	54	9"	4' – 7"	165	17' – 3"	622	17' – 6"	47	38	106	1.395	363.8	1.3	153	57.1	14,703
3	8' – 0"	8' – 0"	8"	7"	162	#6	6"	26' – 1"	6,347	108	#6	9"	13' – 8"	2,217	8' – 2"	1,325	162	#6	6"	21' – 4"	5,191	18	18"	39' – 9"	478	104	18"	39' – 9"	2,762	108	9"	8' – 0"	577	108	9"	4' – 7"	331	17' – 3"	1,244	26' – 1"	70	56	156	1.992	511.8	1.9	226	81.6	20,698
4	8' – 0"	8' – 0"	8"	7"	162	#6	6"	34' – 8"	8,435	108	#6	9"	13' – 8"	2,217	8' – 2"	1,325	162	#6	6"	29' – 11"	7,279	24	18"	39' – 9"	637	134	18"	39' – 9"	3,558	108	9"	8' – 0"	577	162	9"	4' – 7"	496	17' – 3"	1,867	34' – 8"	93	72	200	2.588	659.8	2.6	293	106.1	26,684
5	8' – 0"	8' – 0"	8"	7"	162	#6	6"	43' – 3"	10,524	108	#6	9"	13' – 8"	2,217	8' – 2"	1,325	162	#6	6"	38' – 6"	9,368	30	18"	39' – 9"	797	164	18"	39' – 9"	4,355	108	9"	8' – 0"	577	216	9"	4' – 7"	661	17' – 3"	2,489	43' – 3"	116	90	251	3.185	807.8	3.2	367	130.6	32,680
6	8' – 0"	8' – 0"	8"	7"	162	#6	6"	51' – 10"	12,612	108	#6	9"	13' – 8"	2,217	8' – 2"	1,325	162	#6	6"	47' – 1"	11,457	36	18"	39' – 9"	956	194	18"	39' – 9"	5,151	108	9"	8' – 0"	577	270	9"	4' – 7"	827	17' – 3"	3,111	51' – 10"	138	106	295	3.782	955.8	3.8	433	155.1	38,666

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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE 8'-0" SPAN 0' TO 13' FILL

MC-8-13

FILE: mc813ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		144

DATE: 9/20/2022 2:39:42 PM
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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

Maximum Wingwall Height Hw	W	X	Y	Z	Variable Reinforcing Bars J1 Size	Bars J1 Spa	Bars J2 Size	Bars J2 Spa	Estimated Quantities per ft of wing length (2~wings) (3) Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'-8"	1'-9"	1'-3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'-2"	2'-0"	1'-6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'-8"	2'-3"	1'-9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'-2"	2'-6"	2'-0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'-8"	2'-9"	2'-3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'-2"	3'-0"	2'-6"	9"	#7	6"	#5	6"	162.29	0.721
13'-0"	6'-8"	3'-3"	2'-9"	11"	#7	6"	#5	6"	178.80	0.856
14'-0"	7'-2"	3'-6"	3'-0"	1'-0"	#8	6"	#5	6"	216.78	0.959
15'-0"	7'-8"	4'-0"	3'-0"	1'-1"	#9	6"	#6	6"	283.06	1.068
16'-0"	8'-2"	4'-6"	3'-0"	1'-3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING
(2~wings)

Bar	Size	No.	Spa
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

WING DIMENSION FORMULAS:
(All values are in feet.)

Hw = H + T + C – 0.250'
A = (Hw – 0.333') (SL)
B = (A) tangent (30°)
Lw = (A) ÷ cosine (30°)

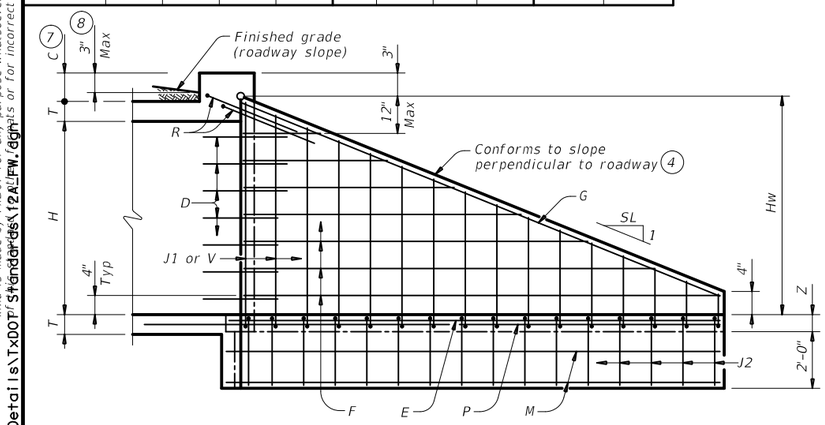
For cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)

For precast culverts:
Ltw = (N) (2U + S) + (N – 1) (0.5')

Total wingwall area (two wings ~ SF) = (Hw + 0.333') (Lw)

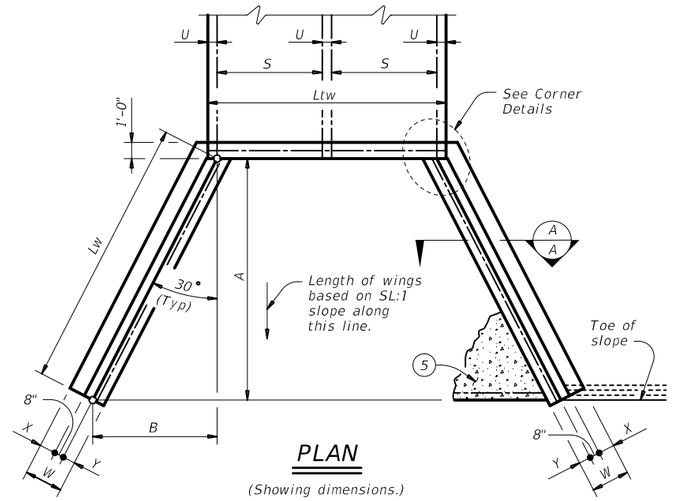
Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans

See applicable box culvert standard sheet for H, S, T, and U values.



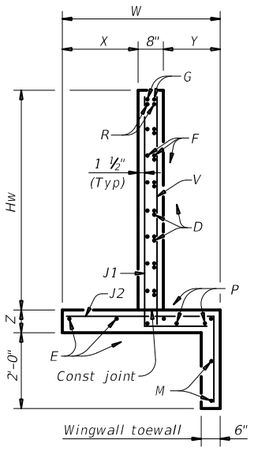
INSIDE ELEVATION

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

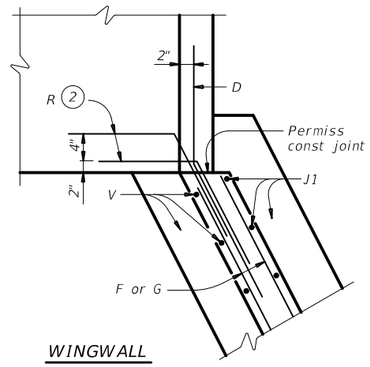


PLAN

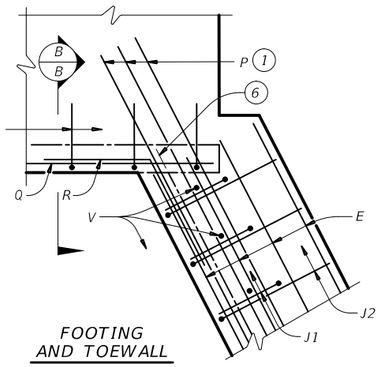
(Showing dimensions.)



SECTION A-A



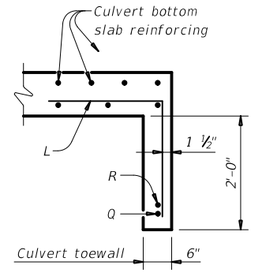
WINGWALL



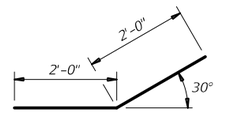
FOOTING AND TOEWALL

CORNER DETAILS

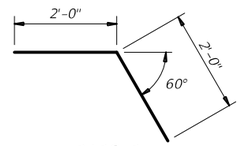
(Culvert and culvert toewall reinforcing not shown for clarity.)



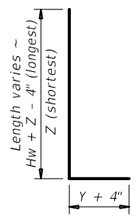
SECTION B-B (5)



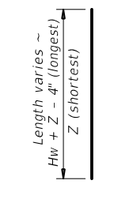
BARS D



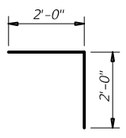
BARS R



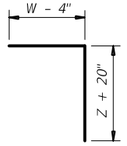
BARS J1



BARS V



BARS L



BARS J2

(1) Extend Bars P 3'-0" minimum into bottom slab of box culvert.

(2) Adjust as necessary to maintain 1 1#2" clear cover and 4" minimum between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by Lw.

(4) Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.

(6) At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.

(7) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

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

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

MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
In riprap concrete synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing unless noted otherwise.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE WINGWALLS
WITH FLARED WINGS FOR 0° SKEW BOX CULVERTS

FW-0

FILE: fw-0std-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		145

DATE: 9/20/2022 2:39:43 PM
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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

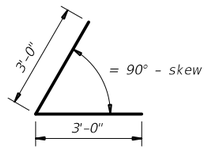
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2–wings) (4)		Estimated Quantities per ft of Toewall (1–toewall)	
					Bars J1		Bars J2					
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'–6"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	48.64	0.406	6.85	0.071
2'–9"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	49.31	0.424	6.85	0.071
3'–0"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	49.98	0.444	6.85	0.071
3'–3"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	53.32	0.462	6.85	0.071
3'–6"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	53.98	0.480	6.85	0.071
4'–0"	3'–2"	1'–2"	1'–0"	7"	#4	1'–0"	#4	1'–0"	55.77	0.532	6.85	0.071
4'–6"	3'–2"	1'–2"	1'–0"	7"	#4	1'–0"	#4	1'–0"	59.77	0.568	6.85	0.071
5'–0"	3'–9"	1'–7"	1'–2"	7"	#4	1'–0"	#4	1'–0"	63.45	0.632	6.96	0.075
5'–6"	3'–9"	1'–7"	1'–2"	7"	#4	1'–0"	#4	1'–0"	67.46	0.668	6.96	0.075
6'–0"	4'–4"	2'–0"	1'–4"	7"	#5	1'–0"	#5	1'–0"	80.67	0.730	7.07	0.078
6'–6"	4'–4"	2'–0"	1'–4"	7"	#5	1'–0"	#5	1'–0"	85.05	0.768	7.07	0.078
7'–0"	5'–0"	2'–3"	1'–9"	8"	#5	1'–0"	#5	1'–0"	92.15	0.864	8.07	0.093
7'–6"	5'–0"	2'–3"	1'–9"	8"	#5	1'–0"	#5	1'–0"	96.54	0.902	8.07	0.093
8'–0"	5'–6"	2'–8"	1'–10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'–6"	5'–6"	2'–8"	1'–10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'–6"	6'–0"	2'–10"	2'–2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'–6"	6'–5"	3'–0"	2'–5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'–6"	7'–2"	3'–6"	2'–8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'–6"	7'–8"	3'–9"	2'–11"	1'–0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'–6"	8'–2"	4'–0"	3'–2"	1'–2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'–6"	8'–10"	4'–5"	3'–5"	1'–4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'–6"	9'–6"	4'–10"	3'–8"	1'–6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'–0"	9'–11"	5'–0"	3'–11"	1'–7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING
(2–wings)

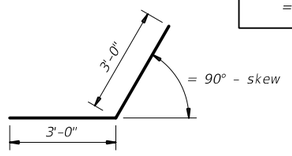
Bar	Size	No.	Spa
D1	#6	~	1'–0"
D2	#6	~	1'–0"
E1	#4	~	1'–0"
F	#4	~	1'–0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'–0"
V	#4	~	1'–0"

TABLE OF TOEWALL REINFORCING

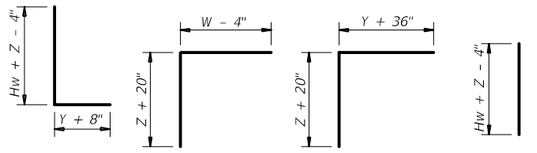
Bar	Size	No.	Spa
J3	#4	~	1'–0"
M2	#4	2	~
E2	#4	~	1'–0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION FORMULAS:
(All values are in feet.)

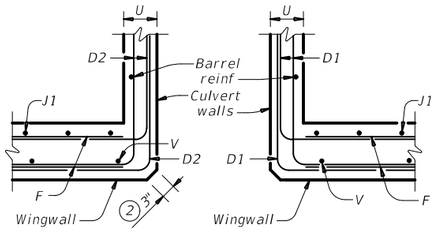
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW–1
= (Hw – 1') (SL) ÷ cosine (θ) for Type PW–2 and Hw ≥ 4'
= (Hw – 0.5') (SL) ÷ cosine (θ) for Type PW–2 and Hw < 4'

For cast–in–place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

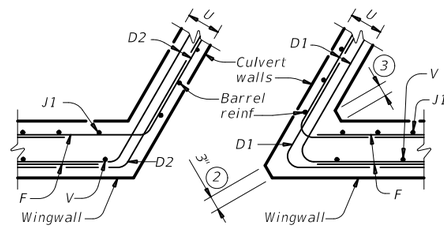
For precast culverts:
Ltw = [(N) (2 U + S) + (N – 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW–1
= (2)(Hw)(Lw) – 6 SF for Type PW–2 and Hw ≥ 4'
= (2)(Hw)(Lw) – 1.5 SF for Type PW–2 and Hw < 4'

Hw = Height of wingwall
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
SL:1 = Channel slope ratio. (horizontal: 1 vertical, usual value is 2:1)
θ = Culvert skew

See applicable box culvert standard sheet for S, H, T, and U values.



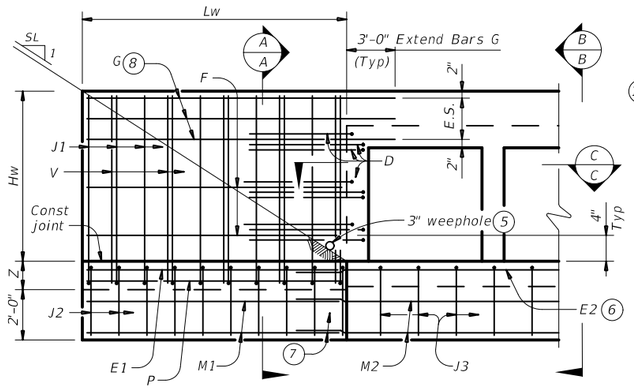
SECTION C-C - PW-1



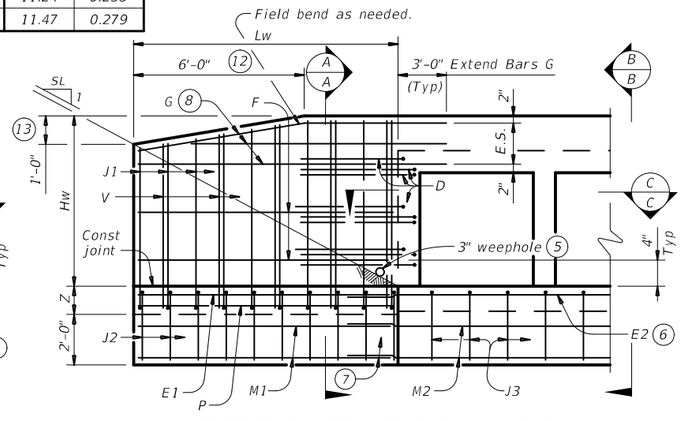
SECTION C-C - PW-2

1. Skew = 0°
2. At discharge end, chamfer may be ¾" minimum.
3. For 15° skew ~ 1"
   For 30° skew ~ 2"
   For 45° skew ~ 3"
4. Quantities shown are for two Type PW–1 wings. Adjust concrete volume for Type PW–2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
5. Provide weepholes for Hw = 5'–0" and greater. Fill around weepholes with coarse gravel.
6. Extend Bars E2 1'–6" minimum into the wingwall footing.
7. Lap Bars M1 1'–6" minimum with Bars M2.
8. Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.
9. 0" Min to 5'–0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'–0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631–CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
10. For vehicle safety, the following requirements must be met:
    - For structures without bridge rail, construct curbs no more than 3" above finished grade.
    - For structures with bridge rail, construct curbs flush with finished grade.

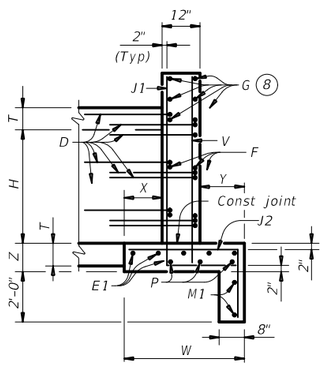
    Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
11. 1'–0" typical. 2'–3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elswhere in the plans.
12. 3'–0" for Hw < 4'.
13. 6" for Hw < 4'.



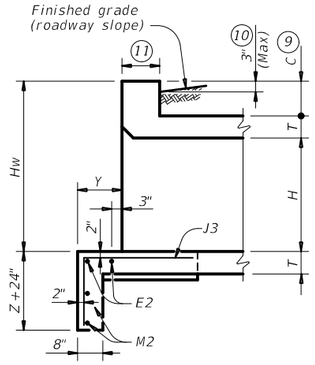
PARTIAL ELEVATION - PW-1



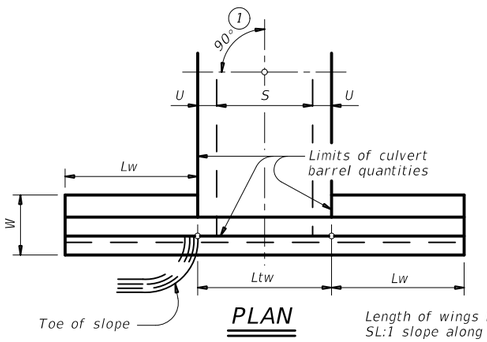
PARTIAL ELEVATION - PW-2



SECTION A-A
(Showing wing reinforcement.)

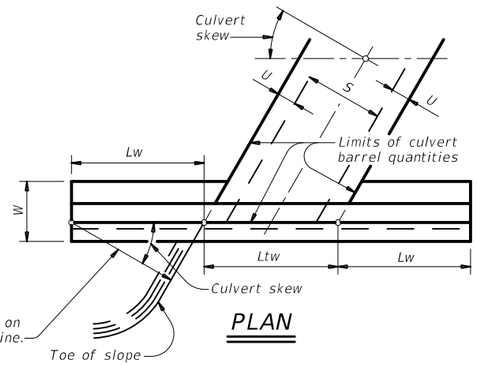


SECTION B-B
(Showing wing reinforcement.)



PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

DESIGNER NOTES:
Type PW–1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW–2 can only be used for applications without a railing mounted to the wingwall.

MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.

GENERAL NOTES:
Designed in accordance with AASHTO LRFD Bridge Design Specifications.
Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for wingwall type and additional dimensions and information.
Quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out–to–out of bars.

Texas Department of Transportation
Bridge Division Standard

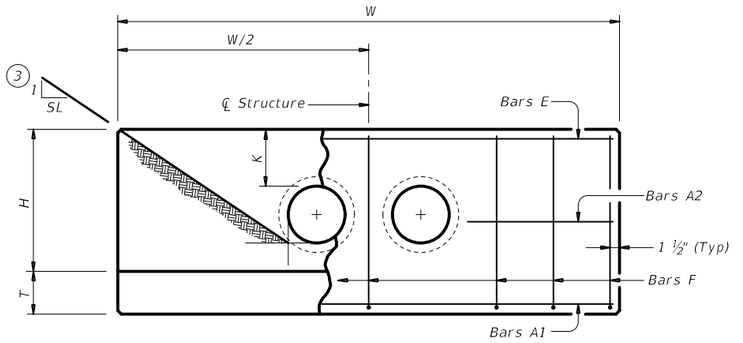
CONCRETE WINGWALLS
WITH PARALLEL WINGS FOR BOX CULVERTS
TYPES PW-1 AND PW-2

PW

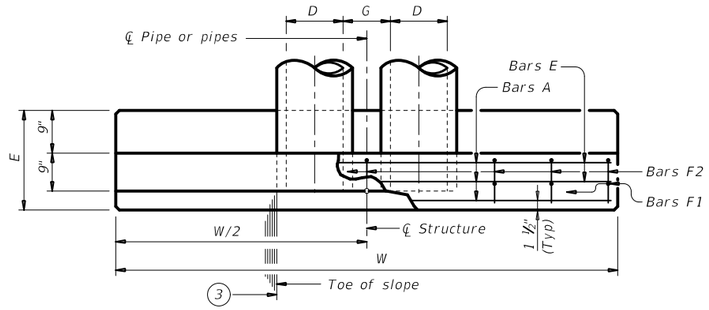
FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		146

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

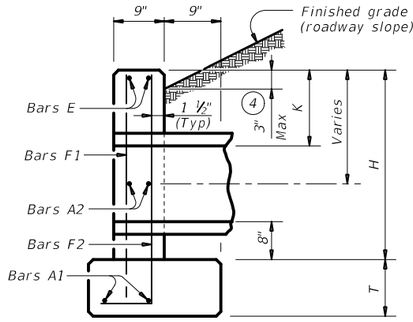
Slope	Dia of Pipe (D)	Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 0"	122	1.1	1' – 9"	15	0.2
	15"	10' – 3"	136	1.3	2' – 2"	16	0.2
	18"	11' – 6"	163	1.5	2' – 8"	19	0.3
	21"	12' – 9"	200	1.8	3' – 1"	31	0.4
	24"	14' – 0"	217	2.1	3' – 7"	34	0.4
	27"	15' – 3"	254	2.4	3' – 11"	37	0.5
	30"	16' – 6"	272	2.7	4' – 4"	40	0.6
	33"	17' – 9"	314	3.1	4' – 8"	43	0.6
	36"	19' – 0"	371	3.9	5' – 1"	46	0.8
	42"	21' – 6"	442	4.9	5' – 10"	52	1.0
	48"	25' – 0"	569	6.4	6' – 7"	59	1.3
	54"	27' – 6"	701	7.5	7' – 6"	82	1.6
	60"	30' – 0"	794	8.8	8' – 3"	90	1.8
	66"	32' – 6"	894	10.2	8' – 9"	96	2.0
	72"	35' – 0"	1,055	11.7	9' – 4"	103	2.3
3:1	12"	13' – 0"	175	1.6	1' – 9"	14	0.2
	15"	14' – 9"	193	1.9	2' – 2"	17	0.2
	18"	16' – 6"	228	2.2	2' – 8"	19	0.3
	21"	18' – 3"	299	2.6	3' – 1"	31	0.4
	24"	20' – 0"	323	3.0	3' – 7"	33	0.4
	27"	21' – 9"	371	3.5	3' – 11"	37	0.5
	30"	23' – 6"	415	4.0	4' – 4"	40	0.5
	33"	25' – 3"	469	4.6	4' – 8"	43	0.6
	36"	27' – 0"	556	5.7	5' – 1"	46	0.8
	42"	30' – 6"	675	7.1	5' – 10"	52	1.0
	48"	35' – 6"	837	9.2	6' – 7"	59	1.3
	54"	39' – 0"	1,015	11.0	7' – 6"	84	1.6
	60"	42' – 6"	1,171	12.9	8' – 3"	91	1.8
	66"	46' – 0"	1,298	14.9	8' – 9"	98	2.0
	72"	49' – 6"	1,561	17.1	9' – 4"	103	2.3
4:1	12"	17' – 0"	229	2.0	1' – 9"	15	0.2
	15"	19' – 3"	266	2.4	2' – 2"	17	0.2
	18"	21' – 6"	308	2.9	2' – 8"	19	0.3
	21"	23' – 9"	382	3.5	3' – 1"	31	0.3
	24"	26' – 0"	430	3.9	3' – 7"	34	0.4
	27"	28' – 3"	486	4.7	3' – 11"	37	0.5
	30"	30' – 6"	539	5.2	4' – 4"	40	0.6
	33"	32' – 9"	603	6.0	4' – 8"	42	0.6
	36"	35' – 0"	738	7.5	5' – 1"	47	0.8
	42"	39' – 6"	881	9.3	5' – 10"	52	1.0
	48"	46' – 0"	1,102	12.1	6' – 7"	61	1.3
	54"	50' – 6"	1,364	14.4	7' – 6"	84	1.6
	60"	55' – 0"	1,547	16.9	8' – 3"	91	1.8
	66"	59' – 6"	1,741	19.5	8' – 9"	98	2.0
	72"	64' – 0"	2,077	22.4	9' – 4"	102	2.3
6:1	12"	25' – 0"	336	3.0	1' – 9"	14	0.2
	15"	28' – 3"	384	3.6	2' – 2"	17	0.2
	18"	31' – 6"	452	4.2	2' – 8"	19	0.3
	21"	34' – 9"	581	5.1	3' – 1"	31	0.4
	24"	38' – 0"	644	5.8	3' – 7"	34	0.4
	27"	41' – 3"	737	6.9	3' – 11"	37	0.5
	30"	44' – 6"	807	7.7	4' – 4"	39	0.6
	33"	47' – 9"	912	8.9	4' – 8"	44	0.6
	36"	51' – 0"	1,108	11.0	5' – 1"	48	0.8
	42"	57' – 6"	1,318	13.7	5' – 10"	54	1.0
	48"	67' – 0"	1,682	17.9	6' – 7"	59	1.3
	54"	73' – 6"	2,072	21.3	7' – 6"	83	1.6
	60"	80' – 0"	2,351	24.9	8' – 3"	89	1.8
	66"	86' – 6"	2,643	28.9	8' – 9"	96	2.0
	72"	93' – 0"	3,121	33.1	9' – 4"	101	2.3



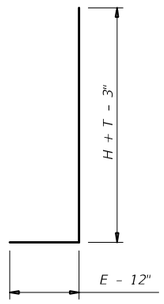
ELEVATION



PLAN OF NON-SKEWED PIPES



SECTION AT CENTER OF PIPE



BARS F2

(1) Total quantities include one 3'-1" lap for bars over 60' in length.

(2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(3) Indicated slope is perpendicular to centerline pipe or pipes.

(4) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) Dimensions shown are usual and maximum.

(6) Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' – 9"	1' – 0"	2' – 8"	0' – 9"	1' – 9"
15"	0' – 11"	1' – 0"	2' – 11"	0' – 9"	1' – 9"
18"	1' – 2"	1' – 0"	3' – 2"	0' – 9"	1' – 9"
21"	1' – 4"	1' – 0"	3' – 5"	0' – 9"	2' – 0"
24"	1' – 7"	1' – 0"	3' – 8"	0' – 9"	2' – 0"
27"	1' – 8"	1' – 0"	3' – 11"	0' – 9"	2' – 3"
30"	1' – 10"	1' – 0"	4' – 2"	0' – 9"	2' – 3"
33"	1' – 11"	1' – 0"	4' – 5"	0' – 9"	2' – 6"
36"	2' – 1"	1' – 0"	4' – 8"	1' – 0"	2' – 6"
42"	2' – 4"	1' – 0"	5' – 2"	1' – 0"	2' – 9"
48"	2' – 7"	1' – 3"	5' – 11"	1' – 0"	3' – 0"
54"	3' – 0"	1' – 3"	6' – 5"	1' – 0"	3' – 3"
60"	3' – 3"	1' – 3"	6' – 11"	1' – 0"	3' – 6"
66"	3' – 3"	1' – 3"	7' – 5"	1' – 0"	3' – 9"
72"	3' – 4"	1' – 3"	7' – 11"	1' – 0"	4' – 0"

TABLE OF REINFORCING STEEL (6)

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' – 6"	~
E	#5	~	2
F	#5	1' – 0"	~

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS

CH-PW-0

FILE: chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		147

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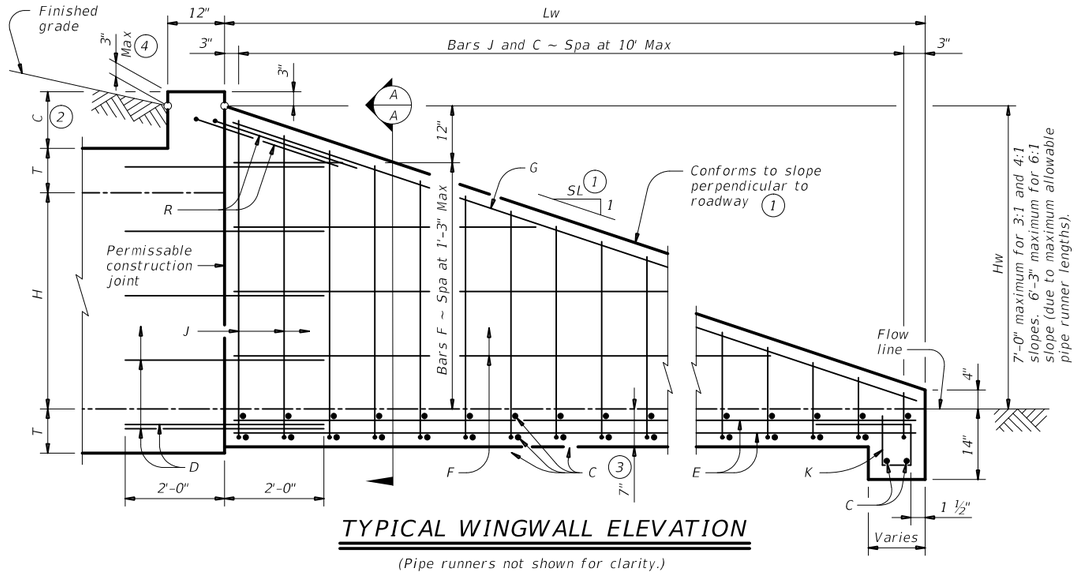
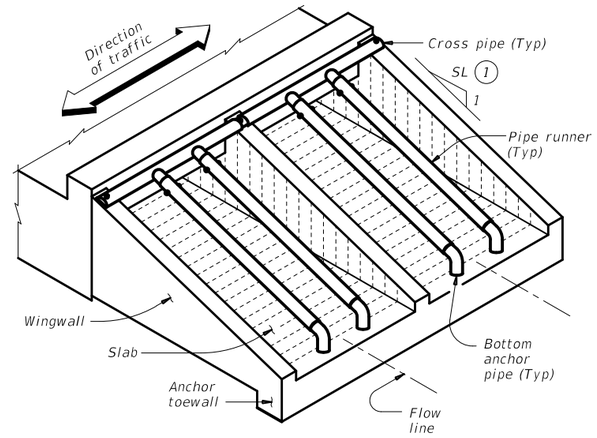


TYPICAL WINGWALL ELEVATION

(Pipe runners not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

WING DIMENSION CALCULATIONS:

Hw = H + T + C – 0.250'
Lw = (Hw – 0.333') (SL)

For cast-in-place culverts:
Atw = (N) (S) + (N + 1) (U)
For precast culverts:
Atw = (N) (2U + S) + (N – 1) (0.500')

Total Wingwall Area (SF)
= (0.5) (Hw + 0.333') (Lw) (N + 1)
Total Concrete Volume (CY)
= [(Wingwall Area) (0.583') +
(Lw) (Atw) (0.583') +
(Atw) (1.167') (1.167' – 0.583')] ÷ (27)

PIPE RUNNER DIMENSION CALCULATIONS:

Pipe Runner Length
= (Lw) (K1) – (1.917')
Total Reinforcing (Lb)
= (1.55) (Lw) (Atw) +
(4.43) (Atw) +
(K2) (Hw) (N + 1) (√Lw)

C = Height of curb above top of top slab (feet)
Hw = Height of wingwall (feet)
K = Constant value for use in formulas

Slope SL:1	K1	K2
3:1	~ 1.054 ~	7.45
4:1	~ 1.031 ~	8.49
6:1	~ 1.014 ~	10.30

Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)

See applicable box culvert standard for H, S, T, and U values.

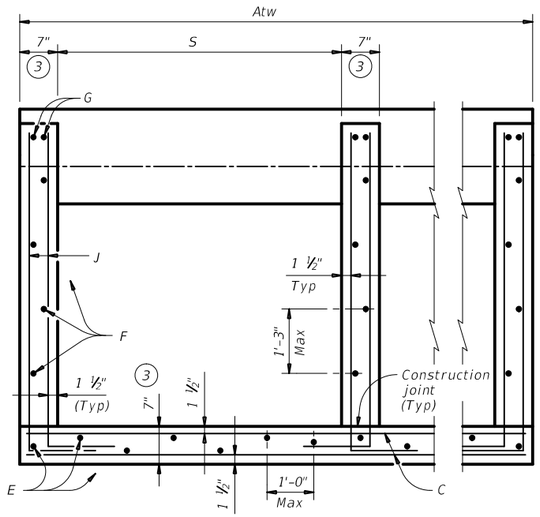
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".
Provide Class "C" concrete (f`c = 3,600 psi).
Provide pipe runners, cross pipes, 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.
Galvanize all steel components, except the concrete reinforcing, unless required elsewhere in the plans, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".

GENERAL NOTES:

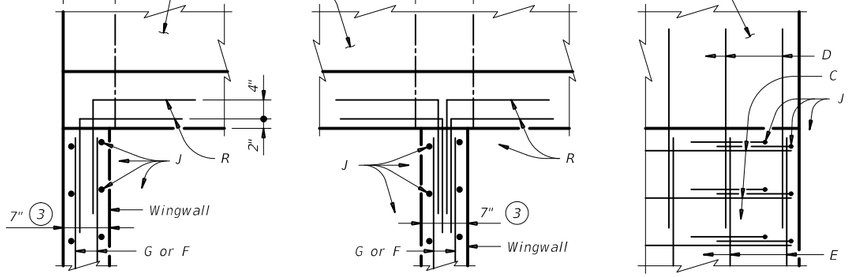
Designed according to AASHTO LRFD Bridge Design Specifications.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Pipe runners are designed for a traversing 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.
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.
Alternate design drawings bearing the seal of a professional engineer will be acceptable for precast construction of the safety end treatments.

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



SECTION A-A

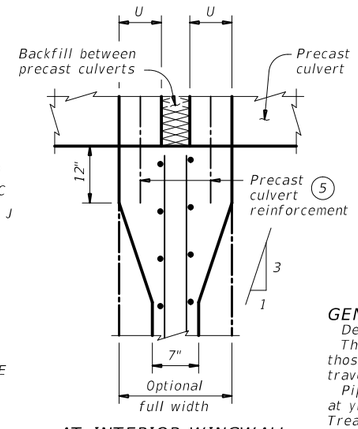
(Showing typical wingwall and wing slab reinforcing. Pipe runners not shown for clarity.)



AT TOP OF EXTERIOR WINGWALL
(Cast-in-place culvert)

AT TOP OF INTERIOR WINGWALL
(Cast-in-place culvert)

AT OUTSIDE OF BOTTOM SLAB
(Cast-in-place culvert)



AT INTERIOR WINGWALL
(Precast culvert)

PLAN VIEWS OF CORNER DETAILS

Bar	Size	Spacing
C	#4	10" Max
D	#4	Match F and E
E	#4	1'-0" Max
F	#4	1'-3" Max
G	#6	As shown
J	#4	10" Max
K	#4	1'-0" Max
R	#4	As shown

TABLE OF REINFORCING BAR SIZES AND SPACING

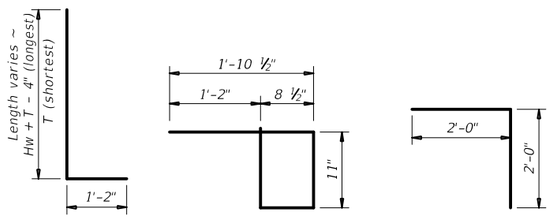
(1) *Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.*

(2) *0" 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 Extended Curb Details (ECD) standard sheet.*

(3) *Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.*

(4) *For vehicle safety, reduce curb height, if necessary, to provide a maximum 3" projection. No changes will be made in quantities and no additional compensation will be allowed for this work.*

(5) *For culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into wingwall. Wingwall Bars D and R may be omitted. Otherwise, refer to the Wingwall Connection detail on the Box Culvert Precast Miscellaneous Details (SCP-MD) standard sheet.*



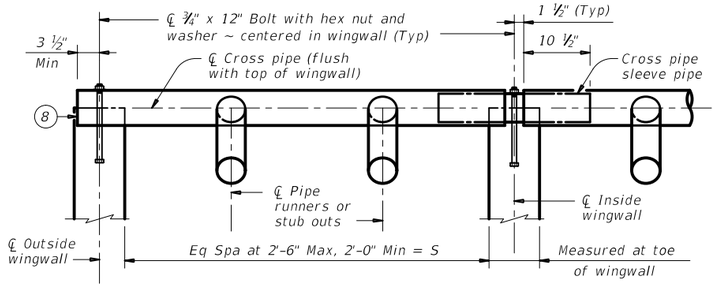
SHEET 1 OF 2

Texas Department of Transportation
Bridge Division Standard

SAFETY END TREATMENT
FOR 0° SKEW BOX CULVERTS (MAXIMUM Hw = 7'-0") TYPE I ~ CROSS DRAINAGE

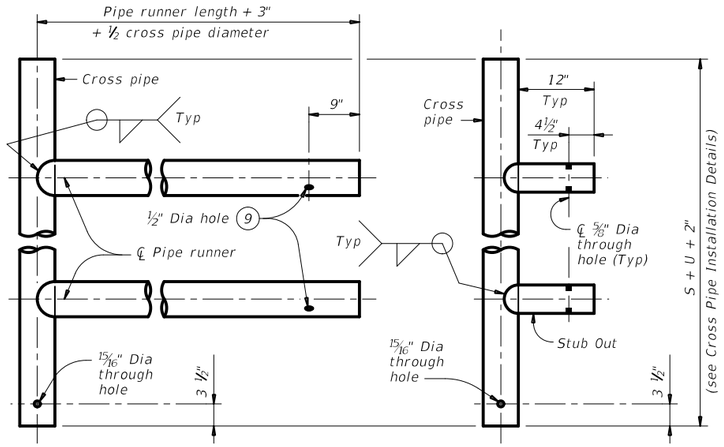
SETB-CD

FILE: setbcdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		148

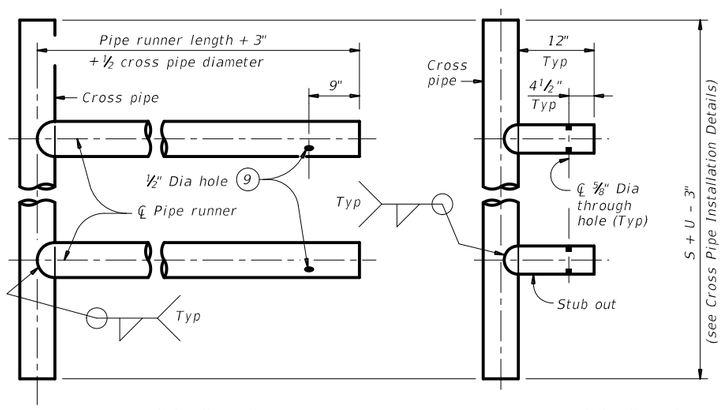


NOTE: At Contractor's option, make the cross pipe continuous across the inside wingwalls. If option is selected, omit the sleeve pipe and make a 15⁄16" diameter through hole in the cross pipe to accept the anchor bolt at the centerline of each inside wingwall.

CROSS PIPE INSTALLATION DETAILS

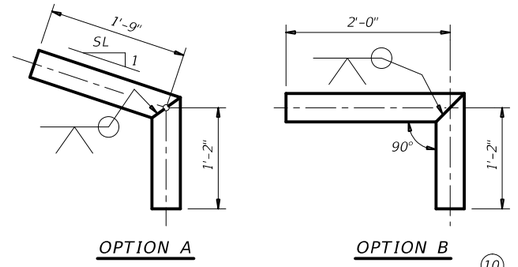


FOR USE IN OUTSIDE CULVERT BAY

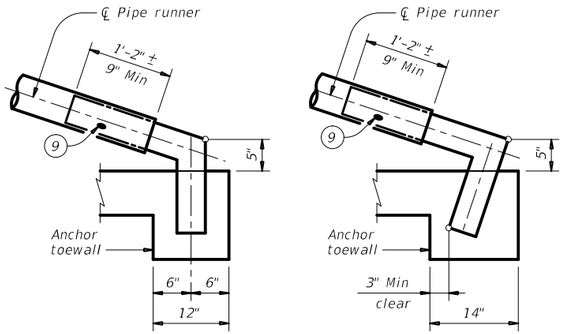


FOR USE IN INSIDE CULVERT BAY

CROSS PIPE AND CONNECTIONS DETAILS

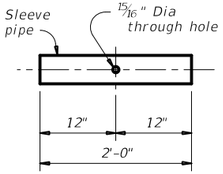


BOTTOM ANCHOR PIPE DETAILS (10)

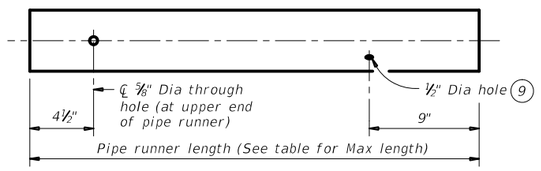


BOTTOM ANCHOR TOEWALL DETAILS

(Wingwall not shown for clarity.)

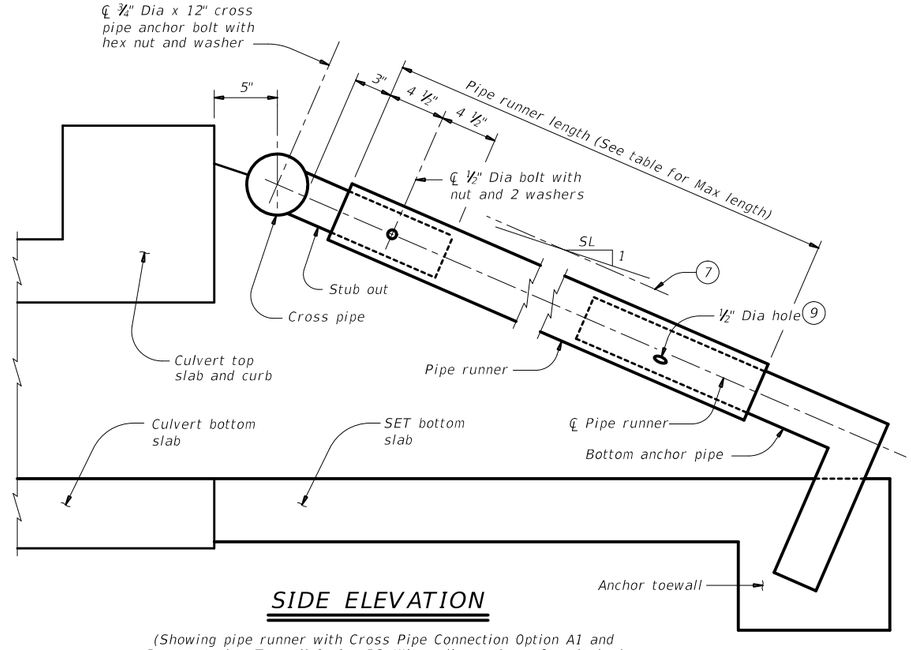


CROSS PIPE SLEEVE PIPE DETAILS



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

PIPE RUNNER DETAILS



SIDE ELEVATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Bottom Anchor Toewall Option B2. Wingwall not shown for clarity.)

(6) Cross pipe is the same size as the pipe runner. Cross pipe stub out is the same size as the anchor pipe.

(7) Note that actual slope of safety pipe runner may vary slightly from side slope.

(8) Take care to 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 safety 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.

MAXIMUM PIPE RUNNER LENGTHS AND (6) REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

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

SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

SAFETY END TREATMENT

FOR 0° SKEW BOX CULVERTS
(MAXIMUM Hw = 7'-0")
TYPE I ~ CROSS DRAINAGE

SETB-CD

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	WACO	BELL		149

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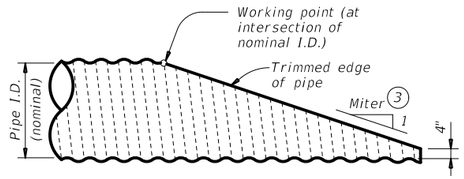
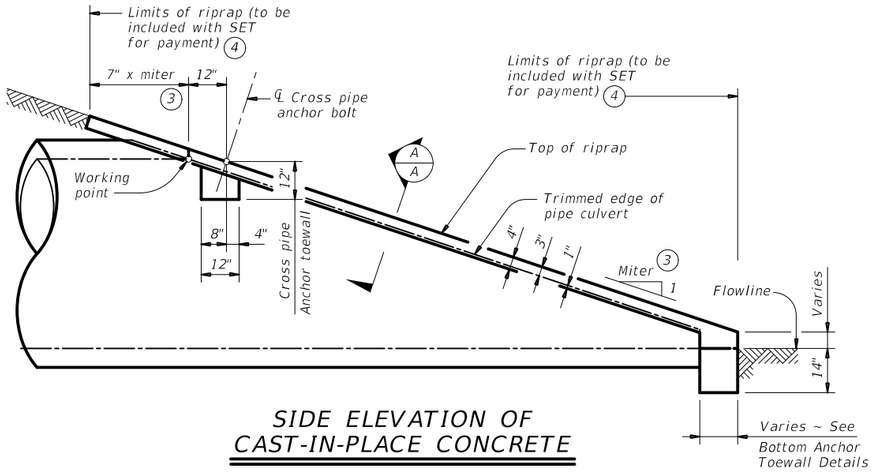


NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

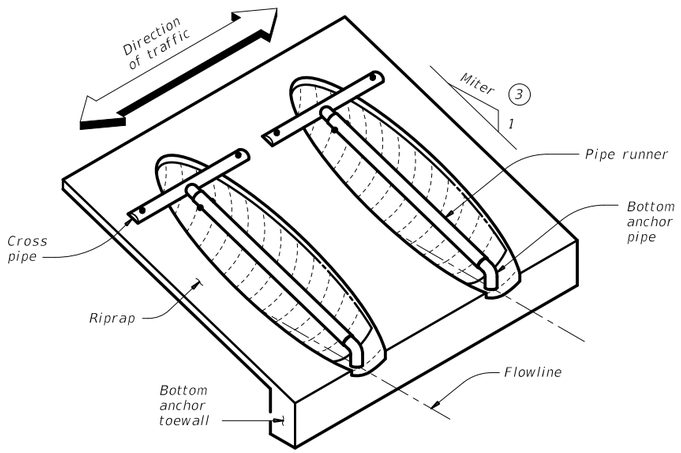
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

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



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1)(2)

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

TYPICAL PIPE CULVERT MITERS (3)

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

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

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

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

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

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

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

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

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

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

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

(3) Miter = slope of mitered end of pipe culvert.

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

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

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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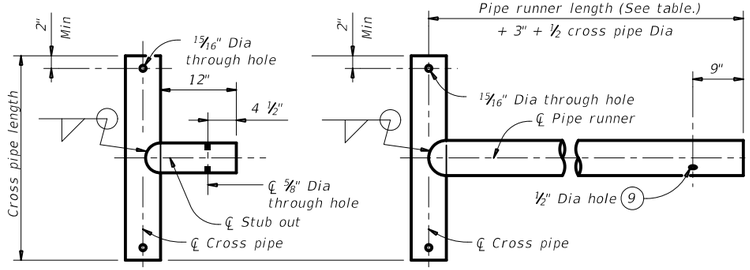
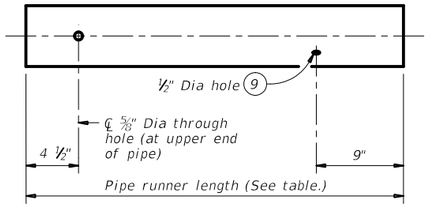


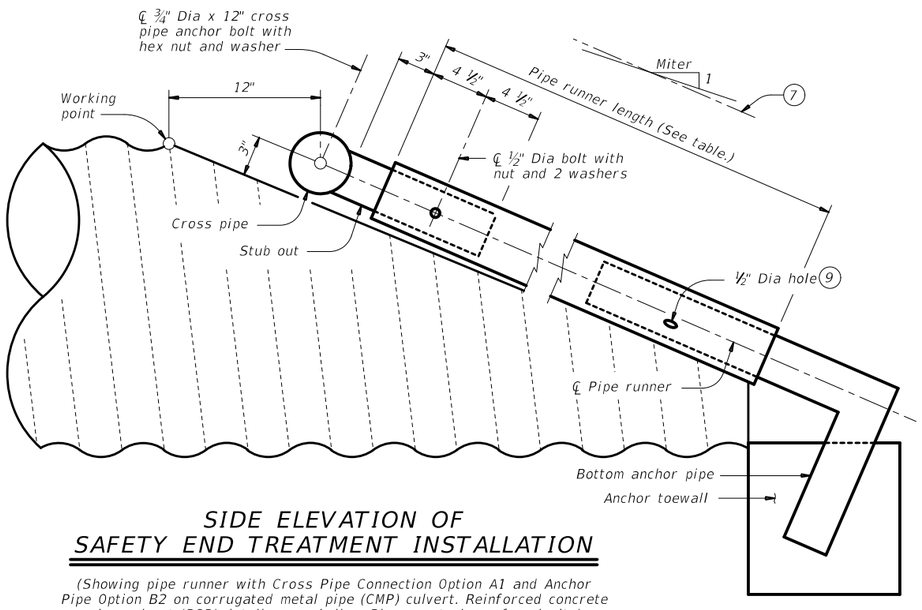
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



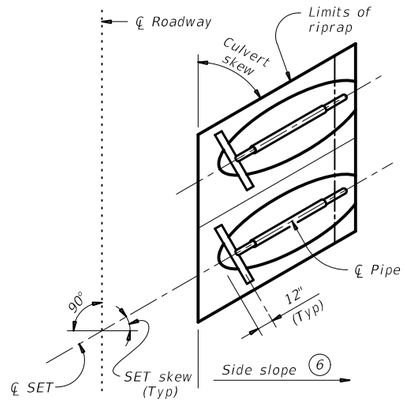
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

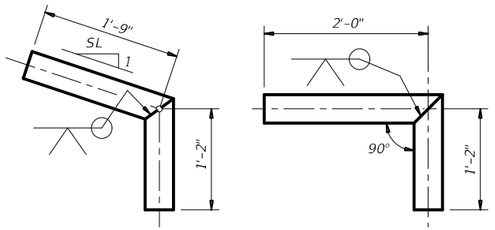


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

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

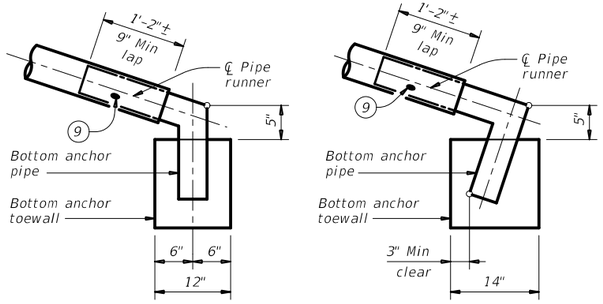


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

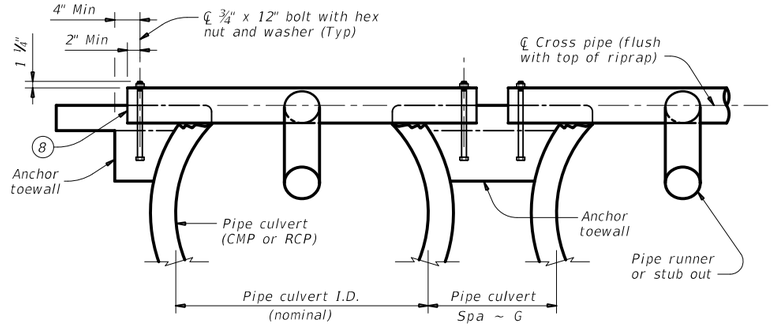
BOTTOM ANCHOR PIPE DETAILS (10)



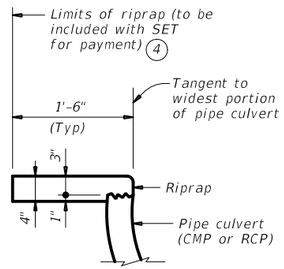
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

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

(6) Recommended values of side slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.

(8) Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1/2" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MATERIAL NOTES:

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

Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

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

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.

Payment for riprap and toewall is included in the price bid for each safety end treatment.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	WACO	BELL		151

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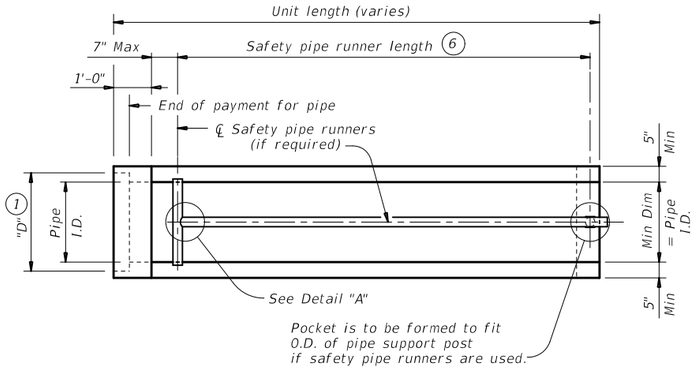
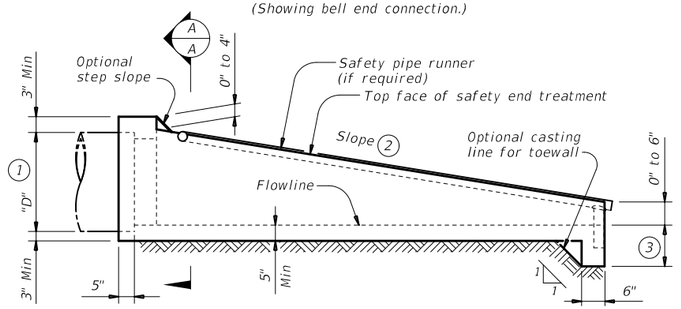
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe Skew	Single Pipe Pipe Runners Required	Multiple Pipes Skew	Multiple Pipes Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' – 11"	≤ 45°	No	≤ 45°	No
				4:1	3' – 6"				
				6:1	4' – 9"				
15"	2 ¼"	1.30"	20.50"	3:1	3' – 8"	≤ 45°	No	≤ 45°	No
				4:1	4' – 7"				
				6:1	6' – 5"				
18"	2 ½"	1.60"	24.00"	3:1	4' – 6"	≤ 45°	No	≤ 45°	No
				4:1	5' – 8"				
				6:1	8' – 0"				
24"	3"	1.95"	31.00"	3:1	6' – 2"	≤ 45°	No	= 30°	No
				4:1	7' – 10"			> 30°	Yes
				6:1	11' – 3"				
30"	3 ½"	2.65"	38.50"	3:1	7' – 10"	= 15°	No	= 15°	No
				4:1	10' – 1"	> 15°	Yes	> 15°	Yes
				6:1	14' – 8"				
36"	4"	2.75"	45.50"	3:1	9' – 5"	= 0°	No	≥ 0°	Yes
				4:1	12' – 3"	> 0°	Yes		
				6:1	17' – 11"				
42"	4 ½"	N/A	52.50"	3:1	11' – 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' – 5"				
				6:1	21' – 2"				



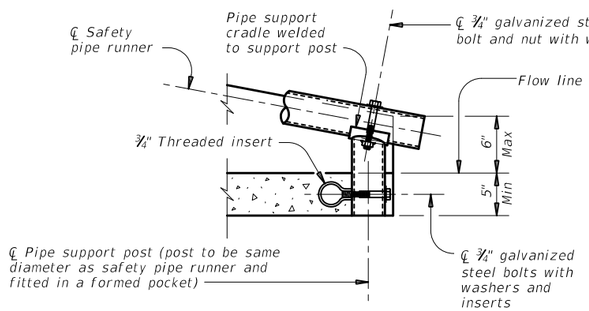
PLAN

(Showing bell end connection.)



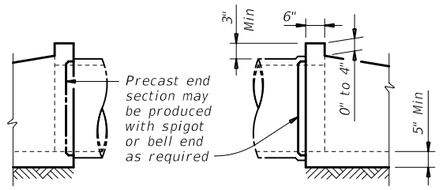
LONGITUDINAL ELEVATION

(Showing bell end connection.)



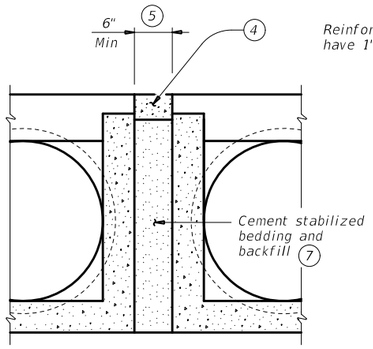
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

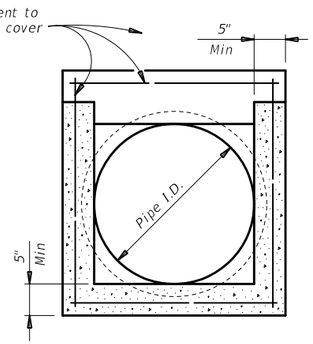


OPTIONAL JOINT FOR RCP

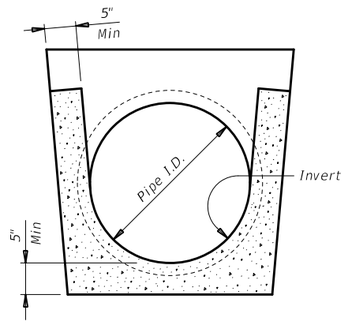
(Showing joint between RCP and precast safety end treatment)



MULTIPLE PIPE INSTALLATION

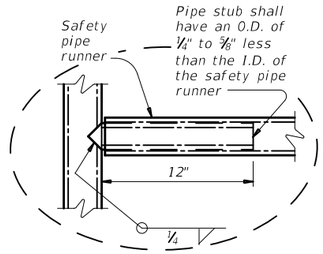


OPTION WITH SQUARE BOTTOM

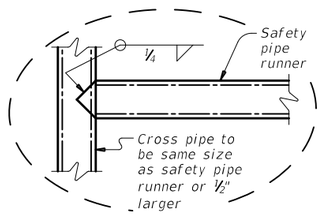


OPTION WITH INVERT BOTTOM

SECTION A-A



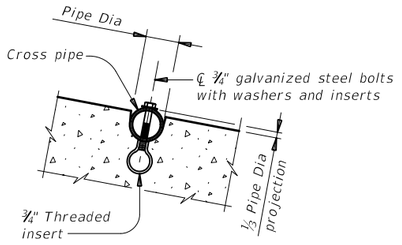
OPTION A



OPTION B

DETAIL A

(If required)



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

SAFETY PIPE RUNNER DIMENSIONS

Max Safety Pipe Runner Length	Required Pipe Runner Size: Pipe Size	Pipe O.D.	Pipe I.D.
11' – 2"	3" STD	3.500"	3.068"
15' – 6"	3 ½" STD	4.000"	3.548"
20' – 10"	4" STD	4.500"	4.026"
35' – 4"	5" STD	5.563"	5.047"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Measured along slope.

(7) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(8) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

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

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

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

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" – D12 x D12 or 5"x5" – D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor, the next larger size of safety end treatment may be furnished as long as the "D" dimension cast is that of the required size of pipe.

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

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

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

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See PBGC standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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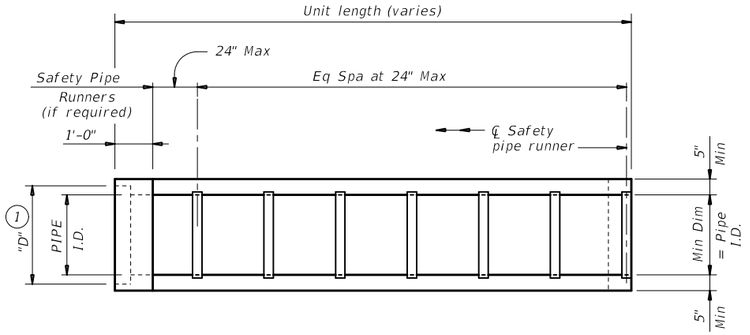
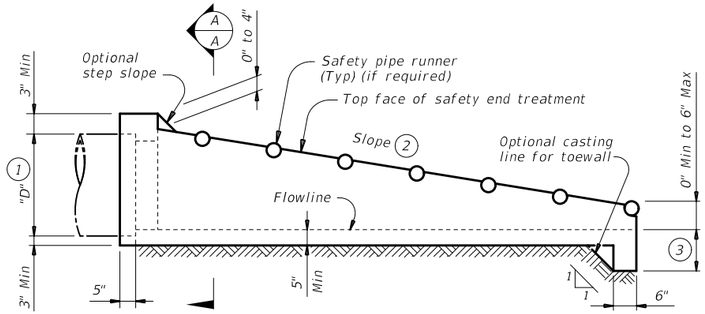


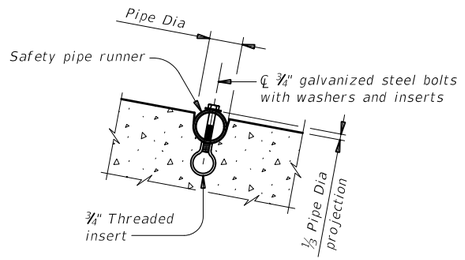
PLAN

(Showing bell end connection.)



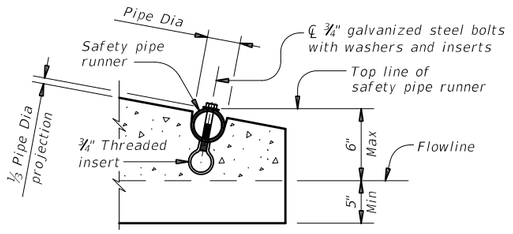
LONGITUDINAL ELEVATION

(Showing bell end connection.)

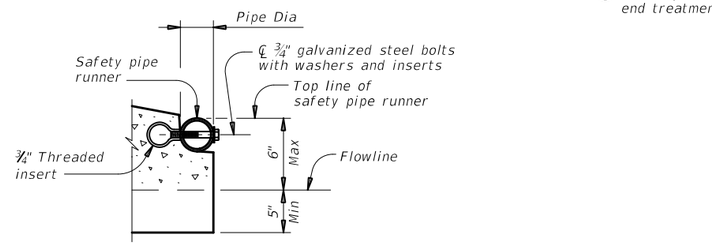


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



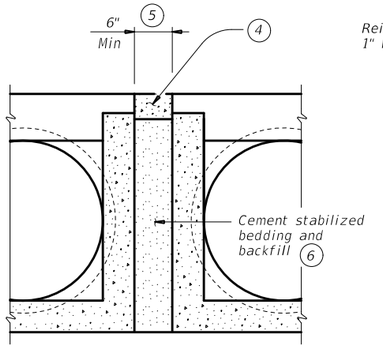
OPTION A



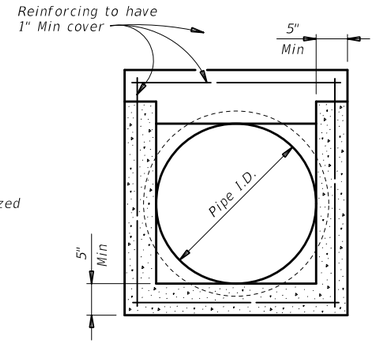
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

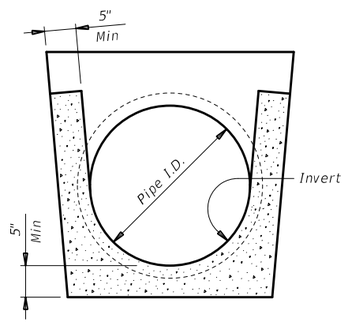
(If required)



MULTIPLE PIPE INSTALLATION

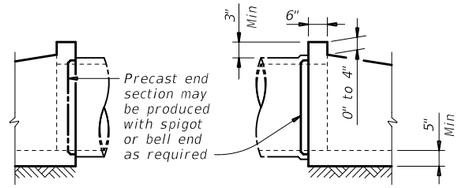


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment.)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (7)	"D" (1)	Slope	Min Length	Pipe Runners Required		Required Pipe Runner Size		
						Single Pipe	Multiple Pipe	Nominal Dia.	O.D.	I.D.
12"	2"	1.15"	17.00"	6:1	4' – 9"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
15"	2 ¼"	1.30"	20.50"	6:1	6' – 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	1.60"	24.00"	6:1	8' – 0"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31.00"	6:1	11' – 3"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
30"	3 ½"	2.65"	38.50"	6:1	14' – 8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17' – 11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	N/A	52.50"	6:1	21' – 2"	Yes	Yes	4" STD	4.500"	4.026"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(7) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

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

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

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

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" – D12 x D12 or 5"x5" – D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

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

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464, "Reinforced Concrete Pipe". Connect TP by grouting. See PBGC standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

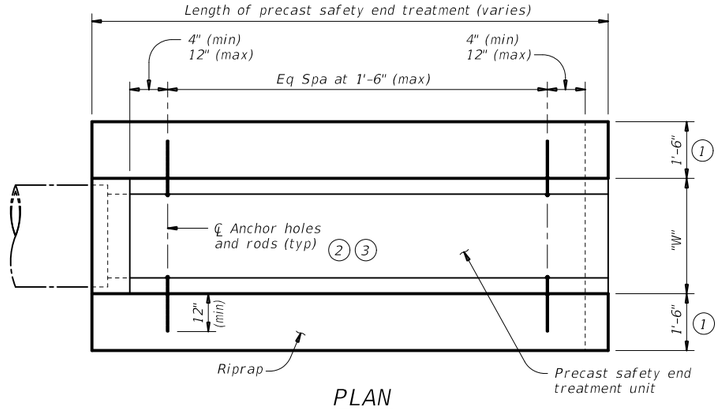
PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

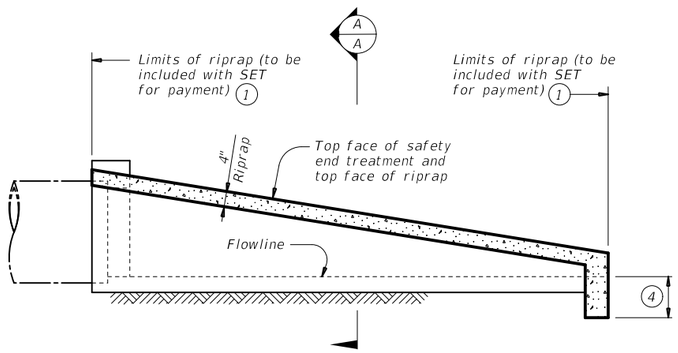
PSET-SP

FILE: psetspss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		153

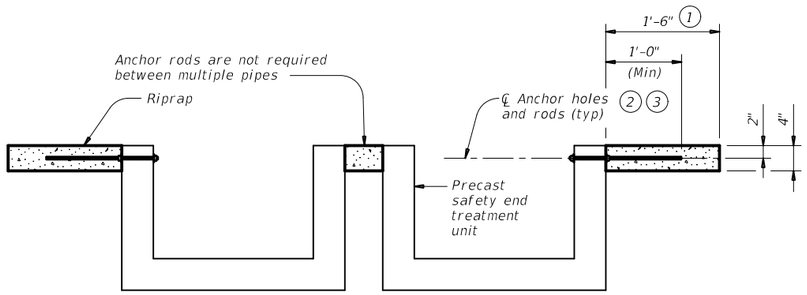
DATE: 9/20/2022 2:39:49 PM
FILE: L:\Waco District\FM 932_FM 2410\CADD\Sheets\07 Drainage Details\TxDOT Standards\19_PSET-RR.dgn



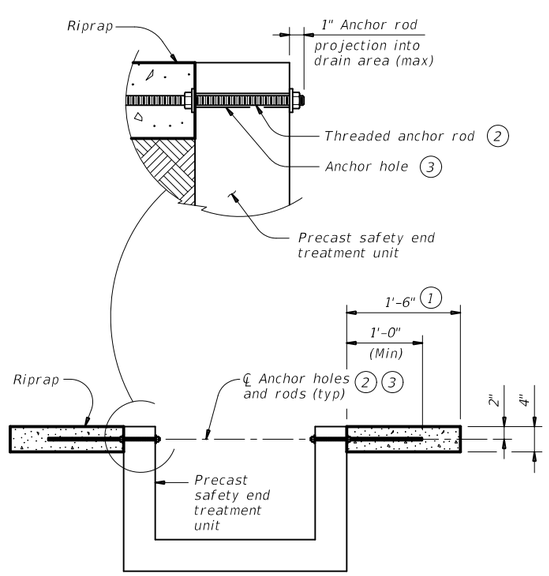
PLAN



LONGITUDINAL ELEVATION



MULTIPLE PIPE INSTALLATION



SINGLE PIPE INSTALLATION

SECTION A-A

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) 5

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

(1) Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap". When riprap is cast integrally with the precast safety end treatment, this dimension is 1'-0" minimum.

(2) 1#2" Dia ASTM A307 Gr A threaded anchor rod with 2 nuts and 2 washers. Galvanize all components in accordance with Item 445, "Galvanizing". Repair galvanizing that is damaged during transport or construction in accordance with the specifications.

(3) 3#4" through holes in walls of safety end treatment for riprap anchor rods may be drilled with rotary (coring or masonry) type drilling equipment or may be formed. Do not use percussive (star) type drilling equipment. If holes are drilled, patch spalls in the inside face of the wall exceeding 1#2" from the holes.

(4) Provide riprap toe wall when dimension is shown elsewhere in the plans or when field conditions require a toe wall.

(5) Quantities shown are for one end of one reinforced concrete pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only. Quantities are based on the minimum unit lengths shown on the Precast Saftey End Treatment (SET) standard sheets.

MATERIAL NOTES:

Provide Class "B" riprap in accordance with Item 432, "Riprap".

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

GENERAL NOTES:

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

Refer to PSET-SC or PSET-SP standard sheets for details of square safety end treatments not shown. Refer to PSET-RC or PSET-RP standard sheets for details of round safety end treatments not shown.

For precast units with integrally cast riprap, substitute reinforcing steel in the amount on 0.26 in./ft. minimum for the threaded anchor rods shown. When requested, submit sealed engineering drawings for approval prior to construction. Shop drawings will not be required. Note that a proprietary precast unit with integral riprap is available from L&R Precast Concrete Works, Inc. (956) 583-6293 or www.lrprecast.com.

Payment for riprap and toewalls is included in the price bid for each safety end treatment.

These riprap details are only applicable when notes that require placement of riprap with precast safety end treatments are shown elsewhere in the plans.

Precast units with integrally cast riprap are permitted unless noted otherwise on the plans.

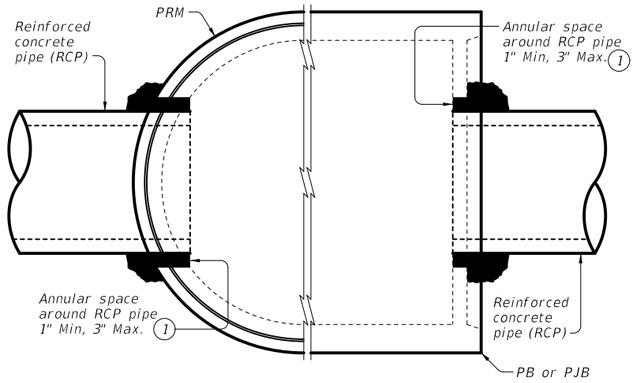
Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT
TYPE II
RIPRAP DETAILS

PSET-RR

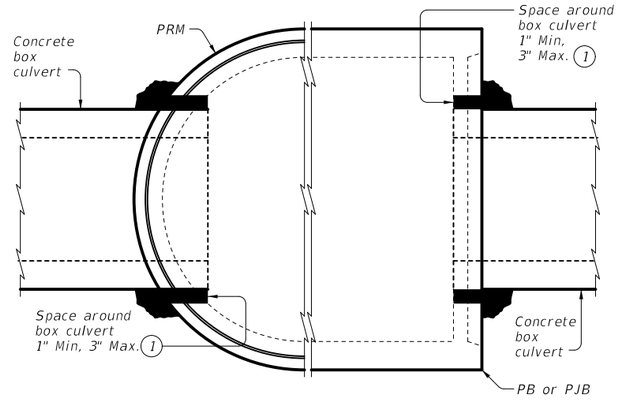
FILE: psetrrse-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		154



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

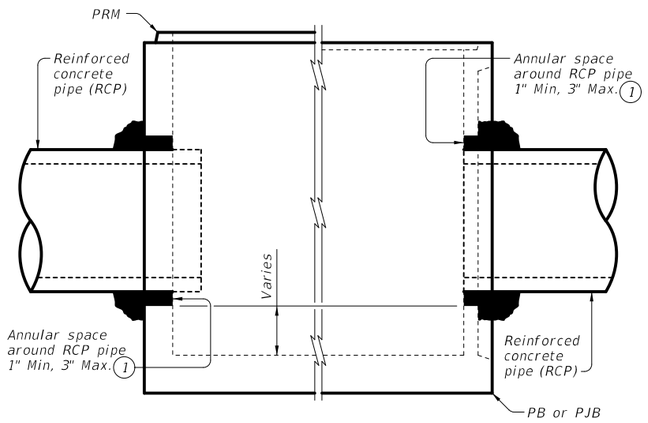
TYPICAL HALF PLAN



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

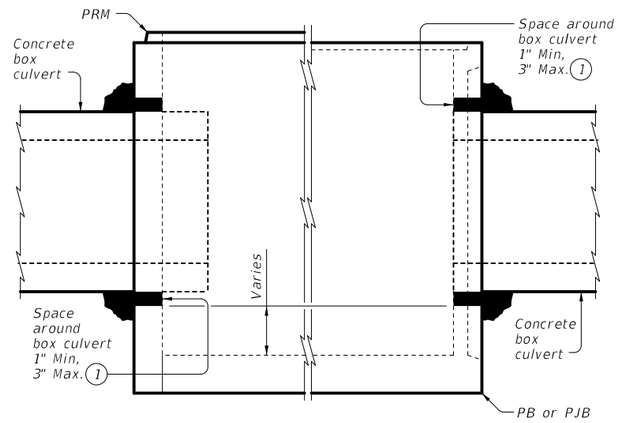
TYPICAL HALF PLAN



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

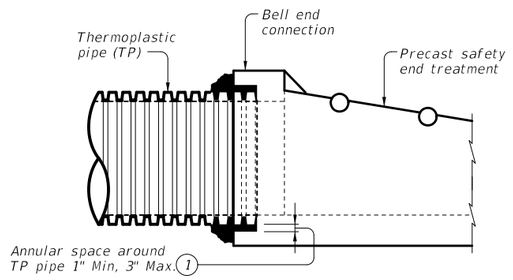
TYPICAL HALF ELEVATION



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF ELEVATION



TYPICAL PARTIAL ELEVATION OF PRECAST SAFETY END TREATMENTS

Showing square PSET for parallel drainage, cross drainage shown similar.

(1) Completely fill the void between the precast structure and the connecting pipe or box with cementitious grouts and mortars in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application".

CONSTRUCTION NOTES:

Do not grout rubber gasket joints without Manufacturer's recommendations.

Do not use bricks, masonry blocks, native stone, or similar materials in conjunction with grouted connections when filling void spaces around pipes or box culverts.

MATERIAL NOTES:

Provide grouted connections in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application".

GENERAL NOTES:

See applicable standards for notes and details not shown:

- Precast Base (PB)
- Precast Junction Box (PJB)
- Precast Round Manhole (PRM)
- Precast Safety End Treatments C/D Square (PSET-SC)
- Precast Safety End Treatments P/D Square (PSET-SP)

Provide Concrete Box Culverts in accordance with Item 462 "Concrete Box Culverts and Drains".

Provide Reinforced Concrete Pipe (RCP) in accordance with Item 464 "Reinforced Concrete Pipe".

Provide Thermoplastic Pipe (TP) in accordance with Special Specification Thermoplastic Pipe.

Payment for grouted connections is considered subsidiary to other bid Items.

Texas Department of Transportation

Bridge Division Standard

PIPE AND BOX GROUTED CONNECTIONS FOR PRECAST STRUCTURES

PBGC

FILE: pbgcstd1-20.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		154A

DATE: 01/04/2023 2:55:49 PM
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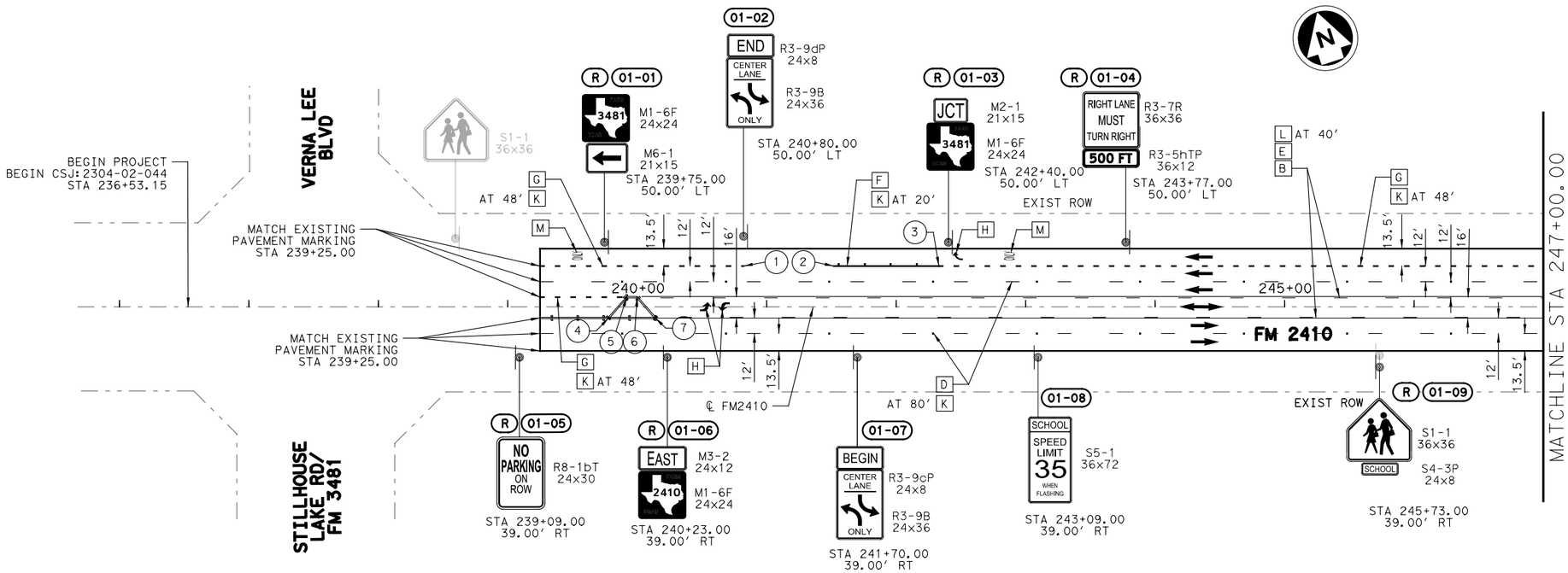
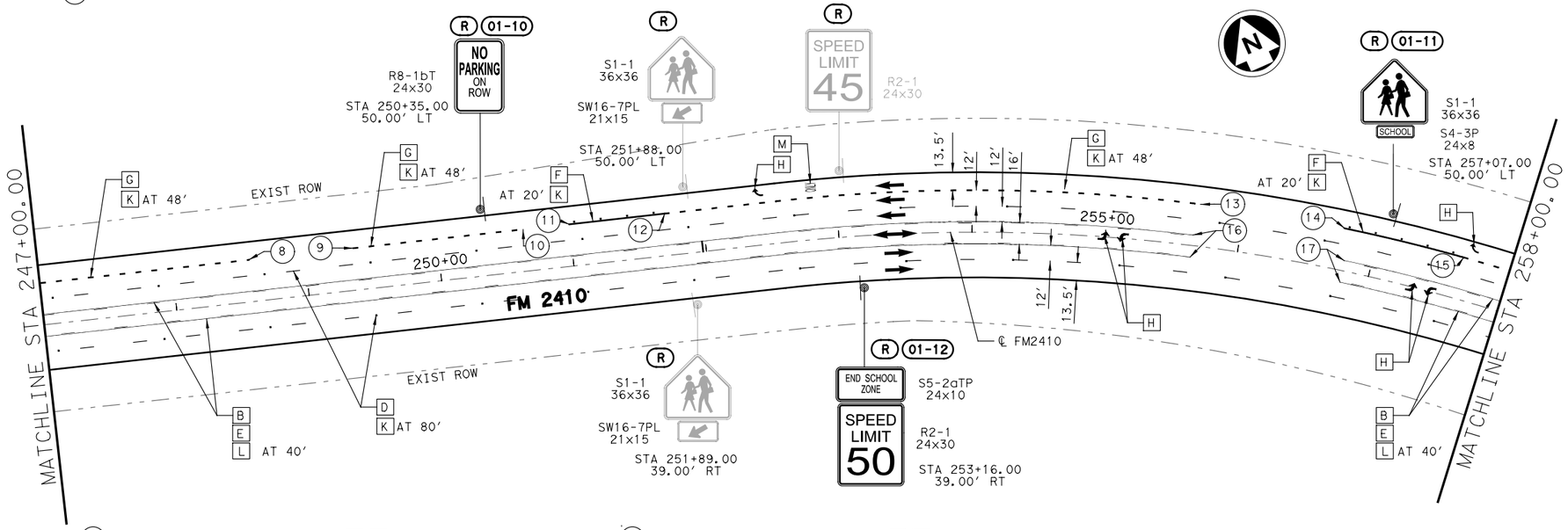


1. STA 240+82.00, 31.50' LT; END G K
2. STA 241+52.00, 31.50' LT; BEGIN F K AT 20'
3. STA 242+33.00, 31.50' LT; END F K AT 20'; BEGIN G K AT 48'
4. STA 239+78.00, 8.50' RT; PI
5. STA 239+92.00, 7.50' LT; PI
6. STA 240+00.00, 7.50' LT; PI; END B x2, L AT 20'; BEGIN B E L AT 40'
7. STA 240+14.00, 8.50' RT; PI; END B x2, L AT 20'; BEGIN B E L AT 40'



8. STA 248+58.00, 31.50' LT; END G K
9. STA 249+37.00, 31.50' LT; BEGIN G K AT 48'
10. STA 250+65.00, 31.50' LT; END G K
11. STA 251+00.00, 31.50' LT; BEGIN F K AT 20'
12. STA 251+72.00, 31.50' LT; END F K AT 20'; BEGIN G K AT 48'
13. STA 255+68.00, 31.50' LT; END G K
14. STA 256+75.00, 31.50' LT; BEGIN F K AT 20'
15. STA 257+65.00, 31.50' LT; END F K AT 20'; BEGIN G K AT 48'
16. STA 255+65.00, 7.50' LT & 8.50' RT; END B E L
17. STA 256+80.00, 7.50' LT & 8.50' RT; BEGIN B E L AT 40'

DISCLAIMER:

BASE TOPO INFORMATION HAS NOT BEEN SURVEYED AND IS BASED ON SATELLITE IMAGERY FROM BEGIN PROJECT TO STA 258+33.00. BASE TOPO IS APPROXIMATE. CONTRACTOR TO FIELD VERIFY PROPOSED SIGN LOCATIONS AND APPROVED BY THE ENGINEER WITHIN THIS LIMIT.

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	3636
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	955
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	844
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	243
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	354
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	9
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	95
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	99
M	0668-6085	PREFAB TY C (W)(WORD)	EA	3
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

1. EXISTING SIGNS ARE TO BE REMOVED AND REPLACED UNLESS NOTED OTHERWISE.
2. ALL STATION AND OFFSETS ARE REFERENCED FROM ℄ FM2410 UNLESS NOTED OTHERWISE.
3. EXISTING STREET NAME SIGNS SHALL BE SALVAGED FOR RE-USE ON NEW POST. ALL WORK SHALL BE SUBSIDIARY TO ITEM 644.

STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SIGNING AND STRIPING LAYOUT

BEGIN PROJECT TO STA 258+00.00

(SHEET 1 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	155
GRAPHICS	CONTROL	SECTION	JOB	
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GRPH CHECK				
JMP				

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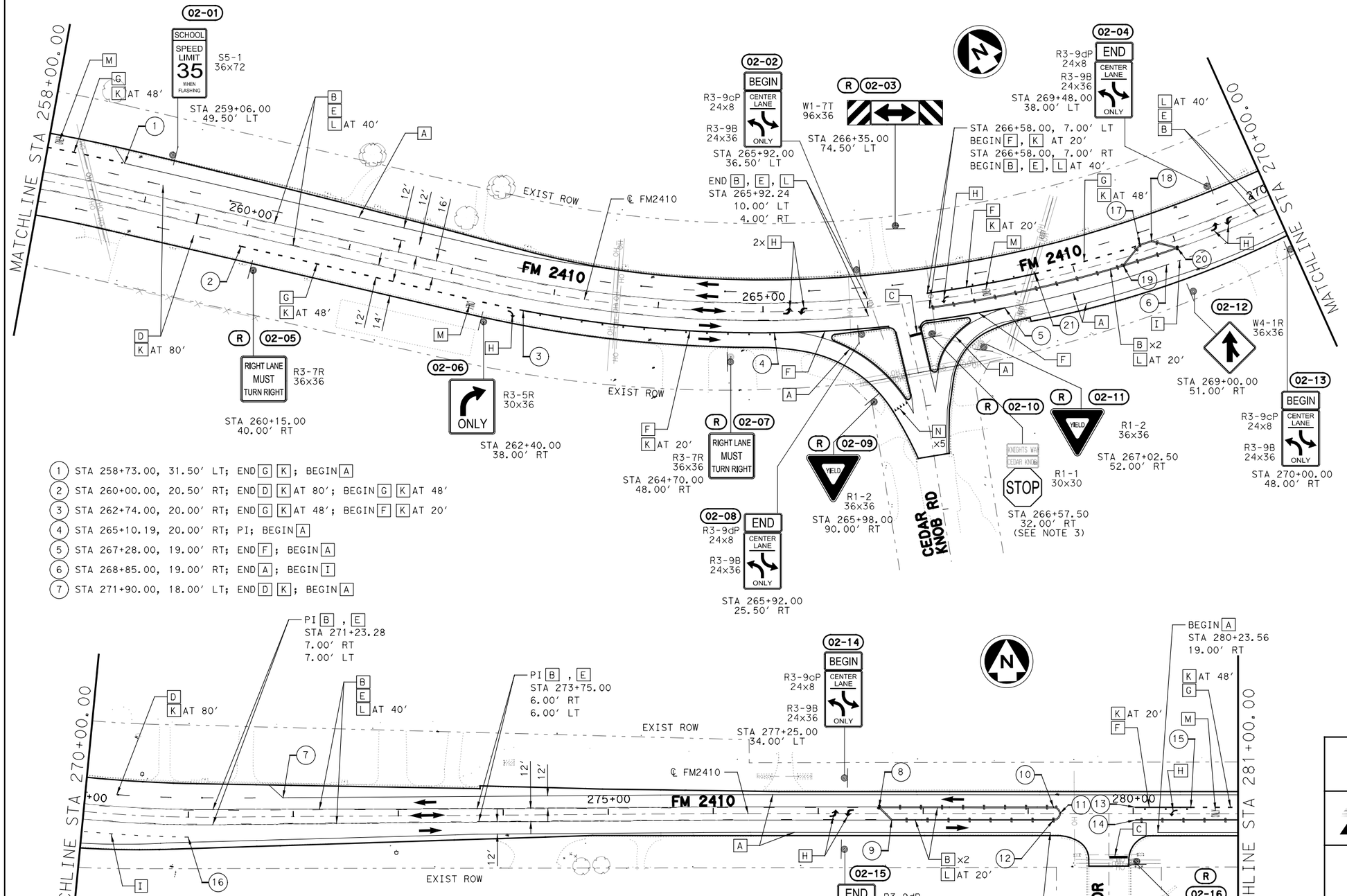

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	3346
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	4852
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	28
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	336
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	834
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	594
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	125
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	9
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	55
K	0672-6007	REFL PAV MRKR TY I-C	EA	55
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	162
M	0668-6085	PREFAB TY C (W)(WORD)	EA	4
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	5

NOTES:

1. EXISTING SIGNS ARE TO BE REMOVED AND REPLACED UNLESS NOTED OTHERWISE.
2. ALL STATION AND OFFSETS ARE REFERENCED FROM ℄ FM2410 UNLESS NOTED OTHERWISE.
3. EXISTING STREET NAME SIGNS SHALL BE SALVAGED FOR RE-USE ON NEW POST. ALL WORK SHALL BE SUBSIDIARY TO ITEM 644.

(1) STA 258+73.00, 31.50' LT; END G K; BEGIN A
(2) STA 260+00.00, 20.50' RT; END D K AT 80'; BEGIN G K AT 48'
(3) STA 262+74.00, 20.00' RT; END G K AT 48'; BEGIN F K AT 20'
(4) STA 265+10.19, 20.00' RT; PI; BEGIN A
(5) STA 267+28.00, 19.00' RT; END F; BEGIN A
(6) STA 268+85.00, 19.00' RT; END A; BEGIN I
(7) STA 271+90.00, 18.00' LT; END D K; BEGIN A

(8) STA 277+58.00, 6.00' LT; END B E L AT 40'; BEGIN B x2 L AT 20'
(9) STA 277+70.00, 6.00' RT; END B E L AT 40'; BEGIN B x2 L AT 20'
(10) STA 279+24.22, 6.00' LT; PI
(11) STA 279+30.22, 0.00'; R=6'
(12) STA 279+24.22, 6.00' RT; PI
(13) STA 280+02.40, 6.00' LT; BEGIN F K AT 20'
(14) STA 280+02.40, 6.00' RT; BEGIN B x2 L AT 20'
(15) STA 280+55.00, 6.00' LT; END F K AT 20'; BEGIN G K AT 48'

(16) STA 271+00.00, 19.00' RT; END I
(17) STA 268+67.16, 7.00' LT; END G K AT 48'; BEGIN B x2 L AT 20'
(18) STA 268+78.82, 7.00' LT; END B x2 L AT 20'; BEGIN B E L AT 40'
(19) STA 268+46.00, 7.00' RT
(20) STA 269+00.00, 7.00' RT; END B x2 L AT 20'; BEGIN B E L AT 40'
(21) STA 267+63.00, 7.00' LT; END F K AT 20'; BEGIN G K AT 48'

STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation
© 2023

FM 2410

SIGNING AND STRIPING LAYOUT

STA 258+00.00 TO STA 281+00.00

(SHEET 2 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	156
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

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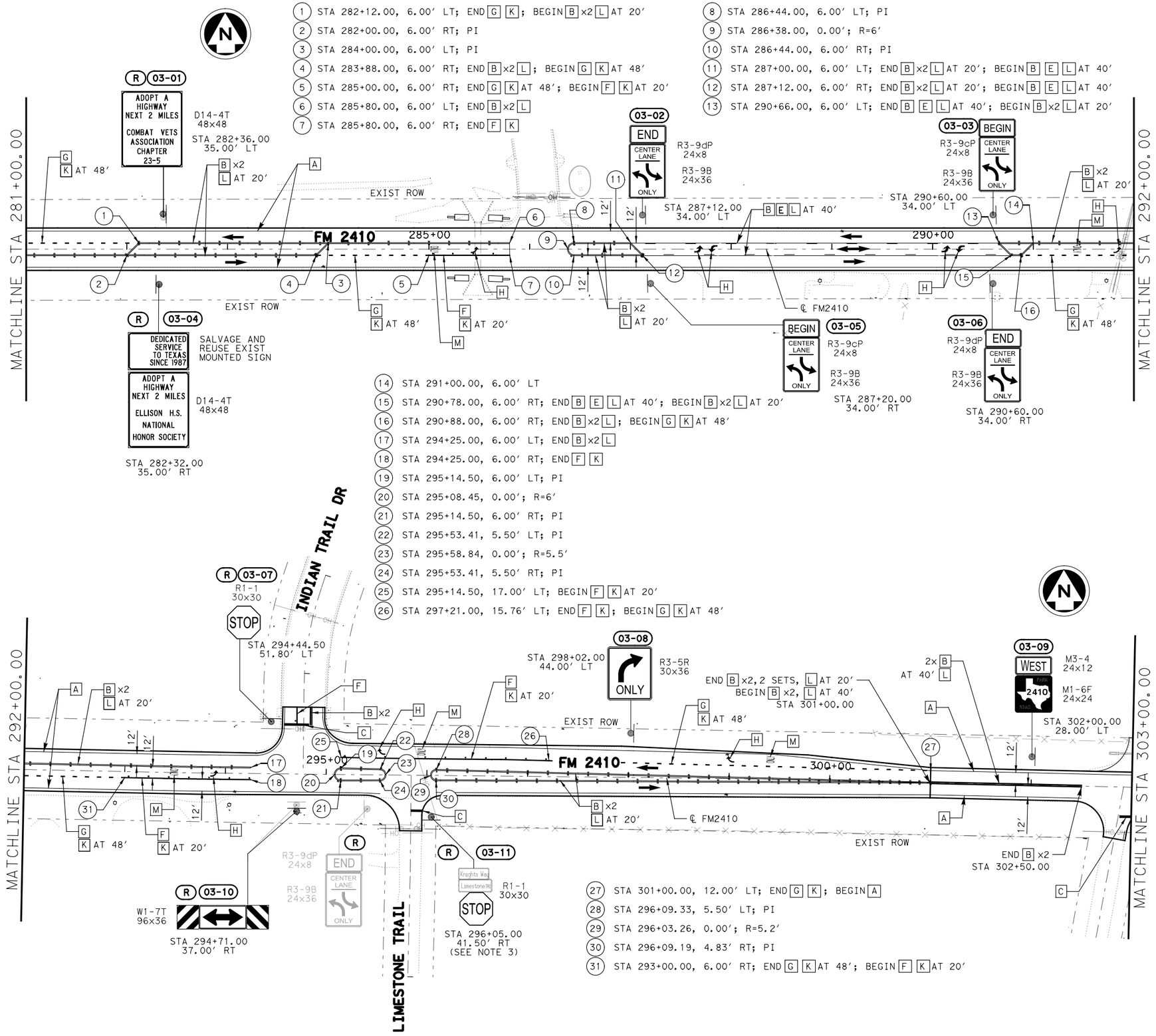
DATE: 1/4/2023 4:38:59 PM



50 25 0 50 100

HORIZONTAL SCALE: 1" = 100′

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	4
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4284
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	5794
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	46
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	184
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	411
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	204
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	9
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	41
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	266
M	0668-6085	PREFAB TY C (W)(WORD)	EA	5
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

1. EXISTING SIGNS ARE TO BE REMOVED AND REPLACED UNLESS NOTED OTHERWISE.
2. ALL STATION AND OFFSETS ARE REFERENCED FROM ℄ FM2410 UNLESS NOTED OTHERWISE.
3. EXISTING STREET NAME SIGNS SHALL BE SALVAGED FOR RE-USE ON NEW POST. ALL WORK SHALL BE SUBSIDIARY TO ITEM 644.

STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SIGNING AND STRIPING LAYOUT

STA 281+00.00 TO STA 303+00.00

(SHEET 3 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	157
RS	2304	02	044	
GRPH CHECK				
JMP				

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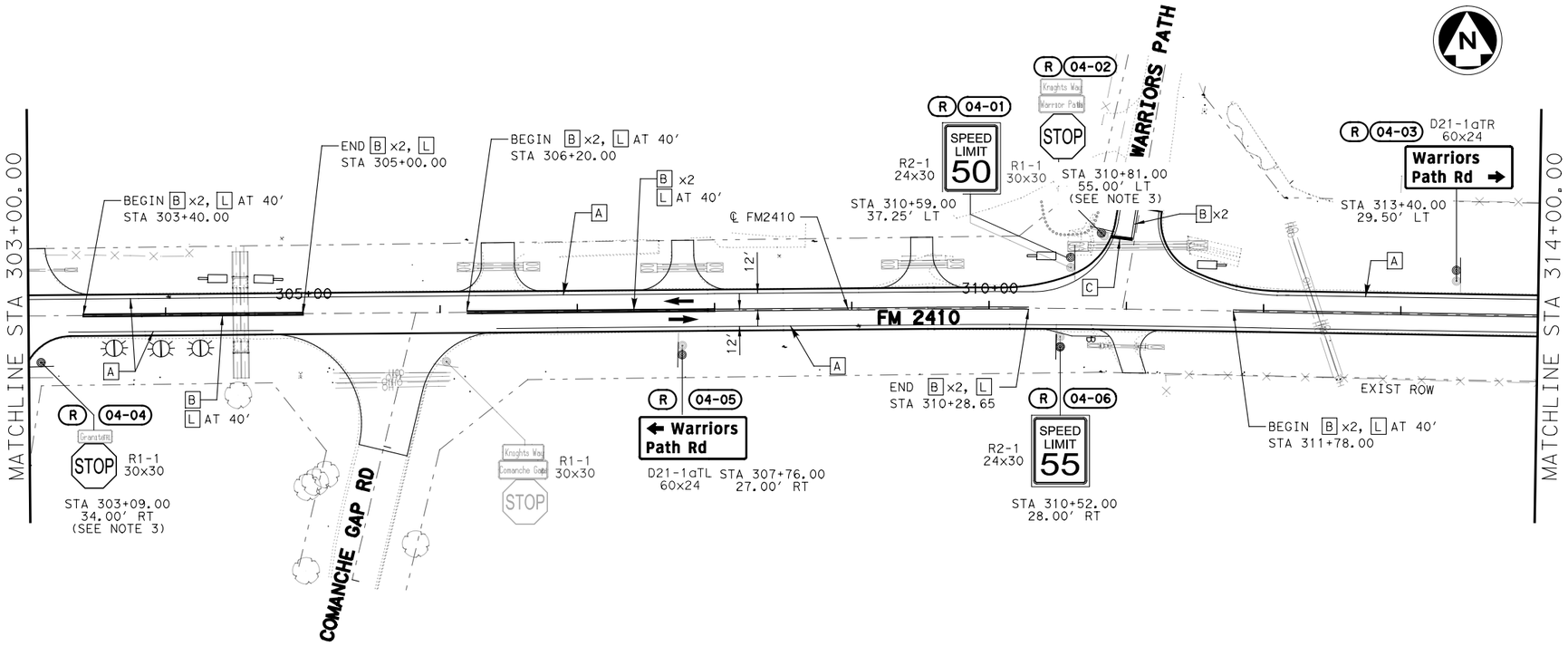

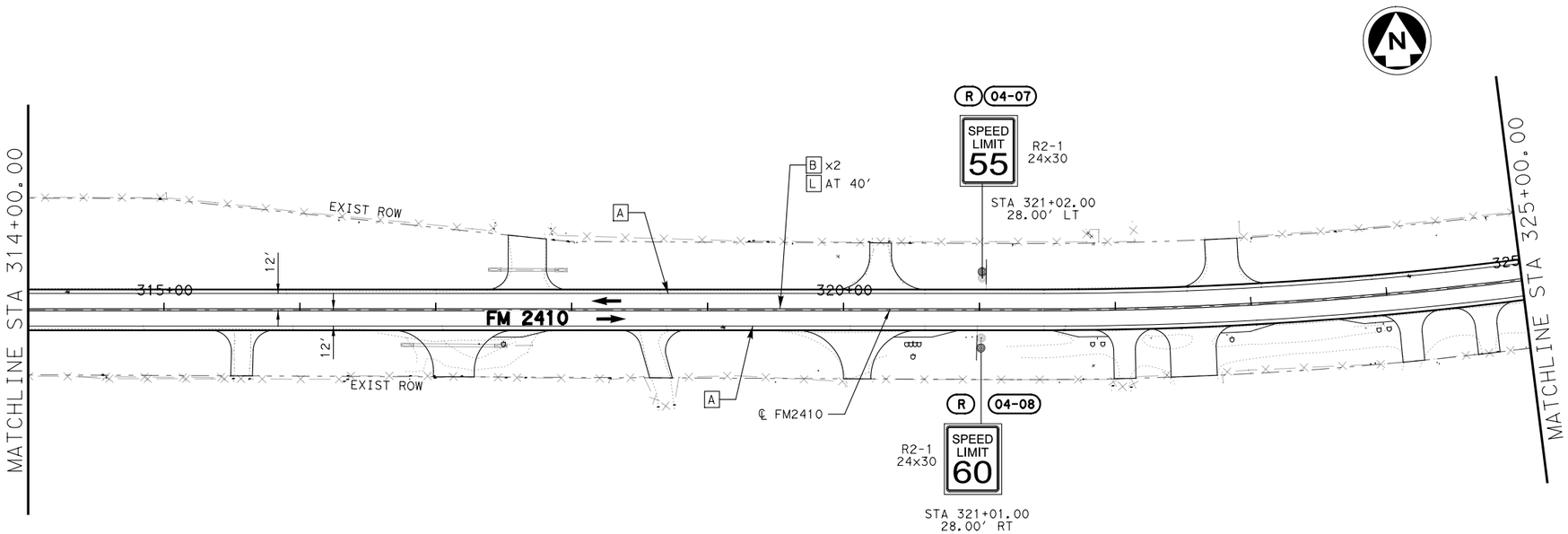

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	3
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	4
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4252
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	3830
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	15
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	49
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

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Texas Department of Transportation

FM 2410

SIGNING AND STRIPING LAYOUT

STA 303+00.00 TO STA 325+00.00

(SHEET 4 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	158
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

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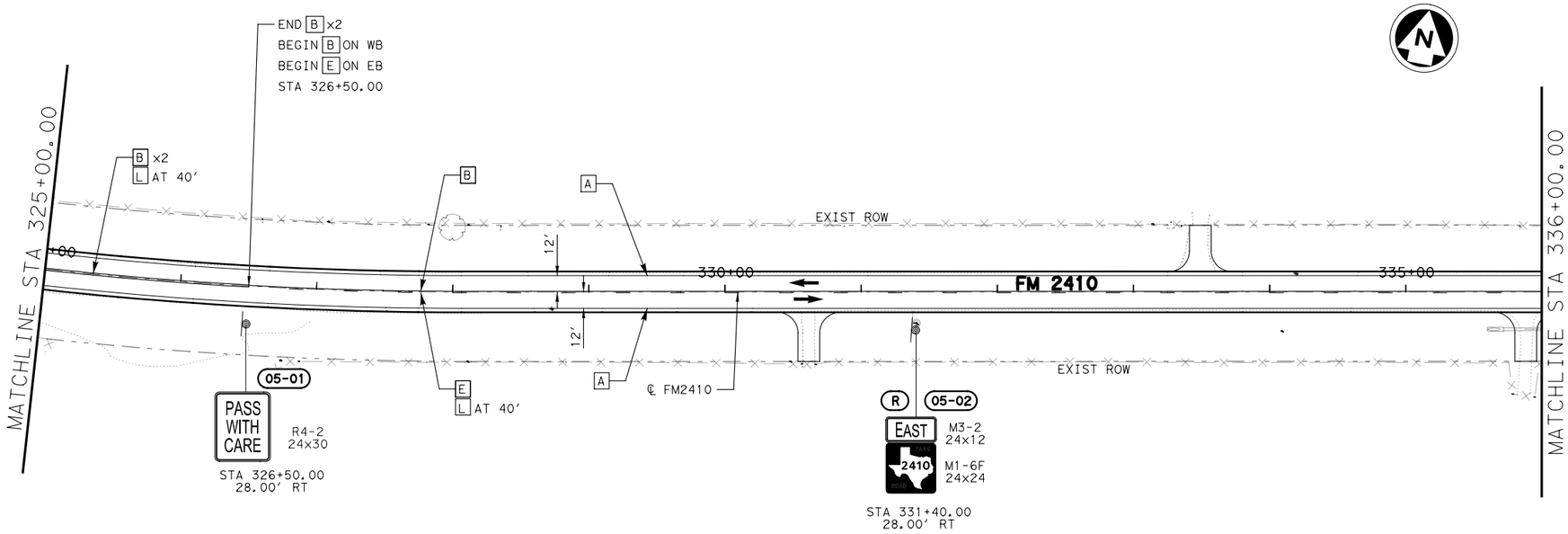

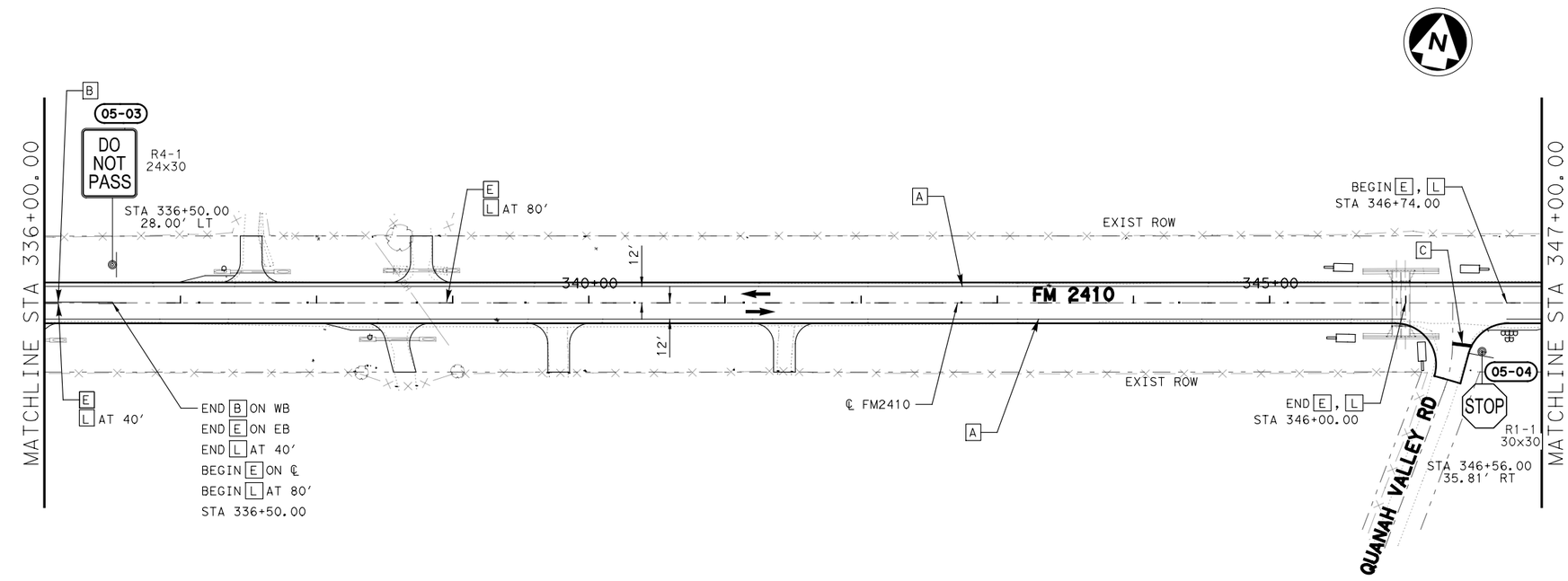

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	4
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4326
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	1300
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	14
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	495
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	42
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

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FM 2410

SIGNING AND STRIPING LAYOUT

STA 325+00.00 TO STA 347+00.00

(SHEET 5 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	159
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

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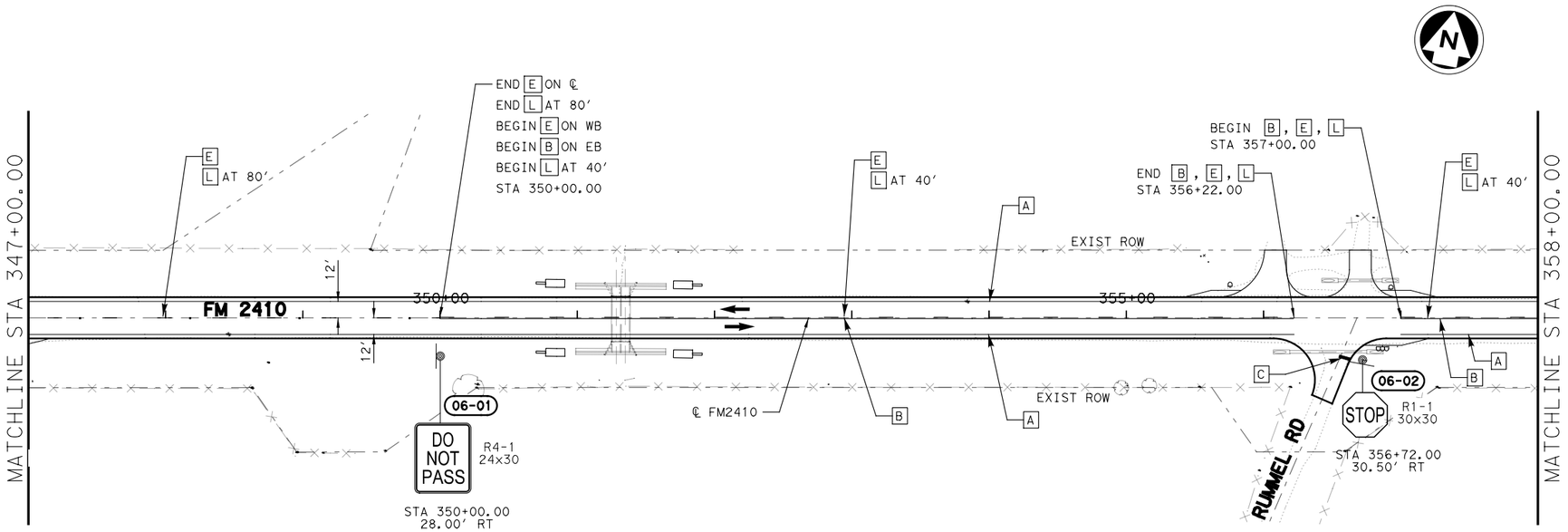

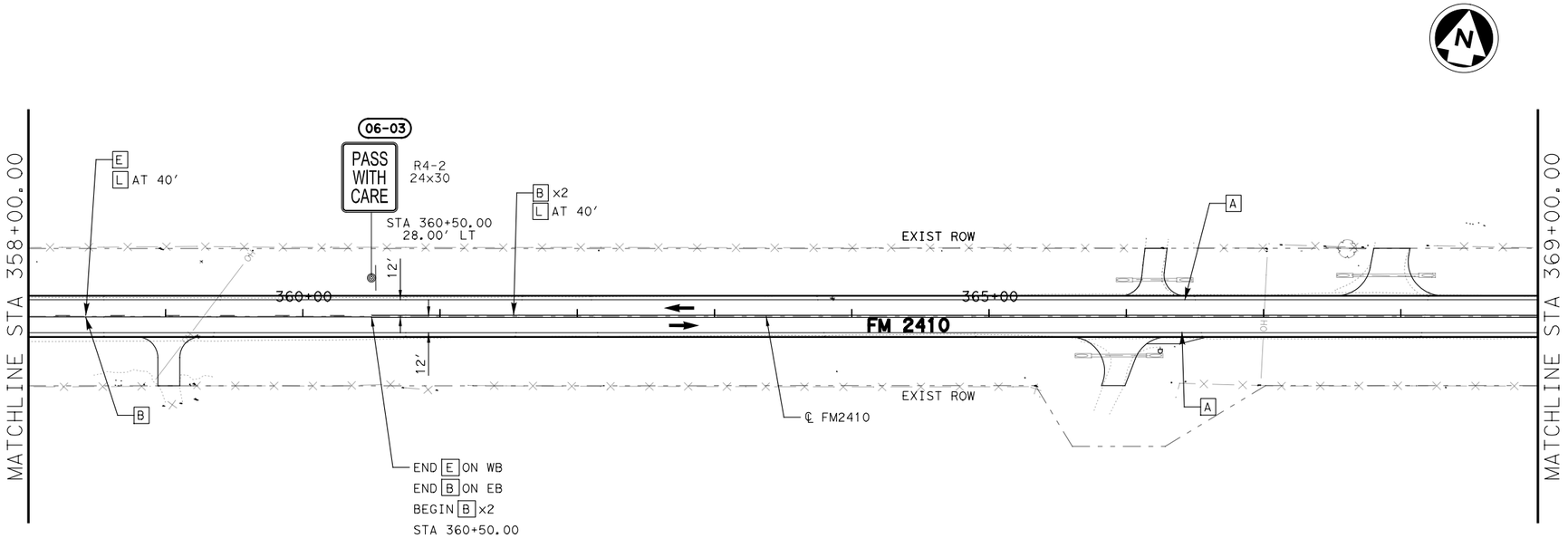

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	4
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4322
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	2672
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	12
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	319
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	51
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

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FM 2410

SIGNING AND STRIPING LAYOUT

STA 347+00.00 TO STA 369+00.00

(SHEET 6 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	160
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

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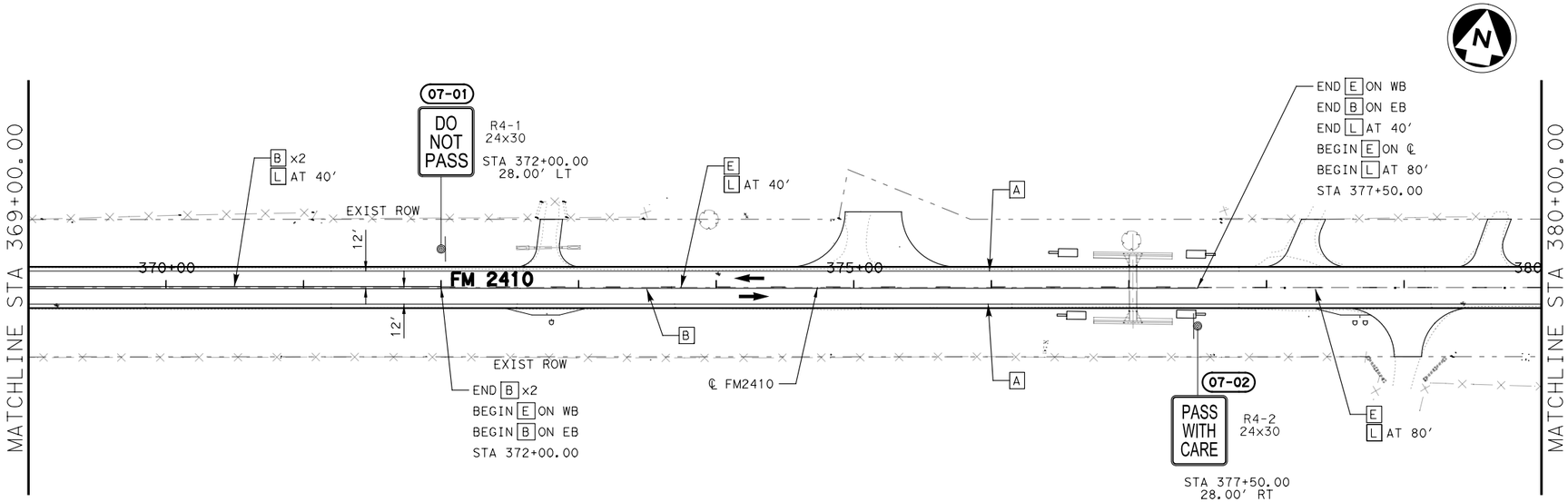

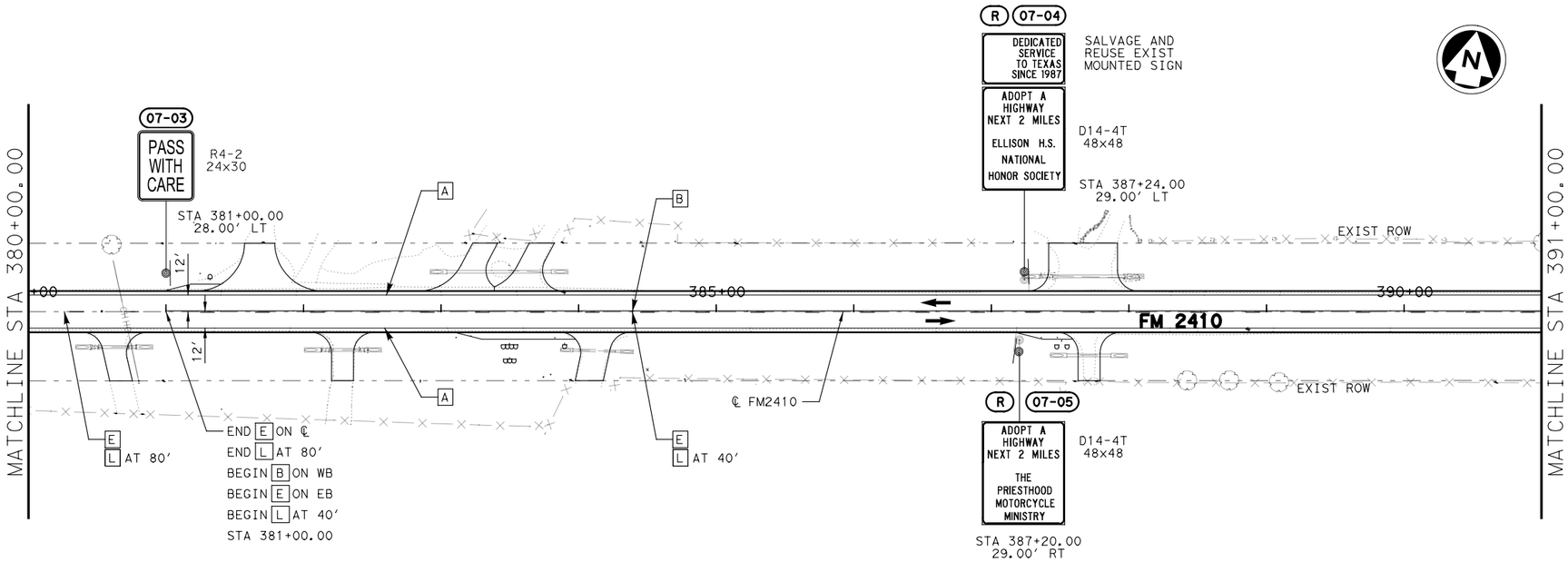

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	4
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4400
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	2150
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	476
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	52
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

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Texas Department of Transportation

FM 2410

SIGNING AND STRIPING LAYOUT

STA 369+00.00 TO STA 391+00.00

(SHEET 7 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	161
GRAPHICS RS	CONTROL	SECTION	JOB	
GRPH CHECK	2304	02	044	
JMP				

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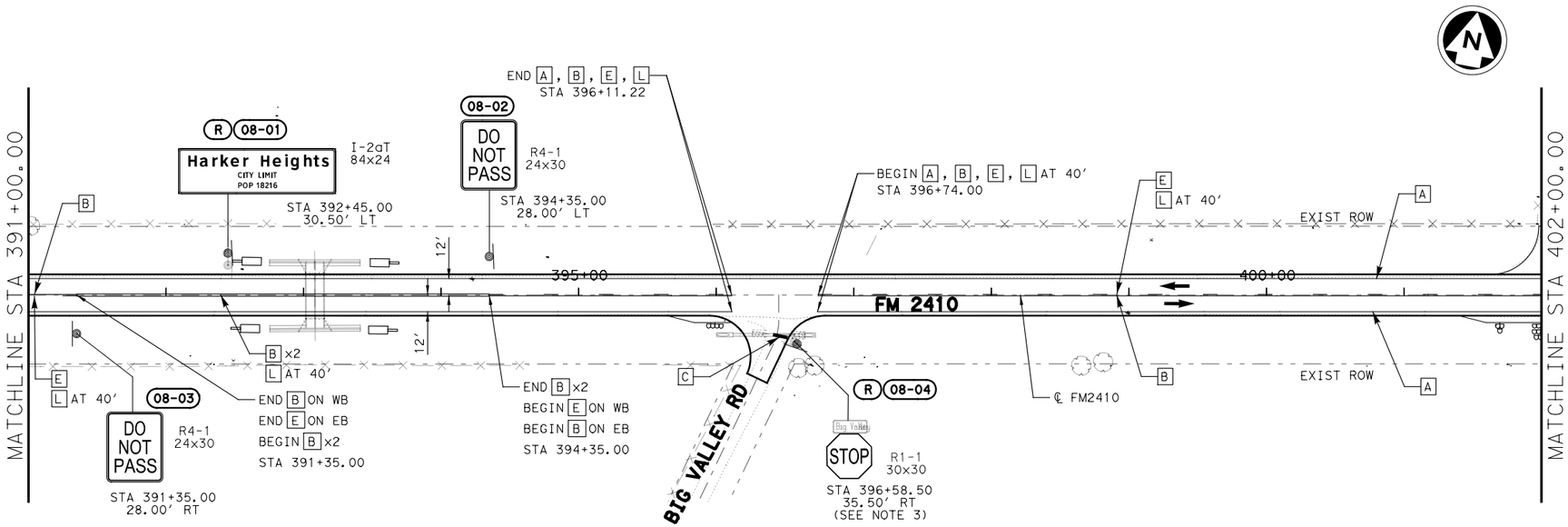

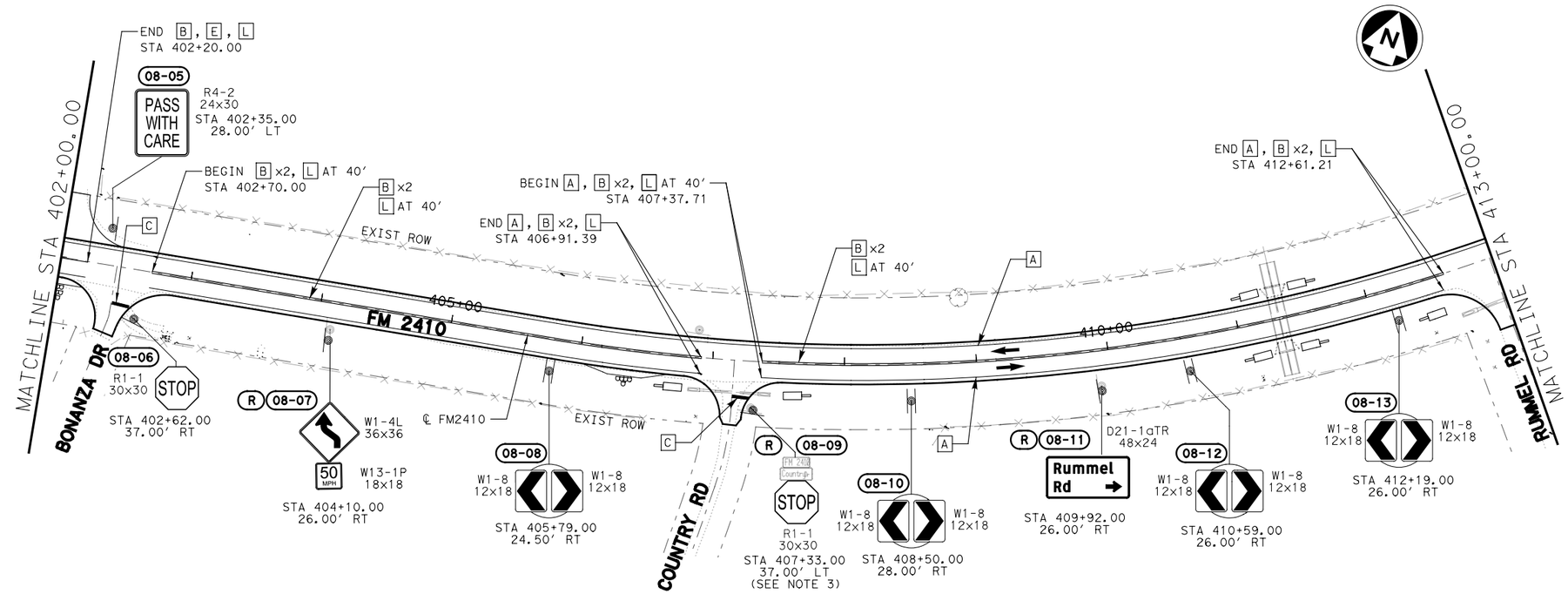

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	11
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4203
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	3245
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	36
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	190
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	53
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

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FM 2410

SIGNING AND STRIPING LAYOUT

STA 391+00.00 TO STA 413+00.00

(SHEET 8 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	162
GRAPHICS RS	CONTROL	SECTION	JOB	
GRPH CHECK	2304	02	044	
JMP				

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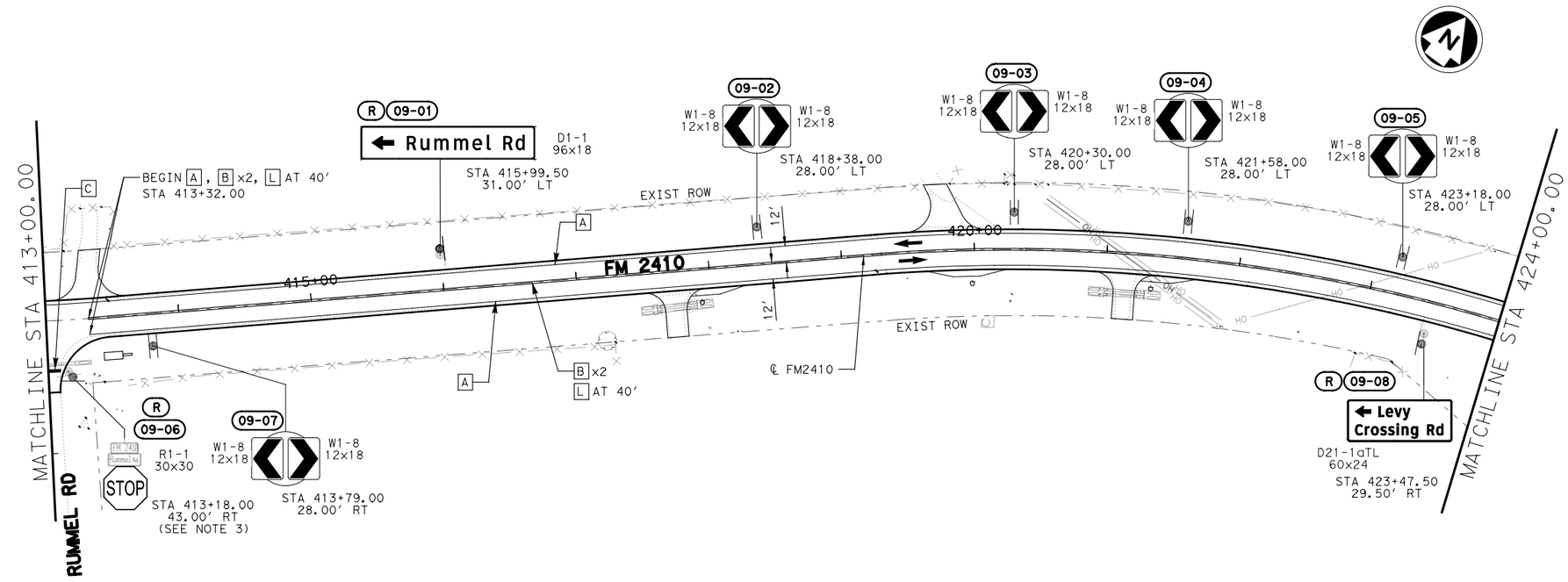

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	1
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4222
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	4072
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	34
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	52
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

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Texas Department of Transportation

FM 2410

SIGNING AND STRIPING LAYOUT

STA 413+00.00 TO STA 435+00.00

(SHEET 9 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	163
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

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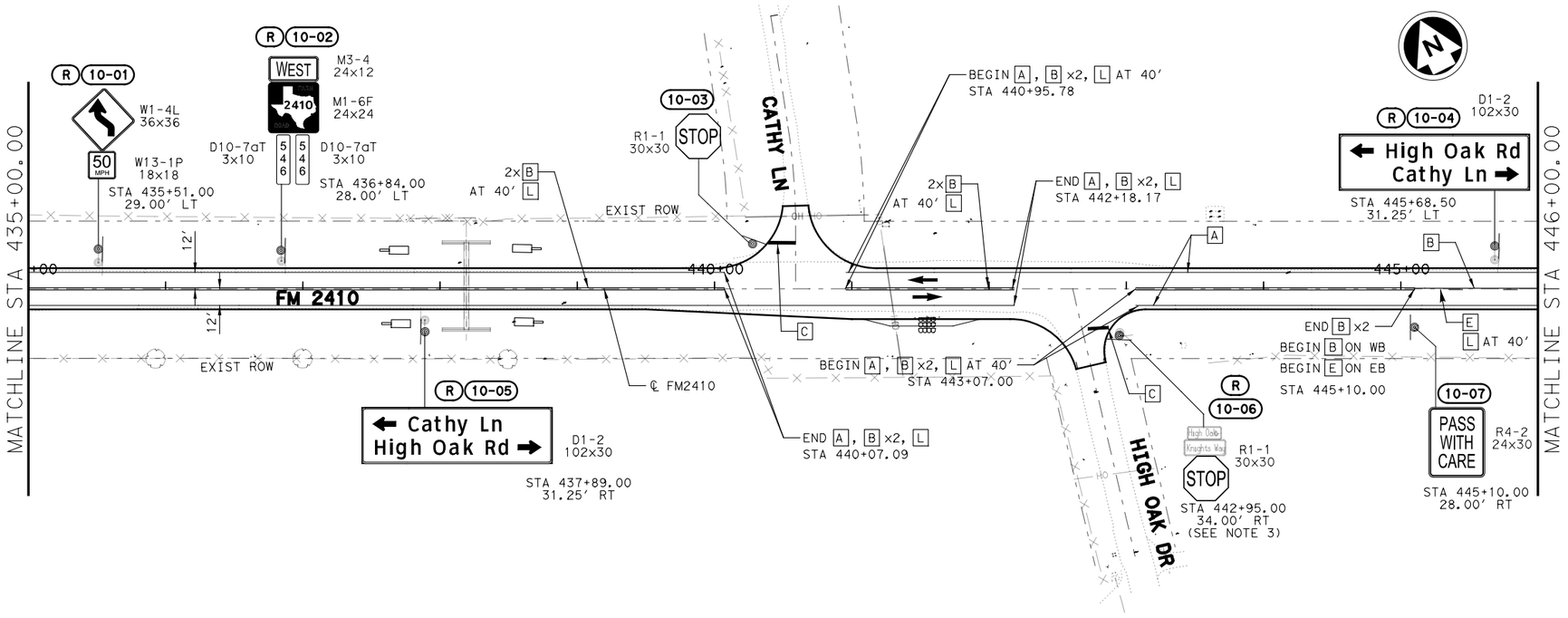

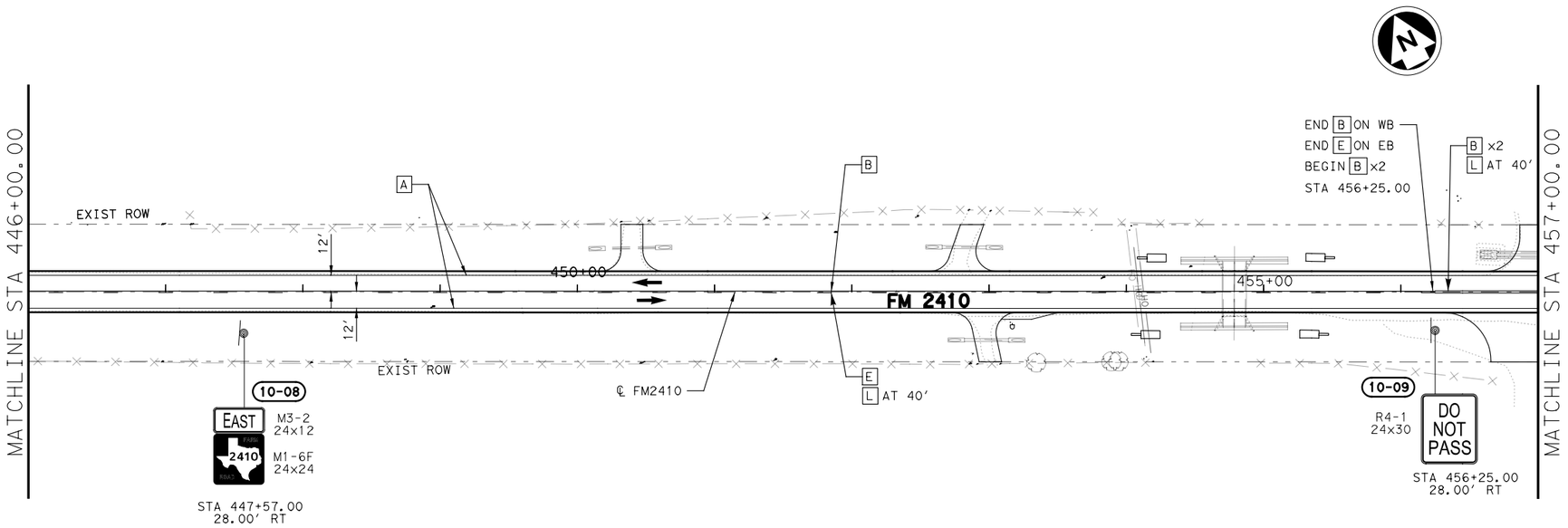

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
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- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	8
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4222
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	2929
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	24
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	279
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	56
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

1. EXISTING SIGNS ARE TO BE REMOVED AND REPLACED UNLESS NOTED OTHERWISE.
2. ALL STATION AND OFFSETS ARE REFERENCED FROM ℄ FM2410 UNLESS NOTED OTHERWISE.
3. EXISTING STREET NAME SIGNS SHALL BE SALVAGED FOR RE-USE ON NEW POST. ALL WORK SHALL BE SUBSIDIARY TO ITEM 644.

STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SIGNING AND STRIPING LAYOUT

STA 435+00.00 TO STA 457+00.00

(SHEET 10 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	164
GRAPHICS RS	CONTROL	SECTION	JOB	
GRPH CHECK	2304	02	044	
JMP				

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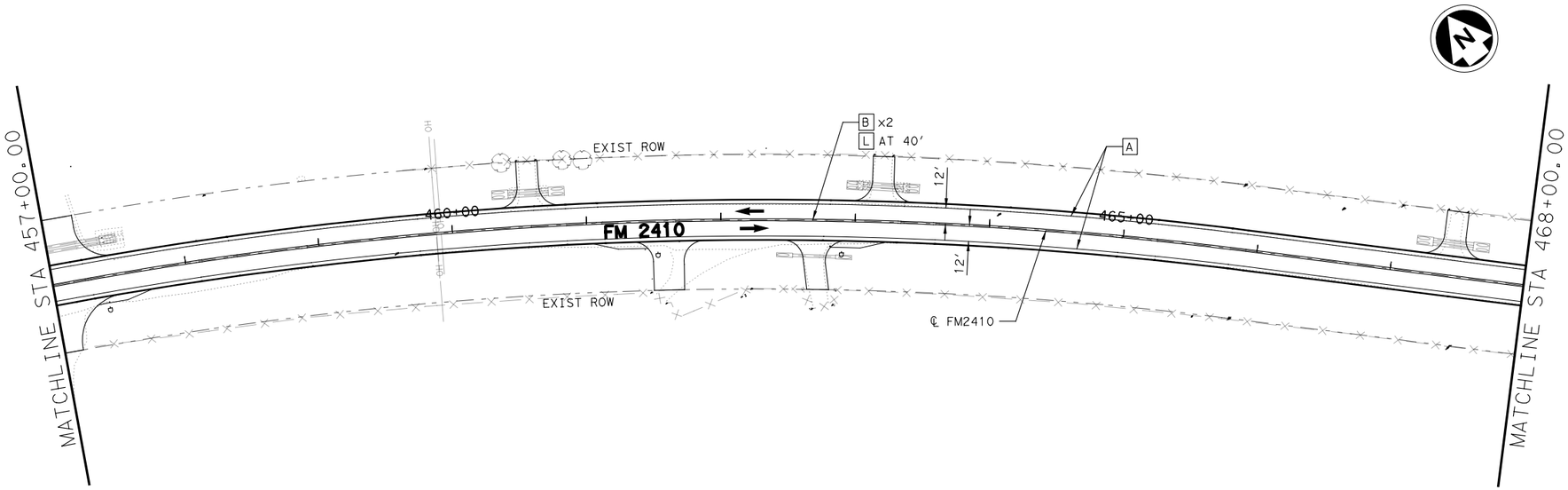

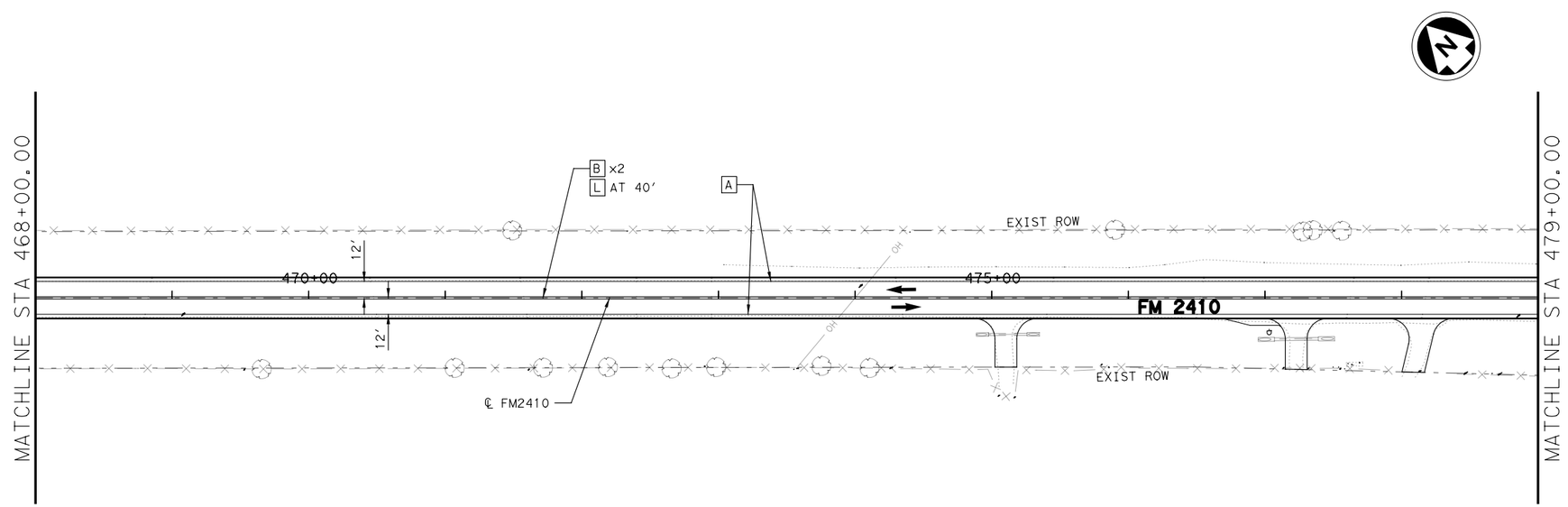

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100′

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4400
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	4400
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	55
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

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STATE OF TEXAS
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Texas Department of Transportation

FM 2410

SIGNING AND STRIPING LAYOUT

STA 457+00.00 TO STA 479+00.00

(SHEET 11 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	165
GRAPHICS RS	CONTROL	SECTION	JOB	
GRPH CHECK	2304	02	044	
JMP				

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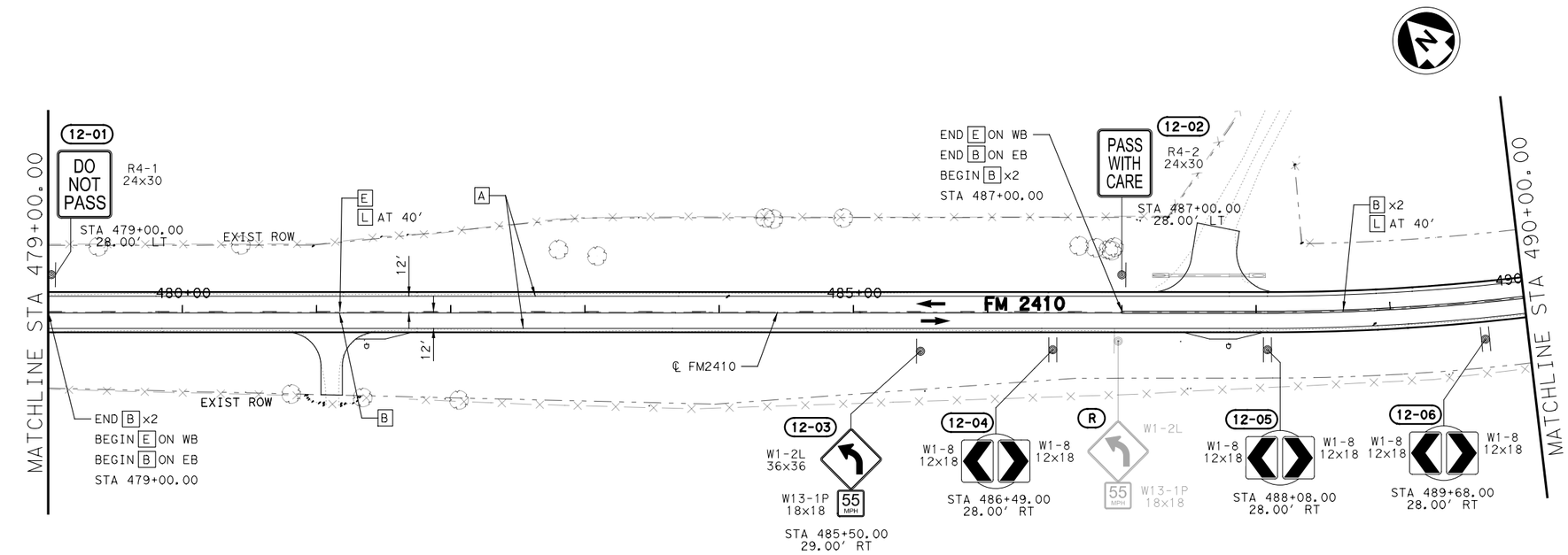

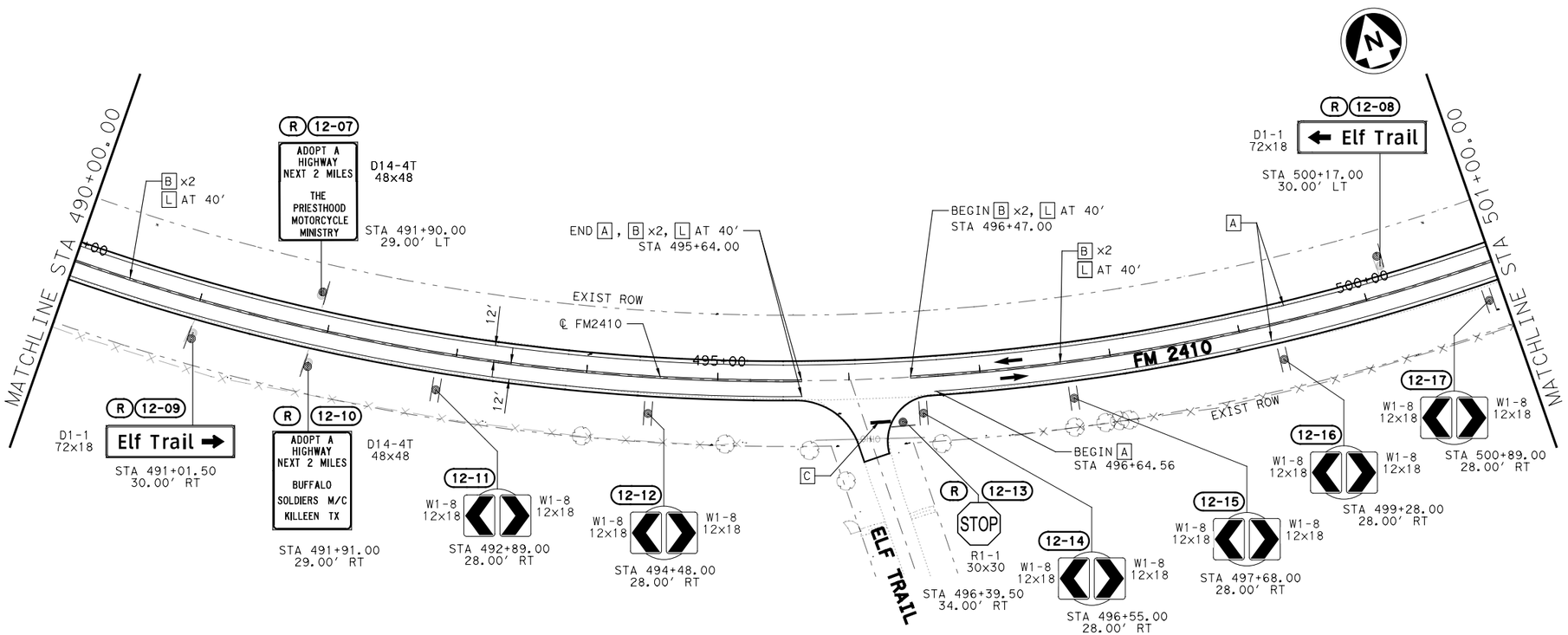

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4300
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	3434
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	12
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	200
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	54
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

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1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

FM 2410

SIGNING AND STRIPING LAYOUT

STA 479+00.00 TO STA 501+00.00

(SHEET 12 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	166
GRAPHICS RS	CONTROL	SECTION	JOB	
GRPH CHECK	2304	02	044	
JMP				

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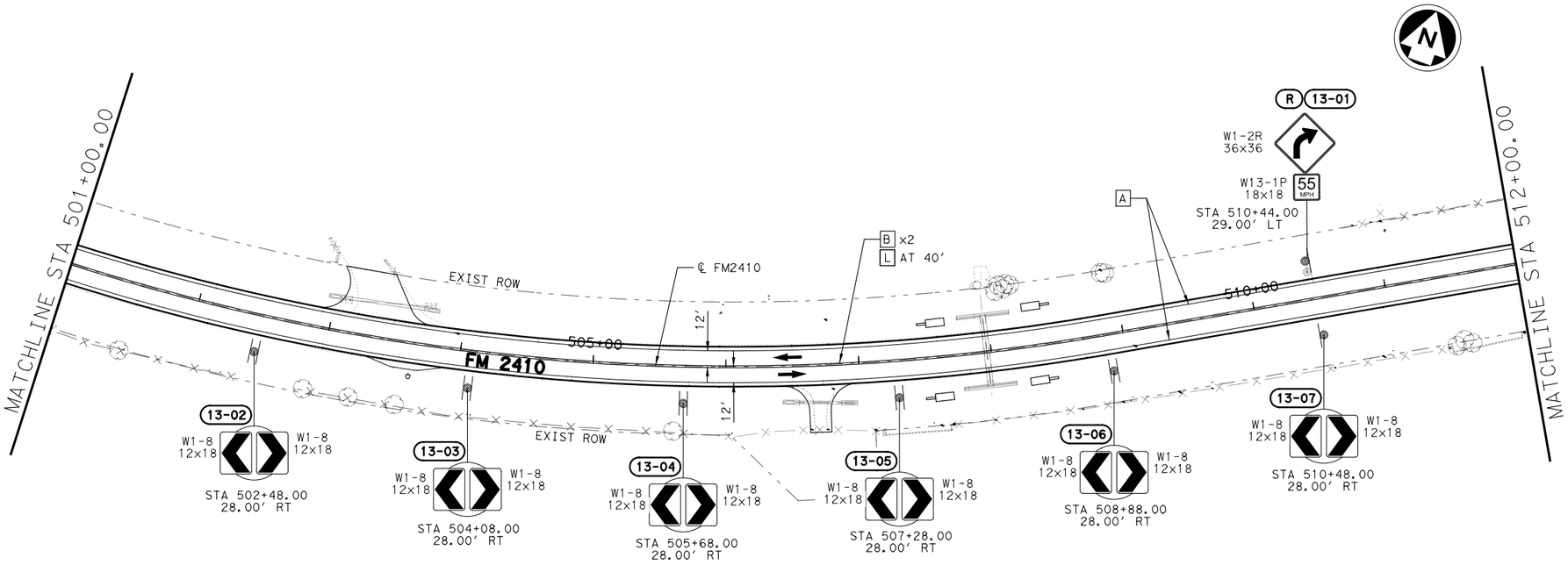

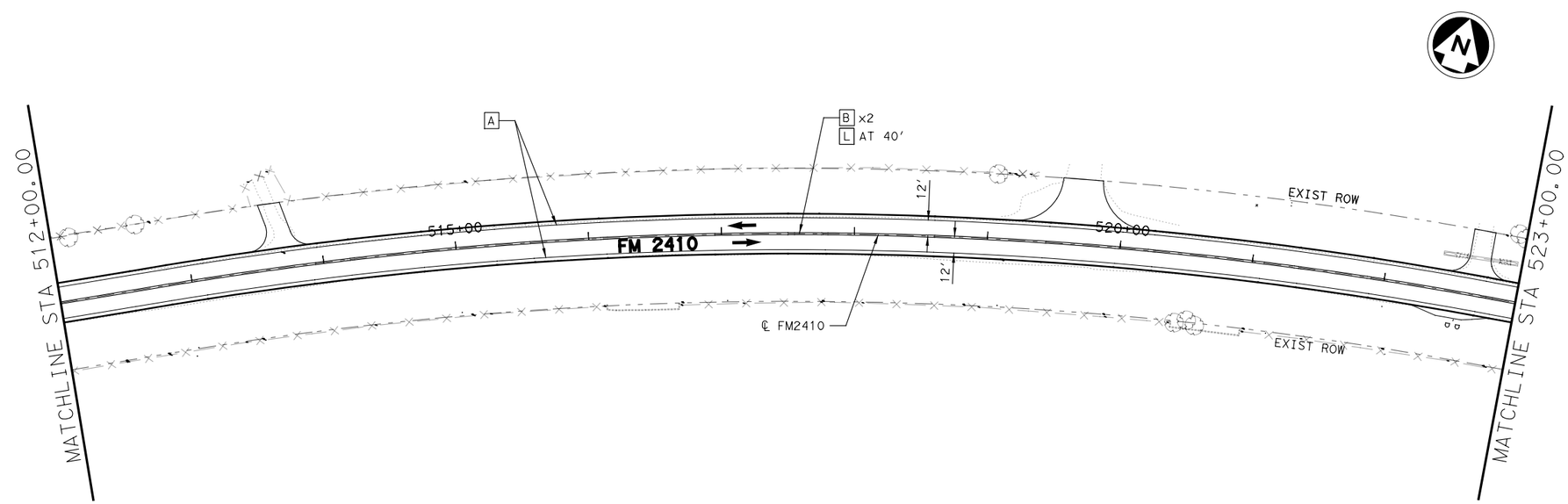

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	4
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4400
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	4400
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	55
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

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1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SIGNING AND STRIPING LAYOUT

STA 501+00.00 TO STA 523+00.00

(SHEET 13 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	167
GRAPHICS RS	CONTROL	SECTION	JOB	
GRPH CHECK	2304	02	044	
JMP				

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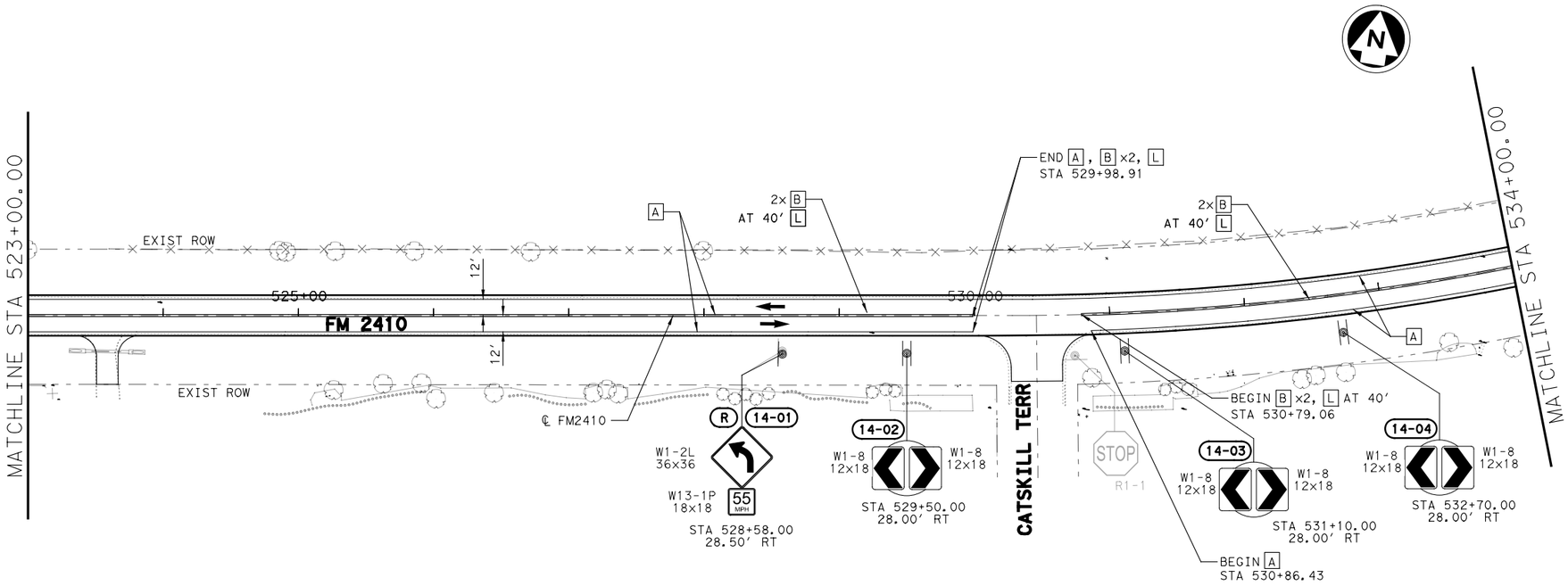

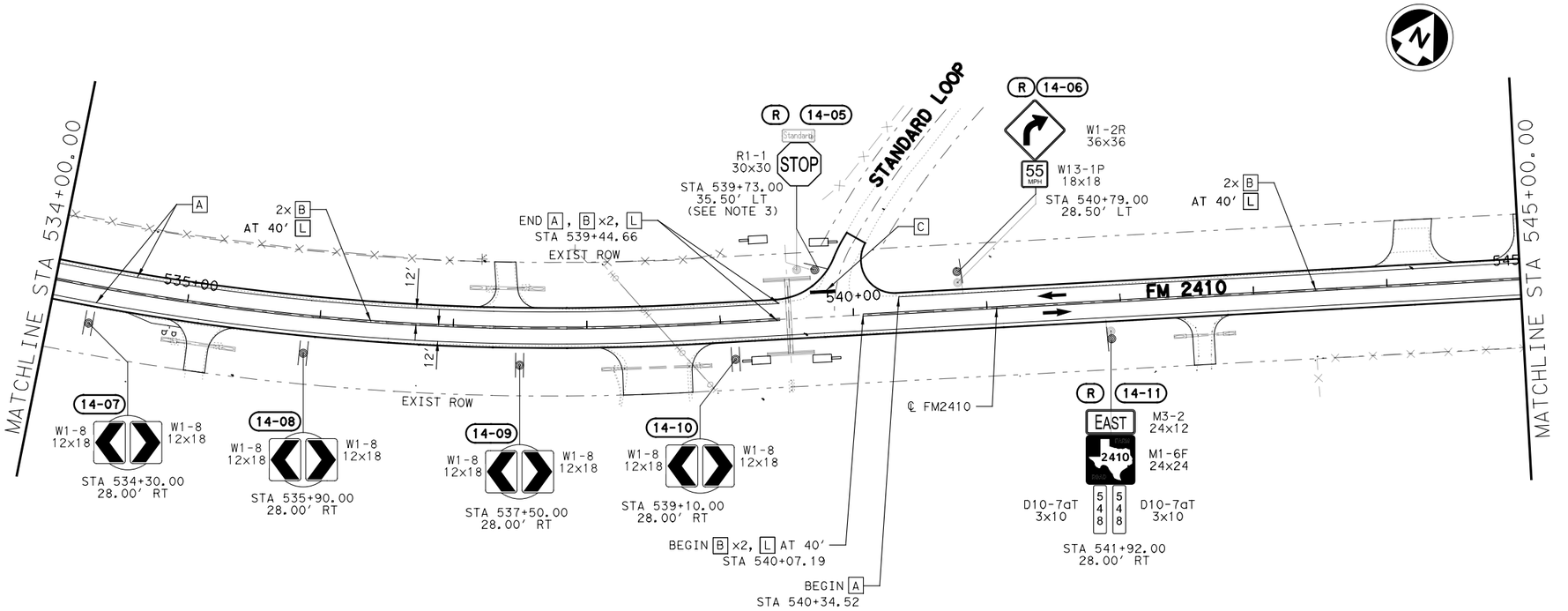

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	4
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4222
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	4114
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	18
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	53
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

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STATE OF TEXAS
JASMINE M. PANSURIYA
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PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SIGNING AND STRIPING LAYOUT

STA 523+00.00 TO STA 545+00.00

(SHEET 14 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	168
GRAPHICS RS	CONTROL	SECTION	JOB	
GRPH CHECK	2304	02	044	
JMP				

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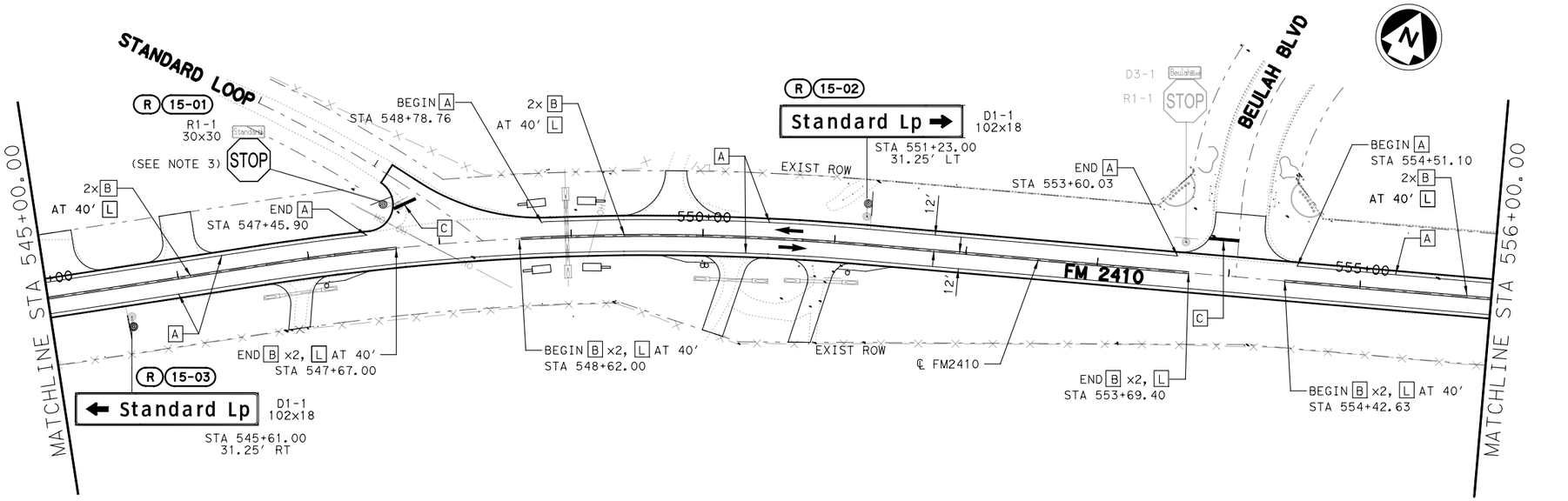

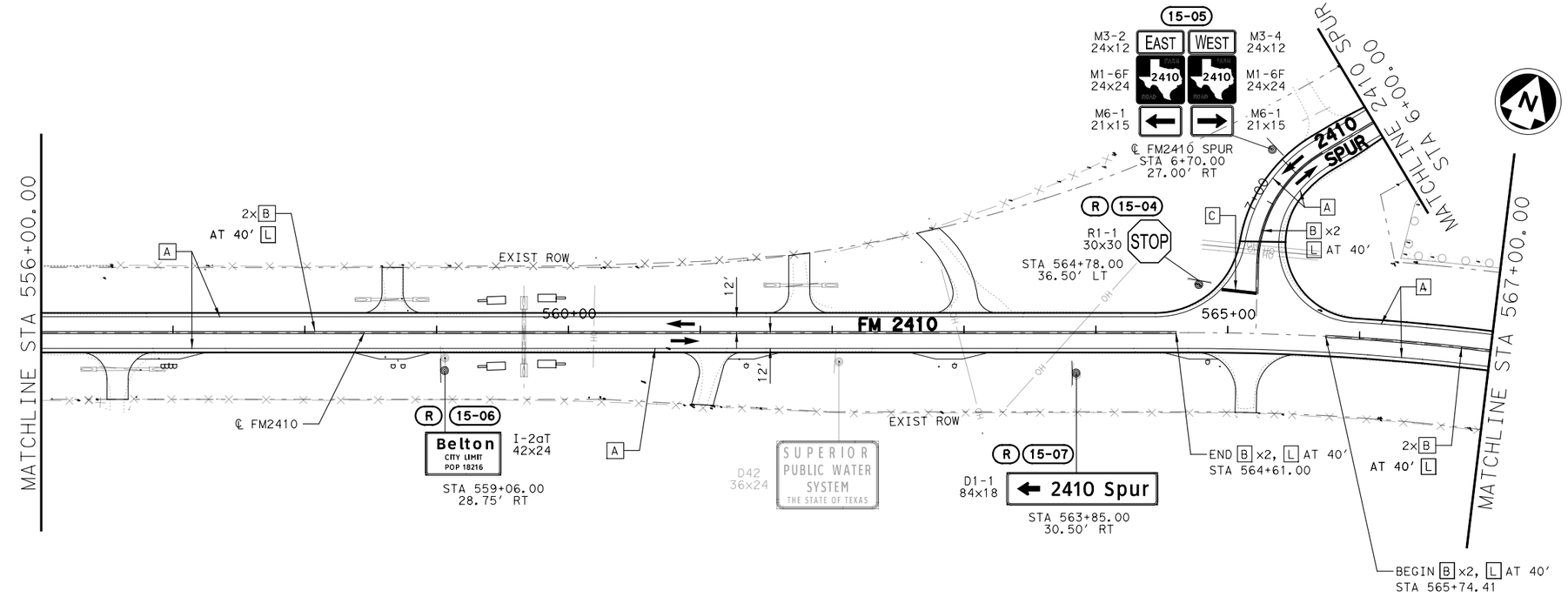

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	8
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4473
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	4176
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	58
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	55
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

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STATE OF TEXAS
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1/4/2023

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Texas Department of Transportation

FM 2410

SIGNING AND STRIPING LAYOUT

STA 545+00.00 TO STA 567+00.00

(SHEET 15 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	169
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

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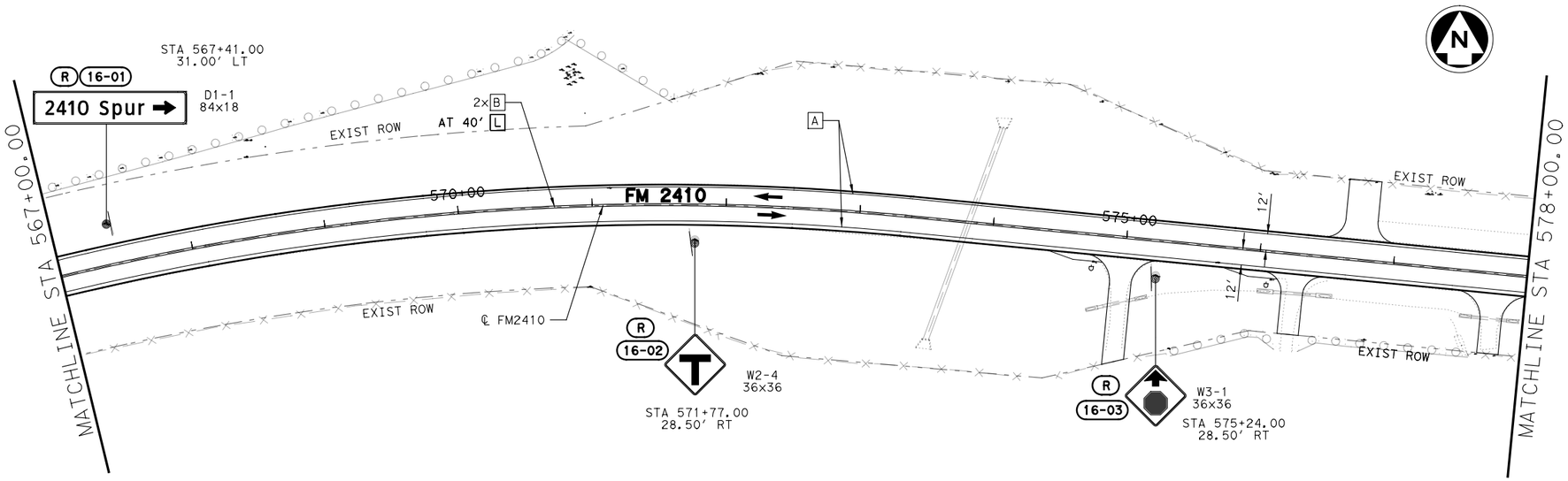

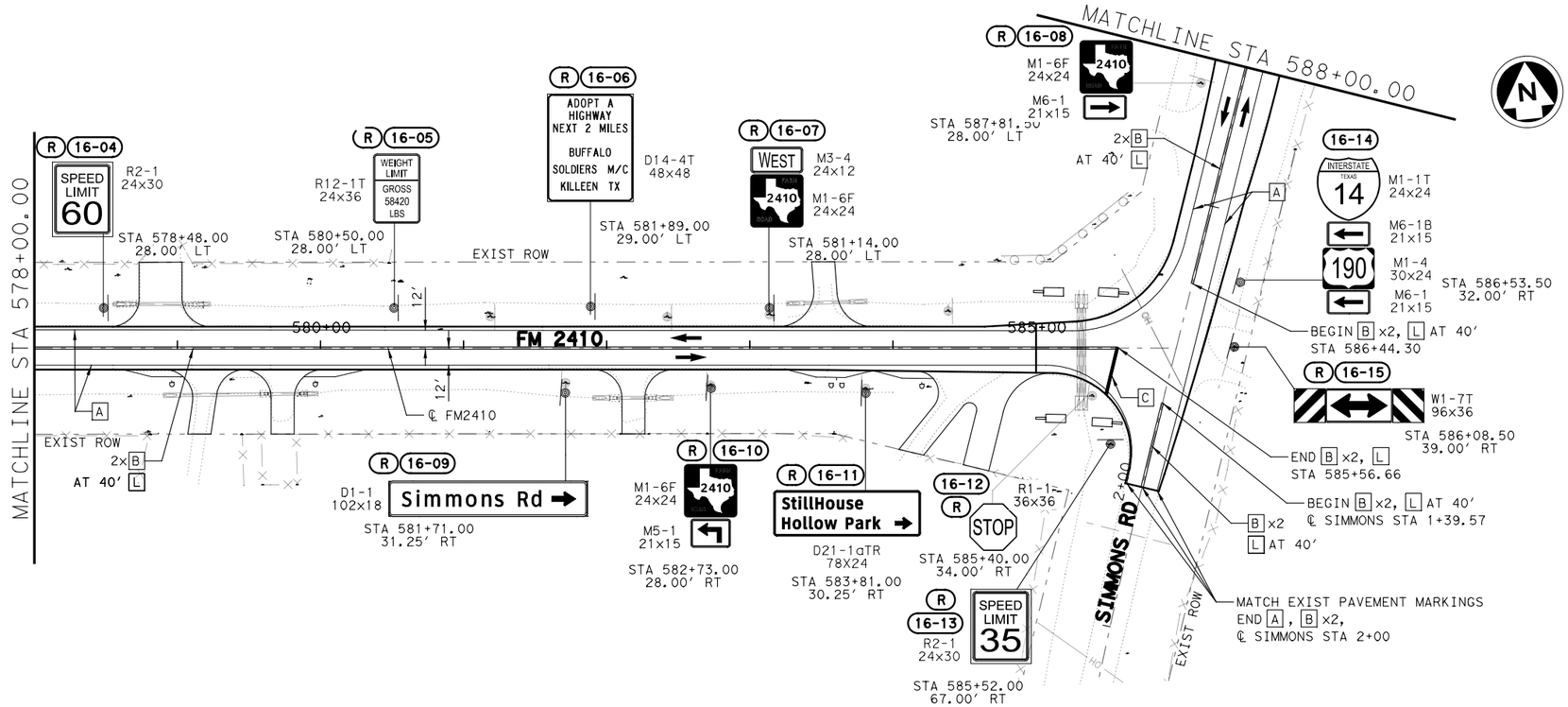

50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	4
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	4290
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	4146
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	33
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	53
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

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1/4/2023

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Texas Department of Transportation

FM 2410

SIGNING AND STRIPING LAYOUT

STA 567+00.00 TO STA 588+00.00

(SHEET 16 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	170
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

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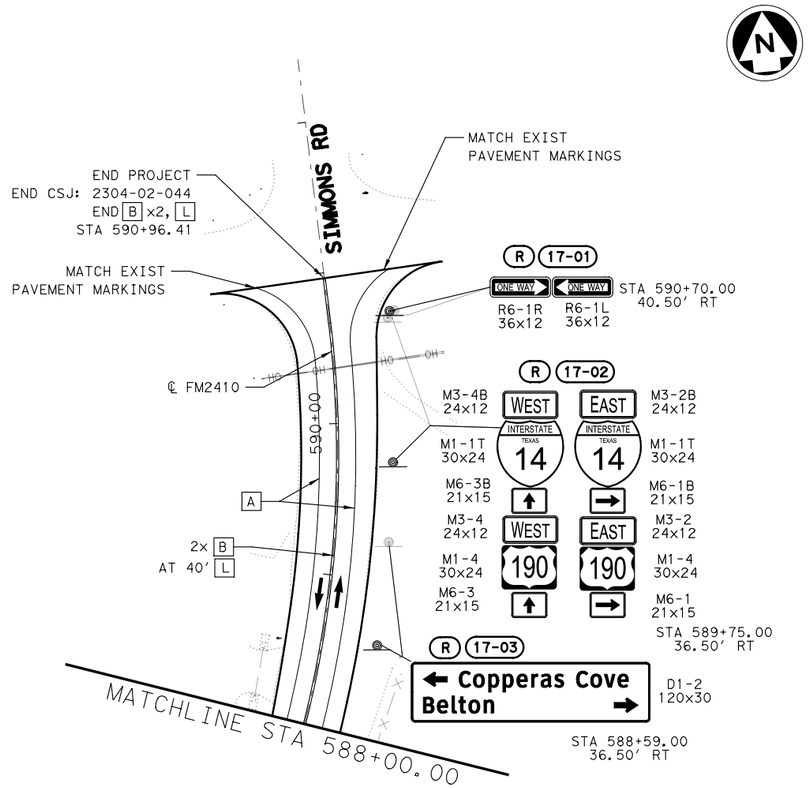
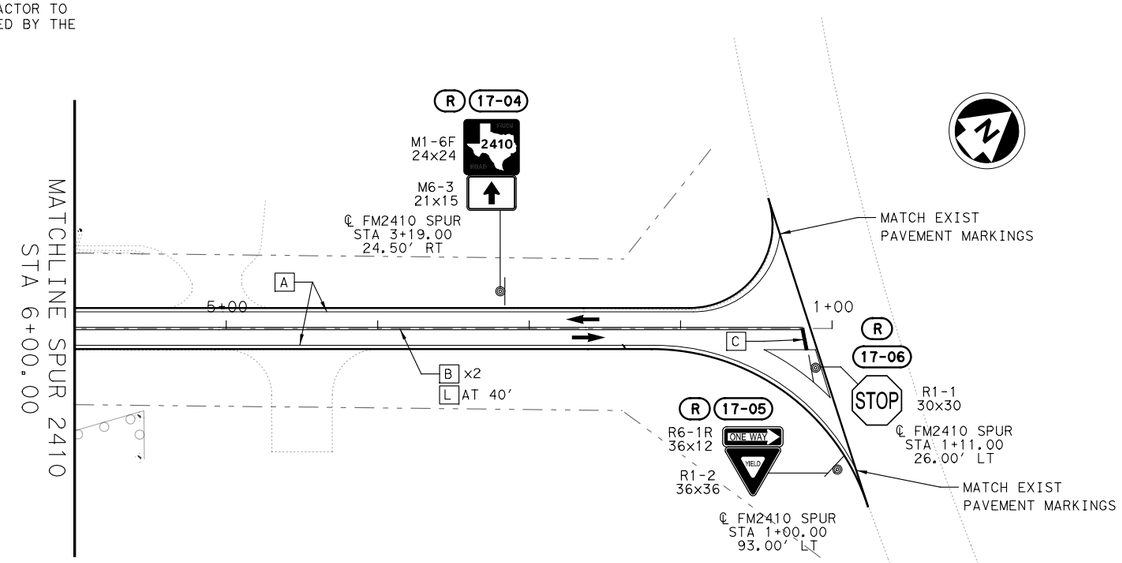


DISCLAIMER:

BASE TOPO INFORMATION HAS NOT BEEN SURVEYED AND IS BASED ON SATELLITE IMAGERY FROM 2410 SPUR STA 4+50.00 TO US 190 SERVICE ROAD. BASE TOPO IS APPROXIMATE. CONTRACTOR TO FIELD VERIFY PROPOSED SIGN LOCATIONS AND APPROVED BY THE ENGINEER WITHIN THIS LIMIT.



50 25 0 50 100

HORIZONTAL SCALE: 1" = 100′

LEGEND

- EXIST ROW
- EXIST FENCE
- DIRECTION OF TRAFFIC
- (R) EXISTING SIGN TO BE REMOVED
- (31-5) PROPOSED SIGN. REFER TO SUMMARY OF SMALL SIGNS (SOSS) AND SIGN DETAILS SHEETS FOR MORE INFORMATION
- OBJECT MARKER (OM-2Z)
- BARRIER DELINEATOR

	0658-6062	(D-SW)SZ1(BRF)GF2(BI)	EA	
	0658-6073	(OM-2Y)(WC)GND(BI)	EA	
A	0666-6343	TY I (W)6"(SLD)(100MIL)	LF	1780
B	0666-6347	TY I (Y)6"(SLD)(100MIL)	LF	1538
C	0666-6048	TY I (W)24"(SLD)(100MIL)	LF	14
D	0666-6306	TY I (W)6"(BRK)(100MIL)	LF	
E	0666-6346	TY I (Y)6"(BRK)(100MIL)	LF	
F	0666-6036	TY I (W)8"(SLD)(100MIL)	LF	
G	0666-6030	TY I (W)8"(DOT)(100MIL)	LF	
H	0668-6077	PREFAB TY C (W)(ARROW)	EA	
I	0666-6021	TY I (W)6"(LNDP)(100MIL)	LF	
K	0672-6007	REFL PAV MRKR TY I-C	EA	
L	0672-6009	REFL PAV MRKR TY II-A-A	EA	21
M	0668-6085	PREFAB TY C (W)(WORD)	EA	
N	0668-6092	PREFAB TY C (36")(YLD TRI)	EA	

NOTES:

1. EXISTING SIGNS ARE TO BE REMOVED AND REPLACED UNLESS NOTED OTHERWISE.
2. ALL STATION AND OFFSETS ARE REFERENCED FROM ℄ FM2410 UNLESS NOTED OTHERWISE.
3. EXISTING STREET NAME SIGNS SHALL BE SALVAGED FOR RE-USE ON NEW POST. ALL WORK SHALL BE SUBSIDIARY TO ITEM 644.

STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SIGNING AND STRIPING LAYOUT

STA 588+00.00 TO END PROJECT
2410 SPUR STA 6+00.00 TO MATCH EXISTING

(SHEET 17 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS RS	CONTROL	SECTION	JOB	171
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTHON*PVMT&SIGN*17.dgn
DATE: 1/4/2023 4:39:12 PM

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
1	1	M1-6F	FARM 3481 ROAD	24"x24"	X		10BWG	1	SA	P		
		M6-1	←	21"x15"	X							
	2	R3-9dP	END	24"x8"	X		10BWG	1	SA	P	BM	
		R3-9B	CENTER LANE ONLY	24"x36"	X							
	3	M2-1	JCT	21"x15"	X		10BWG	1	SA	P		
		M1-6F	FARM 3481 ROAD	24"x24"	X							
	4	R3-7R	RIGHT LANE MUST TURN RIGHT	36"x36"	X		10BWG	1	SA	P		
		R3-5hTP	500 FT	36"x12"	X							
	5	R8-1bT	NO PARKING ON ROW	24"x30"	X		10BWG	1	SA	P		
	6	M3-2	EAST	24"x12"	X		10BWG	1	SA	P		
		M1-6F	FARM 2410 ROAD	24"x24"	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:

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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).

STATE OF TEXAS
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1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 1 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	172
RS	2304	02	044	
GRPH CHECK				
JMP				

FILE: FM2410*OTH*SOSS*01.dgn
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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"	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	7	R3-9cP	BEGIN	24"x8"	X		10BWG	1	SA	P	BM	
		R3-9B	CENTER LANE ONLY	24"x36"	X							
	8	S5-1	SCHOOL SPEED LIMIT 35 WHEN FLASHING	36"x72"	X		S80	1	SA	P		
	9	S1-1		36"x36"	X		10BWG	1	SA	P		
		W16-9P	AHEAD	24"x12"	X							
	10	R8-1bT	NO PARKING ON ROW	24"x30"	X		10BWG	1	SA	P		
	11	S1-1		36"x36"	X		10BWG	1	SA	P		
		S4-3P	SCHOOL	24"x8"	X							

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness[1]
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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NOTE:

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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).

STATE OF TEXAS
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1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 2 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	173
RS				
GRPH CHECK	2304	02	044	
JMP				

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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"	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	12	S5-2aTP	END SCHOOL ZONE	24"x10"	X		10BWG	1	SA	P	BM	
		R2-1	SPEED LIMIT 50	24"x30"	X							
2	1	S5-1	SCHOOL SPEED LIMIT 35 WHEN FLASHING	36"x72"	X		S80	1	SA	P		
	2	R3-9cP	BEGIN	24"x8"	X		10BWG	1	SA	P	BM	
		R3-9B	CENTER LANE ONLY	24"x36"	X							
	3	W1-7T		96"x36"		X	S80	1	SA	T	EXAL	
	4	R3-9dP	END	24"x8"	X		10BWG	1	SA	P	BM	
		R3-9B	CENTER LANE ONLY	24"x36"	X							
	5	R3-7R	RIGHT LANE MUST TURN RIGHT	36"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"

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

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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).

STATE OF TEXAS
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1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

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SUMMARY OF SMALL SIGNS

(SHEET 3 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	
RS				174
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTH*SOSS*03.dgn
DATE: 1/4/2023 4:39:16 PM

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
2	6	R3-5R		30"x36"	X		10BWG	1	SA	P		
	7	R3-7R		36"x36"	X		10BWG	1	SA	P		
	8	R3-9dP		24"x8"	X		10BWG	1	SA	P	BM	
		R3-9B		24"x36"	X							
	9	R1-2		36"x36"	X		10BWG	1	SA	T		
	10	R1-1		30"x30"	X		10BWG	1	SA	P		
	11	R1-2		36"x36"	X		10BWG	1	SA	T		
	12	W4-1R		36"x36"	X		10BWG	1	SA	P		
	13	R3-9cP		24"x8"	X		10BWG	1	SA	P	BM	
		R3-9B		24"x36"	X							
	14	R3-9cP		24"x8"	X		10BWG	1	SA	P	BM	
		R3-9B		24"x36"	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.

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NOTE:

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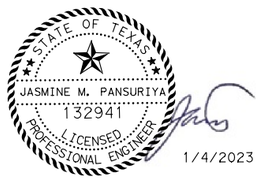
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).



OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

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FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 4 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	175
RS	2304	02	044	
GRPH CHECK				
JMP				

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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
2	15	R3-9dP	END	24"x8"	X		10BWG	1	SA	P	BM	
		R3-9B	CENTER LANE ONLY	24"x36"	X							
	16	R1-1	STOP	30"x30"	X		10BWG	1	SA	P		
3	1	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES COMBAT VETS ASSOCIATION CHAPTER 23-5	48"x48"	X		10BWG	1	SA	T		
	2	R3-9dP	END	24"x8"	X		10BWG	1	SA	P	BM	
		R3-9B	CENTER LANE ONLY	24"x36"	X							
	3	R3-9cP	BEGIN	24"x8"	X		10BWG	1	SA	P	BM	
		R3-9B	CENTER LANE ONLY	24"x36"	X							
	4	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES ELLISON H.S. NATIONAL HONOR SOCIETY	48"x48"	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"
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STATE OF TEXAS
JASMINE M. PANSURIYA
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LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
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Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 5 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	176
RS	2304	02	044	
GRPH CHECK				
JMP				

FILE: FM2410*OTH*SOSS*05.dgn
DATE: 1/4/2023 4:39:16 PM

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
3	5	R3-9cP	BEGIN	24"x8"	X		10BWG	1	SA	P	BM	
		R3-9B	CENTER LANE ONLY	24"x36"	X							
	6	R3-9dP	END	24"x8"	X		10BWG	1	SA	P	BM	
		R3-9B	CENTER LANE ONLY	24"x36"	X							
	7	R1-1	STOP	30"x30"	X		10BWG	1	SA	P		
	8	R3-5R	ONLY	30"x36"	X		10BWG	1	SA	P		
	9	M3-4	WEST	24"x12"	X		10BWG	1	SA	P		
		M1-6F	FARM 2410 ROAD	24"x24"	X							
	10	W1-7T		96"x36"		X	S80	1	SA	T	EXAL	
	11	R1-1	STOP	30"x30"	X		10BWG	1	SA	P		
4	1	R2-1	SPEED LIMIT 50	24"x30"	X		10BWG	1	SA	P		
	2	R1-1	STOP	30"x30"	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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1/4/2023

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Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 6 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	177
RS				
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTH*SOSS*06.dgn
DATE: 1/4/2023 4:39:17 PM

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)
4	3	D21-1aTR	Warriors Path Rd →	60"x24"	X		10BWG	1	SA	T		
	4	R1-1	STOP	30"x30"	X		10BWG	1	SA	P		
	5	D21-1aTL	← Warriors Path Rd	60"x24"	X		10BWG	1	SA	T		
	6	R2-1	SPEED LIMIT 55	24"x30"	X		10BWG	1	SA	P		
	7	R2-1	SPEED LIMIT 55	24"x30"	X		10BWG	1	SA	P		
	8	R2-1	SPEED LIMIT 60	24"x30"	X		10BWG	1	SA	P		
5	1	R4-2	PASS WITH CARE	24"x30"	X		10BWG	1	SA	P		
	2	M3-2	EAST	24"x12"	X		10BWG	1	SA	P		
		M1-6F	FARM 2410 ROAD	24"x24"	X							
	3	R4-1	DO NOT PASS	24"x30"	X		10BWG	1	SA	P		
	4	R1-1	STOP	30"x30"	X		10BWG	1	SA	P		
6	1	R4-1	DO NOT PASS	24"x30"	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

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 7 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	
RS				178
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTH*SOSS*07.dgn
DATE: 1/4/2023 4:39:17 PM

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	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
							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"	BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY = TYPE TY N TY S
6	2	R1-1	STOP	30"x30"	X		10BWG	1	SA	P		
	3	R4-2	PASS WITH CARE	24"x30"	X		10BWG	1	SA	P		
	4	R4-2	PASS WITH CARE	24"x30"	X		10BWG	1	SA	P		
7	1	R4-1	DO NOT PASS	24"x30"	X		10BWG	1	SA	P		
	2	R4-2	PASS WITH CARE	24"x30"	X		10BWG	1	SA	P		
	3	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES ELLISON H.S. NATIONAL HONOR SOCIETY	48"x48"	X		10BWG	1	SA	T		
	4	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES THE PRIESTHOOD MOTORCYCLE MINISTRY	48"x48"	X		10BWG	1	SA	T		
8	1	I-2aT	Harker Heights CITY LIMIT POP 18216	84"x24"	X		10BWG	1	SA	T		
	2	R4-1	DO NOT PASS	24"x30"	X		10BWG	1	SA	P		
	3	R4-1	DO NOT PASS	24"x30"	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:

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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).

STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 8 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	179
RS				
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTH*SOSS*08.dgn
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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
8	4	R1-1	STOP	30"x30"	X		10BWG	1	SA	P		
	5	R4-2	PASS WITH CARE	24"x30"	X		10BWG	1	SA	P		
	6	R1-1	STOP	30"x30"	X		10BWG	1	SA	P		
	7	W1-4L		36"x36"	X		10BWG	1	SA	P		
		W13-1P	50 MPH	18"x18"	X							
	8	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	9	R1-1	STOP	30"x30"	X		10BWG	1	SA	P		
	10	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	11	D21-1aTR	Rummel Rd →	48"x24"	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"

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STATE OF TEXAS
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1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 9 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	180
GRPH CHECK				
JMP				

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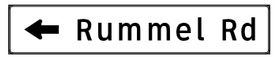
SUMMARY OF SMALL SIGNS

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
8	12	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	13	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
9	1	D1-1		96"x18"	X		10BWG	1	SA	T		
	2	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	3	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	4	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	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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OTHON ENGINEERING
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Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 10 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	181
RS	2304	02	044	
GRPH CHECK				
JMP				

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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"	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
9	5	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	6	R1-1		30"x30"	X		10BWG	1	SA	P		
	7	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	8	D21-1aTL		60"x24"	X		10BWG	1	SA	T		
	9	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	10	R1-1		30"x30"	X		10BWG	1	SA	P		
	11	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	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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NOTE:

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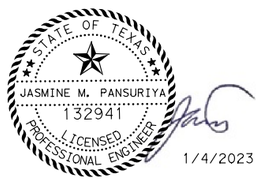
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).



OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 11 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	
RS				182
GRPH CHECK	2304	02	044	
JMP				

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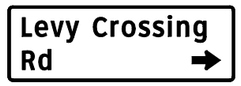
SUMMARY OF SMALL SIGNS

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
9	12	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	13	D21-1aTR		72"x24"	X		10BWG	1	SA	T		
	14	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	15	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
10	1	W1-4		36"x36"	X		10BWG	1	SA	P		
		W13-1P		18"x18"	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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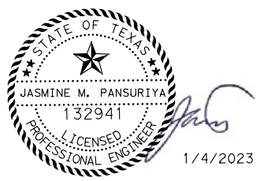

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 12 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	183
RS				
GRPH CHECK	2304	02	044	
JMP				

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DATE: 1/4/2023 4:39:19 PM

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		BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
										PREFABRICATED	1EXT or 2EXT = # of Ext	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"	BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY N TY S
10	2	M3-4	WEST	24"x12"	X		10BWG	1	SA	P		
		M1-6F	FARM 2410 ROAD	24"x24"	X							
		D10-7aT	5 4 6	3"x10"	X							
		D10-7aT	5 4 6	3"x10"	X							
	3	R1-1	STOP	30"x30"	X		10BWG	1	SA	P		
	4	D1-2	← High Oak Rd Cathy Ln →	102"x30"	X		S80	1	SA	T	2 EXT	
	5	D1-2	← Cathy Ln High Oak Rd →	102"x30"	X		S80	1	SA	T	2 EXT	
	6	R1-1	STOP	30"x30"	X		10BWG	1	SA	P		
	7	R4-2	PASS WITH CARE	24"x30"	X		10BWG	1	SA	P		
	8	M3-2	EAST	24"x12"	X		10BWG	1	SA	P		
		M1-6F	FARM 2410 ROAD	24"x24"	X							
	9	R4-1	DO NOT PASS	24"x30"	X		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
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Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 13 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	184
RS				
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTH*SOSS*13.dgn
DATE: 1/4/2023 4:39:19 PM

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
12	1	R4-1	DO NOT PASS	24"x30"	X		10BWG	1	SA	P		
	2	R4-2	PASS WITH CARE	24"x30"	X		10BWG	1	SA	P		
	3	W1-2L		36"x36"	X		10BWG	1	SA	P		
		W13-1P	55 MPH	18"x18"	X							
	4	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	5	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	6	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	7	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES THE PRIESTHOOD MOTORCYCLE MINISTRY	48"x48"	X		10BWG	1	SA	T		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
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Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 14 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	185
RS				
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTH*SOSS*14.dgn
DATE: 1/4/2023 4:39:20 PM

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
12	8	D1-1	← Elf Trail	72"x18"	X		10BWG	1	SA	T		
	9	D1-1	Elf Trail →	72"x18"	X		10BWG	1	SA	T		
	10	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES BUFFALO SOLDIERS M/C KILLEEN TX	48"x48"	X		10BWG	1	SA	T		
	11	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	12	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	13	R1-1	STOP	30"x30"	X		10BWG	1	SA	P		
	14	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	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).

STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 15 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	186
RS				
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTH*SOSS*15.dgn
DATE: 1/4/2023 4:39:20 PM

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
12	15	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	16	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	17	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
13	1	W1-2R		36"x36"	X		10BWG	1	SA	P		
		W13-1P		18"x18"	X							
	2	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	3	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	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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NOTE:

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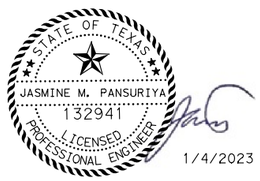
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).



OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

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FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 16 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	187
RS				
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTH*SOSS*16.dgn
DATE: 1/4/2023 4:39:20 PM

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	4	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	5	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	6	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	7	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
14	1	W1-2L		36"x36"	X		10BWG	1	SA	P		
		W13-1P		18"x18"	X							
	2	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
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STATE OF TEXAS
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Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 17 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	188
RS	2304	02	044	
GRPH CHECK				
JMP				

FILE: FM2410*OTH*SOSS*17.dgn
DATE: 1/4/2023 4:39:21 PM

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
14	3	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	4	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	5	R1-1		30"x30"	X		10BWG	1	SA	P		
	6	W1-2R		36"x36"	X		10BWG	1	SA	P		
		W13-1P		18"x18"	X							
	7	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	8	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	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.

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NOTE:

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3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

STATE OF TEXAS
JASMINE M. PANSURIYA
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LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
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Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 18 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	189
RS				
GRPH CHECK	2304	02	044	
JMP				

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DATE: 1/4/2023 4:39:21 PM

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	9	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	10	W1-8		12"x18"	X		10BWG	1	SA	P		
		W1-8		12"x18"	X							
	11	M3-4		24"x12"	X		10BWG	1	SA	P		
		M1-6F		24"x24"	X							
		D10-7aT		3"x10"	X							
		D10-7aT		3"x10"	X							
15	1	R1-1		30"x30"	X		10BWG	1	SA	P		
	2	D1-1		102"x18"	X		S80	1	SA	T	2 EXT	
	3	D1-1		102"x18"	X		S80	1	SA	T	2 EXT	
	4	R1-1		30"x30"	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.

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STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

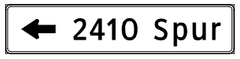
(SHEET 19 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	190
RS				
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTH*SOSS*19.dgn
DATE: 1/4/2023 4:39:22 PM

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
15	5	M3-2		24"x12"	X		S80	1	SA	U		
		M1-6F		24"x24"	X							
		M6-1		21"x15"	X							
		M3-4		24"x12"	X							
		M1-6F		24"x24"	X							
		M6-1		21"x15"	X							
	6	I-2aT		42"x24"	X		10BWG	1	SA	T		
	7	D1-1		84"x18"	X		10BWG	1	SA	T		
16	1	D1-1		84"x18"	X		10BWG	1	SA	T		
	2	W2-4		36"x36"	X		10BWG	1	SA	P		
	3	W3-1		36"x36"	X		10BWG	1	SA	P		
	4	R2-1		24"x30"	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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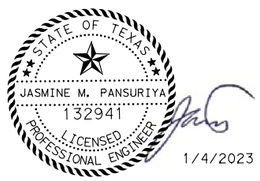

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 20 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	
RS				191
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTH*SOSS*20.dgn
DATE: 1/4/2023 4:39:22 PM

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
16	5	R12-1T	WEIGHT LIMIT / GROSS 58420 LBS	24"x36"	X		10BWG	1	SA	P		
	6	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES / BUFFALO SOLDIERS M/C KILLEEN TX	48"x48"	X		10BWG	1	SA	T		
	7	M3-4	WEST	24"x12"	X		10BWG	1	SA	P		
		M1-6F	FARM 2410 ROAD	24"x24"	X							
	8	M1-6F	FARM 2410 ROAD	24"x24"	X		10BWG	1	SA	P		
		M6-1	→	21"x15"	X							
	9	D1-1	Simmons Rd →	102x18"	X		S80	1	SA	T	2 EXT	
	10	M1-6F	FARM 2410 ROAD	24"x24"	X		10BWG	1	SA	P		
		M5-1	←	21"x15"	X							
	11	D21-1aTR	StillHouse Hollow Park →	78"x24"	X		10BWG	1	SA	T		
	12	R1-1	STOP	30"x30"	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"
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SUMMARY OF SMALL SIGNS

(SHEET 21 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	192
RS				
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTH*SOSS*21.dgn
DATE: 1/4/2023 4:39:22 PM

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
16	13	R2-1		24"x30"	X		10BWG	1	SA	P		
	14	M1-1T		24"x24"	X		10BWG	1	SA	P		
		M6-1B		21"x15"	X							
		M1-4		30"x24"	X							
		M6-1		21"x15"	X							
	15	W1-7T		96"x36"		X	S80	1	SA	T	EXAL	
17	1	R6-1R		36"x12"	X		10BWG	1	SA	P		
		R6-1L		36"x12"	X							

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
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Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 22 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	193
RS	2304	02	044	
GRPH CHECK				
JMP				

FILE: FM2410*OTH*SOSS*22.dgn
DATE: 1/4/2023 4:39:23 PM

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		BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
										PREFABRICATED	1EXT or 2EXT = # of Ext	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"	BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY N TY S
17	2	M3-4B	WEST	24"x12"	X		S80	1	SA	U	2 EXT	
		M1-1T	INTERSTATE TEXAS 14	30"x24"	X							
		M6-3B	↑	21"x15"	X							
		M3-4	WEST	24"x12"	X							
		M1-1	190	30"x24"	X							
		M6-3	↑	21"x15"	X							
		M3-2B	EAST	24"x12"	X							
		M1-1T	INTERSTATE TEXAS 14	30"x24"	X							
		M6-1B	→	21"x15"	X							
		M3-2	EAST	24"x12"	X							
		M1-1	190	30"x24"	X							
		M6-1	→	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"

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).

STATE OF TEXAS
JASMINE M. PANSURIYA
132941
LICENSED PROFESSIONAL ENGINEER
1/4/2023

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

FM 2410

SUMMARY OF SMALL SIGNS

(SHEET 23 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	194
RS				
GRPH CHECK	2304	02	044	
JMP				

FILE: FM2410*OTH*SOSS*23.dgn
DATE: 1/4/2023 4:39:23 PM

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
17	3	D1-2	← Copperas Cove Belton →	120"x30"	X		S80	1	SA	T	2 EXT	
	4	M1-6F	FARM 2410 ROAD	24"x24"	X		10BWG	1	SA	P		
		M6-3		21"x15"	X							
	5	R6-1R	ONE WAY	36"x12"	X		10BWG	1	SA	P	BM	
		R1-2	YIELD	36"x36"	X							
	6	R1-1	STOP	30"x30"	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).

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OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

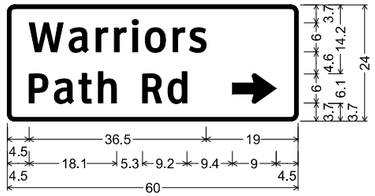
FM 2410

SUMMARY OF SMALL SIGNS

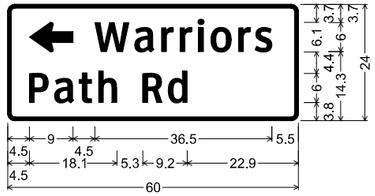
(SHEET 24 OF 24)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	195
RS	2304	02	044	
GRPH CHECK				
JMP				

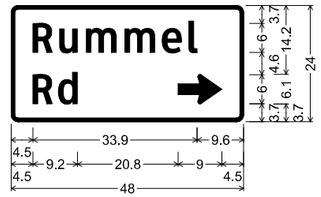
FILE: FM2410*OTH*SOSS*24.dgn
DATE: 1/4/2023 4:39:24 PM



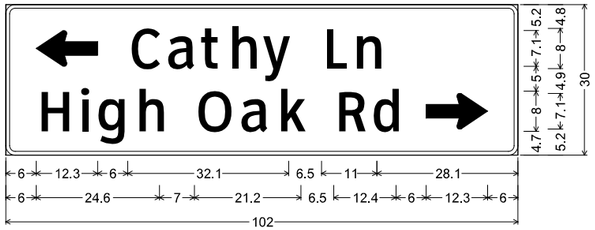
D21-1aTR_VARx24;
1.5" Radius, 0.8" Border, White on Green;
"Warriors", ClearviewHwy-3-W;
"Path Rd", ClearviewHwy-3-W;
Standard Arrow Custom 9.0" X 6.1" 0°;



D21-1aTL_VARx24;
1.5" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 9.0" X 6.1" 180°;
"Warriors", ClearviewHwy-3-W;
"Path Rd", ClearviewHwy-3-W;

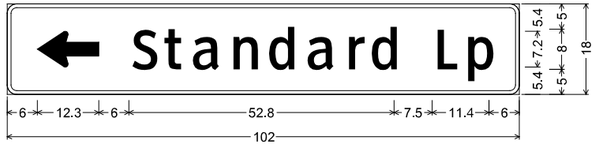


D21-1aTR_VARx24;
1.5" Radius, 0.8" Border, White on Green;
"Rummel", ClearviewHwy-3-W;
"Rd", ClearviewHwy-3-W;
Standard Arrow Custom 9.0" X 6.1" 0°;

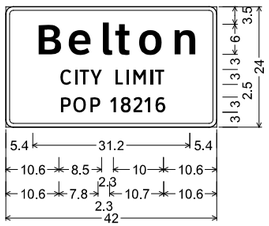


D1-2_VARx30;
1.9" Radius, 0.8" Border, White on, Green;
Standard Arrow Custom 12.3" X 7.1" 180';
"Cathy Ln", ClearviewHwy-3-W 110% spacing;
"High Oak Rd", ClearviewHwy-3-W 110% spacing;
Standard Arrow Custom 12.3" X 7.1" 0';

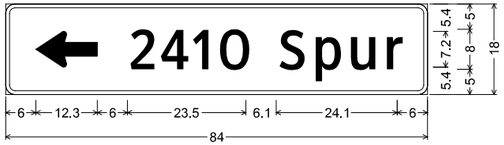
D1-1R_VARx18;
1.5" Radius, 0.8" Border, White on, Green;
"Elf Trail", ClearviewHwy-3-W 80% spacing;
Standard Arrow Custom 12.3" X 7.1" 0';



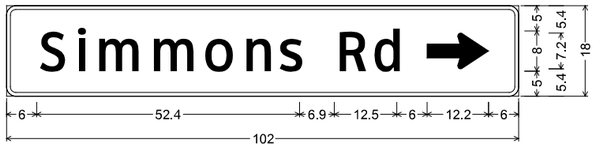
D1-1L_VARx18;
1.5" Radius, 0.5" Border, White on, Green;
Standard Arrow Custom 12.3" X 7.1" 180';
"Standard Lp", ClearviewHwy-3-W 118% spacing;



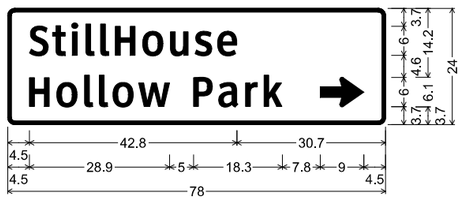
I-2aT_VARx24;
1.5" Radius, 0.8" Border, White on, Green;
"Belton", ClearviewHwy-5-W;
"CITY LIMIT", ClearviewHwy-3-W;
"POP 18216", ClearviewHwy-3-W;



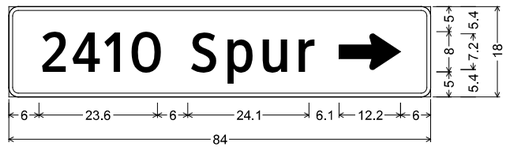
D1-1R_VARx18;
1.5" Radius, 0.5" Border, White on, Green;
Standard Arrow Custom 12.3" X 7.1" 180';
"2410 Spur", ClearviewHwy-3-W 87% spacing;



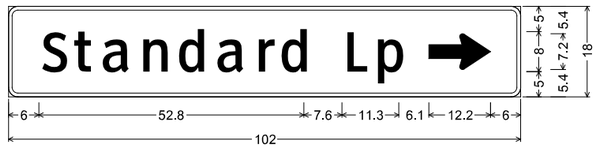
D1-1R_VARx18;
1.9" Radius, 0.8" Border, White on, Green;
"Simmons Rd", ClearviewHwy-3-W 113% spacing;
Standard Arrow Custom 12.3" X 7.1" 0';



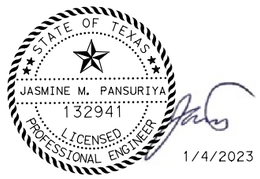
D21-1aTR_VARx24;
1.5" Radius, 0.8" Border, White on Green;
"StillHouse", ClearviewHwy-3-W;
"Hollow Park", ClearviewHwy-3-W;
Standard Arrow Custom 9.0" X 6.1" 0°;



D1-1R_VARx18;
1.5" Radius, 0.5" Border, White on, Green;
"2410 Spur", ClearviewHwy-3-W 87% spacing;
Standard Arrow Custom 12.3" X 7.1" 0';



D1-1R_VARx18;
1.5" Radius, 0.5" Border, White on, Green;
"Standard Lp", ClearviewHwy-3-W 118% spacing;
Standard Arrow Custom 12.3" X 7.1" 0';



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FIRM REGISTRATION NO. F-1471

Texas Department of Transportation
© 2023

FM 2410

SIGN DETAILS

(SHEET 1 OF 2)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	196
GRAPHICS	CONTROL	SECTION	JOB	
RS	2304	02	044	
GRPH CHECK				
JMP				

FILE: FM2410*OTH*SGN*DTL*01.dgn
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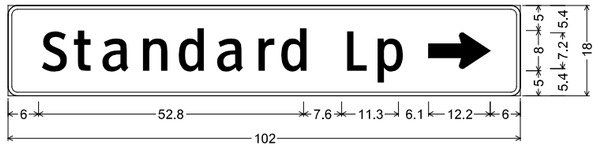
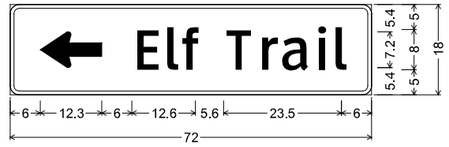
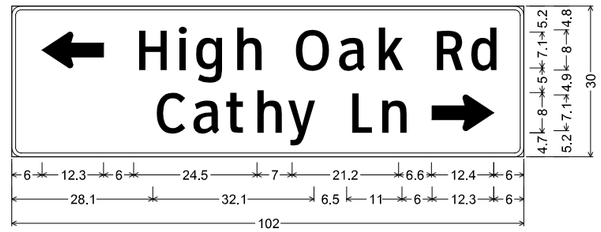


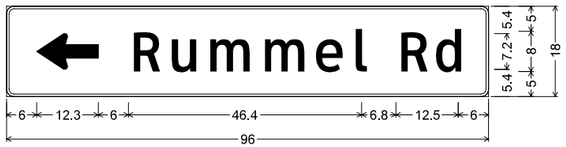
D1-1R_VARx18;
1.5" Radius, 0.5" Border, White on, Green;
"Standard Lp", ClearviewHwy-3-W 118% spacing;
Standard Arrow Custom 12.3" X 7.1" 0';



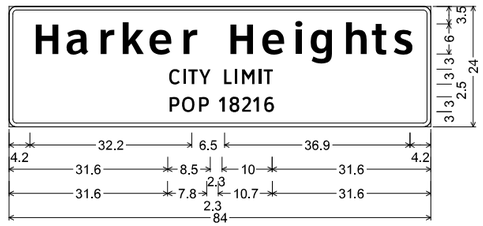
D1-1L_VARx18;
1.5" Radius, 0.5" Border, White on, Green;
Standard Arrow Custom 12.3" X 7.1" 180';
"Elf Trail", ClearviewHwy-3-W 80% spacing;



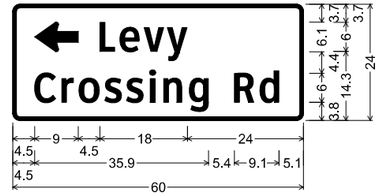
D1-2_VARx30;
1.9" Radius, 0.8" Border, White on, Green;
Standard Arrow Custom 12.3" X 7.1" 180';
"High Oak Rd", ClearviewHwy-3-W 110% spacing;
"Cathy Ln", ClearviewHwy-3-W 110% spacing;
Standard Arrow Custom 12.3" X 7.1" 0';



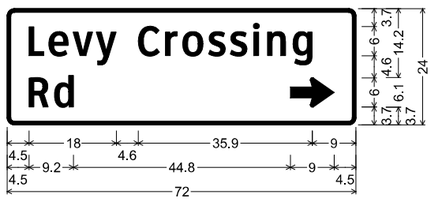
D1-1L_VARx18;
1.5" Radius, 0.5" Border, White on, Green;
Standard Arrow Custom 12.3" X 7.1" 180';
"Rummel Rd", ClearviewHwy-3-W 112% spacing;



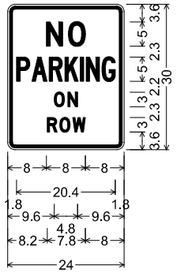
I-2aT_VARx24;
1.5" Radius, 0.8" Border, White on, Green;
"Harker Heights", ClearviewHwy-5-W;
"CITY LIMIT", ClearviewHwy-3-W;
"POP 18216", ClearviewHwy-3-W;



D21-1aTL_VARx24;
1.5" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 9.0" X 6.1" 180°;
"Levy", ClearviewHwy-3-W;
"Crossing Rd", ClearviewHwy-3-W;



D21-1aTR_VARx24;
1.5" Radius, 0.8" Border, White on Green;
"Levy Crossing", ClearviewHwy-3-W;
"Rd", ClearviewHwy-3-W;
Standard Arrow Custom 9.0" X 6.1" 0°;



R8-1bT_24x30;
1.5" Radlus, 0.6" Border, 0.4" Indent, Red on Whlte;
"NO", D;
"PARKING", C 50% spacing;
"ON", D;
"ROW", D;

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1/4/2023

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Texas Department of Transportation

FM 2410

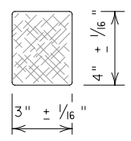
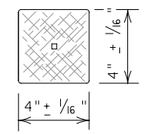
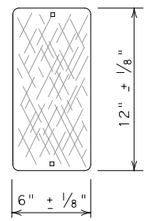
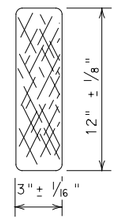
SIGN DETAILS

(SHEET 2 OF 2)

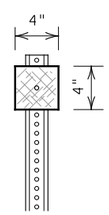
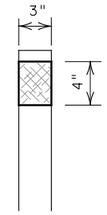
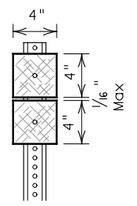
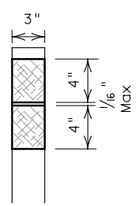
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
RS	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JMP	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	197
RS	2304	02	044	
GRPH CHECK				
JMP				

FILE: FM2410*OTH*SGN*DTL*02.dgn
DATE: 1/4/2023 4:39:25 PM

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
- S = Single
- D = Double

COLOR OF REFLECTORS
- W = White
- Y = Yellow
- R = Red

REFLECTOR UNIT SIZE
- 1 or 2

TYPE OF POST OR DELINEATOR
- WC = Wing Channel Post
- YFLX = Yellow Flexible Post
- WFLX = White Flexible Post
- BRF = Barrier Reflector

TYPE OF MOUNT
- GND = Embedded (drivable or set in concrete)
- CTB = Concrete Barrier Mount
- GF1 or GF2 = Guard Fence Attachment
- SRF = Surface Mount

DIRECTION
If Required
- BI = Bi-Directional
- BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
- 1, 2, 3, or 4

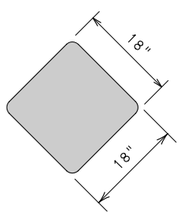
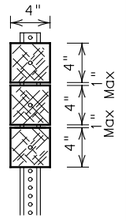
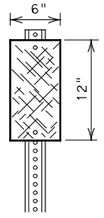
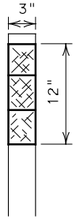
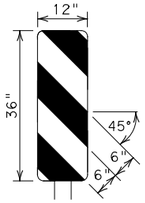
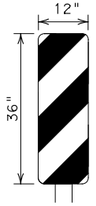
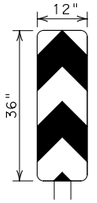
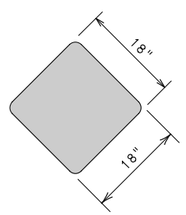
NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker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

TYPE OF POST
- WC = Wing Channel Post
- WFLX = White Flexible Post
- TWT = Thin Walled Tubing

TYPE OF MOUNT
- GND = Embedded (drivable)
- SRF = Surface Mount
- WAS = Wedge Anchor Steel
- WAP = Wedge Anchor Plastic

DIRECTION
If Required
- BI = Bi-Directional

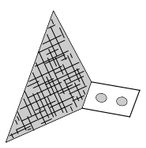
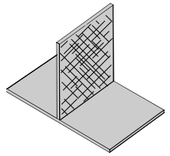
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

DEPARTMENTAL MATERIAL SPECIFICATIONS

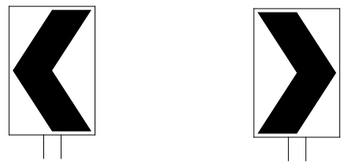
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE



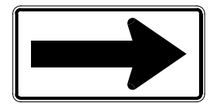
W1-8

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"	

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.

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DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	WACO	BELL		198

20A

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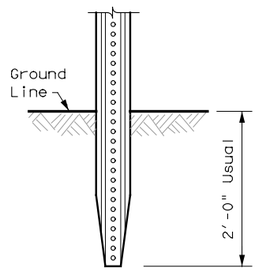
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

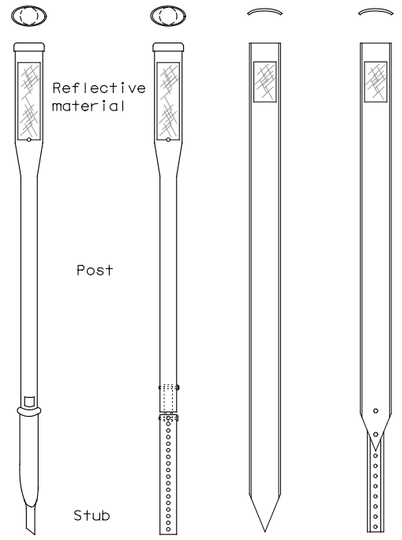


NOTES

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.

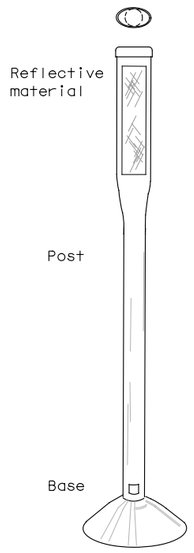
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



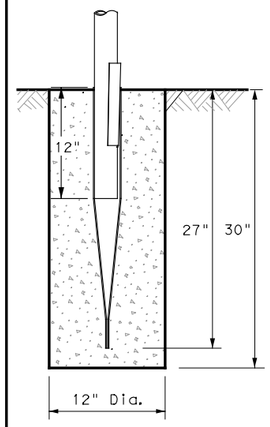
SURFACE MOUNT

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.

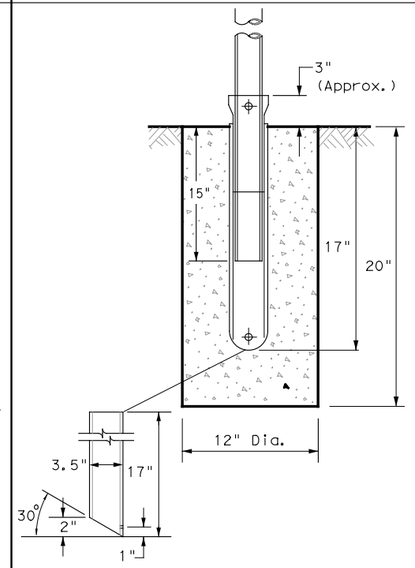
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

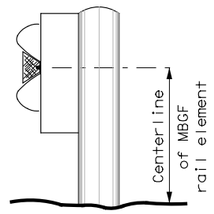
NOTE

1. Install per manufacturer's recommendations.

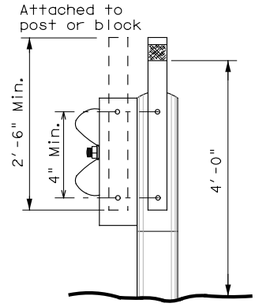
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

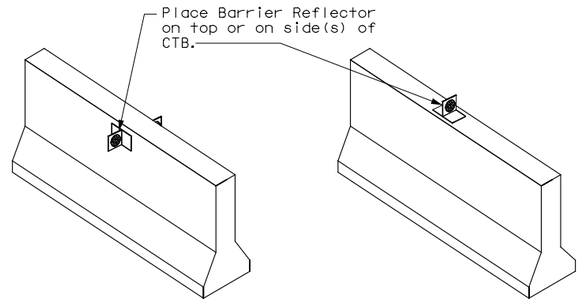
GF1



GF2



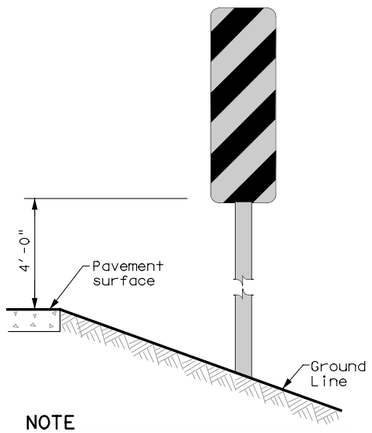
CONCRETE TRAFFIC BARRIER (CTB)



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.

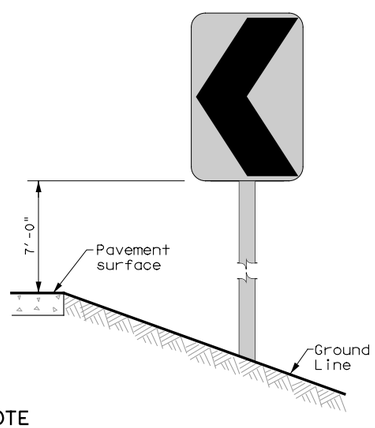
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

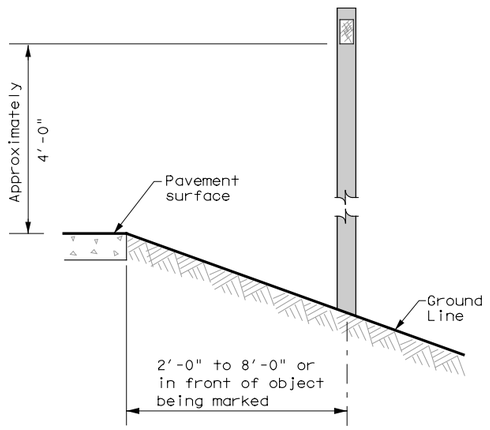
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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
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4-10 7-20	WACO	BELL		199
20B				

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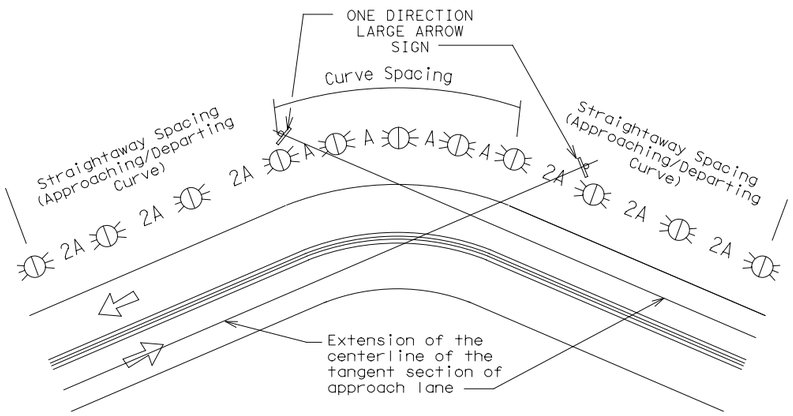
FILE: dom2-20.dgn

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

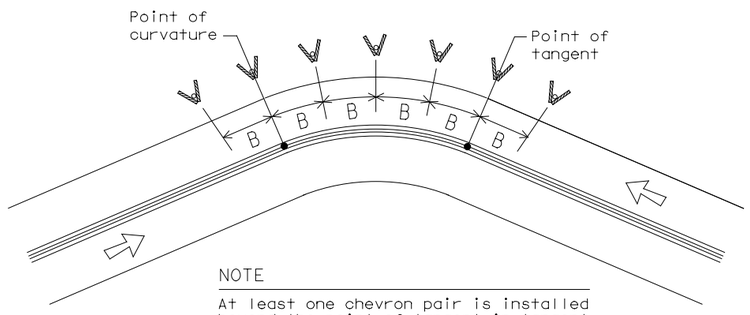
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



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

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DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	WACO	BELL		200

20C

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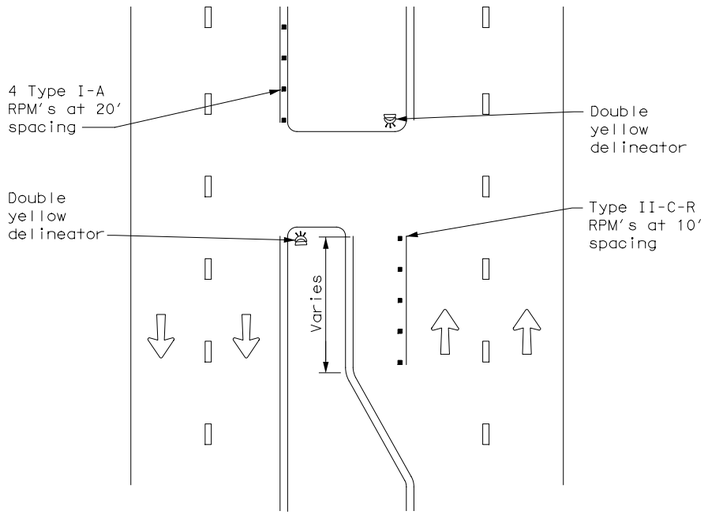
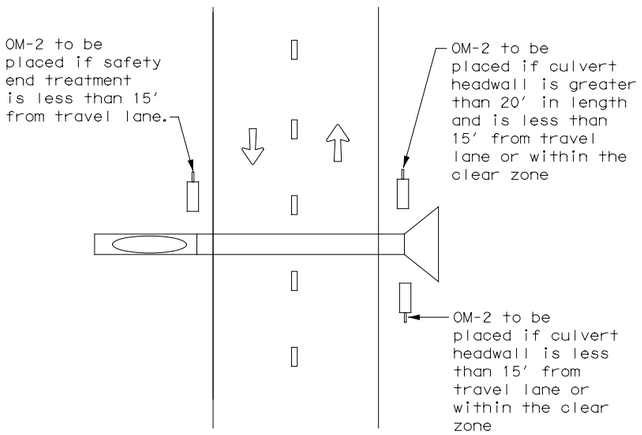
CROSSOVERS



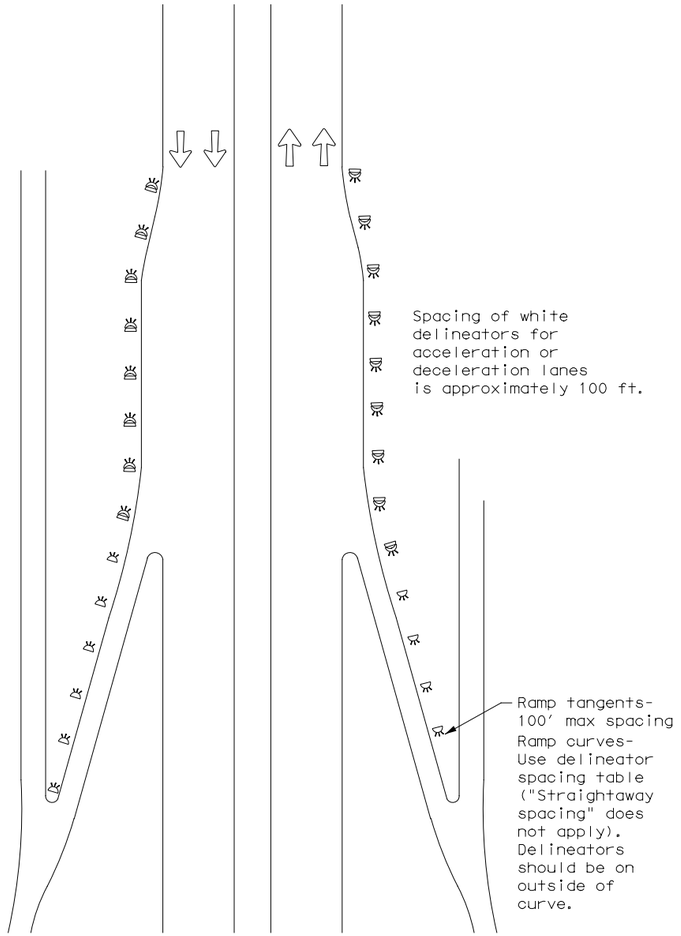
DETAIL 1

FOR CULVERTS WITHOUT MBGF



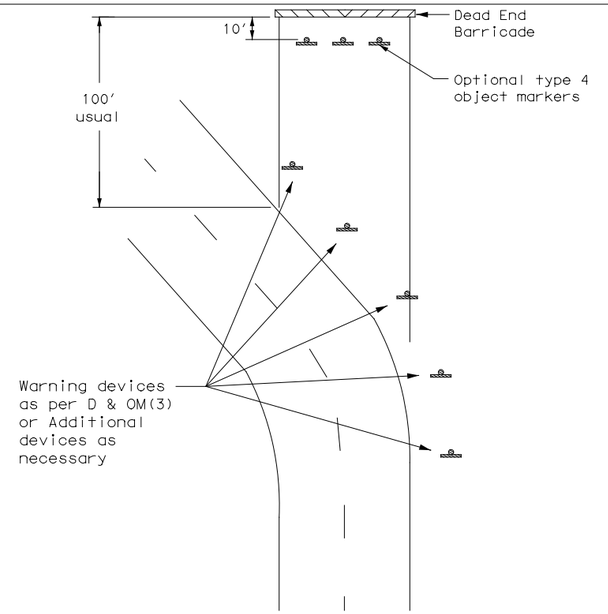
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



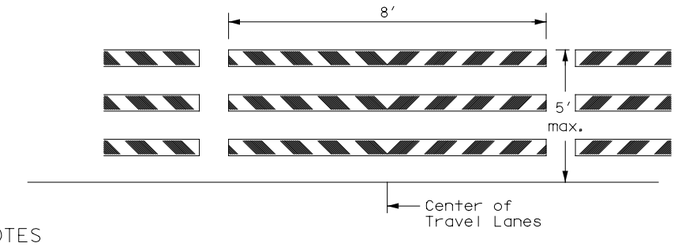
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

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DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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7-20	WACO	BELL		201

20D

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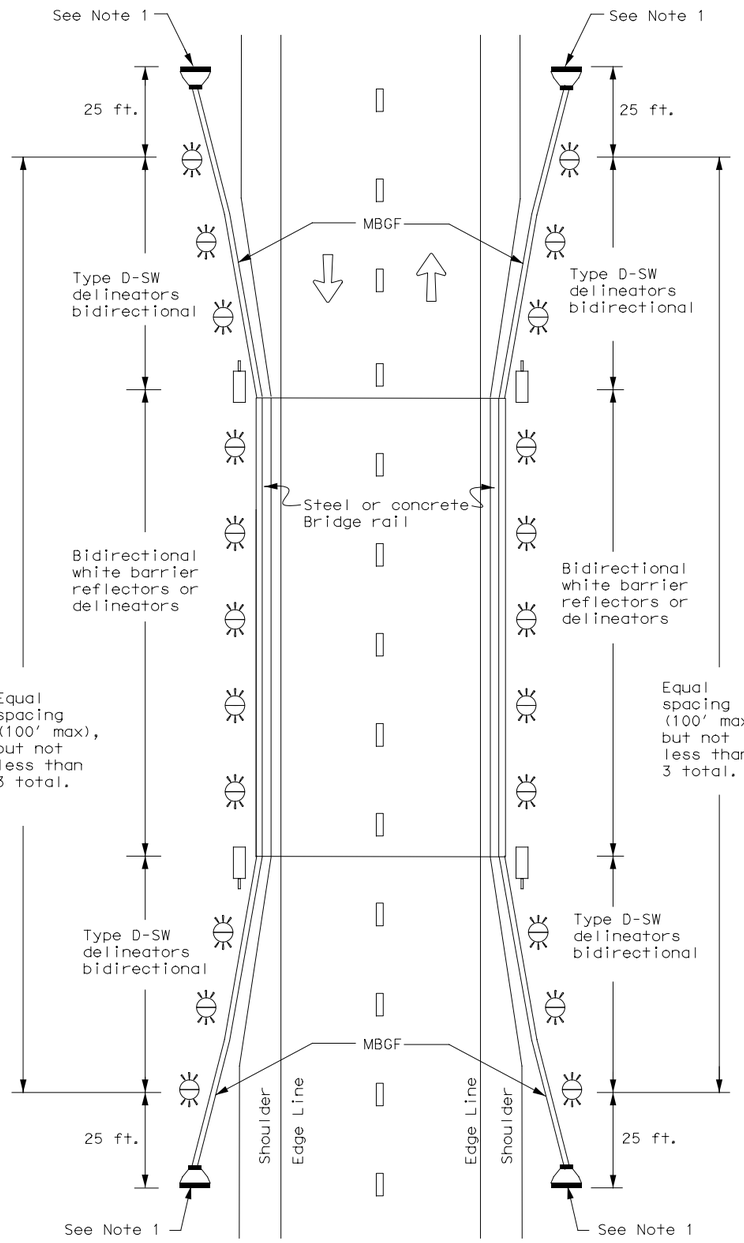
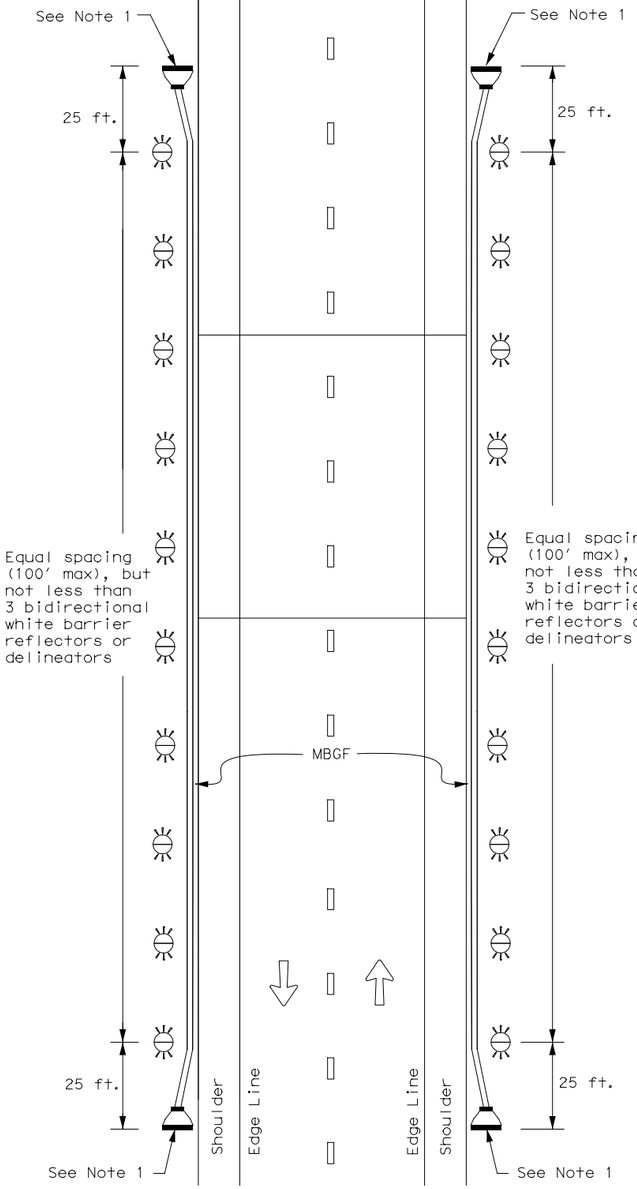
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

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

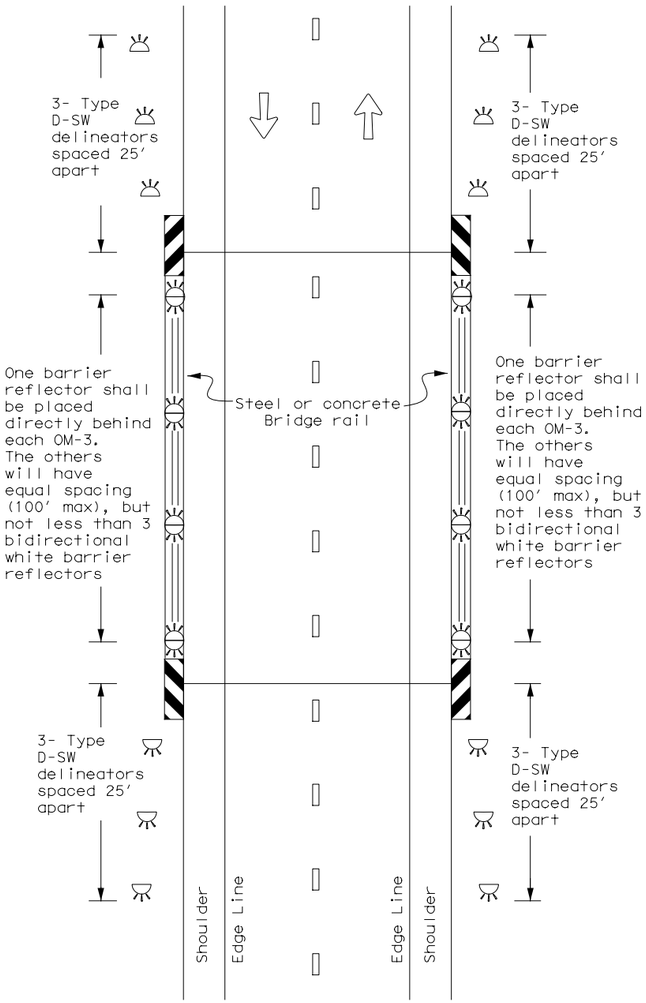
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

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

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
7-20	DIST	COUNTY		SHEET NO.
	WACO	BELL		202

20E

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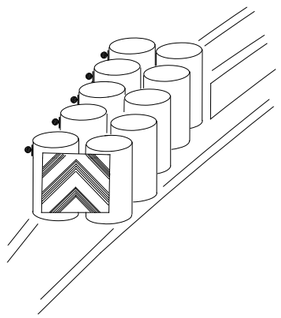
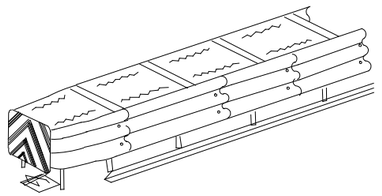
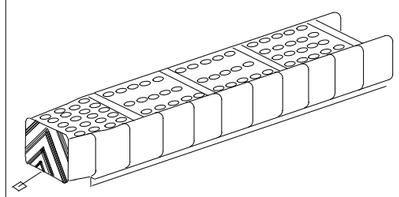
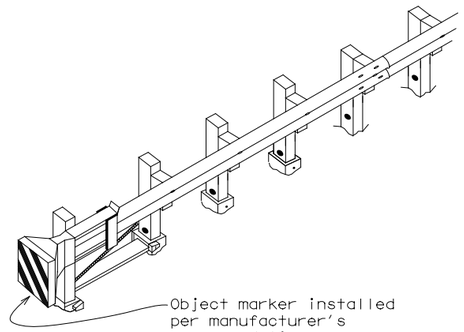
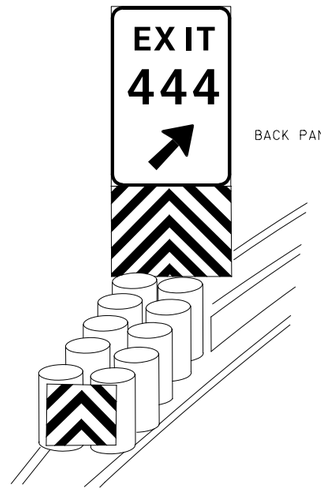
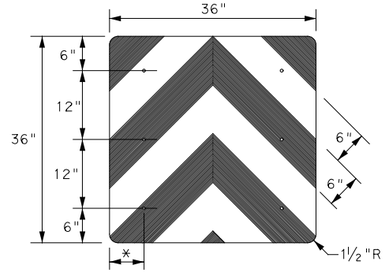


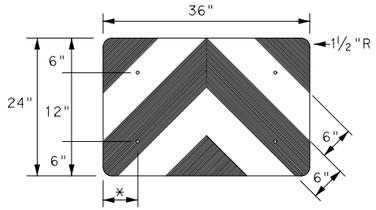




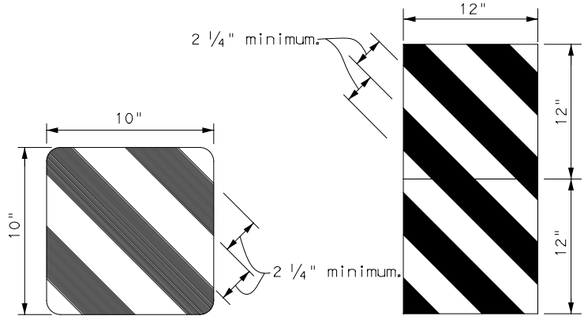




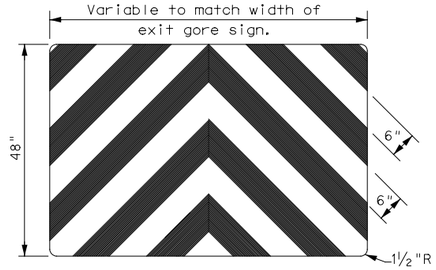


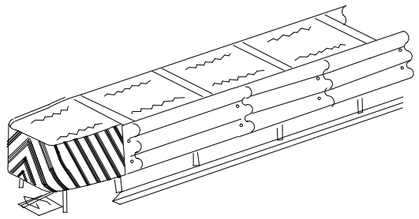


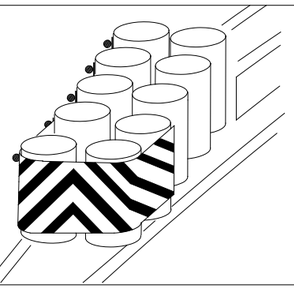
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

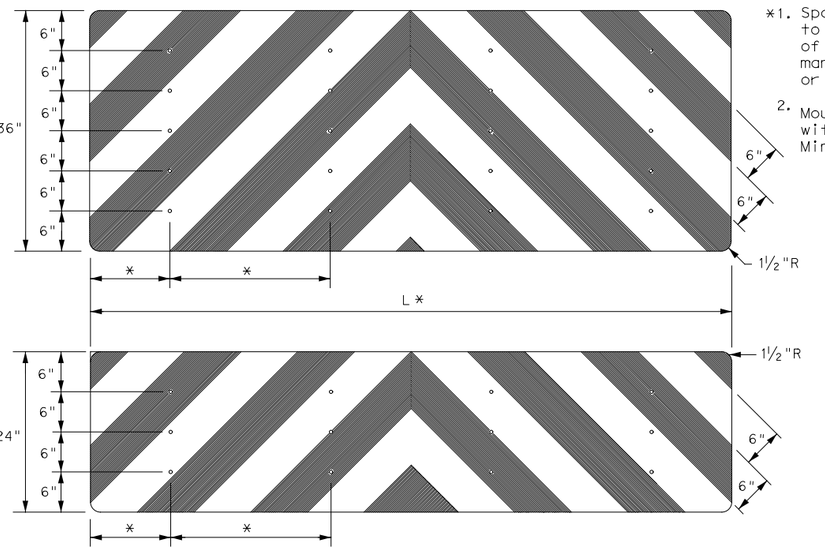


OBJECT MARKERS SMALLER THAN 3 FT^2









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
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4-92 8-04	DIST	COUNTY		SHEET NO.
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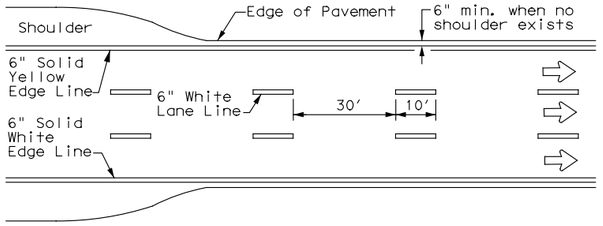
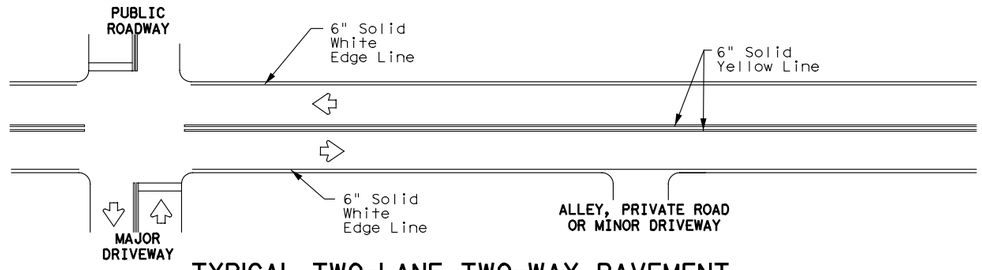
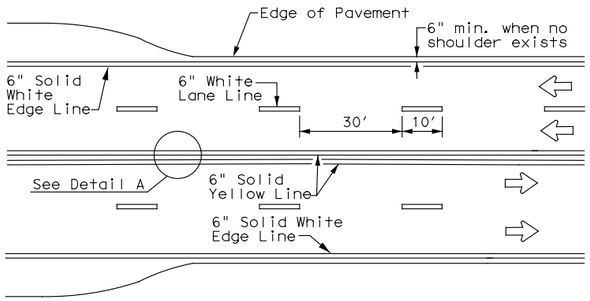
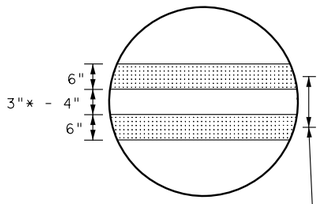


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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





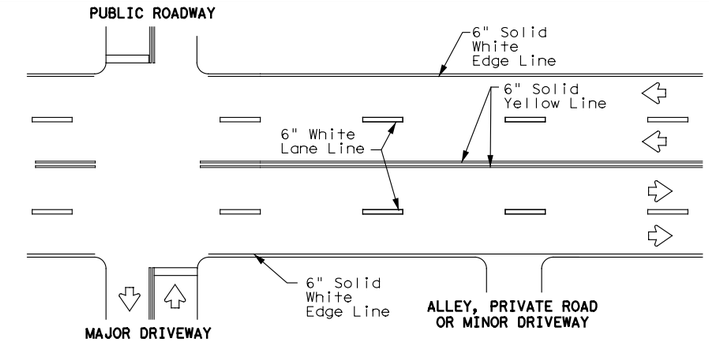
DETAIL "A"

9"** min. - 10" typ.
(18" max. for traveled way greater than 48' only)

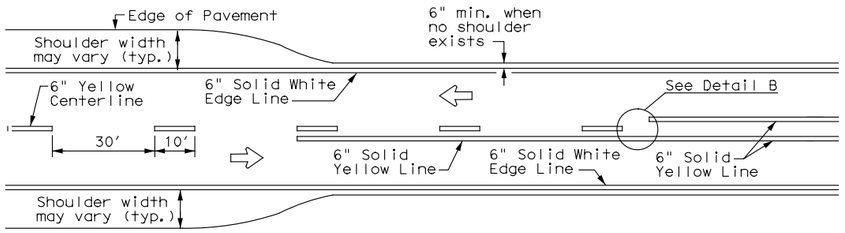
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

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

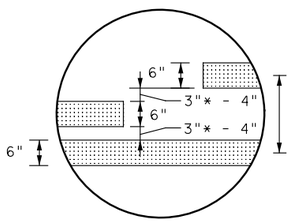
** 8" minimum for restripe projects when approved by the Engineer.



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



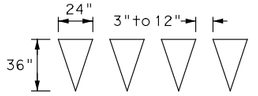
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



18" min. - 20" max.
(16" minimum for restripe projects when approved by the Engineer.)

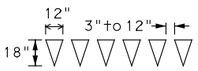
DETAIL "B"

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

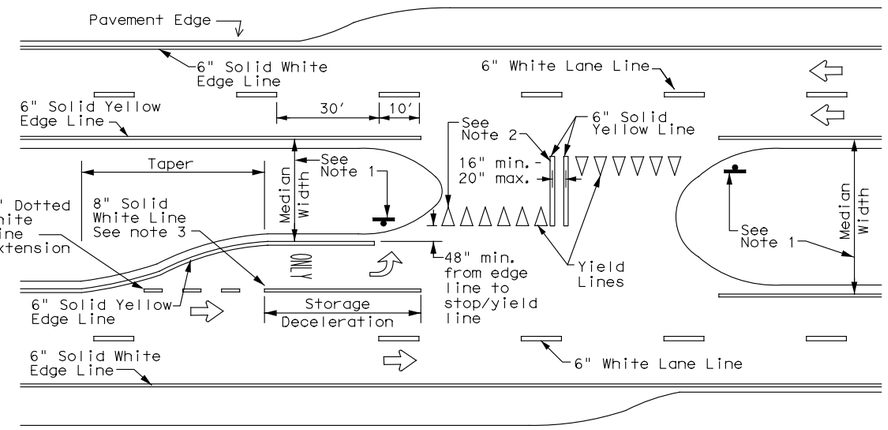


For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



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



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

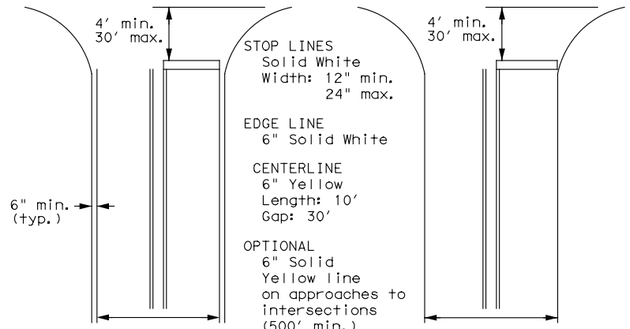
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling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

GENERAL NOTES

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

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

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



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

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

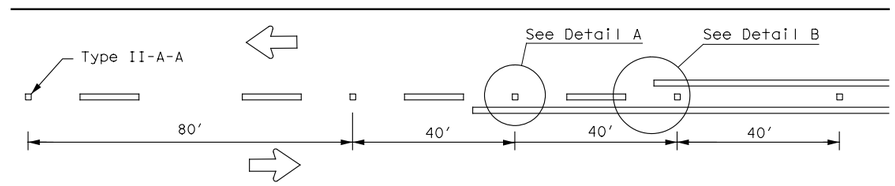
PM(1)-22

FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20	2304	02	044	FM 2410
8-95 3-03 12-22	DIST	COUNTY		SHEET NO.
5-00 2-12	WACO	BELL		204

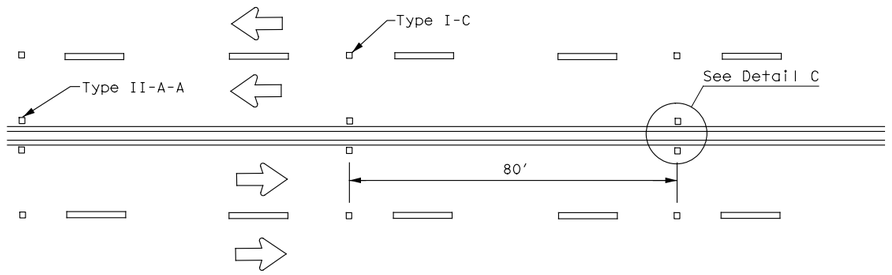
22A

DATE: 1/4/2023 4:39:36 PM
FILE: pm1-22.dgn

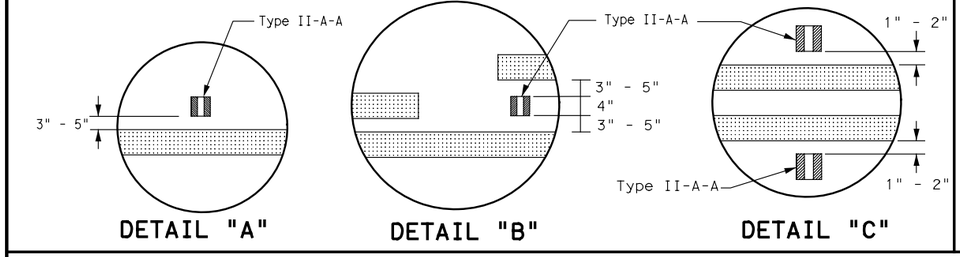
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

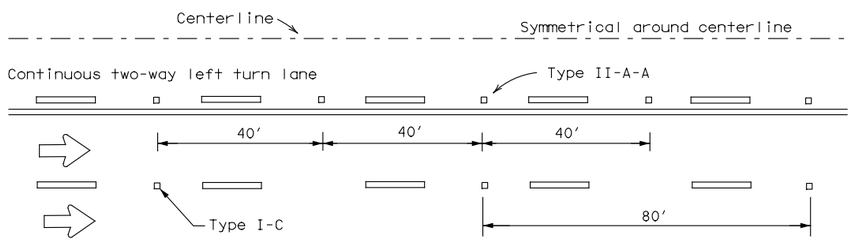


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

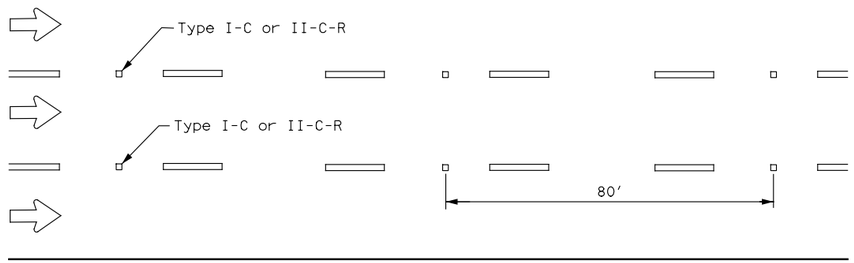


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



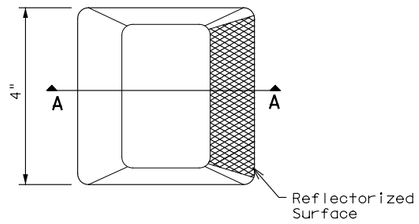
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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

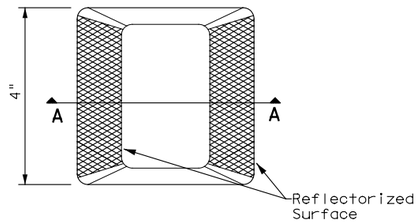
See Note 3.

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

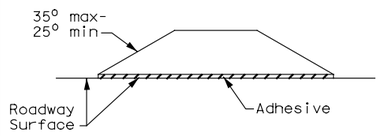
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

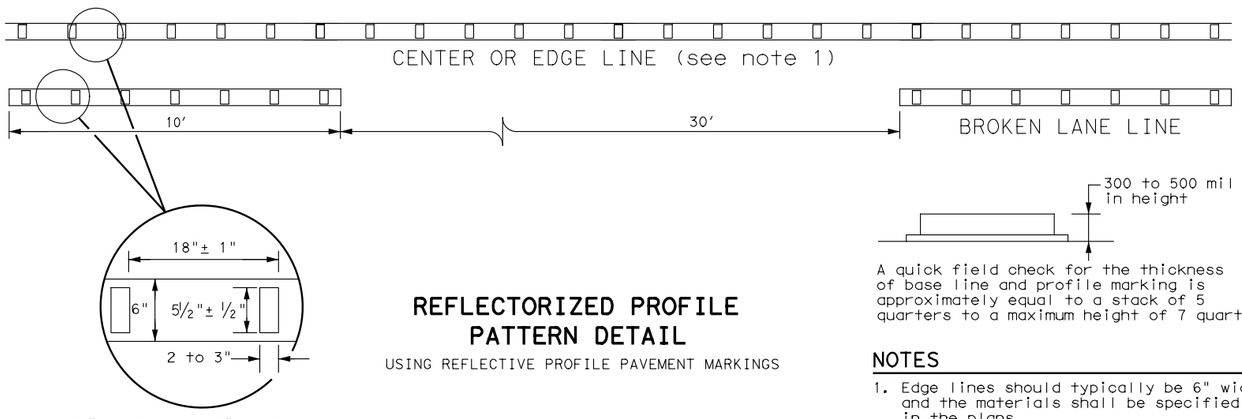


Type II (Top View)



SECTION A

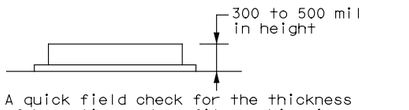
RAISED PAVEMENT MARKERS



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

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

Traffic Safety Division Standard

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

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
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4-77 8-00 6-20	DIST	COUNTY		SHEET NO.
4-92 2-10 12-22	WACO	BELL		205
5-00 2-12				

22B

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DATE: 1/4/2023 4:39:36 PM
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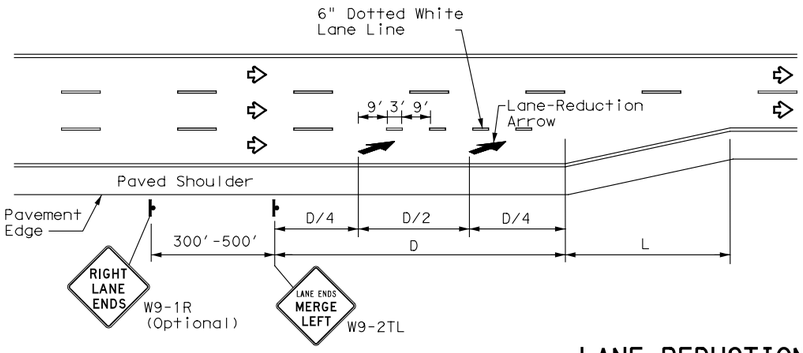
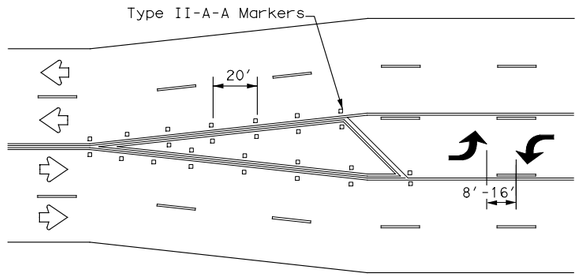


LANE REDUCTION

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional RIGHT LANE ENDS (W9-1R) sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

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



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

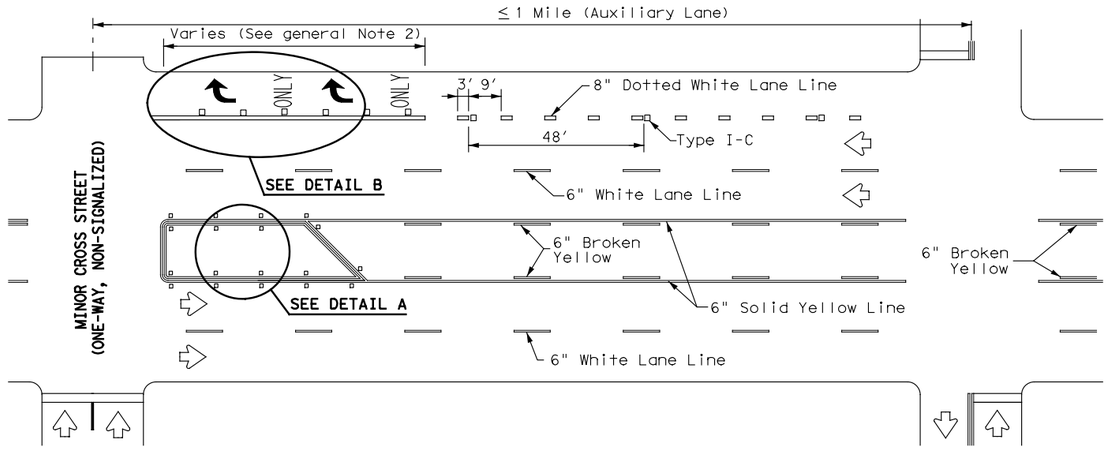
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

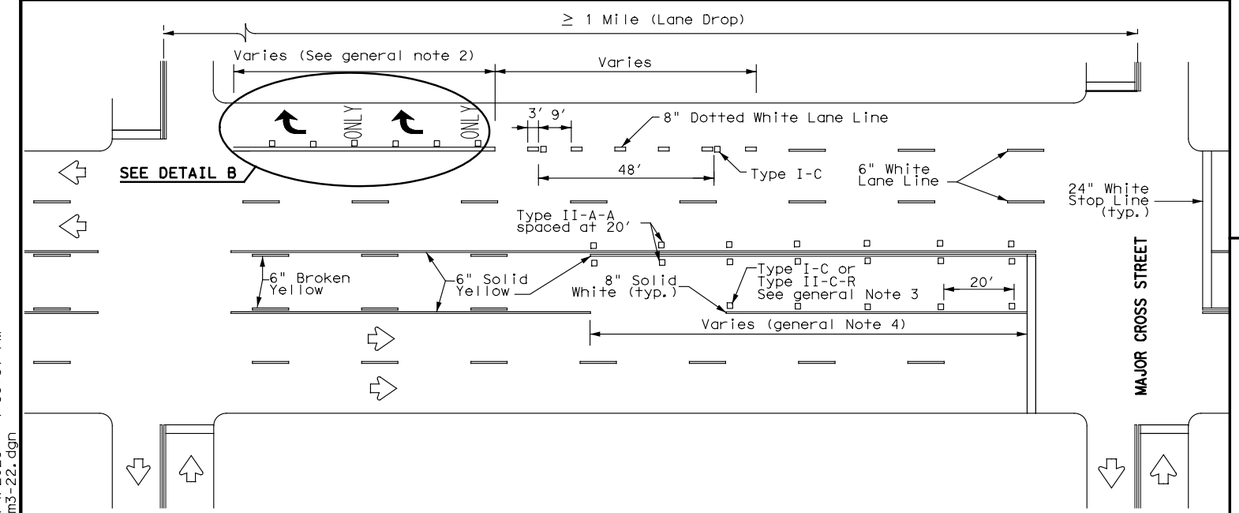
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

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

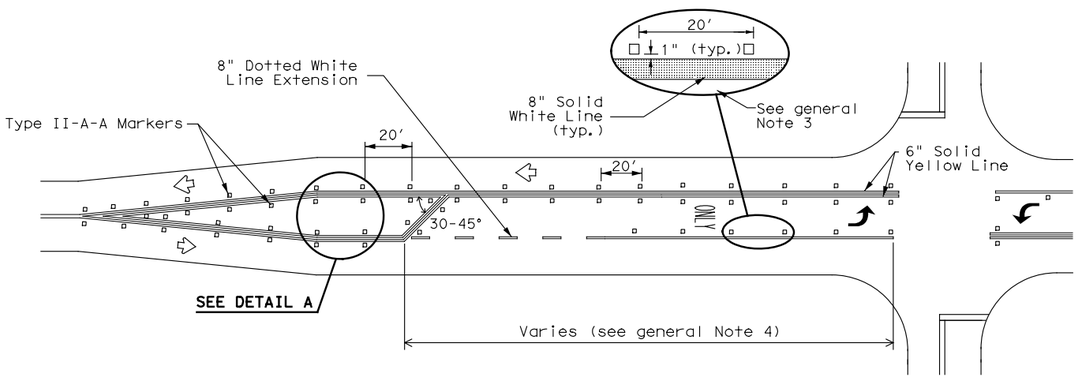
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



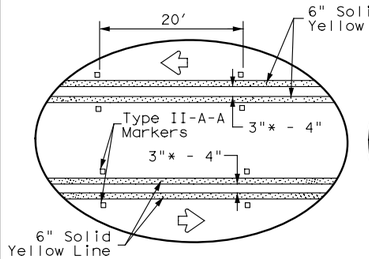
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



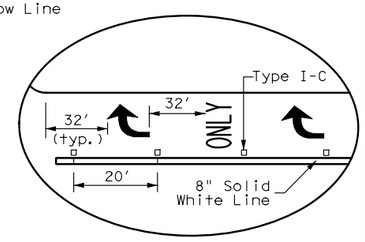
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



DETAIL A



DETAIL B

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

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-22

FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 3-03 6-20 5-00 2-10 12-22 8-00 2-12	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		206

22C

DATE: 1/4/2023 4:39:37 PM
FILE: pm3-22.dgn

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

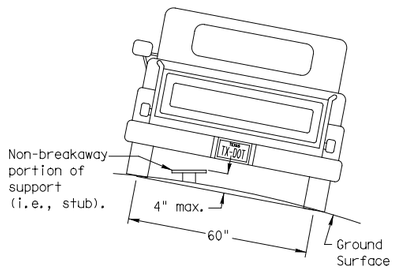
Anchor Type

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

Sign Mounting Designation

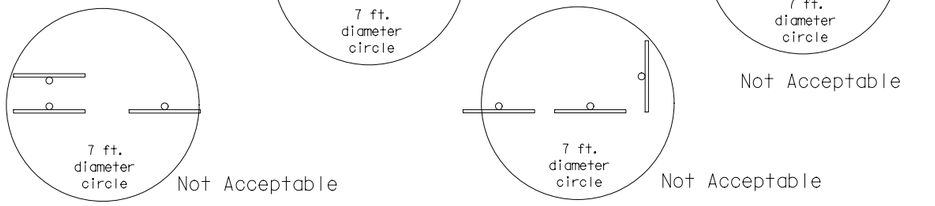
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))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

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



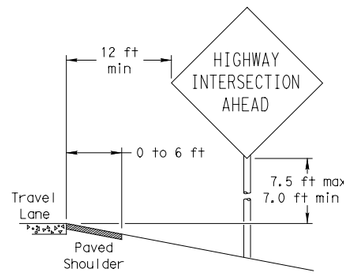
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



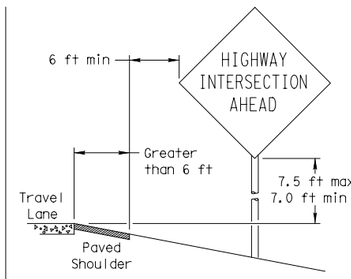
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

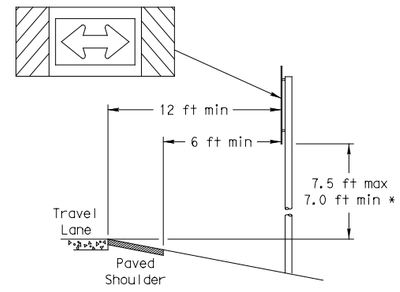
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



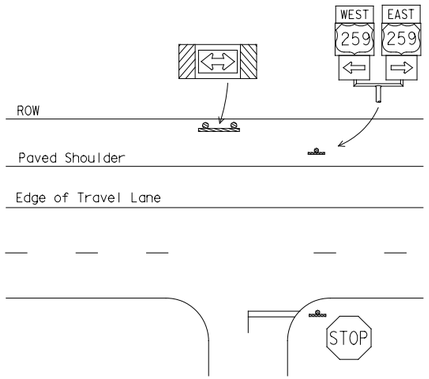
GREATER THAN 6 FT. WIDE

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

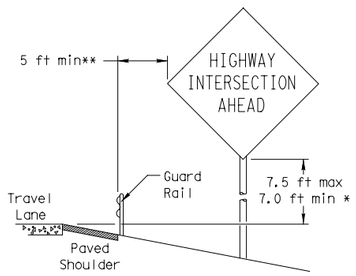
T-INTERSECTION



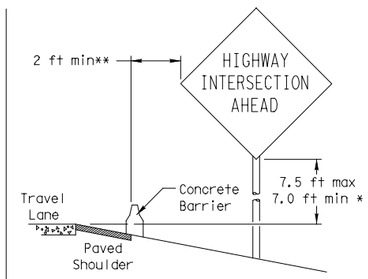
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

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

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

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

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

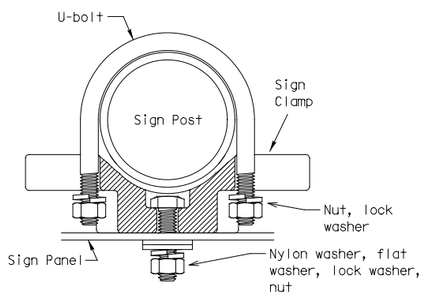
The maximum values may be increased when directed by the Engineer.

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

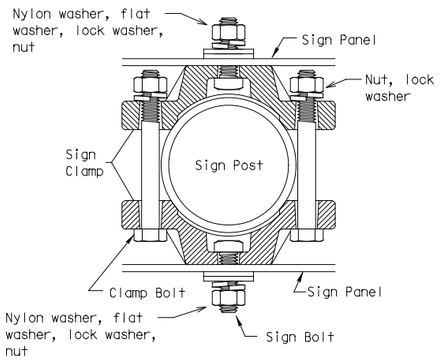
The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



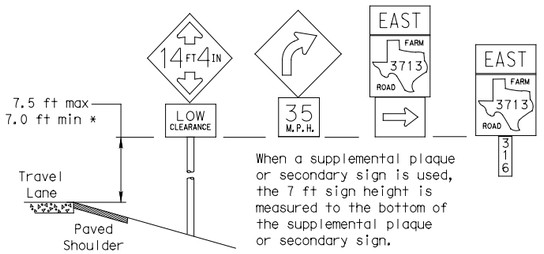
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

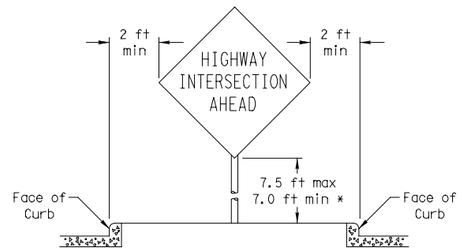
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



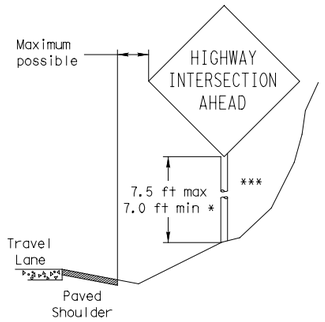
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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

REVISIONS
9-08

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

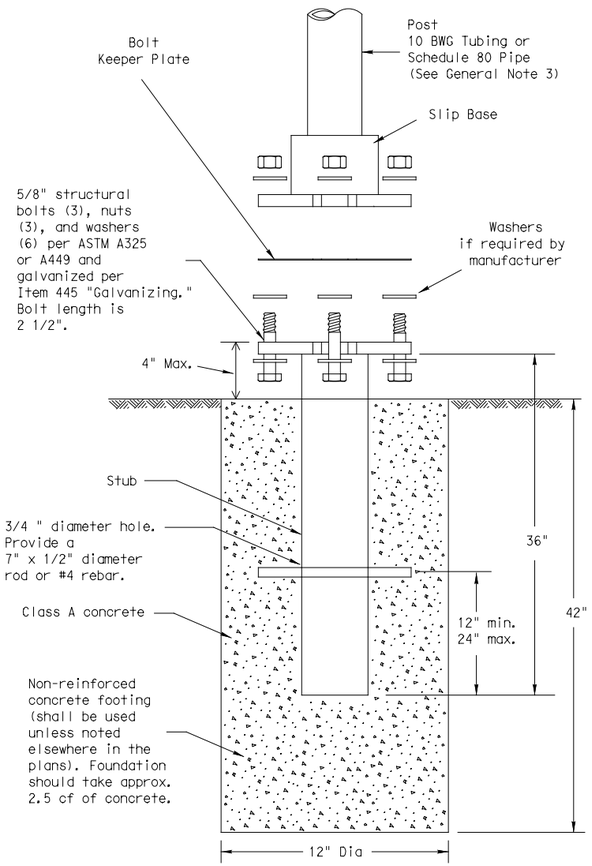
CONT	SECT	JOB	HIGHWAY
2304	02	044	FM 2410

DIST	COUNTY	SHEET NO.
WACO	BELL	207

26A

DATE: 11/1/2022 7:43:00 PM
FILE: smdgen.dgn

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

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

GENERAL NOTES:

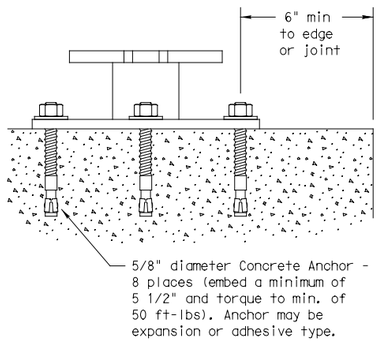
1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)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

ASSEMBLY PROCEDURE

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

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

CONCRETE ANCHOR



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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
2304	02	044	FM 2410

DIST	COUNTY	SHEET NO.
WACO	BELL	208

26B

DATE: 11/1/2022 7:43:00 PM
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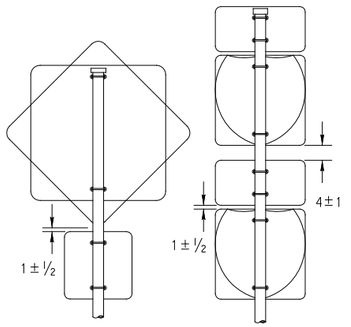
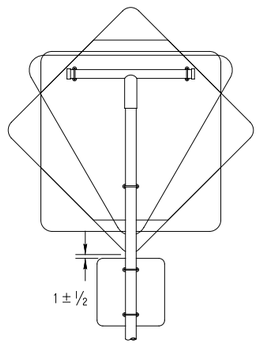


SM RD SGN ASSM TY XXXXX(1)XX(P)



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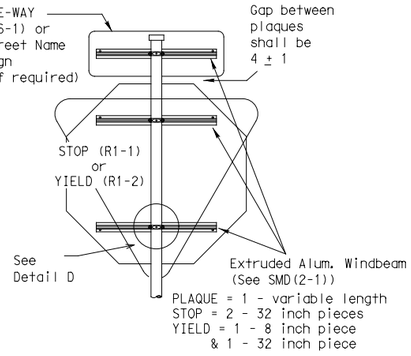

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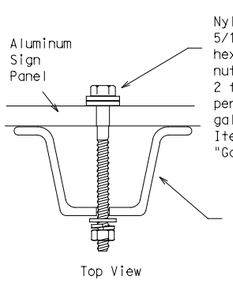
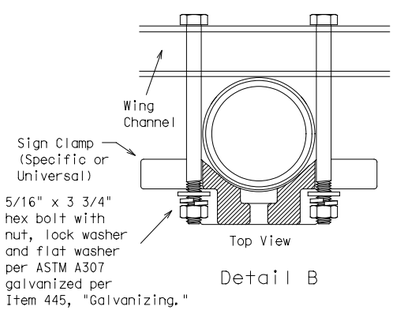


Detail A



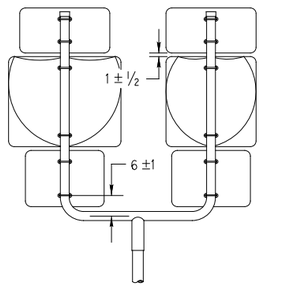
Detail B

GENERAL NOTES:

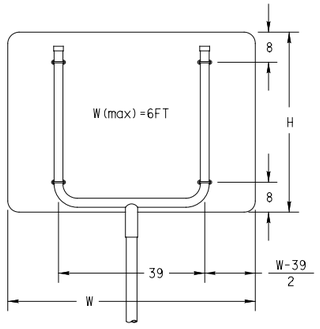
1.

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

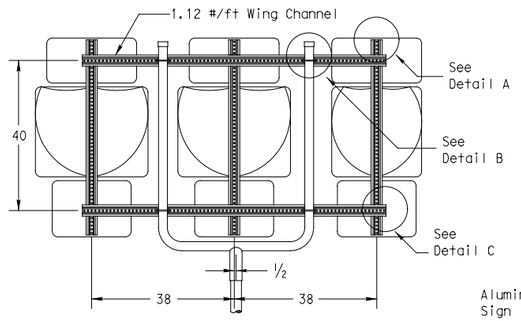
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material 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.



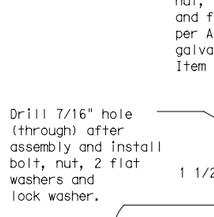
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

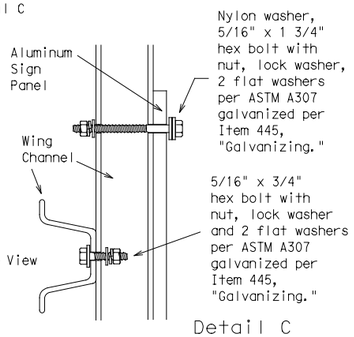


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

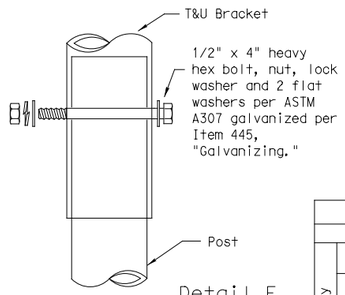


Detail F

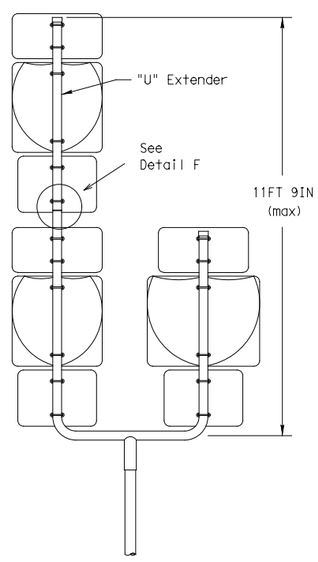
Splices shall only be allowed behind the sign substrate.



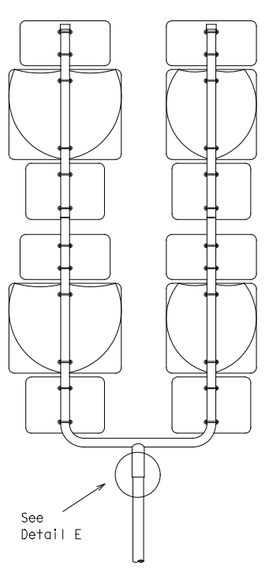
Detail C



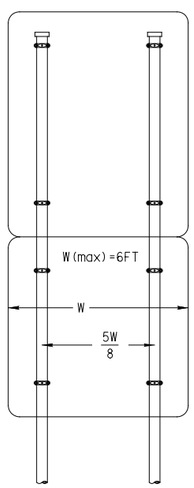
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

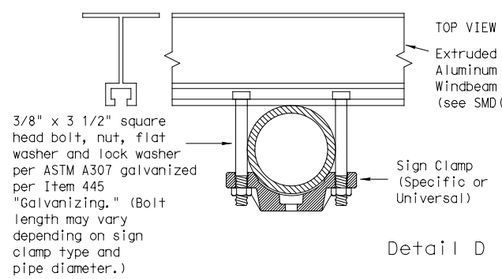


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

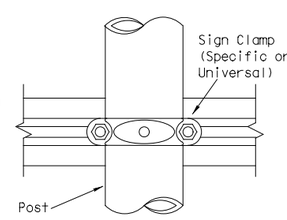


SM RD SGN ASSYM TY XXXXX(2)XX(P)

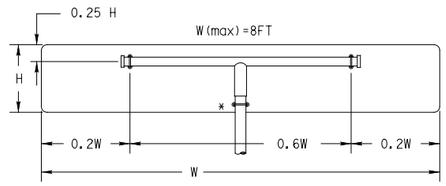
SIDE VIEW



Detail D



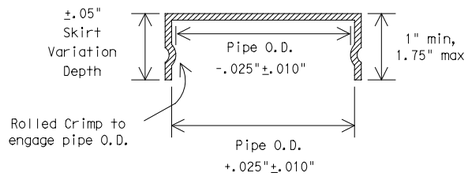
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	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)



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.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

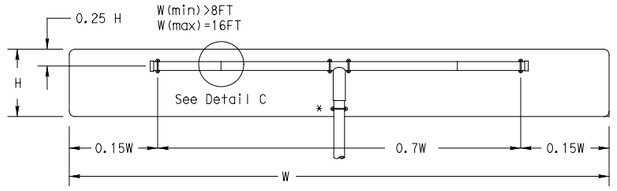
SMD(SLIP-2)-08

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		209

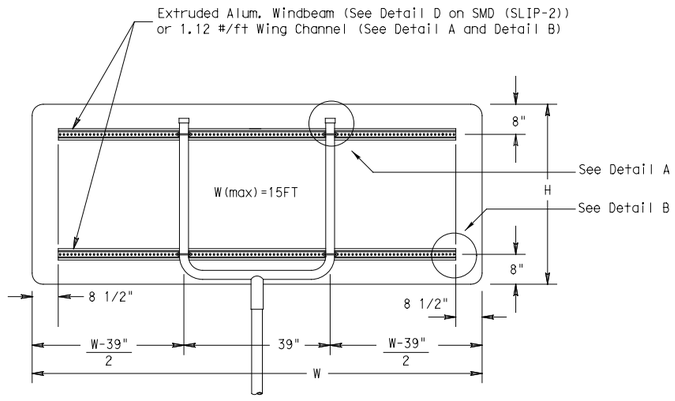
26C

DATE: 11/1/2022 7:43:01 PM
FILE: smds2.dgn

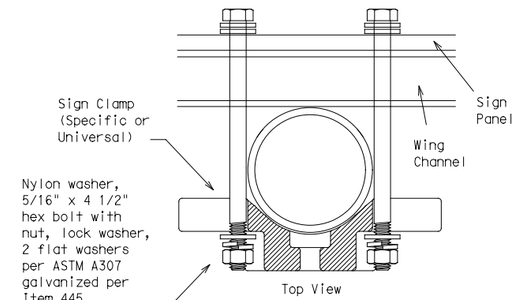


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

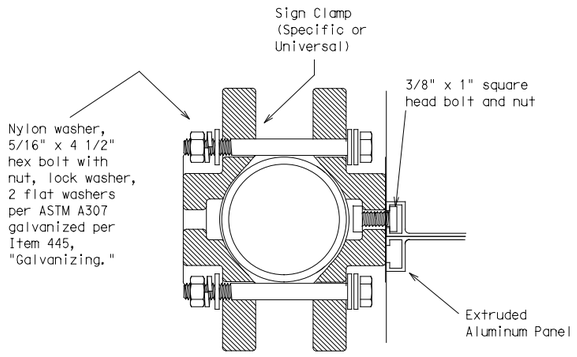
(* - See Note 12)



SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

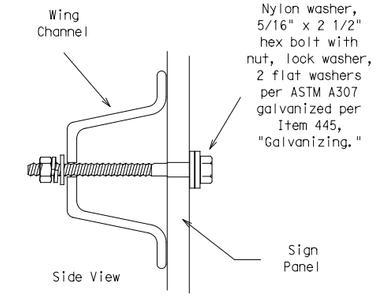


Detail A

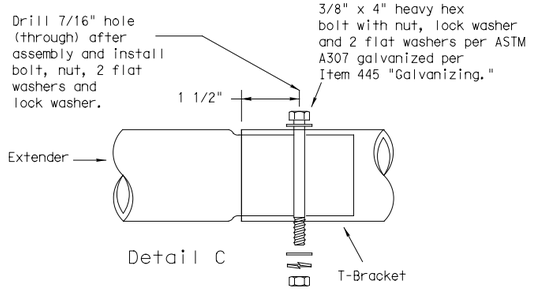


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET

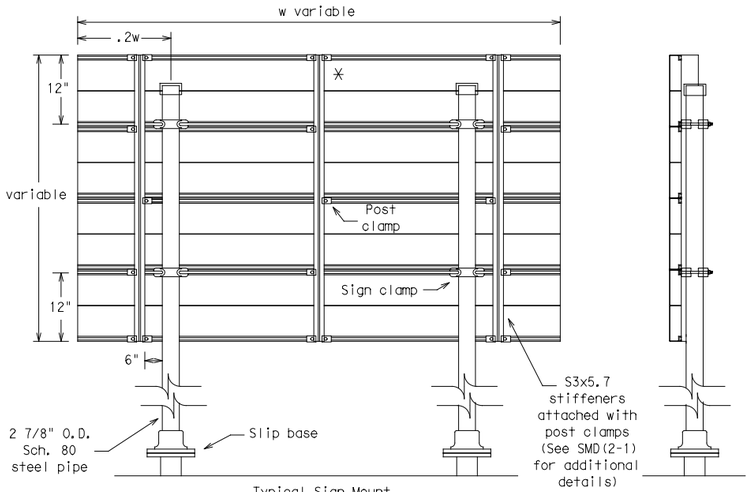


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

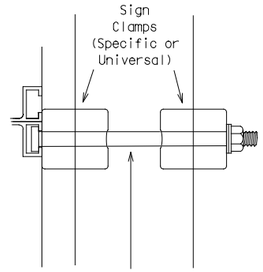


Typical Sign Mount

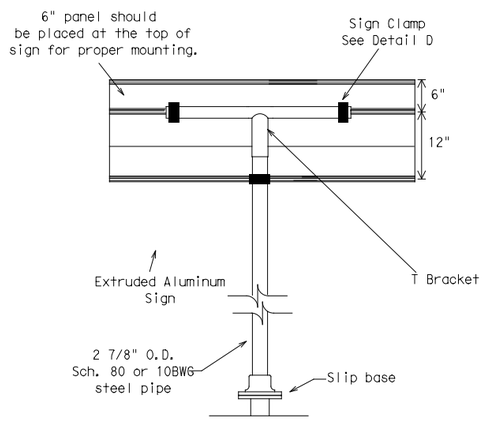
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

✳ Additional stiffener placed at approximate center of signs when sign width is greater than 10′.

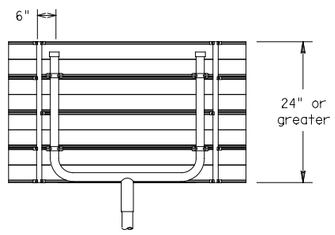
See Detail E
for clamp installation



Detail E



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

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.

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

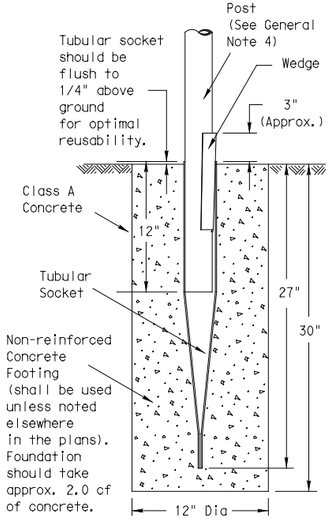
CONT	SECT	JOB	HIGHWAY
2304	02	044	FM 2410

DIST	COUNTY	SHEET NO.
WACO	BELL	210

26D

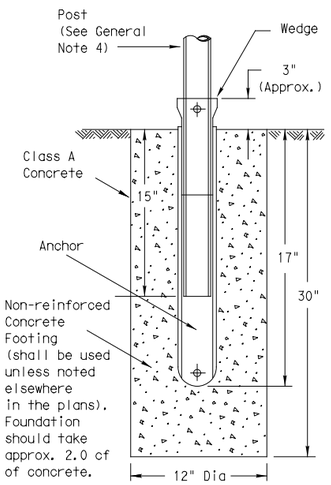
DATE: 11/1/2022 7:43:01 PM
FILE: smds3.dgn

Wedge Anchor Steel System



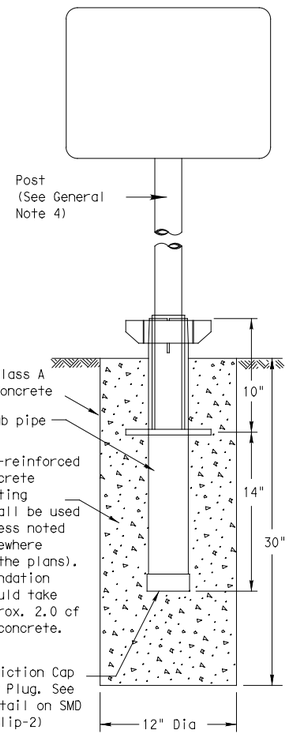
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

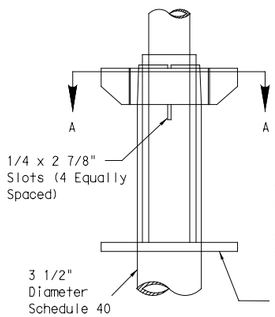


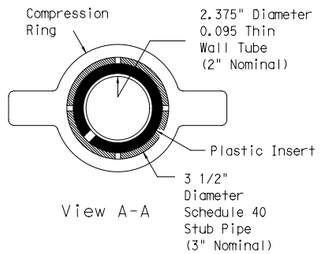
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post



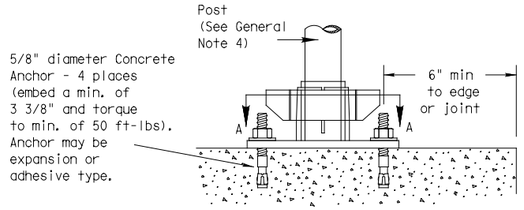
SM RD SGN ASSM TY TWT(X)UA(P)



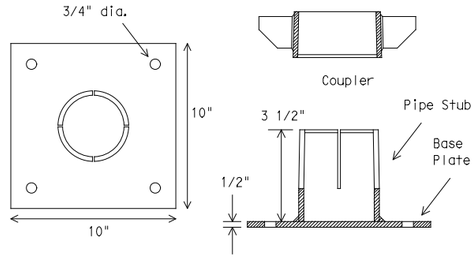


View A-A

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

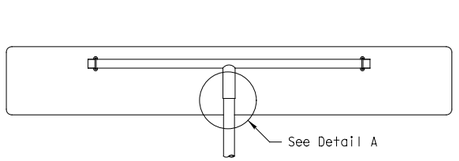


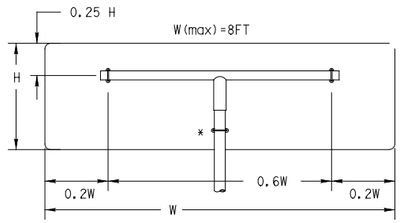
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized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



SM RD SGN ASSM TY TWT(X)UB(P)

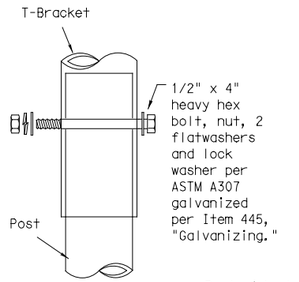
Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)

(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

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

GENERAL NOTES:

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

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

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

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	2304	02	044	FM 2410
	DIST	COUNTY		SHEET NO.
	WACO	BELL		211

26E

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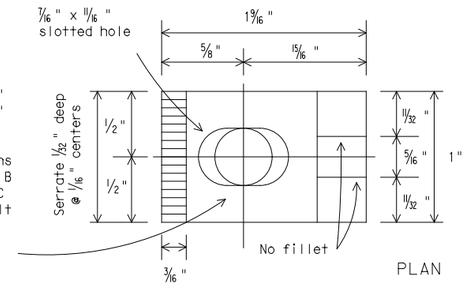
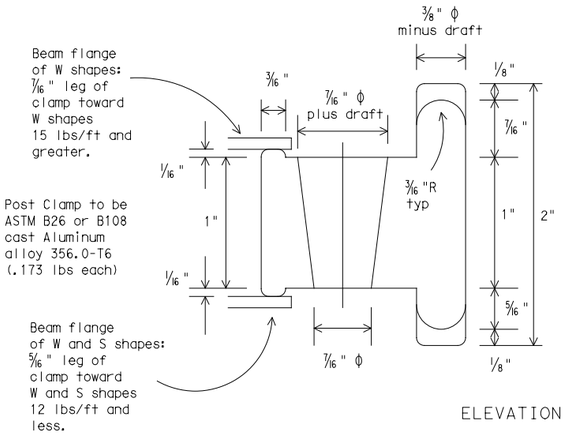
FILE: smdtwt.dgn

NOTE: centerline of hole for 3/8" diameter squarehead bolt x 2 1/4" long with a flat washer and self-locking nut, or lock washer and hex. nut. Bolt head dimensions shall be in accordance with ANSI B 18.2.1 as referred to in the AISC Manual of steel construction. Bolt assembly shall be galvanized.

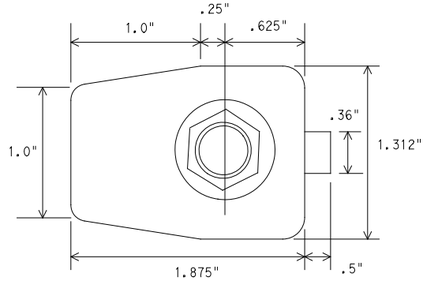


PLAN

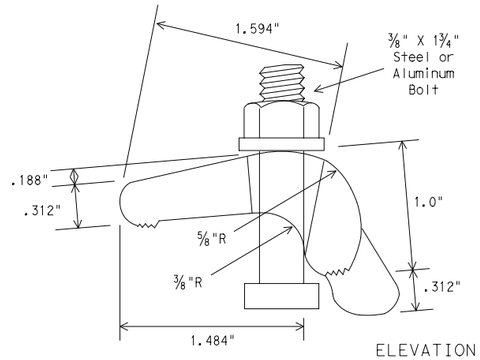


ELEVATION

POST CLAMP DETAIL

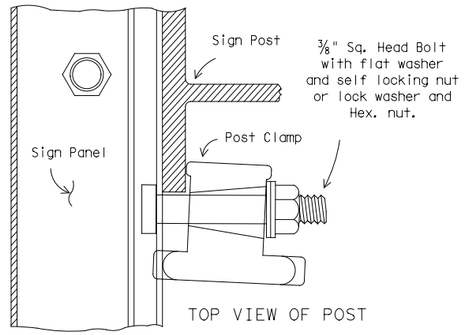


PLAN

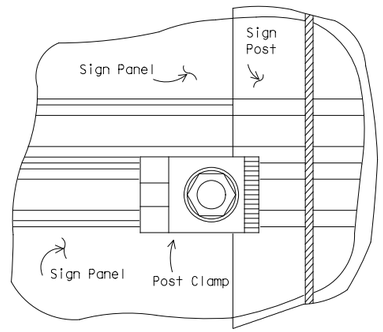


ELEVATION

ALTERNATE POST CLAMP DETAIL



TOP VIEW OF POST



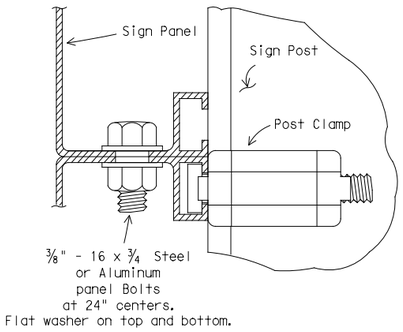
TOP VIEW OF CLAMP

DEPARTMENTAL MATERIAL SPECIFICATIONS

SIGN HARDWARE DMS-7120

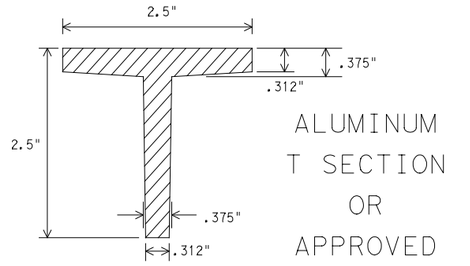
GENERAL NOTES:

1. Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
2. Materials and fabrication shall conform to the requirements of the Department material specifications.
3. Structural steel shall be "low-alloy steel" for non-bridge structures per Item 442, "Metal For Structures."
4. For fiberglass substrate connection details, see manufacturer's recommendations.



SIDE VIEW OF PANELS

CONNECTION DETAILS

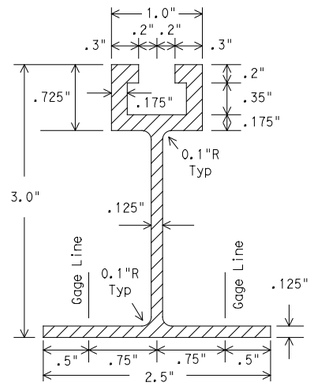


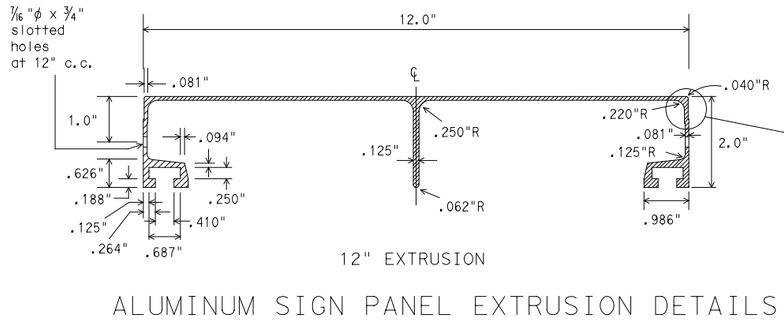
1.912 lbs/ft

ALUMINUM T SECTION OR APPROVED ALTERNATIVE

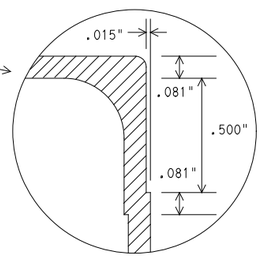
WINDBEAM CROSS SECTION

Windbeam to be extruded aluminum (1.175 lbs/ft) or approved alternative

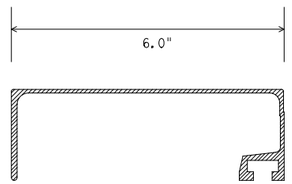




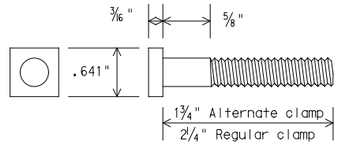
12" EXTRUSION



ALUMINUM SIGN PANEL EXTRUSION DETAILS



6" EXTRUSION



POST CLAMP BOLT DETAIL

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS- EXTRUDED ALUMINUM SIGN PANELS & HARDWARE

SMD(2-1)-08

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

CONT	SECT	JOB	HIGHWAY
2304	02	044	FM 2410

DIST	COUNTY	SHEET NO.
WACO	BELL	212

9-08 REVISIONS

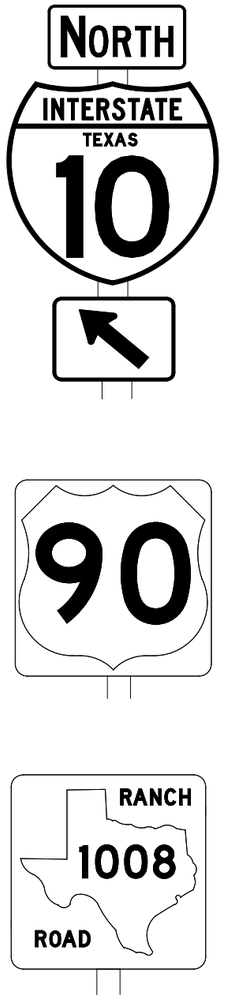
27A

DATE: 11/1/2022 7:43:02 PM
FILE: smd21-08.dgn

DATE: 11/1/2022 7:43:02 PM
FILE: tsr3-13.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

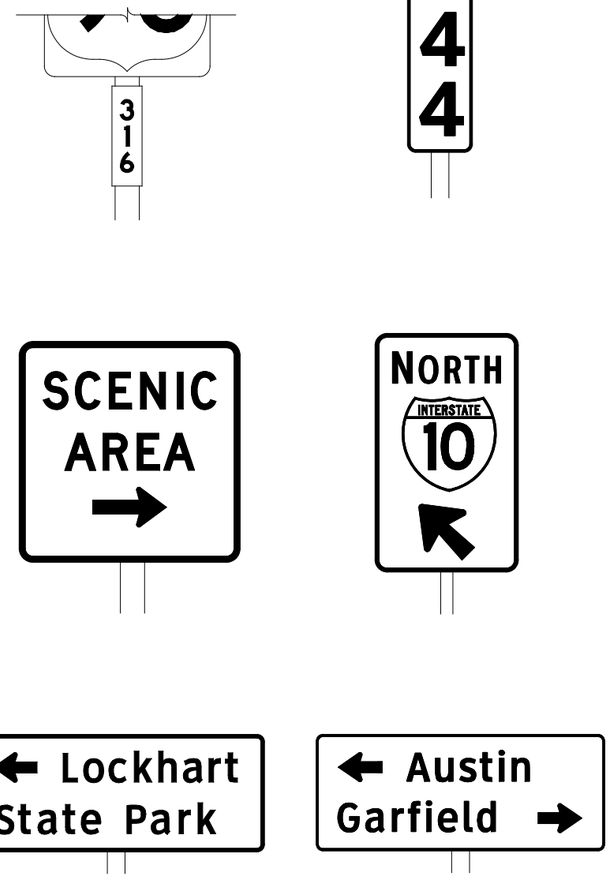
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



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

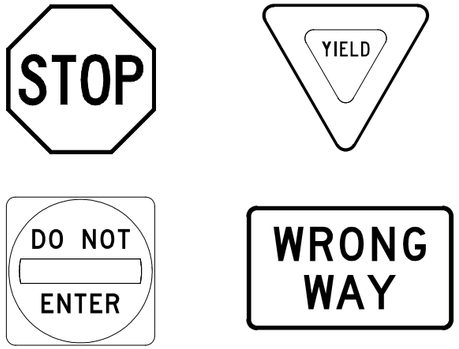
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	WACO	BELL		213

DATE: 11/1/2022 7:43:02 PM
FILE: 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

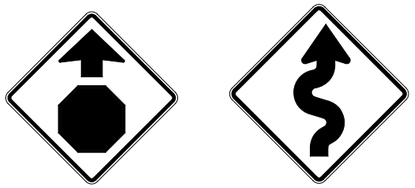
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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

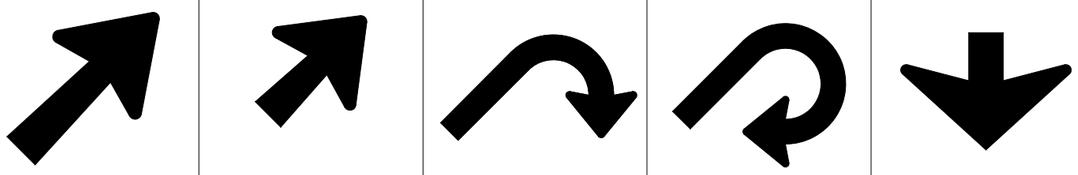
TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	WACO	BELL		214

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



Type A | Type B | E-3 | E-4 | Down Arrow

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

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

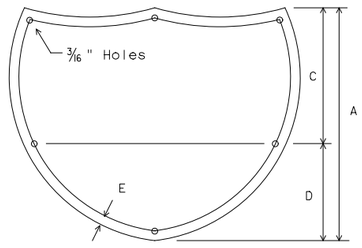
NOTE

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

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

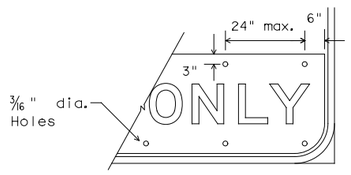
http://www.txdot.gov/

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

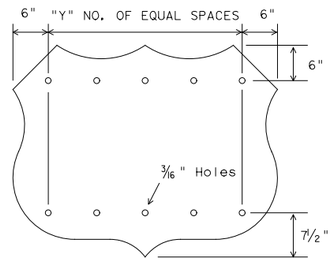


INTERSTATE ROUTE MARKERS

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

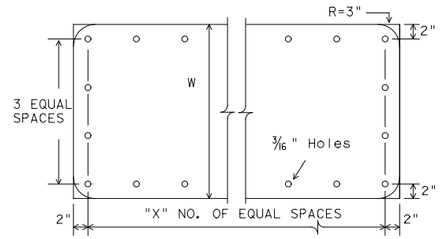


EXIT ONLY PANEL



U.S. ROUTE MARKERS

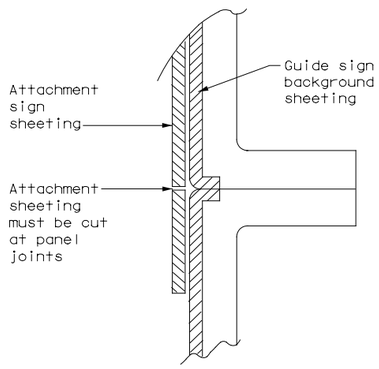
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



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

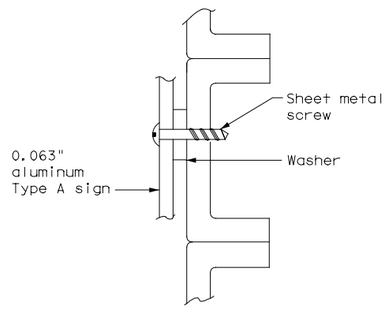
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



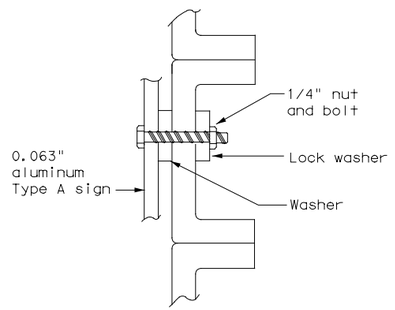
DIRECT APPLIED ATTACHMENT

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



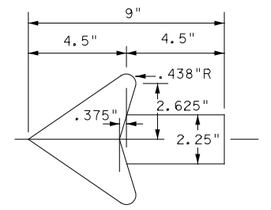
NUT/BOLT ATTACHMENT

NOTE:

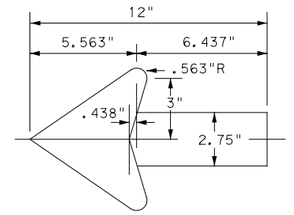
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

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

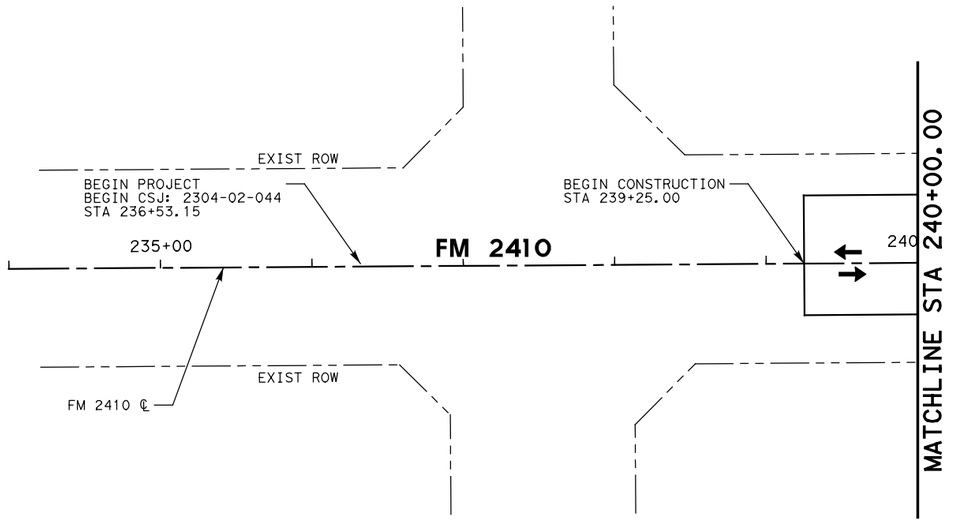
TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2304	02	044	FM 2410
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	WACO	BELL		215

5

DATE: 11/1/2022 7:43:03 PM
FILE: tsr5-13.dgn



50 25 0 50 100

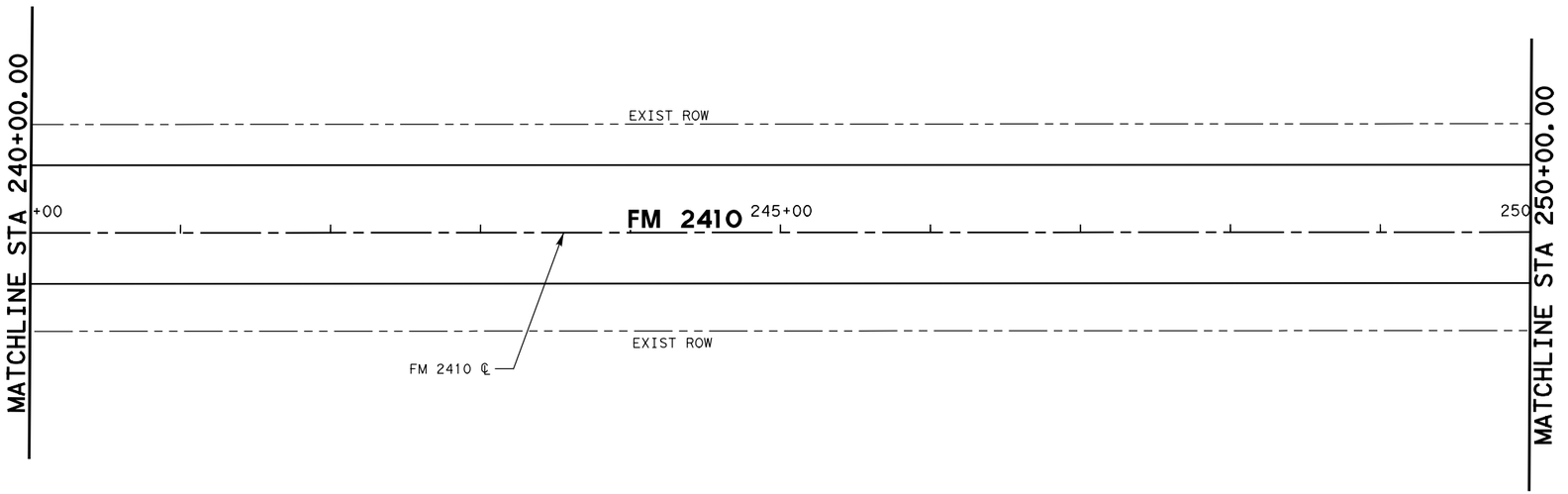
HORIZONTAL SCALE: 1" = 100'

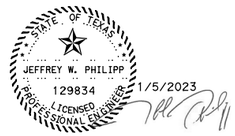
NOTES:
1. NO SW3P ITEMS NEEDED IN MILL AND INLAY AREAS.

LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

NO WORK ON THIS SHEET





FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 1 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	218
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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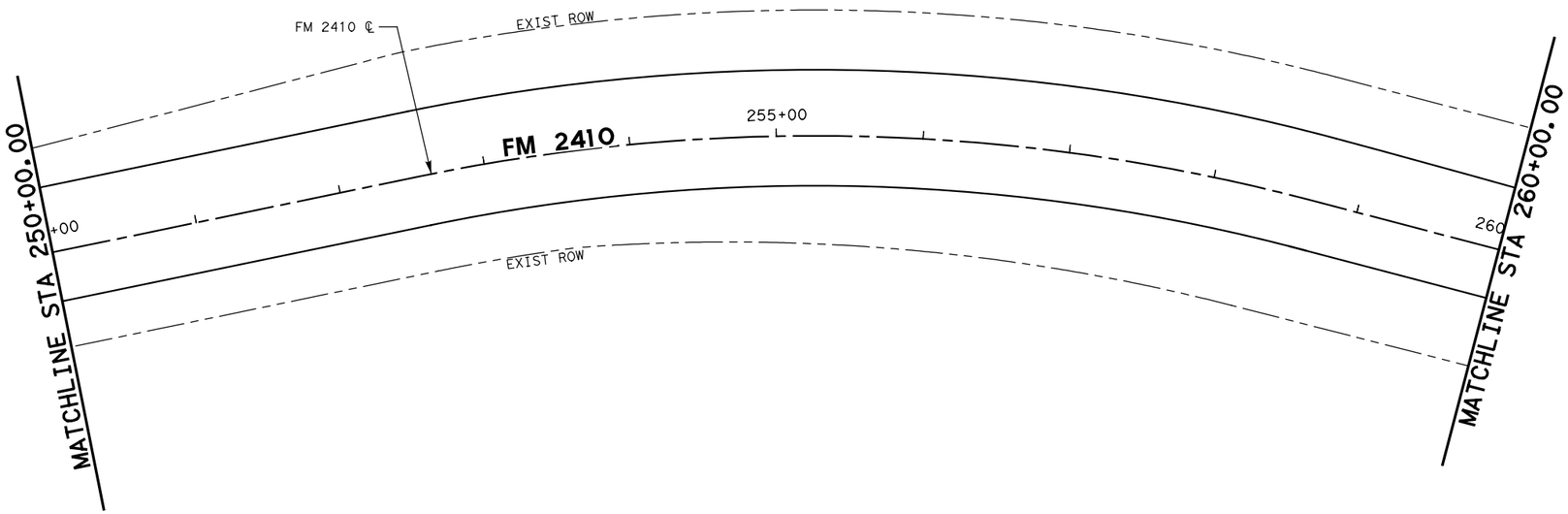
DATE: 1/5/2023 1:29:19 PM mchowdhury



50 25 0 50 100

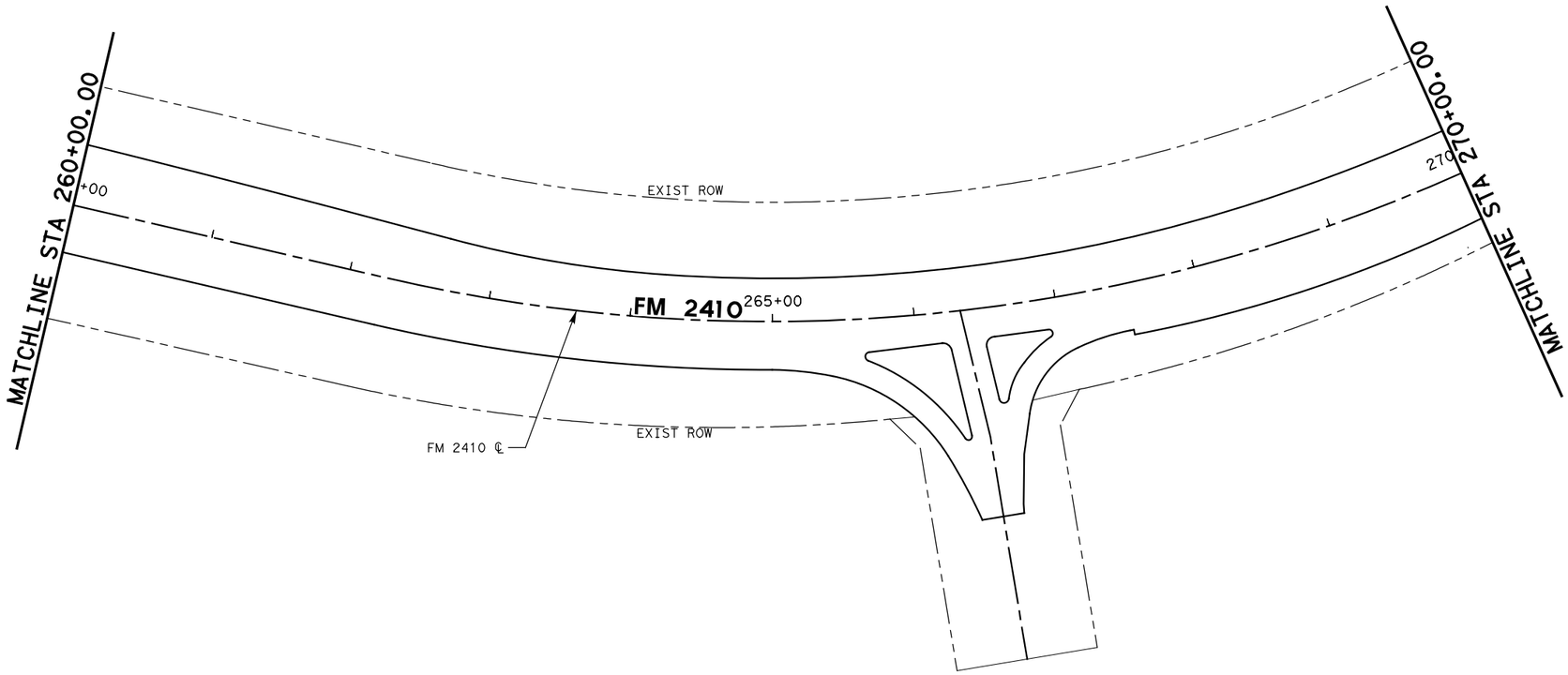
HORIZONTAL SCALE: 1" = 100'

NOTES:
1. NO SW3P ITEMS NEEDED IN MILL AND INLAY AREAS.

LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

NO WORK ON THIS SHEET



FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 2 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	219
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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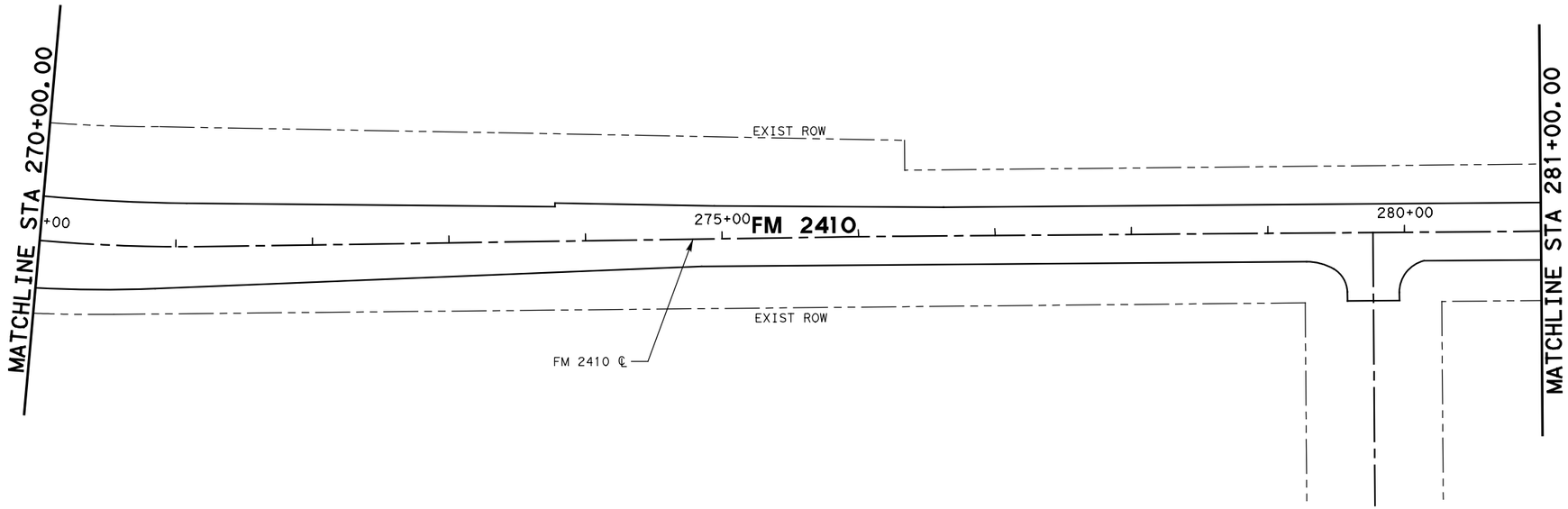
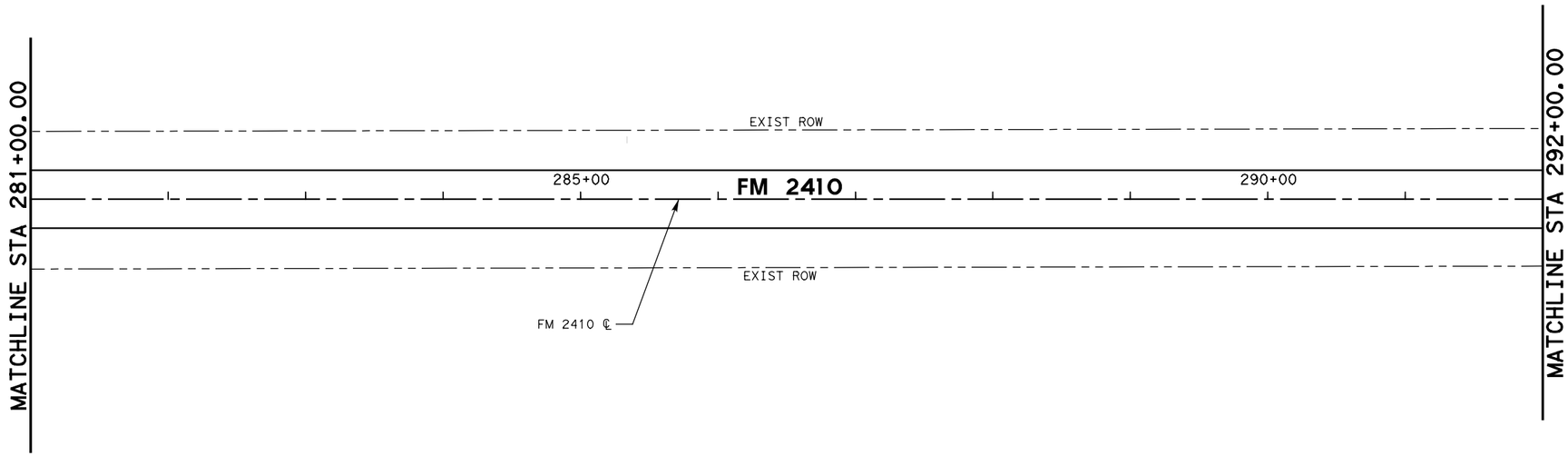


NO WORK ON THIS SHEET



50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

NOTES:
1. NO SW3P ITEMS NEEDED IN MILL AND INLAY AREAS.

LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 3 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	220
GRAPHICS JP	CONTROL	SECTION	JOB	
GRPH CHECK	2304	02	044	
RJ				

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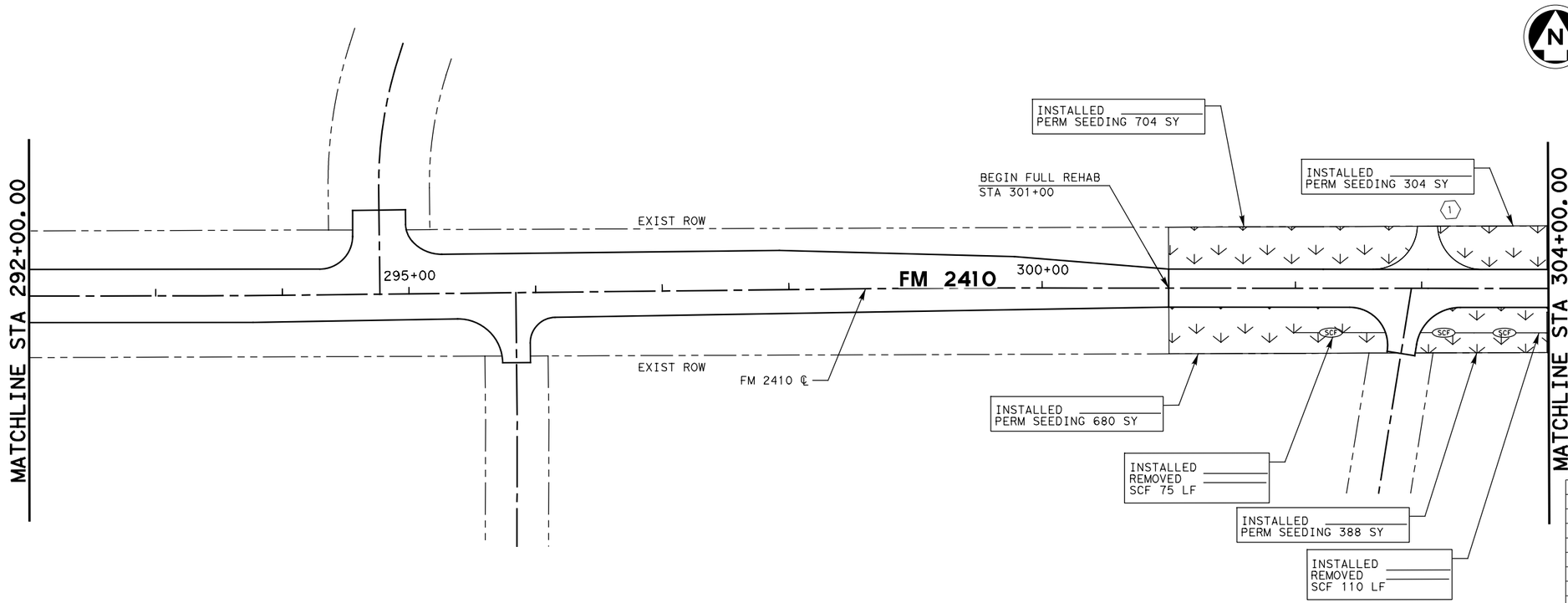
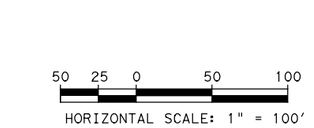


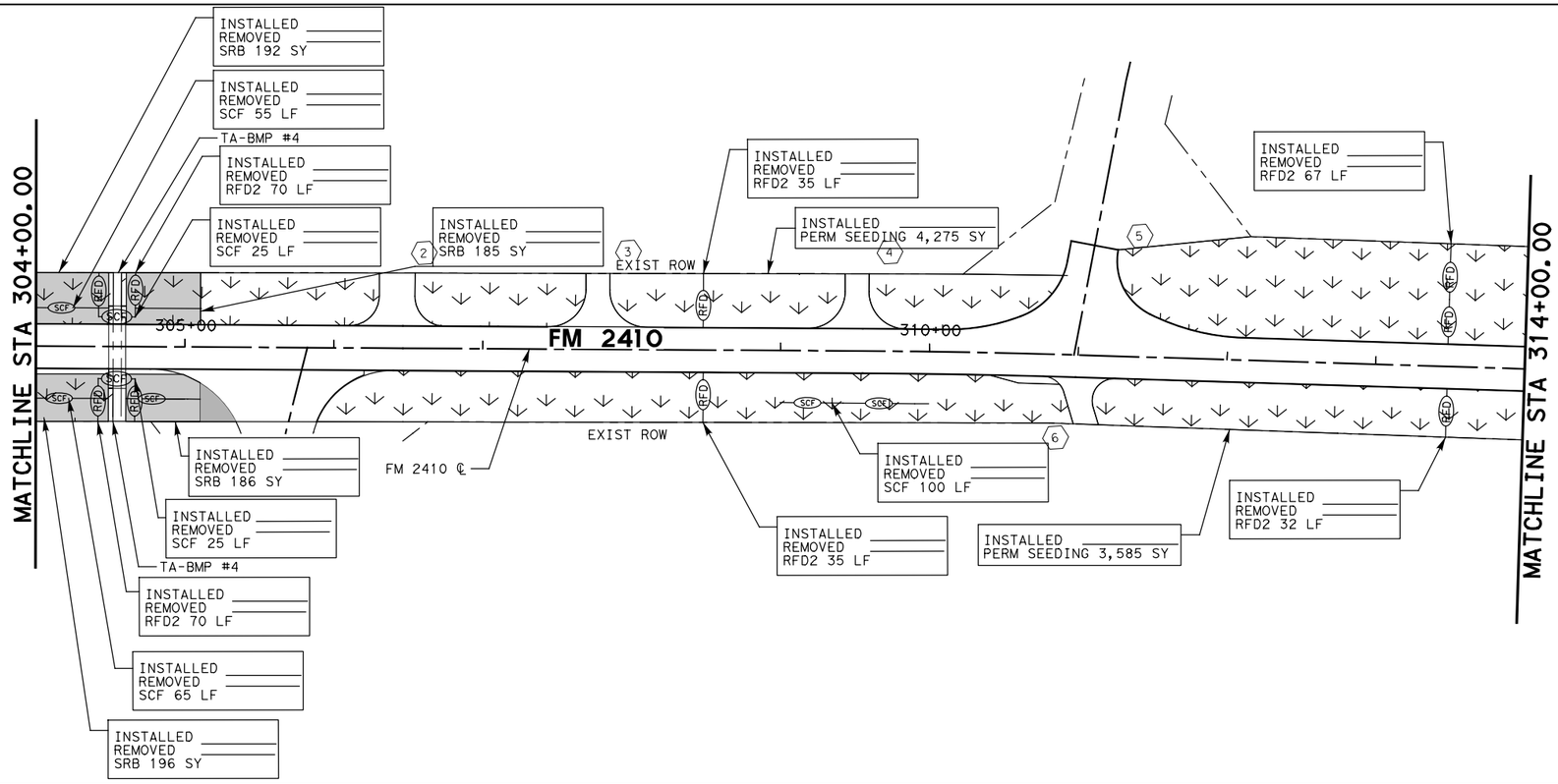


NOTES:
1. NO SW3P ITEMS NEEDED IN MILL AND INLAY AREAS.

LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	9936
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	9936
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	4968
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	4968
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	759
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	309
506-6011	ROCK FILTER DAMS (REMOVE)	LF	309
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	455
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	455



STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 4 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	221
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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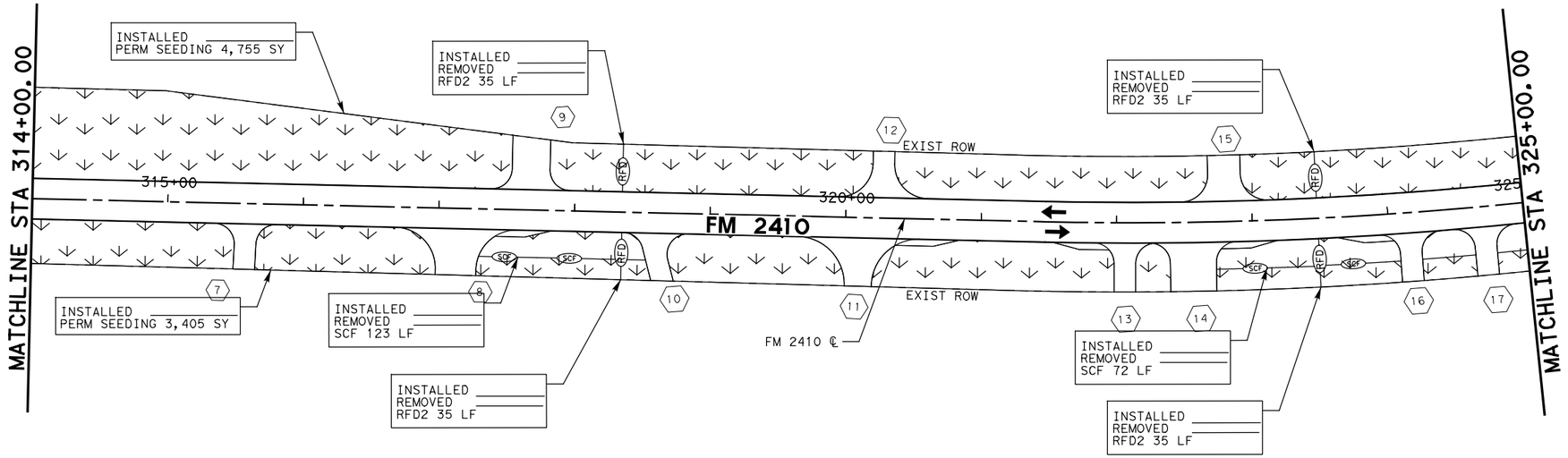


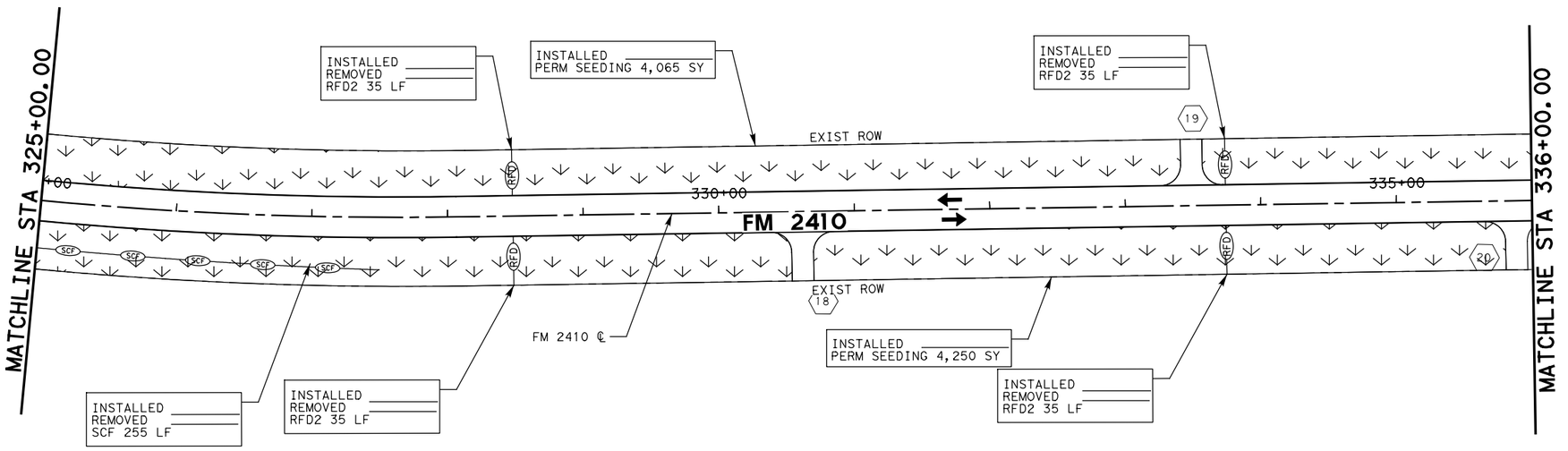
50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	16475
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	16475
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	8238
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	8238
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	280
506-6011	ROCK FILTER DAMS (REMOVE)	LF	280
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	450
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	450



FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 5 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS	CONTROL	SECTION	JOB	222
JP				
GRPH CHECK	2304	02	044	
RJ				

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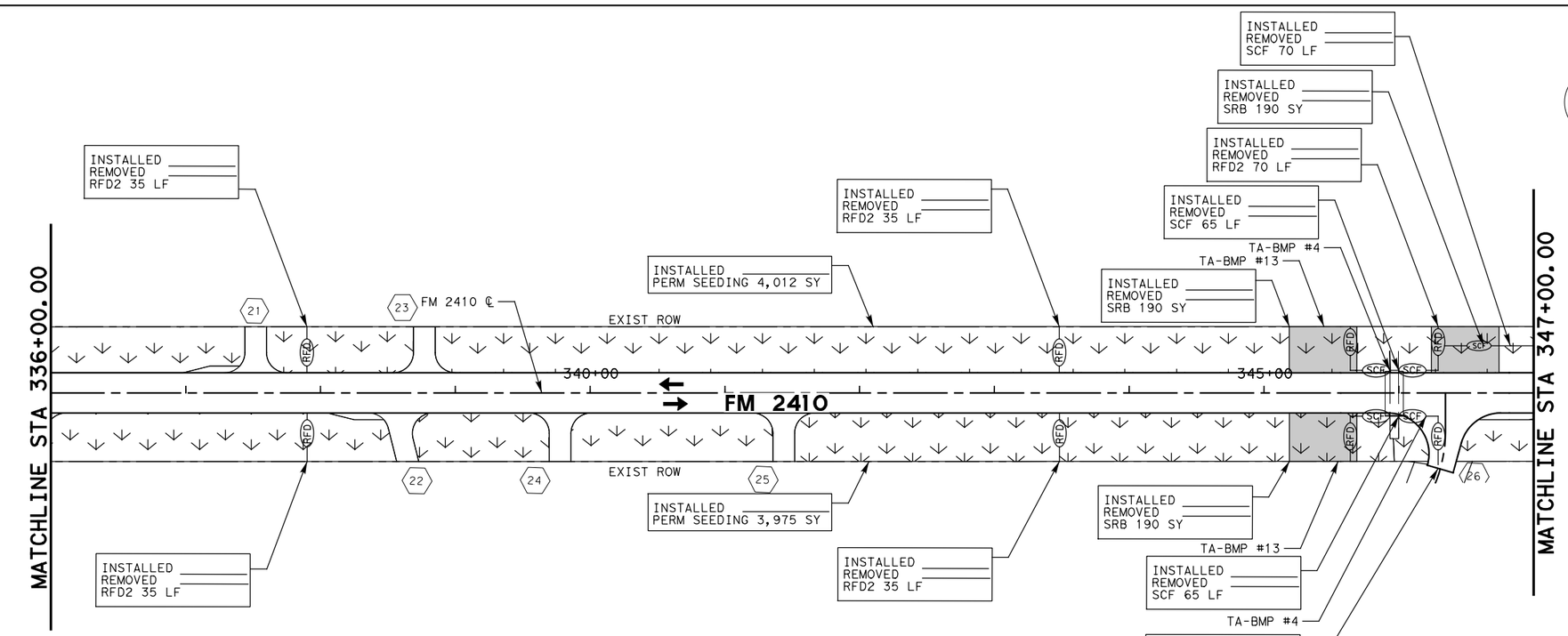


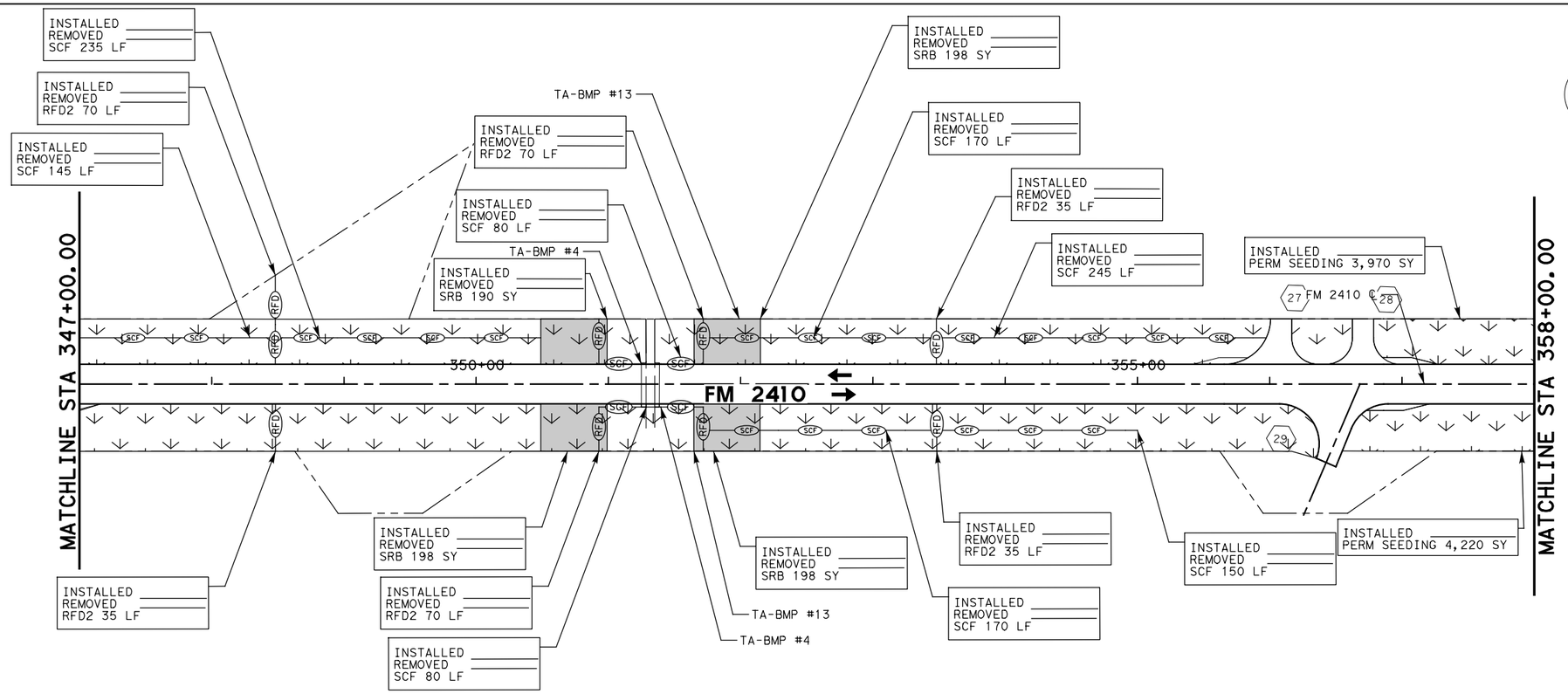
50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	16177
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	16177
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	8089
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	8089
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	1354
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	595
506-6011	ROCK FILTER DAMS (REMOVE)	LF	595
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1475
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1475



STATE OF TEXAS
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STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 6 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	223
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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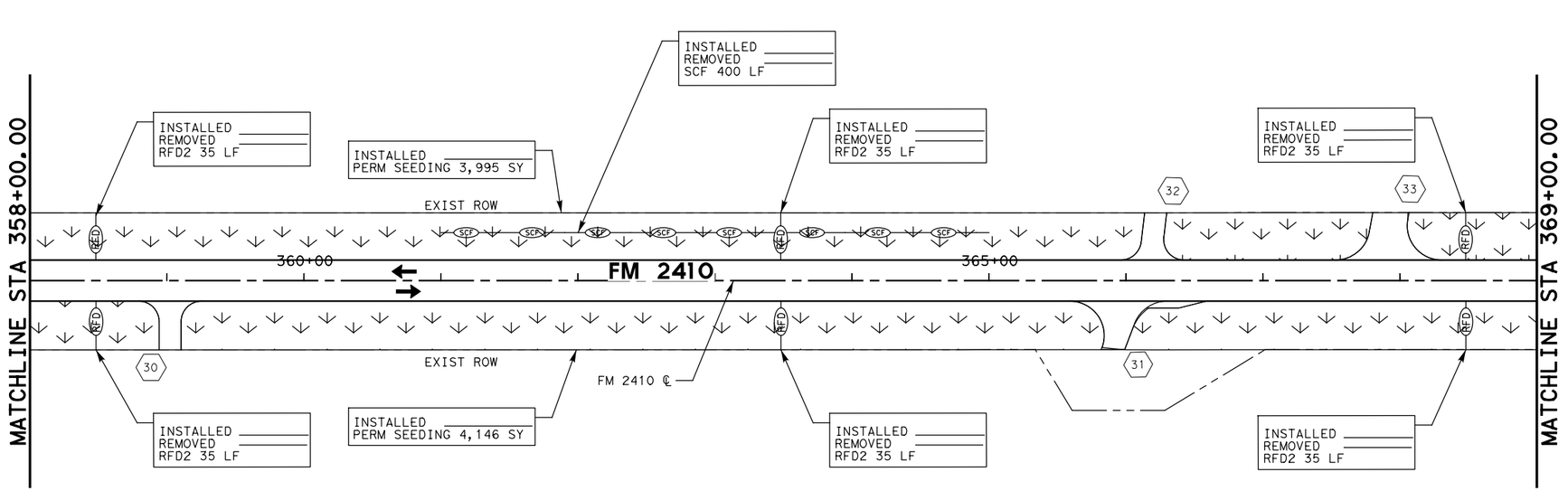
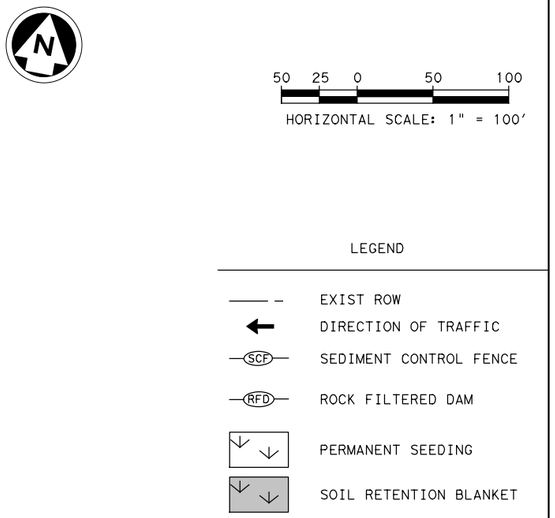
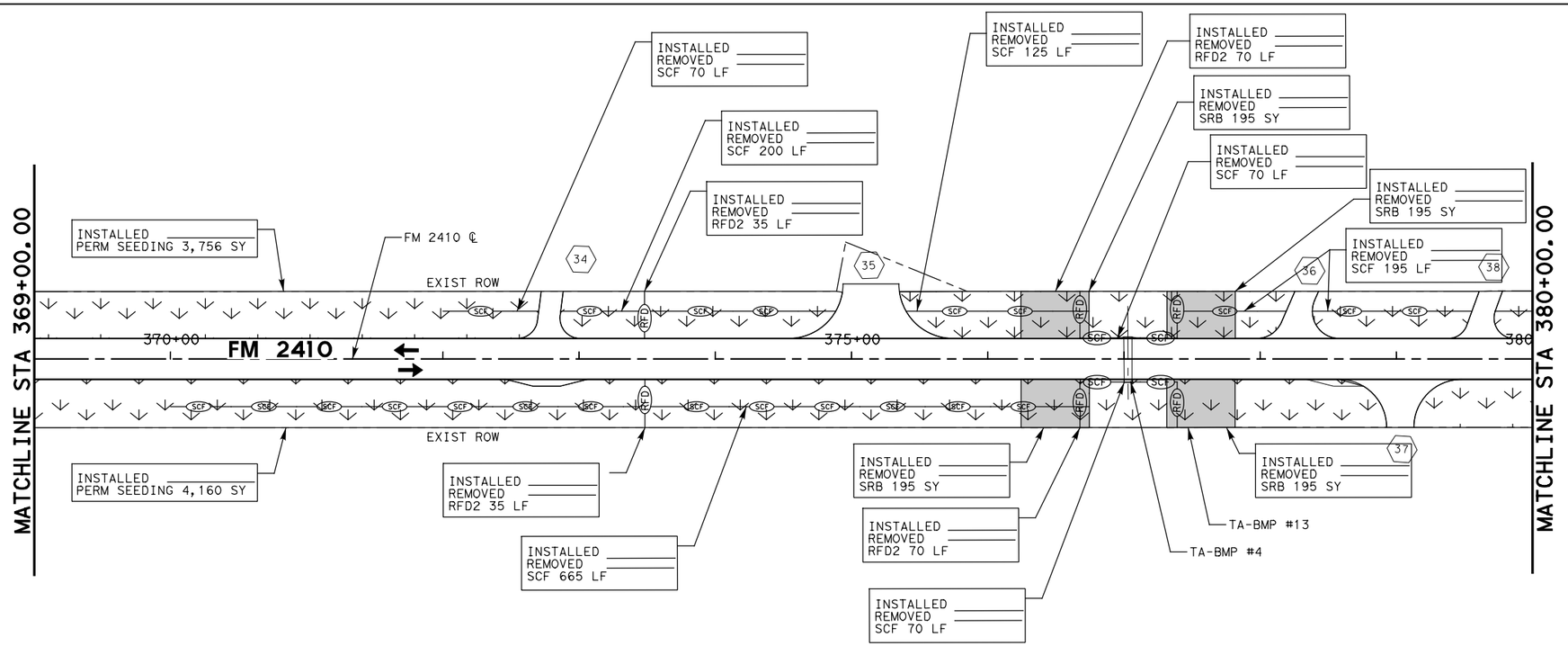




160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	16057
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	16057
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	8029
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	8029
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	780
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	420
506-6011	ROCK FILTER DAMS (REMOVE)	LF	420
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1795
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1795



FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 7 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	224
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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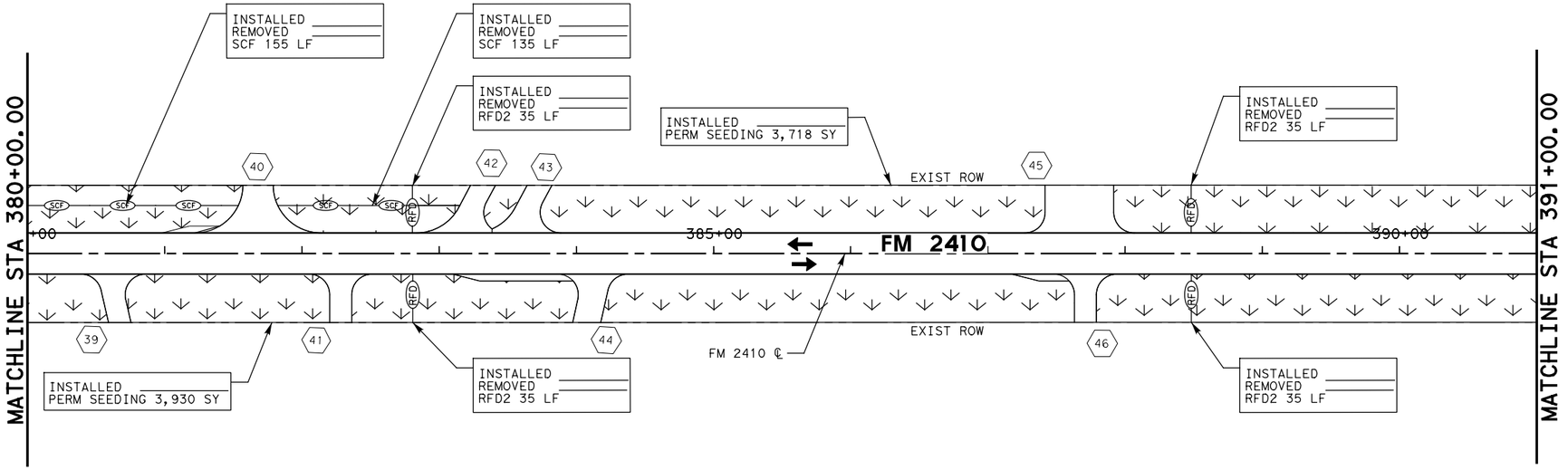
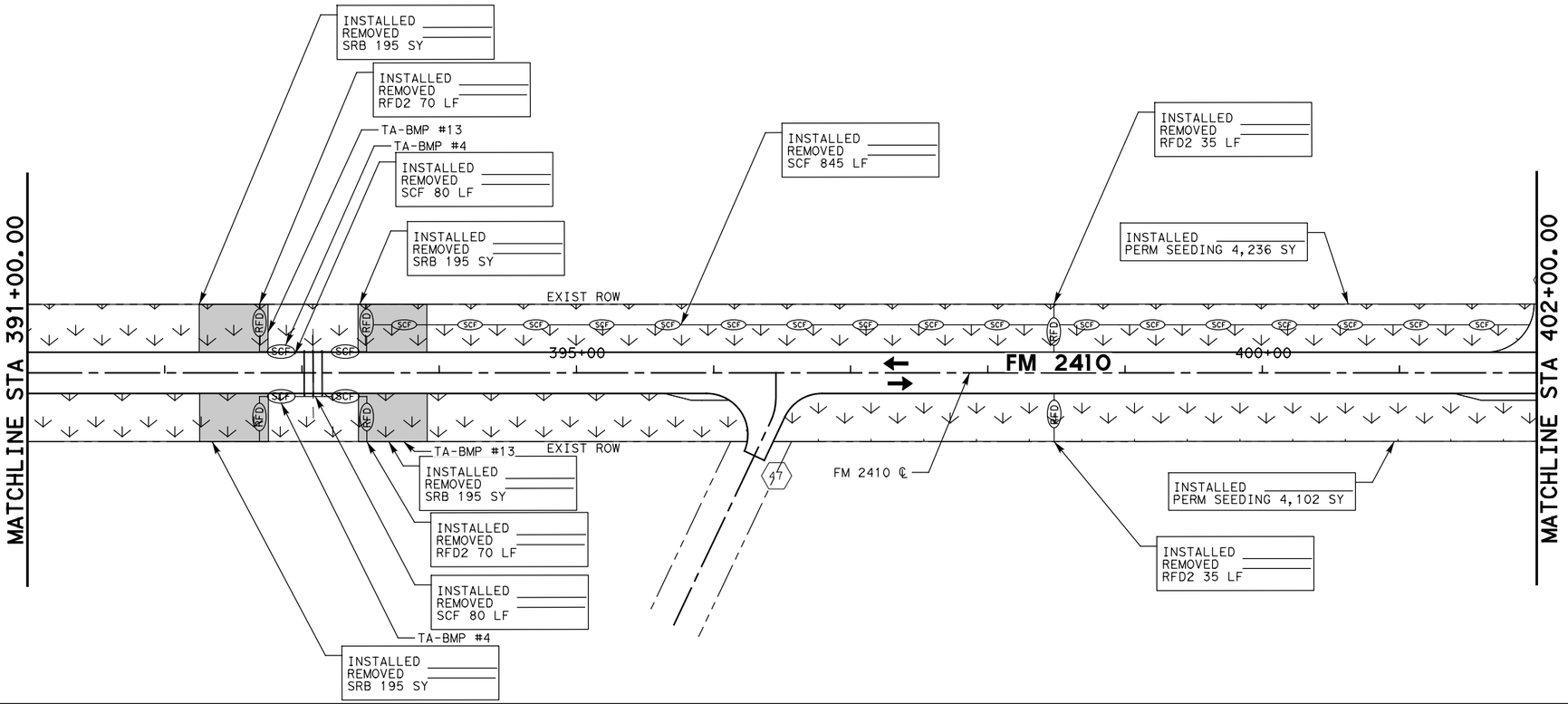
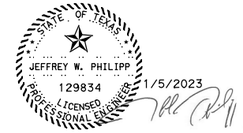


LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	15986
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	15986
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	7993
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	7993
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	780
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	350
506-6011	ROCK FILTER DAMS (REMOVE)	LF	350
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1295
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1295





FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 8 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	225
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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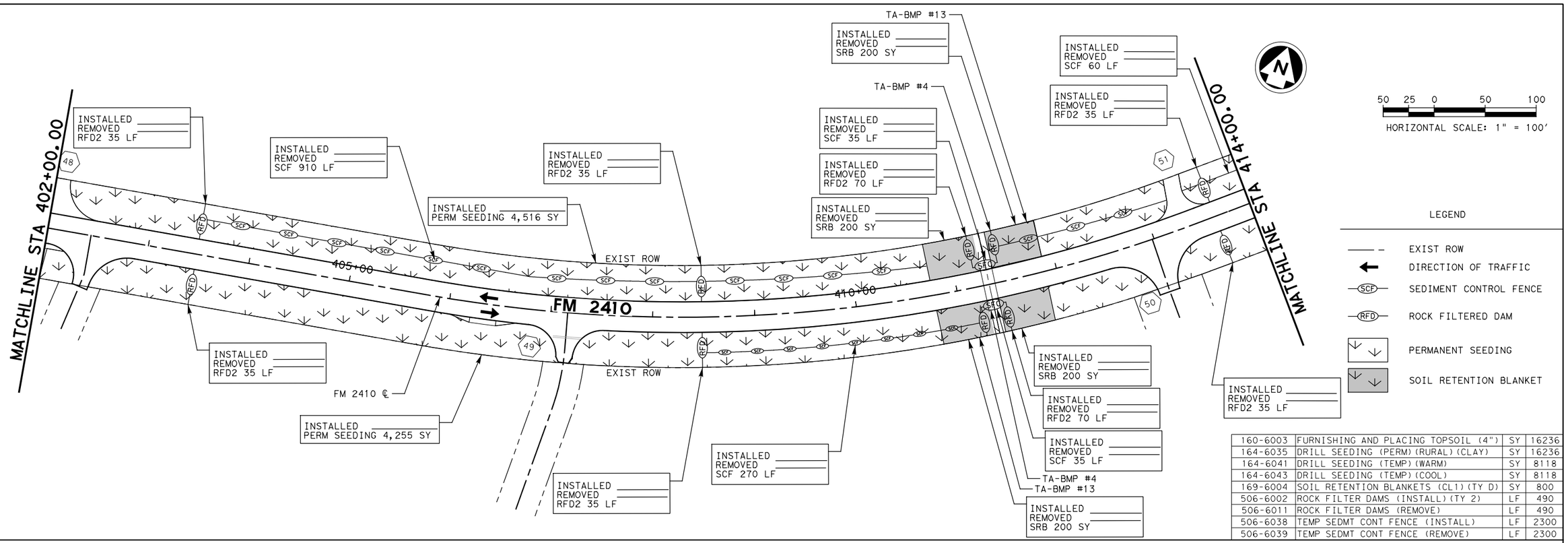
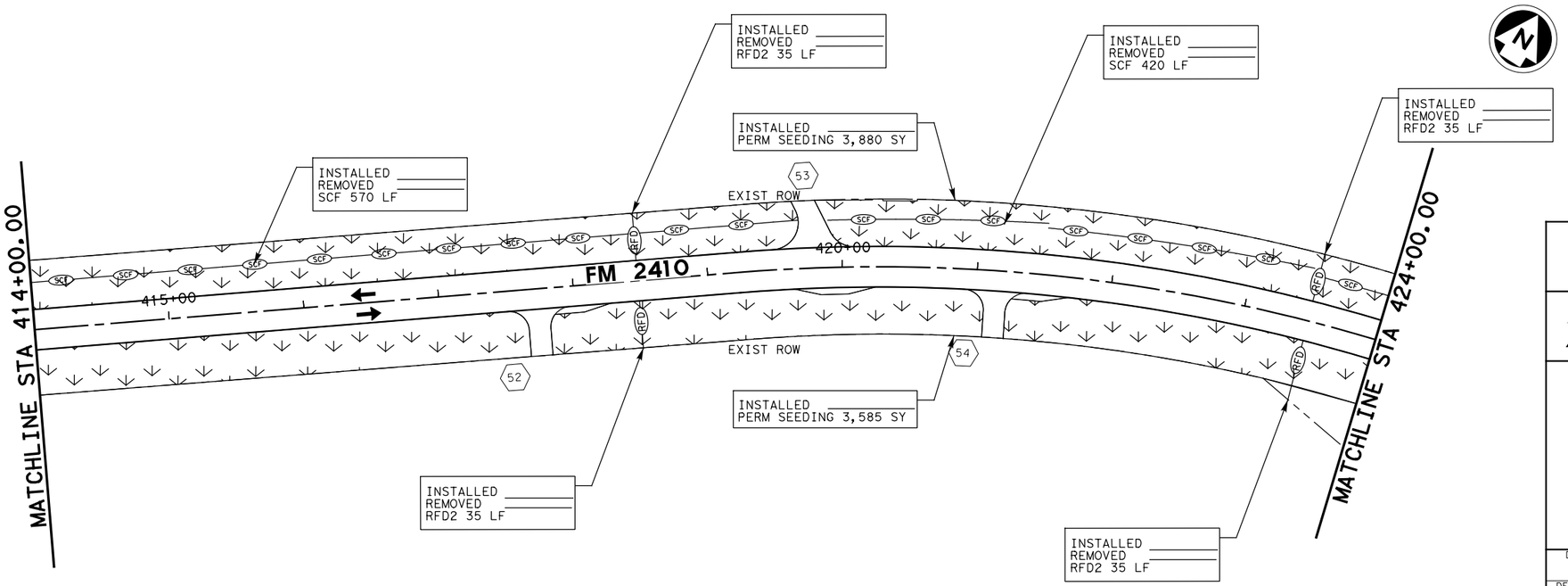


160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	16236
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	16236
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	8118
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	8118
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	800
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	490
506-6011	ROCK FILTER DAMS (REMOVE)	LF	490
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	2300
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	2300



STATE OF TEXAS
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STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 9 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	226
GRAPHICS JP	CONTROL	SECTION	JOB	
GRPH CHECK	2304	02	044	
RJ				

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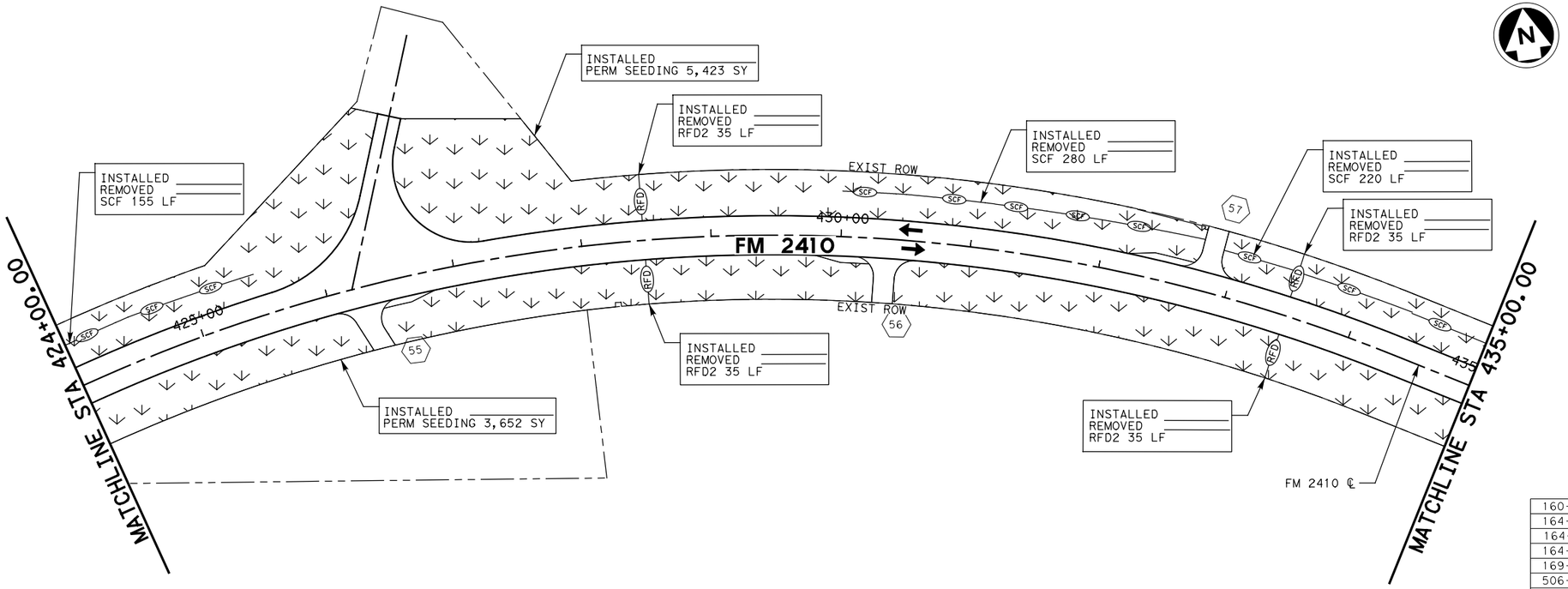


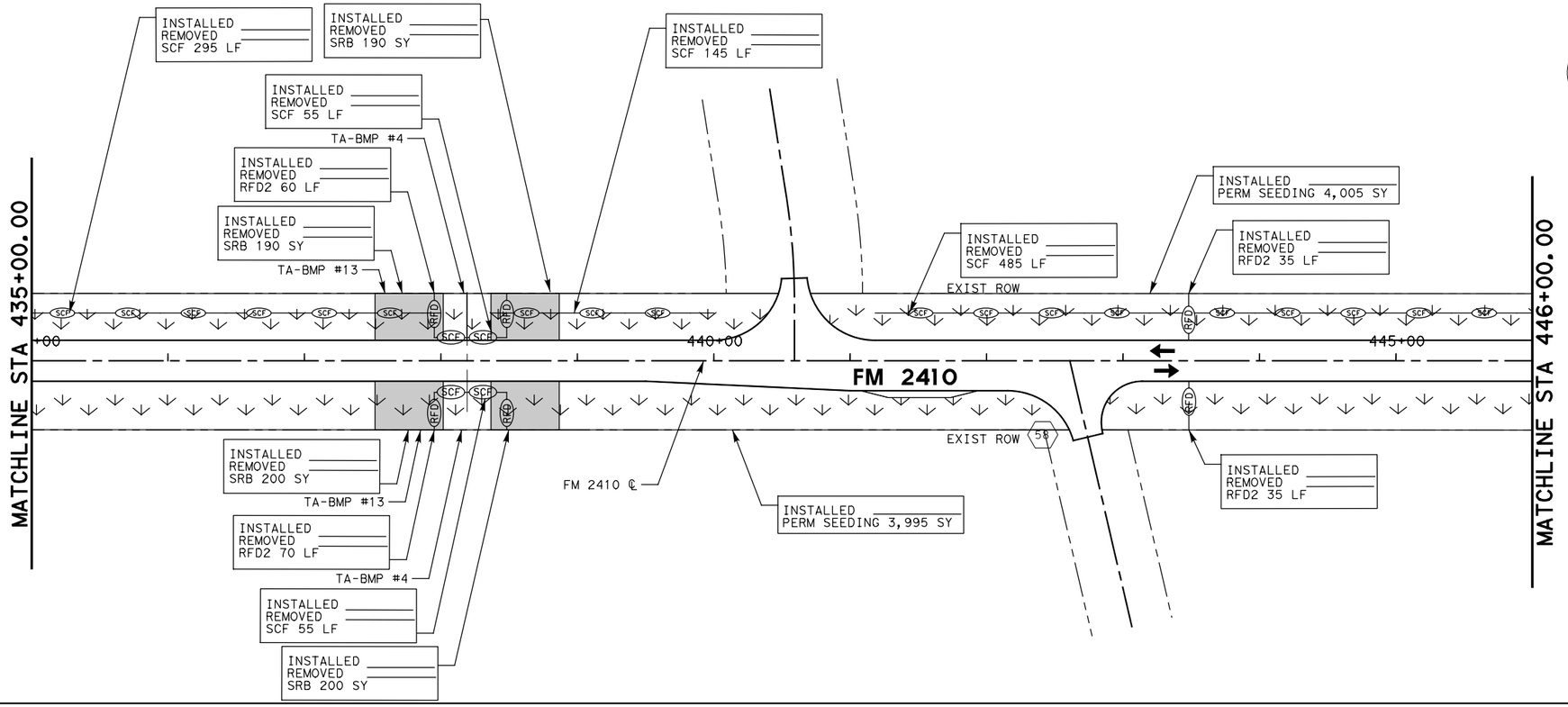
50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	17075
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	17075
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	8538
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	8538
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	780
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	340
506-6011	ROCK FILTER DAMS (REMOVE)	LF	340
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1690
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1690



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FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 10 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	227
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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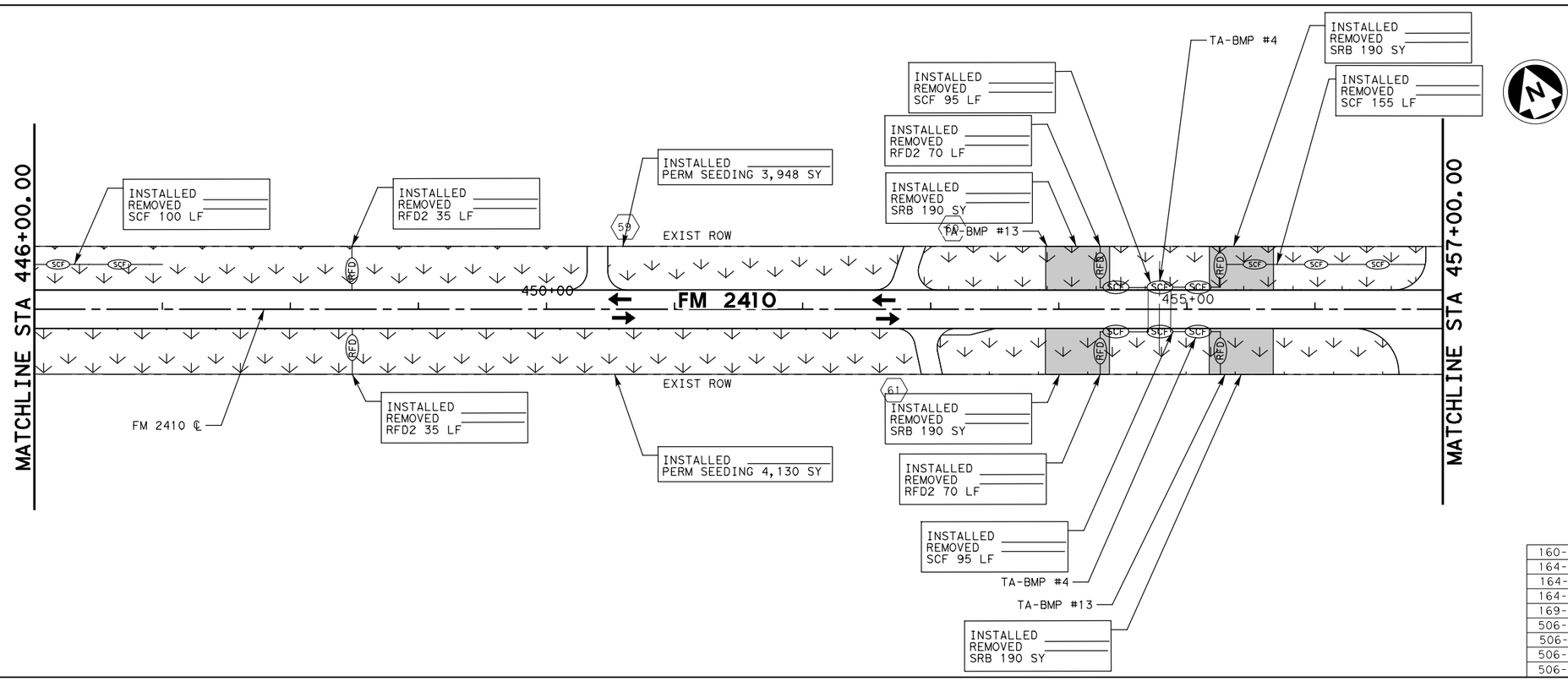
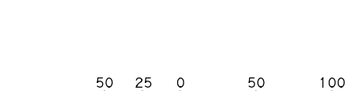
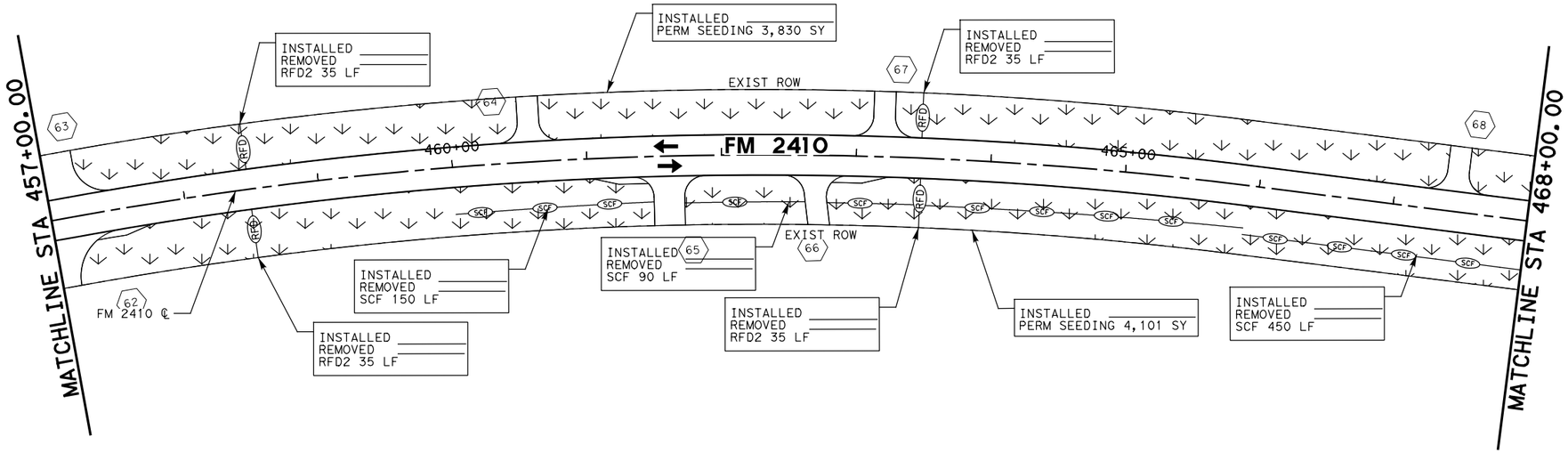




LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	16009
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	16009
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	8005
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	8005
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	760
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	350
506-6011	ROCK FILTER DAMS (REMOVE)	LF	350
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1135
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1135



FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 11 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	228
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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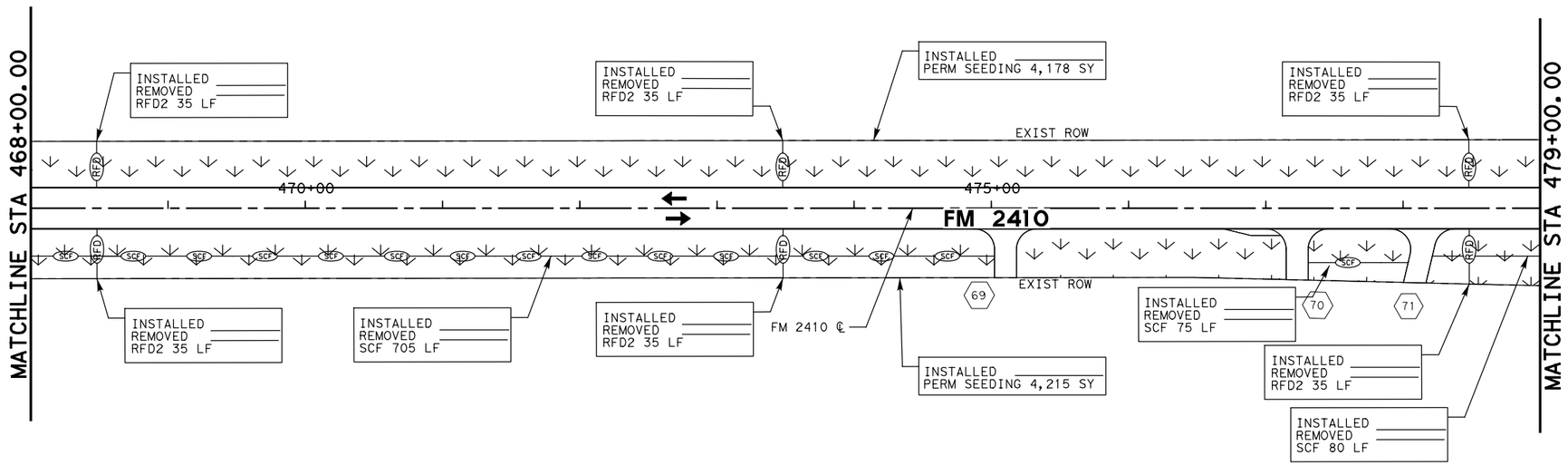
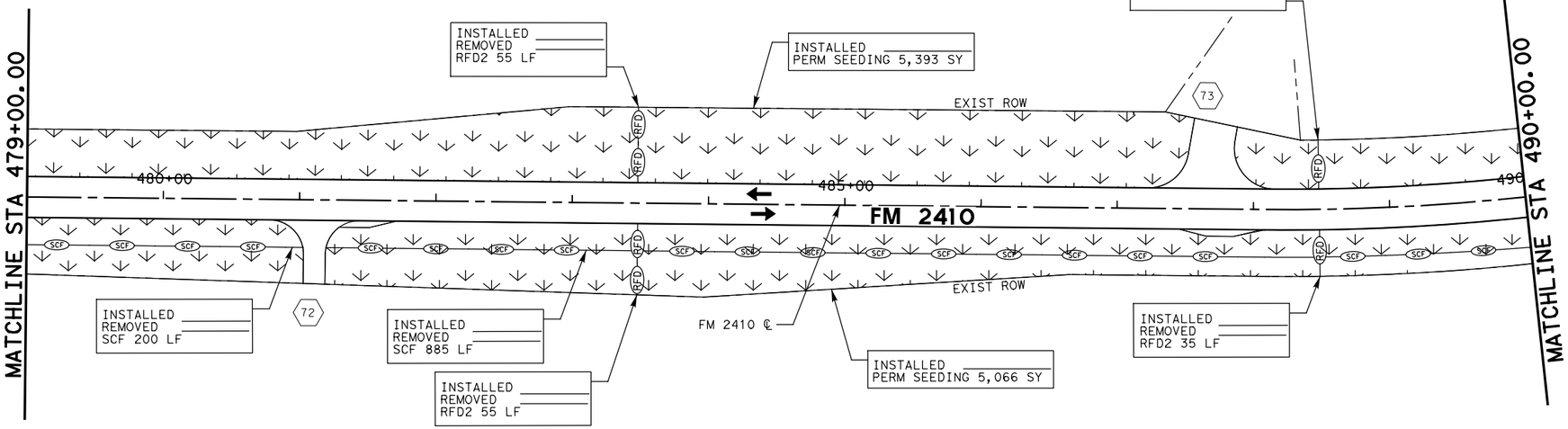
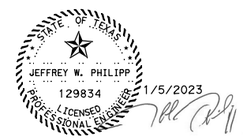


LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	18852
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	18852
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	9426
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	9426
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	390
506-6011	ROCK FILTER DAMS (REMOVE)	LF	390
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1945
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1945





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STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 12 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	229
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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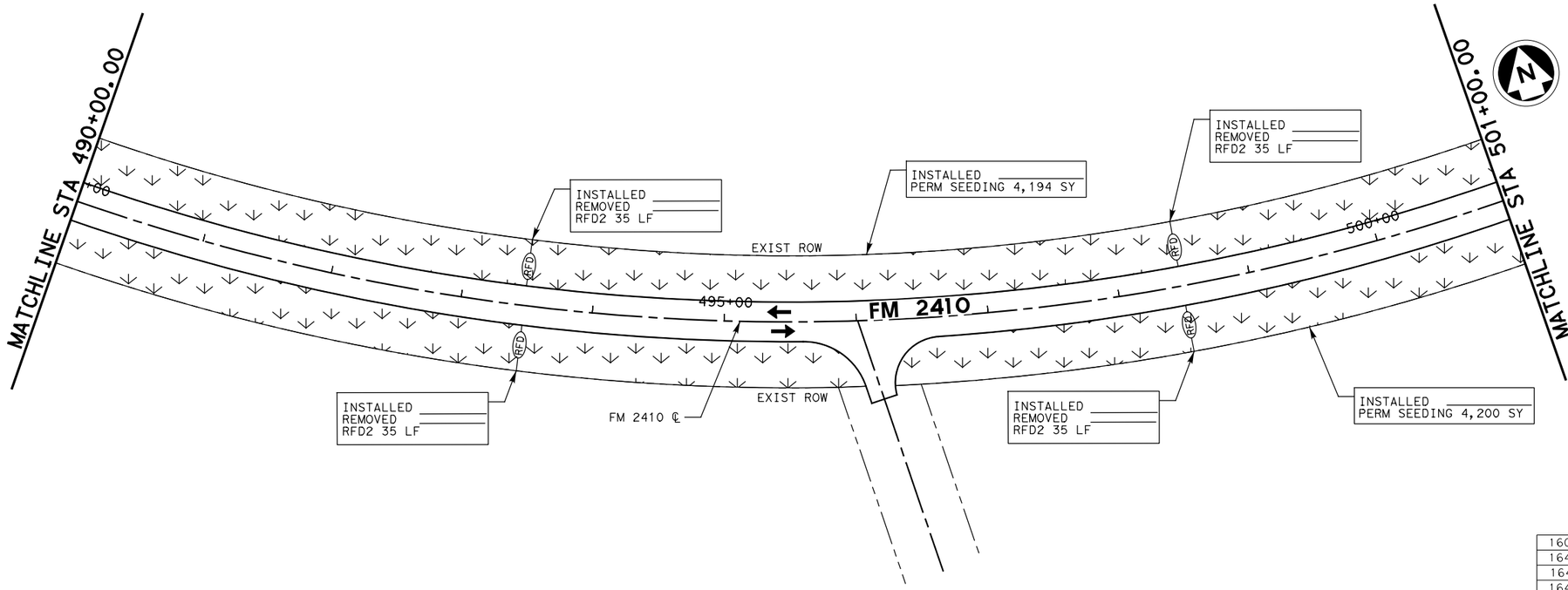
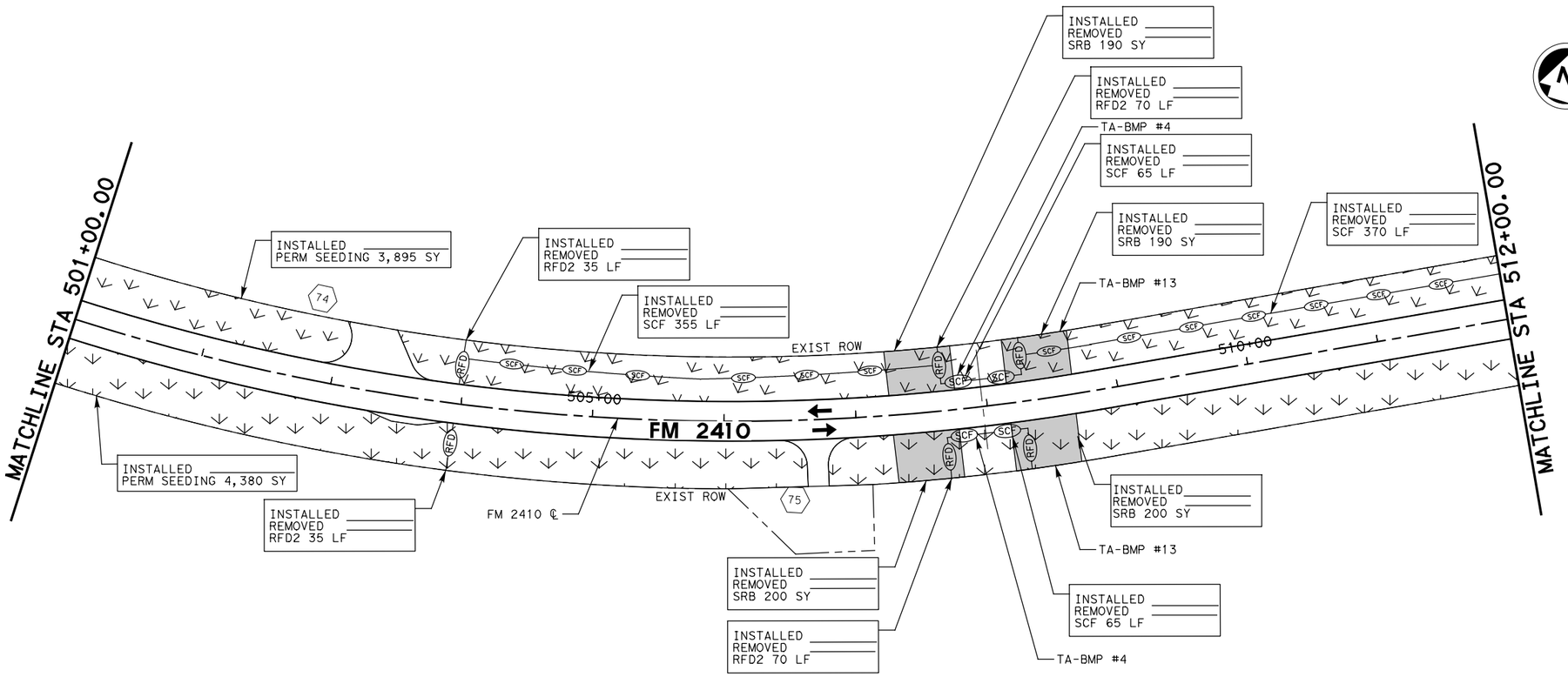


LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	16669
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	16669
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	8335
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	8335
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	780
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	350
506-6011	ROCK FILTER DAMS (REMOVE)	LF	350
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	855
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	855



STATE OF TEXAS
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1/5/2023

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STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 13 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	
GRAPHICS JP	CONTROL	SECTION	JOB	230
GRPH CHECK	2304	02	044	
RJ				

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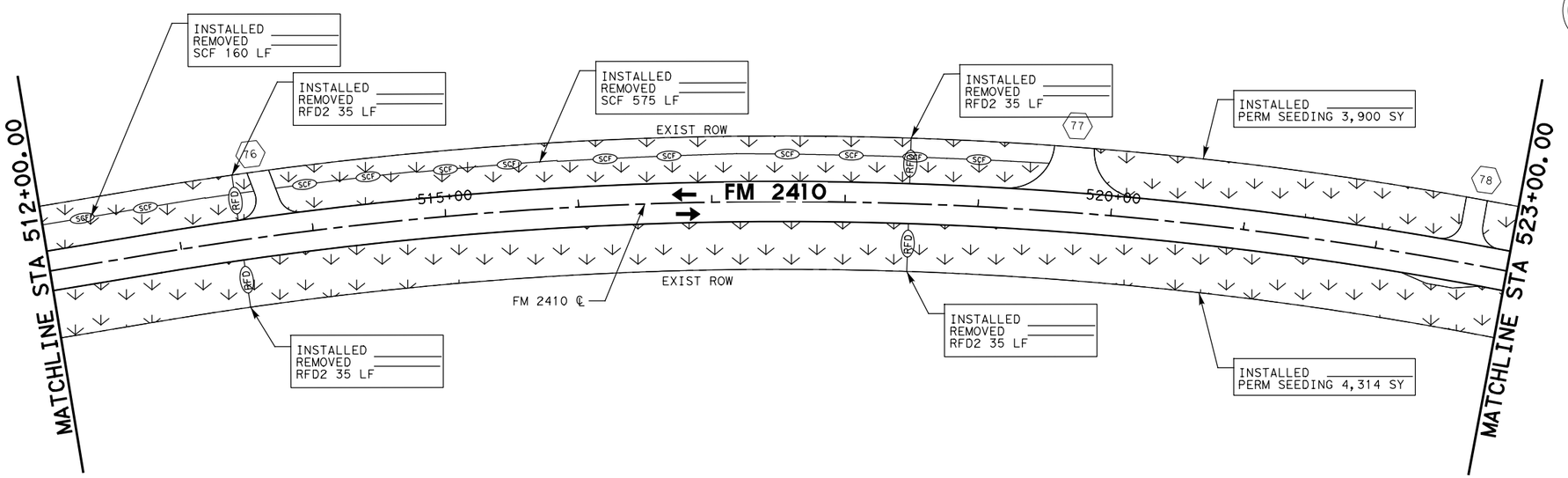


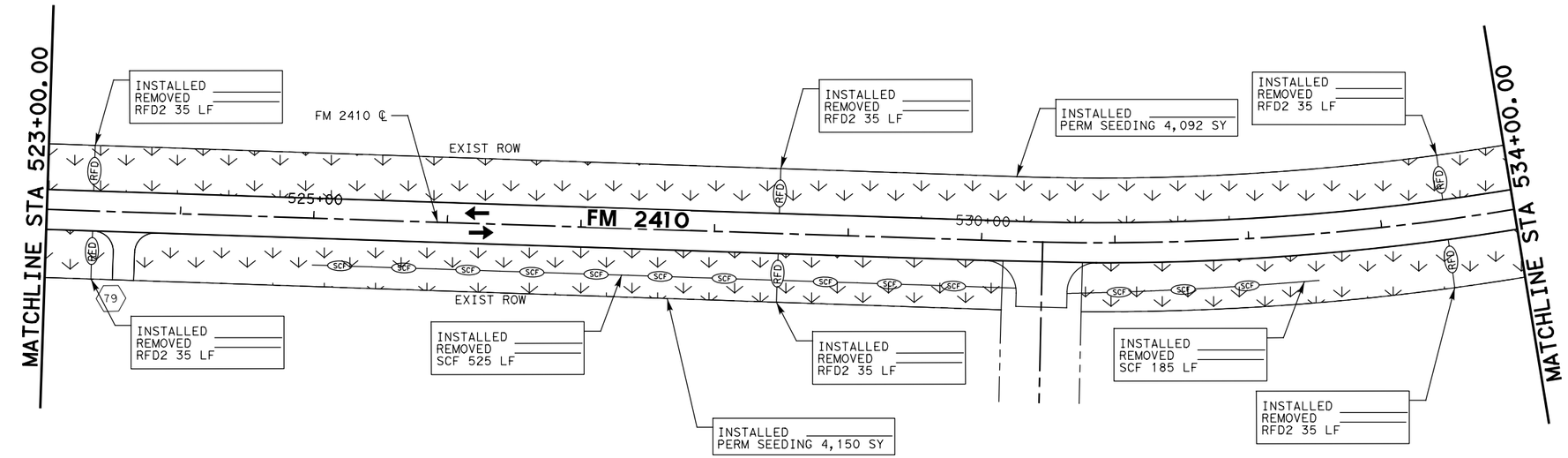
50 25 0 50 100

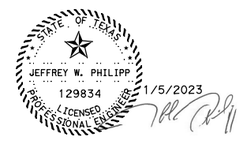
HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	16456
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	16456
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	8228
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	8228
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	350
506-6011	ROCK FILTER DAMS (REMOVE)	LF	350
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1445
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1445





FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 14 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	231
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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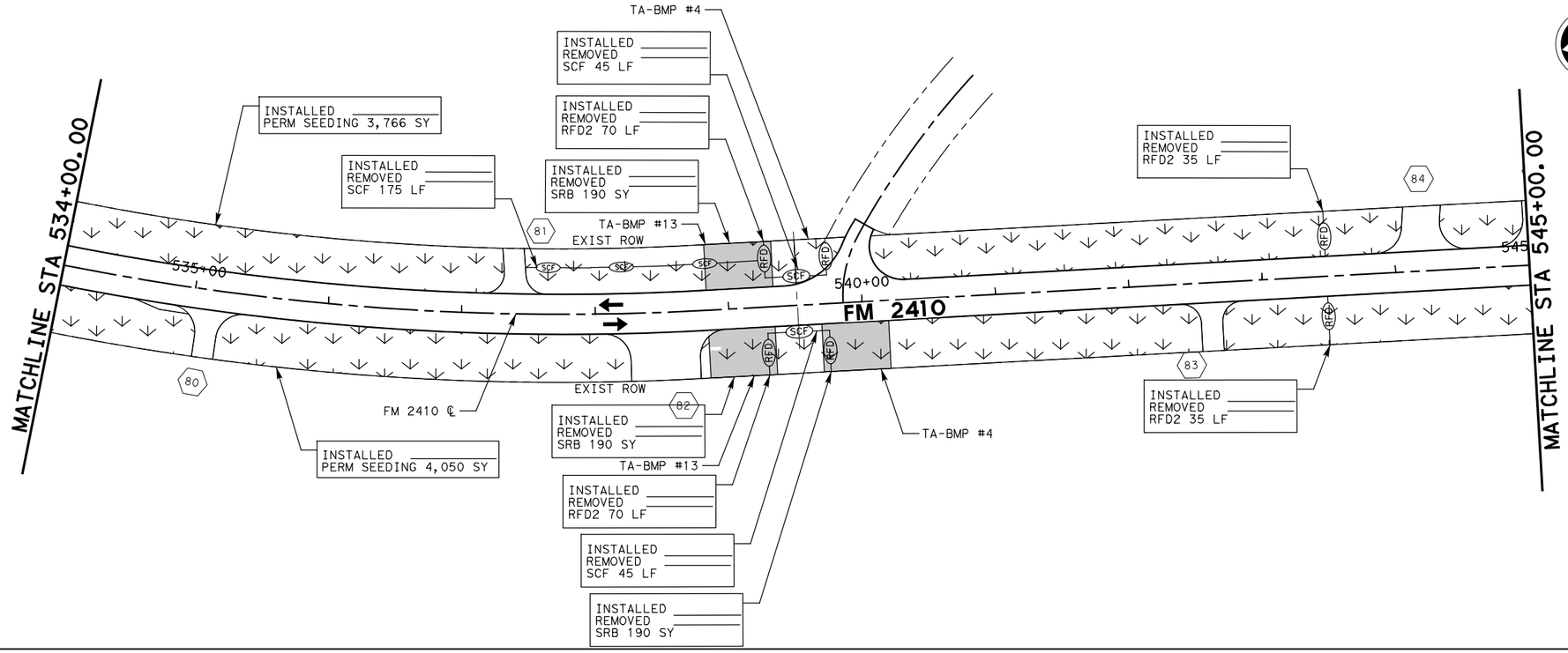


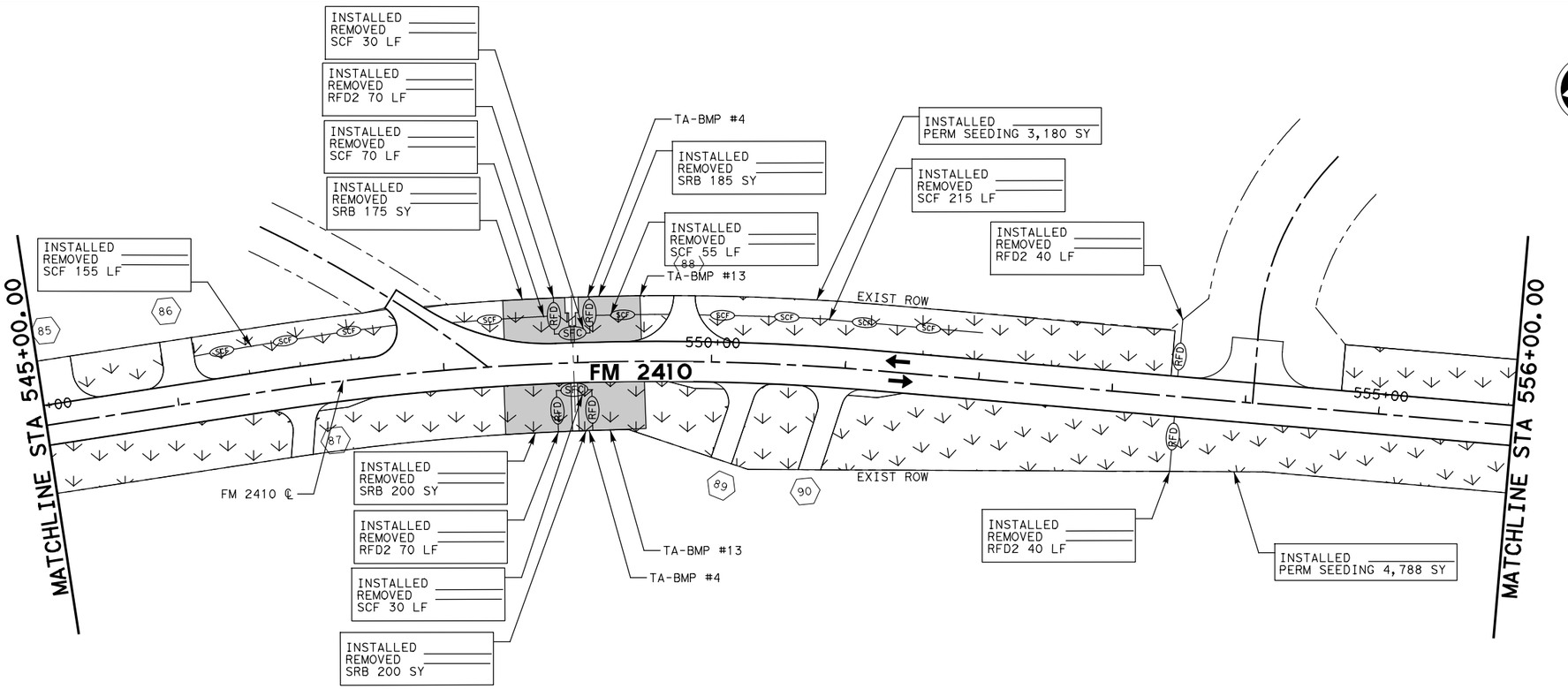
50 25 0 50 100

HORIZONTAL SCALE: 1" = 100'

LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	15784
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	15784
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	7892
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	7892
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	1330
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	430
506-6011	ROCK FILTER DAMS (REMOVE)	LF	430
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	820
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	820



STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 15 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	232
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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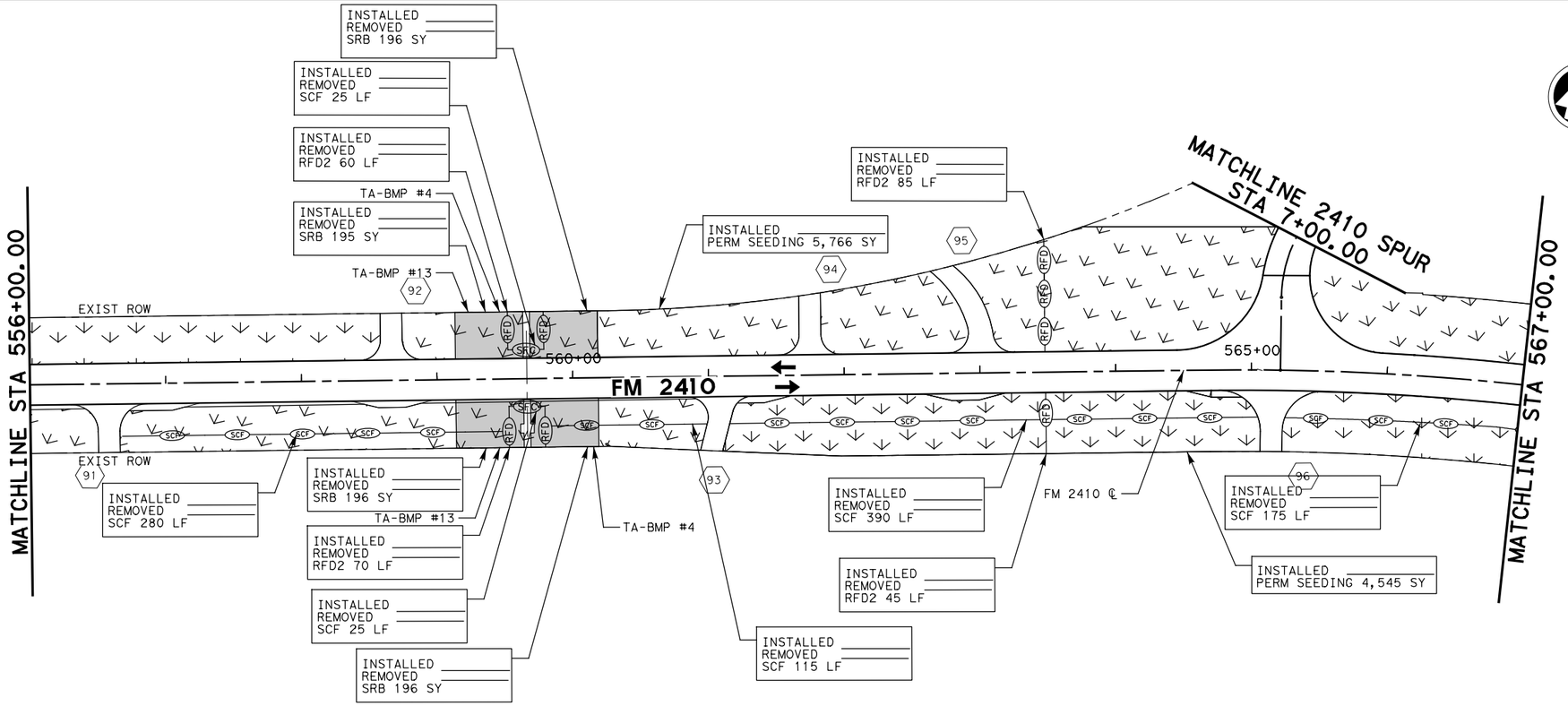
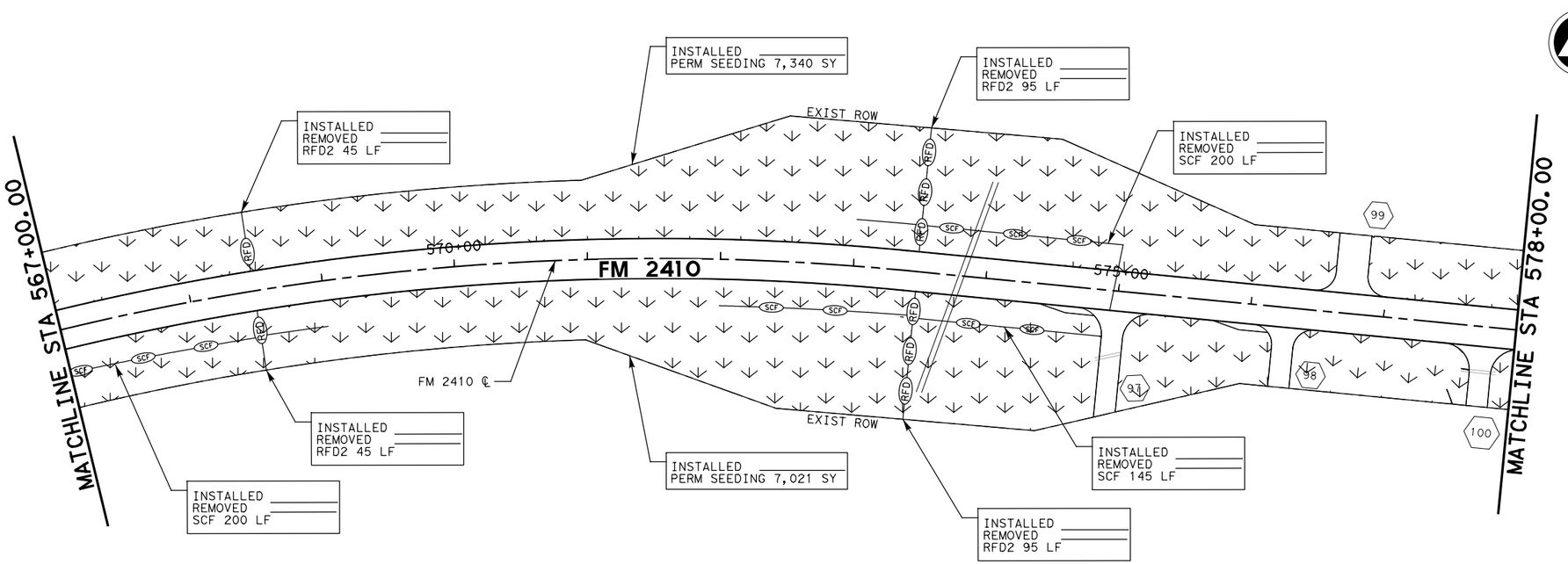


160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	24672
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	24672
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	12336
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	12336
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	783
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	540
506-6011	ROCK FILTER DAMS (REMOVE)	LF	540
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1555
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1555



STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 16 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	233
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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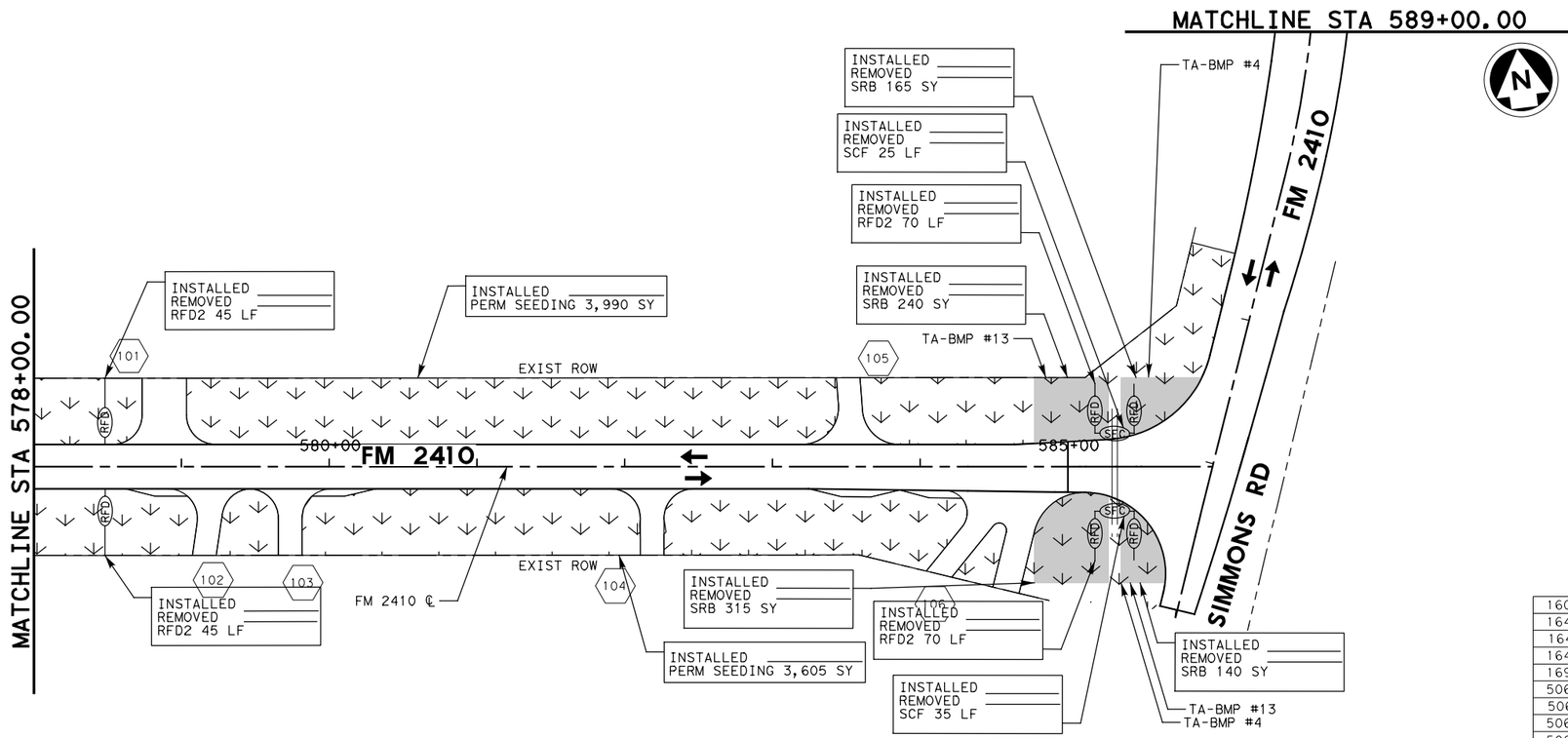


50 25 0 50 100

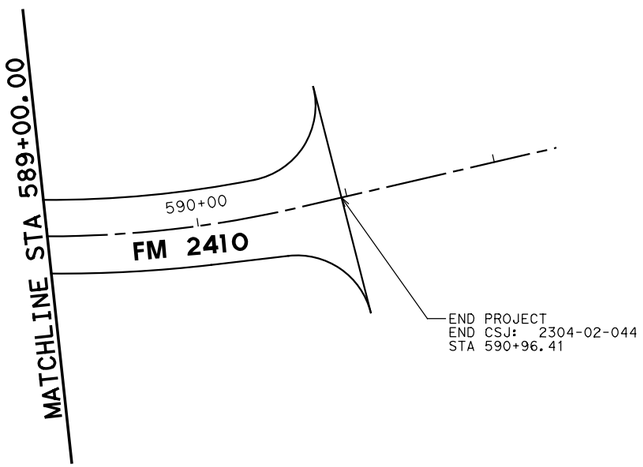
HORIZONTAL SCALE: 1" = 100'

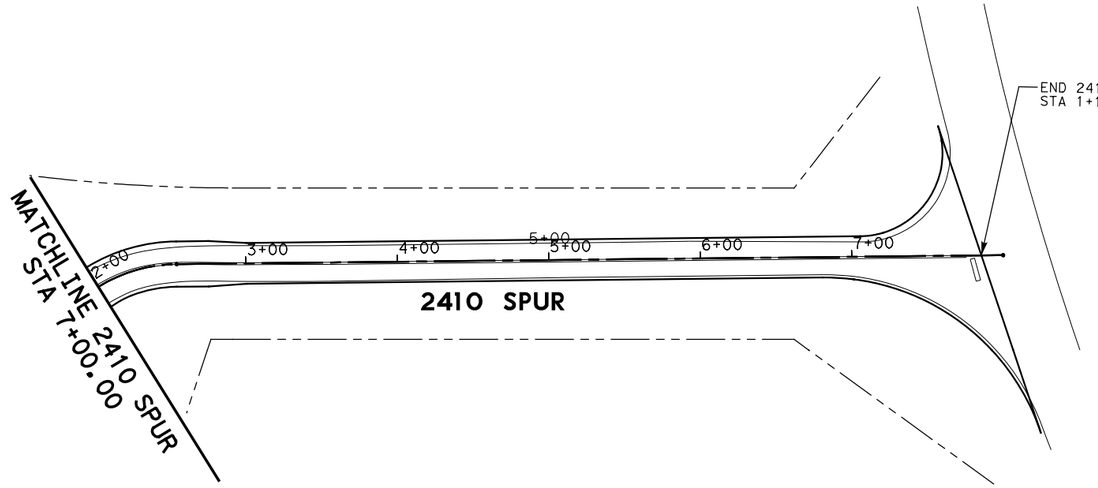
NOTES:
1. NO SW3P ITEMS NEEDED IN MILL AND INLAY AREAS.

LEGEND

- EXIST ROW
- DIRECTION OF TRAFFIC
- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTERED DAM
- PERMANENT SEEDING
- SOIL RETENTION BLANKET

160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	7595
164-6035	DRILL SEEDING (PERM)(RURAL)(CLAY)	SY	7595
164-6041	DRILL SEEDING (TEMP)(WARM)	SY	3798
164-6043	DRILL SEEDING (TEMP)(COOL)	SY	3798
169-6004	SOIL RETENTION BLANKETS (CL1)(TY D)	SY	860
506-6002	ROCK FILTER DAMS (INSTALL)(TY 2)	LF	230
506-6011	ROCK FILTER DAMS (REMOVE)	LF	230
506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	60
506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	60





STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
1/5/2023

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

FM 2410

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

(SHEET 17 OF 17)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JP	6	(SEE TITLE SHEET)		FM 2410
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
RJ	TX	WACO	BELL	234
GRAPHICS	CONTROL	SECTION	JOB	
JP	2304	02	044	
GRPH CHECK				
RJ				

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STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
2304-02-044

1.2 PROJECT LIMITS:
From: FM 3481

To: IH 14

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 31.056255 ,(Long) -97.654102

END: (Lat) 31.054586 ,(Long) -97.550416

1.4 TOTAL PROJECT AREA (Acres): 91.90

1.5 TOTAL AREA TO BE DISTURBED (Acres): 46.27

1.6 NATURE OF CONSTRUCTION ACTIVITY:
Construction of rehabilitation of existing road
Consisting of rehab and widen roadway

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Speck-Tarrant-Purves Association	Gently sloping to sloping and undulating to rolling, very shallow to shallow, gravelly, loamy and clayey soils over limestone;

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):
PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

☐ PSLs determined during preconstruction meeting
☐ PSLs determined during construction
☒ No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:
(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

☒ Mobilization
☒ Install sediment and erosion controls
☒ Blade existing topsoil into windrows, prep ROW, clear and grub
☒ Remove existing pavement
☒ Grading operations, excavation, and embankment
☐ Excavate and prepare subgrade for proposed pavement widening
☒ Remove existing culverts, safety end treatments (SETs)
☐ Remove existing metal beam guard fence (MBGF), bridge rail
☒ Install proposed pavement per plans
☒ Install culverts, culvert extensions, SETs
☒ Install mow strip, MBGF, bridge rail
☒ Place flex base
☐ Rework slopes, grade ditches
☐ Blade windrowed material back across slopes
☒ Revegetation of unpaved areas
☒ Achieve site stabilization and remove sediment and erosion control measures
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

☒ Sediment laden stormwater from stormwater conveyance over disturbed area
☒ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
☐ Solvents, paints, adhesives, etc. from various construction activities
☒ Transported soils from offsite vehicle tracking
☒ Construction debris and waste from various construction activities
☐ Contaminated water from excavation or dewatering pump-out water
☒ Sanitary waste from onsite restroom facilities
☒ Trash from various construction activities/receptacles
☐ Long-term stockpiles of material and waste
☒ Other: Asphalt products or concrete curing compounds and additives
☐ Other: _____
☐ Other: _____

1.11 RECEIVING WATERS:
Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
STILLHOUSE HOLLOW LAKE ON LAMPASAS RIVER	BRAZOS RIVER SYSTEM SEGMENT 1216
NOLAN CREEK ON LEON RIVER WATERSHED	BRAZOS RIVER SYSTEM SEGMENT 1218

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☐ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☐ Post Construction Site Notice
☐ Submit NOI/CSN to local MS4
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☐ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity
City of Harker Heights

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		235
STATE	STATE DIST.	COUNTY	
TEXAS	WACO	BELL	
CONT.	SECT.	JOB	HIGHWAY NO.
2304	02	044	FM 2410

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- X ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- X ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- X ☐ Temporary Seeding
- ☐ X Permanent Planting, Sodding or Seeding
- X ☐ Biodegradable Erosion Control Logs
- X ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ ☐ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- X ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- X ☐ Sediment Control Fence
- ☐ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- ☐ ☐ Sediment Trap
  - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - ☐ 3,600 cubic feet of storage per acre drained
- ☐ ☐ Sedimentation Basin
  - X Not required (<10 acres disturbed)
  - ☐ Required (>10 acres) and implemented.
    - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - ☐ 3,600 cubic feet of storage per acre drained
  - ☐ Required (>10 acres), but not feasible due to:
    - ☐ Available area/Site geometry
    - ☐ Site slope/Drainage patterns
    - ☐ Site soils/Geotechnical factors
    - ☐ Public safety
    - ☐ Other: _____

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- X Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- X Loaded haul trucks to be covered with tarpaulin
- ☐ Stabilized construction exit
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- X Chemical Management
- X Concrete and Materials Waste Management
- X Debris and Trash Management
- X Dust Control
- X Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☐ Fire hydrant flushings
- ☐ Irrigation drainage
- ☐ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☐ Potable water sources
- X Springs
- X Uncontaminated groundwater
- ☐ Water used to wash vehicles or control dust
- X Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

2.9 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		235A
STATE	STATE DIST.	COUNTY	
TEXAS	WACO	BELL	
CONT.	SECT.	JOB	HIGHWAY NO.
2304	02	044	FM 2410

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I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. Project will disturb more than 5 acres, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required

☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1. Station 304+50
2. Station 351+25
3. Station 393+05
4. Station 454+75
5.
6.
7.
8.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☒ Temporary Vegetation	☒ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☒ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☒ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☐ No Action Required ☒ Required Action

Action No.

1. SEE STATEMENT ABOVE

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ Required Action

Action No.

1. Vegetation clearing within the project limits/drainge areas must be completed during the non-nesting season September 15 - March 1.

2.

☐ No Action Required ☒ Required Action

Action No.

1. Comply with Migratory Bird Treaty Act (MBTA)
2. Plains Spotted Skunk: Contractors will be advised of potential occurence in the project area, and to avoid harming the species if encountered, and to avoid unnecessary impacts to dens
3. Texas Horned Lizard: Contractors will be advised of potential occurance in the project area, and to avoid harming the species of encountered. This should include avoiding harvester ant mounds in the selection of Project Specific Locations (PSL's)
4.
5. SEE STATEMENT BELOW

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

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

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☒ Yes ☐ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☒ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1.

VII. OTHER ENVIRONMENTAL ISSUES

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

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ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

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©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY	
REVISIONS 12-12-2011 (DS) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	2304	02	044	FM 2410	
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BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

1. Prior to TxDOT allowing the Contractor to start construction, the Contractor will provide the required storm water and 404 permit documentation and support activities, including but not limited to the following:

   - Provide a list of all chemicals, construction and waste products that will be generated, stored or brought upon TxDOT ROW. The list includes expected construction debris, sanitary wastes, construction chemicals and petroleum products used or generated by the Contractor and sub-contractors. Along with the list, the Contractor will supply a spill prevention plan and clean up procedures that will include each of these chemical products or generated waste.

   - Provide in the construction schedule the necessary line items that will comply with the schedule and planning requirements of the storm water permit.

   - Post the TxDOT storm water permit and any Contractor permits, per permit requirements.

   - Provide copies of storm water permits for Contractor PSL(s). As new PSL(s) may be obtained for the project, provide copies of new or amended permits to TxDOT. The Contractor will not disturb soil without the proper permits.

   - Provide scale drawings of off ROW PSL's within one mile of the project, for field offices, borrow sources, plant sites or other uses.

   - Provide permit information on any Contractor batch plants or concrete crushing plants to be located at a Contractor PSL(s) within one mile of the project limits or boundaries. Copies of the air and water permits are to be provided to TxDOT before materials will be used on the project. No asphalt or concrete batch plants or concrete crushing plants will be located on TxDOT ROW.

   - Provide a letter indicating a Contractor Responsible Person for environmental compliance (CRP) for the project, and maintain a CRP throughout the project duration.

   - Provide all environmental documentation including certification of compliance and EMS training documents/certificates prior to starting work. The Contractor is to provide daily BMP inspection reports that document all field BMPs needing repair or replacement. The Contractor is to clearly document specific BMPs needing repair and location each work day. The Contractor is encouraged to be proactive in fixing BMPs without TxDOT direction.

   - Provide documentation required for Waters of the US, Note #3 and submittals for Item 496 bridge removal. Bridge removal methods submitted will follow all Waters of the US note requirements. The Contractor is not to start construction within the Ordinary High Water Marks of any stream until receiving approval for stream channel construction methods from TxDOT.

   - Provide a written procedure for managing all chemicals and construction items placed in vertical containment structures. Also, provide methods to be used for the treatment, disposal, collection or release of storm water.

   - Provide an estimated date by letter, for the submittal of marked up bridge drawings, indicating cut locations for any structural steel requiring cutting or torching of steel, coated with lead containing paints.

2. Place and maintain trash cans and portable sanitary facilities at locations where there is active construction. Worker generated trash and construction debris will be kept from being transported by storm water and will be collected daily from the ground and routinely hauled from the work area.

3. Contractor will provide TxDOT copies of all correspondence with MS4s, TCEQ, EPA, DSHS and Corps of Engineers regarding activities on this project.

4. Contractor to conduct storm water inspections and develop SWPPP documents to support Contractor permits obtained for the project including PSL(s).

5. Contractor will maintain written documentation of locations of all portable sanitary facilities. The Contractor is required to document the location and disposition of all spills and cleanups from portable sanitary facilities.

6. Contractor will not store chemicals on TxDOT ROW, unless chemicals are stored following all environmental and safety regulations. Fuels for construction equipment will not be stored on TxDOT ROW.

7. The Contractor will store fuels and bulk chemicals on Contractor PSL(s) using a secondary containment method, such as double lined tanks and/or free standing containment reservoirs made of plastic or steel designed to hold bulk chemicals or drums.

8. The Contractor will not remove sediment controls without the prior approval of TxDOT, except for a sediment control that may back up water and cause safety or traffic problems.

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

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BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

9. Any sediment controls removed by the Contractor must be re-installed before the next rainfall event or by the end of day, as approved in advance.

10. Vegetative buffer strips may be used in place of temporary sediment controls such as silt fences and rock filter dams. The amount of disturbed soil area will be limited to 1/3 of an acre or less for a minimum of 50 feet of grassed ditch and 2/3 of an acre of disturbed soil for a minimum of 100 feet of grassed ditch.

11. Construction equipment found to be leaking oil, fuel or coolant will be immediately stopped, the leaking fluid collected and the equipment fixed. Equipment continuing to leak will be removed from the project at no cost to TxDOT. Leaking fluids from equipment will be collected and removed from the project or PSL.

12. Earth berms or mounds typically used to stockpile topsoil and used in place of boundary silt fence will be seeded upon being constructed. Long term use of earth berms or mounds will not be continued without establishing grass on the control.

13. The Contractor will inform TxDOT of new areas where soil will be disturbed to facilitate planning for new sediment controls. Areas of vegetated soil will not be disturbed by the Contractor, unless adequate sediment controls can be installed before the next rainfall event. The Contractor will assist TxDOT in keeping an accurate set of working SWPPP drawings that show the locations of all temporary sediment and erosion controls.

14. The Contractor will maintain an adequate amount of temporary sediment controls on hand at the field office or project staging area for critical SWPPP maintenance, including silt fence (minimum of 200 feet) and rock / fabric for rock filter dams (minimum for 100 feet of Type III dams).

    The requirement for BMP rock quantities on hand is waived for small projects for on and off system bridge installations. The Contractor having a BMP Subcontractor does not eliminate the requirement for the Contractor to have the required silt fence and rock on hand, typically stored at the Contractor PSL.

15. Failure of a sub-contractor to complete storm water work on time will require the Contractor to start storm water sediment control work immediately and complete the work with high priority, or be subject to stop work on the entire project.

16. Earth materials on roads as a result of soil tracking will not be allowed to be transported off ROW in storm water. Soil or rock material found on roadways deposited from Contractor equipment will be removed daily.

17. Unless approved, completed concrete curb inlets will not be blocked by sediment controls. The contractor will frequently sweep the completed or partially completed roadway to keep sediment out of drainage pipes.

18. The Contractor will be responsible for proper dust control and will route construction traffic in a manner that minimizes dust generation.

19. Water for dust control will contain no pollutants, but may be non-potable from upland stock ponds. No quantity of water to be used for construction purposes may be taken from a 404 stream, prior to the proper authorizations or permits being obtained by the Contractor.

20. Contractor is to direct workers and sub-contractors to use portable sanitary facilities provided by the Contractor and not to trespass off ROW.

21. Contractor will provide written verification to TxDOT that earth borrow pits and disposal sources meet environmental and regulatory requirements, prior to use. Excavations will meet all OSHA requirements and the current safety guidelines established for TxDOT Quarries and Pits.

22. Boundary silt fences that are terminated down slope, with one end being at the lowest elevation, will be installed with an L - hook to contain sediment. Boundary silt fences that are installed on flat ground will have L-hooks on both ends.

23. Rock filter dams across ditches will be constructed where the rock filter dam ends are embedded within the ditch side slopes and ditch bottom. The top center elevation of the rock filter dam will be at least 6 inches lower than the elevations on the rock filter dam ends.

24. Silt fence will be constructed in a U or V pattern across ditch lines and up the ditch side slope to keep storm water from flowing around the ends of the silt fence. Small silt fences that do not adequately span the ditch and allows storm water around the end(s) will not be used. Where there is adequate space, large U pattern silt fences are preferred to facilitate sediment collection and sediment removal with equipment.

25. Sediment controls (RFDs or silt fences) will be located along road ditches as marked on the SWPPP drawings. Modifications to the sediment control spacing will be adjusted during the project based on sediment control effectiveness. The installation and maintenance of sediment controls at or near outfalls, where storm water leaves TxDOT ROW, takes persistent over ditch line sediment controls.

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

26. Storm water draining sheet flow over disturbed soil sloped towards the ROW property line, will be intercepted by a boundary silt fence typically installed with L-shaped ends.

27. For ditch grading and shoulder up work, the Contractor is limited during good weather to remove up to one mile (limited to five acres of disturbed soil) of ditch line sediment controls; on one side of the roadway. Outfall controls cannot be removed during this activity. Ditch line controls must be replaced upon completion of work and before the next rain event.

28. Sediment controls damaged by the Contractor, as defined by permit, must be fixed or replaced immediately upon discovery.

29. Notches in silt fences are not typically allowed. Specific silt fences that back up water onto lanes of traffic may be notched if approved.

30. For silt fence maintenance, the Contractor will leave approximately 4 inches of deposited sediment up stream of silt fences and not over excavate around silt fences or rock filter dams.

31. The Contractor will inform TxDOT of new construction areas and where soil is planned to be disturbed. Sediment controls will be installed at outfalls prior to the Contractor beginning soil disturbing activities up slope from the outfall.

32. Water from concrete saw cutting, concrete grinding and concrete coring activities; or fine materials from concrete chipping and salvage will not be allowed to enter storm drains or enter streams.

33. Storm water containing suspended sediment and turbidity needing to be removed from excavations or low areas will be pumped or gravity drained through vegetated buffer strips (50 foot minimum) or placed in ditches with temporary sediment controls, prior to the water being discharged into a stream.

34. Uncontaminated water from natural groundwater seepage, springs, foundations and drains that does not contain suspended sediment or any pollutants may be discharged without storm water controls.

35. Lime or cement if spilled in ditches or outside the defined limits of application is considered a pollutant and will be excavated and removed the same day, to avoid contaminating streams.

36. If located along the project ROW, RAP stockpiles will be located where there is a minimum 100 feet of vegetative buffer strip before storm water will reach a stream. RAP will not be used as a construction material within the Ordinary High Water Marks of a stream channel of a 404 designated stream.

37. If allowed on the project, concrete truck wash out areas will have adequate volume to allow 12 inch freeboard for rain and will be lined with 6 mils of plastic. No concrete will be stored higher than the 12 inch freeboard. Cleaning of truck chutes and equipment does not constitute concrete truck wash out and this activity may be completed at the concrete placement location. Wash out areas will not be located closer than 50 ft from down slope inlets or stream channels.

38. For outfalls near stock ponds closer than 50 foot from disturbed soil at the ROW line, redundant sediment controls will be provided, typically a combination of rock filter dam and a silt fence constructed in line of the flow.

39. Earth stockpiles will utilize silt fence sediment controls, positioned on the low end of the stockpile drainage area with L-hooks or silt fence installed around the entire stockpile.

40. Sediment controls including rock filter dams and silt fences will not be installed across any 404 streams. Sediment controls at 404 streams will be positioned to limit sediment entering the stream from the banks and around structures/culverts, and will allow free flow of storm water to pass through the ROW without being dammed by any sediment controls. Remove loose materials from stream channels prior to each rain event.

41. Sediment controls for non-404 streams may be constructed across the drainage channel in unlimited locations. It is appropriate to use sediment control details typically used for 404 streams for non-404 streams when flow velocities are high. Remove loose material from stream channels prior to each rain event.

42. Incomplete drainage pipe installation across the roadway does not remove the requirement for having sediment controls around the ends of the pipe. To stay within permit requirements, sediment controls should be installed over and around the terminated end and along each side of the banks as soon as construction on the pipe has been completed. Remove loose material from stream channels prior to each rain event.

43. Safety end / headwall construction temporarily will require the removal of part of the sediment control placed over and around the pipe end. Retain in place as much functioning sediment control as possible. Replace the silt fence over and around the top of the pipe, immediately upon concrete placement and form removal. Do not remove culvert sediment controls that cannot be replaced before the next rain event. Sediment control at the ends of culverts must be in place and available for any rain event until the disturbed soil areas are re-vegetated.

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

44. Between the Ordinary High Water Marks of a 404 stream channel, the Contractor will disturb only the minimum amount of stream channel that is necessary to complete the work.

45. Rock riprap for erosion control does not replace the requirements to maintain sediment control until vegetation is re-established. Replace sediment controls immediately after installing erosion rock.

46. At the direction of TxDOT, sediment deposited into existing and new culverts will be removed subsidiary to Item 506. Sediment to be removed is either pre-existing material before construction starts or sediment generated as a part of this project.

47. Provide treated 2X4 cross bracing for rectangular inlet silt fence, subsidiary to Item 506.

48. Loose or granular earth materials will not be used to repair silt fence undercuts. Silt fence undercut repairs will be conducted with well compacted soils or the silt fence will be reset in a nearby location.

49. Silt fence steel T posts of approximately 1.25 pounds per foot are allowed at a spacing of 8 feet or less. Silt fence steel T posts between approximately 1.25 pounds per foot and 0.85 pounds per foot are allowed for T post spacing of 5 feet or less.

50. Silt fence to be used to slow the flow of storm water down slopes will be positioned approximately horizontal (on the contour) with L hooks on the ends and limited to approximately 200 feet in length. Multiple sections and levels of silt fence may be required in addition to temporary / permanent erosion control flumes.

51. Soil retention blankets will be installed rolled down the slope with the small dimension side embedded at the top of slope, unless recommended otherwise by the manufacturer. Excess grass, rocks, trash, debris or clods will be removed before seeding and installing soil retention blankets. All installations will be by the manufacturer recommendations. Contractor equipment, including tractor mowers will be kept off areas with soil retention blankets until the grass is established.

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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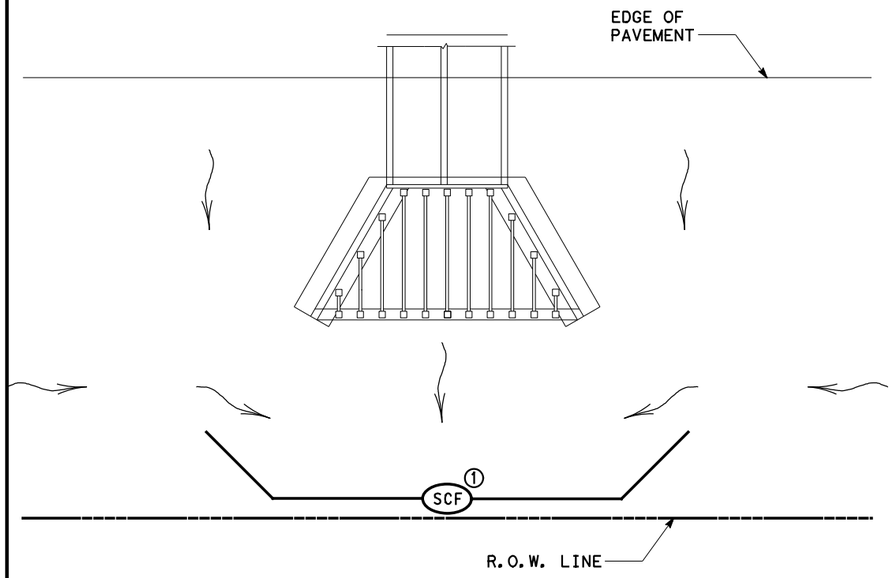
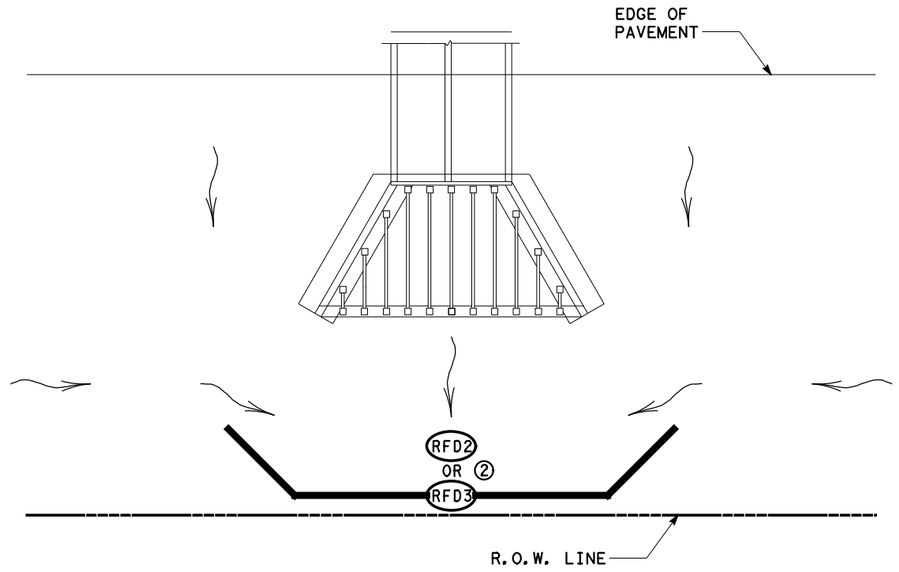


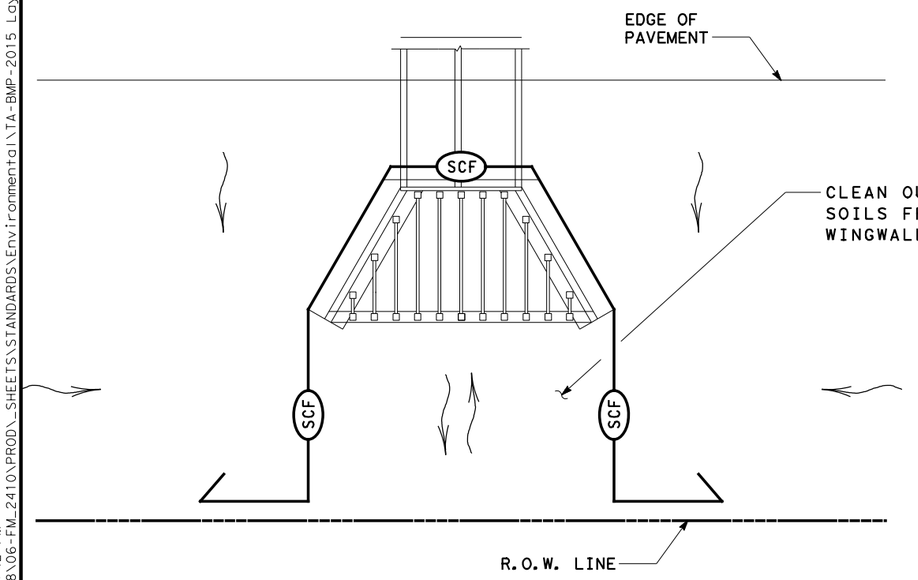
BEST MANAGEMENT PRACTICE (BMP) #1

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



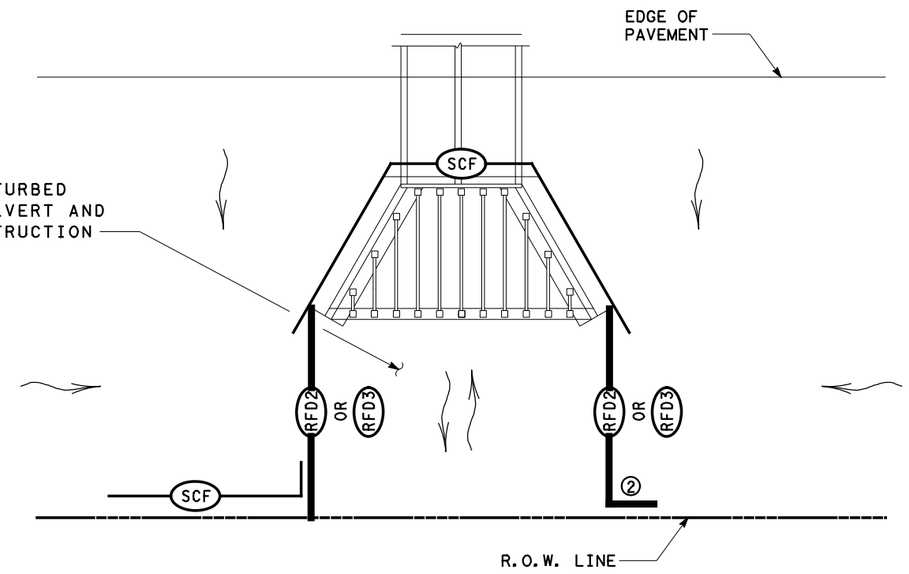
BEST MANAGEMENT PRACTICE (BMP) #2

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #3

FOR 404 OR NON-404 STREAMS ~ SEDIMENT CONTROL AT EXIT OR ENTRANCE OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #4

FOR 404 OR NON-404 STREAMS ~ SEDIMENT CONTROL AT EXIT OR ENTRANCE OF CULVERT

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

NOTES:

1. EXTEND SILT FENCE SO STORM WATER DOES NOT GO AROUND THE ENDS. USE L-HOOKS ON ENDS AS REQUIRED.
2. EXTEND ROCK FILTER DAM SO STORM WATER DOES NOT GO AROUND THE ENDS.

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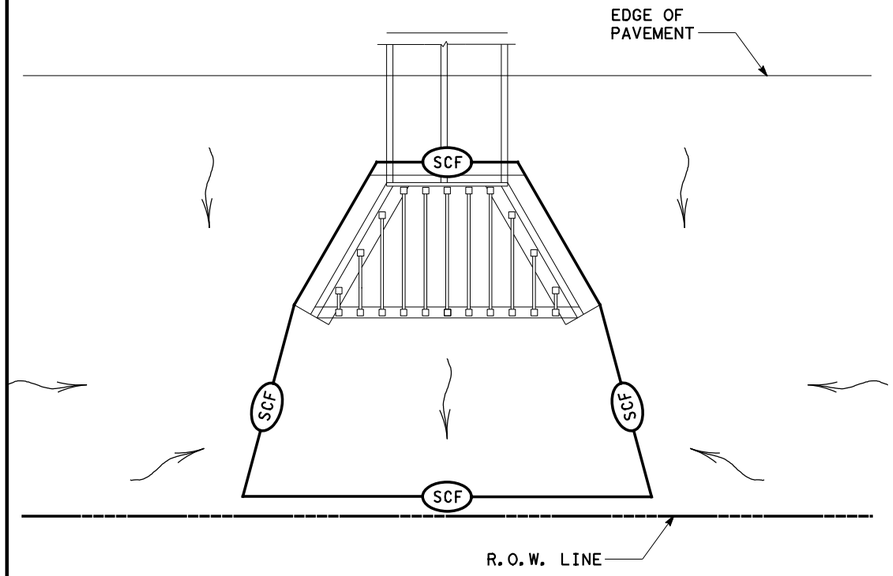
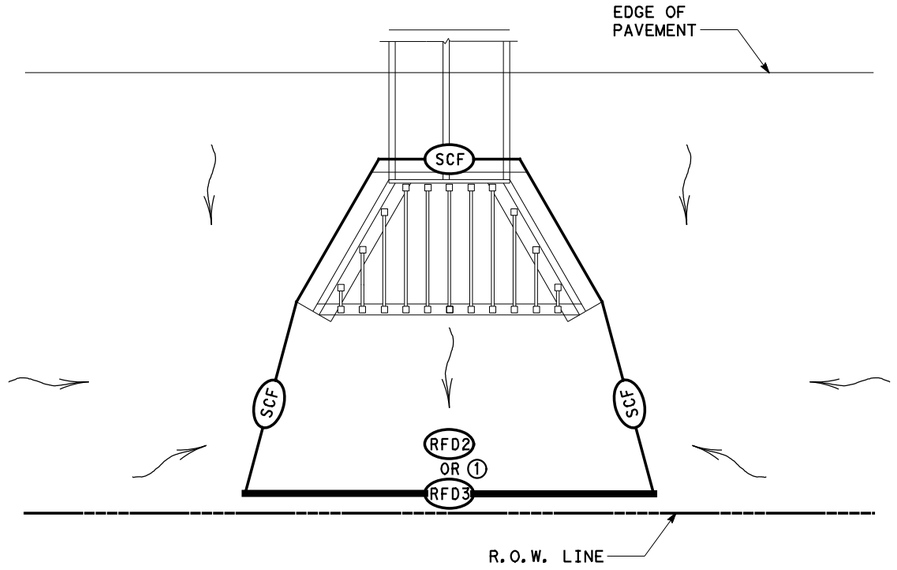


BEST MANAGEMENT PRACTICE (BMP) #5

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #6

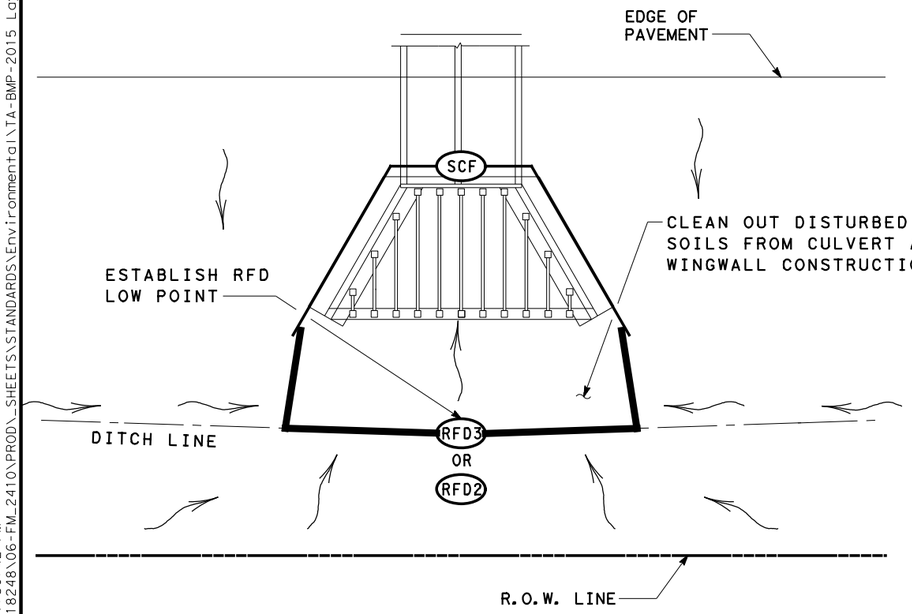
FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

NOTES:

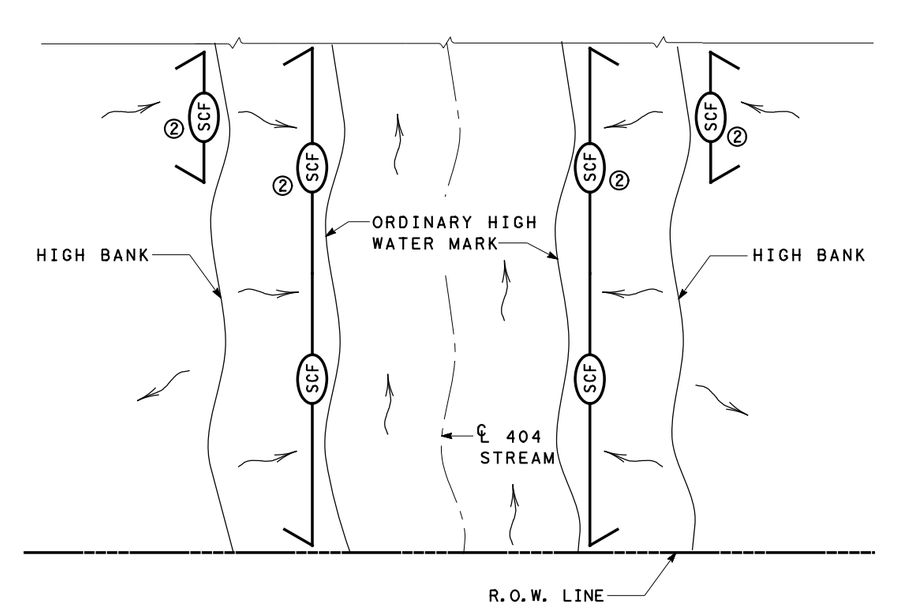
① PROVIDE OVERLAP OF SILT FENCE WITH ROCK FILTER DAM.

② USE SILT FENCE L-HOOKS ON ENDS TO BLOCK STORM WATER SEDIMENT



BEST MANAGEMENT PRACTICE (BMP) #7

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT ENTRANCE OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #8

FOR 404 STREAMS ~ SEDIMENT CONTROL DURING PROJECT CLEARING AND GRUBBING

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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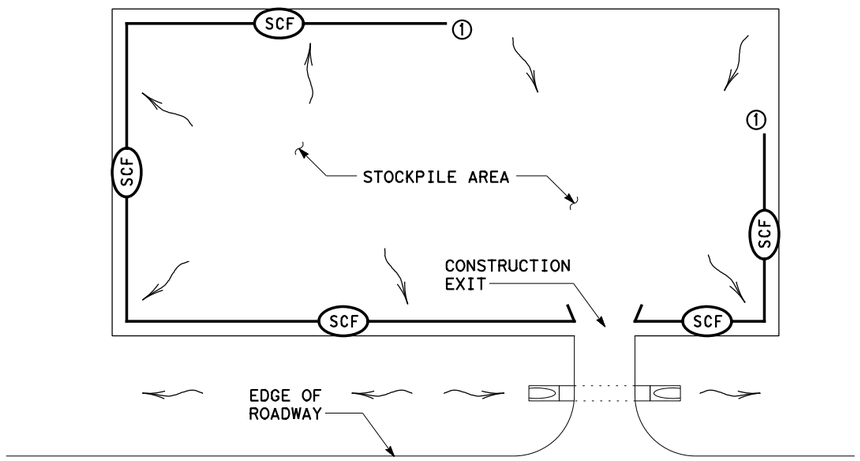
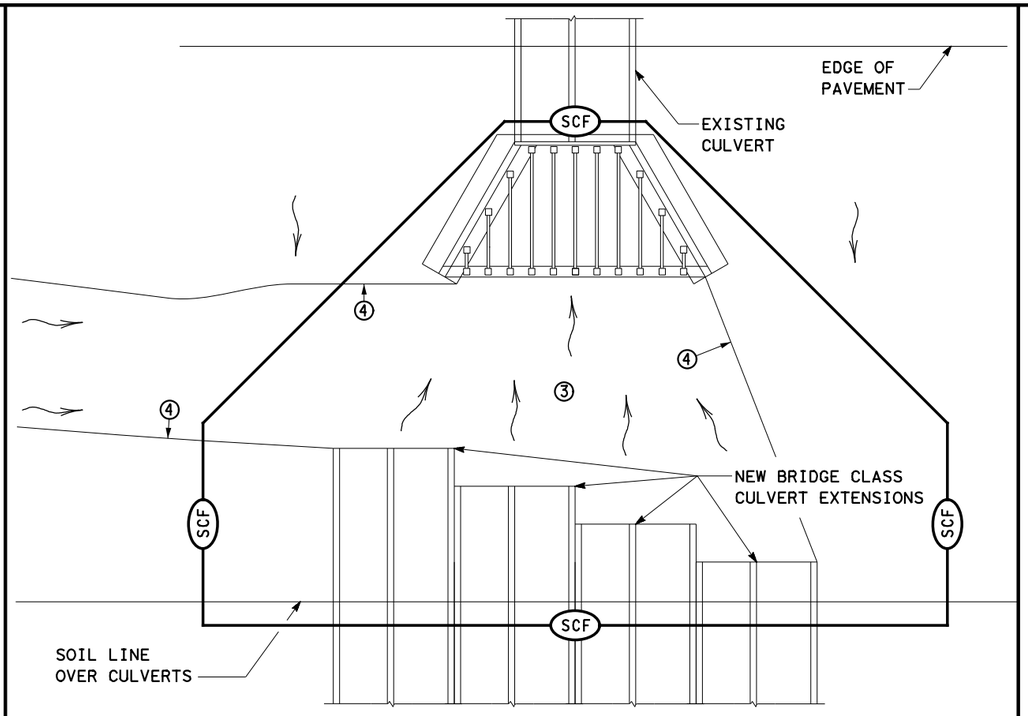


BEST MANAGEMENT PRACTICE (BMP) #9

STOCKPILE SEDIMENT CONTROL



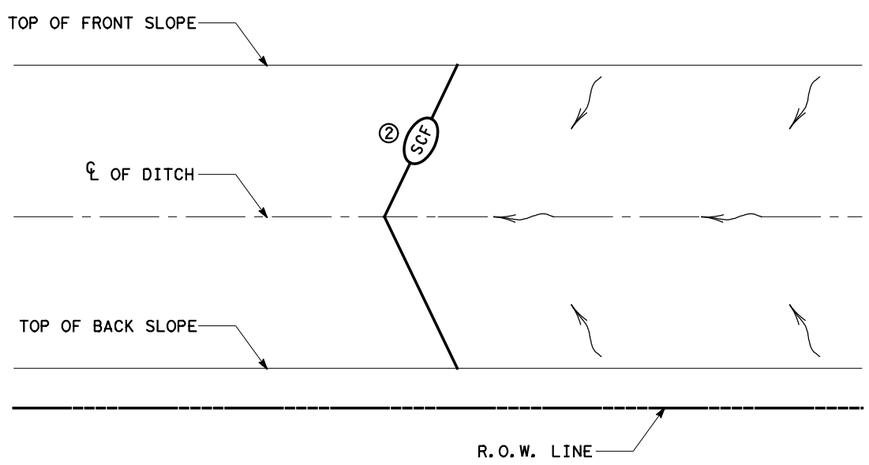
BEST MANAGEMENT PRACTICE (BMP) #10

FOR 404 OR NON-404 STREAMS ONLY ~
SEDIMENT CONTROL AT PHASED CONSTRUCTION OF BRIDGE CLASS CULVERTS

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

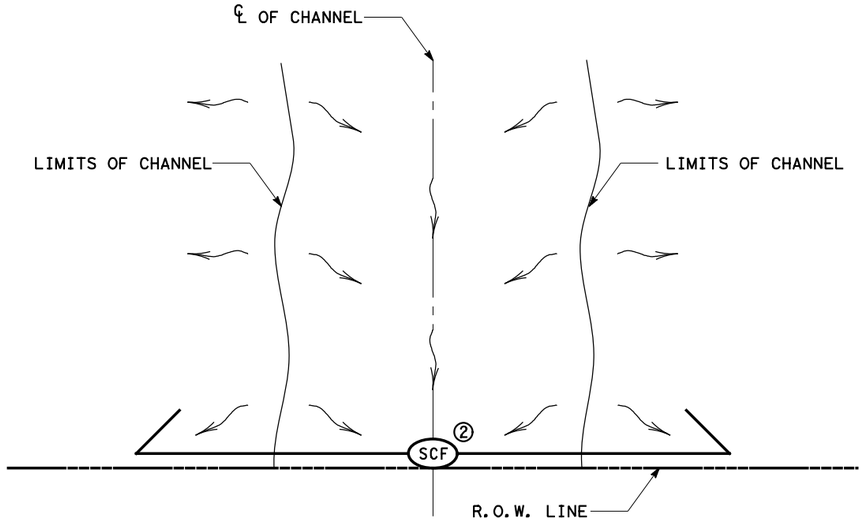
NOTES:

1. START SEDIMENT CONTROL AT LOCATION SO ALL STORM WATER WITH SEDIMENT IS COLLECTED
2. ROCK FILTER DAMS OR EARTH/GRASSED EMBANKMENTS CAN BE SUBSTITUTED AS DIRECTED.
3. PROVIDE A SMOOTH TRANSITION FROM THE INVERT ELEVATIONS BETWEEN CULVERTS. REMOVE LOOSE SOIL FROM EXCAVATED AREA BETWEEN CULVERTS.
4. PROVIDE AND INSTALL PNEUMATICALLY PLACED CONCRETE ON THE DITCH BOTTOM AND SIDE SLOPES BETWEEN TEMPORARY TERMINATIONS BETWEEN OLD AND NEW CULVERTS. PNEUMATICALLY PLACED CONCRETE WILL BE PLACED TO THE HEIGHT OF THE LARGEST CULVERT ON THE DITCH SIDE SLOPES; AND TO A LIMIT 10 FEET OUTSIDE THE LOCATION OF BMPS ALONG THE DITCH BOTTOM. CEMENT STABILIZED SAND MAY BE SUBSTITUTED FOR PNEUMATICALLY PLACED CONCRETE, IN AREAS WHERE INSTALLATION WORKS AND AT THE OPTION OF TXDOT.



BEST MANAGEMENT PRACTICE (BMP) #11

BOUNDRY SEDIMENT CONTROL ~ BOTH ENDS OF CONTROL TERMINATED UP SLOPE



BEST MANAGEMENT PRACTICE (BMP) #12

BOUNDRY SEDIMENT CONTROL ~ BOTH ENDS OF CONTROL TERMINATED DOWN SLOPE

SCALE = NTS SHEET 7 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

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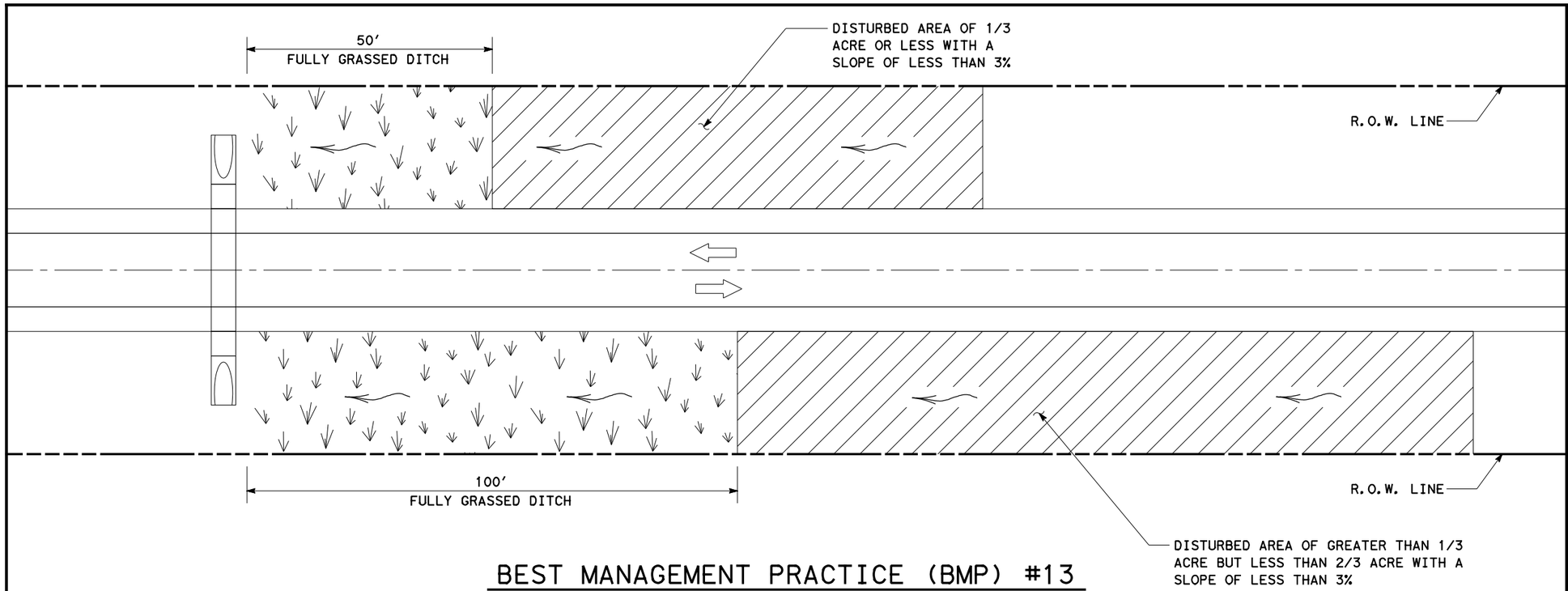
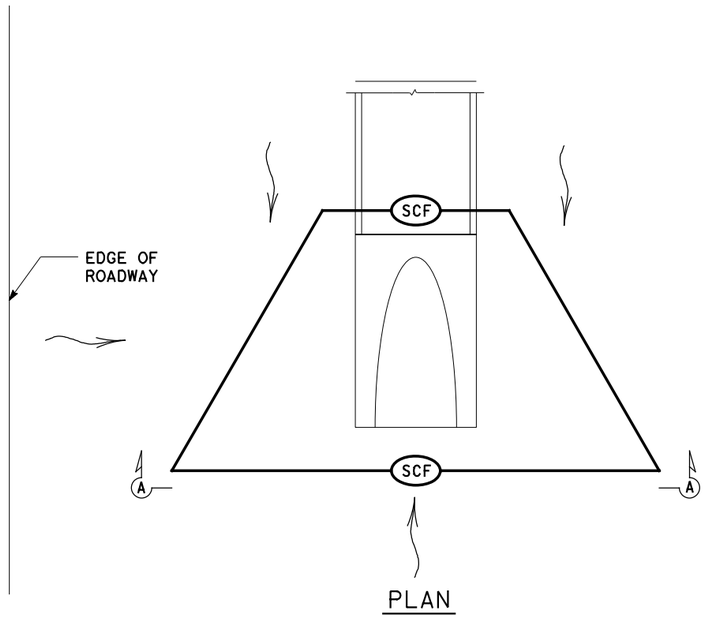
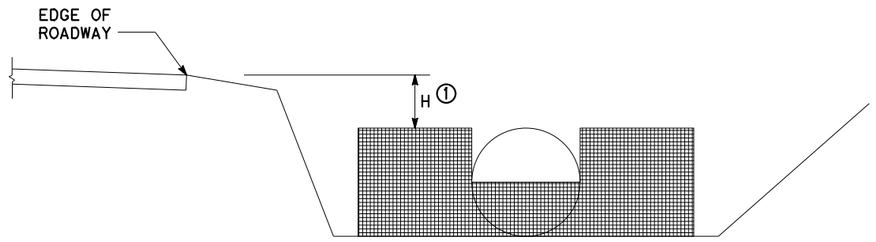


BEST MANAGEMENT PRACTICE (BMP) #13

USE OF VEGETATIVE BUFFERS IN PLACE OF TEMPORARY SEDIMENT CONTROLS SUCH AS SILT FENCE AND ROCK FILTER DAMS



PLAN



VIEW A-A

BEST MANAGEMENT PRACTICE (BMP) #14

NON-404 STREAMS AND DITCHES ONLY ~ SEDIMENT CONTROL AT PARALLEL DRAINAGE STRUCTURE ENTRANCE ②

	FULLY GRASSED DITCH
	DISTURBED AREA
	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE

① FOR H DIMENSIONS LESS THAN 1.5′ SILT FENCE MAY NEED TO BE NOTCHED AS SHOWN IN VIEW A-A. ADD EXTRA POSTS AT NOTCH.

② BMP #14 MAY BE USED AT CROSS DRAINAGE STRUCTURES AS DIRECTED.

SCALE = NTS SHEET 8 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

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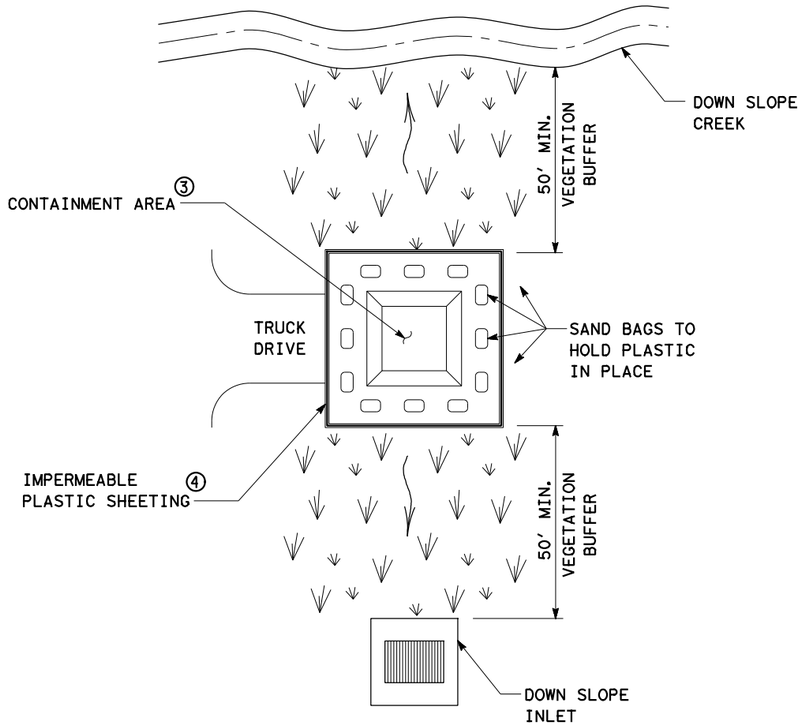
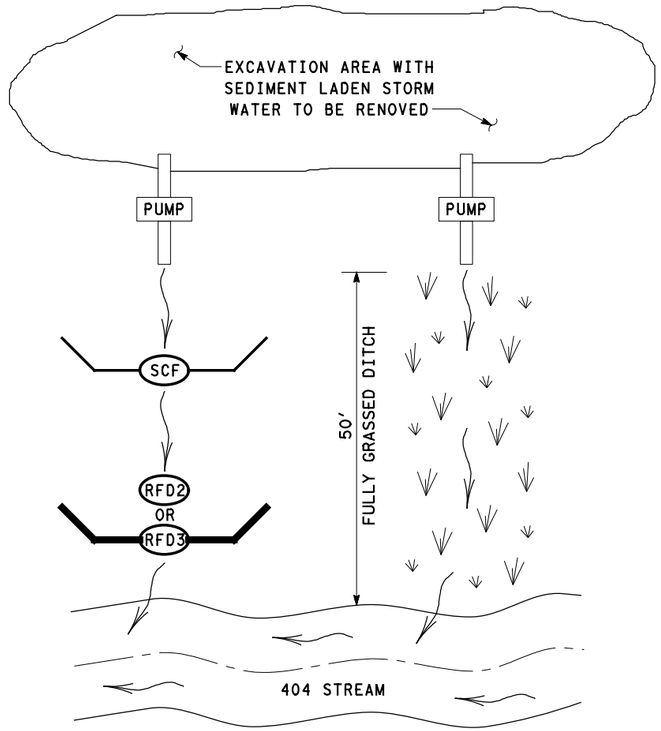


BEST MANAGEMENT PRACTICE (BMP) #15

CONCRETE TRUCK WASHOUT AREA



BEST MANAGEMENT PRACTICE (BMP) #16

PUMPED STORM WATER SEDIMENT CONTROLS ①

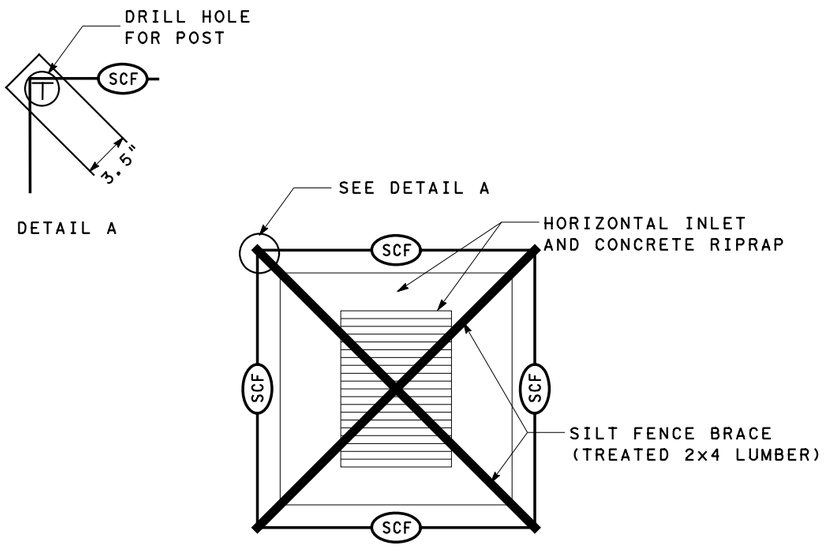
	FULLY GRASSED DITCH
	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)

① PUMPED STROM WATER FROM AN EXCAVATION AREA SHOULD BE DISCHARGED IN A 50' VEGETATIVE BARRIER OR THROUGH TWO TEMPORARY SEDIMENT CONTROLS BEFORE ENTERING A 404 STREAM.

② FOR LANDOWNER STOCKPONDS WITHIN 50' OF THE RIGHT OF WAY LINE, PROVIDE REDUNDANT SEDIMENT CONTROLS AT THE CONVEYANCE OF THE POND. MINIMUM OF TWO SEDIMENT CONTROLS.

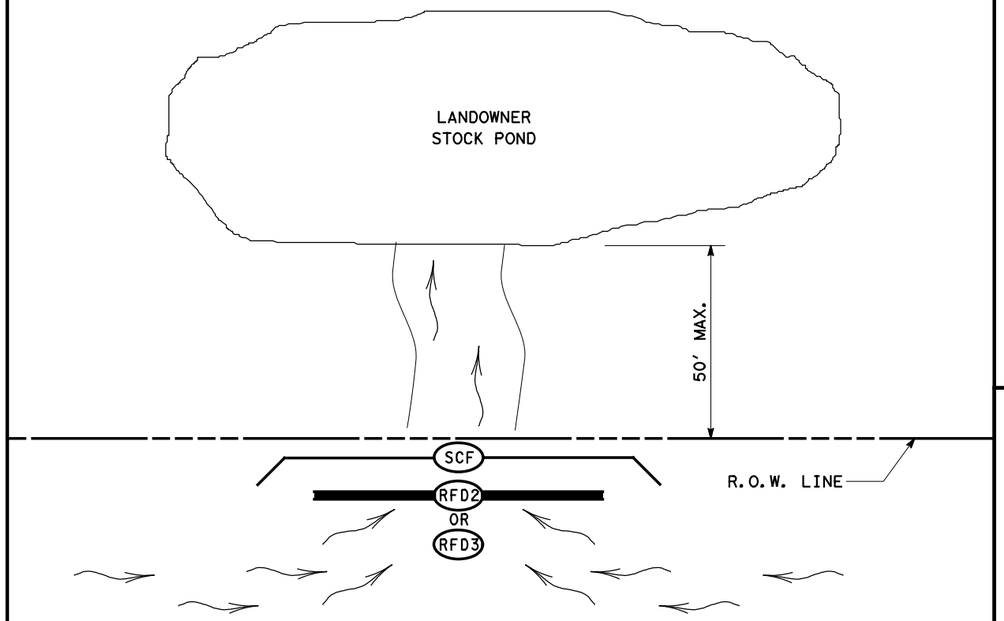
③ WHEN CONTAINMENT AREA REACHES 1' FREEBOARD, DISCONTINUE WASHOUT PLACEMENT AND REMOVE MATERIAL UPON SOLIDIFICATION.

④ EACH TIME SOLIDIFIED MATERIAL IS REMOVED REPLACE PLASTIC SHEETING.



BEST MANAGEMENT PRACTICE (BMP) #17

HORIZONTAL INLET SEDIMENT CONTROL



BEST MANAGEMENT PRACTICE (BMP) #18

LANDOWNER STOCKPOND SEDIMENT CONTROL ②

SCALE = NTS SHEET 9 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

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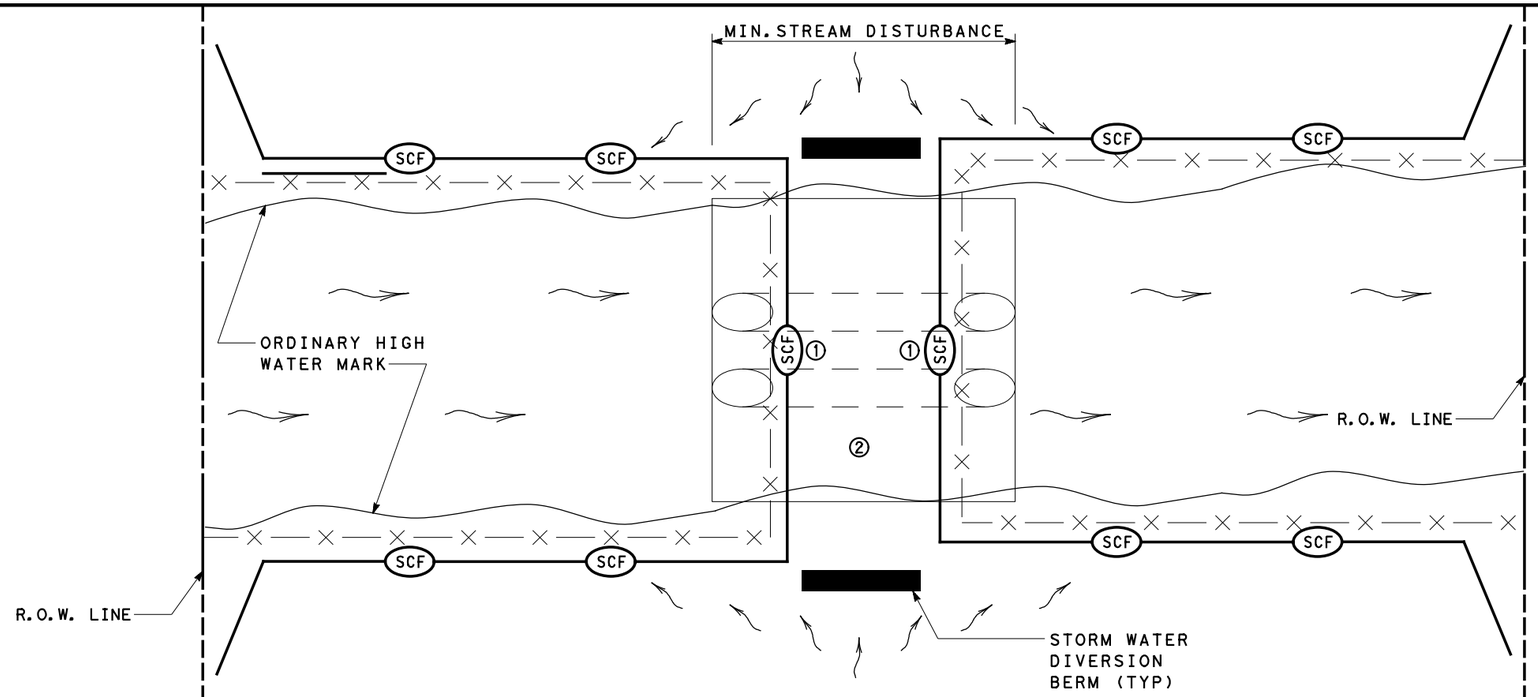


BEST MANAGEMENT PRACTICE (BMP) #19

TYPICAL 404 STREAM CROSSING (SEDIMENT CONTROL AT CROSSING)

	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE
RFD	ROCK FILTER DAM
× — ×	SECURITY FENCING

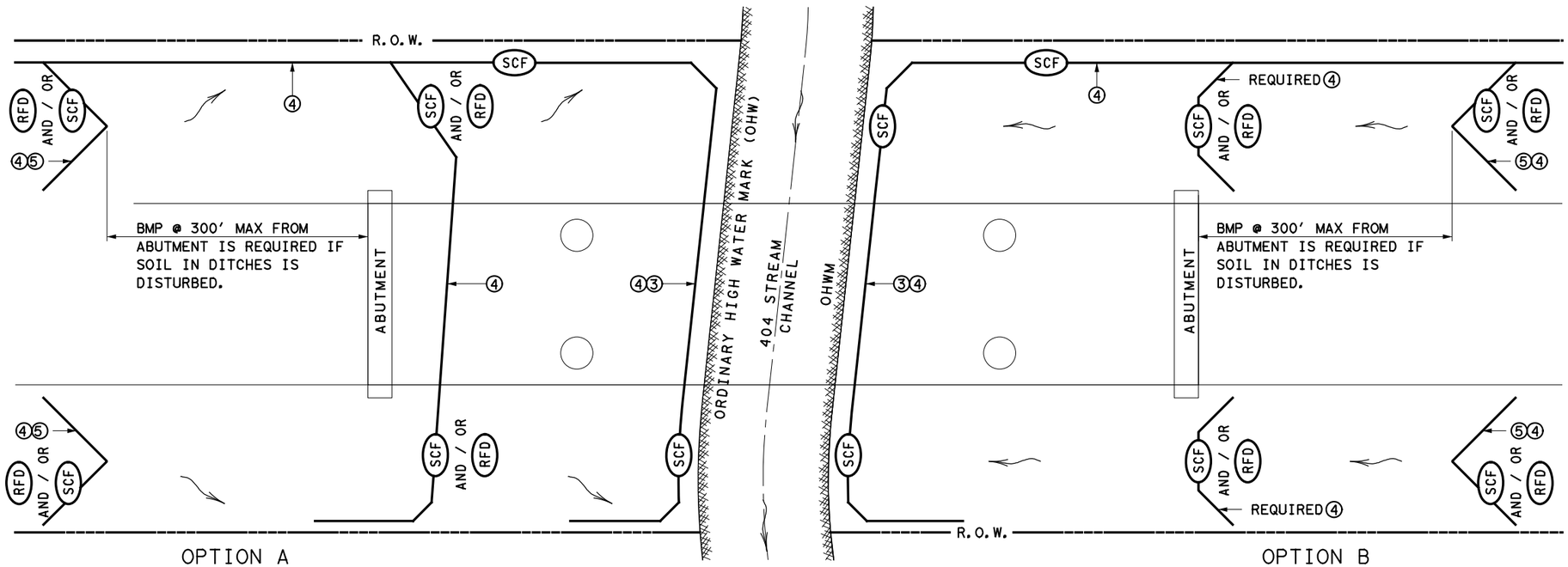
① HAY BALES MAY BE SUBSTITUTED FOR SILT FENCE OVER THE STREAM CROSSING.

② CROSSING WILL BE AS PER REQUIREMENTS OF THE WATERS OF THE US GENERAL NOTES.

③ INSTALL SILT FENCE SLIGHTLY UP FROM OHW MARK FROM R.O.W. TO R.O.W.

④ USE SILT FENCE L-HOOKS ON LEVEL OR DOWN SLOPING ENDS TO BLOCK STORM WATER SEDIMENT

⑤ INSTALL LARGE V OR U SHAPED BMP'S FROM ABUTMENT AS SHOWN. IF THERE IS STEEP DITCH CONDITIONS DECREASE SPACING AND CONSIDER RFD'S. ADD ADDITIONAL BMP'S IF GRADE IS STEEP OR IF FLOW IS HIGH.



BEST MANAGEMENT PRACTICE (BMP) #20

FOR 404 STREAMS ~ BMP'S AT BRIDGES

SCALE = NTS SHEET 10 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

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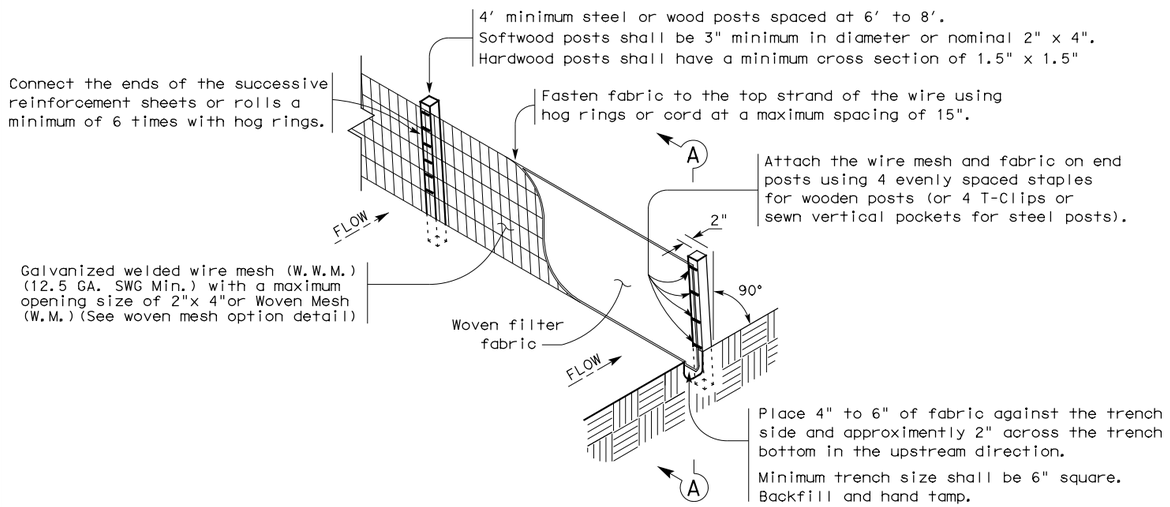
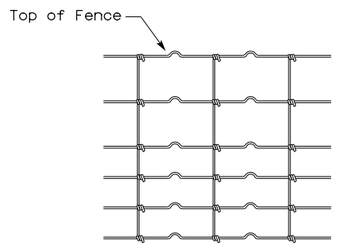
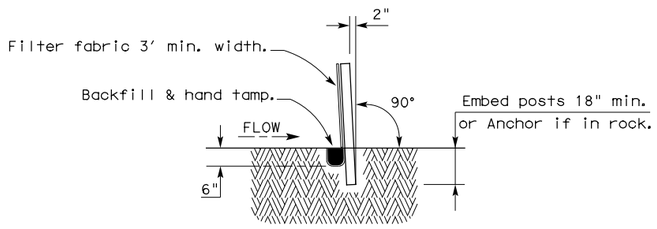


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

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

SEDIMENT CONTROL FENCE USAGE GUIDELINES

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

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

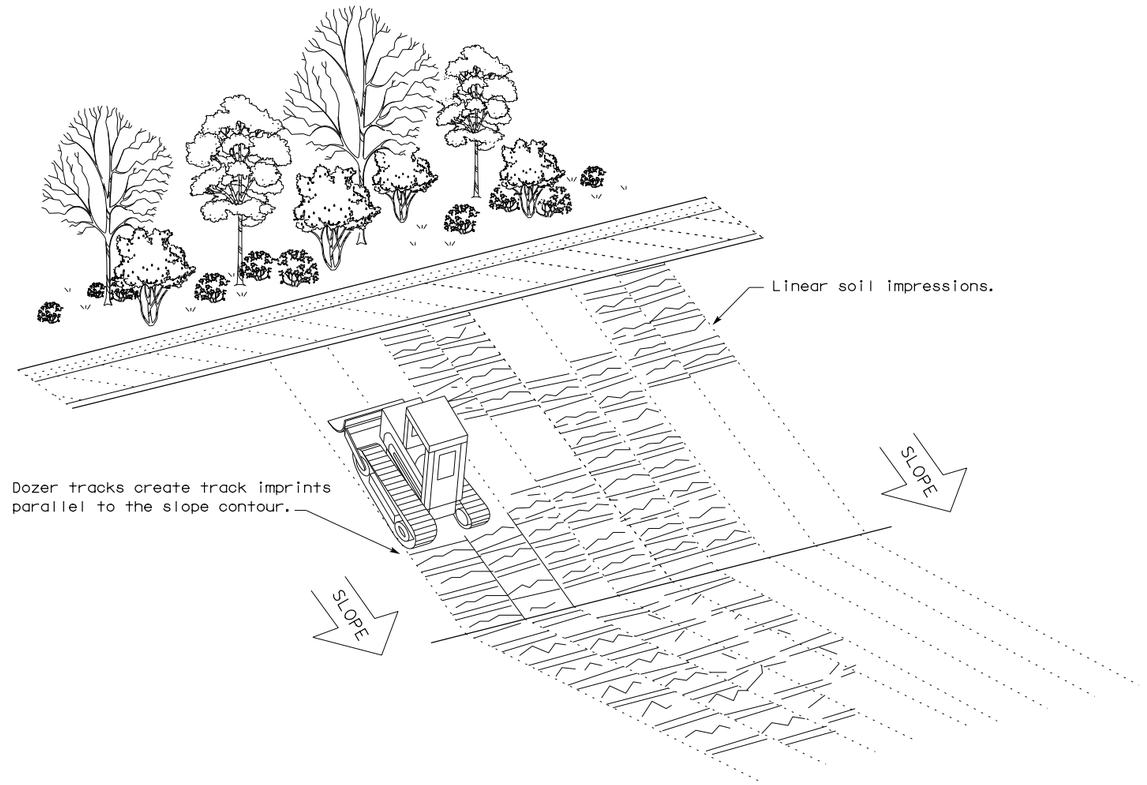
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

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



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
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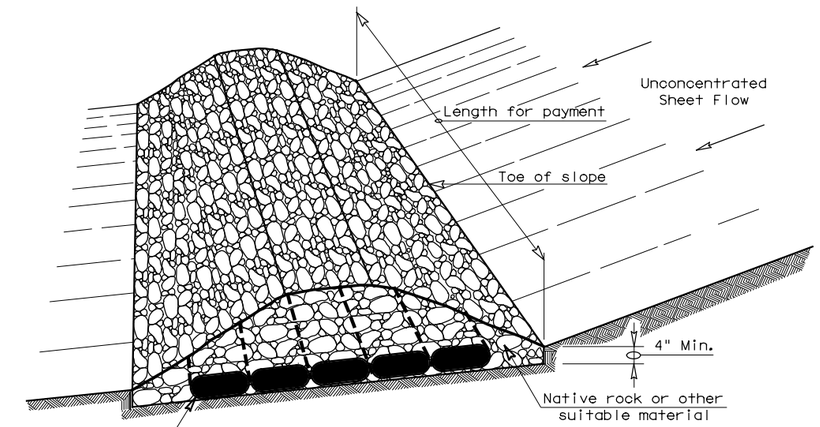
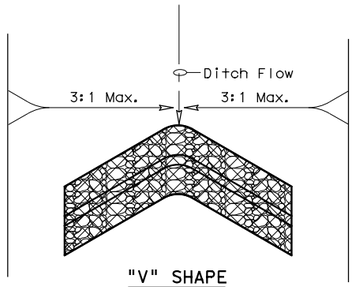
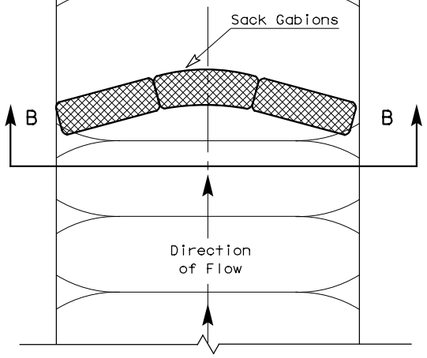


FILTER DAM AT TOE OF SLOPE

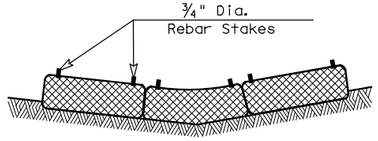
RFD1



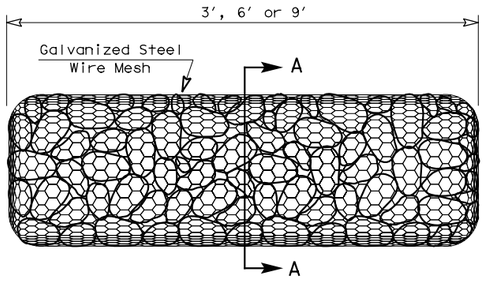
"V" SHAPE
PLAN VIEW



PLAN VIEW

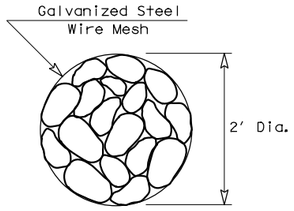


SECTION B-B

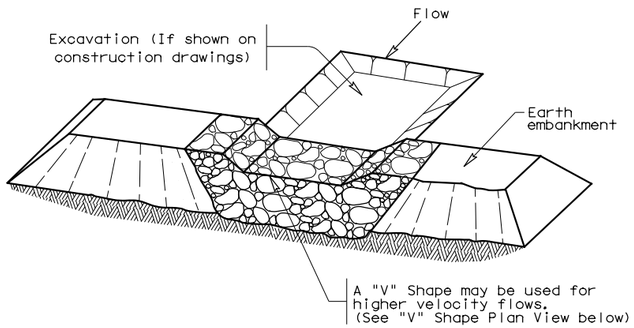


TYPE 4 (SACK GABIONS)

RFD4

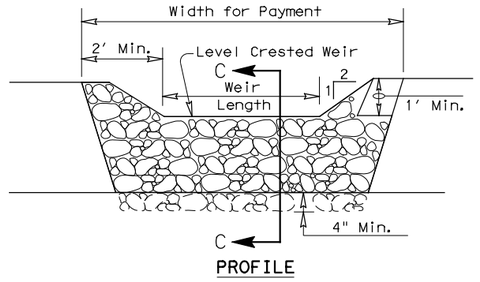


SECTION A-A

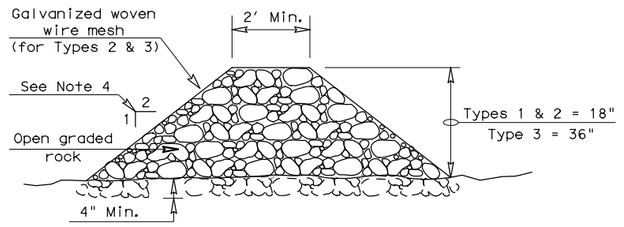


FILTER DAM AT SEDIMENT TRAP

RFD1 — OR — RFD2



PROFILE



SECTION C-C

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

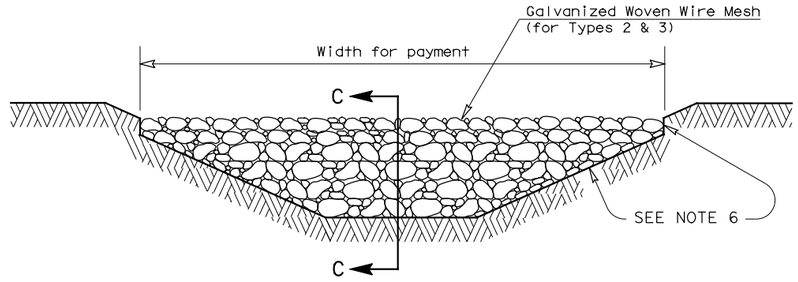
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3
Type 4 Rock Filter Dam — RFD4

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
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REVISIONS	2304	02	044	FM 2410
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