INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO. STP 2024(985)HRR
PROJECT CSJ: 2174-01-018

VOLUME II
(CONTRACT CSJ: 0162-01-100)

FM 2311
McLENNAN COUNTY

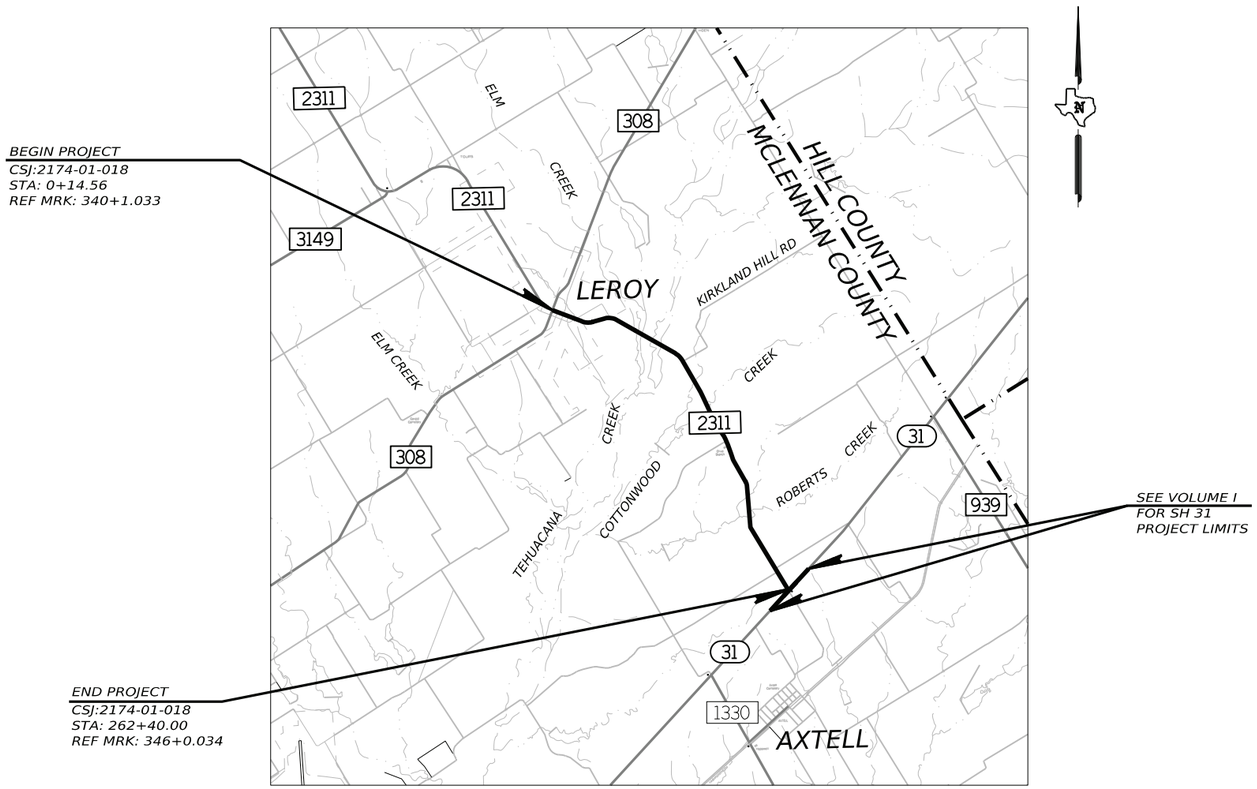
FEDERAL AID PROJECT NO.			
F 2024(984)			
CONT	SECT	JOB	HIGHWAY
0162	01	100	SH 31
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		1

DESIGN SPEED = 40 MPH
A.D.T. (2024)= 1,100
A.D.T. (2044)= 1,500

NET LENGTH OF ROADWAY = 25,451.48 FT.= 4.820 MI.
NET LENGTH OF BRIDGE = 769.99 FT.= .146 MI.
NET LENGTH OF PROJECT = 26,221.47 FT.= 4.966 MI.

LIMITS: FM 308 TO SH 31

FOR THE CONSTRUCTION OF HAZARD ELIMINATION & SAFETY
CONSISTING OF WIDEN LANES, WIDEN PAVED SHOULDERS



BEGIN PROJECT
CSJ:2174-01-018
STA: 0+14.56
REF MRK: 340+1.033

END PROJECT
CSJ:2174-01-018
STA: 262+40.00
REF MRK: 346+0.034

SEE VOLUME I
FOR SH 31
PROJECT LIMITS

SCALE: 1IN=10,000FT

EXCEPTIONS: NONE

EQUATIONS: STA 158+01.49 (AH) =
STA 157+97.52 (BK)

RAILROAD CROSSINGS: NONE

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, OCTOBER 23, 2023)

SUBMITTED FOR LETTING:
ATKINS (DESIGN CONSULTANT)

THOMAS T. LE, P.E.
PROJECT MANAGER

03/06/2024
DATE

AtkinsRéalis
TBPE REG. # F-474
11801 DOMAIN BLVD, SUITE 500
AUSTIN, TEXAS 78758
(512) 327-6840

Texas Department of Transportation

RECOMMENDED FOR LETTING: 3/6/2024
DocuSigned by:
6D9791C615CF49B...
AREA ENGINEER

RECOMMENDED FOR LETTING: 3/6/2024
DocuSigned by:
9AD8C743F95E4E3...
DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 3/6/2024
DocuSigned by:
Stanley Swiatek
B69BD796DD564C9...
DISTRICT ENGINEER

DATE: 3/1/2024 8:48:13 AM
FILE: ...\FM2311 TITLE SHEET.dgn

INDEX OF SHEETS

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (*)
HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

LUKE W. CLARKE, P.E. 60221

STATE OF TEXAS
LUKE W. CLARKE
60221
LICENSED
PROFESSIONAL ENGINEER
3/25/2024

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (**)
HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

RANDY W. HARRIS, P.E. 93663

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
3/25/2024

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (***)
HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

FLORIAN BALTOI, P.E. 119857

STATE OF TEXAS
FLORIAN BALTOI
119857
LICENSED
PROFESSIONAL ENGINEER
3/26/2024

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (****)
HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

PRADEEP KUMAR, P.E. 130846

STATE OF TEXAS
PRADEEP KUMAR
130846
LICENSED
PROFESSIONAL ENGINEER
3/25/2024

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (*****)
HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

MOHAMMED SADRUL ULA, P.E. 131559

STATE OF TEXAS
MOHAMMED SADRUL ULA
131559
LICENSED
PROFESSIONAL ENGINEER
3/25/2024

AtkinsRéalis
TBPE REG. # F-474

Texas Department of Transportation

FM 2311

INDEX OF SHEETS

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CONT.	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.
WAC	McLENNAN		2

DATE: 3/25/2024 5:24:49 PM
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INDEX OF SHEETS

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (*)
HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

LUKE W. CLARKE, P.E. 60221

STATE OF TEXAS
LUKE W. CLARKE
60221
LICENSED
PROFESSIONAL ENGINEER
3/1/2024

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (**)
HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

RANDY W. HARRIS, P.E. 93663

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
3/1/2024

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (***)
HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

FLORIAN BALTOI, P.E. 119857

STATE OF TEXAS
FLORIAN BALTOI
119857
LICENSED
PROFESSIONAL ENGINEER
3/1/2024

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (****)
HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

PRADEEP KUMAR, P.E. 130846

STATE OF TEXAS
PRADEEP KUMAR
130846
LICENSED
PROFESSIONAL ENGINEER
3/1/2024

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (*****)
HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

MOHAMMED SADRUL ULA, P.E. 131559

STATE OF TEXAS
MOHAMMED SADRUL ULA
131559
LICENSED
PROFESSIONAL ENGINEER
3/1/2024

AtkinsRéalis
TBPE REG. # F-474

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FM 2311

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DIST	COUNTY		SHEET NO.
WAC	McLENNAN		3

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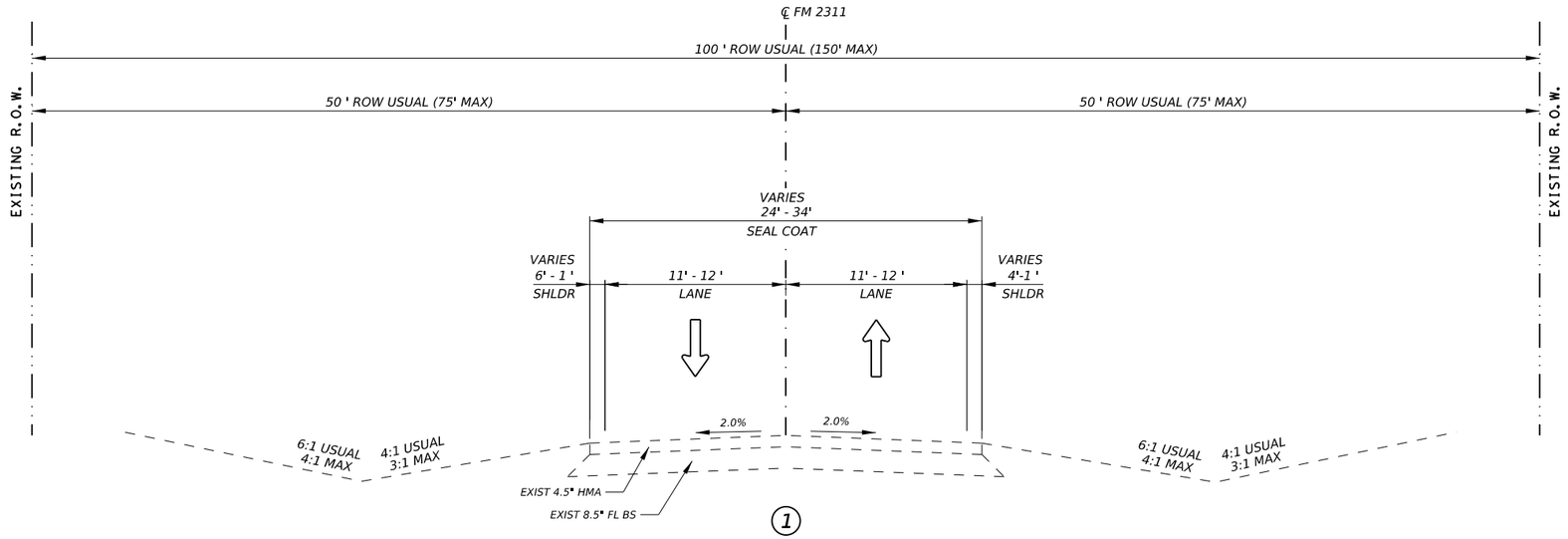

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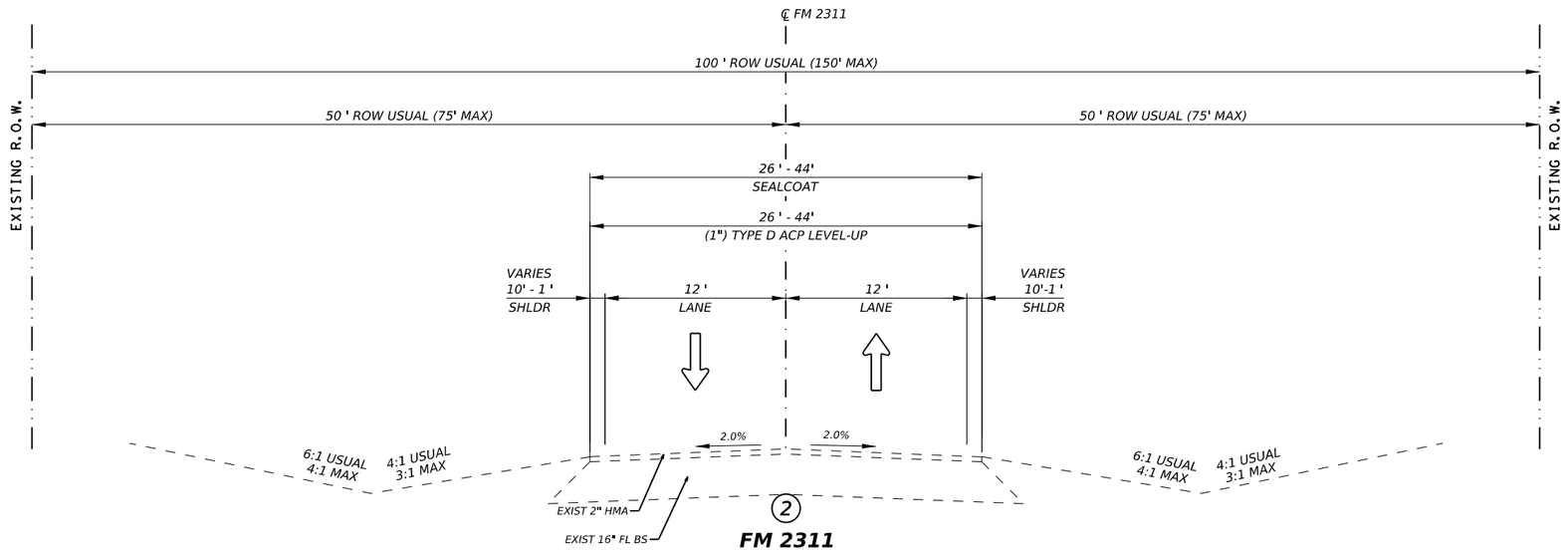
FM 2311
EXISTING TYPICAL SECTION

STA 0+14.56 TO STA 59+30.00
(TRANS FROM STA 59+30.00 TO STA 60+05.00)
STA 69+10.00 TO STA 130+00.00
STA 134+50.00 TO STA 262+40.00



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FM 2311
EXISTING TYPICAL SECTION

STA 60+05.00 TO STA 68+50.00
(TRANS FROM STA 68+50.00 TO STA 69+10.00)
(BRIDGE STA 62+47.32 TO 65+47.32,
BRIDGE STA 69+90.22 TO 71+90.22,
BRIDGE STA 77+57.09 TO 79+57.09)

DATE: 1/31/2024 1:30:21 PM
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STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
1/31/2024
Randy W. Harris, P.E.

AtkinsRéalis
TBPE REG. # F-474

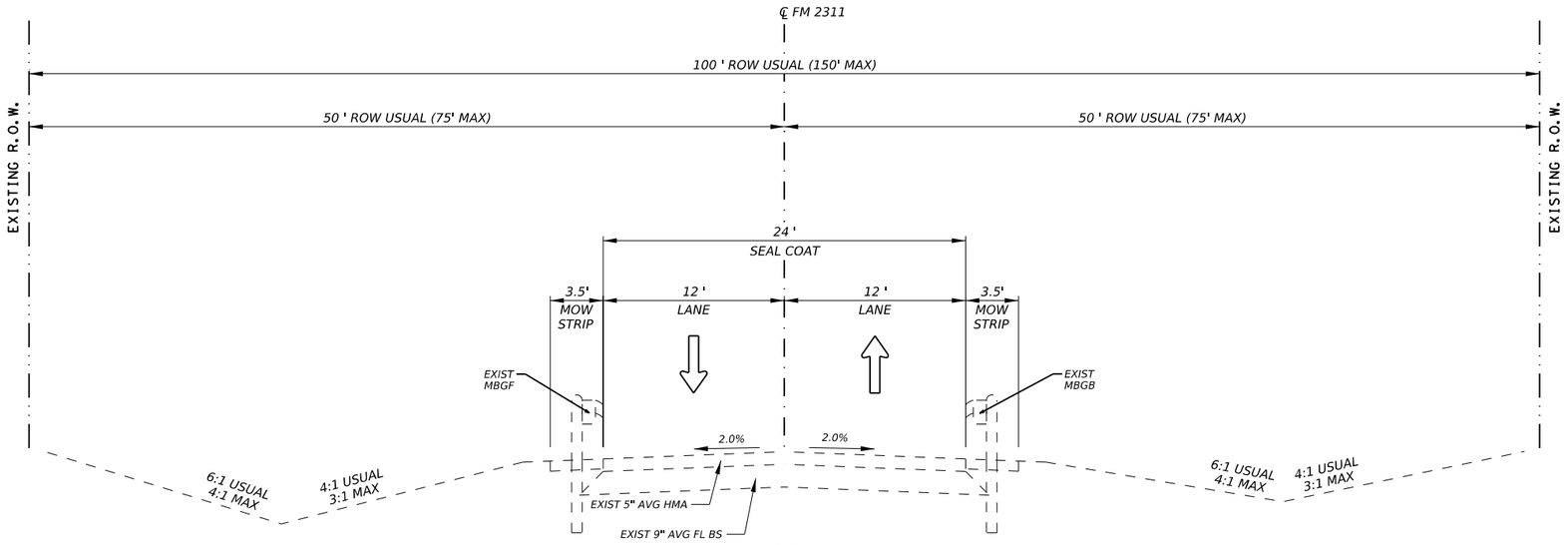
Texas Department of Transportation

FM 2311

TYPICAL SECTION
EXISTING

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		4



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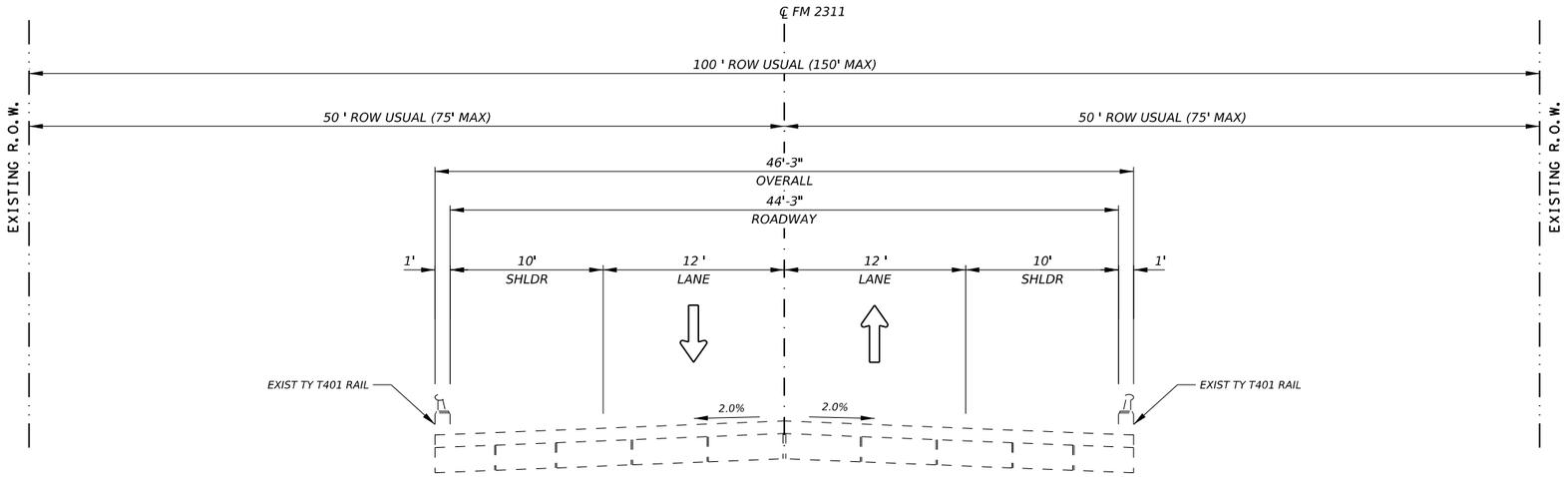
FM 2311
EXISTING TYPICAL SECTION

STA 130+00.00 TO STA 134+50.00



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FM 2311
EXISTING TYPICAL SECTION
BRIDGE

STA 62+47.32 TO STA 65+47.32
RICE CREEK BRIDGE
NBI 09-161-0-2174-01-010

STATE OF TEXAS
RANDY W. HARRIS
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TYPICAL SECTION
EXISTING

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		5

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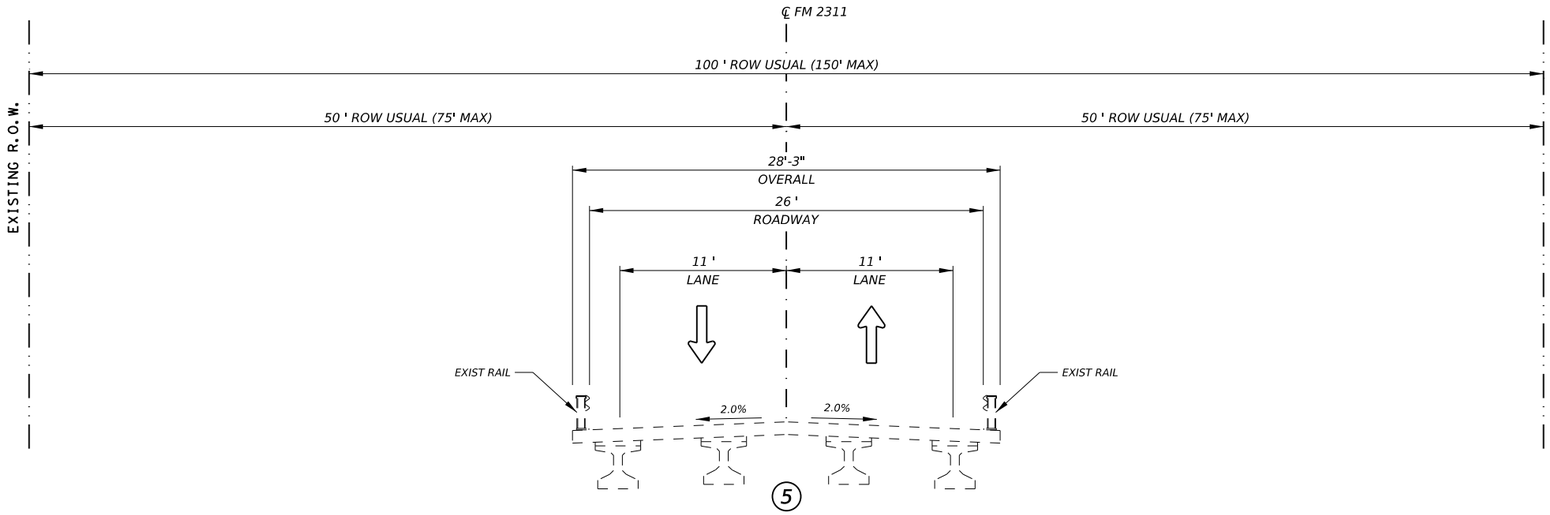

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FM 2311
EXISTING TYPICAL SECTION
BRIDGE

STA 69+90.22 TO STA 71+90.22
TEHUACANA CREEK BRIDGE
NBI 09-161-0-2174-01-005
STA 77+57.09 TO STA 79+57.09
TEHUACANA CREEK RELIEF BRIDGE
NBI 09-161-0-2174-01-006

STATE OF TEXAS
RANDY W. HARRIS
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1/31/2024
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TYPICAL SECTION
EXISTING

SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
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WAC	McLENNAN		6

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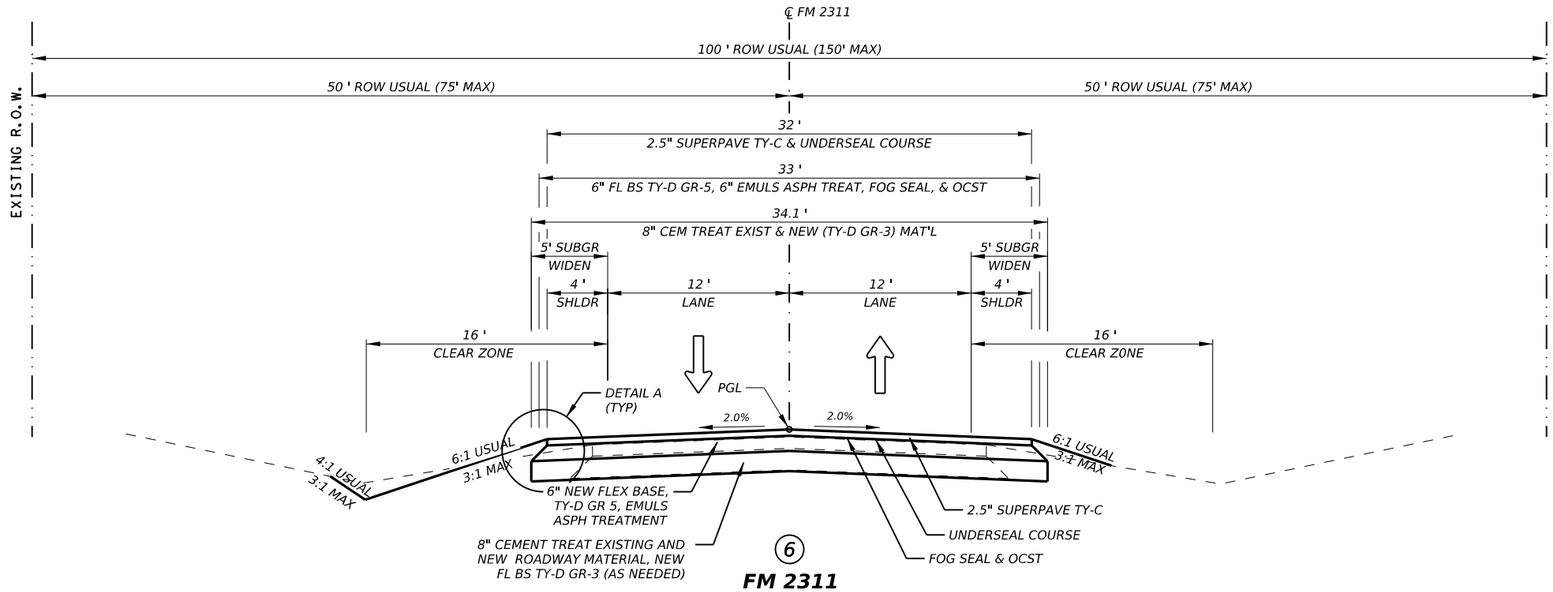
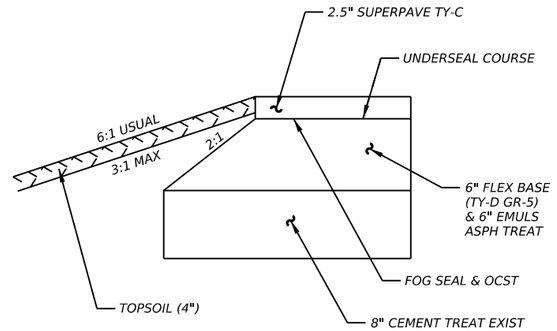


⑥

FM 2311
PROPOSED TYPICAL SECTION

STA 0+14.56 TO STA 58+90.00
STA 58+90.00 TO STA 59+90.00 (TRANSITION FROM 4' TO 10' SHLDR)
STA 83+41.40 TO STA 130+00.00
STA 134+50.00 TO STA 262+40.00



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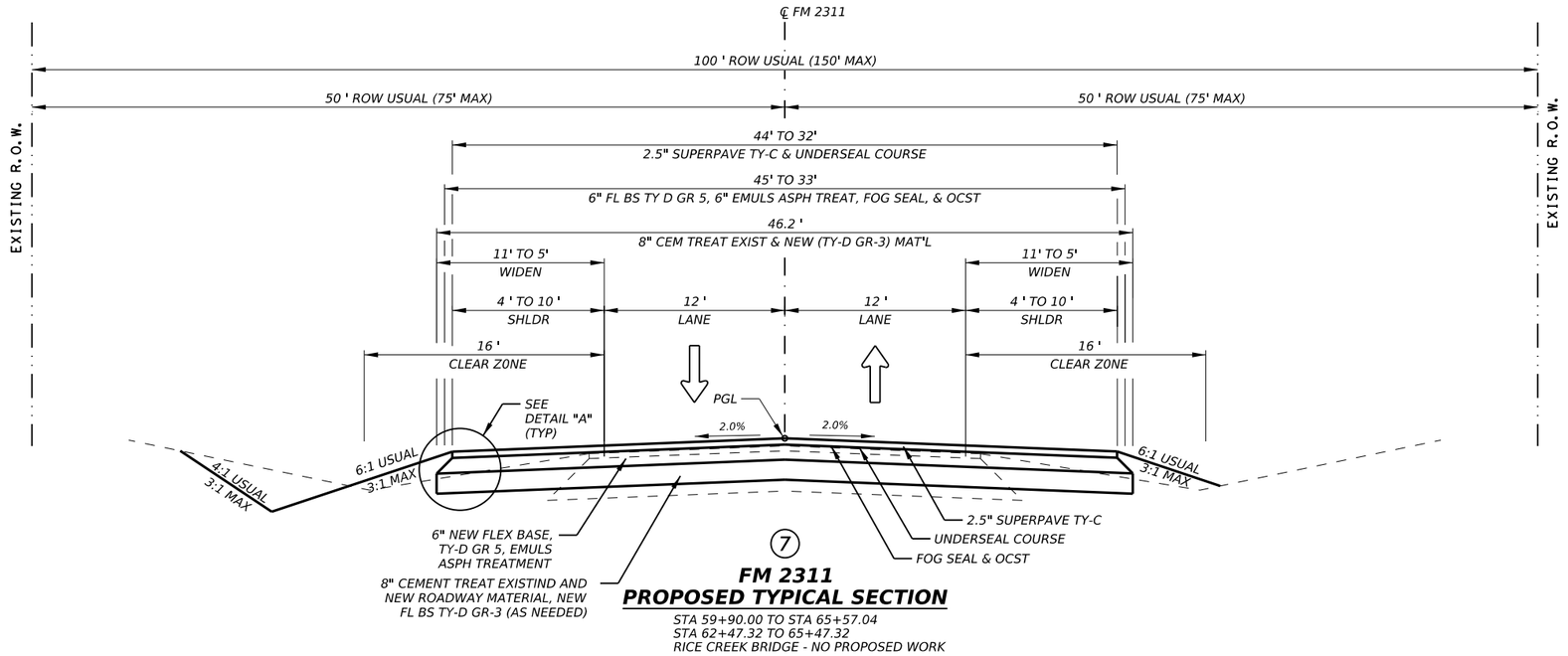
NTS



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FM 2311
PROPOSED TYPICAL SECTION

STA 59+90.00 TO STA 65+57.04
STA 62+47.32 TO 65+47.32
RICE CREEK BRIDGE - NO PROPOSED WORK

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED PROFESSIONAL ENGINEER
1/31/2024
Randy W. Harris, P.E.

AtkinsRéalis
TBPE REG. # F-474

Texas Department of Transportation

FM 2311

TYPICAL SECTION PROPOSED

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		7

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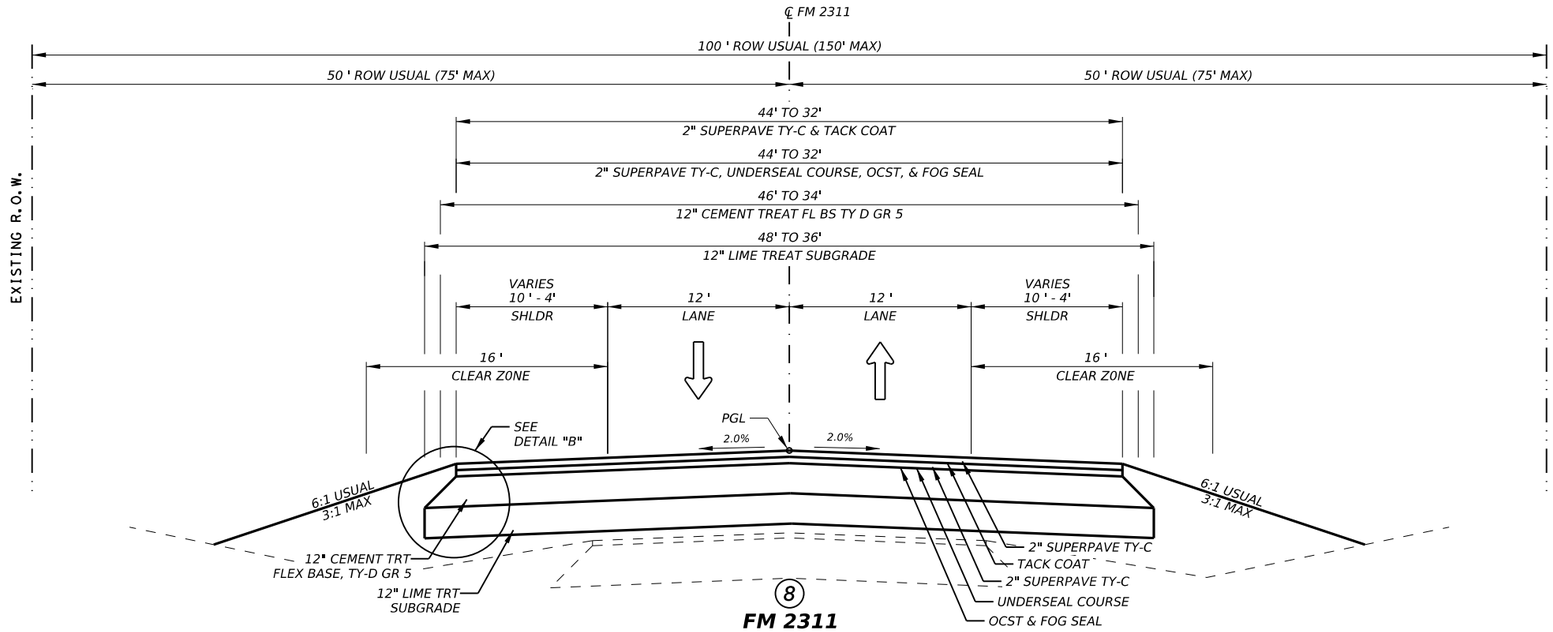
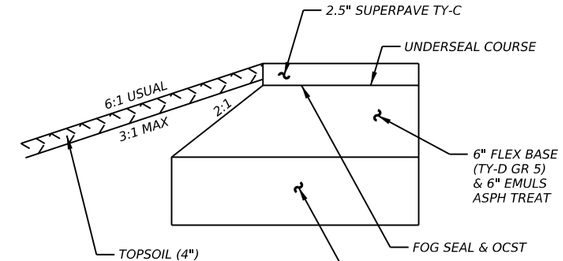


8

FM 2311

PROPOSED TYPICAL SECTION

STA 65+57.04 TO STA 83+41.40
STA 82+10.14 TO STA 83+10.14 (TRANSITION FROM 10' TO 4' SHLDR)
(BRIDGE STA 69+90.22 TO 71+90.22,
BRIDGE STA 77+57.09 TO 79+57.09)



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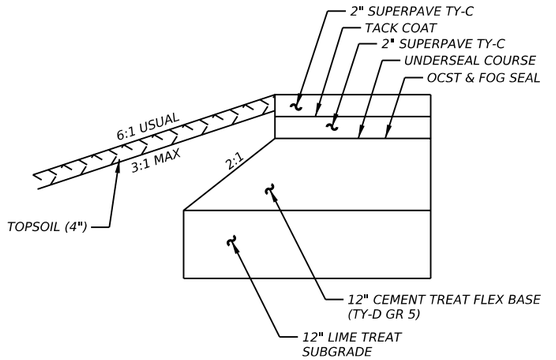

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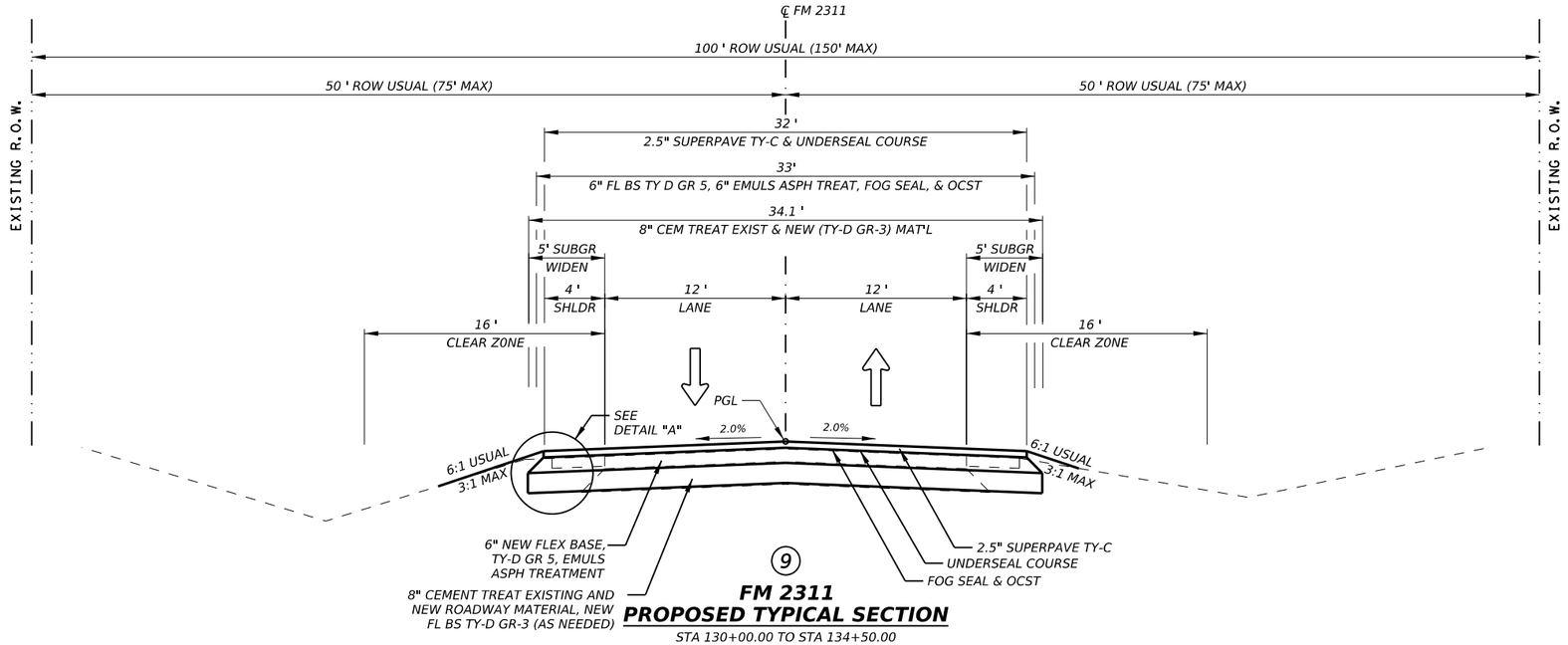

9

FM 2311

PROPOSED TYPICAL SECTION

STA 130+00.00 TO STA 134+50.00

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TBPE REG. # F-474

Texas Department of Transportation

FM 2311

TYPICAL SECTION
PROPOSED

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		8

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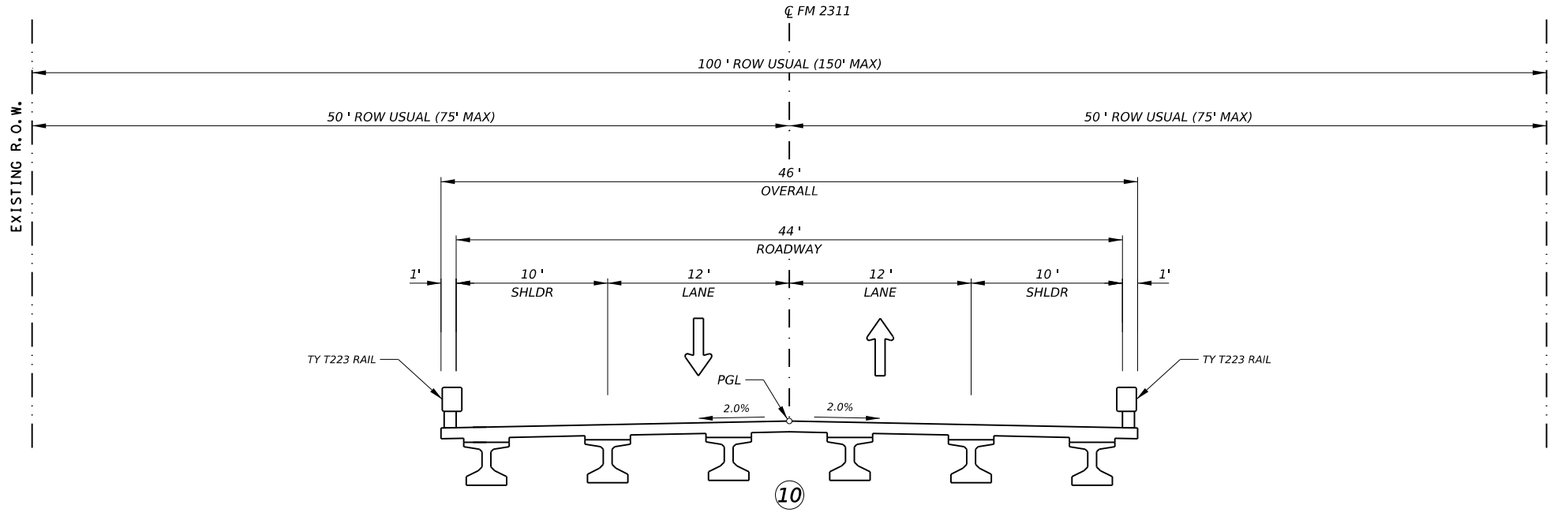
DW



10

FM 2311
PROPOSED TYPICAL SECTION
BRIDGE

STA 69+90.22 TO STA 71+90.22
TEHUACANA CREEK BRIDGE
NBI 09-161-0-2174-01-011
STA 77+57.09 TO STA 79+57.09
TEHUACAN CREEK RELIEF BRIDGE
NBI 09-161-0-2174-01-012

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
1/31/2024
Randy W. Harris, P.E.

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TBPE REG. # F-474

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FM 2311

TYPICAL SECTION
PROPOSED

SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		9

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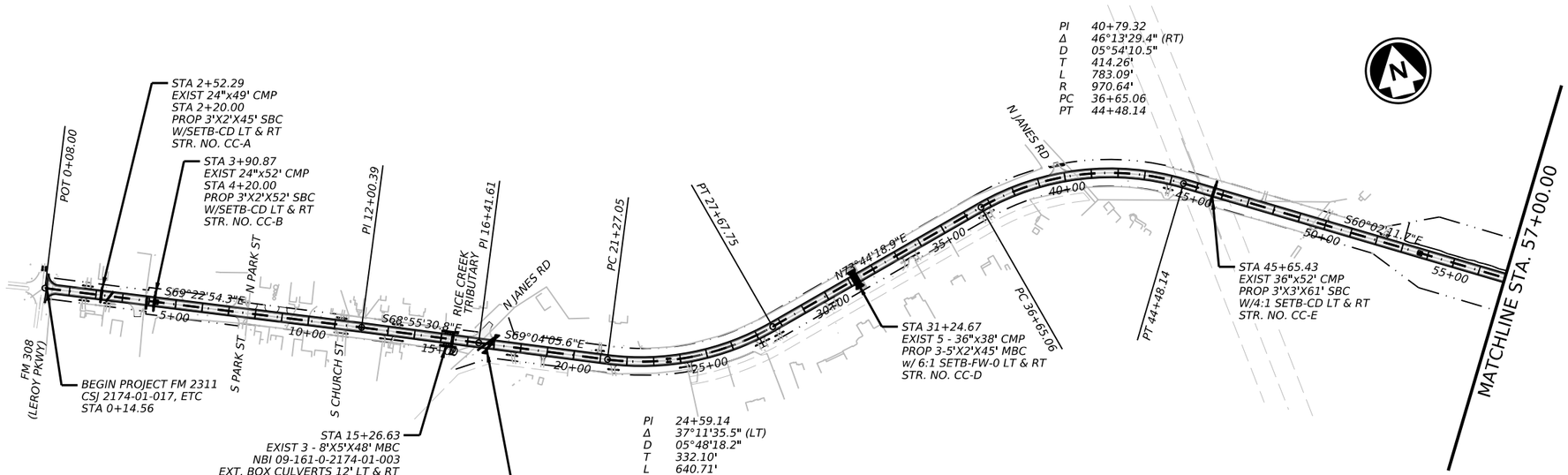
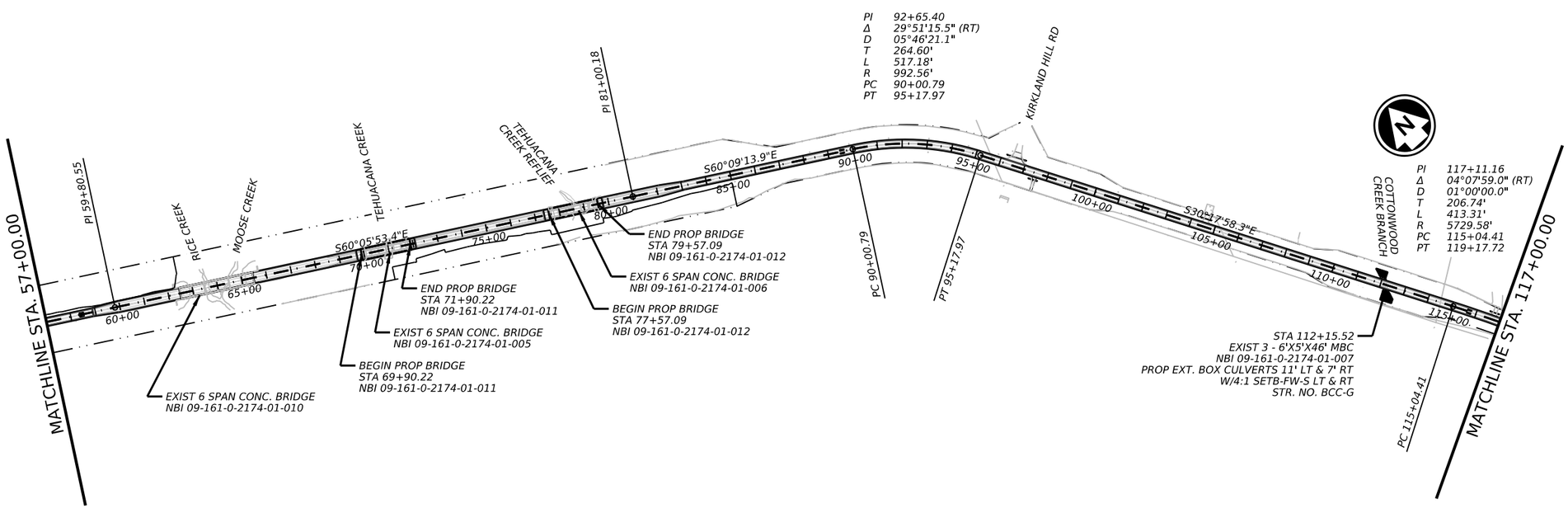
LEGEND

EXISTING ROW

SUPERPAVE TY-C





0 250 500

SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
1/31/2024
Randy W. Harris, P.E.

AtkinsRéalis
TBPE REG. # F-474

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Texas Department of Transportation

FM 2311

PROJECT LAYOUT
BEGIN TO STA 117+00.00

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		10

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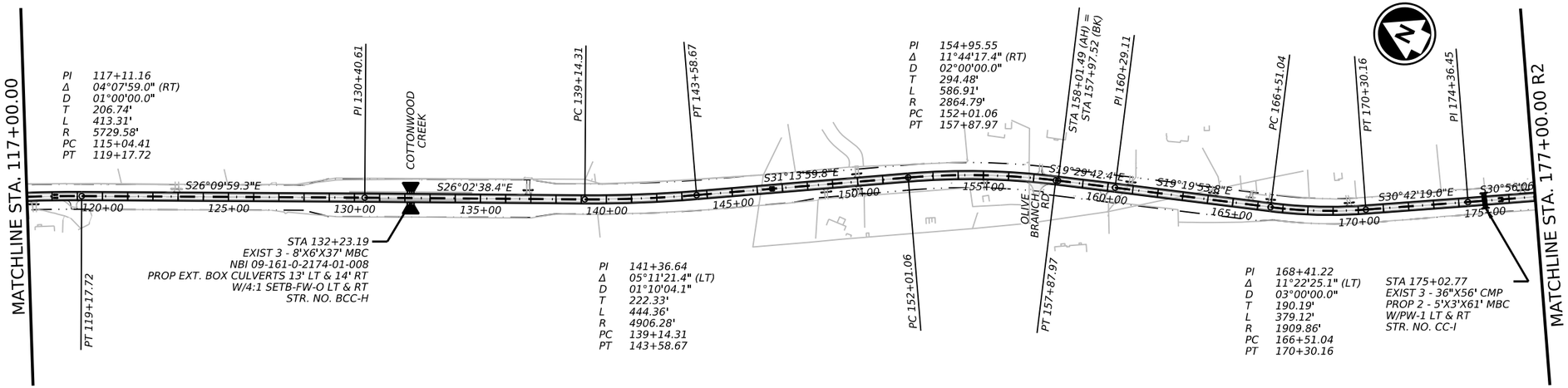
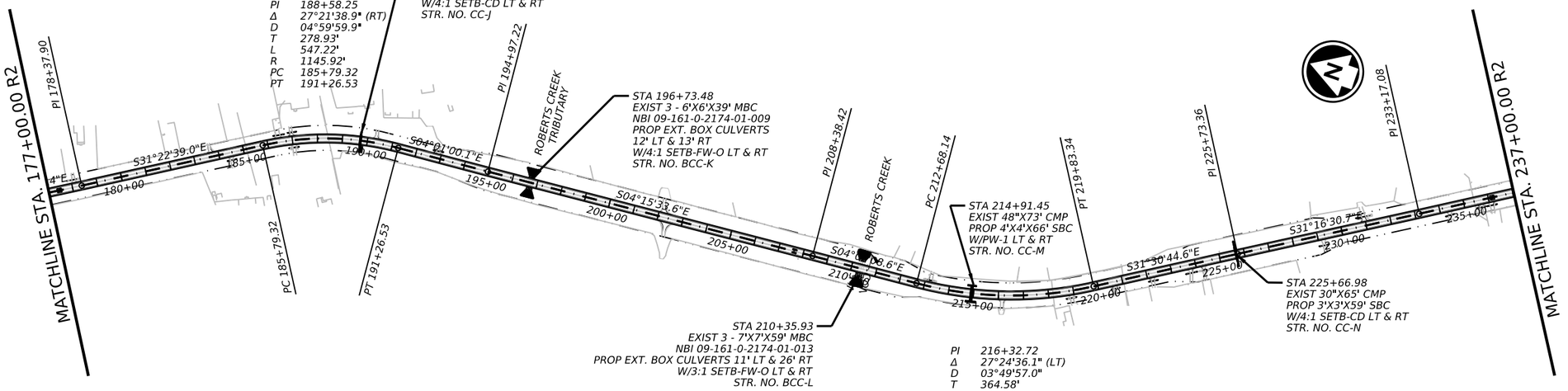
LEGEND

EXISTING ROW

SUPERPAVE TY-C





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SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
3/28/2024

AtkinsRéalis
TBPE REG. # F-474

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FM 2311

PROJECT LAYOUT
STA 117+00 TO STA 237+00 R2

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
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WAC	McLENNAN		11

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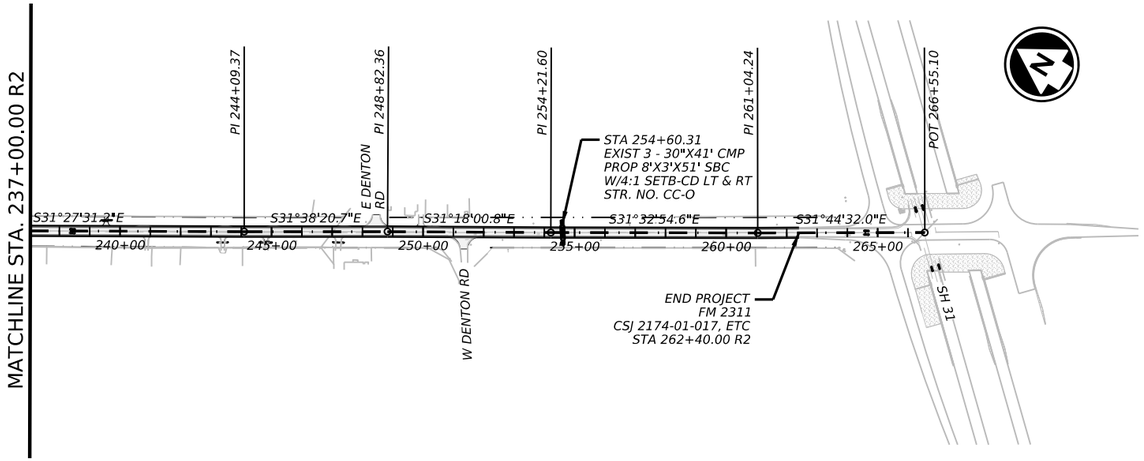

LEGEND

EXISTING ROW

SUPERPAVE TY-C

0 250 500

SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

1/31/2024

Randy W. Harris, P.E.

AtkinsRéalis

TBPE REG. # F-474

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FM 2311

PROJECT LAYOUT
STA 237+00 R2 TO END

SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		12

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GENERAL NOTES
(SEE VOLUME 1)

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TBPE REG. # F-474

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Texas Department of Transportation

FM 2311

GENERAL NOTES

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		13

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ESTIMATE AND QUANTITY SHEET
(SEE VOLUME 1)

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FILE: ...\1. General\FM 2311 EST_QTY.dgn

AtkinsRéalis
TBPE REG. # F-474

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Texas Department of Transportation

FM 2311

ESTIMATE AND QUANTITY

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		14

CK
DW
CK
DW

TRAFFIC CONTROL SUMMARY

ITEM NO. DESC. CODE			512 6017	512 6029	512 6041	545 6003	545 6005	545 6019	662 6008	662 6014	662 6037	662 6109	662 6111	677 6002	677 6005
PLAN SHEET NO.	BEGINNING STATION	ENDING STATION	PORT CTB (DES SOURCE) (F-SHAPE) (TY 1)	PORT CTB (MOVE) (F-SHAPE) (TY 1)	PORT CTB (STKPL) (F-SHAPE) (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) 6" (SLD)	WK ZN PAV MRK NON-REMOV (W) 12" (SLD)	WK ZN PAV MRK NON-REMOV (Y) 6" (SLD)	WK ZN PAV MRK SHT TERM (TAB) TY W	WK ZN PAV MRK SHT TERM (TAB) TY Y-2	ELIM EXT PAV MRK & MRKS (6")	ELIM EXT PAV MRK & MRKS (12")
			LF	LF	LF	EA	EA	EA	LF	LF	LF	EA	EA	LF	LF
FM 2311 - 2174-01-018															
PHASE 1															
SHEET 1 OF 12	BEGIN	21+00.00		120											
SHEET 2 OF 12	21+00.00	45+00.00		60											
SHEET 3 OF 12	45+00.00	69+00.00	30	60											
SHEET 4 OF 12	69+00.00	93+00.00	30												
SHEET 5 OF 12	93+00.00	117+00.00													
SHEET 6 OF 12	117+00.00	141+00.00													
SHEET 7 OF 12	141+00.00	165+00.00													
SHEET 8 OF 12	165+00.00	189+00.00		60											
SHEET 9 OF 12	189+00.00	213+00.00		60											
SHEET 10 OF 12	213+00.00	237+00.00		90											
SHEET 11 OF 12	237+00.00	261+00.00		60											
SHEET 12 OF 12	261+00.00	END													
PHASE 2 - STEP 1															
SHEET 1 OF 12	BEGIN	21+00.00							2092	24	4184	104	208	6276	24
SHEET 2 OF 12	21+00.00	45+00.00							2400	12	4800	120	240	7200	12
SHEET 3 OF 12	45+00.00	69+00.00							1390		2780	120	240	4170	
SHEET 4 OF 12	69+00.00	93+00.00							990		1980	120	240	2970	
SHEET 5 OF 12	93+00.00	117+00.00	120	180				1	2400	12	4800	120	240	7200	12
SHEET 6 OF 12	117+00.00	141+00.00		180		1			2400		4800	120	240	7200	
SHEET 7 OF 12	141+00.00	165+00.00							2400		4800	120	240	7200	
SHEET 8 OF 12	165+00.00	189+00.00							2400		4800	120	240	7200	
SHEET 9 OF 12	189+00.00	213+00.00	180	360		1		1	2400		4800	120	240	7200	
SHEET 10 OF 12	213+00.00	237+00.00							2400		4800	120	240	7200	
SHEET 11 OF 12	237+00.00	261+00.00							2400	12	4800	120	240	7200	12
SHEET 12 OF 12	261+00.00	END							551		1102	28	56	1653	
PHASE 2 - STEP 2															
SHEET 1 OF 12	BEGIN	21+00.00							2092	12	4184	104	208	6276	12
SHEET 2 OF 12	21+00.00	45+00.00							2400		4800	120	240	7200	
SHEET 3 OF 12	45+00.00	69+00.00							1390		2780	120	240	4170	
SHEET 4 OF 12	69+00.00	93+00.00							990		1980	120	240	2970	
SHEET 5 OF 12	93+00.00	117+00.00		180		1			2400		4800	120	240	7200	
SHEET 6 OF 12	117+00.00	141+00.00		180		1			2400		4800	120	240	7200	
SHEET 7 OF 12	141+00.00	165+00.00							2400	12	4800	120	240	7200	12
SHEET 8 OF 12	165+00.00	189+00.00							2400		4800	120	240	7200	
SHEET 9 OF 12	189+00.00	213+00.00		360	360	2	2		2400		4800	120	240	7200	
SHEET 10 OF 12	213+00.00	237+00.00							2400		4800	120	240	7200	
SHEET 11 OF 12	237+00.00	261+00.00							2400	12	4800	120	240	7200	12
SHEET 12 OF 12	261+00.00	END							551		1102	28	56	1653	
PHASE 2 TOTAL			360	1950	360	6	2	2	48446	96	96892	2664	5328	145338	96

PORTABLE CHANGEABLE MESSAGE SIGN SUMMARY

ITEM NO. DESC. CODE	6001 6001	6001 6002	6185 6002	6185 6003
LOCATION	PORTABLE CHANGEABLE MESSAGE SIGN	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	DAY	EA	DAY	HR
FM 2311 - 2174-01-018	15	2	90	1080
TOTAL	15	2	90	1080

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TBPE REG. # F-474

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FM 2311

SUMMARY OF QUANTITIES
(TRAFFIC CONTROL)

SHEET 1 OF 8

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		15

DATE: 3/1/2024 9:32:42 AM
FILE: ...\1. General\FM 2311 QTY 01.dgn

ROADWAY SUMMARY

ITEM NO. DESC. CODE			110 6001	132 6004	247 6015	247 6392	251 6073	260 6012	260 6084	275 6001	275 6011	275 6035	314 6005	315 6004	316 6022	316 6397	530 6008	3077 6023	3077 6075	3085 6001
PLAN SHEET NO.	BEGINNING STATION	ENDING STATION	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY B)	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	FL BS (CMP IN PLC) (TY D GR 5) (FNAL POS)	REWRKING BS MATL (TY C)(10") (ORD COMP)	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)	LIME TRT (SUBGRADE) (12")	CEMENT	CEMENT TREAT (EXIST MATL) (8")	CEMENT TREAT (NEW BASE)(12")	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	FOG SEAL (CSS-1H)	ASPH (CRS-2)	AGGR (TY-D GR-4 OR TY-L GR-4)	TURNOUTS (ACP)	SP MIXES SP-C SAC-B PG 70-22	TACK COAT	UNDERSEAL COURSE
			CY	CY	CY	CY	SY	TON	SY	TON	SY	SY	GAL	GAL	GAL	CY	SY	TON	GAL	GAL
FM 2311 - 2174-01-018																				
SHEET 1 OF 23	BEGIN	9+00.00	305	162	72	537	2425			40	3355		3869	322	1451	24	12	443		806
SHEET 2 OF 23	9+00.00	21+00.00	235	586	122	733	3200			55	4547		5121	427	1920	32	49	587		1067
SHEET 3 OF 23	21+00.00	33+00.00	171	436	122	733	3200			55	4547		5121	427	1920	32	51	587		1067
SHEET 4 OF 23	33+00.00	45+00.00	110	513	122	733	3200			55	4547		5120	427	1920	32	24	587		1067
SHEET 5 OF 23	45+00.00	57+00.00		921	122	733	3200			55	4547		5120	427	1920	32	12	587		1067
SHEET 6 OF 23	57+00.00	69+00.00		1107		1280		44	1829	81	4025	1829	2718	389	1755	26		670	390	973
SHEET 7 OF 23	69+00.00	81+00.00		8778		2560		100	4160	74		4160		350	1585	24		772	352	878
SHEET 8 OF 23	81+00.00	93+00.00		2210		1134		28	1162	64	3632	1162	5376	553	2498	39		852	555	1388
SHEET 9 OF 23	93+00.00	105+00.00	76	745	122	733	3200			55	4547		5121	427	1920	32		586		1067
SHEET 10 OF 23	105+00.00	117+00.00	128	1014	122	733	3200			55	4547		5121	427	1920	32	14	587		1066
SHEET 11 OF 23	117+00.00	129+00.00	73	844	122	733	3200			55	4547		5120	427	1920	32	12	587		1067
SHEET 12 OF 23	129+00.00	141+00.00	242	1703	122	733	3200			55	4547		5120	427	1920	32	12	587		1067
SHEET 13 OF 23	141+00.00	153+00.00	187	744	122	733	3200			55	4547		5120	427	1920	32	24	587		1067
SHEET 14 OF 23	153+00.00	165+00.00	97	531	121	731	3190			54	4532		5104	425	1914	32	44	585		1063
SHEET 15 OF 23	165+00.00	177+00.00	205	1255	122	733	3200			55	4547		5120	427	1920	32	36	587		1067
SHEET 16 OF 23	177+00.00	189+00.00		1060	122	733	3200			55	4547		5120	427	1920	32	71	587		1067
SHEET 17 OF 23	189+00.00	201+00.00	45	1056	122	733	3200			55	4547		5120	427	1920	32	25	587		1067
SHEET 18 OF 23	201+00.00	213+00.00		827	122	733	3200			55	4547		5120	427	1920	32	31	587		1067
SHEET 19 OF 23	213+00.00	225+00.00		1097	122	733	3200			55	4547		5120	427	1920	32	64	587		1067
SHEET 20 OF 23	225+00.00	237+00.00		868	122	733	3200			55	4547		5120	427	1920	32	28	587		1067
SHEET 21 OF 23	237+00.00	249+00.00	78	896	122	733	3200			55	4547		5121	427	1920	32	67	587		1067
SHEET 22 OF 23	249+00.00	261+00.00	82	776	122	733	3200			55	4547		5121	427	1920	32	17	587		1067
SHEET 23 OF 23	261+00.00	END		62	14	239	374			6	530		598	50	224	4		68		125
TOTAL			2034	28191	2281	18942	60389	172	7151	1254	93373	7151	104711	9348	42067	693	593	13368	1297	23371

REMOVAL SUMMARY

ITEM NO. DESC. CODE			100 6002	104 6010	104 6017	* 105 6033	658 6060
PLAN SHEET NO.	BEGINNING STATION	ENDING STATION	PREPARING ROW	REMOVING CONC (RIPRAP)	REMOVING CONC (DRIVEWAYS)	REMOVING STB BASE AND ASPH PAV(10-14")	REMOVE DELIN & OBJECT MARKER ASSMS
			STA	CY	SY	SY	EA
FM 2311 - 2174-01-018							
SHEET 1 OF 23	BEGIN	9+00.00	8.9				2
SHEET 2 OF 23	9+00.00	21+00.00	12.0				6
SHEET 3 OF 23	21+00.00	33+00.00	12.0				4
SHEET 4 OF 23	33+00.00	45+00.00	12.0		125		2
SHEET 5 OF 23	45+00.00	57+00.00	12.0				0
SHEET 6 OF 23	57+00.00	69+00.00	12.0	3.2		1632	8
SHEET 7 OF 23	69+00.00	81+00.00	12.0			3520	11
SHEET 8 OF 23	81+00.00	93+00.00	12.0			1072	
SHEET 9 OF 23	93+00.00	105+00.00	12.0				
SHEET 10 OF 23	105+00.00	117+00.00	12.0				3
SHEET 11 OF 23	117+00.00	129+00.00	12.0				
SHEET 12 OF 23	129+00.00	141+00.00	12.0				10
SHEET 13 OF 23	141+00.00	153+00.00	12.0				
SHEET 14 OF 23	153+00.00	165+00.00	12.0				
SHEET 15 OF 23	165+00.00	177+00.00	12.0				2
SHEET 16 OF 23	177+00.00	189+00.00	12.0				
SHEET 17 OF 23	189+00.00	201+00.00	12.0				5
SHEET 18 OF 23	201+00.00	213+00.00	12.0				2
SHEET 19 OF 23	213+00.00	225+00.00	12.0				
SHEET 20 OF 23	225+00.00	237+00.00	12.0				
SHEET 21 OF 23	237+00.00	249+00.00	12.0		86		
SHEET 22 OF 23	249+00.00	261+00.00	12.0				2
SHEET 23 OF 23	261+00.00	END	4.0				
TOTAL			264.9	3.2	211	6224	57

* REMOVAL DEPTH BASED ON 14"

MBGF SUMMARY

ITEM NO. DESC. CODE	104 6054	432 6045	540 6002	540 6006	540 6014	542 6001	542 6004	544 6001	544 6003
PLAN SHEET NO.	REMOVING CONCRETE (MOW STRIP)	RIPRAP (MOW STRIP) (4 IN)	MTL W-BEAM GD FEN (STEEL POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	SHORT RADIUS	REMOVE METAL BEAM GUARD FENCE	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)
	LF	CY	LF	EA	LF	LF	EA	EA	EA
FM 2311 - 2174-01-018									
SHEET 2 OF 23		35.5	300		57	200		4	4
SHEET 6 OF 23	603	38.6	300	4		300	4	4	4
SHEET 7 OF 23	428	77.2	600	8		200		8	8
SHEET 12 OF 23	873					650			4
TOTAL	1904	151.3	1200	12	57	1350	4	16	20

MAILBOX SUMMARY

ITEM NO. DESC. CODE			560 6001	560 6002	560 6003
SHEET NO.	BEGINNING STATION	ENDING STATION	MAILBOX INSTALL-S (TWG-POST) TY 1	MAILBOX INSTALL-D (TWG-POST) TY 1	MAILBOX INSTALL-M (TWG-POST) TY 1
			EA	EA	EA
FM 2311 - 2174-01-018					
SHEET 1 OF 23	BEGIN	9+00.00		1	
SHEET 2 OF 23	9+00.00	21+00.00	4		
SHEET 3 OF 23	21+00.00	33+00.00	4		
SHEET 4 OF 23	33+00.00	45+00.00	2		
SHEET 5 OF 23	45+00.00	57+00.00	1		
SHEET 6 OF 23	57+00.00	69+00.00			
SHEET 7 OF 23	69+00.00	81+00.00			
SHEET 8 OF 23	81+00.00	93+00.00			
SHEET 9 OF 23	93+00.00	105+00.00			
SHEET 10 OF 23	105+00.00	117+00.00			
SHEET 11 OF 23	117+00.00	129+00.00	2		
SHEET 12 OF 23	129+00.00	141+00.00	1		
SHEET 13 OF 23	141+00.00	153+00.00	2		
SHEET 14 OF 23	153+00.00	165+00.00	4		
SHEET 15 OF 23	165+00.00	177+00.00	3		
SHEET 16 OF 23	177+00.00	189+00.00	3	2	
SHEET 17 OF 23	189+00.00	201+00.00	2		
SHEET 18 OF 23	201+00.00	213+00.00	2	1	
SHEET 19 OF 23	213+00.00	225+00.00	4		
SHEET 20 OF 23	225+00.00	237+00.00	1	1	
SHEET 21 OF 23	237+00.00	249+00.00	3		1
SHEET 22 OF 23	249+00.00	261+00.00			1
SHEET 23 OF 23	261+00.00	END			
TOTAL			38	5	2

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TBPE REG. # F-474

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FM 2311

SUMMARY OF QUANTITIES
(ROADWAY, REMOVAL, MBGF, MAILBOXES)

SHEET 2 OF 8

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		16

DATE: 3/1/2024 9:38:29 AM
FILE: ...\1. General\FM 2311 QTY 02.dgn

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EARTHWORK SUMMARY*		
	110 6001	132 6004
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY B)
STA	CY	CY
0+14.57	0	0
1+00.00	130	4
2+00.00	27	29
3+00.00	16	41
4+00.00	15	21
5+00.00	26	7
6+00.00	23	18
7+00.00	22	22
8+00.00	23	12
9+00.00	22	9
10+00.00	23	8
11+00.00	17	15
12+00.00	28	14
13+00.00	30	9
14+00.00	13	67
15+00.00	1	180
16+00.00	15	119
17+00.00	31	13
18+00.00	21	45
19+00.00	24	50
20+00.00	25	34
21+00.00	7	32
22+00.00	0	40
23+00.00	7	38
24+00.00	13	24
25+00.00	17	17
26+00.00	21	11
27+00.00	14	8
28+00.00	7	22
29+00.00	15	46
30+00.00	24	41
31+00.00	20	51
32+00.00	18	73
33+00.00	19	64
34+00.00	20	39
35+00.00	24	26
36+00.00	23	26
37+00.00	18	17
38+00.00	11	18
39+00.00	4	26
40+00.00	3	24
41+00.00	4	42
42+00.00	0	61
43+00.00	0	67
44+00.00	0	72
45+00.00	3	95
46+00.00	0	116
47+00.00	0	92
48+00.00	0	89
49+00.00	0	90
50+00.00	0	57
51+00.00	0	53
52+00.00	0	82
53+00.00	0	121
54+00.00	0	97
55+00.00	0	35
56+00.00	0	31
57+00.00	0	57
58+00.00	0	91
59+00.00	0	65
60+00.00	0	48
61+00.00	0	39
62+00.00	0	37
63+00.00	0	37
64+00.00	0	37
65+00.00	0	37
66+00.00	0	37
67+00.00	0	46
68+00.00	0	118
69+00.00	0	516
70+00.00	0	445
71+00.00	0	38
72+00.00	0	619
73+00.00	0	1097
74+00.00	0	896
75+00.00	0	1599
76+00.00	0	995
77+00.00	0	1020
78+00.00	0	560
79+00.00	0	38
80+00.00	0	569
81+00.00	0	902
82+00.00	0	538

EARTHWORK SUMMARY*		
	110 6001	132 6004
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY B)
STA	CY	CY
83+00.00	0	283
84+00.00	0	140
85+00.00	0	77
86+00.00	0	62
87+00.00	0	80
88+00.00	0	85
89+00.00	0	75
90+00.00	0	63
91+00.00	0	157
92+00.00	0	321
93+00.00	0	328
94+00.00	0	196
95+00.00	2	104
96+00.00	0	97
97+00.00	0	98
98+00.00	24	49
99+00.00	15	26
100+00.00	15	24
101+00.00	6	26
102+00.00	0	27
103+00.00	0	38
104+00.00	0	35
105+00.00	14	23
106+00.00	24	30
107+00.00	21	39
108+00.00	21	41
109+00.00	12	56
110+00.00	0	100
111+00.00	0	91
112+00.00	0	213
113+00.00	8	222
114+00.00	21	65
115+00.00	13	52
116+00.00	5	44
117+00.00	3	61
118+00.00	0	67
119+00.00	0	50
120+00.00	6	55
121+00.00	12	72
122+00.00	0	87
123+00.00	0	65
124+00.00	11	56
125+00.00	8	77
126+00.00	0	84
127+00.00	19	55
128+00.00	18	60
129+00.00	0	115
130+00.00	6	118
131+00.00	26	127
132+00.00	7	400
133+00.00	8	372
134+00.00	40	64
135+00.00	34	47
136+00.00	0	101
137+00.00	0	85
138+00.00	0	88
139+00.00	0	121
140+00.00	117	68
141+00.00	0	111
142+00.00	21	63
143+00.00	22	116
144+00.00	0	153
145+00.00	0	148
146+00.00	5	78
147+00.00	28	16
148+00.00	35	9
149+00.00	31	12
150+00.00	23	9
151+00.00	18	24
152+00.00	5	55
153+00.00	0	61
154+00.00	0	84
155+00.00	0	90
156+00.00	9	63
157+00.00	16	34
159+00.00	4	45
160+00.00	3	31
161+00.00	9	28
162+00.00	11	42
163+00.00	13	49
164+00.00	14	34
165+00.00	18	31
166+00.00	18	59

EARTHWORK SUMMARY*		
	110 6001	132 6004
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY B)
STA	CY	CY
167+00.00	10	105
168+00.00	24	146
169+00.00	26	143
170+00.00	7	128
171+00.00	0	99
172+00.00	0	67
173+00.00	16	47
174+00.00	43	23
175+00.00	27	142
176+00.00	12	189
177+00.00	22	107
178+00.00	0	99
179+00.00	0	96
180+00.00	0	81
181+00.00	0	80
182+00.00	0	112
183+00.00	0	130
184+00.00	0	111
185+00.00	0	87
186+00.00	0	82
187+00.00	0	54
188+00.00	0	42
189+00.00	0	86
190+00.00	1	140
191+00.00	8	94
192+00.00	0	30
193+00.00	0	25
194+00.00	15	14
195+00.00	11	98
196+00.00	0	207
197+00.00	0	256
198+00.00	0	156
199+00.00	3	22
200+00.00	7	7
201+00.00	0	8
202+00.00	0	7
203+00.00	0	23
204+00.00	0	56
205+00.00	0	47
206+00.00	0	43
207+00.00	0	127
208+00.00	0	149
209+00.00	0	88
210+00.00	0	94
211+00.00	0	86
212+00.00	0	50
213+00.00	0	58
214+00.00	0	82
215+00.00	0	222
216+00.00	0	178
217+00.00	0	20
218+00.00	0	75
219+00.00	0	78
220+00.00	0	43
221+00.00	0	61
222+00.00	0	73
223+00.00	0	66
224+00.00	0	92
225+00.00	0	108
226+00.00	0	52
227+00.00	0	28
228+00.00	0	42
229+00.00	0	23
230+00.00	0	63
231+00.00	0	89
232+00.00	0	74
233+00.00	0	142
234+00.00	0	150
235+00.00	0	73
236+00.00	0	47
237+00.00	0	85
238+00.00	0	118
239+00.00	0	121
240+00.00	0	103
241+00.00	4	75
242+00.00	2	75
243+00.00	1	86
244+00.00	0	103
245+00.00	0	81
246+00.00	20	42
247+00.00	21	35
248+00.00	20	27
249+00.00	10	31

EARTHWORK SUMMARY*		
	110 6001	132 6004
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY B)
STA	CY	CY
250+00.00	8	27
251+00.00	11	28
252+00.00	0	67
253+00.00	0	105
254+00.00	0	100
255+00.00	6	95
256+00.00	17	96
257+00.00	8	73
258+00.00	0	56
259+00.00	15	43
260+00.00	17	39
261+00.00	0	48
262+00.00	0	46
262+39.92	0	15

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AtkinsRéalis
TBPE REG. # F-474

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FM 2311

SUMMARY OF QUANTITIES
EARTHWORK SUMMARY

SHEET 2 OF 8

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		17

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CK
DW
CK
DW

SUMMARY OF DRAINAGE STRUCTURE QUANTITIES

STRUCTURE	STA	400 6005	400 6008	402 6001	432 6002	432 6033	462 6001	462 6002	462 6005	462 6006	462 6007	462 6096	466 6179	466 6182	466 6184	467 6104	467 6105	467 6106	467 6144	467 6173	467 6224	467 6270	496 6004	496 6007	658 6046
		CEM STABIL BKFL	CUT & RESTORE ASPH PAVING	TRENCH EXCAVATION PROTECTION	RIPRAP (CONC)(5 IN)	RIPRAP (STONE PROTECTION) (18 IN)	CONC BOX CULV (3 FT X 2 FT)	CONC BOX CULV (3 FT X 3 FT)	CONC BOX CULV (4 FT X 4 FT)	CONC BOX CULV (5 FT X 2 FT)	CONC BOX CULV (5 FT X 3 FT)	CONC BOX CULV (8 FT X 3 FT)	WINGWALL (PW-1) (HW=4 FT)	WINGWALL (PW - 1) (HW=7 FT)	WINGWALL (PW - 1) (HW=9 FT)	SET (TY I)(S=3 FT)(HW=2FT)(6:1)(C)	SET (TY I)(S=3 FT)(HW=3FT)(3:1)(C)	SET (TY I)(S=3 FT)(HW=3 FT)(4:1)(C)	SET (TY I)(S=4 FT)(HW=4 FT)(4:1) (C)	SET (TY I)(S=5 FT)(HW=3 FT)(6:1) (C)	SET (TY I)(S=6 FT)(HW=6 FT)(4:1) (C)	SET (TY I)(S=8 FT)(HW=4 FT)(4:1) (C)	REMOV STR (SET)	REMOV STR (PIPE)	INSTL OM ASSM (OM-2X)(WC)GND
		CY	SY	LF	CY	CY	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
CC-A	2+20.00	21	34	94	-	-	45	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	49	2
CC-B	4+20.00	18	36	105	-	-	52	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	53	2
CC-C2	16+86.85	16	45	155	3	-	59	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	96	2
CC-D	31+24.67	24	83	45	9	-	-	-	-	135	-	-	-	-	-	-	-	-	-	6	-	-	-	190	2
CC-E	45+65.43	57	21	61	1	2	-	61	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	52	2
CC-I	175+02.77	117	57	61	-	-	-	-	-	-	122	-	2	-	-	-	-	-	-	-	-	-	-	169	2
CC-J	189+72.08	23	21	48	1	32	48	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	46	2
CC-M	214+91.45	188	32	66	12	-	-	-	66	-	-	-	-	1	1	-	-	-	-	-	-	-	-	73	2
CC-N	225+66.98	77	21	59	3	-	-	59	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	66	2
CC-O	254+60.31	82	48	51	1	-	-	-	-	-	-	51	-	-	-	-	-	-	-	-	-	2	6	41	2
Total		623	398	745	30	34	204	120	66	135	122	51	2	1	1	4	2	2	2	6	2	2	6	835	20

SUMMARY OF BRIDGE CLASS CULVERT QUANTITIES

STRUCTURE	STA	400 6005	403 6001	432 6002	432 6033	462 6009	462 6056	462 6057	462 6062	462 6064	462 6065	466 6182	467 6228	467 6232	467 6262	467 6287	480 6001	658 6046
		CEM STABIL BKFL	TEMP SPL SHORING	RIPRAP (CONC)(5 IN)	RIPRAP (STONE PROTECTION) (18 IN)	CONC BOX CULV (5 FT X 5 FT)	CONC BOX CULV (6 FT X 5 FT)(EXTEND)	CONC BOX CULV (6 FT X 6 FT)(EXTEND)	CONC BOX CULV (7 FT X 7 FT)(EXTEND)	CONC BOX CULV (8 FT X 5 FT)(EXTEND)	CONC BOX CULV (8 FT X 6 FT)(EXTEND)	WINGWALL (PW - 1) (HW=7 FT)	SET (TY I)(S=6 FT)(HW=7 FT)(4:1) (C)	SET (TY I)(S=6 FT)(HW=8 FT)(4:1) (C)	SET (TY I)(S=7 FT)(HW=9 FT)(3:1) (C)	SET (TY I)(S=8 FT)(HW=8 FT)(4:1) (C)	CLEAN EXIST CULVERTS	INSTL OM ASSM (OM-2X)(WC)GND
		CY	SF	CY	CY	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA
BCC-C	15+26.63	10	2100	-	-	56	-	-	-	72	-	2	-	-	-	-	1	4
BCC-G	112+15.52	-	2160	23	50	-	54	-	-	-	-	-	6	-	-	-	1	4
BCC-H	132+23.19	-	3300	38	-	-	-	-	-	-	81	-	-	-	-	6	1	4
BCC-K	196+73.48	-	3360	27	-	-	-	75	-	-	-	-	-	6	-	-	1	4
BCC-L	210+35.93	-	3900	31	35	-	-	-	111	-	-	-	-	-	6	-	1	4
Total		10	14820	119	85	56	54	75	111	72	81	2	6	6	6	6	5	20

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FM 2311

SUMMARY OF QUANTITIES
(DRAINAGE)

SHEET 3 OF 8

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		18

BRIDGE SUMMARY													
ITEM NO. DESC. CODE	400 6005	416 6001	416 6004	420 6014	420 6030	420 6038	422 6001	422 6015	425 6036	432 6031	450 6006	454 6004	496 6010
LOCATION	CEM STABIL BKFL	DRILL SHAFT (18 IN)	DRILL SHAFT (36 IN)	CL C CONC (ABUT)(HPC)	CL C CONC (CAP)(HPC)	CL C CONC (COLUMN)(HPC)	REINF CONC SLAB	APPROACH SLAB	PRESTR CONC GIRDER (TX34)	RIPRAP (STONE PROTECTION)(12 IN)	RAIL (TY T223)	ARMOR JOINT (SEALED)	REMOV STR (BRIDGE 100 - 499 FT LENGTH)
	CY	LF	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF	EA
FM 2311 @ TEHUACANA CREEK	200	148	574	57.3	42.0	24.2	9200	71.0	1,191.00	998	452.0	84	1
FM 2311 @ TEHUACANA CREEK RELIEF	200	144	600	57.3	42.0	14.8	9200	71.0	1,191.00	984	452.0	84	1
TOTAL	400	292	1174	114.6	84.0	39.0	18400	142.0	2,382.00	1982	904.0	168	2

CK

DW

CK

DW

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FM 2311

SUMMARY OF QUANTITIES
(BRIDGE)

SHEET 4 OF 8

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		19

CK: SU
DW: HFJ
CK: SU
DN: HFJ

PAVEMENT MARKINGS SUMMARY

ITEM NO.DESC.CODE			533 6001	533 6002	666 6048	666 6225	666 6309	666 6318	666 6321	672 6009	678 6002
PLAN SHEET NO.	BEGINNING STATION	ENDING STATION	RUMBLE STRIPS (SHOULDER)	RUMBLE STRIPS (CENTERLINE)	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	PAVEMENT SEALER 6"	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	REFL PAV MRKR TY II-A-A	PAV SURF PREP FOR MRK (6")
			LF	LF	LF	LF	LF	LF	LF	EA	LF
SHEET 1 OF 12	BEGIN	21+00.00	680	340	130		3760		3420	44	
SHEET 2 OF 12	21+00.00	45+00.00	4610	2210	25		4710		4620	58	
SHEET 3 OF 12	45+00.00	69+00.00	3300	1650		2250	4810	600	910	42	2250
SHEET 4 OF 12	69+00.00	93+00.00	2440	1220		2475	4810	460	1510	42	2475
SHEET 5 OF 12	93+00.00	117+00.00	4590	2190	35		4700	210	3000	49	
SHEET 6 OF 12	117+00.00	141+00.00	4800	2400			4810	310	2410	45	
SHEET 7 OF 12	141+00.00	165+00.00	4590	2190	35		4700	190	3870	57	
SHEET 8 OF 12	165+00.00	189+00.00	4800	2400			4810		4810	61	
SHEET 9 OF 12	189+00.00	213+00.00	4800	2400			4810	270	2710	61	
SHEET 10 OF 12	213+00.00	237+00.00	4800	2400			4810	180	4110	61	
SHEET 11 OF 12	237+00.00	261+00.00	3810	1905	60		4600	460	1510	42	
SHEET 12 OF 12	261+00.00	END	280	140			820	15	770	11	
TOTAL			43500	21445	285	4725	52150	2695	33650	573	4725

SIGNING SUMMARY

ITEM NO.DESC.CODE			644 6001	644 6004	644 6007	644 6033	644 6036	644 6080	658 6062
PLAN SHEET NO.	BEGINNING STATION	ENDING STATION	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	IN SM RD SN SUP&AM TYS80(1)SA(U)	IN SM RD SN SUP&AM TYS80(1)SA(U-BM)	RELOCATE SM RD SN SUP & AM TY TEMP	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
PLAN SHEET NO.	BEGINNING STATION	ENDING STATION	EA	EA	EA	EA	EA	EA	EA
SHEET 1 OF 12	BEGIN	21+00.00	15	1			1	19	6
SHEET 2 OF 12	21+00.00	45+00.00	14					5	
SHEET 3 OF 12	45+00.00	69+00.00	4					3	13
SHEET 4 OF 12	69+00.00	93+00.00	5	2				6	23
SHEET 5 OF 12	93+00.00	117+00.00	5	1				6	
SHEET 6 OF 12	117+00.00	141+00.00							
SHEET 7 OF 12	141+00.00	165+00.00	5	3				6	
SHEET 8 OF 12	165+00.00	189+00.00	4					1	
SHEET 9 OF 12	189+00.00	213+00.00	7		1			2	
SHEET 10 OF 12	213+00.00	237+00.00	6					1	
SHEET 11 OF 12	237+00.00	261+00.00	7	4			1	9	
SHEET 12 OF 12	261+00.00	END	1			1		5	
TOTAL			73	11	1	1	2	63	42

NOTE: PAY ITEM 644-6080 WILL ALSO INCLUDE REMOVAL OF THESE SIGNS ONCE FINAL REPLACEMENTS ARE INSTALLED.

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infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SUMARRY OF QUANTITIES (SIGNING & PAVEMENT MARKINGS)

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		20

EROSION CONTROL SUMMARY

ITEM NO. DESC. CODE			160 6003	164 6003	164 6071	* 166 ****	168 6001	506 6002	506 6011	506 6038	506 6039
PLAN SHEET NO.	BEGINNING STATION	ENDING STATION	FURNISHING AND PLACING TOPSOIL (4")	BROADCAST SEED (PERM) (RURAL) (CLAY)	BROADCAST SEED (TEMP) (WARM OR COOL)	FERTILIZER	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
			SY	SY	SY	TON	MG	LF	LF	LF	LF
FM 2311 - 2174-01-018											
SHEET 1 OF 12	BEGIN	21+00.00	4556	4556	4556	0.1	74	150	150	150	150
SHEET 2 OF 12	21+00.00	45+00.00	6910	6910	6910	0.2	112	100	100	125	125
SHEET 3 OF 12	45+00.00	69+00.00	5674	5674	5674	0.2	92	200	200	1063	1063
SHEET 4 OF 12	69+00.00	93+00.00	11220	11220	11220	0.3	182	100	100	1532	1532
SHEET 5 OF 12	93+00.00	117+00.00	7946	7946	7946	0.2	128	100	100	100	100
SHEET 6 OF 12	117+00.00	141+00.00	11054	11054	11054	0.4	180	100	100	850	850
SHEET 7 OF 12	141+00.00	165+00.00	8751	8751	8751	0.3	142			75	75
SHEET 8 OF 12	165+00.00	189+00.00	9526	9526	9526	0.3	155	75	75	925	925
SHEET 9 OF 12	189+00.00	213+00.00	7830	7830	7830	0.2	127	250	250	25	25
SHEET 10 OF 12	213+00.00	237+00.00	9108	9108	9108	0.3	148	200	200	125	125
SHEET 11 OF 12	237+00.00	261+00.00	8151	8151	8151	0.2	132	100	100	25	25
SHEET 12 OF 12	261+00.00	END	396	396	396	0.1	6			25	25
TOTAL			91122	91122	91122	2.8	1478	1375	1375	5020	5020

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FM 2311

SUMMARY OF QUANTITIES
(SW3P)

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		21

SUMMARY OF DRIVEWAYS AND INTERSECTIONS

ROADWAY PLAN SHEET NO.	DRWY #	STATION	LT/RT	DECRIPTION	INTERSECTION	MATERIAL	DIMENSIONS FOR DRIVEWAYS & SIDE STREETS				ITEM 464		ITEM 467		ITEM 496		ITEM 530		
											464 6003	464 6005	467 6363	467 6395	496 6004	496 6007	530 6002	530 6005	530 6017
							RADIUS (LT)	RADIUS (RT)	W	L	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)	INTERSECTION (ACP)	DRIVEWAYS (ACP)	DRIVEWAY (CONC) (HES)
							FT	FT	FT	FT	LF	LF	EA	EA	EA	LF	SY	SY	SY
1 OF 23	1	1+58.62	RT	PRIVATE		GRAVEL	15	15	11	23								40	
	2	1+68.31	LT	PRIVATE		GRAVEL	15	15	14	25	24		2			24		50	
	3	2+50.58	RT	RESIDENTIAL		GRASS	15	15	13	23	26		2		1	24		44	
	4	3+61.21	RT	INTERSECTION	S 1ST ST	ASPHALT	40	40	24	47							205		
	5	5+01.75	LT	COMMERCIAL		GRAVEL	35	15	36	50								170	
	6	7+42.23	LT	INTERSECTION	N PARK ST	GRAVEL	30	30	31	33							157		
	7	7+50.73	RT	INTERSECTION	S PARK ST	ASPHALT	25	25	15.5	25							73		
	8	8+17.73	LT	COMMERCIAL		GRAVEL	15	15	30	22.5								87	
	8A	8+99.82	LT	COMMERCIAL		GRAVEL	15	15	30	22.5								86	
2 OF 23	9	11+24.69	LT	PRIVATE		GRAVEL	15	15	10	22	24		2			24		35	
	10	11+25.48	RT	INTERSECTION	S CHURCH ST	ASPHALT	25	25	18	26	36		2			36	82		
	11	13+04.67	RT	PRIVATE		GRAVEL	15	15	23	26	72		2			72		77	
	12	13+32.79	LT	PRIVATE		ASPHALT	15	15	10	22	24		2			24		35	
	13	16+53.73	LT	INTERSECTION	N JANES RD	ASPHALT	60	36	18	69							294		
	14	17+74.50	RT	PRIVATE		GRAVEL	15	15	10	35	26		2			26		51	
	15	18+88.37	RT	PRIVATE		GRAVEL	15	15	10	34								48	
	16	20+94.60	LT	RESIDENTIAL		GRAVEL	15	15	10	35		20		2		18		49	
3 OF 23	17	21+50.10	RT	RESIDENTIAL		GRAVEL	15	15	11	34	28		2			27		54	
	18	24+32.58	RT	RESIDENTIAL		GRAVEL	15	15	10	36	46		2			43		50	
	19	26+98.61	RT	RESIDENTIAL		GRAVEL	15	1.25	12	35	22		1		1	21		53	
	20	27+12.47	RT	RESIDENTIAL		GRAVEL	1.25	15	12	35	22		1		1	21		53	
	21	27+76.50	RT	RESIDENTIAL		GRAVEL	15	15	10	35	22		2			22		50	
	22	30+02.01	RT	RESIDENTIAL		GRAVEL	15	15	36	35	44		2		1	43		124	
4 OF 23	23	33+43.68	RT	RESIDENTIAL		GRAVEL	15	15	48	34	62		2		2	61		163	
	24	36+57.19	RT	RESIDENTIAL		CONCRETE	15	15	12	34	22		1		1	18			55
	25	36+81.23	RT	RESIDENTIAL		CONCRETE	15	15	14	34	22		1		1	18			63
	26	39+76.62	LT	INTERSECTION	N JANES RD	ASPHALT	40	40	17	43	36		2			35	160		
	27	43+98.33	RT	RESIDENTIAL		GRAVEL	15	15	10	35	22		2			21		50	
5 OF 23	28	47+53.71	LT	RESIDENTIAL		GRAVEL	15	15	10	33								47	
	29	49+59.43	RT	RESIDENTIAL		GRAVEL	15	15	10	35								53	
	30	49+96.08	LT	RESIDENTIAL		GRAVEL	15	15	11	33								55	
	31	52+22.79	LT	PRIVATE		GRASS	15	15	10	28	22		2			20		47	
9 OF 23	32	96+59.04	LT	INTERSECTION	KIRKLAND HILL RD	ASPHALT	40	40	29	41	66		2			66	210		
	33	97+52.01	RT	RESIDENTIAL		GRAVEL	15	15	10	59	24		2			24		76	
	34	104+57.87	LT	PRIVATE		GRAVEL	15	15	19	34	30		2			29		82	
10 OF 23	35	116+70.65	LT	PRIVATE		GRAVEL	15	15	14	35	26		2			23		65	
11 OF 23	36	117+29.20	RT	PRIVATE		GRAVEL	15	15	14	36	26		2			24		66	
	37	118+81.37	RT	PRIVATE		GRAVEL	20	20	22	36								111	
	38	122+95.30	LT	RESIDENTIAL		GRAVEL	15	15	14	32		30		2	2	30		61	
12 OF 23	39	136+89.65	LT	RESIDENTIAL		GRAVEL	15	15	12	60		24		2		24		90	
13 OF 23	40	148+71.43	RT	RESIDENTIAL		GRAVEL	15	15	10	35	26		2			26		49	
	41	150+00.23	LT	RESIDENTIAL		GRAVEL	15	15	12	34	24		2			24		56	
	42	150+01.32	RT	RESIDENTIAL		GRAVEL	15	15	10	34	26		2			25		49	
14 OF 23	43	155+09.09	RT	RESIDENTIAL		GRAVEL	15	15	10	34	20		2			17		49	
	44	157+16.80	RT	INTERSECTION	OLIVE BRANCH RD	ASPHALT	45	45	24	46							221		
	45	157+23.98	LT	PRIVATE		GRAVEL	15	15	10	34								48	
	46	159+86.62	RT	COMMERCIAL		GRAVEL	20	20	18	44								108	
	47	160+87.48	LT	RESIDENTIAL		GRAVEL	15	15	10	34	24		2			24		48	
	48	164+18.95	LT	RESIDENTIAL		GRAVEL	15	15	13	34	26		2			23		60	
15 OF 23	49	165+69.35	LT	RESIDENTIAL		GRAVEL	15	15	10	34	22		2		2	21		49	
	50	166+47.20	LT	RESIDENTIAL		GRAVEL	15	15	10	34	22		2			22		49	
	51	169+65.97	LT	RESIDENTIAL		GRAVEL	15	15	11	33	24		2			24		53	
	52	176+55.05	LT	RESIDENTIAL		GRAVEL	15	15	12	35	32		2			32		57	
16 OF 23	53	178+11.19	LT	RESIDENTIAL		GRAVEL	15	15	10	35	38		2		2	37		50	
	54	183+68.64	LT	RESIDENTIAL		GRAVEL	15	15	10	33								47	
	55	184+45.80	RT	RESIDENTIAL		GRAVEL	15	15	10	36	22		2			22		51	
	56	186+44.32	LT	PRIVATE		GRAVEL	15	15	16	33	30		2			30		69	
	57	186+97.71	LT	RESIDENTIAL		GRAVEL	15	15	10	34	22		2			21		49	
	58	187+04.31	RT	RESIDENTIAL		GRAVEL	15	15	12	33	26		2		1	25		56	
17 OF 23	59	190+33.09	LT	RESIDENTIAL		GRAVEL	15	15	10	33								48	
	60	192+88.53	LT	PRIVATE		GRAVEL	15	15	14	34	26		2			26		68	
18 OF 23	61	202+18.22	LT	RESIDENTIAL		GRAVEL	15	30	12	58								101	
	62	202+37.04	RT	RESIDENTIAL		GRAVEL	30	30	12	60								125	
19 OF 23	63	213+20.72	LT	RESIDENTIAL		GRAVEL	15	15	12	34	32		2		2	32		57	
	64	216+14.66	RT	RESIDENTIAL		GRAVEL	15	15	12	34								56	
	65	218+90.50	RT	RESIDENTIAL		GRAVEL	15	15	12	32	26		2			26		54	
	66	220+66.86	RT	RESIDENTIAL		GRAVEL	15	15	10	32	22		2			22		48	
	67	222+18.39	RT	RESIDENTIAL		GRAVEL	15	15	12	32	24		2			23		54	
	68	223+75.80	RT	PRIVATE		GRAVEL	15	15	10	53		32		2		32		71	
	69	224+29.50	RT	RESIDENTIAL		GRAVEL	15	15	10	58		24		2	2	23		76	
							SHEET TOTALS				1288	130	84	10	19	1375	1402	3877	118

AtkinsRéalis
TBPE REG. # F-474

Texas Department of Transportation

FM 2311

SUMMARY OF QUANTITIES
(DRIVEWAYS AND INTERSECTIONS)

SHEET 7 OF 8

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		22

DATE: 1/31/2024 1:38:42 PM
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SUMMARY OF DRIVEWAYS AND INTERSECTIONS

ROADWAY PLAN SHEET NO.	DRWY #	STATION	LT/RT	DECRIPTION	INTERSECTION	MATERIAL	DIMENSIONS FOR DRIVEWAYS & SIDE STREETS				ITEM 464		ITEM 467		ITEM 496		ITEM 530		
											464 6003	464 6005	467 6363	467 6395	496 6004	496 6007	530 6002	530 6005	530 6017
							RADIUS (LT)	RADIUS (RT)	W	L	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)	INTERSECTION (ACP)	DRIVEWAYS (ACP)	DRIVEWAY (CONC) (HES)
							FT	FT	FT	FT	LF	LF	EA	EA	EA	LF	SY	SY	SY
20 OF 23	70	229+19.87	RT	RESIDENTIAL		GRAVEL	15	15	10	54		26		2		25		70	
	71	230+95.96	LT	RESIDENTIAL		GRAVEL	15	15	14	34		44		2	1	43		64	
	72	234+37.65	RT	RESIDENTIAL		GRAVEL	15	15	10	34	20		2			20		50	
	73	235+68.15	RT	RESIDENTIAL		GRAVEL	15	15	12	35	24		2			24		62	
	74	236+07.92	RT	RESIDENTIAL		GRAVEL	15	15	13	35	26		2			26		61	
21 OF 23	75	239+54.00	LT	RESIDENTIAL		GRAVEL	15	15	12	32	24		2					54	
	76	240+87.79	RT	RESIDENTIAL		GRAVEL	15	15	10	36								51	
	77	243+38.90	RT	RESIDENTIAL		GRAVEL	15	15	11	37	24		2			21		56	
	78	244+81.13	RT	RESIDENTIAL		GRAVEL	15	15	10	37	26		2			26		52	
	79	247+20.71	RT	RESIDENTIAL		CONCRETE	15	15	17.50	37	22		2			22			83
	80	248+45.84	LT	INTERSECTION	E DENTON RD	ASPHALT	40	40	25	40							187		
22 OF 23	81	249+92.67	LT	RESIDENTIAL		GRAVEL	15	15	16	32								67	
	82	251+34.95	RT	INTERSECTION	W DENTON RD	ASPHALT	40	40	25	40							187		
							SHEET TOTALS				166	70	14	4	1	207	374	587	83
							PROJECT TOTALS				1454	200	98	14	20	1582	1776	4464	201

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FM 2311

SUMMARY OF QUANTITIES
(DRIVEWAYS AND INTERSECTIONS)

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311

DIST	COUNTY	SHEET NO.
WAC	McLENNAN	23

CK: SU
DW: HFJ
CK: SU
DW: HFJ

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
1	1	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		W4-4P	CROSS TRAFFIC DOES NOT STOP (PLAQUE)	24 x 12	X							
	2	M1-6F	FM 308	24 x 24	X		10BWG	1	SA	P		
		M6-4	<ARROW - DUAL LEFT & RIGHT> <AUX. SIGN>	21 x 15	X							
	3	M3-2	EAST <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	FM 308	24 x 24	X							
	4	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
	5	W11-10L	SYMBOL - BE ALERT FOR TRUCKS ENTERING LT	36 x 36	X		10BWG	1	SA	P		
	6	D1-2	(LEFT ARROW) ELM MOTT (RIGHT ARROW) BIROME	84 x 30	X		S80	1	SA	U	BM	
	7	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
	8	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
	9	R2-1	SPEED LIMIT (SPEED)	24 x 30	X		10BWG	1	SA	P		
	10	W11-10L	SYMBOL - BE ALERT FOR TRUCKS ENTERING LT	36 x 36	X		10BWG	1	SA	P		
	11	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
	12	W3-1	SYMBOL - STOP AHEAD	36 x 36	X		10BWG	1	SA	P		
	13	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
	14	M2-1	JCT <AUXILIARY SIGN>	21 x 15	X		10BWG	1	SA	P		
		M1-6F	FM 308	24 x 24	X							
	15	W2-1AT	HIGHWAY INTERSECTION AHEAD	48 x 48	X		10BWG	1	SA	T		
	16	W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X		10BWG	1	SA	P		
	17	R2-1	SPEED LIMIT (SPEED)	24 x 30	X		10BWG	1	SA	P		
2	1	W1-8L	<CHEVRON LEFT>	18 x 24	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	18 x 24	X							
	2	W1-8L	<CHEVRON LEFT>	18 x 24	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	18 x 24	X							
	3	W1-8L	<CHEVRON LEFT>	18 x 24	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	18 x 24	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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STATE OF TEXAS
MOHAMMED S ULA
131559
LICENSED
PROFESSIONAL ENGINEER
Mohammed S Ula
1/24/2024

infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SUMMARY OF SMALL SIGNS
SOSS

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		24

DATE: 1/24/2024 2:05:02 PM
FILE: ...\SPM\FM 2311-SOSS.dgn

CK: SU
DW: HFJ
CK: SU
DW: HFJ

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
2	4	W1-8L	<CHEVRON LEFT>	18 x 24	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	18 x 24	X							
	5	W1-8L	<CHEVRON LEFT>	18 x 24	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	18 x 24	X							
	6	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		
	7	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		
	8	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
	9	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
	10	R1-1	STOP	36 X 36	X		10BWG	1	SA	P		
	11	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
	12	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
	13	I-2aT	LEROY CITY LIMIT POP XXXX	36 x 24	X		10BWG	1	SA	P		
	14	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
3	1	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
	2	M3-2	EAST <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	FM 2311	24 x 24	X							
		D10-7aT	TRM 342	3 x 10	X							
	3	R2-1	SPEED LIMIT (SPEED)	24 x 30	X		10BWG	1	SA	P		
	4	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 x 36	X		10BWG	1	SA	P		
4	1	D14-4T-3	ADOPT A HIGHWAY NEXT 2 MILES LEROY TOURS GERALD COMMUNITIES	48X48	X		10BWG	1	SA	T		
	2	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 x 36	X		10BWG	1	SA	P		
	3	R2-1	SPEED LIMIT (SPEED)	24 x 30	X		10BWG	1	SA	P		
	4	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	ADVISORY SPEED 50 MPH	18 x 18	X							
	5	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
	6	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
	7	D21-1TL	(LEFT ARROW) KIRKLAND HILL RD	60 x 24	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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LICENSED
PROFESSIONAL ENGINEER
Mohammed S Ula
1/24/2024

infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SUMMARY OF SMALL SIGNS
SOSS

SHEET 2 OF 5

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		25

DATE: 1/24/2024 2:05:06 PM
FILE: ...\SPM\FM 2311-SOSS.dgn

CK: SU
DW: HFJ
CK: SU
DW: HFJ

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
5	1	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
	2	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
	3	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
	4	W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	ADVISORY SPEED 50 MPH	18 x 18	X							
	5	R2-1	SPEED LIMIT (SPEED)	24 x 30	X		10BWG	1	SA	P		
	6	D21-1TR	KIRKLAND HILL RD (RIGHT ARROW)	66 x 24	X		10BWG	1	SA	T		
7	1	R2-1	SPEED LIMIT (SPEED)	24 x 30	X		10BWG	1	SA	P		
	2	M3-4	WEST <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	FM 2311	24 x 24	X							
		D10-7aT	TRM 344	3 x 10	X							
	3	D14-4T-3	ADOPT A HIGHWAY NEXT 2 MILES AXTELL 4-H CLUB	48 x 48	X		10BWG	1	SA	T		
	4	D21-1TR	OLIVE BRANCH RD (RIGHT ARROW)	66 x 24	X		10BWG	1	SA	T		
	5	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
	6	M3-2	EAST <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	FM 2311	24 x 24	X							
	7	D21-1TL	(LEFT ARROW) OLIVE BRANCH RD	54 x 24	X		10BWG	1	SA	T		
	8	R2-1	SPEED LIMIT (SPEED)	24 x 30	X		10BWG	1	SA	P		
8	1	R2-1	SPEED LIMIT (SPEED)	24 x 30	X		10BWG	1	SA	P		
	2	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		
	3	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
	4	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
9	1	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
	2	W1-8R	<CHEVRON RIGHT>	18 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	18 x 24	X							
	3	W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	ADVISORY SPEED 50 MPH	18 x 18	X							

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Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
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Texas Department of Transportation

FM 2311

SUMMARY OF SMALL SIGNS
SOSS

SHEET 3 OF 5

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		26

DATE: 1/24/2024 2:05:10 PM
FILE: ...\SPM\FM 2311-SOSS.dgn

CK: SU
DW: HFJ
CK: SU
DW: HFJ

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	4	R2-1	SPEED LIMIT (SPEED)	24 x 30	X		10BWG	1	SA	P		
	5	D2-2	LEROY 4 WEST 11	60 x 30	X		10BWG	1	SA	U		
	6	R2-1	SPEED LIMIT (SPEED)	24 x 30	X		10BWG	1	SA	P		
	7	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	ADVISORY SPEED 55 MPH	18 x 18	X							
	8	W1-8L	<CHEVRON LEFT>	18 x 24	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	18 x 24	X							
10	1	W1-8L	<CHEVRON LEFT>	18 x 24	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	18 x 24	X							
	2	W1-8L	<CHEVRON LEFT>	18 x 24	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	18 x 24	X							
	3	W1-8L	<CHEVRON LEFT>	18 x 24	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	18 x 24	X							
	4	W1-8L	<CHEVRON LEFT>	18 x 24	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	18 x 24	X							
	5	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	ADVISORY SPEED 55 MPH	18 x 18	X							
	6	R2-1	SPEED LIMIT (SPEED)	24 x 30			10BWG	1	SA	P		
11	1	D21-2T	(LEFT ARROW) EAST DENTON ROAD WEST DENTON ROAD (RIGHT ARROW)	96 x 24	X		10BWG	1	SA	T		
	2	W2-1aT	HIGHWAY INTERSECTION AHEAD	48 x 48	X		10BWG	1	SA	T		
	3	R2-1	SPEED LIMIT (SPEED)	24 x 30	X		10BWG	1	SA	P		
	4	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
	5	M2-1	JCT <AUXILIARY SIGN>	21 x 15	X		10BWG	1	SA	P		
		M1-6T-2	31 TEXAS	24 x 24	X							
	6	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
	7	M4-6	END <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	FM 2311	24 x 24	X							
		R3-5HTP	1500 FT	24 x 8	X							
	8	D21-2T	(LEFT ARROW) WEST DENTON RD EAST DENTON RD (RIGHT ARROW)	96 x 24	X		10BWG	1	SA	T		
	9	W3-1	SYMBOL - STOP AHEAD	36 x 36	X		10BWG	1	SA	P		
	10	D14-4T-3	ADOPT A HIGHWAY AXTELL 4-H CLUB	48 x 48	X		10BWG	1	SA	T		
	11	D1-2	(LEFT ARROW) HUBBARD WACO (RIGHT ARROW)	78 x 30	X		S80	1	SA	U	BM	

ALUMINUM SIGN BLANKS THICKNESS	
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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
MOHAMMED S ULA
131559
LICENSED
PROFESSIONAL ENGINEER
Mohammed S Ula
1/24/2024

infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SUMMARY OF SMALL SIGNS
SOSS

SHEET 4 OF 5

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		27

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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	MOUNTING DESIGNATION	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"	1EXT or 2EXT - # of Ext BM - Extruded Wind Beam WC - 1.12 #/ft Wing Channel EXAL- Extruded Alum Sign Panels	TY N TY S
11	*12*	*R12-1T*	*WEIGHT LIMIT/GROSS (WEIGHT) LBS*	*24 x 36*	*X*		*10BWG*	*1*	*SA*	*P*		
12	*1*	*M3-2*	*EAST <AUXILIARY SIGN>*	*24 x 12*	*X*		*S80*	*1*	*SA*	*U*		
		M1-6T-2	*31 TEXAS*	*24 x 24*	*X*							
		M5-1L	*<ARROW - STRAIGHT THEN LEFT> <AUX. SIGN>*	*21 x 15*	*X*							
		M3-4	*WEST <AUXILIARY SIGN>*	*24 x 12*	*X*							
		M1-6T-2	*31 TEXAS*	*24 x 24*	*X*							
		M6-1	*<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>*	*21 x 15*	*X*							
	2	*M3-4*	*WEST <AUXILIARY SIGN>*	*24 x 12*	*X*		*10BWG*	*1*	*SA*	*P*		
		M1-6F	*<FM SHIELD> FARM ROAD (ROUTE #)*	*24 x 24*	*X*							
		D10-7aT	*TRM 346*	*3 x 10*	*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).

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FM 2311

SUMMARY OF SMALL SIGNS
SOSS

SHEET 5 OF 5

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		28

CK: SU
DW: HFJ
CK: SU
DW: HFJ

DATE: 1/24/2024 2:05:18 PM
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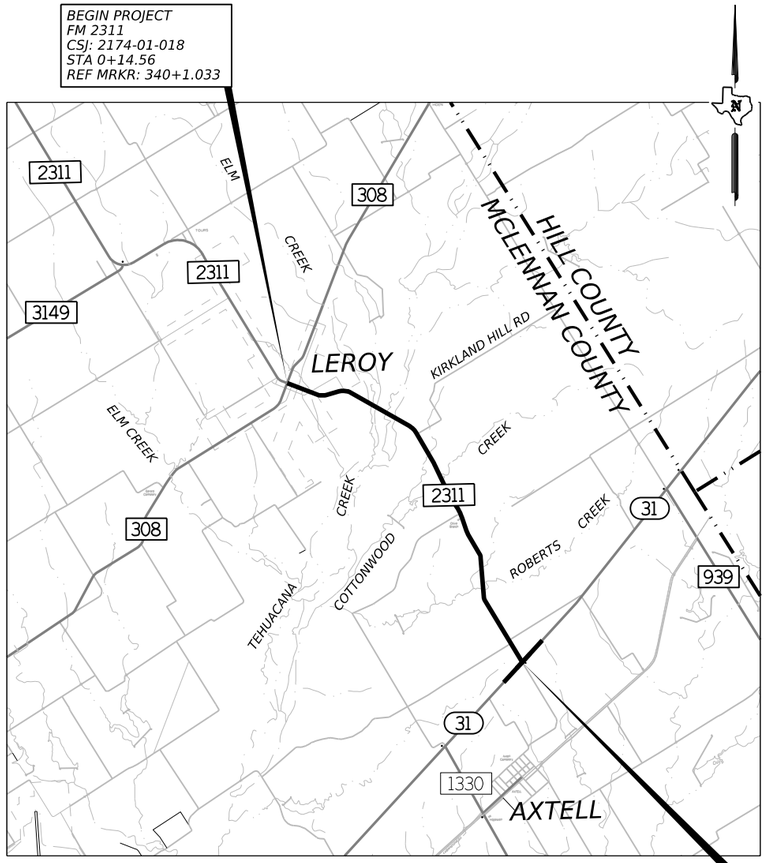
LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
															MOVE / RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE/ RESET	FROM LOC.#	N	W	N	W	N	W
1	2-STEP 1	40	LT	112+15.52	TL-3	UNI	NA	NA	PORT. CTB	24"	3'-6"	20'	1								X	
2	2-STEP 1	41	LT	196+73.48	TL-3	UNI	NA	NA	PORT. CTB	24"	3'-6"	20'			1	1					X	
3	2-STEP 1	44	LT	196+73.48	TL-3	UNI	NA	NA	PORT. CTB	24"	3'-6"	20'	1								X	
4	2-STEP 1	44	LT	210+35.93	TL-3	UNI	NA	NA	PORT. CTB	24"	3'-6"	20'			1	2					X	
5	2-STEP 2	52	RT	112+15.52	TL-3	UNI	NA	NA	PORT. CTB	24"	3'-6"	20'			1	3					X	
6	2-STEP 2	53	RT	196+73.48	TL-3	UNI	NA	NA	PORT. CTB	24"	3'-6"	20'			1	4					X	
7	2-STEP 2	54	RT	196+73.48	TL-3	UNI	NA	NA	PORT. CTB	24"	3'-6"	20'		1	1	5					X	
8	2-STEP 2	54	RT	210+35.93	TL-3	UNI	NA	NA	PORT. CTB	24"	3'-6"	20'		1	1	6					X	
												TOTALS	2	2	6							

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/rdwyise.htm

CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:		CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		
	WAC	McLENNAN		
	FEDERAL AID PROJECT			SHEET NO.
				29



SCALE: 1 IN. = 10,000 FT.

VICINITY MAP

REQUIRED SIGNS

1. SIGNS R20-3T, G20-10T, G20-9TP, R20-5T, R20-5aTP, G20-5T, G20-6T, G20-2 AND G20-2bT WILL BE REQUIRED AT PROJECT LIMITS.

SIGNAGE LEGEND

G20-5T	48X24	BEGIN ROAD WORK NEXT X MILES
G20-6T	48X30	NAME, ADDRESS, CITY, STATE, CONTRACTOR
G20-9TP	24X24	BEGIN WORK ZONE
G20-2bT	36X18	END WORK ZONE
R20-3T	48X42	OBEY WARNING SIGNS STATE LAW
CW20-1D	36X36	ROAD WORK AHEAD
R20-5T	24X30	TRAFFIC FINES DOUBLE
R20-5aTP	36X18	WHEN WORKERS ARE PRESENT
R2-1	30X36	SPEED LIMIT 60
G20-10T	60X48	STAY ALERT TALK OR TEXT LATER
G20-2	48X24	END ROAD WORK

GENERAL

A. INSTALL ALL SIGNS, BARRICADES AND TRAFFIC CONTROL DEVICES AS SHOWN AND IN ACCORDANCE WITH THE STANDARD BC SHEETS AND AS DIRECTED.
B. ADDITIONAL SIGNS, BARRICADES OR TRAFFIC CONTROL DEVICES OTHER THAN THOSE SPECIFIED MAY BE REQUIRED FOR THE SAFE MOVEMENT OF TRAFFIC THROUGH THE PROJECT. PAYMENT FOR ALL SUCH SIGNS, BARRICADES OR TRAFFIC CONTROL DEVICES WILL BE CONSIDERED SUBSIDIARY TO THE ITEM "BARRICADES, SIGNS AND TRAFFIC HANDLING".
C. WORK SITES SHOULD BE CAREFULLY MONITORED TO ENSURE THAT TRAFFIC CONTROL MEASURES ARE OPERATING EFFECTIVELY AND THAT ALL DEVICES USED ARE CLEARLY VISIBLE, CLEAN AND IN GOOD REPAIR.
D. THE CONTRACTOR WILL PROVIDE SAFE ACCESS TO AND FROM ALL PRIVATE PROPERTY AT ALL TIMES AND IN ALL WEATHER CONDITIONS.
E. THE CONTRACTOR WILL BE REQUIRED TO SUBMIT A DETAILED SCHEDULE OF WORK PRIOR TO THE BEGINNING OF CONSTRUCTION WHICH GENERALLY CONFORMS TO THE SEQUENCE SHOWN ON THE TCP SEQUENCE OF OPERATION BELOW.
F. COMPLETE ALL WORK ON PROJECT AS SHOWN ON THE VARIOUS PLAN SHEETS AND IN COMPLIANCE WITH THE GENERAL NOTES OF THIS CONTRACT.
G. ANY REQUEST TO ALTER THE SEQUENCE OF OPERATION OR TRAFFIC CONTROL PLAN WILL BE SUBMITTED TO THE ENGINEER FOR WRITTEN APPROVAL.
H. TWO LANES OF TRAFFIC SHALL BE OPEN TO TRAFFIC AND THE END OF EACH WORKDAY.

SEQUENCE OF CONSTRUCTION

A. CENTERLINE TO BE MAINTAINED THROUGH PROJECT.
B. LANE CLOSURES WILL BE LIMITED TO ONE DIRECTION AT A TIME AND WILL REQUIRE FLAGGERS FOR ONE-LANE TWO-WAY TRAFFIC AS DIRECTED BY APPLICABLE TCP STANDARDS AND SPECIFICATIONS. LANE CLOSURES SHALL BE LIMITED TO DAYTIME HOUR ONLY.
C. ALL LANE CLOSURES WILL REQUIRE TEMPORARY RUMBLE STRIPS.
D. ALL WORK ZONES WILL BE LIMITED TO A MAXIMUM OF 1 MILE IN LENGTH.
E. ACCESS WILL BE MAINTAINED TO ALL PROPERTIES AT ALL TIMES.
F. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME UTILIZING STANDARD DRAWING TCP (SC-4)-22.
G. FINISH PROPOSED WORK IN EACH WORK AREA BEFORE PROCEEDING TO PERFORM WORK (NOT INCLUDING FINAL OVERLAY AND PERMANENT MARKINGS) IN ANOTHER WORK AREA. AT A MINIMUM, ALL SAFETY END TREATMENT FOR SIDE ROAD AND CROSS DRAINAGE CULVERTS WILL BE COMPLETE AND IN PLACE. OBTAIN APPROVAL BEFORE PROCEEDING TO BEGIN WORK IN ANOTHER WORK AREA.
H. 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:

PHASE 1 -

1. PROVIDE AND INSTALL ALL SIGNS, BARRICADES, AND TRAFFIC CONTROL DEVICES IN ACCORDANCE WITH THE TRAFFIC CONTROL STANDARDS.
2. PROVIDE AND INSTALL ALL SWP3 DEVICES IN ACCORDANCE WITH THE APPLICABLE STANDARDS.
3. ESTABLISH A MAJOR DETOUR (SEE TCP DETOUR PLAN SHEETS) AND CLOSE THE ROADWAY TO THRU TRAFFIC BETWEEN STATIONS 58+90.00 AND 83+41.10. USING THE ROAD CLOSURE, CONSTRUCT THE BRIDGES FROM STATIONS 69+70.22 TO 72+10.22 AND 77+37.09 TO 79+77.09 (INCLUDING MBGF AND T223 RAIL). ALSO CONSTRUCT THE CEMENT TREATED ROADWAY MATERIAL,FOG SEAL & OCST. TY-D FLEXIBLE BASE, UNDERSEAL COURSE, SP-C (INCLUDING THE SECOND LAYER) FROM STATION 65+57.04 TO 83+41.04) AND TEMPORARY PAVEMENT MARKINGS (TABS) FOR THE ENTIRE ROADWAY FROM STATIONS 58+90.000 TO 62+27.32, 65+67.32 TO 69+70.22, 72+10.22 TO 77+37.09, AND 79+77.09 TO 83+41.40.
4. ESTABLISH A LOCAL ROAD CLOSURE (SEE TCP DETOUR PLAN SHEETS) AND CONSTRUCT THE CROSSDRAINS AT STATIONS 2+20.00 (2+52), (3+91) 4+20.00, 15+26.63, 16+86.85, 31+24.67, 45+65.43, 175+02.77, 189+72.08, 214+91.45 AND 225+66.98 AND 254+60.31. AT STATION LOCATION 2+52, REMOVE EXISTING CULVERT AFTER INSTALLATION OF PROPOSED CULVERT AT STA 2+00.00. AT STATION LOCATION 3+91, REMOVE EXISTING CULVERT AFTER INSTALLATION OF PROPOSED CULVERT AT STA 4+20.00.

PHASE 2 - STEP 1

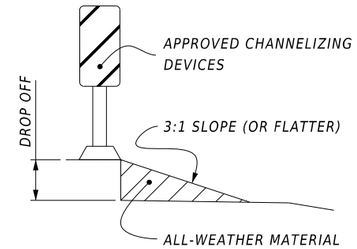
1. ESTABLISH A DAYTIME WORK ZONE ON THE SOUTHBOUND ROADWAY, ERECT VERTICAL PANELS AND UTILIZE THE ONE-LANE/TWO-WAY TRAFFIC CONTROL DETAILS, FLAGGERS, PILOT CARS AND PAVEMENT EDGE DROP-OFF DETAIL TO CONSTRUCT THE CEMENT TREATED ROADWAY MATERIAL, FOG SEAL & OCST. TY-D FLEXIBLE BASE, UNDERSEAL COURSE, SP-C AND TEMPORARY PAVEMENT MARKINGS (TABS) FOR THE SOUTHBOUND ROADWAY FROM STATIONS 00+14.56 TO 58+90.00, AND 83+40.10 TO STATION 262+40.00.
2. CONSTRUCT THE WEST HALF OF THE CULVERT EXTENTIONS AT STATIONS 112+15.52, 132+23.19, 196+73.48 AND 210+35.93.
3. CONSTRUCT DRIVEWAYS AND PERMANANT PARALLEL DRAINAGE ON THE SOUTHBOUND SIDE OF THE ROADWAY.
4. REMOVE THE DAYTIME WORK ZONE AT THE END OF EACH DAY. PLACE SIGNS AND TEMPORARY PAVEMENT MARKINGS (TABS) TO ALLOW TRAFFIC TO RUN ON THE PREVIOUSLY CONSTRUCTED SOUTHBOUND ROADWAY DURING THE NIGHTTIME.

PHASE 2 - STEP 2

1. ESTABLISH A DAYTIME WORK ZONE ON THE NORTHBOUND ROADWAY, ERECT VERTICAL PANELS AND UTILIZE THE ONE-LANE/TWO-WAY TRAFFIC CONTROL DETAILS, FLAGGERS, PILOT CARS AND PAVEMENT EDGE DROP-OFF DETAIL TO CONSTRUCT THE CEMENT TREATED ROADWAY MATERIAL, FOG SEAL & OCST. TY-D FLEXIBLE BASE, UNDERSEAL COURSE, SP-C AND TEMPORARY PAVEMENT MARKINGS (TABS) FOR THE SOUTHBOUND ROADWAY FROM STATIONS 00+14.56 TO 58+90.00, AND 83+40.10 TO STATION 262+40.00.
2. CONSTRUCT THE EAST HALF OF THE CULVERT EXTENTIONS AT STATIONS 112+15.52, 132+23.19, 196+73.48 AND 210+35.93.
3. CONSTRUCT DRIVEWAYS AND PERMANANT PARALLEL DRAINAGE ON THE SOUTHBOUND SIDE OF THE ROADWAY.
4. REMOVE THE DAYTIME WORK ZONE AT THE END OF EACH DAY. PLACE SIGNS AND TEMPORARY PAVEMENT MARKINGS (TABS) TO ALLOW TRAFFIC TO RUN ON THE PREVIOUSLY CONSTRUCTED NORTHBOUND ROADWAY DURING THE NIGHTTIME.

PHASE 3-

1. PLACE PERMANENT PAVEMENT MARKERS.
2. INSTALL ALL REMAINING MBGF AS SHOWN IN PLANS.
3. PERFORM FINAL CLEAN UP, INCLUDING CLEANING OF EXISTING CULVERTS.



PAV EDGE DROP-OFF DETAIL

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

NOTES:

1. ALL TRAFFIC CONTROL DEVICES WILL CONFORM WITH THE TEXAS "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" (TMUTCD), AND WILL BE MAINTAINED AS DIRECTED.ADDITIONAL GUIDELINES FOR TRAFFIC CONTROL DEVICES MAY BE FOUND IN THE TMUTCD.
2. FOR CHANNELING DEVICE PLACEMENT AND SPACING FOR ALL PHASES, REFER TO THE TCP STANDARDS.
3. THE CONTRACTOR SHALL PHASE THE MILLING AND OVERLAY OPERATIONS IN A MANNER SO AS TO PROVIDE POSITIVE DRAINAGE AND AVOID PONDING ON THE TRAVELWAY.
4. THE SPEED LIMIT FOR THE CONSTRUCTION WORK ZONE SHALL BE 50 MPH.

STATE OF TEXAS
LUKE W. CLARKE
60221
LICENSED
PROFESSIONAL ENGINEER
1/31/2024

AtkinsRéalis
TBPE REG. # F-474

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Texas Department of Transportation

FM 2311

SEQUENCE OF CONSTRUCTION NARRATIVE

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		30

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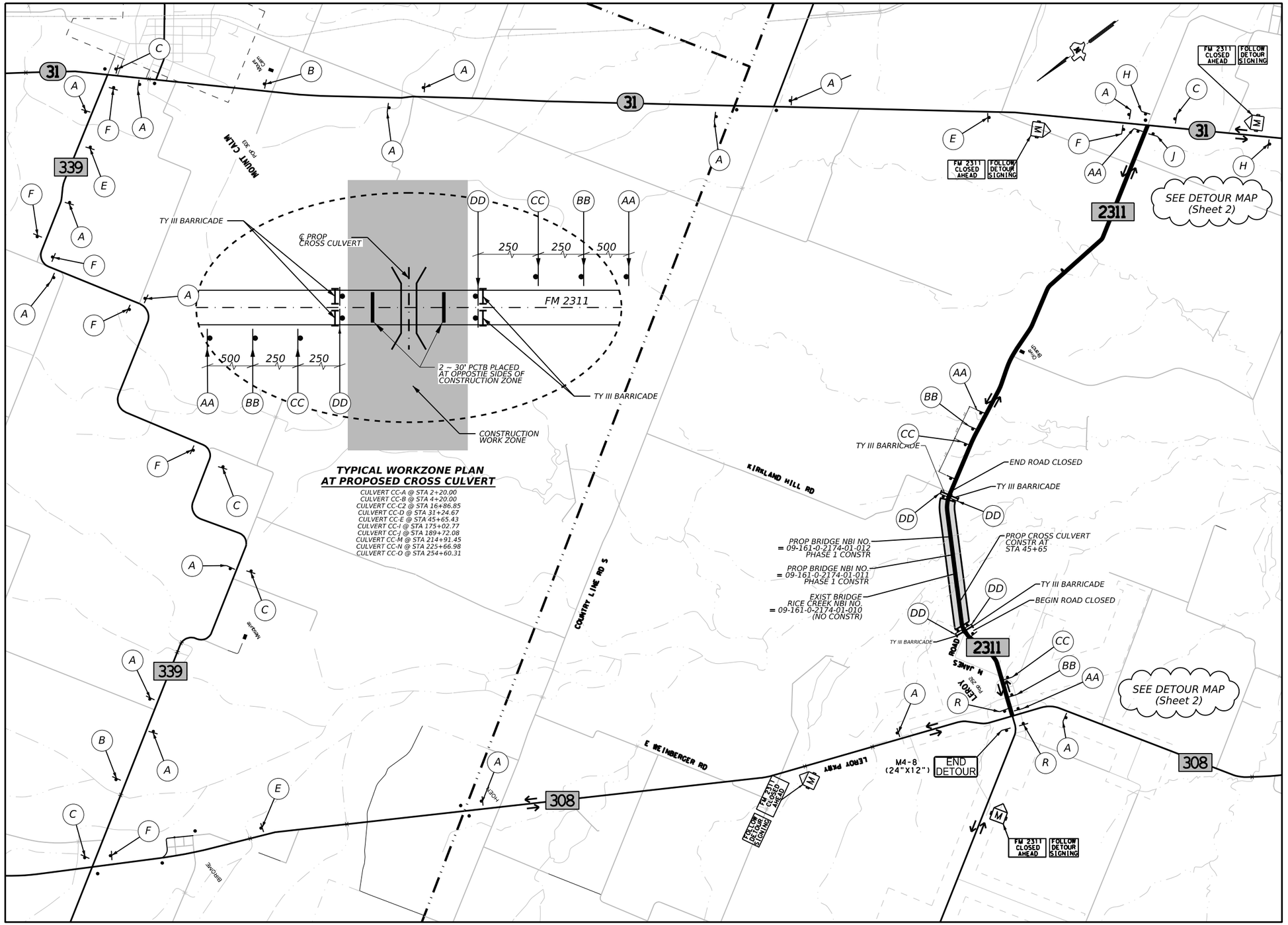

TYPICAL WORKZONE PLAN AT PROPOSED CROSS CULVERT

CULVERT CC-A @ STA 2+20.00
CULVERT CC-B @ STA 4+20.00
CULVERT CC-C2 @ STA 16+86.85
CULVERT CC-D @ STA 31+24.67
CULVERT CC-E @ STA 45+65.43
CULVERT CC-I @ STA 175+02.77
CULVERT CC-J @ STA 189+72.08
CULVERT CC-M @ STA 214+91.45
CULVERT CC-N @ STA 225+66.98
CULVERT CC-O @ STA 254+60.31

NOTES:

1. SEE SHEET 3 OF 3 FOR TCP DETOUR SIGN LEGEND FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
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3/1/2024

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Texas Department of Transportation

FM 2311

TCP DETOUR PLAN

NOT TO SCALE SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		31

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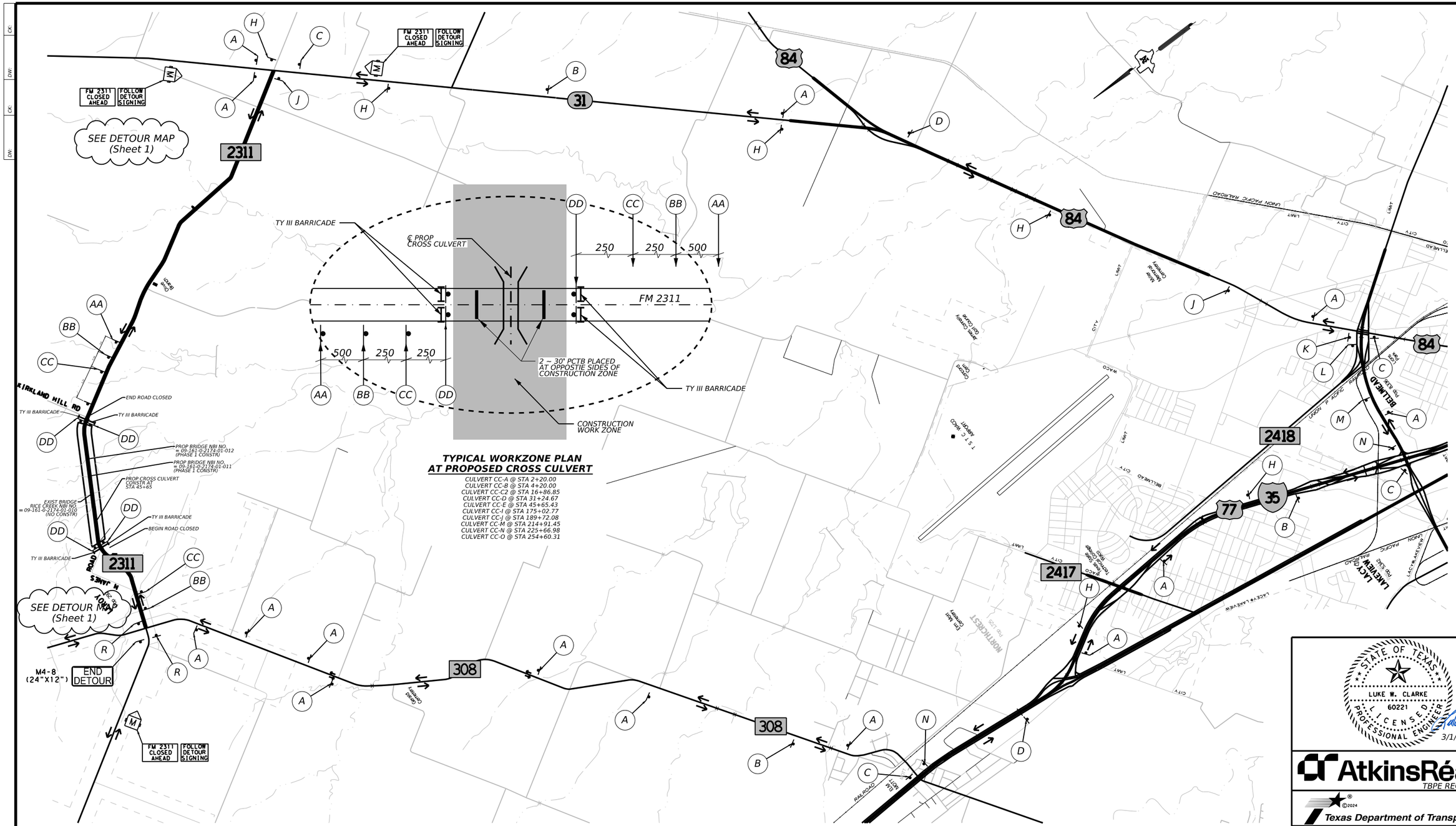

TYPICAL WORKZONE PLAN AT PROPOSED CROSS CULVERT

CULVERT CC-A @ STA 2+20.00
CULVERT CC-B @ STA 4+20.00
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CULVERT CC-I @ STA 175+02.77
CULVERT CC-J @ STA 189+72.08
CULVERT CC-M @ STA 214+91.45
CULVERT CC-N @ STA 225+66.98
CULVERT CC-O @ STA 254+60.31

NOTES:

1. SEE SHEET 3 OF 3 FOR TCP DETOUR SIGN LEGEND FOR ADDITIONAL INFORMATION.

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3/1/2024

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FM 2311

TCP DETOUR PLAN

NOT TO SCALE SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		32

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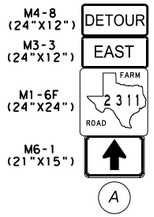

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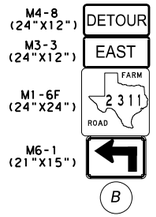

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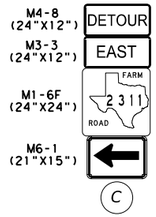

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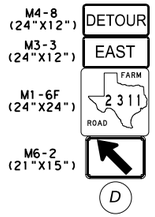

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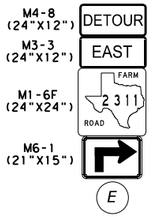

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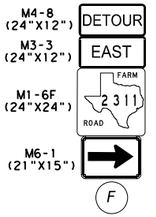

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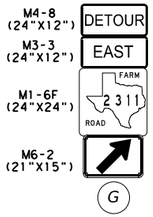

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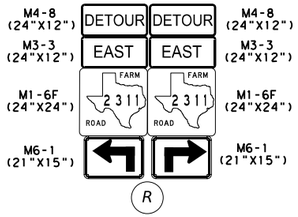

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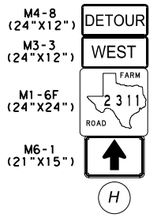

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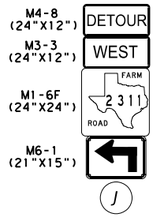

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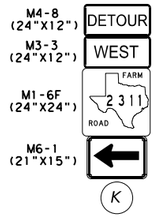

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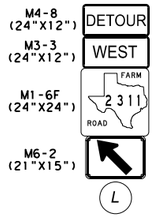

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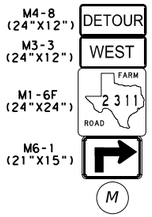

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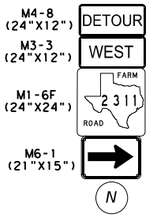

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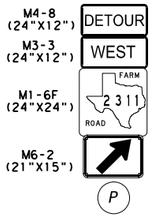

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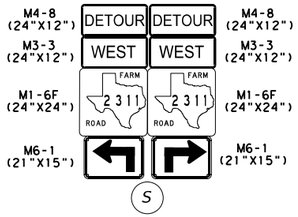

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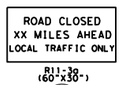

R11-3a
(60"X30")
AA

W20-3D
(48"X48")
BB

G20-24
(48"X48")
CC

R11-2
(48"X30")
DD

DATE: 1/31/2024 5:54:23 PM
FILE: ...\FM2311_TCP_DETOUR_02C.dgn

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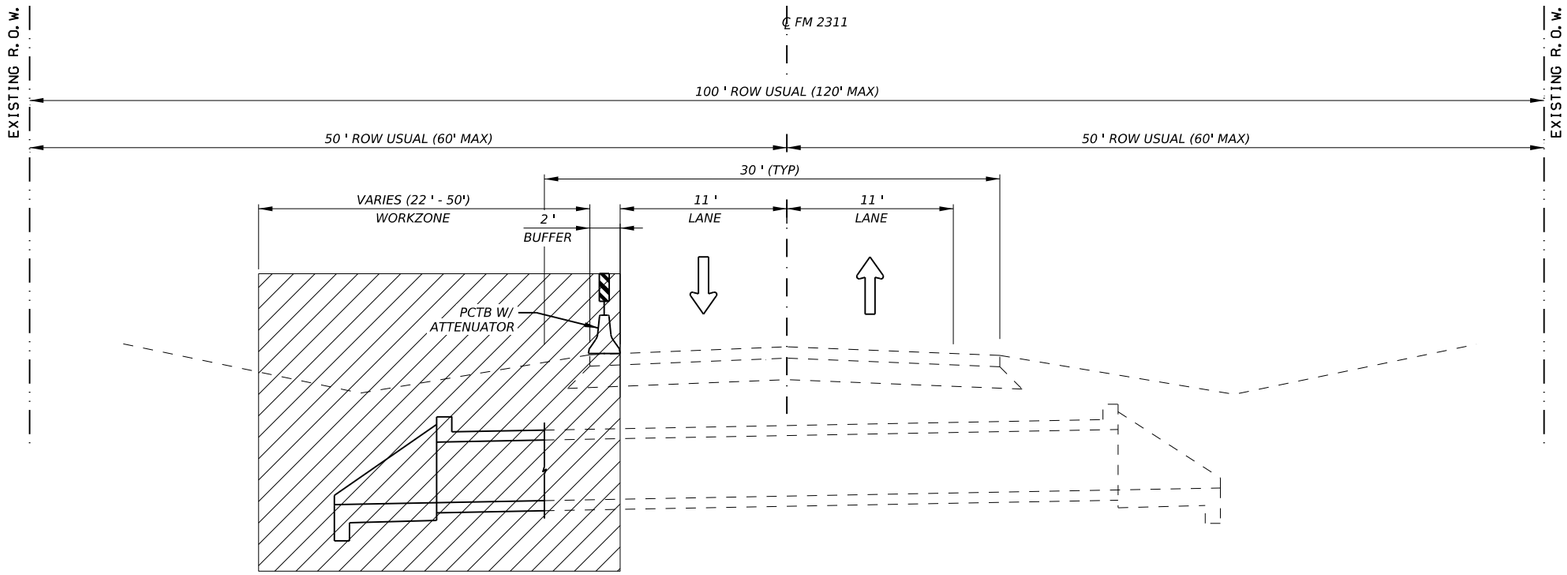
FM 2311

TCP DETOUR LEGEND

NOT TO SCALE SHEET 1 OF 1

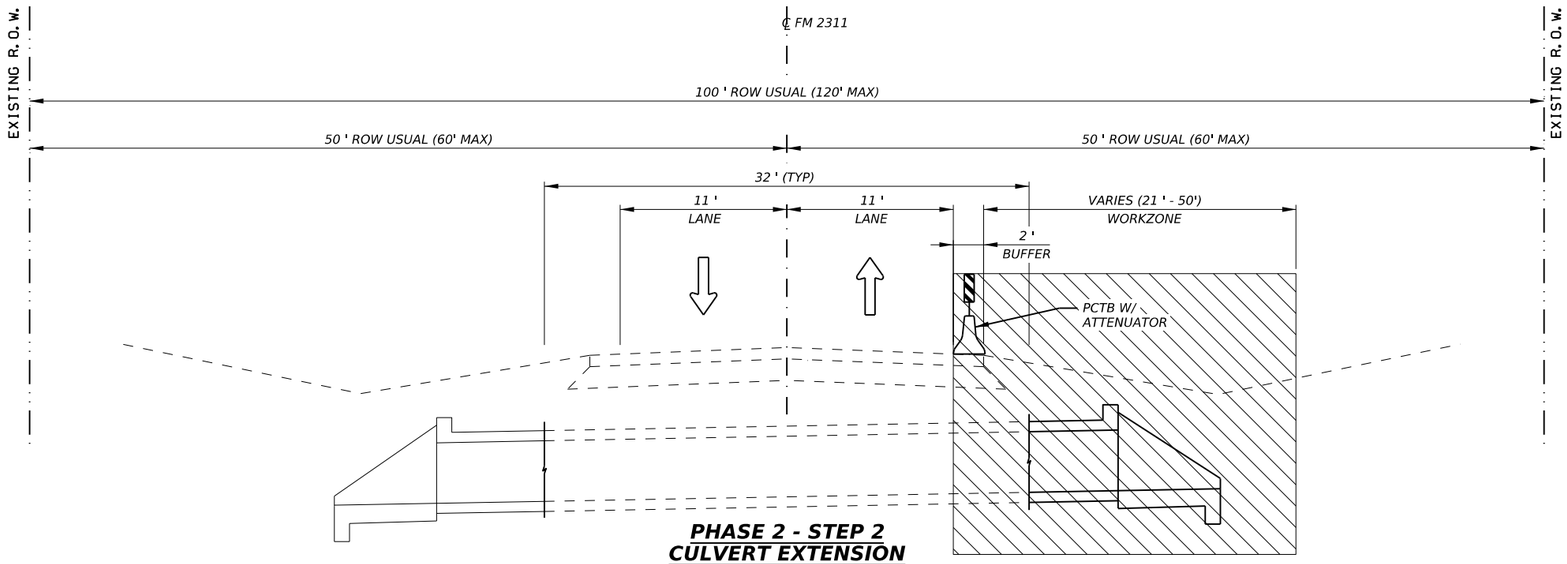
CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311

DIST	COUNTY	SHEET NO.
WAC	McLENNAN	33



PHASE 2 - STEP 1
CULVERT EXTENSION

STA 112+15.52, 132+23.19, 196+73.48, 210+35.93



PHASE 2 - STEP 2
CULVERT EXTENSION

STA 112+15.52, 132+23.19, 196+73.48, 210+35.93

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TCP TYPICAL SECTIONS
PROPOSED

NOT TO SCALE SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		34

DATE: 1/31/2024 5:54:39 PM
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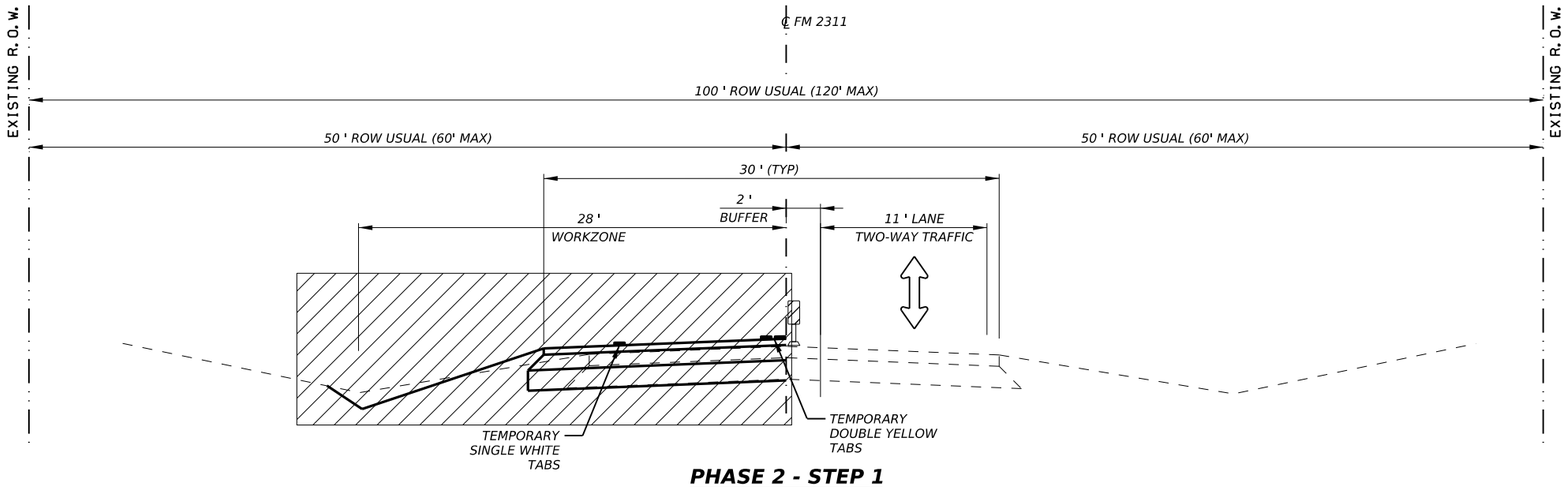
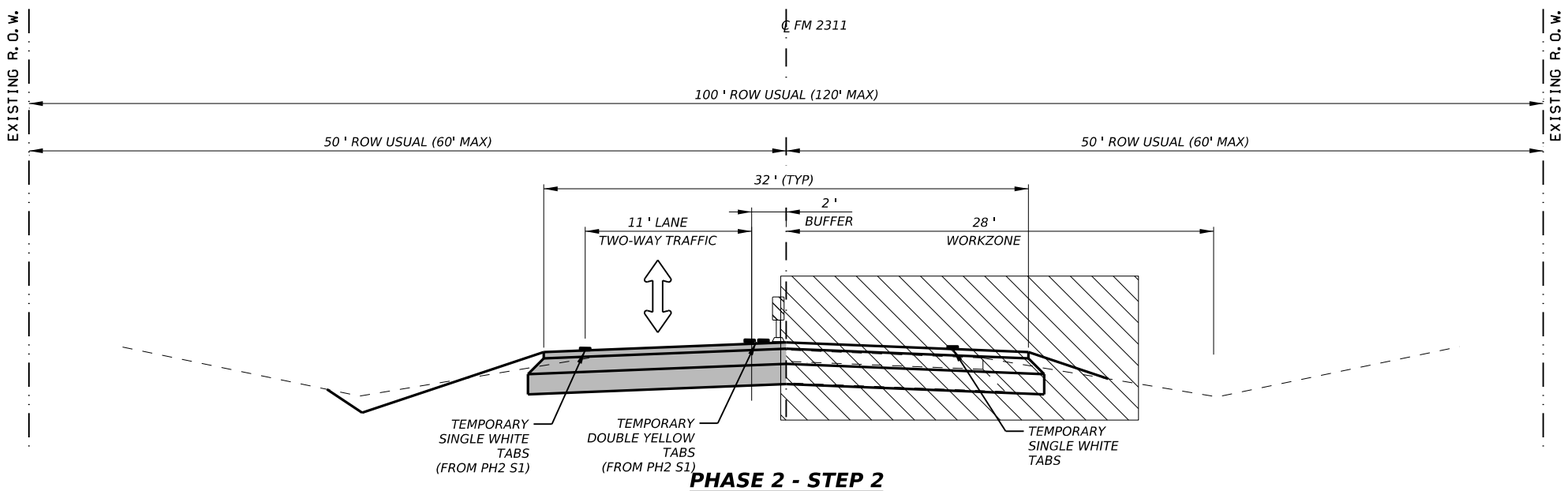


PHASE 2 - STEP 1

STA 0+14.56 TO STA 58+90.00 (FULL DEPTH)
STA 58+90.00 TO STA 59+90.00 (TRANSITION FROM 4' TO 10' SHLDR)
STA 83+41.40 TO STA 130+00.00 (FULL DEPTH)
STA 134+50.00 TO STA 262+40.00 (FULL DEPTH)



PHASE 2 - STEP 2

STA 0+14.56 TO STA 58+90.00 (FULL DEPTH)
STA 58+90.00 TO STA 59+90.00 (TRANSITION FROM 4' TO 10' SHLDR)
STA 83+41.40 TO STA 130+00.00 (FULL DEPTH)
STA 134+50.00 TO STA 262+40.00 (FULL DEPTH)

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TCP TYPICAL SECTIONS
PROPOSED

NOT TO SCALE SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311

DIST	COUNTY	SHEET NO.
WAC	McLENNAN	35

DATE: 1/31/2024 5:54:55 PM
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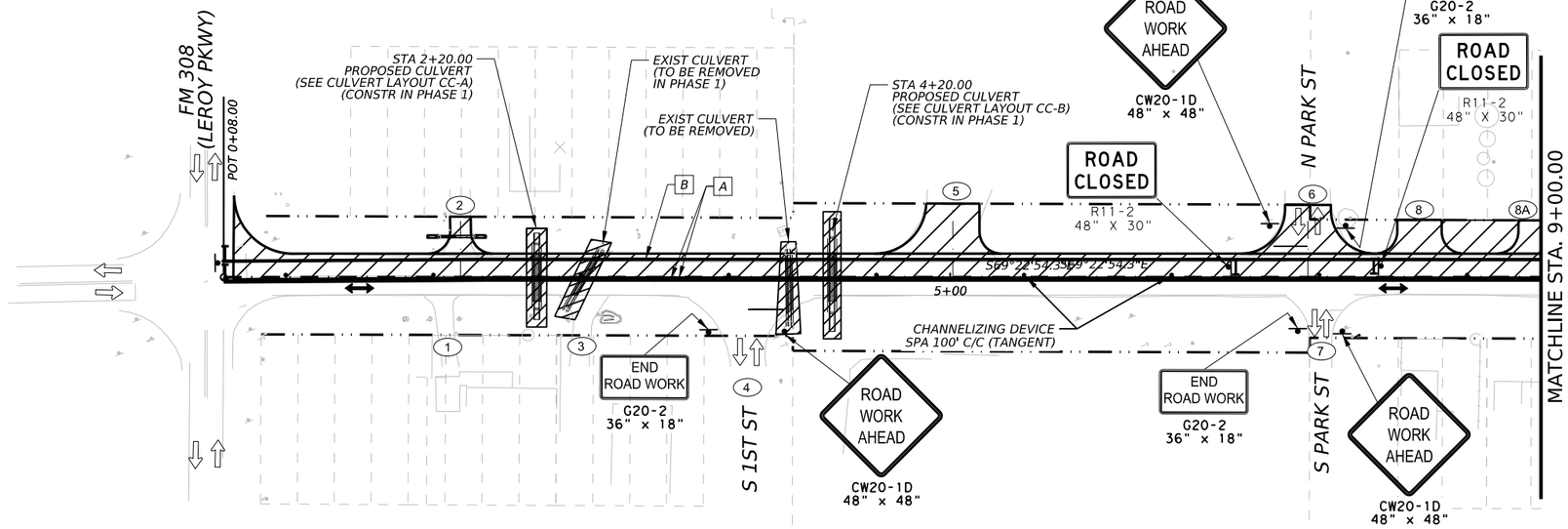

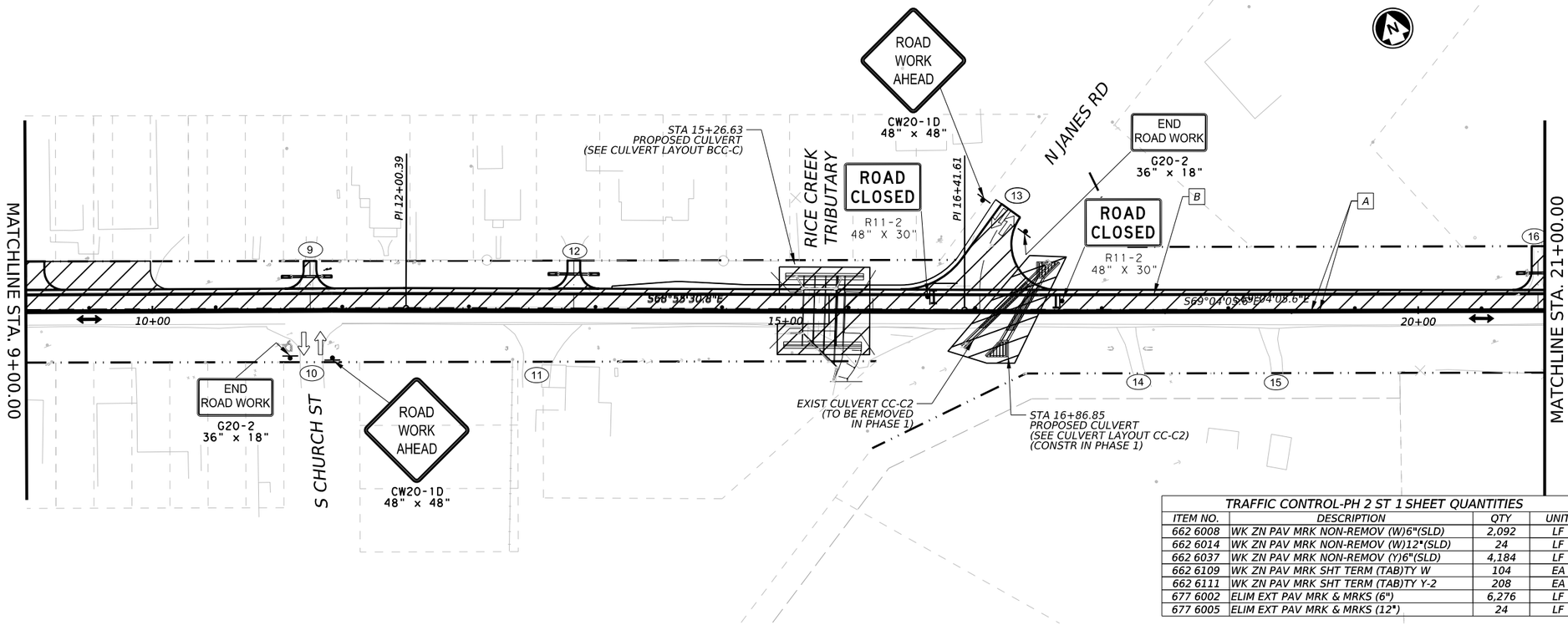

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN AND SHALL BE COVERED.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. FOR ADDITIONAL SIGNS AND BARRICADES REQUIRED TO ESTABLISH A TEMPORARY WORK ZONE UTILIZE STANDARD DRAWING TCP(1-2)-18, TCP ONE-TWO WAY TRAFFIC CONTROL
5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 1 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,092	LF
662 6014	WK ZN PAV MRK NON-REMOV (W)12"(SLD)	24	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,184	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	104	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	208	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	6,276	LF
677 6005	ELIM EXT PAV MRK & MRKS (12")	24	LF

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TCP PHASE 2 - STEP 1
BEGIN PROJECT to STA 21+00

SHEET 1 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		36

DATE: 1/31/2024 5:55:40 PM
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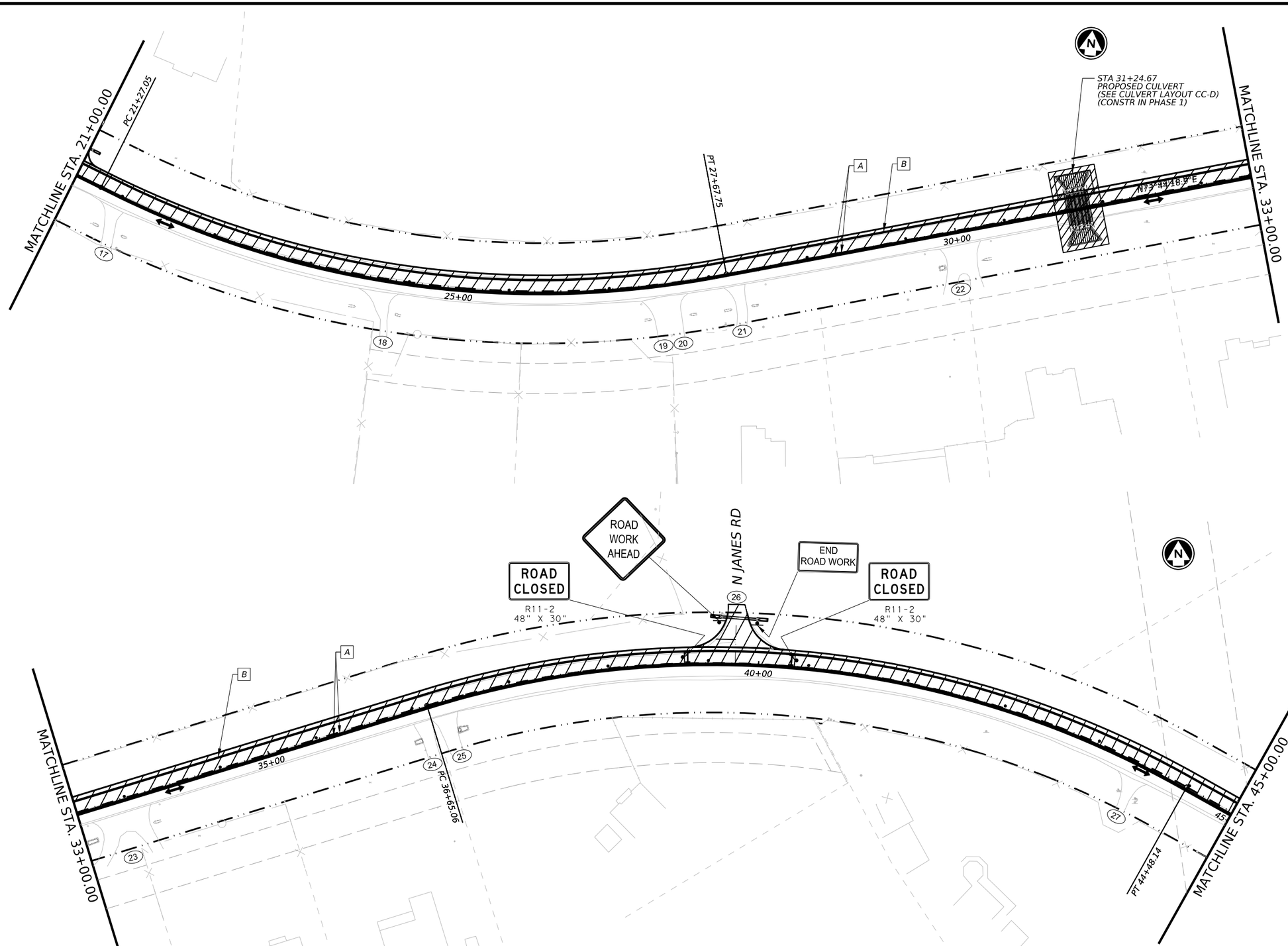

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN AND SHALL BE COVERED.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. FOR ADDITIONAL SIGNS AND BARRICADES REQUIRED TO ESTABLISH A TEMPORARY WORK ZONE UTILIZE STANDARD DRAWING TCP(1-2)-18, TCP ONE-TWO WAY TRAFFIC CONTROL
5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 1 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6014	WK ZN PAV MRK NON-REMOV (W)12"(SLD)	12	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF
677 6005	ELIM EXT PAV MRK & MRKS (12")	12	LF

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FM 2311

TCP PHASE 2 - STEP 1
STA 21+00 to STA 45+00

SHEET 2 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		37

DATE: 1/31/2024 5:55:58 PM
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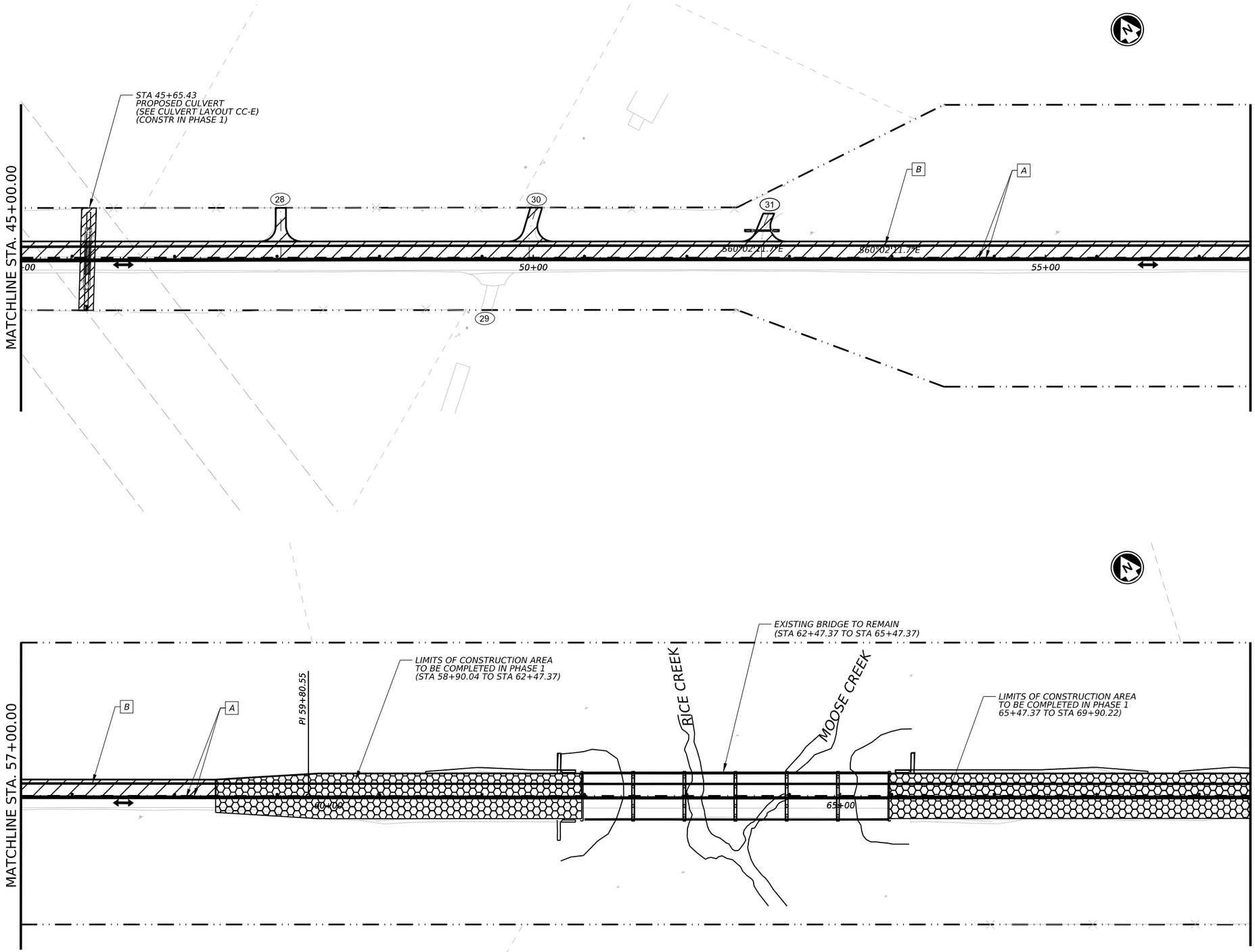

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- [A] WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- [B] WORK ZONE PVMNT MARK TABS WHITE
- [C] WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

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3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. FOR ADDITIONAL SIGNS AND BARRICADES REQUIRED TO ESTABLISH A TEMPORARY WORK ZONE UTILIZE STANDARD DRAWING TCP(1-2)-18, TCP ONE-TWO WAY TRAFFIC CONTROL
5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 1 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	1,390	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	2,780	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	4,170	LF

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FM 2311

TCP PHASE 1 & TCP PHASE 2 - STEP 1 STA 45+00 to STA 69+00

SHEET 3 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		38

DATE: 1/31/2024 5:56:34 PM
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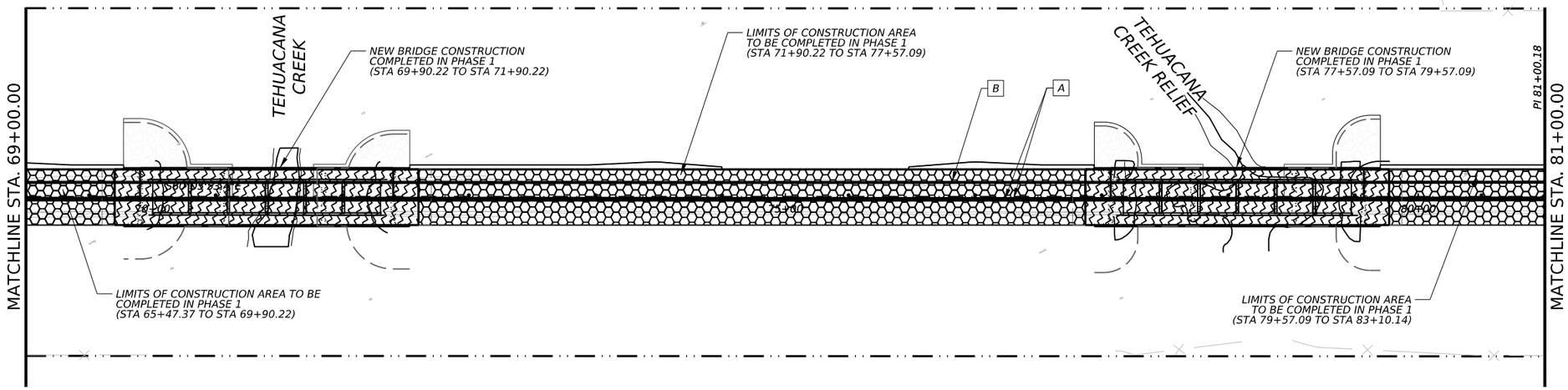

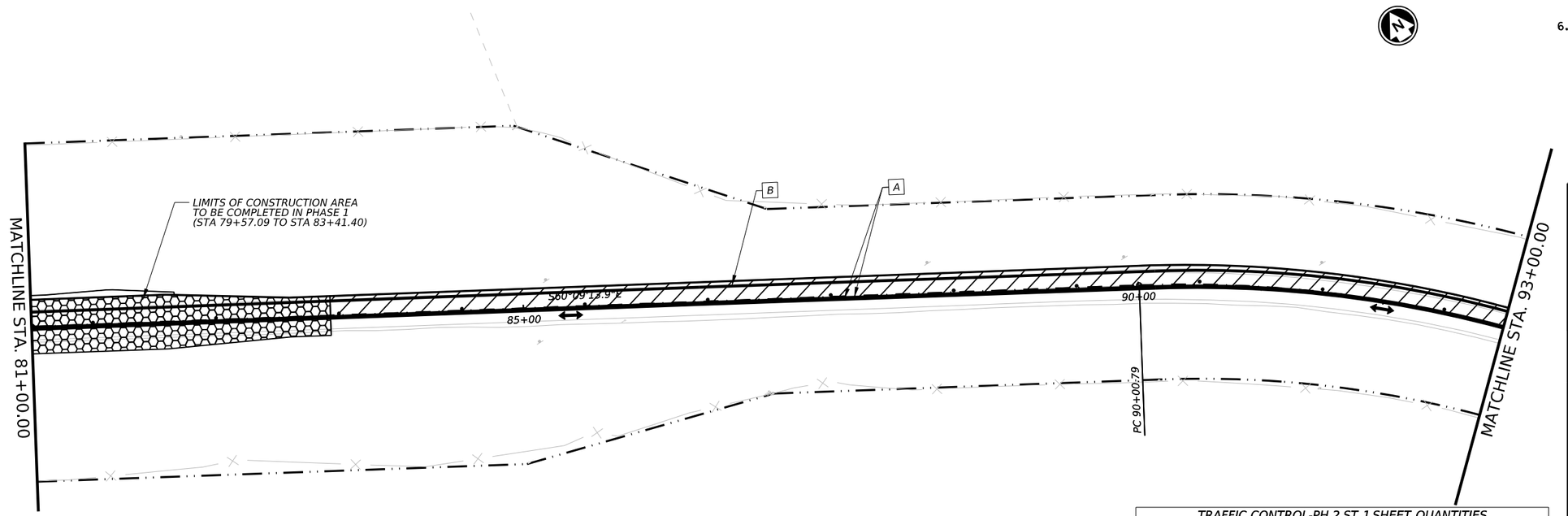

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN AND SHALL BE COVERED.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. FOR ADDITIONAL SIGNS AND BARRICADES REQUIRED TO ESTABLISH A TEMPORARY WORK ZONE UTILIZE STANDARD DRAWING TCP(1-2)-18, TCP ONE-TWO WAY TRAFFIC CONTROL
5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 1 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	990	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	1,980	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	2,970	LF

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FM 2311
TCP PHASE 1 &
TCP PHASE 2 - STEP 1
STA 69+00 to STA 93+00

SHEET 4 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		39

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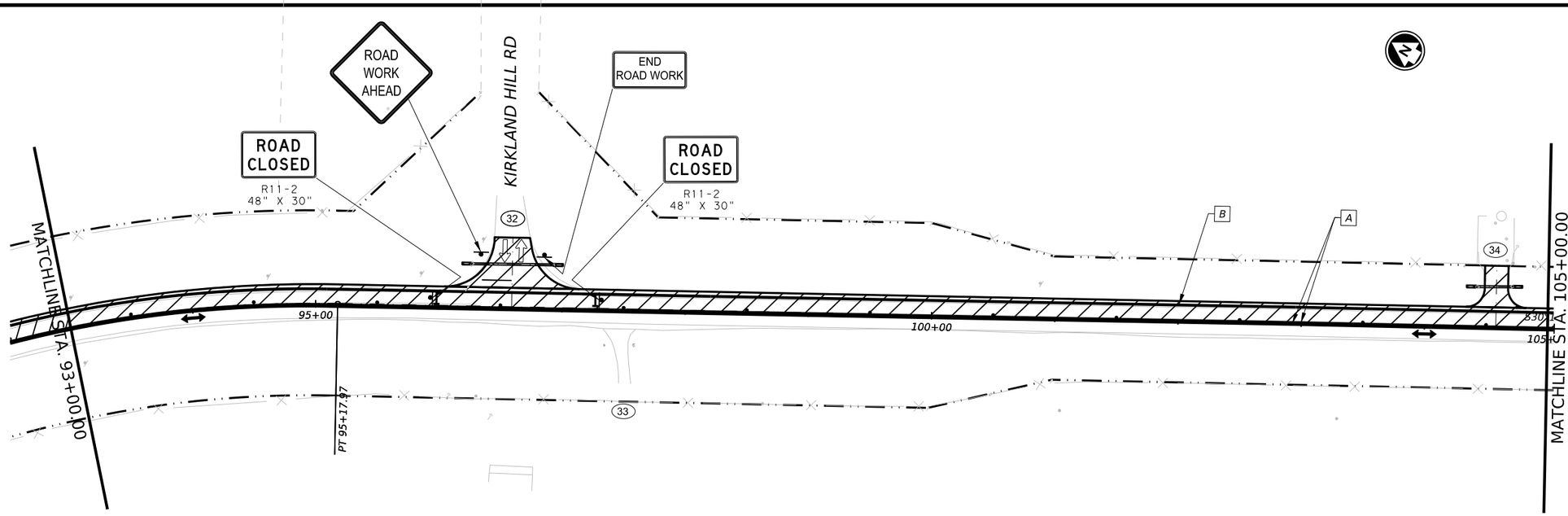

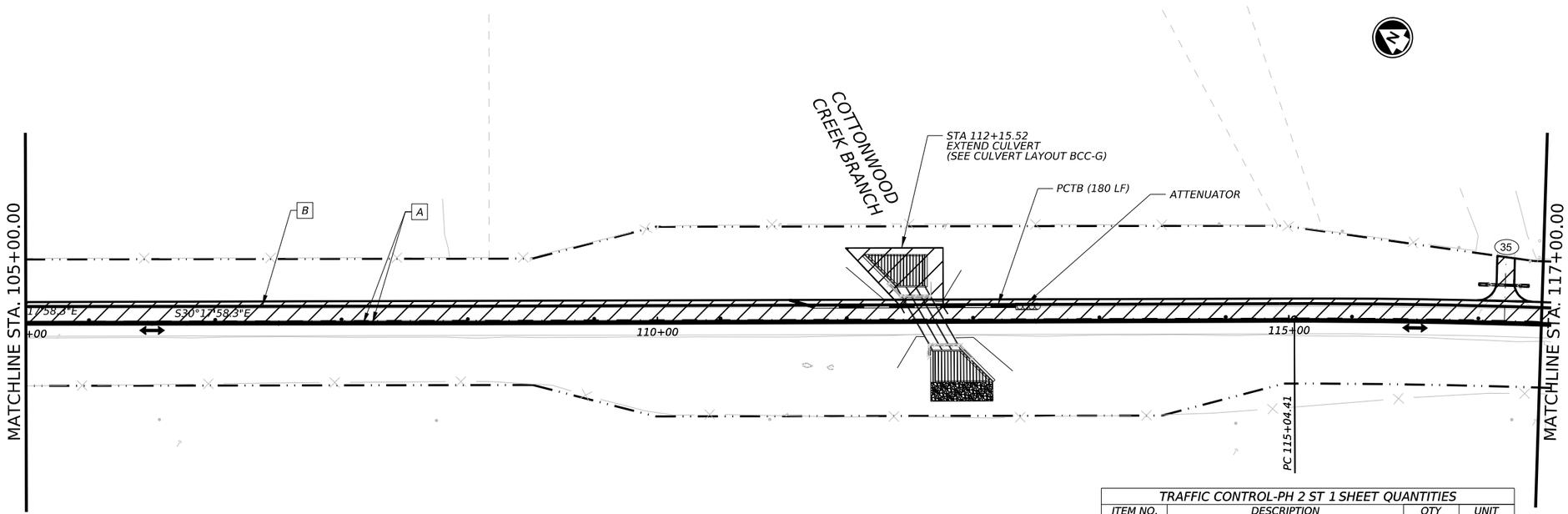

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- [A] WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- [B] WORK ZONE PVMNT MARK TABS WHITE
- [C] WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN AND SHALL BE COVERED.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. FOR ADDITIONAL SIGNS AND BARRICADES REQUIRED TO ESTABLISH A TEMPORARY WORK ZONE UTILIZE STANDARD DRAWING TCP(1-2)-18, TCP ONE-TWO WAY TRAFFIC CONTROL
5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 1 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
512 6017	PORT CTB (DES SOURCE)(F-SHAPE)(TY 1)	120	LF
512 6029	PORT CTB (MOVE)(F-SHAPE)(TY 1)	180	LF
545 6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	1	EA
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6014	WK ZN PAV MRK NON-REMOV (W)12"(SLD)	12	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF
677 6005	ELIM EXT PAV MRK & MRKS (12")	12	LF

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FM 2311

TCP PHASE 2 - STEP 1
STA 93+00 to STA 117+00

SHEET 5 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		40

DATE: 3/1/2024 9:51:23 AM
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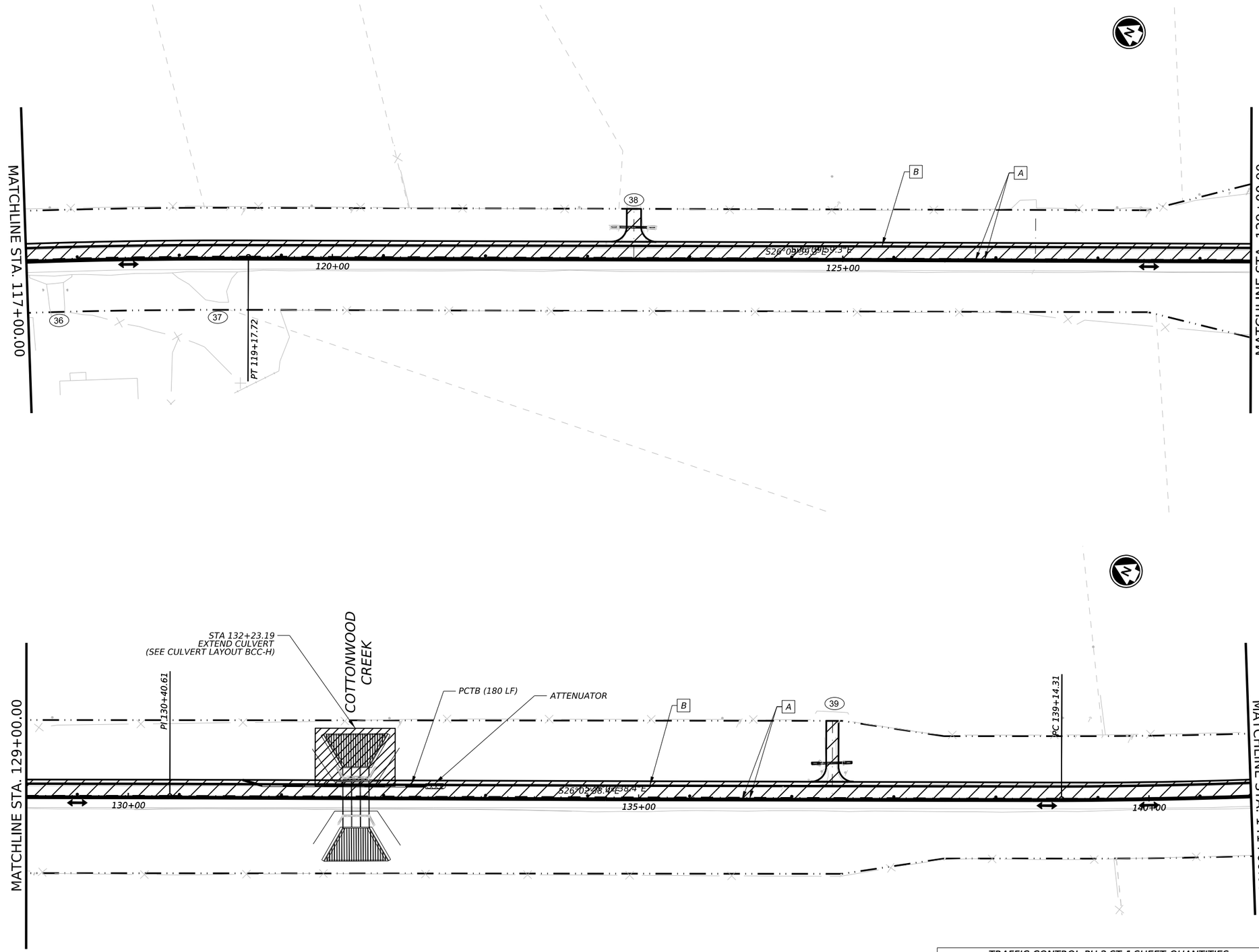

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- [A] WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- [B] WORK ZONE PVMNT MARK TABS WHITE
- [C] WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN AND SHALL BE COVERED.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. FOR ADDITIONAL SIGNS AND BARRICADES REQUIRED TO ESTABLISH A TEMPORARY WORK ZONE UTILIZE STANDARD DRAWING TCP(1-2)-18, TCP ONE-TWO WAY TRAFFIC CONTROL
5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 1 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
512 6029	PORT CTB (MOVE)(F-SHAPE)(TY 1)	180	LF
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF

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FM 2311

TCP PHASE 2 - STEP 1
STA 117+00 to STA 141+00

SHEET 6 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		41

DATE: 1/31/2024 5:58:32 PM
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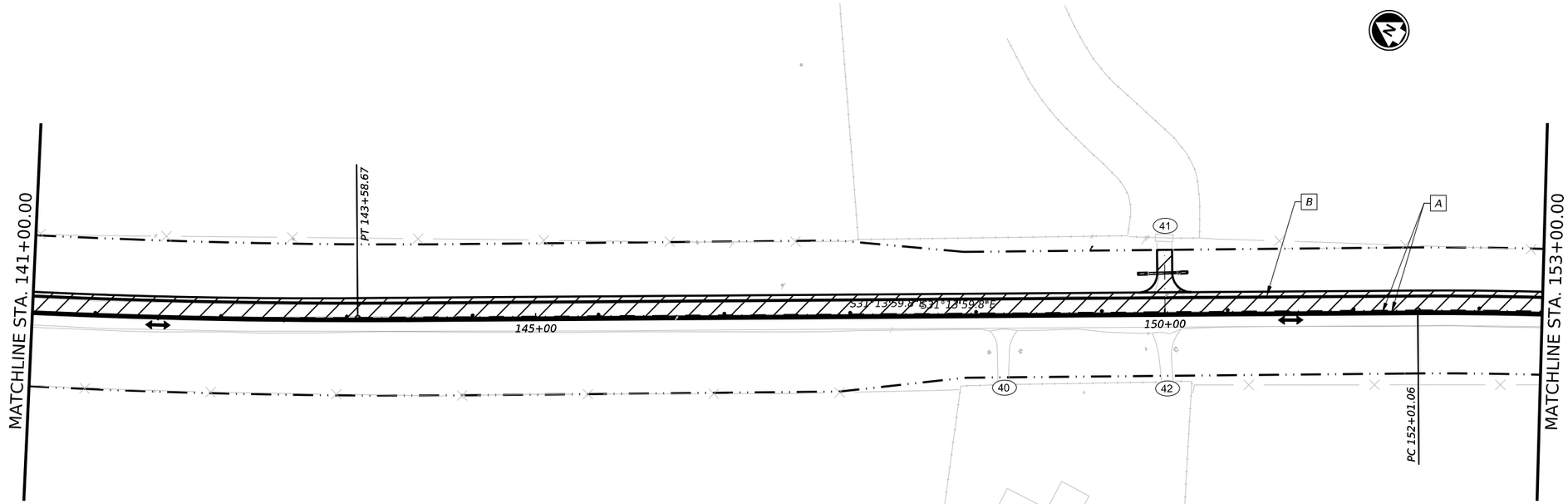

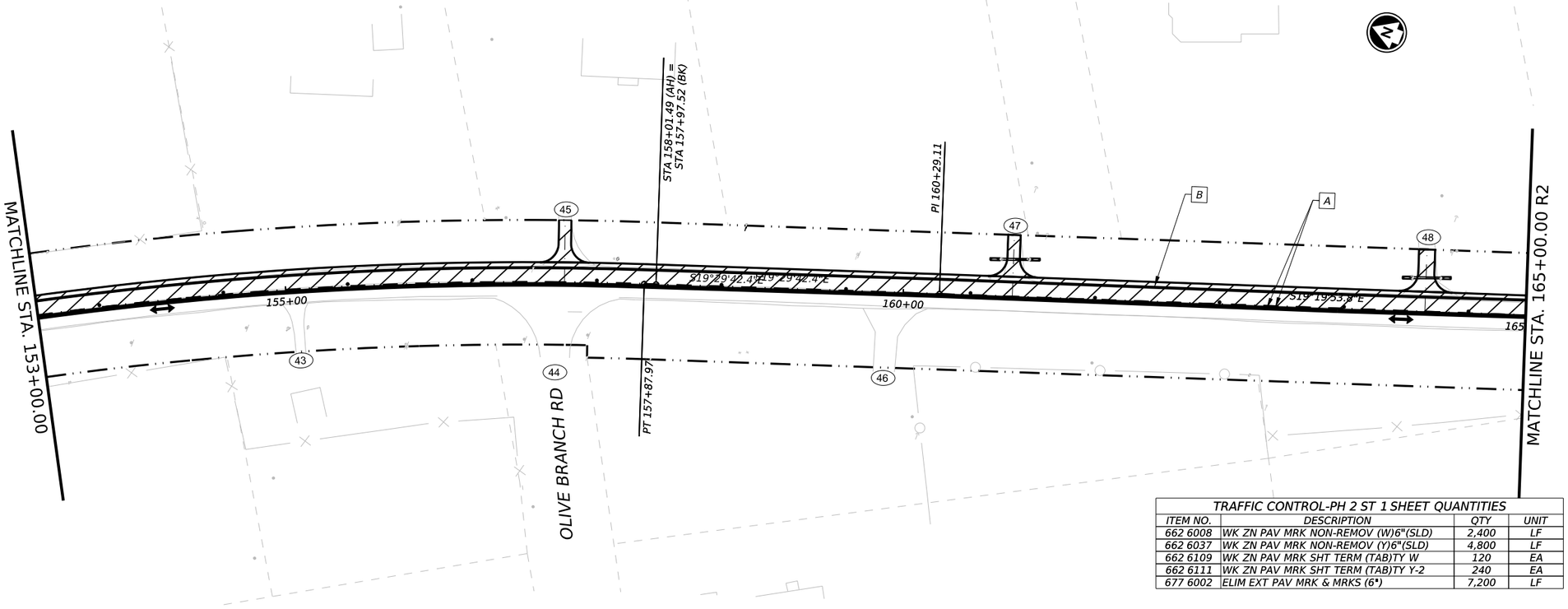

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN AND SHALL BE COVERED.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. FOR ADDITIONAL SIGNS AND BARRICADES REQUIRED TO ESTABLISH A TEMPORARY WORK ZONE UTILIZE STANDARD DRAWING TCP(1-2)-18, TCP ONE-TWO WAY TRAFFIC CONTROL
5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 1 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF

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PROFESSIONAL ENGINEER
1/31/2024

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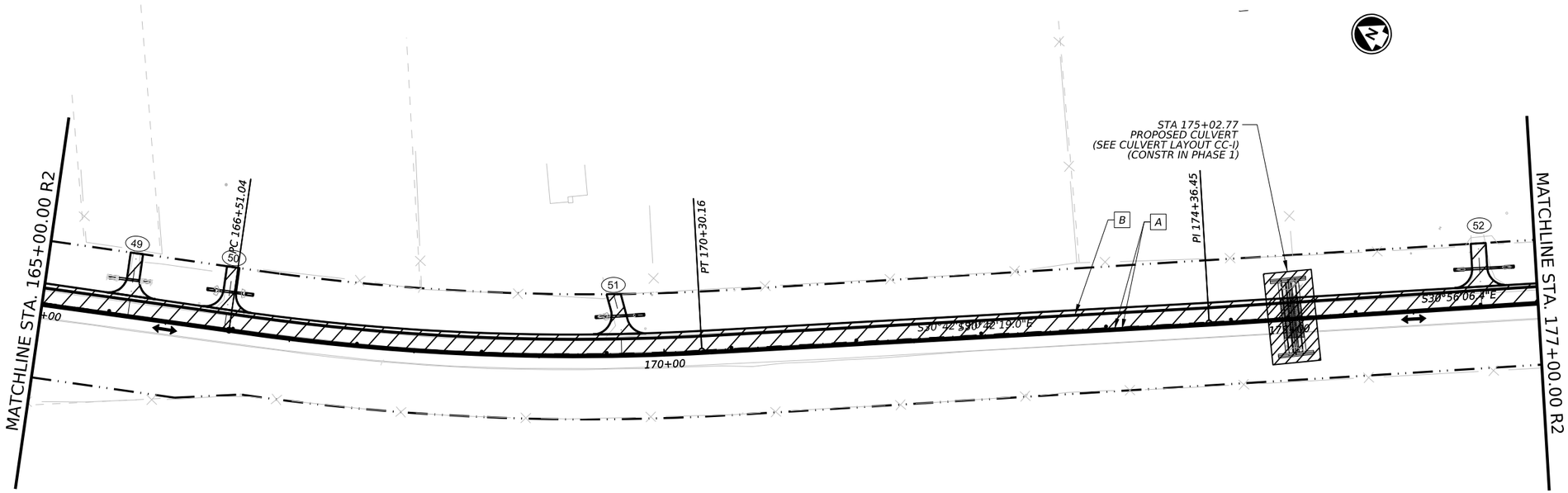
FM 2311

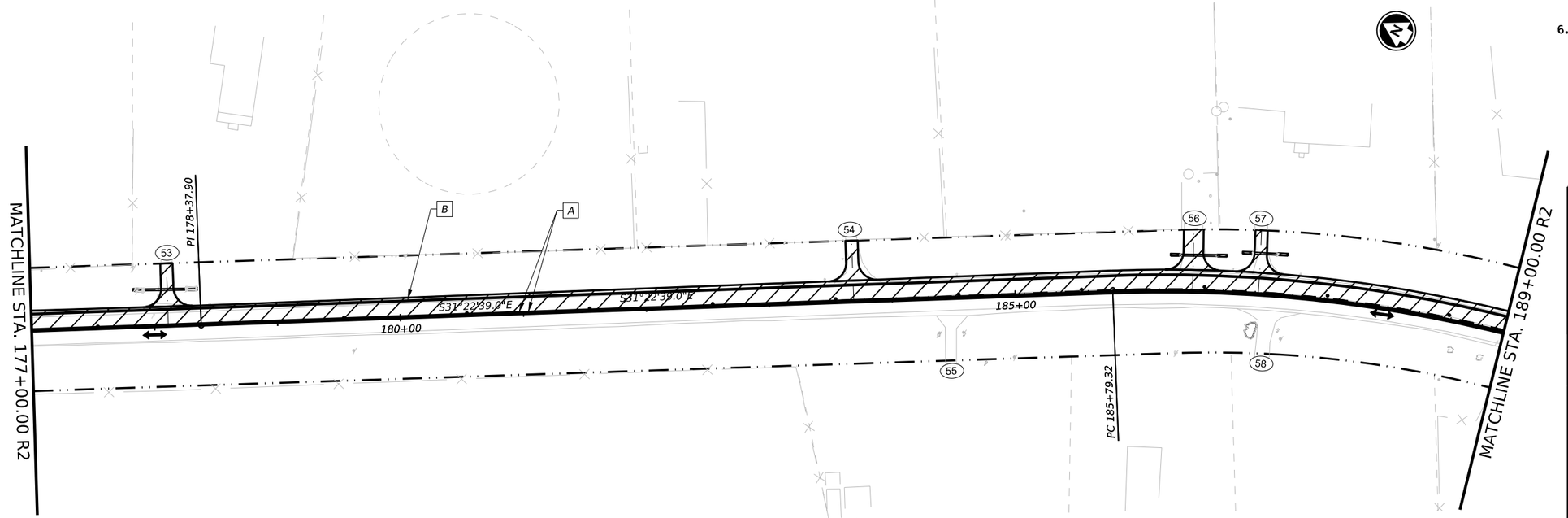
TCP PHASE 2 - STEP 1
STA 141+00 to STA 165+00

SHEET 7 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		42

DATE: 1/31/2024 5:58:50 PM
FILE: ...\FM 2311 TCP PLAN PH2S1-07.dgn





LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- [A] WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- [B] WORK ZONE PVMNT MARK TABS WHITE
- [C] WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

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2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. FOR ADDITIONAL SIGNS AND BARRICADES REQUIRED TO ESTABLISH A TEMPORARY WORK ZONE UTILIZE STANDARD DRAWING TCP(1-2)-18, TCP ONE-TWO WAY TRAFFIC CONTROL
5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 1 SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF

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1/31/2024

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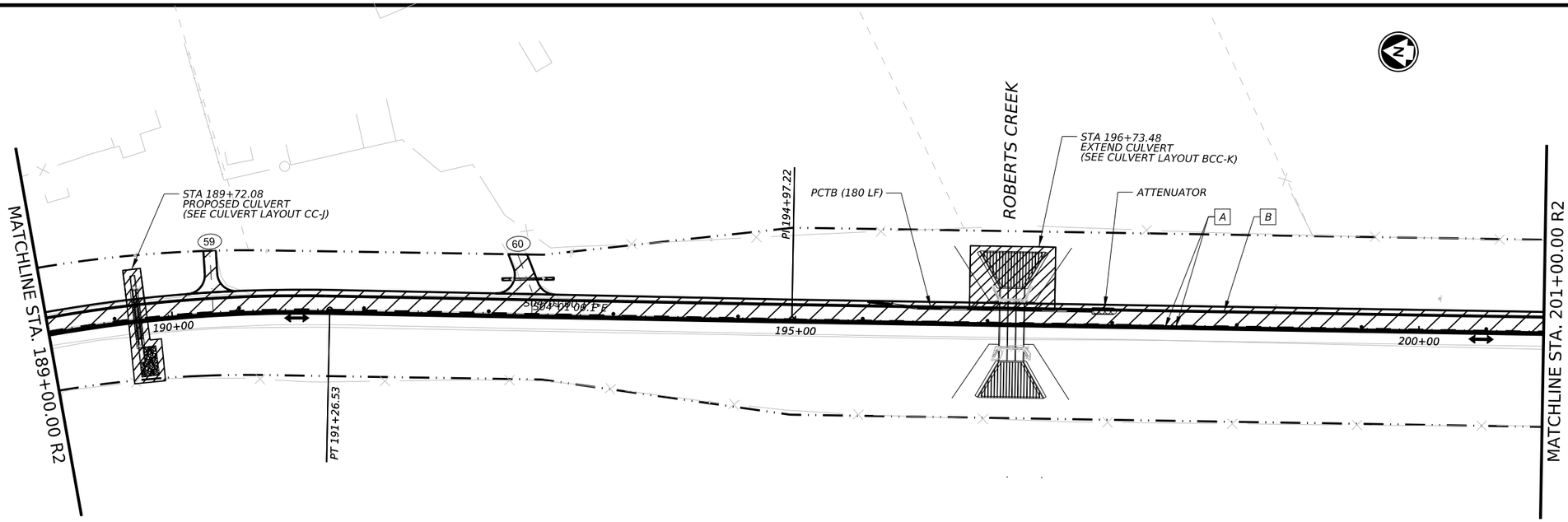
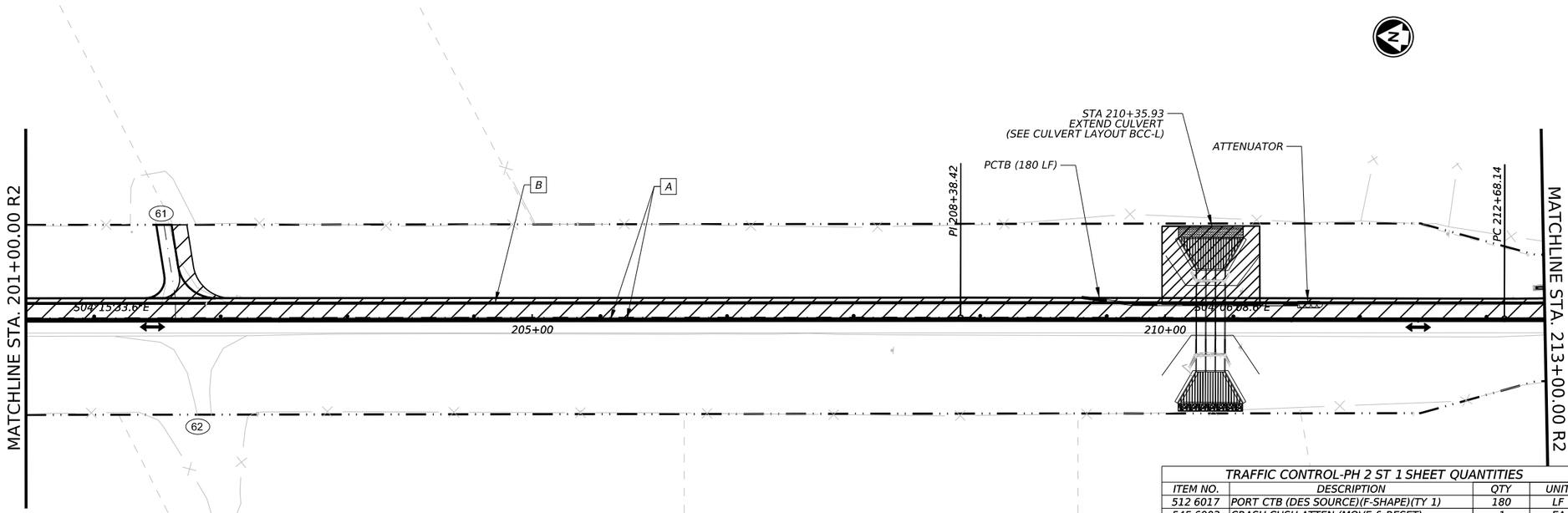
TCP PHASE 2 - STEP 1
STA 165+00 to STA 189+00

SHEET 8 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		43

DATE: 1/31/2024 5:59:06 PM
FILE: ...\FM 2311 TCP PLAN PH2S1-08.dgn





LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

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3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
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5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 1 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
512 6017	PORT CTB (DES SOURCE)(F-SHAPE)(TY 1)	180	LF
545 6003	CRASH CUSH ATTEN (MOVE & RESET)	1	EA
545 6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	1	EA
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF

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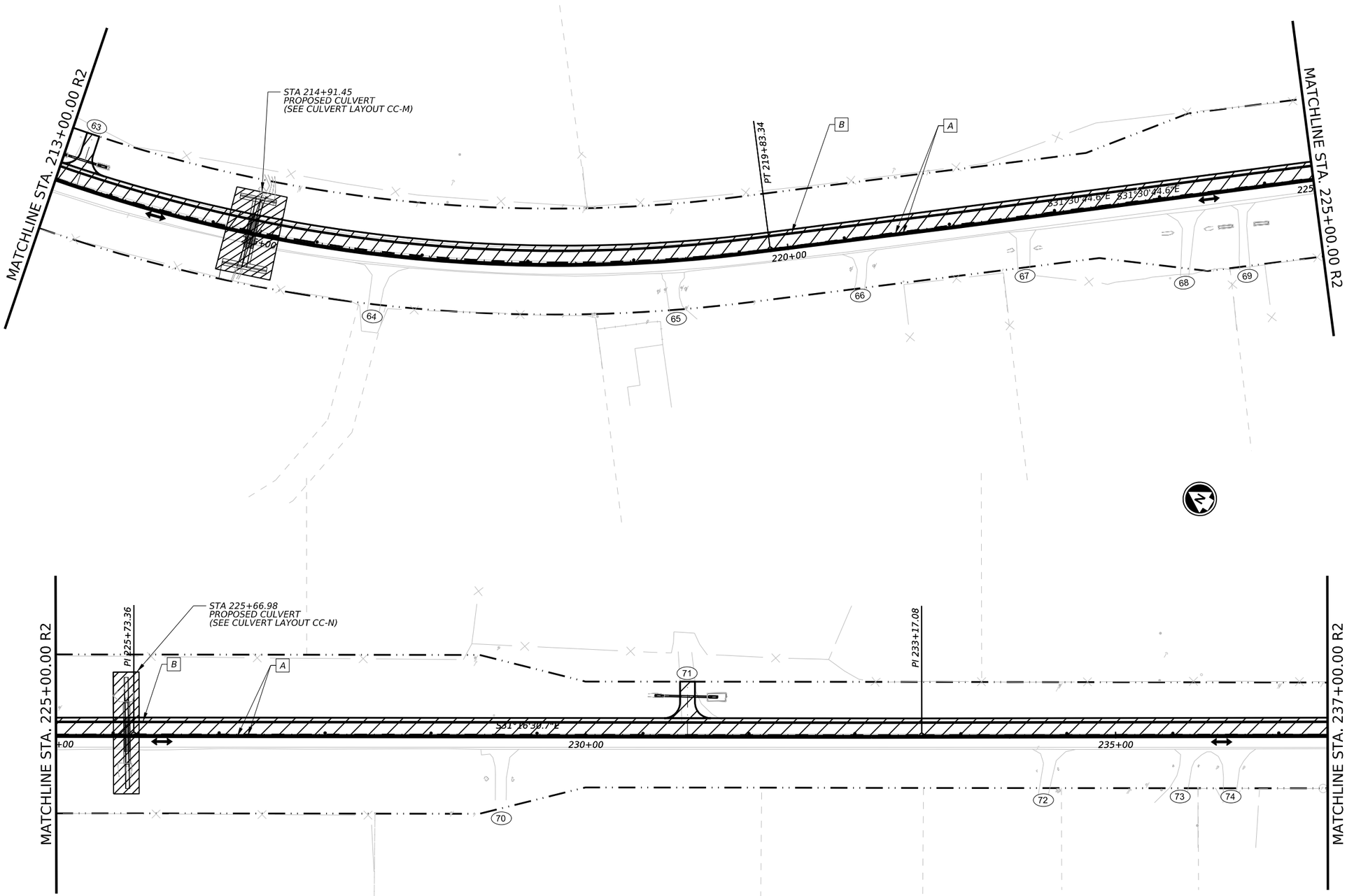
TCP PHASE 2 - STEP 1
STA 189+00 to STA 213+00

SHEET 9 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		44

DATE: 1/31/2024 5:59:44 PM
FILE: ...\FM 2311 TCP PLAN PH2S1-09.dgn



LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- [A] WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- [B] WORK ZONE PVMNT MARK TABS WHITE
- [C] WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

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6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 1 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF

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TCP PHASE 2 - STEP 1
STA 213+00 to STA 237+00

SHEET 10 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		45

DATE: 1/31/2024 6:00:23 PM
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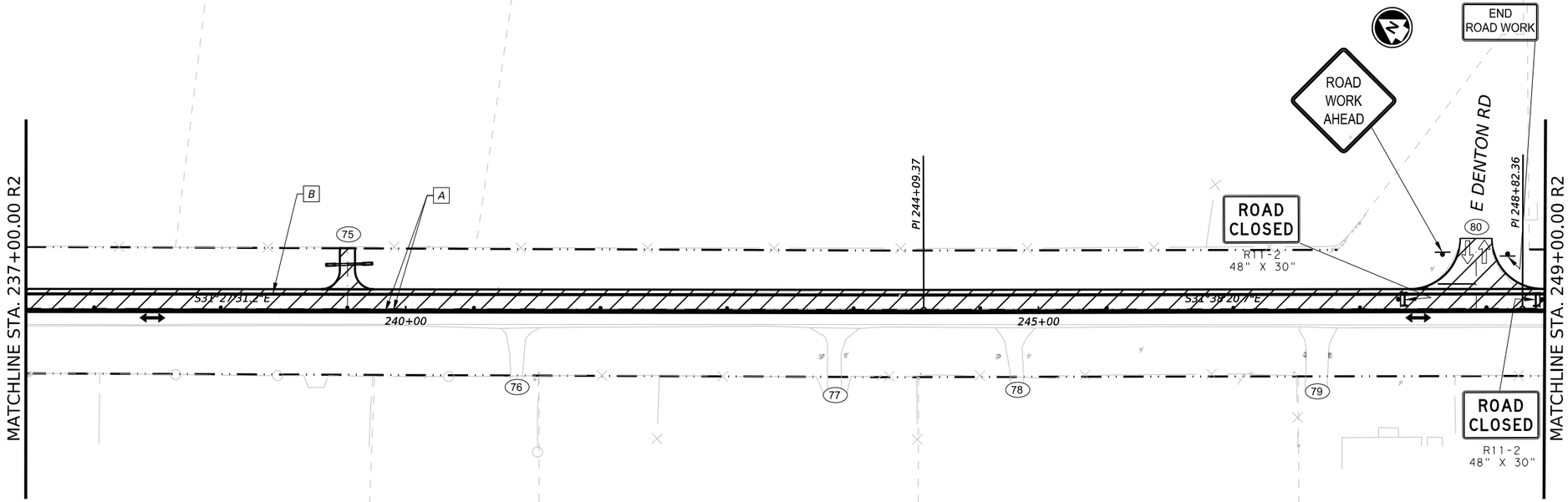

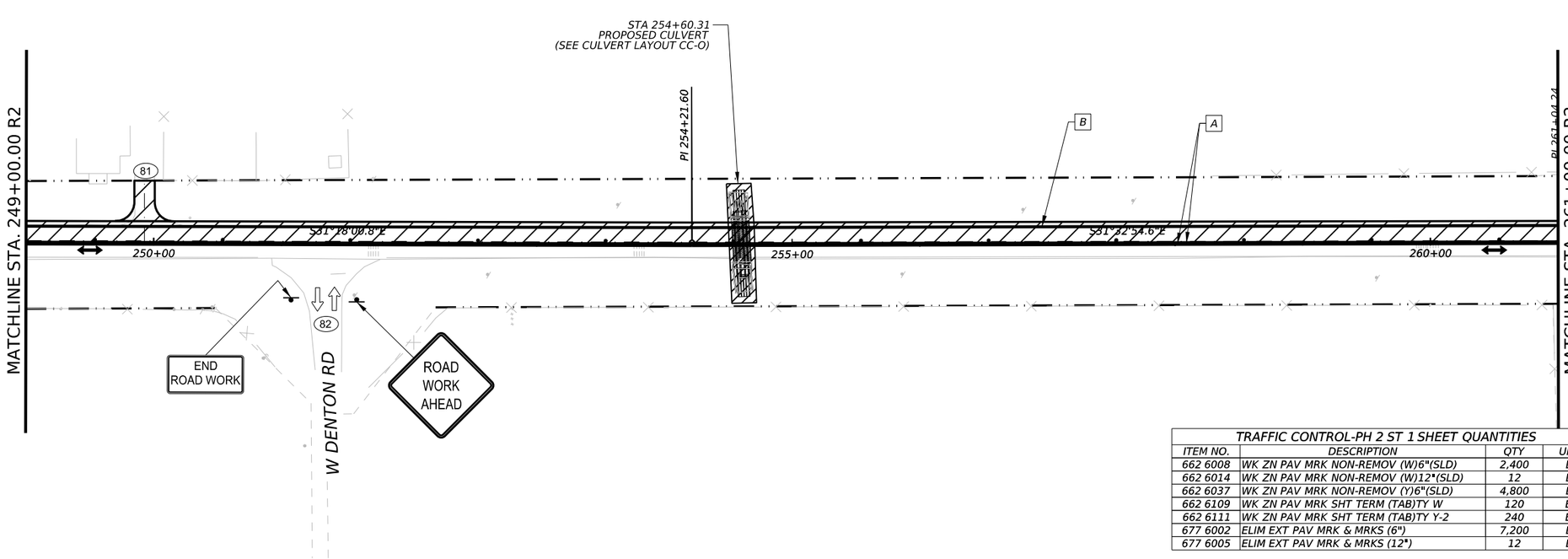

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
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- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

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6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 1 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6014	WK ZN PAV MRK NON-REMOV (W)12"(SLD)	12	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF
677 6005	ELIM EXT PAV MRK & MRKS (12")	12	LF

STATE OF TEXAS
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TCP PHASE 2 - STEP 1
STA 237+00 to STA 261+00

SHEET 11 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		46

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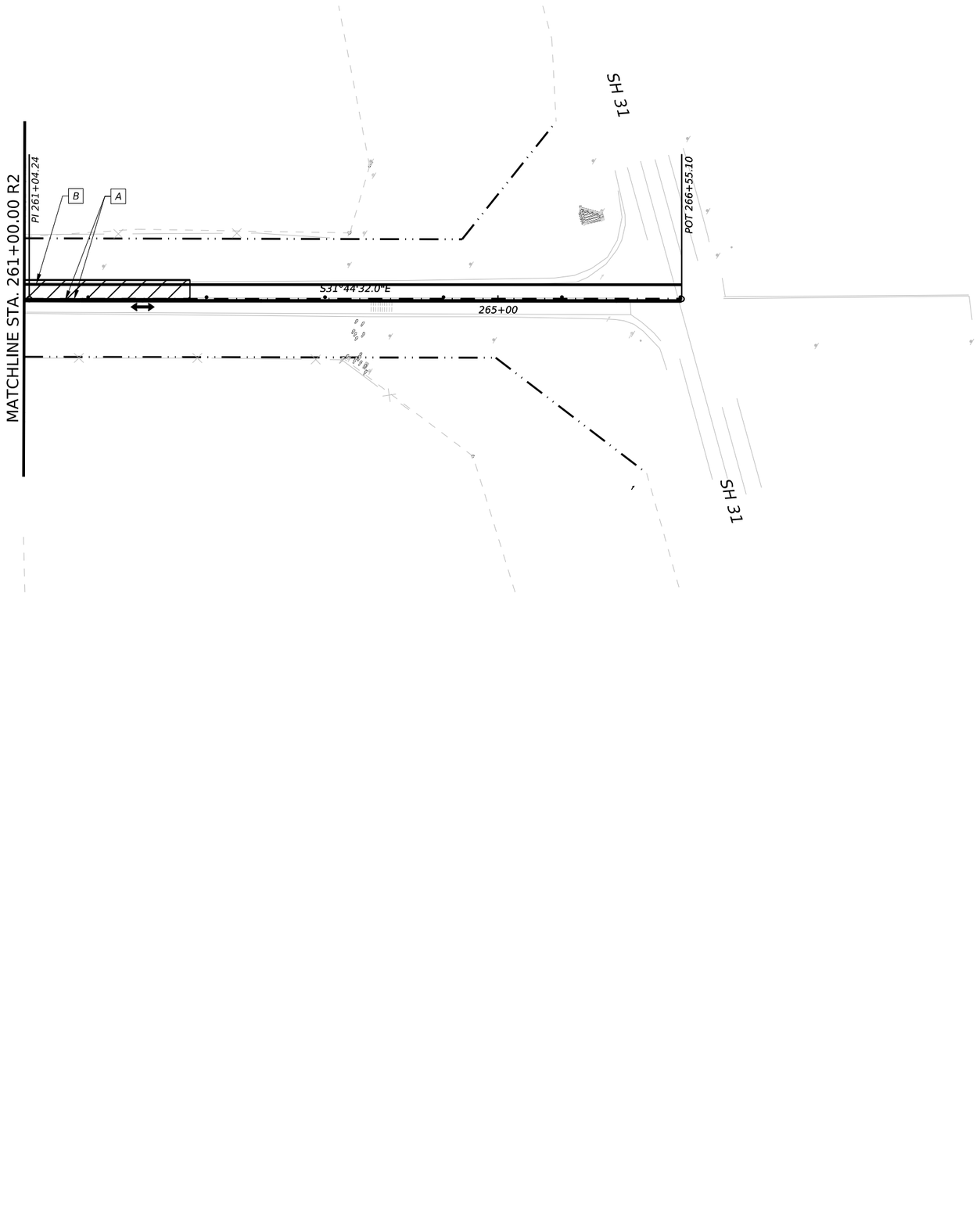

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- [A] WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- [B] WORK ZONE PVMNT MARK TABS WHITE
- [C] WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

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6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 1 SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	551	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	1,102	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	28	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	56	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	1,653	LF

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FM 2311

TCP PHASE 2 - STEP 1
STA 261+00 to END PROJECT

SHEET 12 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		47

DATE: 1/31/2024 6:01:39 PM
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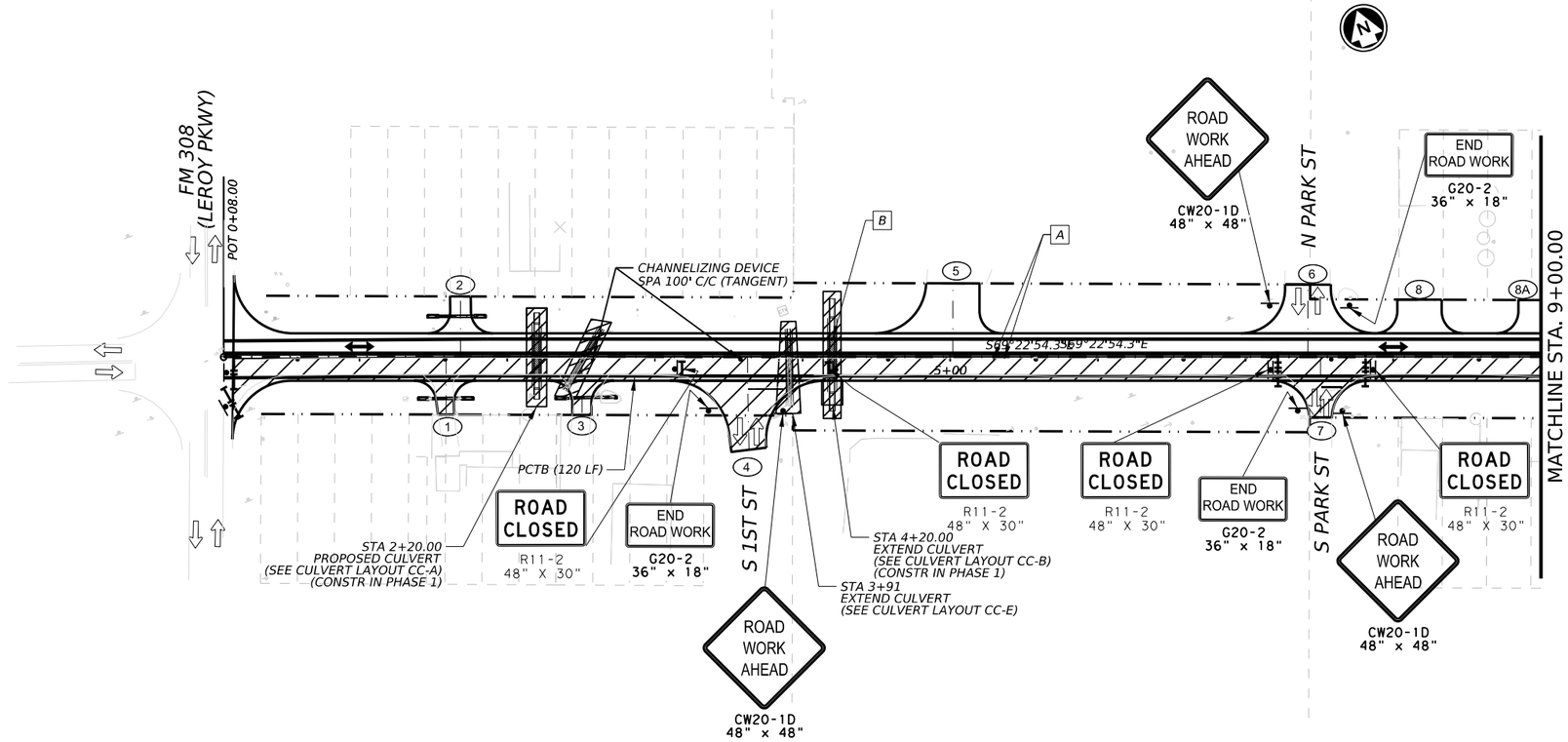

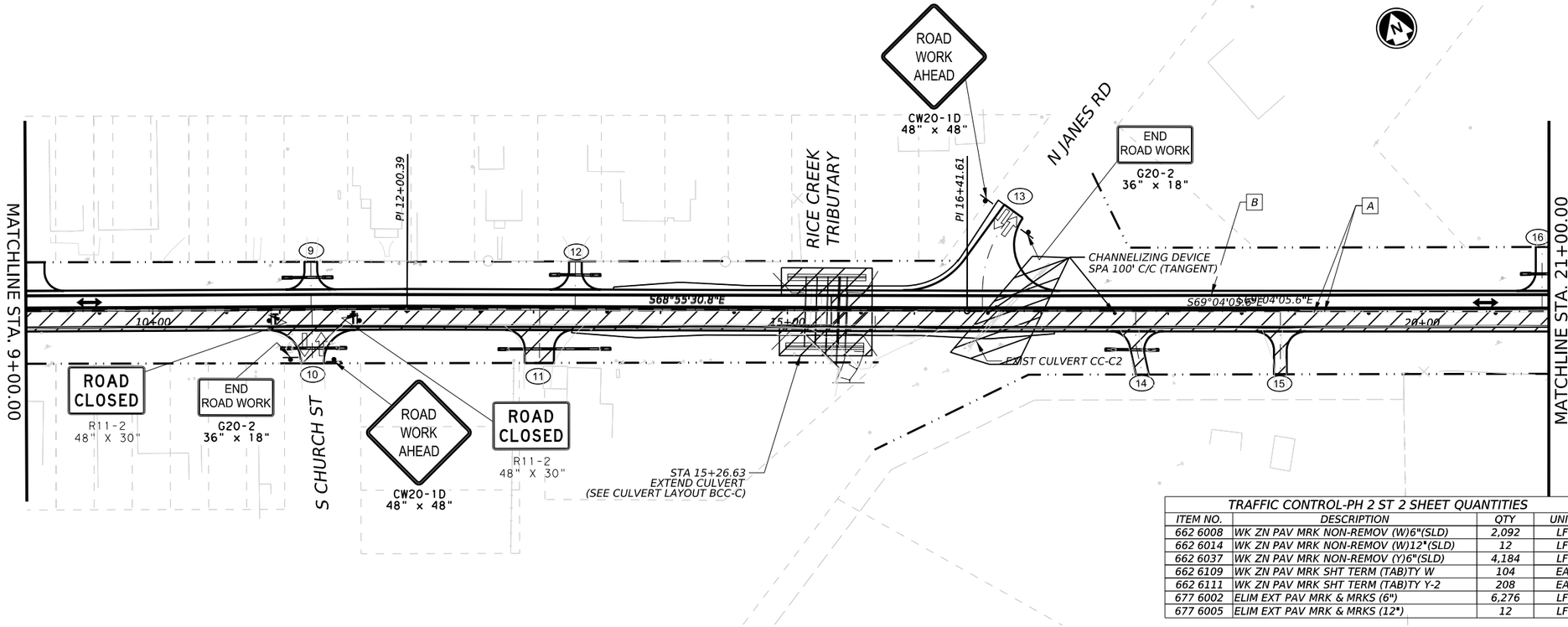

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

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0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 2 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,092	LF
662 6014	WK ZN PAV MRK NON-REMOV (W)12"(SLD)	12	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,184	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	104	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	208	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	6,276	LF
677 6005	ELIM EXT PAV MRK & MRKS (12")	12	LF

STATE OF TEXAS
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1/31/2024

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FM 2311

TCP PHASE 2 - STEP 2
BEGIN PROJECT to STA 21+00

SHEET 1 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		48

DATE: 1/31/2024 6:02:17 PM
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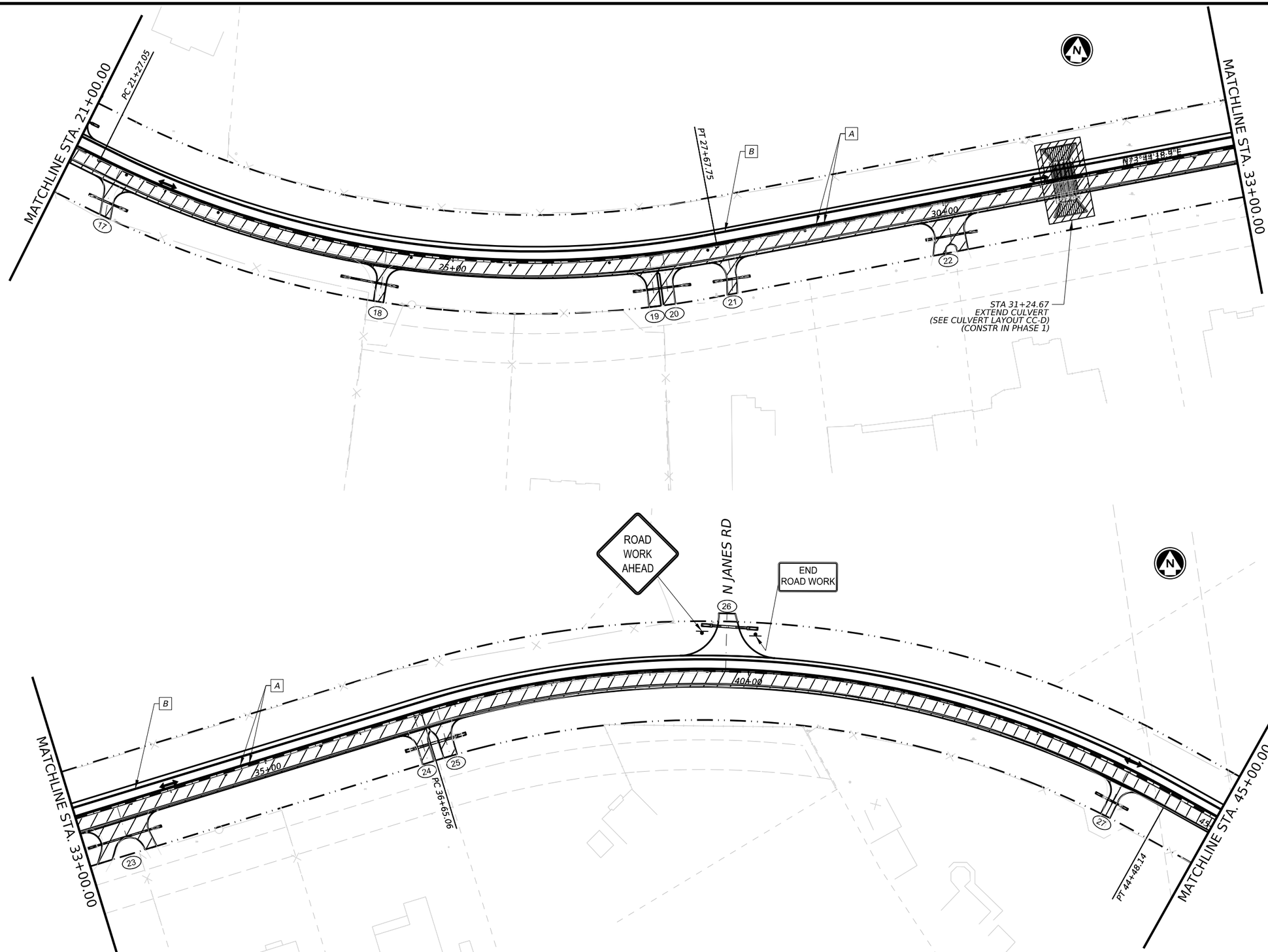

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
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0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 2 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF

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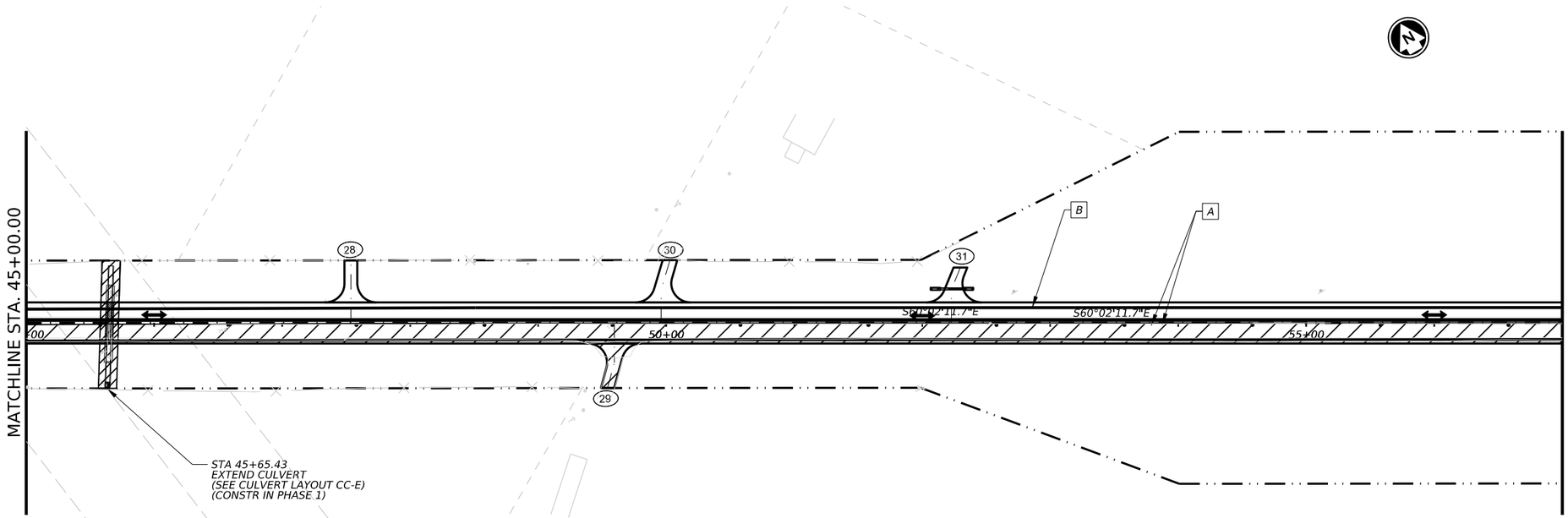
FM 2311

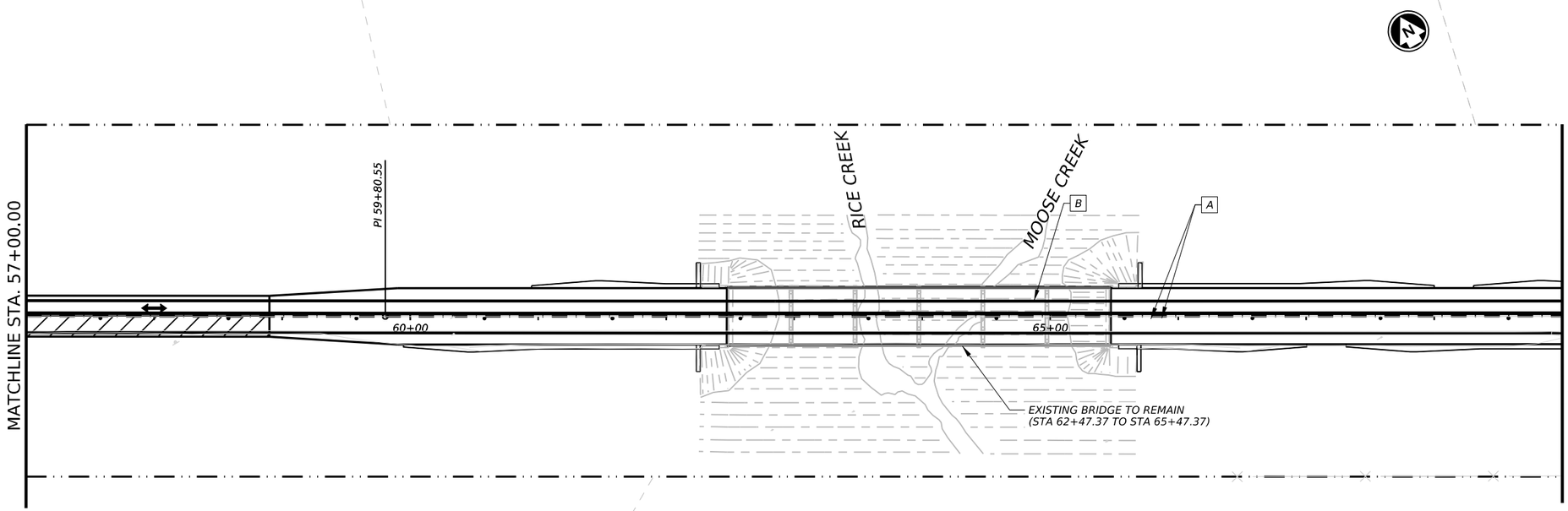
TCP PHASE 2 - STEP 2
STA 21+00 to STA 45+00

SHEET 2 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		49

DATE: 1/31/2024 6:02:35 PM
FILE: ...\FM 2311 TCP PLAN PH2S2-02.dgn





LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- [A] WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- [B] WORK ZONE PVMNT MARK TABS WHITE
- [C] WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN AND SHALL BE COVERED.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. FOR ADDITIONAL SIGNS AND BARRICADES REQUIRED TO ESTABLISH A TEMPORARY WORK ZONE UTILIZE STANDARD DRAWING TCP(1-2)-18, TCP ONE-TWO WAY TRAFFIC CONTROL
5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 2 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	1,390	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	2,780	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	4,170	LF

STATE OF TEXAS
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FM 2311

TCP PHASE 2 - STEP 2
STA 45+00 to STA 69+00

SHEET 3 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		50

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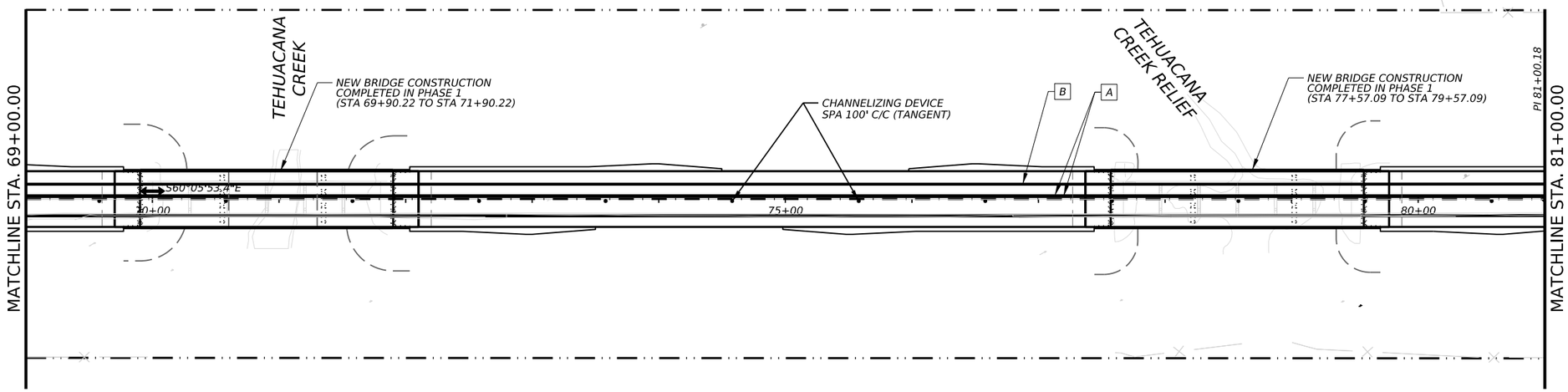

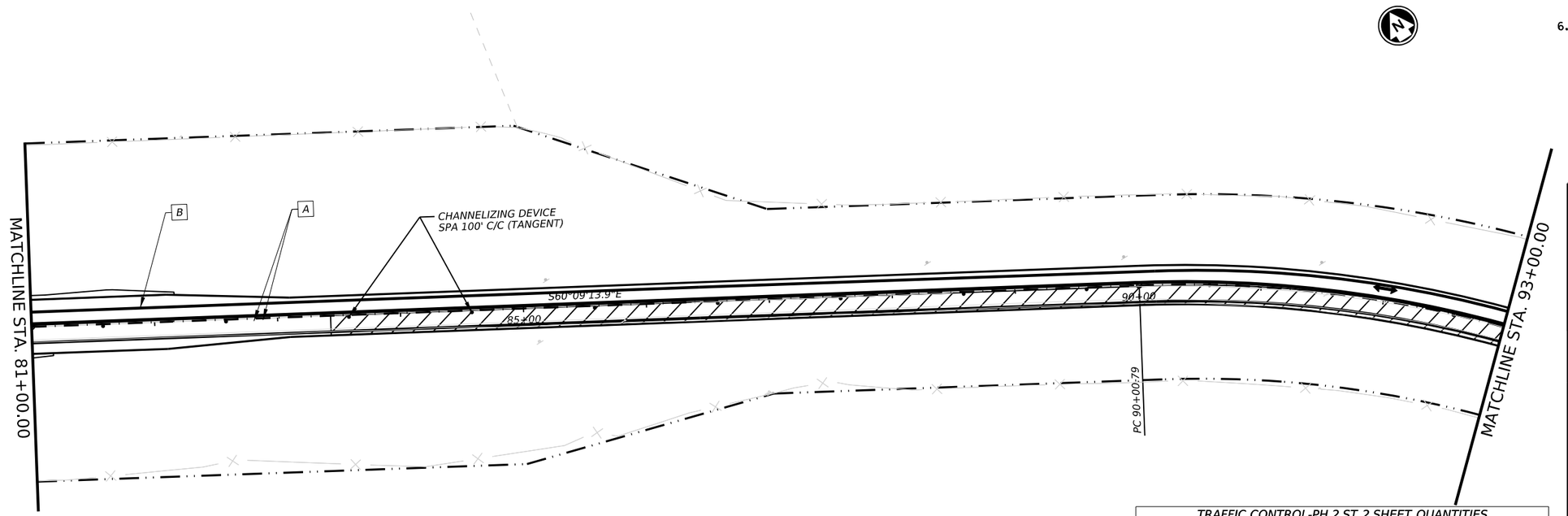

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- [A] WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- [B] WORK ZONE PVMNT MARK TABS WHITE
- [C] WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN AND SHALL BE COVERED.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. FOR ADDITIONAL SIGNS AND BARRICADES REQUIRED TO ESTABLISH A TEMPORARY WORK ZONE UTILIZE STANDARD DRAWING TCP(1-2)-18, TCP ONE-TWO WAY TRAFFIC CONTROL
5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 2 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	990	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	7	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	2,970	LF

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FM 2311

TCP PHASE 2 - STEP 2
STA 69+00 to STA 93+00

SHEET 4 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		51

DATE: 1/31/2024 6:03:51 PM
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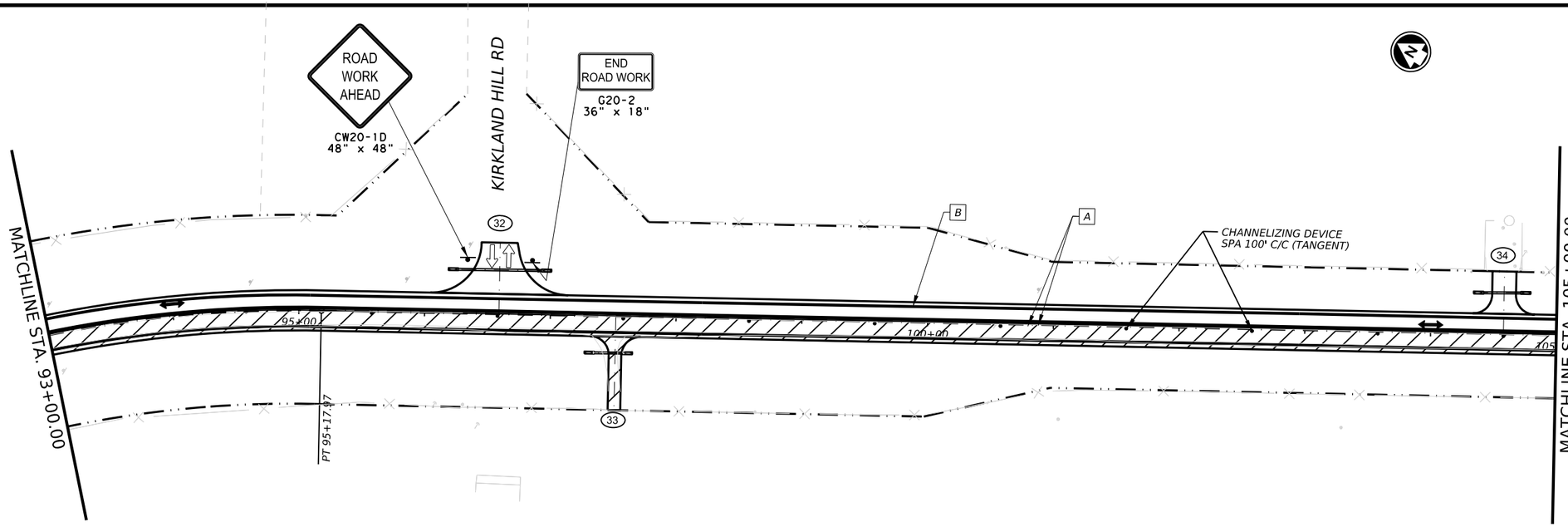

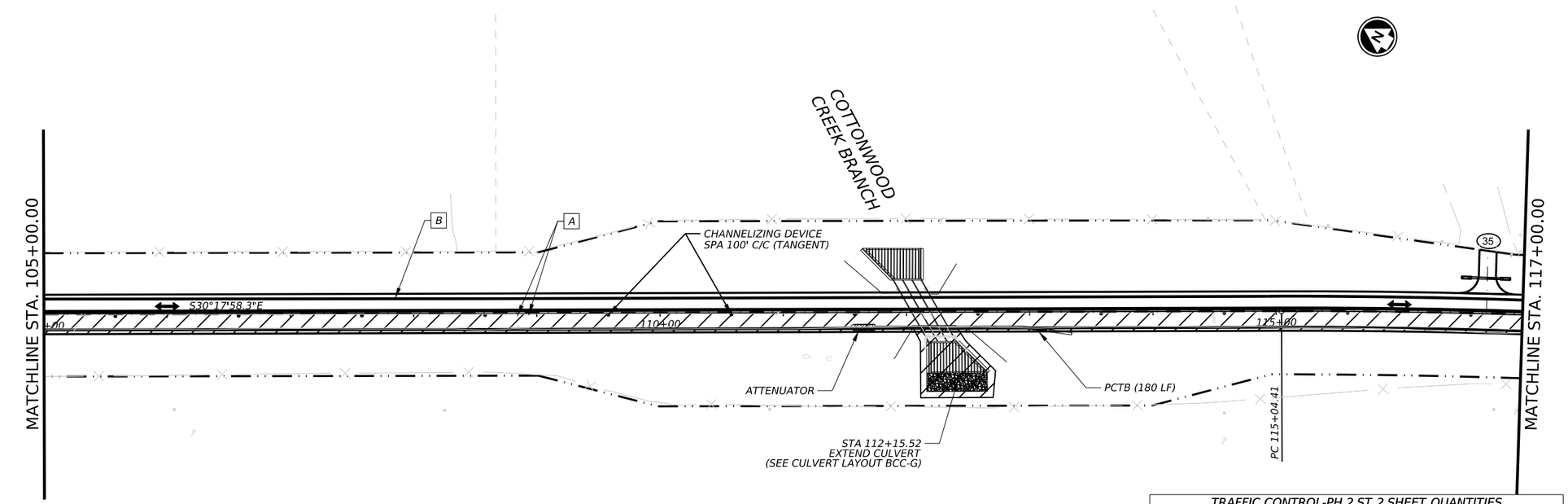

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- [A] WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- [B] WORK ZONE PVMNT MARK TABS WHITE
- [C] WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

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3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. FOR ADDITIONAL SIGNS AND BARRICADES REQUIRED TO ESTABLISH A TEMPORARY WORK ZONE UTILIZE STANDARD DRAWING TCP(1-2)-18, TCP ONE-TWO WAY TRAFFIC CONTROL
5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 2 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
512 6029	PORT CTB (MOVE)(F-SHAPE)(TY 1)	180	LF
545 6003	CRASH CUSH ATTEN (MOVE & RESET)	1	EA
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF

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FM 2311

TCP PHASE 2 - STEP 2
STA 93+00 to STA 117+00

SHEET 5 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		52

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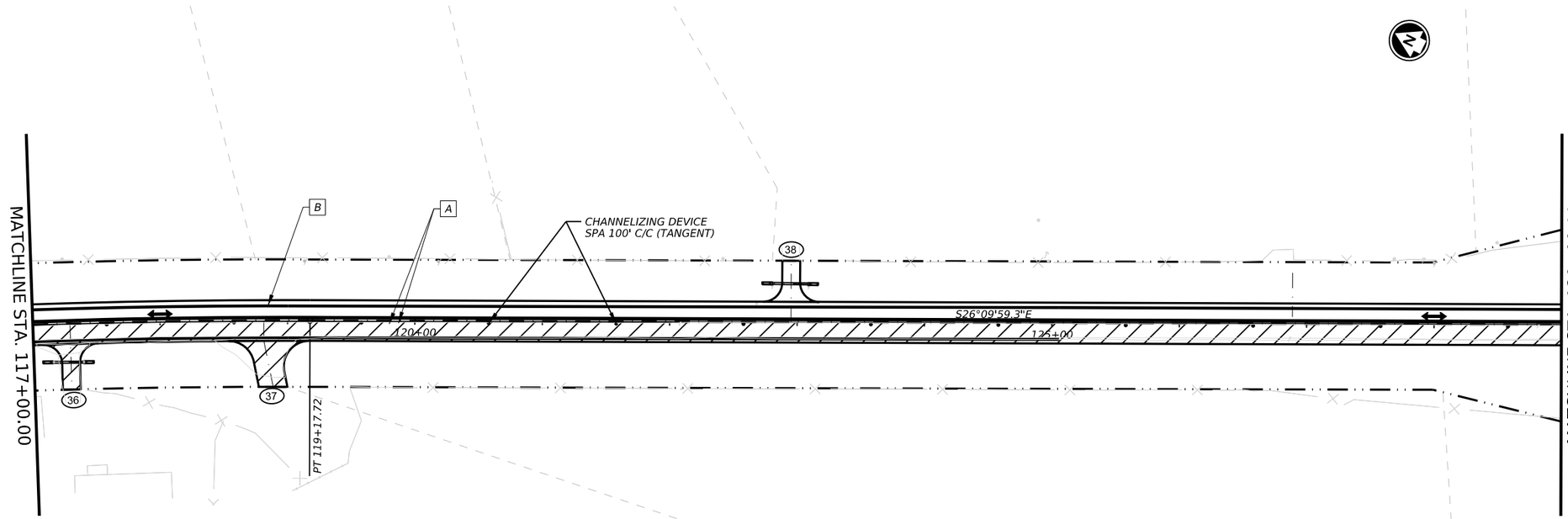

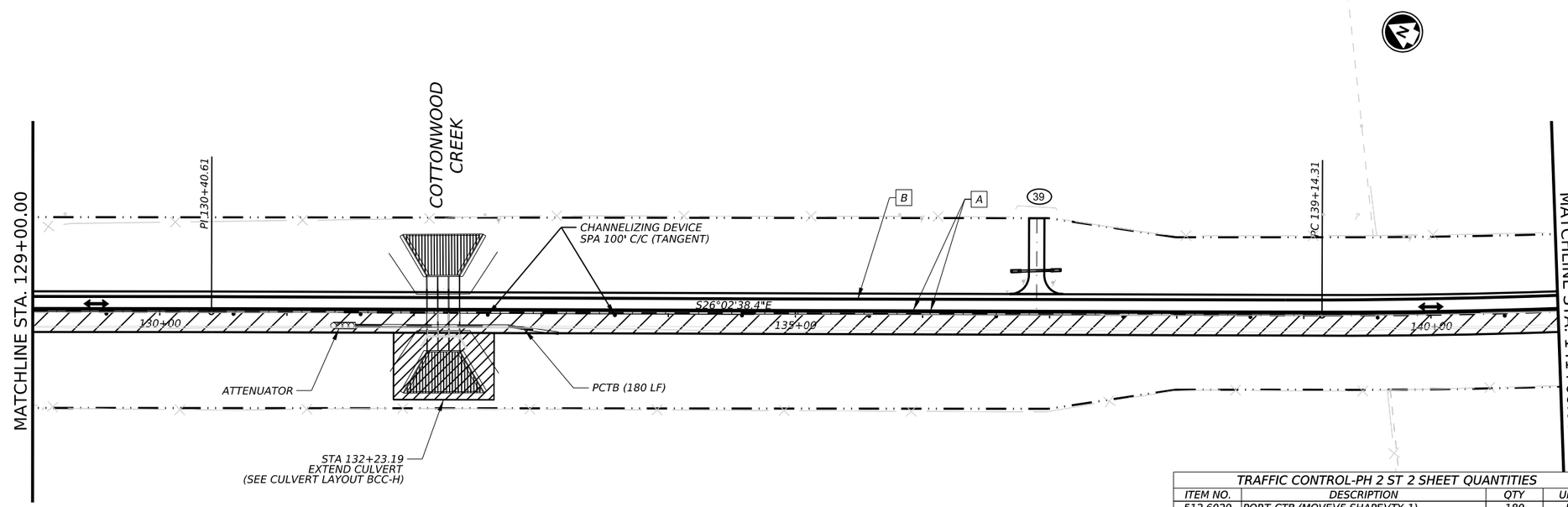

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

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5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 2 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
512 6029	PORT CTB (MOVE)(F-SHAPE)(TY 1)	180	LF
545 6003	CRASH CUSH ATTEN (MOVE & RESET)	1	EA
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF

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FM 2311

TCP PHASE 2 - STEP 2
STA 117+00 to STA 141+00

SHEET 6 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		53

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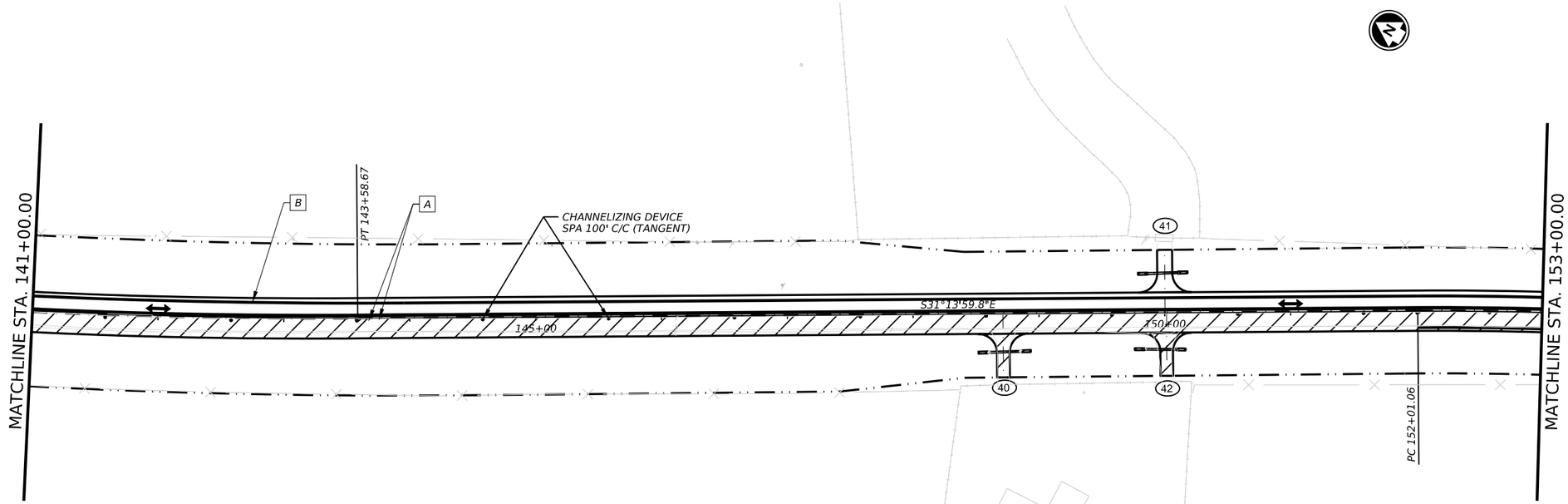

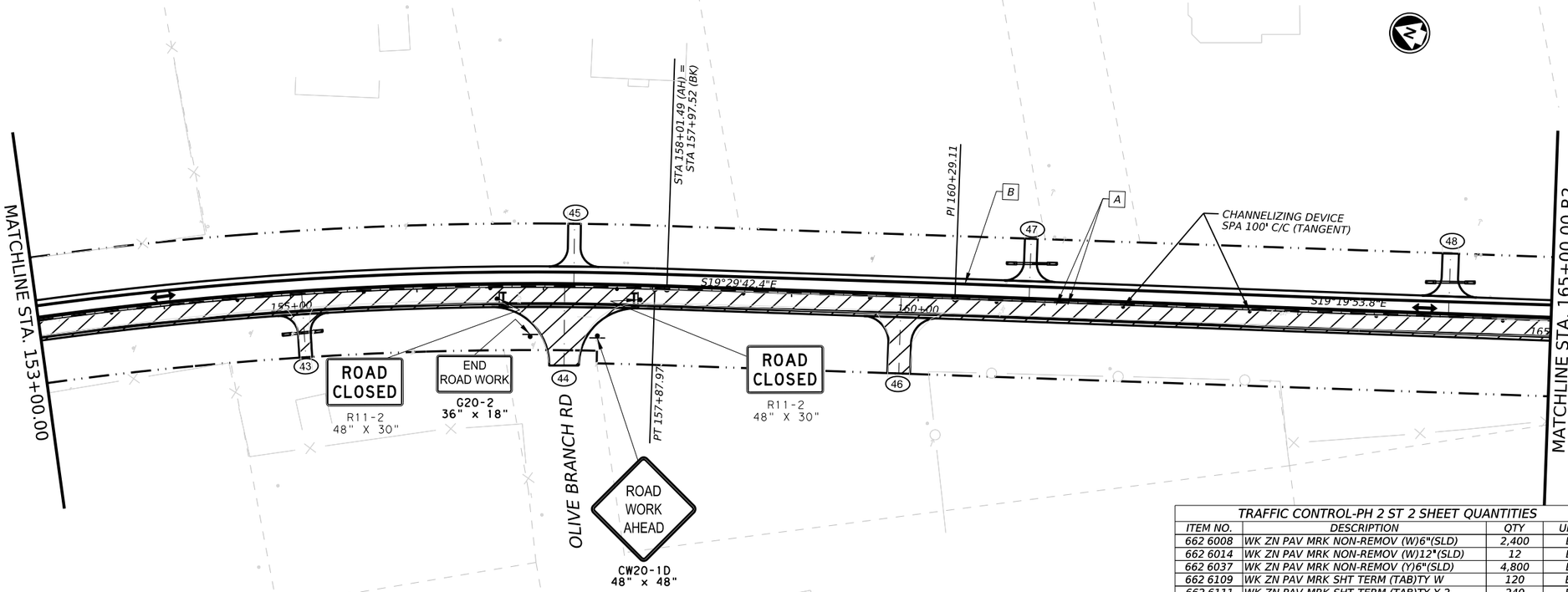

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

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5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 2 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6014	WK ZN PAV MRK NON-REMOV (W)12"(SLD)	12	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF
677 6005	ELIM EXT PAV MRK & MRKS (12")	12	LF

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FM 2311

TCP PHASE 2 - STEP 2
STA 141+00 to STA 165+00

SHEET 7 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		54

DATE: 1/31/2024 6:05:46 PM
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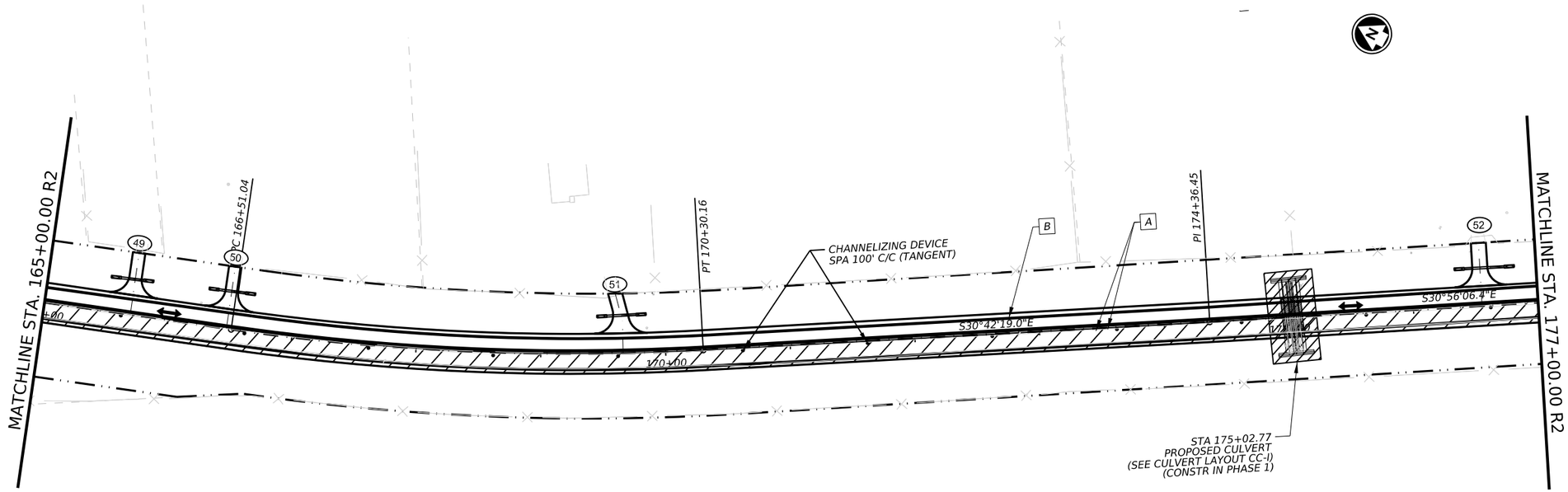

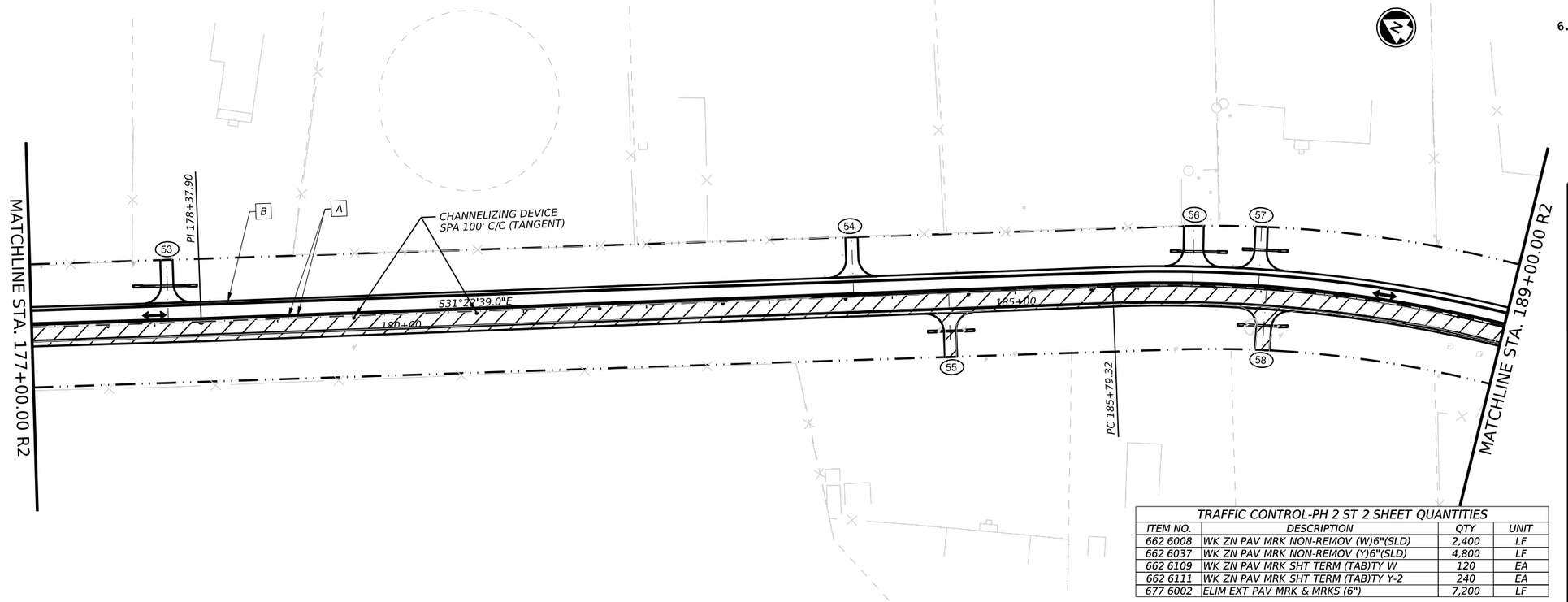

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- [A] WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- [B] WORK ZONE PVMNT MARK TABS WHITE
- [C] WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

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6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 2 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF

STATE OF TEXAS
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FM 2311

TCP PHASE 2 - STEP 2
STA 165+00 to STA 189+00

SHEET 8 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		55

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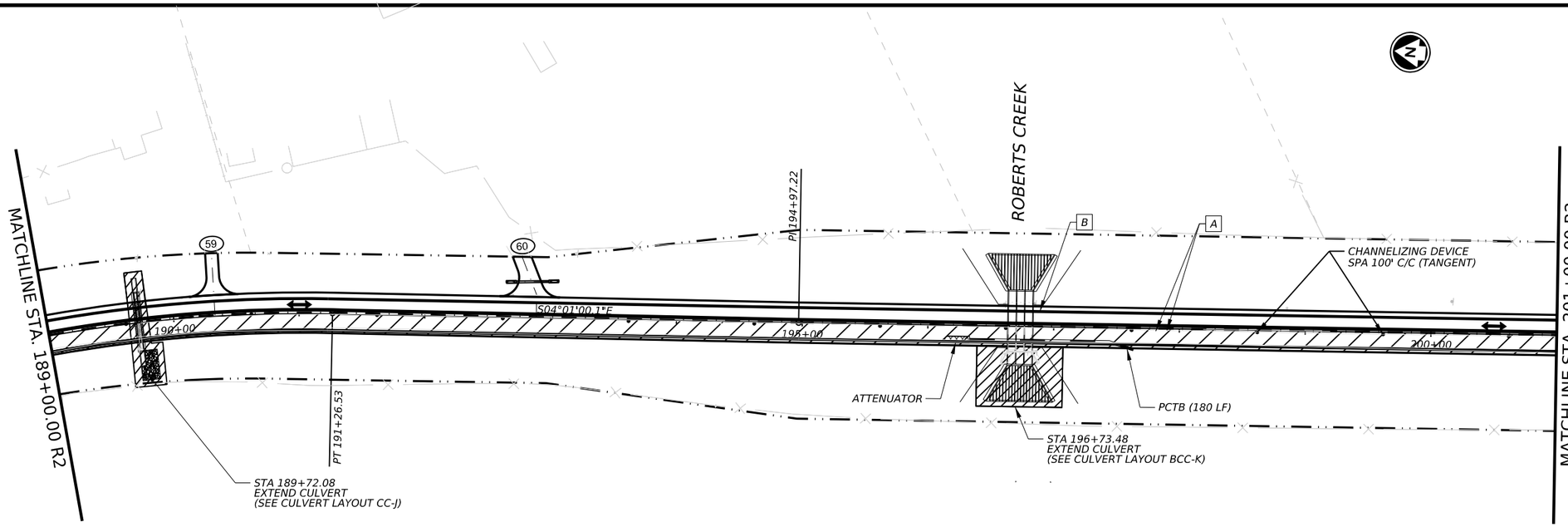

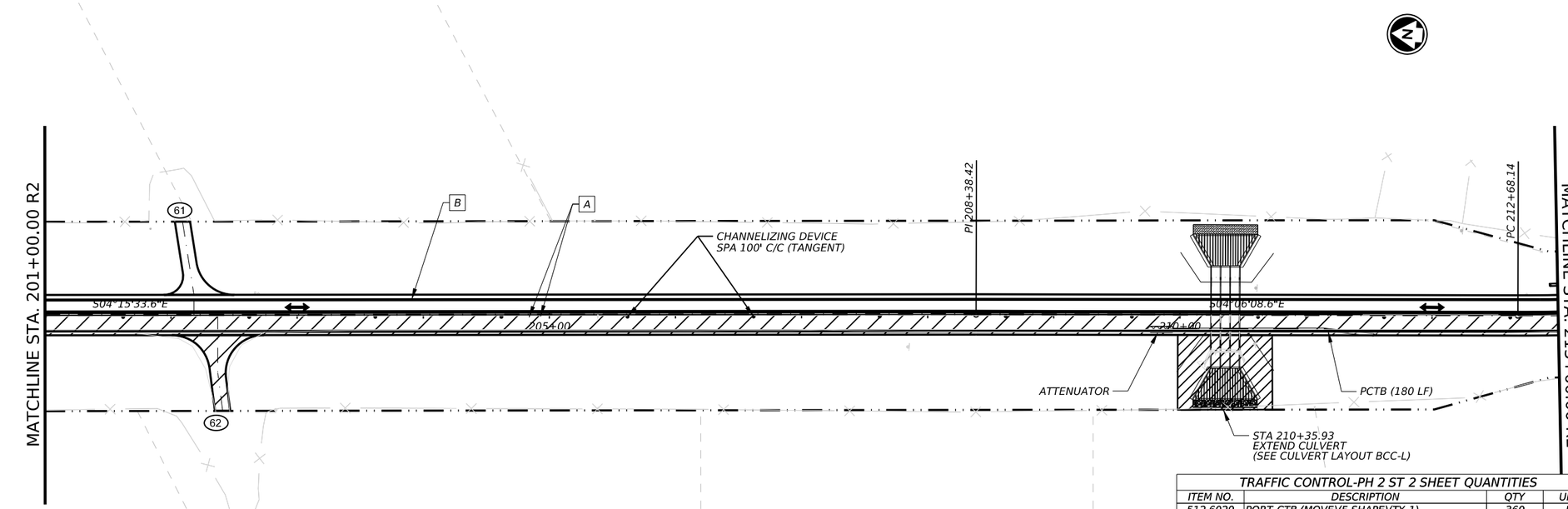

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

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6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 2 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
512 6029	PORT CTB (MOVE)(F-SHAPE)(TY 1)	360	LF
512 6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	360	LF
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF

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TCP PHASE 2 - STEP 2
STA 189+00 to STA 213+00

SHEET 9 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		56

DATE: 1/31/2024 6:07:04 PM
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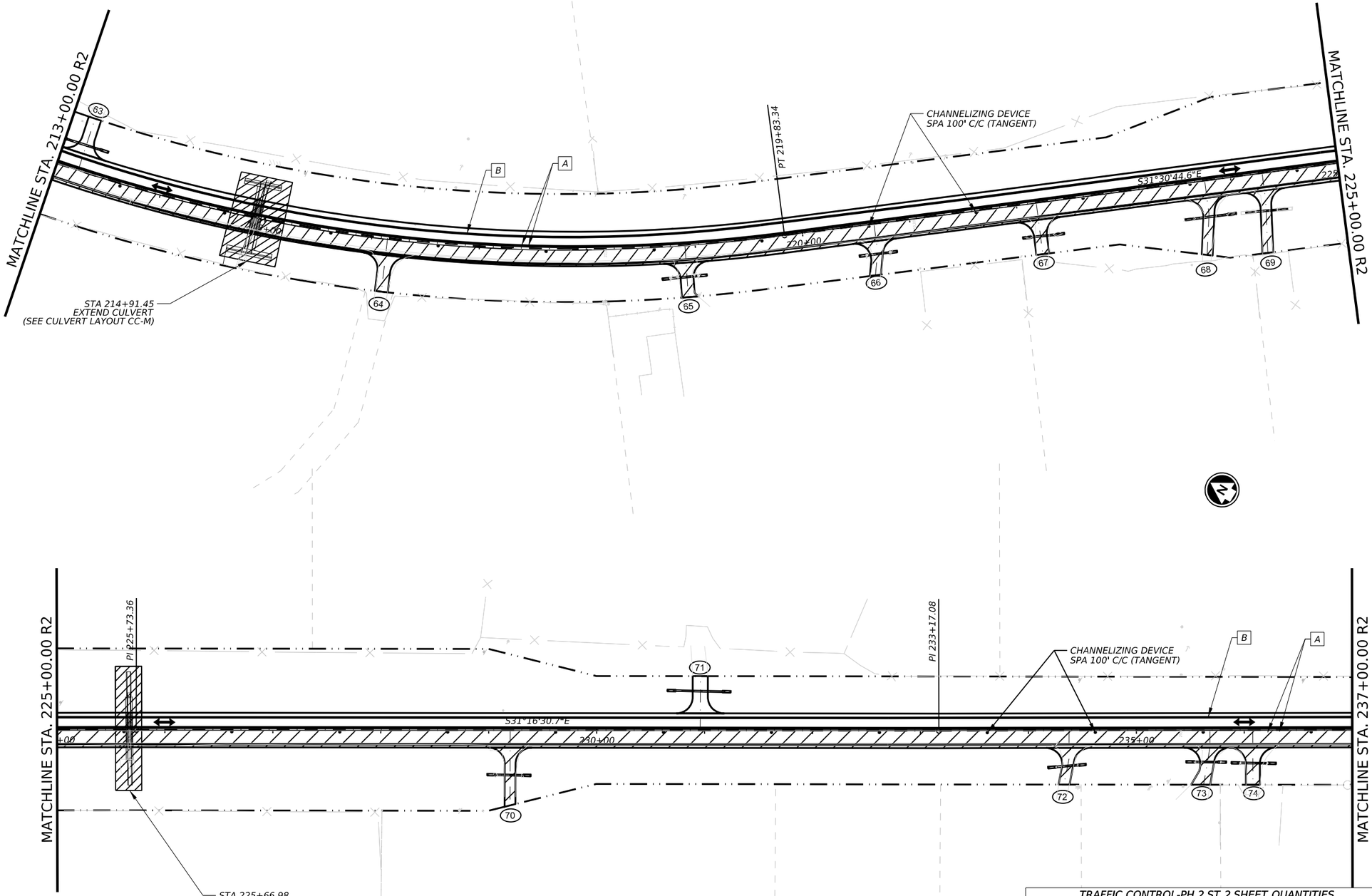

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
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- CHANNELIZING DEVICE
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- CURRENT CONSTRUCTION AREA
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6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 2 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF

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TCP PHASE 2 - STEP 2
STA 213+00 to STA 237+00

SHEET 10 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		57

DATE: 1/31/2024 6:07:42 PM
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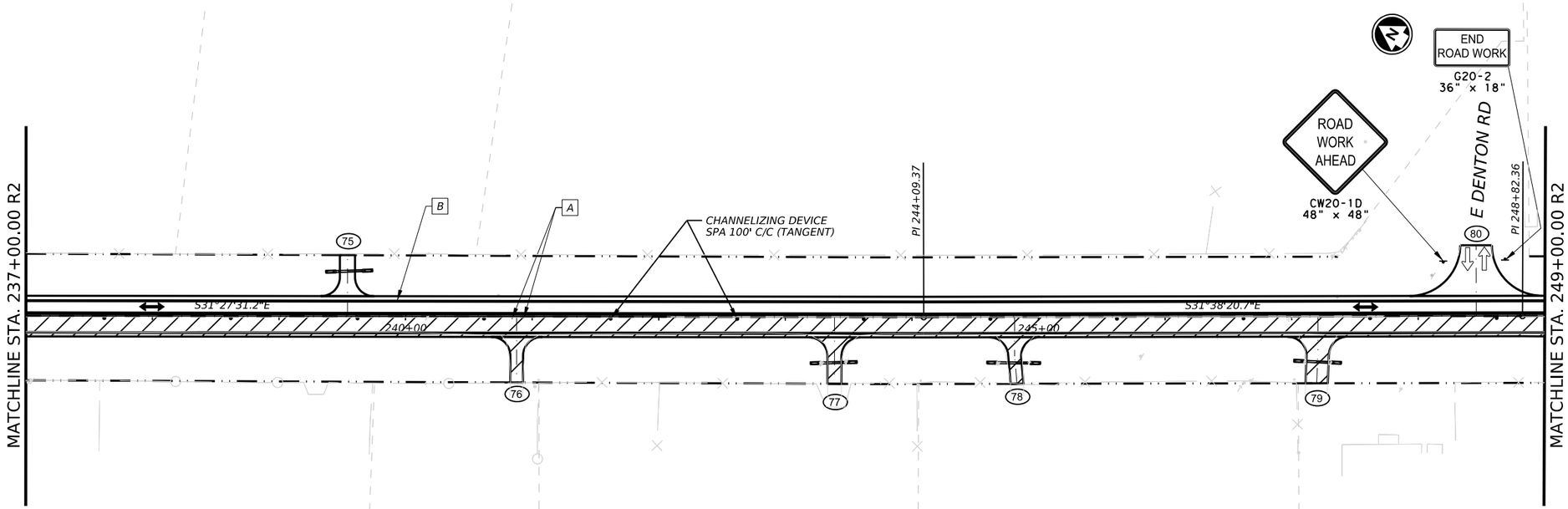

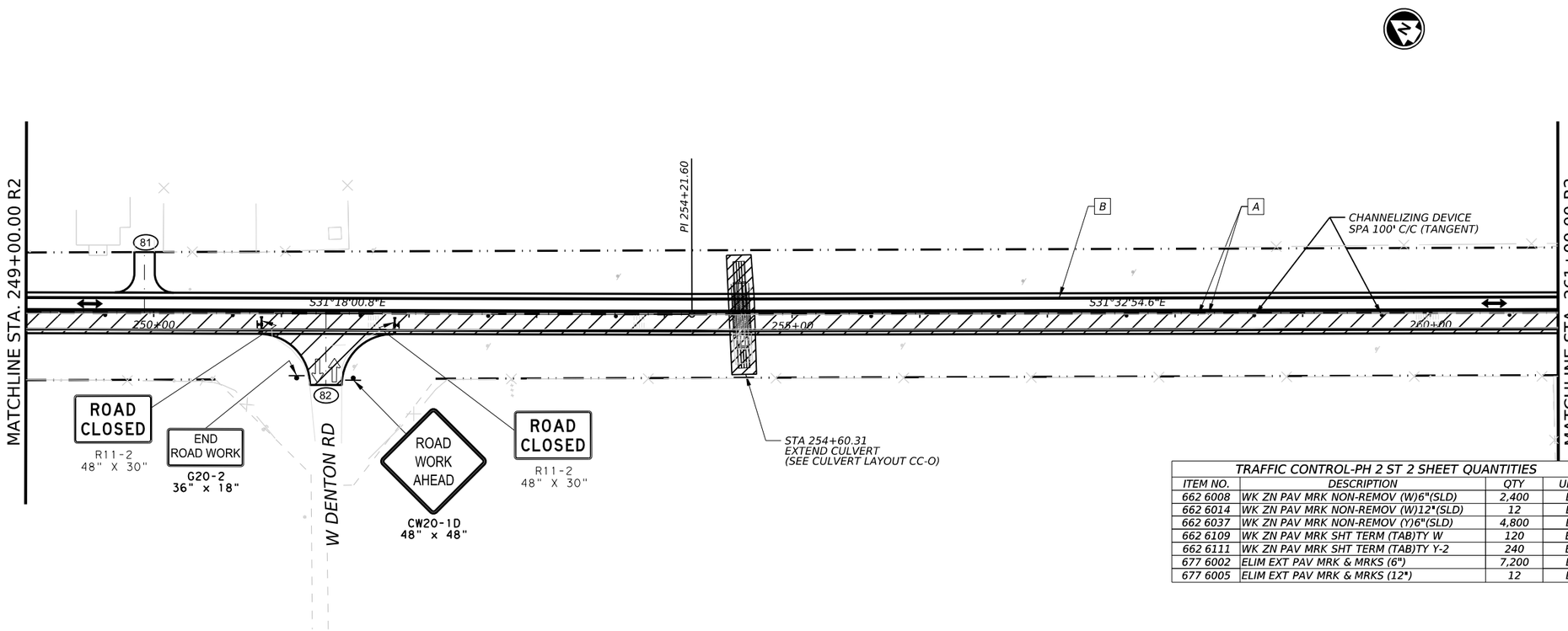

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- A — WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- B — WORK ZONE PVMNT MARK TABS WHITE
- C — WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN AND SHALL BE COVERED.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. FOR ADDITIONAL SIGNS AND BARRICADES REQUIRED TO ESTABLISH A TEMPORARY WORK ZONE UTILIZE STANDARD DRAWING TCP(1-2)-18, TCP ONE-TWO WAY TRAFFIC CONTROL
5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 2 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	2,400	LF
662 6014	WK ZN PAV MRK NON-REMOV (W)12"(SLD)	12	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	4,800	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	120	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	240	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	7,200	LF
677 6005	ELIM EXT PAV MRK & MRKS (12")	12	LF

STATE OF TEXAS
LUKE W. CLARKE
60221
LICENSED
PROFESSIONAL ENGINEER
1/31/2024

AtkinsRéalis
TBPE REG. # F-474

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FM 2311

TCP PHASE 2 - STEP 2
STA 237+00 to STA 261+00

SHEET 11 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		58

DATE: 1/31/2024 6:08:20 PM
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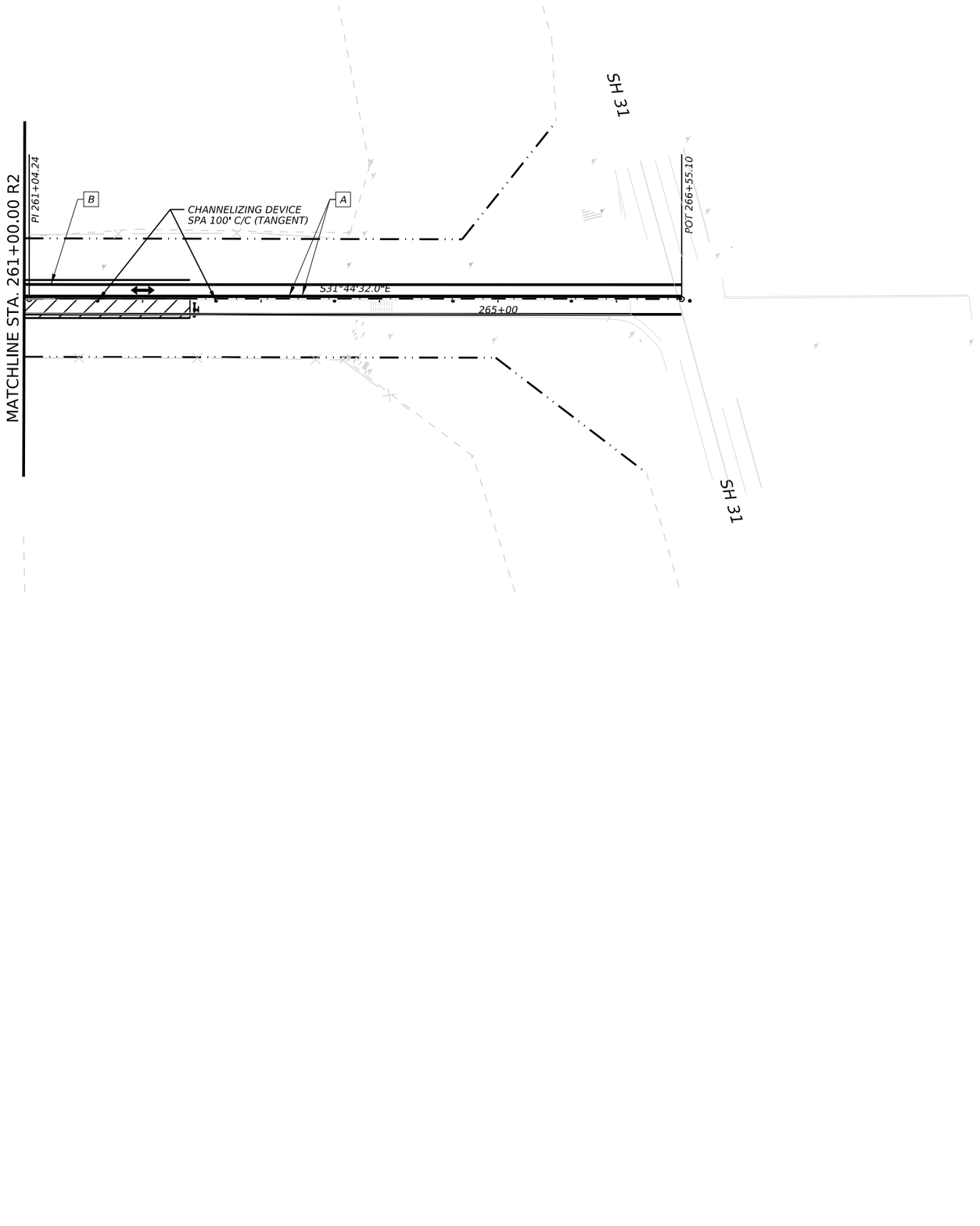

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- [A] WORK ZONE PVMNT MARK TABS DOUBLE YELLOW
- [B] WORK ZONE PVMNT MARK TABS WHITE
- [C] WORK ZONE PVMNT MARK (REMOV) 12" WHITE SOLID
- TRAFFIC SIGN ON POST
- CHANNELIZING DEVICE
- TYPE III BARRICADE
- CURRENT CONSTRUCTION AREA
- PHASE 1 MILL / INLAY AREA
- PHASE 1 BRIDGE RE-CONSTR AREA

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN AND SHALL BE COVERED.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
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5. ALL SIDEROADS WILL REMAIN OPEN AT ALL TIMES AND ARE TO BE CONSTRUCTED HALF AT A TIME. UTILIZE STANDARD DRAWING TCP(SC-4)-22.
6. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

TRAFFIC CONTROL-PH 2 ST 2 SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
662 6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	551	LF
662 6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	1,102	LF
662 6109	WK ZN PAV MRK SHT TERM (TAB)TY W	28	EA
662 6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	56	EA
677 6002	ELIM EXT PAV MRK & MRKS (6")	1,653	LF

STATE OF TEXAS
LUKE W. CLARKE
60221
LICENSED
PROFESSIONAL ENGINEER
1/31/2024

AtkinsRéalis
TBPE REG. # F-474

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FM 2311

TCP PHASE 2 - STEP 2
STA 261+00 to END PROJECT

SHEET 12 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		59

DATE: 1/31/2024 6:08:58 PM
FILE: ...\FM 2311 TCP PLAN PH2S2-12.dgn

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

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	2174	01	018	FM 2311
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	WAC	McLENNAN		60
5-10 5-21				

DATE: 1/31/2024 4:53:24 PM
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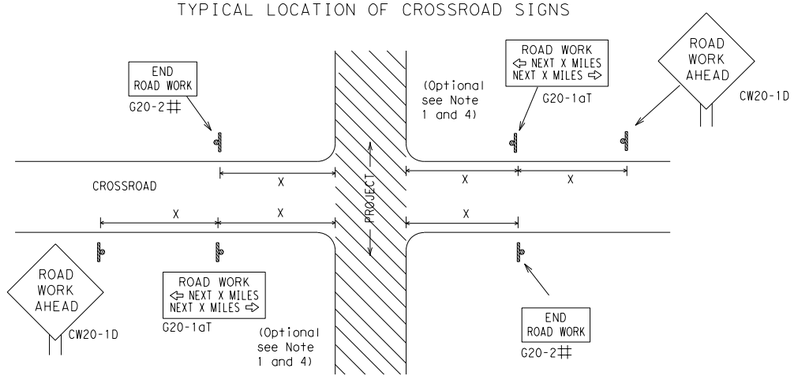
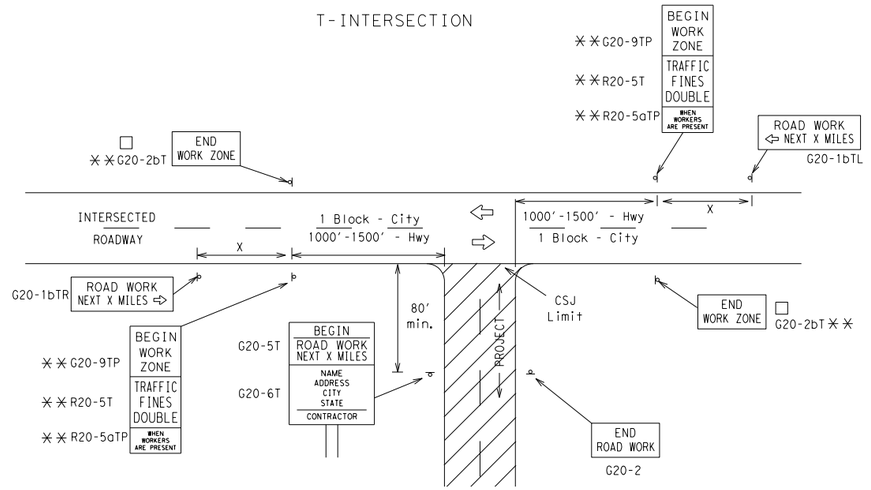
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

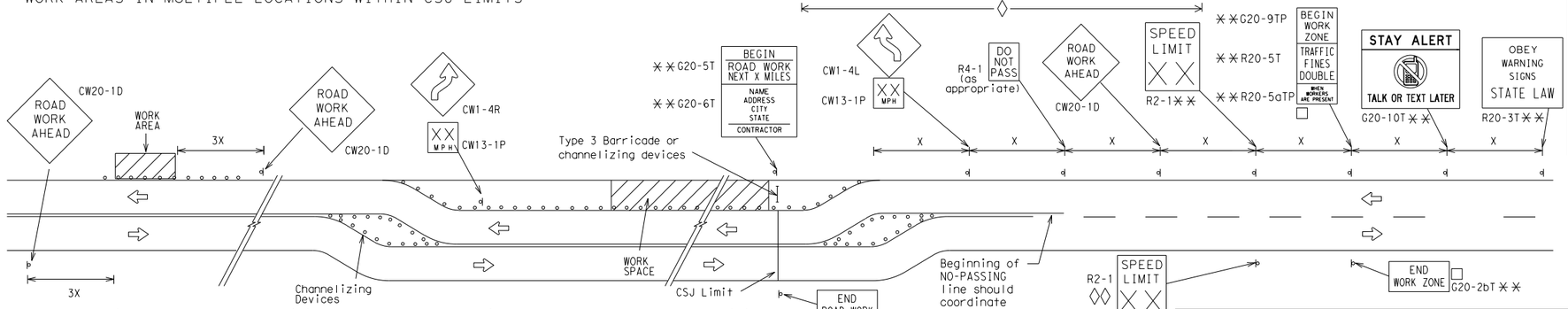
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

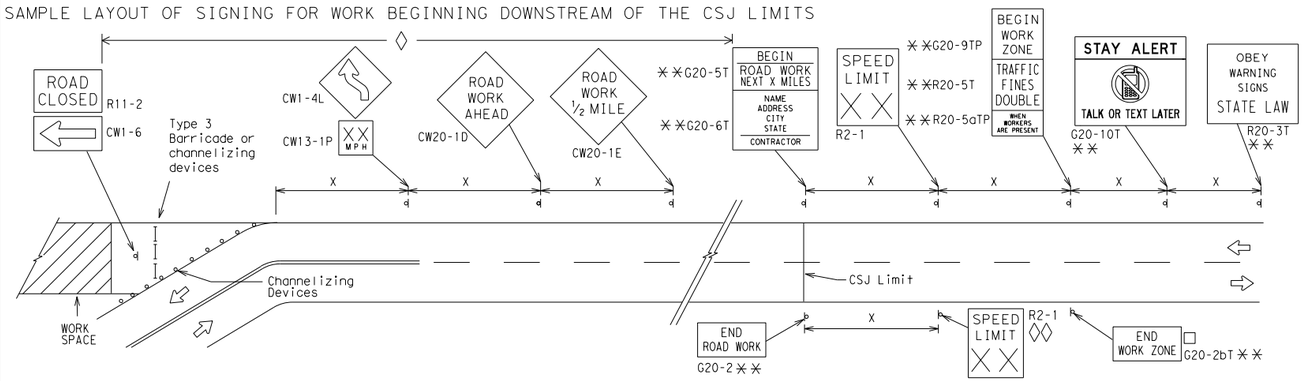
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

NOTES

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

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

✳✳ 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	2174	01	018	FM 2311
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WAC	McLENNAN		61

DATE: 1/31/2024 4:53:24 PM
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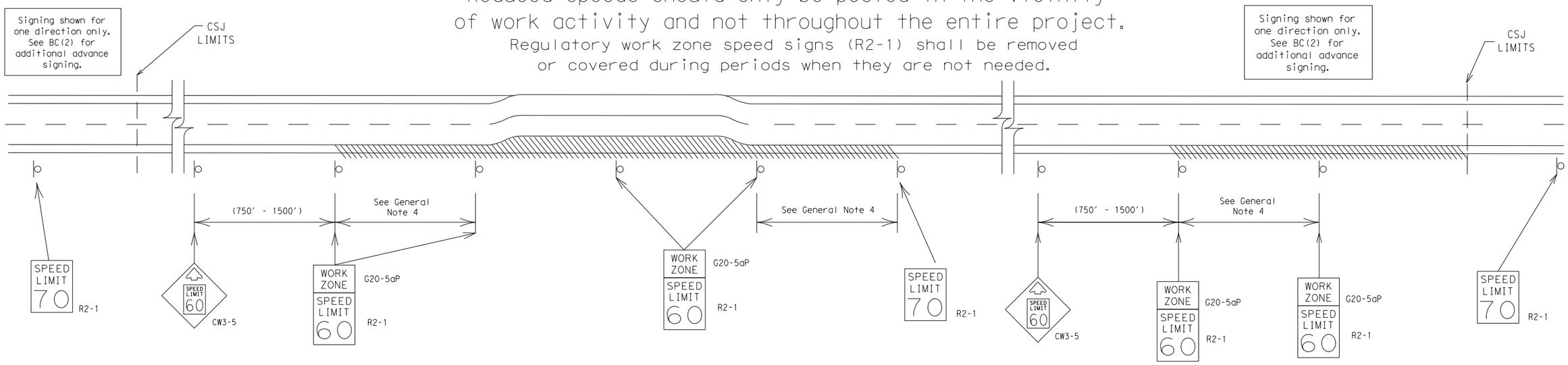
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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	2174	01	018	FM 2311
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WAC	McLENNAN		62

DATE: 1/31/2024 4:53:24 PM
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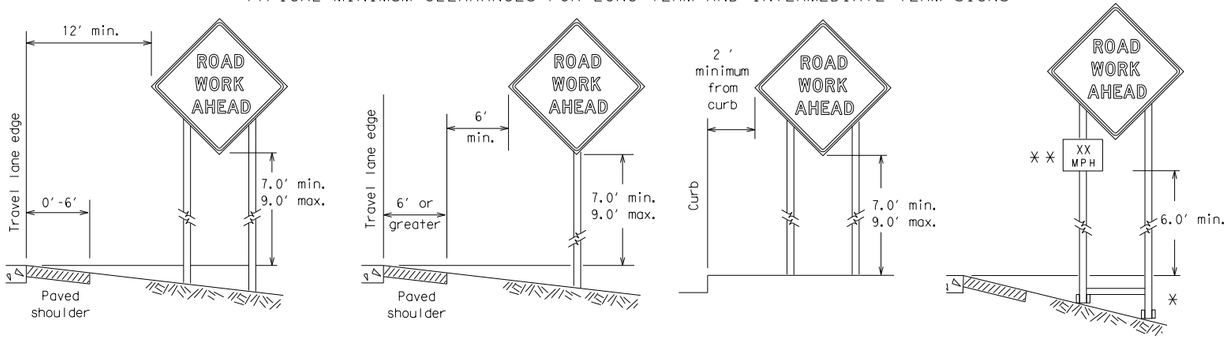
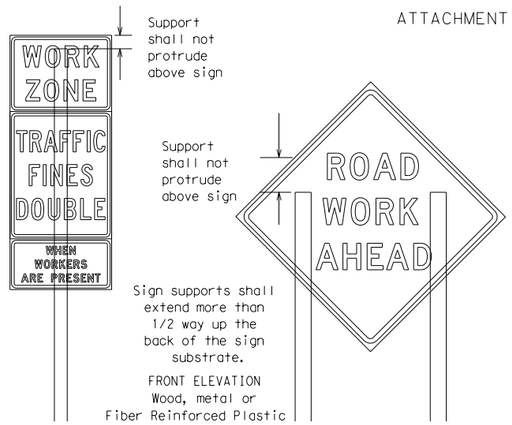
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

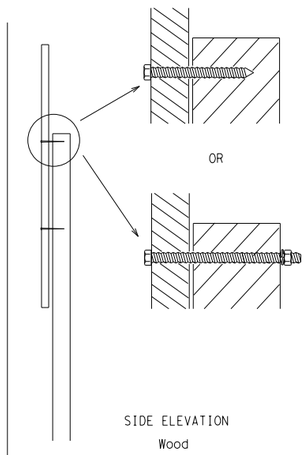


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ 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





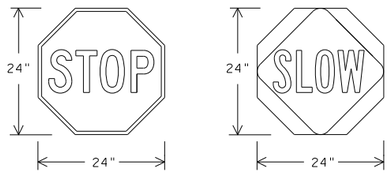
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.



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.

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BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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©TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS		2174	01	018	FM 2311
9-07 8-14		DIST	COUNTY		SHEET NO.
7-13 5-21		WAC	McLENNAN		63

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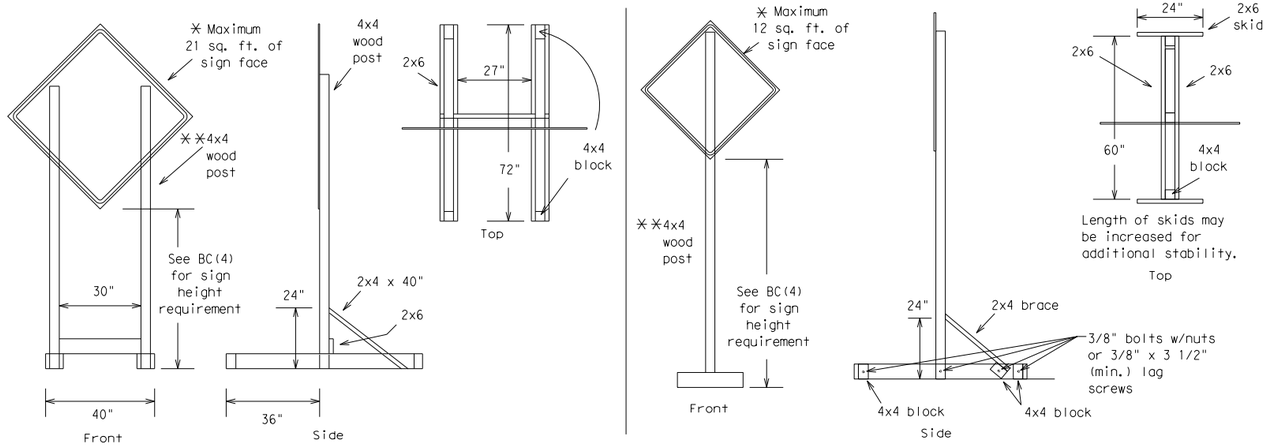
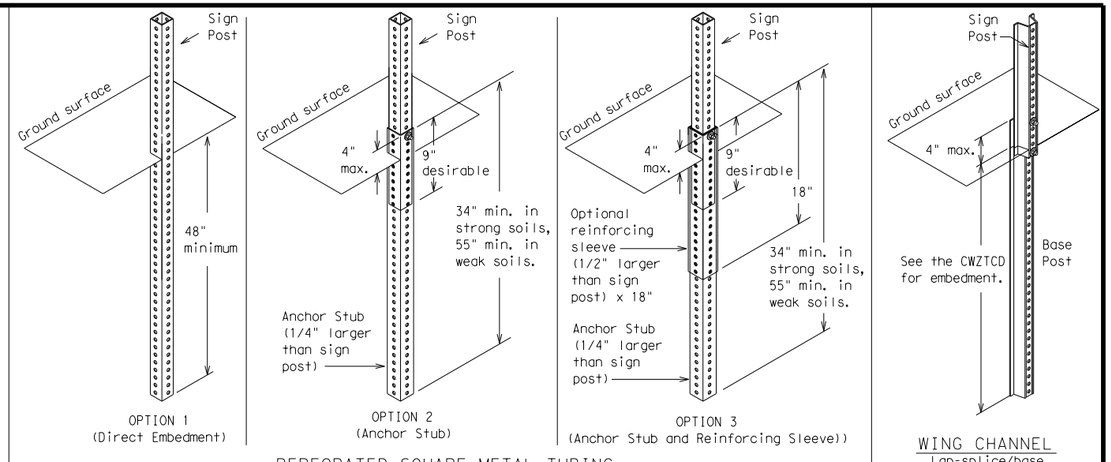


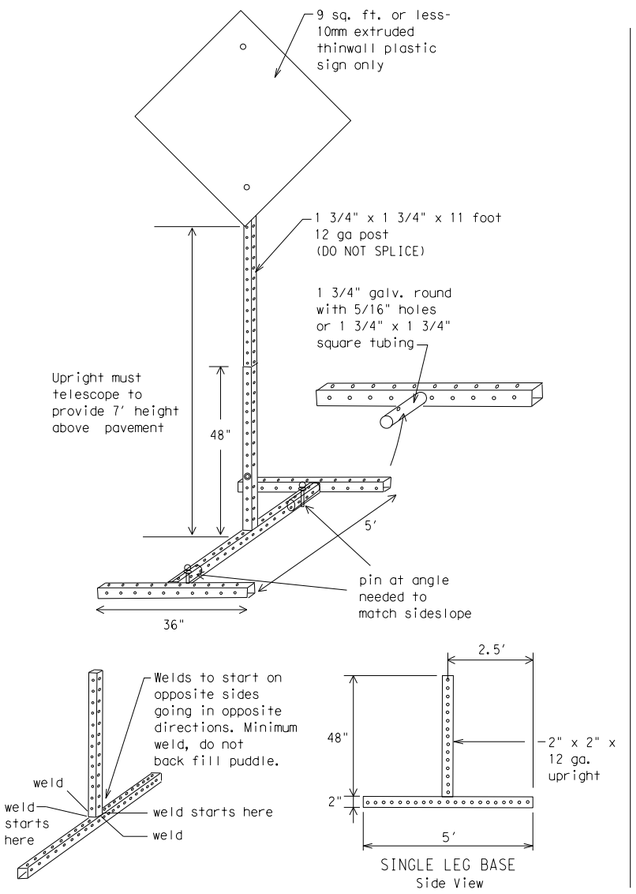
SKID MOUNTED WOOD SIGN SUPPORTS

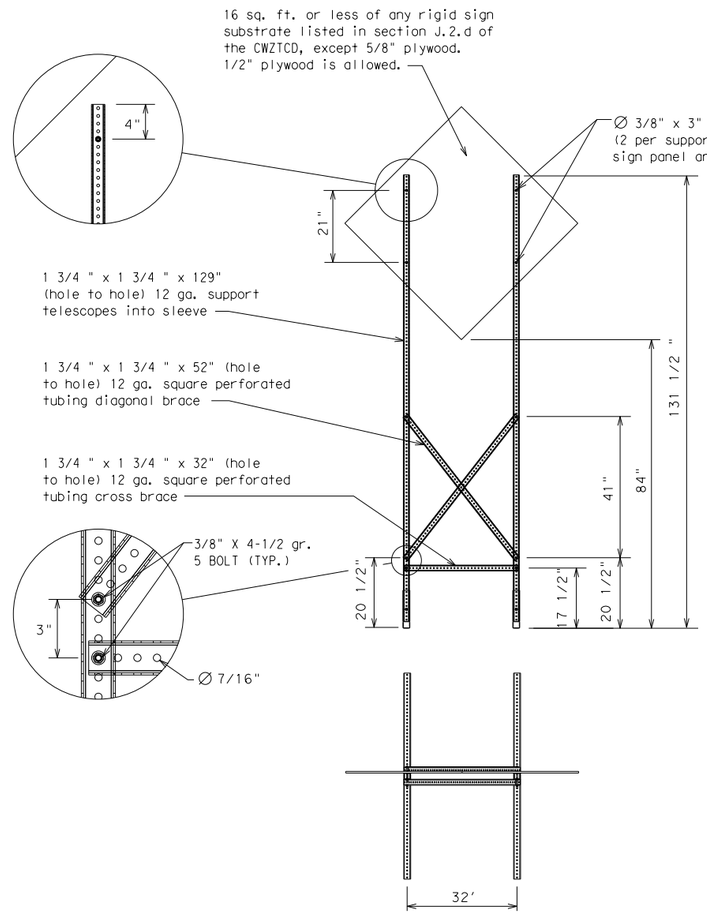
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

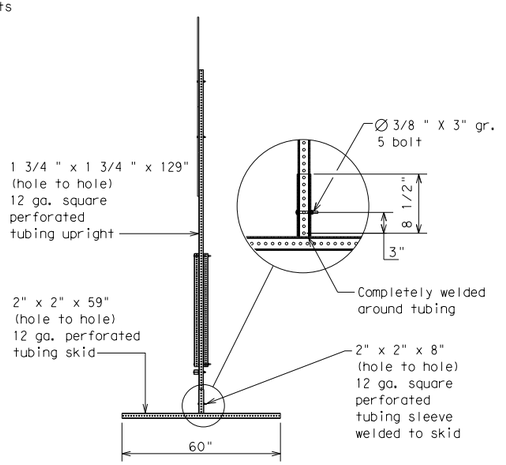


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

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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	2174	01	018	FM 2311
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WAC	McLENNAN		64

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WAC	McLENNAN		65

100

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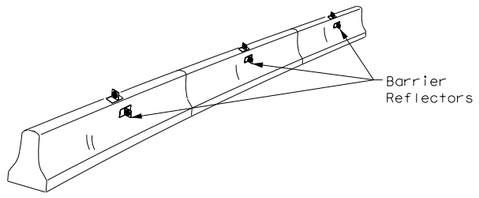
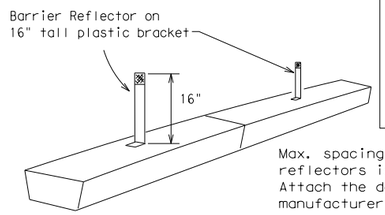
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



CONCRETE TRAFFIC BARRIER (CTB)

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

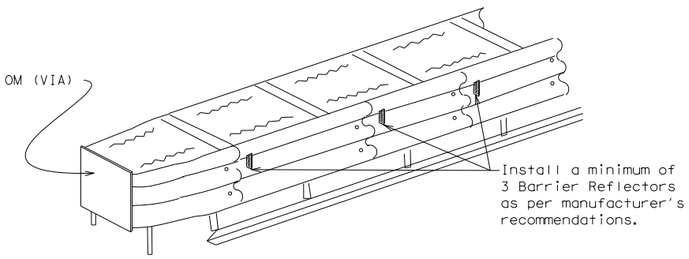


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

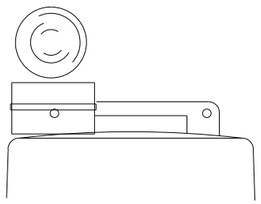


DELINEATION OF END TREATMENTS

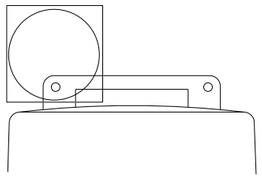
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

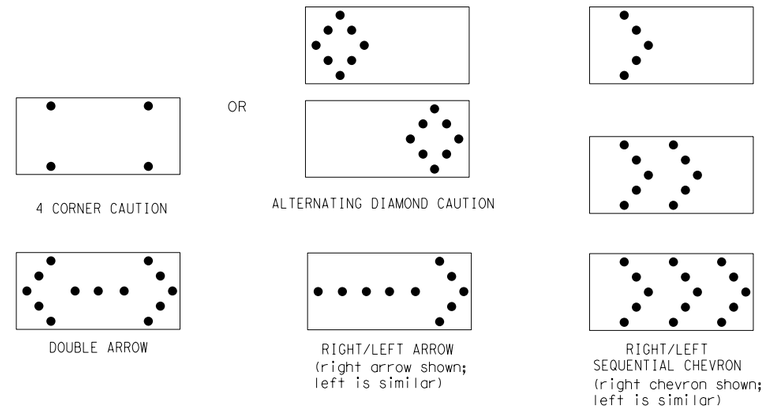
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



4 CORNER CAUTION

ALTERNATING DIAMOND CAUTION

DOUBLE ARROW

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

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

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

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

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

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
9-07 8-14 7-13 5-21	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		66

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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:

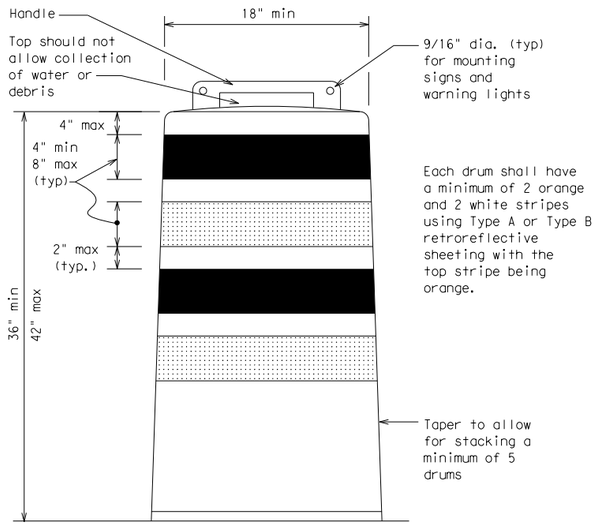
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

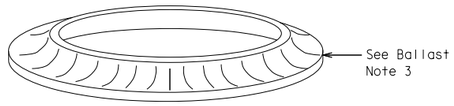
RETROREFLECTIVE SHEETING

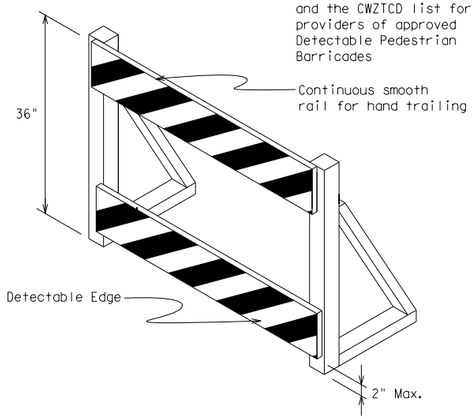
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall 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.

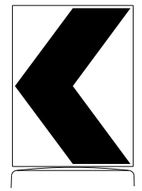




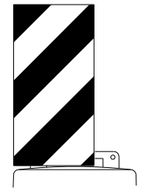


DETECTABLE PEDESTRIAN BARRICADES

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	2174	01	018	FM 2311
4-03 8-14	DIST	COUNTY		SHEET NO.
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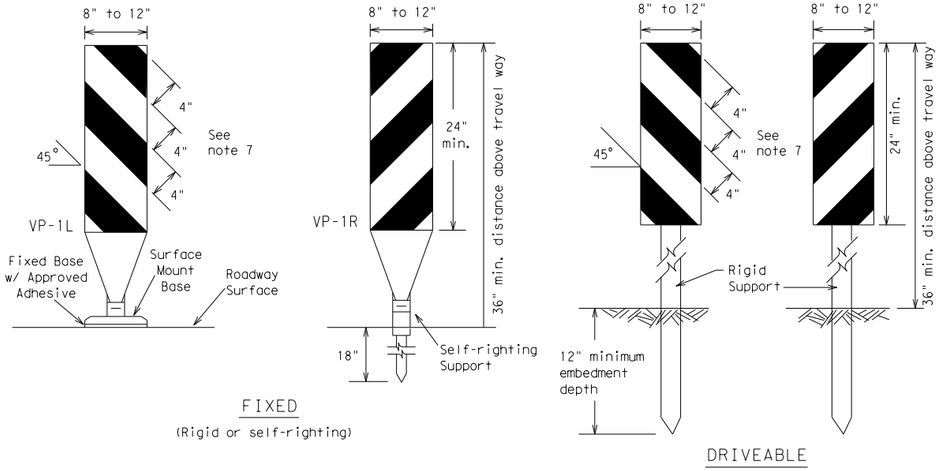
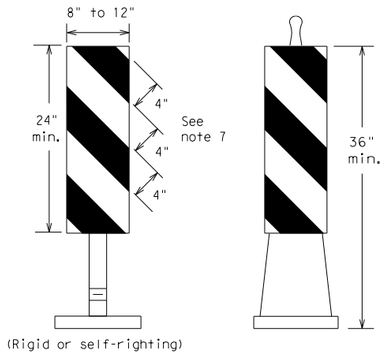


FIXED

(Rigid or self-righting)

DRIVEABLE

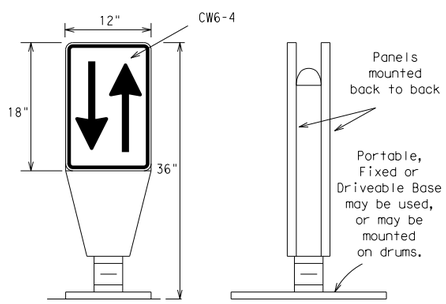


(Rigid or self-righting)

PORTABLE

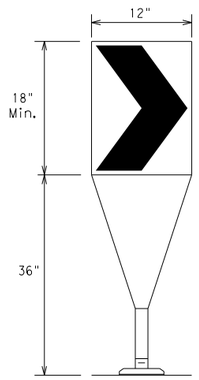
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



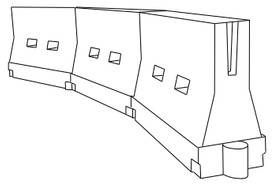
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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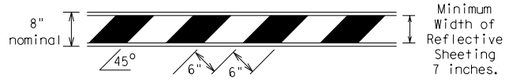
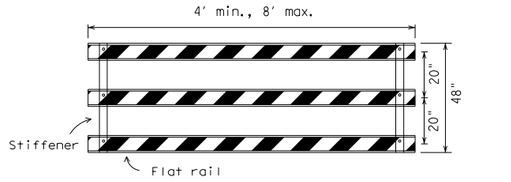
TYPE 3 BARRICADES

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.



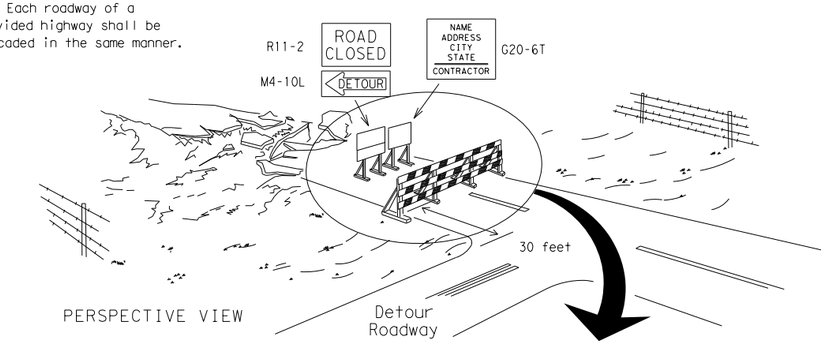
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

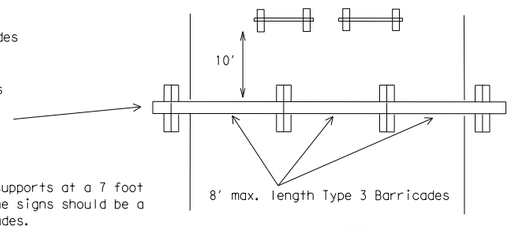
Each roadway of a divided highway shall be barricaded in the same manner.



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.

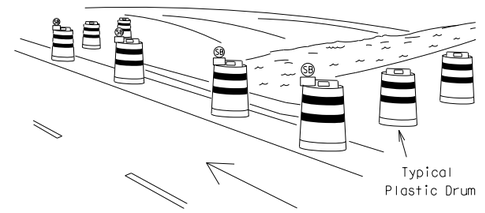
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

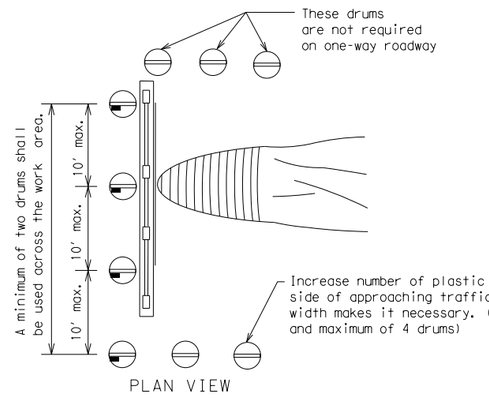
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

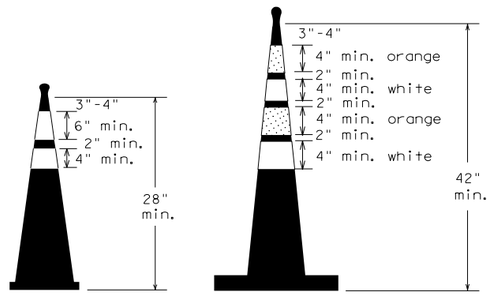
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



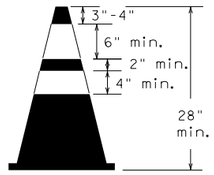
PLAN VIEW

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

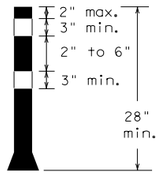
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

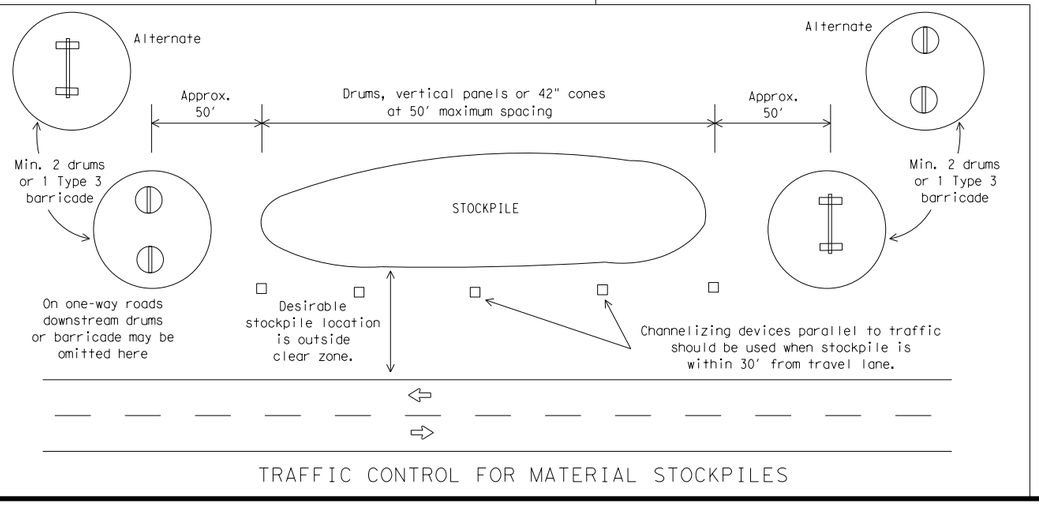


Tubular Marker

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	2174	01	018	FM 2311
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	WAC	McLENNAN		69

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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.

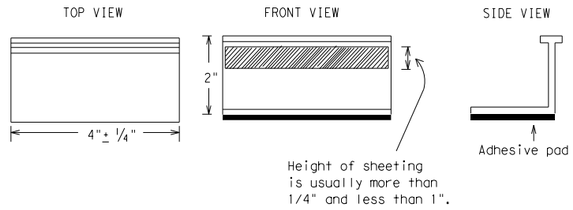
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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
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REVISIONS 2-98 9-07 5-21 1-02 7-13 11-02 8-14	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		70

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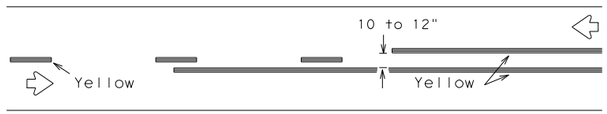
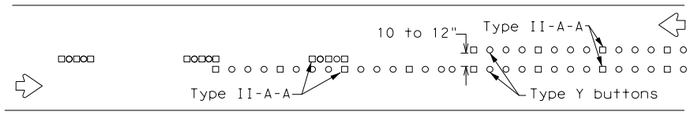
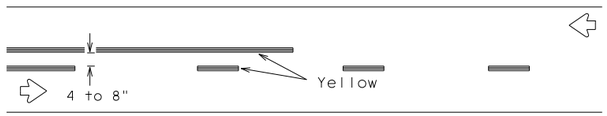
PAVEMENT MARKING PATTERNS



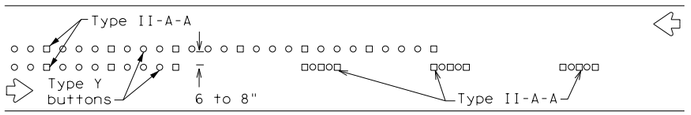
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



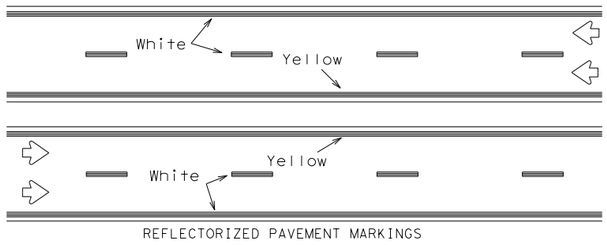
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



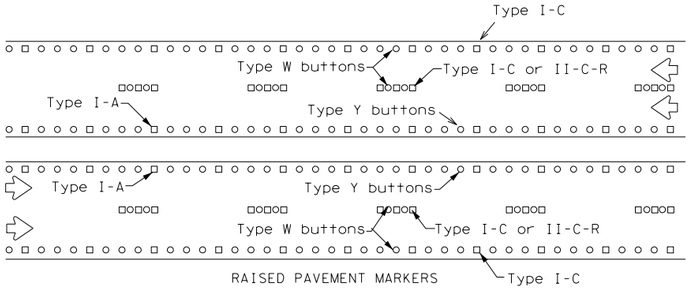
RAISED PAVEMENT MARKERS - PATTERN B

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

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



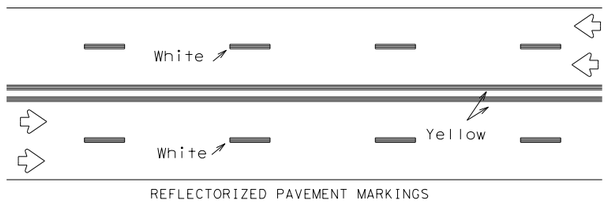
REFLECTORIZED PAVEMENT MARKINGS



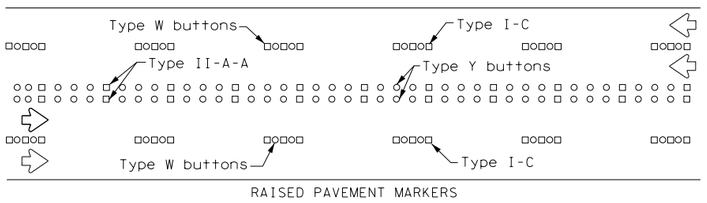
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



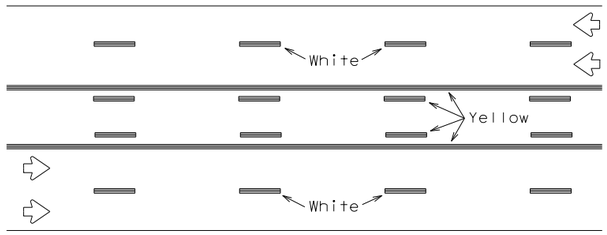
REFLECTORIZED PAVEMENT MARKINGS



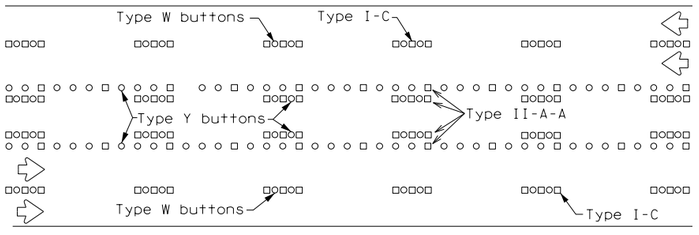
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

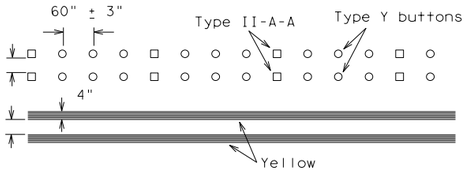
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

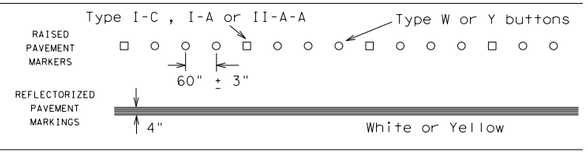
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

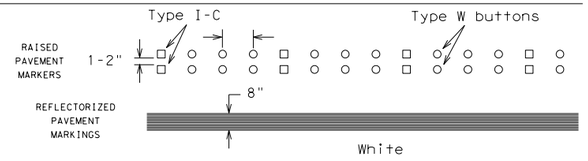


EDGE LINE OR SINGLE NO-PASSING LINE



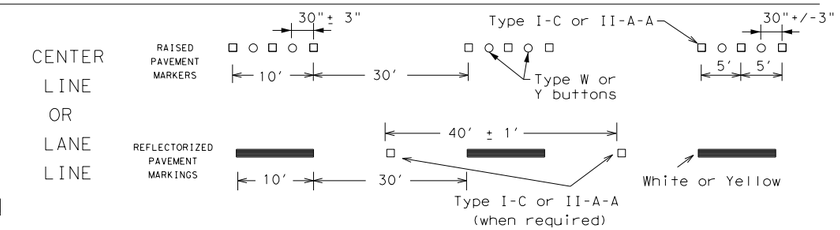
WIDE LINE

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

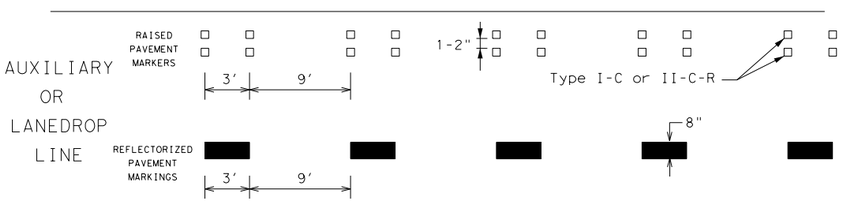


BROKEN LINES

CENTER LINE OR LANE LINE

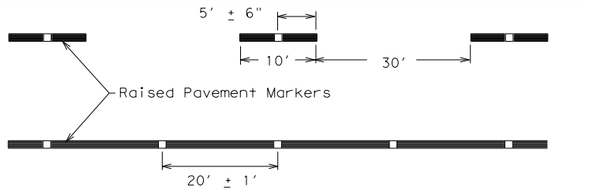


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

SHEET 12 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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11-02 8-14				

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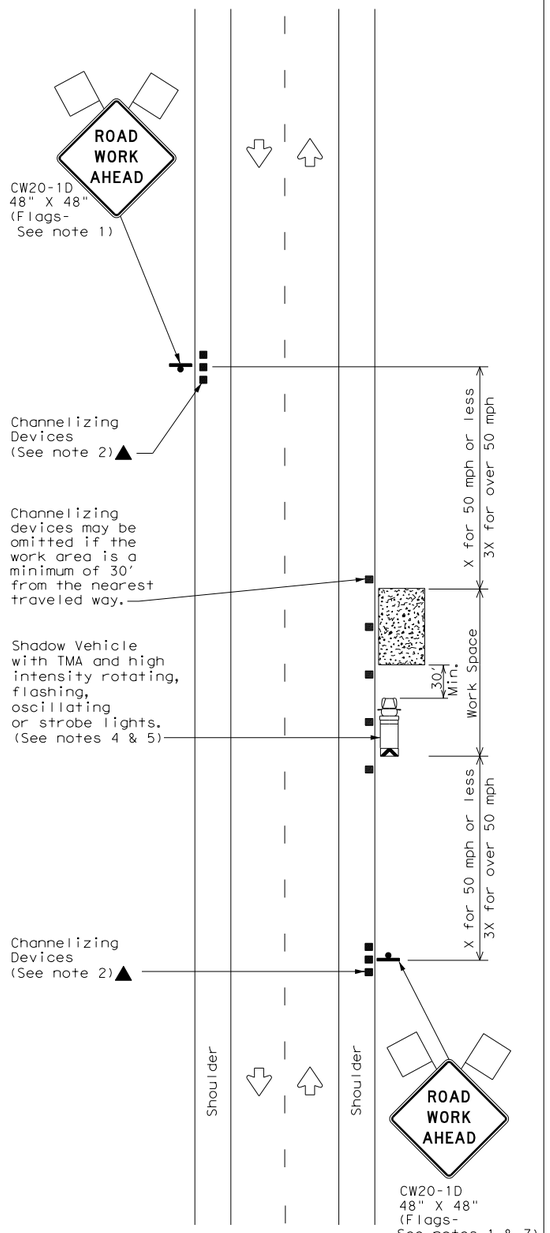
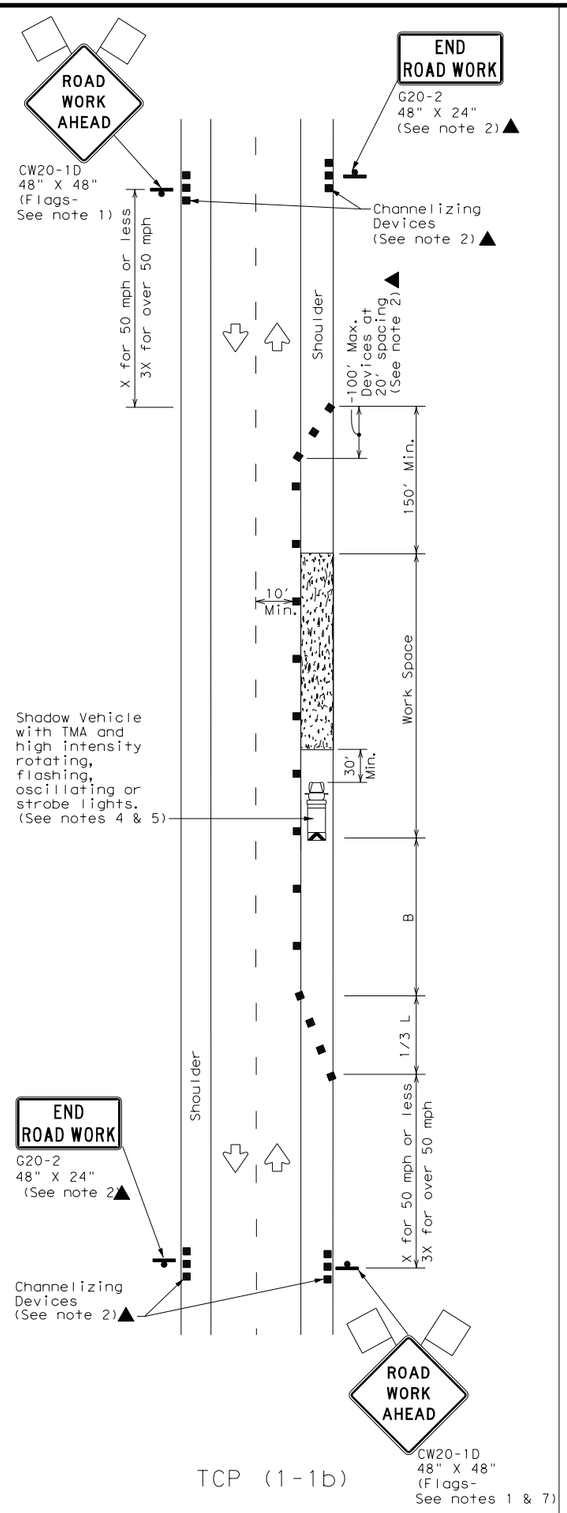


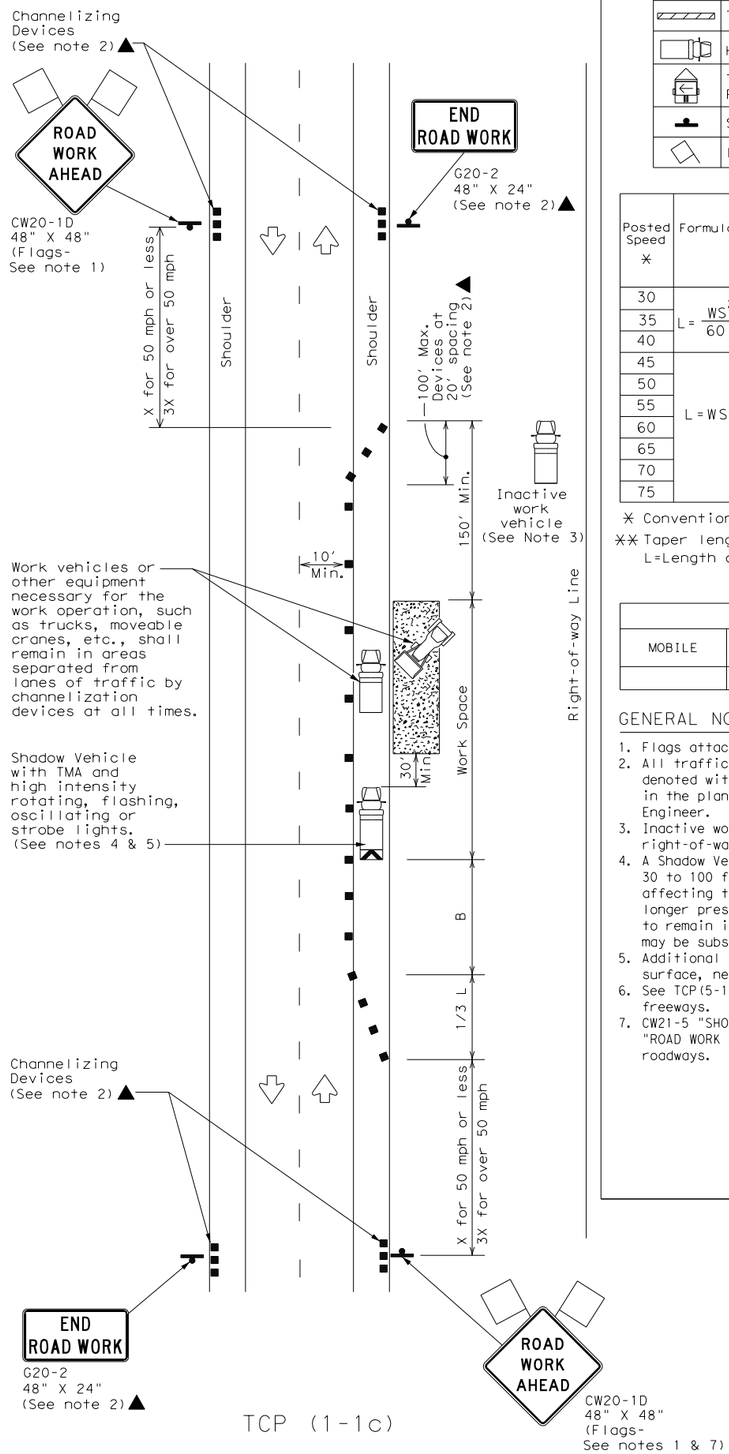
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

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8-95 2-12	WAC	McLENNAN		72
1-97 2-18				

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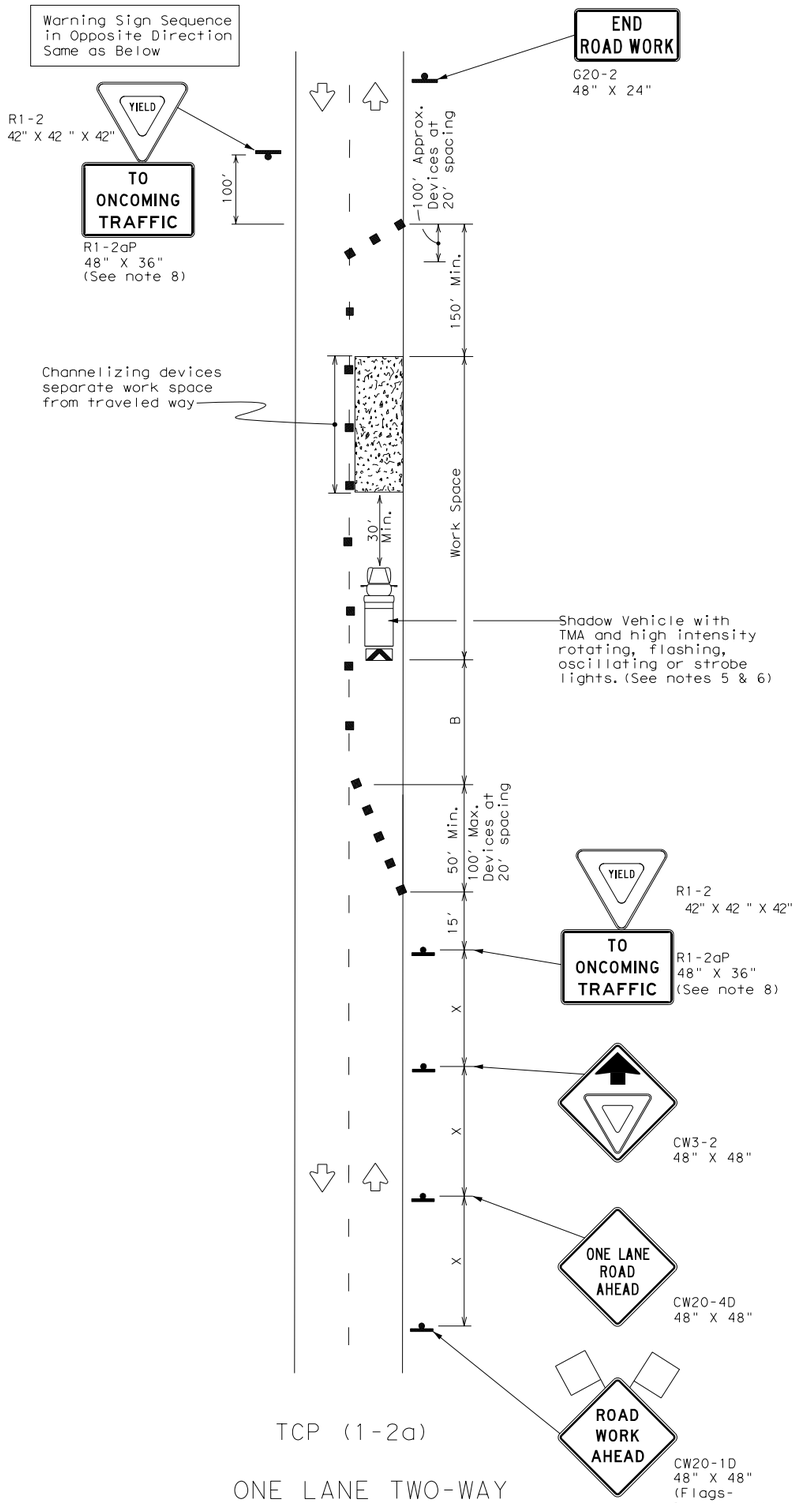
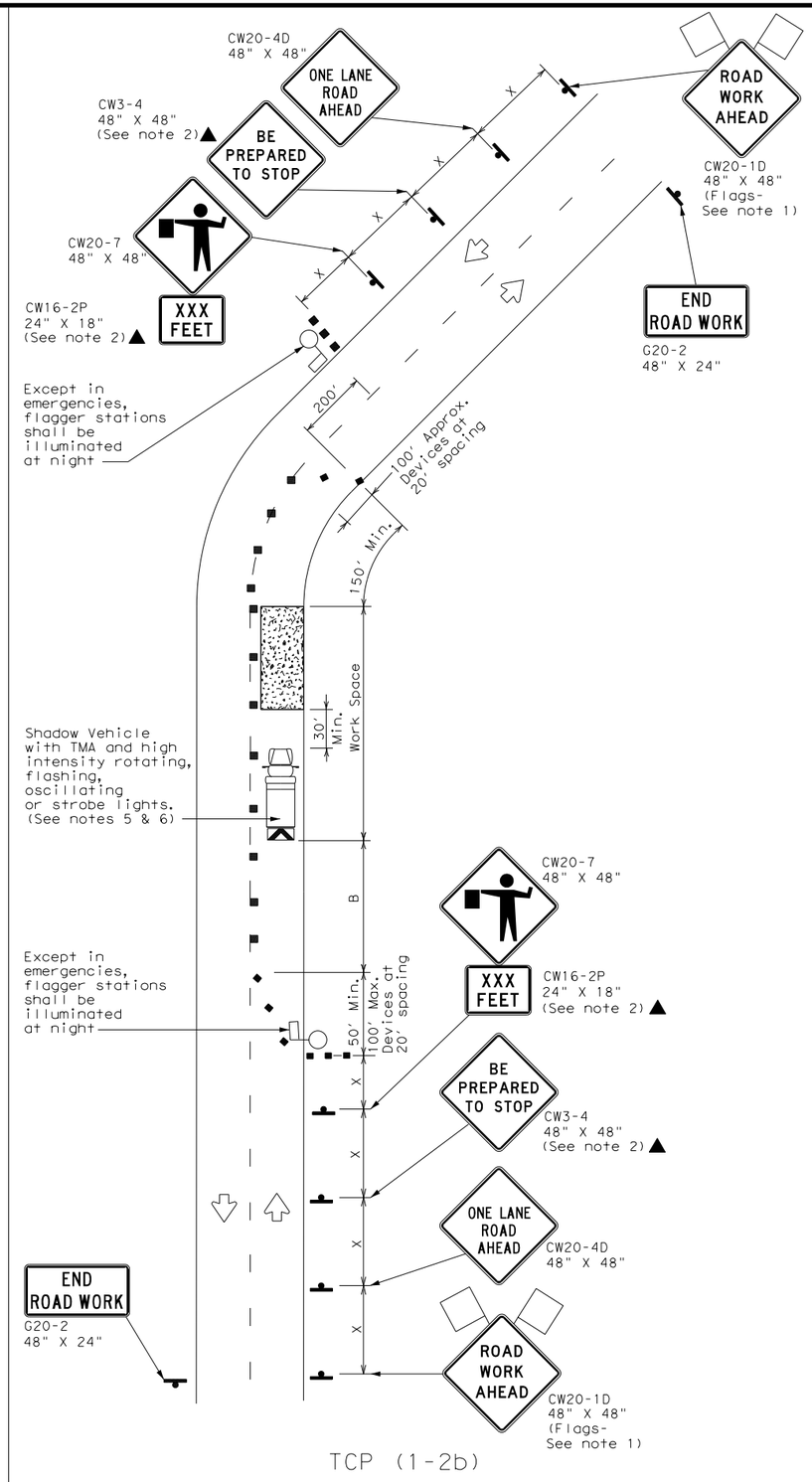


TCP (1-2a)

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
4. Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
5. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
6. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-2a)

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

TCP (1-2b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP (1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		73

DATE: 1/31/2024 4:54:13 PM
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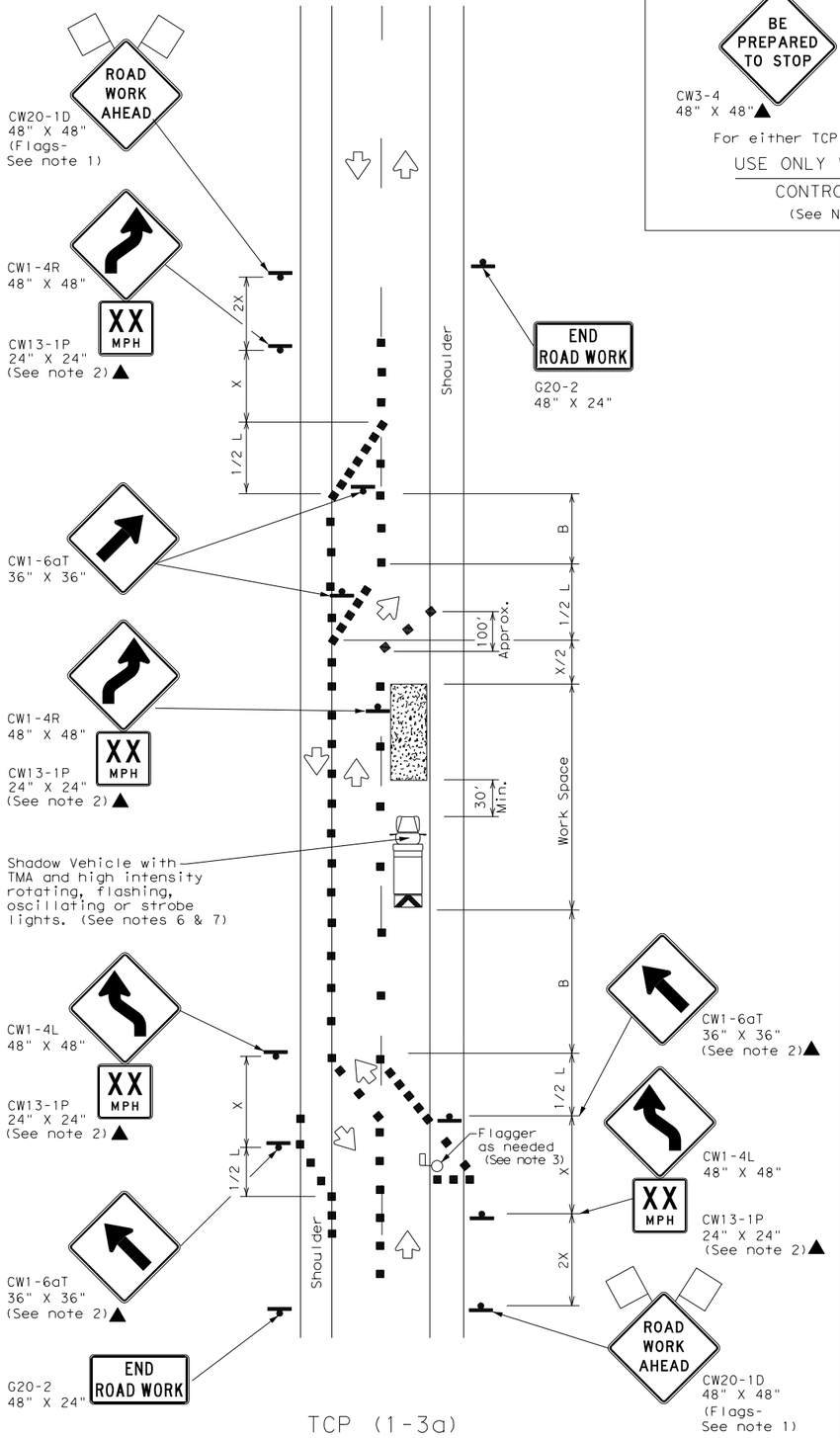
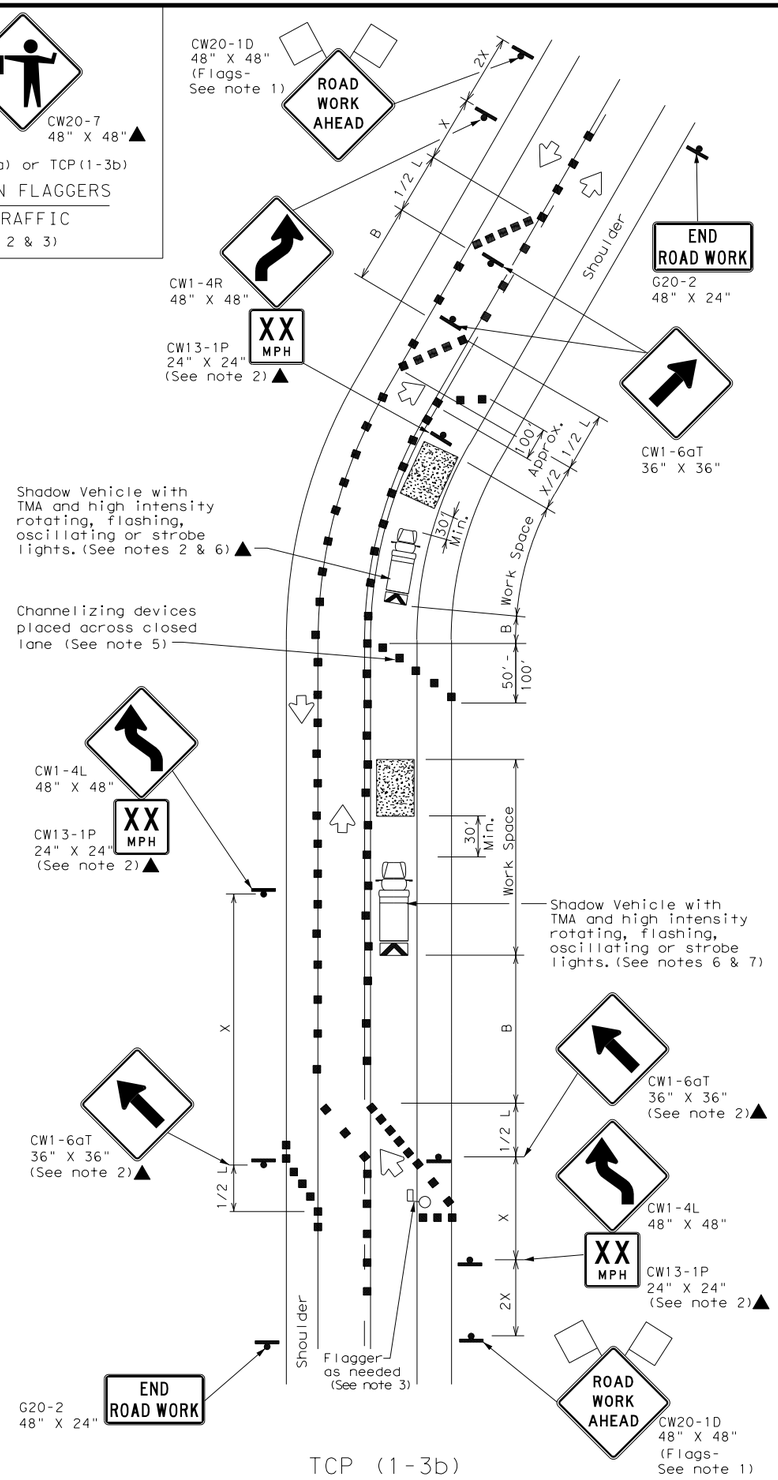


TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



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

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
8. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20', or 15' if posted speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the area of conflicting markings not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	WAC	McLENNAN		74
1-97 2-18				

DATE: 1/31/2024 4:54:29 PM
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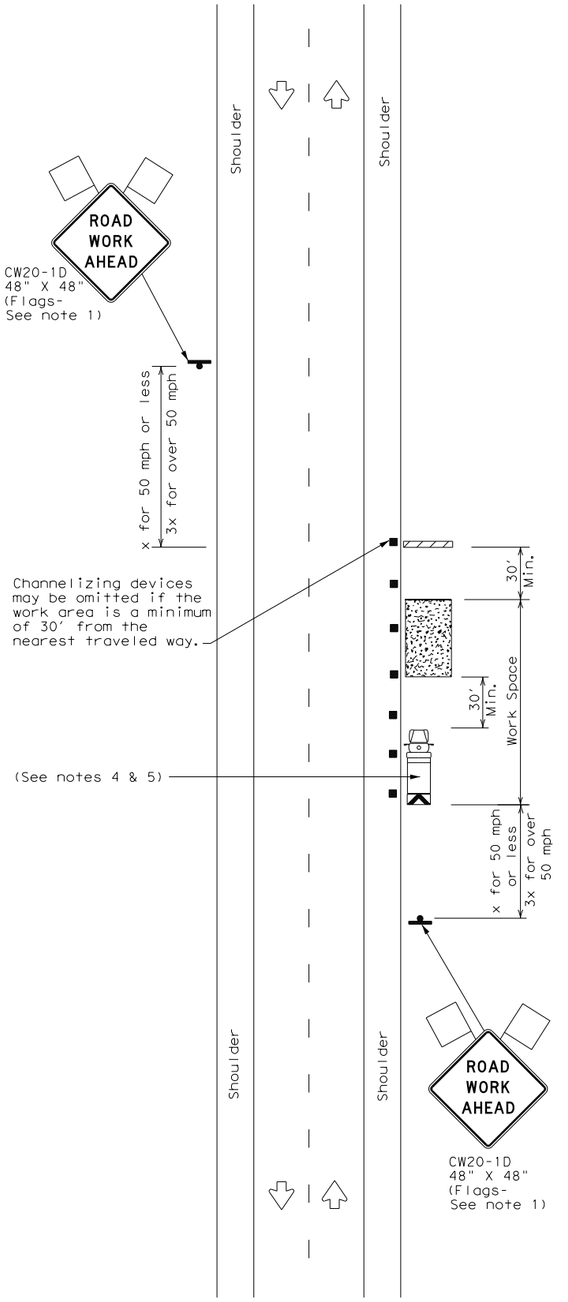
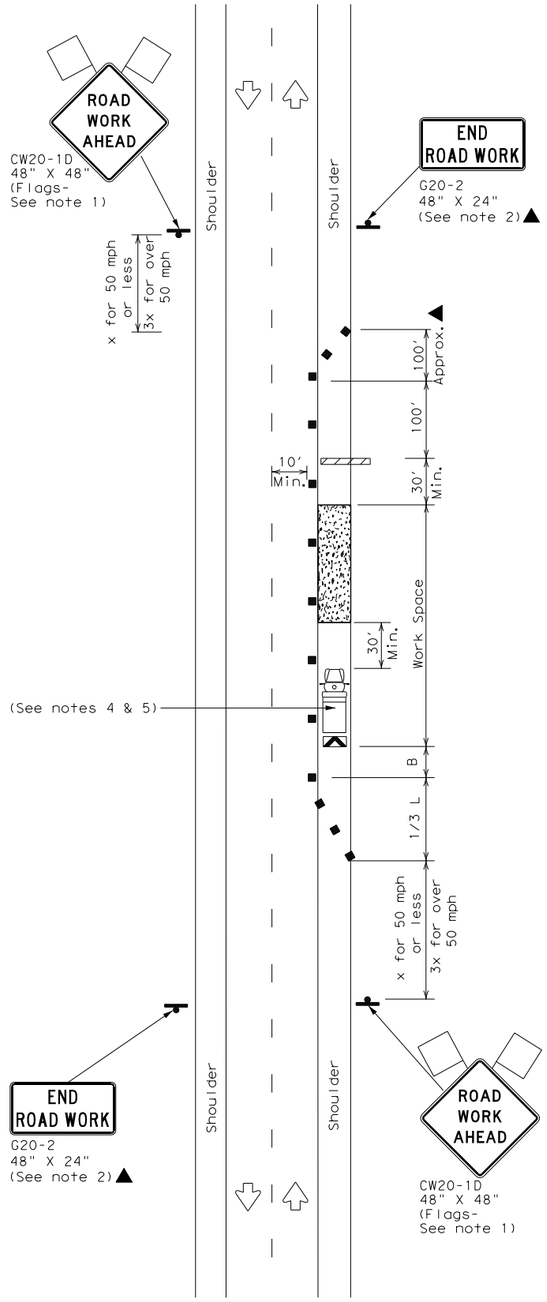


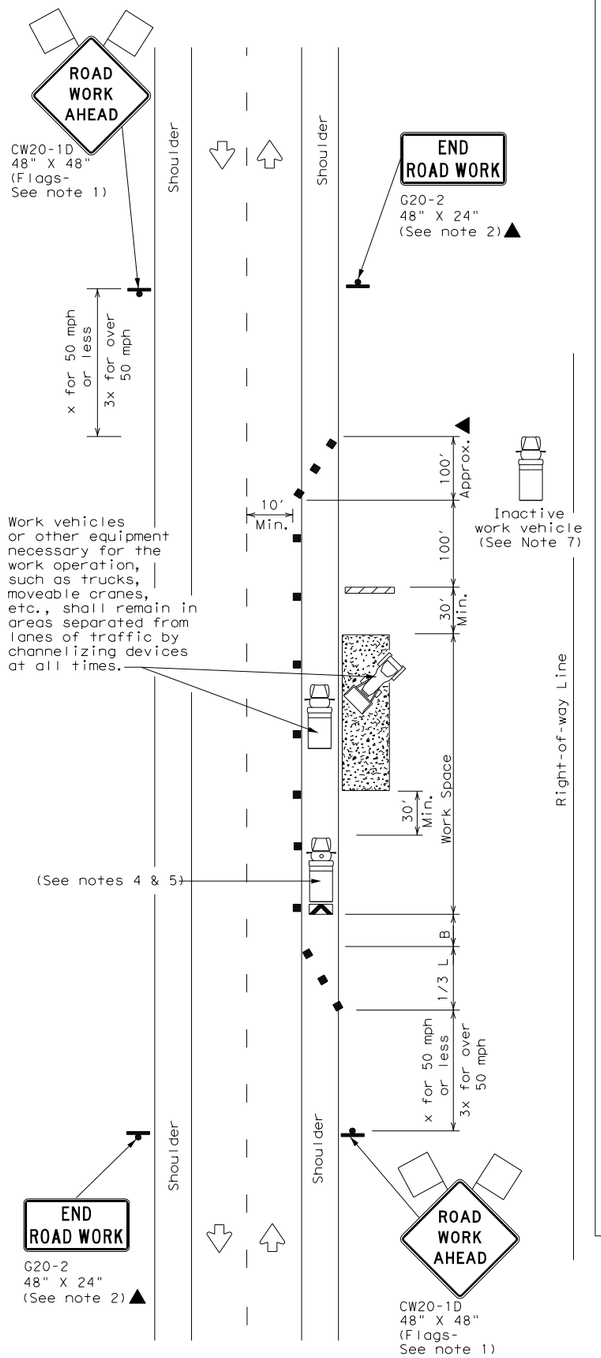
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation | Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

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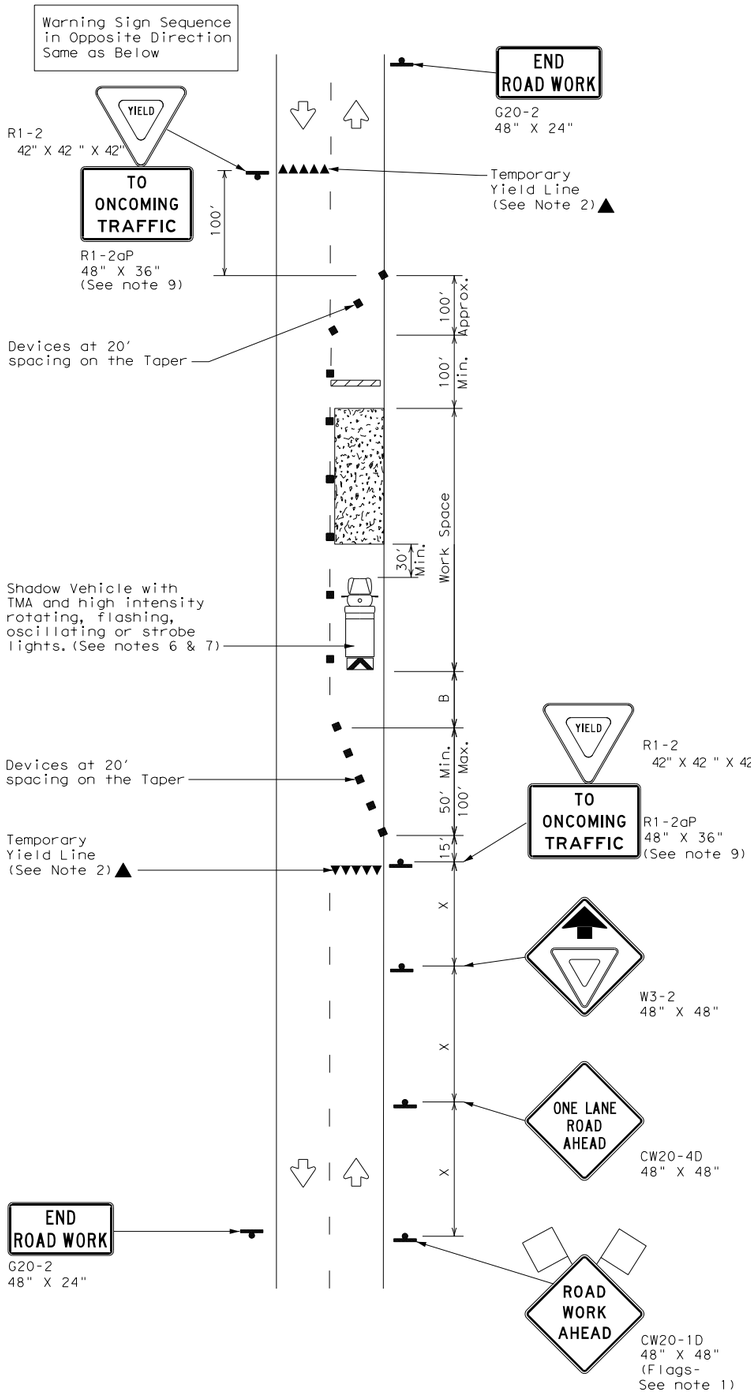
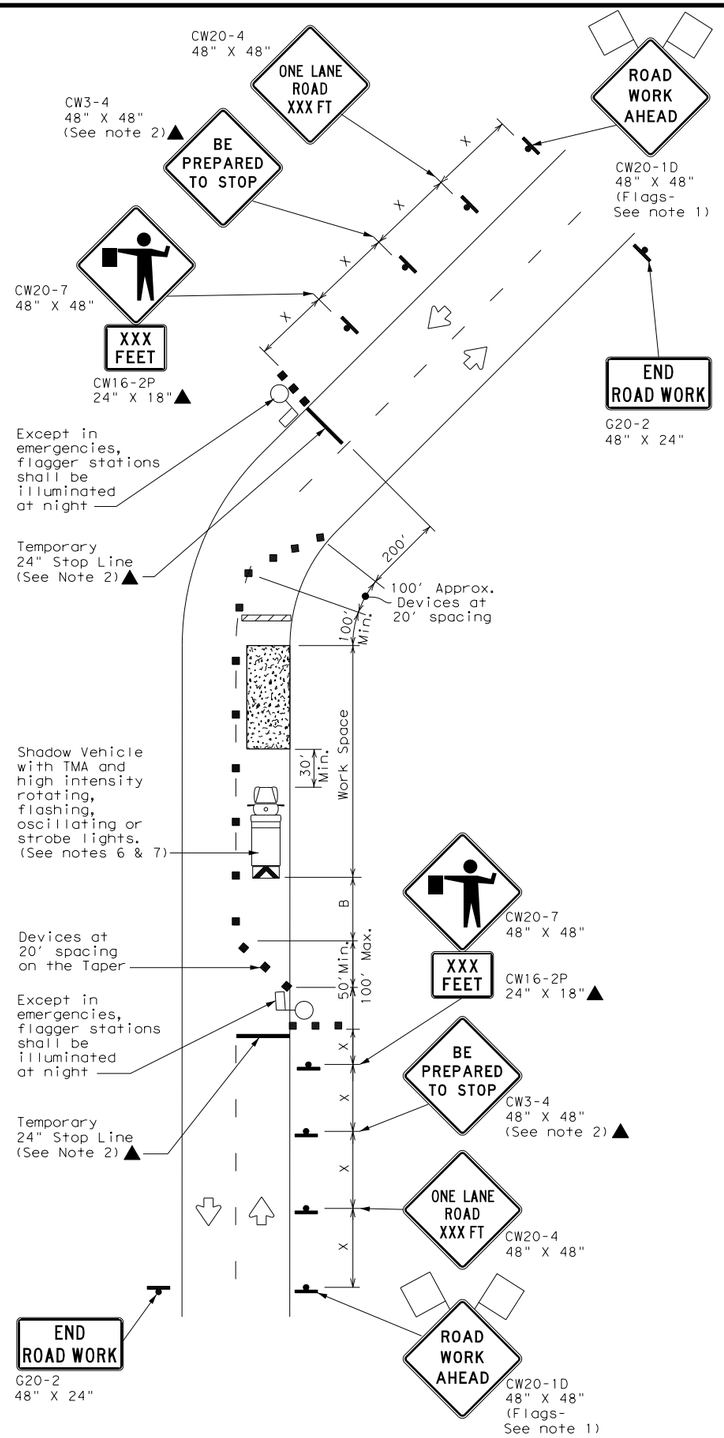
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	WAC	McLENNAN		75
1-97 2-18				



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	2174	01	018	FM 2311
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	WAC	McLENNAN		76

DATE: 1/31/2024 4:54:45 PM
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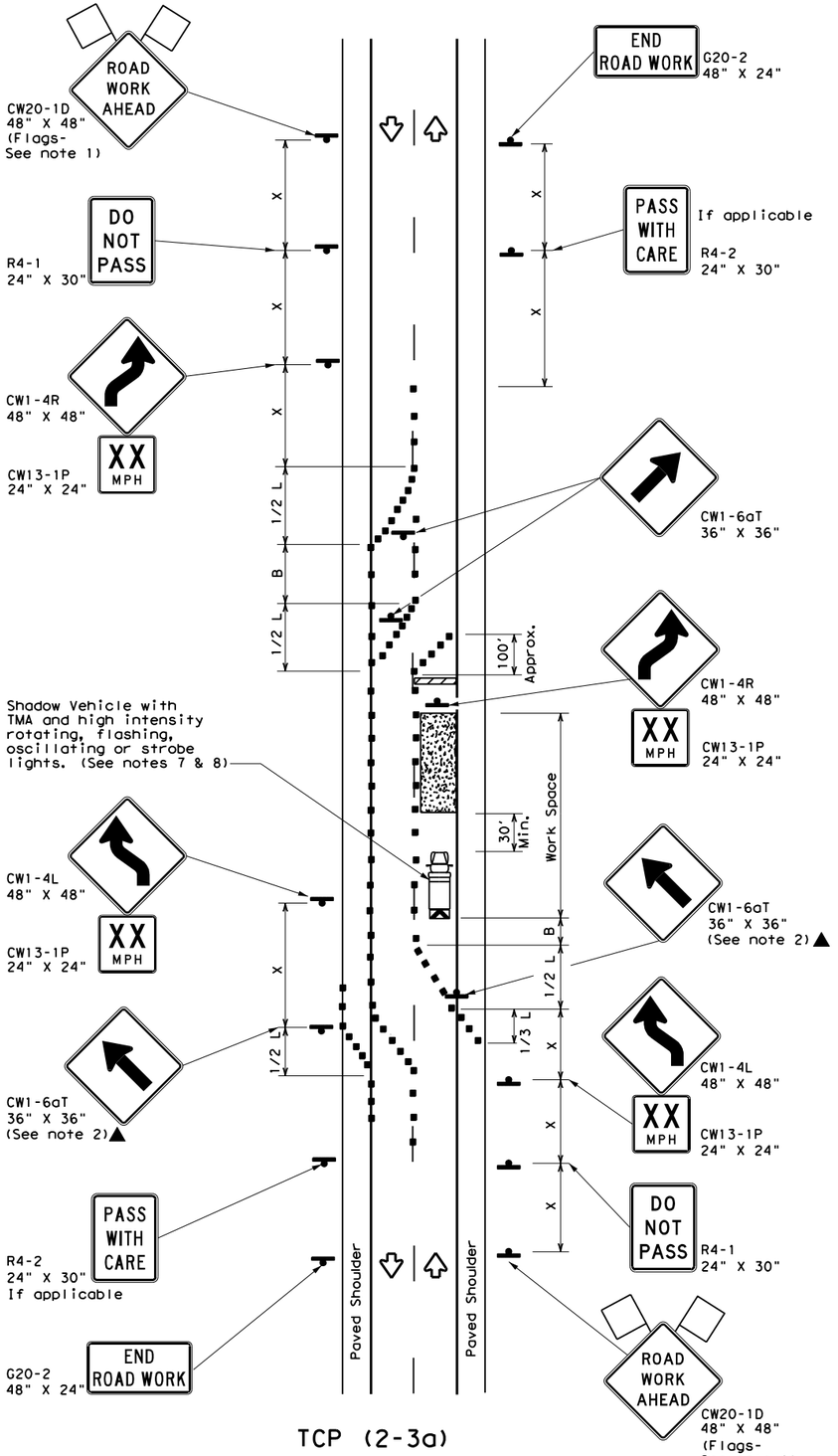
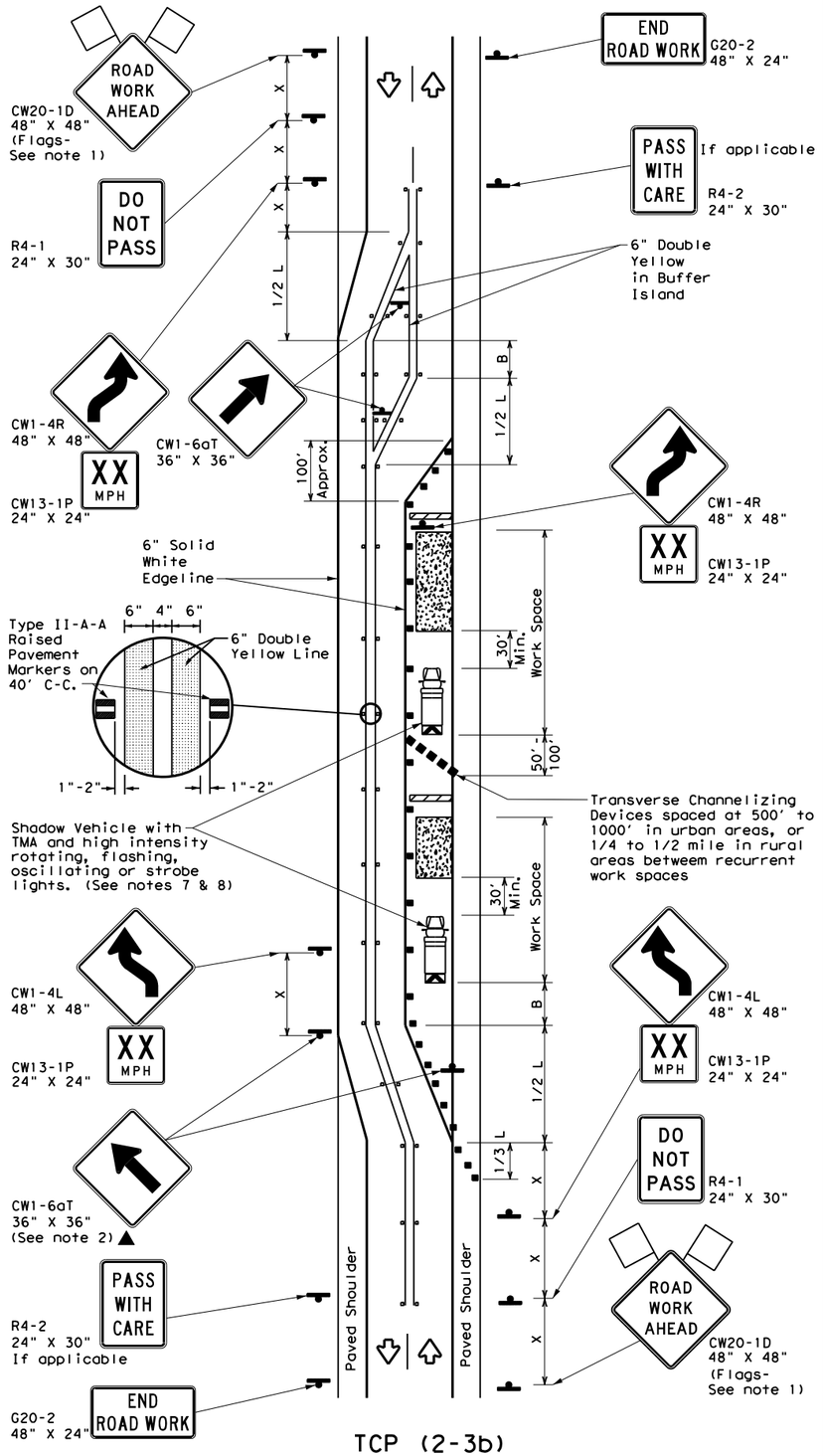


TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



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

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 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
				TCP(2-3b)ONLY
			✓	✓

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted.
8. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-3a)

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

Texas Department of Transportation — *Traffic Safety Division Standard*

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-23

FILE: tcp(2-3)-23.dgn	DN:	CK:	DW:	CK:
© TxDOT April 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-85 4-98 2-18	2174	01	018	FM 2311
8-95 3-03 4-23	DIST	COUNTY		SHEET NO.
1-97 2-12	WAC	McLENNAN		77

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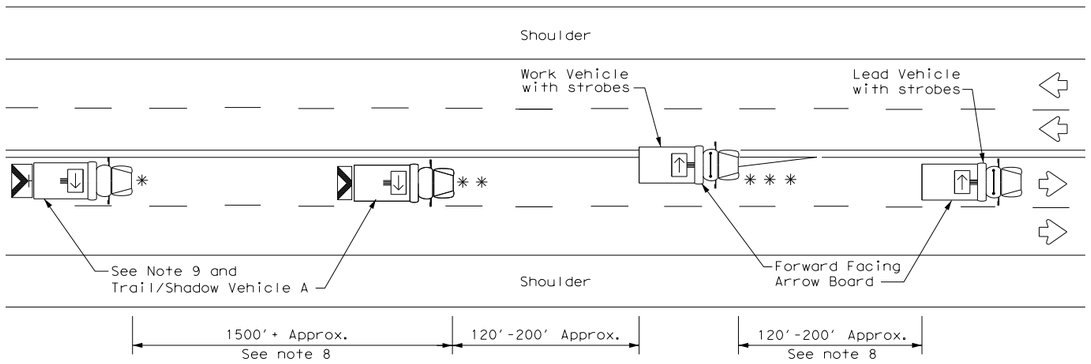
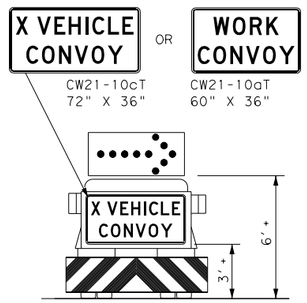


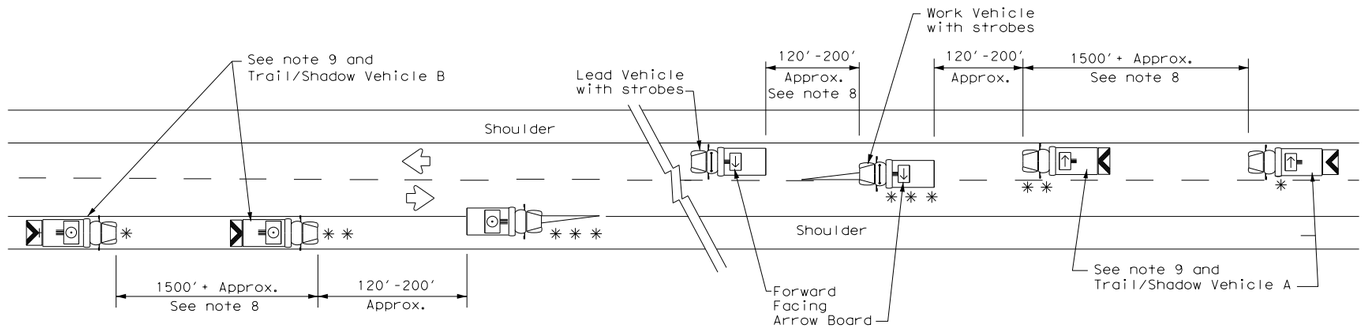
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional
display Flashing Arrow Board

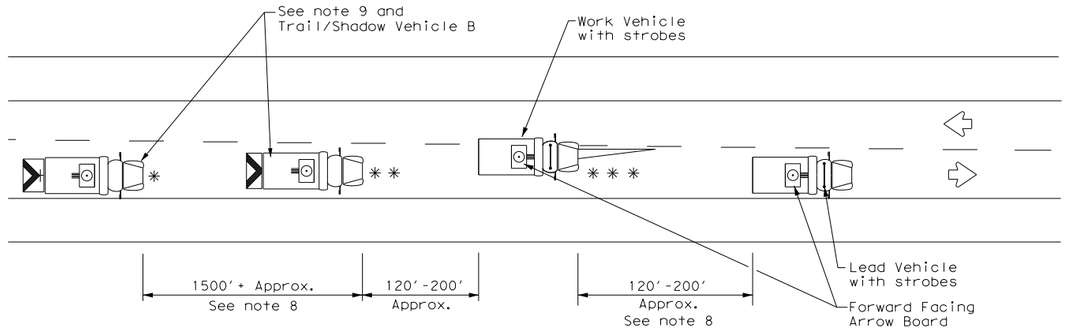


WORK ON SHOULDER

WORK ON TRAVEL LANE

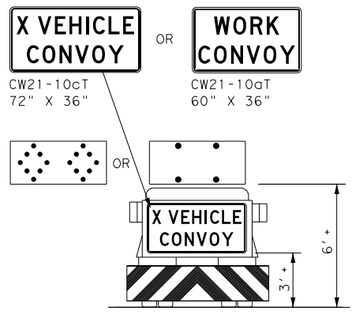
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

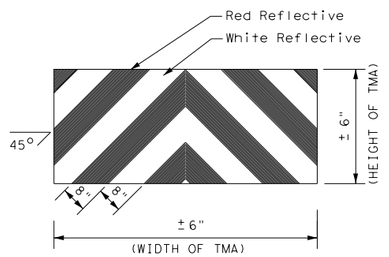
with Flashing Arrow Board
in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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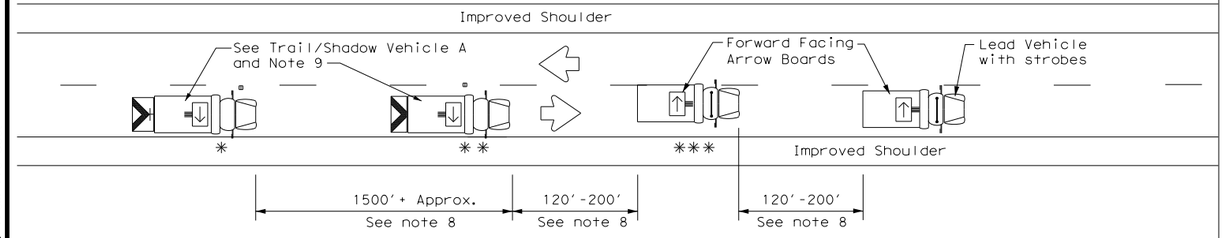
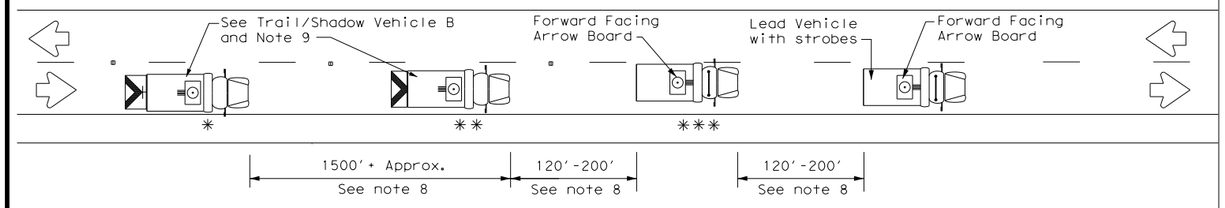


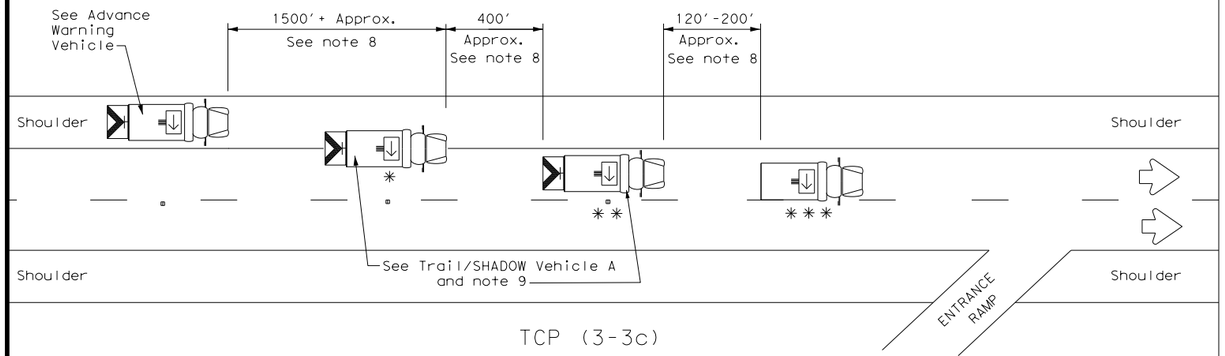
TCP (3-3a)

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



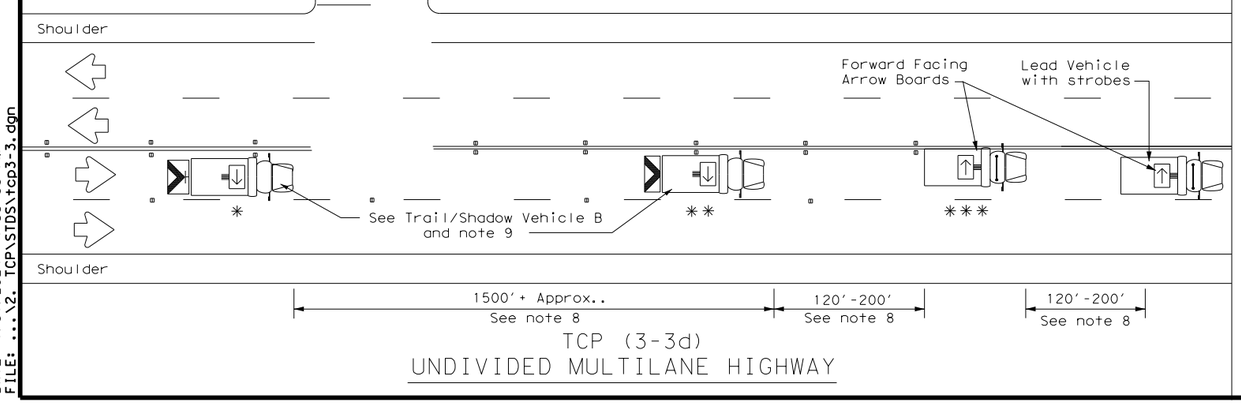
TCP (3-3b)

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



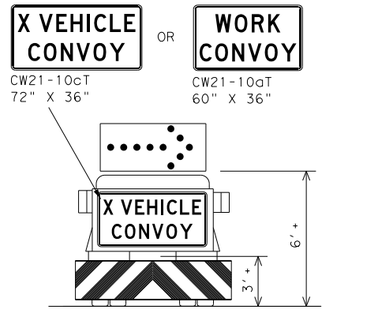
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



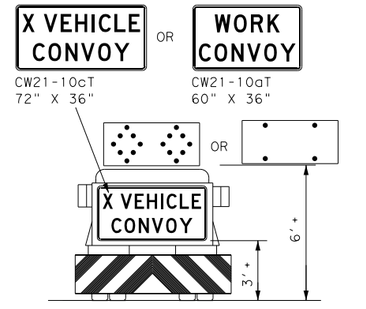
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



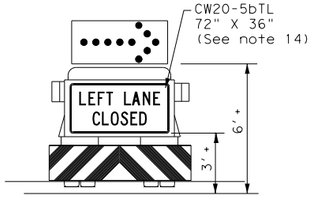
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

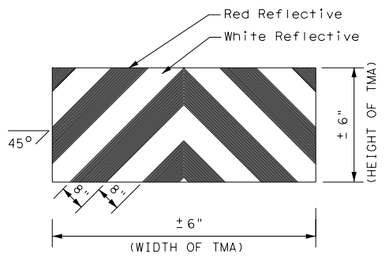


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

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

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©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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8-95 7-13	WAC	McLENNAN		79
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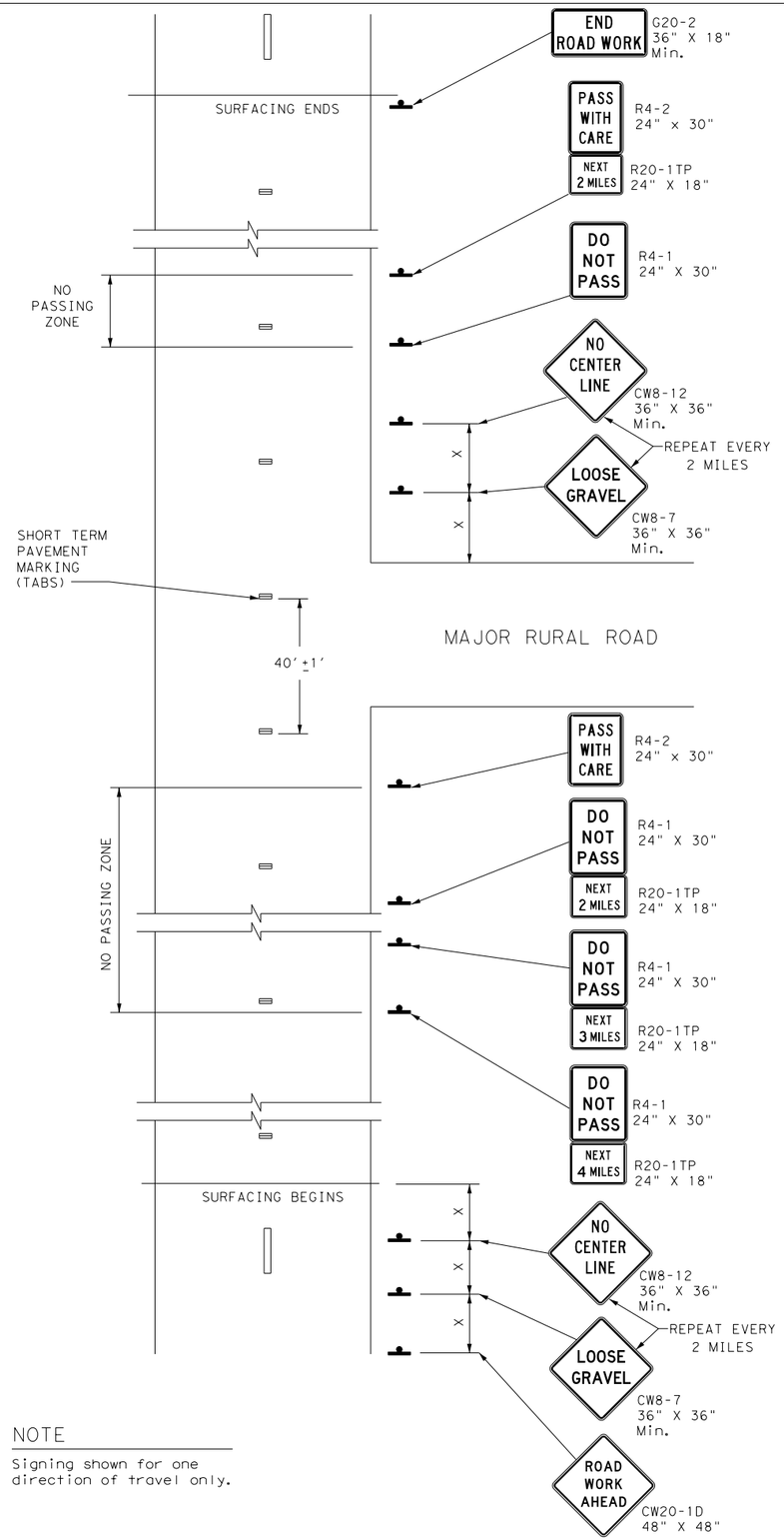
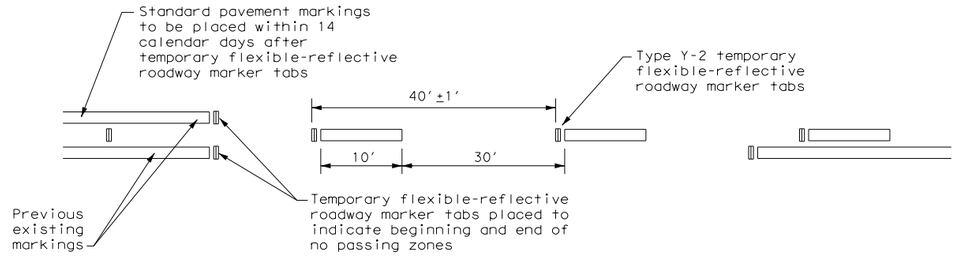


NOTE

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

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© TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
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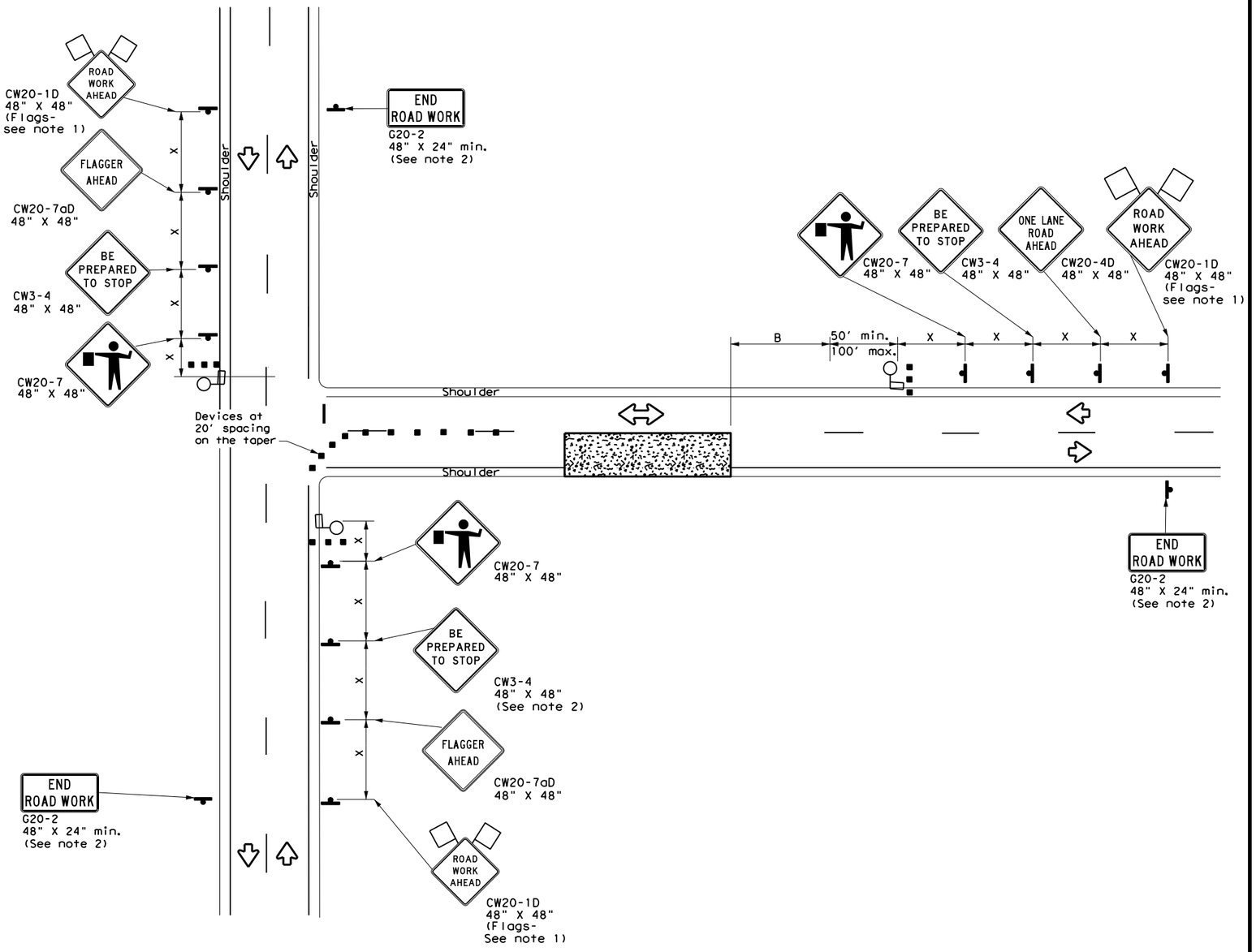

ONE LANE TWO-WAY (T-INTERSECTION) CONTROL WITH PILOT VEHICLE

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing Distance "X"	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: if project signing is present, END ROAD WORK (G20-2) sign is optional with approval by the Engineer.
3. Flaggers should use two-way radios or other methods of communication at all times for traffic control coordination.
4. Flaggers should use 24" STOP (CW20-8) / SLOW (CW20-8aT) paddles to control traffic. Flags should be limited to emergency situations.
5. 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).
6. Temporary rumble strips are not required on seal coat operations.
7. The pilot car is used to guide vehicles through traffic control zone. The pilot car shall have an identification name displayed and PILOT CAR, FOLLOW ME (G20-4) sign or message board mounted in a conspicuous position on rear.

Texas Department of Transportation

Traffic Safety Division Standard

TRAFFIC CONTROL PLAN SEAL COAT OPERATIONS NEAR INTERSECTION

TCP(SC-4)-22

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©TxDOT October 2022	CONT	SECT	JOB	HIGHWAY
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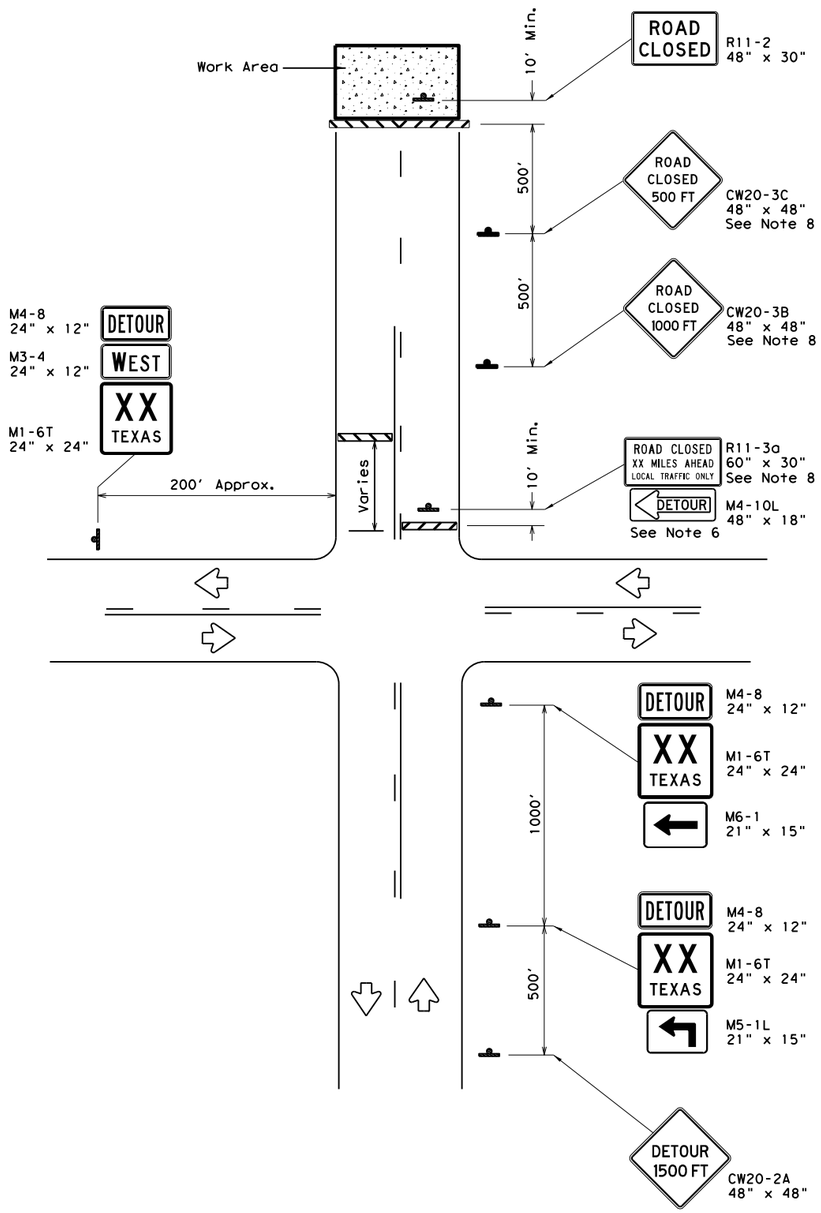
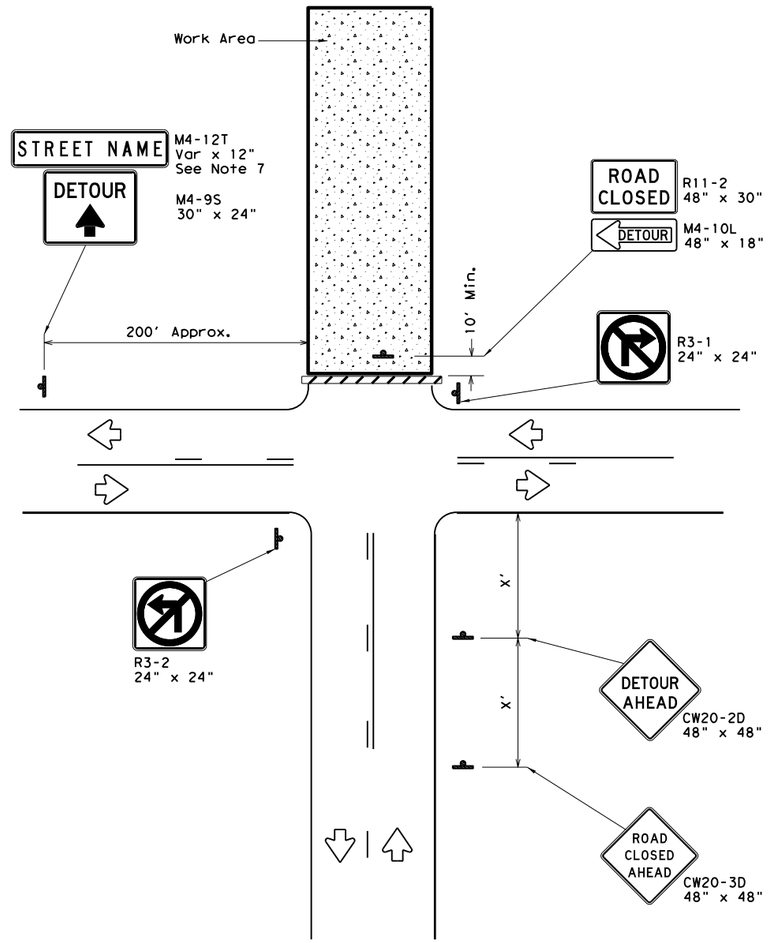


ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

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

GENERAL NOTES

1. This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&OM standards.
2. Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices list (CWZTCD).
3. Stockpiled materials shall not be placed on the traffic side of barricades.
4. Barricades at the road closure should extend from pavement edge to pavement edge.
5. Detour signing shown is intended to illustrate the type of signing that is appropriate for numbered routes or un-numbered routes as labeled. It does not indicate the full extent of detour signing required. Detour routes should be signed as shown elsewhere in the plans.
6. If the road is open for a significant distance beyond the intersection or there are significant origin/destination points beyond the intersection, the signs and barricades at this location should be located at the edge of the traveled way.
7. The Street Name (M4-12T) sign is to be placed above the DETOUR (M4-9S) sign.
8. For urban areas where there is a shorter distance between the intersection and the actual closure location, the ROAD CLOSED XX MILES AHEAD (R11-3a) sign may be replaced with a ROAD CLOSED TO THRU TRAFFIC (R11-4) sign. If adequate space does not exist between the intersection and the closure a single ROAD CLOSED AHEAD (CW20-3D) sign spaced as per the table above may replace the ROAD CLOSED 1000 FT (CW20-3B) and ROAD CLOSED 500 FT (CW20-3C) signs.
9. Signs and barricades shown shall be subsidiary to Item 502. Locations where these details will be required shall be as shown elsewhere in the plans.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

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©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
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2-98 3-03	WAC	McLENNAN		82

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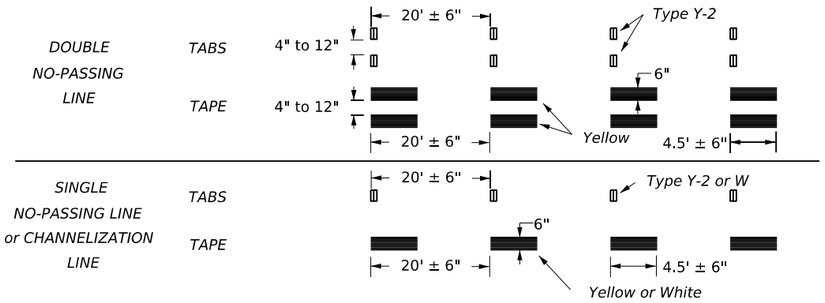
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



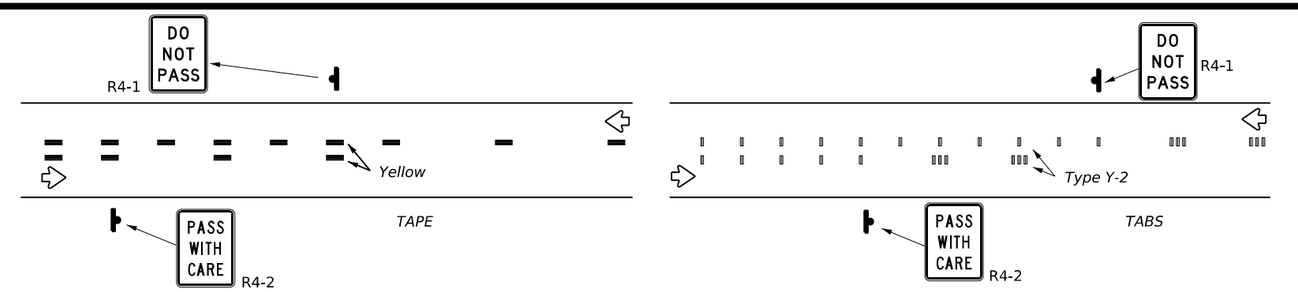
NOTES:

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.

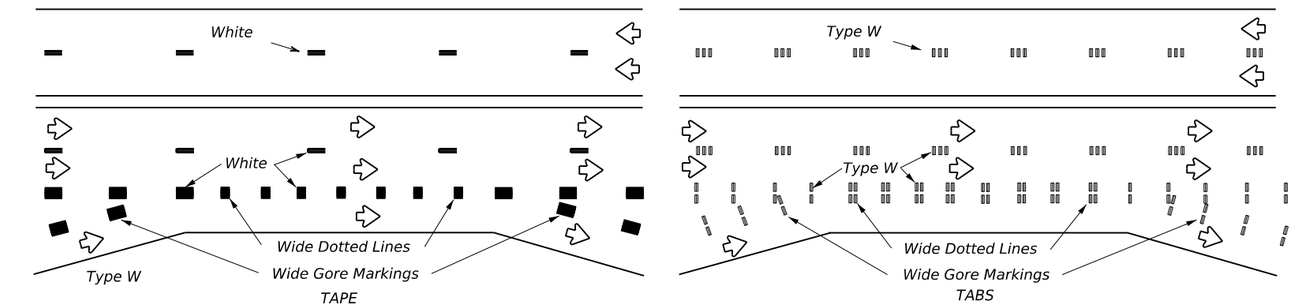
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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.

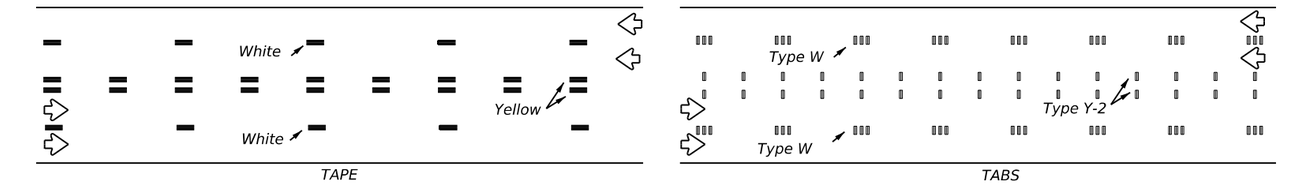
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



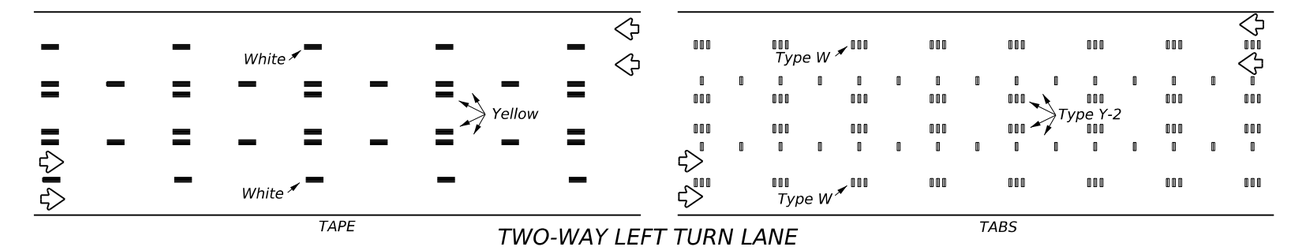
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



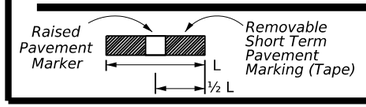
LANE LINES FOR DIVIDED HIGHWAY



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 Safety Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-23

FILE: wzstpm-23.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2023	CONT	SECT	JOB	HIGHWAY
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4-92 7-13 1-97 2-23 3-03	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		83

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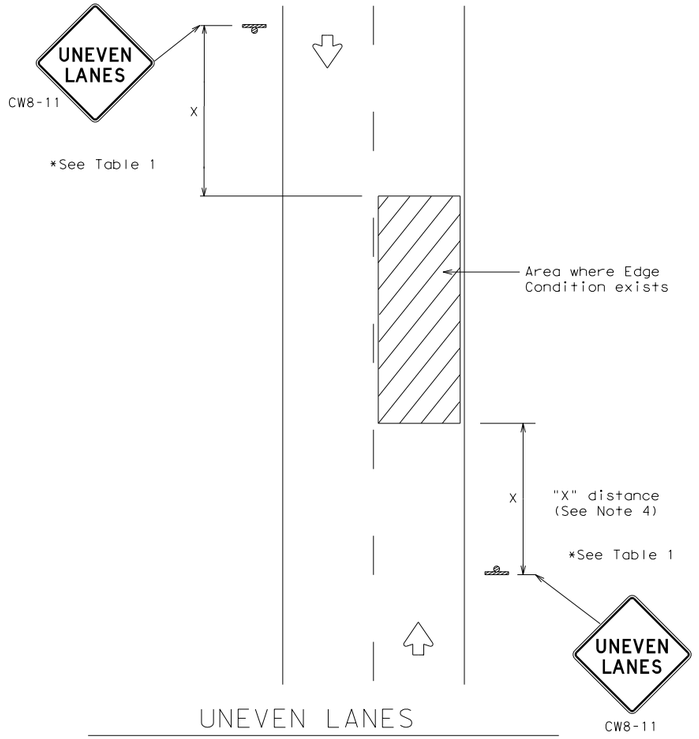
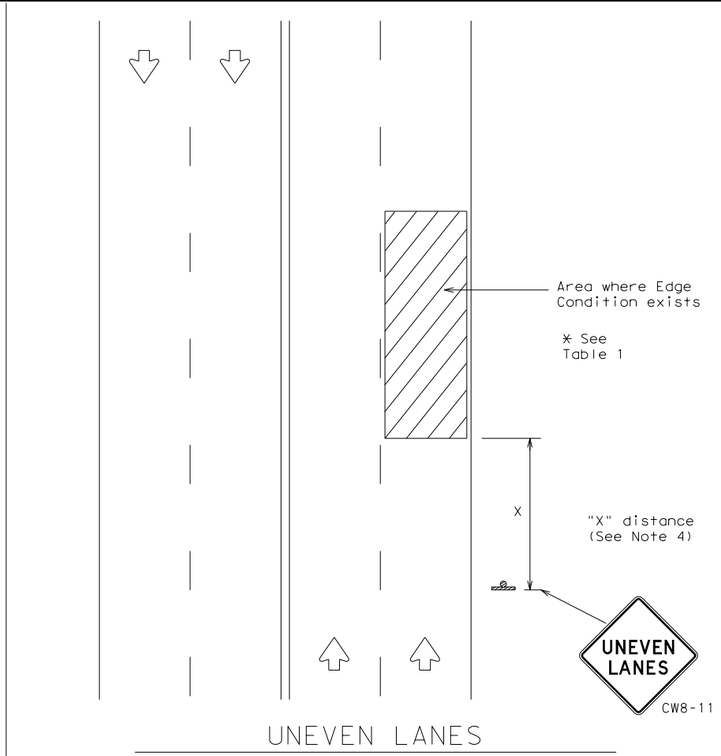


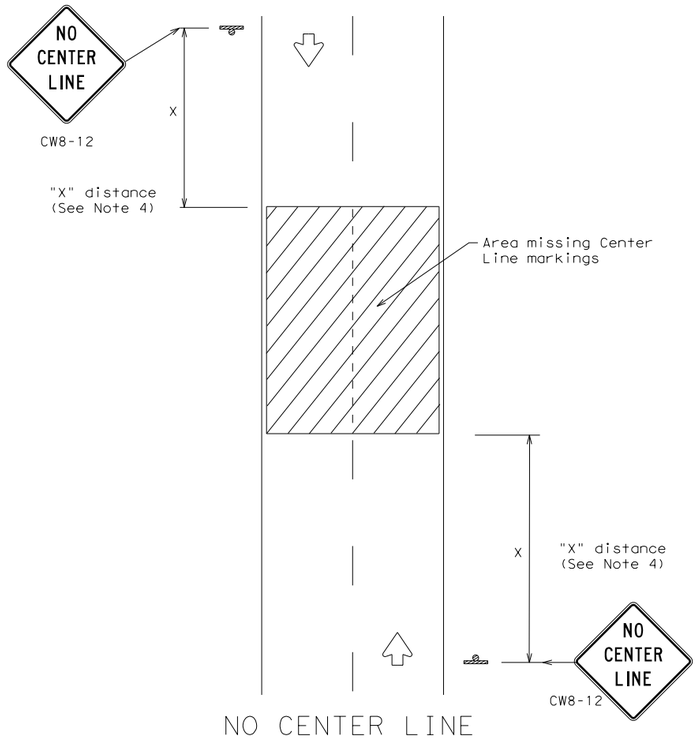
UNEVEN LANES

TWO LANE CONVENTIONAL ROAD



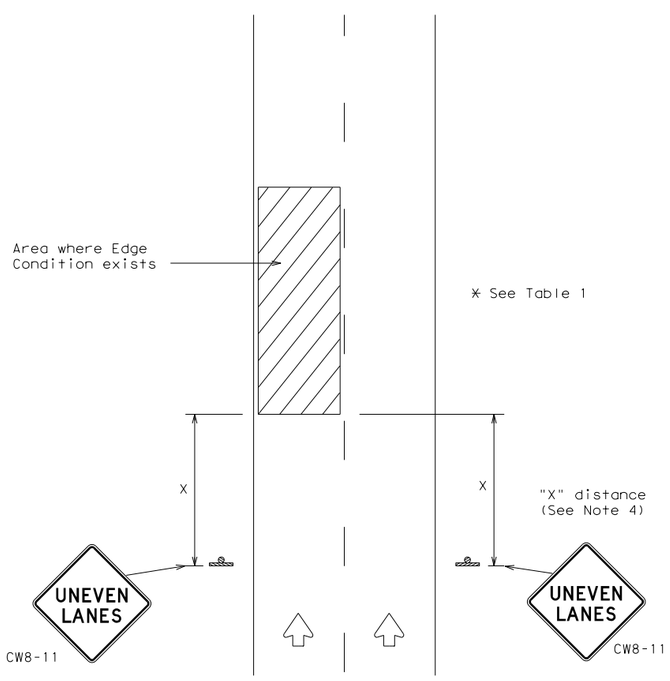
UNEVEN LANES

FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE

TWO LANE CONVENTIONAL ROAD



UNEVEN LANES

DIVIDED ROADWAY

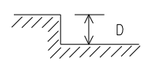
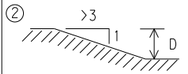
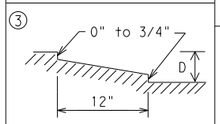
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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	2174	01	018	FM 2311
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	WAC	McLENNAN		84

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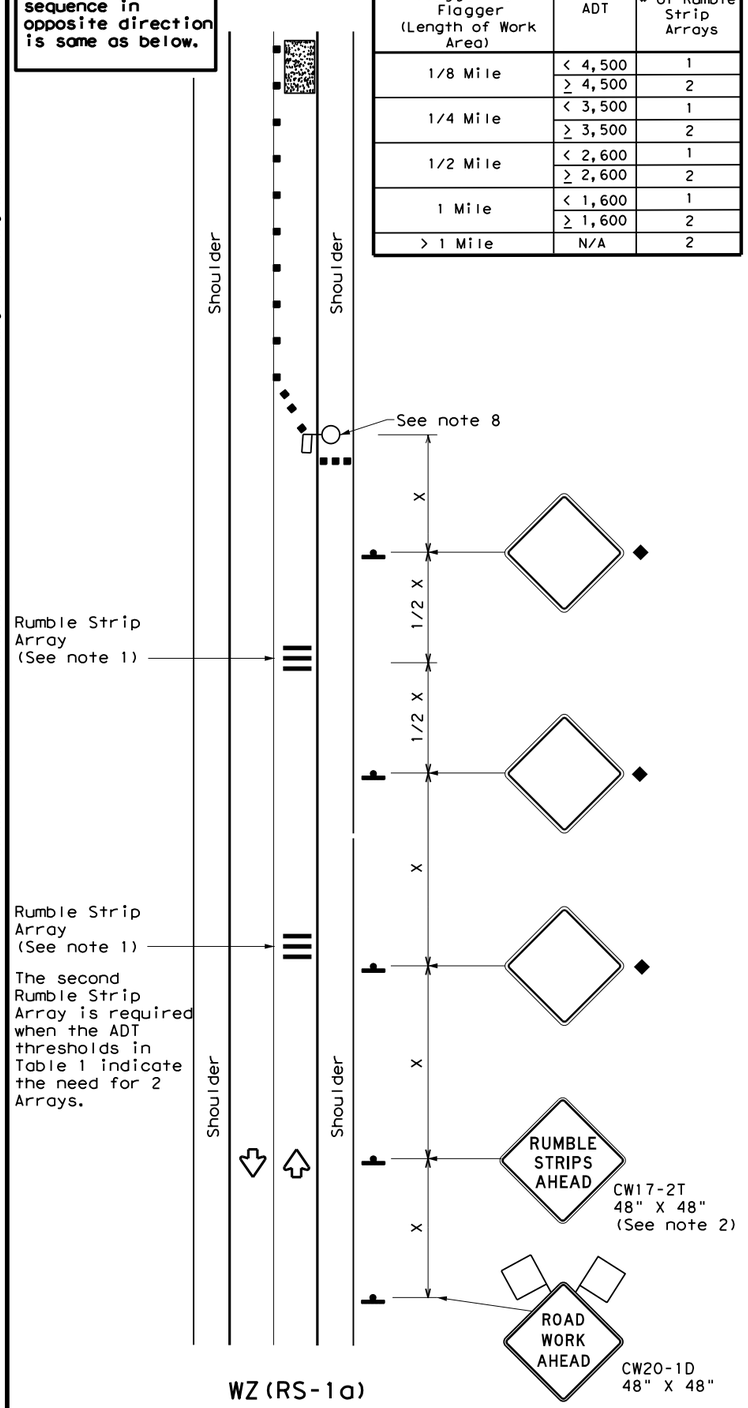
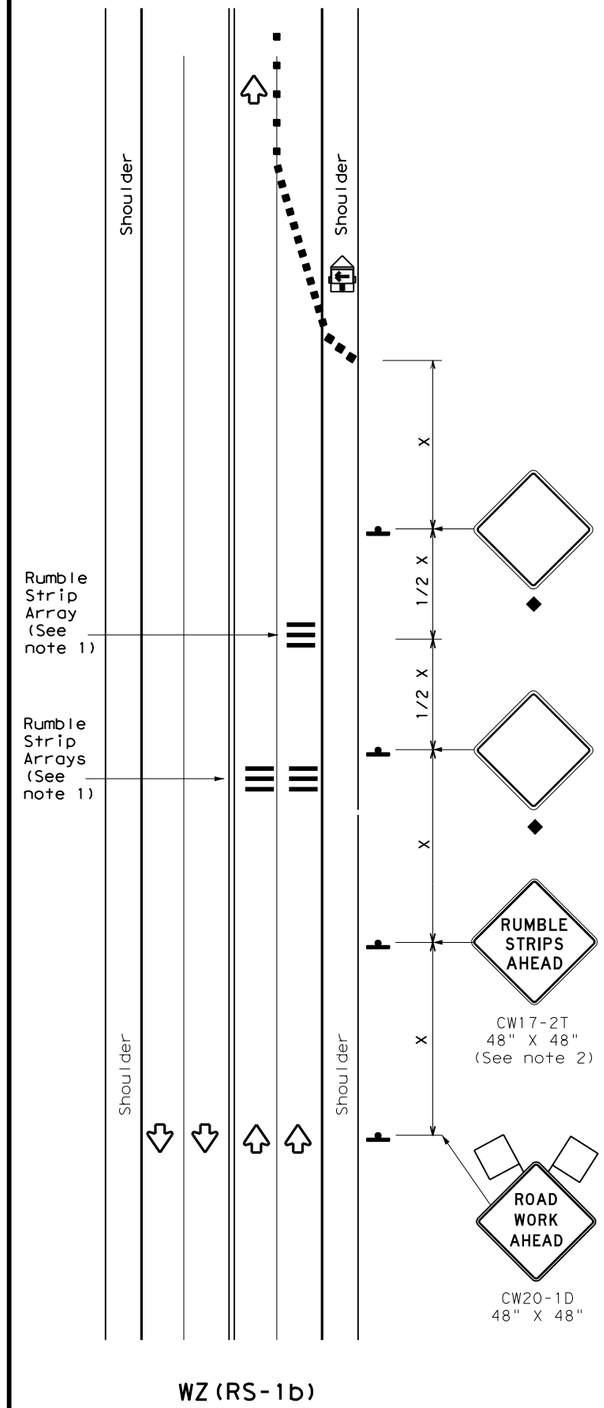
Warning sign and rumble strip sequence in opposite direction is same as below.

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

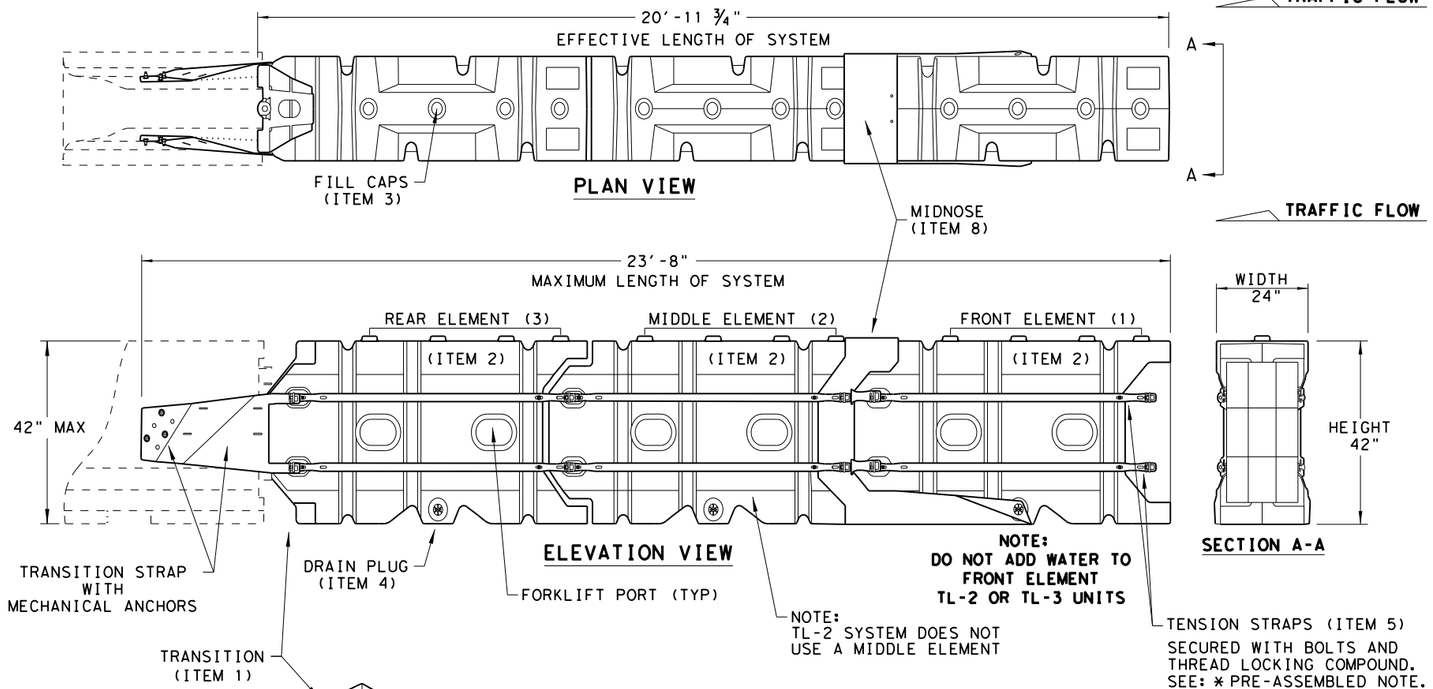
TEMPORARY RUMBLE STRIPS

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	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		85

117

SYSTEM SHOWN - ABSORB-M TL-3



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

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

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

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

GENERAL NOTES

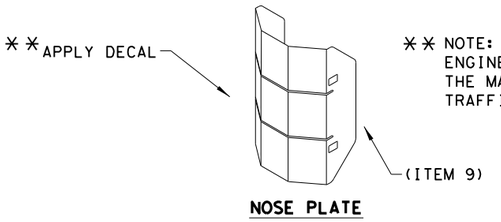
1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. THE ABSORB-M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

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

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE

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



NOSE PLATE

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

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

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

SACRIFICIAL

Texas Department of Transportation — Design Division Standard

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

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		85A

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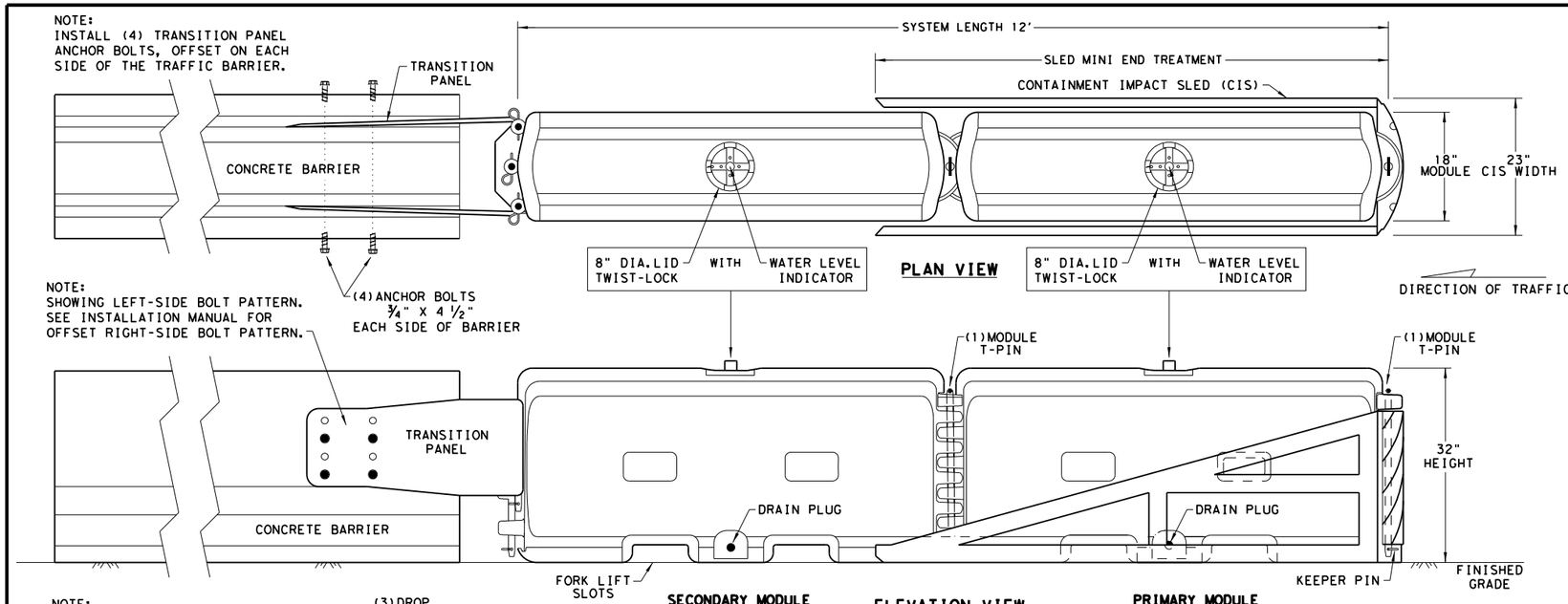
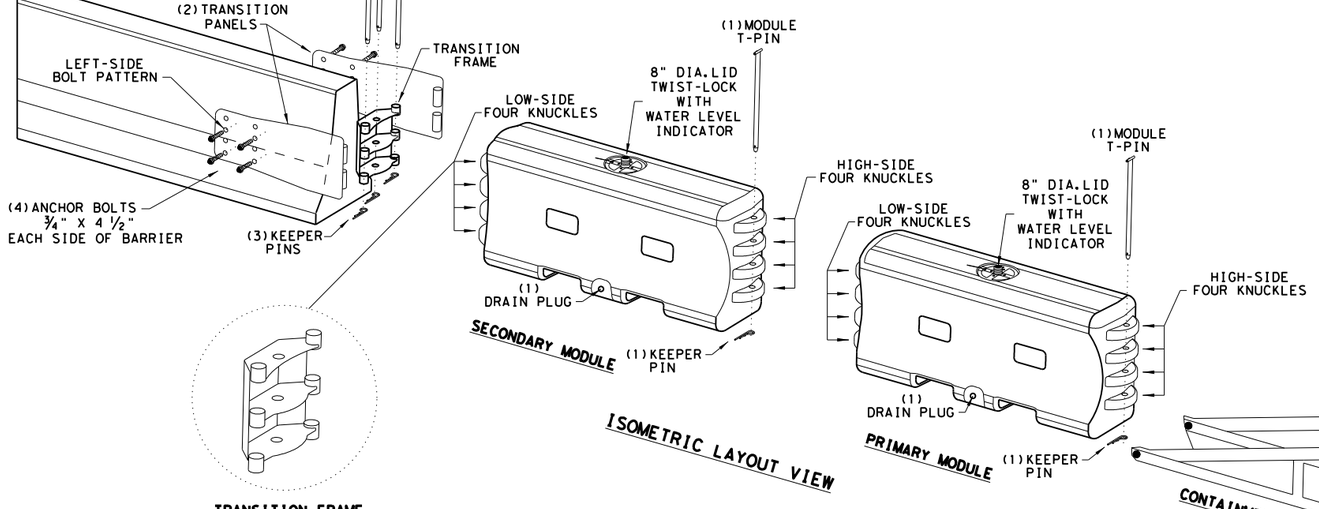




GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT TrafFix Devices, Inc. AT 1(949)361-5663
2. THE SLED MINI IS A MASH APPROVED TEST LEVEL 2 (TL-2) CRASH CUSHION APPROVED FOR USE WITHIN TEMPORARY WORK ZONE LOCATIONS. TL-2 IS APPROVED FOR SPEEDS OF 45 MPH OR LESS.
3. THE SLED MINI IS A GATING, NON-REDIRECTIVE CRASH CUSHION THAT DOES NOT NEED TO BE BOLTED TO THE GROUND AND CAN BE INSTALLED ON CONCRETE, ASPHALT, GRAVEL OR COMPACTED SOIL.
4. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, AND DEPRESSIONS.
5. THE SLED MINI CAN BE ATTACHED TO CONCRETE BRIDGE ABUTMENTS, CONCRETE BARRIER, STEEL BARRIER AND PLASTIC BARRIER.

SLED MINI TL-2 - BILL OF MATERIALS

QTY:	PART #	PART DESCRIPTIONS
2	45332-MY	WATER FILLED MODULE
2	45032-CPGAL	T-PINS - LENGTH 26" WITH KEEPER PINS - FOR MODULES
2	18009-B-I	WATER LEVEL INDICATOR FLOAT LID
1	45032-S	CONTAINMENT IMPACT SLED (CIS)
2	45151	UNIVERSAL TRANSITION PANELS
1	45132	TRANSITION FRAME
1	45141	DROP PIN - LENGTH 26.50" WITH KEEPER PIN
2	45142	DROP PINS - LENGTH 18.50" WITH KEEPER PINS
8	45050	TRANSITION PANEL ANCHOR BOLTS ¾" X 4 ½" (4 EA. SIDE)

MODULE SPECIFICATIONS	(CIS) SPECIFICATIONS
LENGTH: 73" (PIN TO PIN)	LENGTH: 87 ⅞"
HEIGHT: 32"	HEIGHT: 32"
WIDTH: 18"	WIDTH: 23"
EMPTY WEIGHT: 110 lbs.	APPROX. WEIGHT: 1250 lbs.
FILLED WEIGHT: 1100 lbs.	
FILL CAPACITY: 118.5 Gal	

NOTES:
✳ SEE DELINEATION GUIDE FOR DECAL PLACEMENT.
SEE INSTALLATION MANUAL FOR CUSTOMIZED DELINEATION NOSE SHEETING FOR DECAL PLACEMENT.

DELINEATION DECAL PLACEMENT GUIDE

TRAFFIC FLOW ON LEFT-SIDE OF BARRIER

TRAFFIC FLOW ON BOTH-SIDES OF BARRIER

TRAFFIC FLOW ON RIGHT-SIDE OF BARRIER

✳ NOTE:
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. THE ORIENTATION BETWEEN THE LEFT-SIDE AND RIGHT-SIDE TRAFFIC IS CHANGED BY ROTATING THE DECAL 90 DEGREES AND REINSTALLING.

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

SACRIFICIAL

Texas Department of Transportation

Design Division Standard

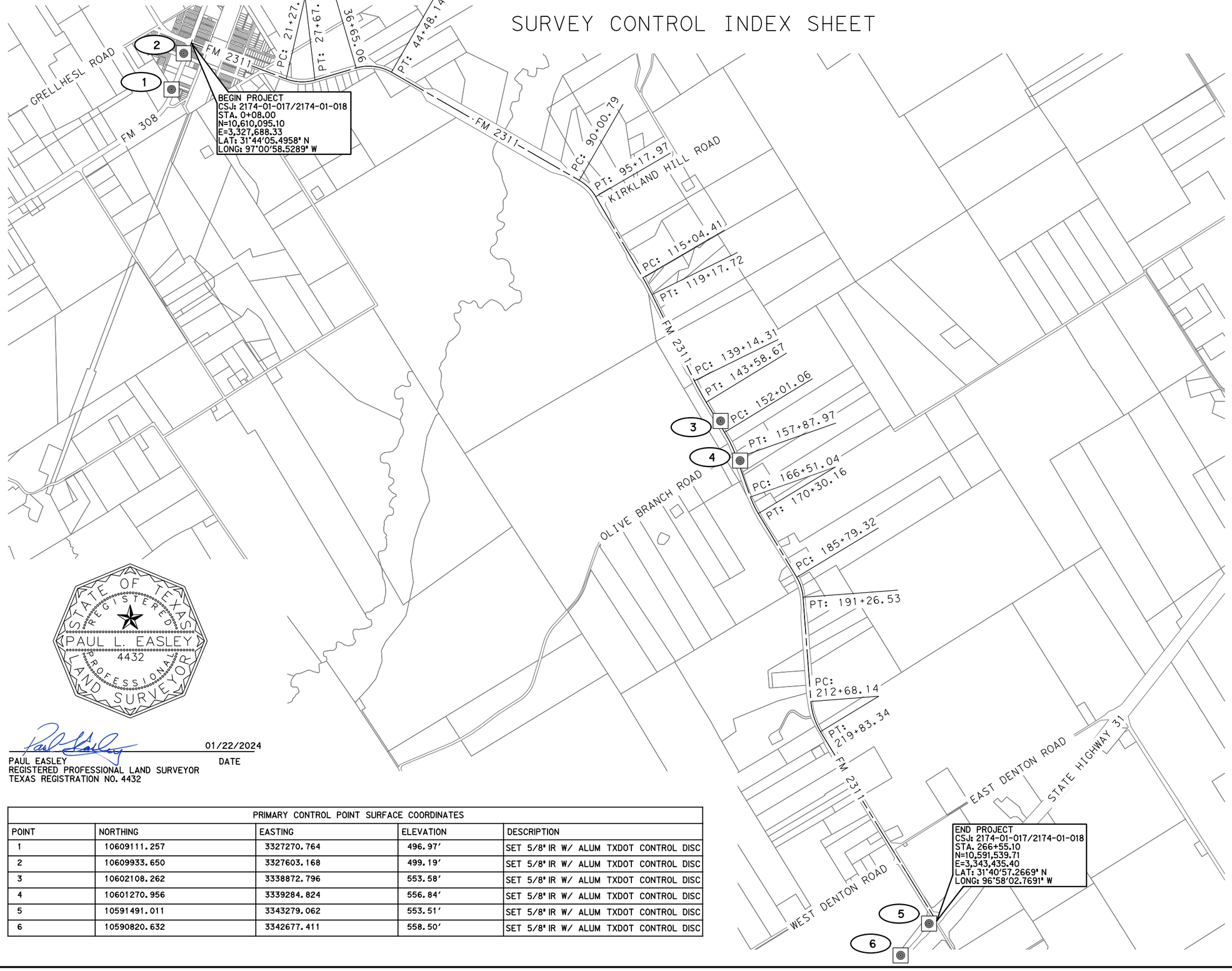
SLED MINI END TREATMENT TL-2 MASH COMPLIANT (TEMPORARY, WORK ZONE)

SLEDMINI-19

FILE: sledmini19	DN: TxDOT	CK: KM	DN: VP	CK:
©TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		85B

DATE: 3/25/2024
FILE: ...\2. TCP\STDS\sledmini19.dgn

SURVEY CONTROL INDEX SHEET



0 1000' 2000' 3000' 4000'

SCALE: 1"=2000'

LEGEND

5/8IN-IRON ROD W/ ALUMINUM DISC STAMPED "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"

NOTES:

1. BASIS OF BEARINGS IS THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE 4203, NAD 83 (2011), EPOCH 2010.00. ALL COORDINATES AND DISTANCES ARE U.S. SURVEY FEET, SHOWN IN SURFACE VALUES AND MAY BE CONVERTED TO GRID USING THE SURFACE ADJUSTMENT FACTOR OF 1.00012.

2. HORIZONTAL CONTROL WAS ESTABLISHED USING THE TXDOT RTK NETWORK.

3. ELEVATIONS ARE BASED ON NAVD88 VALUES, GEOID 18, AND OBTAINED BY USING THE TXDOT RTK NETWORK.

4. FIELD SURVEYS WERE CONDUCTED DECEMBER 2022.

5. THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

STATE OF TEXAS
REGISTERED
PAUL L EASLEY
4432
PROFESSIONAL
LAND SURVEYOR

01/22/2024

PAUL EASLEY — DATE
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 4432

PRIMARY CONTROL POINT SURFACE COORDINATES

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	10609111.257	3327270.764	496.97'	SET 5/8" IR W/ ALUM TXDOT CONTROL DISC
2	10609933.650	3327603.168	499.19'	SET 5/8" IR W/ ALUM TXDOT CONTROL DISC
3	10602108.262	3338872.796	553.58'	SET 5/8" IR W/ ALUM TXDOT CONTROL DISC
4	10601270.956	3339284.824	556.84'	SET 5/8" IR W/ ALUM TXDOT CONTROL DISC
5	10591491.011	3343279.062	553.51'	SET 5/8" IR W/ ALUM TXDOT CONTROL DISC
6	10590820.632	3342677.411	558.50'	SET 5/8" IR W/ ALUM TXDOT CONTROL DISC

HALFF
13620 BRIARWICK DRIVE, SUITE 100
AUSTIN, TEXAS 78729
TEL (512) 777-4600
FAX (512) 252-8141
TBPELS SURVEYING FIRM #10029607

SHEET 1 of 1

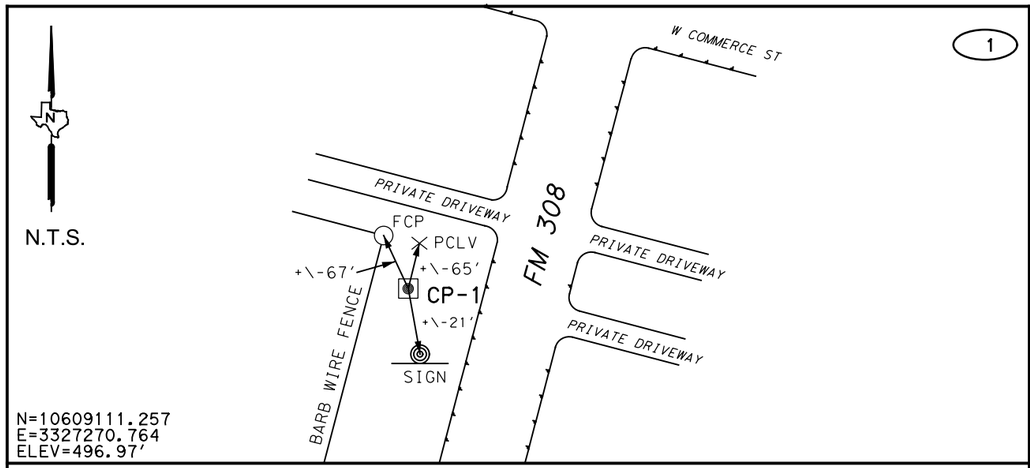
SURVEY CONTROL INDEX

Texas Department of Transportation

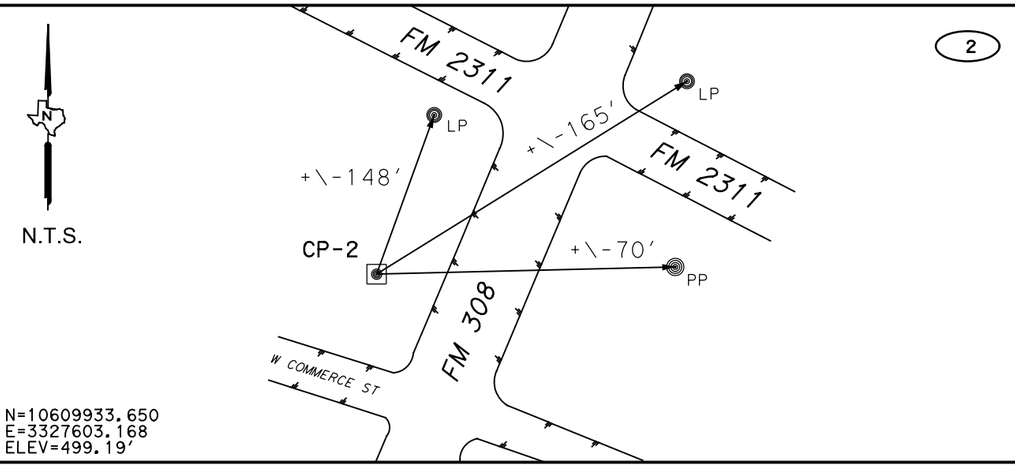
FEDERAL AID PROJECT NO.	FEDERAL ROAD DIVISION NO.

	CONT	SECT	JOB	HIGHWAY
	2174	01	17	FM 2311
	2174	01	18	
STATE	DIST	COUNTY		SHEET NO.
TEXAS	9	MCLENNAN		86

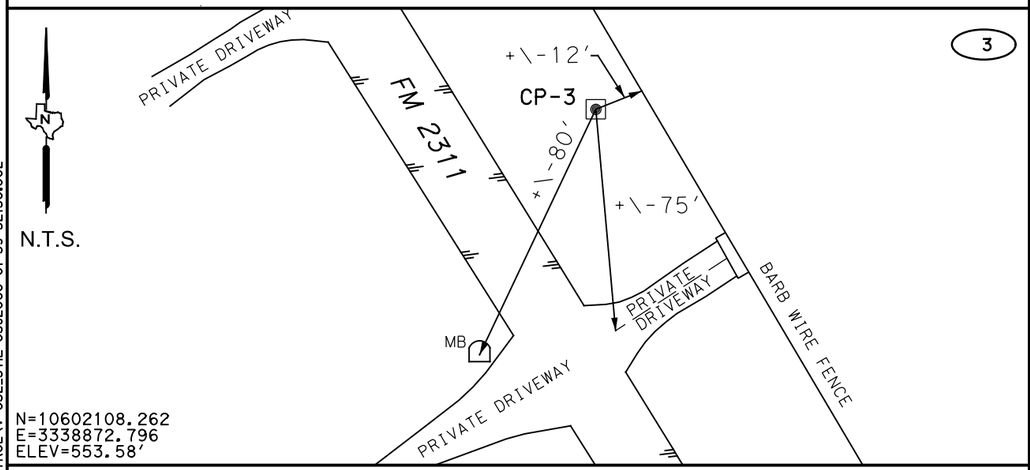
DATE: 1/22/2024 12:41:32 PM
FILE: I:\CADD\REFERENCESAUS\CSJ2174-01-17-52150.002_CONTROL\V-CS-CSJ2174-01-17-52150.002



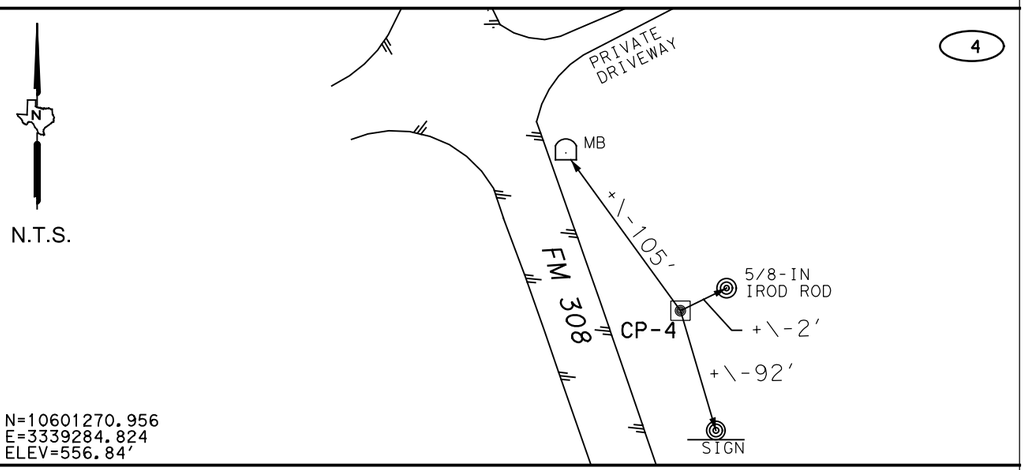
CONTROL POINT 1 IS LOCATED IN THE WEST RIGHT-OF-WAY OF FM 308, 350' NORTHEAST OF S 1ST ST, +/- 21 FEET NORTHWEST FROM A ROAD SIGN, +/- 67 FEET SOUTHEAST OF A FENCE CORNER POST, AND +/-65 FEET SOUTHWEST OF A PIPE CULVERT.



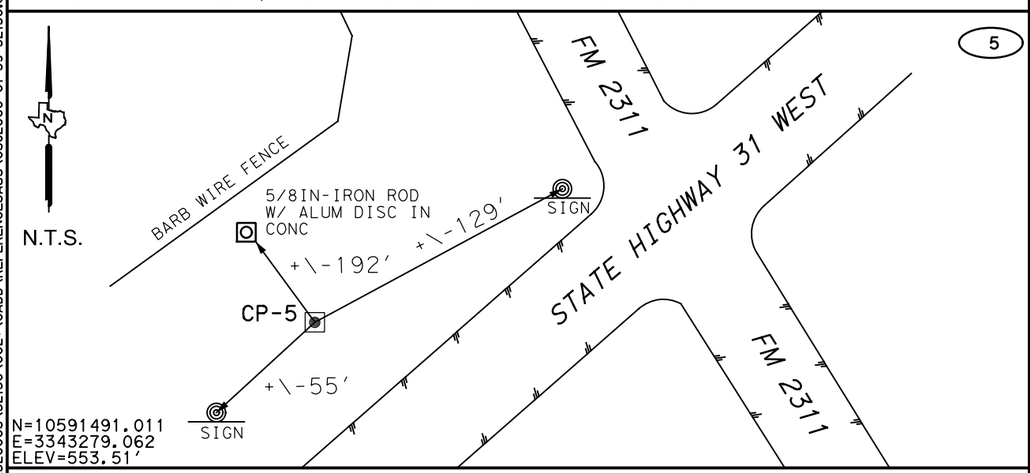
CONTROL POINT 2 IS LOCATED IN THE WEST RIGHT-OF-WAY OF FM 308, +/-161 FEET NORTH OF W COMMERCE ST, +/- 70 FEET WEST OF A POWER POLE, +/-148 FEET SOUTHWEST OF A METAL LIGHT POLE, AND +/-165 FEET SOUTHWEST OF A METAL LIGHT POLE.



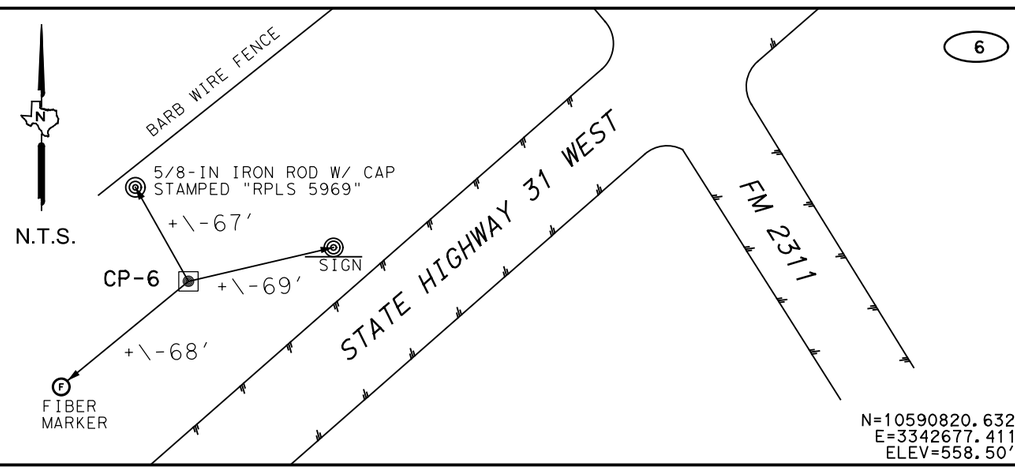
CONTROL POINT 3 IS LOCATED 0.15 MILES NORTH OF OLIVE BRANCH DR AND IN THE EAST RIGHT-OF-WAY OF FM 308, +/-75 FEET NORTHWEST OF THE CENTERLINE OF A GRAVEL DRIVEWAY, +/-80 FEET NORTHEAST OF A MAILBOX, AND +/- 12 FEET WEST OF A BARB WIRE FENCE.



CONTROL POINT 4 IS LOCATED IN THE EAST RIGHT OF WAY OF FM 308 AND +/-144' SOUTH OF A GRAVEL DRIVEWAY, +/-105' SOUTHEAST OF A MAILBOX, +/-2' WEST OF A PROPERTY CORNER (5/8" ROD) AND 92' NORTHWEST FROM A ROAD SIGN. (OLIVE BRANCH RD)



CONTROL POINT 5 IS LOCATED AT THE INTERSECTION OF THE NORTH RIGHT-OF-WAY OF STATE HIGHWAY 31 WEST AND WEST RIGHT-OF-WAY OF FM 2311, +/-55 NORTHEAST OF A 31 WEST SIGN, +/-192' SOUTHEAST OF A SURVEY MARKER (BRASS CAP IN CONCRETE/TEXAS DEPARTMENT OF TRANSPORTATION), AND +/-129' SOUTHWEST OF A STOP SIGN.



CONTROL POINT 6 IS LOCATED IN THE NORTH RIGHT-OF-WAY OF STATE HIGHWAY 31 WEST, +/- 69' SOUTHWEST FROM A ROAD SIGN (BELLMEAD 10/ WACO 13), +/-68' NORTHEAST FROM A FIBER OPTIC MARKER(FIBERLIGHT), +/-67' SOUTHEAST FROM A PROPERTY CORNER. (RPLS 5969)

LEGEND

- 5/8IN-IRON ROD W/ ALUMINUM DISC STAMPED "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"
- FENCE CORNER POST
- SIGN
- MAILBOX
- POWER POLE
- LIGHT POLE
- PIPE CULVERT
- FIBER OPTIC MARKER
- EDGE OF PAVEMENT
- CENTERLINE
- BARB WIRE FENCE

NOTES:

1. BASIS OF BEARINGS IS THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE 4203, NAD 83 (2011), EPOCH 2010.00. ALL COORDINATES AND DISTANCES ARE U.S. SURVEY FEET, SHOWN IN SURFACE VALUES AND MAY BE CONVERTED TO GRID USING THE SURFACE ADJUSTMENT FACTOR OF 1.00012.

2. HORIZONTAL CONTROL WAS ESTABLISHED USING THE TXDOT RTK NETWORK.

3. ELEVATIONS ARE BASED ON NAVD88 VALUES, GEOID 18, AND OBTAINED BY USING THE TXDOT RTK NETWORK.

4. FIELD SURVEYS WERE CONDUCTED DECEMBER 2022.

5. THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

STATE OF TEXAS
REGISTERED
PAUL L. EASLEY
4432
PROFESSIONAL
LAND SURVEYOR

01/22/2024
PAUL EASLEY — DATE
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 4432

HALFF
13620 BRIARWICK DRIVE, SUITE 100
AUSTIN, TEXAS 78729
TEL (512) 777-4600
FAX (512) 252-8141
TBPELS SURVEYING FIRM #10029607

SHEET 1 of 1

HORIZONTAL AND VERTICAL CONTROL

Texas Department of Transportation

FEDERAL AID PROJECT NO.	FEDERAL ROAD DIVISION NO.

	CONT	SECT	JOB	HIGHWAY
	2174	01	17	FM 2311
	2174	01	18	

STATE	DIST	COUNTY	SHEET NO.
TEXAS	9	MCLENNAN	87

DATE: 1/22/2024 2:06:36 PM
FILE: I:\S2000\S52150.002\CADD\REFERENCESAUS\CSJ2060-01-39-52150.002_CONTROL V-CS2_3TIE-CSJ2060-01-39-52150.0

Alignment Name: BL CL-FM_2311
Alignment Description:
Alignment Style: Alignment\Baseline

		Station	Northing	Easting
Element: Linear				
POT	( )	0+08.00 R1	10610089.59	3327698.44
PI	( )	12+00.39 R1	10609669.7	3328814.46
Tangential Direction:	S69°22'54.3"E			
Tangential Length:	1192.39			
Element: Linear				
PI	( )	12+00.39 R1	10609669.7	3328814.46
PI	( )	16+41.61 R1	10609511.05	3329226.17
Tangential Direction:	S68°55'30.8"E			
Tangential Length:	441.23			
Element: Linear				
PI	( )	16+41.61 R1	10609511.05	3329226.17
PC	( )	21+27.05 R1	10609337.62	3329679.57
Tangential Direction:	S69°04'05.6"E			
Tangential Length:	485.43			
Element: Circular				
PC	( )	21+27.05 R1	10609337.62	3329679.57
PI	( )	24+59.14 R1	10609218.98	3329989.75
CC	( )		10610259.49	3330032.18
PT	( )	27+67.75 R1	10609311.97	3330308.56
Radius:	987			
Delta:	37°11'35.54"	Left		
Degree of Curvature (Arc):	05°48'18.16"			
Length:	640.71			
Tangent:	332.1			
Chord:	629.51			
Middle Ordinate:	51.53			
External:	54.37			
Back Tangent Direction:	S69°04'05.6"E			
Back Radial Direction:	S20°55'54.4"W			
Chord Direction:	S87°39'53.3"E			
Ahead Radial Direction:	S16°15'41.1"E			
Ahead Tangent Direction:	N73°44'18.9"E			
Element: Linear				
PT	( )	27+67.75 R1	10609311.97	3330308.56
PC	( )	36+65.06 R1	10609563.24	3331169.97
Tangential Direction:	N73°44'18.9"E			
Tangential Length:	897.31			
Element: Circular				
PC	( )	36+65.06 R1	10609563.24	3331169.97
PI	( )	40+79.32 R1	10609679.24	3331567.65
CC	( )		10608631.43	3331441.76
PT	( )	44+48.14 R1	10609472.34	3331926.55
Radius:	970.64			
Delta:	46°13'29.40"	Right		
Degree of Curvature (Arc):	05°54'10.47"			
Length:	783.09			
Tangent:	414.26			
Chord:	762.02			
Middle Ordinate:	77.91			
External:	84.71			
Back Tangent Direction:	N73°44'18.9"E			
Back Radial Direction:	S16°15'41.1"E			
Chord Direction:	S83°08'56.4"E			
Ahead Radial Direction:	S29°57'48.3"W			
Ahead Tangent Direction:	S60°02'11.7"E			
Element: Linear				
PT	( )	44+48.14 R1	10609472.34	3331926.55
PI	( )	59+80.55 R1	10608706.98	3333254.14
Tangential Direction:	S60°02'11.7"E			
Tangential Length:	1532.41			
Element: Linear				
PI	( )	59+80.55 R1	10608706.98	3333254.14
PI	( )	81+00.18 R1	10607650.31	3335091.6
Tangential Direction:	S60°05'53.4"E			
Tangential Length:	2119.63			
Element: Linear				
PI	( )	81+00.18 R1	10607650.31	3335091.6
PC	( )	90+00.79 R1	10607202.1	3335872.77
Tangential Direction:	S60°09'13.9"E			
Tangential Length:	900.62			
Element: Circular				
PC	( )	90+00.79 R1	10607202.1	3335872.77
PI	( )	92+65.40 R1	10607070.42	3336102.27
CC	( )		10606341.19	3335378.8
PT	( )	95+17.97 R1	10606841.96	3336235.77
Radius:	992.56			
Delta:	29°51'15.53"	Right		
Degree of Curvature (Arc):	05°46'21.11"			
Length:	517.18			
Tangent:	264.6			
Chord:	511.35			
Middle Ordinate:	33.49			
External:	34.66			
Back Tangent Direction:	S60°09'13.9"E			
Back Radial Direction:	S29°50'46.1"W			
Chord Direction:	S45°13'36.1"E			
Ahead Radial Direction:	S59°42'01.7"W			
Ahead Tangent Direction:	S30°17'58.3"E			
Element: Linear				
PT	( )	95+17.97 R1	10606841.96	3336235.77
PC	( )	115+04.41 R1	10605126.87	3337237.97
Tangential Direction:	S30°17'58.3"E			
Tangential Length:	1986.44			
Element: Circular				
PC	( )	115+04.41 R1	10605126.87	3337237.97
PI	( )	117+11.16 R1	10604948.36	3337342.28
CC	( )		10602236.17	3332291.06
PT	( )	119+17.72 R1	10604762.81	3337433.45
Radius:	5729.58			
Delta:	04°07'59.05"	Right		
Degree of Curvature (Arc):	01°00'00.00"			
Length:	413.31			
Tangent:	206.74			
Chord:	413.22			
Middle Ordinate:	3.73			
External:	3.73			
Back Tangent Direction:	S30°17'58.3"E			
Back Radial Direction:	S59°42'01.7"W			
Chord Direction:	S28°13'58.8"E			
Ahead Radial Direction:	S63°50'00.7"W			
Ahead Tangent Direction:	S26°09'59.3"E			
Element: Linear				
PT	( )	119+17.72 R1	10604762.81	3337433.45
PI	( )	130+40.61 R1	10603755	3337928.62
Tangential Direction:	S26°09'59.3"E			
Tangential Length:	1122.89			
Element: Linear				
PI	( )	130+40.61 R1	10603755	3337928.62
PC	( )	139+14.31 R1	10602970.01	3338312.23
Tangential Direction:	S26°02'38.4"E			
Tangential Length:	873.7			
Element: Circular				
PC	( )	139+14.31 R1	10602970.01	3338312.23
PI	( )	141+36.64 R1	10602770.26	3338409.85
CC	( )		10605124.17	3342720.31
PT	( )	143+58.67 R1	10602580.15	3338525.13
Radius:	4906.28			
Delta:	05°11'21.36"	Left		
Degree of Curvature (Arc):	01°10'04.10"			
Length:	444.36			
Tangent:	222.33			
Chord:	444.21			
Middle Ordinate:	5.03			
External:	5.04			
Back Tangent Direction:	S26°02'38.4"E			
Back Radial Direction:	S63°57'21.6"W			
Chord Direction:	S28°38'19.1"E			
Ahead Radial Direction:	S58°46'00.2"W			
Ahead Tangent Direction:	S31°13'59.8"E			
Element: Linear				
PT	( )	143+58.67 R1	10602580.15	3338525.13
PC	( )	152+01.06 R1	10601859.85	3338961.93
Tangential Direction:	S31°13'59.8"E			
Tangential Length:	842.39			
Element: Circular				
PC	( )	152+01.06 R1	10601859.85	3338961.93
PI	( )	154+95.55 R1	10601608.05	3339114.63
CC	( )		10600374.39	3336512.36
PT	( )	157+87.97 R1	10601330.45	3339212.91
Radius:	2864.79			
Delta:	11°44'17.39"	Right		
Degree of Curvature (Arc):	02°00'00.00"			
Length:	586.91			
Tangent:	294.48			
Chord:	585.88			
Middle Ordinate:	15.02			
External:	15.1			
Back Tangent Direction:	S31°13'59.8"E			
Back Radial Direction:	S58°46'00.2"W			
Chord Direction:	S25°21'51.1"E			
Ahead Radial Direction:	S70°30'17.6"W			
Ahead Tangent Direction:	S19°29'42.4"E			

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
1/29/2024
Randy W. Harris, PE

AtkinsRéalis
TBPE REG. # F-474

©2024
Texas Department of Transportation

FM 2311

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		88

DATE: 1/29/2024 2:20:05 PM
FILE: ...\FM 2311 HORIZ DATA.dgn

CK:
DW:
CK:
DW:

Element: Linear				
PT	( )	157+87.97 R1	10601330.45	3339212.91
	EQNBK	157+97.52 R1	10601321.45	3339216.09
	EQNAHD	158+01.49 R2	10601321.45	3339216.09
PI	( )	160+29.11 R2	10601106.87	3339292.06
	Tangential Direction:	S19°29'42.4"E		
	Tangential Length:	237.17		
Element: Linear				
PI	( )	160+29.11 R2	10601106.87	3339292.06
PC	( )	166+51.04 R2	10600520.01	3339497.94
	Tangential Direction:	S19°19'53.8"E		
	Tangential Length:	621.92		
Element: Circular				
PC	( )	166+51.04 R2	10600520.01	3339497.94
PI	( )	168+41.22 R2	10600340.55	3339560.89
CC	( )		10601152.24	3341300.11
PT	( )	170+30.16 R2	10600177.03	3339658.01
	Radius:	1909.86		
	Delta:	11°22'25.13"	Left	
	Degree of Curvature (Arc):	03°00'00.00"		
	Length:	379.12		
	Tangent:	190.19		
	Chord:	378.5		
	Middle Ordinate:	9.4		
	External:	9.45		
	Back Tangent Direction:	S19°19'53.8"E		
	Back Radial Direction:	S70°40'06.2"W		
	Chord Direction:	S25°01'06.4"E		
	Ahead Radial Direction:	S59°17'41.0"W		
	Ahead Tangent Direction:	S30°42'19.0"E		
Element: Linear				
PT	( )	170+30.16 R2	10600177.03	3339658.01
PI	( )	174+36.45 R2	10599827.7	3339865.47
	Tangential Direction:	S30°42'19.0"E		
	Tangential Length:	406.29		
Element: Linear				
PI	( )	174+36.45 R2	10599827.7	3339865.47
PI	( )	178+37.90 R2	10599483.35	3340071.84
	Tangential Direction:	S30°56'06.4"E		
	Tangential Length:	401.45		
Element: Linear				
PI	( )	178+37.90 R2	10599483.35	3340071.84
PC	( )	185+79.32 R2	10598850.36	3340457.88
	Tangential Direction:	S31°22'39.0"E		
	Tangential Length:	741.41		
Element: Circular				
PC	( )	185+79.32 R2	10598850.36	3340457.88
PI	( )	188+58.25 R2	10598612.23	3340603.11
CC	( )		10598253.71	3339479.54
PT	( )	191+26.53 R2	10598333.98	3340622.65
	Radius:	1145.92		
	Delta:	27°21'38.93"	Right	
	Degree of Curvature (Arc):	04°59'59.93"		
	Length:	547.22		
	Tangent:	278.93		
	Chord:	542.03		
	Middle Ordinate:	32.51		
	External:	33.46		
	Back Tangent Direction:	S31°22'39.0"E		
	Back Radial Direction:	S58°37'21.0"W		
	Chord Direction:	S17°41'49.6"E		
	Ahead Radial Direction:	S85°58'59.9"W		
	Ahead Tangent Direction:	S04°01'00.1"E		
Element: Linear				
PT	( )	191+26.53 R2	10598333.98	3340622.65
PI	( )	194+97.22 R2	10597964.21	3340648.61
	Tangential Direction:	S04°01'00.1"E		
	Tangential Length:	370.69		
Element: Linear				
PI	( )	194+97.22 R2	10597964.21	3340648.61
PI	( )	208+38.42 R2	10596626.71	3340748.22
	Tangential Direction:	S04°15'33.6"E		
	Tangential Length:	1341.2		
Element: Linear				
PI	( )	208+38.42 R2	10596626.71	3340748.22
PC	( )	212+68.14 R2	10596198.09	3340778.97
	Tangential Direction:	S04°06'08.6"E		
	Tangential Length:	429.72		

Element: Circular				
PC	( )	212+68.14 R2	10596198.09	3340778.97
PI	( )	216+32.72 R2	10595834.44	3340805.05
CC	( )		10596305.04	3342270.14
PT	( )	219+83.34 R2	10595523.63	3340995.61
	Radius:	1495		
	Delta:	27°24'36.08"	Left	
	Degree of Curvature (Arc):	03°49'56.98"		
	Length:	715.2		
	Tangent:	364.58		
	Chord:	708.4		
	Middle Ordinate:	42.57		
	External:	43.81		
	Back Tangent Direction:	S04°06'08.6"E		
	Back Radial Direction:	S85°53'51.4"W		
	Chord Direction:	S17°48'26.6"E		
	Ahead Radial Direction:	S58°29'15.4"W		
	Ahead Tangent Direction:	S31°30'44.6"E		
Element: Linear				
PT	( )	219+83.34 R2	10595523.63	3340995.61
PI	( )	225+73.36 R2	10595020.62	3341304
	Tangential Direction:	S31°30'44.6"E		
	Tangential Length:	590.02		
Element: Linear				
PI	( )	225+73.36 R2	10595020.62	3341304
PI	( )	233+17.08 R2	10594384.98	3341690.1
	Tangential Direction:	S31°16'30.7"E		
	Tangential Length:	743.72		
Element: Linear				
PI	( )	233+17.08 R2	10594384.98	3341690.1
PI	( )	244+09.37 R2	10593453.24	3342260.15
	Tangential Direction:	S31°27'31.2"E		
	Tangential Length:	1092.29		
Element: Linear				
PI	( )	244+09.37 R2	10593453.24	3342260.15
PI	( )	248+82.36 R2	10593050.55	3342508.26
	Tangential Direction:	S31°38'20.7"E		
	Tangential Length:	472.99		
Element: Linear				
PI	( )	248+82.36 R2	10593050.55	3342508.26
PI	( )	254+21.60 R2	10592589.79	3342788.41
	Tangential Direction:	S31°18'00.8"E		
	Tangential Length:	539.24		
Element: Linear				
PI	( )	254+21.60 R2	10592589.79	3342788.41
PI	( )	261+04.24 R2	10592008.05	3343145.58
	Tangential Direction:	S31°32'54.6"E		
	Tangential Length:	682.64		
Element: Linear				
PI	( )	261+04.24 R2	10592008.05	3343145.58
POT	( )	266+55.10 R2	10591539.58	3343435.39
	Tangential Direction:	S31°44'32.0"E		
	Tangential Length:	550.86		

STATE OF TEXAS
RANDY W. HARRIS
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PROFESSIONAL ENGINEER
1/29/2024
Randy W. Harris, PE

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FM 2311

HORIZONTAL ALIGNMENT DATA

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		89

DATE: 1/29/2024 2:20:29 PM
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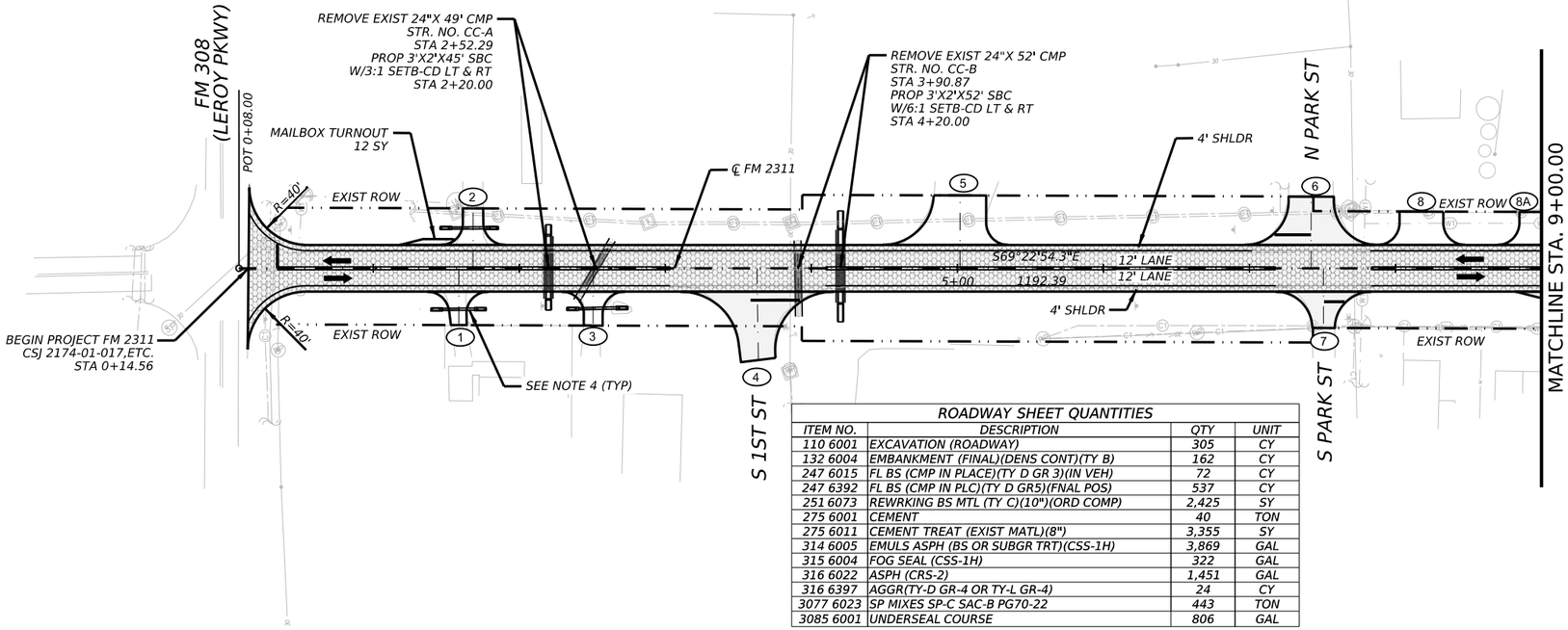


LEGEND

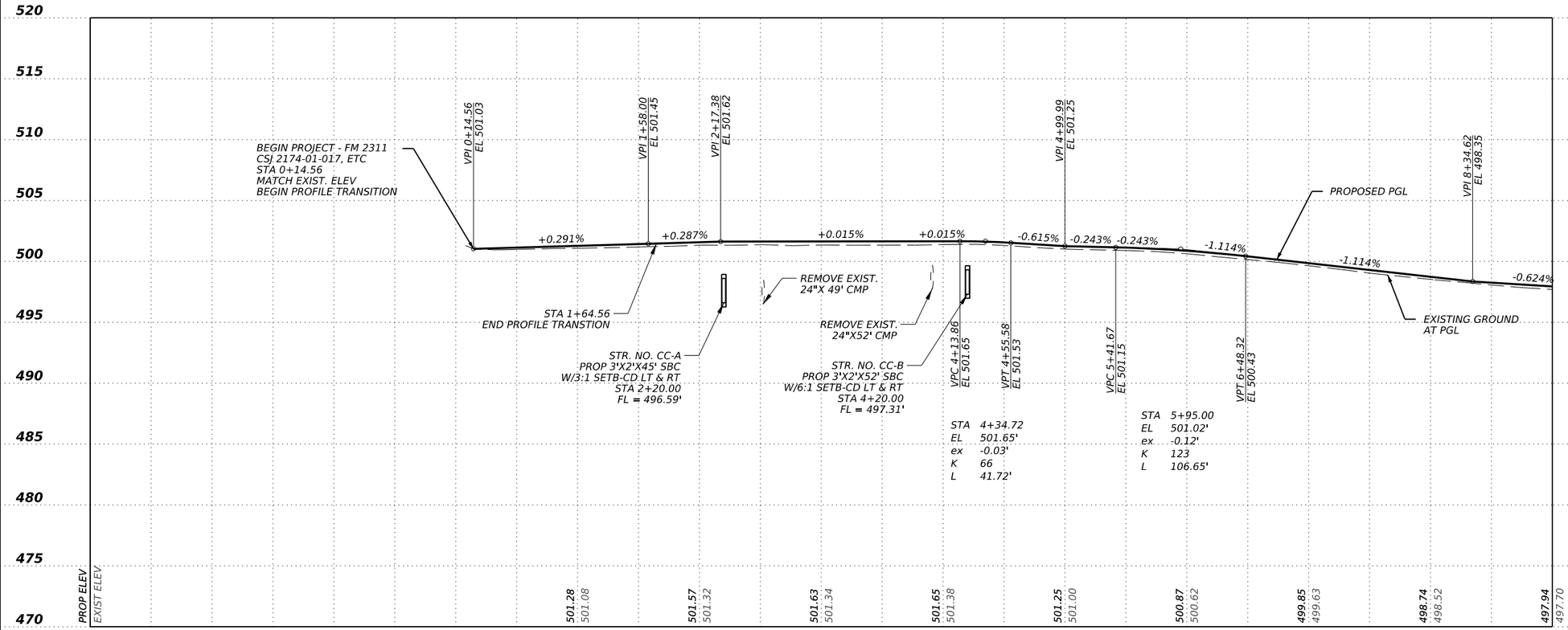
- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
3. RUMBLE STRIPS NOT SHOWN FOR CLARITY.
4. SEE "SUMMARY OF QUANTITIES (DRIVEWAYS & INTERSECTIONS)" AND DRIVEWAY AND INTERSECTION DETAILS FOR ADDITIONAL INFORMATION.
5. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

0 50 100
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	305	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	162	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	72	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	537	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	2,425	SY
275 6001	CEMENT	40	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	3,355	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	3,869	GAL
315 6004	FOG SEAL (CSS-1H)	322	GAL
316 6022	ASPH (CRS-2)	1,451	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	24	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	443	TON
3085 6001	UNDERSEAL COURSE	806	GAL



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STATE OF TEXAS
RANDY W. HARRIS
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1/29/2024
Randy W. Harris, P.E.

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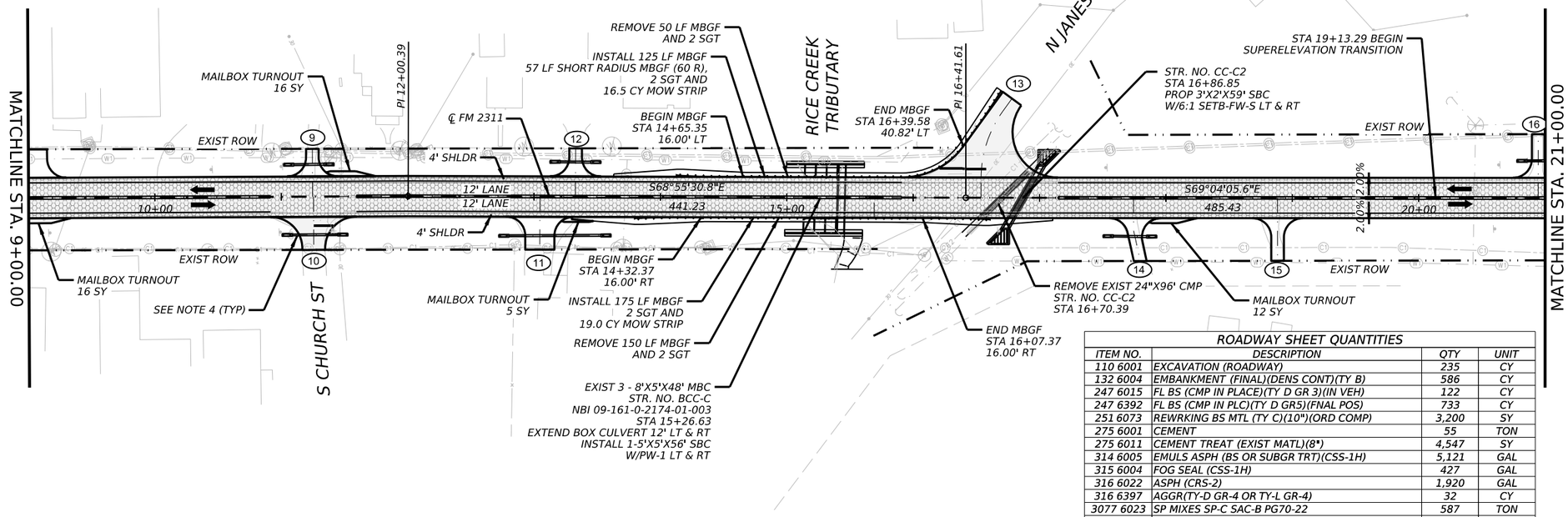
FM 2311

PLAN AND PROFILE
BEGIN TO STA 9+00

SCALE: 1"=100' H; 1"=10' V SHEET 1 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		90



LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
3. RUMBLE STRIPS NOT SHOWN FOR CLARITY.
4. SEE "SUMMARY OF QUANTITIES (DRIVEWAYS & INTERSECTIONS)" AND DRIVEWAY AND INTERSECTION DETAILS FOR ADDITIONAL INFORMATION.
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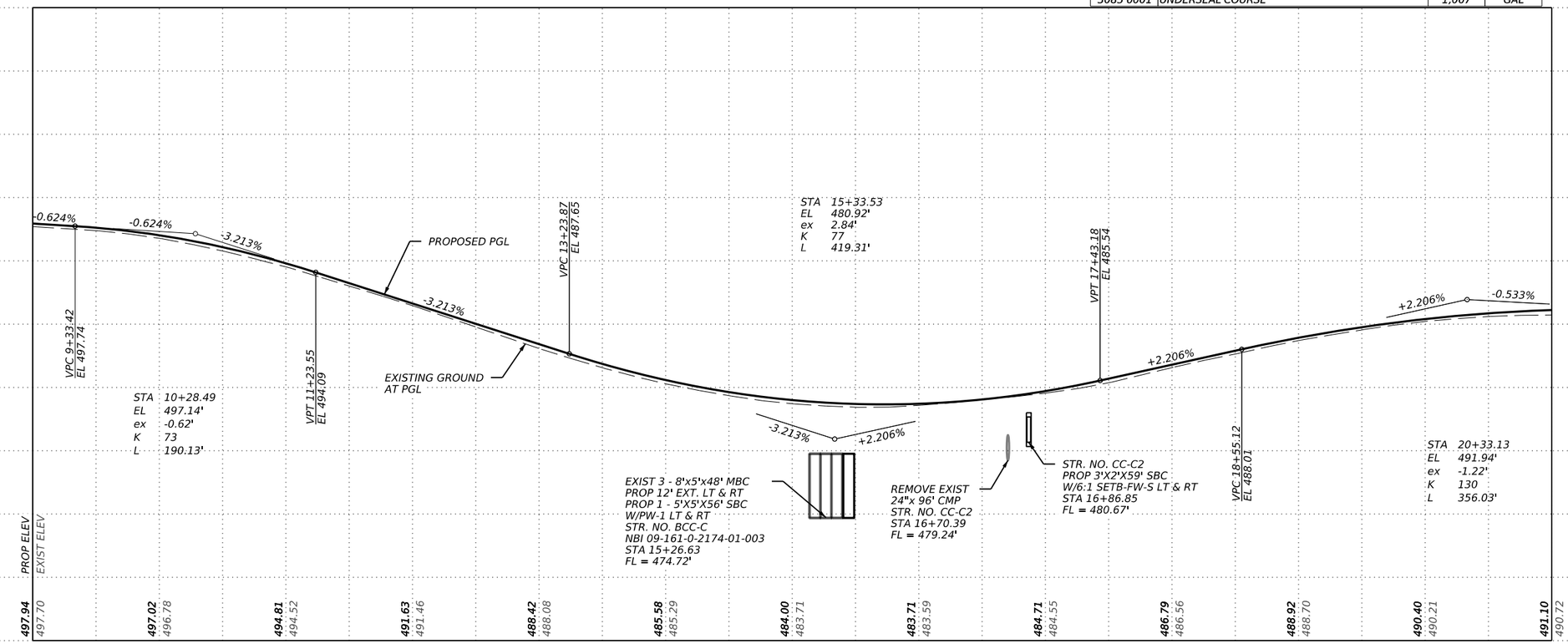
0 50 100
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	235	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	586	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FINAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,121	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL



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STATE OF TEXAS
RANDY W. HARRIS
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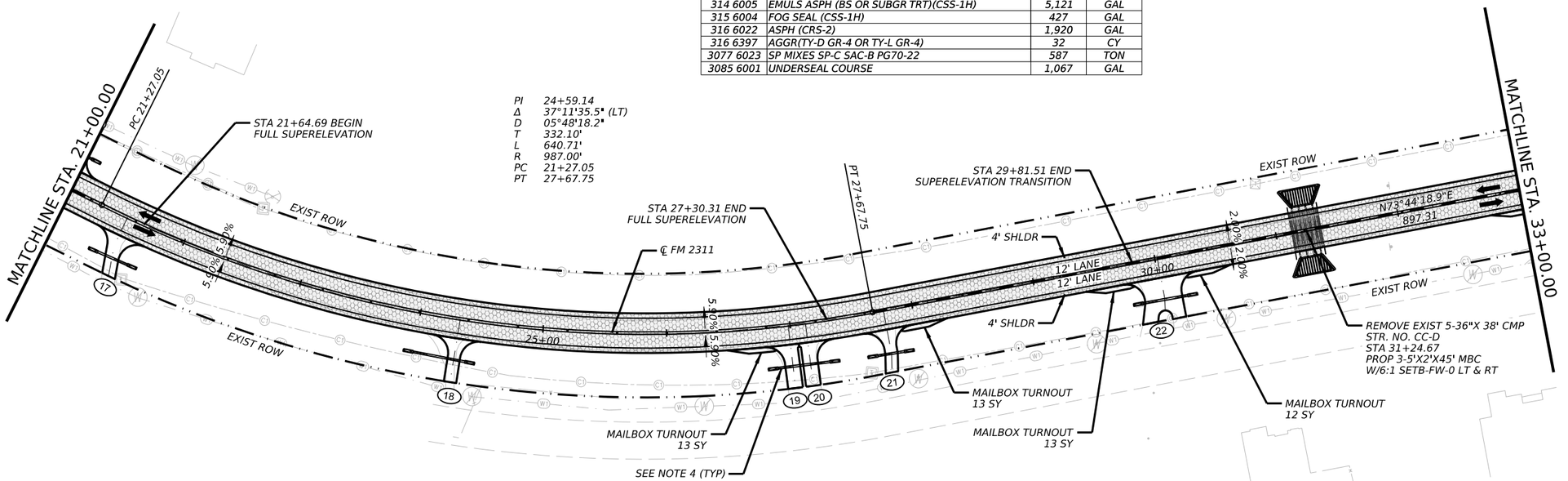
PLAN AND PROFILE
STA 9+00 TO STA 21+00

SCALE: 1"=100' H; 1"=10' V SHEET 2 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		91

ROADWAY SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	171	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	436	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,121	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL

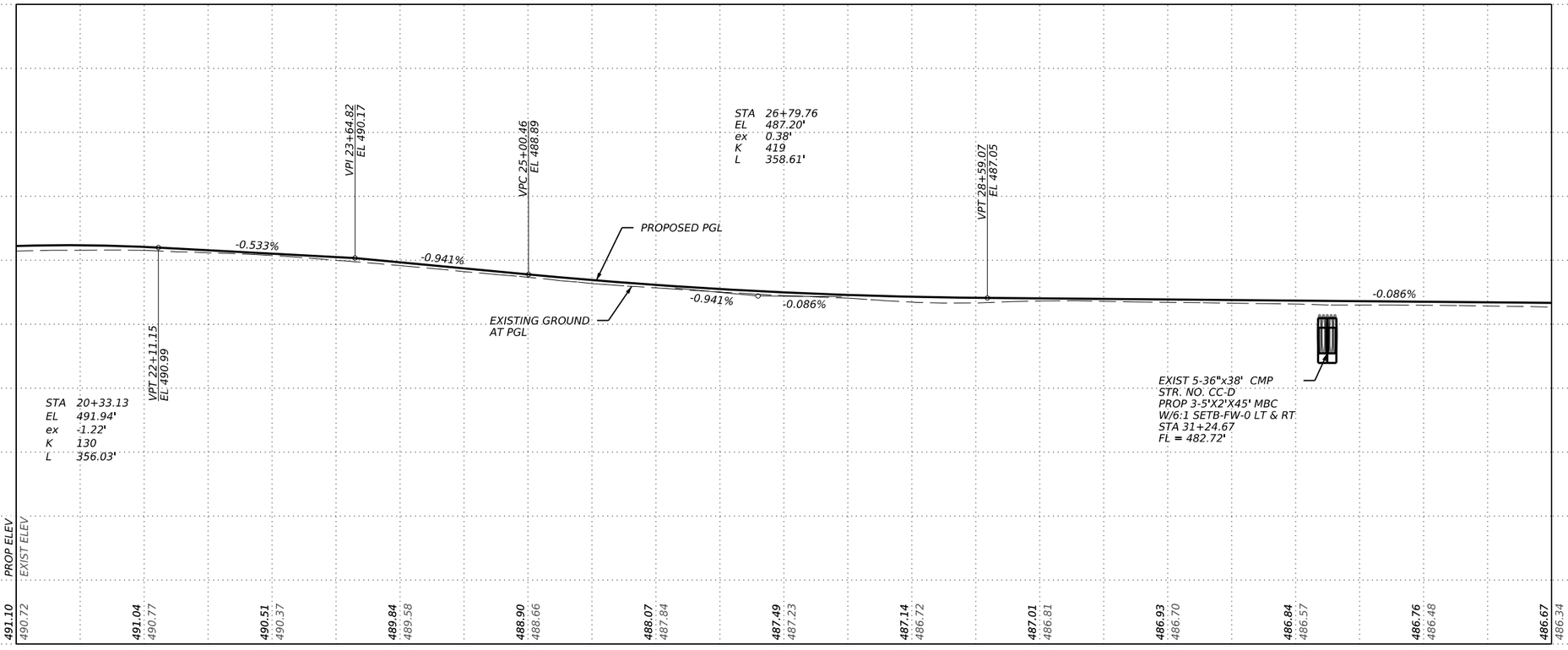


LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
3. RUMBLE STRIPS NOT SHOWN FOR CLARITY.
4. SEE "SUMMARY OF QUANTITIES (DRIVEWAYS & INTERSECTIONS)" AND DRIVEWAY AND INTERSECTION DETAILS FOR ADDITIONAL INFORMATION.
5. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

0 50 100
SCALE IN FEET



STATE OF TEXAS
RANDY W. HARRIS
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1/29/2024
Randy W. Harris, P.E.

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PLAN AND PROFILE
STA 21+00 TO STA 33+00

SCALE: 1"=100' H; 1"=10' V SHEET 3 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		92

DATE: 1/29/2024 2:21:25 PM
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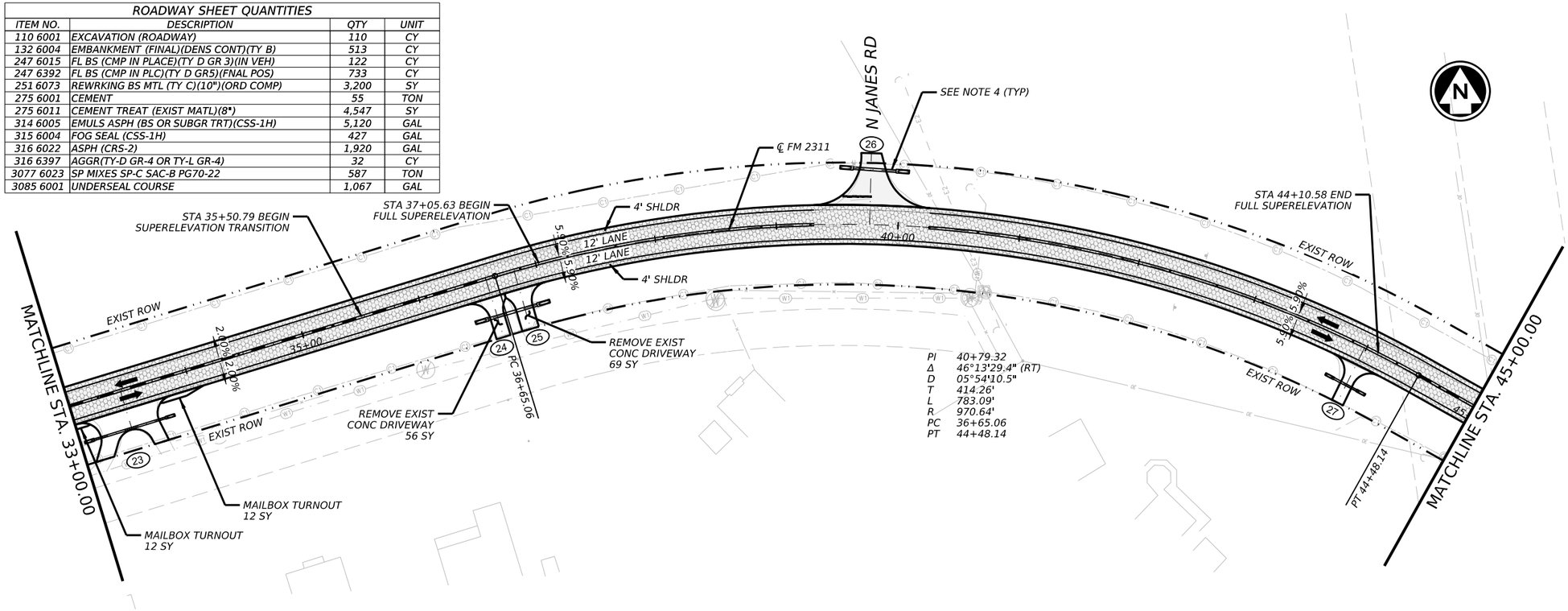
ROADWAY SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	110	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	513	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,120	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL



LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
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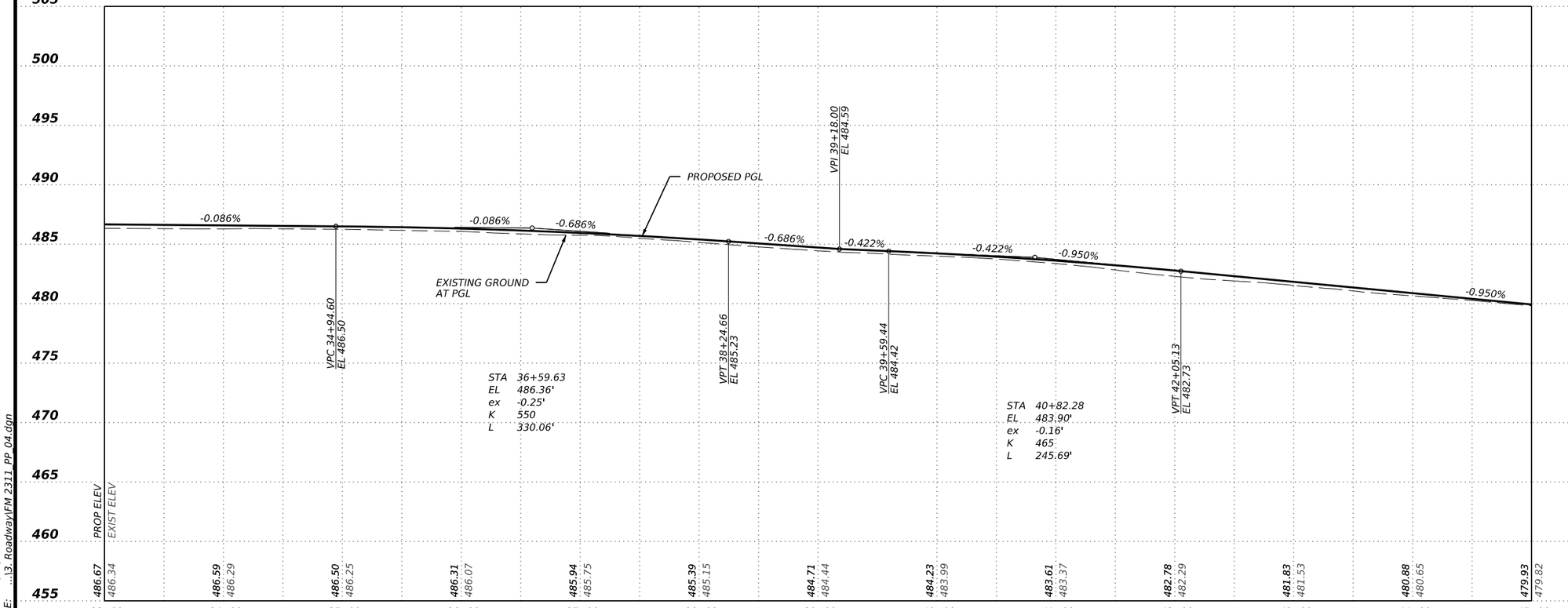
0 50 100
SCALE IN FEET



RANDY W. HARRIS 93663 LICENSED PROFESSIONAL ENGINEER
1/29/2024
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PLAN AND PROFILE STA 33+00 TO STA 45+00

SCALE: 1"=100' H; 1"=10' V SHEET 4 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		93

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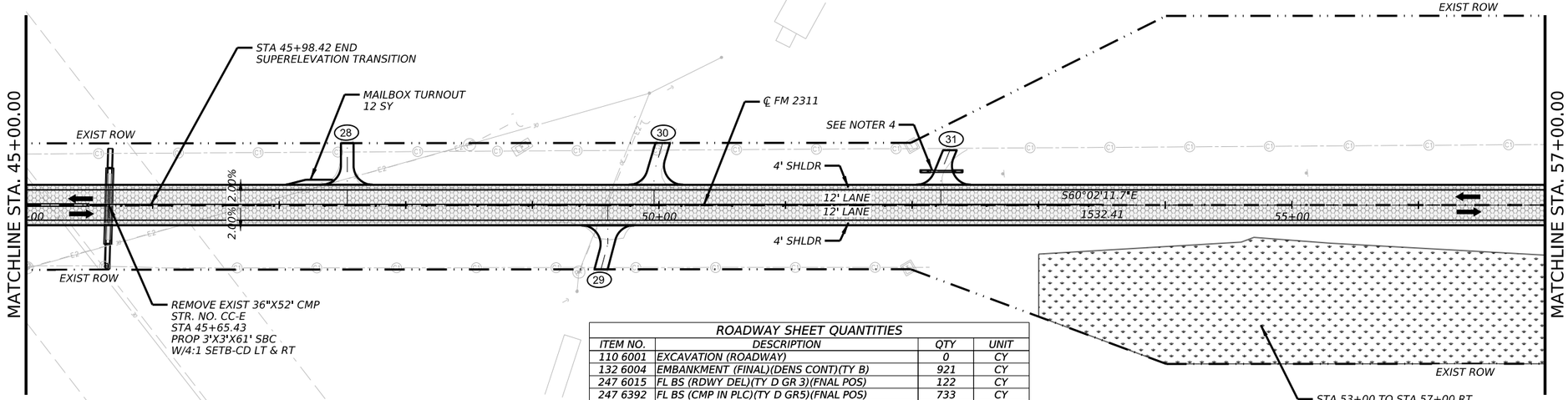

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	0	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	921	CY
247 6015	FL BS (RDWY DEL)(TY D GR 3)(FNAL POS)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,120	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER
- EXISTING WETLAND AREA

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
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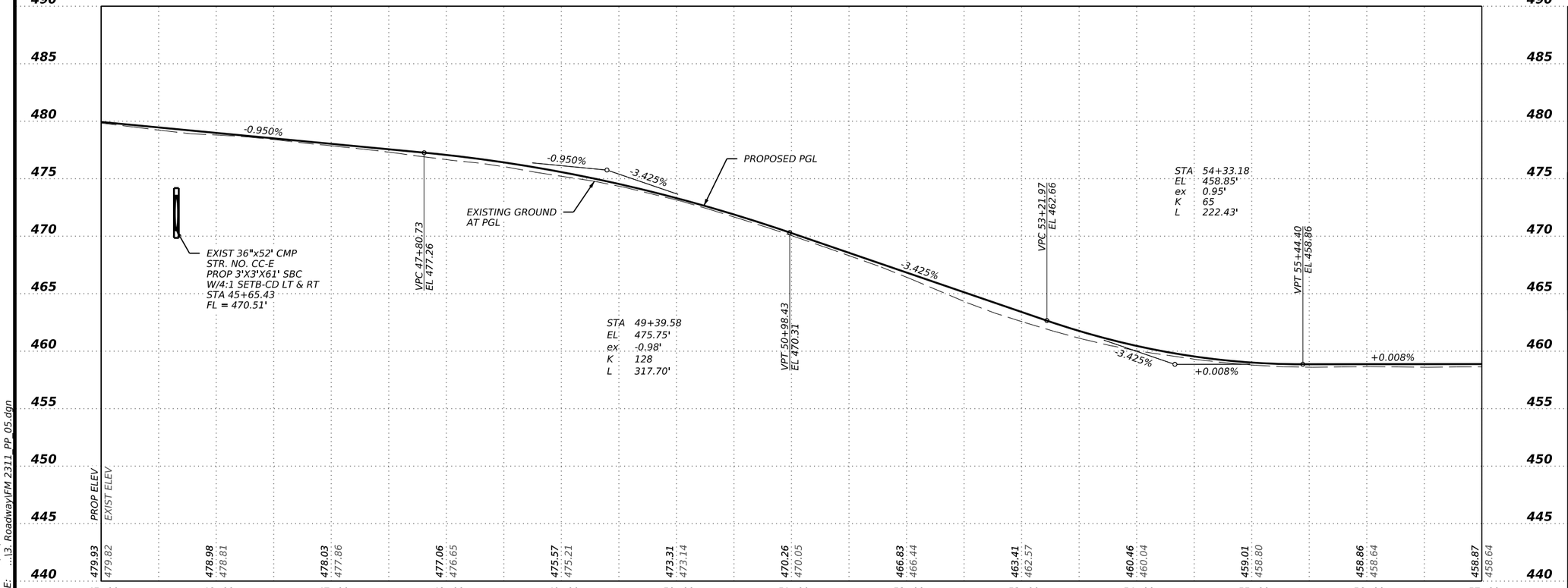
0 50 100
SCALE IN FEET



RANDY W. HARRIS
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STATE OF TEXAS
1/29/2024
Randy W. Harris, P.E.

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PLAN AND PROFILE
STA 45+00 TO STA57+00

SCALE: 1"=100' H; 1"=10' V SHEET 5 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		94

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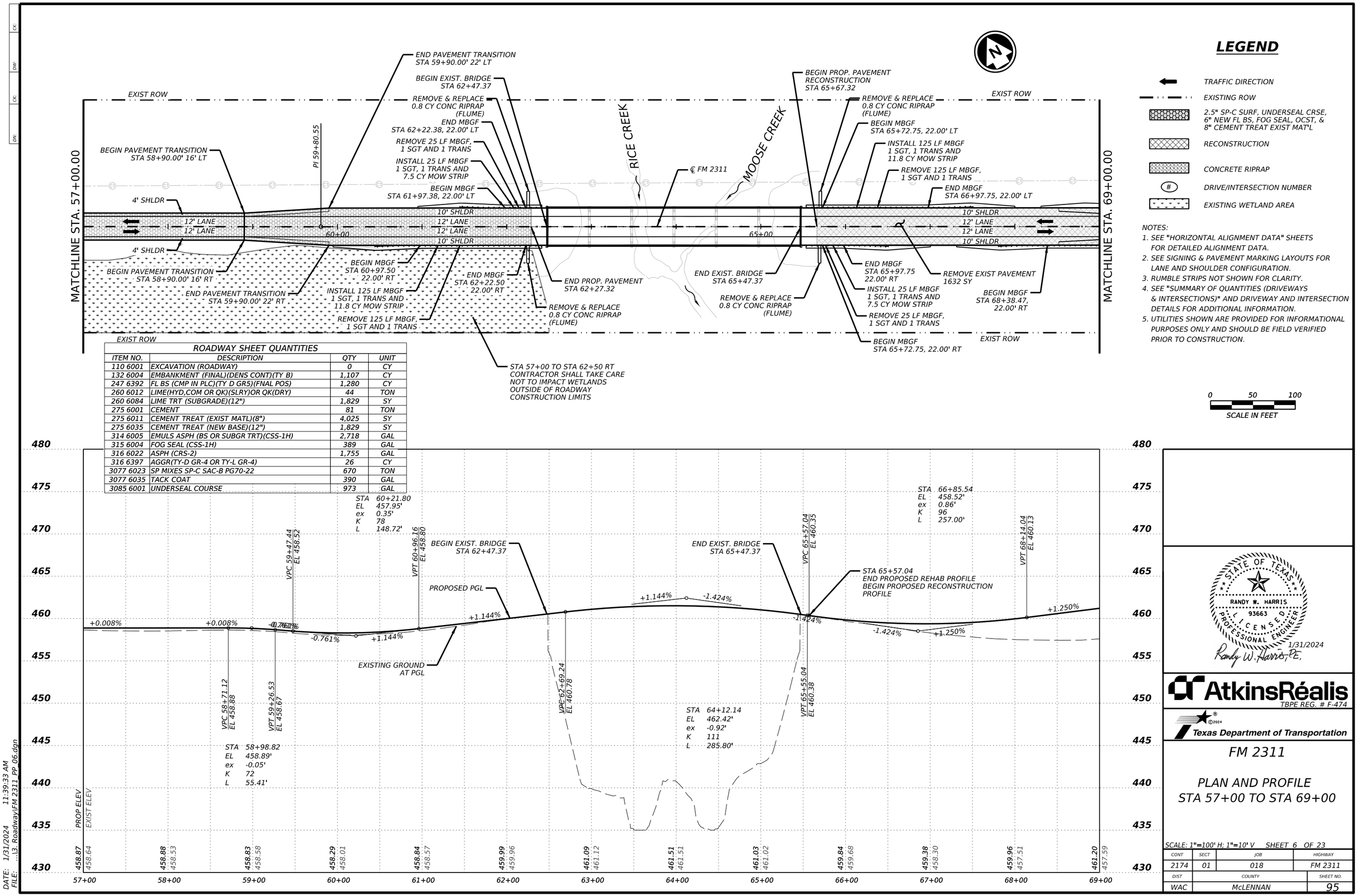

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER
- EXISTING WETLAND AREA

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
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0 50 100
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	0	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	1,107	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	1,280	CY
260 6012	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)	44	TON
260 6084	LIME TRT (SUBGRADE)(12")	1,829	SY
275 6001	CEMENT	81	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,025	SY
275 6035	CEMENT TREAT (NEW BASE)(12")	1,829	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	2,718	GAL
315 6004	FOG SEAL (CSS-1H)	389	GAL
316 6022	ASPH (CRS-2)	1,755	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	26	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	670	TON
3077 6035	TACK COAT	390	GAL
3085 6001	UNDERSEAL COURSE	973	GAL

STATE OF TEXAS
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1/31/2024
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Texas Department of Transportation

FM 2311

PLAN AND PROFILE STA 57+00 TO STA 69+00

SCALE: 1"=100' H; 1"=10' V SHEET 6 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		95

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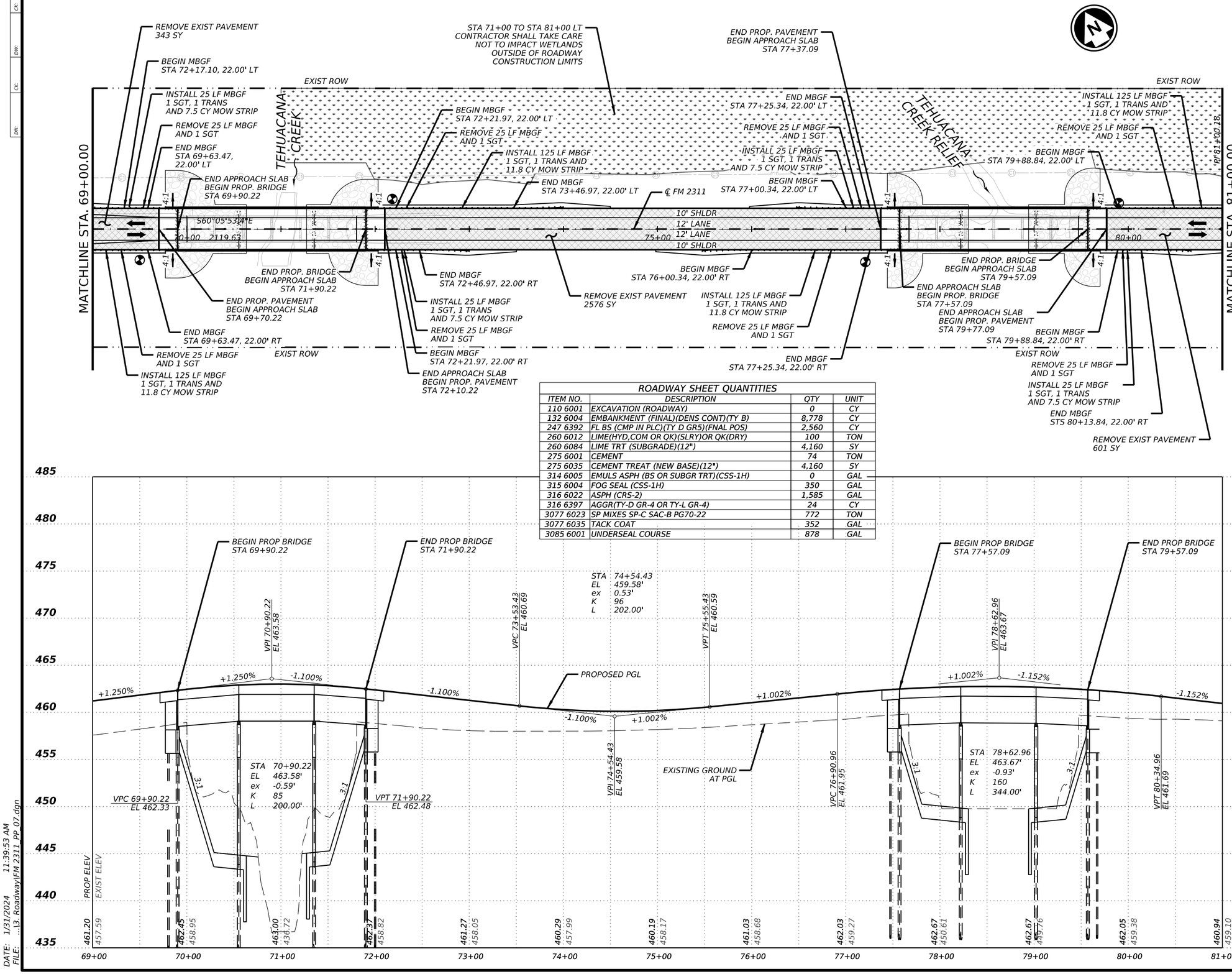

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER
- EXISTING WETLAND AREA

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
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0 50 100
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	0	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	8,778	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	2,560	CY
260 6012	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)	100	TON
260 6084	LIME TRT (SUBGRADE)(12")	4,160	SY
275 6001	CEMENT	74	TON
275 6035	CEMENT TREAT (NEW BASE)(12")	4,160	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	0	GAL
315 6004	FOG SEAL (CSS-1H)	350	GAL
316 6022	ASPH (CRS-2)	1,585	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	24	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	772	TON
3077 6035	TACK COAT	352	GAL
3085 6001	UNDERSEAL COURSE	878	GAL

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PROFESSIONAL ENGINEER
1/31/2024
Randy W. Harris, P.E.

AtkinsRéalis
TBPE REG. # F-474

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FM 2311

PLAN AND PROFILE
STA 69+00 TO STA 81+00

SCALE: 1"=100' H; 1"=10' V SHEET 7 OF 23

CONT.	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		96

DATE: 1/31/2024 11:39:53 AM
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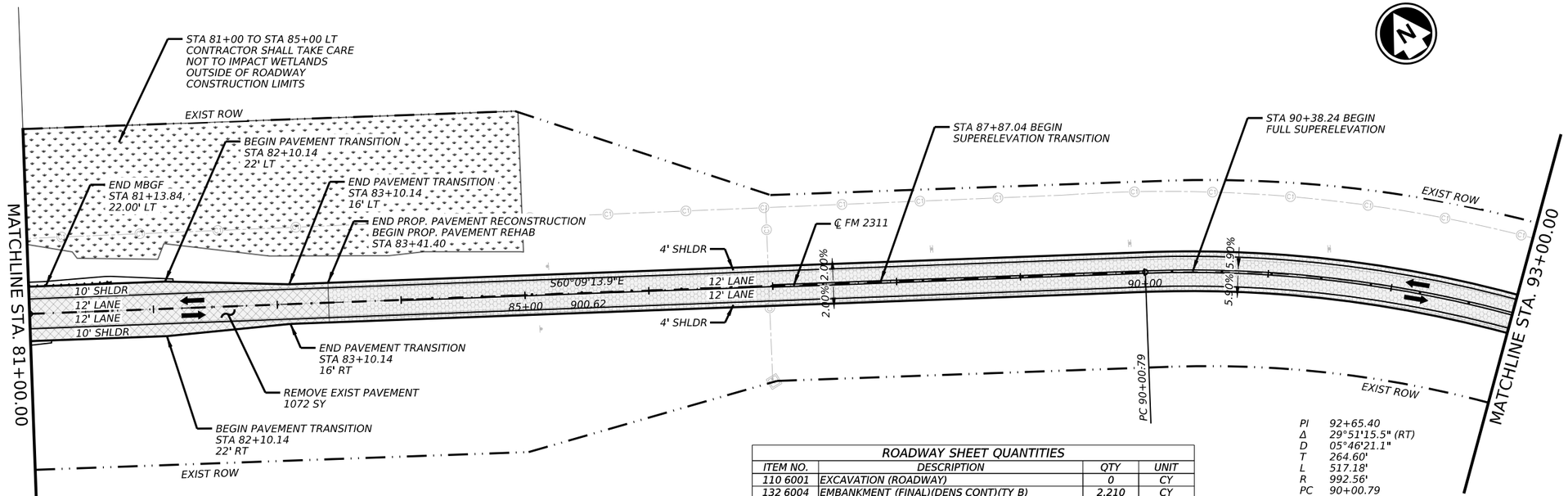

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D 05°46'21.1"
T 264.60'
L 517.18'
R 992.56'
PC 90+00.79
PT 95+17.97

ROADWAY SHEET QUANTITIES

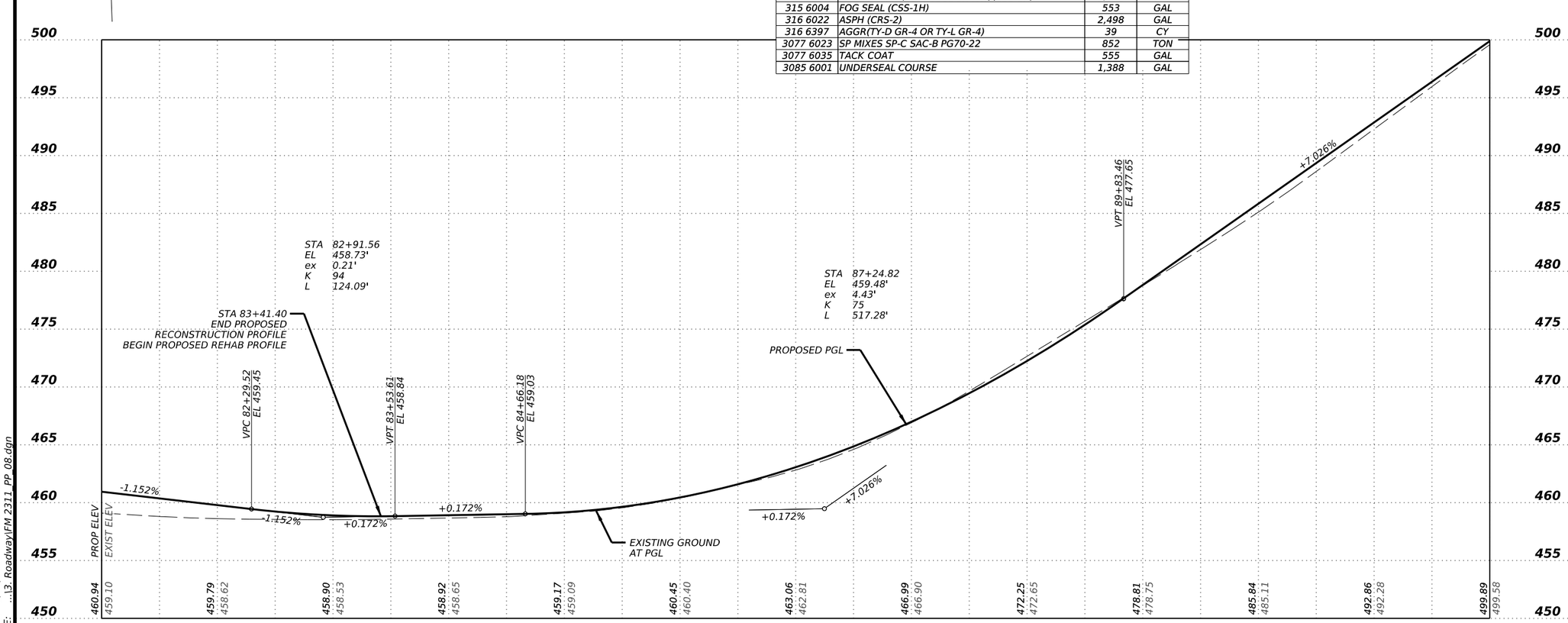
ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	0	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	2,210	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	0	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	1,134	CY
260 6012	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)	28	TON
260 6084	LIME TRT (SUBGRADE)(12")	1,162	SY
275 6001	CEMENT	64	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	3,632	SY
275 6035	CEMENT TREAT (NEW BASE)(12")	1,162	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,376	GAL
315 6004	FOG SEAL (CSS-1H)	553	GAL
316 6022	ASPH (CRS-2)	2,498	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	39	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	852	TON
3077 6035	TACK COAT	555	GAL
3085 6001	UNDERSEAL COURSE	1,388	GAL

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER
- EXISTING WETLAND AREA

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
3. RUMBLE STRIPS NOT SHOWN FOR CLARITY.
4. SEE "SUMMARY OF QUANTITIES (DRIVEWAYS & INTERSECTIONS)" AND DRIVEWAY AND INTERSECTION DETAILS FOR ADDITIONAL INFORMATION.
5. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

0 50 100
SCALE IN FEET



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STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
1/31/2024
Randy W. Harris, P.E.

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FM 2311

PLAN AND PROFILE
STA 81+00 TO STA 93+00

SCALE: 1"=100' H; 1"=10' V SHEET 8 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		97

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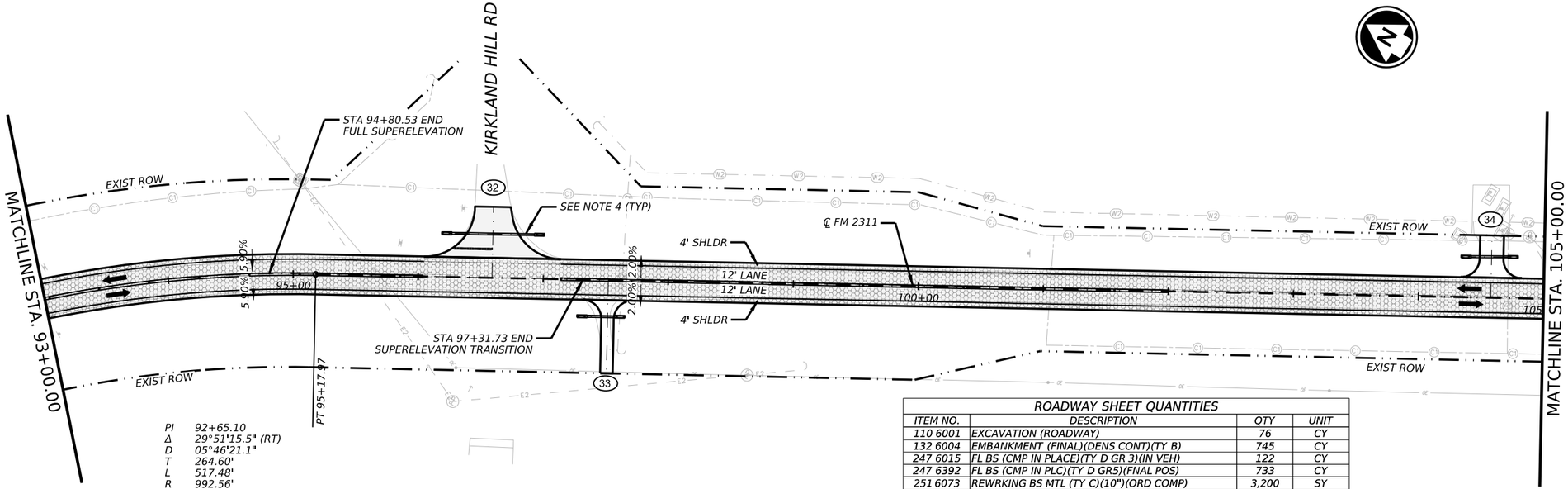

PI 92+65.10
Δ 29°51'15.5" (RT)
D 05°46'21.1"
T 264.60'
L 517.48'
R 992.56'
PC 90+00.79
PT 95+17.97

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	76	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	745	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,121	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	586	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
3. RUMBLE STRIPS NOT SHOWN FOR CLARITY.
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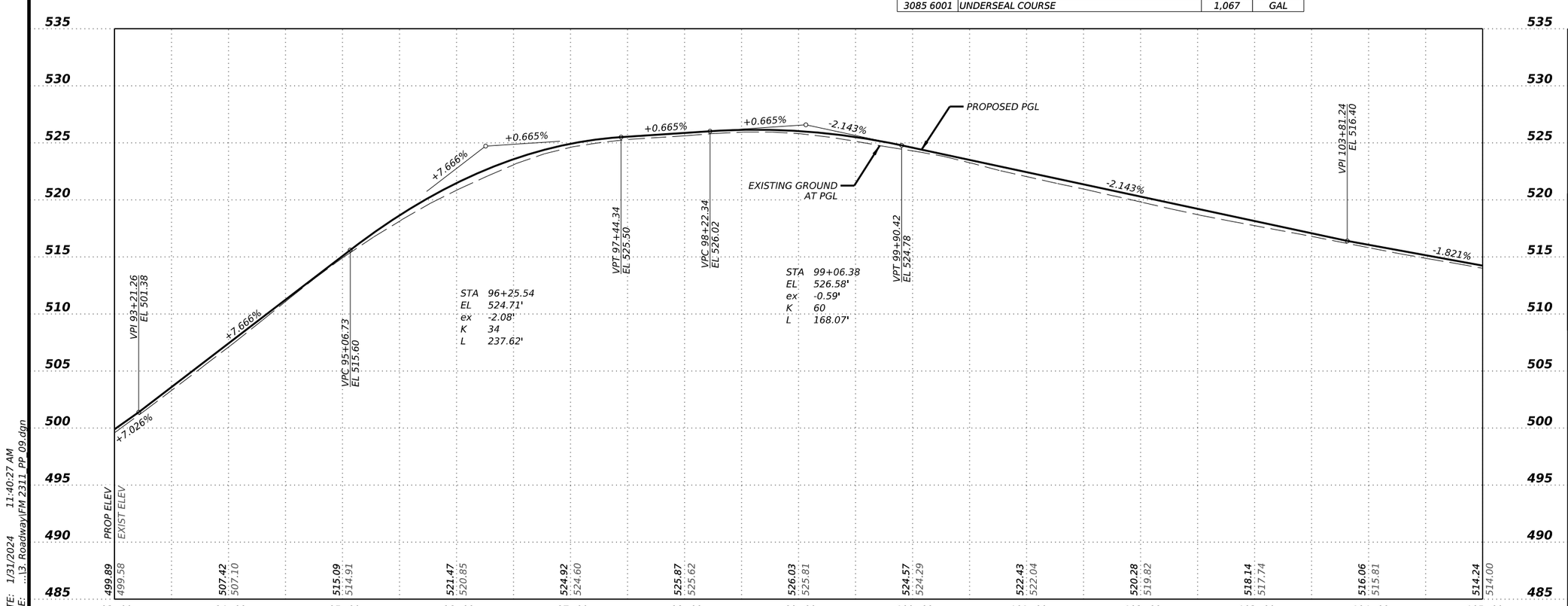
0 50 100
SCALE IN FEET



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FM 2311

PLAN AND PROFILE
STA 93+00 TO STA 105+00

SCALE: 1"=100' H; 1"=10' V SHEET 9 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		98

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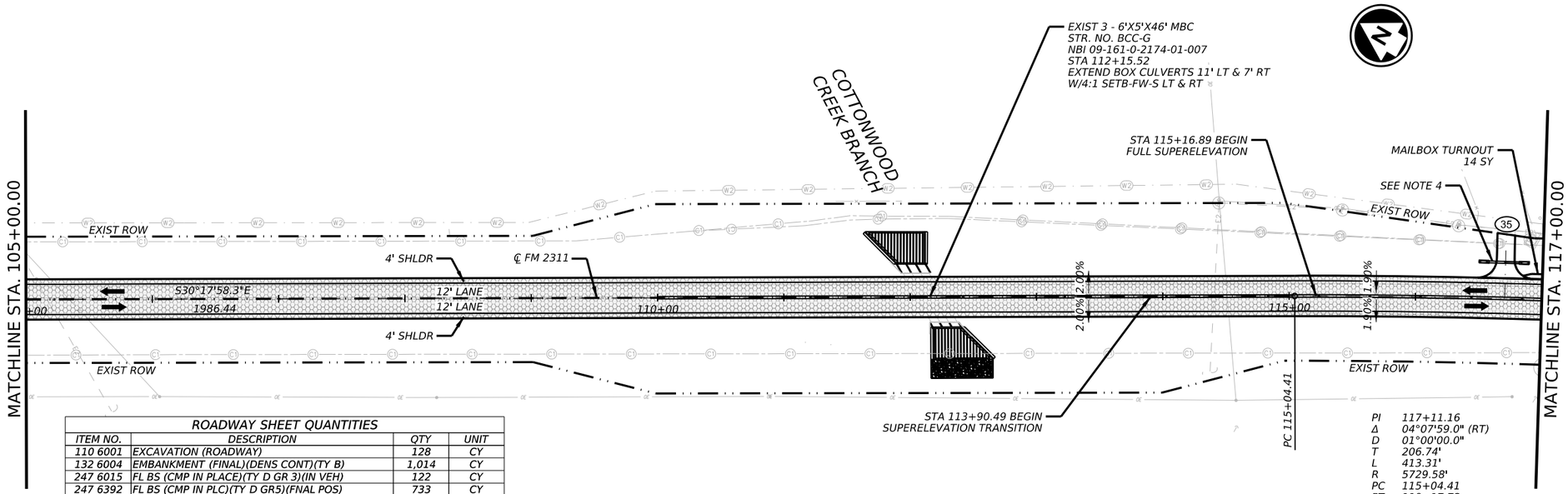

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
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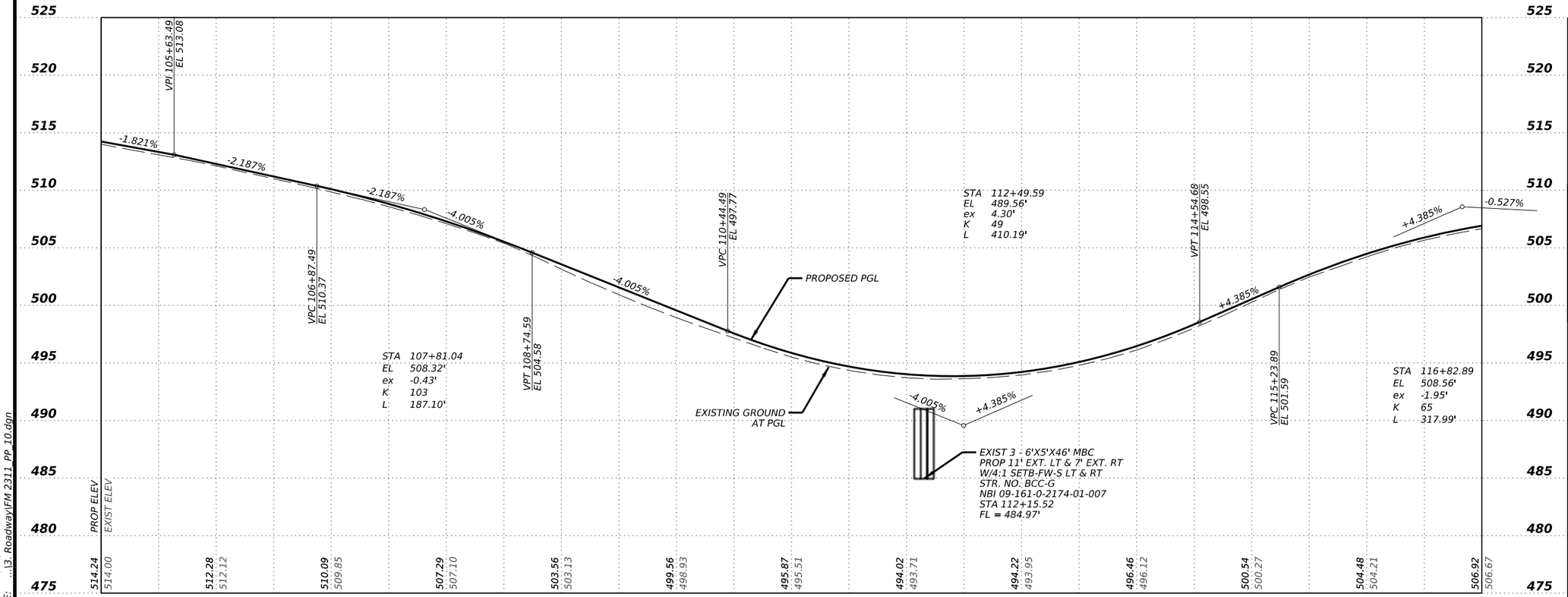
0 50 100
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	128	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	1,014	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,121	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL



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STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
1/29/2024
Randy W. Harris, P.E.

AtkinsRéalis
TBPE REG. # F-474

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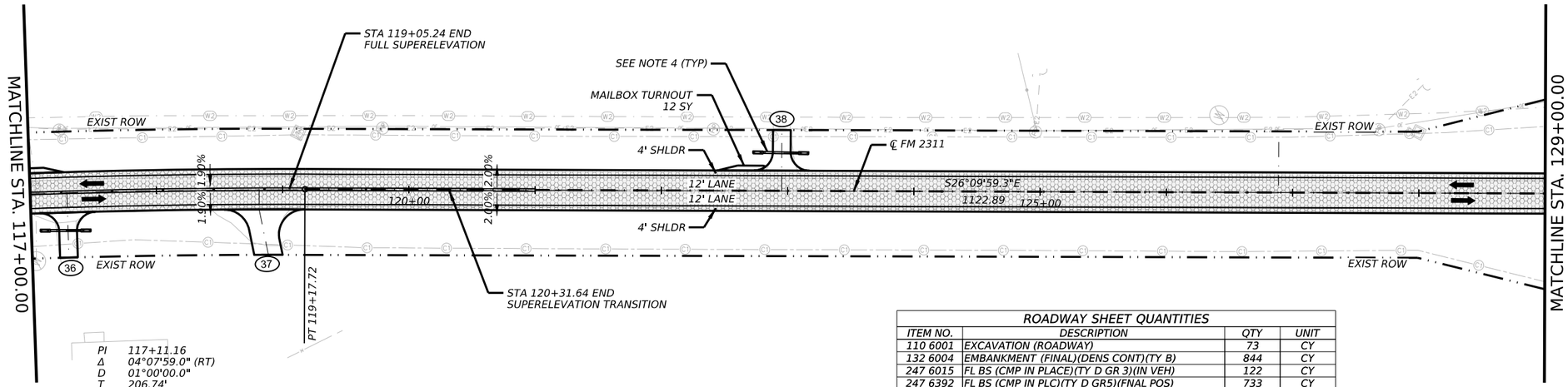
FM 2311

PLAN AND PROFILE
STA 105+00 TO STA 117+00

SCALE: 1"=100' H; 1"=10' V SHEET 10 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		99



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T 206.74'
L 413.31'
R 5729.58'
PC 115+04.41
PT 119+17.72

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	73	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	844	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,120	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
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2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
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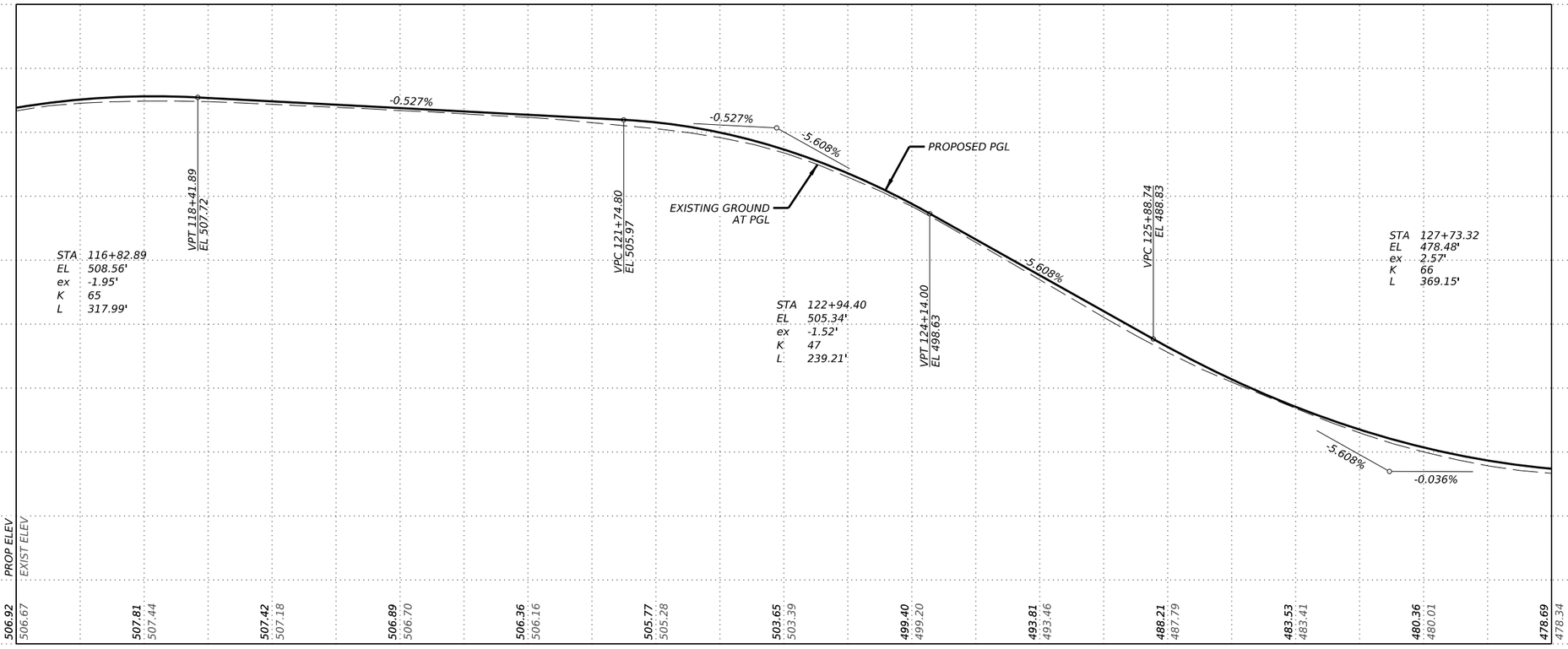
0 50 100
SCALE IN FEET



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STATE OF TEXAS
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PLAN AND PROFILE
STA 117+00 TO STA 129+00

SCALE: 1"=100' H; 1"=10' V SHEET 11 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		100

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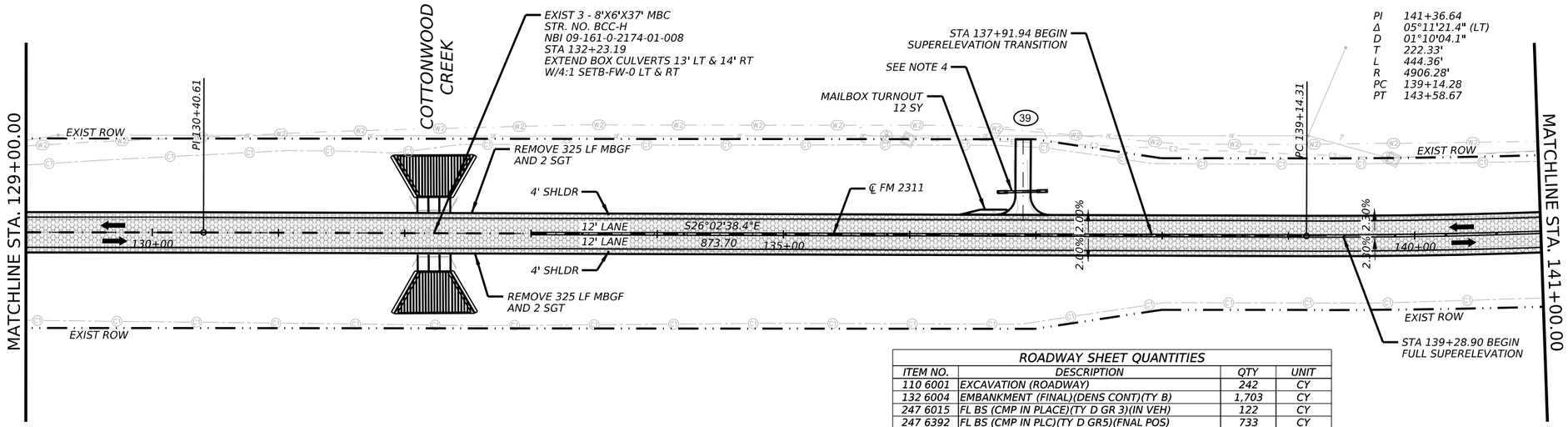

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
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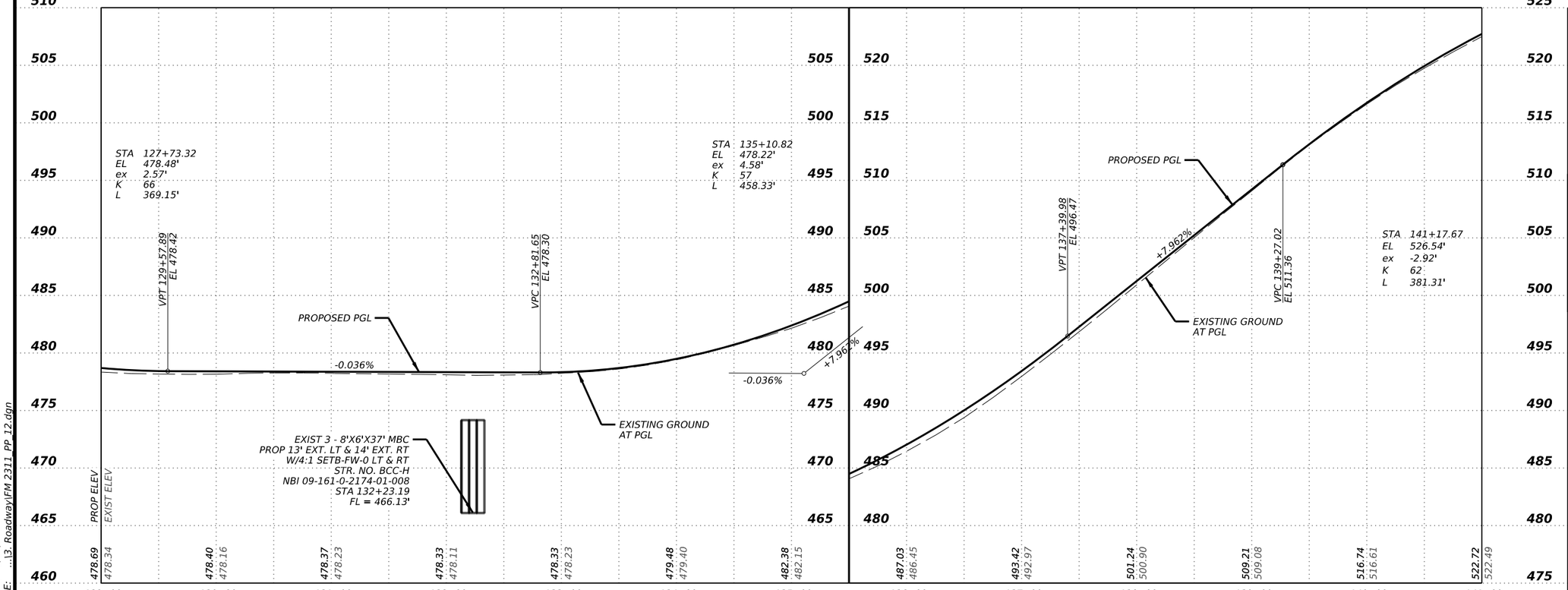
0 50 100
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	242	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	1,703	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,120	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL



RANDY W. HARRIS 93663 LICENSED PROFESSIONAL ENGINEER
1/29/2024
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TBPE REG. # F-474

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FM 2311

PLAN AND PROFILE
STA 129+00 TO STA 141+00

SCALE: 1"=100' H; 1"=10' V SHEET 12 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		101

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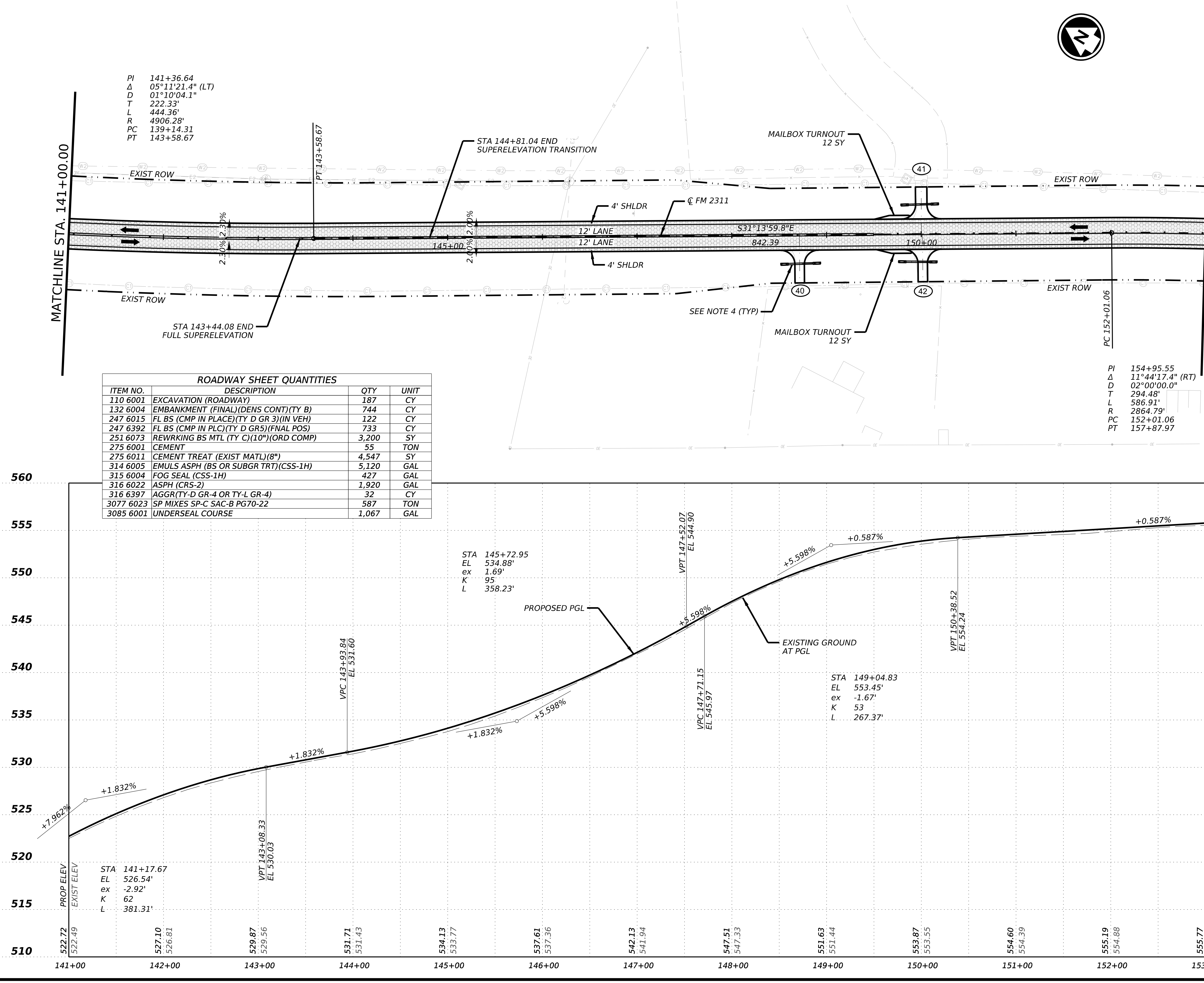

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	187	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	744	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,120	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- # DRIVE/INTERSECTION NUMBER

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
3. RUMBLE STRIPS NOT SHOWN FOR CLARITY.
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STATE OF TEXAS
RANDY W. HARRIS
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FM 2311

PLAN AND PROFILE
STA 141+00 TO STA 153+00

SCALE: 1"=100' H; 1"=10' V SHEET 13 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST		COUNTY	SHEET NO.
WAC		McLENNAN	102

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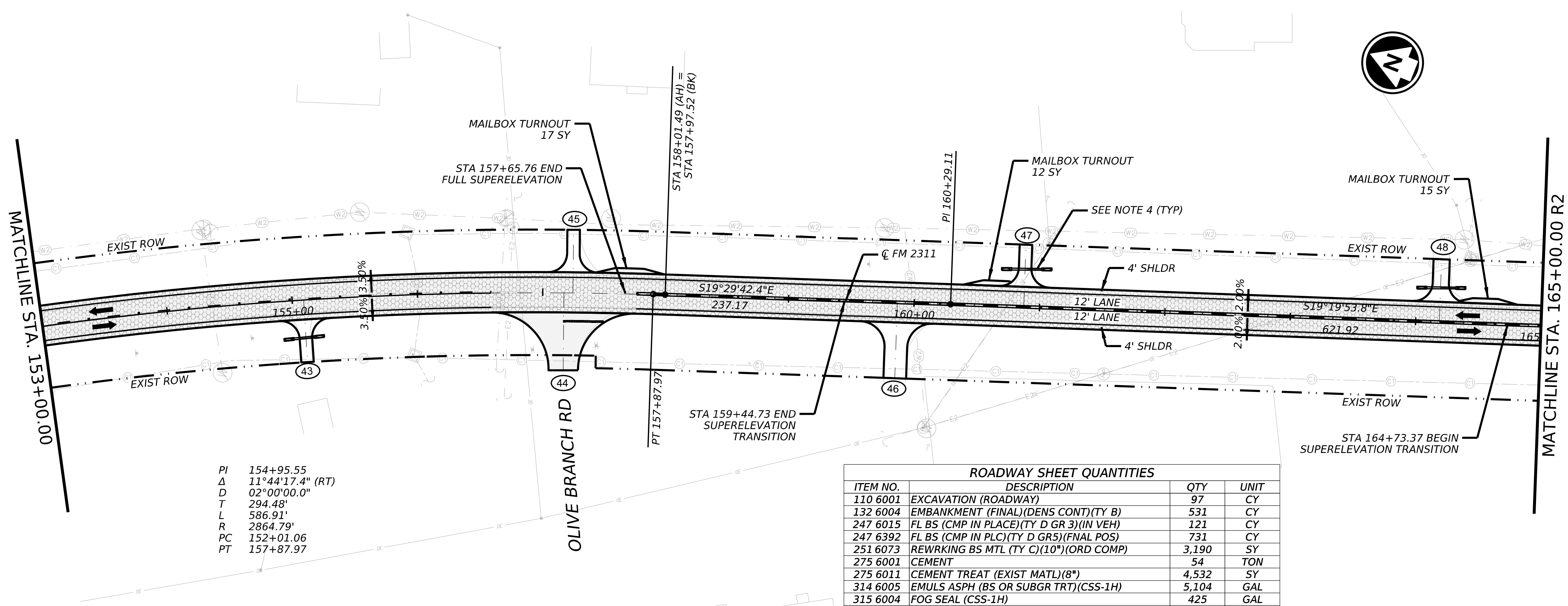

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- # DRIVE/INTERSECTION NUMBER

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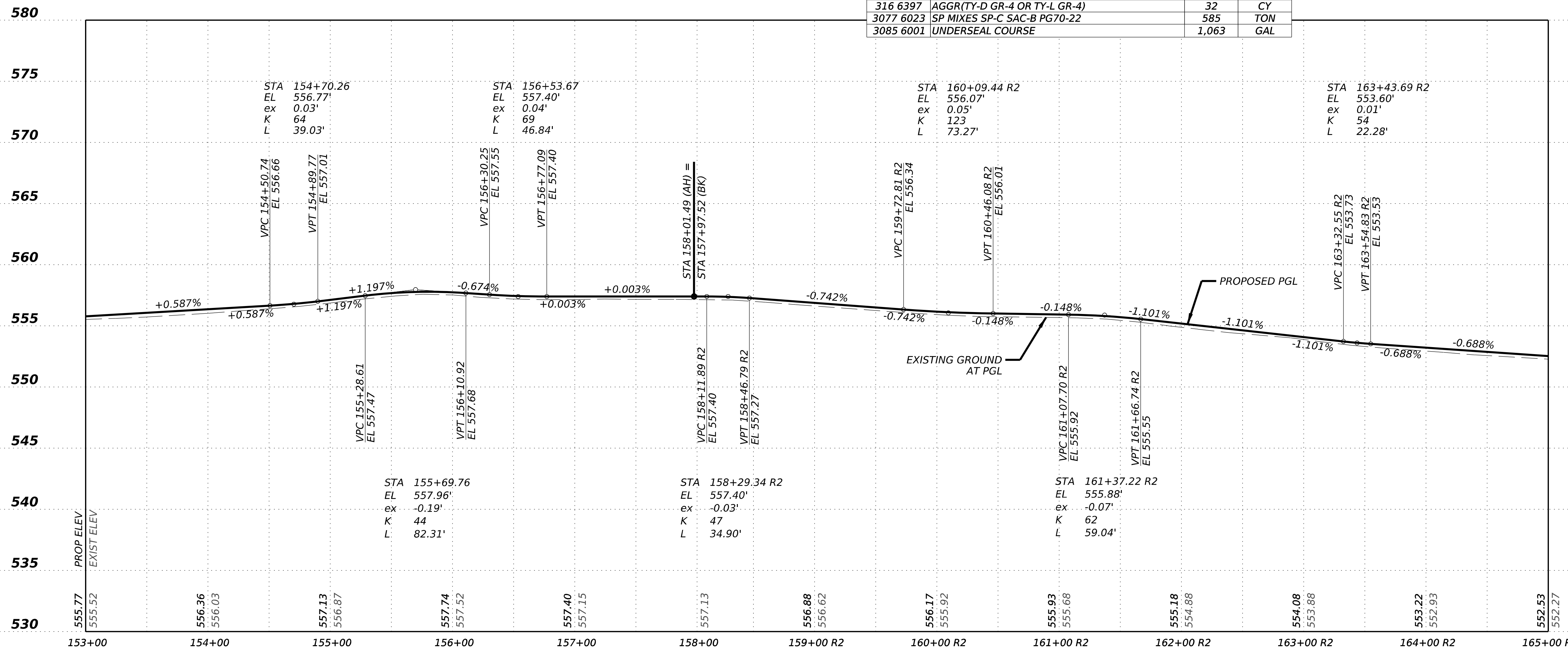
0 50 100
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	97	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	531	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	121	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	731	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,190	SY
275 6001	CEMENT	54	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,532	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,104	GAL
315 6004	FOG SEAL (CSS-1H)	425	GAL
316 6022	ASPH (CRS-2)	1,914	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	585	TON
3085 6001	UNDERSEAL COURSE	1,063	GAL



STATE OF TEXAS
RANDY W. HARRIS
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TBPE REG. # F-474

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FM 2311

PLAN AND PROFILE
STA 153+00 TO STA 165+00 R2

SCALE: 1"=100' H; 1"=10' V SHEET 14 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST		COUNTY	SHEET NO.
WAC		McLENNAN	103

DATE: 1/29/2024 2:24:28 PM
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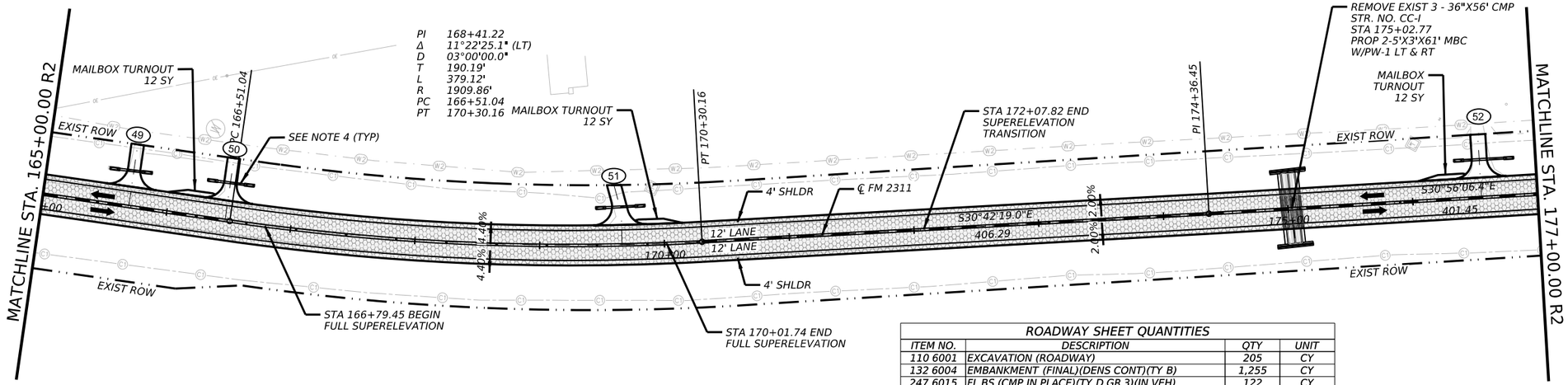


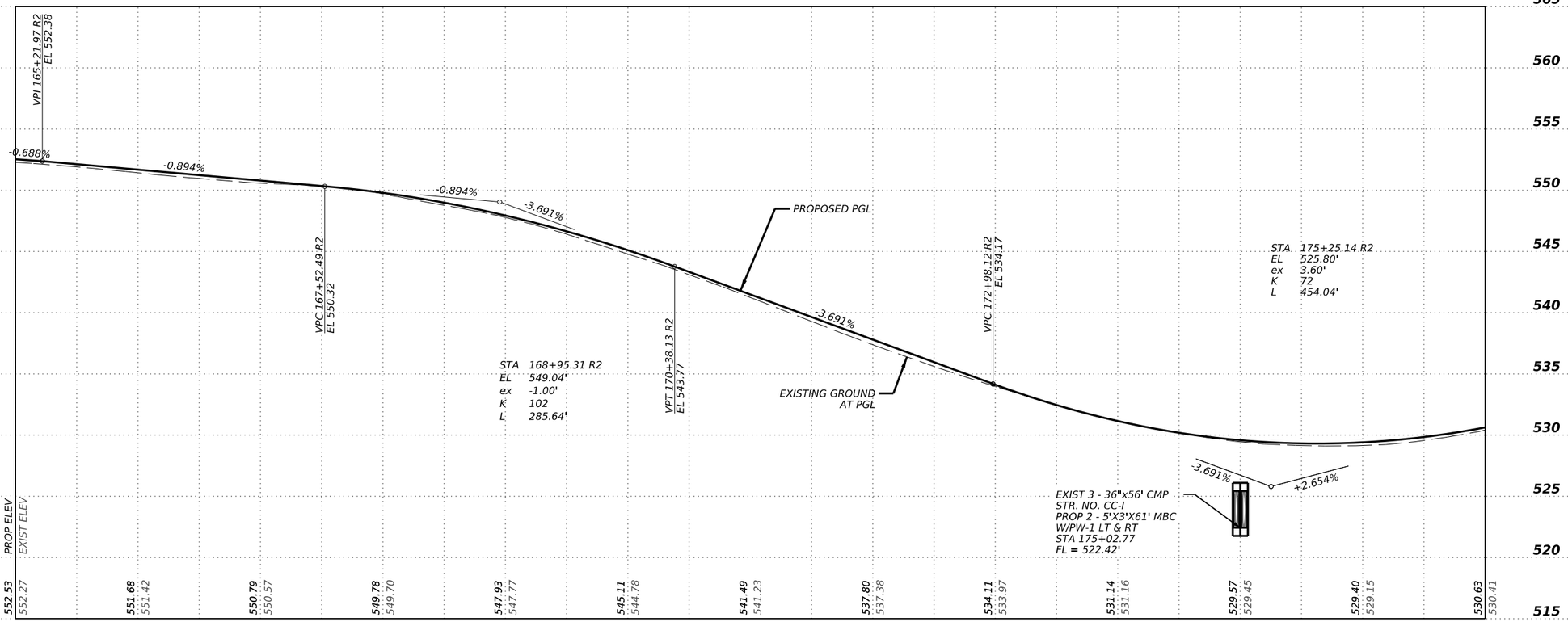
ROADWAY SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	205	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	1,255	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,120	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
3. RUMBLE STRIPS NOT SHOWN FOR CLARITY.
4. SEE "SUMMARY OF QUANTITIES (DRIVEWAYS & INTERSECTIONS)" AND DRIVEWAY AND INTERSECTION DETAILS FOR ADDITIONAL INFORMATION.
5. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

0 50 100
SCALE IN FEET



RANDY W. HARRIS
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STATE OF TEXAS
1/29/2024
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PLAN AND PROFILE
STA 165+00 R2 TO STA 177+00 R2

SCALE: 1"=100' H; 1"=10' V SHEET 15 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		104

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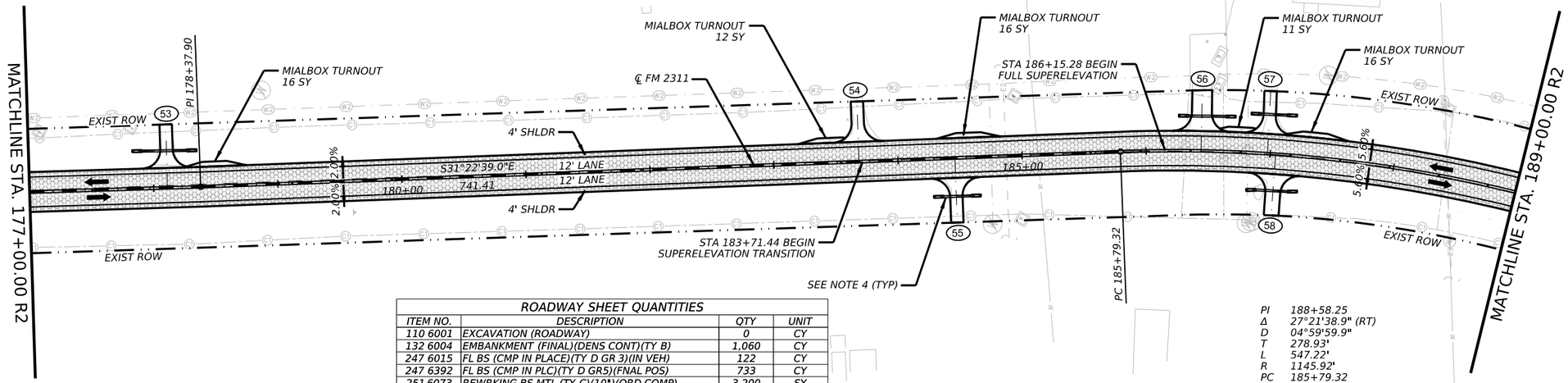

ROADWAY SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	0	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	1,060	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,120	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL

PI 188+58.25
Δ 27°21'38.9" (RT)
D 04°59'59.9"
T 278.93'
L 547.22'
R 1145.92'
PC 185+79.32
PT 191+26.53

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
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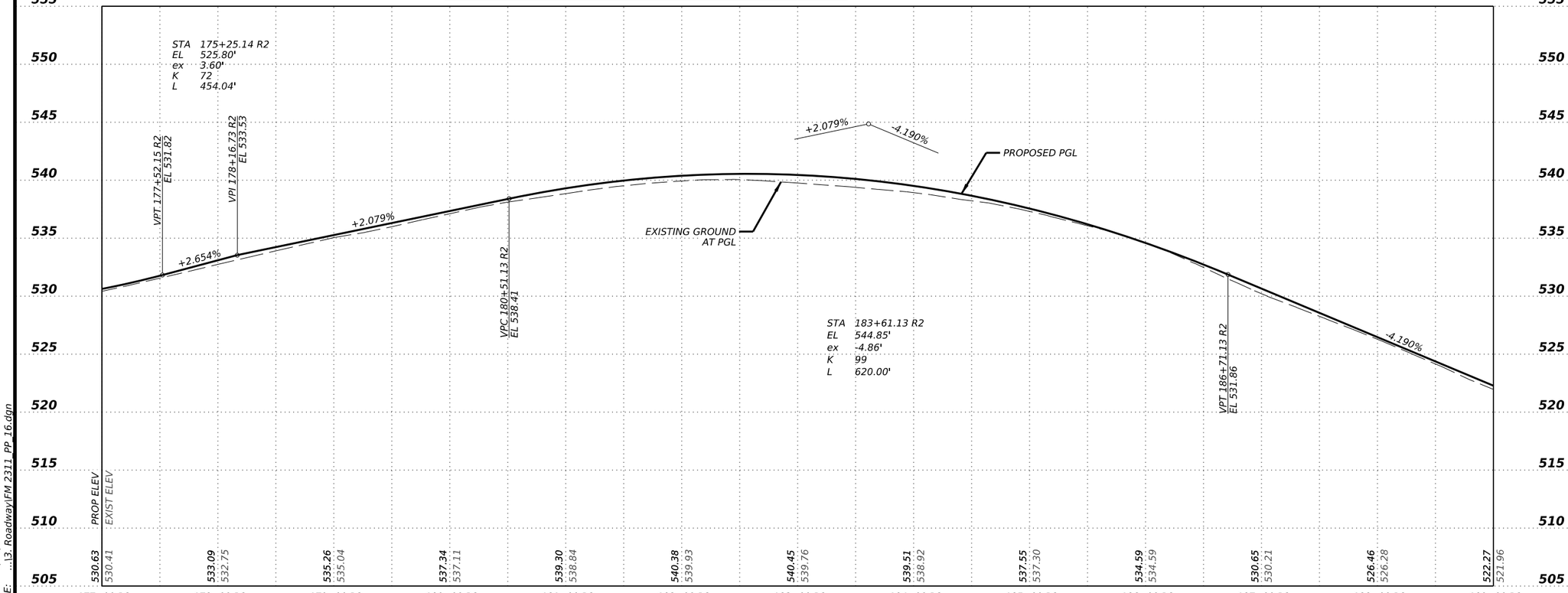
5. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

0 50 100
SCALE IN FEET



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PLAN AND PROFILE
STA 177+00 R2 TO STA 189+00 R2

SCALE: 1"=100' H; 1"=10' V SHEET 16 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		105

DATE: 1/29/2024 2:25:00 PM
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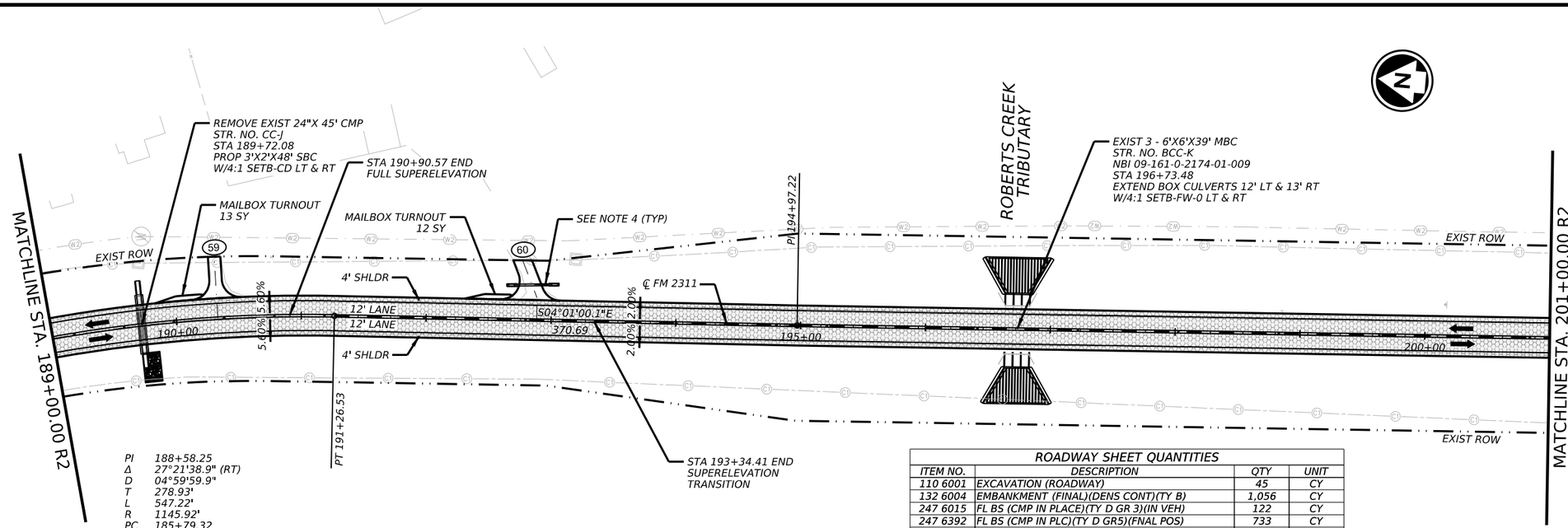

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	45	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	1,056	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,120	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
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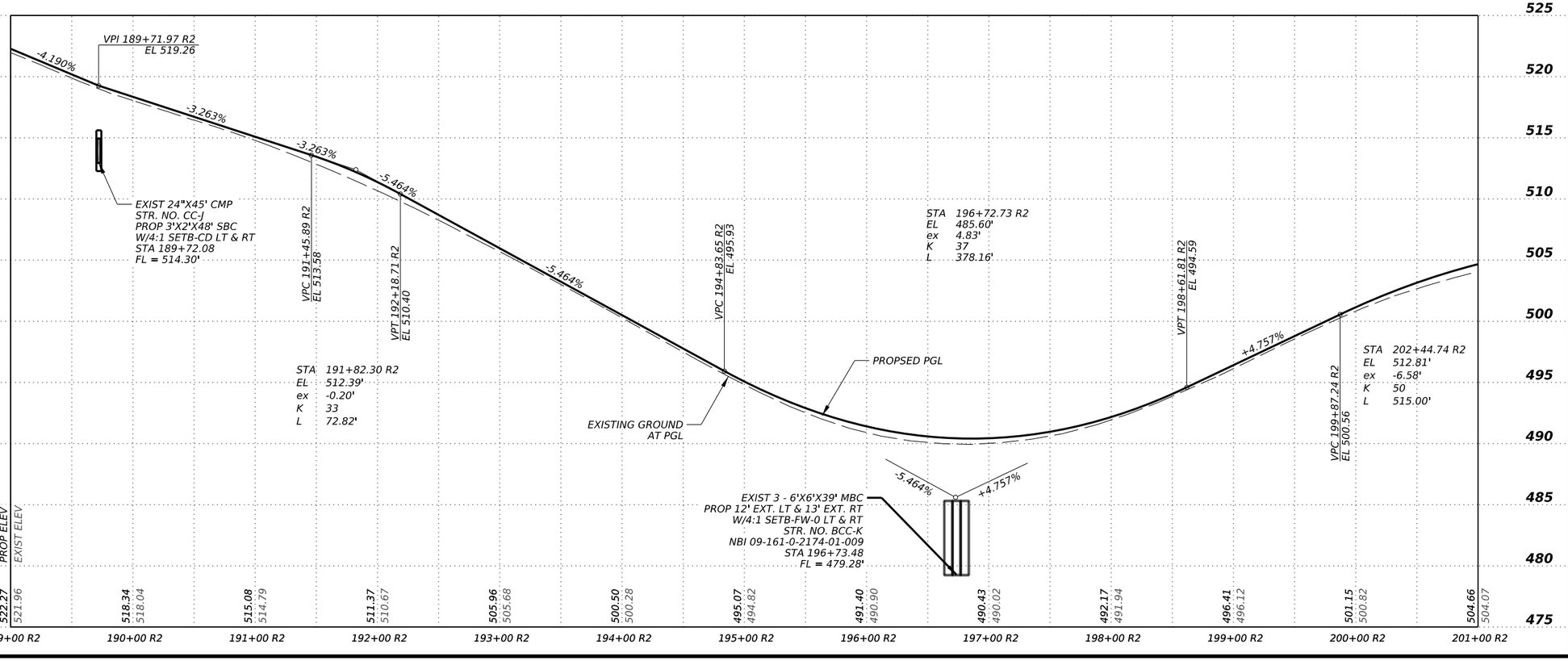
0 50 100
SCALE IN FEET



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PLAN AND PROFILE
STA 189+00 R2 TO STA 201+00 R2

SCALE: 1"=100' H; 1"=10' V SHEET 17 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		106

DATE: 3/28/2024 11:56:34 AM
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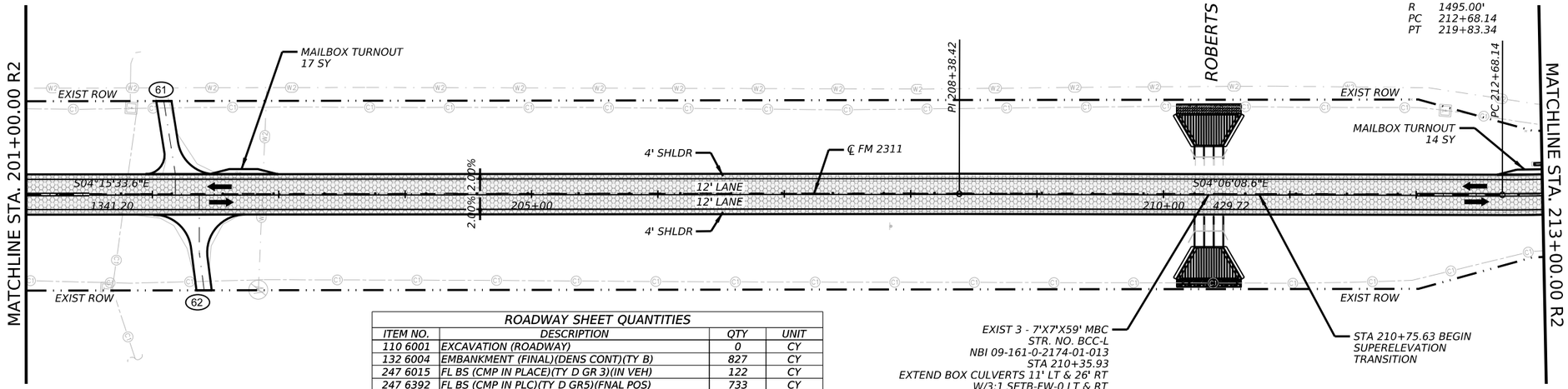

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	0	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	827	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,120	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
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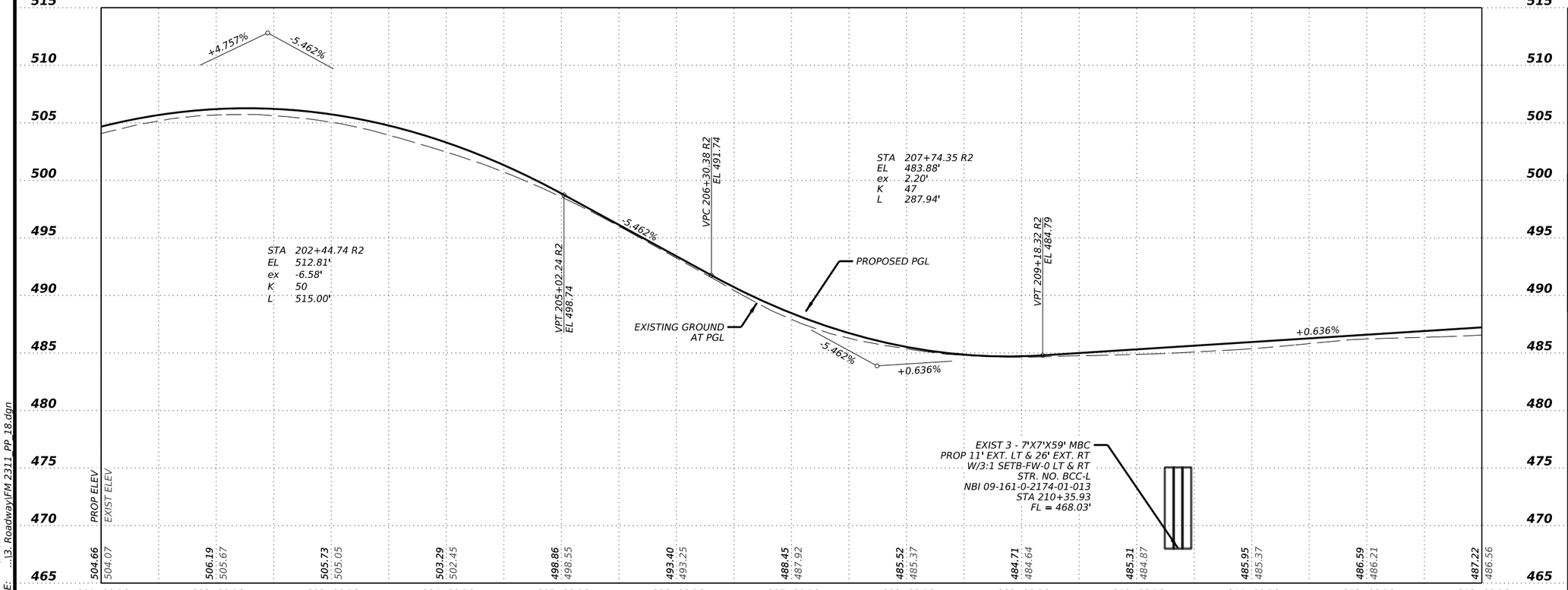
5. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

0 50 100
SCALE IN FEET



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PLAN AND PROFILE
STA 201+00 R2 TO STA 213+00 R2

SCALE: 1"=100' H; 1"=10' V SHEET 18 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		107

DATE: 3/28/2024 11:56:56 AM
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DW:
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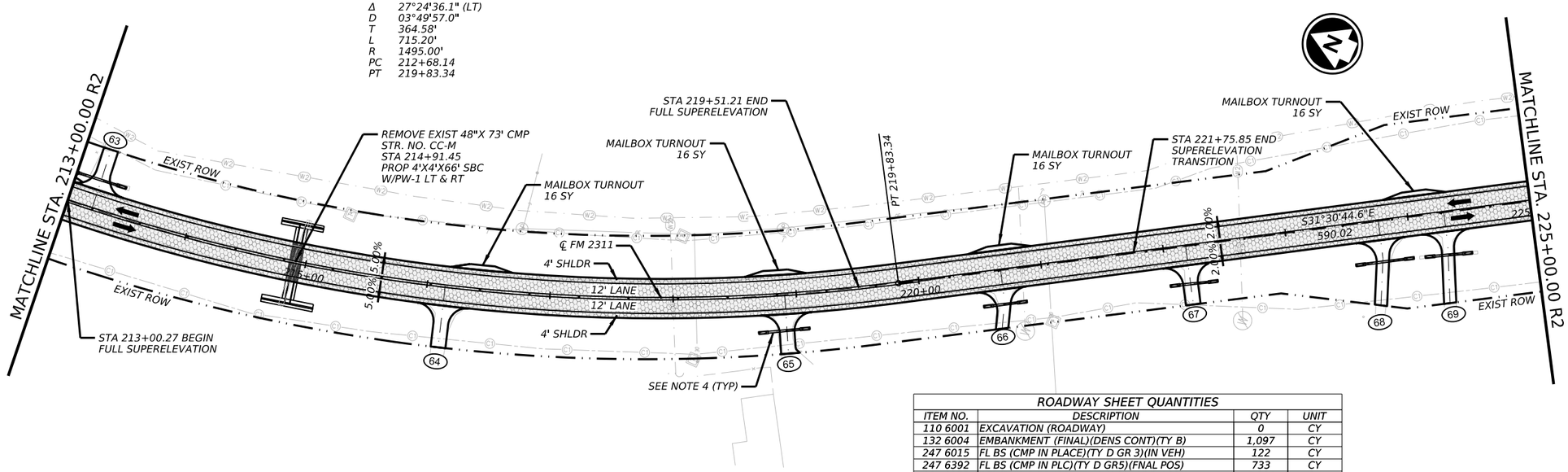
PI 216+32.72
Δ 27°24'36.1" (LT)
D 03°49'57.0"
T 364.58'
L 715.20'
R 1495.00'
PC 212+68.14
PT 219+83.34



LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
3. RUMBLE STRIPS NOT SHOWN FOR CLARITY.
4. SEE "SUMMARY OF QUANTITIES (DRIVEWAYS & INTERSECTIONS)" AND DRIVEWAY AND INTERSECTION DETAILS FOR ADDITIONAL INFORMATION.
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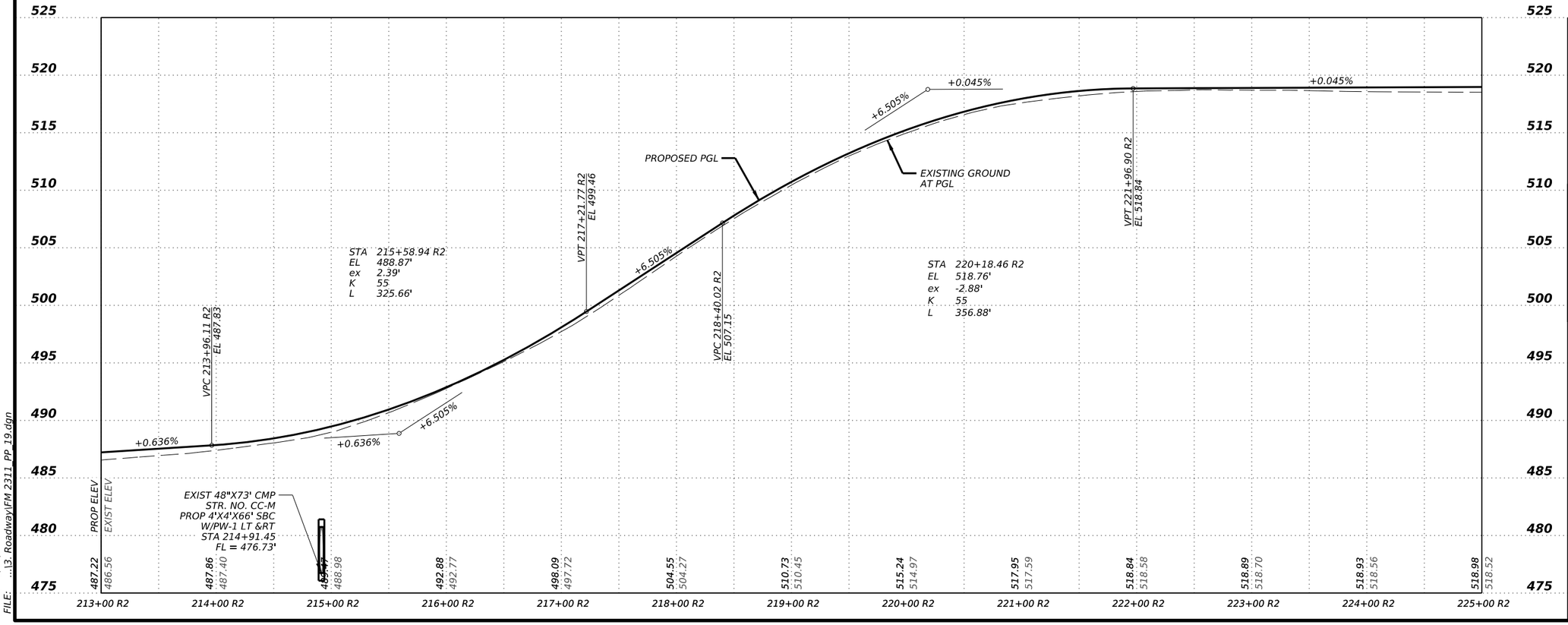
0 50 100
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	0	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	1,097	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,120	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL



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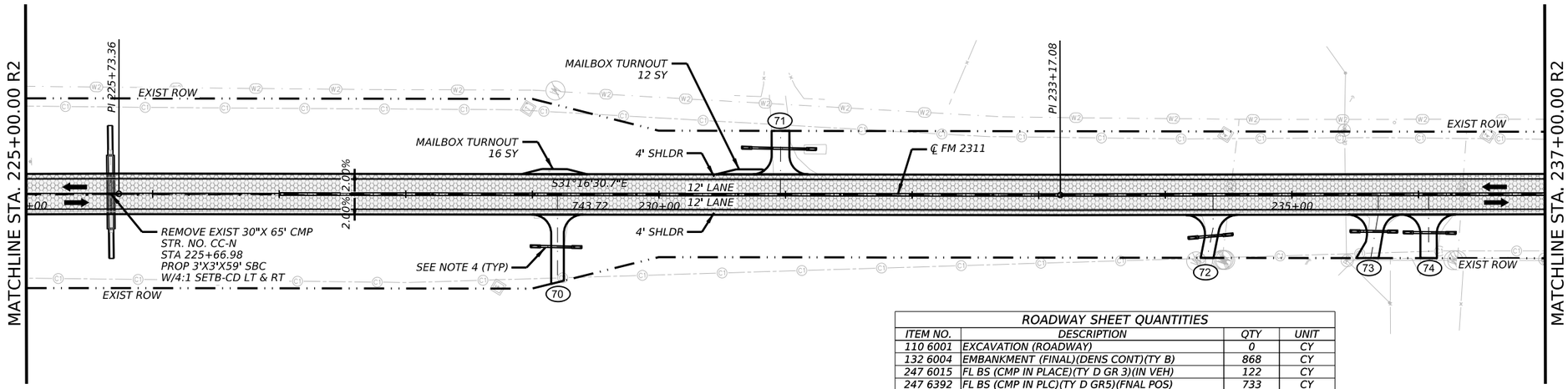
PLAN AND PROFILE
STA 213+00 R2 TO STA 225+00 R2

SCALE: 1"=100' H; 1"=10' V SHEET 19 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		108



ROADWAY SHEET QUANTITIES

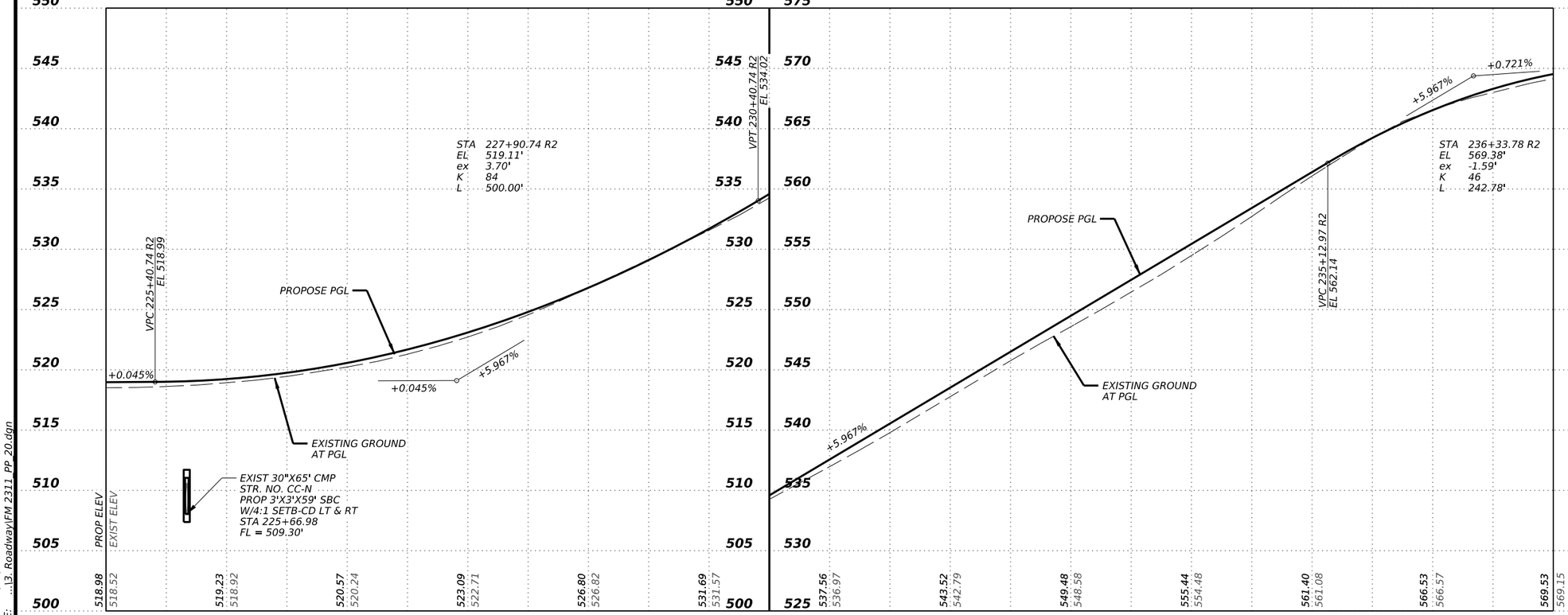
ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	0	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	868	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,120	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
3. RUMBLE STRIPS NOT SHOWN FOR CLARITY.
4. SEE "SUMMARY OF QUANTITIES (DRIVEWAYS & INTERSECTIONS)" AND DRIVEWAY AND INTERSECTION DETAILS FOR ADDITIONAL INFORMATION.
5. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

0 50 100
SCALE IN FEET



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PLAN AND PROFILE
STA 225+00 R2 TO STA 237+00 R2

SCALE: 1"=100' H; 1"=10' V SHEET 20 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		109

DATE: 1/29/2024 2:26:04 PM
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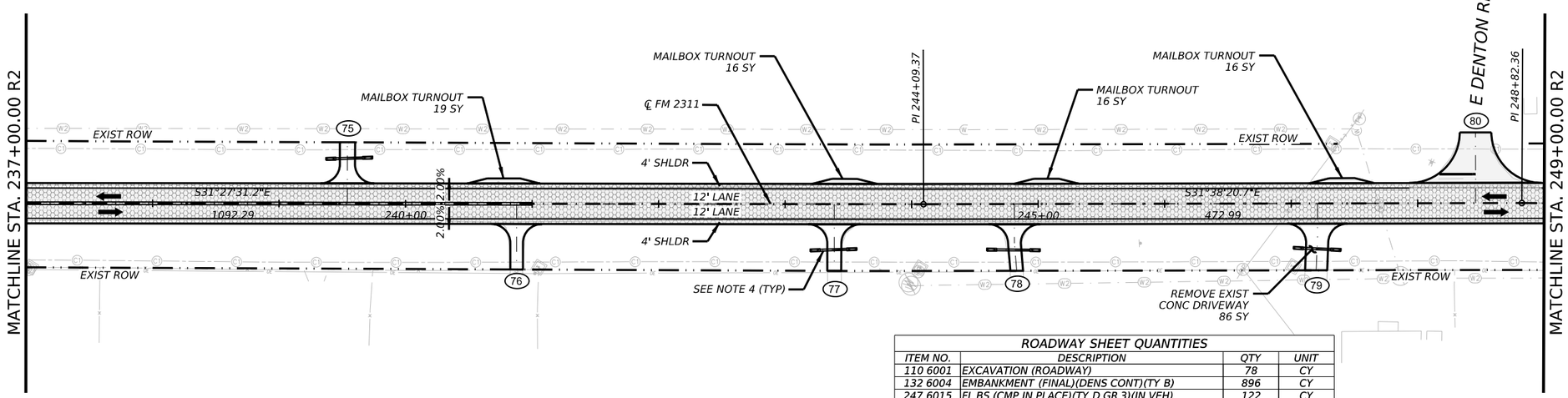

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
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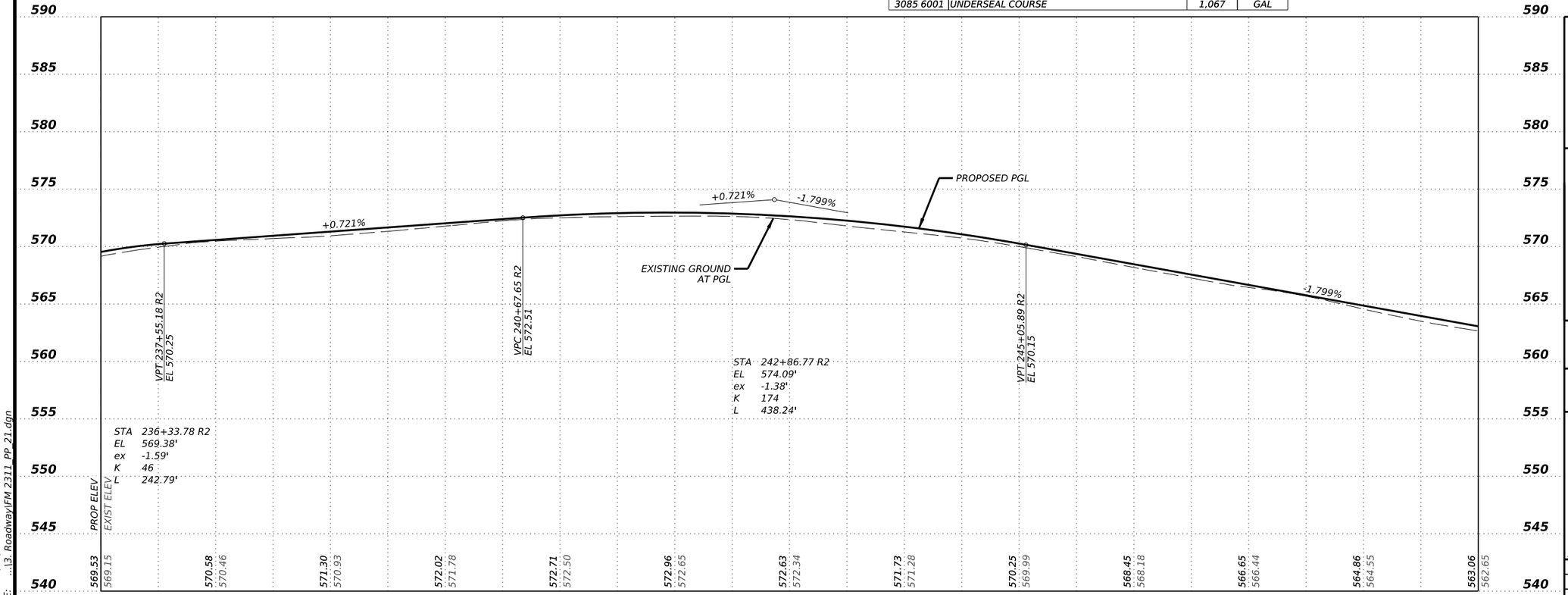
0 50 100
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	78	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	896	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,121	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL



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PLAN AND PROFILE
STA 237+00 R2 TO STA 249+00 R2

SCALE: 1"=100' H; 1"=10' V SHEET 21 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		110

DATE: 1/29/2024 2:26:18 PM
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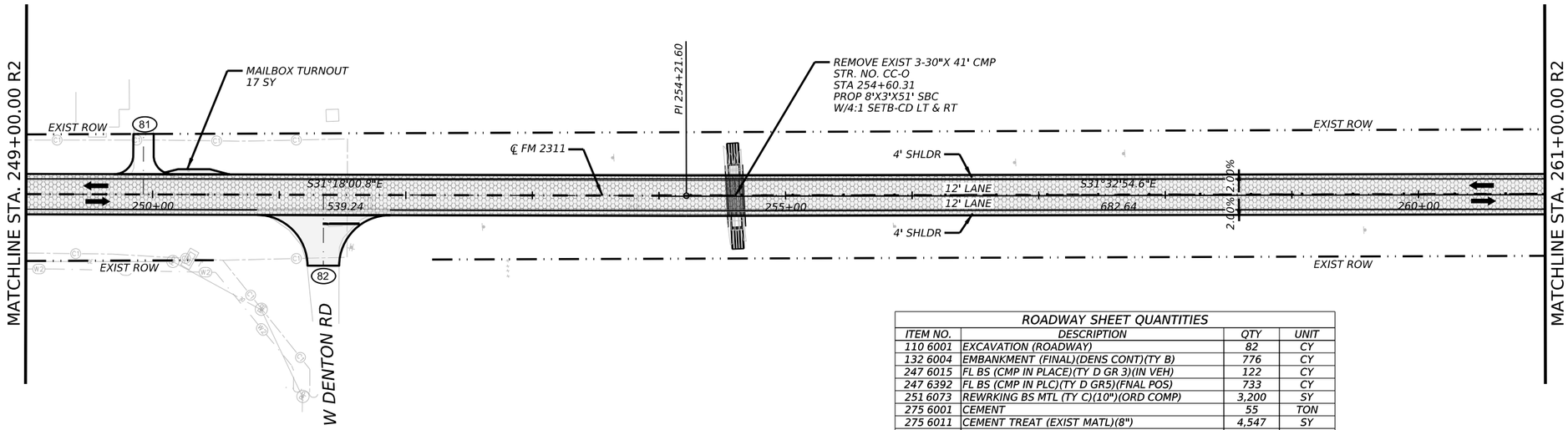

LEGEND

- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
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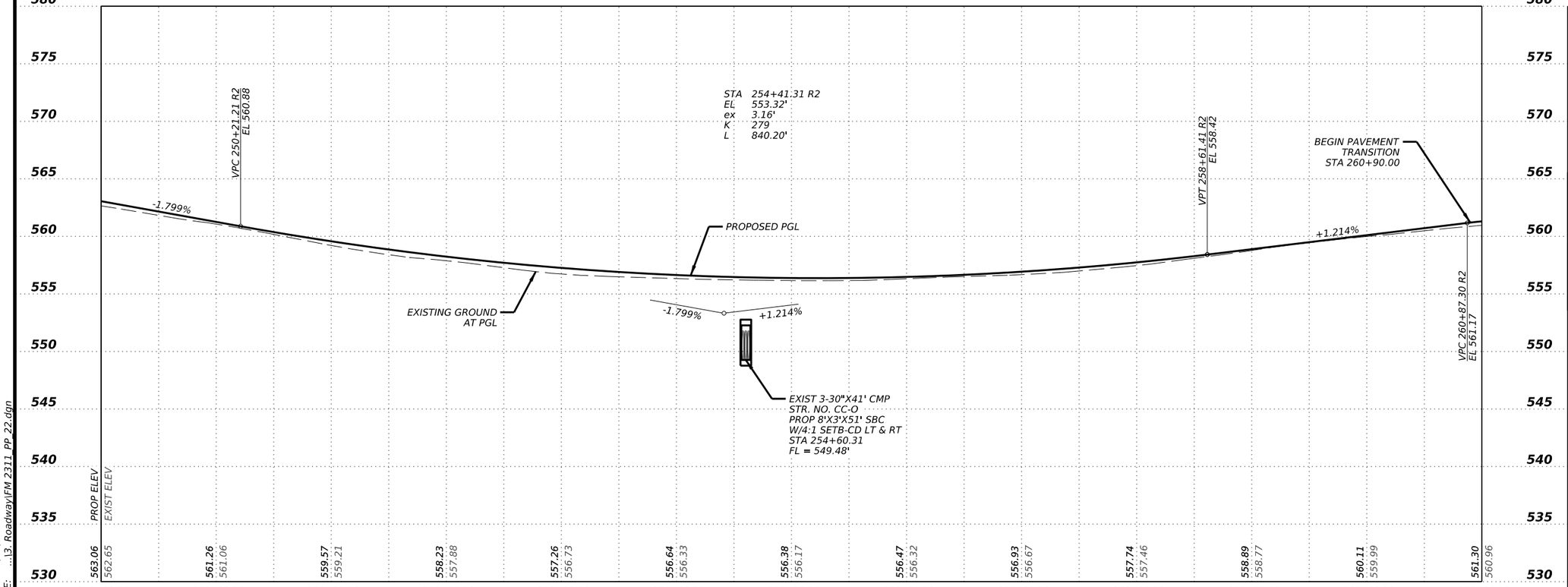
0 50 100
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	82	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	776	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	122	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	733	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	3,200	SY
275 6001	CEMENT	55	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	4,547	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	5,121	GAL
315 6004	FOG SEAL (CSS-1H)	427	GAL
316 6022	ASPH (CRS-2)	1,920	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	32	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	587	TON
3085 6001	UNDERSEAL COURSE	1,067	GAL



STATE OF TEXAS
RANDY W. HARRIS
93663
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1/29/2024
Randy W. Harris, P.E.

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PLAN AND PROFILE
STA 249+00 R2 TO STA 261+00 R2

SCALE: 1"=100' H; 1"=10' V SHEET 22 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		111

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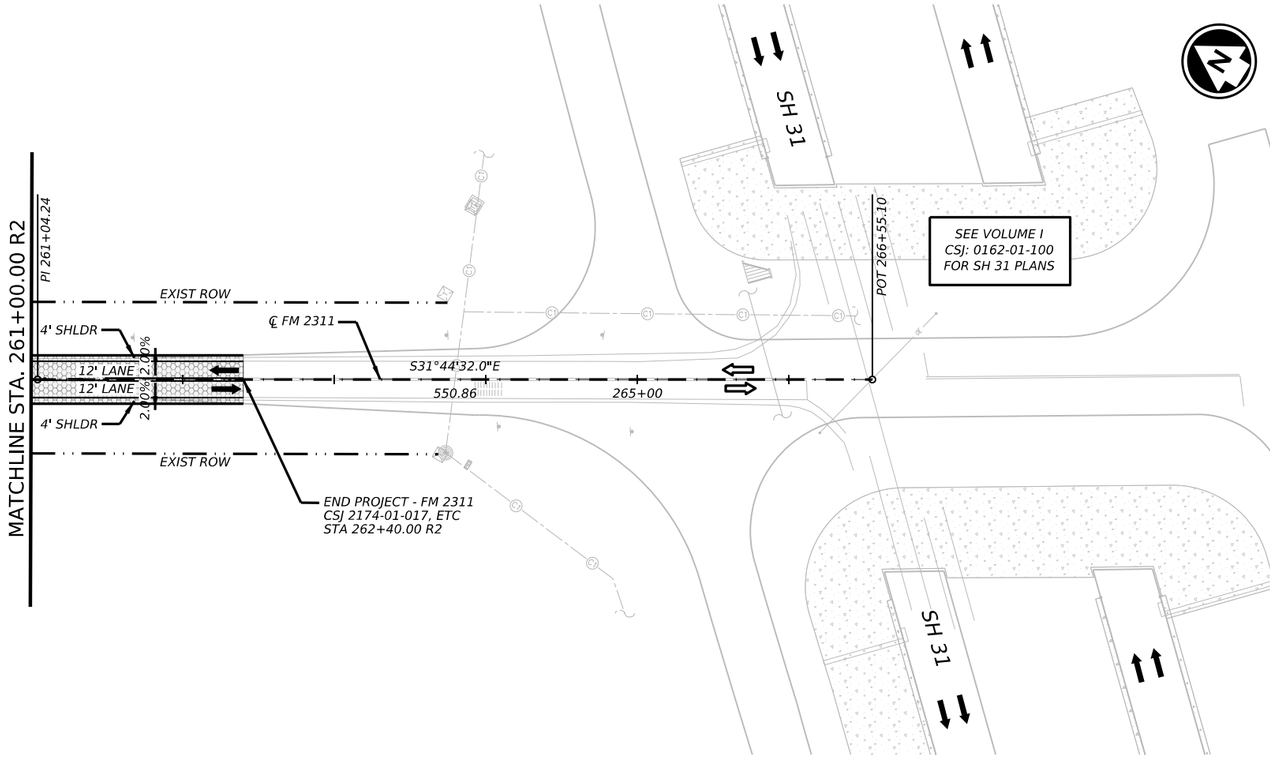


LEGEND

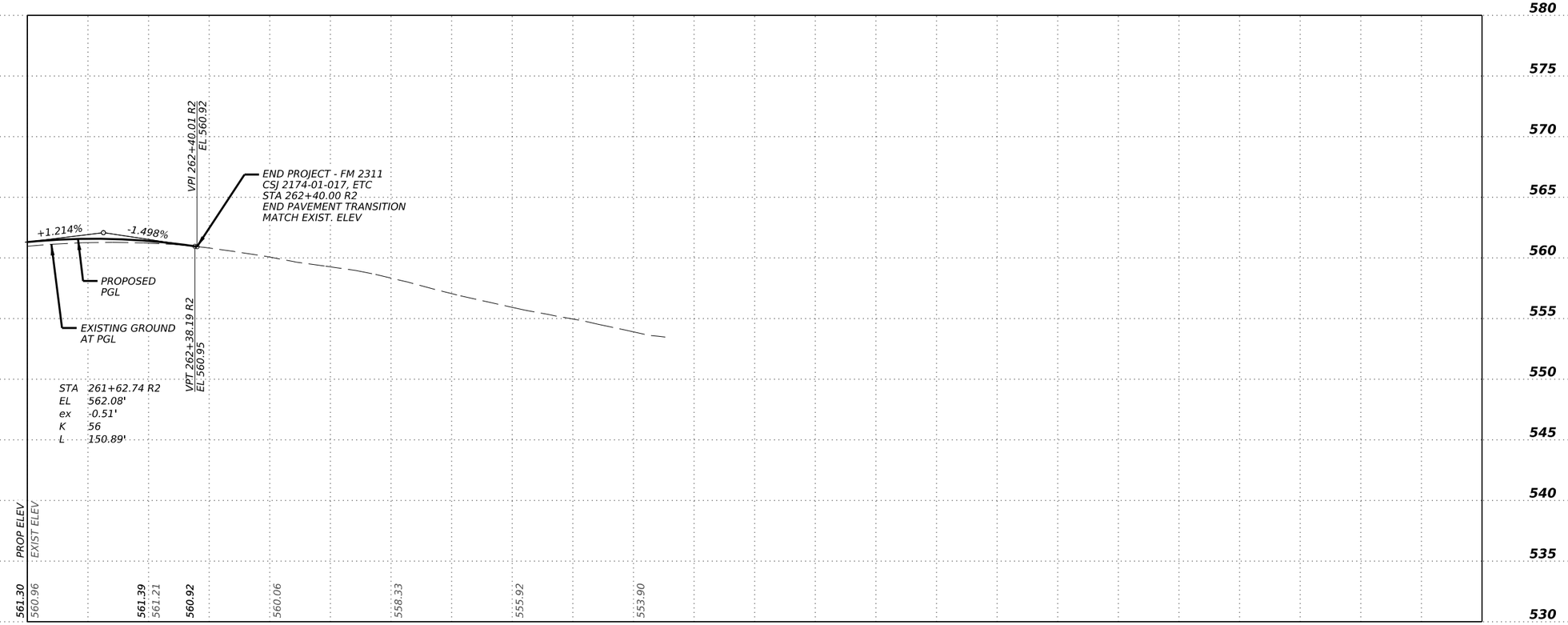
- TRAFFIC DIRECTION
- EXISTING ROW
- 2.5" SP-C SURF, UNDERSEAL CRSE, 6" NEW FL BS, FOG SEAL, OCST, & 8" CEMENT TREAT EXIST MAT'L
- RECONSTRUCTION
- CONCRETE RIPRAP
- (#) DRIVE/INTERSECTION NUMBER

NOTES:
1. SEE "HORIZONTAL ALIGNMENT DATA" SHEETS FOR DETAILED ALIGNMENT DATA.
2. SEE SIGNING & PAVEMENT MARKING LAYOUTS FOR LANE AND SHOULDER CONFIGURATION.
3. RUMBLE STRIPS NOT SHOWN FOR CLARITY.
4. SEE "SUMMARY OF QUANTITIES (DRIVEWAYS & INTERSECTIONS)" AND DRIVEWAY AND INTERSECTION DETAILS FOR ADDITIONAL INFORMATION.
5. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
110 6001	EXCAVATION (ROADWAY)	0	CY
132 6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	62	CY
247 6015	FL BS (CMP IN PLACE)(TY D GR 3)(IN VEH)	14	CY
247 6392	FL BS (CMP IN PLC)(TY D GR5)(FNAL POS)	239	CY
251 6073	REWRKING BS MTL (TY C)(10")(ORD COMP)	374	SY
275 6001	CEMENT	6	TON
275 6011	CEMENT TREAT (EXIST MATL)(8")	530	SY
314 6005	EMULS ASPH (BS OR SUBGR TRT)(CSS-1H)	598	GAL
315 6004	FOG SEAL (CSS-1H)	50	GAL
316 6022	ASPH (CRS-2)	224	GAL
316 6397	AGGR(TY-D GR-4 OR TY-L GR-4)	4	CY
3077 6023	SP MIXES SP-C SAC-B PG70-22	68	TON
3085 6001	UNDERSEAL COURSE	125	GAL

0 50 100
SCALE IN FEET



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PLAN AND PROFILE
STA 261+00 R2 TO END

SCALE: 1"=100' H; 1"=10' V SHEET 23 OF 23

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		112

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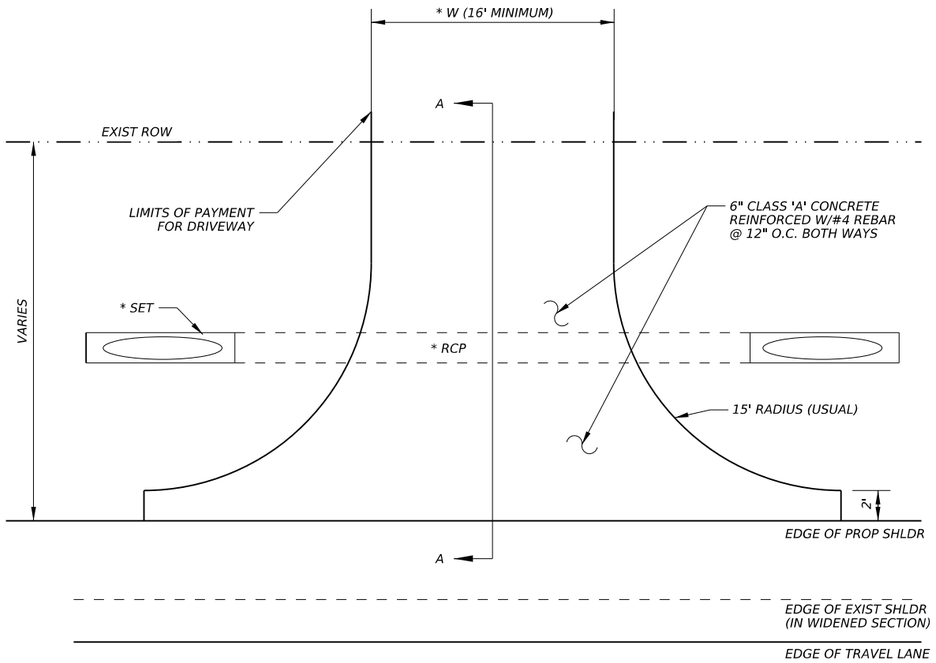
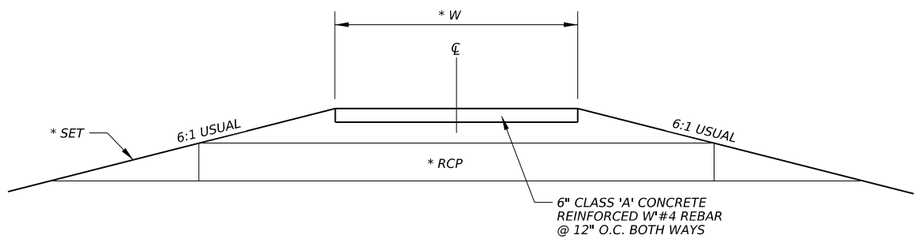


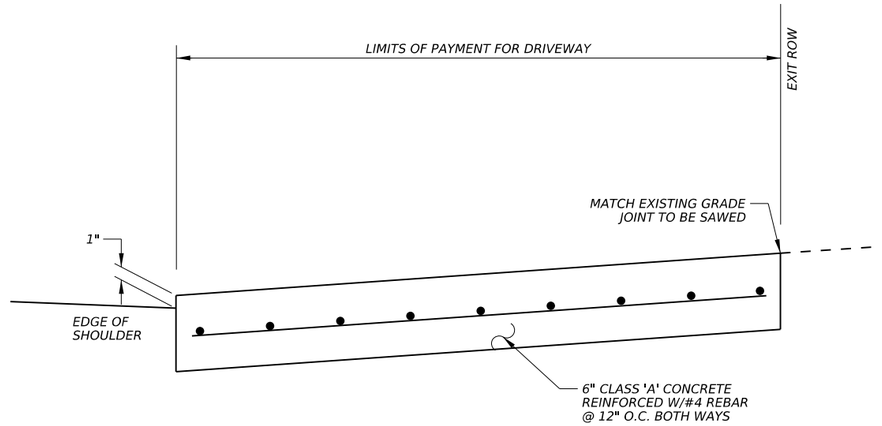
DRIVEWAYS (CONC) (HES)

DRIVEWAYS (CONC) (HES) SHALL CONSIST OF: BLADING AND RESHAPING THE SUBGRADE, ANY EXTRA EMBANKMENT MATERIAL NECESSARY TO ACHIEVE THE PROPER SUBGRADE WIDTH, THE PLACEMENT OF 6" CLASS 'A' CONCRETE AND REMOVAL OF ANY EXISTING CONCRETE AND/OR CONC CURB AND GUTTER.



DRIVEWAYS (CONC) (HES) TYPICAL SECTION

* SEE SUMMARY OF QUANTITIES (DRIVEWAYS & INTERSECTIONS) FOR: LOCATION, DIMENSION "W" AND RCP/SET DETAILS (IF REQ'D)



SECTION A-A

STATE OF TEXAS
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DRIVEWAY AND INTERSECTION DETAILS

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		113

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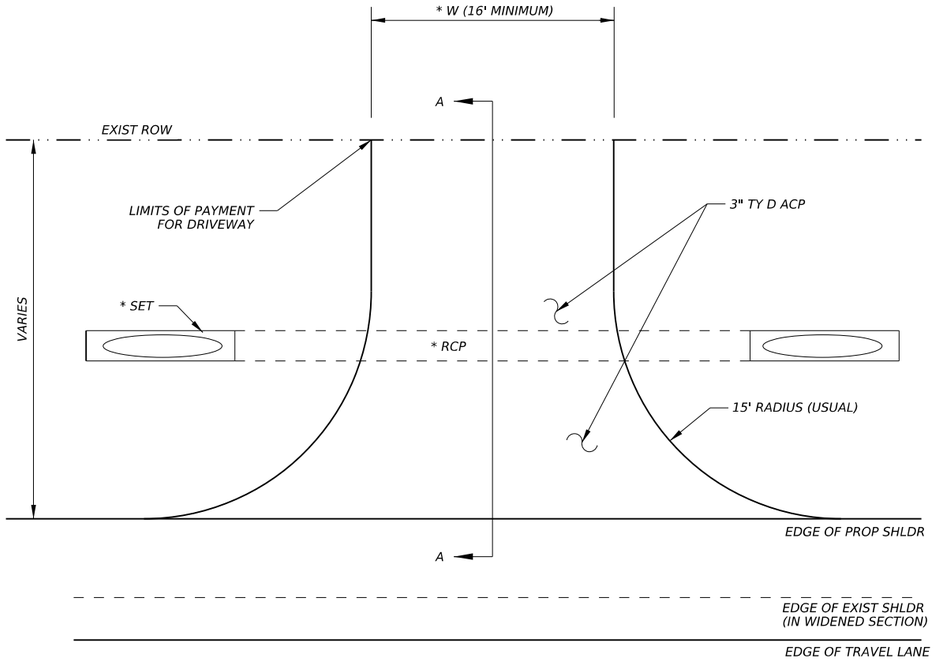
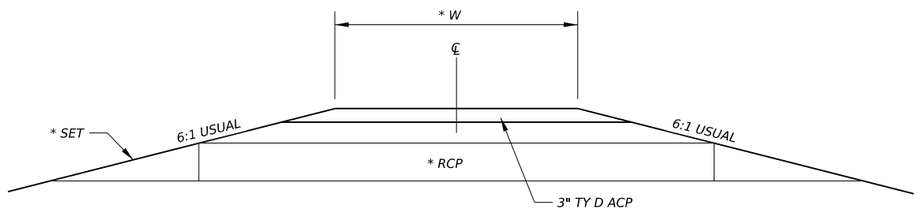


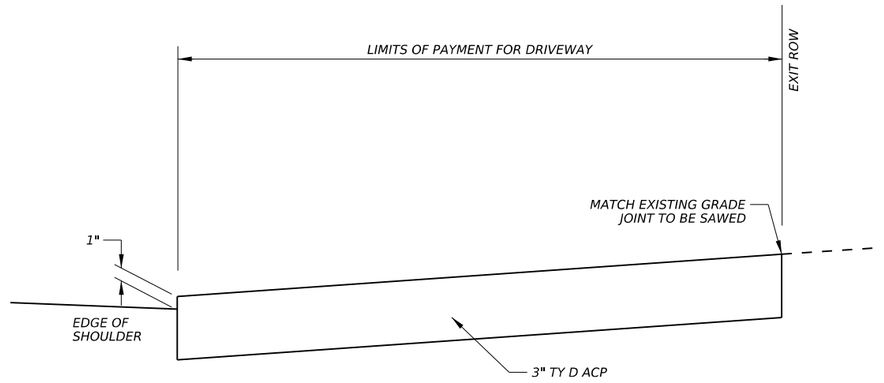
DRIVEWAYS (ACP)

DRIVEWAYS (ACP) SHALL CONSIST OF: BLADING AND RESHAPING THE SUBGRADE, ANY EXTRA EMBANKMENT MATERIAL NECESSARY TO ACHIEVE THE PROPER SUBGRADE WIDTH, AND PLACEMENT OF 3" TY D ACP.



DRIVEWAYS (ACP) TYPICAL SECTION

* SEE SUMMARY OF QUANTITIES (DRIVEWAYS & INTERSECTIONS) FOR: LOCATION, DIMENSION "W" AND RCP/SET DETAILS (IF REQ'D)



SECTION A-A

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DRIVEWAY AND INTERSECTION DETAILS

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		114

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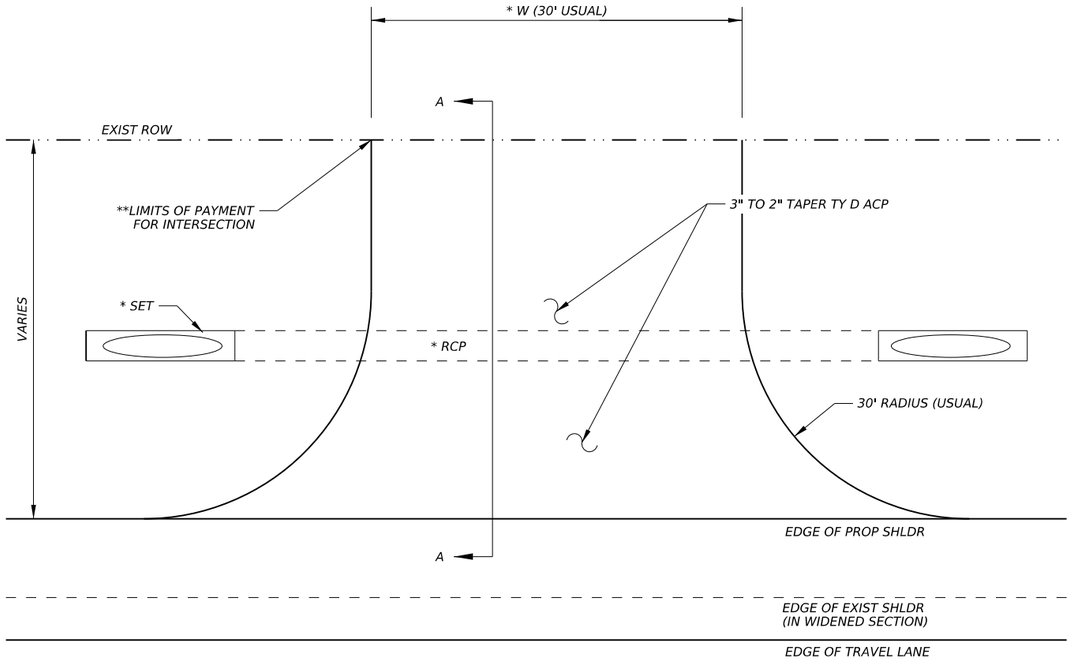
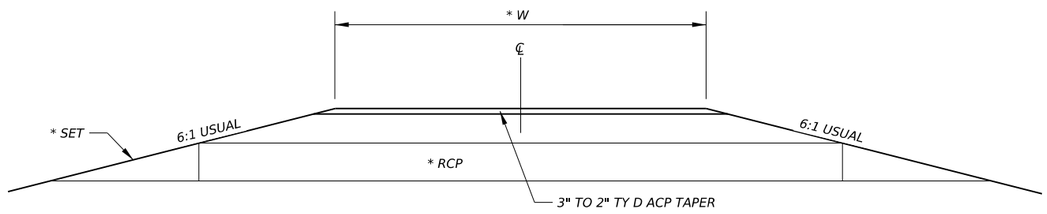
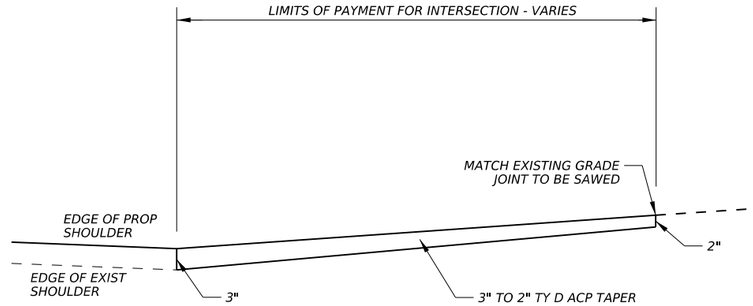


INTERSECTIONS (ACP)

INTERSECTIONS (ACP) SHALL CONSIST OF: BLADING AND RESHAPING THE SUBGRADE, ANY EXTRA EMBANKMENT MATERIAL NECESSARY TO ACHIEVE THE PROPER SUBGRADE WIDTH, AND PLACEMENT OF A 3" TO 2" TY D ACP TAPER.



INTERSECTIONS (ACP) TYPICAL SECTION



SECTION A-A

* SEE SUMMARY OF QUANTITIES (DRIVEWAYS & INTERSECTIONS) FOR: LOCATION, DIMENSION "W" AND RCP/SET DETAILS (IF REQ'D)

STATE OF TEXAS
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DRIVEWAY AND INTERSECTION DETAILS

SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.
WAC	McLENNAN		115

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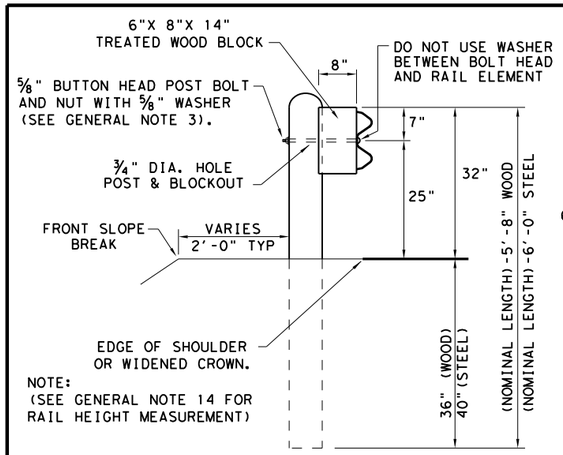
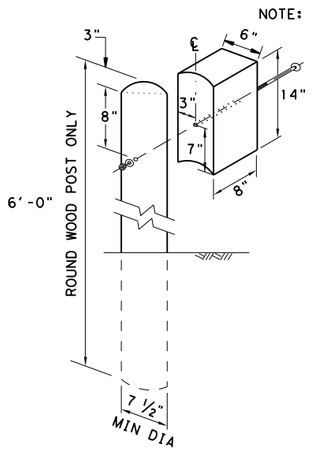
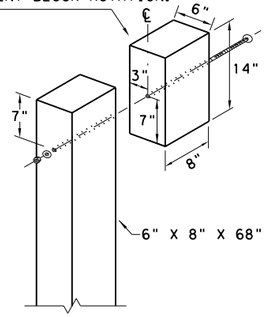


TYPICAL POST PLACEMENT

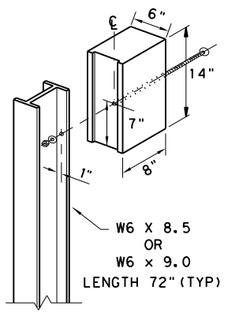


WOOD BLOCK TO ROUND WOOD POST

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

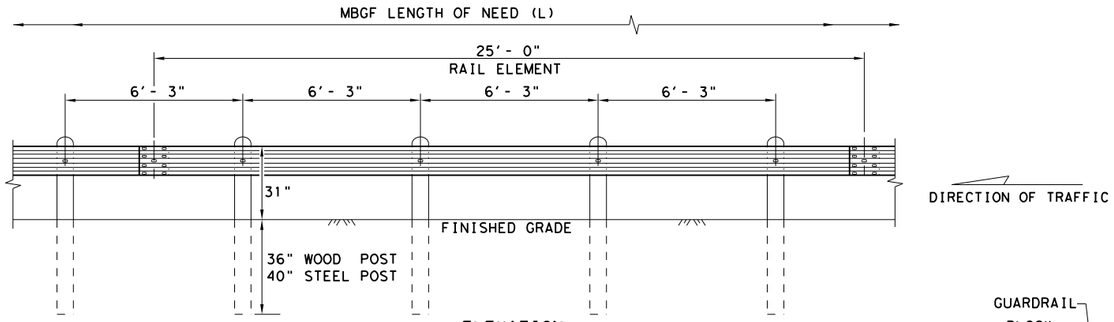


WOOD BLOCK TO RECTANGULAR WOOD POST



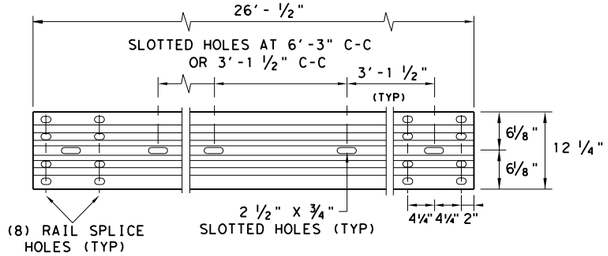
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



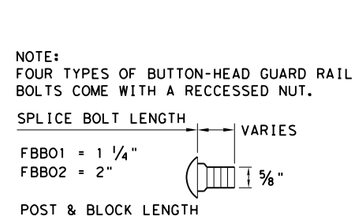
ELEVATION
MID-SPAN RAIL SPLICE

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



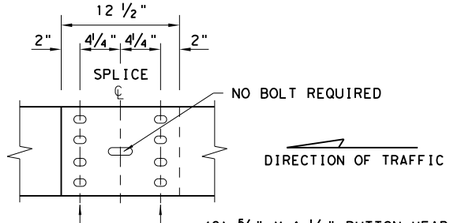
ELEVATION 25'- 0" (NOM.) W-BEAM SECTION

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



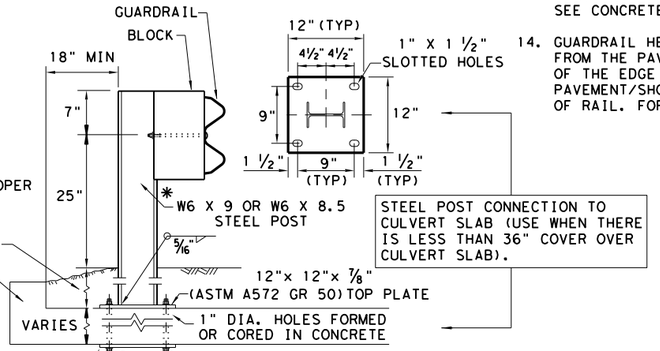
BUTTON HEAD BOLT

NOTE: 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.



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

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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

GENERAL NOTES

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

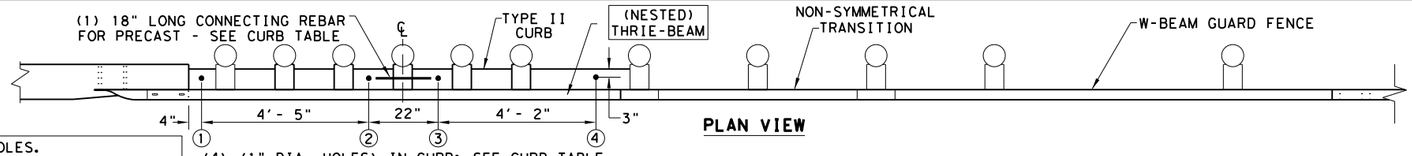
Texas Department of Transportation

Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		116

DATE: 1/29/2024
FILE: ...\3. Roadway\STDS\gf3119.dgn



PLAN VIEW

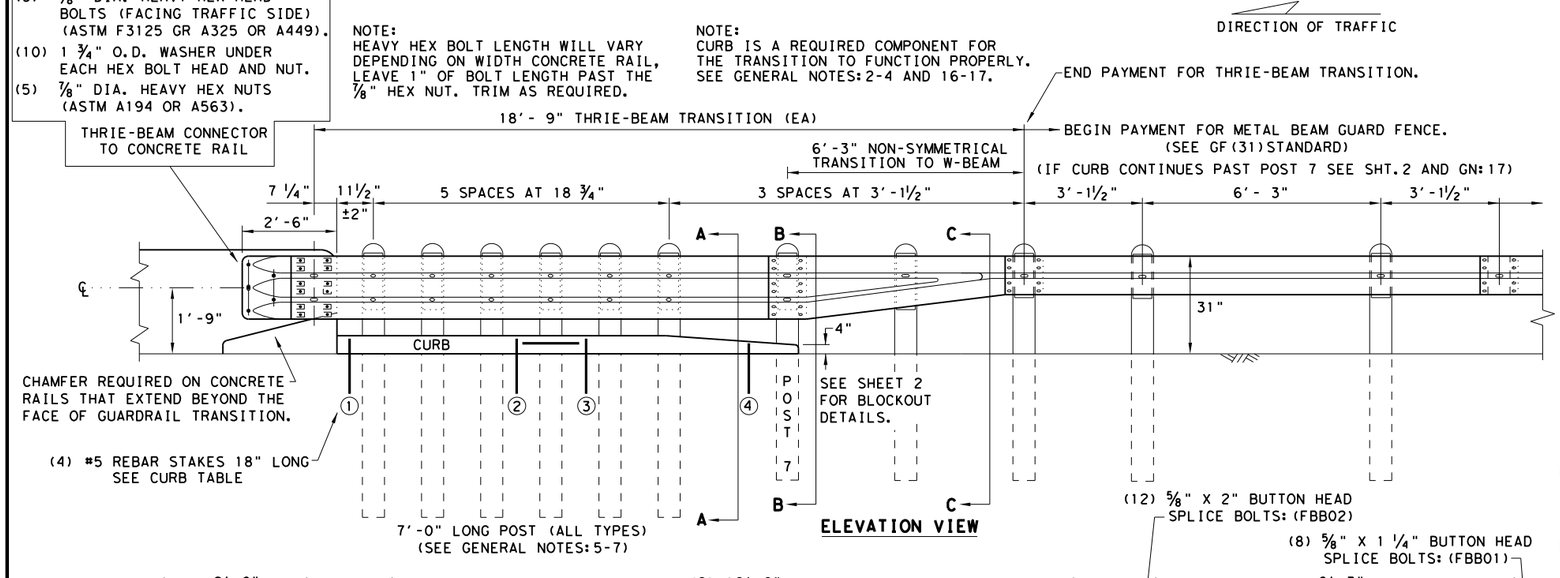
(4) (1" DIA. HOLES) IN CURB: SEE CURB TABLE

(5) 1" DIA. HOLES.
(5) ⅞" DIA. HEAVY HEX HEAD BOLTS (FACING TRAFFIC SIDE) (ASTM F3125 GR A325 OR A449).
(10) 1 ¾" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
(5) ⅞" DIA. HEAVY HEX NUTS (ASTM A194 OR A563).

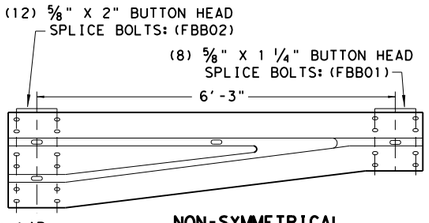
NOTE:
HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL, LEAVE 1" OF BOLT LENGTH PAST THE ⅞" HEX NUT. TRIM AS REQUIRED.

NOTE:
CURB IS A REQUIRED COMPONENT FOR THE TRANSITION TO FUNCTION PROPERLY. SEE GENERAL NOTES: 2-4 AND 16-17.

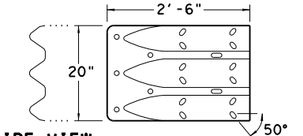
DIRECTION OF TRAFFIC



ELEVATION VIEW

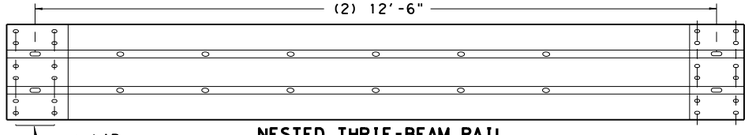


NON-SYMMETRICAL W-BEAM TO THRIE-BEAM TRANSITION 10GA.
PART DESIGNATOR RWT02a OR RWT02b



SIDE-VIEW

THRIE-BEAM TERMINAL CONNECTOR 10GA.
PART DESIGNATOR RTE01b
NOTE: SEE GENERAL NOTE: 9

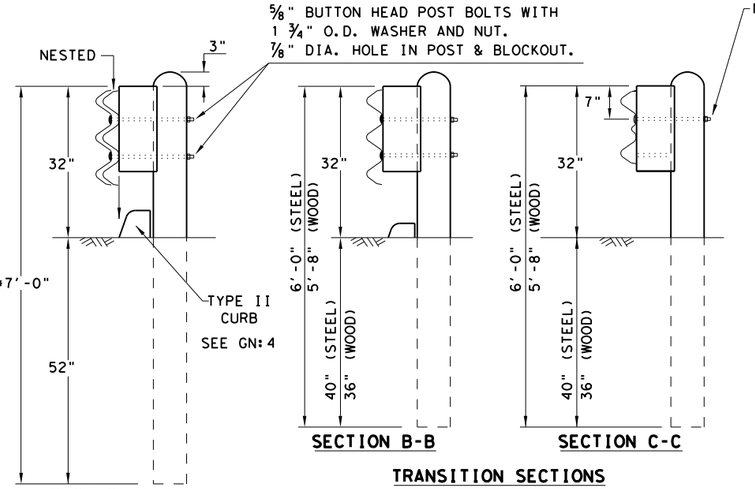


NESTED THRIE-BEAM RAIL
PART DESIGNATOR RTM10a

(12) ⅝" X 2" BUTTON HEAD SPLICE BOLTS WITH RECESSED NUTS: (FBB02)
(12) RECTANGULAR GUARDRAIL PLATE WASHERS: (FWR03)

PLATE WASHER INSTRUCTIONS

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



SECTION A-A **SECTION B-B** **SECTION C-C**

TRANSITION SECTIONS

NOTE: ALL POST TYPES, SEE GENERAL NOTE: 5 & 6

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

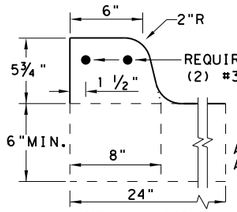
THRIE-BEAM TERMINAL - CURB TABLE

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

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

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

SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *:
FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND ½" BELOW TOP OF CURB.
FILL HOLES WITH APPROVED GROUT MIXTURE.



TYPE II CURB

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

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

TYPE II CURB DETAILS

GENERAL NOTES

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

HIGH-SPEED TRANSITION

Texas Department of Transportation — Design Division Standard

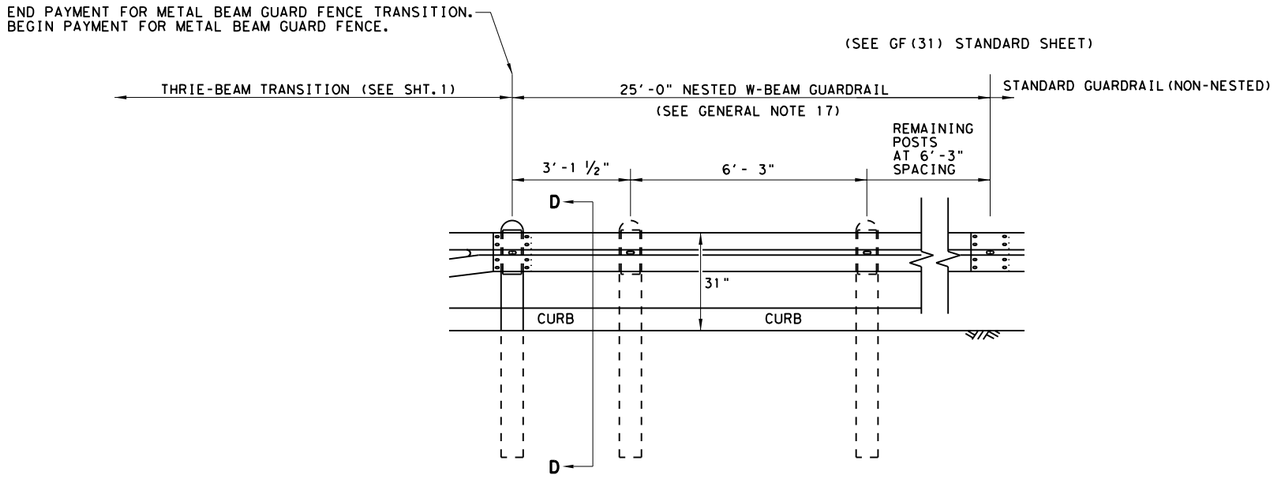
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-20

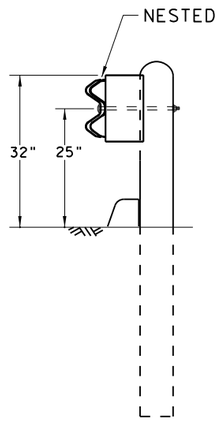
FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2174	01	018	FM 2311	
	DIST	COUNTY		SHEET NO.	
	WAC	McLENNAN		117	

DATE: 1/29/2024
FILE: ...\STDS\gf31trt1320.dgn

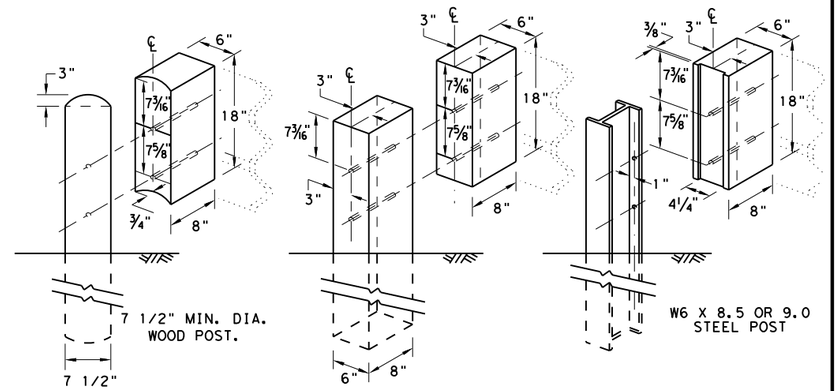
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
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DATE: 1/29/2024
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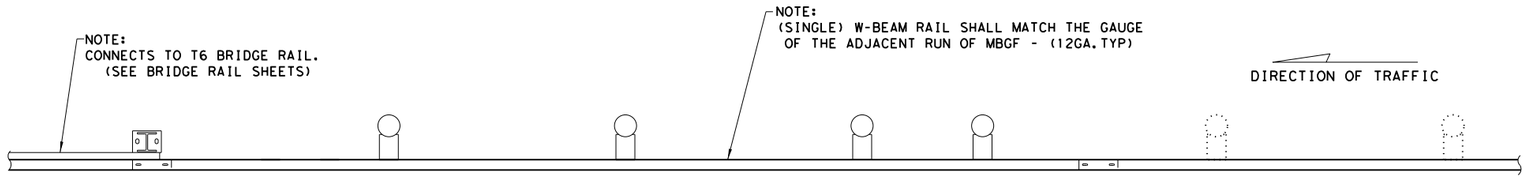
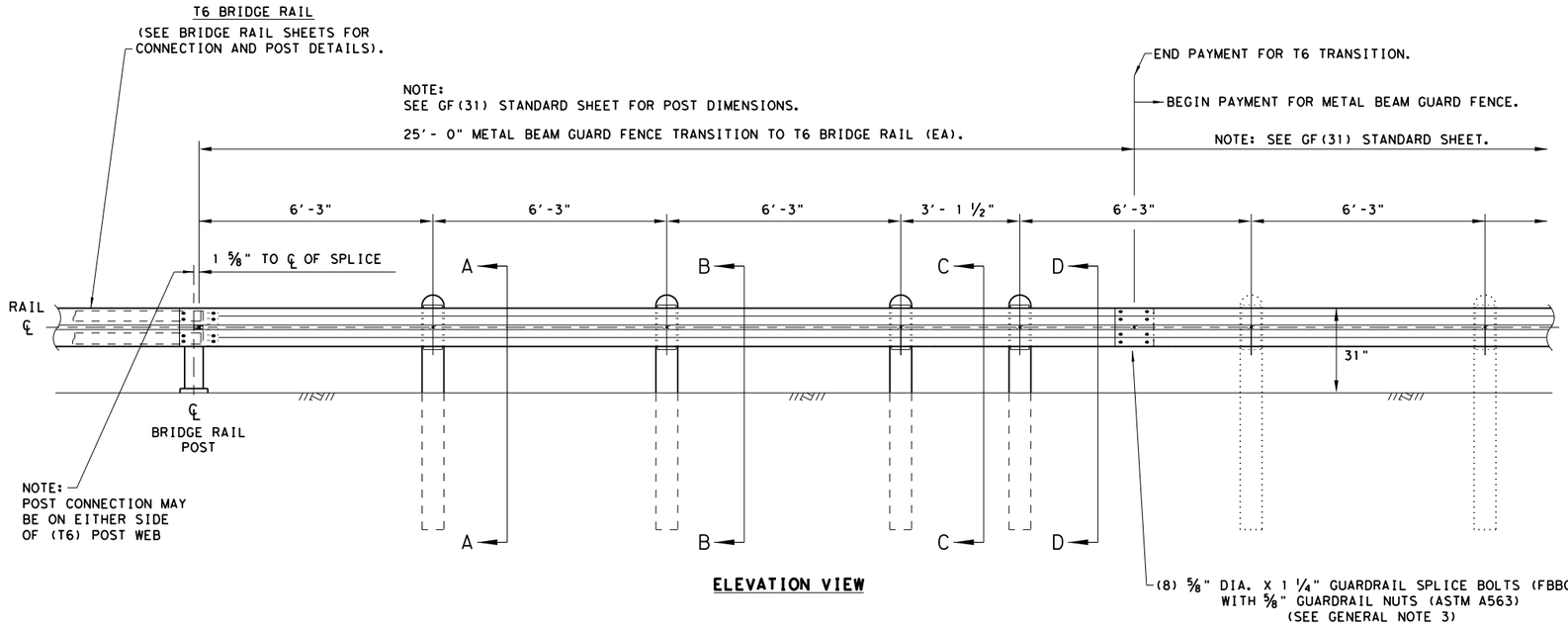


PLAN VIEW

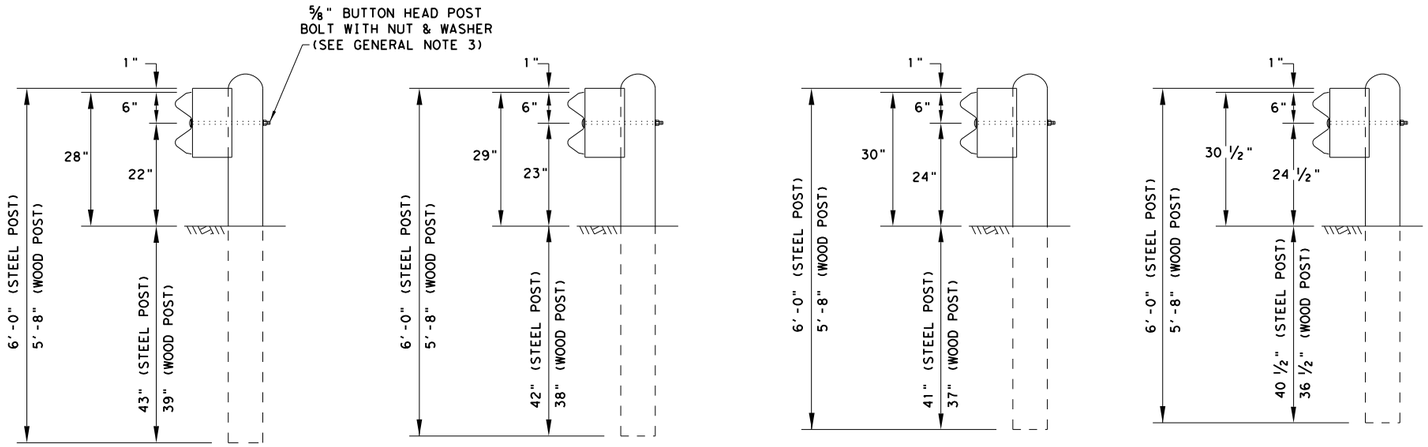


ELEVATION VIEW

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 ELEMENT 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 1/2" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST" BOLTS (ASTM A307 GR.A) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND 5/8" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE 5/8" X 1- 1/4" WITH 5/8" NUTS (ASTM A563).
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. WHERE SOLID ROCK IS ENCOUNTERED. CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. 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.
9. REFER TO STANDARD GF(31) & APPLICABLE BRIDGE RAILING STANDARD FOR ADDITIONAL DETAILS.

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



SECTION A-A **SECTION B-B** **SECTION C-C** **SECTION D-D**

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE TRANSITION (T6)

GF(31)T6-19

FILE: gf31t619.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
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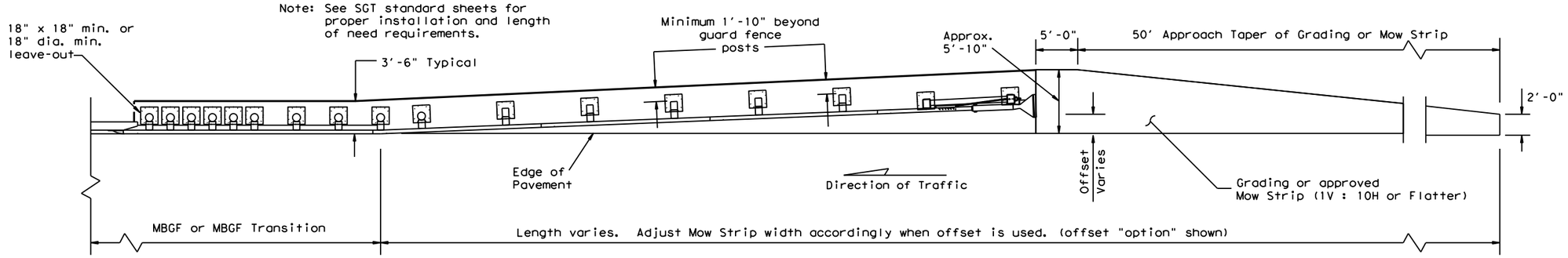
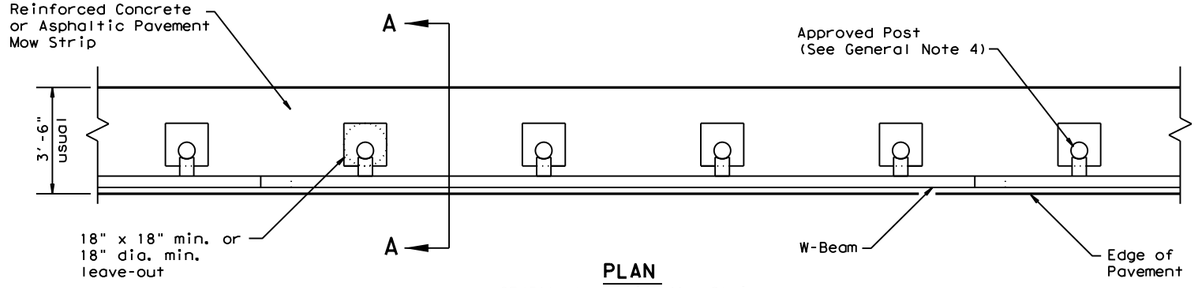
	WAC	McLENNAN		119	

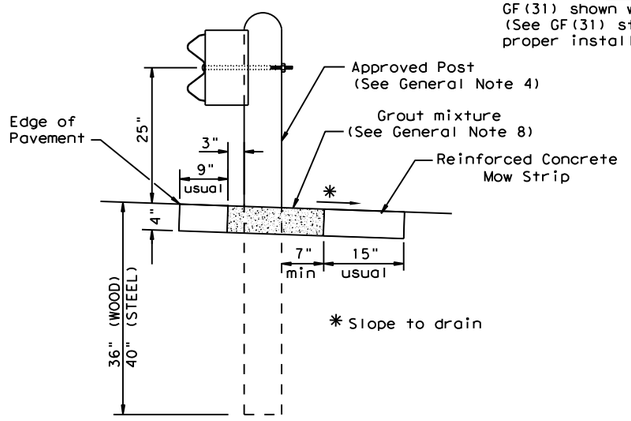


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



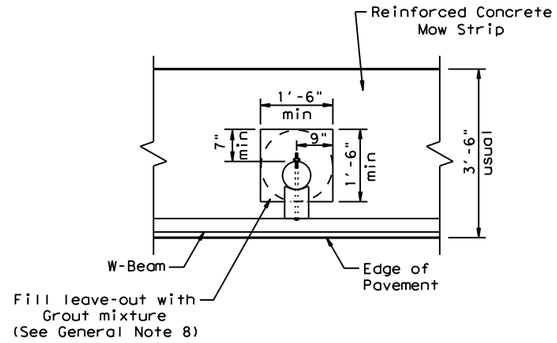
PLAN

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



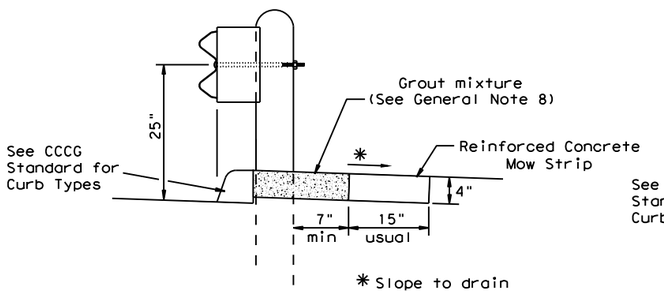
SECTION A-A

Typical



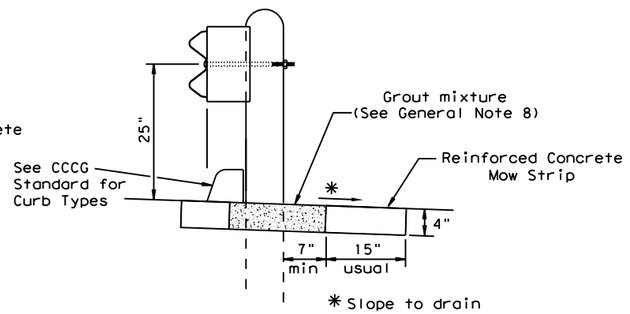
MOW STRIP DETAIL

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



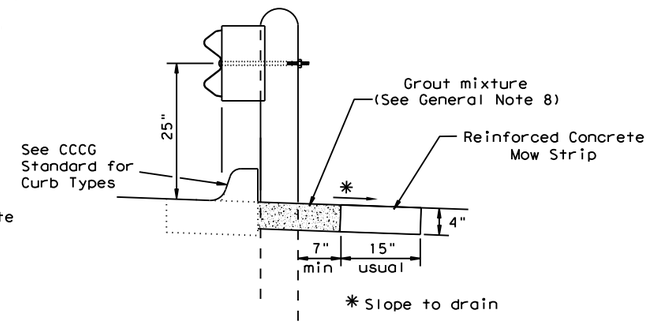
CURB OPTION (1)

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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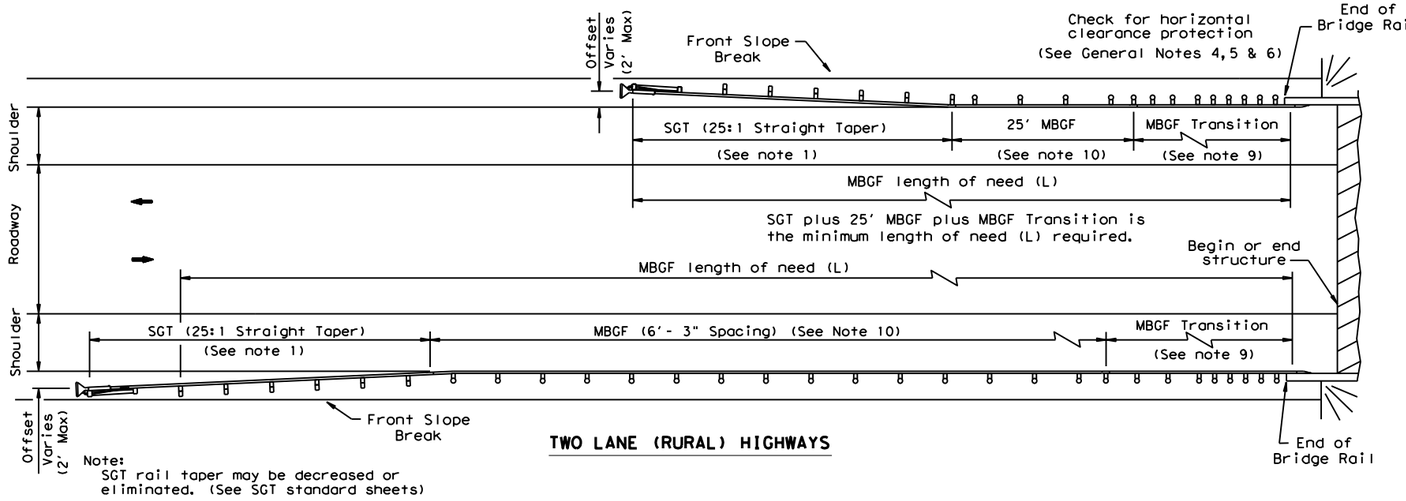
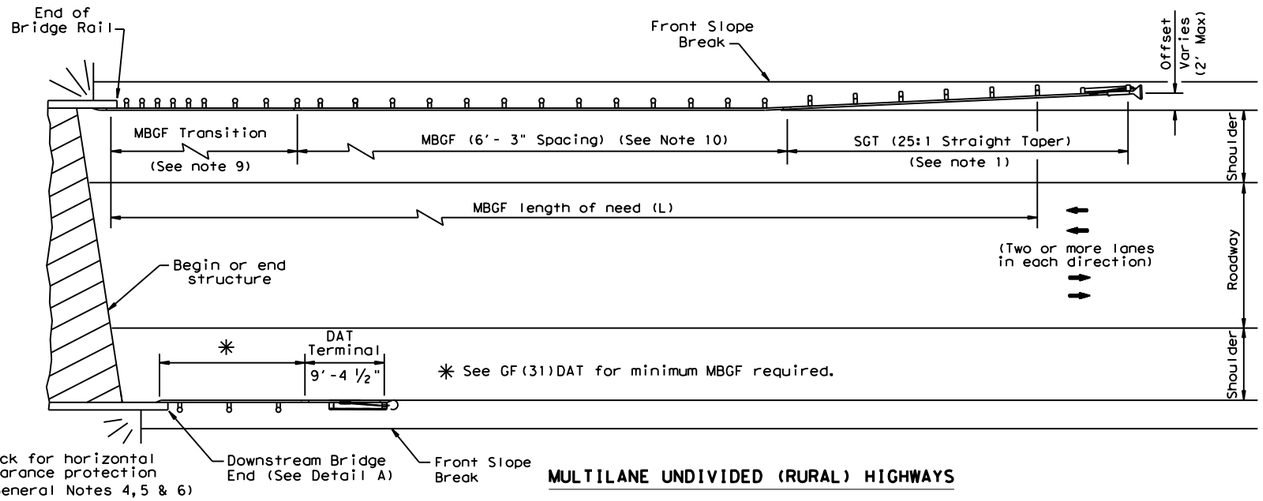
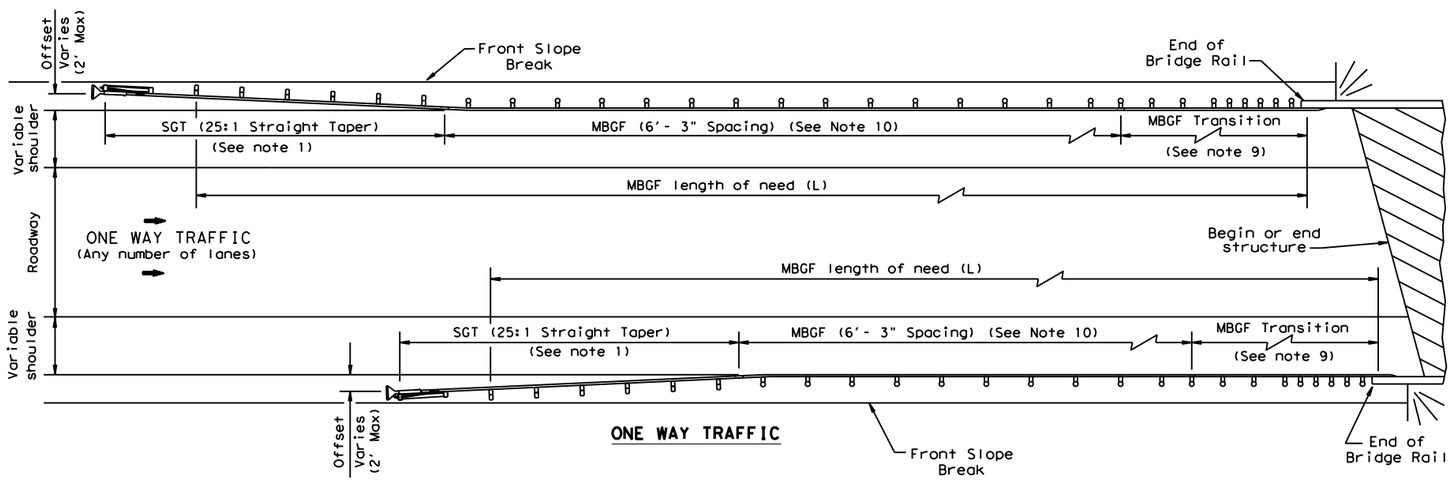


TWO LANE (RURAL) HIGHWAYS

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



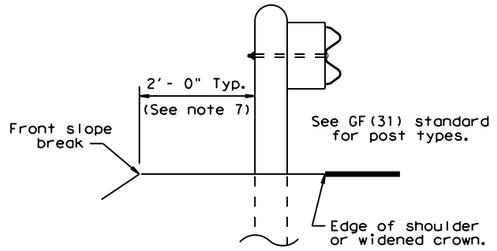
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



ONE WAY TRAFFIC

GENERAL NOTES

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



TYPICAL CROSS SECTION AT MBGF

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

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation — Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED APRIL 2014 SEE (MEMO 0414)	2174	01	018	FM 2311
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	WAC	McLENNAN		121

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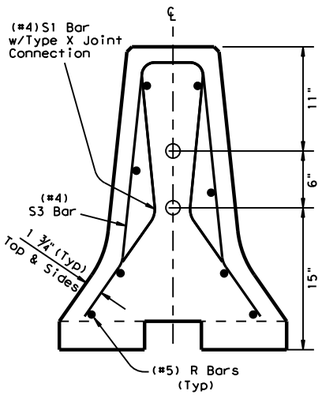
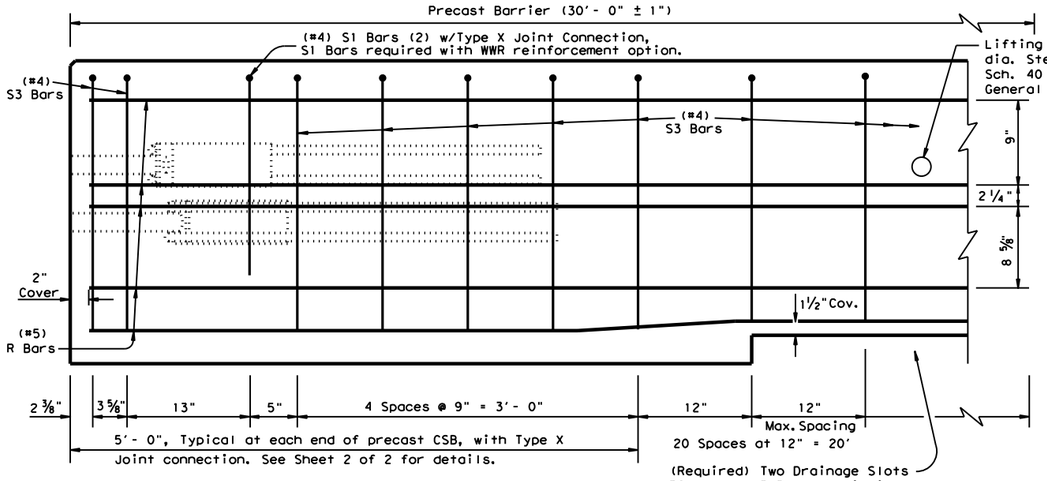


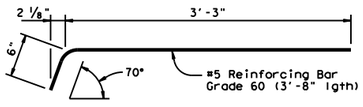
End View Precast Barrier

See sheet 2 of 3 for Joint connection Type X



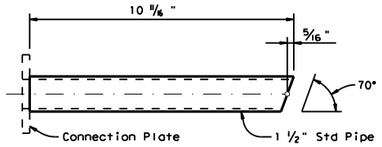
Reinforcement for Precast (CSB) Concrete Safety Barrier (Type 1)

Showing reinforcement for Joint Type X



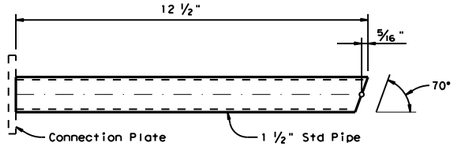
DEFORMED BAR ANCHOR DETAILS

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



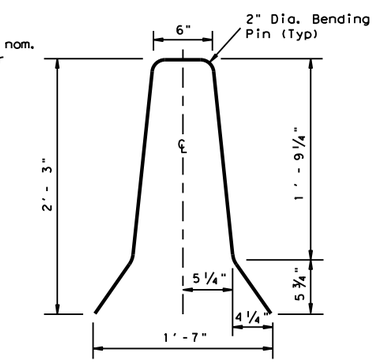
UPPER CONNECTION PIPE DETAILS

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



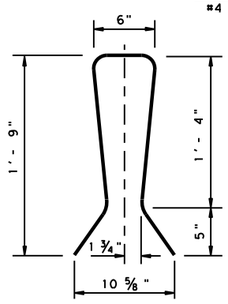
LOWER CONNECTION PIPE DETAILS

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



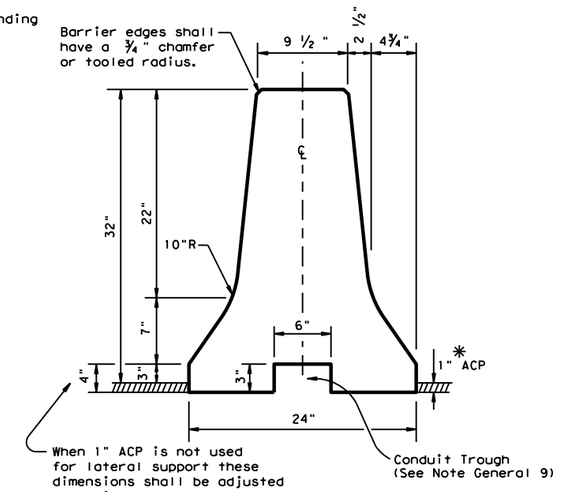
S3 Bar

#4 Bar



S1 Bar

#4 Bar (2)
(Joint Type X)

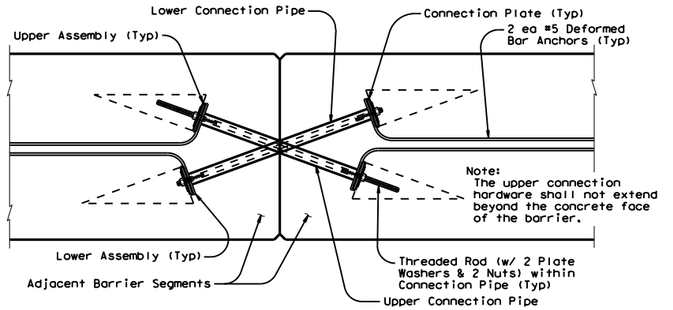


Concrete Safety Barrier

✱ When 1" ACP is "not" used as lateral support for permanent barrier placement. A permissible method of attaining the equivalent lateral support may be used, See CSB(6) sheet.

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 tooled radius.
5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
6. All steel assemblies for joint shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
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 involved.
9. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.



TYPE X JOINT INSTALLATION DETAIL

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

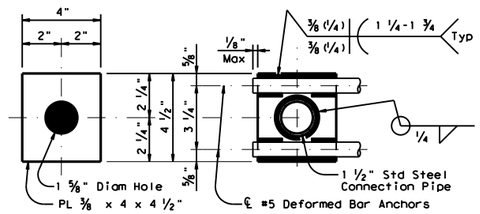
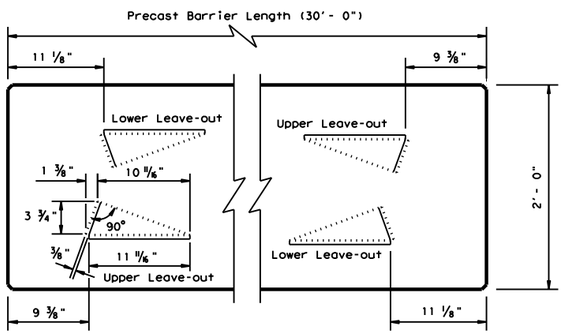


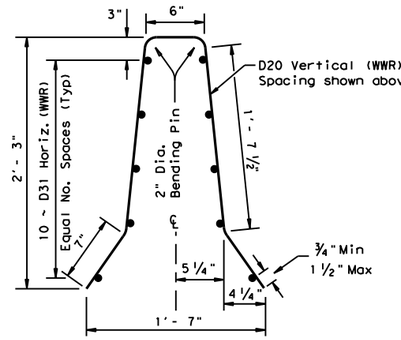
PLATE DIMENSIONS WELDING DETAILS

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.



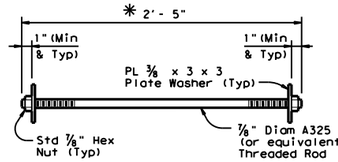
BARRIER PLAN AT END JOINTS



Welded Wire Reinforcement (WWR) Option for Bars R and S3

(WWR) General Notes

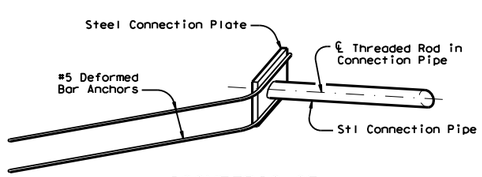
1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing 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".



CONNECTION BOLT OR THREADED ROD DETAIL

Two (2) Threaded Rods (Or Equivalent Hex Hd. Bolts) (w/ Two (2) PL 3/8 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.



ISOMETRIC OF TYPICAL WELDED ASSEMBLY

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

Weight of one Precast 30 ft. (CSB) segment = Approx. 6.5 Tons or 440 lbs per ft.

SHEET 1 OF 2

Texas Department of Transportation

Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER (TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		122

DATE: 1/29/2024 2:27:38 PM
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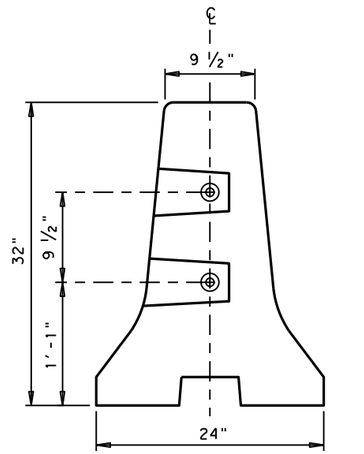
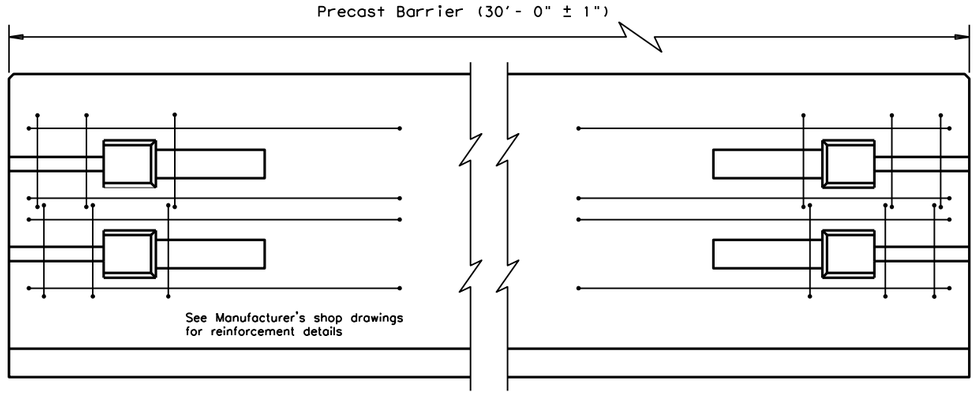


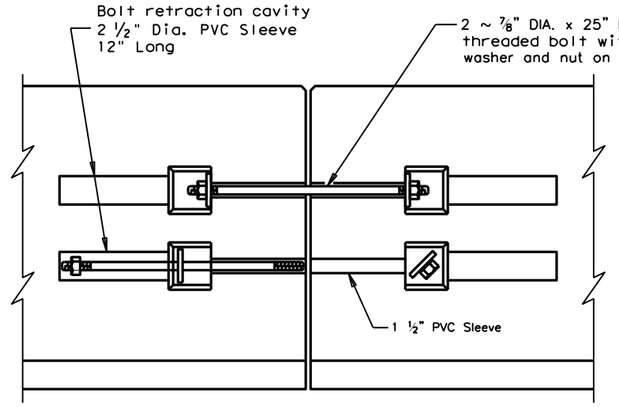
END VIEW (CSB) QUICK-BOLT

QUICK-BOLT POCKET LOCATIONS



ELEVATION (CSB) QUICK-BOLT

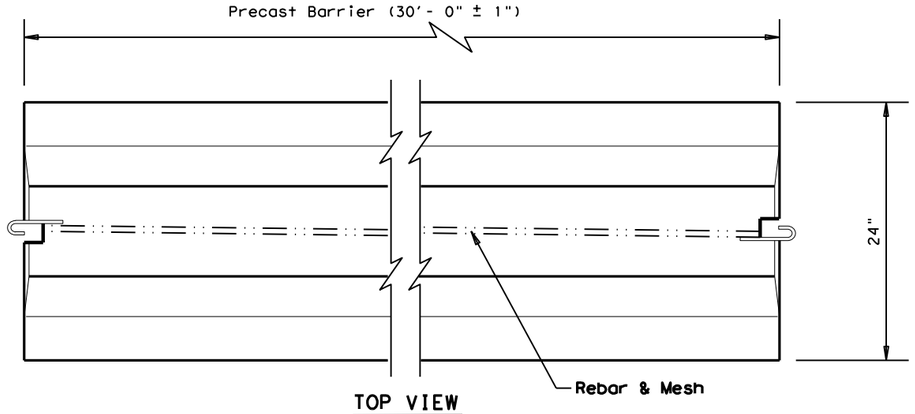
See Manufacturer's shop drawing for additional details



ELEVATION VIEW SHOWING JOINT CONNECTION

"QUICK-BOLT"

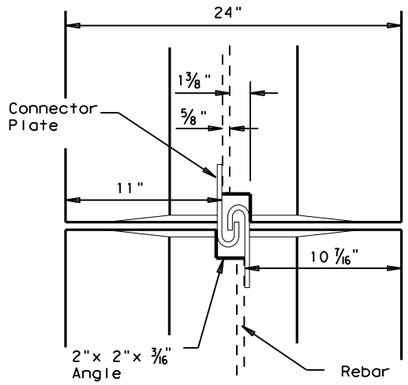
Joint Connection (Type Q)



TOP VIEW

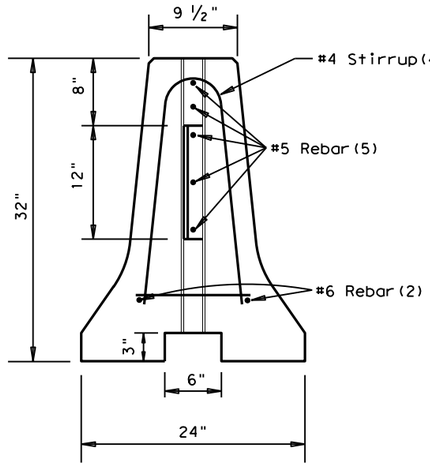
PRECAST (CSB) WITH J-J HOOKS

See Manufacturer's shop drawing for additional details



VIEW FROM ABOVE

J-J HOOK CONNECTION



END VIEW

J-J HOOK CONNECTION

Joint Connection (Type J)

Proprietary Joint Connections (CSB)

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.

SHEET 2 OF 2

Texas Department of Transportation

Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER
(TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		123

DATE: 1/29/2024 2:27:39 PM
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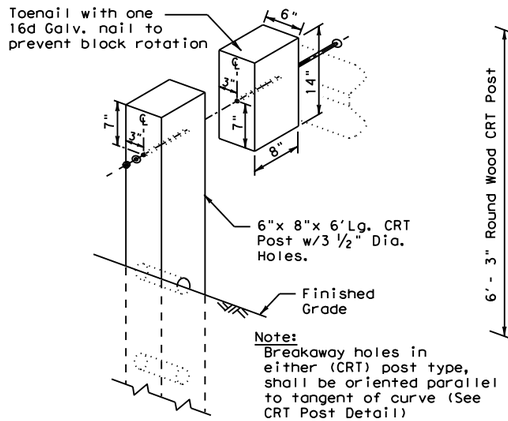
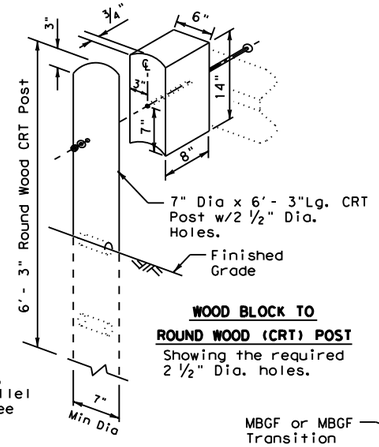
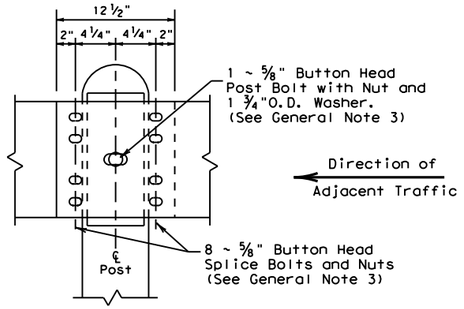


Note: Breakaway holes in either (CRT) post type, shall be oriented parallel to tangent of curve (See CRT Post Detail)

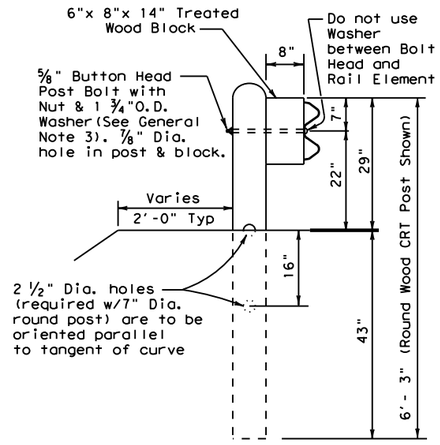
WOOD BLOCK TO RECTANGULAR WOOD (CRT) POST
Showing the required 3 ½" Dia. holes.



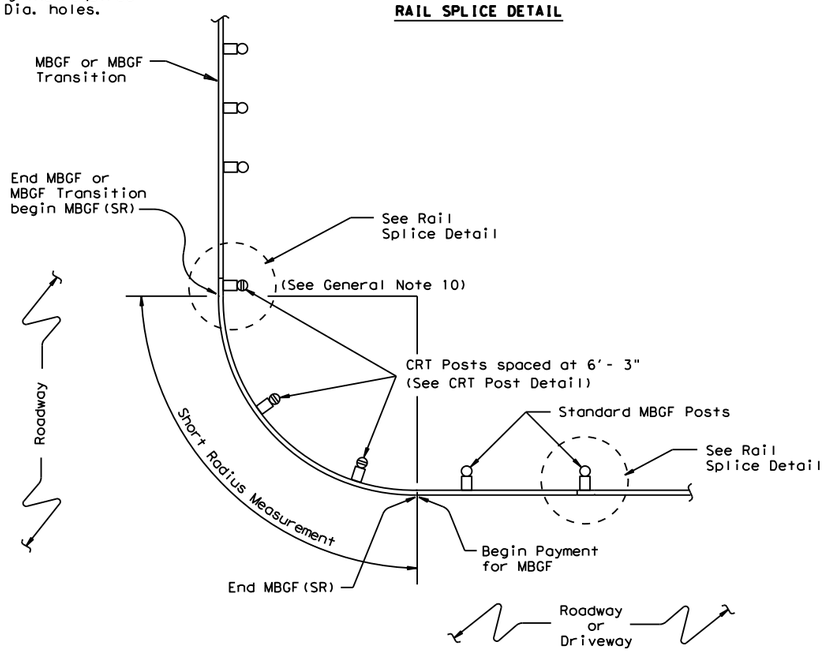
WOOD BLOCK TO ROUND WOOD (CRT) POST
Showing the required 2 ½" Dia. holes.



RAIL SPLICE DETAIL



(CRT) POST DETAIL
CONTROLLED RELEASE TERMINAL POST
Two or more wood CRT post(s) are required at any radius installation located at intersecting roadways or driveways.



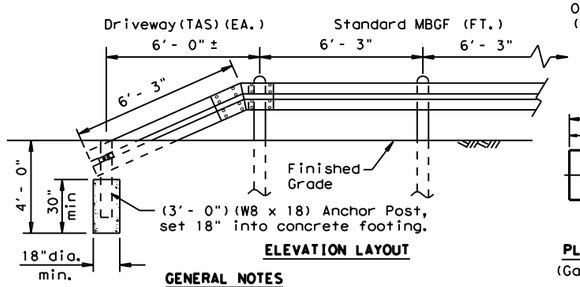
PLAN VIEW
SHOWING TYPICAL RADIUS
The required radius is shown elsewhere on the plans.

GENERAL NOTES

1. The type of (CRT) post (round wood post, or rectangular wood post) will be shown elsewhere in the plans. The exact position of MBGF shall be shown elsewhere in the plans or as directed by the Engineer.
2. Steel posts are not permitted at CRT post positions.
3. Rail element shall meet the requirements of Item 540,"Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 ½ or 25 foot nominal lengths.
4. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 ¾" O.D.)washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are ⅝" x 1 ¼" (or 2" long at triple rail splices) with a ⅝" double recessed nut (ASTM A563).
5. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
6. Crown shall be widened to accommodate the Metal Beam Guard Fence.
7. The lateral approach to the guard fence, shall have a slope rate of not more than 1V:10H.
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 block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
9. If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 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 is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
10. Guardrail posts shall not be set in concrete, of any depth.
11. Special rail fabrication will be required at installations having a curvature of less than 150 ft. radius. The required radius shall be shown on the plans.
12. The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421,"Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
13. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210,"Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.

"DRIVEWAY" TERMINAL ANCHOR SECTION

Only for use within driveway locations, where a standard (TAS) Terminal Anchor Section can not be installed.



ELEVATION LAYOUT

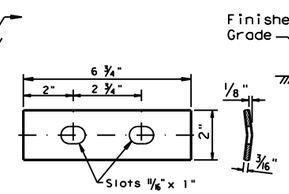
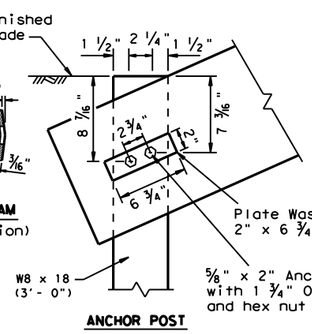
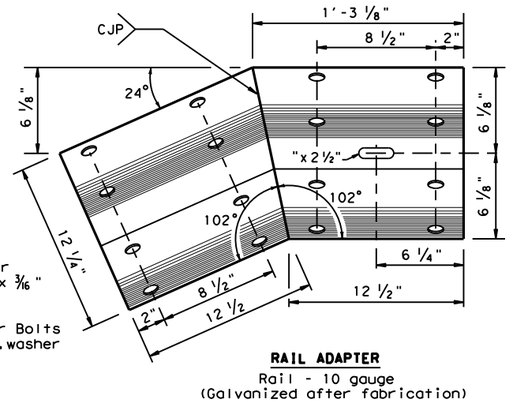


PLATE WASHER FOR METAL BEAM
(Galvanized after fabrication)



ANCHOR POST



RAIL ADAPTER
Rail - 10 gauge
(Galvanized after fabrication)

GENERAL NOTES

1. The "Driveway" Terminal Anchor Section is ONLY to be used within driveway locations, where the ROW is limited and a standard 25 ft.(TAS)Terminal Anchor Section,is too long.
2. Terminal anchor post shall be set in Class A concrete.
3. All steel shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."

ONLY FOR USE IN MAINTENANCE REPAIRS OR HIGHLY CONSTRAINED SITE CONDITIONS.

Texas Department of Transportation — Design Division Standard

METAL BEAM GUARD FENCE
(SHORT RADIUS)
MBGF(SR)-19

FILE: mbgfsr19.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
©TxDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		124

DATE: 1/29/2024
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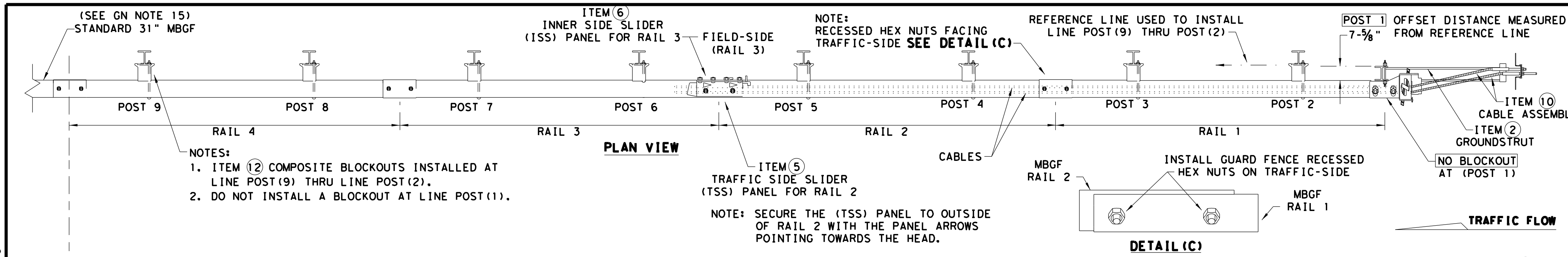
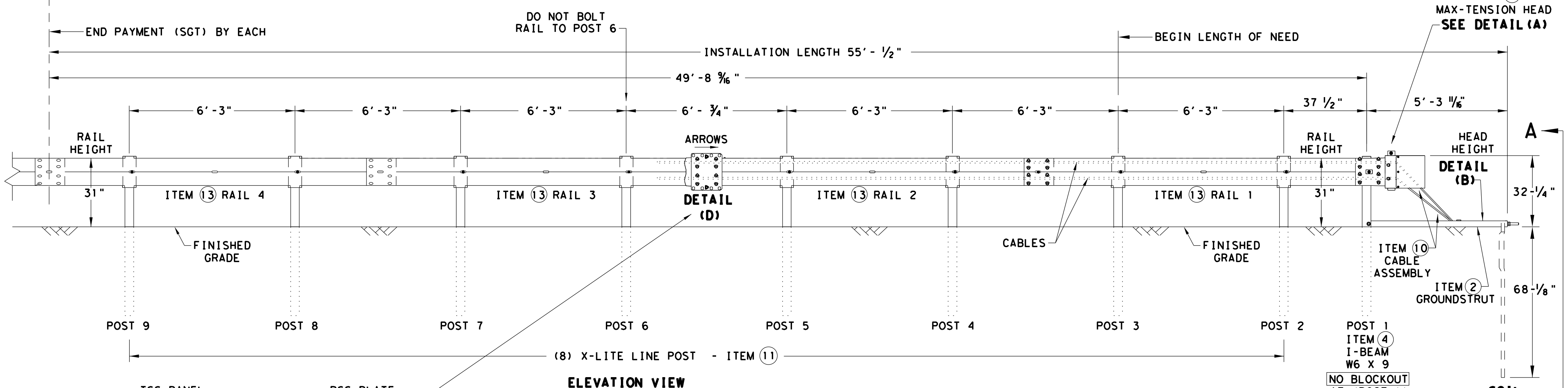


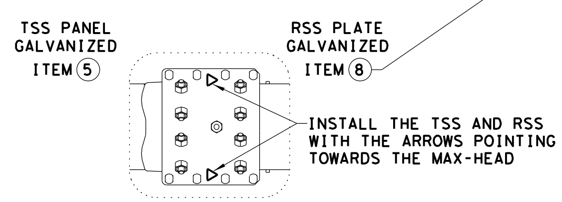
PLAN VIEW

MBGF
RAIL 2
INSTALL GUARD FENCE RECESSED
HEX NUTS ON TRAFFIC-SIDE
MBGF
RAIL 1
DETAIL (C)

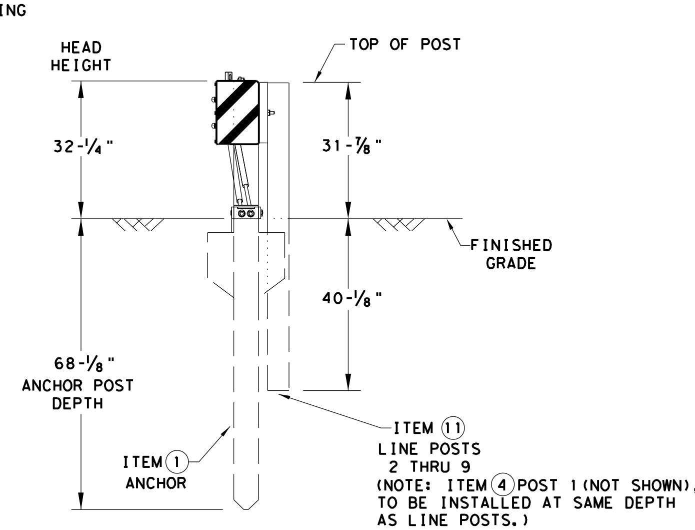
TRAFFIC FLOW



ELEVATION VIEW

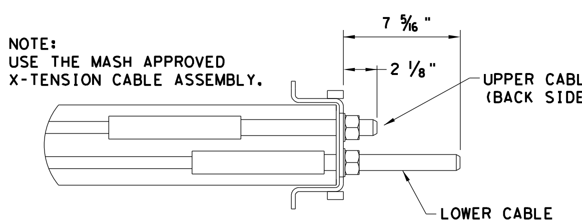


TSS PANEL AND RSS PLATE
DETAIL (D)

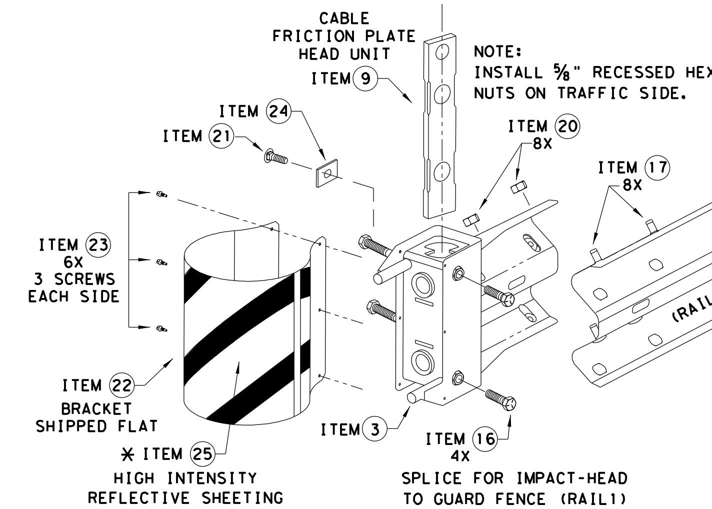


SOIL ANCHOR, POST 1
& LINE POST 2 THRU 9

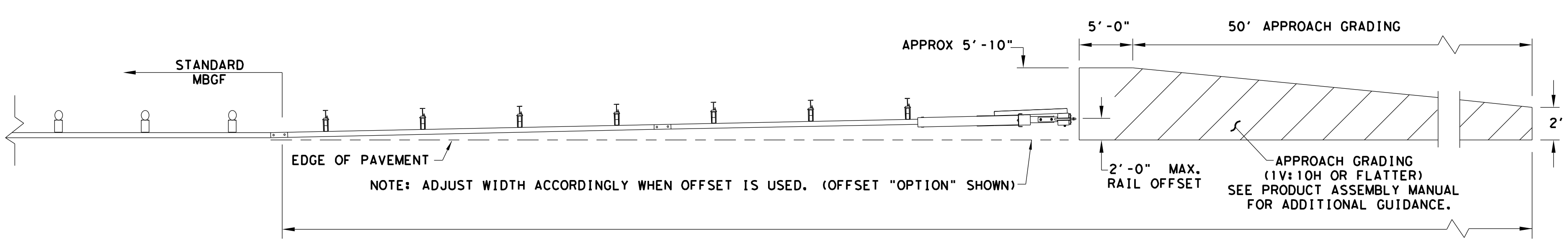
SECTION VIEW A-A



DETAIL (B)



DETAIL (A)



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

TRAFFIC FLOW

GENERAL NOTES

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

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

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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

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

Texas Department of Transportation

Design Division Standard

MAX-TENSION END TERMINAL
MASH - TL-3

SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		125

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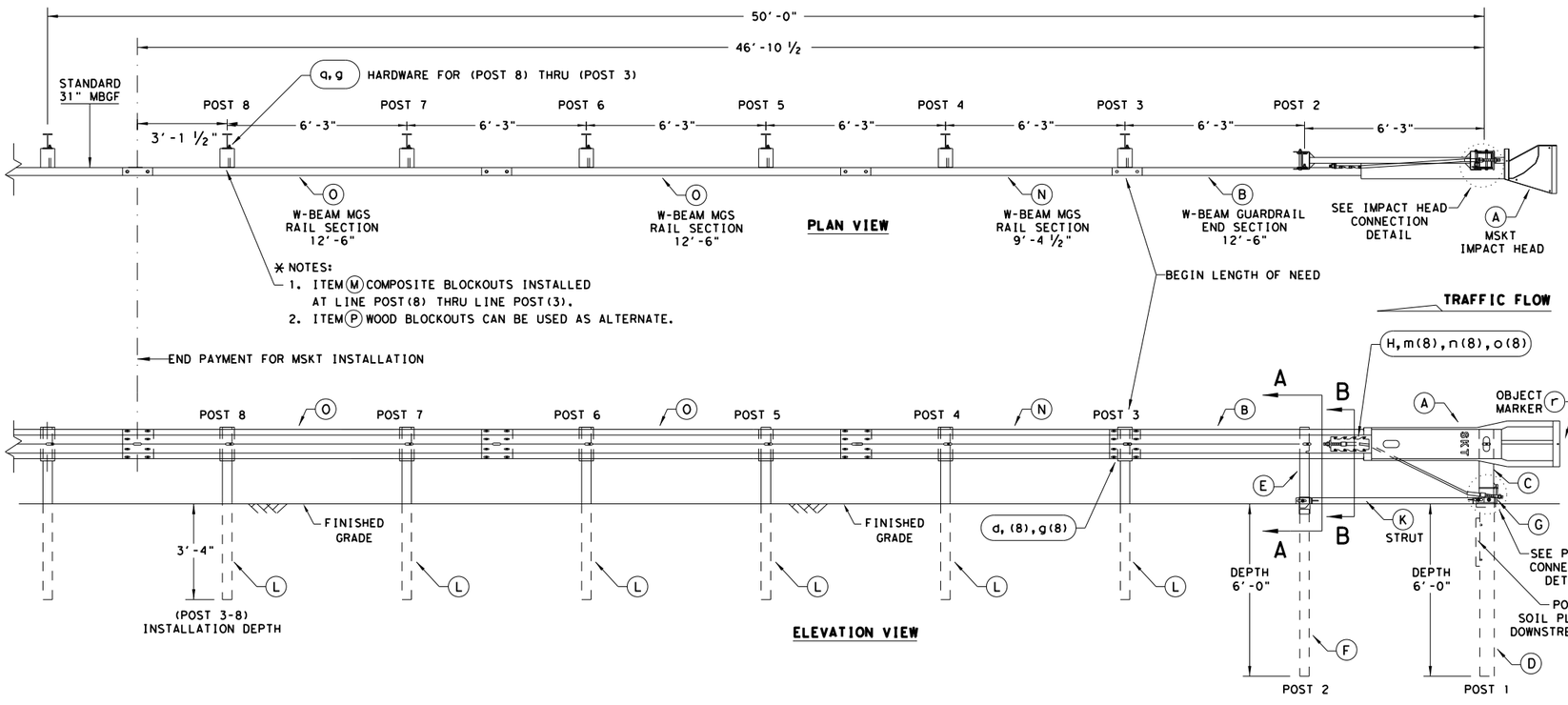
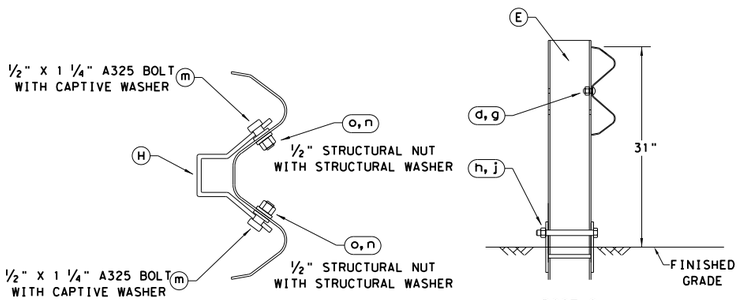
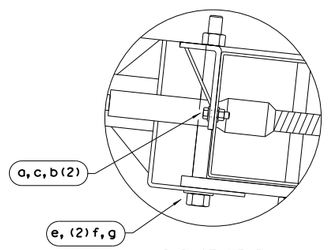
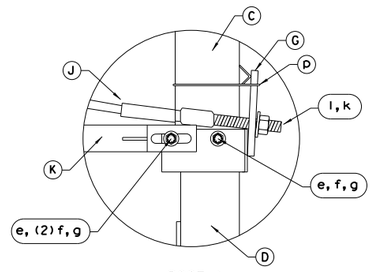


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.







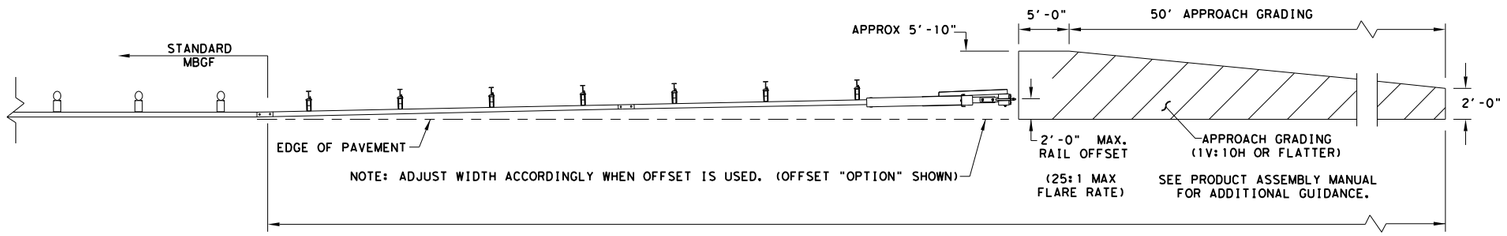
GENERAL NOTES

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

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 ⅛" 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 ½")	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	⅝" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	⅝" WASHER	W0516
c	2	⅝" HEX NUT	N0516
d	25	⅝" Dia. x 1 ¼" SPLICE BOLT (POST 2)	B580122
e	2	⅝" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	⅝" WASHER	W050
g	33	⅝" Dia. H.G.R NUT	N050
h	1	¾" Dia. x 8 ½" HEX BOLT (GRD A449)	B340854A
j	1	¾" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	½" x 1 ¼" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	½" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x ⅜" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	⅝" 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



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL
MSKT-MASH-TL-3
SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
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	DIST	COUNTY		SHEET NO.	
	WAC	McLENNAN		126	

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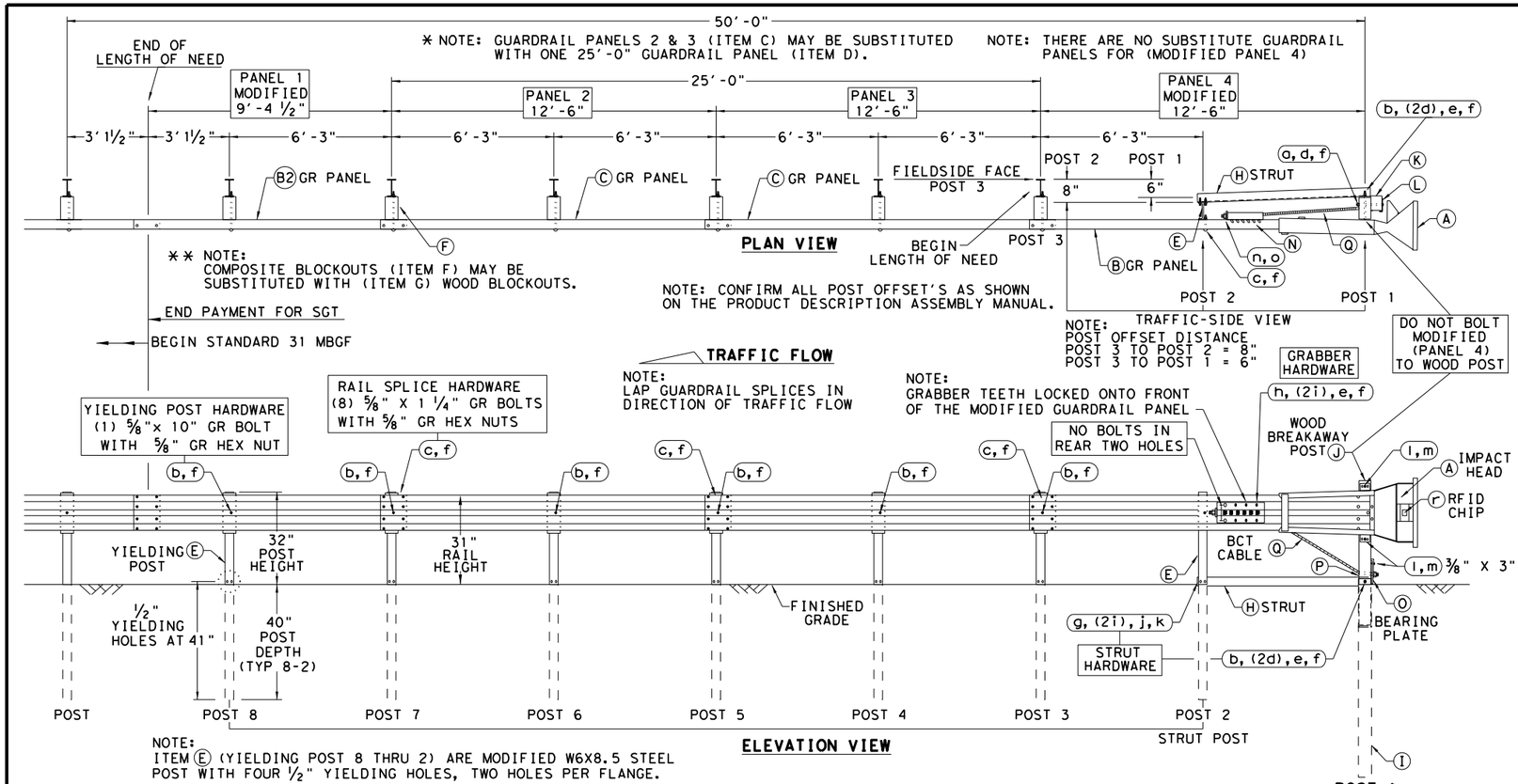
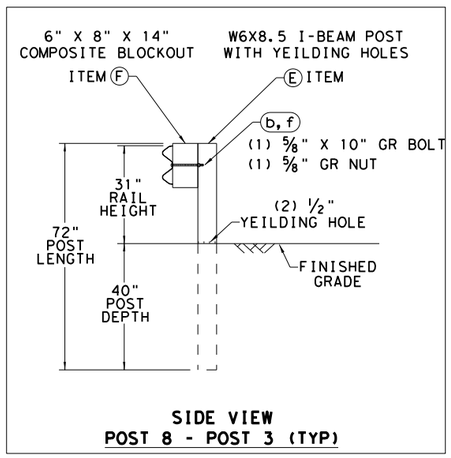


GENERAL NOTES

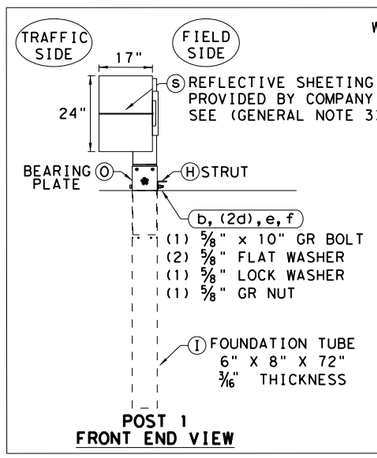
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

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

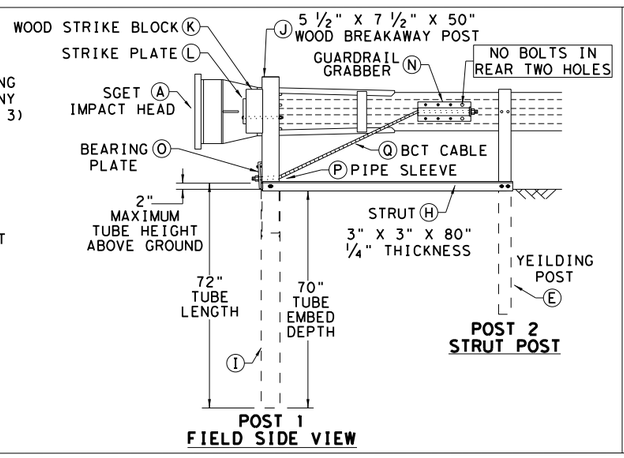
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



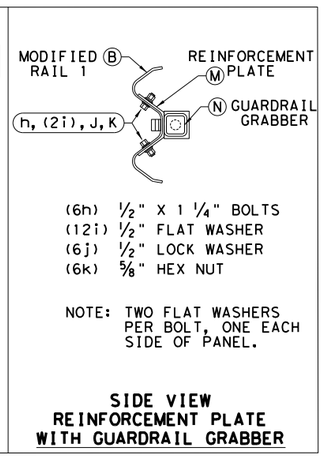
SIDE VIEW
POST 8 - POST 3 (TYP)



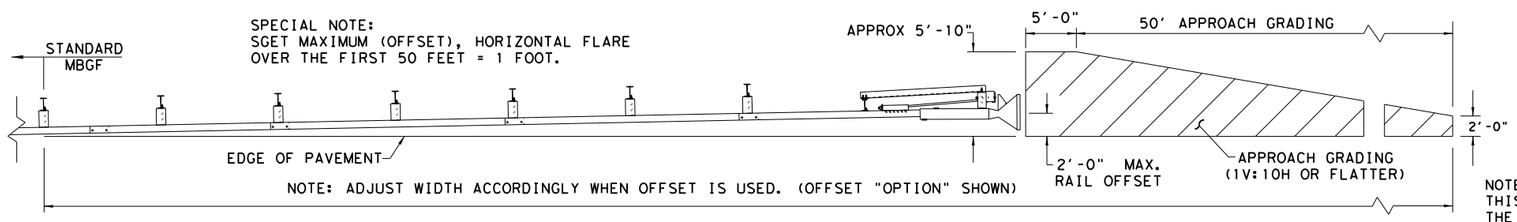
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW
POST 2
STRUT POST



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation
Design Division Standard

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

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP		
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY		
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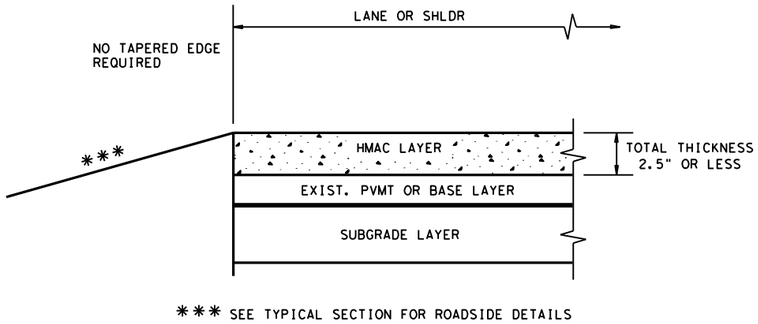
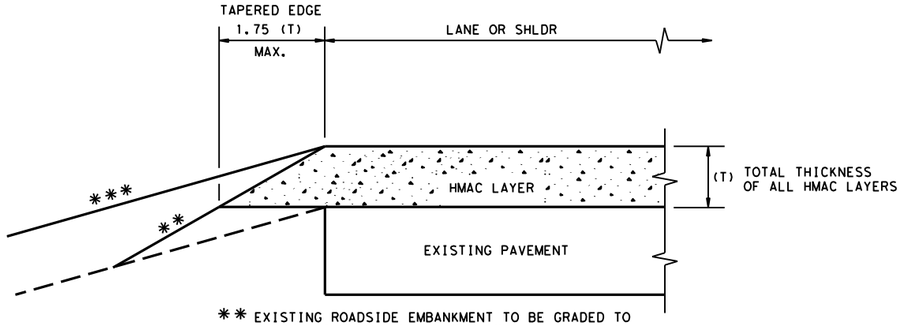


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

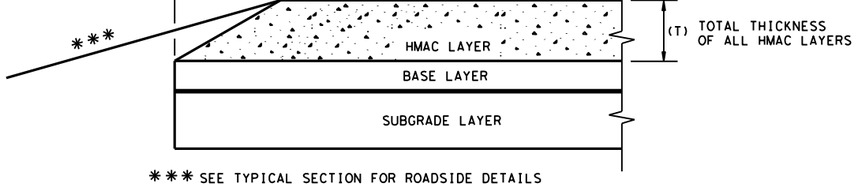
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



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

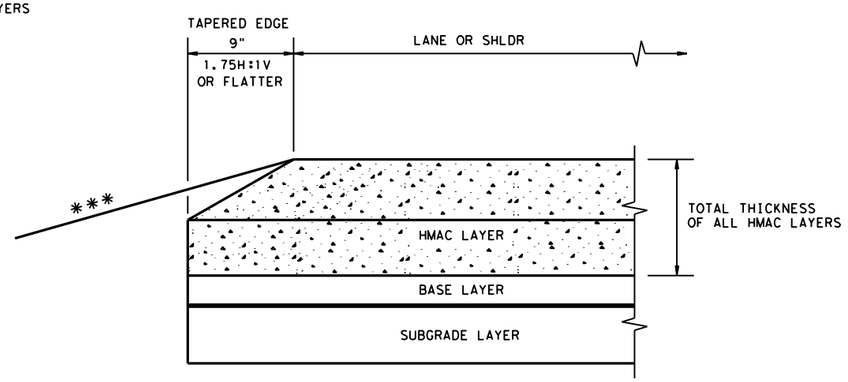
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

(NOT TO SCALE)

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

TAPERED EDGE DETAILS HMAC PAVEMENT

TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY
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	WAC	McLENNAN		128

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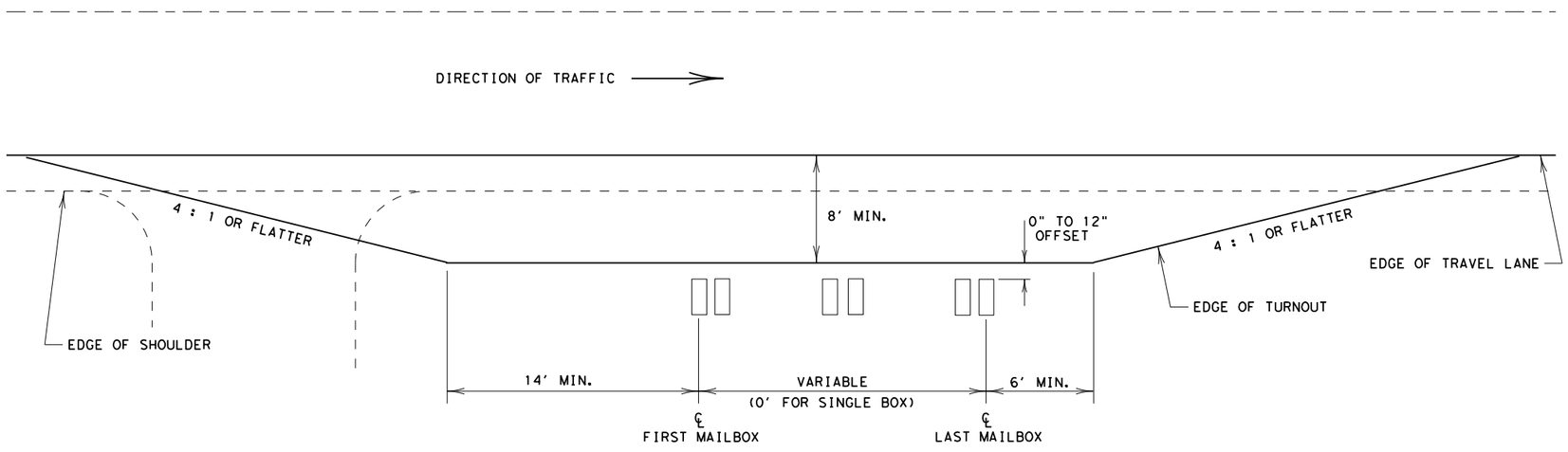
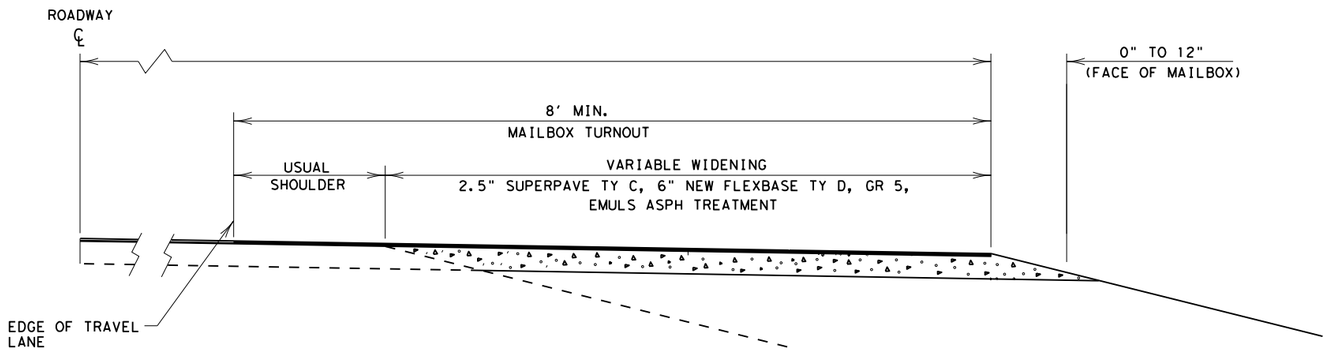


PLAN



TYPICAL SECTION

SUMMARY OF MAILBOX TURNOUTS

LOACTION (STATION)	FLEX BASE	EMULS ASPH	530 6008 TURNOUTS (ACP)
			SY
1+40 LT			12
9+12 RT			16
11+45 RT			16
13+38 RT			5
18+03 RT			12
26+79 RT			13
28+05 RT			13
29+70 RT			13
30+38 RT			12
33+04 RT			12
33+89 RT			12
47+27 LT			12
116+97 LT			14
122+66 LT			12
136+62 LT			12
149+72 LT			12
149+83 RT			12
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160+61 LT			12
164+51 LT			15
166+20 LT			12
169+86 LT			12
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178+46 LT			16
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186+71 LT			11
187+31 LT			16
190+07 LT			13
192+53 LT			12
202+68 LT			17
212+86 LT			14
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218+80 LT			16
220+64 LT			16
224+04 LT			16
229+14 LT			16
230+67 LT			12
240+74 LT			19
243+43 LT			16
245+03 LT			16
247+36 LT			16
250+29 LT			17
TOTALS			593

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E. 1/29/2024

DESIGN DETAILS FOR TYPICAL MAILBOX TURNOUTS

MBTRNOUT

FILE: mbtrnout.dgn	DN: TxDOT	CK:	DW:	CK:
©TxDOT 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		129

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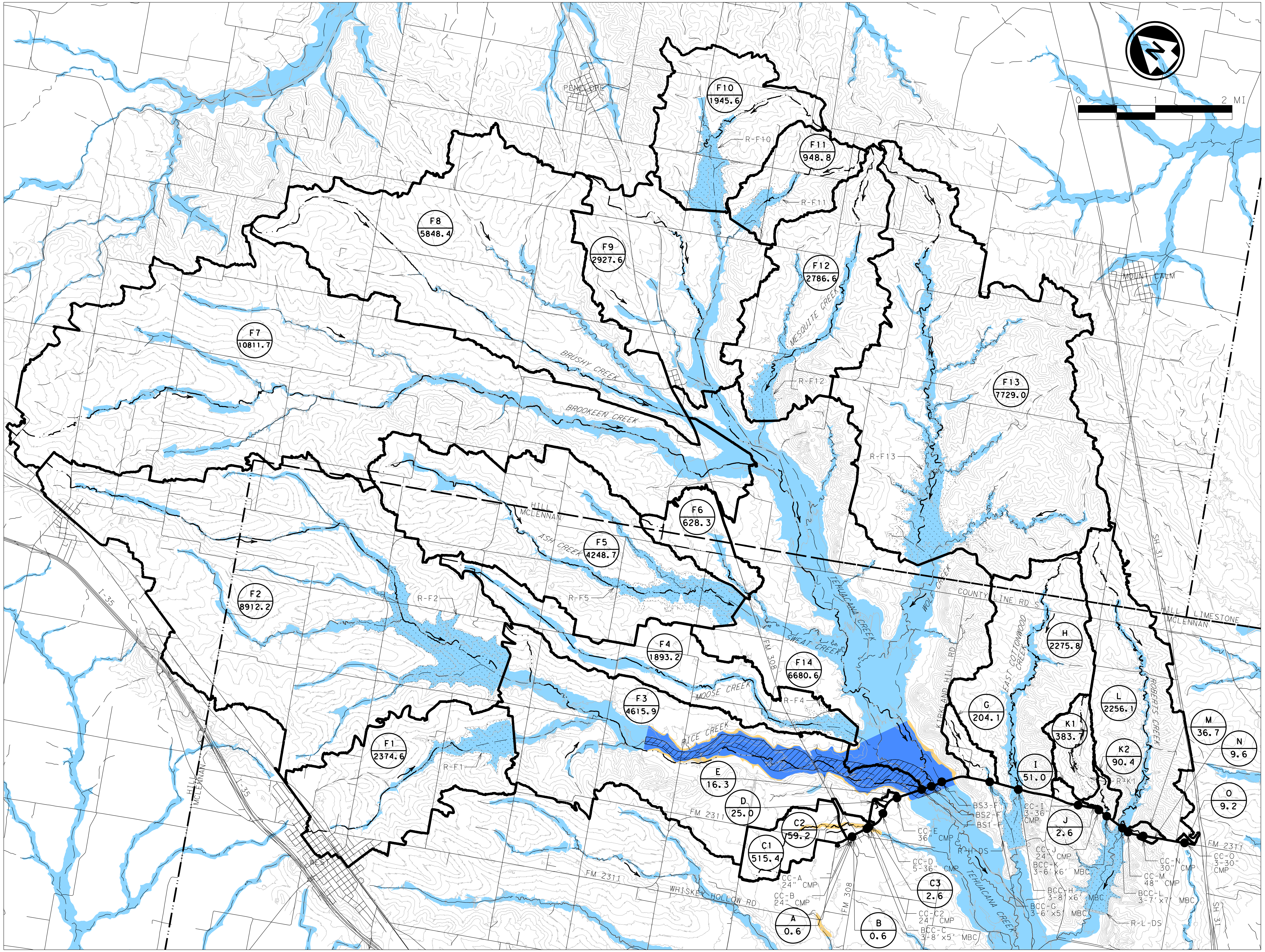

LEGEND

- BASIN BOUNDARY
- STREAM
- 10 FT ELEVATION CONTOUR
- TIME OF CONCENTRATION FLOWPATH
- FLOW DIRECTION
- RESERVOIR
- FEMA FLOOD ZONE A
- FEMA FLOOD ZONE AE
- FEMA SHADED FLOOD ZONE X
- FEMA FLOODWAY
- COUNTY BOUNDARY
- A — DRAINAGE AREA ID
- 208.7 — DRAINAGE AREA (ACRES)

NOTES:

1. FLOWS ESTIMATED USING THE HEC-HMS PROGRAM, VERSION 4.9, WITH THE SOIL CONSERVATION SERVICE (SCS) CURVE NUMBER (CN) LOSS METHOD, AND THE SCS UNIT HYDROGRAPH TRANSFORM METHOD.
2. THE TNRIS 2013 ONE (1) METER RESOLUTION LIDAR DATA WAS USED FOR DRAINAGE BASIN DELINEATION.
3. THE PROJECT ROAD INTERSECTS THE FOLLOWING FEMA FLOOD ZONES:
   - FLOOD ZONE X SHADED OF TRIBUTARY TO TEHUACANA CREEK (FIRM NR. 48309C0225D, EFFECTIVE DECEMBER 20, 2019)
   - FLOOD ZONE AE OF RICE CREEK, MOOSE CREEK, AND TEHUACANA CREEK (FIRMS NR. 48309C0225D AND 48309C0250D, EFFECTIVE DECEMBER 20, 2019)
   - FLOOD ZONE A OF EAST COTTONWOOD CREEK TRIBUTARY 1 (FIRM NR. 48309C0250D, EFFECTIVE DECEMBER 20, 2019)
   - FLOOD ZONE A OF EAST COTTONWOOD CREEK (FIRM NR. 48309C0250D, EFFECTIVE DECEMBER 20, 2019)
   - FLOOD ZONE A OF UNNAMED TRIBUTARY TO ROBERTS CREEK (FIRM NR. 48309C0250D, EFFECTIVE DECEMBER 20, 2019)
   - FLOOD ZONE A OF ROBERTS CREEK (FIRM NR. 48309C0250D, EFFECTIVE DECEMBER 20, 2019)
4. BS1-F TO REMAIN. BS2-F AND BS3-F TO BE REPLACED.

STATE OF TEXAS — FLORIAN BALTOI — 119857 — LICENSED PROFESSIONAL ENGINEER

Florian Baltoi 2/1/2024

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FM 2311

DRAINAGE AREA MAP

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		130

DATE: 2/1/2024 6:35:48 AM
FILE: c:\pw work\atknatx01\mcca2543\dms93813\FM 2311 DRAINAGE AREA MAP.dgn

DN: CK: DW: CK:

Time of Concentration and Lag Time Calculations for Drainage Basins (NRCS Method)

Flow Type	Parameters	A	B	C1	C2	C3	D	E	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	G	H	I	J	K1	K2	L	M	N	O
Sheet Flow	n_{sl} = overland flow roughness coefficient	0.011	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.015	0.015
	L_{sh} = sheet flow length (ft) (100 ft maximum)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Upstream elevation (ft)	500.8	500.4	537.5	501.4	495.3	492.0	492.0	647.0	712.6	575.5	607.7	622.0	556.5	722.6	636.0	609.7	658.9	665.7	669.3	668.0	503.6	560.9	611.2	566.4	537.3	587.7	546.1	618.8	570.3	565.8	560.2
	Downstream elevation (ft)	499.2	498.77	536.7	499.0	493.2	490.2	490.1	646.0	710.0	572.3	606.7	619.6	556.0	722.0	635.3	609.2	657.4	663.9	667.9	666.3	500.8	559.7	609.9	566.0	535.1	587.4	545.4	614.9	569.1	559.1	557.7
	P_2 = 2-year, 24-hr rainfall depth (in)	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.36	3.36	3.36	3.36	3.36	3.36	4.36	3.36	3.36	3.36	3.36
	S_{sh} = sheet flow slope (ft/ft)	0.0160	0.0163	0.0080	0.0240	0.0210	0.0180	0.0190	0.0100	0.0260	0.0320	0.0100	0.0240	0.0050	0.0060	0.0070	0.0050	0.0150	0.0180	0.0140	0.0170	0.0280	0.0120	0.0130	0.0040	0.0220	0.0033	0.0070	0.0390	0.0120	0.0670	0.0250
	t_{sh} = sheet flow travel time (hr)	0.02	0.17	0.23	0.15	0.16	0.17	0.16	0.21	0.14	0.13	0.21	0.15	0.28	0.25	0.23	0.27	0.17	0.16	0.18	0.16	0.14	0.20	0.19	0.30	0.15	0.33	0.21	0.12	0.20	0.02	0.02
Shallow Concentrated Flow	L_{sc} = shallow concentrated flow length (ft)	112.3	120.4	3265.2	839.2	319.3	1690.8	1020.0	997.3	2774.1	4424.1	3236.6	3877.6	2052.5	1355.0	3316.4	2817.3	2571.1	1306.1	3167.0	2172.9	9479.2	656.7	2672.2	1516.3	630.4	3030.8	1722.6	2480.8	265.2	0.0	530.0
	Upstream elevation (ft)	499.2	498.8	536.7	499.0	493.2	490.2	490.1	646.0	710.0	572.3	606.7	619.6	556.0	722.0	635.3	609.2	657.4	663.9	667.9	666.3	500.8	559.7	609.9	566.0	535.1	587.4	545.4	614.9	569.1	0.0	557.7
	Downstream elevation (ft)	498.6	498.70	518.2	486.6	488.3	484.0	483.5	638.0	687.0	514.0	588.5	586.0	542.4	706.0	608.0	580.0	604.0	626.0	608.0	640.0	487.0	545.1	561.0	553.5	516.1	557.7	495.8	582.8	567.0	0.0	550.7
	K = 16.13 for unpaved surface, 20.32 for paved surface	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	16.13	0	16.13
	S_{sc} = shallow concentrated flow slope (ft/ft)	0.0053	0.0011	0.0057	0.0148	0.0155	0.0037	0.0065	0.0080	0.0083	0.0132	0.0056	0.0087	0.0066	0.0118	0.0082	0.0104	0.0208	0.0290	0.0189	0.0121	0.0015	0.0222	0.0183	0.0082	0.0301	0.0098	0.0288	0.0129	0.0079	0.0000	0.0132
	t_{sc} = shallow concentrated flow time (hr)	0.03	0.06	0.75	0.12	0.04	0.48	0.22	0.19	0.52	0.66	0.74	0.72	0.43	0.21	0.63	0.48	0.31	0.13	0.40	0.34	4.28	0.08	0.34	0.29	0.06	0.53	0.17	0.38	0.05	0.00	0.08
Channel Flow	L_{ch} = channel flow length (ft)	0.0	0.0	7396.7	2205.9	359.3	0.0	640.8	14039.6	39067.6	34510.1	30048.3	27719.3	9537.4	63081.3	35538.0	21299.8	11207.4	8836.6	21280.3	41179.4	32787.9	2063.5	2635.8	2618.3	26277.3	1382.1	0.0	5561.0	2921.5	6485.2	25890.1	631.5	850.3	1092.4	969.2	0.0
	Upstream elevation (ft)	0.0	0.0	518.2	486.6	488.3	0.0	483.5	638.0	687.0	514.0	588.5	586.0	542.4	706.0	608.0	580.0	604.0	626.0	608.0	640.0	487.0	545.1	528.2	506.6	561.0	553.5	0.0	557.7	495.8	582.8	543.5	567.0	534.4	504.2	559.1	0.0
	Downstream elevation (ft)	0.0	0.0	486.6	475.7	481.4	0.0	472.8	533.0	520.0	469.0	469.0	494.0	486.9	477.8	490.2	488.1	545.0	549.2	502.0	489.0	436.0	528.2	506.6	485.7	466.3	523.3	0.0	515.0	480.0	543.5	469.5	534.4	504.2	497.1	509.6	0.0
	S_{ch} = channel flow slope (ft/ft)	0.0000	0.0000	0.0043	0.0049	0.0191	0.0000	0.0167	0.0075	0.0043	0.0013	0.0040	0.0033	0.0058	0.0036	0.0033	0.0043	0.0053	0.0087	0.0050	0.0037	0.0016	0.0082	0.0082	0.0080	0.0036	0.0219	0.0000	0.0077	0.0054	0.0061	0.0029	0.0516	0.0355	0.0065	0.0511	0.0000
	n = Manning's roughness coefficient	0.000	0.000	0.045	0.045	0.035	0.000	0.035	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.035	0.045	0.035	0.045	0.035	0.000	0.045	0.045	0.035	0.045	0.035	0.035	0.045	0.035	0.000
	b = channel bottom width (ft)	0	0	1.1	1.1	3.4	0	4.6	6	10	14	5	7	4	18	16	5	6	8	5	6	12	11	0	3	1.2	3	0	5.5	4.3	6	4.7	3.8	1.8	1	0	0
	z = channel bank slope (zH:1V)	0.00	0.00	4.00	4.00	8.70	0.00	8.00	3.00	2.00	2.00	4.00	2.00	4.00	2.00	2.00	3.00	4.00	4.00	2.00	1.00	1.00	24.00	7.00	22.00	3.00	8.00	0.00	8.78	1.97	15.00	2.00	8.00	6.00	7.41	17.84	0.00
	y = channel depth (ft)	0.0	0.0	3.0	3.0	1.0	0.0	1.0	5.0	7.0	12.0	4.0	4.0	1.5	12.0	11.0	11.0	5.0	4.0	5.0	8.0	14.0	0.5	2.0	1.0	4.0	1.5	0.0	2.0	3.0	1.0	6.5	2.0	7.0	8.0	2.0	0.0
	a = cross-sectional area (sq-ft)	0.0	0.0	39.3	39.3	12.1	0.0	12.6	105.0	168.0	456.0	84.0	60.0	15.0	504.0	418.0	418.0	130.0	96.0	75.0	112.0	364.0	11.5	28.0	25.0	52.8	22.5	0.0	46.1	30.6	21.0	115.1	39.6	306.6	482.1	71.4	0.0
	p_w = wetted perimeter (ft)	0.00	0.00	25.84	25.84	20.91	0.00	20.72	37.62	41.30	67.67	37.98	24.89	16.37	71.67	65.19	74.57	47.23	40.98	27.36	28.63	51.60	35.02	28.28	47.05	26.50	27.19	0.00	40.83	17.54	36.07	33.77	36.05	86.96	120.60	71.47	0.00
	R= channel hydraulic radius (ft)	0.00	0.00	1.52	1.52	0.58	0.00	0.61	2.79	4.07	6.74	2.21	2.41	0.92	7.03	6.41	5.61	2.75	2.34	2.74	3.91	7.05	0.33	0.99	0.53	1.99	0.83	0.00	1.13	1.74	0.58	3.41	1.10	3.53	4.00	1.00	0.00
	t_{ch} = channnel flow time (hr)	0.00	0.00	0.72	0.20	0.02	0.00	0.05	0.69	1.97	2.25	2.35	2.25	1.11	2.40	1.50	0.86	0.66	0.45	1.29	2.30	1.90	0.31	0.25	0.29	2.32	0.07	0.00	0.49	0.23	0.78	1.79	0.02	0.01	0.05	0.03	0.00
	tc (hr)	0.05	0.24	1.69	0.47	0.22	0.65	0.43	1.09	2.64	3.04	3.31	3.11	1.82	2.86	2.36	1.61	1.14	0.74	1.87	2.80	6.31	1.12	2.85	0.66	0.22	1.35	0.62	3.07	0.32	0.04	0.10
	tc (min)	2.9	14.2	101.7	28.0	13.5	38.8	25.6	65.3	158.1	182.6	198.5	186.6	109.4	171.7	141.9	96.4	68.4	44.6	111.9	168.1	378.8	67.3	170.9	39.6	13.0	80.8	37.1	184.3	19.3	2.6	6.2
	Selected tc (min)	10.0	14.0	102.0	28.0	13.0	39.0	26.0	65.0	158.0	183.0	199.0	187.0	109.0	172.0	142.0	96.0	68.0	45.0	112.0	168.0	379.0	67.0	171.0	40.0	13.0	81.0	37.0	184.0	19.0	10.0	10.0
	Lag (min)	6	8	61	17	8	23	16	39	95	110	119	112	65	103	85	58	41	27	67	101	227	40	103	24	8	49	22	110	11	6	6

HYDROLOGIC PARAMETERS FOR PROPOSED CONDITIONS

DRAINAGE BASIN	CURVE NUMBER	TIME OF CONCENTRATION (MIN)	LAG TIME (MIN)	DRAINAGE AREA (MI^2)	DRAINAGE AREA (ACRES)
A	80	10	6	0.0009	0.6
B	80	14	8	0.0009	0.6
C1	75	102	61	0.8054	515.4
C2	73	28	17	0.0924	59.2
C3	62	13	8	0.0040	2.6
D	70	39	23	0.0391	25
E	70	26	16	0.0255	16.3
F1	77	65	39	3.7103	2374.6
F2	75	158	95	13.9253	8912.2
F3	74	183	110	7.2124	4615.9
F4	75	199	119	2.9582	1893.2
F5	75	187	112	6.6385	4248.7
F6	76	109	65	0.9817	628.3
F7	76	172	103	16.8933	10811.7
F8	78	142	85	9.1382	5848.4
F9	76	96	58	4.5743	2927.6
F10	73	68	41	3.04	1945.6
F11	74	45	27	1.4823	948.7
F12	73	112	67	4.354	2786.6
F13	72	168	101	12.0766	7729
F14	73	379	227	10.4384	6680.6
G	70	67	40	0.3189	204.1
H	71	171	103	3.5559	2275.8
I	72	40	24	0.0797	51
J	70	13	8	0.0041	2.6
K1	71	81	49	0.5995	383.7
K2	71	37	22	0.1412	90.4
L	72	184	110	3.5251	2256.1
M	70	19	11	0.0573	36.7
N	70	10	6	0.0151	9.6
O	74	10	6	0.0143	9.2

ESTIMATED PEAK FLOWS FOR PROPOSED CONDITIONS

POINT OF INTEREST	DRAINAGE STRUCTURE SIZE AND TYPE	PEAK FLOW Q (CFS)					
		2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
CC-A	24" CMP	1.3	2.1	2.7	3.5	4.2	4.8
CC-B	24" CMP	1.2	1.9	2.5	3.2	3.8	4.4
BCC-C	3-8'x5' MBC	198	321	413	685	910	1143
CC-C2	24" CMP	1.4	3.7	5.6	8.6	11	14
CC-D	5-36" CMP	17	34	47	67	83	100
CC-E	36" CMP	13	27	37	53	65	78
BS-F	Bridges BS1-F, BS2-F, and BS3-F	7753	14494	21026	30197	38603	47493
BCC-G	3-6'x5' MBC	97	197	274	391	487	588
BCC-H	3-8'X6' MBC	587	1175	1637	2339	2916	3526
CC-I	3-36" CMP	38	74	101	141	173	206
CC-J	24" CMP	2.9	5.9	8.2	12.0	14	17
BCC-K	3-6'X6' MBC	79	221	356	573	760	948
BCC-L	3-7'X7' MBC	591	1158	1603	2273	2823	3404
CC-M	48" CMP	44	90	111	129	140	146
CC-N	30" CMP	12	24	33	47	57	68
CC-O	3-30" CMP	15	27	36	49	60	70

NOTES:

FLOWS ESTIMATED USING THE HEC-HMS PROGRAM, VERSION 4.9.

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119857
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HYDROLOGIC DATA

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		131

DATE: 2/1/2024 6:36:06 AM
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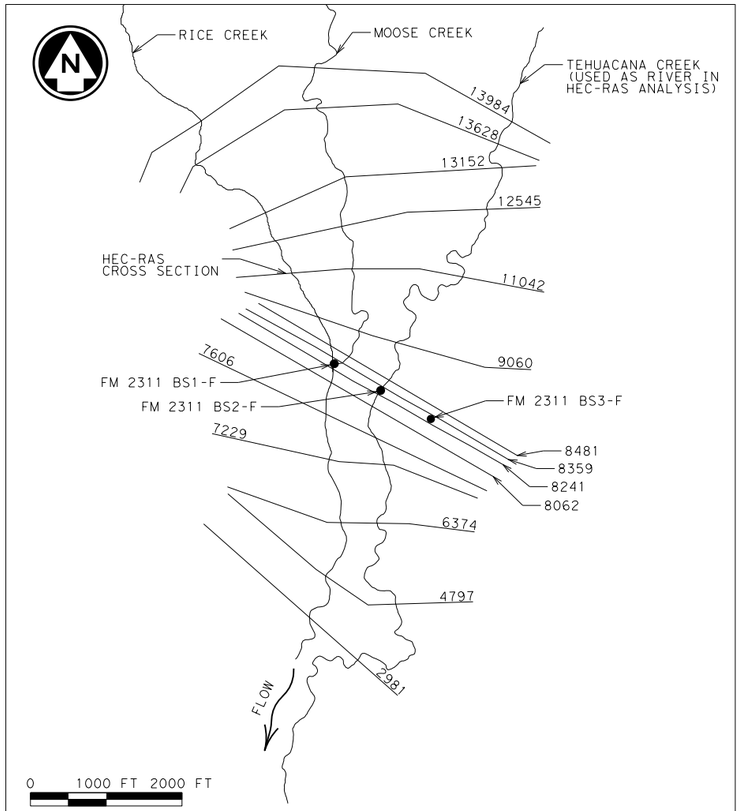
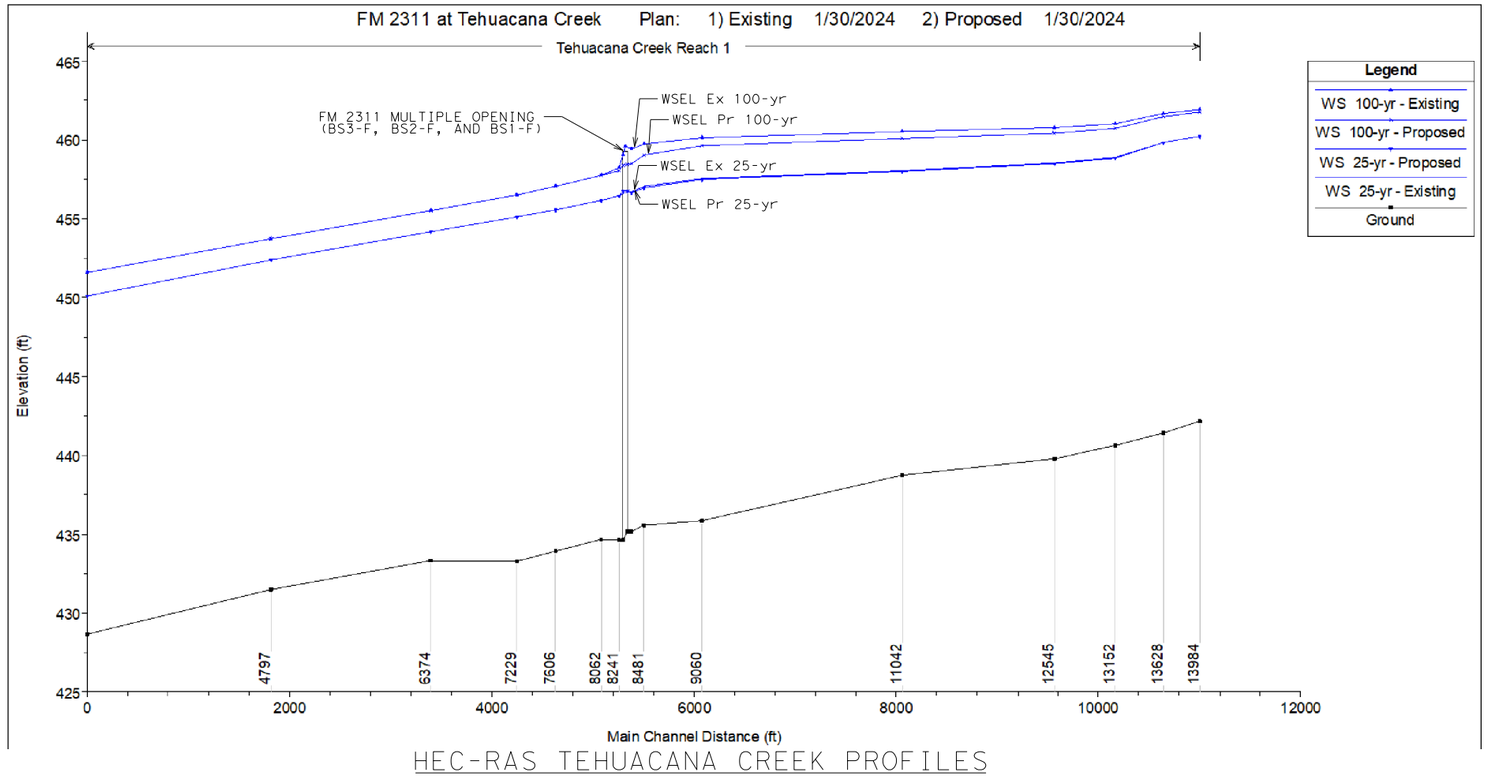
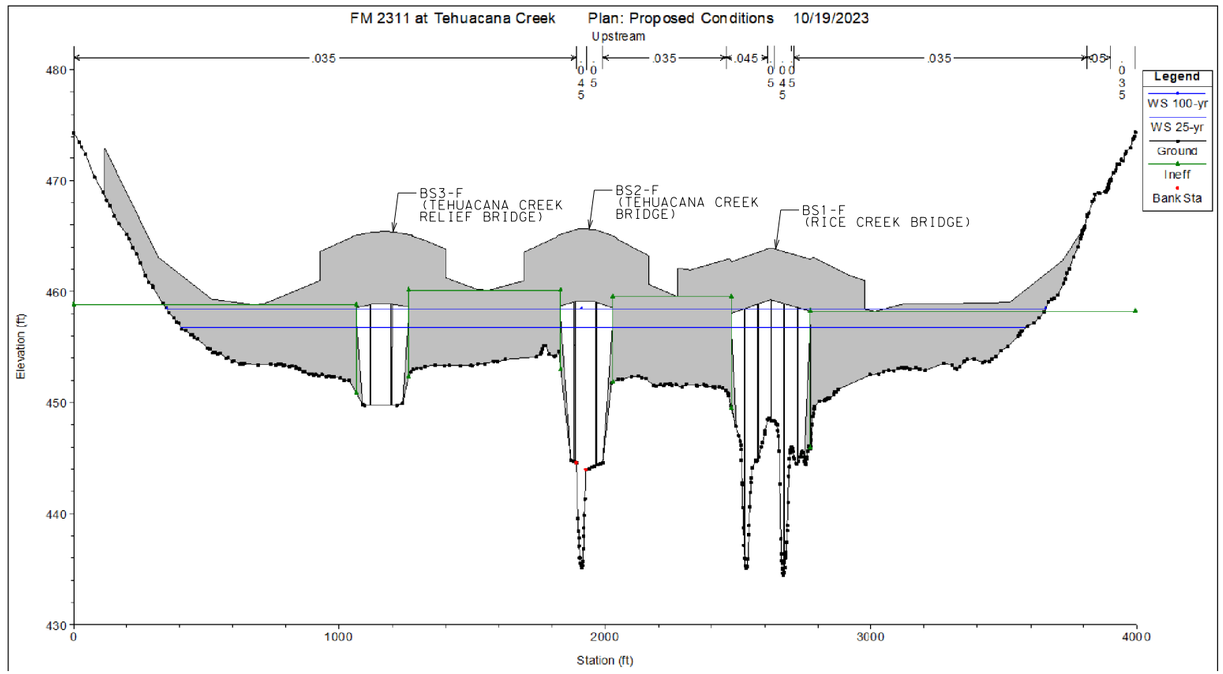


HEC-RAS CROSS SECTION LOCATIONS

PROPOSED BRIDGES AT RIVER STATION 8301



HEC-RAS TEHUACANA CREEK PROFILES



HEC-RAS UPSTREAM BRIDGE FACE

NOTES:

1. HYDRAULIC MODELING WAS PERFORMED USING THE HEC-RAS VERSION 6.4.1 WITH STEADY FLOW ANALYSIS.
2. THE BRIDGES TO BE REPLACED, BS2-F AND BS3-F, ARE IN FLOOD ZONE AE OF RICE CREEK, MOOSE CREEK, AND TEHUACANA CREEK. IN ADDITION BS2-F IS IN THE FLOODWAY ZONE, WHILE BS3-F IS NOT.
3. THE MCLENNAN COUNTY FLOODPLAIN ADMINISTRATOR (FPA) ZANE DUNNAM WAS INFORMED ABOUT THE TXDOT FM 2311 ROADWAY IMPROVEMENT PROJECT IN NOVEMBER 2022 AND NOVEMBER 2023. THE FINAL HYDRAULIC MODEL AND PLAN SET WILL BE SENT TO THE FPA AT THE 100% SUBMITTAL.
4. THE TNRIS 2021 ONE (1) METER RESOLUTION LIDAR DATA WAS USED FOR HYDRAULIC MODELING. ADDITIONALLY, SITE SURVEY DATA PROVIDED BY HALFF ASSOCIATES, INC. WAS USED FOR HYDRAULIC MODELING.
5. FOR THIS STUDY, THE HORIZONTAL DATUM OF REFERENCE USED WAS THE NORTH AMERICAN DATUM 1983 (NAD 83), AND THE VERTICAL DATUM OF REFERENCE USED WAS THE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88).
6. THE BOUNDARY CONDITION USED IN THE HYDRAULIC MODEL WAS NORMAL DEPTH WITH A DOWNSTREAM SLOPE OF 0.0021 FT/FT.

STATE OF TEXAS
FLORIAN BALTOI
119857
LICENSED PROFESSIONAL ENGINEER

Florian Baltoi 2/1/2024

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TBPE REG. # F-474

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FM 2311 TEHUACANA CREEK BRIDGE REPLACEMENTS

HYDRAULIC DATA

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		132

DATE: 2/1/2024 6:36:36 AM
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Reach	River Sta	Profile	Plan	Q Total	W.S. Elev	Vel Chnl
				(cfs)	(ft)	(ft/s)
Reach 1	13984	25-yr	Existing	30197	460.25	3.85
Reach 1	13984	25-yr	Proposed	30197	460.25	3.87
Reach 1	13984	100-yr	Existing	47493	461.95	3.49
Reach 1	13984	100-yr	Proposed	47493	461.77	3.67
Reach 1	13628	25-yr	Existing	30197	459.85	3.70
Reach 1	13628	25-yr	Proposed	30197	459.84	3.71
Reach 1	13628	100-yr	Existing	47493	461.68	3.46
Reach 1	13628	100-yr	Proposed	47493	461.46	3.65
Reach 1	13152	25-yr	Existing	30197	458.90	4.71
Reach 1	13152	25-yr	Proposed	30197	458.87	4.76
Reach 1	13152	100-yr	Existing	47493	461.03	4.25
Reach 1	13152	100-yr	Proposed	47493	460.71	4.56
Reach 1	12545	25-yr	Existing	30197	458.54	4.45
Reach 1	12545	25-yr	Proposed	30197	458.50	4.85
Reach 1	12545	100-yr	Existing	47493	460.80	4.08
Reach 1	12545	100-yr	Proposed	47493	460.43	4.70
Reach 1	11042	25-yr	Existing	30197	458.07	4.45
Reach 1	11042	25-yr	Proposed	30197	458.03	4.48
Reach 1	11042	100-yr	Existing	47493	460.52	3.98
Reach 1	11042	100-yr	Proposed	47493	460.08	4.35
Reach 1	9060	25-yr	Existing	30197	457.57	3.89
Reach 1	9060	25-yr	Proposed	30197	457.50	3.94
Reach 1	9060	100-yr	Existing	47493	460.16	3.86
Reach 1	9060	100-yr	Proposed	47493	459.63	4.22
Reach 1	8481	25-yr	Existing	30197	457.04	5.97
Reach 1	8481	25-yr	Proposed	30197	456.98	5.97
Reach 1	8481	100-yr	Existing	47493	459.73	6.27
Reach 1	8481	100-yr	Proposed	47493	459.04	6.95
Reach 1	8359	25-yr	Existing	30197	456.74	4.52
Reach 1	8359	25-yr	Proposed	30197	456.68	4.48
Reach 1	8359	100-yr	Existing	47493	459.45	5.91
Reach 1	8359	100-yr	Proposed	47493	458.47	6.64
Reach 1	8301	FM 2311 MULTIPLE OPENING (BS3-F, BS2-F, AND BS1-F)				
Reach 1	8241	25-yr	Existing	30197	456.47	4.23
Reach 1	8241	25-yr	Proposed	30197	456.46	4.19
Reach 1	8241	100-yr	Existing	47493	458.25	7.31
Reach 1	8241	100-yr	Proposed	47493	458.05	5.65
Reach 1	8062	25-yr	Existing	30197	456.18	7.65
Reach 1	8062	25-yr	Proposed	30197	456.18	7.58
Reach 1	8062	100-yr	Existing	47493	457.77	9.74
Reach 1	8062	100-yr	Proposed	47493	457.75	9.25
Reach 1	7606	25-yr	Existing	30197	455.59	5.79
Reach 1	7606	25-yr	Proposed	30197	455.59	5.78
Reach 1	7606	100-yr	Existing	47493	457.05	6.92
Reach 1	7606	100-yr	Proposed	47493	457.05	6.91
Reach 1	7229	25-yr	Existing	30197	455.10	5.12
Reach 1	7229	25-yr	Proposed	30197	455.10	5.14
Reach 1	7229	100-yr	Existing	47493	456.51	5.66
Reach 1	7229	100-yr	Proposed	47493	456.51	5.68
Reach 1	6374	25-yr	Existing	30197	454.18	5.89
Reach 1	6374	25-yr	Proposed	30197	454.18	5.89
Reach 1	6374	100-yr	Existing	47493	455.51	6.68
Reach 1	6374	100-yr	Proposed	47493	455.51	6.68
Reach 1	4797	25-yr	Existing	30197	452.38	8.11
Reach 1	4797	25-yr	Proposed	30197	452.38	8.11
Reach 1	4797	100-yr	Existing	47493	453.72	8.67
Reach 1	4797	100-yr	Proposed	47493	453.72	8.67
Reach 1	2981	25-yr	Existing	30197	450.11	7.14
Reach 1	2981	25-yr	Proposed	30197	450.11	7.14
Reach 1	2981	100-yr	Existing	47493	451.60	7.74
Reach 1	2981	100-yr	Proposed	47493	451.60	7.74

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CK: DW: CK: DW:

STATE OF TEXAS
FLORIAN BALTOI
119857
LICENSED PROFESSIONAL ENGINEER

Florian Baltoi 2/1/2024

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FM 2311
TEHUACANA CREEK
BRIDGE REPLACEMENTS

HYDRAULIC DATA

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		133

CK:
DW:
CK:
DW:

Opening #3 (BS1-F)
Rice Creek Bridge

Plan: Existing Tehuacana Creek Reach 1 RS: 8301 Open#3: Bridge Profile: 25-yr					Plan: Proposed Tehuacana Creek Reach 1 RS: 8301 Open#3: Bricge Profile: 25-yr				
E.G. US. (ft)	457.13	Element	Inside BR US	Inside BR DS	E.G. US. (ft)	457.06	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	456.69	E.G. Elev (ft)	457.02	456.95	W.S. US. (ft)	456.7	E.G. Elev (ft)	456.99	456.91
Q Total (cfs)	19596.49	W.S. Elev (ft)	456.45	456.41	Q Total (cfs)	17730.29	W.S. Elev (ft)	456.54	456.48
Q Bridge (cfs)	19596.49	Crit W.S. (ft)	449.88	449.49	Q Bridge (cfs)	17730.29	Crit W.S. (ft)	449.51	449.12
Q Weir (cfs)		Max Chl Dpth (ft)	21.99	23.4	Q Weir (cfs)		Max Chl Dpth (ft)	22.08	23.47
Weir Sta Lft (ft)		Vel Total (ft/s)	6.03	5.87	Weir Sta Lft (ft)		Vel Total (ft/s)	5.41	5.28
Weir Sta Rgt (ft)		Flow Area (sq ft)	3251.67	3338.63	Weir Sta Rgt (ft)		Flow Area (sq ft)	3276.58	3357.74
Weir Submerg		Froude # Chl	0	0	Weir Submerg		Froude # Chl	0	0
Weir Max Depth (ft)		Specif Force (cu ft)	25317.89	27296.84	Weir Max Depth (ft)		Specif Force (cu ft)	24913.4	26855.46
Min El Weir Flow (ft)	458.01	Hydr Depth (ft)	11.37	11.68	Min El Weir Flow (ft)	458.26	Hydr Depth (ft)	11.44	11.74
Min El Prs (ft)	459.28	W.P. Total (ft)	451.95	422.35	Min El Prs (ft)	459.28	W.P. Total (ft)	453.21	423.32
Delta EG (ft)	0.26	Conv. Total (cfs)	122856.5	187747.2	Delta EG (ft)	0.22	Conv. Total (cfs)	127455.6	191663.1
Delta WS (ft)	0.26	Top Width (ft)	285.99	285.84	Delta WS (ft)	0.21	Top Width (ft)	286.34	286.11
BR Open Area (sq ft)	3899.64	Frctn Loss (ft)	0.05	0.03	BR Open Area (sq ft)	3899.64	Frctn Loss (ft)	0.07	0.03
BR Open Vel (ft/s)	6.03	C & E Loss (ft)	0.01	0.05	BR Open Vel (ft/s)	5.41	C & E Loss (ft)	0.01	0.04
BR Sluice Coef		Shear Total (lb/sq ft)	0.96	0.8	BR Sluice Coef		Shear Total (lb/sq ft)	0.78	0.64
BR Sel Method	Energy only	Power Total (lb/ft s)	5.81	4.68	BR Sel Method	Energy only	Power Total (lb/ft s)	4.2	3.4

Plan: Existing Tehuacana Creek Reach 1 RS: 8301 Open#3: Bridge Profile: 100-yr					Plan: Proposed Tehuacana Creek Reach 1 RS: 8301 Open#3: Bridge Profile: 100-yr				
E.G. US. (ft)	459.86	Element	Inside BR US	Inside BR DS	E.G. US. (ft)	459.1	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	459.59	E.G. Elev (ft)	459.86	459.39	W.S. US. (ft)	458.52	E.G. Elev (ft)	458.96	458.83
Q Total (cfs)	25537.72	W.S. Elev (ft)	459.59	459.05	Q Total (cfs)	27299.6	W.S. Elev (ft)	458.15	458.05
Q Bridge (cfs)	23335.22	Crit W.S. (ft)	450.99	450.6	Q Bridge (cfs)	27028.86	Crit W.S. (ft)	451.31	450.91
Q Weir (cfs)	2202.5	Max Chl Dpth (ft)	25.13	26.04	Q Weir (cfs)	270.74	Max Chl Dpth (ft)	23.69	25.04
Weir Sta Lft (ft)	2974.4	Vel Total (ft/s)	5.98	5.85	Weir Sta Lft (ft)	2947.84	Vel Total (ft/s)	7.23	7.1
Weir Sta Rgt (ft)	3576.46	Flow Area (sq ft)	3899.64	3990.9	Weir Sta Rgt (ft)	3494.05	Flow Area (sq ft)	3738.55	3809.01
Weir Submerg	0.05	Froude # Chl	0.21	0.2	Weir Submerg	0	Froude # Chl	0.26	0.25
Weir Max Depth (ft)	1.86	Specif Force (cu ft)	37471.64	37732.92	Weir Max Depth (ft)	0.85	Specif Force (cu ft)	33645.48	35533.08
Min El Weir Flow (ft)	458.01	Hydr Depth (ft)		69.03	Min El Weir Flow (ft)	458.26	Hydr Depth (ft)	13.39	13.24
Min El Prs (ft)	459.28	W.P. Total (ft)	767.61	680.3	Min El Prs (ft)	459.28	W.P. Total (ft)	480.37	443.09
Delta EG (ft)	1	Conv. Total (cfs)	101091.1	195778.9	Delta EG (ft)	0.38	Conv. Total (cfs)	513979.8	588815.6
Delta WS (ft)	1.11	Top Width (ft)		57.81	Delta WS (ft)	0.46	Top Width (ft)	279.28	287.6
BR Open Area (sq ft)	3899.64	Frctn Loss (ft)			BR Open Area (sq ft)	3899.64	Frctn Loss (ft)	0.11	0.05
BR Open Vel (ft/s)	5.98	C & E Loss (ft)			BR Open Vel (ft/s)	7.23	C & E Loss (ft)	0.01	0.06
BR Sluice Coef	0.27	Shear Total (lb/sq ft)	1.29	0.97	BR Sluice Coef		Shear Total (lb/sq ft)	1.37	1.15
BR Sel Method	Press/Weir	Power Total (lb/ft s)	7.69	5.68	BR Sel Method	Energy/Weir	Power Total (lb/ft s)	9.91	8.19

Opening #2 (BS2-F)
Tehuacana Creek Bridge

Plan: Existing Tehuacana Creek Reach 1 RS: 8301 Open#2: Bridge Profile: 25-yr					Plan: Proposed Tehuacana Creek Reach 1 RS: 8301 Open#2: Bricge Profile: 25-yr				
E.G. US. (ft)	457.08	Element	Inside BR US	Inside BR DS	E.G. US. (ft)	457.04	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	456.8	E.G. Elev (ft)	456.99	456.93	W.S. US. (ft)	456.7	E.G. Elev (ft)	456.94	456.92
Q Total (cfs)	6113.16	W.S. Elev (ft)	456.65	456.6	Q Total (cfs)	6780.31	W.S. Elev (ft)	456.75	456.74
Q Bridge (cfs)	6113.16	Crit W.S. (ft)	449.27	447.75	Q Bridge (cfs)	6780.31	Crit W.S. (ft)	447.93	447.41
Q Weir (cfs)		Max Chl Dpth (ft)	21.5	21.99	Q Weir (cfs)		Max Chl Dpth (ft)	21.6	22.13
Weir Sta Lft (ft)		Vel Total (ft/s)	4.57	4.49	Weir Sta Lft (ft)		Vel Total (ft/s)	3.29	3.24
Weir Sta Rgt (ft)		Flow Area (sq ft)	1338.7	1361.71	Weir Sta Rgt (ft)		Flow Area (sq ft)	2059.85	2092.97
Weir Submerg		Froude # Chl	0.18	0.17	Weir Submerg		Froude # Chl	0.14	0.13
Weir Max Depth (ft)		Specif Force (cu ft)	8884.18	9525.53	Weir Max Depth (ft)		Specif Force (cu ft)	14622.92	15165.54
Min El Weir Flow (ft)	459.87	Hydr Depth (ft)	8.86	8.31	Min El Weir Flow (ft)	459.56	Hydr Depth (ft)	11.1	11.28
Min El Prs (ft)	457.08	W.P. Total (ft)	289.76	277.85	Min El Prs (ft)	459.07	W.P. Total (ft)	245.99	245.28
Delta EG (ft)	0.21	Conv. Total (cfs)	134524.2	138683.8	Delta EG (ft)	0.19	Conv. Total (cfs)	315578.7	363827.1
Delta WS (ft)	0.21	Top Width (ft)	151.01	163.91	Delta WS (ft)	0.19	Top Width (ft)	185.61	185.56
BR Open Area (sq ft)	1370.8	Frctn Loss (ft)	0.06	0.04	BR Open Area (sq ft)	2470.17	Frctn Loss (ft)	0.02	0.02
BR Open Vel (ft/s)	4.57	C & E Loss (ft)	0.01	0.02	BR Open Vel (ft/s)	3.29	C & E Loss (ft)	0.01	0.05
BR Sluice Coef		Shear Total (lb/sq ft)	0.6	0.59	BR Sluice Coef		Shear Total (lb/sq ft)	0.24	0.19
BR Sel Method	Energy only	Power Total (lb/ft s)	2.72	2.67	BR Sel Method	Energy only	Power Total (lb/ft s)	0.77	0.6

Plan: Existing Tehuacana Creek Reach 1 RS: 8301 Open#2: Bridge Profile: 100-yr					Plan: Proposed Tehuacana Creek Reach 1 RS: 8301 Open#2: Bridge Profile: 100-yr				
E.G. US. (ft)	459.65	Element	Inside BR US	Inside BR DS	E.G. US. (ft)	459.1	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	459.33	E.G. Elev (ft)	459.65	459.43	W.S. US. (ft)	458.37	E.G. Elev (ft)	458.93	458.87
Q Total (cfs)	10313.35	W.S. Elev (ft)	459.33	458.85	Q Total (cfs)	12318	W.S. Elev (ft)	458.44	458.42
Q Bridge (cfs)	10136.5	Crit W.S. (ft)	453.38	451.96	Q Bridge (cfs)	12318	Crit W.S. (ft)	450.26	449.67
Q Weir (cfs)	176.86	Max Chl Dpth (ft)	24.18	24.24	Q Weir (cfs)		Max Chl Dpth (ft)	23.29	23.81
Weir Sta Lft (ft)	2075.3	Vel Total (ft/s)	7.39	7.23	Weir Sta Lft (ft)		Vel Total (ft/s)	5.17	5.11
Weir Sta Rgt (ft)	2100	Flow Area (sq ft)	1370.8	1401.39	Weir Sta Rgt (ft)		Flow Area (sq ft)	2380.43	2411.32
Weir Submerg	0.32	Froude # Chl	0.27	0.26	Weir Submerg		Froude # Chl	0.2	0.19
Weir Max Depth (ft)	2.08	Specif Force (cu ft)	14043.48	14113.82	Weir Max Depth (ft)		Specif Force (cu ft)	19738.81	20271.81
Min El Weir Flow (ft)	457.57	Hydr Depth (ft)			Min El Weir Flow (ft)	464.05	Hydr Depth (ft)	12.56	12.72
Min El Prs (ft)	457.08	W.P. Total (ft)	443.1	445.99	Min El Prs (ft)	459.07	W.P. Total (ft)	257.85	257.13
Delta EG (ft)	0.78	Conv. Total (cfs)	103339.6	106675.1	Delta EG (ft)	0.37	Conv. Total (cfs)	394104.3	445713.2
Delta WS (ft)	1.01	Top Width (ft)			Delta WS (ft)	0.42	Top Width (ft)	189.5	189.5
BR Open Area (sq ft)	1370.8	Frctn Loss (ft)			BR Open Area (sq ft)	2470.17	Frctn Loss (ft)	0.04	0.04
BR Open Vel (ft/s)	7.39	C & E Loss (ft)			BR Open Vel (ft/s)	5.17	C & E Loss (ft)	0.02	0.1
BR Sluice Coef		Shear Total (lb/sq ft)	1.92	1.83	BR Sluice Coef	0.27	Shear Total (lb/sq ft)	0.56	0.45
BR Sel Method	Press/Weir	Power Total (lb/ft s)	14.22	13.26	BR Sel Method	Energy only	Power Total (lb/ft s)	2.91	2.28

Opening #1 (BS3-F)
Tehuacana Creek Relief Bridge

Plan: Existing Tehuacana Creek Reach 1 RS: 8301 Open#1: Bridge Profile: 25-yr					Plan: Proposed Tehuacana Creek Reach 1 RS: 8301 Open#1: Bricge Profile: 25-yr				
E.G. US. (ft)	457.12	Element	Inside BR US	Inside BR DS	E.G. US. (ft)	457.06	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	456.83	E.G. Elev (ft)	457.01	456.94	W.S. US. (ft)	456.64	E.G. Elev (ft)	457	456.92
Q Total (cfs)	4487.35	W.S. Elev (ft)	456.63	456.58	Q Total (cfs)	5686.4	W.S. Elev (ft)	456.6	456.51
Q Bridge (cfs)	4487.35	Crit W.S. (ft)	453.99	453.73	Q Bridge (cfs)	5686.4	Crit W.S. (ft)	453.32	453.32
Q Weir (cfs)		Max Chl Dpth (ft)	6.57	7.38	Q Weir (cfs)		Max Chl Dpth (ft)	6.84	6.75
Weir Sta Lft (ft)		Vel Total (ft/s)	4.96	4.79	Weir Sta Lft (ft)		Vel Total (ft/s)	5.08	5.15
Weir Sta Rgt (ft)		Flow Area (sq ft)	903.8	937.63	Weir Sta Rgt (ft)		Flow Area (sq ft)	1119.52	1103.22
Weir Submerg		Froude # Chl	0	0	Weir Submerg		Froude # Chl	0.34	0.35
Weir Max Depth (ft)		Specif Force (cu ft)	3186.89	3409.73	Weir Max Depth (ft)		Specif Force (cu ft)	4559.68	4474.28
Min El Weir Flow (ft)	457.99	Hydr Depth (ft)	5.31	5.51	Min El Weir Flow (ft)	458.83	Hydr Depth (ft)	6.09	6.02
Min El Prs (ft)	457.52	W.P. Total (ft)	228.92	231.55	Min El Prs (ft)	458.89	W.P. Total (ft)	215.43	214.51
Delta EG (ft)	0.26	Conv. Total (cfs)	96025.9	101964.3	Delta EG (ft)	0.22	Conv. Total (cfs)	143328.5	140258.2
Delta WS (ft)	0.26	Top Width (ft)	170.1	170.1	Delta WS (ft)	0.23	Top Width (ft)	183.92	183.39
BR Open Area (sq ft)	1034.8	Frctn Loss (ft)	0.06	0.04	BR Open Area (sq ft)	1532.77	Frctn Loss (ft)	0.07	0.06
BR Open Vel (ft/s)	4.96	C & E Loss (ft)	0.01	0.03	BR Open Vel (ft/s)	5.15	C & E Loss (ft)	0	0.01
BR Sluice Coef		Shear Total (lb/sq ft)	0.54	0.49	BR Sluice Coef		Shear Total (lb/sq ft)	0.51	0.53
BR Sel Method	Energy only	Power Total (lb/ft s)	2.67	2.34	BR Sel Method	Energy only	Power Total (lb/ft s)	2.59	2.72

Plan: Existing Tehuacana Creek Reach 1 RS: 8301 Open#1: Bridge Profile: 100-yr					Plan: Proposed Tehuacana Creek Reach 1 RS: 8301 Open#1: Bridge Profile: 100-yr				
E.G. US. (ft)	459.66	Element	Inside BR US	Inside BR DS	E.G. US. (ft)	458.89	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	459.41	E.G. Elev (ft)	459.66	459.57	W.S. US. (ft)	458.42	E.G. Elev (ft)	458.84	458.77
Q Total (cfs)	11641.93	W.S. Elev (ft)	459.41	459.25	Q Total (cfs)	7875.4	W.S. Elev (ft)	458.38	458.31
Q Bridge (cfs)	9023.42	Crit W.S. (ft)	456.58	456.34	Q Bridge (cfs)	7875.4	Crit W.S. (ft)	454.16	454.16
Q Weir (cfs)	2618.51	Max Chl Dpth (ft)	9.35	10.05	Q Weir (cfs)		Max Chl Dpth (ft)	8.62	8.55
Weir Sta Lft (ft)	489.96	Vel Total (ft/s)	8.72	8.39	Weir Sta Lft (ft)		Vel Total (ft/s)	5.41	5.46
Weir Sta Rgt (ft)	1781.74	Flow Area (sq ft)	1034.8	1076.11	Weir Sta Rgt (ft)		Flow Area (sq ft)	1455.95	1441.77
Weir Submerg	0	Froude # Chl	0.5	0.47	Weir Submerg		Froude # Chl	0.32	0.33
Weir Max Depth (ft)	1.68	Specif Force (cu ft)	7769.78	7900.59	Weir Max Depth (ft)		Specif Force (cu ft)	7288.27	7192.83
Min El Weir Flow (ft)	457.99	Hydr Depth (ft)			Min El Weir Flow (ft)	458.83	Hydr Depth (ft)	7.68	7.61
Min El Prs (ft)	457.52	W.P. Total (ft)	413.19	416.25	Min El Prs (ft)	458.89	W.P. Total (ft)	229.32	228.94
Delta EG (ft)	0.79	Conv. Total (cfs)	81191.5	86851.4	Delta EG (ft)	0.17	Conv. Total (cfs)	212880.5	209679.9
Delta WS (ft)	2.11	Top Width (ft)			Delta WS (ft)	0.18	Top Width (ft)	189.5	189.5
BR Open Area (sq ft)	1034.8	Frctn Loss (ft)			BR Open Area (sq ft)	1532.77	Frctn Loss (ft)	0.06	0.05
BR Open Vel (ft/s)	8.72	C & E Loss (ft)			BR Open Vel (ft/s)	5.46	C & E Loss (ft)	0	0
BR Sluice Coef	0.47	Shear Total (lb/sq ft)	3.21	2.9	BR Sluice Coef		Shear Total (lb/sq ft)	0.54	0.55
BR Sel Method	Press/Weir	Power Total (lb/ft s)	28.03	24.32	BR Sel Method	Energy only	Power Total (lb/ft s)	2.93	3.03

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STATE OF TEXAS
FLORIAN BALTOI
119857
LICENSED
PROFESSIONAL ENGINEER

Florian Baltoi 2/1/2024

AtkinsRéalis
TBPE REG. # F-474

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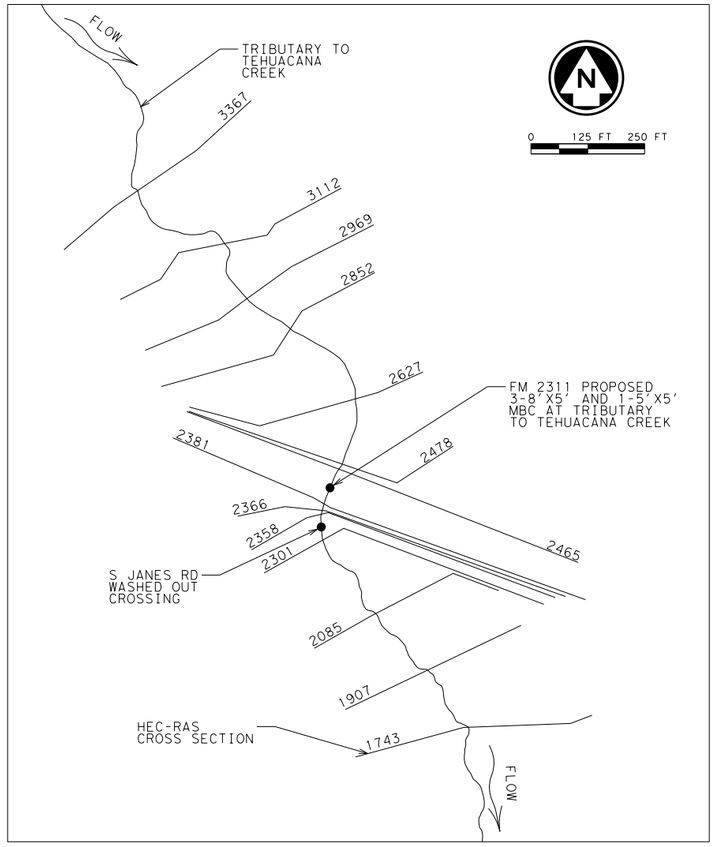
FM 2311 TEHUACANA CREEK BRIDGE REPLACEMENTS

HYDRAULIC DATA

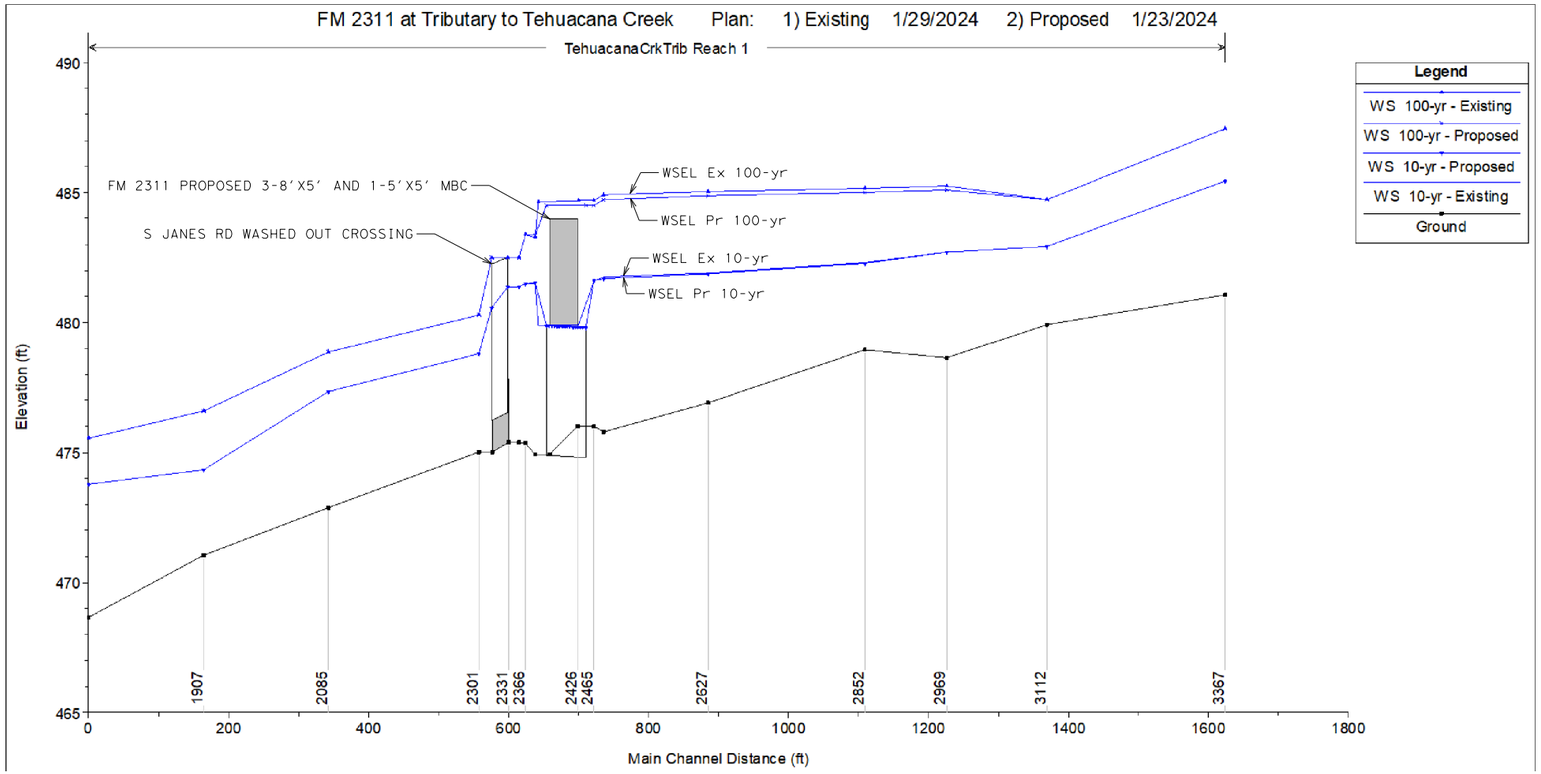
SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		134

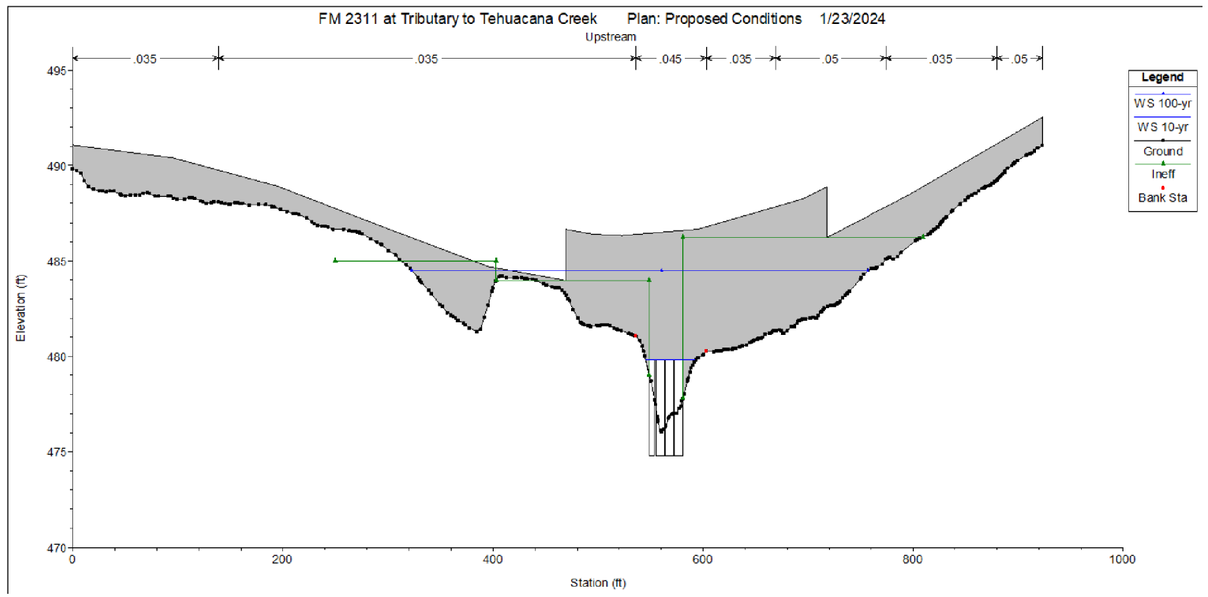


HEC-RAS CROSS SECTION LOCATIONS

CULVERT TO BE EXTENDED AT RIVER STATION 2426



HEC-RAS TRIBUTARY TO TEHUACANA CREEK PROFILES



HEC-RAS UPSTREAM CULVERT FACE

NOTES:

1. HYDRAULIC MODELING WAS PERFORMED USING THE HEC-RAS VERSION 6.4.1 WITH STEADY FLOW ANALYSIS.
2. THE BRIDGE CLASS CULVERT TO BE MODIFIED IS IN FLOOD ZONE X SHADED OF TRIBUTARY TO TEHUACANA CREEK (FIRM NR. 48309C0225D, EFFECTIVE DECEMBER 20, 2019).
3. THE TNRIS 2021 ONE (1) METER RESOLUTION LIDAR DATA WAS USED FOR HYDRAULIC MODELING.
4. FOR THIS STUDY, THE HORIZONTAL DATUM OF REFERENCE USED WAS THE NORTH AMERICAN DATUM 1983 (NAD 83), AND THE VERTICAL DATUM OF REFERENCE USED WAS THE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88).
5. THE BOUNDARY CONDITION USED IN THE HYDRAULIC MODEL WAS NORMAL DEPTH WITH A DOWNSTREAM SLOPE OF 0.0028 FT/FT.
6. METAL BEAM GUARD FENCES WILL BE USED FOR TRAFFIC SAFETY AT THE BRIDGE CLASS CULVERT TO BE MODIFIED.

STATE OF TEXAS
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119857
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FM 2311 CROSS-DRAINAGE STRUCTURE BCC-C

HYDRAULIC DATA

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		135

DATE: 2/1/2024 6:37:24 AM
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Reach	River Sta	Profile	Plan	Q Total	W.S. Elev	Vel Chnl
				(cfs)	(ft)	(ft/s)
Reach 1	3367	10-yr	Existing	413	485.44	3.64
Reach 1	3367	10-yr	Proposed	413	485.44	3.64
Reach 1	3367	100-yr	Existing	1143	487.47	3.92
Reach 1	3367	100-yr	Proposed	1143	487.47	3.92
Reach 1	3112	10-yr	Existing	413	482.94	8.03
Reach 1	3112	10-yr	Proposed	413	482.94	8.03
Reach 1	3112	100-yr	Existing	1143	484.72	11.06
Reach 1	3112	100-yr	Proposed	1143	484.72	11.06
Reach 1	2969	10-yr	Existing	413	482.73	2.87
Reach 1	2969	10-yr	Proposed	413	482.71	2.89
Reach 1	2969	100-yr	Existing	1143	485.24	3.29
Reach 1	2969	100-yr	Proposed	1143	485.10	3.45
Reach 1	2852	10-yr	Existing	413	482.32	3.58
Reach 1	2852	10-yr	Proposed	413	482.29	3.63
Reach 1	2852	100-yr	Existing	1143	485.17	2.57
Reach 1	2852	100-yr	Proposed	1143	485.00	2.72
Reach 1	2627	10-yr	Existing	413	481.90	2.48
Reach 1	2627	10-yr	Proposed	413	481.86	2.52
Reach 1	2627	100-yr	Existing	1143	485.04	2.32
Reach 1	2627	100-yr	Proposed	1143	484.87	2.40
Reach 1	2478	10-yr	Existing	413	481.75	2.30
Reach 1	2478	10-yr	Proposed	413	481.69	2.34
Reach 1	2478	100-yr	Existing	1143	484.92	2.75
Reach 1	2478	100-yr	Proposed	1143	484.73	2.86
Reach 1	2465	10-yr	Existing	413	481.60	3.41
Reach 1	2465	10-yr	Proposed	413	481.62	2.86
Reach 1	2465	100-yr	Existing	1143	484.71	4.45
Reach 1	2465	100-yr	Proposed	1143	484.51	4.38
Reach 1	2426	FM 2311 PROPOSED 3-8'X5' AND 1-5'X5' MBC				
Reach 1	2381	10-yr	Existing	413	481.5	2.49
Reach 1	2381	10-yr	Proposed	413	481.54	1.97
Reach 1	2381	100-yr	Existing	1143	483.27	5.44
Reach 1	2381	100-yr	Proposed	1143	483.36	4.28
Reach 1	2366	10-yr	Existing	413	481.50	2.37
Reach 1	2366	10-yr	Proposed	413	481.51	2.29
Reach 1	2366	100-yr	Existing	1143	483.38	3.77
Reach 1	2366	100-yr	Proposed	1143	483.40	3.62
Reach 1	2358	10-yr	Existing	413	481.37	3.41
Reach 1	2358	10-yr	Proposed	413	481.37	3.41
Reach 1	2358	100-yr	Existing	1143	482.48	7.45
Reach 1	2358	100-yr	Proposed	1143	482.48	7.45
Reach 1	2331	S JANES RD WASHED OUT CROSSING				
Reach 1	2301	10-yr	Existing	413	478.79	4.12
Reach 1	2301	10-yr	Proposed	413	478.79	4.12
Reach 1	2301	100-yr	Existing	1143	480.30	6.86
Reach 1	2301	100-yr	Proposed	1143	480.30	6.86
Reach 1	2085	10-yr	Existing	413	477.34	5.01
Reach 1	2085	10-yr	Proposed	413	477.34	5.01
Reach 1	2085	100-yr	Existing	1143	478.86	6.39
Reach 1	2085	100-yr	Proposed	1143	478.86	6.39
Reach 1	1907	10-yr	Existing	413	474.35	7.94
Reach 1	1907	10-yr	Proposed	413	474.35	7.94
Reach 1	1907	100-yr	Existing	1143	476.59	8.23
Reach 1	1907	100-yr	Proposed	1143	476.59	8.23
Reach 1	1743	10-yr	Existing	413	473.79	3.84
Reach 1	1743	10-yr	Proposed	413	473.79	3.84
Reach 1	1743	100-yr	Existing	1143	475.55	4.69
Reach 1	1743	100-yr	Proposed	1143	475.55	4.69

NOTE:

HYDRAULIC MODELING WAS PERFORMED USING THE HEC-RAS VERSION 6.4.1 WITH STEADY FLOW ANALYSIS.

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FM 2311
CROSS-DRAINAGE STRUCTURE BCC-C

HYDRAULIC DATA

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		136

DATE: 2/1/2024 6:37:41 AM
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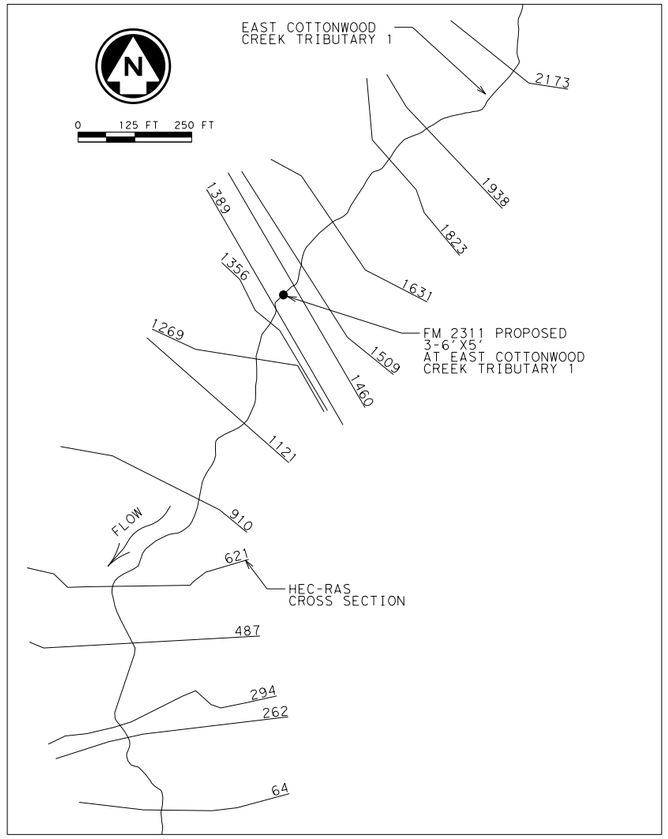
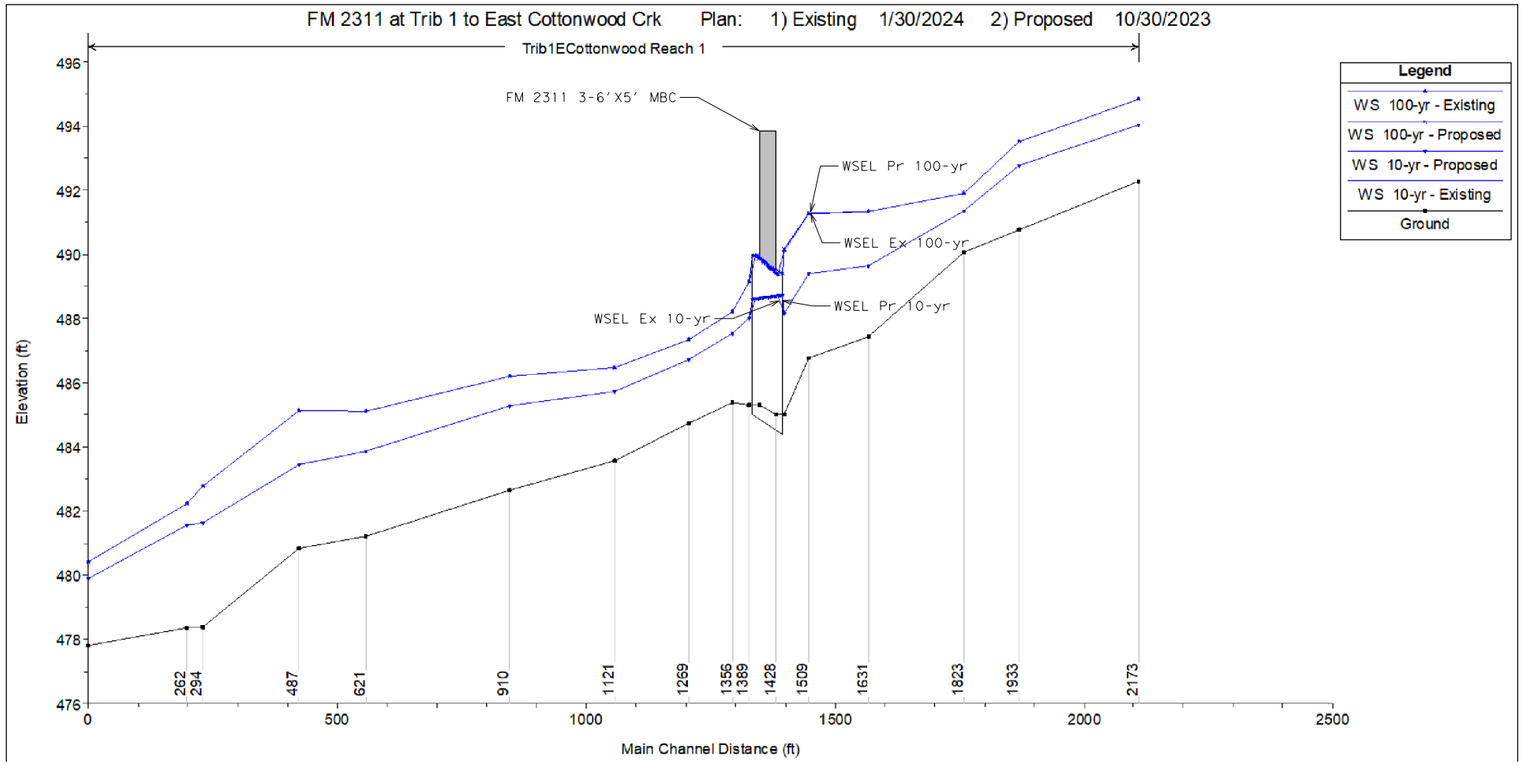
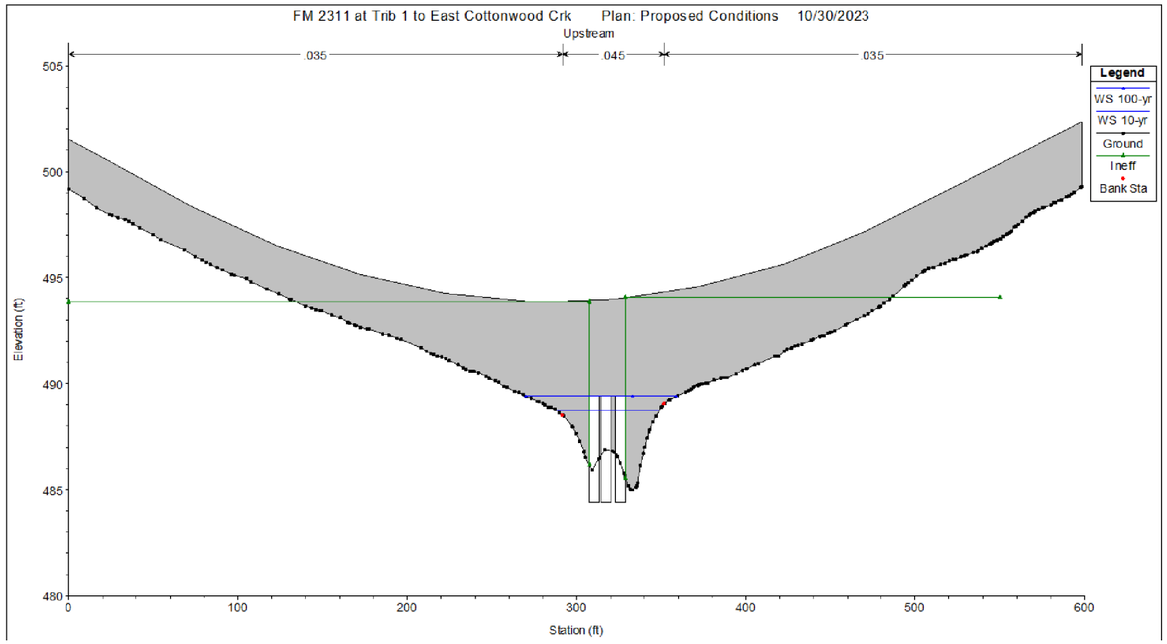


HEC-RAS CROSS SECTION LOCATIONS

CULVERT TO BE MODIFIED AT RIVER STATION 1428



HEC-RAS EAST COTTONWOOD CREEK TRIBUTARY 1 PROFILES



HEC-RAS UPSTREAM CULVERT FACE

NOTES:

1. HYDRAULIC MODELING WAS PERFORMED USING THE HEC-RAS VERSION 6.4.1 WITH STEADY FLOW ANALYSIS.
2. THE BRIDGE CLASS CULVERT TO BE MODIFIED IS IN FLOOD ZONE A OF EAST COTTONWOOD CREEK TRIBUTARY 1 (FIRM NR. 48309C0250D, EFFECTIVE DECEMBER 20, 2019).
3. THE MCLENNAN COUNTY FLOODPLAIN ADMINISTRATOR (FPA) ZANE DUNNAM WAS INFORMED ABOUT THE TXDOT FM 2311 ROADWAY IMPROVEMENT PROJECT IN NOVEMBER 2022 AND NOVEMBER 2023. THE FINAL HYDRAULIC MODEL AND PLAN SET WILL BE SENT TO THE FPA AT THE 100% SUBMITTAL.
4. THE TNRIS 2021 ONE (1) METER RESOLUTION LIDAR DATA WAS USED FOR HYDRAULIC MODELING.
5. FOR THIS STUDY, THE HORIZONTAL DATUM OF REFERENCE USED WAS THE NORTH AMERICAN DATUM 1983 (NAD 83), AND THE VERTICAL DATUM OF REFERENCE USED WAS THE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88).
6. THE BOUNDARY CONDITION USED IN THE HYDRAULIC MODEL WAS NORMAL DEPTH WITH A DOWNSTREAM SLOPE OF 0.01 FT/FT.
7. AS THE BRIDGE CLASS CULVERT TO BE MODIFIED WILL BE FITTED WITH SAFETY END TREATMENTS, METAL BEAM GUARD FENCES OR BRIDGE RAILS ARE NOT REQUIRED.

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FM 2311
CROSS-DRAINAGE STRUCTURE BCC-G

HYDRAULIC DATA

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		137

DATE: 2/1/2024 6:37:58 AM
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Reach	River Sta	Profile	Plan	Q Total (cfs)	W.S. Elev (ft)	Vel Chnl (ft/s)
Reach 1	2173	10-yr	Existing	274	494.03	2.79
Reach 1	2173	10-yr	Proposed	274	494.03	2.79
Reach 1	2173	100-yr	Existing	588	494.84	3.34
Reach 1	2173	100-yr	Proposed	588	494.84	3.34
Reach 1	1933	10-yr	Existing	274	492.78	3.53
Reach 1	1933	10-yr	Proposed	274	492.78	3.53
Reach 1	1933	100-yr	Existing	588	493.52	4.90
Reach 1	1933	100-yr	Proposed	588	493.52	4.90
Reach 1	1823	10-yr	Existing	274	491.36	5.12
Reach 1	1823	10-yr	Proposed	274	491.36	5.12
Reach 1	1823	100-yr	Existing	588	491.91	6.64
Reach 1	1823	100-yr	Proposed	588	491.91	6.64
Reach 1	1631	10-yr	Existing	274	489.65	2.87
Reach 1	1631	10-yr	Proposed	274	489.65	2.87
Reach 1	1631	100-yr	Existing	588	491.33	2.06
Reach 1	1631	100-yr	Proposed	588	491.35	2.04
Reach 1	1509	10-yr	Existing	274	489.40	1.89
Reach 1	1509	10-yr	Proposed	274	489.40	1.89
Reach 1	1509	100-yr	Existing	588	491.25	1.73
Reach 1	1509	100-yr	Proposed	588	491.28	1.71
Reach 1	1460	10-yr	Existing	274	488.16	7.49
Reach 1	1460	10-yr	Proposed	274	488.16	7.49
Reach 1	1460	100-yr	Existing	588	490.12	7.46
Reach 1	1460	100-yr	Proposed	588	490.18	7.35
Reach 1	1428	FM 2311 3-6'X5' MBC				
Reach 1	1389	10-yr	Existing	274	488.01	7.53
Reach 1	1389	10-yr	Proposed	274	488.01	7.53
Reach 1	1389	100-yr	Existing	588	489.16	9.71
Reach 1	1389	100-yr	Proposed	588	489.16	9.71
Reach 1	1356	10-yr	Existing	274	487.54	4.88
Reach 1	1356	10-yr	Proposed	274	487.54	4.88
Reach 1	1356	100-yr	Existing	588	488.22	6.43
Reach 1	1356	100-yr	Proposed	588	488.22	6.43
Reach 1	1269	10-yr	Existing	274	486.72	3.93
Reach 1	1269	10-yr	Proposed	274	486.72	3.93
Reach 1	1269	100-yr	Existing	588	487.34	5.33
Reach 1	1269	100-yr	Proposed	588	487.34	5.33
Reach 1	1121	10-yr	Existing	274	485.73	3.45
Reach 1	1121	10-yr	Proposed	274	485.73	3.45
Reach 1	1121	100-yr	Existing	588	486.47	4.27
Reach 1	1121	100-yr	Proposed	588	486.47	4.27
Reach 1	910	10-yr	Existing	274	485.27	1.78
Reach 1	910	10-yr	Proposed	274	485.27	1.78
Reach 1	910	100-yr	Existing	588	486.19	1.90
Reach 1	910	100-yr	Proposed	588	486.19	1.90
Reach 1	621	10-yr	Existing	274	483.86	5.64
Reach 1	621	10-yr	Proposed	274	483.86	5.64
Reach 1	621	100-yr	Existing	588	485.11	5.65
Reach 1	621	100-yr	Proposed	588	485.11	5.65
Reach 1	487	10-yr	Existing	274	483.44	1.80
Reach 1	487	10-yr	Proposed	274	483.44	1.80
Reach 1	487	100-yr	Existing	588	485.12	1.71
Reach 1	487	100-yr	Proposed	588	485.12	1.71
Reach 1	294	10-yr	Existing	274	481.64	7.06
Reach 1	294	10-yr	Proposed	274	481.64	7.06
Reach 1	294	100-yr	Existing	588	482.77	10.08
Reach 1	294	100-yr	Proposed	588	482.77	10.08
Reach 1	262	10-yr	Existing	274	481.55	4.13
Reach 1	262	10-yr	Proposed	274	481.55	4.13
Reach 1	262	100-yr	Existing	588	482.22	5.93
Reach 1	262	100-yr	Proposed	588	482.22	5.93
Reach 1	64	10-yr	Existing	274	479.90	4.40
Reach 1	64	10-yr	Proposed	274	479.90	4.40
Reach 1	64	100-yr	Existing	588	480.41	5.30
Reach 1	64	100-yr	Proposed	588	480.41	5.30

NOTES:

1. HYDRAULIC MODELING WAS PERFORMED USING THE HEC-RAS VERSION 6.4.1 WITH STEADY FLOW ANALYSIS.
2. THE CULVERT TO BE MODIFED IS IN FLOOD ZONE A OF EAST COTTONWOOD CREEK TRIBUTARY 1 (FIRM NR. 48309C0250D, EFFECTIVE DECEMBER 20, 2019).

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FM 2311 CROSS-DRAINAGE STRUCTURE BCC-G

HYDRAULIC DATA

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		138

DATE: 2/1/2024 6:38:14 AM
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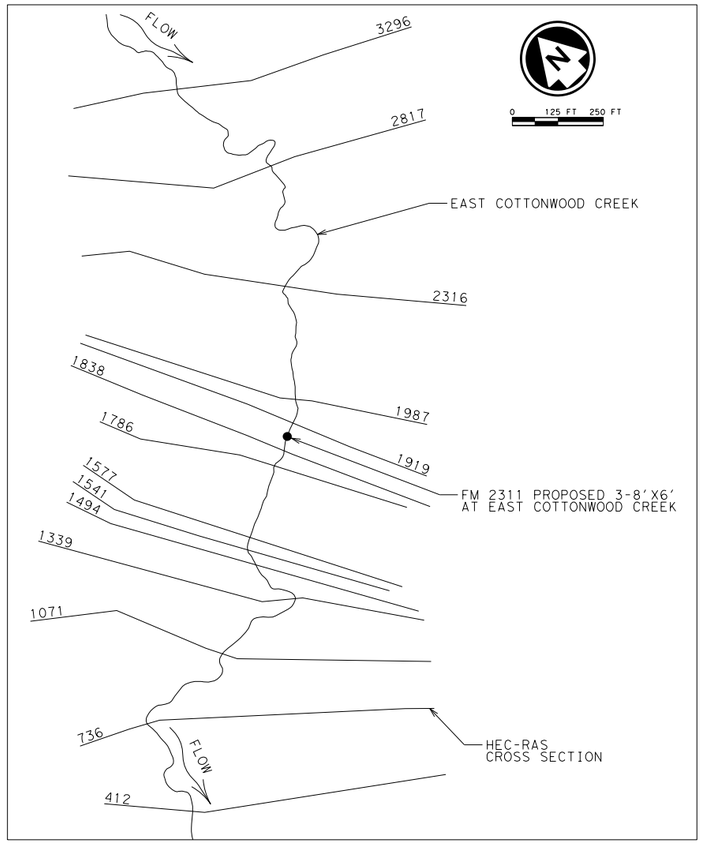
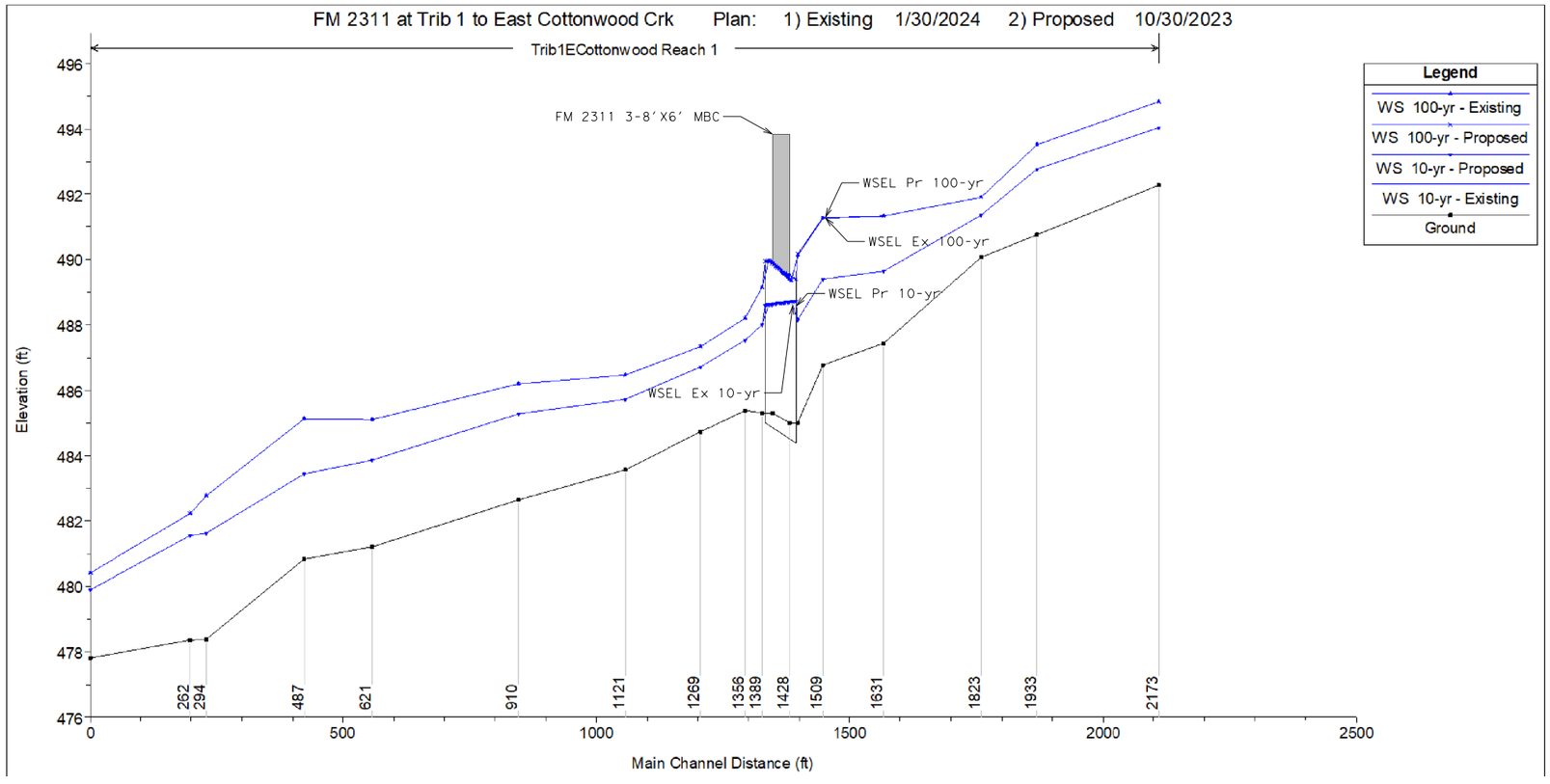
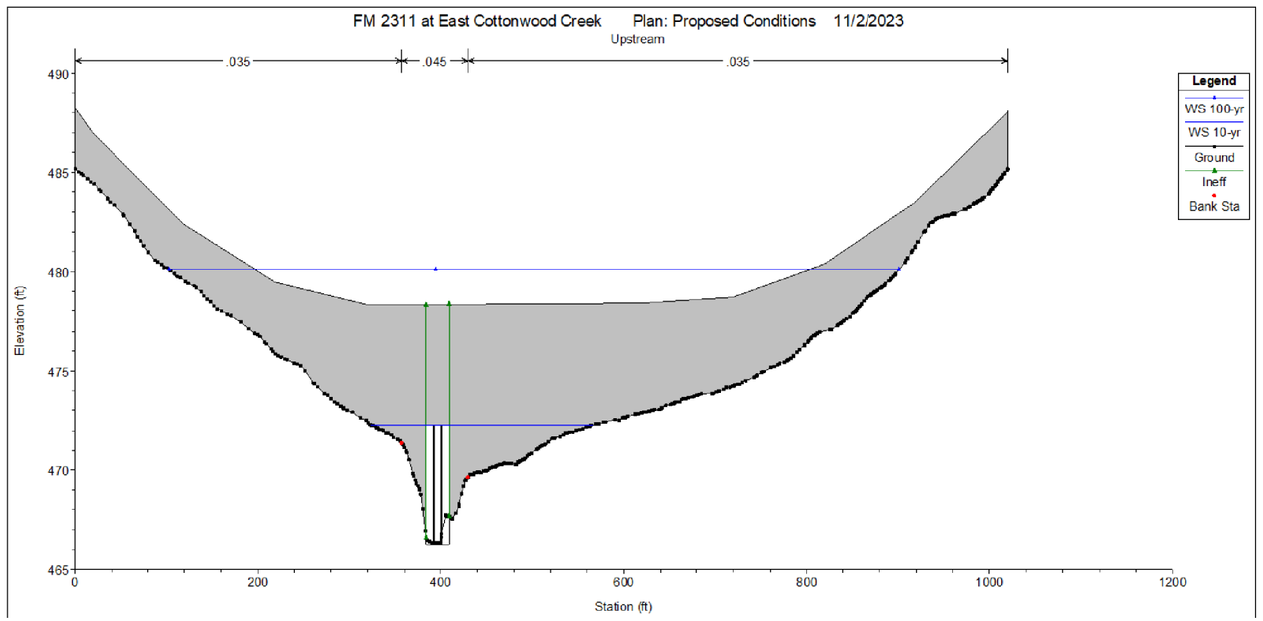


HEC-RAS CROSS SECTION LOCATIONS

PROPOSED CULVERT AT RIVER STATION 1881



HEC-RAS EAST COTTONWOOD CREEK PROFILES



HEC-RAS UPSTREAM CULVERT FACE

NOTES:

1. HYDRAULIC MODELING WAS PERFORMED USING THE HEC-RAS VERSION 6.4.1 WITH STEADY FLOW ANALYSIS.
2. THE BRIDGE CLASS CULVERT TO BE MODIFIED IS IN FLOOD ZONE A OF EAST COTTONWOOD CREEK (FIRM NR. 48309C0250D, EFFECTIVE DECEMBER 20, 2019).
3. THE MCLENNAN COUNTY FLOODPLAIN ADMINISTRATOR (FPA) ZANE DUNNAM WAS INFORMED ABOUT THE TXDOT FM 2311 ROADWAY IMPROVEMENT PROJECT IN NOVEMBER 2022 AND NOVEMBER 2023. THE FINAL HYDRAULIC MODEL AND PLAN SET WILL BE SENT TO THE FPA AT THE 100% SUBMITTAL.
4. THE TNRIS 2021 ONE (1) METER RESOLUTION LIDAR DATA WAS USED FOR HYDRAULIC MODELING.
5. FOR THIS STUDY, THE HORIZONTAL DATUM OF REFERENCE USED WAS THE NORTH AMERICAN DATUM 1983 (NAD 83), AND THE VERTICAL DATUM OF REFERENCE USED WAS THE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88).
6. THE BOUNDARY CONDITION USED IN THE HYDRAULIC MODEL WAS KNOWN WATER SURFACE, WITH ELEVATIONS OF 473.31 FT AND 479.50 FT FOR THE 10-YR AND 100-YR EVENTS RESPECTIVELEY.

   THESE WATER SURFACE ELEVATIONS WERE ESTIMATED BASED ON THE ASSUMPTION THAT IN EACH EVENT THE ENTIRE RUNOFF VOLUME TO THE RESERVOIR WOULD BE STORED IN THE RESERVOIR.

   THE RESERVOIR STARTING WATER SURFACE ELEVATION FOR EACH EVENT WAS ASSUMED TO BE 464.49 FT. THIS ELEVATION WAS DETERMINED BASED ON DATA FROM TNRIS 2013 ONE (1) METER RESOLUTION LIDAR AND THE NATIONAL INVENTORY OF DAMS RECORD FOR THE TEHUACANA CREEK WS SCS SITE 11 DAM (ID TX04119).
7. AS THE BRIDGE CLASS CULVERT TO BE MODIFIED WILL BE FITTED WITH SAFETY END TREATMENTS, METAL BEAM GUARD FENCES OR BRIDGE RAILS ARE NOT REQUIRED.

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FM 2311 CROSS-DRAINAGE STRUCTURE BCC-H

HYDRAULIC DATA

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		139

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Reach	River Sta	Profile	Plan	Q Total	W.S. Elev	Vel Chnl
				(cfs)	(ft)	(ft/s)
Reach 1	3296	10-yr	Existing	1637	478.04	3.98
Reach 1	3296	10-yr	Proposed	1637	478.08	3.90
Reach 1	3296	100-yr	Existing	3526	481.44	2.55
Reach 1	3296	100-yr	Proposed	3526	480.65	3.25
Reach 1	2817	10-yr	Existing	1637	477.55	3.37
Reach 1	2817	10-yr	Proposed	1637	477.62	3.29
Reach 1	2817	100-yr	Existing	3526	481.33	2.45
Reach 1	2817	100-yr	Proposed	3526	480.44	3.11
Reach 1	2316	10-yr	Existing	1637	477.32	2.76
Reach 1	2316	10-yr	Proposed	1637	477.41	2.67
Reach 1	2316	100-yr	Existing	3526	481.28	1.86
Reach 1	2316	100-yr	Proposed	3526	480.34	2.38
Reach 1	1987	10-yr	Existing	1637	476.99	3.41
Reach 1	1987	10-yr	Proposed	1637	477.10	3.32
Reach 1	1987	100-yr	Existing	3526	481.16	2.79
Reach 1	1987	100-yr	Proposed	3526	480.13	3.47
Reach 1	1919	10-yr	Existing	1637	476.09	7.04
Reach 1	1919	10-yr	Proposed	1637	476.22	6.95
Reach 1	1919	100-yr	Existing	3526	481.15	2.23
Reach 1	1919	100-yr	Proposed	3526	480.09	3.21
Reach 1	1881	FM 2311 3-8'X6' MBC				
Reach 1	1838	10-yr	Existing	1637	473.87	10.13
Reach 1	1838	10-yr	Proposed	1637	473.87	10.13
Reach 1	1838	100-yr	Existing	3526	479.61	6.01
Reach 1	1838	100-yr	Proposed	3526	479.83	3.99
Reach 1	1786	10-yr	Existing	1637	474.23	5.37
Reach 1	1786	10-yr	Proposed	1637	474.23	5.37
Reach 1	1786	100-yr	Existing	3526	479.57	4.82
Reach 1	1786	100-yr	Proposed	3526	479.59	4.79
Reach 1	1577	10-yr	Existing	1637	473.44	6.88
Reach 1	1577	10-yr	Proposed	1637	473.44	6.88
Reach 1	1577	100-yr	Existing	3526	479.53	3.80
Reach 1	1577	100-yr	Proposed	3526	479.53	4.05
Reach 1	1541	10-yr	Existing	1637	473.46	6.32
Reach 1	1541	10-yr	Proposed	1637	473.46	6.32
Reach 1	1541	100-yr	Existing	3526	479.49	3.81
Reach 1	1541	100-yr	Proposed	3526	479.48	4.05
Reach 1	1494	10-yr	Existing	1637	473.51	4.00
Reach 1	1494	10-yr	Proposed	1637	473.51	4.00
Reach 1	1494	100-yr	Existing	3526	479.51	2.20
Reach 1	1494	100-yr	Proposed	3526	479.51	2.29
Reach 1	1339	10-yr	Existing	1637	473.39	3.92
Reach 1	1339	10-yr	Proposed	1637	473.39	3.92
Reach 1	1339	100-yr	Existing	3526	479.51	1.61
Reach 1	1339	100-yr	Proposed	3526	479.51	1.67
Reach 1	1071	10-yr	Existing	1637	473.36	1.63
Reach 1	1071	10-yr	Proposed	1637	473.36	1.63
Reach 1	1071	100-yr	Existing	3526	479.51	0.78
Reach 1	1071	100-yr	Proposed	3526	479.51	0.78
Reach 1	736	10-yr	Existing	1637	473.34	1.21
Reach 1	736	10-yr	Proposed	1637	473.34	1.21
Reach 1	736	100-yr	Existing	3526	479.51	0.84
Reach 1	736	100-yr	Proposed	3526	479.51	0.84
Reach 1	412	10-yr	Existing	1637	473.31	1.27
Reach 1	412	10-yr	Proposed	1637	473.31	1.27
Reach 1	412	100-yr	Existing	3526	479.50	0.89
Reach 1	412	100-yr	Proposed	3526	479.50	0.89

NOTES:

1. HYDRAULIC MODELING WAS PERFORMED USING THE HEC-RAS VERSION 6.4.1 WITH STEADY FLOW ANALYSIS.
2. THE PROPOSED CULVERT IS IN FLOOD ZONE A OF EAST COTTONWOOD CREEK (FIRM NR. 48309C0250D, EFFECTIVE DECEMBER 20, 2019).

STATE OF TEXAS
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FM 2311
CROSS-DRAINAGE
STRUCTURE BCC-H

HYDRAULIC DATA

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		140

DATE: 2/1/2024 6:38:46 AM
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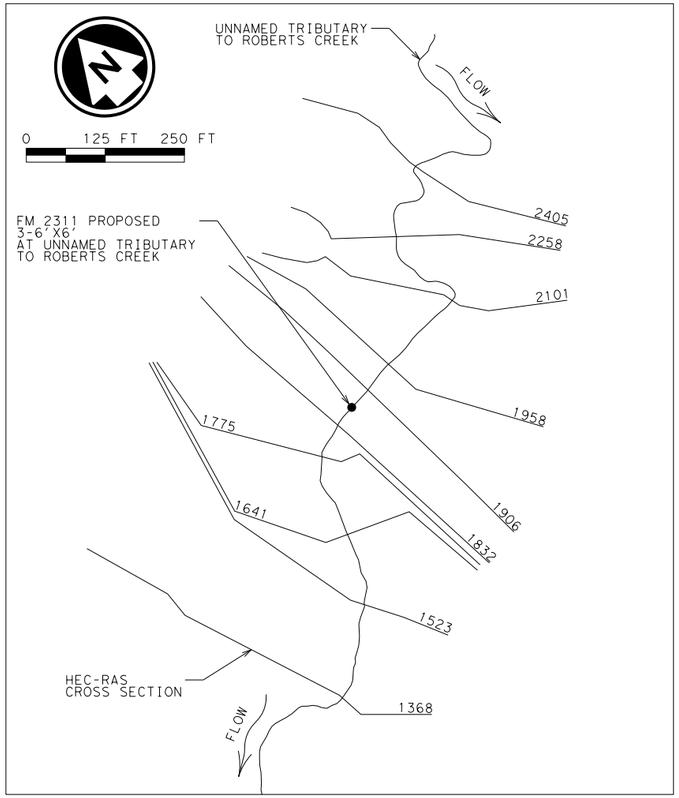
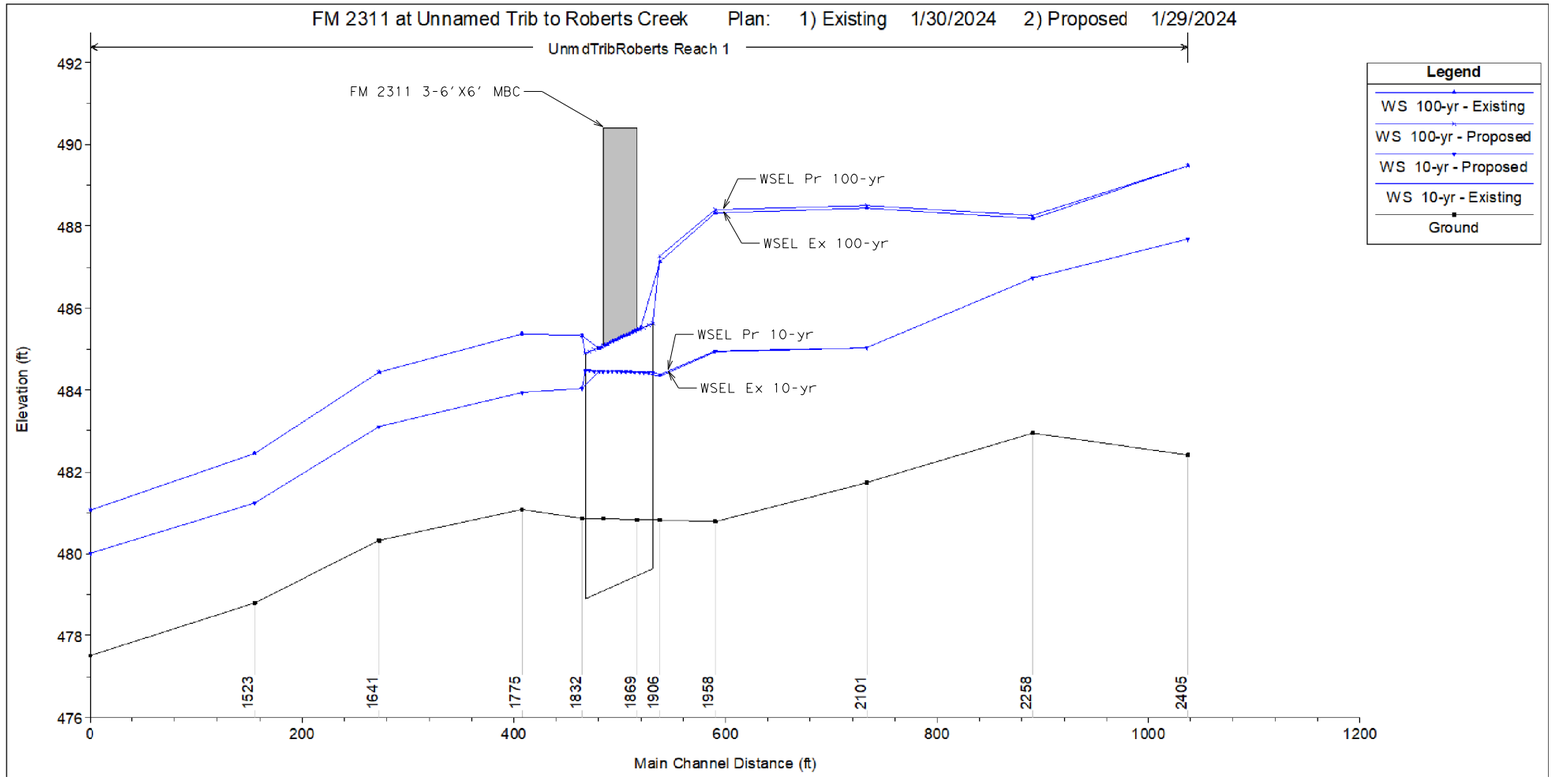
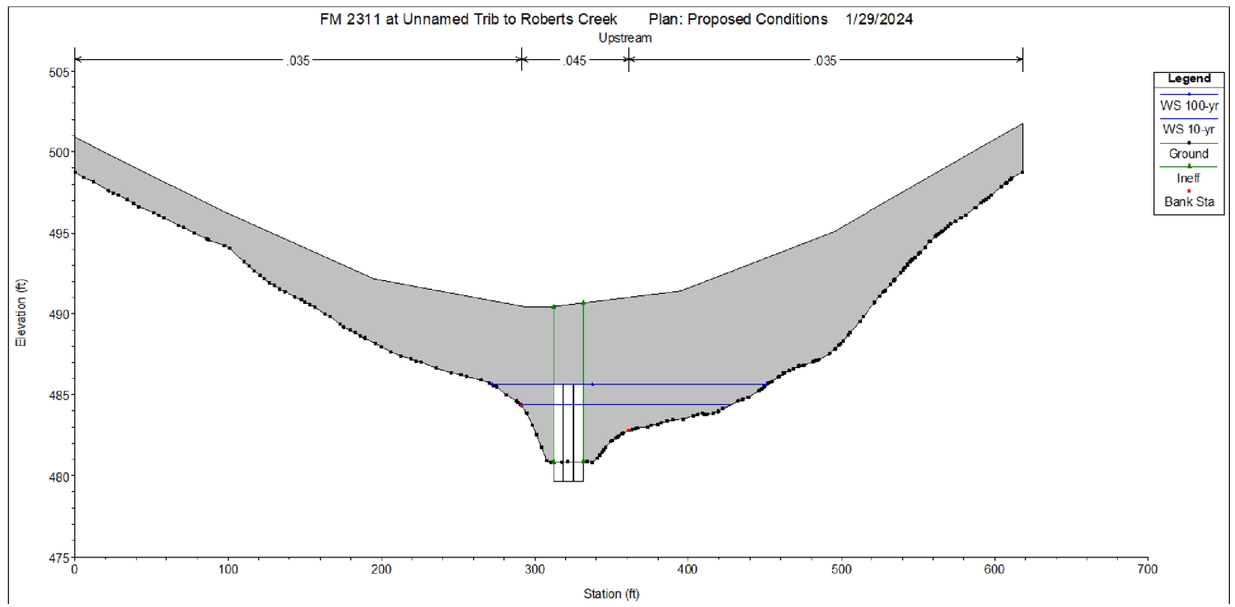


HEC-RAS CROSS SECTION LOCATIONS

PROPOSED CULVERT AT RIVER STATION 1869



HEC-RAS UNNAMED TRIBUTARY TO ROBERTS CREEK PROFILES



HEC-RAS UPSTREAM CULVERT FACE

NOTES:

1. HYDRAULIC MODELING WAS PERFORMED USING THE HEC-RAS VERSION 6.4.1 WITH STEADY FLOW ANALYSIS.
2. THE BRIDGE CLASS CULVERT TO BE MODIFIED IS IN FLOOD ZONE A OF ROBERTS CREEK(FIRM NR. 48309C0250D, EFFECTIVE DECEMBER 20, 2019).
3. THE MCLENNAN COUNTY FLOODPLAIN ADMINISTRATOR (FPA) ZANE DUNNAM WAS INFORMED ABOUT THE TXDOT FM 2311 ROADWAY IMPROVEMENT PROJECT IN NOVEMBER 2022 AND NOVEMBER 2023. THE FINAL HYDRAULIC MODEL AND PLAN SET WILL BE SENT TO THE FPA AT THE 100% SUBMITTAL.
4. THE TNRIS 2021 ONE (1) METER RESOLUTION LIDAR DATA WAS USED FOR HYDRAULIC MODELING.
5. FOR THIS STUDY, THE HORIZONTAL DATUM OF REFERENCE USED WAS THE NORTH AMERICAN DATUM 1983 (NAD 83), AND THE VERTICAL DATUM OF REFERENCE USED WAS THE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88).
6. THE BOUNDARY CONDITION USED IN THE HYDRAULIC MODEL WAS NORMAL DEPTH WITH A DOWNSTREAM SLOPE OF 0.0058 FT/FT.
7. AS THE BRIDGE CLASS CULVERT TO BE MODIFIED WILL BE FITTED WITH SAFETY END TREATMENTS, METAL BEAM GUARD FENCES OR BRIDGE RAILS ARE NOT REQUIRED.

STATE OF TEXAS
FLORIAN BALTOI
119857
LICENSED
PROFESSIONAL ENGINEER

Florian Baltoi 2/1/2024

AtkinsRéalis
TBPE REG. # F-474

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FM 2311
CROSS-DRAINAGE STRUCTURE BCC-K

HYDRAULIC DATA

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		141

DATE: 2/1/2024 6:39:02 AM
FILE: c:\pw_work\atknatx01\mcca2543\dms93813\FM 2311 HYDRAULIC DATA BCC-K 1.dgn

Reach	River Sta	Profile	Plan	Q Total	W.S. Elev	Vel Chnl
				(cfs)	(ft)	(ft/s)
Reach 1	2405	10-yr	Existing	356	487.7	3.18
Reach 1	2405	10-yr	Proposed	356	487.7	3.18
Reach 1	2405	100-yr	Existing	948	489.47	4.71
Reach 1	2405	100-yr	Proposed	948	489.48	4.7
Reach 1	2258	10-yr	Existing	356	486.75	5.93
Reach 1	2258	10-yr	Proposed	356	486.73	5.97
Reach 1	2258	100-yr	Existing	948	488.18	8.4
Reach 1	2258	100-yr	Proposed	948	488.28	8.12
Reach 1	2101	10-yr	Existing	356	485.02	6.05
Reach 1	2101	10-yr	Proposed	356	485.04	5.98
Reach 1	2101	100-yr	Existing	948	488.44	2.79
Reach 1	2101	100-yr	Proposed	948	488.52	2.74
Reach 1	1958	10-yr	Existing	356	484.93	2.34
Reach 1	1958	10-yr	Proposed	356	484.94	2.33
Reach 1	1958	100-yr	Existing	948	488.33	2.56
Reach 1	1958	100-yr	Proposed	948	488.41	2.53
Reach 1	1906	10-yr	Existing	356	484.35	5.31
Reach 1	1906	10-yr	Proposed	356	484.37	5.28
Reach 1	1906	100-yr	Existing	948	487.14	7.83
Reach 1	1906	100-yr	Proposed	948	487.27	7.68
Reach 1	1869	FM 2311 3-6'X6' MBC				
Reach 1	1832	10-yr	Existing	356	484.05	6.3
Reach 1	1832	10-yr	Proposed	356	484.05	6.3
Reach 1	1832	100-yr	Existing	948	485.32	11.8
Reach 1	1832	100-yr	Proposed	948	485.32	11.8
Reach 1	1775	10-yr	Existing	356	483.95	3.54
Reach 1	1775	10-yr	Proposed	356	483.95	3.54
Reach 1	1775	100-yr	Existing	948	485.38	5.58
Reach 1	1775	100-yr	Proposed	948	485.38	5.58
Reach 1	1641	10-yr	Existing	356	483.11	4.26
Reach 1	1641	10-yr	Proposed	356	483.11	4.26
Reach 1	1641	100-yr	Existing	948	484.44	5.81
Reach 1	1641	100-yr	Proposed	948	484.44	5.81
Reach 1	1523	10-yr	Existing	356	481.25	6.28
Reach 1	1523	10-yr	Proposed	356	481.25	6.28
Reach 1	1523	100-yr	Existing	948	482.45	8.52
Reach 1	1523	100-yr	Proposed	948	482.45	8.52
Reach 1	1368	10-yr	Existing	356	480.02	3.73
Reach 1	1368	10-yr	Proposed	356	480.02	3.73
Reach 1	1368	100-yr	Existing	948	481.06	4.99
Reach 1	1368	100-yr	Proposed	948	481.06	4.99

NOTES:

1. HYDRAULIC MODELING WAS PERFORMED USING THE HEC-RAS VERSION 6.4.1 WITH STEADY FLOW ANALYSIS.
2. THE PROPOSED CULVERT IS IN FLOOD ZONE A OF ROBERTS CREEK (FIRM NR. 48309C0250D, EFFECTIVE DECEMBER 20, 2019).

STATE OF TEXAS
FLORIAN BALTOI
119857
LICENSED
PROFESSIONAL ENGINEER

Florian Baltoi 2/1/2024

AtkinsRéalis
TBPE REG. # F-474

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Texas Department of Transportation

FM 2311 CROSS-DRAINAGE STRUCTURE BCC-K

HYDRAULIC DATA

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		142

DATE: 2/1/2024 6:39:19 AM
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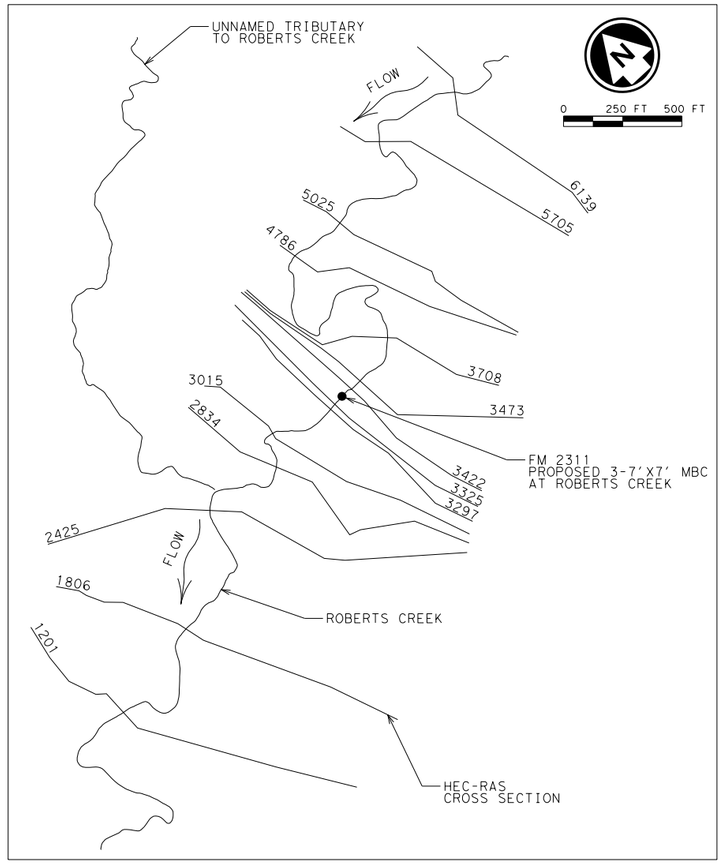
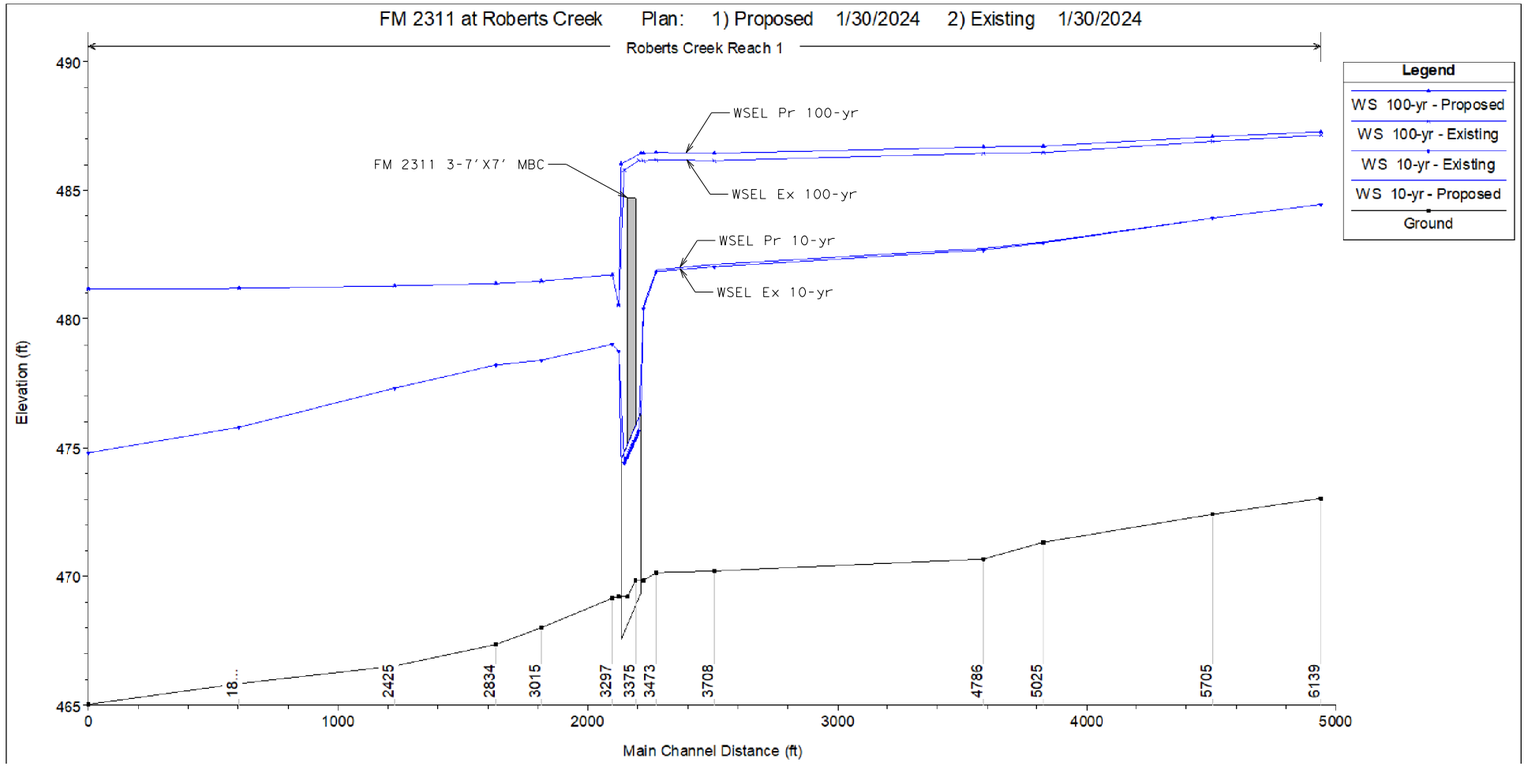


HEC-RAS CROSS SECTION LOCATIONS

PROPOSED CULVERT AT RIVER STATION 3375



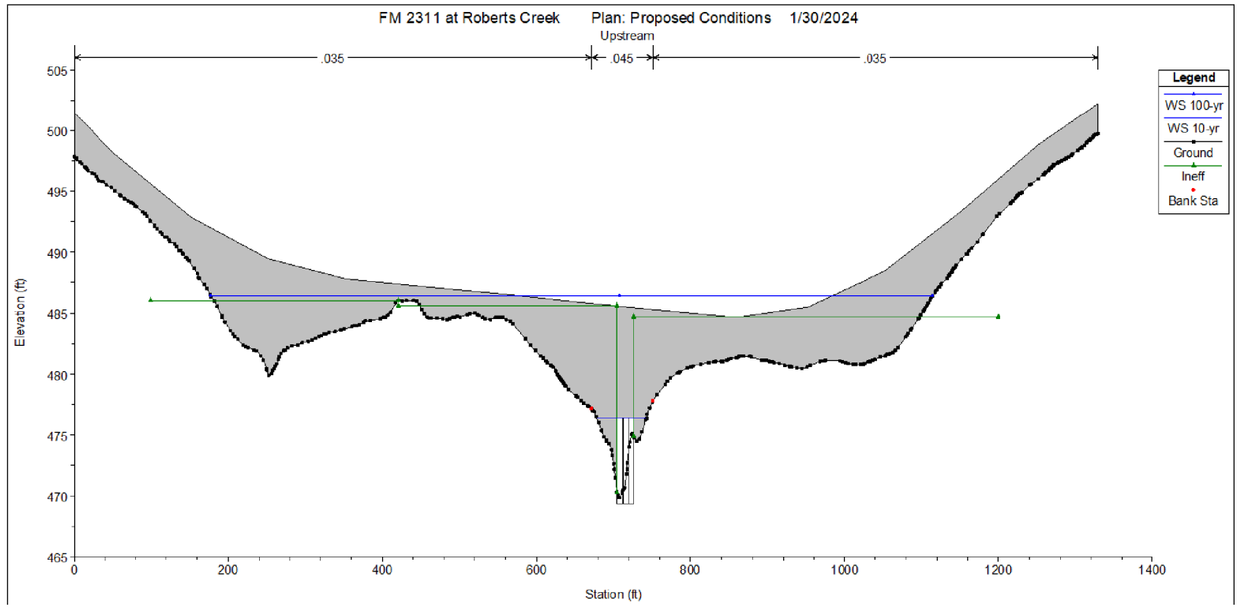
HEC-RAS ROBERTS CREEK PROFILES

NOTES:

1. HYDRAULIC MODELING WAS PERFORMED USING THE HEC-RAS VERSION 6.4.1 WITH STEADY FLOW ANALYSIS.
2. THE BRIDGE CLASS CULVERT TO BE MODIFIED IS IN FLOOD ZONE A OF ROBERTS CREEK (FIRM NR. 48309C0250D, EFFECTIVE DECEMBER 20, 2019).
3. THE MCLENNAN COUNTY FLOODPLAIN ADMINISTRATOR (FPA) ZANE DUNNAM WAS INFORMED ABOUT THE TXDOT FM 2311 ROADWAY IMPROVEMENT PROJECT IN NOVEMBER 2022 AND NOVEMBER 2023. THE FINAL HYDRAULIC MODEL AND PLAN SET WILL BE SENT TO THE FPA AT THE 100% SUBMITTAL.
4. THE TNRIS 2021 ONE (1) METER RESOLUTION LIDAR DATA WAS USED FOR HYDRAULIC MODELING.
5. FOR THIS STUDY, THE HORIZONTAL DATUM OF REFERENCE USED WAS THE NORTH AMERICAN DATUM 1983 (NAD 83), AND THE VERTICAL DATUM OF REFERENCE USED WAS THE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88).
6. THE BOUNDARY CONDITION USED IN THE HYDRAULIC MODEL WAS KNOWN WATER SURFACE, WITH ELEVATIONS OF 474.79 FT AND 481.16 FT FOR THE 10-YR AND 100-YR EVENTS RESPECTIVELEY.

   THESE WATER SURFACE ELEVATIONS WERE ESTIMATED BASED ON THE ASSUMPTION THAT IN EACH EVENT THE ENTIRE RUNOFF VOLUME TO THE RESERVOIR WOULD BE STORED IN THE RESERVOIR.

   THE RESERVOIR STARTING WATER SURFACE ELEVATION FOR EACH EVENT WAS ASSUMED TO BE 464.78 FT. THIS ELEVATION WAS DETERMINED BASED ON DATA FROM TNRIS 2013 ONE (1) METER RESOLUTION LIDAR AND THE NATIONAL INVENTORY OF DAMS RECORD FOR THE TEHUACANA CREEK WS SCS SITE 12 DAM (ID TX04120).
7. AS THE BRIDGE CLASS CULVERT TO BE MODIFIED WILL BE FITTED WITH SAFETY END TREATMENTS, METAL BEAM GUARD FENCES OR BRIDGE RAILS ARE NOT REQUIRED.



HEC-RAS UPSTREAM CULVERT FACE

FLORIAN BALTOI 119857 LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

Florian Baltoi 2/1/2024

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FM 2311
CROSS-DRAINAGE STRUCTURE BCC-L

HYDRAULIC DATA

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		143

DATE: 2/1/2024 6:39:34 AM
FILE: c:\pw_work\atkinsnalx01\mcca2543\dms93813\FM 2311 HYDRAULIC DATA BCC-L 1.dgn

Reach	River Sta	Profile	Plan	Q Total	W.S. Elev	Vel Chnl
				(cfs)	(ft)	(ft/s)
Reach 1	6139	10-yr	Existing	1603	484.46	4.62
Reach 1	6139	10-yr	Proposed	1603	484.44	4.63
Reach 1	6139	100-yr	Existing	3404	487.28	5.17
Reach 1	6139	100-yr	Proposed	3404	487.15	5.38
Reach 1	5705	10-yr	Existing	1603	483.93	4.40
Reach 1	5705	10-yr	Proposed	1603	483.91	4.42
Reach 1	5705	100-yr	Existing	3404	487.07	3.89
Reach 1	5705	100-yr	Proposed	3404	486.91	4.12
Reach 1	5025	10-yr	Existing	1603	482.99	4.62
Reach 1	5025	10-yr	Proposed	1603	482.95	4.65
Reach 1	5025	100-yr	Existing	3404	486.7	3.82
Reach 1	5025	100-yr	Proposed	3404	486.48	4.05
Reach 1	4786	10-yr	Existing	1603	482.73	4.21
Reach 1	4786	10-yr	Proposed	1603	482.68	4.24
Reach 1	4786	100-yr	Existing	3404	486.67	2.57
Reach 1	4786	100-yr	Proposed	3404	486.44	2.75
Reach 1	3708	10-yr	Existing	1603	482.11	3.26
Reach 1	3708	10-yr	Proposed	1603	482.03	3.31
Reach 1	3708	100-yr	Existing	3404	486.43	3.41
Reach 1	3708	100-yr	Proposed	3404	486.15	3.64
Reach 1	3473	10-yr	Existing	1603	481.92	3.84
Reach 1	3473	10-yr	Proposed	1603	481.83	3.90
Reach 1	3473	100-yr	Existing	3404	486.45	1.90
Reach 1	3473	100-yr	Proposed	3404	486.18	1.99
Reach 1	3422	10-yr	Existing	1603	480.51	8.67
Reach 1	3422	10-yr	Proposed	1603	480.38	8.81
Reach 1	3422	100-yr	Existing	3404	486.44	1.25
Reach 1	3422	100-yr	Proposed	3404	486.17	1.34
Reach 1	3375	FM 2311 3-7'X7' MBC				
Reach 1	3325	10-yr	Existing	1603	478.74	8.87
Reach 1	3325	10-yr	Proposed	1603	478.74	8.87
Reach 1	3325	100-yr	Existing	3404	480.54	15.37
Reach 1	3325	100-yr	Proposed	3404	480.54	15.37
Reach 1	3297	10-yr	Existing	1603	479.03	5.43
Reach 1	3297	10-yr	Proposed	1603	479.03	5.43
Reach 1	3297	100-yr	Existing	3404	481.72	7.92
Reach 1	3297	100-yr	Proposed	3404	481.72	7.92
Reach 1	3015	10-yr	Existing	1611	478.41	5.44
Reach 1	3015	10-yr	Proposed	1611	478.41	5.44
Reach 1	3015	100-yr	Existing	3422	481.47	5.70
Reach 1	3015	100-yr	Proposed	3422	481.47	5.70
Reach 1	2834	10-yr	Existing	1611	478.21	4.50
Reach 1	2834	10-yr	Proposed	1611	478.21	4.50
Reach 1	2834	100-yr	Existing	3422	481.38	4.52
Reach 1	2834	100-yr	Proposed	3422	481.38	4.52
Reach 1	2425	10-yr	Existing	1894	477.33	5.54
Reach 1	2425	10-yr	Proposed	1894	477.33	5.54
Reach 1	2425	100-yr	Existing	4034	481.29	2.73
Reach 1	2425	100-yr	Proposed	4034	481.29	2.74
Reach 1	1806	10-yr	Existing	1894	475.81	5.94
Reach 1	1806	10-yr	Proposed	1894	475.81	5.94
Reach 1	1806	100-yr	Existing	4034	481.20	1.97
Reach 1	1806	100-yr	Proposed	4034	481.20	1.97
Reach 1	1201	10-yr	Existing	1894	474.79	4.65
Reach 1	1201	10-yr	Proposed	1894	474.79	4.65
Reach 1	1201	100-yr	Existing	4034	481.16	1.44
Reach 1	1201	100-yr	Proposed	4034	481.16	1.44

NOTES:

1. HYDRAULIC MODELING WAS PERFORMED USING THE HEC-RAS VERSION 6.4.1 WITH STEADY FLOW ANALYSIS.
2. THE PROPOSED CULVERT IS IN FLOOD ZONE A OF ROBERTS CREEK (FIRM NR. 48309C0250D, EFFECTIVE DECEMBER 20, 2019).

STATE OF TEXAS
FLORIAN BALTOI
119857
LICENSED
PROFESSIONAL ENGINEER

Florian Baltoi 2/1/2024

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TBPE REG. # F-474

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FM 2311 CROSS-DRAINAGE STRUCTURE BCC-L

HYDRAULIC DATA

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	MCLENNAN		144

CK:
DW:
CK:
DW:

DATE: 2/1/2024 6:39:50 AM
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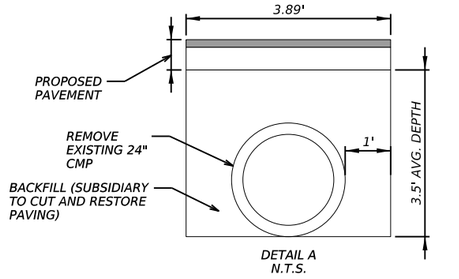
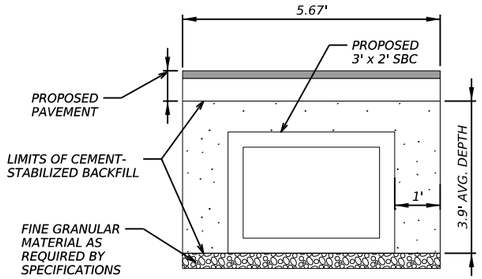


DETAIL A
N.T.S.



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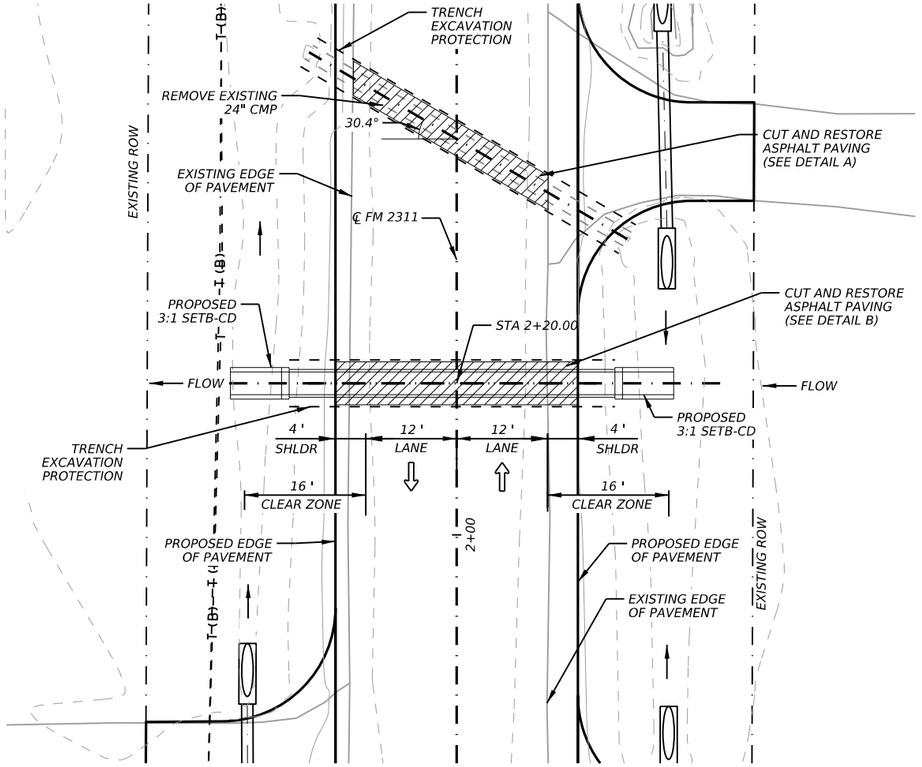
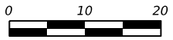
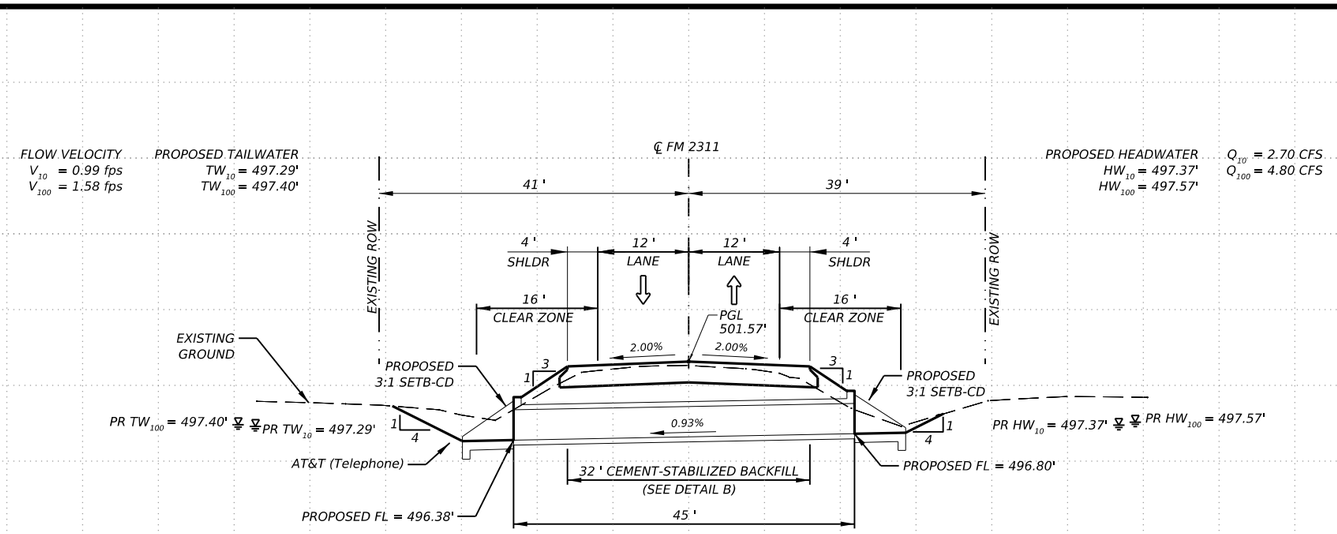


NOTE:
CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.



SUMMARY OF CULVERT QUANTITIES		
BID ITEM	DESCRIPTION	QUANTITY
400 6005	CEM STABIL BKFL	21 CY
400 6008	CUT & RESTORE ASPH PAVING	34 SY
402 6001	TRENCH EXCAVATION PROTECTION	94 LF
462 6001	CONC BOX CULV (3 FT X 2 FT)	45 LF
467 6105	SET (TY I)(S=3 FT)(HW=3FT)(3:1)(C)	2 EA
496 6007	REMOV STR (PIPE)	49 LF
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	2 EA



CULVERT CC-A
STA 2+20.00 at ℄ FM 2311
EXISTING 24" X 48.70' CMP (30.4° LFS)

PROPOSED: INSTALL 3' X 2' X 45' SBC
INSTALL 3:1 SETB-CD LT AND 3:1 SETB-CD RT
SCP-3, SCP-MD, SCC-3 & 4, SCC-MD, & SETB-CD

STATE OF TEXAS
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Florian Baltoi 2/1/2024

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TBPE REG. # F-474

Texas Department of Transportation

FM 2311

CULVERT LAYOUT
CC-A

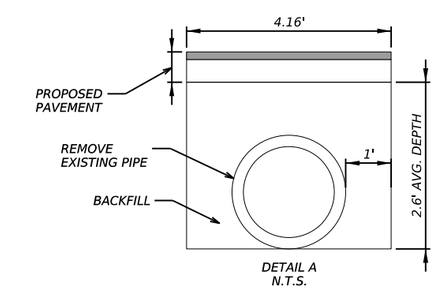
SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		145

CK:
DW:
CK:
DW:

DATE TIME
DOCUMENT NAME

DATE:
FILE:



DETAIL A
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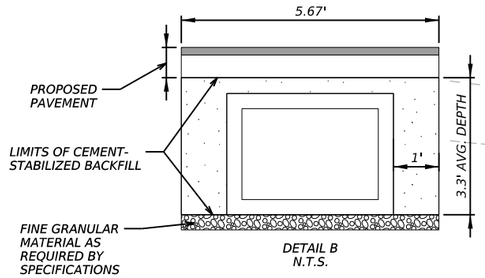

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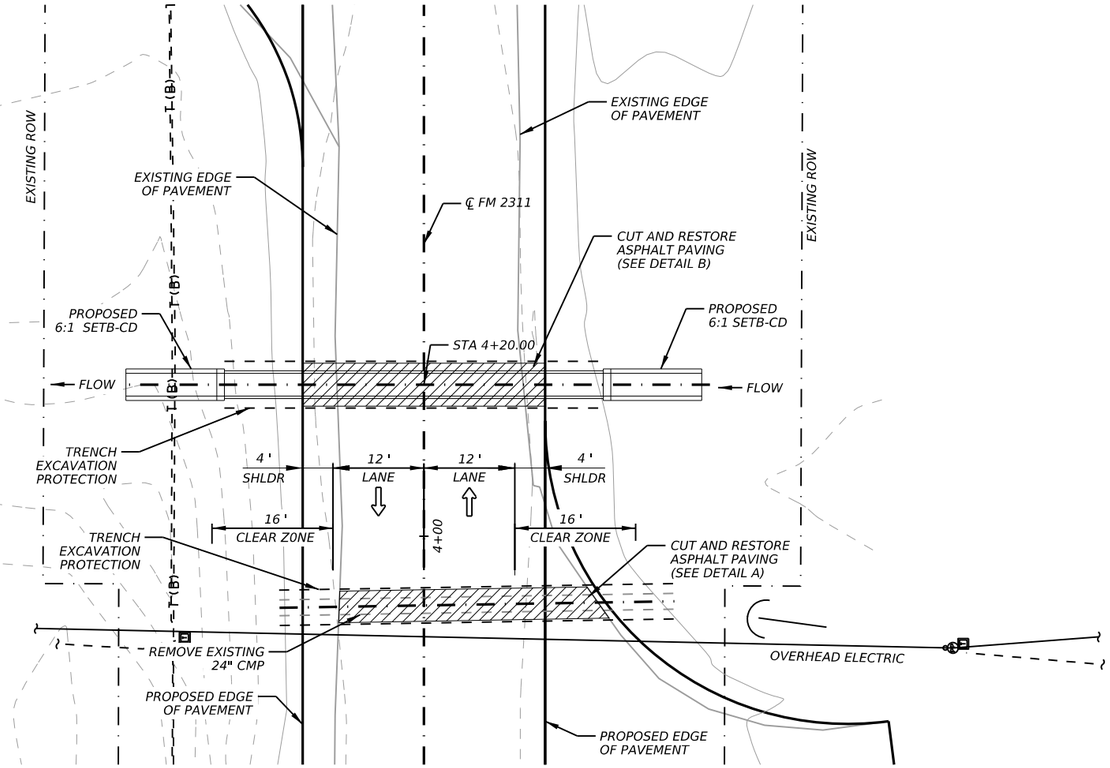
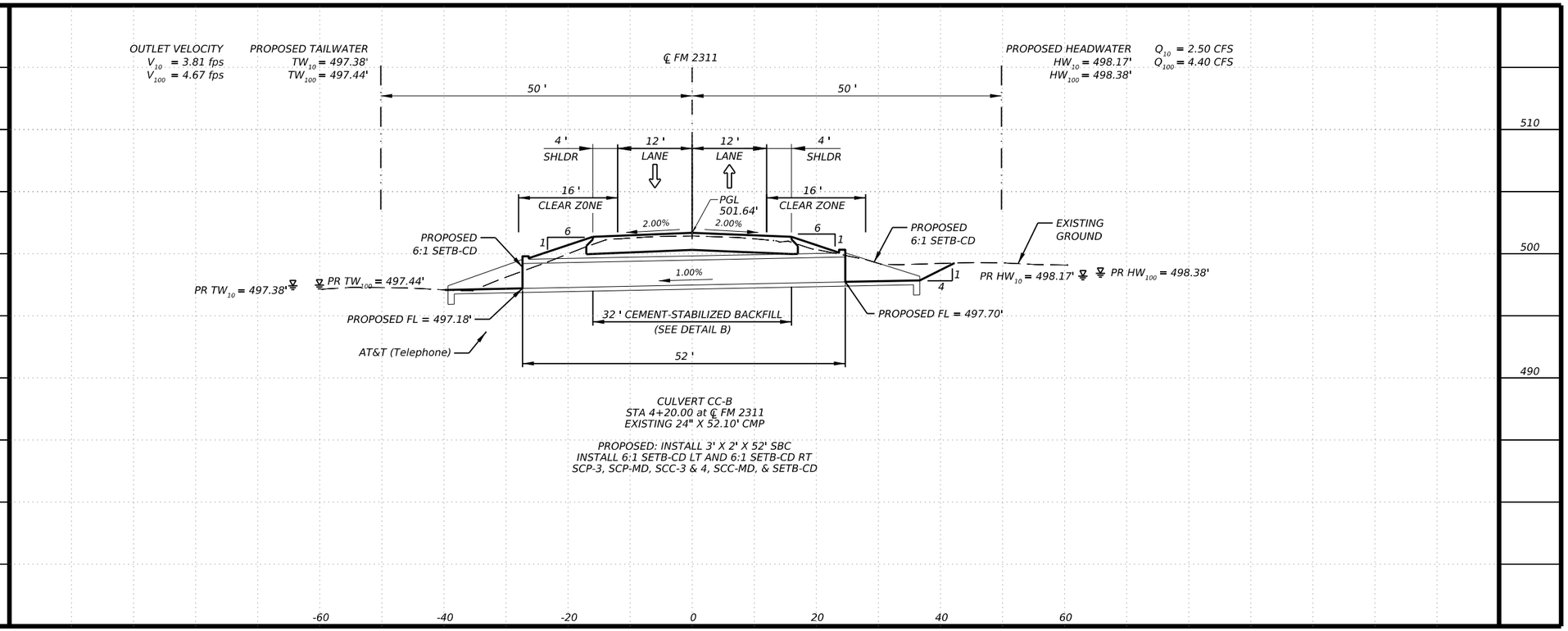


NOTE:
CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

0 10 20
SCALE IN FEET

SUMMARY OF CULVERT QUANTITIES

BID ITEM	DESCRIPTION	QUANTITY
400 6005	CEM STABIL BKFL	18 CY
400 6008	CUT & RESTORE ASPH PAVING	36 SY
402 6001	TRENCH EXCAVATION PROTECTION	105 LF
462 6001	CONC BOX CULV (3 FT X 2 FT)	52 LF
467 6104	SET (TY I)(S=3 FT)(HW=2FT)(6:1)(C)	2 EA
496 6007	REMOV STR (PIPE)	53 LF
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	2 EA



CULVERT CC-B
STA 4+20.00 at ℄ FM 2311
EXISTING 24" X 52.10' CMP

PROPOSED: INSTALL 3' X 2' X 52' SBC
INSTALL 6:1 SETB-CD LT AND 6:1 SETB-CD RT
SCP-3, SCP-MD, SCC-3 & 4, SCC-MD, & SETB-CD

STATE OF TEXAS
FLORIAN BALTOI
119857
LICENSED PROFESSIONAL ENGINEER
Florian Baltoi 2/1/2024

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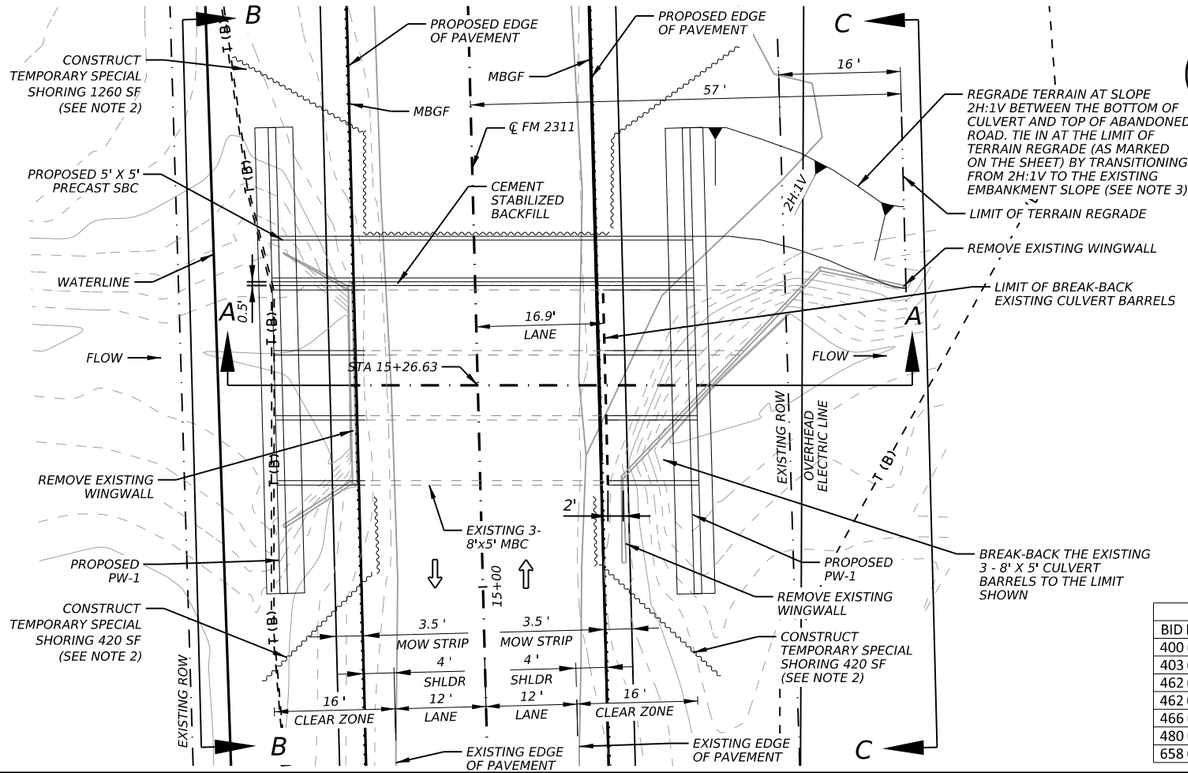
FM 2311

CULVERT LAYOUT
CC-B

SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		146

DATE:
FILE:
DATE TIME
DOCUMENT NAME



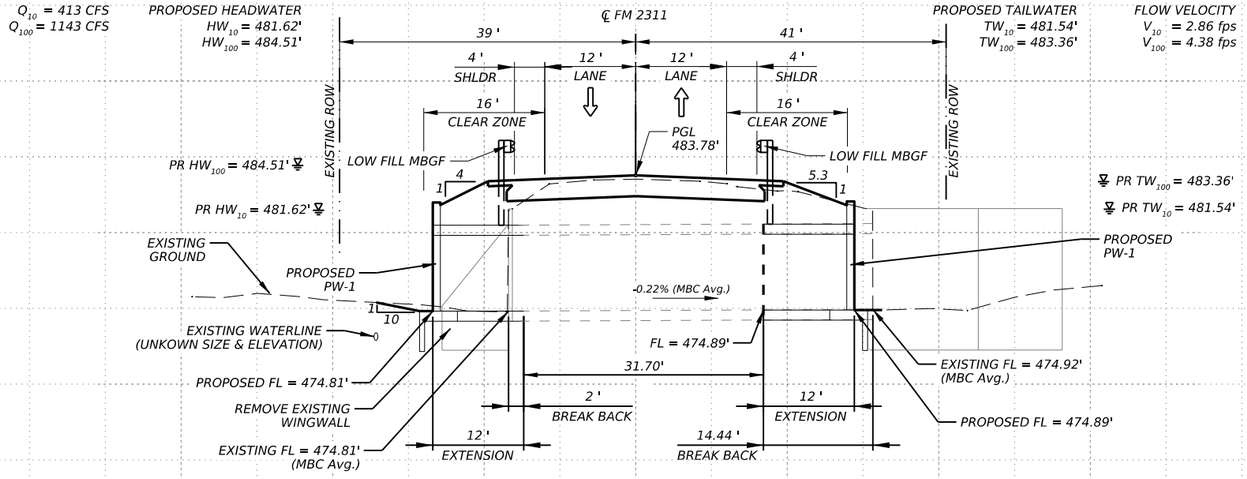
NOTES:

1. CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

2. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY SPECIAL SHORING DESIGN.

3. TxDOT TO OBTAIN CONSTRUCTION LICENSE AGREEMENT FOR AREA THAT WILL BE REGRADED OUTSIDE OF ROW.

SUMMARY OF CULVERT QUANTITIES		
BID ITEM	DESCRIPTION	QUANTITY
400 6005	CEM STABIL BKFL	10 CY
403 6001	TEMP SPL SHORING	2100 SF
462 6009	CONC BOX CULV (5 FT X 5 FT)	56 LF
462 6064	CONC BOX CULV (8 FT X 5 FT)(EXTEND)	72 LF
466 6182	WINGWALL (PW - 1) (HW=7 FT)	2 EA
480 6001	CLEAN EXIST CULVERTS	1 EA
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	4 EA



CULVERT BCC-C AT TRIBUTARY TO TEHUACANA CREEK
EXISTING NBI NO. = 09-161-0-2174-01-003
SECTION A-A
STA 15+26.63 at ℄ FM 2311
EXISTING 3 - 8' X 5' MBC

PROPOSED: REMOVE EXISTING WINGWALLS LT AND RT. BREAK BACK EACH BARREL 2' LT. BREAK BACK RT THE BARRELS TO THE LIMIT INDICATED IN THE PLAN VIEW.
EXTEND EACH BARREL 12' LT AND 12' RT. INSTALL 5' X 5' SBC. INSTALL PW-1 LT AND PW-1 RT.
USE STANDARDS PW-1, SCP-MD, SCP-5 (8" TOP SLAB THICKNESS), AND MC-MD

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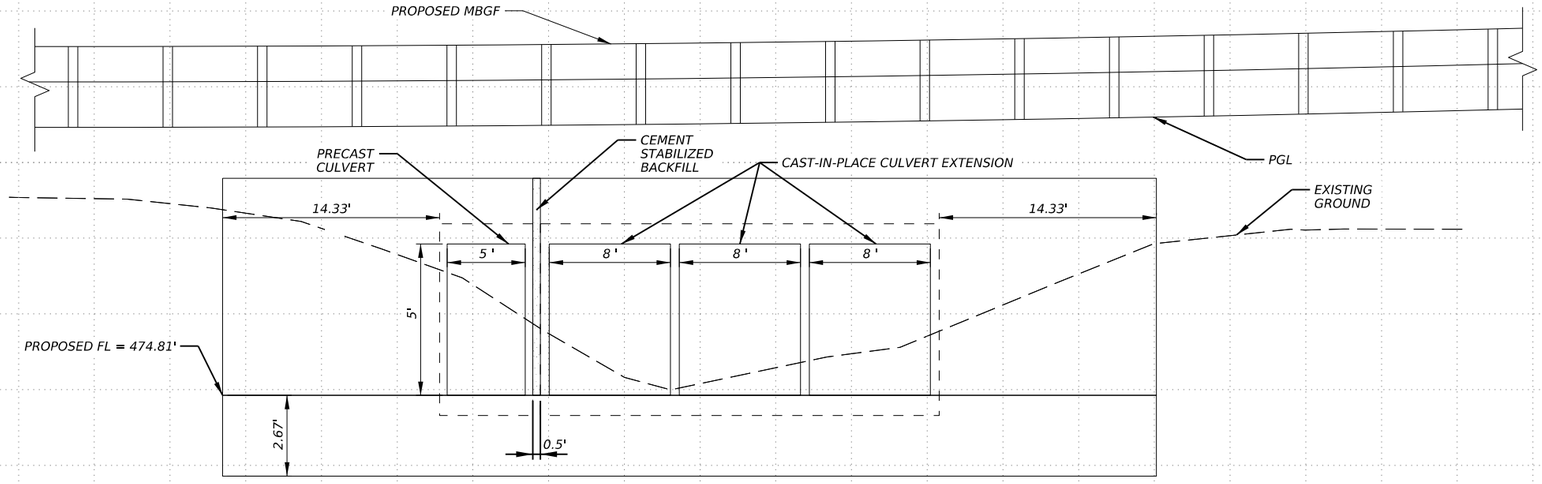
CULVERT LAYOUT
BCC-C

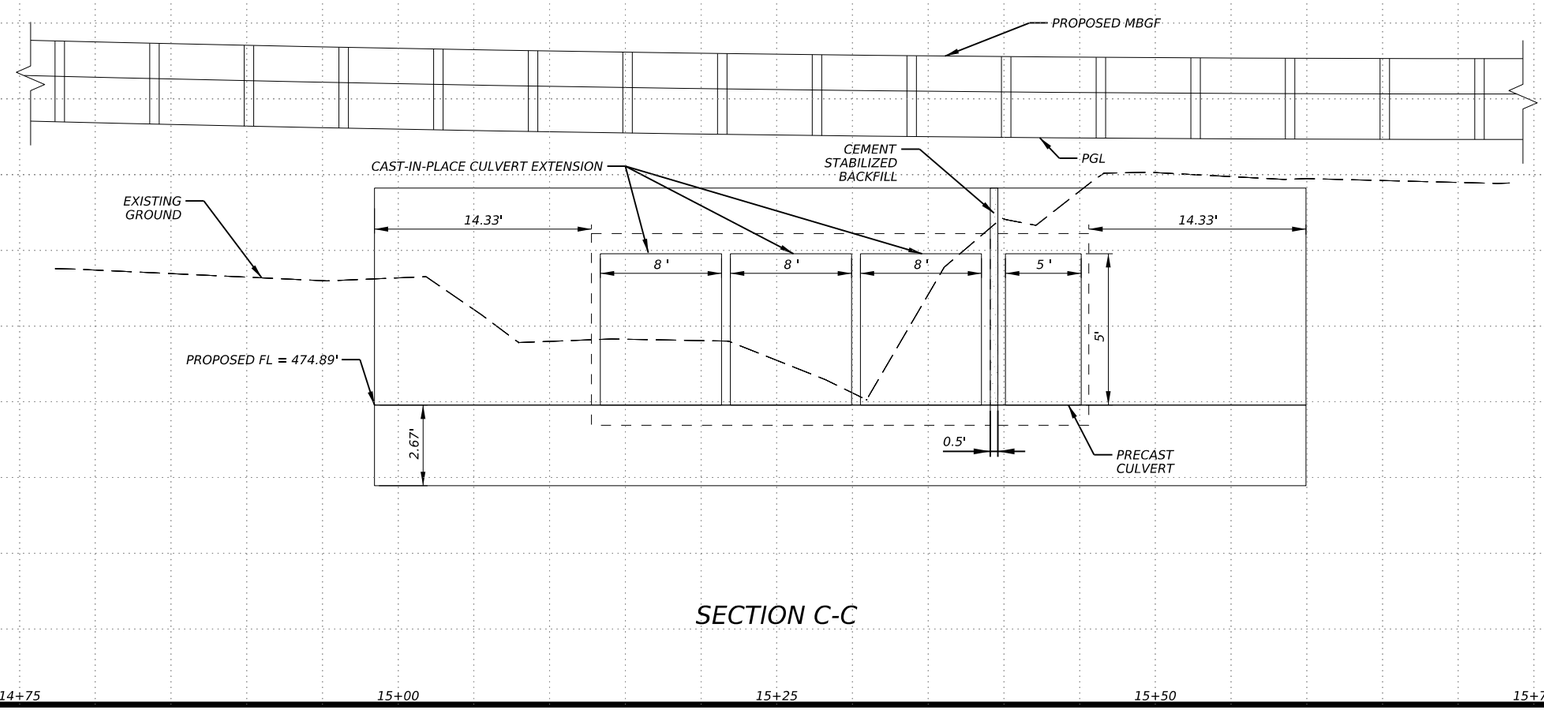
SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		147

DATE TIME
DOCUMENT NAME
DATE:
FILE:



SECTION B-B



SECTION C-C

DATE: 2/1/2024 6:41:23 AM
FILE: ...\FM 2311 BRIDGE CLASS CULVERT LAYOUT 01.dgn

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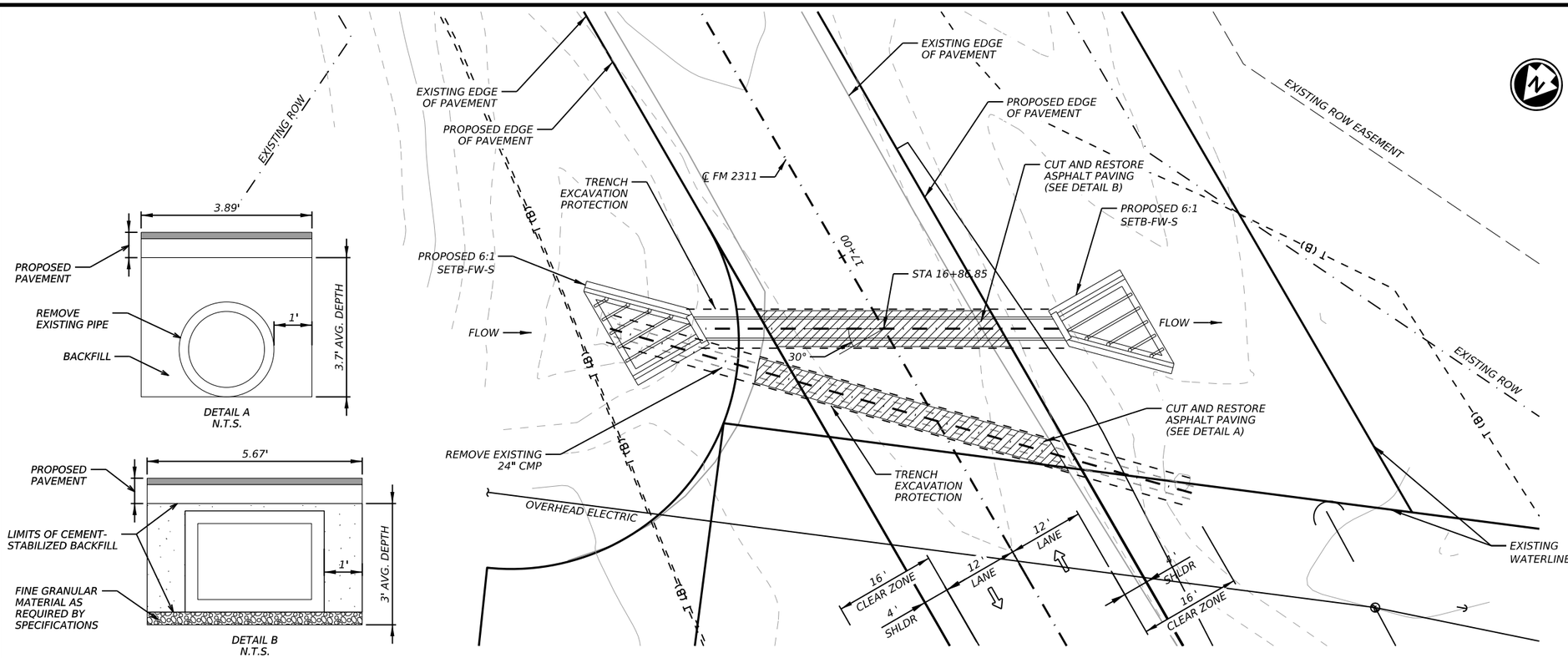
CULVERT LAYOUT
BCC-C

SCALE: 1"= 5'V, 1"=10'H SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		148

CK:
DW:
CK:
DW:

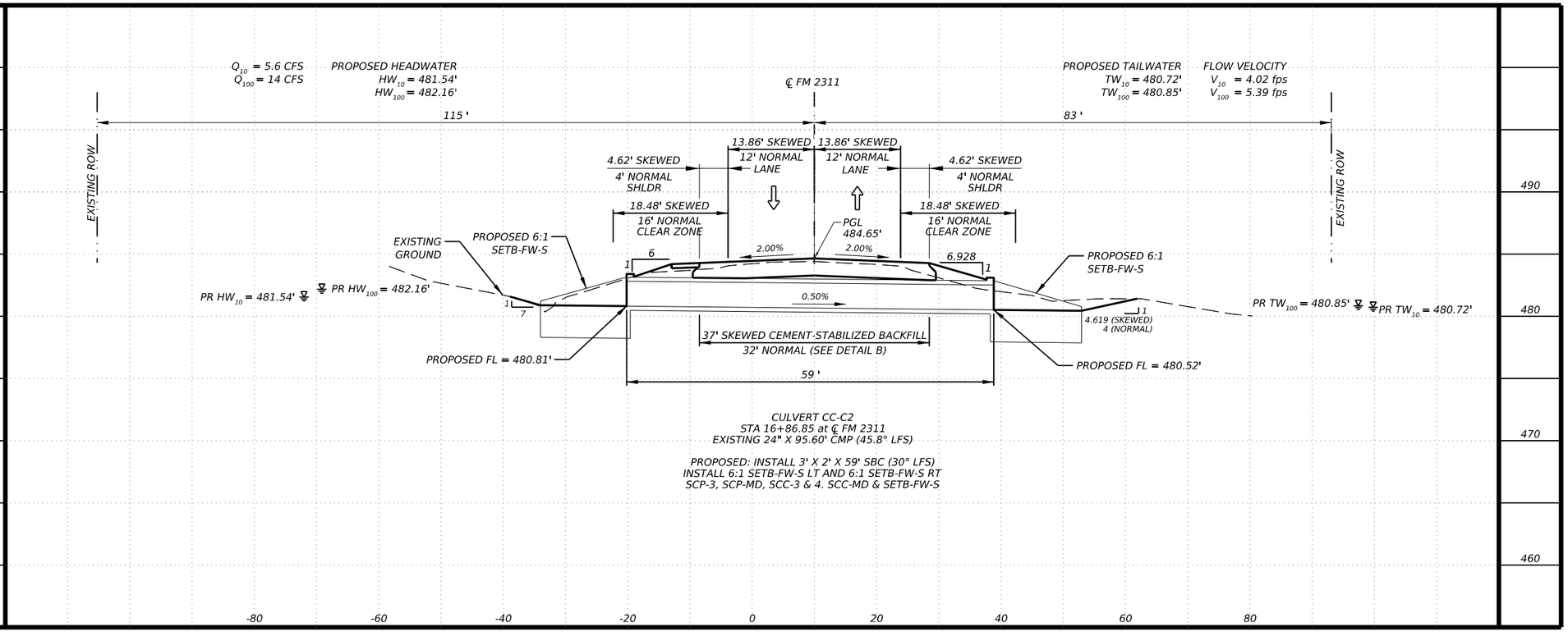


NOTE:
CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

0 10 20
SCALE IN FEET

SUMMARY OF CULVERT QUANTITIES		
BID ITEM	DESCRIPTION	QUANTITY
400 6005	CEM STABIL BKFL	16 CY
400 6008	CUT & RESTORE ASPH PAVING	45 SY
402 6001	TRENCH EXCAVATION PROTECTION	155 LF
432 6002	RIPRAP (CONC)(5 IN)*	3 CY
462 6001	CONC BOX CULV (3 FT X 2 FT)	59 LF
467 6104	SET (TY I)(S=3 FT)(HW= 2 FT)(6:1)(C)	2 EA
496 6007	REMOV STR (PIPE)	96 LF
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	2 EA

*RIPRAP APRON QUANTITY



CULVERT CC-C2
STA 16+86.85 at ℄ FM 2311
EXISTING 24" X 95.60' CMP (45.8° LFS)

PROPOSED: INSTALL 3' X 2' X 59' SBC (30° LFS)
INSTALL 6:1 SETB-FW-S LT AND 6:1 SETB-FW-S RT
SCP-3, SCP-MD, SCC-3 & 4. SCC-MD & SETB-FW-S

DATE TIME
DOCUMENT NAME
DATE:
FILE:

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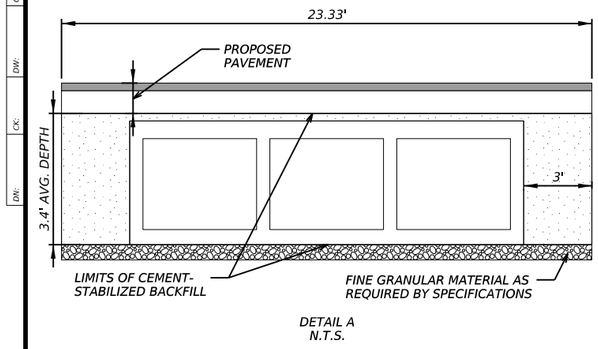
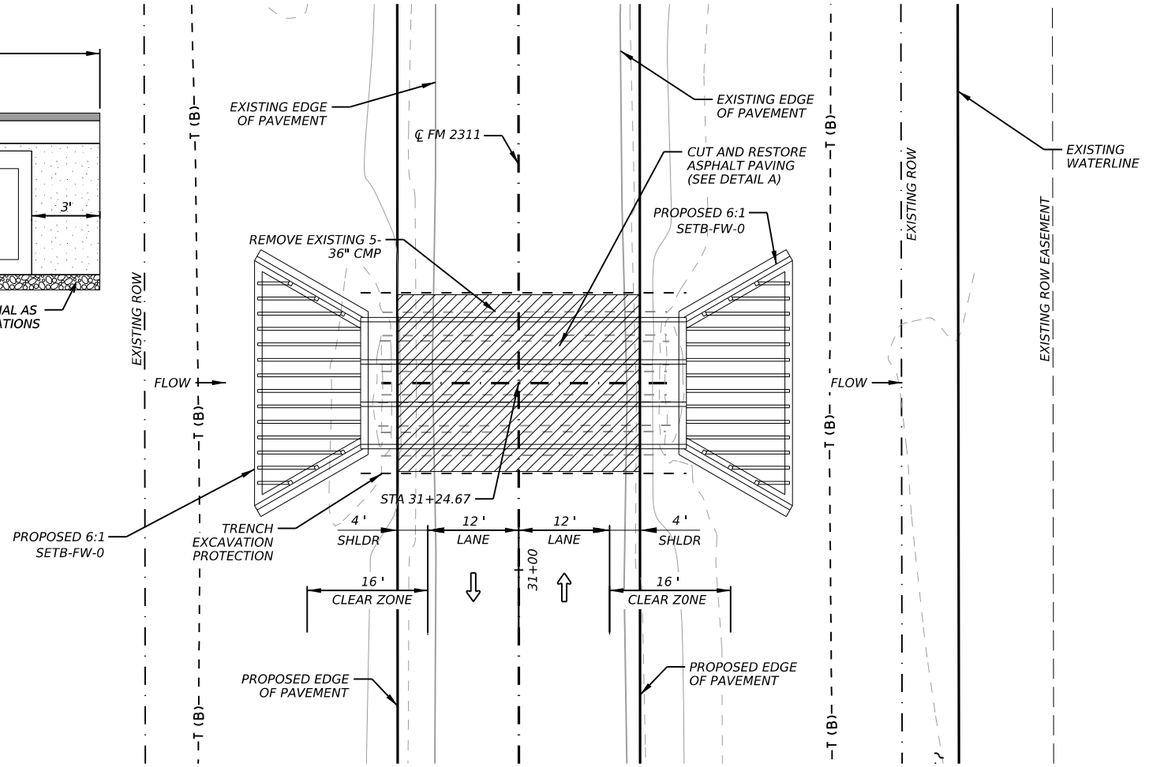
CULVERT LAYOUT
CC-C2

SCALE: 1"=10'V, 1"=20'H SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		149



DETAIL A
N.T.S.

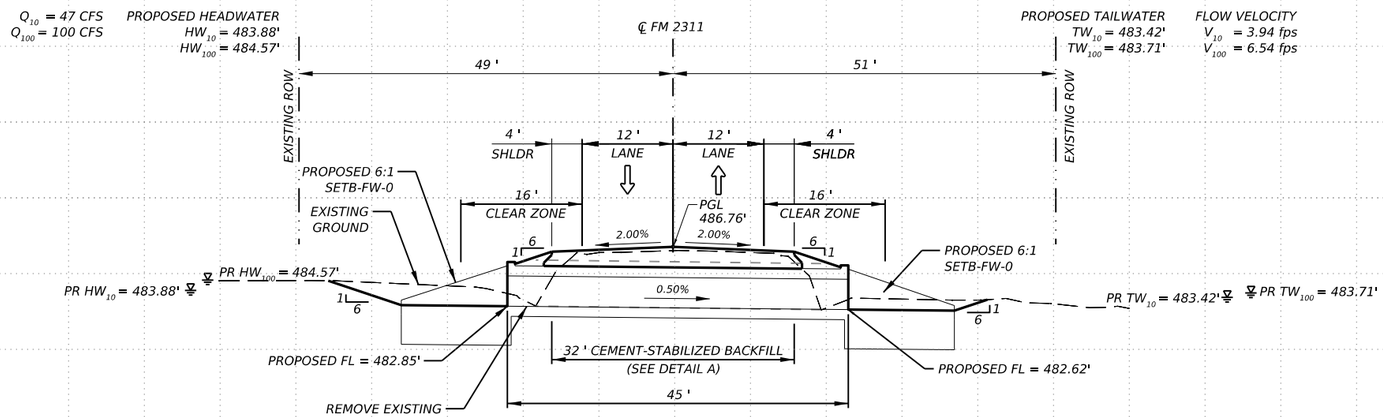


NOTE:
CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

0 10 20
SCALE IN FEET

SUMMARY OF CULVERT QUANTITIES		
BID ITEM	DESCRIPTION	QUANTITY
400 6005	CEM STABIL BKFL	24 CY
400 6008	CUT & RESTORE ASPH PAVING	83 SY
402 6001	TRENCH EXCAVATION PROTECTION	45 LF
432 6002	RIPRAP (CONC)(5 IN)*	9 CY
462 6006	CONC BOX CULV (5 FT X 2 FT)	135 LF
467 6173	SET (TY I)(S= 5 FT)(HW= 3 FT)(6:1) (C)	6 EA
496 6007	REMOV STR (PIPE)	190 LF
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	2 EA

*RIPRAP APPRON QUANTITY



CULVERT CC-D
STA 31+24.67 at ℄ FM 2311
EXISTING 5 - 36" X 37.9' CMP

PROPOSED: INSTALL 3 - 5' X 2' X 45' MBC
INSTALL 6:1 SETB-FW-0 LT AND 6:1 SETB-FW-0 RT
MC-5-20, MC-MD, & SETB-FW-0

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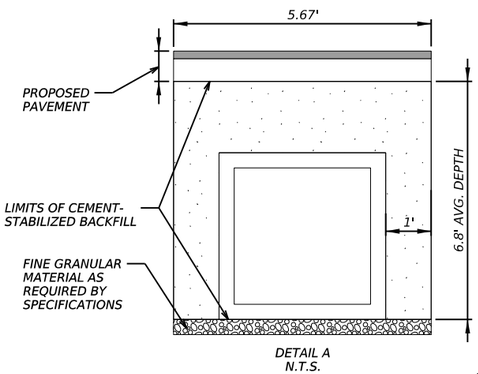
CULVERT LAYOUT CC-D

SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		150

DATE TIME
DOCUMENT NAME
DATE:
FILE:

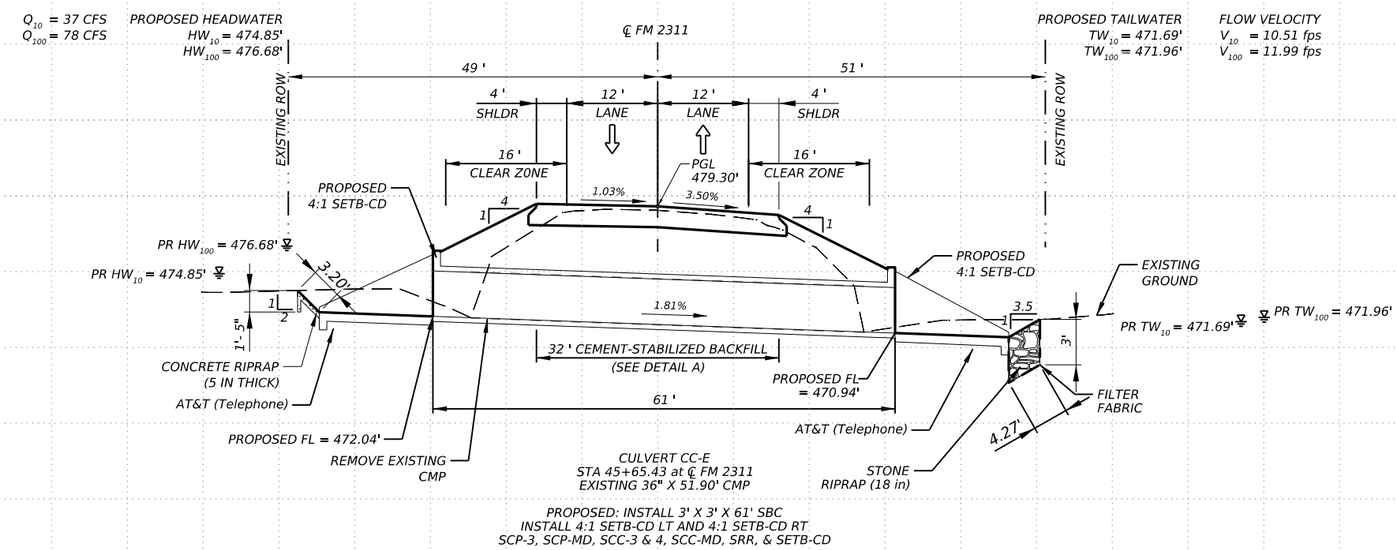


DETAIL A
N.T.S.

NOTE:
CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

0 10 20
SCALE IN FEET

SUMMARY OF CULVERT QUANTITIES		
BID ITEM	DESCRIPTION	QUANTITY
400 6005	CEM STABIL BKFL	57 CY
400 6008	CUT & RESTORE ASPH PAVING	21 SY
402 6001	TRENCH EXCAVATION PROTECTION	61 LF
432 6002	RIPRAP (CONC)(5 IN)	1 CY
432 6033	RIPRAP (STONE PROTECTION)(18 IN)	2 CY
462 6002	CONC BOX CULV (3 FT X 3 FT)	61 LF
467 6144	SET (TY I)(S= 4 FT)(HW= 4 FT)(4:1) (C)	2 EA
496 6007	REMOV STR (PIPE)	52 LF
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	2 EA



PROPOSED: INSTALL 3' X 3' X 61' SBC
INSTALL 4:1 SETB-CD LT AND 4:1 SETB-CD RT
SCP-3, SCP-MD, SCC-3 & 4, SCC-MD, SRR, & SETB-CD

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CULVERT LAYOUT CC-E

SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

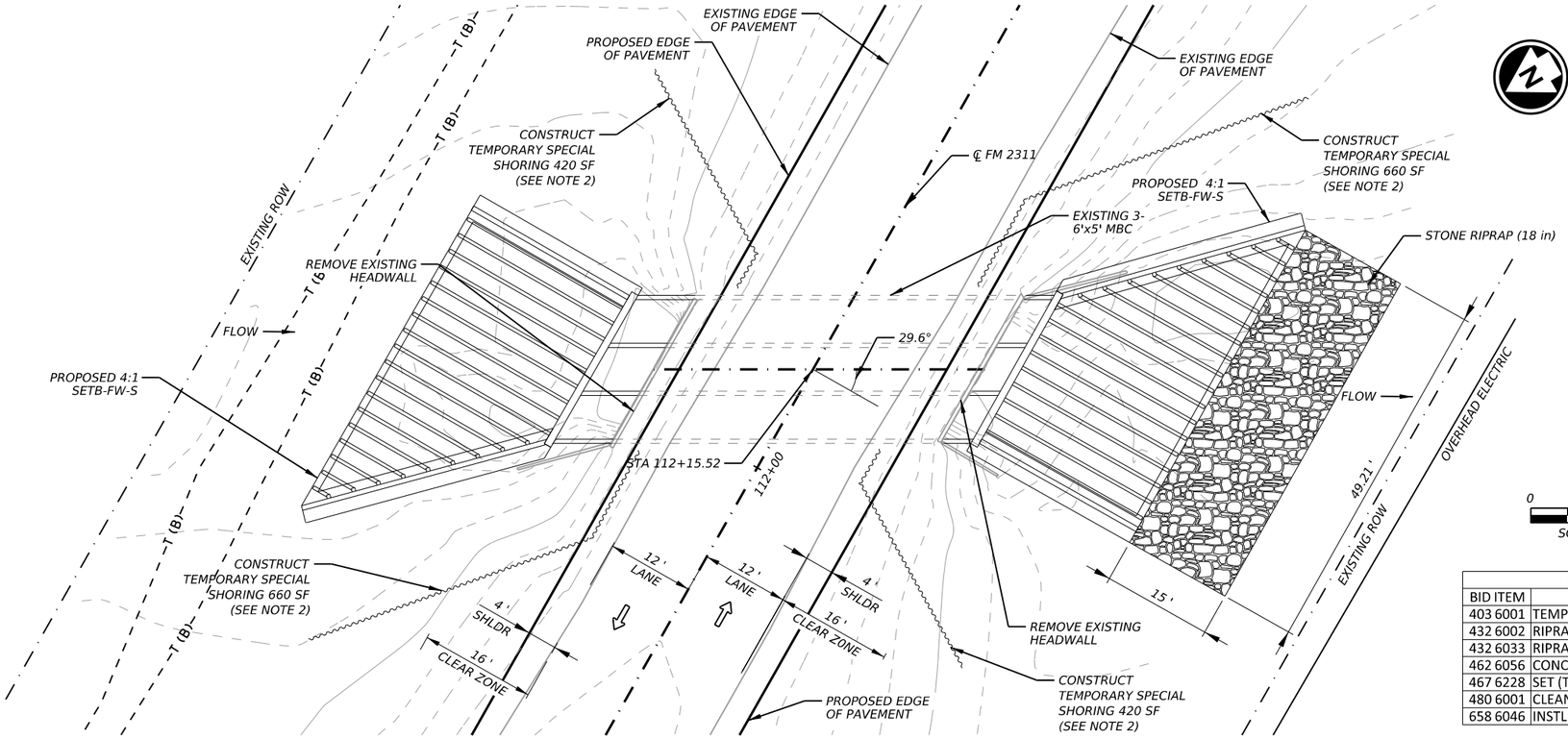
CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		151

DATE: DATE TIME
FILE: DOCUMENT NAME

NOTES:

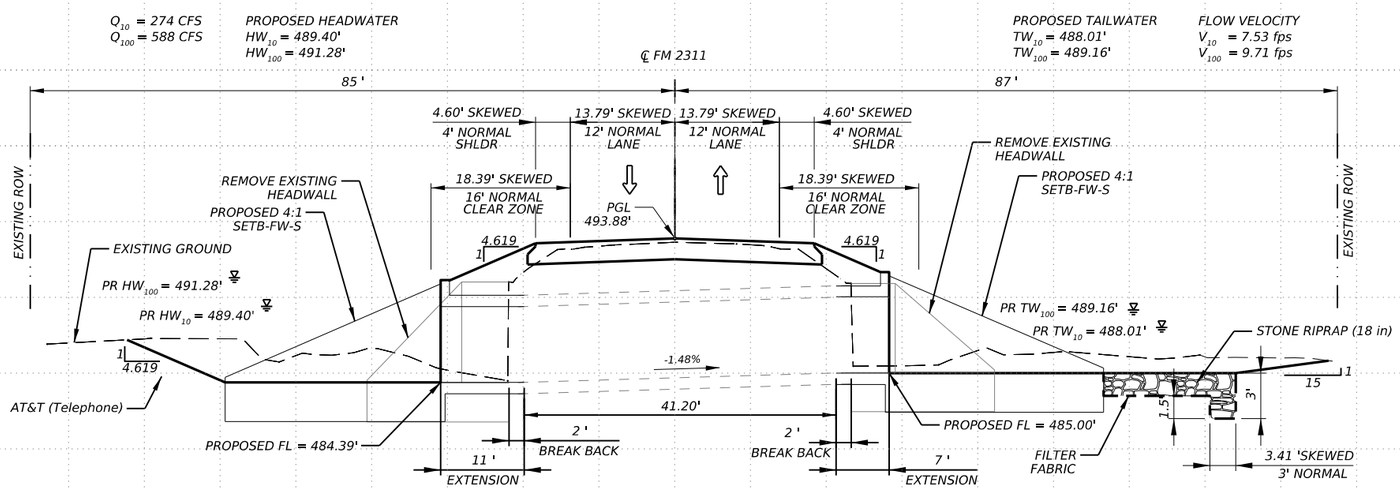
1. CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

2. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY SPECIAL SHORING DESIGN.



SUMMARY OF CULVERT QUANTITIES		
BID ITEM	DESCRIPTION	QUANTITY
403 6001	TEMP SPL SHORING	2160 SF
432 6002	RIPRAP (CONC)(5 IN)*	23 CY
432 6033	RIPRAP (STONE PROTECTION)(18 IN)	50 CY
462 6056	CONC BOX CULV (6 FT X 5 FT)(EXTEND)	54 LF
467 6228	SET (TY I)(S= 6 FT)(HW= 7 FT)(4:1) (C)	6 EA
480 6001	CLEAN EXIST CULVERTS	1 EA
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	4 EA

*RIPRAP APRON QUANTITY



CULVERT BCC-G AT EAST COTTONWOOD CREEK TRIBUTARY 1
EXISTING NBI NO. = 09-161-0-2174-01-007
STA 112+15.52 at ℄ FM 2311
EXISTING 3 - 6' X 5' X 45.20' MBC (29.6° RFS)

PROPOSED: BREAK BACK 2' RT AND 2' LT
EXTEND 11' LT AND 7' RT (29.6° RFS)
INSTALL 4:1 SETB-FW-S LT AND 4:1 SETB-FW-S RT
MC-6-16, MC-MD, SETB-FW-S, & SRR

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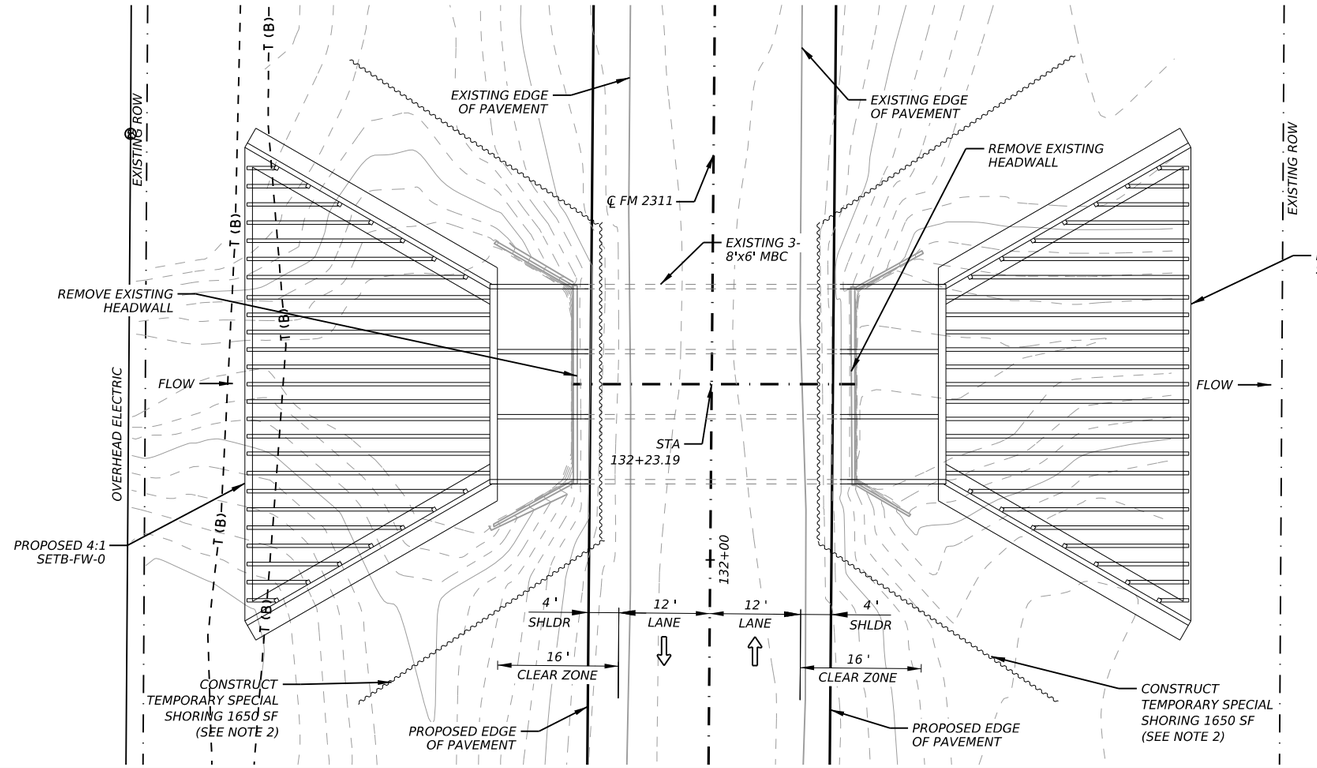
CULVERT LAYOUT
BCC-G

SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		152

DATE: DATE TIME
FILE: DOCUMENT NAME



NOTES:

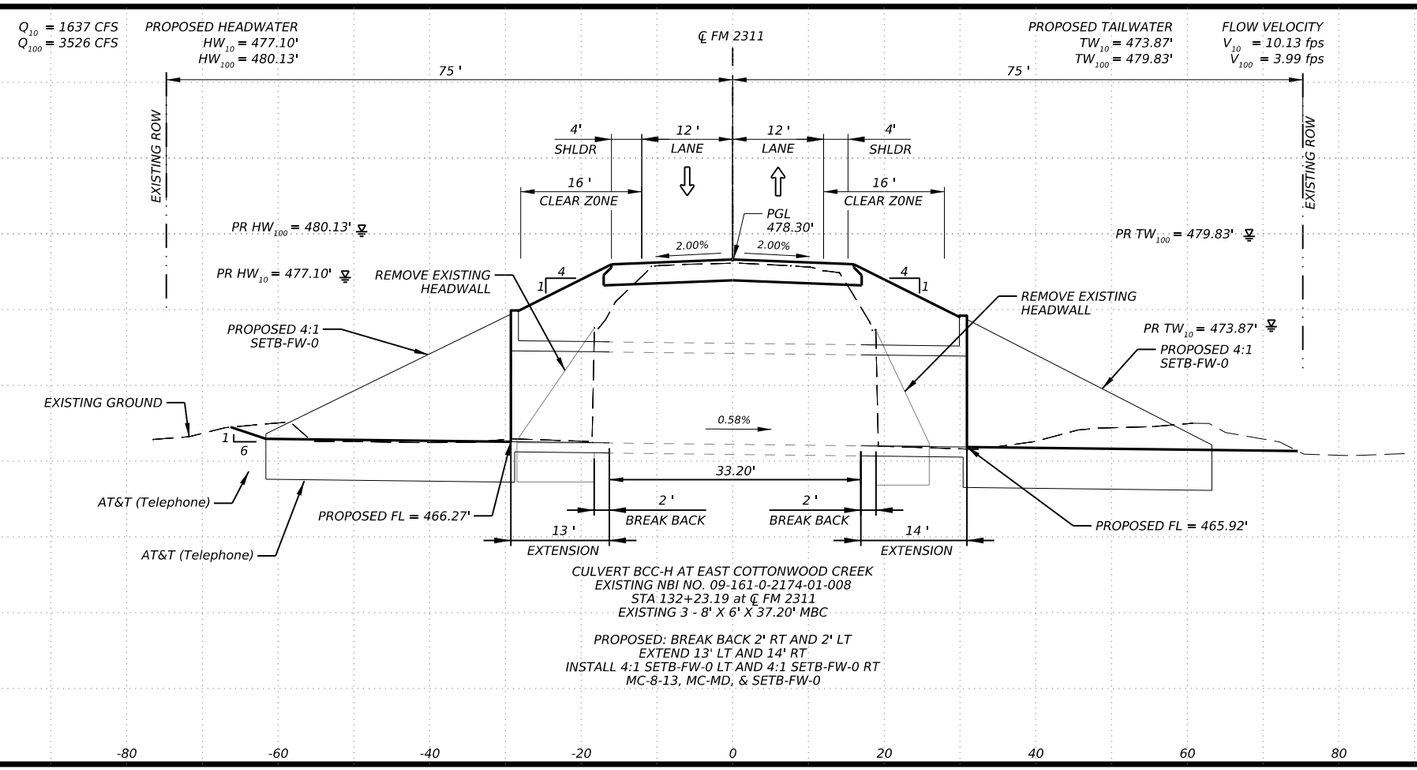
1. CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

2. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY SPECIAL SHORING DESIGN.

0 10 20
SCALE IN FEET

SUMMARY OF CULVERT QUANTITIES		
BID ITEM	DESCRIPTION	QUANTITY
403 6001	TEMP SPL SHORING	3300 SF
432 6002	RIPRAP (CONC)(5 IN)*	38 CY
462 6065	CONC BOX CULV (8 FT X 6 FT)(EXTEND)	81 LF
467 6287	SET (TY I)(S= 8 FT)(HW= 8 FT)(4:1)(C)	6 EA
480 6001	CLEAN EXIST CULVERTS	1 EA
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	4 EA

*RIPRAP APRON QUANTITY



CULVERT BCC-H AT EAST COTTONWOOD CREEK
EXISTING NBI NO. 09-161-0-2174-01-008
STA 132+23.19 at ℄ FM 2311
EXISTING 3 - 8' X 6' X 37.20' MBC

PROPOSED: BREAK BACK 2' RT AND 2' LT
EXTEND 13' LT AND 14' RT
INSTALL 4:1 SETB-FW-0 LT AND 4:1 SETB-FW-0 RT
MC-8-13, MC-MD, & SETB-FW-0

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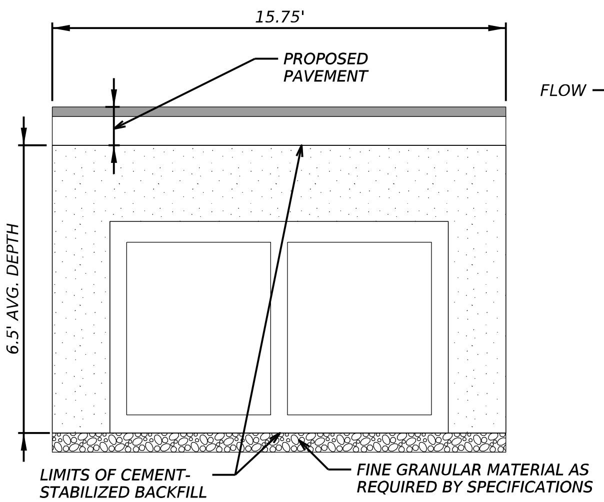
CULVERT LAYOUT
BCC-H

SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

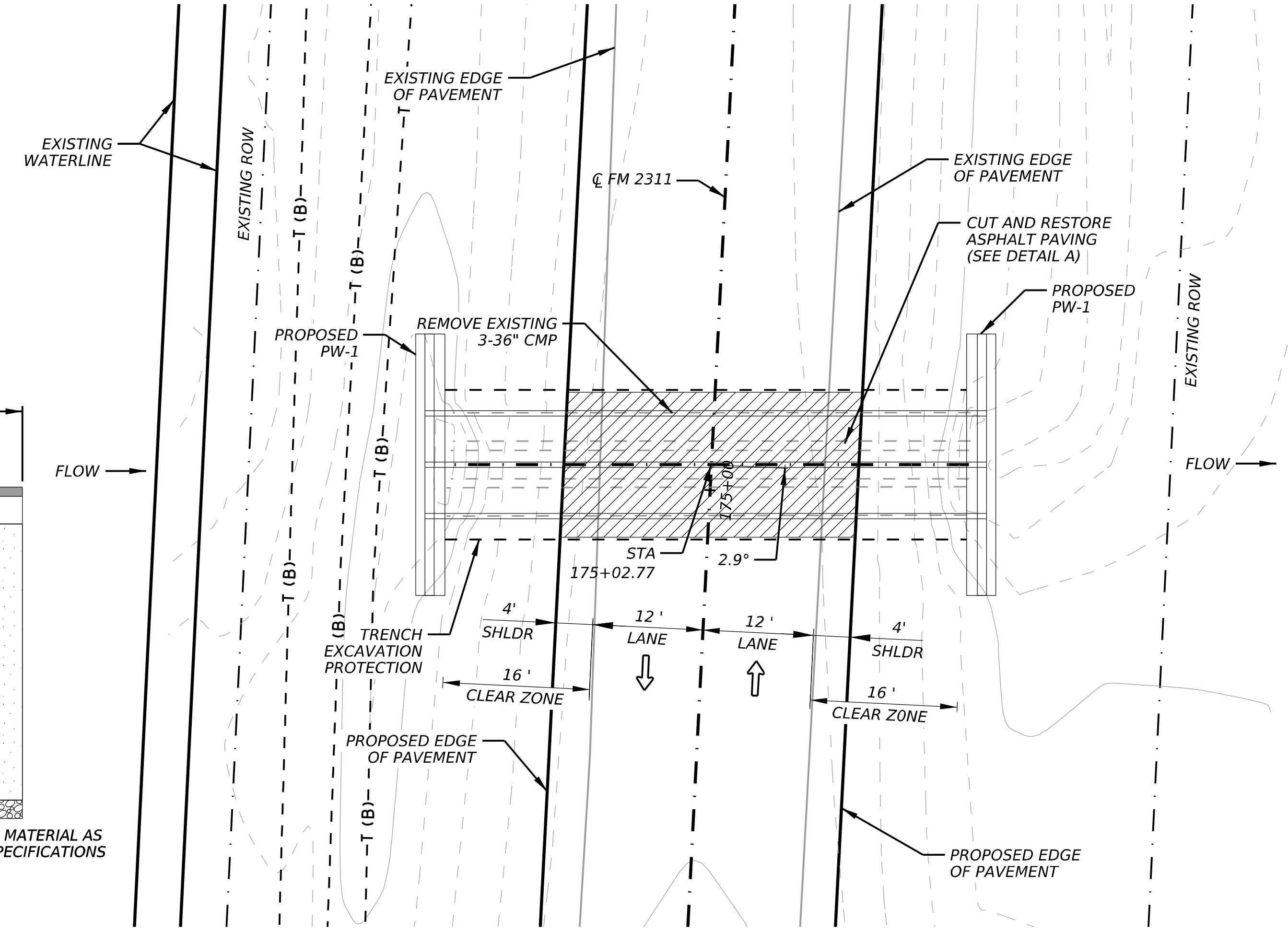
CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		153

DATE: DATE TIME
FILE: DOCUMENT NAME

NOTE:
CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.



DETAIL A
N.T.S.



0 10 20
SCALE IN FEET

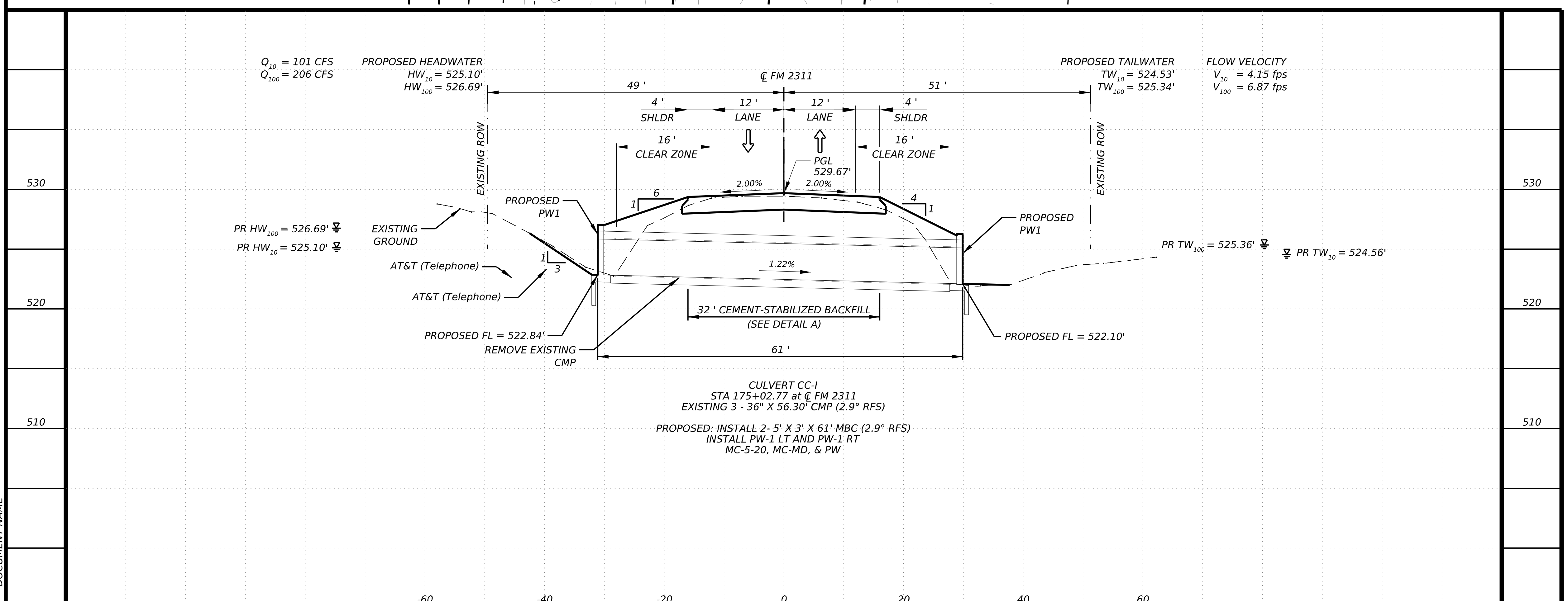
SUMMARY OF CULVERT QUANTITIES		
BID ITEM	DESCRIPTION	QUANTITY
400 6005	CEM STABIL BKFL	117 CY
400 6008	CUT & RESTORE ASPH PAVING	57 SY
402 6001	TRENCH EXCAVATION PROTECTION	61 LF
462 6007	CONC BOX CULV (5 FT X 3 FT)	122 LF
466 6179	WINGWALL (PW-1) (HW=4 FT)	2 EA
496 6007	REMOV STR (PIPE)	169 LF
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	2 EA

Q_{10} = 101 CFS
Q_{100} = 206 CFS

PROPOSED HEADWATER
HW_{10} = 525.10'
HW_{100} = 526.69'

PROPOSED TAILWATER
TW_{10} = 524.53'
TW_{100} = 525.34'

FLOW VELOCITY
V_{10} = 4.15 fps
V_{100} = 6.87 fps



CULVERT CC-I
STA 175+02.77 at ℄ FM 2311
EXISTING 3 - 36" X 56.30' CMP (2.9° RFS)

PROPOSED: INSTALL 2- 5' X 3' X 61' MBC (2.9° RFS)
INSTALL PW-1 LT AND PW-1 RT
MC-5-20, MC-MD, & PW

DATE TIME
DOCUMENT NAME
DATE:
FILE:

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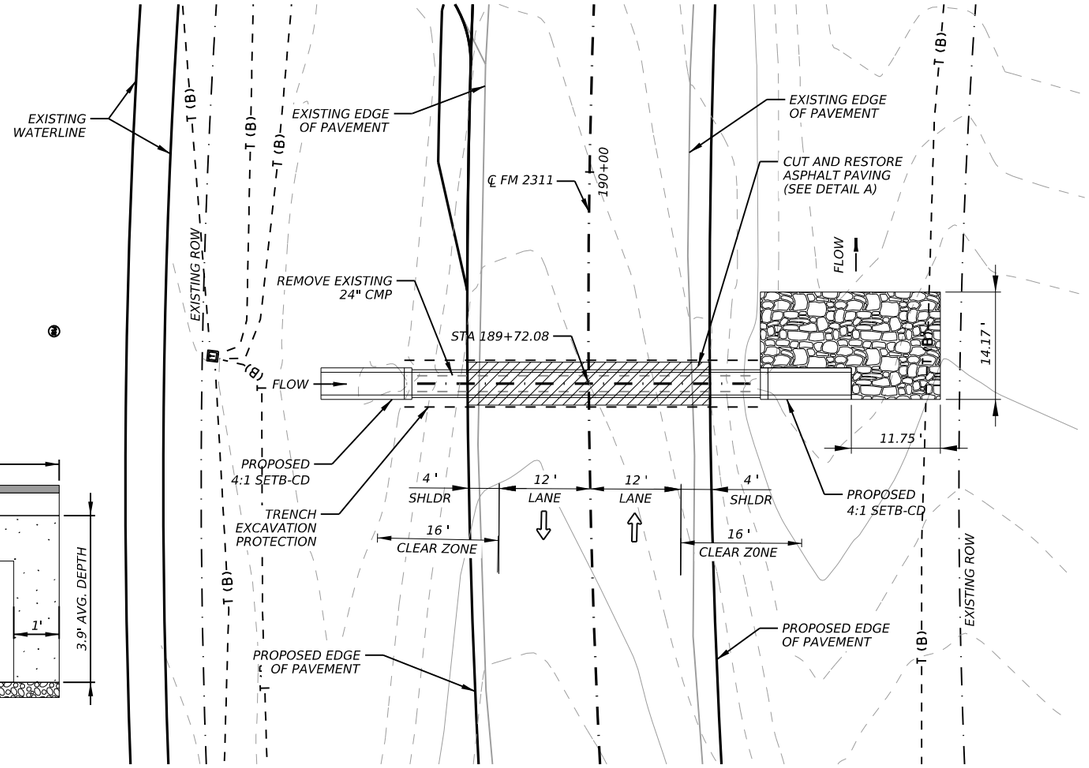
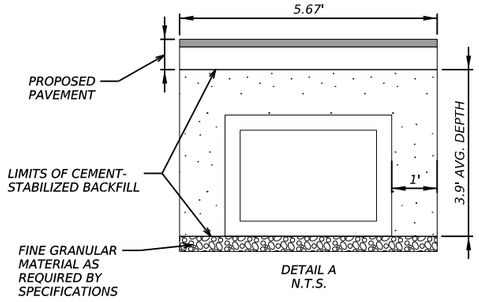
CULVERT LAYOUT
CC-I

SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		154

NOTE:
CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

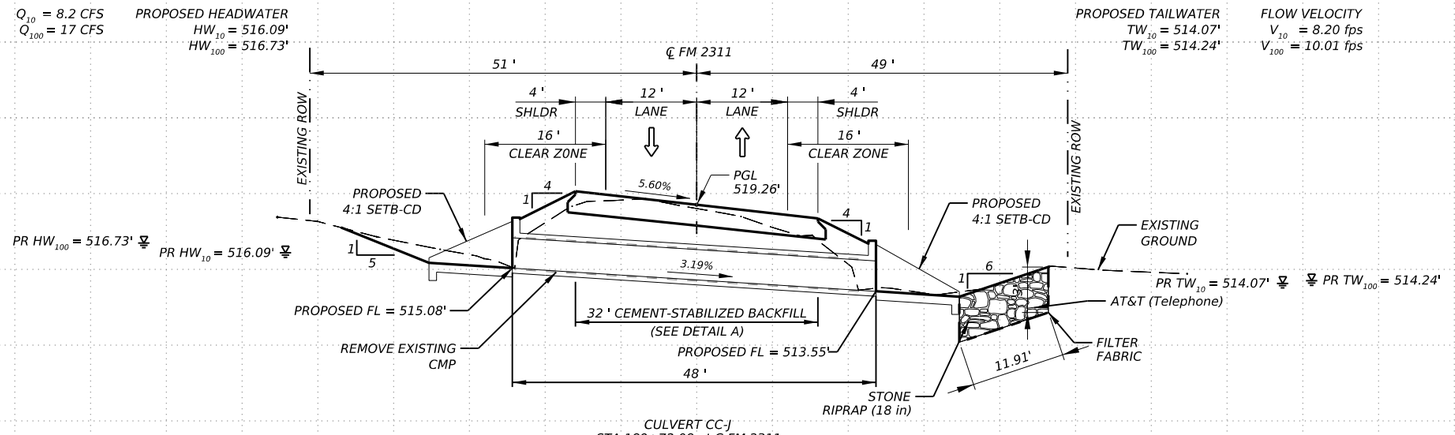




DETAIL A
N.T.S.

0 10 20
SCALE IN FEET

SUMMARY OF CULVERT QUANTITIES		
BID ITEM	DESCRIPTION	QUANTITY
400 6005	CEM STABIL BKFL	23 CY
400 6008	CUT & RESTORE ASPH PAVING	21 SY
402 6001	TRENCH EXCAVATION PROTECTION	48 LF
432 6002	RIPRAP (CONC)(5 IN)	1 CY
432 6033	RIPRAP (STONE PROTECTION)(18 IN)	32 CY
462 6001	CONC BOX CULV (3 FT X 2 FT)	48 LF
467 6106	SET (TY I)(S=3 FT)(HW= 3 FT)(4:1)(C)	2 EA
496 6007	REMOV STR (PIPE)	46 LF
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	2 EA



CULVERT CC-J
STA 189+72.08 at ℄ FM 2311
EXISTING 24" X 45.40' CMP

PROPOSED: INSTALL 3' X 2' X 48' SBC
INSTALL 4:1 SETB-CD LT AND 4:1 SETB-CD RT
SCP-3, SCP-MD, SCC-3 & 4, SCC-MD, SRR & SETB-CD

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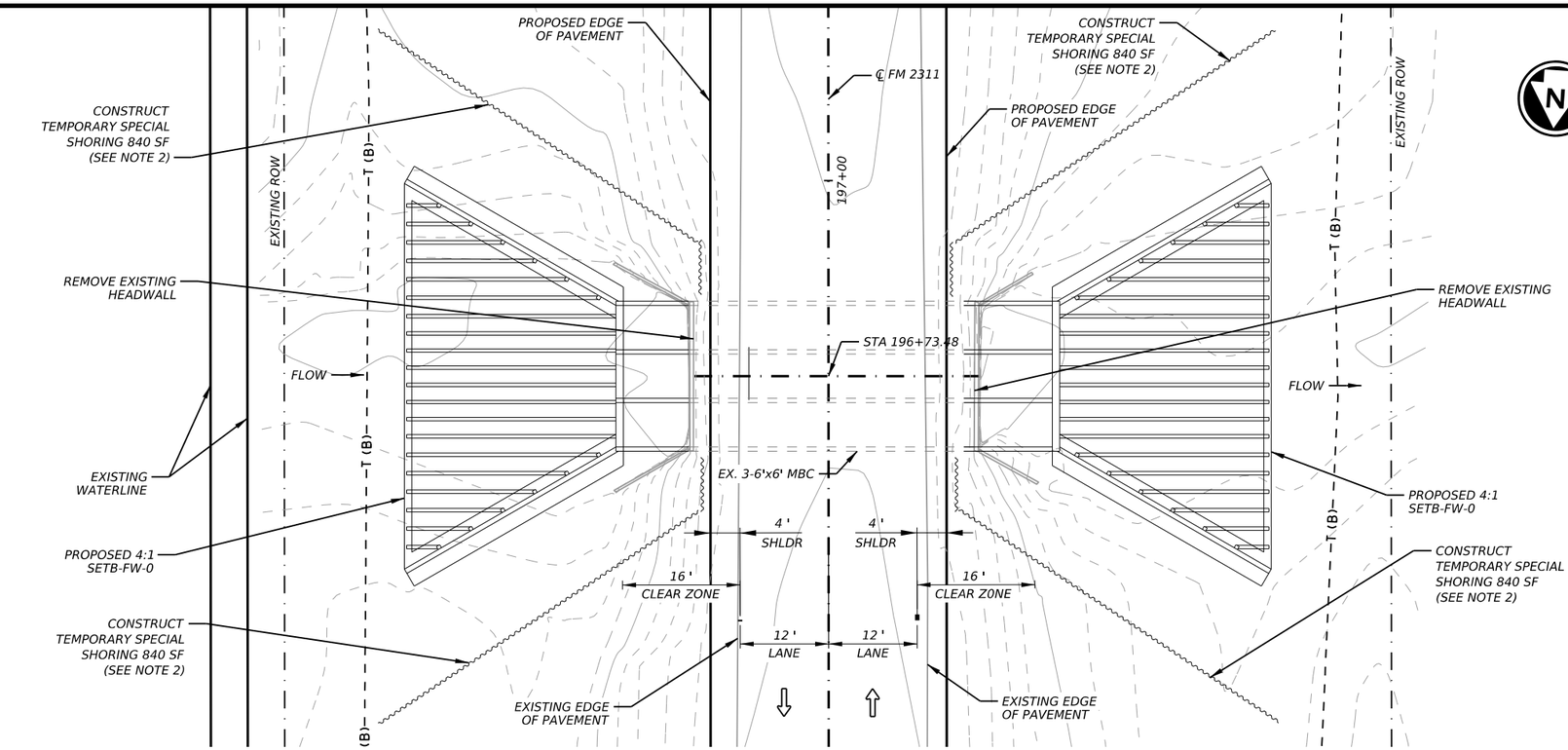
FM 2311

CULVERT LAYOUT CC-J

SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		155

DATE:
FILE:
DATE TIME
DOCUMENT NAME



NOTES:

1. CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

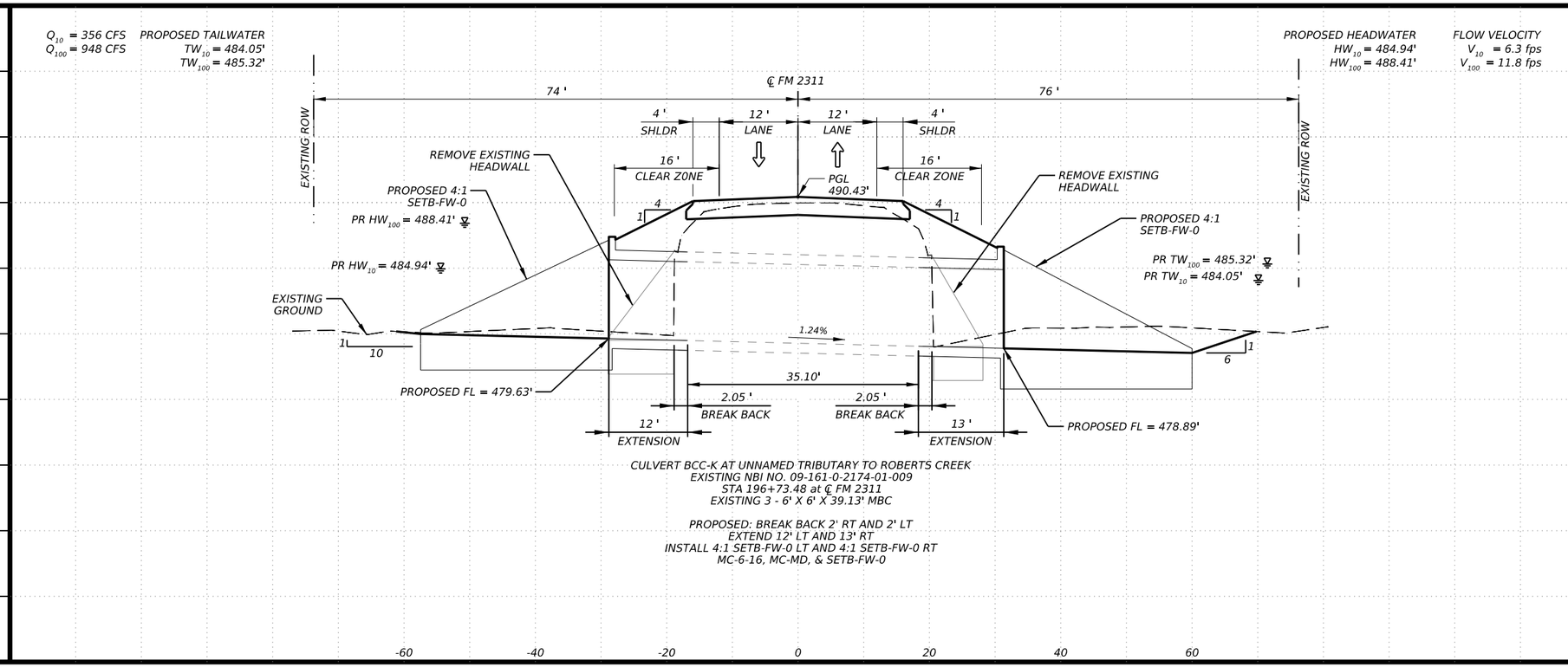
2. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY SPECIAL SHORING DESIGN.

0 10 20
SCALE IN FEET

SUMMARY OF CULVERT QUANTITIES

BID ITEM	DESCRIPTION	QUANTITY
403 6001	TEMP SPL SHORING	3360 SF
432 6002	RIPRAP (CONC)(5 IN)*	27 CY
462 6057	CONC BOX CULV (6 FT X 6 FT)(EXTEND)	75 LF
467 6232	SET (TY I)(S= 6 FT)(HW= 8 FT)(4:1) (C)	6 EA
480 6001	CLEAN EXIST CULVERTS	1 EA
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	4 EA

*RIPRAP APRON QUANTITY



CULVERT BCC-K AT UNNAMED TRIBUTARY TO ROBERTS CREEK
EXISTING NBI NO. 09-161-0-2174-01-009
STA 196+73.48 at ℄ FM 2311
EXISTING 3 - 6' X 6' X 39.13' MBC

PROPOSED: BREAK BACK 2' RT AND 2' LT
EXTEND 12' LT AND 13' RT
INSTALL 4:1 SETB-FW-0 LT AND 4:1 SETB-FW-0 RT
MC-6-16, MC-MD, & SETB-FW-0

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3/28/2024

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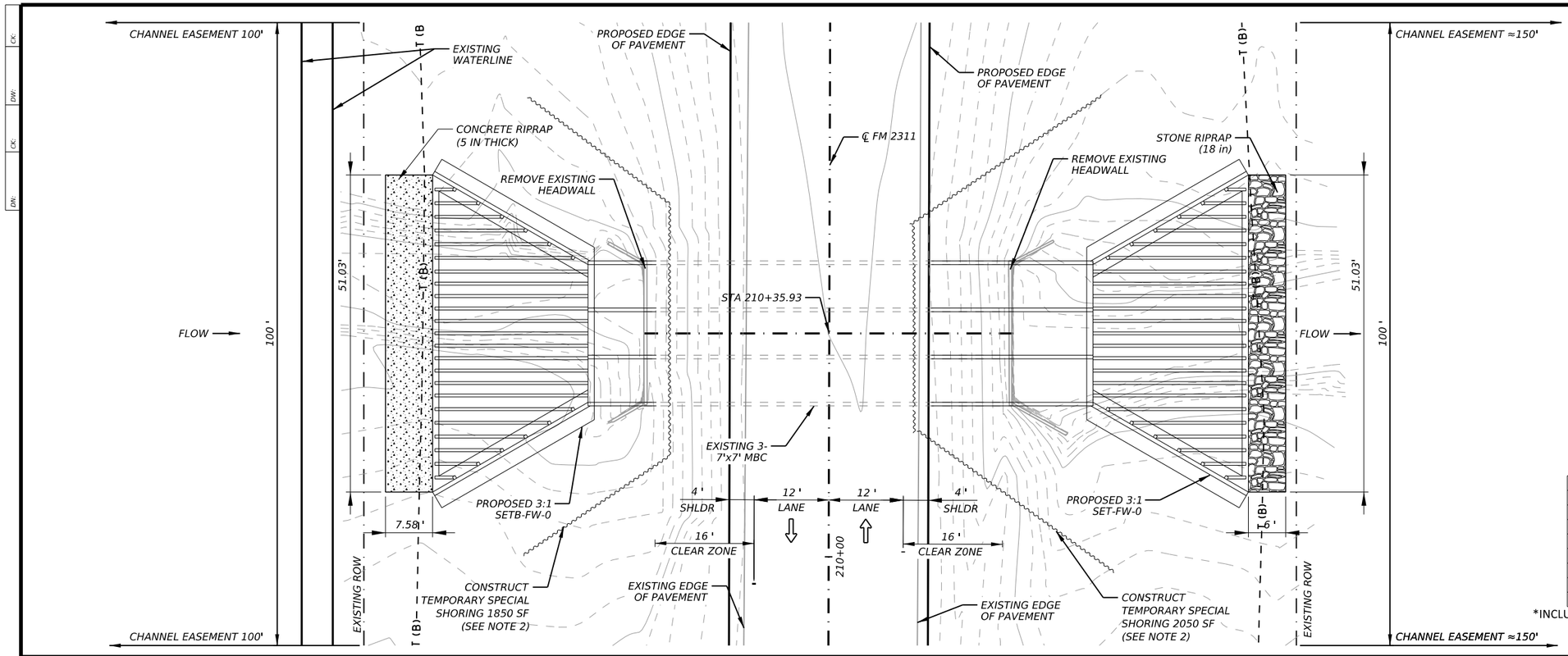
FM 2311

CULVERT LAYOUT
BCC-K

SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		156

DATE:
FILE:
DATE TIME
DOCUMENT NAME



NOTES:

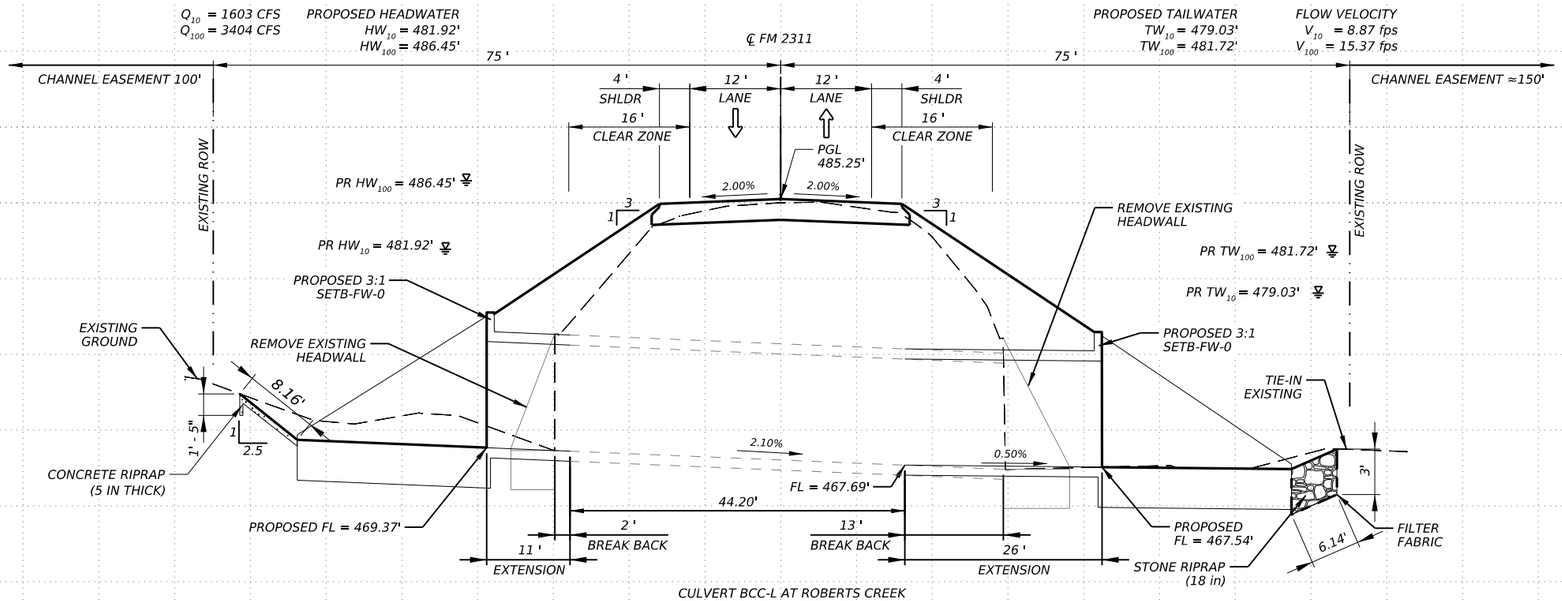
1. CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

2. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY SPECIAL SHORING DESIGN.

SUMMARY OF CULVERT QUANTITIES

BID ITEM	DESCRIPTION	QUANTITY
403 6001	TEMP SPL SHORING	3900 SF
432 6002	RIPRAP (CONC)(5 IN)*	31 CY
432 6033	RIPRAP (STONE PROTECTION)(18 IN)	35 CY
462 6062	CONC BOX CULV (7 FT X 7 FT)(EXTEND)	111 LF
467 6262	SET (TY I)(S= 7 FT)(HW= 9 FT)(3:1) (C)	6 EA
480 6001	CLEAN EXIST CULVERTS	1 EA
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	4 EA

*INCLUDES CONCRETE RIPRAP AT CULVERT INLET AND APRON RIPRAP QUANTITIES



CULVERT BCC-L AT ROBERTS CREEK
EXISTING NBI NO. 09-161-0-2174-01-013
STA 210+35.93 at ℄ FM 2311
EXISTING 3 - 7' X 7' X 59.20' MBC

PROPOSED: BREAK BACK 2' LT AND 13' RT
EXTEND 11' LT AND 26' RT
INSTALL 3:1 SETB-FW-0 LT AND 3:1 SETB-FW-0 RT
MC-7-10, MC-MD, SRR, & SETB-FW-0

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FM 2311

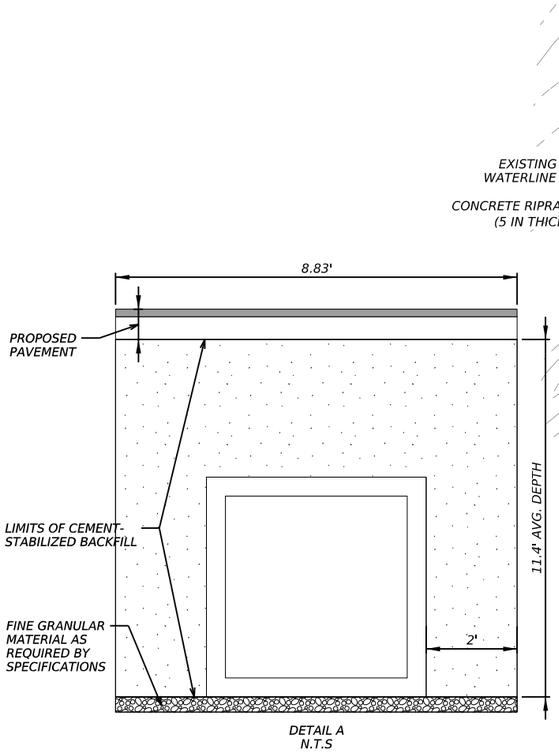
CULVERT LAYOUT BCC-L

SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

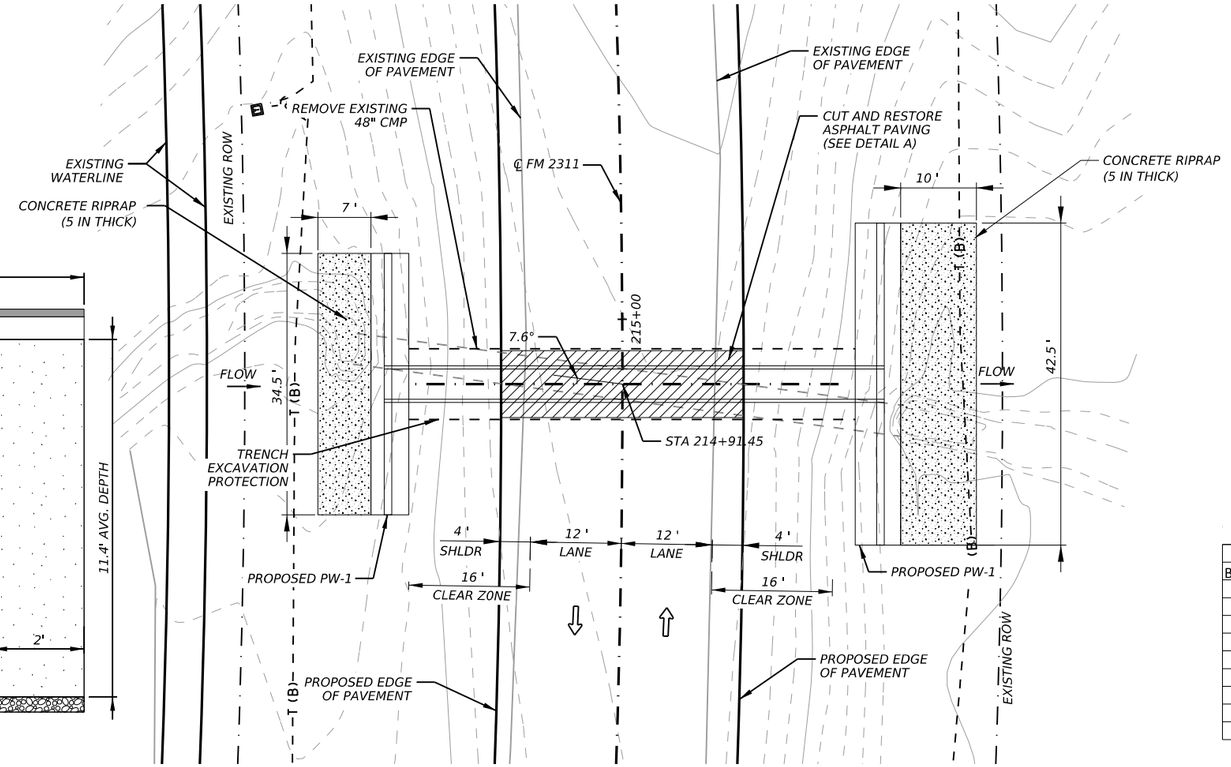
CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		157

DATE:
FILE:
DATE TIME
DOCUMENT NAME

NOTE:
CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

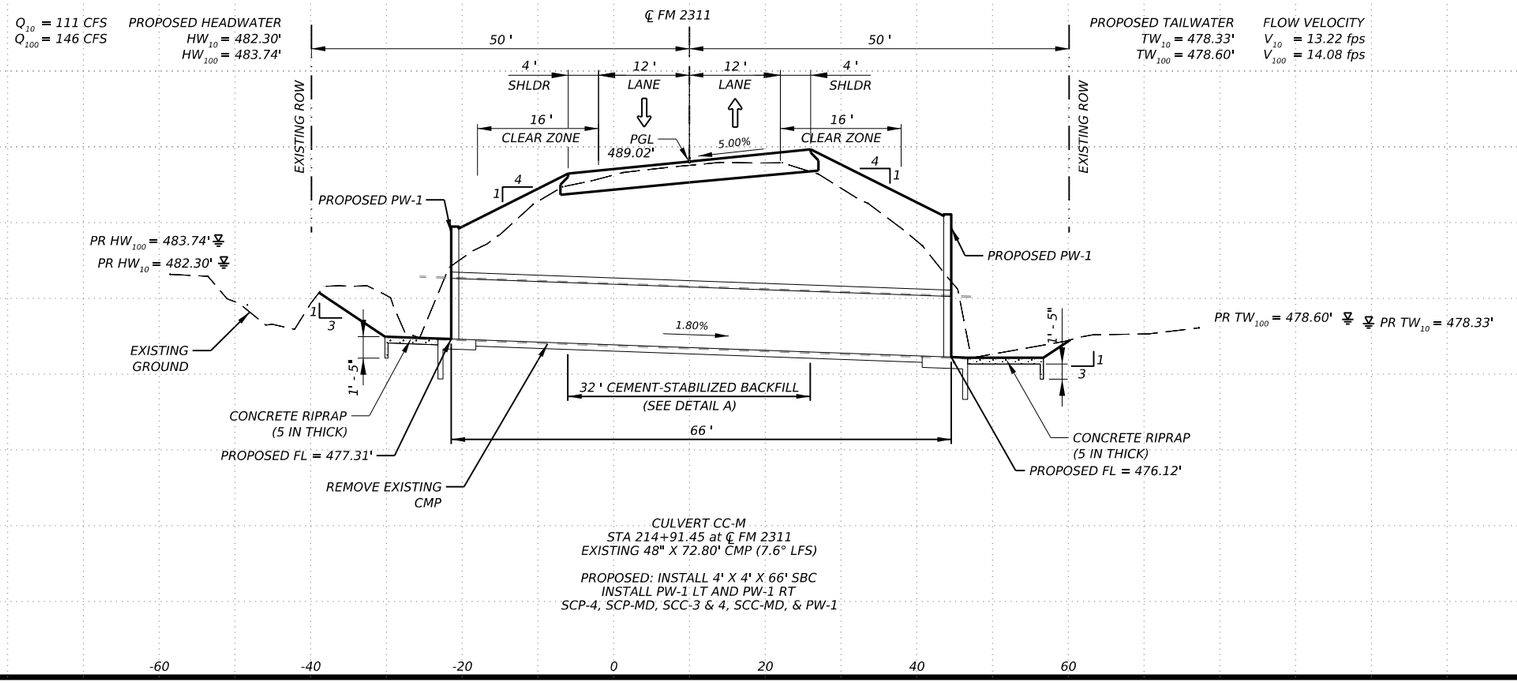


DETAIL A
N.T.S



0 10 20
SCALE IN FEET

SUMMARY OF CULVERT QUANTITIES		
BID ITEM	DESCRIPTION	QUANTITY
400 6005	CEM STABIL BKFL	188 CY
400 6008	CUT & RESTORE ASPH PAVING	32 SY
402 6001	TRENCH EXCAVATION PROTECTION	66 LF
432 6002	RIPRAP (CONC)(5 IN)	12 CY
462 6005	CONC BOX CULV (4 FT X 4 FT)	66 LF
466 6184	WINGWALL (PW - 1) (HW=9 FT)	1 EA
466 6182	WINGWALL (PW - 1) (HW=7 FT)	1 EA
496 6007	REMOV STR (PIPE)	73 LF
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	2 EA



CULVERT CC-M
STA 214+91.45 at ℄ FM 2311
EXISTING 48" X 72.80' CMP (7.6° LFS)

PROPOSED: INSTALL 4' X 4' X 66' SBC
INSTALL PW-1 LT AND PW-1 RT
SCP-4, SCP-MD, SCC-3 & 4, SCC-MD, & PW-1

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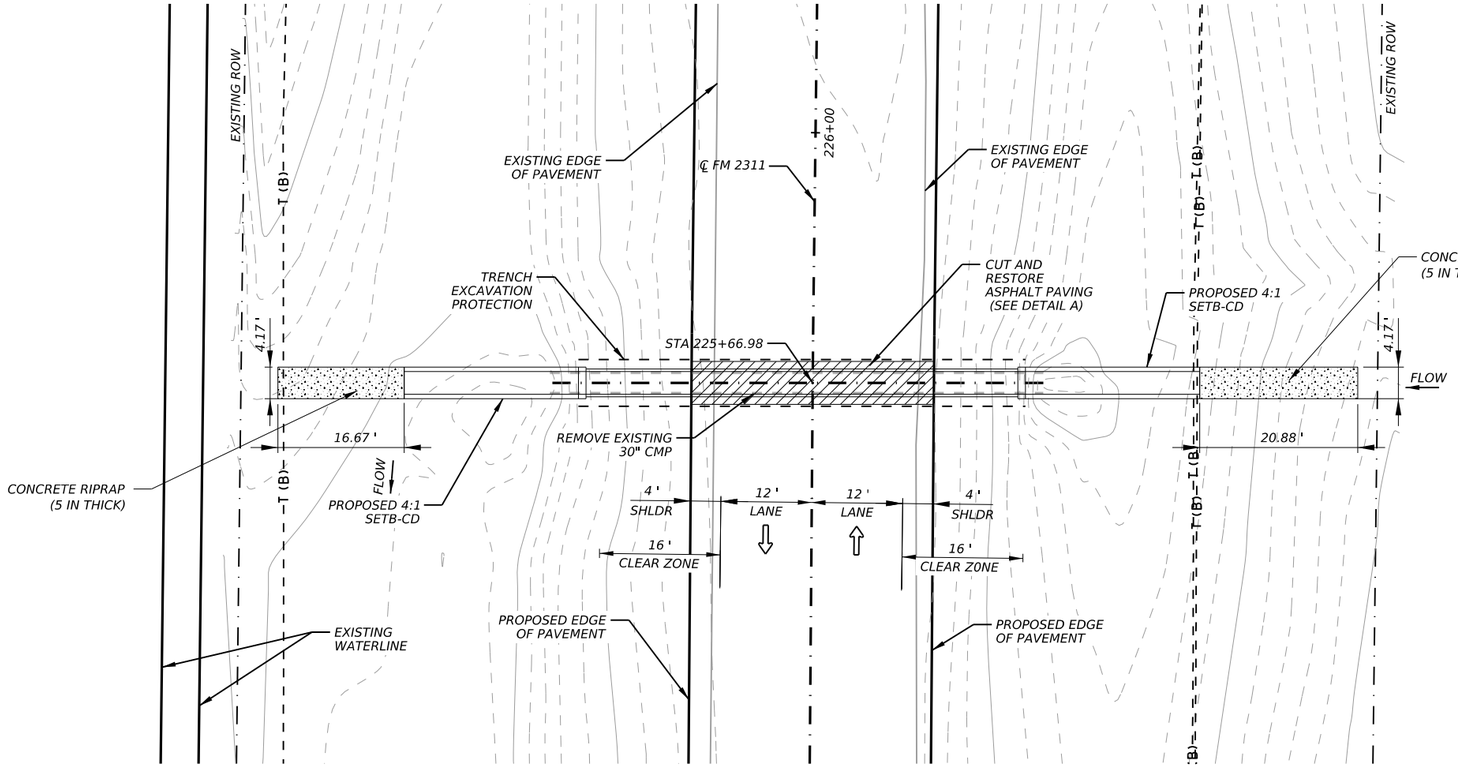
FM 2311

CULVERT LAYOUT CC-M

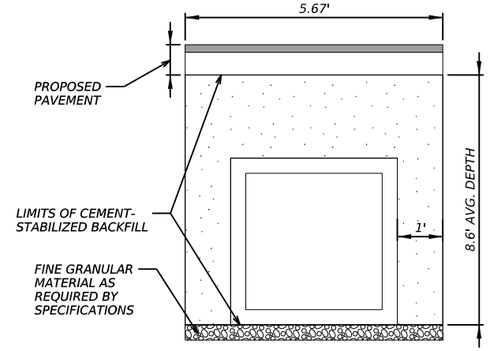
SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		158

DATE:
FILE:
DATE TIME
DOCUMENT NAME



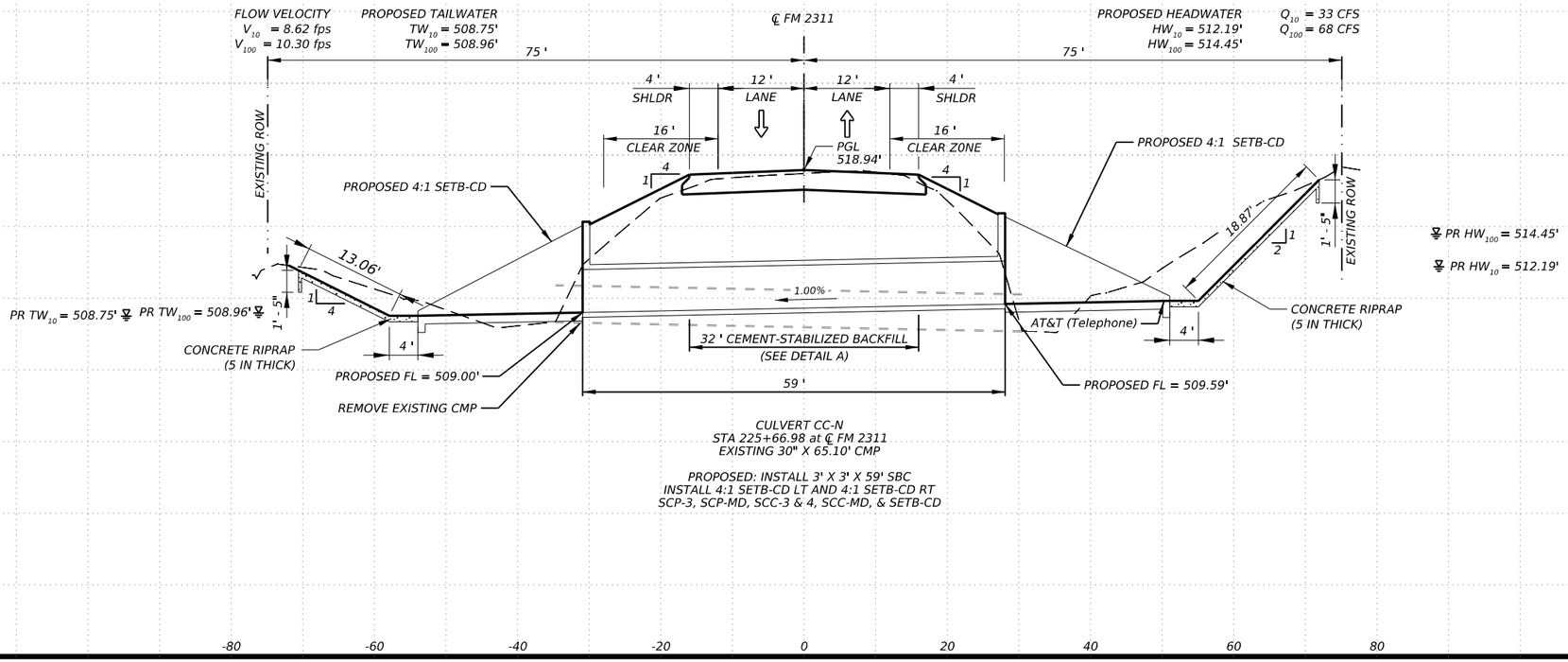
NOTE:
CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.



DETAIL A
N.T.S.

0 10 20
SCALE IN FEET

SUMMARY OF CULVERT QUANTITIES		
BID ITEM	DESCRIPTION	QUANTITY
400 6005	CEM STABIL BKFL	77 CY
400 6008	CUT & RESTORE ASPH PAVING	21 SY
402 6001	TRENCH EXCAVATION PROTECTION	59 LF
432 6002	RIPRAP (CONC)(5 IN)	3 CY
462 6002	CONC BOX CULV (3 FT X 3 FT)	59 LF
467 6224	SET (TY I)(S= 6 FT)(HW= 6 FT)(4:1) (C)	2 EA
496 6007	REMOV STR (PIPE)	66 LF
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	2 EA



CULVERT CC-N
STA 225+66.98 at ℄ FM 2311
EXISTING 30" X 65.10' CMP

PROPOSED: INSTALL 3' X 3' X 59' SBC
INSTALL 4:1 SETB-CD LT AND 4:1 SETB-CD RT
SCP-3, SCP-MD, SCC-3 & 4, SCC-MD, & SETB-CD

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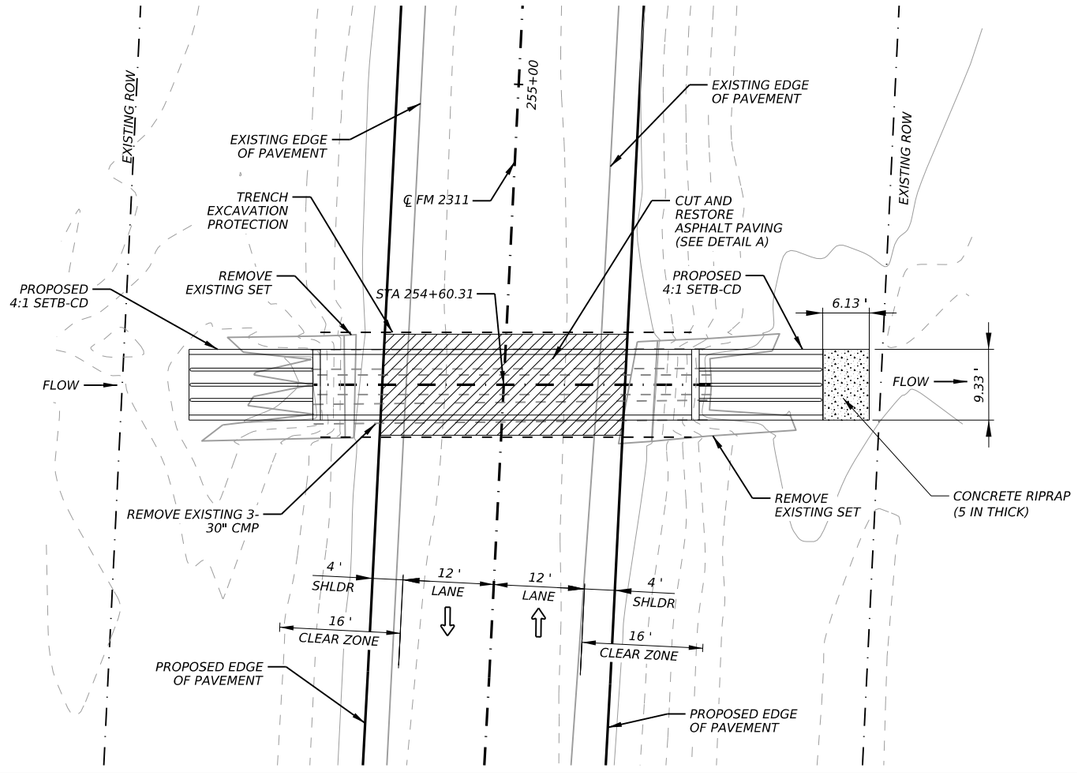
FM 2311

CULVERT LAYOUT
CC-N

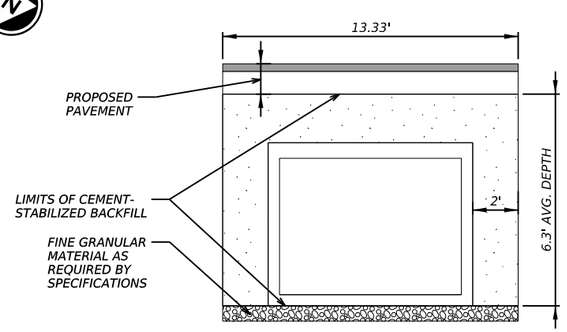
SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		159

DATE: DATE TIME
FILE: DOCUMENT NAME



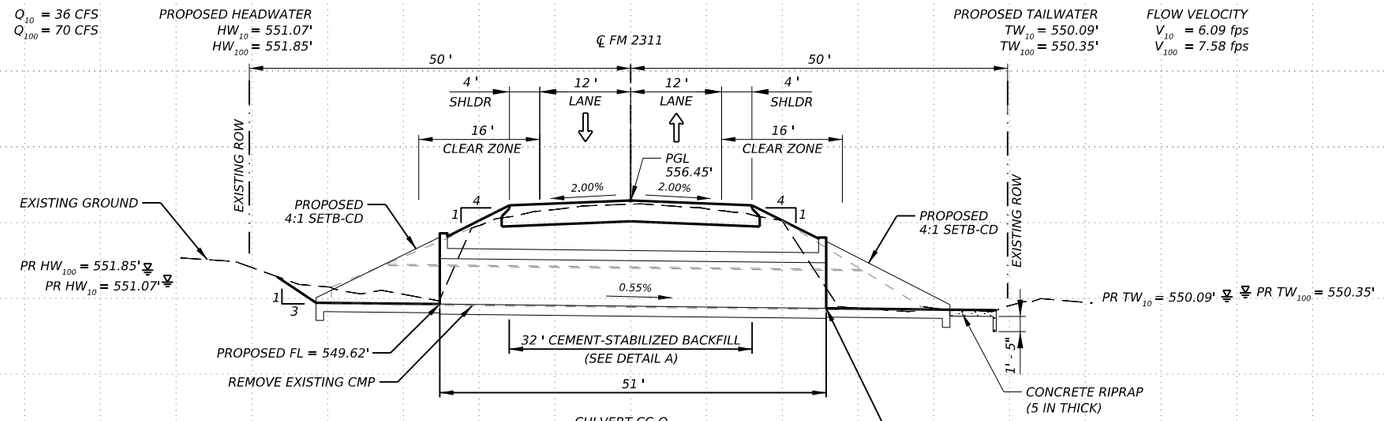
NOTE:
CONTRACTOR SHALL LOCATE ALL UTILITIES AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.



DETAIL A
N.T.S.

0 10 20
SCALE IN FEET

SUMMARY OF CULVERT QUANTITIES		
BID ITEM	DESCRIPTION	QUANTITY
400 6005	CEM STABIL BKFL	82 CY
400 6008	CUT & RESTORE ASPH PAVING	48 SY
402 6001	TRENCH EXCAVATION PROTECTION	51 LF
432 6002	RIPRAP (CONC)(5 IN)	1 CY
462 6096	CONC BOX CULV (8 FT X 3 FT)	51 LF
467 6270	SET (TY I)(S= 8 FT)(HW= 4 FT)(4:1) (C)	2 EA
496 6004	REMOV STR (SET)	6 EA
496 6007	REMOV STR (PIPE)	41 LF
658 6046	INSTL OM ASSM (OM-2X)(WC)GND	2 EA



CULVERT CC-O
STA 254+60.31 at ℄ FM 2311
EXISTING 3 - 30" X 40.90' CMP

PROPOSED: INSTALL 8' X 3' X 51' SBC
INSTALL 4:1 SETB-CD LT AND 4:1 SETB-CD RT
SCP-8, SCP-MD, SCC-8, SCC-MD, & SETB-CD

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FM 2311

CULVERT LAYOUT
CC-O

SCALE: 1"= 10'V, 1"=20'H SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		160

CK:
DW:
CK:
DW:

DATE TIME
DOCUMENT NAME

DATE:
FILE:

Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw Height of Wingwall (1) (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
CC-A STA 2+20.00 (Both)	1 ~ 3' X 2'	3'	SCP-3	SETB-CD	0	3:1	4"	4"	0.5	2.583	N/A	N/A	6.75	N/A	4.167	0	0.2	2.2	N/A
CC-B STA 4+20.00 (Both)	1 ~ 3' X 2'	2'	SCP-3	SETB-CD	0	6:1	4"	4"	0.25	2.333	N/A	N/A	12	N/A	4.167	0	0	3.8	N/A
BCC C STA 15+26.63 (Both)	3 ~ 8' X 5'	4'	MC-8-13	PW-1	0	2:1	8"	7"	1.5	7.167	N/A	N/A	14.333	26.333	N/A	0	3	30.8	410
BCC C Proposed (Both)	1 ~ 5' X 5'	1'	SCP-5	PW-1	0	2:1	8"	6"	1.5	7.167	N/A	N/A	14.333	6.000	N/A	0	0.6	27	410
CC-C2 STA 16+86.65 (Both)	1 ~ 3' X 2'	2'	SCP-3	SETB-FW-S	30	6:1	4"	4"	0.25	2.333	12	12	16.971	N/A	15.464	2.4	0	9.2	N/A
CC-D STA 31+24.67 (Both)	3 ~ 5' X 2'	1.4'	MC-5-20	SETB-FW-0	0	6:1	8"	7"	0.25	2.667	14	8.083	16.166	N/A	32.332	8.8	0.4	13	N/A
CC-E STA 45+65.17 (Both)	1 ~ 3' X 3'	4.6'	SCP-3	SETB-CD	0	4:1	4"	4"	1	4.083	N/A	N/A	15	N/A	4.167	0	0.2	5.8	N/A
BCC-G STA 112+15.52 (Both)	3 ~ 6' X 5'	3.6'	MC-6-16	SETB-FW-S	30	4:1	9"	7"	1	6.5	24.667	24.667	34.884	N/A	46.798	22.6	1.8	31.2	N/A
BCC-H STA 132+23.19 (Both)	3 ~ 8' X 6'	5.6'	MC-8-13	SETB-FW-0	0	4:1	8"	7"	2	8.417	32.333	18.668	37.335	N/A	62.502	38	4	48.6	N/A
CC-I STA 175+02.77 (Both)	2 ~ 5' X 3'	3.6'	MC-5-20	PW-1	0	2:1	8"	7"	0.5	4.167	N/A	N/A	8.333	11.750	N/A	0	0.4	11.2	138
CC-J STA 189+37.85 (Both)	1 ~ 3' X 2'	3'	SCP-3	SETB-CD	0	4:1	4"	4"	1	3.083	N/A	N/A	11	N/A	4.167	0	0.2	3.8	N/A
BCC-K STA 196+73.48 (Both)	3 ~ 6' X 6'	4.5'	MC-6-16	SETB-FW-0	0	4:1	9"	7"	1	7.5	28.667	16.551	33.101	N/A	52.268	27	1.6	39.4	N/A
BCC-L STA 210+35.93 (Both)	3 ~ 7' X 7'	9.4'	MC-7-10	SETB-FW-0	0	3:1	8"	7"	1.25	8.667	25	14.434	28.868	N/A	51.034	23.6	2.2	37.8	N/A
CC-M STA 214+91.45 (Lt)	1 ~ 4' X 4'	9.2'	SCP-4	PW-1	0	2:1	5"	5"	5	9.417	N/A	N/A	18.833	4.833	N/A	0	0.9	21.9	355
CC-M STA 214+91.45 (Rt)	1 ~ 4' X 4'	8'	SCP-4	PW-1	0	2:1	5"	5"	3	7.417	N/A	N/A	14.833	4.833	N/A	0	0.5	13.8	220
CC-N STA 225+62.84 (Both)	1 ~ 3' X 3'	6.4'	SCP-3	SETB-CD	0	4:1	4"	4"	3	6.083	N/A	N/A	23	N/A	4.167	0	0.8	10.8	N/A
CC-O STA 254+56.18 (Both)	1 ~ 8' X 3'	3.4'	SCP-8	SETB-CD	0	4:1	8"	8"	1	4.417	N/A	N/A	16.333	N/A	9.333	0	0.6	10.4	N/A

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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.

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2/1/2024

SPECIAL NOTE:

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

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

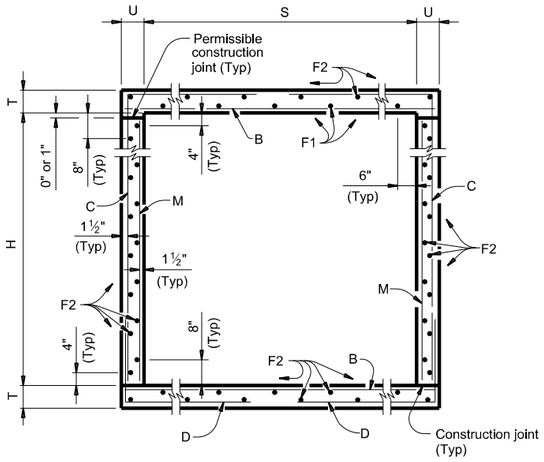
Texas Department of Transportation

Bridge Division Standard

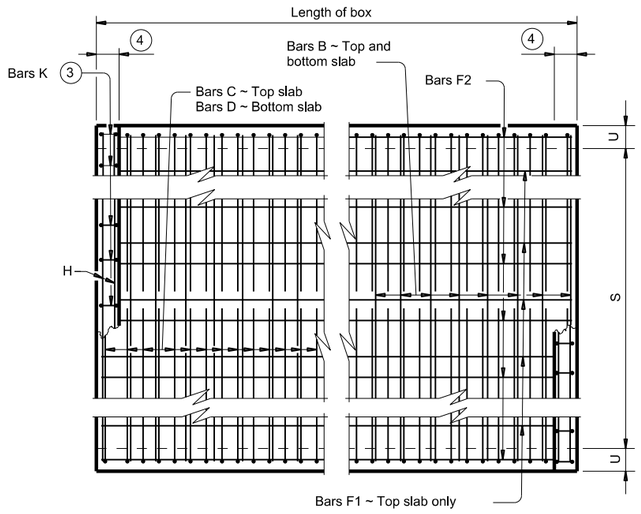
BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		161



TYPICAL SECTION



PLAN OF REINF STEEL

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.

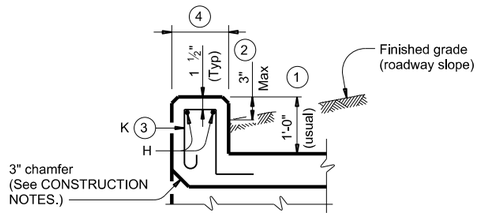
2. For vehicle safety, the following requirements must be met:
   · For structures without bridge rail, construct curbs no more than 3" above finished grade.
   · For structures with bridge rail, construct curbs flush with finished grade.
   Reduce curb heights, if necessary, to meet the above requirements. 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).



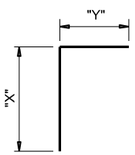
SECTION THRU CURB

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

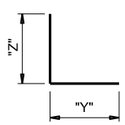
MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
· culverts with overlay,
· culverts with 1-to-2 course surface treatment, or
· culverts with the top slab as the final riding surface.
Provide bar laps, where required, as follows:
· Uncoated or galvanized ~ #4 = 1'-8" Min
· Uncoated or galvanized ~ #5 = 2'-1" Min

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

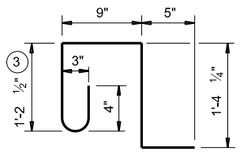
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-3 & 4

FILE: CD-SCC34-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		162

DATE: 2/1/2024 6:45:46 AM
FILE: ...\SFDS\CD-SCC34-21.dgn

SECTION DIMENSIONS				(5) FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
3' - 0"	2' - 0"	8"	7"	30'	108	#5	9"	3' - 11"	441	108	#4	9"	5' - 4"	385	2' - 6"	2' - 10"	108	#4	9"	5' - 1"	367	2' - 10"	2' - 3"	108	9"	2' - 0"	144	3	39' - 9"	80	19	39' - 9"	505	3' - 11"	10	10	28	0.292	48.1	0.3	38	12.0	1,960
3' - 0"	3' - 0"	8"	7"	30'	108	#5	9"	3' - 11"	441	108	#4	9"	6' - 4"	457	3' - 6"	2' - 10"	108	#4	9"	5' - 1"	367	2' - 10"	2' - 3"	108	9"	3' - 0"	216	3	39' - 9"	80	23	39' - 9"	611	3' - 11"	10	10	28	0.335	54.3	0.3	38	13.7	2,210
4' - 0"	2' - 0"	8"	7"	30'	108	#5	9"	4' - 11"	554	162	#4	6"	5' - 8"	613	2' - 6"	3' - 2"	162	#4	6"	5' - 5"	586	3' - 2"	2' - 3"	108	9"	2' - 0"	144	3	39' - 9"	80	21	39' - 9"	558	4' - 11"	13	12	33	0.342	63.4	0.4	46	14.1	2,581
4' - 0"	3' - 0"	8"	7"	30'	108	#5	9"	4' - 11"	554	162	#4	6"	6' - 8"	721	3' - 6"	3' - 2"	162	#4	6"	5' - 5"	586	3' - 2"	2' - 3"	108	9"	3' - 0"	216	3	39' - 9"	80	25	39' - 9"	664	4' - 11"	13	12	33	0.385	70.5	0.4	46	15.8	2,867
4' - 0"	4' - 0"	8"	7"	30'	108	#5	9"	4' - 11"	554	162	#4	6"	7' - 8"	830	4' - 6"	3' - 2"	162	#4	6"	5' - 5"	586	3' - 2"	2' - 3"	108	9"	4' - 0"	289	3	39' - 9"	80	25	39' - 9"	664	4' - 11"	13	12	33	0.428	75.1	0.4	46	17.5	3,049

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

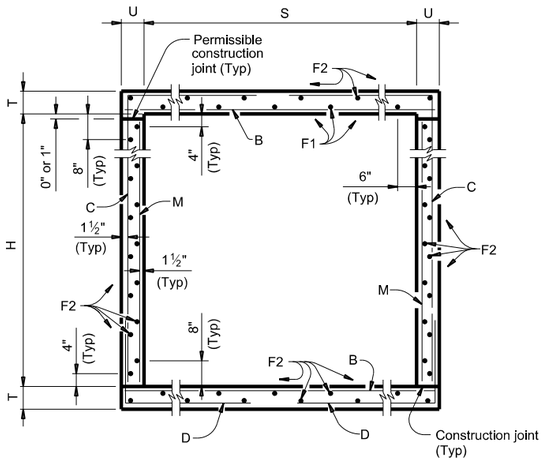
Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE

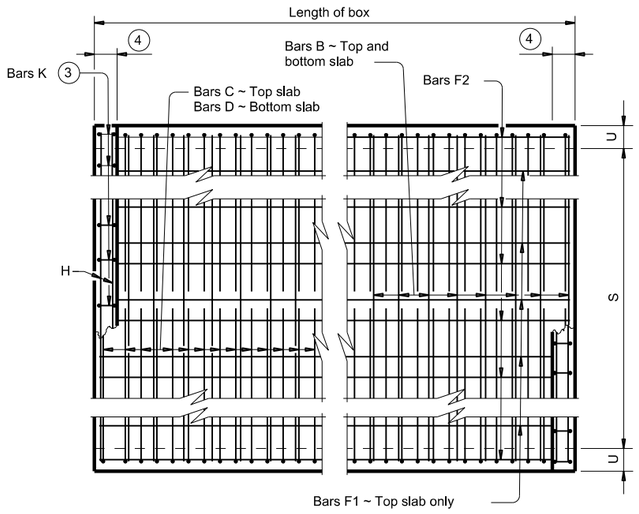
0' TO 30' FILL

SCC-3 & 4

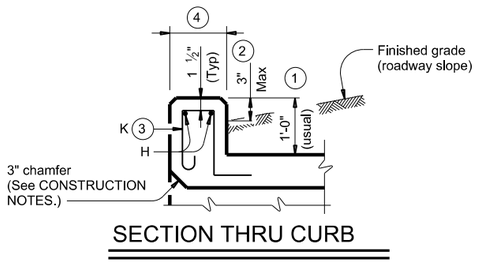
FILE: CD-SCC34-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		163



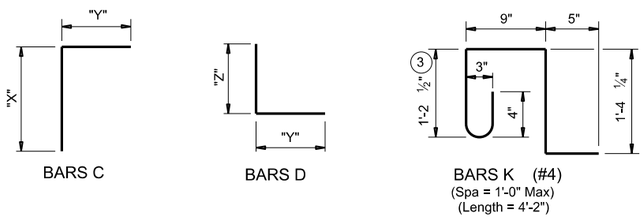
TYPICAL SECTION



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

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SINGLE BOX CULVERTS CAST-IN-PLACE

0' TO 30' FILL

SCC-8

FILE: CD-SCC08-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		164

DATE: 2/1/2024 6:46:01 AM
FILE: ...\STDS\CD-SCC08-21.dgn

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: CD-SCC08-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT	
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2174	01	018	FM 2311	
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.	
	WAC	McLENNAN		164A	

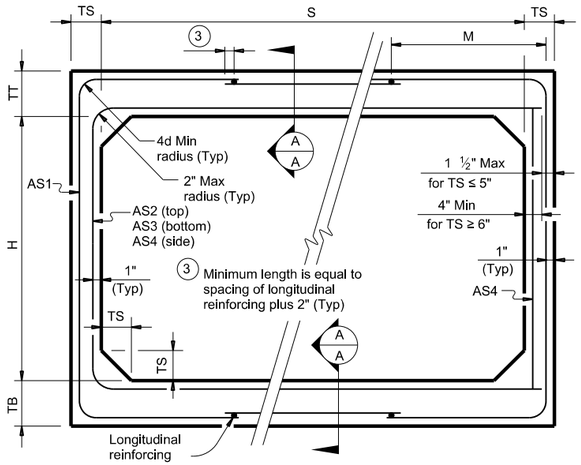
DATE: 2/1/2024 6:46:02 AM
FILE: ...\SFDS\CD-SCC08-21.dgn

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)
3	2	7	6	4	< 2	-	0.17	0.25	0.16	0.10	0.17	0.17	0.14	3.3
3	2	4	4	4	2 < 3	31	0.13	0.19	0.18	0.10	-	-	-	2.4
3	2	4	4	4	3 - 5	31	0.10	0.11	0.12	0.10	-	-	-	2.4
3	2	4	4	4	10	31	0.10	0.10	0.10	0.10	-	-	-	2.4
3	2	4	4	4	15	31	0.10	0.13	0.13	0.10	-	-	-	2.4
3	2	4	4	4	20	31	0.11	0.17	0.17	0.10	-	-	-	2.4
3	2	4	4	4	25	31	0.14	0.21	0.21	0.10	-	-	-	2.4
3	2	4	4	4	30	31	0.17	0.25	0.25	0.10	-	-	-	2.4
3	2	4	4	4	35	31	0.20	0.29	0.30	0.10	-	-	-	2.4
3	3	7	6	4	< 2	-	0.17	0.27	0.17	0.10	0.17	0.17	0.14	3.7
3	3	4	4	4	2 < 3	31	0.10	0.22	0.21	0.10	-	-	-	2.8
3	3	4	4	4	3 - 5	31	0.10	0.14	0.14	0.10	-	-	-	2.8
3	3	4	4	4	10	31	0.10	0.11	0.11	0.10	-	-	-	2.8
3	3	4	4	4	15	31	0.10	0.14	0.15	0.10	-	-	-	2.8
3	3	4	4	4	20	31	0.10	0.18	0.19	0.10	-	-	-	2.8
3	3	4	4	4	25	31	0.10	0.23	0.23	0.10	-	-	-	2.8
3	3	4	4	4	30	31	0.12	0.27	0.28	0.10	-	-	-	2.8
3	3	4	4	4	35	31	0.14	0.32	0.32	0.10	-	-	-	2.8

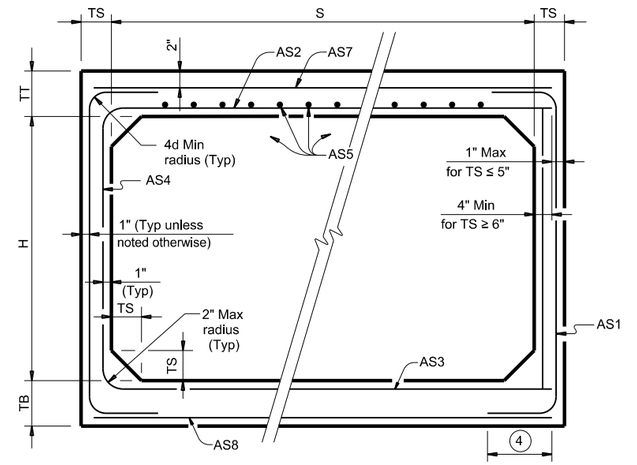
(1) For box length = 8'-0"

(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"

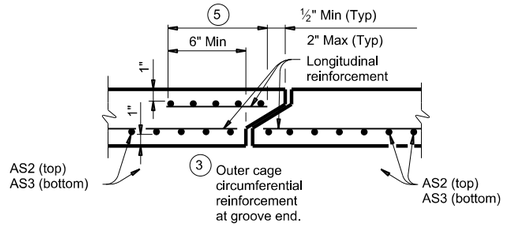
FILL HEIGHT 2 FT AND GREATER



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

3'-0" SPAN

SCP-3

FILE: CD-SCP03-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		165

DATE: 2/1/2024 6:46:17 AM
FILE: ...\STDS\CD-SCP03-20.dgn

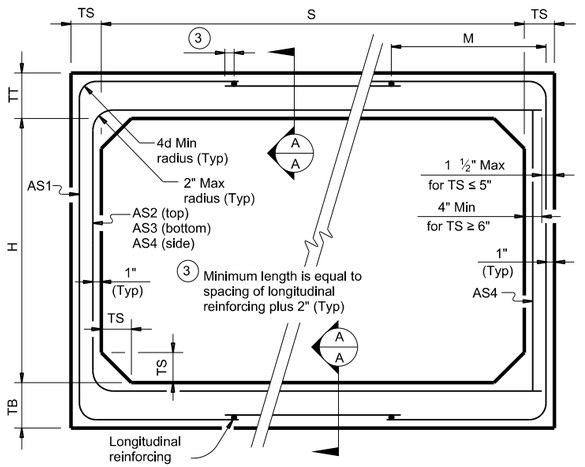
DATE: 2/1/2024 6:46:30 AM
FILE: ...\STDS\CD-SCP04-20.dgn

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)
4	2	7.5	6	5	< 2	-	0.18	0.27	0.15	0.12	0.18	0.18	0.14	4.5
4	2	5	5	5	2 < 3	38	0.18	0.19	0.17	0.12	-	-	-	3.6
4	2	5	5	5	3 - 5	38	0.13	0.13	0.13	0.12	-	-	-	3.6
4	2	5	5	5	10	38	0.12	0.12	0.12	0.12	-	-	-	3.6
4	2	5	5	5	15	38	0.14	0.16	0.16	0.12	-	-	-	3.6
4	2	5	5	5	20	38	0.18	0.20	0.21	0.12	-	-	-	3.6
4	2	5	5	5	25	38	0.23	0.25	0.25	0.12	-	-	-	3.6
4	2	5	5	5	30	38	0.28	0.30	0.30	0.12	-	-	-	3.6
4	3	7.5	6	5	< 2	-	0.18	0.31	0.18	0.12	0.18	0.18	0.14	5.0
4	3	5	5	5	2 < 3	38	0.15	0.23	0.20	0.12	-	-	-	4.1
4	3	5	5	5	3 - 5	38	0.12	0.16	0.16	0.12	-	-	-	4.1
4	3	5	5	5	10	38	0.12	0.14	0.14	0.12	-	-	-	4.1
4	3	5	5	5	15	38	0.12	0.18	0.18	0.12	-	-	-	4.1
4	3	5	5	5	20	38	0.14	0.23	0.24	0.12	-	-	-	4.1
4	3	5	5	5	25	38	0.17	0.29	0.29	0.12	-	-	-	4.1
4	3	5	5	5	30	38	0.21	0.35	0.35	0.12	-	-	-	4.1
4	4	7.5	6	5	< 2	-	0.18	0.33	0.20	0.12	0.18	0.18	0.14	5.5
4	4	5	5	5	2 < 3	38	0.12	0.26	0.23	0.12	-	-	-	4.6
4	4	5	5	5	3 - 5	38	0.12	0.18	0.18	0.12	-	-	-	4.6
4	4	5	5	5	10	38	0.12	0.15	0.15	0.12	-	-	-	4.6
4	4	5	5	5	15	38	0.12	0.19	0.20	0.12	-	-	-	4.6
4	4	5	5	5	20	38	0.12	0.25	0.25	0.12	-	-	-	4.6
4	4	5	5	5	25	38	0.14	0.31	0.31	0.12	-	-	-	4.6
4	4	5	5	5	30	38	0.17	0.37	0.37	0.12	-	-	-	4.6

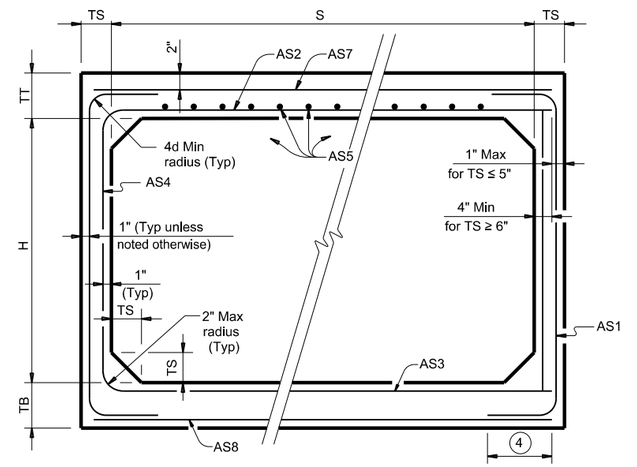
(1) For box length = 8'-0"

(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"

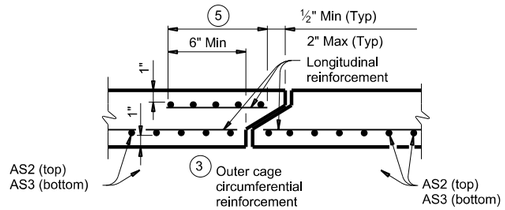
FILL HEIGHT 2 FT AND GREATER



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

4'-0" SPAN

SCP-4

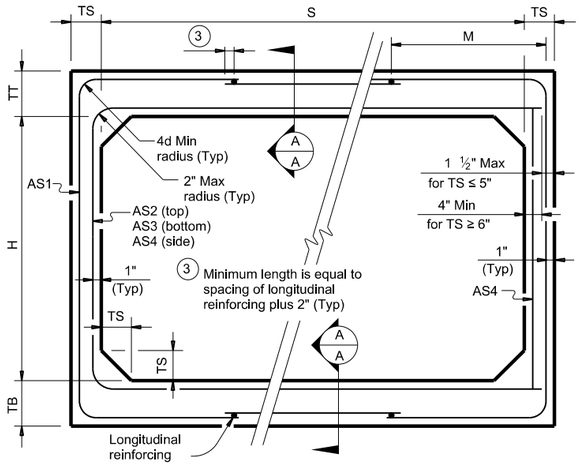
FILE: CD-SCP04-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		166

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

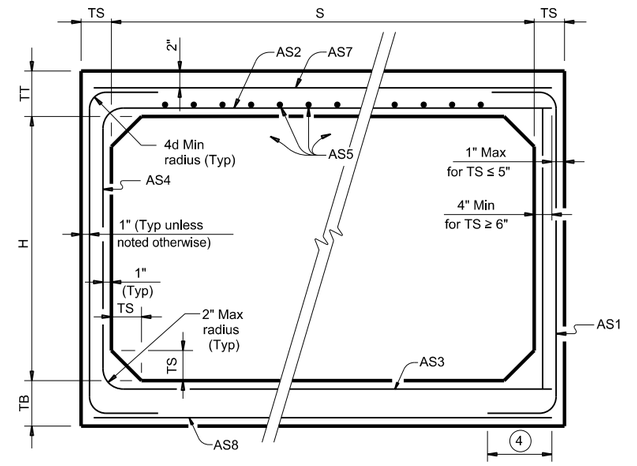
(1) For box length = 8'-0"

(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"

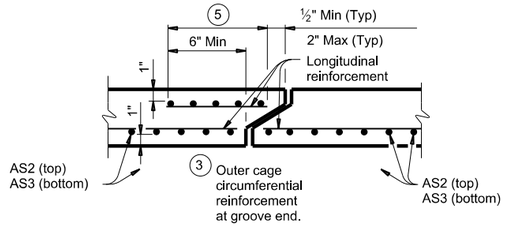
FILL HEIGHT 2 FT AND GREATER



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:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		167

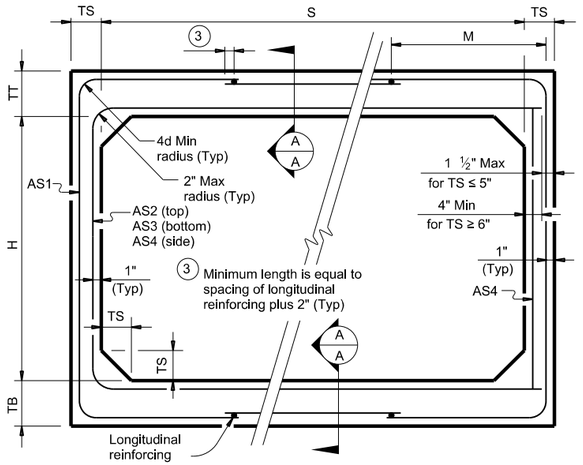
DATE: 2/1/2024 6:46:44 AM
FILE: ...\STDS\CD-SCP05-20.dgn

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

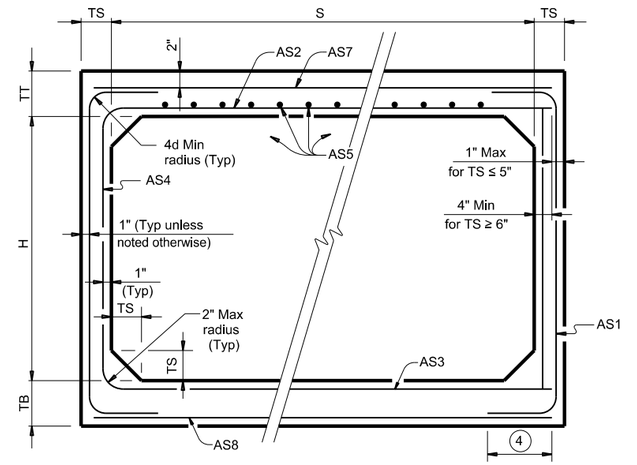
(1) For box length = 8'-0"

(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"

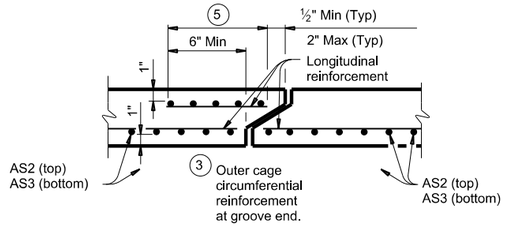
FILL HEIGHT 2 FT AND GREATER



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: CD-SCP08-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	2174	01	018	FM 2311
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	WAC	McLENNAN		168

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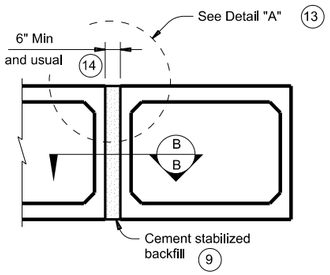
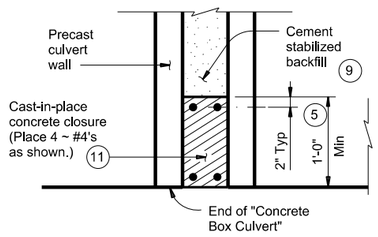
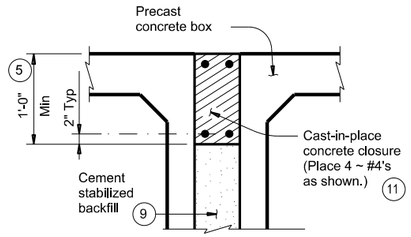


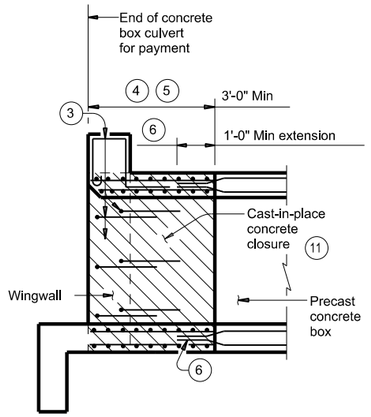
MULTIPLE UNIT PLACEMENT



SECTION B-B

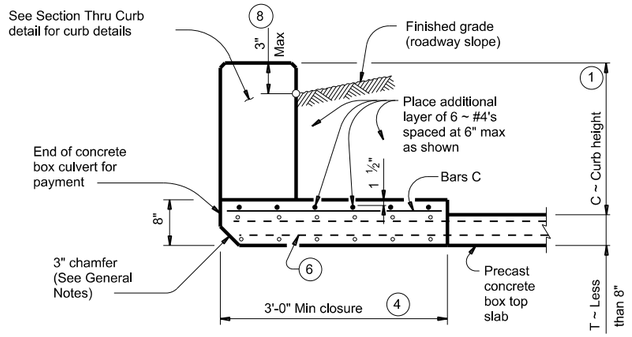


DETAIL "A" (13)

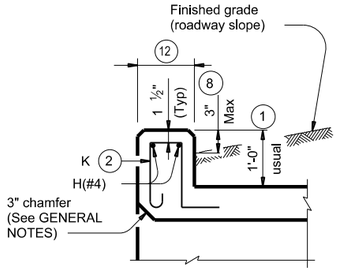


WINGWALL CONNECTION

(Also applies to safety end treatment.)

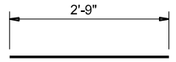


SECTION THRU TOP SLABS LESS THAN 8"

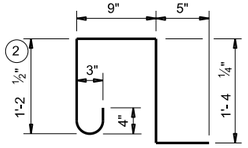


SECTION THRU CURB

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")

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.

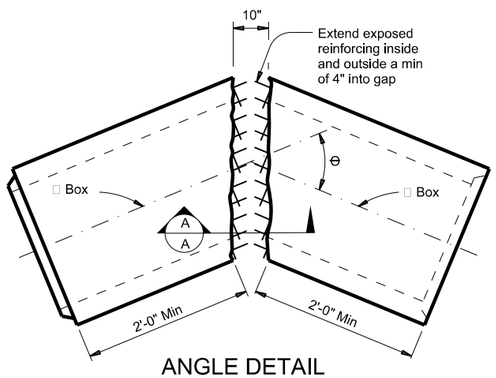
MATERIAL NOTES:

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.

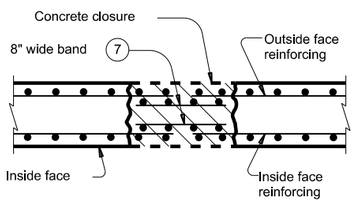
GENERAL NOTES:

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.

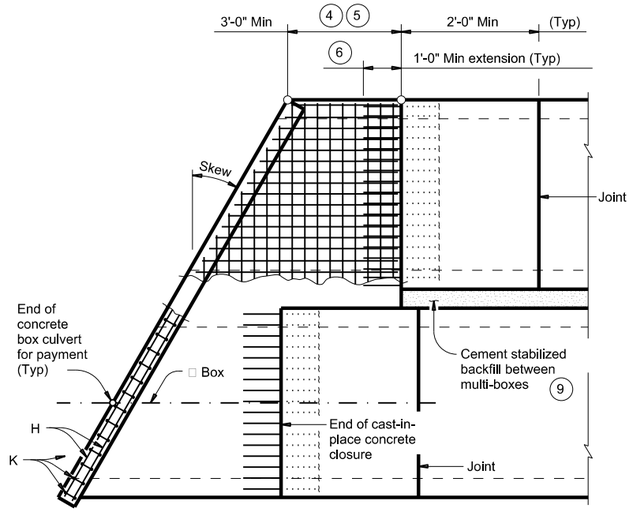
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bars dimensions are out-to-out of bars.



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

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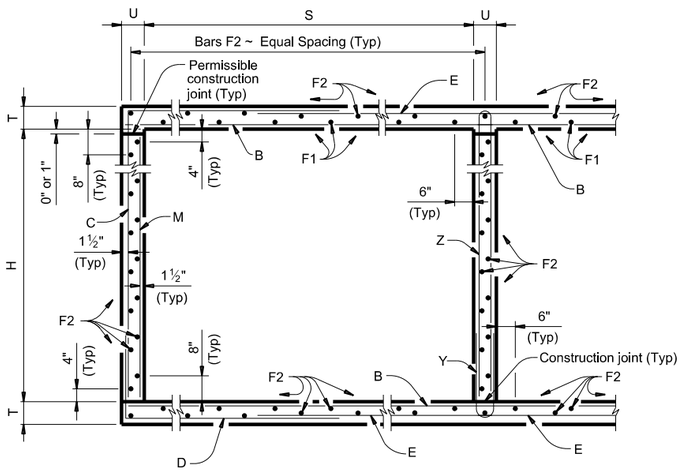
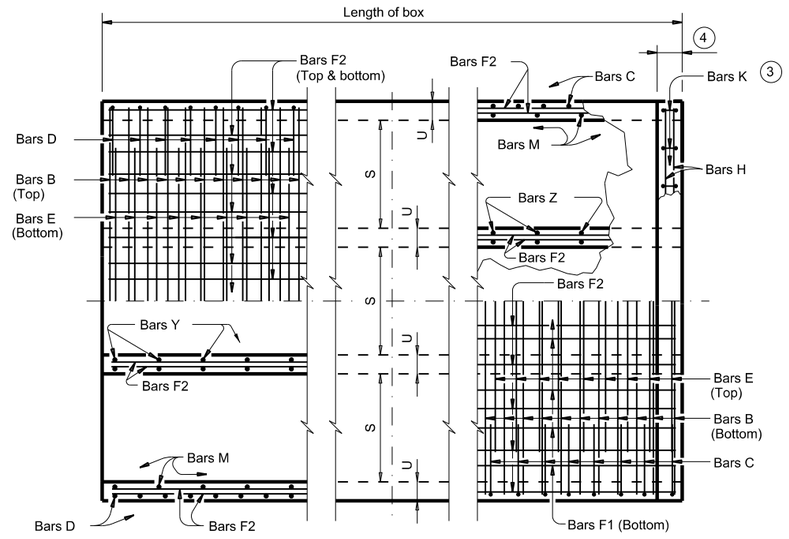


TYPICAL SECTION



BOTTOM SLAB

TOP SLAB

PART PLANS

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

2. For vehicle safety, the following requirements must be met:
   · For structures without bridge rail, construct curbs no more than 3" above finished grade.
   · For structures with bridge rail, construct curbs flush with finished grade.
   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

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

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

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

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

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.

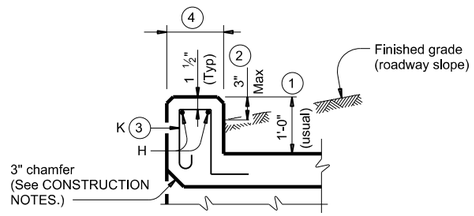
MATERIAL NOTES:

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:

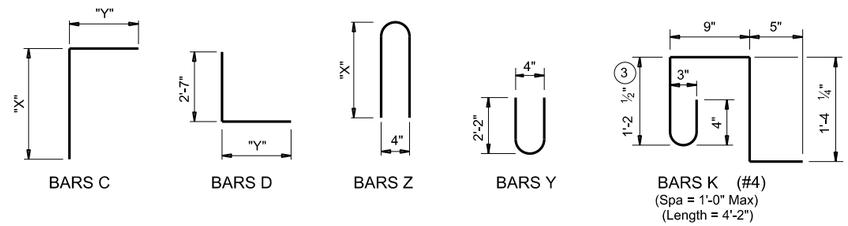
Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

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



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"



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: CD-MC520-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
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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	
	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	Bars Y Length	Bars Y Wt	Bars Z Length	Bars Z Wt	No.	Spa	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
5	5' - 0"	4' - 0"	8"	7"	108	#6	9"	28' - 3"	4,583	108	#5	9"	8' - 3"	929	6' - 4"	713	108	#5	9"	25' - 5"	2,863	20	18"	39' - 9"	531	98	18"	39' - 9"	2,602	108	9"	4' - 0"	289	216	9"	4' - 7"	661	9' - 3"	1,335	28' - 3"	75	60	167	1.926	362.7	2.1	242	79.1	14,748
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

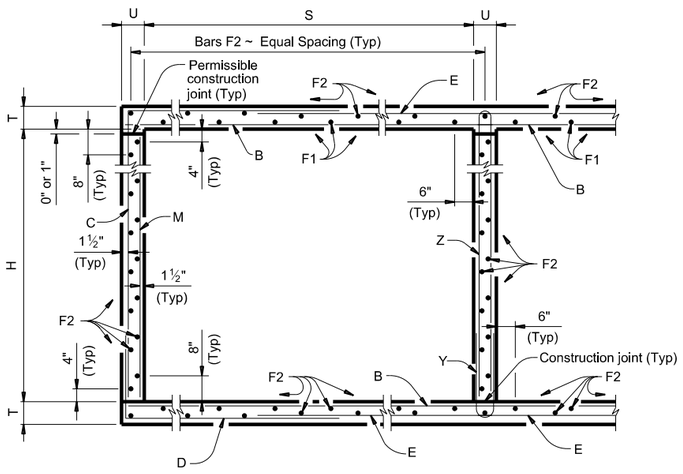
Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

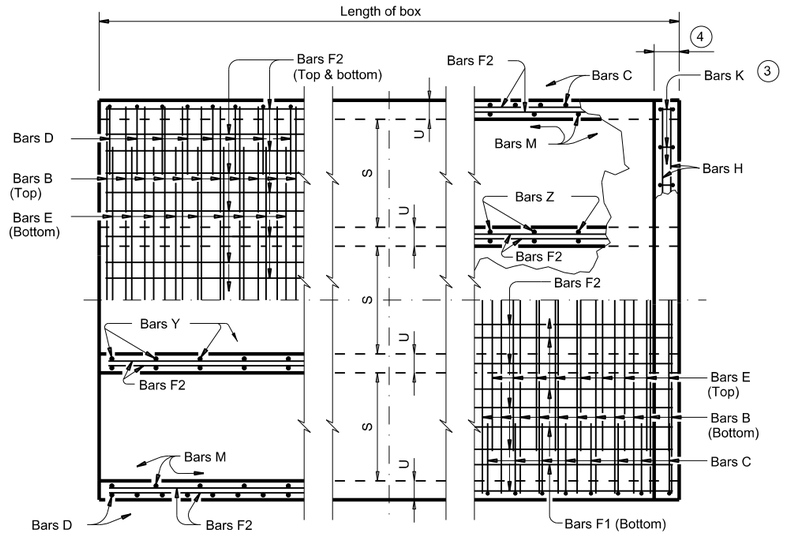
5'-0" SPAN
0' TO 20' FILL

MC-5-20

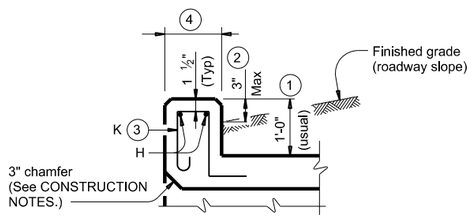
FILE: CD-MC520-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		171



TYPICAL SECTION

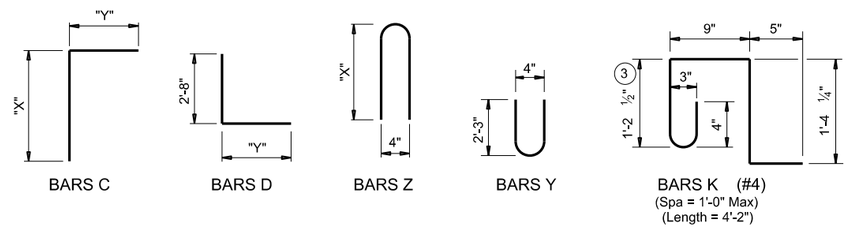


PART PLANS



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"



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

6'-0" SPAN
0' TO 16' FILL

MC-6-16

FILE: CD-MC616-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		172

DATE: 2/1/2024 6:47:44 AM
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DATE: 2/1/2024 6:47:45 AM
FILE: ...\STDS\CD-MC616-20.dgn

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	6' - 0"	2' - 0"	9"	7"	108	#6	9"	13' - 6"	2,190	108	#5	9"	6' - 8"	751	6' - 9"	760	108	#6	9"	10' - 2"	1,649	10	18"	39' - 9"	266	44	18"	39' - 9"	1,168	108	9"	2' - 0"	144	54	9"	4' - 9"	171	5' - 5"	195	13' - 6"	36	30	84	0.894	182.4	1.0	120	36.8	7,414
3	6' - 0"	2' - 0"	9"	7"	108	#6	9"	20' - 1"	3,258	108	#5	9"	6' - 8"	751	6' - 9"	760	108	#6	9"	16' - 9"	2,717	15	18"	39' - 9"	398	63	18"	39' - 9"	1,673	108	9"	2' - 0"	144	108	9"	4' - 9"	343	5' - 5"	391	20' - 1"	54	44	122	1.302	260.9	1.5	176	53.6	10,611
4	6' - 0"	2' - 0"	9"	7"	108	#6	9"	26' - 8"	4,326	108	#5	9"	6' - 8"	751	6' - 9"	760	108	#6	9"	23' - 4"	3,785	20	18"	39' - 9"	531	82	18"	39' - 9"	2,177	108	9"	2' - 0"	144	162	9"	4' - 9"	514	5' - 5"	586	26' - 8"	71	56	156	1.711	339.4	2.0	227	70.4	13,801
5	6' - 0"	2' - 0"	9"	7"	108	#6	9"	33' - 3"	5,394	108	#5	9"	6' - 8"	751	6' - 9"	760	108	#6	9"	29' - 11"	4,853	25	18"	39' - 9"	664	101	18"	39' - 9"	2,682	108	9"	2' - 0"	144	216	9"	4' - 9"	685	5' - 5"	782	33' - 3"	89	70	195	2.120	417.9	2.5	284	87.3	16,999
6	6' - 0"	2' - 0"	9"	7"	108	#6	9"	39' - 10"	6,462	108	#5	9"	6' - 8"	751	6' - 9"	760	108	#6	9"	36' - 6"	5,921	30	18"	39' - 9"	797	120	18"	39' - 9"	3,186	108	9"	2' - 0"	144	270	9"	4' - 9"	857	5' - 5"	977	39' - 10"	106	82	228	2.529	496.4	3.0	334	104.1	20,189
2	6' - 0"	3' - 0"	9"	7"	108	#6	9"	13' - 6"	2,190	108	#5	9"	7' - 8"	864	6' - 9"	760	108	#6	9"	10' - 2"	1,649	10	18"	39' - 9"	266	50	18"	39' - 9"	1,328	108	9"	3' - 0"	216	54	9"	4' - 9"	171	7' - 5"	268	13' - 6"	36	30	84	0.958	192.8	1.0	120	39.3	7,832
3	6' - 0"	3' - 0"	9"	7"	108	#6	9"	20' - 1"	3,258	108	#5	9"	7' - 8"	864	6' - 9"	760	108	#6	9"	16' - 9"	2,717	15	18"	39' - 9"	398	71	18"	39' - 9"	1,885	108	9"	3' - 0"	216	108	9"	4' - 9"	343	7' - 5"	535	20' - 1"	54	44	122	1.389	274.4	1.5	176	57.1	11,152
4	6' - 0"	3' - 0"	9"	7"	108	#6	9"	26' - 8"	4,326	108	#5	9"	7' - 8"	864	6' - 9"	760	108	#6	9"	23' - 4"	3,785	20	18"	39' - 9"	531	92	18"	39' - 9"	2,443	108	9"	3' - 0"	216	162	9"	4' - 9"	514	7' - 5"	803	26' - 8"	71	56	156	1.819	356.1	2.0	227	74.7	14,469
5	6' - 0"	3' - 0"	9"	7"	108	#6	9"	33' - 3"	5,394	108	#5	9"	7' - 8"	864	6' - 9"	760	108	#6	9"	29' - 11"	4,853	25	18"	39' - 9"	664	113	18"	39' - 9"	3,000	108	9"	3' - 0"	216	216	9"	4' - 9"	685	7' - 5"	1,070	33' - 3"	89	70	195	2.250	437.7	2.5	284	92.5	17,790
6	6' - 0"	3' - 0"	9"	7"	108	#6	9"	39' - 10"	6,462	108	#5	9"	7' - 8"	864	6' - 9"	760	108	#6	9"	36' - 6"	5,921	30	18"	39' - 9"	797	134	18"	39' - 9"	3,558	108	9"	3' - 0"	216	270	9"	4' - 9"	857	7' - 5"	1,338	39' - 10"	106	82	228	2.681	519.3	3.0	334	110.2	21,107
2	6' - 0"	4' - 0"	9"	7"	108	#6	9"	13' - 6"	2,190	108	#5	9"	8' - 8"	976	6' - 9"	760	108	#6	9"	10' - 2"	1,649	10	18"	39' - 9"	266	50	18"	39' - 9"	1,328	108	9"	4' - 0"	289	54	9"	4' - 9"	171	9' - 5"	340	13' - 6"	36	30	84	1.023	199.2	1.0	120	41.9	8,089
3	6' - 0"	4' - 0"	9"	7"	108	#6	9"	20' - 1"	3,258	108	#5	9"	8' - 8"	976	6' - 9"	760	108	#6	9"	16' - 9"	2,717	15	18"	39' - 9"	398	71	18"	39' - 9"	1,885	108	9"	4' - 0"	289	108	9"	4' - 9"	343	9' - 5"	679	20' - 1"	54	44	122	1.475	282.6	1.5	176	60.5	11,481
4	6' - 0"	4' - 0"	9"	7"	108	#6	9"	26' - 8"	4,326	108	#5	9"	8' - 8"	976	6' - 9"	760	108	#6	9"	23' - 4"	3,785	20	18"	39' - 9"	531	92	18"	39' - 9"	2,443	108	9"	4' - 0"	289	162	9"	4' - 9"	514	9' - 5"	1,019	26' - 8"	71	56	156	1.927	366.1	2.0	227	79.1	14,870
5	6' - 0"	4' - 0"	9"	7"	108	#6	9"	33' - 3"	5,394	108	#5	9"	8' - 8"	976	6' - 9"	760	108	#6	9"	29' - 11"	4,853	25	18"	39' - 9"	664	113	18"	39' - 9"	3,000	108	9"	4' - 0"	289	216	9"	4' - 9"	685	9' - 5"	1,359	33' - 3"	89	70	195	2.380	449.5	2.5	284	97.7	18,264
6	6' - 0"	4' - 0"	9"	7"	108	#6	9"	39' - 10"	6,462	108	#5	9"	8' - 8"	976	6' - 9"	760	108	#6	9"	36' - 6"	5,921	30	18"	39' - 9"	797	134	18"	39' - 9"	3,558	108	9"	4' - 0"	289	270	9"	4' - 9"	857	9' - 5"	1,698	39' - 10"	106	82	228	2.832	533.0	3.0	334	116.2	21,652
2	6' - 0"	5' - 0"	9"	7"	108	#6	9"	13' - 6"	2,190	108	#5	9"	9' - 8"	1,089	6' - 9"	760	108	#6	9"	10' - 2"	1,649	10	18"	39' - 9"	266	56	18"	39' - 9"	1,487	108	9"	5' - 0"	361	54	9"	4' - 9"	171	11' - 5"	412	13' - 6"	36	30	84	1.088	209.6	1.0	120	44.5	8,505
3	6' - 0"	5' - 0"	9"	7"	108	#6	9"	20' - 1"	3,258	108	#5	9"	9' - 8"	1,089	6' - 9"	760	108	#6	9"	16' - 9"	2,717	15	18"	39' - 9"	398	79	18"	39' - 9"	2,098	108	9"	5' - 0"	361	108	9"	4' - 9"	343	11' - 5"	824	20' - 1"	54	44	122	1.562	296.2	1.5	176	64.0	12,024
4	6' - 0"	5' - 0"	9"	7"	108	#6	9"	26' - 8"	4,326	108	#5	9"	9' - 8"	1,089	6' - 9"	760	108	#6	9"	23' - 4"	3,785	20	18"	39' - 9"	531	102	18"	39' - 9"	2,708	108	9"	5' - 0"	361	162	9"	4' - 9"	514	11' - 5"	1,235	26' - 8"	71	56	156	2.035	382.7	2.0	227	83.4	15,536
5	6' - 0"	5' - 0"	9"	7"	108	#6	9"	33' - 3"	5,394	108	#5	9"	9' - 8"	1,089	6' - 9"	760	108	#6	9"	29' - 11"	4,853	25	18"	39' - 9"	664	125	18"	39' - 9"	3,319	108	9"	5' - 0"	361	216	9"	4' - 9"	685	11' - 5"	1,647	33' - 3"	89	70	195	2.509	469.3	2.5	284	102.8	19,056
6	6' - 0"	5' - 0"	9"	7"	108	#6	9"	39' - 10"	6,462	108	#5	9"	9' - 8"	1,089	6' - 9"	760	108	#6	9"	36' - 6"	5,921	30	18"	39' - 9"	797	148	18"	39' - 9"	3,930	108	9"	5' - 0"	361	270	9"	4' - 9"	857	11' - 5"	2,059	39' - 10"	106	82	228	2.983	555.9	3.0	334	122.3	22,570
2	6' - 0"	6' - 0"	9"	7"	108	#6	9"	13' - 6"	2,190	108	#5	9"	10' - 8"	1,202	6' - 9"	760	108	#6	9"	10' - 2"	1,649	10	18"	39' - 9"	266	62	18"	39' - 9"	1,646	108	9"	6' - 0"	433	54	9"	4' - 9"	171	13' - 5"	484	13' - 6"	36	30	84	1.153	220.0	1.0	120	47.1	8,921
3	6' - 0"	6' - 0"	9"	7"	108	#6	9"	20' - 1"	3,258	108	#5	9"	10' - 8"	1,202	6' - 9"	760	108	#6	9"	16' - 9"	2,717	15	18"	39' - 9"	398	87	18"	39' - 9"	2,310	108	9"	6' - 0"	433	108	9"	4' - 9"	343	13' - 5"	968	20' - 1"	54	44	122	1.648	309.7	1.5	176	67.4	12,565
4	6' - 0"	6' - 0"	9"	7"	108	#6	9"	26' - 8"	4,326	108	#5	9"	10' - 8"	1,202	6' - 9"	760	108	#6	9"	23' - 4"	3,785	20	18"	39' - 9"	531	112	18"	39' - 9"	2,974	108	9"	6' - 0"	433	162	9"	4' - 9"	514	13' - 5"	1,452	26' - 8"	71	56	156	2.144	399.4	2.0	227	87.7	16,204
5	6' - 0"	6' - 0"	9"	7"	108	#6	9"	33' - 3"	5,394	108	#5	9"	10' - 8"	1,202	6' - 9"	760	108	#6	9"	29' - 11"	4,853	25	18"	39' - 9"	664	137	18"	39' - 9"	3,638	108	9"	6' - 0"	433	216	9"	4' - 9"	685	13' - 5"	1,936	33' - 3"	89	70	195	2.639	489.1	2.5	284	108.0	19,849
6	6' - 0"	6' - 0"	9"	7"	108	#6	9"	39' - 10"	6,462	108	#5	9"	10' - 8"	1,202	6' - 9"	760	108	#6	9"	36' - 6"	5,921	30	18"	39' - 9"	797	162	18"	39' - 9"	4,302	108	9"	6' - 0"	433	270	9"	4' - 9"	857	13' - 5"	2,420	39' - 10"	106	82	228	3.134	578.9	3.0	334	128.3	23,488

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

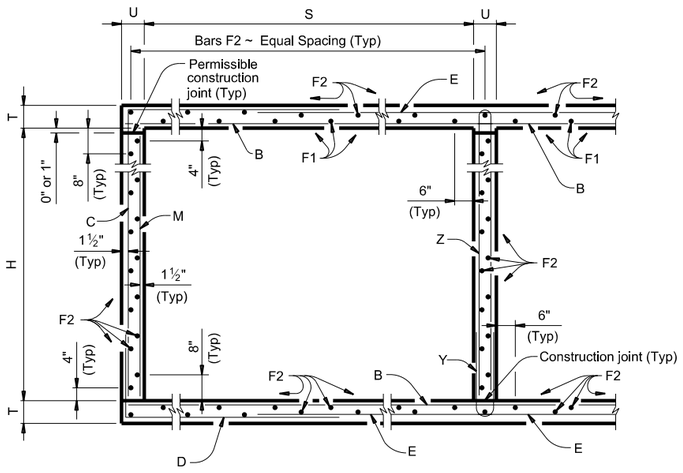
Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

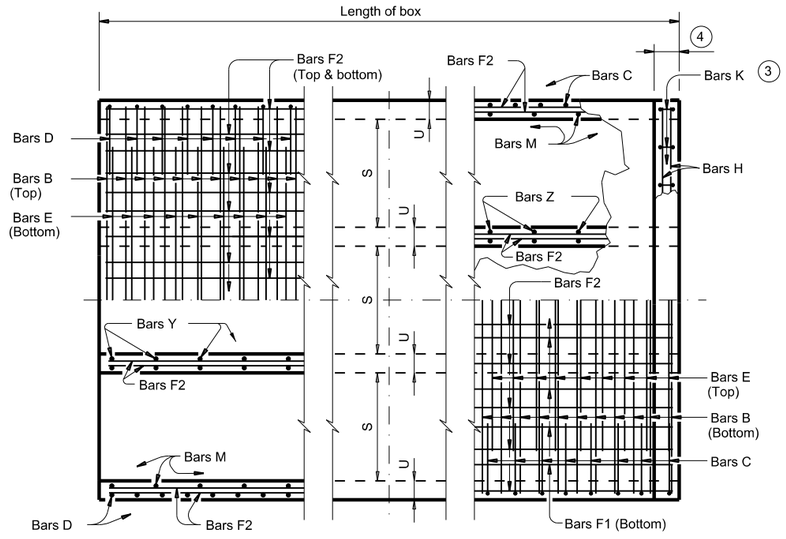
6'-0" SPAN
0' TO 16' FILL

MC-6-16

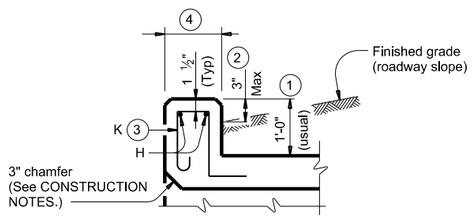
FILE: CD-MC616-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		173



TYPICAL SECTION

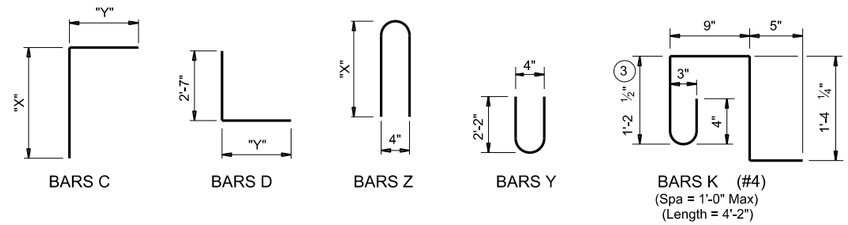


PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
3'-0"	3'-6 ½"	4'-5"
4'-0"	4'-6 ½"	4'-5"
5'-0"	5'-6 ½"	4'-5"
6'-0"	6'-6 ½"	4'-5"
7'-0"	7'-6 ½"	4'-5"



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

7'-0" SPAN
0' TO 10' FILL

MC-7-10

FILE: CD-MC710-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		174

DATE: 2/1/2024 6:48:00 AM
FILE: ...\STDS\CD-MC710-20.dgn

DATE: 2/1/2024 6:48:01 AM
FILE: ...\STDS\CD-MC710-20.dgn

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	Bars Y Length	Bars Y Wt	Bars Z Length	Bars Z Wt	No.	Spa	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	7' - 0"	3' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	54	18"	39' - 9"	1,434	108	9"	3' - 0"	216	54	9"	4' - 7"	165	7' - 3"	262	15' - 6"	41	34	95	0.972	230.8	1.2	136	40.0	9,366
3	7' - 0"	3' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	77	18"	39' - 9"	2,045	108	9"	3' - 0"	216	108	9"	4' - 7"	331	7' - 3"	523	23' - 1"	62	50	139	1.412	321.5	1.7	201	58.2	13,061
4	7' - 0"	3' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	100	18"	39' - 9"	2,655	108	9"	3' - 0"	216	162	9"	4' - 7"	496	7' - 3"	785	30' - 8"	82	64	178	1.851	412.3	2.3	260	76.3	16,751
5	7' - 0"	3' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	123	18"	39' - 9"	3,266	108	9"	3' - 0"	216	216	9"	4' - 7"	661	7' - 3"	1,046	38' - 3"	102	80	223	2.290	503.0	2.8	325	94.4	20,446
6	7' - 0"	3' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	146	18"	39' - 9"	3,877	108	9"	3' - 0"	216	270	9"	4' - 7"	827	7' - 3"	1,308	45' - 10"	122	94	262	2.729	593.9	3.4	384	112.6	24,138
2	7' - 0"	4' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	54	18"	39' - 9"	1,434	108	9"	4' - 0"	289	54	9"	4' - 7"	165	9' - 3"	334	15' - 6"	41	34	95	1.037	238.6	1.2	136	42.6	9,680
3	7' - 0"	4' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	77	18"	39' - 9"	2,045	108	9"	4' - 0"	289	108	9"	4' - 7"	331	9' - 3"	667	23' - 1"	62	50	139	1.498	331.2	1.7	201	61.6	13,447
4	7' - 0"	4' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	100	18"	39' - 9"	2,655	108	9"	4' - 0"	289	162	9"	4' - 7"	496	9' - 3"	1,001	30' - 8"	82	64	178	1.959	423.7	2.3	260	80.6	17,209
5	7' - 0"	4' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	123	18"	39' - 9"	3,266	108	9"	4' - 0"	289	216	9"	4' - 7"	661	9' - 3"	1,335	38' - 3"	102	80	223	2.420	516.3	2.8	325	99.6	20,977
6	7' - 0"	4' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	146	18"	39' - 9"	3,877	108	9"	4' - 0"	289	270	9"	4' - 7"	827	9' - 3"	1,668	45' - 10"	122	94	262	2.881	608.9	3.4	384	118.6	24,740
2	7' - 0"	5' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	60	18"	39' - 9"	1,593	108	9"	5' - 0"	361	54	9"	4' - 7"	165	11' - 3"	406	15' - 6"	41	34	95	1.102	250.4	1.2	136	45.2	10,152
3	7' - 0"	5' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	85	18"	39' - 9"	2,257	108	9"	5' - 0"	361	108	9"	4' - 7"	331	11' - 3"	812	23' - 1"	62	50	139	1.584	346.1	1.7	201	65.1	14,045
4	7' - 0"	5' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	110	18"	39' - 9"	2,921	108	9"	5' - 0"	361	162	9"	4' - 7"	496	11' - 3"	1,217	30' - 8"	82	64	178	2.067	441.8	2.3	260	85.0	17,932
5	7' - 0"	5' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	135	18"	39' - 9"	3,585	108	9"	5' - 0"	361	216	9"	4' - 7"	661	11' - 3"	1,623	38' - 3"	102	80	223	2.549	537.5	2.8	325	104.8	21,825
6	7' - 0"	5' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	160	18"	39' - 9"	4,248	108	9"	5' - 0"	361	270	9"	4' - 7"	827	11' - 3"	2,029	45' - 10"	122	94	262	3.032	633.2	3.4	384	124.7	25,713
2	7' - 0"	6' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	66	18"	39' - 9"	1,752	108	9"	6' - 0"	433	54	9"	4' - 7"	165	13' - 3"	478	15' - 6"	41	34	95	1.167	262.2	1.2	136	47.8	10,624
3	7' - 0"	6' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	93	18"	39' - 9"	2,469	108	9"	6' - 0"	433	108	9"	4' - 7"	331	13' - 3"	956	23' - 1"	62	50	139	1.671	361.0	1.7	201	68.6	14,642
4	7' - 0"	6' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	120	18"	39' - 9"	3,186	108	9"	6' - 0"	433	162	9"	4' - 7"	496	13' - 3"	1,434	30' - 8"	82	64	178	2.175	459.9	2.3	260	89.3	18,655
5	7' - 0"	6' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	147	18"	39' - 9"	3,903	108	9"	6' - 0"	433	216	9"	4' - 7"	661	13' - 3"	1,912	38' - 3"	102	80	223	2.679	558.7	2.8	325	110.0	22,673
6	7' - 0"	6' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	174	18"	39' - 9"	4,620	108	9"	6' - 0"	433	270	9"	4' - 7"	827	13' - 3"	2,390	45' - 10"	122	94	262	3.183	657.6	3.4	384	130.7	26,687
2	7' - 0"	7' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	66	18"	39' - 9"	1,752	108	9"	7' - 0"	505	54	9"	4' - 7"	165	15' - 3"	550	15' - 6"	41	34	95	1.231	270.0	1.2	136	50.4	10,937
3	7' - 0"	7' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	93	18"	39' - 9"	2,469	108	9"	7' - 0"	505	108	9"	4' - 7"	331	15' - 3"	1,100	23' - 1"	62	50	139	1.757	370.7	1.7	201	72.0	15,027
4	7' - 0"	7' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	120	18"	39' - 9"	3,186	108	9"	7' - 0"	505	162	9"	4' - 7"	496	15' - 3"	1,650	30' - 8"	82	64	178	2.283	471.3	2.3	260	93.6	19,112
5	7' - 0"	7' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	147	18"	39' - 9"	3,903	108	9"	7' - 0"	505	216	9"	4' - 7"	661	15' - 3"	2,200	38' - 3"	102	80	223	2.809	571.9	2.8	325	115.2	23,202
6	7' - 0"	7' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	174	18"	39' - 9"	4,620	108	9"	7' - 0"	505	270	9"	4' - 7"	827	15' - 3"	2,750	45' - 10"	122	94	262	3.334	672.6	3.4	384	136.8	27,288

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

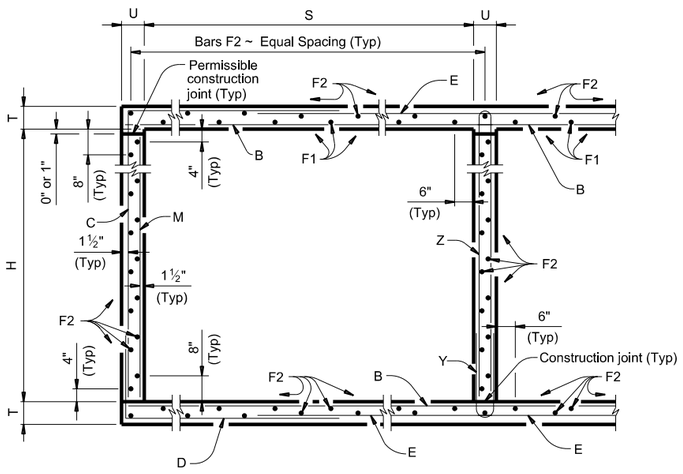
Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

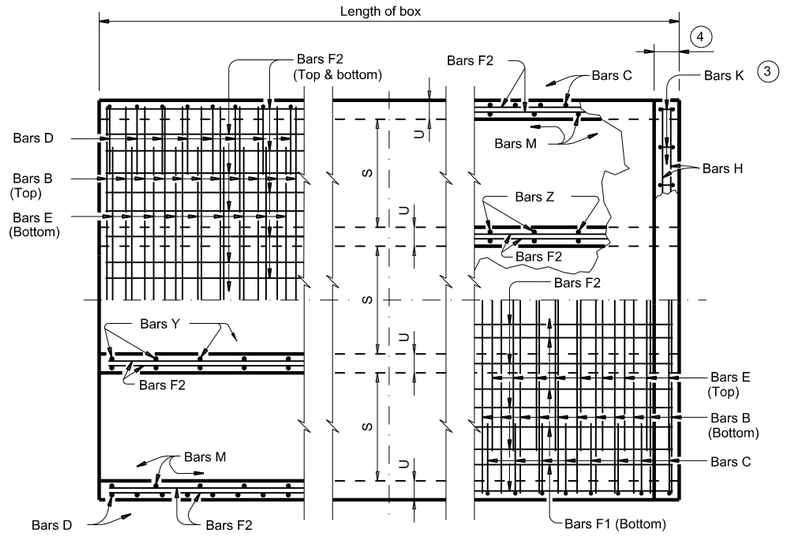
7'-0" SPAN
0' TO 10' FILL

MC-7-10

FILE: CD-MC710-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		175



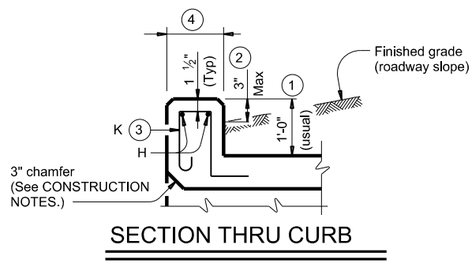
TYPICAL SECTION



BOTTOM SLAB

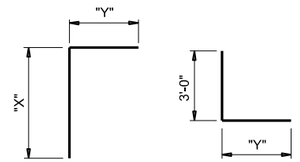
TOP SLAB

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: CD-MC813-20.dgn	DN: TBE		CK: BMP	DW: TxDOT		CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB		HIGHWAY	
REVISIONS	2174	01	018		FM 2311	
	DIST	COUNTY				SHEET NO.
	WAC	McLENNAN				176

DATE: 2/1/2024 6:48:16 AM
FILE: ...\STDS\CD-MC813-20.dgn

DATE: 2/1/2024 6:48:16 AM
FILE: ...\SFDS\CD-MC813-20.dgn

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	Bars Y Length	Bars Y Wt	Bars Z Length	Bars Z Wt	No.	Spa	Length	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

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: CD-MC813-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
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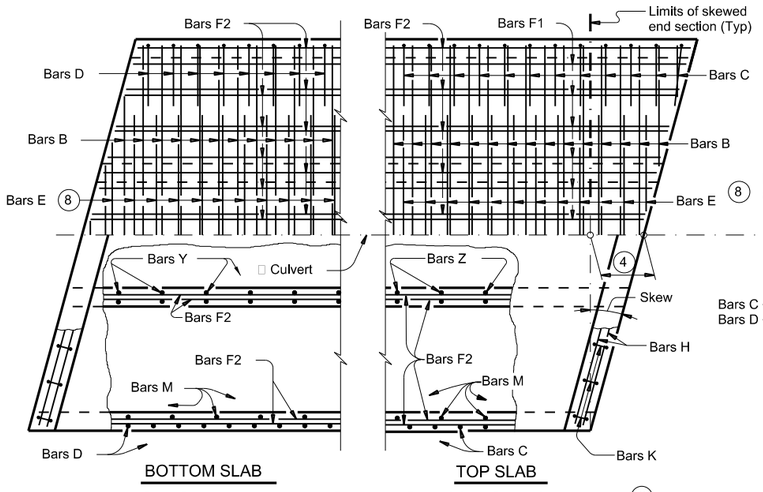
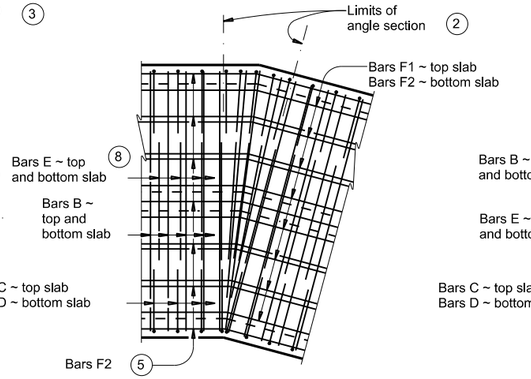
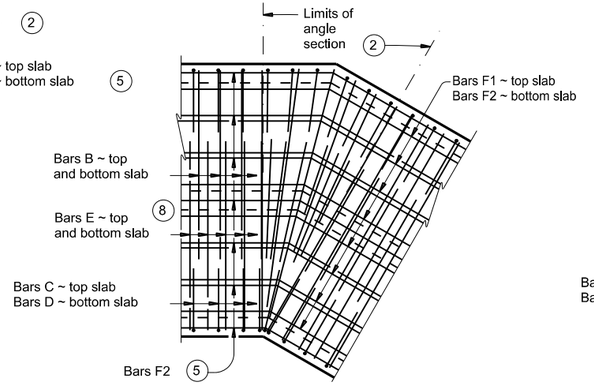
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		177



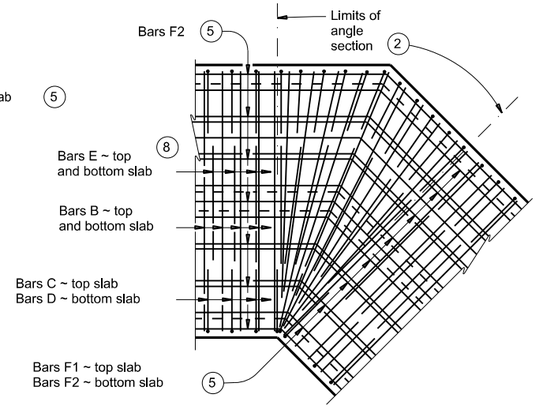
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



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: CD-MC-MD-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		178

DATE: 2/1/2024 6:48:31 AM
FILE: ...\STDS\CD-MC-MD-20.dgn

DATE: 2/1/2024 6:48:47 AM
FILE: ...\S. Drainage\STDS\CD-PW-20.dgn

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

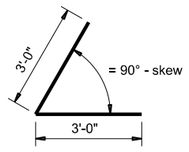
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
Maximum Wingwall Height Hw	W	X	Y	Z	Bars J1		Bars J2					
					Size	Spa	Size	Spa	Reinf Lb/Ft	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#4	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)

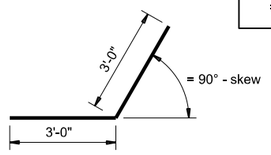
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

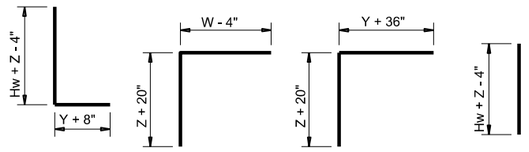
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION FORMULAS:

(All values are in feet.)

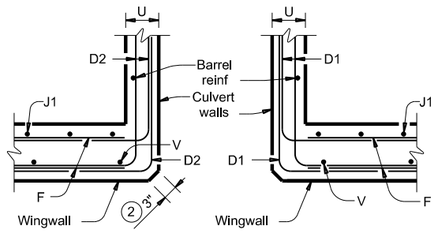
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw 4' ≥
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw 4' <

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

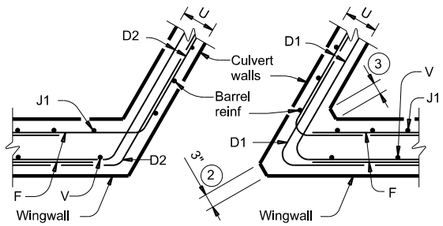
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) + 6 SF for Type PW-2 and Hw 4' ≥
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw 4' <

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

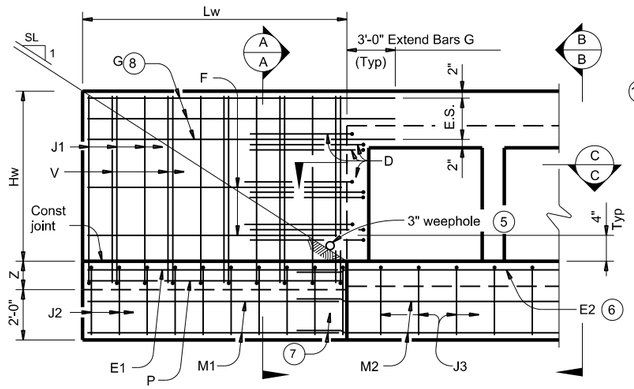
See applicable box culvert standard sheet for S, H, T, and U values.



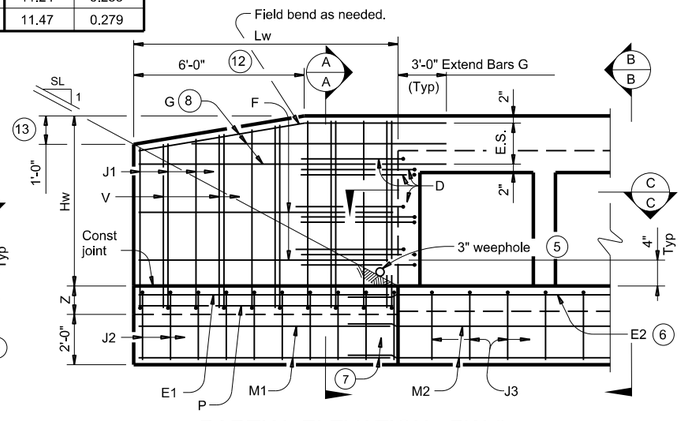
SECTION C-C - PW-1



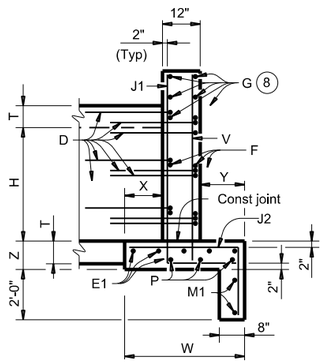
SECTION C-C - PW-2



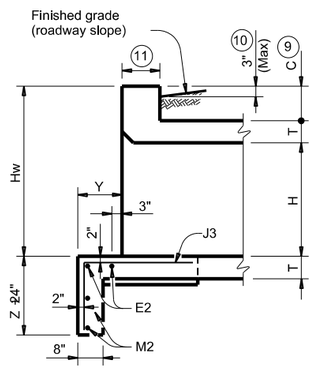
PARTIAL ELEVATION - PW-1



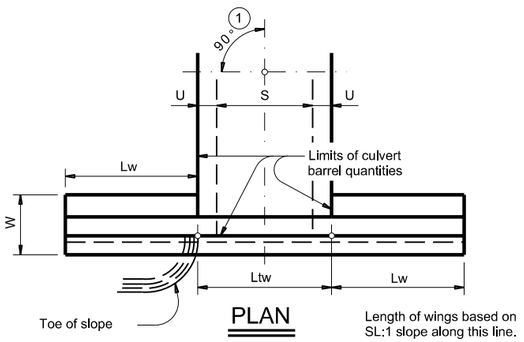
PARTIAL ELEVATION - PW-2



SECTION A-A
(Showing wing reinforcement.)



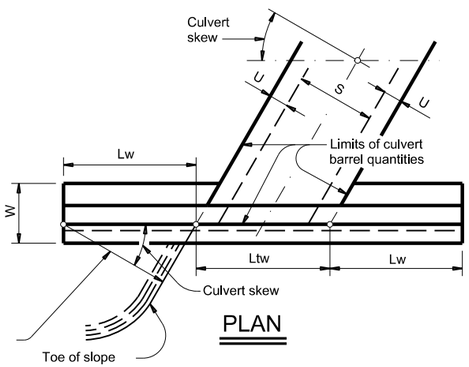
SECTION B-B
(Showing wing reinforcement.)



PLAN

Length of wings based on SL:1 slope along this line.

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

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 elsewhere in the plans.
12. 3'-0" for Hw < 4'.
13. 6" for Hw < 4'.

DESIGNER NOTES:
Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW-2 can only be used for applications without a railing mounted to the wingwall.

MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized 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: CD-PW-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
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REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		179

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing length (Two~Wings) (3)	
					Bars J1		Bars J2			
Maximum Wingwall Height (10) Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'- 8"	1'- 9"	1'- 3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'- 2"	2'- 0"	1'- 6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'- 8"	2'- 3"	1'- 9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'- 2"	2'- 6"	2'- 0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'- 8"	2'- 9"	2'- 3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'- 2"	3'- 0"	2'- 6"	9"	#7	6"	#5	6"	162.29	0.721

TABLE OF WINGWALL REINFORCING (Two~Wings)

Bar	Size	No.	Spa
DL & DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RL	#5	3	~
RS	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

TABLE OF ESTIMATED ANCHOR TOEWALL QUANTITIES

Bar	Size	No.	Spa
K	#4	~	1'-0"
N	#5	6	~
OL	#4	3	~
OS	#4	3	~
Reinf (Lb/Ft)			9.82
Conc (CY/Ft)			0.074

(1) Extend Bars P 3'-0" Min into bottom slab of box culvert.

(2) Adjust to fit as necessary to maintain 11#2" clearcover and 4" Min between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by 0.5 (A Lw). +

(4) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap." Unless otherwise shown on the plans or directed by the Engineer, extend construction joints or grooved joints, oriented in the direction of flow, across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B is not required.

(6) At Contractor's option, end the culvert toewall flush with wingwall toewall. Adjust reinforcing as needed.

(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet.

(8) For vehicle safety, reduce curb heights, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

(9) Culvert skew (limit to 15° or 30°)

(10) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

(11) Typical wingwall angle for all skews.

TABLE OF MAXIMUM WING HEIGHTS (10)

Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"

WING DIMENSION CALCULATIONS:

Formulas:

Hw = H + T + C - 0.250' (10)

A = (Hw - 0.333') (SL)

B = (A) [tan (θ + 15°)]

Lw = (A) ÷ [cos (θ + 15°)]

For cast-in-place culverts:

Ltw = [(N) (S) + (N + 1) (U)] ÷ (cos θ)

For precast culverts:

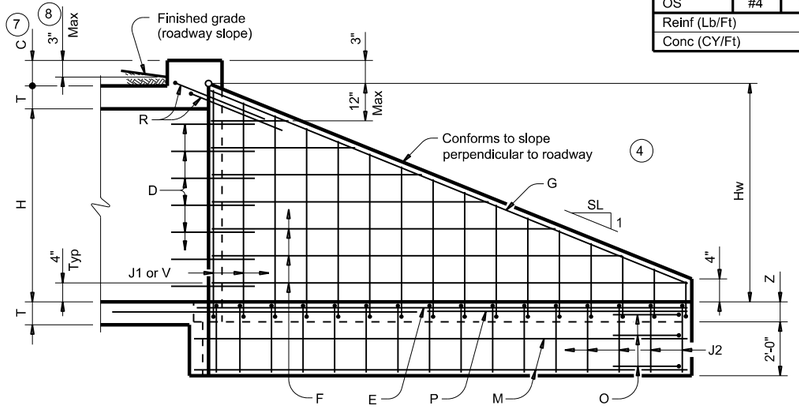
Ltw = [(N) (2U + S) + (N - 1) (0.500')] ÷ (cos θ)

Lc = (Ltw) - (2U) ÷ (cos θ)

Atw = (Lc) + (B)

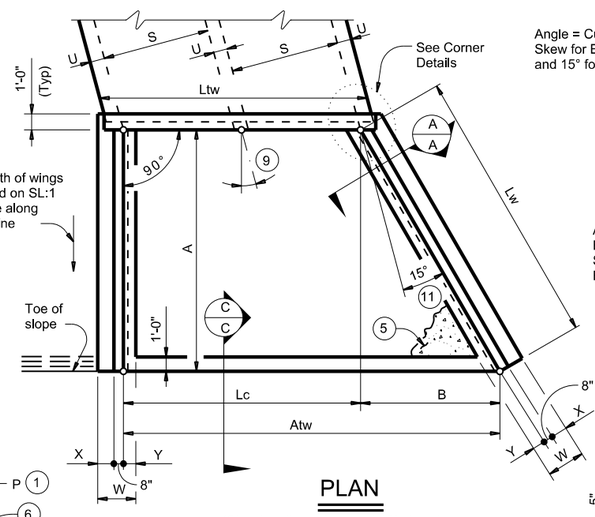
Total Wingwall Area (two wings ~ S.F.)
= (0.5) (Hw 0.333Ⱨ) (Lw + A)

Hw = Height of wingwall (feet)
SL:1 = Side slope ratio (horizontal : 1 vertical)
Lw = Length of wingwall (feet)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)
Atw = Anchor toewall length (feet)
N = Number of culvert spans
θ = Culvert skew
See applicable box culvert standard for H, S, T, and U values.
See Table of Maximum Wall Heights for limits on Hw.



INSIDE ELEVATION OF WINGWALL

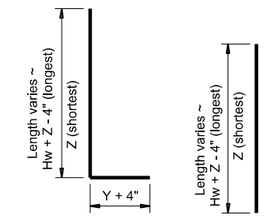
(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

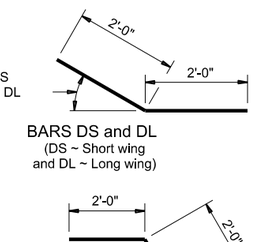


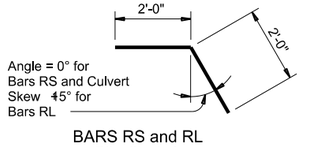
PLAN

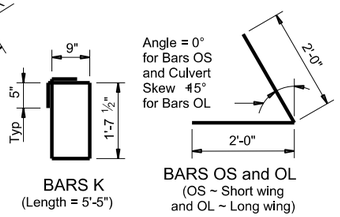
(Showing dimensions and 15° skew.)

Angle = Culvert Skew for Bars DS and 15° for Bars DL









MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

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

Provide Class "C" concrete (f`c = 3,600 psi).

Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".

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

Provide ASTM A307 bolts and nuts.

Provide ASTM A36 steel plates.

Galvanize all steel components, except reinforcing unless required elsewhere in the plans, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing."

For optional adhesive anchors, install adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing adhesive, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Provide anchorage rods that are clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.

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

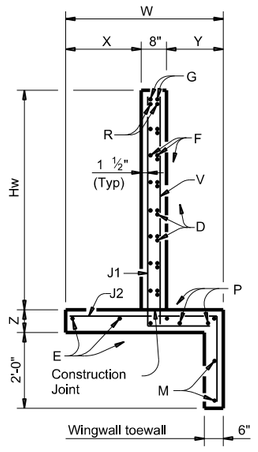
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.

All bolts, nuts, washers, brackets, angles, and pipe runners are considered parts of the safety end treatment for payment

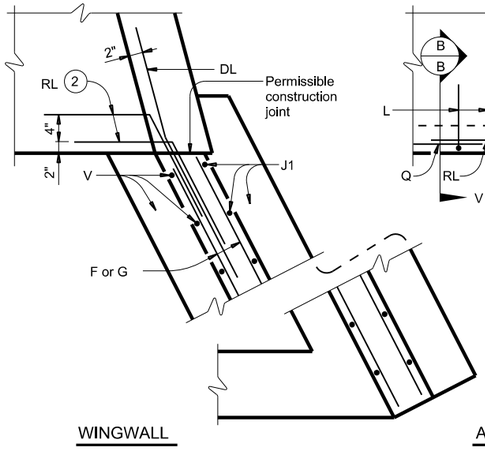
The quantities for pipe runners, reinforcing steel, and concrete, resulting from the formulas given herein are for Contractor's information only.

See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.

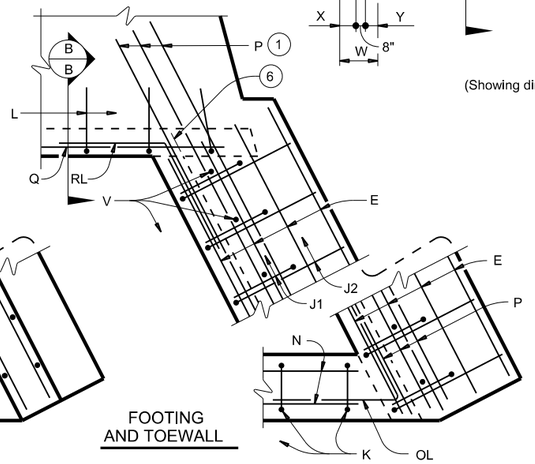
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.



SECTION A-A



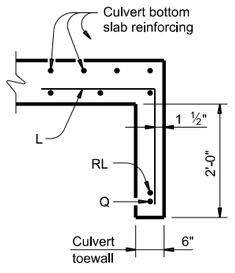
WINGWALL



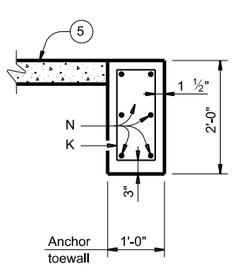
FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and culvert toewall reinforcing not shown for clarity.)



SECTION B-B (5)



SECTION C-C

SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° & 30° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

SETB-FW-S

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REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		180

DATE: 2/1/2024 6:49:03 AM
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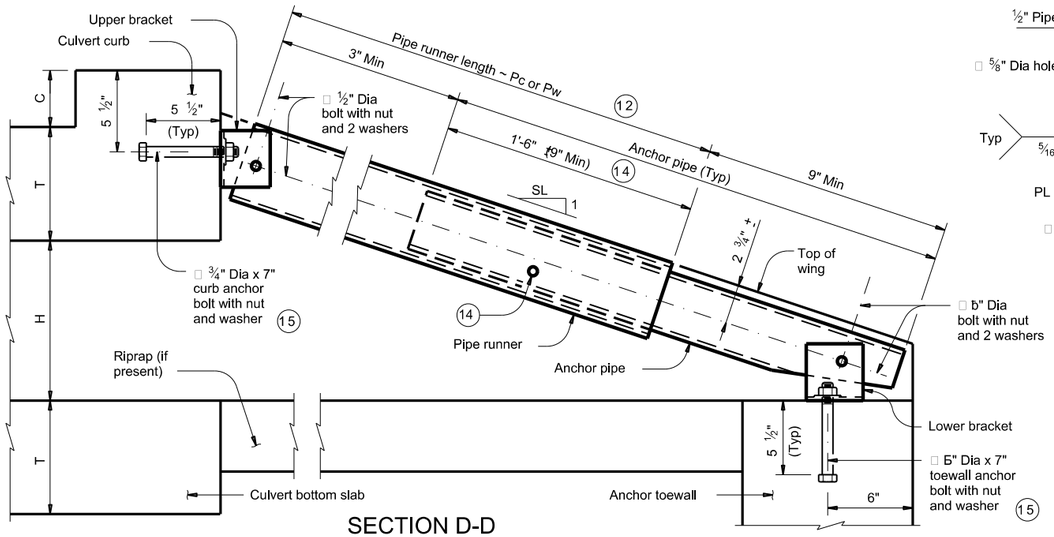
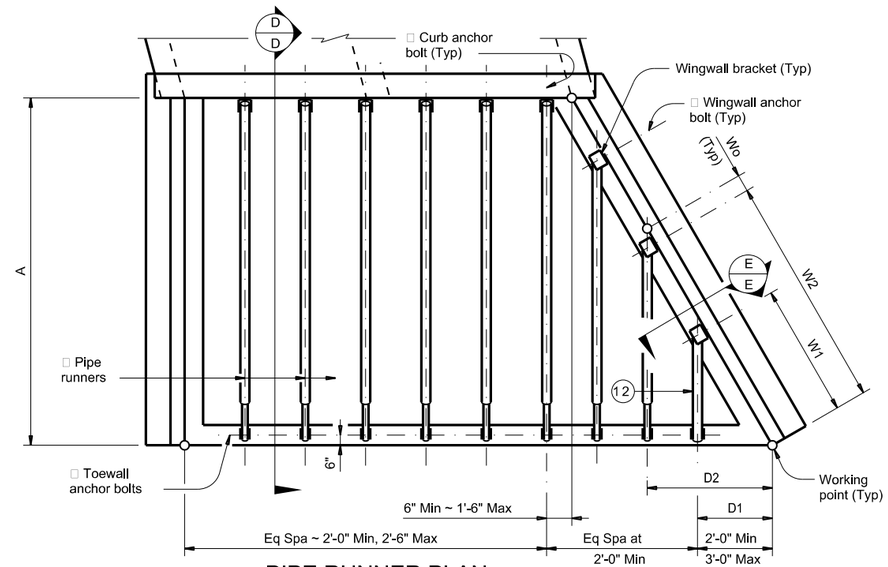
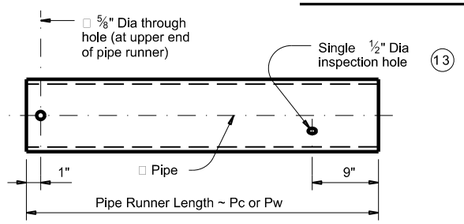


SECTION D-D

(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)

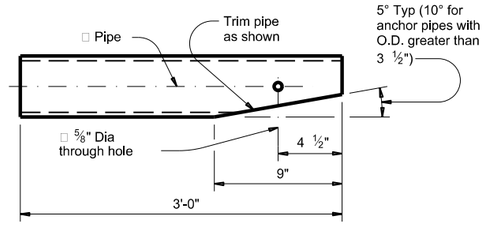


PIPE RUNNER PLAN

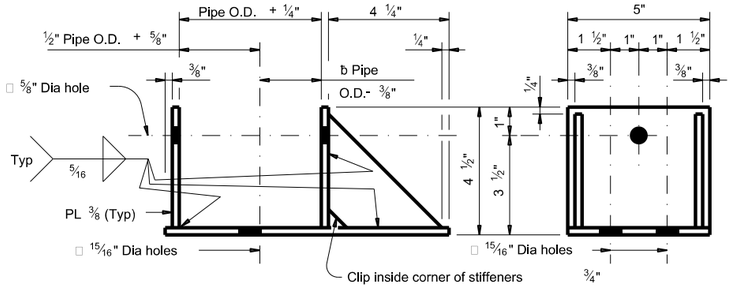


Note: Use pipe diameter required for curb pipe runner for wingwall pipe runner.

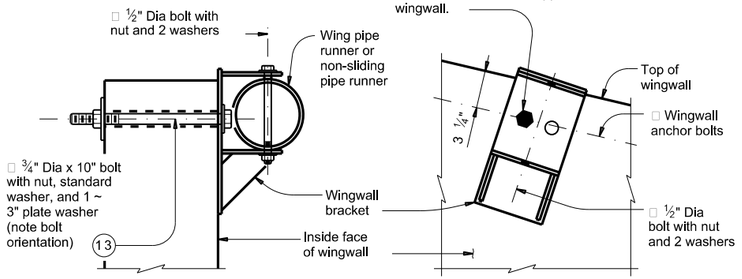
PIPE RUNNER DETAILS



ANCHOR PIPE DETAILS



ELEVATION SIDE VIEW

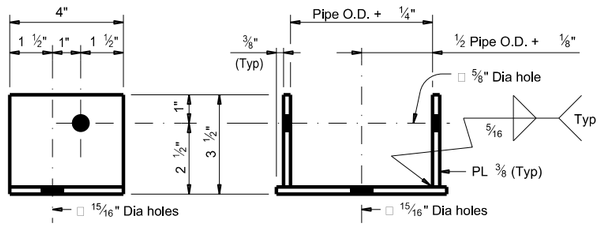


SECTION E-E (Showing installed bracket.)

ELEVATION (Showing installed bracket normal to wall. Pipe not shown for clarity.)

Note: Match wingwall bracket to the upper curb bracket size.

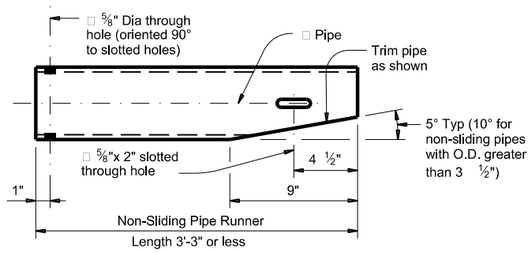
WINGWALL BRACKET DETAILS



SIDE VIEW ELEVATION

Note: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, to the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS



Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

NON-SLIDING PIPE RUNNER DETAILS

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(12) If pipe runner length (Pw) is 1'-9" or less, replace the normal pipe runner and anchor pipe with a single non-sliding pipe runner. See Non-Sliding Pipe Runner Details for additional information.

(13) At Contractor's option, ⅞" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(14) After installation of pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

(15) At Contractor's option, an adhesive anchor may be used. Provide ¾" Dia adhesive anchors that meet the requirements of ASTM A307, Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 ½". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use.

PIPE RUNNER DIMENSION CALCULATIONS:

Wn = (K3) (Dn) - (Wo)
Pwn = (Dn) (K2) - (2.063')
Pw1 Non-Sliding Pipe Runner (If required)
= (D1) (K2) - (0.563')
Pc = (A) (K1) - (1.688')

Wn = Distance from working point to centerline anchor bolt measured along bottom inside face of wing (feet)
Dn = Distance from working point to centerline pipe runner measured along outside face of anchor toewall (feet)
Pw = Wingwall pipe runner length (feet)
Pc = Curb pipe runner length (feet)
K = Constant values for use in formulas

Slope SL:1	K1	K2~15° Skew	K2~30° Skew
3:1	~ 1.054	~ 1.826	~ 1.054
4:1	~ 1.031	~ 1.785	~ 1.031
6:1	~ 1.014	~ 1.756	~ 1.014

K3 = 15° Skew ~ 2.000
30° Skew ~ 1.414
n = Wing pipe runner number
Wo = 15° Skew ~ 5"
30° Skew ~ 2 b"

SHEET 2 OF 3

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° & 30° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

SETB-FW-S

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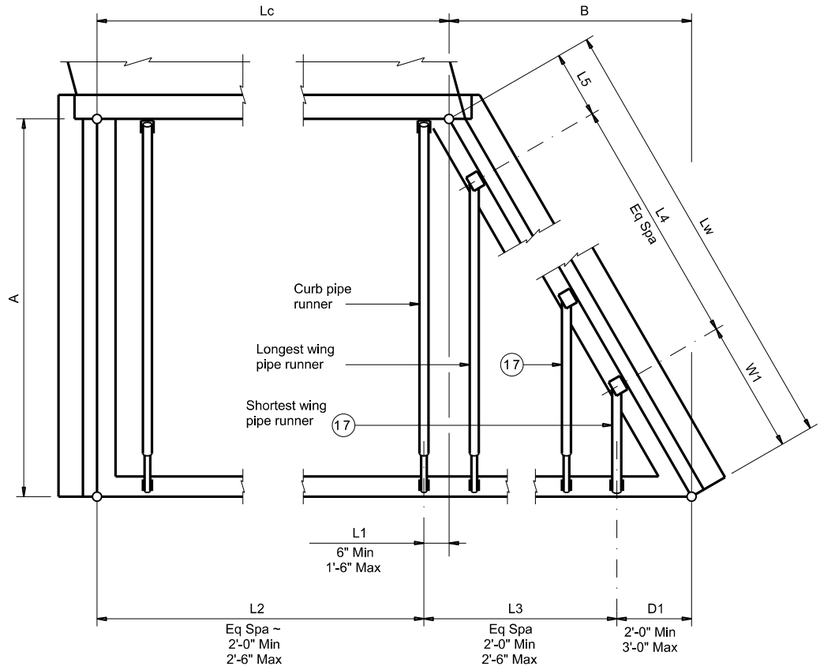
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		181

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (16)	Lc	L1	L2			D1	L3			W1	L4			L5	Curb Pipe Runner (Pc)		Longest Wing Pipe Runner (Pw)	Shortest Wing Pipe Runner (Pw)	Non-Sliding Wing Pipe Runner (if applicable)	Curb, Wing, and/or Non-Sliding Pipe Runners		3'-0" Anchor Pipe	
			No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No.	Length				Size (3",4" or 5")	Total Length (16)	Size (2",3" or 4")	Total Length (16)
	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)	(Ft)				
CC-C2 STA 16+86.85 (Both)	*3.464*	*0.5*	*2*	*1.482*	*2.964*	*3*	*4*	*2.375*	*9.500*	*NG*	*NG*	*NG*	*NG*	*NG*	*NG*	*NG*	*NG*	*N/A*	*NG*	*NG*	*NG*	*NG*	*NG*
BCC-G STA 112+15.52 (Both)	*22.132*	*0.5*	*9*	*2.404*	*21.632*	*3*	*9*	*2.463*	*22.167*	*4.034*	*8*	*3.483*	*27.861*	*2.989*	*9*	*23.75*	*21.354*	*3.563*	*2.521*	*5"*	*631.875*	*4"*	*102*



PIPE RUNNER LAYOUT

Note: Right forward culvert skew shown, actual culvert skew may be opposite hand.

(16) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(17) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner as the shortest.

SPECIAL NOTE:

This tabular sheet is to be filled out by the culvert specifier and provides information for the construction details and quantities of pipe runners.

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

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, all dimensions must be verified by the Contractor in the field prior to fabrication of the safety end treatment components.

STATE OF TEXAS
FLORIAN BALTOI
119857
LICENSED
PROFESSIONAL ENGINEER

Florian Baltoi

2/1/2024

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Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° & 30° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

SETB-FW-S

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REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		182

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

Maximum Wingwall Height Hw (9)	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 (Two~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

TABLE OF WING WALL REINFORCING
(Two~Wings)

Bar	Size	No.	Spa
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

TABLE OF ESTIMATED ANCHOR TOEWALL QUANTITIES

Bar	Size	No.	Spa
K	#4	~	1'-0"
N	#5	6	~
OL	#4	6	~
Reinf (Lb/Ft)			9.82
Conc (CY/Ft)			0.074

(1) Extend Bars P 3'-0" Min into bottom slab of box culvert.

(2) Adjust to fit as necessary to maintain 1 1#2" clear cover and 4" Min between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by Lw.

(4) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap." Unless otherwise shown on the plans or directed by the Engineer, extend construction joints or grooved joints, oriented in the direction of flow, across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B is not required.

(6) At Contractor's option, end the culvert toewall flush with wingwall toewall. Adjust reinforcing as needed.

(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extend Curb Details (ECD) standard sheet.

(8) For vehicle safety, reduce curb heights, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

(9) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

TABLE OF MAXIMUM WING HEIGHTS (9)

Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"

WING DIMENSION CALCULATIONS:

Hw = H + T + C - 0.250' (9)
A = (Hw - 0.333') (SL)
B = (A) (tan (30°))
Lw = (A) ÷ cos (30°))

For cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)
For precast culverts:
Ltw = (N) (2U + S) + (N - 1) (0.500')

Lc = (Ltw) - (2U)
Atw = (Lc) + (2B)
Total Wingwall Area (two wings ~ SF)
= (Hw + 0.333') (Lw)

Hw = Height of wingwall (feet)
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)

See applicable box culvert standard for H, S, T, and U values.
See Table of Maximum Wall Heights for limits on Hw.

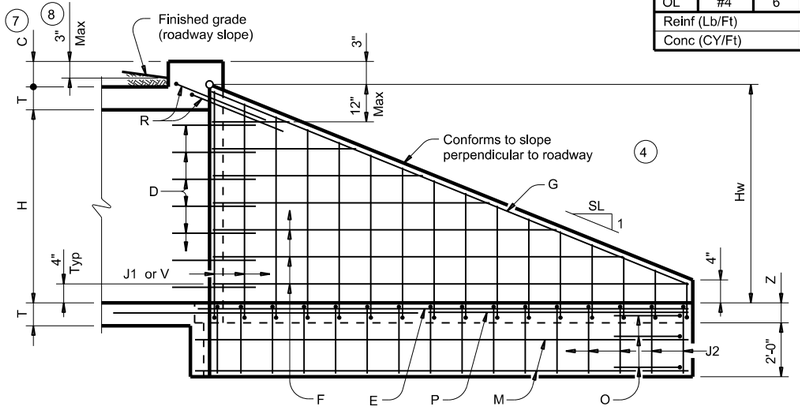
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
Provide Class "C" concrete (f'c = 3,600 psi).
Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".
Provide pipe runners and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts and nuts.
Provide ASTM A36 steel plates.
Galvanize all steel components, except reinforcing unless required elsewhere in the plans, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing."
For optional adhesive anchors, install adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing adhesive, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Provide anchorage rods that are clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

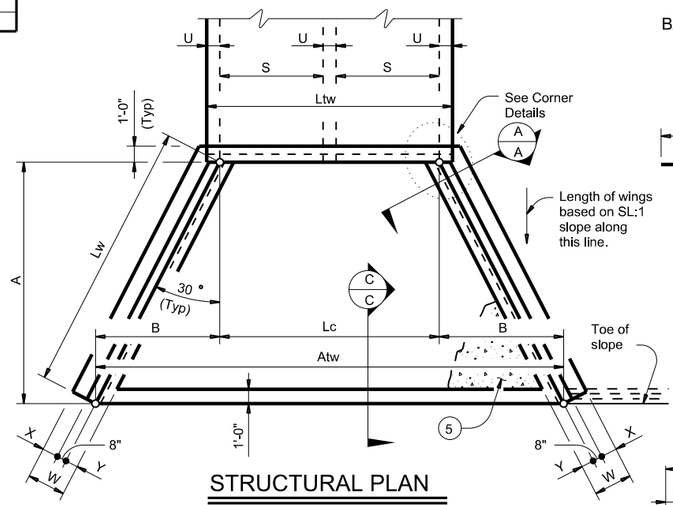
Designed according to AASHTO LRFD Bridge Design Specifications.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
All bolts, nuts, washers, brackets, angles, and pipe runners are considered parts of the safety end treatment for payment.
The quantities for pipe runners, reinforcing steel, and concrete, resulting from the formulas given herein are for Contractor's information only.
See the Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.

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



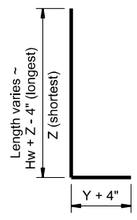
INSIDE ELEVATION OF WINGWALL

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

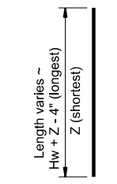


STRUCTURAL PLAN

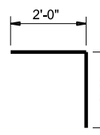
(Showing dimensions.)



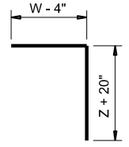
BARS J1



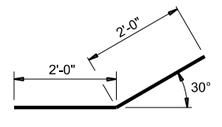
BARS V



BARS L



BARS J2



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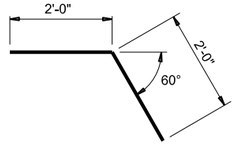

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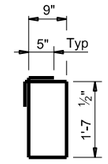
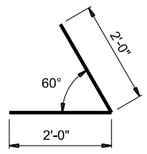
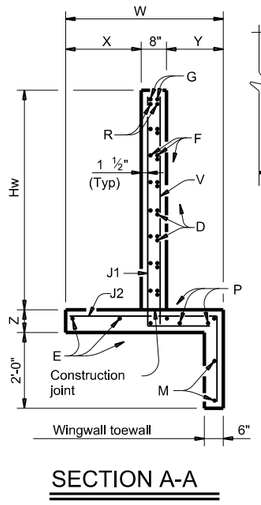


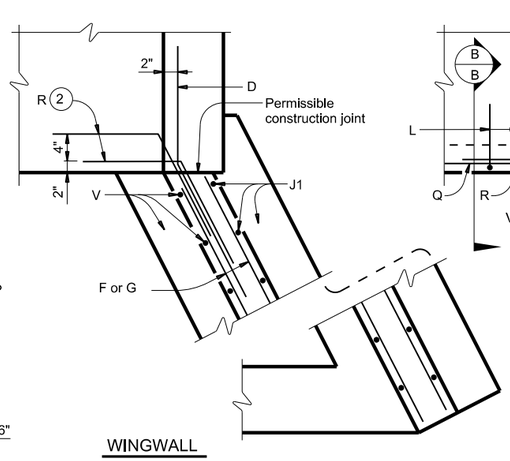
BARS K
(Length = 5'-5")



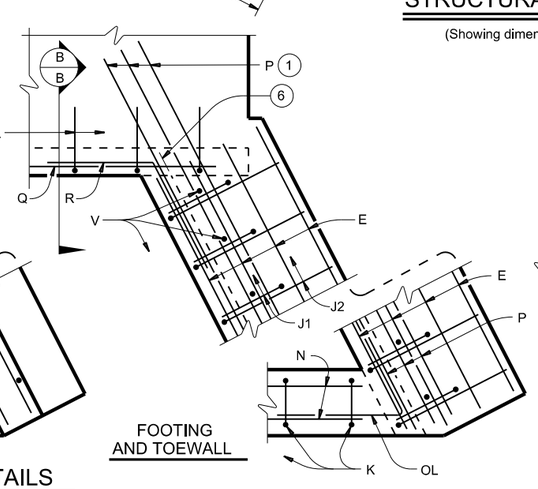
BARS OL



SECTION A-A



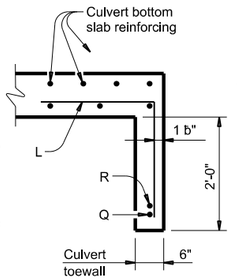
WINGWALL



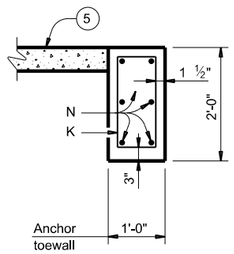
FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and culvert toewall reinforcing not shown for clarity.)



SECTION B-B (5)



SECTION C-C

SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS
FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: CD-SETB-FW0-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		183

DATE: 2/1/2024 6:49:20 AM
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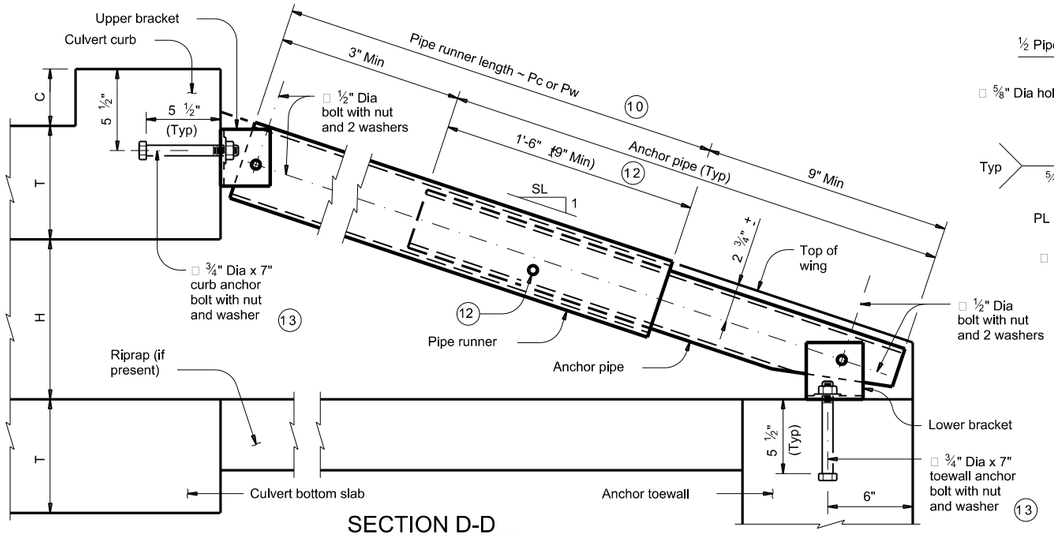
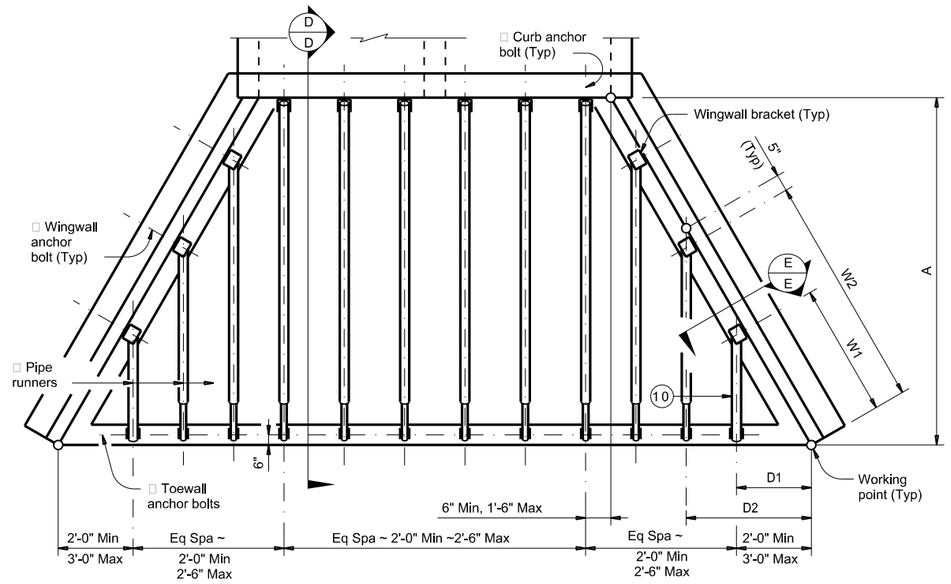
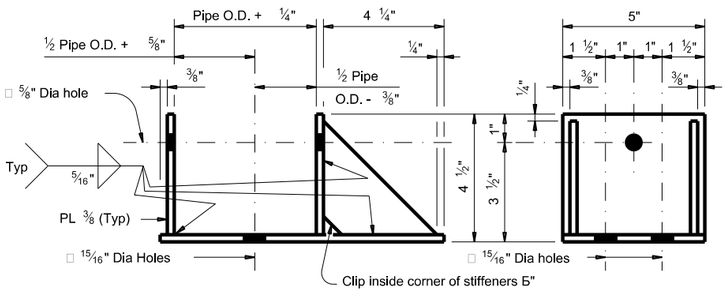


SECTION D-D

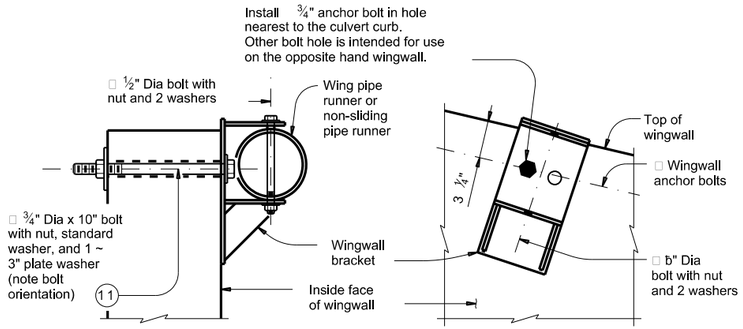
(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)



PIPE RUNNER PLAN



ELEVATION SIDE VIEW

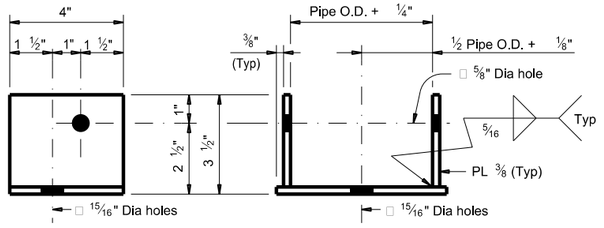


SECTION E-E
(Showing installed bracket.)

ELEVATION
(Showing installed bracket normal to wall. Pipe not shown for clarity.)

Note: Match wingwall bracket to the upper curb bracket size.

WINGWALL BRACKET DETAILS



SIDE VIEW ELEVATION

Note: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, to the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER SIZES

Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(10) If pipe runner length (Pw) is 1'-9" or less replace the normal pipe runner and anchor pipe with a single non-sliding pipe runner. See Non-Sliding Pipe Runner Details for additional information.

(11) At Contractor's option, 7/8" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(12) After installation of pipe runner, use the b" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

(13) At Contractor's option, an adhesive anchor may be used. Provide ¾" Dia adhesive anchors that meet the requirements of ASTM A307 Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 b". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use.

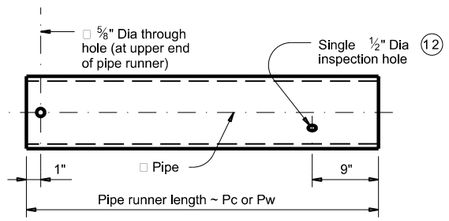
PIPE RUNNER DIMENSION CALCULATIONS:

Wn = (2.000) (Dn) - (0.416')
Pwn = (Dn) (K2) - (2.063')
Pw1 Non-Sliding Pipe Runner (If required)
= (D1) (K2) - (0.563')
Pc = (A) (K1) - (1.688')

Wn = Distance from working point to centerline anchor bolt measured along bottom inside face of wing (feet)
Dn = Distance from working point to centerline pipe runner measured along outside face of anchor toewall (feet)
Pw = Wingwall pipe runner length (feet)
Pc = Curb pipe runner length (feet)
K = Constant values for use in formulas

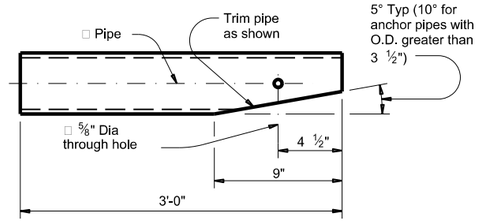
Slope SL:	K1	K2
3:1	~ 1.054 ~	1.826
4:1	~ 1.031 ~	1.785
6:1	~ 1.014 ~	1.756

n = Wing pipe runner number

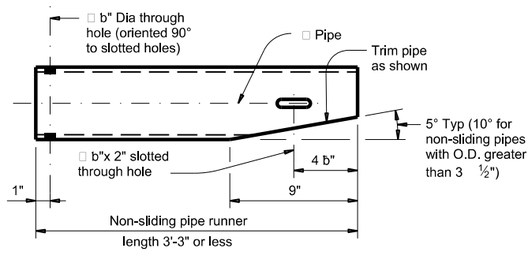


Note: Pipe diameter required for curb pipe runner is also used for wingwall pipe runner.

PIPE RUNNER DETAILS



ANCHOR PIPE DETAILS



Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

NON-SLIDING PIPE RUNNER DETAILS

SHEET 2 OF 3

Texas Department of Transportation

Bridge Division Standard

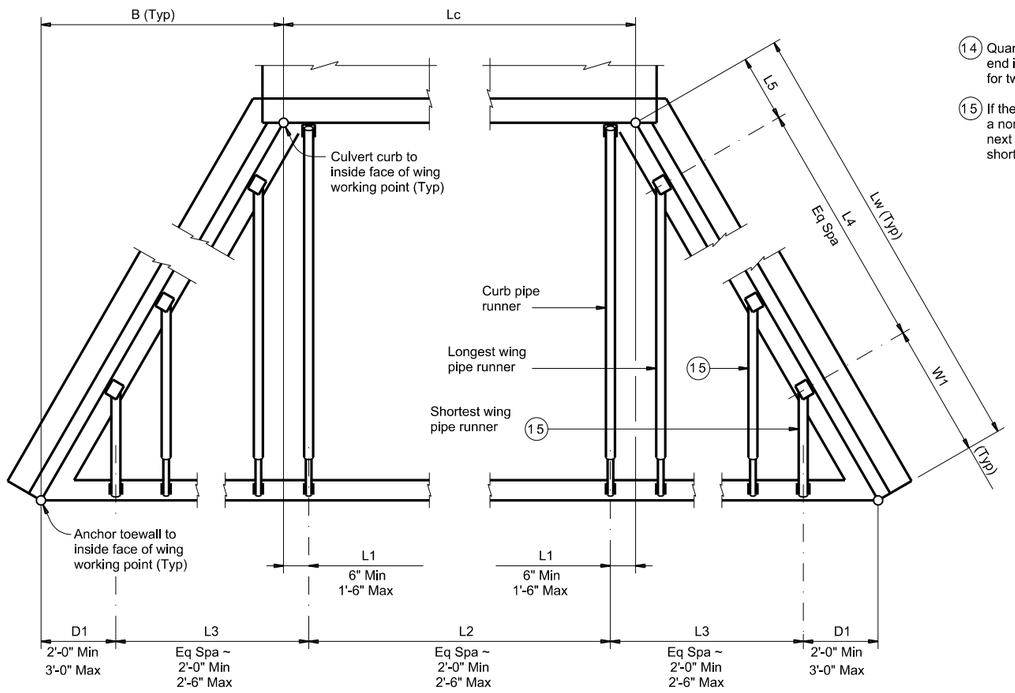
SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: CD-SETB-FW0-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		184

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (14)	Lc	L1	L2			D1	L3			W1	L4			L5	Curb Pipe Runner (Pc)		Longest Wing Pipe Runner (Pw)	Shortest Wing Pipe Runner (Pw)	Non-Sliding Wing Pipe Runner (if applicable)	Curb, Wing, and/or Non-Sliding Pipe Runners		3'-0" Anchor Pipe	
			No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No.	Length				Size (3",4" or 5")	Total Length (14)	Size (2",3" or 4")	Total Length (14)
	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)	(Ft)				
CC-D STA 31+24.67 (Both)	*16.167*	*0.5*	*7*	*2.1667*	*15.1667*	*3*	*3*	*1.861*	*5.583*	*NG*	*NG*	*NG*	*NG*	*NG*	*NG*	*NG*	*NG*	*N/A*	*NG*	*NG*	*NG*	*NG*	*NG*
BCC-H STA 132+23.19 (Both)	*25.167*	*0.5*	*10*	*2.4167*	*24.1667*	*3*	*7*	*2.310*	*16.168*	*5.583*	*6*	*4.619*	*27.716*	*4.036*	*11*	*31.646*	*28.021*	*3.292*	*N/A*	*5"*	*1134.58*	*4"*	*150*
BCC-K STA 196+73.48 (Both)	*19.167*	*0.5*	*8*	*2.2708*	*18.1667*	*3*	*6*	*2.342*	*14.051*	*5.583*	*5*	*4.684*	*23.418*	*4.100*	*9*	*27.875*	*24.188*	*3.292*	*N/A*	*5"*	*831.500*	*4"*	*126*
BCC-L STA 210+35.93 (Both)	*22.167*	*0.5*	*9*	*2.3519*	*21.1667*	*3*	*5*	*2.387*	*11.934*	*5.583*	*4*	*4.774*	*19.094*	*4.190*	*10*	*24.667*	*20.854*	*3.417*	*N/A*	*5"*	*736.042*	*4"*	*120*



PIPE RUNNER LAYOUT

(14) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(15) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner as the shortest.

SPECIAL NOTE:

This tabular sheet is to be filled out by the culvert specifier and provides information for the construction details and quantities of pipe runners.

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

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, all dimensions must be verified by the Contractor in the field prior to fabrication of the safety end treatment components.

STATE OF TEXAS
FLORIAN BALTOI
119857
LICENSED
PROFESSIONAL ENGINEER

Florian Baltoi

2/1/2024

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Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: CD-SETB-FW0-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	WAC	McLENNAN		185

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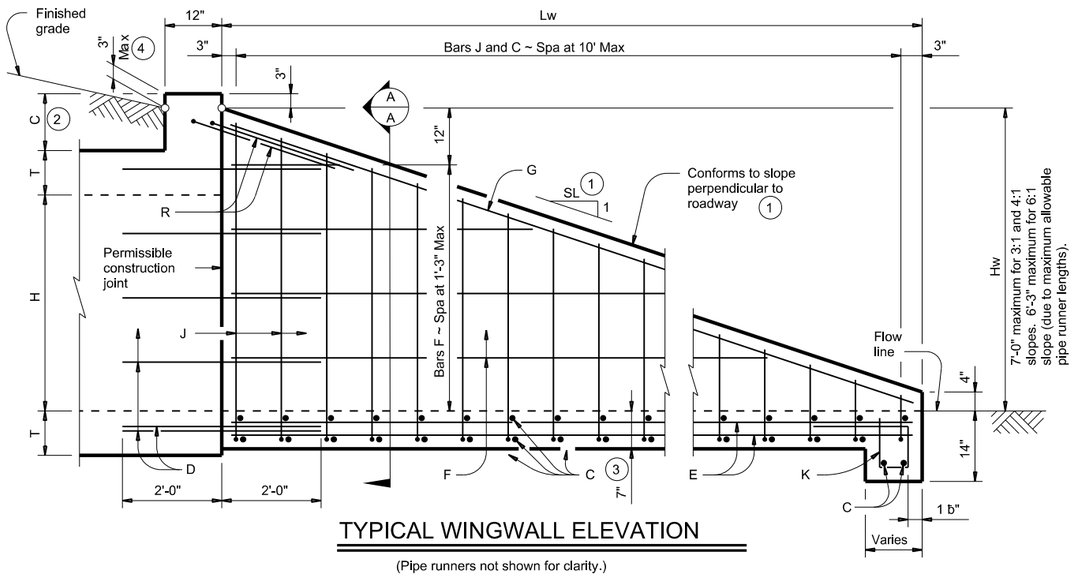
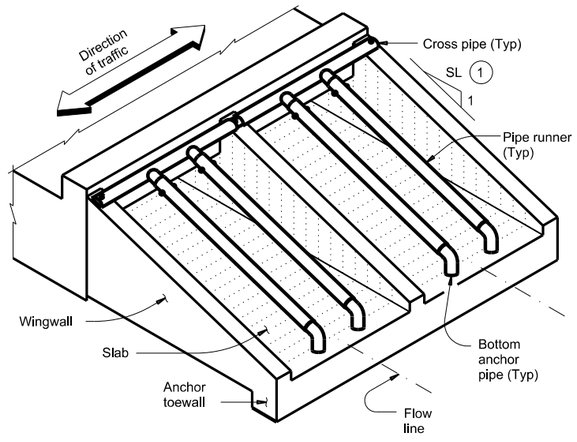


TYPICAL WINGWALL ELEVATION

(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:

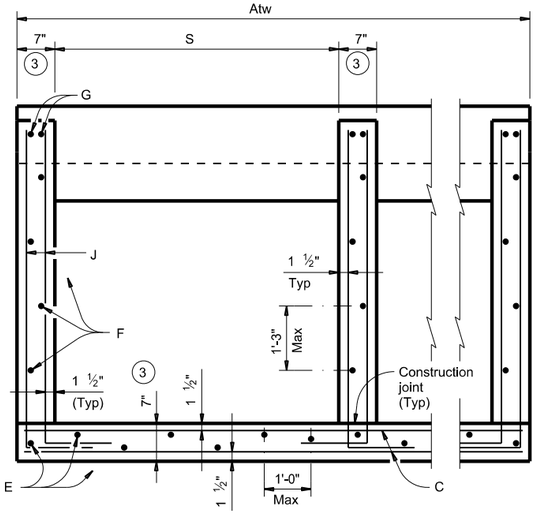
Pipe Runner Length
= (Lw) (K1) (1.917')
Total Reinforcing (Lb)
= (1.55) (Lw) (Atw) +
(4.43) (Atw) +
(K2) (Hw) (N + 1) (Lw) √

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

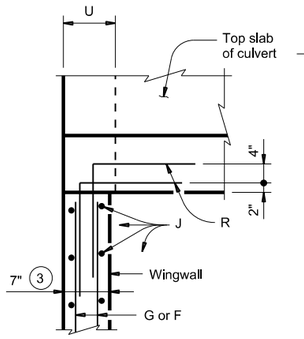
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)

See applicable box culvert standard for H, S, T, and U values.



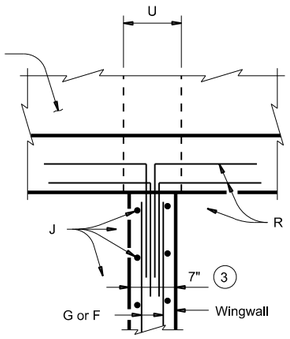
SECTION A-A

(Showing typical wingwall and wing slab reinforcing. Pipe runners not shown for clarity.)



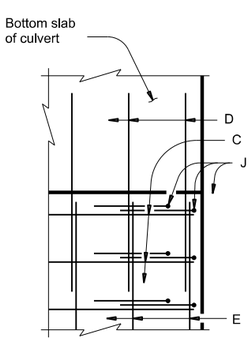
AT TOP OF EXTERIOR WINGWALL

(Cast-in-place culvert)



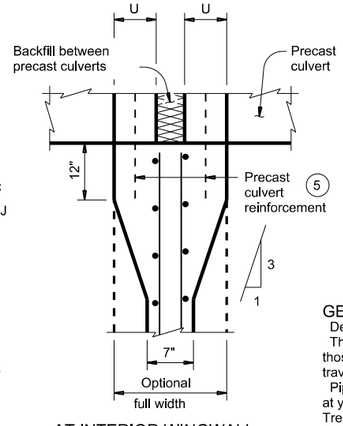
AT TOP OF INTERIOR WINGWALL

(Cast-in-place culvert)



AT OUTSIDE OF BOTTOM SLAB

(Cast-in-place culvert)



AT INTERIOR WINGWALL

(Precast culvert)

PLAN VIEWS OF CORNER DETAILS

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.

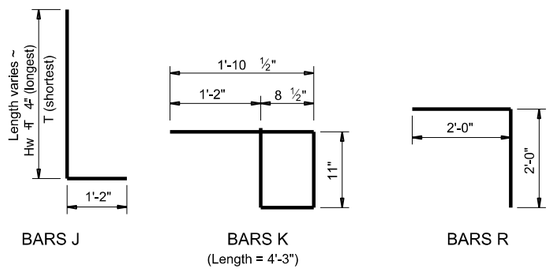


TABLE OF REINFORCING BAR SIZES AND SPACING

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

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

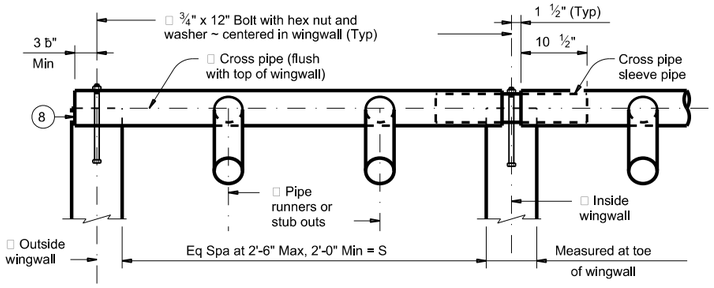
Texas Department of Transportation
Bridge Division Standard

SAFETY END TREATMENT
FOR 0° SKEW BOX CULVERTS (MAXIMUM Hw = 7'-0")
TYPE I ~ CROSS DRAINAGE

SETB-CD

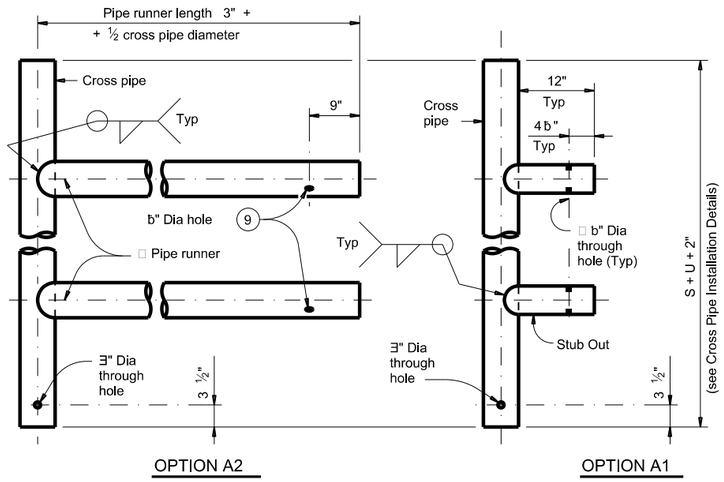
FILE: CD-SETBCD-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		186

DATE: 2/1/2024 6:49:36 AM
FILE: DOCUMENT NAME



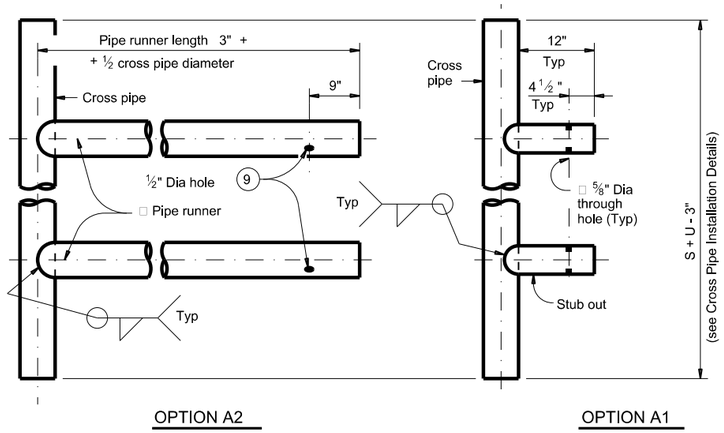
NOTE: At Contractor's option, make the cross pipe continuous across the inside wingwalls. If option is selected, omit the sleeve pipe and make a ∃" diameter through hole in the cross pipe to accept the anchor bolt at the centerline of each inside wingwall.

CROSS PIPE INSTALLATION DETAILS



OPTION A2 OPTION A1

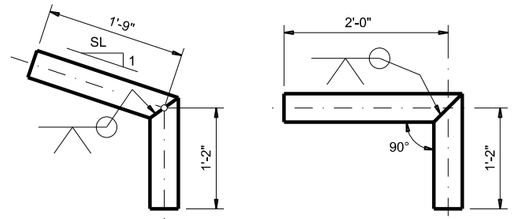
FOR USE IN OUTSIDE CULVERT BAY



OPTION A2 OPTION A1

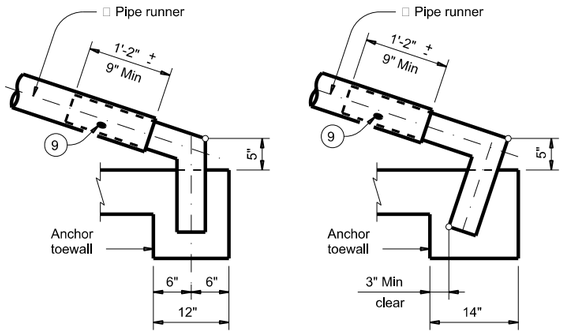
FOR USE IN INSIDE CULVERT BAY

CROSS PIPE AND CONNECTIONS DETAILS



OPTION A OPTION B

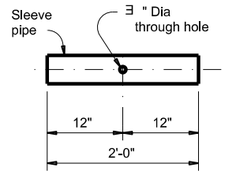
BOTTOM ANCHOR PIPE DETAILS



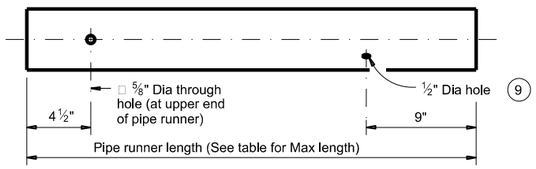
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Wingwall not shown for clarity.)

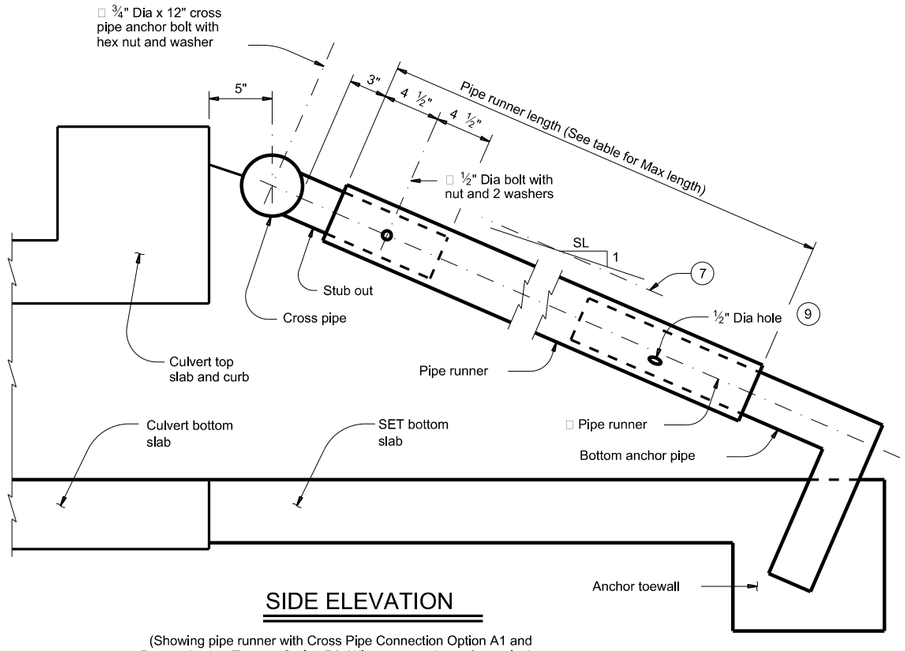


CROSS PIPE SLEEVE PIPE DETAILS



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 REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES (6)

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

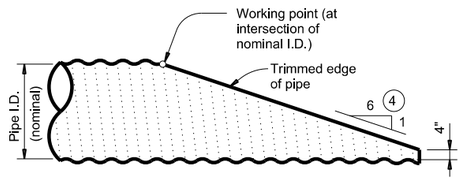
Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT
FOR 0° SKEW BOX CULVERTS (MAXIMUM Hw = 7'-0")
TYPE I ~ CROSS DRAINAGE

SETB-CD

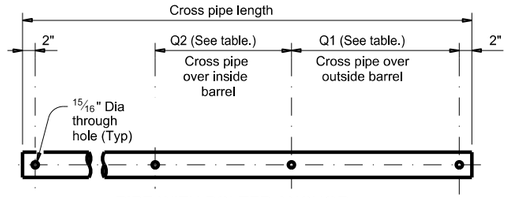
FILE: CD-SETBCD-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		187



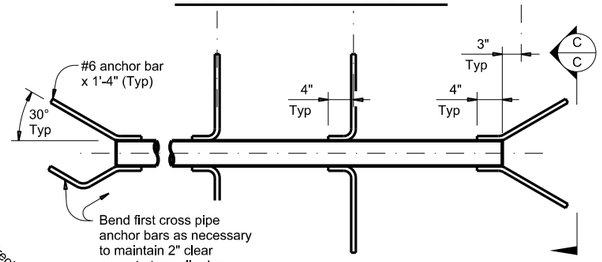
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

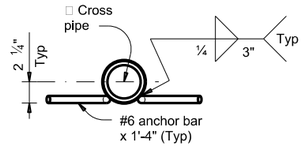
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



PIPE WITH BOLTED ANCHOR

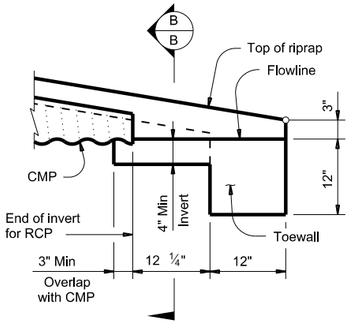


PIPE WITH ANCHOR BARS



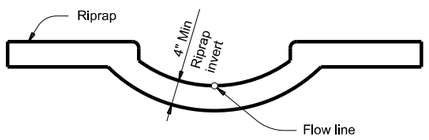
SECTION C-C

CROSS PIPE DETAILS



DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



SECTION B-B

(Cross pipes not shown for clarity.)

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"		
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	3 or more pipe culverts	3 1/2" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

(3) Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

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

(6) Quantities shown are for one end of one 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.

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 cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

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

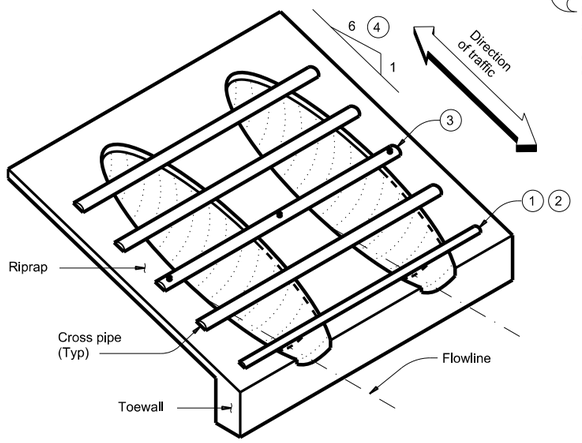
GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

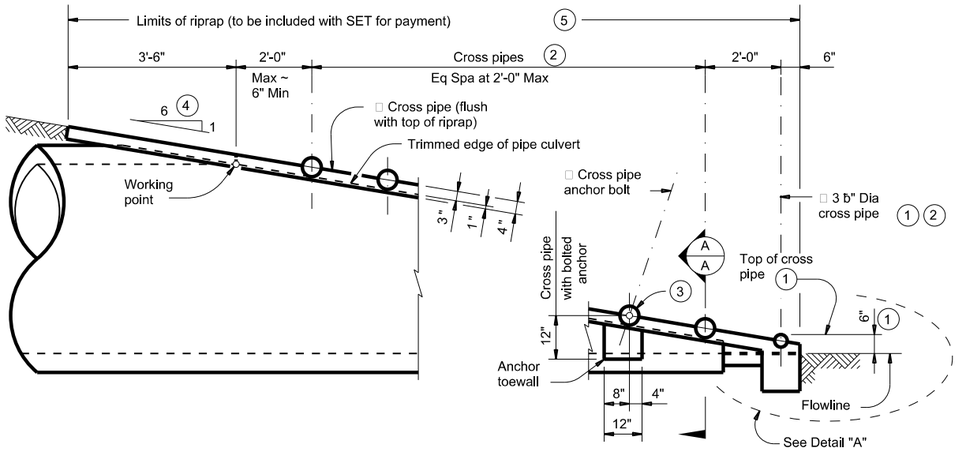
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap."

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

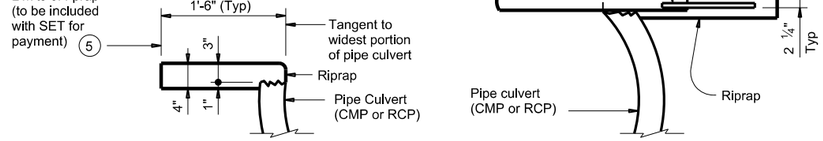


ISOMETRIC VIEW OF TYPICAL INSTALLATION



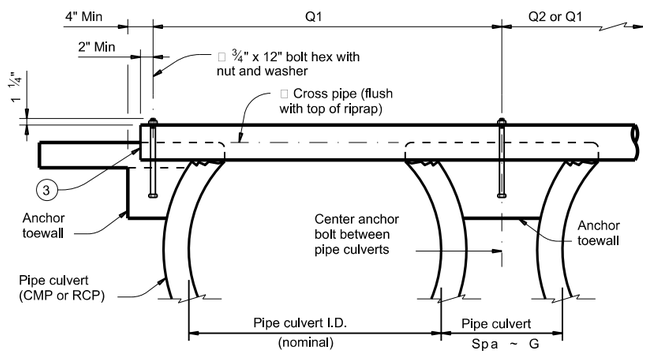
SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

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



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SHOWING CROSS PIPE WITH ANCHOR BAR



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA PIPE CULVERTS TYPE II ~ PARALLEL DRAINAGE

SETP-PD

FILE: CD-SETP-PD-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		188

DATE: 2/1/2024 6:49:51 AM
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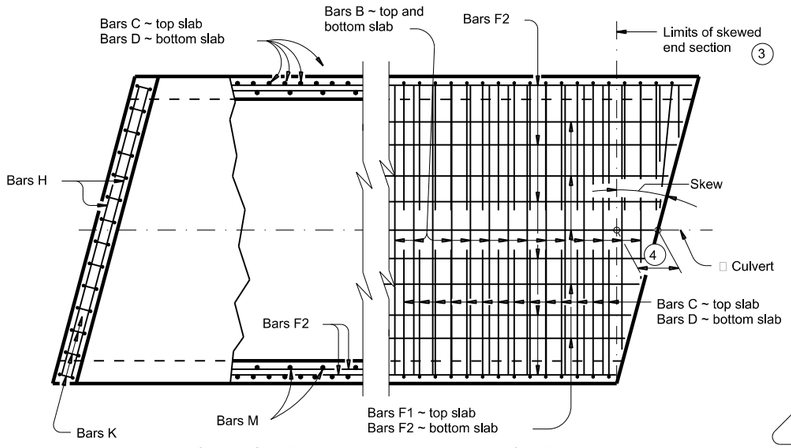
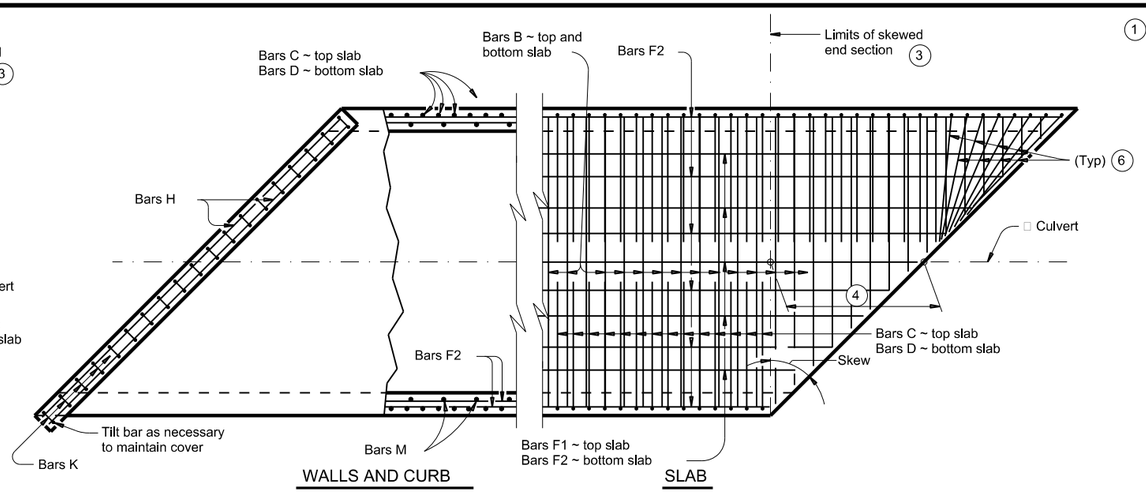
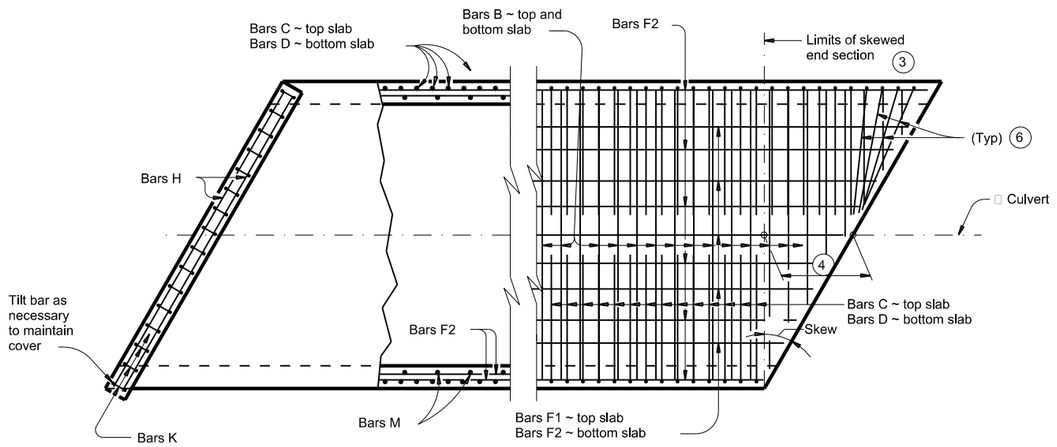


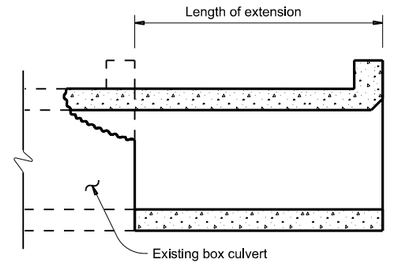
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



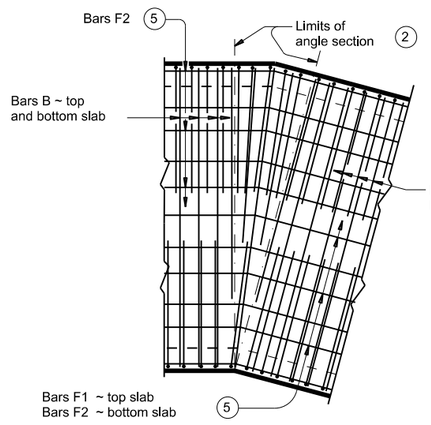
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



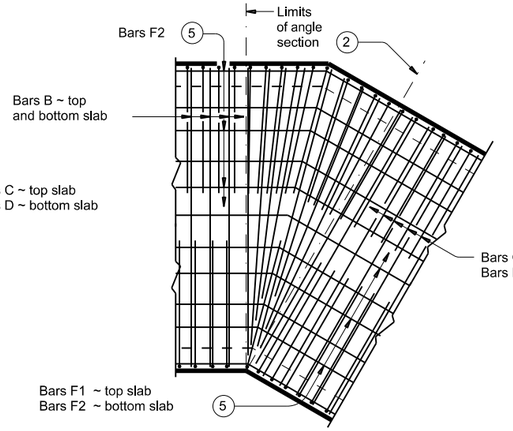
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



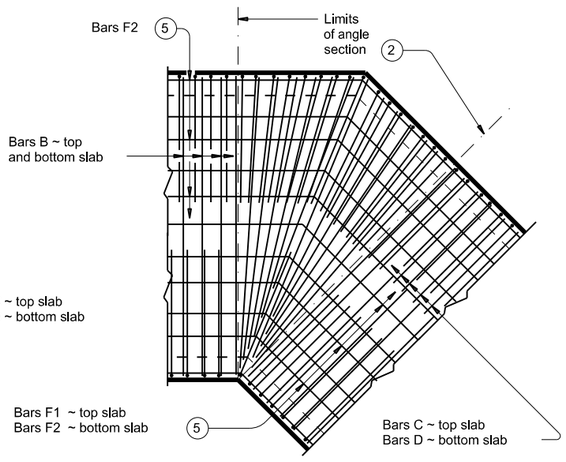
LENGTHENING DETAIL (1)



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 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, C, D , E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.

For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.

For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

FILE: CD-SCC-MD-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
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	WAC	McLENNAN		189

DATE: 2/1/2024 6:50:06 AM
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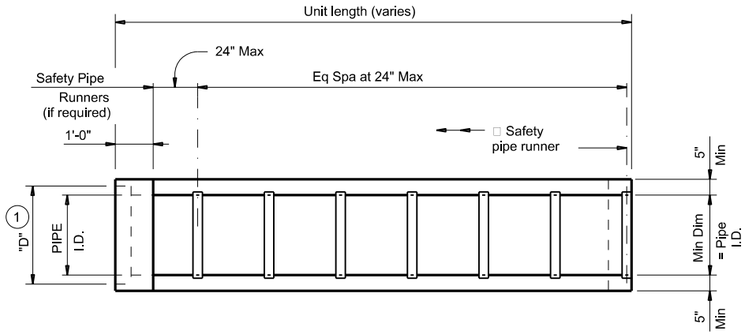
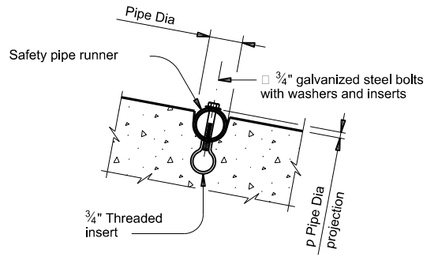


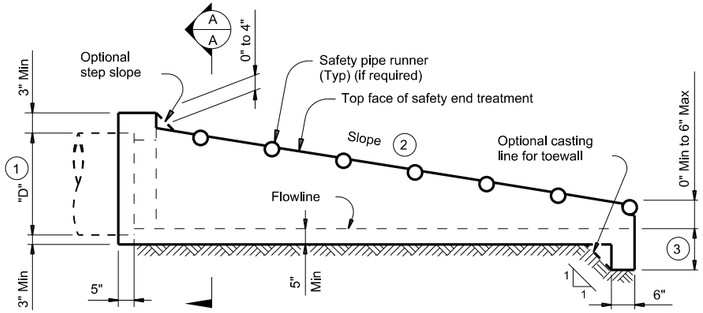
PLAN

(Showing bell end connection.)



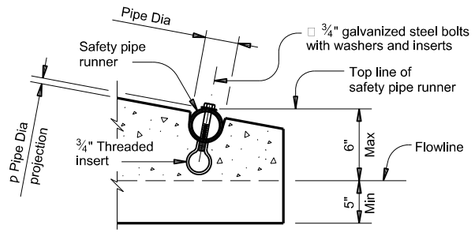
INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

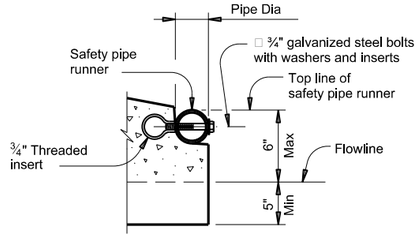


LONGITUDINAL ELEVATION

(Showing bell end connection.)



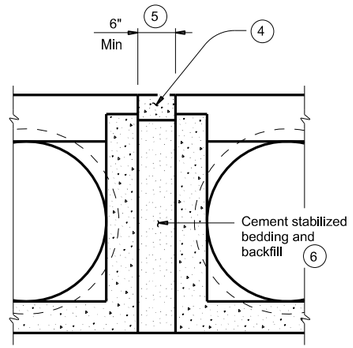
OPTION A



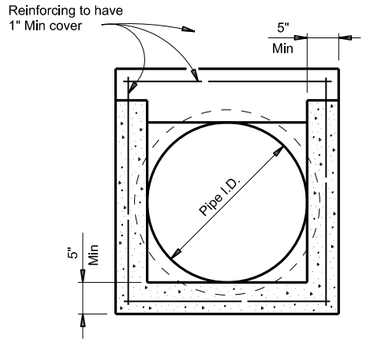
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

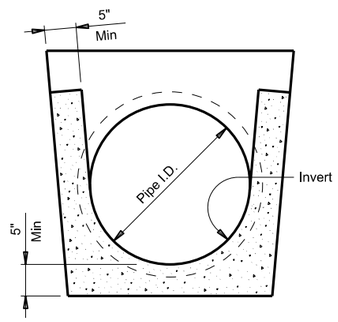
(If required)



MULTIPLE PIPE INSTALLATION

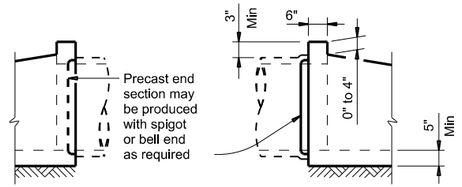


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment.)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (7)	"D" (1)	Slope	Min Length	Pipe Runners Required		Required Pipe Runner Size		
						Single Pipe	Multiple Pipe	Nominal Dia.	O.D.	I.D.
12"	2"	1.15"	17.00"	6:1	4' - 9"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
15"	2 ¼"	1.30"	20.50"	6:1	6' - 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	1.60"	24.00"	6:1	8' - 0"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31.00"	6:1	11' - 3"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
30"	3 ½"	2.65"	38.50"	6:1	14' - 8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17' - 11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	2.7"	52.50"	6:1	21' - 2"	Yes	Yes	4" STD	4.500"	4.026"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment."

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures." Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment." When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(7) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

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

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

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

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

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

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464, "Reinforced Concrete Pipe." Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	2174	01	018	FM 2311
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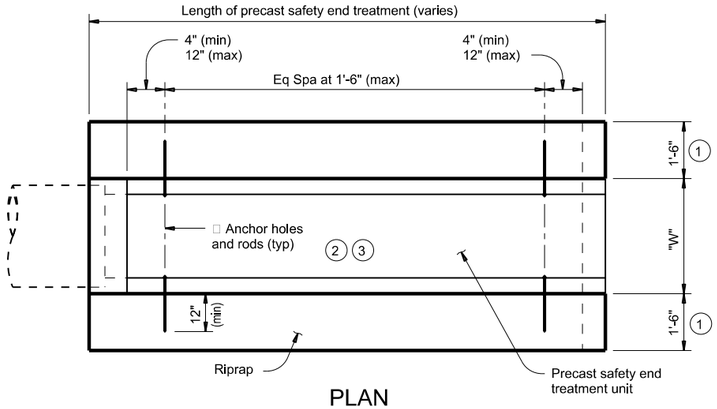
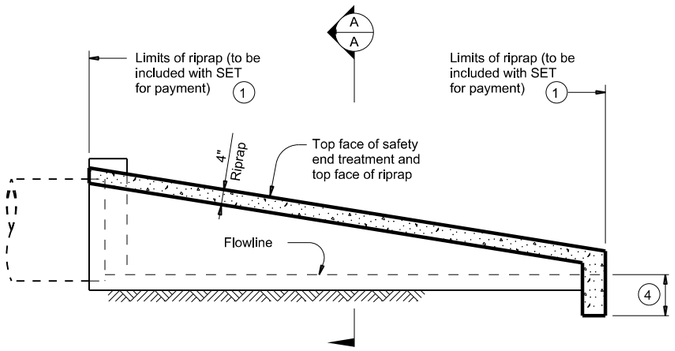
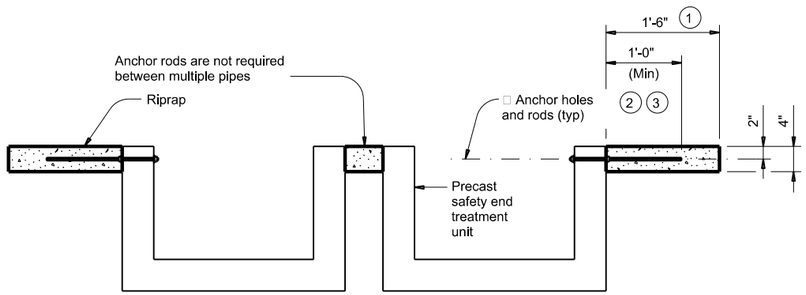


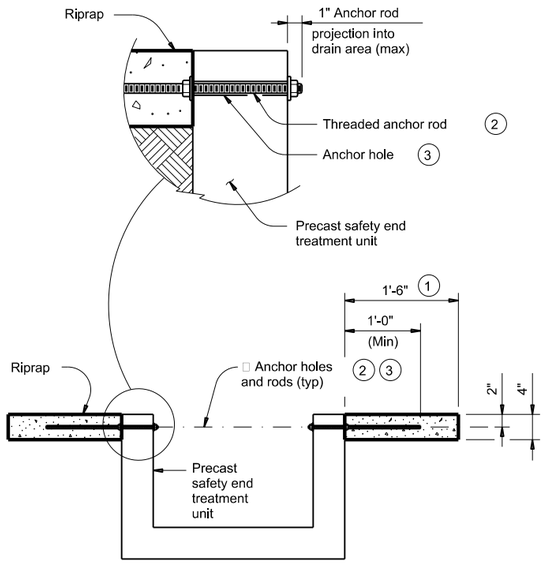
PLAN



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: CD-PSET-RR-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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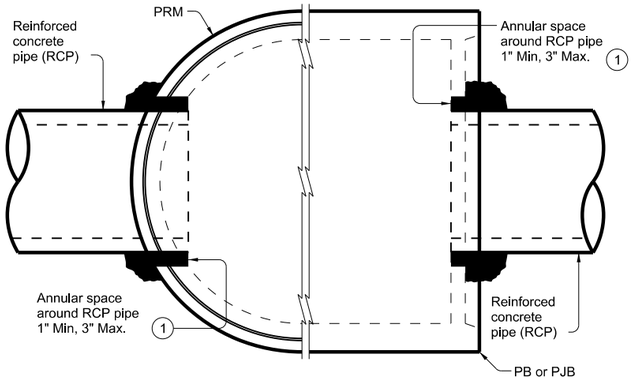
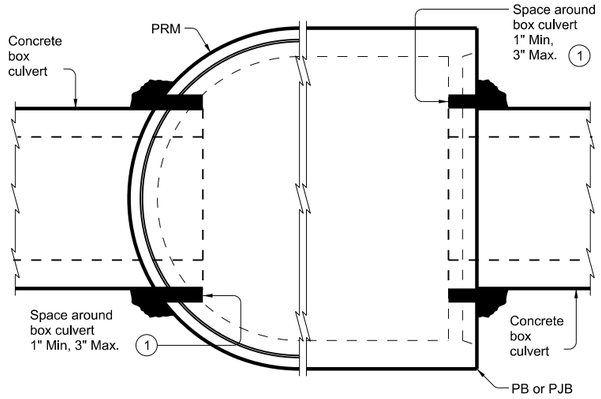


PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

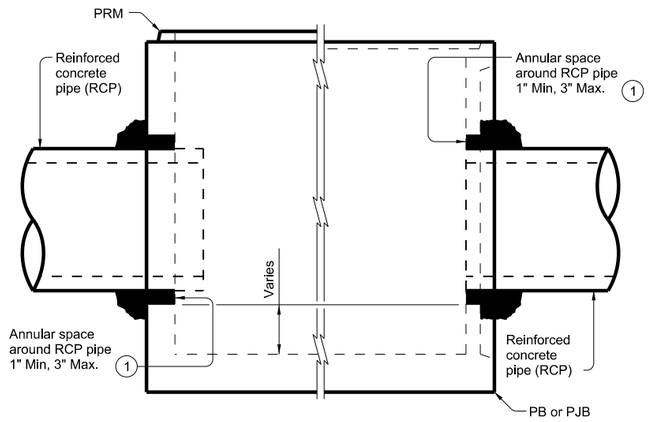
TYPICAL HALF PLAN



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

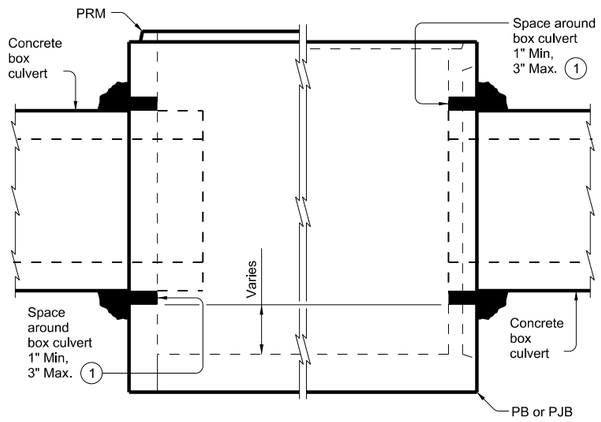
TYPICAL HALF PLAN



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

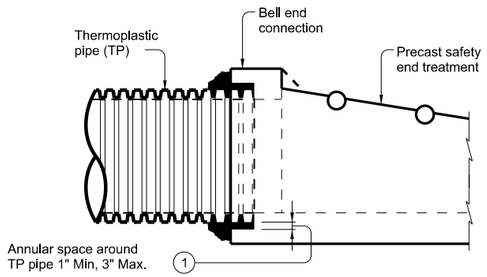
TYPICAL HALF ELEVATION



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: CD-PBGC-20.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
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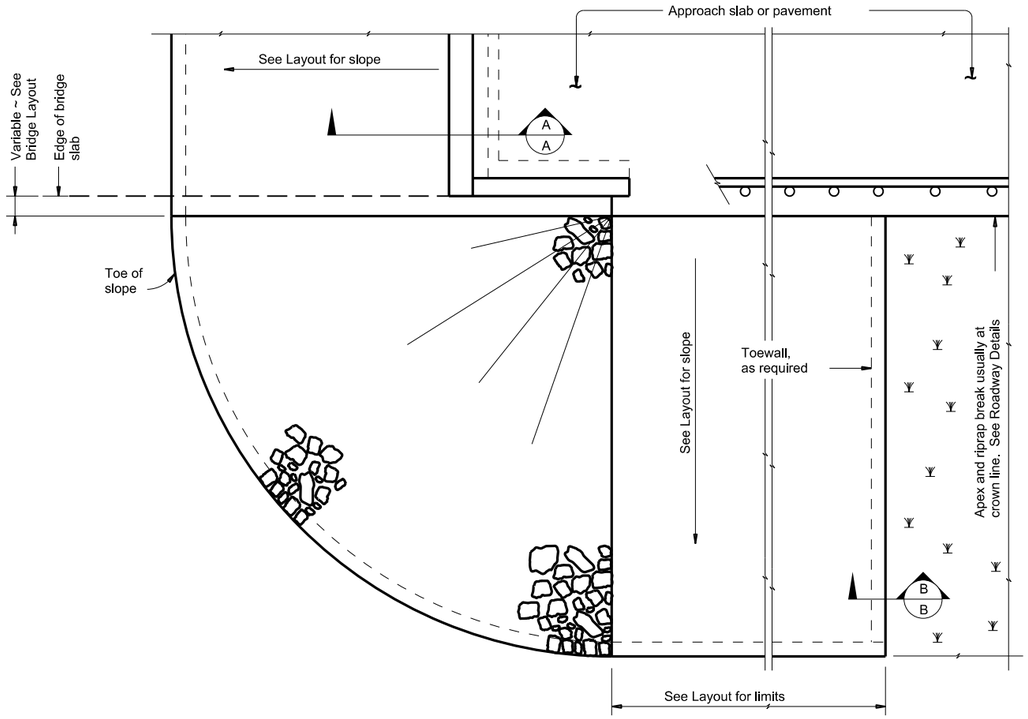
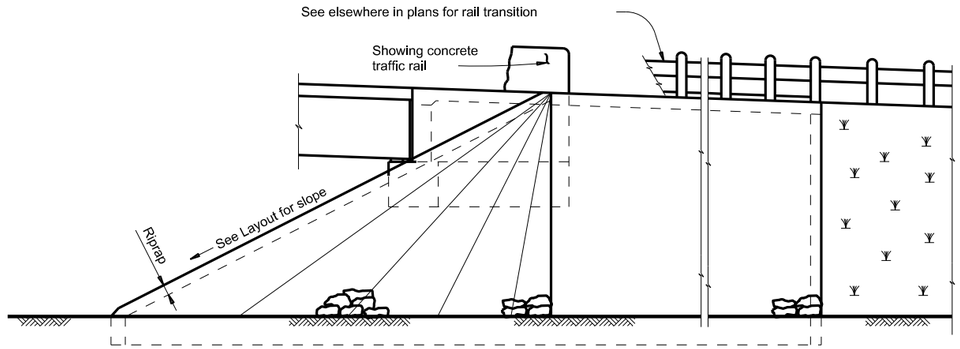
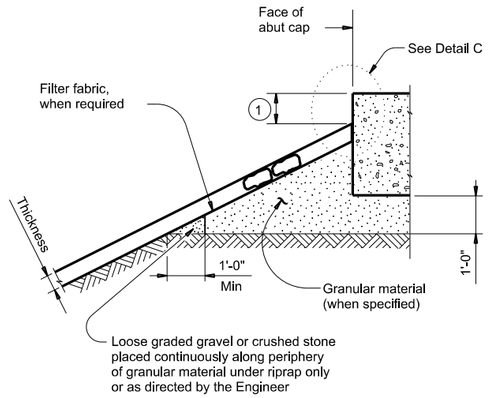


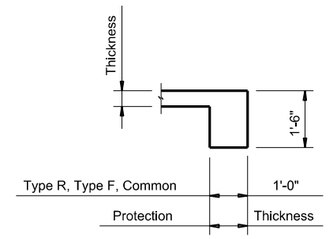
PLAN



ELEVATION

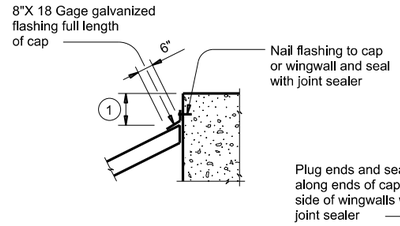


SECTION A-A AT CAP

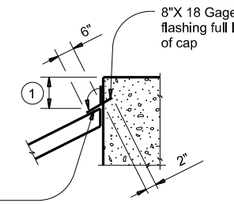


SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A



CAP OPTION B

DETAIL C

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
See elsewhere in plans for locations and details of shoulder drains.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: 18_SRR.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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	WAC	McLENNAN		193

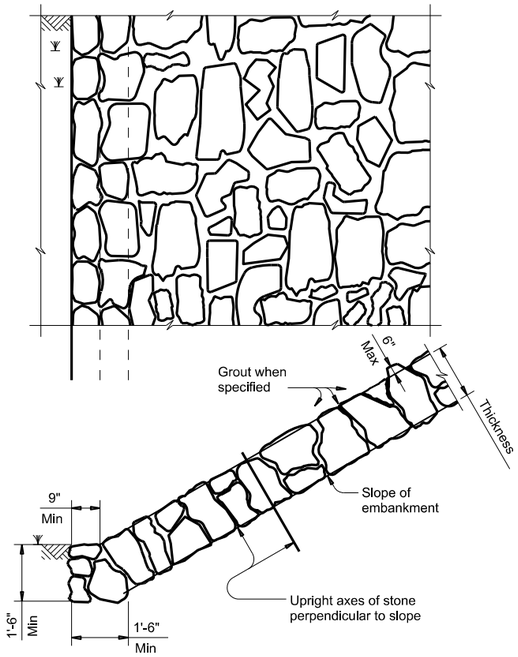


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

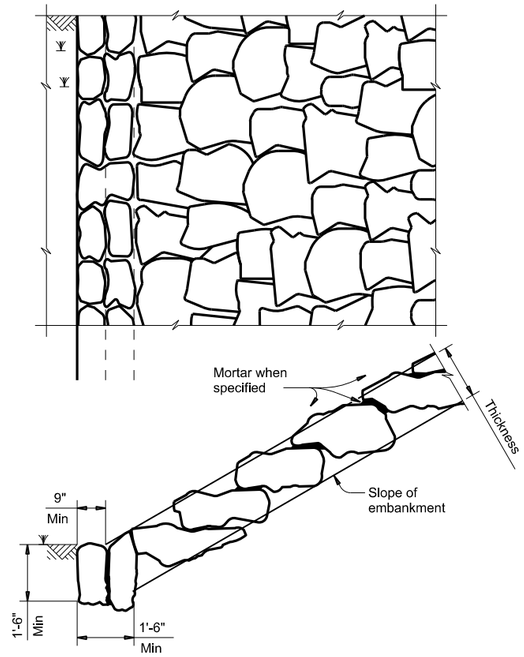


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

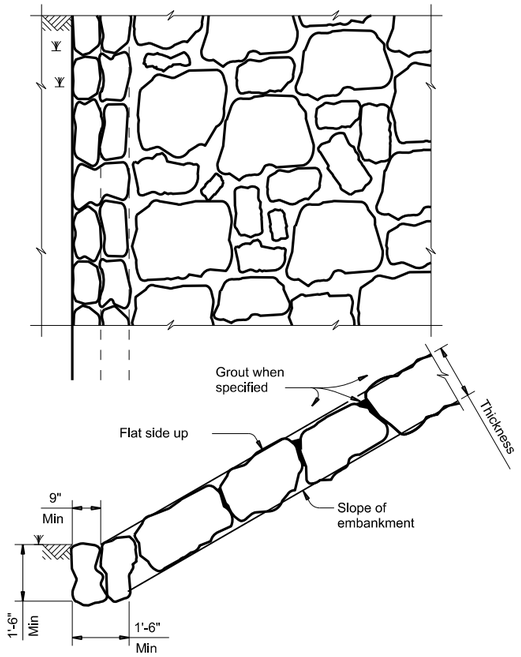


FIGURE 3 ~ TYPE F STONE RIPRAP

grouted

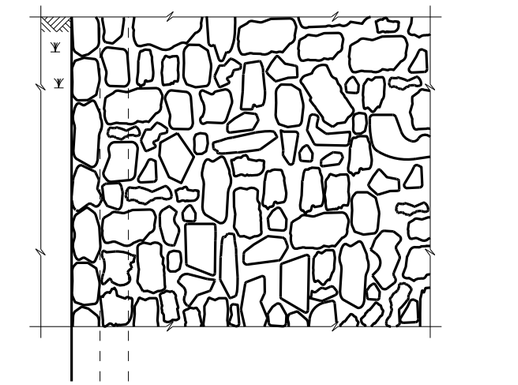


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

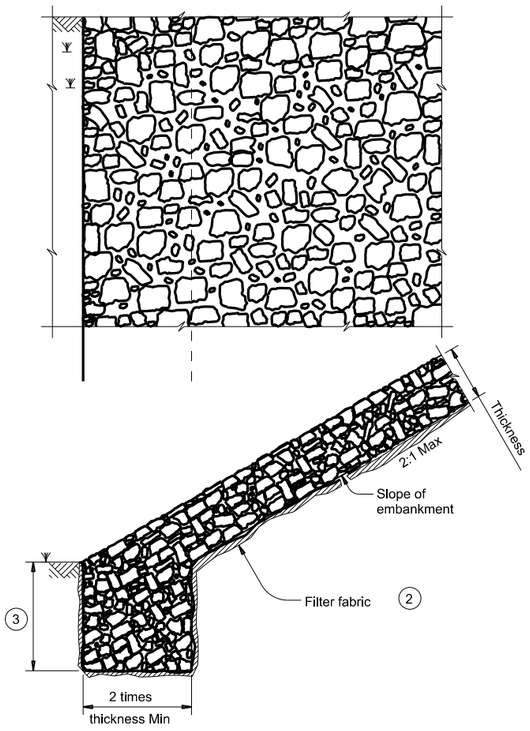


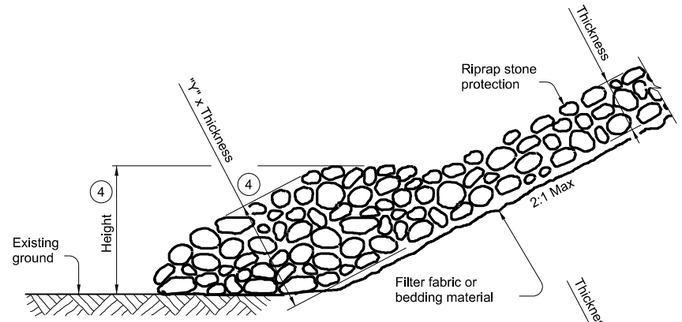
FIGURE 5 ~ PROTECTION STONE RIPRAP 5

2 Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

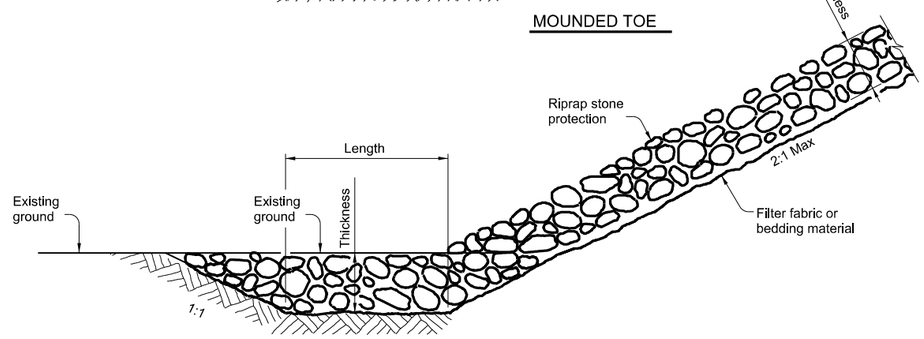
3 Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

4 "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.

5 List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS 5

SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

STONE RIPRAP

SRR

FILE: 18_SRR.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		194

DATE: 2/1/2024 6:51:07 AM
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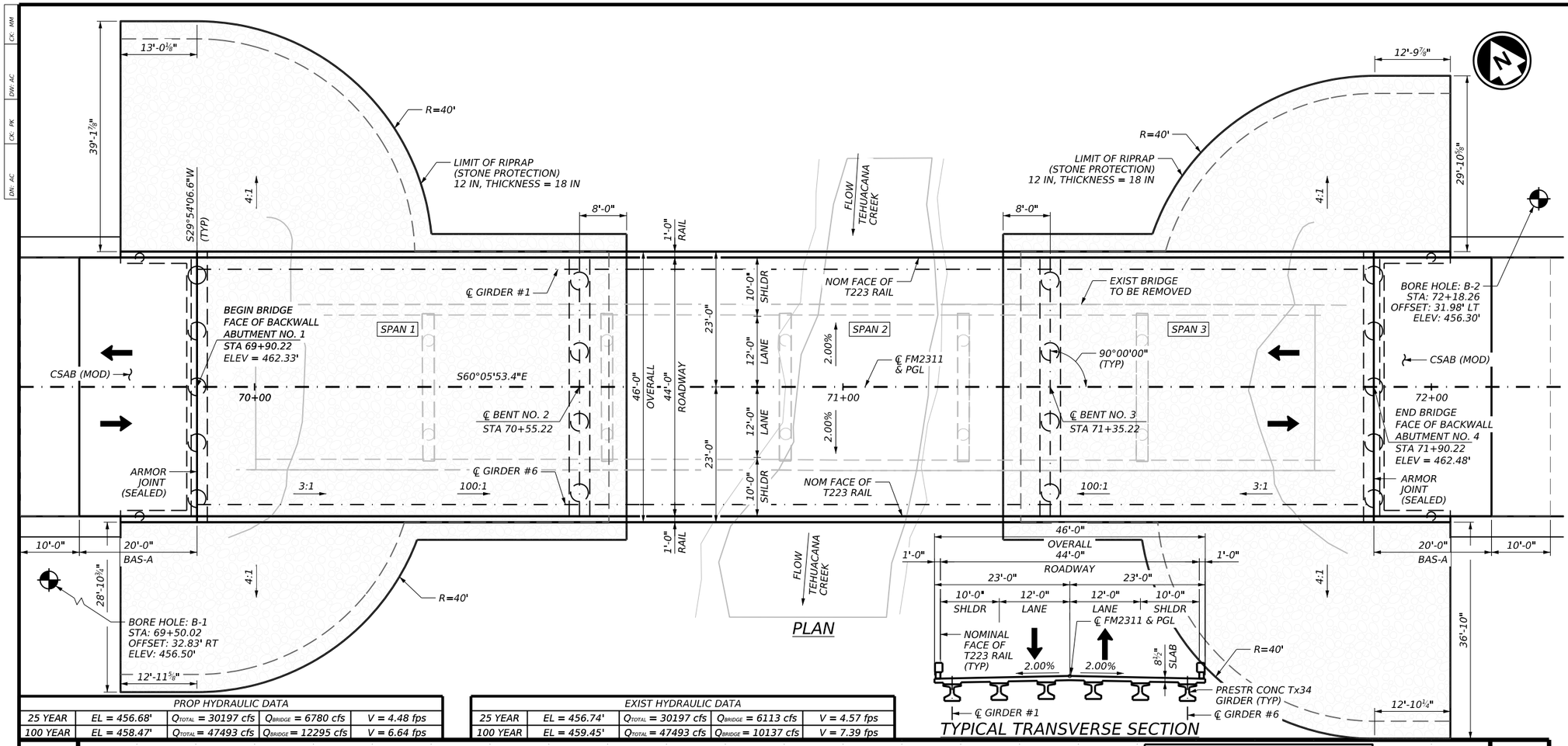
DW: AC | CK: PK | DW: AC | CK: MM

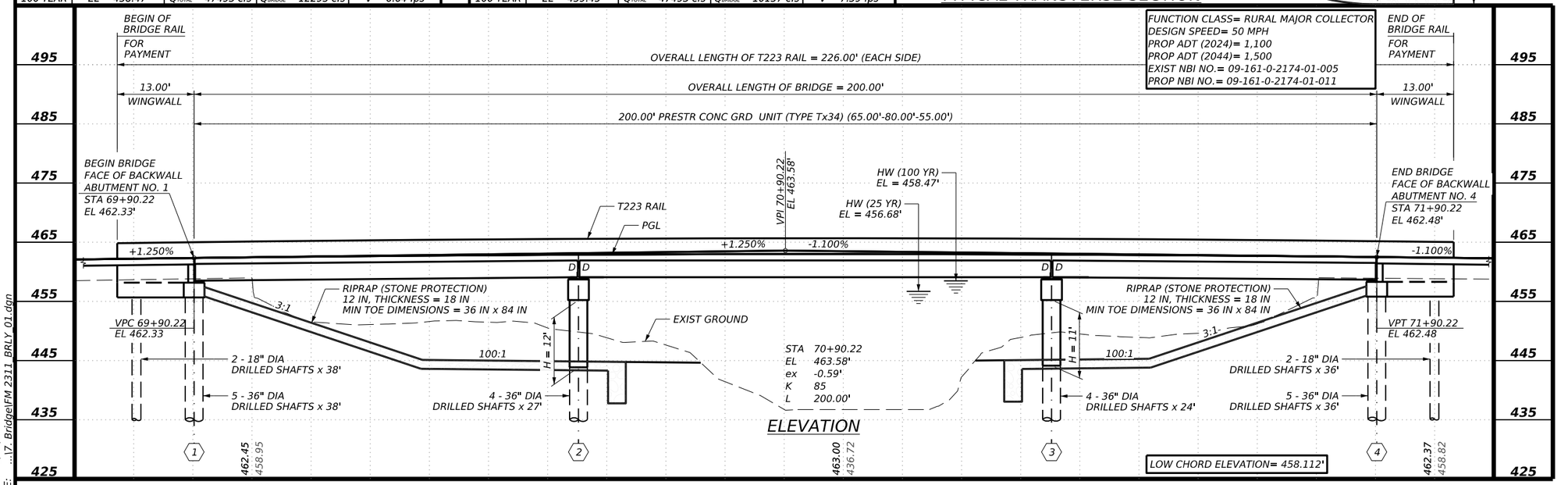


PLAN

TYPICAL TRANSVERSE SECTION

PROP HYDRAULIC DATA				
25 YEAR	EL = 456.68'	Q_{TOTAL} = 30197 cfs	Q_{BRIDGE} = 6780 cfs	V = 4.48 fps
100 YEAR	EL = 458.47'	Q_{TOTAL} = 47493 cfs	Q_{BRIDGE} = 12295 cfs	V = 6.64 fps

EXIST HYDRAULIC DATA				
25 YEAR	EL = 456.74'	Q_{TOTAL} = 30197 cfs	Q_{BRIDGE} = 6113 cfs	V = 4.57 fps
100 YEAR	EL = 459.45'	Q_{TOTAL} = 47493 cfs	Q_{BRIDGE} = 10137 cfs	V = 7.39 fps



ELEVATION

GENERAL NOTES

1. DESIGNED IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020), AS MODIFIED BY 2023 TXDOT BDM.
2. FOR VERTICAL PROFILE AND HORIZONTAL ALIGNMENT SEE ROADWAY PLAN AND PROFILE SHEETS.
3. ALL DIMENSIONS ARE EITHER HORIZONTAL OR VERTICAL AND MUST BE CORRECTED FOR GRADE, CROWN AND/OR SUPERELEVATION.
4. THE CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING THE LOCATION OF ALL UTILITIES AND EXISTING STRUCTURES PRIOR TO ORDERING MATERIALS AND EXCAVATION. NOTIFY ENGINEER IN WRITING OF ANY DISCREPANCIES OR CONFLICTS.
5. THE H VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING THE ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.
6. THE EXISTING 6 SPAN BRIDGE IS TO BE REMOVED BY THE CONTRACTOR. PAN GIRDERS SUPPORTED ON CAST-IN-PLACE SUBSTRUCTURE ON DRILLED SHAFTS FOUNDATION. THIS BRIDGE IS TO BE REMOVED AND DISPOSED OF IN ACCORDANCE WITH STANDARD SPECIFICATION ITEM 496. CONTRACTOR IS REQUIRED TO SUBMIT SIGN AND SEALED DEMO PLAN TO THE ENGINEER FOR APPROVAL.
7. FOR PLAN OF EXISTING BRIDGE REFER TO CSJ 2174-01-005.
8. "D" DENOTED DOWEL IN OUTSIDE GIRDER.
9. SHEAR KEYS REQUIRED AT ABUTMENTS AND BENTS, SEE "IGSK" STANDARD AND DETAILS SHEETS.
10. FOUND DRILLED SHAFTS AT LENGTHS SHOWN OR LONGER TO OBTAIN A MINIMUM TWO DRILLED SHAFT DIAMETER PENETRATION INTO HARD ROCK.
11. CONTRACTOR'S ATTENTION IS DIRECTED TO POTENTIAL WATER BEARING SANDY CLAY AND/OR CLAYEY SAND LAYER(S) SHOWN IN THE BORING LOGS. PROVIDE PROPER INSTALLATION METHOD FOR THE DRILLED SHAFT FOUNDATIONS. IT IS CONTRACTOR'S SOLE RESPONSIBILITY TO MAINTAIN THE STABILITY OF DRILLED SHAFT HOLES.

HL93 LOADING
SUPERSTRUCTURE INV/OPR RATINGS: 1.07/1.68

0 10 20
SCALE IN FEET

STATE OF TEXAS
PRADEEP KUMAR
130846
LICENSED
PROFESSIONAL ENGINEER
1/30/2024

AtkinsRéalis
TBPE REG. # F-474

Texas Department of Transportation

FM 2311

BRIDGE LAYOUT TEHUACANA CREEK BRIDGE

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		195

DATE: 1/30/2024 4:31:26 PM
FILE: ...\7_Bridge\FM 2311_BRLY_01.dgn

CK: MM
DW: AC
CK: PK
DW: AC

SUMMARY OF BRIDGE ESTIMATED QUANTITIES TEHUACANA CREEK BRIDGE													
BID CODES	0400 6005	0416 6001	0416 6004	0420 6014	0420 6030	0420 6038	0422 6001	0422 6015	0425 6036	0432 6031	0450 6006	0454 6004	0496 6010
BID ITEM DESCRIPTION / BRIDGE ELEMENT	CEM STABIL BKFL	DRILL SHAFT (18 IN)	DRILL SHAFT (36 IN)	CL C CONC (ABUT) (HPC)	CL C CONC (CAP) (HPC)	CL C CONC (COLUMN) (HPC)	REINF CONC SLAB	APPROACH SLAB	PRESTR CONC GIRDER (TX34)	RIPRAP (STONE PROTECTION) (12 IN)	RAIL (TY T223)	ARMOR JOINT (SEALED)	REMOV STR (BRIDGE 100-499 FT LENGTH)
	CY	LF	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF	EA
2 - ABUTMENTS	200	148	370	57.3				71.0		998	52.0	84	
2 - BENTS			204		42.0	24.2							
1 - 200.000' PRESTR CONC GIRDER UNIT							9200		1191.00		400.0		
TOTAL	200	148	574	57.3	42.0	24.2	9200	71.0	1191.00	998	452.0	84	1.0

BEARING SEAT ELEVATIONS (FT)

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
ABUT 1 (FWD)	457.883	458.043	458.203	458.203	458.043	457.883

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
BENT 2 (BK)	458.428	458.588	458.748	458.748	458.588	458.428
(FWD)	458.438	458.598	458.758	458.758	458.598	458.438

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
BENT 3 (BK)	458.450	458.610	458.770	458.770	458.610	458.450
(FWD)	458.440	458.600	458.760	458.760	458.600	458.440

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
ABUT 4 (BK)	458.028	458.188	458.348	458.348	458.188	458.028

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ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS TEHUACANA CREEK BRIDGE

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		196

DATE: 1/29/2024 2:38:29 PM
FILE: ...\7. Bridge\FM 2311 BREB 01.dgn

CK: MM
DW: AC
CK: PK
DW: AC

NOTE:

1. BORING LOGS CONDUCTED BY TERRACON CONSULTANT INC. ARE SHOWN HERE FOR INFORMATIONAL PURPOSE ONLY.

DRILLING LOG

WinCore Version 3.3

County	McLennan	Hole	B-1	District	Waco
Highway	FM 2311	Structure	Bridge	Date	2/27/2023
CSJ	2174-01-018	Station	69+50.02	Grnd. Elev.	456.50 ft
		Offset	32.83	GW Elev.	429.50 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	Properties LL	Properties PI	Properties Wet Den. (pcf)	Additional Remarks
			CLAY, fat, soft, dark brown to brown (CH)			20	51	36		#200(%)-98; HP=2.0
						24				HP=1.5
5		7 (6) 8 (6)				29				HP=4.5
										-gravel seam from 6 to 8 ft
						21	68	51		SPT(mod):3-5-7
				7.53	42.7	24			127	HP=2.5
10		6 (6) 7 (6)								
443.5			CLAY, lean, soft to stiff, brown to light brown (CL)			24	46	31		#200(%)-87; HP=1.5
15		7 (6) 8 (6)								
				0	36	21			123	HP=3.0
20		9 (6) 11 (6)								
										HP=1.5
25		9 (6) 10 (6)								
						17				HP=1.0
30		9 (6) 20 (6)								
423.5			SHALE, hard to very hard, dark gray to gray, highly fractured							N/A (Disturbed)
35		50 (0.5) 50 (0)								-clayey seams to 45 ft
				0	325	17			125	REC:97%; RQD:23%
40		50 (1) 50 (1)								

Remarks: Advancement Method: Dry auger to 35 feet; Air rotary thereafter. GPS: (Lat: 31.72565, Lon: -96.99731). SPT testing was modified using a 170-lb hammer with a 24-inch drop height.

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: A. Puente Logger: S. Moreno Organization: Terracon Consultants Inc.

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DRILLING LOG

WinCore Version 3.3

County	McLennan	Hole	B-1	District	Waco
Highway	FM 2311	Structure	Bridge	Date	2/27/2023
CSJ	2174-01-018	Station	69+50.02	Grnd. Elev.	456.50 ft
		Offset	32.83	GW Elev.	429.50 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	Properties LL	Properties PI	Properties Wet Den. (pcf)	Additional Remarks
			SHALE, hard to very hard, dark gray to gray, highly fractured							REC:38%; RQD:38%
411.5		50 (1) 50 (0.5)								
45			SHALE, very hard, dark gray to gray, slightly to moderately fractured							
										REC:70%; RQD:70%
50		50 (0.5) 50 (0.5)								
										-clayey seam from 51 to 52 ft
				0	97	18			134	REC:100%; RQD:68%
55		50 (0.5) 50 (0)								
										REC:93%; RQD:93%
60		50 (0.5) 50 (0)								
										REC:98%; RQD:98%
65		50 (0.5) 50 (0)								
				0	264	16			134	REC:100%; RQD:100%
70		50 (0) 50 (0)								-clayey seam at 70 ft
										REC:100%; RQD:95%
75		50 (0) 50 (0)								
										REC:98%; RQD:97%
376.5		50 (0.5) 50 (0)								
80										

Remarks: Advancement Method: Dry auger to 35 feet; Air rotary thereafter. GPS: (Lat: 31.72565, Lon: -96.99731). SPT testing was modified using a 170-lb hammer with a 24-inch drop height.

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Driller: A. Puente Logger: S. Moreno Organization: Terracon Consultants Inc.

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Texas Department of Transportation

FM 2311

BORING LOGS
TEHUACANA CREEK BRIDGE

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		197

DATE: 1/29/2024 2:38:35 PM
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CK: MM
DW: AC
CK: PK
DW: AC

NOTE:

1. BORING LOGS CONDUCTED BY TERRACON CONSULTANT INC. ARE SHOWN HERE FOR INFORMATIONAL PURPOSE ONLY.

DRILLING LOG

WinCore Version 3.3

County	McLennan	Hole	B-2	District	Waco
Highway	FM 2311	Structure	Bridge	Date	2/28/2023
CSJ	2174-01-018	Station	72+18.26	Grnd. Elev.	456.30 ft
		Offset	-31.98	GW Elev.	430.30 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	Properties LL	Properties PI	Properties Wet Den. (pcf)	Additional Remarks
			CLAY, fat, soft, dark brown to brown (CH)			23				HP=2.0
						23	62	47		HP=2.0
5		6 (6) 8 (6)		0	23	24			125	HP=1.5
						20				SPT(mod):5-8-9
448.3			CLAY, lean, sandy, soft, brown to light brown (CL)			6				HP=4.0
10		9 (6) 7 (6)								
						18	28	14		#200(%)-54; HP=1.5
15		6 (6) 4 (6)								
438.3			CLAY, lean, soft, brown to light brown (CL)	15.04	24.72	22			129	HP=2.0
20		5 (6) 8 (6)								
						24	45	30		#200(%)-89; HP=1.5
25		7 (6) 9 (6)								
426.3		50 (6) 50 (1.5)								SPT(mod):2-2-8
30			SHALE, soft to very hard, dark gray to gray, slightly fractured							
35		50 (1) 50 (1)								SPT(mod):12-42-50/5in
				0	370	15			137	REC:100%; RQD:100%
40		50 (0.5) 50 (0)								

Remarks: Advancement Method: Dry auger to 35 feet; Air rotary thereafter. GPS: (Lat: 31.72541, Lon: -96.99646). SPT testing was modified using a 170-lb hammer with a 24-inch drop height.

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: A. Puente Logger: S. Moreno Organization: Terracon Consultants Inc.

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DRILLING LOG

WinCore Version 3.3

County	McLennan	Hole	B-2	District	Waco
Highway	FM 2311	Structure	Bridge	Date	2/28/2023
CSJ	2174-01-018	Station	72+18.26	Grnd. Elev.	456.30 ft
		Offset	-31.98	GW Elev.	430.30 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	Properties LL	Properties PI	Properties Wet Den. (pcf)	Additional Remarks
			SHALE, soft to very hard, dark gray to gray, slightly fractured							REC:97%; RQD:95%
45		50 (0) 50 (0.5)								
				0	25	16			135	REC:95%; RQD:95%
50		50 (0.5) 50 (1)								
										REC:100%; RQD:100%
55		50 (0.5) 50 (0)								
				0	382	15			134	REC:100%; RQD:100%
60		50 (0.5) 50 (0.5)								
										REC:100%; RQD:97%
65		50 (0.5) 50 (0)								
										REC:100%; RQD:97%
70		50 (0.5) 50 (0.5)								-clayey seam at 70 ft
										REC:100%; RQD:100%
75		50 (0) 50 (0)								
										REC:98%; RQD:92%
376.3 80		50 (0.5) 50 (0)								

Remarks: Advancement Method: Dry auger to 35 feet; Air rotary thereafter. GPS: (Lat: 31.72541, Lon: -96.99646). SPT testing was modified using a 170-lb hammer with a 24-inch drop height.

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: A. Puente Logger: S. Moreno Organization: Terracon Consultants Inc.

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Texas Department of Transportation

FM 2311

BORING LOGS
TEHUACANA CREEK BRIDGE

SHEET 2 OF 2

CONT.	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		198

DATE: 1/29/2024 2:38:42 PM
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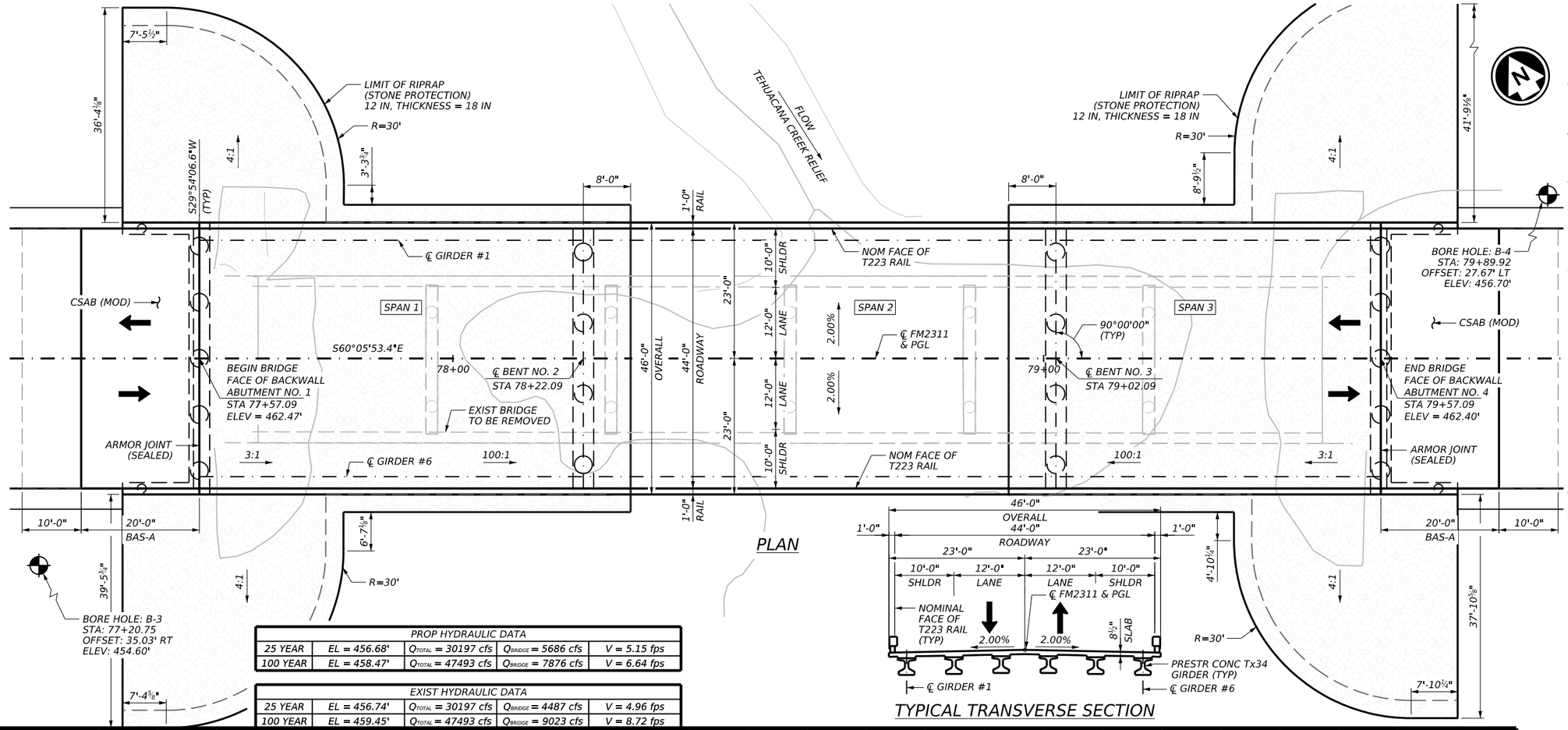
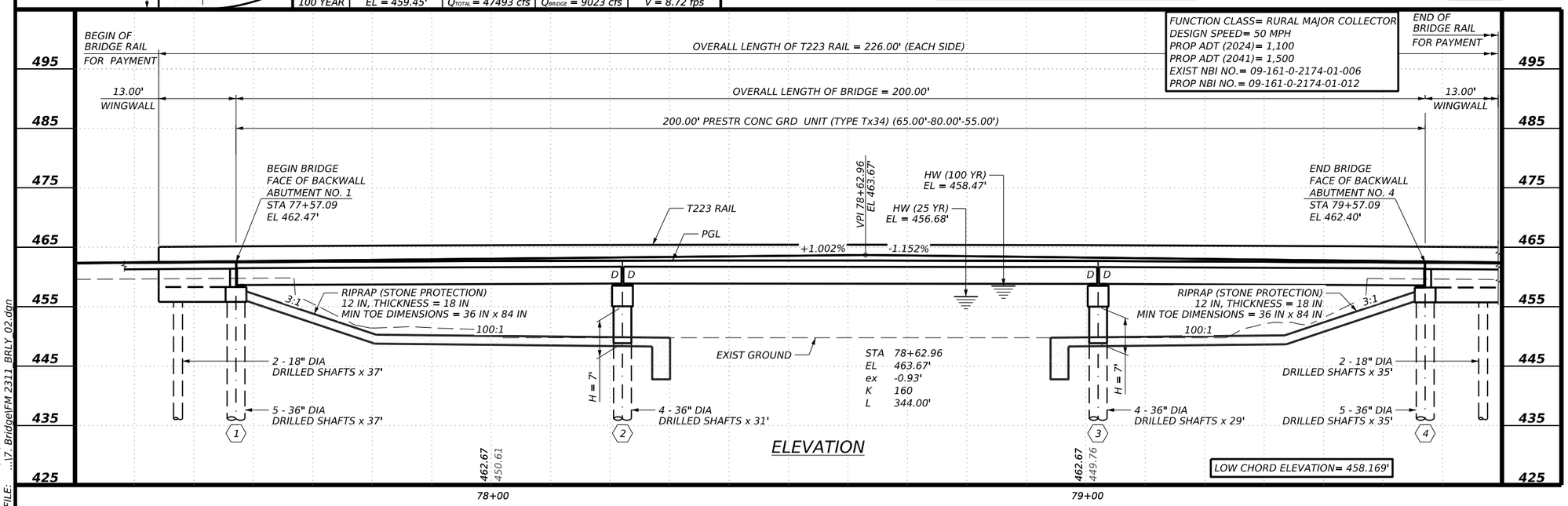
DW: AC
CK: PK
DW: AC



PROP HYDRAULIC DATA				
25 YEAR	EL = 456.68'	Q_{TOTAL} = 30197 cfs	Q_{BRIDGE} = 5686 cfs	V = 5.15 fps
100 YEAR	EL = 458.47'	Q_{TOTAL} = 47493 cfs	Q_{BRIDGE} = 7876 cfs	V = 6.64 fps

EXIST HYDRAULIC DATA				
25 YEAR	EL = 456.74'	Q_{TOTAL} = 30197 cfs	Q_{BRIDGE} = 4487 cfs	V = 4.96 fps
100 YEAR	EL = 459.45'	Q_{TOTAL} = 47493 cfs	Q_{BRIDGE} = 9023 cfs	V = 8.72 fps



DATE: 1/30/2024 4:31:43 PM
FILE: ...\7- Bridge\FM 2311_BRLY_02.dgn

GENERAL NOTES

1. DESIGNED IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020), AS MODIFIED BY 2023 TXDOT BDM.
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9. SHEAR KEYS REQUIRED AT ABUTMENTS AND BENTS, SEE "IGSK" STANDARD AND DETAILS SHEETS.
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HL93 LOADING
SUPERSTRUCTURE INV/OPR RATINGS: 1.07/1.68

0 10 20
SCALE IN FEET

STATE OF TEXAS
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130846
LICENSED
PROFESSIONAL ENGINEER
1/30/2024

AtkinsRéalis
TBPE REG. # F-474

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FM 2311

BRIDGE LAYOUT
TEHUACANA CREEK
RELIEF BRIDGE

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		199

CK: MM
DW: AC
CK: PK
DW: AC

SUMMARY OF BRIDGE ESTIMATED QUANTITIES TEHUACANA CREEK RELIEF BRIDGE													
BID CODES	0400 6005	0416 6001	0416 6004	0420 6014	0420 6030	0420 6038	0422 6001	0422 6015	0425 6036	0432 6031	0450 6006	0454 6004	0496 6010
BID ITEM DESCRIPTION / BRIDGE ELEMENT	CEM STABIL BKFL	DRILL SHAFT (18 IN)	DRILL SHAFT (36 IN)	CL C CONC (ABUT) (HPC)	CL C CONC (CAP) (HPC)	CL C CONC (COLUMN) (HPC)	REINF CONC SLAB	APPROACH SLAB	PRESTR CONC GIRDER (TX34)	RIPRAP (STONE PROTECTION) (12IN)	RAIL (TY T223)	ARMOR JOINT (SEALED)	REMOV STR (BRIDGE 100-499 FT LENGTH)
	CY	LF	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF	EA
2 - ABUTMENTS	200	144	360	57.3				71.0		984	52.0	84	
2 - BENTS			240		42.0	14.8							
1 - 200.000' PRESTR CONC GIRDER UNIT							9200		1191.00		400.0		
TOTAL	200	144	600	57.3	42.0	14.8	9200	71.0	1191.00	984	452.0	84	1.0

BEARING SEAT ELEVATIONS (FT)

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
ABUT 1 (FWD)	458.013	458.173	458.333	458.333	458.173	458.013

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
BENT 2 (BK)	458.257	458.417	458.577	458.577	458.417	458.257
(FWD)	458.260	458.420	458.580	458.580	458.420	458.260

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
BENT 3 (BK)	458.207	458.367	458.527	458.527	458.367	458.207
(FWD)	458.200	458.360	458.520	458.520	458.360	458.200

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
ABUT 4 (BK)	457.940	458.100	458.260	458.260	458.100	457.940

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PROFESSIONAL ENGINEER
1/29/2024

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FM 2311

ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS TEHUACANA CREEK RELIEF BRIDGE

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		200

DATE: 1/29/2024 2:38:54 PM
FILE: ...\7. Bridge\FM 2311 BREB 02.dgn

CK: MM
DW: AC
CK: PK
DW: AC

NOTE:

1. BORING LOGS CONDUCTED BY TERRACON CONSULTANT INC. ARE SHOWN HERE FOR INFORMATIONAL PURPOSE ONLY.

DRILLING LOG

WinCore Version 3.3

County	McLennan	Hole	B-3	District	Waco
Highway	FM 2311	Structure	Bridge	Date	3/1/2023
CSJ	2174-01-018	Station	77+20.75	Grnd. Elev.	454.60 ft
		Offset	35.03	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	Properties LL	Properties PI	Properties Wet Den. (pcf)	Additional Remarks
			CLAY, fat, soft to stiff, dark brown to brown (CH)			29				HP=1.0
						33	86	62		#200(%)-100; HP=1.5
5		7 (6) 8 (6)		0	20	28			124	HP=1.5
						29				SPT(mod):3-4-7
				7.5	55.04	19			129	HP=4.5
10		9 (6) 12 (6)								
441.6			CLAY, lean, soft to stiff, brown to light brown, with sand (CL)			21	39	24		#200(%)-84; HP=3.0
15		10 (6) 11 (6)								
										HP=2.0
20		9 (6) 10 (6)								
				0	29	20			127	HP=3.5
25		16 (6) 24 (6)								
										SPT(mod):16-32-50/6in
424.6 30		50 (2) 50 (1)	SHALE, hard to very hard, dark gray to gray, slightly fractured							
										REC:100%; RQD:98%
35		50 (0.5) 50 (0)								
				0	214	17			135	REC:100%; RQD:100%
40		50 (0.5) 50 (0.5)								

Remarks: Advancement Method: Dry auger to 30 feet; Air rotary thereafter. GPS: (Lat: 31.72453, Lon: -96.99520). SPT testing was modified using a 170-lb hammer with a 24-inch drop height.

The ground water elevation was not determined during the course of this boring.

Driller: A. Puente Logger: S. Moreno Organization: Terracon Consultants Inc.

C:\Users\lmsnyder\Terracon Consultants Inc\Texas Transportation Team - 36-9IDP5088 - AUS PSE IDIQ (Atkins)\Projects\WA5 - Waco District Three PS&E\Laboratory-Field Data-Boring Logs\WinCore\96225226.FM2311.

DRILLING LOG

WinCore Version 3.3

County	McLennan	Hole	B-3	District	Waco
Highway	FM 2311	Structure	Bridge	Date	3/1/2023
CSJ	2174-01-018	Station	77+20.75	Grnd. Elev.	454.60 ft
		Offset	35.03	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	Properties LL	Properties PI	Properties Wet Den. (pcf)	Additional Remarks
			SHALE, hard to very hard, dark gray to gray, slightly fractured							
										REC:97%; RQD:97%
45		50 (0.5) 50 (0.5)								
				0	17	23			126	REC:100%; RQD:83%
50		50 (0.5) 50 (0)								-clayey seam from 49 to 50 ft
										REC:95%; RQD:88%
55		50 (0) 50 (0)								-clayey seam at 55 ft
										REC:100%; RQD:100%
60		50 (0.5) 50 (0)								
				0	14	17			134	REC:98%; RQD:97%
65		50 (0) 50 (0)								
										REC:97%; RQD:97%
70		50 (0.5) 50 (0.5)								
										REC:97%; RQD:97%
75		50 (0.5) 50 (0)								
										REC:100%; RQD:97%
374.6 80		50 (0) 50 (0)								

Remarks: Advancement Method: Dry auger to 30 feet; Air rotary thereafter. GPS: (Lat: 31.72453, Lon: -96.99520). SPT testing was modified using a 170-lb hammer with a 24-inch drop height.

The ground water elevation was not determined during the course of this boring.

Driller: A. Puente Logger: S. Moreno Organization: Terracon Consultants Inc.

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FM 2311

BORING LOGS
TEHUACANA CREEK
RELIEF BRIDGE

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		201

DATE: 1/29/2024 2:39:00 PM
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NOTE:

1. BORING LOGS CONDUCTED BY TERRACON CONSULTANT INC. ARE SHOWN HERE FOR INFORMATIONAL PURPOSE ONLY.

DRILLING LOG

WinCore Version 3.3

County	McLennan	Hole	B-4	District	Waco
Highway	FM 2311	Structure	Bridge	Date	3/6/2023
CSJ	2174-01-018	Station	79+89.92	Grnd. Elev.	456.70 ft
		Offset	-27.67	GW Elev.	433.70 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	Properties LL	Properties PI	Properties Wet Den. (pcf)	Additional Remarks
			CLAY, fat, soft, dark brown to brown (CH)			27				HP=1.0
						23	53	38		HP=1.5
5		6 (6) 6 (6)		3.87	23.59	22			125	HP=1.5
						26				SPT(mod):7-8-11
						30	53	35		#200(%)-95; HP=1.5
10		6 (6) 7 (6)								
443.7			CLAY, fat, soft to stiff, brown to light brown (CH)	0	22	25			123	HP=2.5
15		6 (6) 8 (6)								
						27	63	44		HP=1.5
20		8 (6) 11 (6)								
				0	43	24			120	HP=4.5
25		19 (6) 20 (6)								
426.7	30	50 (1) 50 (1)	SHALE, very hard, dark gray to gray, slightly fractured							SPT(mod):18-39-50/5in
										REC:93%; RQD:85%
35		50 (0) 50 (1)								
				0	243	18			134	REC:98%; RQD:87%
40		50 (1) 50 (0)								

Remarks: Advancement Method: Dry auger to 30 feet; Air rotary thereafter. GPS: (Lat: 31.72429, Lon: -96.99436). SPT testing was modified using a 170-lb hammer with a 24-inch drop height.

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: A. Puente Logger: S. Moreno Organization: Terracon Consultants Inc.

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DRILLING LOG

WinCore Version 3.3

County	McLennan	Hole	B-4	District	Waco
Highway	FM 2311	Structure	Bridge	Date	3/6/2023
CSJ	2174-01-018	Station	79+89.92	Grnd. Elev.	456.70 ft
		Offset	-27.67	GW Elev.	433.70 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	Properties LL	Properties PI	Properties Wet Den. (pcf)	Additional Remarks
			SHALE, very hard, dark gray to gray, slightly fractured							REC:95%; RQD:95%
45		50 (0.5) 50 (0)								
										REC:97%; RQD:97%
50		50 (1) 50 (0.5)								
				0	259	17			136	REC:98%; RQD:95%
55		50 (0.5) 50 (0)								
										REC:97%; RQD:88%
60		50 (1.5) 50 (0.5)								
										REC:95%; RQD:95%
65		50 (0.5) 50 (0)								
				0	332	18			138	REC:98%; RQD:98%
70		50 (0.5) 50 (0)								
										REC:98%; RQD:98%
75		50 (0) 50 (0.5)								
										REC:92%; RQD:90%
376.7	80	50 (0.25) 50 (0)								

Remarks: Advancement Method: Dry auger to 30 feet; Air rotary thereafter. GPS: (Lat: 31.72429, Lon: -96.99436). SPT testing was modified using a 170-lb hammer with a 24-inch drop height.

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: A. Puente Logger: S. Moreno Organization: Terracon Consultants Inc.

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Texas Department of Transportation

FM 2311

BORING LOGS
TEHUACANA CREEK
RELIEF BRIDGE

SHEET 2 OF 2

CONT.	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		202

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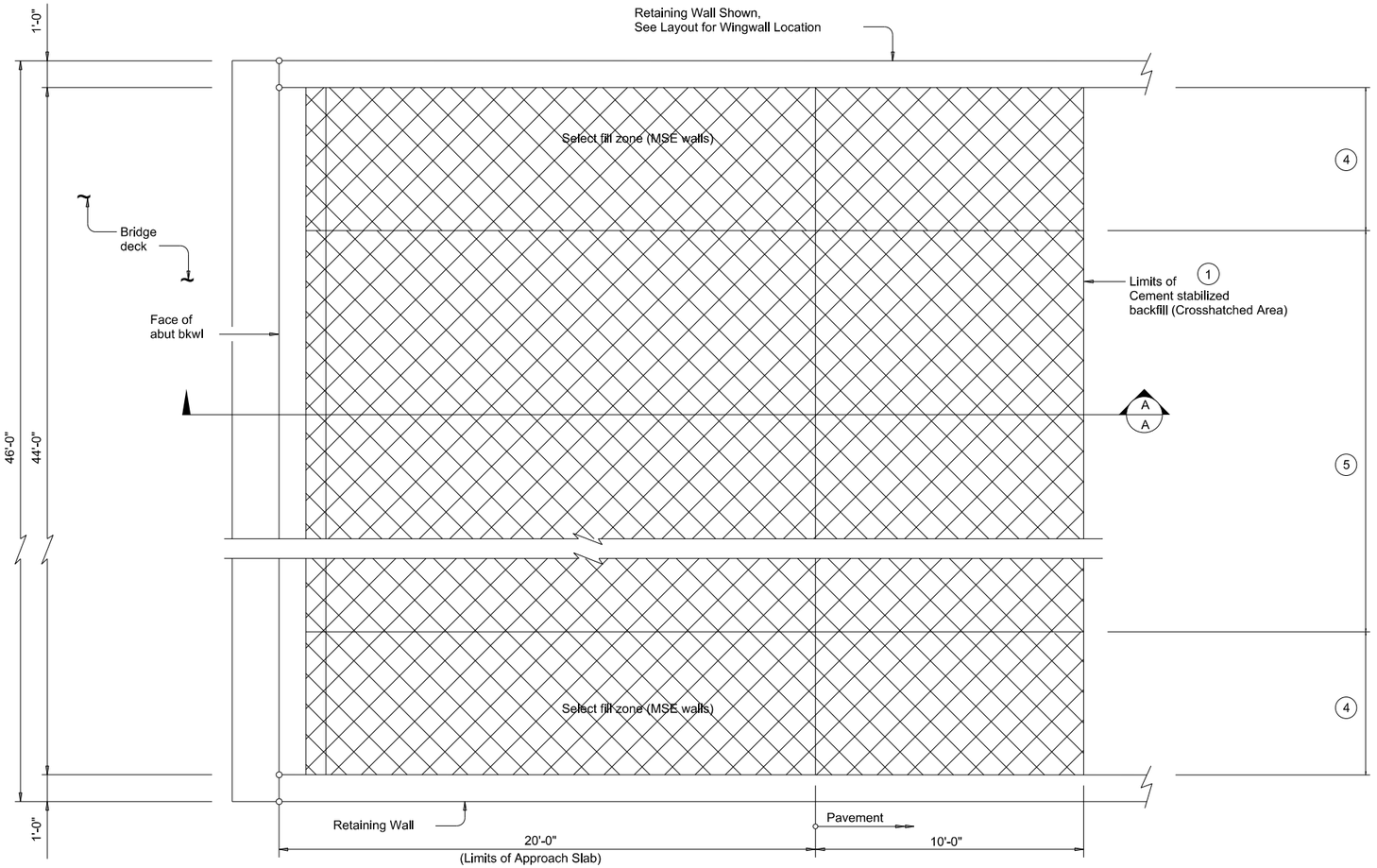
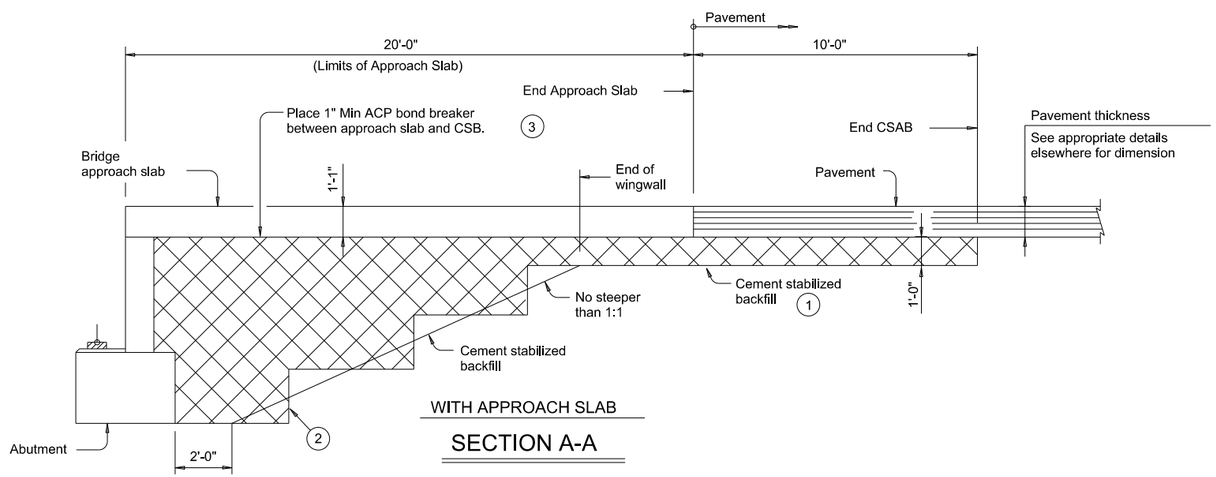


PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



WITH APPROACH SLAB

SECTION A-A

1. Extend CSB limits as shown.
2. Bench backfill as shown with 12" (approximate) bench depths.
3. Other materials can be used as a bond breaker if permitted by the Engineer. 2 layers of 30 Lb roofing felt or 2 layers of heavy mil polyethylene sheeting are examples.
4. Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.
5. When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill *with approval from the Engineer.*

GENERAL NOTES:

Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.

STATE OF TEXAS
PRADEEP KUMAR
130846
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PROFESSIONAL ENGINEER
1/29/2024

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CEMENT STABILIZED ABUTMENT BACKFILL DETAILS

BRIDGE ABUTMENT CSAB (MOD)

FILE: csabdet.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		203

DATE: 1/29/2024 2:39:11 PM
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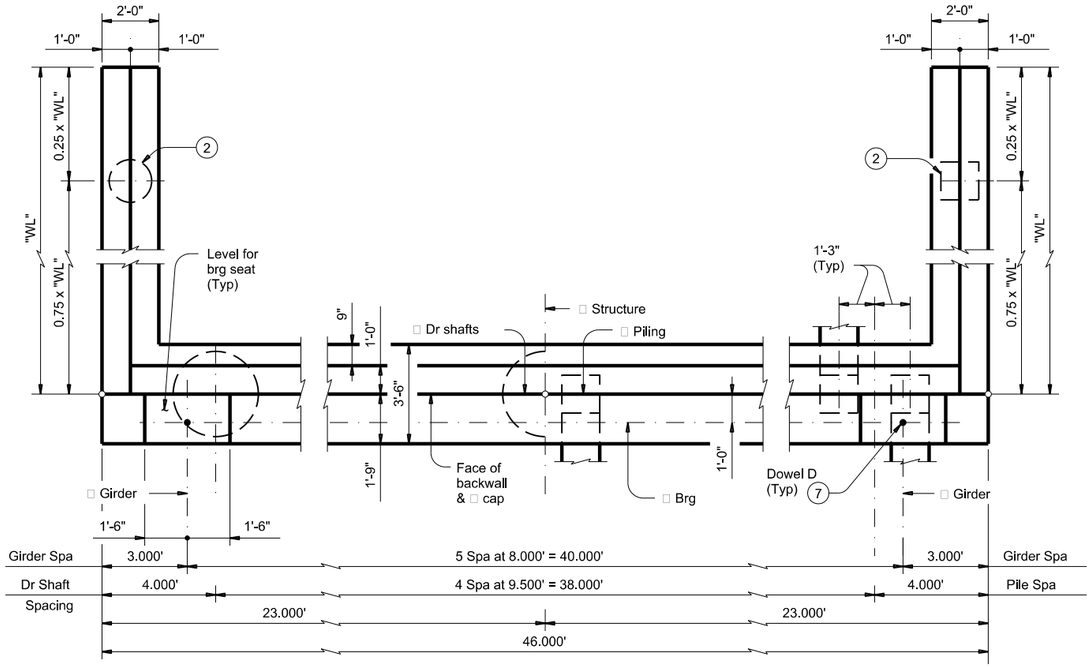
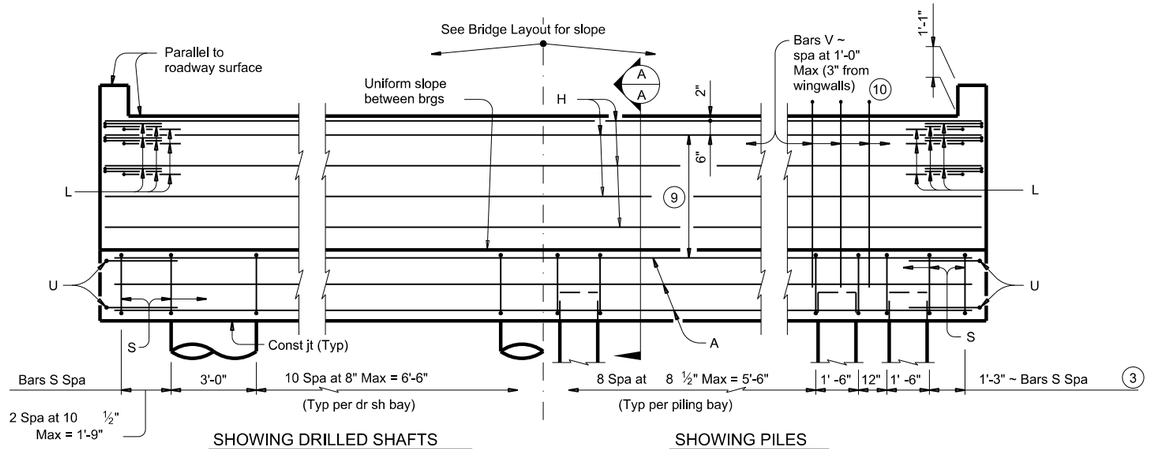


SHOWING DRILLED SHAFTS SHOWING PILES

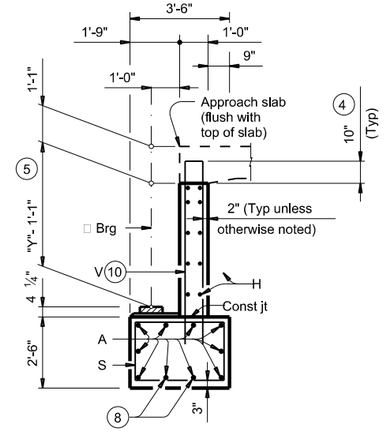
PLAN (1)



SHOWING DRILLED SHAFTS SHOWING PILES

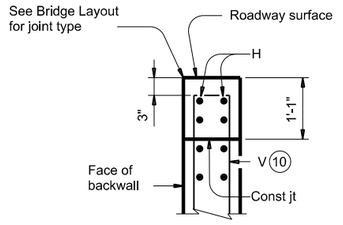
ELEVATION

TABLE A			
Header Slope	Girder Type	Wingwall Type	Wingwall Lgth "WL"
2:1	Tx28	Cantilevered	8.000'
	Tx34	Cantilevered	9.000'
	Tx40	Cantilevered	10.000'
	Tx46	Cantilevered	11.000'
	Tx54	Cantilevered	12.000'
3:1	Tx28	Cantilevered	12.000'
	Tx34	Founded	13.000'
	Tx40	Founded	15.000'
	Tx46	Founded	16.000'
	Tx54	Founded	18.000'



SECTION A-A

(With approach slab) (6)



BACKWALL DETAIL

(Without approach slab) (6)

TABLE OF FOUNDATION LOADS		
Span Length	All Girder Types	
Ft	Tons/Shaft	Tons/Pile
40	55	51
45	59	53
50	63	55
55	66	56
60	70	58
65	73	60
70	77	62
75	80	64
80	84	66
85	87	67
90	91	69
95	94	71
100	98	73
105	101	74
110	104	76
115	108	78
120	111	80
125	114	81

(1) See Table A for variable dimensions based on header slope and girder type.

(2) See Table A to determine if wingwall foundations are required.

(3) For piling larger than 16" adjust Bars S spacing as required to avoid piling.

(4) Increase as required to maintain 3" from finished grade.

(5) See Span details for "Y" value.

(6) See Bridge Layout to determine if approach slab is present.

(7) Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.

(8) With pile foundations, move Bars A shown to clear piles.

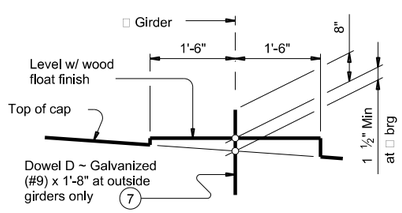
(9) Spacing based on girder type:
Tx28 ~ 3 spaces at 1'-0" Max
Tx34 ~ 3 spaces at 1'-0" Max
Tx40 ~ 4 spaces at 1'-0" Max
Tx46 ~ 4 spaces at 1'-0" Max
Tx54 ~ 5 spaces at 1'-0" Max

(10) Field bend as needed to clear piles.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
See Bridge Layout for header slope and foundation type, size and length.
See Common Foundation Details (FD) standard sheet for all foundation details and notes.
See Concrete Riprap (CRR) standard sheet or Stone Riprap (SRR) standard sheet for riprap attachment details, if applicable.
See applicable rail details for rail anchorage in wingwalls.
These abutment details may be used with standard SIG-44 only.

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

MATERIAL NOTES:
Provide Class C concrete (f'c = 3,600 psi).
Provide Class C (HPC) concrete if shown elsewhere in the plans.
Provide Grade 60 reinforcing steel.
Galvanize dowel bars D.



BEARING SEAT DETAIL

(Bearing surface must be clean and free of all loose material before placing bearing pad.)

HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

ABUTMENTS
TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
44' ROADWAY

AIG-44

FILE: AIG-44.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		204

DATE: 1/29/2024 2:39:16 PM
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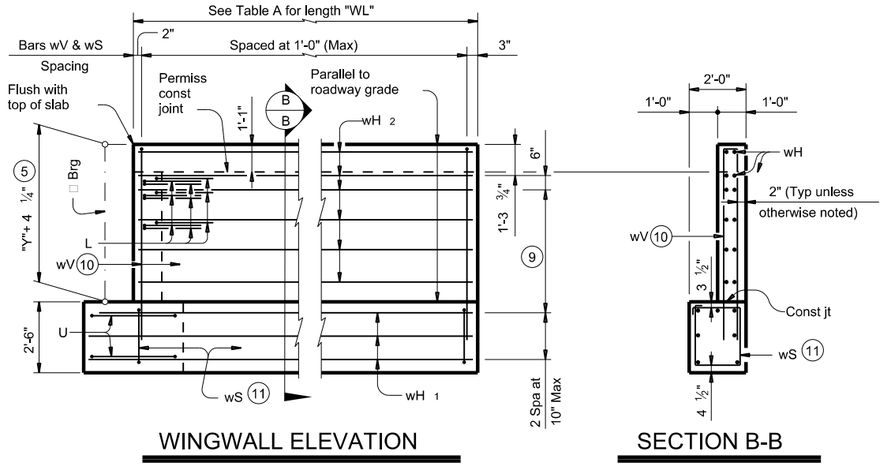
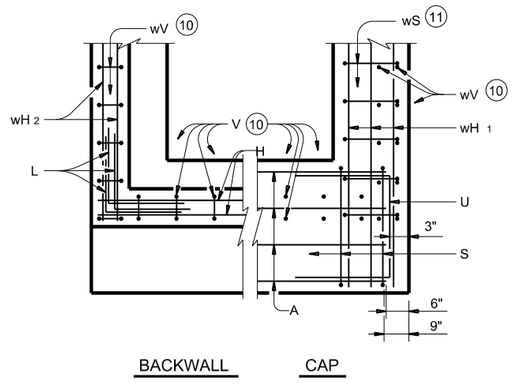


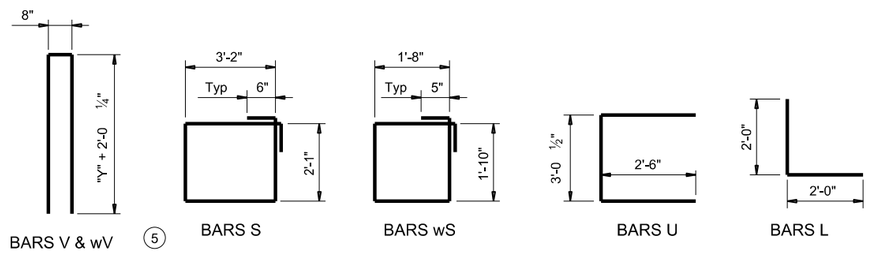
WINGWALL ELEVATION

SECTION B-B



BACKWALL CAP

CORNER DETAILS



(5) See Span details for "Y" value.

(9) Spacing based on girder type:
Tx28 ~ 3 spaces at 1'-0" Max
Tx34 ~ 3 spaces at 1'-0" Max
Tx40 ~ 4 spaces at 1'-0" Max
Tx46 ~ 4 spaces at 1'-0" Max
Tx54 ~ 5 spaces at 1'-0" Max

(10) Field bend as needed to clear piles.

(11) Adjust as required to avoid piling.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation

Bridge Division Standard

ABUTMENTS

TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
44' ROADWAY

AIG-44

FILE: AIG-44.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		205

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TABLES OF ESTIMATED QUANTITIES WITH 2:1 HEADER SLOPE (12)

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	45'-0"	2,391
D (7)	2	#9	1'-8"	11
H	8	#6	45'-8"	549
L	18	#6	4'-0"	108
S	50	#5	11'-6"	600
U	4	#6	8'-1"	49
V	45	#5	11'-4"	532
wH1	14	#6	9'-5"	198
wH2	20	#6	7'-8"	230
wS	18	#4	7'-10"	94
wV	18	#5	11'-4"	213
Reinforcing Steel			Lb	4,975
Class "C" Concrete			CY	23.6

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	45'-0"	2,391
D (7)	2	#9	1'-8"	11
H	8	#6	45'-8"	549
L	18	#6	4'-0"	108
S	50	#5	11'-6"	600
U	4	#6	8'-1"	49
V	45	#5	12'-4"	579
wH1	14	#6	10'-5"	219
wH2	20	#6	8'-8"	260
wS	20	#4	7'-10"	105
wV	20	#5	12'-4"	257
Reinforcing Steel			Lb	5,128
Class "C" Concrete			CY	25.4

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	45'-0"	2,391
D (7)	2	#9	1'-8"	11
H	10	#6	45'-8"	686
L	18	#6	4'-0"	108
S	50	#5	11'-6"	600
U	4	#6	8'-1"	49
V	45	#5	13'-4"	626
wH1	14	#6	11'-5"	240
wH2	24	#6	9'-8"	348
wS	22	#4	7'-10"	115
wV	22	#5	13'-4"	306
Reinforcing Steel			Lb	5,480
Class "C" Concrete			CY	27.3

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	45'-0"	2,391
D (7)	2	#9	1'-8"	11
H	10	#6	45'-8"	686
L	18	#6	4'-0"	108
S	50	#5	11'-6"	600
U	4	#6	8'-1"	49
V	45	#5	14'-4"	673
wH1	14	#6	12'-5"	261
wH2	24	#6	10'-8"	385
wS	24	#4	7'-10"	126
wV	24	#5	14'-4"	359
Reinforcing Steel			Lb	5,649
Class "C" Concrete			CY	29.2

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	45'-0"	2,391
D (7)	2	#9	1'-8"	11
H	12	#6	45'-8"	823
L	18	#6	4'-0"	108
S	50	#5	11'-6"	600
U	4	#6	8'-1"	49
V	45	#5	15'-8"	735
wH1	14	#6	13'-5"	282
wH2	28	#6	11'-8"	491
wS	26	#4	7'-10"	136
wV	26	#5	15'-8"	425
Reinforcing Steel			Lb	6,051
Class "C" Concrete			CY	31.7

TABLES OF ESTIMATED QUANTITIES WITH 3:1 HEADER SLOPE (12)

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	45'-0"	2,391
D (7)	2	#9	1'-8"	11
H	8	#6	45'-8"	549
L	18	#6	4'-0"	108
S	50	#5	11'-6"	600
U	4	#6	8'-1"	49
V	45	#5	11'-4"	532
wH1	14	#6	13'-5"	282
wH2	20	#6	11'-8"	350
wS	26	#4	7'-10"	136
wV	26	#5	11'-4"	307
Reinforcing Steel			Lb	5,315
Class "C" Concrete			CY	26.2

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	45'-0"	2,391
D (7)	2	#9	1'-8"	11
H	8	#6	45'-8"	549
L	18	#6	4'-0"	108
S	50	#5	11'-6"	600
U	4	#6	8'-1"	49
V	45	#5	12'-4"	579
wH1	14	#6	14'-5"	303
wH2	20	#6	12'-8"	381
wS	28	#4	7'-10"	147
wV	28	#5	12'-4"	360
Reinforcing Steel			Lb	5,478
Class "C" Concrete			CY	28.1

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	45'-0"	2,391
D (7)	2	#9	1'-8"	11
H	10	#6	45'-8"	686
L	18	#6	4'-0"	108
S	50	#5	11'-6"	600
U	4	#6	8'-1"	49
V	45	#5	13'-4"	626
wH1	14	#6	16'-5"	345
wH2	24	#6	14'-8"	529
wS	32	#4	7'-10"	167
wV	32	#5	13'-4"	445
Reinforcing Steel			Lb	5,957
Class "C" Concrete			CY	30.9

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	45'-0"	2,391
D (7)	2	#9	1'-8"	11
H	10	#6	45'-8"	686
L	18	#6	4'-0"	108
S	50	#5	11'-6"	600
U	4	#6	8'-1"	49
V	45	#5	14'-4"	673
wH1	14	#6	17'-5"	366
wH2	24	#6	15'-8"	565
wS	34	#4	7'-10"	178
wV	34	#5	14'-4"	508
Reinforcing Steel			Lb	6,135
Class "C" Concrete			CY	33.0

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	45'-0"	2,391
D (7)	2	#9	1'-8"	11
H	12	#6	45'-8"	823
L	18	#6	4'-0"	108
S	50	#5	11'-6"	600
U	4	#6	8'-1"	49
V	45	#5	15'-8"	735
wH1	14	#6	19'-5"	408
wH2	28	#6	17'-8"	743
wS	38	#4	7'-10"	199
wV	38	#5	15'-8"	621
Reinforcing Steel			Lb	6,688
Class "C" Concrete			CY	36.5

(7) Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.

(12) Quantities shown are for one abutment only (with approach slab). With no approach slab, add 1.8 CY Class "C" concrete and 274 lbs reinforcing steel for 4 additional Bars H.

HL93 LOADING

SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

ABUTMENTS

TYPE TX28 THRU TX54

PRESTR CONC I-GIRDERS

44' ROADWAY

AIG-44

FILE: AIG-44.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
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	WAC	McLENNAN		206

DATE: 1/29/2024 2:39:17 PM
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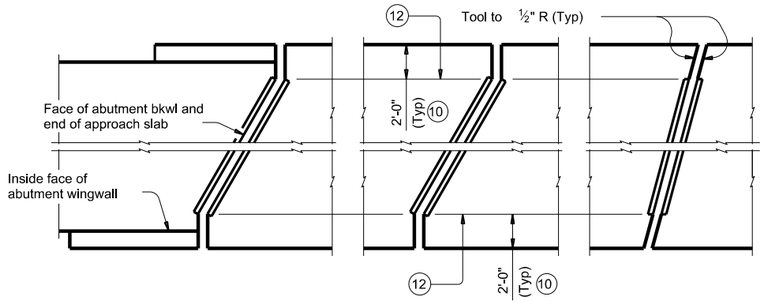
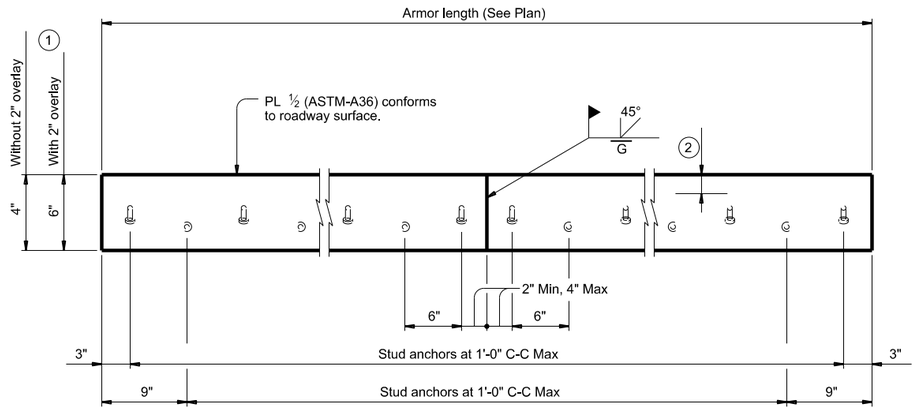
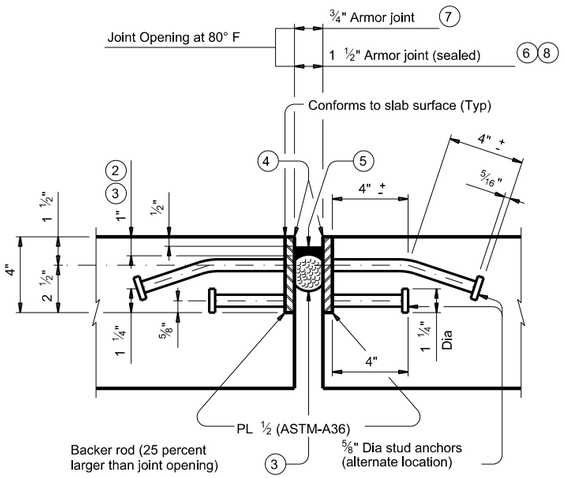


PLANS OF ARMOR PLATES

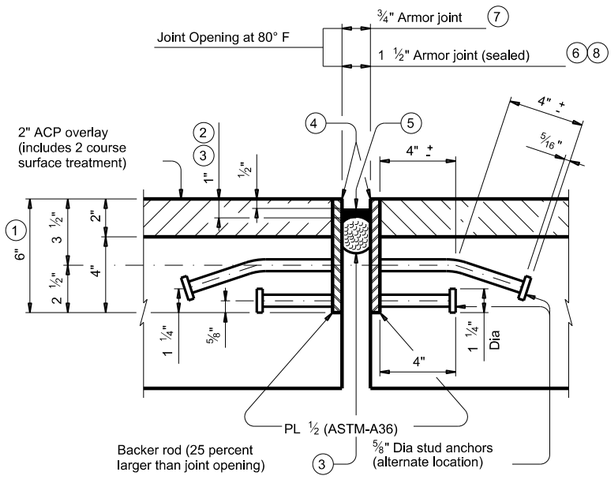


ELEVATION OF BASIC ARMOR PLATE

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



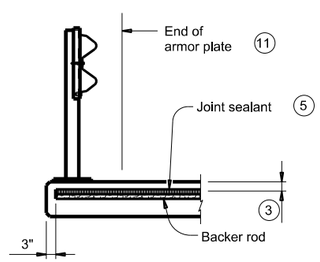
SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION



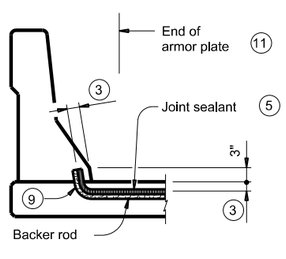
SHOWN WITH 2" OVERLAY AT JOINT LOCATION 1

ARMOR JOINT SECTIONS

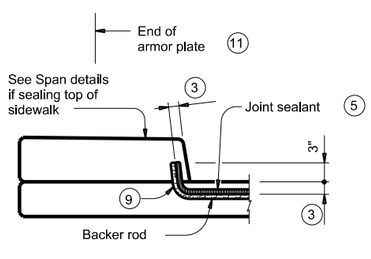
Showing Armor Joint (Sealed)



AT STEEL POST BRIDGE RAIL



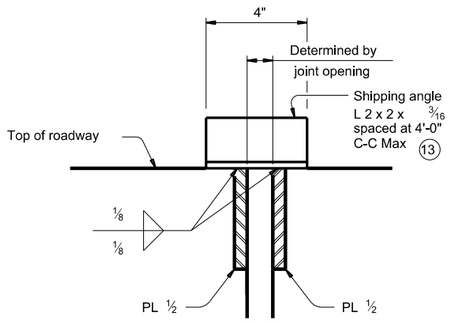
AT CONCRETE BRIDGE RAIL



AT SIDEWALK

JOINT SEALANT TERMINATION DETAILS

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



SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION

With overlay similar

SHIPPING ANGLE

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

FABRICATION NOTES:

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

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

Weld studs in accordance with AWS D1.1.

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

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

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

CONSTRUCTION NOTES:

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

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

GENERAL NOTES:

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

These joint details accommodate a joint movement range of 1 ⅜" (¾" opening movement and ⅝" closure movement).

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

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

Texas Department of Transportation

Bridge Division Standard

ARMOR JOINT DETAILS

AJ

FILE: MS-AJ-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
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	WAC	McLENNAN		207

DATE: 1/29/2024 2:39:23 PM
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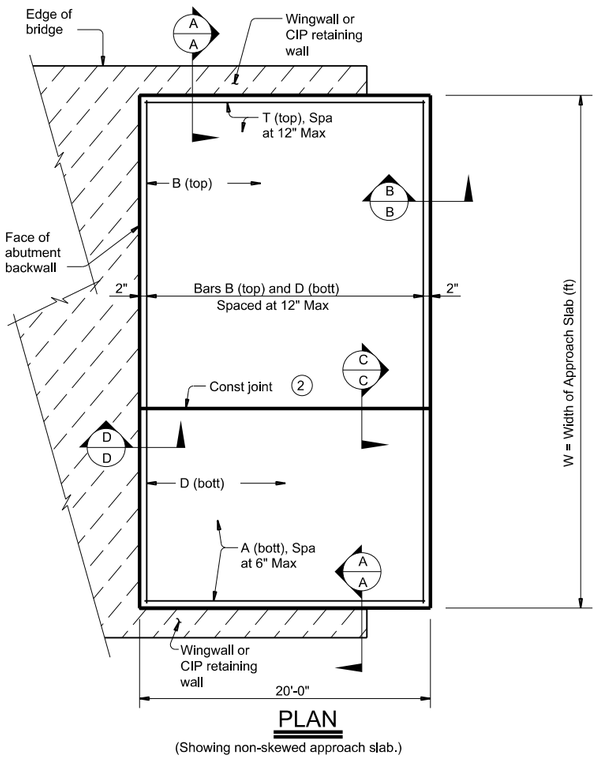
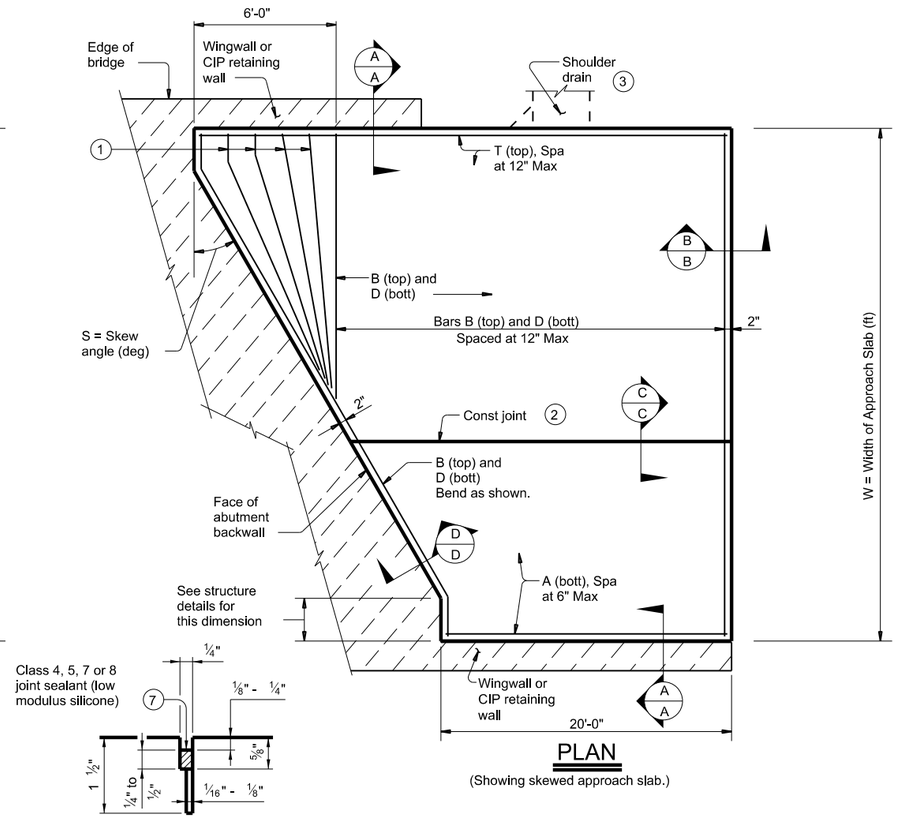


PLAN

(Showing non-skewed approach slab.)



PLAN

(Showing skewed approach slab.)

LONGITUDINAL SAW CUT JOINT DETAIL

BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
T	#5

APPROXIMATE QUANTITIES (4)

Reinf steel weight = 8.5 Lbs/SF of Approach Slab

Volume of Appr Slab Conc (CY) = 0.802W + 0.02W² Tan S

W = Width of Approach Slab (ft)

S = Skew Angle (deg)

(1) Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.

(2) Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.

(3) See details elsewhere in plans for shoulder drain location and details.

(4) For Contractor's information only. Quantities shown are for one approach slab.

(5) Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.

(6) See details elsewhere in plans for required cross-slope.

(7) Place in accordance with Item 438.

(8) Provide backer rod that is 25% larger than joint opening and compatible with the sealant.

(9) If bridge rail is present at the wingwall or CIP retaining wall, place ½" rebonded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

GENERAL NOTES:

Construct approach slab in accordance with Item 422.

Provide Class "S" concrete with a minimum compressive strength of 4,000 psi.

Provide Grade 60 reinforcing steel.

Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 ½" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 ½" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

Provide rebonded recycled tire rubber joint filler that meets the requirements of DMS-6310. "Joint Sealants and Fillers."

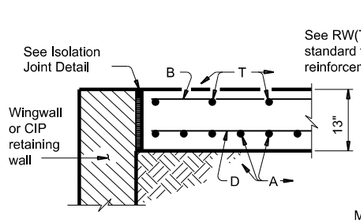
Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans.

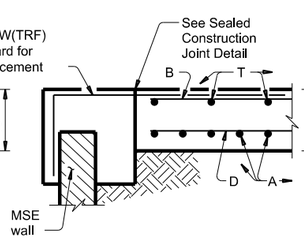
Cure for 4 days using water or membrane curing per Item 422.

All details shown herein are subsidiary to bridge approach slab.

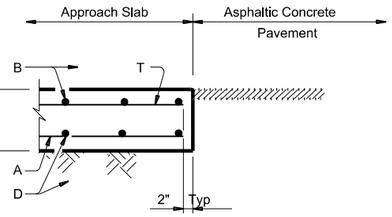
Cover dimensions are clear dimensions, unless noted otherwise.



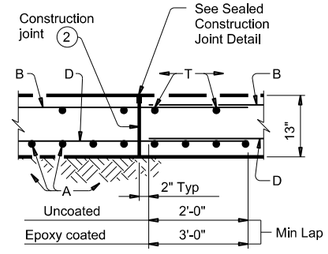
SHOWING WINGWALL OR CIP RETAINING WALL



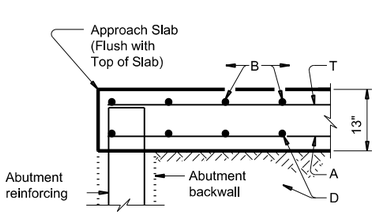
SHOWING MSE WALL



SECTION A-A

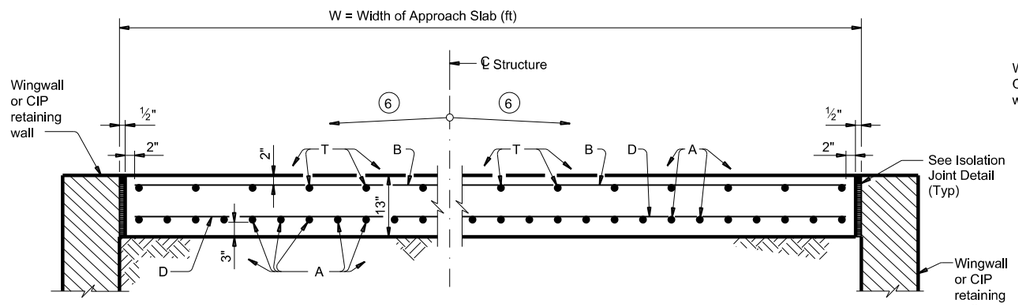


SECTION B-B

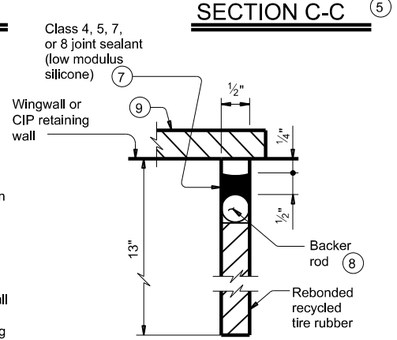


SECTION C-C (5)

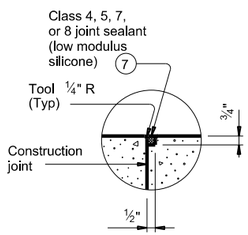
SECTION D-D



TYPICAL TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

Texas Department of Transportation

Bridge Division Standard

BRIDGE APPROACH SLAB
ASPHALTIC CONCRETE PAVEMENT

BAS-A

FILE: MS-BAS-A-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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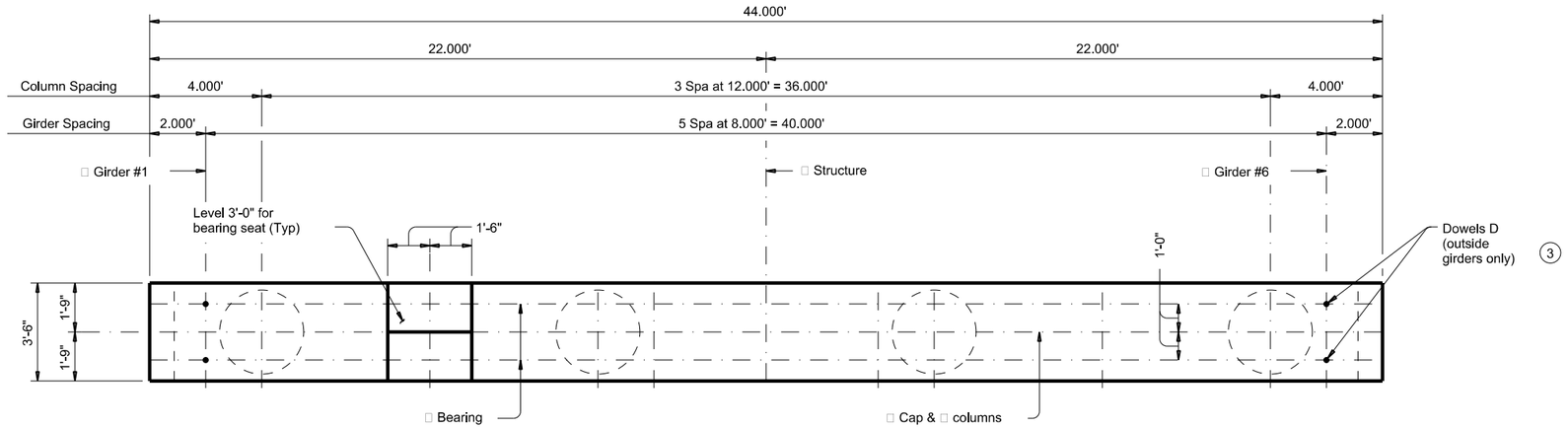
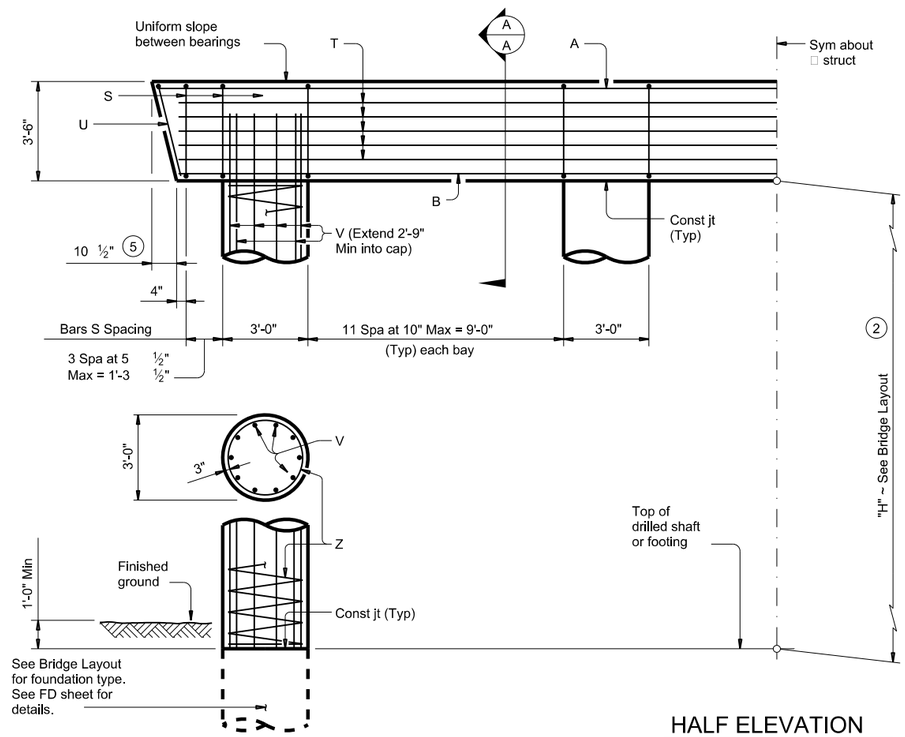
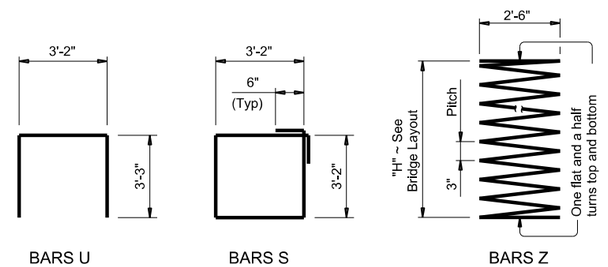
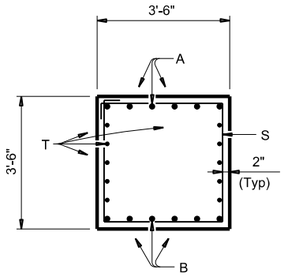


PLAN

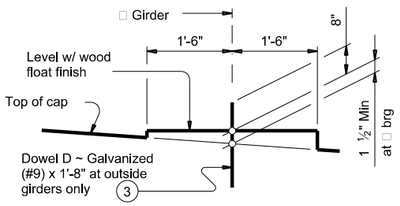


HALF ELEVATION





SECTION A-A



BEARING SEAT DETAIL

(Bearing surface must be clean and free of all loose material before placing bearing pad.)

TABLE OF ESTIMATED QUANTITIES (1)

Bar	No.	Size	Length	Weight
A	6	#11	43'- 6"	1,387
B	6	#11	42'- 0"	1,339
D (3)	4	#9	1'- 8"	23
S	44	#5	13'- 8"	627
T	10	#5	42'- 0"	438
U	2	#5	9'- 8"	20
V	40	#9	38'- 9"	5,270
Z	4	#4	1,154'- 7"	3,085
Reinforcing Steel			Lb	12,189
Class "C" Concrete (Cap)			CY	19.9
Class "C" Concrete (Col)			CY	37.7

FOUNDATION LOADS (4)

Span Average	Drilled Shaft Loads	Pile Load (Tons/Pile)		
		3 Pile Ftg	4 Pile Ftg	5 Pile Ftg
Ft	Tons/Shaft			
40	114	41	32	26
45	123	44	34	28
50	131	47	36	29
55	140	50	38	31
60	149	53	40	33
65	157	56	42	35
70	166	59	45	36
75	174	61	47	38
80	183	64	49	40
85	191	67	51	41
90	199	70	53	43
95	208	73	55	45
100	216	75	57	46
105	225	78	59	48
110	233	81	61	50
115	241	84	63	51
120	250	87	66	53
125	258	89	68	55

(1) Quantities shown are based on an "H" value of 36'. For each linear foot variation in "H" value, make the following adjustments:
Bars V length, 1'-0"
Bars Z length, 31'-5"
Reinforcing steel, 220 Lb
Class "C" conc (col), 1.05 CY

(2) This standard may not be used for "H" heights exceeding 36'. In areas of very soft soil or where scour is anticipated, allowable "H" heights must be evaluated by the Engineer prior to the use of this standard.

(3) Omit Dowels D at end of multi-span units. Adjust reinforcing steel total accordingly.

(4) Foundation Loads based on "H" = 36'.

(5) Measured parallel to top of cap cross-slope.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
See Bridge Layout for foundation type, size and length.
See Common Foundation Details (FD) standard sheet for all foundation details and notes.
See Shear Key (IGSK) standard sheet for all shear key details and notes, if applicable.
Bent selected must be based on the average span length rounded up to the next 5 ft increment.
These bent details may be used with standard SIG-44 only.

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

MATERIAL NOTES:
Provide Class C concrete (f'c = 3,600 psi).
Provide Class C (HPC) concrete if shown elsewhere in the plans.
Provide Grade 60 reinforcing steel.
Galvanize dowel bars D.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

INTERIOR BENTS
TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
44' ROADWAY

BIG-44

FILE: IG-BIG4400-17.dgn	DN: TAR	CK: SDB	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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	WAC	McLENNAN		209

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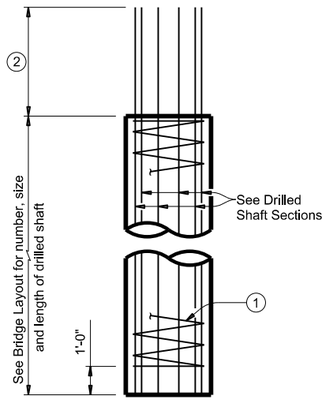
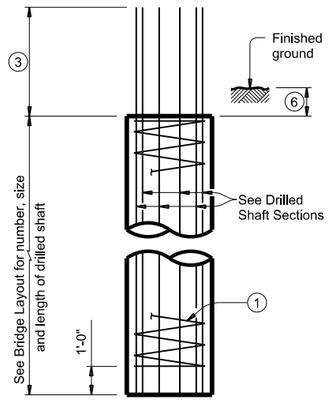
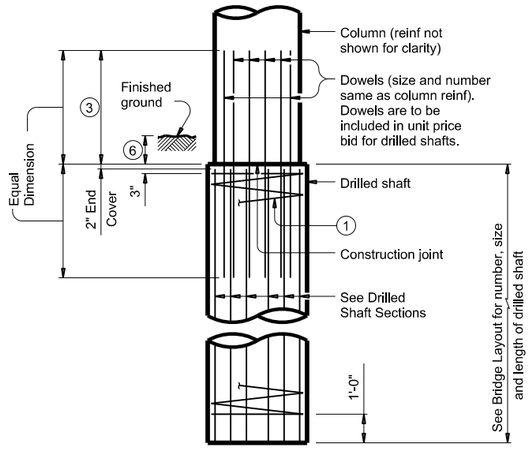


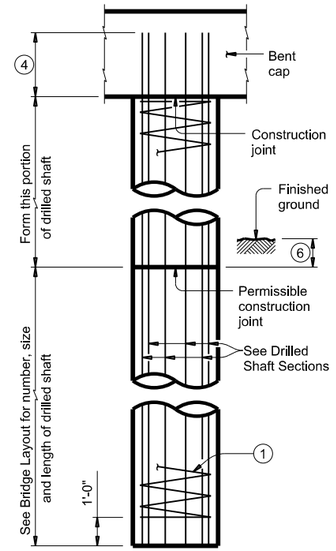
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



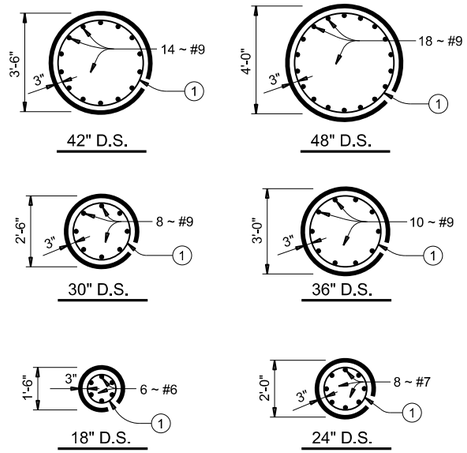
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL (5)

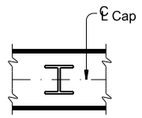


DRILLED SHAFT SECTIONS

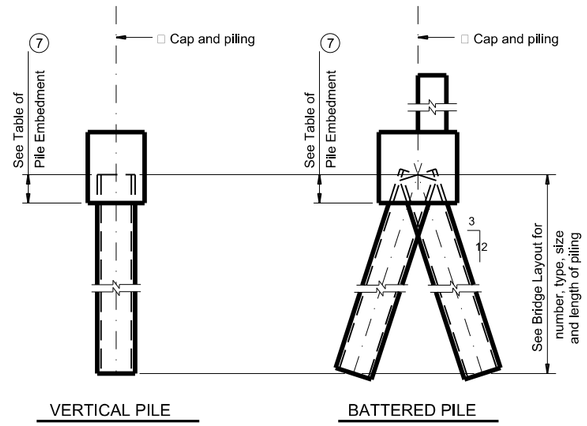
DRILLED SHAFT DETAILS

TABLE OF PILE EMBEDMENT	
Pile Type	Embedment Depth (Ft)
16" Sq Concrete 18" Sq Concrete HP14 Steel HP16 Steel	1'-0"
20" Sq Concrete 24" Sq Concrete HP18 Steel	1'-6"

See Prestressed Concrete Piling (CP) standard for additional details on concrete pile embedment.

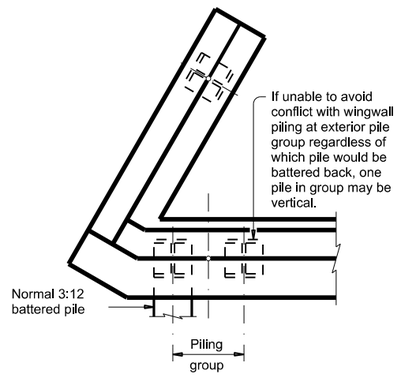


ORIENTATION OF STEEL H-PILING

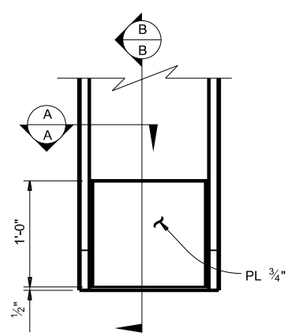


VERTICAL PILE BATTERED PILE

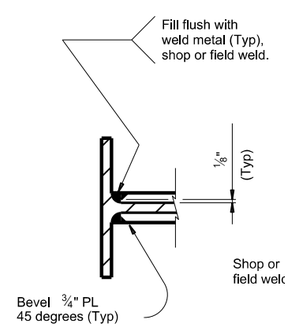
PILING DETAILS
(Concrete or steel H)



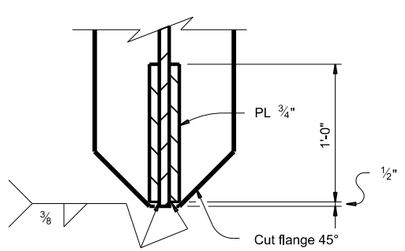
DETAIL "A"
(Showing plan view of a 30° skewed abutment)



ELEVATION



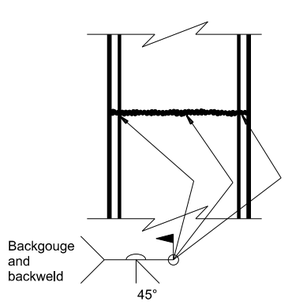
SECTION A-A



SECTION B-B

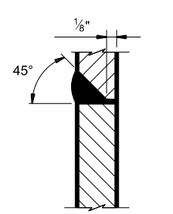
STEEL H-PILE TIP REINFORCEMENT

See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.



STEEL H-PILE SPLICE DETAIL

Use when required.



SECTION THRU FLANGE OR WEB

(1) #3 spiral at 6" pitch (one and a half flat turns top and bottom).

(2) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-0"
#9 Bars = 2'-3"

(3) Min lap with column reinf:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(4) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-3"
#9 Bars = 2'-9"

(5) Drilled shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved. This option can only be used when the drilled shaft diameter equals the column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

SHEET 1 OF 2

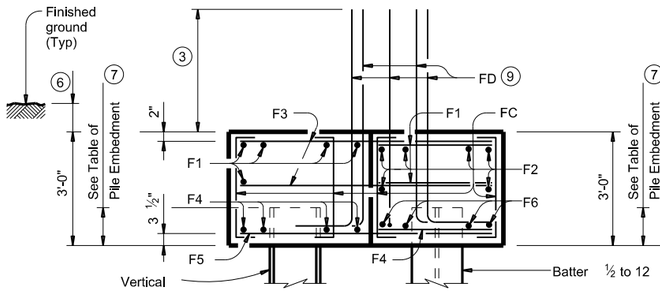
Texas Department of Transportation | Bridge Division Standard

COMMON FOUNDATION DETAILS

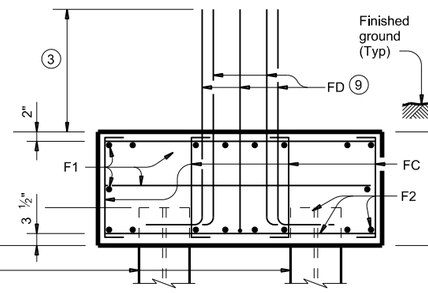
FD

FILE: MS-FD-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		210

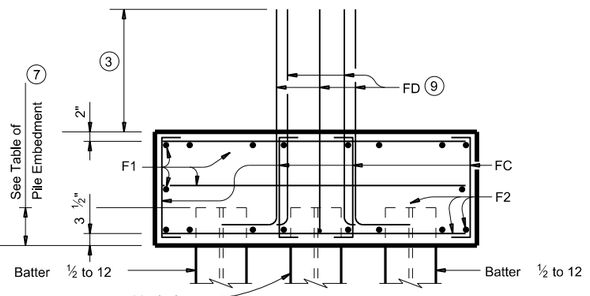
DATE: 1/29/2024 2:39:38 PM
FILE: ...\7. Bridge\STDS\06_FD.dgn



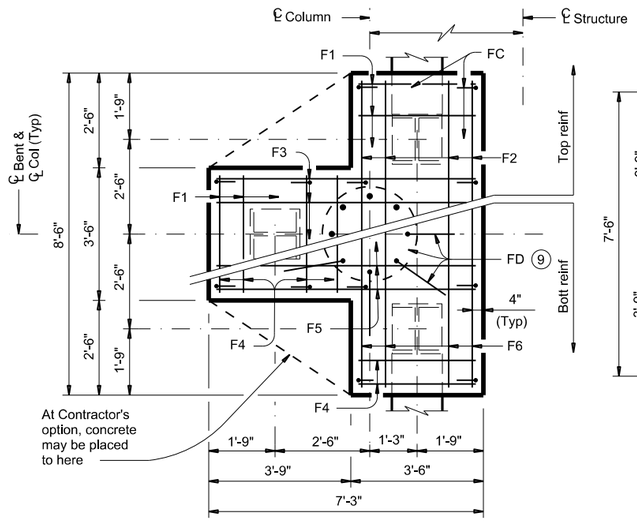
ELEVATION



ELEVATION



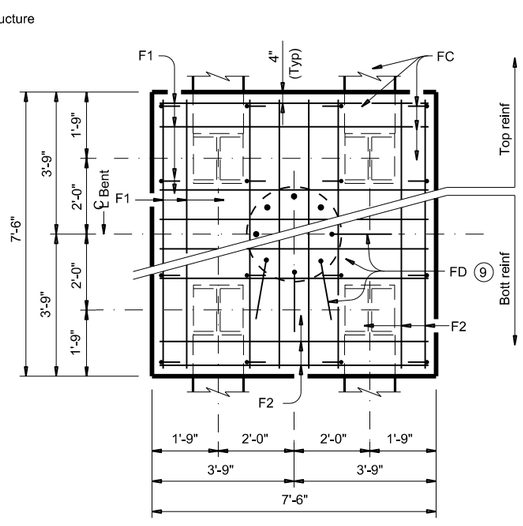
ELEVATION



PLAN

THREE PILE FOOTING (8)

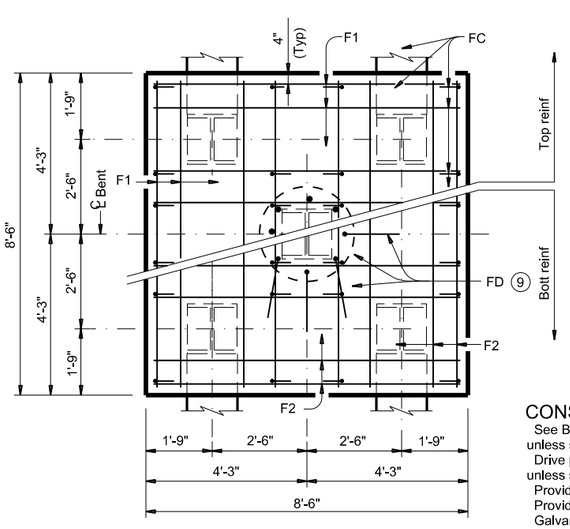
For 36" Dia and smaller columns.



PLAN

FOUR PILE FOOTING (8)

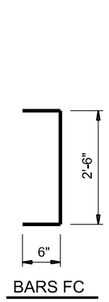
For 42" Dia and smaller columns.



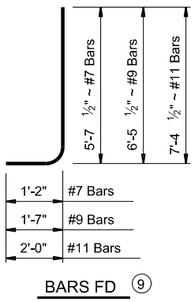
PLAN

FIVE PILE FOOTING (8)

For 42" Dia and smaller columns.



BARS FC



BARS FD (9)

(3) Min lap with column reinforcing:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

(8) See Bridge Layout for type, size and length of piling.

(9) Number and size of FD bars must match column reinforcing. Tie FD bars to the top of the bottom reinforcing mat.

(10) Adjust FD quantity, size and weight as needed to match column reinforcing.

TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS

ONE 3 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	11	#4	3'- 2"	23
F2	6	#4	8'- 2"	33
F3	6	#4	6'- 11"	28
F4	8	#9	3'- 2"	86
F5	4	#9	6'- 11"	94
F6	4	#9	8'- 2"	111
FC	12	#4	3'- 6"	28
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	623
Class "C" Concrete			CY	4.8

ONE 4 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	20	#4	7'- 2"	96
F2	16	#8	7'- 2"	306
FC	16	#4	3'- 6"	37
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	659
Class "C" Concrete			CY	6.3

ONE 5 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	20	#4	8'- 2"	109
F2	16	#9	8'- 2"	444
FC	24	#4	3'- 6"	56
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	829
Class "C" Concrete			CY	8.0

CONSTRUCTION NOTES:

See Bridge Layout for foundation type required. Use these foundation details unless shown otherwise.

Drive piling under abutment wingwalls to a minimum resistance of 10 Tons/Pile unless shown otherwise.

Provide Class C Concrete (f'c = 3,600 psi), unless shown otherwise.

Provide Grade 60 reinforcing steel.

Galvanize reinforcing if shown elsewhere in the plans.

Provide bar laps for drilled shaft reinforcing, where required, as follows:

Uncoated or galvanized (#6) ~ 2'-6"
Uncoated or galvanized (#7) ~ 2'-11"
Uncoated or galvanized (#9) ~ 3'-9"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

DESIGNER NOTES:

Do not use the drilled shaft details shown on this standard for retaining wall, noise wall, barrier, or sign foundations without structural evaluation.

Do not use the footings shown on this standard in direct contact with salt water or exposed to salt water spray.

Maximum allowable pile loads for the footings shown are:

72 Tons/Pile with 24" Dia Columns
80 Tons/Pile with 30" Dia Columns
100 Tons/Pile with 36" Dia Columns
120 Tons/Pile with 42" Dia Columns

Texas Department of Transportation

Bridge Division Standard

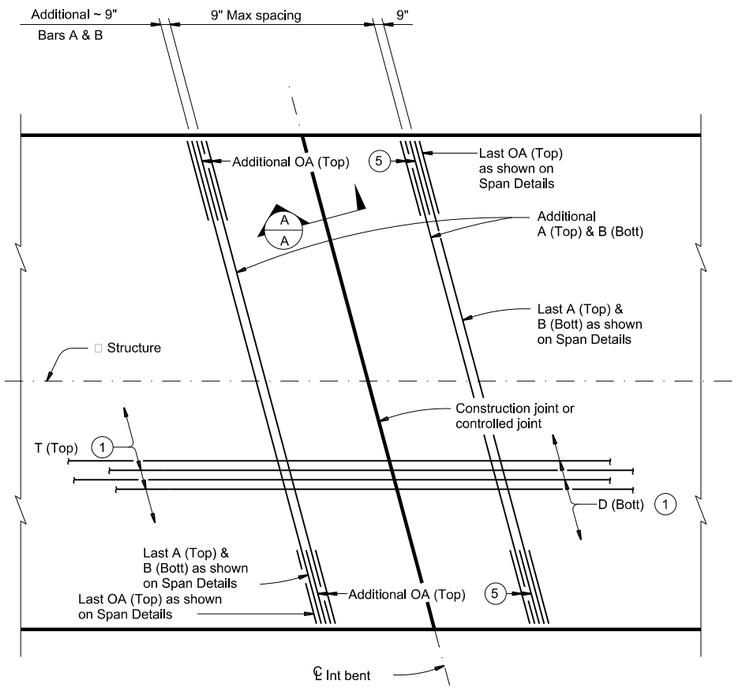
COMMON FOUNDATION DETAILS

FD

FILE: MS-FD-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		211

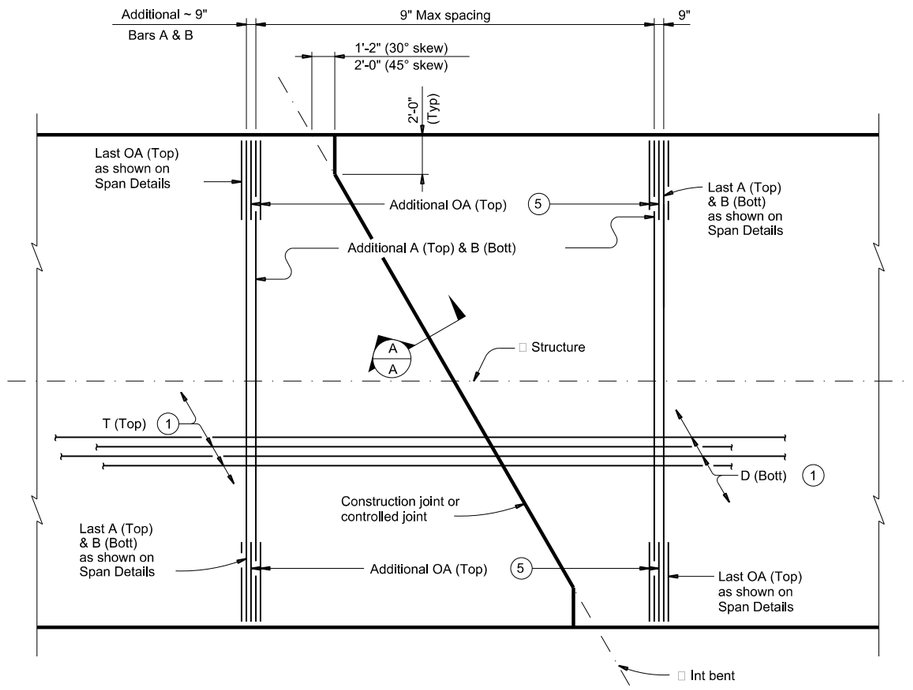
DATE: 1/29/2024 2:39:38 PM
FILE: ...\7. Bridge\STDS\06_FD.dgn

DATE: 1/29/2024 2:39:43 PM
FILE: ...\7. Bridge\STDS\07_IGCS.dgn



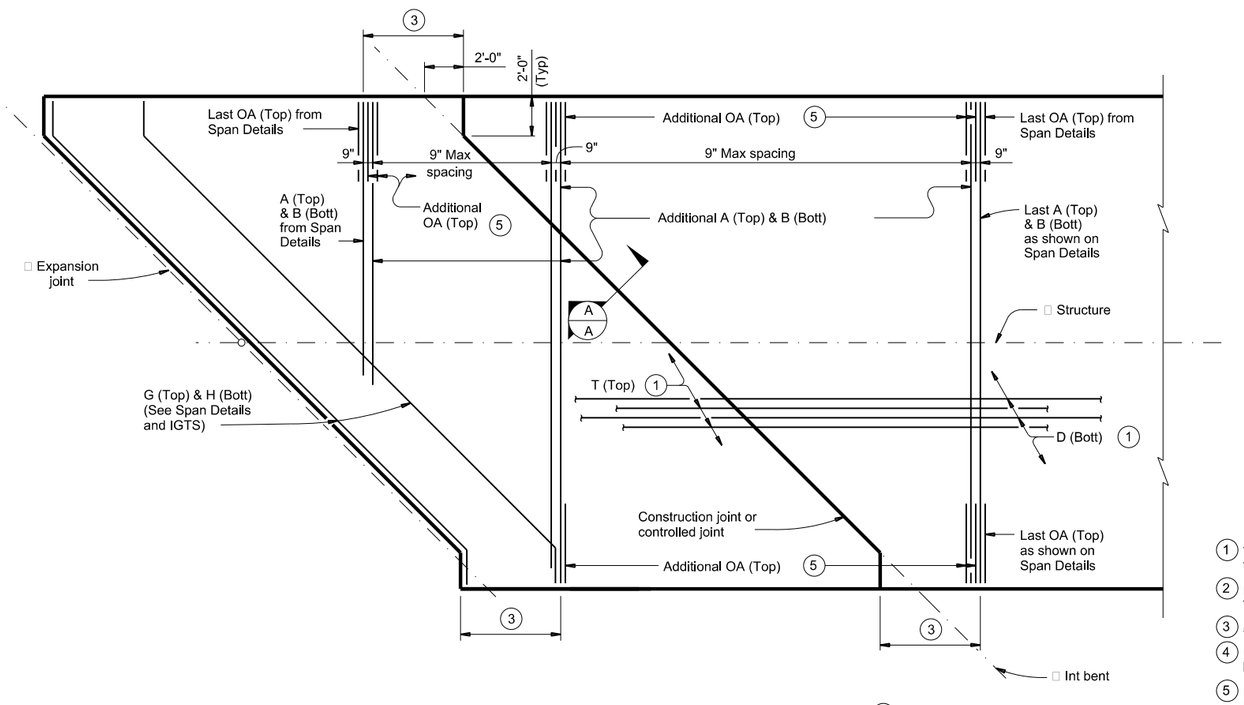
PLAN FOR 0° OR 15° SKEW

(Showing 15° skew)



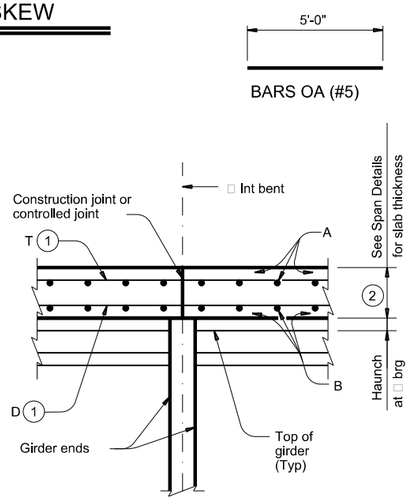
PLAN FOR 30° OR 45° SKEW

(Showing 30° skew)



PLAN FOR 45° SKEW 4

(Showing short span condition.)



SECTION A-A

Bars OA (Top) not shown for clarity.

1. Top and bottom mats must be continuous through joint.
2. Maintain a constant slab thickness over the bent.
3. 5'-4" as shown on Span Details.
4. Use these details when no full slab width bars A and B are shown on Span Details.
5. Bars OA (Top) at 9" Max spacing between Bars A (Top).
6. Values in table assume a temperature change of 70° F after erection when calculating thermal movement in one direction (not total).

TABLE OF ALLOWABLE UNIT LENGTH 6

Max Rdwy Grade, Percent	Unit Length Factor
0.00	4.1
1.00	3.9
2.00	3.7
3.00	3.5
4.00	3.3
5.00	3.1

Unit length must not exceed the length of the shortest end span times the Unit Length Factor shown in table or 400', whichever is less.

BAR TABLE

BAR	SIZE
A	#4
B	#4
D	#4
T	#4
OA	#5

The details shown on this sheet are applicable for two and three span units comprised of the same girder type.
Units may be comprised of different span lengths. See "Table of Allowable Unit Length".

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

CONSTRUCTION NOTES:

Where multi-span units are indicated on the Bridge Layout, the thickened slab end details and reinforcement shown on IGTS standard (Bars AA, G, H, J, K, and M) and on the Span Details will be omitted where slabs are continuous over interior bents. At these locations, the slab details and reinforcement will be as shown on this sheet or on PCP standard (if using this option).
Thickened slab end reinforcement and details still apply at expansion joint locations (ends of units).
See Span Details for remainder of slab reinforcement and details.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide Class "S" concrete (f'c = 4,000 psi). Provide Class "S" (HPC) if shown elsewhere on the plans.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

The details shown on this sheet are applicable for use only with the Prestressed Concrete I-Girder Standard Designs shown on standards IGSD-24, IGSD-28, IGSD-30, IGSD-32, IGSD-34, IGSD-38, IGSD-40 and IGSD-44.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

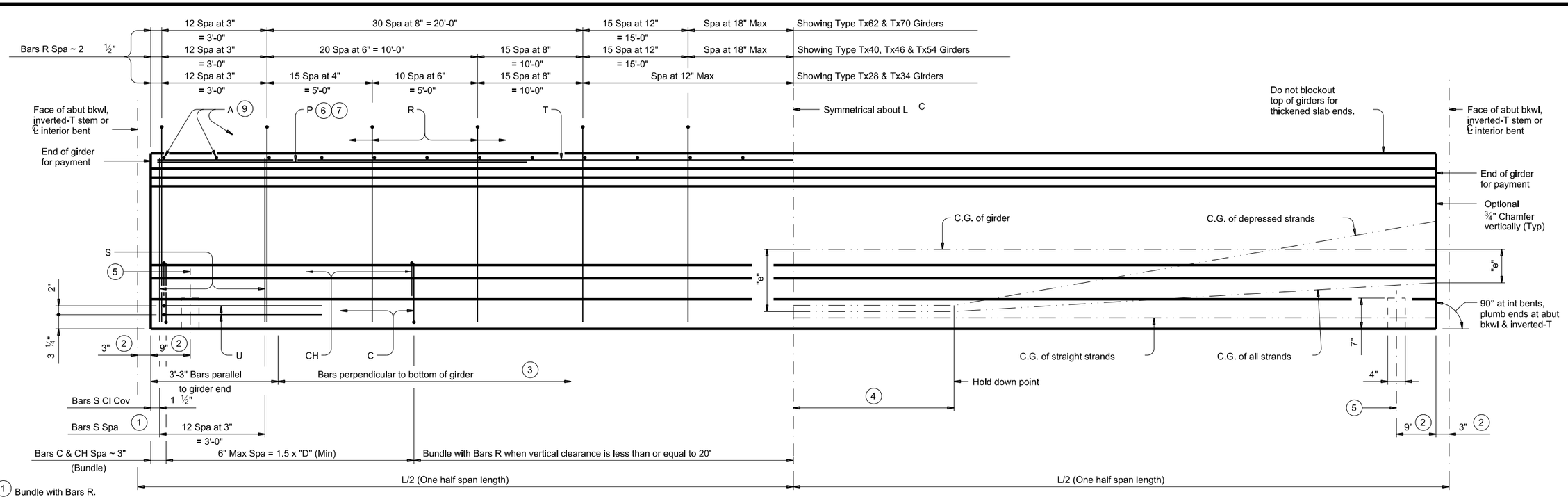
CONTINUOUS SLAB DETAILS

PRESTR CONC I-GIRDER SPANS

IGCS

FILE: IG-IGCS-23.dgn	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
10-19: Added bubble note 6.	DIST	COUNTY		SHEET NO.
01-23: Added 34' Rdwy.	WAC	McLENNAN		212

DATE: 1/29/2024 2:39:49 PM
FILE: ...\V. Bridge\STDS\08_IGD.dgn



(1) Bundle with Bars R.

(2) Measured along ℄ Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.

(3) The average of the top and bottom spacing of Bars R cannot exceed the required spacing.

(4) L/20, but not less than 5'-0" (-0,+2').

(5) ⬭ 4" x 1 ½" Vertical Slotted Hole at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details. Anchorage holes may be tapered (4 ¾" x 1 ⅝") at base. If holes are formed with sheet metal, forms may be left in place.

GIRDER ELEVATION

(6) Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

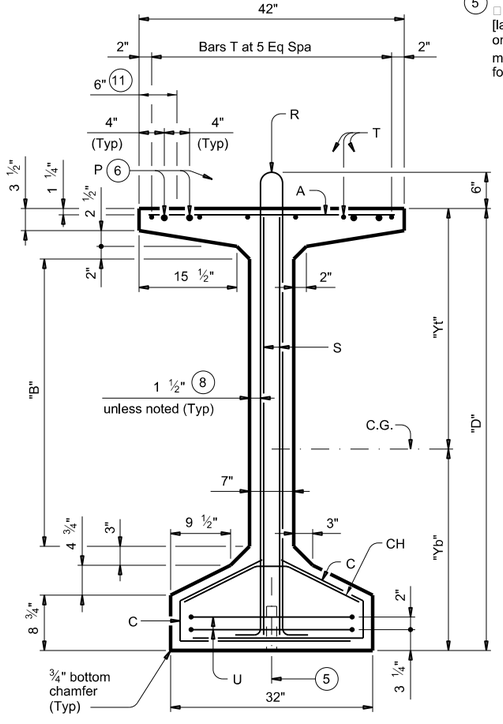
(7) Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

(8) 1 ⅜" Clear Cover to Bars S.

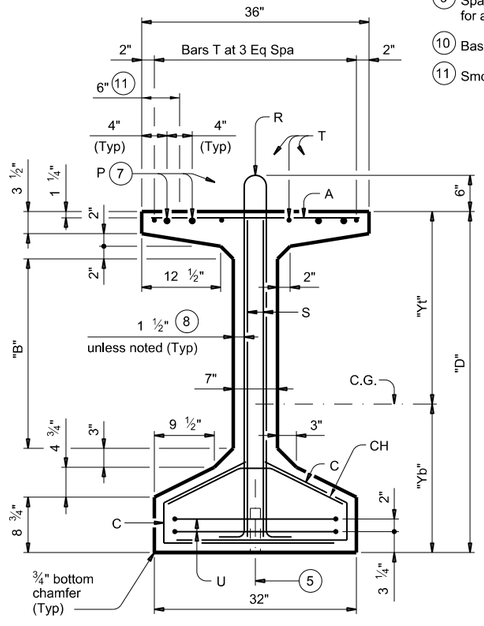
(9) Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".

(10) Based on 155 pcf total weight of concrete and reinforcing steel.

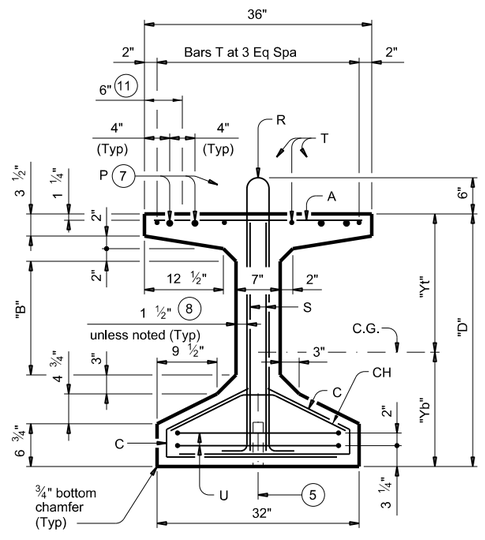
(11) Smooth trowel finish on the slab overhang side of exterior girder.



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40

GIRDER DIMENSIONS AND SECTION PROPERTIES

Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in.²)	"Ix" (in.⁴)	"Iy" (in.⁴)	Weight (10) (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 ½"	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 ½"	38.09	31.91	966	628,747	57,579	1,040

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Provide Class H concrete.
Provide Grade 60 reinforcing steel.
An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A1064) may be substituted for Bars A, C, R or T unless otherwise noted.
It is permissible for bars or strands to come in contact with materials used in forming anchor holes.
When vertical clearance of the span is less than or equal to 20', provide additional Bars C and CH in every girder of that span.

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

HL93 LOADING SHEET 1 OF 2

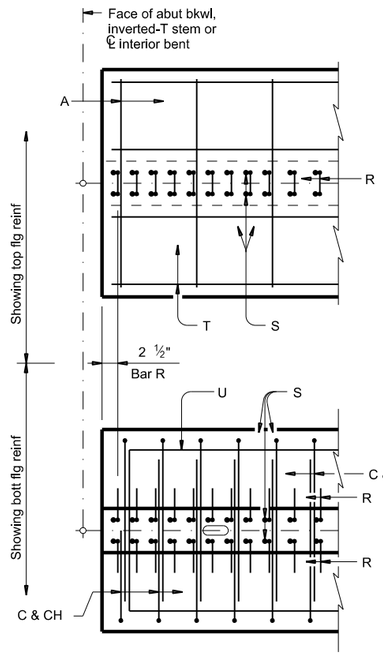
Texas Department of Transportation

Bridge Division Standard

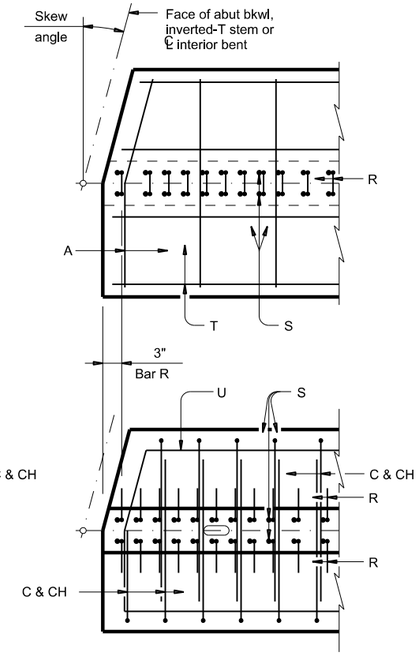
PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

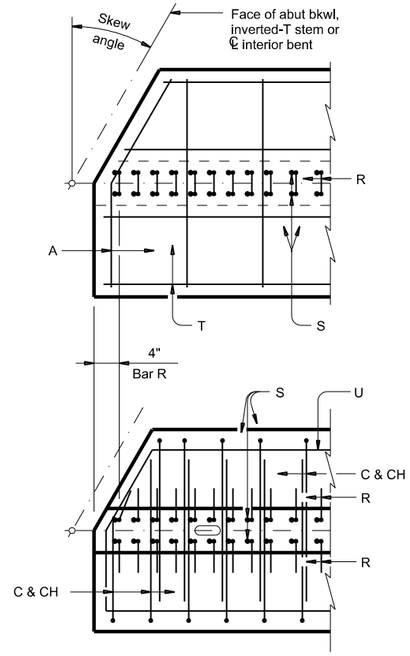
FILE:	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Added Bars C and CH full length for VC<= 20' 3-23: Clarified C and CH requirement	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		213



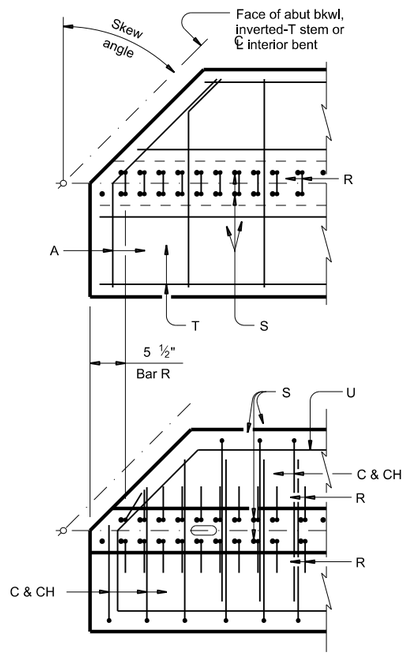
0° SKEW



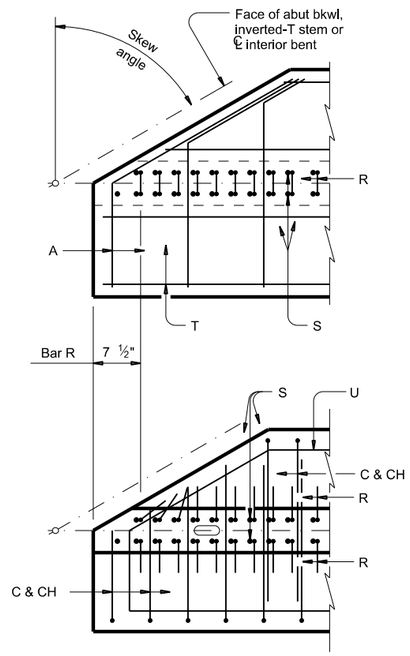
15° SKEW



30° SKEW



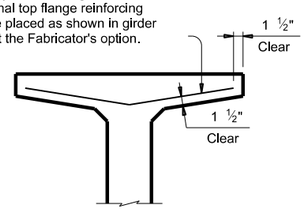
45° SKEW



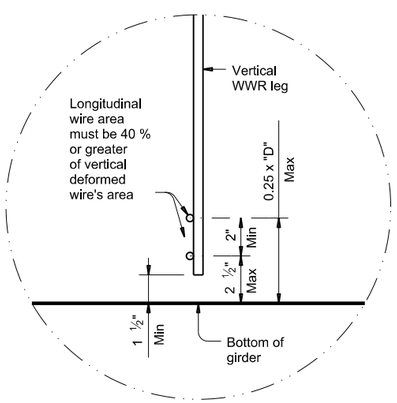
60° SKEW

PLAN OF GIRDER ENDS (12)

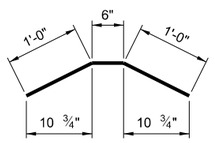
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



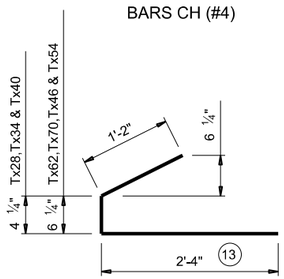
OPTIONAL TOP FLANGE REINFORCING DETAIL



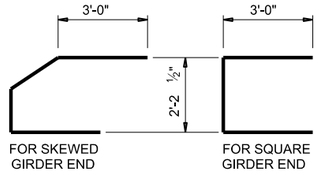
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



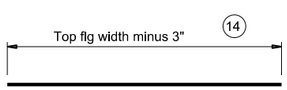
BARS CH (#4)



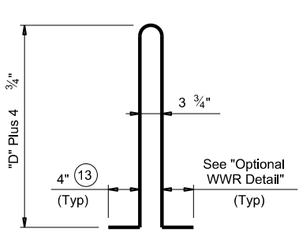
BARS C (#4)



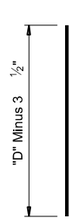
BARS U (#5)



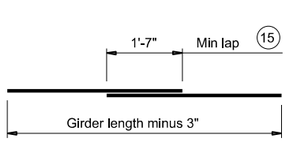
BARS A (#3)



BARS R (#4) (16)



BARS S (#6)



BARS T (#4)

(12) Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.

(13) Bars may be cut or bent at skewed end as required.

(14) Increase as necessary for bars at skewed end.

(15) No portion of bar less than 10 ft.

(16) For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE:	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
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REVISIONS	2174	01	018	FM 2311
10-19: Added Bars C and CH full length for VC<= 20' 3-23: Clarified C and CH requirement	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		214

DATE: 1/29/2024 2:39:49 PM
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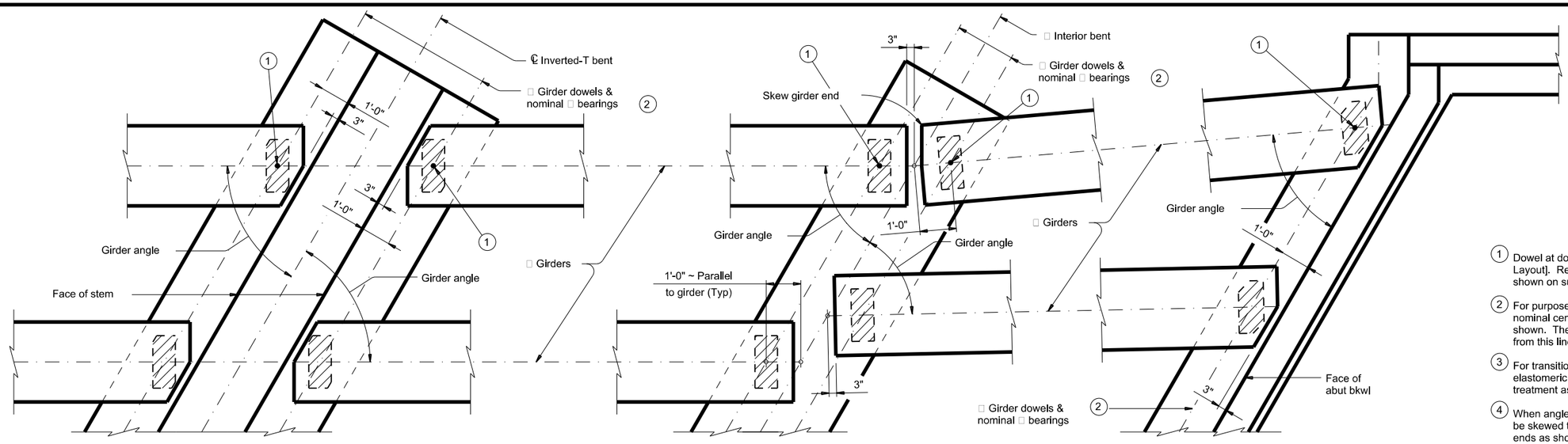
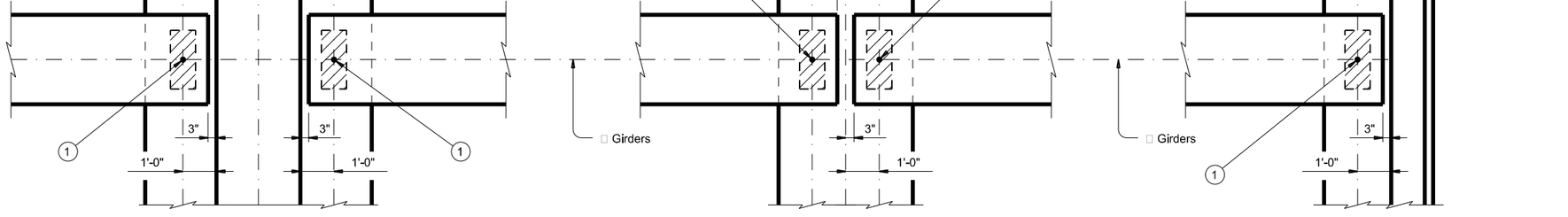
DATE: 1/29/2024 2:39:54 PM
FILE: ...17. Bridge\STDS\09_IGEB.dgn

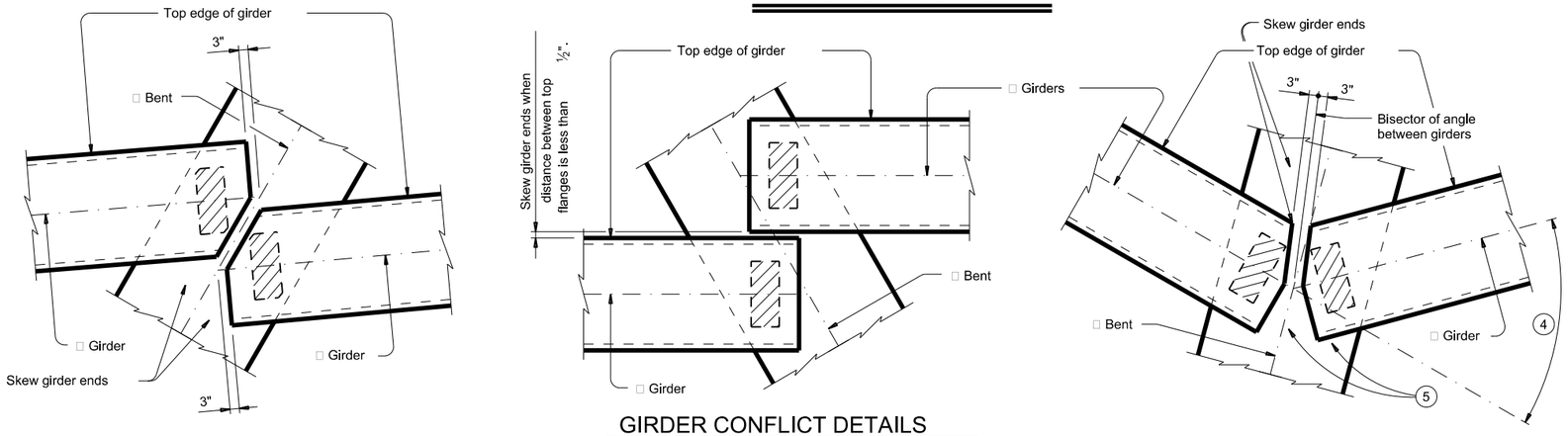


1. Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.
2. For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.
3. For transition bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for abutments.
4. When angle exceeds 0°, one or both girders ends must be skewed to maintain the clearance between girder ends as shown in view.
5. See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.



GENERAL NOTES:
These details accommodate skew angles up to 60°.
Shop drawings for approval are required.
A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer.
Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".

GIRDER END DETAILS



GIRDER CONFLICT DETAILS

HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

FILE: IG-IGEB-17.dgn	DN: AEE		CK: JMH	DW: JTR		CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB		HIGHWAY	
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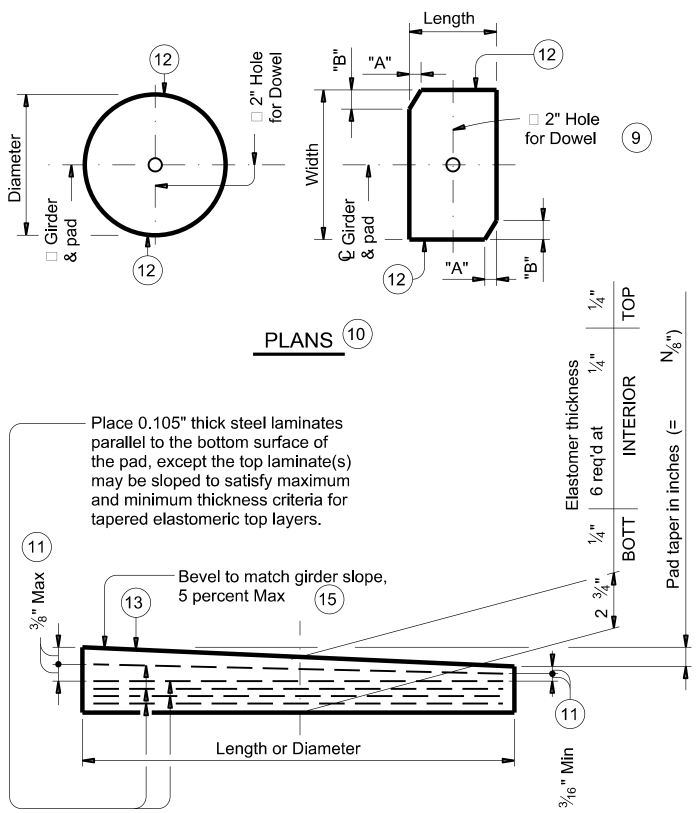
	WAC	McLENNAN			215	

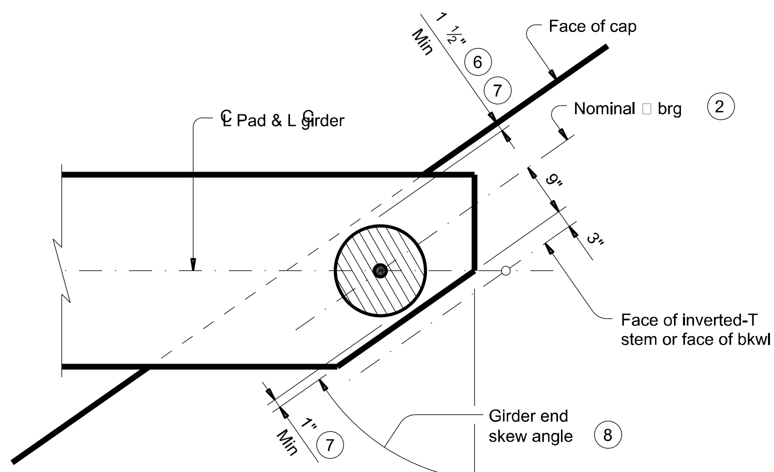


PLANS (10)

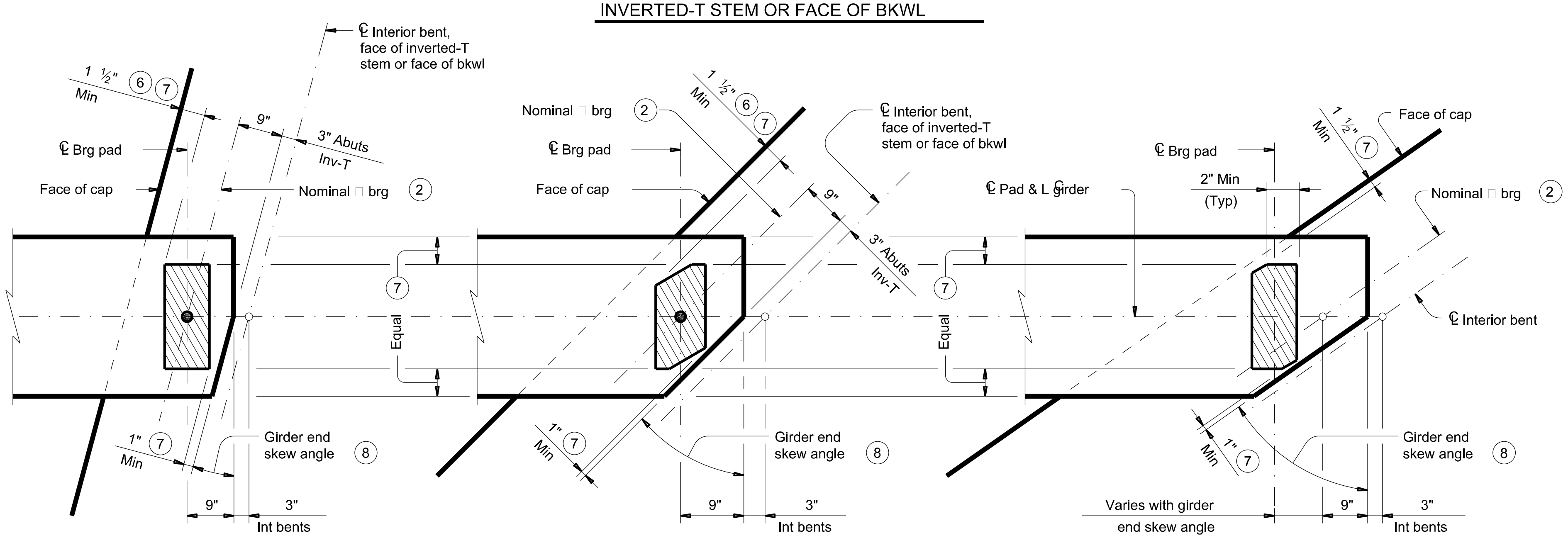
ELEVATION

LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)



ROUND BEARINGS FOR SKEWED GIRDER ENDS AT FACE OF INVERTED-T STEM OR FACE OF BKWL



SKEWED GIRDER ENDS AT INT BENTS, FACE OF INVERTED-T STEM OR FACE OF BKWL

SKEWED GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (16)

(NO GIRDER DOWELS)

BEARING PAD PLACEMENT DIAGRAMS

TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)

Girder Type	Abutments: Face of Bkwl to Face of Cap	Int Bents: Overall Cap Width	Inv-T Bents: Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 ½"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 ½"

TABLE OF BEARING PAD DIMENSIONS

Bent Type	Girder Type	Bearing Type (13)	Girder End Skew Angle Range	Pad Size Lgth x Wdth	Pad Clip Dimensions "A"	Pad Clip Dimensions "B"
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---
		G-2-"N"	21°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-3-"N"	30°+ thru 45°	9" x 21"	4 ½"	4 ½"
		G-4-"N"	45°+ thru 60°	15" Dia	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---
		G-6-"N"	21°+ thru 30°	9" x 21"	1 ½"	2 ½"
		G-7-"N"	30°+ thru 45°	10" x 21"	4 ½"	4 ½"
		G-8-"N"	45°+ thru 60°	10" x 21"	7 ¼"	4 ¼"
CONVENTIONAL INTERIOR BENTS	Tx28,Tx34, Tx40,Tx46 & Tx54	---	---	---	---	---
		---	---	---	---	---
		G-1-"N"	0° thru 60°	8" x 21"	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 60°	9" x 21"	---	---
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS) (16)	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---
		G-2-"N"	18°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-9-"N"	30°+ thru 45°	8" x 21"	3"	3"
		G-10-"N"	45°+ thru 60°	9" x 21"	6"	3 ½"
	Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
		G-5-"N"	18°+ thru 30°	9" x 21"	---	---
		G-11-"N"	30°+ thru 45°	9" x 21"	1 ½"	1 ½"
		G-12-"N"	45°+ thru 60°	9" x 21"	3"	1 ¾"

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(6) 3" for inverted-T.

(7) Place centerline pad as near nominal centerline bearing as possible between limits shown.

(8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.

(9) Provide 2" dia hole only at locations required. See Substructure details for location.

(10) See Table of Bearing Pad Dimensions for dimensions.

(11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

(12) Locate Permanent Mark here.

(13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in ⅛" increments) in this mark.
Examples: N=0, (for 0" taper)
N=1, (for ⅛" taper)
N=2, (for ¼" taper)
(etc.)
Fabricated pad top surface slope must not vary from plan girder slope by more than $\left(\frac{0.0625\ \text{IN.}}{\text{Length or Dia}}\right)$

(14) Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.

(15) See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.

(16) If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation — Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

FILE: IG-IGEB-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
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REVISIONS	DIST WAC	COUNTY McLENNAN		SHEET NO. 216

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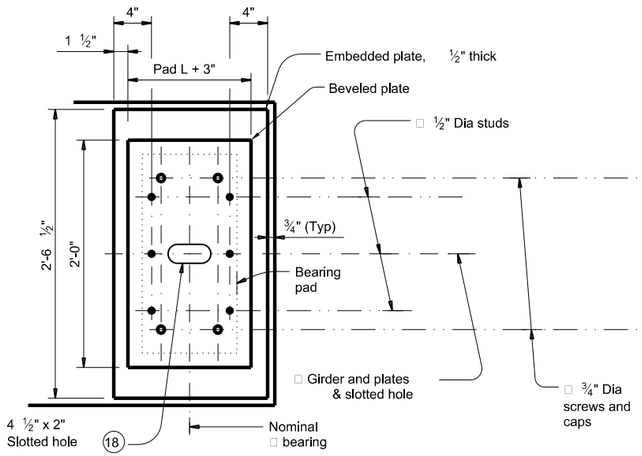
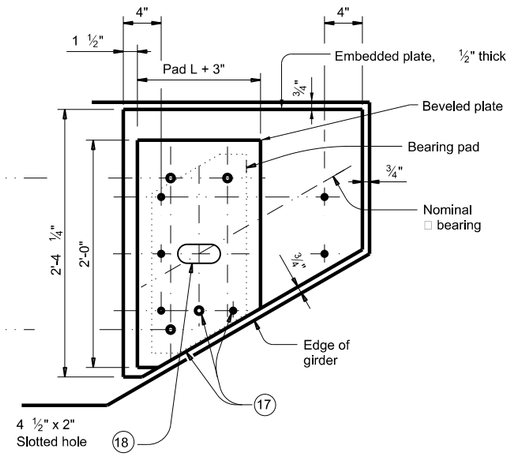
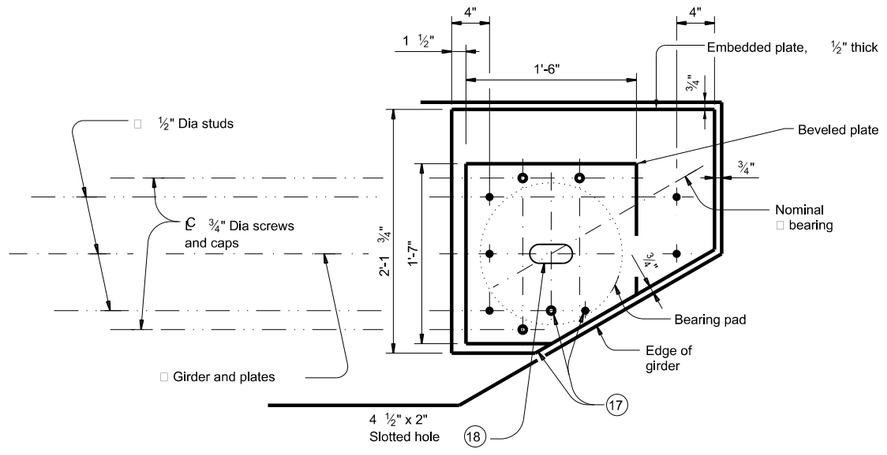


NORMAL GIRDER END
RECTANGULAR BEARING PAD

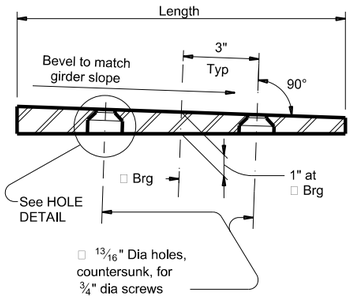


SKEWED GIRDER END
CLIPPED RECTANGULAR BEARING PAD

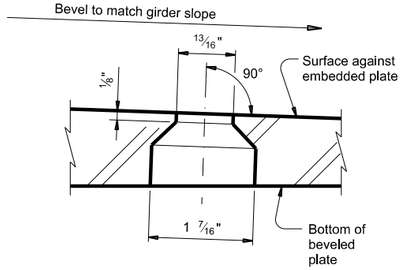


SKEWED GIRDER END
15" DIA BEARING PAD

PLAN VIEW OF SOLE PLATE DETAILS



SECTION



HOLE DETAIL

BEVELED PLATE DETAILS

17 Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.

18 Slotted hole is required at doweled girder end locations.

SOLE PLATE NOTES:

Provide constant thickness elastomeric bearings with beveled and embedded steel sole plates in accordance with these details when the girder slope exceeds 5 percent or if otherwise required in the plans. Provide for all girders in the span.

On the shop drawings, dimension sole plates to the nearest ⅛" based on required thickness at centerline of bearing and slope of girder. Thickness tolerance variation from the approved shop drawings is 1/16"+/-, except variation from a plane parallel to the theoretical top surface can not exceed 1/16" total. Bearing surface tolerances listed in Item 424 apply to embedded and beveled plates.

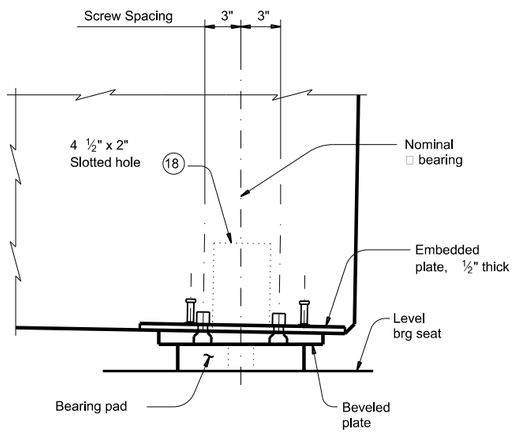
Steel plate must conform to ASTM A36, A572 Gr 50, or A709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".

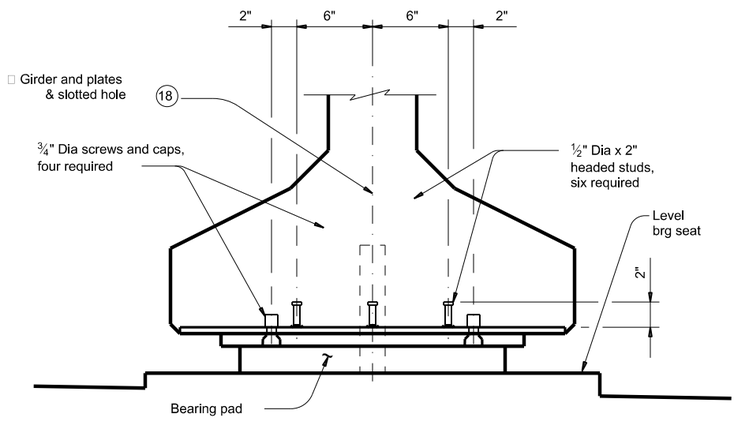
Tap threads in the embedded plate only. Drill and tap prior to galvanizing.

¾" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and ½" deep or deep enough to accommodate the screws, but not less than deeper than 1".

Install beveled sole plates prior to shipping girders. Installed screw heads must not protrude below the bottom of the beveled plate.



SIDE ELEVATION



END ELEVATION
Showing normal girder end.

GIRDER DETAILS

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

IGEB

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	WAC	McLENNAN		217

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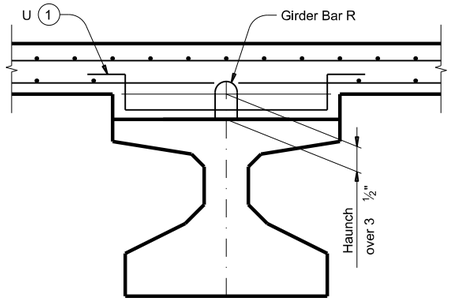
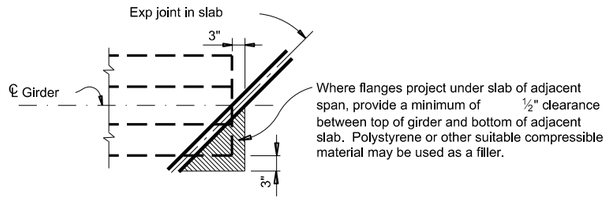
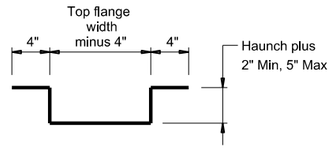


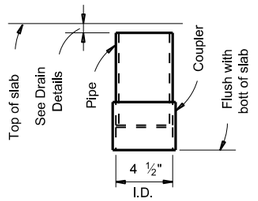
HAUNCH REINFORCING DETAIL



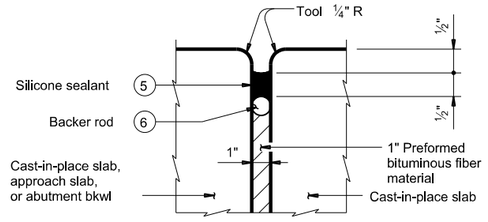
TREATMENT AT GIRDER END FOR SKEWED SPANS



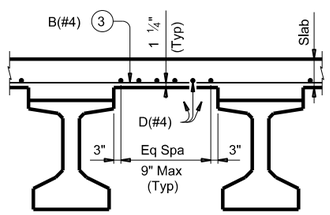
BARS U (#4)



C-I-P DRAIN DETAIL (2)

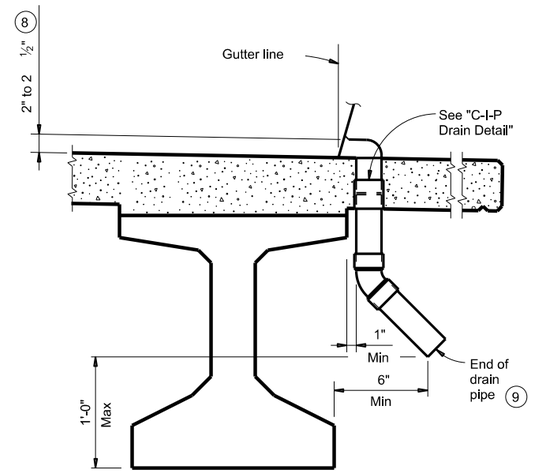


TYPE A JOINT DETAIL (7)



TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP (4)

Top reinforcing steel not shown for clarity.



DRAIN DETAIL (10)

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Payment for Type A joint will be as per Item 454, "Bridge Expansion Joints."
All other items (reinforcing steel, drains, etc.) shown on this sheet are subsidiary to other bid items.

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

DECK FORMWORK NOTES:
Overhang bracket hangers are limited to a safe working load of 3,600 lbs, applied to and along the axis of a coil rod at 45 degrees from vertical, regardless of higher loads permitted by hanger manufacturers. Do not place a hanger less than 12" from girder end. Space hangers accordingly.

(1) Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 ½".

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

(3) Bars B(#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#4) at centerline outside girder.

(4) Provide Grade 60 reinforcing steel. Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

(5) Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.

(6) 1 ¼" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

(7) The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.

(8) Drain entrance formed in rail or sidewalk.

(9) Water may not be discharged onto girders.

(10) All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railways, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.

Texas Department of Transportation

Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE I-GIRDERS

IGMS

FILE: IG-IGMS-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
10-19: Modified Note 7. Type A now a pay item.	DIST	COUNTY		SHEET NO.
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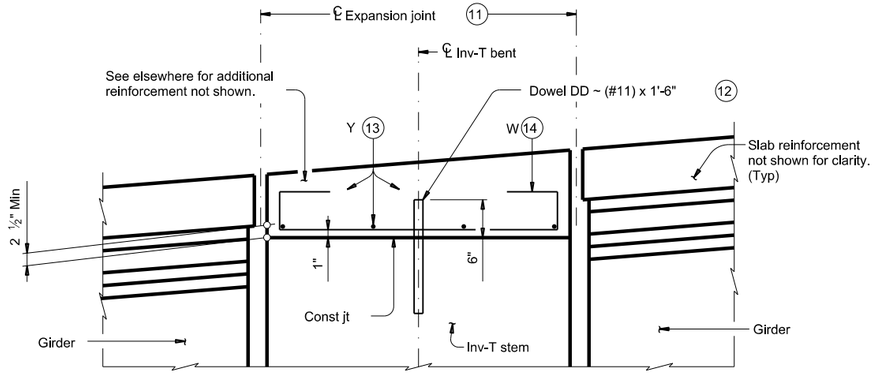
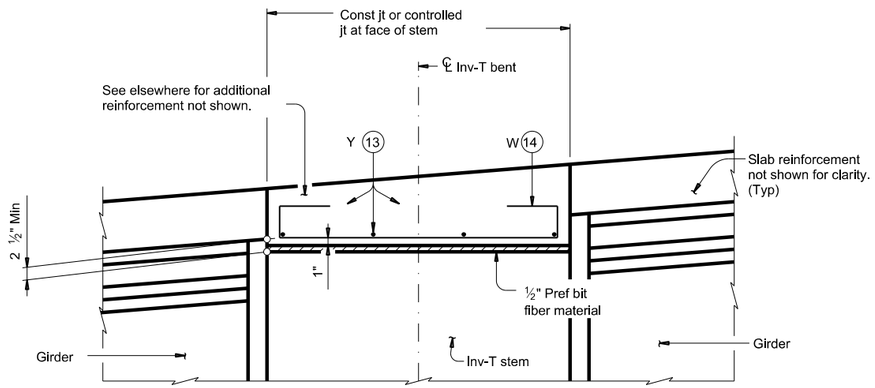
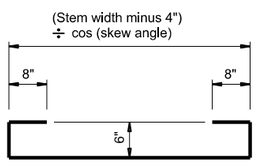


SHOWING EXPANSION JOINTS

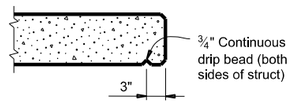


SHOWING CONST JTS OR CONTROLLED JTS

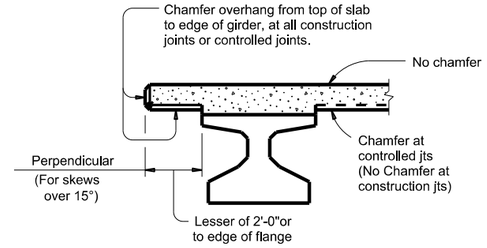
REINFORCEMENT OVER INV-T BENTS



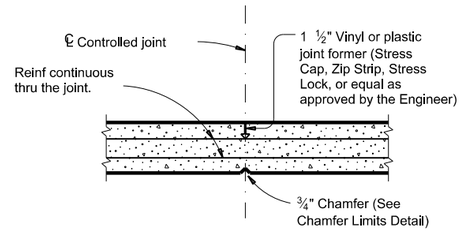
BARS W (#4)



DRIP BEAD DETAIL



CHAMFER LIMITS DETAIL 15



CONTROLLED JOINT DETAIL

(Saw-cutting is not allowed)

(11) See Layout for joint type.

(12) Dowels DD (#11) spaced at 5 Ft Max. See Inv-T bents for quantity and location.

(13) Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.

(14) Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.

(15) See Span details for type of joint and joint locations.

DATE: 1/29/2024 2:40:00 PM
FILE: ...\7. Bridge\STDS\10_IGMS.dgn

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE I-GIRDERS

IGMS

FILE: IG-IGMS-19.dgn	DN: TxDOT		CK: TxDOT	DW: JTR		CK: TxDOT	
©TxDOT August 2017	CONT	SECT	JOB		HIGHWAY		
REVISIONS	2174	01	018		FM 2311		
10-19: Modified Note 7. Type A now a pay item.	DIST	COUNTY				SHEET NO.	
	WAC	McLENNAN				219	

DATE: 1/29/2024 2:40:06 PM
FILE: ...\7. BridgeSTDS\11_IGSD-44.dgn

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS			
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS						NO.	TO END	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III	
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (In)	"e" END (In)		(in)						Moment	Shear	Inv	Opr	Inv
Type Tx28 Girders 44' Roadway 8.5" Slab	40	ALL	Tx28		12	0.6	270	10.48	10.48			4.700	5.000	1.118	-1.542	1586	0.760	0.960	1.71	2.22	2.09
	45	ALL	Tx28		12	0.6	270	10.48	10.48			4.500	5.500	1.403	-1.879	1555	0.740	0.970	1.39	1.80	1.53
	50	ALL	Tx28		14	0.6	270	10.48	9.62	2	8.5	4.000	5.200	1.733	-2.266	1813	0.710	0.970	1.37	1.78	1.34
	55	ALL	Tx28		16	0.6	270	10.23	9.23	4	8.5	4.000	5.600	2.083	-2.688	2121	0.700	0.980	1.31	1.69	1.13
	60	ALL	Tx28		20	0.6	270	9.88	6.28	4	22.5	4.000	6.300	2.478	-3.135	2424	0.680	0.980	1.60	2.07	1.30
	65	ALL	Tx28		24	0.6	270	9.65	6.31	4	24.5	4.700	6.500	2.879	-3.586	2725	0.660	0.980	1.45	1.94	1.12
	70	ALL	Tx28		28	0.6	270	9.48	6.62	4	24.5	5.600	7.000	3.340	-4.101	3068	0.650	0.990	1.28	1.82	1.11
Type Tx34 Girders 44' Roadway 8.5" Slab	40	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	0.881	-1.184	1785	0.790	0.940	2.01	2.60	2.70
	45	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	1.110	-1.440	1920	0.760	0.950	1.66	2.15	2.10
	50	ALL	Tx34		14	0.6	270	13.01	13.01			5.100	6.100	1.359	-1.735	2194	0.740	0.950	1.63	2.12	1.87
	55	ALL	Tx34		14	0.6	270	13.01	13.01			4.900	5.900	1.642	-2.056	2186	0.720	0.960	1.34	1.74	1.40
	60	ALL	Tx34		16	0.6	270	12.76	11.76	4	8.5	4.000	5.000	1.934	-2.383	2493	0.700	0.960	1.33	1.73	1.24
	65	ALL	Tx34		18	0.6	270	12.57	11.23	4	10.5	4.000	5.200	2.267	-2.754	2839	0.690	0.960	1.21	1.68	1.07
	70	ALL	Tx34		22	0.6	270	12.28	7.92	4	28.5	4.000	5.700	2.604	-3.128	3186	0.680	0.970	1.44	1.86	1.09
	75	ALL	Tx34		26	0.6	270	12.09	8.40	4	28.5	4.800	6.000	2.980	-3.521	3523	0.660	0.970	1.55	2.01	1.14
	80	ALL	Tx34		30	0.6	270	11.81	7.41	6	28.5	5.200	6.200	3.356	-3.927	3886	0.650	0.970	1.37	2.01	1.10
	85	ALL	Tx34		34	0.6	270	11.48	7.60	6	28.5	5.900	6.600	3.782	-4.375	4273	0.640	0.980	1.37	1.75	1.06
Type Tx40 Girders 44' Roadway 8.5" Slab	40	ALL	Tx40		10	0.6	270	15.60	15.60			4.000	5.000	0.727	-0.959	1847	0.820	0.930	1.84	2.39	2.77
	45	ALL	Tx40		12	0.6	270	15.60	15.60			4.000	5.000	0.913	-1.165	2181	0.790	0.930	1.90	2.47	2.61
	50	ALL	Tx40		14	0.6	270	15.60	15.60			4.500	5.500	1.125	-1.410	2588	0.770	0.940	1.87	2.42	2.34
	55	ALL	Tx40		14	0.6	270	15.60	15.60			4.300	5.300	1.347	-1.662	2519	0.750	0.940	1.55	2.01	1.84
	60	ALL	Tx40		16	0.6	270	15.35	14.35	4	8.5	4.000	5.000	1.598	-1.935	2633	0.730	0.950	1.54	2.00	1.66
	65	ALL	Tx40		16	0.6	270	15.35	14.35	4	8.5	4.000	5.000	1.868	-2.224	2927	0.710	0.950	1.31	1.70	1.29
	70	ALL	Tx40		18	0.6	270	15.16	14.27	4	8.5	4.000	5.000	2.144	-2.525	3287	0.700	0.950	1.30	1.69	1.16
	75	ALL	Tx40		20	0.6	270	15.00	13.40	4	12.5	4.000	5.000	2.451	-2.841	3637	0.680	0.950	1.31	1.76	1.03
	80	ALL	Tx40		24	0.6	270	14.77	9.43	4	36.5	4.000	5.400	2.758	-3.168	4013	0.670	0.960	1.31	1.89	1.09
	85	ALL	Tx40		28	0.6	270	14.60	10.03	4	36.5	4.800	5.600	3.106	-3.529	4415	0.660	0.960	1.42	2.03	1.12
	90	ALL	Tx40		32	0.6	270	14.23	8.60	6	36.5	5.100	5.700	3.445	-3.881	4809	0.650	0.960	1.51	2.11	1.11
	95	ALL	Tx40		34	0.6	270	14.07	10.19	6	28.5	5.800	6.800	3.829	-4.272	5232	0.640	0.970	1.40	1.85	1.02
Type Tx46 Girders 44' Roadway 8.5" Slab	40	ALL	Tx46		10	0.6	270	17.60	17.60			4.000	5.000	0.638	-0.765	1924	0.850	0.920	2.04	2.65	3.31
	45	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	0.800	-0.930	2275	0.820	0.920	2.11	2.74	3.13
	50	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	0.983	-1.120	2688	0.790	0.920	1.73	2.25	2.47
	55	ALL	Tx46		14	0.6	270	17.60	17.60			4.000	5.000	1.184	-1.328	3015	0.770	0.930	1.75	2.27	2.28
	60	ALL	Tx46		14	0.6	270	17.60	17.60			4.000	5.000	1.406	-1.555	2964	0.760	0.930	1.45	1.88	1.78
	65	ALL	Tx46		16	0.6	270	17.35	16.35	4	8.5	4.000	5.000	1.629	-1.779	3161	0.740	0.930	1.47	1.91	1.66
	70	ALL	Tx46		16	0.6	270	17.35	16.85	4	6.5	4.000	5.000	1.880	-2.022	3426	0.720	0.940	1.26	1.63	1.30
	75	ALL	Tx46		18	0.6	270	17.16	15.83	4	10.5	4.000	5.000	2.151	-2.287	3827	0.710	0.940	1.27	1.64	1.18
	80	ALL	Tx46		20	0.6	270	17.00	15.40	4	12.5	4.000	5.000	2.422	-2.552	4226	0.700	0.940	1.26	1.65	1.07
	85	ALL	Tx46		24	0.6	270	16.77	14.10	4	20.5	4.000	5.000	2.725	-2.843	4652	0.690	0.940	1.43	1.86	1.11
	90	ALL	Tx46		28	0.6	270	16.60	11.46	4	40.5	4.200	5.100	3.022	-3.129	5071	0.680	0.950	1.55	2.03	1.15
	95	ALL	Tx46		32	0.6	270	16.23	9.48	6	42.5	4.400	5.300	3.358	-3.445	5521	0.670	0.950	1.62	2.15	1.13
	100	ALL	Tx46		34	0.6	270	16.07	10.43	6	38.5	4.900	5.600	3.710	-3.774	5983	0.660	0.950	1.43	2.07	1.03
	105	ALL	Tx46		38	0.6	270	15.81	10.76	6	38.5	5.500	6.300	4.063	-4.103	6444	0.650	0.950	1.52	2.14	1.05
	110	ALL	Tx46		42	0.6	270	15.60	10.75	6	40.5	6.000	6.900	4.429	-4.443	6915	0.640	0.950	1.58	1.83	1.06

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER

(1) Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

Tension = 0.24 $\sqrt{f'ci}$

Optional designs must likewise conform.

(2) Portion of full HL93.

DESIGN NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation.

Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.

Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

Use low relaxation strands, each pretensioned to 75 percent of fpu.

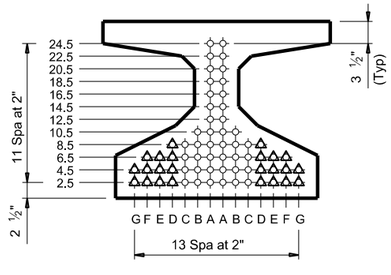
Strand debonding must comply with Item 424.4.2.2.2.4. Full-length debonded strands are only permitted in positions marked Δ. Double wrap full-length debonded strands in outer most position of each row.

When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

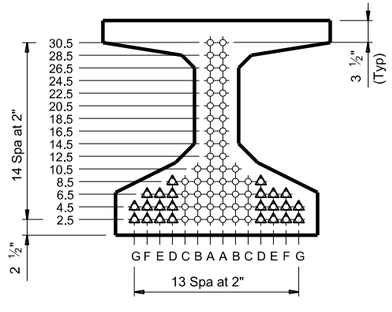
Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

DEPRESSED STRAND DESIGNS:

Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.



TYPE Tx28



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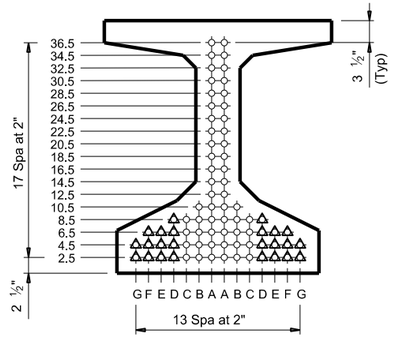

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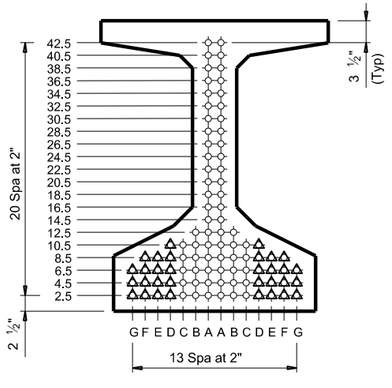


TYPE Tx46

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

44' ROADWAY

IGSD-44

FILE: IGHGSD44-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Redesigned girders. 1-21: Added load rating.	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		220

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS		
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS						NO.	TO END	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ⌓) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT ⌓) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (In)	"e" END (In)		(In)						Moment	Shear	Inv	Opr	Inv
Type Tx54 Girders 44' Roadway 8.5" Slab	40	ALL	Tx54		10	0.6	270	21.01	21.01			4.000	5.000	0.530	-0.623	1989	0.880	0.910	2.33	3.03	3.97
	45	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.662	-0.758	2354	0.850	0.910	2.42	3.13	3.78
	50	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.812	-0.912	2784	0.820	0.910	2.00	2.59	3.04
	55	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	0.978	-1.081	3245	0.800	0.920	2.02	2.61	2.83
	60	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	1.157	-1.259	3617	0.780	0.920	1.71	2.21	2.31
	65	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.350	-1.447	3859	0.760	0.920	1.73	2.25	2.17
	70	ALL	Tx54		16	0.6	270	20.76	20.26	4	6.5	4.000	5.000	1.548	-1.644	3811	0.750	0.920	1.48	1.92	1.76
	75	ALL	Tx54		18	0.6	270	20.56	19.67	4	8.5	4.000	5.000	1.766	-1.851	4040	0.730	0.930	1.51	1.96	1.66
	80	ALL	Tx54		18	0.6	270	20.56	19.67	4	8.5	4.000	5.000	2.002	-2.076	4367	0.720	0.930	1.30	1.69	1.31
	85	ALL	Tx54		20	0.6	270	20.41	18.81	4	12.5	4.000	5.000	2.251	-2.312	4809	0.710	0.930	1.12	1.45	1.01
	90	ALL	Tx54		22	0.6	270	20.28	18.46	4	14.5	4.000	5.000	2.496	-2.545	5246	0.700	0.930	1.33	1.73	1.13
	95	ALL	Tx54		24	0.6	270	20.17	17.84	4	18.5	4.000	5.000	2.771	-2.802	5712	0.690	0.930	1.33	1.73	1.02
	100	ALL	Tx54		28	0.6	270	20.01	14.29	4	44.5	4.000	5.000	3.060	-3.069	6192	0.680	0.940	1.48	1.93	1.05
	105	ALL	Tx54		32	0.6	270	19.63	11.38	6	50.5	4.100	5.000	3.338	-3.327	6660	0.670	0.940	1.61	2.09	1.07
	110	ALL	Tx54		36	0.6	270	19.34	12.01	6	50.5	4.700	5.400	3.652	-3.613	7163	0.660	0.940	1.53	2.04	1.02
	115	ALL	Tx54		38	0.6	270	19.22	12.27	6	50.5	5.000	5.900	3.980	-3.910	7680	0.650	0.940	1.49	2.00	1.04
	120	ALL	Tx54		42	0.6	270	19.01	12.72	6	50.5	5.600	6.500	4.311	-4.222	8253	0.650	0.940	1.50	2.01	1.07
	125	ALL	Tx54		46	0.6	270	18.66	11.36	8	50.5	5.800	7.100	4.665	-4.539	8796	0.640	0.940	1.45	1.87	1.04
Type Tx62 Girders 44' Roadway 8.5" Slab	60	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	0.911	-1.054	3863	0.800	0.910	1.93	2.51	2.79
	65	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	1.063	-1.217	4246	0.790	0.910	1.63	2.12	2.28
	70	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.224	-1.383	4540	0.770	0.910	1.68	2.18	2.18
	75	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.398	-1.564	4494	0.760	0.920	1.44	1.87	1.78
	80	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.567	-1.736	4780	0.740	0.920	1.50	1.94	1.73
	85	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.760	-1.933	5010	0.730	0.920	1.30	1.68	1.40
	90	ALL	Tx62		18	0.6	270	25.33	25.33			4.000	5.000	1.965	-2.140	5488	0.720	0.920	1.12	1.45	1.10
	95	ALL	Tx62		20	0.6	270	25.18	24.78	4	6.5	4.000	5.000	2.179	-2.355	5980	0.710	0.920	1.15	1.49	1.04
	100	ALL	Tx62		24	0.6	270	24.94	23.28	4	14.5	4.000	5.000	2.405	-2.579	6487	0.700	0.920	1.36	1.76	1.14
	105	ALL	Tx62		26	0.6	270	24.85	22.70	4	18.5	4.000	5.000	2.620	-2.795	6978	0.690	0.930	1.37	1.78	1.07
	110	ALL	Tx62		30	0.6	270	24.58	17.78	6	40.5	4.000	5.000	2.864	-3.035	7510	0.680	0.930	1.52	1.97	1.10
	115	ALL	Tx62		34	0.6	270	24.25	15.42	6	56.5	4.200	5.000	3.119	-3.284	8055	0.670	0.930	1.50	1.95	1.00
	120	ALL	Tx62		36	0.6	270	24.11	15.78	6	56.5	4.500	5.300	3.357	-3.518	8575	0.660	0.930	1.63	2.11	1.07
	125	ALL	Tx62		40	0.6	270	23.88	16.08	6	58.5	5.000	5.900	3.637	-3.798	9210	0.660	0.930	1.58	2.04	1.02
	130	ALL	Tx62		42	0.6	270	23.78	16.35	6	58.5	5.300	6.200	3.888	-4.044	9750	0.650	0.930	1.40	2.16	1.05
	135	ALL	Tx62		46	0.6	270	23.43	14.73	8	58.5	5.500	6.400	4.180	-4.324	10345	0.640	0.940	1.46	1.90	1.05

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER

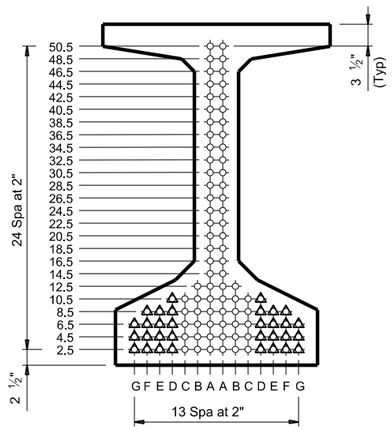
(1) Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

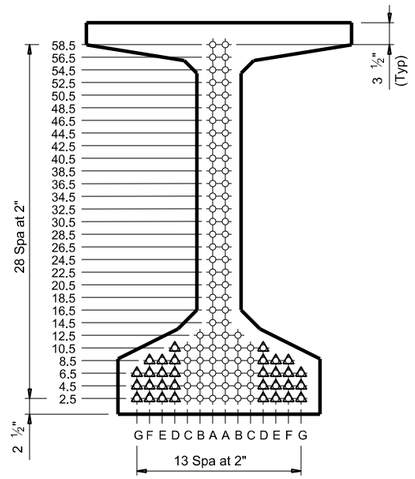
Tension = 0.24 $\sqrt{f'ci}$

Optional designs must likewise conform.

(2) Portion of full HL93.



TYPE Tx54



TYPE Tx62

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

44' ROADWAY

IGSD-44

FILE: IGSD44-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Redesigned girders. 1-21: Added load rating.	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		221

DATE: 1/29/2024 2:40:06 PM
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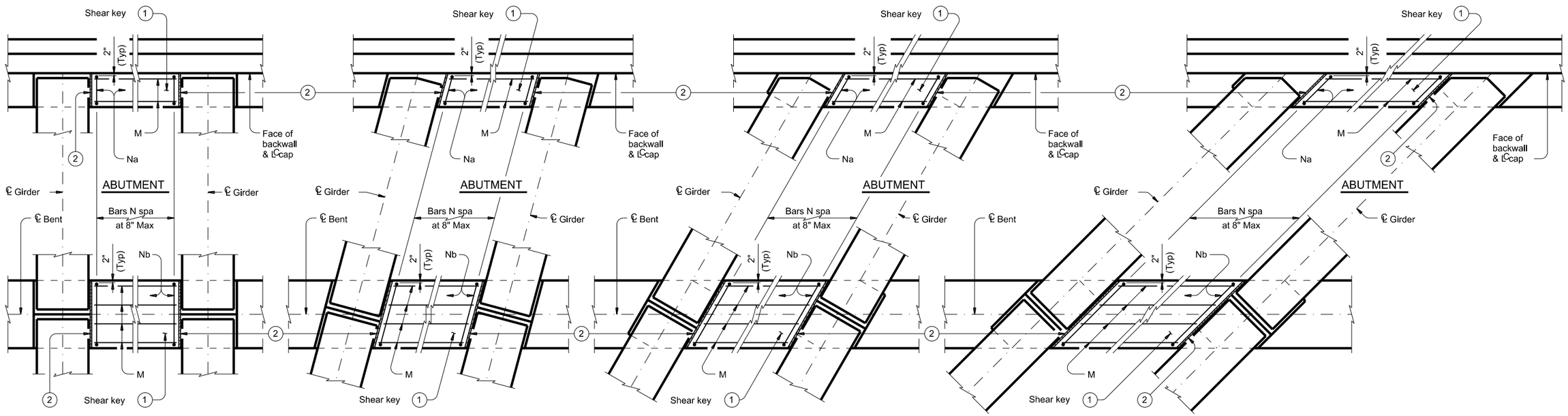


PARTIAL PLANS WITH NO SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

PARTIAL PLANS WITH 15° SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

PARTIAL PLANS WITH 30° SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

PARTIAL PLANS WITH 45° SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

(1) Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.

(2) UHMW polyethylene wear pad. (Typ)

(3) Leave a ¼" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. Care must be taken to keep concrete from flowing under girder. Slope top of shear keys in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces."

(4) Measure at higher bearing seat elevation forward or back. Dimension based on typical bearing pad and bearing seat. Increase as necessary to maintain 5" overlap.

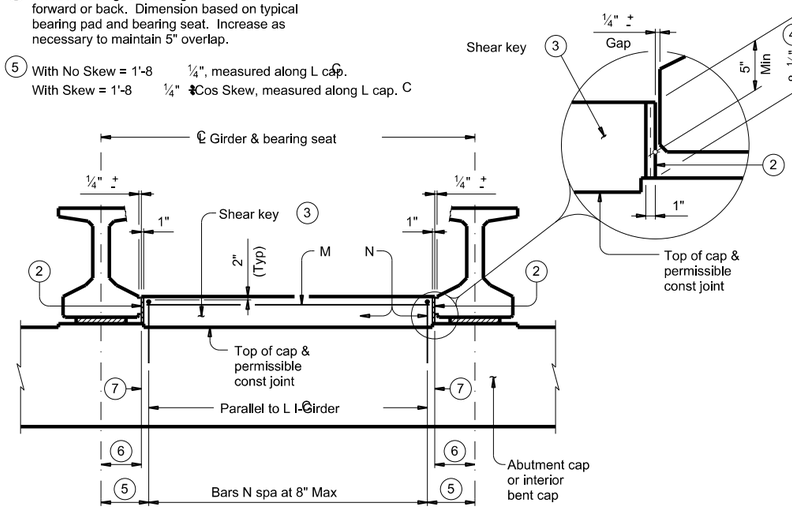
(5) With No Skew = 1'-8 ¼", measured along L cap.
With Skew = 1'-8 ¼" ± Cos Skew, measured along L cap.

(6) With No Skew = 1'-4 ¼", measured along L cap.
With Skew = 1'-4 ¼" ± Cos Skew, measured along L cap.

(7) Face of UHMW polyethylene wear pad. Smooth side of pad facing girder.

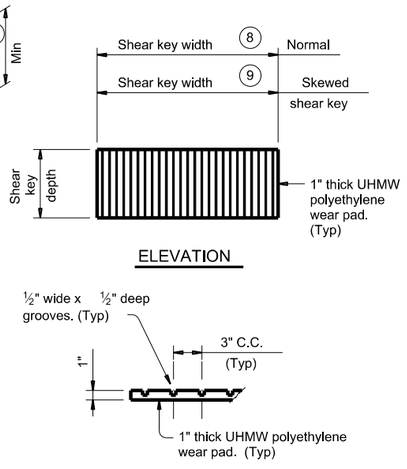
(8) Abutments = ½ Cap width.
Interior bents = Cap width.

(9) Abutments = ½ Cap width Cos Skew.
Interior bents = Cap width Cos Skew.

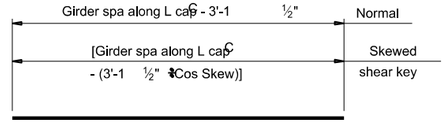


PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

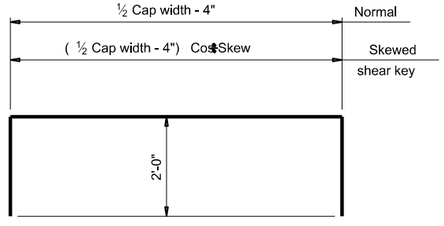
Showing shear key with girder Type Tx46.
Other I-Girder types similar.



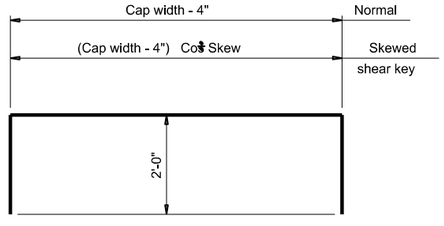
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



BARS M (#5)



BARS Na (#5)
(For abutments)



BARS Nb (#5)
(For interior bents)

CONSTRUCTION NOTES:

Provide Class "C" concrete (f'c = 3,600 psi). Provide Class "C" (HPC) if shown elsewhere on the plans.
Provide Grade 60 reinforcing steel.
Provide epoxy coated reinforcing steel for shear key if abutment or interior bent reinforcing steel is epoxy coated.
Provide Ultra High Molecular Weight (UHMW) polyethylene wear pads in accordance with ASTM D6712.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Details showing skew are drawn showing right forward skew. See Bridge Layout for actual skew direction.
These details are limited to bridges skewed 45 degrees and less.
This standard is only applicable for I-Girders.
Modify details for bearing conditions, and girder spacing not shown on this standard. Details do not account for sole plate or pedestal bearing seat.
Include shear key concrete in abutment or bent concrete for payment.
UHMW polyethylene wear pads are subsidiary to Class "C" concrete.

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

Texas Department of Transportation

Bridge Division Standard

SHEAR KEY DETAILS
PRESTR CONCRETE I-GIRDERS

IGSK

FILE: IGSK-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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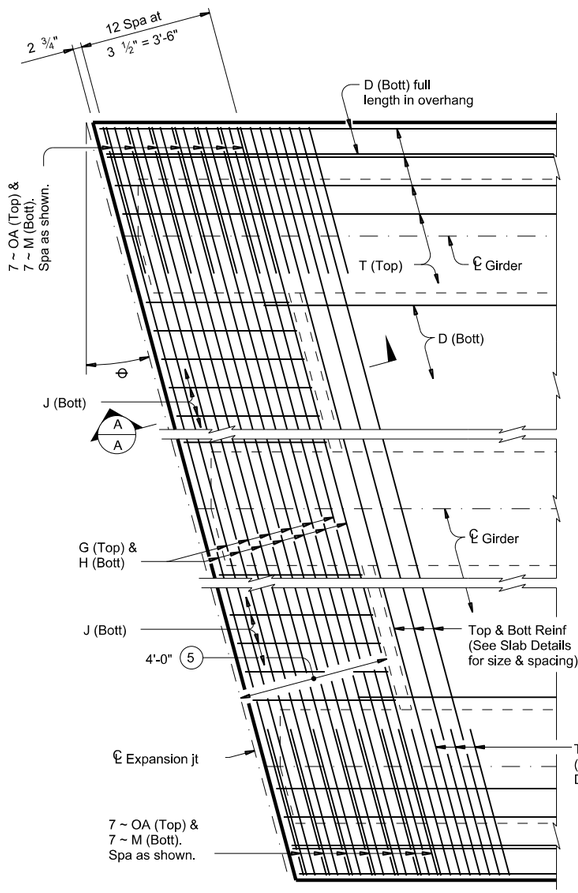
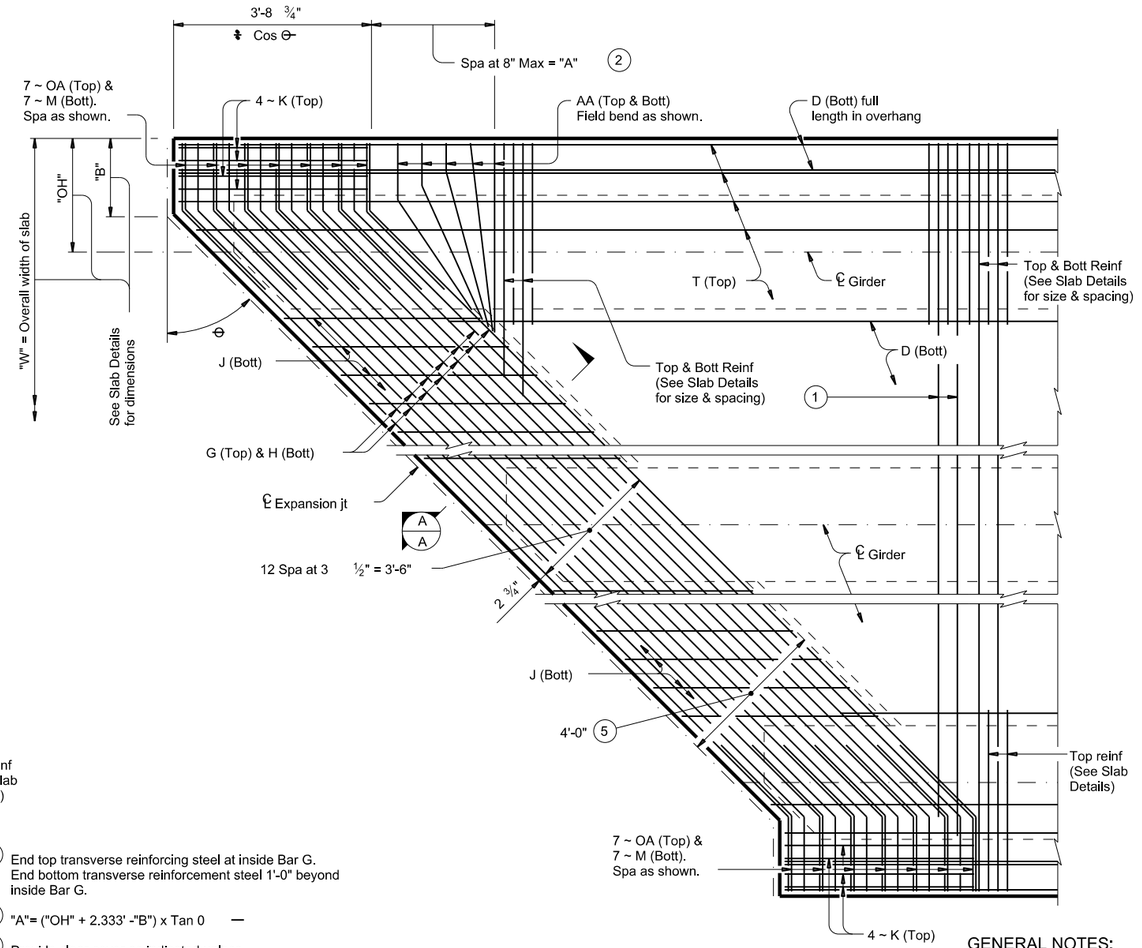
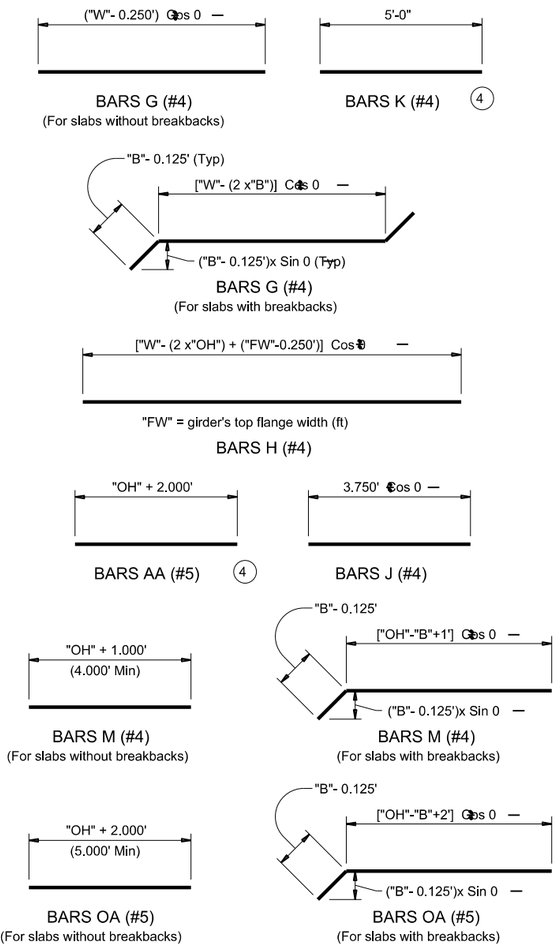


PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



PARTIAL PLAN FOR SLABS WITH BREAKBACK

1. End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
2. "A"= ("OH" + 2.333' -"B") x Tan 0 —
3. Provide clear cover as indicated unless otherwise shown on Span Details.
4. Only required on slabs with breakbacks.
5. Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.



GENERAL NOTES:

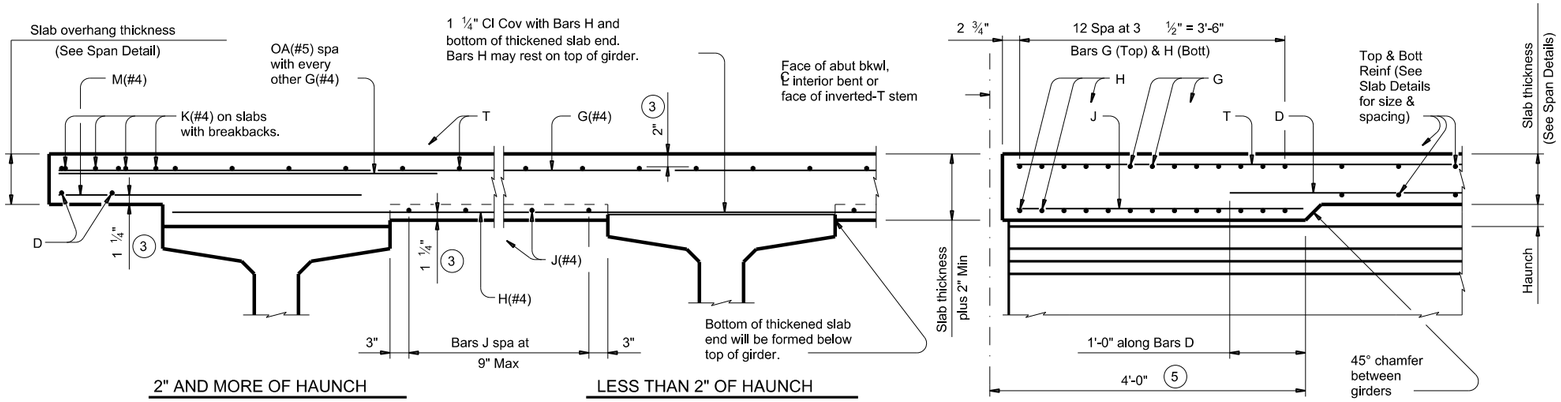
Designed according to AASHTO LRFD Bridge Design Specifications.
These details are restricted to Prestressed Concrete I-Girder Spans.
These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used).
When Option 2 from PCP standard is used, provide Bars AA, G, K and OA in the slab.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and OA must be epoxy coated.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

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

HL93 LOADING



TYPICAL TRANSVERSE SECTION

(Showing Prestressed Conc I-Girders at L Brg)

2" AND MORE OF HAUNCH

LESS THAN 2" OF HAUNCH

SECTION A-A

(Showing with 2" and more of haunch)

Texas Department of Transportation

Bridge Division Standard

THICKENED SLAB END DETAILS

PRESTRESSED CONCRETE I-GIRDER SPANS

IGTS

FILE: IG-IGTS-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
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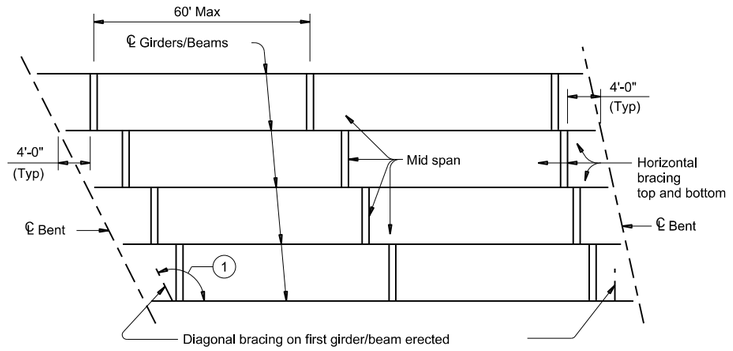
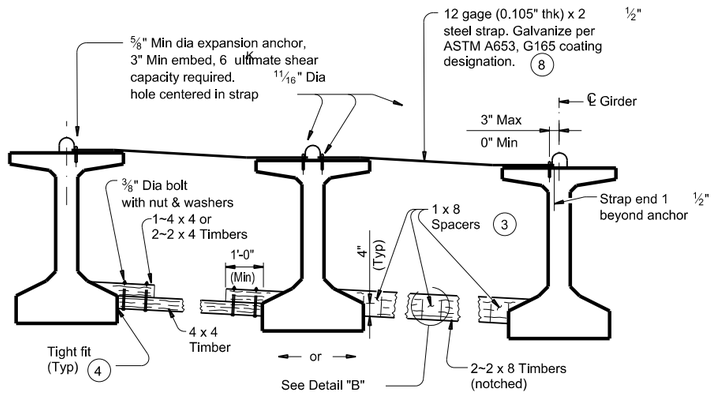
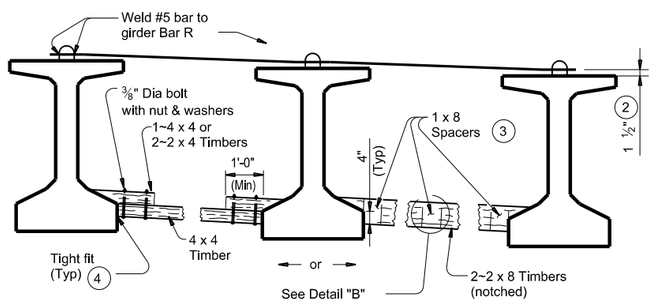


ERECTION BRACING



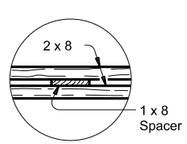
FOR ERECTION BRACING, OPTION 1

(This option is not allowed when slab is formed with PMDF or plywood.)



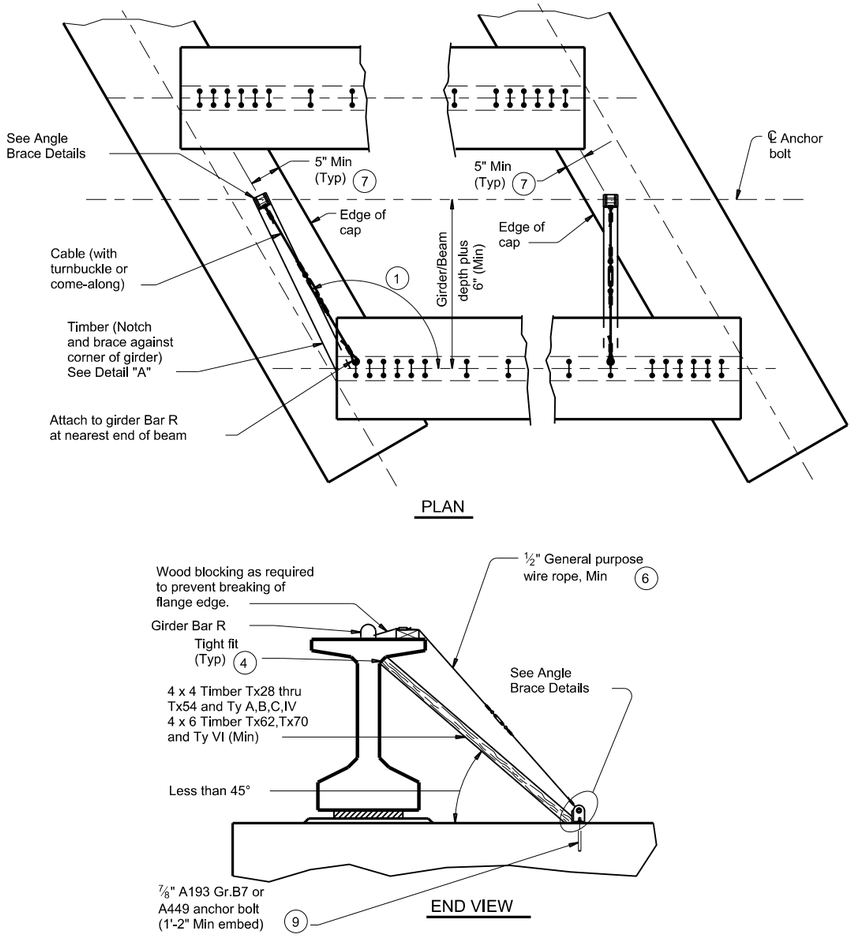
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS 5



PLAN

DETAIL "B"

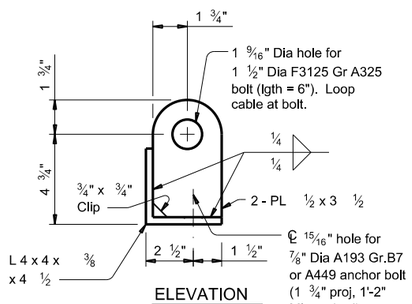


PLAN

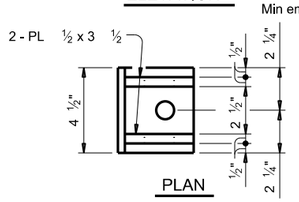
END VIEW

DIAGONAL BRACING DETAILS 5

(To be used on both ends of the first girder/beam erected in the span in each phase.)



ELEVATION



PLAN

ANGLE BRACE DETAILS

HAULING & ERECTION:

The Contractor's attention is directed to the possible lateral instability of prestressed concrete girders and beams over 130' long, especially during hauling and erection. The use of the following methods to improve stability is encouraged: Locate lifting devices at the maximum practical distance from girder ends; use external lateral stiffening devices during hauling and erection; lift with vertical lines using two machines; and take care in handling to minimize inertial and impact forces.

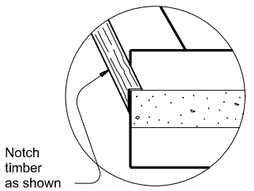
ERECTION BRACING:

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425.

Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

PHASED CONSTRUCTION:

Place erection and slab placement bracing for all girders in a phase as shown in these details. For phases after first, also place erection and slab placement bracing between outer girder of completed phase and adjacent girder of current phase. When the phase construction joint is between girders, top bracing can be omitted.



DETAIL "A"

1. If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.
2. Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R (See Sheet 2 of 2).
3. Clear distance between spacers must not exceed 3'. Nail together with 16d nails.
4. Use wedges as necessary to obtain tight fit. Nail wedges to timbers.
5. Pressure treated landscape timbers can not be used.
6. All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing aginst the dead end.
7. It is acceptable to tie anchor bolts to cap reinforcement.
8. Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.
9. Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

FILE: IG-MEBR(C)-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2017 REVISIONS	CONT	SECT	JOB	HIGHWAY
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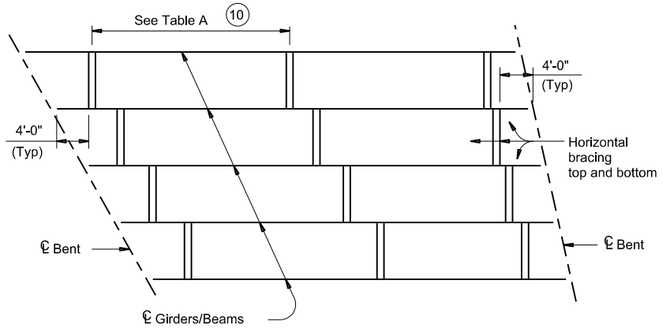
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		224



SLAB PLACEMENT BRACING

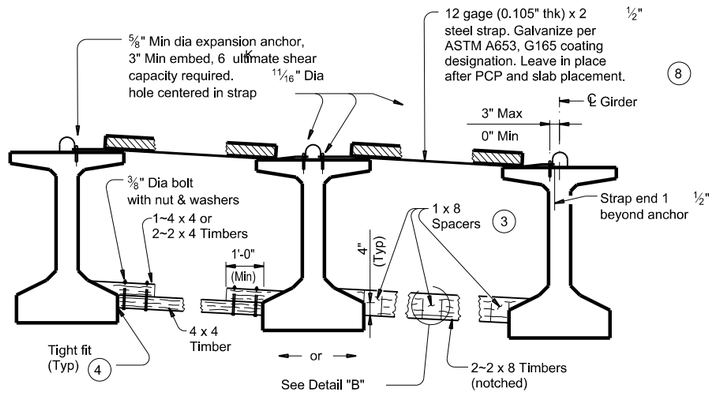
TABLE A

OPTION 1-RIGID BRACING (STEEL STRAP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	¼ points
Tx34	¼ points	¼ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	⅛ points	⅛ points
B	⅛ points	⅛ points
C	⅛ points	⅛ points
IV	¼ points	⅛ points
VI	¼ points	⅛ points

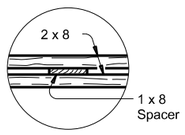
OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	⅛ points
Tx34	¼ points	⅛ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	2.0 ft	1.5 ft
B	3.0 ft	2.0 ft
C	4.5 ft	2.0 ft
IV	¼ points	4.0 ft
VI	¼ points	4.0 ft



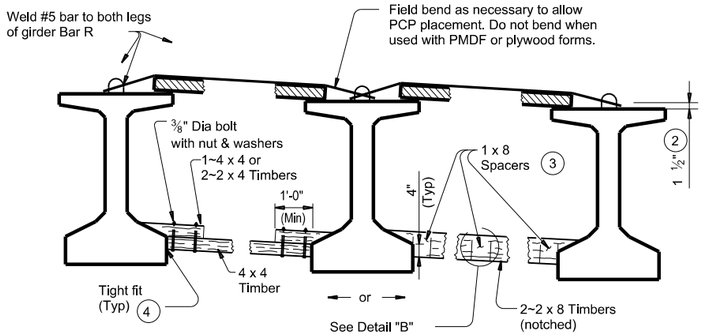
FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID

(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



PLAN

DETAIL "B"



FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE

(Showing slab formed with PCP.)

HORIZONTAL BRACING DETAILS (5)

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(10) Bracing spacing (¼ and ⅛ points) measured between first and last typical brace location.

(11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

SLAB PLACEMENT BRACING:

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425.

Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

GENERAL NOTES:

Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection.

Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection.

Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

Removal of bracing for short periods of time to align girders and beams is permissible.

All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown.

Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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	WAC	McLENNAN		225

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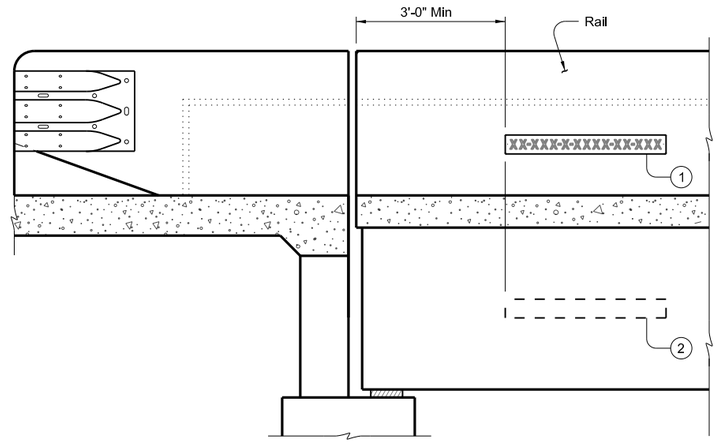
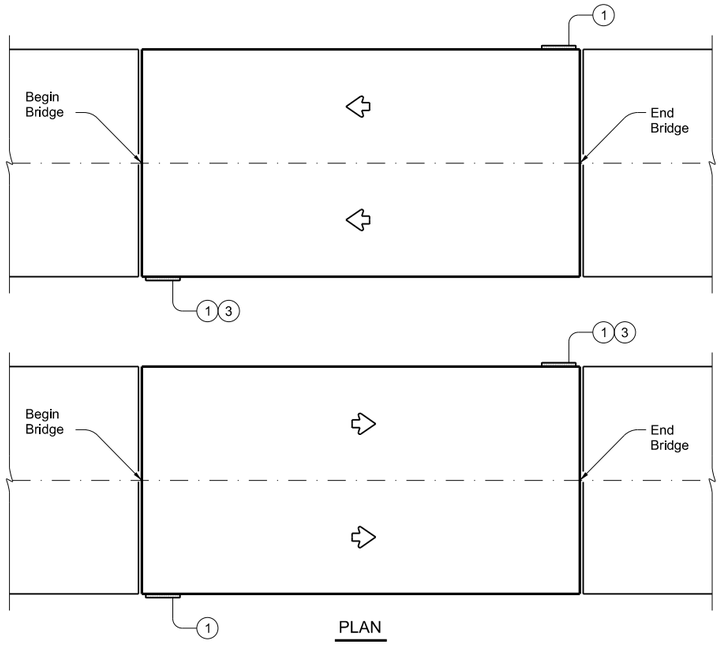
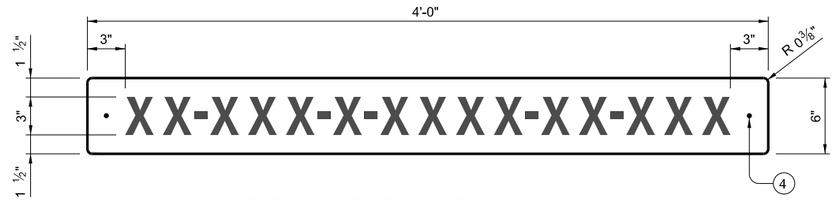


ELEVATION

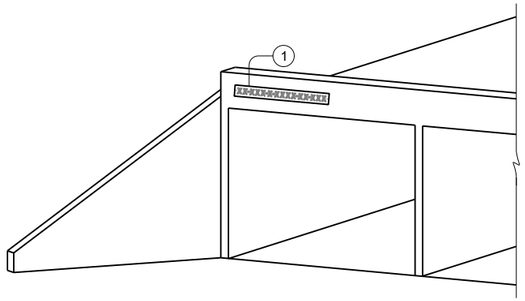


PLAN

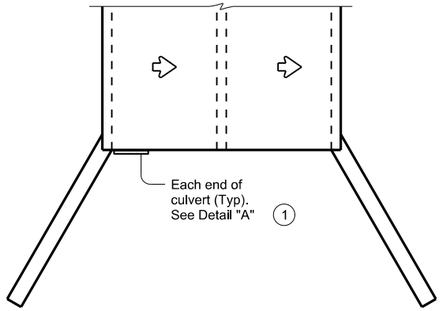
BRIDGE SIGN LOCATIONS



BRIDGE IDENTIFICATION SIGN

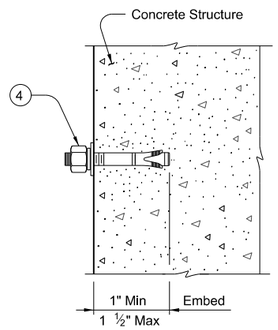


DETAIL "A"



PLAN

BRIDGE CLASS CULVERT SIGN PLACEMENT



ANCHOR DETAIL

SHEETING REQUIREMENTS		
Usage	Color	Sign Face Material
Background	White	Type B or C Sheeting
Letters and Symbols	Black	Type B or C Sheeting

(1) Bridge identification sign location

(2) Alternate sign placement location for exterior concrete beams.

(3) If adjacent bridges are less than 2 feet apart, these signs may be omitted.

(4) ¼" Diameter stainless steel expansion anchor with hex nut, washer, and spring-lock washer.

SIGN NOTES:

Standard sign designs can be found in the Standard Highway Sign Designs for Texas (SHSD).

Use the Clearview Alphabet CV-2W for the letters and symbols.

MATERIAL NOTES:

Provide lateral spacing between letters and numerals conforming with the SHSD, and any approved changes thereto. Provide a balanced appearance when spacing is not shown.

Provide aluminum sign blanks with a minimum thickness of 0.080" that meet the requirements of DMS-7110.

Provide sign face materials that meet the requirements of DMS-8300 and the sheeting requirements shown in the table.

Provide ¼" diameter stainless steel expansion anchors with one hex head nut, one flat washer, and one helical spring-lock washer each.

Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). Provide anchor products that have a designated ICC-ES Evaluation Report number. The approval status must be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.

Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.

Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environments, provide both stainless steel anchor bodies and expansion wedges.

GENERAL NOTES:

Prior to hole drilling, locate rebar to ensure clearing of existing reinforcement and/or strands.

Prior to installation, obtain approval of sign locations from the Engineer. Avoid placement of sign over travel lanes and pedestrian walkways. Submit proposed installation method to Engineer prior to beginning work. Install anchors as shown on plans and in accordance with the anchor manufacturer's published installation instructions.

Do not install anchors sections of members under tension.

For new construction, the signs and anchors are subsidiary to the bridge. For installations on existing structures, the signs and anchors are paid under Item 442, "Metal for Structures." Each sign weighs 28 lbs.

Texas Department of Transportation

Bridge Division Standard

NBIS BRIDGE IDENTIFICATION SIGN STANDARD

NBIS

FILE: 14A_NBIS.dgn	DN: TAR	CK: TxDOT	DW: JER	CK: TAR
©TxDOT March 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		226

DATE: 1/29/2024 2:40:35 PM
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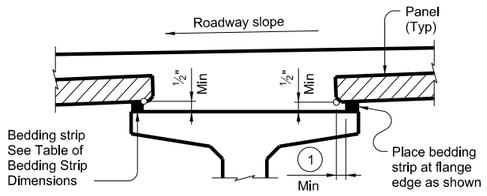
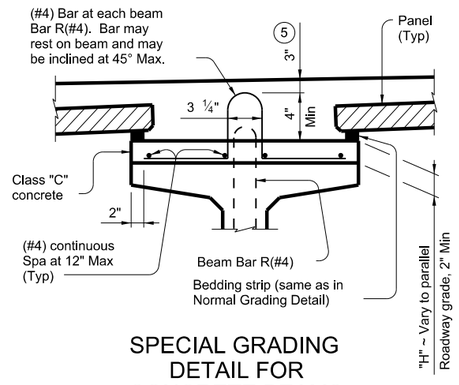


NORMAL GRADING DETAIL (3)

Showing prestressed concrete I-girders.
(Other beam types similar)



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

Showing prestressed concrete I-girders.
(Other beam types similar)

TABLE OF BEDDING STRIP DIMENSIONS		
WIDTH	HEIGHT (4)	
	Min	Max
1" (Min)	½"	2"
1 ¼"	½"	2 ½"
1 ½"	½"	3"
1 ¾"	½"	3 ½"
2"	½"	4"
2 ¼"	½"	4 ½" (2)
2 ½"	½"	5" (2)
2 ¾"	½"	5 ½" (2)
3" (Max)	½"	6" (2)

(1) 2" Min for I-girders, 1 ½" Min for all other beam types.

(2) Allowed for prestressed concrete I-girders, not allowed on other beam types.

(3) To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in ¼" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is ¼". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.

(4) Height must not exceed twice the width.

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(7) Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 ½" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.

(8) Do not locate construction joints on top of a panel.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

CONSTRUCTION NOTES:

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges.

Placing panels to minimize joint openings is recommended.

If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction.

Bars U, shown on PCP-FAB, may be bent over or cut off if necessary.

Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 ½" under the panels as the slab concrete is placed.

To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least ½". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required.

For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated.

Provide bar Laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees.

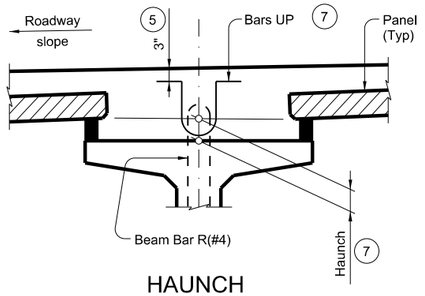
Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use.

These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.

When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer.

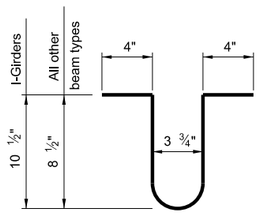
Any additional reinforcement or concrete required on this standard is considered subsidiary to the bid Item "Reinforced Concrete Slab".

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



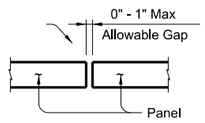
HAUNCH REINFORCING DETAIL

Showing prestressed concrete I-girders.
(Other beam types similar)



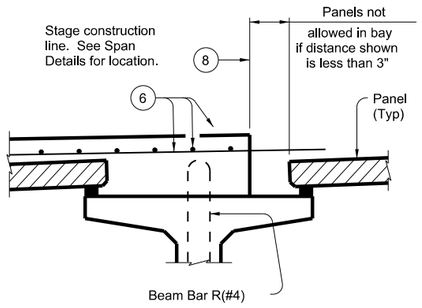
BARS UP (#4) (7)

Seal joint between panels when gap exceeds ¼" with polyurethane sealant or expanding foam sealer. Make seal flush with top of panel.

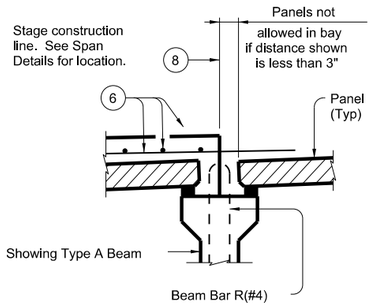


PANEL JOINTS

(Panel reinforcing not shown for clarity.
The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



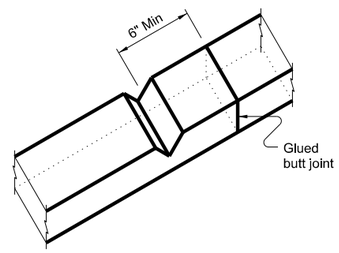
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)



BEDDING STRIP DETAIL (9)

HL93 LOADING SHEET 1 OF 4

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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3/2023: Removed top flange tension limit.	DIST	COUNTY		SHEET NO.
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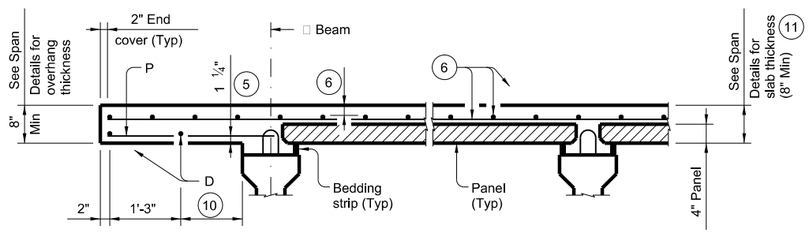
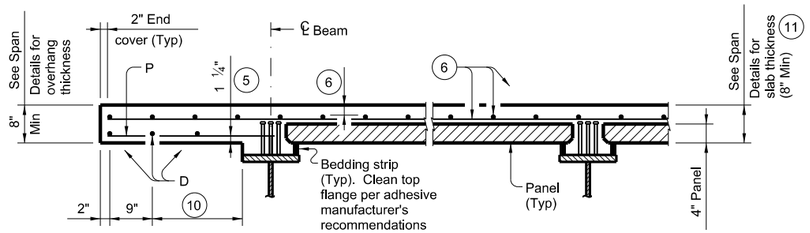
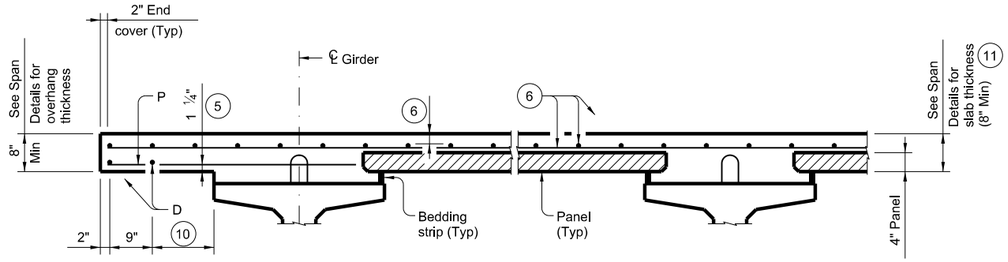


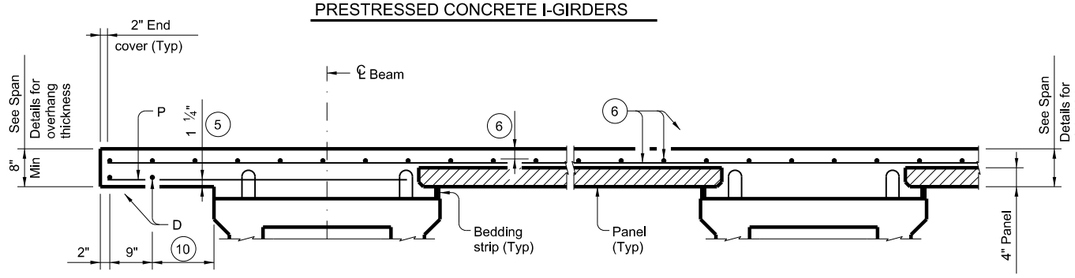
PRESTRESSED CONCRETE I-BEAMS



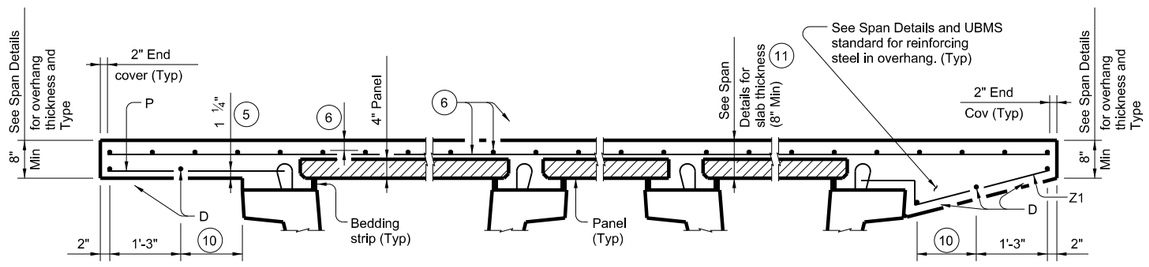
STEEL BEAMS (13)



PRESTRESSED CONCRETE I-GIRDERS



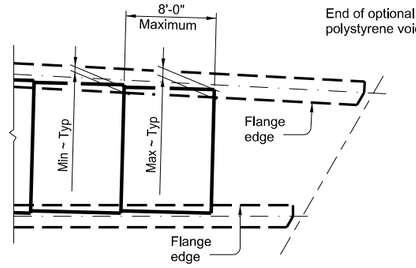
PRESTRESSED CONCRETE X-BEAMS



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

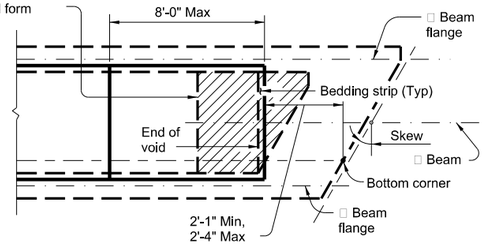
SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

TYPICAL PART TRANSVERSE SECTIONS



AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on beam/girder type.



OVER CONC U-BEAMS

PART PLANS OF PANEL PLACEMENT

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

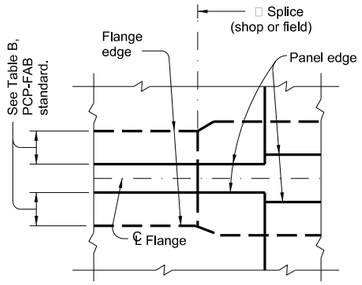
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(10) Equally space additional bar if more than 1'-3" Max.

(11) The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.

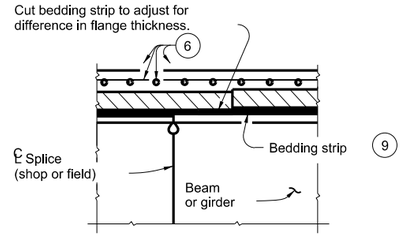
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Panels are allowed over top tension flanges, as approved by the Engineer. See Span Details for additional top mat reinforcement required in tension zones. Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



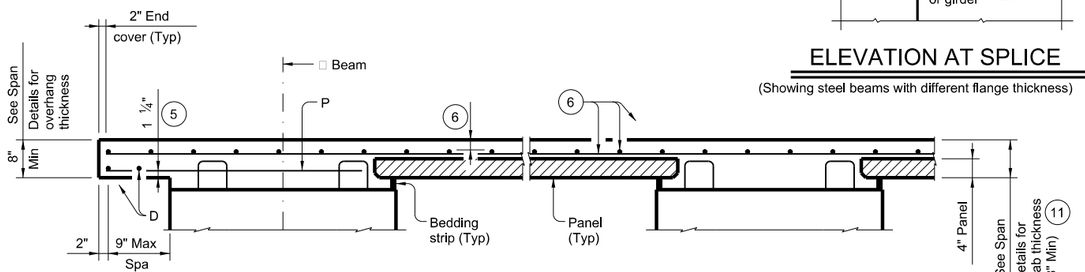
PLAN AT SPLICE

(Showing steel beams with flange width transition)



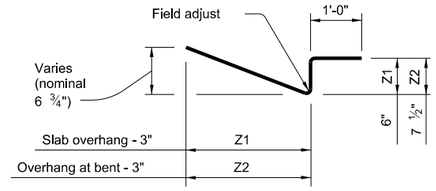
ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



PRESTRESSED CONCRETE SPREAD SLAB BEAMS

Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



BARS Z (#4) (12)

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Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

FILE: MS-PCP-23.dgn		DN: TxDOT		CK: TxDOT	DW: JTR		CK: JMH
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3/2023: Removed top flange tension limit.		DIST	COUNTY				SHEET NO.
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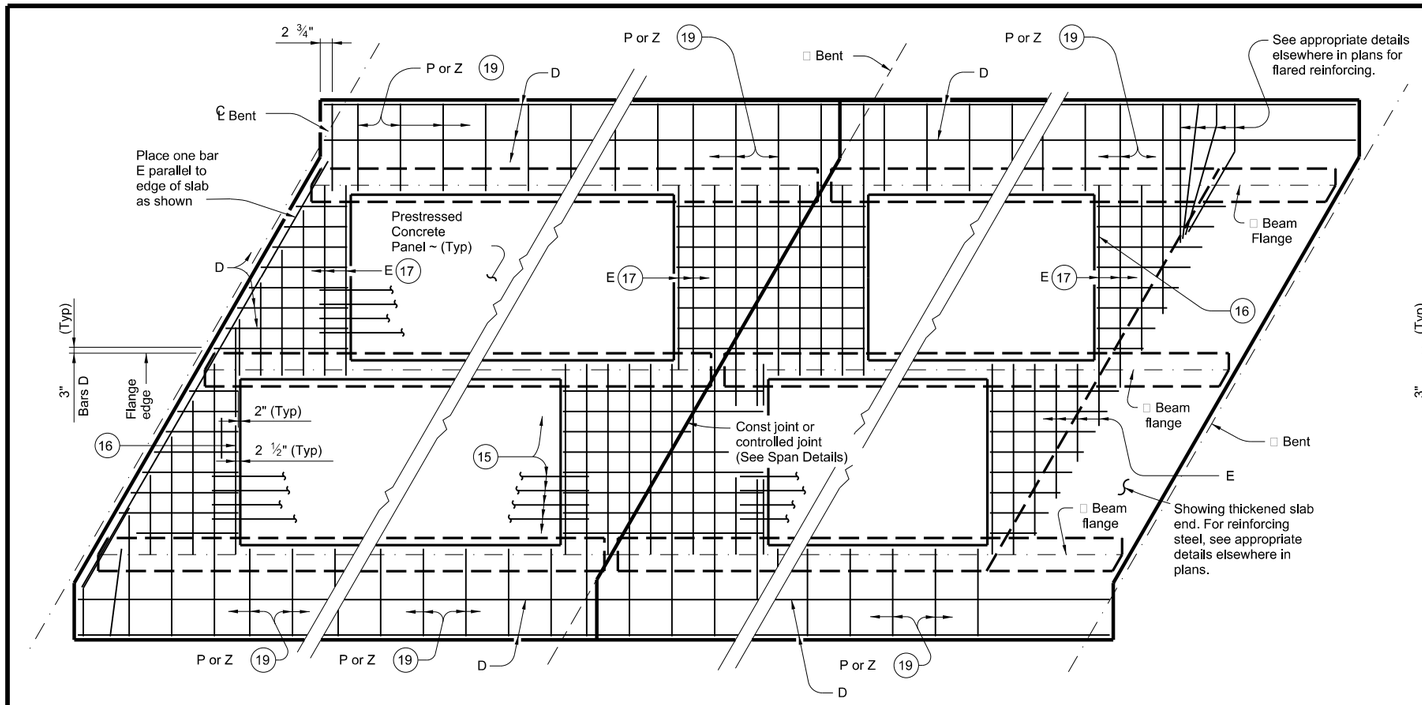
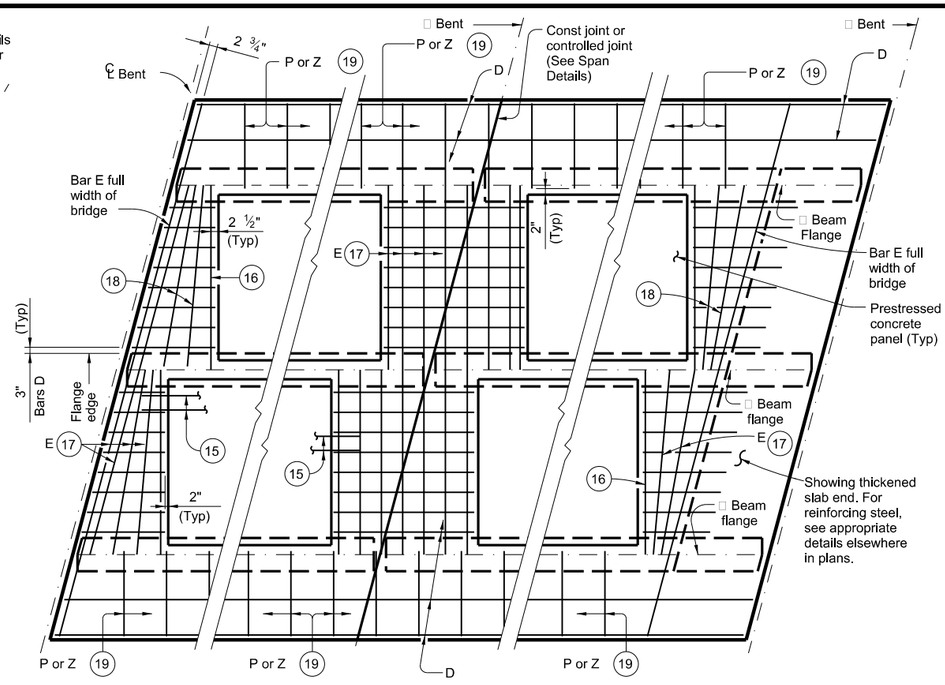


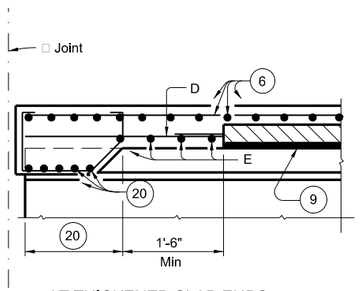
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

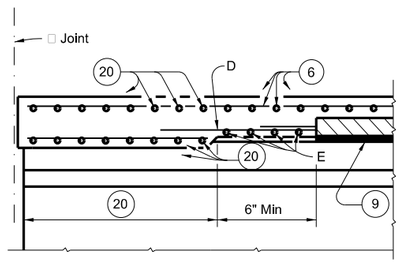


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

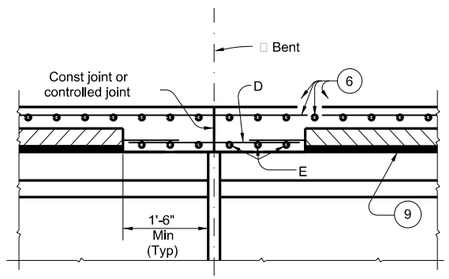
OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



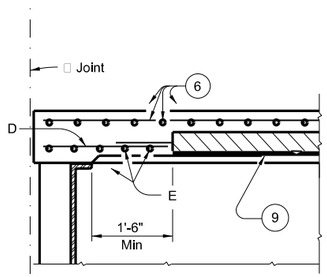
AT THICKENED SLAB ENDS FOR PRESTR CONCRETE U-BEAMS



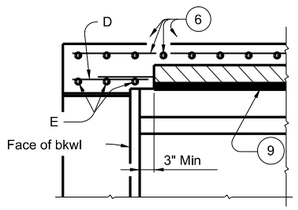
AT THICKENED SLAB ENDS FOR PRESTR CONCRETE I-BEAMS AND STEEL BEAMS



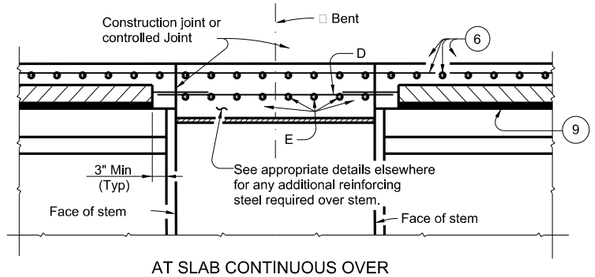
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BEAMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BEAMS



AT SLAB OVER ABUTMENT BACKWALL FOR ALL BEAMS



AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BEAMS

OPTION 1 ~ ELEVATIONS AT BEAM ENDS

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c.

(14) Max Spacing as listed unless otherwise shown.

(15) At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.

(16) Maintain one Bar E(#4) parallel to panel ends (Typ).

(17) Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.

(18) Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.

(19) Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.

(20) See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

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Texas Department of Transportation | Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

FILE: MS-PCP-23.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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3/2023: Removed top flange tension limit.	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		229

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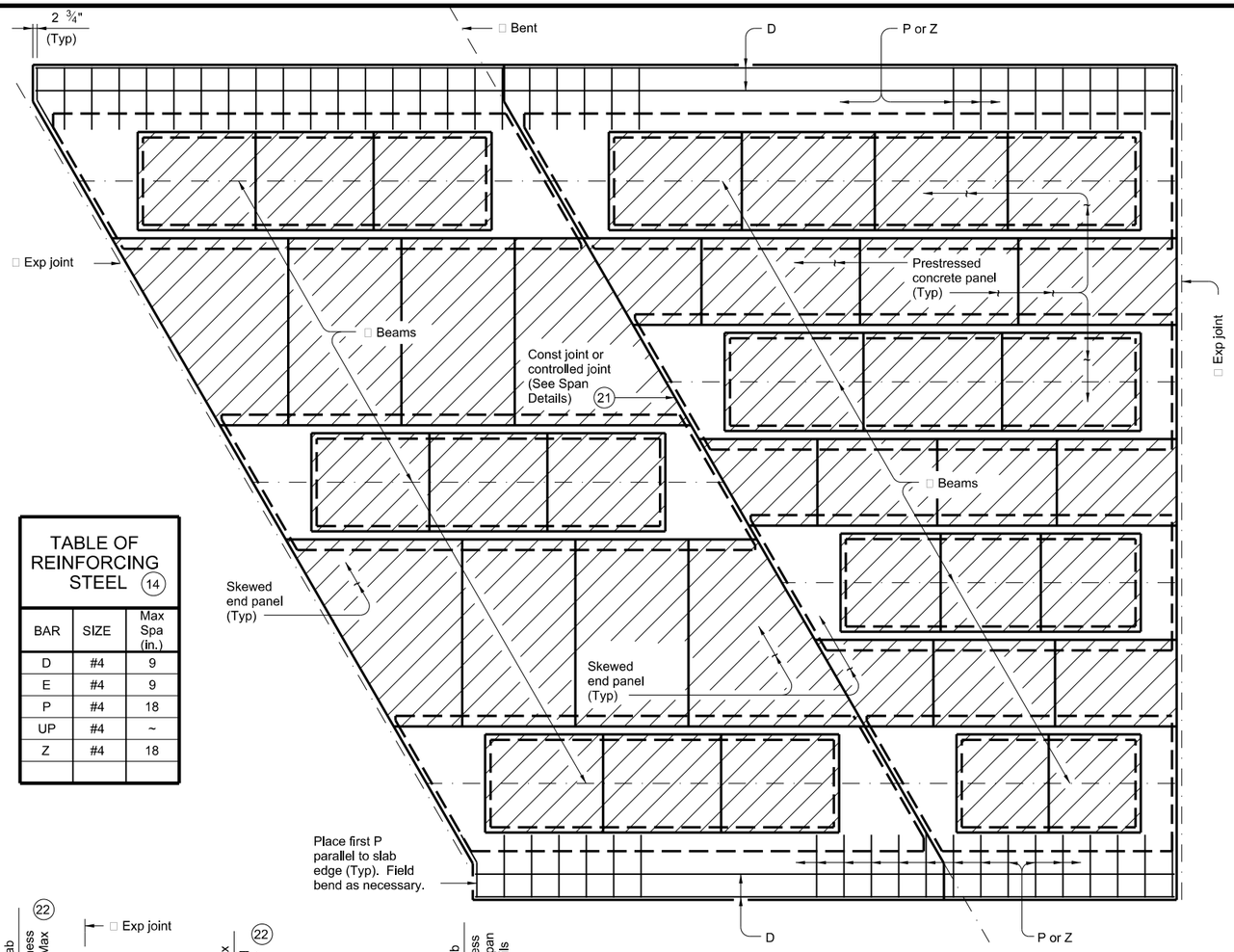
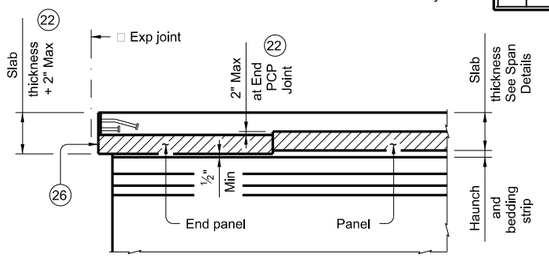


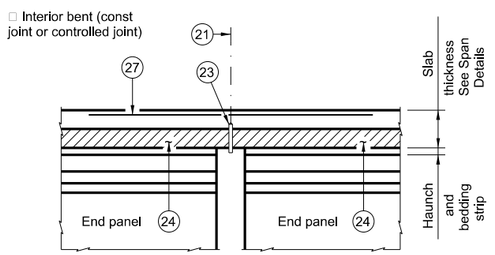
OPTION 2 ~ PLAN OF SLAB

(Showing U-Beams; other beams similar)



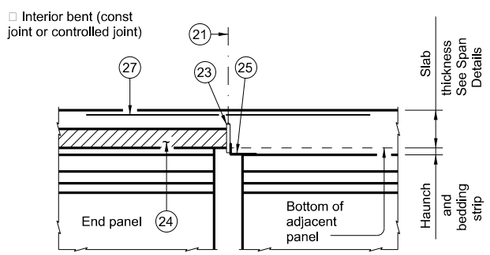
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-B, SEJ-M, SEJ-S(O), AJ, and Type A expansion joints only.



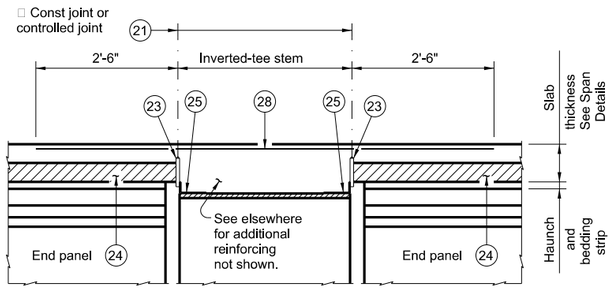
CONVENTIONAL INTERIOR BENT

Panel against panel between beams/girders.



CONVENTIONAL INTERIOR BENT

Panel against beam/girder end in adjacent span.

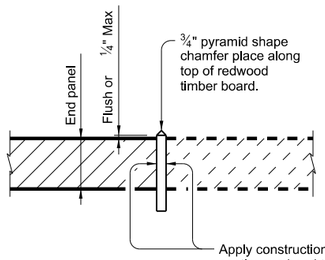


INVERTED-T BENT

Panels against inverted-tee stem

OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)

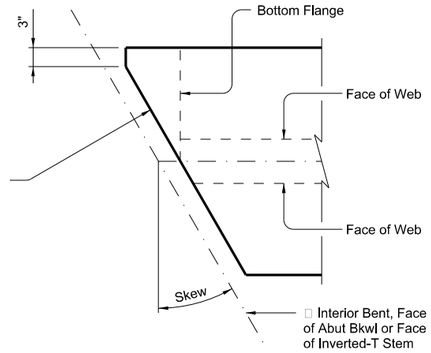
TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)

See "Option 2 ~ Elevation At Beam Ends".

Skew top flange of Bms/Girders as shown for flange edge supporting a panel. Not applicable to flange edges on exterior side of fascia Bms/Girders.



OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°

Showing I-Beam/I-Girder, U-Beams and Steel Beams similar.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(14) Max Spacing as listed unless otherwise shown.

(21) 1 ½" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

(22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than ½" thick.

(23) ¾" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within ¼" Max above panel. Place ¾" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within ¼" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.

(24) Place panel within ½" of ¾" thick board.

(25) Permanent galvanized steel sheet form. Removable formwork is acceptable.

(26) Place end panel within ½" of expansion joint opening. End panel cannot encroach on required expansion joint opening.

(27) Place additional (#4) bar 5'-0" in length between every slab Bars T. Center (#4) bar on Joint.

(28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.

SPECIAL OPTION 2 CONSTRUCTION NOTES:

When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 ½".

Do not extend the longitudinal panel reinforcement into the cast-in-place slab.

Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.

Bending of anchor studs of expansion joints shown on standards AJ, SEJ-B, SEJ-M, and SEJ-S(O) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and OA from standard IGTS in the slab.

HL93 LOADING SHEET 4 OF 4

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

FILE: MS-PCP-23.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
3/2023: Removed top flange tension limit.	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		230

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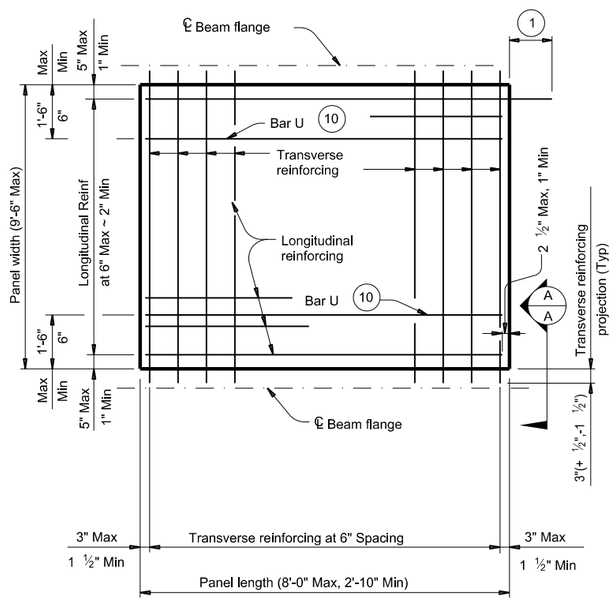
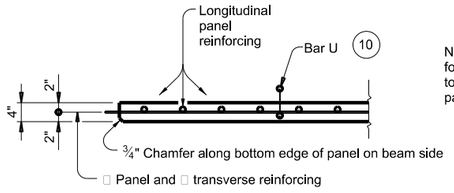
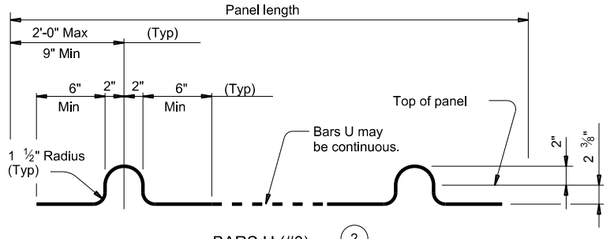


TYPICAL NON-SKEWED PANEL PLAN

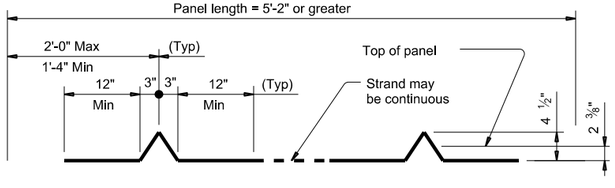


SECTION A-A

(Not showing supplemental #4 bars for skewed end panels.)

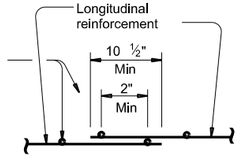


BARS U (#3) (2)



OPTIONAL STRAND FOR BARS U (3)

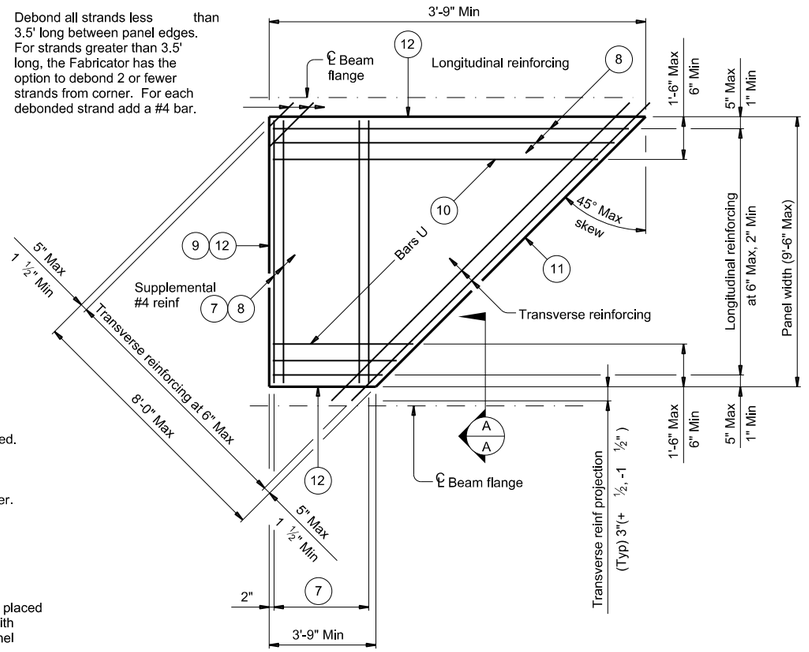
1. At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2",-0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
2. Four loops required per panel.
3. Four loops required per panel. ⅜" or ½" strands may be used.
4. Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
5. See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
6. One Splice allowed per panel. No more than two sheets of WWR are allowed.
7. Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
8. End Cover 2 ½" Max, 1" Min.
9. Recess strands on indicated panel edge in accordance with Item 424.
10. At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
11. Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
12. Timber form work permissible this edge.



No splice required for wires parallel to strands (transverse panel reinforcement)

WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)

Debond all strands less than 3.5' long between panel edges. For strands greater than 3.5' long, the Fabricator has the option to debond 2 or fewer strands from corner. For each debonded strand add a #4 bar.



TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

TABLE A (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3 4	½
IV	6	4 7	½
VI	6 ½	4 ½"	8 ½
U40 - 54	5 ½	5 ½	7
Tx28-70	6	5 7	½
XB20 - 40	4	3 4	½
XSB12 - 15	4	3 4	½

TABLE B (4) (5)			
Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 ¾	2 ½	2 ¾
Over 12" to 15"	3 ¼	3 3	¼
Over 15" to 18"	4	3 4	¾
Over 18"	5	3 ½	6 ¼

GENERAL NOTES:

Provide Class H concrete for panels. Release strength f'ci=3,500 psi. Minimum 28 day strength f'c=5,000 psi.

Provide ¾" chamfer along bottom edge of panel on beam side.

Do not use epoxy-coated reinforcing steel bar or strand in panels.

Remove laitance from top panel surface.

Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

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

A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:

For panel widths over 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.

For panel widths over 3'-6" up to and including 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.

For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).

Place transverse panel reinforcement at panel centroid and space at 6" Max.

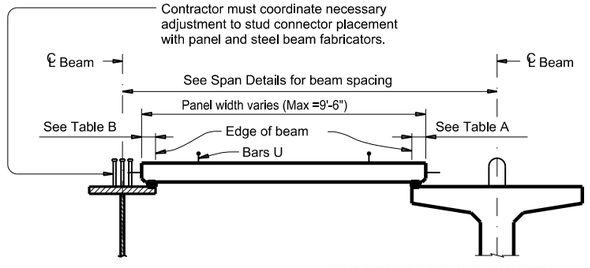
LONGITUDINAL PANEL REINFORCEMENT:

Any of the following options may be used for longitudinal panel reinforcement:

1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
2. ⅜" Dia prestressing strands at 4 ½" Max Spacing (unstressed). No splices allowed.
3. ½" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.

No combination of longitudinal reinforcement options in a panel is allowed.

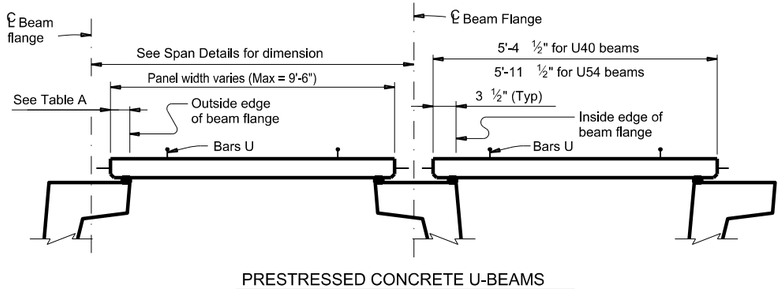
Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.



STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

Typ unless noted otherwise



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANEL FABRICATION DETAILS

PCP-FAB

FILE: MS-PCP-FAB-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		231

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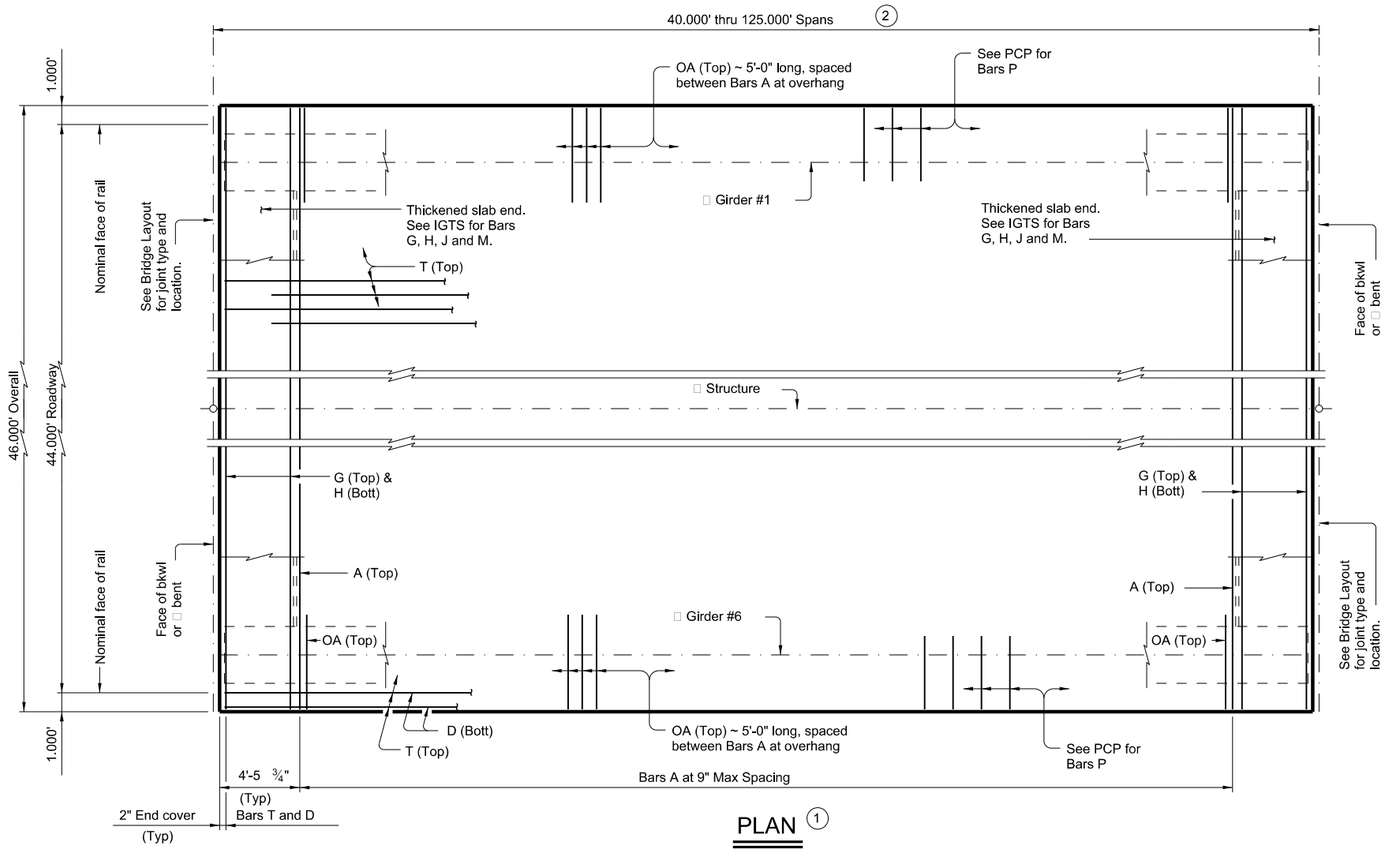
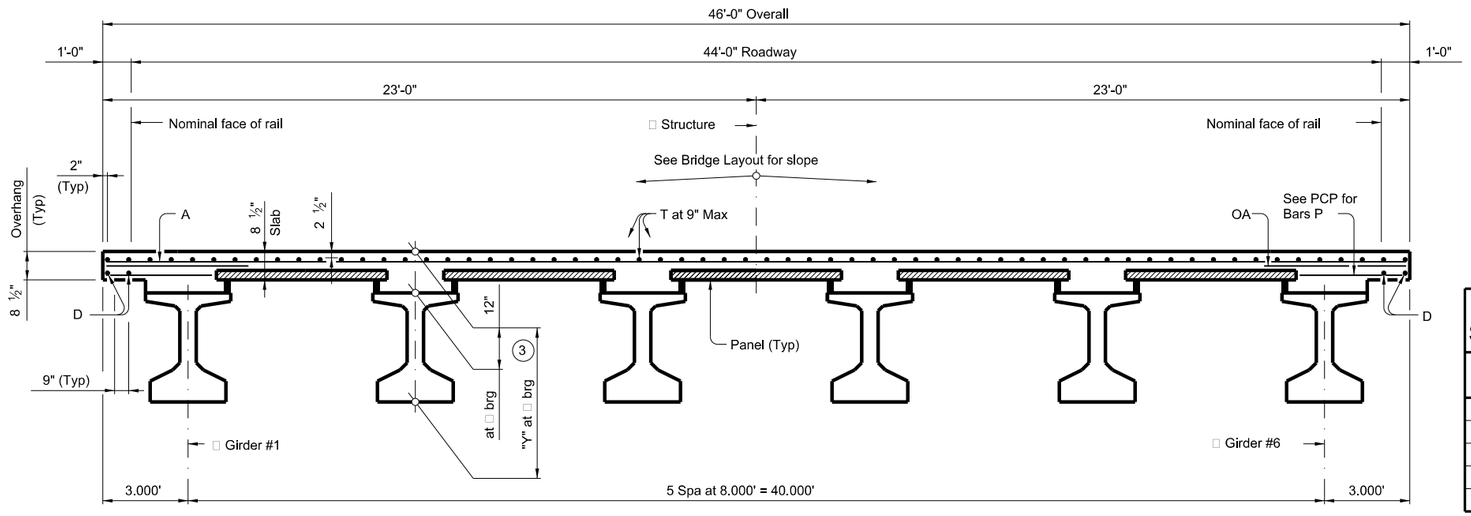


PLAN (1)



TYPICAL TRANSVERSE SECTION
(Showing girder type Tx46)

TABLE OF SECTION DEPTHS	
GIRDER TYPE	"Y" AT BRG (3)
	Ft/In
Tx28	3'-4"
Tx34	3'-10"
Tx40	4'-4"
Tx46	4'-10"
Tx54	5'-6"

BAR TABLE	
BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

(1) If multi-span units (with slab continuous over interior bents) are indicated on the Bridge Layout, see standard IGCS for adjustment to slab reinforcement and quantities.

(2) Span lengths for prestressed concrete I-Girder type:
Type Tx28 for spans lengths 40.000' thru 70.000'.
Type Tx34 for spans lengths 40.000' thru 85.000'.
Type Tx40 for spans lengths 40.000' thru 95.000'.
Type Tx46 for spans lengths 40.000' thru 110.000'.
Type Tx54 for spans lengths 40.000' thru 125.000'.

(3) "Y" value shown is based on theoretical girder camber, dead load deflection from an 8 1/2" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54)

44' ROADWAY

SIG-44

FILE: IG-SIG4400-23.dgn	DN: JMH	CK: NRN	DW: JTR	CK: TAR	
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2174	01	018	FM 2311	
10-19: Increased "X" and "Y" Values. 01-23: Removed PCP(O) reference.	DIST	COUNTY		SHEET NO.	
	WAC	McLENNAN		232	

TABLE OF DEAD LOAD DEFLECTIONS

TYPE Tx28 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.009	0.013
45	0.015	0.021
50	0.023	0.032
55	0.034	0.048
60	0.048	0.068
65	0.068	0.095
70	0.092	0.129

TYPE Tx34 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.006	0.008
45	0.009	0.012
50	0.014	0.019
55	0.020	0.028
60	0.029	0.041
65	0.041	0.057
70	0.055	0.077
75	0.073	0.102
80	0.095	0.134
85	0.122	0.171

TYPE Tx40 GIRDERS

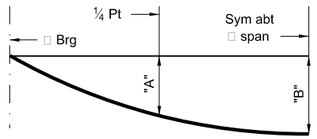
SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.004	0.005
45	0.006	0.008
50	0.009	0.013
55	0.014	0.019
60	0.019	0.027
65	0.026	0.037
70	0.036	0.050
75	0.048	0.067
80	0.062	0.087
85	0.080	0.112
90	0.101	0.142
95	0.126	0.177

TYPE Tx46 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.002	0.003
45	0.004	0.006
50	0.006	0.009
55	0.009	0.013
60	0.013	0.018
65	0.018	0.025
70	0.024	0.034
75	0.033	0.046
80	0.043	0.060
85	0.054	0.076
90	0.068	0.096
95	0.085	0.120
100	0.105	0.148
105	0.129	0.181
110	0.156	0.219

TYPE Tx54 GIRDERS

SPAN LENGTH	"A"	"B"
Ft	Ft	Ft
40	0.001	0.002
45	0.003	0.004
50	0.004	0.006
55	0.006	0.008
60	0.009	0.012
65	0.012	0.017
70	0.016	0.023
75	0.021	0.030
80	0.028	0.039
85	0.036	0.050
90	0.046	0.064
95	0.057	0.080
100	0.070	0.098
105	0.085	0.120
110	0.103	0.145
115	0.123	0.173
120	0.147	0.206
125	0.173	0.243



DEAD LOAD DEFLECTION DIAGRAM

Calculated deflections shown are due to the concrete slab on interior girders only (Ec = 5000 ksi). Adjust values as required for exterior girders and if optional slab forming is used. These values may require field verification.

TABLE OF ESTIMATED QUANTITIES

SPAN LENGTH	REINF CONCRETE SLAB	Prestressed Concrete Girders: ABUT TO INT BT (4)	Prestressed Concrete Girders: INT BT TO INT BT (4)	Prestressed Concrete Girders: ABUT TO ABUT (4)	TOTAL REINF STEEL (5)
Ft	SF	LF	LF	LF	Lb
40	1,840	237.00	237.00	237.00	4,232
45	2,070	267.00	267.00	267.00	4,761
50	2,300	297.00	297.00	297.00	5,290
55	2,530	327.00	327.00	327.00	5,819
60	2,760	357.00	357.00	357.00	6,348
65	2,990	387.00	387.00	387.00	6,877
70	3,220	417.00	417.00	417.00	7,406
75	3,450	447.00	447.00	447.00	7,935
80	3,680	477.00	477.00	477.00	8,464
85	3,910	507.00	507.00	507.00	8,993
90	4,140	537.00	537.00	537.00	9,522
95	4,370	567.00	567.00	567.00	10,051
100	4,600	597.00	597.00	597.00	10,580
105	4,830	627.00	627.00	627.00	11,109
110	5,060	657.00	657.00	657.00	11,638
115	5,290	687.00	687.00	687.00	12,167
120	5,520	717.00	717.00	717.00	12,696
125	5,750	747.00	747.00	747.00	13,225

(4) Fabricator will adjust lengths for girder slopes as required.

(5) Reinforcing steel weight is calculated using an approximate factor of 2.3 lbs/SF.

MATERIAL NOTES:

Provide Class S concrete (f'c = 4,000 psi).
Provide Class S (HPC) concrete if shown elsewhere in the plans.
Provide Grade 60 reinforcing steel.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"
Deformed welded wire reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars A, D, OA, P or T unless noted otherwise.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Multi-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet and the I-Girder Continuous Slab Detail (IGCS) standard.
See I-Girder Thickened Slab End Details (IGTS) standard for details and quantity adjustments.
See Prestressed Concrete Panels (PCP) standard and Prestressed Concrete Panel Fabrication Details (PCP-FAB) standard for panel details not shown.
See I-Girder Miscellaneous Slab Details (IGMS) standard for miscellaneous details.
See applicable rail details for rail anchorage in slab.
See Permanent Metal Deck Forms (PMDF) standard for details and quantity adjustments if this option is used.
This standard does not support the use of transition bents.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54)

44' ROADWAY

SIG-44

FILE: IG-SIG4400-23.dgn	DN: JMH	CK: NRN	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
10-19: Increased "X" and "Y" Values. 01-23: Removed PCP(O) reference.	DIST	COUNTY		SHEET NO.
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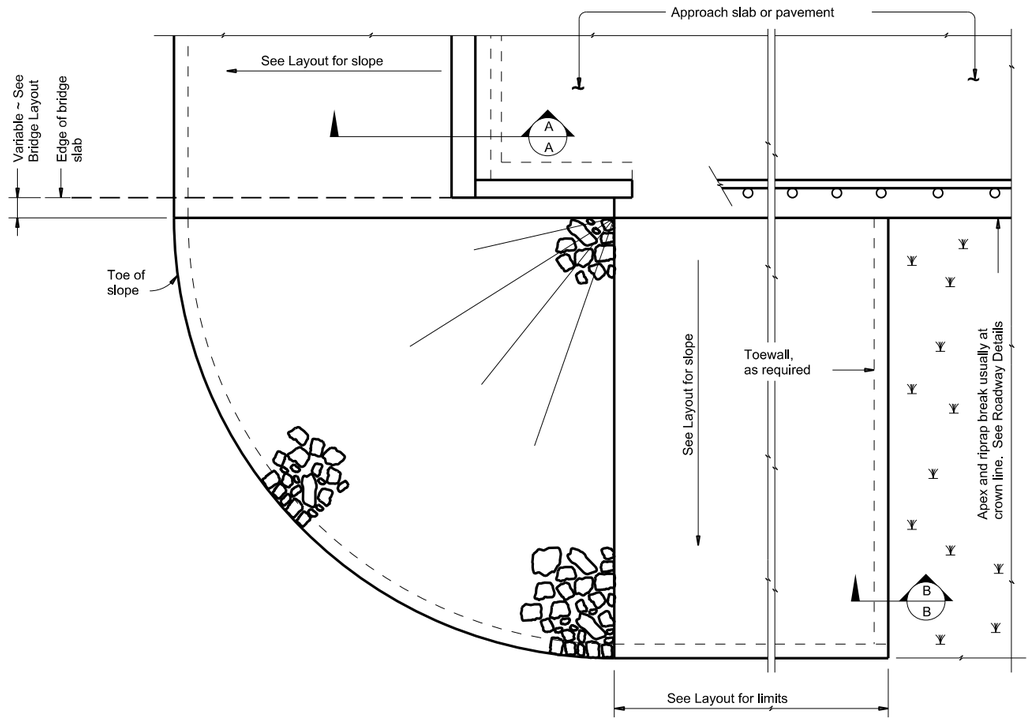
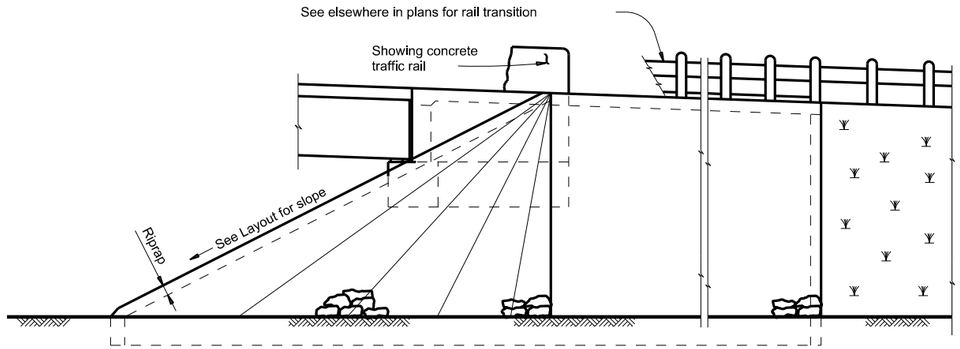
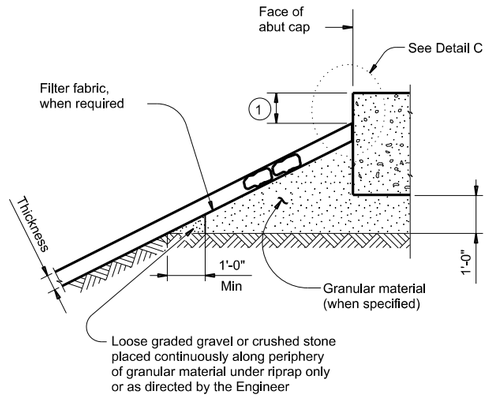


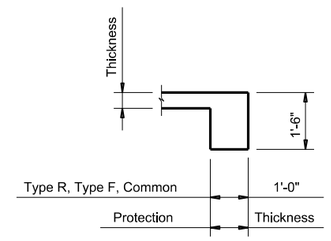
PLAN



ELEVATION

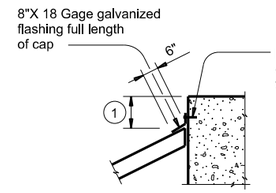


SECTION A-A AT CAP

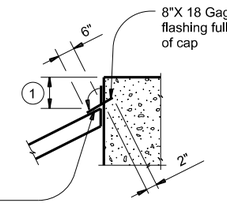


SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A



CAP OPTION B

DETAIL C

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
See elsewhere in plans for locations and details of shoulder drains.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: MS-SRR-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		234

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FILE: ...\7. Bridge\STDS\18_SRR.dgn

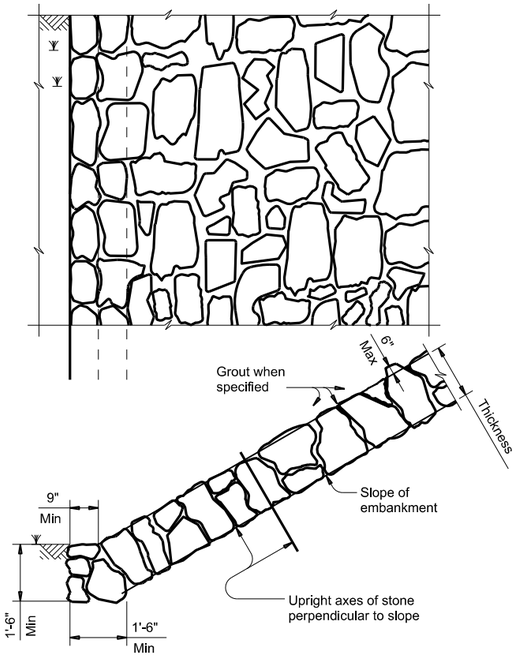


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

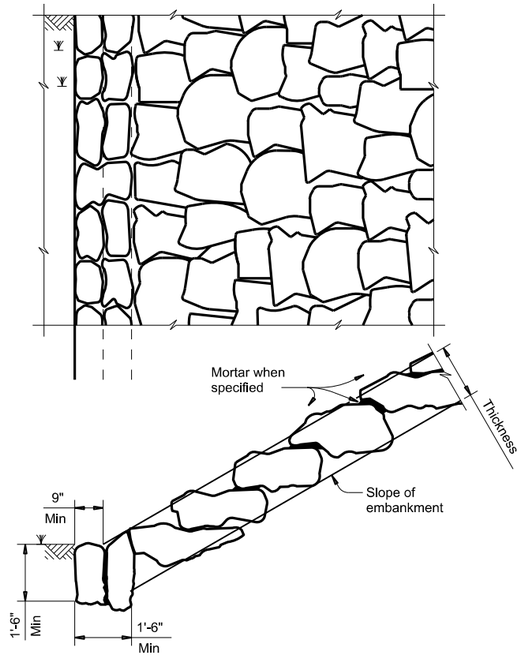


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

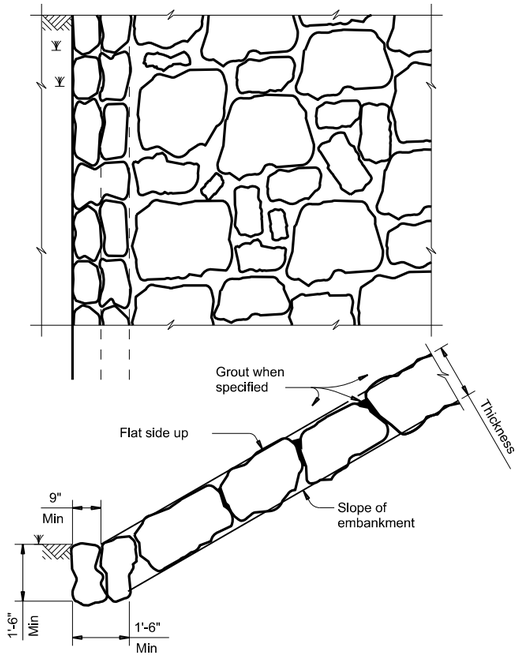


FIGURE 3 ~ TYPE F STONE RIPRAP

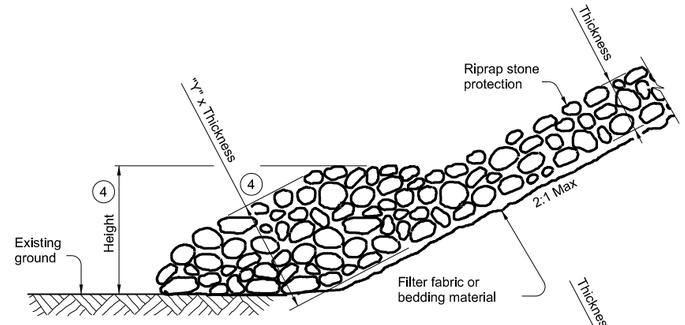
grouted

2 Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

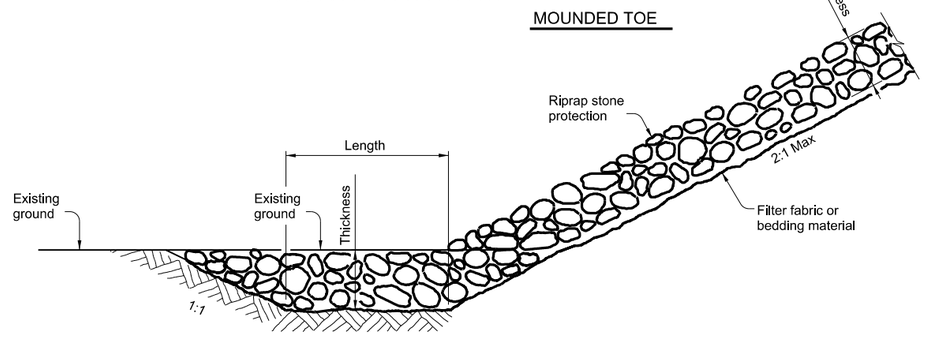
3 Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

4 "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.

5 List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)

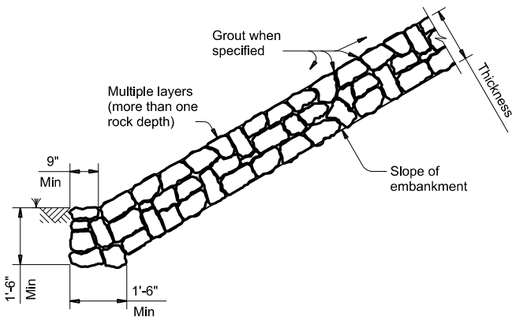


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

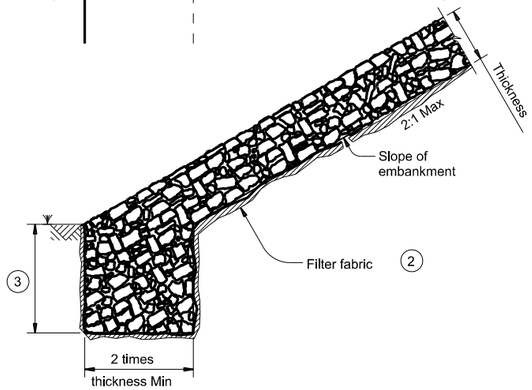


FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

SHEET 2 OF 2

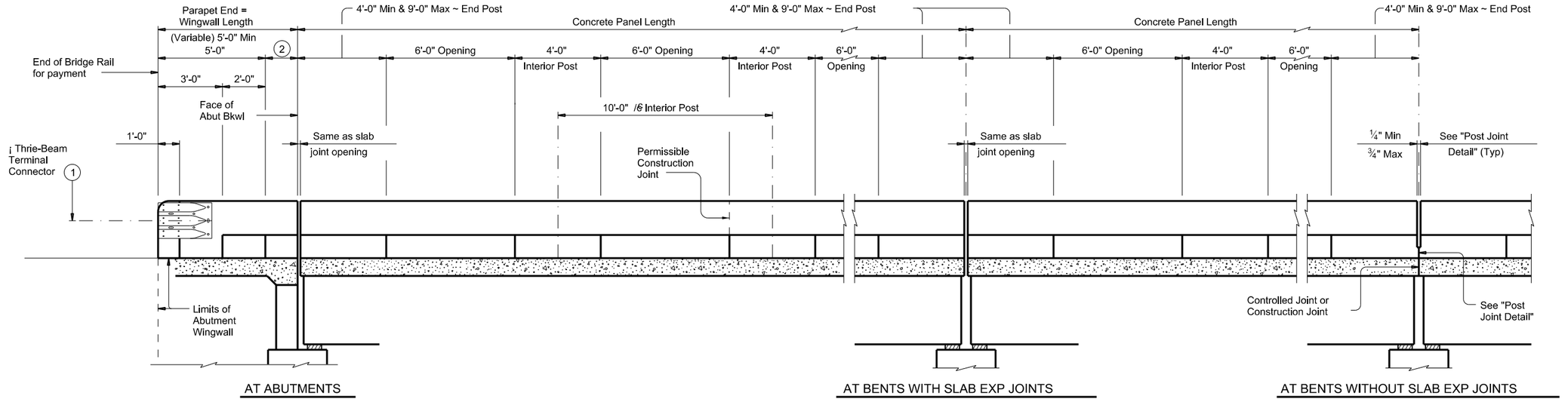
Texas Department of Transportation | Bridge Division Standard

STONE RIPRAP

SRR

FILE: MS-SRR-19.dgn	DN: AES		CK: JGD	DW: BWH	CK: AES		
©TxDOT April 2019	CONT	SECT	JOB		HIGHWAY		
REVISIONS	2174	01	018		FM 2311		
	DIST	COUNTY			SHEET NO.		
	WAC	McLENNAN			235		

DATE: 1/29/2024 2:40:52 PM
FILE: ...\7. Bridge\STDS\18_SRR.dgn

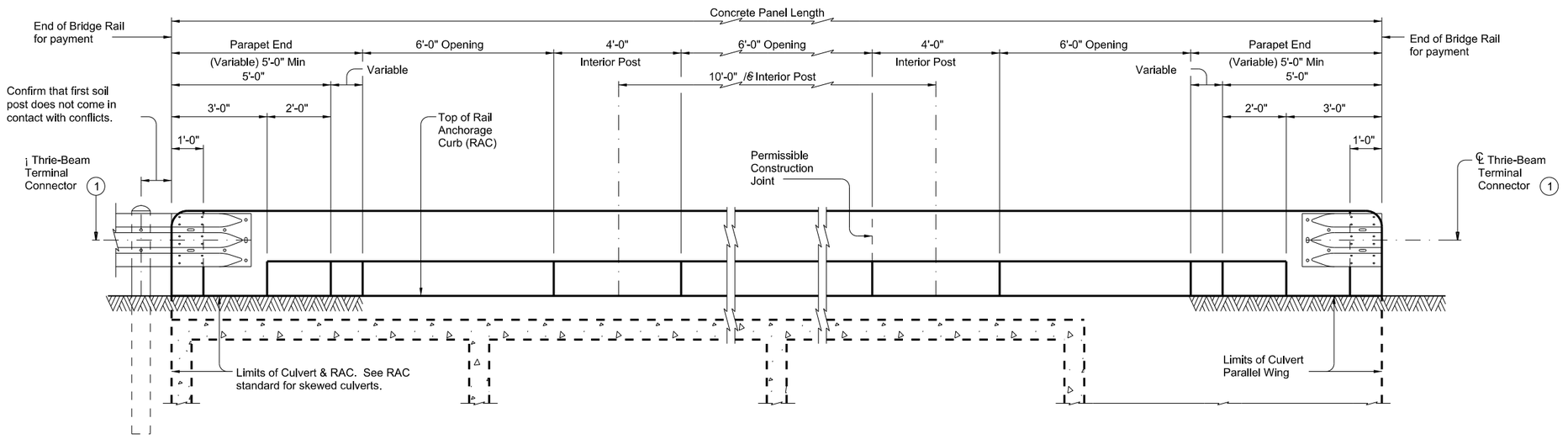


AT ABUTMENTS

AT BENTS WITH SLAB EXP JOINTS

AT BENTS WITHOUT SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL ON BRIDGE



AT STRAIGHT OR FLARED WINGS

AT PARALLEL WINGS

ROADWAY ELEVATION OF RAIL ON BOX CULVERTS

Showing 0° skew culvert. Skewed culverts similar. See RAC standard for details not shown.
Vertical joints in concrete rail are not required, unless shown elsewhere.

(1) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.

(2) Wingwall Length minus 5'-0" (Varies)

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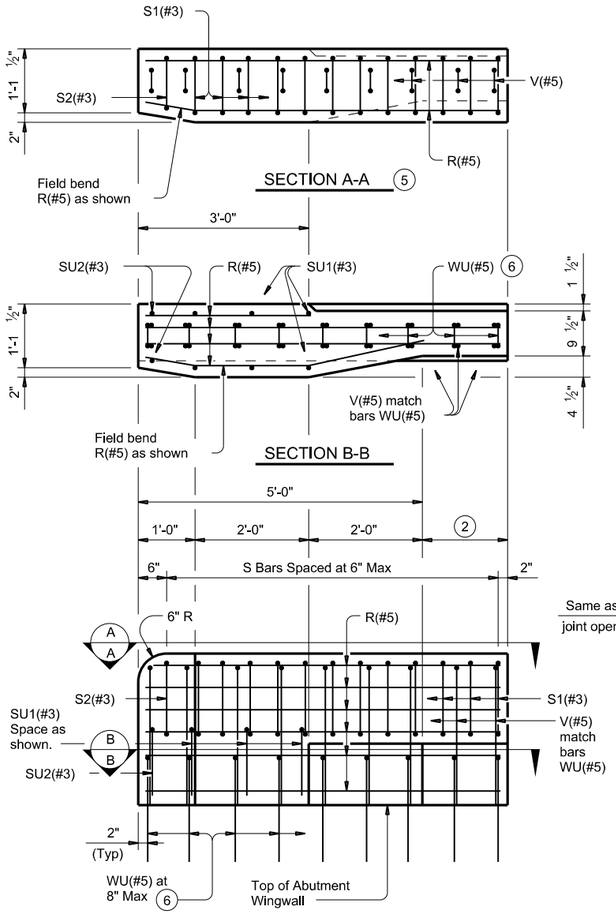
Texas Department of Transportation

Bridge Division Standard

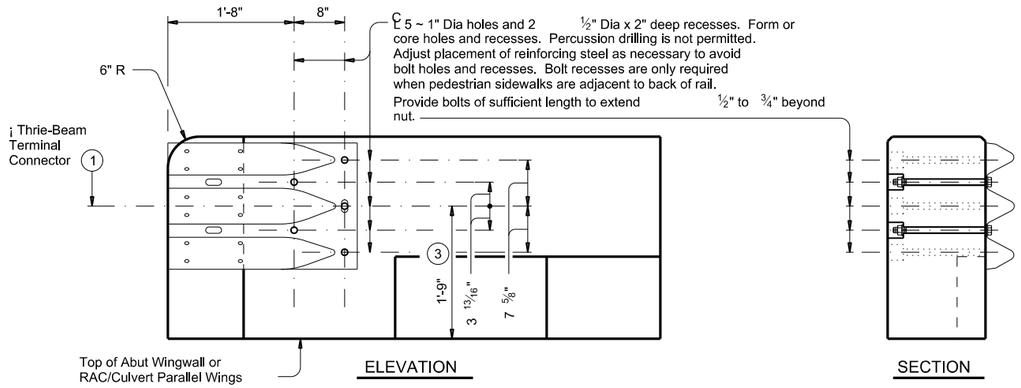
TRAFFIC RAIL

TYPE T223

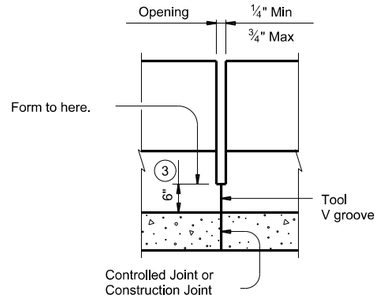
FILE: RL-T223-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		236



PARAPET END
AT ABUT WINGWALL (6)

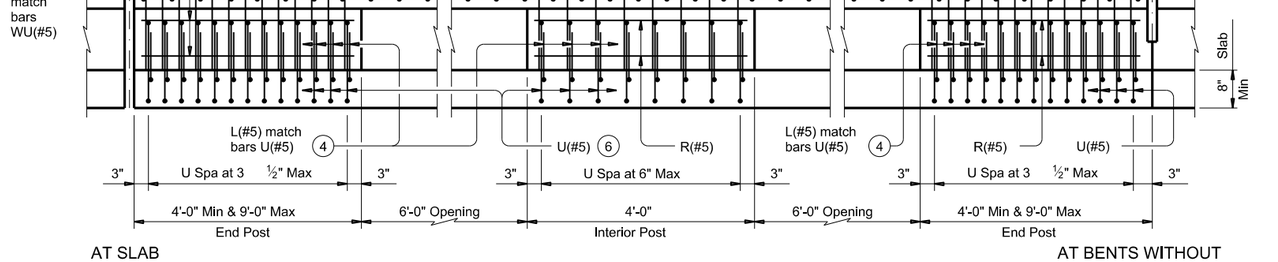


TERMINAL CONNECTION DETAILS



POST JOINT DETAIL

Provide at all interior bents
without slab expansion joints.



AT SLAB
EXPANSION JOINTS

AT 4' INTERIOR POST

AT BENTS WITHOUT
SLAB EXPANSION JOINTS

ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

Showing rail on slab. Rail on box culvert similar.

(1) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.

(2) Wingwall Length minus 5'-0" (Varies)

(3) Increase 2" for structures with overlay.

(4) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.

(5) Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.

(6) Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

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SHEET 2 OF 3

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Bridge Division Standard

TRAFFIC RAIL

TYPE T223

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	WAC	McLENNAN				237	

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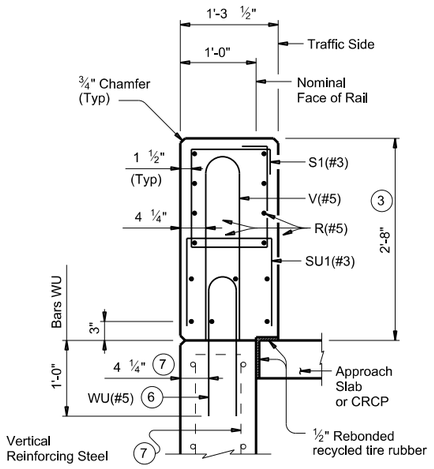
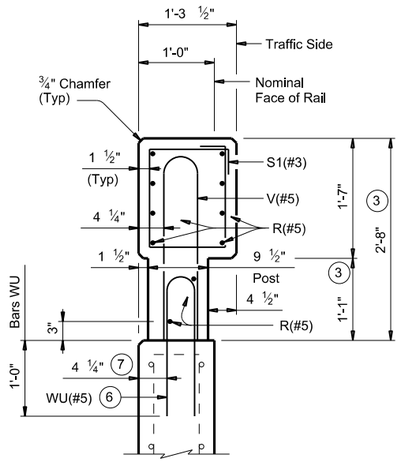
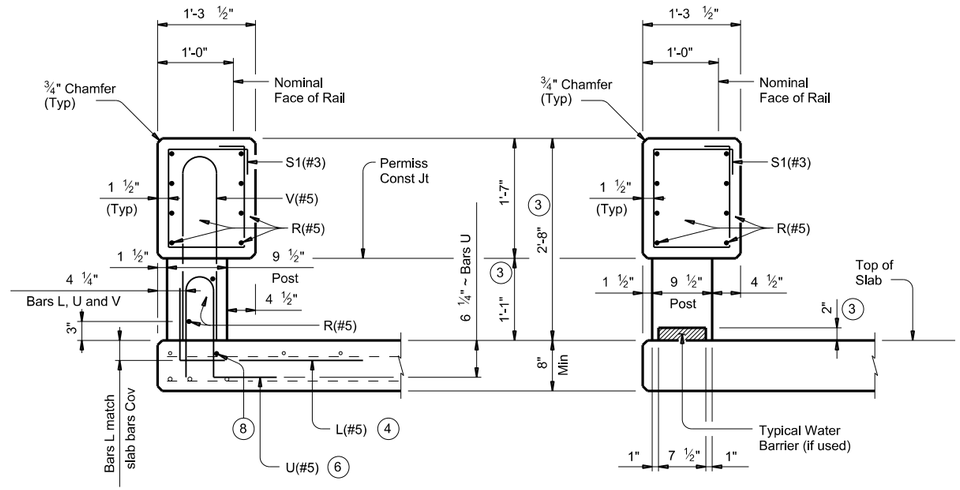


SECTION C-C
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

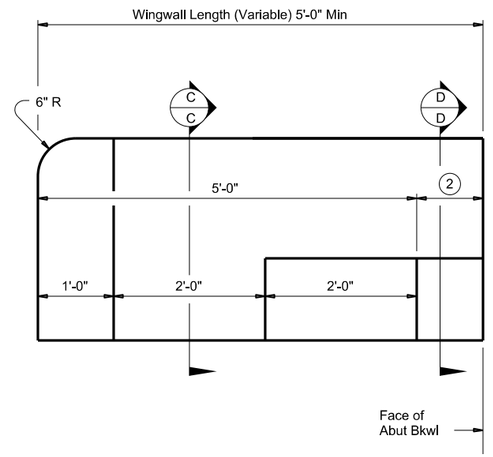


AT POST
ON BRIDGE SLAB

AT OPENING
ON BRIDGE SLAB

SECTIONS THRU RAIL

Sections on box culverts similar.



ELEVATION AT ABUTMENT WINGWALL

Box culvert parallel wings or rail anchorage curb similar.

(2) Wingwall Length minus 5'-0" (Varies)

(3) Increase 2" for structures with overlay.

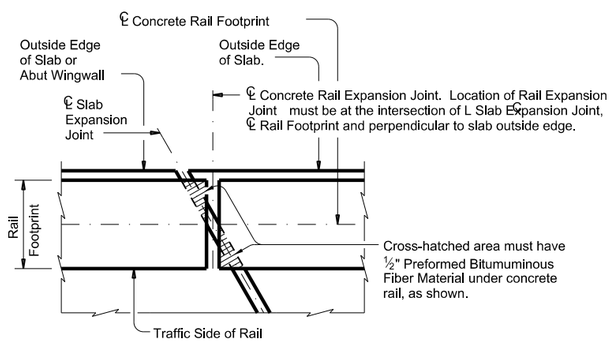
(4) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.

(6) Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

(7) When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on traffic side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars conflict.

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

(9) At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5 ¼" above the roadway surface without overlay.



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

CONSTRUCTION NOTES:

Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.

Provide water barriers at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.

Chamfer all exposed corners.

MATERIAL NOTES:

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

Provide Grade 60 reinforcing steel.

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

Deformed Welded Wire Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

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

Epoxy coated ~ #5 = 3'-0"

GENERAL NOTES:

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

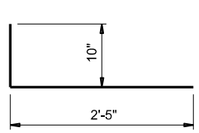
Do not use this railing on bridges with expansion joints providing more than 5" movement.

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

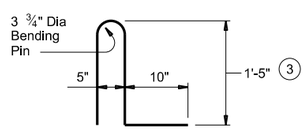
Shop drawings are not required for this rail.

Average weight of railing with no overlay is 358 plf.

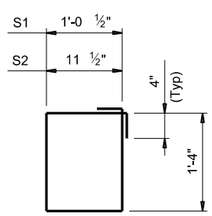
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



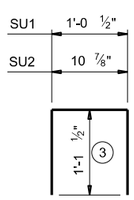
BARS L (#5)



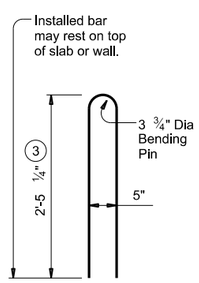
BARS U (#5) (9)



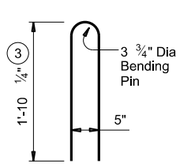
BARS S (#3)



BARS SU (#3)



BARS V (#5) (9)



BARS WU (#5)

SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T223

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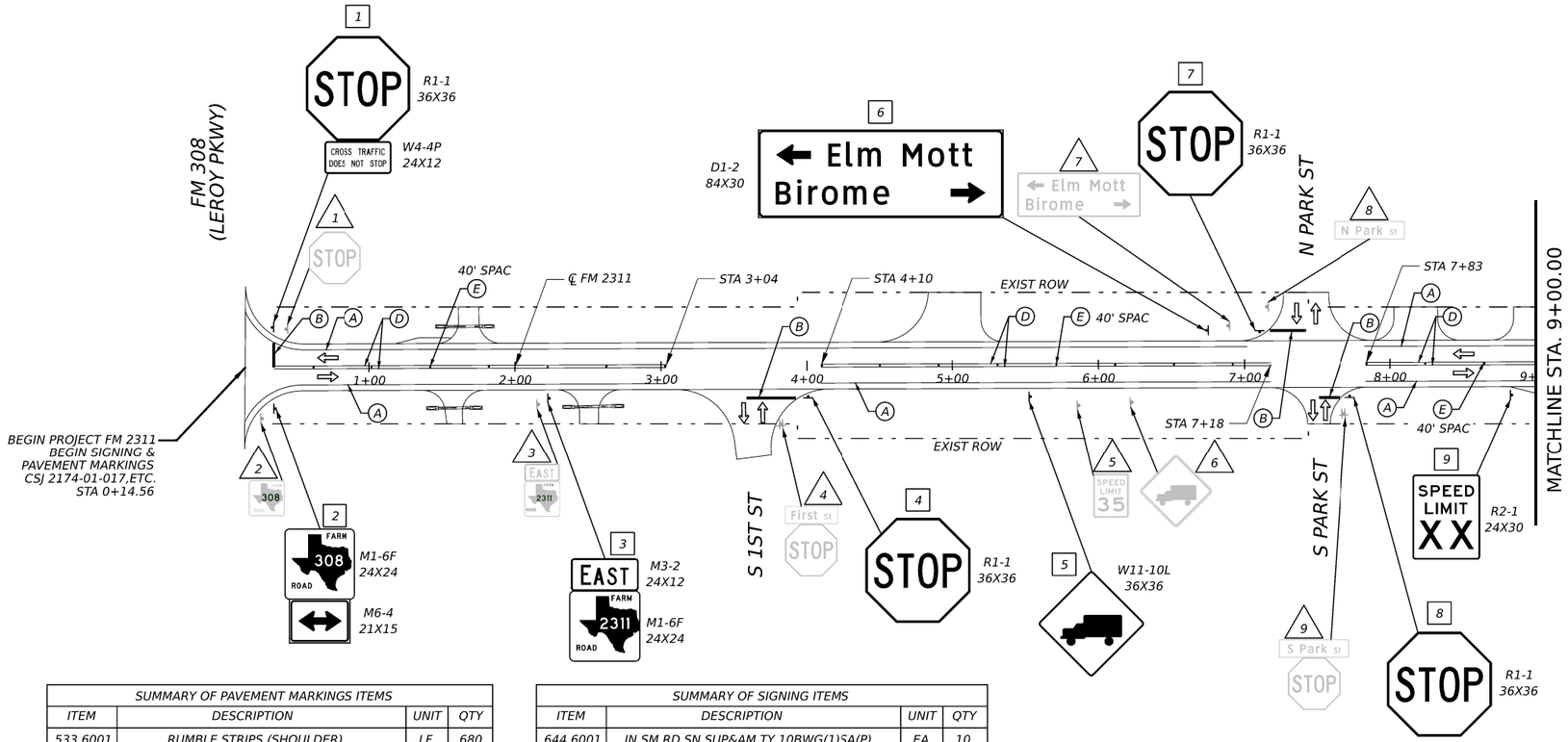
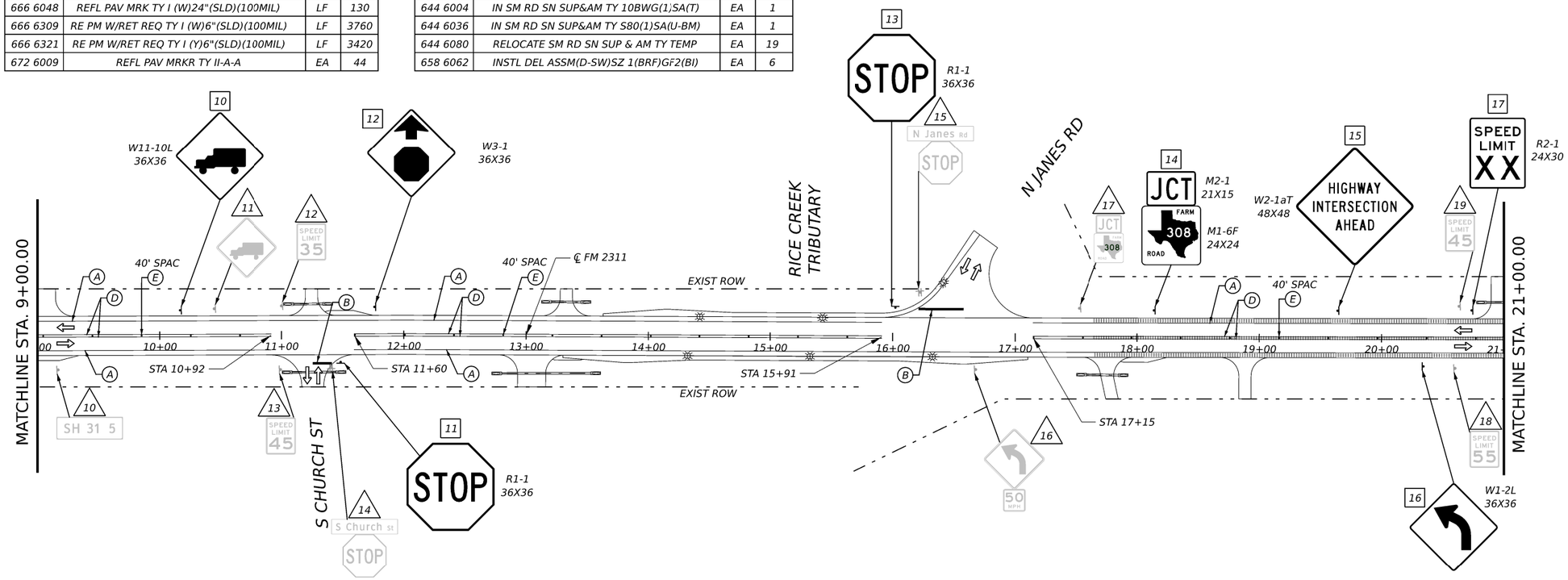
REVISIONS	2174	01	018	FM 2311
	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		238

CK: SU
DW: HFJ
CK: SU
DW: HFJ



SUMMARY OF PAVEMENT MARKINGS ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
533 6001	RUMBLE STRIPS (SHOULDER)	LF	680
533 6002	RUMBLE STRIPS (CENTERLINE)	LF	340
666 6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	130
666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	3760
666 6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	3420
672 6009	REFL PAV MRKR TY II-A-A	EA	44

SUMMARY OF SIGNING ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
644 6001	IN SM RD SN SUP&AM TY 10BWG(1)SA(P)	EA	10
644 6002	IN SM RD SN SUP&AM TY 10BWG(1)SA(P-BM)	EA	5
644 6004	IN SM RD SN SUP&AM TY 10BWG(1)SA(T)	EA	1
644 6036	IN SM RD SN SUP&AM TY S80(1)SA(U-BM)	EA	1
644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	19
658 6062	INSTL DEL ASSM(D-SW)SZ 1(BRF)GF2(BI)	EA	6



LEGEND

- (A) RE PM W/RET REQ TY I(W)6"(SLD)
- (B) REFL PAV MRK TY I (W)24"(SLD)
- (C) RE PM W/RET REQ TY I(Y)6"(BRK)
- (D) RE PM W/RET REQ TY I(Y)6"(SLD)
- (E) REFL PAV MRKR TY II A-A
- PROP SMALL SIGN
- [X] PROP SMALL SIGN NUMBER
- X EXIST SIGN REMOVAL NUMBER
- DELINEATOR
- RUMBLE STRIP
- EXISTING ROW
- DIRECTION OF TRAVEL

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

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SCALE IN FEET

STATE OF TEXAS
MOHAMMED S ULA
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PROFESSIONAL ENGINEER
1/24/2024

infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SIGNING & PAVEMENT MARKINGS LAYOUT BEGIN to STA 21+00

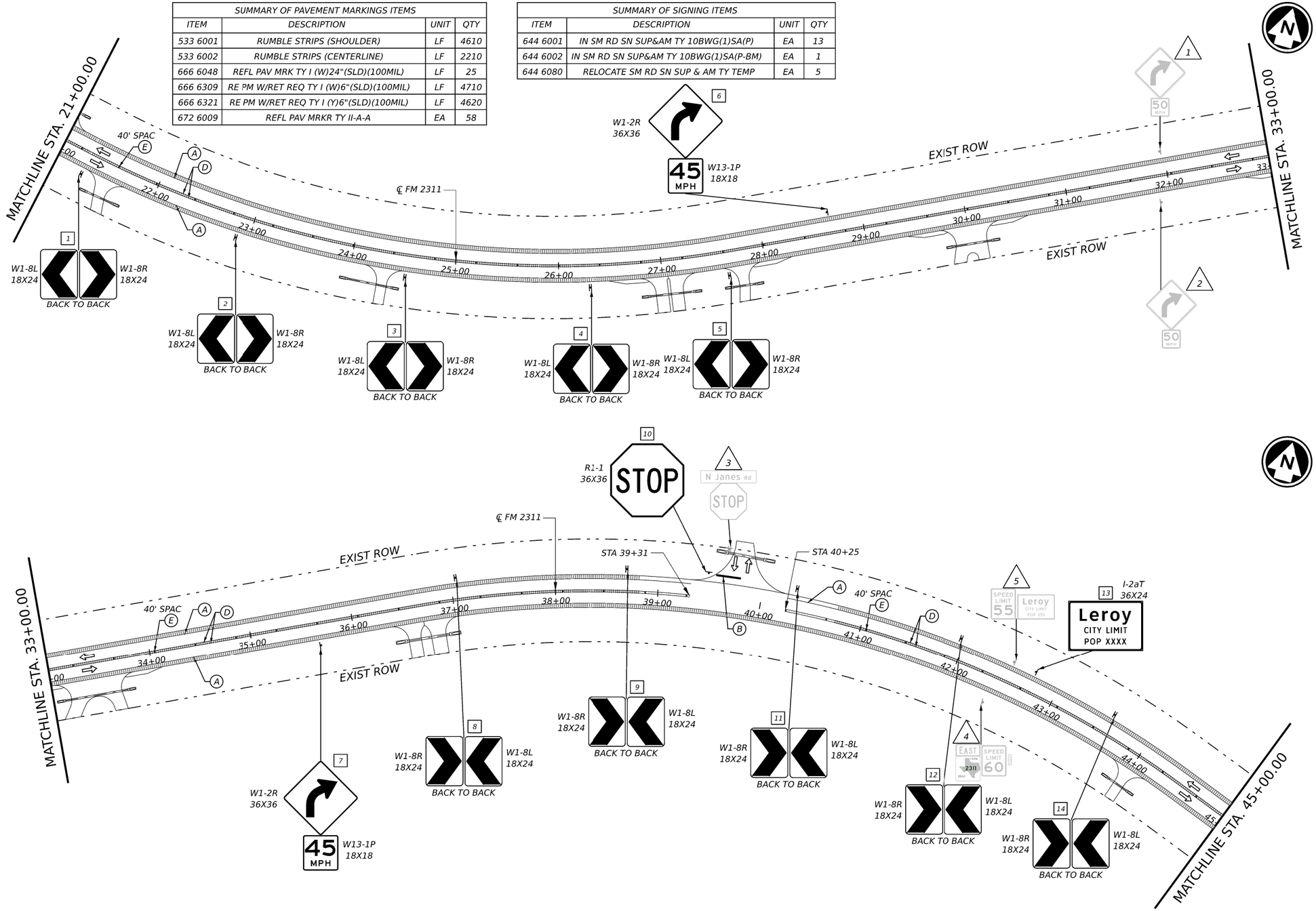
SHEET 1 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		239

DATE: 1/24/2024 2:05:32 PM
FILE: ...\SPM\FM 2311-SPM 01.dgn

SUMMARY OF PAVEMENT MARKINGS ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
533 6001	RUMBLE STRIPS (SHOULDER)	LF	4610
533 6002	RUMBLE STRIPS (CENTERLINE)	LF	2210
666 6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	25
666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	4710
666 6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	4620
672 6009	REFL PAV MRKR TY II-A-A	EA	58

SUMMARY OF SIGNING ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
644 6001	IN SM RD SN SUP&AM TY 10BWG(1)SA(P)	EA	13
644 6002	IN SM RD SN SUP&AM TY 10BWG(1)SA(P-BM)	EA	1
644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	5



LEGEND

- (A) RE PM W/RET REQ TY I(W)6"(SLD)
- (B) REFL PAV MRK TY I (W)24"(SLD)
- (C) RE PM W/RET REQ TY I(Y)6"(BRK)
- (D) RE PM W/RET REQ TY I(Y)6"(SLD)
- (E) REFL PAV MRKR TY II A-A
- PROP SMALL SIGN
- [X] PROP SMALL SIGN NUMBER
- △X EXIST SIGN REMOVAL NUMBER
- DELINEATOR
- RUMBLE STRIP
- EXISTING ROW
- DIRECTION OF TRAVEL

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

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SCALE IN FEET

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LICENSED
PROFESSIONAL ENGINEER
1/24/2024

infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SIGNING & PAVEMENT MARKINGS LAYOUT STA 21+00 to STA 45+00

SHEET 2 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		240

DATE: 1/24/2024 2:05:41 PM
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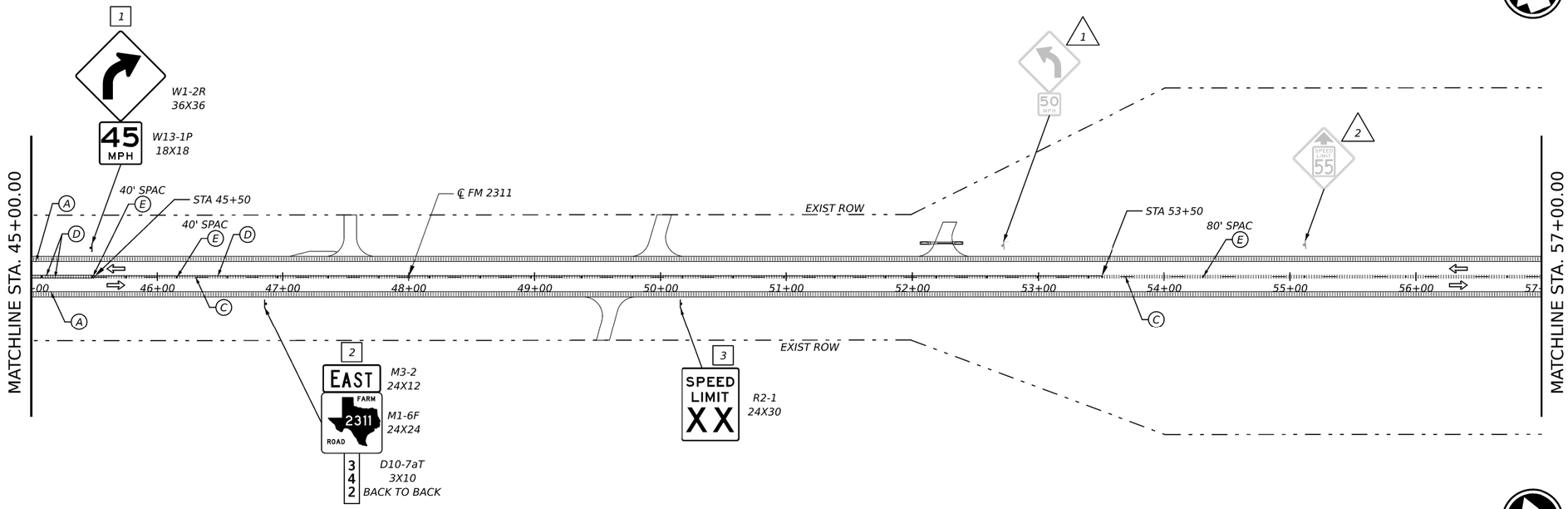

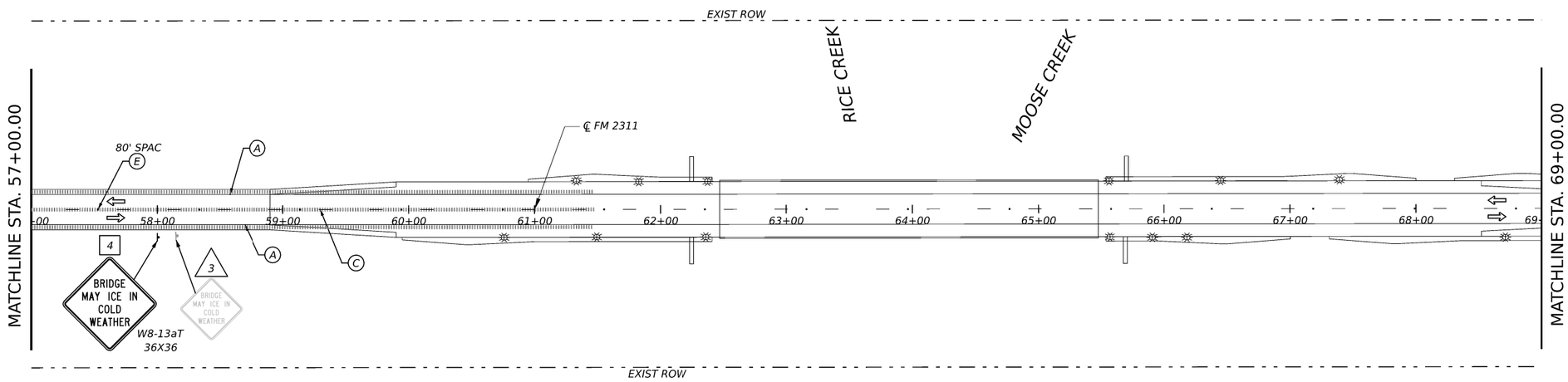

SUMMARY OF PAVEMENT MARKINGS ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
533 6001	RUMBLE STRIPS (SHOULDER)	LF	3300
533 6002	RUMBLE STRIPS (CENTERLINE)	LF	1650
666 6225	PAVEMENT SEALER 6"	LF	2250
666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	4810
666 6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	600
666 6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	910
672 6009	REFL PAV MRKR TY II-A-A	EA	42
678 6002	PAV SURF PREP FOR MRK (6")	LF	2250

SUMMARY OF SIGNING ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
644 6001	IN SM RD SN SUP&AM TY 10BWG(1)SA(P)	EA	4
644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	3
658 6062	INSTL DEL ASSM(D-SW)SZ 1(BRF)GF2(BI)	EA	13

LEGEND

- (A) RE PM W/RET REQ TY I(W)6"(SLD)
- (B) REFL PAV MRK TY I (W)24"(SLD)
- (C) RE PM W/RET REQ TY I(Y)6"(BRK)
- (D) RE PM W/RET REQ TY I(Y)6"(SLD)
- (E) REFL PAV MRKR TY II A-A
- PROP SMALL SIGN
- [X] PROP SMALL SIGN NUMBER
- X EXIST SIGN REMOVAL NUMBER
- DELINEATOR
- RUMBLE STRIP
- EXISTING ROW
- DIRECTION OF TRAVEL

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MOHAMMED S ULA
131559
LICENSED
PROFESSIONAL ENGINEER
1/24/2024

infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SIGNING & PAVEMENT MARKINGS LAYOUT STA 45+00 to STA 69+00

SHEET 3 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		241

DATE: 1/24/2024 2:05:48 PM
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CK: SU
DW: HFJ
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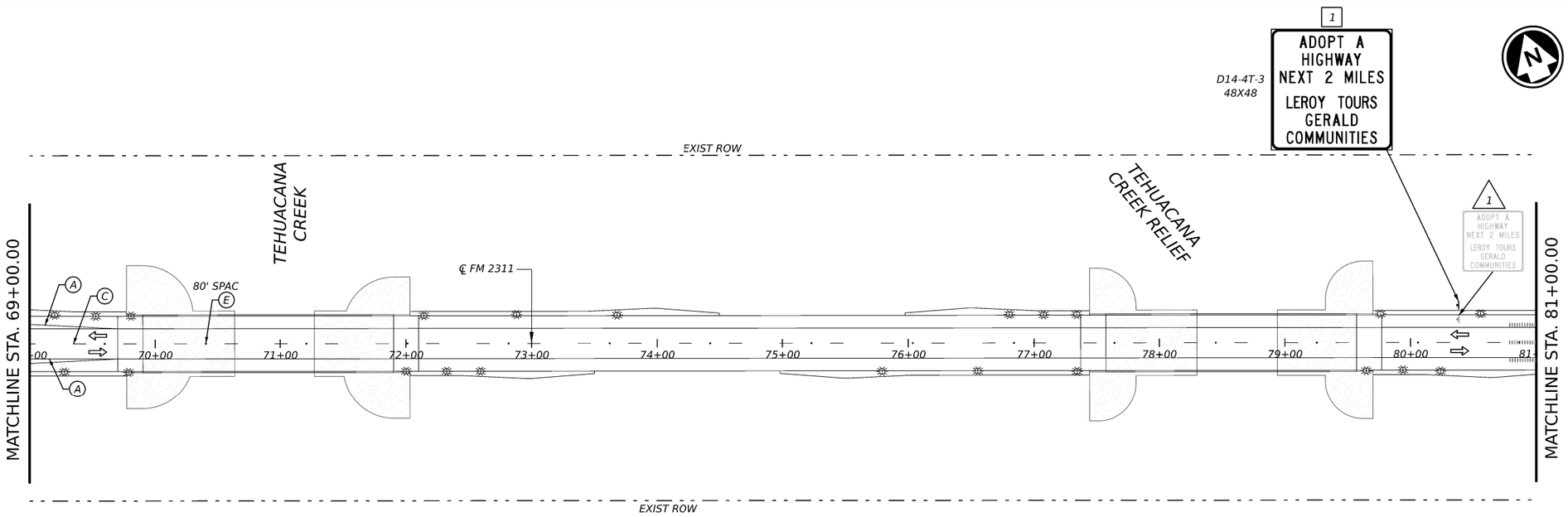
DW: HFJ

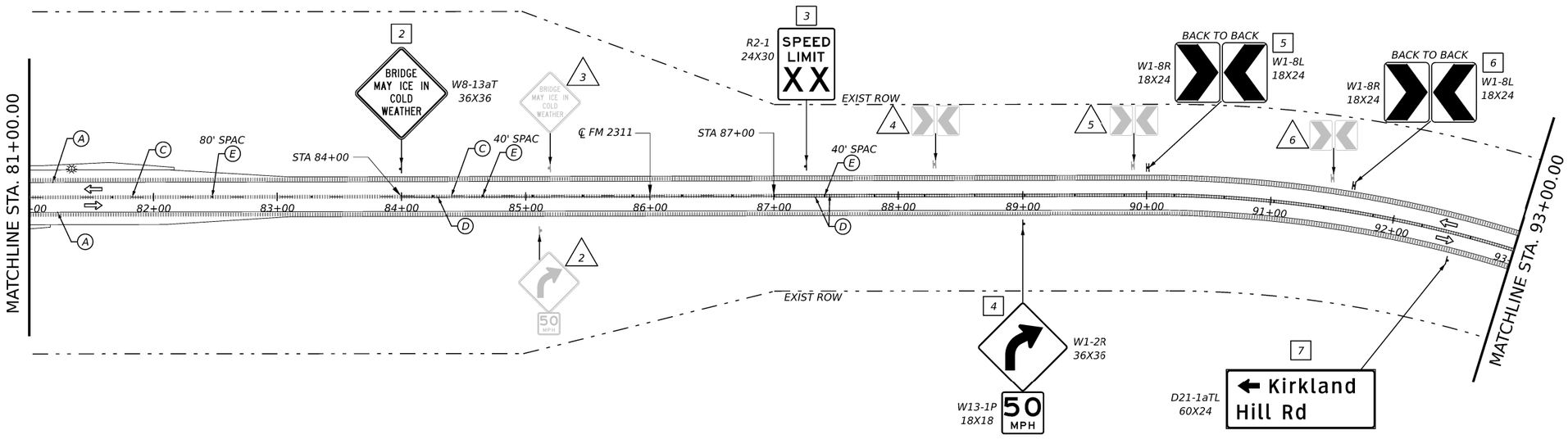


LEGEND

- (A) RE PM W/RET REQ TY I(W)6"(SLD)
- (B) REFL PAV MRK TY I (W)24"(SLD)
- (C) RE PM W/RET REQ TY I(Y)6"(BRK)
- (D) RE PM W/RET REQ TY I(Y)6"(SLD)
- (E) REFL PAV MRKR TY II A-A
- PROP SMALL SIGN
- [X] PROP SMALL SIGN NUMBER
- X EXIST SIGN REMOVAL NUMBER
- DELINEATOR
- RUMBLE STRIP
- EXISTING ROW
- DIRECTION OF TRAVEL

SUMMARY OF PAVEMENT MARKINGS ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
533 6001	RUMBLE STRIPS (SHOULDER)	LF	2440
533 6002	RUMBLE STRIPS (CENTERLINE)	LF	1220
666 6225	PAVEMENT SEALER 6"	LF	2475
666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	4810
666 6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	460
666 6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	1510
672 6009	REFL PAV MRKR TY II-A-A	EA	42
678 6002	PAV SURF PREP FOR MRK (6")	LF	2475

SUMMARY OF SIGNING ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
644 6001	IN SM RD SN SUP&AM TY 10BWG(1)SA(P)	EA	5
644 6004	IN SM RD SN SUP&AM TY 10BWG(1)SA(T)	EA	2
644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	6
658 6062	INSTL DEL ASSM(D-SW)SZ 1(BRF)GF2(BI)	EA	23



NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SIGNING & PAVEMENT MARKINGS LAYOUT STA 69+00 to STA 93+00

SHEET 4 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		242

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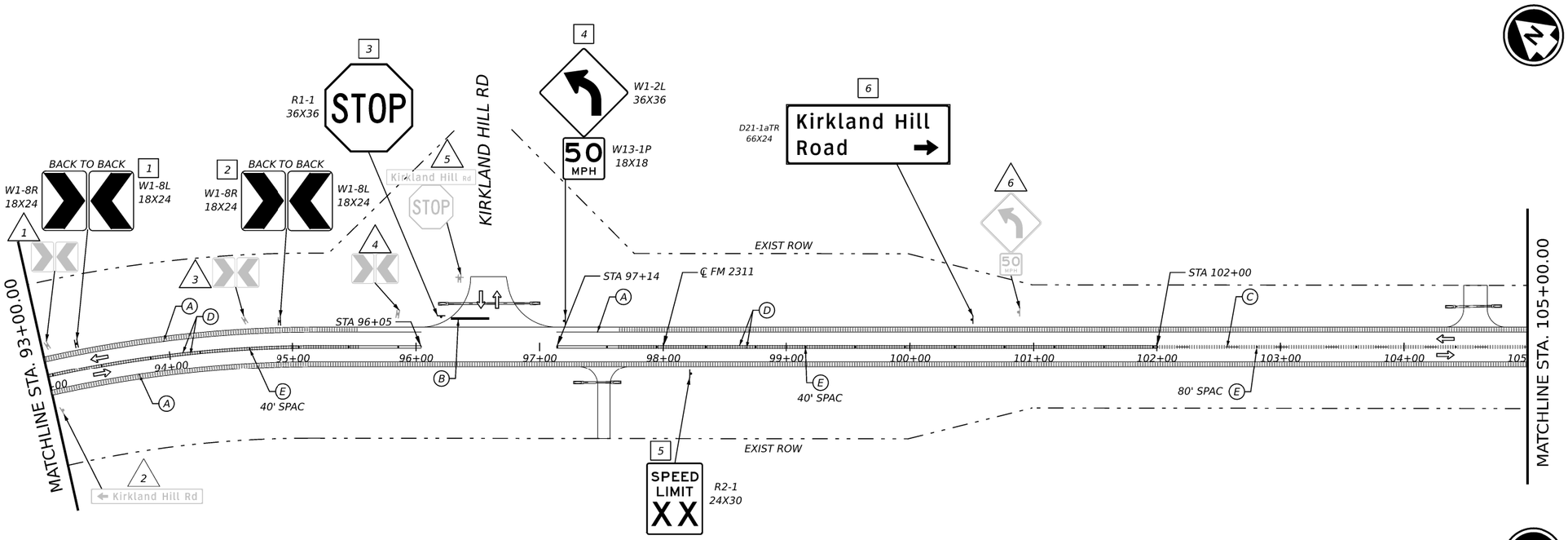
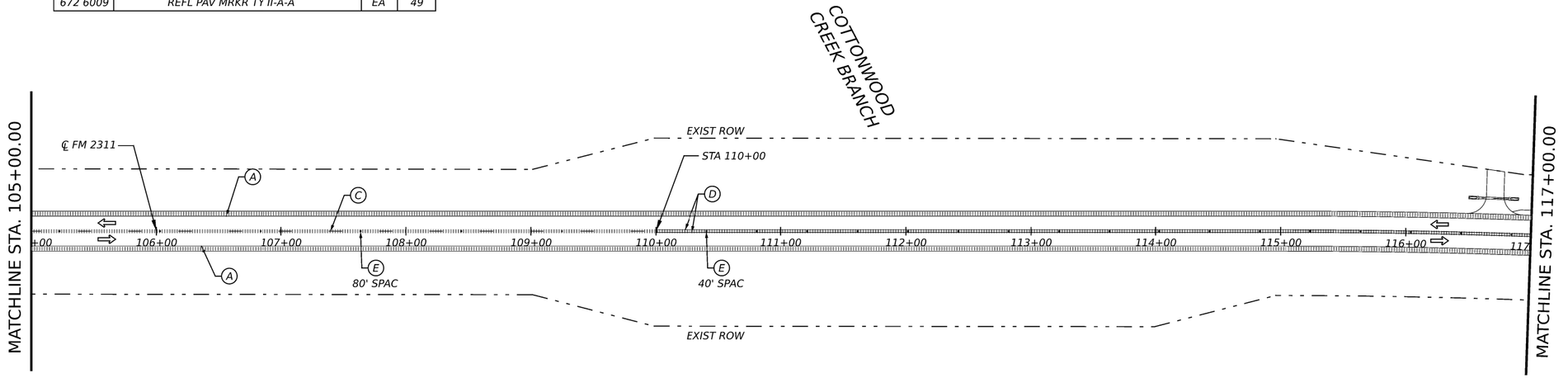


SUMMARY OF PAVEMENT MARKINGS ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
533 6001	RUMBLE STRIPS (SHOULDER)	LF	4590
533 6002	RUMBLE STRIPS (CENTERLINE)	LF	2190
666 6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	35
666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	4700
666 6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	210
666 6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	3000
672 6009	REFL PAV MRKR TY II-A-A	EA	49

SUMMARY OF SIGNING ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
644 6001	IN SM RD SN SUP&AM TY 10BWG(1)SA(P)	EA	4
644 6004	IN SM RD SN SUP&AM TY 10BWG(1)SA(T)	EA	1
644 6028	IN SM RD SN SUP&AM TY S80(1)SA(P-BM)	EA	1
644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	6



LEGEND

- (A) RE PM W/RET REQ TY I(W)6"(SLD)
- (B) REFL PAV MRK TY I (W)24"(SLD)
- (C) RE PM W/RET REQ TY I(Y)6"(BRK)
- (D) RE PM W/RET REQ TY I(Y)6"(SLD)
- (E) REFL PAV MRKR TY II A-A
- PROP SMALL SIGN
- [X] PROP SMALL SIGN NUMBER
- X EXIST SIGN REMOVAL NUMBER
- DELINEATOR
- RUMBLE STRIP
- EXISTING ROW
- DIRECTION OF TRAVEL

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MOHAMMED S ULA
131559
LICENSED
PROFESSIONAL ENGINEER
1/24/2024

infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SIGNING & PAVEMENT MARKINGS LAYOUT STA 93+00 to STA 117+00

SHEET 5 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		243

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CK: SU
DW: HFJ

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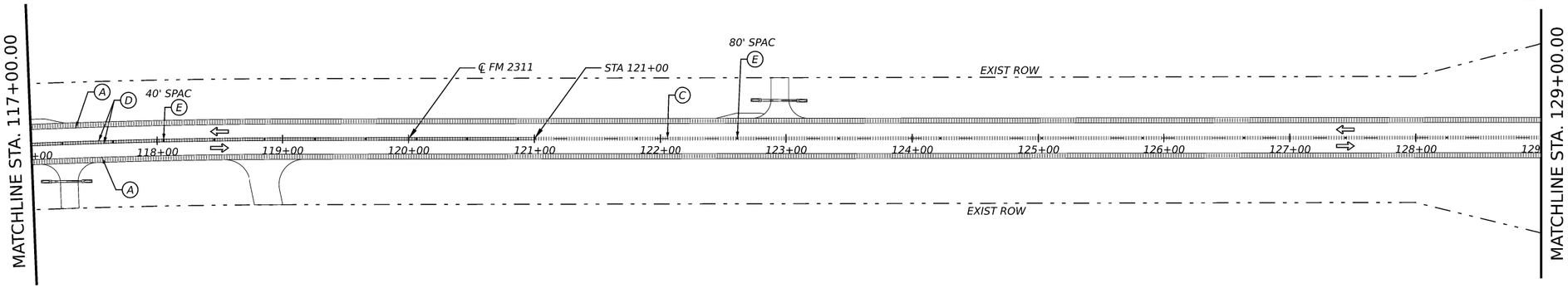
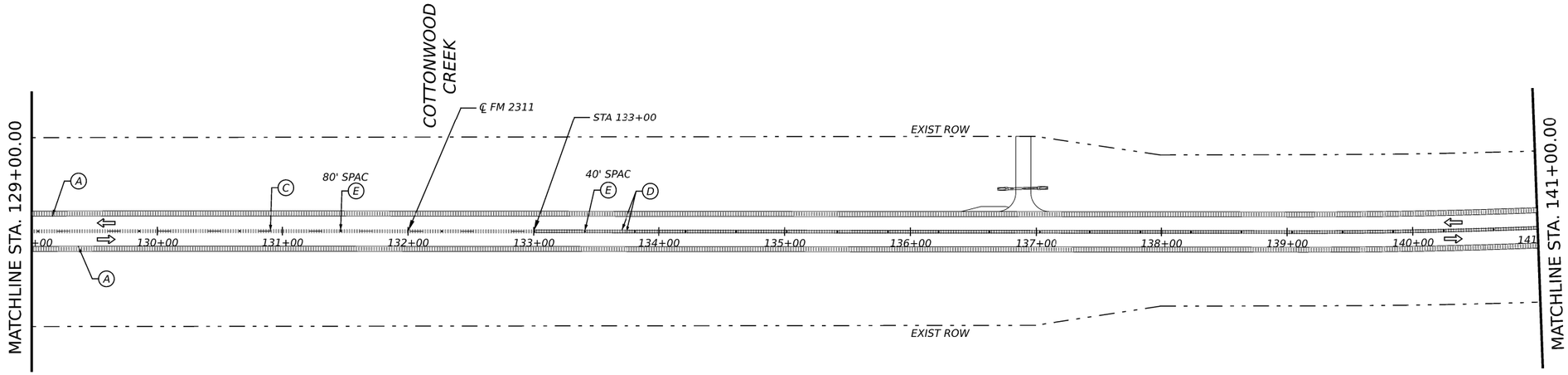


LEGEND

- (A) RE PM W/RET REQ TY I(W)6"(SLD)
- (B) REFL PAV MRK TY I (W)24"(SLD)
- (C) RE PM W/RET REQ TY I(Y)6"(BRK)
- (D) RE PM W/RET REQ TY I(Y)6"(SLD)
- (E) REFL PAV MRKR TY II A-A
- PROP SMALL SIGN
- [X] PROP SMALL SIGN NUMBER
- <X> EXIST SIGN REMOVAL NUMBER
- DELINEATOR
- RUMBLE STRIP
- EXISTING ROW
- DIRECTION OF TRAVEL

SUMMARY OF PAVEMENT MARKINGS ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
533 6001	RUMBLE STRIPS (SHOULDER)	LF	4800
533 6002	RUMBLE STRIPS (CENTERLINE)	LF	2400
666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	4810
666 6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	310
666 6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	2410
672 6009	REFL PAV MRKR TY II-A-A	EA	45



NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MOHAMMED S ULA
131559
LICENSED
PROFESSIONAL ENGINEER
Mohammed S Ula
1/24/2024

infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SIGNING & PAVEMENT MARKINGS LAYOUT STA 117+00 to STA 141+00

SHEET 6 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		244

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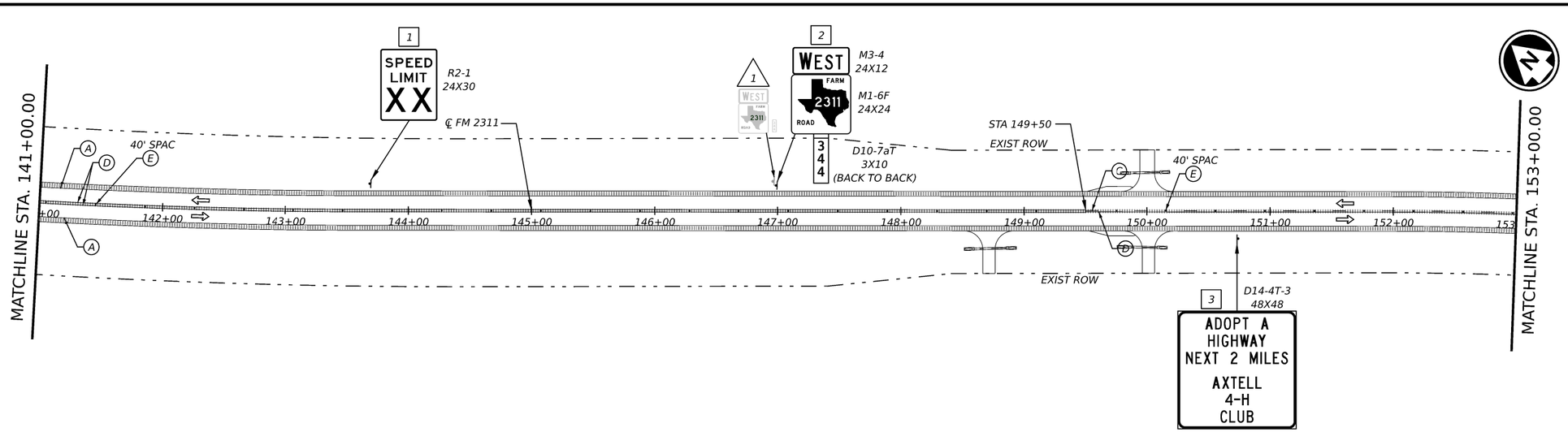
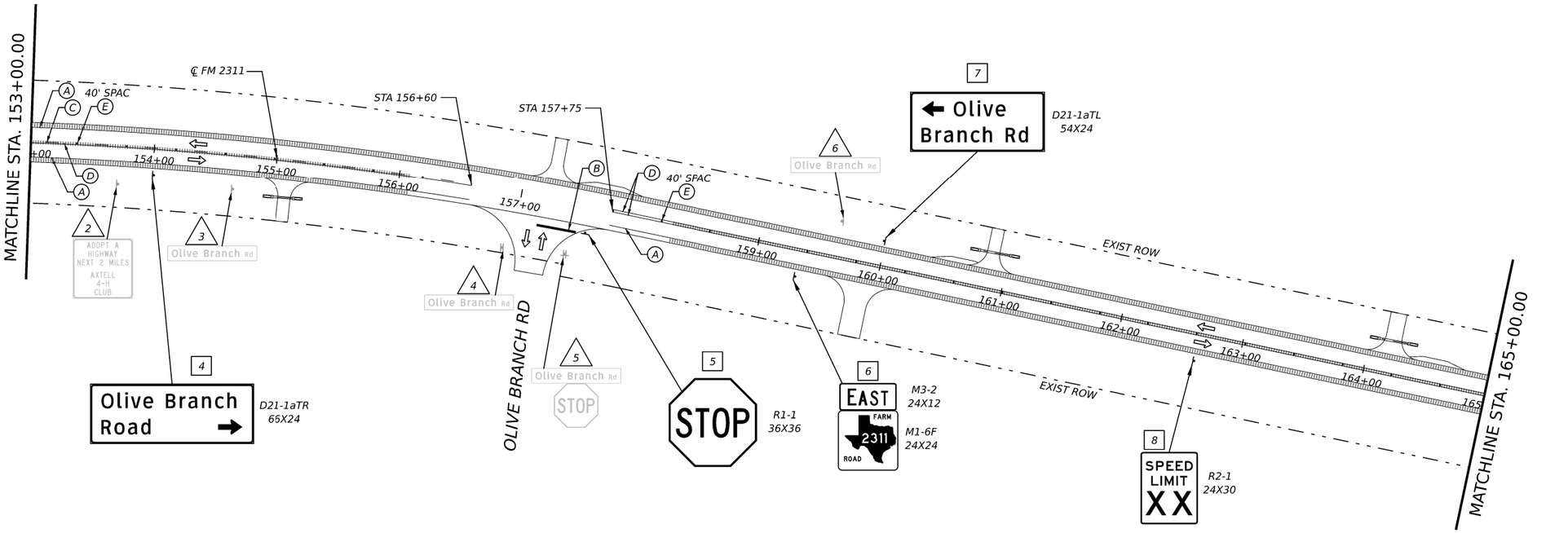


LEGEND

- (A) RE PM W/RET REQ TY I(W)6"(SLD)
- (B) REFL PAV MRK TY I (W)24"(SLD)
- (C) RE PM W/RET REQ TY I(Y)6"(BRK)
- (D) RE PM W/RET REQ TY I(Y)6"(SLD)
- (E) REFL PAV MRKR TY II A-A
- PROP SMALL SIGN
- [X] PROP SMALL SIGN NUMBER
- X EXIST SIGN REMOVAL NUMBER
- DELINEATOR
- RUMBLE STRIP
- EXISTING ROW
- DIRECTION OF TRAVEL

SUMMARY OF PAVEMENT MARKINGS ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
533 6001	RUMBLE STRIPS (SHOULDER)	LF	4590
533 6002	RUMBLE STRIPS (CENTERLINE)	LF	2190
666 6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	35
666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	4700
666 6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	190
666 6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	3870
672 6009	REFL PAV MRKR TY II-A-A	EA	57

SUMMARY OF SIGNING ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
644 6001	IN SM RD SN SUP&AM TY 10BWG(1)SA(P)	EA	4
644 6002	IN SM RD SN SUP&AM TY 10BWG(1)SA(P-BM)	EA	1
644 6004	IN SM RD SN SUP&AM TY 10BWG(1)SA(T)	EA	3
644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	6



NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MOHAMMED S ULA
131559
LICENSED
PROFESSIONAL ENGINEER
1/24/2024

infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SIGNING & PAVEMENT MARKINGS LAYOUT STA 141+00 to STA 165+00

SHEET 7 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		245

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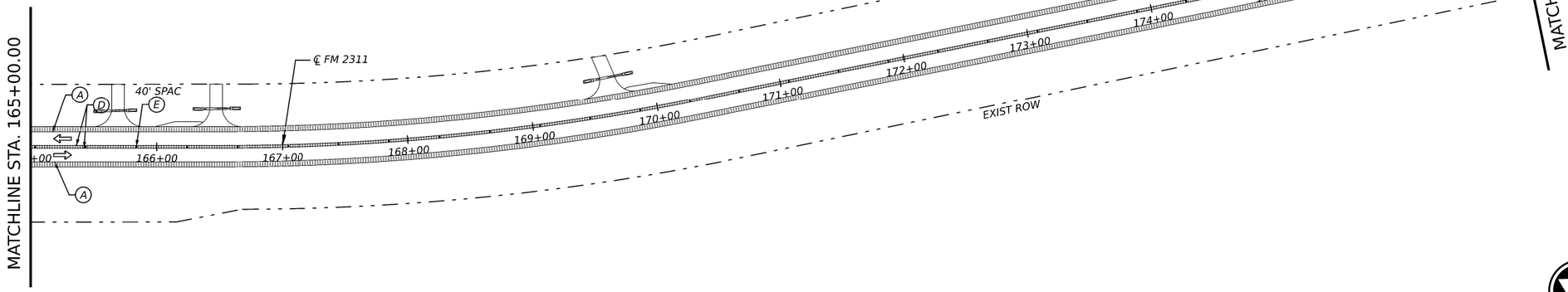
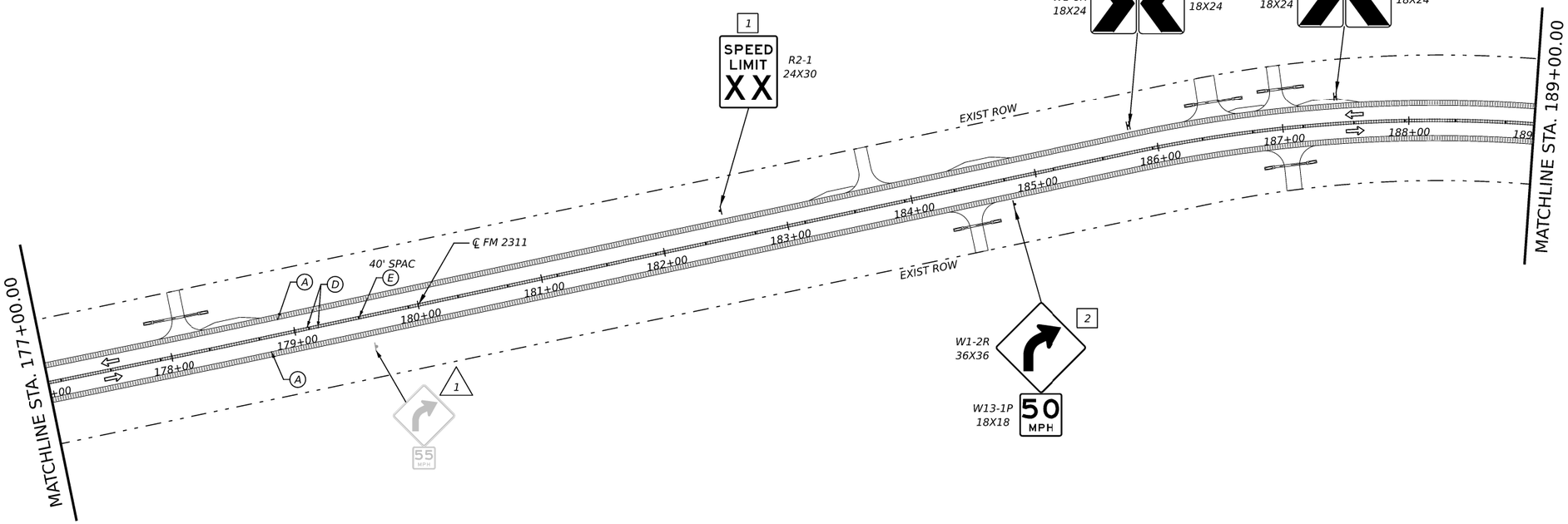
DW: HFJ
CK: SU
DN: HFJ

SUMMARY OF PAVEMENT MARKINGS ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
533 6001	RUMBLE STRIPS (SHOULDER)	LF	4800
533 6002	RUMBLE STRIPS (CENTERLINE)	LF	2400
666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	4810
666 6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	4810
672 6009	REFL PAV MRKR TY II-A-A	EA	61

SUMMARY OF SIGNING ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
644 6001	IN SM RD SN SUP&AM TY 10BWG(1)SA(P)	EA	4
644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	1





LEGEND

- (A) RE PM W/RET REQ TY I(W)6"(SLD)
- (B) REFL PAV MRK TY I (W)24"(SLD)
- (C) RE PM W/RET REQ TY I(Y)6"(BRK)
- (D) RE PM W/RET REQ TY I(Y)6"(SLD)
- (E) REFL PAV MRKR TY II A-A
- PROP SMALL SIGN
- [X] PROP SMALL SIGN NUMBER
- ⟨X⟩ EXIST SIGN REMOVAL NUMBER
- DELINEATOR
- RUMBLE STRIP
- EXISTING ROW
- DIRECTION OF TRAVEL

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MOHAMMED S ULA
131559
LICENSED
PROFESSIONAL ENGINEER
1/24/2024

infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SIGNING & PAVEMENT MARKINGS LAYOUT STA 165+00 to STA 189+00

SHEET 8 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		246

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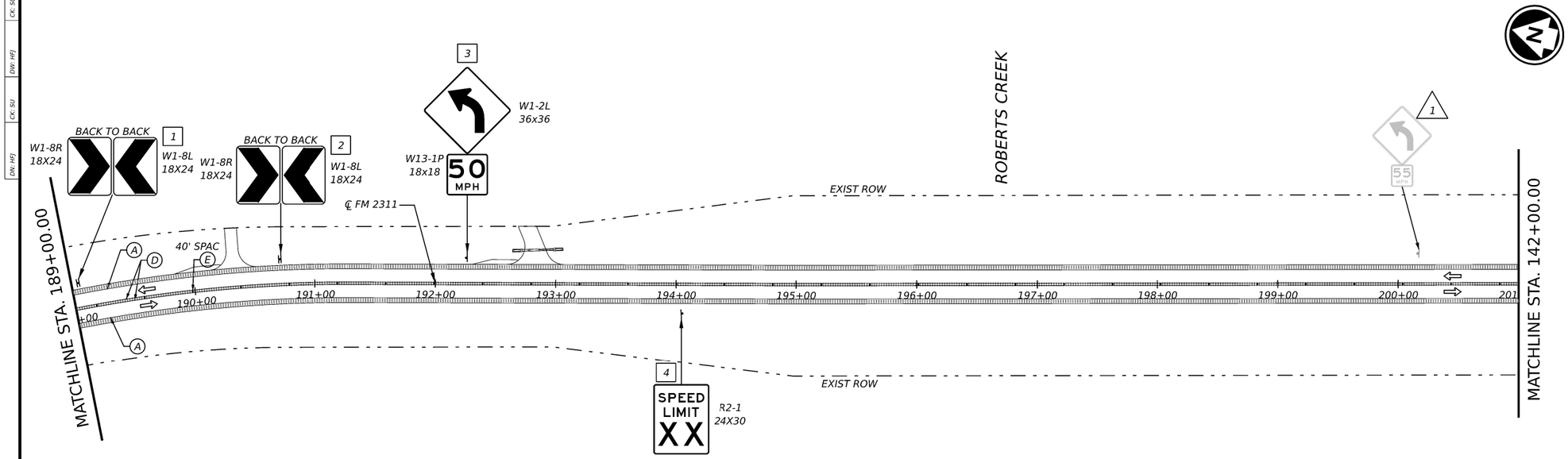
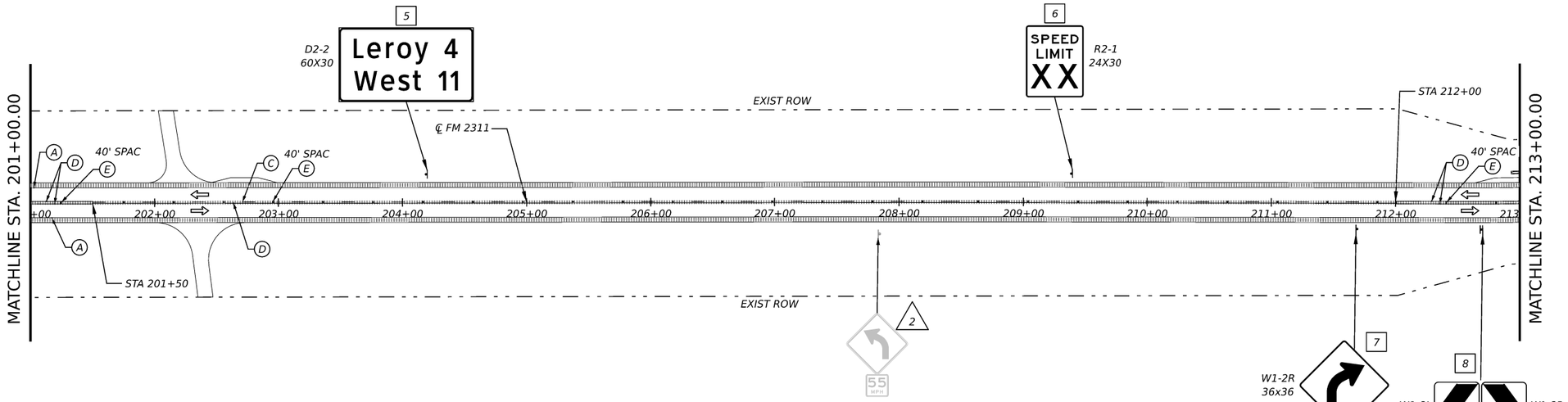


SUMMARY OF PAVEMENT MARKINGS ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
533 6001	RUMBLE STRIPS (SHOULDER)	LF	4800
533 6002	RUMBLE STRIPS (CENTERLINE)	LF	2400
666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	4810
666 6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	270
666 6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	2710
672 6009	REFL PAV MRKR TY II-A-A	EA	61

SUMMARY OF SIGNING ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
644 6001	IN SM RD SN SUP&AM TY 10BWG(1)SA(P)	EA	7
644 6007	IN SM RD SN SUP&AM TY 10BWG(1)SA(U)	EA	1
644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	2



LEGEND

- (A) RE PM W/RET REQ TY I(W)6"(SLD)
- (B) REFL PAV MRK TY I (W)24"(SLD)
- (C) RE PM W/RET REQ TY I(Y)6"(BRK)
- (D) RE PM W/RET REQ TY I(Y)6"(SLD)
- (E) REFL PAV MRKR TY II A-A
- PROP SMALL SIGN
- [X] PROP SMALL SIGN NUMBER
- X EXIST SIGN REMOVAL NUMBER
- DELINEATOR
- RUMBLE STRIP
- EXISTING ROW
- DIRECTION OF TRAVEL

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MOHAMMED S ULA
131559
LICENSED
PROFESSIONAL ENGINEER
1/24/2024

infraTECH
Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SIGNING & PAVEMENT MARKINGS LAYOUT STA 189+00 to STA 213+00

SHEET 9 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		247

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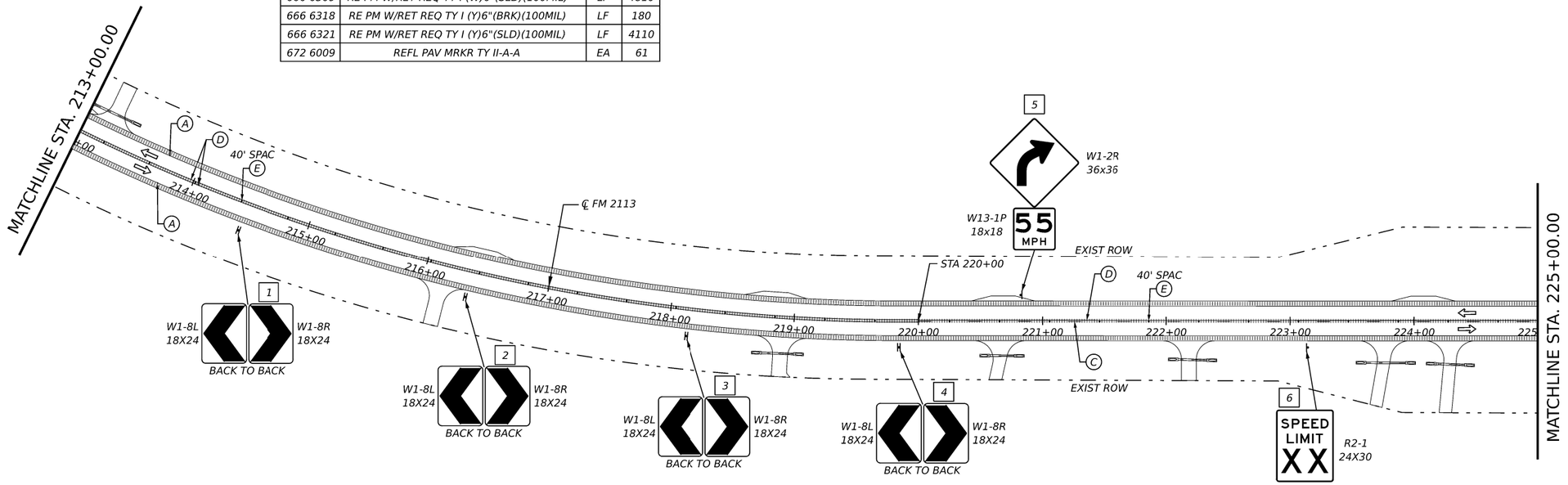
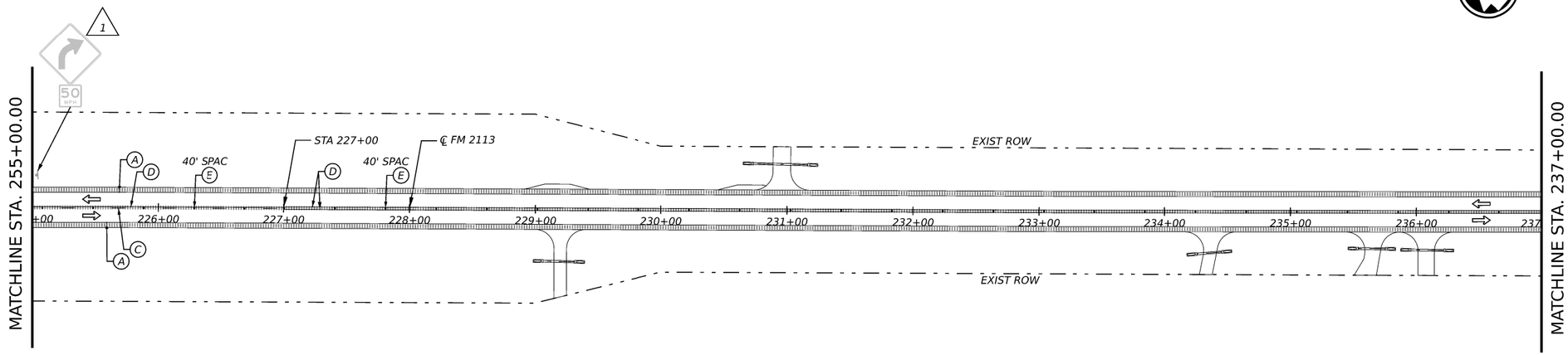
CK: SU
DW: HFJ
CK: SU
DN: HFJ

SUMMARY OF PAVEMENT MARKINGS ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
533 6001	RUMBLE STRIPS (SHOULDER)	LF	4800
533 6002	RUMBLE STRIPS (CENTERLINE)	LF	2400
666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	4810
666 6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	180
666 6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	4110
672 6009	REFL PAV MRKR TY II-A-A	EA	61

SUMMARY OF SIGNING ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
644 6001	IN SM RD SN SUP&AM TY 10BWG(1)SA(P)	EA	6
644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	1





LEGEND

- (A) RE PM W/RET REQ TY I(W)6"(SLD)
- (B) REFL PAV MRK TY I (W)24"(SLD)
- (C) RE PM W/RET REQ TY I(Y)6"(BRK)
- (D) RE PM W/RET REQ TY I(Y)6"(SLD)
- (E) REFL PAV MRKR TY II A-A
- PROP SMALL SIGN
- [X] PROP SMALL SIGN NUMBER
- X EXIST SIGN REMOVAL NUMBER
- DELINEATOR
- RUMBLE STRIP
- EXISTING ROW
- DIRECTION OF TRAVEL

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MOHAMMED S ULA
131559
LICENSED
PROFESSIONAL ENGINEER
1/24/2024

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Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SIGNING & PAVEMENT MARKINGS LAYOUT STA 213+00 to STA 237+00

SHEET 10 OF 12

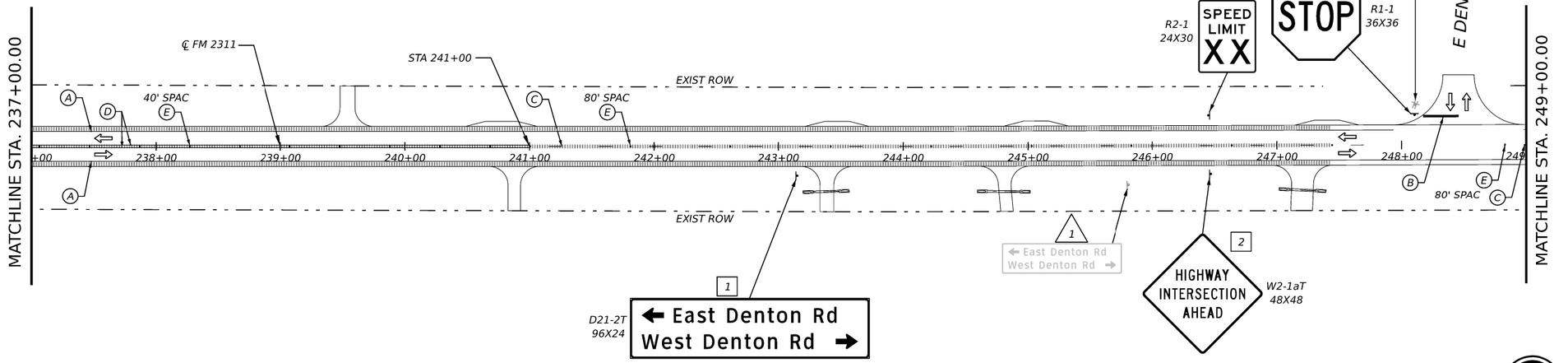
CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		248

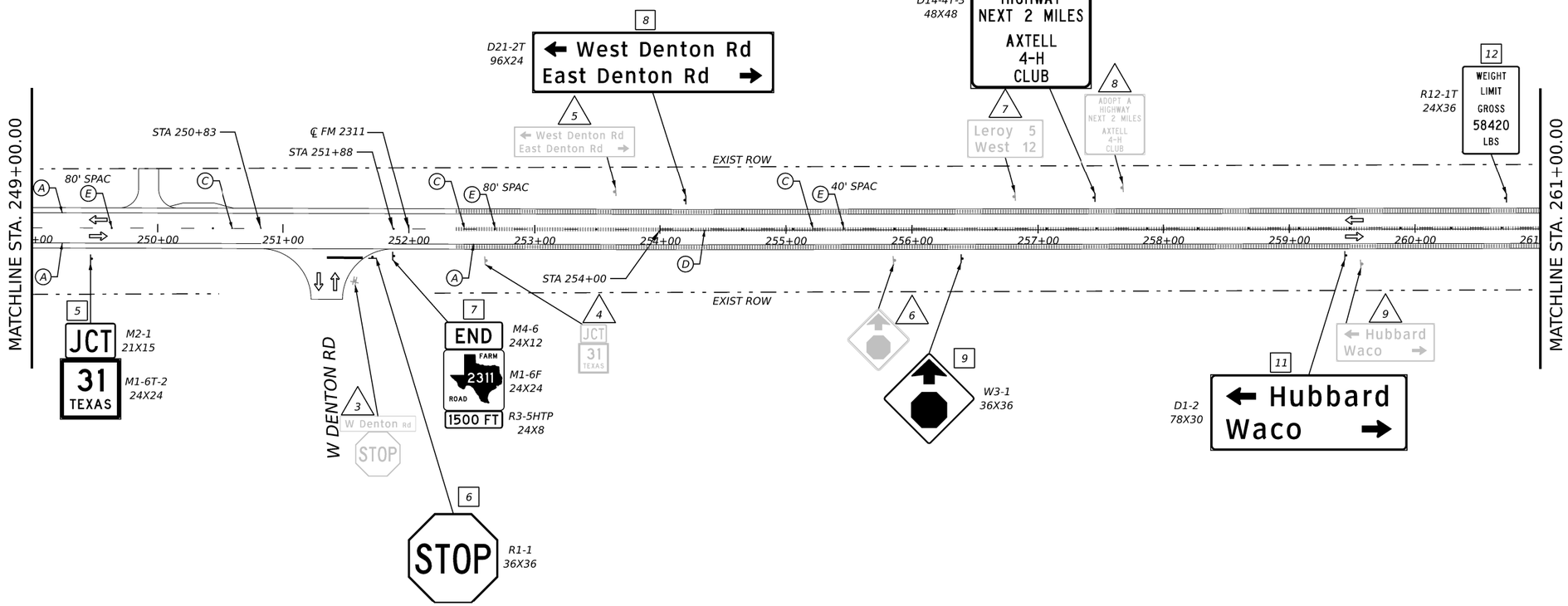
DATE: 1/24/2024 2:06:35 PM
FILE: ...\SPM\FM 2311-SPM 10.dgn

CK: SU
DW: HFJ
CK: SU
DW: HFJ

SUMMARY OF PAVEMENT MARKINGS ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
533 6001	RUMBLE STRIPS (SHOULDER)	LF	3810
533 6002	RUMBLE STRIPS (CENTERLINE)	LF	1905
666 6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	60
666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	4600
666 6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	460
666 6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	1510
672 6009	REFL PAV MRKR TY II-A-A	EA	42

SUMMARY OF SIGNING ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
644 6001	IN SM RD SN SUP&AM TY 10BWG(1)SA(P)	EA	5
644 6002	IN SM RD SN SUP&AM TY 10BWG(1)SA(P-BM)	EA	2
644 6004	IN SM RD SN SUP&AM TY 10BWG(1)SA(T)	EA	4
644 6036	IN SM RD SN SUP&AM TY S80(1)SA(U-BM)	EA	1
644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	9





LEGEND

- (A) RE PM W/RET REQ TY I(W)6"(SLD)
- (B) REFL PAV MRK TY I (W)24"(SLD)
- (C) RE PM W/RET REQ TY I(Y)6"(BRK)
- (D) RE PM W/RET REQ TY I(Y)6"(SLD)
- (E) REFL PAV MRKR TY II A-A
- PROP SMALL SIGN
- [X] PROP SMALL SIGN NUMBER
- X EXIST SIGN REMOVAL NUMBER
- DELINEATOR
- RUMBLE STRIP
- EXISTING ROW
- DIRECTION OF TRAVEL

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MOHAMMED S ULA
131559
LICENSED
PROFESSIONAL ENGINEER
Mohammed S Ula
1/24/2024

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Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SIGNING & PAVEMENT MARKINGS LAYOUT
STA 237+00 to STA 261+00

SHEET 11 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		249

DATE: 1/24/2024 2:06:42 PM
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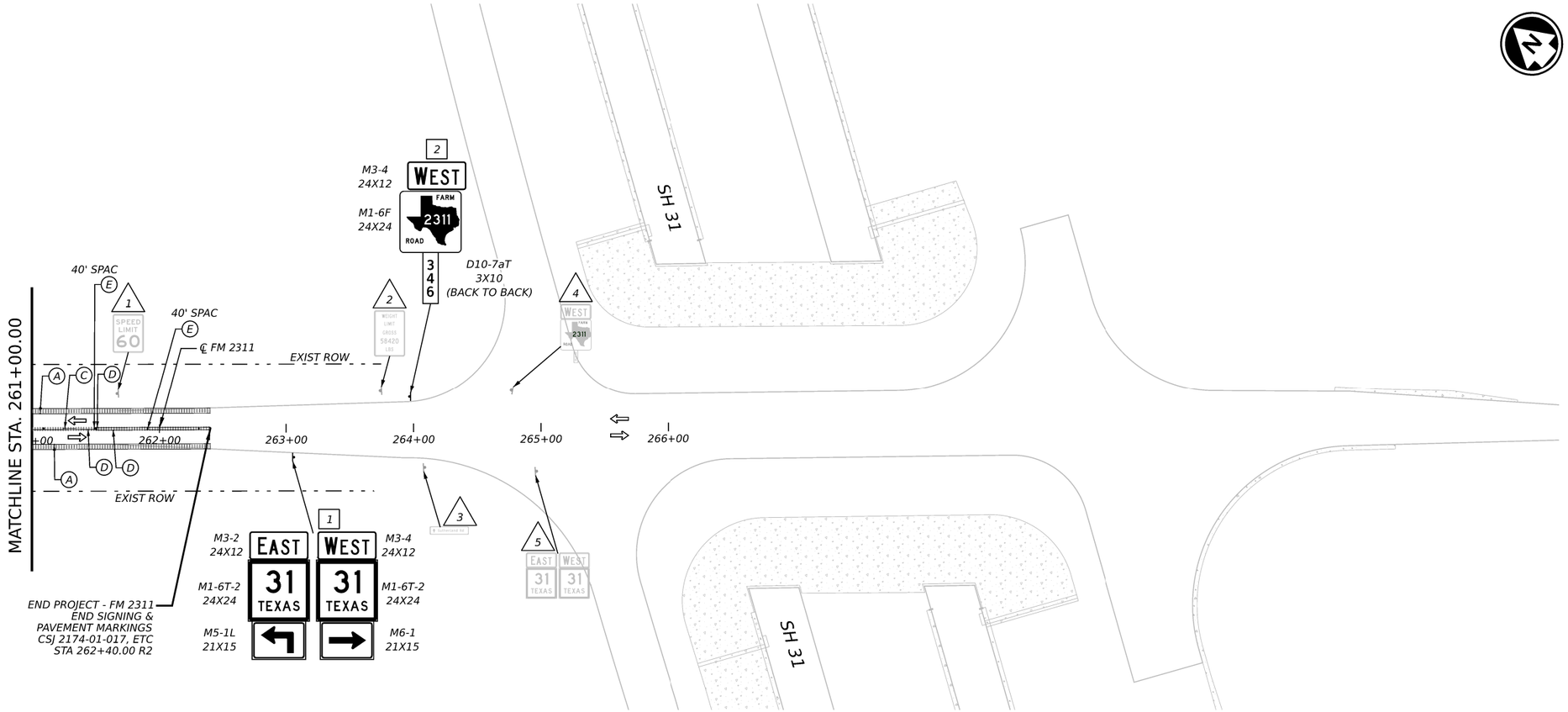
DW: HFJ
CK: SU
DW: HFJ



LEGEND

- (A) RE PM W/RET REQ TY I(W)6"(SLD)
- (B) REFL PAV MRK TY I (W)24"(SLD)
- (C) RE PM W/RET REQ TY I(Y)6"(BRK)
- (D) RE PM W/RET REQ TY I(Y)6"(SLD)
- (E) REFL PAV MRKR TY II A-A
- PROP SMALL SIGN
- [X] PROP SMALL SIGN NUMBER
- X EXIST SIGN REMOVAL NUMBER
- DELINEATOR
- RUMBLE STRIP
- EXISTING ROW
- DIRECTION OF TRAVEL

NOTES:

1. EXISTING SIGNS NOT NOTED IN THE PLANS WILL REMAIN.
2. SMALL SIGN LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. FM 2311 CENTERLINE IS NOT SHOWN FOR CLARITY.
4. REFER TO TXDOT STATEWIDE STANDARDS FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

SUMMARY OF PAVEMENT MARKINGS ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
533 6001	RUMBLE STRIPS (SHOULDER)	LF	280
533 6002	RUMBLE STRIPS (CENTERLINE)	LF	140
666 6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	820
666 6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	15
666 6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	770
672 6009	REFL PAV MRKR TY II-A-A	EA	11

SUMMARY OF SIGNING ITEMS			
ITEM	DESCRIPTION	UNIT	QTY
644 6001	IN SM RD SN SUP&AM TY 10BWG(1)SA(P)	EA	1
644 6033	IN SM RD SN SUP&AM TY S80(1)SA(U)	EA	1
644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	5

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Texas Department of Transportation

FM 2311

SIGNING & PAVEMENT MARKINGS LAYOUT STA 261+00 to END

SHEET 12 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		250

DATE: 1/24/2024 2:06:49 PM
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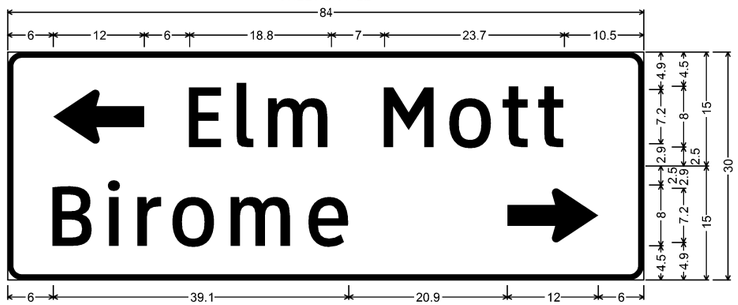
CK: SU
DW: HFJ
CK: SU
DW: HFJ

6
SHEET 1 OF 12

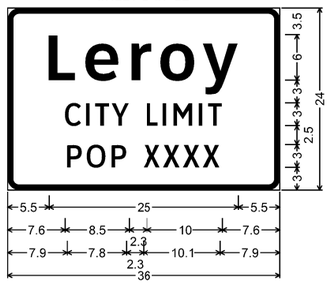


D1-2;

1.9" Radius, 0.8" Border, White on, Green;
Standard Arrow Custom 12.0" X 7.1" 180'; "Elm Mott" ClearviewHwy-3-W;

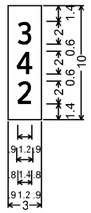
1.9" Radius, 0.8" Border, White on, Green;
"Birome" ClearviewHwy-3-W; Standard Arrow Custom 12.0" X 7.1" 0';

13
SHEET 2 OF 12



I-2aT;
1.5" Radius, 0.8" Border, White on, Green;
"Leroy" ClearviewHwy-5-W-R;
"CITY LIMIT" ClearviewHwy-3-W;
"POP XXXX" ClearviewHwy-3-W;

2
SHEET 3 OF 12



D10-7aT;
No border, White on, Green;
"3" ClearviewHwy-4-W;
"4" ClearviewHwy-4-W;
"2" ClearviewHwy-4-W;

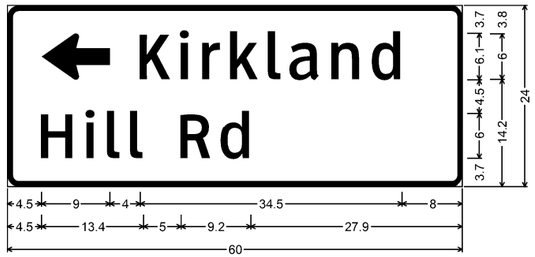
1
SHEET 4 OF 12

D14-4T-3;

3.0" Radius, 1.0" Border, White on, Blue;
"ADOPT A" C; "HIGHWAY" C; "NEXT 2 MILES" C;

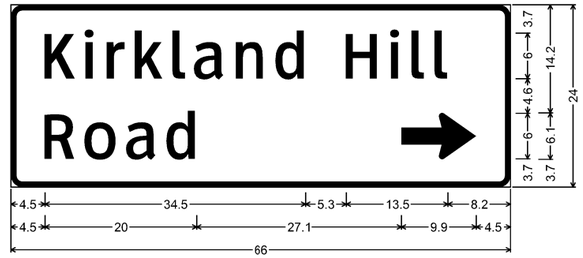
3.0" Radius, 1.0" Border, White on, Blue;
"LEROY TOURS" C 50% spacing; "GERALD" C;
"COMMUNITIES" C 95% spacing;

7
SHEET 4 OF 12



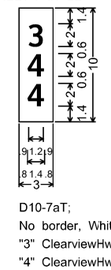
D21-1aTL;
1.5" Radius, 0.75" Border, White on, Green;
Standard Arrow Custom 9.0" X 6.1" 180'; "Kirkland" ClearviewHwy-3-W;
"Hill Rd" ClearviewHwy-3-W;

6
SHEET 5 OF 12



D21-1aTR;
1.5" Radius, 0.75" Border, White on, Green;
"Kirkland Hill" ClearviewHwy-3-W; "Road" ClearviewHwy-3-W;
Standard Arrow Custom 9.9" X 6.1" 0';

2
SHEET 7 OF 12



D10-7aT;
No border, White on, Green;
"3" ClearviewHwy-4-W;
"4" ClearviewHwy-4-W;
"4" ClearviewHwy-4-W;

STATE OF TEXAS
MOHAMMED S ULA
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1/24/2024

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TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SMALL SIGN DETAILS

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		251

DATE: 1/24/2024 2:06:54 PM
FILE: ...\SPM\FM 2311-Sign Details.dgn

CK: SU
DW: HFJ
CK: SU
DW: HFJ

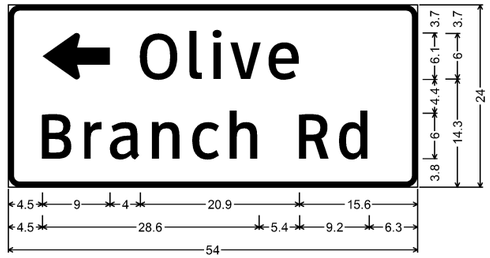
(3) SHEET 7 OF 12 — (10) SHEET 11 OF 12

D14-4T-3;

3.0" Radius, 1.0" Border, White on, Blue;
"ADOPT A" C; "HIGHWAY" C; "NEXT 2 MILES" C;

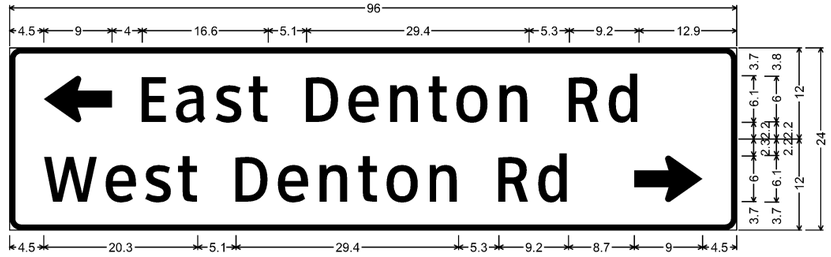
3.0" Radius, 1.0" Border, White on, Blue;
"AXTELL" C; "4-H" C 70% spacing; "CLUB" C;

(7) SHEET 7 OF 12



D21-1aTL;
1.5" Radius, 0.75" Border, White on, Green;
Standard Arrow Custom 9.0" X 6.1" 180';
"Olive" ClearviewHwy-3-W; "Branch Rd" ClearviewHwy-3-W;

(1) SHEET 11 OF 12

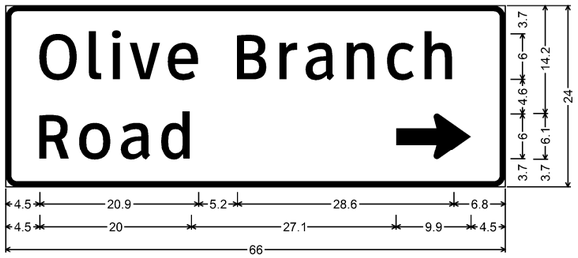


D21-2T;

1.5" Radius, 0.8" Border, White on, Green;
Standard Arrow Custom 9.0" X 6.1" 180'; "East Denton Rd" ClearviewHwy-3-W;

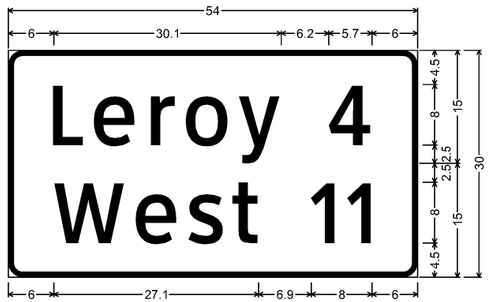
1.5" Radius, 0.8" Border, White on, Green;
"West Denton Rd" ClearviewHwy-3-W; Standard Arrow Custom 9.0" X 6.1" 0';

(4) SHEET 7 OF 12



D21-1aTR;
1.5" Radius, 0.75" Border, White on, Green;
"Olive Branch" ClearviewHwy-3-W; "Road" ClearviewHwy-3-W;
Standard Arrow Custom 9.9" X 6.1" 0';

(4) SHEET 9 OF 12



D2-2;

1.9" Radius, 0.8" Border, White on, Green;
"Leroy" ClearviewHwy-3-W; "4" ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on, Green;
"West" ClearviewHwy-3-W; "11" ClearviewHwy-3-W;

DATE: 1/24/2024 2:06:58 PM
FILE: ...\SPM\FM 2311-Sign Details.dgn

STATE OF TEXAS
MOHAMMED S ULA
131559
LICENSED
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1/24/2024

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Texas Department of Transportation

FM 2311

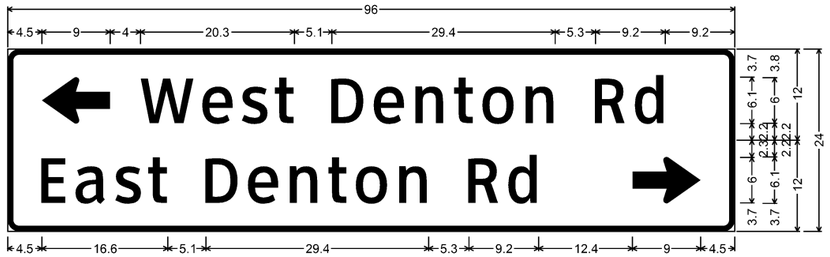
SMALL SIGN DETAILS

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		252

CK: SU
DW: HFJ
CK: SU
DW: HFJ

(8)
SHEET 11 OF 12

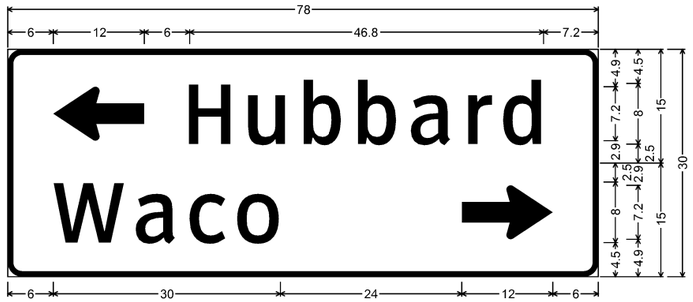


D21-2T;

1.5" Radius, 0.8" Border, White on, Green;
Standard Arrow Custom 9.0" X 6.1" 180'; "West Denton Rd" ClearviewHwy-3-W;

1.5" Radius, 0.8" Border, White on, Green;
"East Denton Rd" ClearviewHwy-3-W; Standard Arrow Custom 9.0" X 6.1" 0';

(11)
SHEET 11 OF 12

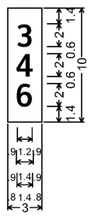


D1-2;

1.9" Radius, 0.8" Border, White on, Green;
Standard Arrow Custom 12.0" X 7.1" 180'; "Hubbard" ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on, Green;
"Waco" ClearviewHwy-3-W; Standard Arrow Custom 12.0" X 7.1" 0';

(2)
SHEET 12 OF 12



D10-7aT;
No border, White on, Green;
"3" ClearviewHwy-4-W;
"4" ClearviewHwy-4-W;
"6" ClearviewHwy-4-W;

DATE: 1/24/2024 2:07:02 PM
FILE: ...\SPM\FM 2311-Sign Details.dgn

STATE OF TEXAS
MOHAMMED S ULA
131559
LICENSED
PROFESSIONAL ENGINEER
Mohammed S Ula
1/24/2024

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Engineers & Innovators, LLC
TBPE REGISTRATION NO. F-18368

Texas Department of Transportation

FM 2311

SMALL SIGN DETAILS

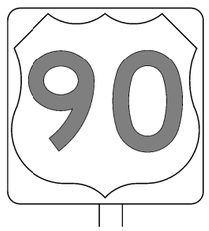
SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		253

DATE:
FILE:

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

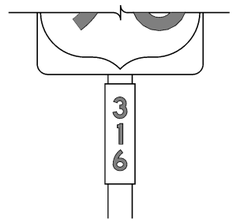
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING

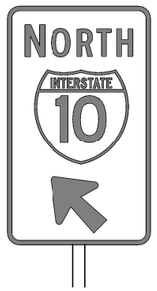


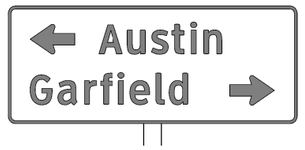
TYPICAL EXAMPLES

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

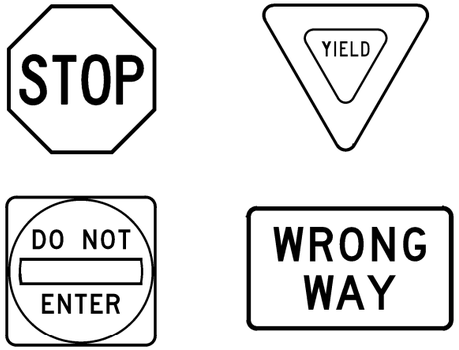
TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	WAC	McLENNAN		254

DATE:
FILE:

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS
(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

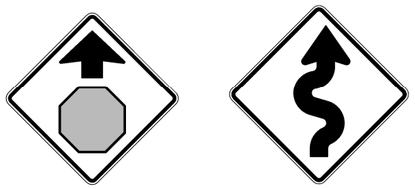
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

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

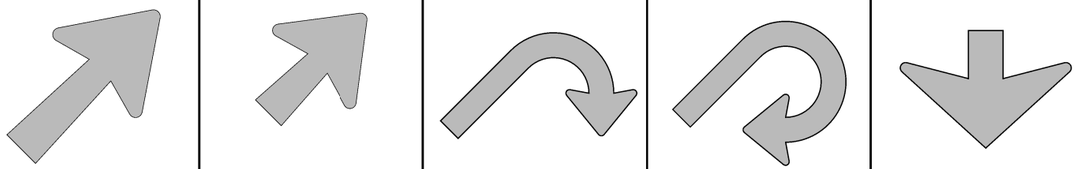
TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	WAC	McLENNAN		255

DATE:
FILE:

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



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

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

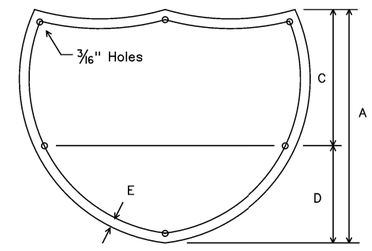
NOTE

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

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

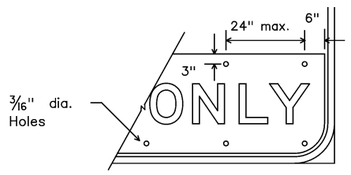
http://www.txdot.gov/

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

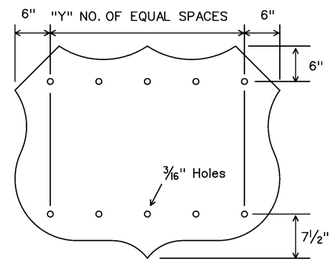


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1½
48	28	20	1¾

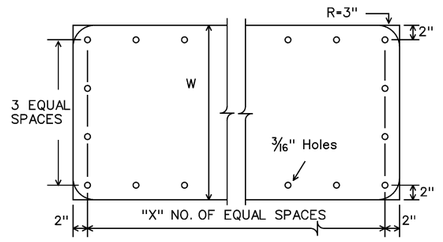


EXIT ONLY PANEL



U.S. ROUTE MARKERS

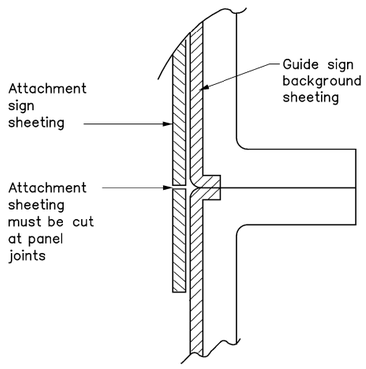
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



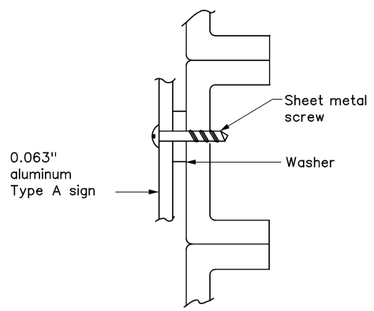
STATE ROUTE MARKERS

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

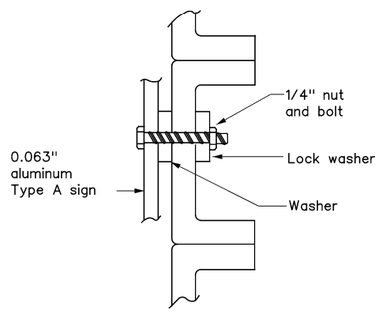
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT



NUT/BOLT ATTACHMENT

NOTE:

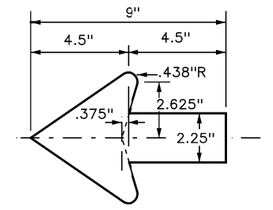
1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

NOTE:

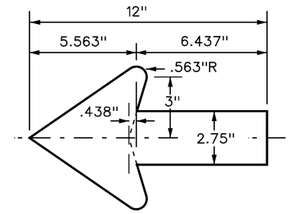
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

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

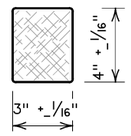
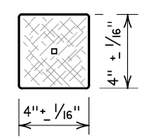
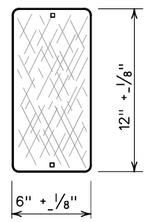
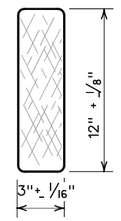
TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	WAC	McLENNAN		256

DATE:
FILE:

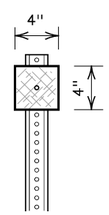
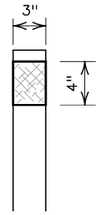
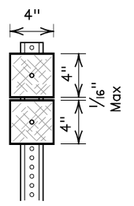
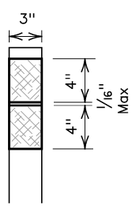
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	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

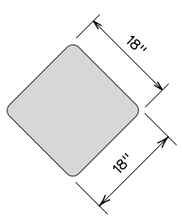
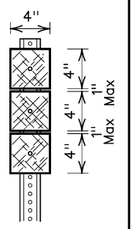
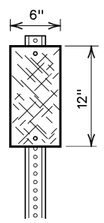
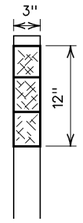
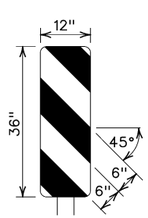
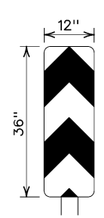
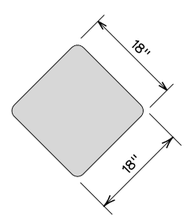
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

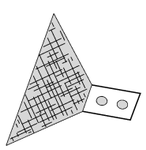
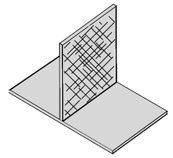
OBJECT MARKERS

	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 or C Sheeting FL FL	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B or C Sheeting FL FL			Red -Type B or C Sheeting FL FL
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)

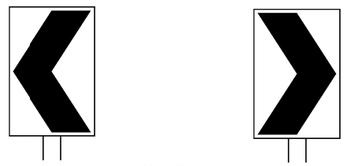
	GF1	GF2	CTB
DEVICE			

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	

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

1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	WAC	McLENNAN		257

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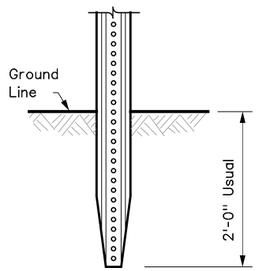
DATE:
FILE:

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

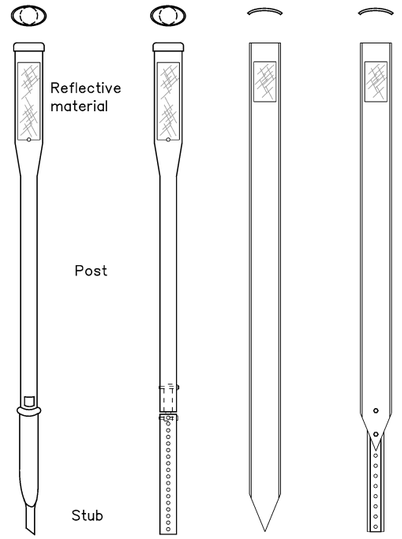


NOTES

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.

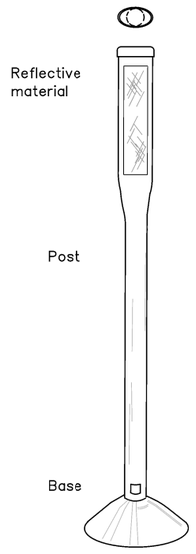
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



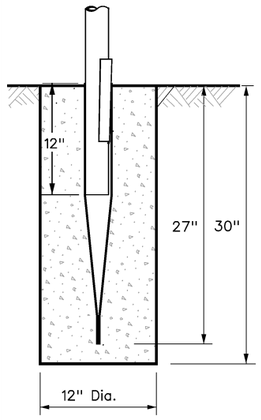
SURFACE MOUNT

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.

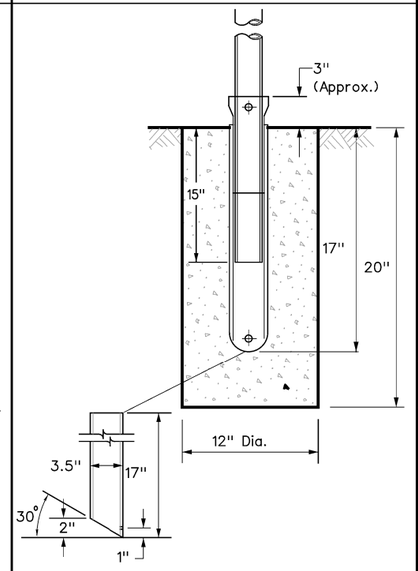
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

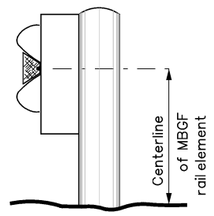
NOTE

1. Install per manufacturer's recommendations.

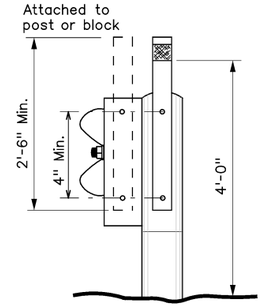
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

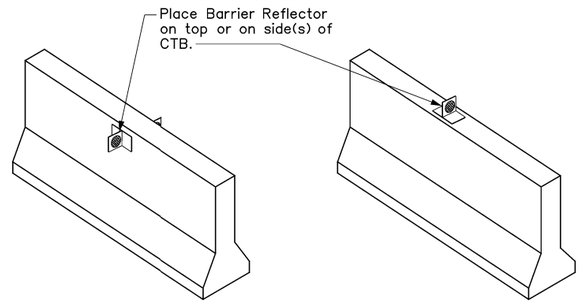
GF1



GF2



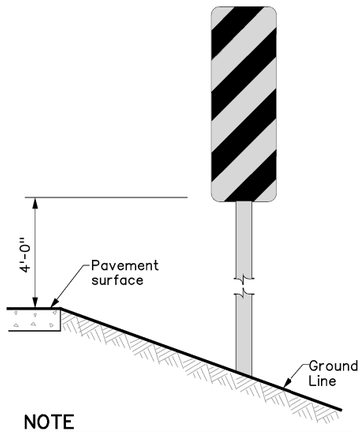
CONCRETE TRAFFIC BARRIER (CTB)



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.

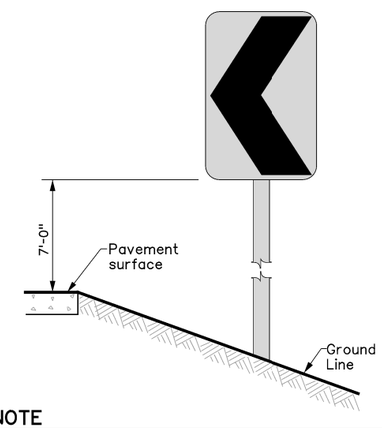
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

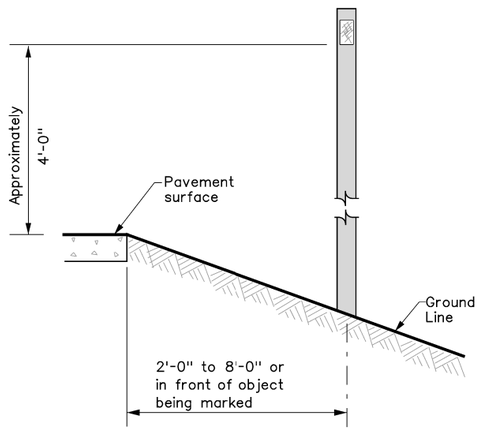
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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.

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DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
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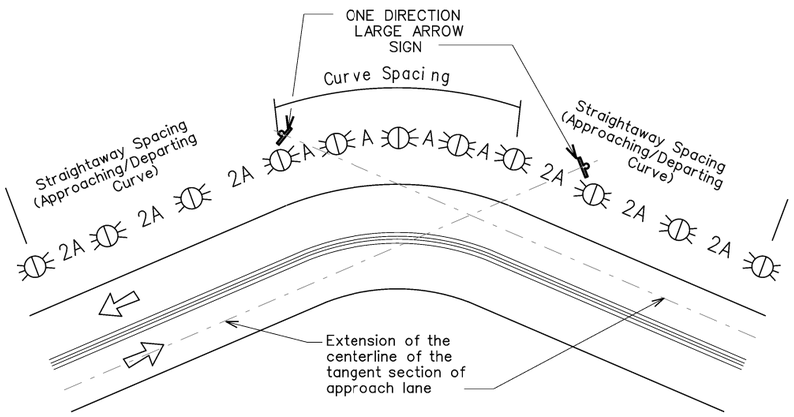
DATE:
FILE:

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

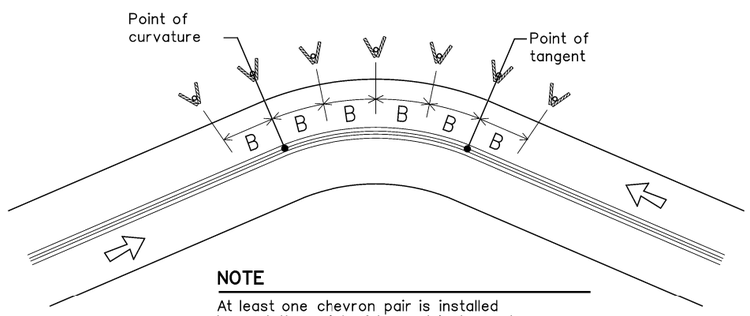
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

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

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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20C

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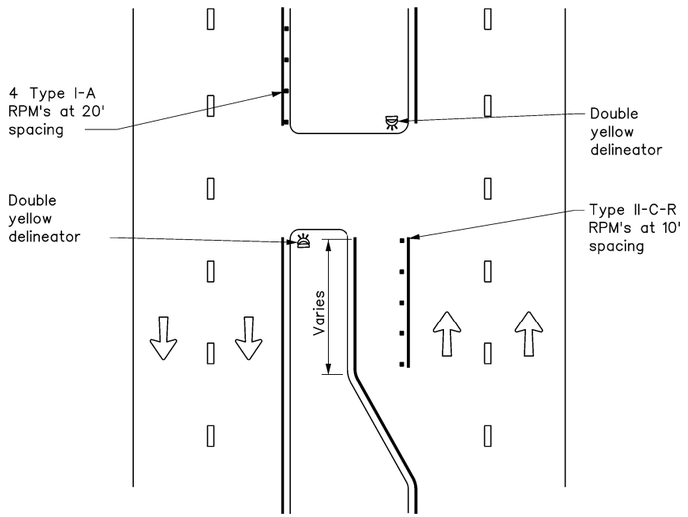
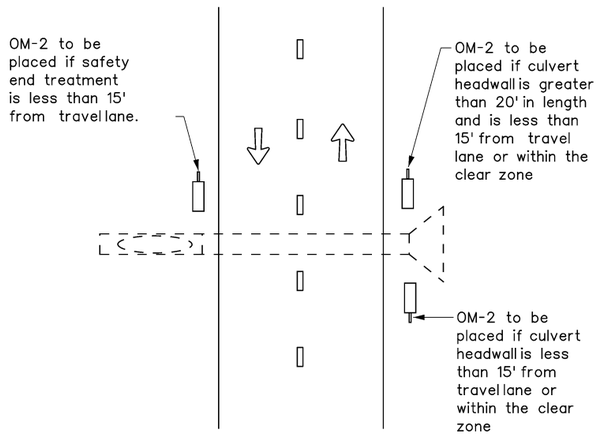
CROSSOVERS



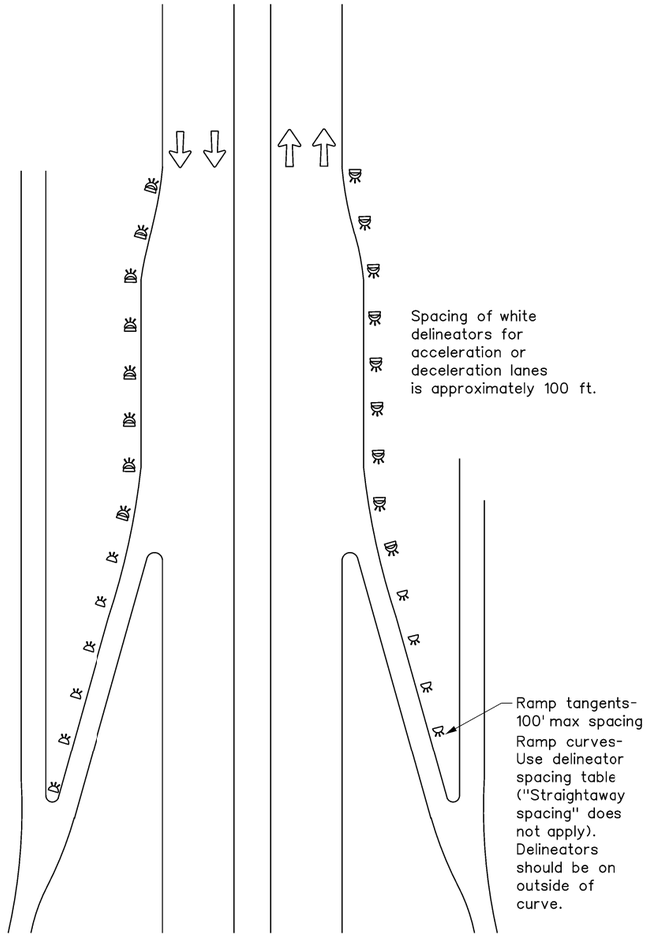
DETAIL 1

FOR CULVERTS WITHOUT MBGF



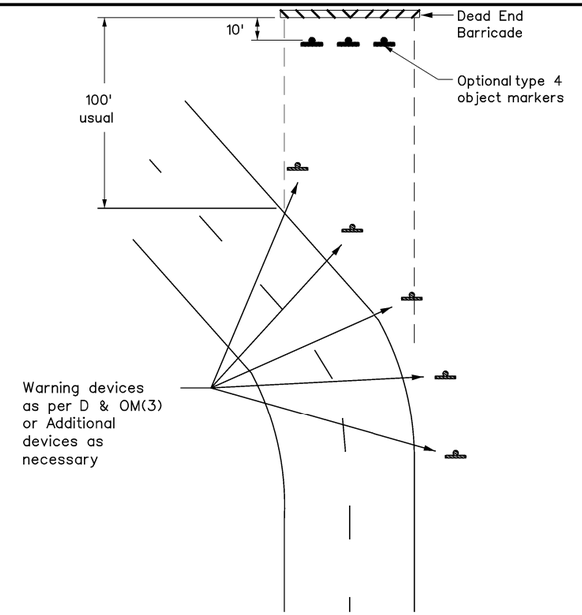
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



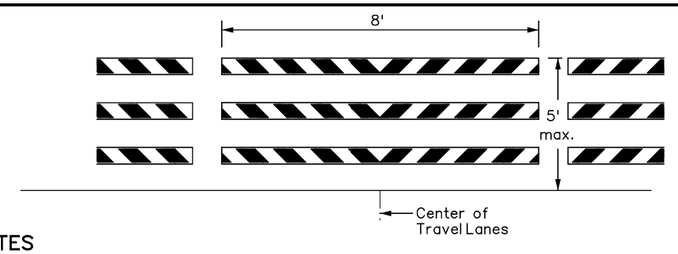
DETAIL 3

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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REVISIONS	2174	01	018	FM 2311
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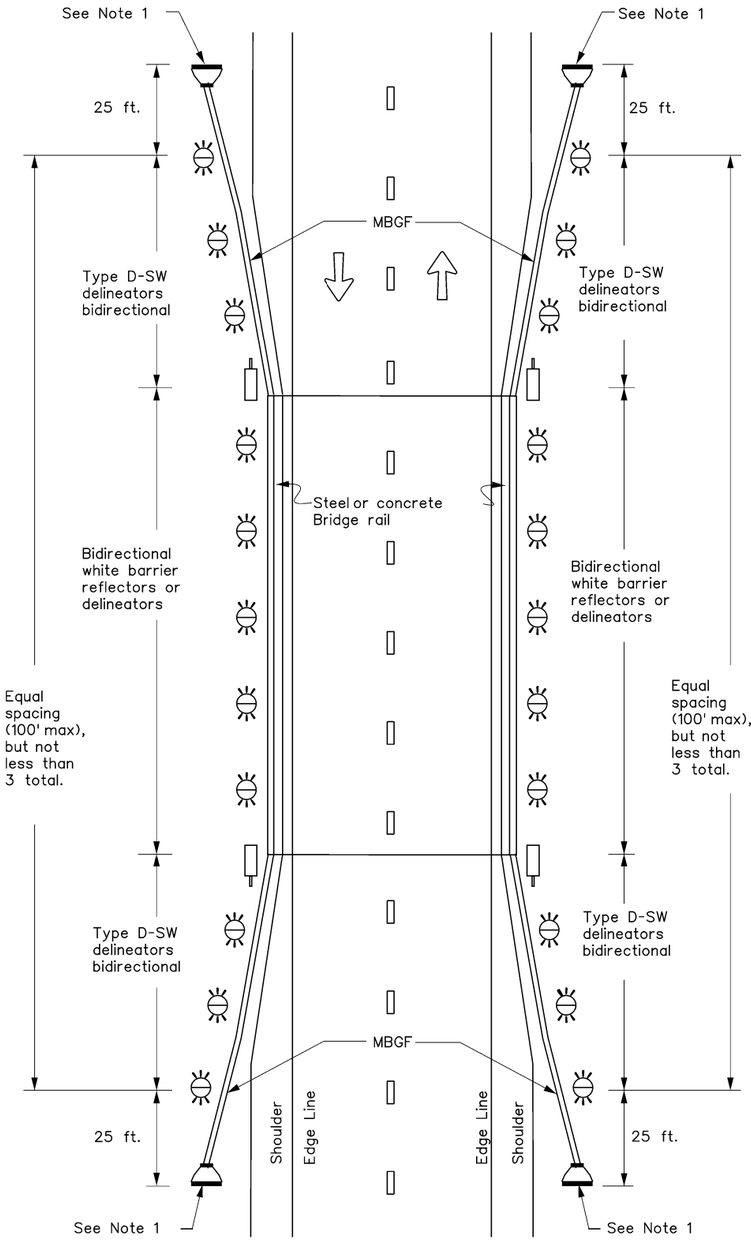
7-20	WAC	McLENNAN		260

20D

DATE:
FILE:

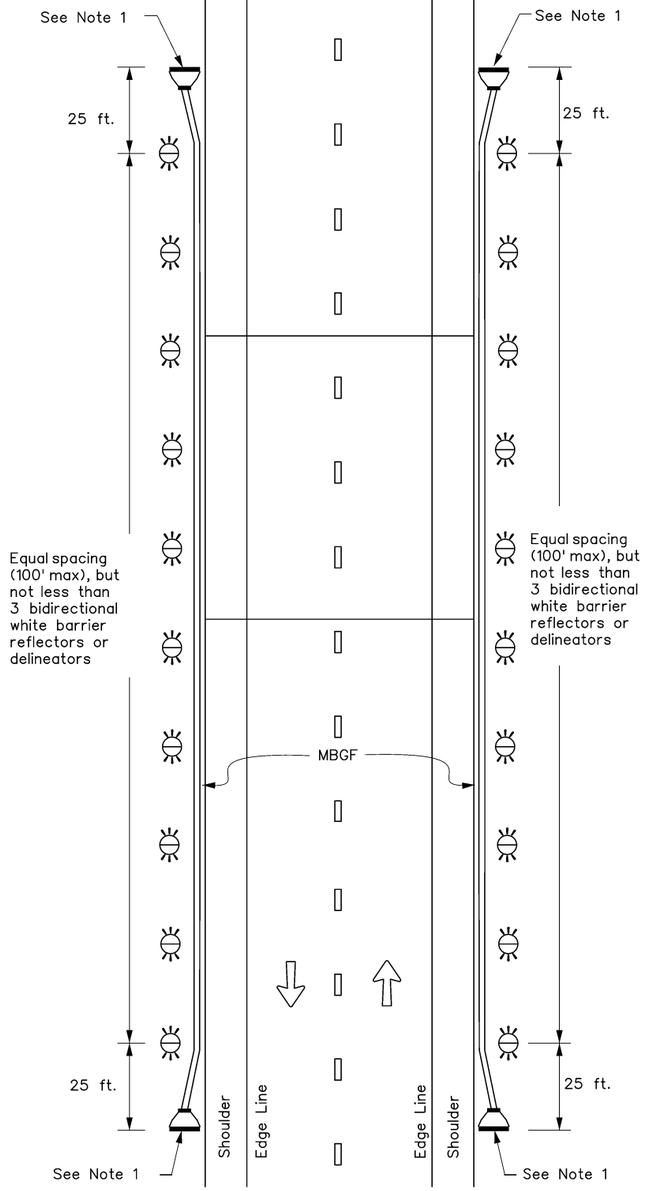
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

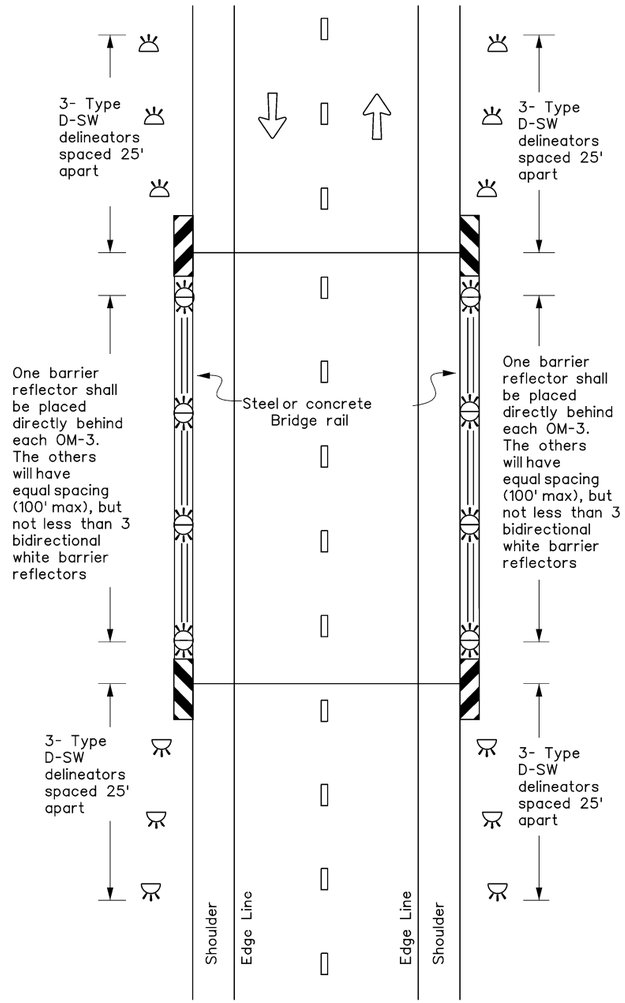
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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

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DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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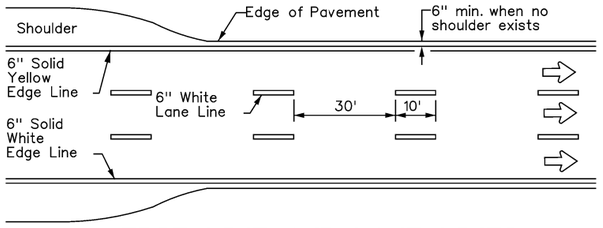
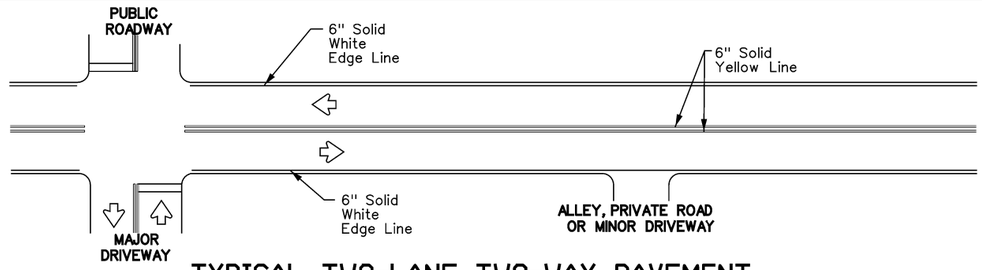
REVISIONS	2174	01	018	FM 2311
7-20	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		261

20E



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



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

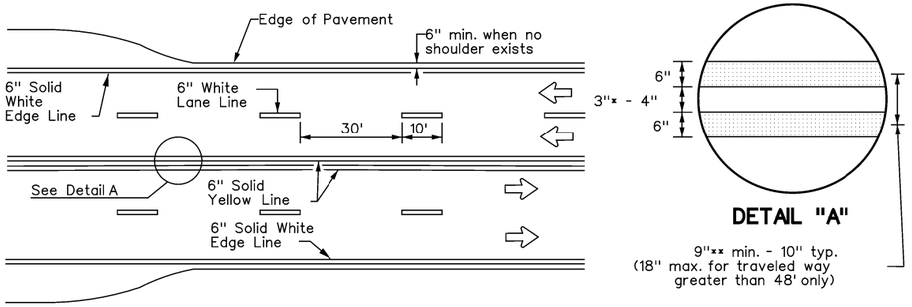
GENERAL NOTES

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.



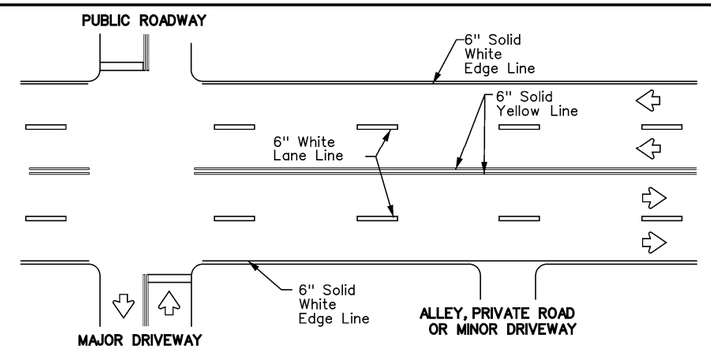
DETAIL "A"

9"** min. - 10" typ.
(18" max. for traveled way greater than 48' only)

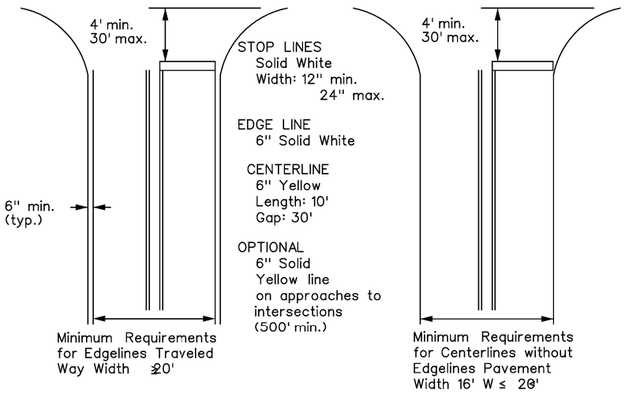
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

* 2" minimum for restripe projects when approved by the Engineer.

** 8" minimum for restripe projects when approved by the Engineer.



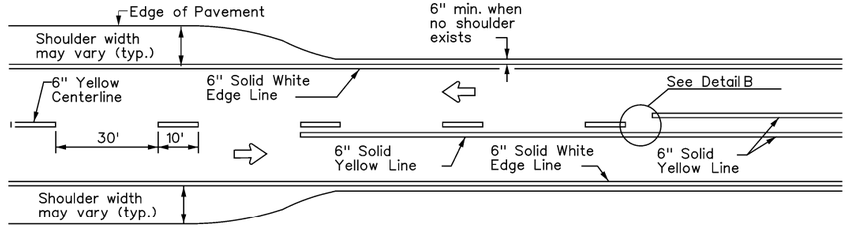
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



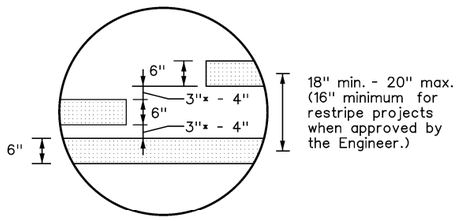
NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

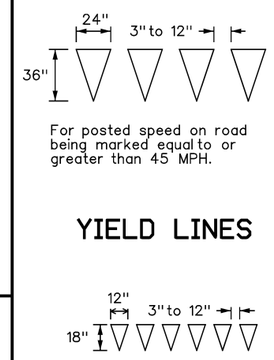


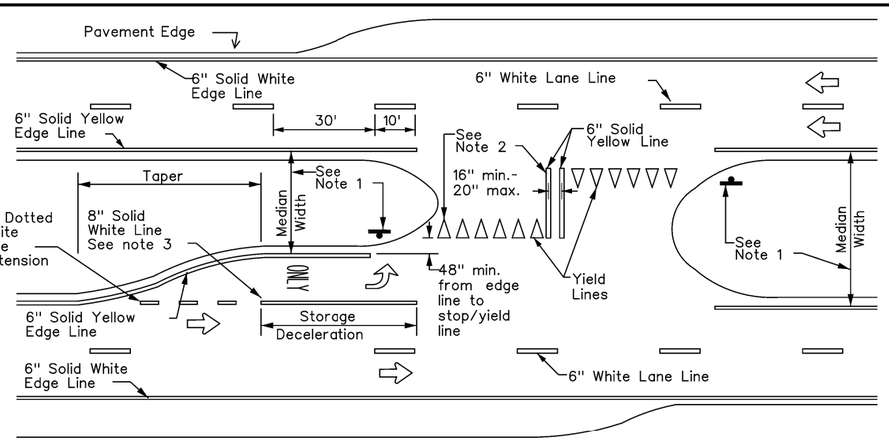
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



DETAIL "B"

* 2" minimum for restripe projects when approved by the Engineer.





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.

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TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
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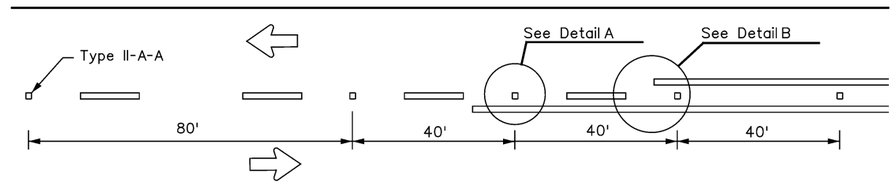
REVISIONS	2174	01	018	FM 2311
11-78 8-00 6-20	DIST	COUNTY		SHEET NO.
8-95 3-03 12-22	WAC	McLENNAN		262
5-00 2-12				

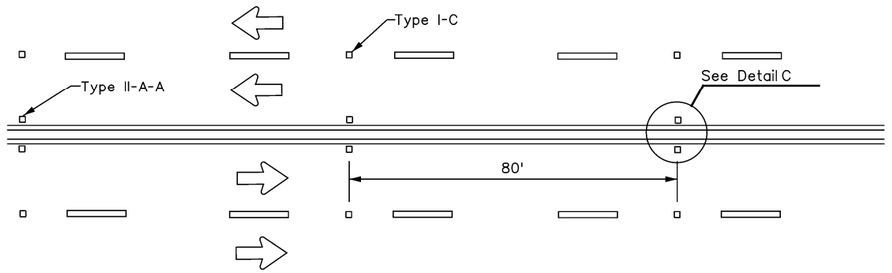
22A

DATE:
FILE:

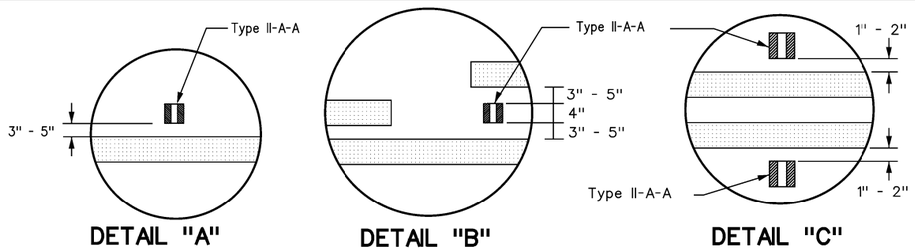
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

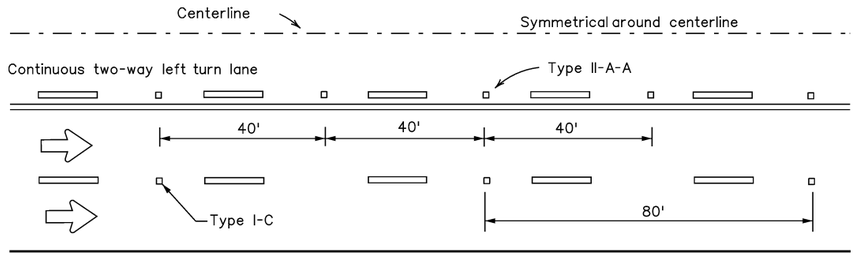


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

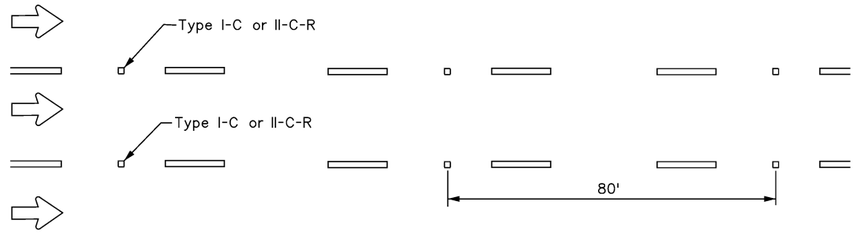


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



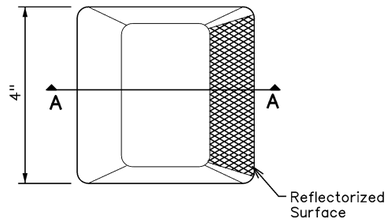
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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

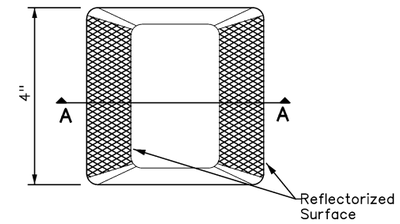
See Note 3.

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

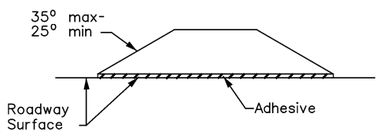
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

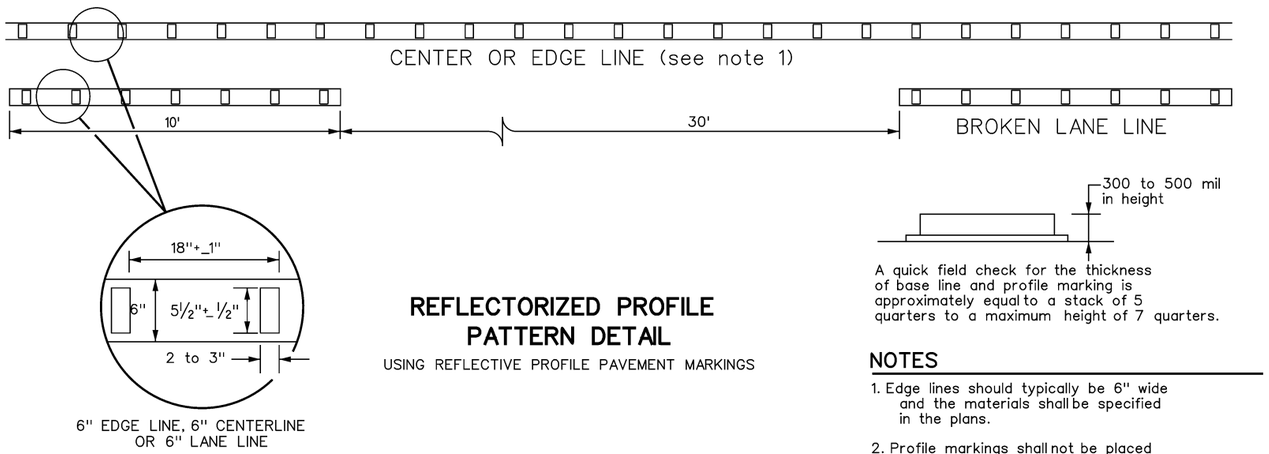


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

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
REVISIONS	2174	01	018	FM 2311
4-77 8-00 6-20	DIST	COUNTY		SHEET NO.
4-92 2-10 12-22	WAC	McLENNAN		263
5-00 2-12				

22B

DATE:
FILE:

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

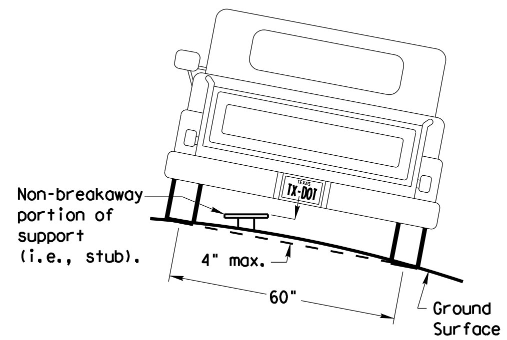
Anchor Type

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

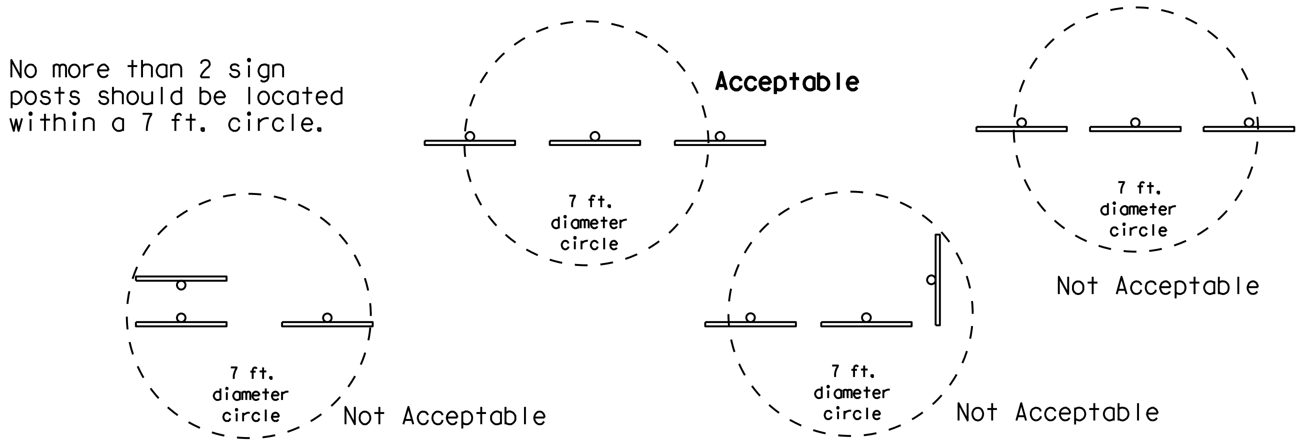
Sign Mounting Designation

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

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT

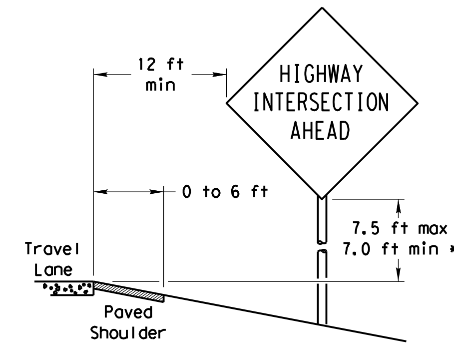


To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).



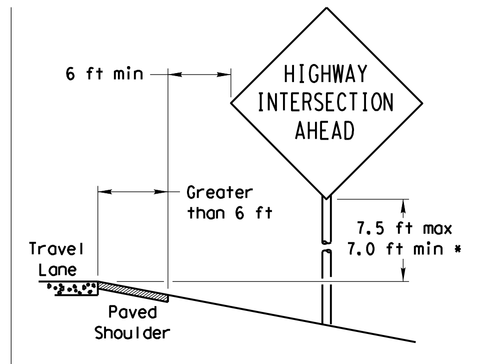
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

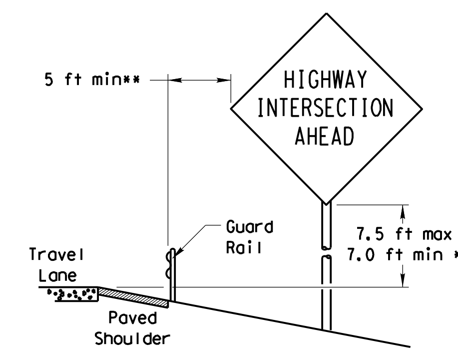
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



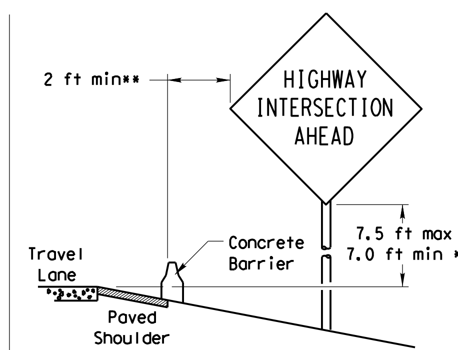
GREATER THAN 6 FT. WIDE

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

BEHIND BARRIER



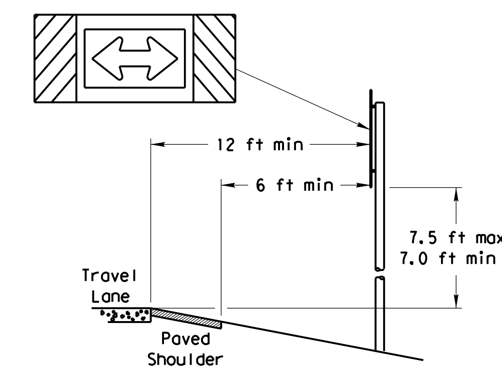
BEHIND GUARDRAIL



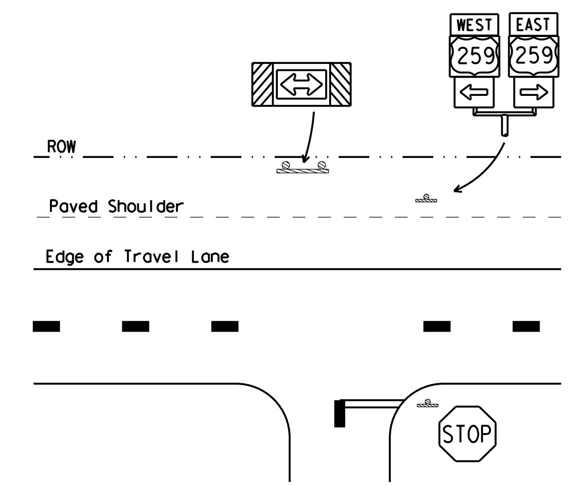
BEHIND CONCRETE BARRIER

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

T-INTERSECTION



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



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

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

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

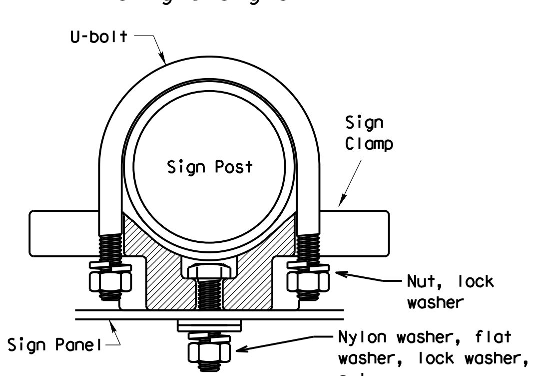
The maximum values may be increased when directed by the Engineer.

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

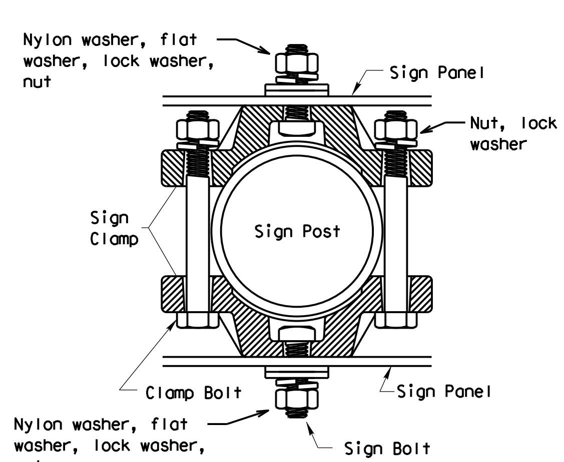
The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



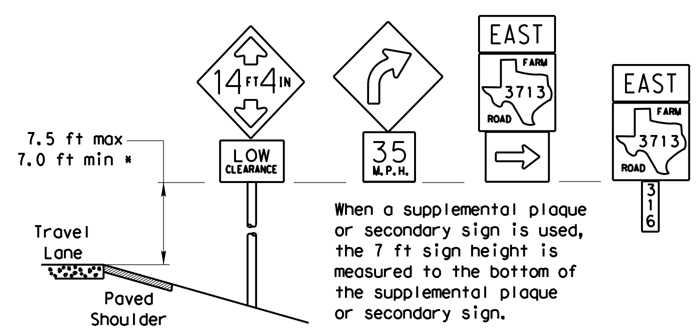
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

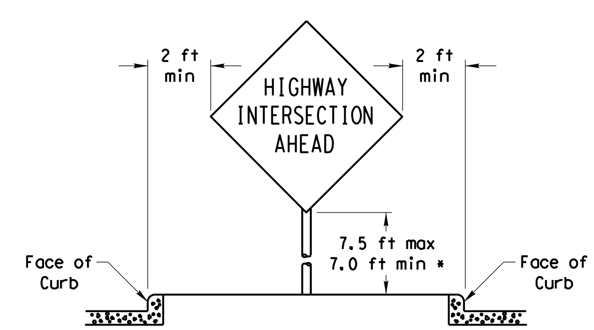
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



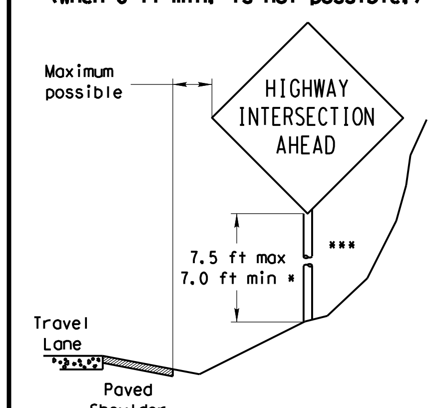
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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

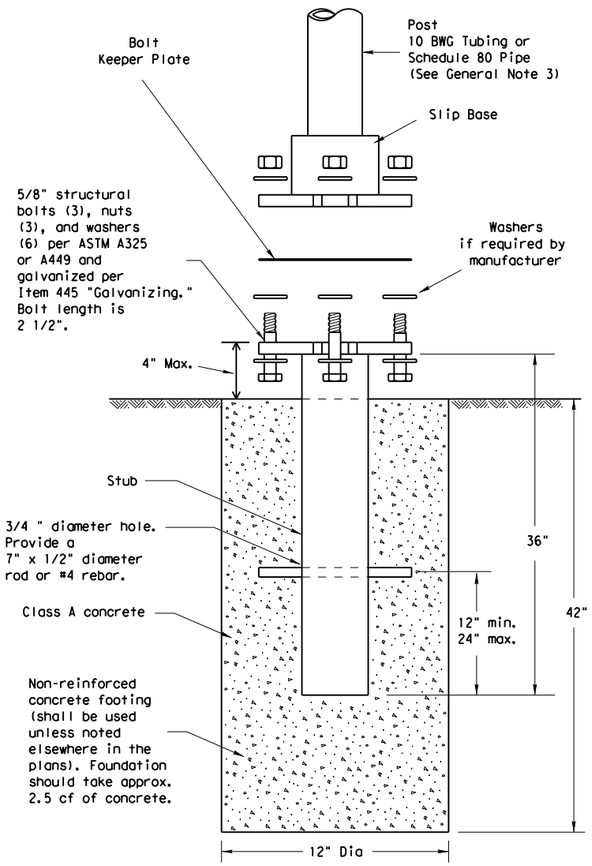
SMD(GEN)-08

©TxDOT July 2002	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	2174	01	018	FM 2311
	DIST		COUNTY	SHEET NO.
	WAC		McLENNAN	264

26A

DATE:
FILE:

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.

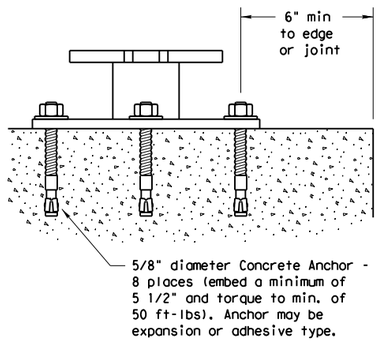
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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

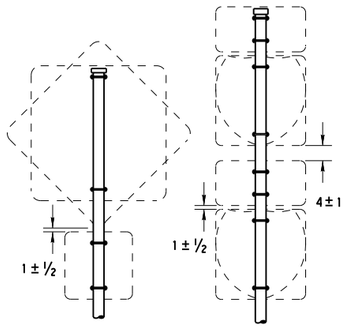
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

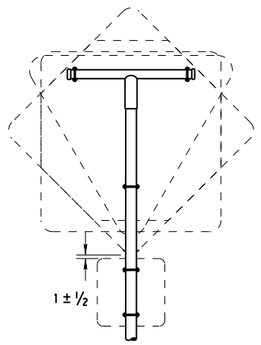
CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311

DIST	COUNTY	SHEET NO.
WAC	McLENNAN	265

DATE:
FILE:



SM RD SGN ASSM TY XXXXX(1)XX(P)



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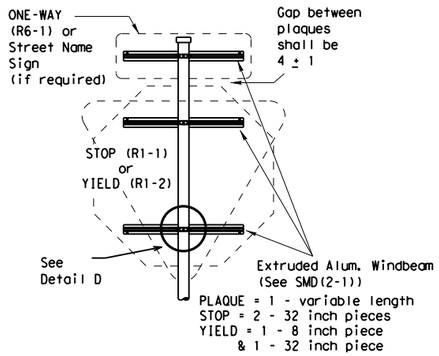
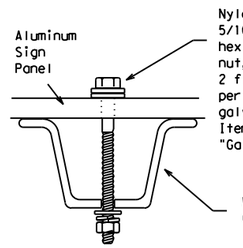
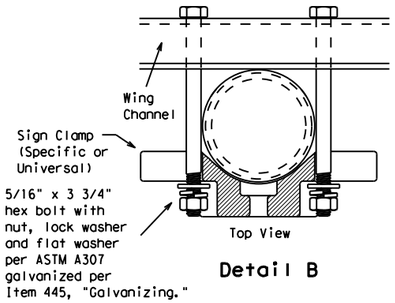


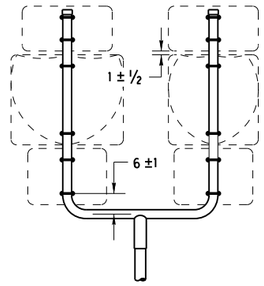
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



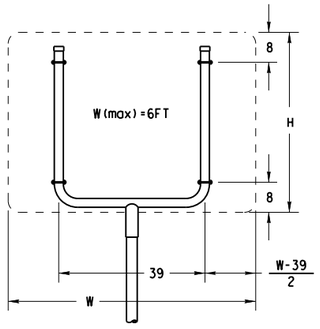
Detail A



Detail B



SM RD SGN ASSM TY XXXXX(1)XX(U)



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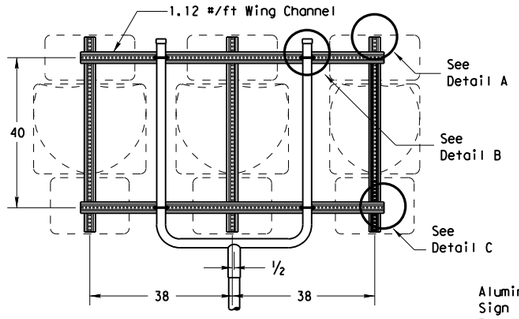
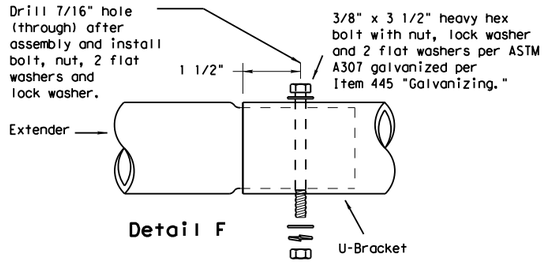
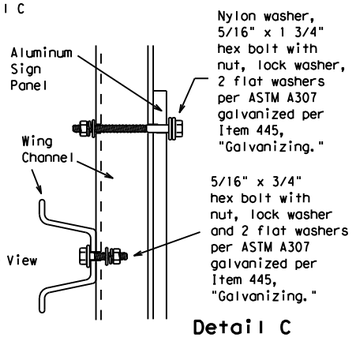


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

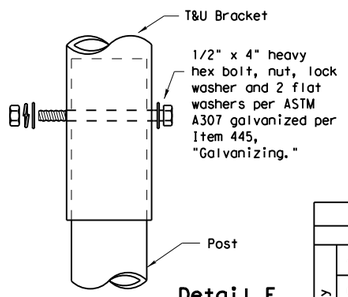


Detail F

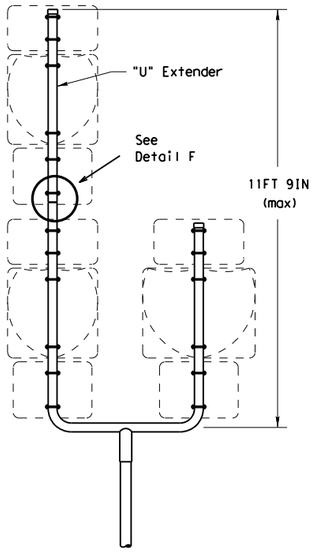
Splices shall only be allowed behind the sign substrate.



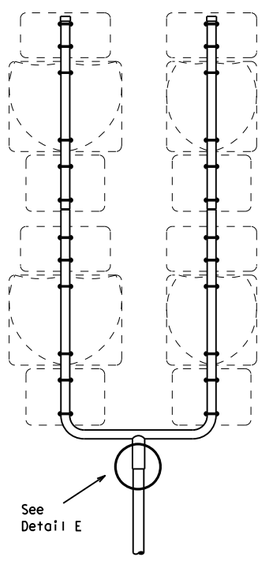
Detail C



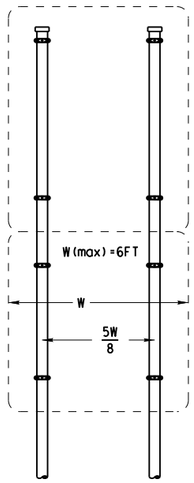
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

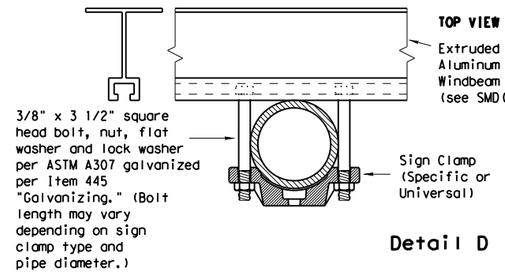


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

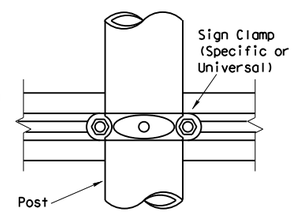


SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D



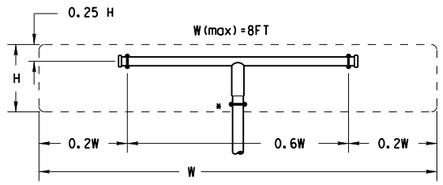
GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

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

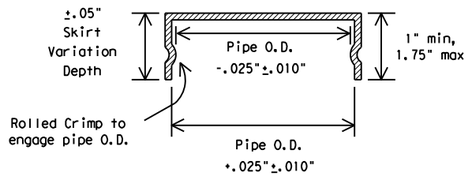
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)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



All dimensions are in english unless detailed otherwise.

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

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

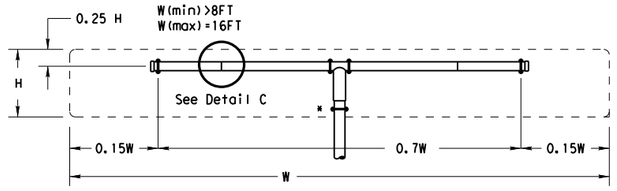
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311

DIST	COUNTY	SHEET NO.
WAC	McLENNAN	266

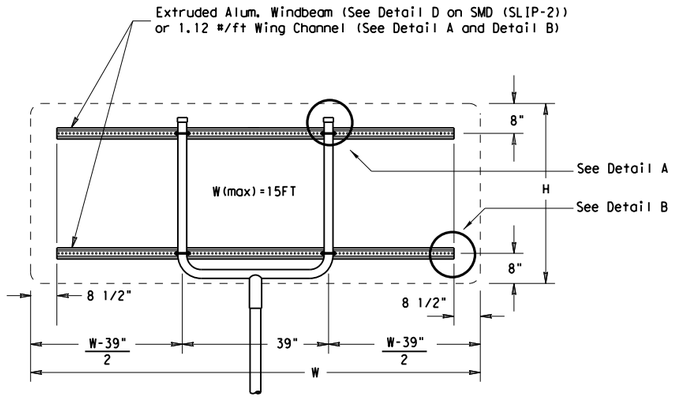
9-08 REVISIONS

DATE:
FILE:

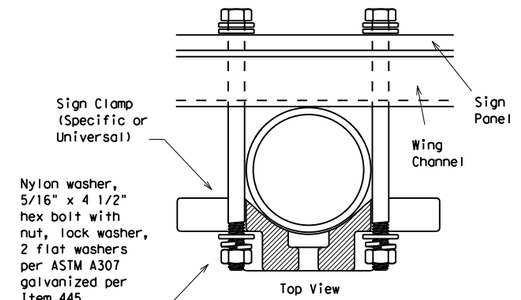


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

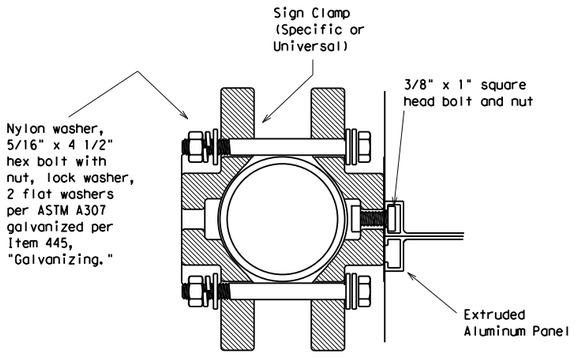
(* - See Note 12)



SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

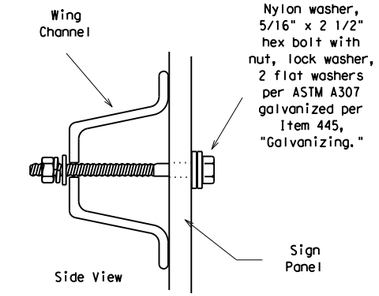


Detail A

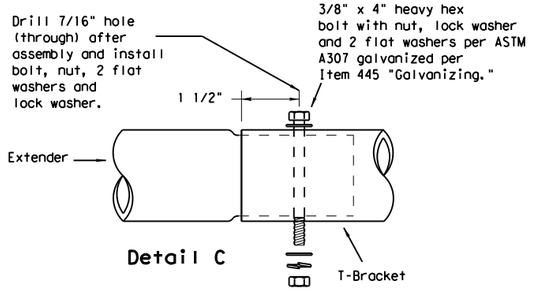


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET

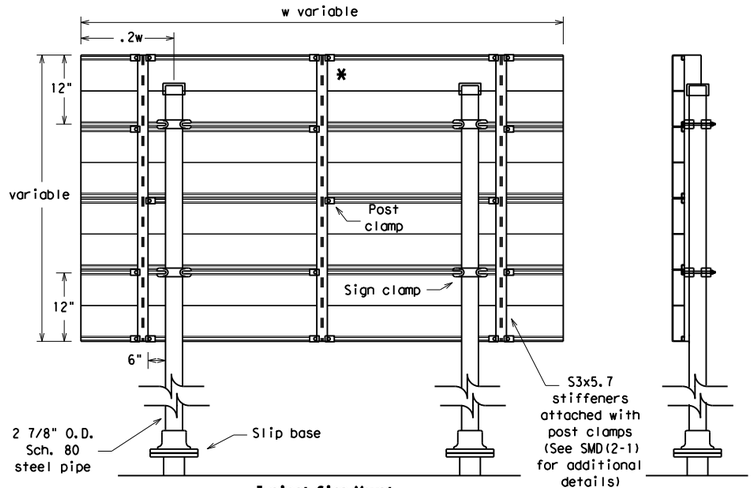


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

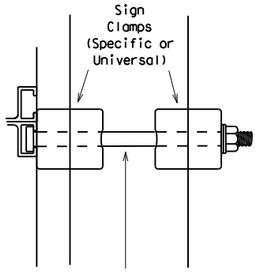


Typical Sign Mount

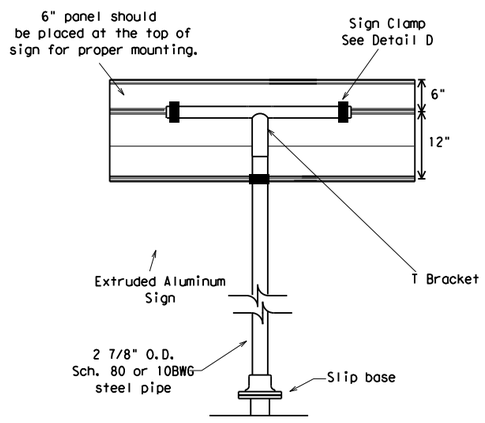
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

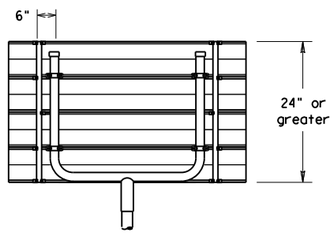
See Detail E
for clamp installation



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

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

REQUIRED SUPPORT

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS
9-08

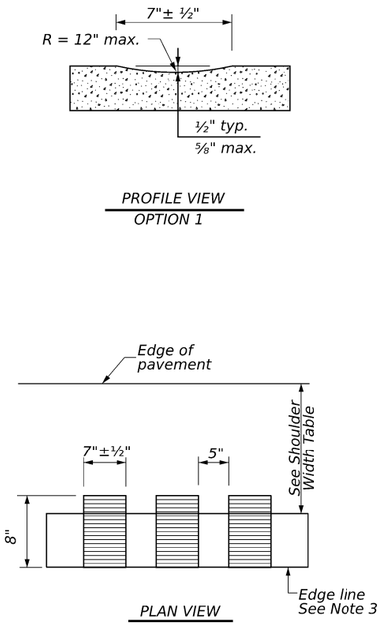
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311

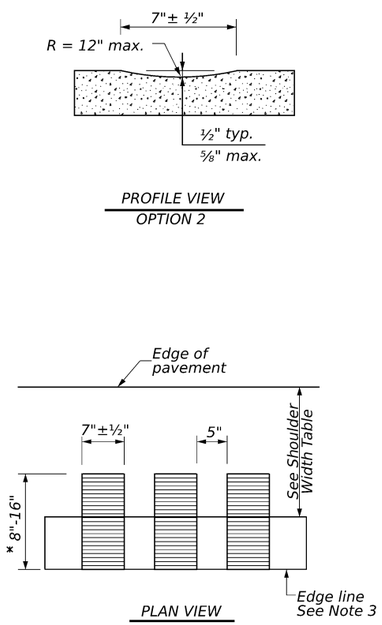
DIST	COUNTY	SHEET NO.
WAC	McLENNAN	267

DATE:
FILE:

DATE:
FILE:

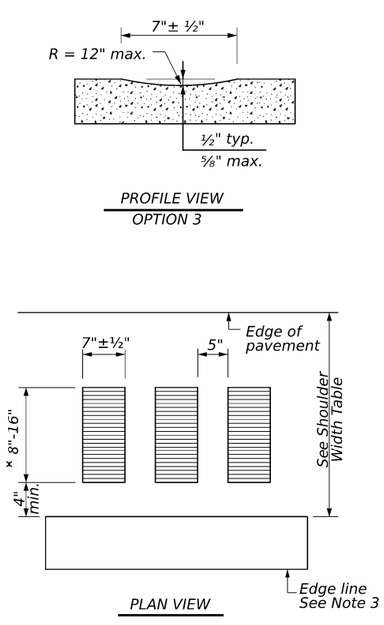


CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



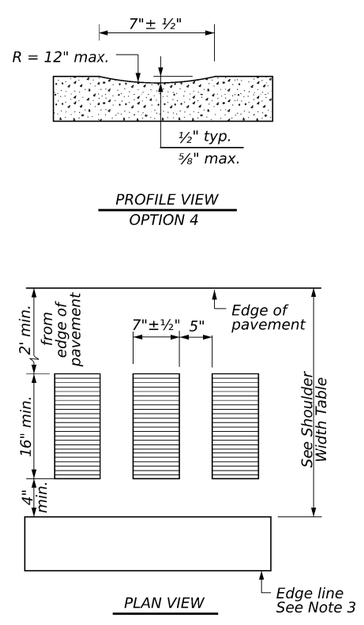
* This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

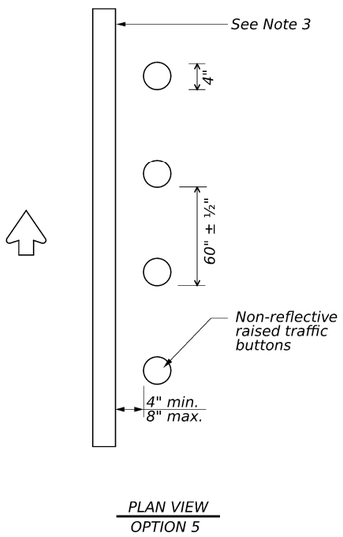


* This distance may vary based on width of shoulder

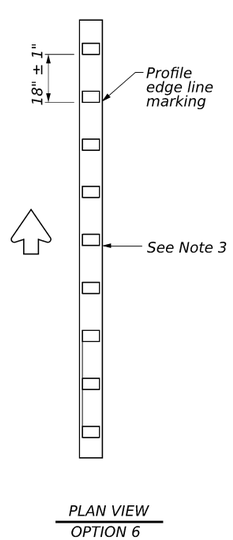
CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



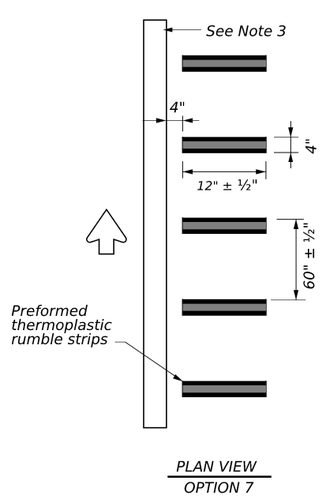
CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



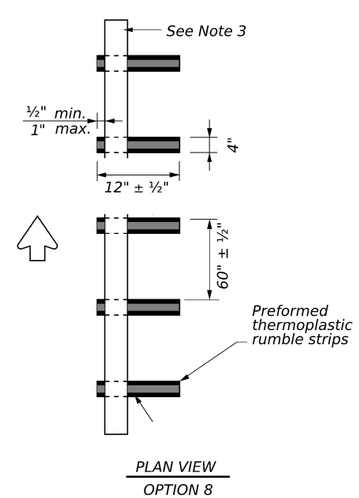
RAISED EDGE LINE (Rumble Strips)



PROFILE EDGE LINE MARKINGS (Rumble Strips)



PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)



PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5, 6 or 8	Option 1, 2, 3 5, 6 or 7	Option 2, 4, 5 6 or 7

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) and FPM(1) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the Shoulder Width Table below for determining what options may be used for edge line rumble strips.
5. Breaks in edge line rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections, or driveways with high usage of large trucks when installed on conventional highways.
6. Rumble strips shall not be placed across exit or entrance ramps, acceleration or deceleration lanes, crossovers, gore areas, or intersections with other roadways.
7. Consideration should be given to noise levels when edgeline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

9. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
10. Pavement markings can be applied over milled shoulder rumble strips to create an edge line rumble strip.

WHEN INSTALLING RAISED OR PROFILE EDGE LINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edge line when used as a rumble strip. The color of the button should match the color of the adjacent edge line marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.
15. Raised profile thermoplastic markings used as edge lines may substitute for buttons.

Texas Department of Transportation

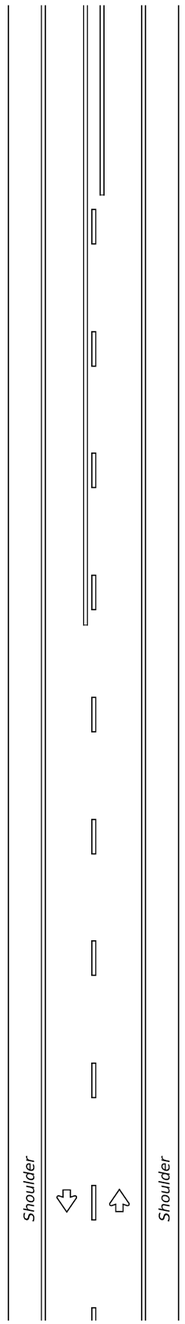
Traffic Safety Division Standard

EDGE LINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23

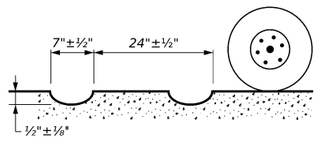
FILE: rs(2)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
10-13 1-23	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		268

DATE:
FILE:

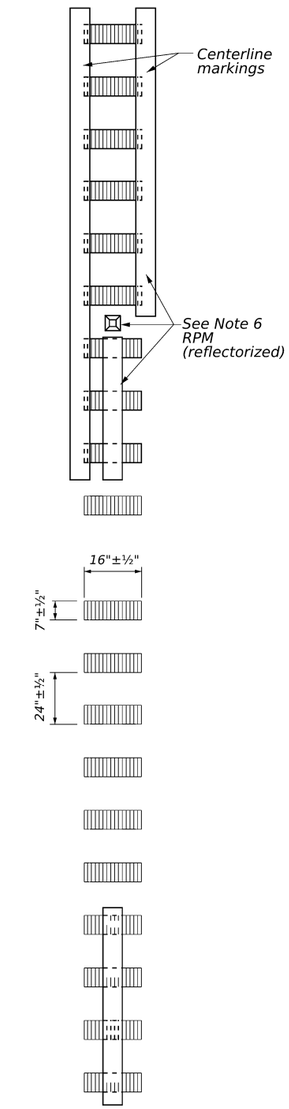
CENTERLINE RUMBLE STRIPS



TWO LANE TWO-WAY HIGHWAYS

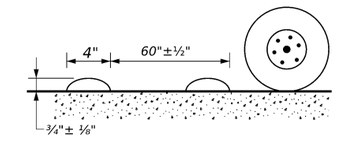


PROFILE VIEW

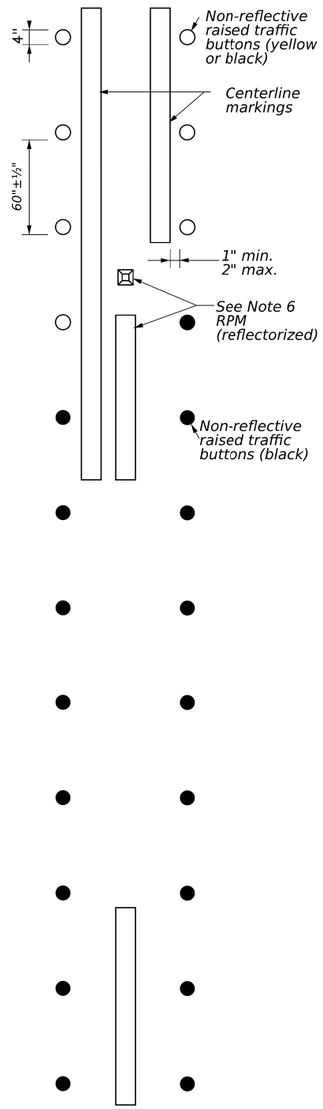


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

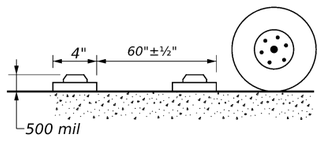


PROFILE VIEW

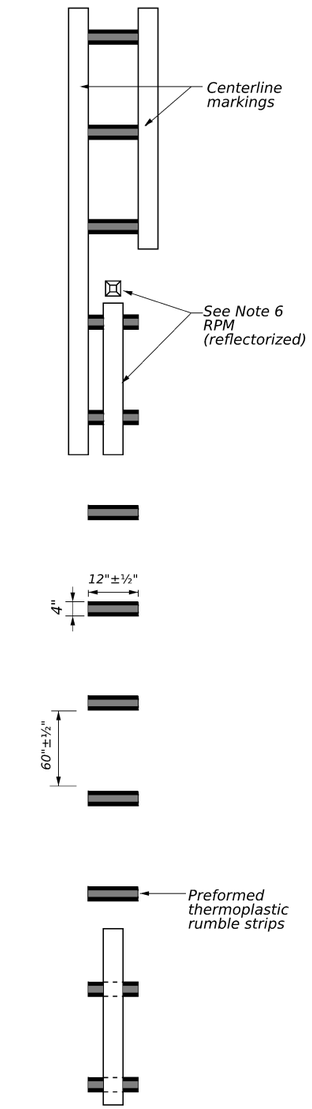


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

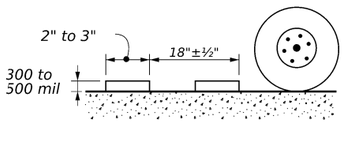


PROFILE VIEW

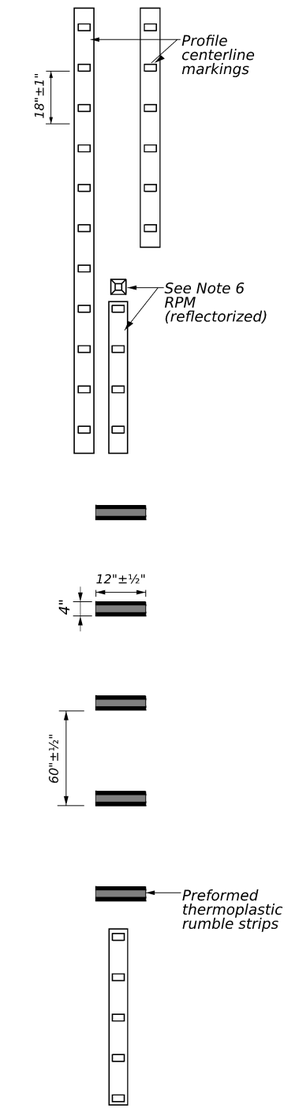


PLAN VIEW
OPTION 3

PREFORMED THERMOPLASTIC RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC RUMBLE STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edge line rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections or driveways with high usage of large trucks.
6. Use standard sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.
12. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING EDGE LINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

13. See standard sheet RS(2).

Texas Department of Transportation

Traffic Safety Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23

FILE: rs(4)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
10-13 1-23	DIST	COUNTY		SHEET NO.
	WAC	McLENNAN		269

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 soil disturbing activity and for projects that have Environmental, Permits, Issues, and Commitments (EPICs) dependent on stormwater controls and water quality measures TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office, Area Office, or electronically.

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):
2174-01-018

1.2 PROJECT LIMITS:
From: FM 308

To: SH 31

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 31.7314964 ,(Long) -97.0179313

END: (Lat) 31.6791652 ,(Long) -96.9688590

1.4 TOTAL PROJECT AREA (Acres): 38.5

1.5 TOTAL AREA TO BE DISTURBED (Acres): 18.8

1.6 NATURE OF CONSTRUCTION ACTIVITY:
Pavement reconstruction and widening, drainage upgrades, signing and pavement markings

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Tinn clay, 0 to 1% slopes	Various locations along route at creek crossings, slightly well drained, low rate of runoff, slight erosion potential
Heiden clay, 5 to 8% slopes	Various locations along route, well drained, high rate of runoff, moderate erosion potential
Ferris clay, 8 to 15% slopes	Various locations along route, well drained, high rate of runoff, high erosion potential
Heiden clay, 1 to 3% slopes	Various locations along route, slightly well drained, low rate of runoff, slight erosion potential
Houston Black clay, 1 to 3% slopes	Various locations along route, slightly well drained, low rate of runoff, slight erosion potential
Burleson clay, 0 to 1% slopes	Various locations along route, slightly well drained, low rate of runoff, slight erosion potential
Branyon clay, 0 to 1% slopes	Various locations along route, slightly well drained, low rate of runoff, slight erosion potential

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
Sediment Control Fencing	SW3P Plan Sheets

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: _____
☐ 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
Tehuacana Creek (1242N)	Brazos River Above Navasota River (1242)

* 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

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

 July 2023

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			270
STATE	STATE DIST.	COUNTY	
TEXAS		McLENNAN	
CONT.	SECT.	JOB	HIGHWAY NO.
2174	01	018	FM 2311

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
- [ ] [ ] Soil Retention Blankets
- [ ] [ ] Geotextiles
- [ ] [ ] Mulching/ Hydromulching
- [ ] [ ] Soil Surface Treatments
- [X] [ ] Temporary Seeding
- [ ] [X] Permanent Planting, Sodding or Seeding
- [ ] [ ] 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
  - [ ] 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
- [ ] Daily street sweeping
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- [ ] Chemical Management
- [ ] Concrete and Materials Waste Management
- [ ] Debris and Trash Management
- [ ] Dust Control
- [ ] 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:

- [X] Fire hydrant flushings
- [X] Irrigation drainage
- [X] Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- [X] Potable water sources
- [X] Springs
- [X] Uncontaminated groundwater
- [X] Water used to wash vehicles or control dust
- [X] Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 DEWATERING:

Dewatering discharges of accumulated stormwater, groundwater, and surface water including discharges from dewatering of trenches, excavations, foundations, vaults, and other points of accumulation are prohibited unless managed by appropriate controls to prevent and minimize the offsite discharge of sediment and other pollutants.

2.9 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.

When dewatering activities are present, a daily inspection will be conducted once per day during those activities and documented in accordance with CGP and TxDOT requirements.

2.10 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)

July 2023 Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			271
STATE	STATE DIST.	COUNTY	
TEXAS		McLENNAN	
CONT.	SECT.	JOB	HIGHWAY NO.
2174	01	018	FM 2311

DATE:
FILE:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. Project will disturb more than 5 acres. Submit NOI to TCEQ and the engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required

☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1. NWP 14 will be required for the following locations:
   15+26.23, 71+00, 78+62.96, 112+15.52, 132+23.19, 196+73.48, 210+35.93, 254+60.31
2. Wetland areas between stations 53+00 and 62+50 (RT) & stations 71+00 and 85+00 (LT). must be avoided.
3.
4.

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
2.
3.
4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ Required Action

Action No.

1. SEE STATEMENT ABOVE
2.
3.
4.

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

☐ No Action Required ☒ Required Action

Action No.

1. Comply with Migratory Bird Treaty Act (MBTA)
   (Migratory bird nesting season is from March 1 - September 1)
2. SEE STATEMENT BELOW
3.
4.

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. Lead paint to be removed by contractor prior to demolition
2.
3.

VII. OTHER ENVIRONMENTAL ISSUES

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

☒ No Action Required ☐ Required Action

Action No.

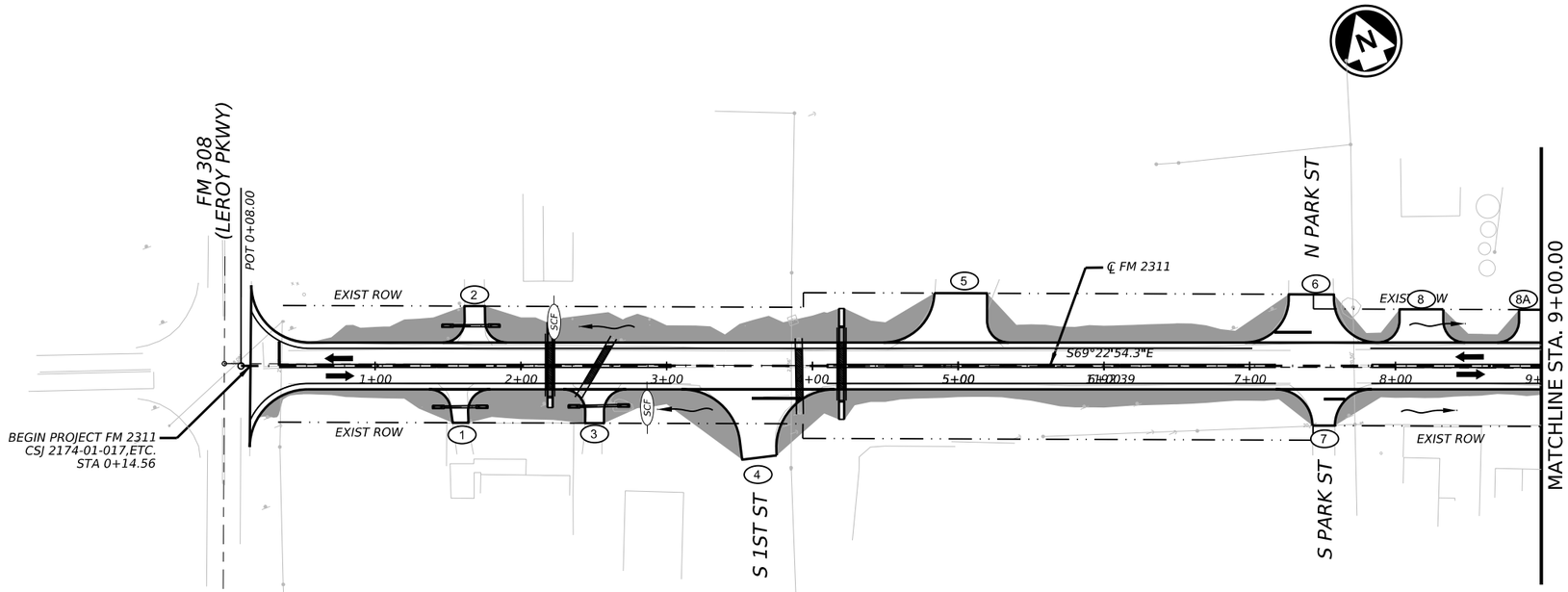
1.
2.
3.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
© TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	2174	01	018	FM 2311
12-12-2011 (DS)	DIST	COUNTY		SHEET NO.
05-07-14 ADDED NOTE SECTION IV.	WAC	MCLENNAN		272
01-23-2015 SECTION II CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.				

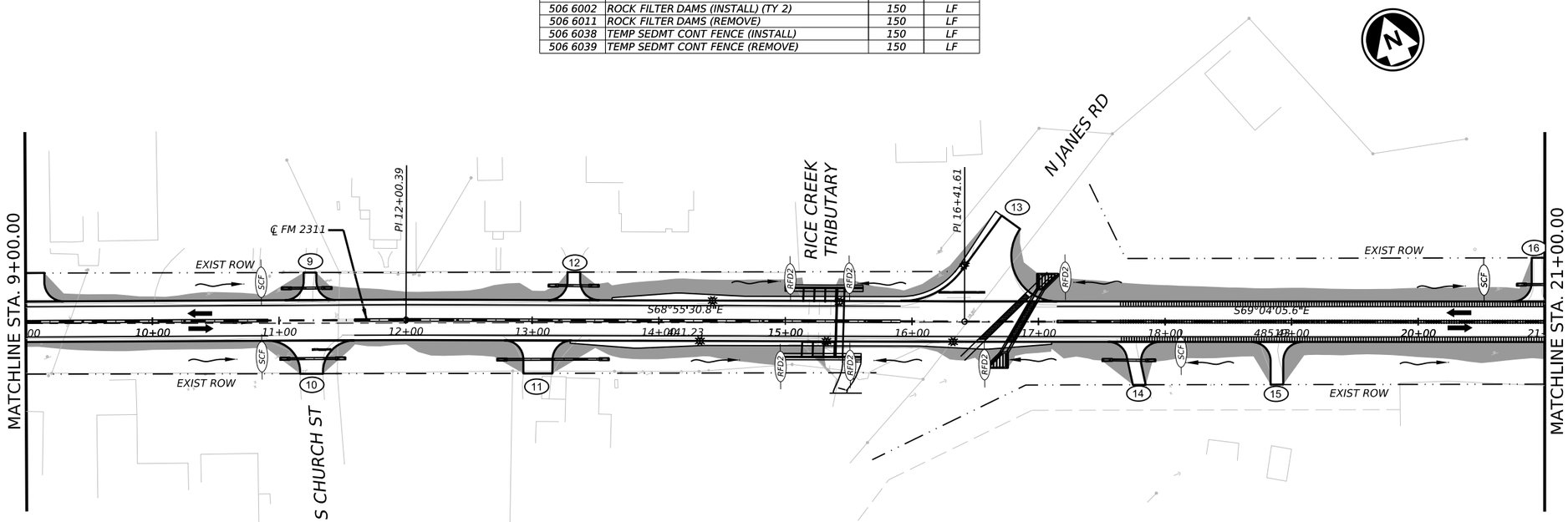


LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SEEDING
- SCF — SEDIMENT CONTROL FENCE (TEMP)
- RFD 2 — ROCK FILTER DAM (RFD 2)
- DIRECTION OF WATER FLOW

SWP3 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
160 6003	FURNISHING AND PLACING TOPSOIL (4")	4,556	SY
164 6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	4,556	SY
164 6071	BROADCAST SEED (TEMP) (WARM OR COOL)	4,556	SY
168 6001	VEGETATIVE WATERING	74	MG
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	150	LF
506 6011	ROCK FILTER DAMS (REMOVE)	150	LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	150	LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	150	LF



0 50 100
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
1/26/2024
Randy W. Harris, PE

AtkinsRéalis
TBPE REG. # F-474

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FM 2311

SWP3 LAYOUT
BEGIN TO STA 21+00

SCALE: 1" = 100' SHEET 1 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		273

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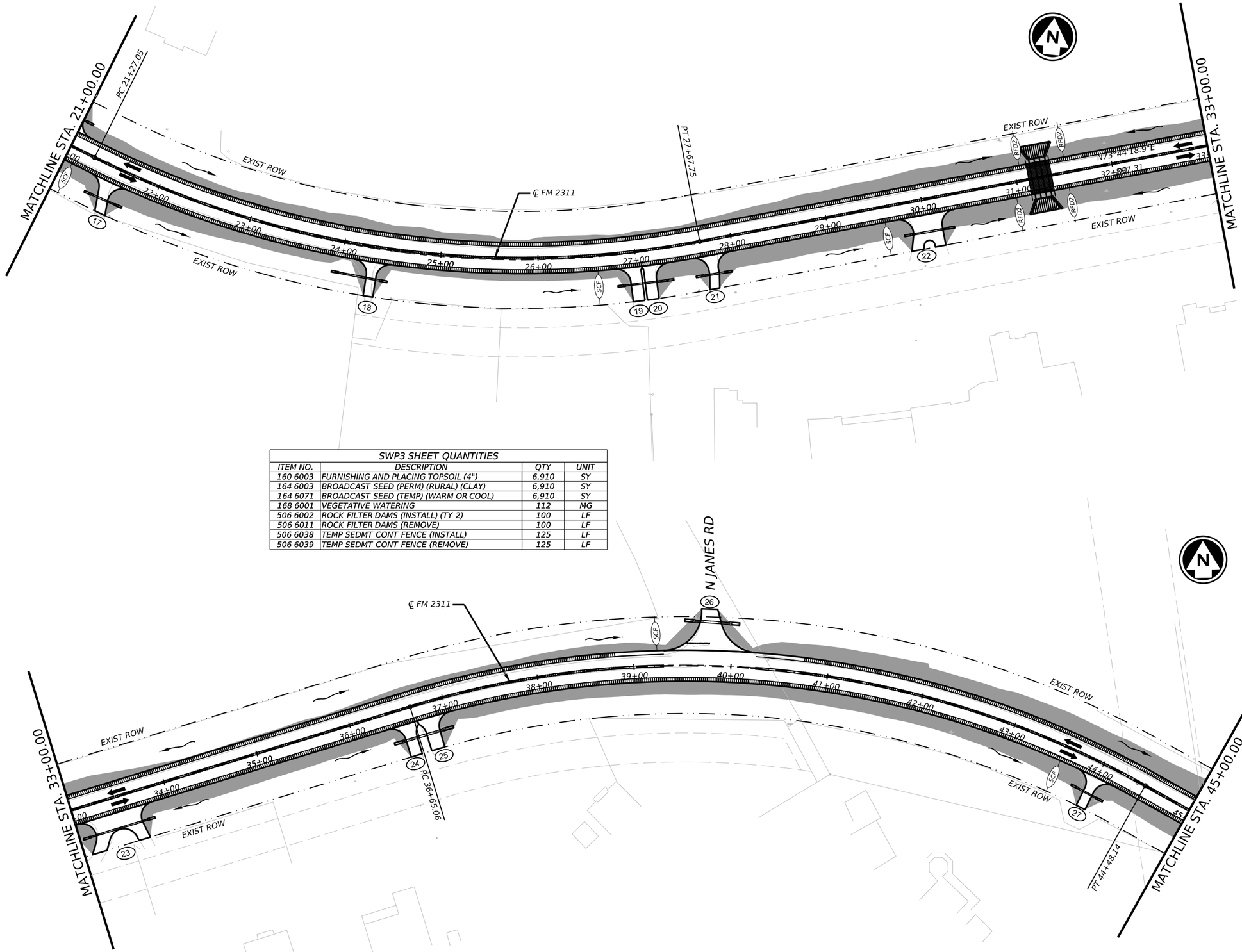

SWP3 SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
160 6003	FURNISHING AND PLACING TOPSOIL (4")	6,910	SY
164 6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	6,910	SY
164 6071	BROADCAST SEED (TEMP) (WARM OR COOL)	6,910	SY
168 6001	VEGETATIVE WATERING	112	MG
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	100	LF
506 6011	ROCK FILTER DAMS (REMOVE)	100	LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	125	LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	125	LF

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SEEDING
- SCF — SEDIMENT CONTROL FENCE (TEMP)
- RFD 2 — ROCK FILTER DAM (RFD 2)
- DIRECTION OF WATER FLOW

0 50 100
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
1/26/2024
Randy W. Harris, PE

AtkinsRéalis
TBPE REG. # F-474

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FM 2311

SWP3 LAYOUT
STA 21+00 TO STA 45+00

SCALE: 1" = 100' SHEET 2 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		274

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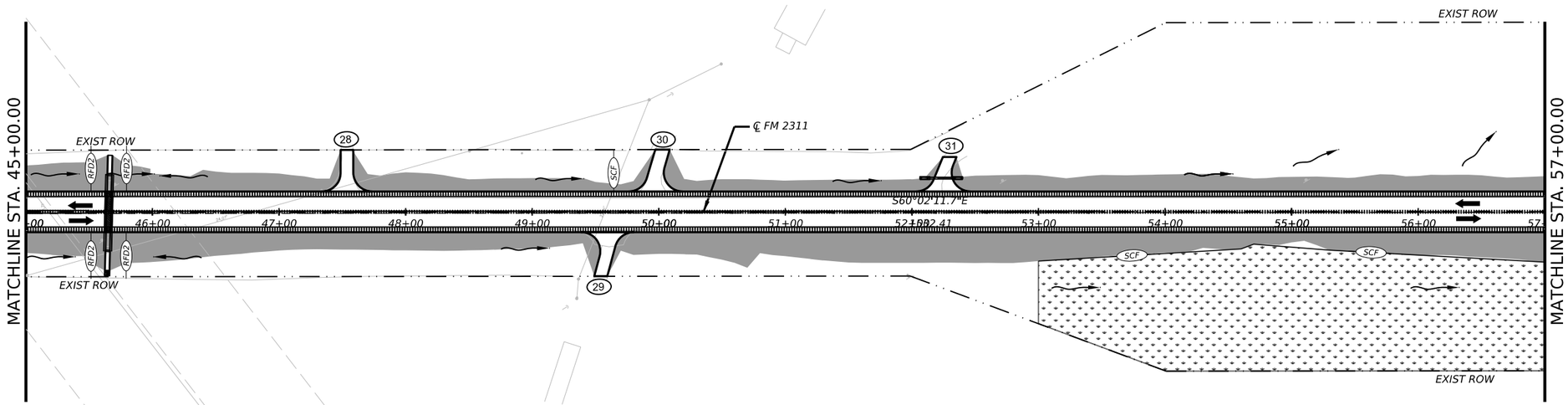
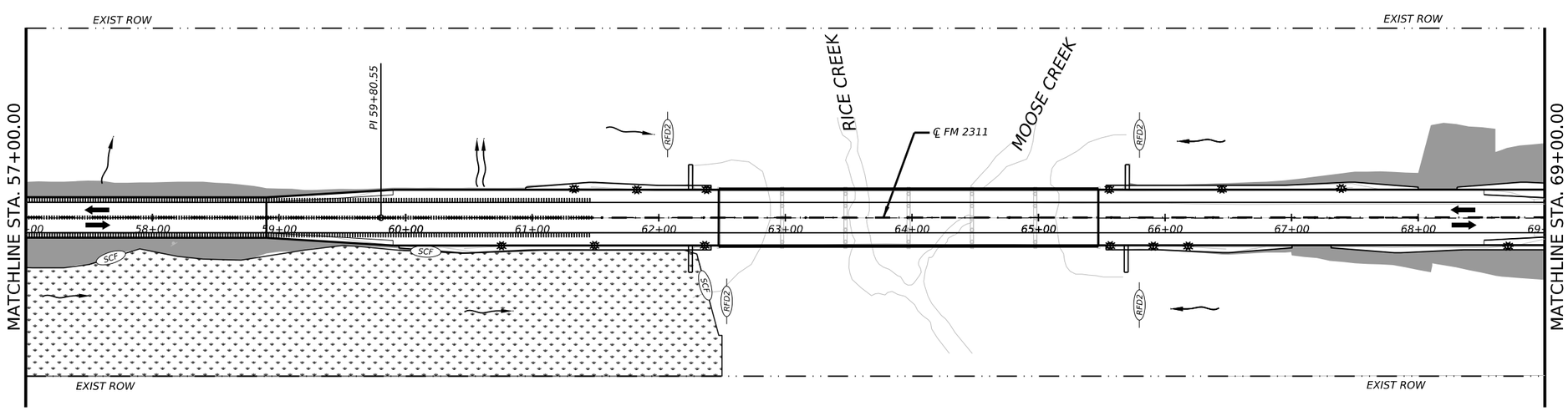


LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SEEDING
- SEDIMENT CONTROL FENCE (TEMP)
- ROCK FILTER DAM (RFD 2)
- DIRECTION OF WATER FLOW
- EXISTING WETLAND AREA

SWP3 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
160 6003	FURNISHING AND PLACING TOPSOIL (4")	5,674	SY
164 6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	5,674	SY
164 6071	BROADCAST SEED (TEMP) (WARM OR COOL)	5,674	SY
168 6001	VEGETATIVE WATERING	92	MG
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	200	LF
506 6011	ROCK FILTER DAMS (REMOVE)	200	LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	1,063	LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	1,063	LF



0 50 100
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
1/26/2024
Randy W. Harris, PE

AtkinsRéalis
TBPE REG. # F-474

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FM 2311

SWP3 LAYOUT
STA 45+00 TO STA 69+00

SCALE: 1" = 100' SHEET 3 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		275

DATE: 1/26/2024 12:18:14 PM
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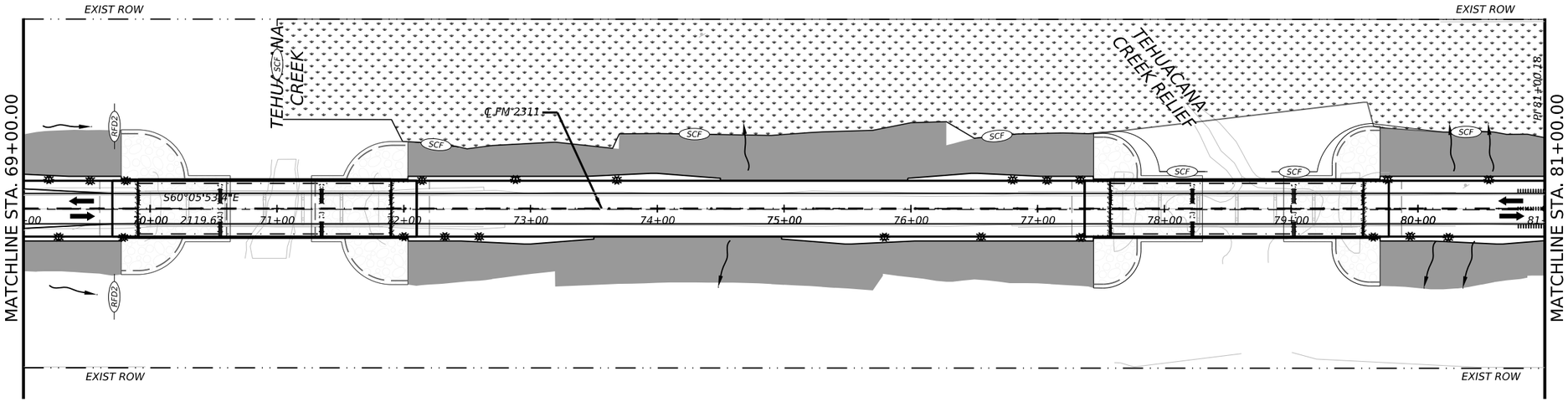
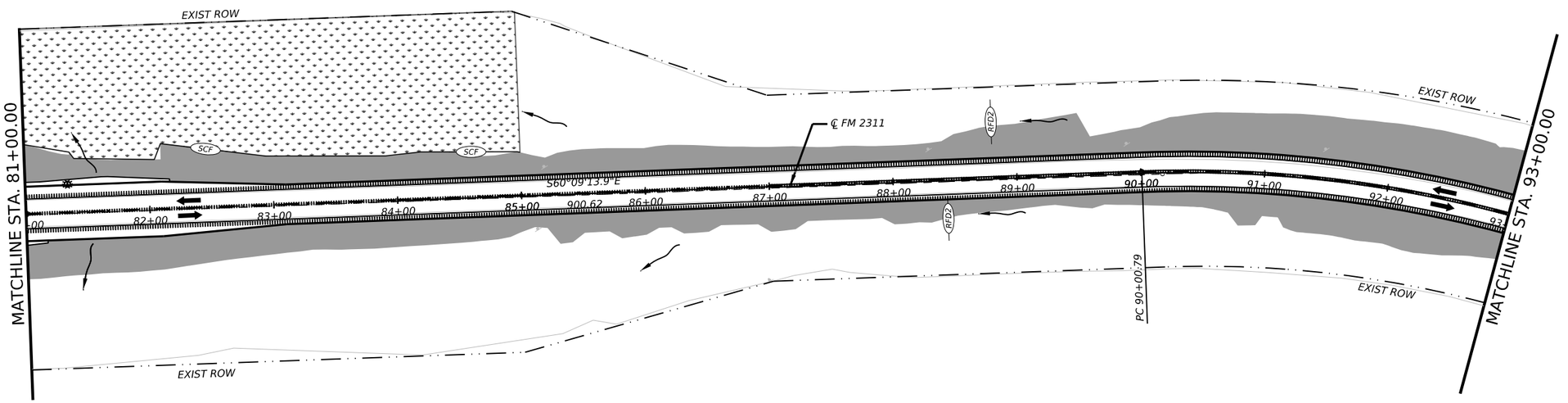
CK DW CK DW



LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SEEDING
- SEDIMENT CONTROL FENCE (TEMP)
- ROCK FILTER DAM (RFD 2)
- DIRECTION OF WATER FLOW
- EXISTING WETLAND AREA

SWP3 SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
160 6003	FURNISHING AND PLACING TOPSOIL (4")	11,220	SY
164 6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	11,220	SY
164 6071	BROADCAST SEED (TEMP) (WARM OR COOL)	11,220	SY
168 6001	VEGETATIVE WATERING	182	MG
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	100	LF
506 6011	ROCK FILTER DAMS (REMOVE)	100	LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	1,532	LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	1,532	LF



0 50 100
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
1/26/2024
Randy W. Harris, PE

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FM 2311

SWP3 LAYOUT
STA 69+00 TO STA 93+00

SCALE: 1" = 100' SHEET 4 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		276

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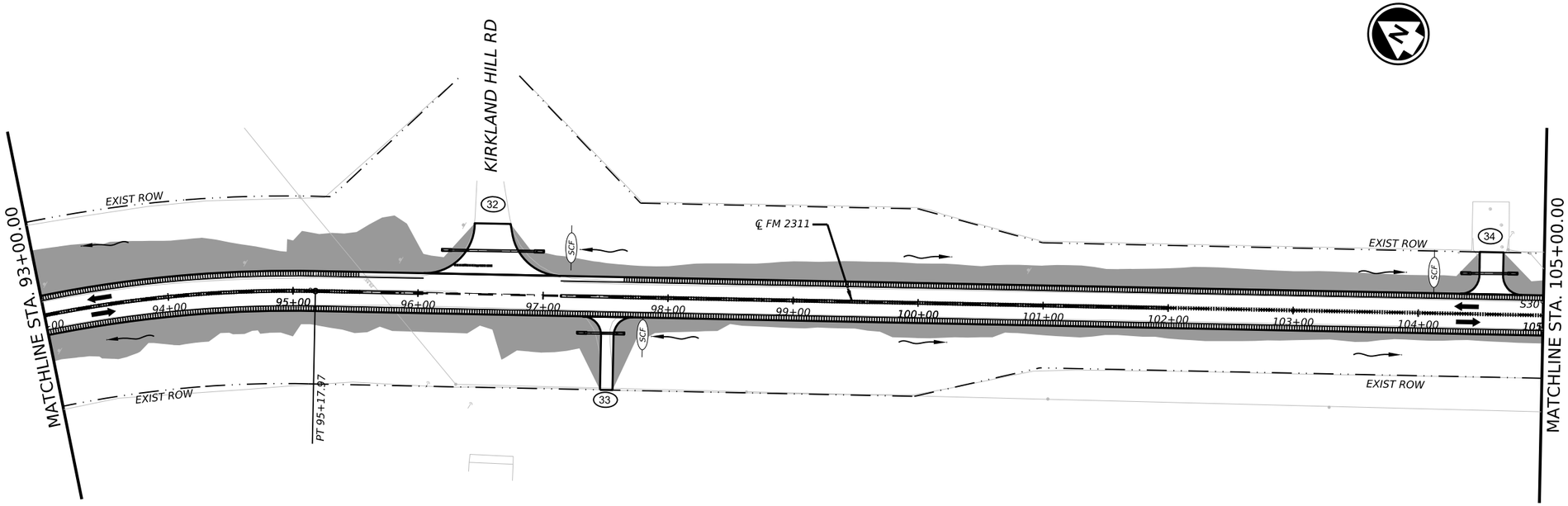
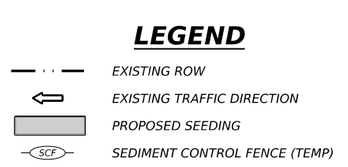
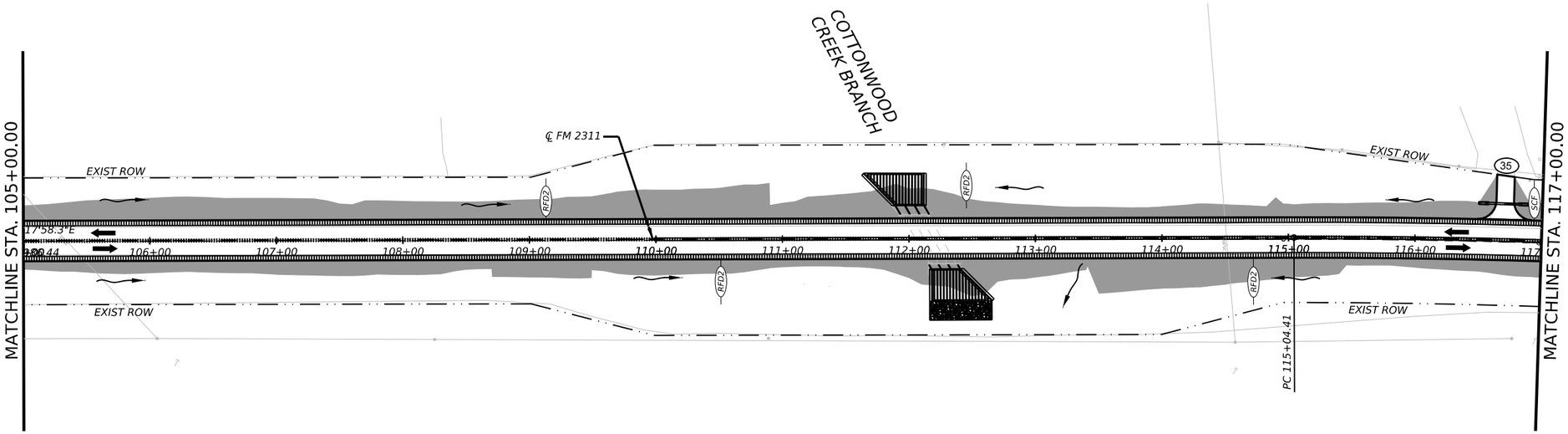




SWP3 SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
160 6003	FURNISHING AND PLACING TOPSOIL (4")	7,946	SY
164 6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	7,946	SY
164 6071	BROADCAST SEED (TEMP) (WARM OR COOL)	7,946	SY
168 6001	VEGITATIVE WATERING	129	MG
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	100	LF
506 6011	ROCK FILTER DAMS (REMOVE)	100	LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	100	LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	100	LF



0 50 100
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
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1/26/2024
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FM 2311

SWP3 LAYOUT
STA 93+00 TO STA 117+00

SCALE: 1" = 100' SHEET 5 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		277

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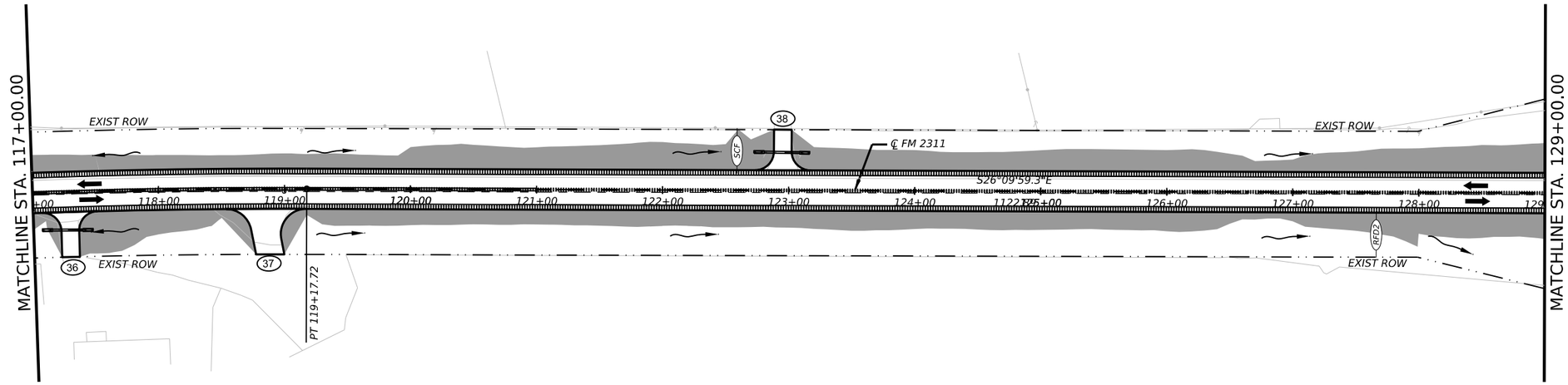
DW
CK
DW

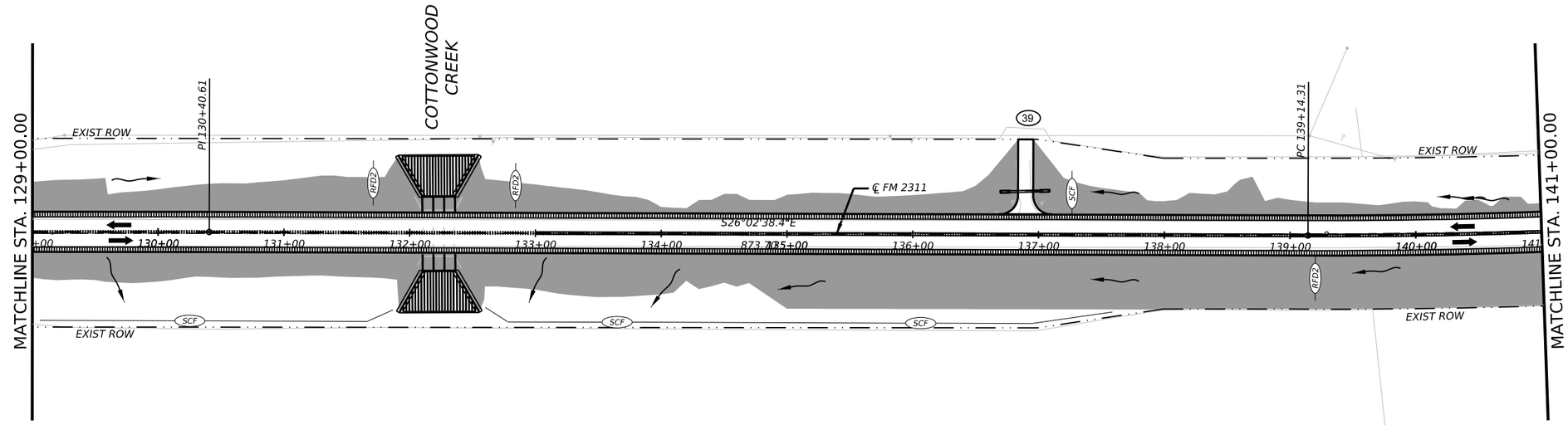


LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SEEDING
- SCF — SEDIMENT CONTROL FENCE (TEMP)
- RFD 2 — ROCK FILTER DAM (RFD 2)
- DIRECTION OF WATER FLOW

SWP3 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
160 6003	FURNISHING AND PLACING TOPSOIL (4")	11,054	SY
164 6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	11,054	SY
164 6071	BROADCAST SEED (TEMP) (WARM OR COOL)	11,054	SY
168 6001	VEGETATIVE WATERING	180	MG
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	100	LF
506 6011	ROCK FILTER DAMS (REMOVE)	100	LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	850	LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	850	LF



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SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
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FM 2311

SWP3 LAYOUT
STA 117+00 TO STA 141+00

SCALE: 1" = 100' SHEET 6 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		278

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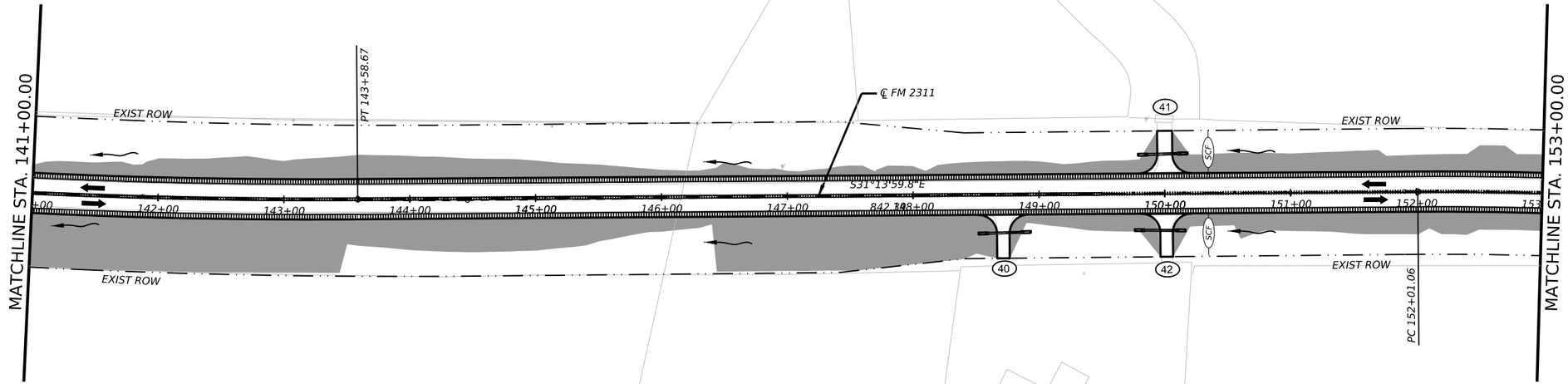
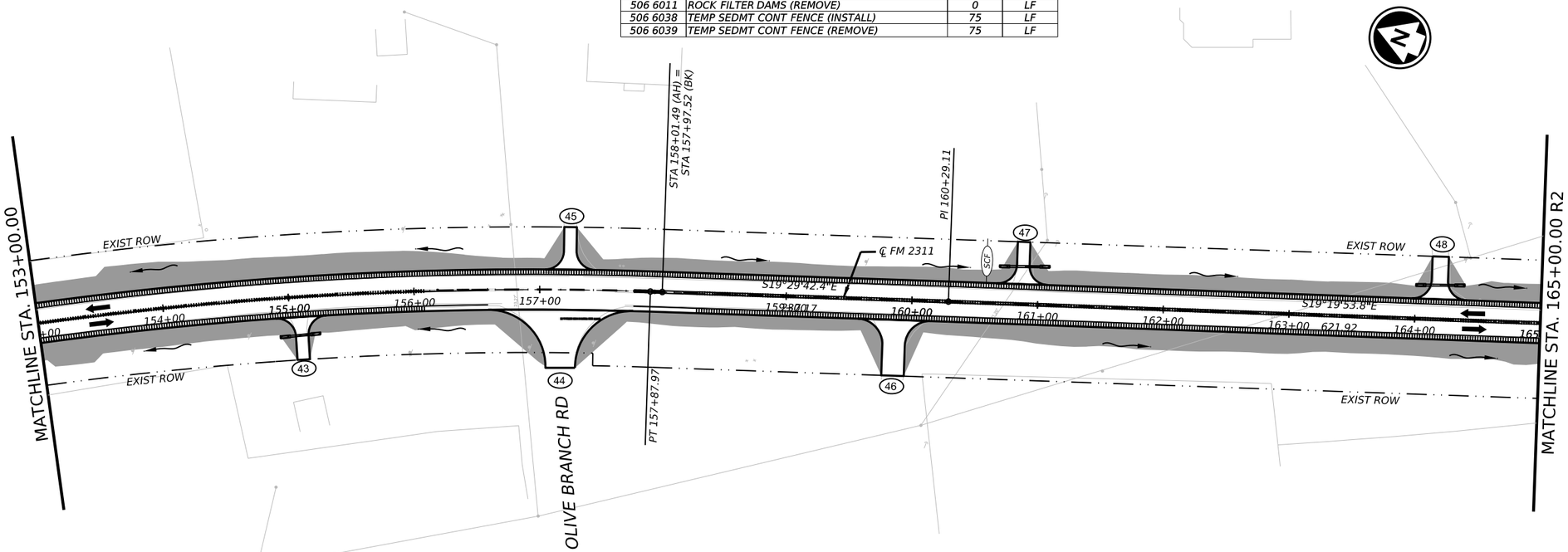


LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SEEDING
- SCF — SEDIMENT CONTROL FENCE (TEMP)
- RFD 2 — ROCK FILTER DAM (RFD 2)
- DIRECTION OF WATER FLOW

SWP3 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
160 6003	FURNISHING AND PLACING TOPSOIL (4")	8,751	SY
164 6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	8,751	SY
164 6071	BROADCAST SEED (TEMP) (WARM OR COOL)	8,751	SY
168 6001	VEGETATIVE WATERING	142	MG
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	0	LF
506 6011	ROCK FILTER DAMS (REMOVE)	0	LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	75	LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	75	LF



0 50 100
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
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1/26/2024
Randy W. Harris, PE

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FM 2311

SWP3 LAYOUT
STA 141+00 TO STA 165+00

SCALE: 1" = 100' SHEET 7 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		279

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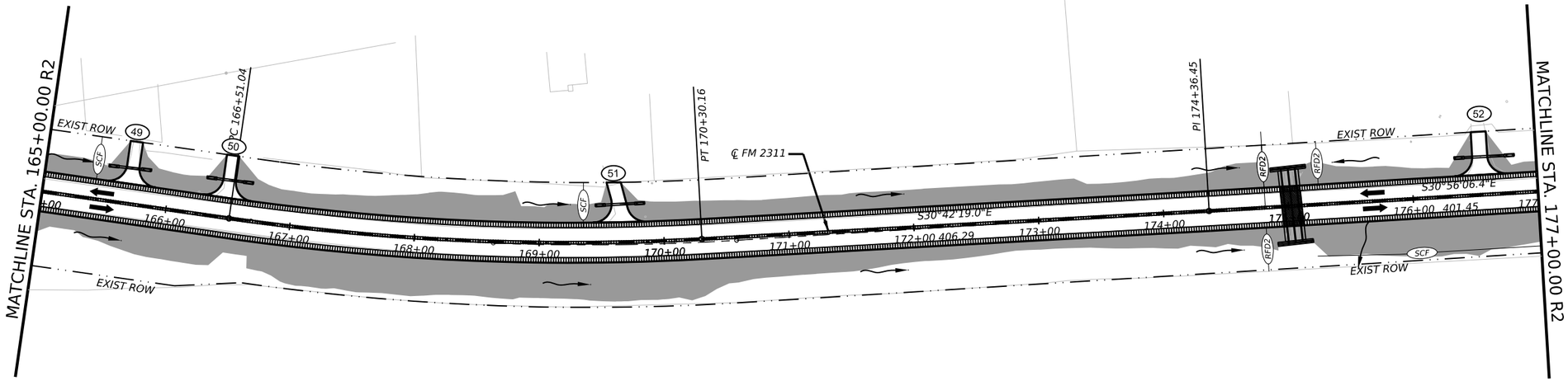

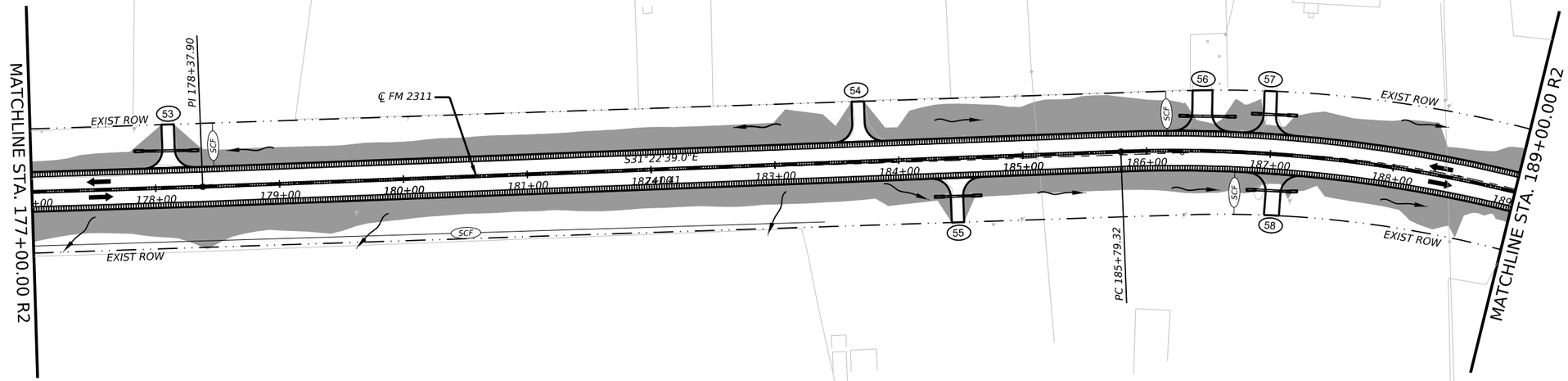

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SEEDING
- SCF — SEDIMENT CONTROL FENCE (TEMP)
- RFD 2 — ROCK FILTER DAM (RFD 2)
- DIRECTION OF WATER FLOW

SWP3 SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
160 6003	FURNISHING AND PLACING TOPSOIL (4")	9,526	SY
164 6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	9,526	SY
164 6071	BROADCAST SEED (TEMP) (WARM OR COOL)	9,526	SY
168 6001	VEGETATIVE WATERING	155	MG
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	75	LF
506 6011	ROCK FILTER DAMS (REMOVE)	75	LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	925	LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	925	LF

0 50 100
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
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1/26/2024
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FM 2311

SWP3 LAYOUT
STA 165+00 TO STA 189+00

SCALE: 1" = 100' SHEET 8 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		280

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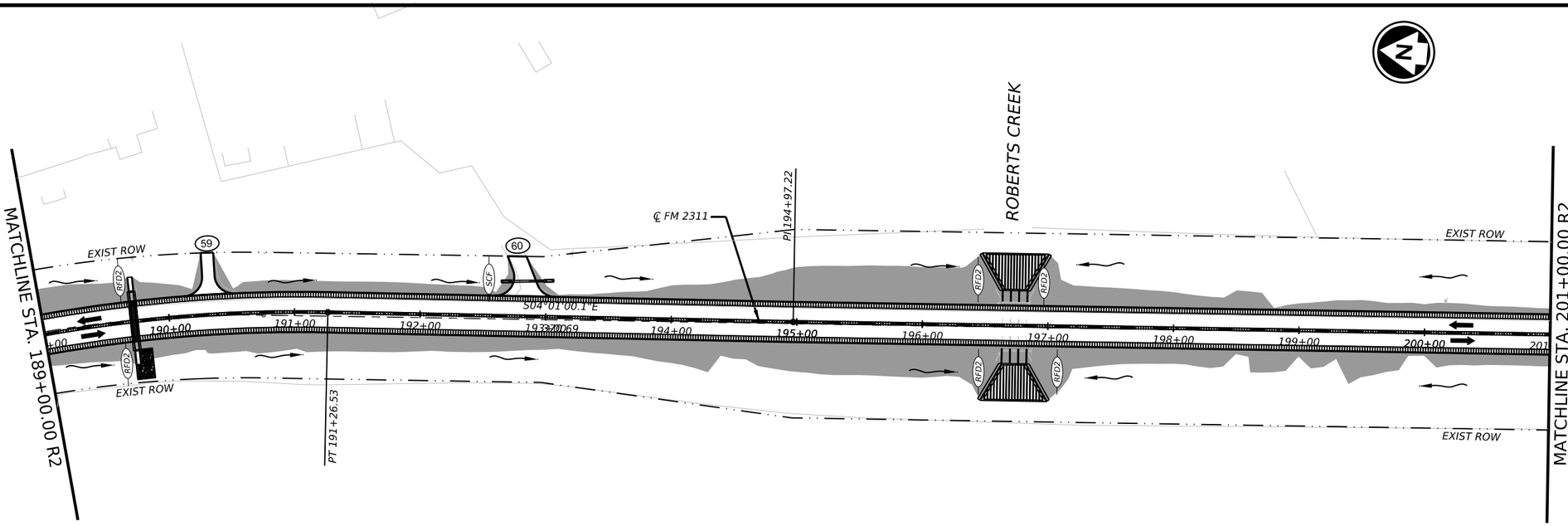
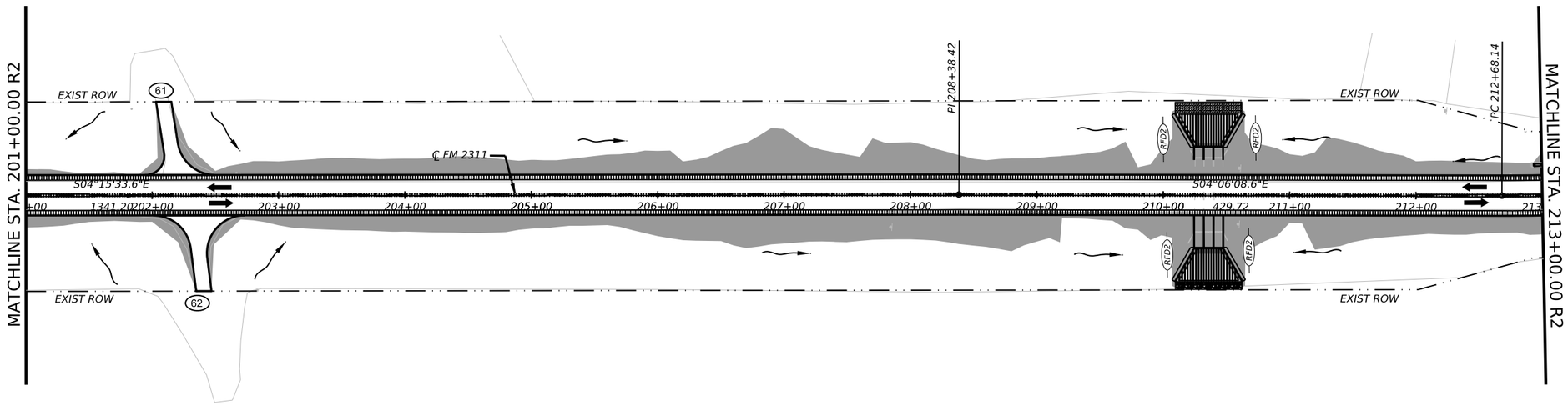


SWP3 SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
160 6003	FURNISHING AND PLACING TOPSOIL (4")	7,830	SY
164 6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	7,830	SY
164 6071	BROADCAST SEED (TEMP) (WARM OR COOL)	7,830	SY
168 6001	VEGETATIVE WATERING	127	MG
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	250	LF
506 6011	ROCK FILTER DAMS (REMOVE)	250	LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	25	LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	25	LF



LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SEEDING
- SCF — SEDIMENT CONTROL FENCE (TEMP)
- RFD 2 — ROCK FILTER DAM (RFD 2)
- DIRECTION OF WATER FLOW

0 50 100
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
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1/26/2024
Randy W. Harris, PE,

AtkinsRéalis
TBPE REG. # F-474

Texas Department of Transportation

FM 2311

SWP3 LAYOUT
STA 189+00 TO STA 213+00

SCALE: 1" = 100' SHEET 9 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		281

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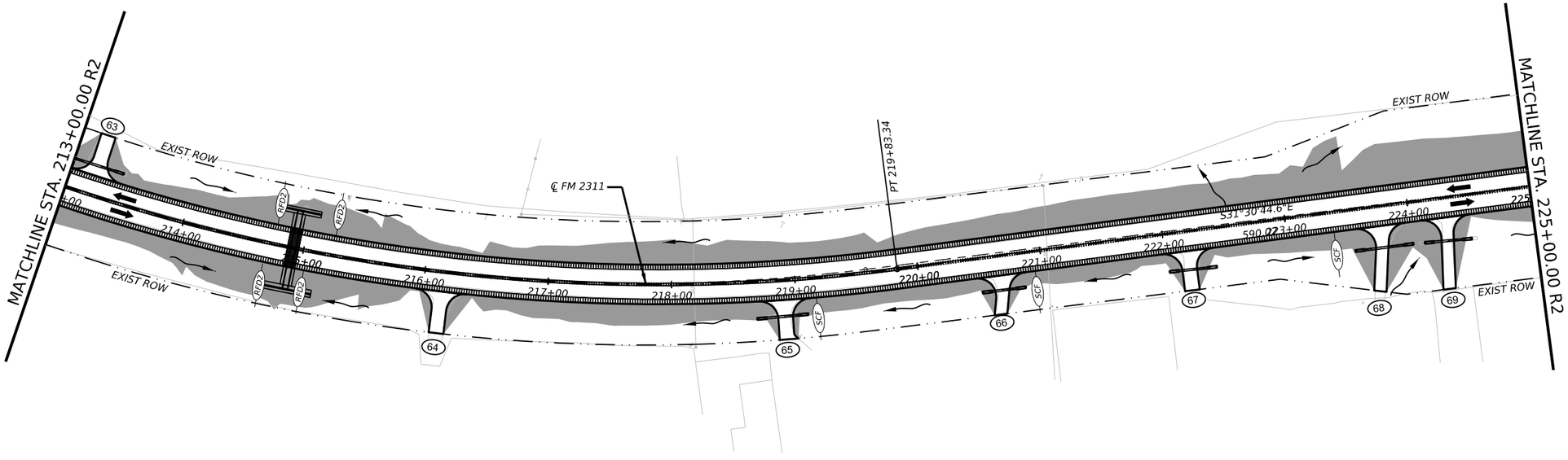
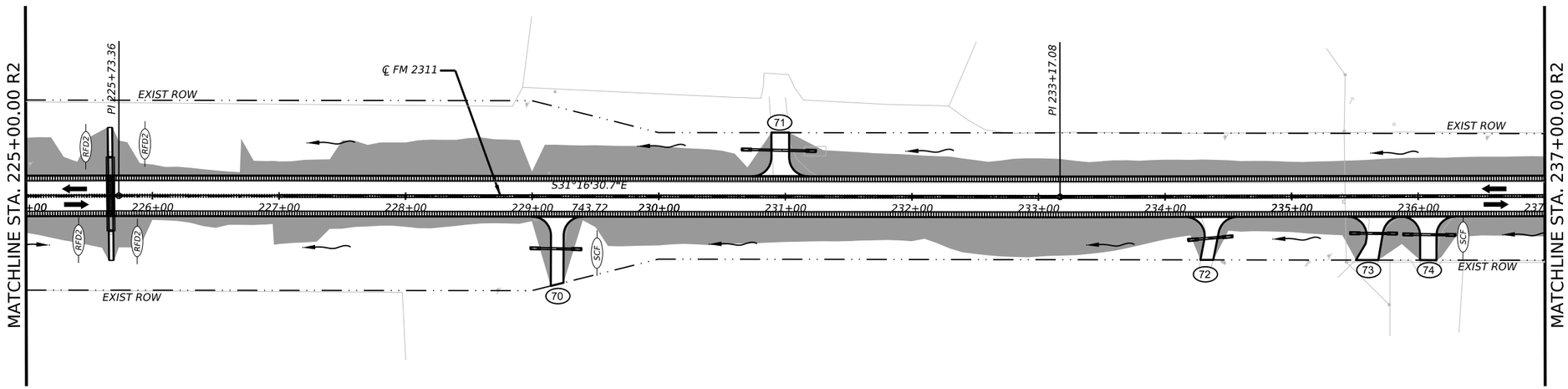


LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SEEDING
- SCF — SEDIMENT CONTROL FENCE (TEMP)
- RFD 2 — ROCK FILTER DAM (RFD 2)
- DIRECTION OF WATER FLOW

SWP3 SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
160 6003	FURNISHING AND PLACING TOPSOIL (4")	9,108	SY
164 6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	9,108	SY
164 6071	BROADCAST SEED (TEMP) (WARM OR COOL)	9,108	SY
168 6001	VEGETATIVE WATERING	148	MG
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	200	LF
506 6011	ROCK FILTER DAMS (REMOVE)	200	LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	125	LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	125	LF



0 50 100
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
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FM 2311

SWP3 LAYOUT
STA 213+00 TO STA 237+00

SCALE: 1" = 100' SHEET 10 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		282

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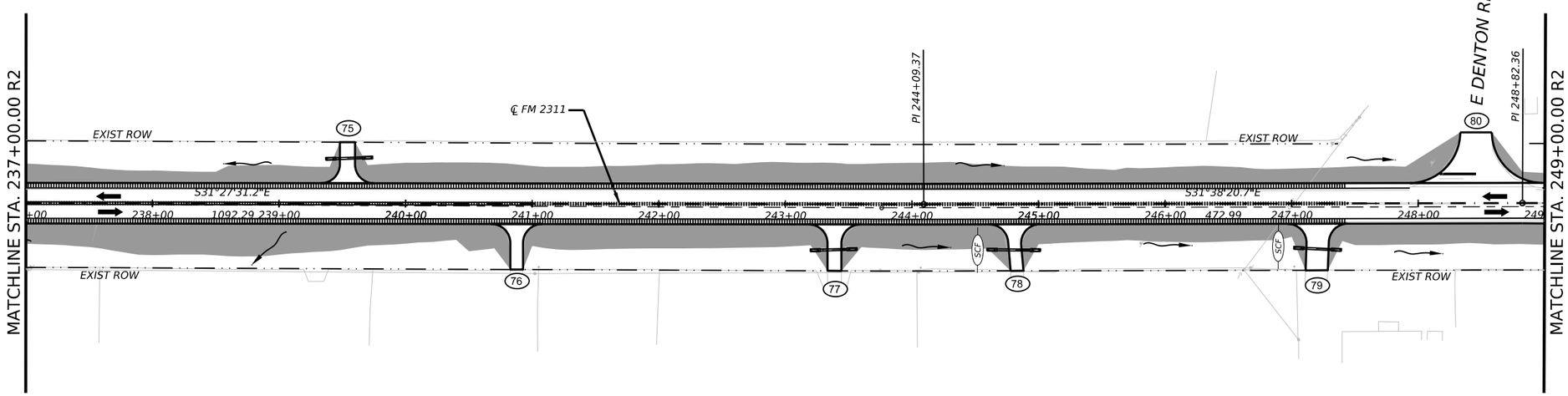

SWP3 SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
160 6003	FURNISHING AND PLACING TOPSOIL (4")	8,151	SY
164 6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	8,151	SY
164 6071	BROADCAST SEED (TEMP) (WARM OR COOL)	8,151	SY
168 6001	VEGETATIVE WATERING	132	MG
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	100	LF
506 6011	ROCK FILTER DAMS (REMOVE)	100	LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	25	LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	25	LF

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SEEDING
- SCF — SEDIMENT CONTROL FENCE (TEMP)
- RFD 2 — ROCK FILTER DAM (RFD 2)
- DIRECTION OF WATER FLOW

0 50 100
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
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FM 2311

SWP3 LAYOUT
STA 237+00 TO STA 261+00

SCALE: 1" = 100' SHEET 11 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		283

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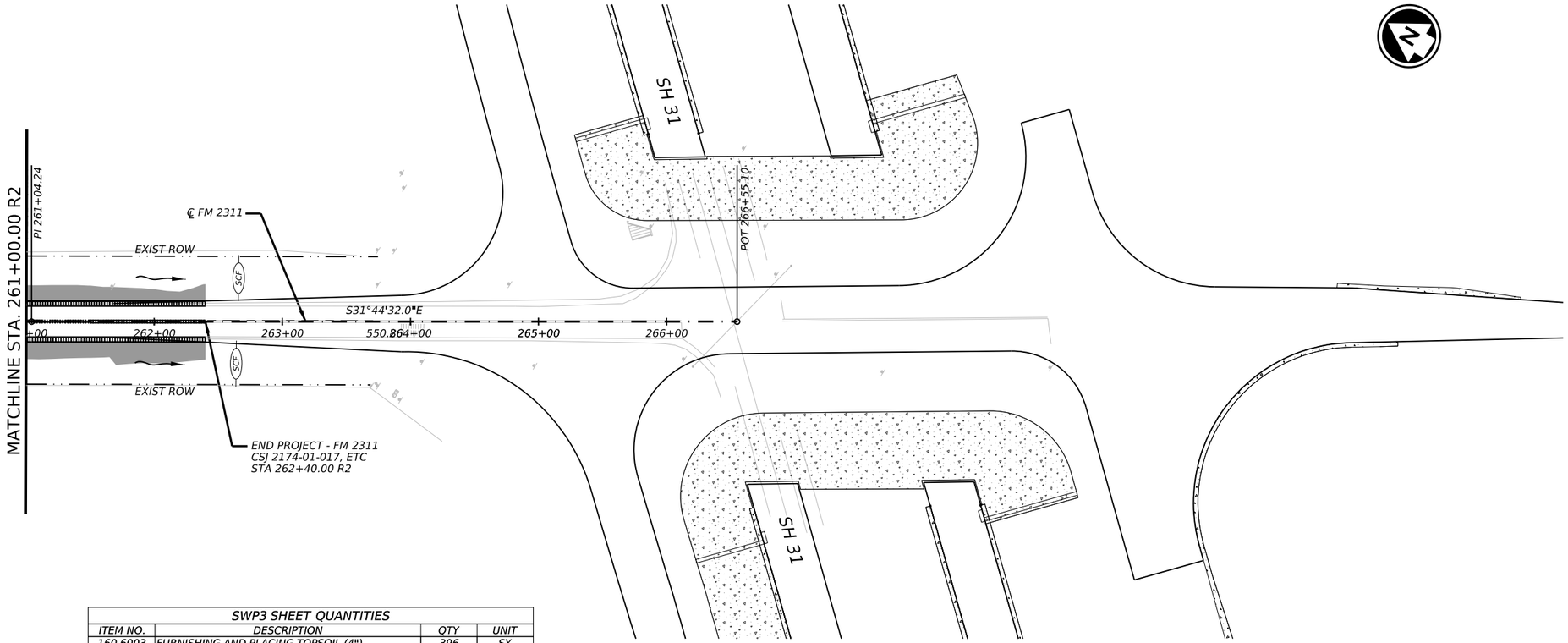

LEGEND

- EXISTING ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SEEDING
- SCF — SEDIMENT CONTROL FENCE (TEMP)
- RFD 2 — ROCK FILTER DAM (RFD 2)
- DIRECTION OF WATER FLOW

0 50 100
SCALE IN FEET

SWP3 SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
160 6003	FURNISHING AND PLACING TOPSOIL (4")	396	SY
164 6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	396	SY
164 6071	BROADCAST SEED (TEMP) (WARM OR COOL)	396	SY
168 6001	VEGETATIVE WATERING	6	MG
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	0	LF
506 6011	ROCK FILTER DAMS (REMOVE)	0	LF
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	25	LF
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	25	LF

STATE OF TEXAS
RANDY W. HARRIS
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FM 2311

SWP3 LAYOUT
STA 261+00 TO END

SCALE: 1" = 100' SHEET 12 OF 12

CONT	SECT	JOB	HIGHWAY
2174	01	018	FM 2311
DIST	COUNTY		SHEET NO.
WAC	McLENNAN		284

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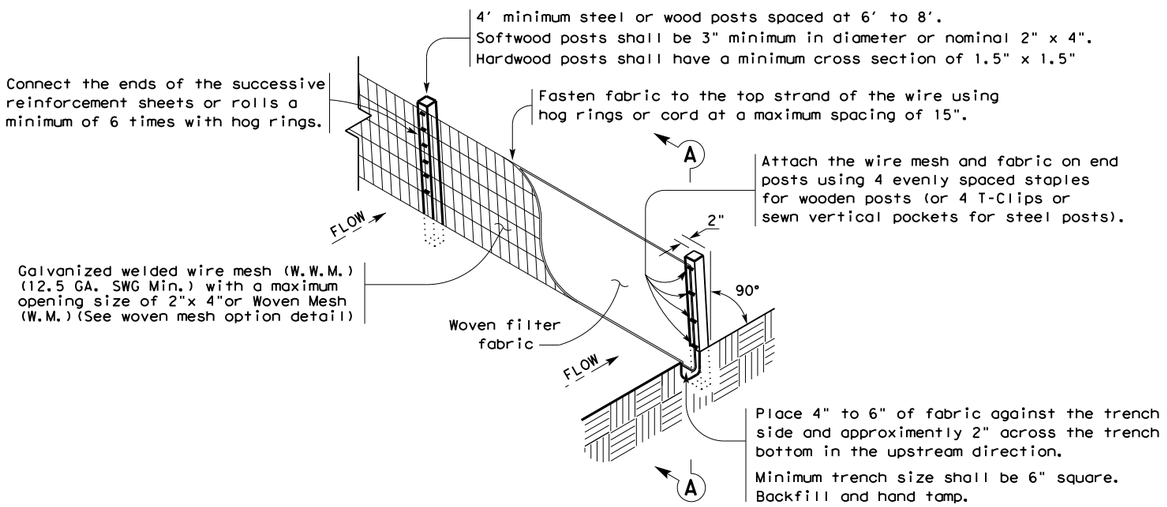
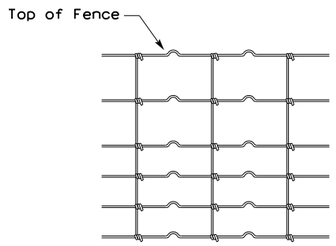
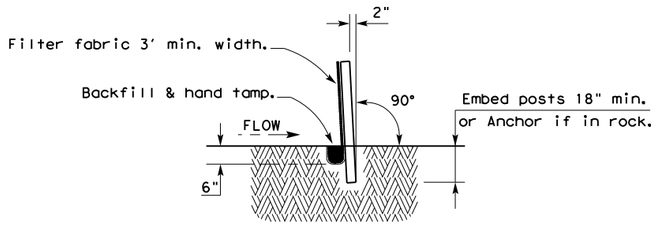


TEMPORARY SEDIMENT CONTROL FENCE

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.

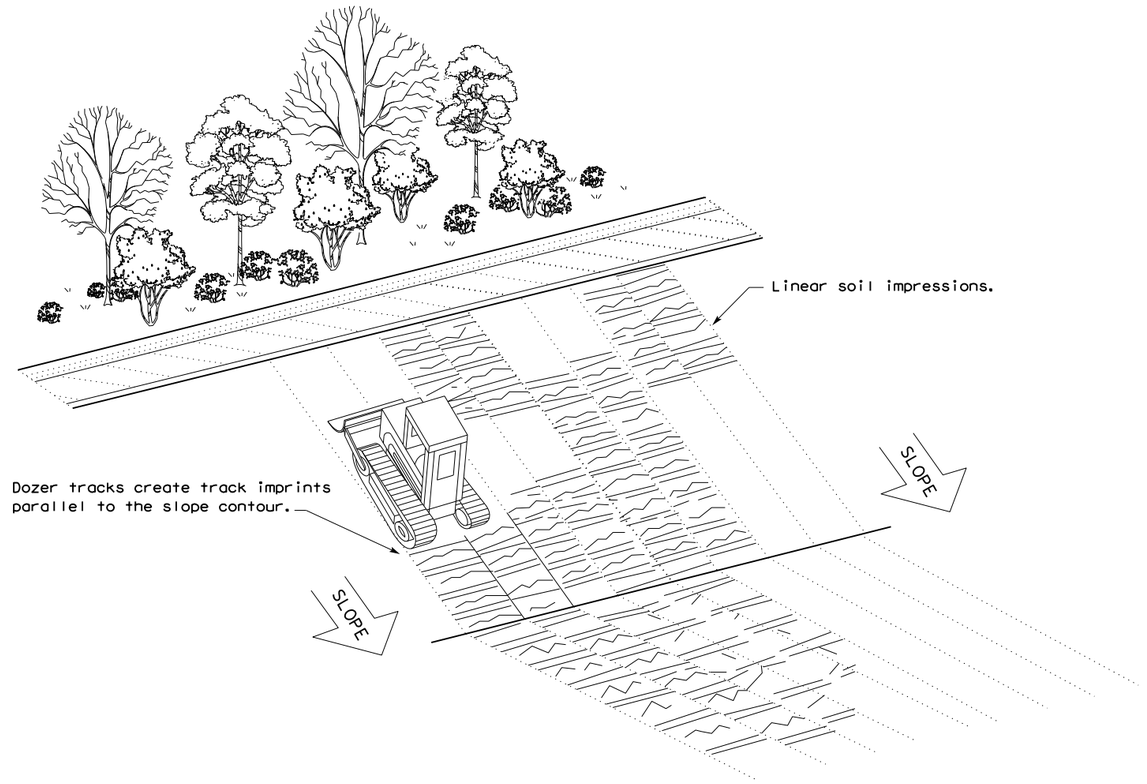
LEGEND

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
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	2174	01	018		FM 2311	
	DIST	COUNTY			SHEET NO.	
	WAC	McLENNAN			285	

10/8/2024
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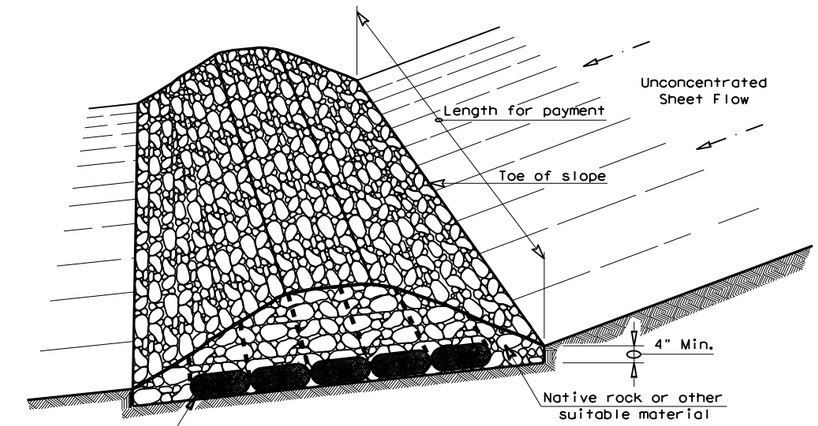
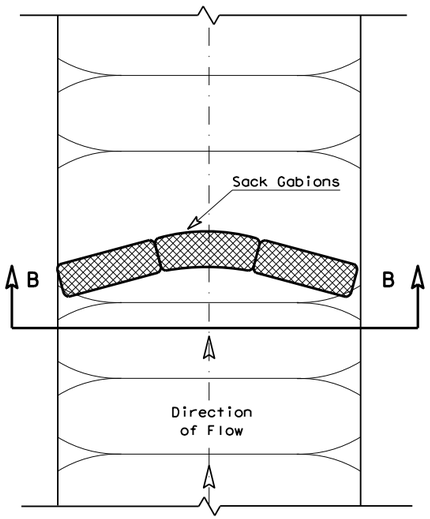
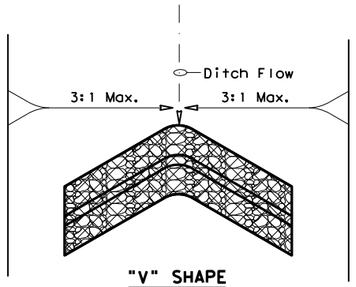


FILTER DAM AT TOE OF SLOPE

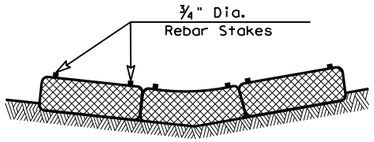
RFD1



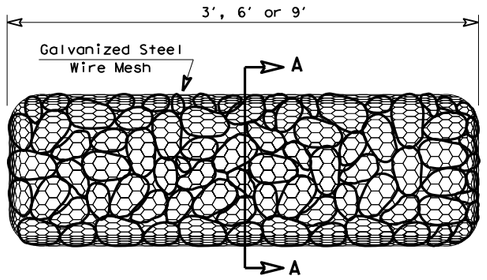
PLAN VIEW



"V" SHAPE
PLAN VIEW

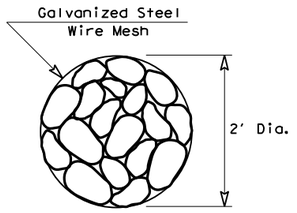


SECTION B-B



TYPE 4 (SACK GABIONS)

RFD4



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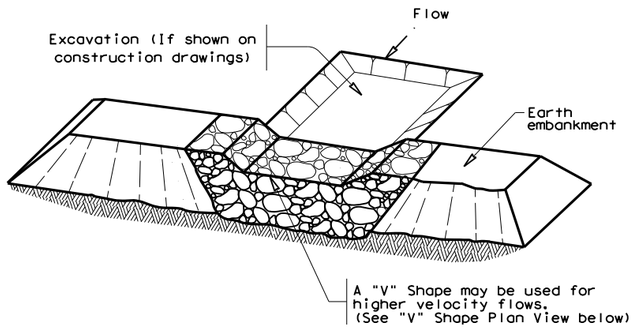
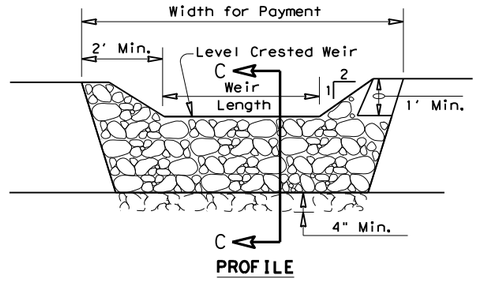


FILTER DAM AT SEDIMENT TRAP

RFD1 — OR — RFD2



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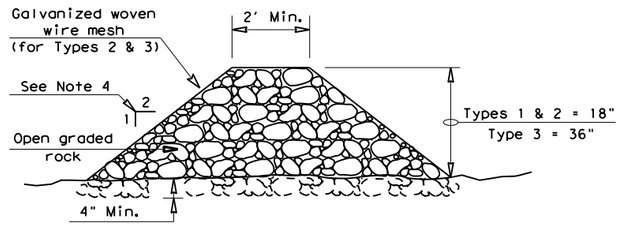
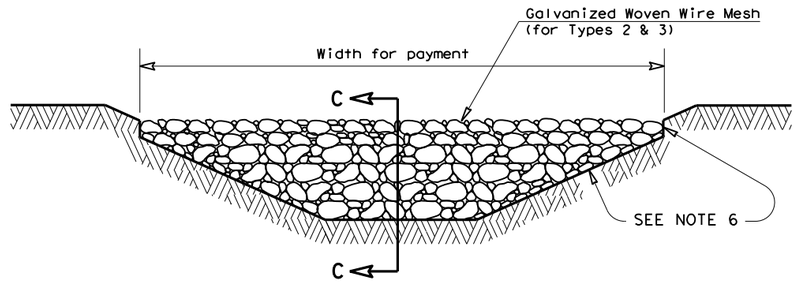


SECTION C-C



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.

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.

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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DATE: 1/26/2024
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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.

SCALE = NTS SHEET 1 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) GENERAL NOTES

9. Any sediment controls removed by the Contractor must be re-installed before the next rainfall event or by the end of day, as approved in advance.

10. Vegetative buffer strips may be used in place of temporary sediment controls such as silt fences and rock filter dams. The amount of disturbed soil area will be limited to 1/3 of an acre or less for a minimum of 50 feet of grassed ditch and 2/3 of an acre of disturbed soil for a minimum of 100 feet of grassed ditch.

11. Construction equipment found to be leaking oil, fuel or coolant will be immediately stopped, the leaking fluid collected and the equipment fixed. Equipment continuing to leak will be removed from the project at no cost to TxDOT. Leaking fluids from equipment will be collected and removed from the project or PSL.

12. Earth berms or mounds typically used to stockpile topsoil and used in place of boundary silt fence will be seeded upon being constructed. Long term use of earth berms or mounds will not be continued without establishing grass on the control.

13. The Contractor will inform TxDOT of new areas where soil will be disturbed to facilitate planning for new sediment controls. Areas of vegetated soil will not be disturbed by the Contractor, unless adequate sediment controls can be installed before the next rainfall event. The Contractor will assist TxDOT in keeping an accurate set of working SWPPP drawings that show the locations of all temporary sediment and erosion controls.

14. The Contractor will maintain an adequate amount of temporary sediment controls on hand at the field office or project staging area for critical SWPPP maintenance, including silt fence (minimum of 200 feet) and rock / fabric for rock filter dams (minimum for 100 feet of Type III dams).

    The requirement for BMP rock quantities on hand is waived for small projects for on and off system bridge installations. The Contractor having a BMP Subcontractor does not eliminate the requirement for the Contractor to have the required silt fence and rock on hand, typically stored at the Contractor PSL.

15. Failure of a sub-contractor to complete storm water work on time will require the Contractor to start storm water sediment control work immediately and complete the work with high priority, or be subject to stop work on the entire project.

16. Earth materials on roads as a result of soil tracking will not be allowed to be transported off ROW in storm water. Soil or rock material found on roadways deposited from Contractor equipment will be removed daily.

17. Unless approved, completed concrete curb inlets will not be blocked by sediment controls. The contractor will frequently sweep the completed or partially completed roadway to keep sediment out of drainage pipes.

18. The Contractor will be responsible for proper dust control and will route construction traffic in a manner that minimizes dust generation.

19. Water for dust control will contain no pollutants, but may be non-potable from upland stock ponds. No quantity of water to be used for construction purposes may be taken from a 404 stream, prior to the proper authorizations or permits being obtained by the Contractor.

20. Contractor is to direct workers and sub-contractors to use portable sanitary facilities provided by the Contractor and not to trespass off ROW.

21. Contractor will provide written verification to TxDOT that earth borrow pits and disposal sources meet environmental and regulatory requirements, prior to use. Excavations will meet all OSHA requirements and the current safety guidelines established for TxDOT Quarries and Pits.

22. Boundary silt fences that are terminated down slope, with one end being at the lowest elevation, will be installed with an L - hook to contain sediment. Boundary silt fences that are installed on flat ground will have L-hooks on both ends.

23. Rock filter dams across ditches will be constructed where the rock filter dam ends are embedded within the ditch side slopes and ditch bottom. The top center elevation of the rock filter dam will be at least 6 inches lower than the elevations on the rock filter dam ends.

24. Silt fence will be constructed in a U or V pattern across ditch lines and up the ditch side slope to keep storm water from flowing around the ends of the silt fence. Small silt fences that do not adequately span the ditch and allows storm water around the end(s) will not be used. Where there is adequate space, large U pattern silt fences are preferred to facilitate sediment collection and sediment removal with equipment.

25. Sediment controls (RFDs or silt fences) will be located along road ditches as marked on the SWPPP drawings. Modifications to the sediment control spacing will be adjusted during the project based on sediment control effectiveness. The installation and maintenance of sediment controls at or near outfalls, where storm water leaves TxDOT ROW, takes persistent over ditch line sediment controls.

Texas Department of Transportation
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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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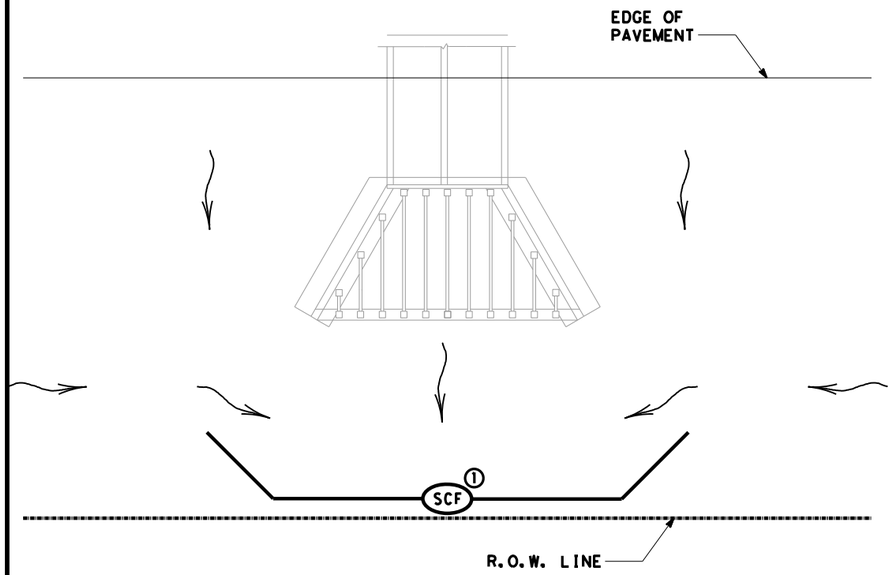
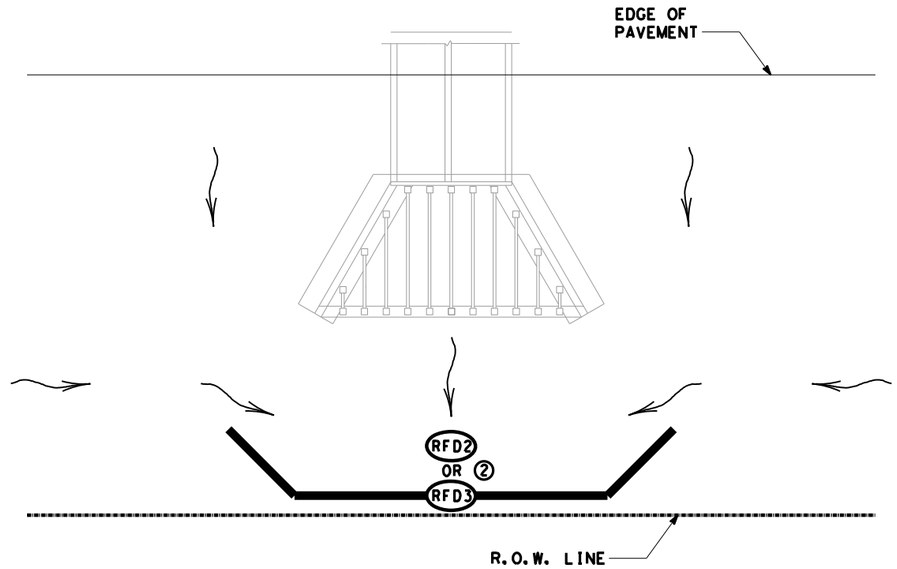


BEST MANAGEMENT PRACTICE (BMP) #1

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



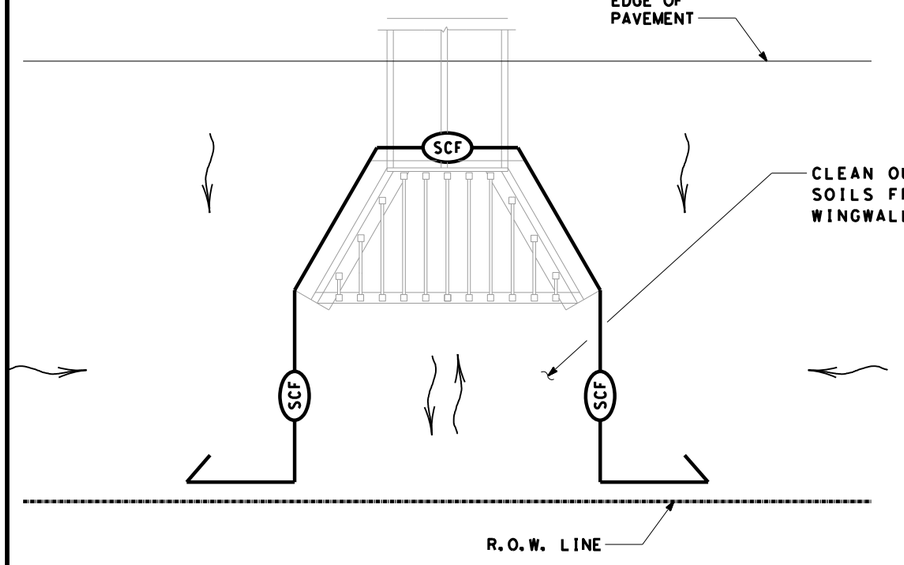
BEST MANAGEMENT PRACTICE (BMP) #2

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

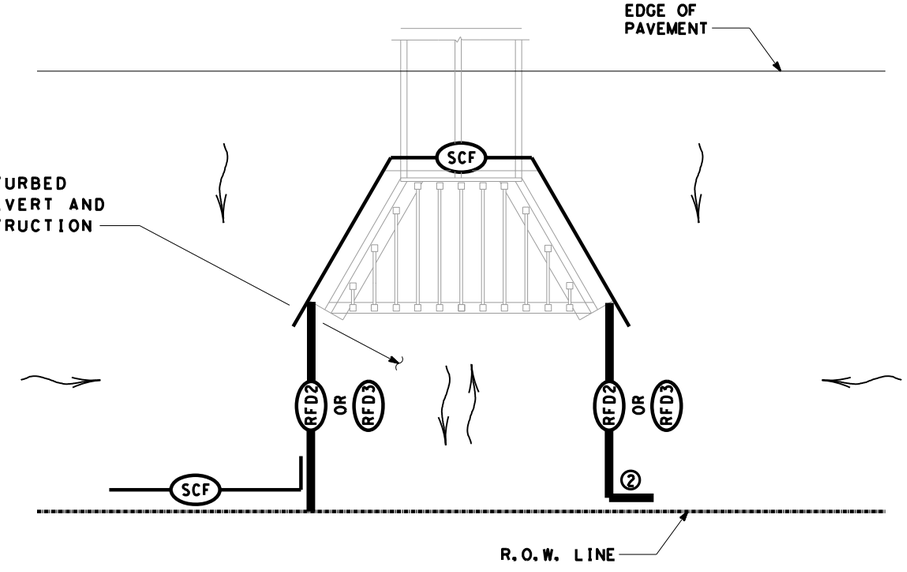
NOTES:

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.



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

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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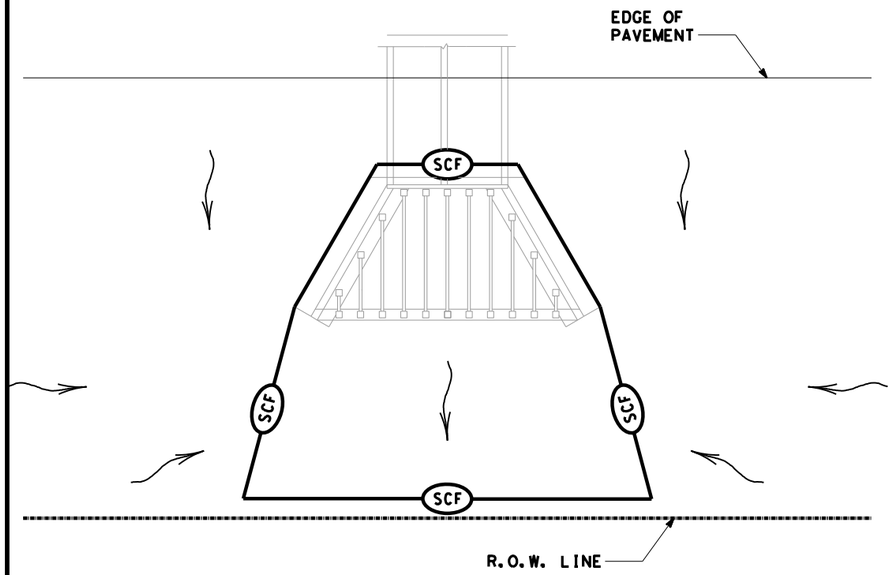
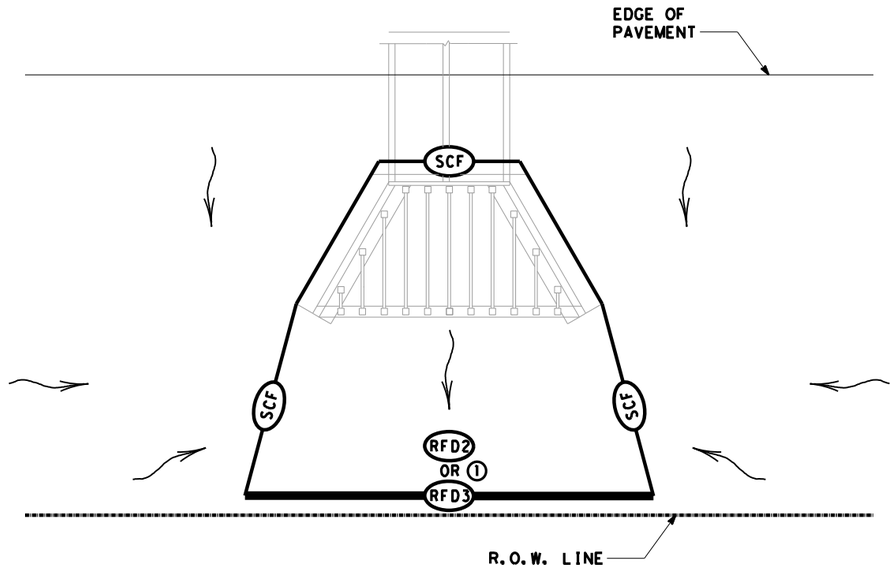


BEST MANAGEMENT PRACTICE (BMP) #5

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #6

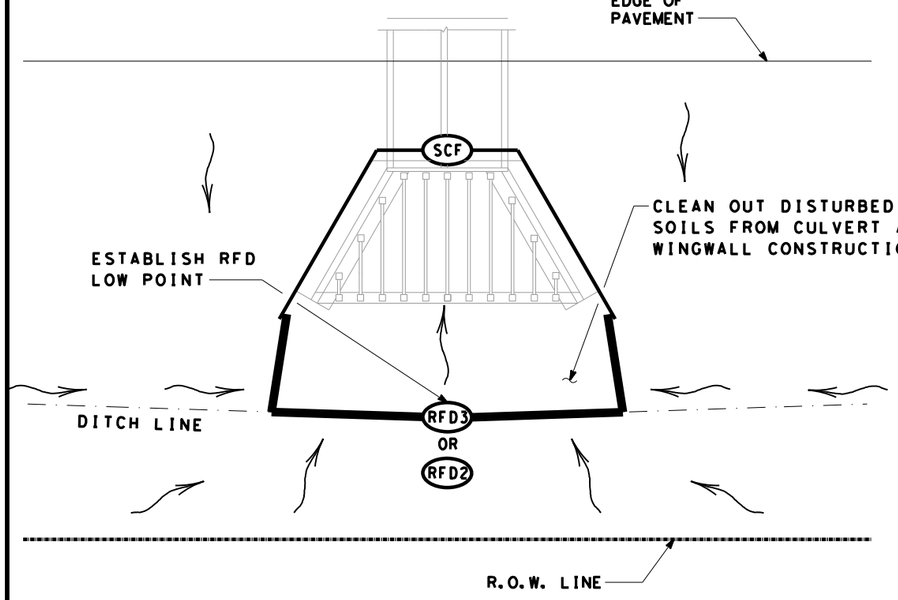
FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

NOTES:

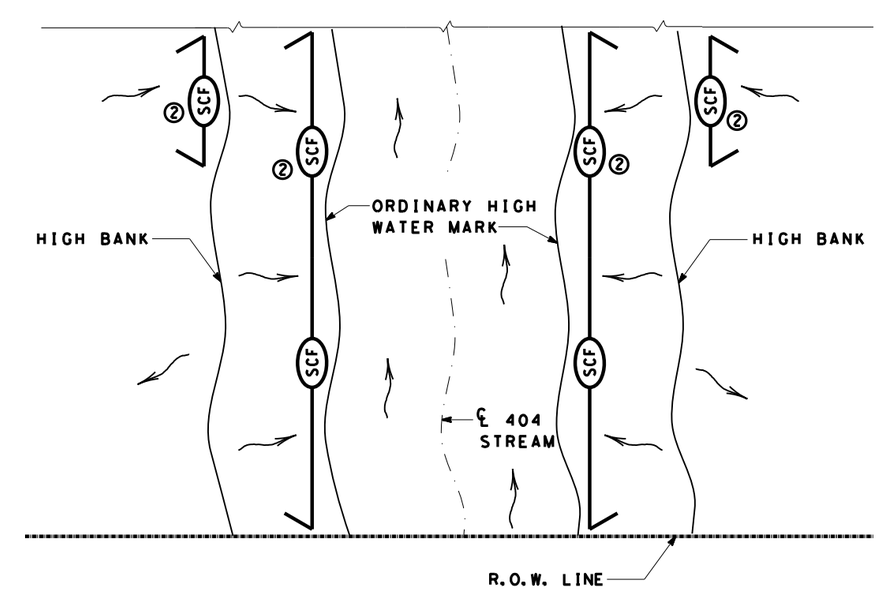
① PROVIDE OVERLAP OF SILT FENCE WITH ROCK FILTER DAM.

② USE SILT FENCE L-HOOKS ON ENDS TO BLOCK STORM WATER SEDIMENT



BEST MANAGEMENT PRACTICE (BMP) #7

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT ENTRANCE OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #8

FOR 404 STREAMS ~ SEDIMENT CONTROL DURING PROJECT CLEARING AND GRUBBING

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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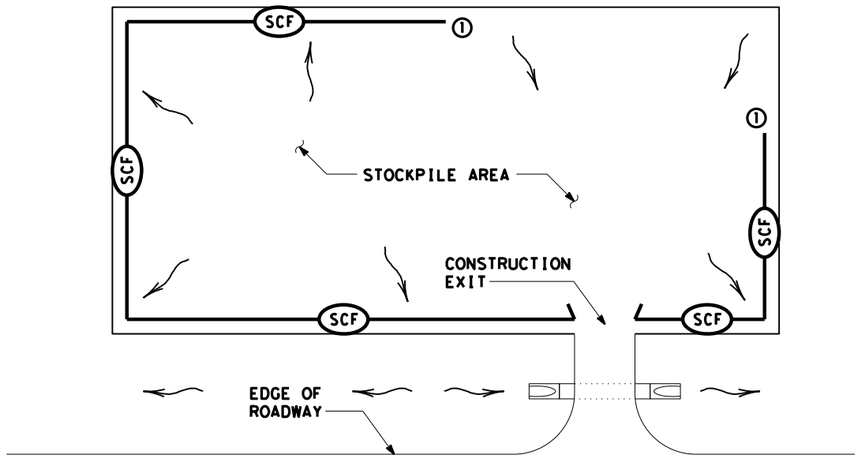
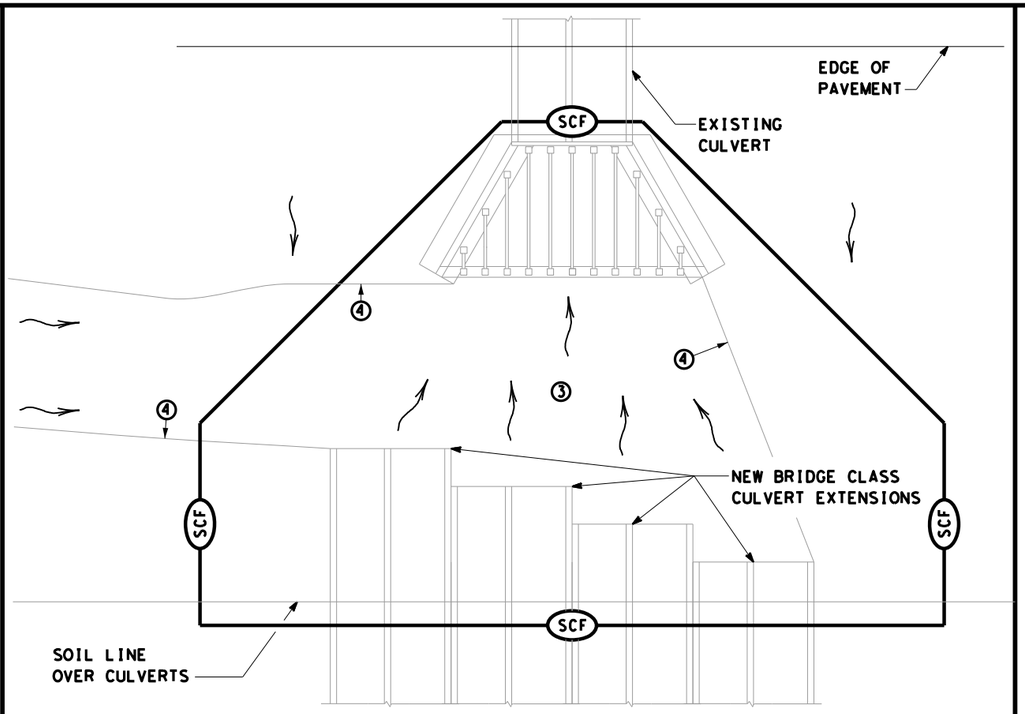


BEST MANAGEMENT PRACTICE (BMP) #9

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

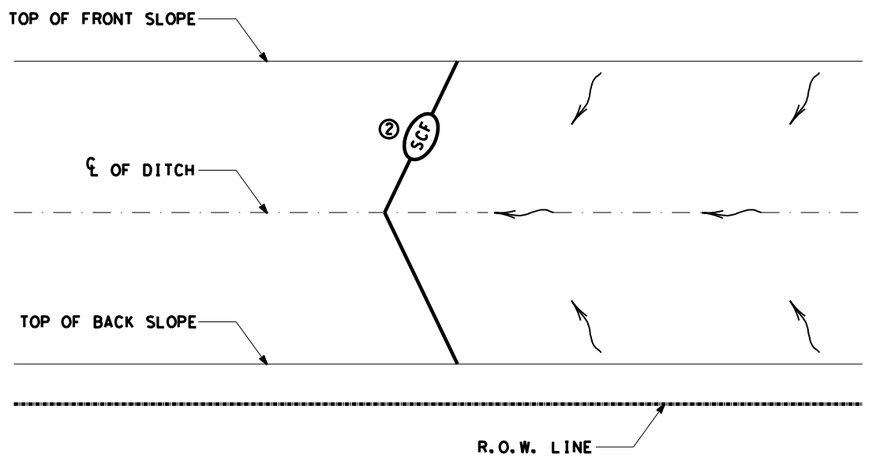
NOTES:

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.

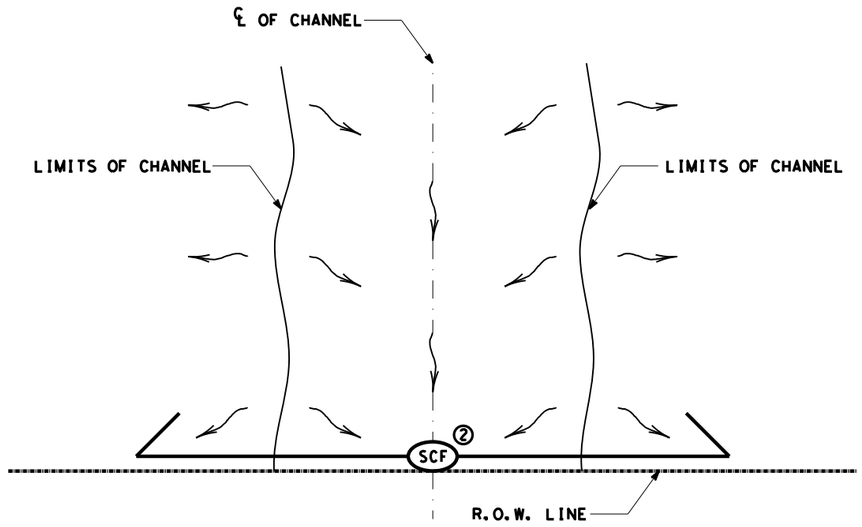
③ PROVIDE A SMOOTH TRANSITION FROM THE INVERT ELEVATIONS BETWEEN CULVERTS. REMOVE LOOSE SOIL FROM EXCAVATED AREA BETWEEN CULVERTS.

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

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

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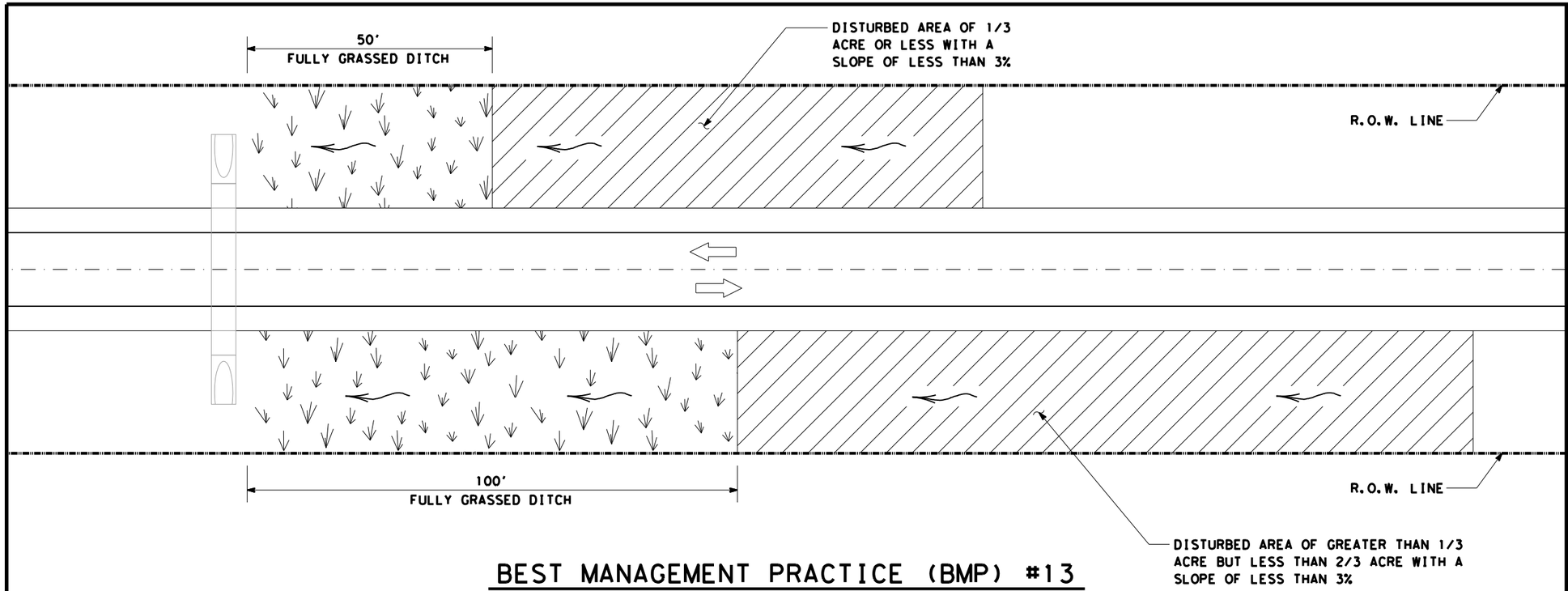


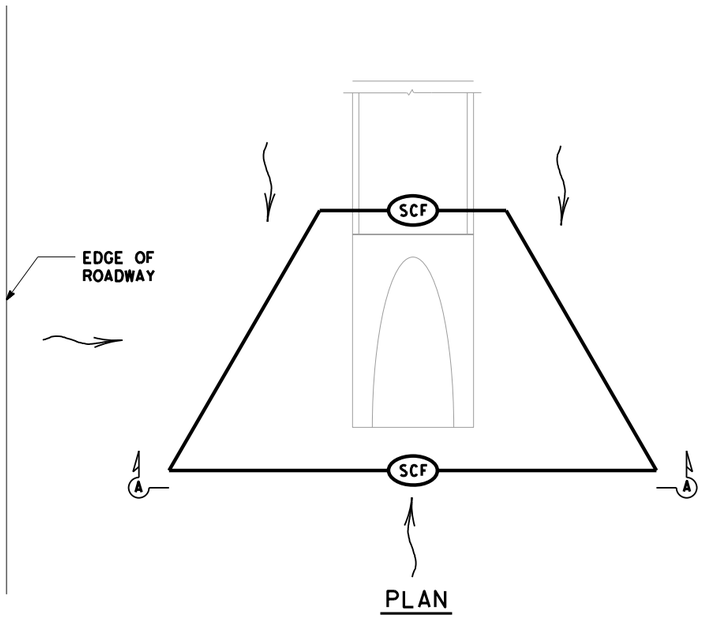
BEST MANAGEMENT PRACTICE (BMP) #13

USE OF VEGETATIVE BUFFERS IN PLACE OF TEMPORARY SEDIMENT CONTROLS SUCH AS SILT FENCE AND ROCK FILTER DAMS

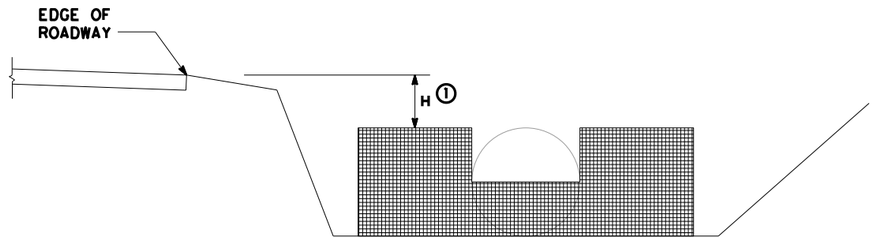
	FULLY GRASSED DITCH
	DISTURBED AREA
	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE

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.



PLAN



VIEW A-A

BEST MANAGEMENT PRACTICE (BMP) #14

NON-404 STREAMS AND DITCHES ONLY - SEDIMENT CONTROL AT PARALLEL DRAINAGE STRUCTURE ENTRANCE ②

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Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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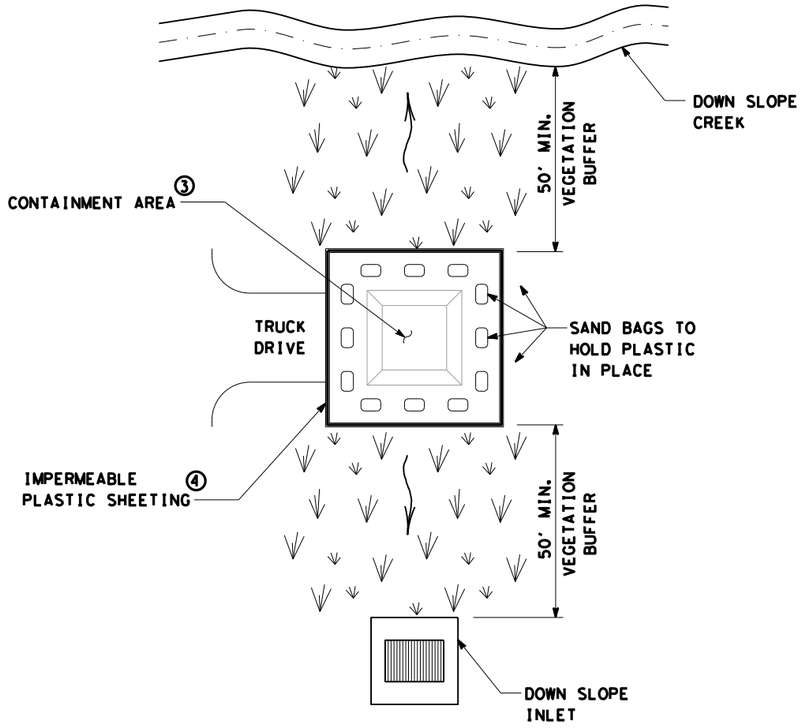
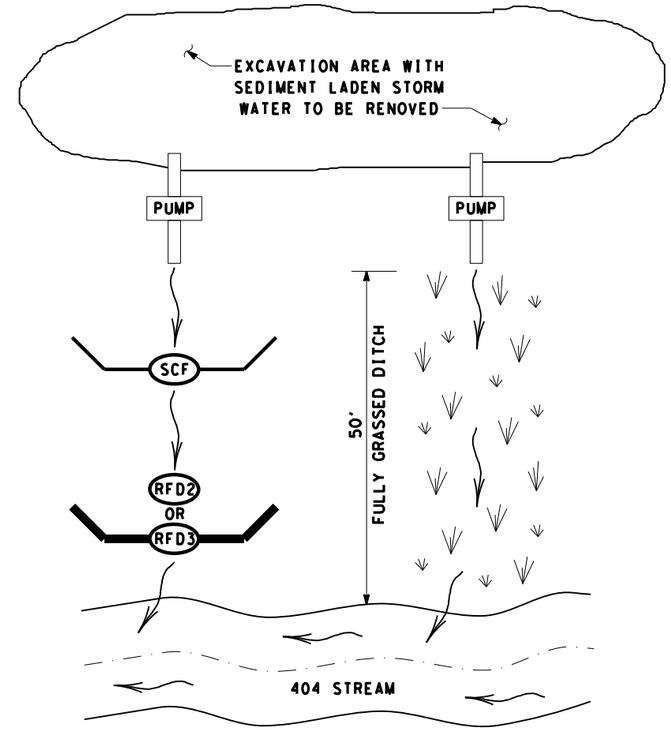


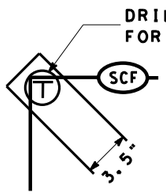
BEST MANAGEMENT PRACTICE (BMP) #15

CONCRETE TRUCK WASHOUT AREA

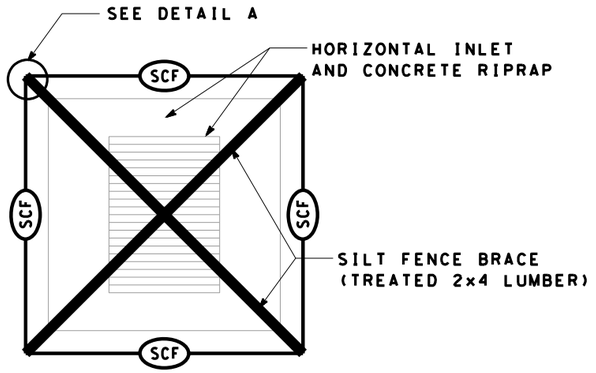


BEST MANAGEMENT PRACTICE (BMP) #16

PUMPED STORM WATER SEDIMENT CONTROLS ①

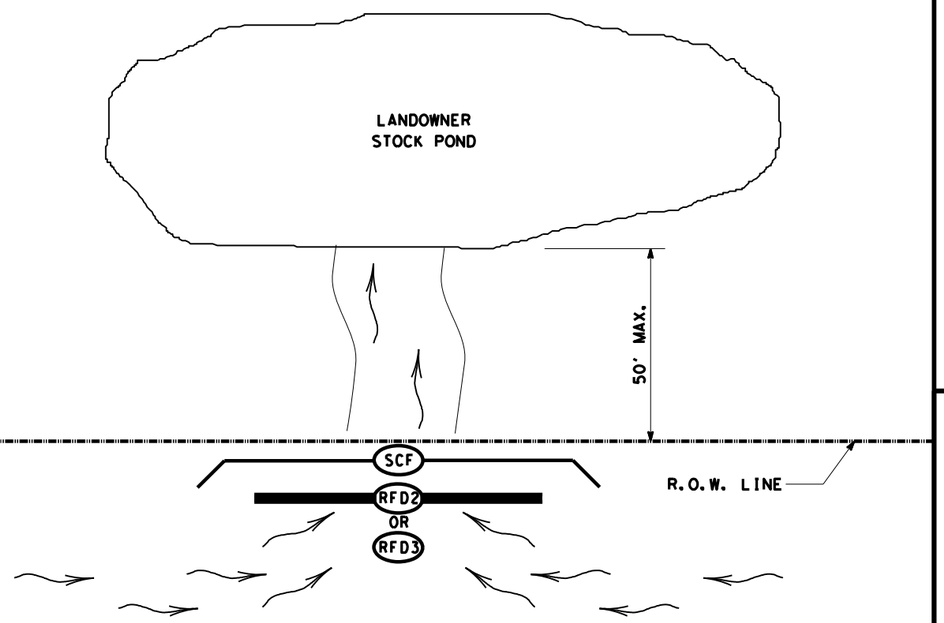


DETAIL A



BEST MANAGEMENT PRACTICE (BMP) #17

HORIZONTAL INLET SEDIMENT CONTROL



BEST MANAGEMENT PRACTICE (BMP) #18

LANDOWNER STOCKPOND SEDIMENT CONTROL ②

	FULLY GRASSED DITCH
	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)

① PUMPED STROM WATER FROM AN EXCAVATION AREA SHOULD BE DISCHARGED IN A 50' VEGETATIVE BARRIER OR THROUGH TWO TEMPORARY SEDIMENT CONTROLS BEFORE ENTERING A 404 STREAM.

② FOR LANDOWNER STOCKPONDS WITHIN 50' OF THE RIGHT OF WAY LINE, PROVIDE REDUNDANT SEDIMENT CONTROLS AT THE CONVEYANCE OF THE POND. MINIMUM OF TWO SEDIMENT CONTROLS.

③ WHEN CONTAINMENT AREA REACHES 1' FREEBOARD, DISCONTINUE WASHOUT PLACEMENT AND REMOVE MATERIAL UPON SOLIDIFICATION.

④ EACH TIME SOLIDIFIED MATERIAL IS REMOVED REPLACE PLASTIC SHEETING.

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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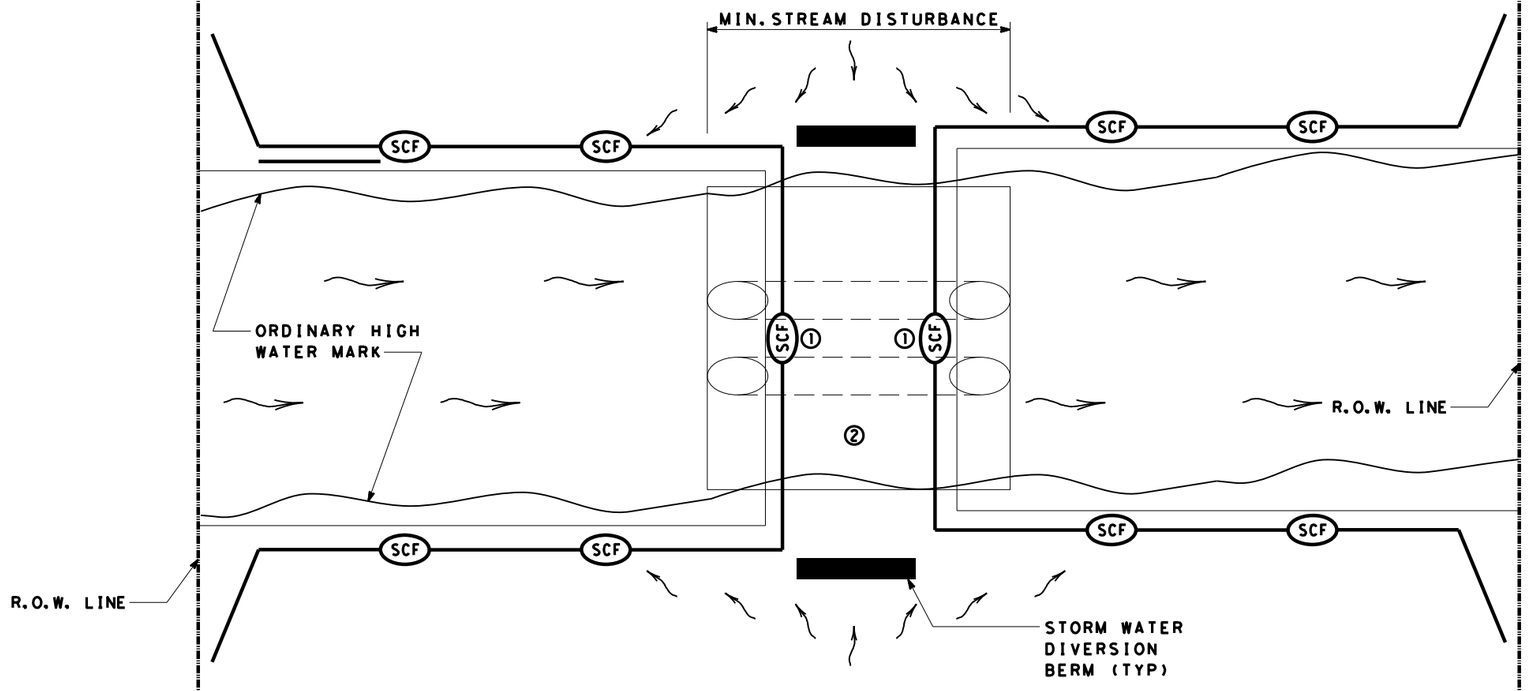


BEST MANAGEMENT PRACTICE (BMP) #19

TYPICAL 404 STREAM CROSSING (SEDIMENT CONTROL AT CROSSING)

	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE
RFD	ROCK FILTER DAM
	SECURITY FENCING

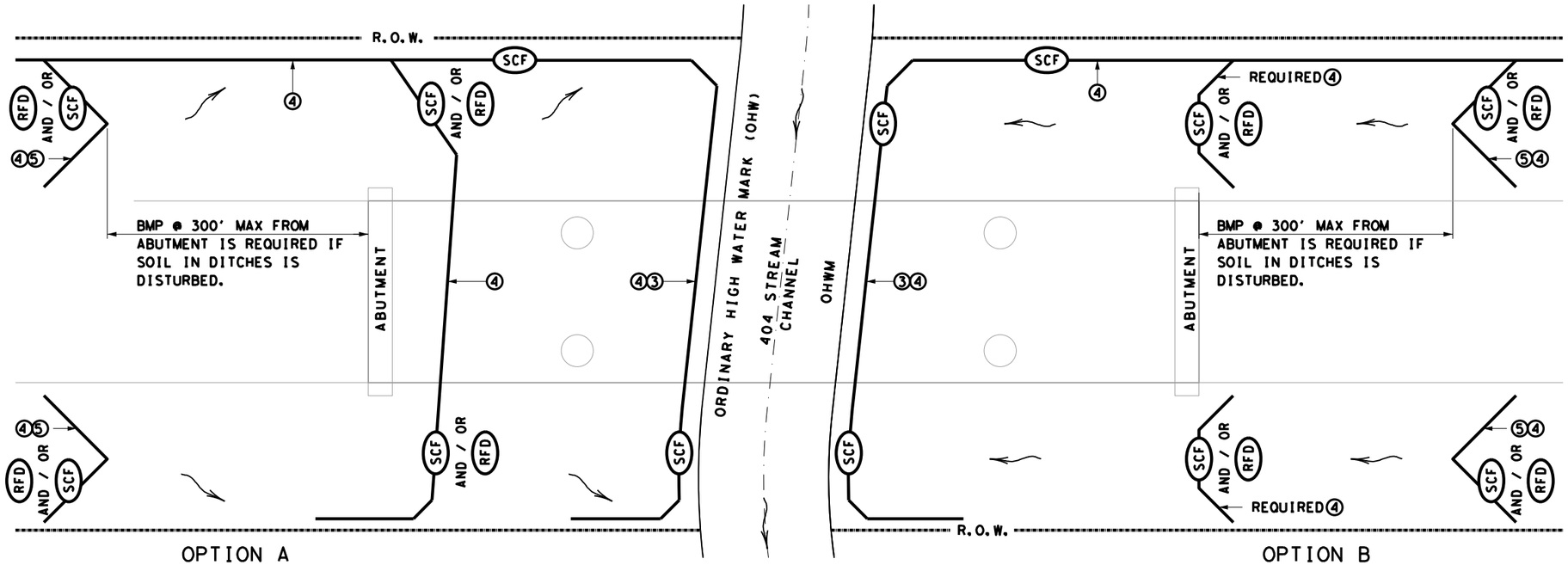
① HAY BALES MAY BE SUBSTITUTED FOR SILT FENCE OVER THE STREAM CROSSING.

② CROSSING WILL BE AS PER REQUIREMENTS OF THE WATERS OF THE US GENERAL NOTES.

③ INSTALL SILT FENCE SLIGHTLY UP FROM OHW MARK FROM R.O.W. TO R.O.W.

④ USE SILT FENCE L-HOOKS ON LEVEL OR DOWN SLOPING ENDS TO BLOCK STORM WATER SEDIMENT

⑤ INSTALL LARGE V OR U SHAPED BMP'S FROM ABUTMENT AS SHOWN. IF THERE IS STEEP DITCH CONDITIONS DECREASE SPACING AND CONSIDER RFD'S. ADD ADDITIONAL BMP'S IF GRADE IS STEEP OR IF FLOW IS HIGH.



OPTION A

OPTION B

BEST MANAGEMENT PRACTICE (BMP) #20

FOR 404 STREAMS ~ BMP'S AT BRIDGES

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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