FEDERAL AID PROJECT NO.			
F 2024 (675)			
CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		1

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO. F 2024(675)
CSJ: 0028-02-098,etc

US 90
HARRIS COUNTY

DESIGN SPEED (MAINLANE)= 65 MPH
DESIG SPEED (FRONTAGE RD) : 45 MPH
MAINLANE A.D.T. : 20,836 (2024), 29,945 (2044)
FRONTAGE RD A.D.T.: 6,933 (2024), 9,599 (2044)

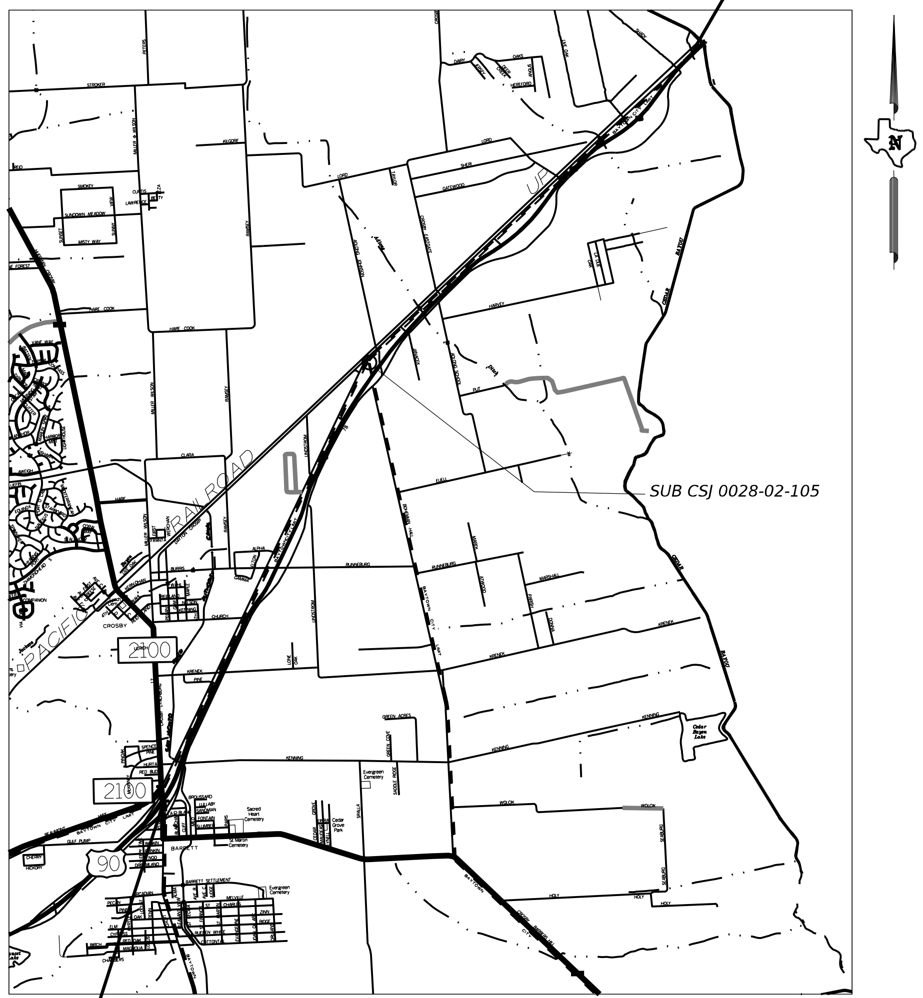
NET LENGTH OF ROADWAY =	39810 FT.=	7.539 MI.
NET LENGTH OF BRIDGE =	807 FT.=	.153 MI.
NET LENGTH OF PROJECT =	40617 FT.=	7.692 MI.

LIMITS: EAST OF FM 2100 TO WEST OF LIBERTY COUNTY LINE

FOR THE CONSTRUCTION OF ASPHALT OVERLAY CONSISTING OF MILLING, FULL DEPTH REPAIR, BASE REPAIR, TRAFFIC SIGNAL, SIGNING AND PAVEMENT MARKING AND GUARD RAIL.

BEGIN PROJECT
CONTROLLING CSJ: 0028-02-098, ETC
STA: 1253+12
END RM: 864+0.034
END MP: 24.611
END DFO: 680.568

REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC (1)- 22 THRU BC (12)- 22 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".



SCALE: N.T.S

END PROJECT
CONTROLLING CSJ: 0028-02-098,ETC
STA. 846+95
BEGIN RM: 854+1.866
BEGIN MP: 16.919
BEGIN DFO: 672.876

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS:

UPRR 762866P ADLONG JOHNSON RD RR MP: 338.220
UPRR 762865H CROSBY EASTGATE RD RR MP: 337.530
UPRR 762861F LORD RD RR MP: 336.260
UPRR 762860Y LIVE OAK RR MP: 335.540
UPRR 762859E SHADY LN RR MP: 334.910

Texas Department of Transportation
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SUBMITTED FOR LETTING: 1/30/2024
DocuSigned by:
Phillip B. Garlin, P.E.
023DD75DDDCF428...
AREA ENGINEER

RECOMMENDED FOR LETTING: 1/31/2024
DocuSigned by:
P.E.
DIRECTOR OF TP&D... ENGINEER

FINAL PLANS

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

NOTE:

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)

DATE: 1/30/2024 10:24:50 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT3/Documents/12 - HOU/Design Projects/0028020984 - Design/Plan Set/1. General/001 TITLE SHEET.dgn

TITLE SHEET
00000

CK:
DW:
CK:
DW:

DATE: 2/16/2024 1:38:02 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT3/Documents/12 - HOU/Design Projects/0028020098/4 - Design/Plan Set/1. General/002 INDEX SHEET.dgn

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE (##) HAVE BEEN SELECTED BY ME, OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, PE
02/16/2024

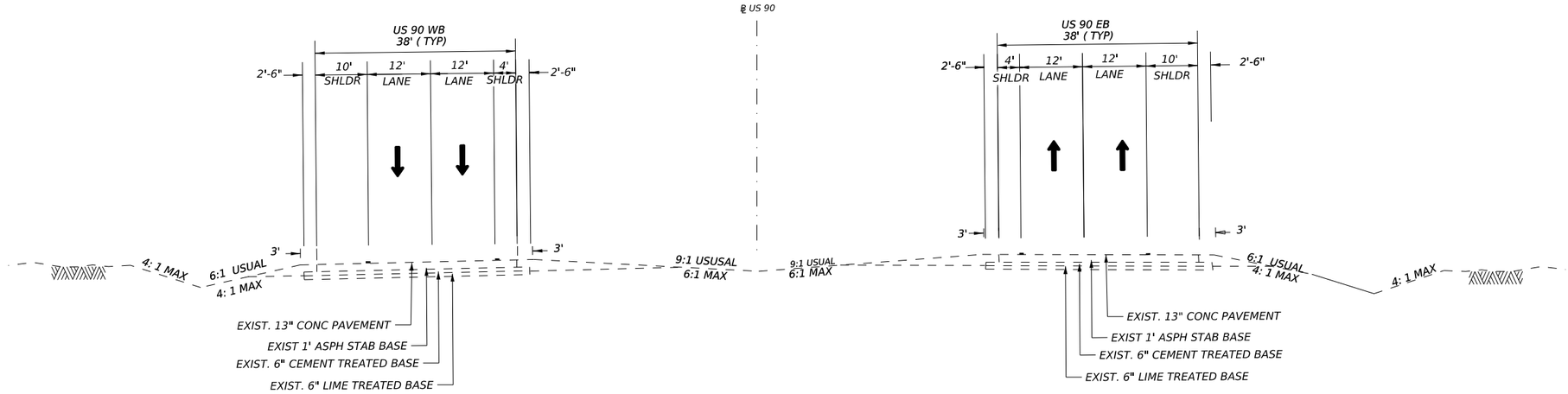
Texas Department of Transportation

US 90

INDEX SHEET

SHEET 1 OF 1

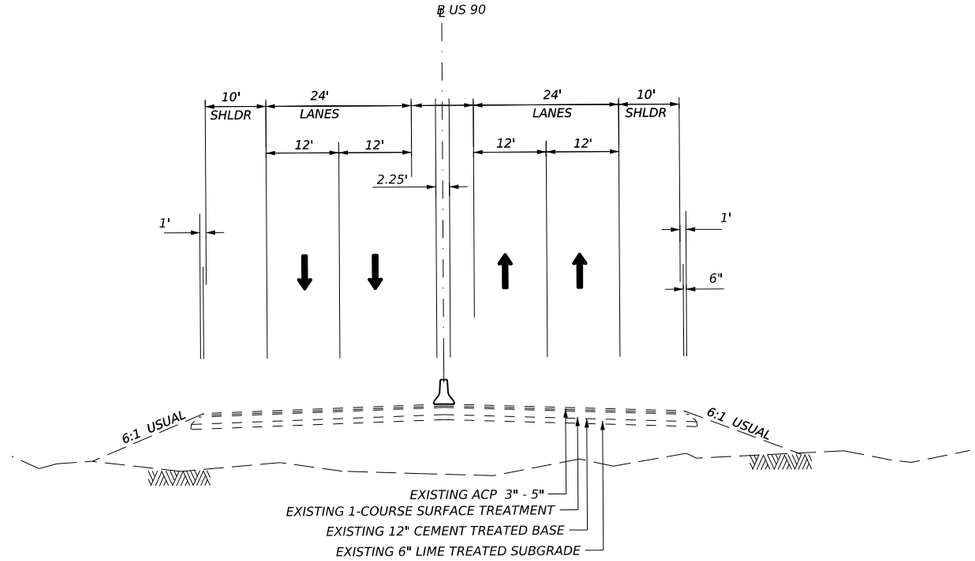
CONT	SECT	JOB	HIGHWAY
0028	02	098	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		2



STA 848+70.25 TO STA 886+27.60

EXISTING US 90 ML TYPICAL SECTION (CONCRETE PAVEMENT)

STA 846+95 TO 884+00



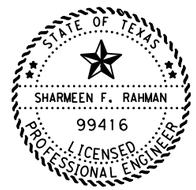
WB ML

STA 886+27.60 TO STA 905+73.00
STA 908+56 TO STA 921+58.93
STA 923+00 TO STA 956+23.93
STA 959+04 TO STA 985+22.43
STA 985+22.43 TO 1253+12

EB ML

STA 88+00 TO STA 905+73.00
STA 908+56 TO STA 921+58.93
STA 923+00 TO STA 956+23.93
STA 959+04 TO STA 998+00

EXISTING US 90 ML TYPICAL SECTION (ASPHALT PAVEMENT)



Sharmeen Rahman, P.E.

01/29/2024

Texas Department of Transportation

US 90

EXISTING TYPICAL SECTONS

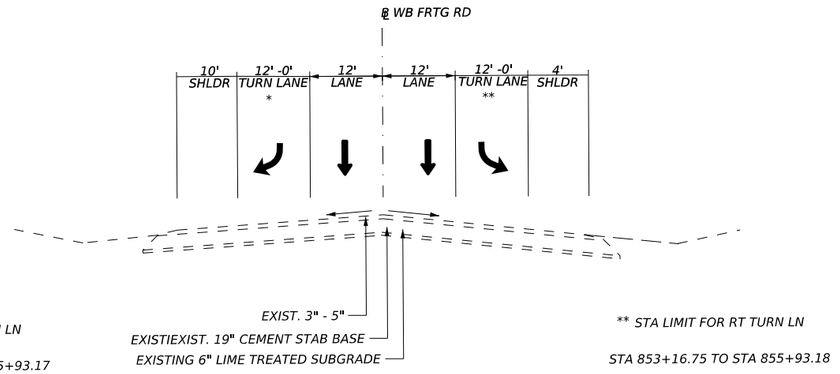
SCALE:

SHEET 1 OF 4

FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
6		3

STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90

DATE: $DATE$
FILE: $FILE$



*STA LIMIT FOR LT TURN LN

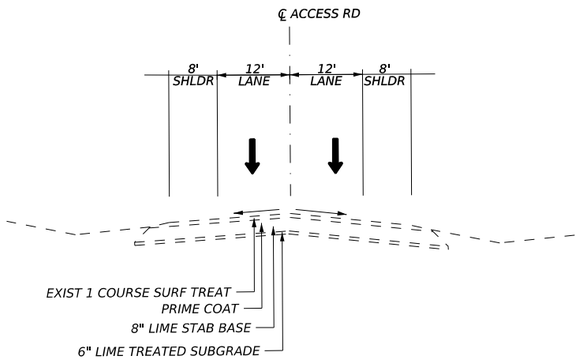
STA 853+16.75 TO STA 855+93.17
STA 956+78.82 TO STA 962+81.38
STA 1002+46.04 TO STA 1008+12.47
STA 1063+82.58 TO STA 1068+19.16
STA 1078+11.66 TO STA 1083+81.61
STA 1100+60.23 TO STA 1105+89.00
STA 1133+30.60 TO STA 1139+00.00
STA 1172+43.68 TO STA 1177+90.80
STA 1210+84.68 TO STA 1216+17.37
STA 1242+28.80 TPO STA 1248+14.55

** STA LIMIT FOR RT TURN LN

STA 853+16.75 TO STA 855+93.18
STA 1051+86.70 TO STA 1056+32.50

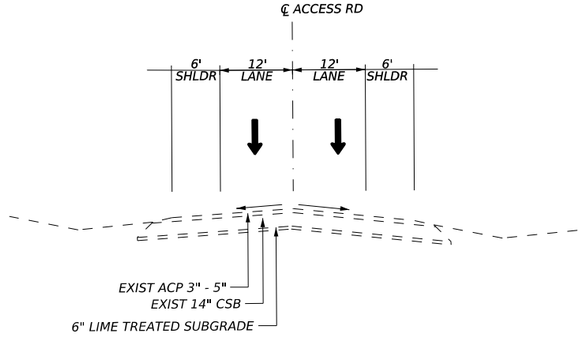
STA 852+00 TO STA 985+22.43

EXISTING WB FRONTAGE RD TYPICAL SECTION



EXISTING ACCESS RD TYPICAL SECTION

STA 880+20.40 TO STA 909+01.77
STA 988+48.40 TO STA 1002+62.36
STA 1048+78.60 TO STA 1077+71.50
STA 1095+46.12 TO STA 1099+43.40
STA 1234+73.00 TO STA 1244+25.15



EXISTING CROSS OVER TYPICAL SECTION

KRENEK RD
RUNNERBURG RD
LINDSTORM RD
ADLONG JOHNSON RD
CROSSBY EASTGATE RD
LORD RD
LIVE OAK
SHADY LN

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, P.E.

0129/2024

Texas Department of Transportation

US 90

EXISTING TYPICAL SECTONS

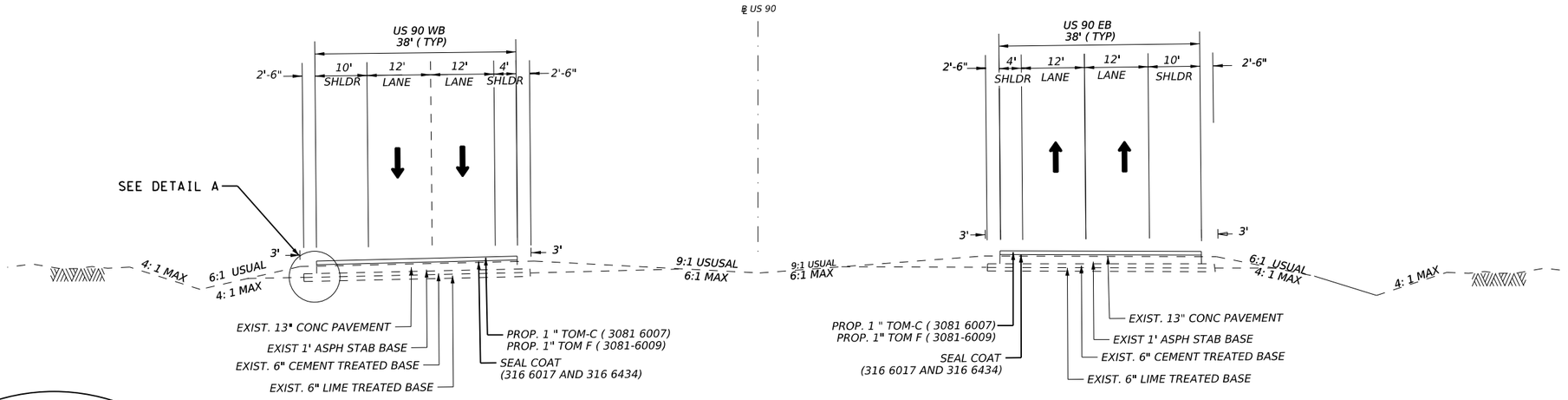
SCALE:

SHEET 2 OF 4

FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
6		3A

STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90

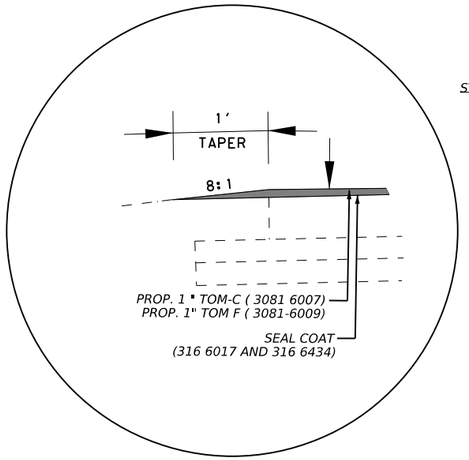
DATE: $DATE$
FILE: $FILE$



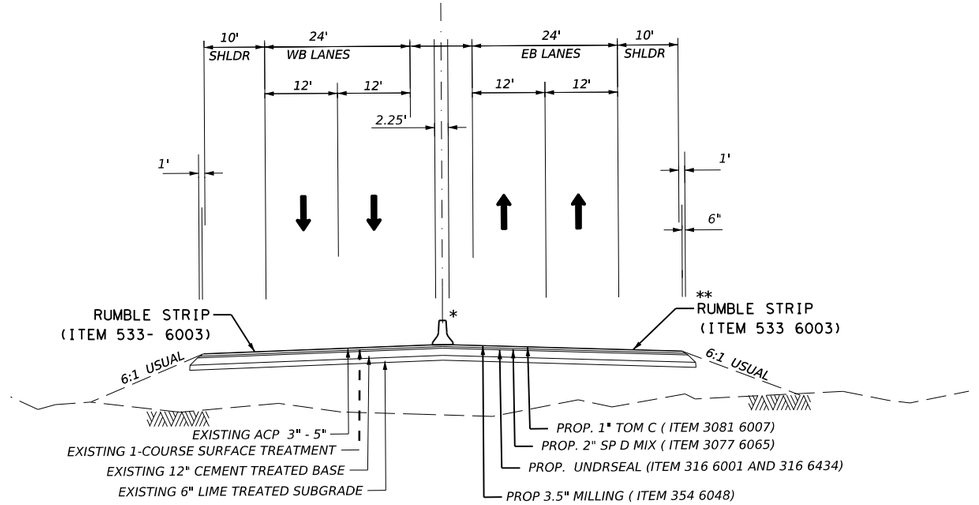
STA 848+70.25 TO STA 886+27.60

PROPOSED US 90 ML TYPICAL SECTION (CONCRETE PAVEMENT)

STA 846+95 TO 884+00



DETAIL 'A'



WB ML

STA 886+27.60 TO STA 905+73.00
STA 908+56 TO STA 921+58.93
STA 923+00 TO STA 956+23.93
STA 959+04 TO STA 985+22.43
STA 985+22.43 TO 1253+12

EB ML

STA 88+00 TO STA 905+73.00
STA 908+56 TO STA 921+58.93
STA 923+00 TO STA 956+23.93
STA 959+04 TO STA 998+00

PROPOSED US 90 ML TYPICAL SECTION (ASPHALT PAVEMENT)

* US 90 EBML AND WBML IS DIVIDED BY MEDIAN FROM ℄ US 90 STA 975+79.19 TO STA 1263+12

** RUMBLE STRIP ON EB ML CONCRETE PAVEMENT (ITEM 533 6005) (FROM STA 998+00 TO STA 1253+12)

DATE: $DATE$
FILE: $FILE$

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED PROFESSIONAL ENGINEER

Sharmeen Rahman, P.E.

0129/2024

Texas Department of Transportation

US 90

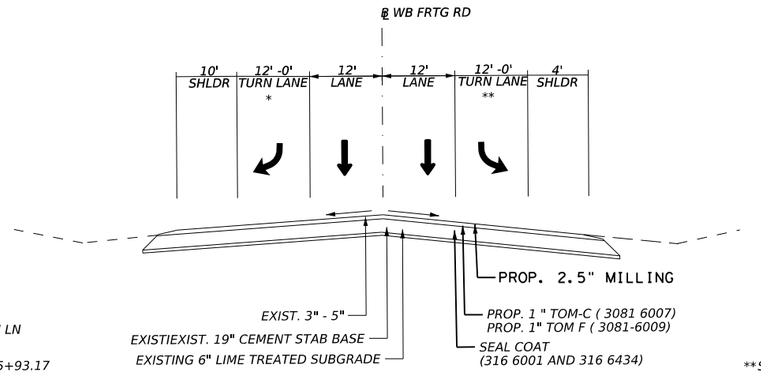
PROPOSED TYPICAL SECTONS

SCALE:

SHEET 3 OF 4

FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
6		3B

STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90



*STA LIMIT FOR LT TURN LN

STA 853+16.75 TO STA 855+93.17
STA 956+78.82 TO STA 962+81.38
STA 1002+46.04 TO STA 1008+12.47
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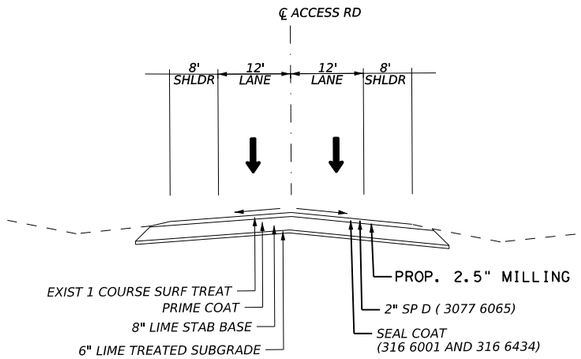
STA 1133+30.60 TO STA 1139+00.00
STA 1172+43.68 TO STA 1177+90.80
STA 1210+84.68 TO STA 1216+17.37
STA 1242+28.80 TPO STA 1248+14.55

STA 852+00 TO STA 985+22.43

PROPOSED WB FRONTAGE RD TYPICAL SECTION

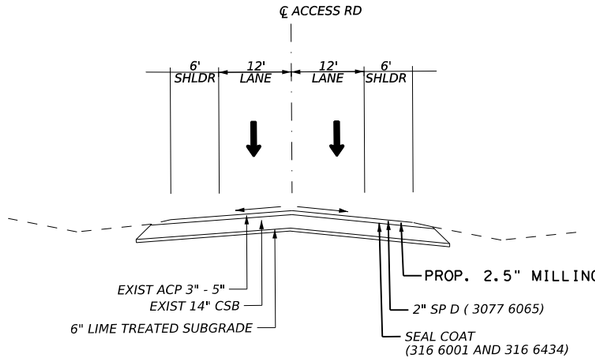
**STA LIMIT FOR RT TURN LN

STA 853+16.75 TO STA 855+93.18
STA 1051+86.70 TO STA 1056+32.50



PROPOSED ACCESS RD TYPICAL SECTION

STA 880+20.40 TO STA 909+01.77
STA 988+48.40 TO STA 1002+62.36
STA 1048+78.60 TO STA 1077+71.50
STA 1095+46.12 TO STA 1099+43.40
STA 1234+73.00 TO STA 1244+25.15



PROPOSED CROSS OVER TYPICAL SECTION

KRENEK RD
RUNNERBURG RD
LINDSTORM RD
ADLONG JOHNSON RD
CROSSBY EASTGATE RD
LORD RD
LIVE OAK
SHADY LN

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED PROFESSIONAL ENGINEER

Sharmeen Rahman, P.E.

01/29/2024

Texas Department of Transportation

US 90

PROPOSED TYPICAL SECTONS

SCALE:

SHEET 4 OF 4

FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
6		3C

STATE	DIST	COUNTY
TEXAS	HOU	HARRIS

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90

DATE: $DATE$
FILE: $FILE$

FY	MSE	HIGHWAY	RDB	REFERENCE MARKERS BEGIN				END			LEN	PTYPE	IRI(IN/MI) TEST			
													MM/DD/YYYY	LEFT	RIGHT	SI
2024	10	US0090	A1	0854	+	1.864	0854	+	1.964	0.1	01	8/8/2023	183	157	2.6
2024	10	US0090	A1	0854	+	1.964	0856	+	0.084	0.1	01	8/8/2023	193	177	2.4
2024	10	US0090	A1	0856	+	0.084	0856	+	0.184	0.1	01	8/8/2023	172	199	2.4
2024	10	US0090	A1	0856	+	0.184	0856	+	0.284	0.1	01	8/8/2023	146	175	2.7
2024	10	US0090	A1	0856	+	0.284	0856	+	0.384	0.1	01	8/8/2023	157	177	2.6
2024	10	US0090	A1	0856	+	0.384	0856	+	0.484	0.1	01	8/8/2023	232	253	1.8
2024	10	US0090	A1	0856	+	0.484	0856	+	0.584	0.1	01	8/8/2023	246	281	1.6
2024	10	US0090	A1	0856	+	0.584	0856	+	0.622	0.1	01	8/8/2023	156	196	2.5
2024	10	US0090	A1	0856	+	1.329	0856	+	1.429	0.1	01	8/16/2023	103	101	3.6
2024	10	US0090	A1	0856	+	1.429	0856	+	1.529	0.1	01	8/16/2023	107	108	3.5
2024	10	US0090	A1	0856	+	1.529	0856	+	1.629	0.1	01	8/16/2023	107	107	3.5
2024	10	US0090	A1	0856	+	1.629	0856	+	1.729	0.1	01	8/16/2023	147	147	2.9
2024	10	US0090	A1	0856	+	1.729	0856	+	1.829	0.1	01	8/16/2023	123	120	3.3
2024	10	US0090	A1	0856	+	1.829	0856	+	1.929	0.1	01	8/16/2023	108	100	3.6
2024	10	US0090	A1	0856	+	1.929	0856	+	2.029	0.1	01	8/16/2023	107	111	3.5
2024	10	US0090	A1	0856	+	2.029	0856	+	2.129	0.1	01	8/16/2023	98	92	3.8
2024	10	US0090	A1	0856	+	2.129	0856	+	2.229	0.1	01	8/16/2023	105	101	3.6
2024	10	US0090	A1	0856	+	2.229	0856	+	2.329	0.1	01	8/16/2023	90	99	3.8
2024	10	US0090	A1	0856	+	2.329	0856	+	2.429	0.1	01	8/16/2023	105	107	3.6
2024	10	US0090	A1	0856	+	2.429	0856	+	2.529	0.1	01	8/16/2023	156	135	2.9
2024	10	US0090	A1	0856	+	2.529	0856	+	2.629	0.1	01	8/16/2023	141	120	3.2
2024	10	US0090	A1	0856	+	2.629	0858	+	0.017	0.1	01	8/16/2023	170	149	2.7
2024	10	US0090	A1	0858	+	0.017	0858	+	0.117	0.1	01	8/16/2023	99	102	3.7
2024	10	US0090	A1	0858	+	0.117	0858	+	0.217	0.1	01	8/16/2023	114	118	3.4
2024	10	US0090	A1	0858	+	0.217	0858	+	0.317	0.1	01	8/16/2023	111	115	3.4
2024	10	US0090	A1	0858	+	0.317	0858	+	0.417	0.1	01	8/16/2023	103	118	3.5
2024	10	US0090	A1	0858	+	0.417	0858	+	0.517	0.1	01	8/16/2023	93	98	3.7
2023	10	US0090	L1	0854	+	1.819	0854	+	1.919	0.1	05	10/12/2022	190	160	2.5
2023	10	US0090	L1	0854	+	1.919	0856	+	0.030	0.1	05	10/12/2022	94	72	4.0
2023	10	US0090	L1	0856	+	0.030	0856	+	0.130	0.1	05	10/12/2022	83	70	4.1
2023	10	US0090	L1	0856	+	0.130	0856	+	0.230	0.1	05	10/12/2022	86	77	4.0
2023	10	US0090	L1	0856	+	0.230	0856	+	0.330	0.1	05	10/12/2022	65	60	4.4
2023	10	US0090	L1	0856	+	0.330	0856	+	0.430	0.1	05	10/12/2022	75	54	4.4
2023	10	US0090	L1	0856	+	0.430	0856	+	0.530	0.1	05	10/12/2022	99	100	3.7
2023	10	US0090	L1	0856	+	0.530	0856	+	0.630	0.1	05	10/12/2022	125	108	3.4
2023	10	US0090	L1	0856	+	0.630	0856	+	0.730	0.1	05	10/12/2022	55	75	4.4
2023	10	US0090	L1	0856	+	0.730	0856	+	0.830	0.1	05	10/12/2022	61	67	4.4
2023	10	US0090	L1	0856	+	0.830	0856	+	0.930	0.1	05	10/12/2022	56	64	4.5
2023	10	US0090	L1	0856	+	0.930	0856	+	1.030	0.1	05	10/12/2022	172	176	2.6
2023	10	US0090	L1	0856	+	1.030	0856	+	1.130	0.1	05	10/12/2022	112	111	3.5
2023	10	US0090	L1	0856	+	1.130	0856	+	1.230	0.1	05	10/12/2022	146	173	2.7
2023	10	US0090	L1	0856	+	1.230	0856	+	1.330	0.1	05	10/12/2022	107	120	3.4
2023	10	US0090	L1	0856	+	1.330	0856	+	1.430	0.1	05	10/12/2022	131	132	3.1
2023	10	US0090	L1	0856	+	1.430	0856	+	1.530	0.1	05	10/12/2022	164	124	3.0
2023	10	US0090	L1	0856	+	1.530	0856	+	1.630	0.1	05	10/12/2022	77	88	4.0
2023	10	US0090	L1	0856	+	1.630	0856	+	1.730	0.1	05	10/12/2022	109	140	3.2
2023	10	US0090	L1	0856	+	1.730	0856	+	1.830	0.1	05	10/12/2022	116	137	3.2
2023	10	US0090	L1	0856	+	1.830	0856	+	1.930	0.1	05	10/12/2022	153	197	2.5
2023	10	US0090	L1	0856	+	1.930	0858	+	0.027	0.1	05	10/12/2022	121	174	2.9
2023	10	US0090	L1	0858	+	0.027	0858	+	0.127	0.1	05	10/12/2022	191	115	2.8
2023	10	US0090	L1	0858	+	0.127	0858	+	0.227	0.1	05	10/12/2022	131	173	2.8
2023	10	US0090	L1	0858	+	0.227	0858	+	0.327	0.1	05	10/12/2022	94	140	3.4
2023	10	US0090	L1	0858	+	0.327	0858	+	0.427	0.1	05	10/12/2022	129	141	3.1
2023	10	US0090	L1	0858	+	0.427	0858	+	0.527	0.1	05	10/12/2022	221	197	2.1
2023	10	US0090	L1	0858	+	0.527	0858	+	0.627	0.1	05	10/12/2022	126	123	3.2
2023	10	US0090	L1	0858	+	0.627	0858	+	0.708	0.1	05	10/12/2022	67	63	4.4
2023	10	US0090	L1	0858	+	0.708	0858	+	0.808	0.1	05	10/12/2022	69	59	4.4
2023	10	US0090	L1	0858	+	0.808	0858	+	0.908	0.1	05	10/12/2022	52	72	4.5
2023	10	US0090	L1	0858	+	0.908	0858	+	1.008	0.1	05	10/12/2022	74	91	4.0
2023	10	US0090	L1	0858	+	1.008	0858	+	1.108	0.1	05	10/12/2022	65	55	4.5
2023	10	US0090	L1	0858	+	1.108	0858	+	1.208	0.1	05	10/12/2022	67	56	4.5
2023	10	US0090	L1	0858	+	1.208	0858	+	1.308	0.1	05	10/12/2022	60	63	4.5
2023	10	US0090	L1	0858	+	1.308	0858	+	1.408	0.1	05	10/12/2022	54	61	4.6
2023	10	US0090	L1	0858	+	1.408	0858	+	1.508	0.1	05	10/12/2022	48	64	4.6
2023	10	US0090	L1	0858	+	1.508	0858	+	1.608	0.1	05	10/12/2022	74	59	4.4
2023	10	US0090	L1	0858	+	1.608	0858	+	1.708	0.1	05	10/12/2022	73	80	4.1
2023	10	US0090	L1	0858	+	1.708	0858	+	1.808	0.1	05	10/12/2022	88	97	3.8
2023	10	US0090	L1	0858	+	1.808	0858	+	1.908	0.1	05	10/12/2022	100	63	4.0
2023	10	US0090	L1	0858	+	1.908	0860	+	0.068	0.1	05	10/12/2022	86	92	3.9
2023	10	US0090	L1	0860	+	0.068	0860	+	0.168	0.1	05	10/12/2022	65	84	4.2
2023	10	US0090	L1	0860	+	0.168	0860	+	0.268	0.1	05	10/12/2022	67	63	4.4
2023	10	US0090	L1	0860	+	0.268	0860	+	0.368	0.1	05	10/12/2022	77	57	4.3
2023	10	US0090	L1	0860	+	0.368	0860	+	0.468	0.1	05	10/12/2022	82	73	4.1
2023	10	US0090	L1	0860	+	0.468	0860	+	0.568	0.1	05	10/12/2022	111	149	3.2
2023	10	US0090	L1	0860	+	0.568	0860	+	0.668	0.1	05	10/12/2022	67	69	4.3
2023	10	US0090	L1	0860	+	0.668	0860	+	0.768	0.1	05	10/12/2022	104	81	3.8
2023	10	US0090	L1	0860	+	0.768	0860	+	0.868	0.1	05	10/12/2022	61	64	4.4
2023	10	US0090	L1	0860	+	0.868	0860	+	0.968	0.1	05	10/12/2022	51	63	4.6
2023	10	US0090	L1	0860	+	0.968	0860	+	1.068	0.1	05	10/12/2022	57	54	4.6
2023	10	US0090	L1	0860	+	1.068	0860	+	1.168	0.1	05	10/12/2022	55	55	4.6
2023	10	US0090	L1	0860	+	1.168	0860	+	1.268	0.1	05	10/12/2022	65	72	4.3
2023	10	US0090	L1	0860	+	1.268	0860	+	1.368	0.1	05	10/12/2022	55	66	4.5
2023	10	US0090	L1	0860	+	1.368	0860	+	1.468	0.1	05	10/12/2022	68	63	4.4
2023	10	US0090	L1	0860	+	1.468	0860	+	1.568	0.1	05	10/12/2022	65	69	4.3
2023	10	US0090	L1	0860	+	1.568	0860	+	1.668	0.1	05	10/12/2022	58	62	4.5
2023	10	US0090	L1	0860	+	1.668	0860	+	1.768	0.1	05	10/12/2022	57	68	4.4
2023	10	US0090	L1	0860	+	1.768	0860	+	1.868	0.1	05	10/12/2022	63	80	4.2
2023	10	US0090	L1	0860	+	1.868	0860	+	1.968	0.1	05	10/12/2022	67	83	4.2
2023	10	US0090	L1	0860	+	1.968	0862	+	0.017	0.1	05	10/12/2022	63	80	4.2
2023	10	US0090	L1	0862	+	0.017	0862	+	0.117	0.1	05	10/12/2022	53	60	4.6
2023	10	US0090	L1	0862	+	0.117	0862	+	0.217	0.1	05	10/12/2022	47	61	4.7
2023	10	US0090	L1	0862	+	0.217	0862	+	0.317	0.1	05	10/12/2022	44	49	4.9
2023	10	US0090	L1	0862	+	0.317	0862	+	0.417	0.1	05	10/12/2022	57	61	4.5
2023	10	US0090	L1	0862	+	0.417	0862	+	0.517	0.1	05	10/12/2022	67	63	4.4
2023	10	US0090	L1	0862	+	0.517	0862	+	0.617	0.1	05	10/12/2022	79	73	4.1
2023	10	US0090	L1	0862	+	0.617	0862	+	0.717	0.1	05	10/12/2022	74	81	4.1
2023	10	US0090	L1	0862	+	0.717	0862	+	0.817	0.1	05	10/12/2022	62	85	4.2
2023	10	US0090	L1	0862	+	0.817	0862	+	0.917	0.1	05	10/12/2022	53	60	4.6
2023	10	US0090	L1	0862	+	0.917	0862	+	1.017	0.1	05	10/12/2022	53	57	4.6
2023	10	US0090	L1	0862	+	1.017	0862	+	1.117	0.1	05	10/12/2022	48	70	4.5
2023	10	US0090	L1	0862	+	1.117	0862	+	1.217	0.1	05	10/12/2022	58	71	4.4
2023	10	US0090	L1	0862	+	1.217	0862	+	1.317	0.1	05	10/12/2022	52	58	4.6
2023	10	US0090	L1	0862	+	1.317	0862	+	1.417	0.1	05	10/12/2022	84	86	3.9
2023	10	US0090	L1	0862	+	1.417	0862	+	1.517	0.1	05	10/12/2022	136	136	3.1
2023	10	US0090	L1	0862	+	1.517	0864	+	0.076	0.1	05	10/12/2022	135	142	3.0
2023	10	US0090	R1	0854	+	1.807	0854	+	1.907	0.1	01	10/12/2022	123	119	3.3
2023	10	US0090	R1	0854	+	1.907	0856	+	0.018	0.1	01	10/12/2022	111	87	3.7
2023	10	US0090	R1	0856	+	0.018	0856	+	0.118	0.1	01	10/12/2022	99	58	4.1
2023	10	US0090	R1	0856	+	0.118	0856	+	0.218	0.1	01	10/12/2022	112	65	3.9
2023	10	US0090	R1	0856	+	0.218	0856	+	0.318	0.1	01	10/12/2022	81	81	4.0
2023	10	US0090	R1	0856	+	0.318	0856	+	0.418	0.1	01	10/12/2022	90	57	4.2
2023	10	US0090	R1	0856	+	0.418	0856	+	0.518	0.1	01	10/12/2022	139	108	3.3
2023	10	US0090	R1	0856	+	0.518	0856	+	0.618	0.1	01	10/12/2022	136	115	3.2
2023	10	US0090	R1	0856	+	0.618	0856	+	0.718	0.1	07	10/12/2022	121	118	3.3

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US 90

IRI DATA

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		4

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DW: CE: DW: CK:

F Y	M S E C	HIGHWAY	R D B D	REFERENCE MARKERS BEGIN			REFERENCE MARKERS END			LEN	P T Y P E	IRI(IN/MI) TEST MM/DD/YYYY	IRI(IN/MI) LEFT	IRI(IN/MI) RIGHT	IRI(IN/MI) SI
2023	10	US0090	R1	0856	+	0.718	0856	+	0.818	0.1	07	10/12/2022	105	103	3.6
2023	10	US0090	R1	0856	+	0.818	0856	+	0.918	0.1	07	10/12/2022	153	167	2.7
2023	10	US0090	R1	0856	+	0.918	0856	+	1.018	0.1	07	10/12/2022	158	169	2.7
2023	10	US0090	R1	0856	+	1.018	0856	+	1.118	0.1	07	10/12/2022	148	181	2.7
2023	10	US0090	R1	0856	+	1.118	0856	+	1.218	0.1	07	10/12/2022	181	210	2.3
2023	10	US0090	R1	0856	+	1.218	0856	+	1.318	0.1	07	10/12/2022	142	139	3.0
2023	10	US0090	R1	0856	+	1.318	0856	+	1.418	0.1	07	10/12/2022	156	233	2.3
2023	10	US0090	R1	0856	+	1.418	0856	+	1.518	0.1	07	10/12/2022	191	220	2.2
2023	10	US0090	R1	0856	+	1.518	0856	+	1.618	0.1	07	10/12/2022	157	163	2.7
2023	10	US0090	R1	0856	+	1.618	0856	+	1.718	0.1	07	10/12/2022	128	114	3.3
2023	10	US0090	R1	0856	+	1.718	0856	+	1.818	0.1	07	10/12/2022	151	151	2.9
2023	10	US0090	R1	0856	+	1.818	0856	+	1.918	0.1	07	10/12/2022	173	134	2.8
2023	10	US0090	R1	0856	+	1.918	0858	+	0.015	0.1	07	10/12/2022	173	145	2.7
2023	10	US0090	R1	0858	+	0.015	0858	+	0.115	0.1	07	10/12/2022	109	117	3.4
2023	10	US0090	R1	0858	+	0.115	0858	+	0.215	0.1	07	10/12/2022	144	139	3.0
2023	10	US0090	R1	0858	+	0.215	0858	+	0.315	0.1	07	10/12/2022	170	204	2.4
2023	10	US0090	R1	0858	+	0.315	0858	+	0.415	0.1	07	10/12/2022	126	134	3.2
2023	10	US0090	R1	0858	+	0.415	0858	+	0.515	0.1	07	10/12/2022	192	209	2.2
2023	10	US0090	R1	0858	+	0.515	0858	+	0.615	0.1	07	10/12/2022	124	133	3.2
2023	10	US0090	R1	0858	+	0.615	0858	+	0.634	0.1	07	10/12/2022	154	173	2.7
2023	10	US0090	R1	0858	+	0.634	0858	+	0.734	0.1	01	10/12/2022	180	147	2.7
2023	10	US0090	R1	0858	+	0.734	0858	+	0.834	0.1	01	10/12/2022	154	117	3.1
2023	10	US0090	R1	0858	+	0.834	0858	+	0.934	0.1	01	10/12/2022	106	108	3.5
2023	10	US0090	R1	0858	+	0.934	0858	+	1.034	0.1	01	10/12/2022	96	89	3.8
2023	10	US0090	R1	0858	+	1.034	0858	+	1.134	0.1	01	10/12/2022	107	97	3.6
2023	10	US0090	R1	0858	+	1.134	0858	+	1.234	0.1	01	10/12/2022	108	106	3.5
2023	10	US0090	R1	0858	+	1.234	0858	+	1.334	0.1	01	10/12/2022	93	95	3.8
2023	10	US0090	R1	0858	+	1.334	0858	+	1.434	0.1	01	10/12/2022	96	111	3.6
2023	10	US0090	R1	0858	+	1.434	0858	+	1.534	0.1	01	10/12/2022	103	112	3.5
2023	10	US0090	R1	0858	+	1.534	0858	+	1.634	0.1	01	10/12/2022	76	82	4.1
2023	10	US0090	R1	0858	+	1.634	0858	+	1.734	0.1	01	10/12/2022	141	152	2.9
2023	10	US0090	R1	0858	+	1.734	0858	+	1.834	0.1	01	10/12/2022	115	98	3.5
2023	10	US0090	R1	0858	+	1.834	0858	+	1.934	0.1	01	10/12/2022	95	96	3.7
2023	10	US0090	R1	0858	+	1.934	0860	+	0.094	0.1	01	10/12/2022	101	97	3.7
2023	10	US0090	R1	0860	+	0.094	0860	+	0.194	0.1	01	10/12/2022	104	96	3.7
2023	10	US0090	R1	0860	+	0.194	0860	+	0.294	0.1	01	10/12/2022	127	126	3.2
2023	10	US0090	R1	0860	+	0.294	0860	+	0.394	0.1	01	10/12/2022	137	157	2.9
2023	10	US0090	R1	0860	+	0.394	0860	+	0.494	0.1	01	10/12/2022	138	138	3.0
2023	10	US0090	R1	0860	+	0.494	0860	+	0.594	0.1	01	10/12/2022	152	154	2.8
2023	10	US0090	R1	0860	+	0.594	0860	+	0.694	0.1	01	10/12/2022	168	173	2.6
2023	10	US0090	R1	0860	+	0.694	0860	+	0.794	0.1	01	10/12/2022	145	151	2.9
2023	10	US0090	R1	0860	+	0.794	0860	+	0.894	0.1	01	10/12/2022	106	110	3.5
2023	10	US0090	R1	0860	+	0.894	0860	+	0.994	0.1	01	10/12/2022	130	113	3.3
2023	10	US0090	R1	0860	+	0.994	0860	+	1.094	0.1	01	10/12/2022	145	127	3.1
2023	10	US0090	R1	0860	+	1.094	0860	+	1.194	0.1	01	10/12/2022	156	168	2.7
2023	10	US0090	R1	0860	+	1.194	0860	+	1.294	0.1	01	10/12/2022	145	148	2.9
2023	10	US0090	R1	0860	+	1.294	0860	+	1.394	0.1	01	10/12/2022	130	119	3.2
2023	10	US0090	R1	0860	+	1.394	0860	+	1.494	0.1	01	10/12/2022	150	147	2.9
2023	10	US0090	R1	0860	+	1.494	0860	+	1.594	0.1	01	10/12/2022	128	122	3.2
2023	10	US0090	R1	0860	+	1.594	0860	+	1.694	0.1	01	10/12/2022	137	115	3.2
2023	10	US0090	R1	0860	+	1.694	0860	+	1.794	0.1	01	10/12/2022	122	119	3.3
2023	10	US0090	R1	0860	+	1.794	0860	+	1.894	0.1	01	10/12/2022	123	137	3.2
2023	10	US0090	R1	0860	+	1.894	0860	+	1.994	0.1	01	10/12/2022	144	150	2.9
2023	10	US0090	R1	0860	+	1.994	0862	+	0.043	0.1	01	10/12/2022	134	140	3.1
2023	10	US0090	R1	0862	+	0.043	0862	+	0.143	0.1	01	10/12/2022	131	124	3.2
2023	10	US0090	R1	0862	+	0.143	0862	+	0.243	0.1	01	10/12/2022	106	119	3.4
2023	10	US0090	R1	0862	+	0.243	0862	+	0.343	0.1	01	10/12/2022	132	129	3.2
2023	10	US0090	R1	0862	+	0.343	0862	+	0.443	0.1	01	10/12/2022	139	136	3.0
2023	10	US0090	R1	0862	+	0.443	0862	+	0.543	0.1	01	10/12/2022	137	153	2.9
2023	10	US0090	R1	0862	+	0.543	0862	+	0.643	0.1	01	10/12/2022	119	121	3.3
2023	10	US0090	R1	0862	+	0.643	0862	+	0.743	0.1	01	10/12/2022	121	133	3.2
2023	10	US0090	R1	0862	+	0.743	0862	+	0.843	0.1	01	10/12/2022	141	149	2.9
2023	10	US0090	R1	0862	+	0.843	0862	+	0.943	0.1	01	10/12/2022	152	144	2.9
2023	10	US0090	R1	0862	+	0.943	0862	+	1.043	0.1	01	10/12/2022	154	157	2.8
2023	10	US0090	R1	0862	+	1.043	0862	+	1.143	0.1	01	10/12/2022	189	171	2.5
2023	10	US0090	R1	0862	+	1.143	0862	+	1.243	0.1	01	10/12/2022	169	173	2.6
2023	10	US0090	R1	0862	+	1.243	0862	+	1.343	0.1	01	10/12/2022	154	167	2.7
2023	10	US0090	R1	0862	+	1.343	0862	+	1.443	0.1	01	10/12/2022	133	156	2.9
2023	10	US0090	R1	0862	+	1.443	0864	+	0.002	0.1	01	10/12/2022	130	146	3.0
2023	10	US0090	R1	0864	+	0.002	0864	+	0.064	0.1	01	10/12/2022	124	122	3.3
2023	10	US0090	X1	0856	+	0.000	0856	+	0.070	0.1	05	10/12/2022	155	112	3.1
2023	10	US0090	X1	0856	+	0.070	0856	+	0.170	0.1	05	10/12/2022	131	103	3.4
2023	10	US0090	X1	0856	+	0.170	0856	+	0.270	0.1	05	10/12/2022	88	86	3.9
2023	10	US0090	X1	0856	+	0.270	0856	+	0.370	0.1	05	10/12/2022	105	90	3.7
2023	10	US0090	X1	0856	+	0.370	0856	+	0.470	0.1	05	10/12/2022	105	93	3.7
2023	10	US0090	X1	0856	+	0.470	0856	+	0.570	0.1	05	10/12/2022	100	79	3.9
2023	10	US0090	X1	0856	+	0.570	0856	+	0.670	0.1	05	10/12/2022	67	59	4.4
2023	10	US0090	X1	0856	+	0.670	0856	+	0.770	0.1	05	10/12/2022	93	75	4.0
2023	10	US0090	X1	0856	+	0.770	0856	+	0.870	0.1	05	10/12/2022	74	74	4.2
2023	10	US0090	X1	0856	+	0.870	0856	+	0.970	0.1	05	10/12/2022	74	92	4.0
2023	10	US0090	X1	0856	+	0.970	0856	+	1.070	0.1	05	10/12/2022	105	97	3.6
2023	10	US0090	X1	0856	+	1.070	0856	+	1.170	0.1	05	10/12/2022	86	89	3.9
2023	10	US0090	X1	0856	+	1.170	0856	+	1.270	0.1	05	10/12/2022	101	85	3.8
2023	10	US0090	X1	0856	+	1.270	0856	+	1.370	0.1	05	10/12/2022	90	79	4.0
2023	10	US0090	X1	0856	+	1.370	0856	+	1.470	0.1	05	10/12/2022	68	69	4.3
2023	10	US0090	X1	0856	+	1.470	0856	+	1.570	0.1	05	10/12/2022	80	74	4.1
2023	10	US0090	X1	0856	+	1.570	0856	+	1.670	0.1	05	10/12/2022	54	57	4.6
2023	10	US0090	X1	0856	+	1.670	0856	+	1.770	0.1	05	10/12/2022	41	53	4.9
2023	10	US0090	X1	0856	+	1.770	0856	+	1.870	0.1	05	10/12/2022	47	46	4.9
2023	10	US0090	X1	0856	+	1.870	0856	+	1.970	0.1	05	10/12/2022	98	92	3.8
2023	10	US0090	X1	0856	+	1.970	0858	+	0.067	0.1	05	10/12/2022	93	83	3.9
2023	10	US0090	X1	0858	+	0.067	0858	+	0.167	0.1	05	10/12/2022	79	72	4.1
2023	10	US0090	X1	0858	+	0.167	0858	+	0.267	0.1	05	10/12/2022	64	62	4.4
2023	10	US0090	X1	0858	+	0.267	0858	+	0.367	0.1	05	10/12/2022	89	97	3.8
2023	10	US0090	X1	0858	+	0.367	0858	+	0.467	0.1	05	10/12/2022	61	58	4.5

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IRI DATA

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		4A

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DW: DW: CE: CE:

General Notes:

General:

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Submit any questions about this project via the Letting Pre-Bid Q&A web page, located at:

https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors

The Letting Pre-Bid Q&A web page for each project can be accessed by scrolling or filtering the dashboard using the controls on the left side to navigate to the project. Hover over the blue hyperlink of the project to view the Q&A and click on the link in the window that pops up.

Large files with relevant project documentation, such as Geotech reports, As-Built plans, and cross-sections will continue to be provided on the following FTP site:

Index of /pub/txdot-info/Pre-Letting Responses/Houston District (state.tx.us) or

https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/Houston%20District/

Unless otherwise shown on the plans, RAP generated by this project will become the property of the Contractor for use in the current construction project or in future projects.

If fixed features require, the governing slopes shown may vary between the limits shown and to the extent determined by the Engineer.

Notify the Engineer immediately if discrepancies are discovered in the horizontal control or the benchmark data.The following standard detail sheets are modified:

Modified Standards

FPM(2) -22 (MOD)

References to manufacturer's trade name or catalog numbers are for the purpose of identification only. Similar materials from other manufacturers are permitted if they are of equal quality, comply with the specifications for this project, and are approved, except for roadway illumination, electrical, and traffic signal items.

The cost for materials, labor, and incidentals to provide for traffic across the roadway and for ingress and egress to private property in accordance with Section 7.2.4 of the standard

Sheet 5

County: Harris **Control:** 0028-02-098,etc

Highway: US 90

specifications is subsidiary to the various bid items. Restore access roadways to their original condition upon completing construction.

Grade street intersections and median openings for surface drainage.

If a foundation is to be placed where a riprap surface or an asphalt concrete surface presently exists, use caution in breaking out the existing surface for placement. Break out no greater area than is required to place the foundation. After placing the foundation, wrap the periphery with 0.5 in. pre-molded mastic expansion joint. Then replace the remaining portion of the broken out surface with Class A or Class C concrete or cold mix asphalt concrete to the exact slope, pattern, and thickness of the existing riprap or asphalt. Payment for breaking out the existing surface, wrapping the foundation, and replacing the surface is subsidiary to the various bid items.

The lengths of the posts for ground mounted signs and the tower legs for the overhead sign supports are approximate. Verify the lengths before ordering these materials to meet the existing field conditions and to conform to the minimum sign mounting heights shown in the plans.

Furnish aluminum Type A signs instead of plywood signs for signs shown on the Summary of Small Signs sheet.

Stencil the National Bridge Inventory (NBI) number on each existing bridge shown on these plans. The NBI number is shown above the title block for each bridge layout.

Clearly mark or highlight on the shop drawings, the items being furnished for this project. Submit required shop drawings in accordance with the shop drawing distribution list shown in the note for Item 5 for review and distribution.

Unless otherwise shown on the plans or otherwise directed, commence work after sunrise and ensure construction equipment is off the road by sunset.

Tolls incurred by the Contractor are subsidiary to the various bid items.

Procure permits and licenses, which are to be issued by the City, County, or Municipal Utility District.

General: Roadway Illumination and Electrical

For roadway illumination and electrical items, use materials from pre-qualified producers as shown on the Construction Division (CST) of the Department's material producers list. Check the latest link on the Department's website for this list. The category/item is "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials found on this list.

Perform electrical work in conformance with the National Electrical Code (NEC) and the Department's standard sheets.

County: Harris

Highway: US 90

General: Traffic Signals

For traffic signal items, use materials from the Pre-Qualified Producers List (located at http://www.dot.state.tx.us/GSD/purchasing/supps.htm) and the materials pre-qualified for illumination and electrical items (located at http://ftp.dot.state.tx.us/pub/txdot-info/cmd/mpl/riaes.pdf) as shown on the Department's Material Producers List and the Roadway Illumination and Electrical Supplies List. Check the latest links on the Department's website for these lists. No substitutions will be allowed for materials found on these lists.

General: Site Management

Mow the grass and weeds within the project limits a maximum of 3 times a year as directed. This work is subsidiary to the various bid items.

Mark stations every 100 ft. and maintain the markings for the project duration. Remove the station markings at the completion of the project. This work is subsidiary to the various bid items.

Do not mix or store materials, or store or repair equipment, on top of concrete pavement or bridge decks unless authorized by the Engineer. Permission will be granted to store materials on surfaces if no damage or discoloration will result.

Personal vehicles of employees are not permitted to park within the right of way, including sections closed to public traffic. Employees may park on the right of way at the Contractor's office, equipment, and materials storage yard sites.

Assume ownership of debris and dispose of at an approved location. Do not dispose of debris on private property unless approved in writing by the District Engineer.

Control the dust caused by construction operations. For sweeping the base material in preparation for laying asphalt and for sweeping the finished concrete pavement, use one of the following types of sweepers or approved equal:

Tricycle Type	**Truck Type - 4 Wheel**
Wayne Series 900	M-B Cruiser II
Elgin White Wing	Wayne Model 945
Elgin Pelican	Mobile TE-3
	Mobile TE-4
	Murphy 4042

General: Traffic Control and Construction

Schedule construction operations such that preparing individual items of work follows in close sequence to constructing storm drains in order to provide as little inconvenience as practical to the businesses and residents along the project.

Schedule work so that the base placement operations follow the subgrade work as closely as practical to reduce the hazard to the traveling public and to prevent undue delay caused by wet weather.

This project requires extensive grading operations in an environmentally sensitive area.

If relocating mailboxes, place them with the post firmly in the ground at nearby locations. Upon completing the project, the Engineer will locate the final mailbox placement. Perform this work in accordance with the requirements of the Item, "Mailbox Assemblies," except for measurement and payment. This work is subsidiary to the various bid items.

If fences cross construction easements shown on the plans and work is required beyond the fences, remove and replace the fences as directed. This work and the materials are subsidiary to the various bid items.

When design details are not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

General: Utilities

Consider the locations of underground utilities depicted in the plans as approximate and employ responsible care to avoid damaging utility facilities. Depending upon scope and magnitude of planned construction activities, advanced field confirmation by the utility owner or operator may be prudent. Where possible, protect and preserve permanent signs, markers, and designations of underground facilities.

If the Contractor damages or causes damage (breaks, leaks, nicks, dents, gouges, etc.) to the utility, contact the utility facility owner or operator immediately.

Be aware that an operational Computerized Transportation Management System (CTMS) exists within the limits of this project and that the system must remain operational throughout construction. If the Contractor damages or causes damage to this system, repair such damage within 8 hours of occurrence at no cost to the Department. In the event of system damage, notify the Director of Traffic Management Systems at 713-881-3283 within one hour of occurrence. Failure of the Contractor to repair damage to the main fiber optic cable and CCTV cable trunk lines, which convey all corridor information to TranStar, will result in the Contractor being billed for the full cost of emergency repairs.

At least 72 hours before starting work, make arrangements for locating existing Department-owned above ground and underground fiber optic, communications, power, illumination, and traffic signal cabling and conduit. Do this by calling the Department's Houston District Traffic Signal Operations Office at 713-802-5662, or by e-mailing the Department's Houston District Traffic Signal Operations Office at: HOU-LocateRequest@txdot.gov, to schedule marking of underground lines on the ground. Use caution if working in these areas to avoid damaging or interfering with existing facilities.

Notify the Engineer at least 48 hours before constructing junction boxes at storm drain and utility intersections.

Install or remove poles and luminaires located near overhead or underground electrical lines using established industry and utility safety practices. Consult the appropriate utility company before beginning such work.

If overhead or underground power lines need to be de-energized, contact the electrical service provider to perform this work. Costs associated with de-energizing the power lines or other protective measures required are at no expense to the Department.

If working near power lines, comply with the appropriate sections of Texas State Law and Federal Regulations relating to the type of work involved.

Perform electrical work in conformance with the National Electrical Code (NEC) and Department's standard sheets.

Before beginning any underground work, notify the City of Houston's Chief Inspector, Public Works and Engineering, to establish the locations of any existing electrical systems for lighting facilities within the limits of this project.

Item 5: Control of Work

Submit shop drawings electronically for the fabrication of items as documented in Table 1 or Table 2 below. Information and requirements for electronic submittals can be viewed in the "Guide to Electronic Shop Drawing Submittal" which can be accessed through the following web link, https://ftp.txdot.gov/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf References to 11 in. x 17 in. sheets in individual specifications for structural items imply electronic CAD sheets.

Table 1

2014 Construction Specification Required Shop/Working Drawing Submittals - TxDOT Generated Plans

Spec Item No.'s	Product	Submittal Required	Approval Required (Y/N)	Contractor/ Fabricator P.E. Seal Required	Reviewing Party	Shop or Working Drawing (Note 1)
7.16.1&.2	Construction Load Analyses	Y	Y	Y	B	WD
400	Excavation and Backfill for Structures (cofferdams)	Y	N	Y	A	WD
403	Temporary Special Shoring	Y	N	Y	C	WD
420	Formwork/Falsework	Y	N	Y	A	WD
423	Retaining Walls, (calcs req'd.)	Y	Y	Y	C	SD
425	Optional Design Calculations (Prstrs Bms)	Y	Y	Y	B	SD
425	Prestr Concr Sheet Piling	Y	Y	N	B	SD
425	Prestr Concr Beams	Y	Y	N	B	SD
425	Prestr Concr Bent	Y	Y	N	B	SD
426	Post Tension Details	Y	Y	N	B	SD
434	Elastomeric Bearing Pads (All)	Y	Y	N	B	SD
441	Bridge Protective Assembly	Y	Y	N	B	SD
441	Misc Steel (various steel assemblies)	Y	Y	N	B	SD
441	Steel Pedestals (bridge raising)	Y	Y	N	B	SD
441	Steel Bearings	Y	Y	N	B	SD
441	Steel Bent	Y	Y	N	B	SD
441	Steel Diaphragms	Y	Y	N	B	SD
441	Steel Finger Joint	Y	Y	N	B	SD
441	Steel Plate Girder	Y	Y	N	B	SD
441	Steel Tub-Girders	Y	Y	N	B	SD
441	Erection Plans, including Falsework	Y	N	Y	A	WD
449	Sign Structure Anchor Bolts	Y	Y	N	T	SD
450	Railing	Y	Y	N	A	SD
462	Concrete Box Culvert	Y	Y	N	C	SD
462	Concrete Box Culvert (Alternate Designs Only,calcs reqd.)	Y	Y	Y	B	SD
464	Reinforced Concrete Pipe (Jack and Bore only; ONLY when requested)	Y	Y	Y	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets	Y	Y	N	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets (Alternate Designs Only, calcs req'd.)	Y	Y	Y	B	SD
466	Pre-cast Headwalls and Wingwalls	Y	Y	N	A	SD
467	Pre-cast Safety End Treatments	Y	Y	N	A	SD
495	Raising Existing Structure (calcs reqd.)	Y	Y	Y	B	SD
610	Roadway Illumination Supports (Non-Standard only, calcs reqd.)	Y	Y	Y	BRG	SD
613	High Mast Illumination Poles (Non-standard only, calcs reqd.)	Y	Y	Y	BRG	SD
627	Treated Timber Poles	Y	Y	N	T	SD
644	Special Non-Standard Supports (Bridge Mounts, Barrier Mounts,	Y	Y	Y	T	SD

	Etc.)					
647	Large Roadside Sign Supports	Y	Y	Y	T	SD
650	Cantilever Sign Structure Supports - Alternate Design Calcs.	Y	Y	Y	T	SD
650	Sign Structures	Y	Y	N	T	SD
680	Installation of Highway Traffic Signals	Y	Y	N	T	SD
682	Vehicle and Pedestrian Signal Heads	Y	Y	N	T	SD
684	Traffic Signal Cables	Y	Y	N	T	SD
685	Roadside Flashing Beacon Assemblies	Y	Y	N	T	SD
686	Traffic Signal Pole Assemblies (Steel) (Non-Standard only)	Y	Y	Y	T	SD
687	Pedestal Pole Assemblies	Y	Y	N	T	SD
688	Detectors	Y	Y	N	A	SD
784	Repairing Steel Bridge Members	Y	Y	Y	B	WD
SS	Prestr Concr Crown Span	Y	Y	N	B	SD
SS	Sound Barrier Walls	Y	Y	Y	A	SD
SS	Camera Poles	Y	Y	Y	TMS	SD
SS	Pedestrian Bridge (Calcs req'd.)	Y	Y	Y	B	SD
SS	Screw-In Type Anchor Foundations	Y	Y	N	T	SD
SS	Fiber Optic/Communication Cable	Y	Y	N	TMS	SD
SS	Spread Spectrum Radios for Signals	Y	Y	N	T	SD
SS	VIVDS System for Signals	Y	Y	N	T	SD
SS	CTMS Equipment	Y	Y	N	TMS	SD

Notes:

1. Document flow for Working Drawings differs from Shop Drawings in that Working Drawings must be submitted to the Engineer rather than the Engineer of Record and they are for the information of the Engineer only; an approval stamp and distribution to all project offices is not required.

Key to Reviewing Party

A - Area Office

Area Office	Email Address
Brazoria Area Office	HOU-BRZAShpDrwgs@txdot.gov
Fort Bend Area Office	HOU-FBAShpDrwgs@txdot.gov
Galveston Area Office	HOU-GALVAShpDrwgs@txdot.gov
Montgomery Area Office	HOU-MONTAShpDrwgs@txdot.gov
North Harris Area Office	HOU-NHAShpDrwgs@txdot.gov
Southeast Area Office	HOU-SEHAShpDrwgs@txdot.gov
Traffic Systems Construction Office	HOU-TSCShpDrwgs@txdot.gov
West/Central Harris Area Office	HOU-WWCHAOShpDrwgs@txdot.gov

B - Houston Bridge Engineer

Bridge Design (Houston TxDOT)	HOU-BrgShpDrwgs@txdot.gov

BRG - Austin Bridge Division

Bridge Design (Austin TxDOT)	BRG_ShopPlanReview@txdot.gov

C - Construction Office

Construction	HOU-ConstrShpDrwgs@txdot.gov
Laboratory	HOU-LabShpDrwgs@txdot.gov

T - Traffic Engineer

Traffic Operations	HOU-TrfShpDrwgs@txdot.gov

TMS – Traffic Management System

Computerized Traffic Management Systems (CTMS)	HOU-CTMSShpDrwgs@txdot.gov

Item 6: Control of Materials

To comply with the latest provisions of the Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, the Contractor must submit a notarized original of the TxDOT Construction Material Buy America Certification Form for items classified as construction materials. This form is not required for materials classified as a manufactured product.

Refer to the Buy America Material Classification Sheet for clarification on material categorization.

The Buy America Material Classification Sheet is located at the below link.

https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html for clarification on material categorization.

Item 7: Legal Relations and Responsibilities

Do not initiate activities in a Project Specific Location (PSL), associated with a U.S. Army Corps of Engineers (USACE) permit area, that have not been previously evaluated by the USACE as part of the permit review of this project. Such activities include those pertaining to, but are not limited to, haul roads, equipment staging areas, borrow and disposal sites. Associated defined here means materials are delivered to or from the PSL. The permit area includes the waters of the U.S. or associated wetlands affected by activities associated with this project. Special restrictions may be required for such work. Assume responsibility for consultations with the USACE regarding activities, including PSLs that have not been previously evaluated by the USACE. Provide the Department with a copy of consultations or approvals from the USACE before initiating activities.

The Contractor may proceed with activities in PSLs that do not affect a USACE permit area if a self-determination has been made that the PSL is non-jurisdictional or if proper USACE clearances have been obtained in jurisdictional areas or have been previously evaluated by the USACE as part of the permit review of this project. The Contractor is solely responsible for documenting any determinations that their activities do not affect a USACE permit area. Maintain copies of their determinations for review by the Department or any regulatory agency.

Document and coordinate with the USACE, if required, before hauling any excavation from or hauling any embankment to a USACE permit area by either 1 or 2 below:

1. **Restricted Use of Materials for the Previously Evaluated Permit Areas.** Document both the Project Specific Locations (PSL) and their authorization. Maintain copies for review by the Department or any regulatory agency. When an area within the project limits has been evaluated by the USACE as part of the permit process for this project:
   a. Suitable excavation of required material in the areas shown on the plans and cross sections as specified in the Item, "Excavation" is used for permanent or temporary fill (under the Item, "Embankment") within a USACE permit area.
   b. Suitable embankment (under the Item, "Embankment") from within the USACE permit area is used as fill within a USACE evaluated area.
   c. Unsuitable excavation or excess excavation, "Waste" (under the Item, "Excavation"), that is disposed of at a location approved within a USACE evaluated area.

2. **Contractor Materials from Areas Other than Previously Evaluated Areas.** Provide the Department with a copy of USACE coordination or approvals before initiating any activities for an area within the project limits that has not been evaluated by the USACE or for any off right of way locations used for the following, but not limited to, haul roads, equipment staging areas, borrow and disposal sites:
   a. The Item, "Embankment" used for temporary or permanent fill within a USACE permit area.
   b. Unsuitable excavation or excess excavation, "Waste" (under the Item, "Excavation"), that is disposed of outside a USACE evaluated area.

This project does not require a U.S. Army Corps of Engineers (USACE) Section 404 Permit before letting, but if a permit is needed during construction, assume responsibility for preparing the permit application. Submit the permit application to the Department's District Environmental Section for approval. Once the permit application is approved, the Department will submit it to the USACE. Assume responsibility for the requested revisions, in coordination with the Department's District Environmental Section.

Maintain the roadway slope stability. Maintaining slope stability is subsidiary to the various bid items.

If the work is on or in the vicinity of an at-grade railroad crossing, involves incidental work on railroad right of way, or involves construction of a railroad grade separation structure, notify the railroad company's Division Engineer and the Department's Project Engineer at least 30 days before performing any work on the railroad right of way and make arrangements for railroad flaggers unless otherwise shown in the contract. Obtain the required Railroad Right of Entry

Permit from the railroad company. Payment of applicable permit fees is the responsibility of the Contractor. Acquiring the Railroad Right of Entry Permit is a lengthy process, allow sufficient time for this.

No significant traffic generator events have been identified.

Item 8: Prosecution and Progress

The Department will not adjust the number of days for the project and milestones, if any, due to differences in opinion regarding any assumptions made in the preparation of the schedule or for errors, omissions, or discrepancies found in the time determination schedule.

Working days will be computed and charged based on a [standard] workweek with nighttime work in accordance with Section 8.3.3.2.2.

The Lane Closure Assessment Fee is $800.00 (Mainlane) and $500 (Frontage Rd). This fee applies to the Contractor for closures or obstructions that overlap into restricted hour traffic for each hour or portion thereof, per lane, regardless of the length of lane closure or obstruction. For Restricted Hours subject to Lane Assessment Fee refer to the Item, "Barricades, Signs, and Traffic Handling." The time increment for the Lane Closure Assessment fee for this project is one hour.

Item 134: Backfilling Pavement Edges

Quantity by station includes both sides of the roadway.

The Contractor has the option of selecting the type of backfill material consisting of Reclaimable Asphalt Pavement (RAP), Flex Base, or Crushed Concrete provided that it meets the requirements listed below.

For Permeable Friction Courses (PFC), the backfill material chosen must meet the requirements of Department Test Method Tex-246-F.

If using salvaged asphalt concrete pavement, size it so that all the material, passes the 2-in. sieve. Use RAP that does not contain deleterious material such as clay or organic material.

Flex Base must meet the requirements of Item 247, Type A, Grade 1-2. Department Test Method Tex-117-E will not be required.

Crushed concrete must meet the requirements of Item 247, Grade 1-2. Department Test Methods Tex-116-E and Tex-117-E will not be required.

Place emulsified asphalt (SS-1, CSS-1, or CSS-1H) at an application rate of 0.25 gal/sq. yard.

County: Harris

Highway: US 90

Item 204: Sprinkling

Perform subsidiary sprinkling as required under various other items in accordance with the Item, "Sprinkling."

Sprinkling for dust control is subsidiary to the various bid items.

Item 210: Rolling

Use a medium pneumatic roller meeting the requirements of Item 210 as directed. This work is subsidiary to the various bid items. On every asphalt shot, use a minimum of 3 pneumatic rollers or as directed. Use approved rolling patterns. Successive asphalt shots will not be allowed until acceptable rolling has been accomplished on the preceding asphalt shot.

Item 316: Seal Coat

Seal coat shall be covered with TOM within 1 calendar day.

Place seal coats only from May 1 to September 15, inclusive, unless written approval is obtained to extend the placement period if weather conditions warrant an extension.
The asphalt application rate shown on the "Basis of Estimate" is an average rate for calculating asphalt quantities. Vary the rate based on the pavement conditions and other factors such as the type and grade of aggregate used, weather, and traffic.

Item 351: Flexible Pavement Structure Repair

Use asphalt stabilized base for the base repair material.

Item 354: Planing and Texturing Pavement

Removing the Asphalt Concrete Pavement (ACP) is paid for under item 354.

Unless otherwise shown on plans, RAP generated by this project will become the property of the contractor for use in the current construction project or in future projects.

Item 361: Repair of Concrete Pavement

For full depth repair, remove only the quantity of pavement replaceable during the daily allowable work schedule.

Remove loose sub-base material and replace it with concrete. Use a bondbreaker, such as a polyethylene sheet, at the interface between the replaced sub-base material and the new concrete pavement.

Supply polyethylene fabric on the job site sufficient to cover the area of repair.

Do not place concrete if impending weather may result in rainfall or low temperatures that may impair the quality of the finished work.

Repair portions of the concrete pavement surfaces that are damaged while in a plastic state before those areas receive permanent pavement markings and open to traffic. Perform repairs that are structurally equivalent to and cosmetically uniform with adjacent undamaged areas. Do not repair by grouting onto the surface.

Ready mix concrete will be permitted if the equipment and construction methods can produce the desired results. Hand finishing will be permitted.

Perform saw cutting as shown on the plans in accordance with Section 360.4.10, "Sawing Joints." This saw cutting is subsidiary to this bid Item.

Item 416: Drilled Shaft Foundations

Include the cost for furnishing and installing anchor bolts mounted in the drilled shafts in the unit bid price for the various diameter drilled shafts.

The Department may test using ultrasonic methods the anchor bolts for overhead sign supports, light standards, and traffic signal poles after they are installed. Replace faulty anchor bolts as directed. Do not weld the anchor bolts.

Item 420: Concrete Substructures

Unless otherwise noted, use Class C concrete with an ordinary surface finish for signal, lighting, or sign structure foundations.

Mass concrete is a plans quantity item.

Item 421: Hydraulic Cement Concrete

Entrained air is required in all slip formed concrete (bridge rail, concrete traffic barrier, pavement, etc.), but is not required for other structural concrete. Adjust the dosage of air entraining agent for low air content as directed or allowed by the Engineer. If entrained air is provided where not required, do not exceed the manufacturer's recommended dosage.

Item 502: Barricades, Signs, and Traffic Handling

Use a traffic control plan for handling traffic through the various phases of construction. Follow the phasing sequence unless otherwise agreed upon by the Area Engineer and the Project Manager. Ensure this plan conforms to the latest "Texas Manual on Uniform Traffic Control Devices" and the latest Barricade and Construction (BC) Standard Sheets. The latest versions of Work Zone Standard Sheets WZ (BTS-1) and WZ (BTS-2) are the traffic control plan for the signal installations.

County: Harris

Highway: US 90

Submit changes to the traffic control plan to the Area Engineer. Provide a layout showing the construction phasing, signs, striping, and signalizations for changes to the original traffic control plan.

Furnish and maintain the barricades and warning signs, including the necessary temporary and portable traffic control devices, during the various phases of construction. Place and construct these barricades and warning signs in accordance with the latest "Texas Manual on Uniform Traffic Control Devices" for typical construction layouts.

Cover work zone signs when work related to the signs is not in progress, or when any hazard related to the signs no longer exists.

Keep the delineation devices, signs, and pavement markings clean. This work is subsidiary to the Item, "Barricades, Signs, and Traffic Handling."

Erect temporary signs when exit ramps are closed or moved to new locations during construction.

If a section is not complete before the end of the workday, pull back the base material to the existing pavement edge on a 6H: 1V slope. Edge drop-offs during the hours of darkness are not permitted.

Before detouring traffic onto the mainlane shoulders, remove dirt, debris, vegetation, and other deleterious material from the surface of the shoulders. Appropriately sign the detour in an approved manner. This work is subsidiary to the various bid items.

Cover or remove the permanent signs and construction signs that are incorrect or that do not apply to the current situation for a particular phase.

Replace the overhead signs, informational signs, and exit signs to be removed, with temporary signs providing the correct information to the traveling public. Size the replacement signs and include them in the traffic control plan.

Do not mount signs on drums or barricades, except those listed in the latest Barricades and Construction standard sheets.

Use traffic cones for daytime work only. Replace the cones with plastic drums during nighttime hours.

Place positive barriers to protect drop-off conditions greater than 2 ft. within the clear zone that remain overnight.

Do not reduce the existing number of lanes open to traffic except as shown on the following time schedule:

County: Harris **Control:** 0028-02-098,etc

Highway: US 90

One Lane /Ramp Closure

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Monday	9:00 AM – 3:00 PM	9:00 PM – 11:59 PM 12:00 AM – 5:00 AM	3:00 PM – 9:00 PM 5:00 AM – 9:00 AM
Tuesday	9:00 AM – 3:00 PM	9:00 PM – 11:59 PM 12:00 AM – 5:00 AM	3:00 PM – 9:00 PM 5:00 AM – 9:00 AM
Wednesday	9:00 AM – 3:00 PM	9:00 PM – 11:59 PM 12:00 AM – 5:00 AM	3:00 PM – 9:00 PM 5:00 AM – 9:00 AM
Thursday	9:00 AM – 3:00 PM	9:00 PM – 11:59 PM 12:00 AM – 5:00 AM	3:00 PM – 9:00 PM 5:00 AM – 9:00 AM
Friday	9:00 AM – 3:00 PM	9:00 PM – 11:59 PM 12:00 AM – 5:00 AM	3:00 PM – 9:00 PM 5:00 AM – 9:00 AM
Saturday	As approved by the Engineer	As approved by the Engineer	As approved by the Engineer
Sunday	No work on Sunday	N/A	N/A

Two Lane Closure

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Monday	N/A	9:00 PM – 11:59 PM 12:00 AM – 5:00 AM	5:00 AM – 9:00 PM
Tuesday	N/A	9:00 PM – 11:59 PM 12:00 AM – 5:00 AM	5:00 AM – 9:00 PM
Wednesday	N/A	9:00 PM – 11:59 PM 12:00 AM – 5:00 AM	5:00 AM – 9:00 PM
Thursday	N/A	9:00 PM – 11:59 PM 12:00 AM – 5:00 AM	5:00 AM – 9:00 PM
Friday	N/A	9:00 PM – 11:59 PM 12:00 AM – 5:00 AM	5:00 AM – 9:00 PM
Saturday	As approved by the Engineer	As approved by the Engineer	As approved by the Engineer
Sunday	No work on Sunday	N/A	N/A

The above times are approved for the traffic control conditions listed. The Area Engineer may approve other closure times if traffic counts warrant. The Area Engineer may reduce the above times for special events.

Law enforcement assistance will be required for this project and is expected to be required for major traffic control changes and lane closures. Coordinate with local law enforcement and arrange for law enforcement as directed or agreed by the Engineer. Before payment will be made, complete the "Daily Report on Law Enforcement Force Account Work" (Form 318), provided by the Department and submit daily invoices that agree with this form for any day during the month in which approved services were provided.

Provide full-time, off-duty, uniformed, certified peace officers, as part of traffic control operations. The peace officers must be able to show proof of certification by the Texas Commission on Law Enforcement Officers Standards. The cost of the officers is paid for on a force account basis.

A minimum of 7 days in advance of any total closure, notify the Houston District Public Information Office of which roadways, ramps, intersections, or lanes will be closed, the dates they will remain closed, and when they will be opened again to traffic.

A minimum of 7 days in advance of any total closure, place a portable changeable message (PCM) sign at the location of each total closure which informs the traveling public of the details of the closure. Alternately, if the Traffic Control Plan provides a positive barrier at the location, a non-trailer mounted static message board sign behind the positive barrier may be used in place of a PCM.

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

Item 506: Temporary Erosion, Sedimentation and Environmental Controls

bales is not permitted as Storm Water Pollution Prevention Plan (SWP3) measures.

The Storm Water Pollution Prevention Plan (SWP3) consists of temporary erosion control measures needed and provided for under this Item. The disturbed area is less than one acre and use of erosion control measures is not anticipated. If physical conditions encountered at the job site require necessary controls, BMP installation, maintenance, and removal will be paid as extra work on a force account basis per Articles 4.4 and 9.7. Since the disturbed area is less than 5 acres, a "Notice of Intent" (NOI) is not required.

Use appropriate measures to prevent, minimize, and control the spill of hazardous materials in the construction staging area. Remove and dispose of materials in compliance with State and Federal laws.

Item 540: Metal Beam Guard Fence

Painting the timber posts is not required.

Use timber posts for galvanized steel metal beam guard fence, except for anchorage at turned down ends.

Furnish and install wood blocks between the rail elements and the timber posts as detailed on the plans. These block-outs are subsidiary to this bid Item.

The quantity of the metal beam guard fence is subject to change.

Provide a mow strip as shown on the plans, at metal beam guard fence locations, including any guardrail end treatments.

Galvanize the rail elements supplied for this project by using a Type II Zinc Coating.

At locations requiring attachment of Metal Beam Guard Fence (MBGF) to concrete railing or concrete traffic barrier, repair and fill any existing holes in the railing or barrier that are not in the correct location for attaching the new MBGF. Perform this work in accordance with the Item, "Concrete Structure Repair." Existing anchor bolt holes that cannot be utilized must be filled with an epoxy grout before drilling new holes. Then core-drill new holes in the correct locations and repair any resulting spalls at no expense to the Department. This work is considered subsidiary to the MBGF transition section (Item 540).

Item 542: Removing Metal Beam Guard Fence

Remove and assume ownership of unsalvageable metal beam guard fence rail elements and posts. Transport and store any functional, salvageable rail elements, including steel posts, which are not reused in this project, to the Department's stockpile located at *16803 Eastex Freeway, Humble, TX*

Replace removed wood posts which are unusable because of damage by the Contractor, at no expense to the Department.

Item 585: Ride Quality for Pavement Surfaces

To eliminate the need for corrective action due to excessive deviations in the final surface layers, exercise caution to ensure satisfactory profile results in the intermediate paving layers (mixture).

Milling will not be allowed as a corrective action for excessive deviations in the final surface layer of hot-mix asphalt.

For Continuously Reinforced Concrete Pavement (CRCP) mainlanes and direct connectors, use Surface Test Type B and Pay Adjustment Schedule 2. For ramps use Surface Test Type A.

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For asphalt mainlanes and direct connectors, use Surface Test Type B and Pay Adjustment Schedule 1. For ramps use Surface Test Type A.

For all other roads (cross streets and intersections), use Surface Test Type A.

Item 644: Small Roadside Sign Assemblies

Sign locations shown on the plans are approximate. Before placing them, obtain approval of and then stake the exact locations for these signs.

Use the Texas Universal Triangular Slip Base with the concrete foundation for small ground mounted signs, unless otherwise shown in the plans.

Remove existing street name signs from existing stop signs and re-install them above the new stop signs. Removing and re-installing existing street name signs is subsidiary to the Item, "Small Roadside Sign Assemblies."

When design details are not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Use Type E Super High Specific Intensity (Fluorescent Prismatic) yellow green reflective sheeting background to fabricate school signs (S1-1, S3-1, S4-3, S5-1, W16-2, SW16-9p, and SW16-7pL(R)).

Assume ownership of the removed existing signposts. Store removed sign panels at the Contractor's field office, to be picked up by the maintenance office. This work is subsidiary to this item.

Locations of the relocated signs are approximate. Before placing them, obtain approval of and then stake the exact locations for these signs.

Replace existing signs that become damaged during relocation at no expense to the Department.

Item 618: Conduit
Item 620: Electrical Conductors
Item 628: Electrical Services

Department standard sheets. Place conduit under driveways or roadways a minimum of 24 in. below the pavement surface.

If using casing to place bored conduit, the casing is subsidiary to the conduit.

If placing the conduit under existing pavement to reach the service poles, bore the conduit in place and extend it a minimum distance of 5 ft. beyond the edge of shoulder or the back of curb.

Item 620: Electrical Conductors

Test each wire of each cable or conductor after installation. Incomplete circuits or damage to the wire or the cable are cause for immediate rejection of the entire cable being tested. Remove and replace the entire cable at no expense to the Department. Also test the replacement cable after installation.

When pulling cables or conductors through the conduit, do not exceed the manufacturer's recommended pulling tensions. Lubricate the cables or conductors with a lubricant recommended by the cable manufacturer.

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holders as shown on the Department's Construction Division (CST) material producers list. Check the latest link on the Department's website for this list. The category is "Roadway Illumination and Electrical Supplies." The fuse holder is shown on the list under Items 610 and 620. Provide 10 Amp time delay fuses.

Ensure that circuits test clear of faults, grounds, and open circuits.

Split bolt connectors are allowed only for splices on the grounding conductors.

For electrical licensing and electrical certification requirements for this project, see Item 7 of the Standard Specifications and any applicable special provisions to Item 7.

Item 624: Ground Boxes

The ground box locations are approximate. Alternate ground box locations may be used as directed, to avoid placing in sidewalks or driveways.

Ground metal ground box covers. Bond the ground box cover and ground conductors to a ground rod located in the ground box and to the system ground.

Ground the existing metal ground box covers as shown on the latest standard sheet ED (4)-14.

During construction and until project completion, provide personnel and equipment necessary to remove ground box lids for inspection. Provide this assistance within 24 hours of notification.

Construct concrete aprons in accordance with the latest standard sheet ED (4)-14. Make the depth of the concrete apron the same as the depth of the ground box, construct the concrete apron in accordance with details shown on the "Ground Box Details Installations" standard.

Item 628: Electrical Services

Verify and coordinate the electrical service location with the engineering section of the appropriate utility district or company.

Identify the electrical service pole with an address number assigned by the Utility Service Provider. Provide 2-in. numerals visible from the highway. Provide numbers cut out aluminum figures nailed to wood poles or painted figures on steel poles or service cabinets.

Item 636: Signs

Furnish and install signs shown on the traffic signal "Summary of Traffic Signal Materials" sheet. Ensure that the legend on these sign panels is in accordance with the latest "Standard Highway Sign Designs for Texas" manual.

If the specifications for electrical items require UL-listed products, this means UL-listed or CSA-listed.

Item 618: Conduit

When backfilling bore pits, ensure that the conduit is not damaged during installation or due to settling backfill material. Compact select backfill in 3 equal lifts to the bottom of the conduit; or if using sand, place it 2 in. above the conduit. Ensure backfill density is equal to that of the existing soil. Prevent material from entering the conduit.

Construct bore pits a minimum of 5 ft. from the edge of the base or pavement. Close the bore pit holes overnight.

Unless otherwise shown on the plans, install underground conduit a minimum of 24 in. deep. Install the conduit in accordance with the latest National Electrical Code (NEC) and applicable

Item 662: Work Zone Pavement Markings

At the end of each workday, mark roadways that remain open to traffic during construction operations with standard pavement markings, in accordance with the latest "Texas Manual on Uniform Traffic Control Devices."

Do not use raised pavement markers as optional work zone pavement markings on final asphalt surfaces.

For transition lane lines and detour lane lines, use raised pavement markers as shown for solid lines on the latest Barricade and Construction standard sheet for "Work Zone Pavement Marking Details."

Item 662: Work Zone Pavement Markings
Item 666: Reflectorized Pavement Markings
Item 668: Prefabricated Pavement Markings
Item 6038: Multipolymer Pavement Markings (MPM)

Use Type III glass beads for thermoplastic and multipolymer pavement markings.

Use a 0.100 in. (100 mil) thickness for thermoplastic pavement markings, measured to the top of the thermoplastic, not including the exposed glass beads.

Use a 0.022 in. (22 mil) thickness for multipolymer pavement markings, measured to the top of the multipolymer, not including the exposed glass beads.

For roadways with asphalt surfaces to be striped with work zone or permanent thermoplastic markings, the Contractor has the option to apply paint and beads markings for a maximum 30-day period until placing the thermoplastic markings, or until starting the succeeding phase of work on the striped area. Maintain the paint and beads markings, at no expense to the Department, until placing the thermoplastic markings or starting the succeeding phase of work on the striped area. The work zone markings, whether paint and beads or thermoplastic, are paid under the Item, "Work Zone Pavement Markings" and the markings are paid for only once for the given phase of construction.

If using paint and bead markings as described above, purchase the traffic paint from the open market.

If the Type II markings become dirty and require cleaning by washing, brushing, compressed air, or other approved methods before applying the Type I thermoplastic markings, this additional cleaning is subsidiary to the Item, "Reflectorized Pavement Markings."

Establish the alignment and layout for work zone striping and permanent striping.

Stripe all roadways before opening them to traffic.

Place pavement markings under these items in accordance with details shown on the plans, the latest "Texas Manual on Uniform Traffic Control Devices," or as directed.

When design details are not shown on the plans, provide pavement markings for arrows, words, and symbols conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Place the pedestrian crosswalk pavement markings only after the pedestrian signals and push buttons are installed and operating.

Item 672: Raised Pavement Markers

If other operations are complete on the project and if the curing time period is not yet elapsed, the contract time will be suspended until the curing is done.

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Before placing the raised pavement markers on concrete pavement, blast clean the surface using an abrasive-blasting medium. This work is subsidiary to the Item, "Raised Pavement Markers."

Provide epoxy adhesive that is machine-mixed or nozzle-mixed and dispensed. Equip the machine or nozzle with a mechanism to ensure positive mix measurement control.

Item 677: Eliminating Existing Pavement Markings and Markers

Remove existing pavement markings on concrete or asphalt surfaces by flail milling or as directed.

Item 678: Pavement Surface Preparation for Markings

Do not blast clean asphalt concrete pavement. Clean asphalt concrete pavement as required under the applicable specifications or as directed.

On existing concrete pavement when placing a new stripe on an existing location, after removing the existing stripe under the Item, "Eliminating Existing Pavement Markings and Markers," air-blast the surface with compressed air just before placing the new stripe.

Do not clean concrete pavement by grinding.

Item 680: Highway Traffic Signals

Clearly mark or highlight on the shop drawings the items being furnished for this project.

Furnish labor, tools, equipment, and materials as shown on the plans and specifications for a complete and operating signal installation.

Furnish the type of controller cabinet specified on the plans. Refer to the table shown in the Departmental Material Specifications (DMS-11170, Fully Actuated, Solid-State Traffic Signal Controller Assembly), Section 11170.6.A, Type 2 cabinet, page 4 of 39, regarding the size of the cabinet, back panel configuration, and the size of the load bay. Use the following website to view this specification:

https://www.txdot.gov/business/resources/materials/material-specifications.html

Complete traffic signal construction work, including correcting discrepancies shown on the Department inspector's "Traffic Signal Installation Inspection Report" before the beginning of the test period.

Provide a full-time qualified traffic signal technician responsible for installing, maintaining, or replacing traffic signal devices.

Staking in the field is subject to approval.

Adjust project construction, if needed, due to conflicts with underground utilities.

Do not aim the luminaire arms mounted on traffic signal poles into the intersection. Aim each arm perpendicular to the centerline of the roadway it is intended to cover, to develop the proper illumination pattern for the intersection.
Provide continuous conductors without splices from signal controller to signal heads. Route the conductors for luminaires to the service enclosure. Splices or attachments to the terminal block in the access compartment of the mast arm pole are not permitted except for the luminaire cable.

Abrasions to the conductor insulation caused while pulling cable for the traffic signal system are cause for immediate rejection. Remove and replace the entire damaged cable at no expense to the Department.

When pulling cables or conductors through conduit, do not exceed the manufacturer's recommended pulling tensions. Lubricate the cables or conductors with a lubricant as recommended by the cable manufacturer.

Bond the controller housing, signal poles, conduit, and spans to a minimum No. 6 AWG stranded copper conductor. An equipment grounding conductor is required in every conduit to form a continuous grounding system. Effectively connect the grounding system to ground rods or concrete encased grounding electrodes as indicated in the plans.

Wrap signal heads with dark plastic or suitable material to conceal the signal faces from the time of installation until placing into operation. Do not use burlap.

Furnish signal heads from the same manufacturer.

Use Type B (high intensity prismatic) or Type D (diamond grade) retroreflective sheeting for signs mounted under or adjacent to the signal heads.

Furnish and attach compression type connectors. Install the connectors with a compression mechanical release hand-crimping tool to each individual conductor before making connections to the terminal strips.

Item 682: Vehicle and Pedestrian Signal Heads

Install two set screws on vehicle signal head mounting hardware fittings.

Furnish black housings for vehicle flasher signals. Furnish black vehicle signal head back plates with 2 in. retroreflective yellow borders.

Item 686: Traffic Signal Pole Assemblies (Steel)

For a steel mast arm assembly, hold the anchor bolts and conduits rigidly in place with a welded steel template.

Leave a minimum of one full diameter thread exposed on each anchor bolt securing a signal pole.

Use a Texas Cone Penetrometer reading of 10. The drilled shaft length is from the surface elevation to the bottom of the drilled shaft. Provide an additional length of the pole foundation from the surface level to the roadway level, if required for unusual locations. Provide the drilled shaft depth regardless of the length of the pole foundation. The pole foundation depth from the surface level to the roadway level is a maximum of 4 ft., or as approved.

Locate traffic signal pole assembly foundations a minimum of 4 ft. from the roadway curb or pavement edge, or as shown on the plans.

After the traffic signal pole assembly is plumb and the nuts are tight, tack-weld each anchor bolt nut in two places to its washer. Tack-weld each washer to the base plate in two places. Do not weld components to the bolt. Perform tack-welding in accordance with the Item, "Steel Structures." After tack-welding, repair galvanizing damage on bolts, nuts, and washers in accordance with Section 445.3.5, "Repairs."

The Department may test the anchor bolts using ultrasonic methods for traffic signal poles after they are installed. Replace faulty anchor bolts as directed. Do not weld the anchor bolts.

Item 3081: Thin Overlay Mixtures (TOM)

Place mixtures only when the air temperature is above 70°F.

Item 6185: Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)

A shadow vehicle with Truck Mounted Attenuators (TMAs) or Trailer Attenuators (TAs) is required as shown on the appropriate Traffic Control Plan (TCP) sheets. TMAs/TAs must meet the requirements of the Compliant Work Zone Traffic Control Device List.

Level 3 Compliant TMAs/TAs are required for this project.

A total of one (1) shadow vehicle with a TMA/TA is required for the work with the exception of Pavement Marking Operations. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

A total of three (3) shadow vehicles with a TMA/TA are required for Pavement Marking Operations. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

Basis of Estimate

Item	Description	Limit and Rate	Unit
134	Backfilling Pavement Edges • Asphalt Emulsion	 0.25 Gal. / Sq. Yd.	STA
316	Seal Coat • Asphalt • Aggregate (Gr 4)	 0.32 Gal. / Sq. Yd. 1/130 Cu. Yd. / Sq. Yd.	 GAL CY
3077	Superpave Mixtures • Asphalt • Aggregate Tack Coat • Applied on new HMA • Applied on Existing HMA • Applied on Milled HMA	100 Lb. / Sq. Yd.-In. 8 % by weight 92 % by weight 0.06 Gal. / Sq. Yd. 0.09 Gal. / Sq. Yd. 0.11 Gal. / Sq. Yd.	TON GAL
3081	• Thin Overlay Mix (TOM) • Aggregate Tack Coat • Applied on new HMA • Applied on Existing HMA • Applied on Milled HMA	113 Lb. / Sq. Yd.-In. 6.7 % by weight 93.3 % by weight 0.06 Gal. / Sq. Yd. 0.09 Gal. / Sq. Yd. 0.11 Gal. / Sq. Yd.	TON GAL

If used in existing roadway base, rate will be determined on a case by case basis.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0028-02-098 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY US 90

			CONTROL SECTION JOB		**0028-02-098**		**0028-02-105**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00129237**		**A00180619**			
			COUNTY		**Harris**		**Harris**			
			HIGHWAY		**US 90**		**US 90**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	134-6004	BACKFILL (TY A OR B)		STA	398.000				398.000	
	316-6001	ASPH (MULTI OPTION)		GAL	46,877.000				46,877.000	
	316-6017	ASPH (AC-20-5TR)		GAL	92,457.000				92,457.000	
	316-6434	AGGR (TY-PB GR-4 OR TY-PL GR-4 (SAC-B)		CY	2,820.000				2,820.000	
	351-6035	FLEX PAV STR REPAIR(11.5"-20.5")		SY	256.000				256.000	
	354-6064	PLANE ASPH CONC PAV (2 1/2")		SY	113,944.000				113,944.000	
	354-6065	PLANE ASPH CONC PAV (3 1/2")		SY	220,135.000				220,135.000	
	354-6205	PLAN & TEXT CONC PAV (0" TO 2.5")		SY	2,532.000				2,532.000	
	361-6007	FULL - DEPTH REPAIR CRCP (13")		SY	800.000				800.000	
	416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)		LF	84.000		86.000		170.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)		CY	456.000				456.000	
	500-6001	MOBILIZATION		LS	1.000				1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING		MO	9.000				9.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT		LF	64,995.000				64,995.000	
	533-6005	RUMBLE STRIPS (SHOULDER) CONCRETE		LF	26,512.000				26,512.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)		LF	9,625.000				9,625.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)		EA	17.000				17.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION		EA	8.000				8.000	
	540-6037	MTL BM GD FEN TRANS (ANCHOR PLATE)		EA	17.000				17.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE		LF	10,663.000				10,663.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION		EA	6.000				6.000	
	542-6003	REMOVE DOWNSTREAM ANCHOR TERMINAL		EA	2.000				2.000	
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)		EA	1.000				1.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)		EA	14.000				14.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)		EA	10.000				10.000	
	618-6046	CONDT (PVC) (SCH 80) (2")		LF	20.000		1,050.000		1,070.000	
	618-6053	CONDT (PVC) (SCH 80) (3")		LF	510.000		1,040.000		1,550.000	
	618-6054	CONDT (PVC) (SCH 80) (3") (BORE)		LF	320.000		430.000		750.000	
	620-6007	ELEC CONDR (NO.8) BARE		LF	850.000		2,520.000		3,370.000	
	620-6012	ELEC CONDR (NO.4) INSULATED		LF	340.000		1,080.000		1,420.000	
	621-6005	TRAY CABLE (4 CONDR) (12 AWG)		LF	1,390.000		3,375.000		4,765.000	
	624-6010	GROUND BOX TY D (162922)W/APRON		EA	9.000		10.000		19.000	
	628-6145	ELC SRV TY D 120/240 060(NS)SS(E)SP(O)		EA	1.000		1.000		2.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)		EA	8.000				8.000	
	644-6076	REMOVE SM RD SN SUP&AM		EA	3.000				3.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND		EA	7.000				7.000	
	658-6061	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2		EA	193.000				193.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0028-02-098 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY US 90

			CONTROL SECTION JOB		**0028-02-098**		**0028-02-105**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00129237**		**A00180619**			
			COUNTY		**Harris**		**Harris**			
			HIGHWAY		**US 90**		**US 90**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	662-6005	WK ZN PAV MRK NON-REMOV (W)6"(BRK)		LF	40,748.000				40,748.000	
	662-6006	WK ZN PAV MRK NON-REMOV (W)6"(DOT)		LF	2,488.000				2,488.000	
	662-6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)		LF	134,826.000				134,826.000	
	662-6012	WK ZN PAV MRK NON-REMOV (W)8"(SLD)		LF	16,382.000				16,382.000	
	662-6014	WK ZN PAV MRK NON-REMOV (W)12"(SLD)		LF	7,062.000				7,062.000	
	662-6016	WK ZN PAV MRK NON-REMOV (W)24"(SLD)		LF	2,200.000				2,200.000	
	662-6017	WK ZN PAV MRK NON-REMOV (W)(ARROW)		EA	116.000				116.000	
	662-6018	WK ZN PAV MRK NON-REMOV (W)(DBL ARW)		EA	1.000				1.000	
	662-6023	WK ZN PAV MRK NON-REMOV (W)(RR XING)		EA	10.000				10.000	
	662-6029	WK ZN PAV MRK NON-REMOV(W)(WORD)		EA	138.000				138.000	
	662-6035	WK ZN PAV MRK NON-REMOV (Y)6"(BRK)		LF	3,418.000				3,418.000	
	662-6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)		LF	99,694.000				99,694.000	
	662-6039	WK ZN PAV MRK NON-REMOV (Y)12"(SLD)		LF	3,184.000				3,184.000	
	662-6048	WK ZN PAV MRK REMOV (REFL) TY I-C		EA	678.000				678.000	
	662-6050	WK ZN PAV MRK REMOV (REFL) TY II-A-A		EA	1,526.000				1,526.000	
	662-6052	WK ZN PAV MRK REMOV (REFL) TY II-C-R		EA	3,540.000				3,540.000	
	666-6018	REFL PAV MRK TY I (W)6"(DOT)(100MIL)		LF	1,166.000				1,166.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)		LF	7,549.000				7,549.000	
	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)		LF	3,531.000				3,531.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)		LF	1,160.000				1,160.000	
	666-6093	REFL PAV MRK TY I (W)(RR XING)(100MIL)		EA	8.000				8.000	
	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)		LF	1,592.000				1,592.000	
	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)		LF	20,374.000				20,374.000	
	666-6288	REF PROF PAV MRK TY I(Y)6"(SLD)(060MIL)		LF	28,810.000				28,810.000	
	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)		LF	20,374.000				20,374.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)		LF	97,496.000				97,496.000	
	666-6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)		LF	1,709.000				1,709.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)		LF	50,349.000				50,349.000	
	666-6350	REFL PAV MRK TY I (W)12"(DOT)(100MIL)		LF	252.000				252.000	
	668-6077	PREFAB PAV MRK TY C (W) (ARROW)		EA	58.000				58.000	
	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)		EA	1.000				1.000	
	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)		EA	2.000				2.000	
	668-6085	PREFAB PAV MRK TY C (W) (WORD)		EA	69.000				69.000	
	672-6007	REFL PAV MRKR TY I-C		EA	339.000				339.000	
	672-6009	REFL PAV MRKR TY II-A-A		EA	789.000				789.000	
	672-6010	REFL PAV MRKR TY II-C-R		EA	1,770.000				1,770.000	
	677-6002	ELIM EXT PAV MRK & MRKS (6")		LF	108,282.000				108,282.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0028-02-098 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY US 90

			CONTROL SECTION JOB		**0028-02-098**		**0028-02-105**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00129237**		**A00180619**			
			COUNTY		**Harris**		**Harris**			
			HIGHWAY		**US 90**		**US 90**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	677-6003	ELIM EXT PAV MRK & MRKS (8")		LF	3,225.000				3,225.000	
	677-6005	ELIM EXT PAV MRK & MRKS (12")		LF	3,120.000				3,120.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")		LF	224.000				224.000	
	677-6008	ELIM EXT PAV MRK & MRKS (ARROW)		EA	20.000				20.000	
	677-6012	ELIM EXT PAV MRK & MRKS (WORD)		EA	24.000				24.000	
	677-6016	ELIM EXT PAV MRK & MRKS (RR XING)		EA	8.000				8.000	
	678-6002	PAV SURF PREP FOR MRK (6")		LF	386,117.000				386,117.000	
	678-6004	PAV SURF PREP FOR MRK (8")		LF	11,416.000				11,416.000	
	678-6006	PAV SURF PREP FOR MRK (12")		LF	8,518.000				8,518.000	
	678-6008	PAV SURF PREP FOR MRK (24")		LF	1,312.000				1,312.000	
	678-6009	PAV SURF PREP FOR MRK (ARROW)		EA	60.000				60.000	
	678-6010	PAV SURF PREP FOR MRK (DBL ARROW)		EA	1.000				1.000	
	678-6016	PAV SURF PREP FOR MRK (WORD)		EA	69.000				69.000	
	678-6020	PAV SURF PREP FOR MRK (RR XING)		EA	8.000				8.000	
	680-6003	INSTALL HWY TRF SIG (SYSTEM)		EA	1.000		1.000		2.000	
	680-6004	REMOVING TRAFFIC SIGNALS		EA	1.000		1.000		2.000	
	682-6003	VEH SIG SEC (12")LED(YEL)		EA	4.000		4.000		8.000	
	682-6005	VEH SIG SEC (12")LED(RED)		EA	8.000		8.000		16.000	
	682-6021	BACK PLATE (12")(1 SEC)		EA	12.000		12.000		24.000	
	684-6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)		LF	1,860.000		4,485.000		6,345.000	
	684-6021	TRF SIG CBL (TY A)(12 AWG)(16 CONDR)		LF	325.000		470.000		795.000	
	686-6031	INS TRF SIG PL AM(S)1 ARM(28')LUM		EA	4.000		2.000		6.000	
	686-6035	INS TRF SIG PL AM(S)1 ARM(32')LUM		EA			1.000		1.000	
	686-6047	INS TRF SIG PL AM(S)1 ARM(44')LUM		EA	2.000		3.000		5.000	
	3077-6065	SP MIXES SP-D SAC-A PG76-22		TON	27,086.000				27,086.000	
	3077-6075	TACK COAT		GAL	22,377.000				22,377.000	
	3081-6007	TOM-C PG76-22 SAC-A		TON	17,903.000				17,903.000	
	3081-6009	TOM-F PG76-22 SAC-A		TON	5,465.000				5,465.000	
	3081-6015	TACK COAT		GAL	22,741.000				22,741.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN		DAY	68.000				68.000	
	6038-6004	MULTIPOLYMER PAV MRK (W)(6")(SLD)		LF	47,655.000				47,655.000	
	6038-6005	MULTIPOLYMER PAV MRK (W)(6")(BRK)		LF	8,926.000				8,926.000	
	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)		LF	926.000				926.000	
	6038-6007	MULTIPOLYMER PAV MRK (W)(8")(SLD)		LF	3,225.000				3,225.000	
	6038-6009	MULTIPOLYMER PAV MRK (W)(8")(DOT)		LF	1,047.000				1,047.000	
	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)		LF	1,428.000				1,428.000	
	6038-6013	MULTIPOLYMER PAV MRK (W)(24")(SLD)		LF	152.000				152.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0028-02-098 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY US 90

			CONTROL SECTION JOB		**0028-02-098**		**0028-02-105**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00129237**		**A00180619**			
			COUNTY		**Harris**		**Harris**			
			HIGHWAY		**US 90**		**US 90**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	6038-6017	MULTIPOLYMER PAV MRK (Y)(6")(SLD)		LF	39,846.000				39,846.000	
	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)		LF	995.000				995.000	
	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)		LF	1,692.000				1,692.000	
	6038-6024	MULTIPOLYMER PAV MRK (BLK)(6")(BRK)		LF	8,926.000				8,926.000	
	6058-6001	BBU SYSTEM (EXTERNAL BATT CABINET)		EA	1.000		1.000		2.000	
	6185-6002	TMA (STATIONARY)		DAY	252.000				252.000	
	6185-6005	TMA (MOBILE OPERATION)		DAY	48.000				48.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
		CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)		LS	1.000				1.000	

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SUMMARY OF ROADWAY ITEMS

LOCATION	134 6004	316 6001	316 6017	316 6434	351 6035	354 6064	354 6065	354 6205	361 6007	432 6045	540 6001	540 6006	540 6016	540 6037
	BACKFILL (TY A OR B)	ASPH (MULTI OPTION)	ASPH (AC-20-5TR)	AGGR (TY-PB GR-4 OR TY-PL GR-4 (SAC-B)	FLEX PAV STR REPAIR(11.5"-20.5")	PLANE ASPH CONC PAV (2 1/2")	PLANE ASPH CONC PAV (3 1/2")	PLAN & TEXT CONC PAV (0" TO 2.5")	FULL - DEPTH REPAIR CRCP (13")	RIPRAP (MOW STRIP)(4 IN)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	DOWNSTREAM ANCHOR TERMINAL SECTION	MTL BM GD FEN TRANS (ANCHOR PLATE)
	STA	GAL	GAL	CY	SY	SY	SY	SY	SY	CY	LF	EA	EA	EA
SHEET 1 OF 17		3,995		89		3,201	0	1,266						
SHEET 2 OF 17		15,944		302		13,091	0	633		75	1,500		4	
SHEET 3 OF 17		3,678	8,383	330		22,939	19,960	633		85	1,825	4	1	4
SHEET 4 OF 17		3,748	9,011	255		11,711	21,454			124	2,750	4		4
SHEET 5 OF 17		4,120	8,703	253		14,182	20,721			76	1,625	4	1	4
SHEET 6 OF 17		5,677	10,836	279	193	10,505	25,800			68	1,525		1	
SHEET 7 OF 17		1,059	7,353	188	63	6,918	17,507							
SHEET 8 OF 17		2,746	5,147	102		1,037	12,255							
SHEET 9 OF 17	398	1,891	5,355	180		10,697	12,750			14	275		1	
SHEET 10 OF 17		1,288	5,282	142		5,839	12,577			10	100	4		4
SHEET 11 OF 17		0	5,301	123		3,425	12,621		800					
SHEET 12 OF 17		372	5,386	113		1,864	12,823							
SHEET 13 OF 17		821	5,018	92		0	11,947							
SHEET 14 OF 17		111	5,262	105		1,161	12,528							
SHEET 15 OF 17		1,427	5,367	118		2,566	12,779			4	25	1		1
SHEET 16 OF 17		0	5,207	132		4,806	12,398							
SHEET 17 OF 17		0	846	15		0	2,015							
PROJECT TOTALS	398	46,877	92,457	2,820	256	113,944	220,135	2,532	800	456	9,625	17	8	17

LOCATION	542 6001	542 6002	542 6003	542 6004	544 6001	544 6003	644 6076	658 6047	658 6061	3077 6065	3077 6075	3081 6007	3081 6009	3081 6015
	REMOVE METAL BEAM GUARD FENCE	REMOVE TERMINAL ANCHOR SECTION	REMOVE DOWNSTREAM ANCHOR TERMINAL	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)	REMOVE SM RD SN SUP&AM	INSTL OM ASSM (OM-2Y)(WC)GND	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2	SP MIXES SP-D SAC-A PG76-22	TACK COAT	TOM-C PG76-22 SAC-A	TOM-F PG76-22 SAC-A	TACK COAT
	LF	EA	EA	EA	EA	EA	EA	EA	EA	TON	GAL	TON	TON	GAL
SHEET 1 OF 17										169	6075	653	653	886
SHEET 2 OF 17	2,375	2	2		4	2			30	1145	101	2,221	2,221	3,144
SHEET 3 OF 17	1,875	1			1	1		2	37	1996	1884	1,777	649	2,577
SHEET 4 OF 17	2,925	1			1	1		2	55	2145	1287	1,874	662	2,693
SHEET 5 OF 17	2,125	1			1	1		2	33	2072	1243	1,857	687	2,702
SHEET 6 OF 17	1,050				1	1			31	3200	1548	2,051	594	2,809
SHEET 7 OF 17										1854	1466	989		1,050
SHEET 8 OF 17										2295	798	692		735
SHEET 9 OF 17	175	1			1	1	3		6	1859	1407	720		765
SHEET 10 OF 17	100			1	4	2		1	2	1600	1105	711		755
SHEET 11 OF 17										1448	963	713		757
SHEET 12 OF 17										1282	889	724		769
SHEET 13 OF 17										1311	717	675		717
SHEET 14 OF 17										1509	821	708		752
SHEET 15 OF 17	38				1	1			1	1759	921	722		767
SHEET 16 OF 17										1240	1032	701		744
SHEET 17 OF 17										201	121	114		121
PROJECT TOTALS	10,663	6	2	1	14	10	3	7	193	27,086	22,377	17,903	5,465	22,741

Texas Department of Transportation

US 90

SUMMARY OF ROADWAY QUANTITIES

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		7

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LOCATION	533 6003	533 6005	666 6018	666 6036	666 6042	666 6048	666 6093	666 6141	666 6162	666 6288	666 6306
	RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (SHOULDER) CONCRETE	REFL PAV MRK TY I (W)6"(DOT)(100MIL)	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	REFL PAV MRK TY I (W)(RR XING)(100MIL)	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	RE PV MRK TY I(BLACK)6"(SHADOW)(100 MIL)	REF PROF PAV MRK TY I(Y)6"(SLD)(060MIL)	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)
	LF	LF	LF	LF	LF	LF	EA	LF	LF	LF	LF
SHEET 1 OF 17	2,285		78	642	23	207		915	610	2,287	610
SHEET 2 OF 17	4,552		234	1,629	1,363				1,950	5,200	1,950
SHEET 3 OF 17	6,508		135	1,765	622	114		137	1,550	4,572	1,550
SHEET 4 OF 17	7,622		81					311	5,850	5,200	5,850
SHEET 5 OF 17	7,396		78	560		135		100	1,910	5,200	1,910
SHEET 6 OF 17	7,562		45	632	795			85	1,790	4,955	1,790
SHEET 7 OF 17	3,136		102	620	751	74		44	814	1,396	814
SHEET 8 OF 17	2,598		65	246		24			650		650
SHEET 9 OF 17	2,026	26,512	12	468		120	2		580		580
SHEET 10 OF 17	4,670		115	238		50			650		650
SHEET 11 OF 17	2,797		48	255		146	2		640		640
SHEET 12 OF 17	2,627		50	252		30			650		650
SHEET 13 OF 17	2,625								650		650
SHEET 14 OF 17	2,606		50	324		76	1		600		600
SHEET 15 OF 17	2,622		63	308		72	1		640		640
SHEET 16 OF 17	2,585		88	252		112	2		640		640
SHEET 17 OF 17	778								200		200
PROJECT TOTALS	64,995	26,512	1,166	7,549	3,531	1,160	8	1,592	20,374	28,810	20,374

LOCATION	666 6309	666 6318	666 6321	666 6350	668 6077	668 6078	668 6083	668 6085	672 6007	672 6009	672 6010
	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 MRK TY I (W)12"(DOT)(100MIL)	PREFAB PAV MRK TY C (W) (ARROW)	PREFAB PAV MRK TY C (W) (DBL ARROW)	PREFAB PAV MRK TY C (W) (LNDP ARROW)	PREFAB PAV MRK TY C (W) (WORD)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	REFL PAV MRKR TY II-C-R
	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA
SHEET 1 OF 17	2,745		875		4			3	31	62	52
SHEET 2 OF 17	8,324	100	1,658	252	2			2		65	242
SHEET 3 OF 17	15,980	586	2,615		4			4	13	81	205
SHEET 4 OF 17	7,800		2,946		0			4		47	135
SHEET 5 OF 17	7,211		3,500		6			10	39	48	143
SHEET 6 OF 17	7,119		2,470					4		5	179
SHEET 7 OF 17	6,294	300	3,223		8	1		8	49	71	160
SHEET 8 OF 17	3,170		2,952		4			4	24	20	43
SHEET 9 OF 17	9,524	242	6,131		6			6	35	106	81
SHEET 10 OF 17	5,738	264	3,294		4			4	23	52	79
SHEET 11 OF 17	3,704		3,576		4		2	4	23	50	81
SHEET 12 OF 17	3,495		4,445		4			4	23	36	72
SHEET 13 OF 17	2,600		2,600		1			1	6		64
SHEET 14 OF 17	3,127		2,825		3			3	22	32	66
SHEET 15 OF 17	5,003		3,497		4			4	27	70	73
SHEET 16 OF 17	4,885	217	2,965		4			4	24	44	77
SHEET 17 OF 17	777		777								18
PROJECT TOTALS	97,496	1,709	50,349	252	58	1	2	69	339	789	1,770

SUMMARY OF PAVEMENT MARKING QUANTITIES

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Texas Department of Transportation

US 90

SUMMARY OF PAVEMENT MARKING QUANTITIES

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		8

LOCATION	677 6002	677 6003	677 6005	677 6007	677 6008	677 6012	677 6016	678 6002	678 6004	678 6006	678 6008	678 6009
	ELIM EXT PAV MRK & MRKS (6")	ELIM EXT PAV MRK & MRKS (8")	ELIM EXT PAV MRK & MRKS (12")	ELIM EXT PAV MRK & MRKS (24")	ELIM EXT PAV MRK & MRKS (ARROW)	ELIM EXT PAV MRK & MRKS (WORD)	ELIM EXT PAV MRK & MRKS (RR XING)	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (8")	PAV SURF PREP FOR MRK (12")	PAV SURF PREP FOR MRK (24")	PAV SURF PREP FOR MRK (ARROW)
	LF	LF	LF	LF	EA	EA	EA	LF	LF	LF	LF	EA
SHEET 1 OF 17	6,837	0	0	22			0	14,182	642	938	229	4
SHEET 2 OF 17	8,205	0	0	0			0	31,393	1,629	1,615	0	2
SHEET 3 OF 17	4,659	40	0	36			0	42,795	1,805	759	150	4
SHEET 4 OF 17	9,100	0	744	0			0	38,777	0	1,055	0	0
SHEET 5 OF 17	6,244	258	316	40	2	6	0	27,454	818	416	175	6
SHEET 6 OF 17	6,534	0	0	0			0	26,207	632	880	0	0
SHEET 7 OF 17	6,971	1,205	1,276	0	2	2	0	24,992	1,825	2,071	74	8
SHEET 8 OF 17	6,482	252	0	0	2	2	0	16,489	498	0	24	4
SHEET 9 OF 17	5,434	210	180	48	2	2	2	30,703	678	180	132	6
SHEET 10 OF 17	6,411	200	0	0	2	2	0	19,927	438	0	50	4
SHEET 11 OF 17	6,305	200	0	78	2	2	2	17,467	455	0	188	6
SHEET 12 OF 17	6,540	200	0	0	2	2	0	18,665	452	0	30	4
SHEET 13 OF 17	6,745	34	0	0	1	1	0	15,185	34	0	0	1
SHEET 14 OF 17	6,430	118	198	0	1	1	1	16,109	442	198	76	3
SHEET 15 OF 17	6,552	258	406	0	2	2	1	20,738	566	406	72	4
SHEET 16 OF 17	6,879	250	0	0	2	2	2	20,549	502	0	112	4
SHEET 17 OF 17	1,954	0	0	0			0	4,485	0	0	0	0
PROJECT TOTALS	108,282	3,225	3,120	224	20	24	8	386,117	11,416	8,518	1,312	60

LOCATION	678 6010	678 6016	678 6020	6038 6004	6038 6005	6038 6006	6038 6007	6038 6009	6038 6011	6038 6013	6038 6017
	PAV SURF PREP FOR MRK (DBL ARROW)	PAV SURF PREP FOR MRK (WORD)	PAV SURF PREP FOR MRK (RR XING)	MULTIPOLYMER PAV MRK (W)(6")(SLD)	MULTIPOLYMER PAV MRK (W)(6")(BRK)	MULTIPOLYMER PAV MRK (W)(6")(DOT)	MULTIPOLYMER PAV MRK (W)(8")(SLD)	MULTIPOLYMER PAV MRK (W)(8")(DOT)	MULTIPOLYMER PAV MRK (W)(12")(SLD)	MULTIPOLYMER PAV MRK (W)(24")(SLD)	MULTIPOLYMER PAV MRK (Y)(6")(SLD)
	EA	EA	EA	LF	LF	LF	LF	LF	LF	LF	LF
SHEET 1 OF 17	0	3	0	4,170	320					22	1,587
SHEET 2 OF 17	0	2	0	7,650							
SHEET 3 OF 17	0	4	0	2,346	390	78	40			36	1,455
SHEET 4 OF 17	0	4	0	2,600	650						5,200
SHEET 5 OF 17	0	10	0	2,476	610	72	258		316	40	2,476
SHEET 6 OF 17	0	4	0	2,607	660			757			2,607
SHEET 7 OF 17	1	8	0	2,546	626	46	1,205	290	932		3,127
SHEET 8 OF 17	0	4	0	2,598	650	58	252				2,526
SHEET 9 OF 17	0	6	2	1,762	610	222	210		180	12	1,780
SHEET 10 OF 17	0	4	0	2,543	620	86	200				2,542
SHEET 11 OF 17	0	4	2	2,515	310	94	200			42	2,518
SHEET 12 OF 17	0	4	0	2,627	660	50	200				2,543
SHEET 13 OF 17	0	1	0	2,625	660	50	34				2,750
SHEET 14 OF 17	0	3	1	2,606	650		118				2,524
SHEET 15 OF 17	0	4	1	2,622	660	80	258				2,530
SHEET 16 OF 17	0	4	2	2,585	650	90	250				2,904
SHEET 17 OF 17	0	0	0	777	200						777
PROJECT TOTALS	1	69	8	47,655	8,926	926	3,225	1,047	1,428	152	39,846

Texas Department of Transportation

US 90

SUMMARY OF PAVEMENT MARKING QUANTITIES

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		8A

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LOCATION	6038 6018	6038 6021	6038 6024
	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	MULTIPOLYMER PAV MRK (BLK)(6")(BRK)
	LF	LF	LF
SHEET 1 OF 17	440		320
SHEET 2 OF 17	555		
SHEET 3 OF 17			390
SHEET 4 OF 17		744	650
SHEET 5 OF 17			610
SHEET 6 OF 17			660
SHEET 7 OF 17		344	626
SHEET 8 OF 17			650
SHEET 9 OF 17			610
SHEET 10 OF 17			620
SHEET 11 OF 17			310
SHEET 12 OF 17			660
SHEET 13 OF 17			660
SHEET 14 OF 17		198	650
SHEET 15 OF 17		406	660
SHEET 16 OF 17			650
SHEET 17 OF 17			200
PROJECT TOTALS	995	1,692	8,926

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Texas Department of Transportation

US 90

SUMMARY OF PAVEMENT MARKING QUANTITIES

SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		8B

SUMMARY OF WORK ZONE TRAFFIC CONTROL ITEMS																
LOCATION	500 6001	502 6001	662 6005	662 6006	662 6008	662 6012	662 6014	662 6016	662 6017	662 6018	662 6023	662 6029	662 6035	662 6037	662 6039	662 6048
	MOBILIZATION	BARRICADES, SIGNS AND TRAFFIC HANDLING	WK ZN PAV MRK NON-REMOV (W)6"(BRK)	WK ZN PAV MRK NON-REMOV (W)6"(DOT)	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	WK ZN PAV MRK NON-REMOV (W)8"(SLD)	WK ZN PAV MRK NON-REMOV (W)12"(SLD)	WK ZN PAV MRK NON-REMOV (W)24"(SLD)	WK ZN PAV MRK NON-REMOV (W)(ARROW)	WK ZN PAV MRK NON-REMOV (W)(DBL ARW)	WK ZN PAV MRK NON-REMOV (W)(RR XING)	WK ZN PAV MRK NON-REMOV(W) (WORD)	WK ZN PAV MRK NON-REMOV (Y)6"(BRK)	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	WK ZN PAV MRK NON-REMOV (Y)12"(SLD)	WK ZN PAV MRK REMOV (REFL) TY I-C
	LS	MO	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	LF	LF	LF	EA
SHEET 1 OF 17			1,220	156	920	1,284		414	8			6		1,750	1,830	62
SHEET 2 OF 17			3,900	468	7,544	3,258	2,726		4			4	200	3,316		
SHEET 3 OF 17			3,100	270	23,076	3,530	1,244	228	8			8	1,172	5,230	274	26
SHEET 4 OF 17			11,700	162	5,200				0			8		5,892	622	
SHEET 5 OF 17			3,820	156	4,022	1,120		270	12			20		7,000	200	78
SHEET 6 OF 17			3,580	90	4,328	1,264	1,590					8		4,940	170	
SHEET 7 OF 17			1,628	204	11,408	1,240	1,502	148	16	1		16	600	6,446	88	98
SHEET 8 OF 17			1,300	130	6,340	492		48	8			8		5,904		48
SHEET 9 OF 17	1	9	1,160	24	18,520	936		168	12		2	12	484	11,810		70
SHEET 10 OF 17			1,300	230	6,850	476		100	8			8	528	6,588		46
SHEET 11 OF 17			1,280	96	6,844	510		244	8		2	8		6,600		46
SHEET 12 OF 17			1,300	100	6,990	504		60	8			8		8,890		46
SHEET 13 OF 17			1,300		5,200				2			2		5,200		12
SHEET 14 OF 17			1,200	100	6,254	648		152	6		1	6		5,650		44
SHEET 15 OF 17			1,280	126	10,006	616		144	8		1	8		6,994		54
SHEET 16 OF 17			1,280	176	9,770	504		224	8		4	8	434	5,930		48
SHEET 17 OF 17			400		1,554									1,554		
PROJECT TOTALS	1	9	40,748	2,488	134,826	16,382	7,062	2,200	116	1	10	138	3,418	99,694	3,184	678

SUMMARY OF WORK XONE TRAFFIC CONTROL ITEMS					
LOCATION	662 6050	662 6052	6001 6001	6185 6002	6185 6005
	WK ZN PAV MRK REMOV (REFL) TY II-A-A	WK ZN PAV MRK REMOV (REFL) TY II-C-R	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	EA	EA	DAY	DAY	DAY
SHEET 1 OF 17	124	104			
SHEET 2 OF 17	130	484			
SHEET 3 OF 17	162	410			
SHEET 4 OF 17	94	270			
SHEET 5 OF 17	96	286			
SHEET 6 OF 17	10	358			
SHEET 7 OF 17	142	320			
SHEET 8 OF 17	40	86			
SHEET 9 OF 17	188	162	68	252	48
SHEET 10 OF 17	104	158			
SHEET 11 OF 17	72	162			
SHEET 12 OF 17	72	144			
SHEET 13 OF 17		128			
SHEET 14 OF 17	64	132			
SHEET 15 OF 17	140	146			
SHEET 16 OF 17	88	154			
SHEET 17 OF 17		36			
PROJECT TOTALS	1,526	3,540	68	252	48

Texas Department of Transportation

US 90

SUMMARY OF TRAFFIC ITEMS QUANTITIES

2024 SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		9

DATE: 1/30/2024 9:27:44 AM
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DN: CK: DW: CK:

DISTRICT	COUNTY	CSJ		PROJ NAME
HOUSTON	HARRIS	0028-02-098		US 90 @ Adlong School Rd/Crosby-Eastgate Rd
ITEM	**CODE**	**DESCRIPTION**	**UNIT**	**QUANTITY**
416	6032	DRILL SHAFT (TRAF SIG POLE)(36 IN)	LF	84
618	6046	CONDT(PVC)(SCHD 80)(2")	LF	20
618	6053	CONDT(PVC)(SCHD 80)(3")	LF	510
618	6054	CONDT(PVC)(SCHD 80)(3")(BORE)	LF	320
620	6007	ELEC CONDUCTOR (NO. 8) BARE	LF	850
620	6012	ELEC CONDUCTOR (NO. 4) INSULATED	LF	340
621	6005	TRAY CABLE (4 CONDR)(12 AWG)	LF	1390
624	6010	GROUND BOX TY D(162922) W/APRON	EA	9
628	6145	ELEC SERV TYD(120/240)060(NS)SS(E)SP(O)	EA	1
680	6003	INSTALL HWY TRF SIG (SYSTEM)	EA	1
	**	TRAFFIC SIGNAL CONTROLLER ASSEMBLY	EA	1
	**	CABINET FULL - ACTUATED	EA	1
	**	TRAFFIC SIGNAL CONTROLLER FOUNDATION	EA	1
	**	LED LUMINAIRE HEAD - EQUIVALENT TO 250W (HPS)	EA	6
	**	ROD, 5/8" X 10' COPPER - CLAD GROUND (CONTROLLER ONLY)	EA	1
	**	"ONE WAY" (12"X36")(R6-1L)	EA	2
	**	"ONE WAY" (12"X36")(R6-1R)	EA	2
	**	STREET NAME SIGN' "US 90 (42" x 18")	EA	4
	**	STREET NAME SIGN 'Adlong School Rd/Crosby Eastgate Rd' (120" x 24")	EA	1
	**	STREET NAME SIGN 'Crosby Eastgate Rd/Adlong School Rd' (120" x 24")	EA	1
	**	MAST ARM DAMPER	EA	6
	**	4C LTE CELLULAR MODEM (INSTALL ONLY)	EA	1
	**	18" CABINET BASE EXTENSION	EA	1
	**	INSTALL "RR" PREEMPTION SYSTEM	EA	1
680	6004	REMOVE TRAFFIC SIGNALS	EA	1

** MATERIAL SUBSIDIARY TO PERTINENT ITEM

DISTRICT	COUNTY	CSJ		PROJ NAME
HOUSTON	HARRIS	0028-02-098		US 90 @ Adlong School Rd/Crosby-Eastgate Rd
ITEM	**CODE**	**DESCRIPTION**	**UNIT**	**QUANTITY**
682	6003	VEH SIG SEC (12 IN) LED (YEL)	EA	4
682	6005	VEH SIG SEC (12 IN) LED (RED)	EA	8
682	6021	BACKPLATE (12") (1 SEC)	EA	12
684	6012	TRF SIG CBL(TY A)(12 AWG)(7 CONDR)	LF	1860
684	6021	TRF SIG CBL(TY A)(12 AWG)(16 CONDR)	LF	325
686	6031	INS TRF SIG PL AM(S)1 ARM(28')LUM	EA	4
686	6047	INS TRF SIG PL AM(S)1 ARM(44')LUM	EA	2
6058	6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1

PRINT DATE	REVISION DATE
1/19/2024	

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT RD PHONE: (713) 828-4742
Houston, TX. 77095

Texas Department of Transportation®

US 90 AT ADLONG SCHOOL RD /CROSBY EASTGATE RD

TRAFFIC SIGNAL SUMMARY OF QUANTITIES

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		9A
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

DISTRICT	COUNTY	CSJ		PROJ NAME
HOUSTON	HARRIS	0028-02-105		US 90 @ Adlong Johnson Rd/ Bohemian Hall Rd
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
416	6032	DRILL SHAFT (TRAF SIG POLE)(36 IN)	LF	86
618	6046	CONDT(PVC)(SCHD 80)(2")	LF	1050
618	6053	CONDT(PVC)(SCHD 80)(3")	LF	1040
618	6054	CONDT(PVC)(SCHD 80)(3")(BORE)	LF	430
620	6007	ELEC CONDUCTOR (NO. 8) BARE	LF	2520
620	6012	ELEC CONDUCTOR (NO. 4) INSULATED	LF	1080
621	6005	TRAY CABLE (4 CONDR)(12 AWG)	LF	3375
624	6010	GROUND BOX TY D(162922) W/APRON	EA	10
628	6145	ELEC SERV TYD(120/240)060(NS)SS(E)SP(O)	EA	1
680	6003	INSTALL HWY TRF SIG (SYSTEM)	EA	1
	**	TRAFFIC SIGNAL CONTROLLER ASSEMBLY	EA	1
	**	CABINET FULL - ACTUATED	EA	1
	**	TRAFFIC SIGNAL CONTROLLER FOUNDATION	EA	1
	**	LED LUMINAIRE HEAD - EQUIVALENT TO 250W (HPS)	EA	6
	**	ROD, 5/8" X 10' COPPER - CLAD GROUND (CONTROLLER ONLY)	EA	1
	**	"ONE WAY" (12"X36")(R6-1L)	EA	2
	**	"ONE WAY" (12"X36")(R6-1R)	EA	2
	**	STREET NAME SIGN 'US 90' (42" x 18")	EA	4
	**	STREET NAME SIGN' "Adlong Johnson Rd/Bohemian Hall Rd (120" x 24")	EA	1
	**	STREET NAME SIGN' "Bohemian Hall Rd/Adlong Johnson Rd (120" x 24")	EA	1
	**	MAST ARM DAMPER	EA	6
	**	4C LTE CELLULAR MODEM (INSTALL ONLY)	EA	1
	**	18" CABINET BASE EXTENSION	EA	1
	**	INSTALL "RR" PREEMPTION SYSTEM	EA	1
680	6004	REMOVE TRAFFIC SIGNALS	EA	1

** MATERIAL SUBSIDIARY TO PERTINENT ITEM

DISTRICT	COUNTY	CSJ		PROJ NAME
HOUSTON	HARRIS	0028-02-105		US 90 @ Adlong Johnson Rd/ Bohemian Hall Rd
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
682	6003	VEH SIG SEC (12 IN) LED (YEL)	EA	4
682	6005	VEH SIG SEC (12 IN) LED (RED)	EA	8
682	6021	BACK PLATE (12")(1 SEC)	EA	12
684	6012	TRF SIG CBL(TY A)(12 AWG)(7 CONDR)	LF	4485
684	6021	TRF SIG CBL(TY A)(12 AWG)(16 CONDR)	LF	470
686	6031	INS TRF SIG PL AM(S)1 ARM(28')LUM	EA	2
686	6035	INS TRF SIG PL AM(S)1 ARM(32')LUM	EA	1
686	6047	INS TRF SIG PL AM(S)1 ARM(44')LUM	EA	3
6058	6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1

PRINT DATE	REVISION DATE
1/29/2024	

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABITT RD
Houston, TX. 77095
PHONE: (713) 828-4742

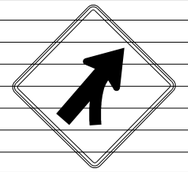
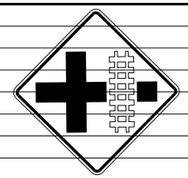
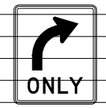
US 90 AT ADLONG JOHNSON RD /BOHEMIAN HALL RD

TRAFFIC SIGNAL SUMMARY OF QUANTITIES

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		9B
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
6	1	W4-5		36" X 36"	✓		10BWG	1	SA	P		
10	7	W10-2R		36" X 36"	✓		10BWG	1	SA	P		
9	6	W10-1		36" DIA	✓		10BWG	1	SA	P		
14	8	W10-1		36" DIA	✓		10BWG	1	SA	P		
7	3	W4-1R		36" X 36"	✓		10BWG	1	SA	P		
6	2	R3-7R		30" X 30"	✓		10BWG	1	SA	P		
7	4	R3-7R		30" X 30"	✓		10BWG	1	SA	P		
7	5	R3-5R		30" X 30"	✓		10BWG	1	SA	P		

ITEM 644-6001 8 EA
IN SM RD SN SUP&AM
TY10BWG(1)SA(P)

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

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

DATE:
FILE:

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16ex.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc	US 90
4-16	DIST	COUNTY		SHEET NO.
8-16	HOU	HARRIS		10

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	HOU	HARRIS		11
5-10 5-21				

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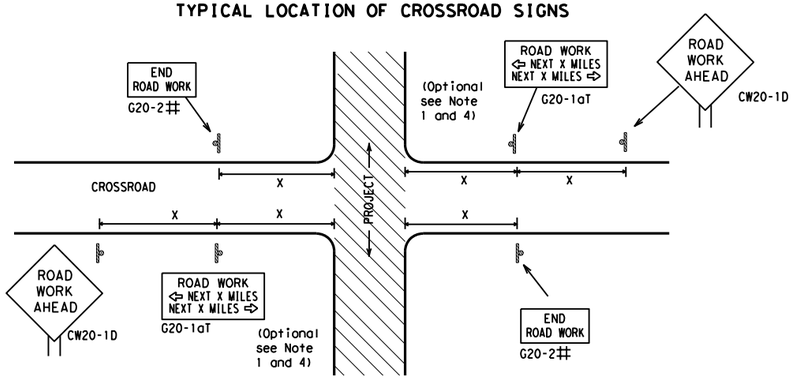
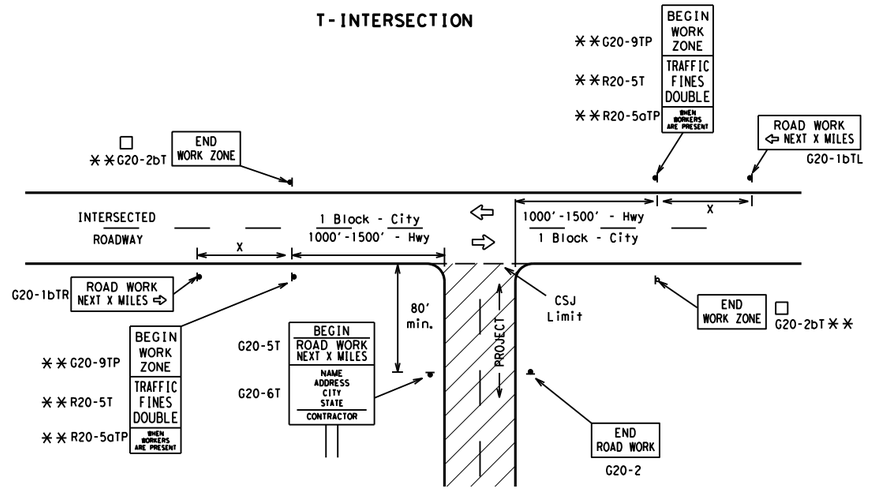
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

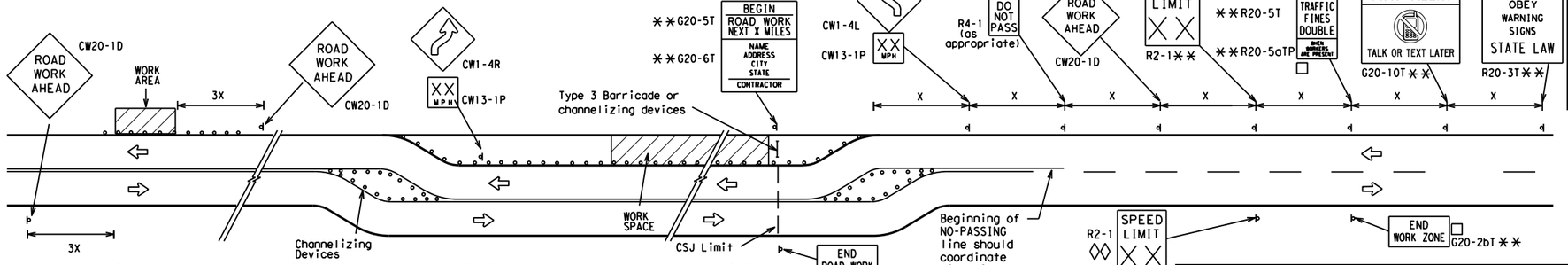
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

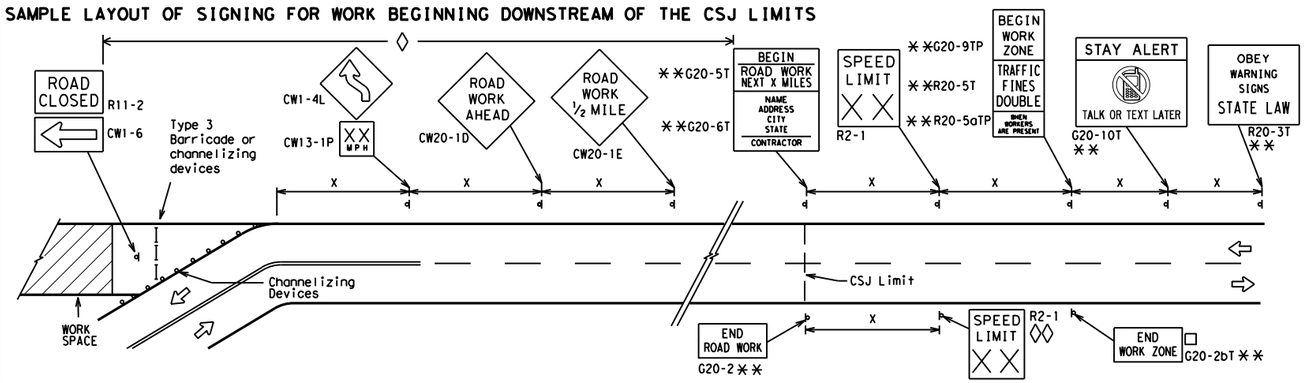
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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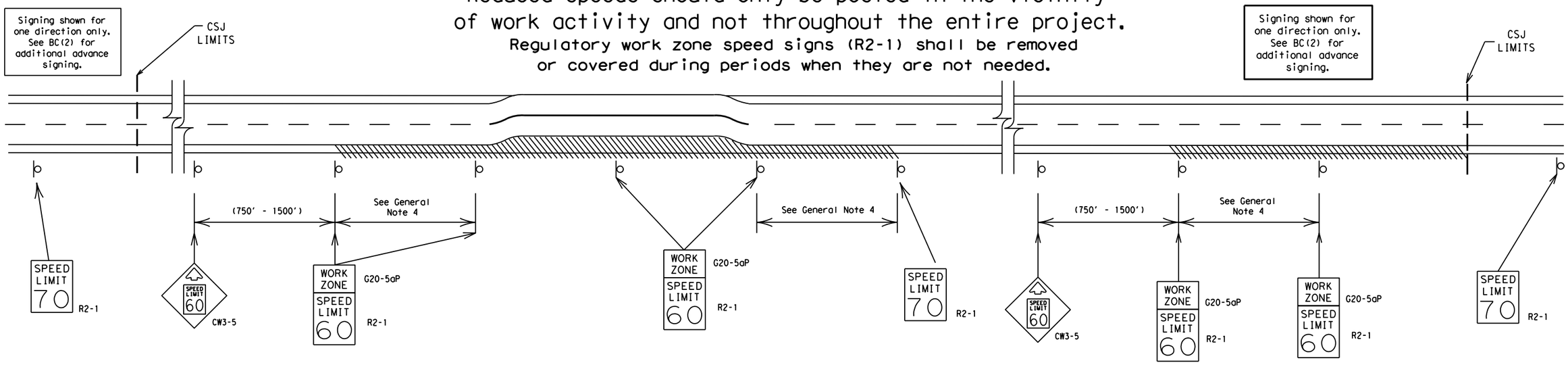
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	HARRIS		12

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.

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SHEET 3 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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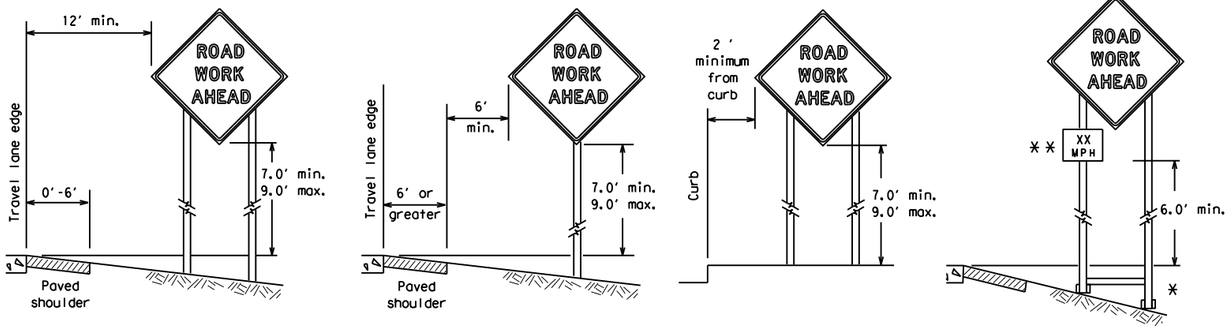
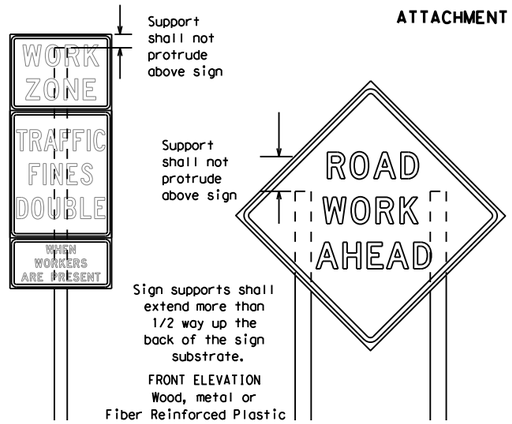
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

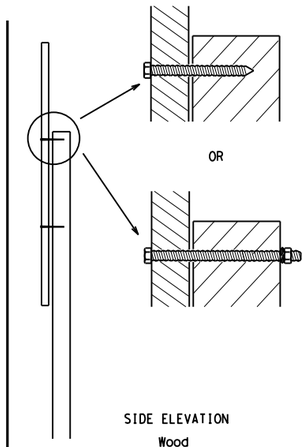


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





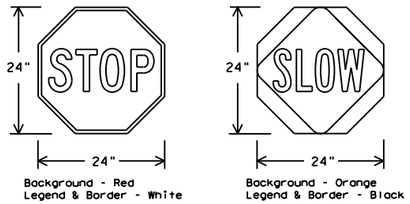
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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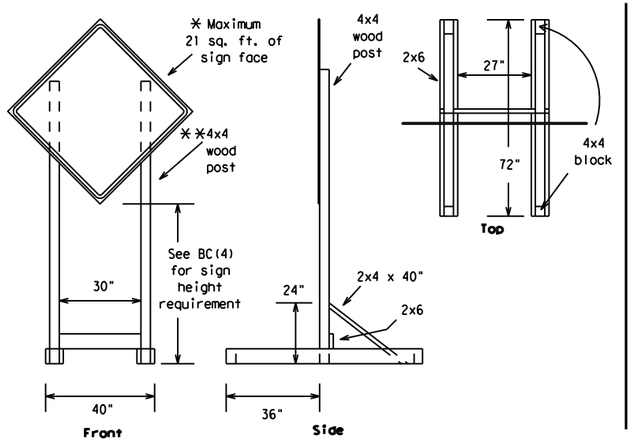
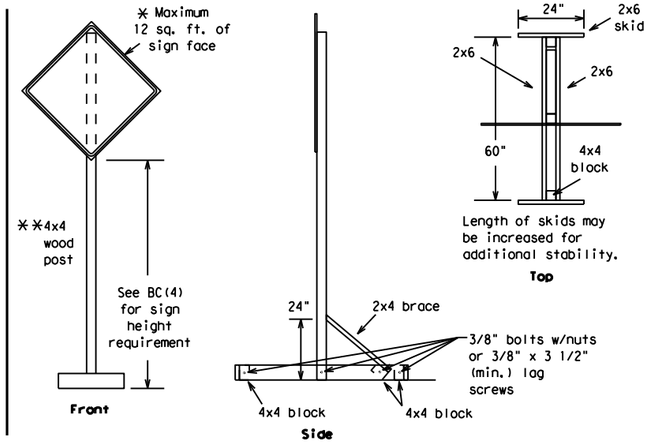
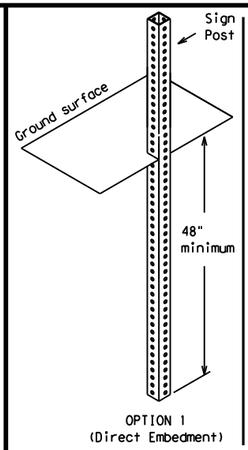
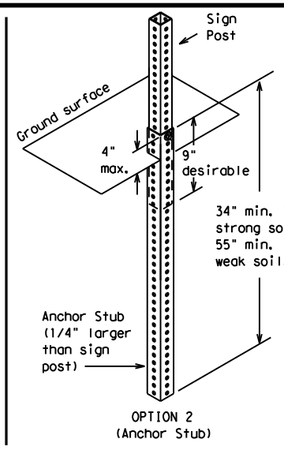


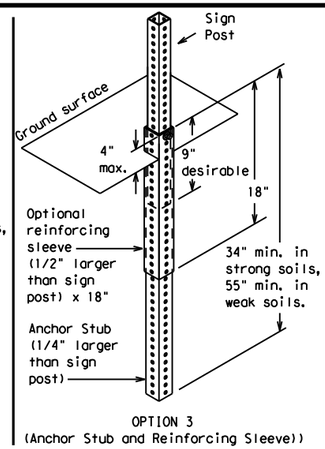


SKID MOUNTED WOOD SIGN SUPPORTS

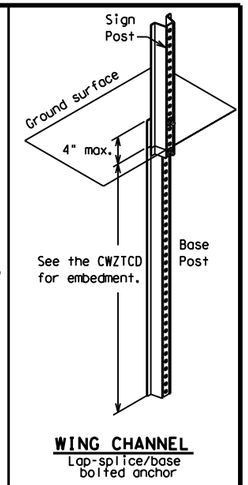
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







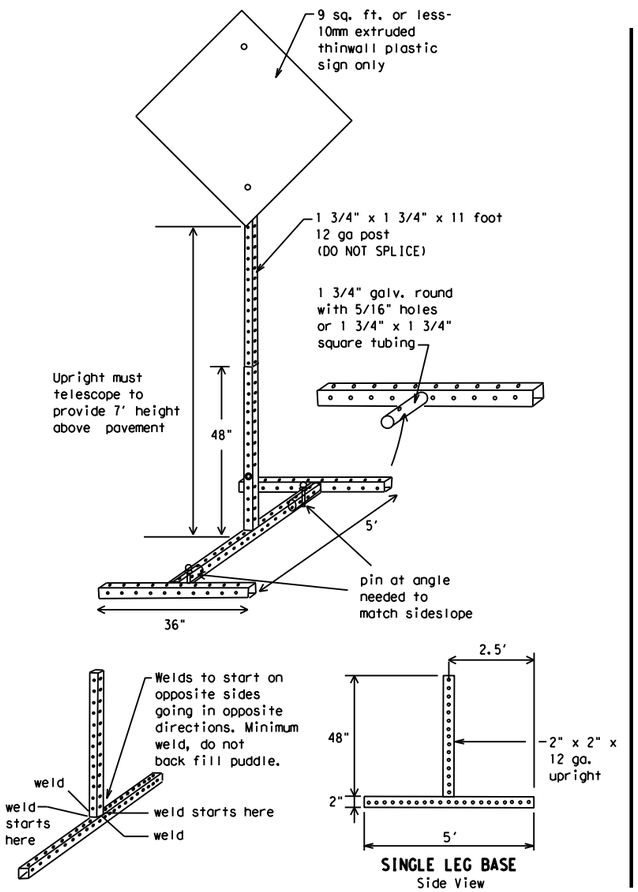
PERFORATED SQUARE METAL TUBING

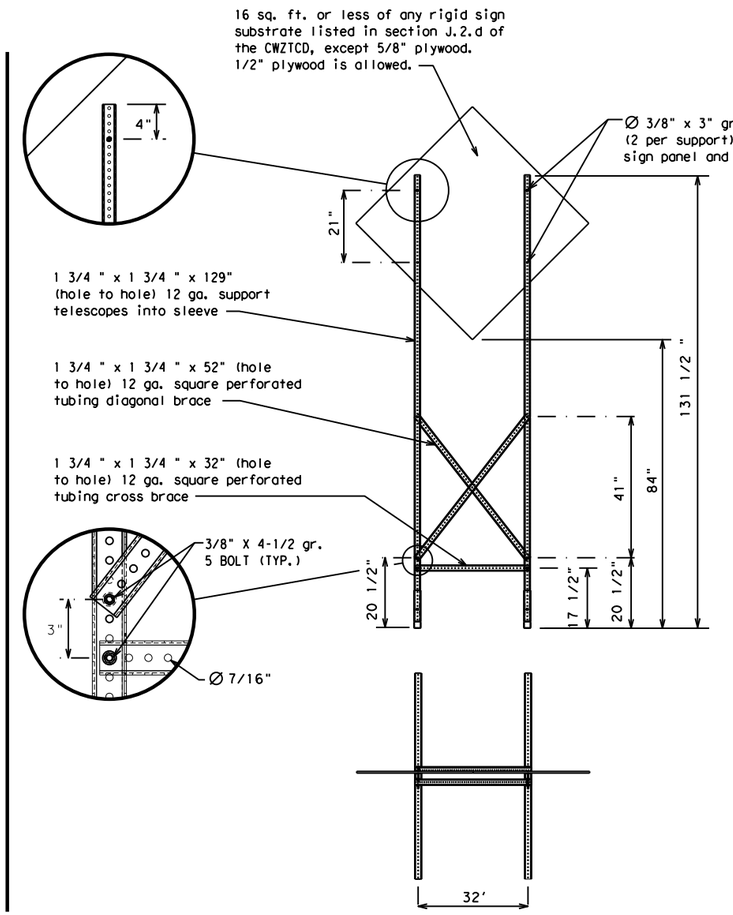


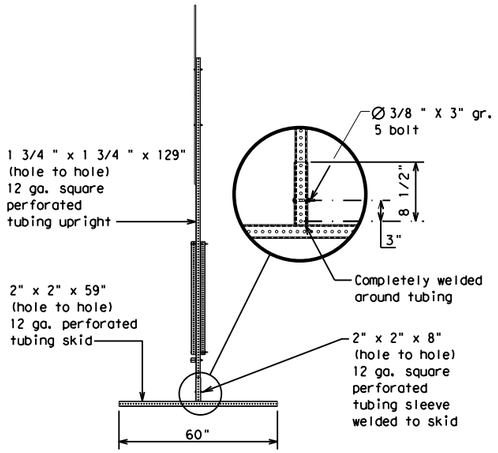
WING CHANNEL
Lap-splice/base bolted anchor

GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

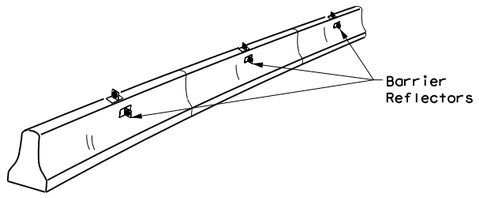
BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	HARRIS		16

100

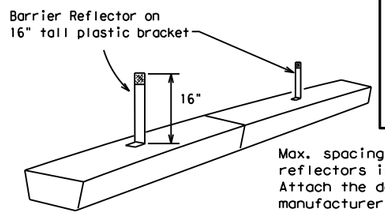
DATE: 11/8/2023 9:44:57 AM
FILE: pw:\\txdot.projectwiseonline.com:TxDOT3\Documents\12 - HOU\Design Projects\002802098\4 - Design\Plan Set\2. TCP\Standards\BC (1)-21 THRU BC (12)-21.dgn

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



CONCRETE TRAFFIC BARRIER (CTB)

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

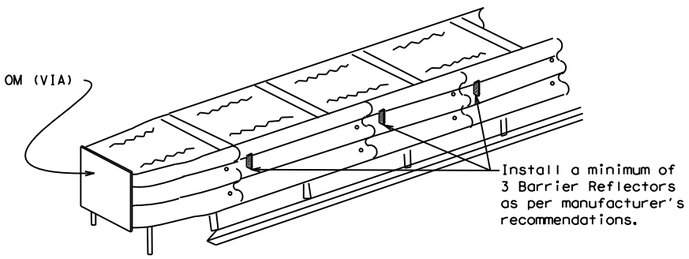


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

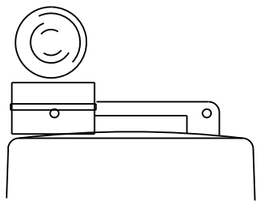


DELINEATION OF END TREATMENTS

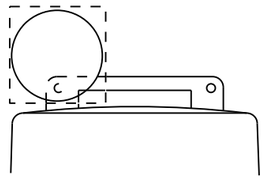
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

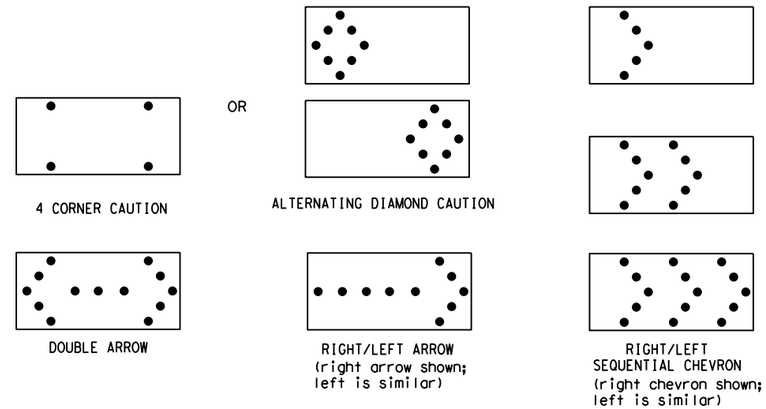
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

SHEET 7 OF 12

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	0028	02	098,etc.	US 90
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	HARRIS		17

101

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

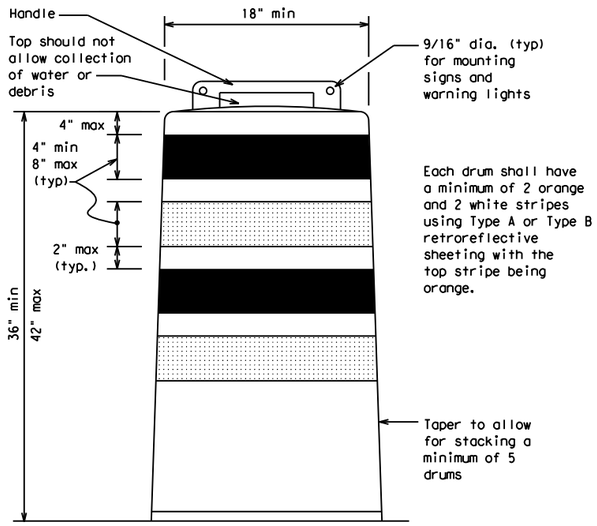
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

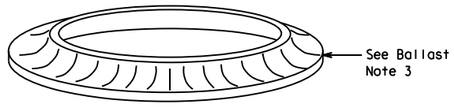
RETROREFLECTIVE SHEETING

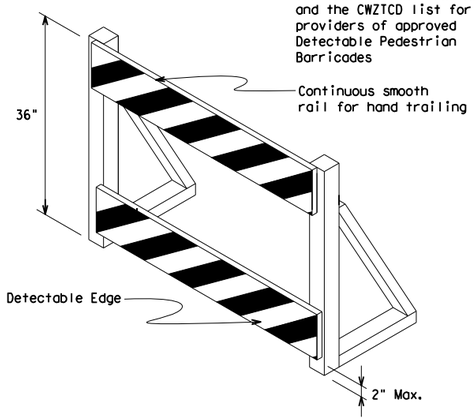
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

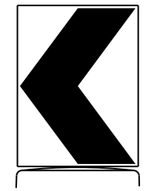




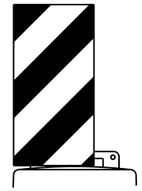


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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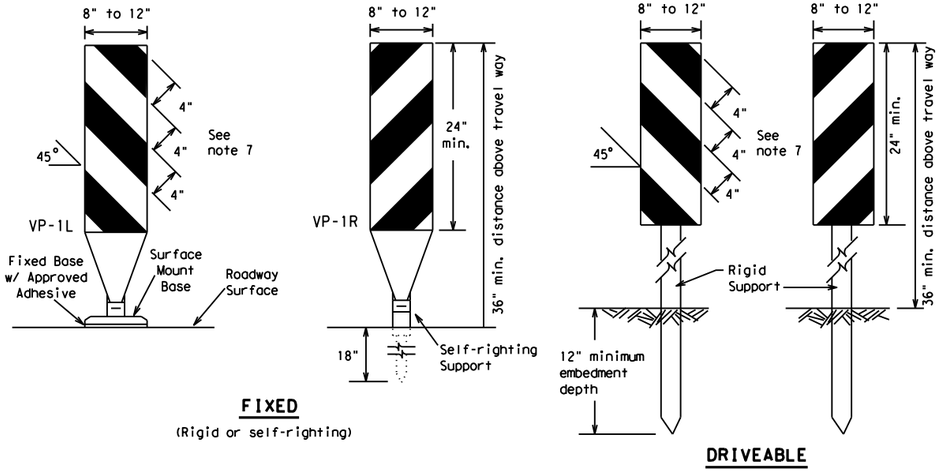
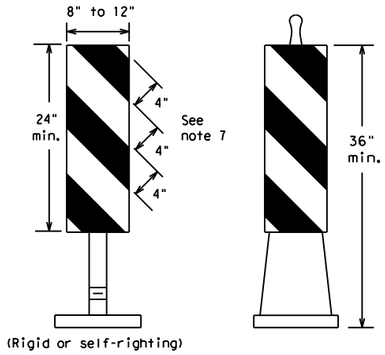


FIXED
(Rigid or self-righting)

DRIVEABLE

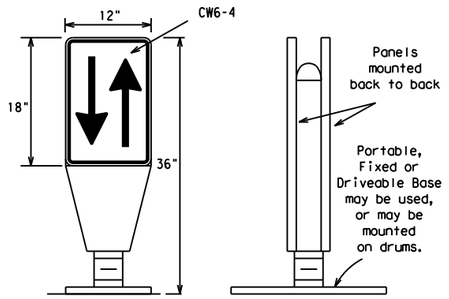


(Rigid or self-righting)

PORTABLE

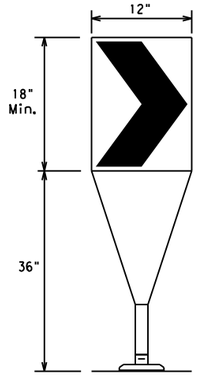
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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



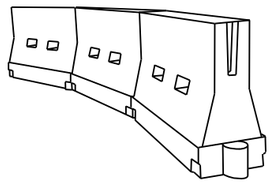
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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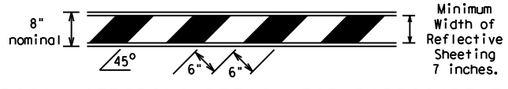
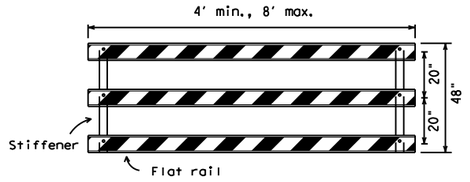
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



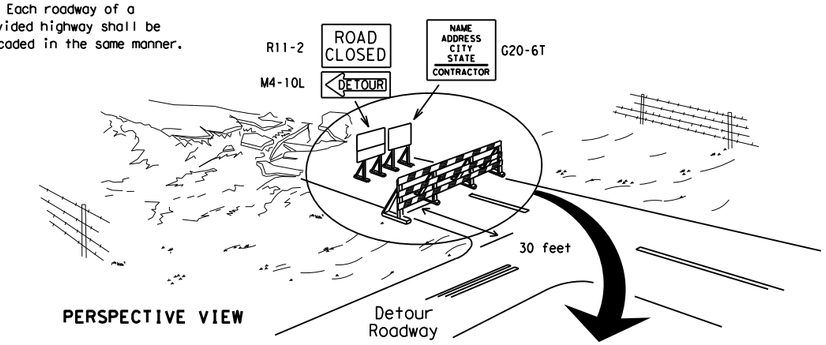
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

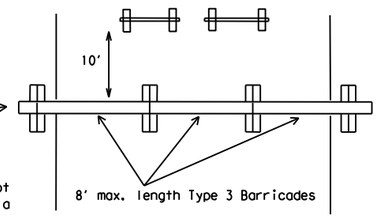
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

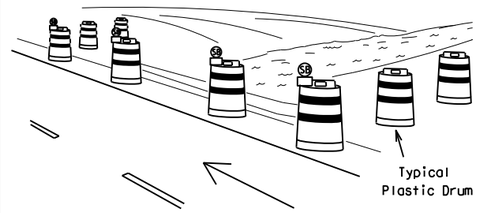
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

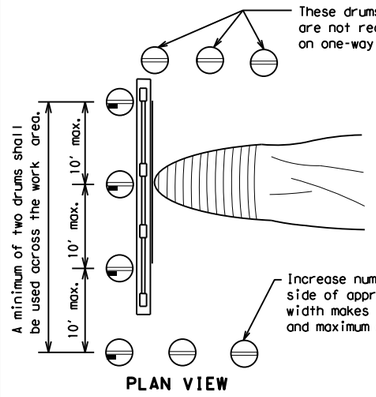
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

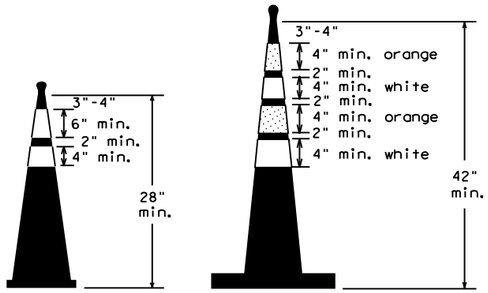
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

PLAN VIEW

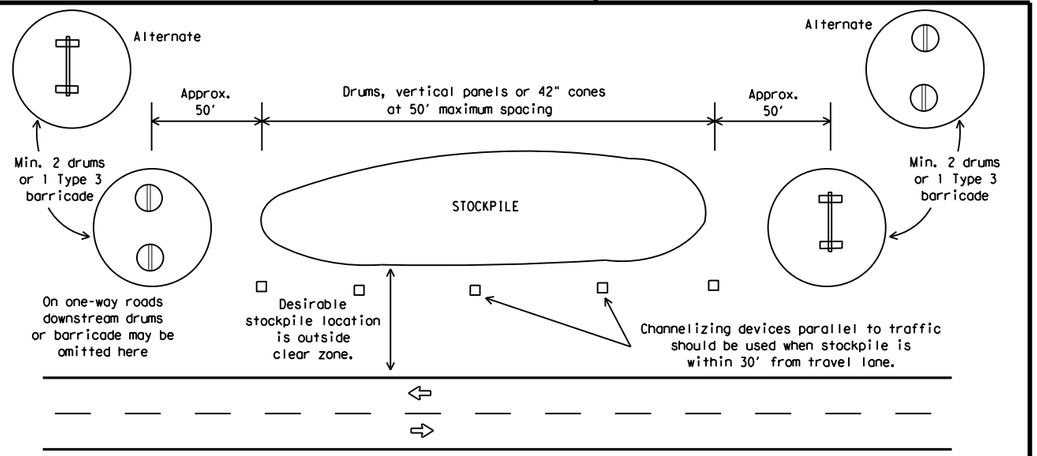
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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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.

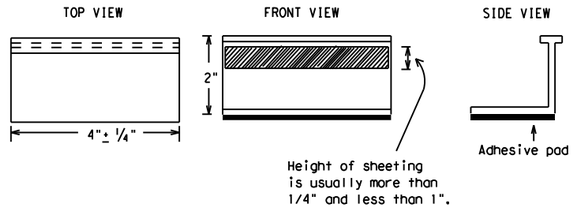
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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).

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BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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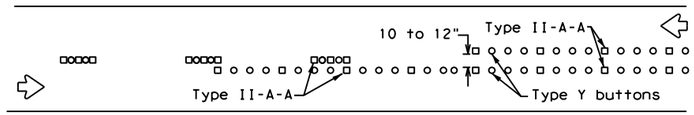
1-02 7-13	HOU	HARRIS		21
11-02 8-14				

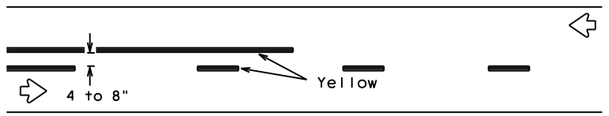
DATE: 11/8/2023 9:50:49 AM
FILE: pw:\\txdot.projectwiseonline.com:TxDOT3\Documents\12 - HOU\Design Projects\002802098\4 - Design\Plan Set\2. TCP\Standards\BC (1)-21 THRU BC (12)-21.dgn

PAVEMENT MARKING PATTERNS

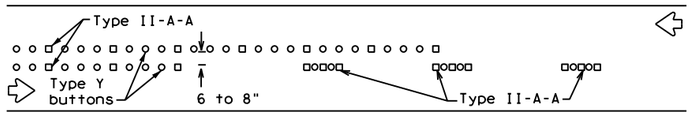
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



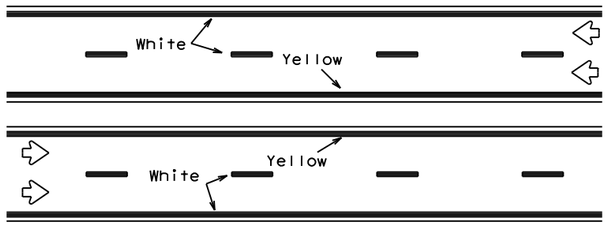
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



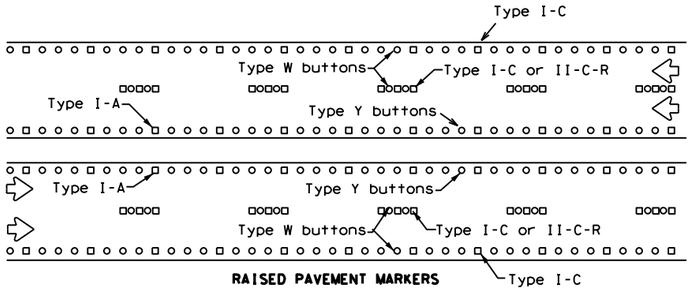
RAISED PAVEMENT MARKERS - PATTERN B

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

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



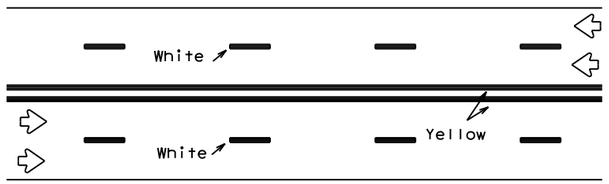
REFLECTORIZED PAVEMENT MARKINGS



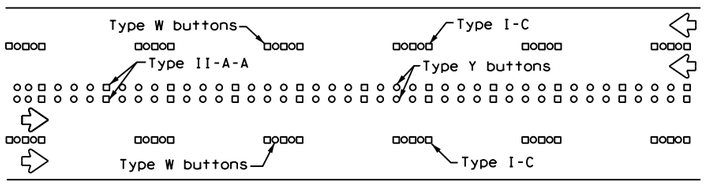
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



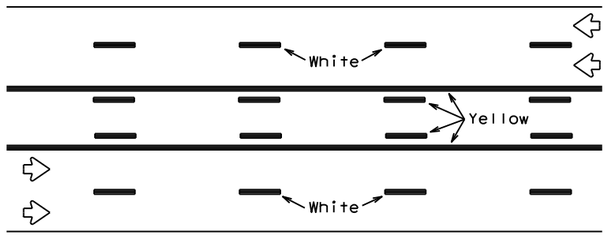
REFLECTORIZED PAVEMENT MARKINGS



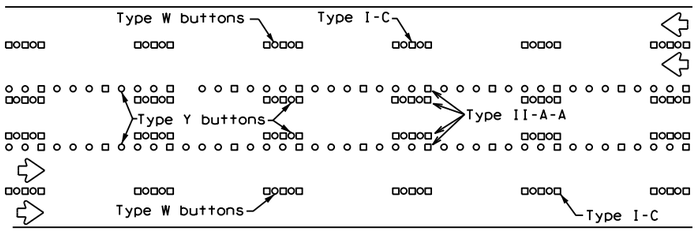
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

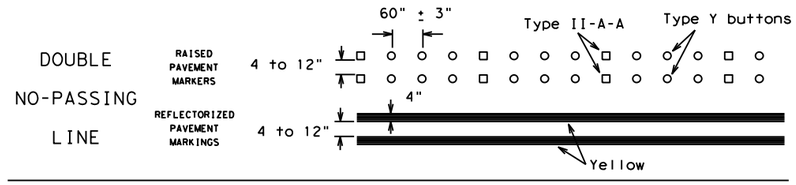
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

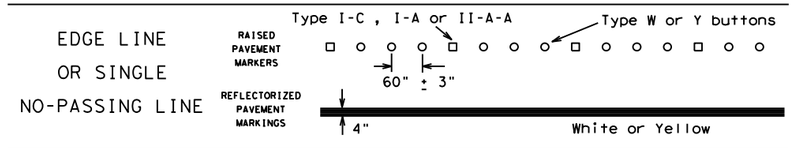
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

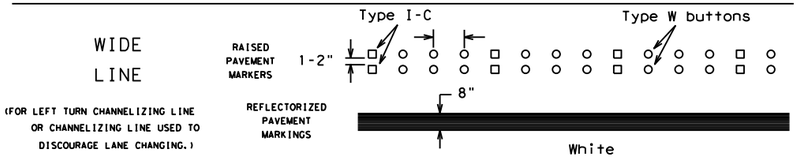


EDGE LINE OR SINGLE NO-PASSING LINE



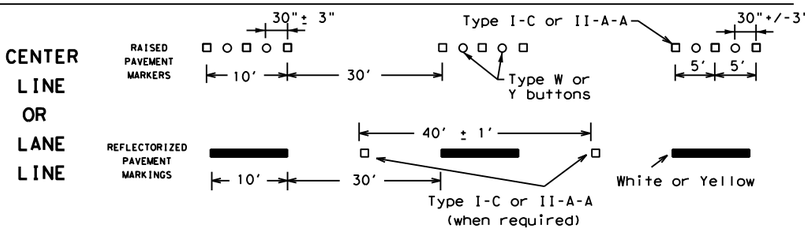
WIDE LINE

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

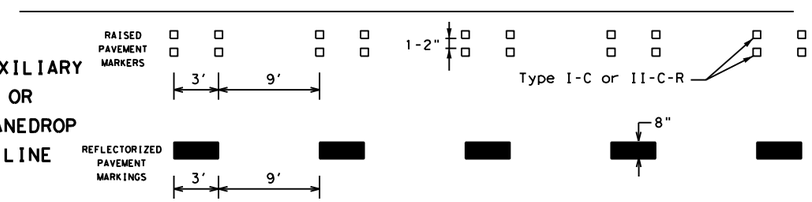


BROKEN LINES

CENTER LINE OR LANE LINE

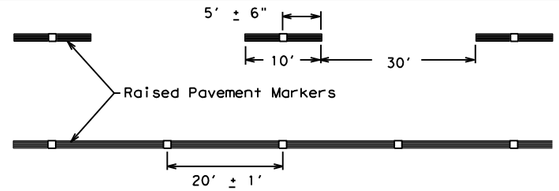


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

SHEET 12 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0028	02	098,etc.	US 90
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		22

106

DATE: 11/8/2023 8:47:49 AM
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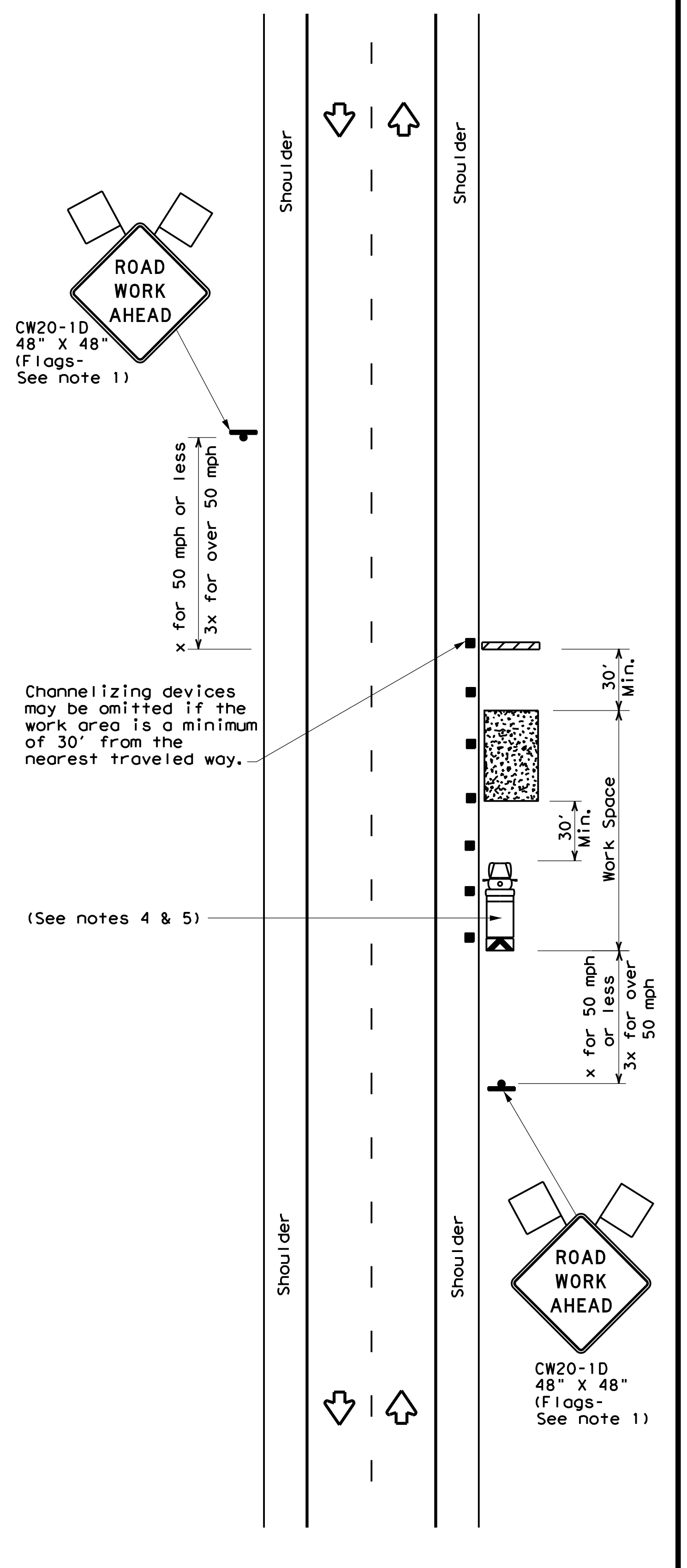
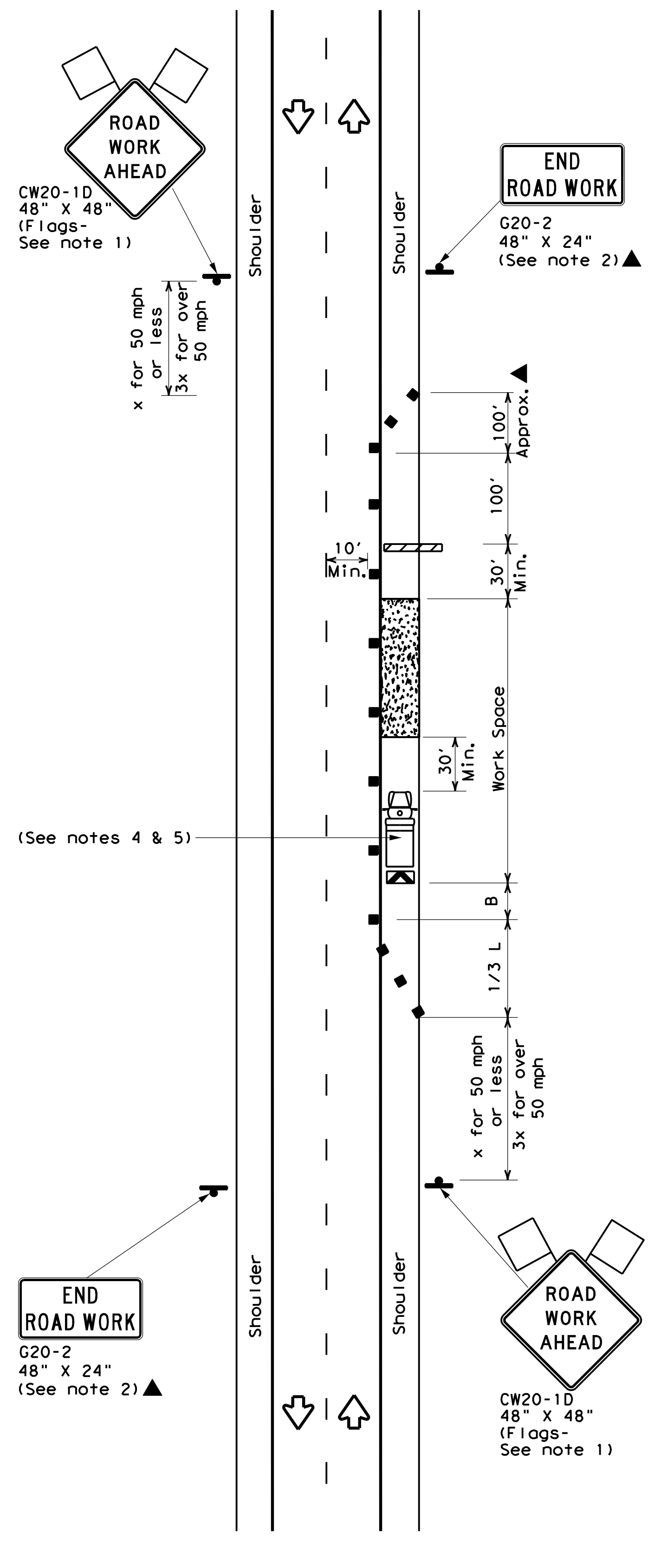


TCP (2-1a)

WORK SPACE NEAR SHOULDER

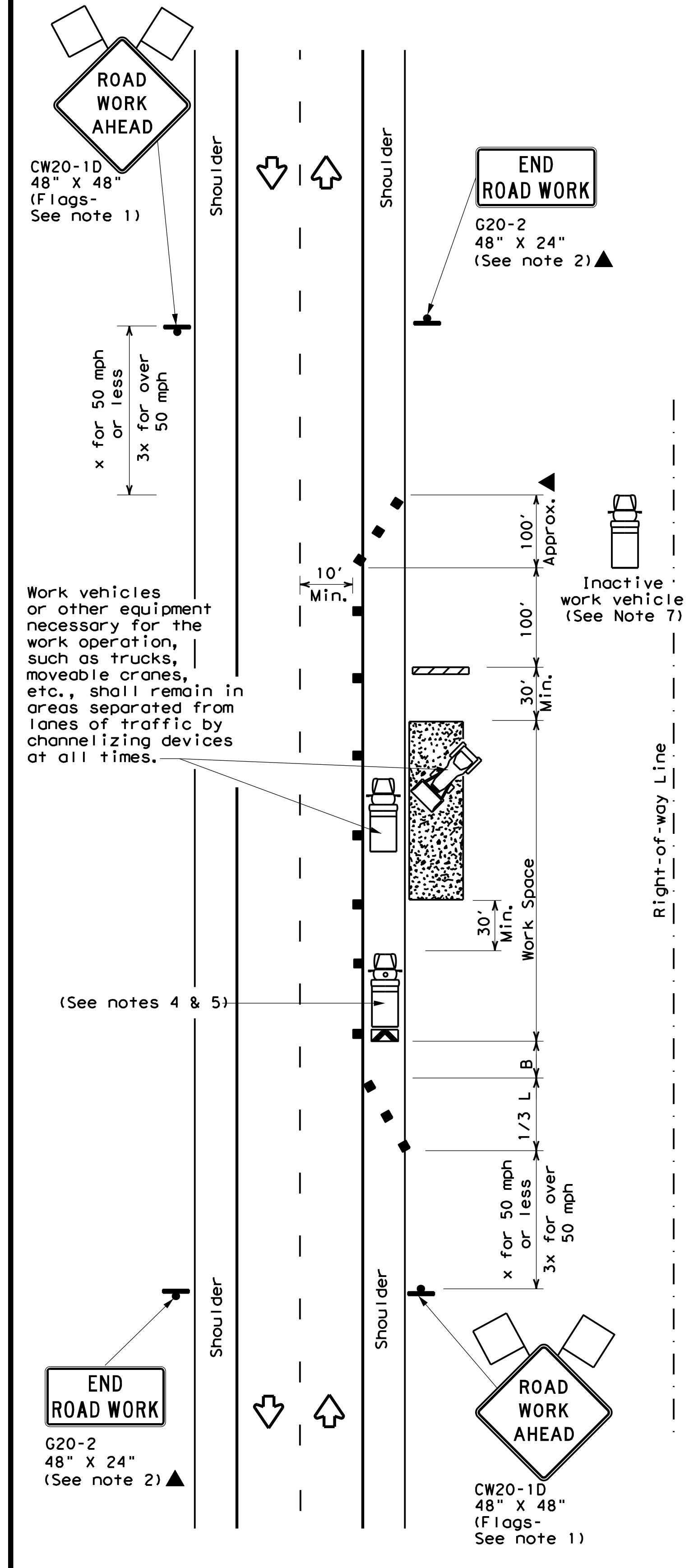
Conventional Roads



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

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

* Conventional Roads Only

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

TYPICAL USAGE

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

GENERAL NOTES

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

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS: 2-94 4-98 8-95 2-12 1-97 2-18	0028	02	098,etc.	US 90
	DIST		COUNTY	SHEET NO.
	HOU		HARRIS	23

161

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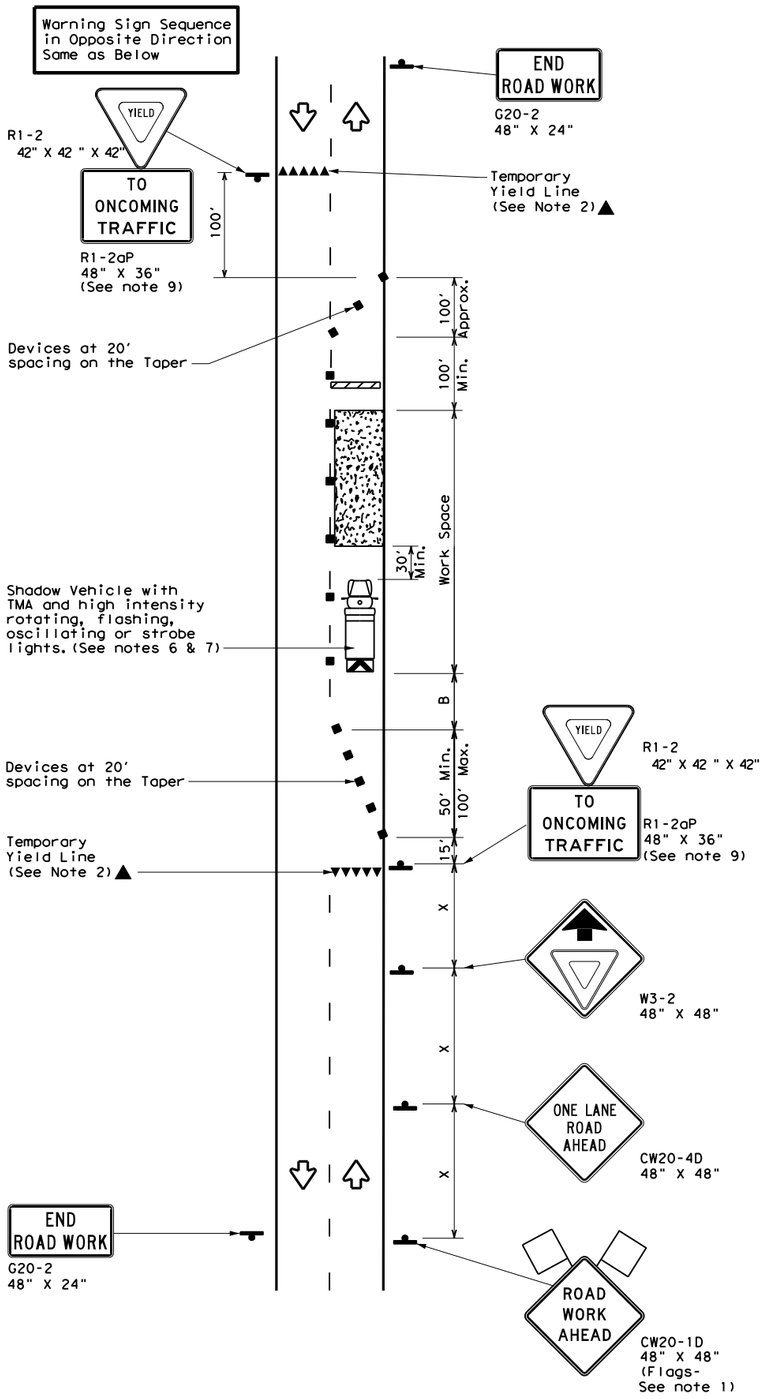
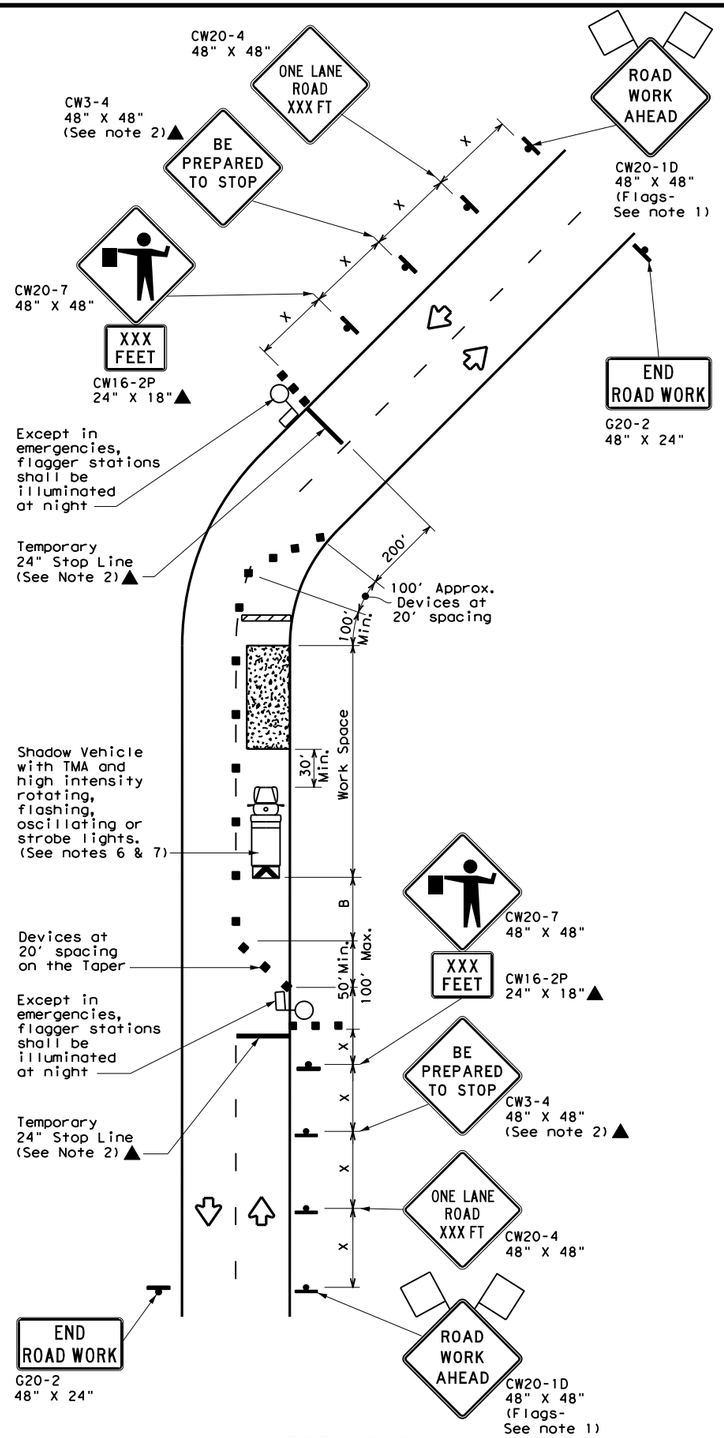


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	HOU	HARRIS		24
4-98 2-18				

LEGEND

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

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

* Conventional Roads Only

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

TYPICAL USAGE

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

GENERAL NOTES

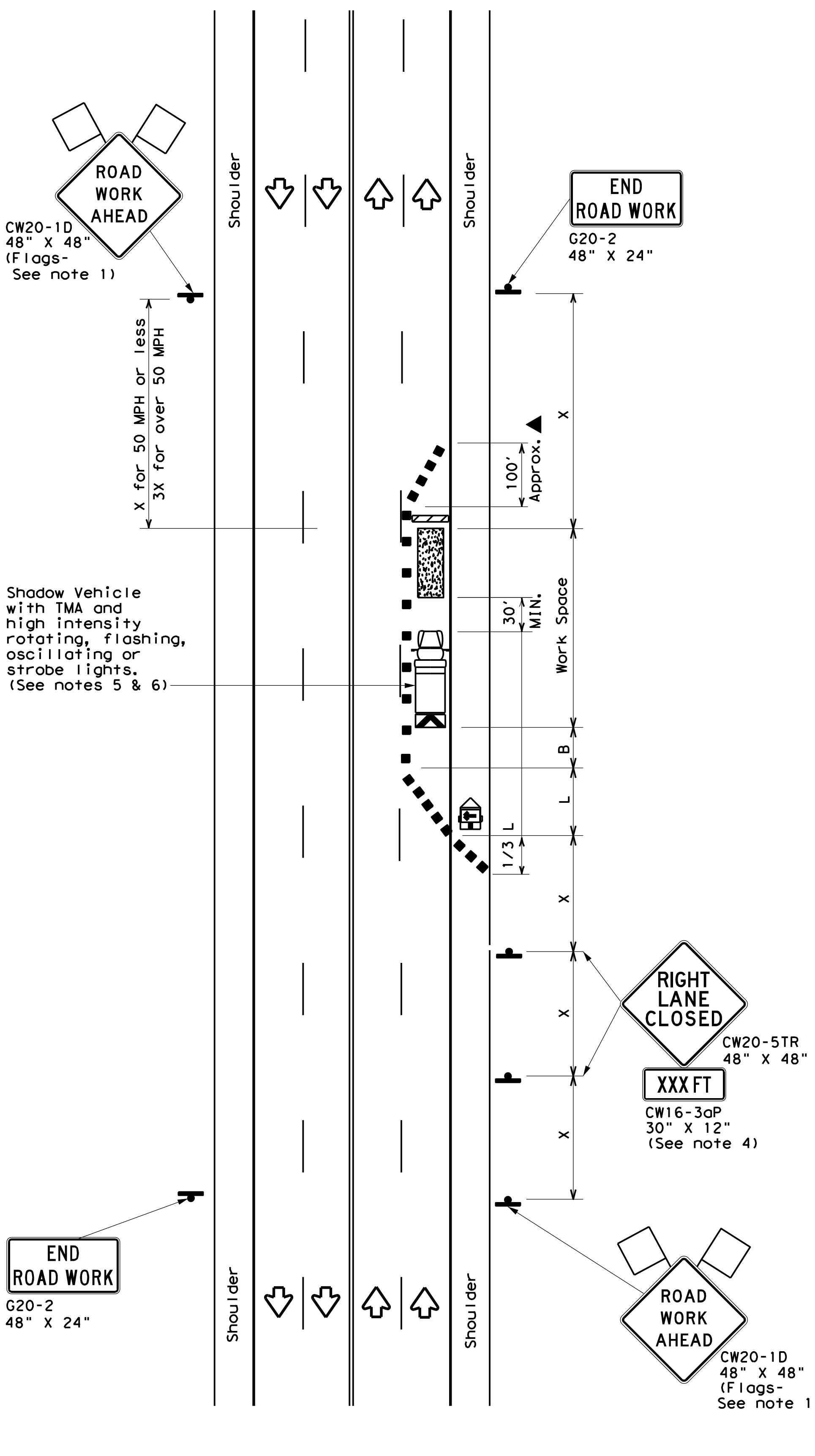
1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The downstream taper is optional.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

TCP (2-4a)

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

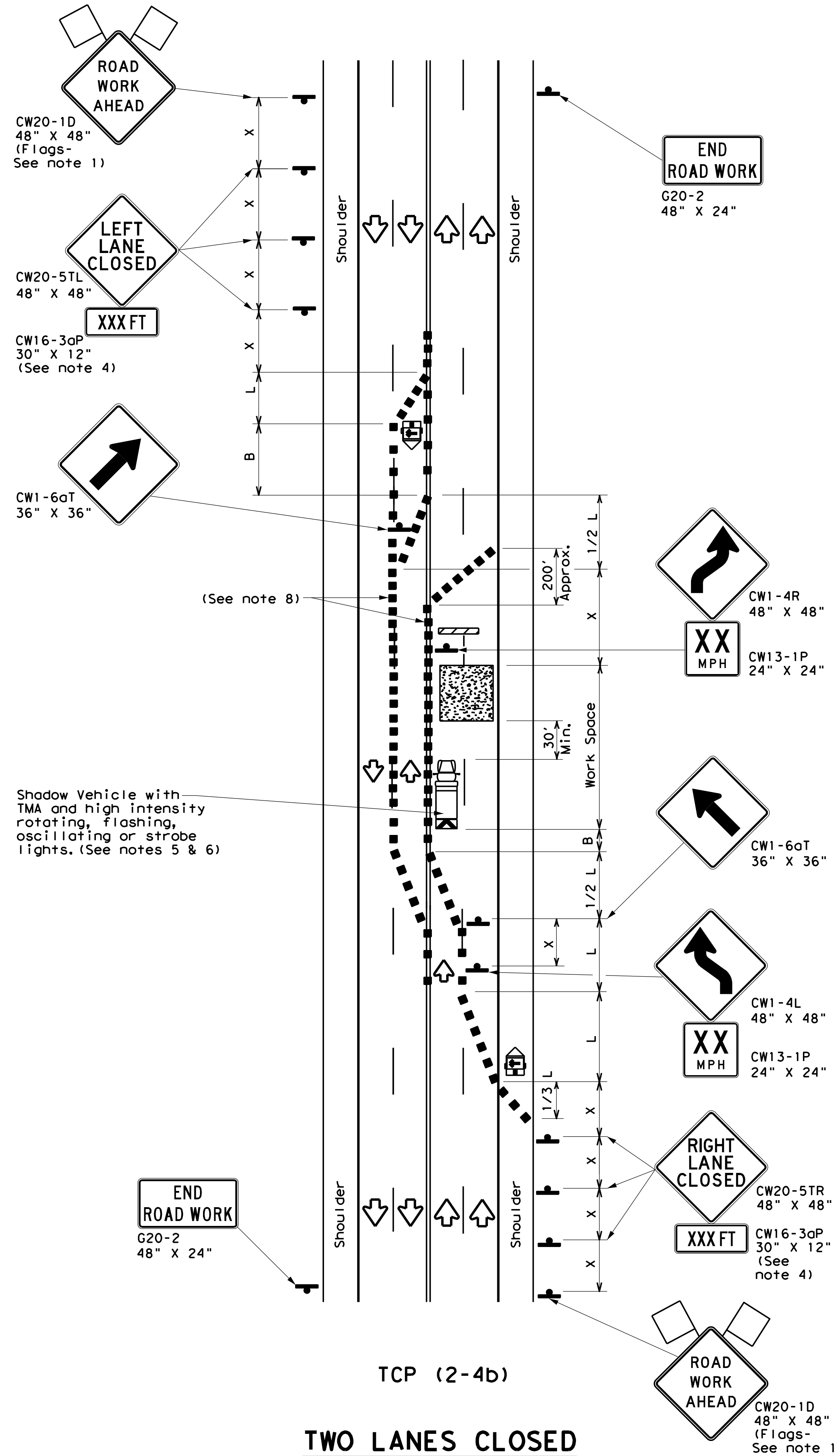
TCP (2-4b)

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



TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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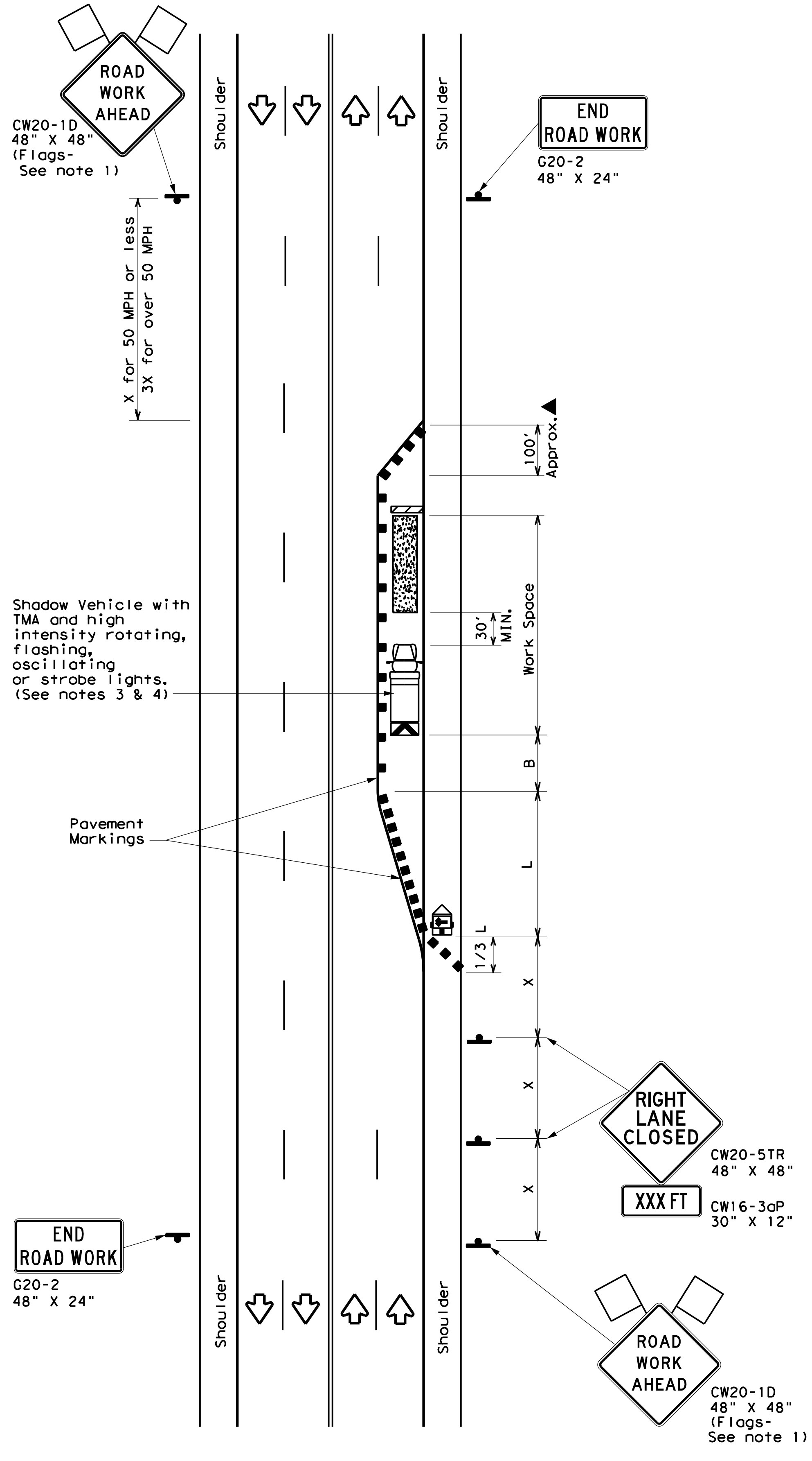
Texas Department of Transportation | Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

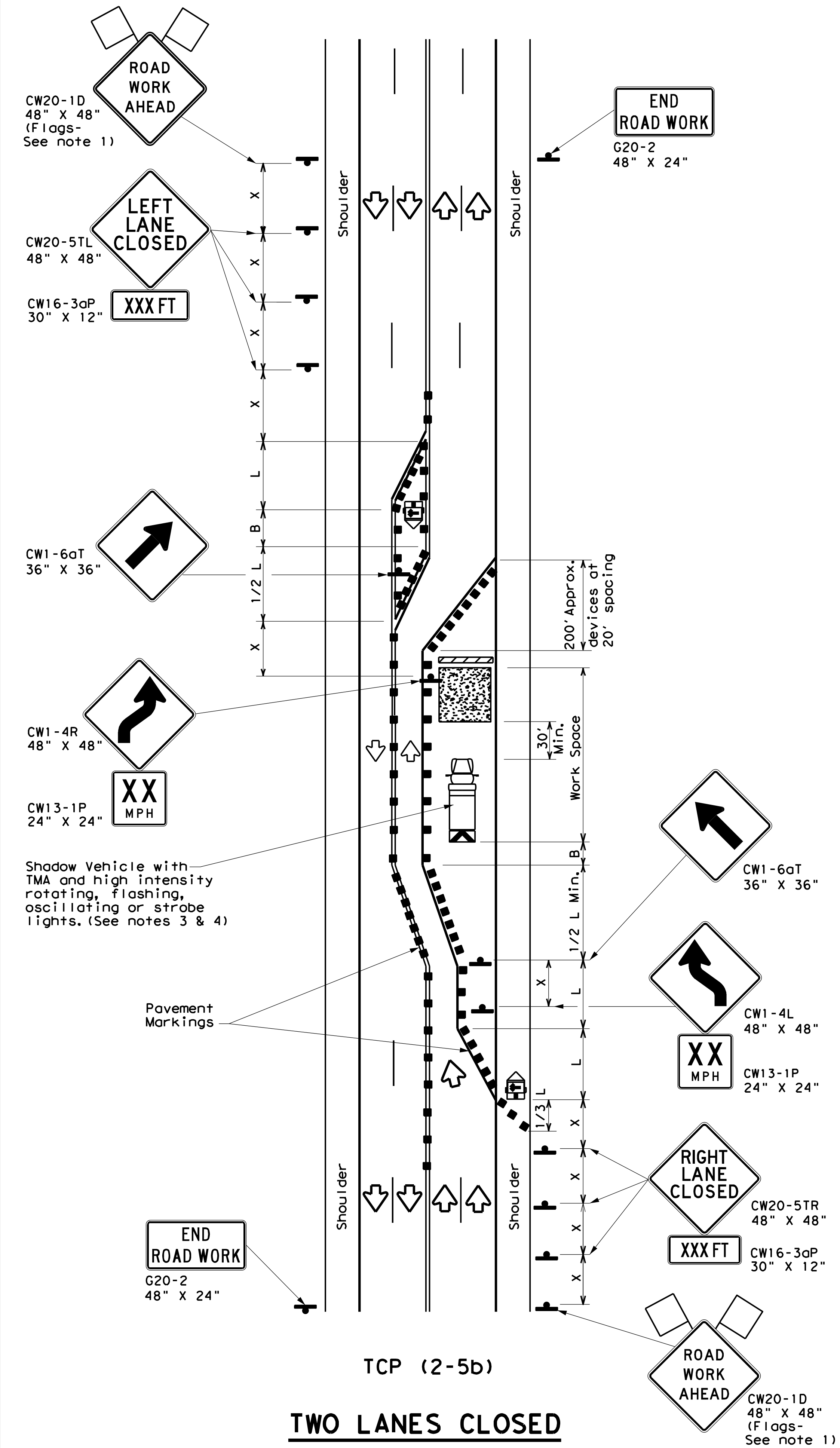
TCP(2-4)-18

FILE: tcp2-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT 0028	SECT 02	JOB 098,etc.	HIGHWAY US 90
REVISIONS 8-95 3-03, 1-97 2-12, 4-98 2-18	DIST HOU		COUNTY HARRIS	SHEET NO. 25



TCP (2-5a)

ONE LANE CLOSED



TCP (2-5b)

TWO LANES CLOSED

LEGEND

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew eposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substitutued for the Shadow Vehicle and TMA.
4. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.
5. The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

TCP (2-5a)

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

TCP (2-5b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LONG TERM LANE CLOSURES MULTILANE CONVENTIONAL RDS.

TCP(2-5)-18

FILE: tcp2-5-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 2-12 1-97 3-03 4-98 2-18	0028	02	098,etc.	US 90
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		26

165

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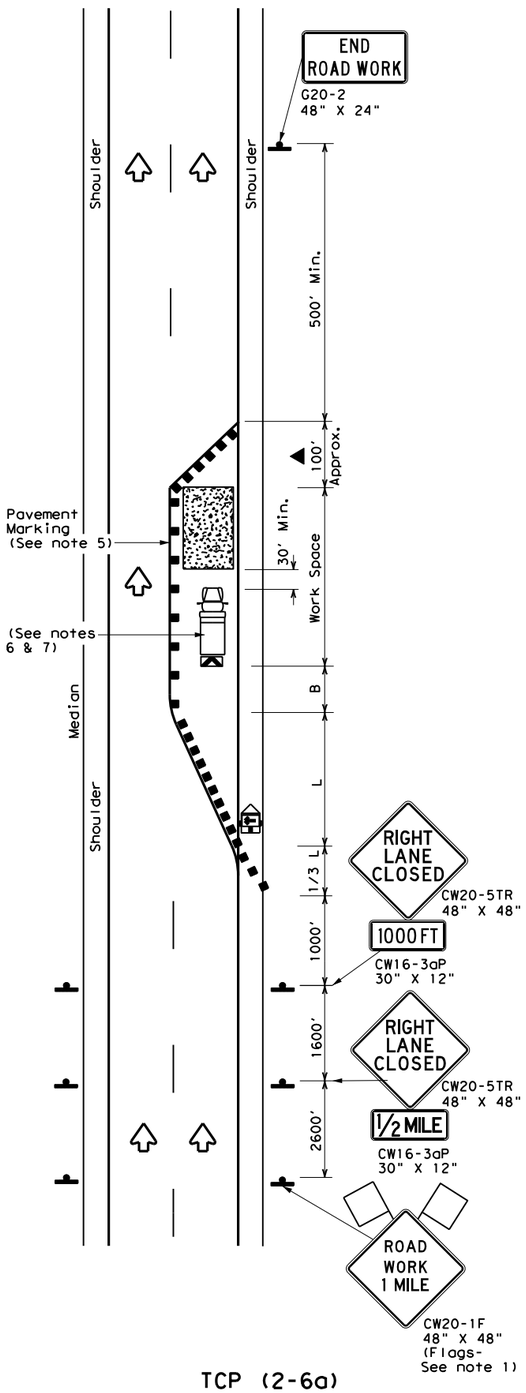
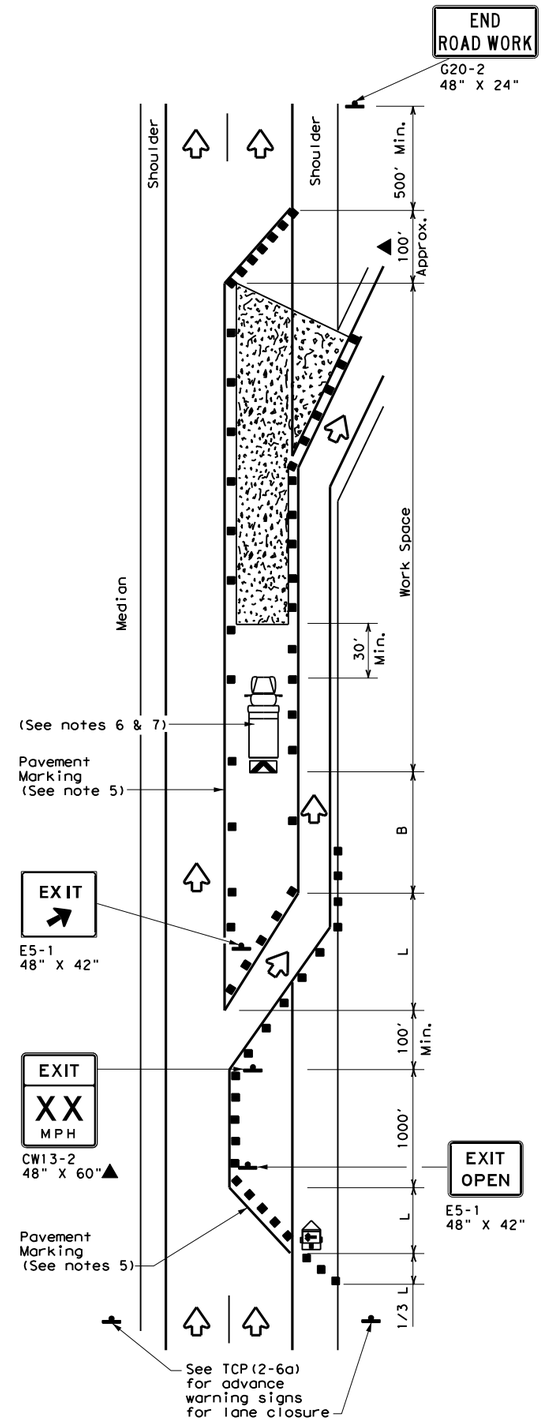


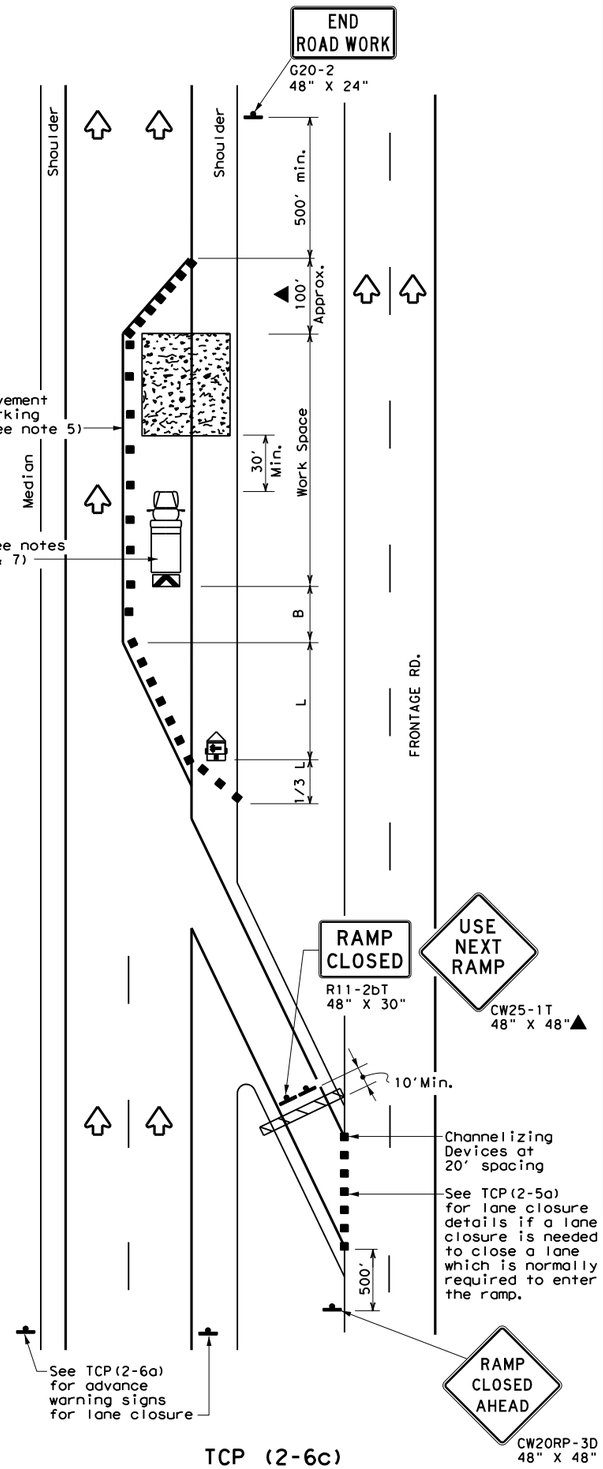
TCP (2-6a)

ONE LANE CLOSURE



TCP (2-6b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (2-6c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP(2-6)-18

FILE: tcp2-6-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0028	02	098,etc.	US 90
	DIST	COUNTY		SHEET NO.
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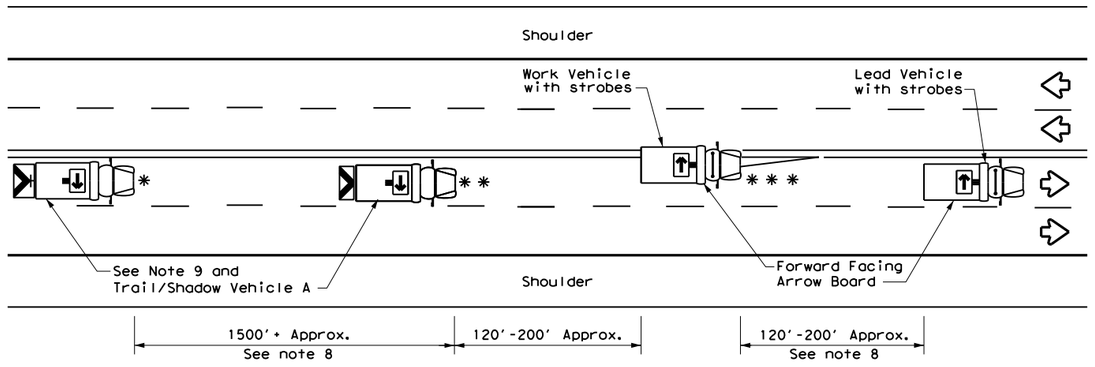
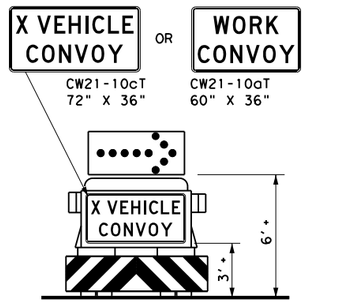


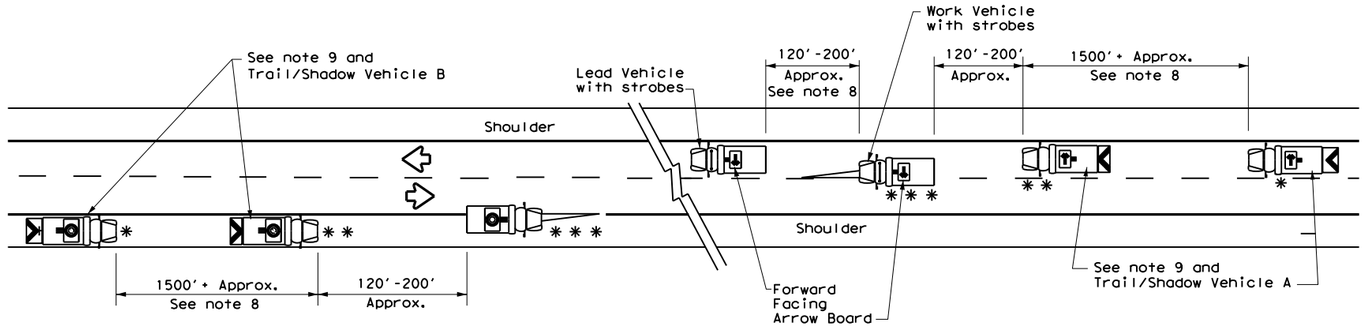
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

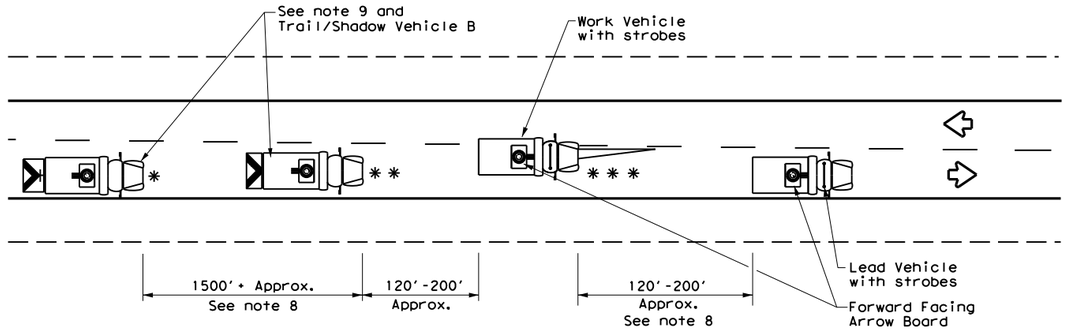


WORK ON SHOULDER

WORK ON TRAVEL LANE

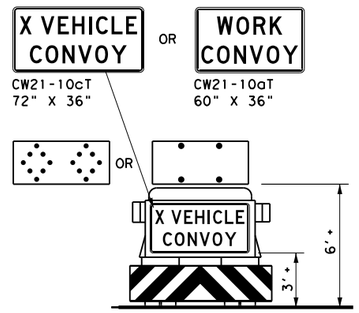
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

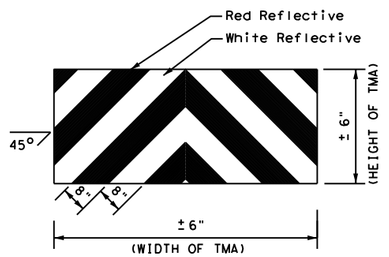
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0028	02	098,etc.	US 90
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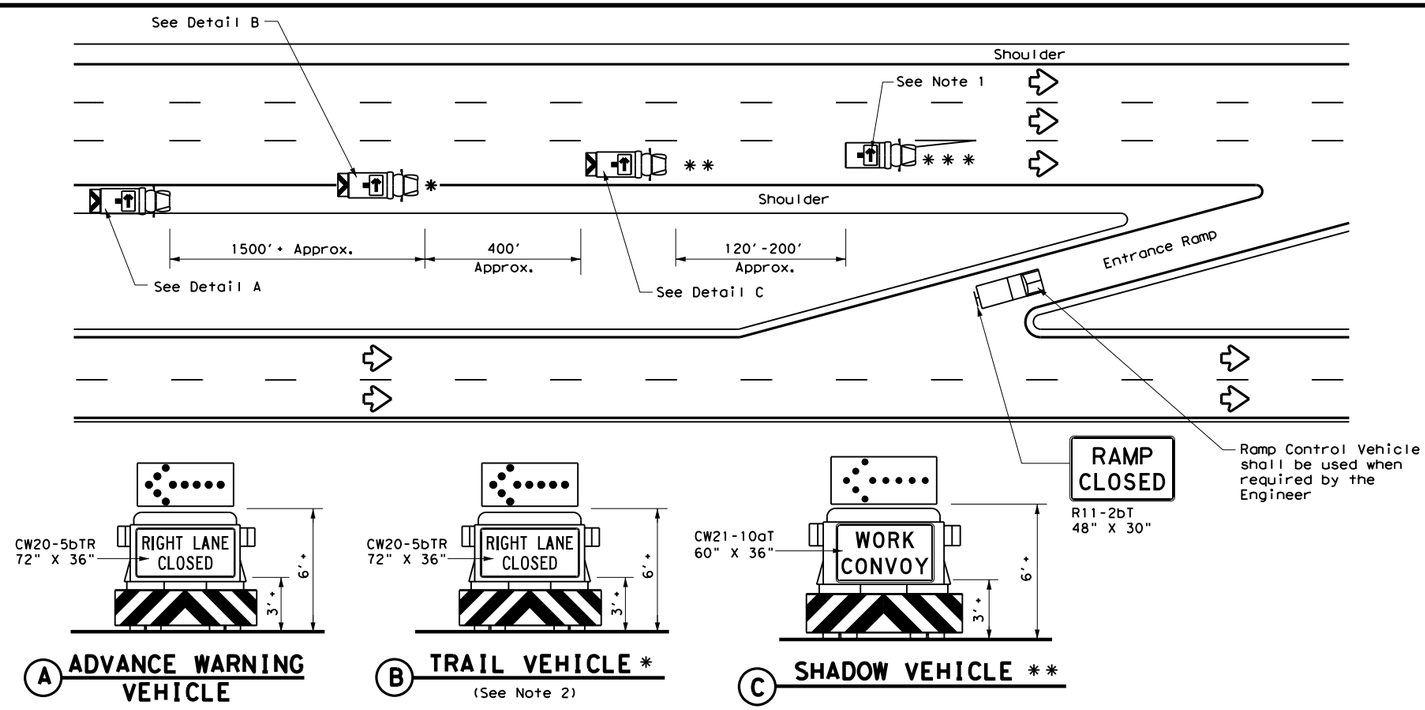
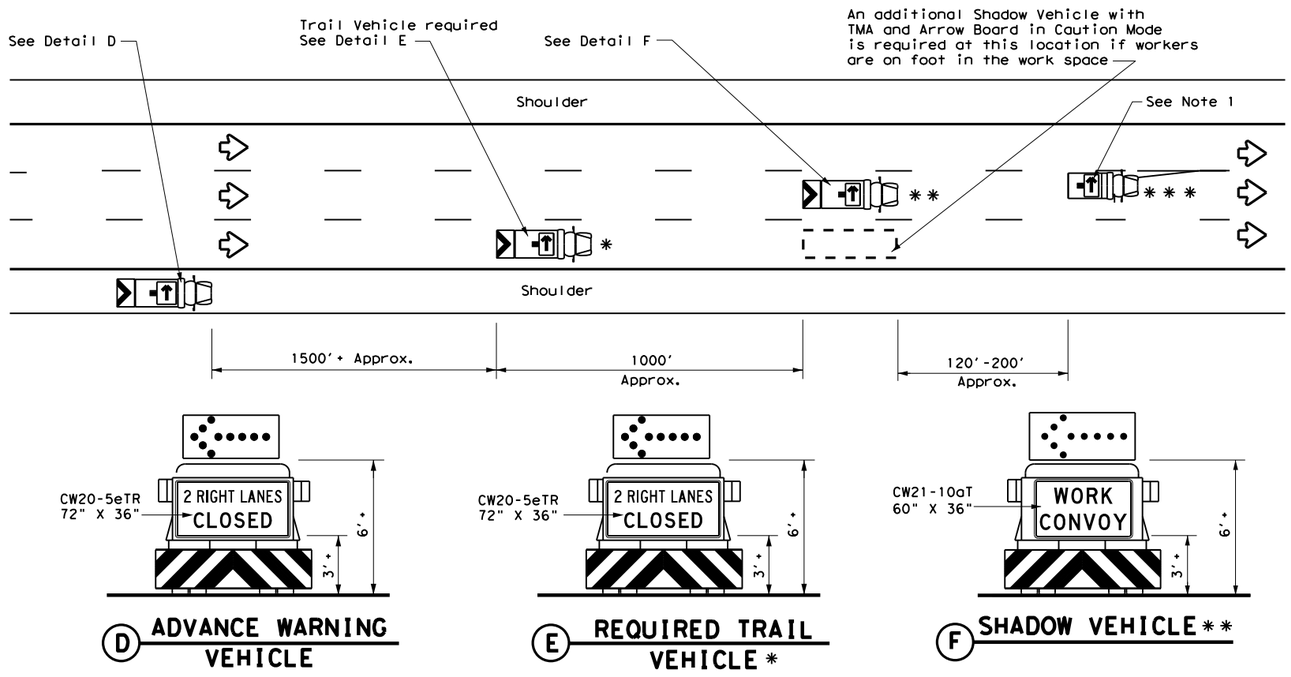


RIGHT LANE CLOSURE ON DIVIDED HIGHWAY - TCP(3-2a)



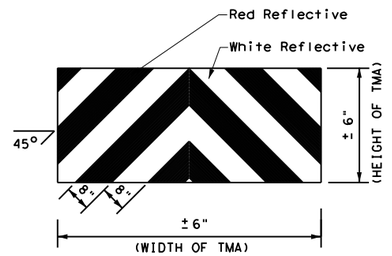
INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP(3-2b)

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS

TCP(3-2)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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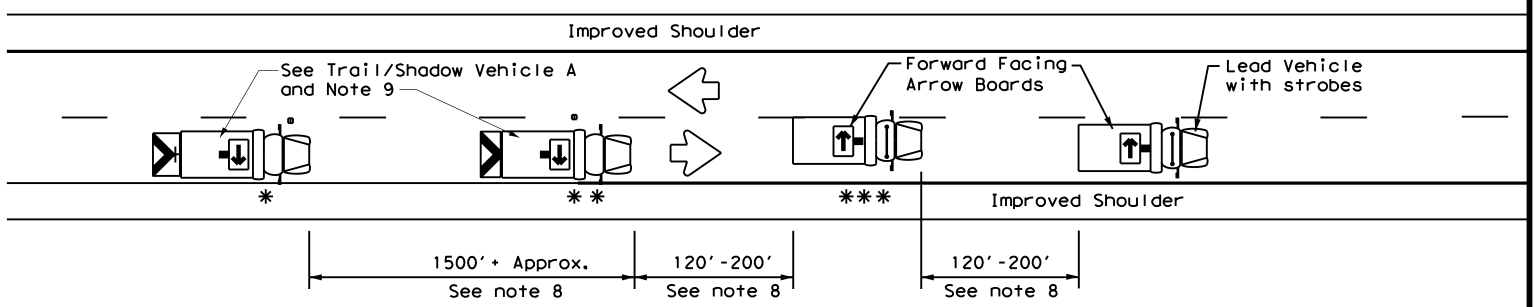
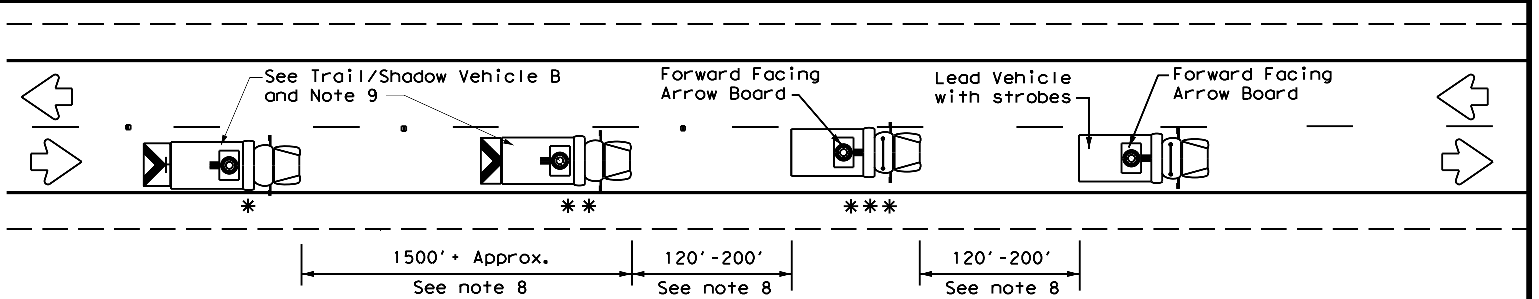
8-95 7-13	HOU	HARRIS		29
1-97				

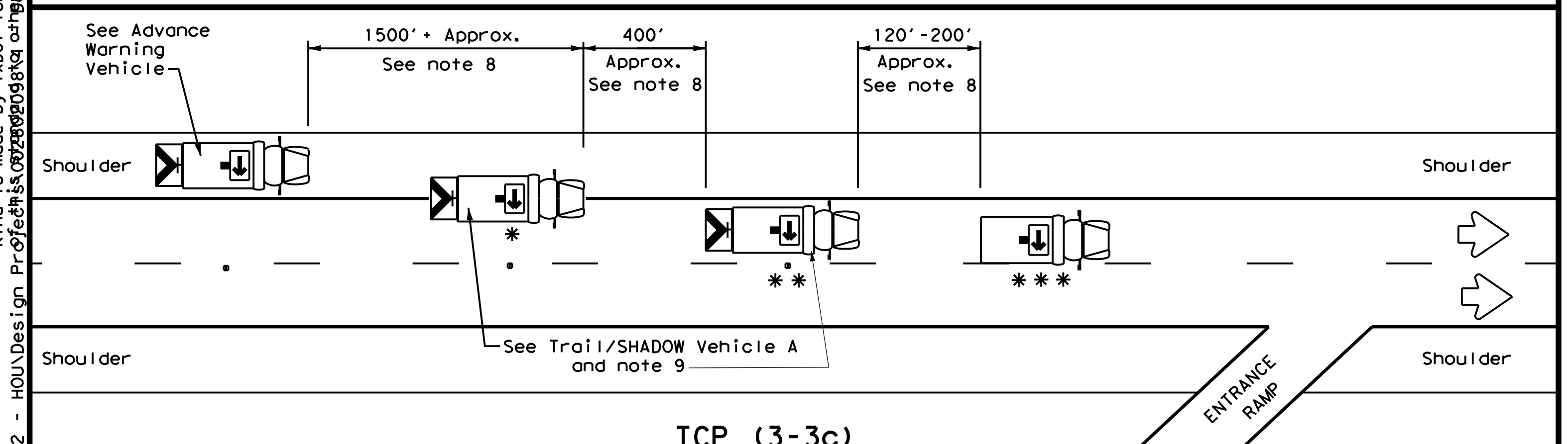
176



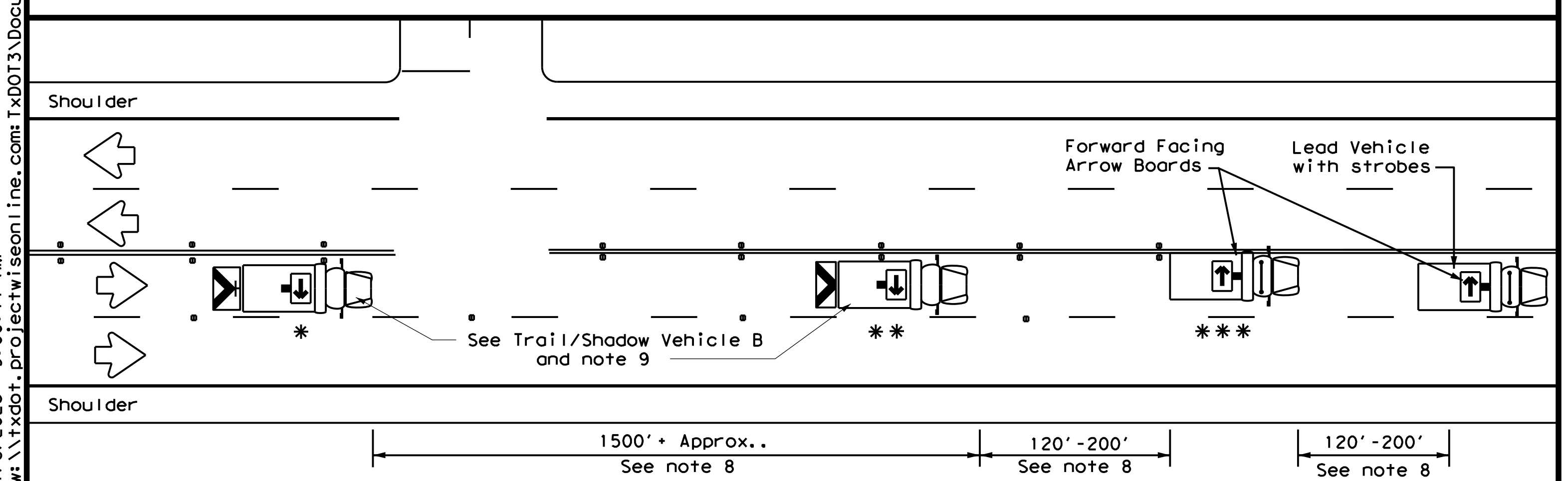
TCP (3-3a)
TWO LANE HIGHWAY WITH PAVED SHOULDERS (WORK ON TRAVEL LANE)



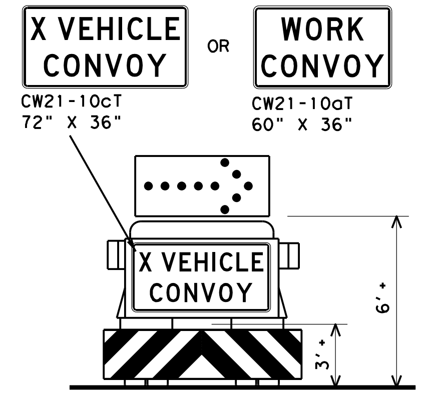
TCP (3-3b)
TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS (WORK ON TRAVEL LANE)



TCP (3-3c)
DIVIDED MULTILANE HIGHWAY

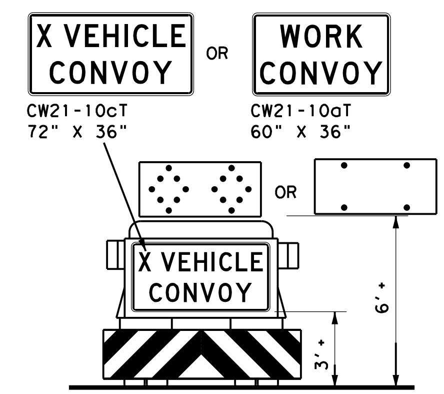


TCP (3-3d)
UNDIVIDED MULTILANE HIGHWAY



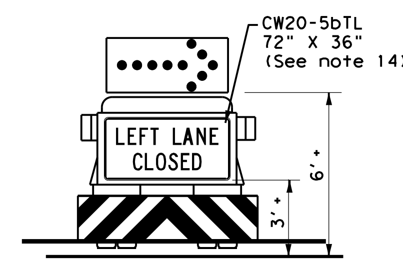
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

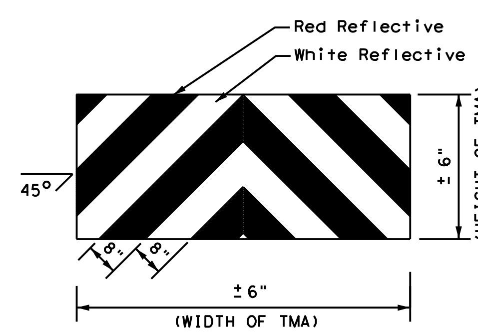


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND

Symbol	Description	Arrow Board Display	Description
*	Trail Vehicle		
**	Shadow Vehicle		
***	Work Vehicle	(right arrow)	RIGHT Directional
(symbol)	Heavy Work Vehicle	(left arrow)	LEFT Directional
(symbol)	Truck Mounted Attenuator (TMA)	(double arrow)	Double Arrow
(arrow)	Traffic Flow	(symbol)	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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	DIST		COUNTY	SHEET NO.
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177

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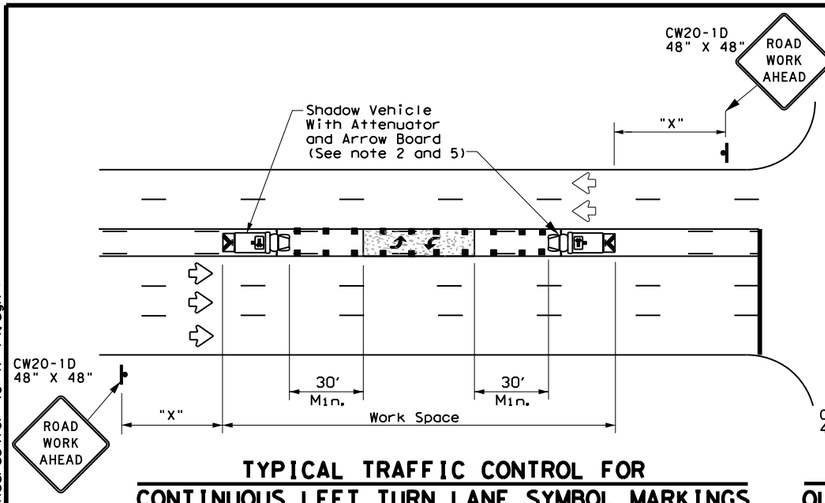
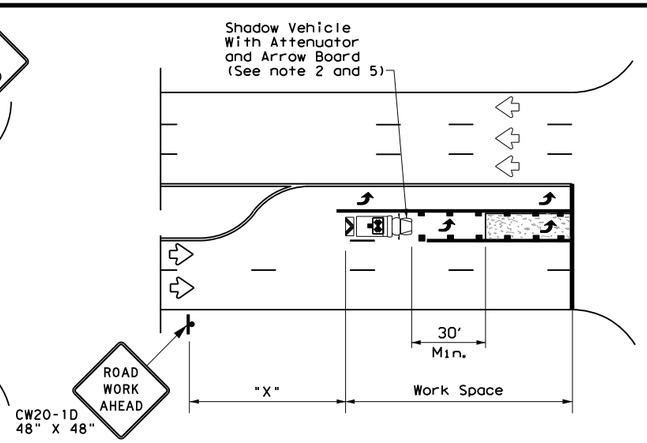
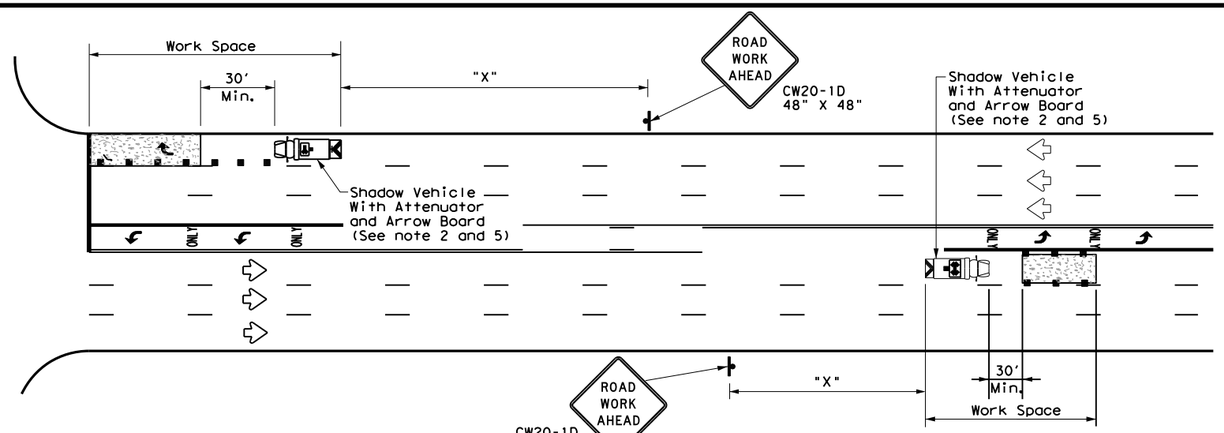


TYPICAL TRAFFIC CONTROL FOR
CONTINUOUS LEFT TURN LANE SYMBOL MARKINGS

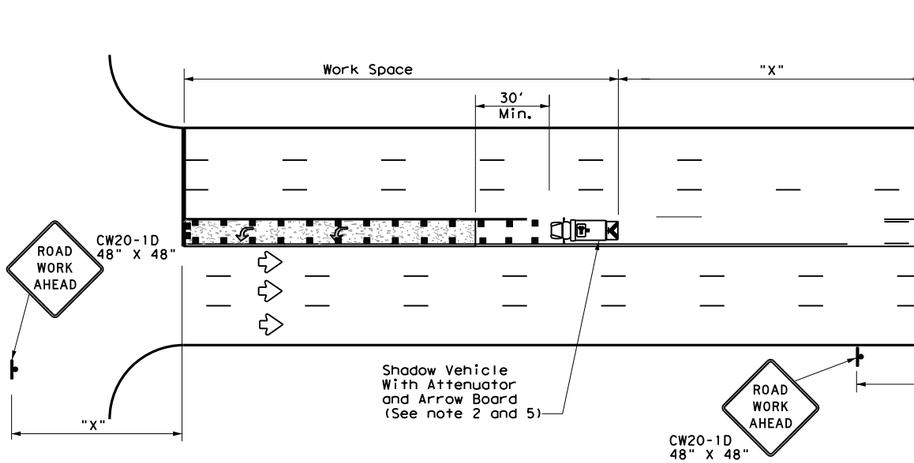


TYPICAL TRAFFIC CONTROL FOR
OUTSIDE DUAL LEFT TURN LANE SYMBOL MARKINGS

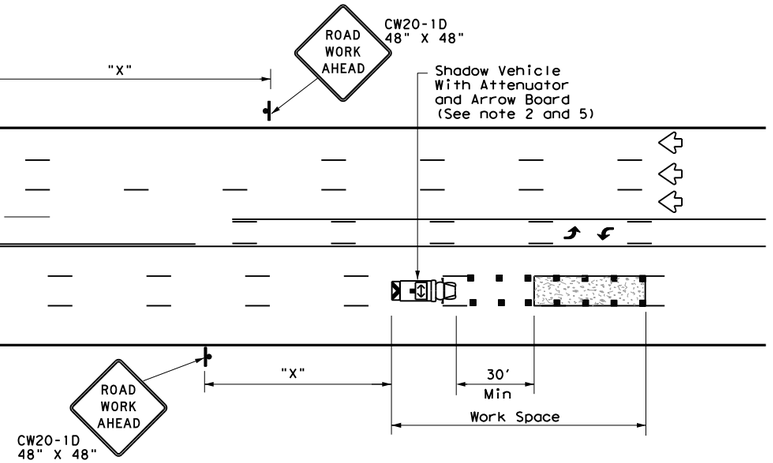


TYPICAL TRAFFIC CONTROL FOR
OUTSIDE LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
INSIDE LANE MARKINGS



TYPICAL TRAFFIC CONTROL FOR
LEFT TURN LANE MARKINGS



TYPICAL TRAFFIC CONTROL FOR
CENTER LANE MARKINGS

LEGEND

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

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

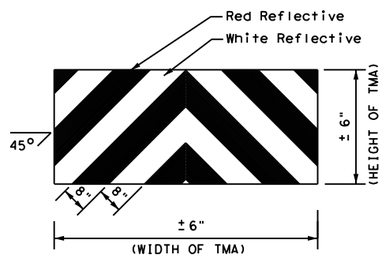
* Conventional Roads Only

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS FOR ISOLATED WORK AREAS UNDIVIDED HIGHWAYS

TCP(3-4)-13

FILE: tcp3-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT July, 2013	CONT	SECT	JOB	HIGHWAY
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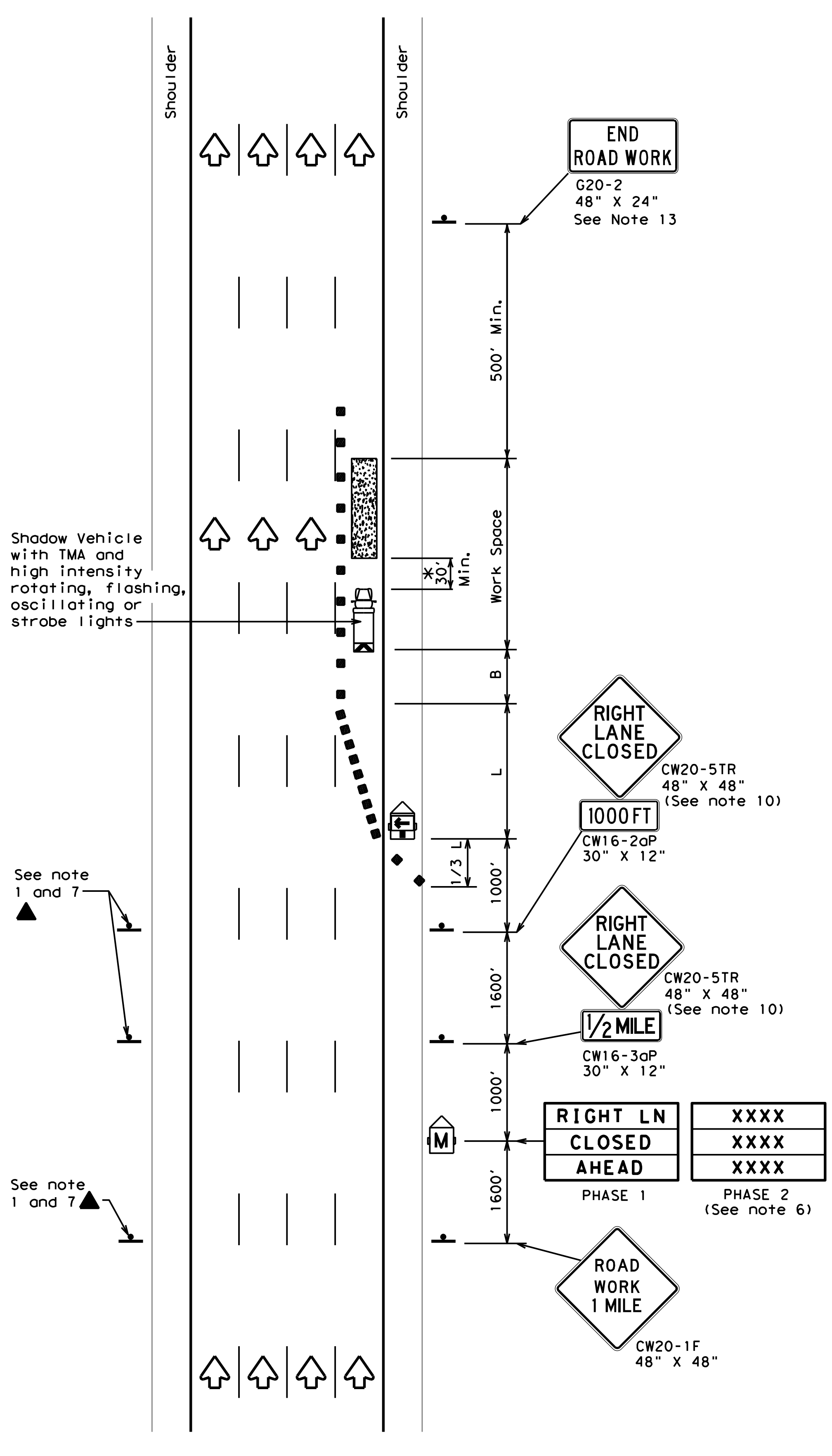
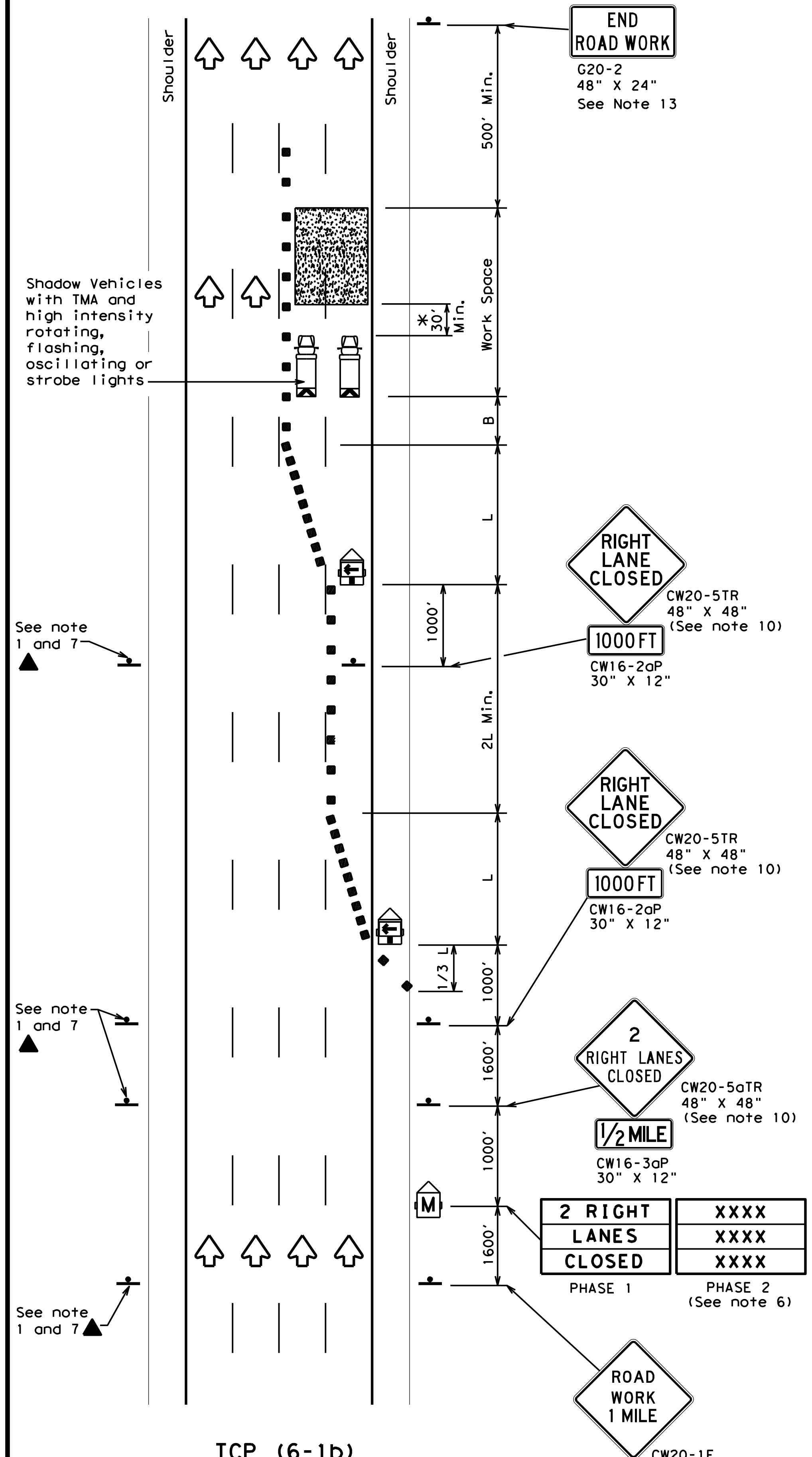
	HOU	HARRIS		31



TCP (6-1a)

TYPICAL FREEWAY
ONE LANE CLOSURE



TCP (6-1b)

TYPICAL FREEWAY
TWO LANE CLOSURE

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 "L" **			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. Drums or 42"cones are the typical channelizing devices. For Intermediate Term Stationary work, drums shall be used on tapers with drums or 42" cones used on tangent sections. Other channelizing devices may be used as directed by the Engineer.
3. All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
4. The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
5. Static message boards or changeable message signs stating the date and duration of ramp or freeway lane closures shall be placed a minimum of seven (7) calendar days in advance of the actual closure.
6. Phase 2 of the PCMS message should include appropriate information formatted as shown on BC(6), such as "MERGE LEFT," recommended advisory speed, delay information, or other specific warnings.
7. Duplicate construction warning signs should be erected on the medians side of freeways where median width will permit and traffic volume justifies the signing.
8. The number of closed lanes may be increased provided the spacing of traffic control devices, taper lengths and tangent lengths meet the requirements of the TMUTCD.
9. Warning signs for intermediate term stationary work should be mounted at 7' to the bottom of the sign.
10. Warning signs shown shall be appropriately altered for left lane closures. When signs are mounted at 1' height for short term stationary or short duration work, sign versions shown in the SHSD for Texas with distances on the sign face rather than mounted on a plaque below the sign may be used.
11. When possible, PCMS units should be located in advance of the last available exit ramp prior to the lane closure to allow motorists an alternate route. They may also be relocated to improve advance warning in case of unanticipated queuing or congestion.
12. For Intermediate Term Stationary work at night, floodlights should be used to illuminate the work area and equipment crossings. Floodlights shall not produce a disabling glare condition for road users or workers.
13. The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

* A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
FREEWAY LANE CLOSURES

TCP(6-1)-12

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© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
8-12	DIST		COUNTY	SHEET NO.
	HOU		HARRIS	32

201

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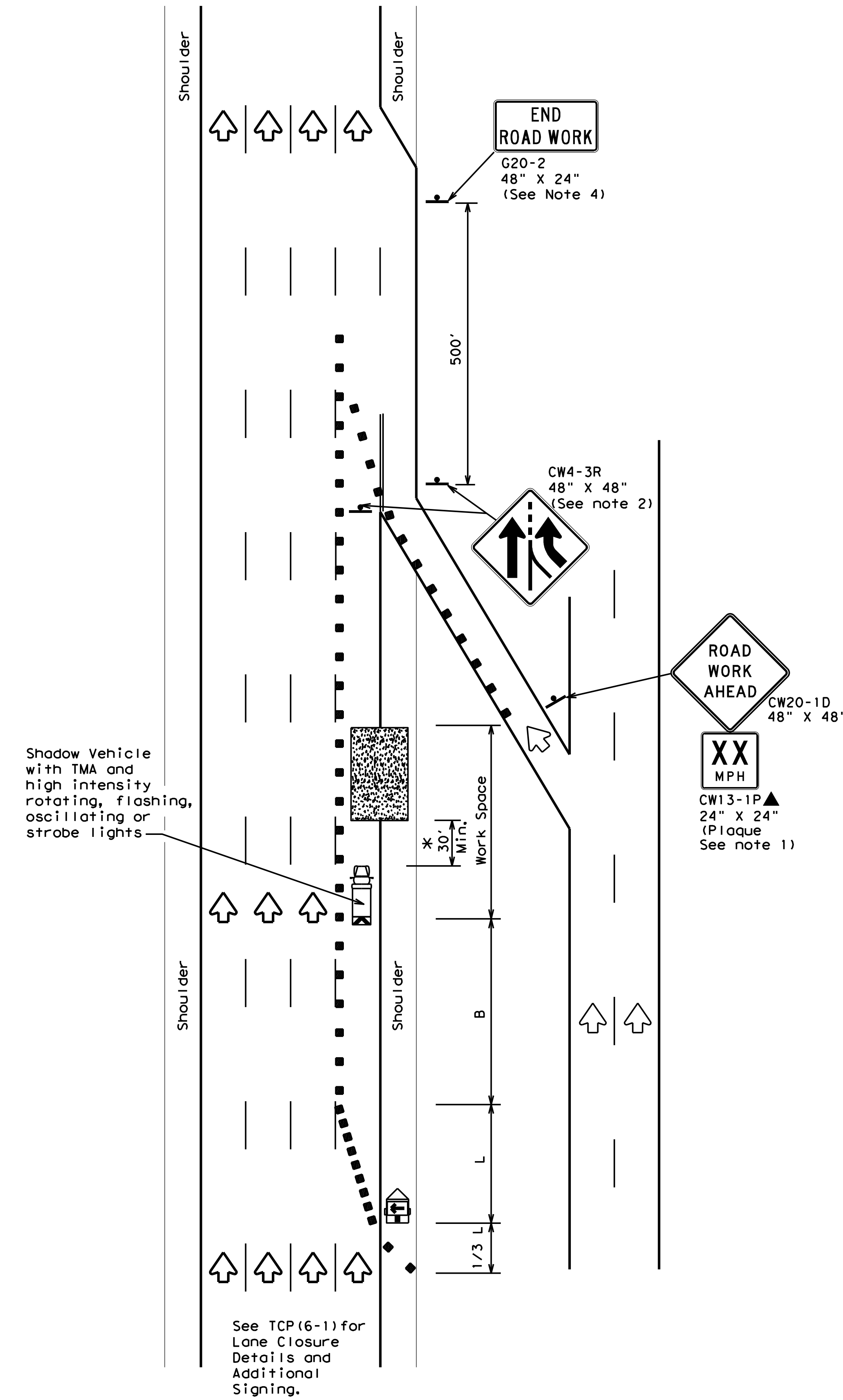
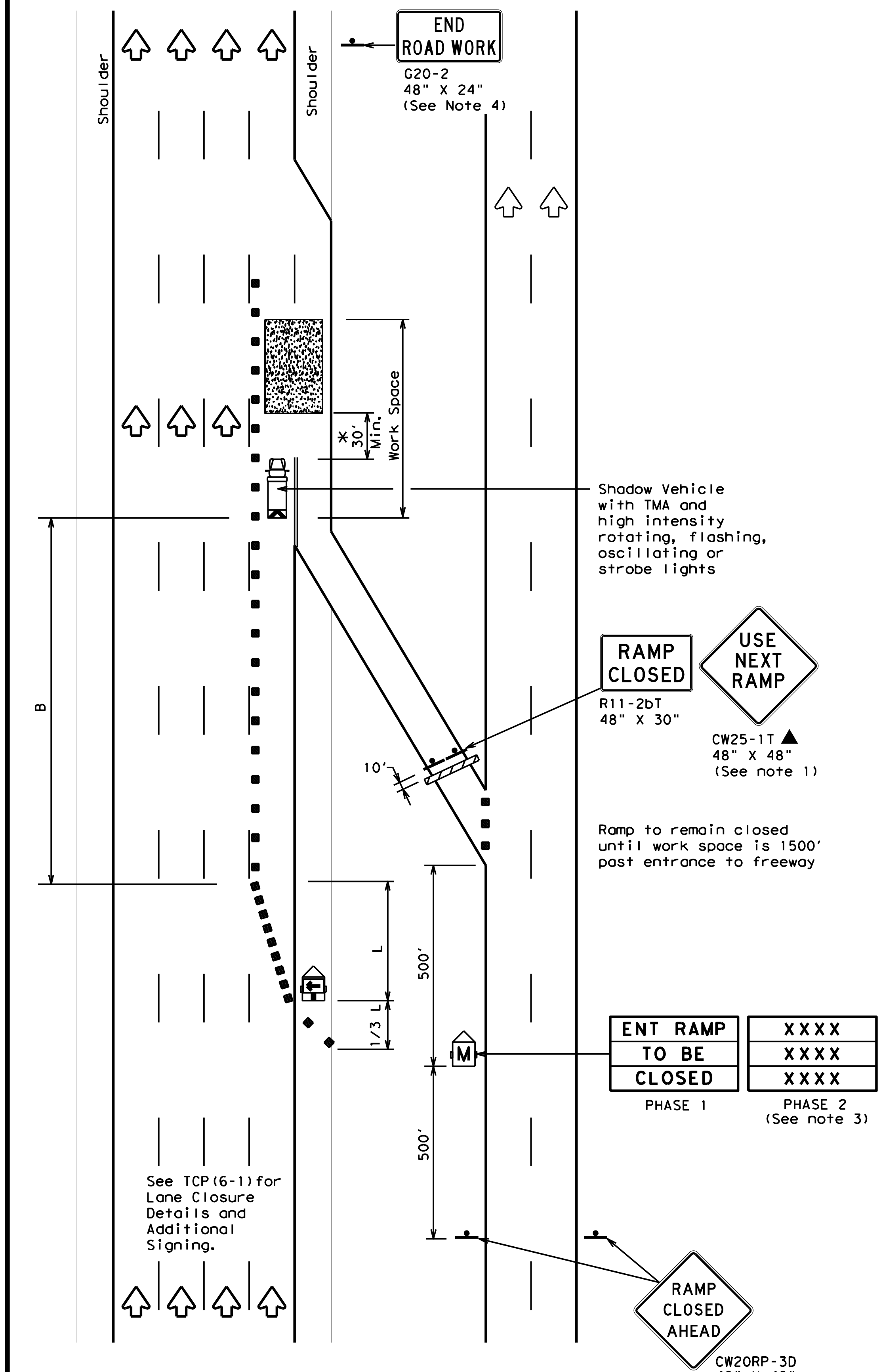


TCP (6-2a)

ENTRANCE RAMP OPEN
WORK WITHIN 500' OF RAMP



TCP (6-2b)

ENTRANCE RAMP CLOSED

LEGEND

Symbol	Description	Symbol	Description
	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 "L" **			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. ADDED LANE Symbol (CW4-3) sign may be omitted when sign between ramp and mainlane can be seen from both roadways.
3. See "Advance Notice List" on BC(6) for recommended date and time formatting options for PCMS Phase 2 message.
4. The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA NEAR RAMP

TCP(6-2)-12

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©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY			
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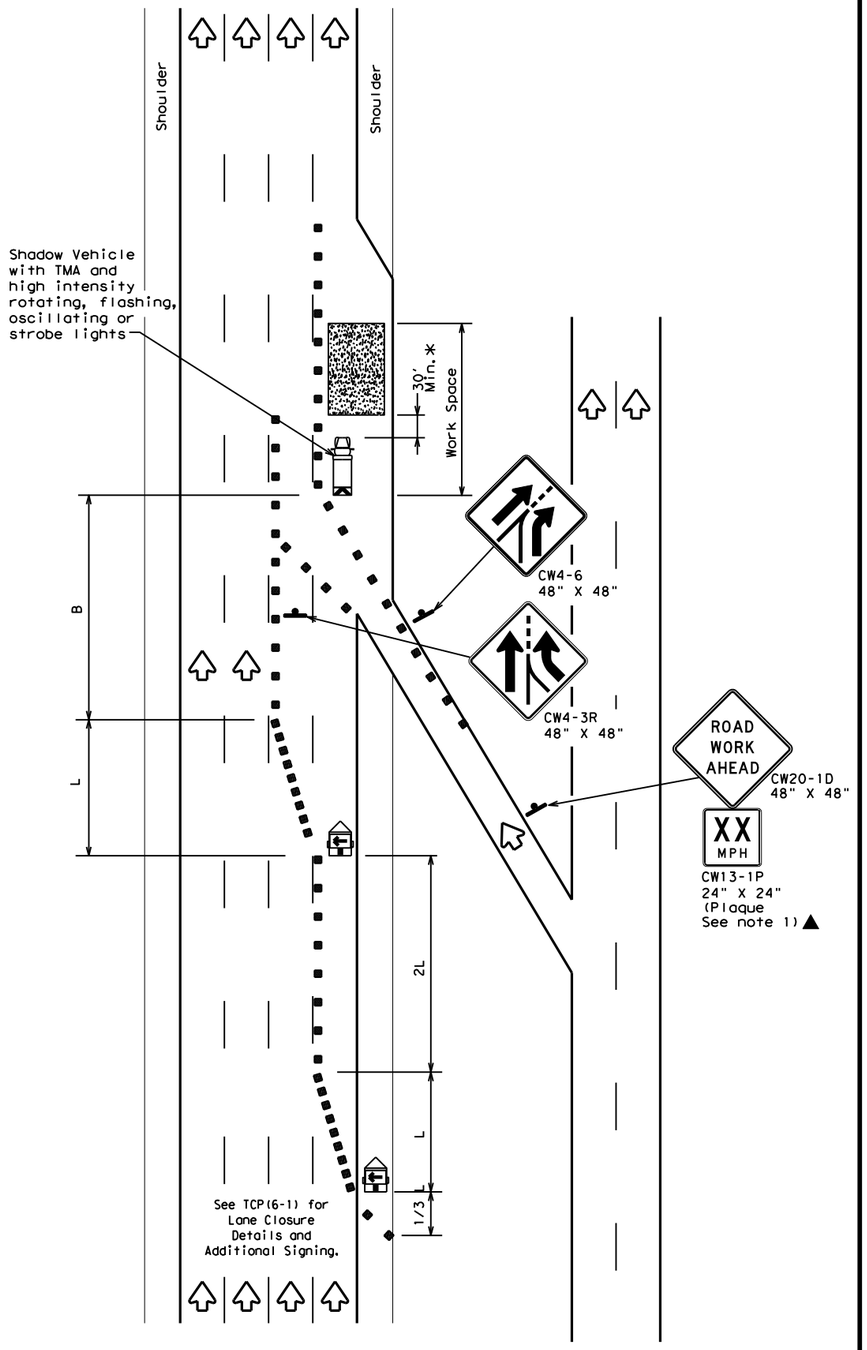
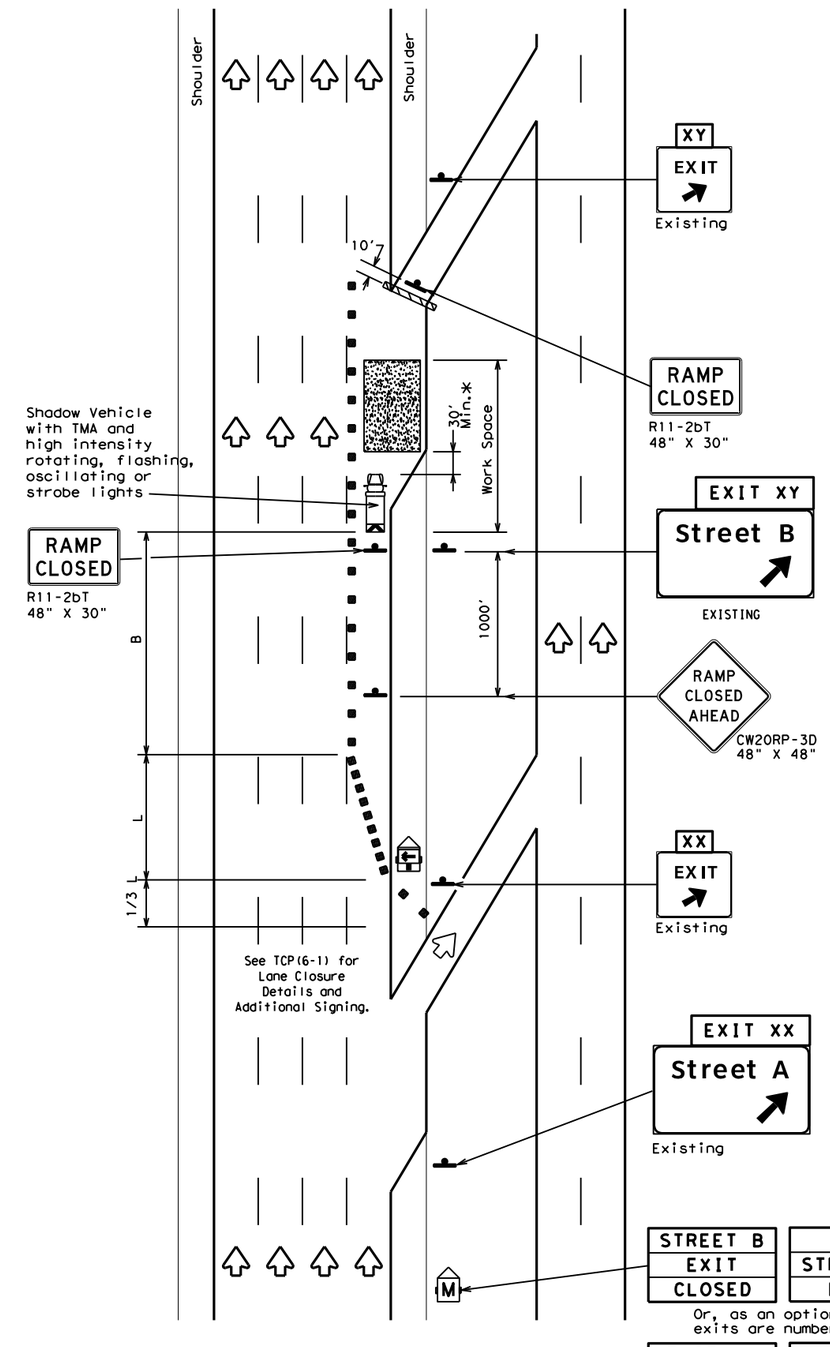
1-97 8-98	DIST	COUNTY		SHEET NO.			
4-98 8-12	HOU	HARRIS		33			



TCP (6-3a)

ENTRANCE RAMP OPEN



STREET B	USE
EXIT	STREET A
CLOSED	EXIT

Or, as an option when exits are numbered

EXIT XY	USE
CLOSED	EXIT XX

Place 1 mile (approx.) in advance of Street A exit.

TCP (6-3b)

EXIT RAMP CLOSED

TRAFFIC EXITS PRIOR TO CLOSED RAMP

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 "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.

*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA BEYOND RAMP

TCP(6-3)-12

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©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
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1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	HOU	HARRIS		34

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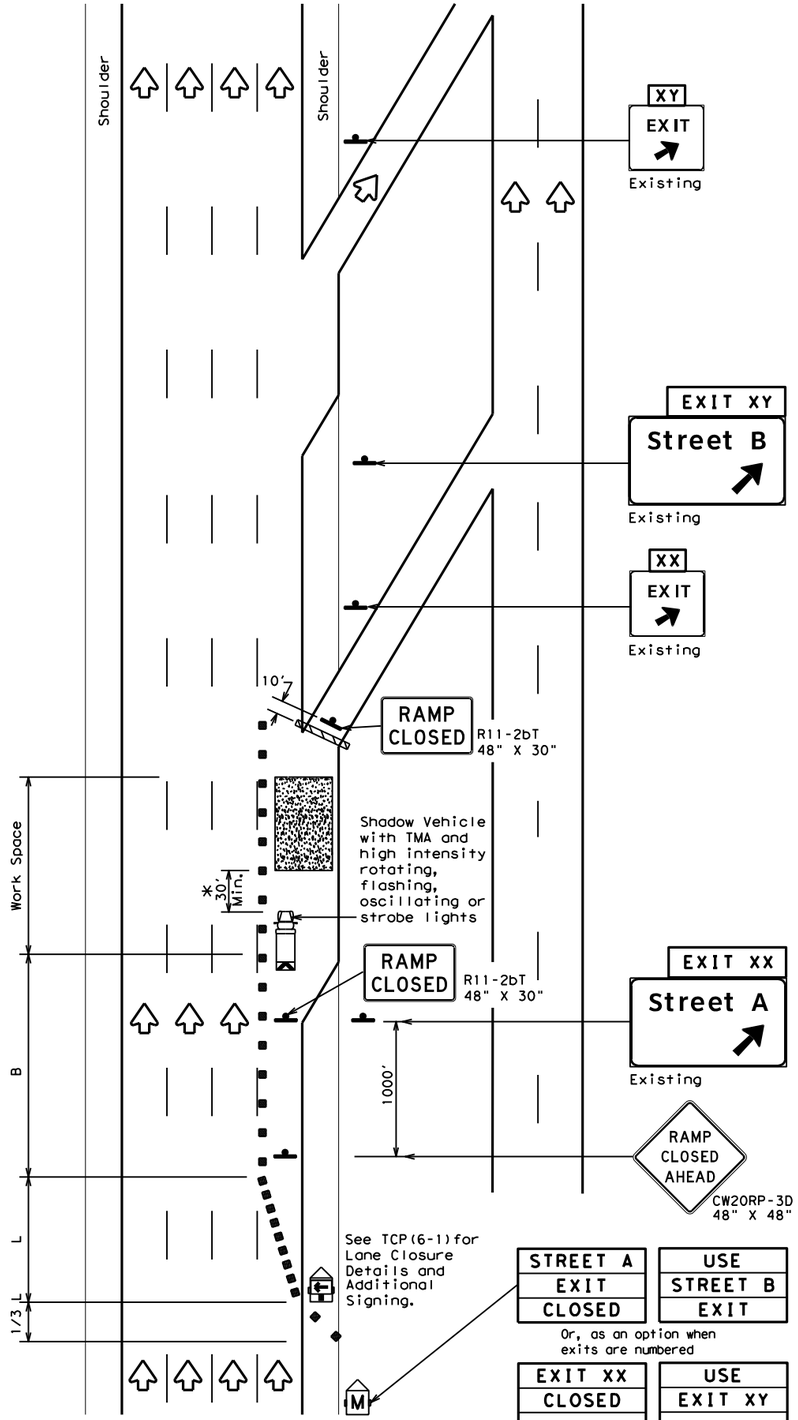
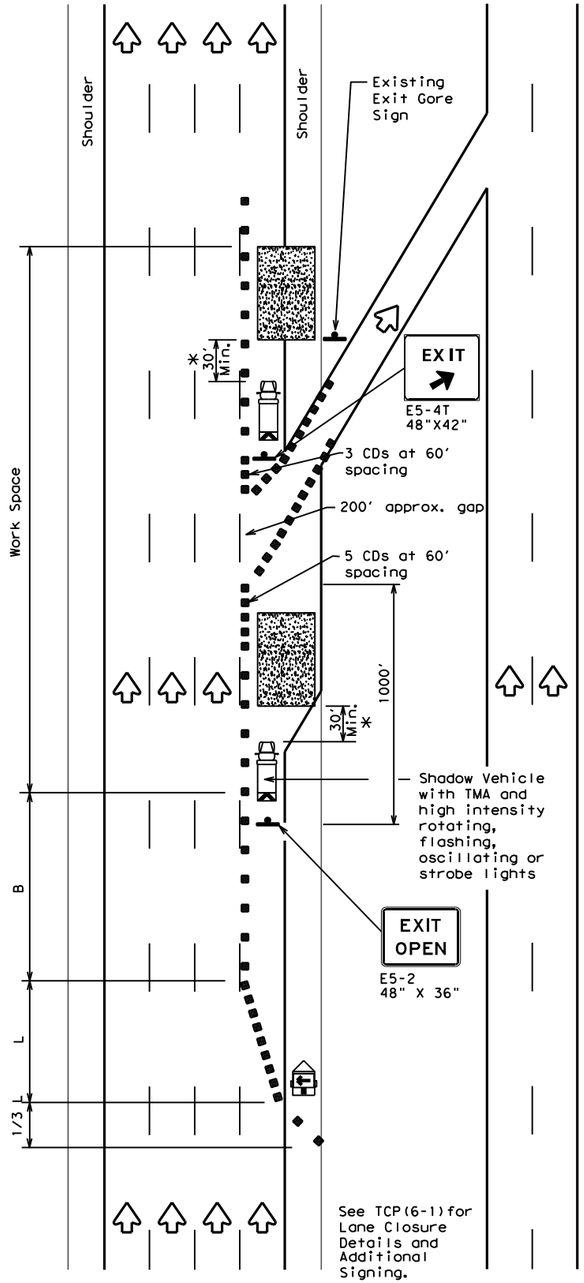


TCP (6-4a)

EXIT RAMP CLOSED
TRAFFIC EXITS PAST CLOSED RAMP



TCP (6-4b)

EXIT RAMP OPEN

LEGEND

	Type 3 Barricade		Channelizing Devices (CDs)
	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 "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. See BC Standards for sign details.

*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA AT EXIT RAMP

TCP(6-4)-12

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©TxDOT Feburary 1994	CONT	SECT	JOB	HIGHWAY
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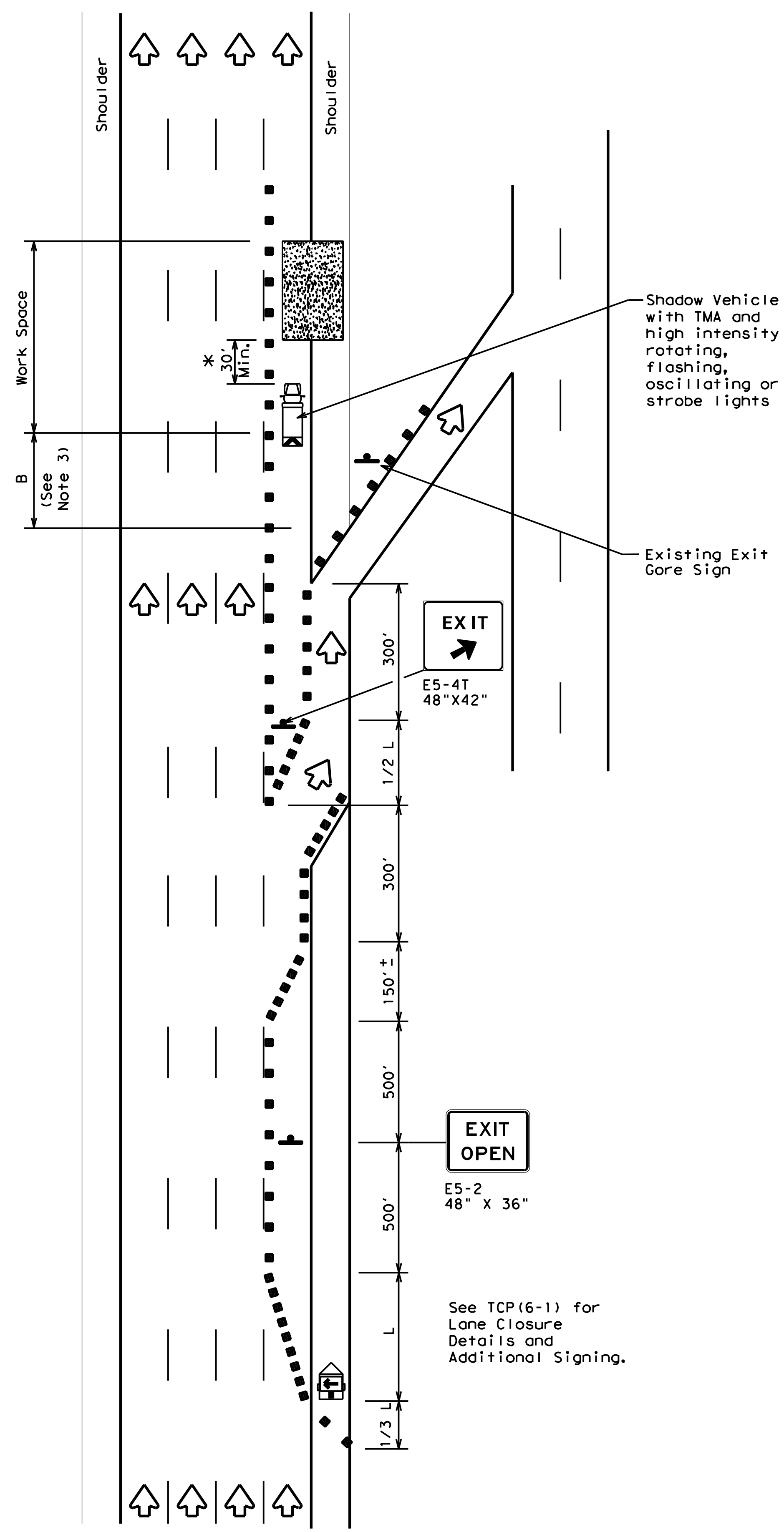
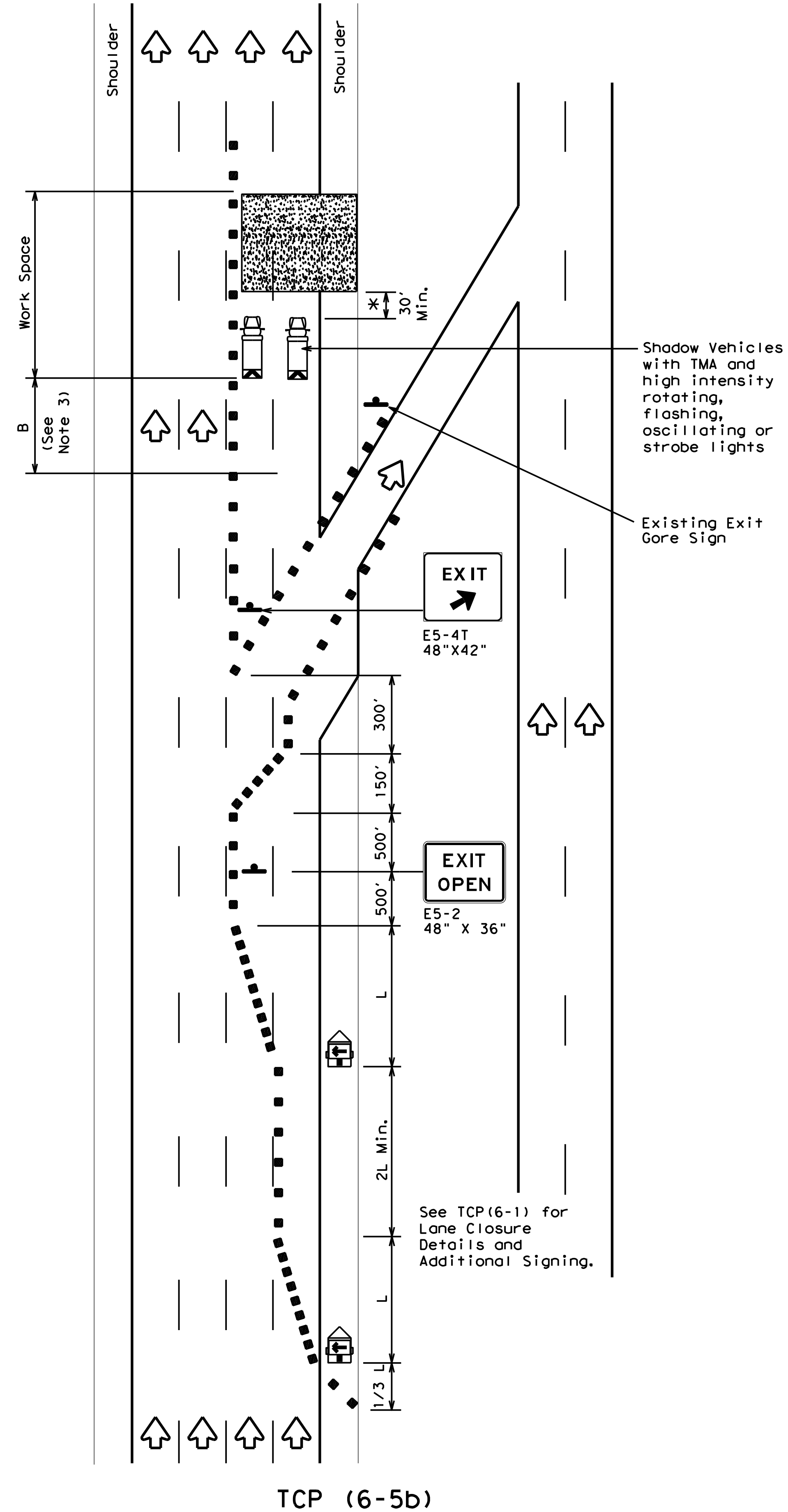
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	HOU	HARRIS		35



TCP (6-5a)

EXIT RAMP OPEN



TCP (6-5b)

EXIT RAMP OPEN
TWO LANE CLOSURE WITHIN 1500' PAST EXIT RAMP

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 "L" **			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. See BC standards for sign details.
3. If adequate longitudinal buffer length "B" does not exist between the work space and the exit ramp, consideration should be given to closing the ramp.

*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN WORK AREA BEYOND EXIT RAMP

TCP(6-5)-12

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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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1-97 8-98	DIST		COUNTY	SHEET NO.
4-98 8-12	HOU		HARRIS	36

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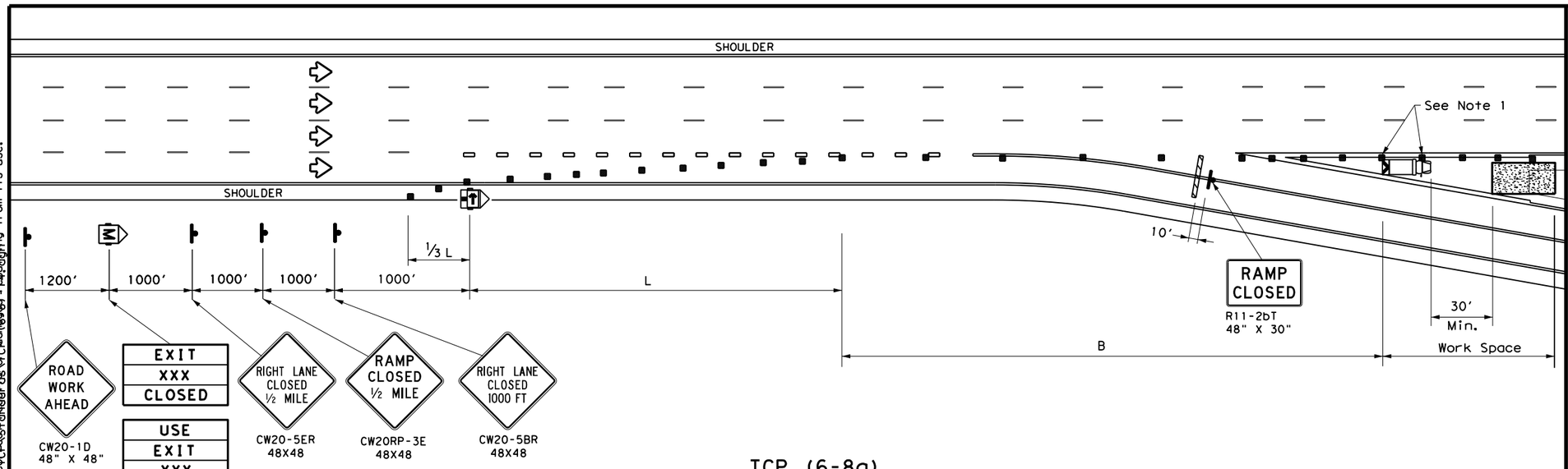
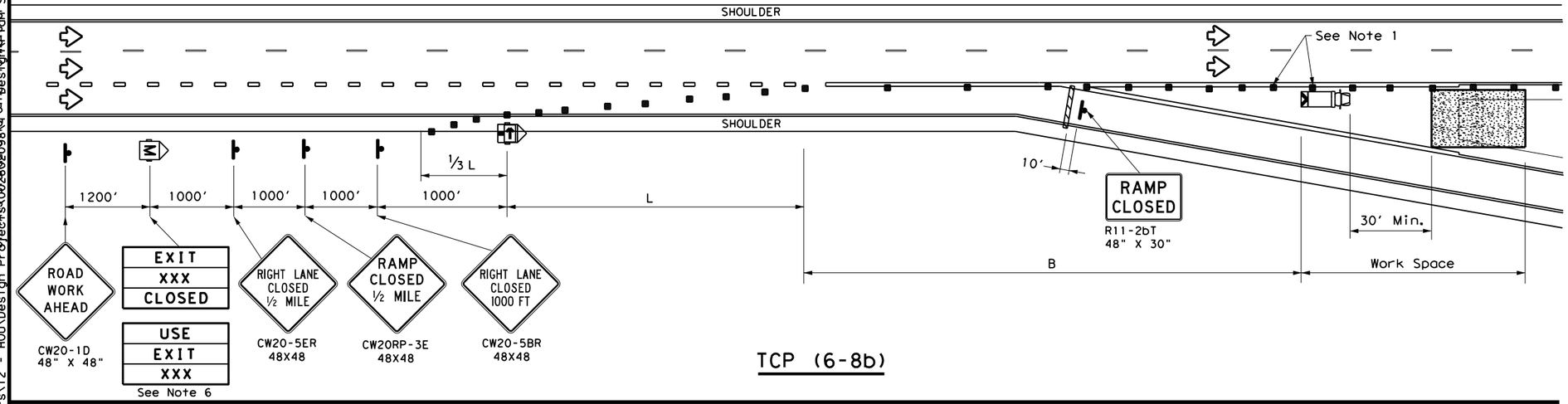
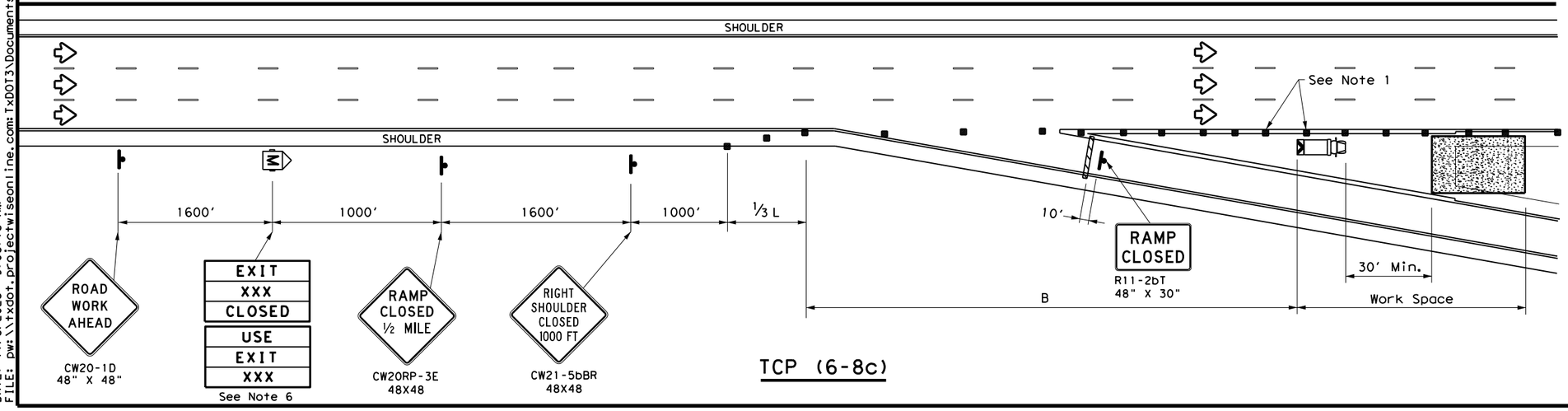


TCP (6-8a)



TCP (6-8b)



TCP (6-8c)

LEGEND			
	Type 3 Barricade		Channelizing Devices (CDs)
	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 "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. Place channelizing devices in the gore at 20' spacing.
2. See the Standard Highway Sign Design for Texas (SHSD) for sign details.
3. The PCMS may be omitted when a permanent DMS sign is available in an appropriate location to display a similar message as called for on the PCMS.
4. When it is determined that a through lane should be closed in addition to the exit ramp, refer to TCP(6-4) for traffic control details.
5. Truck mounted attenuator is required.
6. The PCMS may be omitted if replaced with a "RAMP CLOSED" AHEAD (CW20RP-3D) Sign.
7. Roadway ADT should be greater than 10,000.

Texas Department of Transportation

Traffic Operations Division Standard

WORK IN EXIT GORE FOR ADT GREATER THAN 10,000

TCP(6-8)-14

FILE: tcp6-8.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2014	CONT	SECT	JOB	HIGHWAY
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	HOU	HARRIS		37

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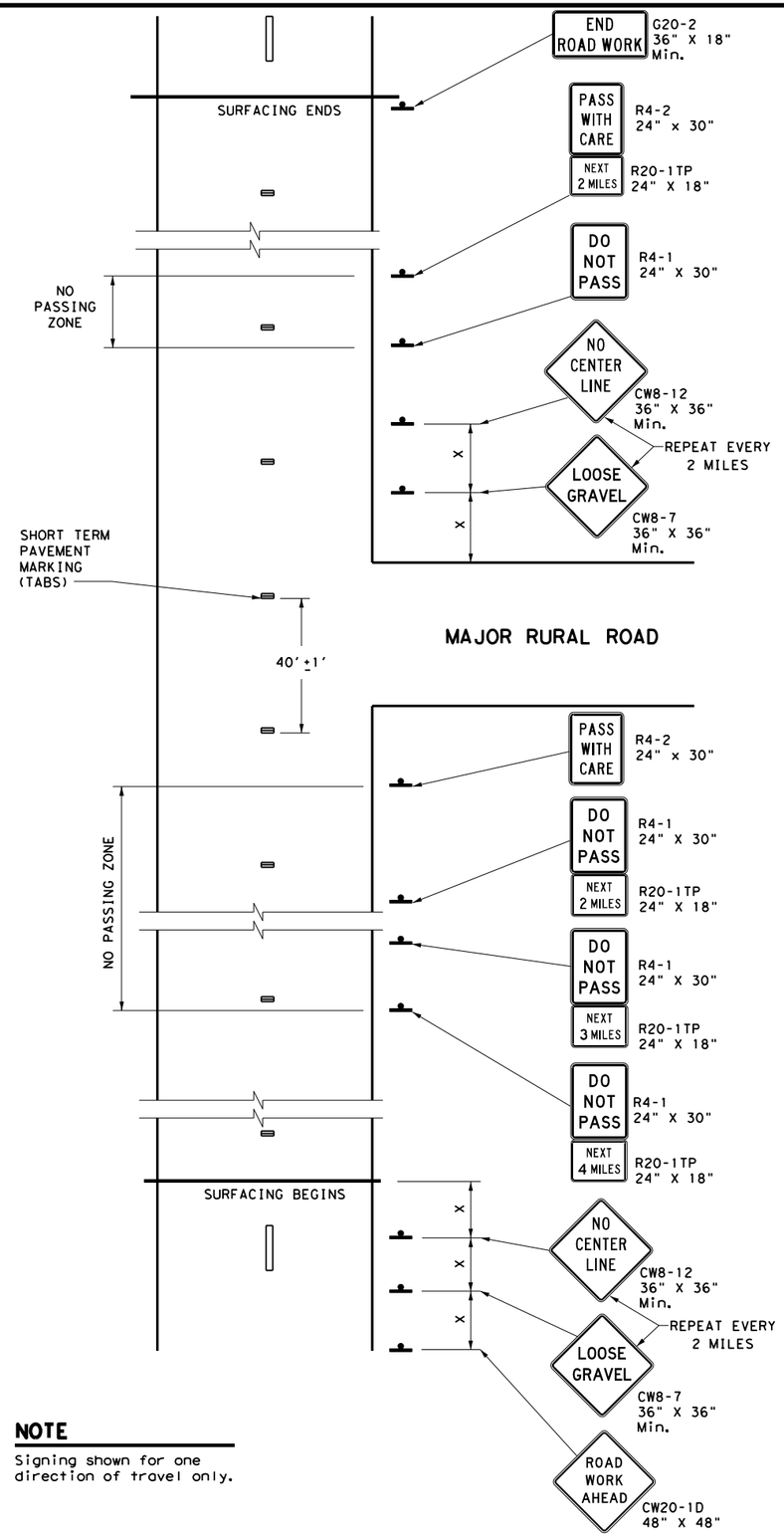
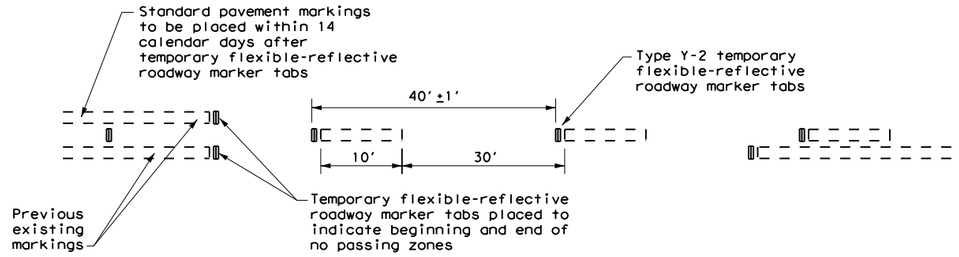


NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

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

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

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

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

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

"NO CENTER LINE" SIGN (CW8-12)

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

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

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

"LOOSE GRAVEL" SIGN (CW8-7)

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

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

PAVEMENT MARKINGS

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

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

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

COORDINATION OF SIGN LOCATIONS

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

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

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

* Conventional Roads Only

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

FILE: tcp7-1.dgn		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 1991		CONT	SECT	JOB	HIGHWAY
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1-97 7-13		HOU	HARRIS		38

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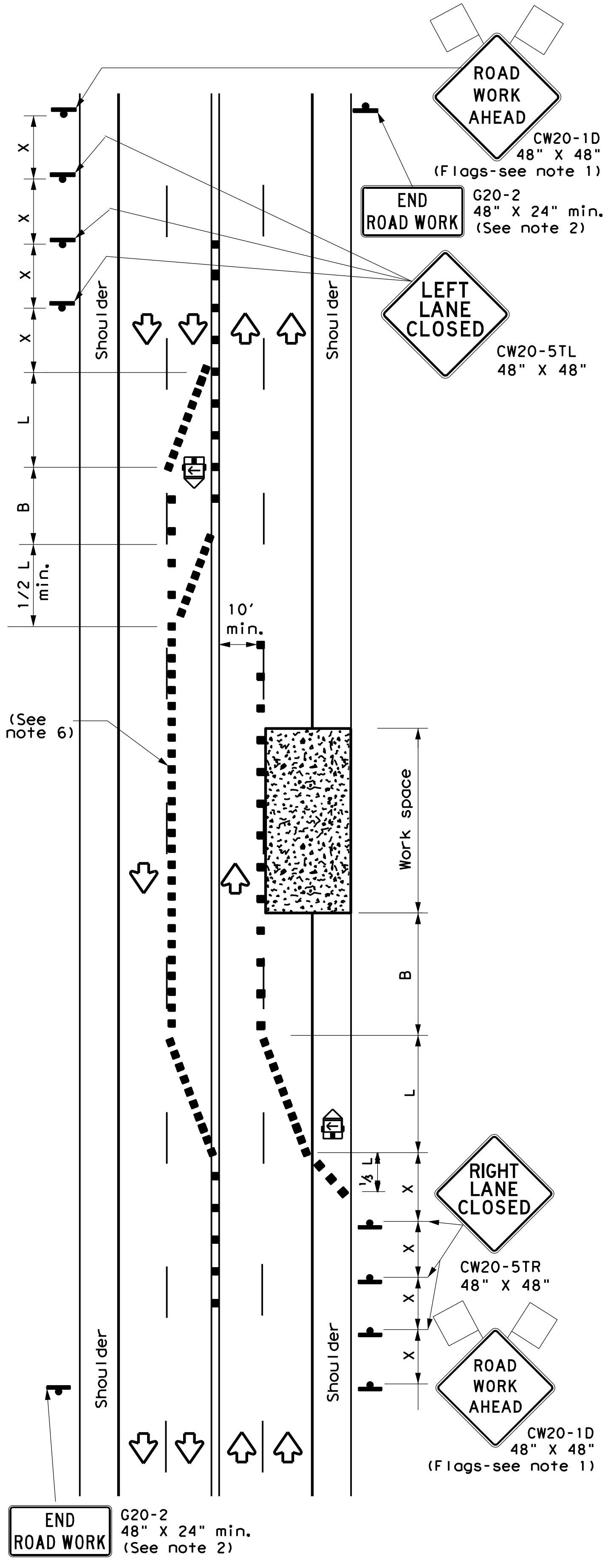
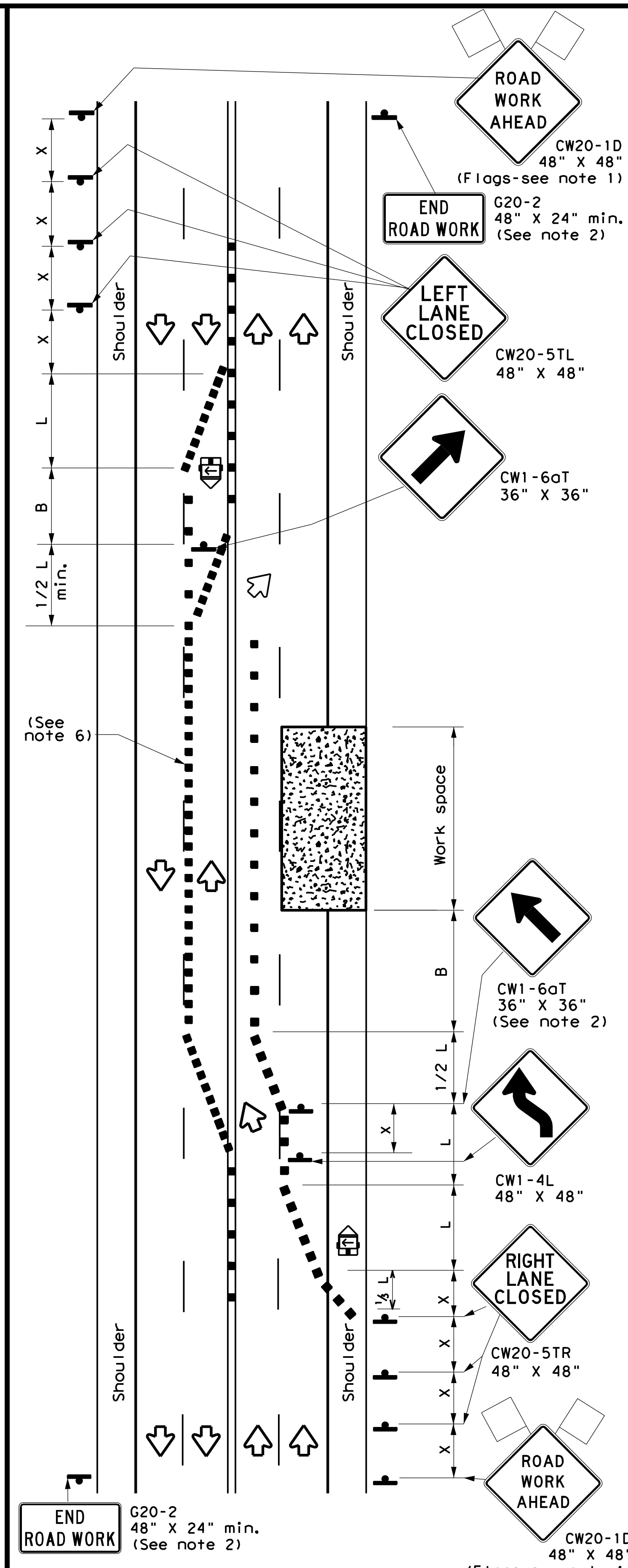


TCP (SC-2a)

ONE LANE CLOSED EACH DIRECTION

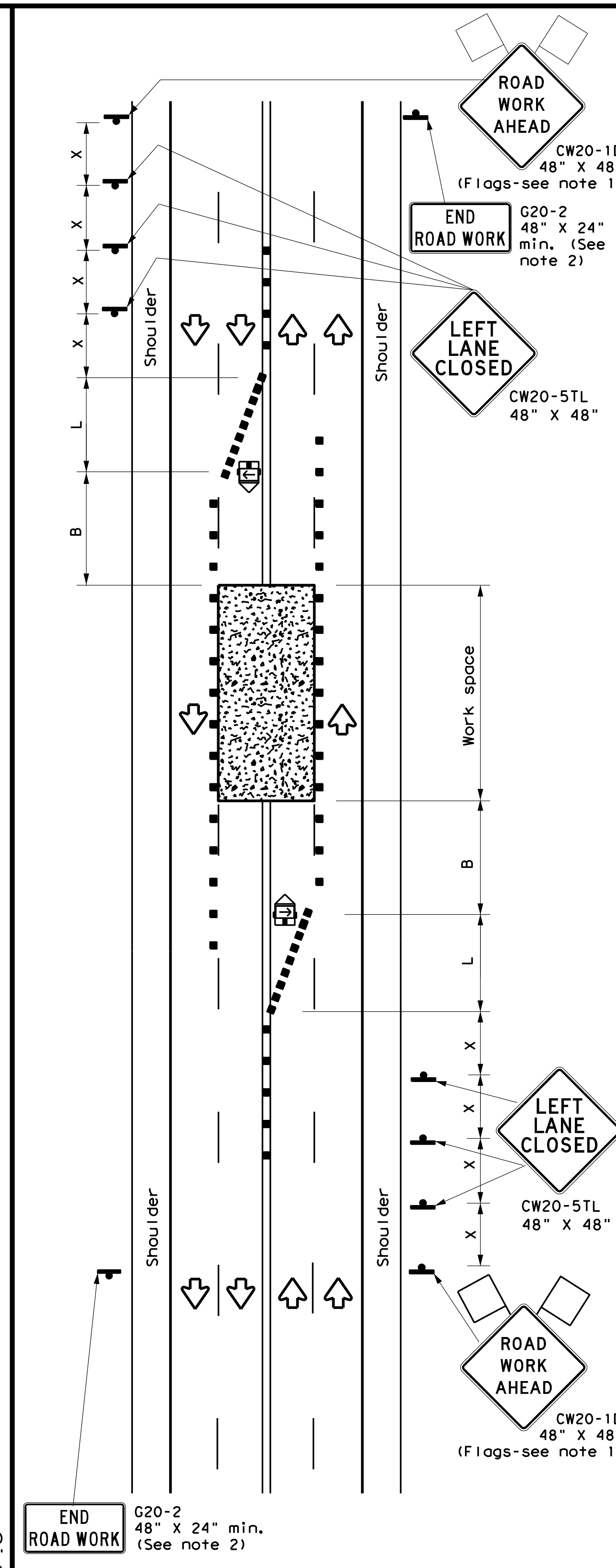
CONTROL W/ CHANNELIZING DEVICES



TCP (SC-2b)

ONE LANE CLOSED EACH DIRECTION

CONTROL W/ CHANNELIZING DEVICES



TCP (SC-2c)

CENTER LANES CLOSED

CONTROL W/ CHANNELIZING DEVICES

LEGEND

Symbol	Description	Symbol	Description
	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"
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: if project signing is present, END ROAD WORK (G20-2) sign is optional with approval by the Engineer.
3. The ROAD WORK AHEAD (CW20-1D) sign may be repeated if the visibility of the work zone is less than 1500 feet.
4. If the seal coat operation crosses intersections, traffic in these areas must be controlled. Care must be taken to prevent vehicles from crossing the asphalt before the aggregate is placed. This may require positioning additional traffic control personnel (flaggers) at the intersection.
5. Temporary rumble strips are not required on seal coat operations.

TCP (SC-2a) and (SC-2b)

6. Channelizing devices which separate two-way traffic shall be spaced on tapers at:
   a.) 20 feet;
   b.) 15 feet when posted speeds are 35 mph or slower; or
   c.) at 1/2(S) for tangent sections.
   This tighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

SHEET 2 OF 8

Texas Department of Transportation — Traffic Safety Division Standard

TRAFFIC CONTROL PLAN SEALCOAT OPERATIONS MULTILANE ROADS (UNDIVIDED)

TCP(SC-2)-22

FILE: tcpsc-2-22.dgn	DN:	CK:	DW:	CK:
© TxDOT October 2022	CONT 0028	SECT 02	JOB 098,etc.	HIGHWAY US 90
REVISIONS 4-21 10-22	DIST HOU		COUNTY HARRIS	SHEET NO. 39

218

DATE: 11/8/2023 9:09:22 AM
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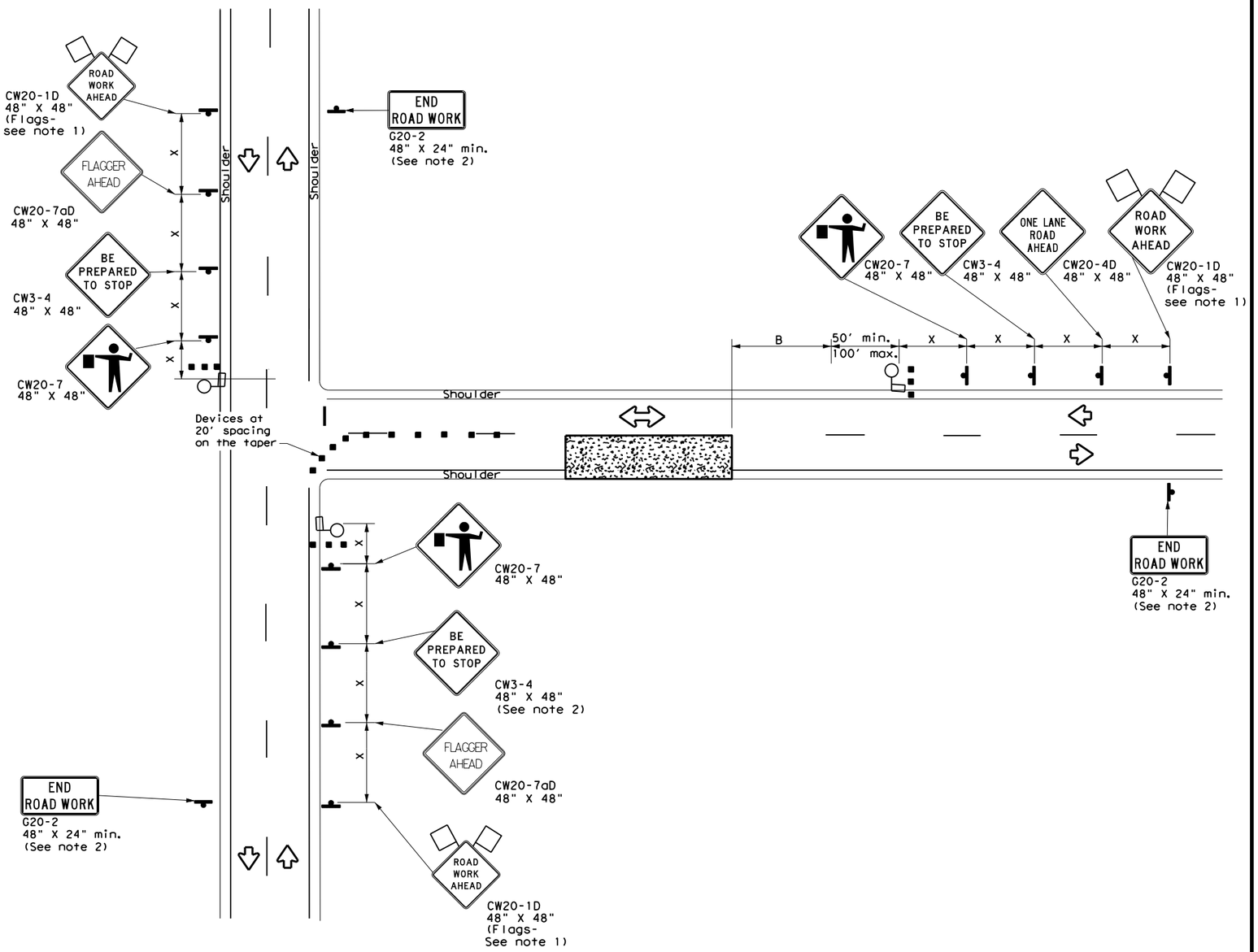

ONE LANE TWO-WAY (T-INTERSECTION) CONTROL WITH PILOT VEHICLE

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	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 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 REVISIONS 4-21 10-22	CONT	SECT	JOB	HIGHWAY
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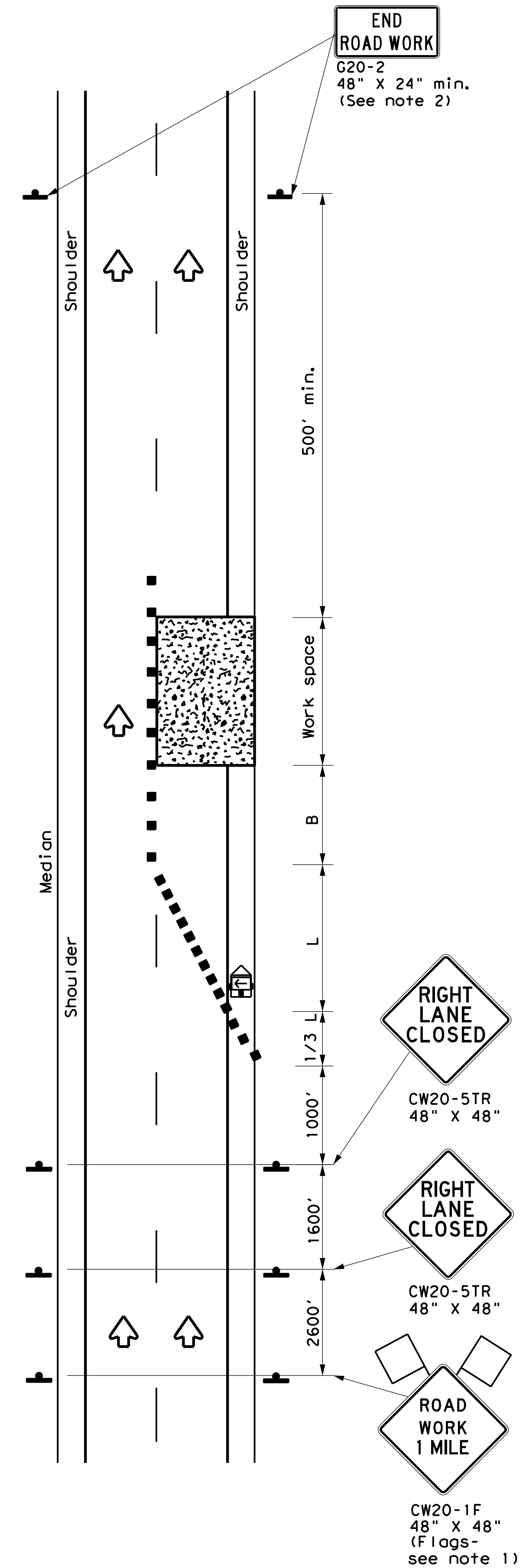
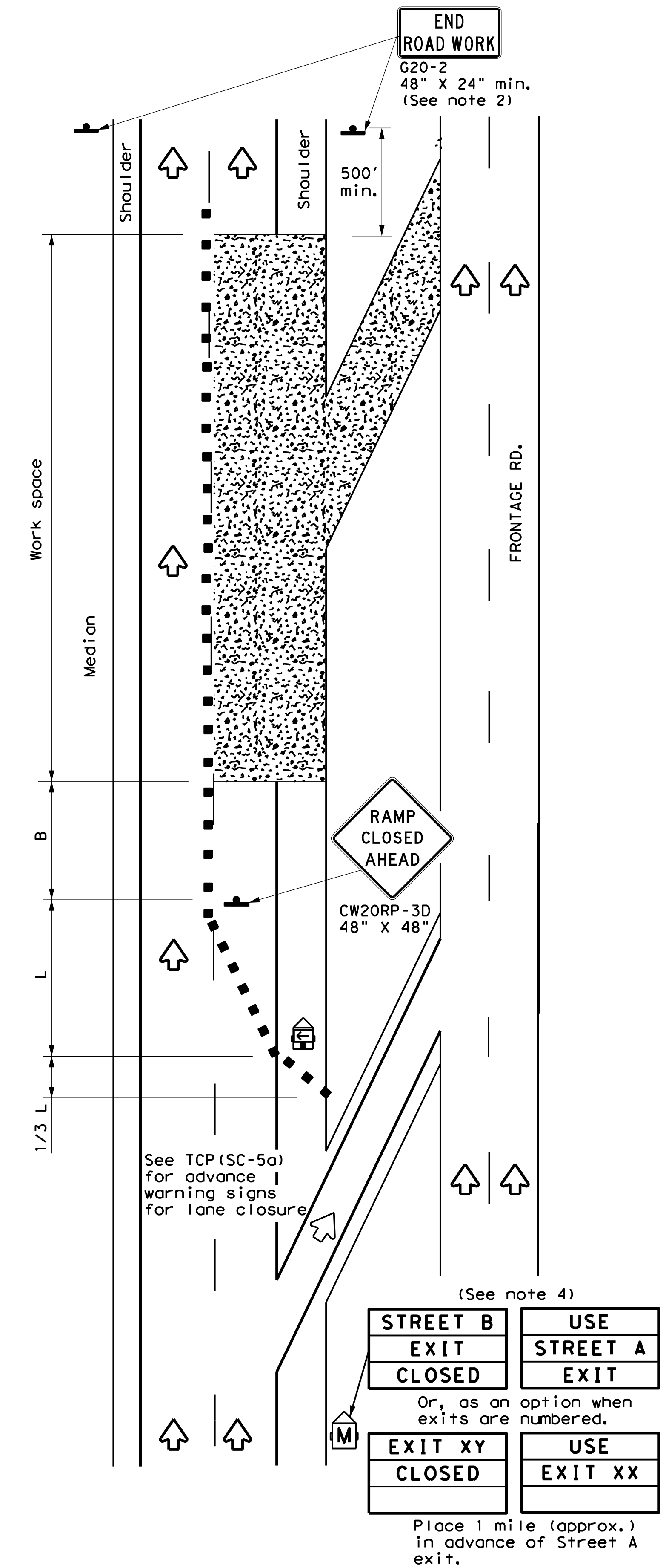


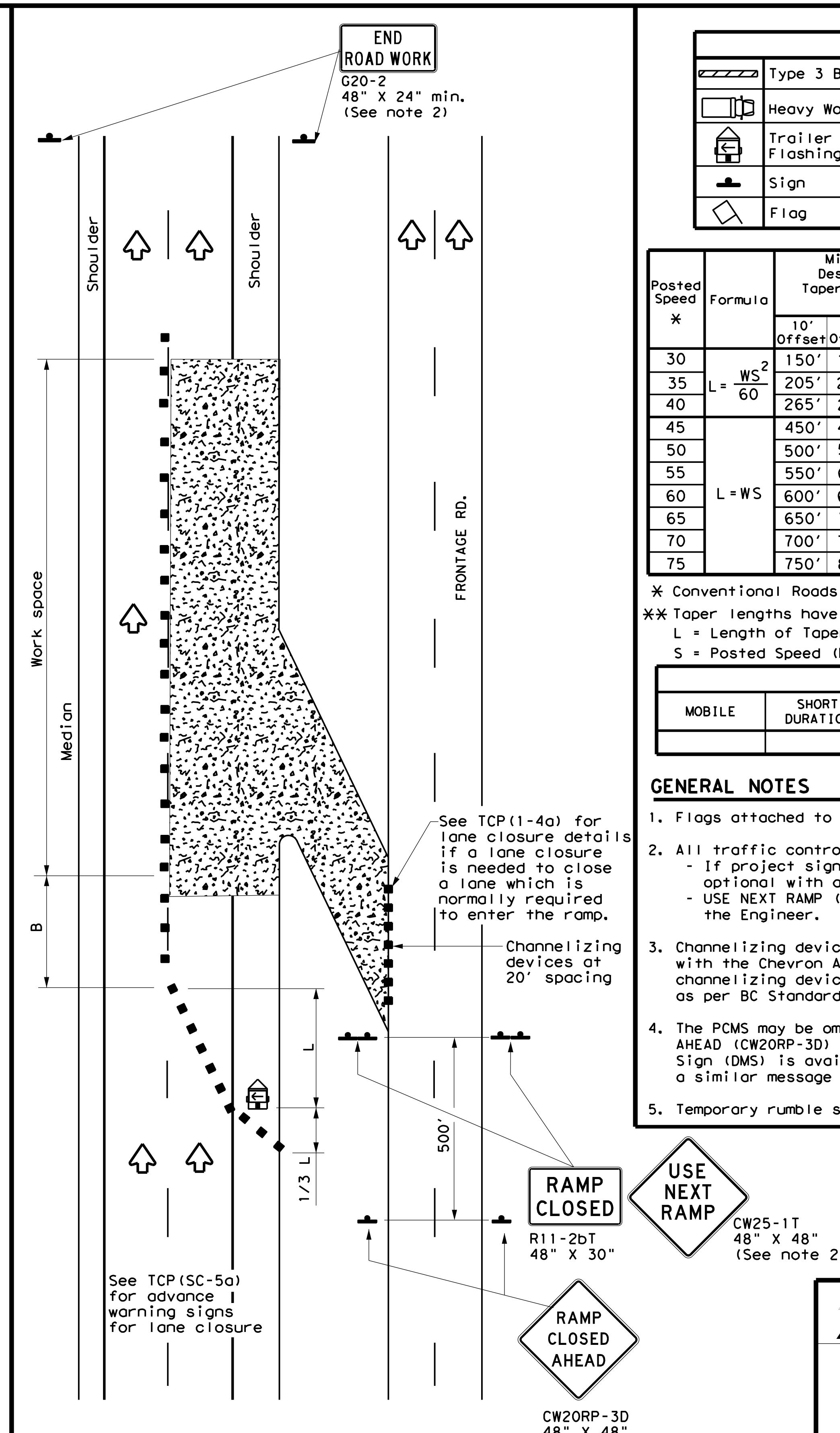
TCP (SC-5a)

ONE LANE CLOSURE



TCP (SC-5b)

LANE AND RAMP CLOSURE AT EXIT RAMPS



TCP (SC-5c)

LANE AND RAMP CLOSURE AT ENTRANCE RAMPS

LEGEND

Symbol	Description	Symbol	Description
	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"
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:
   - If project signing is present, END ROAD WORK (G20-2) sign is optional with approval by the Engineer.
   - USE NEXT RAMP (CW25-1T) sign is optional with approval by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. The PCMS may be omitted if: it is replaced with a RAMP CLOSED AHEAD (CW20RP-3D) sign or when a permanent Dynamic Message Sign (DMS) is available in the appropriate location to display a similar message as called for on the PCMS.
5. Temporary rumble strips are not required on seal coat operations.

Texas Department of Transportation

Traffic Safety Division Standard

TRAFFIC CONTROL PLAN SEAL COAT OPERATIONS DIVIDED HIGHWAYS

TCP(SC-5)-22

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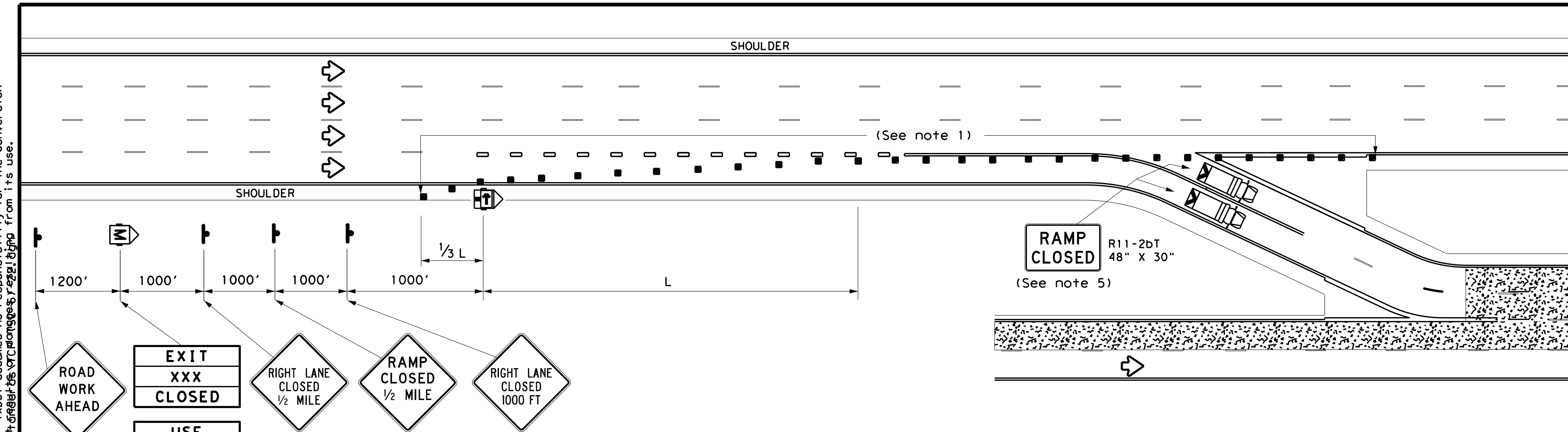
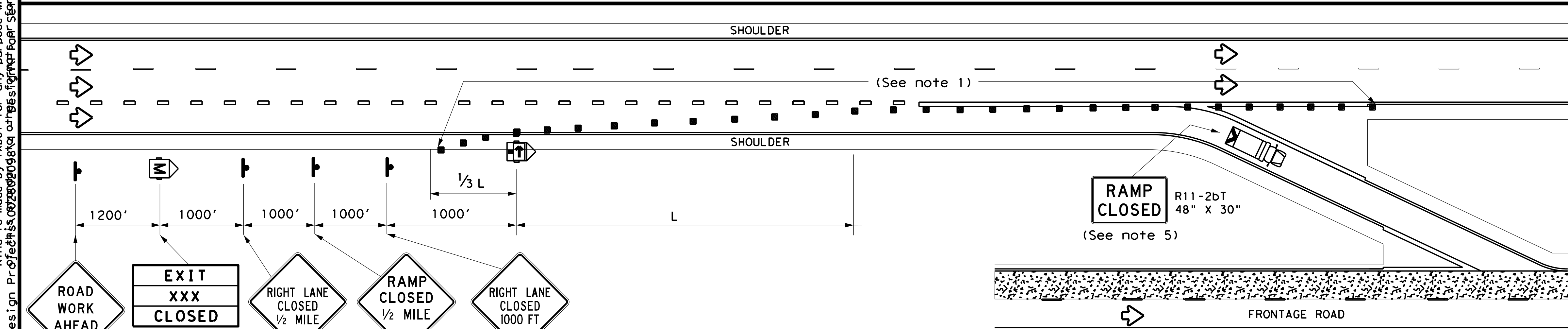


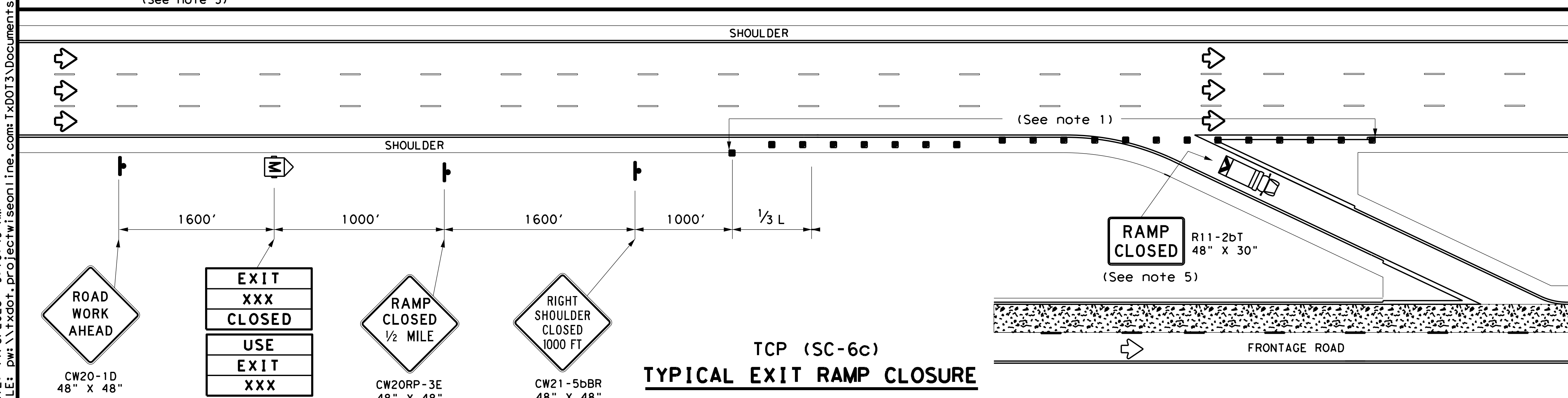
TCP (SC-6a)

MULTIPLE LANE EXIT RAMP CLOSURE



TCP (SC-6b)

SINGLE LANE EXIT RAMP CLOSURE



TCP (SC-6c)

TYPICAL EXIT RAMP CLOSURE

LEGEND

▭	Type 3 Barricade	▪▪	Channelizing Devices (CDs)
▭	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 "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'
85		850'	935'	1020'	85'	170'	695'

** 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. Place channelizing devices at 20' spacings. Tighter spacing allowed as necessary to address field conditions or observed driver behavior.
2. See the Standard Highway Sign Design for Texas (SHSD) for sign details.
3. The PCMS may be omitted if replaced with a RAMP CLOSED AHEAD (CW20RP-3D) sign or when a permanent Dynamic Message Sign (DMS) is available in an appropriate location to display a similar message as called for on the PCMS.
4. When it is determined that a through lane should be closed in addition to the exit ramp, refer to TCP(6-4) for traffic control details.
5. A Truck Mounted Attenuator (TMA), where shown, is REQUIRED and shall have a RAMP CLOSED (R11-2bT) sign mounted on the rear of the truck.

Texas Department of Transportation

Traffic Safety Division Standard

TRAFFIC CONTROL PLAN SEAL COAT OPERATIONS DIVIDED HIGHWAYS

TCP(SC-6)-22

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REVISIONS 10-22	0028	02	098,etc.	US 90
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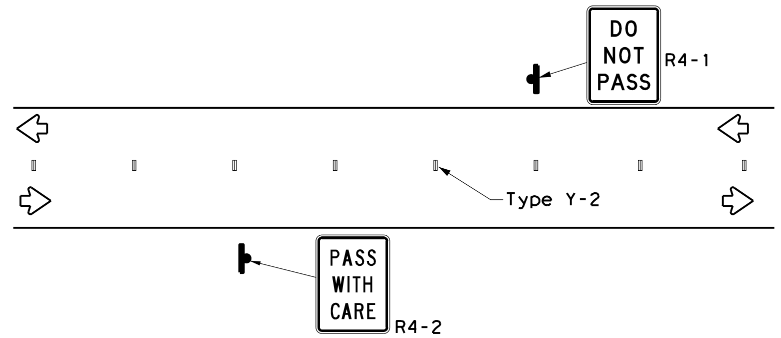
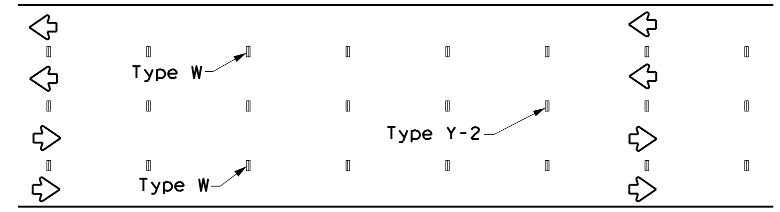
222

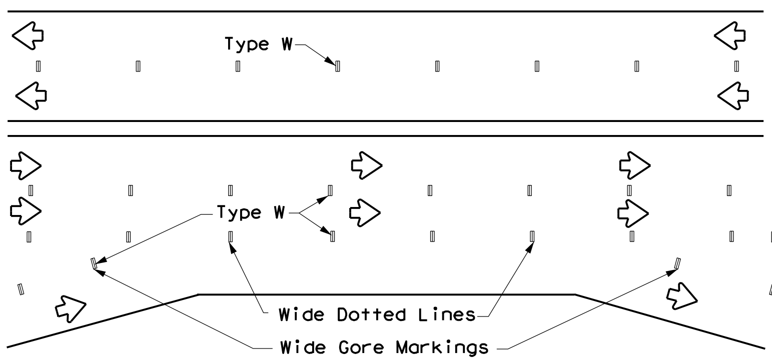
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS (TABS)



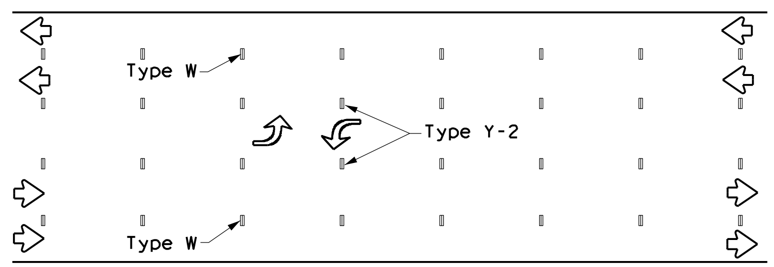
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



LANE LINES FOR DIVIDED HIGHWAY

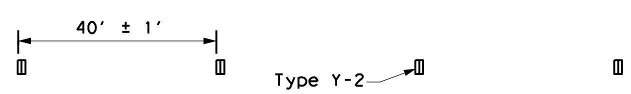


TWO-WAY LEFT TURN LANE

WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS (TABS)

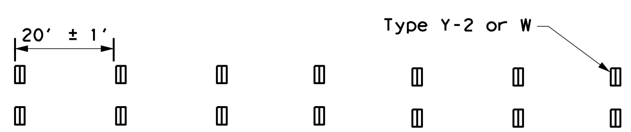
SOLID LINES

DOUBLE NO-PASSING LINE



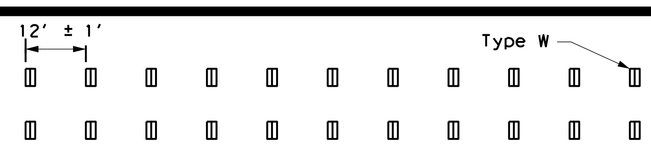
SINGLE NO-PASSING LINE or CHANNELIZATION LINE

8" WIDE SOLID LINE

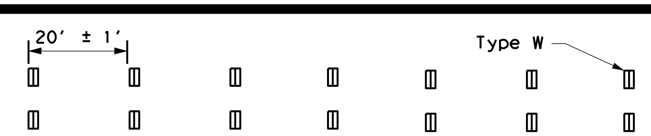


BROKEN LINES
(FOR CENTER LINE OR LANE LINE)

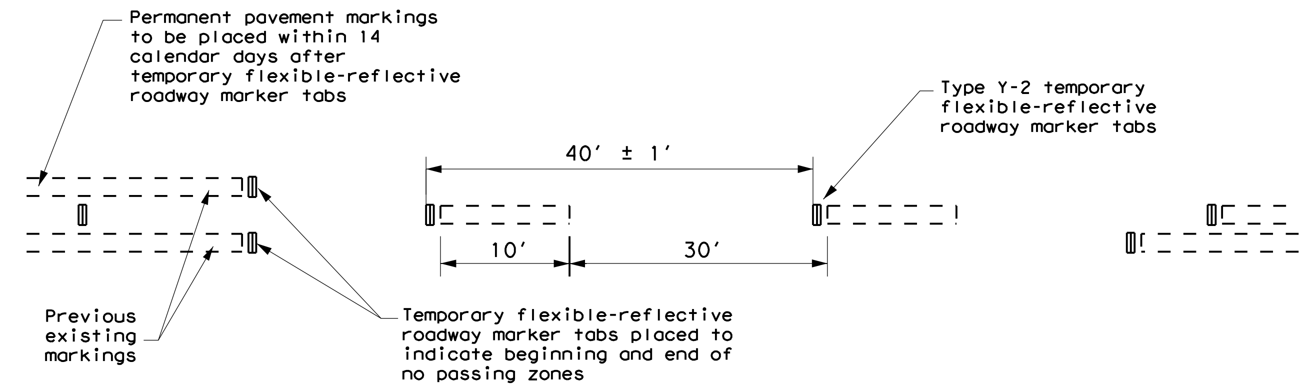
WIDE DOTTED LINES
(FOR LANE DROP LINES)



WIDE GORE MARKINGS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS



TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS

1. Temporary markings for surfacing projects shall be Temporary Flexible-Reflective Roadway Marker Tabs with protective cover 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 days before the surfacing is applied. After the surfacing is rolled and swept, the protective cover over the reflective strip shall be removed.
2. Temporary Flexible-Reflective Roadway Marker Tabs detailed on this sheet will be designated Type Y-2 (two amber reflective surfaces with a 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).
3. Temporary Flexible-Reflective Roadway Marker Tabs will require normal maintenance replacement when used on roadways with an Average Daily Traffic (ADT) per lane of up to 7500 vehicles with no more than 10% truck mix. When roadway volumes exceed these values, additional maintenance replacement of these devices should be planned for.
4. 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.
5. 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 4.
6. Tabs shall meet requirements of Departmental Material Specification DMS-8242.
7. Tabs shall NOT be used to simulate edge lines.

NOTES:

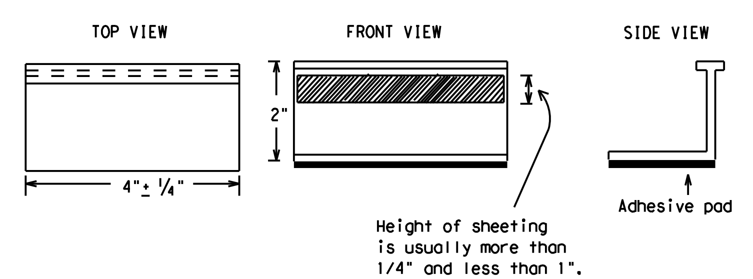
1. The Contractor will be responsible for maintaining short term pavement markings until permanent pavement markings are in place. When the Contractor is responsible for placement of permanent pavement markings, no segment of roadway shall remain without permanent pavement markings for a period greater than 14 calendar days unless weather conditions prohibit placement. Permanent pavement markings shall be placed as soon as weather permits.
2. 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 acceptable.
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 ¼ inch, unless otherwise noted.

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

1. DMSs referenced above may be found along with embedded links to their respective MPLs at the following website: http://www.txdot.gov

SHEET 7 OF 8

TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS



Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY PAVEMENT MARKINGS FOR SEAL COAT OPERATIONS

TCP(SC-7)-22

FILE: tcpsc-7-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2022	CONT	SECT	JOB	HIGHWAY
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4-21 10-22	DIST		COUNTY	SHEET NO.
	HOU		HARRIS	43

223

DATE: 11/13/2023
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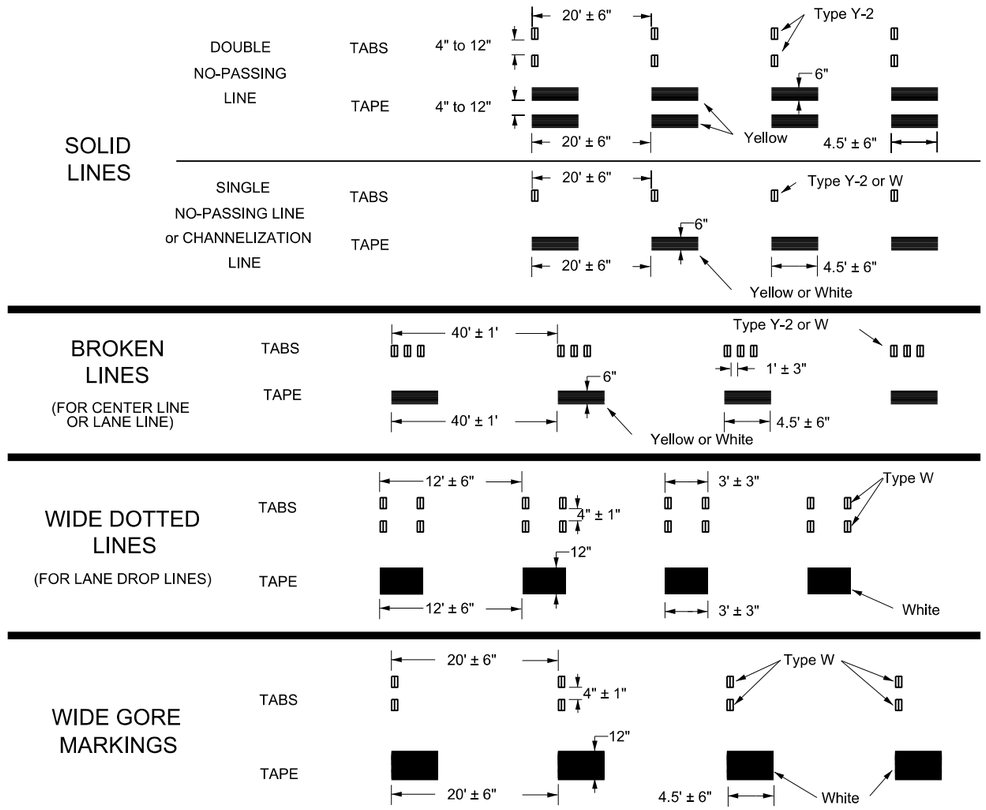
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



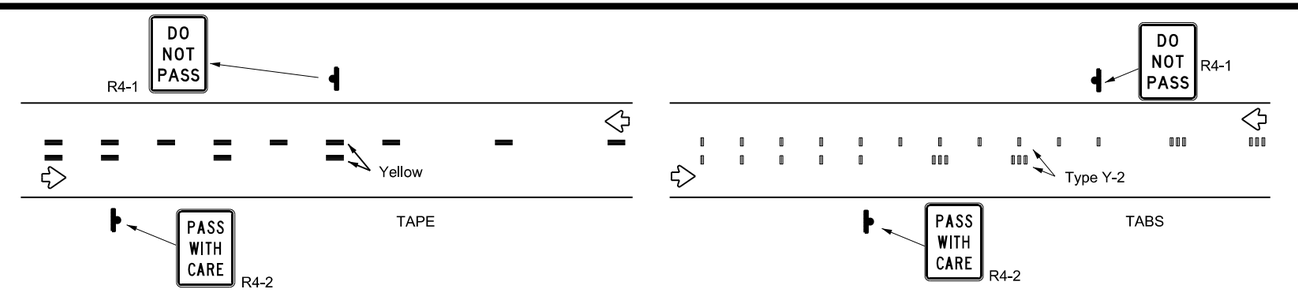
NOTES:

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.

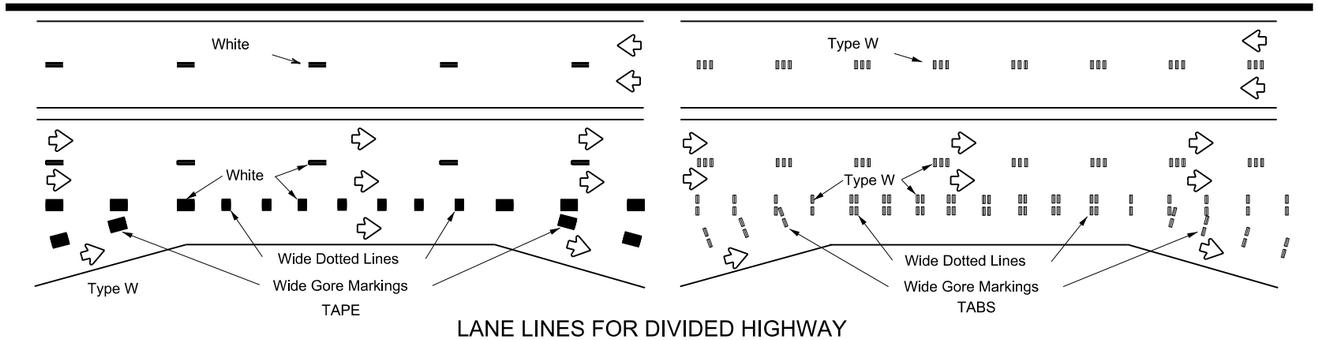
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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.

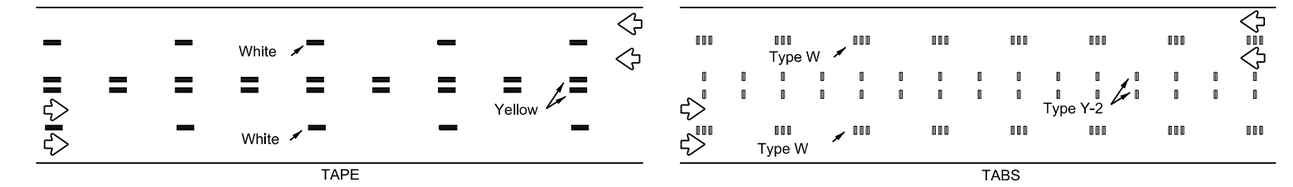
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



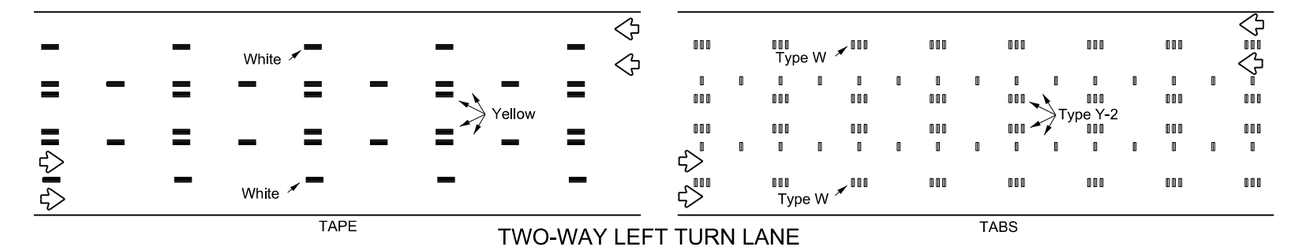
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



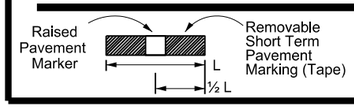
LANE LINES FOR DIVIDED HIGHWAY



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
REVISIONS	0028	02	098,etc.	US 90
4-92 7-13 1-97 2-23 3-03	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		44

111

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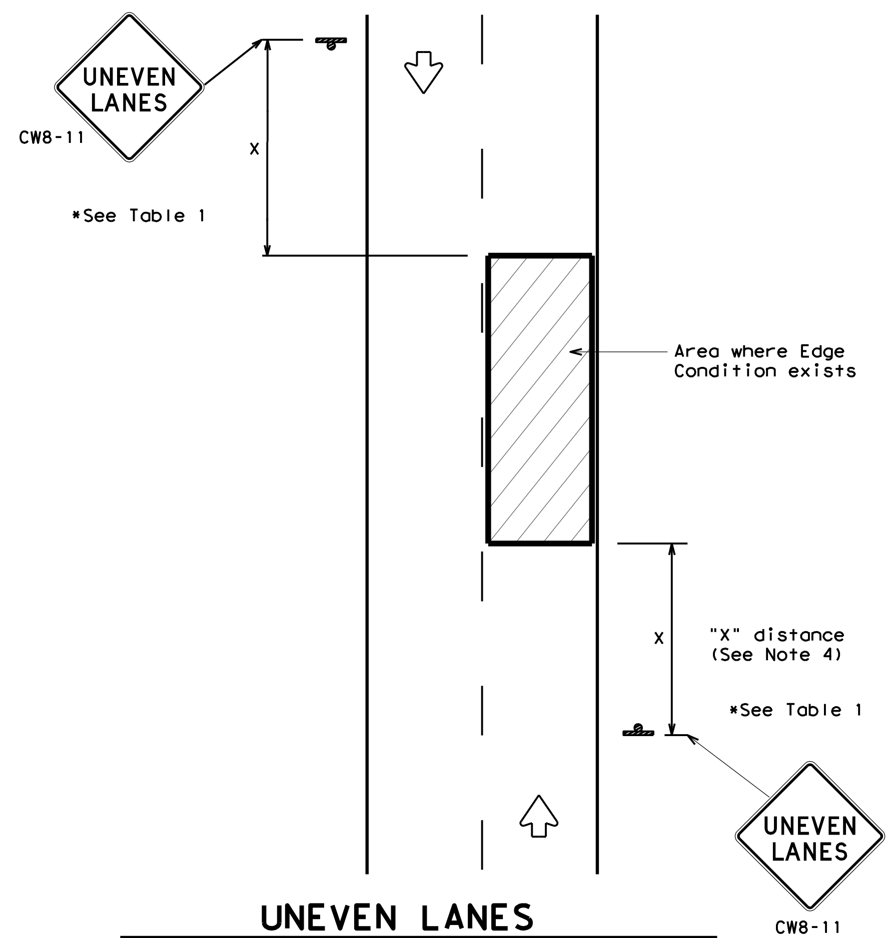
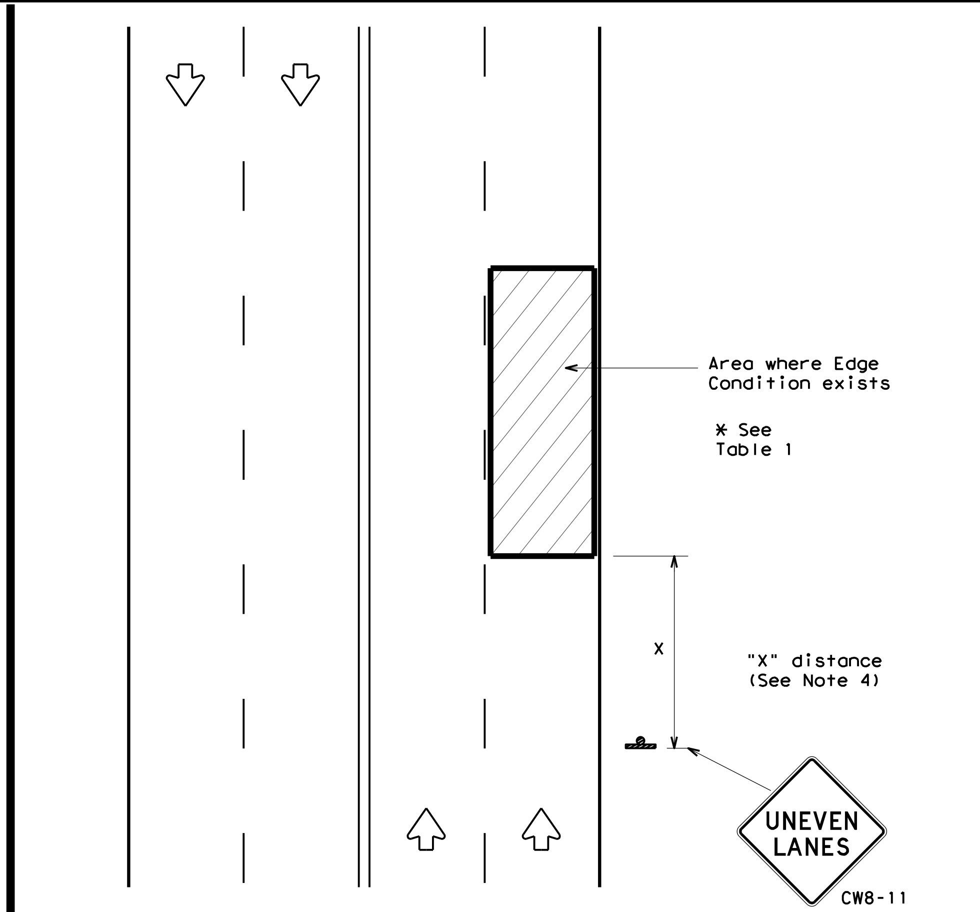
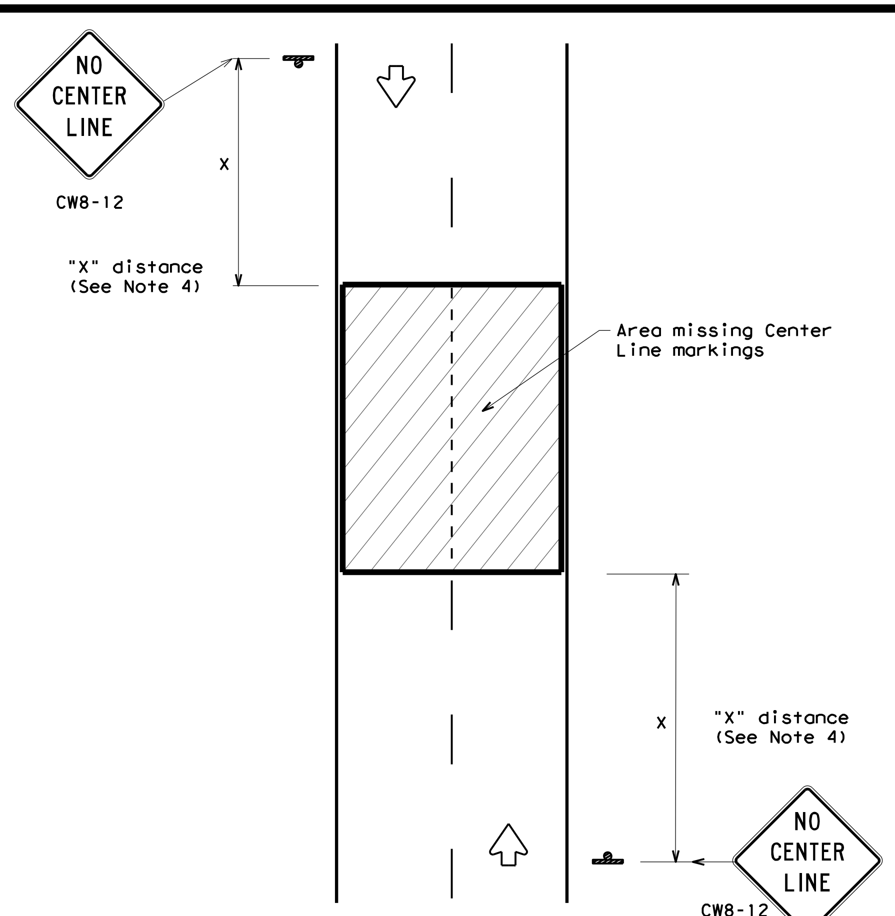


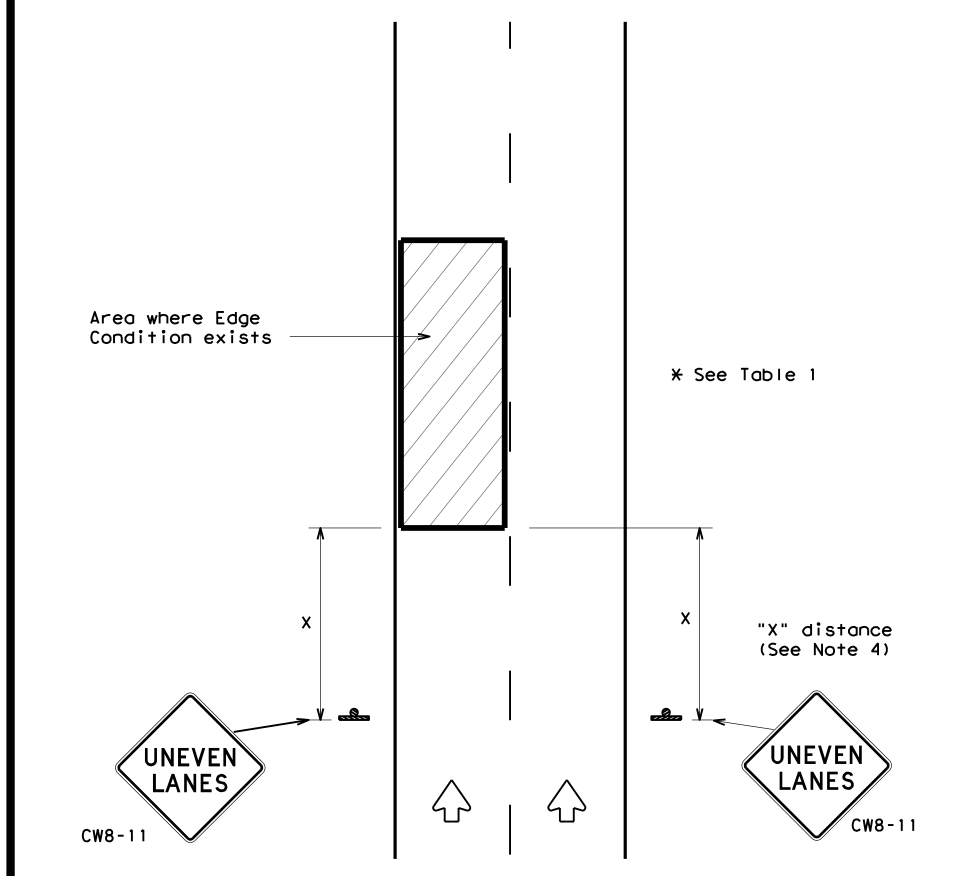
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

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

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

GENERAL NOTES

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

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① (D)	Less than or equal to: 1¼" (maximum-planing) 1½" (typical-overlay)	Sign: CW8-11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② (>3, 1, D)	Less than or equal to 3"	Sign: CW8-11
③ (0" to 3/4", D, 12") Notched Wedge Joint	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

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

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

Texas Department of Transportation — Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT 0028	SECT 02	JOB 098,etc.	HIGHWAY US 90
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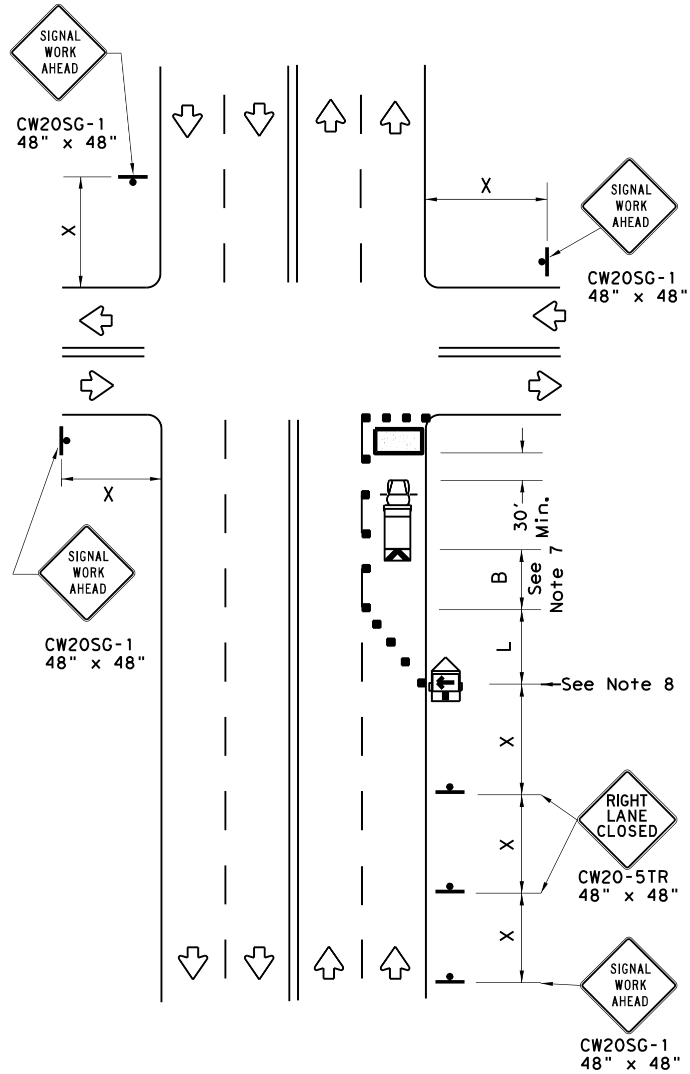
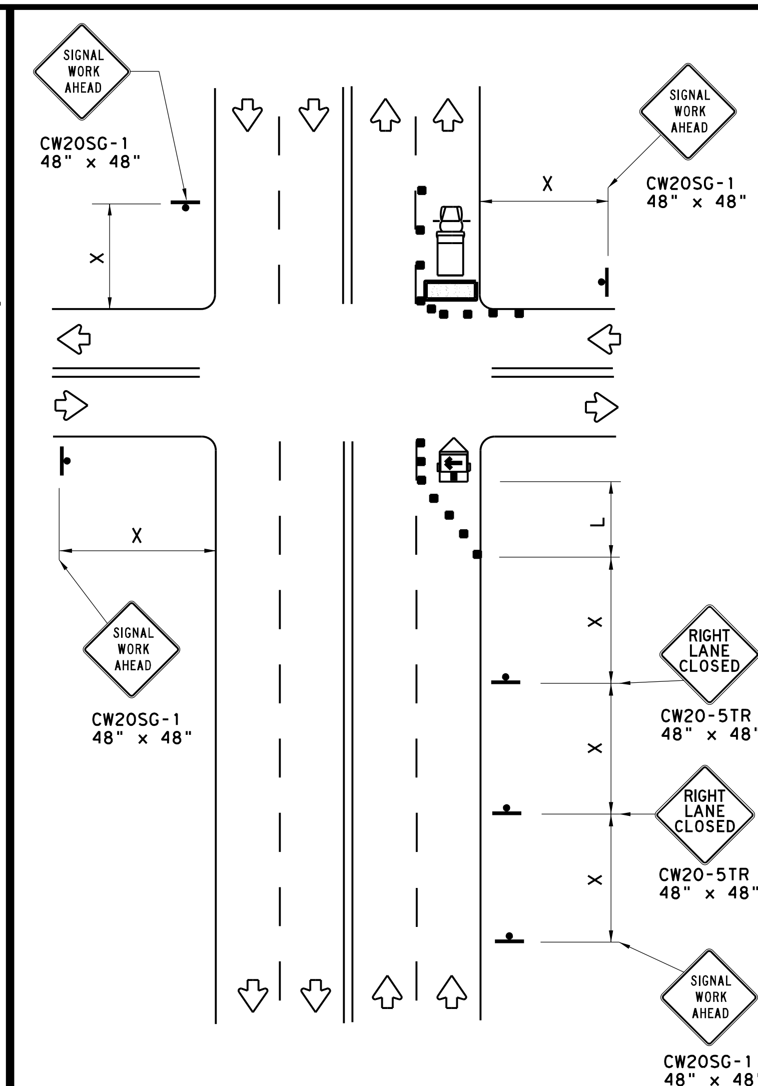


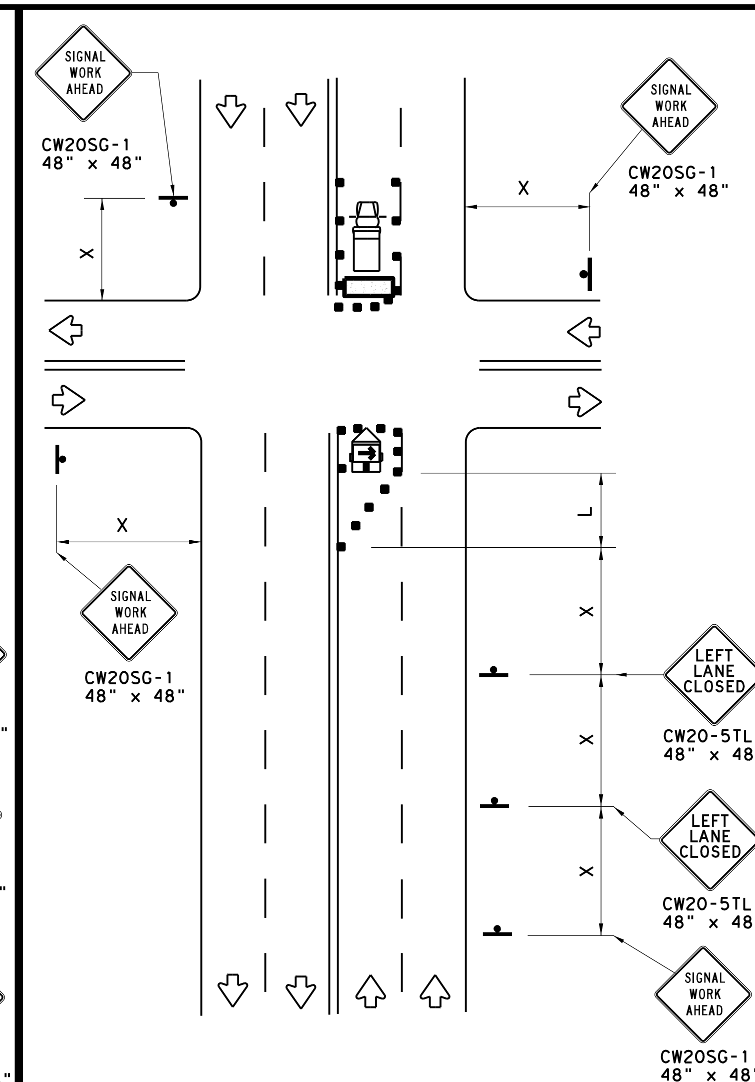
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE RIGHT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY

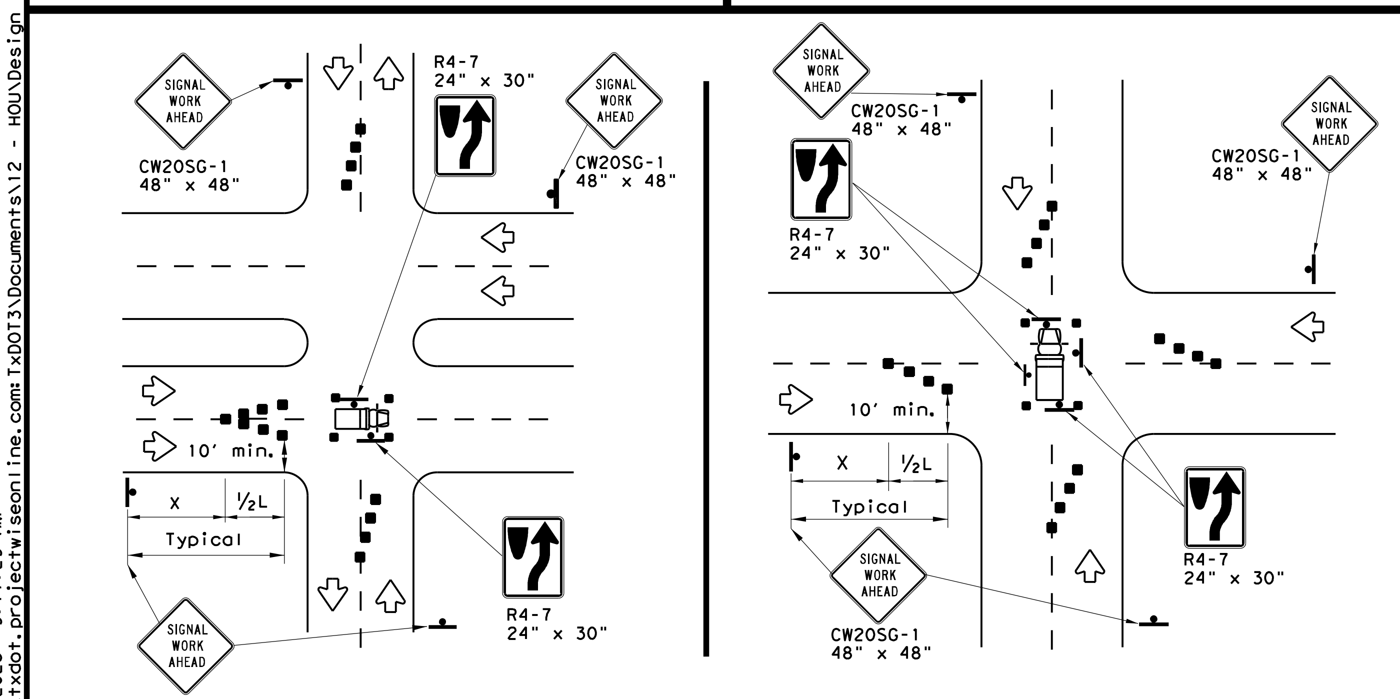
LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

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"
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)

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.



OPERATIONS IN THE INTERSECTION

SHORT DURATION

GENERAL NOTES

1. The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
2. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) signs may be implemented when approved by the engineer.
7. For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
8. The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
9. Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

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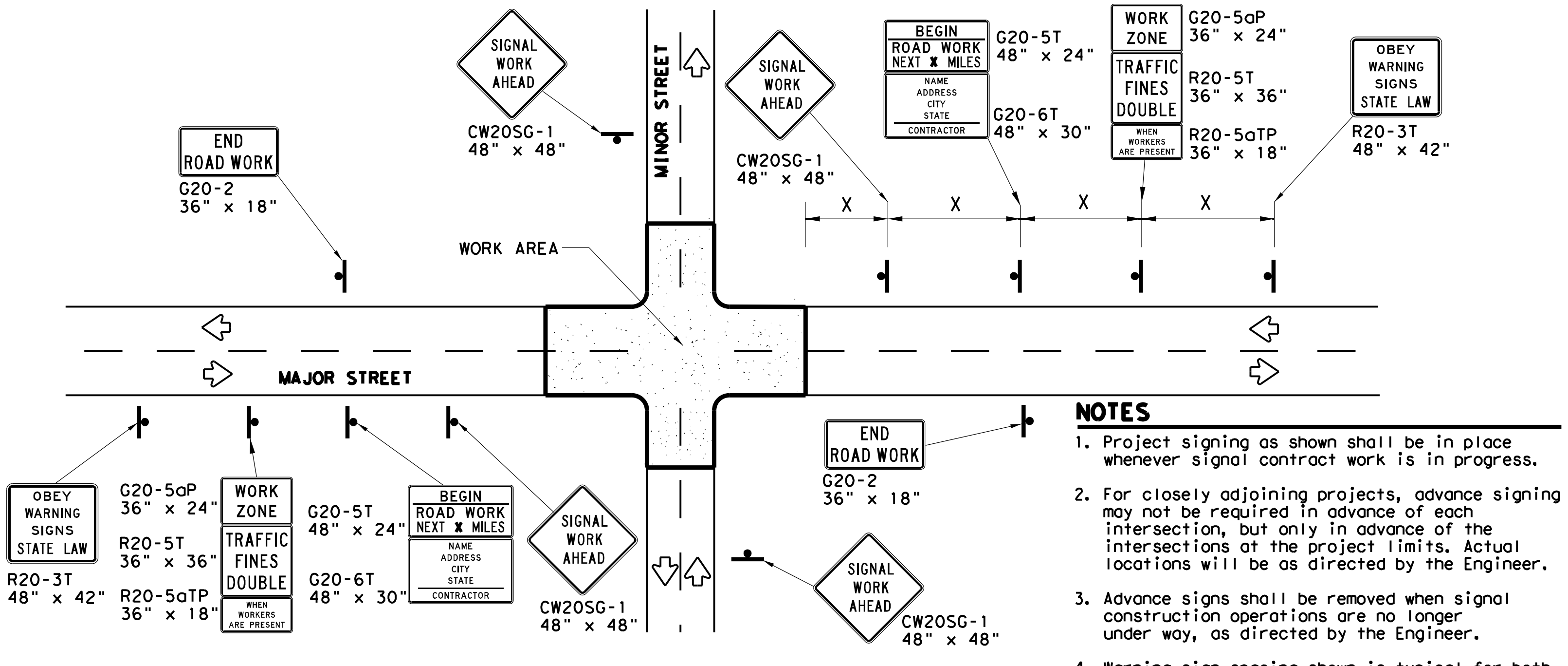


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

1. Project signing as shown shall be in place whenever signal contract work is in progress.
2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
4. Warning sign spacing shown is typical for both directions.
5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. 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".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. 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. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

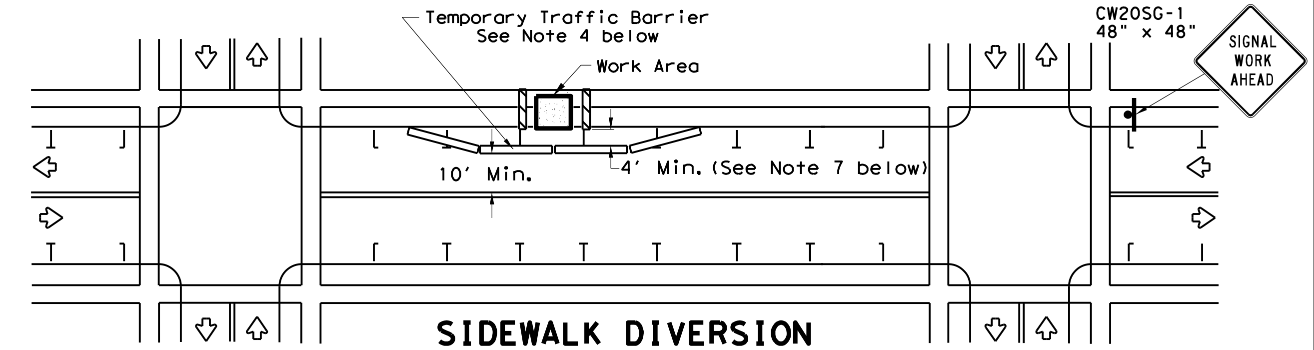
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support 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 fastners. 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.

LEGEND	
(symbol)	Sign
(symbol)	Channelizing Devices
(symbol)	Type 3 Barricade

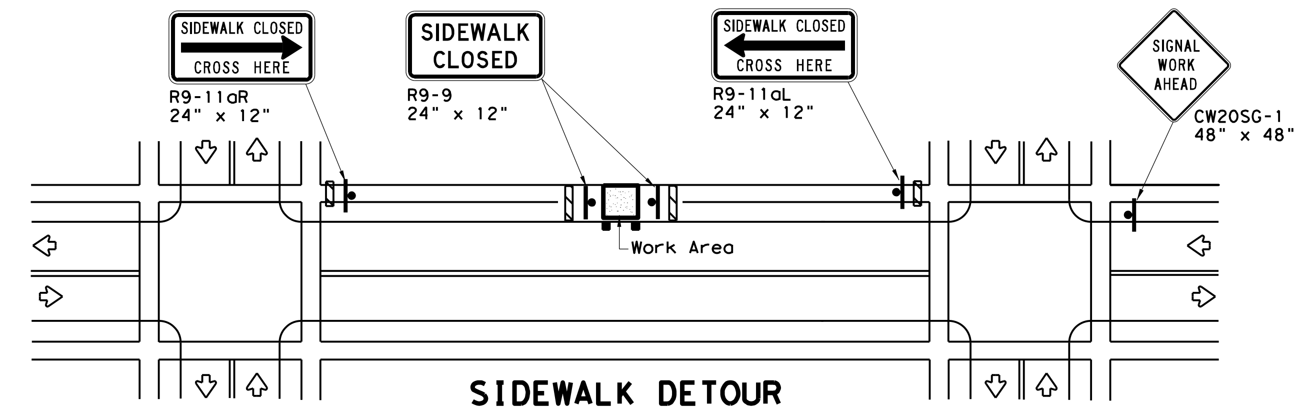
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

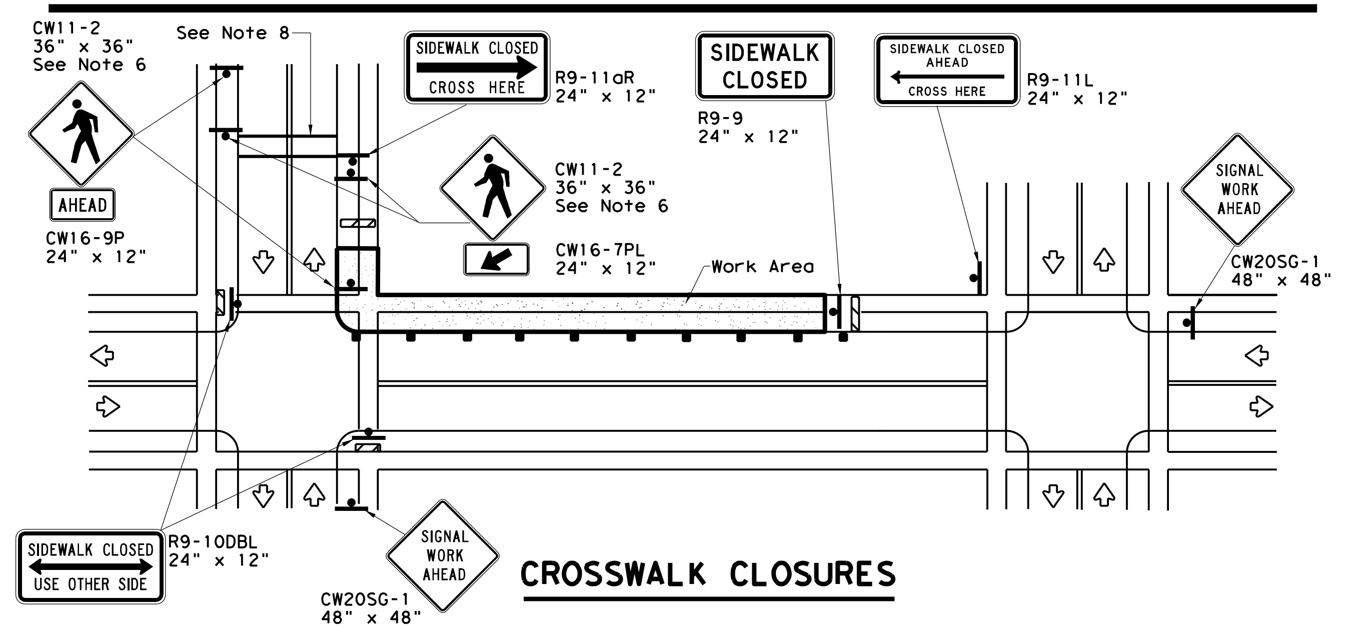
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

SHEET 2 OF 2

Texas Department of Transportation — Traffic Operations Division Standard

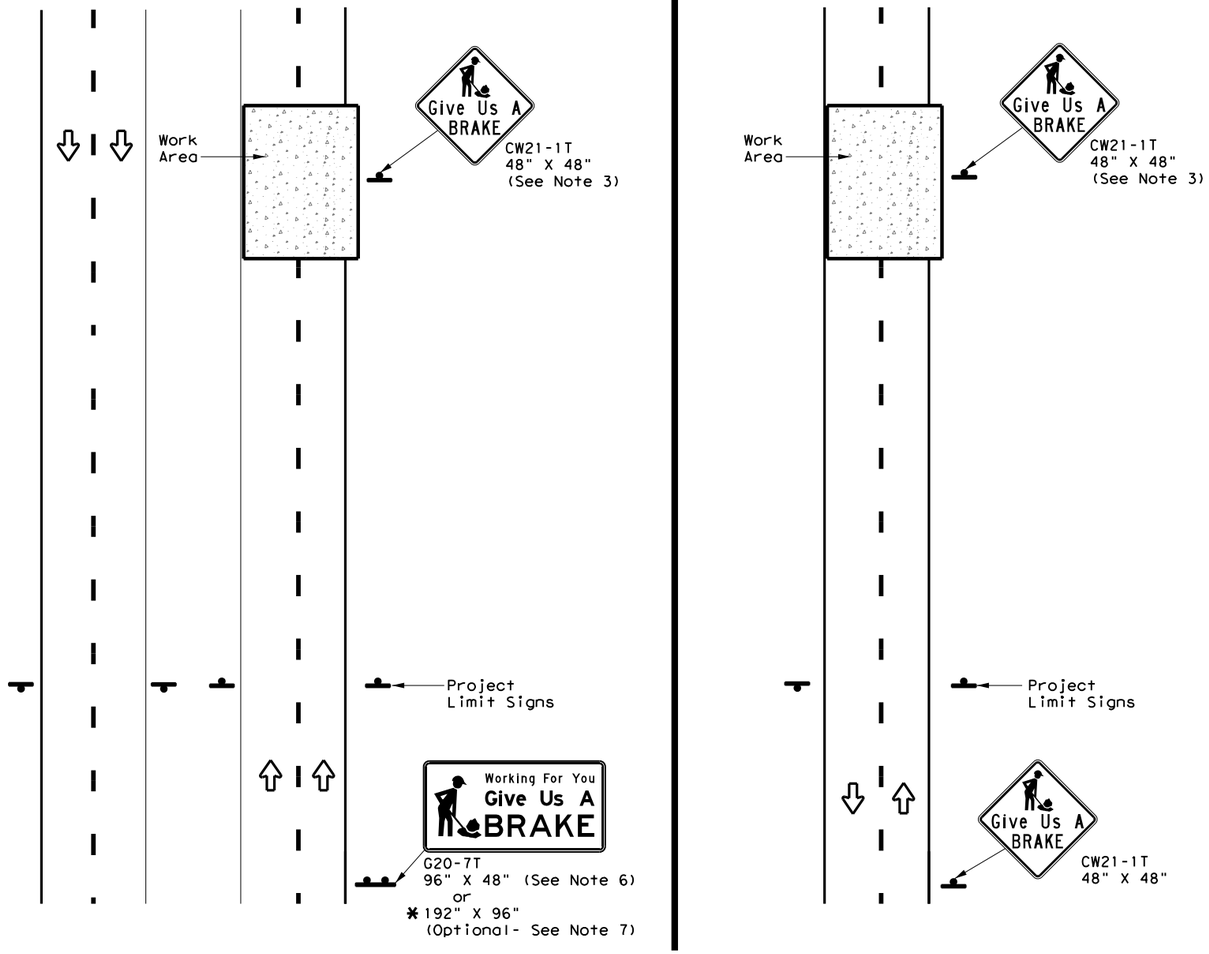
TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT 0028	SECT 02	JOB 098,etc.	HIGHWAY US 90
REVISIONS 2-98 10-99 7-13 4-98 3-03	DIST HOU	COUNTY HARRIS		SHEET NO. 47

115

DATE: 11/8/2023 9:11:28 AM
FILE: pw:\\txdot.projectwiseonline.com:TxDOT3\Documents\12 - HOU\Design Projects\0028098\Traffic Operations Standards\wzbrk-13.dgn



DIVIDED HIGHWAY

UNDIVIDED HIGHWAY

SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

* When the optional larger WORKING FOR YOU GIVE US A BRAKE (G20-7T) 192" x 96" sign is required, the locations shall be noted elsewhere in the plans.

SUMMARY OF LARGE SIGNS

BACKGROUND COLOR	SIGN DESIGNATION	SIGN	SIGN DIMENSIONS	REFLECTIVE SHEETING	SQ FT	GALVANIZED STRUCTURAL STEEL			DRILLED SHAFT 24" DIA. (LF)
						Size	(LF) ①	(LF) ②	
Orange	G20-7T	Working For You Give Us A BRAKE	96" X 48"	Type B_{FL} or C_{FL}	32	▲	▲	▲	▲
Orange	G20-7T	Working For You Give Us A BRAKE	192" X 96"	Type B_{FL} or C_{FL}	128	W8x18	16	17	12

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PLYWOOD SIGN BLANKS	DMS-7100
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

1. See BC and SMD sheets for additional sign support details.
2. Sign locations shall be approved by the Engineer.
3. For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.
4. Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.
5. Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
6. The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.
7. The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:
   Item 636 - Aluminum Signs
   Item 647 - Large Roadside Sign Supports and Assemblies.
   Item 416 - Drilled Shaft Foundations
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.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	HOU	HARRIS		48

116

HORIZONTAL ALIGNMENT REPORT

Alignment name: BL US 90
Alignment description:
Report Created: Friday, August 18, 2023
Time: 9:06:09 AM

	STATION	X	Y
PC	834+07.800 R1	3215485.508	13891003.790
PI	848+73.632 R1	3216543.584	13892018.255
CC		3211520.213	13895139.552
PT	862+77.903 R1	3216984.476	13893416.209
Radius:	5729.580		
Delta:	28°42'03.664" Left		
Degree of Curvature(Arc):	00°59'59.999"		
Length:	2870.103		
Tangent:	1465.832		
Chord:	2840.189		
Middle Ordinate:	178.777		
External:	184.534		
Tangent Back Direction:	N46°12'19.695"E		
Radial Direction:	S43°47'40.305"E		
Chord Direction:	N31°51'17.863"E		
Radial Direction:	S72°29'43.969"E		
Tangent Ahead Direction:	N17°30'16.031"E		

PT	862+77.903 R1	3216984.476	13893416.209
PC	872+57.484 R1	3217279.115	13894350.430
Tangential Direction:	N17°30'16.031"E		
Tangential Length:	979.582		

PC	872+57.484 R1	3217279.115	13894350.430
PI	876+04.129 R1	3217383.379	13894681.023
CC		3222743.379	13892627.087
PT	879+49.929 R1	3217526.738	13894996.634
Radius:	5729.580		
Delta:	06°55'28.010" Right		
Degree of Curvature(Arc):	00°59'59.999"		
Length:	692.445		
Tangent:	346.644		
Chord:	692.024		
Middle Ordinate:	10.457		
External:	10.477		
Tangent Back Direction:	N17°30'16.031"E		
Radial Direction:	S72°29'43.969"E		
Chord Direction:	N20°58'00.035"E		
Radial Direction:	S65°34'15.960"E		
Tangent Ahead Direction:	N24°25'44.040"E		

PT	879+49.929 R1	3217526.738	13894996.634
PI	891+99.063 R1	3218043.335	13896133.939
Tangential Direction:	N24°25'44.040"E		
Tangential Length:	1249.134		

PI	891+99.063 R1	3218043.335	13896133.939
PC	933+94.903 R1	3219850.277	13899920.762
Tangential Direction:	N25°30'31.962"E		
Tangential Length:	4195.840		

PC	933+94.903 R1	3219850.277	13899920.762
PI	935+83.386 R1	3219931.447	13900090.872
CC		3225021.329	13897453.313
PT	937+71.733 R1	3220023.622	13900255.279
Radius:	5729.580		
Delta:	03°46'05.883" Right		
Degree of Curvature(Arc):	00°59'59.999"		
Length:	376.830		
Tangent:	188.483		
Chord:	376.762		
Middle Ordinate:	3.098		
External:	3.099		
Tangent Back Direction:	N25°30'31.962"E		
Radial Direction:	S64°29'28.038"E		
Chord Direction:	N27°23'34.904"E		
Radial Direction:	S60°43'22.155"E		
Tangent Ahead Direction:	N29°16'37.845"E		

PT	937+71.733 R1	3220023.622	13900255.279
PC	947+74.390 R1	3220513.956	13901129.860
Tangential Direction:	N29°16'37.845"E		
Tangential Length:	1002.657		

PC	947+74.390 R1	3220513.956	13901129.860
PI	949+42.519 R1	3220596.178	13901276.514
CC		3215516.249	13903931.826
PT	951+10.553 R1	3220669.658	13901427.736
Radius:	5729.580		
Delta:	03°21'41.858" Left		
Degree of Curvature(Arc):	00°59'59.999"		
Length:	336.163		
Tangent:	168.130		
Chord:	336.115		
Middle Ordinate:	2.465		
External:	2.466		
Tangent Back Direction:	N29°16'37.845"E		
Radial Direction:	S60°43'22.155"E		
Chord Direction:	N27°35'46.916"E		
Radial Direction:	S64°05'04.013"E		
Tangent Ahead Direction:	N25°54'55.987"E		

PT	951+10.553 R1	3220669.658	13901427.736
PI	975+79.195 R1	3221748.568	13903648.130
Tangential Direction:	N25°54'55.987"E		
Tangential Length:	2468.643		

PI	975+79.195 R1	3221748.568	13903648.130
PC	1034+12.233 R1	3224194.760	13908943.456
Tangential Direction:	N24°47'40.981"E		
Tangential Length:	5833.038		

PC	1034+12.233 R1	3224194.760	13908943.456
PI	1056+01.474 R1	3225112.858	13910930.884
CC		3234597.571	13904137.847
PT	1077+38.581 R1	3226698.941	13912439.895
Radius:	11459.160		
Delta:	21°37'54.230" Right		
Degree of Curvature(Arc):	00°29'59.999"		
Length:	4326.348		
Tangent:	2189.240		
Chord:	4300.698		
Middle Ordinate:	203.568		
External:	207.250		
Tangent Back Direction:	N24°47'40.981"E		
Radial Direction:	S65°12'19.019"E		
Chord Direction:	N35°36'38.096"E		
Radial Direction:	S43°34'24.790"E		
Tangent Ahead Direction:	N46°25'35.210"E		

PT	1077+38.581 R1	3226698.941	13912439.895
POT	1255+38.865 R1	3239595.071	13924709.367
Tangential Direction:	N46°25'35.210"E		
Tangential Length:	17800.284		

Alignment name: EBFR
Alignment description:
Report Created: Friday, August 18, 2023
Time: 9:00:02 AM

	STATION	X	Y
POT	890+00.000 R1	3218061.123	13895924.772
PC	933+27.375 R1	3219921.415	13899831.879
Tangential Direction:	N25°27'37.919"E		
Tangential Length:	4327.375		

PC	933+27.375 R1	3219921.415	13899831.879
PI	938+19.482 R1	3220132.967	13900276.194
CC		3225038.560	13897395.452
PT	943+09.128 R1	3220417.934	13900677.397
Radius:	5667.570		
Delta:	09°55'29.794" Right		
Degree of Curvature(Arc):	01°00'39.387"		
Length:	981.753		
Tangent:	492.108		
Chord:	980.526		
Middle Ordinate:	21.244		
External:	21.324		
Tangent Back Direction:	N25°27'37.919"E		
Radial Direction:	S64°32'22.081"E		
Chord Direction:	N30°25'22.816"E		
Radial Direction:	S54°36'52.286"E		
Tangent Ahead Direction:	N35°23'07.714"E		

PT	943+09.128 R1	3220417.934	13900677.397
PC	945+77.401 R1	3220573.284	13900896.113
Tangential Direction:	N35°23'07.714"E		
Tangential Length:	268.273		

PC	945+77.401 R1	3220573.284	13900896.113
PI	950+83.920 R1	3220866.596	13901309.066
CC		3215851.556	13904249.869
PT	955+87.869 R1	3221083.772	13901766.665
Radius:	5791.580		
Delta:	09°59'47.423" Left		
Degree of Curvature(Arc):	00°59'21.460"		
Length:	1010.468		
Tangent:	506.520		
Chord:	1009.187		
Middle Ordinate:	22.023		
External:	22.107		
Tangent Back Direction:	N35°23'07.714"E		
Radial Direction:	S54°36'52.286"E		
Chord Direction:	N30°23'14.002"E		
Radial Direction:	S64°36'39.710"E		
Tangent Ahead Direction:	N25°23'20.290"E		

PT	955+87.869 R1	3221083.772	13901766.665
PC	979+20.234 R1	3222083.800	13903873.765
Tangential Direction:	N25°23'20.290"E		
Tangential Length:	2332.365		

PC	979+20.234 R1	3222083.800	13903873.765
PI	983+99.619 R1	3222289.342	13904306.850
CC		3216851.583	13906356.970
PT	988+76.824 R1	3222420.879	13904767.836
Radius:	5791.580		
Delta:	09°27'48.554" Left		
Degree of Curvature(Arc):	00°59'21.460"		
Length:	956.590		
Tangent:	479.385		
Chord:	955.503		
Middle Ordinate:	19.739		
External:	19.806		
Tangent Back Direction:	N25°23'20.290"E		
Radial Direction:	S64°36'39.710"E		
Chord Direction:	N20°39'26.013"E		
Radial Direction:	S74°04'28.264"E		
Tangent Ahead Direction:	N15°55'31.736"E		

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, P.E.

01/29/2024

Texas Department of Transportation

US 90

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		49

DATE: 01/21/2024 12:35 AM
FILE: pw:txdot.projectwiseonline.com:TxDOT3\Documents\[...HOU\Design Projects\002802098\[...Design\Plan Set\[...Roadway1HORIZONTAL ALIGNMENT DATA SHEET

PT	988+76.824 R1	3222420.879	13904767.836
POT	994+01.778 R1	3222564.920	13905272.643
Tangential Direction:	N15°55'31.736"E		
Tangential Length:	524.955		

HORIZONTAL ALIGNMENT REPORT

Alignment name: WBFR
Alignment description:
Report Created: Friday, August 18, 2023
Time: 8:59:17 AM

	STATION	X	Y
POT	852+00.000 R1	3216226.908	13892589.489
PI	880+00.009 R1	3217429.683	13895118.003
Tangential Direction:	N25°26'22.936"E		
Tangential Length:	2800.009		
PI	880+00.009 R1	3217429.683	13895118.003
POT	985+22.429 R1	3221947.952	13904620.980
Tangential Direction:	N25°25'44.887"E		
Tangential Length:	10522.420		

HORIZONTAL ALIGNMENT REPORT

Alignment name: WBML
Alignment description:
Report Created: Friday, August 18, 2023
Time: 8:57:09 AM

	STATION	X	Y
POT	985+22.430 R1	3221947.952	13904620.980
PI	1002+48.136 R1	3222688.963	13906179.493
Tangential Direction:	N25°25'45.312"E		
Tangential Length:	1725.706		
PI	1002+48.136 R1	3222688.963	13906179.493
PC	1047+97.215 R1	3224641.655	13910288.156
Tangential Direction:	N25°25'11.904"E		
Tangential Length:	4549.079		
PC	1047+97.215 R1	3224641.655	13910288.156
PI	1056+04.606 R1	3224988.228	13911017.380
CC		3228519.131	13908445.338
PT	1063+93.353 R1	3225576.038	13911570.878
Radius:	4293.110		
Delta:	21°18'07.344" Right		
Degree of Curvature(Arc):	01°20'04.554"		
Length:	1596.139		
Tangent:	807.391		
Chord:	1586.961		
Middle Ordinate:	73.965		
External:	75.262		
Tangent Back Direction:	N25°25'11.904"E		
Radial Direction:	S64°34'48.096"E		
Chord Direction:	N36°04'15.576"E		
Radial Direction:	S43°16'40.753"E		
Tangent Ahead Direction:	N46°43'19.247"E		
PT	1063+93.353 R1	3225576.038	13911570.878
POT	1256+04.378 R1	3239562.360	13924740.779
Tangential Direction:	N46°43'19.247"E		
Tangential Length:	19211.025		

HORIZONTAL ALIGNMENT REPORT

Alignment name: BL ACCESS-1
Alignment description:
Report Created: Saturday, January 20, 2024
Time: 9:51:09 PM

	STATION	X	Y
POT	880+00.000 R1	3217716.029	13894965.233
POT	909+00.377 R1	3218960.783	13897584.923
Tangential Direction:	N25?24'53.515"E		
Tangential Length:	2900.377		

HORIZONTAL ALIGNMENT REPORT

Alignment name: BL ACCESS RD 2
Alignment description:
Report Created: Saturday, January 20, 2024
Time: 11:48:20 PM

	STATION	X	Y
POT	988+00.000 R1	3222521.413	13904657.222
PI	995+00.068 R1	3222702.027	13905333.590
Tangential Direction:	N14?57'03.823"E		
Tangential Length:	700.068		
PI	995+00.068 R1	3222702.027	13905333.590
PI	998+84.989 R1	3222823.239	13905698.928
Tangential Direction:	N18?21'17.529"E		
Tangential Length:	384.921		
PI	998+84.989 R1	3222823.239	13905698.928
POT	1002+70.911 R1	3222987.499	13906048.147
Tangential Direction:	N25?11'26.077"E		
Tangential Length:	385.922		

HORIZONTAL ALIGNMENT REPORT

Alignment name: BL ACCESS RD 3
Alignment description:
Report Created: Saturday, January 20, 2024
Time: 11:50:07 PM

	STATION	X	Y
POT	1048+00.000 R1	3225188.490	13909905.708
PC	1052+79.001 R1	3225555.414	13910213.619
Tangential Direction:	N49?59'51.477"E		
Tangential Length:	479.001		
PC	1052+79.001 R1	3225555.414	13910213.619
PI	1055+98.754 R1	3225800.350	13910419.163
CC		3224620.112	13911328.175
PT	1059+08.501 R1	3225936.539	13910708.463
Radius:	1455.000		
Delta:	24?47'19.560" Left		
Degree of Curvature(Arc):	03?56'16.275"		
Length:	629.499		
Tangent:	319.753		
Chord:	624.601		
Middle Ordinate:	33.911		
External:	34.720		
Tangent Back Direction:	N49?59'51.477"E		
Radial Direction:	S40?00'08.523"E		
Chord Direction:	N37?36'11.697"E		
Radial Direction:	S64?47'28.083"E		
Tangent Ahead Direction:	N25?12'31.917"E		
PT	1059+08.501 R1	3225936.539	13910708.463
PC	1062+40.728 R1	3226078.041	13911009.049
Tangential Direction:	N25?12'31.917"E		
Tangential Length:	332.227		
PC	1062+40.728 R1	3226078.041	13911009.049
PI	1069+34.027 R1	3226373.331	13911636.319
CC		3230601.847	13908879.452
PT	1076+18.541 R1	3226828.153	13912159.579
Radius:	5000.000		
Delta:	15?47'18.897" Right		
Degree of Curvature(Arc):	01?08'45.296"		
Length:	1377.814		
Tangent:	693.300		
Chord:	1373.459		
Middle Ordinate:	47.384		
External:	47.838		
Tangent Back Direction:	N25?12'31.917"E		
Radial Direction:	S64?47'28.083"E		
Chord Direction:	N33?06'11.366"E		
Radial Direction:	S49?00'09.185"E		
Tangent Ahead Direction:	N40?59'50.815"E		
PT	1076+18.541 R1	3226828.153	13912159.579
POT	1082+44.877 R1	3227239.045	13912632.299
Tangential Direction:	N40?59'50.815"E		
Tangential Length:	626.336		

HORIZONTAL ALIGNMENT REPORT

Alignment name: BL ACCESS-4
Alignment description:
Report Created: Saturday, January 20, 2024
Time: 11:07:25 PM

	STATION	X	Y
POTBL ACCESS-4	1095+45.640 R1	3228160.034	13913559.642
POTBL ACCESS-4	1100+45.705 R1	3228524.623	13913901.898
Tangential Direction:	N46?48'34.954"E		
Tangential Length:	500.065		

HORIZONTAL ALIGNMENT REPORT

Alignment name: BL ACCESS RD 5
Alignment description:
Report Created: Saturday, January 20, 2024
Time: 11:52:02 PM

	STATION	X	Y
POT	1034+73.540 R1	3238275.169	13922985.077
PI	1036+14.559 R1	3238348.151	13923105.742
Tangential Direction:	N31?09'59.631"E		
Tangential Length:	141.019		
PI	1036+14.559 R1	3238348.151	13923105.742
PI	1038+49.536 R1	3238501.854	13923283.476
Tangential Direction:	N40?51'10.842"E		
Tangential Length:	234.977		
PI	1038+49.536 R1	3238501.854	13923283.476
POT	1045+13.589 R1	3238973.234	13923751.202
Tangential Direction:	N45?13'22.783"E		
Tangential Length:	664.053		

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

Texas Department of Transportation

US 90

HORIZONTAL ALIGNMENT DATA

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		49A

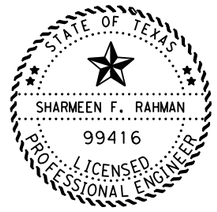
DATE: 01/21/2024 12:35 AM
FILE: pw:txdot.projectwiseonline.com:TxDOT3\Documents\- HOU\Design Projects\0028020098\- Design\Plan Set\- Roadway1\HORIZONTAL ALIGNMENT DATA SHEET

CK DW CK DW

HORIZONTAL ALIGNMENT REPORT

Alignment name: EBML
Alignment description:
Report Created: Friday, August 18, 2023
Time: 8:55:31 AM

	STATION	X	Y
POT	994+00.000 R1	3222564.432	13905270.933
PC	994+06.649 R1	3222566.256	13905277.326
Tangential Direction:	N15°55'31.736"E		
Tangential Length:	6.649		
PC	994+06.649 R1	3222566.256	13905277.326
PI	997+22.970 R1	3222653.051	13905581.507
CC		3226239.411	13904229.234
PT	1000+37.852 R1	3222788.699	13905867.267
Radius:	3819.760		
Delta:	09°28'04.596" Right		
Degree of Curvature(Arc):	01°29'59.942"		
Length:	631.203		
Tangent:	316.322		
Chord:	630.485		
Middle Ordinate:	13.031		
External:	13.075		
Tangent Back Direction:	N15°55'31.736"E		
Radial Direction:	S74°04'28.264"E		
Chord Direction:	N20°39'34.034"E		
Radial Direction:	S64°36'23.668"E		
Tangent Ahead Direction:	N25°23'36.332"E		
PT	1000+37.852 R1	3222788.699	13905867.267
PC	1011+91.778 R1	3223283.539	13906909.706
Tangential Direction:	N25°23'36.332"E		
Tangential Length:	1153.926		
PC	1011+91.778 R1	3223283.539	13906909.706
PI	1055+88.381 R1	3225168.941	13910881.529
CC		3244332.398	13896917.933
PT	1098+82.795 R1	3228372.090	13913893.167
Radius:	23300.000		
Delta:	21°22'17.815" Right		
Degree of Curvature(Arc):	00°14'45.257"		
Length:	8691.018		
Tangent:	4396.603		
Chord:	8640.722		
Middle Ordinate:	404.051		
External:	411.181		
Tangent Back Direction:	N25°23'36.332"E		
Radial Direction:	S64°36'23.668"E		
Chord Direction:	N36°04'45.239"E		
Radial Direction:	S43°14'05.854"E		
Tangent Ahead Direction:	N46°45'54.146"E		
PT	1098+82.795 R1	3228372.090	13913893.167
PC	1113+90.258 R1	3229470.353	13914925.766
Tangential Direction:	N46°45'54.146"E		
Tangential Length:	1507.463		
PC	1113+90.258 R1	3229470.353	13914925.766
PI	1118+90.569 R1	3229834.855	13915268.475
CC		3233437.536	13910706.307
PT	1123+88.402 R1	3230252.729	13915543.597
Radius:	5791.578		
Delta:	09°52'28.500" Right		
Degree of Curvature(Arc):	00°59'21.461"		
Length:	998.144		
Tangent:	500.311		
Chord:	996.909		
Middle Ordinate:	21.490		
External:	21.570		
Tangent Back Direction:	N46°45'54.146"E		
Radial Direction:	S43°14'05.854"E		
Chord Direction:	N51°42'08.396"E		
Radial Direction:	S33°21'37.354"E		
Tangent Ahead Direction:	N56°38'22.646"E		
PT	1123+88.402 R1	3230252.729	13915543.597
PC	1134+38.308 R1	3231129.640	13916120.944
Tangential Direction:	N56°38'22.646"E		
Tangential Length:	1049.907		
PC	1134+38.308 R1	3231129.640	13916120.944
PI	1144+32.161 R1	3231959.734	13916667.467
CC		3228013.025	13920854.660
PT	1154+06.007 R1	3232554.344	13917463.823
Radius:	5667.570		
Delta:	19°53'32.179" Left		
Degree of Curvature(Arc):	01°00'39.387"		
Length:	1967.699		
Tangent:	993.853		
Chord:	1957.831		
Middle Ordinate:	85.180		
External:	86.480		
Tangent Back Direction:	N56°38'22.646"E		
Radial Direction:	S33°21'37.354"E		
Chord Direction:	N46°41'36.556"E		
Radial Direction:	S53°15'09.533"E		
Tangent Ahead Direction:	N36°44'50.467"E		
PT	1154+06.007 R1	3232554.344	13917463.823
PC	1164+61.457 R1	3233185.807	13918309.536
Tangential Direction:	N36°44'50.467"E		
Tangential Length:	1055.450		
PC	1164+61.457 R1	3233185.807	13918309.536
PI	1169+56.232 R1	3233481.824	13918705.989
CC		3237727.126	13914918.699
PT	1174+48.503 R1	3233842.060	13919045.152
Radius:	5667.570		
Delta:	09°58'42.422" Right		
Degree of Curvature(Arc):	01°00'39.387"		
Length:	987.046		
Tangent:	494.774		
Chord:	985.799		
Middle Ordinate:	21.474		
External:	21.556		
Tangent Back Direction:	N36°44'50.467"E		
Radial Direction:	S53°15'09.533"E		
Chord Direction:	N41°44'11.678"E		
Radial Direction:	S43°16'27.111"E		
Tangent Ahead Direction:	N46°43'32.889"E		
PT	1174+48.503 R1	3233842.060	13919045.152
PC	1184+08.732 R1	3234541.185	13919703.380
Tangential Direction:	N46°43'32.889"E		
Tangential Length:	960.229		
PC	1184+08.732 R1	3234541.185	13919703.380
PI	1189+04.176 R1	3234901.908	13920043.002
CC		3238426.250	13915576.927
PT	1193+97.108 R1	3235316.088	13920314.884
Radius:	5667.570		
Delta:	09°59'30.827" Right		
Degree of Curvature(Arc):	01°00'39.387"		
Length:	988.376		
Tangent:	495.444		
Chord:	987.124		
Middle Ordinate:	21.532		
External:	21.614		
Tangent Back Direction:	N46°43'32.889"E		
Radial Direction:	S43°16'27.111"E		
Chord Direction:	N51°43'18.302"E		
Radial Direction:	S33°16'56.285"E		
Tangent Ahead Direction:	N56°43'03.715"E		
PT	1193+97.108 R1	3235316.088	13920314.884
PC	1201+87.189 R1	3235976.578	13920748.453
Tangential Direction:	N56°43'03.715"E		
Tangential Length:	790.081		
PC	1201+87.189 R1	3235976.578	13920748.453
PI	1212+10.634 R1	3236832.154	13921310.083
CC		3232798.364	13925590.080
PT	1222+13.162 R1	3237443.430	13922130.924
Radius:	5791.580		
Delta:	20°02'34.223" Left		
Degree of Curvature(Arc):	00°59'21.460"		
Length:	2025.973		
Tangent:	1023.444		
Chord:	2015.659		
Middle Ordinate:	88.363		
External:	89.733		
Tangent Back Direction:	N56°43'03.715"E		
Radial Direction:	S33°16'56.285"E		
Chord Direction:	N46°41'46.604"E		
Radial Direction:	S53°19'30.507"E		
Tangent Ahead Direction:	N36°40'29.493"E		
PT	1222+13.162 R1	3237443.430	13922130.924
PC	1237+95.896 R1	3238388.755	13923400.336
Tangential Direction:	N36°40'29.493"E		
Tangential Length:	1582.734		
PC	1237+95.896 R1	3238388.755	13923400.336
PI	1243+03.449 R1	3238691.902	13923807.413
CC		3242934.360	13920015.248
PT	1248+08.301 R1	3239062.557	13924154.148
Radius:	5667.570		
Delta:	10°14'05.326" Right		
Degree of Curvature(Arc):	01°00'39.387"		
Length:	1012.405		
Tangent:	507.553		
Chord:	1011.059		
Middle Ordinate:	22.591		
External:	22.681		
Tangent Back Direction:	N36°40'29.493"E		
Radial Direction:	S53°19'30.507"E		
Chord Direction:	N41°47'32.156"E		
Radial Direction:	S43°05'25.181"E		
Tangent Ahead Direction:	N46°54'34.819"E		
PT	1248+08.301 R1	3239062.557	13924154.148
POT	1255+76.338 R1	3239623.437	13924678.833
Tangential Direction:	N46°54'34.819"E		
Tangential Length:	768.037		



Sharmeen Rahman, P.E.

01/29/2024

Texas Department of Transportation

US 90

HORIZONTAL ALIGNMENT DATA

SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		49B

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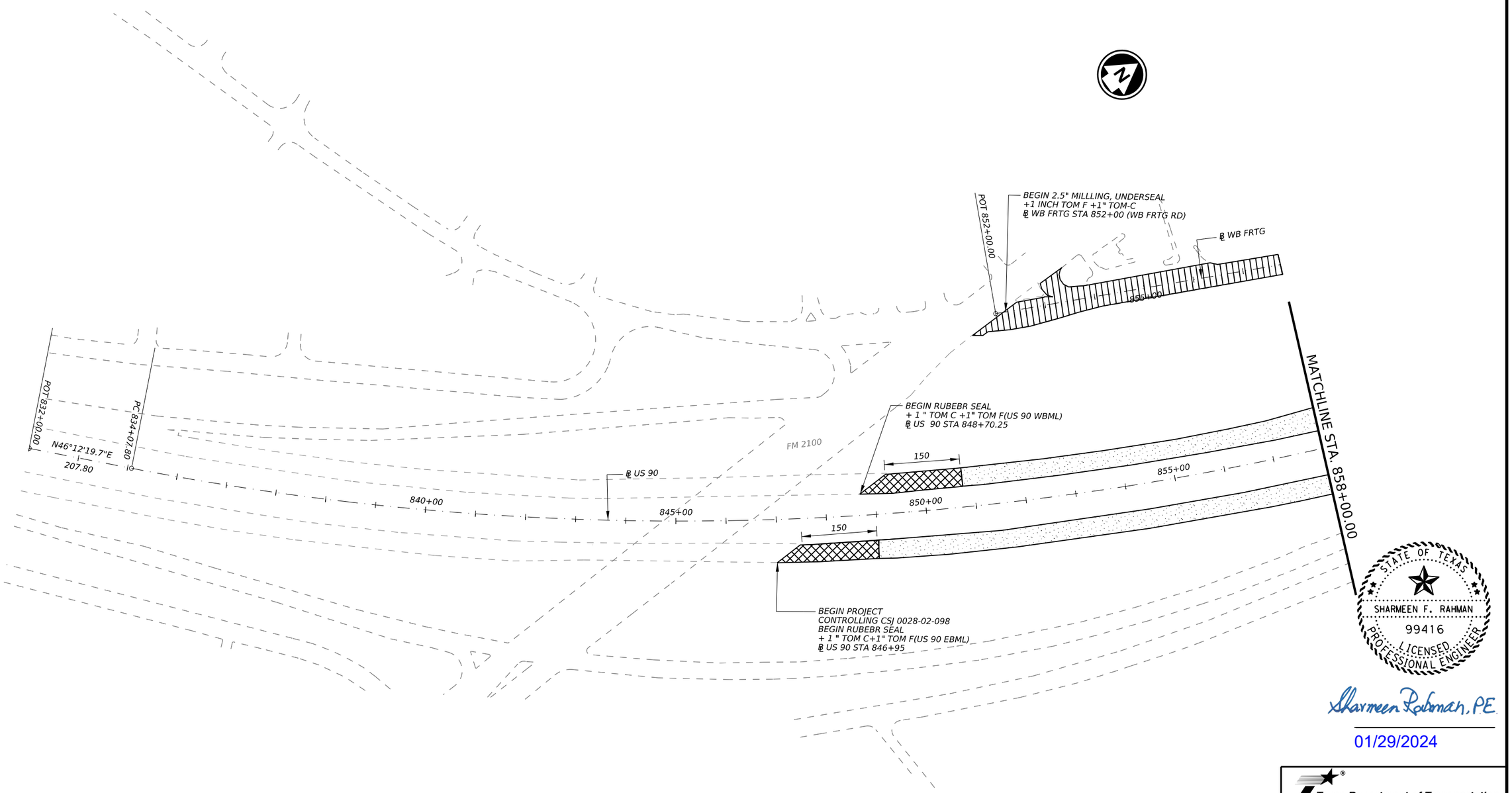

NOTES:

1. FOR ACP OVERLAY DETAILS , BASE REPAIR AND DRIVEWAY OVERLAY DETAILS REFER TO SHEET 67-68.
2. QUANTITIES FOR FLEX PAVEMENT STRUCTURE REPAIR AND FULL DEPTH REPAIR ARE FOR ESTIMATING PURPOSES ONLY. QUANTITIES SHALL BE FIELD VERIFIED.
3. BRIDGES WILL BE EXCLUDED FROM MILL AND OVERLAY AND WILL ONLY BE RESTRIPED.

LEGEND:

- PROP. 2.5" MILLING, SEAL COAT , 1" TOM C AND 1" TOM F
- PROP. SEAL COAT ,1" TOM C AND 1" TOM F
- PROP. 3.5" MILLING AND, SEAL COAT , 2" SP D AND 1" TOM C
- PROP. 2.5" MILLING AND, UNDERSEAL AND 2" SP D
- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, P.E.

01/29/2024

Texas Department of Transportation

US 90

ROADWAY LAYOUT

SHEET 1 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		50

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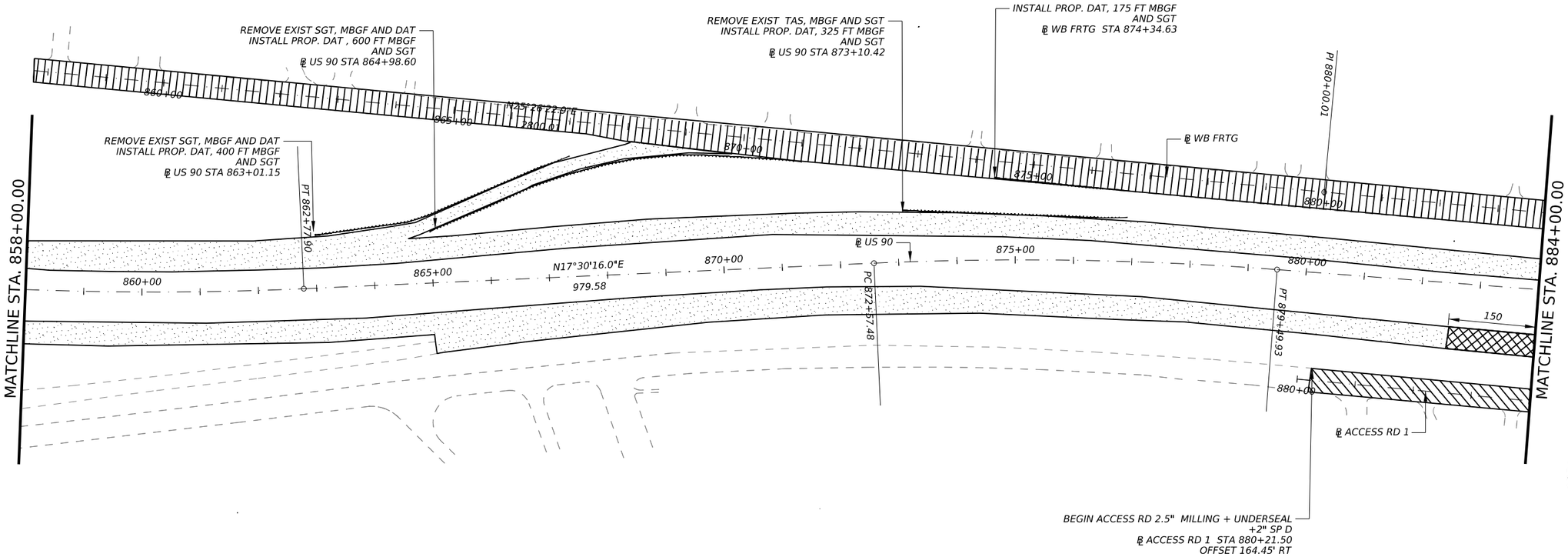

NOTES:

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2. QUANTITIES FOR FLEX PAVEMENT STRUCTURE REPAIR AND FULL DEPTH REPAIR ARE FOR ESTIMATING PURPOSES ONLY. QUANTITIES SHALL BE FIELD VERIFIED.
3. BRIDGES WILL BE EXCLUDED FROM MILL AND OVERLAY AND WILL ONLY BE RESTRIPED.

LEGEND:

- PROP. 2.5" MILLING, SEAL COAT , 1" TOM C AND 1" TOM F
- PROP. SEAL COAT ,1" TOM C AND 1" TOM F
- PROP. 3.5" MILLING AND, SEAL COAT , 2" SP D AND 1" TOM C
- PROP. 2.5" MILLING AND, UNDERSEAL AND 2" SP D
- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

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US 90

ROADWAY LAYOUT

SHEET 2 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		51

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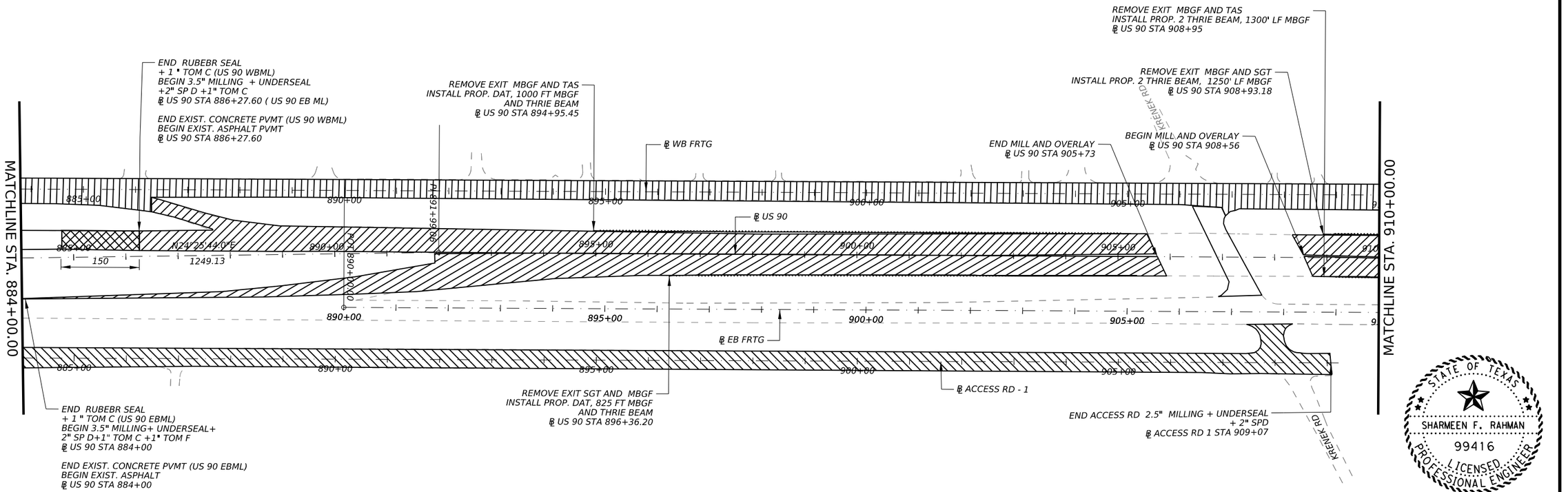

NOTES:

1. FOR ACP OVERLAY DETAILS , BASE REPAIR AND DRIVEWAY OVERLAY DETAILS REFER TO SHEET 67-68.
2. QUANTITIES FOR FLEX PAVEMENT STRUCTURE REPAIR AND FULL DEPTH REPAIR ARE FOR ESTIMATING PURPOSES ONLY. QUANTITIES SHALL BE FIELD VERIFIED.
3. BRIDGES WILL BE EXCLUDED FROM MILL AND OVERLAY AND WILL ONLY BE RESTRIPED.

LEGEND:

- PROP. 2.5" MILLING, SEAL COAT , 1" TOM C AND 1" TOM F
- PROP. SEAL COAT ,1" TOM C AND 1" TOM F
- PROP. 3.5" MILLING AND, SEAL COAT , 2" SP D AND 1" TOM C
- PROP. 2.5" MILLING AND, UNDERSEAL AND 2" SP D
- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

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US 90

ROADWAY LAYOUT

SHEET 3 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		52

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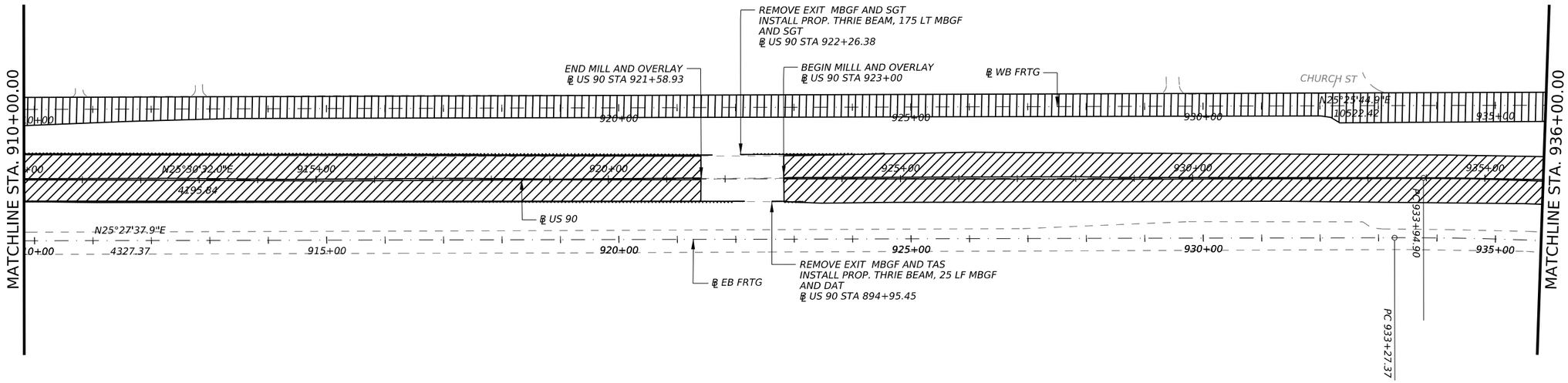

NOTES:

1. FOR ACP OVERLAY DETAILS , BASE REPAIR AND DRIVEWAY OVERLAY DETAILS REFER TO SHEET 67-68.
2. QUANTITIES FOR FLEX PAVEMENT STRUCTURE REPAIR AND FULL DEPTH REPAIR ARE FOR ESTIMATING PURPOSES ONLY. QUANTITIES SHALL BE FIELD VERIFIED.
3. BRIDGES WILL BE EXCLUDED FROM MILL AND OVERLAY AND WILL ONLY BE RESTRIPED.

LEGEND:

- PROP. 2.5" MILLING, SEAL COAT , 1" TOM C AND 1" TOM F
- PROP. SEAL COAT ,1" TOM C AND 1" TOM F
- PROP. 3.5" MILLING AND, SEAL COAT , 2" SP D AND 1" TOM C
- PROP. 2.5" MILLING AND, UNDERSEAL AND 2" SP D
- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

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US 90

ROADWAY LAYOUT

SHEET 4 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		53

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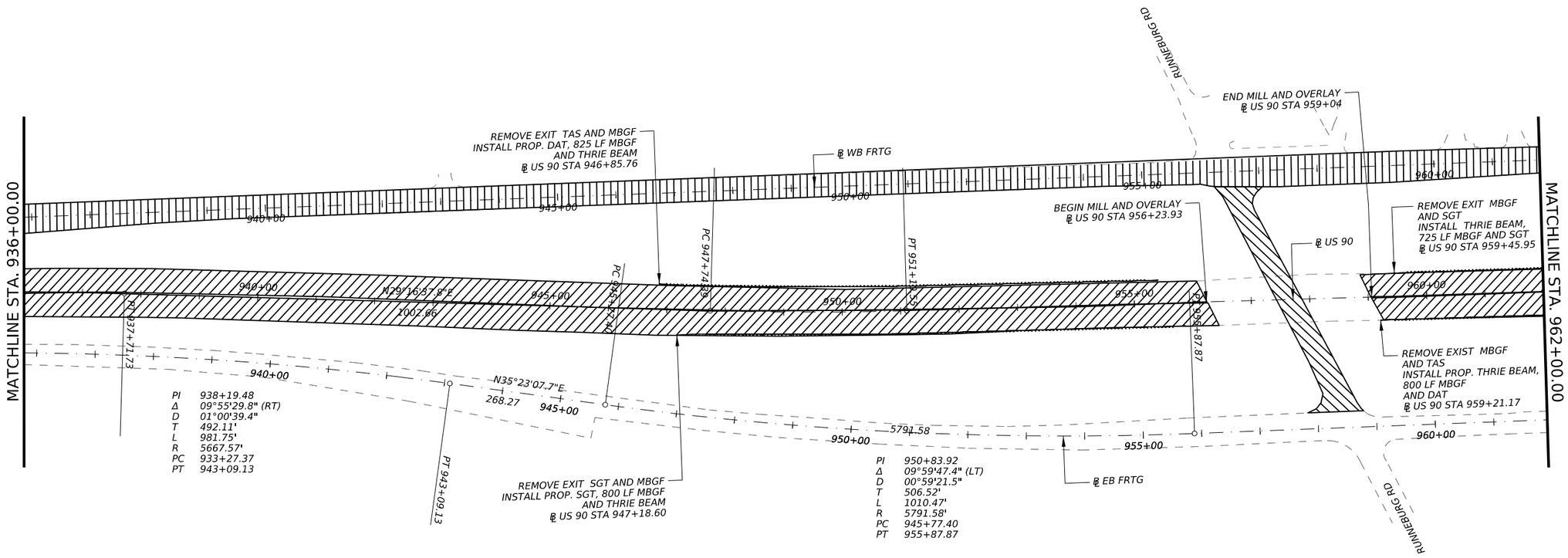

NOTES:

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2. QUANTITIES FOR FLEX PAVEMENT STRUCTURE REPAIR AND FULL DEPTH REPAIR ARE FOR ESTIMATING PURPOSES ONLY. QUANTITIES SHALL BE FIELD VERIFIED.
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LEGEND:

- PROP. 2.5" MILLING, SEAL COAT , 1" TOM C AND 1" TOM F
- PROP. SEAL COAT ,1" TOM C AND 1" TOM F
- PROP. 3.5" MILLING AND, SEAL COAT , 2" SP D AND 1" TOM C
- PROP. 2.5" MILLING AND, UNDERSEAL AND 2" SP D
- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

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US 90

ROADWAY LAYOUT

SHEET 5 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		54

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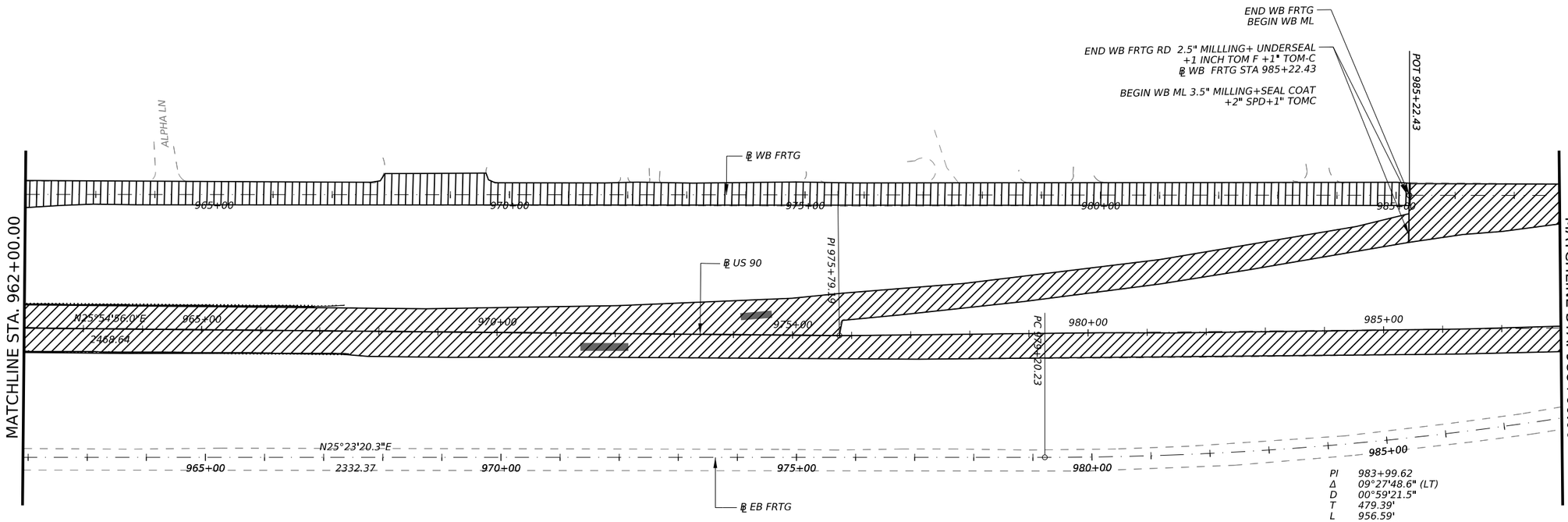

NOTES:

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LEGEND:

- PROP. 2.5" MILLING, SEAL COAT , 1" TOM C AND 1" TOM F
- PROP. SEAL COAT ,1" TOM C AND 1" TOM F
- PROP. 3.5" MILLING AND, SEAL COAT , 2" SP D AND 1" TOM C
- PROP. 2.5" MILLING AND, UNDERSEAL AND 2" SP D
- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

STATE OF TEXAS
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US 90

ROADWAY LAYOUT

SHEET 6 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		55

DATE: 1/25/2024 1:36:08 PM
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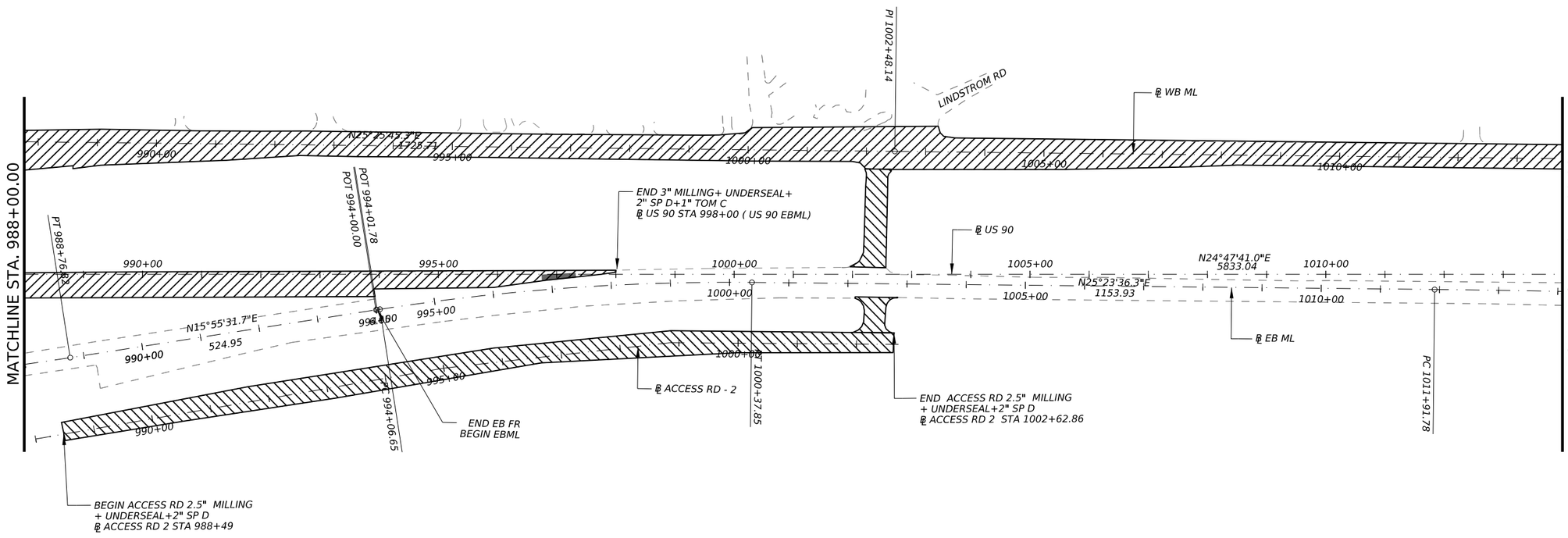

NOTES:

1. FOR ACP OVERLAY DETAILS , BASE REPAIR AND DRIVEWAY OVERLAY DETAILS REFER TO SHEET 67-68.
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LEGEND:

- PROP. 2.5" MILLING, SEAL COAT , 1" TOM C AND 1" TOM F
- PROP. SEAL COAT ,1" TOM C AND 1" TOM F
- PROP. 3.5" MILLING AND, SEAL COAT , 2" SP D AND 1" TOM C
- PROP. 2.5" MILLING AND, UNDERSEAL AND 2" SP D
- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

STATE OF TEXAS
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Sharmeen Rahman, PE

01/29/2024

Texas Department of Transportation

US 90

ROADWAY LAYOUT

SHEET 7 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		56

DATE: 1/25/2024 1:37:16 PM
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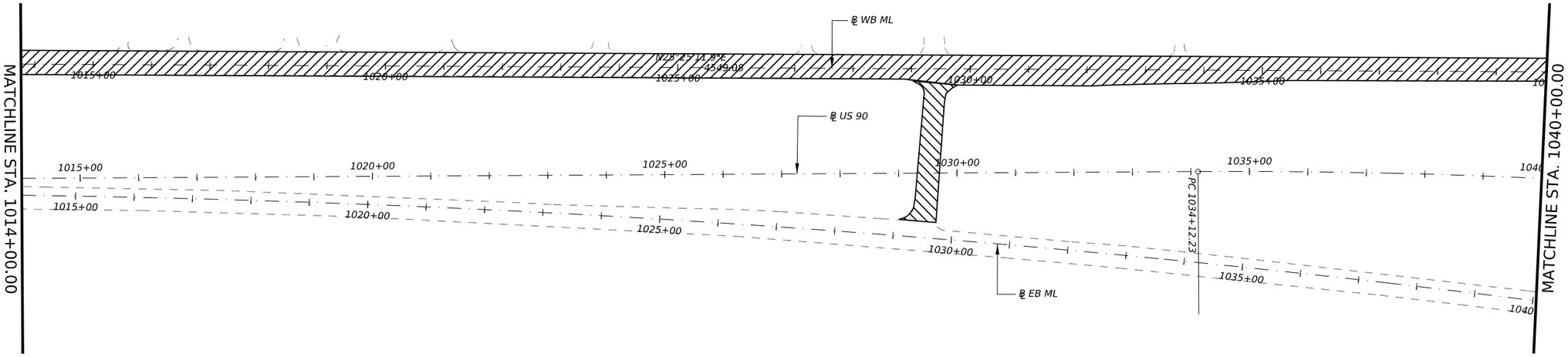

NOTES:

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LEGEND:

- PROP. 2.5" MILLING, SEAL COAT , 1" TOM C AND 1" TOM F
- PROP. SEAL COAT ,1" TOM C AND 1" TOM F
- PROP. 3.5" MILLING AND, SEAL COAT , 2" SP D AND 1" TOM C
- PROP. 2.5" MILLING AND, UNDERSEAL AND 2" SP D
- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

STATE OF TEXAS
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Sharmeen Rahman, P.E.

01/29/2024

Texas Department of Transportation

US 90

ROADWAY LAYOUT

SHEET 8 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		57

DATE: 1/25/2024 1:38:39 PM
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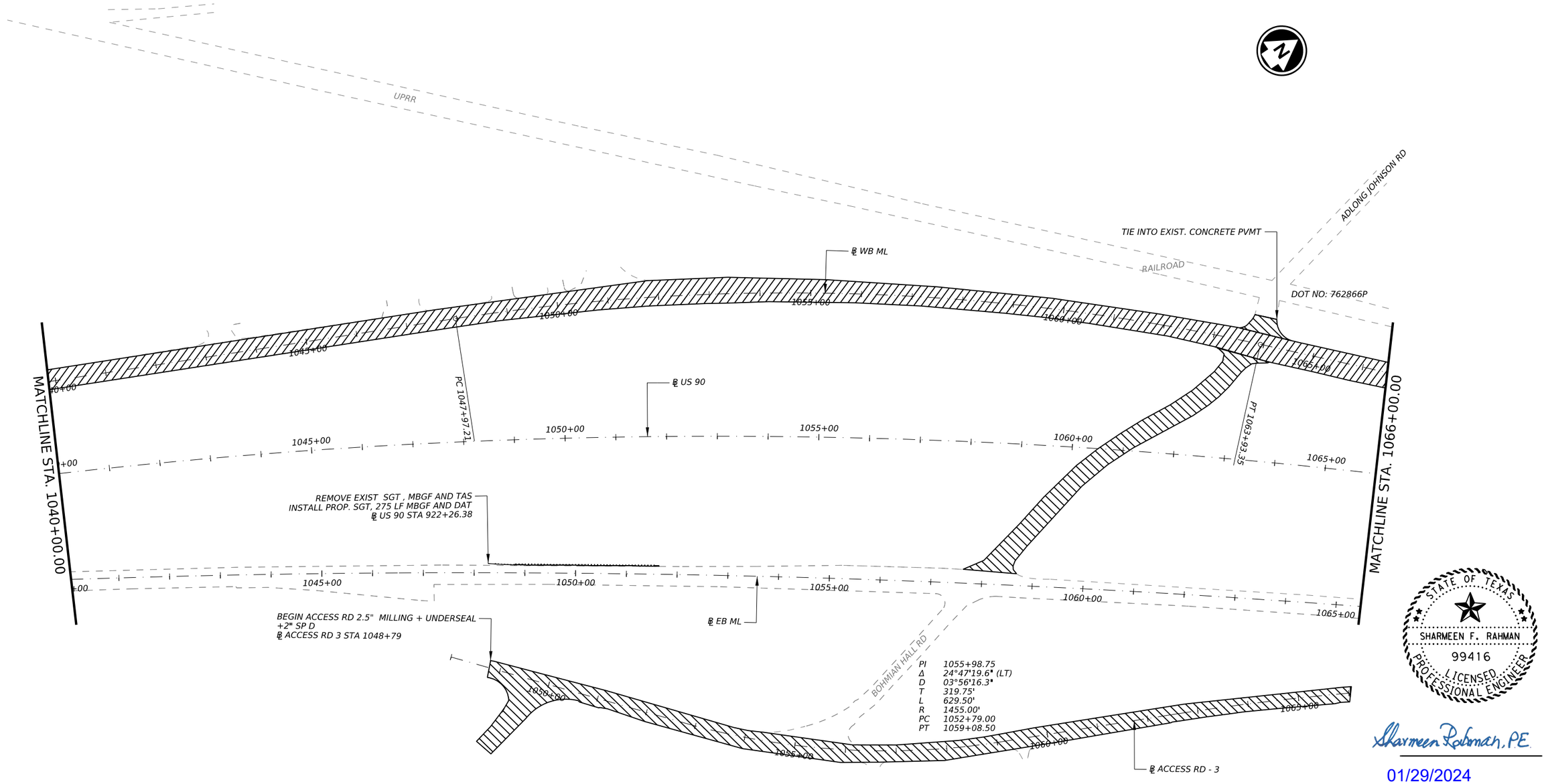

NOTES:

1. FOR ACP OVERLAY DETAILS , BASE REPAIR AND DRIVEWAY OVERLAY DETAILS REFER TO SHEET 67-68.
2. QUANTITIES FOR FLEX PAVEMENT STRUCTURE REPAIR AND FULL DEPTH REPAIR ARE FOR ESTIMATING PURPOSES ONLY. QUANTITIES SHALL BE FIELD VERIFIED.
3. BRIDGES WILL BE EXCLUDED FROM MILL AND OVERLAY AND WILL ONLY BE RESTRIPED.

LEGEND:

- PROP. 2.5" MILLING, SEAL COAT , 1" TOM C AND 1" TOM F
- PROP. SEAL COAT ,1" TOM C AND 1" TOM F
- PROP. 3.5" MILLING AND, SEAL COAT , 2" SP D AND 1" TOM C
- PROP. 2.5" MILLING AND, UNDERSEAL AND 2" SP D
- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
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PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

Texas Department of Transportation

US 90

ROADWAY LAYOUT

EXHIBIT "A"
UPRR DOT 762866P RRMP 338.220
HOUSTON SUB SUBDIVISION

SHEET 9 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		58

DATE: 1/25/2024 1:41:01 PM
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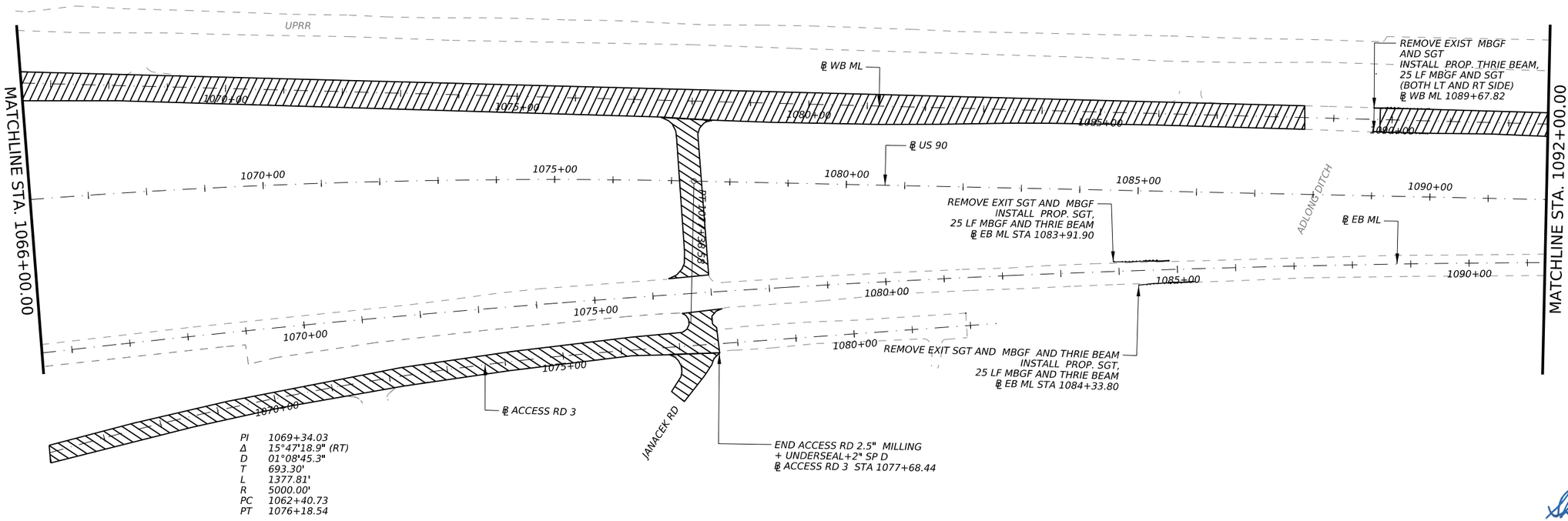

NOTES:

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- PROP. SEAL COAT ,1" TOM C AND 1" TOM F
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- PROP. 2.5" MILLING AND, UNDERSEAL AND 2" SP D
- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

STATE OF TEXAS
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01/29/2024

Texas Department of Transportation

US 90

ROADWAY LAYOUT

SHEET 10 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		59

DATE: 1/25/2024 1:42:25 PM
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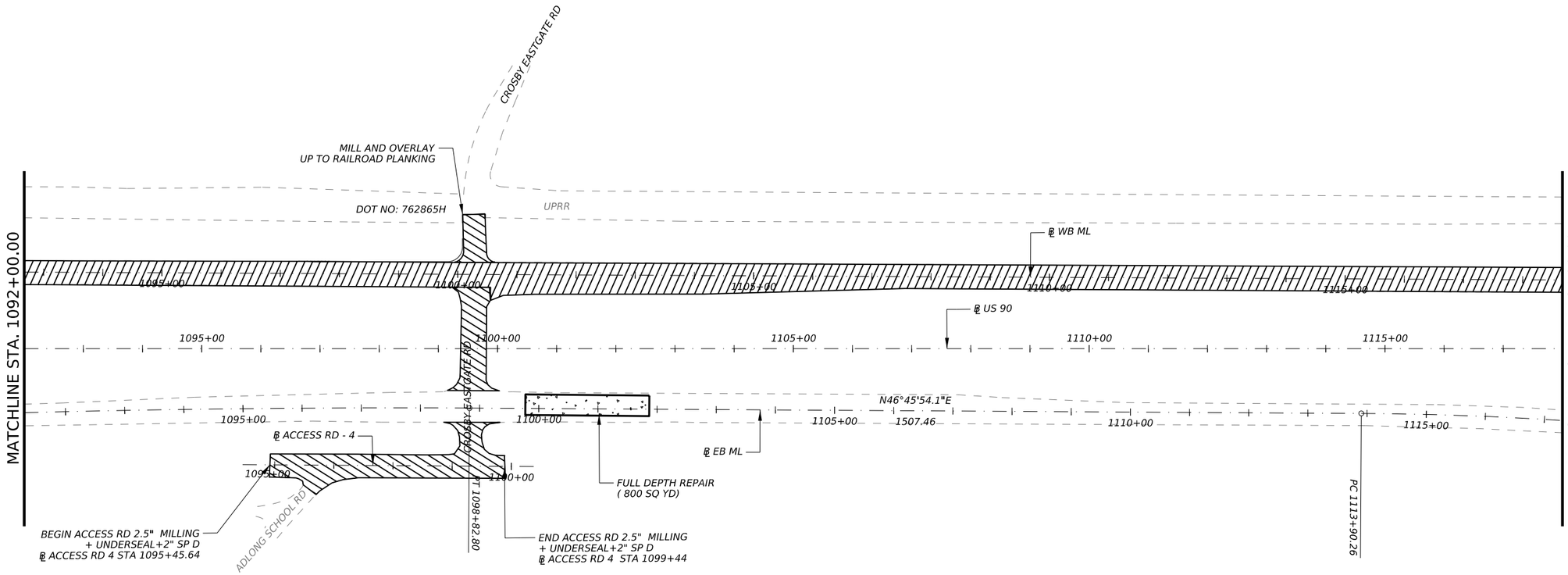

NOTES:

1. FOR ACP OVERLAY DETAILS , BASE REPAIR AND DRIVEWAY OVERLAY DETAILS REFER TO SHEET 67-68.
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- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

STATE OF TEXAS
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Texas Department of Transportation

US 90

ROADWAY LAYOUT

EXHIBIT "A"
UPR DOT 762865H RRMP 337.530
HOUSTON SUB SUBDIVISION

SHEET 11 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		60

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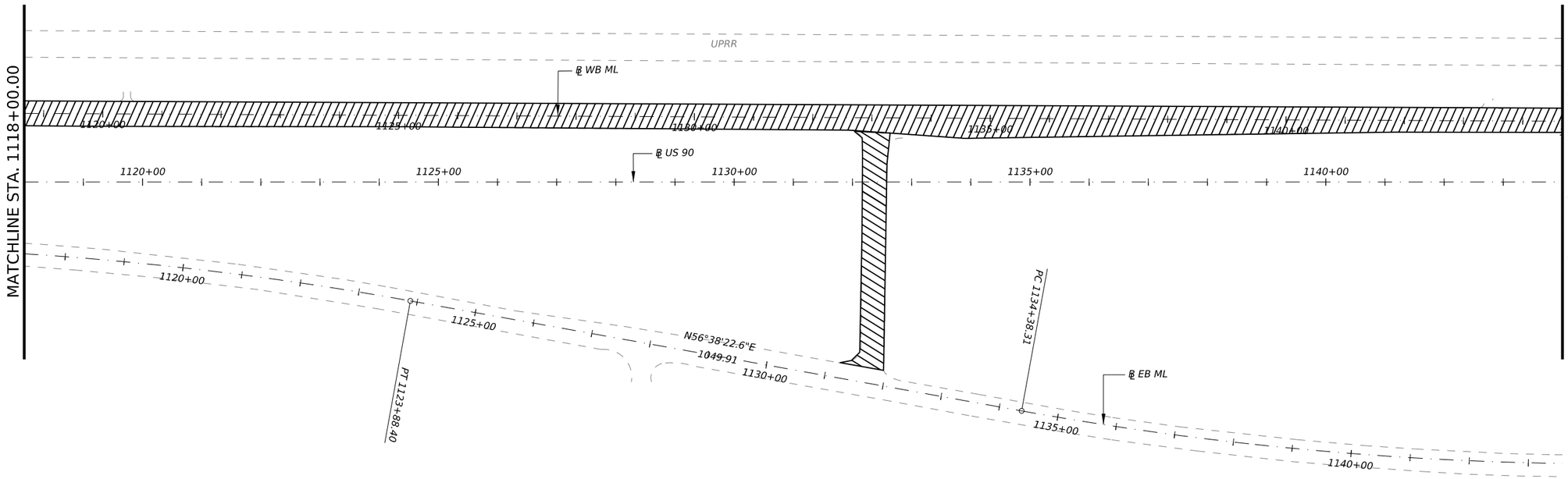

NOTES:

1. FOR ACP OVERLAY DETAILS , BASE REPAIR AND DRIVEWAY OVERLAY DETAILS REFER TO SHEET 67-68.
2. QUANTITIES FOR FLEX PAVEMENT STRUCTURE REPAIR AND FULL DEPTH REPAIR ARE FOR ESTIMATING PURPOSES ONLY. QUANTITIES SHALL BE FIELD VERIFIED.
3. BRIDGES WILL BE EXCLUDED FROM MILL AND OVERLAY AND WILL ONLY BE RESTRIPED.

LEGEND:

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- PROP. SEAL COAT ,1" TOM C AND 1" TOM F
- PROP. 3.5" MILLING AND, SEAL COAT , 2" SP D AND 1" TOM C
- PROP. 2.5" MILLING AND, UNDERSEAL AND 2" SP D
- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

STATE OF TEXAS
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01/29/2024

Texas Department of Transportation

US 90

ROADWAY LAYOUT

SHEET 12 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		61

DATE: 1/25/2024 1:59:58 PM
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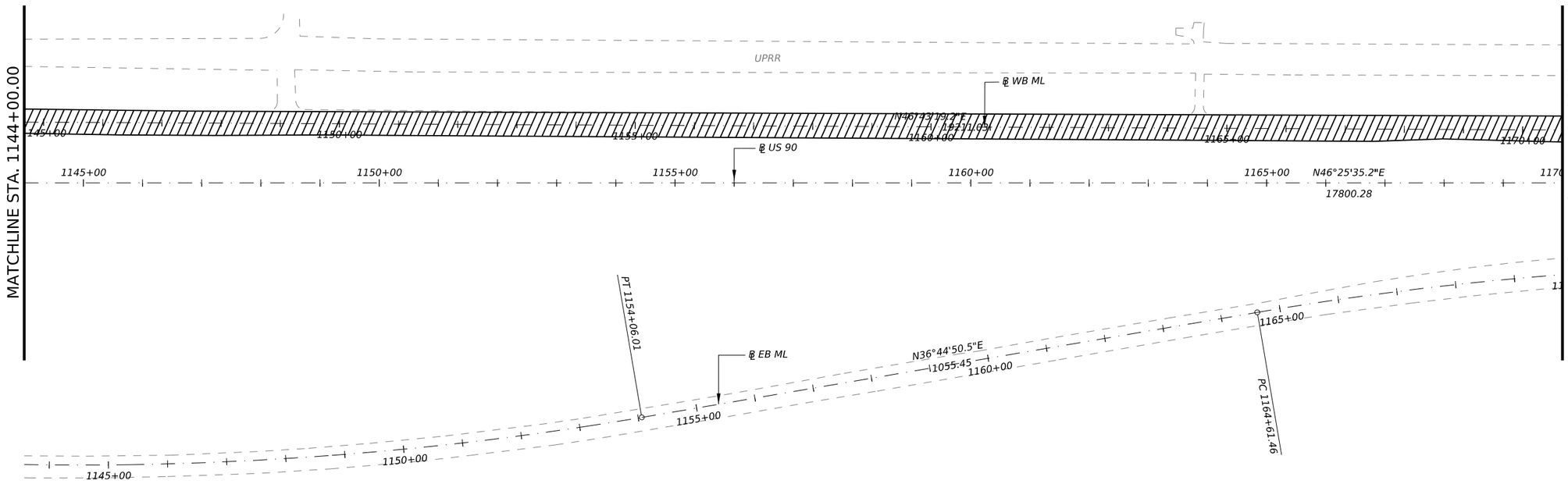

NOTES:

1. FOR ACP OVERLAY DETAILS , BASE REPAIR AND DRIVEWAY OVERLAY DETAILS REFER TO SHEET 67-68.
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- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

STATE OF TEXAS
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01/29/2024

Texas Department of Transportation

US 90

ROADWAY LAYOUT

SHEET 13 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		62

DATE: 1/25/2024 1:47:05 PM
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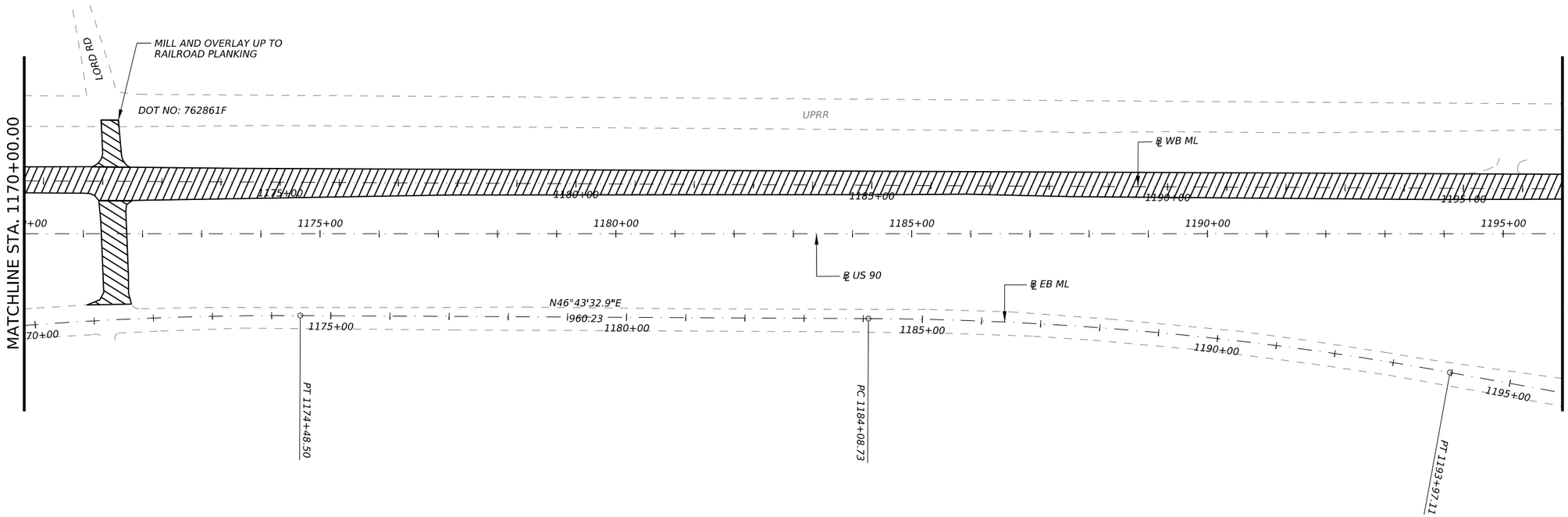

NOTES:

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- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

STATE OF TEXAS
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01/29/2024

Texas Department of Transportation

US 90

ROADWAY LAYOUT

EXHIBIT "A"
UPRR DOT 762861F RRMP 336.260
LAFAYETTE SUBDIVISION

SHEET 14 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		63

DATE: 1/25/2024 1:48:56 PM
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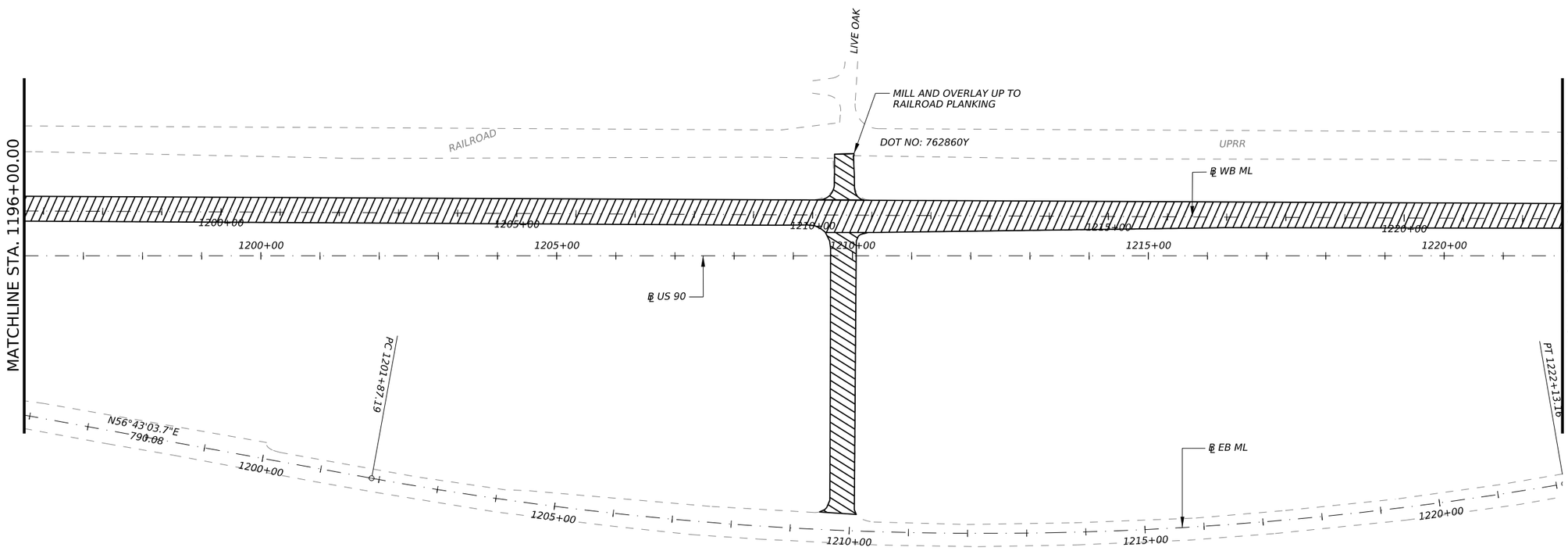

NOTES:

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- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

STATE OF TEXAS
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01/29/2024

Texas Department of Transportation

US 90

ROADWAY LAYOUT

EXHIBIT "A"
UPRR DOT 762860Y RRMP 335.540
HOUSTON SUBDIVISION

SHEET 15 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		64

DATE: 1/25/2024 1:52:45 PM
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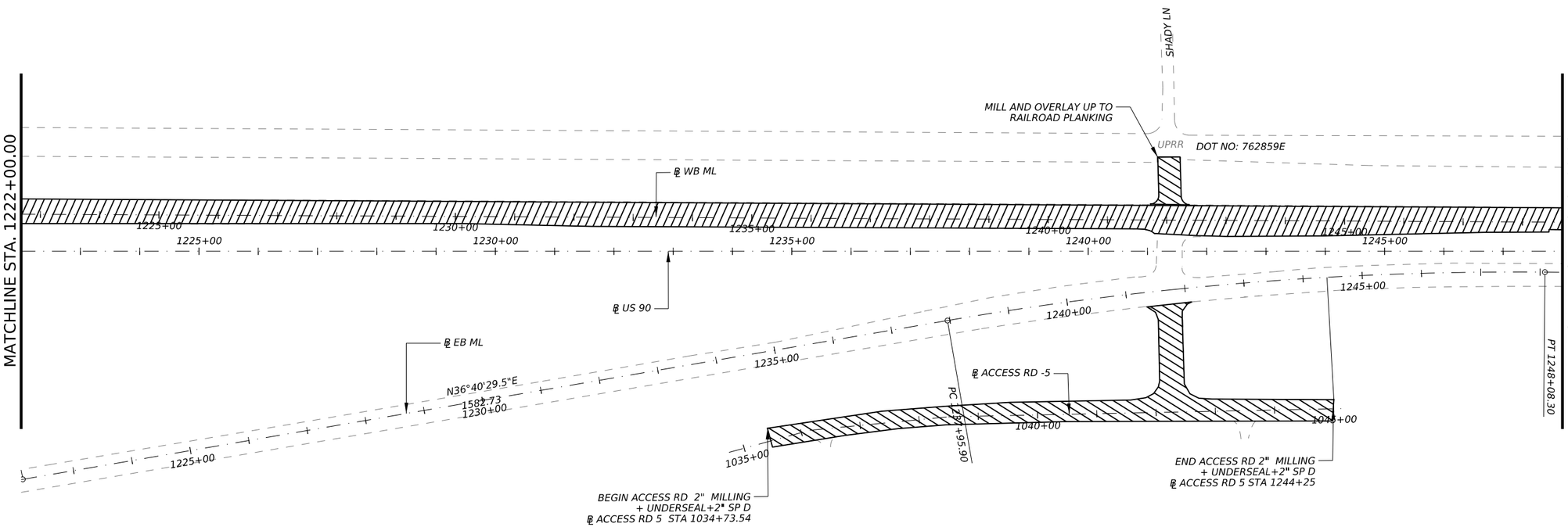

NOTES:

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- PROP. 2.5" MILLING AND, UNDERSEAL AND 2" SP D
- PROP. 0-2.5" MILLING
- PROP. FULL DEPTH REPAIR
- PROP. FLEX BASE REPAIR

STATE OF TEXAS
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01/29/2024

Texas Department of Transportation

US 90

ROADWAY LAYOUT

EXHIBIT "A"
UPRR DOT 762859E RRMP 334.910
LAFAYETTE SUBDIVISION

SHEET 16 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		65

DATE: 1/25/2024 1:53:59 PM
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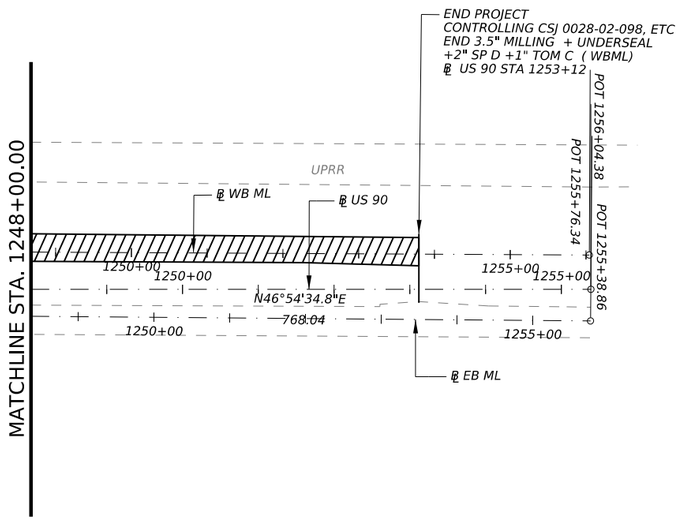

NOTES:

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- PROP. FLEX BASE REPAIR

STATE OF TEXAS
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01/29/2024

Texas Department of Transportation

US 90

ROADWAY LAYOUT

SHEET 17 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		66

DATE: 1/25/2024 2:02:01 PM
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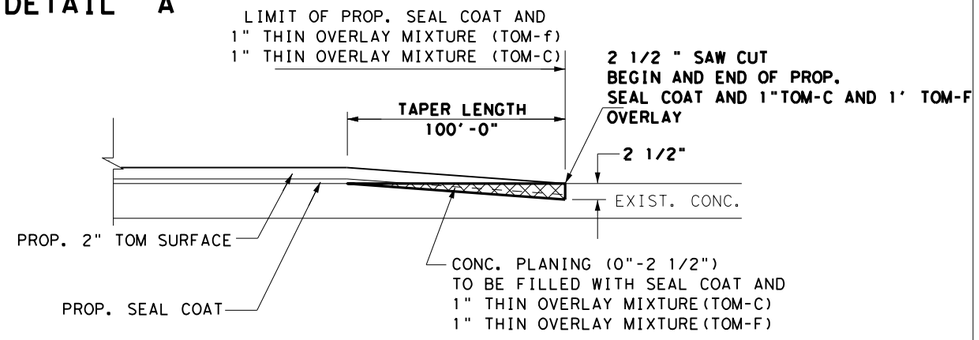
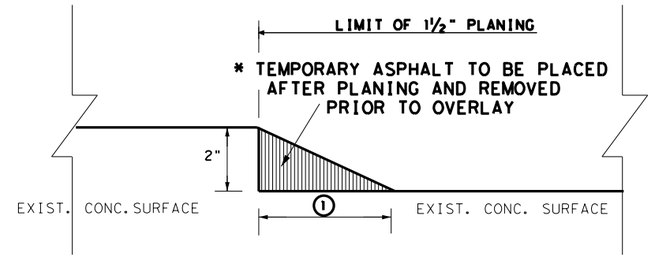
DN: CK: DW: CK:

DETAIL "A"



SURFACE TAPER (BEGINNING & END)

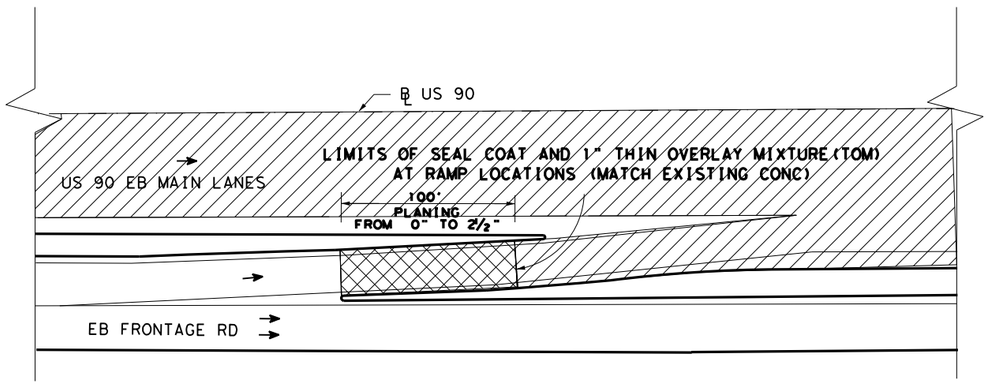


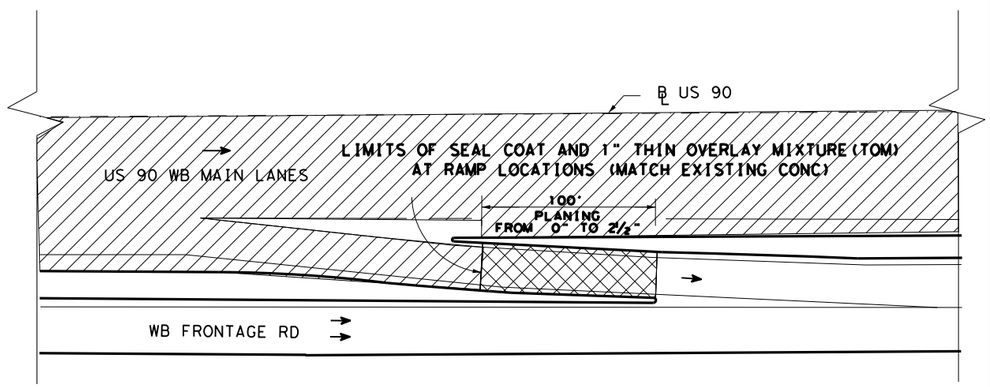
① FOR APPROACH AND DEPARTURE TRAFFIC USE 10:1 TAPER (10 FEET PER INCH)
FOR PARALLEL TRAFFIC USE 1 FT TAPER WITH 1 ½" DROP OFF

* THIS WORK WILL NOT BE PAID FOR DIRECTLY AND WILL BE SUBSIDIARY TO THE PLANING BID ITEMS.

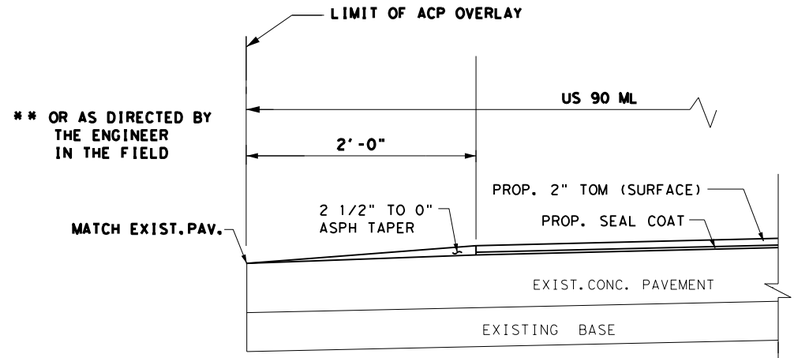
TEMPORARY ASPHALT DETAIL

DETAIL "B"





EXIT / ENTRANCE RAMP ACP OVERLAY DETAILS



AT ROADWAYS (CONCRETE PAVEMENT)

PROP. SEAL COAT AND
2" THIN OVERLAY MIXTURE(1" TOM- C AND 1" TOM-F)

PROP. PLANING (0"-2 1/2")
TO BE FILLED WITH SEAL COAT AND
1" TOM-C AND 1" TOM-F

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US 90

ACP OVERLAY DETAILS
ON CONCRETE PAVEMENT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc.	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		67

DATE: 11/9/2023 3:22:37 PM
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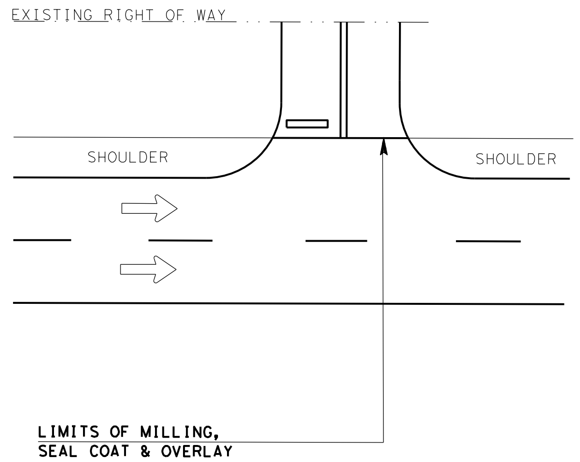
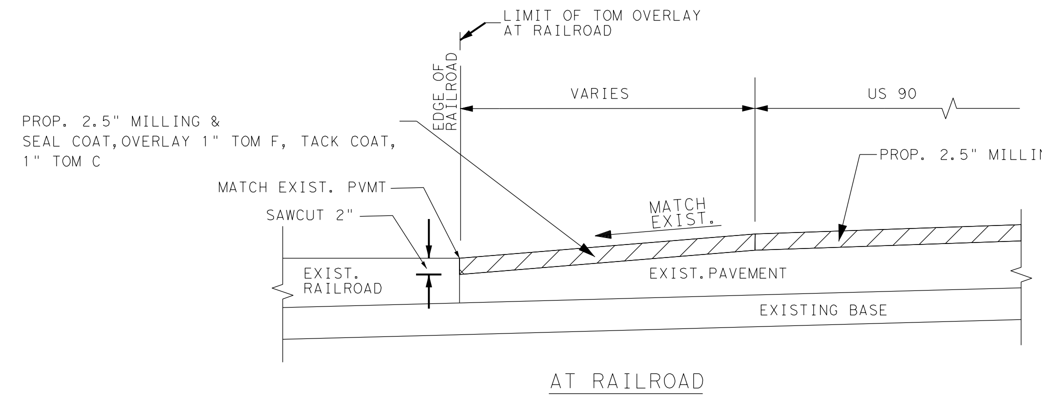


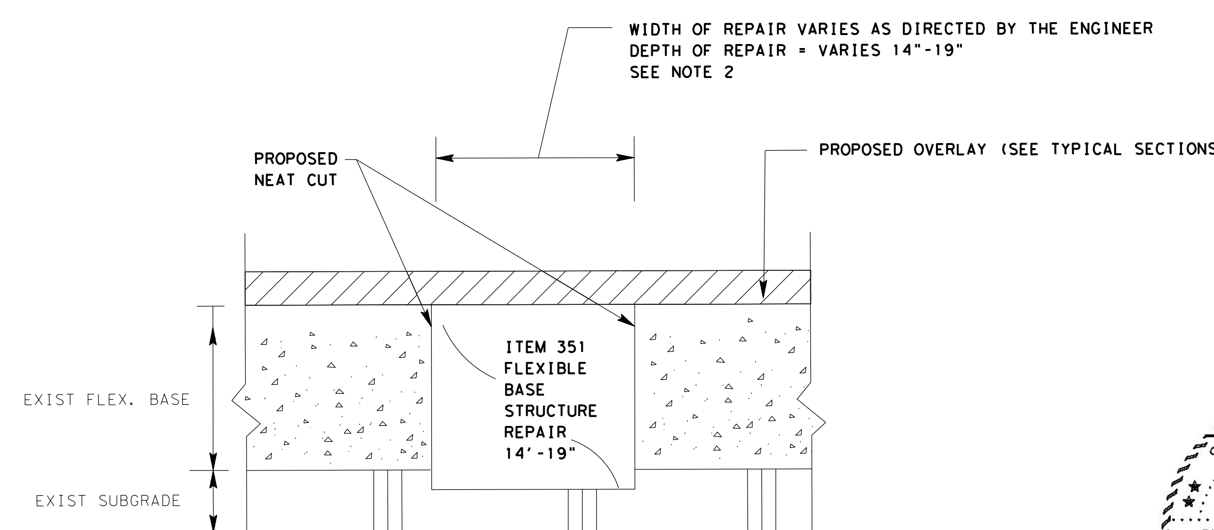
PROPOSED LIMITS OF WORK



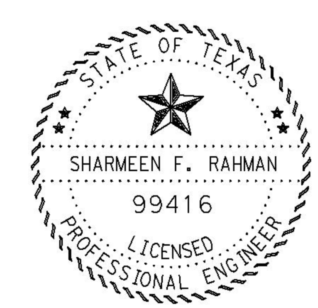
DETAIL A
AT RAILROAD

NOTES:

1. THE ENGINEER SHALL MARK AND VERIFY ALL AREAS TO BE REPAIRED PRIOR TO COMMENCEMENT OF WORK.
2. QUANTITIES SHOWN IN THE PLANS ARE FOR BASIS OF ESTIMATE ONLY AND WILL VARY AS DETERMINED BY THE ENGINEER.
3. FLEXIBLE PAVEMENT STRUCTURE REPAIR SHALL BE PERFORMED IN ACCORDANCE WITH ITEM 351.
4. THE MATERIAL FOR BASE REPAIR SHALL BE ASPHALT STABILIZED BASE CONFORMING TO ITEM 292. USE GRADE 2, PG 64.
5. SAW CUTS SHALL BE SUBSIDIARY TO ITEM 351.
6. ON BASE REPAIR LOCATION, THE SIDES SHALL BE CUT VERTICAL, THEN CLEANED OF ALL LOOSE MATERIAL AND TACK COATED PRIOR TO ANY PLACEMENT OF ASPHALT STABILIZED BASE.



DETAIL 'B'
BASE REPAIR DETAIL



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01/29/2024

Texas Department of Transportation

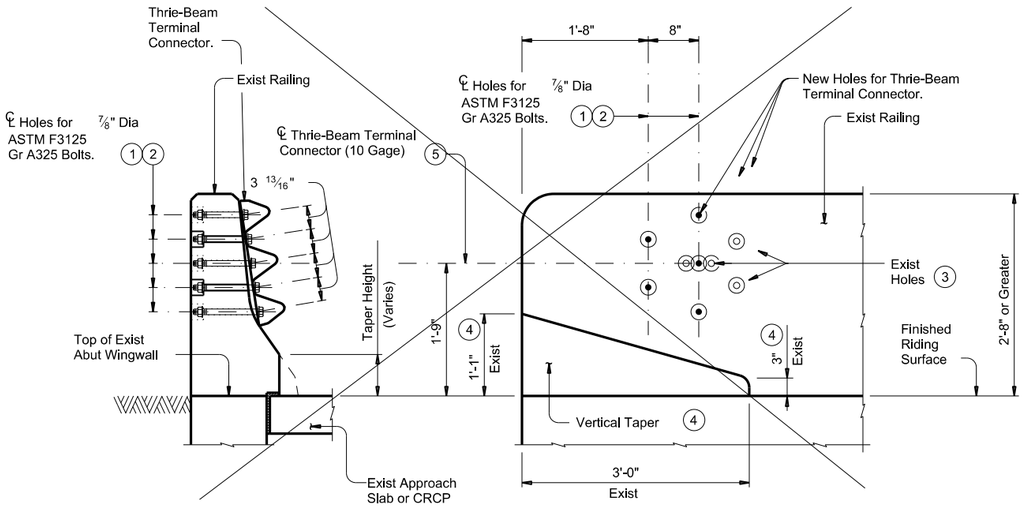
US 90

BASE REPAIR AND DRIVEWAY DETAILS

SHEET OF

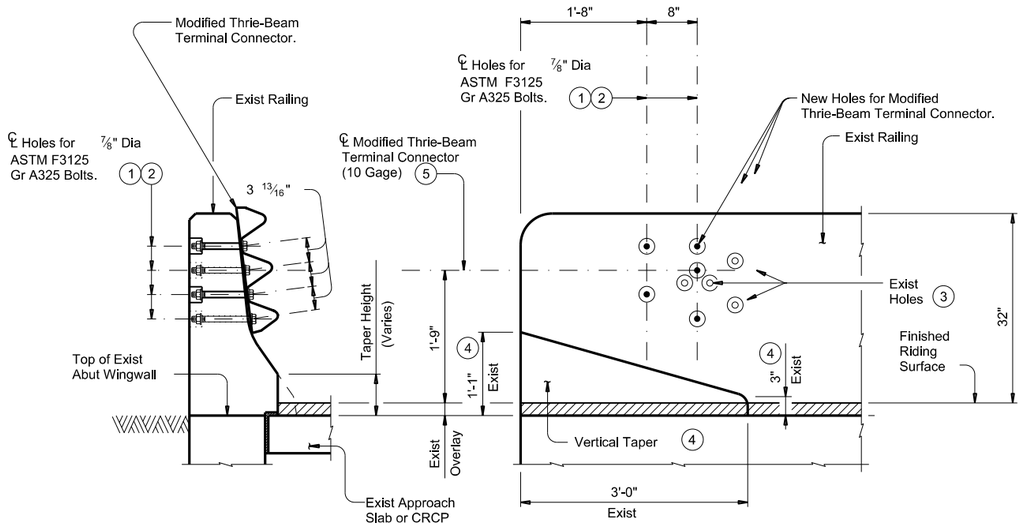
CONT	SECT	JOB	HIGHWAY
0028	02	098,etc.	US 90

DIST	COUNTY	SHEET NO.
HOU	HARRIS	68



SECTION ELEVATION

TERMINAL CONNECTION ON EXISTING RAIL WITHOUT OVERLAY



SECTION ELEVATION

TERMINAL CONNECTION ON EXISTING RAIL WITH OVERLAY

(1) ℄ 5 ~ 1" Dia holes and 2 ½" Dia x 2" deep recesses. Holes and recesses must be core drilled. Percussion drilling is not permitted. Concrete spalls in rail exceeding ½" from edge of holes will be patched in accordance with Item 429, "Concrete Structure Repair" at the contractor's expense. Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail.

(2) ℄ 5 ~ 7/8" Dia F3125 Gr A325 Bolts with two 1 3/4" O.D. washers. Place washer under each head and nut. The 5 Terminal Connection Bolts must be tightened in a well distributed pattern so to prevent damage or distortion of the Thrie-Beam Connection and the MBGF Transition. Bolts must be cut off after installation so as to extend no more than 3/4" beyond nut. End of cut-off bolt must be painted with two coats of zinc-rich paint conforming to the Item "Galvanizing".

(3) Existing anchor bolt holes in rail that can not be utilized and are within 3" of a new bolt hole must be filled with an epoxy grout prior to coring new holes.

(4) If vertical taper is not present, then a vertical taper must be field cut to limits shown when the existing rail measurement is 2'-8". Rail measurement should be taken from behind rail as to not include overlay if present. If existing rail measurement is 2'-10" and existing rail does not have vertical taper, then add 2" to vertical dimensions and field cut vertical taper. Any exposed reinforcing steel from field cut taper must be ground flush and painted with two coats of zinc-rich paint conforming to the Item "Galvanizing".

(5) 10 Gage Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Metal Beam Guard Fence Transitions must be attached to the bridge rail and extended along the embankment unless otherwise shown in the plans.

(6) Terminal Connector must be modified for the Terminal Connection on Existing Rail with Overlay with two new 1" Dia holes as shown. Top new 1" Dia hole is used in lieu of existing top hole in terminal connector. All other existing holes in terminal connector must be used. Additional hole on bottom of terminal connector is used for other side for opposite hand. Damage to galvanization caused by this modification must be painted with two coats of zinc-rich paint conforming to the Item "Galvanizing".

This sheet is intended as a guide in preparing job-specific details to retrofit existing T5/T501/T502 rails with a Thrie-Beam terminal connector. This sheet may not be used without modification. The details shown may need to be amended if the exact existing conditions are not covered. In all cases, details and notes not required are to be removed or crossed out, "(MOD)" added, and the phrase "(Not to be used as a standard)" removed from the title block. This sheet must be signed, sealed, and dated by a registered Professional Engineer.

The effective height of the existing rail (at the terminal connector location) above the finished riding surface, as seen by an errant vehicle, must be between 2'-5" and 2'-10". Alternate methods of retrofit must be used for effective heights beyond these limits. Dimensions of existing rail height (traffic side) should be shown. Particular care should be taken in identifying existing rail conditions and providing for proper MBGF transition positioning.

CONSTRUCTION NOTES:

Field verify dimensions before commencing work and ordering materials.

Remove any MBGF (W-beam) and attachment hardware, from the face of rail if present, prior to installation of new MBGF Transition. Dispose of these materials as directed by the Engineer. Plugging of exposed existing bolt holes is not necessary except as stated herein or otherwise indicated on the plans. This work is considered subsidiary to the pertinent bid items.

If vertical taper is not present, then a vertical taper must be field cut to limits shown and debris removed.

Attach the MBGF Transition to the existing rail and extend along the embankment using the Thrie-Beam Terminal Connection unless shown otherwise on the plans. Splice the Approach Guard Rail and the Terminal Connection with the normal 12 connection bolts. Refer to Metal Beam Guard Fence detail sheets for additional details and information not shown herein.

MATERIAL NOTES:

Galvanize all steel components unless otherwise noted.

GENERAL NOTES:

These details are shown for retrofitting MBGF transitions to existing rails only and not used for new construction.

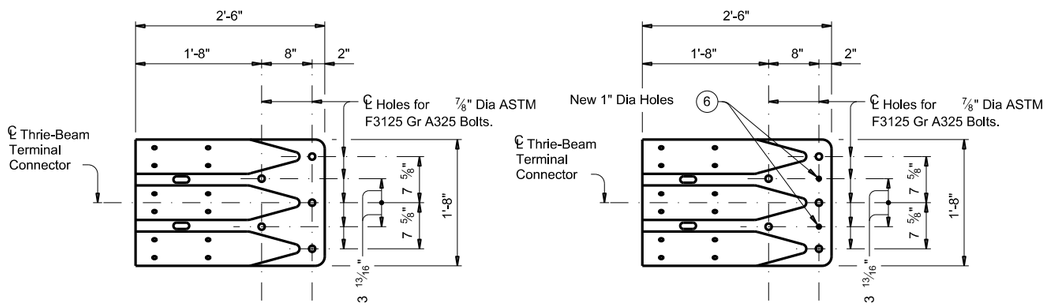
Shop drawings are not required for this installation.

Materials, fabrication and installation of this assembly are to be included in the price bid for "Metal Beam Guard Fence."

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024



THRIE-BEAM TERMINAL CONNECTORS (5)

Texas Department of Transportation

Bridge Division Standard

T5/T501/T502 TRANSITION RETROFIT GUIDE

(NOT TO BE USED AS A STANDARD)

T5/T501/T502TR

FILE:	rlstd039-19.dgn	DN: TxDOT	CK: APK	DW: JTR	CK: APK
©TxDOT	September 2019	CONT	SECT	JOB	HIGHWAY
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		HOU	HARRIS		69

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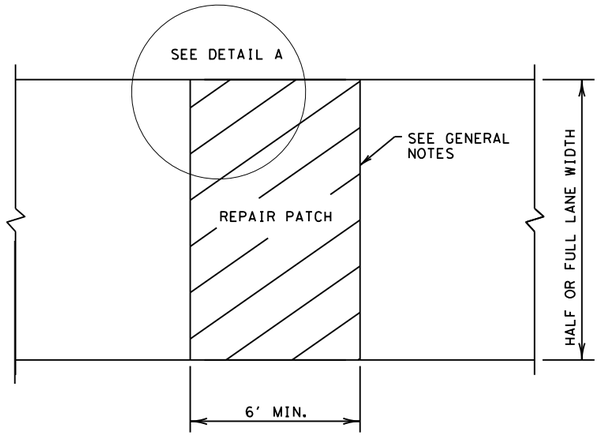
TABLE NO.1 STEEL BAR SIZE AND SPACING						
TYPE PAVEMENT	SLAB THICKNESS AND BAR SIZE		LONGITUDINAL*		TRANSVERSE*	
			REGULAR BARS	TIEBARS	BARS	TIEBARS
	T (IN.)	BAR SIZE	SPACING (IN.)	SPACING (IN.)	SPACING (IN.)	SPACING (IN.)
CRCP	6.0	#5	7.5	7.5	24	24
	6.5		7.0	7.0		
	7.0		6.5	6.5		
	7.5		6.0	6.0		
	8.0	#6	9.0	9.0	24	24
	8.5		8.5	8.5		
	9.0		8.0	8.0		
	9.5		7.5	7.5		
	10.0		7.0	7.0		
	10.5		6.75	6.75		
	11.0		6.5	6.5		
	11.5		6.25	6.25		
	≥12.0		6.0	6.0		
JRCP	<8.0	#5	24.0	12.0	24	24
	≥8.0	#6	24.0	12.0	24	24
CPCD	<8.0	#5	NONE	12.0	NONE	24
	≥8.0	#6	NONE	12.0	NONE	24

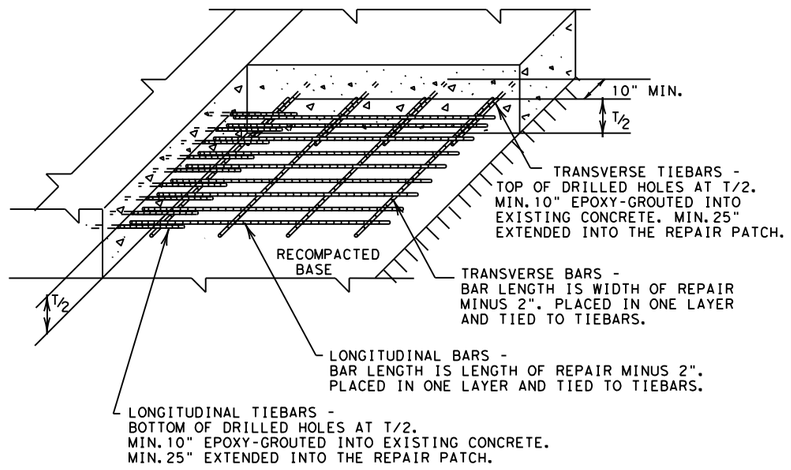
* USE 12" SPACING AS FIRST AND LAST SPACING AT END OR SIDE FOR ALL BARS.

GENERAL NOTES

1. ITEM 361, "REPAIR OF CONCRETE PAVEMENT" SHALL GOVERN FOR THIS WORK.
2. MULTIPLE PIECE TIEBARS SHALL BE USED WHEN THE REPAIR AREA MUST BE PLACED IN TWO STAGES DUE TO SEQUENCE OF CONSTRUCTION.
3. FULL DEPTH SAW CUTS SHALL BE MADE AROUND THE PERIMETER OF THE AREA TO BE REPAIRED. THE CUT SHALL BE MADE AT A RIGHT ANGLE TO THE PAVEMENT EDGE AND TO THE CENTER LINE OF THE PAVEMENT.
4. AT LEAST ONE LONGITUDINAL FULL DEPTH SAW CUT SHALL BE AT AN EXISTING LONGITUDINAL JOINT.
5. ADDITIONAL SAW CUTS MAY BE REQUIRED WITHIN THE AREA OF THE REPAIR TO FACILITATE REMOVAL OF THE CONCRETE OR TO ALLEVIATE BINDING OF THE FULL DEPTH SAW CUT AT THE REPAIR EDGE.
6. THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WILL BE CLEANED AND FILLED WITH A CEMENTITIOUS GROUT APPROVED BY THE ENGINEER.
7. EXISTING LONGITUDINAL AND TRANSVERSE JOINTS REMOVED DUE TO REPAIR OPERATION SHOULD BE RESTORED IN ACCORDANCE WITH STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



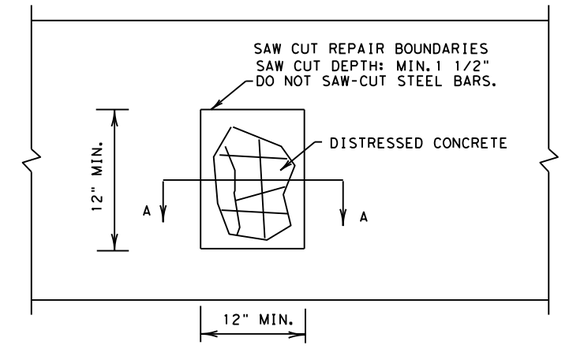
PLAN VIEW



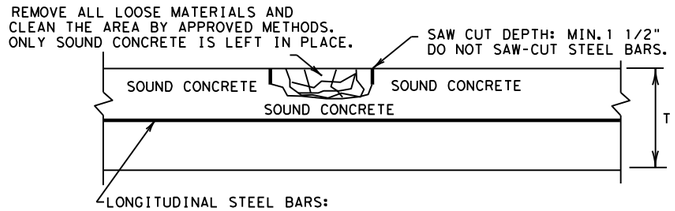
DETAIL A
GROUTED TIEBARS & REINFORCEMENT

GENERAL NOTES

1. ITEM 361, "REPAIR OF CONCRETE PAVEMENT" SHALL GOVERN FOR THIS WORK.
2. THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WILL BE CLEANED AND FILLED WITH A CEMENTITIOUS GROUT APPROVED BY THE ENGINEER.
3. EXISTING LONGITUDINAL AND TRANSVERSE JOINTS REMOVED DUE TO REPAIR OPERATION SHOULD BE RESTORED IN ACCORDANCE WITH STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



PLAN VIEW



LONGITUDINAL STEEL BARS:

*REPAIR AREAS MAY BE ADJUSTED AFTER REMOVING DISTRESSED CONCRETE. SWITCH THE HALF-DEPTH REPAIR TO FULL-DEPTH REPAIR IF EXPOSED EXISTING LONGITUDINAL BARS ARE DEFICIENT, AS APPROVED. COMPENSATION WILL BE MADE FOR UNEXPECTED VOLUMES OF REPAIR AREAS OR CHANGES IN SCOPE OF WORK.

*INCREASE THE REPAIR AREA AND PERFORM A FULL-DEPTH REPAIR AS DIRECTED IF LONGITUDINAL STEEL BARS WERE DAMAGED BY THE REMOVAL OPERATIONS. NO ADDITIONAL COMPENSATION WILL BE MADE.

SECTION A-A

HALF-DEPTH REPAIR

FULL-DEPTH REPAIR OF CRCP, JRCP, AND CPCD

Texas Department of Transportation

Design Division Standard

REPAIR OF CONCRETE PAVEMENT

REPCP-14

FILE: repcp14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
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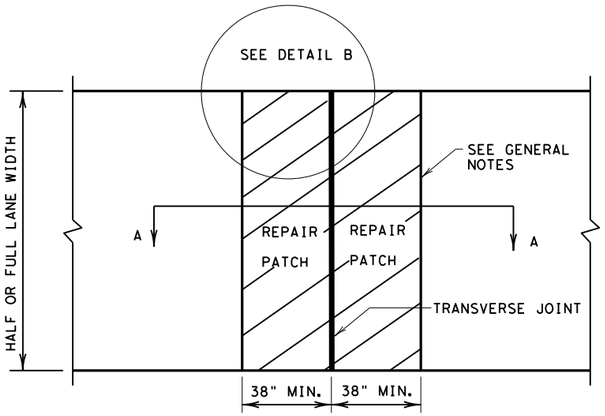
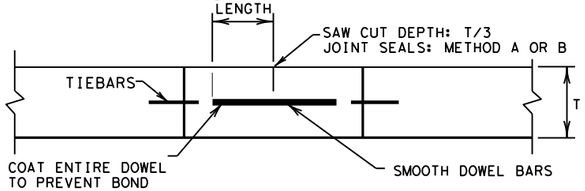
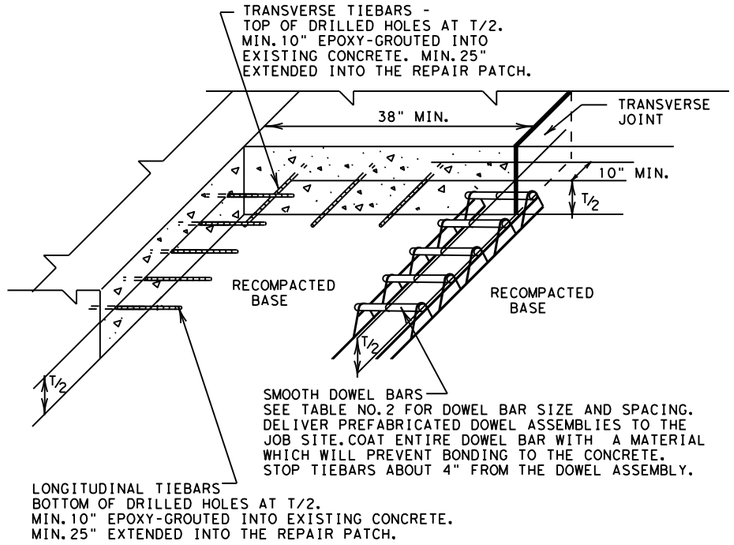


PLAN VIEW



SECTION A-A



DETAIL B
GROUTED TIEBARS & DOWELS

GENERAL NOTES

1. ITEM 361, "REPAIR OF CONCRETE PAVEMENT" SHALL GOVERN FOR THIS WORK.
2. MULTIPLE PIECE TIEBARS SHALL BE USED WHEN THE REPAIR AREA MUST BE PLACED IN TWO STAGES DUE TO SEQUENCE OF CONSTRUCTION.
3. FULL DEPTH SAW CUTS SHALL BE MADE AROUND THE PERIMETER OF THE AREA TO BE REPAIRED. THE CUT SHALL BE MADE AT A RIGHT ANGLE TO THE PAVEMENT EDGE AND TO THE CENTER LINE OF THE PAVEMENT.
4. AT LEAST ONE LONGITUDINAL FULL DEPTH SAW CUT SHALL BE AT AN EXISTING LONGITUDINAL JOINT.
5. ADDITIONAL SAW CUTS MAY BE REQUIRED WITHIN THE AREA OF THE REPAIR TO FACILITATE REMOVAL OF THE CONCRETE OR TO ALLEVIATE BINDING OF THE FULL DEPTH SAW CUT AT THE REPAIR EDGE.
6. THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WILL BE CLEANED AND FILLED WITH A CEMENTITIOUS GROUT APPROVED BY THE ENGINEER.
7. EXISTING LONGITUDINAL AND TRANSVERSE JOINTS REMOVED DUE TO REPAIR OPERATION SHOULD BE RESTORED IN ACCORDANCE WITH STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."
8. DOWEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1/4 IN. HORIZONTALLY AND VERTICALLY UNLESS OTHERWISE SPECIFIED. WHERE DOWEL BAR BASKETS ARE USED, REMOVE THE SHIPPING WIRES.

TABLE NO. 2 DOWELS (SMOOTH BARS)			
PAVEMENT THICKNESS (INCHES)	SIZE AND DIA.	LENGTH (IN.)	SPACING (IN.)
<10	#8 (1 IN.)	18.0	12.0
≥10	#10 (1¼ IN.)		

REPAIR OF TRANSVERSE JOINT OF CPCD

Texas Department of Transportation — Design Division Standard

REPAIR OF CONCRETE PAVEMENT

REPCP-14

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REVISIONS	0028	02	098,etc.	US 90
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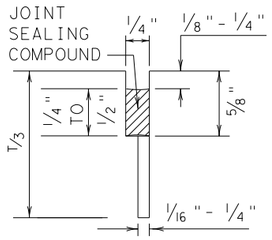
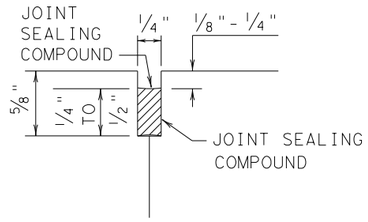
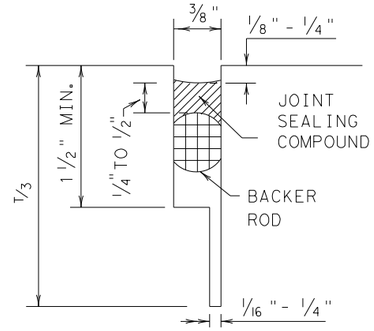
METHOD B: JOINT SEALING COMPOUND



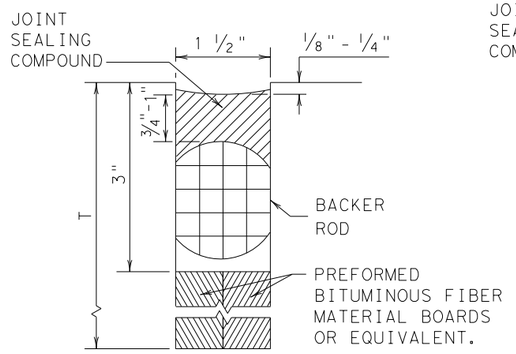
LONGITUDINAL SAWED CONTRACTION JOINT



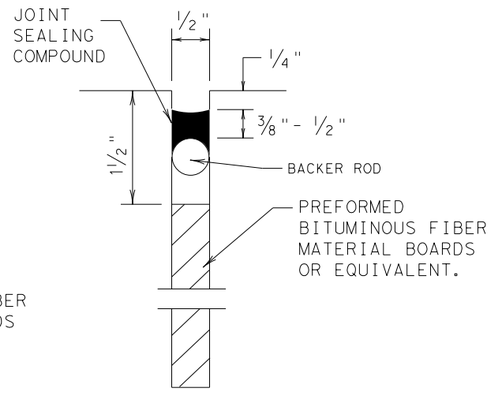
LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT

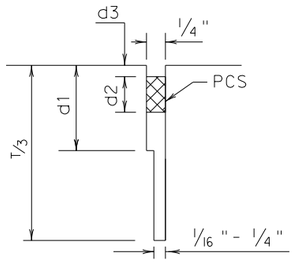


TRANSVERSE FORMED EXPANSION JOINT

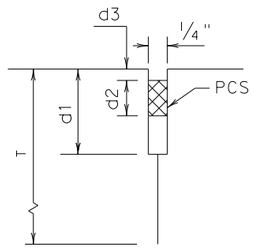


FORMED ISOLATION JOINT

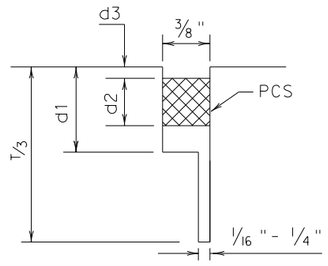
METHOD A: PREFORMED COMPRESSION SEALS (PCS)(DMS-6310 CLASS 6)



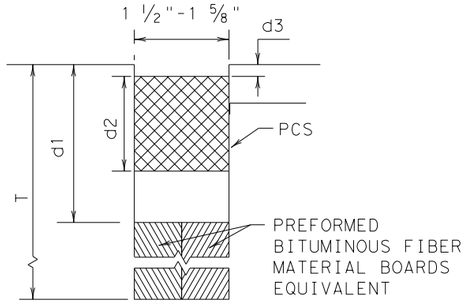
LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT



TRANSVERSE FORMED EXPANSION JOINT

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
2. THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
3. THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
4. DIMENSIONS d1, d2, AND d3 SHOWN IN METHOD A SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
5. REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
6. FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
7. FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4,5,7,OR 8 FOR MAINTAINING EXISTING JOINTS.
8. THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS" OR ITEM 713 "CLEANING AND SEALING JOINTS AND CRACKS (CONCRETE PAVEMENT)".
9. ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A PAVEMENT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, CURB AND GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LIGHTING STRUCTURES.

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CONCRETE PAVING DETAILS

JOINT SEALS

JS-14

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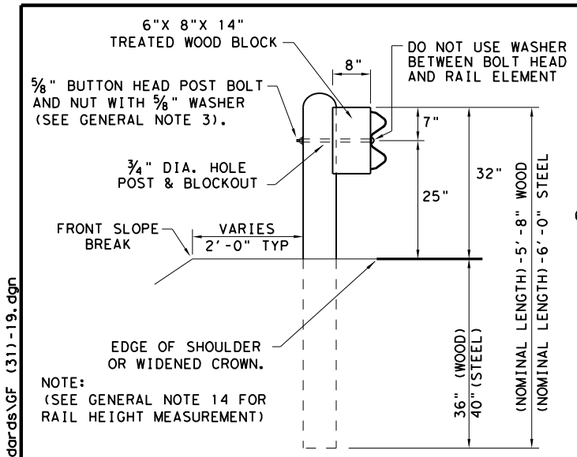
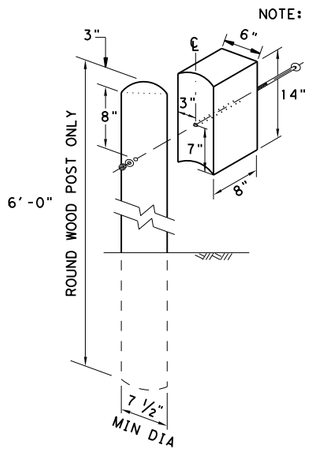
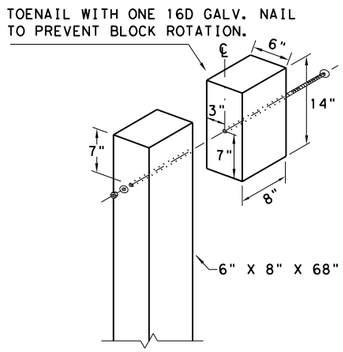


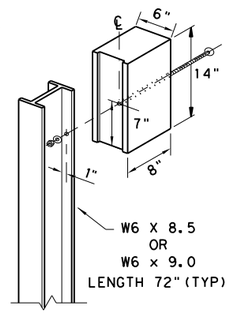
TYPICAL POST PLACEMENT



WOOD BLOCK TO ROUND WOOD POST

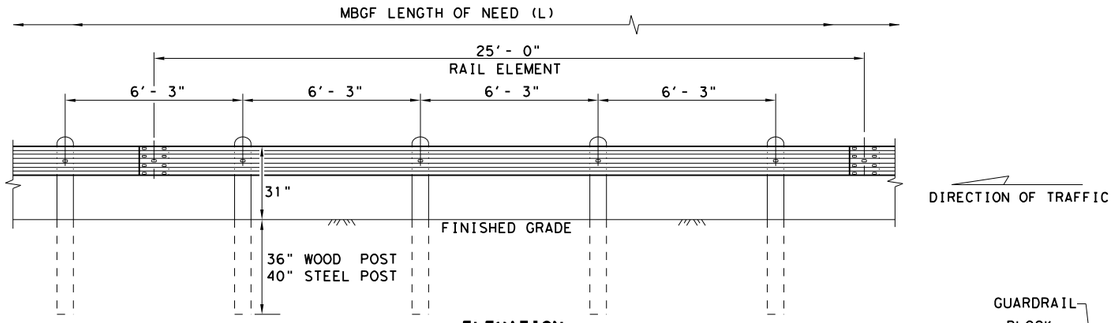


WOOD BLOCK TO RECTANGULAR WOOD POST



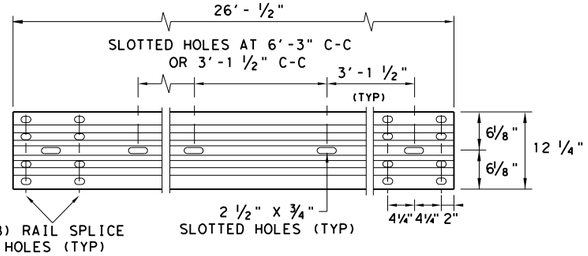
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



ELEVATION
MID-SPAN RAIL SPLICE

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



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

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

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

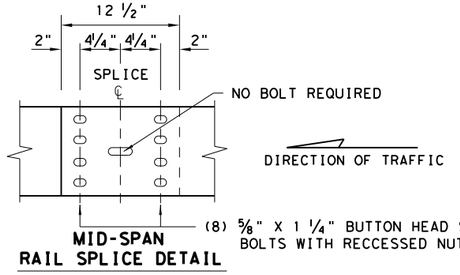
SPLICE BOLT LENGTH → VARIES

FBB01 = 1 ¼"
FBB02 = 2"
⅝"

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

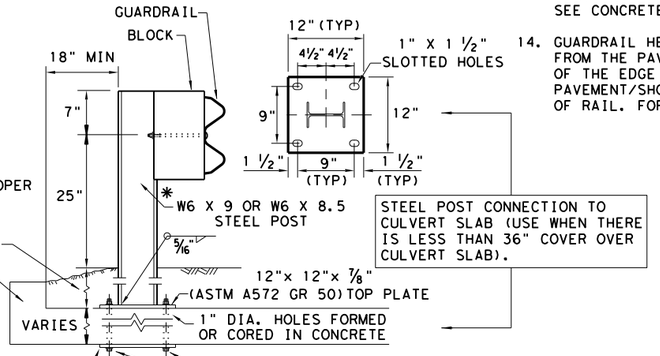
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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
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REVISIONS	0028	02	098,etc.	US 90
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	HOU	HARRIS		72

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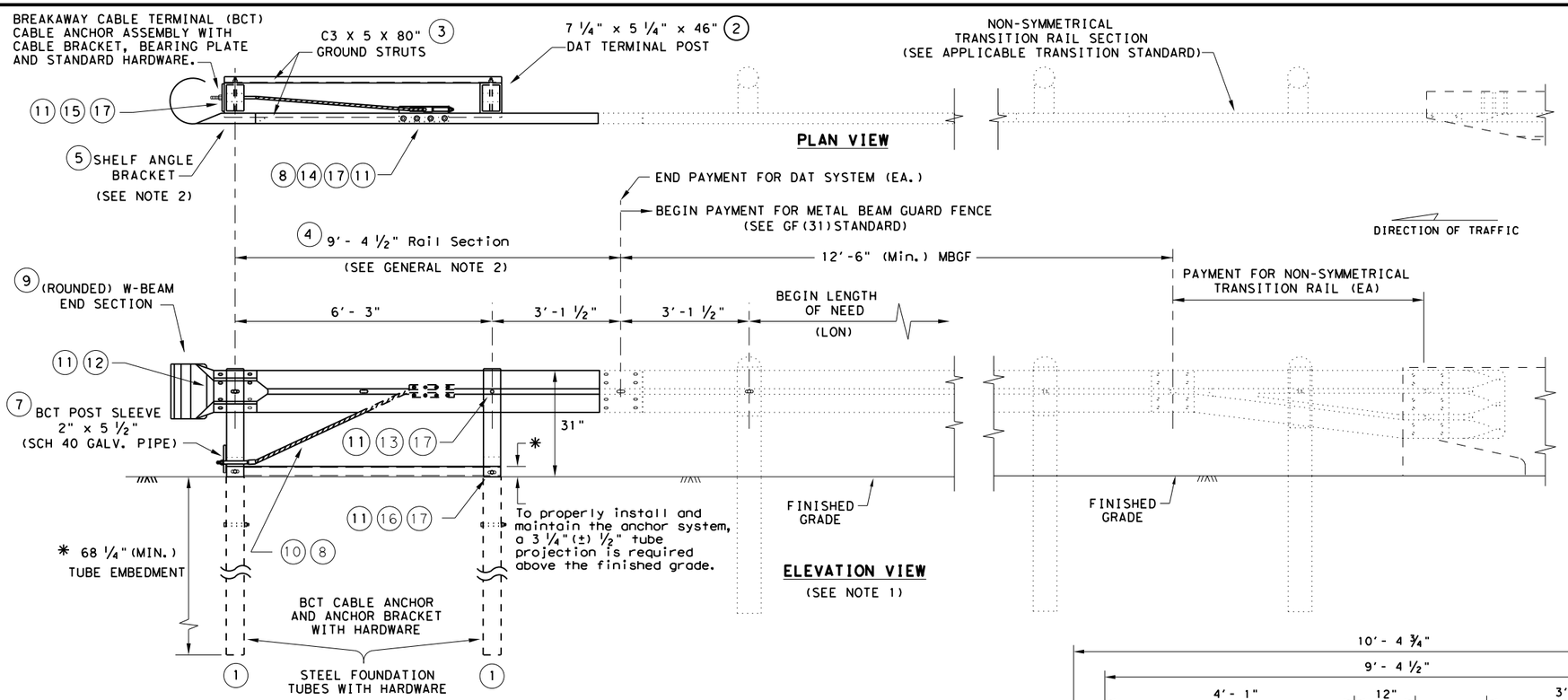


DOWNSTREAM ANCHOR TERMINAL (DAT)

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

GENERAL NOTES

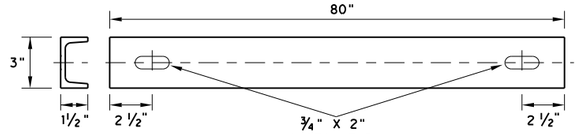
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN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

MOW STRIP INSTALLATION

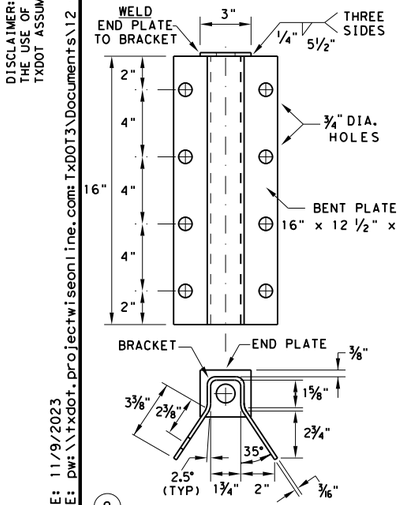
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

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

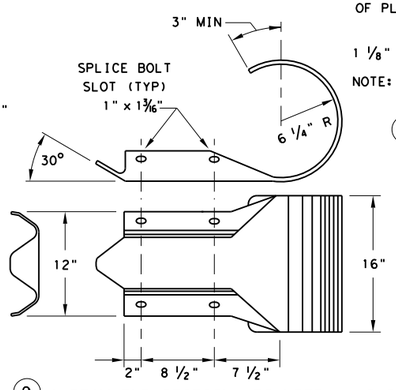
(4) TERMINAL RAIL ELEMENT FOR DAT



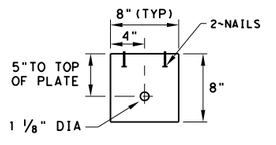
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



(8) GUARDRAIL ANCHOR BRACKET

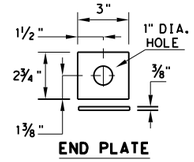


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

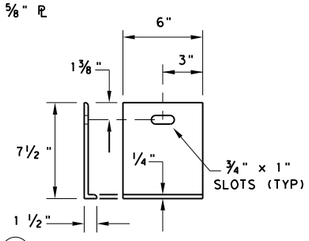


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

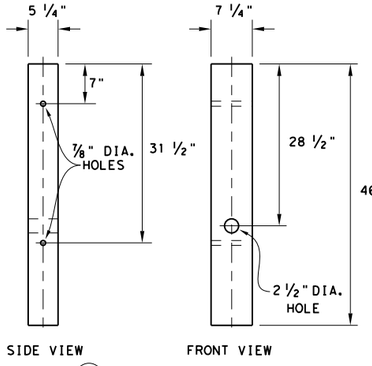
(6) BEARING PLATE
8"x 8"x 5/8" PL



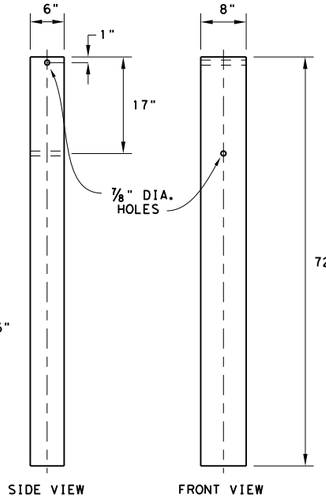
END PLATE



(5) SHELF ANGLE BRACKET



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



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

Texas Department of Transportation

Design Division Standard

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

GF(31)DAT-19

FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
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DATE: 11/9/2023
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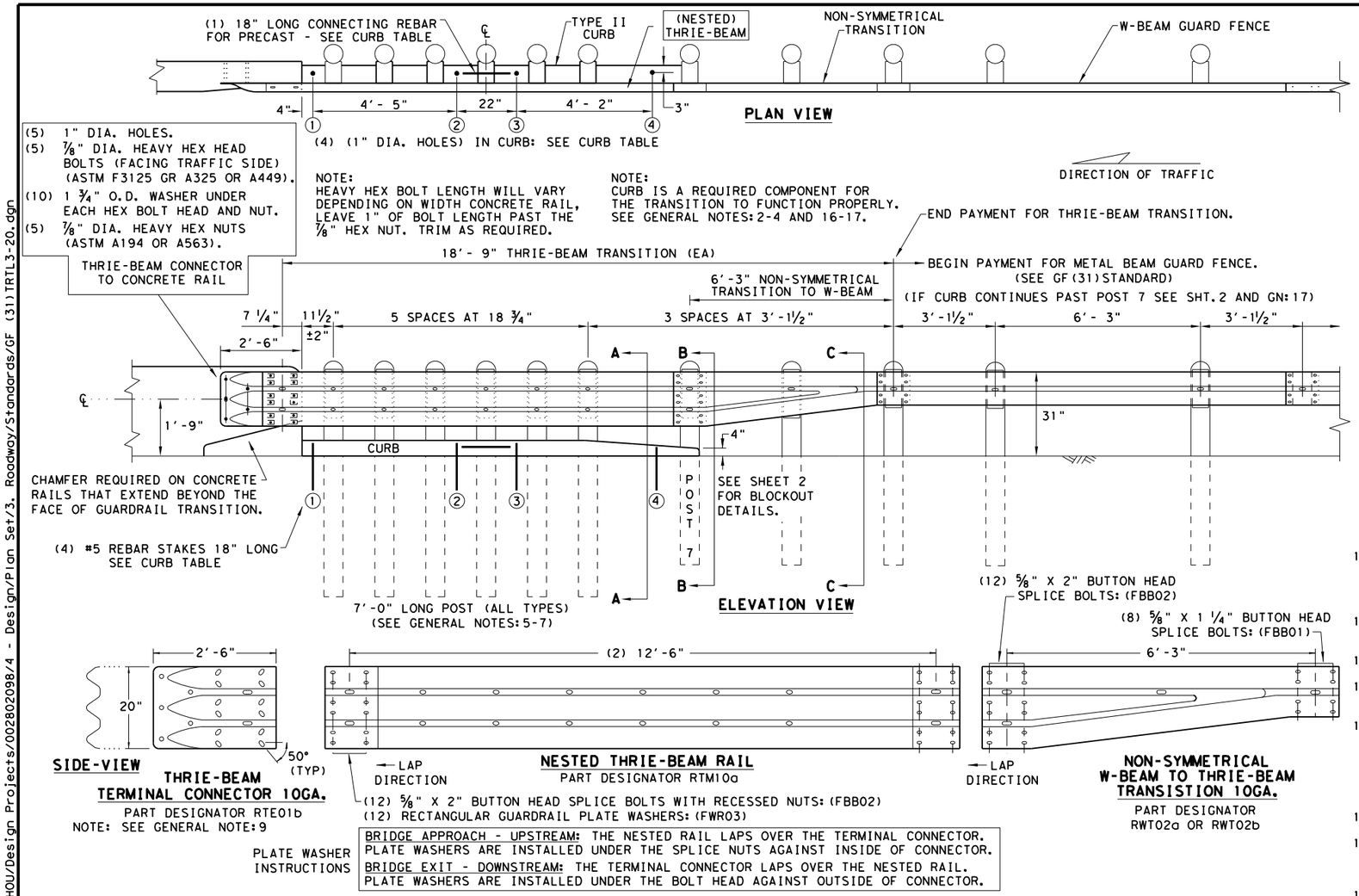


GENERAL NOTES

1. CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
2. CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5- 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.

THRIE-BEAM TERMINAL - CURB TABLE

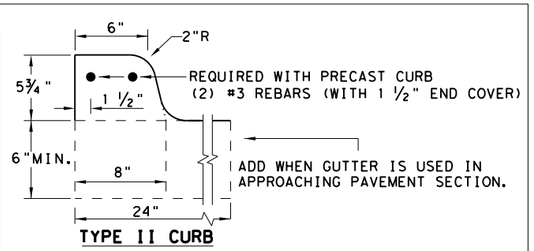
PRECAST CURB FULL LENGTH EQUALS 12'- 2"
THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.

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.

* 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

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

TYPE II CURB DETAILS

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
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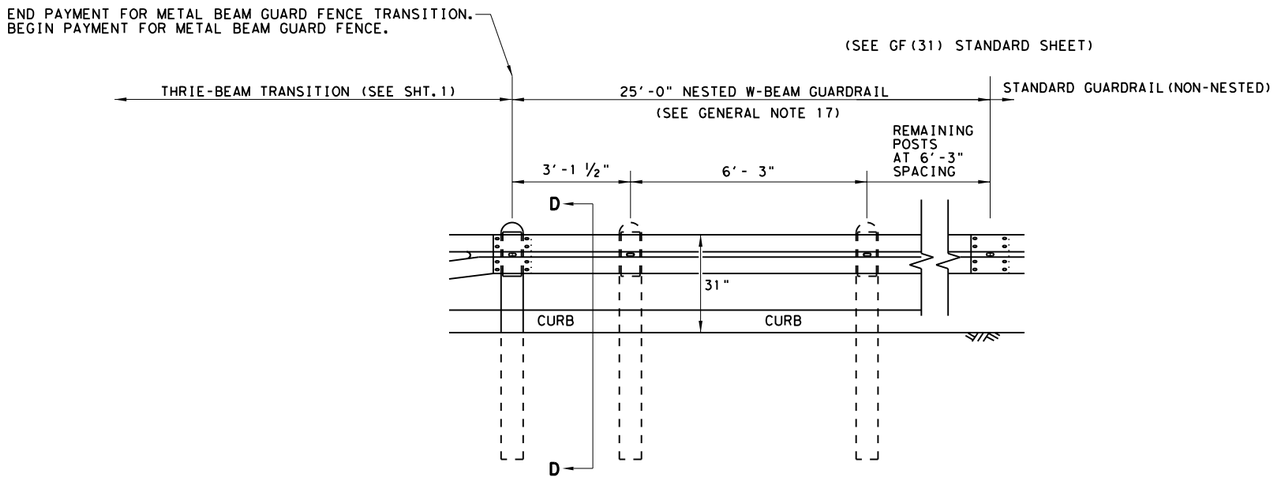
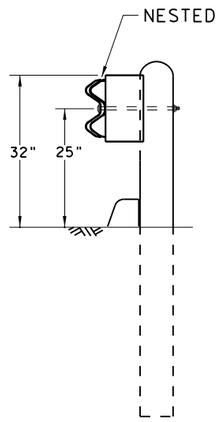
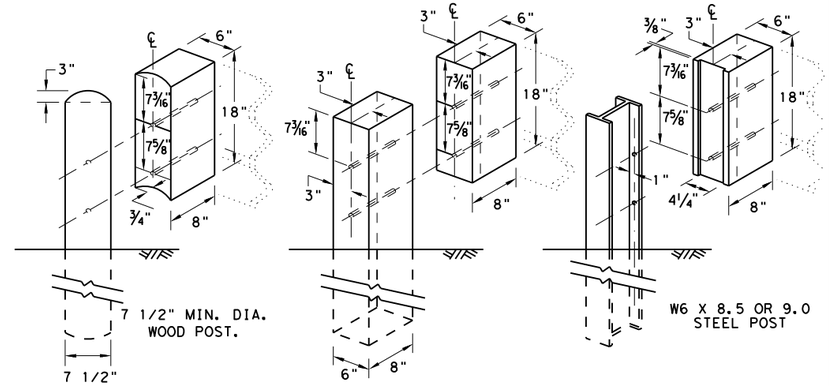
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

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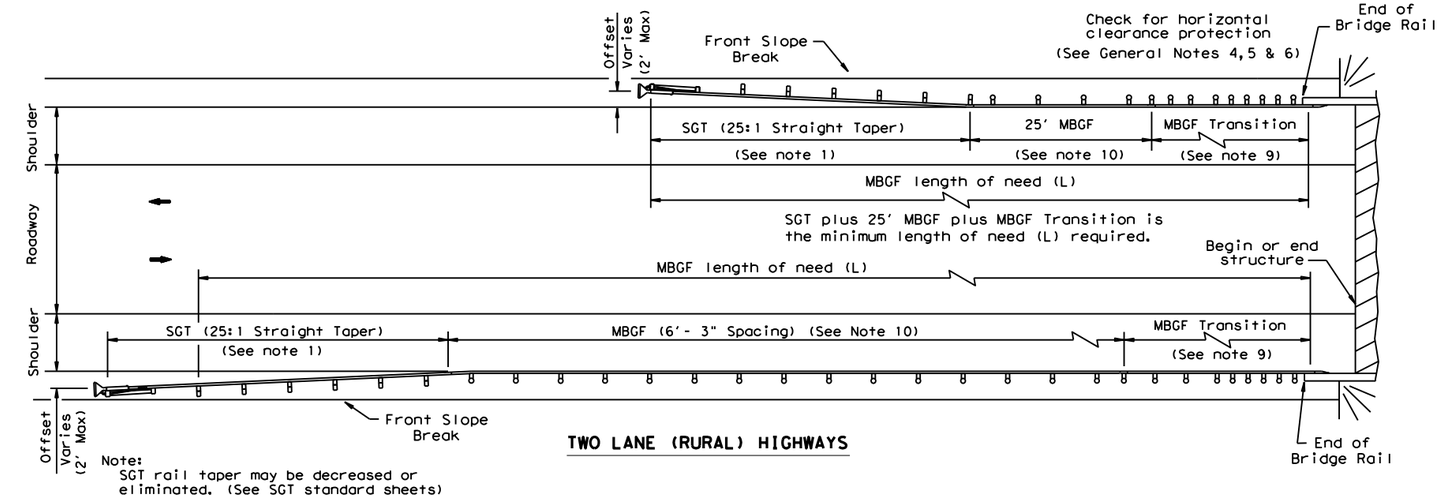
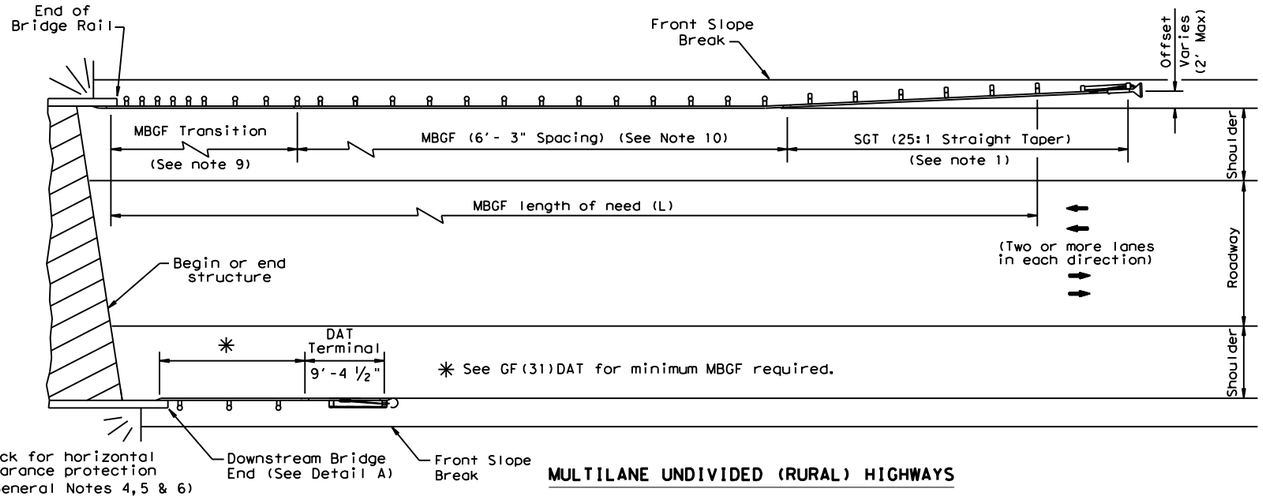
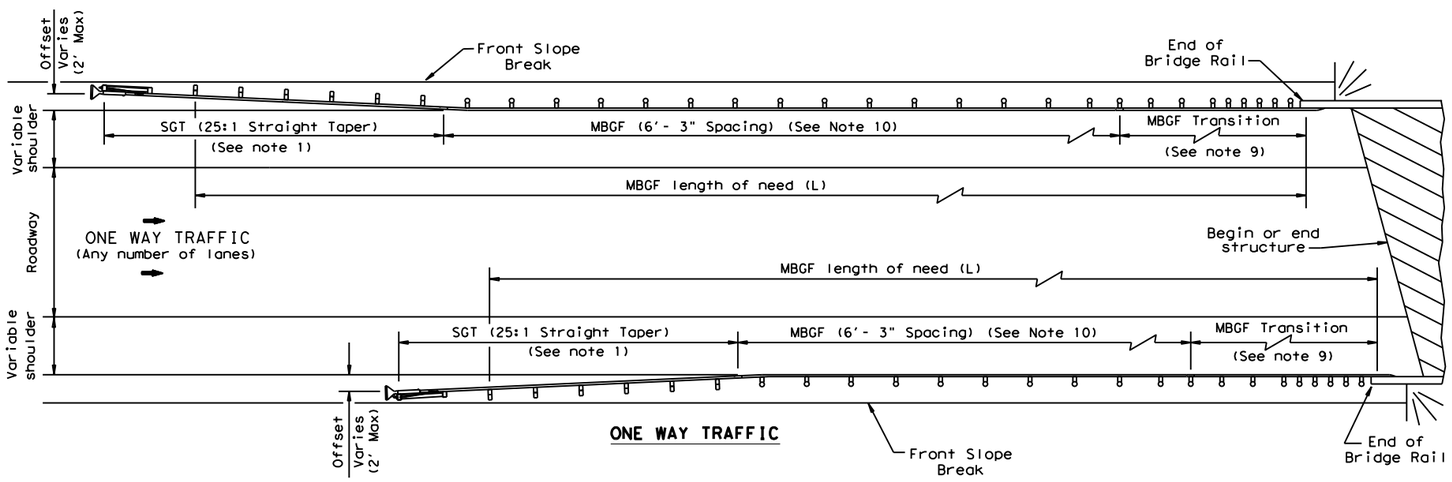


Note:
SGT rail taper may be decreased or eliminated. (See SGT standard sheets)

TWO LANE (RURAL) HIGHWAYS



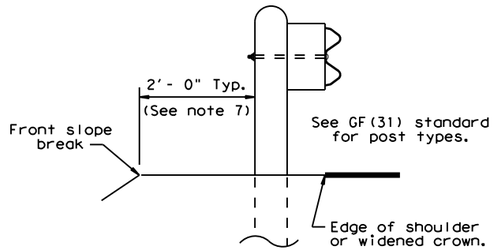
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



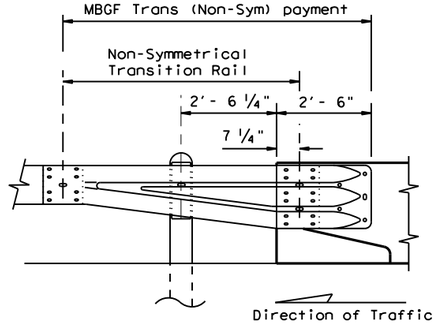
ONE WAY TRAFFIC

GENERAL NOTES

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



TYPICAL CROSS SECTION AT MBGF



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

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
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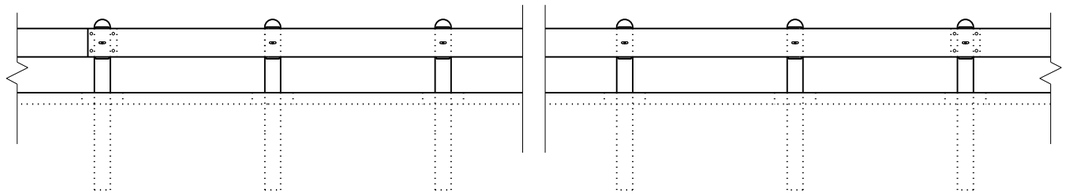
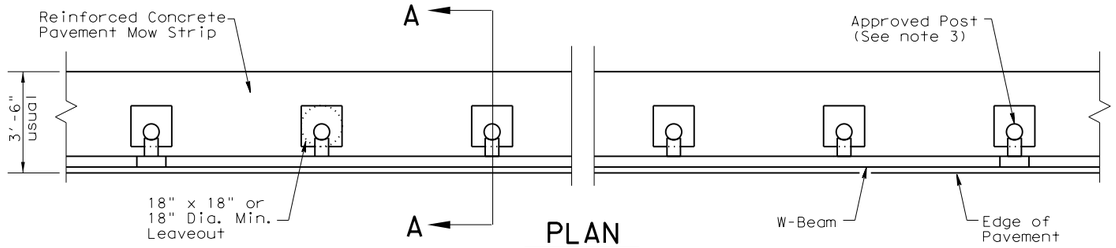
REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		76



ELEVATION

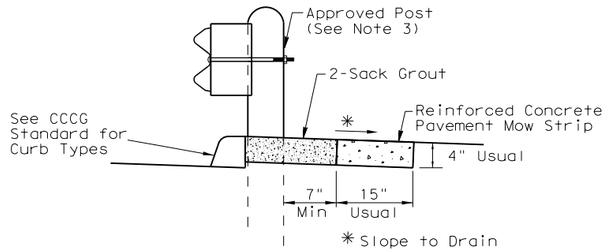
TRAFFIC



PLAN

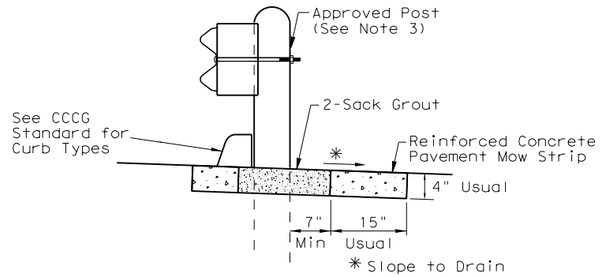
GENERAL NOTES

1. Place concrete riprap mow strips at all Metal Beam Guard Fence locations, and in accordance with Item 432, "Riprap". Use Class B Concrete, reinforced with No. 3 bars spaced at 18 in. centers each direction and 2 in. below the surface.
2. Provide a minimum of 7 in. leave out behind the post. Do not place concrete in the leave out.
3. The type of approved post is shown elsewhere on the plans. See the applicable standard sheets for additional details and information.
4. Other curb placement options may be used. Curbs are not considered part of the mow strip and are paid for under other pertinent bid items.
5. Fill the leave outs with no more than a 2-sack grout mixture and place in accordance with Section 421.2.7, "Mortar and Grout." Payment for furnishing and placing the grout mixture is subsidiary to the Item 432,"RIPRAP."
6. Place the mow strip the entire length of the guard fence plus any Terminal Anchor Section (TAS) or Single Guardrail Terminal (SGT) to 2 ft. beyond the face of the object marker at the end of the SGT. Do not allow concrete to adhere to the ground line strut shown on the SGT standard sheet.



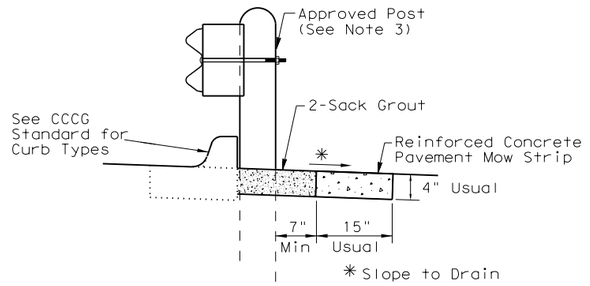
CURB OPTION (1)

Shown at Curbed Location

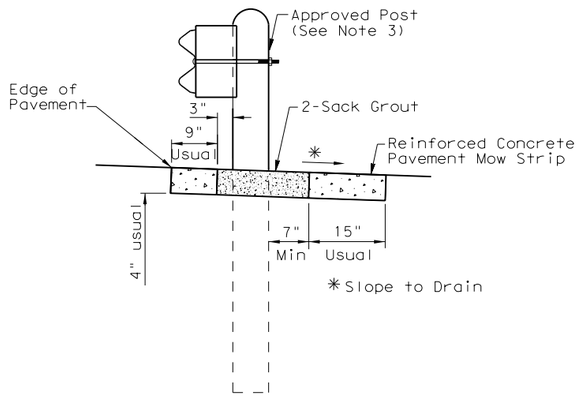


CURB OPTION (2)

Curb Shown on Top of Mow Strip

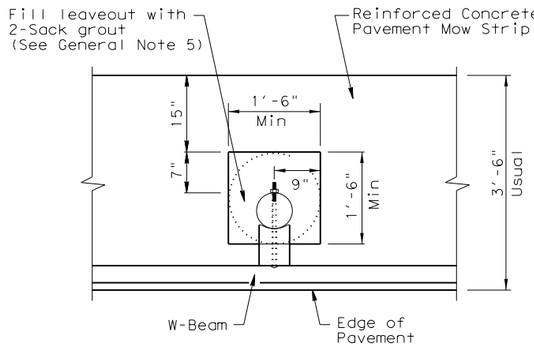


CURB OPTION (3)



SECTION A-A

Typical



MOW STRIP DETAIL

Reinforced Concrete Pavement Mow Strip with 18" x 18"or 18" dia. minimum leaveout.

Texas Department of Transportation
Houston District

MOW STRIP

MS

FILE:	DN:	CK:	DW:	CK:	
© TxDOT 2014	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS	HOU	6			77
03/15 2014 SPECS	COUNTY		CONTROL	SECT	JOB	HWY
	HARRIS		0028	02	098,etc	US 90

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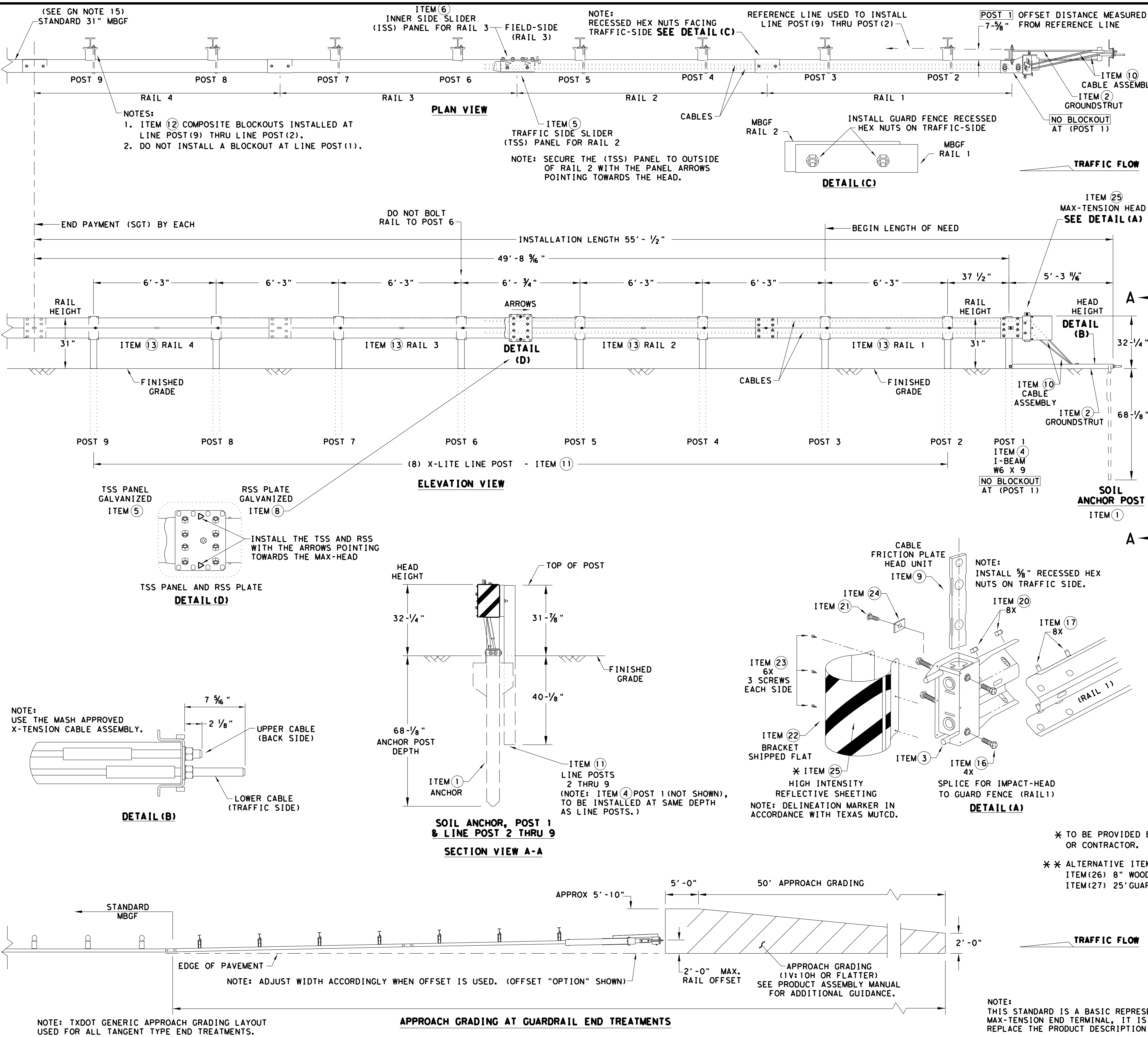

NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

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 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. ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
7. COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST(MPL)FOR CERTIFIED PRODUCERS.
8. REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
9. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
10. POSTS SHALL NOT BE SET IN CONCRETE.
11. A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POST TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST.
12. MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
13. IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
14. THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
15. A MINIMUM OF 12'-6" OF 12GA. MBGF IS REQUIRED IMMEDIATELY DOWNSTREAM OF THE MAX-TENSION SYSTEM.

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

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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

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

Texas Department of Transportation — Design Division Standard

MAX-TENSION END TERMINAL
MASH - TL-3

SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc	US 90
	DIST		COUNTY	SHEET NO.
	HOU		HARRIS	78

DATE: 11/9/2023
FILE: pw:\\txdot.projectwiseonline.com:TxDOT3\Documents\12 - HOU\Design Projects\...

DATE: 11/9/2023
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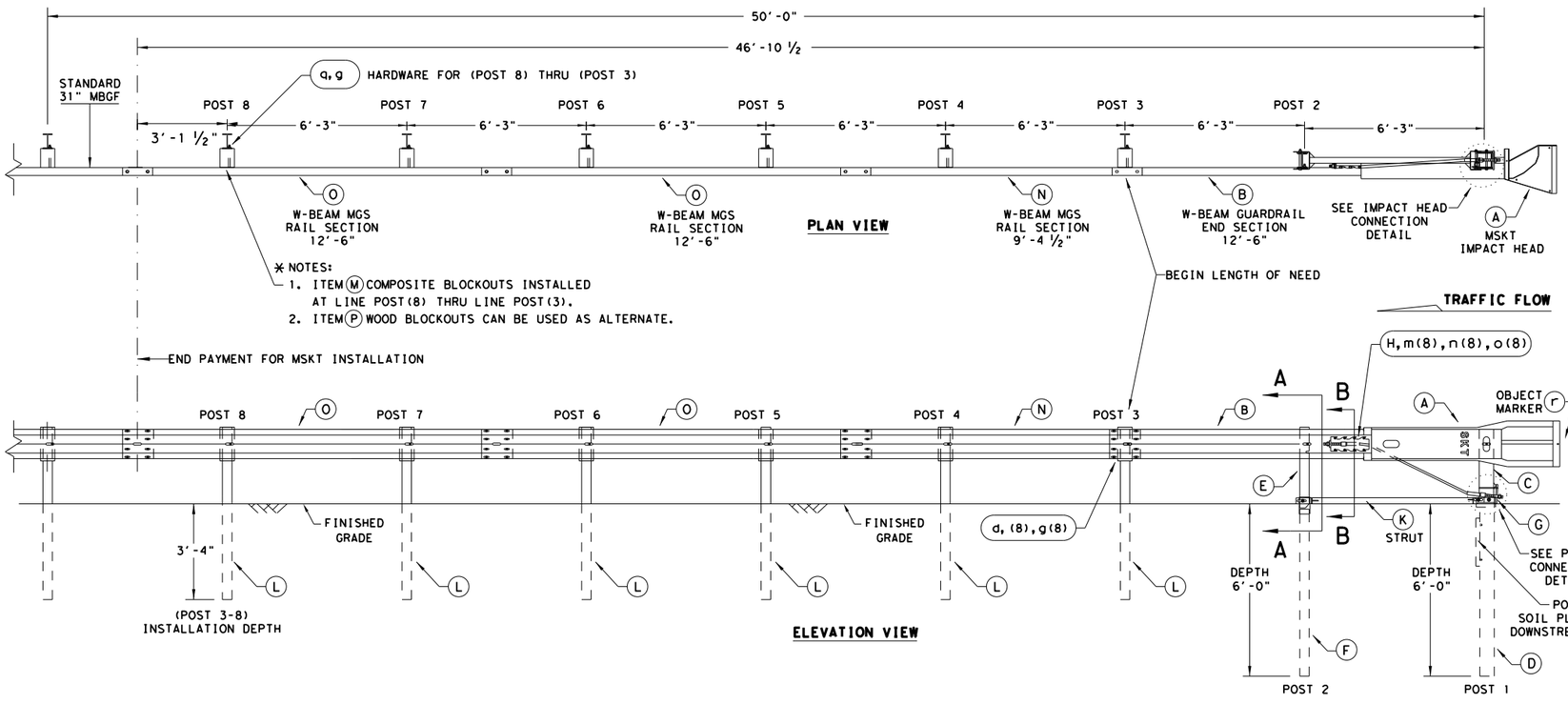
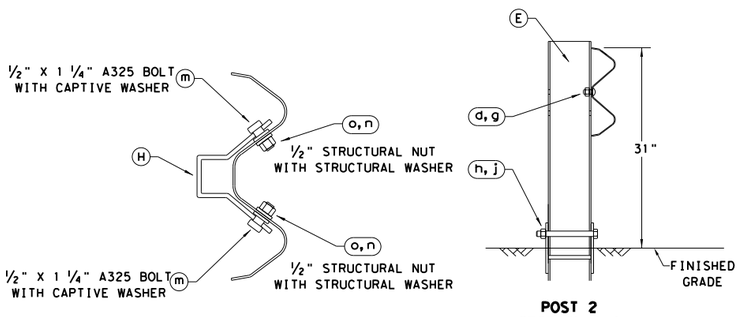
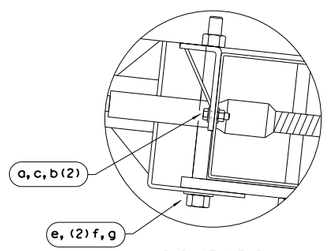
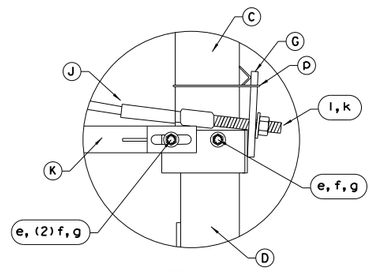
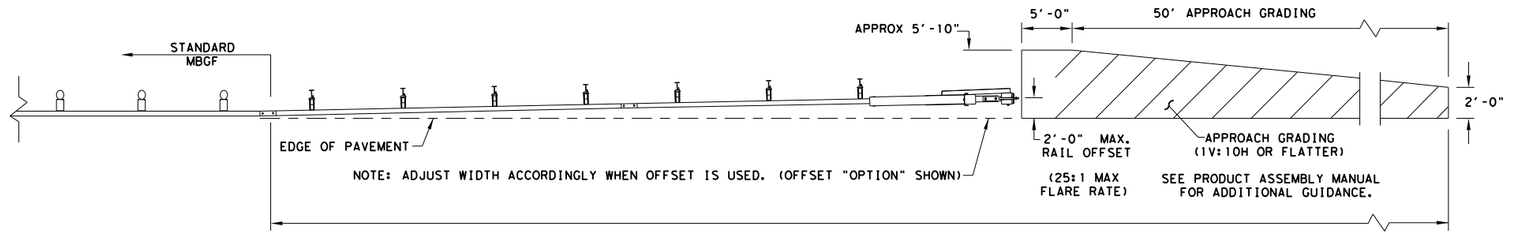


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.









APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

GENERAL NOTES

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

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

SEE NOTES: *

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

Texas Department of Transportation — Design Division Standard

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

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0028	02	098,etc	US 90	
	DIST	COUNTY		SHEET NO.	
	HOU	HARRIS		79	

DATE: 11/9/2023
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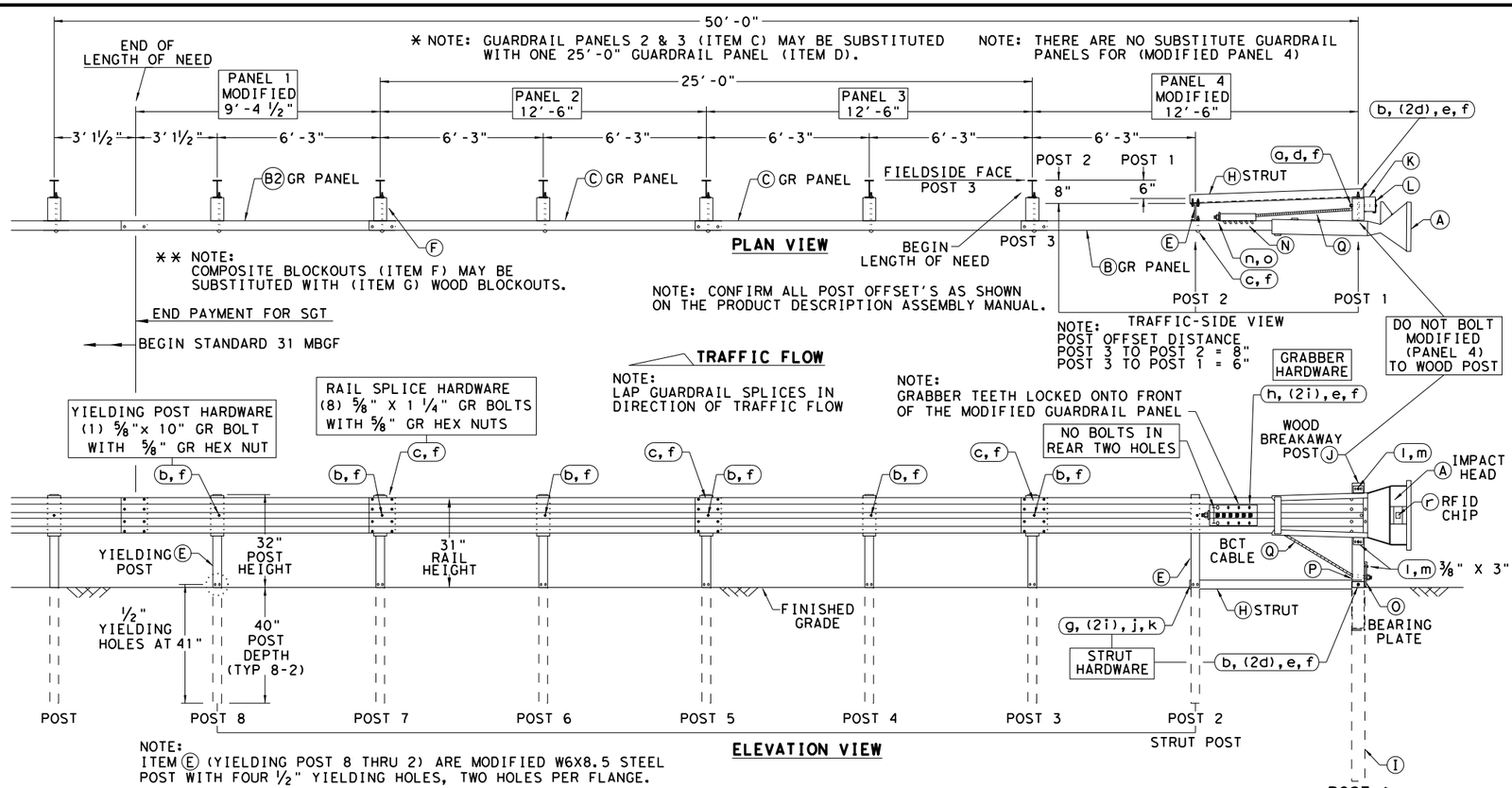
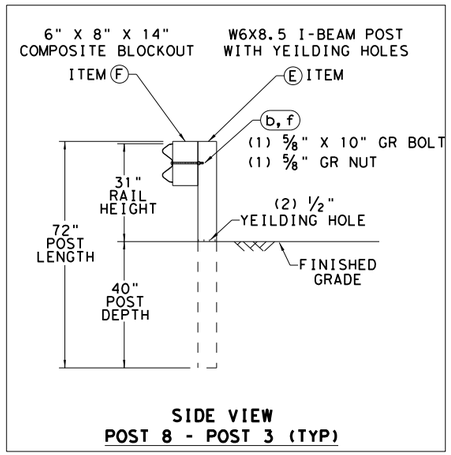


GENERAL NOTES

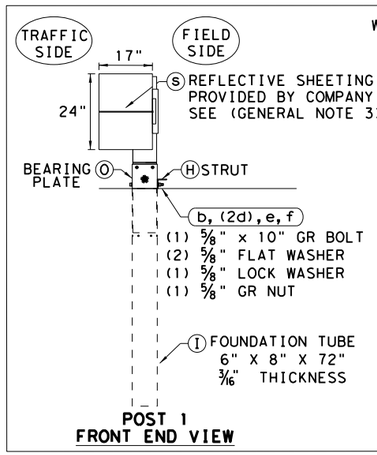
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY 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

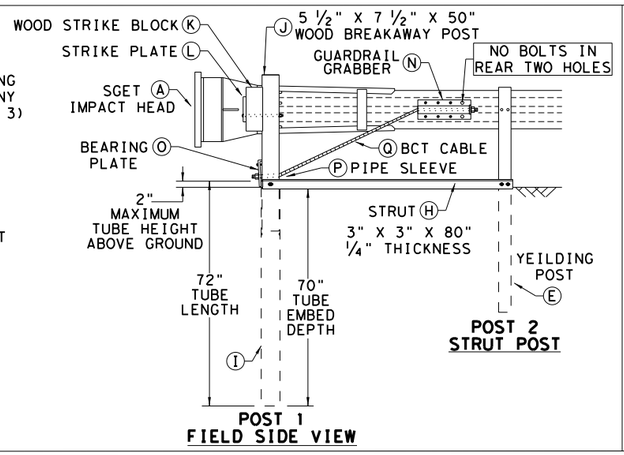
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



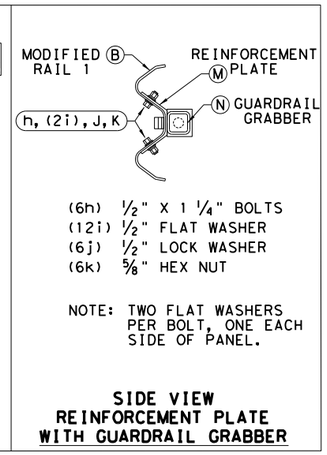
SIDE VIEW
POST 8 - POST 3 (TYP)



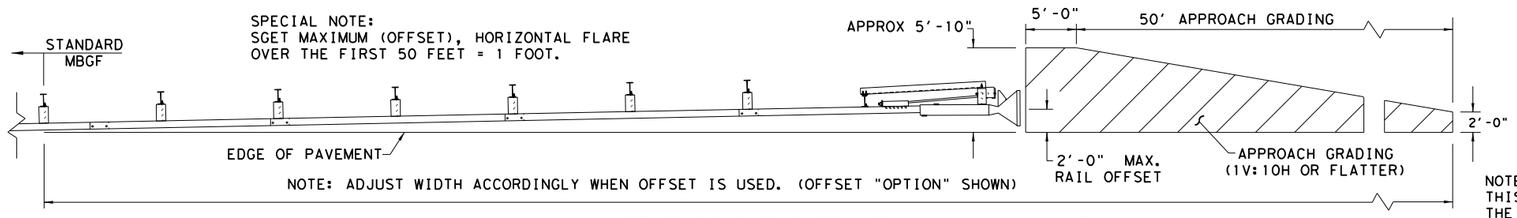
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



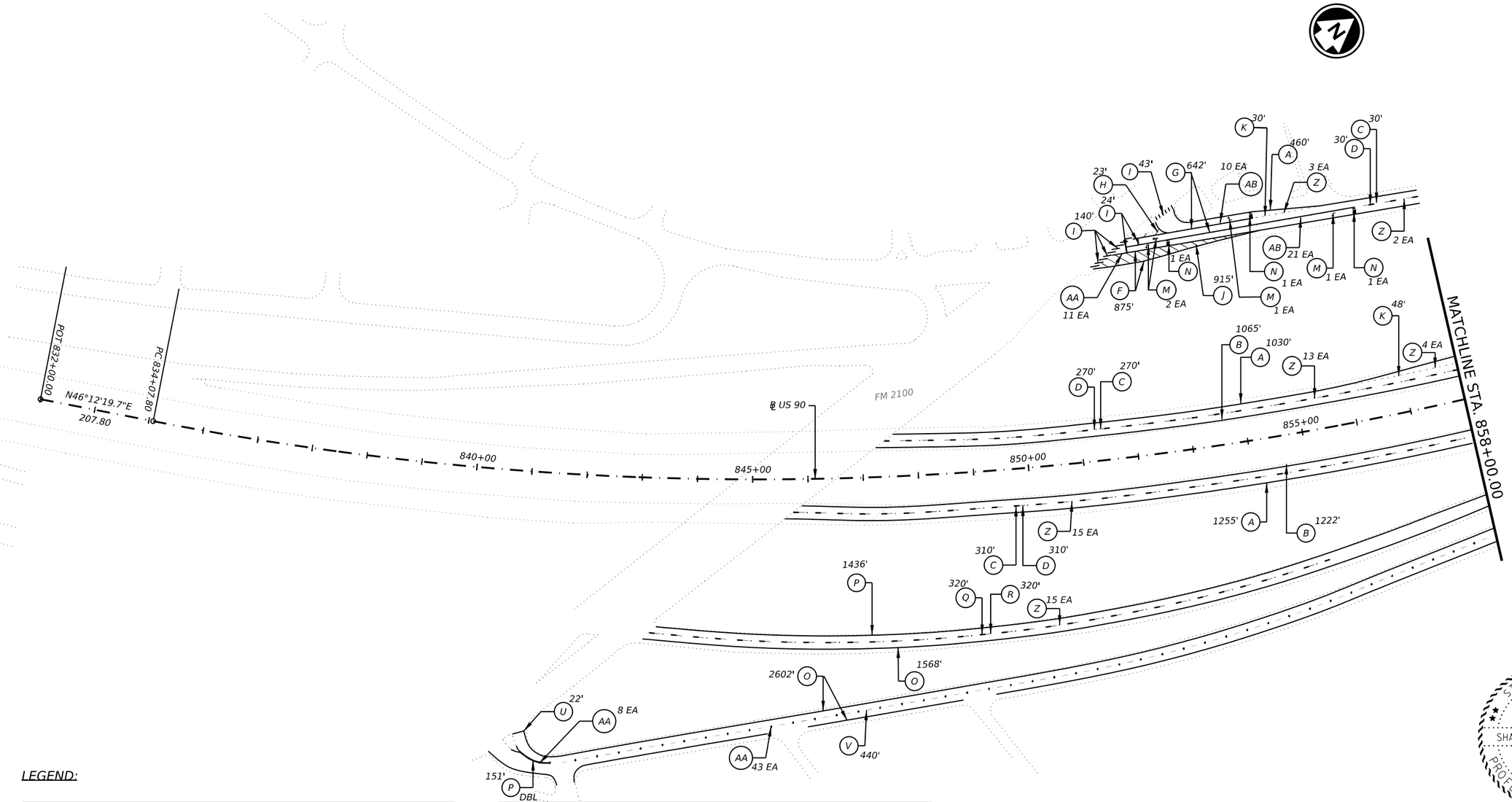
APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation
Design Division Standard

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

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP		
© TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0028	02	098,etc	US 90		
	DIST	COUNTY		SHEET NO.		
	HOU	HARRIS		80		



LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	*2,745*
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	*2,287*
C	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	*610*
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	*610*
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	*875*
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	*642*
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	*23*
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	*207*
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	*915*
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	*78*
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	*4*
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	*3*
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	*4,170*
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	*1,587*
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	*320*

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	*320*
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	-
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	*22*
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	*440*
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	-
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	-
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	-
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	*52*
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	*62*
AB	672-6007	REFL PAV MRKR TY-I-C	EA	*31*
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	-
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

SHEET 1 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		81

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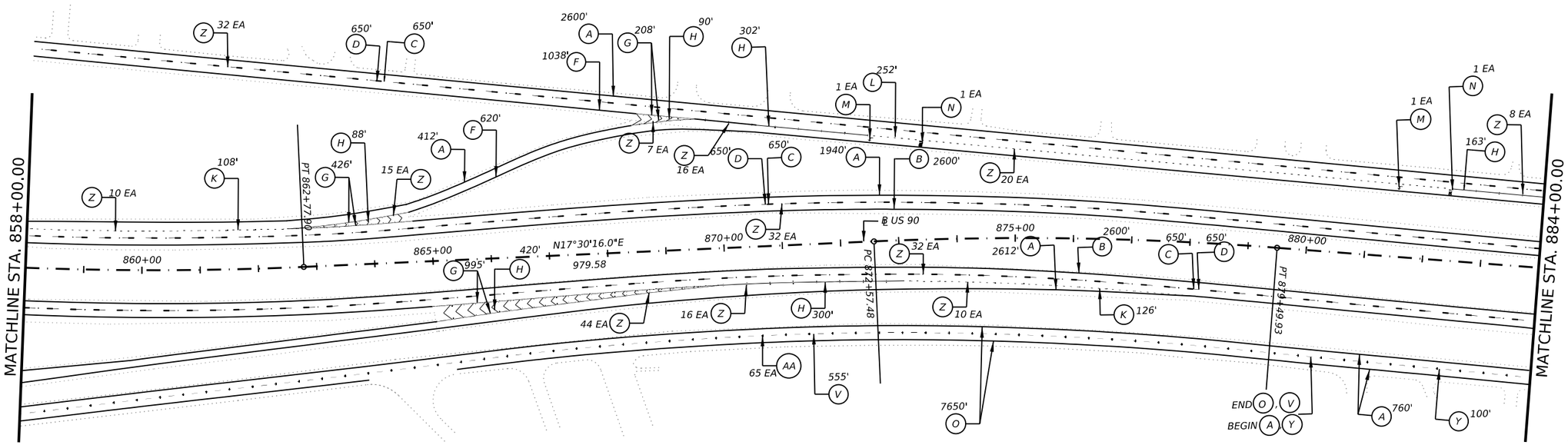

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	*8,324*
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	*5,200*
C	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	*1,950*
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	*1,950*
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	*1,658*
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	*1,629*
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	*1,363*
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	-
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	-
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	*234*
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	*252*
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	*2*
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	*2*
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	*7,650*
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	-
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	-

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	-
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	-
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	-
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	*555*
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	-
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	-
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	*100*
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	*242*
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	*65*
AB	672-6007	REFL PAV MRKR TY-I-C	EA	-
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	-
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, P.E.

01/29/2024

Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

SHEET 2 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		82

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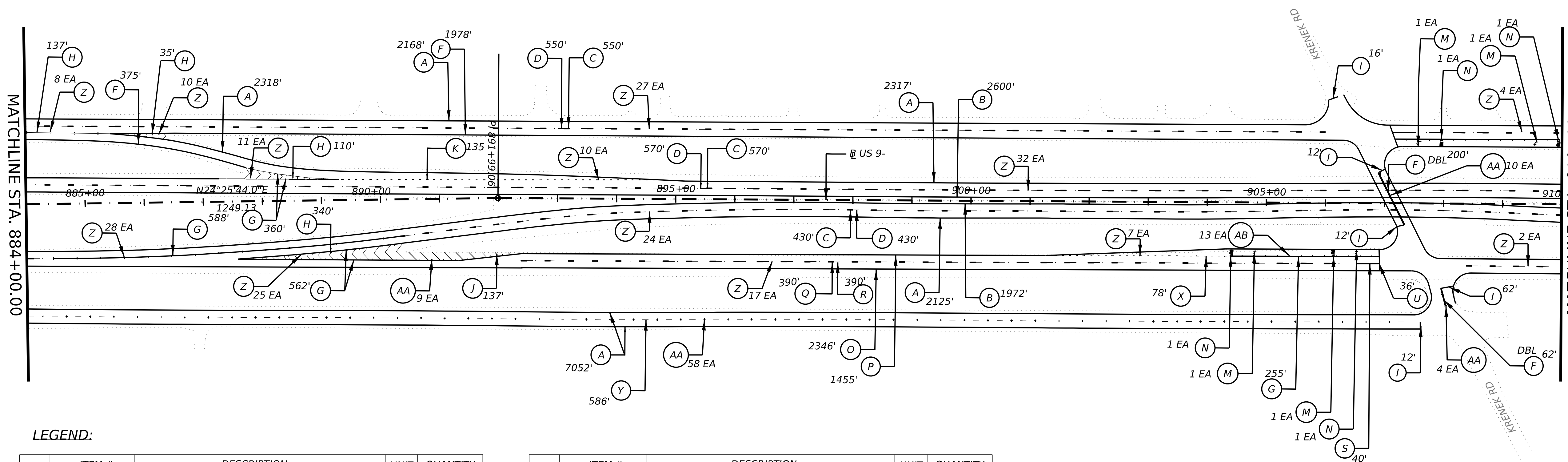


LEGEND:

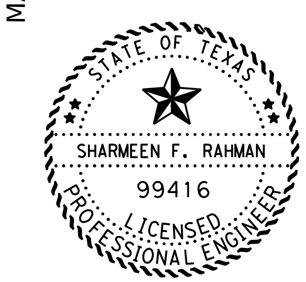
	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	15,980
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	4,572
C	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	1,550
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	1,550
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	2,615
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	1,765
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	622
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	114
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	137
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	135
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	4
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	4
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	2,346
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	1,455
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	390

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	390
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	40
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	36
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	-
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	78
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	586
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	205
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	81
AB	672-6007	REFL PAV MRKR TY-I-C	EA	13
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	-
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.



Sharmeen Rahman, PE

01/29/2024

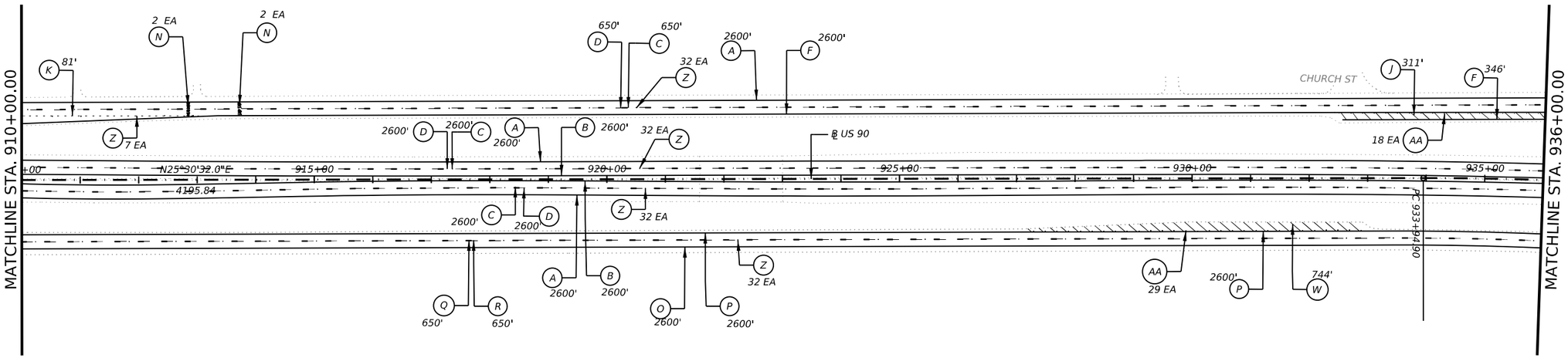
Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

SHEET 3 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		83



LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	7,800
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	5,200
C	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	5,850
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	5,850
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	2,946
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	-
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	-
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	-
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	311
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	81
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	-
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	4
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	2,600
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	5,200
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	650

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	650
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	-
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	--
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	--
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	744
X	666-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	-
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	-
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	135
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	47
AB	672-6007	REFL PAV MRKR TY-I-C	EA	-
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	-
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	EA	-

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, P.E.

01/29/2024

® 2024
Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

SHEET 4 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		84

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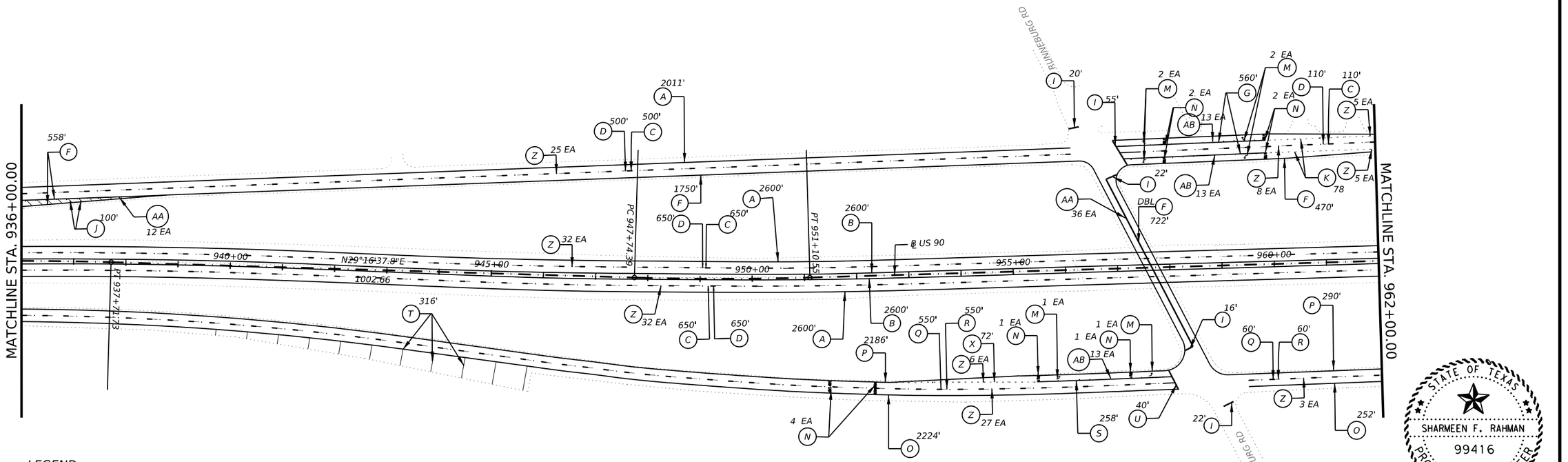

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	*7,211*
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	*5,200*
C	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	*1,910*
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	*1,910*
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	*3,500*
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	*560*
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	-
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	*135*
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	*100*
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	*78*
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	*6*
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	*10*
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	*2,476*
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	*2,476*
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	*610*

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	*610*
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	*258*
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	*316*
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	*40*
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	-
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	*72*
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	-
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	*143*
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	*48*
AB	672-6007	REFL PAV MRKR TY-I-C	EA	*39*
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	-
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

SHEET 5 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		85

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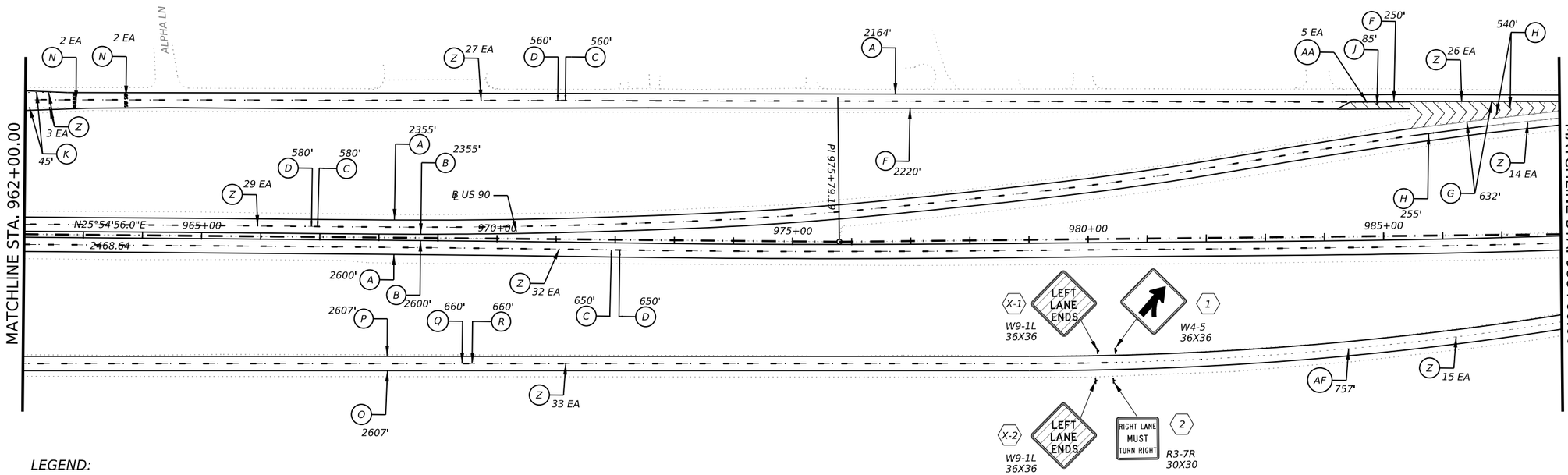

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	*7,119*
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	*4,955*
C	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	*1,790*
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	*1,790*
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	*2,470*
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	*632*
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	*795*
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	-
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	*85*
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	*45*
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	-
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	*4*
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	*2,607*
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	*2,607*
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	*660*

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	*660*
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	-
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	-
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	-
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	-
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	-
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	*179*
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	*5*
AB	672-6007	REFL PAV MRKR TY-I-C	EA	-
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	-
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	*757*

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

® 2024
Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

SHEET 6 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		86

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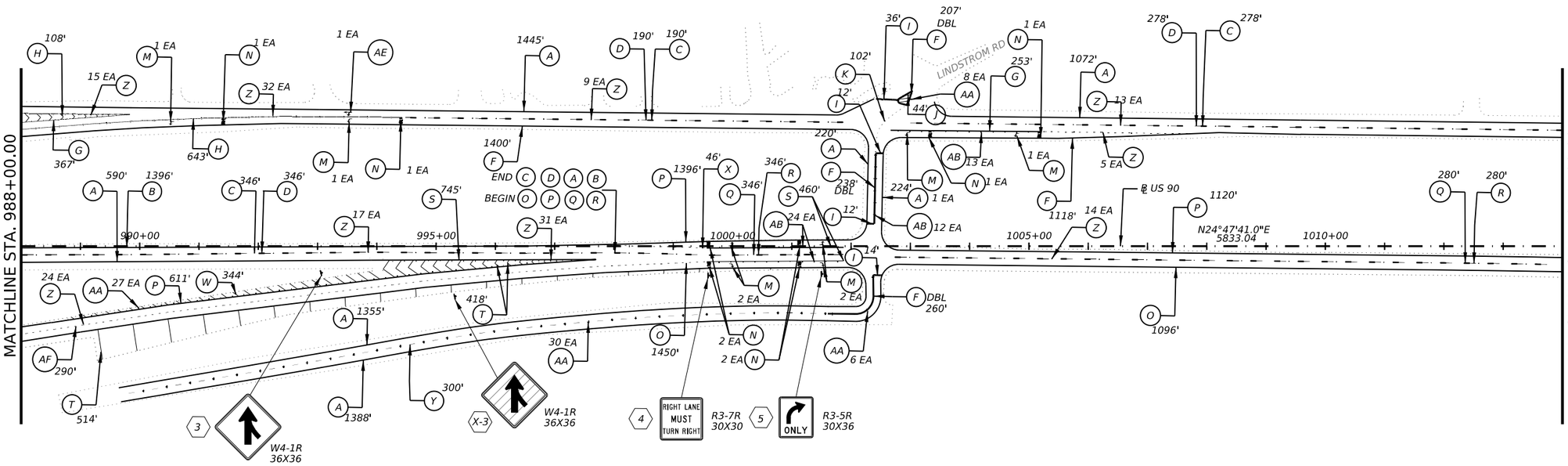

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	6,294
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	1,396
C	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	814
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	814
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	3,223
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	620
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	751
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	74
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	44
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	102
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	8
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	8
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	2546
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	3127
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	626

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	626
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	1,205
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	932
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	-
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	344
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	46
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	300
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	160
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	71
AB	672-6007	REFL PAV MRKR TY-I-C	EA	49
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	-
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	1
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	290

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

SHEET 7 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		87

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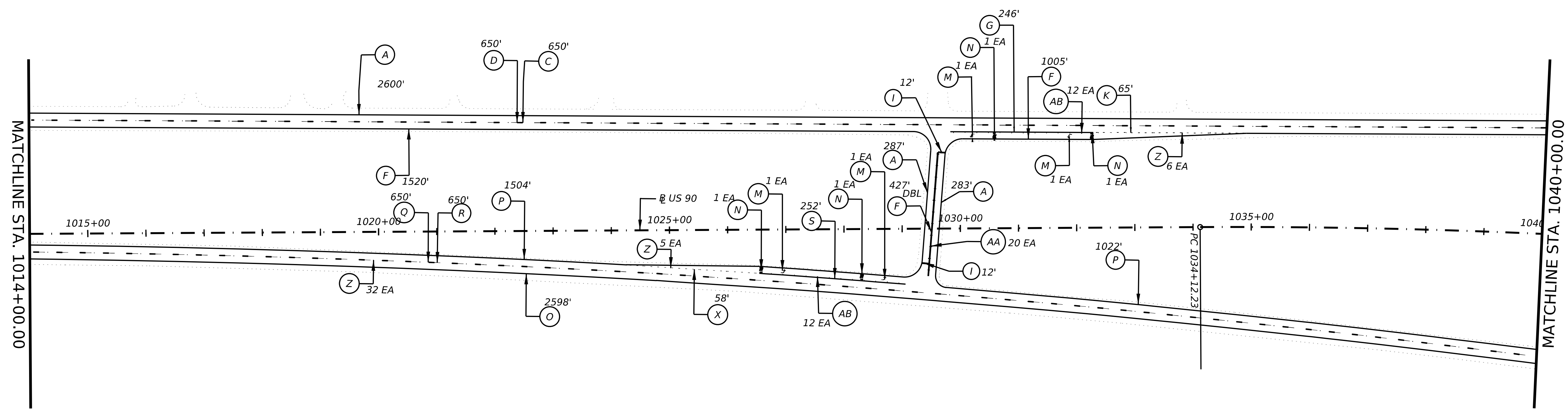

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	3,170
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	-
C	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	650
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	650
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	2,952
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	246
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	-
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	24
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	-
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	65
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	4
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	4
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	2,598
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	2,526
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	650

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	650
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	252
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	-
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	-
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	58
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	-
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	43
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	20
AB	672-6007	REFL PAV MRKR TY-I-C	EA	24
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	-
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

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US 90

PAVEMENT MARKING LAYOUT

SHEET 8 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST		COUNTY	SHEET NO.
HOU		HARRIS	88

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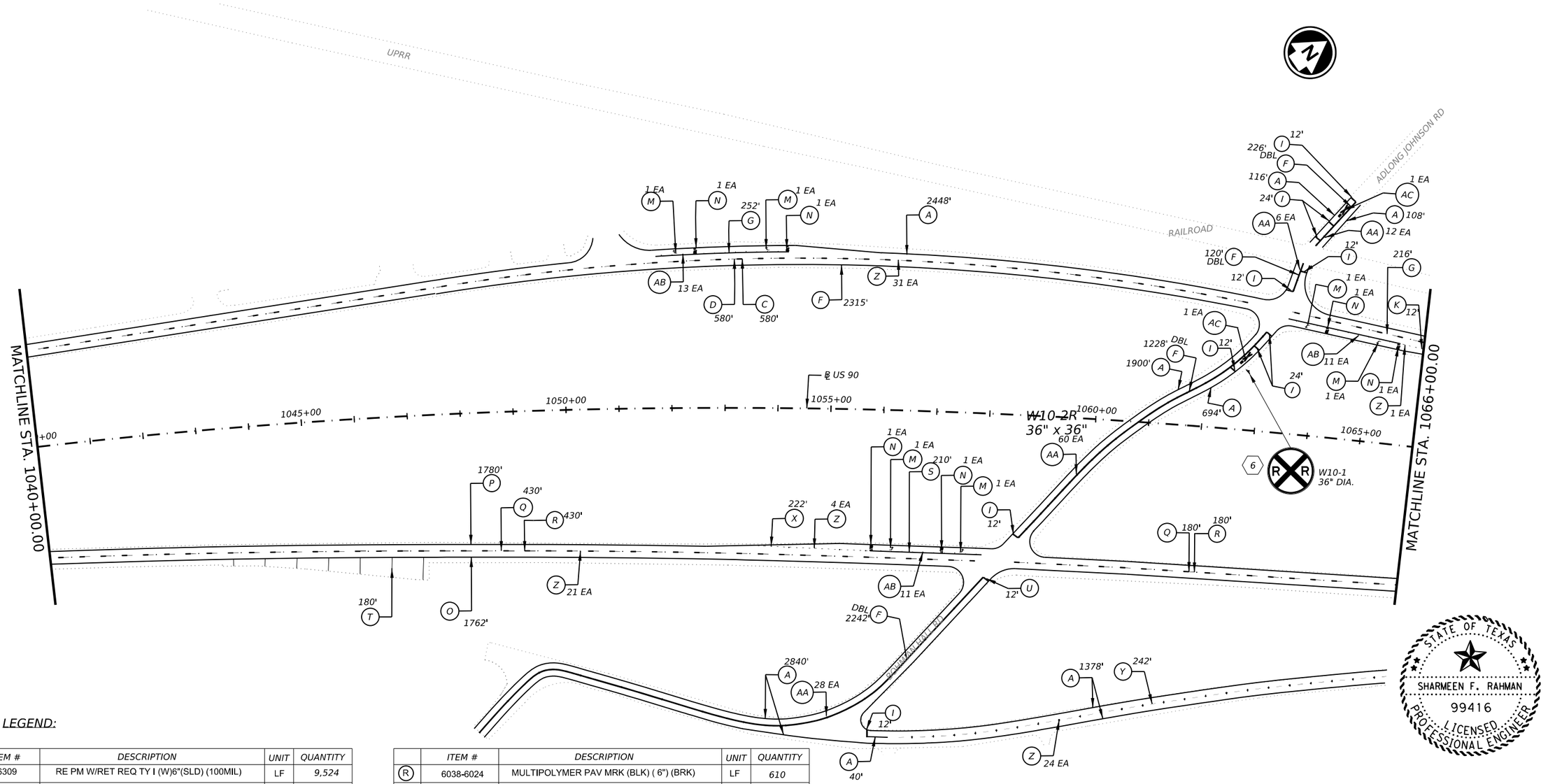

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	*9,524*
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	-
C	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	*580*
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	*580*
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	*6,131*
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	*468*
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	-
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	*120*
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	-
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	*12*
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	*6*
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	*6*
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	*1,762*
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	*1,780*
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	*610*

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	*610*
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	*210*
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	*180*
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	*12*
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	-
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	*222*
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	*242*
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	*81*
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	*106*
AB	672-6007	REFL PAV MRKR TY-I-C	EA	*35*
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	*2*
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

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Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

EXHIBIT "A"
UPRR DOT 762866P RRMP 338.220
HOUSTON SUB SUBDIVISION

SHEET 9 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		89

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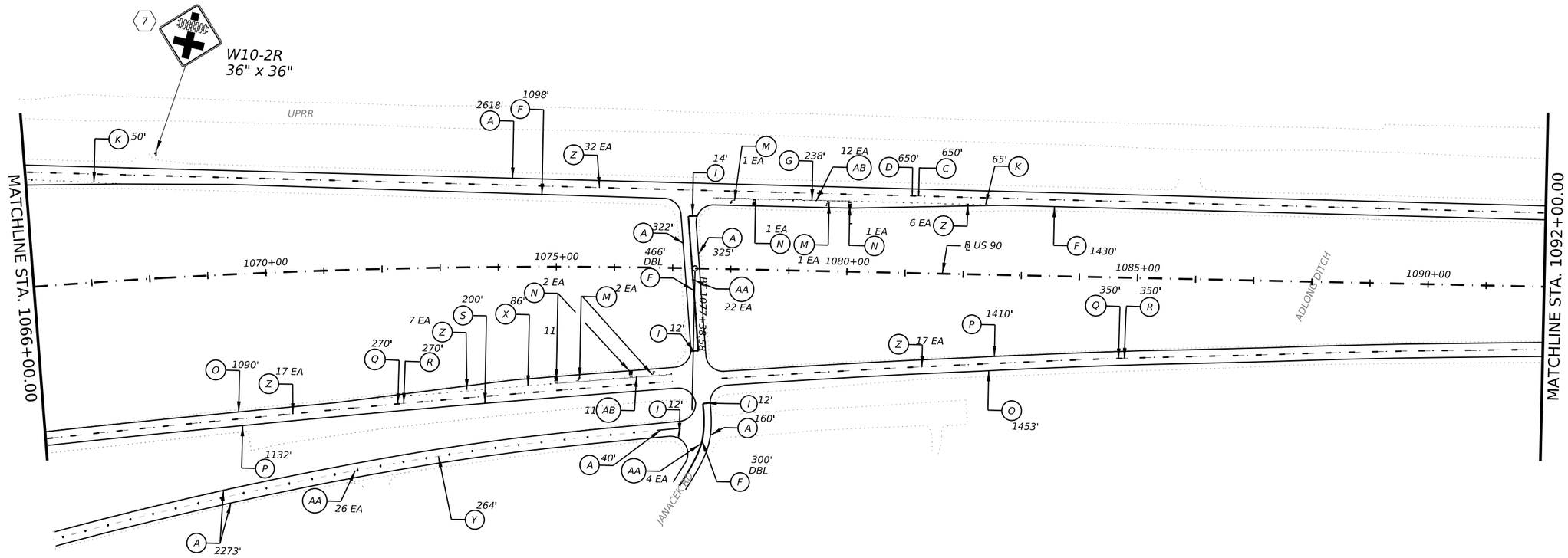

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	*5,738*
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	-
C	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	*650*
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	*650*
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	*3,294*
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	*238*
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	-
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	*50*
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	-
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	*115*
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	*4*
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	*4*
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	*2,543*
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	*2,542*
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	*620*

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	*620*
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	*200*
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	-
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	-
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	*86*
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	*264*
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	*79*
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	*52*
AB	672-6007	REFL PAV MRKR TY-I-C	EA	*23*
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	-
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, P.E.

01/29/2024

® 2024
Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

SHEET 10 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		90

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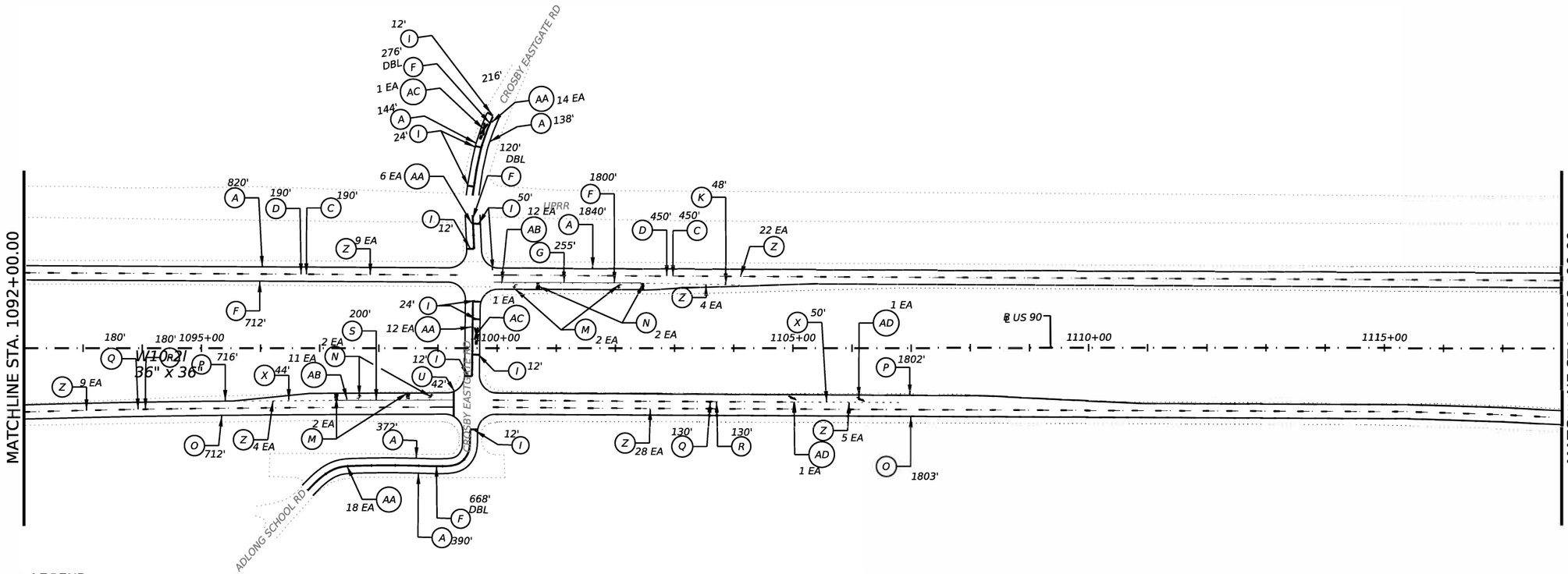

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	3,704
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	-
C	666-6036	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	640
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	640
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	3,576
G	666-6306	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	255
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	-
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	146
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	-
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	48
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	4
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	4
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	2,515
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	2,518
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	310

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	310
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	200
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	0
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	42
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	0
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	94
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	-
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	81
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	50
AB	672-6007	REFL PAV MRKR TY-I-C	EA	23
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	2
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	2
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	0
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	0

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

® 2024
Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

EXHIBIT "A"
UPRR DOT 762865H RRMP 337.530
HOUSTON SUB SUBDIVISION

SHEET 11 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		91

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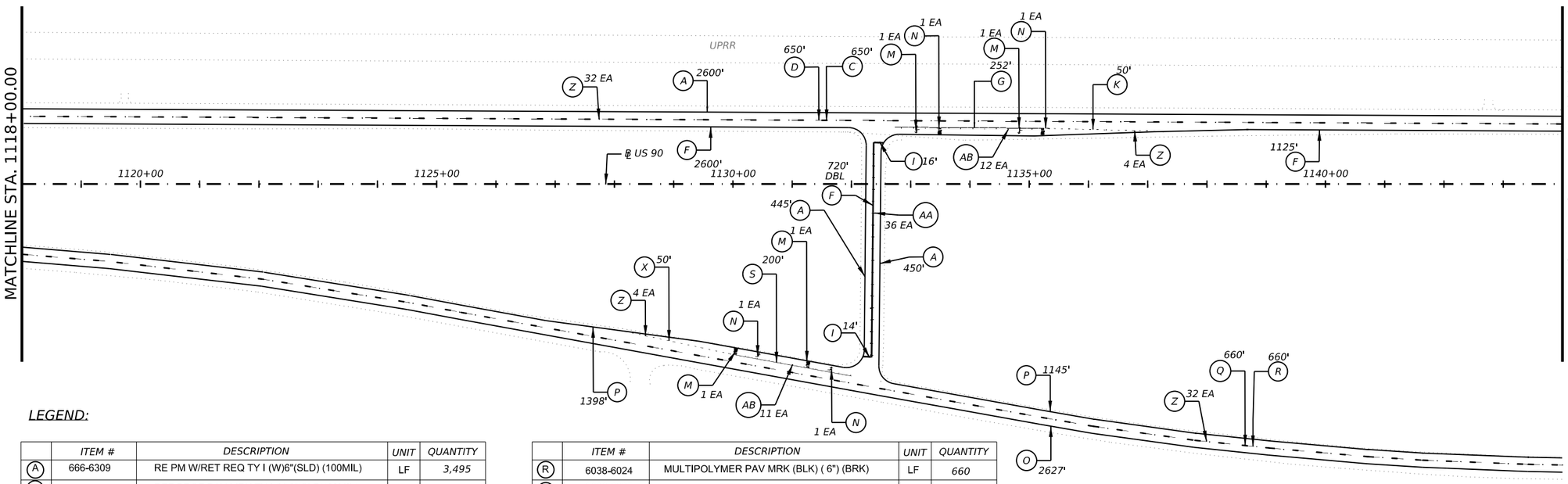

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	3,495
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	-
C	666-6036	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	650
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	650
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	4,445
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	252
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	-
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	30
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	-
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	50
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	4
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	4
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	2,627
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	2,543
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	660

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	660
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	200
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	-
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	-
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	50
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	-
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	72
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	36
AB	672-6007	REFL PAV MRKR TY-I-C	EA	23
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	-
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, P.E.

01/29/2024

Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

SHEET 12 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		92

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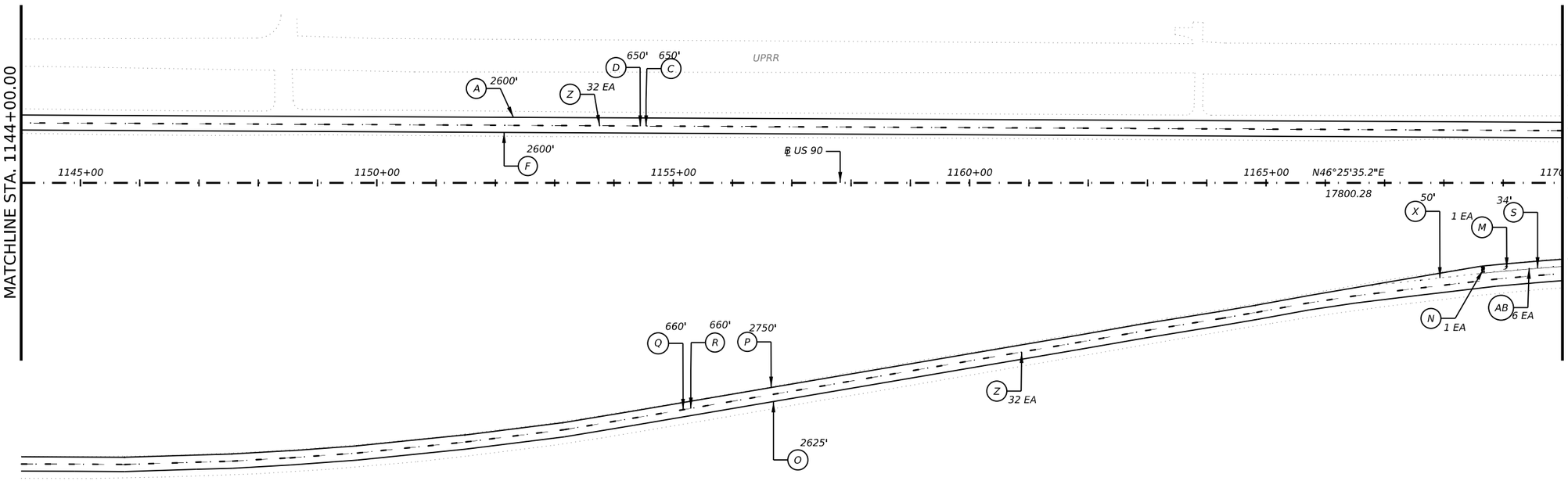

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	2,600
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	-
C	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	650
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	650
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	2.600
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	-
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	-
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	-
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	-
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	-
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	1
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	1
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	2,625
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	2,750
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	660

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	660
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	34
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	-
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	-
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	50
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	-
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	64
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	-
AB	672-6007	REFL PAV MRKR TY-I-C	EA	6
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	-
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

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STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

SHEET 13 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		93

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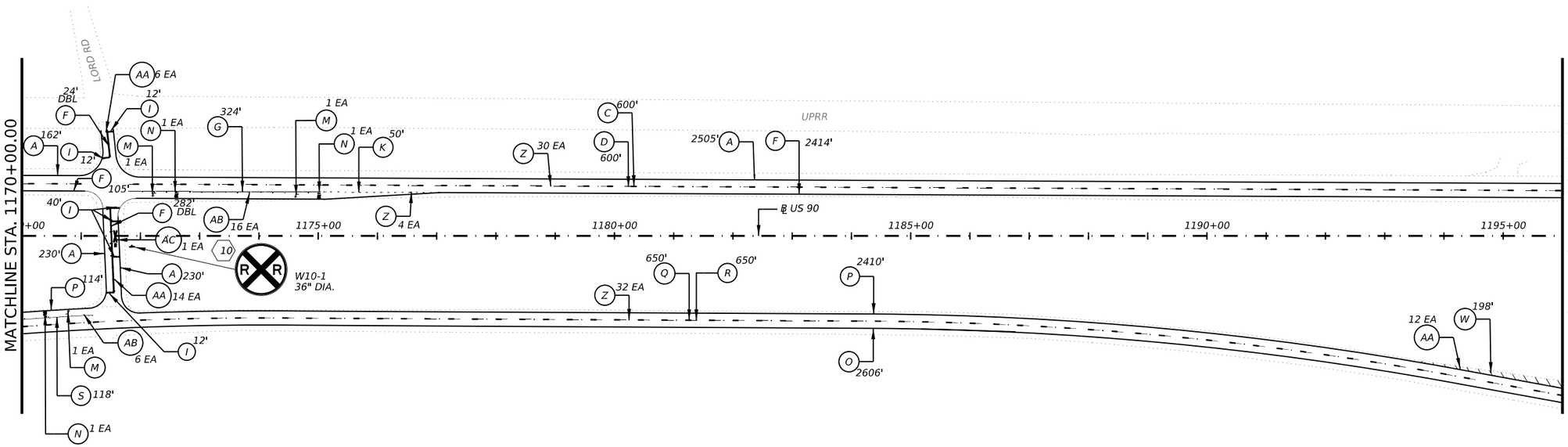

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	*3,127*
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	-
C	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	*600*
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	*600*
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	*2,825*
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	*324*
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	-
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	*76*
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	-
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	*50*
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	*3*
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	*3*
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	*2,606*
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	*2,524*
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	*650*

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	*650*
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	*118*
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	-
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	*198*
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	-
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	-
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	*66*
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	*32*
AB	672-6007	REFL PAV MRKR TY-I-C	EA	*22*
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	*1*
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

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STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED PROFESSIONAL ENGINEER

Sharmeen Rahman, P.E.

01/29/2024

® 2024
Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

EXHIBIT "A"
UPRR DOT 762861F RRMP 336.260
LAFAYETTE SUBDIVISION

SHEET 14 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		94

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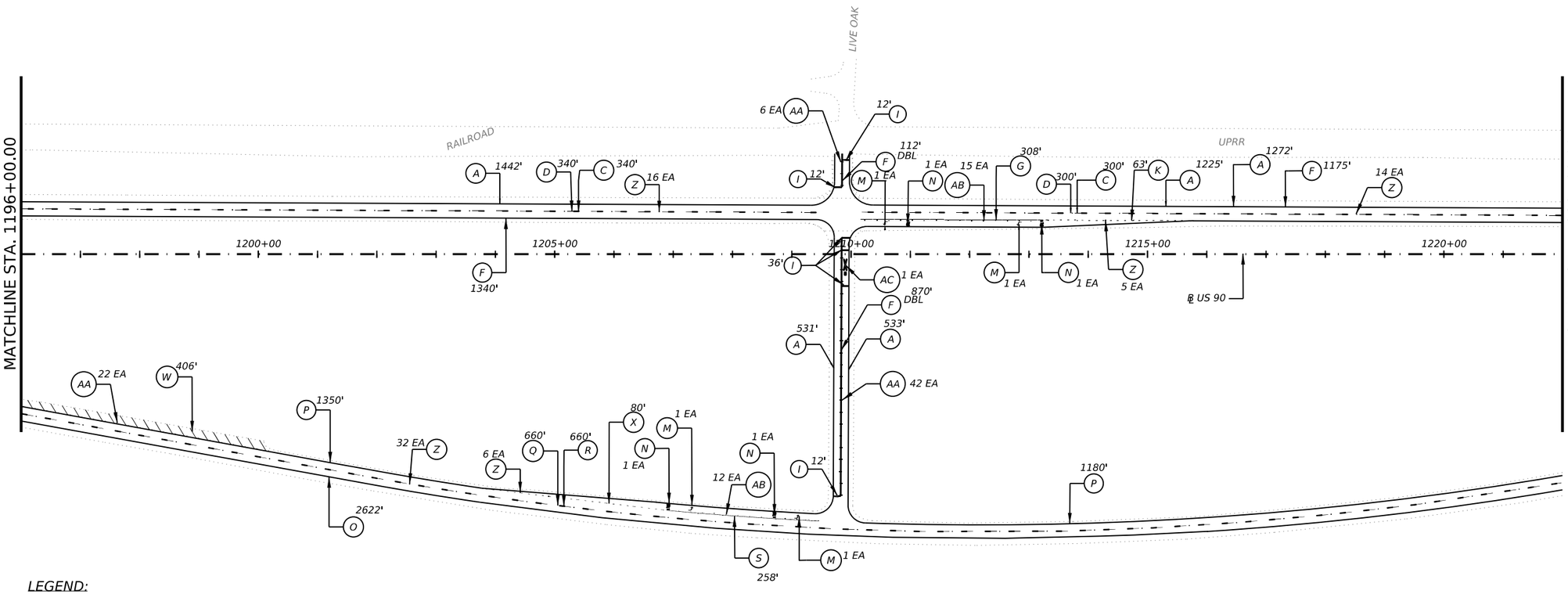

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	*5,003*
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	-
C	666-6036	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	*640*
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	*640*
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	*3,497*
G	666-6306	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	*308*
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	-
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	*72*
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	-
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	*63*
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	*4*
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	*4*
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	*2,622*
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	*2,530*
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	*660*

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	*660*
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	*258*
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	-
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	*406*
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	*80*
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	-
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	*73*
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	*70*
AB	672-6007	REFL PAV MRKR TY-I-C	EA	*27*
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	*1*
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

® 2024
Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

EXHIBIT "A"
UPRR DOT 762860Y RRMP 335.540
HOUSTON SUBDIVISION

SHEET 15 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		95

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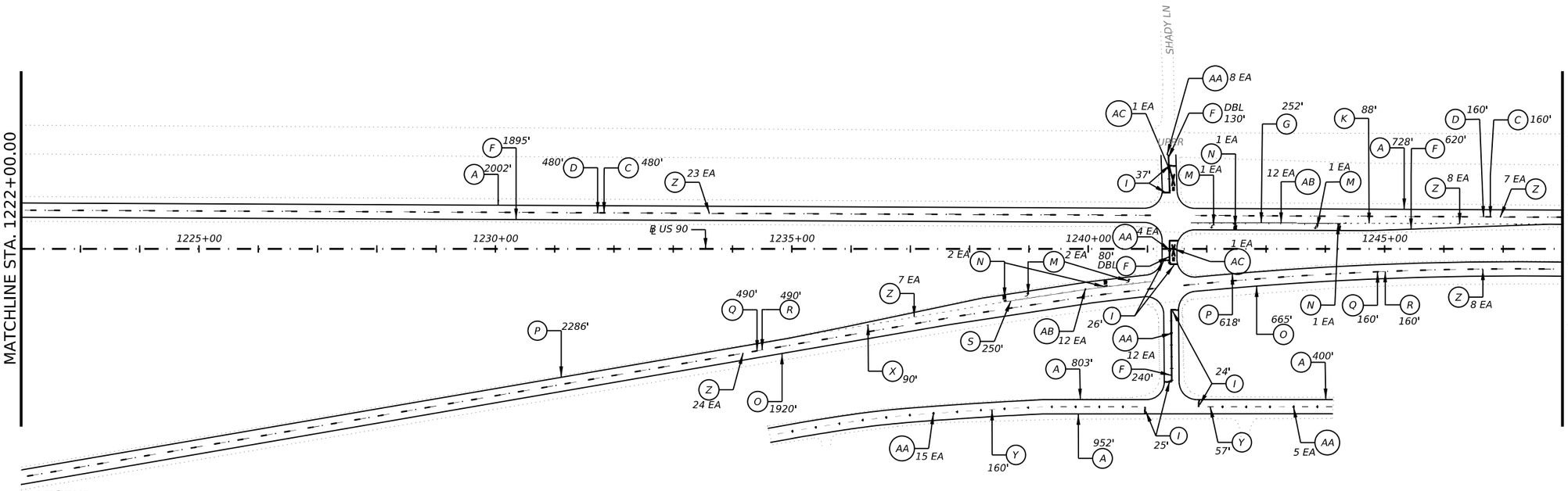

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	4,885
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	-
C	666-6036	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	640
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	640
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	2,965
G	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	252
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	-
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	112
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	-
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	88
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	4
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	4
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	2,585
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	2,904
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	650

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	650
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	250
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	-
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	-
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	90
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	217
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	77
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	44
AB	672-6007	REFL PAV MRKR TY-I-C	EA	24
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	2
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

US 90

PAVEMENT MARKING LAYOUT

EXHIBIT "A"
UPRR DOT 762859E RRMP 334.910
LAFAYETTE SUBDIVISION

SHEET 16 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		96

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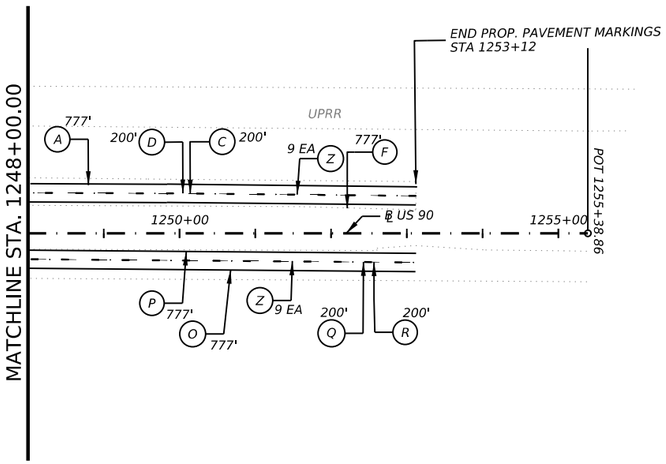

LEGEND:

	ITEM #	DESCRIPTION	UNIT	QUANTITY
A	666-6309	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	LF	777
B	666-6288	REF PROF PAV MRK TY I (Y)6"(SLD)(60MIL)	LF	-
C	666-6036	RE PM W/RET REQ TY I (W)6"(BRK)(100 MIL)	LF	200
D	666-6162	RE PV MRK TY I(BLACK)6"(SHADOW)(100MIL)	LF	200
F	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	777
G	666-6306	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	-
H	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	-
I	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	-
J	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	-
K	666-6018	REFL PAV MRK TY I (W) 6" (DOT) (100 MIL)	LF	-
L	666-6350	REFL PAV MRK TY I (W) 12" (DOT) (100 MIL)	LF	-
M	668-6077	PREFAB PAVMRK TY C (W) (ARROW)	EA	-
N	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	-
O	6038-6004	MULTIPOLYMER PAV MRK (W) (6") (SLD)	LF	777
P	6038-6017	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	LF	777
Q	6038-6005	MULTIPOLYMER PAV MRK (W) (6") (BRK)	LF	200

	ITEM #	DESCRIPTION	UNIT	QUANTITY
R	6038-6024	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	LF	200
S	6038-6007	MULTIPOLYMER PAV MRK (W) (8") (SLD)	LF	-
T	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	-
U	6038-6013	MULTIPOLYMER PAV MRK (W) (24") (SLD)	LF	-
V	6038-6018	MULTIPOLYMER PAV MRK (Y)(6")(BRK)	LF	-
W	6038-6021	MULTIPOLYMER PAV MRK (Y)(12")(SLD)	LF	-
X	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	-
Y	666-6006	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	-
Z	672-6010	REFL PAV MRKR TY II-C-R	EA	18
AA	672-6009	REFL PAV MRKR TY-II-A-A	EA	-
AB	672-6007	REFL PAV MRKR TY-I-C	EA	-
AC	666-6093	PREFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	-
AD	668-6083	PREFAB PAV MRK TY C (W) (LNDP ARROW)	EA	-
AE	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	-
AF	6038-6009	MULTIPOLYMER PAV MRK (W) 8" (DOT)	LF	-

REMOVAL OF EXIST. SIGN

NOTE:

REMOVE EXISTING RPMs. REMOVAL OF EXISTING RPM WILL BE SUBSIDIARY TO ITEM 677 6002.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, P.E.

01/29/2024

® 2024
Texas Department of Transportation

US 90

PAVEMENT MARKING LAYOUT

SHEET 17 OF 17

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		97

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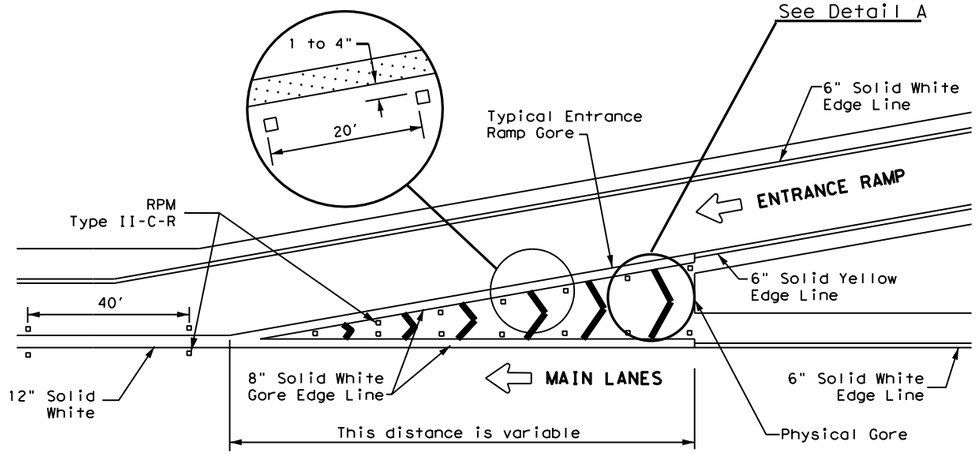
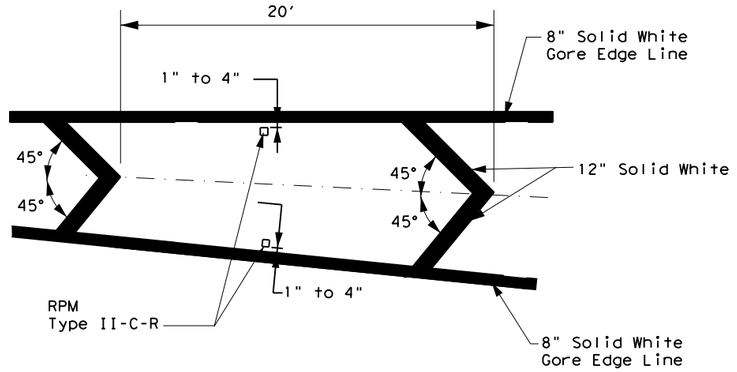


TYPICAL ENTRANCE RAMP GORE MARKING



NOTES

1. Raised pavement markers shall be centered between chevron or gore lines.
2. For more information, see Reflectorized Raised Pavement Marker Detail.

DETAIL A

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED
PROFESSIONAL ENGINEER

Sharmeen Rahman, PE

01/29/2024

Texas Department of Transportation

ENTRANCE GORE PAVEMENT MARKINGS DETAIL

FILE: fpm(5)-19.dgn	DN:	CK:	DW:	CK:
© TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		98

23F

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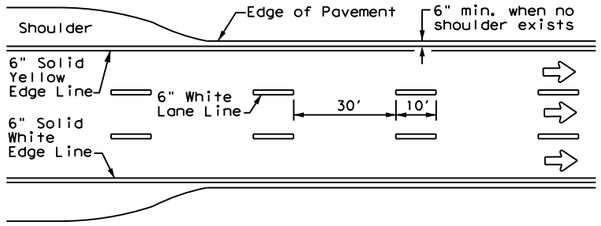
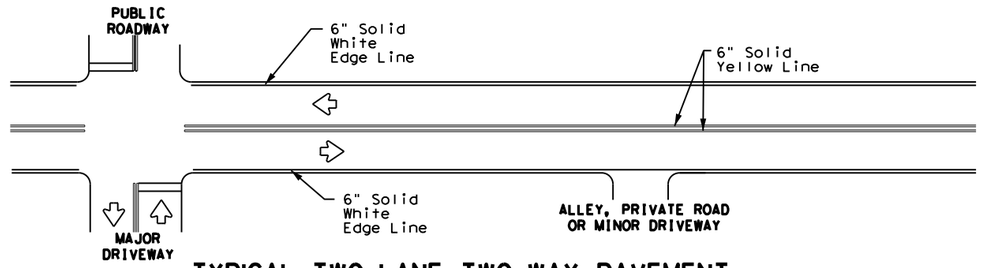
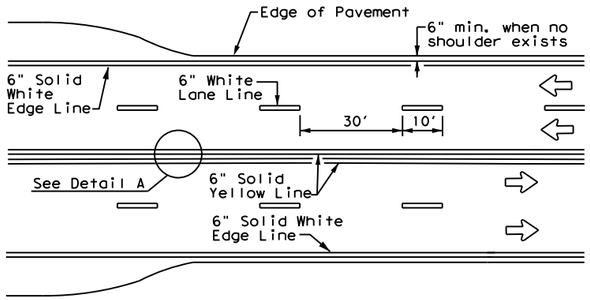
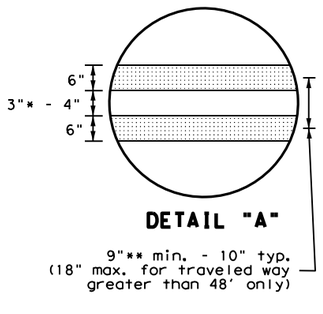


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

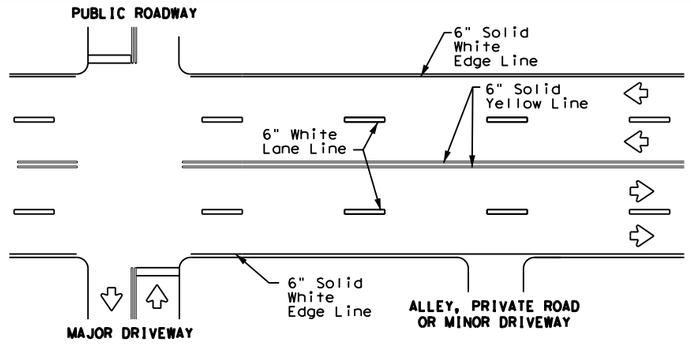




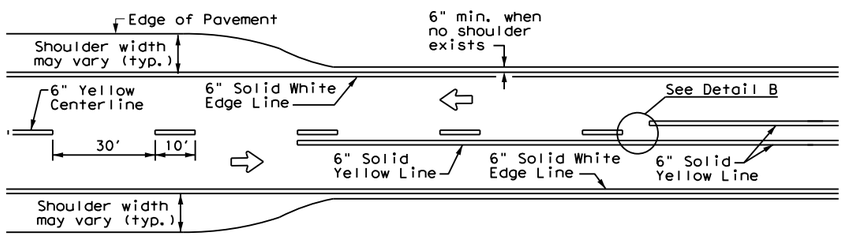
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

* 2" minimum for restripe projects when approved by the Engineer.

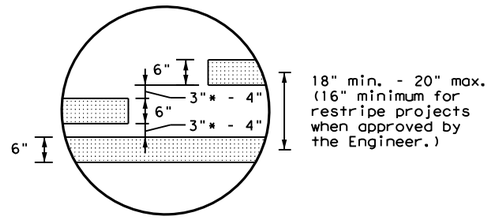
** 8" minimum for restripe projects when approved by the Engineer.



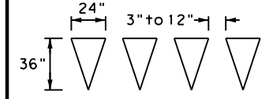
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

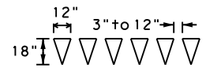


* 2" minimum for restripe projects when approved by the Engineer.

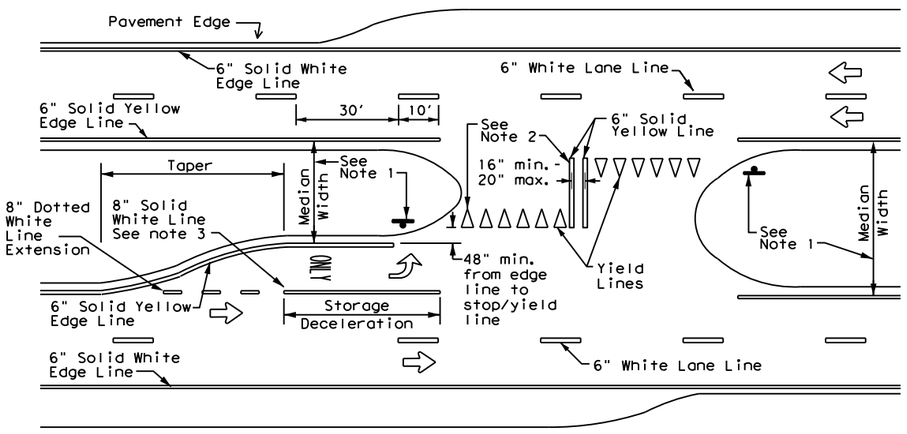


For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



For posted speed on road being marked equal to or less than 40 MPH.



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

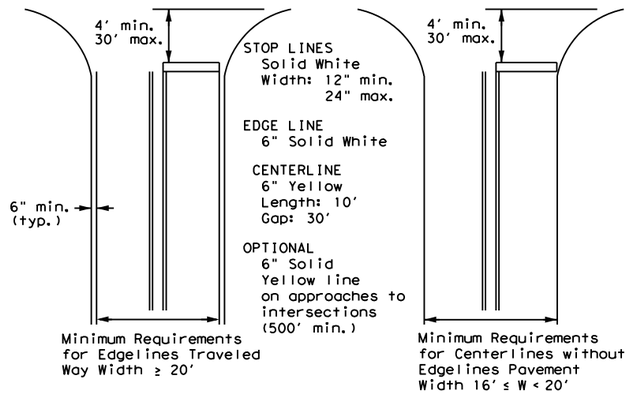
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

Texas Department of Transportation

Traffic Safety Division Standard

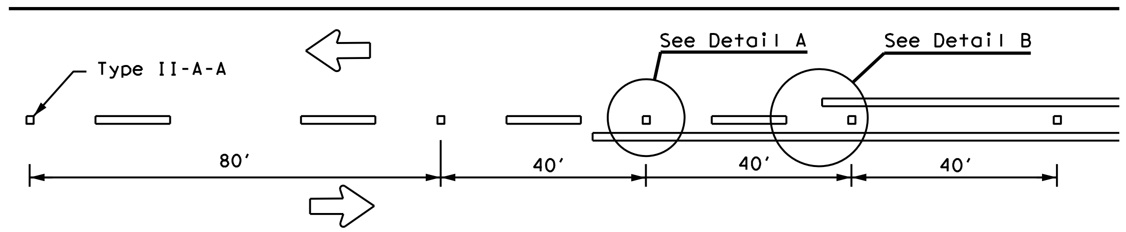
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

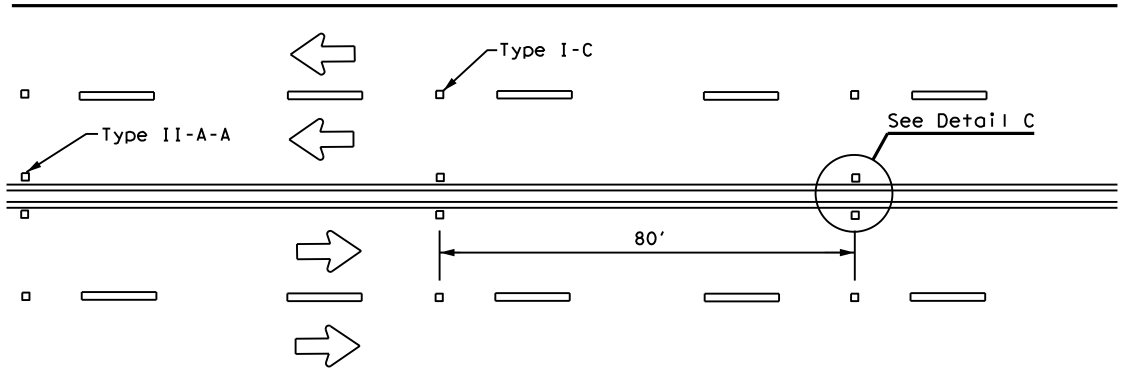
FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
11-78 8-00 6-20	DIST	COUNTY		SHEET NO.
8-95 3-03 12-22	HOU	HARRIS		99
5-00 2-12				

22A

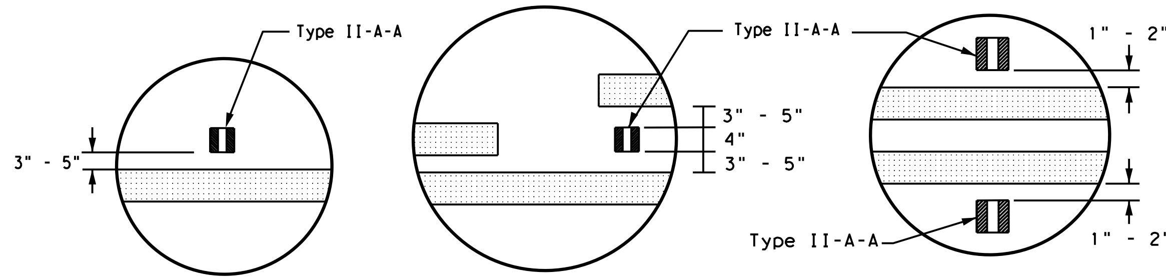
REFLECTIVE RAISED PAVEMENT MARKERS
FOR VEHICLE POSITIONING GUIDANCE

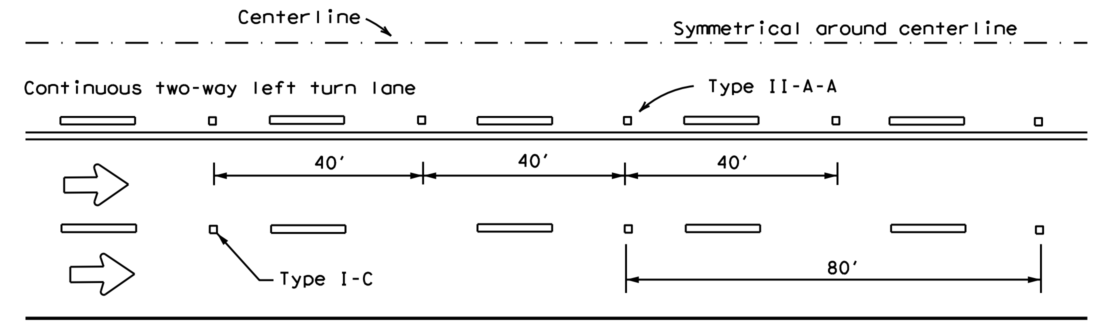


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

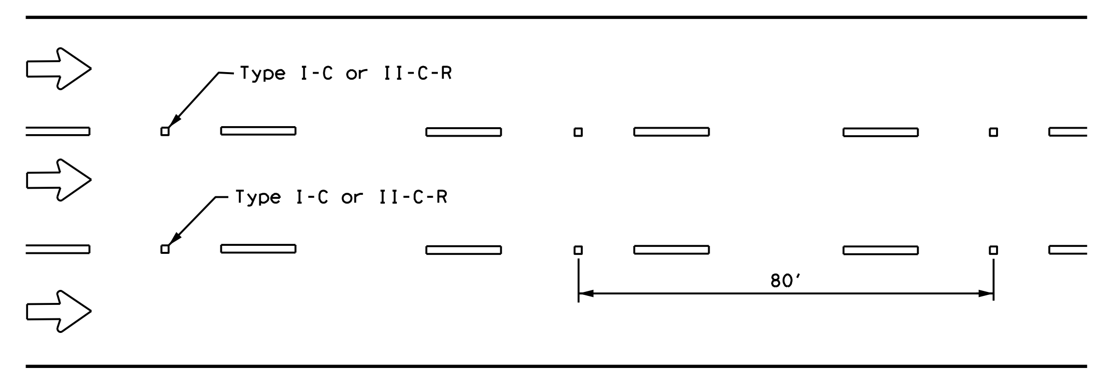


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



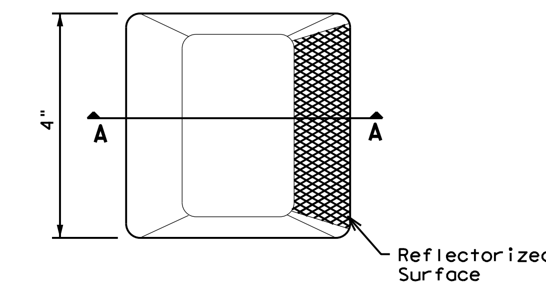
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

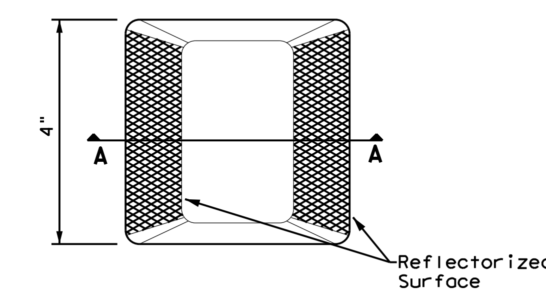
See Note 3.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

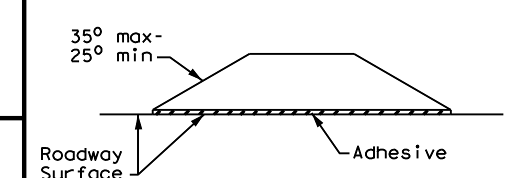
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

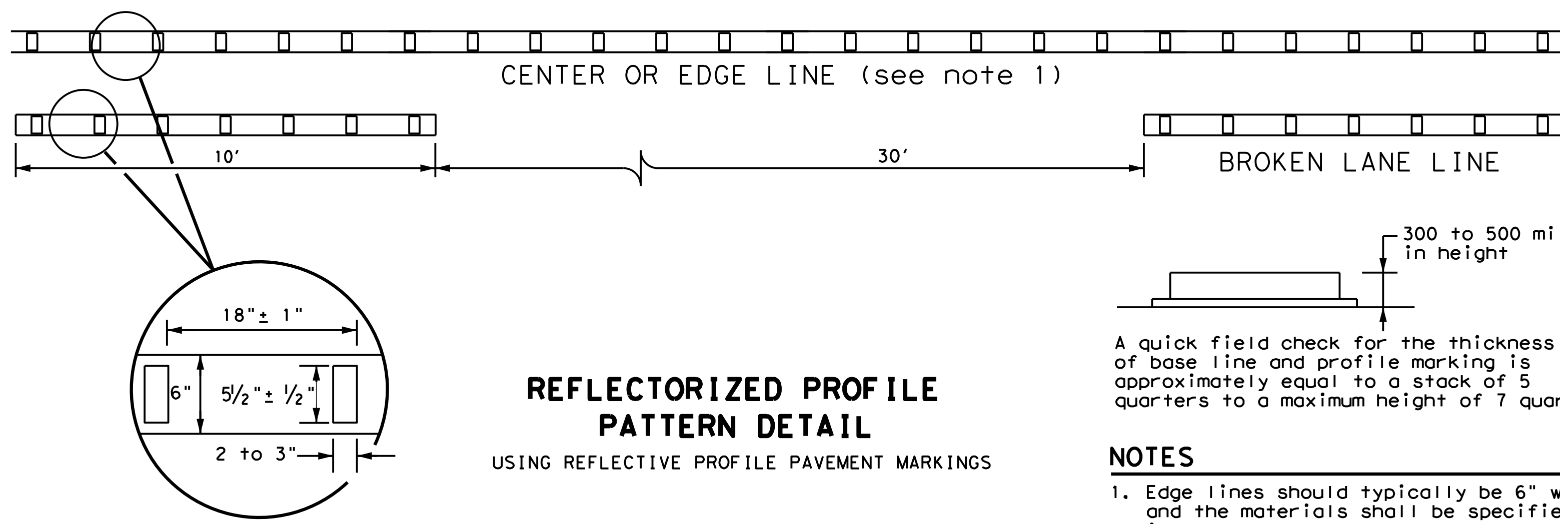


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS
PM(2)-22

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	DIST		COUNTY	SHEET NO.
	HOU		HARRIS	100

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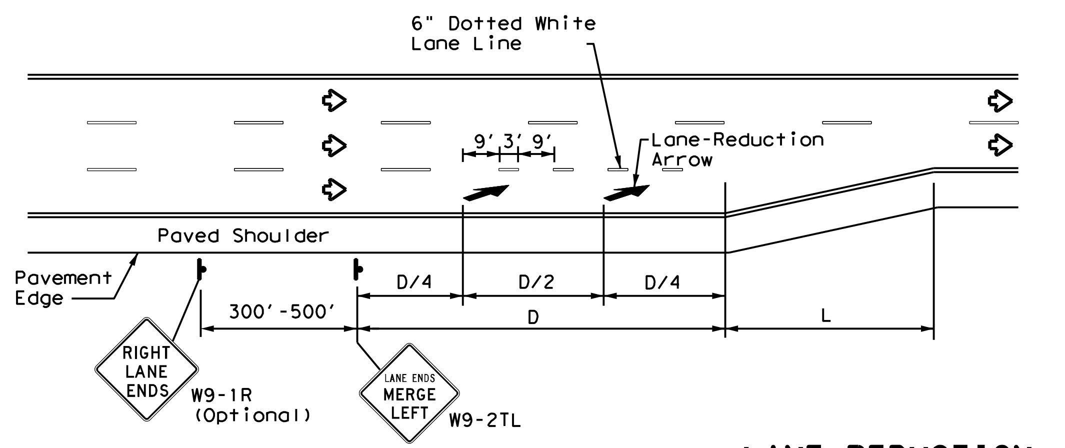


LANE REDUCTION

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional RIGHT LANE ENDS (W9-1R) sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

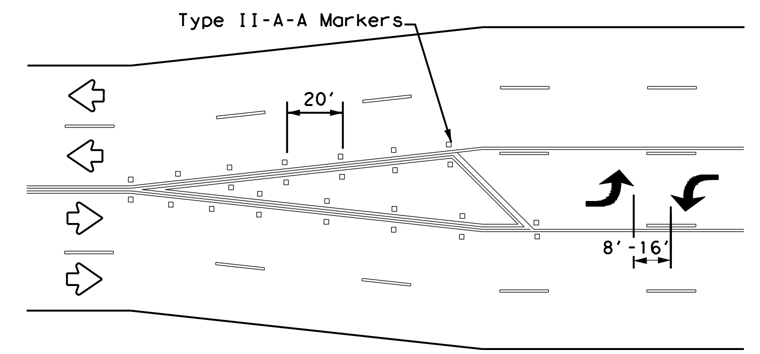
ADVANCED WARNING SIGN DISTANCE (D)		
Posted Speed	D (ft)	L (ft)
30 MPH	460	$L = \frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

GENERAL NOTES

1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

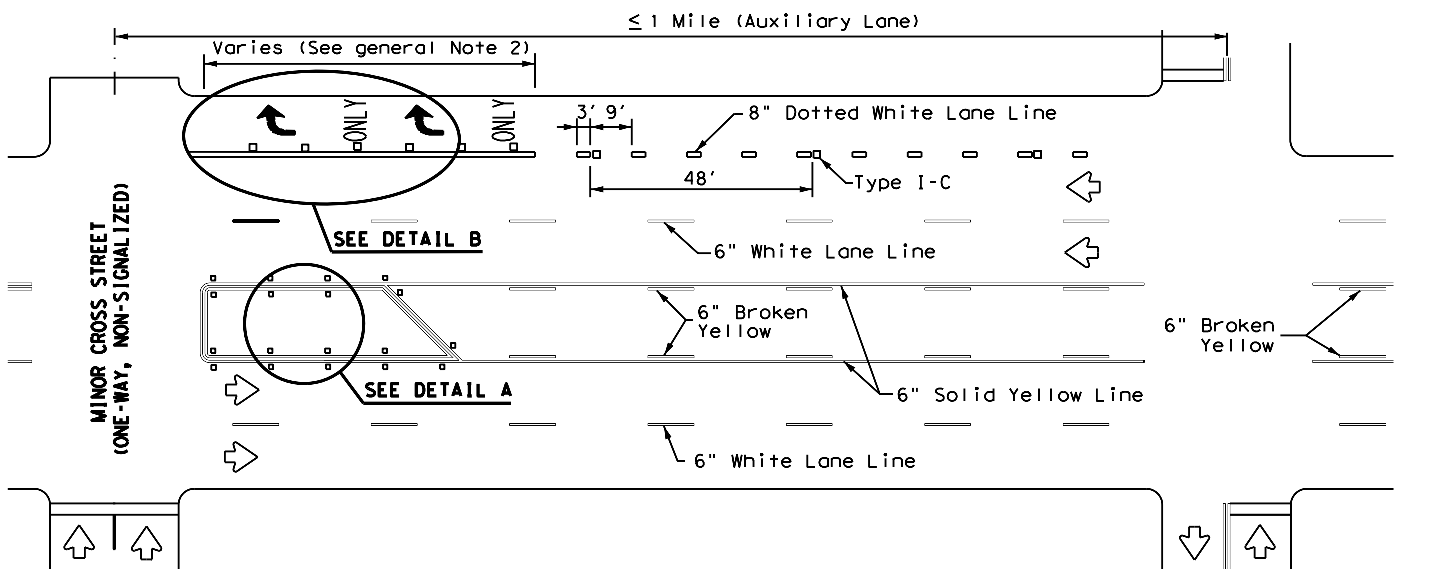
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

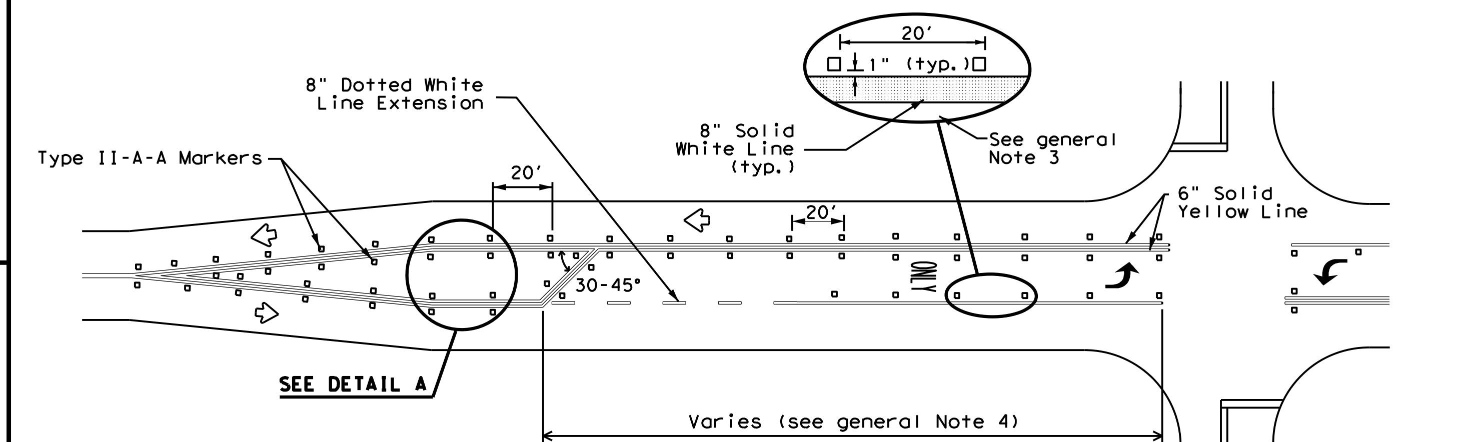


A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

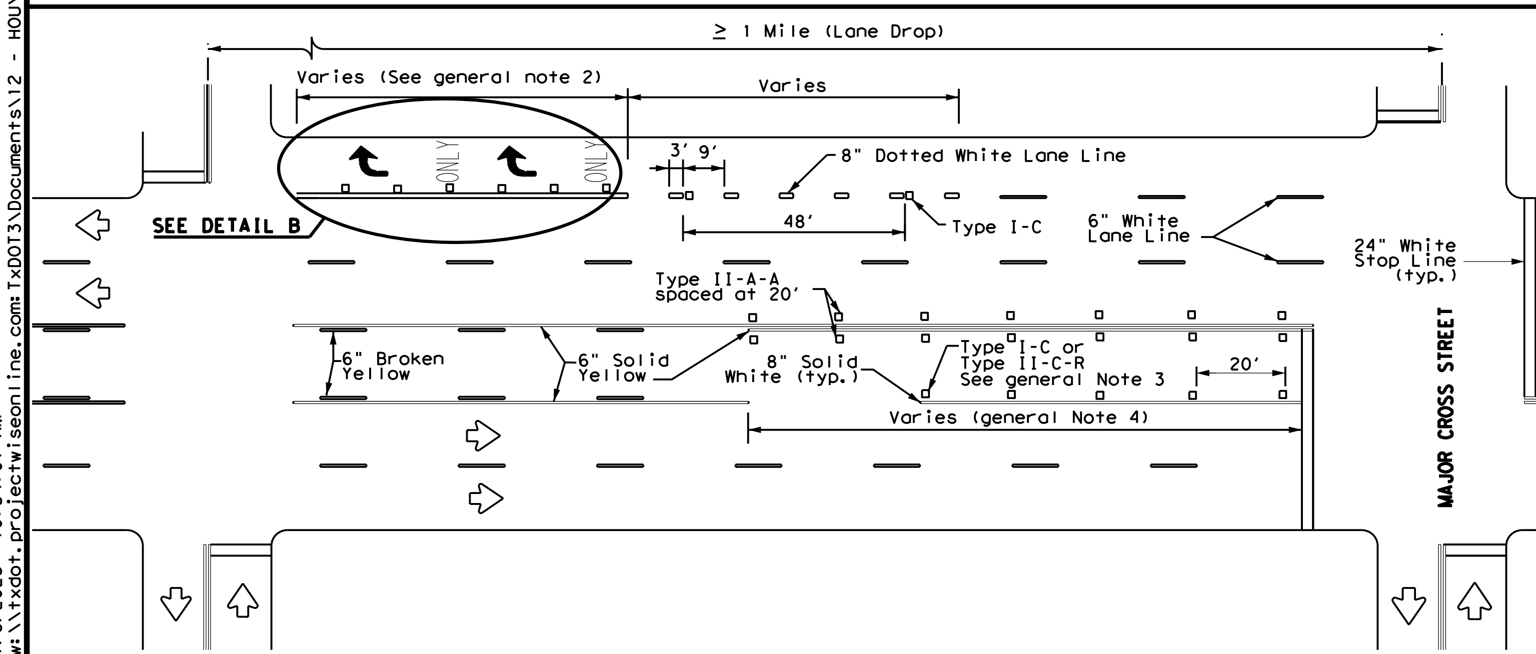
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY



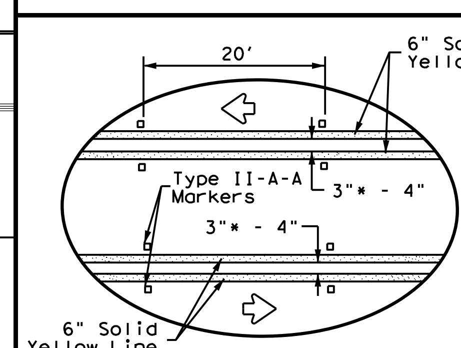
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



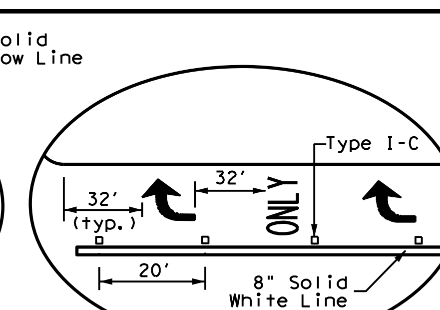
TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



DETAIL A



DETAIL B

* 2" minimum allowed for restripe projects when approved by the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-22

FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT 0028	SECT 02	JOB 098,etc.	HIGHWAY US 90
REVISIONS 4-98 3-03 6-20 5-00 2-10 12-22 8-00 2-12	DIST HOU		COUNTY HARRIS	SHEET NO. 101

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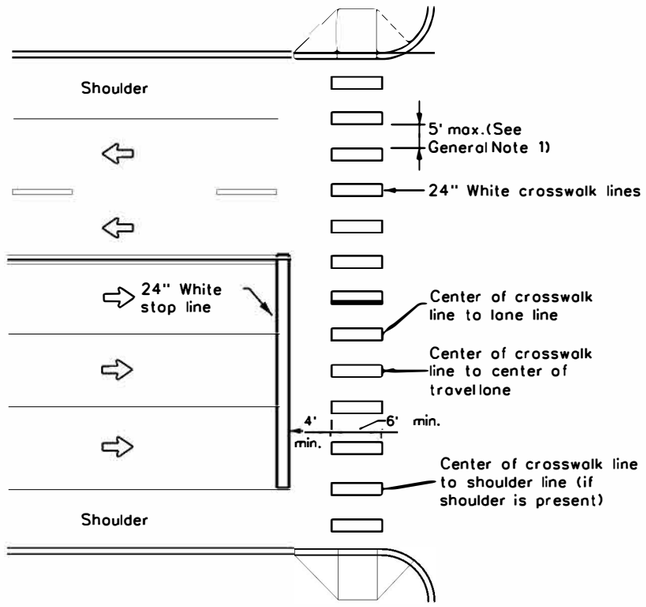


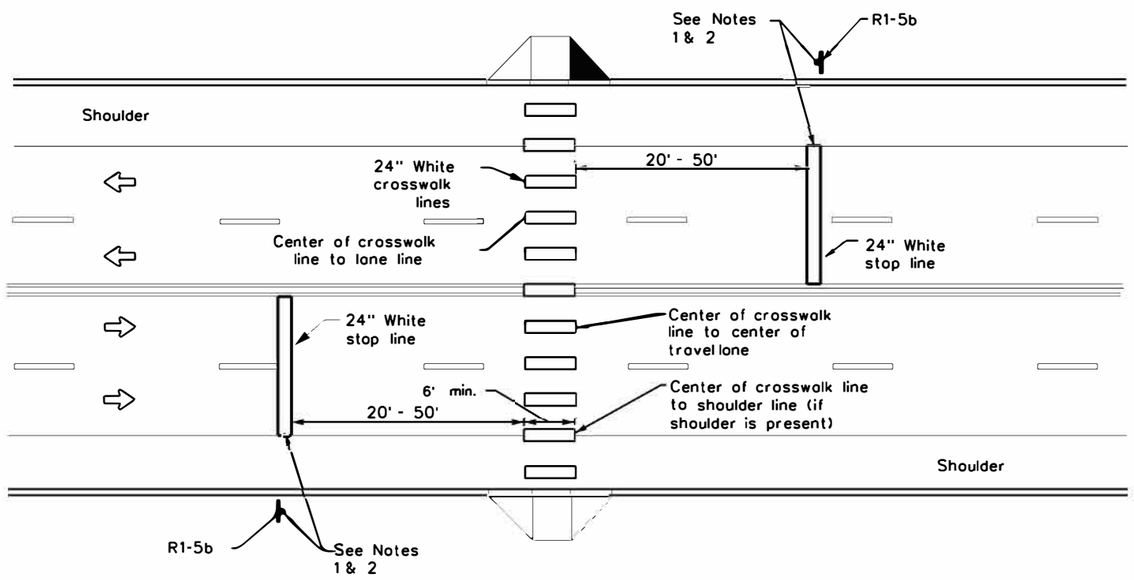
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travellanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Department Material Specifications as specified by the plans.



UNSIGNALIZED MIDBLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES:

1. Use stop bars with Stop Here For Pedestrians (R1-5b) signs at unsignalized midblock cross walks.
2. Use stop bars with STOP HERE ON RED (R10-6 or R10-6a) signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

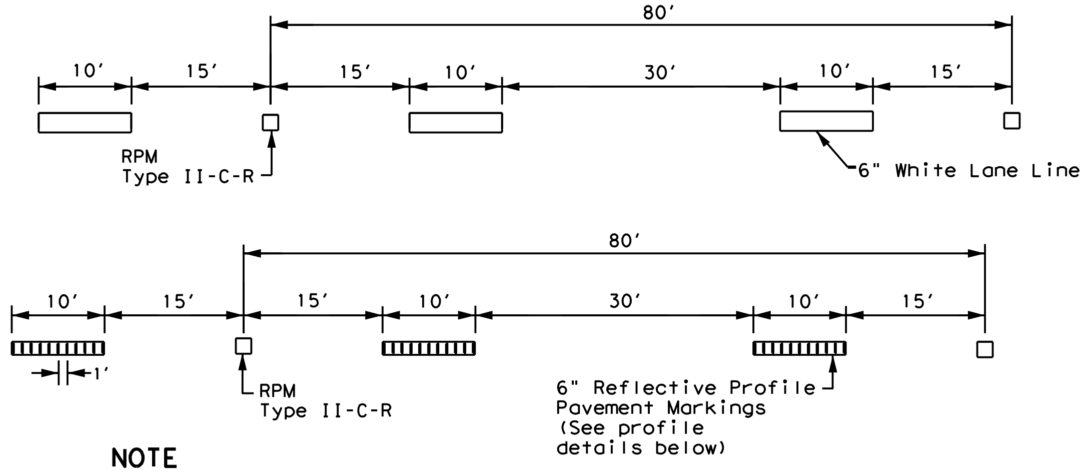
PM(4)-22A

FILE: pm4-22a.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 6-20 9-22 12-22	0028	02	098,etc.	US 90
	DIST	COUNTY		SHEET NO.
226	HOU	HARRIS		102

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.

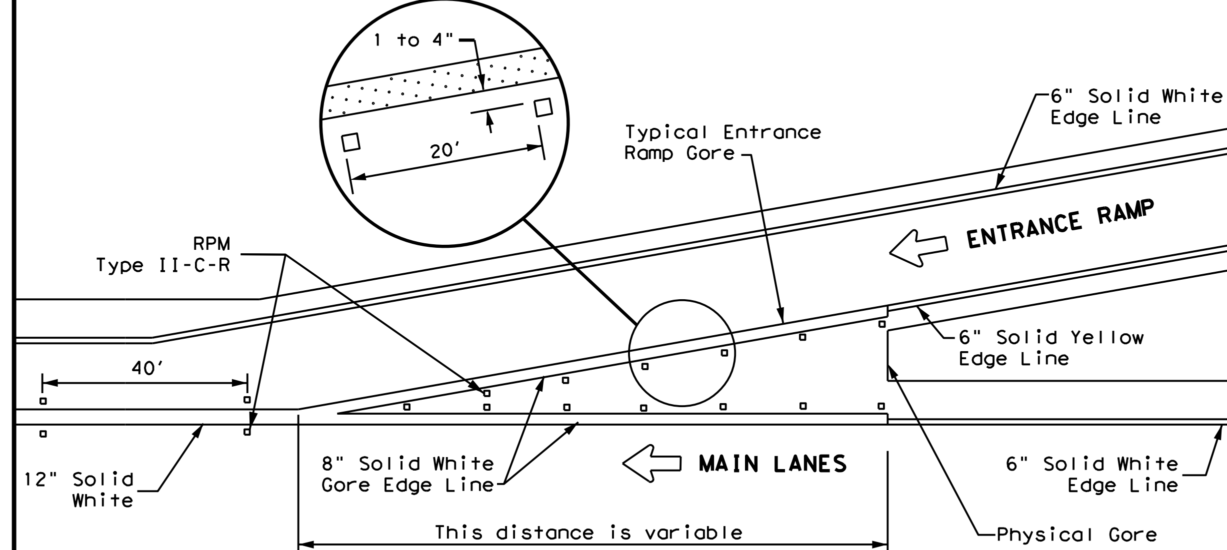
LEGEND	
⇦	Traffic flow
↱	Pavement marking arrows (white)
▫	Reflectorized Raised Markers (RPM) Type II-C-R



NOTE

Reflectorized raised pavement markers Type II-C-R shall be spaced on 80' centers with the clear face toward normal traffic and the red face toward wrong way traffic. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.

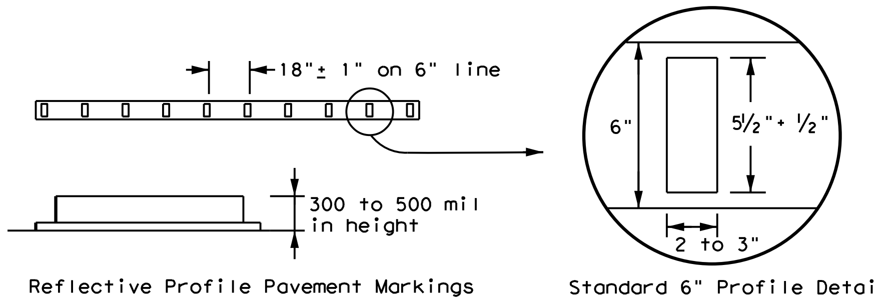
TRAFFIC LANE LINES PAVEMENT MARKING



TYPICAL ENTRANCE RAMP GORE MARKING

GENERAL NOTE

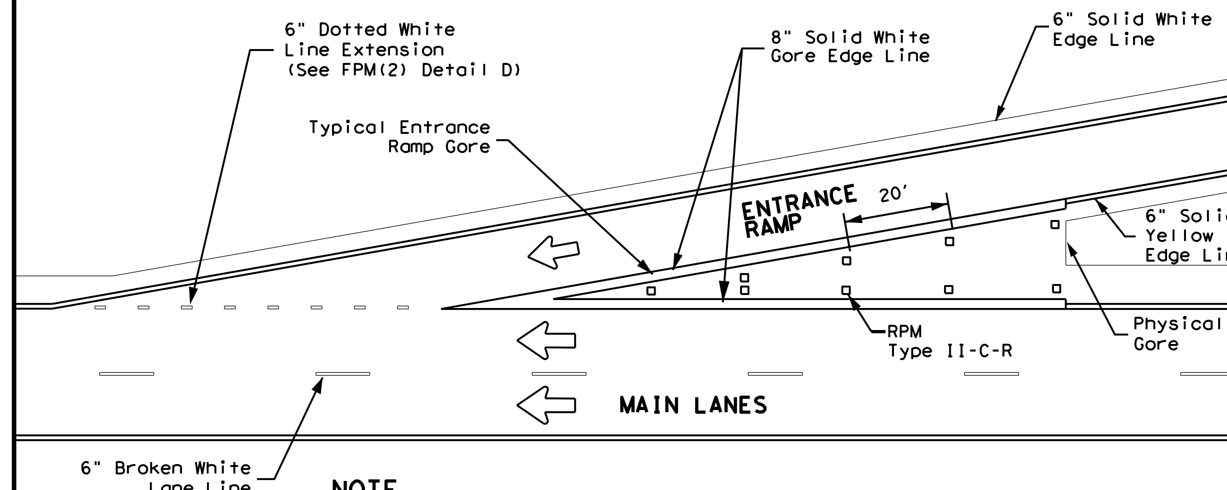
On concrete pavements the raised pavement markers shall be placed to one side of the longitudinal joints.



NOTE

Edge lines should typically be 6" wide and the materials shall be as specified in the plans. See details above if reflective profile pavement markings are to be used.

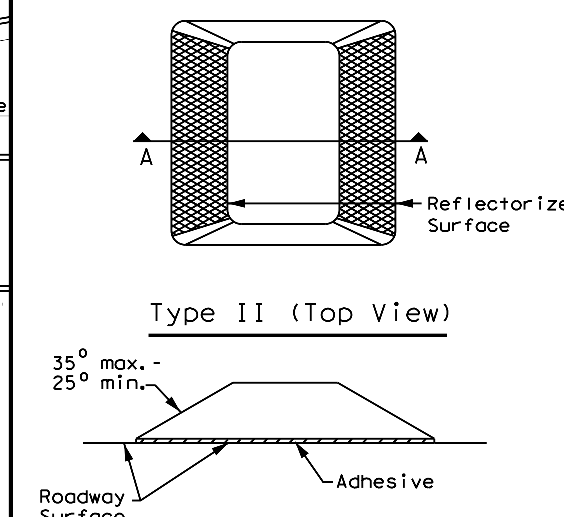
EDGE LINE PAVEMENT MARKINGS



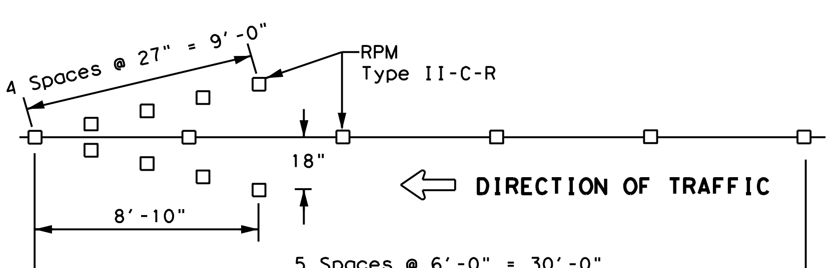
NOTE

See the Roadway Design Manual Chapter 3 to determine if a tapered acceleration lane may be used.

TAPERED ACCELERATION LANE



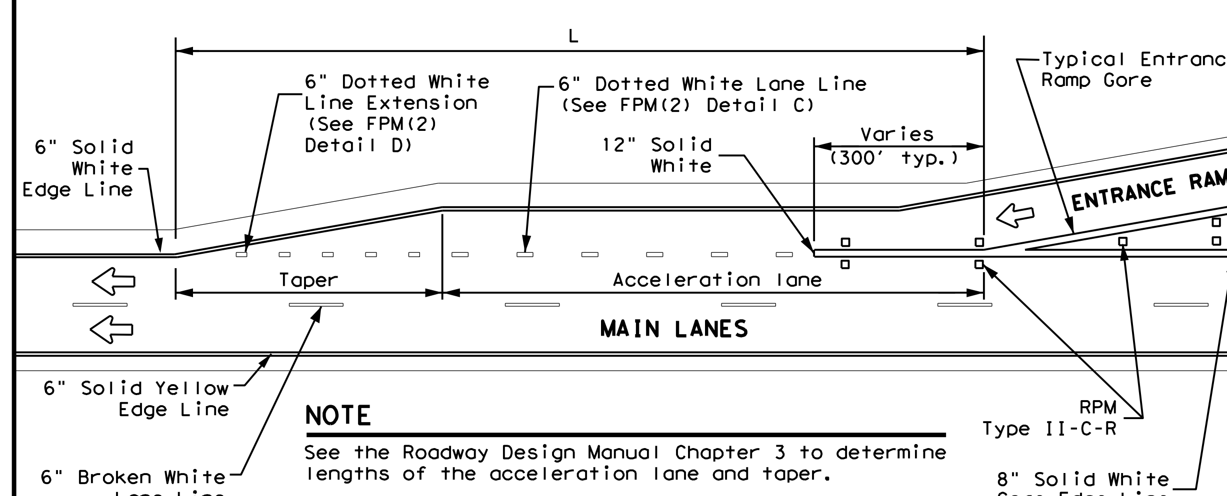
REFLECTORIZED RAISED PAVEMENT MARKER (RPM)



NOTES

1. Reflectorized raised pavement markers Type-II-C-R in the wrong way arrow shall have the clear face toward normal traffic and the red face toward the wrong way traffic.
2. Red reflectorized wrong way arrows, not to exceed two, may be placed on exit ramps. Locations of the arrows shall be as shown in the plans or as directed by the engineer.

WRONG WAY ARROW



NOTE

See the Roadway Design Manual Chapter 3 to determine lengths of the acceleration lane and taper.

PARALLEL ACCELERATION LANE

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD FREEWAY PAVEMENT MARKINGS WITH RAISED PAVEMENT MARKERS

FPM(1)-22

FILE: fpm(1)-22.dgn	DN:	CK:	DW:	CK:
© TxDOT October 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 5-74 8-00 2-12 4-92 2-08 10-22 5-00 2-10	0028	02	098,etc.	US 90
	DIST		COUNTY	SHEET NO.
	HOU		HARRIS	103

23A

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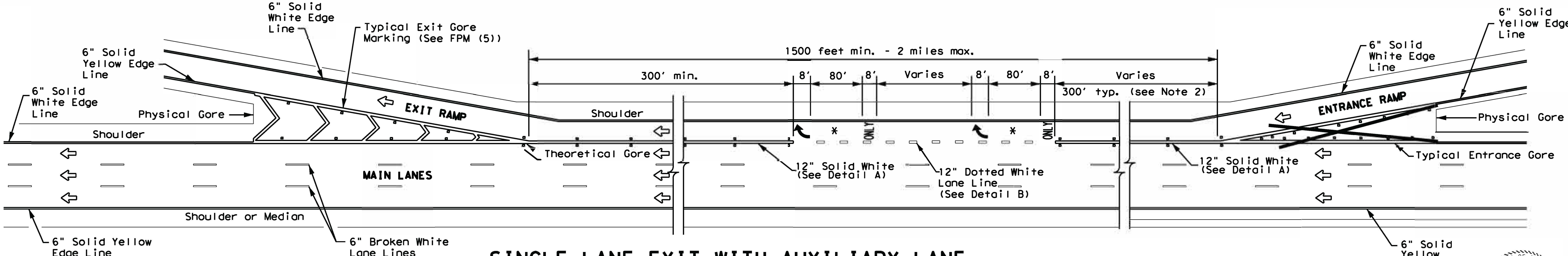
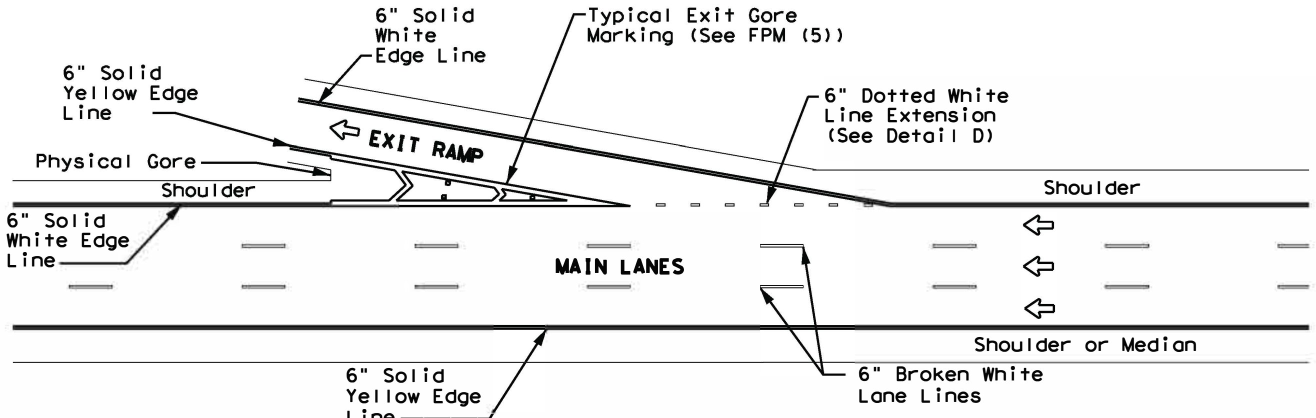


SINGLE LANE EXIT WITH AUXILIARY LANE

(See Note 2)

NOTE: SEE SHEET 98 FOR ENTRANCE RAMP GORE PAVEMENT MARKINGS DETAIL

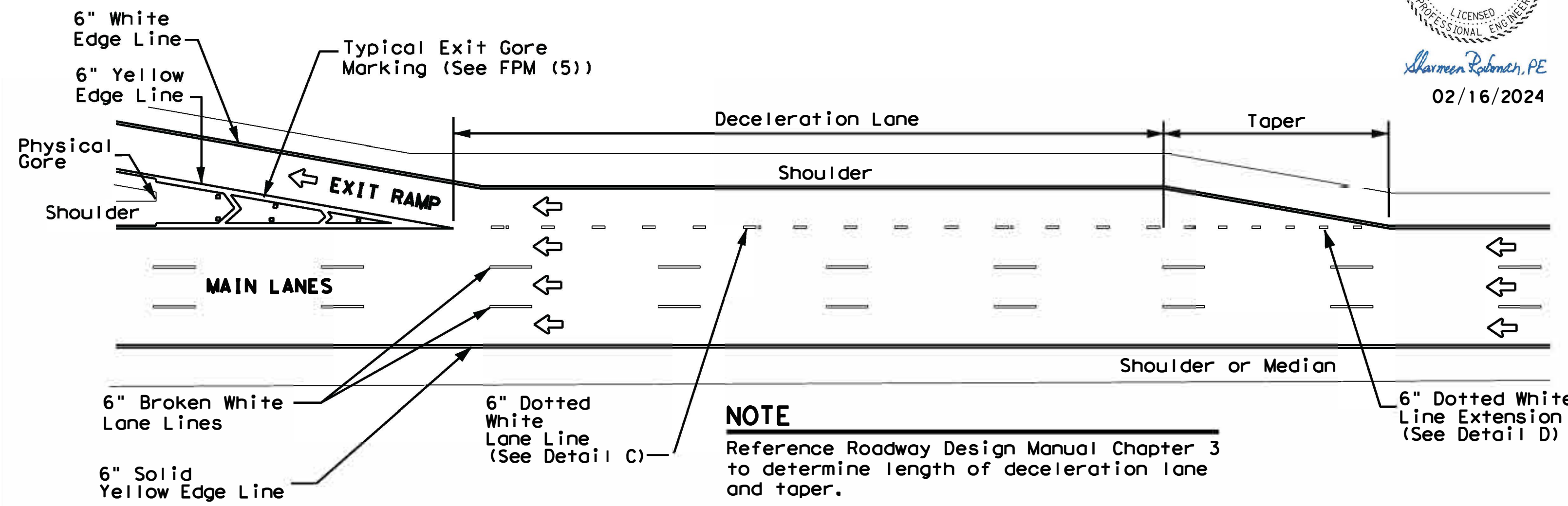
STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED PROFESSIONAL ENGINEER
Sharmeen Rahman, PE
02/16/2024



NOTE

Reference Roadway Design Manual Chapter 3 to determine if tapered deceleration lane may be used.

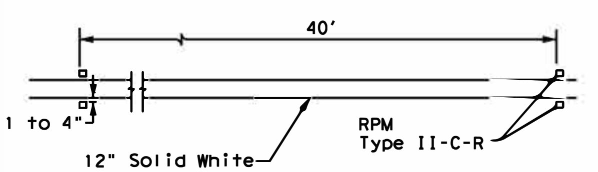
TAPERED DECELERATION LANE



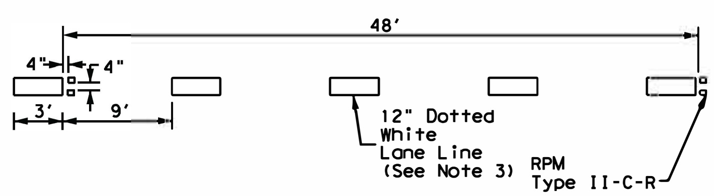
NOTE

Reference Roadway Design Manual Chapter 3 to determine length of deceleration lane and taper.

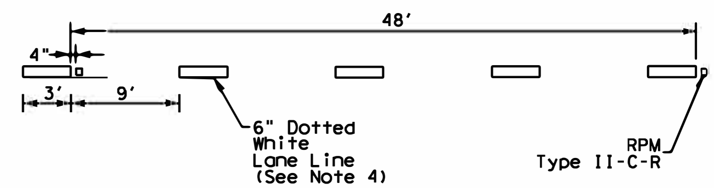
PARALLEL DECELERATION LANE



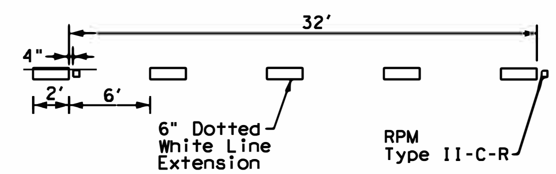
DETAIL A



DETAIL B



DETAIL C



DETAIL D

GENERAL NOTES

1. Pavement markings shall be white except as otherwise noted.
2. Length of 12" white line may vary depending on location.
3. Wide (12") dotted lane line (see Detail B) is used to separate a through lane that continues beyond the interchange from an adjacent mandatory exit lane.
4. Normal (6") dotted lane line (see Detail C) is used at parallel acceleration and deceleration lanes.
5. See FPM(1) for traffic lane line pavement marking details.

LEGEND	
⇦	Traffic flow
↱	Pavement marking arrows (white)
▫	Reflectorized Raised Markers (RPM) Type II-C-R
*	Arrow markings are optional, however "ONLY" is required if arrow is used

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.

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD FREEWAY PAVEMENT MARKINGS ENTRANCE AND EXIT RAMPS

FPM(2)-22 (MOD)

FILE: fpm(2)-22.dgn | DN: | CK: | DW: | CK:

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REVISIONS: 2-77 5-00 2-12 / 4-92 8-00 10-22 / 8-95 2-10

CONT	SECT	JOB	HIGHWAY
0028	02	098,ETC	US 90
DIST		COUNTY	SHEET NO.
HOU		HARRIS	104

238

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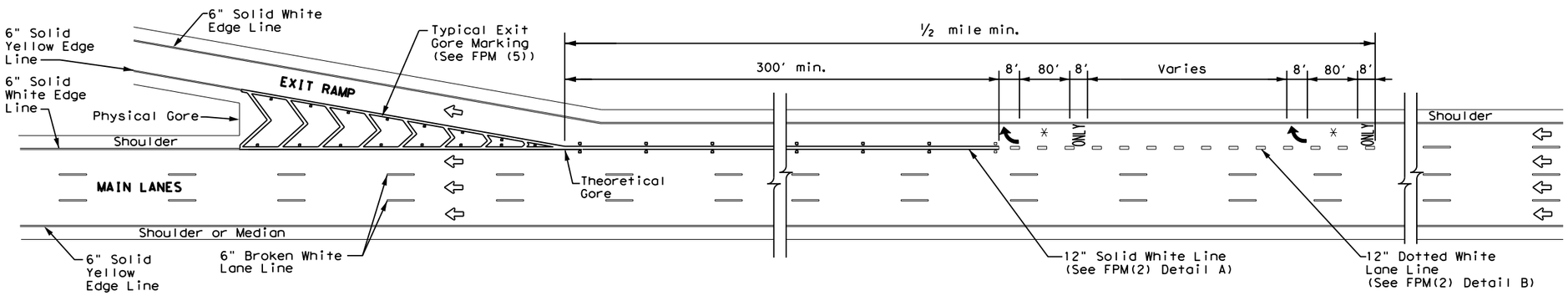
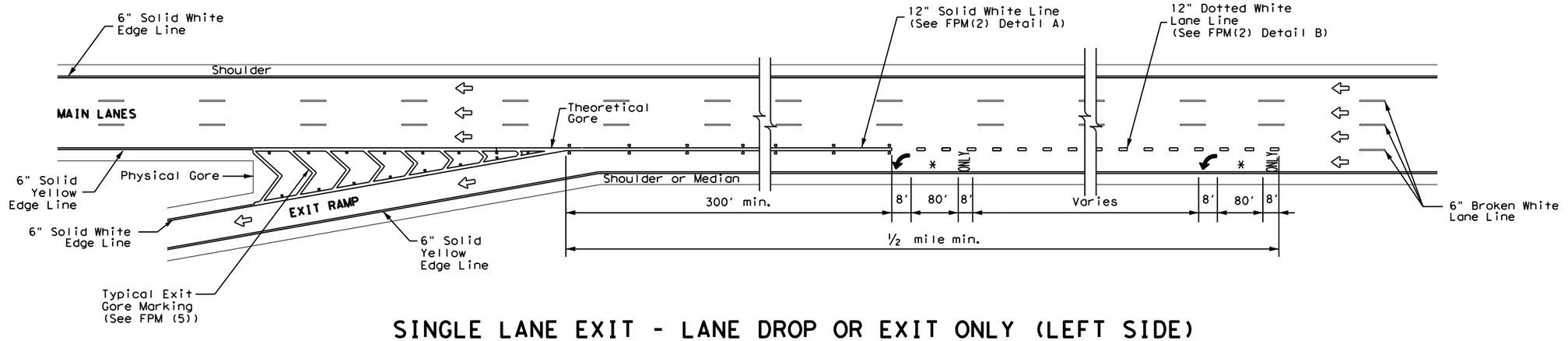


SINGLE LANE EXIT - LANE DROP OR EXIT ONLY

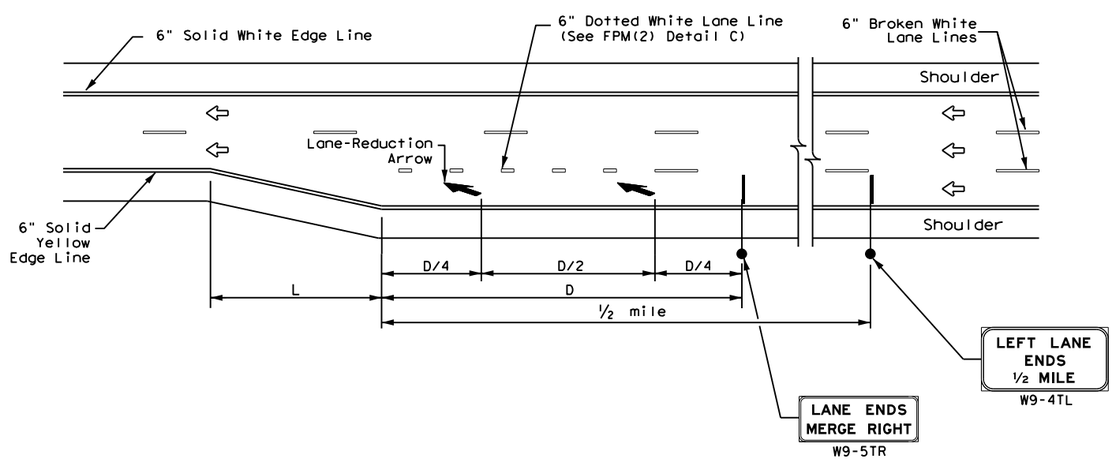
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

LEGEND	
⇦	Traffic flow
↱	Pavement marking arrows (white)
▫	Reflectorized Raised Markers (RPM) Type II-C-R
*	Arrow markings are optional, however "ONLY" is required if arrow is used



SINGLE LANE EXIT - LANE DROP OR EXIT ONLY (LEFT SIDE)



FREEWAY LANE REDUCTION

NOTES

1. Large Guide signs shall conform to the TxDOT Freeway Signing Handbook.
2. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
3. Arrows and sign details can be found in the Standard Highway Sign Designs for Texas (SHSD) at http://www.txdot.gov.
4. These guidelines may also be applied to the design of a right side lane reduction. Use LANE ENDS MERGE LEFT (W9-5TL) and RIGHT LANE ENDS 1/2 MILE (W9-4TR) signs in lieu of what is shown on drawing.

ADVANCED WARNING SIGN DISTANCE (D)		
Posted Speed	D (ft)	L (ft)
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	
80 MPH	1,500	
85 MPH	1,625	

GENERAL NOTES

1. Pavement markings shall be white except as otherwise noted.
2. Length of 12" white line may vary depending on location.
3. Wide (12") dotted lane line (see FPM(2) Detail B) is used to separate a through lane that continues beyond the interchange from an adjacent mandatory exit lane.
4. Edge lines are not required in curb and gutter sections of frontage roads.
5. See FPM(1) for traffic lane line pavement marking details.

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD FREEWAY PAVEMENT MARKINGS SINGLE LANE DROP (EXIT ONLY) AND LANE REDUCTION DETAILS

FPM(3)-22

FILE: fpm(3)-22.dgn	DN:	CK:	DW:	CK:
© TxDOT October 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
4-92 2-10	DIST	COUNTY		SHEET NO.
5-00 2-12	HOU	HARRIS		105
8-00 10-22				

23C

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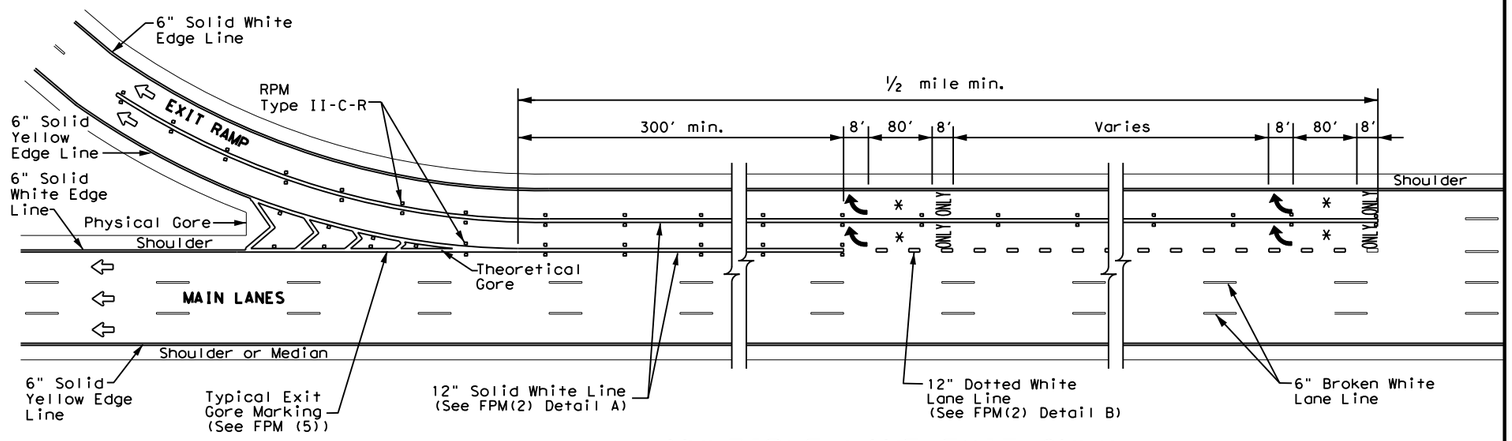


MULTIPLE LANE EXIT ONLY

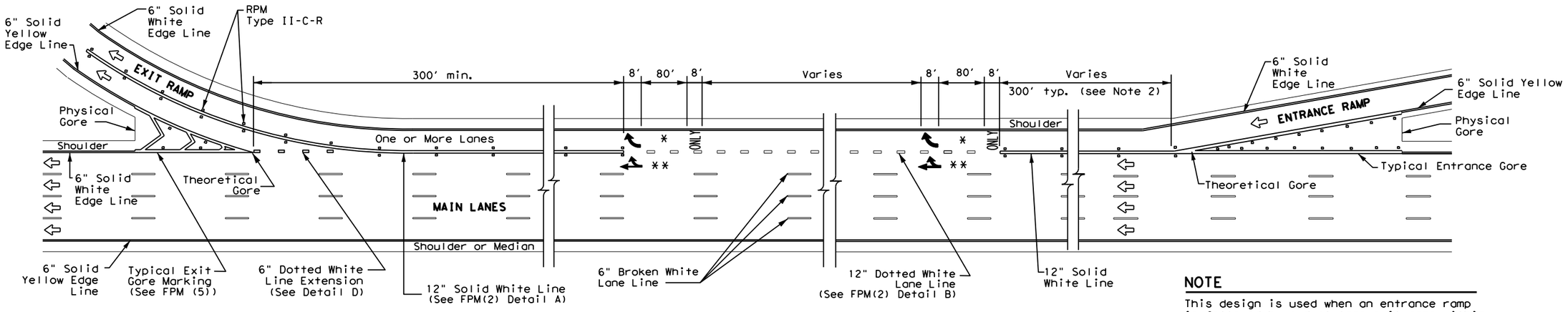
LEGEND	
⇦	Traffic Flow
▫	Reflectorized Raised Markers (RPM) Type II-C-R
↱	Pavement marking arrow (white)
*	Arrow markings are optional, however "ONLY" is required if arrow is used
**	Arrow markings are optional

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.

GENERAL NOTES

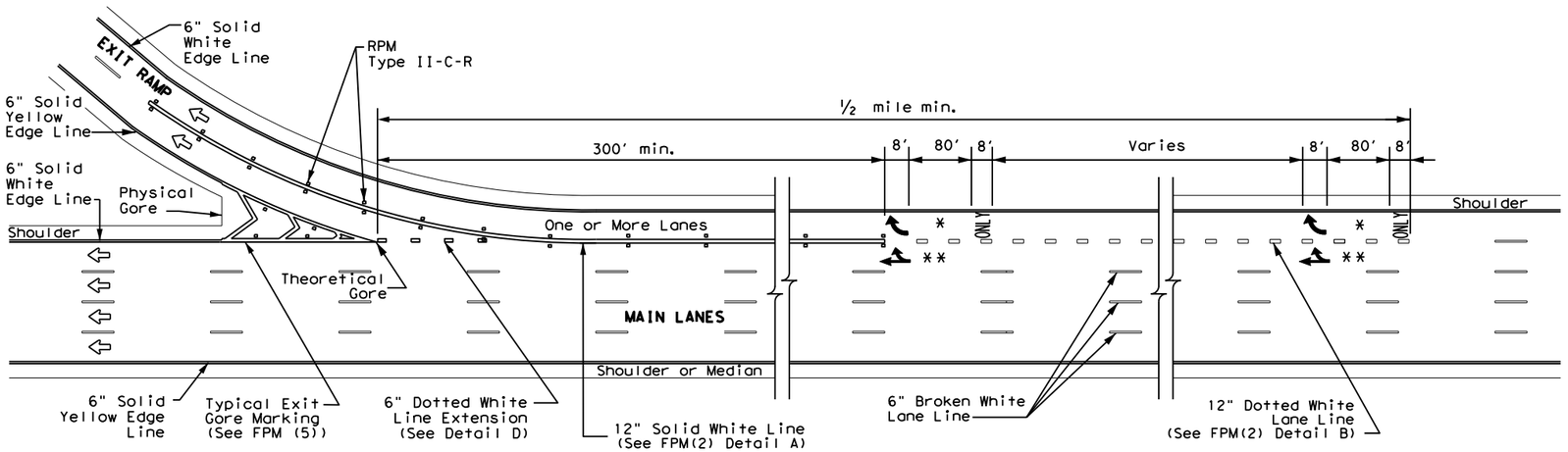
1. Pavement markings shall be white except as otherwise noted.
2. Length of 12" white line may vary depending on location.
3. Wide (12") dotted lane line (see FPM(2) Detail B) is used to separate a through lane that continues beyond the interchange from an adjacent mandatory exit lane.
4. Edge lines are not required in curb and gutter sections of frontage roads.
5. See FPM(1) for traffic lane line pavement marking details.



SINGLE LANE ENTRANCE WITH MULTIPLE LANE EXIT - EXIT ONLY WITH OPTION LANE

NOTE

This design is used when an entrance ramp is followed by a dual lane exit ramp within 2400' downstream (theoretical gore to theoretical gore).



MULTIPLE LANE EXIT - EXIT ONLY WITH OPTION LANE

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD FREEWAY PAVEMENT MARKINGS MULTIPLE LANE DROP (EXIT) DETAILS

FPM(4)-22

FILE: fpm(4)-22.dgn	DN:	CK:	DW:	CK:
© TxDOT October 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
2-77 2-10	DIST	COUNTY		SHEET NO.
5-00 2-12	HOU	HARRIS		106
8-00 10-22				

230

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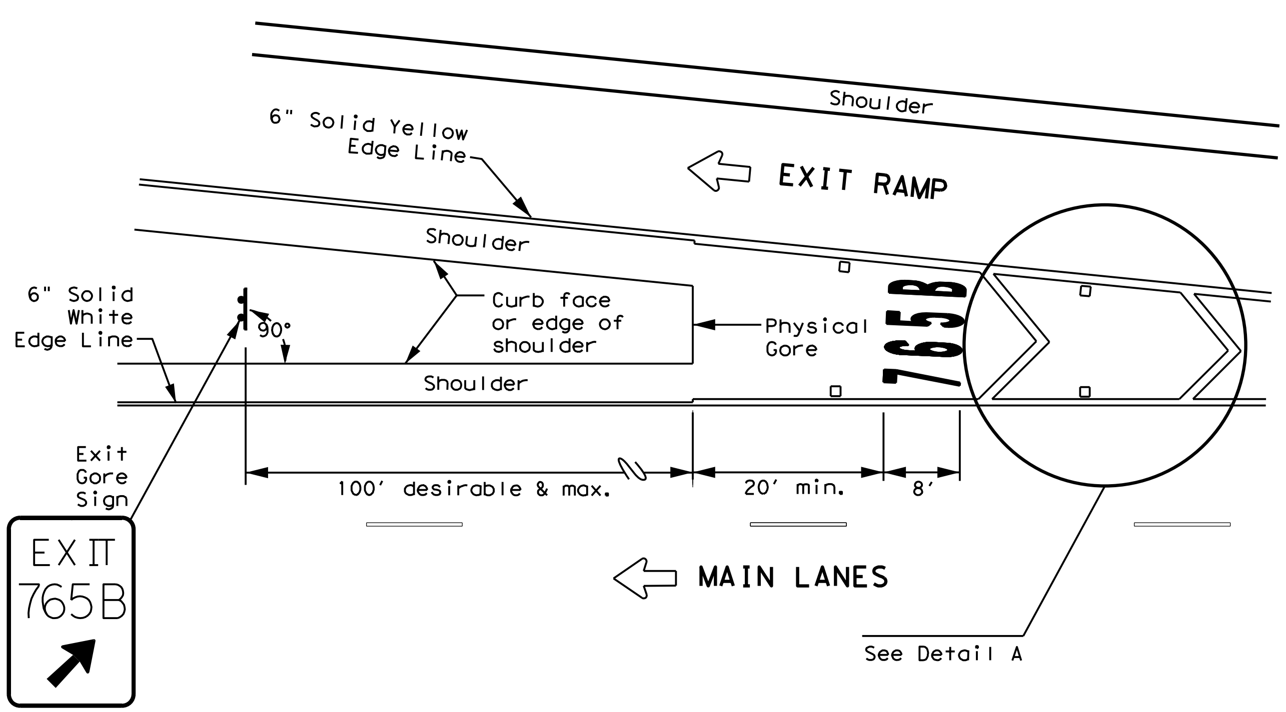
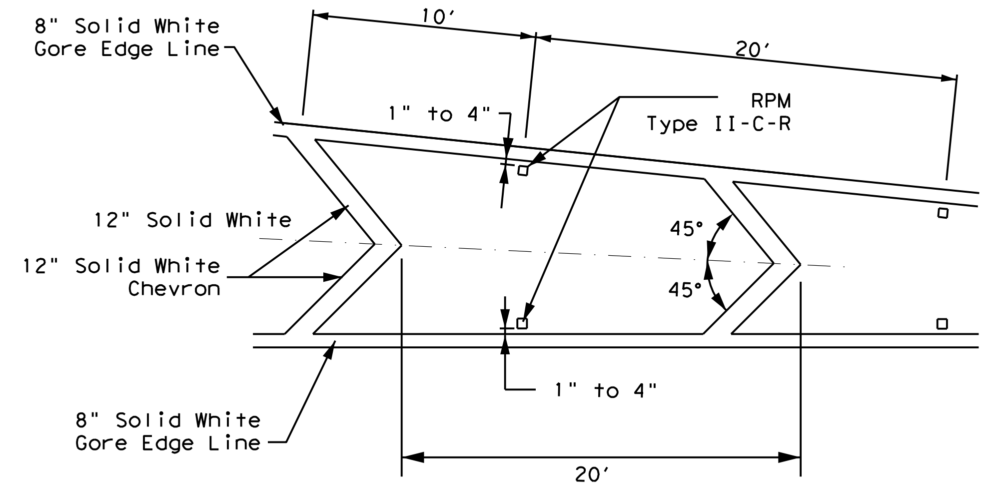
EXIT NUMBER PAVEMENT MARKING NOTES

1. Minimum 8 foot white exit number pavement markings should be used, unless otherwise noted.
2. Spacing between letters and numbers should be approximately 4 inches.
3. Pavement markings are to be located as specified elsewhere in the plans.
4. Numbers and Letters details can be found in the Standard Highway Design for Texas (SHSD) Section 12 at http://www.txdot.gov



MARKINGS WITH EXIT NUMBER



NOTES

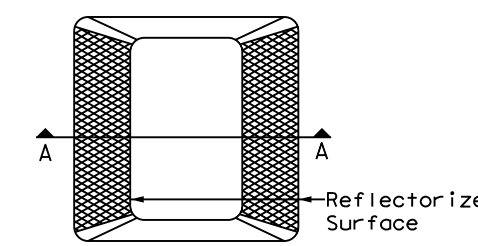
1. Raised pavement markers shall be centered between each chevron or neutral area line.
2. For more information, see Reflectorized Raised Pavement Marker Detail.

DETAIL A

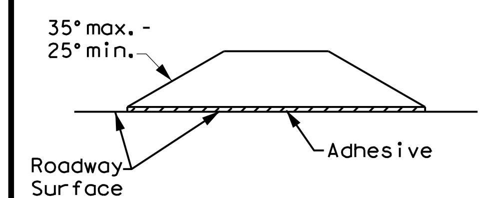
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

LEGEND	
⇦	Traffic flow
▫	Reflectorized Raised Markers (RPM) Type II-C-R

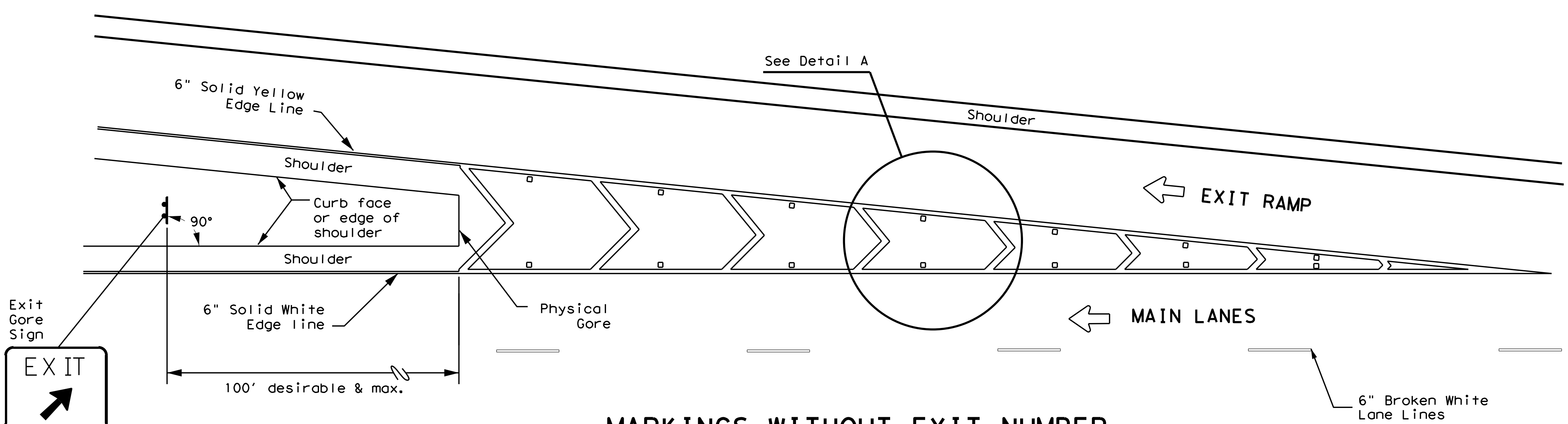


Type II (Top View)



SECTION A

REFLECTORIZED RAISED PAVEMENT MARKER (RPM)



MARKINGS WITHOUT EXIT NUMBER

Texas Department of Transportation

Traffic Safety Division Standard

EXIT GORE PAVEMENT MARKINGS

FPM(5)-22

FILE: fpm(5)-22.dgn	DN:	CK:	DW:	CK:
© TxDOT October 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-19 10-22	0028	02	098,etc.	US 90
	DIST		COUNTY	SHEET NO.
	HOU		HARRIS	107

23E

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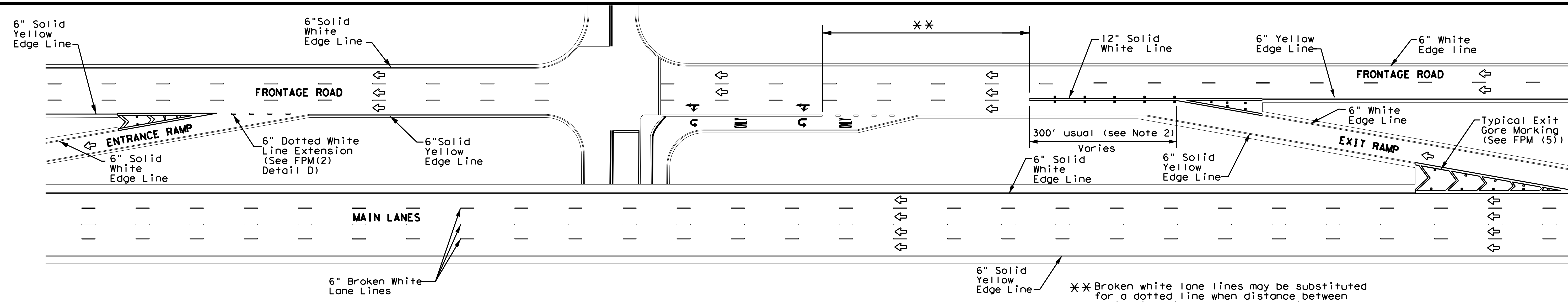
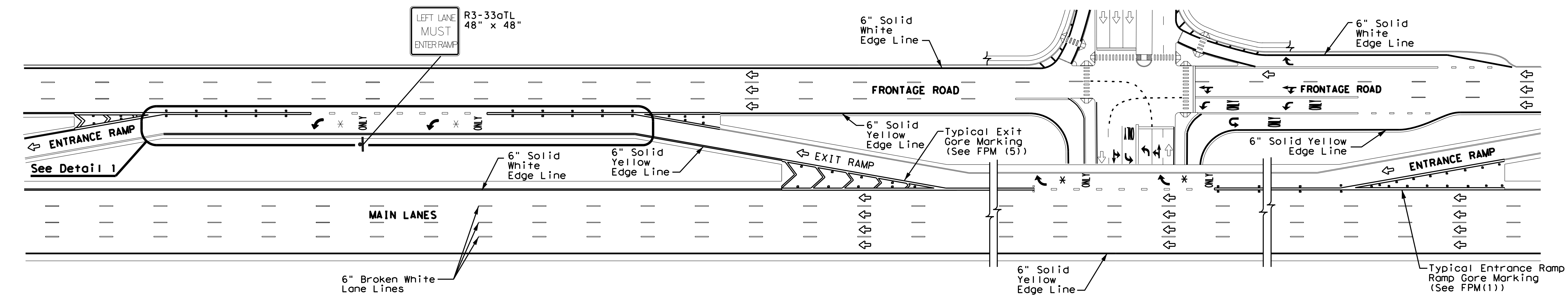
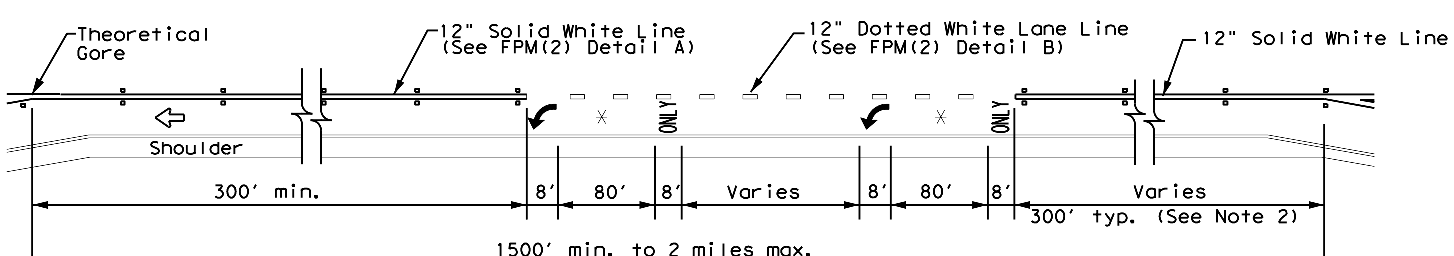


DIAMOND INTERCHANGE

** Broken white lane lines may be substituted for a dotted line when distance between solid lines is <300'. Use 8" white dotted lines with 3' segments and 9' gaps.



URBAN X-RAMP WITH FRONTAGE ROAD AUXILIARY LANE



DETAIL 1

(Frontage Road Auxiliary Lane for X-Ramps)

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.

GENERAL NOTES

1. Pavement markings shall be white except as otherwise noted.
2. Length of 12" white line may vary depending on location.
3. Wide (12") dotted lane line (see FPM(2) Detail B) is used to separate a through lane that continues beyond the interchange from an adjacent mandatory exit lane.
4. Edge lines are not required in curb and gutter sections of frontage roads.
5. See FPM(1) for traffic lane line pavement marking details.

LEGEND	
⇦	Traffic flow
↱	Pavement marking arrows (white)
▫	Reflectorized Raised Markers (RPM) Type II-C-R
✳	Arrow markings are optional, however "ONLY" is required if arrow is used

Texas Department of Transportation — Traffic Safety Division Standard

TYPICAL STANDARD FREEWAY AND FRONTAGE ROAD PAVEMENT MARKINGS

FPM(6)-22

FILE: fpm(6)-22.dgn	DN:	CK:	DW:	CK:
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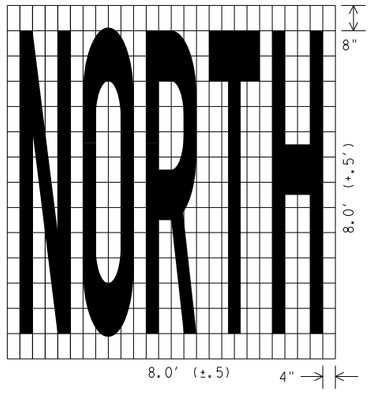
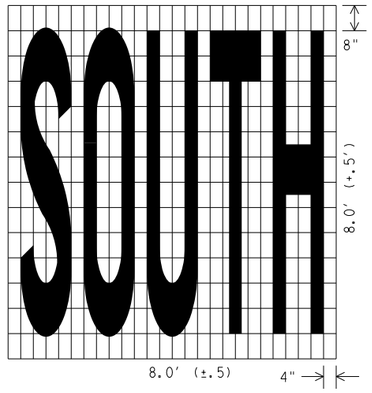
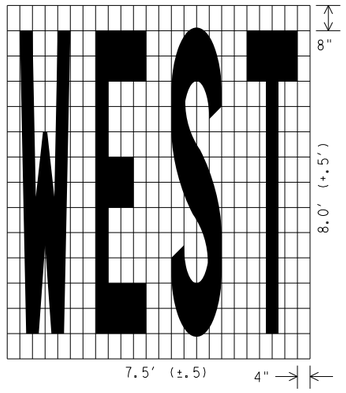
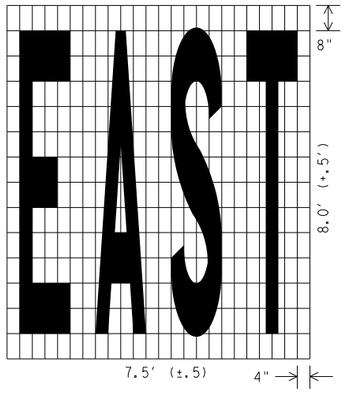
REVISIONS 10-22	0028	02	098,etc.	US 90
	DIST		COUNTY	SHEET NO.
	HOU		HARRIS	108

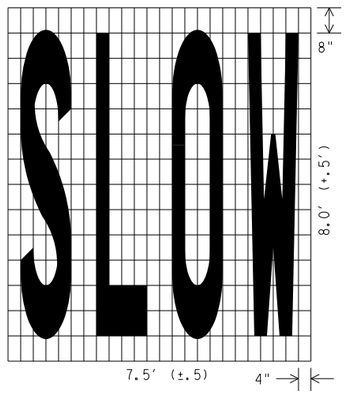
23F

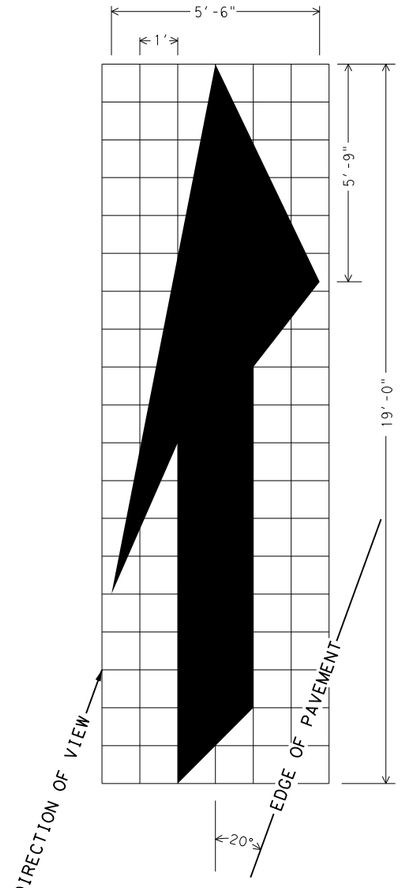






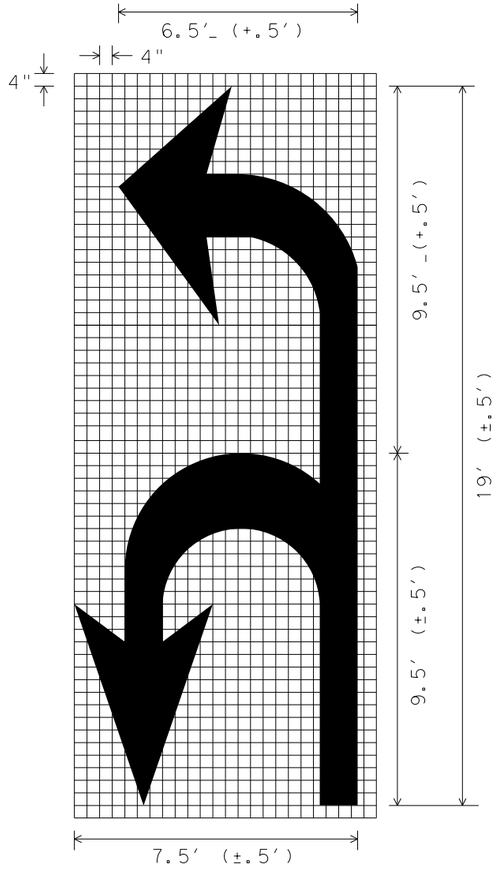




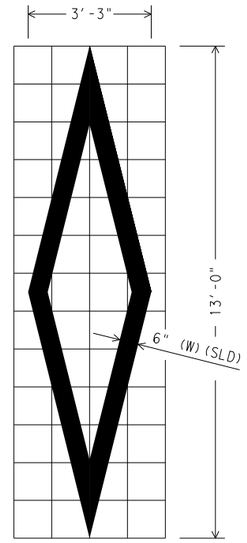


ISOMETRIC ARROW

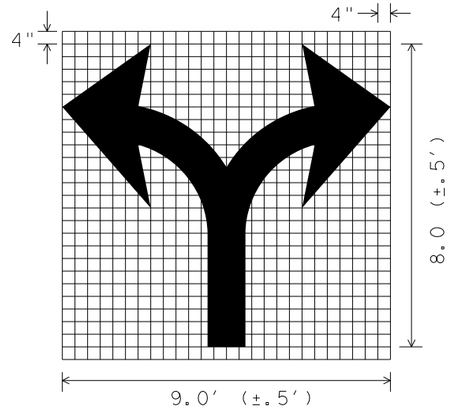
12 INCH GRID
AREA = 42 SQ. FT.
RIGHT LANE DROP ARROW
(FOR LEFT LANE, USE MIRROR IMAGE)



U-L ARROW



DIAMOND SYMBOL



SCALE 1/4" = 1′

Texas Department of Transportation
Houston District

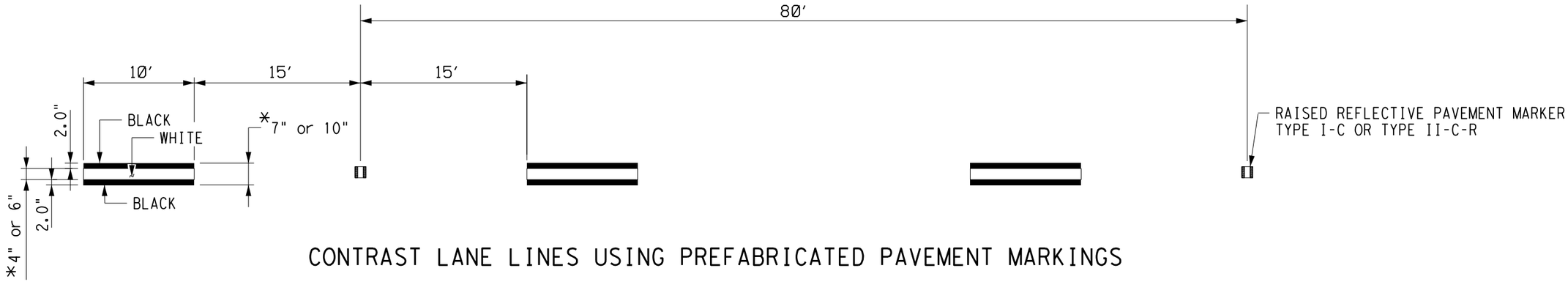
PAVEMENT MARKINGS (WORDS, ARROWS & SYMBOLS)

PM(WAS)-07

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 03-19-07	HOU	6		109

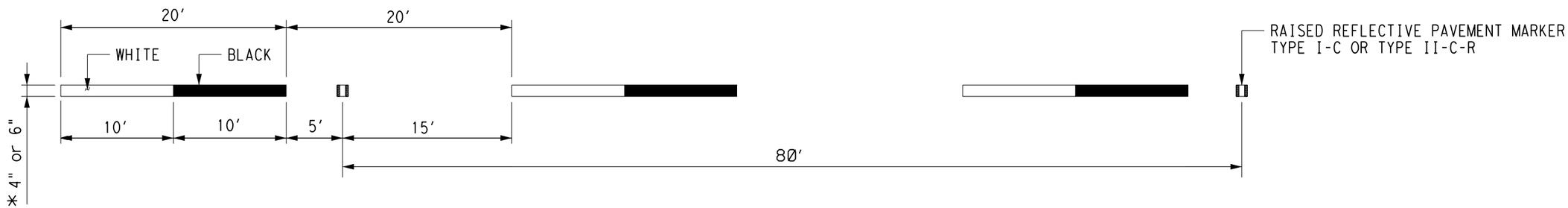
COUNTY	CONTROL	SECT	JOB	HIGHWAY
HARRIS	0028	02	098,etc.	US 90

STD-N31



CONTRAST LANE LINES USING PREFABRICATED PAVEMENT MARKINGS

DIRECTION OF TRAFFIC



CONTRAST LANE LINES USING LIQUID APPLICATIONS
(MULTIPOLYMER, THERMOPLASTIC, ETC.)

* AS SHOWN ON THE PLANS.

Texas Department of Transportation
Houston District

PAVEMENT MARKINGS
(CONTRAST LANE LINES)

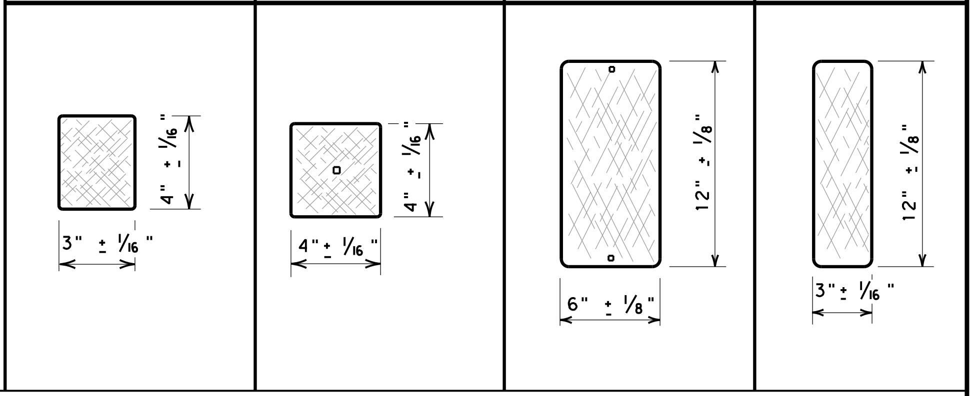
PM(CLL)-14

FILE:	DN:	CK:	DW:	CK:	
© TxDOT 2003	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS 01-10-06 02-12-08 10-2019 9" to 10"	HOU	6			110
	COUNTY		CONTROL	SECT / JOB	HIGHWAY
	HARRIS		0028	02 / 098,etc.	US 90

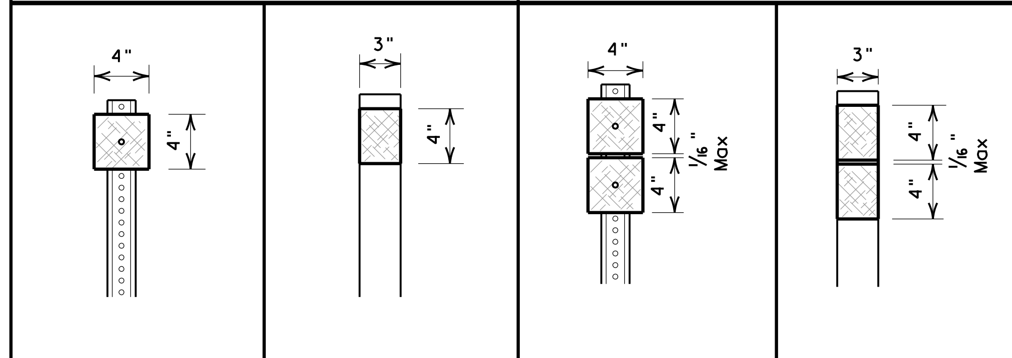
STD N-30

DATE: 1/30/2024 10:44:11 AM
FILE: pw:\\txdot.projectwiseonline.com:TxDOT3\Documents\12 - HOU\Design Projects\0028020981 - SH 6 Bridge\PAVEMENT MARKING STANDARDS\dom(1)-20).dgn

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

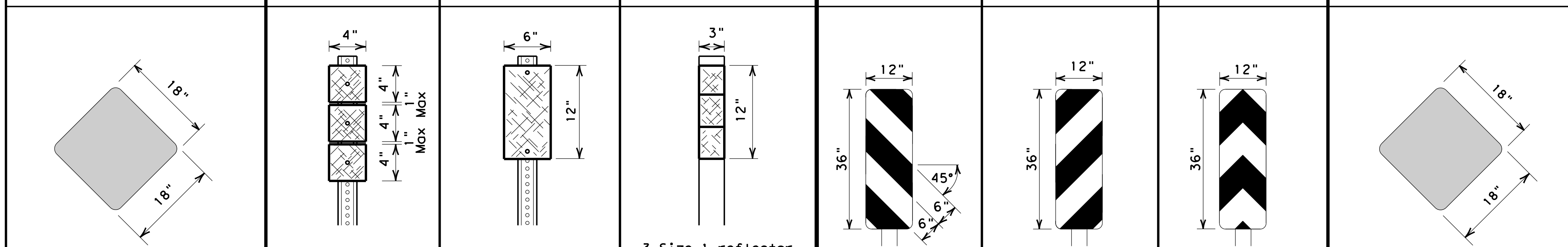
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

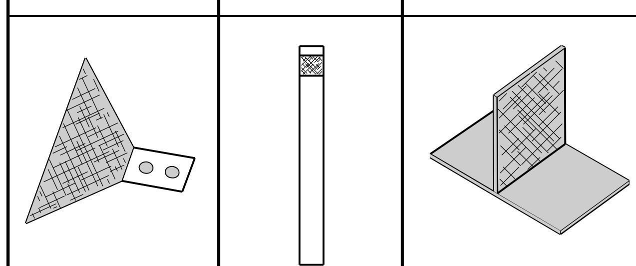
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

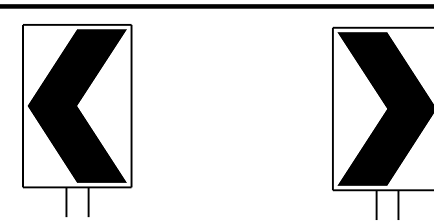
DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

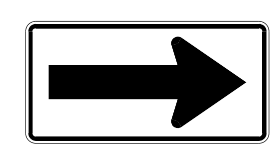
BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE	 W1-8			
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

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

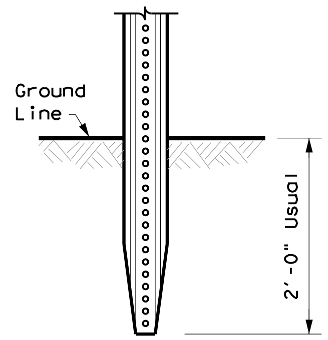
FILE: dom1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2004	CONT 0028	SECT 02	JOB 098,etc	HIGHWAY US 90
REVISIONS 10-09 3-15 4-10 7-20	DIST HOU		COUNTY HARRIS	SHEET NO. 111

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

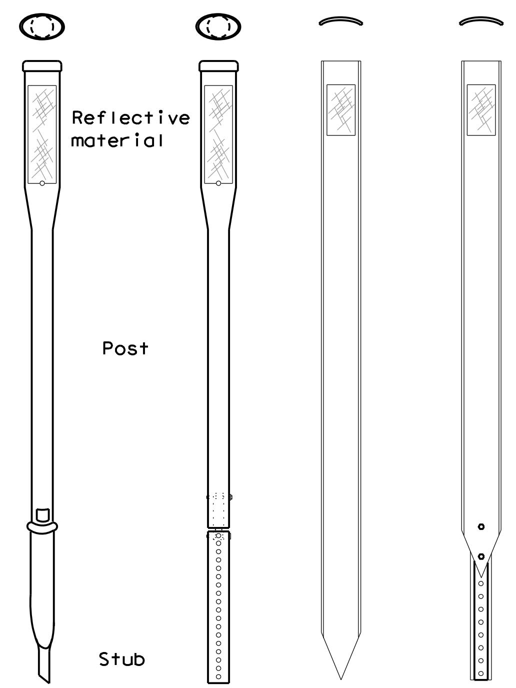


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

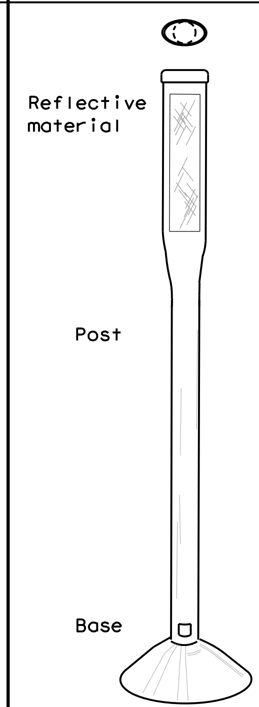
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



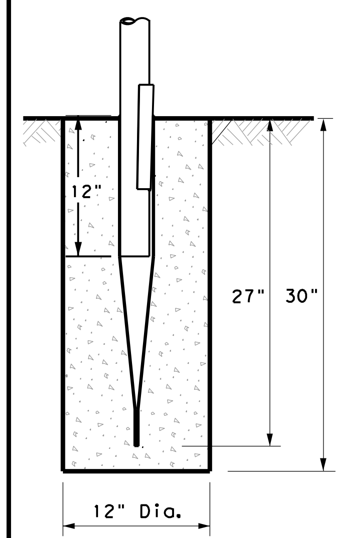
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

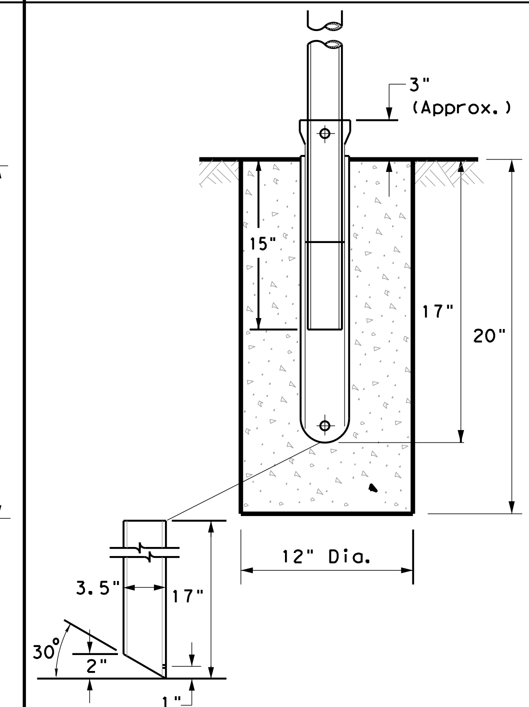
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

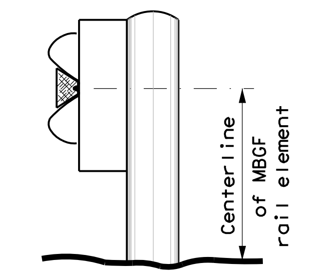
NOTE

1. Install per manufacturer's recommendations.

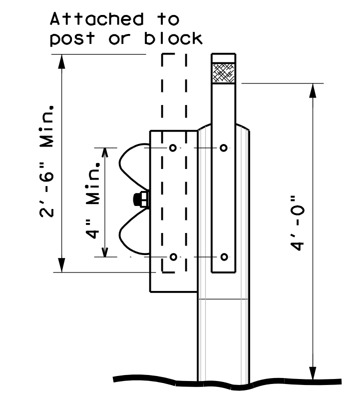
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

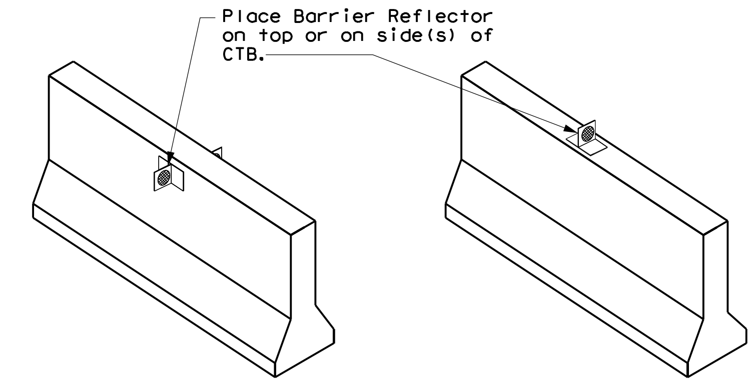
GF1



GF2



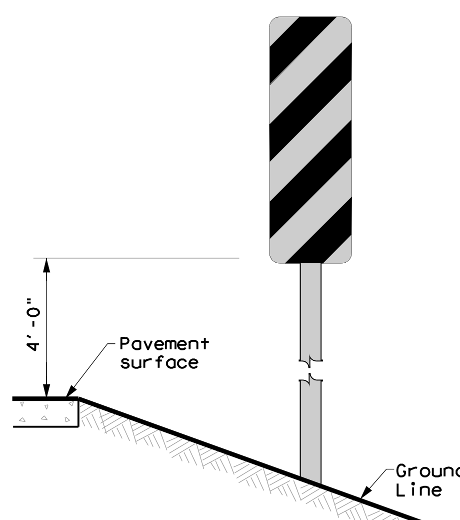
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

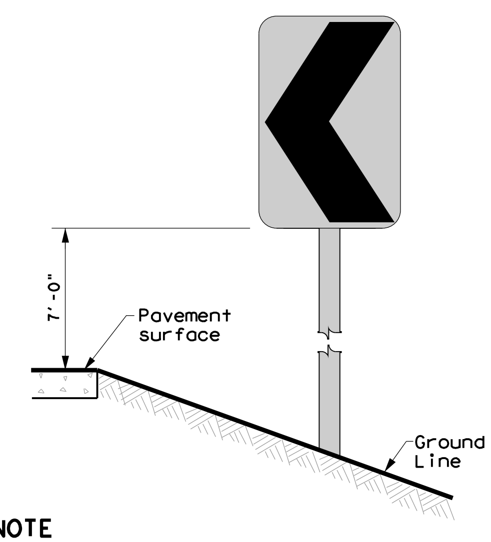
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

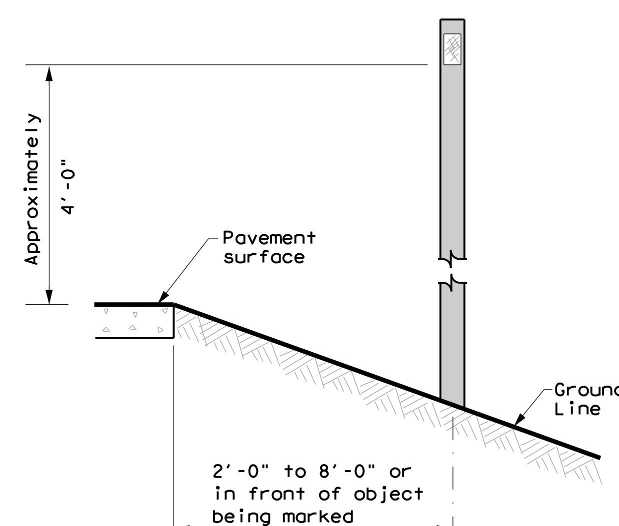
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
10-09 3-15	DIST		COUNTY	SHEET NO.
4-10 7-20	HOU		HARRIS	112

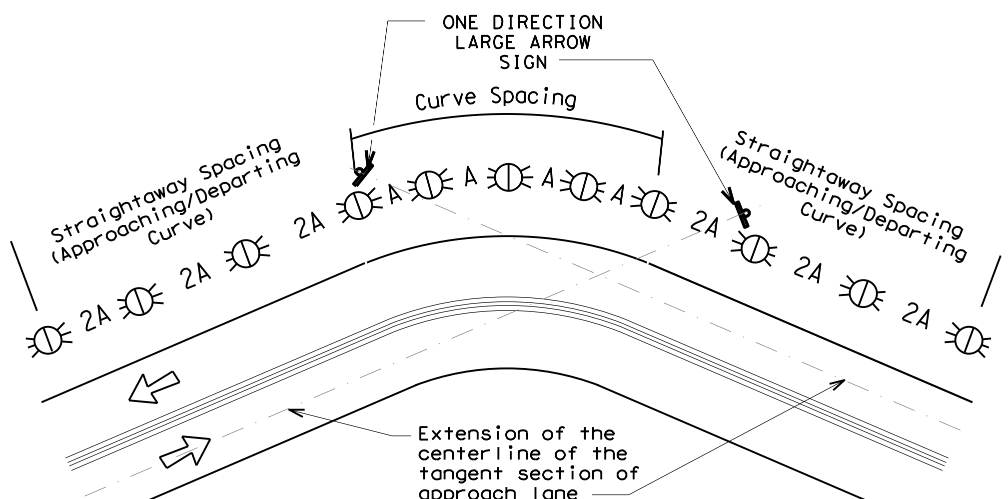
20B

DATE: 11/13/2023 7:45:21 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT3/Documents/12 - HOU/Design Projects/0028-02-098 ... dom3-20.dgn

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed: Turn (30 MPH or less)	Curve Advisory Speed: Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

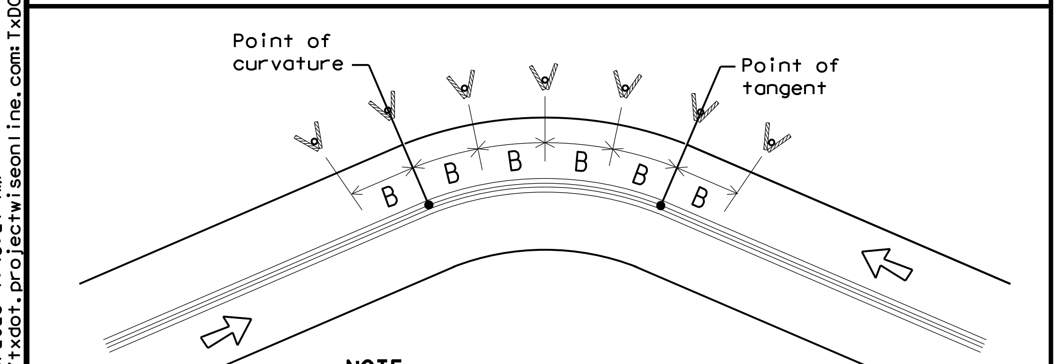
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	Radius of Curve (FEET)	Spacing in Curve (FEET)	Spacing in Straightaway (FEET)	Chevron Spacing in Curve (FEET)
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

Symbol	Meaning
(symbol)	Bi-directional Delineator
(symbol)	Delineator
(symbol)	Sign

Texas Department of Transportation

Traffic Safety Division Standard

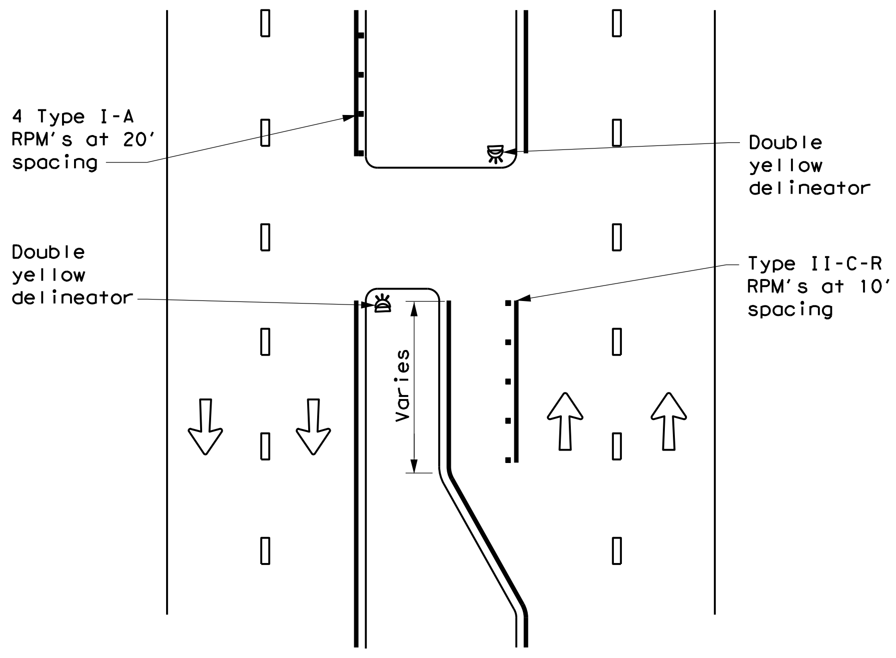
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT 0028	SECT 02	JOB 098,etc.	HIGHWAY US 90
REVISIONS 3-15 8-15 8-15 7-20	DIST HOU		COUNTY HARRIS	SHEET NO. 113

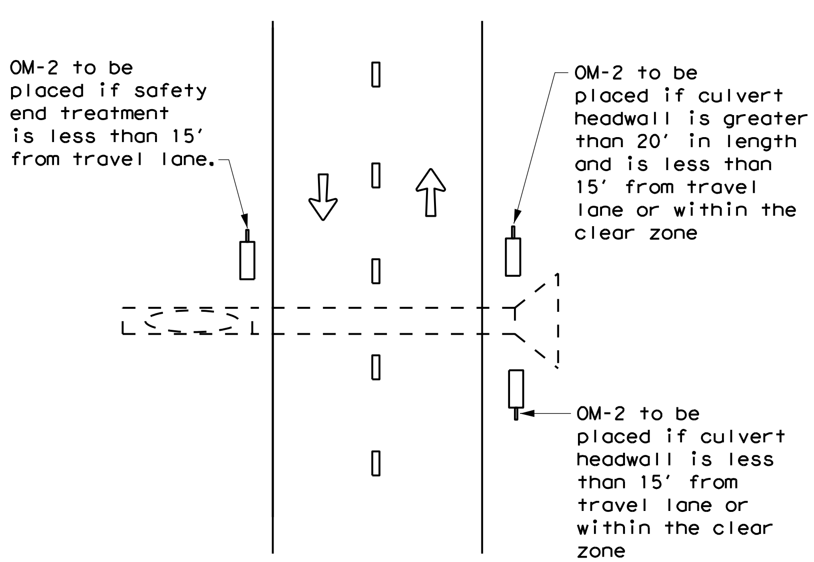
20C

CROSSOVERS



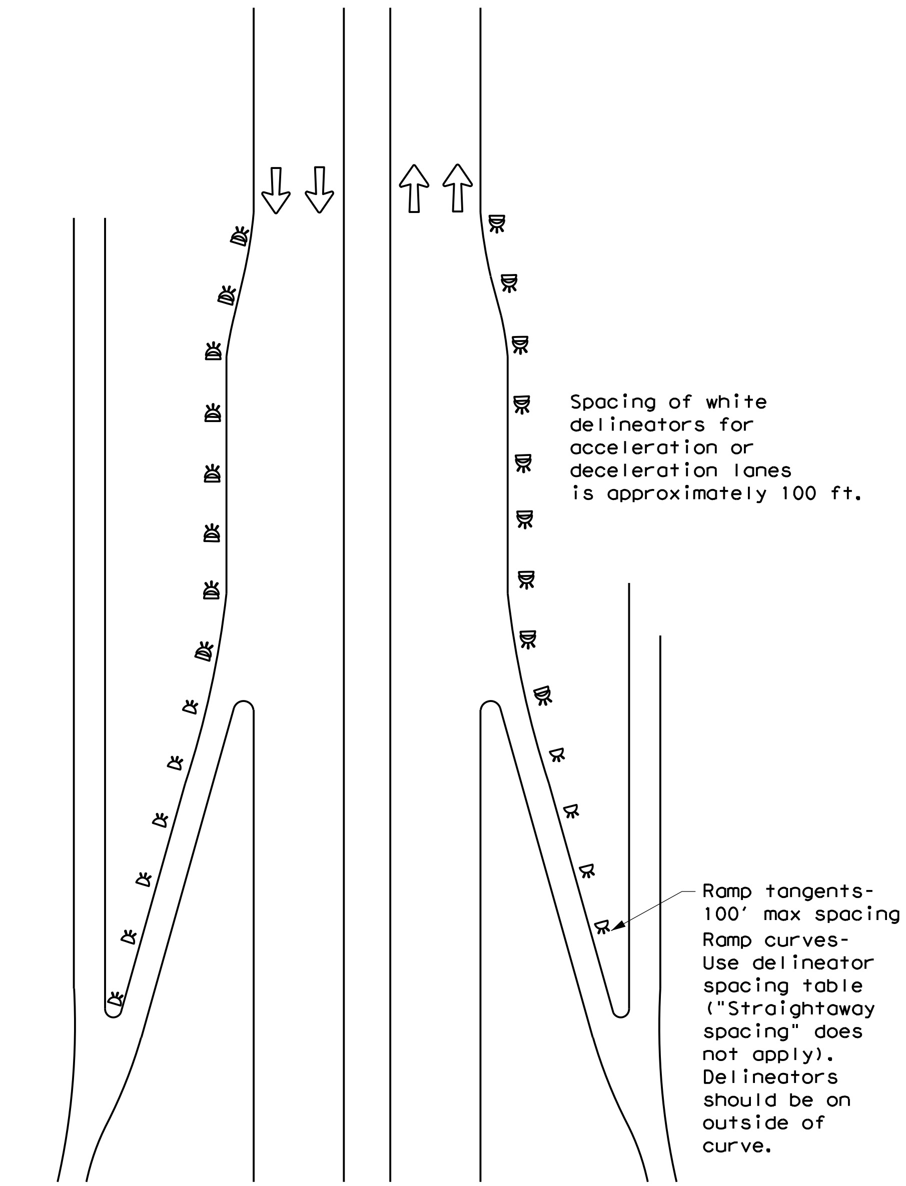
DETAIL 1

FOR CULVERTS WITHOUT MBGF



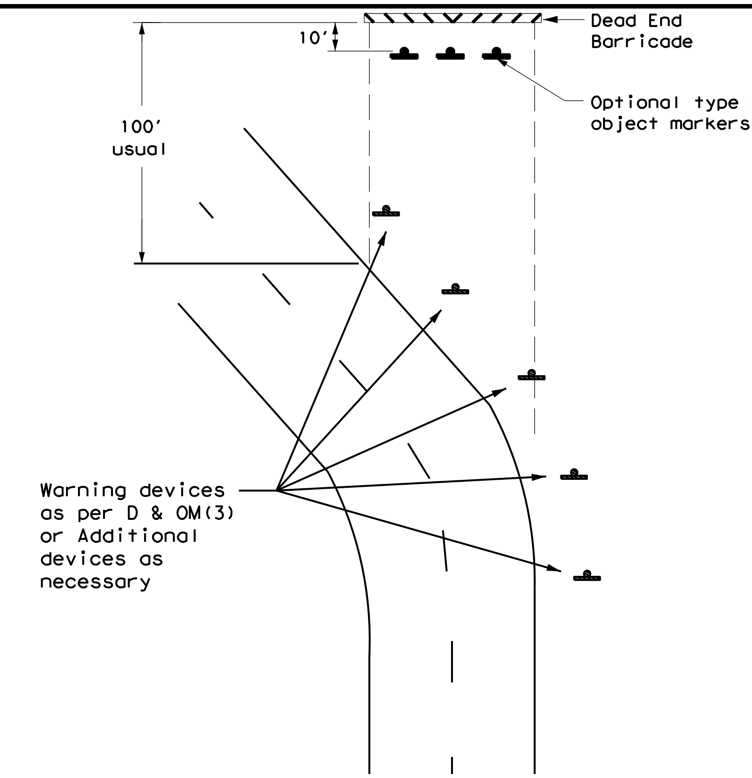
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



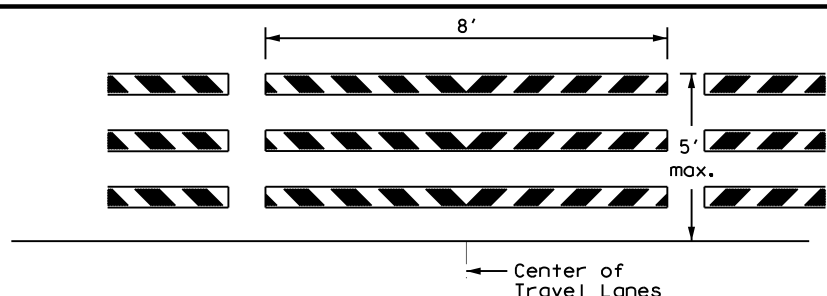
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
(symbol)	Bidirectional Delineator
(symbol)	Delineator
(symbol)	OM-3
(symbol)	Barricade
(symbol)	Sign
(symbol)	OM-2
(symbol)	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2004	CONT	SECT	JOB		HIGHWAY
REVISIONS 3-15 7-20	0028	02	098,etc		US 90
	DIST		COUNTY		SHEET NO.
	HOU		HARRIS		114

20D

DATE: 1/25/2024 11:53:57 AM
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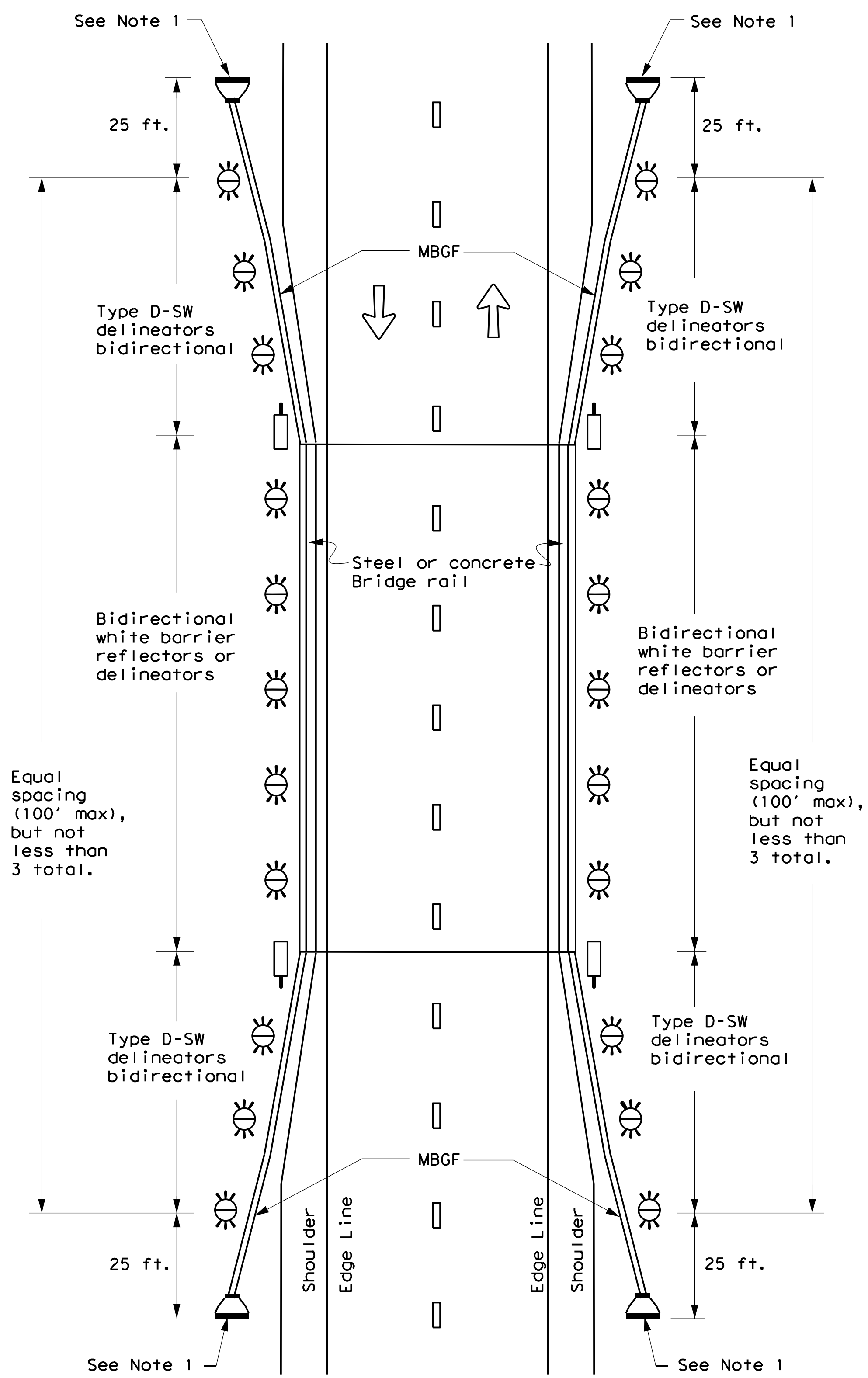
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL	TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)	TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL

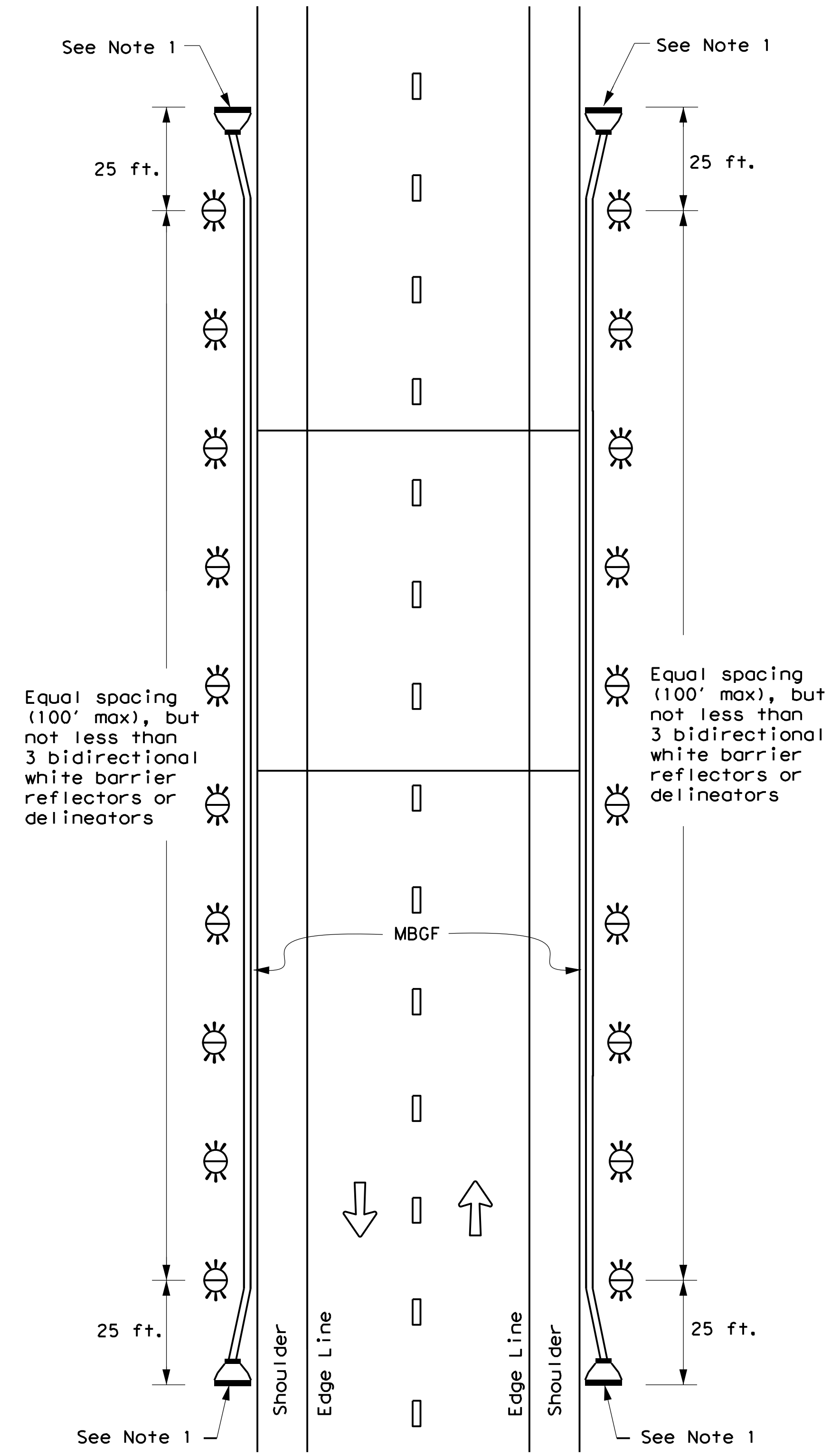
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

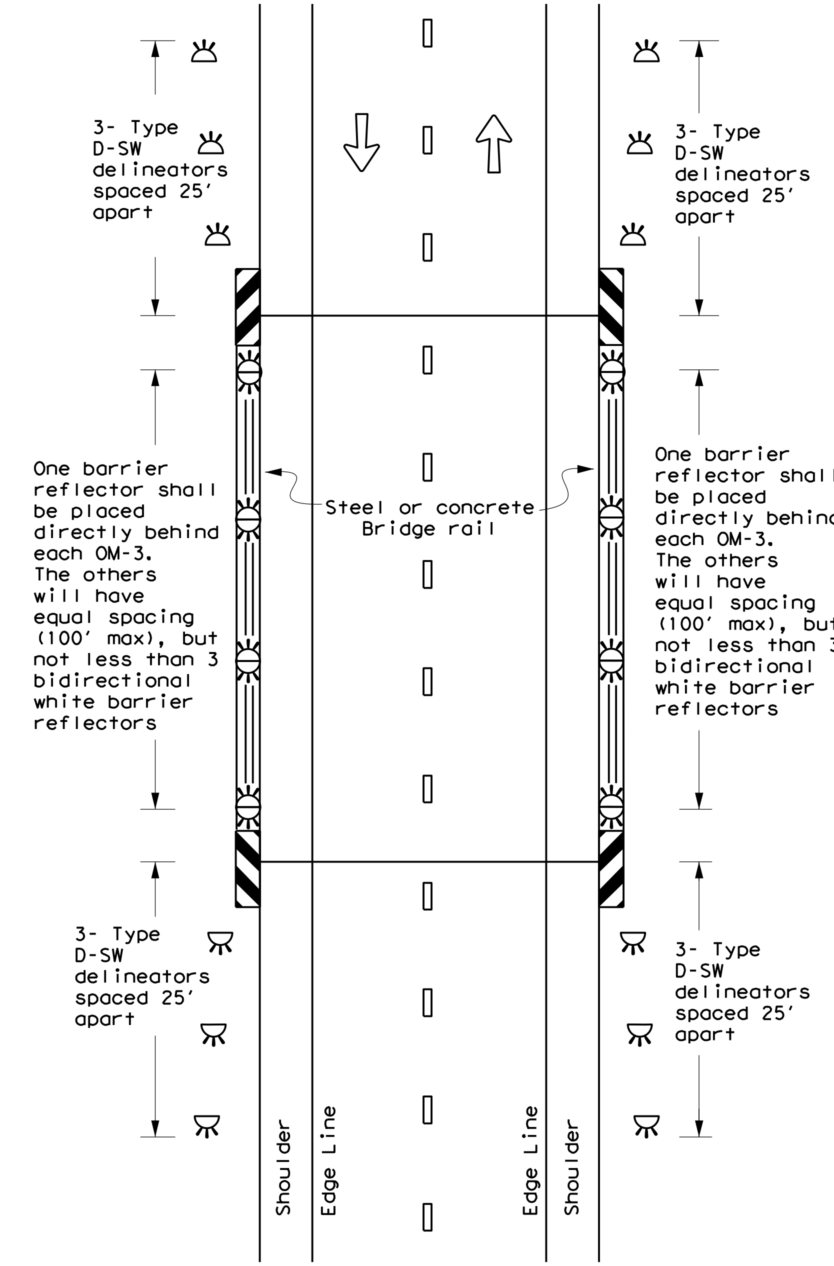
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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

Symbol	Description
	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
7-20	DIST		COUNTY	SHEET NO.
	HOU		HARRIS	115

20E

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DATE: 11/13/2023 7:55:17 AM
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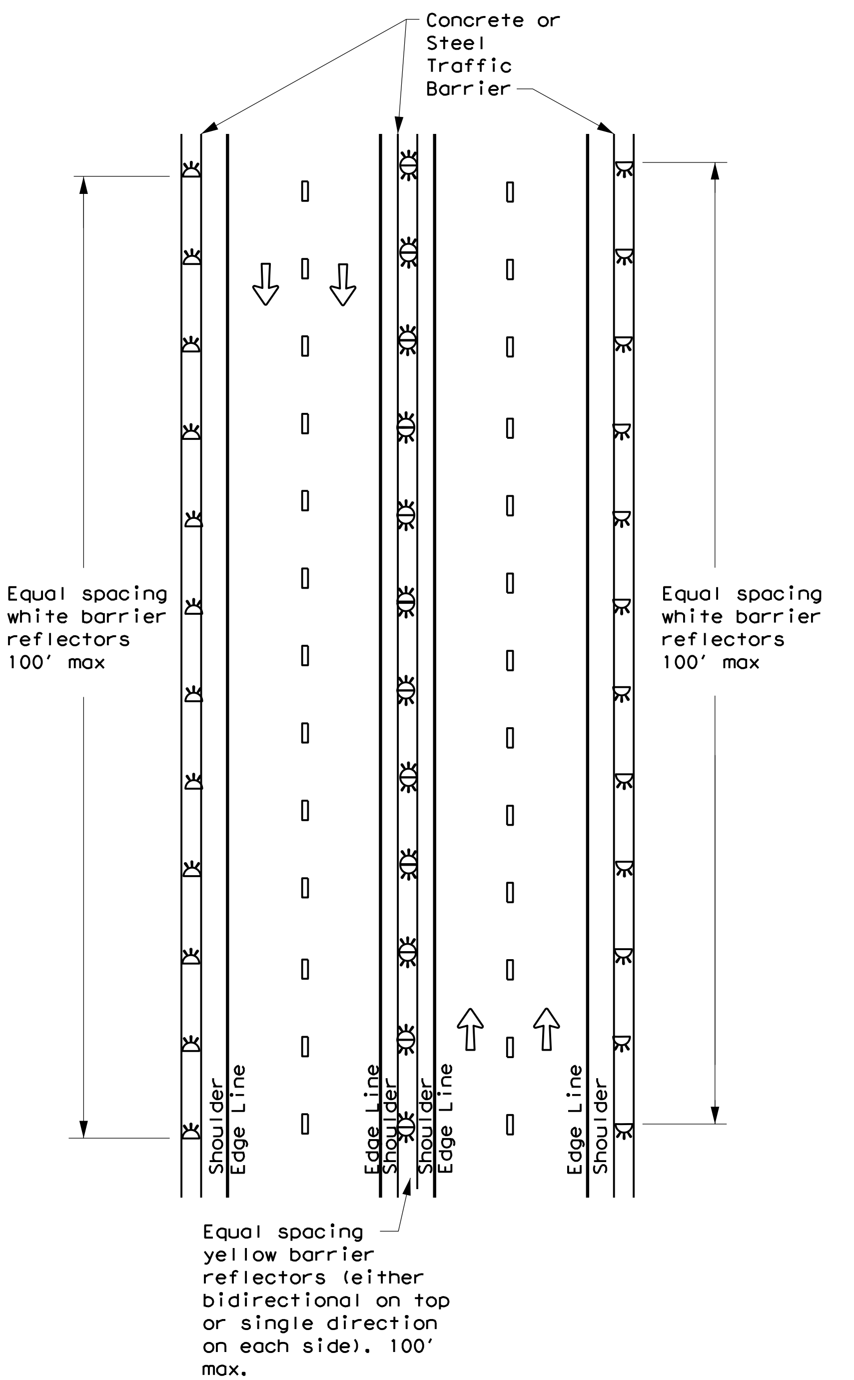
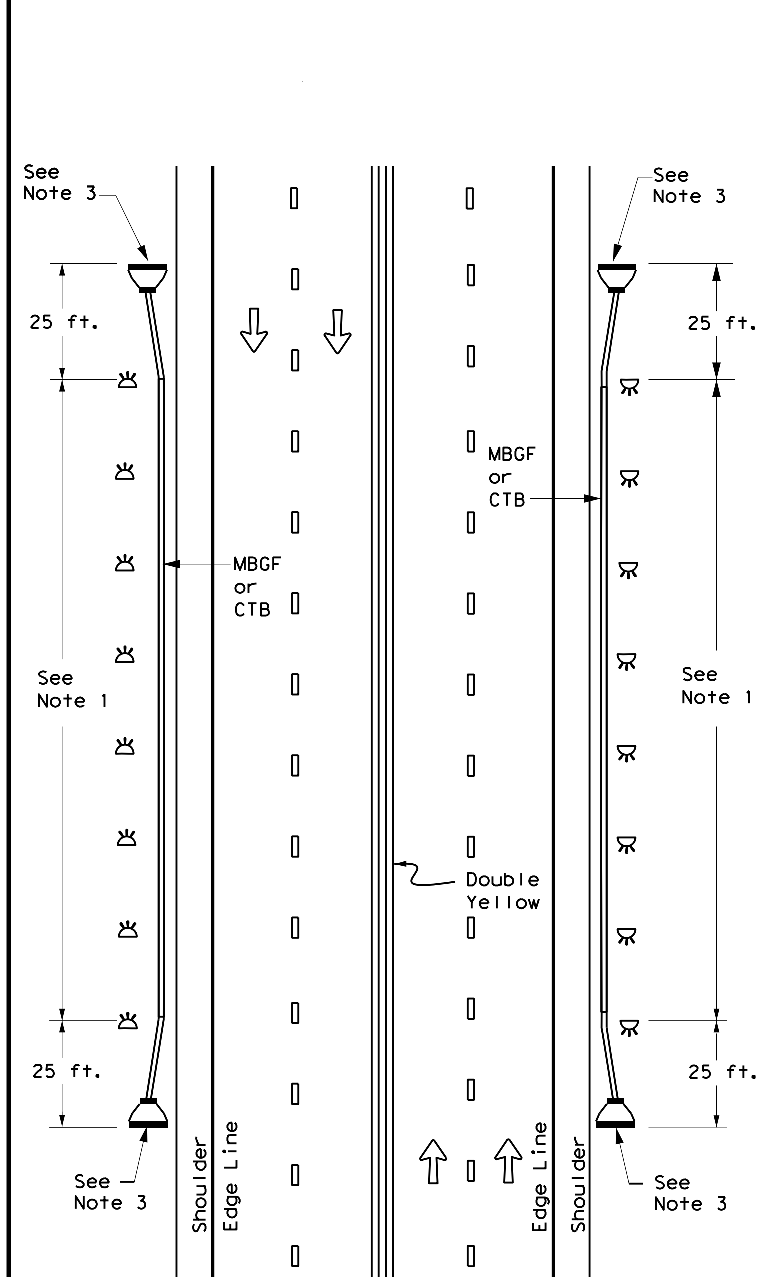
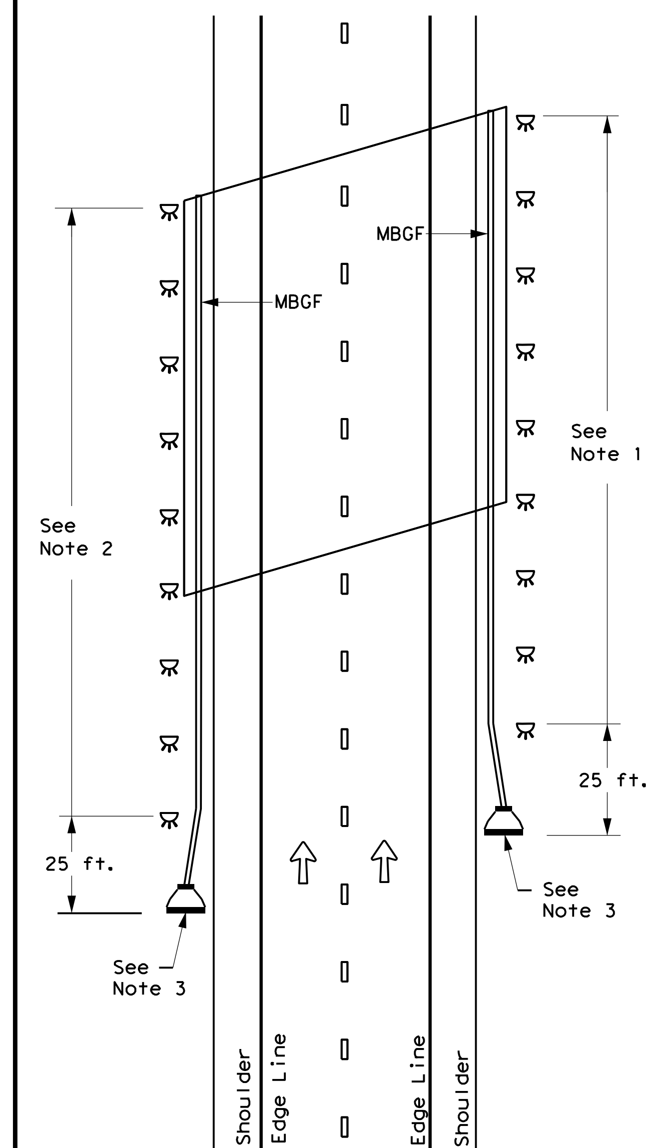
CONTINUOUS CONCRETE OR STEEL BARRIER



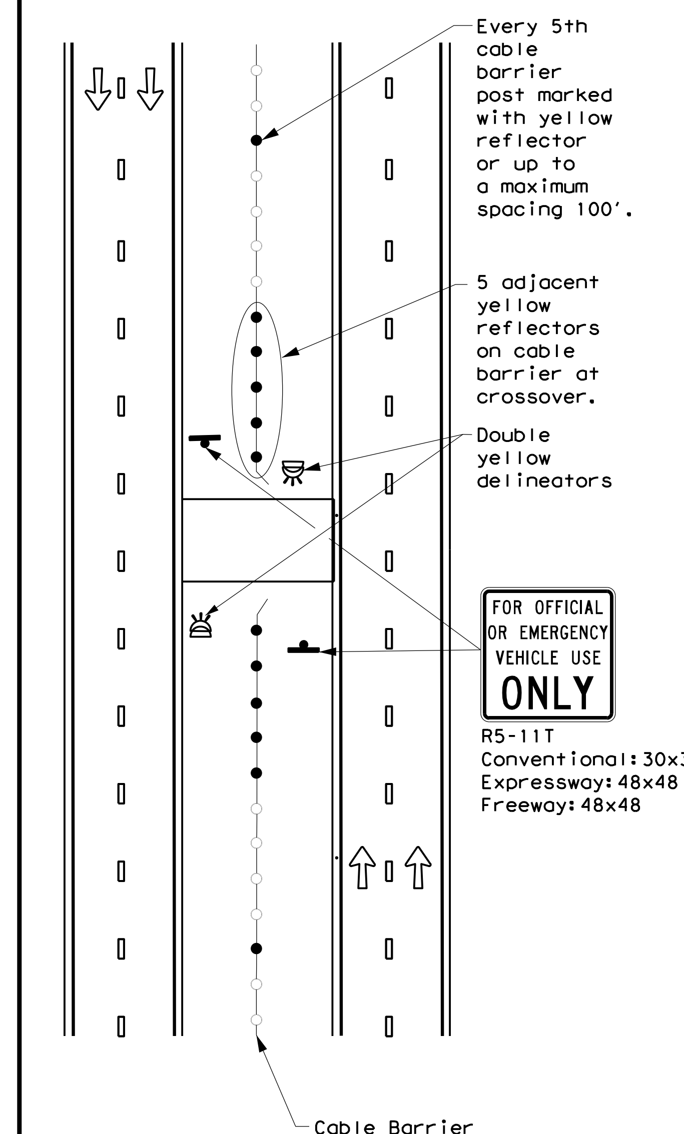
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100' max.)
2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

LEGEND

Symbol	Description
	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
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7-20	DIST		COUNTY	SHEET NO.
	HOU		HARRIS	116

20F

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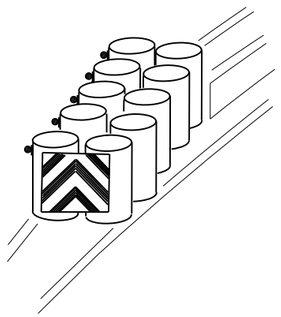
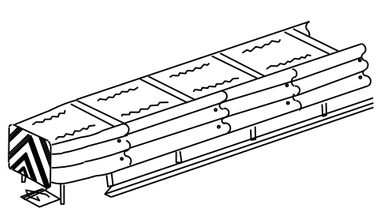
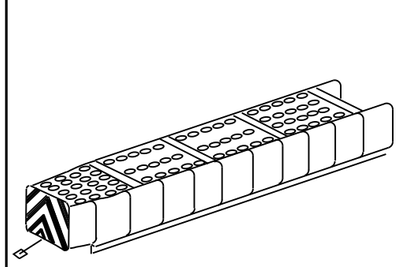
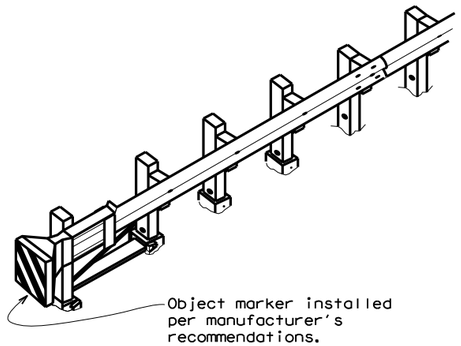
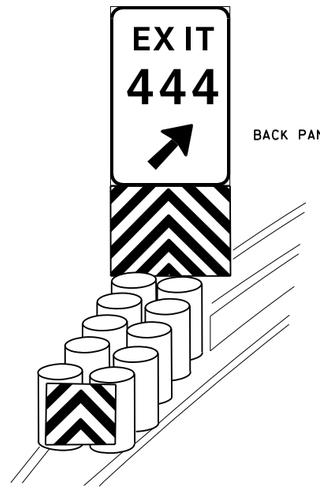
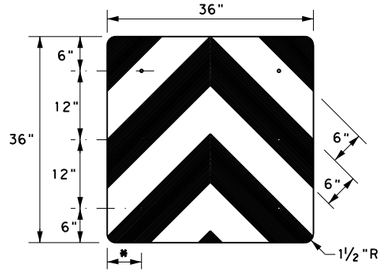


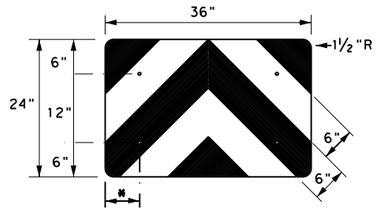




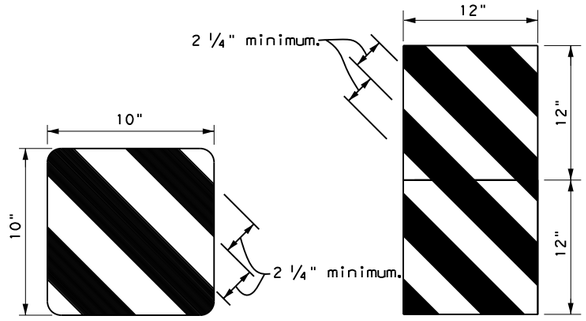




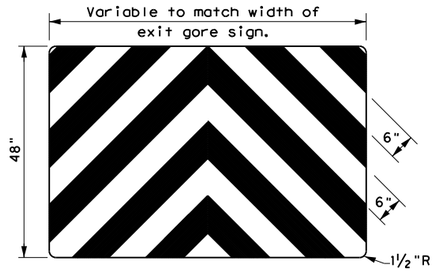


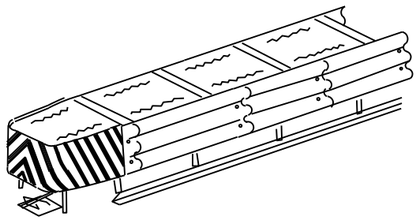


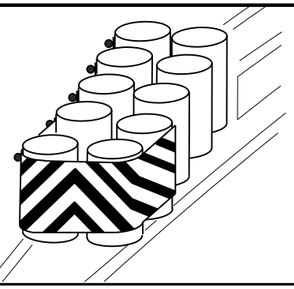
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

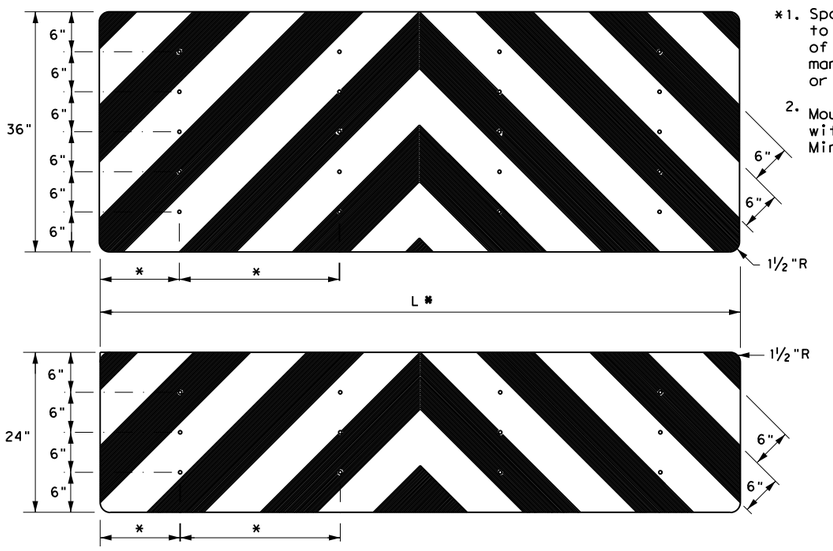


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	HOU	HARRIS		117
4-98 7-20				

20G

DATE: 11/8/2023 11:49:40 AM
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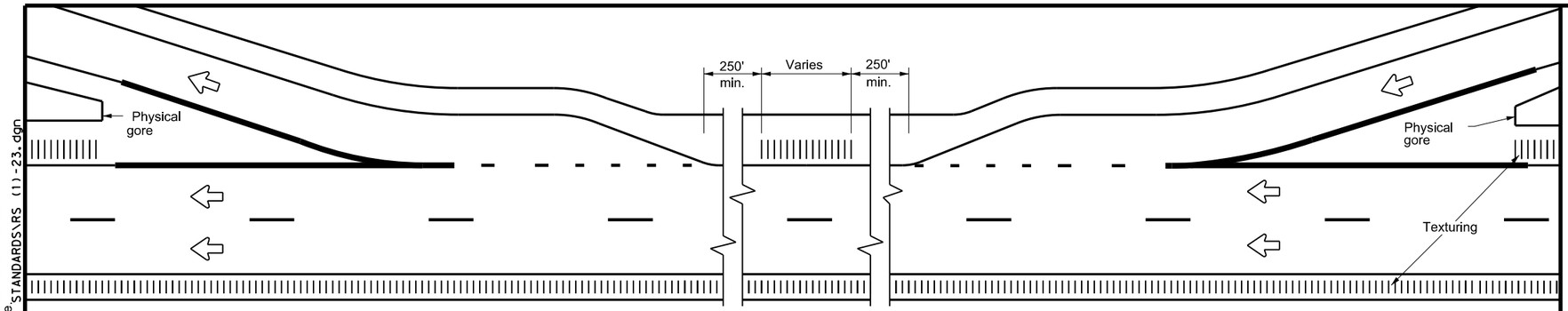
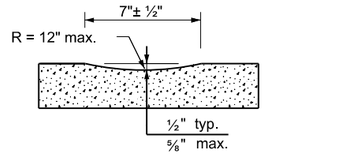
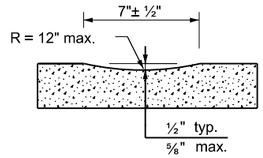


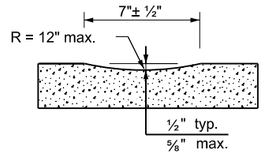
TYPICAL RUMBLE STRIP PLACEMENT AT EXIT AND ENTRANCE RAMPS



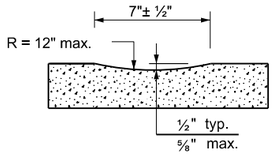
PROFILE VIEW
OPTION 1



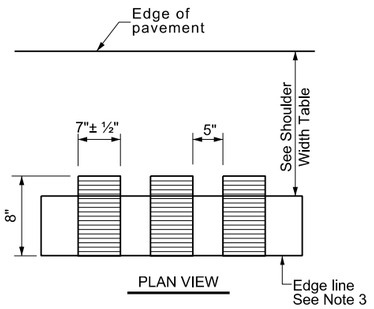
PROFILE VIEW
OPTION 2



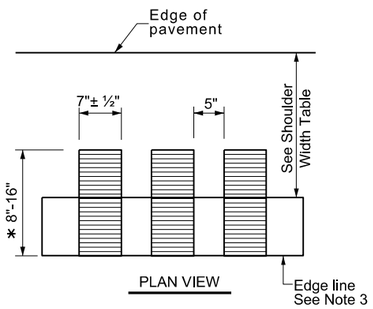
PROFILE VIEW
OPTION 3



PROFILE VIEW
OPTION 4

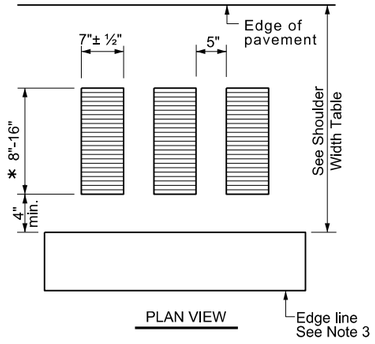


CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



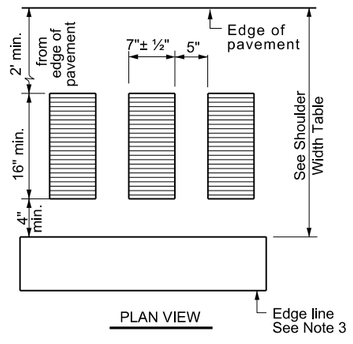
* This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

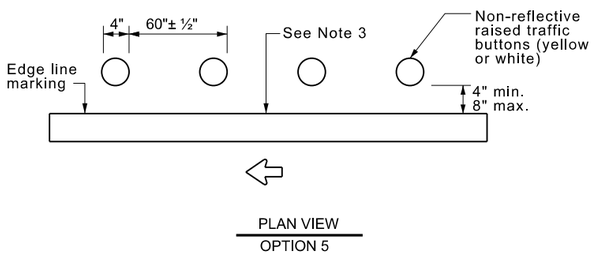


* This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

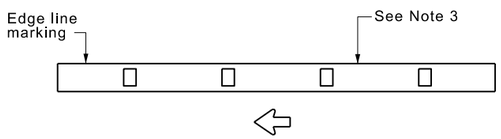


CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGE LINE
(Rumble Strips)



PLAN VIEW
OPTION 6

PROFILE EDGE LINE MARKINGS
(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, or 6	Option 1, 2, 3, 5, or 6	Option 2, 4, 5, or 6

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 sheets 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 edge line 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 stripe.

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

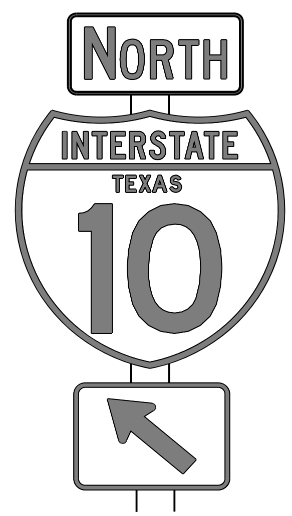
EDGE LINE RUMBLE STRIPS ON FREEWAYS AND DIVIDED HIGHWAYS

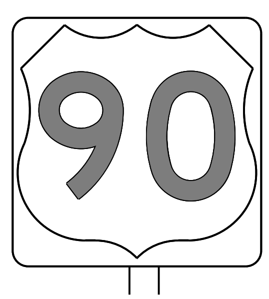
RS(1)-23

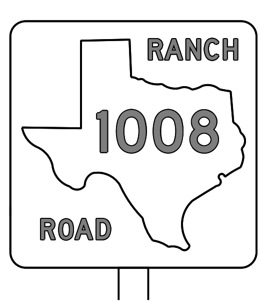
FILE: rs(1)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
4-06 1-23	DIST	COUNTY		SHEET NO.
2-10	HOU	HARRIS		118
10-13				

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



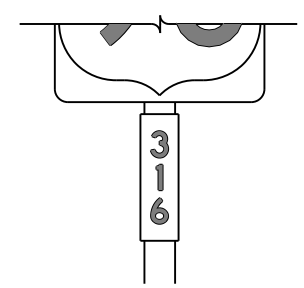


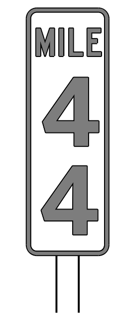


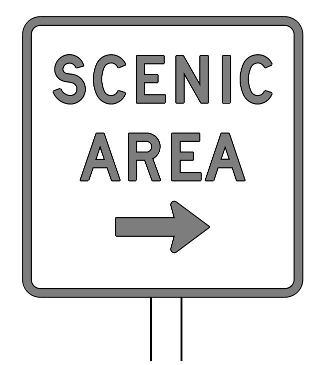
TYPICAL EXAMPLES

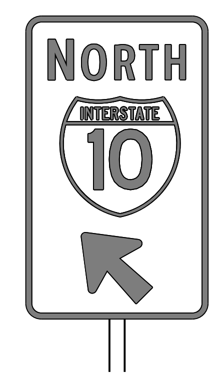
REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

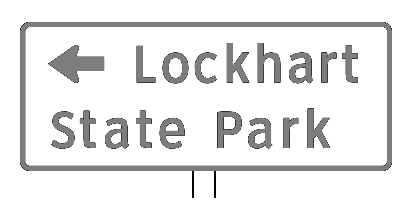
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING

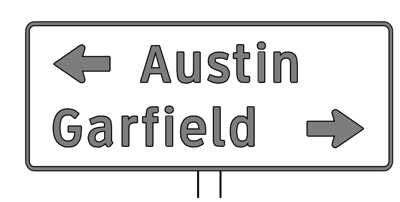












TYPICAL EXAMPLES

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

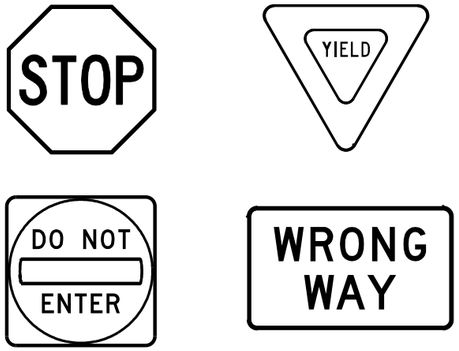
FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT 0028	SECT 02	JOB 098,etc.	HIGHWAY US 90
REVISIONS 12-03 7-13 9-08	DIST HOU	COUNTY HARRIS		SHEET NO. 119

DATE: 11/13/2023 8:13:37 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT3/Documents/12 - HOU/Design Projects/...

DATE: 11/13/2023 8:19:31 AM
FILE: pw://txdot.projectwiseonline.com:TxDOT3/Documents/12 - HOU/Design Projects/0028092098194 atypes/tsr4-13.dgn

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

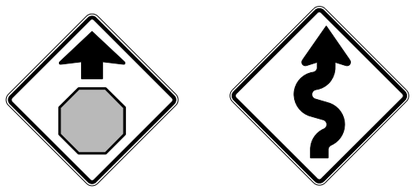
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

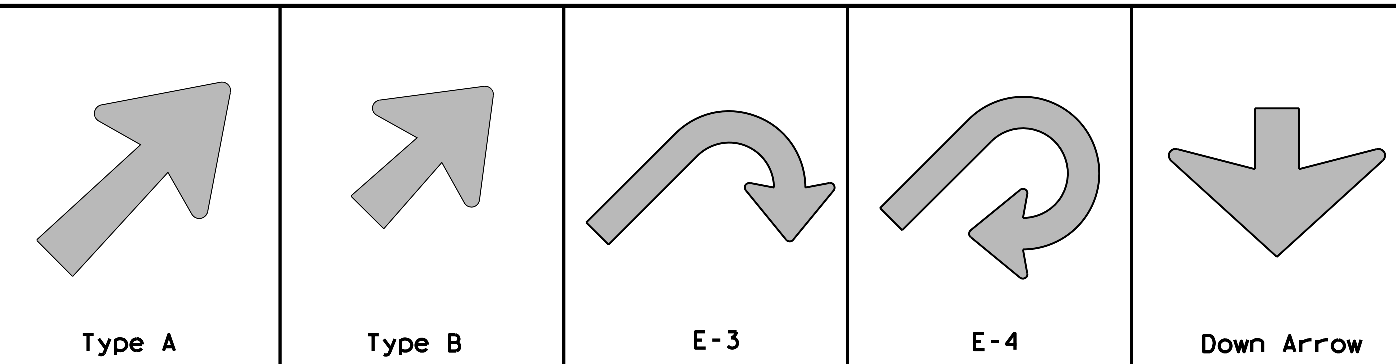
TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		120

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

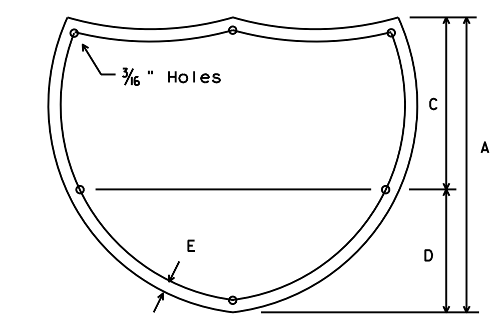
NOTE

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.

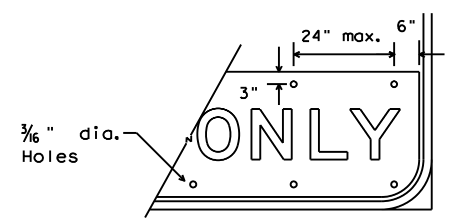
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

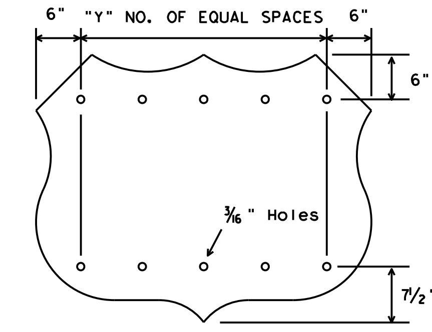


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

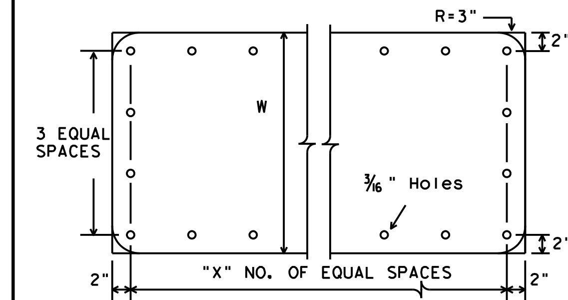


EXIT ONLY PANEL



U.S. ROUTE MARKERS

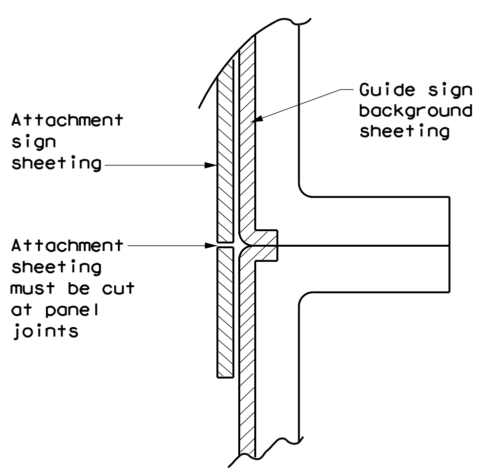
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



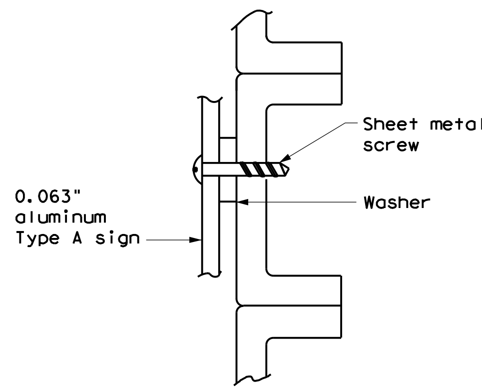
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

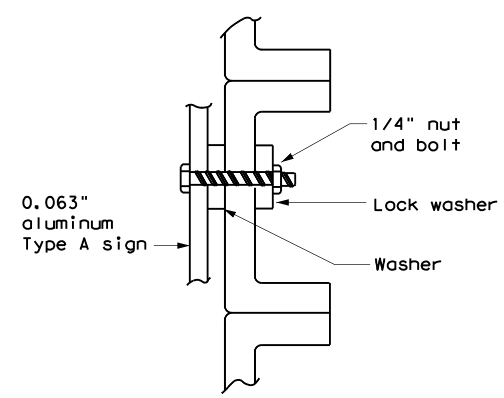
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT



NUT/BOLT ATTACHMENT

NOTE:

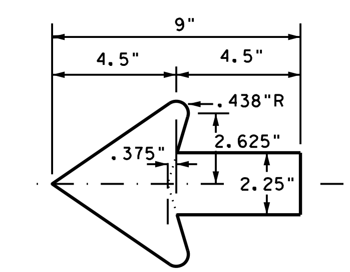
1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

NOTE:

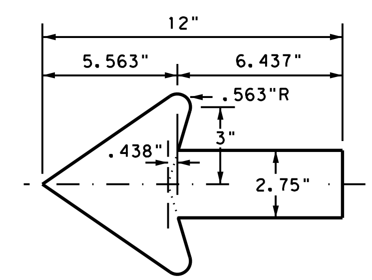
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

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	0028	02	098,etc.	US 90
12-03 7-13 9-08	DIST		COUNTY	SHEET NO.
	HOU		HARRIS	121

5

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

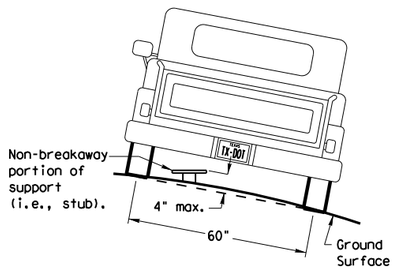
Anchor Type

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

Sign Mounting Designation

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

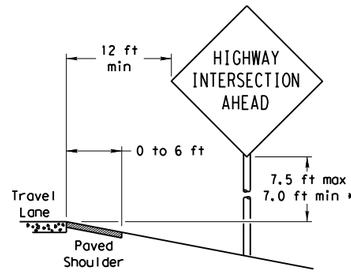
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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

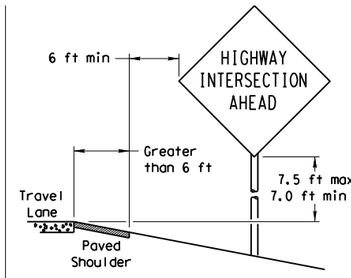
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

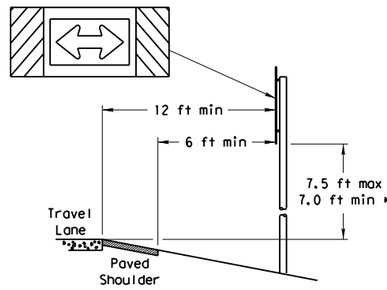
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



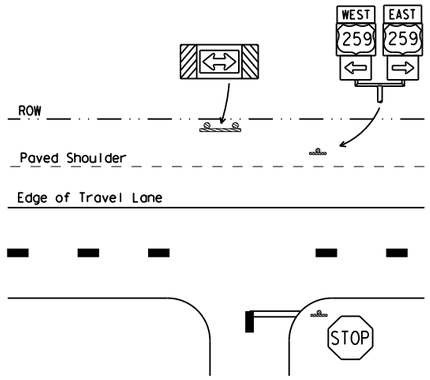
GREATER THAN 6 FT. WIDE

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

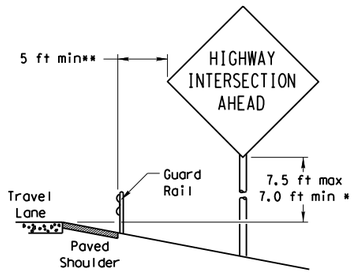
T-INTERSECTION



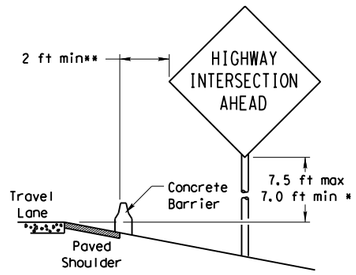
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER

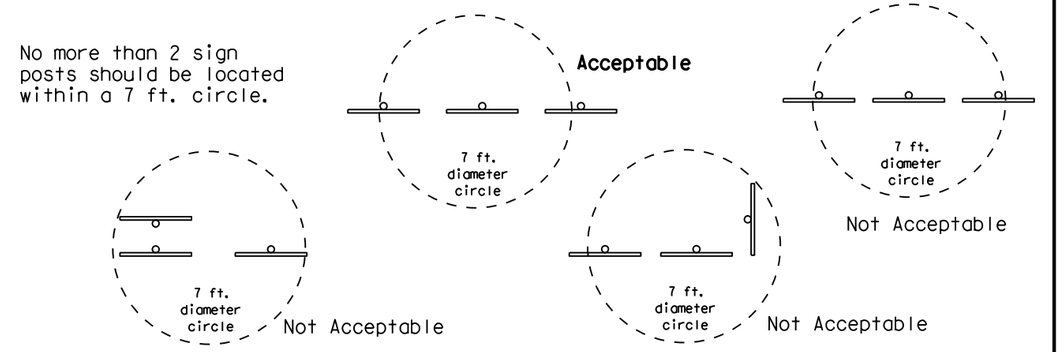


BEHIND GUARDRAIL



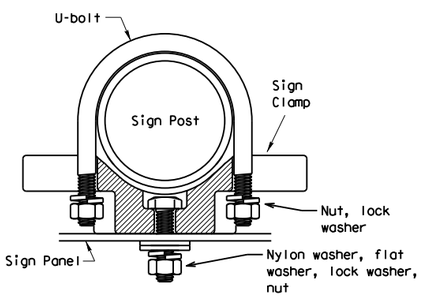
BEHIND CONCRETE BARRIER

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



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

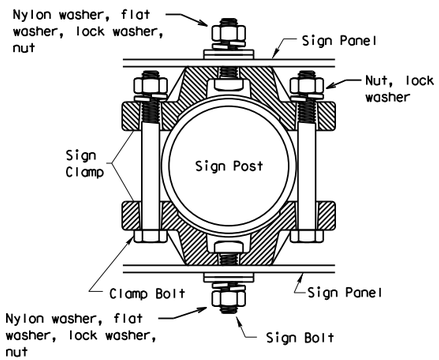


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

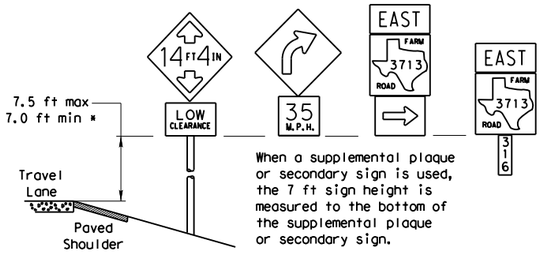
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



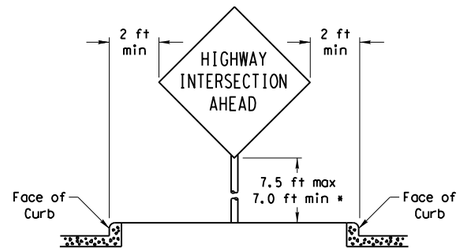
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



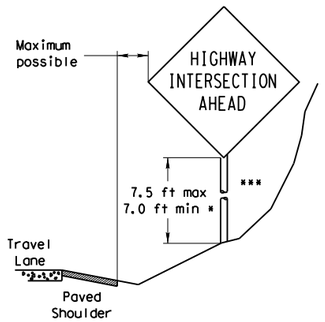
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
http://www.txdot.gov/publications/traffic.htm

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

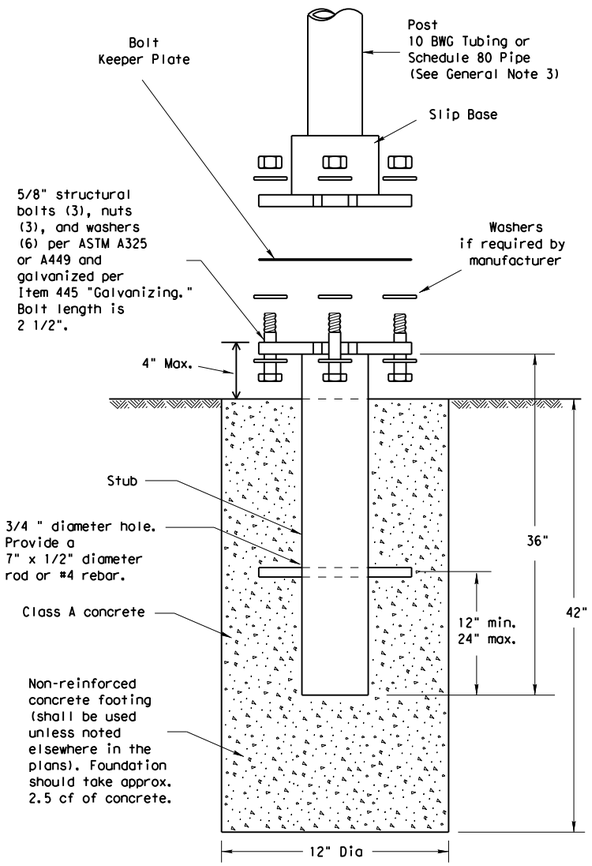
SMD(GEN)-08

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0028	02	098,etc.	US 90
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		122

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.

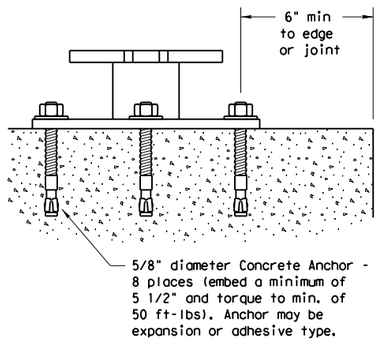
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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

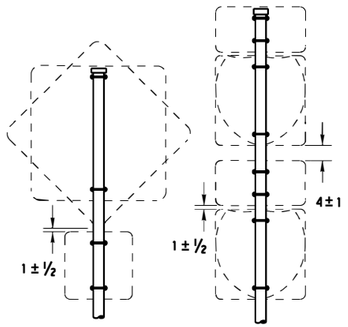
REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0028	02	098,etc	US 90

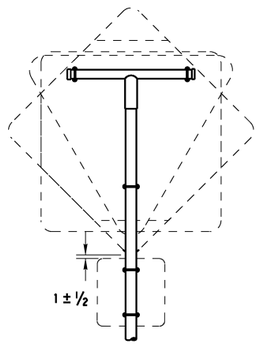
DIST	COUNTY	SHEET NO.
HOU	HARRIS	123

DATE:
FILE:

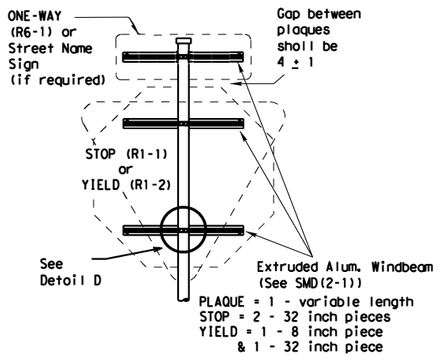
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



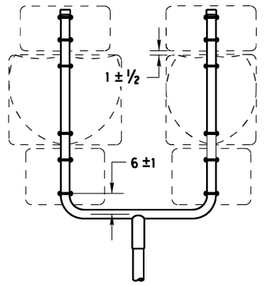
SM RD SGN ASSM TY XXXXX(1)XX(P)



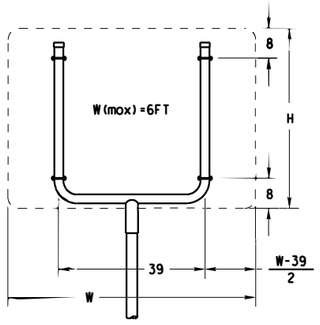
SM RD SGN ASSM TY XXXXX(1)XX(T)



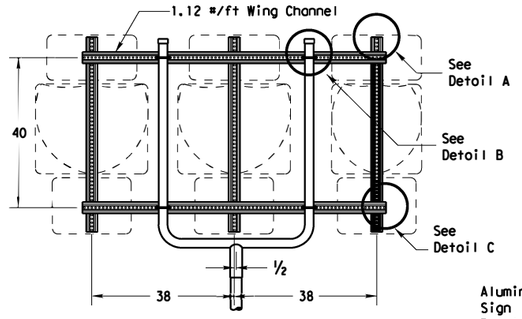
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



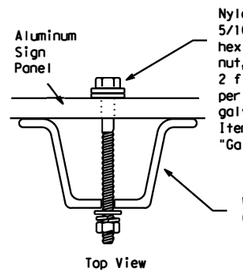
SM RD SGN ASSM TY XXXXX(1)XX(U)



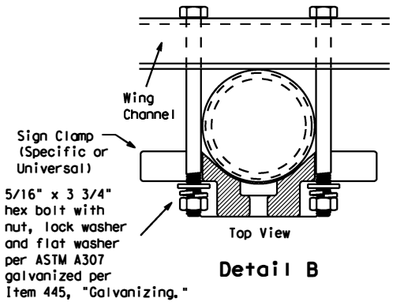
SM RD SGN ASSM TY XXXXX(1)XX(U)



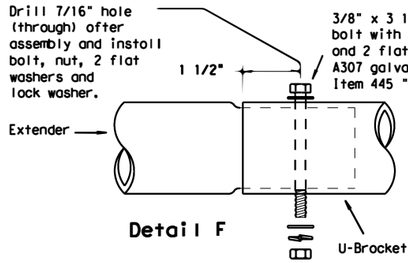
SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)



Detail A

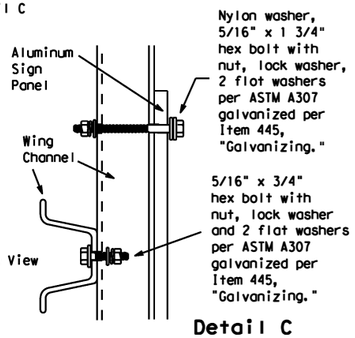


Detail B

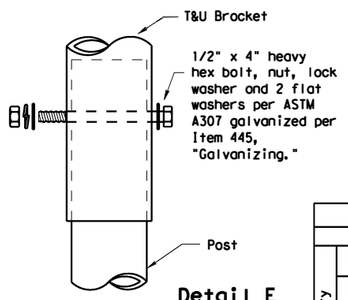


Detail F

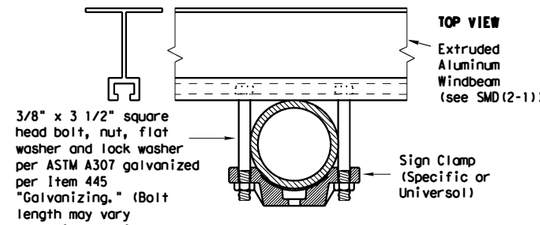
Splices shall only be allowed behind the sign substrate.



Detail C

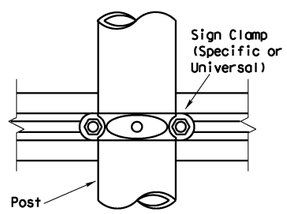


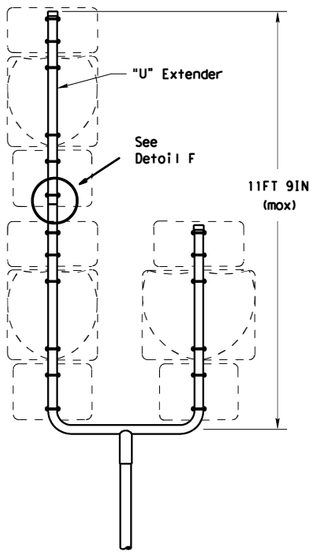
Detail E



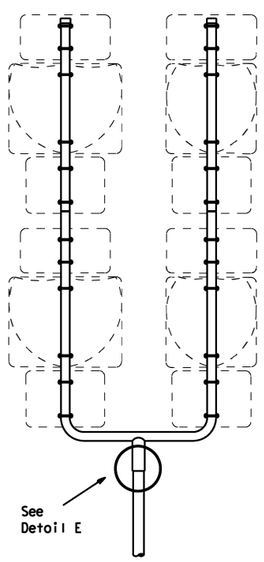
SIDE VIEW

Detail D

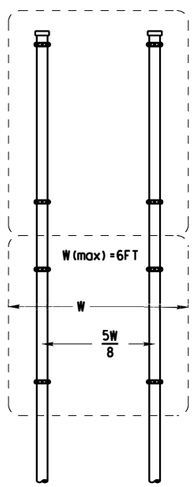




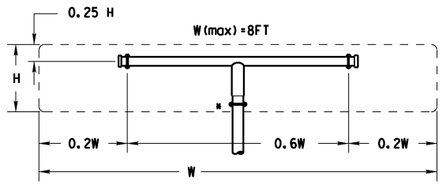
SM RD SGN ASSM TY S80(1)XX(U-1EXT)



SM RD SGN ASSM TY S80(1)XX(U-2EXT)



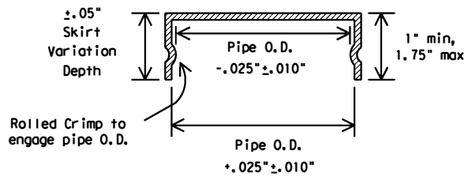
SM RD SGN ASSYM TY XXXXX(2)XX(P)



All dimensions ore in english unless detailed otherwise.

SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

FRICTION CAP DETAIL



Friction cops may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gouge for all cop sizes.

The rim edges shall be reasonably straight and smooth. Cops shall be sized and formed in such o manner os to produce o drive-on friction fit and hove 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.

Cops shall hove an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Closs FE/ZN 8.

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. See table above.
2. The Engineer may require that o Schedule 80 post be used in place of o 10 BWG where o sign height is abnormally high due to o 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 hove 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 windlooding ore indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated fram flat aluminum, T-brockets ore used for signs 24 inches or less in height. U-brockets ore used for signs of greater height.
7. When two triangular slipbose supports ore used to support o single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to oct independently when impocted by on 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 fram 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-brocket" post for 24 inch height signs. Place the clamp 3 inches above bottam of sign when possible.
12. Post open ends shall be fitted with Friction Cops.
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)
	Lorge Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

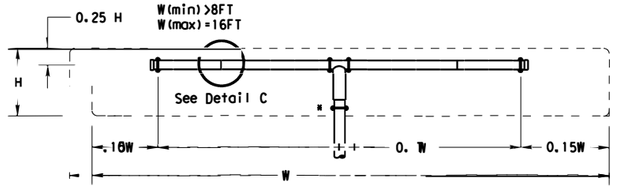
SMD(SLIP-2)-08

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

CONT	SECT	JOB	HIGHWAY
002		098,etc	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		124

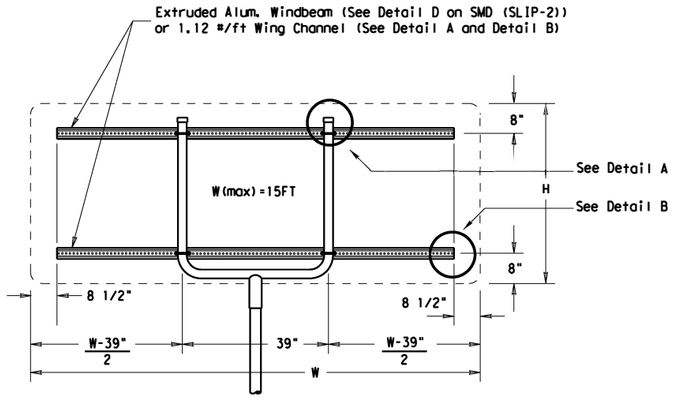
9-08 REVISIONS

DATE:
FILE:

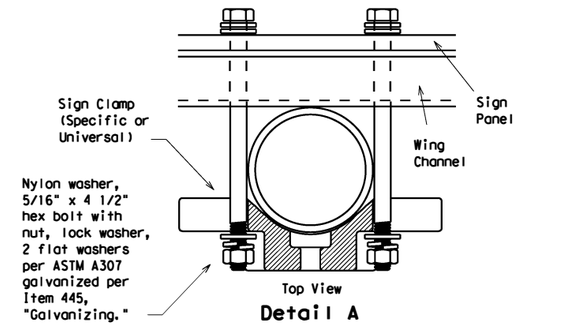


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

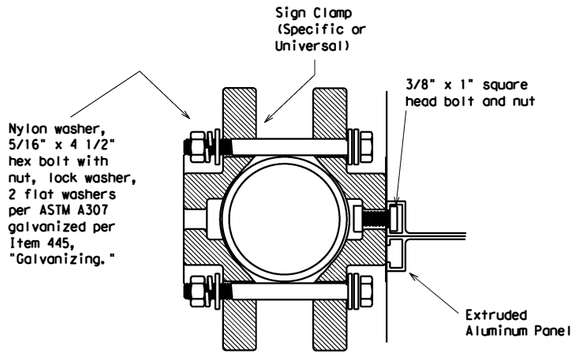
(* - See Note 12)



SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

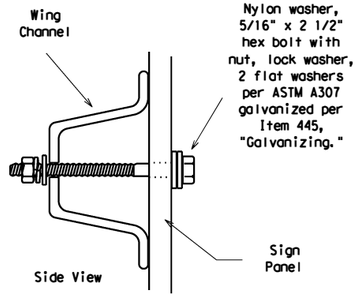


Detail A

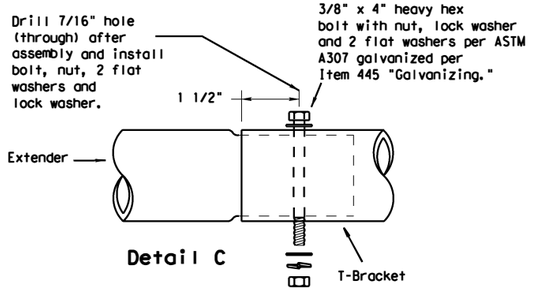


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET

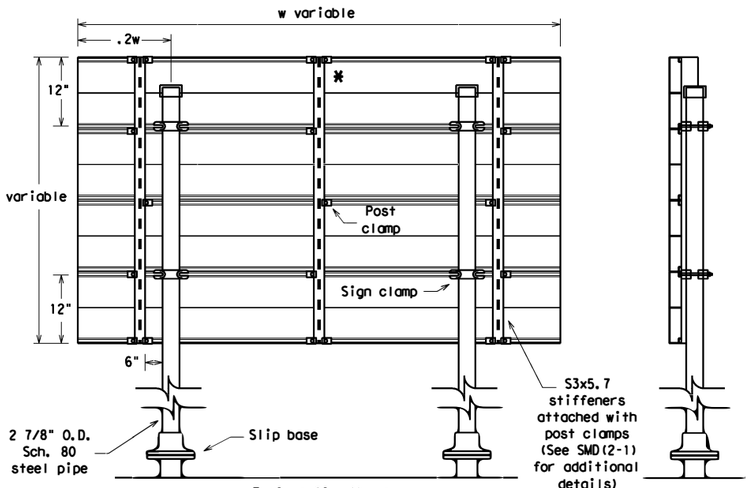


Detail B



Detail C

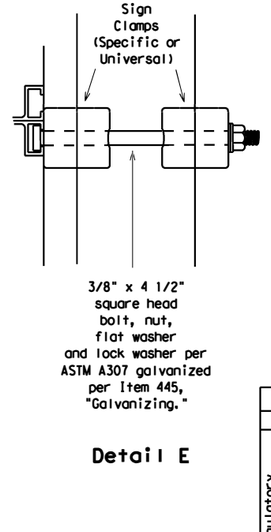
Splices shall only be allowed behind the sign substrate.



Typical Sign Mount

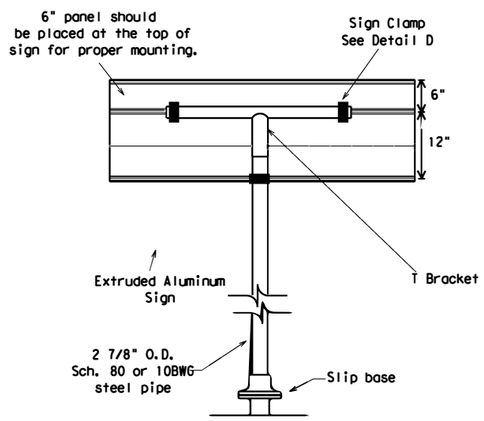
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

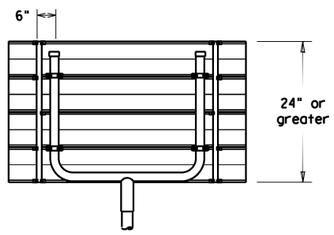


Detail E

See Detail E
for clamp installation



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
0028	02	098,etc.	US 90

DIST	COUNTY	SHEET NO.
HOU	HARRIS	125

DATE:
FILE:

DISCLAIMER:
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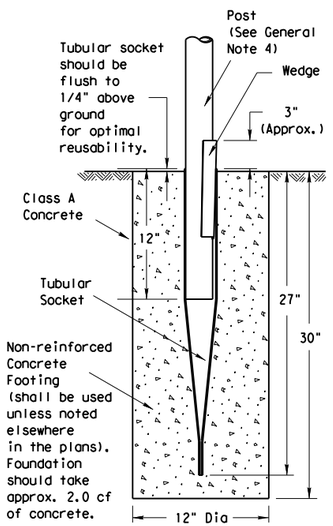
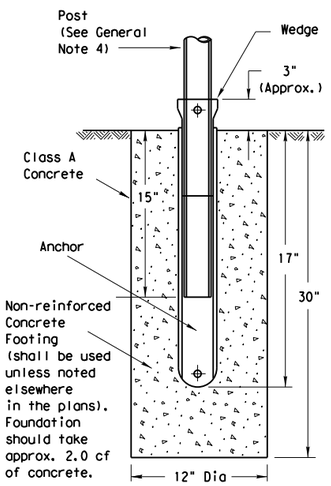
Wedge Anchor Steel System



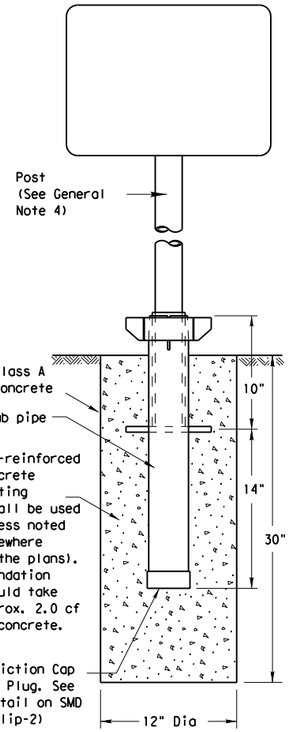
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

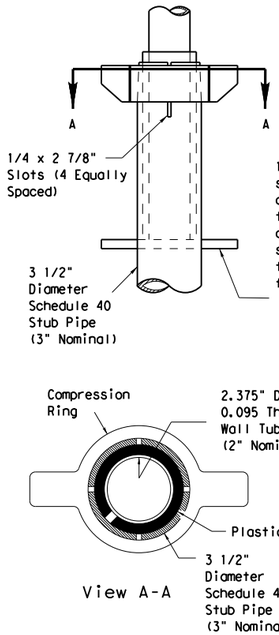


SMD RD SGN ASSM TY TWT(X)WP(X)

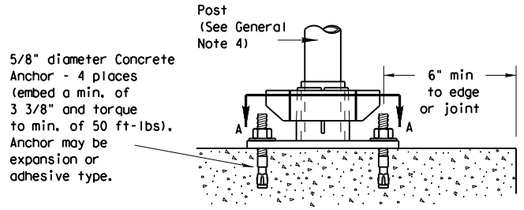
Universal Anchor System with Thin-Walled Tubing Post



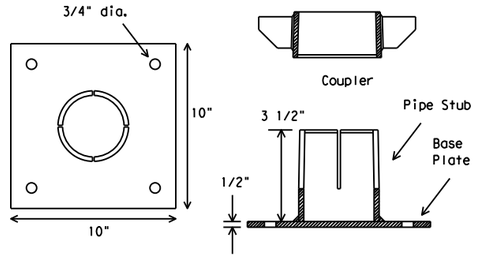
SM RD SGN ASSM TY TWT(X)UA(P)



Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

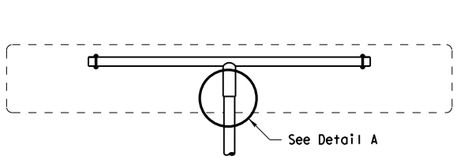


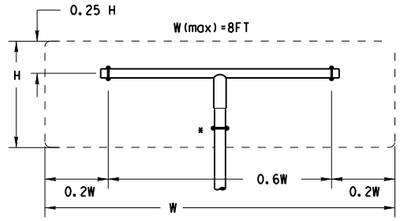
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



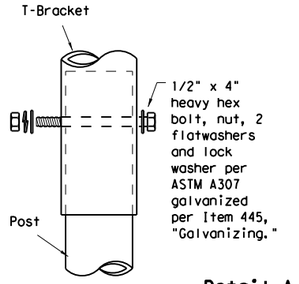
SM RD SGN ASSM TY TWT(X)UB(P)

Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)
(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations.
Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   Other steels may be used if they meet the following:
   55,000 PSI minimum yield strength
   70,000 PSI minimum tensile strength
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

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

9-08 REVISIONS

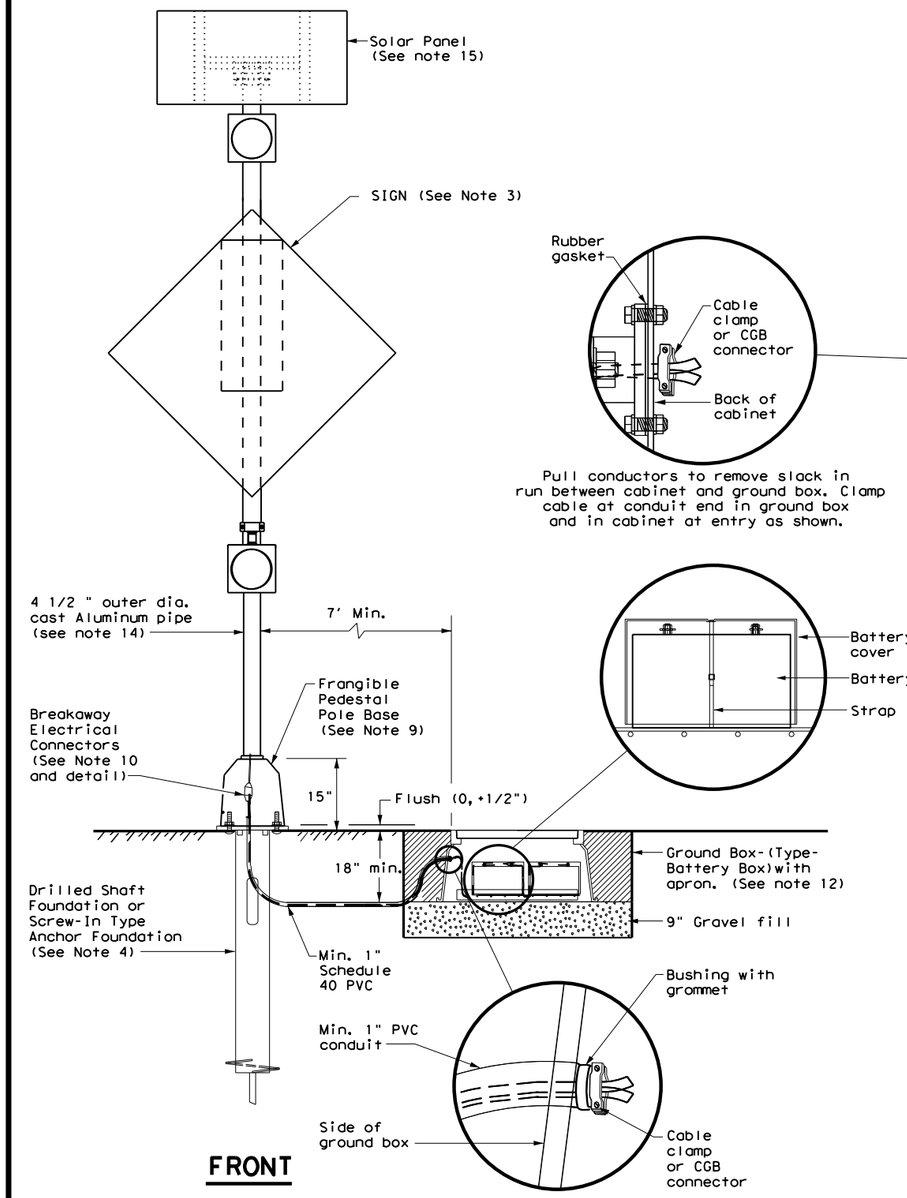
CONT	SECT	JOB	HIGHWAY
0028	02	098,etc.	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		126

26E

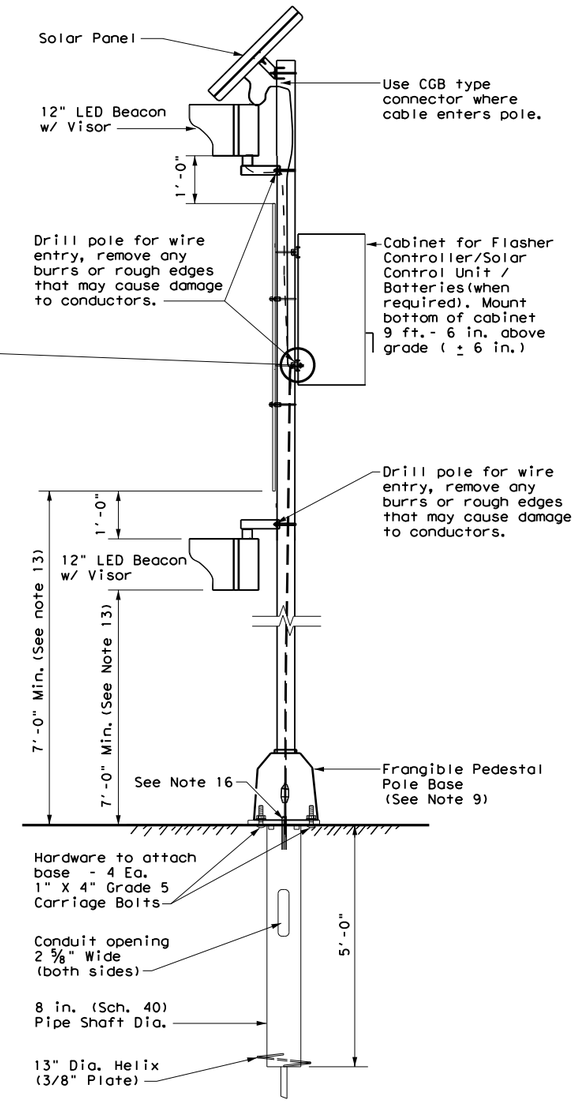
DATE:
FILE:

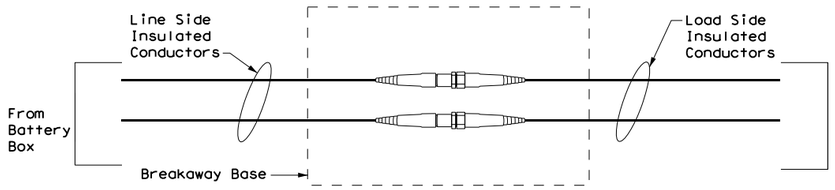
GENERAL NOTES:

1. Details show a typical warning sign with two flashing beacon heads, other arrangements are possible. When only one beacon is required, install the upper beacon.
2. See Item 685, "Roadside Flashing Beacon Assemblies" for further requirements.
3. See SMD standard sheets for lateral and vertical clearances and sign mounting details. Install signs as shown on the sign layout sheets.
4. Use either a Screw-In Type Anchor Foundation or a Drilled Shaft Foundation as shown elsewhere in the plans. When plans require a Drilled Shaft Foundation, see standard sheet TS-FD. Install the Screw-In Type Anchor Foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-In/Drilled Shaft Foundation is subsidiary to Item 685. Installation of a ground rod is not required for solar powered flashing beacon assemblies.
5. When used, provide Screw-In Type Anchor Foundations as shown on TxDOT's Material Producer List (MPL) in the file "Highway Traffic Signals".
6. Use materials specifically designed for attaching cabinets, beacon heads, solar panels, etc., to poles.
7. Install beacon heads as shown here, as shown elsewhere on the plans, or as directed. Use hardware specifically designed for mounting beacon heads on poles.
8. Conduit in foundation and within 6 in. of foundation is subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies."
9. Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base collar assembly to add strength and prevent loosening on connection.
10. Provide single pole non-fused watertight breakaway electrical connectors for frangible pedestal pole bases, as shown on TxDOT's MPL in the file "Roadway Illumination and Electrical Supplies." Approved models are listed under Item 685. For ungrounded (hot) conductors, install a breakaway connector with a dummy fuse slug). For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).
11. Install the batteries in a battery box. Place the batteries on a 3/16" thick plastic sheet and connect together. Place a plastic cover (battery bell jar) over the top of each battery and secure the battery bell jar to the battery with a strap. The batteries, bell jars, straps and 3/16" plastic sheet are subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies." When required, install batteries in the flasher cabinet. Wire batteries according to manufacturers recommendations. Provide the number of batteries as required by the manufacturer.
12. See standard sheet Electrical Details (ED) for additional requirements regarding the installation of ground boxes/battery boxes, conduit, and cabinets.
13. Provide clearance as shown above the sidewalk or pavement grade at the edge of the road. When a bottom beacon is not used, mount the bottom of the sign at least 7 ft. above the sidewalk or pavement grade at the edge of the road.
14. Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 Aluminum pipe, ASTM B429 or B221 (Alloy 6061-T6 only). Aluminum conduit will not develop the necessary strength and will not be allowed.
15. Orient solar panel for optimum exposure to sunlight (face to the south). Prior to installation, check the location to ensure there is no overhead obstruction that would block the solar panel from receiving full sunlight. Unless specified elsewhere, mount a minimum of 14' above grade.
16. Ensure height of conduit is below top of anchor bolts.

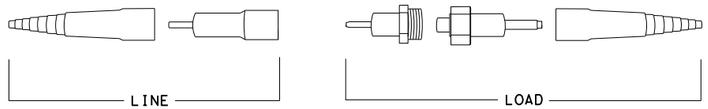


Pull conductors to remove slack in run between cabinet and ground box. Clamp cable at conduit end in ground box and in cabinet at entry as shown.





NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS
EXPLODED VIEW

Texas Department of Transportation

Traffic Operations Division Standard

SOLAR POWERED ROADSIDE FLASHING BEACON ASSEMBLY DETAILS

SPRFBA(1)-13

FILE: spb1-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,etc.	US 90
12-04	DIST	COUNTY		SHEET NO.
3-13	HOU	HARRIS		127

75A

DATE: 01/18/2024 05:39 PM
FILE: DOCUMENT NAME

NOTES FOR PERMANENT TRAFFIC SIGNAL(S):

1. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL CONTACT PUBLIV AND PRIVATE UTILITIES FOR LOCATION OF UNDERGROUND FACILITIES AT LEAST 72 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES WHERTHER UNDERGROUNS, ABOVE GROUND OR OVERHEAD. UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS.

2. INSTALL FLASHER SIGNALS ON MAST ARM, 17 FT.-6 IN. ABOVE THE ROADWAY.

3. FURNISH BLACK HOUSING FOR VEHICLE AND PEDESTRIAN SIGNALS. FURNISH BLACK VEHICLE SIGNAL HEAD BACK PLATES WITH 2 IN. RETROFLECTIVE YELLOW BORDER.

4. FURNISH VEHICLE FLASHER SIGNALS WITH LIGHT EMITTING DIODE (LED) SIGNAL LAMP UNITS.

5. USE TYPE B (HIGH INTENSITY PRISMATIC) OR TYPE D (DIAMOND GRADE) RETROREFLECTIVE SHEETING FOR SIGNS MOUNTED UNDER OR ADJACENT TO THE SIGNAL HEADS.

6. ROUTE CABLE FOR LUMINAIRES (#12/4C) TRAY CABLE) TO THE SERVICE ENCLOSURE. SEE ELECTRICAL DETAIL SHEETS. DO NOT PASS LUMINAIRE CONDUCTORS THROUGH THE SIGNAL CONTROLLER CABINET.

7. FURNISH AND INSTALL FULL-ACTUATED CONTROLLER WITH INTERNAL TIME BASE COORDINATION UNIT IN A CABINET, MOUNTED ON AN 18-INCH BASE EXTENSION.

8. FURNISH ALL MATERIALS. SUPPLY THE CONTROLLER WITH POWER SUPPLY, TO THE DEPARTMENT'S SIGNAL SHOP,
6810 KATY ROAD, HOUSTON, TEXAS FORTY FIVE (45) DAYS IN ADVANCE FOR INSPECTION, SET UP, AND TESTING. CONTACT MR. MICHAEL AWA, P. E., IN WRITING, AT LEAST FIFTEEN (15) WORKING DAYS PRIOR TO PICKING UP THE MATERIALS.

   ADDRESS: TEXAS DEPARTMENT OF TRANSPORTATION
   P.O. BOX 1386
   HOUSTON, TEXAS 77251-1386
   TEL. NO. (713) 802-5661

9. THE DEPARTMENT'S TRAFFIC SIGNAL MAINTENANCE OFFICE WILL PROVIDE PHASING FOR PERMANENT TRAFFIC SIGNALS. THE CONTRACTOR WILL PROVIDE TIMING.

10. LOCATE CABINET(S), STEEL SIGNAL POLES, SIGNAL ETC., AS APPROVED.

11. REPAIR OR REPLACE PAVEMENT AND SIDEWALKS DAMAGED BY THE CONTRACTOR'S FORCES DURING CONSTRUCTION AT NO COST TO THE DEPARTMENT.

12. ASSUME OWNERSHIP OF THE REMOVED EXISTING SIGNS.

13. SEAL ENDS OF ALL CONDUITS WITH DUCT SEAL, EXPANDABLE FOAM, OR BY OTHER METHODS APPROVED BY THE ENGINEER. SEAL CONDUIT IMMEDIATELY AFTER COMPLETION OF CONDUCTOR INSTALLATION AND PULL TESTS. DO NOT USE DUCT TAPE AS PERMANENT CONDUIT SEALANT. DO NOT USE SILICON CAULK AS A CONDUIT SEALANT.

14. CAP SPARE CONDUITS INSTALLED IN POLE FOUNDATIONS AND GROUND BOXES USING APPROVED CAPPING DEVICES.

15. DO NOT PLACE SIGNAL FLASHER HEADS OVER THE ROADWAY UNTIL ALL NECESSARY MATERIALS ARE ON HAND AS APPROVED.

16. INSTALL TWO SET SCREWS ON ALL VEHICLE SIGNAL FLASHER HEAD MOUNTING HARDWARE FITTINGS.

17. INSTALL A 5/8-IN. (MINIMUM) EYE BOLT FOR THE POINT OF ATTACHMENT BELOW THE SERVICE ENTRANCE WEATHERHEAD FOR THE SERVICE DROP TO STEEL POLE.

18. AIM LUMINAIRE ARMS MOUNTED ON TRAFFIC SIGNAL POLES PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY IT IS INTENDED TO COVER, TO DEVELOP THE PROPER ILLUMINATION PATTERN FOR THE INTERSECTION.

19. PROVIDE 250 WATT HPS (HIGH PRESSURE SODIUM) EQUIVALENT LIGHT EMITTING DIODE (LED) LUMINAIRES OPERATING AT 240 VOLTS.

20. WRAP SIGNAL FLASHER HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION.

21. GROUND STEEL MAST ARM POLE ASSEMBLIES IN ACCORDANCE WITH REQUIREMENTS SHOWN ON THE LATEST TRAFFIC SIGNAL POLE FOUNDATION STANDARD. USE THE GROUNDING LUG ON THE POLE TO GROUND THE POLE TO THE GROUND CONDUCTORS FROM THE CONDUITS.

22. VERIFY THE CORRECT MAST ARM POLE LENGTHS FOR EACH SIGNALIZED INTERSECTION PRIOR TO ORDERING THE EQUIPMENT.

23. INSTALL A CLOSE NIPPLE WITH LOCK NUT AND BUSHING (SIZE AS REQUIRED) WHERE THE CABLE ENTERS THE UPPER PORTION OF THE SIGNAL POLE.

24. REFER TO TXDOT'S WEBSITE FOR PREQUALIFIED PRODUCTS LIST REGARDING VEHICLE LED TRAFFIC SIGNAL LAMP UNIT, SIGNAL CONTROLLERS, SIGNAL CABINETS, BUS INTERFACE UNITS, BATTERY BACKUP UNITS. CHECK WEBSITE PERIODICALLY FOR CURRENT UPDATES.

25. THE CONTRACTOR IS RESPONSIBLE FOR THE SIGNAL CARRYING CAPABILITY AND PERFORMANCE OF THE CABLE. INSTALL EACH WIRE WITH A LIGHTNING PROTECTION DEVICE UNLESS OTHERWISE NOTED.

26. CONTRACTOR TO ADJUST SIGNAL FLASHER HEAD ALIGNMENT, AS NEEDED, USING ARTICULATING SIGNAL BRACKET ASSEMBLIES WITH A MINIMUM OF THREE ADJUSTABLE AXES.

27. SEAL WITH WATERPROOF SEALANT EACH END OF THE COMMUNICATIONS CABLE THAT IS EXPOSED TO THE ELEMENTS DURING STORAGE OR AFTER INSTALLATION.

28. THE CONTRACTOR TO FURNISH AND INSTALL ALL EQUIPMENT CALLED FOR AND REQUIRED AS NEEDED FOR A FULLY OPERATIONAL TRAFFIC SIGNAL.

29. REMOVE THE EXISTING PAVEMENT MARKING AS DIRECTED. REMOVE THE PAVEMENT MARKING TO THE EXTENT THAT THEY ARE EITHER COMPLETELY REMOVED OR OBLITERATED TO THE SATISFACTION OF THE ENGINEER.

30. PLACE PAVEMENT MARKINGS AS SHOWN ON THE PLANS OR AS DIRECTED.

NOTE FOR INSTALL ITEM 684-6021 ONLY:

COIL EXTRA 50 LF SLACK INSIDE BOX FOR RR CABINET.

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — DATE 1/19/2024

PRINT DATE	REVISION DATE
1/19/2024	

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT RD PHONE: (713) 828-4742
Houston, TX. 77095

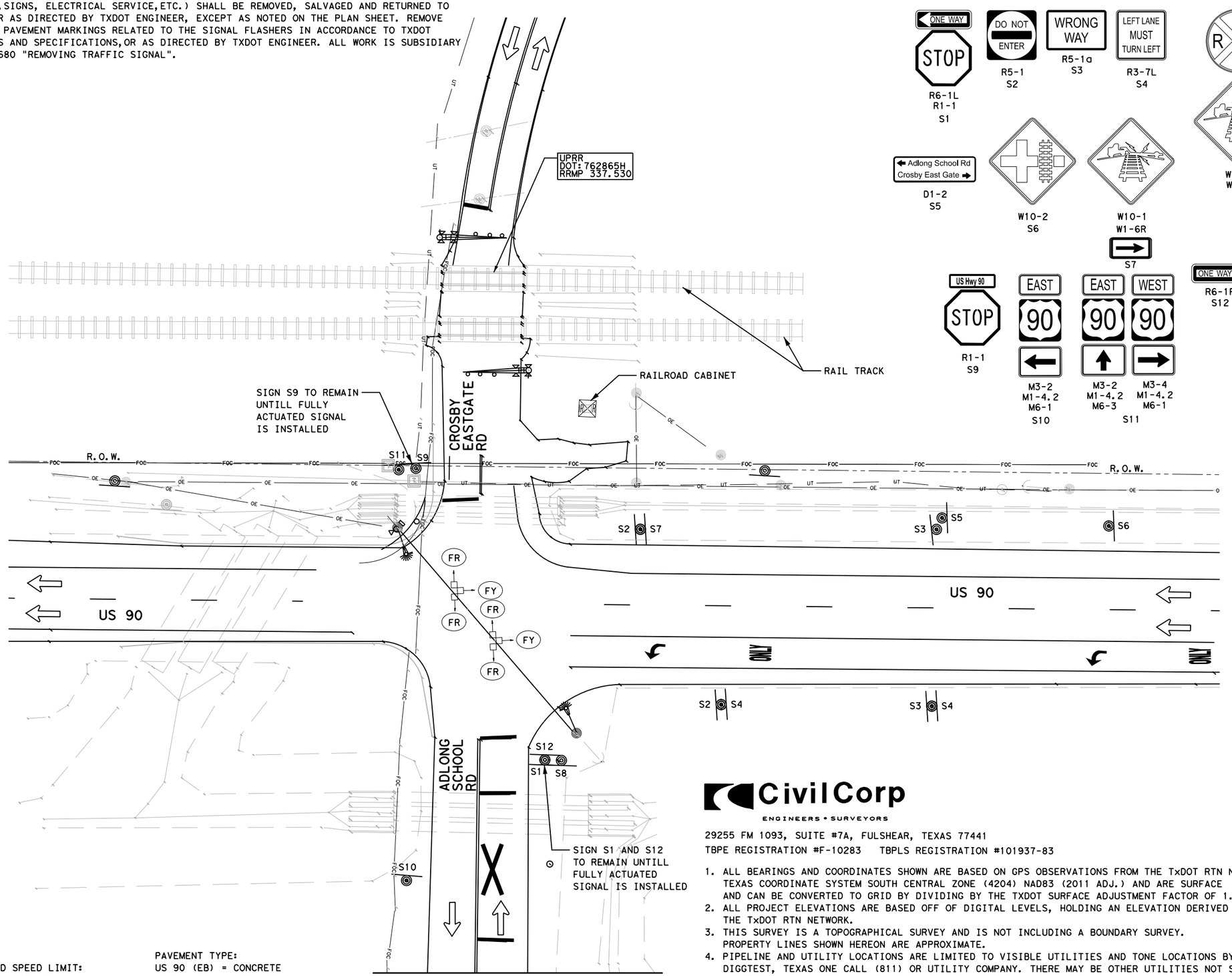
US 90 AT ADLONG SCHOOL RD /CROSBY EASTGATE RD

TRAFFIC SIGNAL NOTES

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		128
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

NOTES:

ALL TRAFFIC SIGNAL EQUIPMENT (CONTROLLER CABINET, POLES, SPANWIRE CABLE, SIGNAL HEADS FLASHERS, SIGNS, ELECTRICAL SERVICE, ETC.) SHALL BE REMOVED, SALVAGED AND RETURNED TO TXDOT, OR AS DIRECTED BY TXDOT ENGINEER, EXCEPT AS NOTED ON THE PLAN SHEET. REMOVE EXISTING PAVEMENT MARKINGS RELATED TO THE SIGNAL FLASHERS IN ACCORDANCE TO TXDOT STANDARDS AND SPECIFICATIONS, OR AS DIRECTED BY TXDOT ENGINEER. ALL WORK IS SUBSIDIARY TO ITEM 680 "REMOVING TRAFFIC SIGNAL".



EXISTING ROADSIDE TRAFFIC SIGNS

SCALE: 1" = 40'
20 0 20

LEGEND

- EXISTING ROADSIDE SIGN
- SPANWIRE SIGNAL POLES W/CONTROLLER & METER SERVICE
- RAILROAD CROSSING GATE
- (FY) EXISTING FLASHER (YELLOW HEAD)
- (FR) EXISTING FLASHER (RED HEAD)
- DIRECTION OF TRAVEL

UTILITY LEGEND

- DITCH BOTTOM
- DITCH TOP
- EDGE OF ASPHALT
- EDGE OF CONCRETE
- OE — OVERHEAD ELECTRIC POWER LINE
- UT — UNDERGROUND TELEPHONE LINE
- FOC — FIBER OPTIC CABLE
- BOX CULVERT
- WING WALL
- REINFORCED CONCRETE PIPE
- POWER POLE & GUY ANCHOR

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 1/25/2024 DATE

POSTED SPEED LIMIT:
US 90 = 65 MPH
CROSBY EASTGATE RD = 40 MPH
ADLONG SCHOOL RD = 30 MPH

PAVEMENT TYPE:
US 90 (EB) = CONCRETE
US 90 (WB) = ASPHALT
ADLONG SCHOOL RD = ASPHALT
CROSBY EASTGATE RD = ASPHALT

CivilCorp
ENGINEERS • SURVEYORS
29255 FM 1093, SUITE #7A, FULSHEAR, TEXAS 77441
TBPE REGISTRATION #F-10283 TBPLS REGISTRATION #101937-83

1. ALL BEARINGS AND COORDINATES SHOWN ARE BASED ON GPS OBSERVATIONS FROM THE TxDOT RTN NETWORK, TEXAS COORDINATE SYSTEM SOUTH CENTRAL ZONE (4204) NAD83 (2011 ADJ.) AND ARE SURFACE AND CAN BE CONVERTED TO GRID BY DIVIDING BY THE TXDOT SURFACE ADJUSTMENT FACTOR OF 1.00013.
2. ALL PROJECT ELEVATIONS ARE BASED OFF OF DIGITAL LEVELS, HOLDING AN ELEVATION DERIVED FROM THE TxDOT RTN NETWORK.
3. THIS SURVEY IS A TOPOGRAPHICAL SURVEY AND IS NOT INCLUDING A BOUNDARY SURVEY. PROPERTY LINES SHOWN HEREON ARE APPROXIMATE.
4. PIPELINE AND UTILITY LOCATIONS ARE LIMITED TO VISIBLE UTILITIES AND TONE LOCATIONS BY DIGGTEST, TEXAS ONE CALL (811) OR UTILITY COMPANY. THERE MAY BE OTHER UTILITIES NOT SHOWN. ADDITIONAL UTILITIES MAY EXIST THAT HAVE NOT BEEN SHOWN HEREON.
   -TEXAS 811 LOCATE TICKET NUMBERS 2267870865, 2267870933, 2267871256, 2267871648, 2267871731, 2267871790 & 2267871850

PRINT DATE	REVISION DATE
1/25/2024	

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 MONTABITT RD
Houston, TX. 77095
PHONE: (713) 828-4742

US 90 AT ADLONG SCHOOL RD /CROSBY EASTGATE RD

TRAFFIC SIGNAL EXISTING LAYOUT

SHEET 1 OF 2

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		129
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

S:\Projects\2100103 TxDOT 4687 Prime WA3 - Not Ex\6.0 Design\6.1 CAD Files\SPLIT PLAN SET*013023\US 90 at [illegible] - Revised - Flashers\SHEETS\130-TRAFFIC SIGNAL Existing LAYOUT.dgn

UTILITY LEGEND

- DITCH BOTTOM
- DITCH TOP
- EDGE OF ASPHALT
- EDGE OF CONCRETE
- OVERHEAD ELECTRIC POWER LINE (OE)
- UNDERGROUND TELEPHONE LINE (UT)
- FIBER OPTIC CABLE (FOC)
- BOX CULVERT
- WING WALL
- REINFORCED CONCRETE PIPE
- POWER POLE & GUY ANCHOR

NOTES:

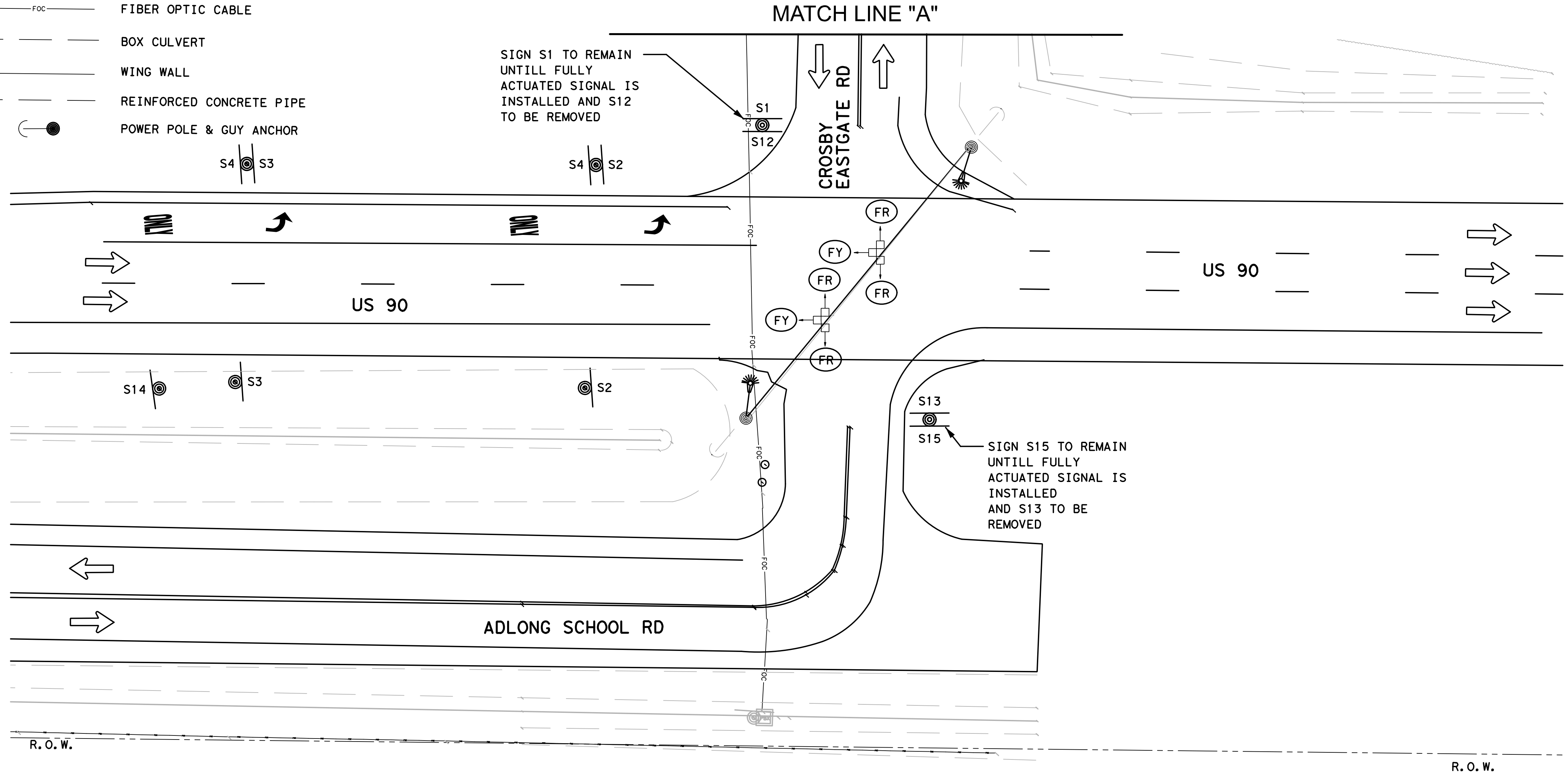
ALL TRAFFIC SIGNAL EQUIPMENT (CONTROLLER CABINET, POLES, SPANWIRE CABLE, SIGNAL HEADS FLASHERS, SIGNS, ELECTRICAL SERVICE, ETC.) SHALL BE REMOVED, SALVAGED AND RETURNED TO TXDOT, OR AS DIRECTED BY TXDOT ENGINEER, EXCEPT AS NOTED ON THE PLAN SHEET. REMOVE EXISTING PAVEMENT MARKINGS RELATED TO THE SIGNAL FLASHERS IN ACCORDANCE TO TXDOT STANDARDS AND SPECIFICATIONS, OR AS DIRECTED BY TXDOT ENGINEER. ALL WORK IS SUBSIDIARY TO ITEM 680 "REMOVING TRAFFIC SIGNAL".

SCALE: 1" = 40'

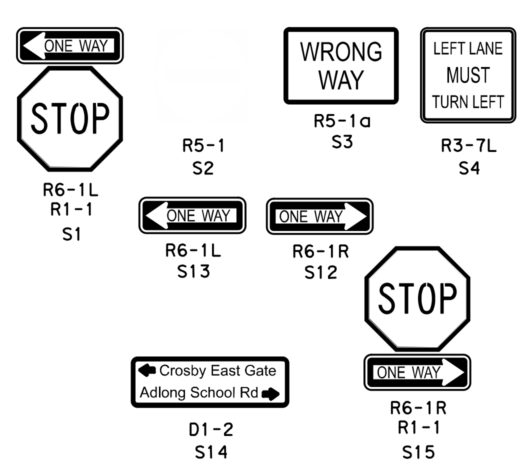
20 0 20

LEGEND

- EXISTING ROADSIDE SIGN
- SPANWIRE SIGNAL POLES W/CONTROLLER & METER SERVICE
- RAILROAD CROSSING GATE
- (FY) EXISTING FLASHER (YELLOW HEAD)
- (FR) EXISTING FLASHER (RED HEAD)
- DIRECTION OF TRAVEL



EXISTING ROADSIDE TRAFFIC SIGNS



CivilCorp
ENGINEERS • SURVEYORS

TBPE REGISTRATION #F-10283 TBPLS REGISTRATION #101937-83

1. ALL BEARINGS AND COORDINATES SHOWN ARE BASED ON GPS OBSERVATIONS FROM THE TxDOT RTN NETWORK, TEXAS COORDINATE SYSTEM SOUTH CENTRAL ZONE (4204) NAD83 (2011 ADJ.) AND ARE SURFACE AND CAN BE CONVERTED TO GRID BY DIVIDING BY THE TXDOT SURFACE ADJUSTMENT FACTOR OF 1.00013.
2. ALL PROJECT ELEVATIONS ARE BASED OFF OF DIGITAL LEVELS, HOLDING AN ELEVATION DERIVED FROM THE TxDOT RTN NETWORK.
3. THIS SURVEY IS A TOPOGRAPHICAL SURVEY AND IS NOT INCLUDING A BOUNDARY SURVEY. PROPERTY LINES SHOWN HEREON ARE APPROXIMATE.
4. PIPELINE AND UTILITY LOCATIONS ARE LIMITED TO VISIBLE UTILITIES AND TONE LOCATIONS BY DIGGTEST, TEXAS ONE CALL (811) OR UTILITY COMPANY. THERE MAY BE OTHER UTILITIES NOT SHOWN. ADDITIONAL UTILITIES MAY EXIST THAT HAVE NOT BEEN SHOWN HEREON.
   -TEXAS 811 LOCATE TICKET NUMBERS 2267870865, 2267870933, 2267871256, 2267871648, 2267871731, 2267871790 & 2267871850

POSTED SPEED LIMIT:
US 90 = 65 MPH
CROSBY EASTGATE RD = 40 MPH
ADLONG SCHOOL RD = 30 MPH

PAVEMENT TYPE:
US 90 (EB) = CONCRETE
US 90 (WB) = ASPHALT
ADLONG SCHOOL RD = ASPHALT
CROSBY EASTGATE RD = ASPHALT

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — DATE 1/19/2024

PRINT DATE	REVISION DATE
1/19/2024	

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT RD, Houston, TX. 77095 PHONE: (713) 828-4742

Texas Department of Transportation®

US 90 AT ADLONG SCHOOL RD /CROSBY EASTGATE RD

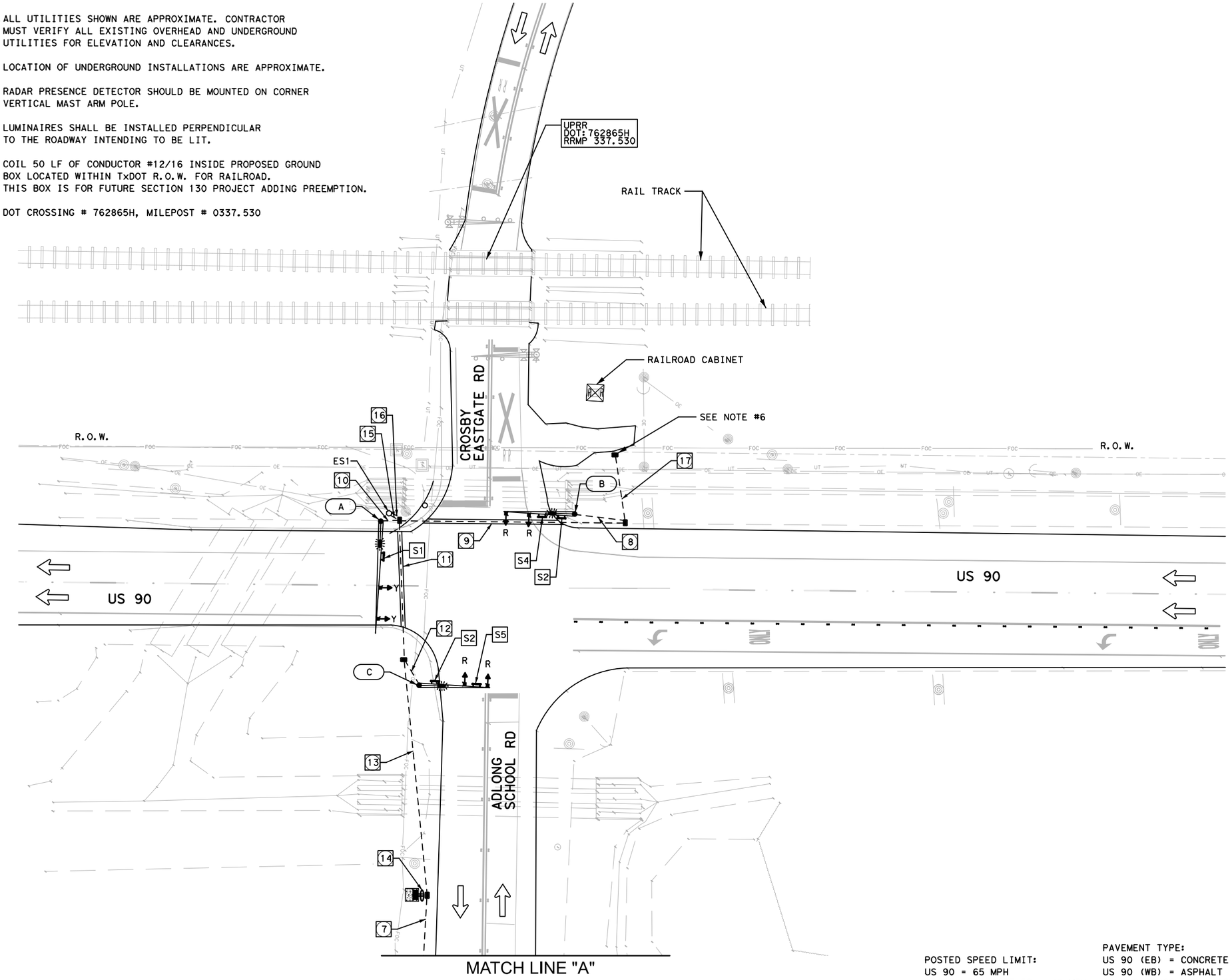
TRAFFIC SIGNAL EXISTING LAYOUT

SHEET 2 OF 2

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		130
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

NOTES:

1. ALL RIGHT-OF-WAY LINES ARE APPROXIMATE. VERIFY LOCATIONS AS NECESSARY.
2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.
3. LOCATION OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE.
4. RADAR PRESENCE DETECTOR SHOULD BE MOUNTED ON CORNER VERTICAL MAST ARM POLE.
5. LUMINAIRES SHALL BE INSTALLED PERPENDICULAR TO THE ROADWAY INTENDING TO BE LIT.
6. COIL 50 LF OF CONDUCTOR #12/16 INSIDE PROPOSED GROUND BOX LOCATED WITHIN TxDOT R.O.W. FOR RAILROAD. THIS BOX IS FOR FUTURE SECTION 130 PROJECT ADDING PREEMPTION.
7. DOT CROSSING # 762865H, MILEPOST # 0337.530



SCALE: 1" = 40'
20 0 20

LEGEND

- PROPOSED MAST ARM POLE
- PROPOSED LUMINAIRE
- Y/R PROPOSED TRAFFIC SIGNAL HEAD
- PROPOSED SIGN ON MAST ARM
- ESx PROPOSED SERVICE POLE TY D WITH SERVICE (120/240 VOLTS), METER SERVICE ENCLOSURE AND SERVICE DISCONNECT
- PROPOSED FULL-ACTUATED CONTROLLER W/CABINET, 4C LTE CELLULAR MODULE AND BATTERY BACK-UP (BBU)
- PROPOSED GROUND BOX TY D
- PROPOSED CONDUIT (TRENCH)
- PROPOSED CONDUIT (BORE)
- EXISTING SIGN ON POST
- DIRECTION OF TRAFFIC FLOW

POSTED SPEED LIMIT:
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ADLONG SCHOOL RD = 30 MPH

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STATE OF TEXAS
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CHARLES R. STEVENS, JR., P.E. — 1/25/2024 DATE

PRINT DATE	REVISION DATE
1/25/2024	

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Texas Department of Transportation®

US 90 AT ADLONG SCHOOL RD /CROSBY EASTGATE RD

TRAFFIC SIGNAL PROPOSED LAYOUT

SHEET 1 OF 3

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		131
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

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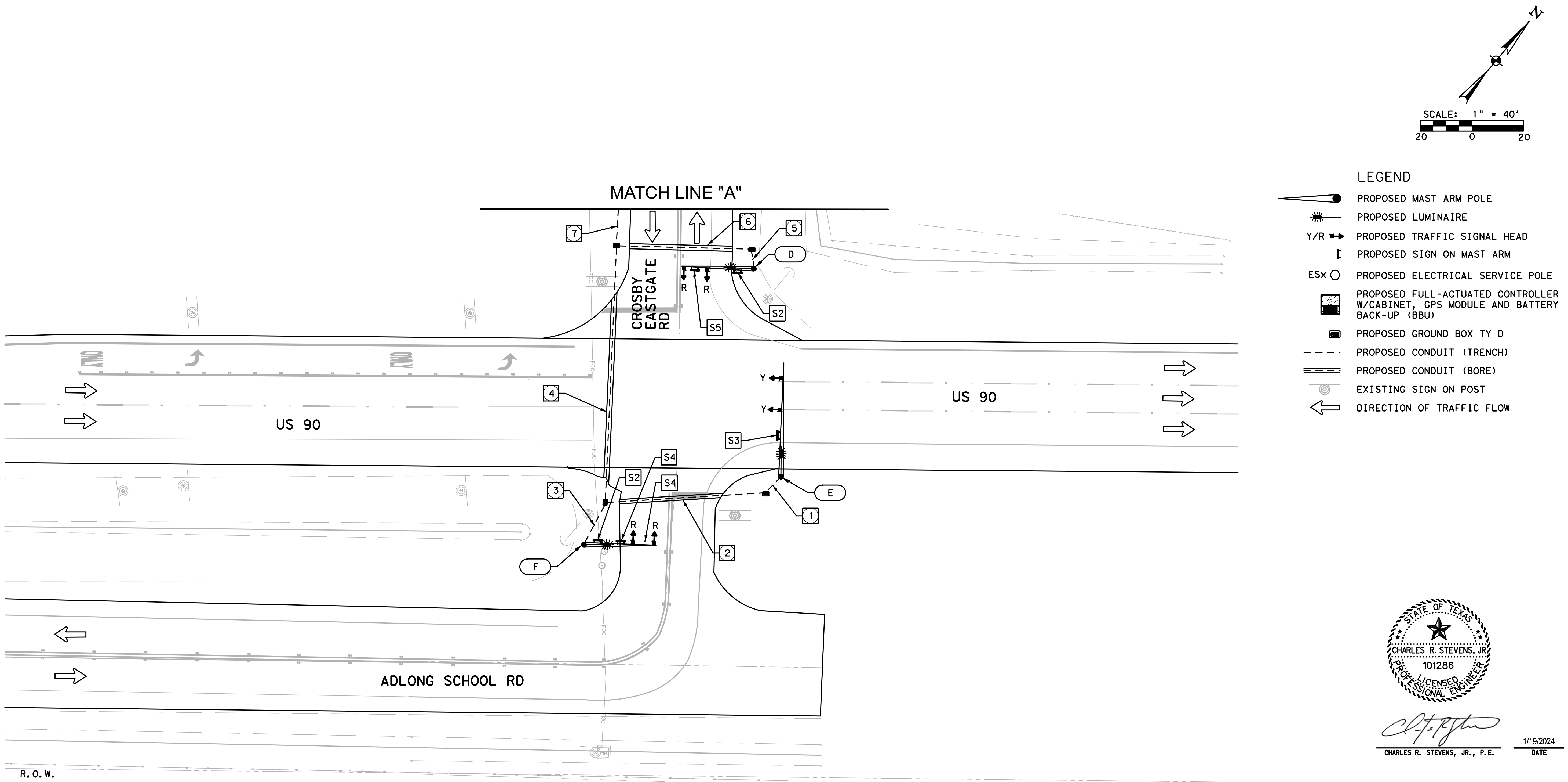

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NOTES:

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2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.
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US 90 AT ADLONG SCHOOL RD /CROSBY EASTGATE RD

TRAFFIC SIGNAL PROPOSED LAYOUT

SHEET 2 OF 3

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		132
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618) PVC 2" (SCHD 80) (6046) NO. EA	TRENCH LF	3" (SCHD 80) (6053) NO. EA	TRENCH LF	(6054) NO. EA	BORE LF	CONDUCTORS (620) GROUND #8 BARE (6007) NO. EA	LENGTH LF	POWER #4 INSULATED (6012) NO. EA	LENGTH LF	TRAY CABLE (621) LUMINAIRE #12/4C TRAY CABLE (6005) NO. EA	LENGTH LF	SIGNAL (684) VEH SIGNAL #12/7C 6012 NO. EA	LENGTH LF	VEH SIGNAL #12/16C (RR) 6021 NO. EA	LENGTH LF
1			1	10			1	10			1	10	2	10		
2			1	20	1	45	1	65			1	65	1	65		
3			1	20			1	20			1	20	1	20		
4			1	20	1	80	1	100			2	100	3	100		
5			1	10			1	10			1	10	1	10		
6					1	55	1	55			1	55	1	55		
7			2	40			2	40			3	40	4	40		
8			1	20			1	20			1	20	1	20		
9			1	30	1	60	1	90			1	90	1	90	1	90
10			1	10			1	10			1	10	2	10		
11			2	15	2	40	2	55	2	55	4	55	3	55	1	55
12			1	15			1	15			1	15	1	15		
13			2	95			2	95	2	95	3	95	4	95	1	95
14			3	10			3	10	2	10			8	10	1	10
15	1	10					1	10			6	10				
16	1	10					1	10	2	10						
17*			1	25			1	25							1	25
POLE A											1	35	2	20		
POLE B											1	35	1	20		
POLE C											1	35	1	20		
POLE D											1	35	1	20		
POLE E											1	35	2	20		
POLE F											1	35	1	20		
MA-44'													2	45		
MB-28'													1	30		
MC-28'													1	30		
MD-28'													1	30		
ME-44'													2	45		
MF-28'													1	30		
TOTAL		20		510		320		850		340		1390		1860		275

*RUN #17 COIL 50 LF CONDUCTOR #12/16 OF SLACK INSIDE PROPOSED GROUND BOX LOCATED WITHIN TxDOT R.O.W. FOR RR CABINET

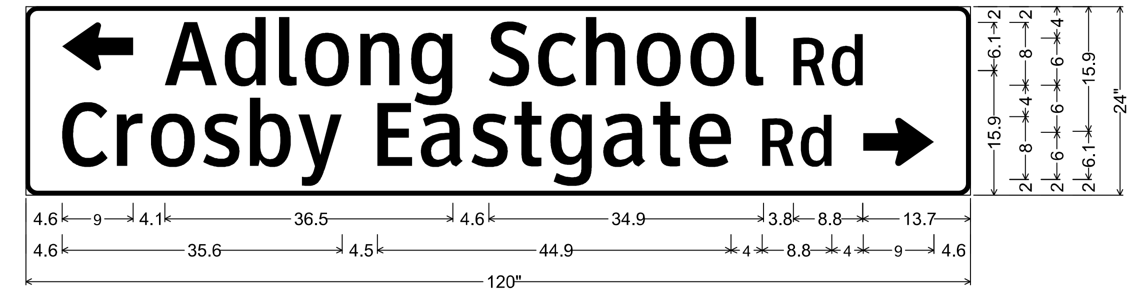
ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE NAME	CALL OUT	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)(6)(7)&(8)-14	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS ***	PANEL BD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CIRCUIT AMPS	BRANCH CKT. BRK. POLE/ AMPS	KVA LOAD
US 90 AT ADLONG SCHOOL ROAD/ CROSBY EASTGATE ROAD	ES	TY D (120/240)060 (NS)SS(E)SP(O)	1-1/4"	3/#6	N/A	2P/60	30	100	SIGNAL	40	1P/50	6.3
									LUMINAIRE	6	2P/20	

LEGEND:

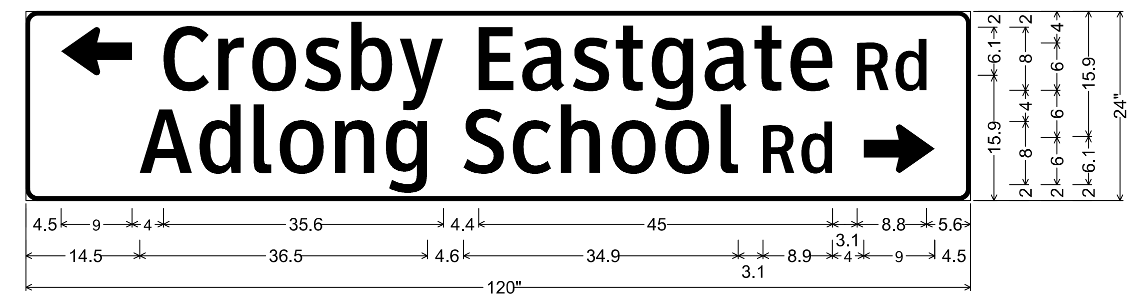
- (A) PROP. 44' MAST ARM POLE W/ LUMINAIRE
- (B) PROP. 28' MAST ARM POLE W/ LUMINAIRE
- (C) PROP. 28' MAST ARM POLE W/ LUMINAIRE
- (D) PROP. 28' MAST ARM POLE W/ LUMINAIRE
- (E) PROP. 44' MAST ARM POLE W/ LUMINAIRE
- (F) PROP. 28' MAST ARM POLE W/ LUMINAIRE

PROPOSED TRAFFIC SIGNAL SIGNS ATTACHED TO MAST ARMS



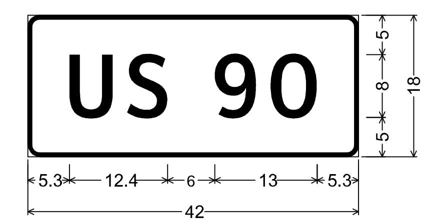
D3-1G-120"x24";
1.5" Radius, 0.5" Border, White on Green;
Standard Arrow Custom 9.0" X 6.1" 180°; "Adlong School Rd", ClearviewHwy-3-W 70% spacing; "", ClearviewHwy-3-W 70% spacing;
"Crosby Eastgate Rd", ClearviewHwy-3-W 70% spacing; Standard Arrow Custom 9.0" X 6.1" 0°;

S1



D3-1G-120"x24";
1.5" Radius, 0.5" Border, White on Green;
Standard Arrow Custom 9.0" X 6.1" 180°; "Crosby Eastgate Rd", ClearviewHwy-3-W 70% spacing;
"", ClearviewHwy-3-W 70% spacing; "Adlong School Rd", ClearviewHwy-3-W 70% spacing; Standard Arrow Custom 9.0" X 6.1" 0°;

S3



D3-1G-42"X18";
1.5" Radius, 0.5" Border, White on Green;
"US", ClearviewHwy-3-W;
"90", ClearviewHwy-3-W;

S2

R6-1(R)
(36"x12")

S4

R6-1(L)
(36"x12")

S5

PROPOSED SIGNAL HEAD SCHEDULE:

(R) FR (8 EA)	(Y) FY (4 EA)

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US 90 AT ADLONG SCHOOL RD /CROSBY EASTGATE RD

TRAFFIC SIGNAL PROPOSED LAYOUT

SHEET 3 OF 3

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		133
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

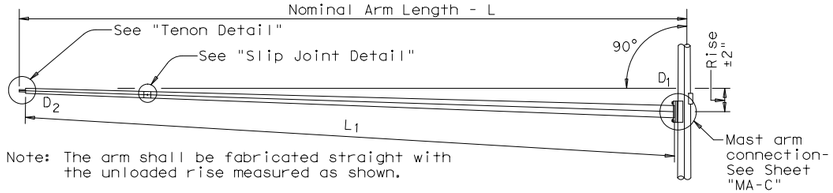
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
24	12.0	9.3	8.6	7.8	.239	13.0	10.0	9.2	8.3	.239	36-A
28	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
32	13.0	10.3	9.6	8.8	.239	14.0	11.0	10.2	9.3	.239	36-A
36	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
40	14.0	11.3	10.6	9.8	.239	16.0	13.0	12.2	11.3	.239	36-B
44	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1′-8"	19.1	8.0	3.5	.179	1′-7"
24	23.1	9.0	5.8	.179	1′-9"	23.1	9.0	3.5	.179	1′-8"
28	27.1	9.5	5.7	.179	1′-10"	27.1	10.0	3.5	.179	1′-9"
32	31.0	9.5	5.2	.239	1′-11"	31.0	9.5	3.5	.239	1′-10"
36	35.0	10.0	5.1	.239	2′-0"	35.0	10.0	3.5	.239	1′-11"
40	39.0	10.5	5.1	.239	2′-3"	39.0	11.0	3.5	.239	2′-1"
44	43.0	11.0	5.1	.239	2′-8"	43.0	11.5	4.0	.239	2′-3"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)

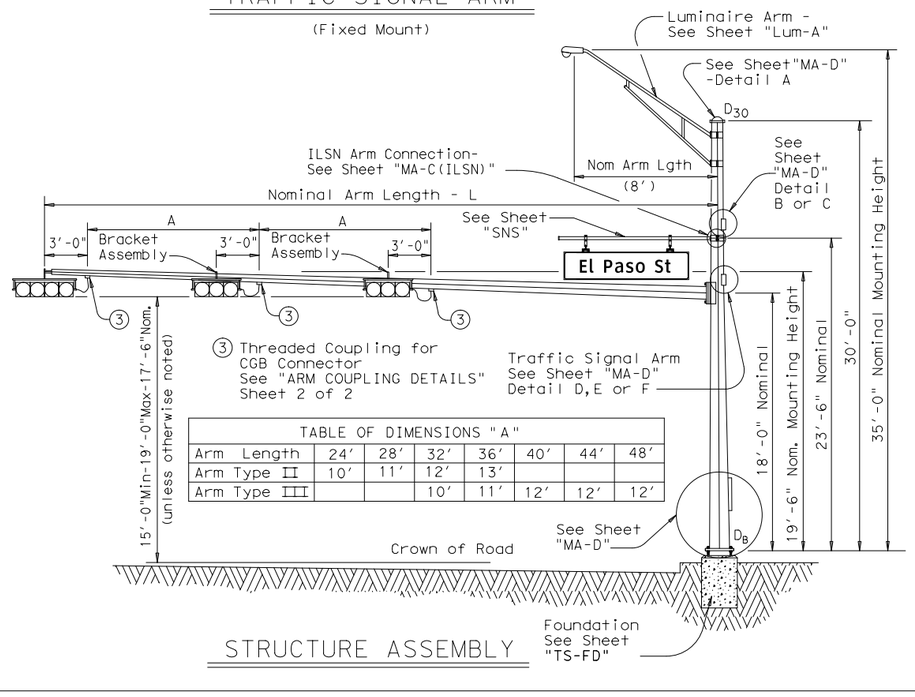


TABLE OF DIMENSIONS "A"

Arm Length	24′	28′	32′	36′	40′	44′	48′
Arm Type II	10′	11′	12′	13′			
Arm Type III			10′	11′	12′	12′	12′

STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30′ Poles With Luminaire		24′ Poles With ILSN		19′ Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-100		20S-100		20-100	
24	24L-100		24S-100		24-100	
28	28L-100	4	28S-100		28-100	
32	32L-100		32S-100		32-100	
36	36L-100		36S-100		36-100	
40	40L-100		40S-100		40-100	
44	44L-100	2	44S-100		44-100	

Traffic Signal Arms (1 per pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 CGB connector		1 Bracket Assembly and 2 CGB Connectors		2 Bracket Assemblies and 3 CGB Connectors	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100	4		
32			32II-100		32III-100	
36			36II-100		36III-100	
40					40III-100	
44					44III-100	2

Luminaire Arms (1 per 30′ pole)

Nominal Arm Length	Quantity
8′ Arm	6

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7′ Arm	
9′ Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3′-4"	
1 ¾"	3′-10"	4
2"	4′-3"	2

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

SHEET 1 OF 2

US 90 @ ADLONG SCHOOL RD/ CROSBY EASTGATE RD

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 1/19/2024 DATE

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(100 MPH WIND ZONE)

SMA-100(1)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
11-99
1-12

CONT	SECT	JOB	HIGHWAY
0028	02	098, ETC.	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		134

123A

DATE:
FILE:

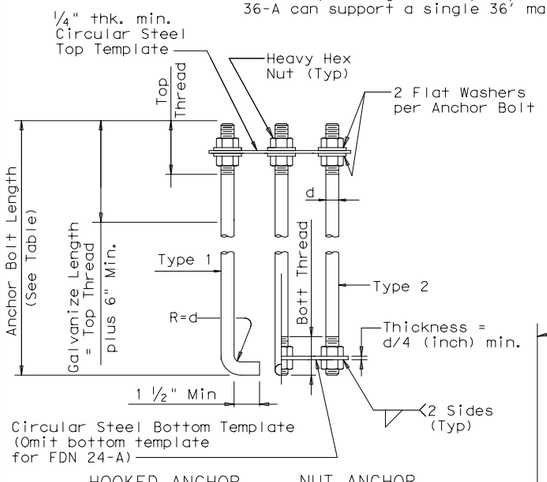
FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft ④, ⑤, ⑥			ANCHOR BOLT DESIGN ①				FOUNDATION DESIGN LOAD ②		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

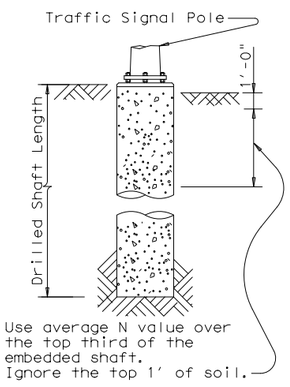
		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'

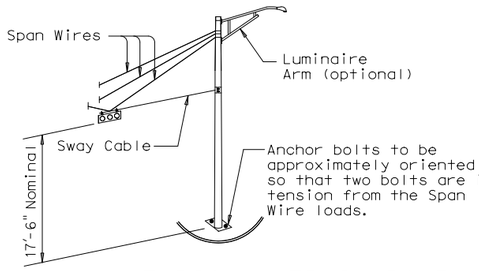
EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



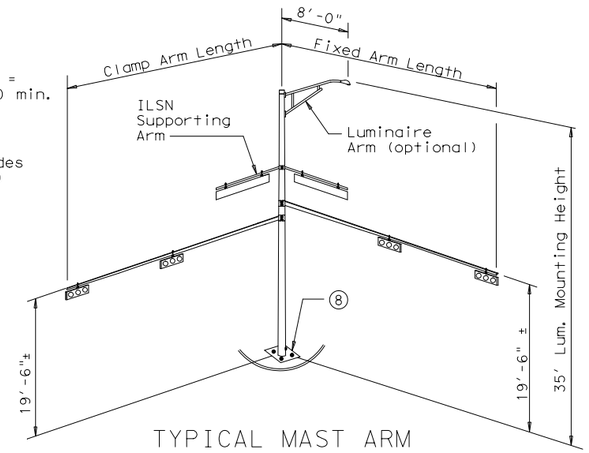
ANCHOR BOLT ASSEMBLY

⑧ Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.





TYPICAL STRAIN POLE ASSEMBLY



TYPICAL MAST ARM ASSEMBLY

NOTES:

① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

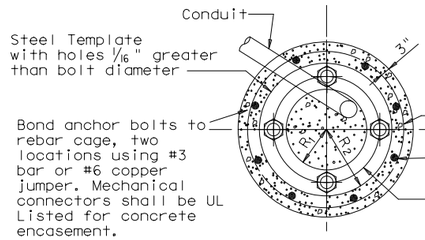
⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

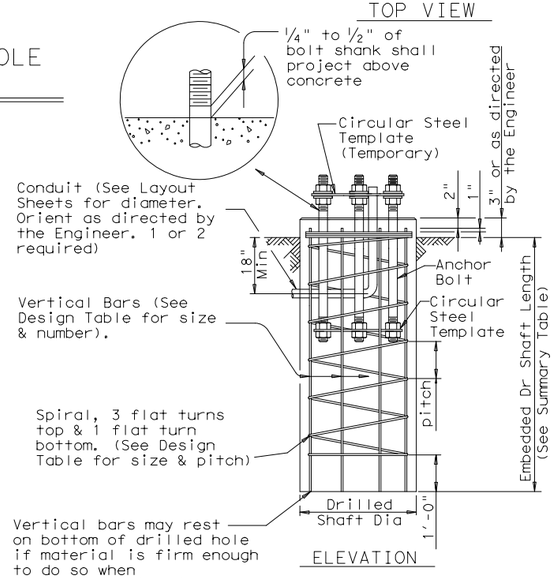
⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

ANCHOR BOLT & TEMPLATE SIZES

BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

⑦ Min dimensions given, longer bolts are acceptable.





FOUNDATION DETAILS

FOUNDATION SUMMARY TABLE ③

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH ⑥ (FEET)				
				24-A	30-A	36-A	36-B	42-A
US 90 @ ADLONG SCHOOL RD/CROSBY EASTGATE RD								
POLE A	10	36-B	1				15.2	
POLE B	10	36-A	1			13.2		
POLE C	10	36-A	1			13.2		
POLE D	10	36-A	1			13.2		
POLE E	10	36-B	1				15.2	
POLE F	10	36-A	1			13.2		
TOTAL DRILLED SHAFT LENGTHS						52.8	30.4	

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

US 90 @ ADLONG SCHOOL RD/ CROSBY EASTGATE RD

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101286
PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. — 1/19/2024 DATE

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

© TxDOT August 1995	DN: MS	CK: JSY	DW: MAO/MMF	CK: JSY/TEB
REVISIONS 5-96 11-98 1-12	CONT	SECT	JOB	HIGHWAY
	0028	02	098, ETC.	US 90
	DIST	COUNTY		SHEET NO.
11/14/2013	HOU	HARRIS		135

128

NOTES FOR PERMANENT TRAFFIC SIGNAL(S):

1. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL CONTACT PUBLIV AND PRIVATE UTILITIES FOR LOCATION OF UNDERGROUND FACILITIES AT LEAST 72 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING, OR EXCAVATING. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES WHERTHER UNDERGROUNS, ABOVE GROUND OR OVERHEAD. UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS.

2. INSTALL FLASHER SIGNALS ON MAST ARM, 17 FT.-6 IN. ABOVE THE ROADWAY.

3. FURNISH BLACK HOUSING FOR VEHICLE AND PEDESTRIAN SIGNALS. FURNISH BLACK VEHICLE SIGNAL HEAD BACK PLATES WITH 2 IN. RETROFLECTIVE YELLOW BORDER.

4. FURNISH VEHICLE FLASHER SIGNALS WITH LIGHT EMITTING DIODE (LED) SIGNAL LAMP UNITS.

5. USE TYPE B (HIGH INTENSITY PRISMATIC) OR TYPE D (DIAMOND GRADE) RETROREFLECTIVE SHEETING FOR SIGNS MOUNTED UNDER OR ADJACENT TO THE SIGNAL HEADS.

6. ROUTE CABLE FOR LUMINAIRES (#12/4C) TRAY CABLE) TO THE SERVICE ENCLOSURE. SEE ELECTRICAL DETAIL SHEETS. DO NOT PASS LUMINAIRE CONDUCTORS THROUGH THE SIGNAL CONTROLLER CABINET.

7. FURNISH AND INSTALL FULL-ACTUATED CONTROLLER WITH INTERNAL TIME BASE COORDINATION UNIT IN A CABINET, MOUNTED ON AN 18-INCH BASE EXTENSION.

8. FURNISH ALL MATERIALS. SUPPLY THE CONTROLLER WITH POWER SUPPLY, TO THE DEPARTMENT'S SIGNAL SHOP,
6810 KATY ROAD, HOUSTON, TEXAS FORTY FIVE (45) DAYS IN ADVANCE FOR INSPECTION, SET UP, AND TESTING. CONTACT MR. MICHAEL AWA, P. E., IN WRITING, AT LEAST FIFTEEN (15) WORKING DAYS PRIOR TO PICKING UP THE MATERIALS.

   ADDRESS: TEXAS DEPARTMENT OF TRANSPORTATION
   P.O. BOX 1386
   HOUSTON, TEXAS 77251-1386
   TEL. NO. (713) 802-5661

9. THE DEPARTMENT'S TRAFFIC SIGNAL MAINTENANCE OFFICE WILL PROVIDE PHASING FOR PERMANENT TRAFFIC SIGNALS. THE CONTRACTOR WILL PROVIDE TIMING.

10. LOCATE CABINET(S), STEEL SIGNAL POLES, SIGNAL ETC., AS APPROVED.

11. REPAIR OR REPLACE PAVEMENT AND SIDEWALKS DAMAGED BY THE CONTRACTOR'S FORCES DURING CONSTRUCTION AT NO COST TO THE DEPARTMENT.

12. ASSUME OWNERSHIP OF THE REMOVED EXISTING SIGNS.

13. SEAL ENDS OF ALL CONDUITS WITH DUCT SEAL, EXPANDABLE FOAM, OR BY OTHER METHODS APPROVED BY THE ENGINEER. SEAL CONDUIT IMMEDIATELY AFTER COMPLETION OF CONDUCTOR INSTALLATION AND PULL TESTS. DO NOT USE DUCT TAPE AS PERMANENT CONDUIT SEALANT. DO NOT USE SILICON CAULK AS A CONDUIT SEALANT.

14. CAP SPARE CONDUITS INSTALLED IN POLE FOUNDATIONS AND GROUND BOXES USING APPROVED CAPPING DEVICES.

15. DO NOT PLACE SIGNAL FLASHER HEADS OVER THE ROADWAY UNTIL ALL NECESSARY MATERIALS ARE ON HAND AS APPROVED.

16. INSTALL TWO SET SCREWS ON ALL VEHICLE SIGNAL FLASHER HEAD MOUNTING HARDWARE FITTINGS.

17. INSTALL A 5/8-IN. (MINIMUM) EYE BOLT FOR THE POINT OF ATTACHMENT BELOW THE SERVICE ENTRANCE WEATHERHEAD FOR THE SERVICE DROP TO STEEL POLE.

18. AIM LUMINAIRE ARMS MOUNTED ON TRAFFIC SIGNAL POLES PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY IT IS INTENDED TO COVER, TO DEVELOP THE PROPER ILLUMINATION PATTERN FOR THE INTERSECTION.

19. PROVIDE 250 WATT HPS (HIGH PRESSURE SODIUM) EQUIVALENT LIGHT EMITTING DIODE (LED) LUMINAIRES OPERATING AT 240 VOLTS.

20. WRAP SIGNAL FLASHER HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION.

21. GROUND STEEL MAST ARM POLE ASSEMBLIES IN ACCORDANCE WITH REQUIREMENTS SHOWN ON THE LATEST TRAFFIC SIGNAL POLE FOUNDATION STANDARD. USE THE GROUNDING LUG ON THE POLE TO GROUND THE POLE TO THE GROUND CONDUCTORS FROM THE CONDUITS.

22. VERIFY THE CORRECT MAST ARM POLE LENGTHS FOR EACH SIGNALIZED INTERSECTION PRIOR TO ORDERING THE EQUIPMENT.

23. INSTALL A CLOSE NIPPLE WITH LOCK NUT AND BUSHING (SIZE AS REQUIRED) WHERE THE CABLE ENTERS THE UPPER PORTION OF THE SIGNAL POLE.

24. REFER TO TXDOT'S WEBSITE FOR PREQUALIFIED PRODUCTS LIST REGARDING VEHICLE LED TRAFFIC SIGNAL LAMP UNIT, SIGNAL CONTROLLERS, SIGNAL CABINETS, BUS INTERFACE UNITS, BATTERY BACKUP UNITS. CHECK WEBSITE PERIODICALLY FOR CURRENT UPDATES.

25. THE CONTRACTOR IS RESPONSIBLE FOR THE SIGNAL CARRYING CAPABILITY AND PERFORMANCE OF THE CABLE. INSTALL EACH WIRE WITH A LIGHTNING PROTECTION DEVICE UNLESS OTHERWISE NOTED.

26. CONTRACTOR TO ADJUST SIGNAL FLASHER HEAD ALIGNMENT, AS NEEDED, USING ARTICULATING SIGNAL BRACKET ASSEMBLIES WITH A MINIMUM OF THREE ADJUSTABLE AXES.

27. SEAL WITH WATERPROOF SEALANT EACH END OF THE COMMUNICATIONS CABLE THAT IS EXPOSED TO THE ELEMENTS DURING STORAGE OR AFTER INSTALLATION.

28. THE CONTRACTOR TO FURNISH AND INSTALL ALL EQUIPMENT CALLED FOR AND REQUIRED AS NEEDED FOR A FULLY OPERATIONAL TRAFFIC SIGNAL.

29. REMOVE THE EXISTING PAVEMENT MARKING AS DIRECTED. REMOVE THE PAVEMENT MARKING TO THE EXTENT THAT THEY ARE EITHER COMPLETELY REMOVED OR OBLITERATED TO THE SATISFACTION OF THE ENGINEER.

30. PLACE PAVEMENT MARKINGS AS SHOWN ON THE PLANS OR AS DIRECTED.

NOTE FOR INSTALL ITEM 684-6021 ONLY:

COIL EXTRA 50 LF SLACK INSIDE BOX FOR RR CABINET.

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
LICENSED
PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E.   1/19/2024 DATE

PRINT DATE	REVISION DATE
1/19/2024	

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT RD
Houston, TX. 77095
PHONE: (713) 828-4742

US 90 AT ADLONG JOHNSON RD /BOHEMIAN HALL RD

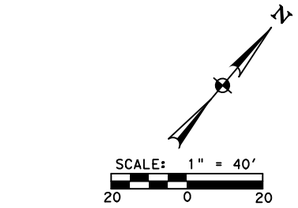
TRAFFIC SIGNAL NOTES

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		136
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

UTILITY LEGEND

- DITCH BOTTOM
- DITCH TOP
- EDGE OF ASPHALT
- EDGE OF CONCRETE
- OE — OVERHEAD ELECTRIC POWER LINE
- UT — UNDERGROUND TELEPHONE LINE
- FOL — FIBER OPTIC CABLE LINE
- BOX CULVERT
- WING WALL
- REINFORCED CONCRETE PIPE
- POWER POLE & GUY ANCHOR

EXISTING ROADSIDE TRAFFIC SIGNS



LEGEND

- EXISTING ROADSIDE SIGN
- SPANWIRE SIGNAL POLES W/CONTROLLER & METER SERVICE
- RAILROAD CROSSING GATE
- FY — EXISTING FLASHER (YELLOW HEAD)
- FR — EXISTING FLASHER (RED HEAD)
- DIRECTION OF TRAVEL

NOTES:

ALL TRAFFIC SIGNAL EQUIPMENT (CONTROLLER CABINET, POLES, SPANWIRE CABLE, SIGNAL HEADS FLASHERS, SIGNS, ELECTRICAL SERVICE, ETC.) SHALL BE REMOVED, SALVAGED AND RETURNED TO TXDOT, OR AS DIRECTED BY TXDOT ENGINEER, EXCEPT AS NOTED ON THE PLAN SHEET. REMOVE EXISTING PAVEMENT MARKINGS RELATED TO THE SIGNAL FLASHERS IN ACCORDANCE TO TXDOT STANDARDS AND SPECIFICATIONS, OR AS DIRECTED BY TXDOT ENGINEER. ALL WORK IS SUBSIDIARY TO ITEM 680 "REMOVING TRAFFIC SIGNAL".

POSTED SPEED LIMITS:	PAVEMENT TYPE:
US 90 = 65 MPH	US 90 = CONCRETE
BOHEMIAN HALL RD = 45 MPH	BOHEMIAN HALL RD = ASPHALT
ADLONG JOHNSON RD = 30 MPH	ADLONG JOHNSON RD = ASPHALT

CivilCorp
ENGINEERS • SURVEYORS
29255 FM 1093, SUITE #7A, FULSHEAR, TEXAS 77441
TBPE REGISTRATION #F-10283 TBPLS REGISTRATION #101937-83

1. ALL BEARINGS AND COORDINATES SHOWN ARE BASED ON GPS OBSERVATIONS FROM THE TxDOT RTN NETWORK, TEXAS COORDINATE SYSTEM SOUTH CENTRAL ZONE (4204) NAD83 (2011 ADJ.) AND ARE SURFACE AND CAN BE CONVERTED TO GRID BY DIVIDING BY THE TXDOT SURFACE ADJUSTMENT FACTOR OF 1.00013.
2. ALL PROJECT ELEVATIONS ARE BASED OFF OF DIGITAL LEVELS, HOLDING AN ELEVATION DERIVED FROM THE TxDOT RTN NETWORK.
3. THIS SURVEY IS A TOPOGRAPHICAL SURVEY AND IS NOT INCLUDING A BOUNDARY SURVEY. PROPERTY LINES SHOWN HEREON ARE APPROXIMATE.
4. PIPELINE AND UTILITY LOCATIONS ARE LIMITED TO VISIBLE UTILITIES AND TONE LOCATIONS BY DIGGTEST, TEXAS ONE CALL (811) OR UTILITY COMPANY. THERE MAY BE OTHER UTILITIES NOT SHOWN. ADDITIONAL UTILITIES MAY EXIST THAT HAVE NOT BEEN SHOWN HEREON.
   -TEXAS 811 LOCATE TICKET NUMBERS 2267870865, 2267870933, 2267871256, 2267871648, 2267871731, 2267871790 & 2267871850

CHARLES R. STEVENS, JR., P.E. — 1/25/2024 DATE

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US 90 AT ADLONG JOHNSON RD /BOHEMIAN HALL RD

TRAFFIC SIGNAL EXISTING LAYOUT

SHEET 1 OF 2

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		137
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

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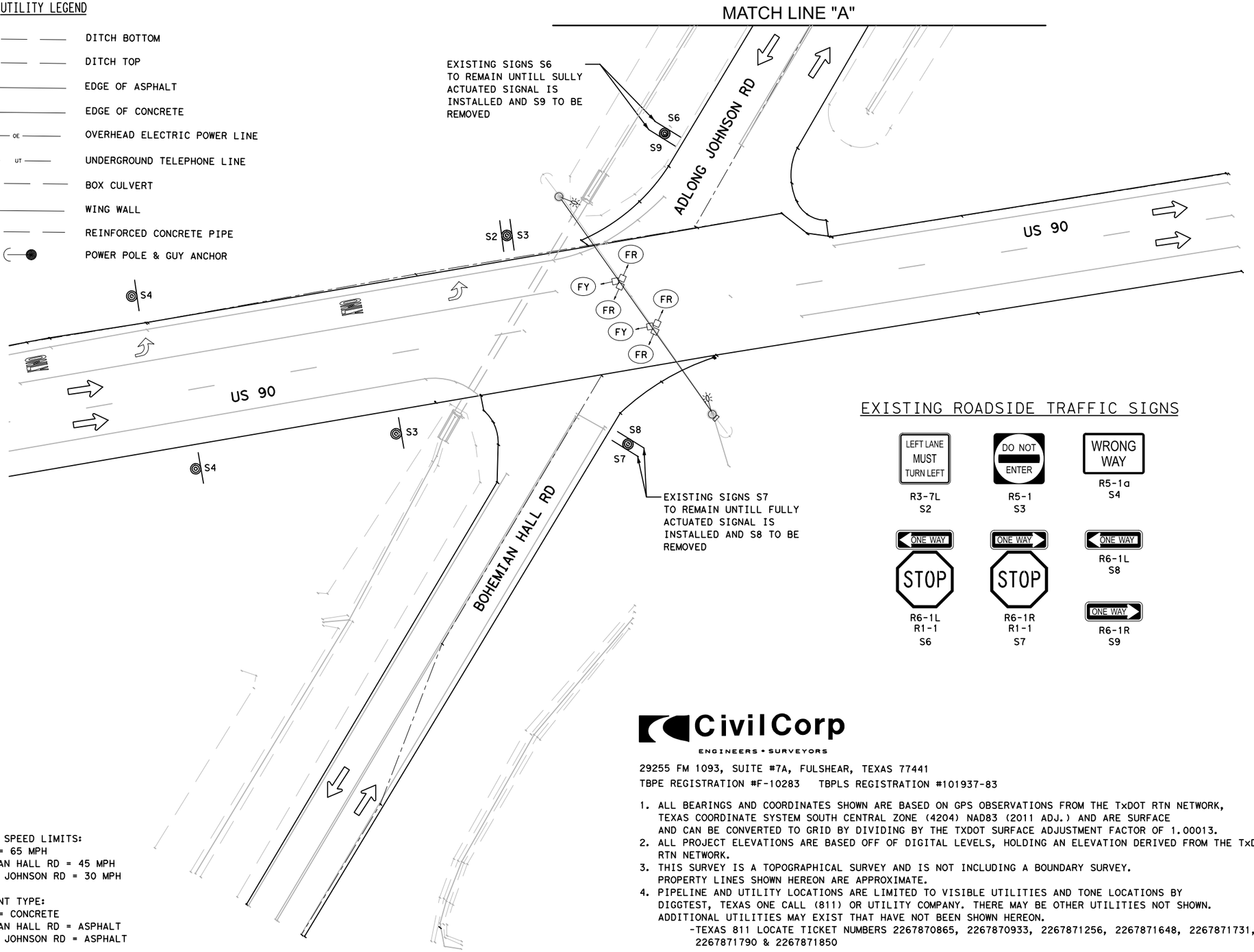
UTILITY LEGEND

- DITCH BOTTOM
- DITCH TOP
- EDGE OF ASPHALT
- EDGE OF CONCRETE
- OE — OVERHEAD ELECTRIC POWER LINE
- UT — UNDERGROUND TELEPHONE LINE
- BOX CULVERT
- WING WALL
- REINFORCED CONCRETE PIPE
- POWER POLE & GUY ANCHOR



SCALE: 1" = 40'
20 0 20

LEGEND

- EXISTING ROADSIDE SIGN
- SPANWIRE SIGNAL POLES W/CONTROLLER & METER SERVICE
- RAILROAD CROSSING GATE
- FY EXISTING FLASHER (YELLOW HEAD)
- FR EXISTING FLASHER (RED HEAD)
- DIRECTION OF TRAVEL

EXISTING ROADSIDE TRAFFIC SIGNS

POSTED SPEED LIMITS:
US 90 = 65 MPH
BOHEMIAN HALL RD = 45 MPH
ADLONG JOHNSON RD = 30 MPH

PAVEMENT TYPE:
US 90 = CONCRETE
BOHEMIAN HALL RD = ASPHALT
ADLONG JOHNSON RD = ASPHALT

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
LICENSED PROFESSIONAL ENGINEER

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TBPE REGISTRATION #F-10283 TBPLS REGISTRATION #101937-83

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   -TEXAS 811 LOCATE TICKET NUMBERS 2267870865, 2267870933, 2267871256, 2267871648, 2267871731, 2267871790 & 2267871850

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Texas Department of Transportation®

US 90 AT ADLONG JOHNSON RD /BOHEMIAN HALL RD

TRAFFIC SIGNAL EXISTING LAYOUT

SHEET 2 OF 2

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		138
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

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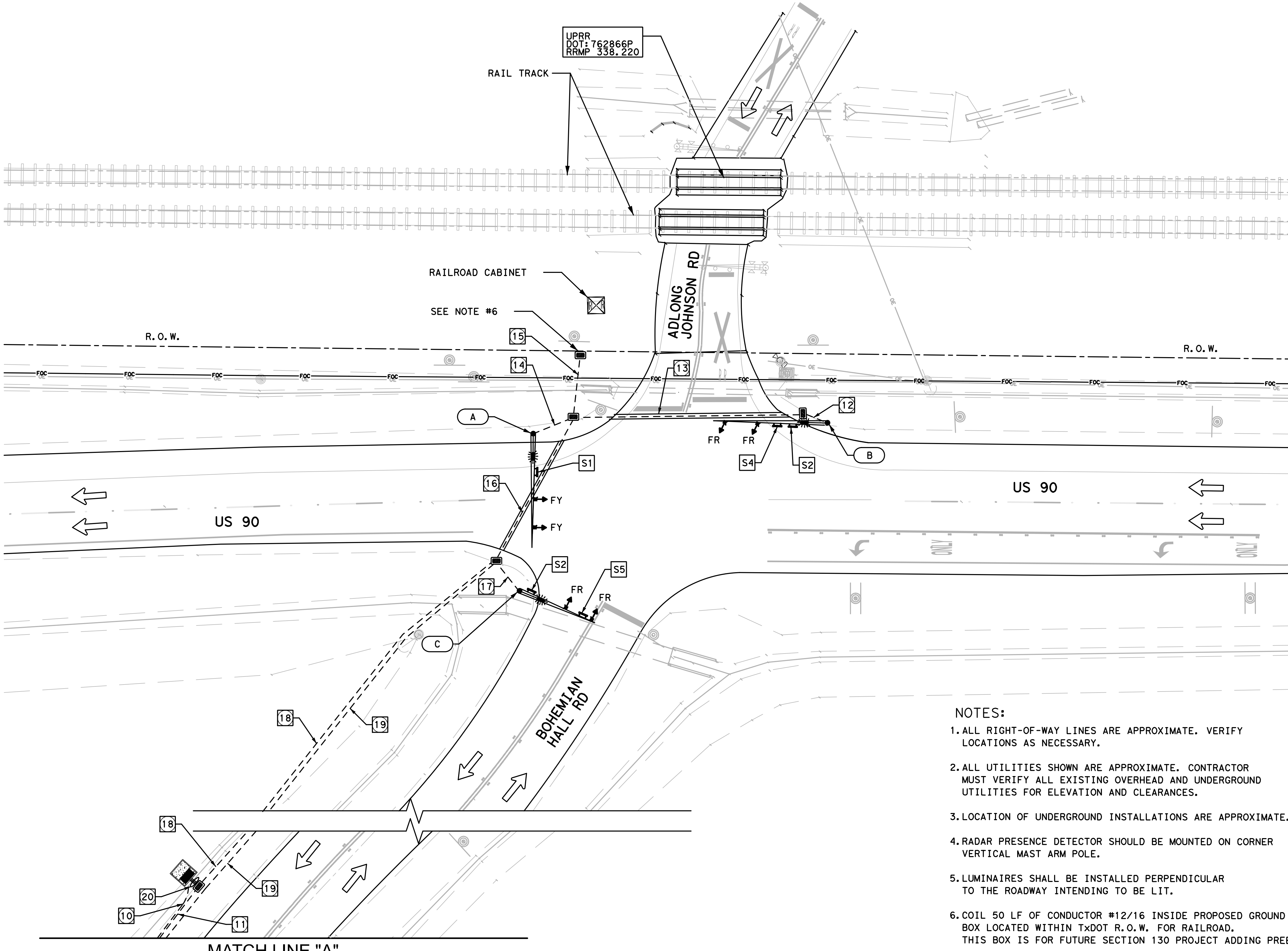

N

SCALE: 1" = 40'

20 0 20

LEGEND

- PROPOSED MAST ARM POLE
- PROPOSED LUMINAIRE
- FY/FR PROPOSED TRAFFIC SIGNAL HEAD
- PROPOSED SIGN ON MAST ARM
- ES PROPOSED SERVICE POLE TY D WITH SERVICE (120/240 VOLTS), METER SERVICE ENCLOSURE AND SERVICE DISCONNECT
- PROPOSED FULL-ACTUATED CONTROLLER W/CABINET, 4C LTE CELLULAR MODULE AND BATTERY BACK-UP (BBU)
- PROPOSED GROUND BOX TY D
- PROPOSED CONDUIT (TRENCH)
- PROPOSED CONDUIT (BORE)
- EXISTING SIGN ON POST
- DIRECTION OF TRAFFIC FLOW

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NOTES:

1. ALL RIGHT-OF-WAY LINES ARE APPROXIMATE. VERIFY LOCATIONS AS NECESSARY.
2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.
3. LOCATION OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE.
4. RADAR PRESENCE DETECTOR SHOULD BE MOUNTED ON CORNER VERTICAL MAST ARM POLE.
5. LUMINAIRES SHALL BE INSTALLED PERPENDICULAR TO THE ROADWAY INTENDING TO BE LIT.
6. COIL 50 LF OF CONDUCTOR #12/16 INSIDE PROPOSED GROUND BOX LOCATED WITHIN TxDOT R.O.W. FOR RAILROAD. THIS BOX IS FOR FUTURE SECTION 130 PROJECT ADDING PREEMPTION.
7. DOT CROSSING # 762866P, MILEPOST # 0338.220

POSTED SPEED LIMITS:
US 90 = 65 MPH
BOHEMIAN HALL RD = 45 MPH
ADLONG JOHNSON RD = 30 MPH

PAVEMENT TYPE:
US 90 = CONCRETE
BOHEMIAN HALL RD = ASPHALT
ADLONG JOHNSON RD = ASPHALT

PRINT DATE	REVISION DATE
1/25/2024	

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PHONE: (713) 828-4742

US 90 AT ADLONG JOHNSON RD /BOHEMIAN HALL RD

TRAFFIC SIGNAL PROPOSED LAYOUT

SHEET 1 OF 3

FHWA TEXAS DIVISION	FEDERAL AID PROJECT			SHEET NO.
	SEE TITLE SHEET			139
STATE	DIST.	COUNTY		
TEXAS	HOU	HARRIS		
CONT.	SECT.	JOB	HIGHWAY NO.	
0028	02	098, ETC.	US 90	

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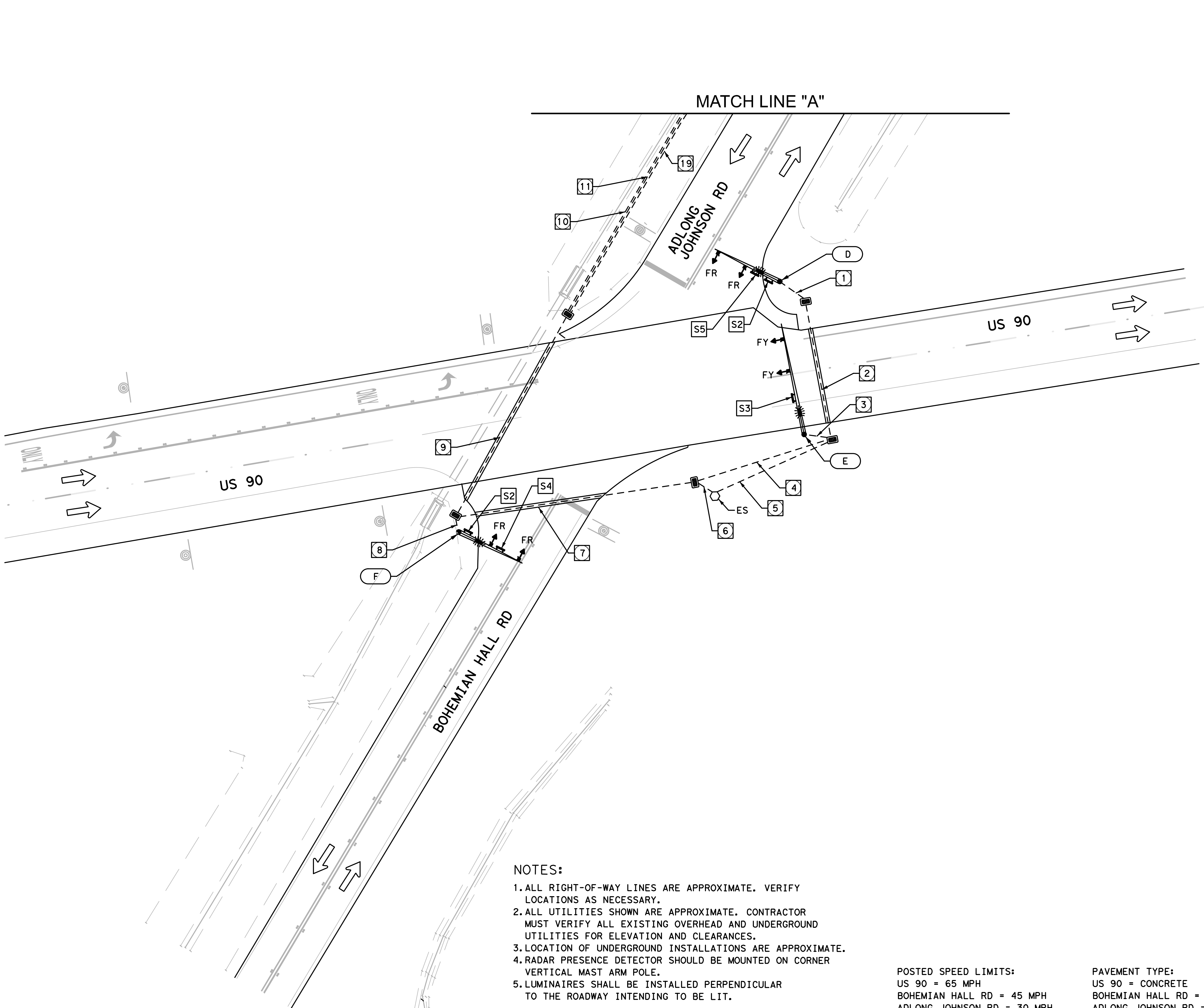

LEGEND

- PROPOSED MAST ARM POLE
- PROPOSED LUMINAIRE
- FY/FR PROPOSED TRAFFIC SIGNAL HEAD
- PROPOSED SIGN ON MAST ARM
- ES PROPOSED SERVICE POLE TY D WITH SERVICE (120/240 VOLTS), METER SERVICE ENCLOSURE AND SERVICE DISCONNECT
- PROPOSED FULL-ACTUATED CONTROLLER W/CABINET, 4C LTE CELLULAR MODULE AND BATTERY BACK-UP (BBU)
- PROPOSED GROUND BOX TY D
- PROPOSED CONDUIT (TRENCH)
- PROPOSED CONDUIT (BORE)
- EXISTING SIGN ON POST
- DIRECTION OF TRAFFIC FLOW

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
LICENSED PROFESSIONAL ENGINEER

CHARLES R. STEVENS, JR., P.E. 1/19/2024 DATE

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POSTED SPEED LIMITS:
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TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT RD Houston, TX. 77095 PHONE: (713) 828-4742

Texas Department of Transportation®

US 90 AT ADLONG JOHNSON RD /BOHEMIAN HALL RD

TRAFFIC SIGNAL PROPOSED LAYOUT

SHEET 2 OF 3

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		140
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)						CONDUCTORS (620)				TRAY CABLE (621)		SIGNAL (684)			
	PVC						GROUND		POWER		LUMINAIRE		VEH SIGNAL		VEH SIGNAL	
	2" (SCHD 80)		3" (SCHD 80)				#8 BARE		#4 INSULATED		#12/4C TRAY CABLE		#12/7C		#12/16C (RR)	
	(6046)		(6053)		(6054)		(6007)		(6012)		(6005)		6012		6021	
	NO.	TRENCH	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
1			1	15			1	15			1	15	1	15		
2			1	20	1	40	1	60			1	60	1	60		
3			1	15			1	15			1	15	2	15		
4			1	60			1	60					3	60		
5	1	55					1	55			2	55				
6	1	10					1	10	2	10	4	10				
7			2	45	2	55	2	100	2	100	4	100	3	100		
8			1	10			1	10			1	10	1	10		
9			2	20	2	75	2	95	2	95	3	95	4	95		
10	1	335					1	335	2	335						
11			1	330			1	330					4	330		
12			1	15			1	15			1	15	1	15		
13			1	20	1	80	1	100			1	100	1	100		
14			1	20			1	20			1	20	2	20		
15*			1	25			1	25							1	25
16			1	15	1	50	1	65			2	65	3	65	1	65
17			1	15			1	15			1	15	1	15		
18			1	320			1	320					4	320	1	320
19	1	650					1	650			3	650				
20			3	10			3	10					8	10	1	10
POLE A											1	35	2	20		
POLE B											1	35	1	20		
POLE C											1	35	1	20		
POLE D											1	35	1	20		
POLE E											1	35	2	20		
POLE F											1	35	1	20		
MA-44'													2	45		
MB-28'													1	30		
MC-32'													1	35		
MD-28'													1	30		
ME-44'													2	45		
MF-28'													1	30		
TOTAL		1050		1040		430		2520		1080		3375		4485		420

*RUN #15 COIL 50 LF CONDUCTOR #12/16 OF SLACK INSIDE PROPOSED GROUND BOX LOCATED WITHIN TxDOT R.O.W. FOR RR CABIN

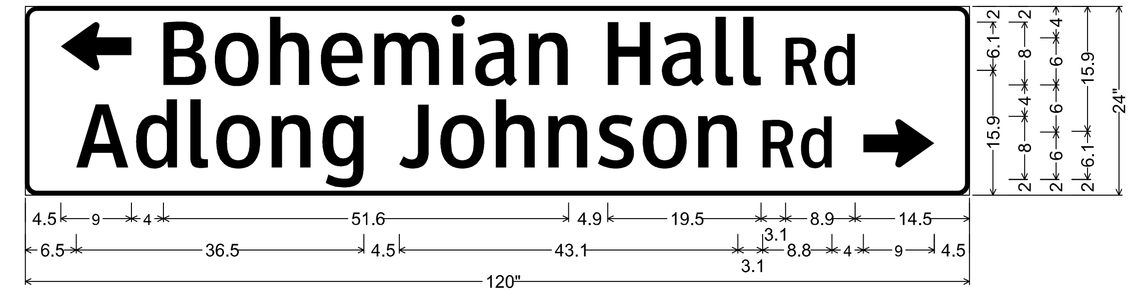
ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE NAME	CALL OUT	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)(6)(7)&(8)-14	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS ***	PANEL BD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CIRCUIT AMPS	BRANCH CKT. BRK. POLE/ AMPS	KVA LOAD
US 90 AT ADLONG JOHNSON RD/ BOHEMIAN HALL RD	ES	TY D (120/240)060 (NS)SS(E)SP(O)	1-1/4"	3/#6	N/A	2P/60	30	100	SIGNAL	40	1P/50	6.3
									LUMINAIRE	6	2P/20	

LEGEND:

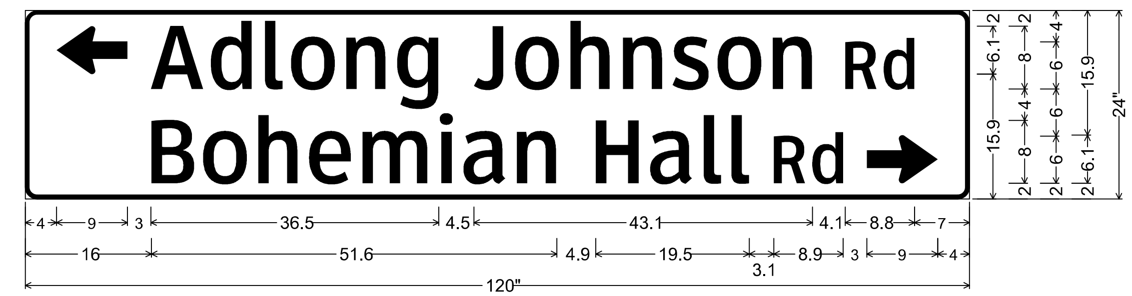
- (A) PROP. 44' MAST ARM POLE W/ LUMINAIRE
- (B) PROP. 44' MAST ARM POLE W/ LUMINAIRE
- (C) PROP. 32' MAST ARM POLE W/ LUMINAIRE
- (D) PROP. 28' MAST ARM POLE W/ LUMINAIRE
- (E) PROP. 44' MAST ARM POLE W/ LUMINAIRE
- (F) PROP. 28' MAST ARM POLE W/ LUMINAIRE

PROPOSED TRAFFIC SIGNAL SIGNS ATTACHED TO MAST ARMS



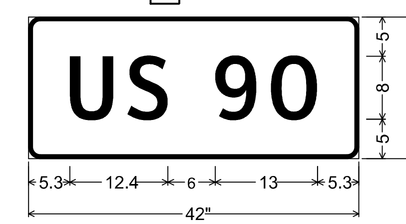
D3-1G-120"x24";
1.5" Radius, 0.5" Border, White on Green;
Standard Arrow Custom 9.0" X 6.1" 180°; "Bohemian Hall Rd", ClearviewHwy-3-W 70% spacing; "", ClearviewHwy-3-W 70% spacing;
"Adlong Johnson Rd", ClearviewHwy-3-W 70% spacing; Standard Arrow Custom 9.0" X 6.1" 0°;

S1



D3-1G-120"x24";
1.5" Radius, 0.5" Border, White on Green;
Standard Arrow Custom 9.0" X 6.1" 180°; "Adlong Johnson Rd", ClearviewHwy-3-W 70% spacing;
"", ClearviewHwy-3-W 70% spacing; "Bohemian Hall Rd", ClearviewHwy-3-W 70% spacing; Standard Arrow Custom 9.0" X 6.1" 0°;

S3



D3-1G-42"X18";
1.5" Radius, 0.5" Border, White on Green;
"US", ClearviewHwy-3-W;
"90", ClearviewHwy-3-W;

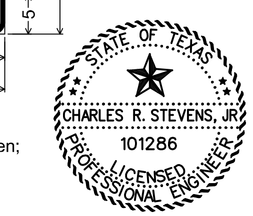
S2

R6-1(R)
(36"x12")

S4

R6-1(L)
(36"x12")

S5



CHARLES R. STEVENS, JR., P.E.

1/19/2024
DATE

PROPOSED SIGNAL HEAD SCHEDULE:

R	Y
FR (8 EA)	FY (4 EA)

PRINT DATE	REVISION DATE
1/19/2024	

STEVENS TECHNICAL
TEXAS REGISTERED ENGINEERING FIRM F-13097
8131 JACKRABBIT RD, Houston, TX 77095
PHONE: (713) 828-4742

Texas Department of Transportation®

US 90 AT ADLONG JOHNSON RD /BOHEMIAN HALL RD

TRAFFIC SIGNAL PROPOSED LAYOUT

SHEET 3 OF 3

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
	SEE TITLE SHEET		141
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	098, ETC.	US 90

S:\Projects\2100103 TxDOT 4687 Prime WA3 - Not Ex\6.0 Design\6.1 CAD Files\SPLIT PLAN SET*013023\ Adlong Johnson Rd - Revised - Flashers\SHEETS\141-TRAFFIC SIGNAL PROPOSED LAYOUT.dgn

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

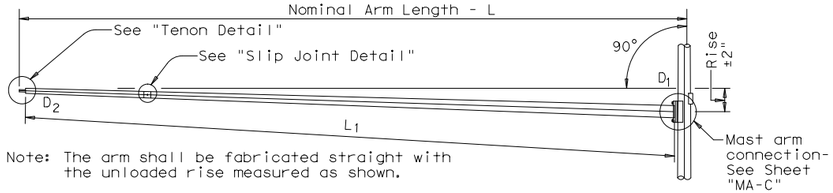
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
24	12.0	9.3	8.6	7.8	.239	13.0	10.0	9.2	8.3	.239	36-A
28	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
32	13.0	10.3	9.6	8.8	.239	14.0	11.0	10.2	9.3	.239	36-A
36	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
40	14.0	11.3	10.6	9.8	.239	16.0	13.0	12.2	11.3	.239	36-B
44	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2	.239	1'-11"	31.0	9.5	3.5	.239	1'-10"
36	35.0	10.0	5.1	.239	2'-0"	35.0	10.0	3.5	.239	1'-11"
40	39.0	10.5	5.1	.239	2'-3"	39.0	11.0	3.5	.239	2'-1"
44	43.0	11.0	5.1	.239	2'-8"	43.0	11.5	4.0	.239	2'-3"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)

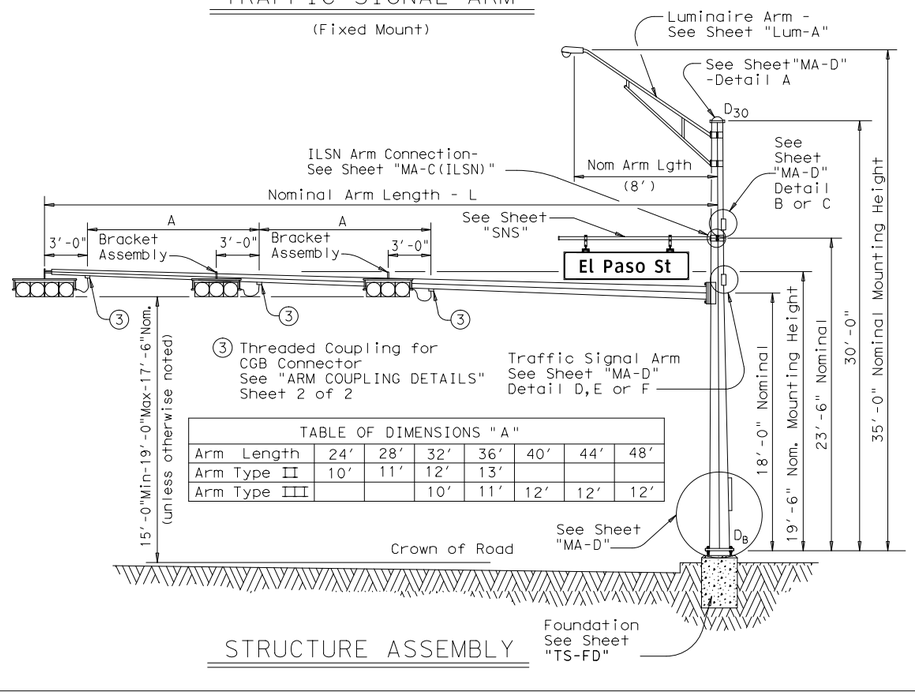


TABLE OF DIMENSIONS "A"

Arm Length	24'	28'	32'	36'	40'	44'	48'
Arm Type II	10'	11'	12'	13'			
Arm Type III			10'	11'	12'	12'	12'

TRAFFIC SIGNAL ARM

STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-100		20S-100		20-100	
24	24L-100		24S-100		24-100	
28	28L-100	2	28S-100		28-100	
32	32L-100	1	32S-100		32-100	
36	36L-100		36S-100		36-100	
40	40L-100		40S-100		40-100	
44	44L-100	3	44S-100		44-100	

Traffic Signal Arms (1 per pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 CGB connector		1 Bracket Assembly and 2 CGB Connectors		2 Bracket Assemblies and 3 CGB Connectors	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100	2		
32			32II-100	1	32III-100	
36			36II-100		36III-100	
40					40III-100	
44					44III-100	3

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	6

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3'-4"	
1 ¾"	3'-10"	3
2"	4'-3"	3

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

US 90 @ ADLONG JOHNSON RD/ BOHEMIAN HALL RD

STATE OF TEXAS
CHARLES R. STEVENS, JR.
101286
PROFESSIONAL LICENSED ENGINEER

CHARLES R. STEVENS, JR., P.E.

1/19/2024
DATE

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(100 MPH WIND ZONE)

SMA-100(1)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
11-99
1-12

CONT	SECT	JOB	HIGHWAY
0028	02	098, ETC.	US 90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		142

123A

DATE:
FILE:

1/19/2024
S:\Projects\2100103 TxDOT 4687 Prime WA3 - Not Ex\6.0 Design\6.1 CAD Files\SPLIT PLAN SET*01302 3\US 90 at Adlong Johnson Rd - Revised - Flashers\SHEETS\143-TS-FD-12.DGN

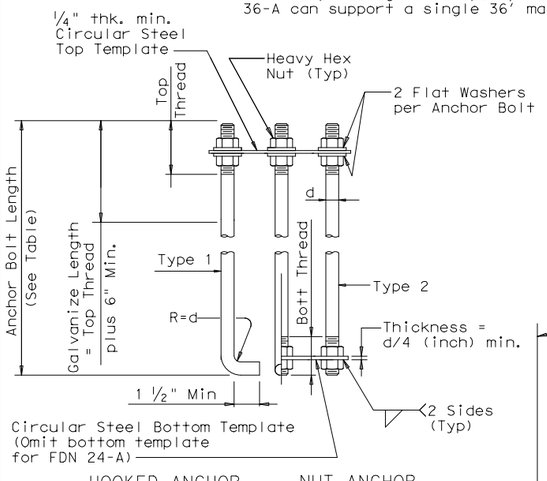
FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft ④, ⑤, ⑥			ANCHOR BOLT DESIGN ①				FOUNDATION DESIGN LOAD ②		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

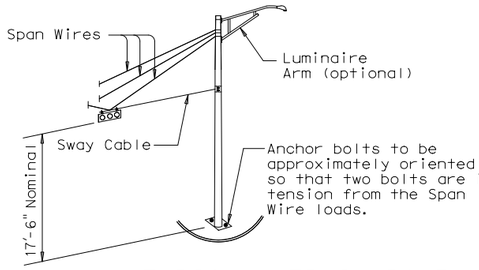
FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'

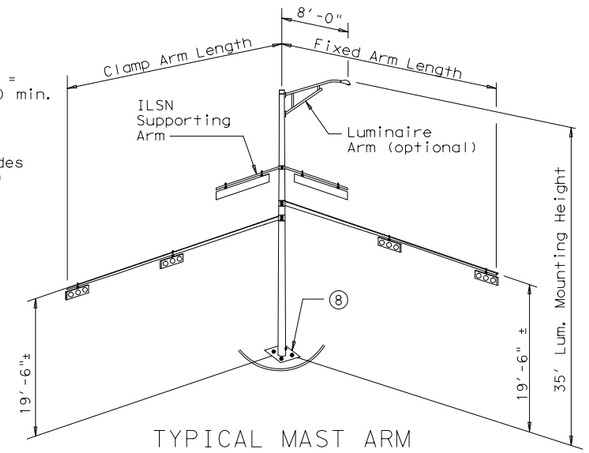
EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



ANCHOR BOLT ASSEMBLY

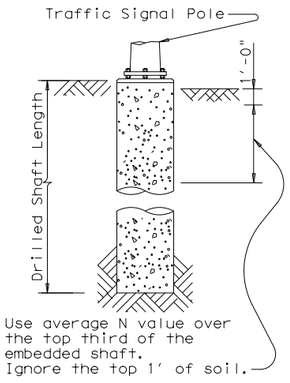


TYPICAL STRAIN POLE ASSEMBLY



⑧Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.

TYPICAL MAST ARM ASSEMBLY



NOTES:

① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

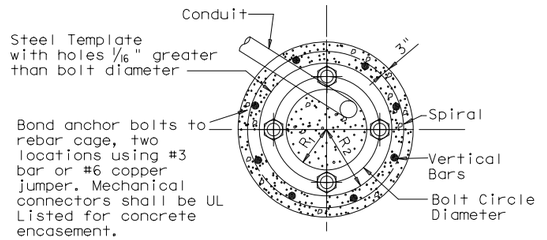
⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

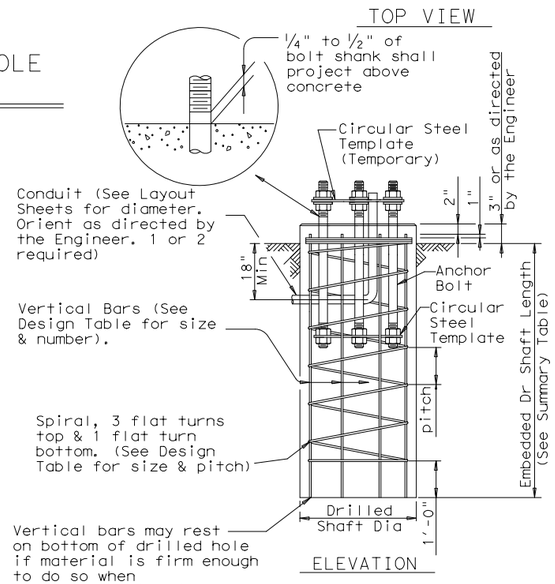
⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

ANCHOR BOLT & TEMPLATE SIZES

BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

⑦ Min dimensions given, longer bolts are acceptable.





FOUNDATION DETAILS

FOUNDATION SUMMARY TABLE ③

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH ⑥ (FEET)				
				24-A	30-A	36-A	36-B	42-A
US 90 @ ADLONG JOHNSON RD/BOHEMIAN HALL RD								
POLE A	10	36-B	1				15.2	
POLE B	10	36-B	1				15.2	
POLE C	10	36-A	1			13.2		
POLE D	10	36-A	1			13.2		
POLE E	10	36-B	1				15.2	
POLE F	10	36-A	1			13.2		
TOTAL DRILLED SHAFT LENGTHS						39.6	45.6	

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

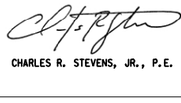
Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

US 90 @ ADLONG JOHNSON RD /BOHEMIAN HALL RD



CHARLES R. STEVENS, JR., P.E.

1/19/2024
DATE

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

DN: MS	CK: JSY	DW: MAO/MMF	CK: JSY/TEB

REVISIONS
5-96
11-98
1-12

CONT	SECT	JOB	HIGHWAY
0028	02	098, ETC.	US 90

DIST	COUNTY	SHEET NO.
HOU	HARRIS	143

11/14/2013

128

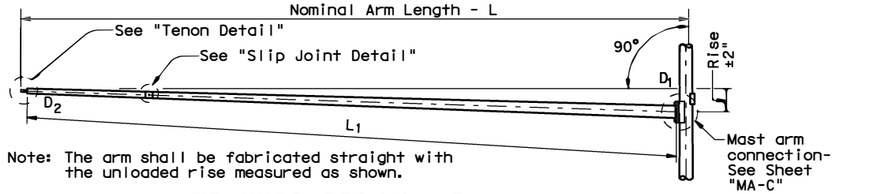
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
24	12.0	9.3	8.6	7.8	.239	13.0	10.0	9.2	8.3	.239	36-A
28	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
32	13.0	10.3	9.6	8.8	.239	14.0	11.0	10.2	9.3	.239	36-A
36	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
40	14.0	11.3	10.6	9.8	.239	16.0	13.0	12.2	11.3	.239	36-B
44	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2	.239	1'-11"	31.0	9.5	3.5	.239	1'-10"
36	35.0	10.0	5.1	.239	2'-0"	35.0	10.0	3.5	.239	1'-11"
40	39.0	10.5	5.1	.239	2'-3"	39.0	11.0	3.5	.239	2'-1"
44	43.0	11.0	5.1	.239	2'-8"	43.0	11.5	4.0	.239	2'-3"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)

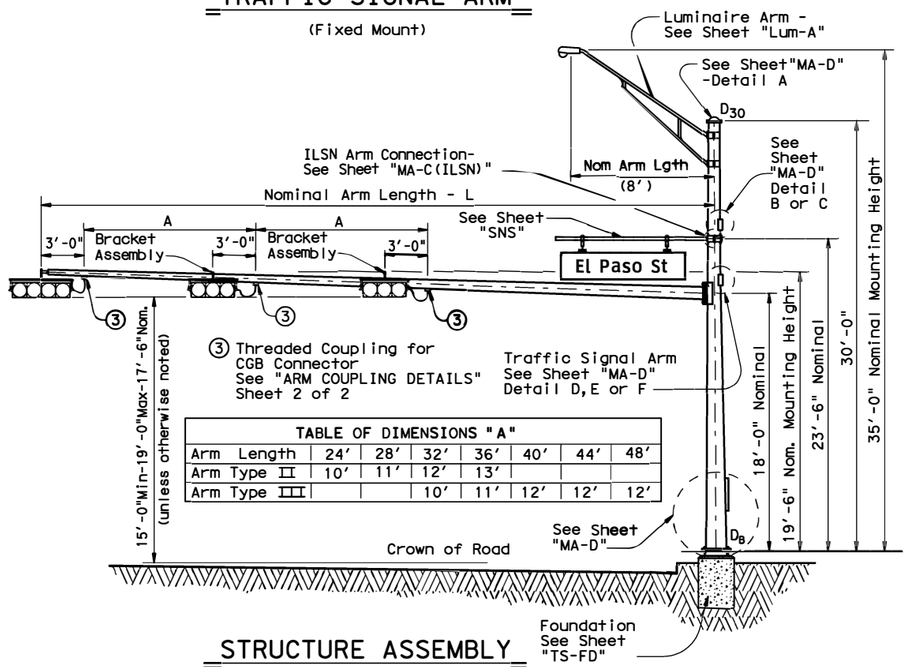


TABLE OF DIMENSIONS "A"

Arm Length	24'	28'	32'	36'	40'	44'	48'
Arm Type II	10'	11'	12'	13'			
Arm Type III			10'	11'	12'	12'	12'

STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-100		20S-100		20-100	
24	24L-100		24S-100		24-100	
28	28L-100		28S-100		28-100	
32	32L-100		32S-100		32-100	
36	36L-100		36S-100		36-100	
40	40L-100		40S-100		40-100	
44	44L-100		44S-100		44-100	

Traffic Signal Arms (1 per pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 CGB connector		1 Bracket Assembly and 2 CGB Connectors		2 Bracket Assemblies and 3 CGB Connectors	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100		36III-100	
40					40III-100	
44					44III-100	

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3'-4"	
1 ¾"	3'-10"	
2"	4'-3"	

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(100 MPH WIND ZONE)

SMA-100(1)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

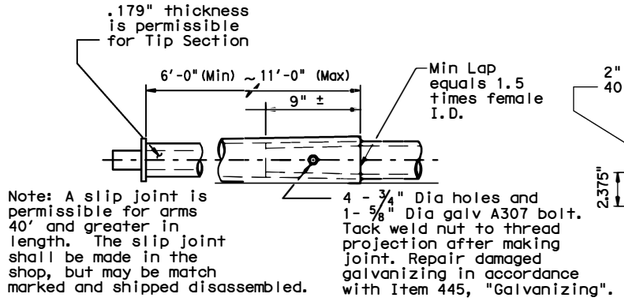
REVISIONS
5-96
11-99
1-12

CONT	SECT	JOB	HIGHWAY
0028	02	098,ETC	US90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		144

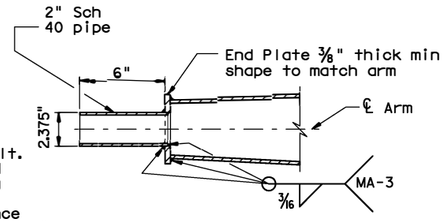
123A

DATE:
FILE:

DATE:
FILE:



SLIP JOINT DETAIL



TENON DETAIL

VIBRATION WARNING

Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

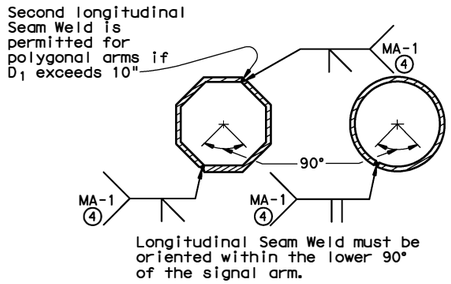
If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backpates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

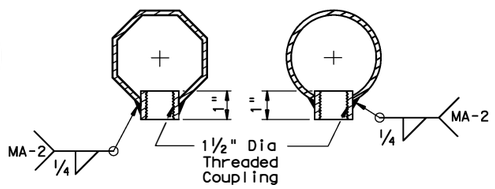
Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL

④60% Min. penetration
100% pemetration within 6" of circumferential base welds.



ARM COUPLING DETAILS

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 100 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(100 MPH WIND ZONE)

SMA-100(2)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
1-12

CONT	SECT	JOB	HIGHWAY
0082	02	098,ETC	US90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		144A

123B

DATE:
FILE:

GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

FILE:	ed1-14.dgn	DN:	CK:	DW:	CK:
©TxDOT	October 2014	CONT	SECT	JOB	HIGHWAY
	REVISIONS	0028	02	098,ETC	US90
		DIST	COUNTY		SHEET NO.
		HOU	HARRIS		145

71A

DATE:
FILE:

ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.
2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.
3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.
4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.
11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.
12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.
4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.
5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

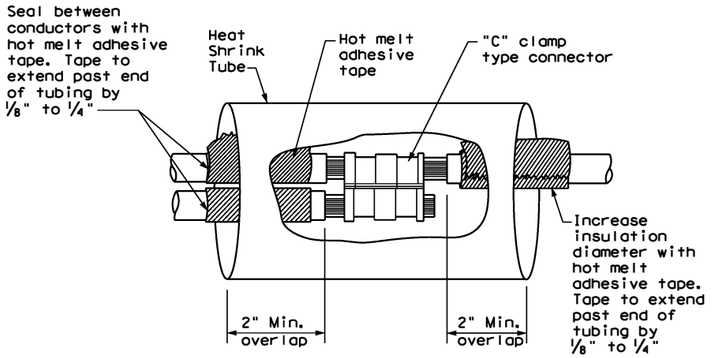
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

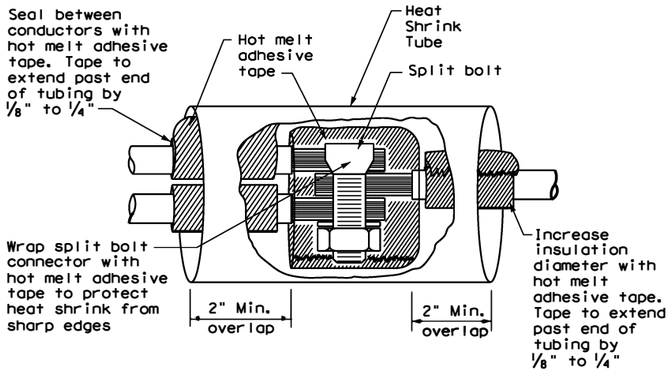
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

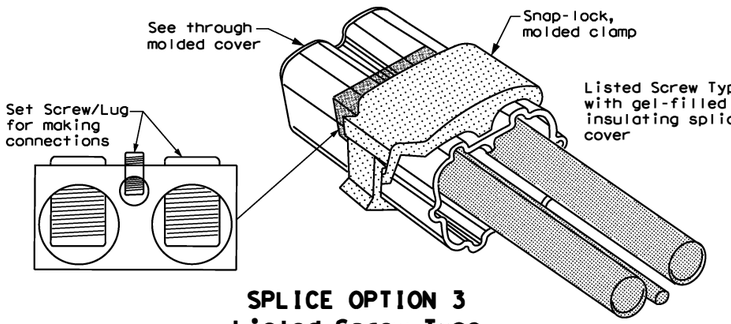
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
2. Do not place ground rods in the same drilled hole as a timber pole.
3. Install ground rods so the imprinted part number is at the upper end of the rod.
4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

FILE: ed3-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	HOU	HARRIS		146

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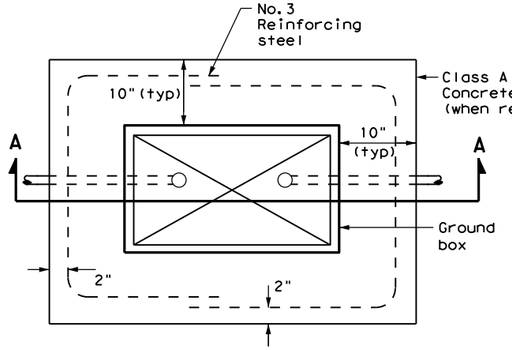
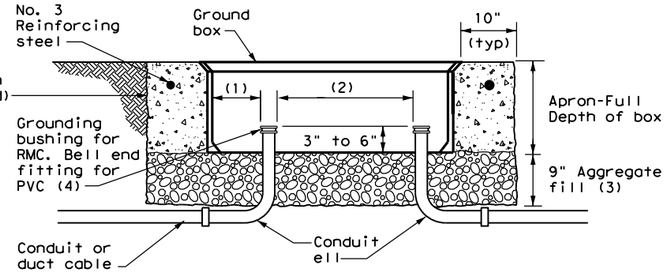
DATE:
FILE:



PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

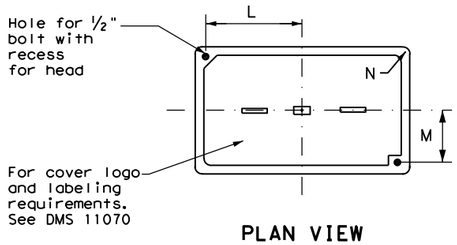
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

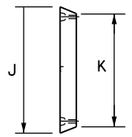
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



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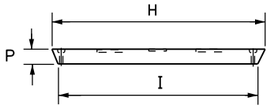

SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."

2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.

2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.

3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.

4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.

5. Temporarily seal all conduits in the ground box until conductors are installed.

6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.

7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.

8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.

10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

ED(4)-14

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	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,ETC	US90
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		147

71D

DATE:
FILE:

ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

*ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

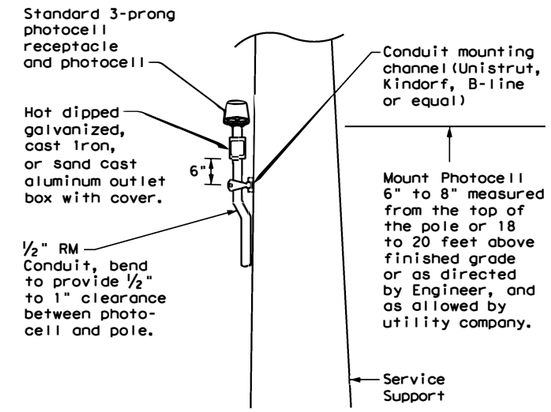
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

- Schematic Type
- Service Voltage V / V
- Disconnect Amp Rating
  000 indicates main lug only/
  Typically Type T
- (SS)= Safety Switch Ahead of Meter-Check with Utility
  (NS)= No safety Switch Ahead of Meter-Check with Utility
- Enclosure Type
  GS= Galvanized steel ("off the shelf")
  SS= Stainless steel (Custom Enclosure) See MPL
  AL= Aluminum (Custom Enclosure) See MPL
- Photocell Mounting Location
  (E)= Inside Service/Enclosure Mounted
  (T)= Top of pole
  (L)= Luminaire mounted
  (N)= None/No Photocell or Lighting Contactor Required
- Service Support Type
  GC= Granite concrete
  OC= Other concrete
  TP= Timber pole
  SP= Steel pole
  SF= Steel frame
  OT= Pole by others or paid for separately
  EX= Existing pole
  TS= Service on traffic signal pole
  PS= Pedestal Service
- O= Overhead Service Feed from Utility
  U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

FILE: ed5-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	HOU	HARRIS		148

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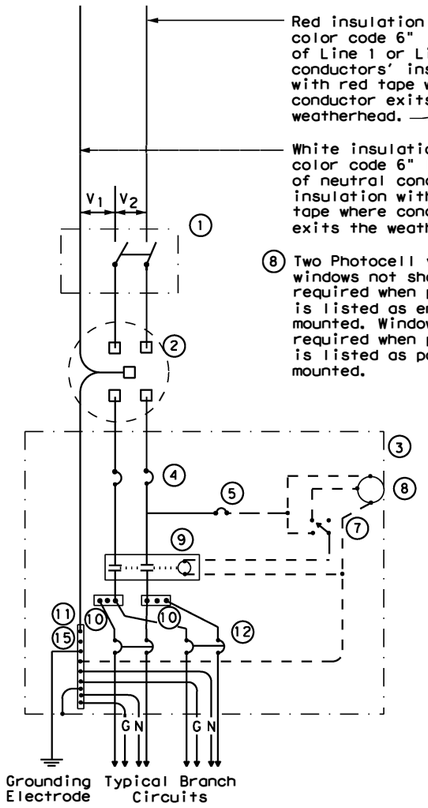
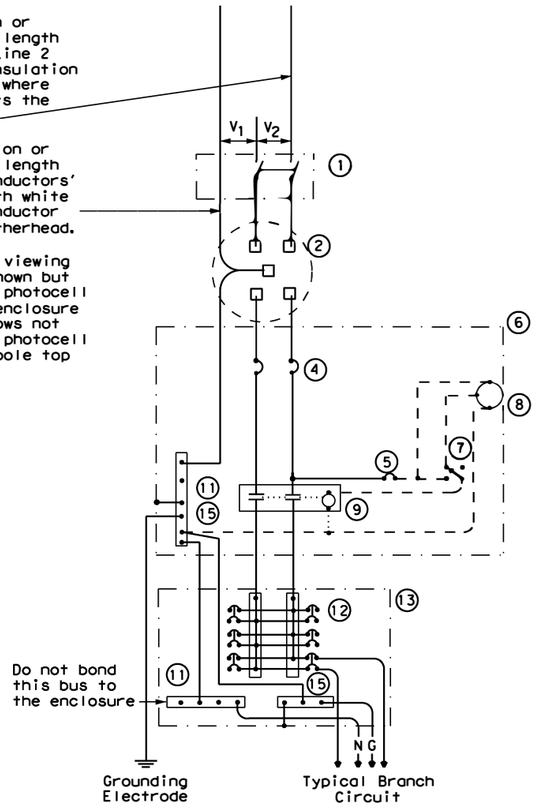
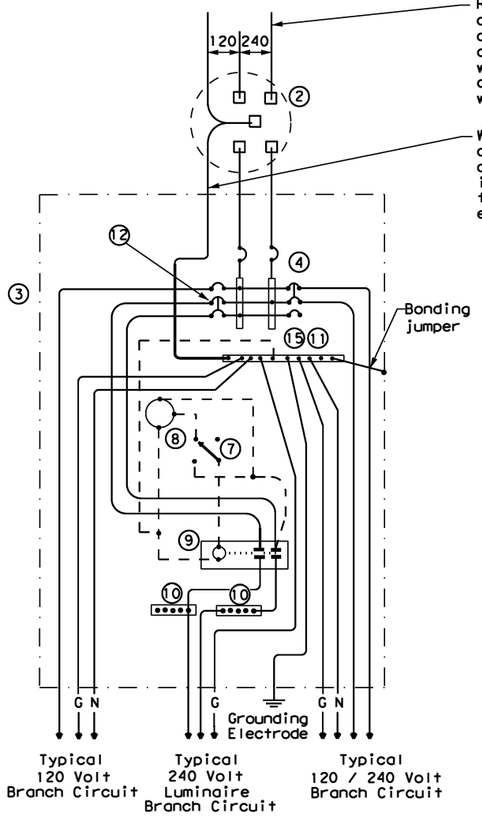


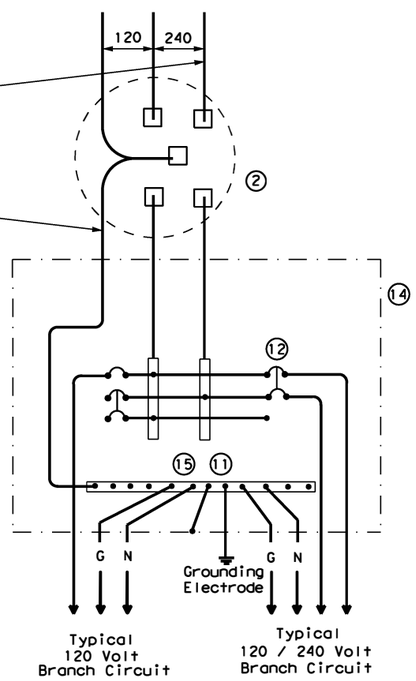
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
———	Power Wiring
- - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

FILE: ed6-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0028	02	098,ETC	US90
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		149

71F

DATE:
FILE:

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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

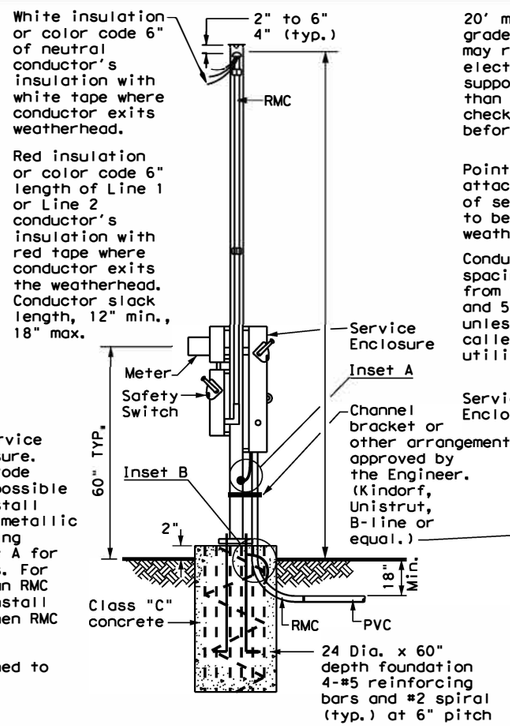
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

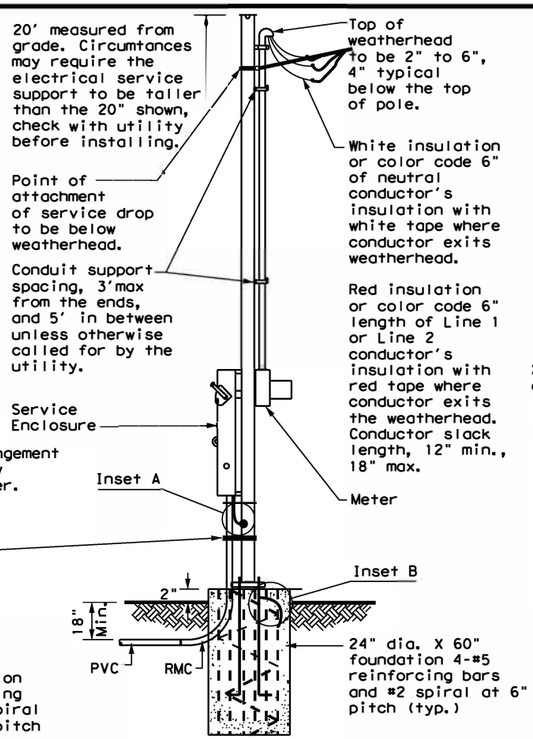
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

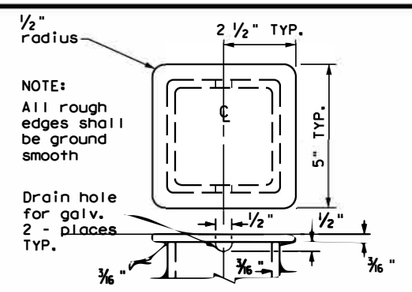


WITH SAFETY SWITCH

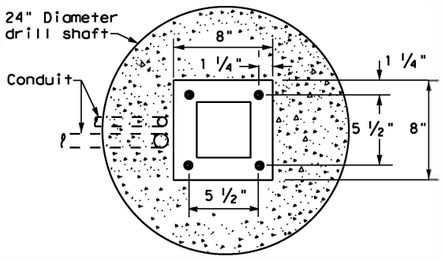


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



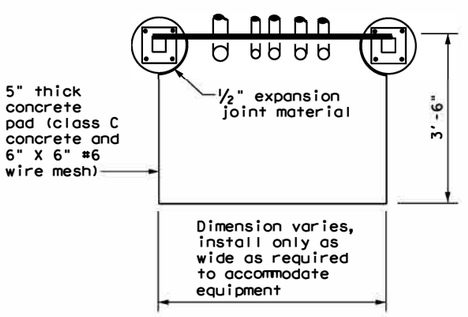
POLE TOP PLATE



BASE PLATE DETAIL

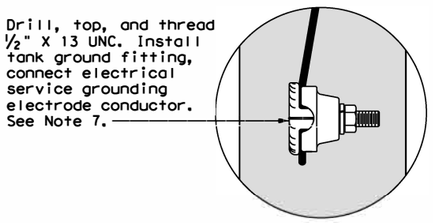
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



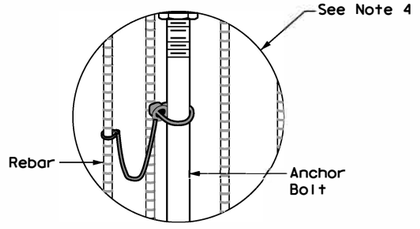
TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

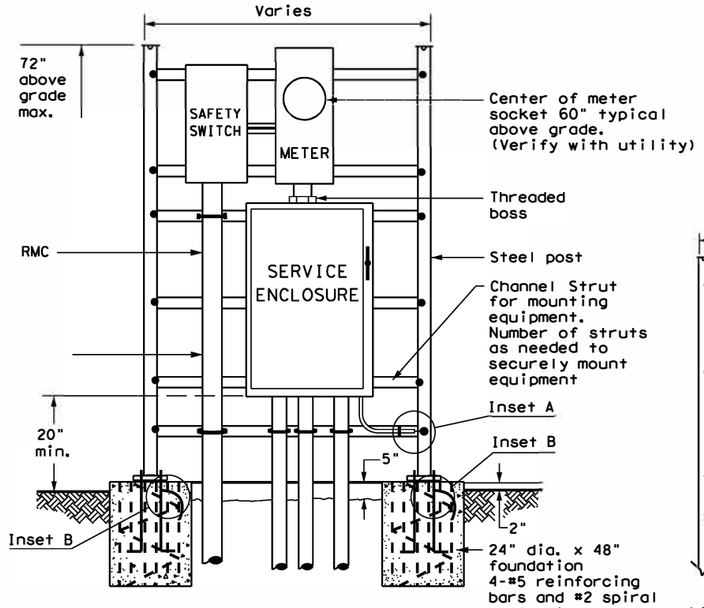


FRONT VIEW

INSET A

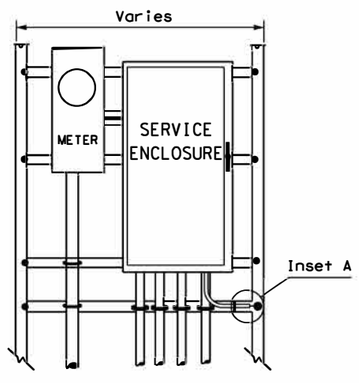


INSET B



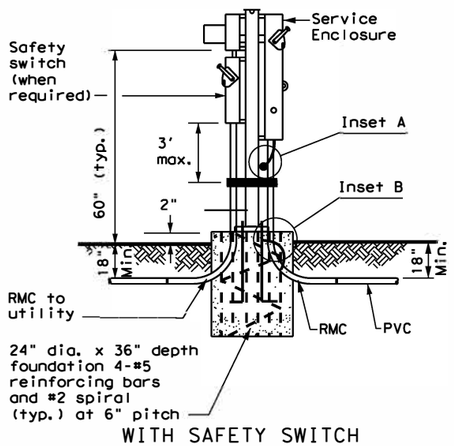
WITH SAFETY SWITCH

FRONT VIEW

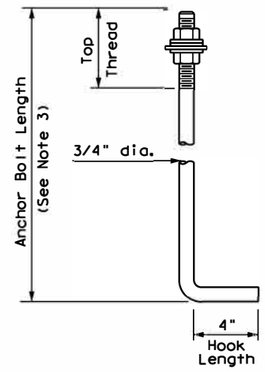


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation

Traffic Operations Division Standard

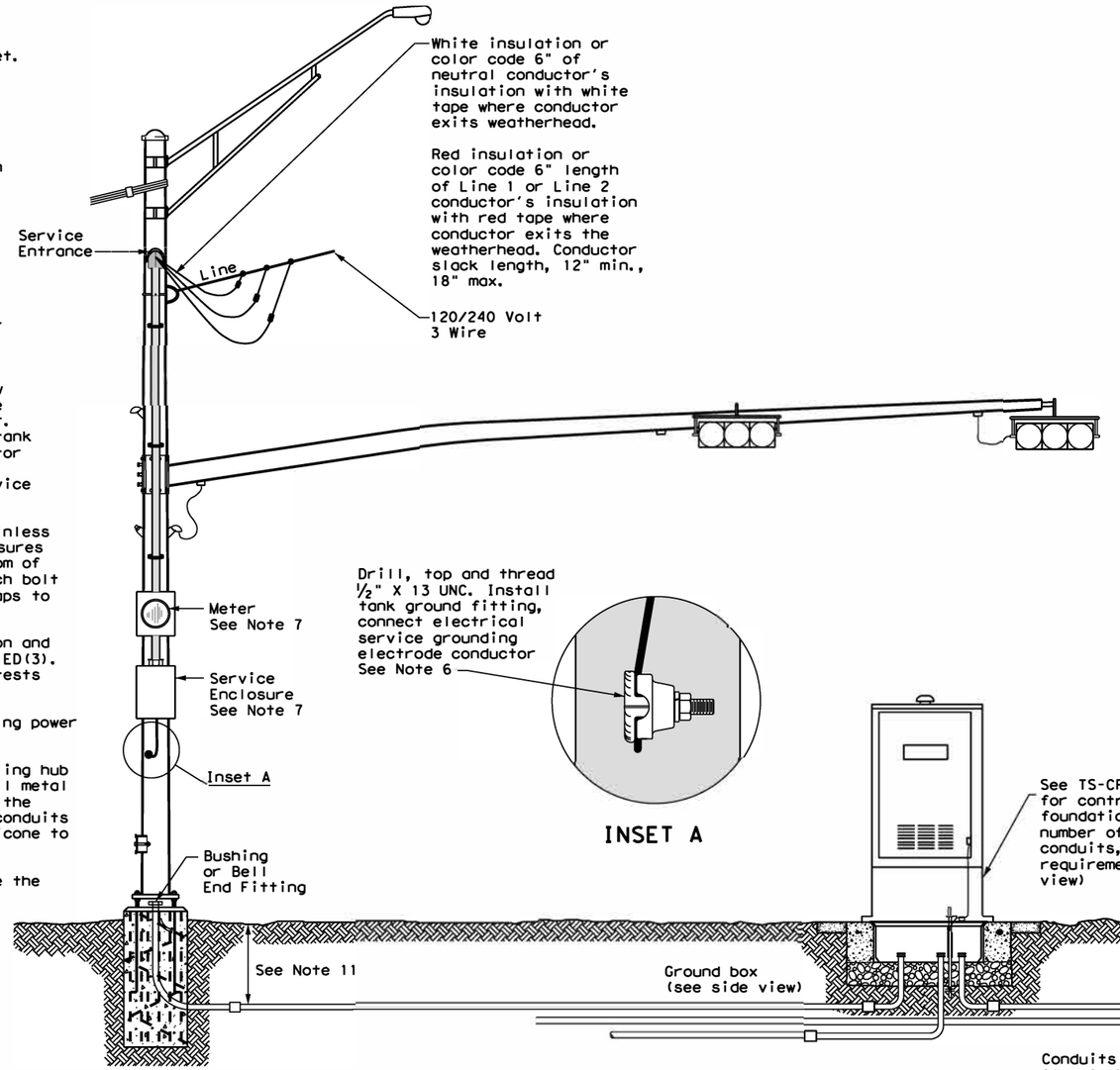
ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,ETC	US90
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		150

TRAFFIC SIGNAL NOTES

1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material and construction sections of Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test installed roadway luminaires for proper operation as a part of the associated traffic signal system test.
4. If internally illuminated street name signs are approved for use, ground the fixture to the pole with a 12 AWG green XHHW conductor.
5. Bond anchor bolts to rebar cage in two locations using #3 bars or 6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TXDOT standard TS-FD for further details.
6. Drill and tap signal poles for ½ in. X 13 UNC tank ground fitting. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Connect the electrical service grounding electrode conductor to the tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole with stainless steel bands. Ensure bands are a minimum width of ¾ in. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole for attaching conduit.
8. Conduct pull tests and insulation resistance tests on all illumination and power conductors as required in Item 620 "Electrical Conductors" and ED(3). To prevent electronics damage, do not conduct insulation resistance tests on traffic signal cables after termination.
9. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
10. Terminate conduits entering the top of enclosures with a conduit-sealing hub or threaded boss such as meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Bond the grounding bushing to the ground bus with a bonding jumper. Seal all conduits entering enclosures with duct seal or expanding foam. Do not use silicone to seal conduit ends.
11. For all conduits, ensure the burial depth is a minimum of 18". Ensure the minimum burial depth for conduit placed under a roadway is 24".

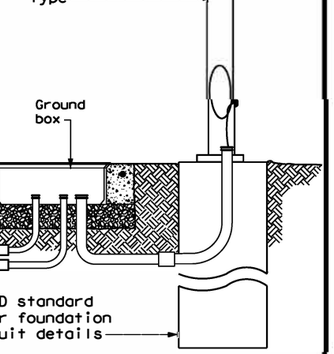


SIGNAL POLE WITH SERVICE

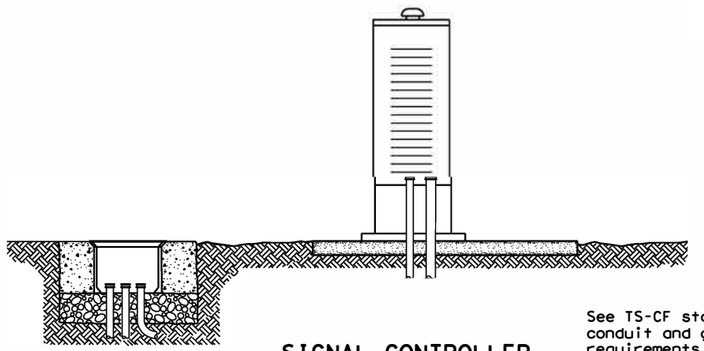
Type T electrical service mounted on signal pole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

INSET A

SIGNAL CONTROLLER FRONT VIEW



SIGNAL POLE



SIGNAL CONTROLLER SIDE VIEW

See TS-CF standard for conduit and grounding requirements. See layout sheets for ground box locations and any additional conduits that are required.

Texas Department of Transportation

Traffic Operations Division Standard

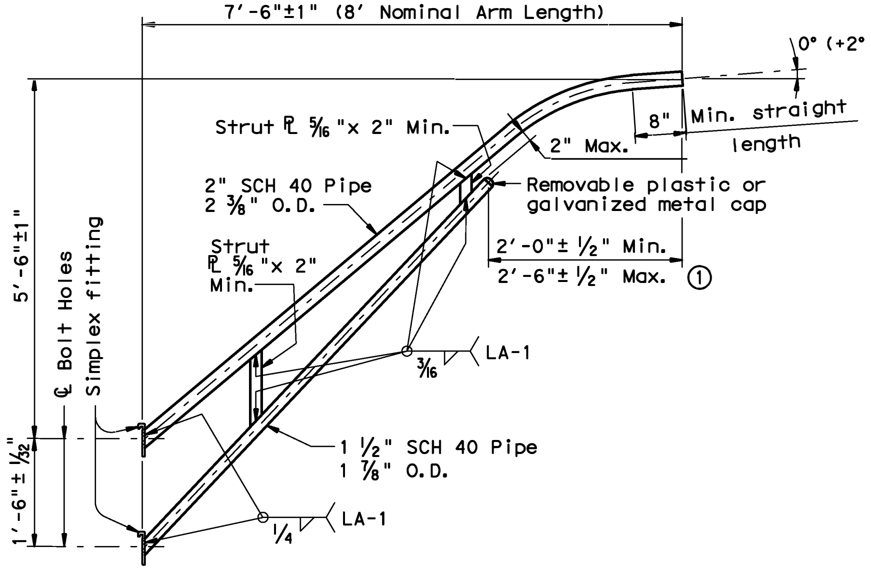
ELECTRICAL DETAILS TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(8)-14

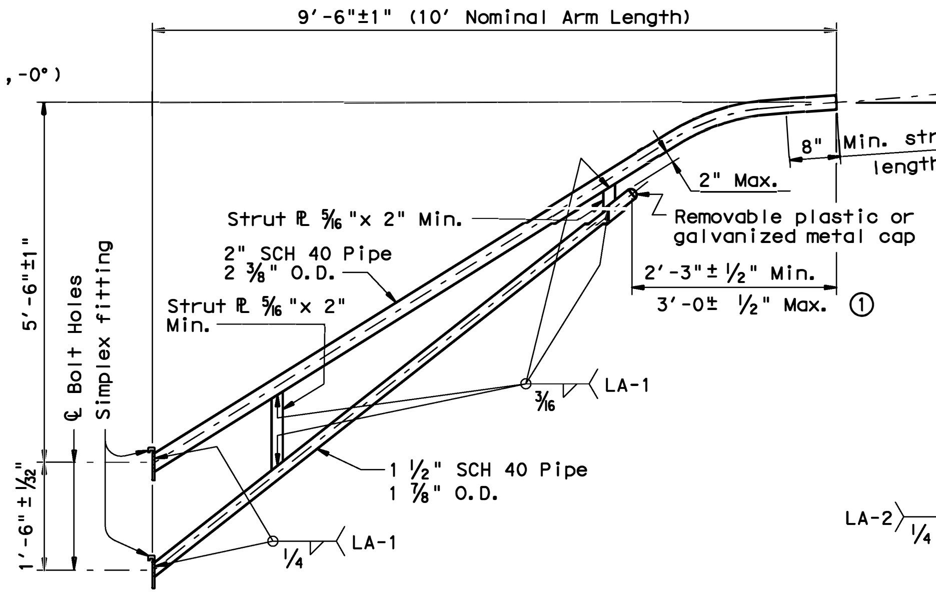
FILE: ed8-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,ETC	US90
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		151

DATE:
FILE:

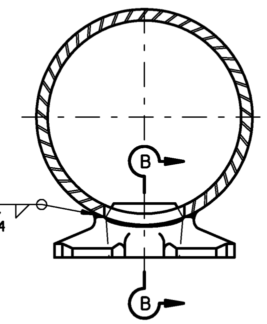
71H



8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM



DIRECT ATTACHMENT DETAIL

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr.65-35 or A148 Gr.80-50, A576 Gr.1021 ③, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50 ④, or A1011 HSLAS-F Gr.50 ④
Arm Strut Plates ②	ASTM A36, A572 Gr.50 ④, or A588
Misc.	ASTM designations as noted

① Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

② Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

③ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

④ ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

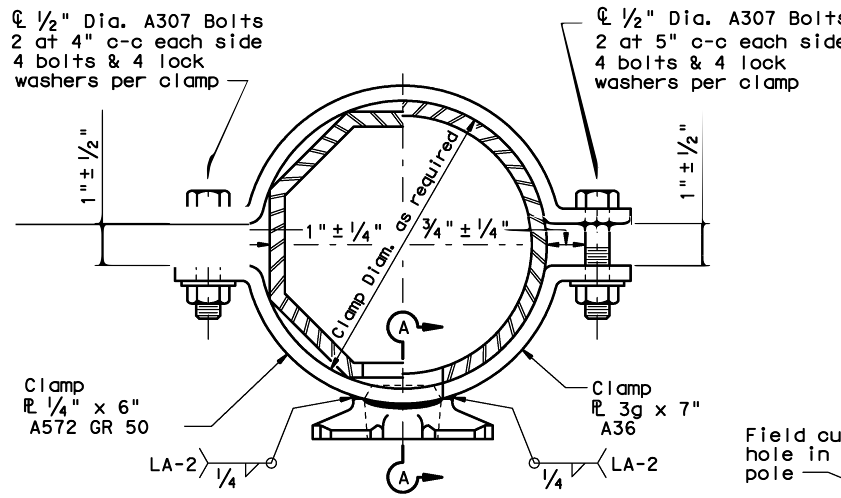
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absense of specified Fabricaton tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

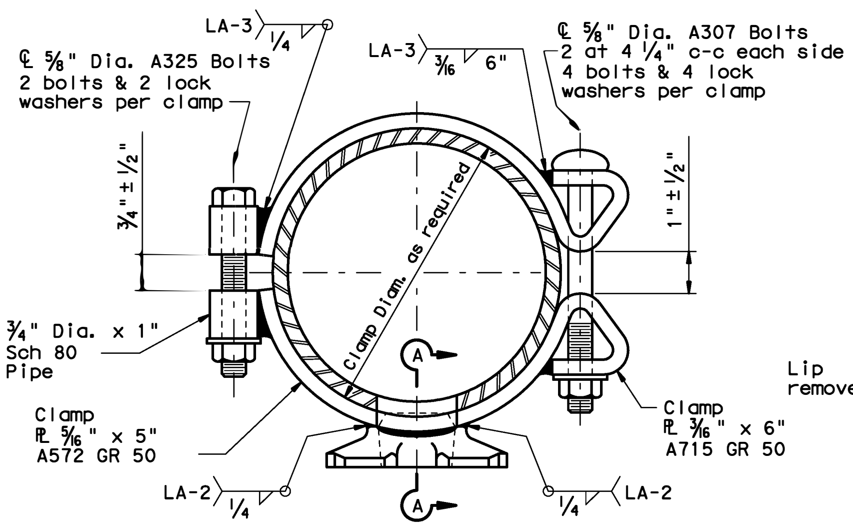
Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.



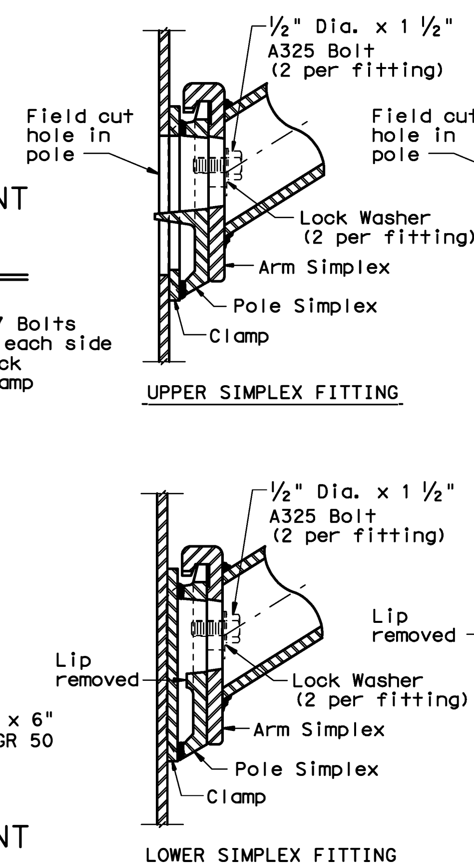
CLAMP ATTACHMENT DETAIL NO.1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO.2 (HALF SECTION)

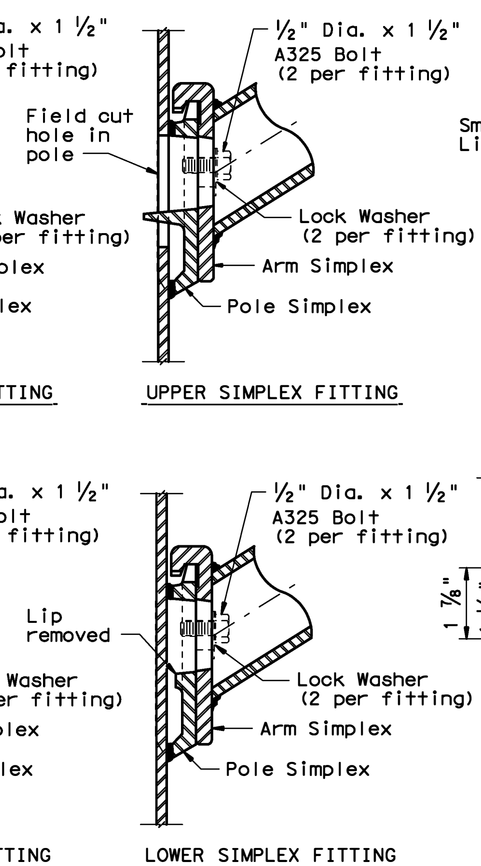


CLAMP ATTACHMENT DETAIL NO.3 (HALF SECTION)

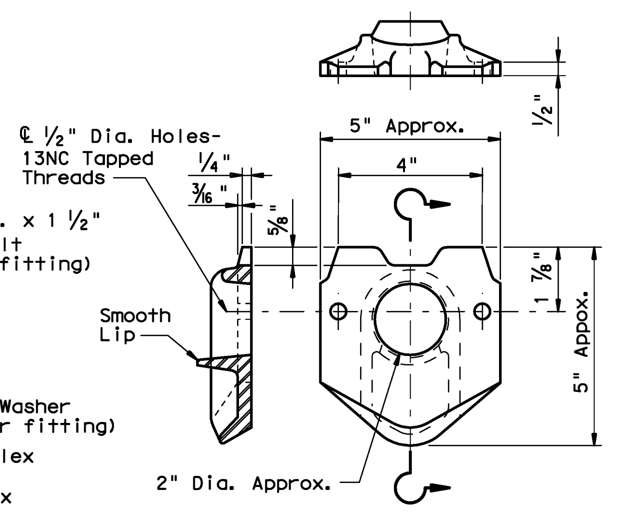
CLAMP ATTACHMENT DETAIL NO.4 (HALF SECTION)



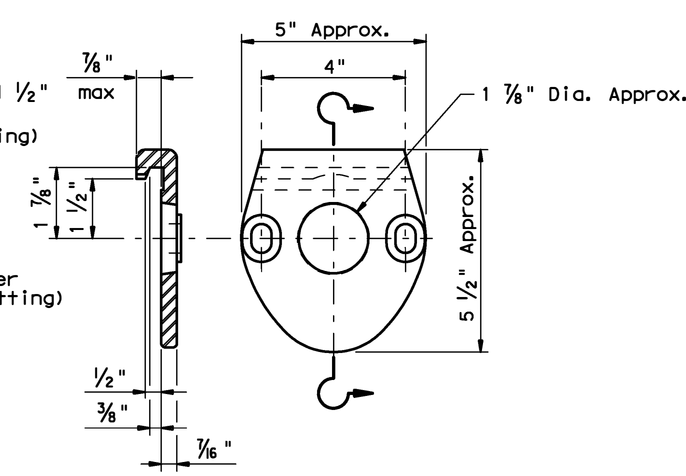
SECTON A-A



SECTON B-B



POLE SIMPLEX DETAIL



ARM SIMPLEX DETAIL

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES

ARM DETAILS

LUM-A-12

©TxDOT August 1995	DN: LEH	CK: JSY	DW: LTT	CK: TEB
REVISIONS 5-96 1-99 1-12	CONT 0028	SECT 02	JOB 098,ETC	HIGHWAY US90
	DIST HOU		COUNTY HARRIS	SHEET NO. 152

DATE:
FILE:

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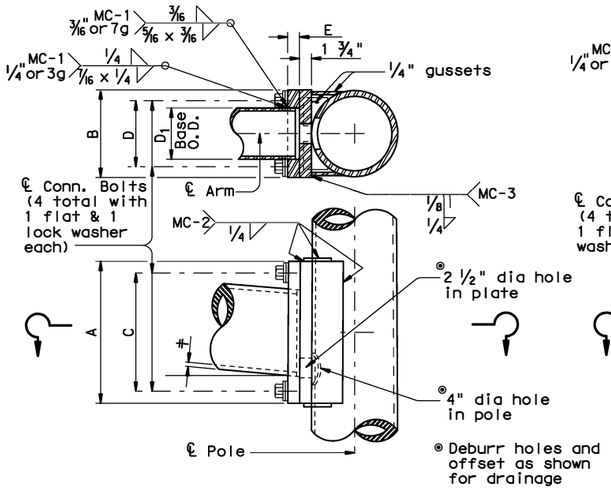
DATE:
FILE:

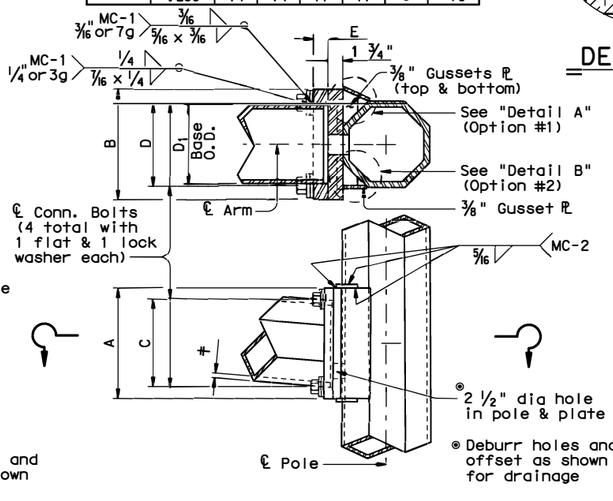
ARM SIZE D_1	ARM SIZE ϕ	A	B	C	D	E	CONN BOLT DIA
in.	in.	in.	in.	in.	in.	in.	in.
6.5	.179	12	9	9	6	1 ¾	1
7.5	.179	13	9	10	6	1 ¾	1
8.0	.179	14	10	11	7	2	1 ¼
9.0	.179	16	11	13	8	2	1 ¼
9.5	.179	17	12	14	9	2	1 ¼
9.5	.239	18	12	15	9	2	1 ¼
10.0	.239	18	12	15	9	2	1 ¼
10.5	.239	18	13	15	10	3	1 ½
11.0	.239	18	13	15	10	3	1 ½



FIXED MOUNT DETAIL 1

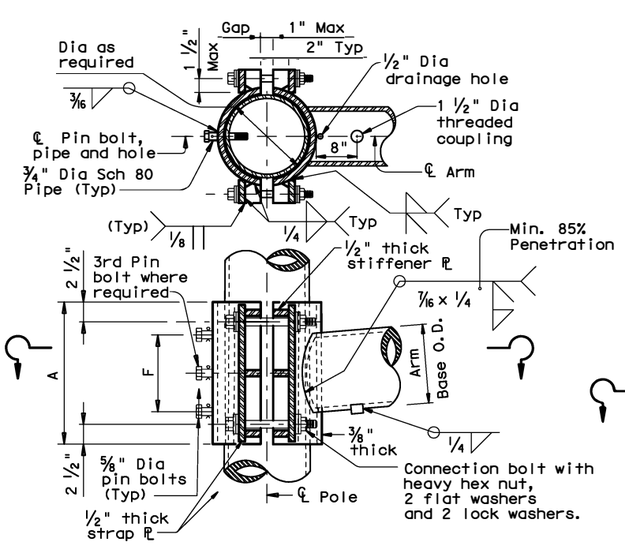
ARM SIZE D_1	ARM SIZE ϕ	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 1/4	3	5/8
9.5	.239	18	12	4	1 1/4	3	5/8
10.0	.239	18	12	4	1 1/4	3	5/8

ARM SIZE D_1	ARM SIZE ϕ	A	B	C	D	E	CONN BOLT DIA
in.	in.	in.	in.	in.	in.	in.	in.
7.0	.179	11	11	8	8	1 ¾	1 ¼
7.5	.179	11	11	8	8	1 ¾	1 ¼
8.0	.179	11	11	8	8	2	1 ¼
9.0	.179	13	13	10	10	2	1 ¼
10.0	.179	13	13	10	10	2	1 ¼
9.5	.239	13	13	10	10	2	1 ¼
10.0	.239	14	14	11	11	2	1 ½
11.0	.239	14	14	11	11	3	1 ½
11.5	.239	14	14	11	11	3	1 ½

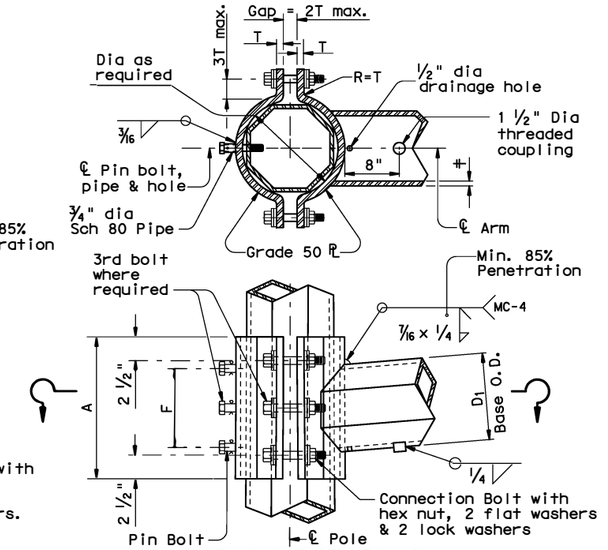


FIXED MOUNT DETAIL 2

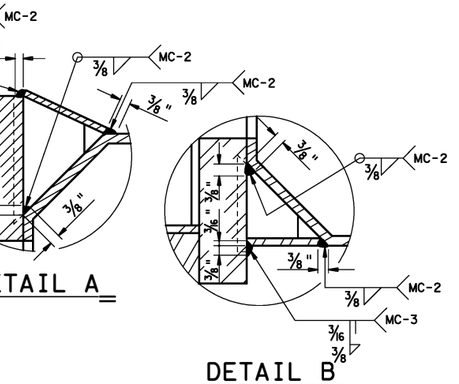
ARM SIZE D_1	ARM SIZE ϕ	A	F	T	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	in.	ea.	in.	ea.	in.
7.0	.179	12	6	¾	4	¾	2	5/8
7.5	.179	14	8	¾	4	¾	2	5/8
8.0	.179	14	8	¾	4	¾	2	5/8
9.0	.179	16	10	⅞	4	1	2	5/8
10.0	.179	18	10	⅞	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8



CLAMP-ON DETAIL 1

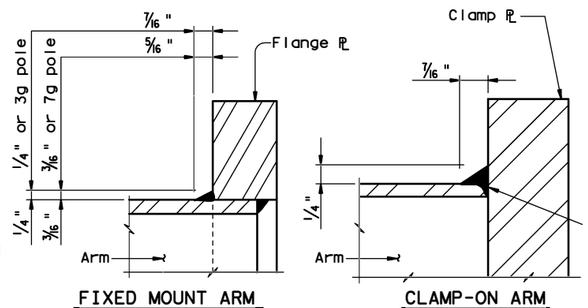


CLAMP-ON DETAIL 2



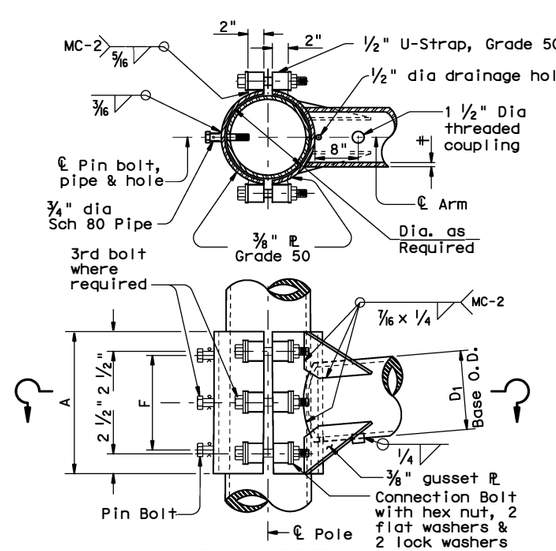
DETAIL A

DETAIL B



ARM BASE WELD DETAILS

ARM SIZE D_1	ARM SIZE ϕ	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8



CLAMP-ON DETAIL 3

MATERIALS	
Round Shafts or Polygonal Shafts ①	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 ②
Plates ①	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 or A449, except where noted
Pin Bolts	ASTM A325
Pipe ①	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

① ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

② ASTM A1011 SS Gr.50 material shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 ½" wide vertical slotted hole shall be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and ¾" dia pipe shall have 3/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a ¾" dia hole for each pin bolt. An 11/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

MAST ARM CONNECTIONS

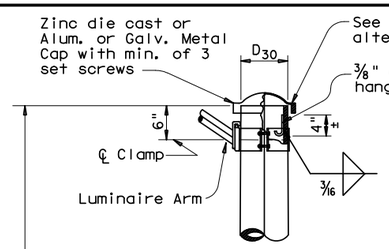
MA-C-12

DN: MS	CK: JSY	DW: MMF	CK: JSY
CONT	SECT	JOB	HIGHWAY
0028	02	098,ETC	US90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		153

REVISIONS
5-96
5-09
1-12

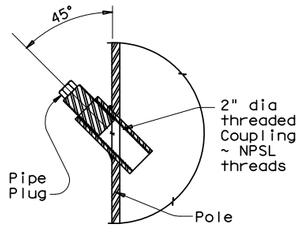
126A

DATE:
FILE:

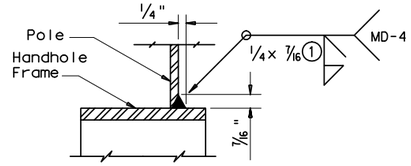


DETAIL A

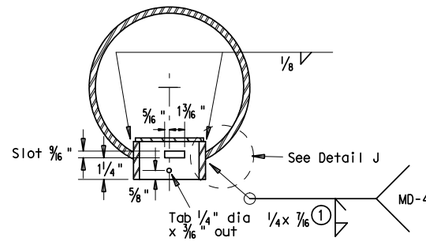
(for pole with luminaire)



POLE COUPLING DETAIL

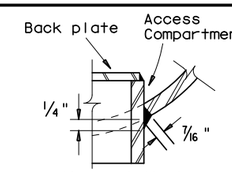


DETAIL G

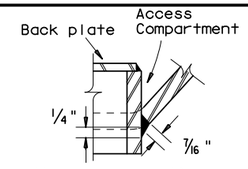


SECTION X-X

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.

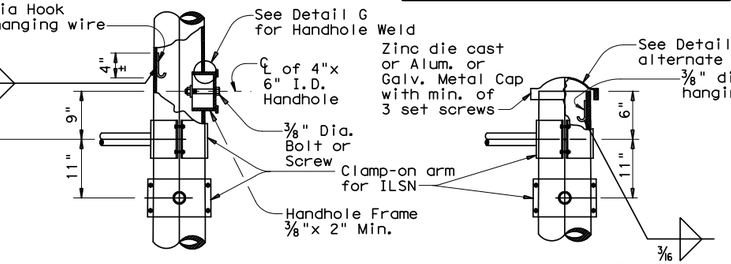


Round Pole



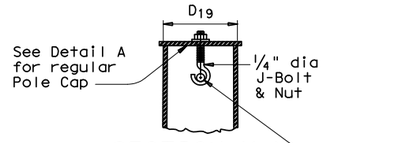
Polygonal Pole

DETAIL J

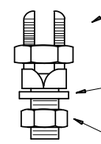


DETAIL B

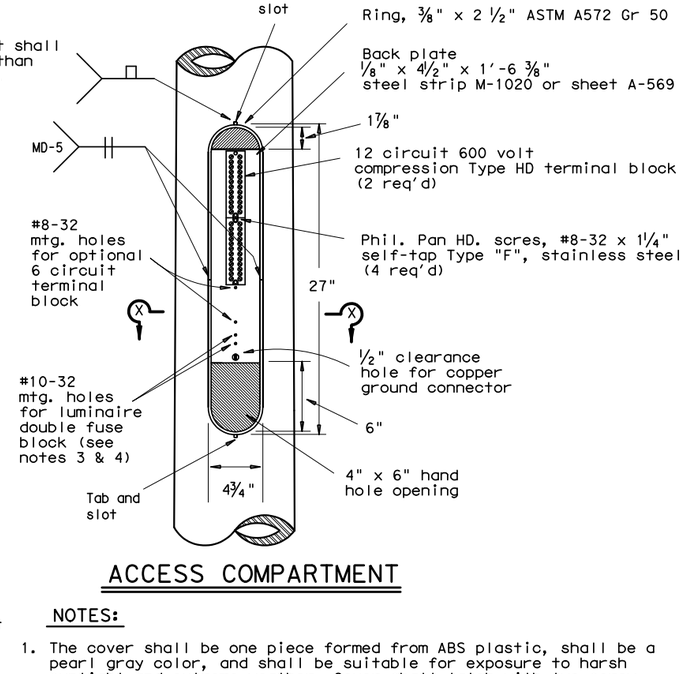
DETAIL C



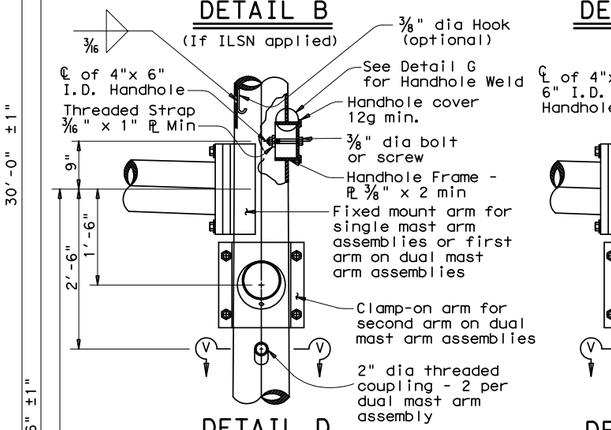
SECTION Y-Y



COPPER GROUND CONNECTOR

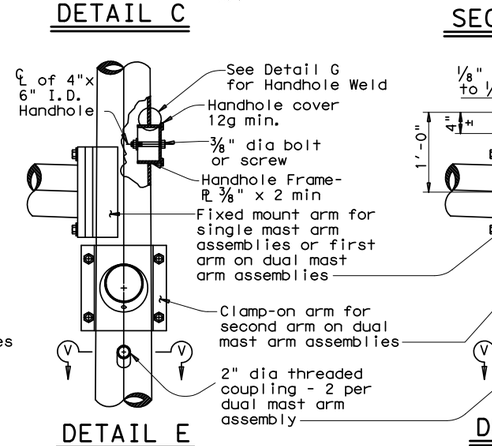


ACCESS COMPARTMENT



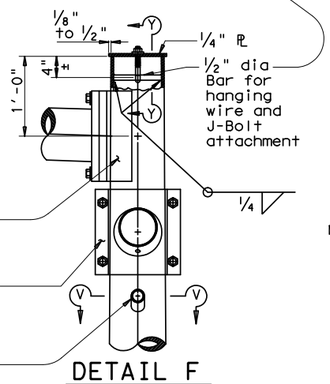
DETAIL D

(for 30' pole with luminaire and ILSN sign)



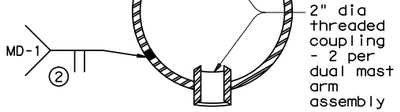
DETAIL E

(for 24' pole with ILSN sign and no luminaire)

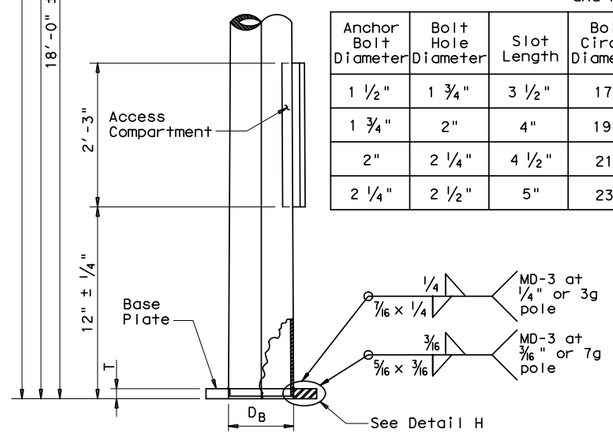


DETAIL F

(for 19' pole with no ILSN sign and no luminaire)

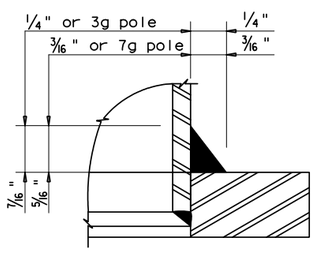


SECTION V-V

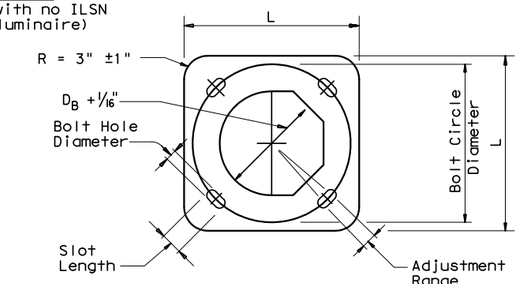


POLE ELEVATION

Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base ℞ Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



DETAIL H



BASE PLATE PLAN

(1) 85% Min. penetration

(2) 60% Min. penetration 100% pemetration within 6" of circumferential base welds.

NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS

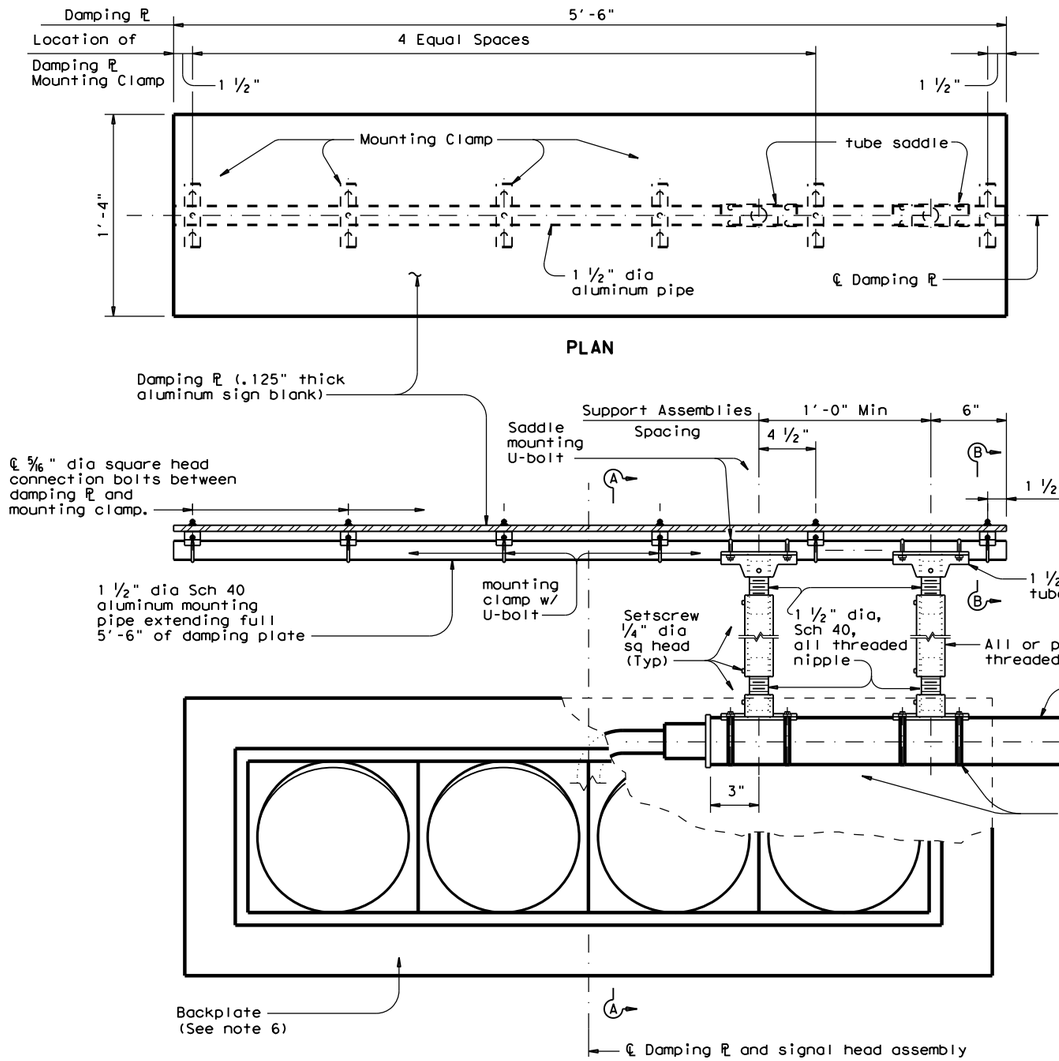
MA-D-12

DN: MS	CK: JSY	DW: FDN	CK: CAL

REVISIONS
8-99
1-12

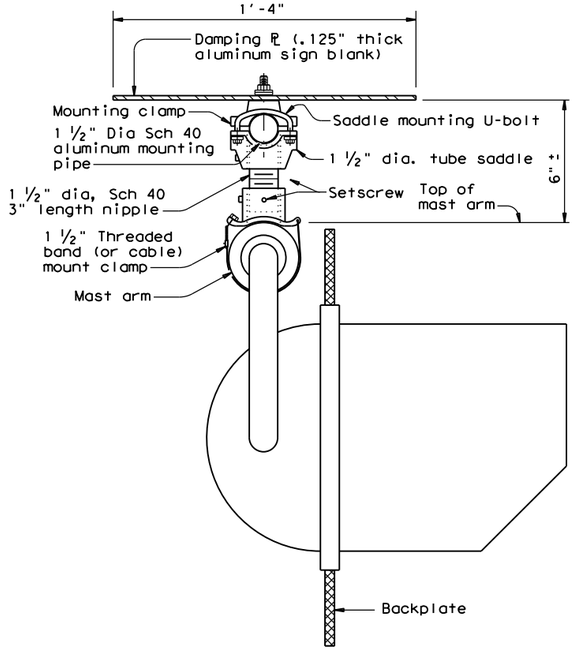
CONT	SECT	JOB	HIGHWAY
0028	02	098,ETC	US90
DIST	COUNTY		SHEET NO.
HOU	HARRIS		154

DATE:
FILE:



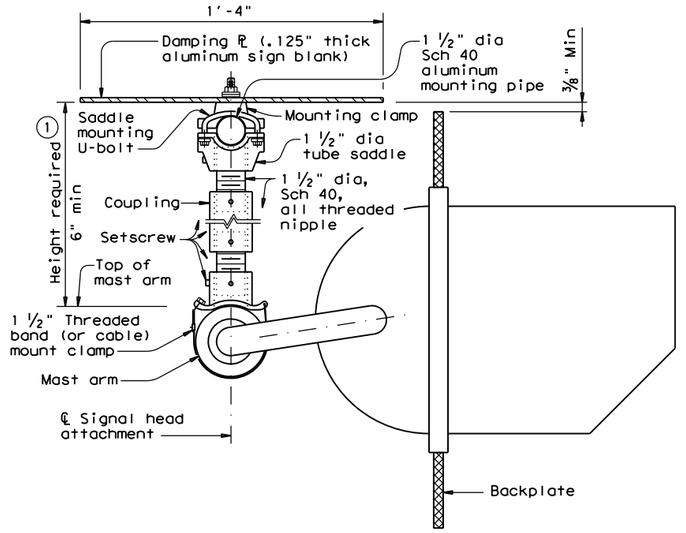
DAMPING PLATE MOUNTING DETAILS

(Showing alternate placement of signal head)



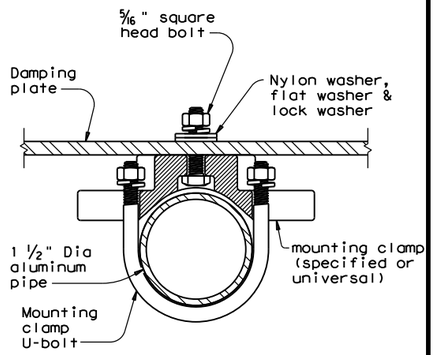
SECTION A-A

(Showing standard placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)



SECTION A-A

(Showing alternate placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)



SECTION B-B

(Showing damping plate attachment)

① Recommended supporting assemblies to achieve required height for horizontal section heads			
Height required	One nipple each length	Two nipples each length plus	One coupling each length
6"-6 ¾"	3"	-	-
7"-8 ½"	4"	-	-
9"-10 ½"	6"	-	-
11"-15 ½"	-	4"	5"
16"-24"	-	6"	10"

GENERAL NOTES:

1. In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.
2. Aluminum sign blank for damping plate will conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle will be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling will be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and u-bolt assemblies will conform to Standard sheet SMD(GEN). U-bolts for saddle mounting will have a minimum yield strength of 36 ksi.
3. Damping plate will be mounted horizontally. Position centerline of damping plate to align with centerline of mast arm or horizontal signal head assembly. Vertical clearance between signal head (with or without backing plate)and bottom of damping plate will be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.
4. Unless stipulated by the manufacturers, all steel parts will be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".
5. Contractor will verify applicable field dimensions before the installation.
6. Backplates are optional for traffic signals. When backplates are used, Backplates will have a 2-inch fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 "Sign Face Materials." See Sheet TS-BP-20 for backplate details.

Texas Department of Transportation

Traffic Safety Division Standard

MAST ARM DAMPING PLATE DETAILS

MA-DPD-20

FILE: ma-dpd-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2012	CONT	SECT	JOB	HIGHWAY
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6-20	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		155

DATE:
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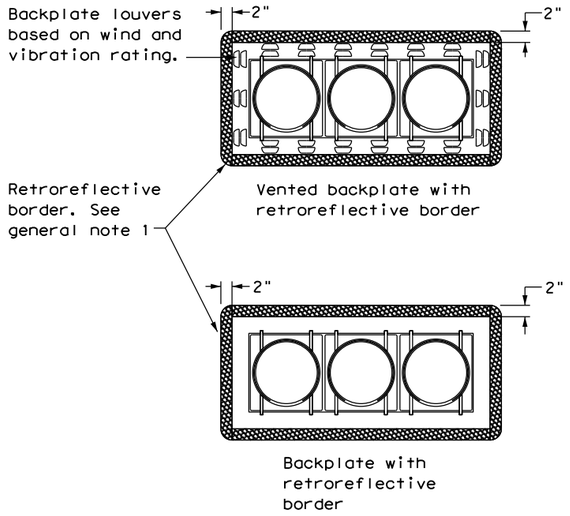
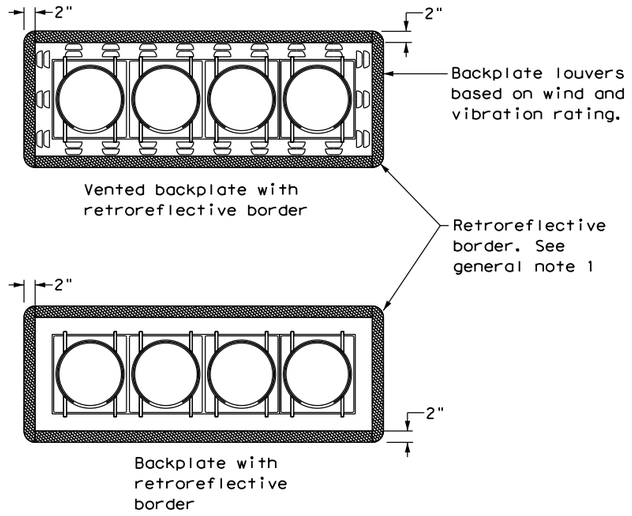
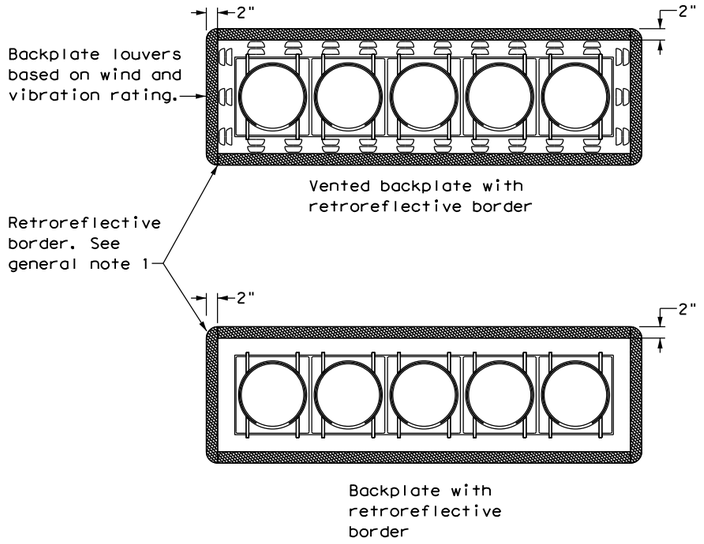


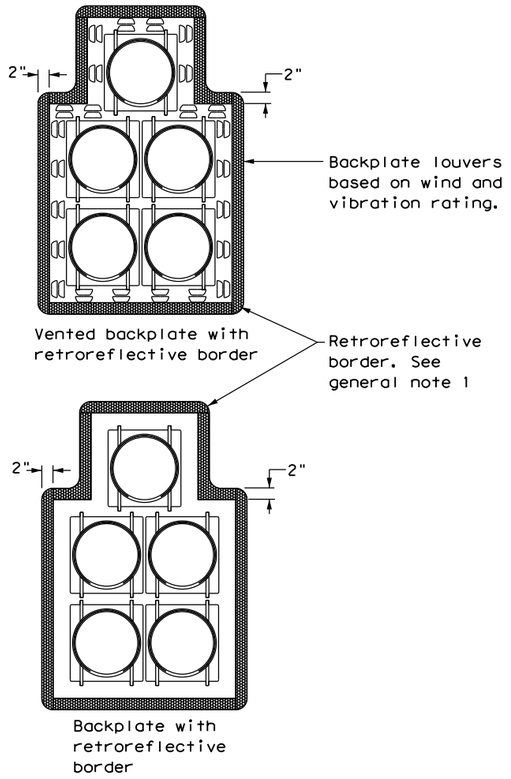
THREE-SECTION HEAD
HORIZONTAL OR VERTICAL



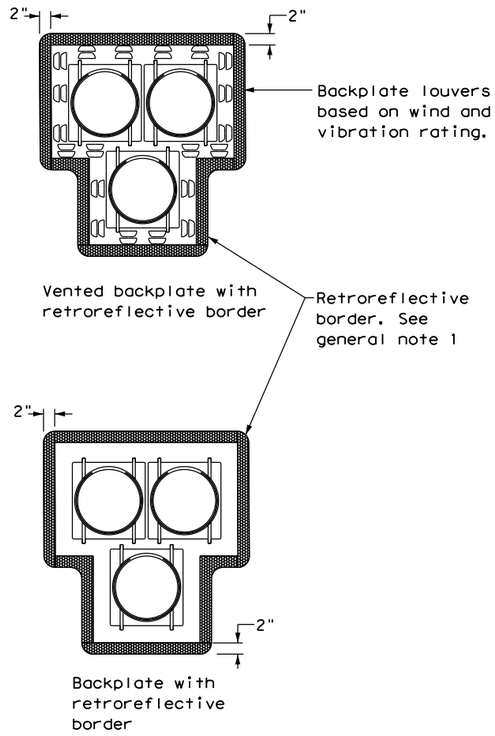
FOUR-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
CLUSTER



PEDESTRIAN HYBRID
BEACON

GENERAL NOTES:

1. Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 is required. Place on all approaches when used.
2. Signal head and backplate compatability must be verified by the contractor prior to installation.
3. When using backplates on signal heads, venting is preferred to reduce cyclic vibration stress.
4. When a vented backplate is used, the retroreflective border must not be placed over the louvers.
5. This standard sheet applies to all signal heads with backplates, including but not limited to:
   - Pole mounted
   - Overhead mounted
   - Span wire mounted
   - Mast arm mounted
   - Vertical signal heads
   - Horizontal signal heads
   - Clustered signal heads
   - Pedestrian hybrid beacons

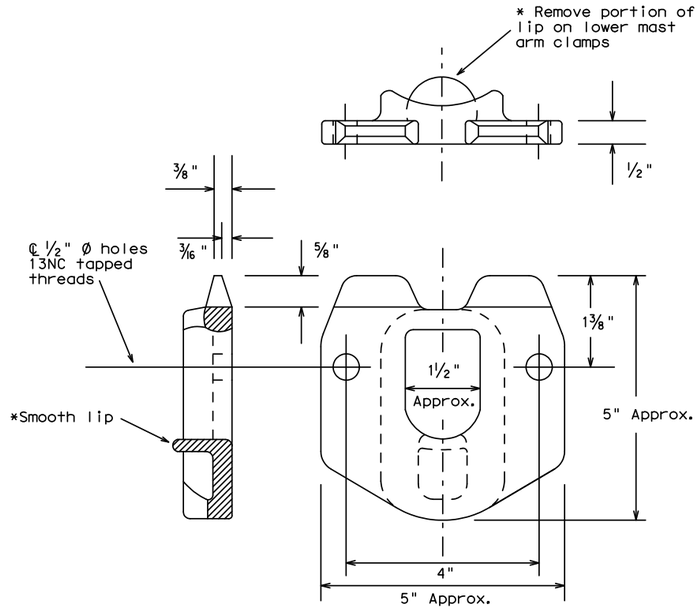
Texas Department of Transportation

Traffic Safety Division Standard

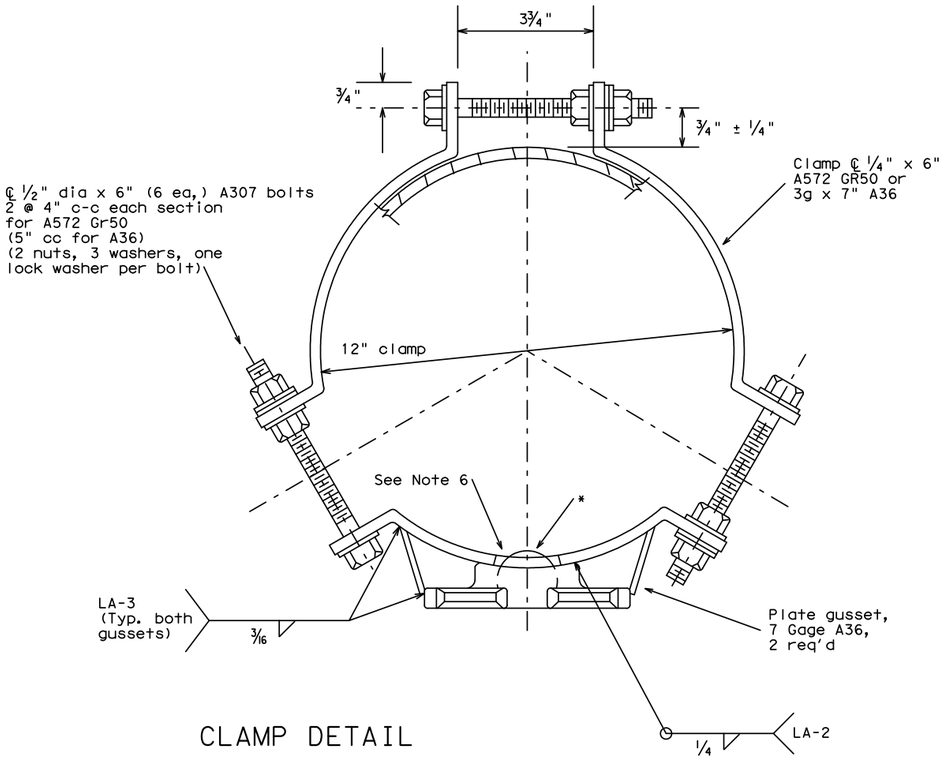
TRAFFIC SIGNAL HEAD WITH BACKPLATE

TS-BP-20

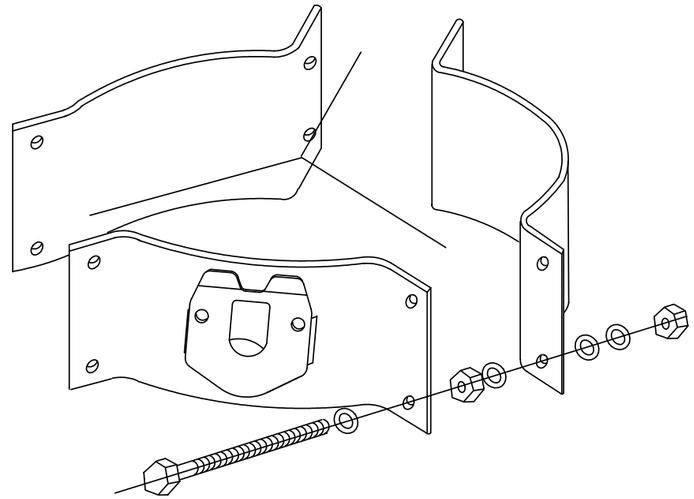
FILE: ts-bp-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098,ETC	US90
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		156



POLE SIMPLEX DETAILS



CLAMP DETAIL



PROJECTION

OTHER MATERIALS:

1. Pole simplex shall be ASTM A27 GR65-35 or A148 GR80-50 or A576 GR1021. ASTM A576 must be suitable for forging and also meet minimum tensile of 65ksi, minimum yield of 35ksi, and a minimum elongation of 22 percent in 2 inches.
2. Welded tabs and backplates shall be ASTM A-36 steel or better.
3. Nylon insert locknuts shall conform to ASTM A563.

GENERAL NOTES:

1. Materials and fabrication shall be in accordance with Standard Sheet "MA-C" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
2. All parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing". The throat of the Simplex shall be made free of all rough or sharp edges resulting from the galvanizing process.
3. Each simplex fitting shall be supplied with 2 ASTM A325 bolts, ½in. X 1½in. and 2 lock washers. The bolts and lock washers shall be secured to the clamp with the other hardware items. The Fabricator shall ship clamp assembly together in a single package, including all bolts, nuts, and washers required for the clamp and simplex fitting.
4. Design conforms to 1994 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" and interim revisions thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. Clamps are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq.ft.,12 ft. maximum arm length.
5. Each assembly shall consist of one upper piece simplex fitting having a smooth lip and one lower piece simplex fitting with the lip removed.
6. Approximately 2 in. diameter hole in upper mast arm clamp.

For 8.9 - 12 inch diameter Signal Poles
(Two req'd for each mast arm)

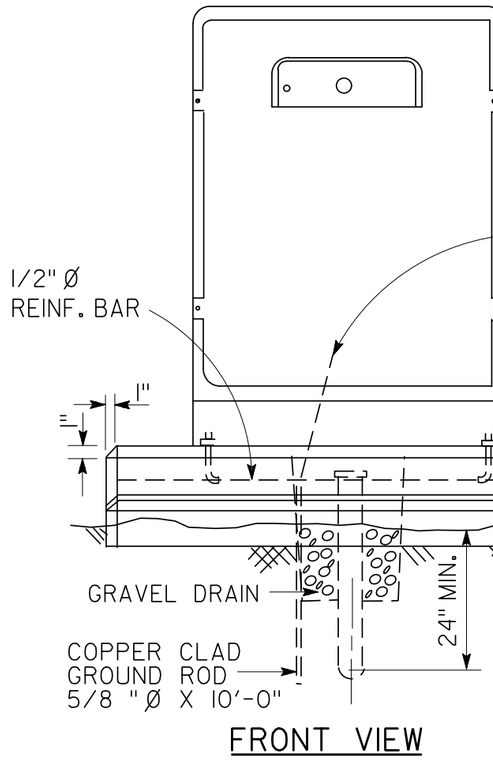
Texas Department of Transportation
Traffic Operations Division

CLAMP ON FITTING ASSEMBLY FOR LUMINAIRE MAST ARM

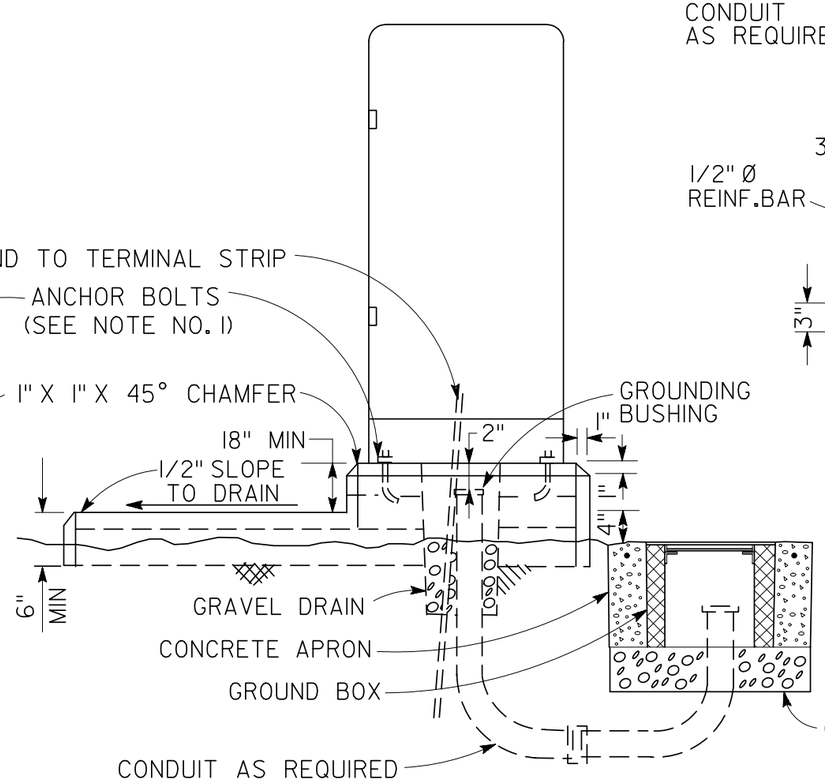
CFA-12

©TxDOT	DN: KAB	CK: RES	DW: FDN	CK: CAL
REVISIONS	CONT	SECT	JOB	HIGHWAY
11-99	0028	02	098,ETC	US90
1-12	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		157

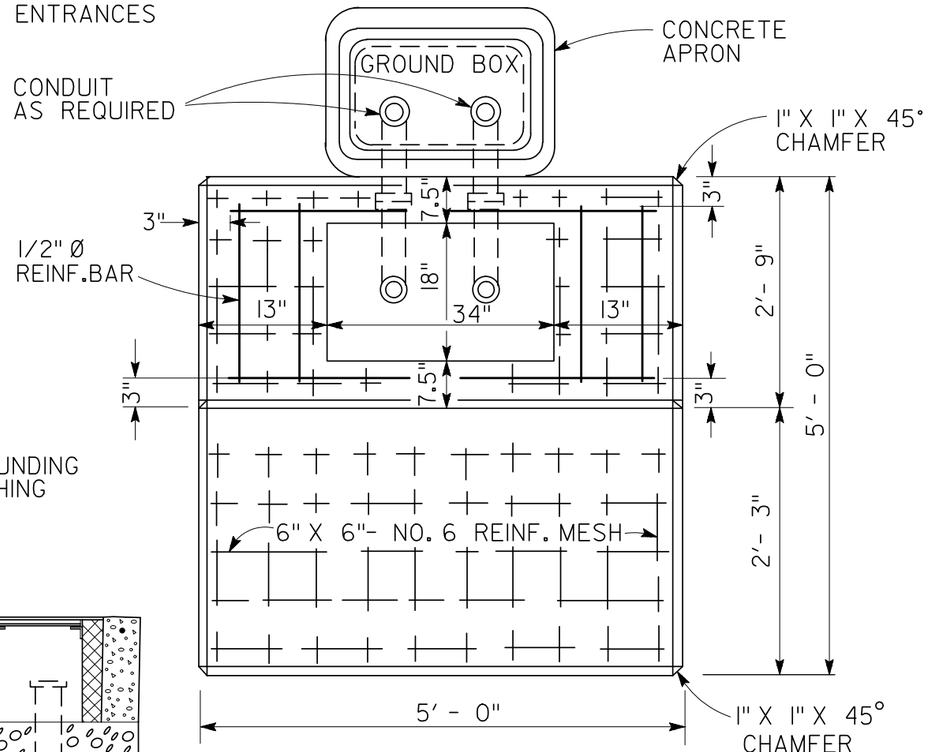
DATE:
FILE:



FRONT VIEW



SIDE VIEW



TOP VIEW
(LESS CABINET)

NOTES:

1. CABINET MANUFACTURER TO PROVIDE DETAILS OF ANCHOR BOLT LOCATION.
2. MODIFY DIMENSIONS FOR CONCRETE BASE TO FIT EQUIPMENT FURNISHED, IF NECESSARY.
3. PROVIDE GRAVEL DRAIN FOR CONTROLLER AND ALL GROUND BOXES.
4. FURNISH CLASS "B" OR CLASS "C" CONCRETE.
5. SET CONTROLLER FOUNDATION LEVEL WITH THE PAVEMENT SURFACE OR AS APPROVED BY THE ENGINEER.
6. FURNISH AT NO COST TO THE DEPARTMENT ANY ADDITIONAL CONCRETE WHICH MAY BE NECESSARY TO STABILIZE THE FOUNDATION AT UNUSUAL LOCATIONS.
7. PLACE REINFORCING BARS AS DIRECTED.
8. UPON INSTALLING THE CONTROLLER CABINET, APPLY A SILICON-BASED CAULKING COMPOUND AROUND THE BASE OF THE CONTROLLER CABINET.

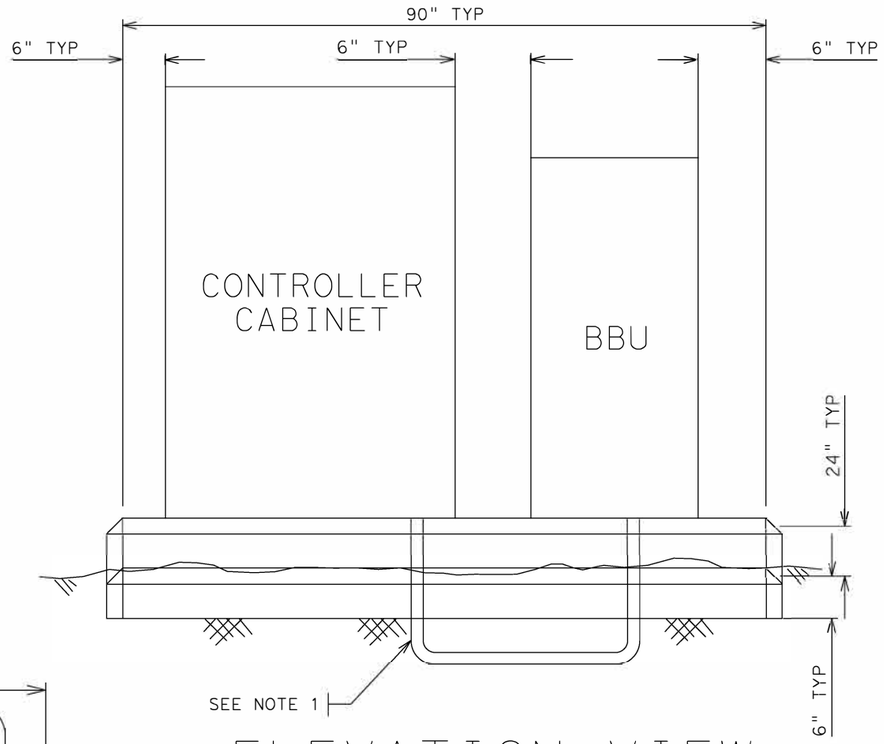
Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS CONTROLLER FOUNDATION DETAIL

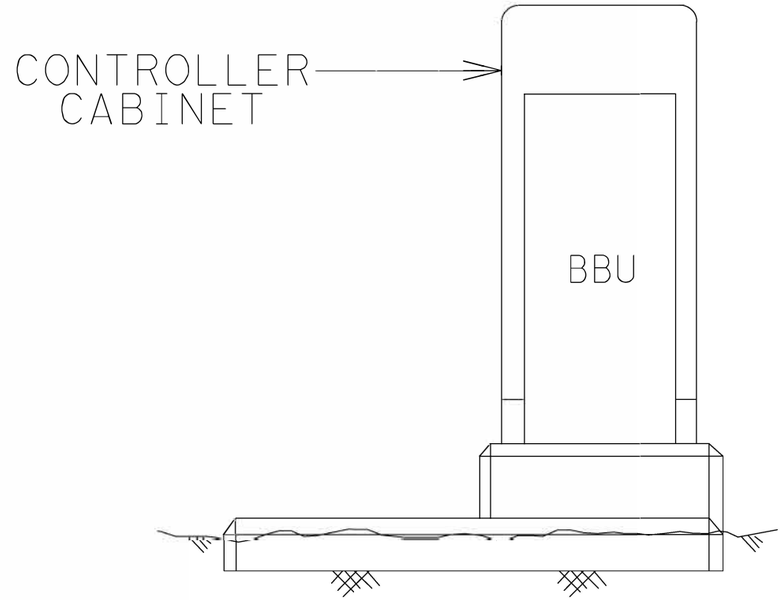
SD/SCFD

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 08-04 03-07	HOU	6		158
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0028	02	098,ETC	US90

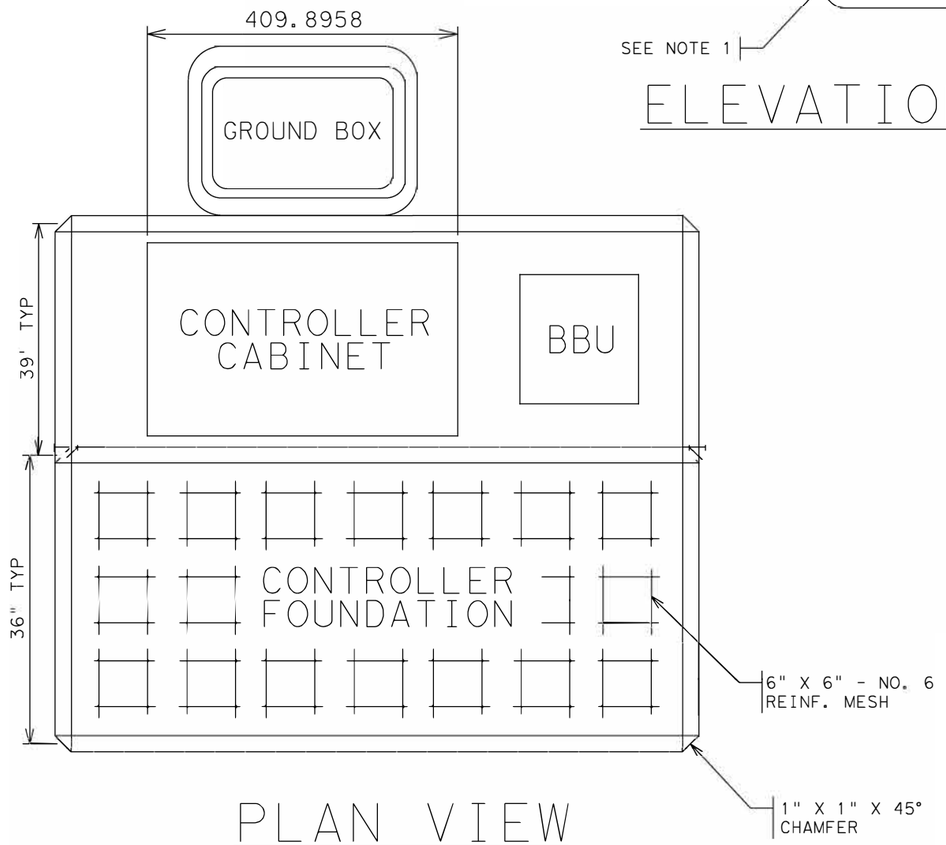
STD-MI



ELEVATION VIEW



SIDE VIEW



PLAN VIEW

NOTES:

1. INSTALL 1-1/2 " PVC CONDUIT WITH FIVE #6 AWG CONDUCTORS, TWO #18 AWG CONDUCTORS AND ONE CAT 5 CABLE WITH CONNECTOR BETWEEN THE TWO CABINETS.
2. EXTEND THE CONCRETE CONTROLLER PAD (REFER TO SD/SCFD) UNDER THE BBU. MODIFY PAD DIMENSIONS TO FIT EQUIPMENT, AS NEEDED.
3. THE WORK PERFORMED AND MATERIALS FURNISHED WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE SUBSIDIARY TO THE BBU ASSEMBLY.
4. FURNISH CLASS "B" OR CLASS "C" CONCRETE.
5. USE 6" X 6" - NO. 6 REINFORCING MESH IN FOUNDATION WITH 1" X 1" X 45° CHAMFER AT ALL CORNERS.

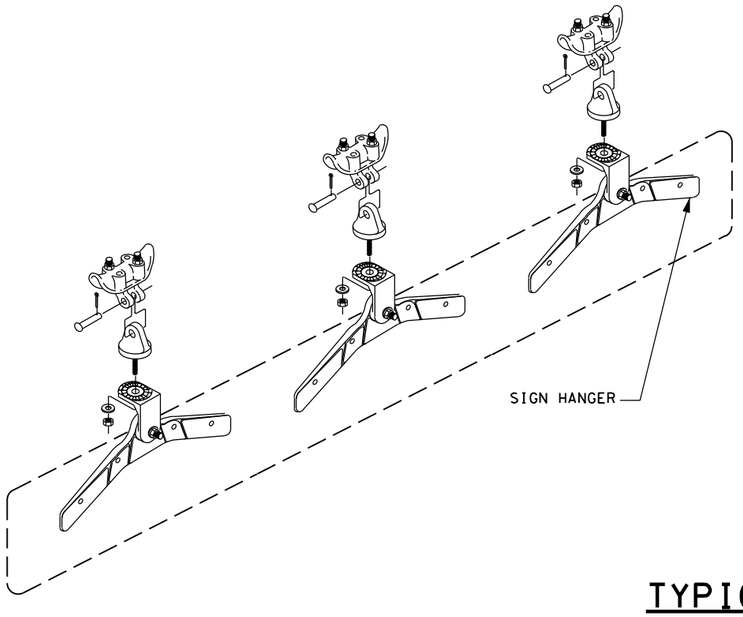
CHARLES R. STEVENS, JR., P.E.

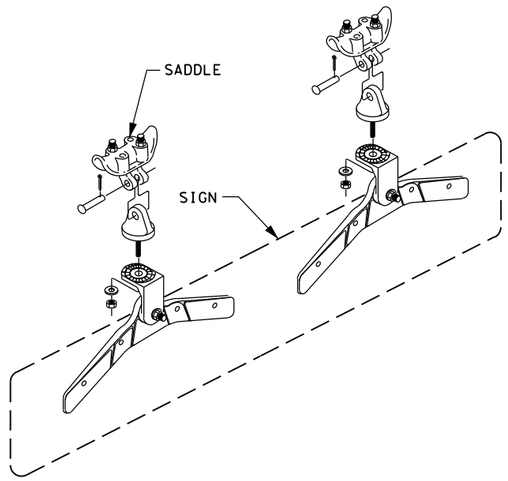
10/12/2023
DATE

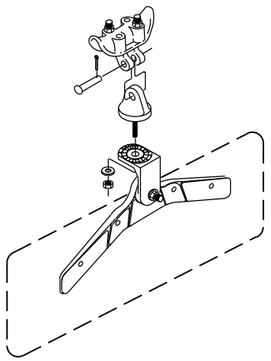
Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS
BBU SIDE MOUNT
SD/S BSM

SCALE	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY
N. T. S.	6					US 90
REVISIONS	STATE DISTRICT	COUNTY	CONTROL	SECTION	JOB	SHEET NO.
9/2019	HOU	HARRIS	0028	02	098, ctc	159

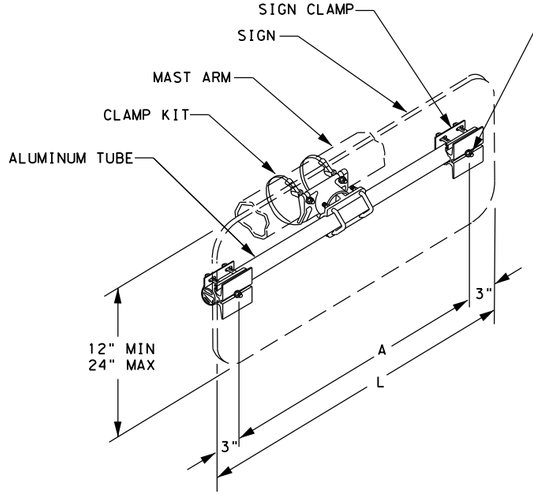


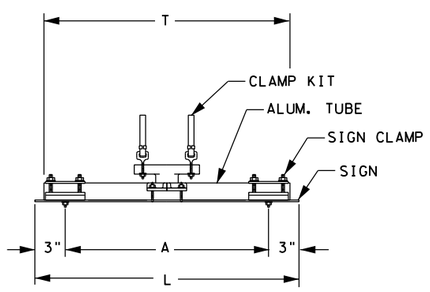


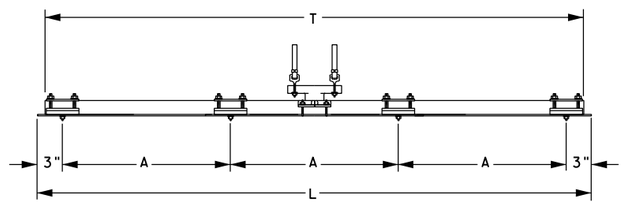


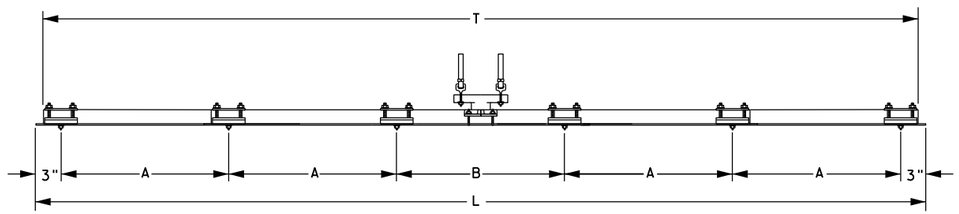
1. USE PELCO PARTS OR APPROVED EQUAL.
2. FURNISH HARDWARE FOR A COMPLETE INSTALLATION.
3. ATTACH THE 90 LB SPAN WIRE CLAMPS (SADDLES) TO TETHERS (SWAY CABLES).
4. FURNISH 1 ADJUSTABLE FREE SWINGING SIGN HANGER PER STREET NAME SIGN SMALLER THAN 3 FT. - 0 IN. SIGNS 3 FT - 0 IN. TO 6 FT.- 0 IN. REQUIRE 2 HANGERS. SIGNS LARGER THAN 6 FT. - 0 IN. REQUIRE 3 HANGERS.

TYPICAL SPAN WIRE SIGN HANGER DETAILS









SIGNS (1'-6" to 3'-0" Long)

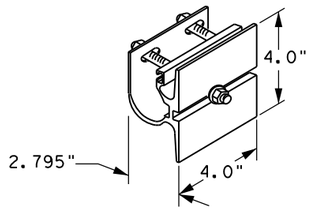
SIGN LENGTH (L)	TUBE LENGTH (T)	A
1'-6"	16"	12"
2'-0"	22"	18"
2'-6"	28"	24"
3'-0"	34"	30"

SIGNS (3'-6" to 8'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A
3'-6"	40"	12"
4'-0"	46"	14"
4'-6"	52"	16"
5'-0"	58"	18"
5'-6"	64"	20"
6'-0"	70"	22"
6'-6"	76"	24"
7'-0"	82"	26"
7'-6"	88"	28"
8'-0"	94"	30"

SIGNS (8'-6" to 10'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A	B
8'-6"	100"	19"	20"
9'-0"	106"	20"	22"
9'-6"	112"	21"	24"
10'-0"	118"	22"	26"



SIGN CLAMP DETAIL

GUSSETED TUBE CROSS SECTION

TYPICAL MAST ARM SIGN MOUNT DETAILS

FILE: Overhead-Sign-mount-det-sp04.dgn

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS
OVERHEAD STREET NAME SIGN MOUNTING DETAILS

OSNS/MD

DN:	CK:	DW:	CK:

DIST	FED REG	PROJECT NO.	SHEET
HOU	6		160

COUNTY	CONTROL	SECT	JOB	HIGHWAY
HARRIS	0028	02	298,ETC	US90

STD-M12

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

☐ This project is adjacent or parallel work, not within RR ROW:

DOT No.: 762866P
Crossing Type: AT GRADE
RR Company Operating Track at Crossing: UNION PACIFIC RAILROAD COMPANY (UPRR)
RR Company Owning Track at Crossing: UPRR
RR MP: 338.220
RR Subdivision: HOUSTON SUB
City: CROSBY
County: HARRIS
CSJ at this Crossing: 0028-02-098
Latitude: 29.9377845
Longitude: -95.0318353

Scope of Work, including any TCP, to be performed by State Contractor:

1. MILL AND OVERLAY UP TO PLANKING: 2" MILLING, SEAL COAT, 1" TOM C, TACK COAT, 1" TOM F AND STRIPING.
2. TCP(2-4a)-18, ONE LANE CLOSURE WILL BE USED WITHIN UPRR RIGHT OF WAY.
3. ALL LANES ACROSS RAILROAD TRACKS ARE TO BE OPEN TO TRAFFIC AT THE END OF THE DAY.

Scope of Work to be performed by Railroad Company:

N/A

II. FLAGGING & INSPECTION

No. of Days of Railroad Flagging Expected: 6

On this project, night or weekend flagging is:

☑ Expected
☐ Not Expected

Flagging services will be provided by:

☐ Railroad Company: 1) Txdot will pay flagging invoices. Flagging Agreement with railroad will be needed or, 2) Permitted crossing. Railroad company to provide flagging.
☑ Outside Party: Contractor will pay flagging invoices to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30-day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

☑ **UPRR** UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
UP.request@nrssinc.net
Call Center 877-984-6777

☐ **BNSF** BNSFinfo@railprosfs.com
Call Center 877-315-0513, Select #1 for flagging

☐ **CPKCR** KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☐ OTHERS:

Contractor must incorporate railroad construction inspection into anticipated construction schedule.

☑ Not Required
☐ Required. Contact Information for Construction Inspection:

III. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

☐ Required.
☑ Not Required

Railroad Point of Contact: _____

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

IV. RAILROAD INSURANCE REQUIREMENTS

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies and corresponding certificates of insurance must be issued by the contractor on behalf of the Railroad. Separate insurance policies and certificates are required when more than one Railroad Company is operating on the same right of way, or when several Railroad Companies are involved and operate on their own separate right of ways.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Escalated Limits

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000

Railroad Protective Liability Limits

☐ Not Required	
☑ Non - Bridge/Typical Maintenance Projects. Includes repairs to overpass/underpass and culvert structures	$2,000,000 / $6,000,000
☐ Bridge Structure Projects. Includes new construction or replacement of overpass/ underpass structures	$5,000,000 / $10,000,000
☐ Other: _____	

V. CONTRACTOR'S RIGHT OF ENTRY (CROE)

☐ Not Required
☑ Required: UPRR Maintenance Consent Letter. TxDOT to assist
☐ Required: TxDOT to assist in obtaining the UPRR CROE
☐ Required: Contractor to obtain
- ☐ BNSF: _____
  https://bnsf.railpermitting.com
- ☐ CPKCR
  https://jllrpg.360works.com/fmi/webd/rpo_web_kcs.fmp12
- ☐ Other Railroads: _____

To view previously approved CROE templates agreed upon between the State and Railroad, see: https://www.txdot.gov/business/resources/railroad-highway-crossing/sample-right-of-entry-agreements.html

Approved CROE templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed CROE between the Contractor and the Railroad if required on project.

VI. RAILROAD COORDINATION MEETING

A Railroad Coordination Meeting is required. See item 5, Article 8.1, of the Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges Manual for more details.

VII. RAILROAD SAFETY ORIENTATION

A. Complete the Railroad's course "Orientation for Contractor's Safety," and maintain registration prior to working on the Railroad's property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

UPRR, BNSF, CPKCR will not accept on-track safety training certificates from other Railroads. Refer to each Railroad's specific contractor right of entry for training information.

Know and follow the Contractor's Right of Entry Agreement EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are subject to the same insurance requirements as the Prime Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
Call: UPRR
Railroad Emergency Line at: 1-800-848-8715
Location: DOT 762866P
RR Milepost: 338.220
Subdivision: HOUSTON SUB

RRD Review Only
Initials: KD
Date: 11/1/2023

Texas Department of Transportation | Rail Division

RAILROAD SCOPE OF WORK
PROJECT SPECIFIC DETAILS

FILE: rr-scope-of-work.pdf		DN: TxDOT	CK:	DW:		CK:	
© TxDOT June 2014		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0028	02	098		US 90	
6/2023		DIST	COUNTY			SHEET NO.	
		HOU	HARRIS			161	

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

☐ This project is adjacent or parallel work, not within RR ROW:

DOT No.: 762865H
Crossing Type: AT GRADE
RR Company Operating Track at Crossing: UNION PACIFIC RAILROAD COMPANY (UPRR)
RR Company Owning Track at Crossing: UPRR
RR MP: 337.530
RR Subdivision: HOUSTON SUB
City: CROSBY
County: HARRIS
CSJ at this Crossing: 0028-02-098
Latitude: 29.9443414
Longitude: -95.0232348

Scope of Work, including any TCP, to be performed by State Contractor:

1. MILL AND OVERLAY UP TO PLANKING: 2" MILLING, SEAL COAT, 1" TOM C, TACK COAT, 1" TOM F AND STRIPING.
2. TCP(2-4a)-18, ONE LANE CLOSURE WILL BE USED WITHIN UPRR RIGHT OF WAY.
3. ALL LANES ACROSS RAILROAD TRACKS ARE TO BE OPEN TO TRAFFIC AT THE END OF THE DAY.

Scope of Work to be performed by Railroad Company:

N/A

II. FLAGGING & INSPECTION

No. of Days of Railroad Flagging Expected: 6

On this project, night or weekend flagging is:

☑ Expected
☐ Not Expected

Flagging services will be provided by:

☐ Railroad Company: 1) Txdot will pay flagging invoices. Flagging Agreement with railroad will be needed or, 2) Permitted crossing. Railroad company to provide flagging.
☑ Outside Party: Contractor will pay flagging invoices to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30-day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

☑ **UPRR** UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
UP.request@nrssinc.net
Call Center 877-984-6777

☐ **BNSF** BNSFinfo@railprosfs.com
Call Center 877-315-0513, Select #1 for flagging

☐ **CPKCR** KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☐ OTHERS:

Contractor must incorporate railroad construction inspection into anticipated construction schedule.

☑ Not Required
☐ Required. Contact Information for Construction Inspection:

III. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

☐ Required.
☑ Not Required

Railroad Point of Contact: _____

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

IV. RAILROAD INSURANCE REQUIREMENTS

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies and corresponding certificates of insurance must be issued by the contractor on behalf of the Railroad. Separate insurance policies and certificates are required when more than one Railroad Company is operating on the same right of way, or when several Railroad Companies are involved and operate on their own separate right of ways.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Escalated Limits

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000

Railroad Protective Liability Limits

☐ Not Required	
☑ Non - Bridge/Typical Maintenance Projects. Includes repairs to overpass/underpass and culvert structures	$2,000,000 / $6,000,000
☐ Bridge Structure Projects. Includes new construction or replacement of overpass/ underpass structures	$5,000,000 / $10,000,000
☐ Other: _____	

V. CONTRACTOR'S RIGHT OF ENTRY (CROE)

☐ Not Required
☑ Required: UPRR Maintenance Consent Letter. TxDOT to assist
☐ Required: TxDOT to assist in obtaining the UPRR CROE
☐ Required: Contractor to obtain
- ☐ BNSF: _____
  https://bnsf.railpermitting.com
- ☐ CPKCR
  https://jllrpg.360works.com/fmi/webd/rpo_web_kcs.fmp12
- ☐ Other Railroads: _____

To view previously approved CROE templates agreed upon between the State and Railroad, see: https://www.txdot.gov/business/resources/railroad-highway-crossing/sample-right-of-entry-agreements.html

Approved CROE templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed CROE between the Contractor and the Railroad if required on project.

VI. RAILROAD COORDINATION MEETING

A Railroad Coordination Meeting is required. See item 5, Article 8.1, of the Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges Manual for more details.

VII. RAILROAD SAFETY ORIENTATION

A. Complete the Railroad's course "Orientation for Contractor's Safety," and maintain registration prior to working on the Railroad's property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

UPRR, BNSF, CPKCR will not accept on-track safety training certificates from other Railroads. Refer to each Railroad's specific contractor right of entry for training information.

Know and follow the Contractor's Right of Entry Agreement EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are subject to the same insurance requirements as the Prime Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
Call: UPRR
Railroad Emergency Line at: 1-800-848-8715
Location: DOT 762865H
RR Milepost: 337.530
Subdivision: HOUSTON SUB

RRD Review Only
Initials: KR
Date: 11/1/2023

Texas Department of Transportation — Rail Division

RAILROAD SCOPE OF WORK
PROJECT SPECIFIC DETAILS

FILE: rr-scope-of-work.pdf		DN: TxDOT	CK:	DW:		CK:	
© TxDOT June 2014		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0028	02	098		US 90	
6/2023		DIST	COUNTY			SHEET NO.	
		HOU	HARRIS			162	

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

☐ This project is adjacent or parallel work, not within RR ROW:

DOT No.: 762861F
Crossing Type: AT GRADE
RR Company Operating Track at Crossing: UNION PACIFIC RAILROAD COMPANY (UPRR)
RR Company Owning Track at Crossing: UPRR
RR MP: 336.260
RR Subdivision: LAFAYETTE
City: DAYTON
County: HARRIS
CSJ at this Crossing: 0028-02-098
Latitude: 29.9573972
Longitude: -95.0061946

Scope of Work, including any TCP, to be performed by State Contractor:

1. MILL AND OVERLAY UP TO PLANKING: 2" MILLING, SEAL COAT, 1" TOM C, TACK COAT, 1" TOM F AND STRIPING
2. TCP(2-4a)-18, ONE LANE CLOSURE WILL BE USED WITHIN UPRR RIGHT OF WAY.
3. ALL LANES ACROSS RAILROAD TRACKS ARE TO BE OPEN TO TRAFFIC AT THE END OF THE DAY.

Scope of Work to be performed by Railroad Company:

N/A

II. FLAGGING & INSPECTION

No. of Days of Railroad Flagging Expected: 6

On this project, night or weekend flagging is:

☑ Expected
☐ Not Expected

Flagging services will be provided by:

☐ Railroad Company: 1) Txdot will pay flagging invoices. Flagging Agreement with railroad will be needed or, 2) Permitted crossing. Railroad company to provide flagging.
☑ Outside Party: Contractor will pay flagging invoices to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30-day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

☑ **UPRR** UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
UP.request@nrssinc.net
Call Center 877-984-6777

☐ **BNSF** BNSFinfo@railprosfs.com
Call Center 877-315-0513, Select #1 for flagging

☐ **CPKCR** KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☐ OTHERS:

Contractor must incorporate railroad construction inspection into anticipated construction schedule.

☑ Not Required
☐ Required. Contact Information for Construction Inspection:

III. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

☐ Required.
☑ Not Required

Railroad Point of Contact: _____

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

IV. RAILROAD INSURANCE REQUIREMENTS

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies and corresponding certificates of insurance must be issued by the contractor on behalf of the Railroad. Separate insurance policies and certificates are required when more than one Railroad Company is operating on the same right of way, or when several Railroad Companies are involved and operate on their own separate right of ways.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Escalated Limits

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000

Railroad Protective Liability Limits

☐ Not Required	
☑ Non - Bridge/Typical Maintenance Projects. Includes repairs to overpass/underpass and culvert structures	$2,000,000 / $6,000,000
☐ Bridge Structure Projects. Includes new construction or replacement of overpass/ underpass structures	$5,000,000 / $10,000,000
☐ Other: _____	

V. CONTRACTOR'S RIGHT OF ENTRY (CROE)

☐ Not Required
☑ Required: UPRR Maintenance Consent Letter. TxDOT to assist
☐ Required: TxDOT to assist in obtaining the UPRR CROE
☐ Required: Contractor to obtain
- ☐ BNSF: _____
  https://bnsf.railpermitting.com
- ☐ CPKCR
  https://jllrpg.360works.com/fmi/webd/rpo_web_kcs.fmp12
- ☐ Other Railroads: _____

To view previously approved CROE templates agreed upon between the State and Railroad, see: https://www.txdot.gov/business/resources/railroad-highway-crossing/sample-right-of-entry-agreements.html

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Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed CROE between the Contractor and the Railroad if required on project.

VI. RAILROAD COORDINATION MEETING

A Railroad Coordination Meeting is required. See item 5, Article 8.1, of the Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges Manual for more details.

VII. RAILROAD SAFETY ORIENTATION

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Know and follow the Contractor's Right of Entry Agreement EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are subject to the same insurance requirements as the Prime Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
Call: UPRR
Railroad Emergency Line at: 1-800-848-8715
Location: DOT 762861F
RR Milepost: 336.260
Subdivision: LAFAYETTE

RRD Review Only
Initials: KD
Date: 11/1/2023

Texas Department of Transportation — *Rail Division*

RAILROAD SCOPE OF WORK
PROJECT SPECIFIC DETAILS

FILE: rr-scope-of-work.pdf	DN: TxDOT	CK:	DW:	CK:	
© TxDOT June 2014	CONT	SECT	JOB	HIGHWAY	
REVISIONS 6/2023	0028	02	098	US 90	
	DIST	COUNTY		SHEET NO.	
	HOU	HARRIS		163	

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

☐ This project is adjacent or parallel work, not within RR ROW:

DOT No.: 762860Y
Crossing Type: AT GRADE
RR Company Operating Track at Crossing: UNION PACIFIC RAILROAD COMPANY (UPRR)
RR Company Owning Track at Crossing: UPRR
RR MP: 335.540
RR Subdivision: HOUSTON
City: CROSBY
County: HARRIS
CSJ at this Crossing: 0028-02-098
Latitude: 29.9643808
Longitude: -94.9970977

Scope of Work, including any TCP, to be performed by State Contractor:

1. MILL AND OVERLAY UP TO PLANKING: 2" MILLING, SEAL COAT, 1" TOM C, TACK COAT, 1" TOM F AND STRIPING.
2. TCP(2-4a)-18, ONE LANE CLOSURE WILL BE USED WITHIN UPRR RIGHT OF WAY.
3. ALL LANES ACROSS RAILROAD TRACKS ARE TO BE OPEN TO TRAFFIC AT THE END OF THE DAY.

Scope of Work to be performed by Railroad Company:

N/A

II. FLAGGING & INSPECTION

No. of Days of Railroad Flagging Expected: 6

On this project, night or weekend flagging is:

☑ Expected
☐ Not Expected

Flagging services will be provided by:

☐ Railroad Company: 1) Txdot will pay flagging invoices. Flagging Agreement with railroad will be needed or, 2) Permitted crossing. Railroad company to provide flagging.
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Contact Information for Flagging:

☑ **UPRR** UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
UP.request@nrssinc.net
Call Center 877-984-6777

☐ **BNSF** BNSFinfo@railprosfs.com
Call Center 877-315-0513, Select #1 for flagging

☐ **CPKCR** KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☐ OTHERS:

Contractor must incorporate railroad construction inspection into anticipated construction schedule.

☑ Not Required
☐ Required. Contact Information for Construction Inspection:

III. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

☐ Required.
☑ Not Required

Railroad Point of Contact: _____

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

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Escalated Limits

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000

Railroad Protective Liability Limits

☐ Not Required	
☑ Non - Bridge/Typical Maintenance Projects. Includes repairs to overpass/underpass and culvert structures	$2,000,000 / $6,000,000
☐ Bridge Structure Projects. Includes new construction or replacement of overpass/ underpass structures	$5,000,000 / $10,000,000
☐ Other: _____	

V. CONTRACTOR'S RIGHT OF ENTRY (CROE)

☐ Not Required
☑ Required: UPRR Maintenance Consent Letter. TxDOT to assist
☐ Required: TxDOT to assist in obtaining the UPRR CROE
☐ Required: Contractor to obtain
- ☐ BNSF: _____
  https://bnsf.railpermitting.com
- ☐ CPKCR
  https://jllrpg.360works.com/fmi/webd/rpo_web_kcs.fmp12
- ☐ Other Railroads: _____

To view previously approved CROE templates agreed upon between the State and Railroad, see: https://www.txdot.gov/business/resources/railroad-highway-crossing/sample-right-of-entry-agreements.html

Approved CROE templates are not to be modified by the Contractor.

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VI. RAILROAD COORDINATION MEETING

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VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are subject to the same insurance requirements as the Prime Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
Call: UPRR
Railroad Emergency Line at: 1-800-848-8715
Location: DOT 762860Y
RR Milepost: 335.540
Subdivision: HOUSTON

RRD Review Only
Initials: _____
Date: 11/1/2023

Texas Department of Transportation | Rail Division

RAILROAD SCOPE OF WORK
PROJECT SPECIFIC DETAILS

FILE: rr-scope-of-work.pdf		DN: TxDOT	CK:	DW:		CK:	
© TxDOT June 2014		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0028	02	098		US 90	
6/2023		DIST	COUNTY			SHEET NO.	
		HOU	HARRIS			164	

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

☐ This project is adjacent or parallel work, not within RR ROW:

DOT No.: 762859E
Crossing Type: AT GRADE
RR Company Operating Track at Crossing: UNION PACIFIC RAILROAD COMPANY (UPRR)
RR Company Owning Track at Crossing: UPRR
RR MP: 334.910
RR Subdivision: LAFAYETTE
City: DAYTON
County: HARRIS
CSJ at this Crossing: 0028-02-098
Latitude: 29.9700609
Longitude: -94.9896585

Scope of Work, including any TCP, to be performed by State Contractor:

1. MILL AND OVERLAY UP TO PLANKING: 2" MILLING, SEAL COAT, 1" TOM C, TACK COAT, 1" TOM F AND STRIPING.
2. TCP(2-4a)-18, ONE LANE CLOSURE WILL BE USED WITHIN UPRR RIGHT OF WAY.
3. ALL LANES ACROSS RAILROAD TRACKS ARE TO BE OPEN TO TRAFFIC AT THE END OF THE DAY.

Scope of Work to be performed by Railroad Company:

N/A

II. FLAGGING & INSPECTION

No. of Days of Railroad Flagging Expected: 6

On this project, night or weekend flagging is:

☑ Expected
☐ Not Expected

Flagging services will be provided by:

☐ Railroad Company: 1) Txdot will pay flagging invoices. Flagging Agreement with railroad will be needed or, 2) Permitted crossing. Railroad company to provide flagging.
☑ Outside Party: Contractor will pay flagging invoices to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30-day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

☑ **UPRR** UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
UP.request@nrssinc.net
Call Center 877-984-6777

☐ **BNSF** BNSFinfo@railprosfs.com
Call Center 877-315-0513, Select #1 for flagging

☐ **CPKCR** KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☐ OTHERS:

Contractor must incorporate railroad construction inspection into anticipated construction schedule.

☑ Not Required
☐ Required. Contact Information for Construction Inspection:

III. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

☐ Required.
☑ Not Required

Railroad Point of Contact: _____

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

IV. RAILROAD INSURANCE REQUIREMENTS

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies and corresponding certificates of insurance must be issued by the contractor on behalf of the Railroad. Separate insurance policies and certificates are required when more than one Railroad Company is operating on the same right of way, or when several Railroad Companies are involved and operate on their own separate right of ways.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Escalated Limits

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000

Railroad Protective Liability Limits

☐ Not Required	
☑ Non - Bridge/Typical Maintenance Projects. Includes repairs to overpass/underpass and culvert structures	$2,000,000 / $6,000,000
☐ Bridge Structure Projects. Includes new construction or replacement of overpass/ underpass structures	$5,000,000 / $10,000,000
☐ Other: _____	

V. CONTRACTOR'S RIGHT OF ENTRY (CROE)

☐ Not Required
☑ Required: UPRR Maintenance Consent Letter. TxDOT to assist
☐ Required: TxDOT to assist in obtaining the UPRR CROE
☐ Required: Contractor to obtain
- ☐ BNSF: _____
  https://bnsf.railpermitting.com
- ☐ CPKCR
  https://jllrpg.360works.com/fmi/webd/rpo_web_kcs.fmp12
- ☐ Other Railroads: _____

To view previously approved CROE templates agreed upon between the State and Railroad, see: https://www.txdot.gov/business/resources/railroad-highway-crossing/sample-right-of-entry-agreements.html

Approved CROE templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed CROE between the Contractor and the Railroad if required on project.

VI. RAILROAD COORDINATION MEETING

A Railroad Coordination Meeting is required. See item 5, Article 8.1, of the Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges Manual for more details.

VII. RAILROAD SAFETY ORIENTATION

A. Complete the Railroad's course "Orientation for Contractor's Safety," and maintain registration prior to working on the Railroad's property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

UPRR, BNSF, CPKCR will not accept on-track safety training certificates from other Railroads. Refer to each Railroad's specific contractor right of entry for training information.

Know and follow the Contractor's Right of Entry Agreement EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are subject to the same insurance requirements as the Prime Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
Call: UPRR
Railroad Emergency Line at: 1-800-848-8715
Location: DOT 762859E
RR Milepost: 334.910
Subdivision: LAFAYETTE

RRD Review Only
Initials: _____
Date: 11/1/2023

Texas Department of Transportation | Rail Division

RAILROAD SCOPE OF WORK
PROJECT SPECIFIC DETAILS

FILE: rr-scope-of-work.pdf	DN: TxDOT	CK:	DW:	CK:		
© TxDOT June 2014	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0028	02	098	US 90		
6/2023	DIST	COUNTY		SHEET NO.		
	HOU	HARRIS		165		

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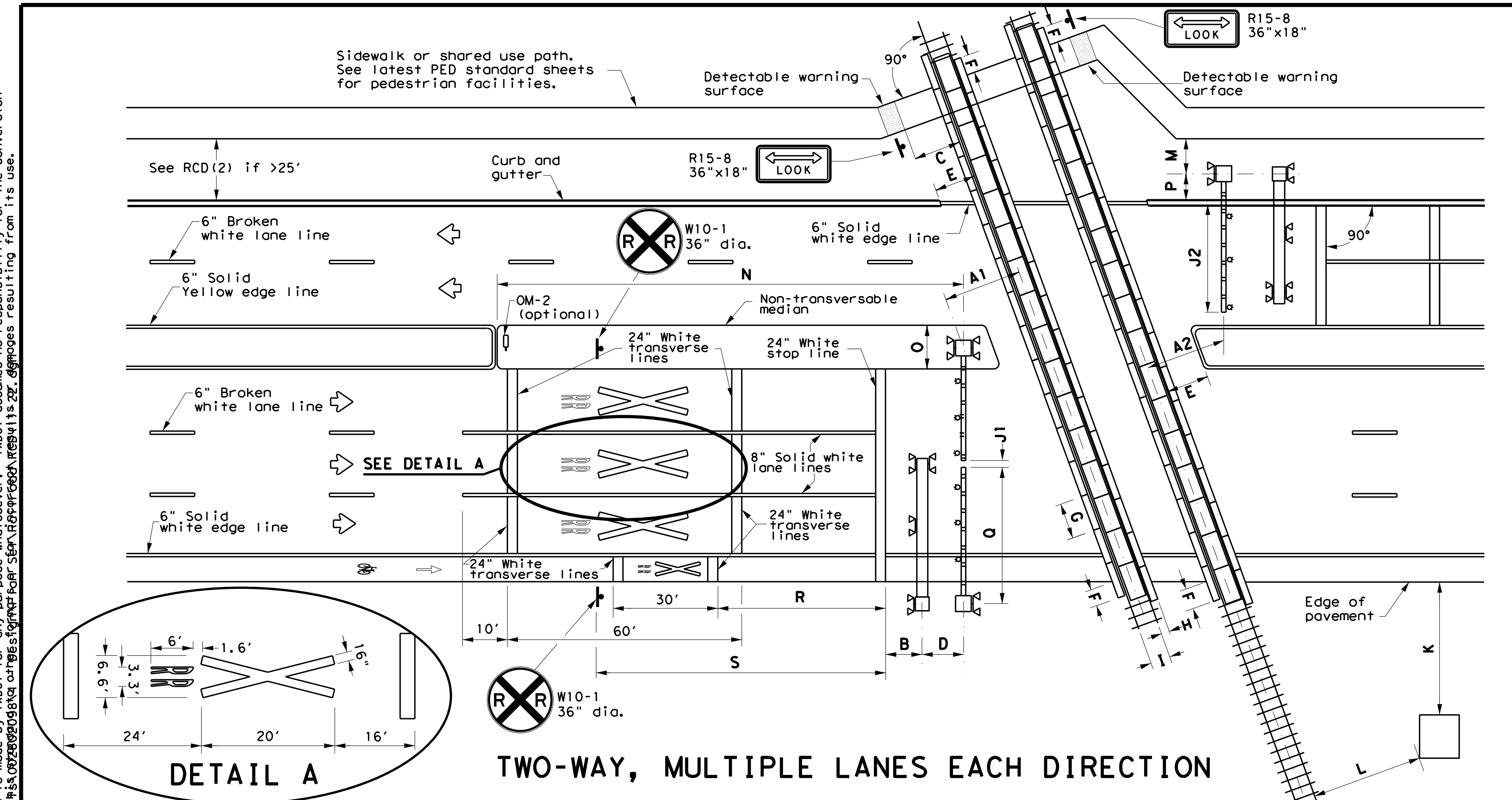


TWO-WAY, MULTIPLE LANES EACH DIRECTION

NOTES

A1: Center of RR mast to center of rail: 12' minimum, 15' typical.

A2: Tip of gate to center of rail: 12' minimum, 15' typical.

B: Center of mast (cantilever, gate, or mast flasher) of nearest active traffic control device to stop line: 8' (NOTE: Stop line may be moved as needed, but should be at least 8' back from gates, if present).

C: Near edge of detectable warning surface to nearest rail: 12' minimum.

D: Center of gate mast to center of cantilever mast: 6' typical. NOTE: Cantilever may be located in front or behind gates.

E: Edge of median or curb to nearest rail: 10' typical. NOTE: Design median edge to be parallel with rail.

F: Edge of planking panel from edge of pavement or sidewalk: 3' minimum. NOTE: Field panels need not be in line with gauge panels.

G: Length of panels along rail: 8' typical.

H: Width of field panel: 2' typical (check with railroad company).

I: Distance between rails: 4'- 8'1/2".

J1: Tip of gate to tip of gate: 2' maximum.

J2: 90% of traveled roadway to be covered by gate.

K: Nearest edge of RR cabinet from edge of pavement: 30' typical. NOTE: Cabinet not required to be parallel to edge of pavement.

L: Nearest edge of RR cabinet from nearest rail: 25' typical.

M: Center of RR mast to edge of sidewalk: 6' minimum.

N: Center of gate mast to leading edge of non-traversable median: 100' minimum to qualify as a Quiet Zone SSM. NOTE: 60' will suffice if there is a street intersection within the 100' and all street intersections within 60' are closed.

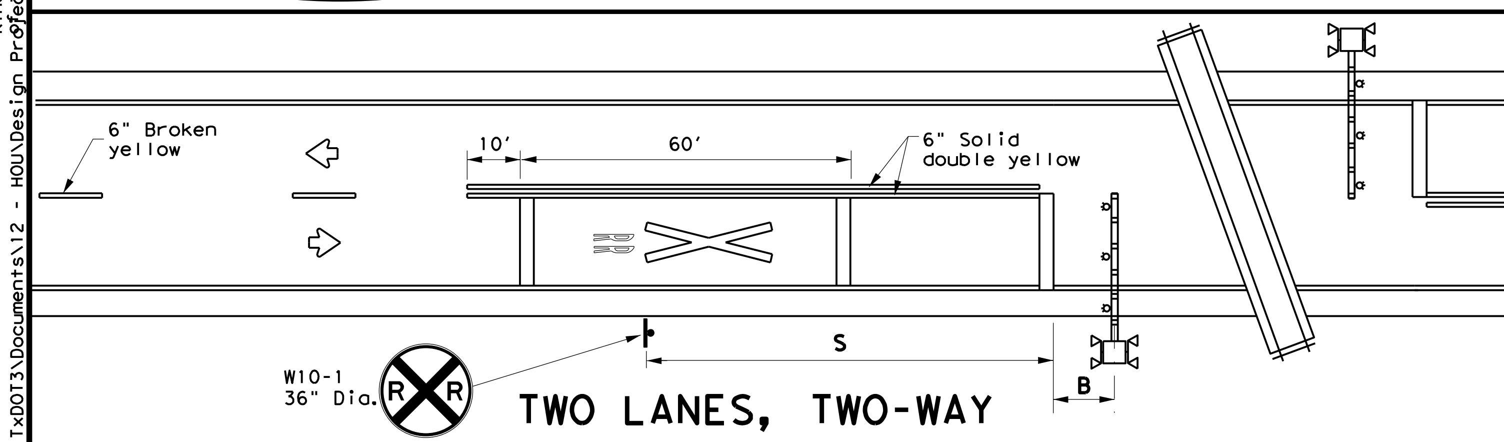
O: Width of median for RR gate assembly: 8'-6" minimum, 10' typical when using median gates. NOTE: Center of gate mast minimum 4'-3" from face of curb.

P: Center of RR mast to face of curb: 5'-3" minimum. Center of RR mast to edge of pavement (with shoulder): 7' minimum. Center of RR mast to edge of pavement (no shoulder): 9'-3" minimum. NOTE: Final location determined by the railroad company.

Q: Gate length: 28' or less typical, but railroad company may allow up to 32' under special circumstances.

R: Stop line to first RR Crossing transverse line (bike lane): 50' typical.

S: Stop line to GRADE CROSSING ADVANCE WARNING (W10-1) sign and adjacent RR Crossing pavement markings. See Table 1. See RCD(2) for other signs.



TWO LANES, TWO-WAY

TABLE 1

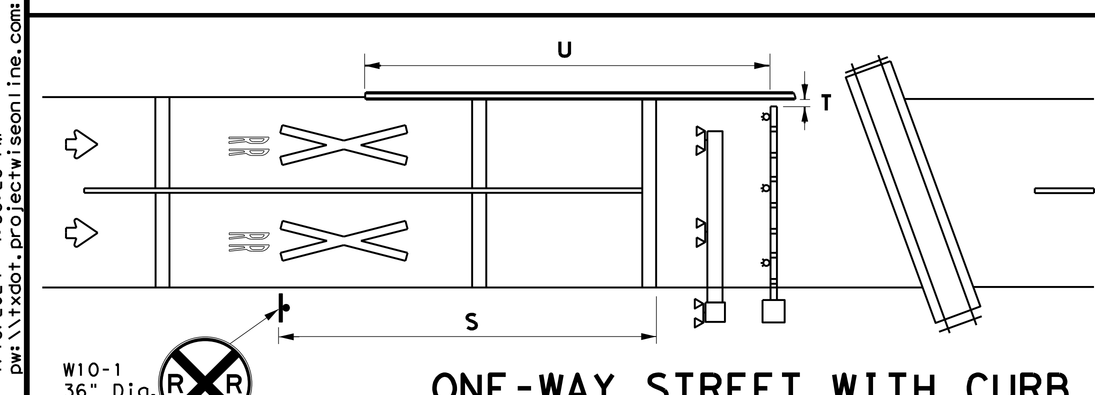
Approach Speed (mph)	Desirable Placement (feet)
20	100
25	100
30	100
35	100
40	125
45	175
50	250
55	325
60	400
65	475
70	550
75	650

LEGEND

Symbol	Meaning
(symbol)	Sign
(symbol)	Object Marker
(symbol)	Traffic Flow
(symbol)	Cantilever
(symbol)	Gate Assembly
(symbol)	Mast Flasher Pair

GENERAL NOTES

1. Medians and curbs must be non-traversable to qualify as a Quiet Zone Supplementary Safety Measure (SSM). Non-traversable curbs in Quiet Zones are 6" tall minimum and used on roadways where speed does not exceed 40 mph.
2. Raised pavement markers may be used to supplement striping. See PM(2) and PM(3) standard sheets.
3. Medians preferred whenever possible to prevent vehicles from driving around gates.
4. Longitudinal edge striping may be continued thru crossing as needed. Illumination may also be considered for nighttime visibility.
5. See SMD standard sheets for sign mounting details.
6. See the Standard Highway Sign Design for Texas (SHSD) manual for sign and pavement marking details.

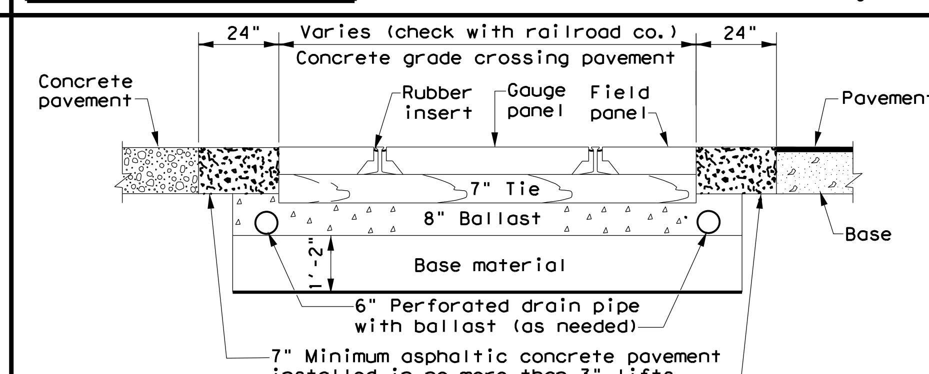


ONE-WAY STREET WITH CURB

NOTES

T: Tip of gate to edge of curb: 1' maximum for Quiet Zone SSM, 90% of traveled way covered by gates for all other locations.

U: Non-traversable curb length from gate: 100' minimum for a Quiet Zone SSM, 10' minimum for all other locations.



CROSSING SURFACE CROSS SECTION

Texas Department of Transportation

Traffic Safety Division Standard

RAILROAD CROSSING DETAILS SIGNING, STRIPING, AND DEVICE PLACEMENT RCD(1)-22

FILE: rcd1-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2022	CONT	SECT	JOB	HIGHWAY
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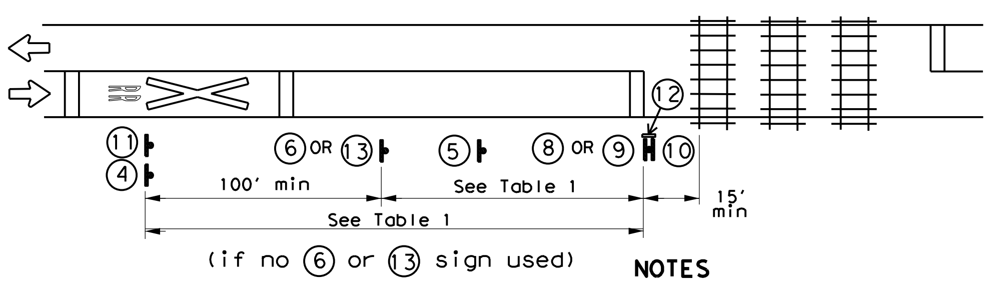
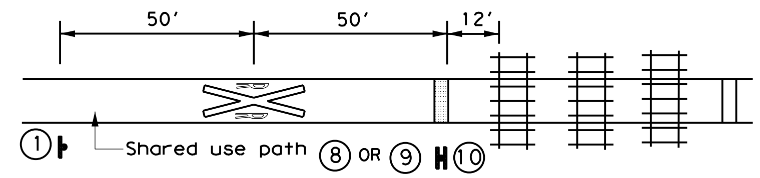
2-16 11-22	DIST		COUNTY	SHEET NO.
	HOU		HARRIS	166



PASSIVE CROSSING

NOTES

1. STOP or YIELD sign may also be installed to the left of the crossbuck sign, rather than below it.
2. A 2" white retroreflective strip shall be installed on front and back of crossbuck sign post.
3. See the Crossbuck Assemblies with YIELD or STOP Signs at Passive Grade Crossings section of the TMUTCD for further details about sign mounting arrangements.



NOTES

1. A shared use path is considered a separate pathway crossing when more than 25' from traveled way of adjacent roadway.
2. Detectable warning used at stop bar.
3. Smaller signs preferred. See the Design of Bicycle Signs section within the TMUTCD for sizing details.

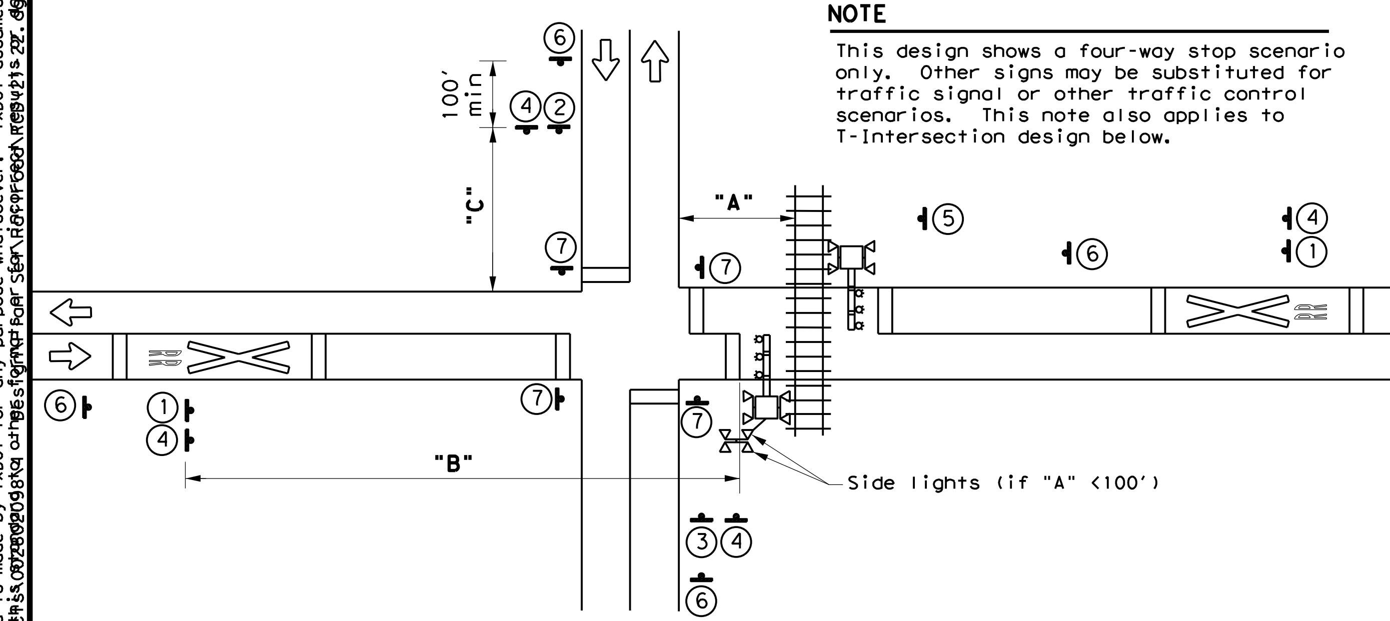
PATHWAY CROSSING

TABLE 1

Approach Speed (mph)	Desirable Placement (feet)
20	100
25	100
30	100
35	100
40	125
45	175
50	250
55	325
60	400
65	475
70	550
75	650

GENERAL NOTES

1. Railroad company to provide active traffic control devices, CROSSBUCK (R15-1), NUMBER OF TRACKS (R15-2P) plaque (if more than 1 track), and EMERGENCY NOTIFICATION (I-13) signs.
2. LOW GROUND CLEARANCE (W10-5) signs may be relocated further upstream of crossing to provide advance warning of alternate route.
3. GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-2) signs may be modified as needed to fit roadway geometry.
4. Table 1 placement distances may vary per the Placement of Warning Signs section of the TMUTCD.
5. See Table 1 to determine placement of STOP AHEAD (W3-1) and YIELD AHEAD (W3-2) signs unless shown otherwise.
6. DO NOT STOP ON TRACKS (R8-8) signs installed when potential for vehicles stopping on tracks is significant as determined by sealing engineer. Install so sign does not block view of RR mast.
7. See the Standard Highway Sign Design for Texas (SHSD) manual for sign and pavement marking details.

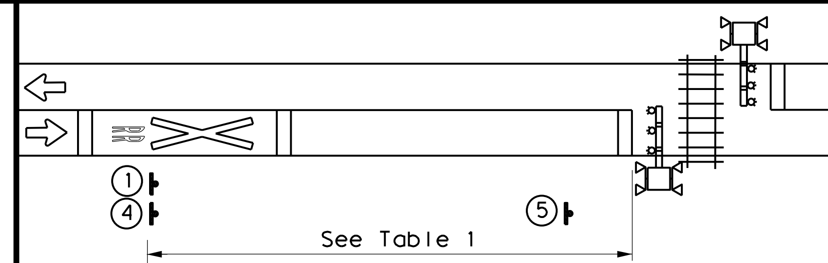


NOTE

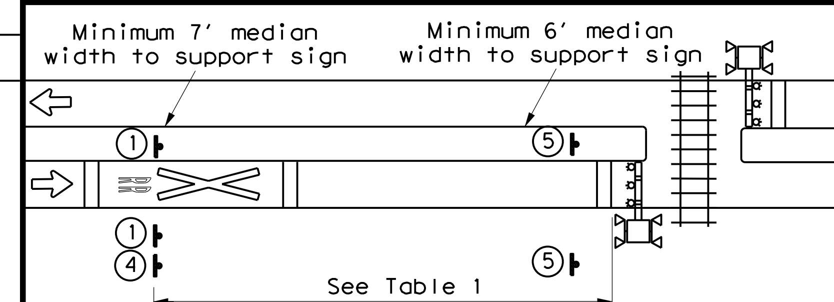
This design shows a four-way stop scenario only. Other signs may be substituted for traffic signal or other traffic control scenarios. This note also applies to T-Intersection design below.

	"A" <100'	"A" ≥100'
"B"	See Table 1. Place pavement markings and signs on opposite side of intersection from rail if spacing from Table 1 would put markings within intersection.	See Table 1. Place pavement markings and signs between rail and intersection if spacing from Table 1 would put markings within intersection.
"C"	See Table 1.	GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-2, W10-3, W10-4) signs should only be installed if W10-1 sign is not between intersection and railroad crossing. If needed, see Table 1.

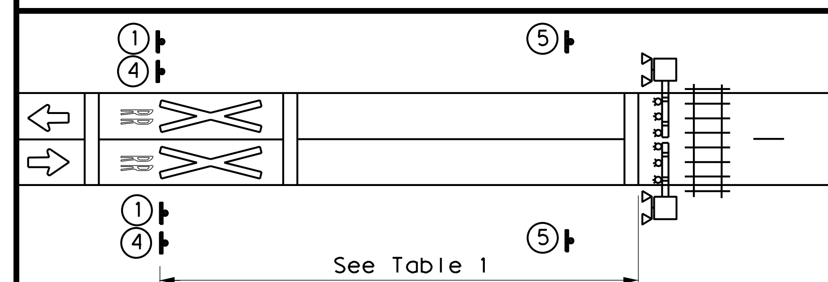
GRADE CROSSING NEAR A PARALLEL STREET



TWO-WAY

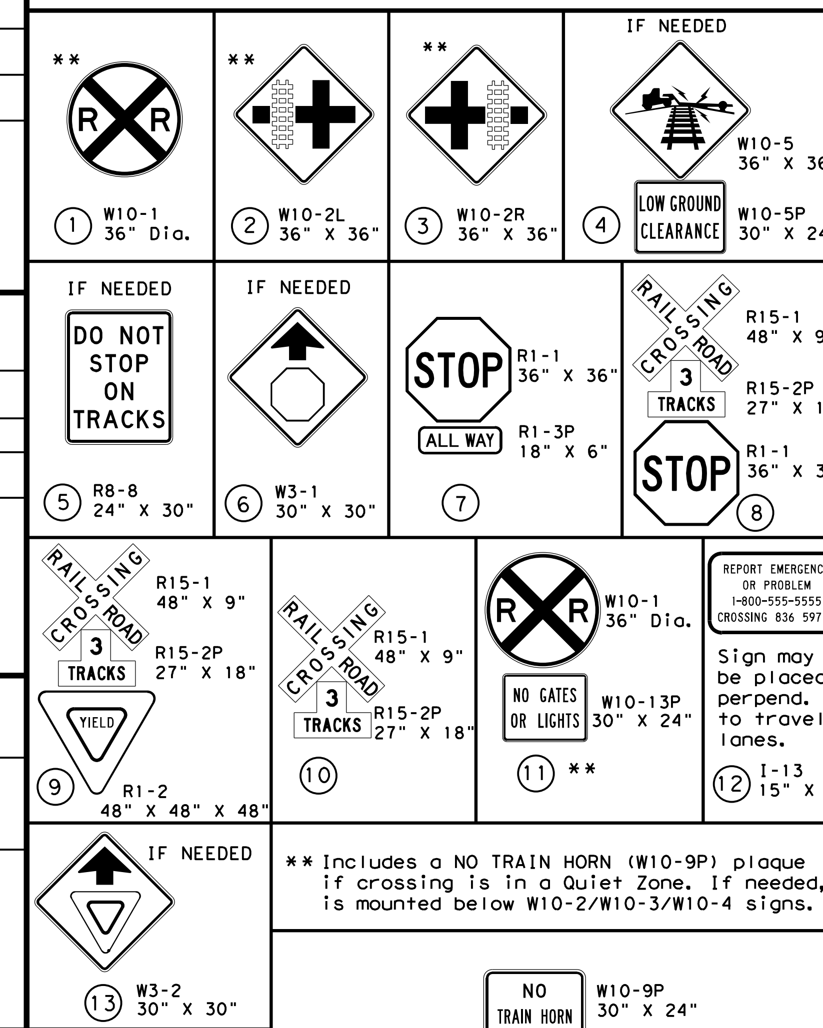


TWO-WAY WITH MEDIAN

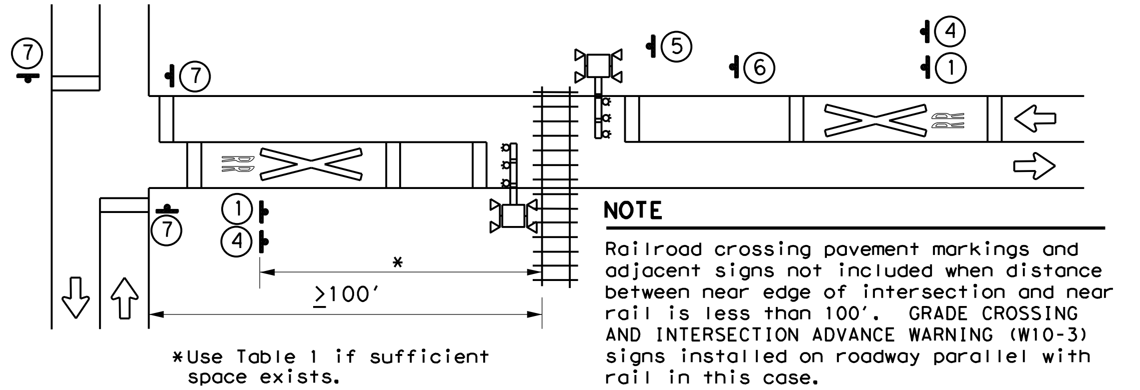


ONE-WAY

SIGNS



** Includes a NO TRAIN HORN (W10-9P) plaque if crossing is in a Quiet Zone. If needed, is mounted below W10-2/W10-3/W10-4 signs.

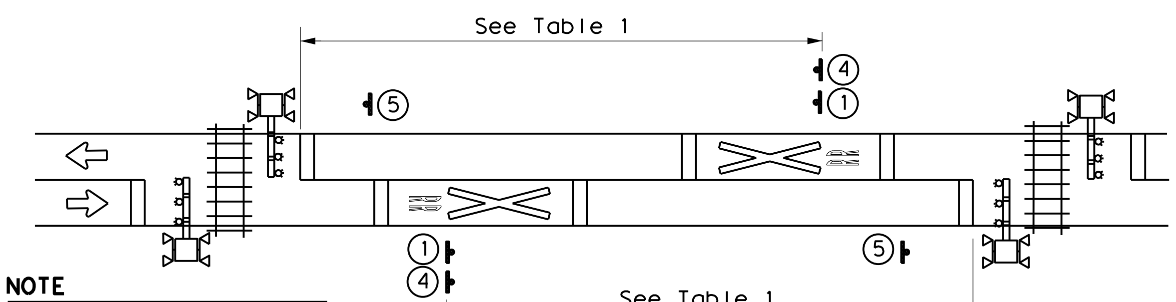


*Use Table 1 if sufficient space exists.

NOTE

Railroad crossing pavement markings and adjacent signs not included when distance between near edge of intersection and near rail is less than 100'. GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-3) signs installed on roadway parallel with rail in this case.

T-INTERSECTION



NOTE

Separate active traffic control devices, railroad crossing pavement markings, and adjacent signs required when tracks are more than 100' apart.

TWO ADJACENT CROSSINGS

Texas Department of Transportation | Traffic Safety Division Standard

RAILROAD CROSSING DETAILS SIGNING & STRIPING

RCD(2)-22

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© TxDOT November 2022	CONT 0028	SECT 02	JOB 098,etc	HIGHWAY US 90
REVISIONS 2-16 11-22	DIST HOU	COUNTY HARRIS		SHEET NO. 167

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PART 1 - GENERAL

1.01 DESCRIPTION

This project includes construction work within the right of way and/or properties of the Railroad and adjacent to its tracks, wire lines and other facilities. These sheets describe the minimum special requirements for coordination with the Railroad when working upon, over or under Railroad Right of Way or when impacting current or future Railroad operations. Coordinate with the Railroad while performing the work outlined herein, and afford the same cooperation with the Railroad as with TxDOT. Complete all submittals and work in accordance with TxDOT Standard Specifications, Railroad Guidelines and AREMA recommendations as modified by these minimum special requirements or as directed in writing by the Railroad Designated Representative.

For purposes of this project, the Railroad Designated Representative is the person or persons designated by the Railroad Manager of Industry and Public Projects to handle specific tasks related to the project.

1.02 REQUEST FOR INFORMATION / CLARIFICATION

Submit Requests for Information ("RFI") involving work within any Railroad Right of Way to the TxDOT Engineer. The TxDOT Engineer will submit the RFI to the Railroad Designated Representative for review and approval for RFI's corresponding to work within Railroad Right of Way. Allow six (6) weeks total time for review and approval, which includes four (4) weeks for review and approval by the Railroad.

1.03 PLANS / SPECIFICATIONS

TxDOT has received written Railroad approval of the plans and specifications for this project. Any revisions or changes in the plans after award of the Contract must have the approval of TxDOT and the Railroad.

PART 2 - UTILITIES AND FIBER OPTIC

Construct all utility installations in accordance with current AREMA recommendations, Railroad, TxDOT and owning utility specifications and requirements. Railroad general guidelines can be found on the Railroad website or by contacting the Railroad Designated Representative.

PART 3 - CONSTRUCTION

3.01 GENERAL

A. Perform all work in compliance with all applicable Railroad, Federal Railroad Administration (FRA), and TxDOT rules and regulations. Arrange and conduct work in a manner that does not endanger or interfere with the safe operation of the tracks and property of the Railroad and the traffic moving on such tracks, or the wires, signals and other property of the Railroad, its tenants or licensees, at or in the vicinity of the Work. The safe operation of railroad train movements takes precedence over any work to be performed by the Contractor. The Contractor is responsible for train delay cost and lost revenue claims due to any delays or interruption of train operations resulting from Contractor's construction or other activities.

B. Construction activities within 15 feet of the operational tracks will only be allowed if absolutely necessary and the Railroad's Designated Representative grants approval. Construction activities within 15 feet of the operational track(s) preferably allow the tracks to stay operational. In such cases, coordination and approval by the Railroad Track Manager is required with regard to schedule, flagging, and slow orders. See Sections 3.07 and 3.08 for additional information.

C. Provide track protection for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail. When not in use, keep Contractor machinery and materials at least 50 feet from the Railroad's nearest track.

D. Vehicular crossings of railroad track are allowed only at existing crossings, or haul road crossings developed with Railroad approval.

E. The Contractor is also advised that new railroad facilities within the project may be built by the Railroad. If applicable, these facilities are delineated in the plans. Be aware of the limits of responsibilities and coordinate efforts with the Railroad and TxDOT.

F. Railroad requirements do not allow work within 50 feet of track centers when a train passes the work site and all personnel must clear the area within 50 feet of the track centerline and secure all equipment. Additional allowances may be pursued as outlined in 3.02 and 3.03.

G. All permanent clearances shall be verified before project closing.

3.02 RAILROAD OPERATIONS

A. Trains and/or equipment are expected on any track, at any time, in either direction. Become familiar with the train schedules in this location and structure bid assuming intermittent track windows in this period, as defined in Paragraph B that follows.

B. All railroad tracks within and adjacent to the contract site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. Coordinate and schedule the work so that construction activities do not interfere with railroad operations.

C. Coordinate work windows with TxDOT and the Railroad's Designated Representative. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:

1. Conditional Work Window: A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and/or adjacent to the railroad tracks within 25 feet of the nearest track, a railroad flag person will be required. At the direction of the railroad flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the Railroad Designated Representative, from the tracks). Conditional Work Windows are available for the Project.

2. Absolute Work Window: An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame, the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window, the railroad tracks and/or signals must be completely operational for train operations and all Railroad, Public Utilities Commission (PUC) and FRA requirements, codes and regulations for operational tracks must be satisfied. In the situation where the operating tracks and/or signals have been affected, the Railroad will perform inspections of the work prior to placing that track back into service. Railroad flag persons will be required for construction activities requiring an Absolute Work Window. Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for Railroad review.

3.03 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES

A. Do not perform any work within Railroad Right of Way without a valid executed Right of Entry Agreement if required on this project.

B. Give advance notice to the Railroad as required in the "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over Railroad Right of Way and observe the Railroad's rules and regulations with respect thereto.

C. Perform all work upon Railroad Right of Way in a manner to avoid interference with or endanger the operations of the Railroad. Whenever work may affect the operations or safety of trains, submit the work method to the Railroad Designated Representative for approval. Approval does not relieve the Contractor from liability. Do not commence any work which requires flagging service or inspection service until the flagging protection required by the Railroad is available at the job site. See Section 3.15 for railroad flagging requirements.

D. Make requests in writing for both Absolute and Conditional Work Windows, at least 30 days in advance of any work. Include in the written request:
1. Exactly what the work entails.
2. The days and hours that work will be performed.
3. The exact location of work, and proximity to the tracks.
4. The type of window requested and the amount of time requested.
5. The designated contact person.

Provide a written confirmation notice to the Railroad at least 48 hours before commencing work in connection with approved work windows when work is within 25 feet of nearest rail. Perform all work in accordance with previously approved work plans.

E. Make provisions to protect operations and property of the Railroad should a condition arising from, or in connection with the work, require immediate and unusual action. If in the judgment of the Railroad Designated Representative such provisions are insufficient, the Railroad Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at the Contractor's expense and without cost to the Railroad or TxDOT. The Railroad or TxDOT shall have the right to order the Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of the Railroad Designated Representative, the Contractor's operations could endanger railroad operations. In the event of such an order, immediately notify TxDOT of the order.

3.04 INSURANCE

Do not begin work upon or over Railroad Right of Way until furnishing the Railroad with the insurance policies, binders, certificates and endorsements required by the "Contractor's Right of Entry Agreement", and until the Railroad Designated Representative has advised TxDOT that such insurance is in accordance with the Agreement.

3.05 RAILROAD SAFETY ORIENTATION

A. Complete the railroad course "Orientation for Contractor's Safety", and maintain current registration prior to working on railroad property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

"UPRR, BNSF, KCS/TEXMEX will not accept on-track safety training certificates from other railroads. Refer to Railroad specific contractor right of entry for training information."

B. Know and follow the "Contractor's Right of Entry Agreement" EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

3.06 COOPERATION

The Railroad will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of Railroad Right of Way in performing the work.

3.07 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES

Abide by the following minimum temporary clearances during the course of construction:
A. 15' - 0" (BNSF)(UPRR)and 14'-0" (KCS) horizontal from centerline of track
B. 22' (KCS) and 21' - 6" (UPRR & BNSF) vertically above top of rail.

For construction clearance less than listed above, obtain local Railroad Operating Unit review and approval.

3.08 APPROVAL OF REDUCED CLEARANCES

A. Maintain minimum track clearances during construction as specified in Section 3.07.

B. Submit any proposed infringement on the specified minimum clearances to the Railroad Designated Representative through TxDOT at least 30 days in advance of the work. Do not proceed with such infringement without written approval by the Railroad Designated Representative.

C. Do not commence work involving an approved infringement without receiving written assurance from the Railroad Designated Representative that arrangements have been made for any necessary flagging service.

Texas Department of Transportation | Rail Division

RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS March 2020	0028	02	098,etc	US 90
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		168

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3.09 MAINTENANCE OF RAILROAD FACILITIES

A. Maintain all ditches and drainage structures free of silt or other obstructions resulting from Contractor's operations. Repair eroded areas and any other damage within Railroad Right of Way and repair any other damage to the property of the Railroad, or its tenants.

B. Perform all such maintenance and repair of damages due to the Contractors's operations at Contractor's expense.

C. Submit a proposed method of erosion control for review by the Railroad prior to beginning any grading on the project site. Comply with all applicable local, state and federal regulations when developing and implementing such erosion control.

3.10 SITE INSPECTIONS BY RAILROAD's DESIGNATED REPRESENTATIVE

A. In addition to the office reviews of construction submittals, site inspections may be performed by the Railroad Designated Representative at significant points during construction, including the following if applicable:
   1. Pre-construction meetings.
   2. Pile driving/drilling of caissons or drilled shafts.
   3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.
   4. Erection of precast concrete or steel bridge superstructure.
   5. Placement of waterproofing (prior to placing ballast on bridge deck).
   6. Completion of the bridge structure.

B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by the Railroad.

C. Provide a detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to TxDOT for submittal to the Railroad Designated Representative for review prior to commencement of work. Include the anticipated dates when the above listed events will occur. Update this schedule for the above listed events as necessary and each month at a minimum to allow the Railroad to schedule site inspections.

3.11 RAILROAD REPRESENTATIVES

Railroad representatives, conductors, flag person or watch person will be provided by the Railroad at expense of TxDOT to protect Railroad facilities, property and movements of its trains or engines. In general, the Railroad will furnish such personnel or other protective services as follows:

A. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from nearest rail of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.

B. For any excavation below elevation of track subgrade if, in the opinion of the Railroad Designated Representative, track or other railroad facilities may be subject to settlement or movement.

C. During any clearing, grubbing, excavation or grading in proximity to railroad facilities, which, in the opinion of the Railroad Designated Representative, may endanger railroad facilities or operations.

D. During any Contractor's operations when, in the opinion of the Railroad Designated Representative, railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.

E. Arrange with the Railroad Designated Representative to provide the adequate number of flag persons to accomplish the work.

3.12 COMMUNICATIONS AND SIGNAL LINES

If required, the Railroad will rearrange its communications and signal lines, its grade crossing warning devices, train signals and tracks, and facilities that are in use and maintained by the Railroad's forces in connection with its operation at expense of TxDOT. This work by the Railroad will be done by its own forces and it is not a part of the Work under this Contract.

3.13 TRAFFIC CONTROL

Coordinate any operations that control traffic across or around railroad facilities with the Railroad Designated Representative.

3.14 CONSTRUCTION EXCAVATIONS AND BORING ACTIVITIES UNDER TRACK

A. Take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of TxDOT, OSHA, AREMA and Railroad "Guidelines for Temporary Shoring".

B. The project plans indicate whether there are fiber optic lines or other such telecommunications systems that require consideration. Regardless, contact the necessary call center to determine if such cable systems are present:

   UPRR 1-800-336-9193
   7:00 AM to 9:00 PM CST Monday-Friday except holidays,
   staffed 24 hrs/day for emergencies
   48 hrs notice required

   BNSF 1-800-533-2891
   24 hour number
   5 working days notice required

   KCS 1-800-344-8377
   Texas One Call, a 24 hour number
   48 hrs notice required, excluding weekends and holidays

   If a telecommunications system is buried anywhere on or near railroad property, coordinate with TxDOT, the Railroad and the Telecommunication Company(ies) to arrange for relocation or protective measures prior to beginning work on or near railroad property. Refer to the project General Notes for additional information.

C. Projects involving a boring or jack and bore operation under track such as drainage pipes or culverts and utilities require an installation plan reviewed and approved by the Railroad and TxDOT prior to proceeding with such construction. A railroad inspector and contractor assisted monitoring of ground and track movement is required to maintain safe passage of rail traffic. Stop installation and do not allow passage of trains if movements in excess of 1/4 inch vertical or horizontal is detected in the tracks. Immediately repair the damage to the satisfaction of TxDOT and the Railroad before proceeding.

3.15 RAILROAD FLAGGING

Per the Right of Entry Agreement for flagging, notify the Railroad Representative at least 10 working days in advance of Contractor's work and at least 30 working days in advance of any Contractor's work in which any person or equipment will be within 25 feet of nearest rail or as specified in the Contractor Right of Entry (CROE).

3.16 CLEANING OF RIGHT-OF-WAY

When work is complete, remove all tools, implements, and other materials brought into Railroad Right of Way and leave the right of Way in a clean and presentable condition to the satisfaction of TxDOT and the Railroad.

Texas Department of Transportation | Rail Division

RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS March 2020	0028	02	098, etc	US 90
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		168A

DATE: 11/13/2023 12:52 PM
FILE: DOCUMENT NAME

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with TxDOT policy for projects disturbing less than 1 acre of soil, and not part of a larger common plan of development.

For projects with less than one acre of soil disturbing activity and 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 project's environmental permits, issues, and commitments (EPICs).

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
0028-02-098,ETC

1.2 PROJECT LIMITS:
From: E. OF FM 2100

To: W. OF LIBERTY COUNTY LINE

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 29^52'59.72" ,(Long) 95^03'46.59"

END: (Lat) 29^58'20.64" ,(Long) -94^59'09.78"

1.4 TOTAL PROJECT AREA (Acres): 565

1.5 TOTAL AREA TO BE DISTURBED (Acres): 0.094

1.6 NATURE OF CONSTRUCTION ACTIVITY:
ASPHALT OVERLAY, SEAL COAT, FULL DEPTH REPAIR, GUARD RAIL, FLEX BASE REPAIR, FLASHING SIGNAL, SIGNING AND PAVEMENT MARKINGS

1.7 MAJOR SOIL TYPES:

Soil Type	Description
SANDY SOIL	ATASCO FILE SANDY LOAM 2 TO 5 PERCENT SLOPE
CLAY	BACLIFF CLAY 0 TO 1 PERCENT SLOPE

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):
PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

☐ PSLs determined during preconstruction meeting
☐ PSLs determined during construction
☐ No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:
(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.3.)

☐ 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
☐ Discharges from concrete washout activities, runoff from concrete cutting activities, and other concrete related activities
☐ 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
SEGMENT ID : 1001	SAN JACINTO RIVER

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☐ Other: _____
☐ Other: _____

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED PROFESSIONAL ENGINEER

Sharmeen Rahman, PE
02/16/2024

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

July 2023 Sheet 1 of 2
Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			169
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	98, ETC	US 90

STORMWATER POLLUTION PRVENTION 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

- ☐ ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- ☐ ☐ Temporary Seeding
- ☐ ☐ Permanent Planting, Sodding or Seeding
- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ 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
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- ☐ ☐ 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

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:

- ☒ Excess dirt/mud on road removed daily
- ☒ Haul roads dampened for dust control
- ☒ 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: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ 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 2.3 of this SWP3 .

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 2.3 of this SWP3.

STATE OF TEXAS
SHARMEEN F. RAHMAN
99416
LICENSED PROFESSIONAL ENGINEER

Sharmeen Rahman, P.E.

02/16/2024

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

July 2023 Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			170
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0028	02	98, ETC	US 90

I. STORMWATER POLLUTION PREVENTION

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506. Refer to Storm Water Pollution Prevention Plan (SWP3) Houston District standard plan.

No Additional Comments

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS

United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Army Corps (USACE) Permit Required

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) with a Pre-Construction Notification (PCN). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Individual Permit (IP). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set.

☐ Work would be authorized by the United States Army Corps of Engineers (USACE) permit. The project specific permit issued by the USACE will be provided to the contractor.

United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Coast Guard (USCG) Coordination Required

☐ United States Coast Guard (USCG) Permit

☐ United States Coast Guard (USCG) Exemption

No Additional Comments

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the area and contact the Engineer immediately.

No Additional Comments

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.

No Additional Comments

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS

If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.

The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to October 1). If removal of structures or vegetation is necessary during the nesting season, the Contractor shall conduct a bird survey no more than 3 days in advance of the clearing/demolish start date. All bird surveys shall be conducted by a Field Biologist and adhere to the guidance document “Avoiding Migratory Birds and Handling Potential Violations” found in the TxDOT Environmental Compliance Toolkits at the time of the survey. (See below for Field Biologist and Ornithologist qualifications)

No Additional Comments

Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor’s degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

Refer to TxDOT Standard Specifications in the event potentially contaminated materials are observed, such as dead or distressed vegetation, trash disposal areas, drums, canisters, barrels, leaching or seepage of substances, unusual smells or odors, or stained soil, cease work in the area and contact the Engineer immediately.

No Additional Comments

VII. OTHER ENVIRONMENTAL ISSUES

Comments:

DATE: Sep 16, 2022
FILE:

Version 2.1

Texas Department of Transportation | TxDOT Houston District

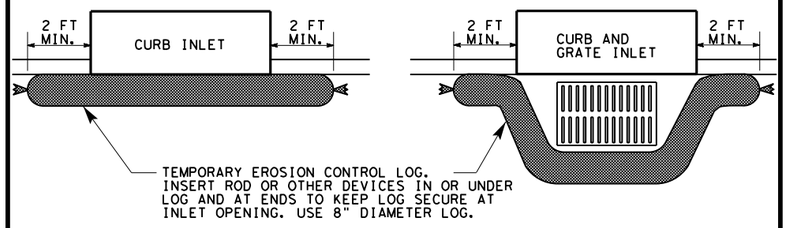
ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0028	02	098	FM 2100
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	HOU	Harris		171

CURB INLETS
8" DIAMETER LOGS

ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8")



MATERIAL REQUIREMENTS

FILL:

Use 100% shredded mulch or other non-compost biodegradable material as fill for logs. No compost or fines.

DO NOT USE MATERIAL WHICH PROHIBITS WATER INFILTRATION.

LOG MESH:
Use mesh with 1/4" openings or larger. Mesh must allow water infiltration but also hold fill material in place.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment trap (erosion control log) may be used to filter sediment out of runoff draining from an unstabilized area.

Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Sediment traps should be placed in the following locations:
1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way

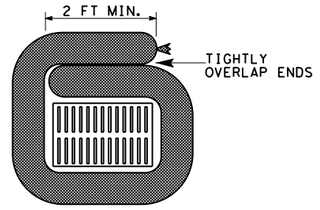
The trap should be cleaned when the capacity has been reduced by 1/2 or the sediment has accumulated to a depth of 1', whichever is less.

REQUIRED ITEMS:

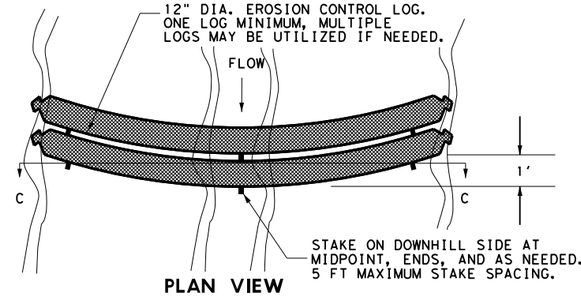
- ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8") LF
- ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12") LF
- ITEM 506-6043 BIODEG EROSN CONT LOGS (REMOVE) LF

DROP INLETS AND OTHER LOCATIONS
12" DIAMETER LOGS

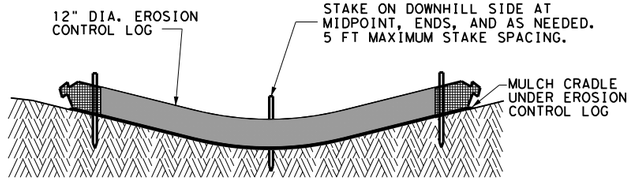
ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL)(12")



DROP INLETS

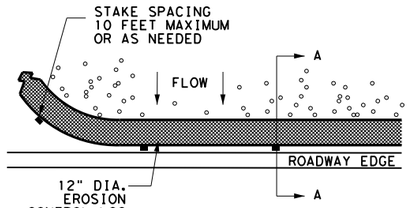


PLAN VIEW

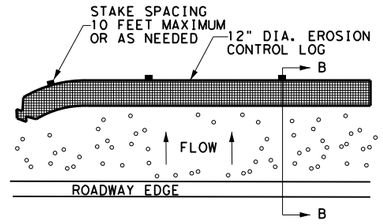


SECTION C-C

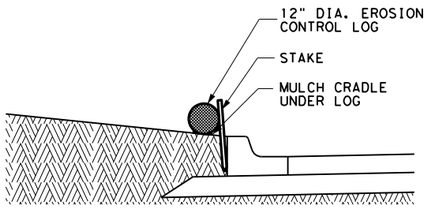
DRAINAGE SWALE OR DITCH



PLAN VIEW

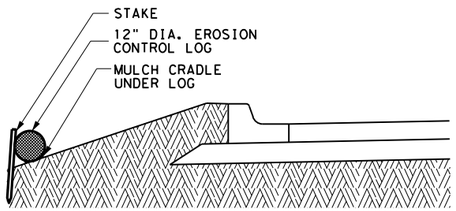


PLAN VIEW



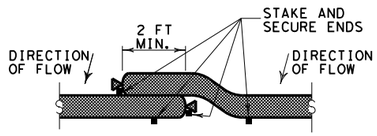
SECTION A-A

SLOPE TO ROADWAY EDGE

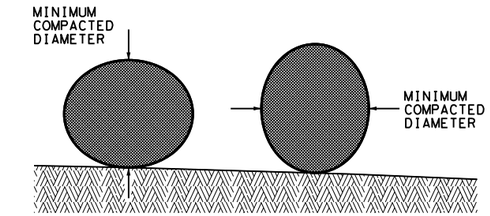


SECTION B-B

SLOPE AWAY FROM ROADWAY EDGE



END OF LOG OVERLAP



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation
Houston District

EROSION CONTROL LOG

ECL-12

FILE: STDG4a.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
©TxDOT 2014	DISTRICT	FED REG	PROJECT NUMBER	SHEET
REVISIONS 3/15 MINOR CORRECTIONS	HOU	6		172
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0028	02	098	US 90

STD G-4A