STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

DESIGN SPEED = 40 MPH

ADT (YR 2024) = 5,040 VPD
ADT (YR 2044) = 7,112 VPD

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	C 523-2-51		1
STATE	DIST.	COUNTY	
TEXAS	HOU	WALLER	
CONT.	SECT.	JOB	HIGHWAY NO.
0523	02	051	FM 362

INDEX OF SHEETS

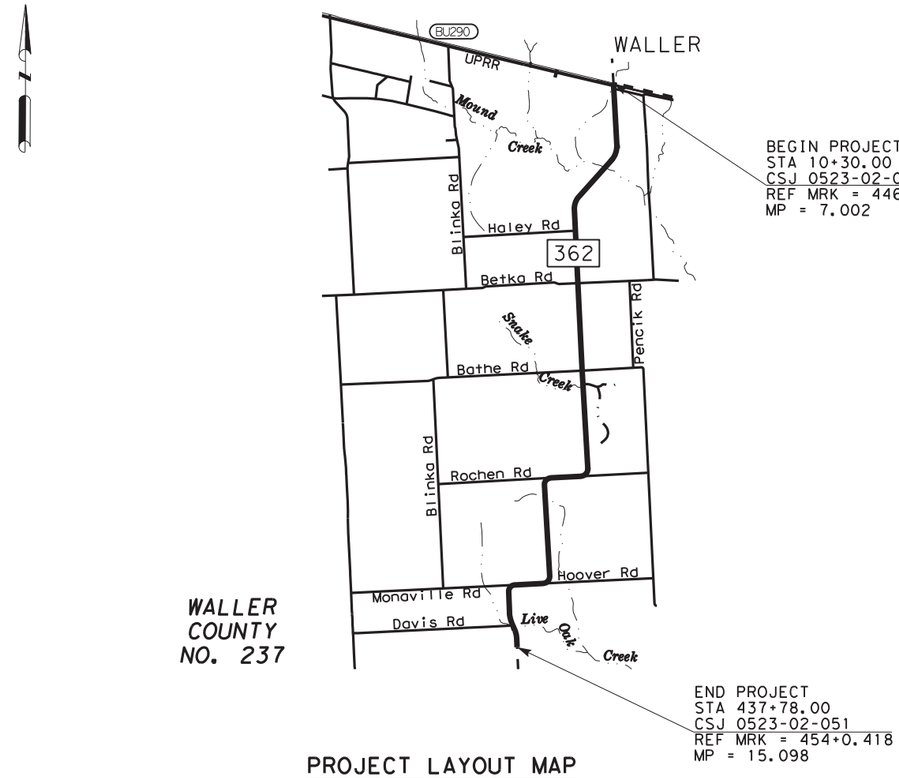
SEE SHEETS 2-3 FOR INDEX OF SHEETS

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

WALLER COUNTY
FM 362
LIMITS: BU 290H TO 0.25 MI SOUTH OF DAVIS ROAD
PROJECT C 523-2-51
CONTROL 0523-02-051

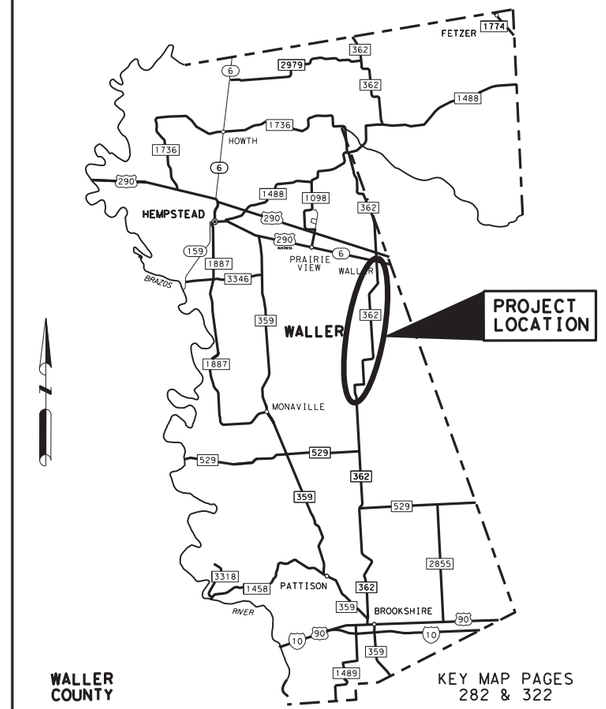
FOR THE CONSTRUCTION OF MISCELLANEOUS WORK CONSISTING OF BASE REPAIR, 2" PLANING, SEAL COAT, 1.5" ACP OVERLAY, RUMBLE STRIPS, SIGNING & PAVEMENT MARKINGS

CSJ	ROADWAY LENGTH	BRIDGE LENGTH	TOTAL LENGTH
0523-02-051	42,484.90 FT / 8.046 MI	263.10 FT / 0.050 MI	42,748.00 FT / 8.096 MI



WALLER COUNTY NO. 237

PROJECT LAYOUT MAP
N. T. S.



VICINITY MAP
N. T. S.

FUNCTIONAL CLASSIFICATION: RURAL MAJOR COLLECTOR

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, AND THE SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT: REQUIRED SPECIAL LABOR PROVISION FOR STATE PROJECTS: SP000---008.

EQUATIONS: NONE
EXCEPTIONS: NONE
RR CROSSINGS: AT UPRR (STA 11+18.48 TO STA 11+28.90)

SUBMITTED FOR LETTING: 10/12/2023

DocuSigned by:
, P.E.
AREA ENGINEER
999EB2AF5ACE472...

APPROVED FOR LETTING: 10/25/2023

DocuSigned by:
James Koch , P.E.
8A2ACEA465C24CC...
For DISTRICT ENGINEER

COUNTY: WALLER PROJ. NO.: C 523-2-51
HWY. NO.: FM 362 LETTING DATE:
DATE ACCEPTED:

SHEET NO.	DESCRIPTION

I. GENERAL

II. TRAFFIC CONTROL PLAN

STANDARDS - TRAFFIC CONTROL

III. ROADWAY DETAILS

SHEET NO.	DESCRIPTION

STANDARDS - ROADWAY

IV. BRIDGE ITEMS

STANDARDS/DETAILS

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED
PROFESSIONAL ENGINEER

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

Robert S. Bissett Jr., P.E. 11/21/23
DATE

INDEX OF SHEETS

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		2

SHEET NO.	DESCRIPTION

V. TRAFFIC ITEMS

TRAFFIC SIGNALS

	113	SOLAR POWER LED CHEVRON SIGN DETAIL

STANDARDS/DETAILS - TRAFFIC SIGNALS

*	114	ELECTRICAL DETAILS CONDUITS & NOTES ED(1)-14
*	115	ELECTRICAL DETAILS SERVICE NOTES & DATA ED(5)-14
*	116	ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES ED(6)-14

SIGNING & PAVEMENT MARKINGS

	117-118	GUIDE SIGN DETAILS

STANDARDS - SIGNING & PAVEMENT MARKINGS

*	119-121	TYPICAL SIGN REQUIREMENT TSR(3)-13 THRU TSR(5)-13
*	122	RAILROAD CROSSING DETAILS SIGNING, STRIPING, AND DEVICE PLACEMENT RCD(1)-22
*	123	RAILROAD CROSSING DETAILS SIGNING & STRIPING RCD(2)-22
*	124	DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION D & OM(1)-20
*	125	DELINEATOR & OBJECT MARKER INSTALLATION D & OM(2)-20
*	126	TYPICAL DELINEATOR & OBJECT MARKER PLACEMENT DETAILS D & OM(3)-20
*	127	DELINEATOR & OBJECT MARKER PLACEMENT DETAILS D & OM(4)-20
*	128	DELINEATOR & OBJECT MARKER PLACEMENT DETAILS D & OM(5)-20
*	129	DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS D & OM(VIA)-20
*	130	TYPICAL STANDARD PAVEMENT MARKINGS PM(1)-22
*	131	POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS PM(2)-22
*	132	TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-22
*	133	PAVEMENT MARKINGS FOR ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT PM(5)-22
*	134	SIGN MOUNTING DETAILS - SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS SMD(GEN)-08
*	135-137	SIGN MOUNTING DETAILS - SMALL ROADSIDE SIGNS - TRIANGULAR SLIPBASE SYSTEM SMD(SLIP-1)-08 THRU SMD(SLIP-3)-08
*	138	EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23
*	139	CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23
	140	EDGELINE RUMBLE STRIPS DETAILS

SHEET NO.	DESCRIPTION

VI. RAILROAD

141	RAILROAD SCOPE OF WORK PROJECT SPECIFIC DETAILS
142-143	RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

VII. ENVIRONMENTAL ISSUES

SW3P

	144-145	STORMWATER POLLUTION PREVENTION PLAN (SWP3) (LESS THAN 1 ACRE)
*	146	EROSION CONTROL LOG ECL-12 (HOU DIST)
*	147	FERTILIZER, SEED, SOD, STRAW, COMPOST, AND WATER FSSSCW-15 (HOU DIST)
	148	ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC

STATE OF TEXAS
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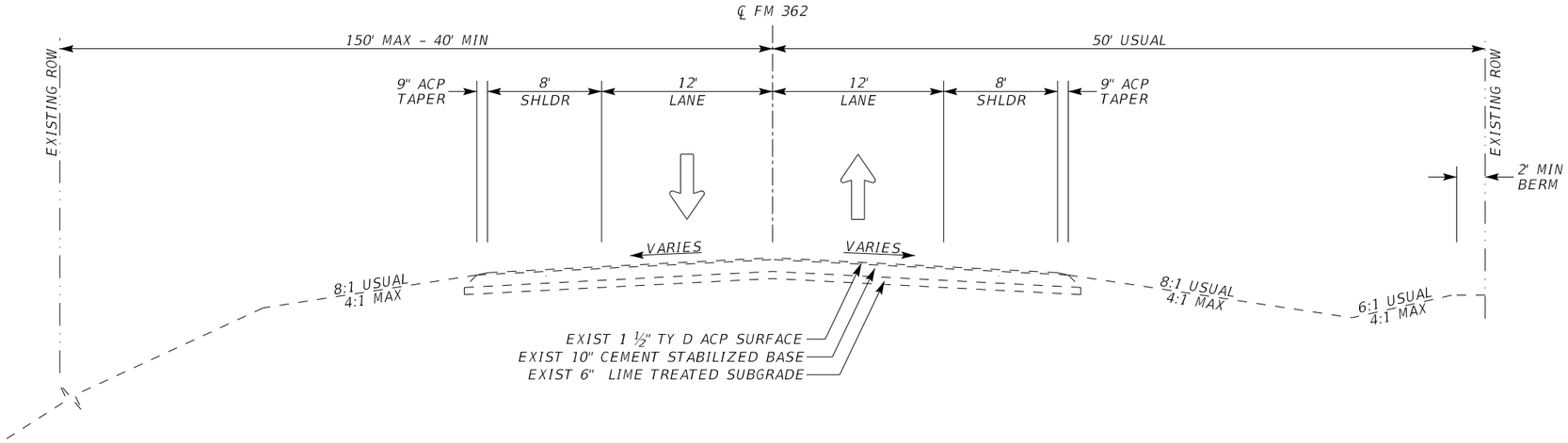
Robert S. Bissett Jr. P.E. 11/21/23
DATE

INDEX OF SHEETS

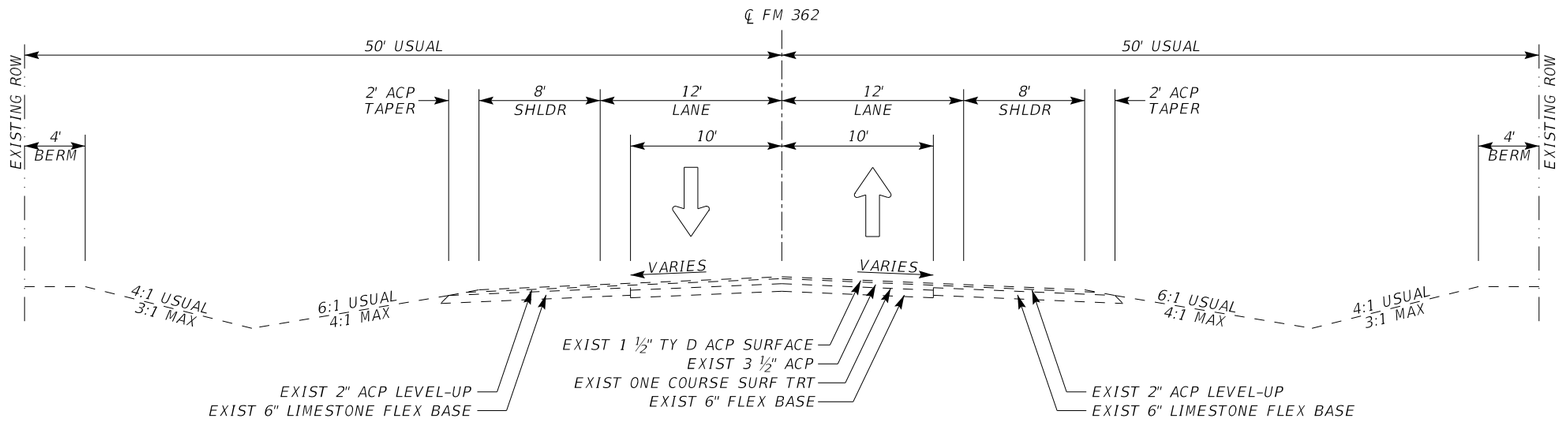
CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		3



EXISTING TYPICAL SECTION

STA 10+43.79 TO STA 12+28.04

STA 12+28.04 TO STA 12+67.71 (BRIDGE CLASS CULVERT)



EXISTING TYPICAL SECTION

STA 12+67.71 TO STA 40+17.87

STATE OF TEXAS
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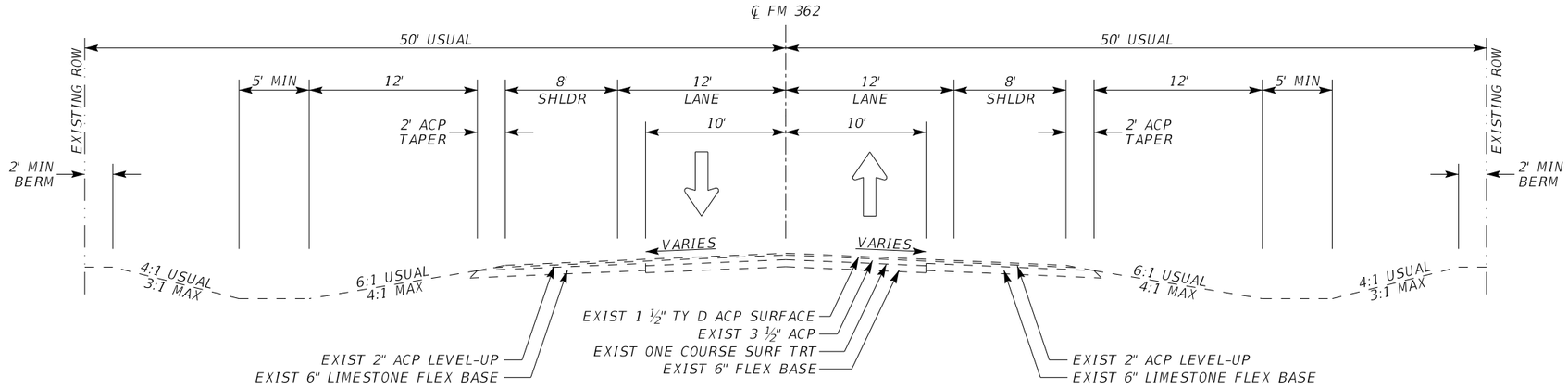
08/14/23

EXISTING TYPICAL SECTIONS

SCALE: 1"=10'H, 1"=10'V

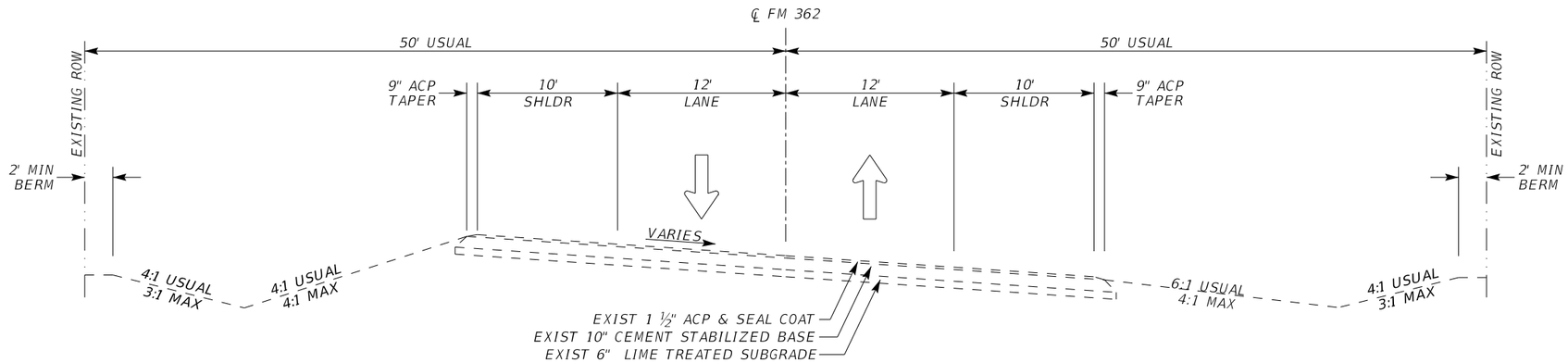
SHEET 1 OF 5

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		4



EXISTING TYPICAL SECTION

STA 40+17.87 TO STA 51+10.55



EXISTING TYPICAL SECTION

STA 51+10.55 TO STA 61+96.00

STATE OF TEXAS
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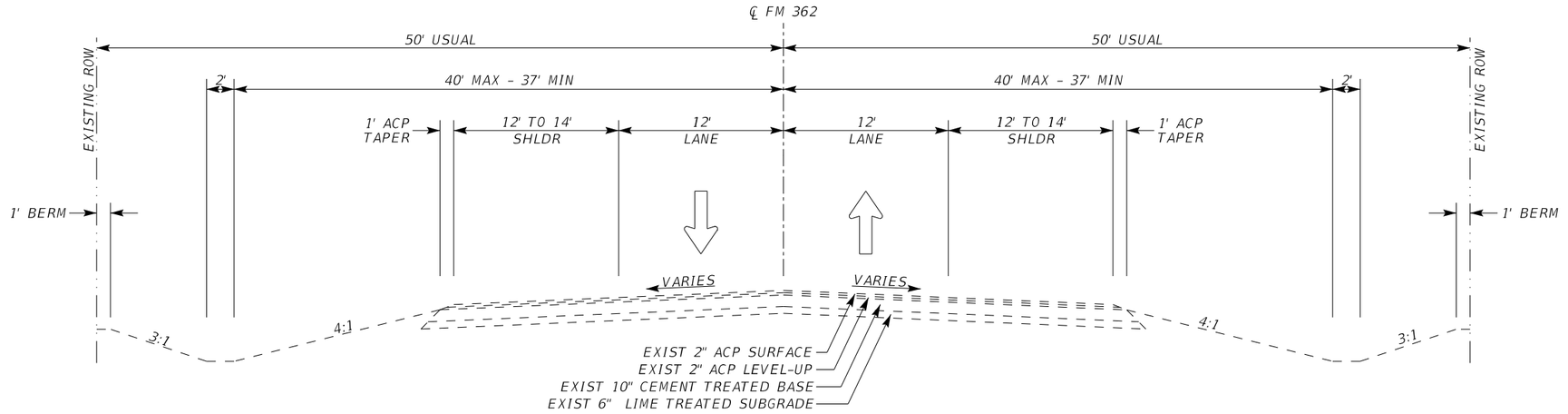
Robert S. Bissett Jr.

06/20/23

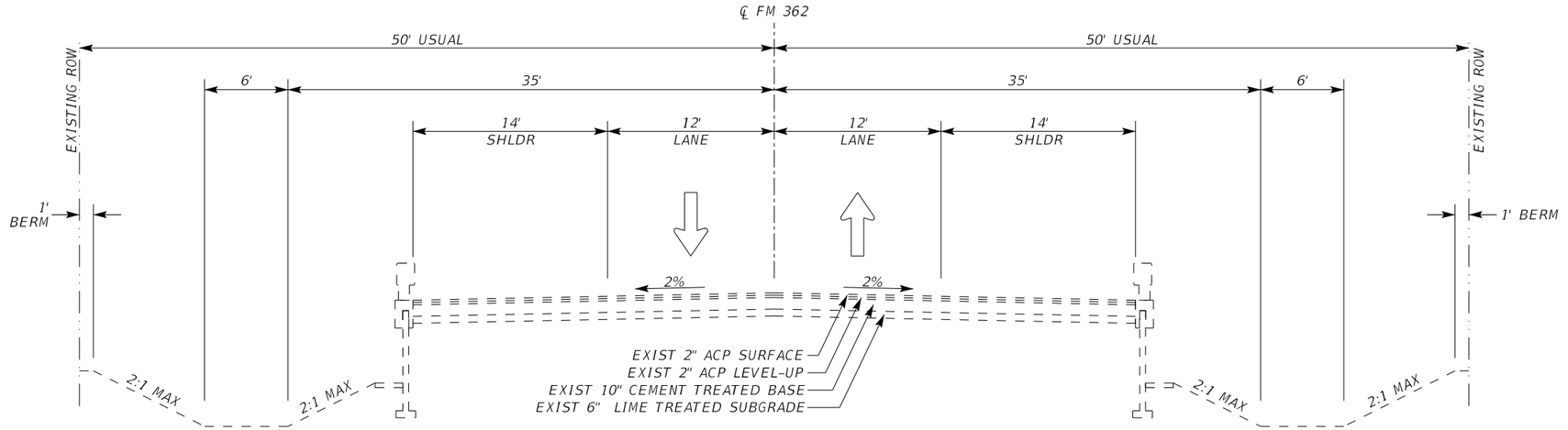
EXISTING TYPICAL SECTIONS

SCALE: 1"=10'H, 1"=10'V

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		5



EXISTING TYPICAL SECTION
STA 61+96.00 TO STA 65+46.00



EXISTING TYPICAL SECTION
STA 65+46.00 TO STA 67+52.84
STA 69+89.16 TO STA 71+64.00

OMITTED - MOUND CREEK BRIDGE AND BRIDGE APPROACHES
STA 67+52.84 TO STA 69+89.16

STATE OF TEXAS
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REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

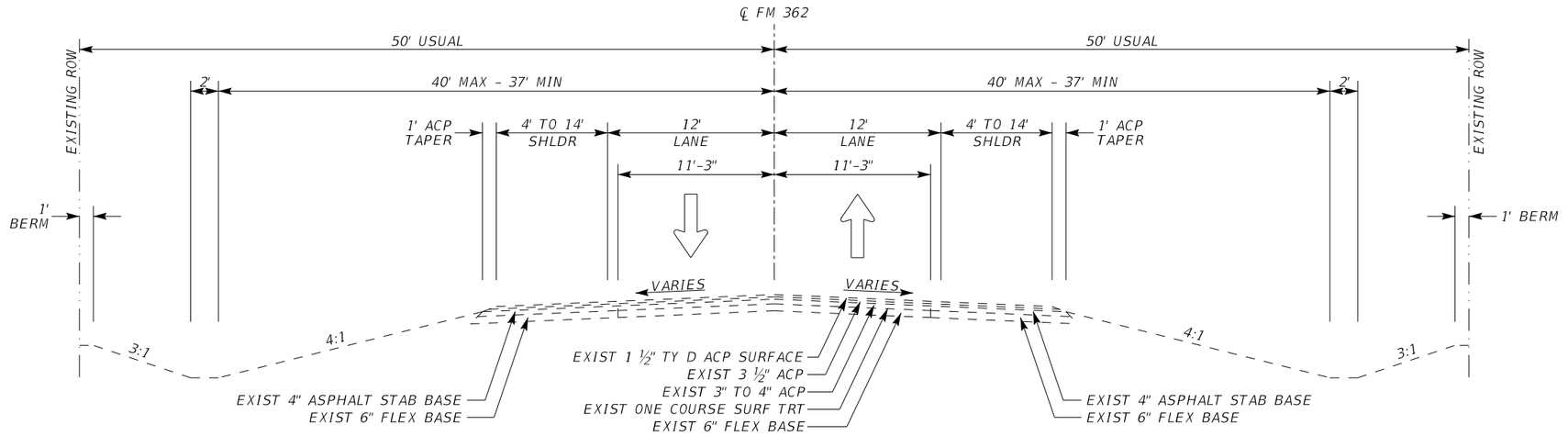
06/20/23

EXISTING TYPICAL SECTIONS

SCALE: 1"=10'H, 1"=10'V

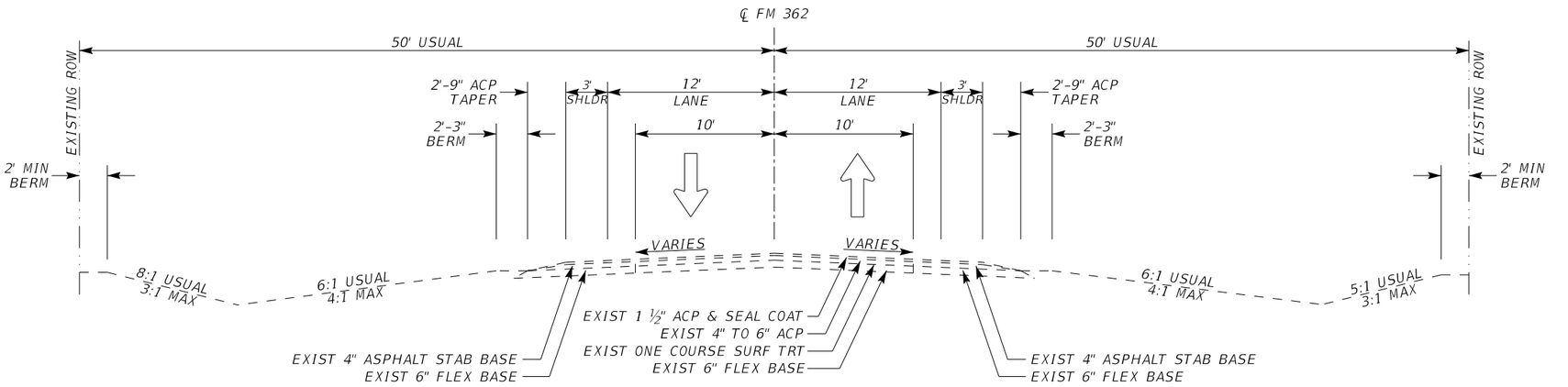
SHEET 3 OF 5

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		6



EXISTING TYPICAL SECTION

STA 71+64.00 TO STA 74+46.00



EXISTING TYPICAL SECTION

STA 74+46.00 TO STA 94+19.12
STA 103+30.04 TO STA 274+11.04
STA 283+21.24 TO STA 300+93.18
STA 310+42.15 TO STA 368+23.30
STA 377+69.97 TO STA 393+45.23
STA 403+13.80 TO STA 416+76.06
STA 421+64.64 TO STA 427+06.46
STA 431+09.45 TO STA 437+78.00

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED
PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

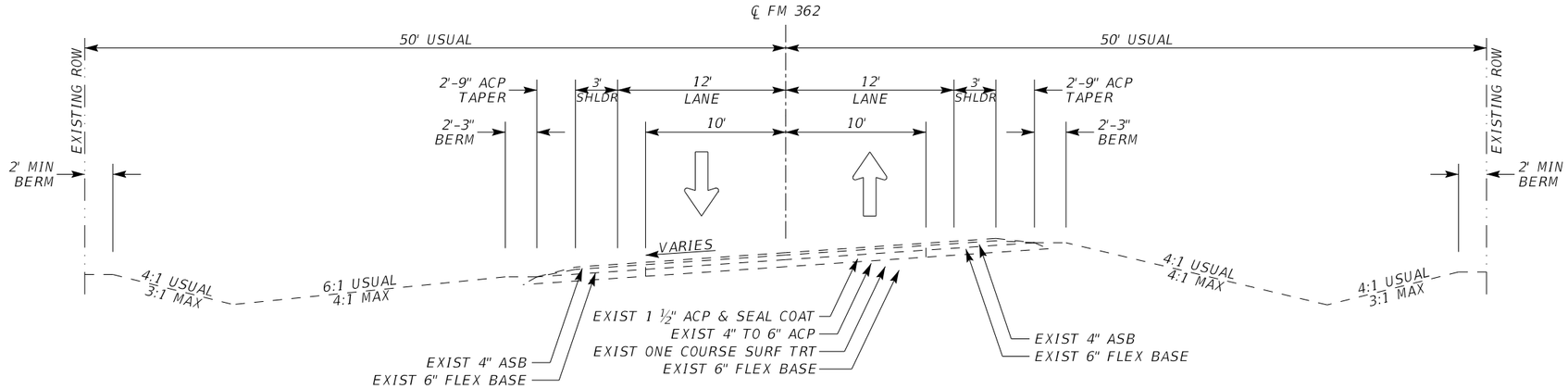
08/14/23

EXISTING TYPICAL SECTIONS

SCALE: 1"=10'H, 1"=10'V

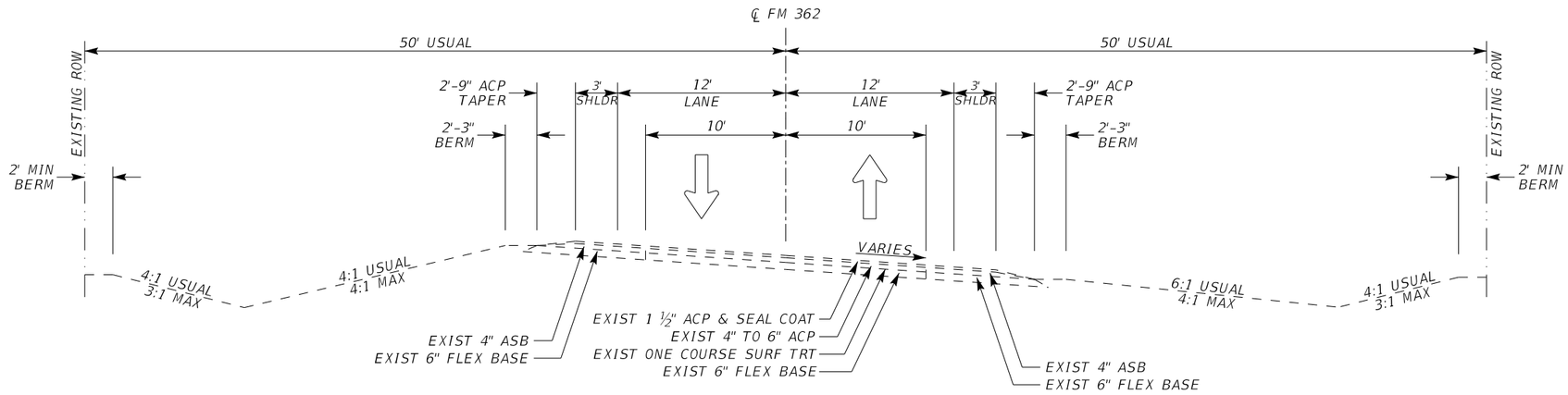
SHEET 4 OF 5

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		7



EXISTING TYPICAL SECTION

STA 94+19.12 TO STA 103+30.04



EXISTING TYPICAL SECTION

STA 274+11.04 TO STA 283+21.24
STA 300+93.18 TO STA 310+42.15
STA 368+23.30 TO STA 377+69.97
STA 393+45.23 TO STA 403+13.80
STA 416+76.06 TO STA 421+64.64
STA 427+06.46 TO STA 431+09.45

STATE OF TEXAS
ROBERT S. BISSETT, JR.
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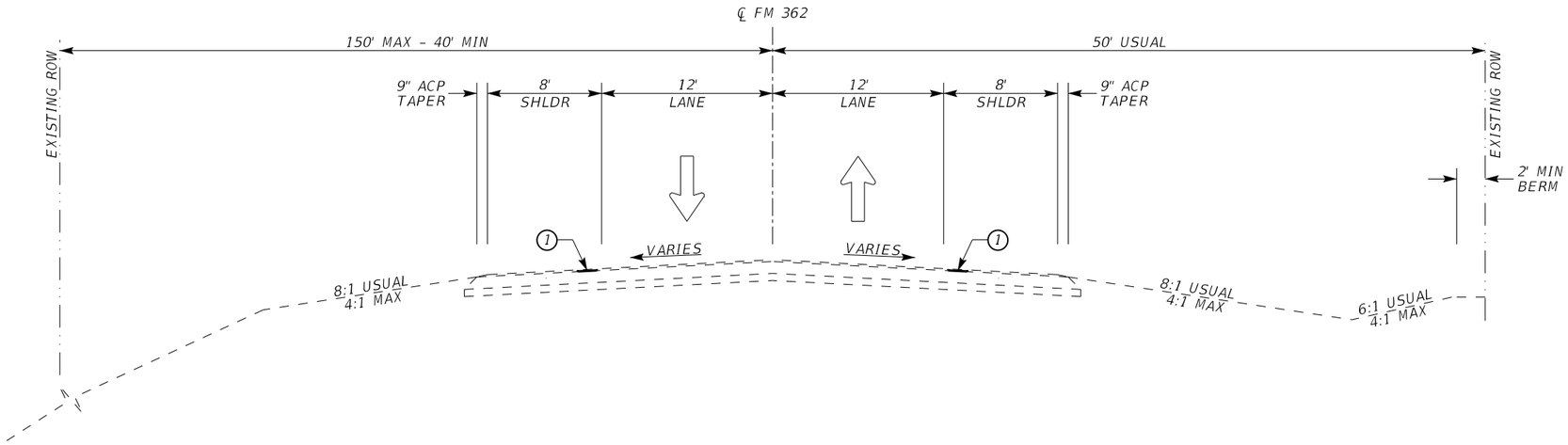
Robert S. Bissett Jr.

08/14/23

EXISTING TYPICAL SECTIONS

SCALE: 1"=10'H, 1"=10'V

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		8



PROPOSED TYPICAL SECTION

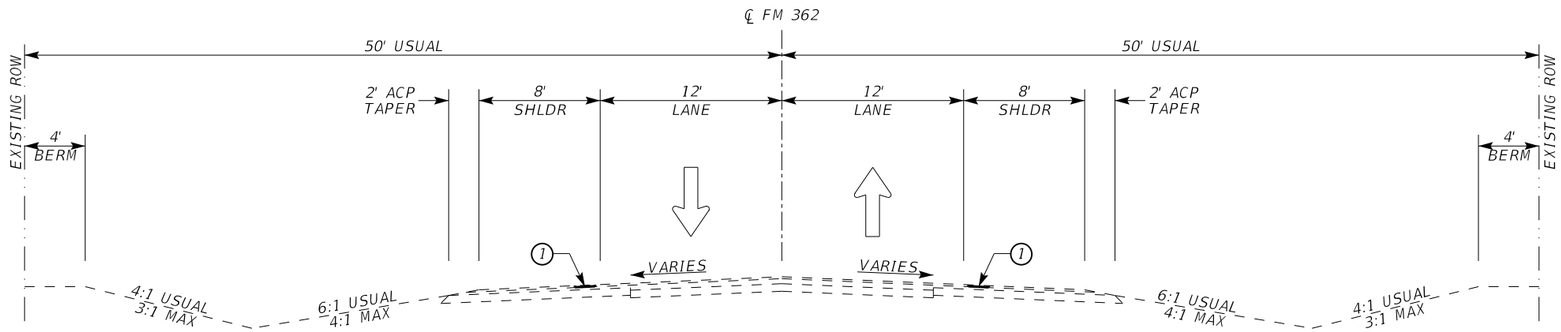
STA 10+43.79 TO STA 12+28.04

STA 12+28.04 TO STA 12+67.71 (BRIDGE CLASS CULVERT)

(PAVEMENT MARKINGS AND RUMBLE STRIPS ONLY)

NOTES:

1. SEE "SIGNING & PAVEMENT MARKING LAYOUT" SHEETS FOR LIMITS OF MILLED RUMBLE STRIPS.
2. REFER TO "EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23" STANDARD.
3. REFER TO "CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23" STANDARD.



PROPOSED TYPICAL SECTION

STA 12+67.71 TO STA 40+17.87

(PAVEMENT MARKINGS AND RUMBLE STRIPS ONLY)

(1) EDGELINE MILLED RUMBLE STRIPS (SEE NOTE 2)
(2) CENTERLINE MILLED RUMBLE STRIPS (SEE NOTE 3)

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

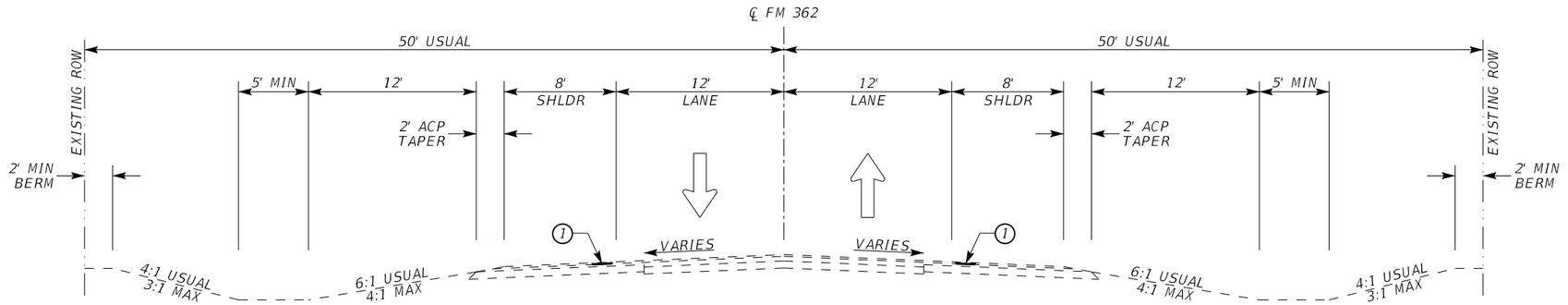
Robert S. Bissett Jr.
08/14/23

PROPOSED TYPICAL SECTIONS

SCALE: 1"=10'H, 1"=10'V

SHEET 1 OF 5

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		9



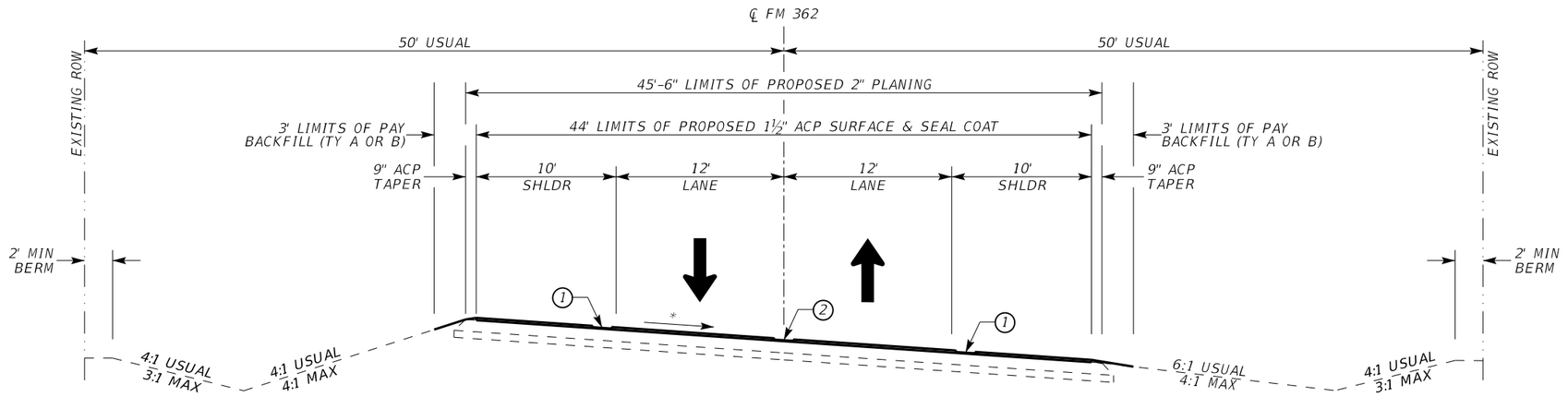
NOTES:

1. SURFACE TEST TYPE B, PAY ADJUSTMENT SCHEDULE 3.
2. SEE "SIGNING & PAVEMENT MARKING LAYOUT" SHEETS FOR LIMITS OF MILLED RUMBLE STRIPS.
3. REFER TO "EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23" STANDARD.
4. REFER TO "CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23" STANDARD.

PROPOSED TYPICAL SECTION

STA 40+17.87 TO STA 51+10.55

(PAVEMENT MARKINGS AND EDGELINE MILLED RUMBLE STRIPS ONLY)



* MATCH EXISTING SLOPE

(1) EDGELINE MILLED RUMBLE STRIPS (SEE NOTE 3)

(2) CENTERLINE MILLED RUMBLE STRIPS (SEE NOTE 4)

PROPOSED TYPICAL SECTION

STA 51+10.55 TO STA 61+96.00

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED
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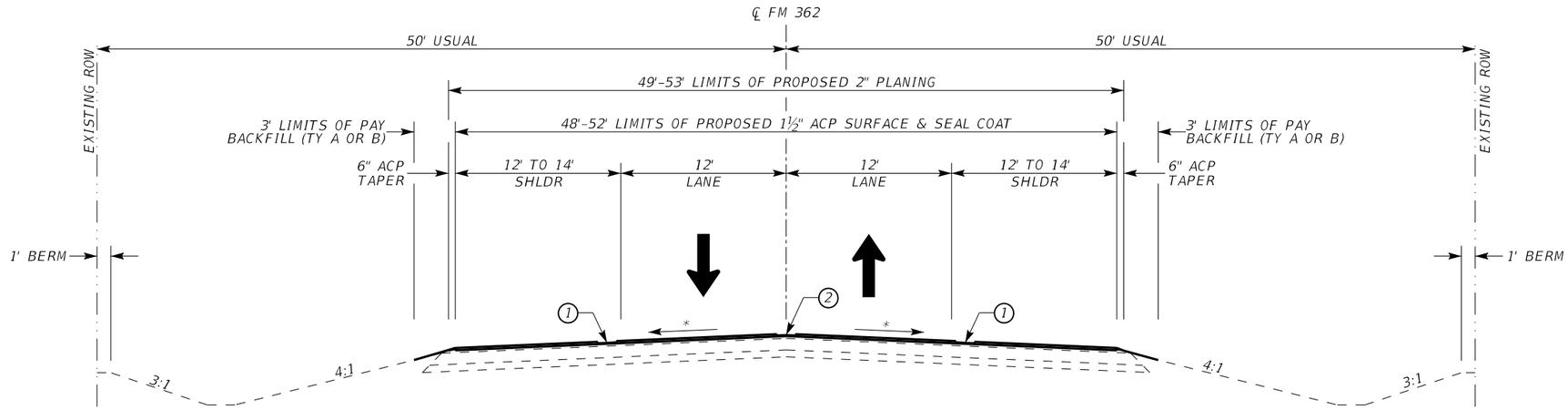
Robert S. Bissett Jr.

08/14/23

PROPOSED TYPICAL SECTIONS

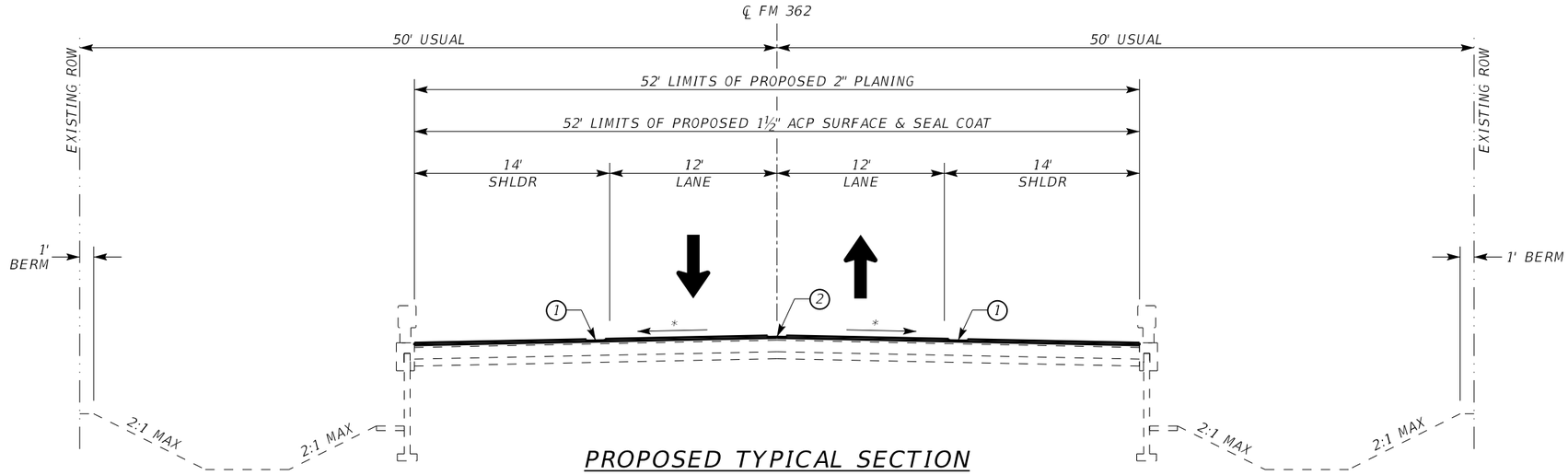
SCALE: 1"=10'H, 1"=10'V

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		10



PROPOSED TYPICAL SECTION

STA 61+96.00 TO STA 65+46.00



PROPOSED TYPICAL SECTION

STA 65+46.00 TO STA 67+52.84
STA 69+89.16 TO STA 71+64.00

* MATCH EXISTING SLOPE
(1) EDGELINE MILLED RUMBLE STRIPS
(2) CENTERLINE MILLED RUMBLE STRIPS

OMITTED - MOUND CREEK BRIDGE AND BRIDGE APPROACHES

STA 67+52.84 TO STA 69+89.16
(PAVEMENT MARKINGS ONLY)

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

06/20/23

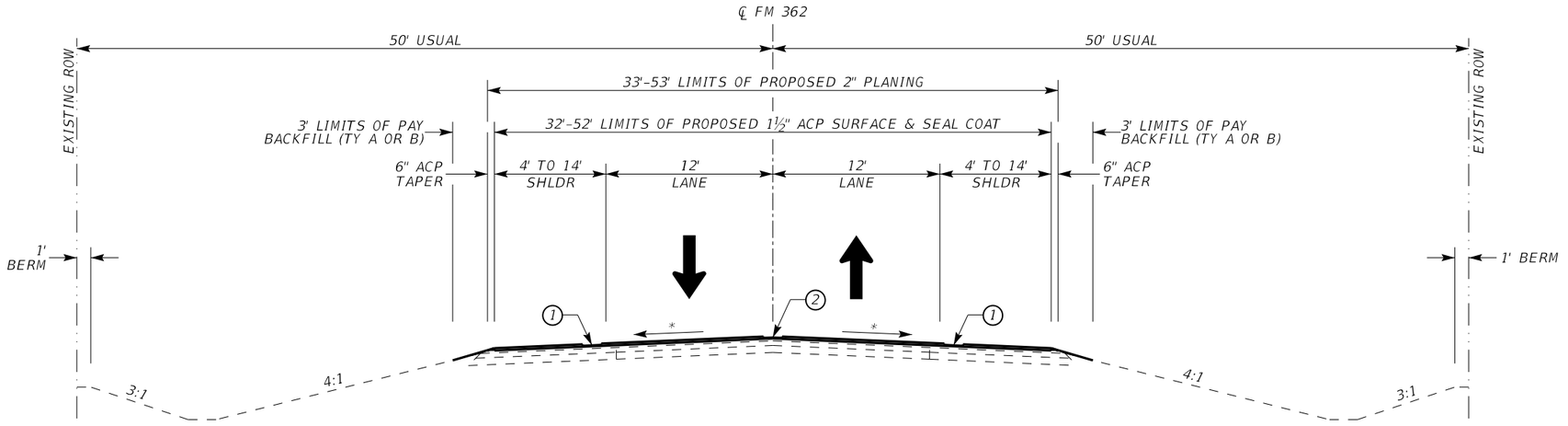
PROPOSED TYPICAL SECTIONS

Texas Department of Transportation

SCALE: 1"=10'H, 1"=10'V

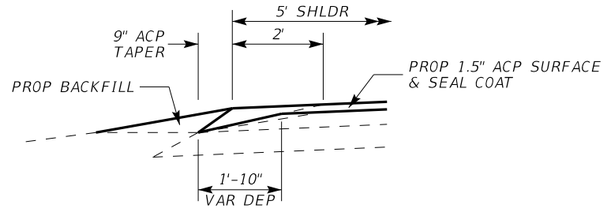
SHEET 3 OF 5

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		11

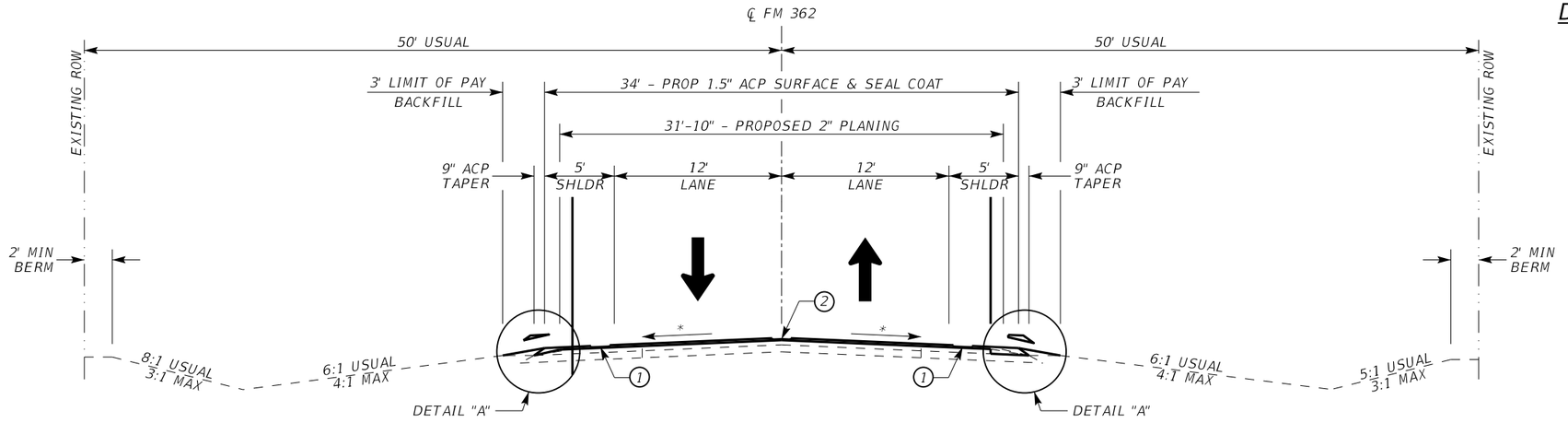


PROPOSED TYPICAL SECTION

STA 71+64.00 TO STA 74+46.00



DETAIL "A"



PROPOSED TYPICAL SECTION

STA 74+46.00 TO STA 94+19.12
STA 103+30.04 TO STA 274+11.04
STA 283+21.24 TO STA 300+93.18
STA 310+42.15 TO STA 368+23.30
STA 377+69.97 TO STA 393+45.23
STA 403+13.80 TO STA 416+76.06
STA 421+64.64 TO STA 427+06.46
STA 431+09.45 TO STA 437+78.00

NOTES:

1. SURFACE TEST TYPE B, PAY ADJUSTMENT SCHEDULE 3.
2. SEE "SIGNING & PAVEMENT MARKING LAYOUT" SHEETS FOR LIMITS OF MILLED RUMBLE STRIPS.
3. REFER TO "EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23" STANDARD.
4. REFER TO "CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23" STANDARD.

* MATCH EXISTING SLOPE
(1) EDGELINE MILLED RUMBLE STRIPS (SEE NOTE 3)
(2) CENTERLINE MILLED RUMBLE STRIPS (SEE NOTE 4)

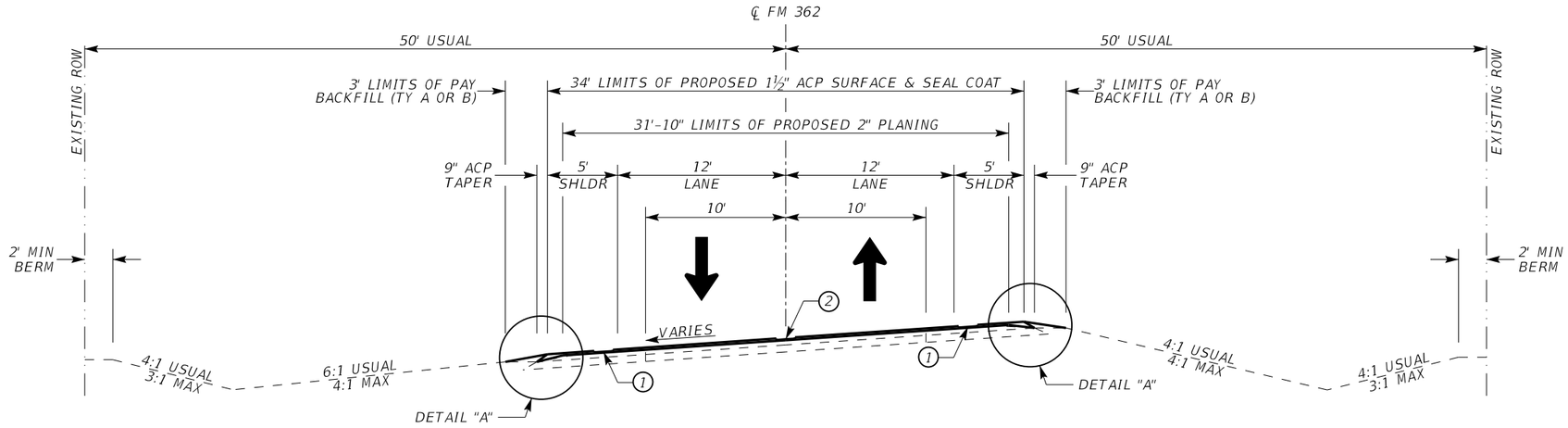
STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.
08/14/23

PROPOSED TYPICAL SECTIONS

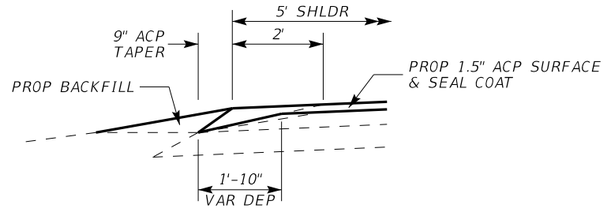
SCALE: 1"=10'H, 1"=10'V

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		12



PROPOSED TYPICAL SECTION

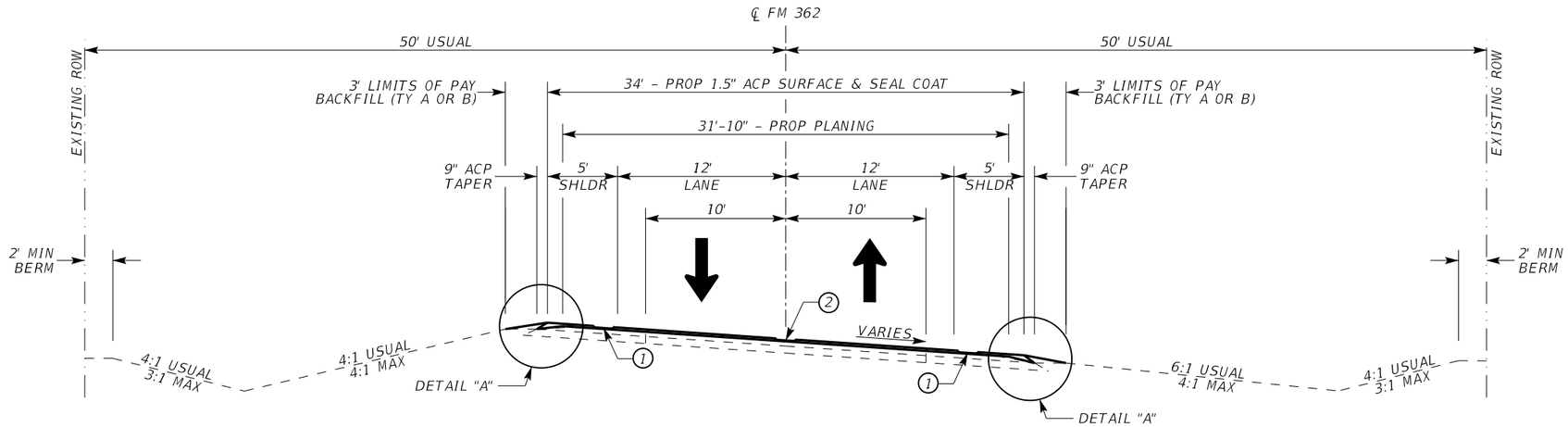
STA 94+19.12 TO STA 103+30.04



DETAIL "A"

NOTES:

1. SURFACE TEST TYPE B, PAY ADJUSTMENT SCHEDULE 3.
2. SEE "SIGNING & PAVEMENT MARKING LAYOUT" SHEETS FOR LIMITS OF MILLED RUMBLE STRIPS.



PROPOSED TYPICAL SECTION

STA 274+11.04 TO STA 283+21.24
STA 300+93.18 TO STA 310+42.15
STA 368+23.30 TO STA 377+69.97
STA 393+45.23 TO STA 403+13.80
STA 416+76.06 TO STA 421+64.64
STA 427+06.46 TO STA 431+09.45

* MATCH EXISTING SLOPE
(1) EDGELINE MILLED RUMBLE STRIPS
(2) CENTERLINE MILLED RUMBLE STRIPS

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06/20/23

PROPOSED TYPICAL SECTIONS

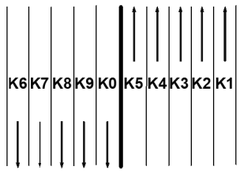
SCALE: 1"=10'H, 1"=10'V

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		13

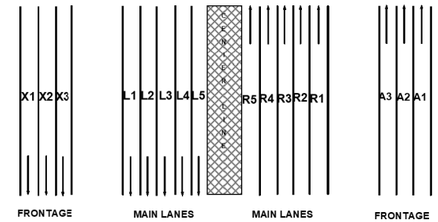
												P						
	M		R									T						
	S		D									Y						
F	E		B	REFERENCE MARKERS								P			IRI(IN/MI)			
Y	C		D									E	TEST	DIST				
		HIGHWAY		BEGIN			END			LEN		MM/DD/YYY	TRAV		LEFT	RIGHT	SI	COMMENTS
2020	07	FM0362	K	0446	+	0.185	0446	+	0.285		05	7/31/2019			288	302	1.3	
2020	07	FM0362	K	0446	+	0.285	0446	+	0.385		05	7/31/2019			53	51	4.7	
2020	07	FM0362	K	0446	+	0.385	0446	+	0.485		05	7/31/2019			47	46	4.9	
2020	07	FM0362	K	0446	+	0.485	0446	+	0.585		05	7/31/2019			52	49	4.8	
2020	07	FM0362	K	0446	+	0.585	0446	+	0.685		05	7/31/2019			52	57	4.7	
2020	07	FM0362	K	0446	+	0.685	0446	+	0.785		05	7/31/2019			57	40	4.8	
2020	07	FM0362	K	0446	+	0.785	0446	+	0.885		05	7/31/2019			61	66	4.4	
2020	07	FM0362	K	0446	+	0.885	0446	+	0.985		05	7/31/2019			71	74	4.2	
2020	07	FM0362	K	0446	+	0.985	0446	+	1.085		05	7/31/2019			80	76	4.1	
2020	07	FM0362	K	0446	+	1.085	0446	+	1.185		05	7/31/2019			64	78	4.2	
2020	07	FM0362	K	0446	+	1.185	0446	+	1.285		05	7/31/2019			106	99	3.6	
2020	07	FM0362	K	0446	+	1.285	0446	+	1.385		05	7/31/2019			158	195	2.5	
2020	07	FM0362	K	0446	+	1.385	0446	+	1.485		05	7/31/2019			98	85	3.8	
2020	07	FM0362	K	0446	+	1.485	0446	+	1.585		05	7/31/2019			76	84	4.1	
2020	07	FM0362	K	0446	+	1.585	0446	+	1.685		05	7/31/2019			70	71	4.3	
2020	07	FM0362	K	0446	+	1.685	0446	+	1.785		05	7/31/2019			61	83	4.2	
2020	07	FM0362	K	0446	+	1.785	0446	+	1.885		05	7/31/2019			74	79	4.1	
2020	07	FM0362	K	0446	+	1.885	0446	+	0.009		05	7/31/2019			61	47	4.7	
2020	07	FM0362	K	0448	+	0.009	0448	+	0.109		05	7/31/2019			78	80	4.1	
2020	07	FM0362	K	0448	+	0.109	0448	+	0.209		05	7/31/2019			52	68	4.5	
2020	07	FM0362	K	0448	+	0.209	0448	+	0.309		05	7/31/2019			79	96	3.9	
2020	07	FM0362	K	0448	+	0.309	0448	+	0.409		05	7/31/2019			50	62	4.6	
2020	07	FM0362	K	0448	+	0.409	0448	+	0.509		05	7/31/2019			66	66	4.4	
2020	07	FM0362	K	0448	+	0.509	0448	+	0.609		05	7/31/2019			75	65	4.3	
2020	07	FM0362	K	0448	+	0.609	0448	+	0.709		05	7/31/2019			58	69	4.4	
2020	07	FM0362	K	0448	+	0.709	0448	+	0.809		05	7/31/2019			59	60	4.5	
2020	07	FM0362	K	0448	+	0.809	0448	+	0.909		05	7/31/2019			77	76	4.1	
2020	07	FM0362	K	0448	+	0.909	0448	+	1.009		05	7/31/2019			70	71	4.3	
2020	07	FM0362	K	0448	+	1.009	0448	+	1.109		05	7/31/2019			63	71	4.3	
2020	07	FM0362	K	0448	+	1.109	0448	+	1.209		05	7/31/2019			71	51	4.5	
2020	07	FM0362	K	0448	+	1.209	0448	+	1.309		05	7/31/2019			78	51	4.4	
2020	07	FM0362	K	0448	+	1.309	0448	+	1.409		05	7/31/2019			79	55	4.3	
2020	07	FM0362	K	0448	+	1.409	0448	+	1.509		05	7/31/2019			74	61	4.3	
2020	07	FM0362	K	0448	+	1.509	0448	+	1.609		05	7/31/2019			75	59	4.3	
2020	07	FM0362	K	0448	+	1.609	0448	+	1.709		05	7/31/2019			87	63	4.2	
2020	07	FM0362	K	0448	+	1.709	0448	+	1.809		05	7/31/2019			70	49	4.5	
2020	07	FM0362	K	0448	+	1.809	0448	+	1.909		05	7/31/2019			60	46	4.7	
2020	07	FM0362	K	0448	+	1.909	0448	+	0.071		05	7/31/2019			64	63	4.4	
2020	07	FM0362	K	0450	+	0.071	0450	+	0.171		05	7/31/2019			63	61	4.5	
2020	07	FM0362	K	0450	+	0.171	0450	+	0.271		05	7/31/2019			124	110	3.4	
2020	07	FM0362	K	0450	+	0.271	0450	+	0.371		05	7/31/2019			56	70	4.4	
2020	07	FM0362	K	0450	+	0.371	0450	+	0.471		05	7/31/2019			68	76	4.2	

												P						
	M		R									T						
	S		D									Y						
F	E		B	REFERENCE MARKERS								P			IRI(IN/MI)			
Y	C		D									E	TEST	DIST				
		HIGHWAY		BEGIN			END			LEN		MM/DD/YYY	TRAV		LEFT	RIGHT	SI	COMMENTS
2020	07	FM0362	K	0450	+	0.471	0450	+	0.571		05	7/31/2019			45	61	4.7	
2020	07	FM0362	K	0450	+	0.571	0450	+	0.671		05	7/31/2019			49	70	4.5	
2020	07	FM0362	K	0450	+	0.671	0450	+	0.771		05	7/31/2019			48	64	4.6	
2020	07	FM0362	K	0450	+	0.771	0450	+	0.871		05	7/31/2019			44	59	4.7	
2020	07	FM0362	K	0450	+	0.871	0450	+	0.971		05	7/31/2019			41	55	4.8	
2020	07	FM0362	K	0450	+	0.971	0450	+	1.071		05	7/31/2019			56	66	4.5	
2020	07	FM0362	K	0450	+	1.071	0450	+	1.171		05	7/31/2019			36	50	5.0	
2020	07	FM0362	K	0450	+	1.171	0450	+	1.271		05	7/31/2019			48	63	4.6	
2020	07	FM0362	K	0450	+	1.271	0450	+	1.293		05	7/31/2019			80	102	3.8	
2020	07	FM0362	K	0450	+	1.293	0450	+	1.393		05	7/31/2019			96	102	3.7	
2020	07	FM0362	K	0450	+	1.393	0450	+	1.493		05	7/31/2019			84	94	3.9	
2020	07	FM0362	K	0450	+	1.493	0450	+	1.593		05	7/31/2019			69	74	4.2	
2020	07	FM0362	K	0450	+	1.593	0450	+	1.693		05	7/31/2019			58	65	4.5	
2020	07	FM0362	K	0450	+	1.693	0450	+	1.793		05	7/31/2019			68	77	4.2	
2020	07	FM0362	K	0450	+	1.793	0450	+	1.893		05	7/31/2019			83	75	4.1	
2020	07	FM0362	K	0450	+	1.893	0450	+	0.043		05	7/31/2019			77	66	4.2	
2020	07	FM0362	K	0452	+	0.043	0452	+	0.143		05	7/31/2019			63	59	4.5	
2020	07	FM0362	K	0452	+	0.143	0452	+	0.243		05	7/31/2019			59	79	4.3	
2020	07	FM0362	K	0452	+	0.243	0452	+	0.343		05	7/31/2019			51	69	4.5	
2020	07	FM0362	K	0452	+	0.343	0452	+	0.443		05	7/31/2019			63	64	4.4	
2020	07	FM0362	K	0452	+	0.443	0452	+	0.543		05	7/31/2019			70	68	4.3	
2020	07	FM0362	K	0452	+	0.543	0452	+	0.643		05	7/31/2019			73	66	4.3	
2020	07	FM0362	K	0452	+	0.643	0452	+	0.743		05	7/31/2019			63	62	4.4	
2020	07	FM0362	K	0452	+	0.743	0452	+	0.843		05	7/31/2019			56	60	4.6	
2020	07	FM0362	K	0452	+	0.843	0452	+	0.943		05	7/31/2019			71	72	4.2	
2020	07	FM0362	K	0452	+	0.943	0452	+	1.043		05	7/31/2019			73	74	4.2	
2020	07	FM0362	K	0452	+	1.043	0452	+	1.143		05	7/31/2019			65	71	4.3	
2020	07	FM0362	K	0452	+	1.143	0452	+	1.243		05	7/31/2019			97	77	3.9	
2020	07	FM0362	K	0452	+	1.243	0452	+	1.343		05	7/31/2019			81	74	4.1	
2020	07	FM0362	K	0452	+	1.343	0452	+	1.443		05	7/31/2019			66	64	4.4	
2020	07	FM0362	K	0452	+	1.443	0452	+	1.543		05	7/31/2019			56	58	4.6	
2020	07	FM0362	K	0452	+	1.543	0452	+	1.643		05	7/31/2019			74	65	4.3	
2020	07	FM0362	K	0452	+	1.643	0452	+	1.743		05	7/31/2019			53	50	4.7	
2020	07	FM0362	K	0452	+	1.743	0452	+	1.843		05	7/31/2019			51	57	4.7	
2020	07	FM0362	K	0452	+	1.843	0452	+	1.943		05	7/31/2019			54	55	4.7	
2020	07	FM0362	K	0452	+	1.943	0452	+	0.064		05	7/31/2019			56	88	4.2	
2020	07	FM0362	K	0454	+	0.064	0454	+	0.164		05	7/31/2019			59	71	4.4	
2020	07	FM0362	K	0454	+	0.164	0454	+	0.264		05	7/31/2019			57	73	4.4	
2020	07	FM0362	K	0454	+	0.264	0454	+	0.364		05	7/31/2019			72	73	4.2	
2020	07	FM0362	K	0454	+	0.364	0454	+	0.464		05	7/31/2019			108	96	3.6	
2020	07	FM0362	K	0454	+	0.464	0454	+	0.564		05	7/31/2019			69	62	4.4	
2020	07	FM0362	K	0454	+	0.564	0454	+	0.664		05	7/31/2019			79	70	4.2	

SINGLE ROADBED



MULTIPLE ROADBEDS



POINT ARROW IN DIRECTION OF INCREASING REFERENCE MARKERS

START FROM THE OUTSIDE LANE AND WORK IN

Pavement Types

Code	Description
01	Continuously Reinforced Concrete Pavement
02	Jointed Reinforced Concrete Pavement
03	Jointed Plain Concrete Pavement
04	Thick Asphaltic Concrete Pavement (greater than 5-1/2”)
05	Intermediate Thickness Asphaltic Concrete Pavement (2-1/2” to 5-1/2”)
06	Thin Surfaced Flexible Base Pavement (less than 2-1/2”)
07	Asphalt Surfacing with Heavily Stabilized Base
08	Overlaid and/or Widened Old Concrete Pavement
09	Overlaid and/or Widened Old Flexible Pavement
10	Thin Surfaced Flexible Base Pavement (Surface Treatment-Seal Coat Combination)

INTERNATIONAL ROUGHNESS INDEX DATA

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		14

General Notes:

General:

Area Engineer contact information for this project follows:

Carlos M. Zepeda, Jr., P.E.,
Email: Carlos.Zepeda@txdot.gov

Daniel J. Dvorak, P.E.
Email:Daniel.Dvorak@txdot.gov

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/

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

Superelevate the curves to match the existing surface.

The following standard detail sheets are modified:

Modified Standards

TCP(1-2)-18 (MOD)
TCP(2-2)-18 (MOD)
TCP(2-8)-18 (MOD)
BRIDGE RAIL RETROFIT T131RC RAIL ON CURB T131RC(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 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 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.

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.

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

There is approximately 300 SF of silver paint on the steel guardrail and guardrail posts that contain 9,100 ppm of lead containing paint on the FM 362 bridge at Cypress Creek. To avoid abatement, the Contractor can perform removal of the guardrail elements by unbolting them. If the Contractor chooses to sawcut or torch cut the guardrail or guardrail posts, the Contractor will be responsible for the lead containing strip abatement at the cut locations at the Contractor's expenses. A copy of the bridge inspection report is available upon request.

Remove existing raised pavement markings. This work is subsidiary to various bid items.

The removal of newspaper boxes are subsidiary to the various bid items.

General: Roadway Illumination and Electrical

For 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.

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.

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

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.

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.

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.

Item 5: Control of Work

Submit shop drawings electronically for the fabrication of items as documented in Table 1 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, ftp://ftp.dot.state.tx.us/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, Etc.)	Y	Y	Y	T	SD
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
Fort Bend Area Office	HOU-FBAShpDrwgs@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

When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design. Acceptance or denial of an alternate is at the sole discretion of the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor.

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.

The nesting / breeding season for migratory birds is February 15 through September 30. Conduct any tree removal outside of the migratory bird nesting season. If this is not possible due to scheduling, then exercise caution to remove only those trees with no active nests. Do not destroy nests on structures or in trees within the project limits during the nesting / breeding season.

Take measures to prevent the building of nests on any structures or trees within the project limits throughout the duration of the construction if work / removal will be performed during the nesting / breeding season. This can be accomplished by application of bird repellent gel, netting by hand every 3 to 4 days, or any other non-threatening method approved by the Houston District Environmental Section. Obtain this approval well in advance of the planned use. Contact the Houston District Environmental Section at 713-802-5244. The cost of this work is subsidiary to the various bid items.

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 in accordance with Section 8.3.1.*4.*

Item 104: Removing Concrete

Removing concrete curb is paid as a separate bid item if the existing pavement on which it rests is not removed at the same time.

Item 110: Excavation

If manipulating the excavated material requires moving the same material more than once to accomplish the desired results, the excavation is measured and paid for only once regardless of the manipulation required.

Item 132: Embankment

If salvaged base is used for the embankment material, break it into small pieces to achieve the required density and to facilitate placing in the embankment. Obtain approval of the material before placing in the embankment.

Furnish Type C material with a maximum Liquid Limit (LL) of 65, a minimum Plasticity Index (PI) of 5, and composed of suitable earth material such as loam, clay, or other materials that form a suitable embankment.

The embankment material used on the project which has a Liquid Limit exceeding 45 will be tested for Liquid Limits at the rate of one test per 20,000 cu. yd. or per total quantity less than 20,000 cu. yd., unless otherwise directed. Only use material that passes the above tests.

For unpaved areas, provide a finished grade with the top 4 in. capable of sustaining vegetation. Use fertile soil that is easily cultivated, free from objectionable material and highly resistant to erosion.

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.

Blade back any sod and/or loose material prior to placement of the ACP overlay and shoulder up material. This work is subsidiary to Item 134.

Item 162: Sodding for Erosion Control
Item 164: Seeding for Erosion Control
Item 166: Fertilizer
Item 168: Vegetative Watering

Refer to the "Fertilizer, Seed, Sod, Straw, Compost, and Water" plan sheet for material specifications, application rates, and for watering requirements.

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 247: Flexible Base

Place the flexible base in courses a maximum of 8 in. thick (loose measurement). Mix flexible base that requires 2 or more mixtures of material, in an approved stationary pugmill type mixer. Material passing the No. 40 sieve is known as soil binder.

Tolerances relating to a specified gradation and to a plasticity index under this specification are permitted.

Furnish one type of the base material unless otherwise authorized.

Compact the courses to a minimum density of 95 percent of the maximum density as determined using test method TEX-113-E.

Sandstone aggregate is not permitted.

Item 292: Asphalt Treatment (Plant-Mixed)

If using the iron ore topsoil as the primary aggregate, meaning 80 percent or more by weight of the total mixture, the requirements for the water susceptibility test are waived.

Mixtures containing the iron ore topsoil are exempted from test methods TEX-217-F (Part I, separation of deleterious material and Part II, decantation test for coarse aggregate) and TEX-203-F (Sand Equivalent Test).

Assume responsibility for proportioning the materials entering the asphalt mixture, regardless of the type of plant used.

Furnish the mix designs for approval.

Compact the courses to a minimum density of 95 percent of the maximum density as determined using test method TEX-126-E.

Item 316: Seal Coat

Place only the amount of seal coat that can be covered by the ACP overlay in the same working day.

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.

Allowable Asphalt Cements based on Average Daily Traffic (ADT) are shown below:

For ADT greater than 5000	ADT 1000 to 5000	ADT less than 1000
AC-20 XP	AC-15P	AC-10-2TR
AC-20-5TR	AC-20-5TR	AC-10 w/2% SBR
	AC-20-XP	AC-15P
	AC-10-2TR	

Item 351: Flexible Pavement Structure Repair

For base repair, place the asphalt stabilized base in compacted lifts of 4 in. maximum, unless otherwise directed.

Existing material to be removed will become the property of the Contractor.

Item 354: Planing and Texturing Pavement

Deliver the first 5,000 CY of RAP material to the Waller Maintenance yard located at 400 FM 1488, Hempstead, TX 77445. Notify Mr. Clifford Dawson with TxDOT 72 hours prior to delivery at (979) 921-2400.

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The remaining RAP generated by this project will become the property of the Contractor for use in the current construction project or in future projects.

Item 432: Riprap

Grouting done with new guardrail elements in existing mow strip will be incidental to Item 432.

Items 496: Removing Structures

Assume ownership and remove from the project site, items salvaged from the existing bridge decks.

Do not permit debris resulting from the structure removal or construction activities to enter a natural or manmade waterway such as drainage channels, rivers, streams, bays, etc. Remove debris which falls into such waterways. This work is subsidiary to the Item, "Removing Structures."

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.

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."

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.

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.

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.

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.

Limit work sections to two (2) miles unless otherwise directed by the Engineer for all work beginning with milling the existing roadway through the placement of the ACP overlay.

Maintain a minimum distance of two (2) miles between work areas. Limit lane closure lengths for seal coat operations to one (1) mile on two lane, two-way highways and three (3) miles on four lane highways. Lengths can increase with approval of the Engineer. The lane closure length will be determined during construction in urban areas.

When using TCP(1-2b)-18 or TCP(2-2b)-18, a pilot car is required to lead traffic through the work space unless otherwise approved by the Engineer.

Flaggers will be required at public intersections when using TCP(1-2b)-18 or TCP(2-2b)-18.

When using TCP(1-2b)-18 or TCP(2-2b)-18, arrow boards, displaying the caution mode, may be used to enhance the flagger stations. If used, place the arrow board in advance of the flagger station a distance of ½X, the sign spacing distance shown on BC(2)-21. Use arrow boards as shown on BC(7)-21.

Provide suitable warning lights mounted high enough to be visible from all directions on all construction equipment, including pilot vehicles, and operate warning lights when the equipment

is within the right of way. Equip other equipment such as trucks, trailers, autos, etc., with emergency flashers and use emergency flashers while within the work area.

No additional payment will be made for relocating existing sign assemblies to temporary mounts.

Signs warning of temporary conditions, such as "NO CENTER LINE," "LOOSE GRAVEL," etc., shall only be displayed when conditions are present. Remove or completely cover signs that do not apply to the roadway conditions. These signs may be installed prior to beginning work but shall remain completely covered until the signs are applicable.

In accordance with Article 502.4.1.2, no payment will be made for the month if the contractor fails to provide or properly maintain signs in compliance with the contract requirements. Temporary warning signs that are visible when conditions do not apply will be considered improper maintenance of signs.

Item 504: Field Office and Laboratory

Furnish one Type A structure for the laboratory. Ensure the windows for the structure have burglar bars.

Furnish a Type D structure for the asphalt mix control laboratory for the Engineer's exclusive use. In addition to the requirements of this Item, "Field Office and Laboratory," ensure this structure has a minimum height of 8 ft. Also ensure it has a minimum of 400 sq. ft. of gross floor area suitable for permanently located asphalt plants or 200 sq. ft. for temporarily located asphalt plants serving one project. Partition the floor area into a minimum of 2 interconnected rooms, and provide each room with an exterior door and a minimum of 2 windows. Construct the floor of sufficient strength to support the testing equipment and with an impervious covering.

Adequately air condition the Type D structure and furnish it with a minimum of one desk, 3 chairs, one file cabinet, a telephone, and one built-in equipment-storage cabinet suitable for storing nuclear equipment. Ensure the cabinet is a minimum of 3 ft. wide by 2 ft. deep by 3 ft. high and has a secure lock. Provide the structure with a 240-volt electrical service entrance. Use a licensed electrician to determine the service size and service entrance conductors. Provide a minimum service of four 120-volt circuits with 20 amp breakers, and a maximum of 2 grounded convenience outlets per circuit and a minimum of two 220-volt ovens with vents to the outside. Provide a structure with a minimum of 2 convenience outlets per wall and a utility sink with an adequate, clean potable water supply for testing. Do not use space heaters to heat the structure. Use support blocks for the portable structures, tie them down, and securely attach them to the ground.

In addition, provide the following: One exterior door opening 48-inches minimum width. If steps are required to gain access to the facility's 48-inch door provide a landing dock with minimum dimensions of 60 inches wide by 60 inches deep. The strong floor and landing of the

facility shall support the weight of all equipment and personnel providing a stable, essentially zero deflection during testing operations, acceptable to the Engineer.

No direct payment will be made for Engineer field labs. All construction, maintenance, utilities, custodial services, security, and permits necessary to establish and maintain readiness of this facility will be the responsibility of the Contractor. This building/facility is required by the standard specifications and is considered a standard part of any asphalt concrete pavement plant producing materials for TxDOT projects.

The SuperPave Gyratory Compactor will be furnished to the Engineer under the asphalt concrete pavement Item(s) of work.

Determine the asphalt content by the ignition method and meet the requirements of Section 504.2.2.4.1, "Asphalt Content by Ignition Method" except provide a NEMA 6-50R (204/240 volt, 50 A) outlet within 2.25 ft. of the ignition oven location.

If an asphalt mix plant is located at the project site, provide a Type D structure with the dimensions of a Type C structure, at the project site to perform the asphalt mix quality control tests.

If a commercial source is used for the asphalt mix, provide a Type D structure with the dimensions of a Type C structure, at the commercial source site to perform the asphalt mix quality control tests.

Equip each lab with a first aid kit and at least a 20 lb. ABC type fire extinguisher. Also equip the labs with an eye wash station. Provide equipment that meets the minimum OSHA requirements.

Item 506: Temporary Erosion, Sedimentation and Environmental Controls

The use of hay 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.

Schedule the seeding or sodding work as soon as possible. The project schedule provides for a vegetation management plan.

After completing earthwork operations, restore and reseed the disturbed areas in accordance with the Department's specifications for permanent or temporary erosion control.

Before starting construction, review with the Engineer the SWP3 used for temporary erosion control as outlined on the plans. Before construction, place the temporary erosion and sedimentation control features as shown on the SWP3.

Implement temporary and permanent erosion control measures to comply with the National Pollution Discharge Elimination System (NPDES) general permit under the Clean Water Act.

Item 529: Concrete Curb

An air-entraining admixture is not required.

For concrete curbs, use Grade 7 aggregate conforming to Section 421.2.6 of the Item, "Hydraulic Cement Concrete."

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).

Metal posts required on guardrail over shallow box culverts, etc., is subsidiary to Item 540.

Item 542: Removing Metal Beam Guard Fence

Remove and assume ownership of unsalvageable metal beam guard fence rail elements and posts.

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

Item 544: Guardrail End Treatments

Provide a mowing strip for the proposed SGT locations.

Use Type III SGT's.

The OB-3F is subsidiary to Item 544.

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 asphalt mainlanes, use Surface Test Type B and Pay Adjustment Schedule 3.

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

Item 636: Signs

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

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.

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 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."

Using raised markers for removable work zone pavement markings on final concrete surfaces is optional.

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

Use Type III glass beads for thermoplastic 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.

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.

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.

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 3076: Dense-Graded Hot Mix Asphalt

Taper the asphalt concrete pavement at the beginning and ending points.

Use a maximum 6H:1V slope for the asphalt concrete pavement edge.

Where the 6H:1V ACP edge taper extends over onto the unsurfaced shoulders, blade off the loose existing shoulder material to provide a solid base for the outside taper edge. After placing the ACP overlay, blade this material back against the edge taper. This work is subsidiary to the various bid items.

The stockpile will be the point of sampling of coarse aggregate for test method TEX-217-F (Part II, decantation).

Place the asphalt concrete pavement in courses as shown on the typical sections.

Do not use petroleum-based solvents in the beds of hot mix asphalt delivery vehicles.

Dilution of tack coat is not allowed.

Do not use Surface Aggregate Classification (SAC) C for this project.

For determining the Asphalt Content, only ignition ovens will be allowed.

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The tack coat rate shown on the "Basis of Estimate" is an average rate for calculating tack coat quantities. Vary the rate based on the pavement conditions and other factors such as

Take all necessary measures to minimize the number of working days between the planing operation and ACP overlay. If a planed section of roadway is not overlayed within 2 weeks, cease all construction activity for the project not affiliated with the overlay of the planed section of roadway until the overlay has been completed. Time charges will not be suspended or added to compensate for such an occurrence and no additional financial compensation provided.

Complete the overlay at intersections (such as left and right turn lanes and crossovers) in a timely manner. Do not leave the roadway surface at an intersection with uneven lanes for longer than two weeks.

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
247	Flexible Base • Crushed Stone	 138 Lb. / Cu. Ft.	TON
292	Asphalt Treatment (Plant-Mixed) • Asphalt • Aggregate	110 Lb. / Sq. Yd.-In. 5 % by weight 95 % by weight	TON
316	Seal Coat • Asphalt • Aggregate (Gr 4) A-R Binder • Asphalt • Aggregate (Gr 4)	 0.32 Gal. / Sq. Yd. 1/130 Cu. Yd. / Sq. Yd. 0.42 Gal. / Sq. Yd. 1/130 Cu. Yd. / Sq. Yd.	 GAL CY GAL CY
3076	Dense-Graded Hot Mix Asphalt • Asphalt • Aggregate Tack Coat • Applied on new HMA • Applied on Existing HMA • Applied on Milled HMA	110 Lb. / Sq. Yd.-In. 6 % by weight 94 % by weight 0.06 Gal. / Sq. Yd. 0.09 Gal. / Sq. Yd. 0.11 Gal. / Sq. Yd.	TON

County: Waller

Highway: FM 362 **Control: 0523-02-051**

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0523-02-051 **DISTRICT** Houston **COUNTY** Waller
HIGHWAY FM 362

							TOTAL EST.	TOTAL FINAL
			CONTROL SECTION JOB		**0523-02-051**			
			PROJECT ID		**A00124522**			
			COUNTY		**Waller**			
			HIGHWAY		**FM 362**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL			
	110-6001	EXCAVATION (ROADWAY)	CY	409.000			409.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	93.000			93.000	
	134-6004	BACKFILL (TY A OR B)	STA	361.980			361.980	
	162-6002	BLOCK SODDING	SY	928.000			928.000	
	162-6003	STRAW OR HAY MULCH	SY	200.000			200.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	14.000			14.000	
	164-6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	186.000			186.000	
	166-6001	FERTILIZER	AC	0.330			0.330	
	168-6001	VEGETATIVE WATERING	MG	39.600			39.600	
	247-6056	FL BS (CMP IN PLC)(TY D GR 4)(FNAL POS)	CY	44.000			44.000	
	292-6002	ASPHALT STAB BASE (GR 2)(PG 64)	TON	817.930			817.930	
	316-6001	ASPH (MULTI OPTION)	GAL	48,246.000			48,246.000	
	316-6434	AGGR (TY-PB GR-4 OR TY-PL GR-4 (SAC-B)	CY	1,190.000			1,190.000	
	351-6002	FLEXIBLE PAVEMENT STRUCTURE REPAIR(6")	SY	3,000.000			3,000.000	
	354-6045	PLANE ASPH CONC PAV (2")	SY	141,606.000			141,606.000	
	429-6011	CONC STR REPR(REMOV AND REPL WINGWALL)	CY	1.340			1.340	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	71.000			71.000	
	450-6018	RAIL (TY T631)	LF	256.130			256.130	
	451-6004	RETROFIT RAIL (TY T131RC)	LF	150.000			150.000	
	496-6099	REMOVE STR (RAIL)	LF	370.000			370.000	
	500-6001	MOBILIZATION	LS	1.000			1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	6.000			6.000	
	510-6003	ONE-WAY TRAF CONT (PORT TRAF SIG)	MO	1.000			1.000	
	512-6105	PCTB MOVE&RESET(F-SHAPE OR SNGL SLPTY1	LF	270.000			270.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	80,075.000			80,075.000	
	533-6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF	35,958.000			35,958.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	2,562.500			2,562.500	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	22.000			22.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1.000			1.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	1,793.500			1,793.500	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA	5.000			5.000	
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	EA	18.000			18.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	31.000			31.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	27.000			27.000	
	560-6011	MAILBOX INSTALL-S (TWW-POST) TY 4	EA	23.000			23.000	
	560-6012	MAILBOX INSTALL-D (TWW-POST) TY 4	EA	7.000			7.000	
	560-6013	MAILBOX INSTALL-M (TWW-POST) TY 4	EA	6.000			6.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0523-02-051 **DISTRICT** Houston **COUNTY** Waller
HIGHWAY FM 362

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0523-02-051**			
		PROJECT ID		**A00124522**			
		COUNTY		**Waller**			
		HIGHWAY		**FM 362**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	636-6007	REPLACE EXISTING ALUMINUM SIGNS(TY A)	SF	18.000		18.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	49.000		49.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	16.000		16.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA	1.000		1.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)	EA	16.000		16.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA	5.000		5.000	
	644-6034	IN SM RD SN SUP&AM TYS80(1)SA(U-1EXT)	EA	1.000		1.000	
	644-6036	IN SM RD SN SUP&AM TYS80(1)SA(U-BM)	EA	3.000		3.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	90.000		90.000	
	658-6002	INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)	EA	51.000		51.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	47.000		47.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	28.000		28.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	121.000		121.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF	77,764.000		77,764.000	
	662-6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	LF	85,930.000		85,930.000	
	662-6012	WK ZN PAV MRK NON-REMOV (W)8"(SLD)	LF	938.000		938.000	
	662-6014	WK ZN PAV MRK NON-REMOV (W)12"(SLD)	LF	31.000		31.000	
	662-6016	WK ZN PAV MRK NON-REMOV (W)24"(SLD)	LF	801.000		801.000	
	662-6017	WK ZN PAV MRK NON-REMOV (W)(ARROW)	EA	1.000		1.000	
	662-6023	WK ZN PAV MRK NON-REMOV (W)(RR XING)	EA	1.000		1.000	
	662-6029	WK ZN PAV MRK NON-REMOV(W)(WORD)	EA	1.000		1.000	
	662-6032	WK ZN PAV MRK NON-REMOV (Y)4"(BRK)	LF	6,750.000		6,750.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	32,598.000		32,598.000	
	662-6035	WK ZN PAV MRK NON-REMOV (Y)6"(BRK)	LF	7,420.000		7,420.000	
	662-6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	LF	37,177.000		37,177.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	503.000		503.000	
	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	31.000		31.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	645.000		645.000	
	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	1.000		1.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	1.000		1.000	
	666-6093	REFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	1.000		1.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	85,930.000		85,930.000	
	666-6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	7,420.000		7,420.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	37,177.000		37,177.000	
	672-6007	REFL PAV MRKR TY I-C	EA	10.000		10.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	834.000		834.000	
	3076-6041	D-GR HMA TY-D SAC-A PG70-22	TON	13,574.490		13,574.490	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0523-02-051 **DISTRICT** Houston **COUNTY** Waller
HIGHWAY FM 362

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0523-02-051**			
		PROJECT ID		**A00124522**			
		COUNTY		**Waller**			
		HIGHWAY		**FM 362**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	3076-6076	D-GR HMA TY-D SAC-A PG70-22 (EXEMPT)	TON	23.830		23.830	
	6185-6002	TMA (STATIONARY)	DAY	87.000		87.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	160.000		160.000	
	6350-6001	LEAD LED CHEVRON	EA	1.000		1.000	
	6350-6002	LED CHEVRON	EA	11.000		11.000	
	08	CONTRACTOR FORCE ACCOUNT LAW ENFORCEMENT (NON-PARTICIPATING)	LS	1.000		1.000	
		CONTRACTOR FORCE ACCOUNT EROSION CONTROL MAINTENANCE (NON-PARTICIPATING)	LS	1.000		1.000	
		CONTRACTOR FORCE ACCOUNT RAILROAD FLAGGING (NON-PARTICIPATING)	LS	1.000		1.000	
		CONTRACTOR FORCE ACCOUNT SAFETY CONTINGENCY (NON-PARTICIPATING)	LS	1.000		1.000	

SUMMARY OF TRAFFIC CONTROL QUANTITIES

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT SHEET	0510-6003	0662 WK ZN PAV MRK NON-REMOV					6185-6002	6185-6005
	ONE-WAY TRAF CONT (PORT TRAF SIG)	-6004 (W) 4" (SLD)	-6012 (W) 8" (SLD)	-6016 (W) 24" (SLD)	-6032 (Y) 4" (BRK)	-6034 (Y) 4" (SLD)	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	MO	LF	LF	LF	LF	LF	DAY	DAY
1								
2								
3		3,979				3,979		
4		4,318			460	1,705		
5		4,409		10	90	3,970		
6		4,422		10	120	3,254		
7		4,452		21	540	32		
8		4,430		7	540	36		
9		4,447		9	540	26		
10	1	4,440		20	540	131		
11		4,400			550	1,830		
12		4,400			550	515		
13		4,501	88	17	370	2,524		
14		4,431	167	25	380	2,515		
15		4,400			550	875		
16		4,400			550			
17		4,497		8	360	2,325		
18		4,429	175	18	390	2,625		
19		4,402	5			4,220		
20		3,007		11	220	2,036		
TOTAL	1	77,764	435	156	6,750	32,598	87	160

SUMMARY OF TRAFFIC CONTROL QUANTITIES

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		17

SUMMARY OF REMOVAL QUANTITIES

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT SHEET	0354-6045	0496-6099	0542-6001	0542-6002	0542-6004	0544-6003	0644-6076
	PLANE ASPH CONC PAV (2") SY	REMOVE STR (RAIL) LF	REMOVE METAL BEAM GUARD FENCE LF	REMOVE TERMINAL ANCHOR SECTION EA	RM MTL BM GD FEN TRANS (THRIE-BEAM) EA	GUARDRAIL END TREATMENT (REMOVE) EA	REMOVE SM RD SN SUP&AM EA
1		100	162.5	3		1	17
2							8
3	9,305		200		2	2	3
4	8,275		156	2	2	2	3
5	7,873						3
6	7,782						4
7	8,046		250		4	4	4
8	7,903						2
9	7,894						2
10	7,641	* 120	100			4	7
11	7,782						3
12	7,782						2
13	8,266						6
14	8,043		250		4	4	5
15	7,782		250		4	4	
16	7,782						2
17	8,235		125		2	2	8
18	7,999						6
19	7,804						3
20	5,412	150	300			4	2
TOTAL	141,606	370	1,793.5	5	18	27	90

* THERE IS APPROXIMATLEY 300 SF OF SILVER PAINT ON THE STEEL GUARDRAIL AND GUARDRAIL POSTS THAT CONTAIN 9,100 PPM OF LEAD CONTAINING PAINT ON THE FM 362 BRIDGE AT CYPRESS CREEK. TO AVOID ABATEMENT, THE CONTRACTOR CAN PERFORM REMOVAL OF THE GUARDRAIL ELEMENTS BY UNBOLTING THEM. IF THE CONTRACTOR CHOOSES TO SAWCUT OR TORCH CUT THE GUARDRAIL OR GUARDRAIL POSTS, THE CONTRACTOR WILL BE RESPONSIBLE FOR THE LEAD CONTAINING STRIP ABATEMENT AT THE CUT LOCATIONS AT THE CONTRACTOR'S EXPENSE. A COPY OF THE BRIDGE INSPECTION REPORT IS AVAILABLE UPON REQUEST.

SUMMARY OF REMOVAL QUANTITIES

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		18

SUMMARY OF ROADWAY QUANTITIES

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT SHEET	0110-6001	0110-6001 (1)	0132-6006 (1)	0134-6004	0162-6002 (1)	0162-6003 (1)	0164-6009 (1)	0164-6051 (1)	0166-6001 (1)
	EXCAVATION (ROADWAY)	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY C)	BACKFILL (TY A OR B)	BLOCK SODDING	STRAW OR HAY MULCH	BROADCAST SEED (TEMP) (WARM)	DRILL SEED (TEMP) (WARM OR COOL)	FERTILIZER
	CY	CY	CY	STA	SY	SY	SY	SY	AC
1									
2									
3				12.90					
4		7	5	18.70	48	11	1	10	0.02
5		12	8	22.00	80	17	1	16	0.03
6		6	4	22.00	40	9	1	8	0.02
7	54			19.10					
8		30	20	22.00	200	42	2	40	0.05
9		18	12	22.00	120	26	2	24	0.04
10		6	4	19.85	40	9	1	8	0.02
11		12	8	22.00	80	17	1	16	0.03
12				22.00					
13		18	12	22.00	120	26	2	24	0.04
14	54			19.10					
15	61	6	4	18.80	40	9	1	8	0.02
16				22.00					
17	27			22.00					
18		12	8	22.00	80	17	1	16	0.03
19		12	8	22.00	80	17	1	16	0.03
20	74			11.53					
TOTAL	270	139	93	361.98	928	200	14	186	0.33

(1) THIS QUANTITY IS FOR THE MAILBOX TURNOUTS.

SUMMARY OF ROADWAY QUANTITIES

SHEET 1 OF 4

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		19

SUMMARY OF ROADWAY QUANTITIES

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT SHEET	0168-6001 (1)	0247-6056 (2)	0292-6002	0292-6002 (1)	0316-6001	0316-6001 (1)	0316-6001 (2)	0316-6434	0316-6434 (1)
	VEGETATIVE WATERING	FL BS (CMP IN PLC) (TY D GR 4) (FNAL POS)	ASPHALT STAB BASE (GR 2) (PG 64)	ASPHALT STAB BASE (GR 2) (PG 64)	ASPH (MULTIOPTION)	ASPH (MULTIOPTION)	ASPH (MULTIOPTION)	AGGR (TY-PB GR OR TY-PL GR-4 (SAC-B)	AGGR (TY-PB GR OR TY-PL GR-4 (SAC-B)
	MG	CY	TON	TON	GAL	GAL	GAL	CY	CY
1									
2									
3		2			2,908		23	70	
4	2.4	8		15.37	2,781	5	37	67	1
5	3.6	1		24.78	2,688	8		65	2
6	2.4	2		12.39	2,660	4	7	64	1
7		4	105.60		2,740			66	
8	6.0	6		61.95	2,697	20	39	65	5
9	4.8	4		37.17	2,695	12	13	65	3
10	2.4	1		12.39	2,576	4		62	1
11	3.6	2		24.78	2,660	8	27	64	2
12					2,660			64	
13	4.8	5		37.17	2,803	12		68	3
14		1	105.60		2,737			66	
15	2.4	3	120.78	12.39	2,660	4	13	64	1
16					2,660			64	
17			53.13		2,800			68	
18	3.6	2		24.78	2,726	8	8	66	2
19	3.6	2		24.78	2,666	8	21	65	2
20		1	144.87		1,848			45	
TOTAL	39.6	44	529.98	287.95	47,965	93	188	1,158	23

(1) THIS QUANTITY IS FOR THE MAILBOX TURNOUTS.

(2) THIS QUANTITY IS FOR ASPHALT DRIVEWAYS IF NEEDED.

SUMMARY OF ROADWAY QUANTITIES

SHEET 2 OF 4

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		20

SUMMARY OF ROADWAY QUANTITIES

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT SHEET	0316-6434 ①	0351-6002 ②	0432-6045	0450-6018	0451-6004	0512-6105	0540-6001	0540-6006
	AGGR (TY-PB GR OR TY-PL GR-4 (SAC-B)	FLEXIBLE PAVEMENT STRUCTURE REPAIR (6")	RIPRAP (MOW STRIP) (4 IN)	RAIL (TY 631)	RETROFIT RAIL (TY 131RC)	PCTB MOVE&RESET (F-SHAPE OR SNGL SLPTY1	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)
	CY	SY	CY	LF	LF	LF	LF	EA
1			16	106.13			200	
2								
3	1						200	2
4	1		6				162.5	2
5								
6	1							
7			2			60	300	4
8	1							
9	1							
10			40		150		600	4
11	1							
12								
13								
14			2			60	300	4
15	1		2			120	300	4
16								
17			1			30	150	2
18	1							
19	1							
20			2	150			350	
TOTAL	9	8,000	71	256.13	150	270	2,562.5	22

① THIS QUANTITY IS FOR THE MAILBOX TURNOUTS.

② LOCATIONS OF BASE REPAIR HAVE NOT BEEN SHOWN ON THE LAYOUTS BUT WILL BE DETERMINED BY THE ENGINEER IN THE FIELD.

SUMMARY OF ROADWAY QUANTITIES

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		21

SUMMARY OF ROADWAY QUANTITIES

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT SHEET	0540-6016	0544-6001	0560-6011	0560-6012	0560-6013	3076-6041	3076-6041 (1)	3076-6076 (2)
	DOWNSTREAM ANCHOR TERMINAL SECTION	GUARDRAIL END TREATMENT (INSTALL)	MAILBOX INSTALL-S (TWW-POST) TY 4	MAILBOX INSTALL-D (TWW-POST) TY 4	MAILBOX INSTALL-M (TWW-POST) TY 4	D-GR HMA TY-D SAC-A PG70-22	D-GR HMA TY-D SAC-A PG70-22	D-GR HMA TY-D SAC-A PG70-22 (EXEMPT)
	EA	EA	EA	EA	EA	TON	TON	TON
1	1	3	1	1				
2			4	1	2			
3		2	3			749.52		2.89
4		4	1		1	777.36	1.13	4.75
5			2			765.54	1.76	
6			1			757.44	0.88	0.87
7		4				778.07		
8			4	1		766.93	4.40	5.00
9			2		1	766.27	2.64	1.65
10		4	1			717.86	0.88	
11			1	1		757.44	1.76	3.39
12						757.44		
13			1	2		793.24	2.64	
14		4				777.16		
15		4		1		757.44	0.88	1.65
16						757.44		
17		2				793.58		
18			1		1	774.44	1.76	0.99
19			1		1	758.85	1.76	2.64
20		4				547.98		
TOTAL	1	31	23	7	6	13,554.00	20.49	23.83

(1) THIS QUANTITY IS FOR THE MAILBOX TURNOUTS.

(2) THIS QUANTITY IS FOR ASPHALT DRIVEWAYS IF NEEDED.

SUMMARY OF ROADWAY QUANTITIES

SHEET 4 OF 4

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		22

SUMMARY OF PAVEMENT MARKING QUANTITIES

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT SHEET	0533-6003	0533-6004	0636-6007	0658-6002	0658-6014	0658-6047	0658-6062	0662 WK ZN PAV MRK NON-REMOV			
	RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	REPLACE EXISTING ALUMINUM SIGNS (TY A)	INSTL DEL ASSM (D-SW)SZ 1 (FLX)GND(BI)	INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)	INSTL OM ASSM (OM-2Y)(WC) GND	INSTL DEL ASSM (D-SW)SZ 1 (BRF)GF2(BI)	-6008 (W) 6" (SLD)	-6012 (W) 8" (SLD)	-6014 (W) 12" (SLD)	-6016 (W) 24" (SLD)
	LF	LF	SF	EA	EA	EA	EA	LF	LF	LF	LF
1	2,510						12	3,296	68	31	77
2	4,200			3		2		4,449			17
3	3,804	1,692		11	36		9	4,400			
4	4,250	2,050		3	2		13	4,318			
5	4,279	2,079		15				4,409			10
6	4,278	2,078						4,422			10
7	4,146	2,073			2	4	14	4,452			21
8	4,285	2,085						4,430			7
9	4,279	2,079						4,447			9
10	3,055	2,079				4	24	4,440			337
11	4,400	2,200						4,400			78
12	4,400	2,200	2.25			2		4,400			
13	3,944	1,755	2.25					4,501	88		17
14	4,031	1,840	2.25		2	4	14	4,431	167		25
15	4,400	2,200	2.25		4	4	14	4,400			
16	4,400	2,200						4,400			
17	4,145	1,950	2.25		1	4	7	4,497			8
18	4,155	1,960	4.50					4,429	175		18
19	4,298	2,100	2.25	9				4,402	5		
20	2,816	1,338		10		4	14	3,007			11
TOTAL	80,075	35,958	18	51	47	28	121	85,930	503	31	645

SUMMARY OF SIGNING & PAVEMENT MARKING QUANTITIES

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		23

SUMMARY OF PAVEMENT MARKING QUANTITIES

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT SHEET	0662 WK ZN PAV MRK NON-REMOV					0666 REFL PAV MRK TY I					
	-6017 (W) (ARROW) EA	-6023 (W) (RR XING) EA	-6029 (W) (WORD) EA	-6035 (Y) 6" (BRK) LF	-6037 (Y) 6" (SLD) LF	-6036 (W) 8" (SLD) (100MIL) LF	-6042 (W) 12" (SLD) (100MIL) LF	-6048 (W) 24" (SLD) (100MIL) LF	-6054 (W) (ARROW) (100MIL) EA	-6078 (W) (WORD) (100MIL) EA	-6093 (W) (RR XING) (100MIL) EA
1	1	1	1	320	1,461	68	31	77	1	1	1
2				350	2,697			17			
3					4,400						
4				460	1,705						
5				90	3,970			10			
6				120	3,254			10			
7				540	32			21			
8				540	36			7			
9				540	26			9			
10				540	131			337			
11				550	1,830			78			
12				550	515						
13				370	2,524	88		17			
14				380	2,515	167		25			
15				550	875						
16				550							
17				360	2,325			8			
18				390	2,625	175		18			
19					4,220	5					
20				220	2,036			11			
TOTAL	1	1	1	7,420	37,177	503	31	645	1	1	1

SUMMARY OF SIGNING & PAVEMENT MARKING QUANTITIES

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		24

SUMMARY OF PAVEMENT MARKING QUANTITIES

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT SHEET	0666 RE PM W/RET REQ TY I			0672 REFL PAV MRKR		6350-6001	6350-6002
	-6309 (W) 6" (SLD) (100MIL) LF	-6318 (Y) 6" (BRK) (100MIL) LF	-6321 (Y) 6" (SLD) (100MIL) LF	-6007 TY I-C EA	-6009 TY II-A-A EA	LEAD LED CHEVRON EA	LED CHEVRON EA
1	3,296	320	1,461	10	33		
2	4,449	350	2,697		50		
3	4,400		4,400		55		
4	4,318	460	1,705		46		
5	4,409	90	3,970		53		
6	4,422	120	3,254		47		
7	4,452	540	32		27		
8	4,430	540	36		27		
9	4,447	540	26		27		
10	4,440	540	131		29		
11	4,400	550	1,830		51		
12	4,400	550	515		34		
13	4,501	370	2,524		48		4
14	4,431	380	2,515		50		1
15	4,400	550	875		39		
16	4,400	550			29		
17	4,497	360	2,325		48	1	5
18	4,429	390	2,625		53		1
19	4,402		4,220		53		
20	3,007	220	2,036		35		
TOTAL	85,930	7,420	37,177	10	834	1	11

SUMMARY OF SIGNING & PAVEMENT MARKING QUANTITIES

SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		25

SUMMARY OF SMALL SIGNS

LAYOUT SHEET NO.	SIGN NO.	SIGN TYPE	SIGN TEXT	SIGN DIMENSIONS (IN)	PLYWOOD SIGNS	ALUMINUM SIGNS TYPE A	644 - INS SM RD SN SUP & AM TYPE OF MOUNT: 6001 10BWG (1) SA (P) EA	6002 10BWG (1) SA (P-BM) EA	6004 10BWG (1) SA (T) EA	6005 10BWG (1) SA (T-2EXT) EA	6007 10BWG (1) SA (U) EA	6017 10BWG (2) SA (P) EA	6019 10BWG (2) SA (T-2EXT) EA	6027 S80 (1) SA (P) EA	6028 S80 (1) SA (P-BM) EA	6030 S80 (1) SA (T) EA	6031 S80 (1) SA (T-2EXT) EA	6033 S80 (1) SA (U) EA	6034 S80 (1) SA (U-1EXT) EA	6035 S80 (1) SA (U-2EXT) EA	6036 S80 (1) SA (U-BM) EA	6037 S80 (1) SA (U-WC) EA	6050 S80 (2) SA (P) EA	6052 S80 (2) SA (T-2EXT) EA
1	1	R1-2	YIELD	36x36x36		X	X																		
	2	M3-4	WEST	24x12		X													X						
		M4-3	BUSINESS	24x12		X																			
		M1-4	290	30x24		X																			
		M6-1	DIRECTIONAL ARROW (SYMBOL)	21x15		X																			
		M4-5	TO	24x12		X																			
		M1-4	290	30x24		X																			
		M6-3	DIRECTIONAL ARROW (SYMBOL)	21x15		X																			
		M3-2	EAST	24x12		X																			
		M4-3	BUSINESS	24x12		X																			
		M1-4	290	30x24		X																			
		M6-1	DIRECTIONAL ARROW (SYMBOL)	21x15		X																			
	3	R8-8	DO NOT STOP ON TRACKS	24x30		X	X																		
	4	R8-8	DO NOT STOP ON TRACKS	24x30		X	X																		
	5	W1-7	TWO-DIRECTION LARGE ARROW	48x24		X			X																
	6	R1-1	STOP	36x36		X	X																		
	7	D1-2	← Hempstead Houston →	96x30		X																X			
	8	M3-3	SOUTH	24x12		X	X																		
		M1-6F	FARM ROAD 362	24x24		X																			
	9	R1-1	STOP	36x36		X	X																		
	10	W1-7	TWO-DIRECTION LARGE ARROW	48x24		X			X																
	11	W10-1	RR CROSSING	36 DIA		X	X																		
	12	R2-1	SPEED LIMIT 35	36x48		X			X																
	13	R2-1	SPEED LIMIT 45	36x48		X			X																
	14	W3-3	SIGNAL AHEAD (SYMBOL)	48x48		X			X																
	15	R19-1T	STOP FOR SCHOOL BUS LOADING OR UNLOADING	48x60		X										X									
	16	M2-1	JCT	21x15		X	X																		
		M4-3	BUSINESS	24x12		X																			
		M1-4	290	30x24		X																			
	17	R19-6aT	Don't Mess With Texas UP TO $2000 FINE FOR LITTERING	48x30		X					X														
2	1	D2-2	Brookshire 21 Richmond 44	90x30		X																X			
	2	R1-1	STOP	36x36		X	X																		
	3	R2-1	SPEED LIMIT 45	36x48		X			X																
	4	R1-1	STOP	36x36		X	X																		
	5	W1-7	TWO-DIRECTION LARGE ARROW	48x24		X			X																
	6	D1-2aT	Waller CITY LIMIT POP 2,767	42x24		X			X																
	7	R2-1	SPEED LIMIT 45	36x48		X			X																
	8	R2-1	SPEED LIMIT 55	48x60		X										X									
3	1	W1-2R	CURVE AHEAD (SYMBOL)	36x36		X	X																		
		W13-1P	45 MPH	18x18		X																			
	2	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	48x48		X			X																
	3	W1-2L	CURVE AHEAD (SYMBOL)	36x36		X	X																		
		W13-1P	45 MPH	18x18		X																			
4	1	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	48x48		X			X																
	2	R2-1	SPEED LIMIT 55	48x60		X										X									
	3	R2-1	SPEED LIMIT 55	48x60		X										X									
	4	W1-2L	CURVE AHEAD (SYMBOL)	36x36		X	X																		
		W13-1P	45 MPH	18x18		X																			
	5	R1-1	STOP	30x30		X	X																		

GENERAL NOTES:

ALL SIGNS SHALL BE ERECTED ACCORDING TO THE LOCATION SHOWN ON THE LAYOUT SHEETS EXCEPT THAT THE ENGINEER MAY SHIFT A SIGN IN ORDER TO SECURE A MORE DESIRABLE LOCATION. THE CONTRACTOR WILL STAKE ALL SIGN LOCATIONS, AND NO CHANGES IN THOSE LOCATIONS SHALL BE MADE WITHOUT PRIOR APPROVAL OF THE ENGINEER.

ALUMINUM SIGN BLANK(SITY A)

Square Ft.	Min. Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

SUMMARY OF SMALL SIGNS

SHEET 1 OF 4

DIST	COUNTY	HIGHWAY
HOU	WALLER	FM 362

CONT	SECT	JOB	SHEET NO.
0523	02	051	26

SUMMARY OF SMALL SIGNS

LAYOUT SHEET NO.	SIGN NO.	SIGN TYPE	SIGN TEXT	SIGN DIMENSIONS (IN)	PLYWOOD SIGNS	ALUMINUM SIGNS TYPE A	644 - INS SM RD SN SUP & AM																				
							TYPE OF MOUNT																				
							6001 10BWG (1) SA (P) EA	6002 10BWG (1) SA (P-BM) EA	6004 10BWG (1) SA (T) EA	6005 10BWG (1) SA (T-2EXT) EA	6007 10BWG (1) SA (U) EA	6017 10BWG (2) SA (P) EA	6019 10BWG (2) SA (T-2EXT) EA	6027 S80 (1) SA (P) EA	6028 S80 (1) SA (P-BM) EA	6030 S80 (1) SA (T) EA	6031 S80 (1) SA (T-2EXT) EA	6033 S80 (1) SA (U) EA	6034 S80 (1) SA (U-1EXT) EA	6035 S80 (1) SA (U-2EXT) EA	6036 S80 (1) SA (U-BM) EA	6037 S80 (1) SA (U-WC) EA	6050 S80 (2) SA (P) EA	6052 S80 (2) SA (T-2EXT) EA	
5	1	M3-1	NORTH	24x12		X	X																				
		M1-6F	FARM ROAD 362	24x24		X																					
		D10-7aT	448	3x10		X	(FRONT AND BACK)																				
	2	M3-3	SOUTH	24x12		X	X																				
		M1-6F	FARM ROAD 362	24x24		X																					
	3	W1-2R	CURVE AHEAD (SYMBOL)	36x36		X	X																				
		W13-1P	45 MPH	18x18		X																					
	4	R2-1	SPEED LIMIT 55	48x60		X											X										
	5	R1-1	STOP	30x30		X	X																				
6	1	W1-7	TWO-DIRECTION LARGE ARROW	48x24		X			X																		
	2	D3-3aTR	Cemetery →	66x12		X			X	(BACK-TO-BACK)																	
		D3-3aTL	← Cemetery	66x12		X																					
	3	R1-1	STOP	36x36		X	X																				
	4	W2-1	INTERSECTION WARNING (SYMBOL)			X	X																				
		W16-8P	Betka Rd	24x8		X																					
7	1	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES / ESTHER CHAPTER #102	48x48		X	2 SEPARATE SIGNS												X								
		CW21-1T	Give Us A Brake	48x48		X	HINGED																				
	2	R2-1	SPEED LIMIT 55	48x60		X											X										
	3	R1-1	STOP	36x36		X	X																				
	4	R1-1	STOP	36x36		X	X																				
	5	R2-1	SPEED LIMIT 55	48x60		X											X										
8	1	W2-1	INTERSECTION WARNING (SYMBOL)	36x36		X	X																				
		W16-8P	Betka Rd	24x8		X																					
	2	R1-1	STOP	30x30		X	X																				
9	1	R1-1	STOP	30x30		X	X																				
	2	W2-1	INTERSECTION WARNING (SYMBOL)	36x36		X	X																				
		W16-8P	Betka Rd	24x8		X																					
10	1	M3-1	NORTH	24x12		X	X																				
		M1-6F	FARM ROAD 362	24x24		X																					
	2	M3-3	SOUTH	24x12		X	X																				
		M1-6F	FARM ROAD 362	24x24		X																					
		D10-7aT	450	3x10		X	(FRONT AND BACK)																				
	3	R1-1	STOP	36x36		X	X																				
	4	R1-1	STOP	36x36		X	X																				
	5	W5-2	NARROW BRIDGE	36x36		X	X																				
	6	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	48x48		X			X																		
	7	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	48x48		X			X																		
	8	W5-2	NARROW BRIDGE	36x36		X	X																				

GENERAL NOTES:

ALL SIGNS SHALL BE ERECTED ACCORDING TO THE LOCATION SHOWN ON THE LAYOUT SHEETS EXCEPT THAT THE ENGINEER MAY SHIFT A SIGN IN ORDER TO SECURE A MORE DESIRABLE LOCATION. THE CONTRACTOR WILL STAKE ALL SIGN LOCATIONS, AND NO CHANGES IN THOSE LOCATIONS SHALL BE MADE WITHOUT PRIOR APPROVAL OF THE ENGINEER.

ALUMINUM SIGN BLANKS(TY A)

Square Ft.	Min. Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

SUMMARY OF SMALL SIGNS

SHEET 2 OF 4

DIST	COUNTY		HIGHWAY
HOU	WALLER		FM 362
CONT	SECT	JOB	SHEET NO.
0523	02	051	27

SUMMARY OF SMALL SIGNS

LAYOUT SHEET NO.	SIGN NO.	SIGN TYPE	SIGN TEXT	SIGN DIMENSIONS (IN)	PLYWOOD SIGNS	ALUMINUM SIGNS TYPE A	644 - INS SM RD SN SUP & AM TYPE OF MOUNT: 6001 10BWG (1) SA (P) EA	6002 10BWG (1) SA (P-BM) EA	6004 10BWG (1) SA (T) EA	6005 10BWG (1) SA (T-2EXT) EA	6007 10BWG (1) SA (U) EA	6017 10BWG (2) SA (P) EA	6019 10BWG (2) SA (T-2EXT) EA	6027 S80 (1) SA (P) EA	6028 S80 (1) SA (P-BM) EA	6030 S80 (1) SA (T) EA	6031 S80 (1) SA (T-2EXT) EA	6033 S80 (1) SA (U) EA	6034 S80 (1) SA (U-1EXT) EA	6035 S80 (1) SA (U-2EXT) EA	6036 S80 (1) SA (U-BM) EA	6037 S80 (1) SA (U-WC) EA	6050 S80 (2) SA (P) EA	6052 S80 (2) SA (T-2EXT) EA
11	1	W2-1	SPEED LIMIT 55	48x60		X										X								
		W16-8P	INTERSECTION WARNING (SYMBOL)	36x36		X	X																		
	2	R2-1	Baethe Rd	24x8		X																			
	3	R2-1	SPEED LIMIT 55	48x60		X										X								
12	1	D14-4T	ADOPT A HIGHWAY / NEXT 2 MILES / ESTHER / CHAPTER #102	48x48		X	2 SEPARATE SIGNS											X							
		CW21-1T	Give Us A Brake	48x48		X	HINGED																		
	2	D14-4T	ADOPT A HIGHWAY / NEXT 2 MILES / THIS SECTION AVAILABLE FOR ADOPTION / (979) 921-2400	48x48		X	2 SEPARATE SIGNS											X							
		CW21-1T	Give Us A Brake	48x48		X	HINGED																		
	3	W1-2R	CURVE AHEAD (SYMBOL)	36x36		X	(SOLAR POWERED, REPLACE SIGN PANEL W13-1P)																		
		W13-1P	40 MPH	18x18		X																			
13	1	R2-1	SPEED LIMIT 55	48x60		X										X								
	2-3	W1-8R	CHEVRON (SYMBOL)	30x36		X	(SOLAR POWERED LED)																		
		W1-8L	CHEVRON (SYMBOL)	30x36		X																			
	4	R1-1	STOP	30x30		X	X																		
	5-6	W1-8R	CHEVRON (SYMBOL)	30x36		X	(SOLAR POWERED LED)																		
		W1-8L	CHEVRON (SYMBOL)	30x36		X																			
	7	R1-1	STOP	36x36		X	X																		
	8	W1-2L	CURVE AHEAD (SYMBOL)	36x36		X	(SOLAR POWERED, REPLACE SIGN PANEL W13-1P)																		
		W13-1P	40 MPH	18x18		X																			
14	1	W1-2R	CURVE AHEAD (SYMBOL)	36x36		X	(SOLAR POWERED, REPLACE SIGN PANEL W13-1P)																		
		W13-1P	40 MPH	18x18		X																			
	2	R1-1	STOP	36x36		X	X																		
	3	W1-8L	CHEVRON (SYMBOL)	30x36		X	(SOLAR POWERED LED)																		
		W1-8R	CHEVRON (SYMBOL)	30x36		X																			
	4	R1-2	YIELD	36x36x36		X	X																		
	5	M3-1	NORTH	24x12		X	X																		
		M1-6F	FARM ROAD 362	24x24		X																			
		D10-7aT	452	3x10		X	(FRONT AND BACK)																		
	6	R2-1	SPEED LIMIT 55	48x60		X										X								
15	1	M3-3	SOUTH	24x12		X	X																		
		M1-6F	FARM ROAD 362	24x24		X																			
	2	W1-2R	CURVE AHEAD (SYMBOL)	36x36		X	(SOLAR POWERED, REPLACE SIGN PANEL W13-1P)																		
		W13-1P	40 MPH	18x18		X																			
16	1	W8-18	ROAD MAY FLOOD	36x36		X	X																		
	2	R2-1	SPEED LIMIT 55	48x60		X										X								

GENERAL NOTES:

ALL SIGNS SHALL BE ERECTED ACCORDING TO THE LOCATION SHOWN ON THE LAYOUT SHEETS EXCEPT THAT THE ENGINEER MAY SHIFT A SIGN IN ORDER TO SECURE A MORE DESIRABLE LOCATION. THE CONTRACTOR WILL STAKE ALL SIGN LOCATIONS, AND NO CHANGES IN THOSE LOCATIONS SHALL BE MADE WITHOUT PRIOR APPROVAL OF THE ENGINEER.

ALUMINUM SIGN BLANKS(TY A)

Square Ft.	Min. Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

SUMMARY OF SMALL SIGNS

SHEET 3 OF 4

DIST	COUNTY	HIGHWAY
HOU	WALLER	FM 362

CONT	SECT	JOB	SHEET NO.
0523	02	051	28

SUMMARY OF SMALL SIGNS

LAYOUT SHEET NO.	SIGN NO.	SIGN TYPE	SIGN TEXT	SIGN DIMENSIONS (IN)	PLYWOOD SIGNS	ALUMINUM SIGNS TYPE A	644 - INS SM RD SN SUP & AM TYPE OF MOUNT: 6001 10BWG (1) SA (P) EA	6002 10BWG (1) SA (P-BM) EA	6004 10BWG (1) SA (T) EA	6005 10BWG (1) SA (T-2EXT) EA	6007 10BWG (1) SA (U) EA	6017 10BWG (2) SA (P) EA	6019 10BWG (2) SA (T-2EXT) EA	6027 S80 (1) SA (P) EA	6028 S80 (1) SA (P-BM) EA	6030 S80 (1) SA (T) EA	6031 S80 (1) SA (T-2EXT) EA	6033 S80 (1) SA (U) EA	6034 S80 (1) SA (U-1EXT) EA	6035 S80 (1) SA (U-2EXT) EA	6036 S80 (1) SA (U-BM) EA	6037 S80 (1) SA (U-WC) EA	6050 S80 (2) SA (P) EA	6052 S80 (2) SA (T-2EXT) EA
17	1	W1-2R	CURVE AHEAD (SYMBOL)	36x36		X	(SOLAR POWERED LED)																		
		W13-1P	40 MPH	18x18		X																			
	2	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES / THIS SECTION AVAILABLE FOR ADOPTION (979) 921-2400	48x48		X	2 SEPARATE SIGNS											X							
		CW21-1T	Give Us a Brake	48x48		X	HINGED																		
	3	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES / THIS SECTION AVAILABLE FOR ADOPTION (979) 921-2400	48x48		X	2 SEPARATE SIGNS											X							
		CW21-1T	Give Us a Brake	48x48		X	HINGED																		
	4	R2-1	SPEED LIMIT 55	48x60		X										X									
	5-9	W1-8R	CHEVRON (SYMBOL)	30x36		X	(SOLAR POWERED LED)																		
		W1-8L	CHEVRON (SYMBOL)	30x36		X																			
	10	R1-1	STOP	36x36		X	X																		
18	1	W1-2L	CURVE AHEAD (SYMBOL)	36x36		X	(SOLAR POWERED, REPLACE SIGN PANEL W13-1P)																		
		W13-1P	40 MPH	18x18		X																			
	2	W1-2L	CURVE AHEAD (SYMBOL)	36x36		X	(SOLAR POWERED, REPLACE SIGN PANEL W13-1P)																		
		W13-1P	40 MPH	18x18		X																			
	3	W8-18	ROAD MAY FLOOD	36x36		X	X																		
	4	D1-2	↑ Monaville / ← Brookshire	90x30		X																X			
	5	R1-1	STOP	36x36		X	X																		
	6	W1-8L	CHEVRON (SYMBOL)	30x36		X	(SOLAR POWERED LED)																		
		W1-8R	CHEVRON (SYMBOL)	30x36		X																			
	7	R1-2	YIELD	36x36		X	X																		
19	1	R2-1	SPEED LIMIT 55	48x60		X										X									
	2	D1-1	← Monaville	84x18		X			X																
	3	W1-2R	CURVE AHEAD (SYMBOL)	36x36		X	(SOLAR POWERED, REPLACE SIGN PANEL W13-1P)																		
		W13-1P	40 MPH	18x18		X																			
	4	W1-4L	CURVE AHEAD (SYMBOL)	36x36		X	X																		
		W13-1P	50 MPH	18x18		X																			
	5	M3-3	SOUTH	24x12		X	X																		
		M1-6F	FARM ROAD 362	24x24		X																			
		D10-7aT	450	3x10		X	(FRONT AND BACK)																		
	6	R2-1	SPEED LIMIT 55	48x60		X										X									
	7	M3-1	NORTH	24x12		X	X																		
		M1-6F	FARM ROAD 362	24x24		X																			
20	1	R1-1	STOP	36x36		X	X																		
	2	W1-4L	CURVE AHEAD (SYMBOL)	36x36		X	X																		
		W13-1P	50 MPH	18x18		X																			
	3	R2-1	SPEED LIMIT 55	48x60		X										X									
			TOTAL				49		16		1					16		5	1		3				

GENERAL NOTES:

ALL SIGNS SHALL BE ERECTED ACCORDING TO THE LOCATION SHOWN ON THE LAYOUT SHEETS EXCEPT THAT THE ENGINEER MAY SHIFT A SIGN IN ORDER TO SECURE A MORE DESIRABLE LOCATION. THE CONTRACTOR WILL STAKE ALL SIGN LOCATIONS, AND NO CHANGES IN THOSE LOCATIONS SHALL BE MADE WITHOUT PRIOR APPROVAL OF THE ENGINEER.

ALUMINUM SIGN BLANK(ST) A)

Square Ft.	Min. Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

SUMMARY OF SMALL SIGNS

SHEET 4 OF 4

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		29

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

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Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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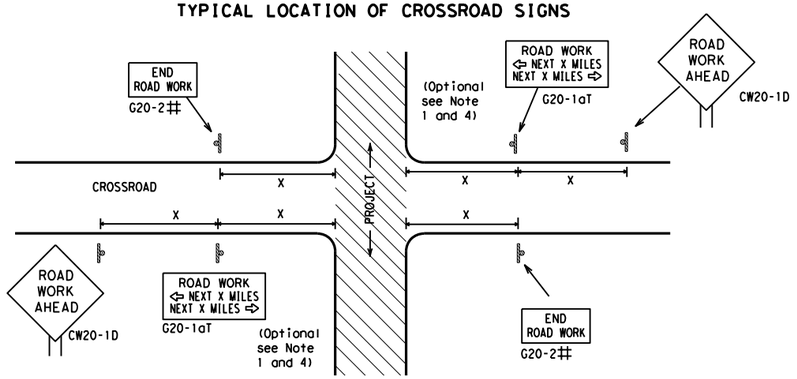
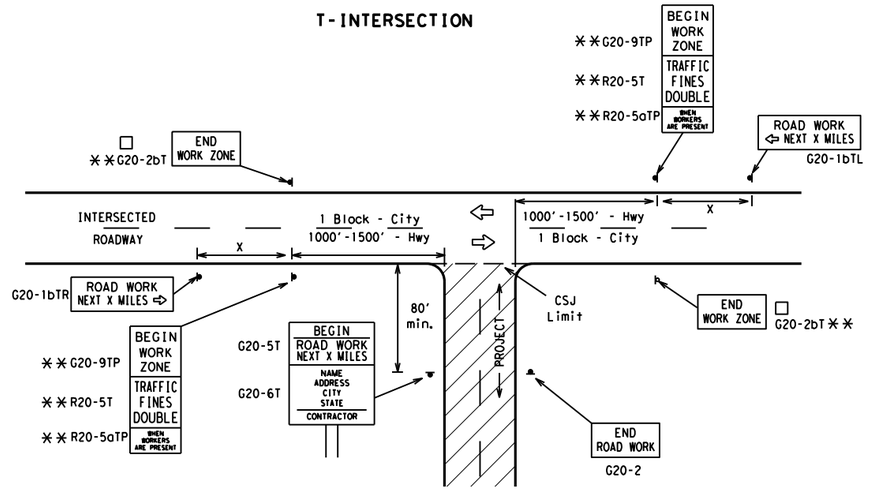
TYPICAL LOCATION OF CROSSROAD SIGNS



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]

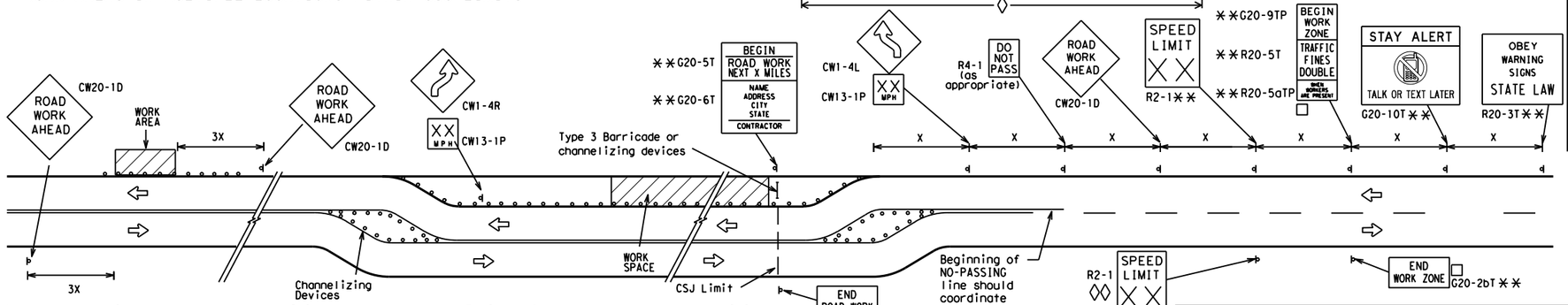
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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.

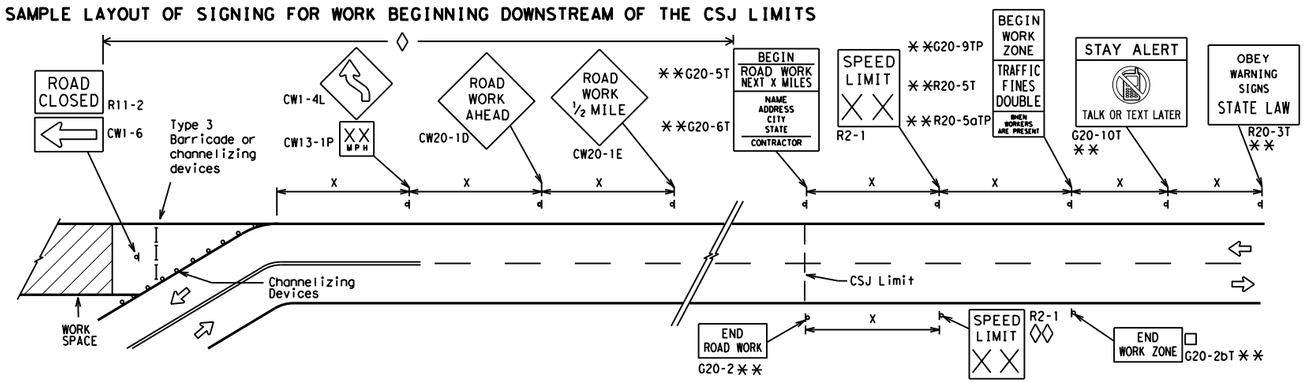
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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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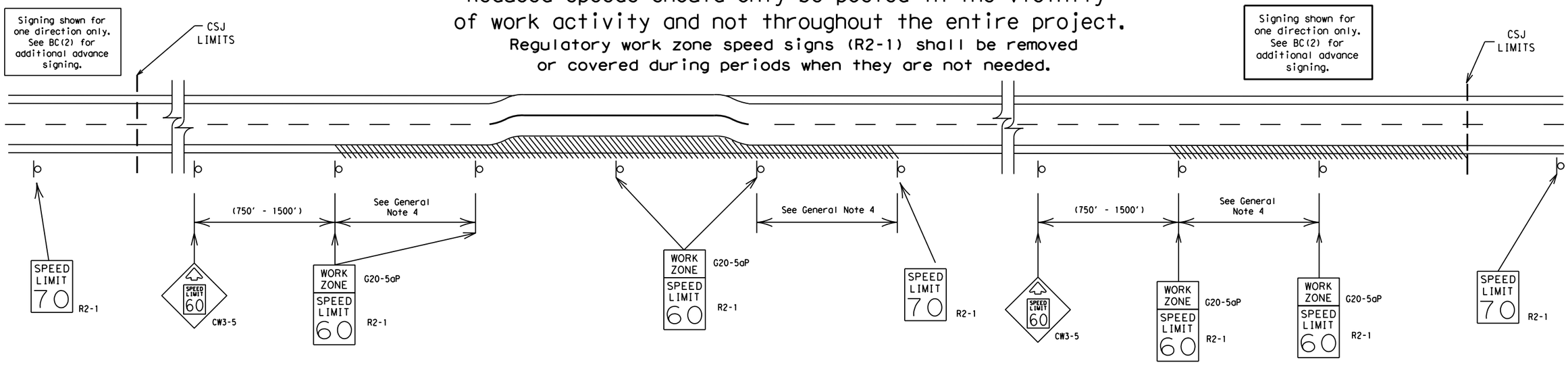
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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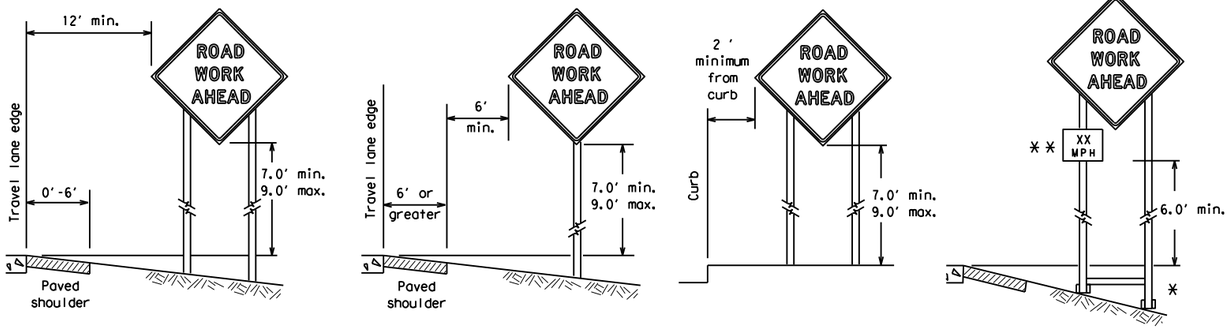
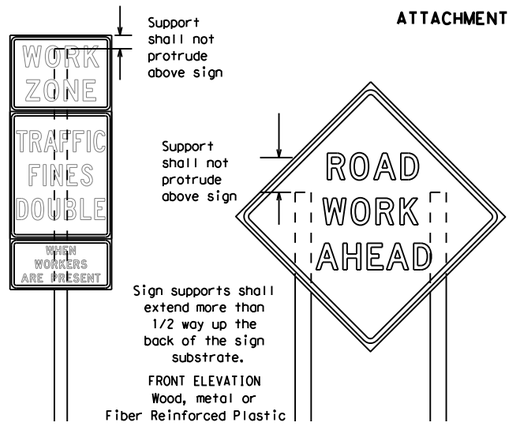
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

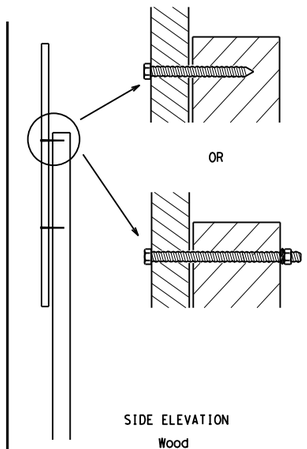


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





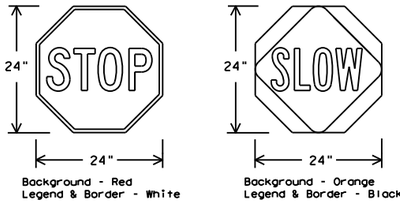
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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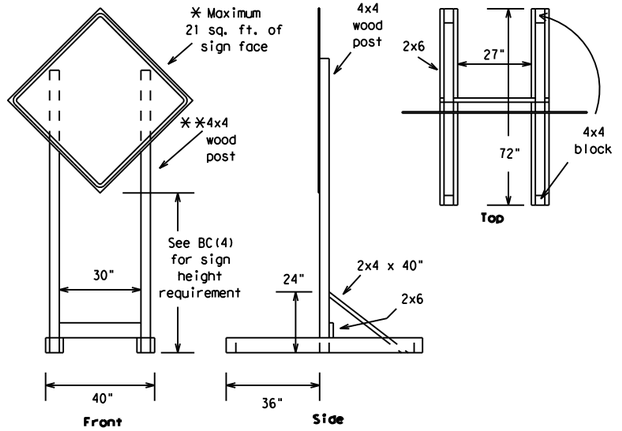
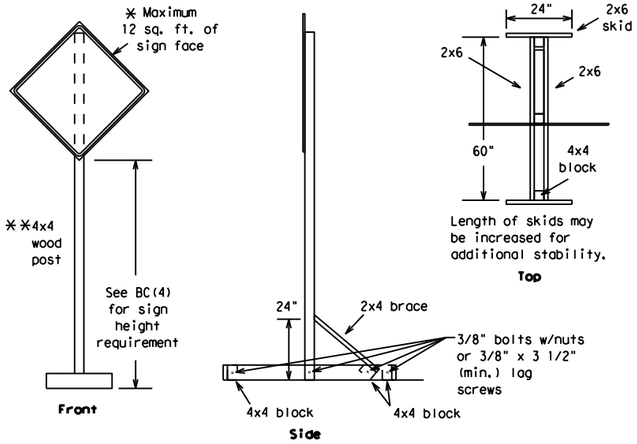
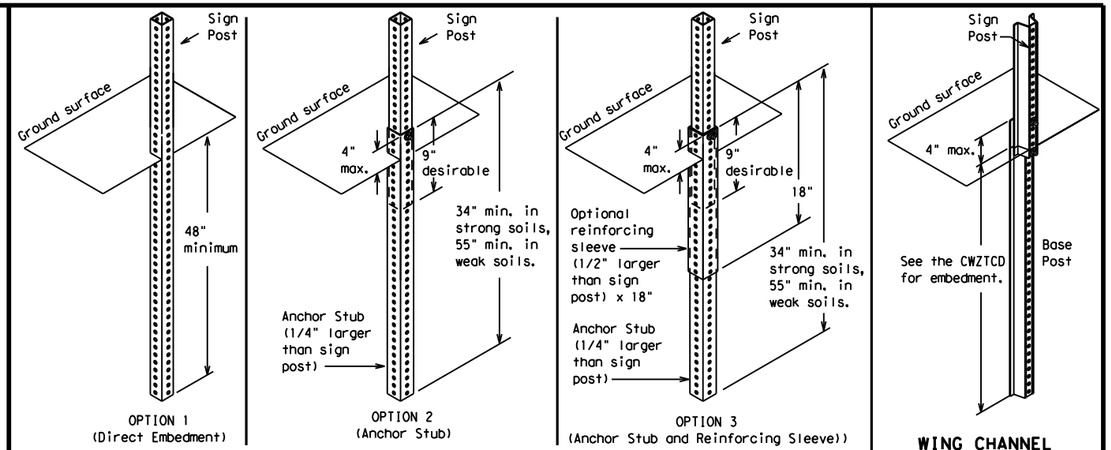




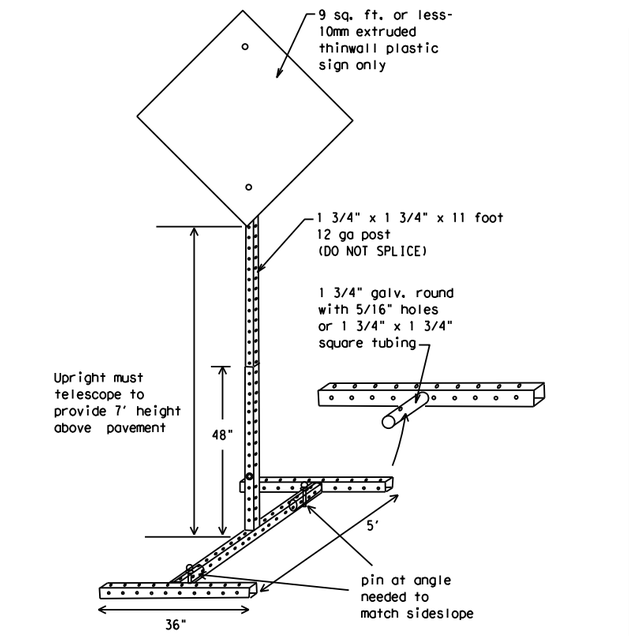
SKID MOUNTED WOOD SIGN SUPPORTS

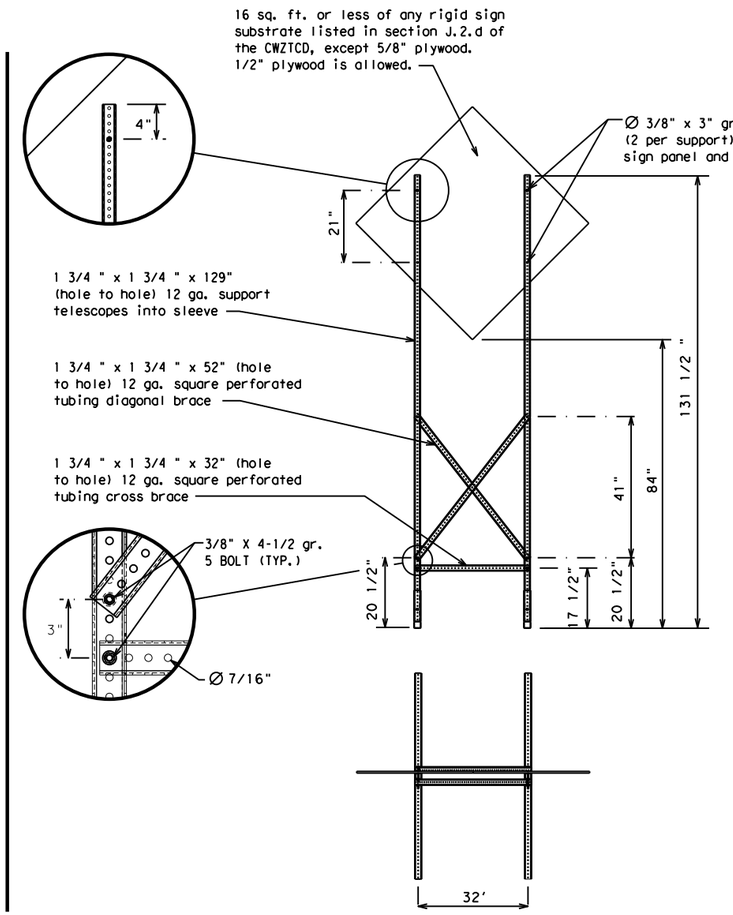
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

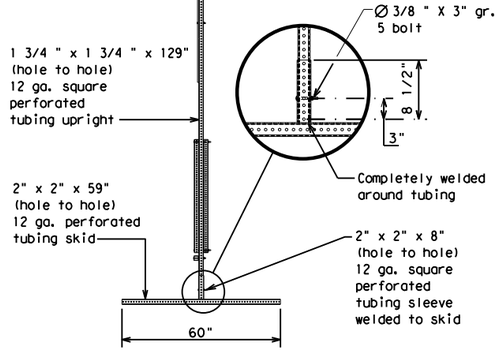


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	WALLER		34

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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

** 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

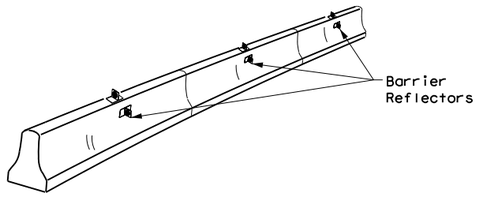
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	WALLER		35

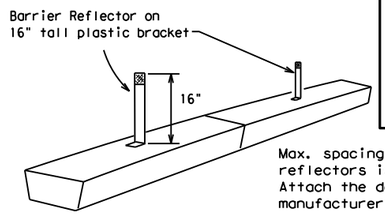
100

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.

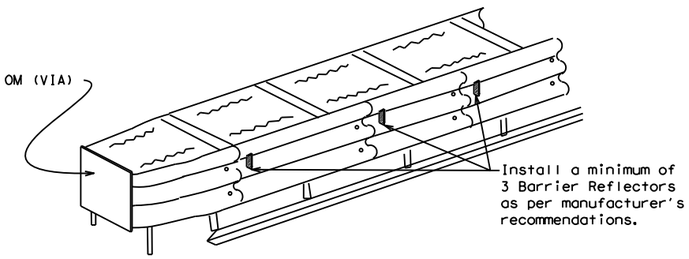


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

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)

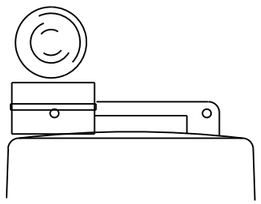


DELINEATION OF END TREATMENTS

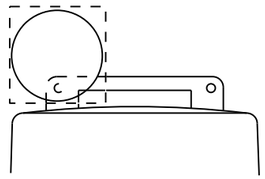
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

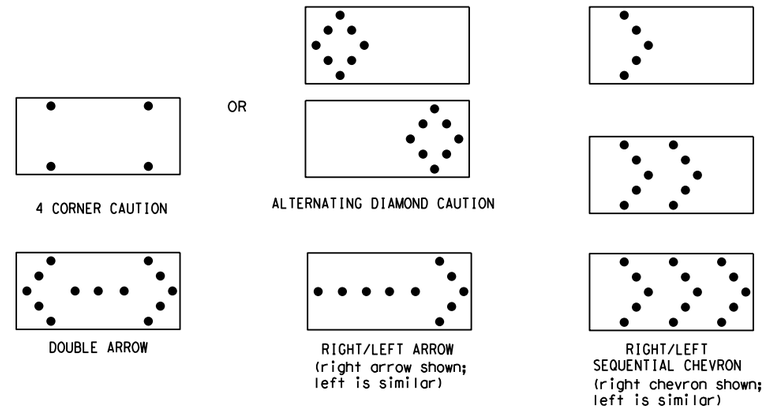
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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	0523	02	051	FM 362
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	WALLER		36

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DATE: $DATE$ $TIME$
FILE: $FILE$

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:

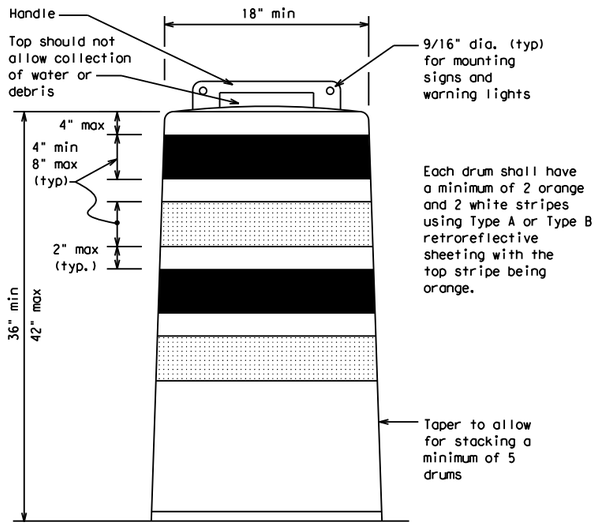
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

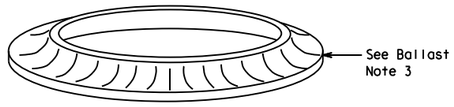
RETROREFLECTIVE SHEETING

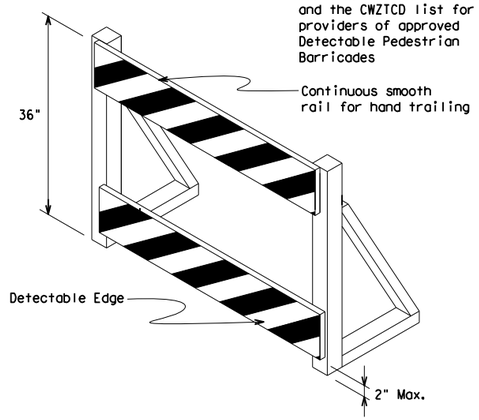
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

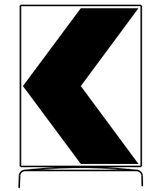




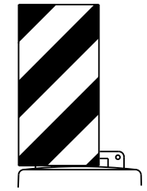


DETECTABLE PEDESTRIAN BARRICADES

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.

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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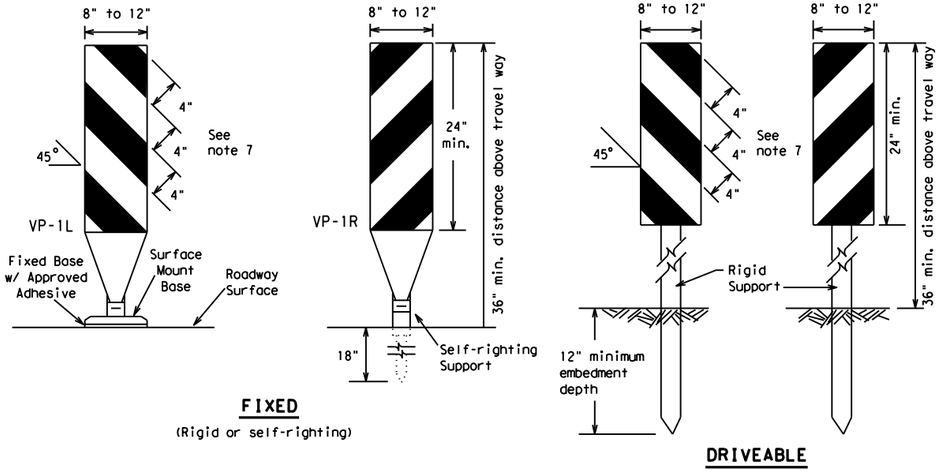
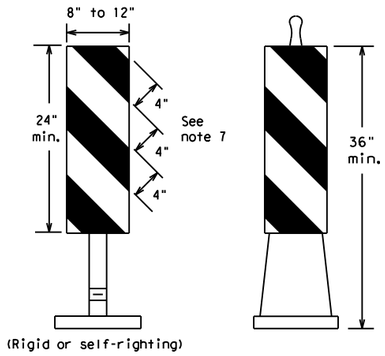


FIXED
(Rigid or self-righting)

DRIVEABLE

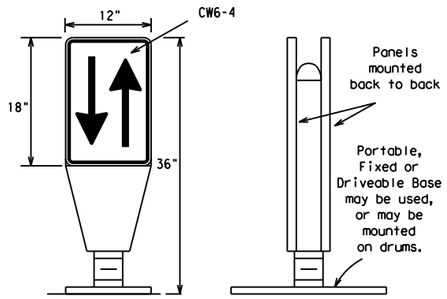


(Rigid or self-righting)

PORTABLE

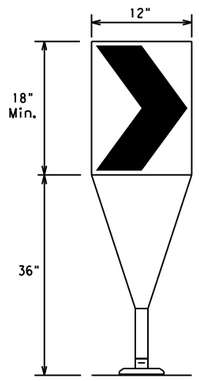
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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



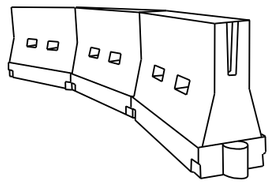
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

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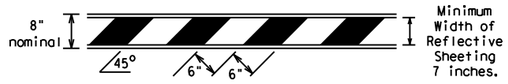
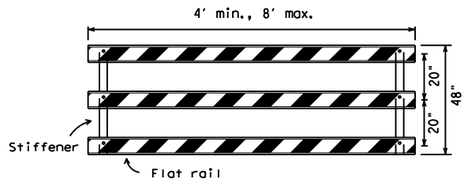
TYPE 3 BARRICADES

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.



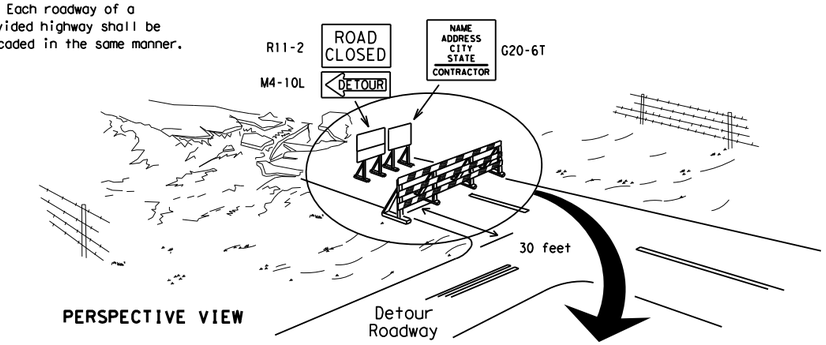
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

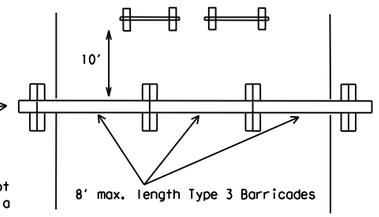
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

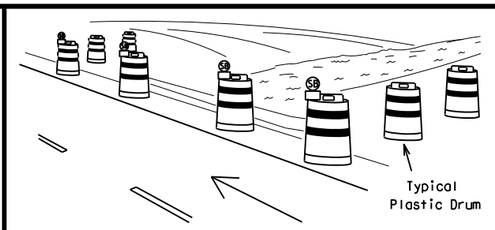
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

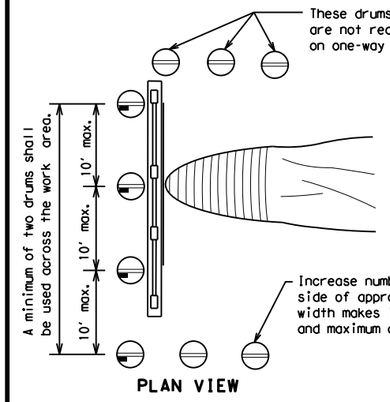
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

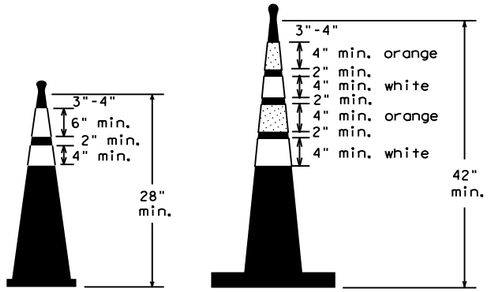
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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

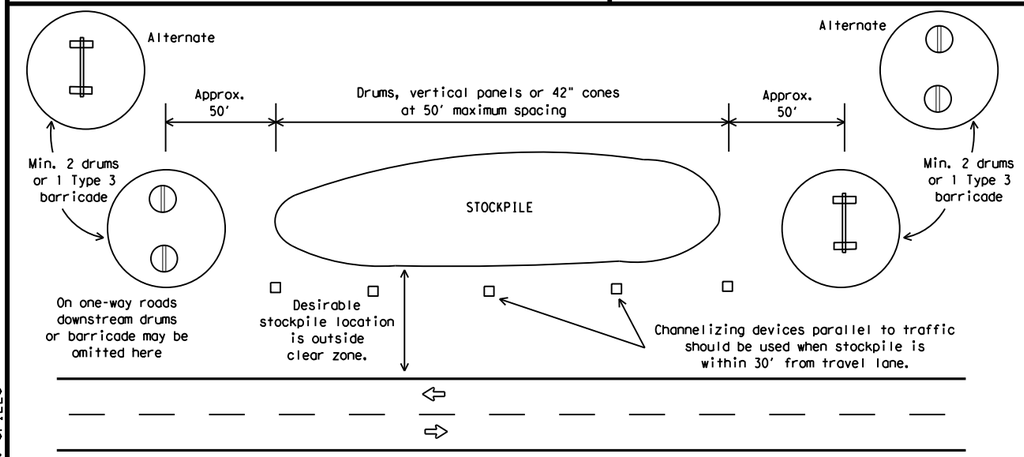
PLAN VIEW

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

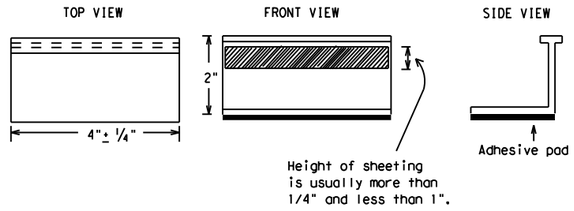
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	HOU	WALLER		40
11-02 8-14				

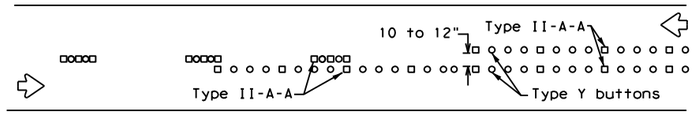
105

DATE: $DATE$ $TIME$
FILE: $FILE$

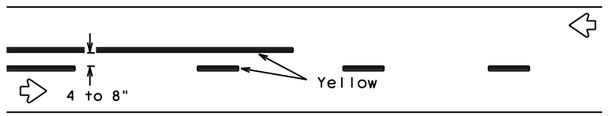
DATE: $DATE$ $TIME$
FILE: $FILE$

PAVEMENT MARKING PATTERNS

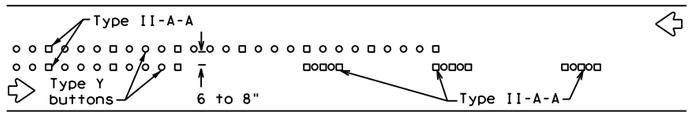
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



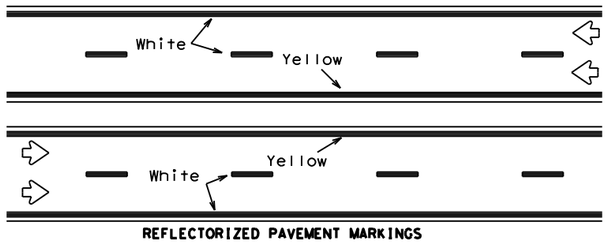
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



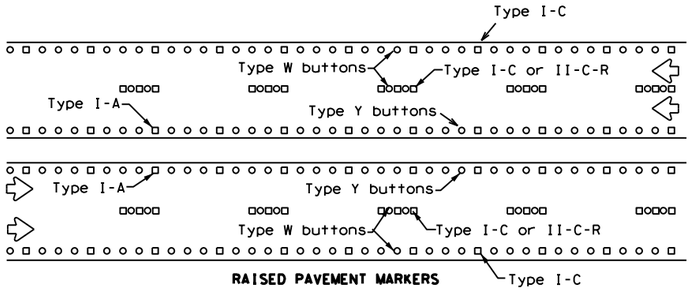
RAISED PAVEMENT MARKERS - PATTERN B

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



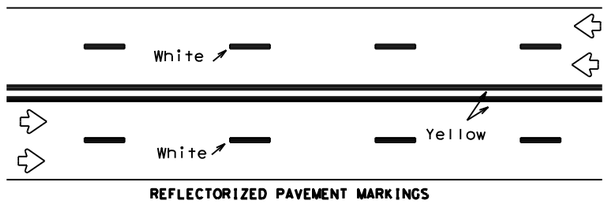
REFLECTORIZED PAVEMENT MARKINGS



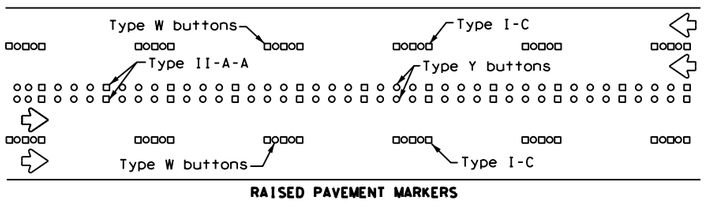
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



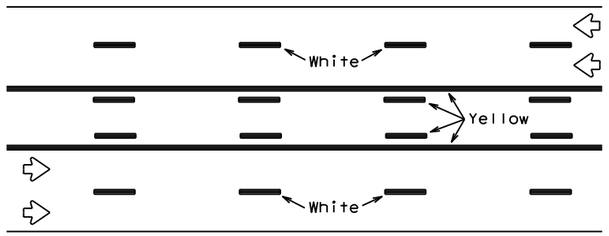
REFLECTORIZED PAVEMENT MARKINGS



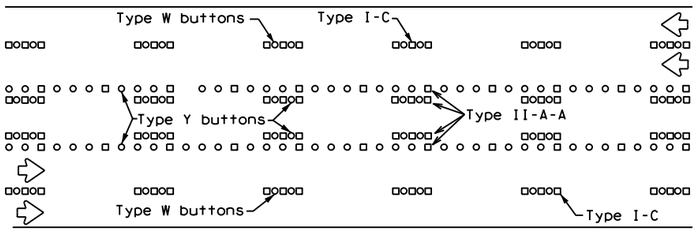
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

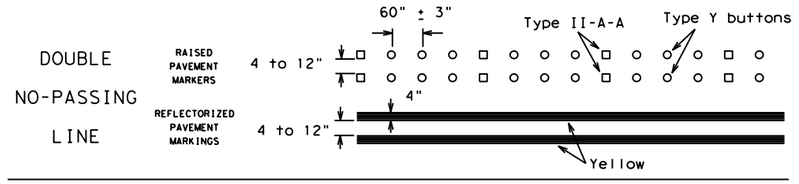
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

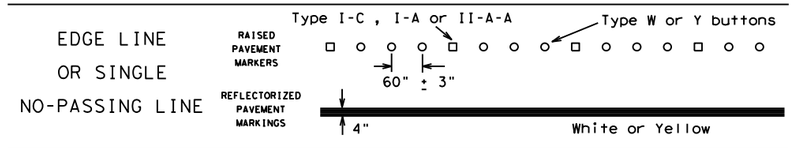
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

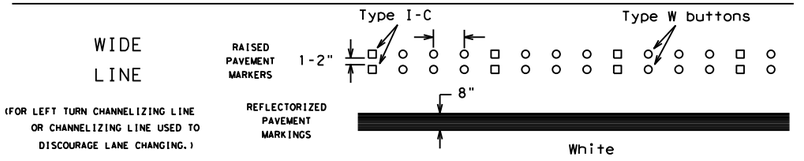


EDGE LINE OR SINGLE NO-PASSING LINE



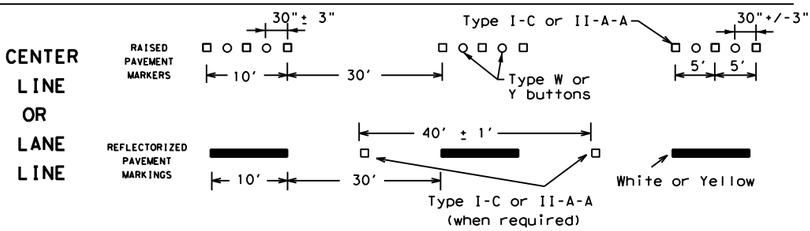
WIDE LINE

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

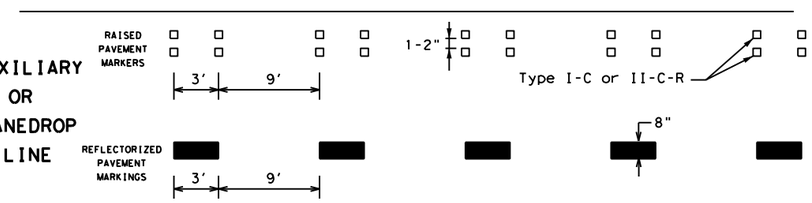


BROKEN LINES

CENTER LINE OR LANE LINE

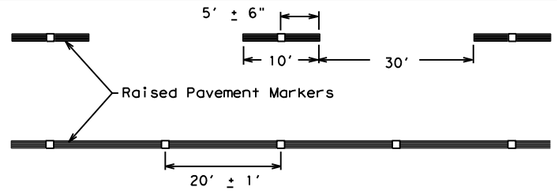


AUXILIARY OR LANEDROP LINE



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	0523	02	051	FM 362
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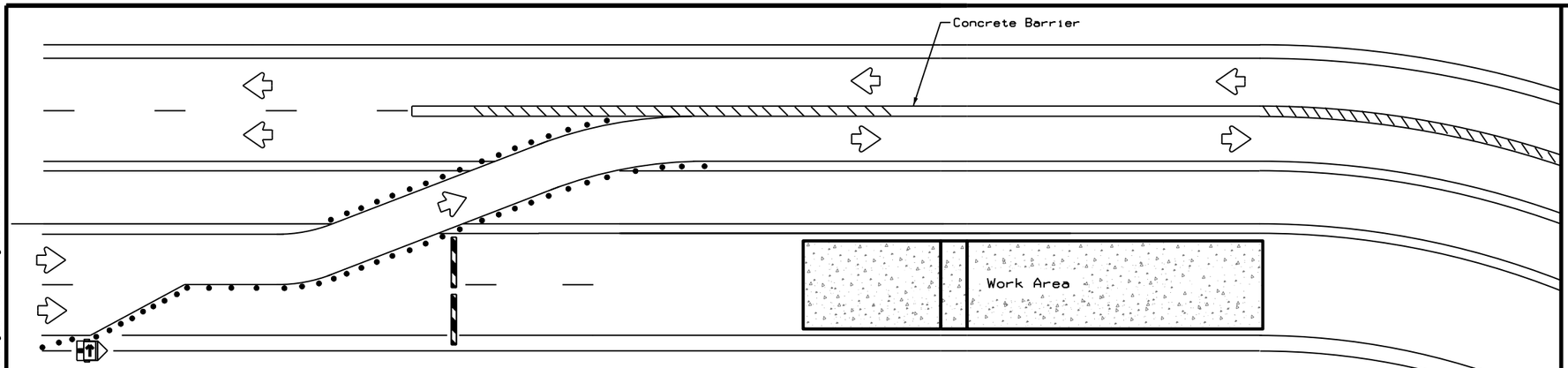
	HOU	WALLER		41

106



NOTES:

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

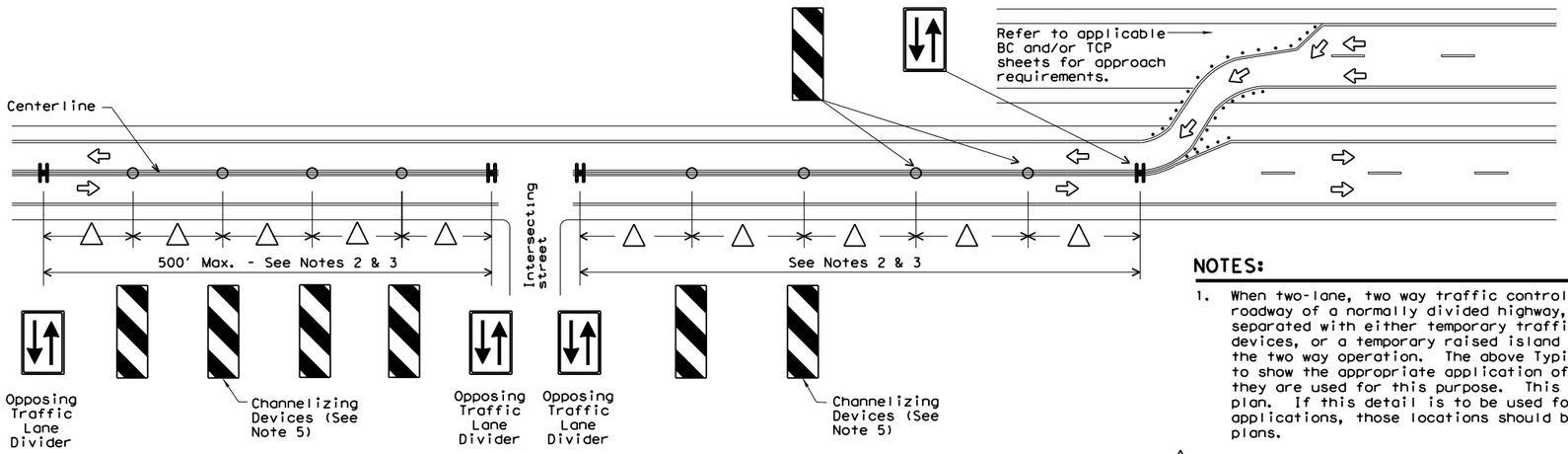
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

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

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

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

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



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

NOTES:

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 2-17 3-03 7-13	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		42

110

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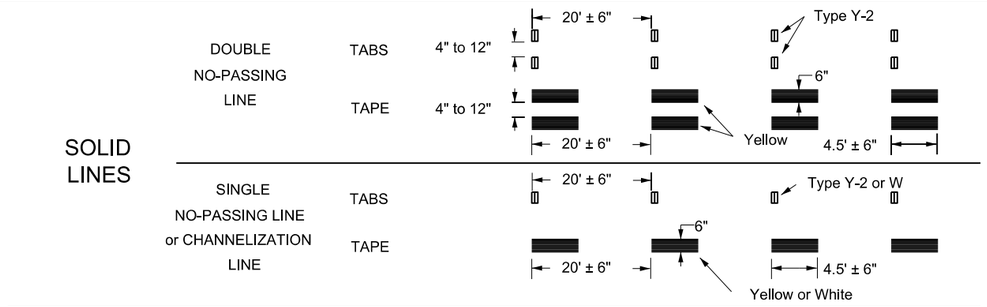
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



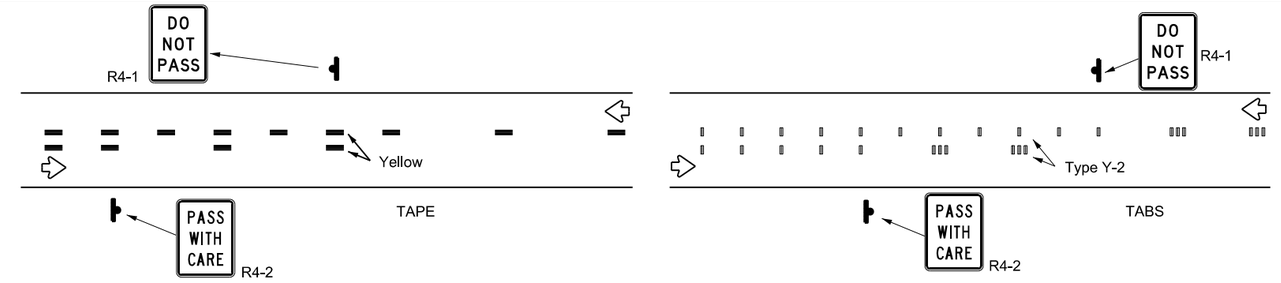
NOTES:

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.

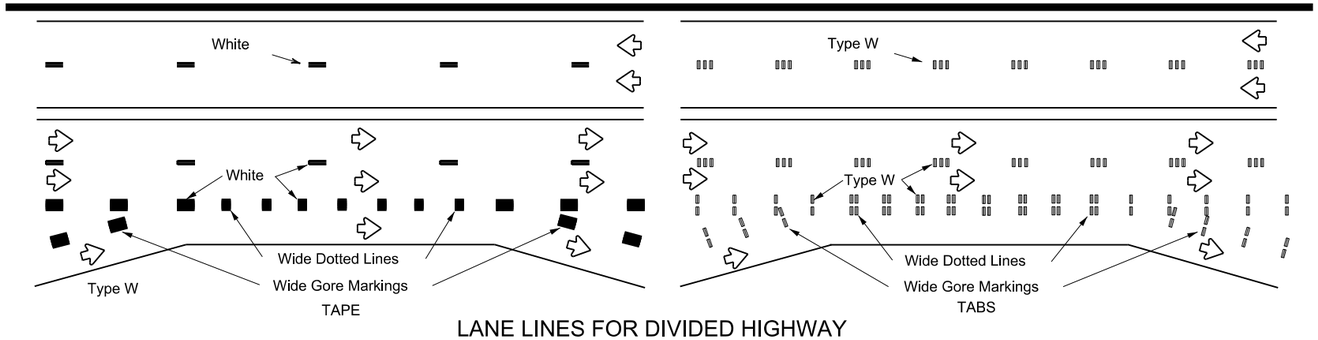
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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.

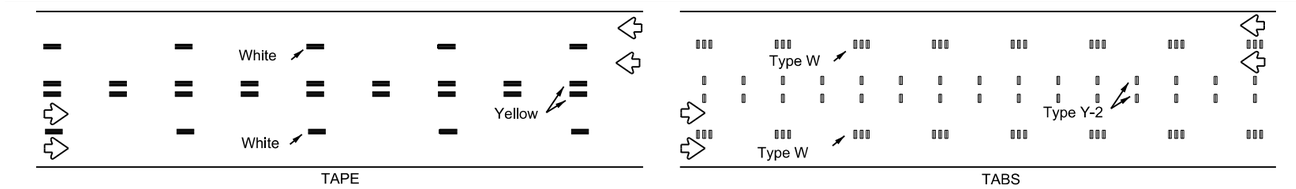
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



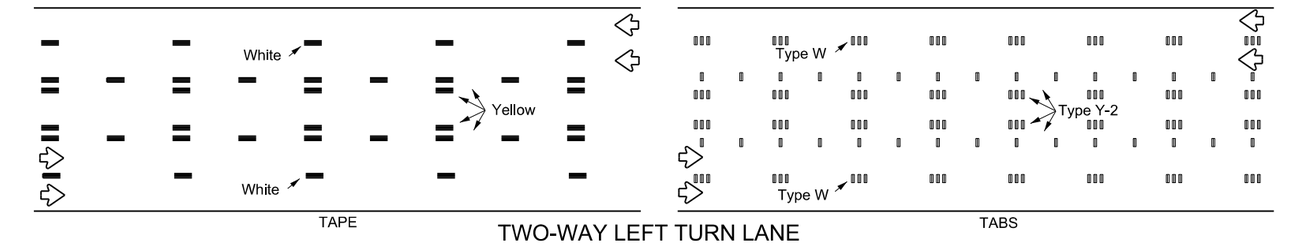
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



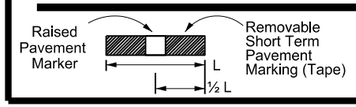
LANE LINES FOR DIVIDED HIGHWAY



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:
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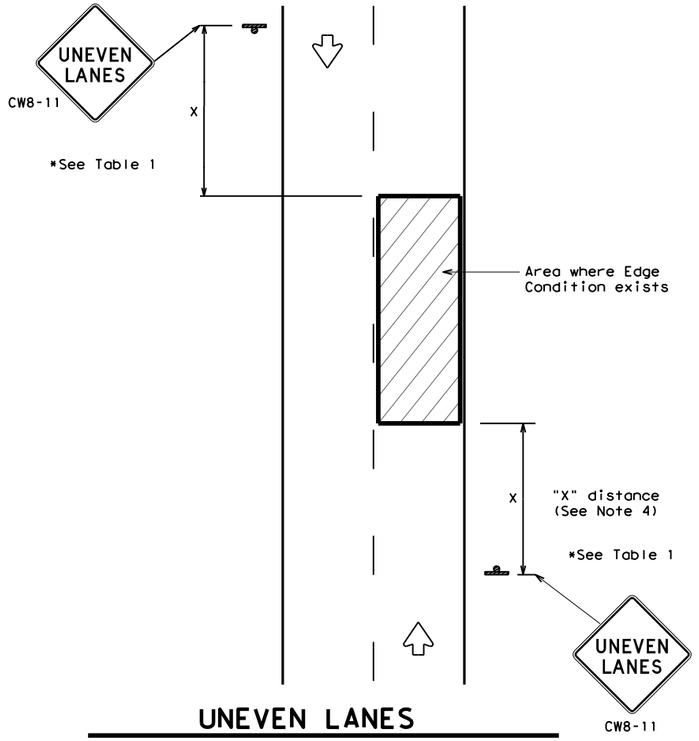
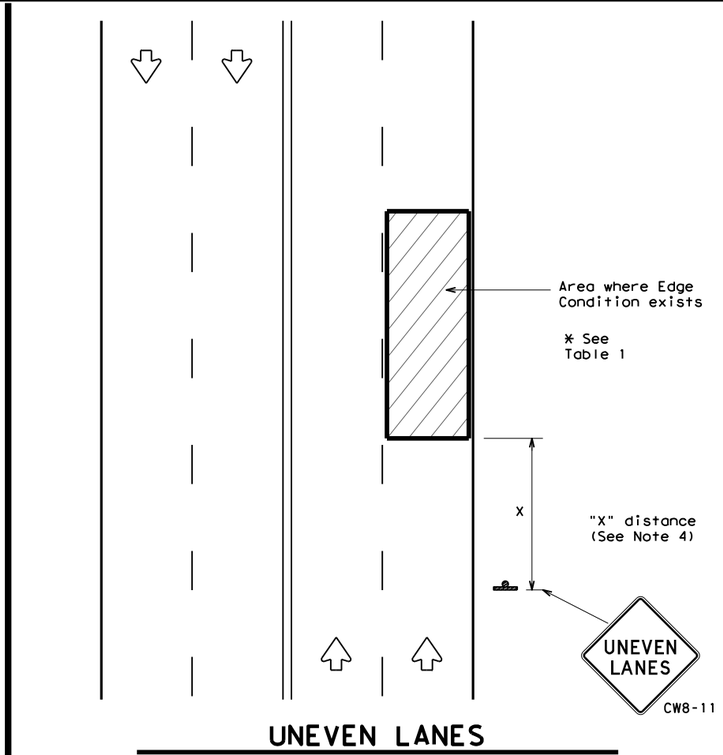
1-97 2-23	HOU	WALLER		43
3-03				

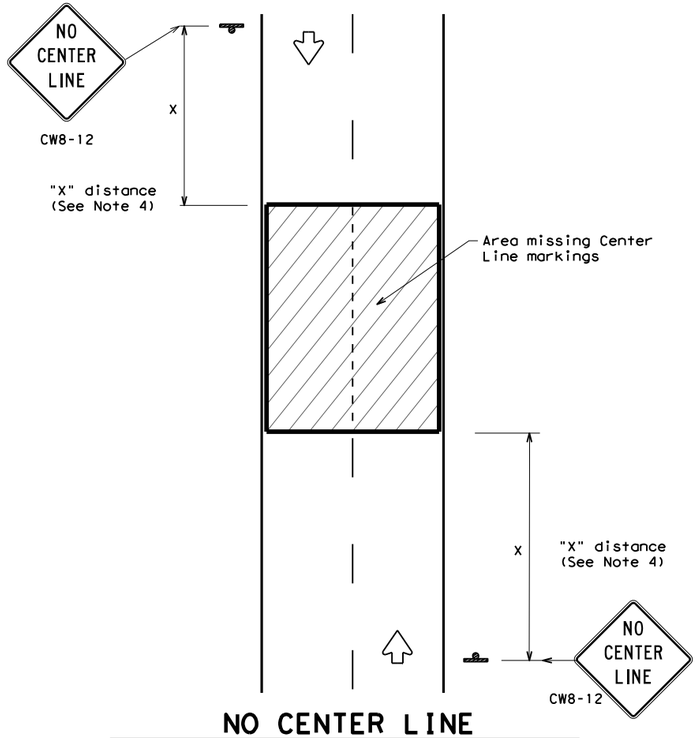
111



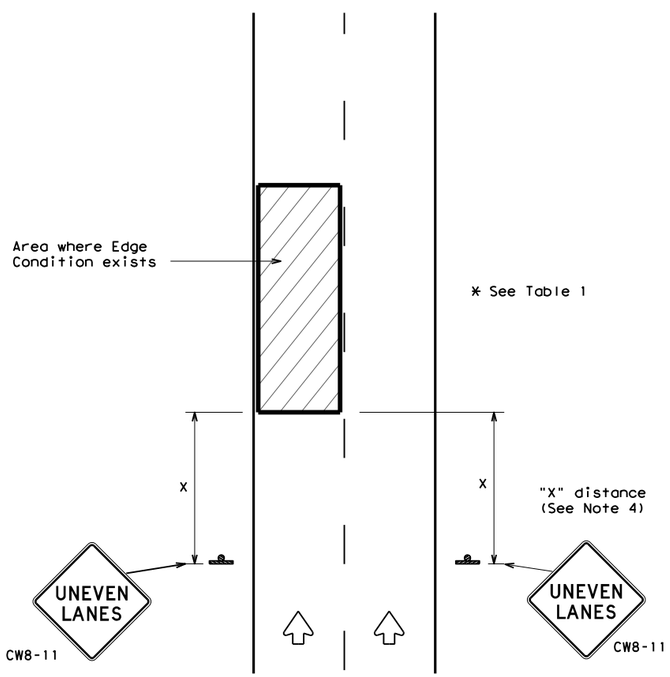
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

DATE: $DATE$ $TIME$
FILE: $FILE$

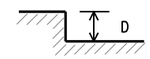
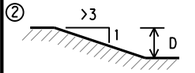
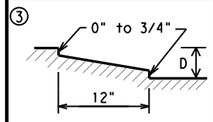
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

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

TABLE 1

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

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

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

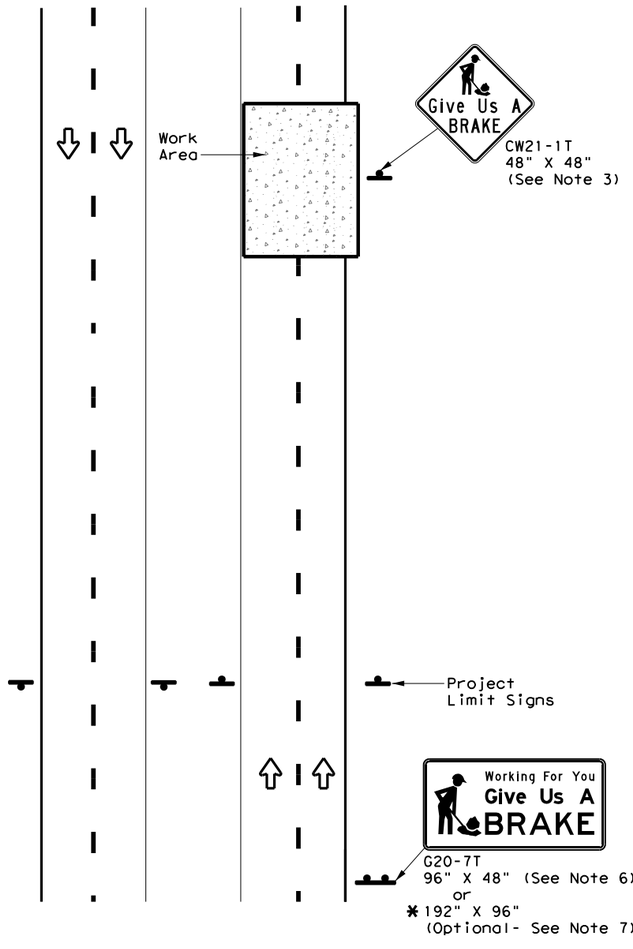
Texas Department of Transportation

Traffic Operations Division Standard

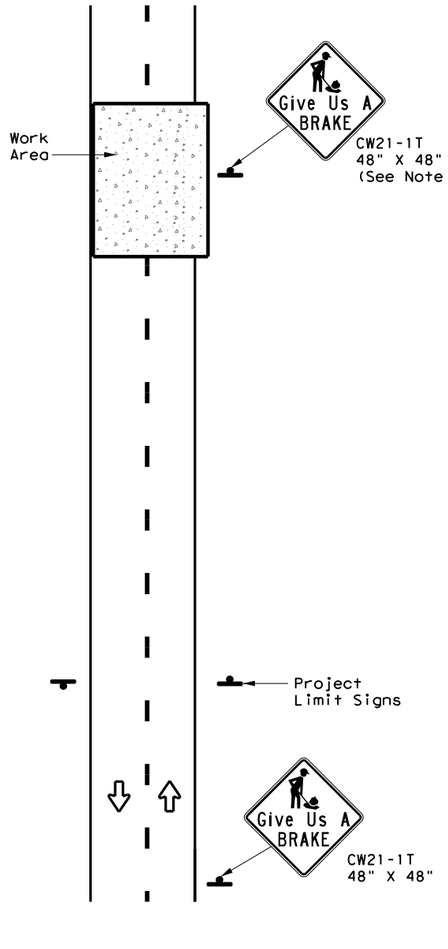
SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	HOU	WALLER		44



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.

DATE: $DATE$ $TIME$
FILE: $FILE$

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	0523	02	051	FM 362
6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	HOU	WALLER		45

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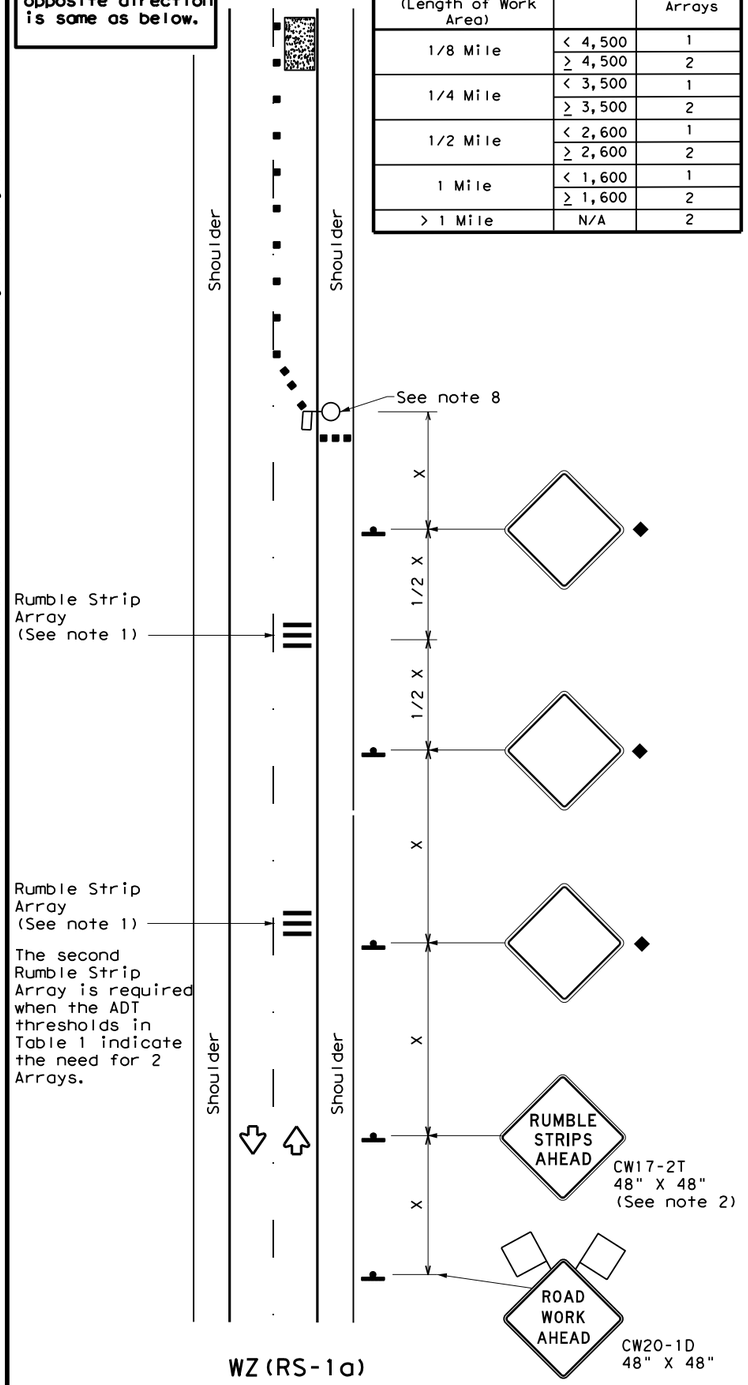
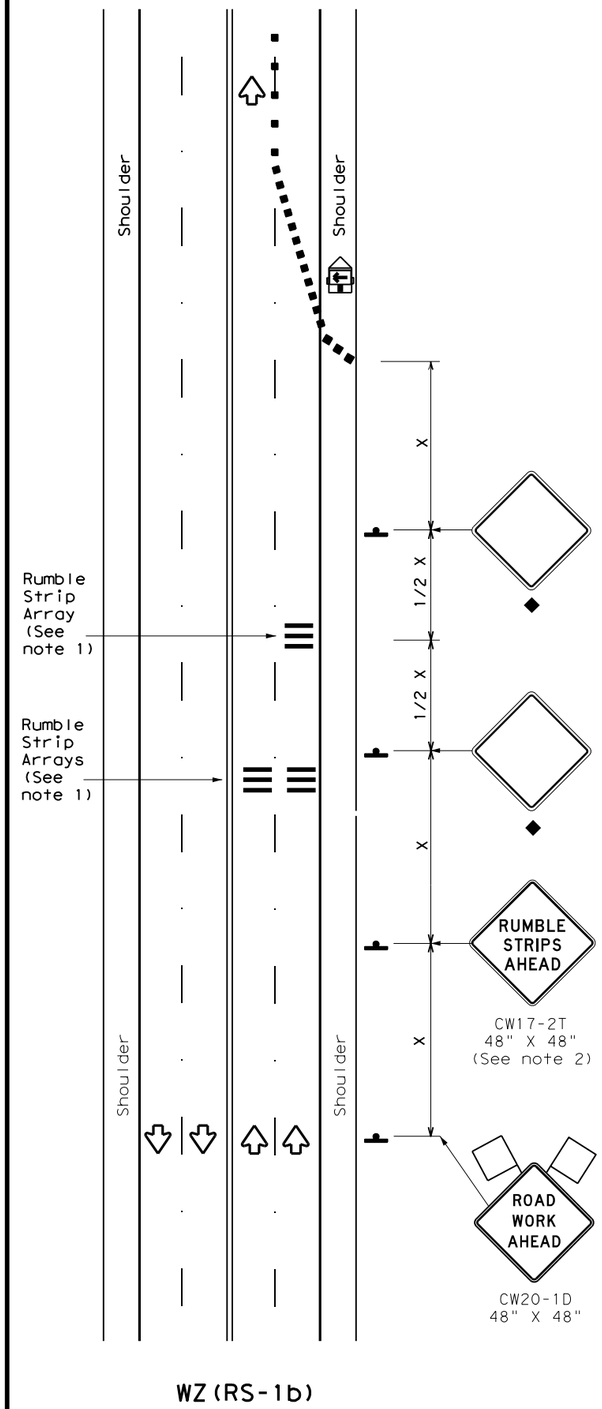
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

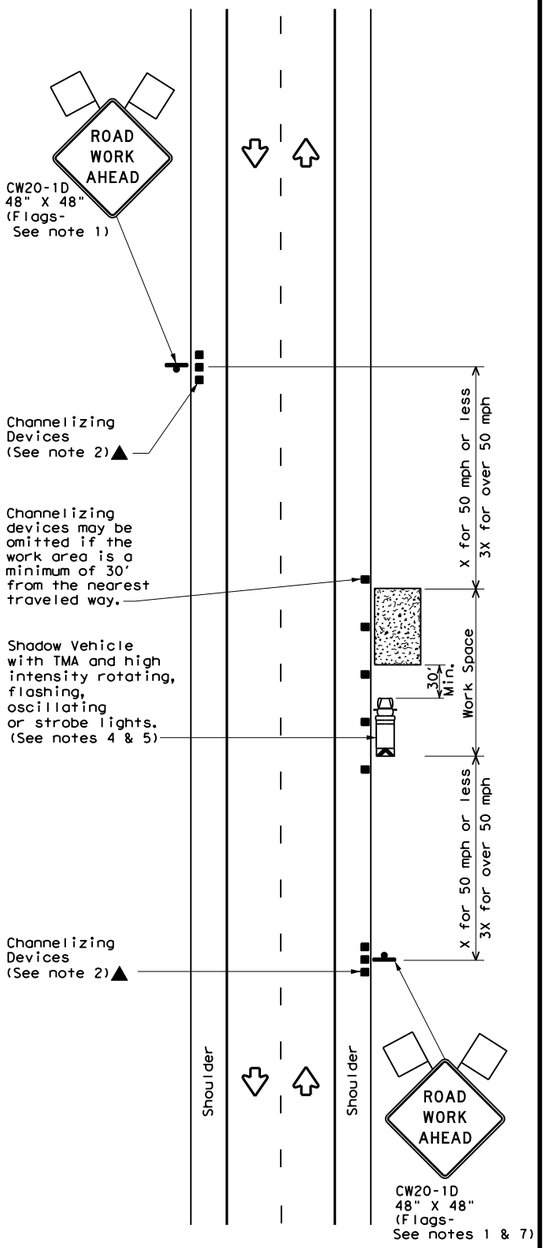
WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		46

117

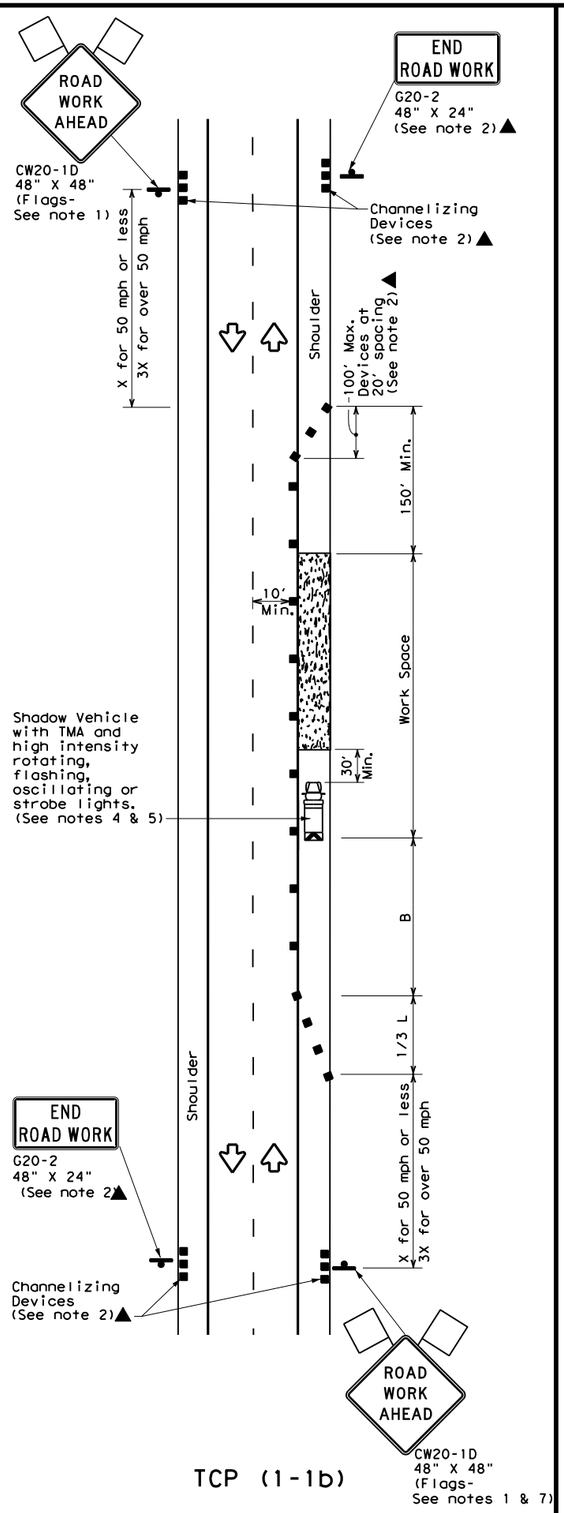
DATE: $DATE$ $TIME$
FILE: $FILE$

DATE: $DATE$ $TIME$
FILE: $FILE$



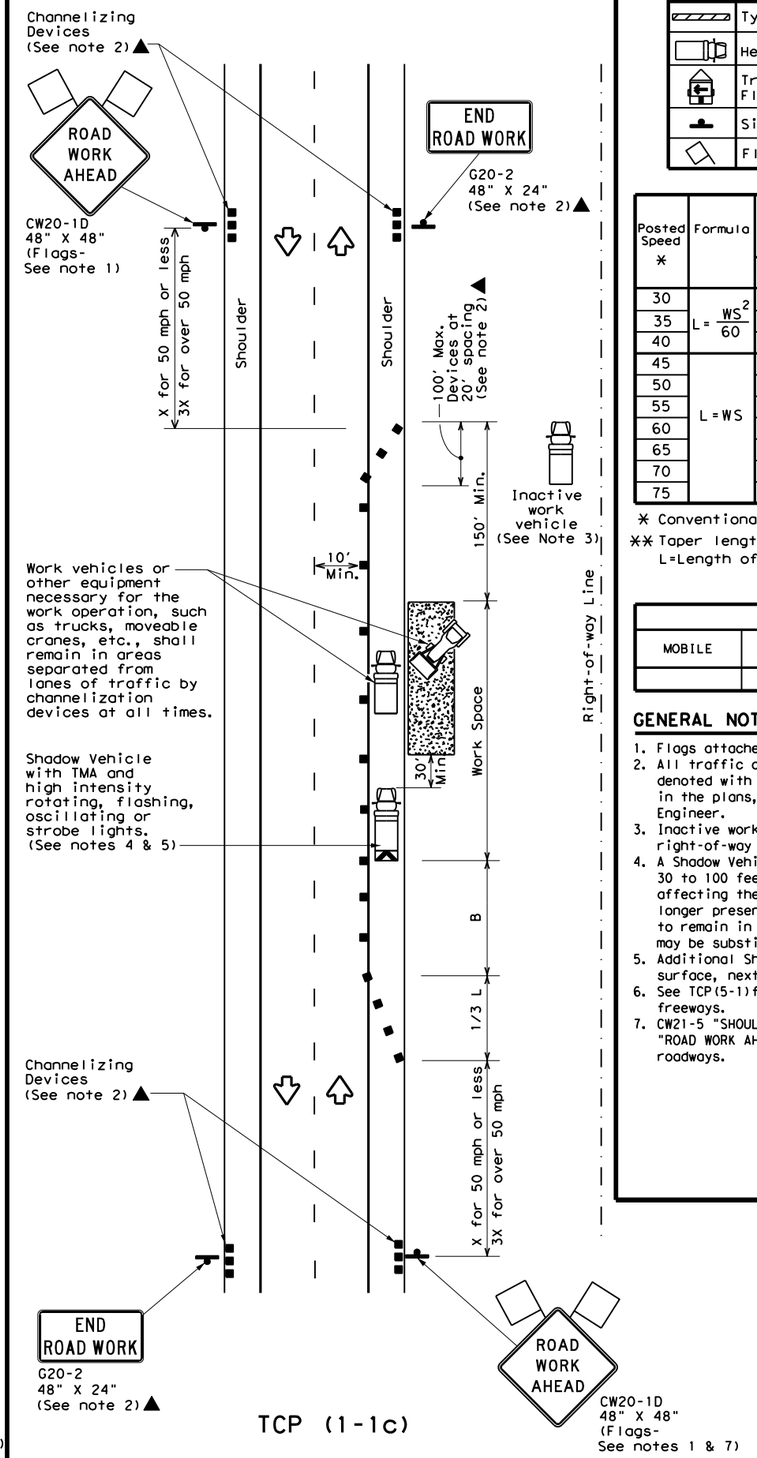
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		47

DATE: $DATE$ $TIME$
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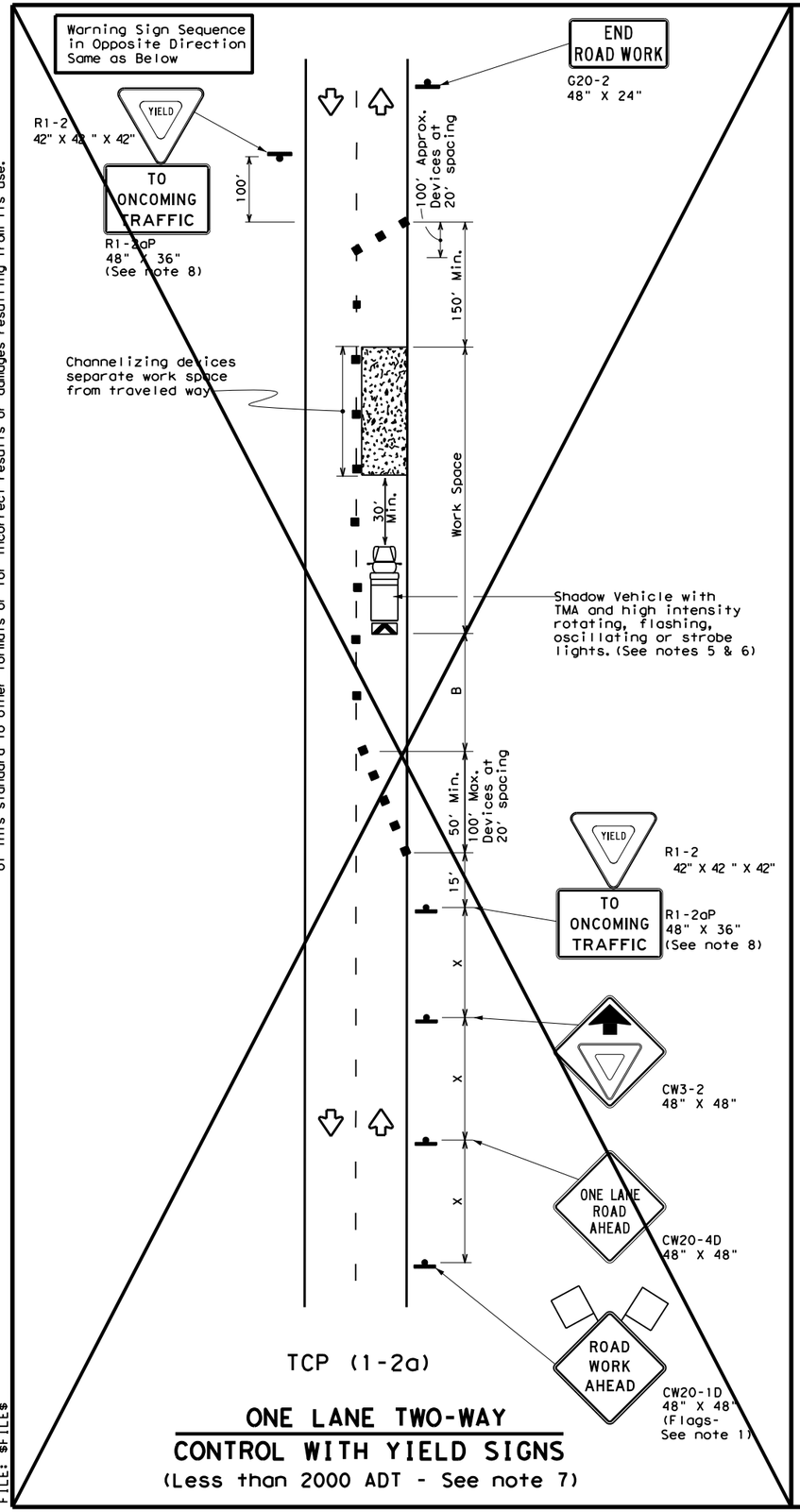
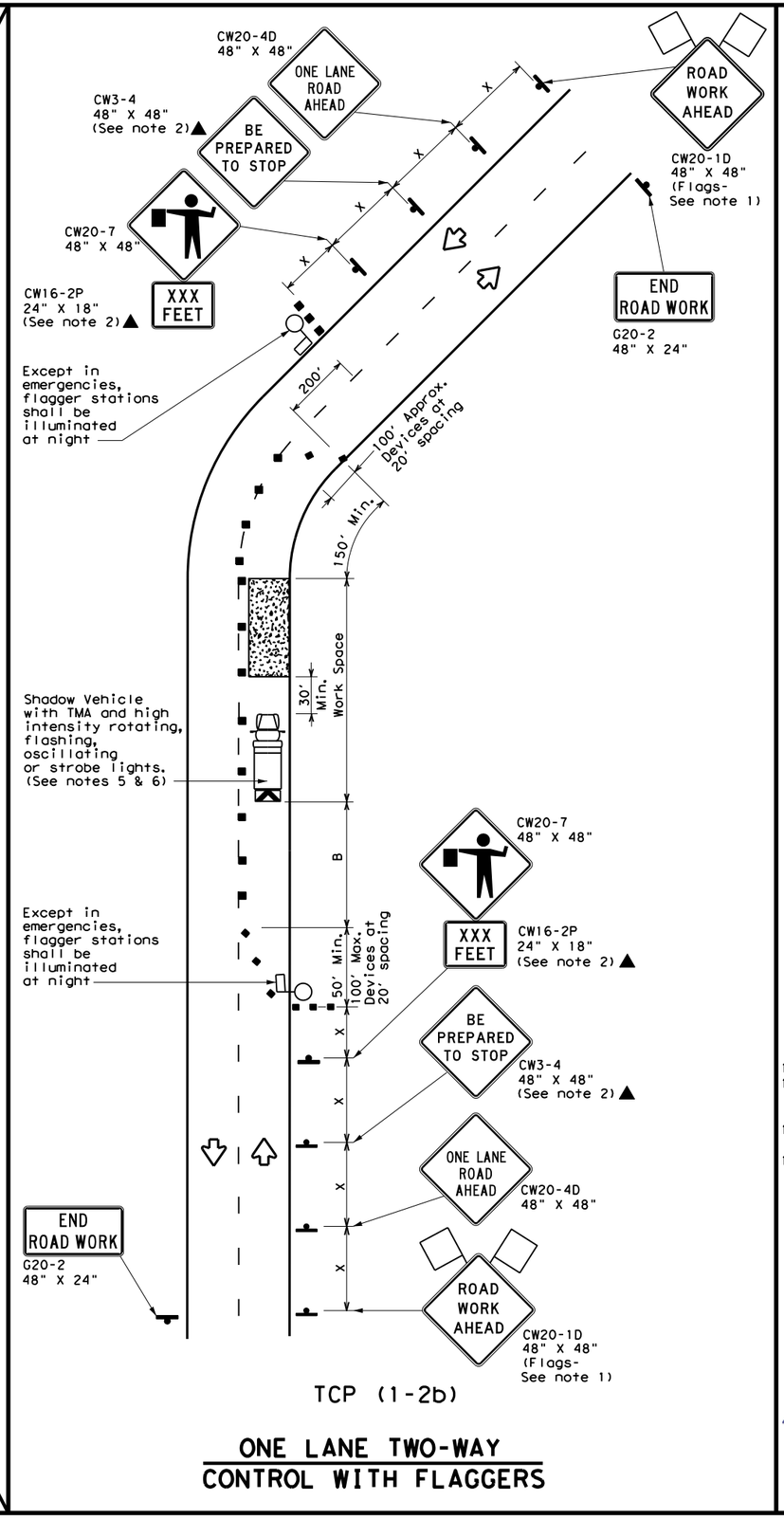


TCP (1-2a)

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



TCP (1-2b)

ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

LEGEND

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

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

TCP (1-2a)

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

TCP (1-2b)

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

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

11/16/23

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18 (MOD)

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98	0523	02	051	FM 362
2-94 2-12	DIST	COUNTY		SHEET NO.
1-97 2-18	HOU	WALLER		48

DATE: $DATE$ $TIME$
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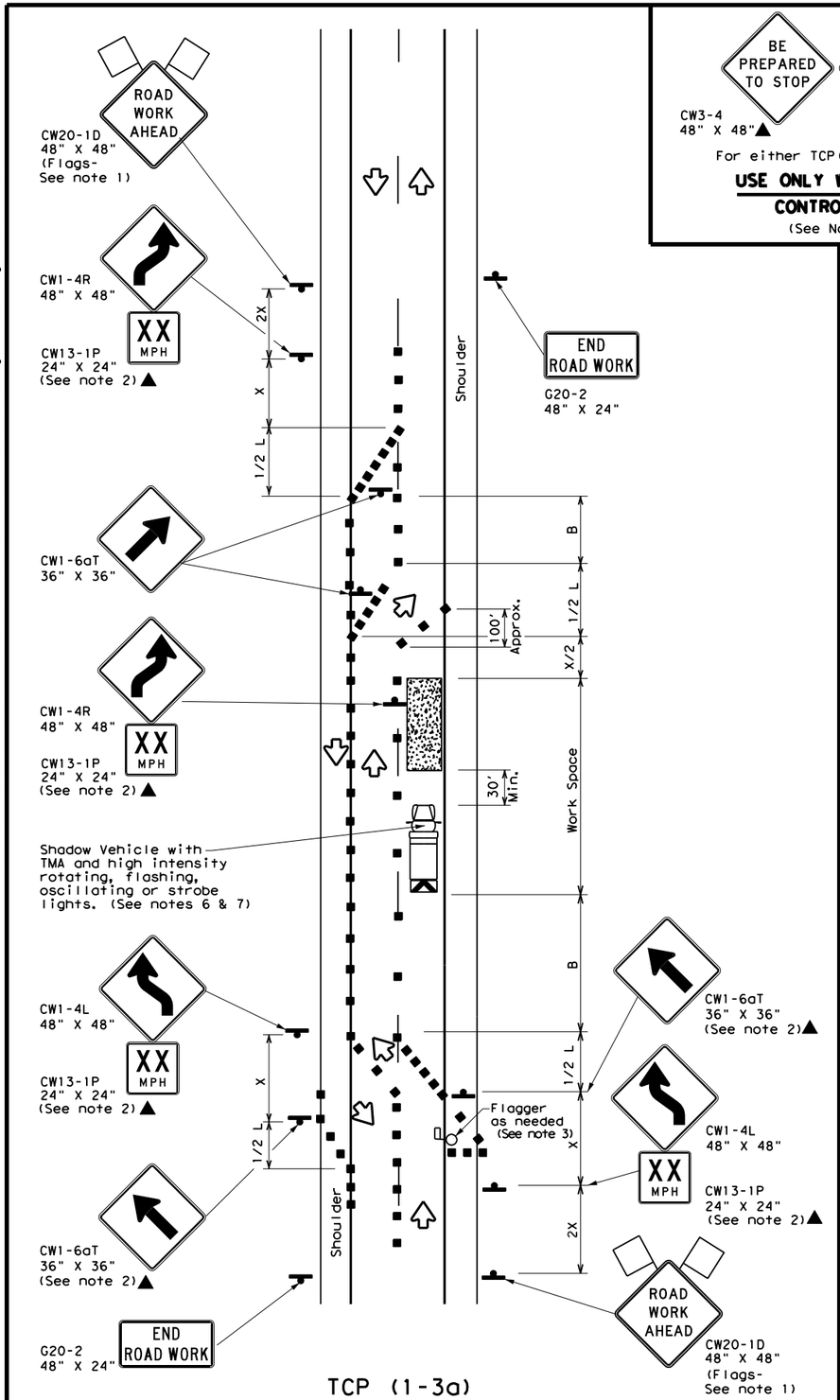
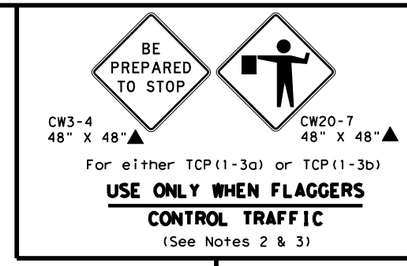


TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

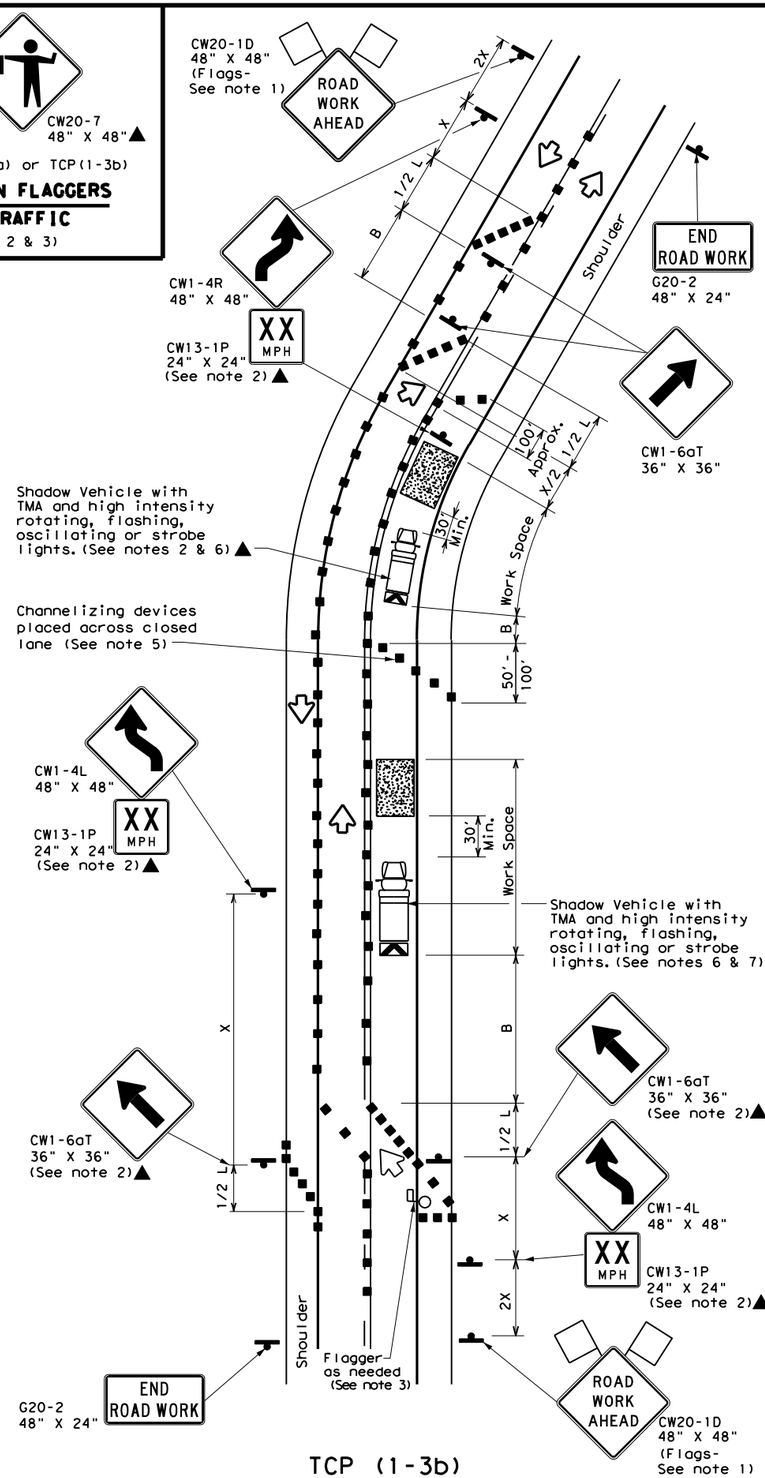
ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



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

USE ONLY WHEN FLAGGERS CONTROL TRAFFIC

(See Notes 2 & 3)



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

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

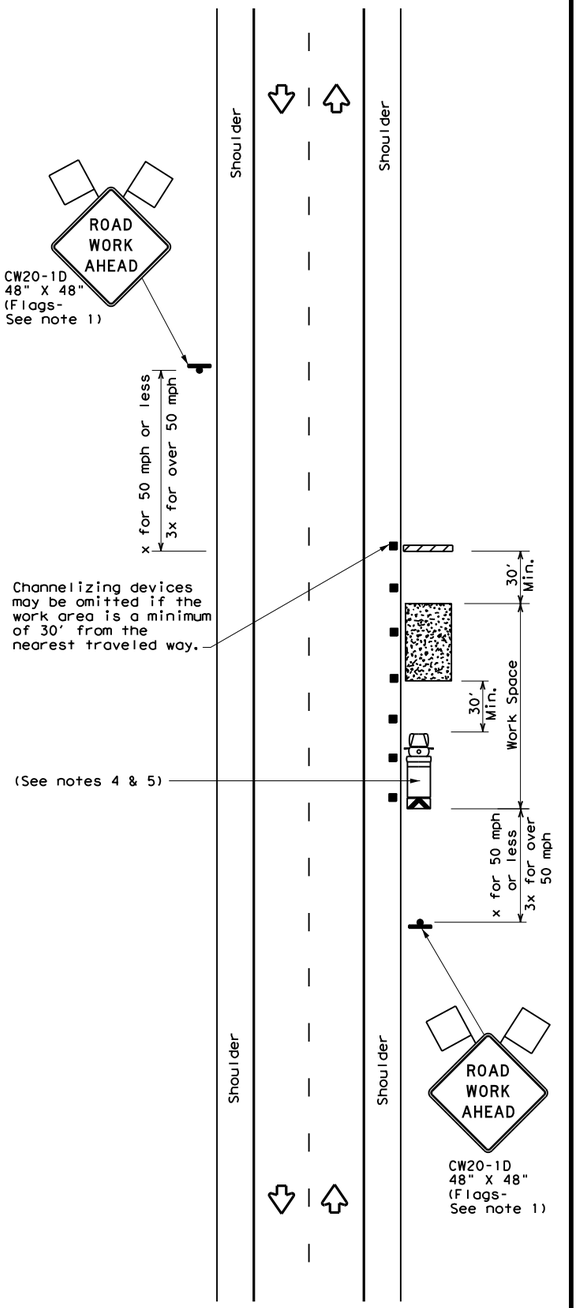
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
TRAFFIC SHIFTS ON TWO LANE ROADS

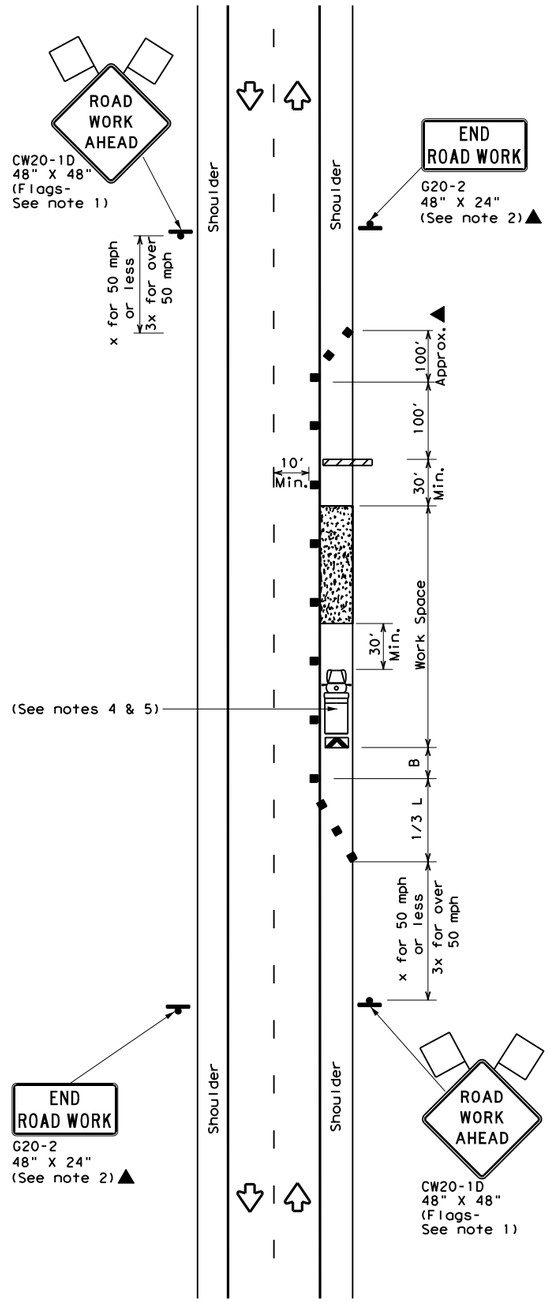
TCP(1-3)-18

FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	WALLER		49
1-97 2-18				



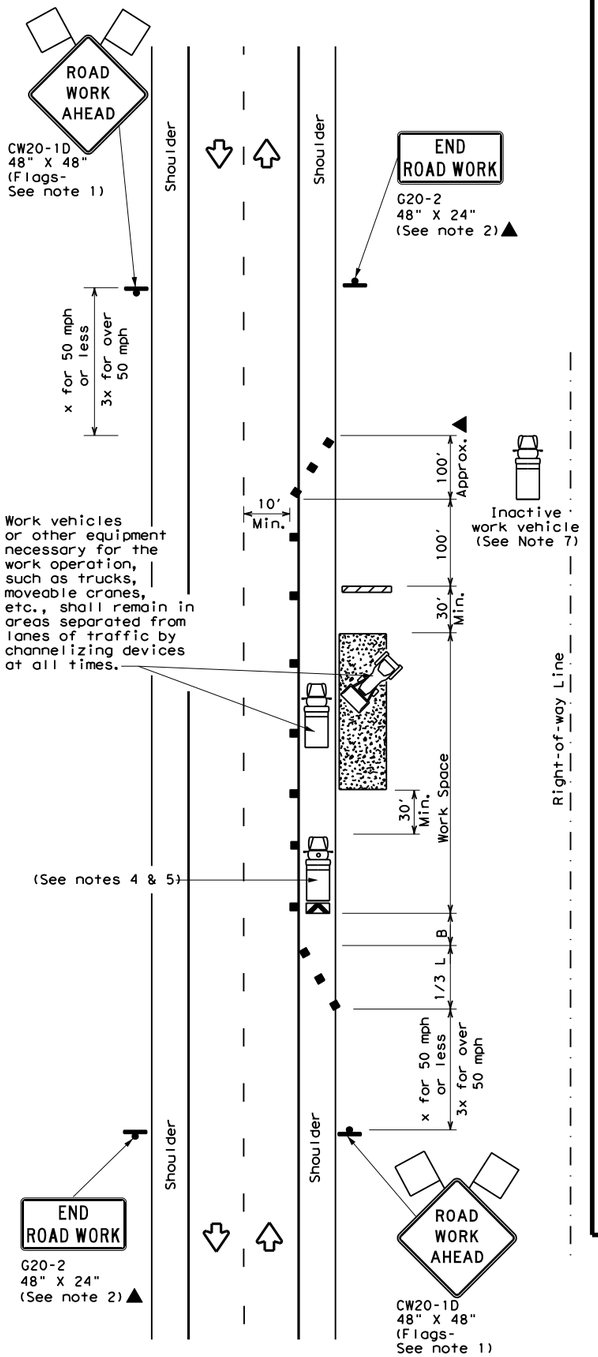
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	WALLER		50
1-97 2-18				

161

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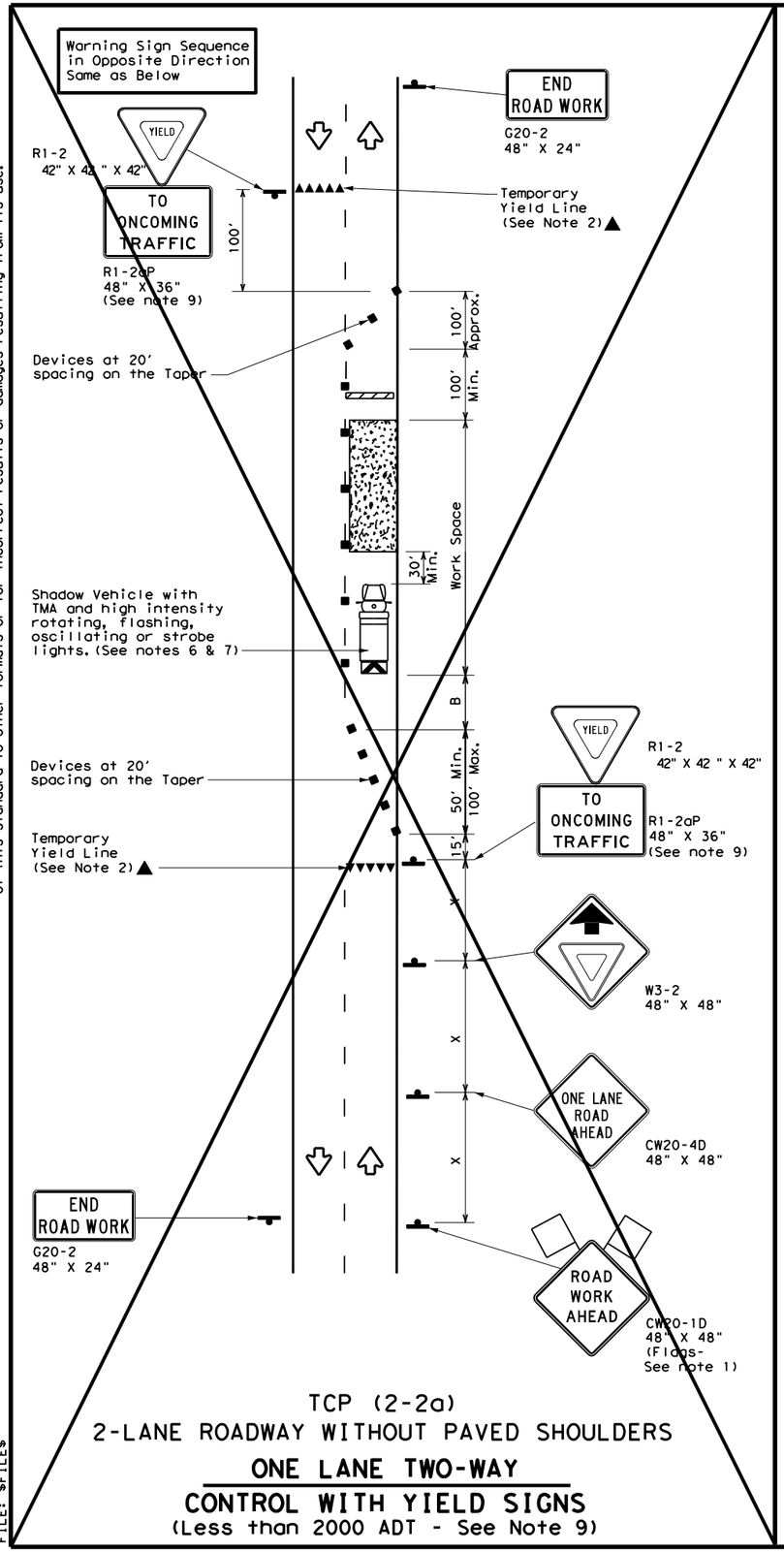


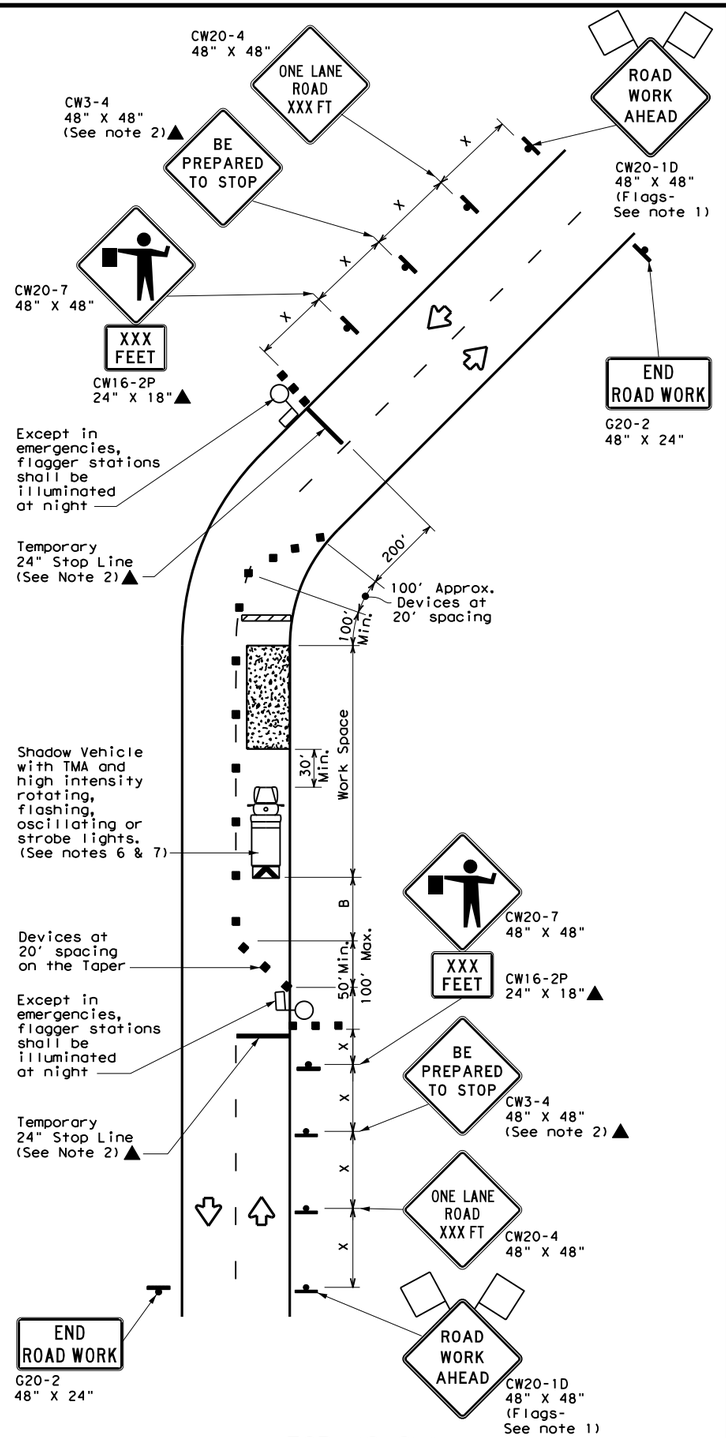
TCP (2-2a)

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.

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79703
REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

08/14/23

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18 (MOD)

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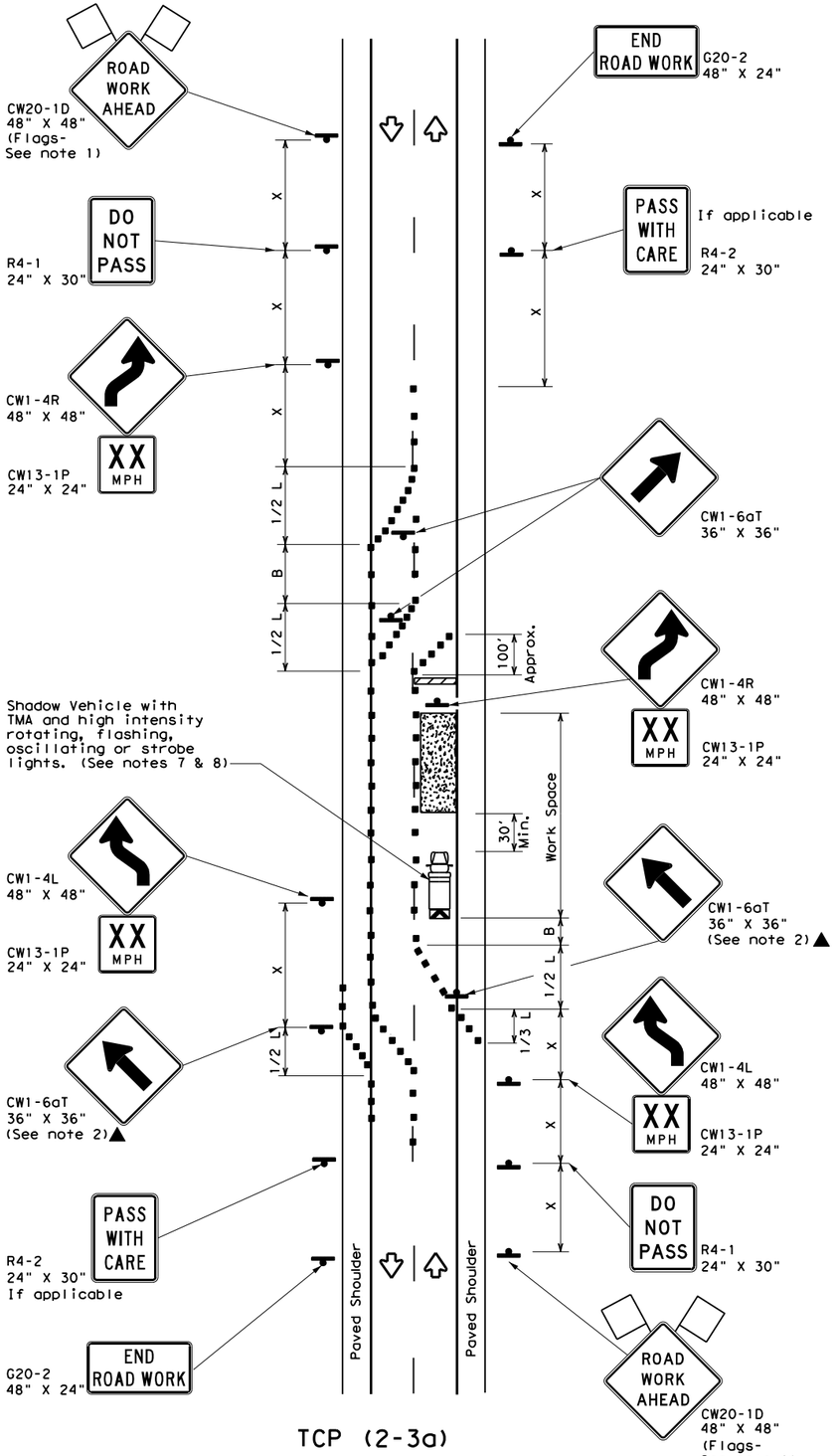
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	HOU	WALLER		51
4-98 2-18				

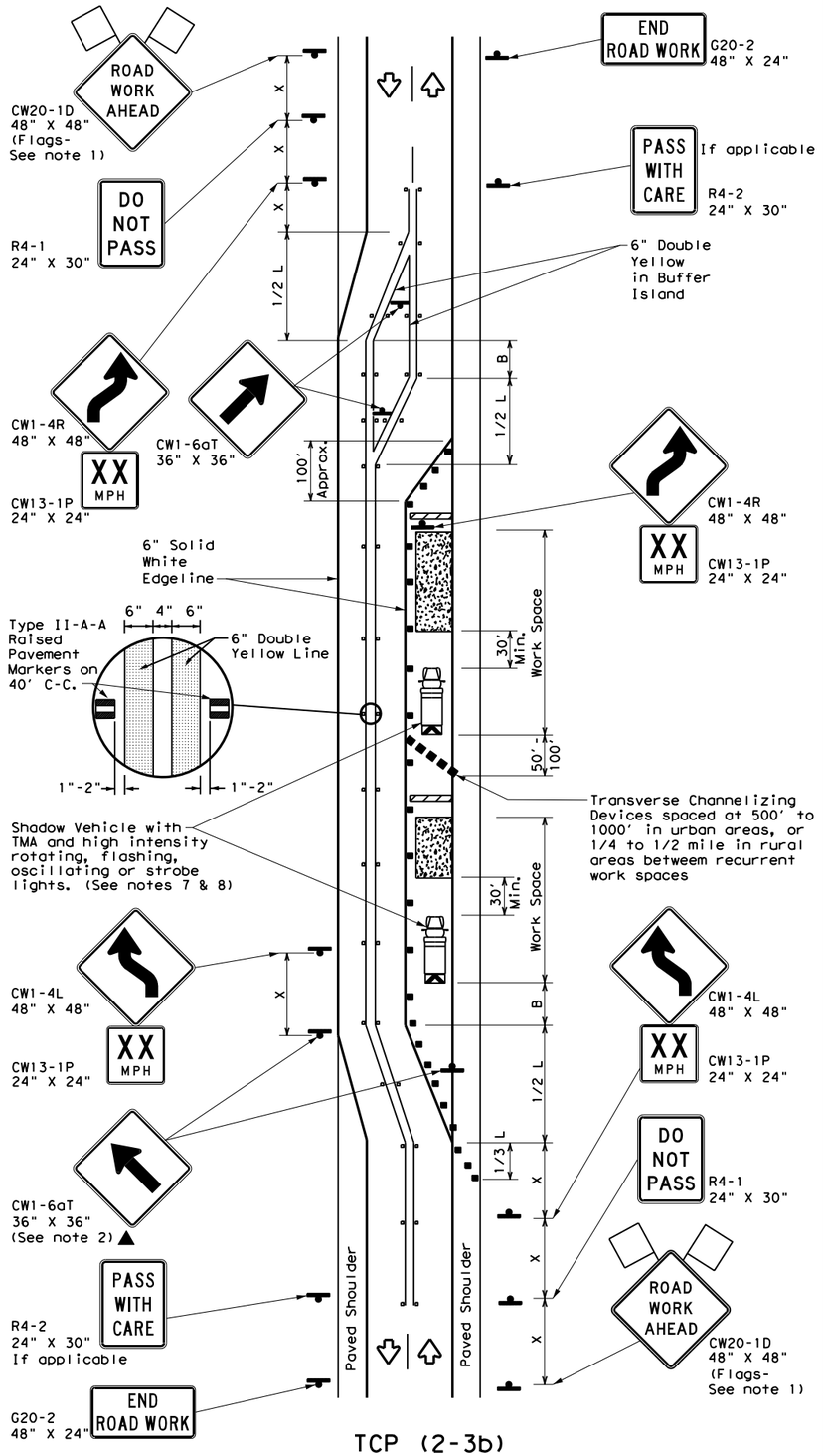
$TIME$
DATE: $DATE$
FILE: $FILE$

DATE: $DATE$ $TIME$
FILE: $FILE$



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

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



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

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-3a)

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

Texas Department of Transportation — *Traffic Operations Division Standard*

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-23

FILE: tcp(2-3)-23.dgn	DN:	CK:	DW:	CK:
© TxDOT April 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-85 4-98 2-18 8-95 3-03 4-23 1-97 2-12	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		52

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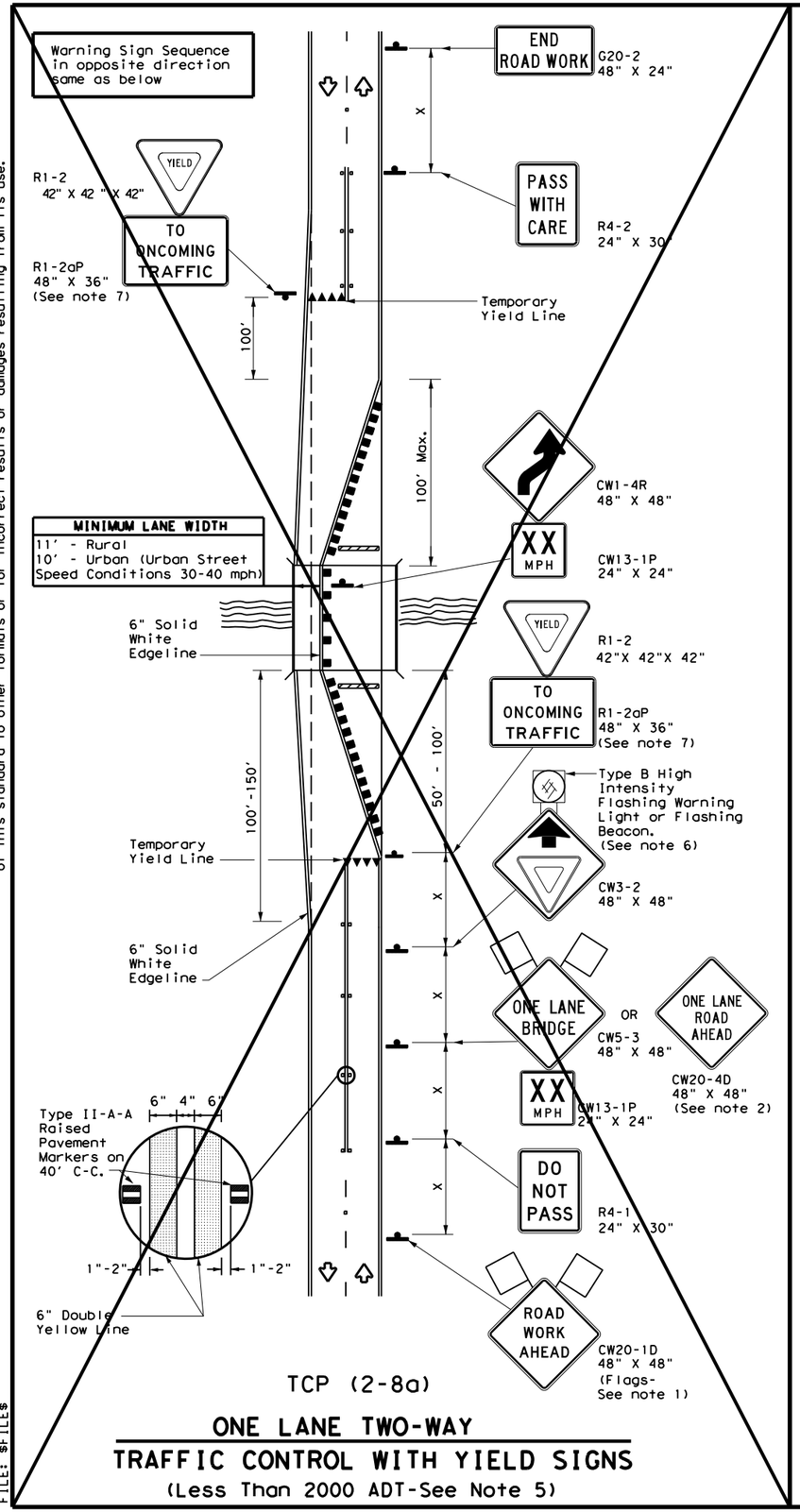
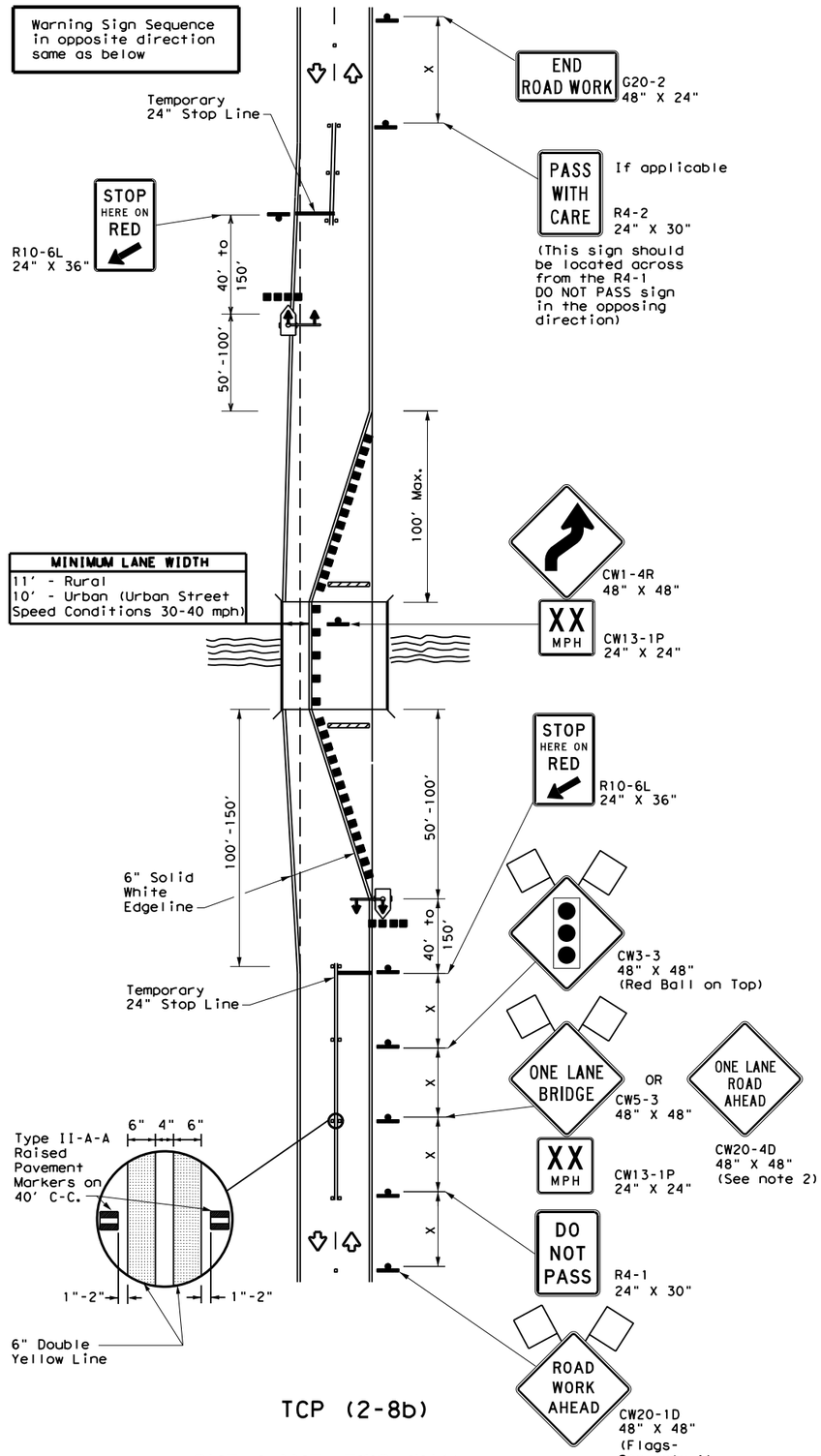


TCP (2-8a)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH YIELD SIGNS
(Less Than 2000 ADT-See Note 5)



TCP (2-8b)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH TRAFFIC SIGNAL

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. When this TCP is used at a location which does not involve a bridge, a 48" x 48" CW20-4D "ONE LANE ROAD AHEAD" signs should be used in lieu of the CW5-3 "ONE LANE BRIDGE" signs. The CW13-1P Advisory Speed Plaque is required with either warning sign.
3. Raised pavement markers shall be placed 40 feet c-c on centerline between DO NOT PASS signs and stop or yield lines.
4. For intermediate term situations, when it is not feasible to remove and restore pavement markings, the channelization must be made dominant by using a very close spacing. This is especially important in locations of conflicting information, such as where traffic is directed over a double yellow centerline. In such locations a maximum channelizing device spacing of 20 feet is recommended. The 20 foot channelizing device spacing recommendation is intended for the area of conflicting information and not the entire work zone.

TCP (2-8a)

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

TCP (2-8b)

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

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REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett, Jr.

08/14/23

Texas Department of Transportation — Traffic Safety Division Standard

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

TCP(2-8)-23 (MOD)

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© TxDOT April 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-85 4-98 2-18 8-95 3-03 4-23 1-97 2-12	0523	02	051	FM 362
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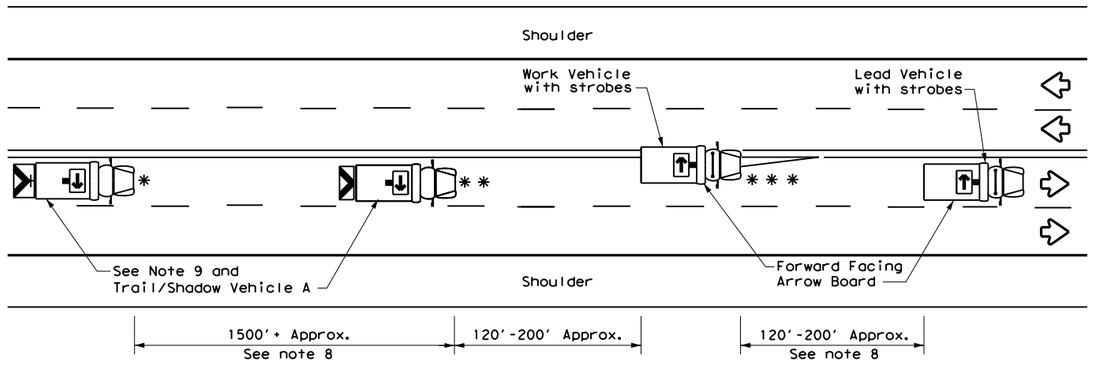
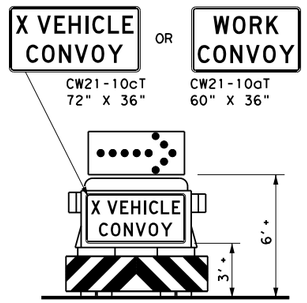
	HOU	WALLER		53



TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

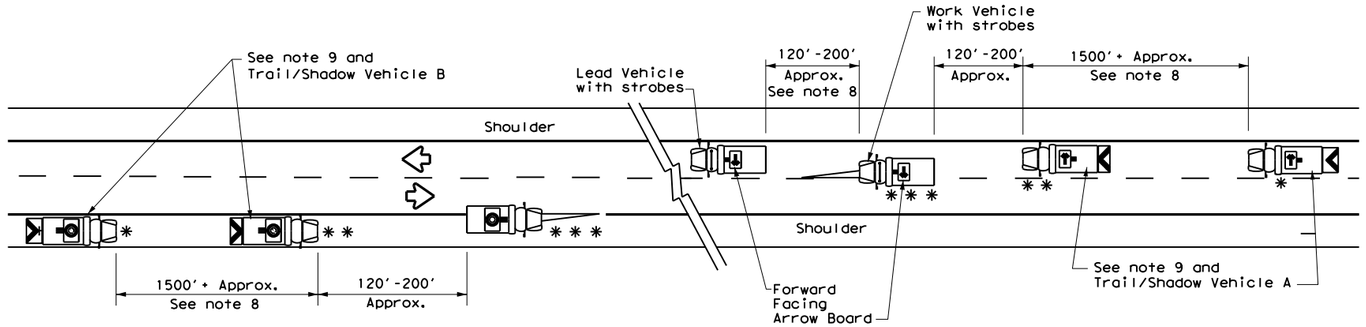
with RIGHT Directional display Flashing Arrow Board

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.

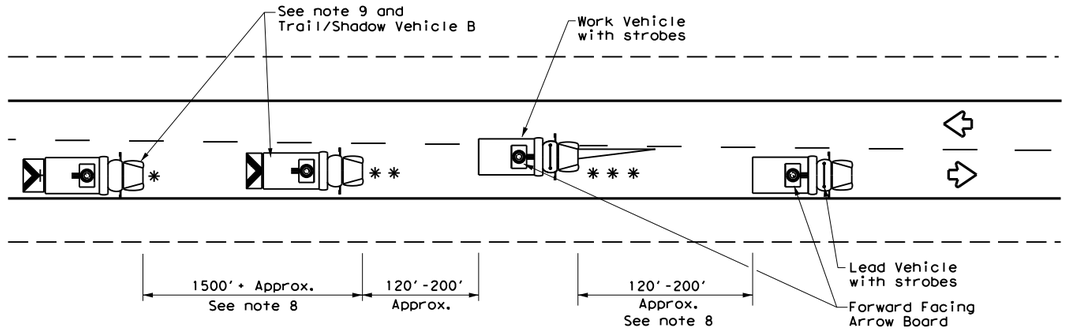


WORK ON SHOULDER

WORK ON TRAVEL LANE

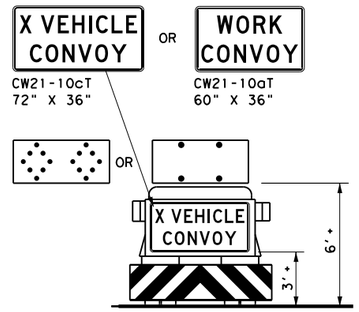
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



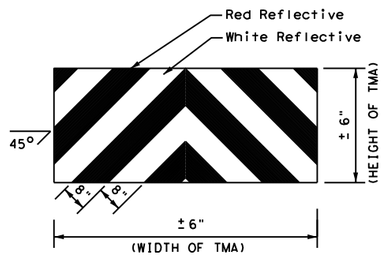
TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display



STRIPING FOR TMA

Texas Department of Transportation

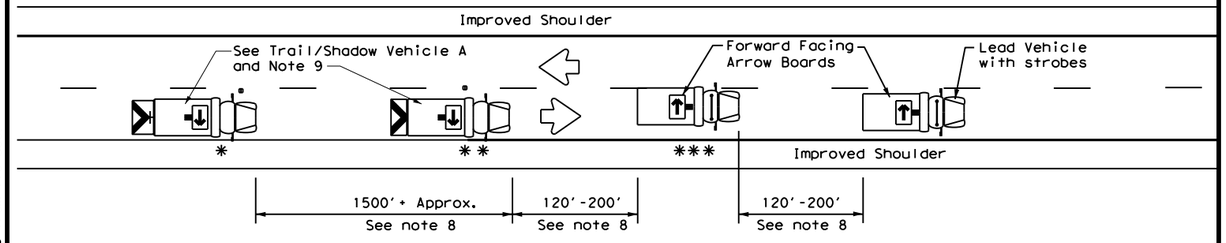
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

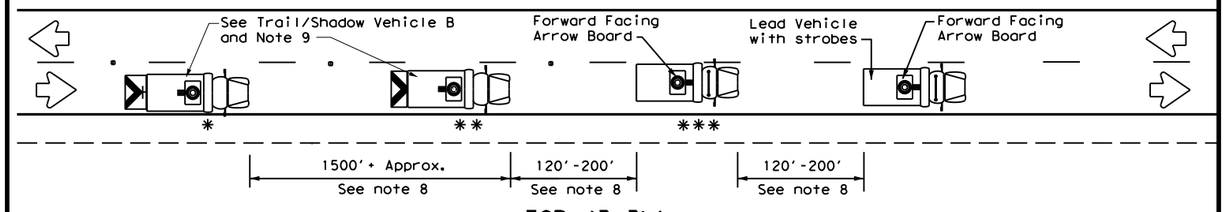
FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		54

DATE: $DATE$ $TIME$
FILE: $FILE$



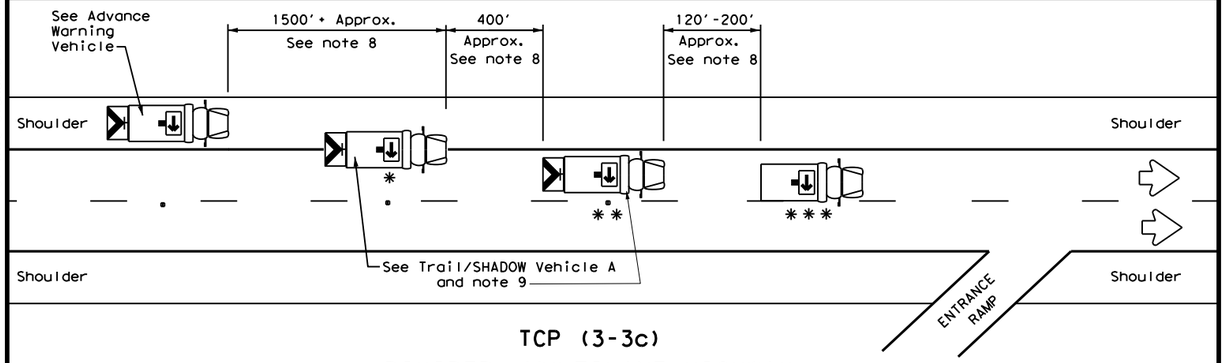
TCP (3-3a)

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



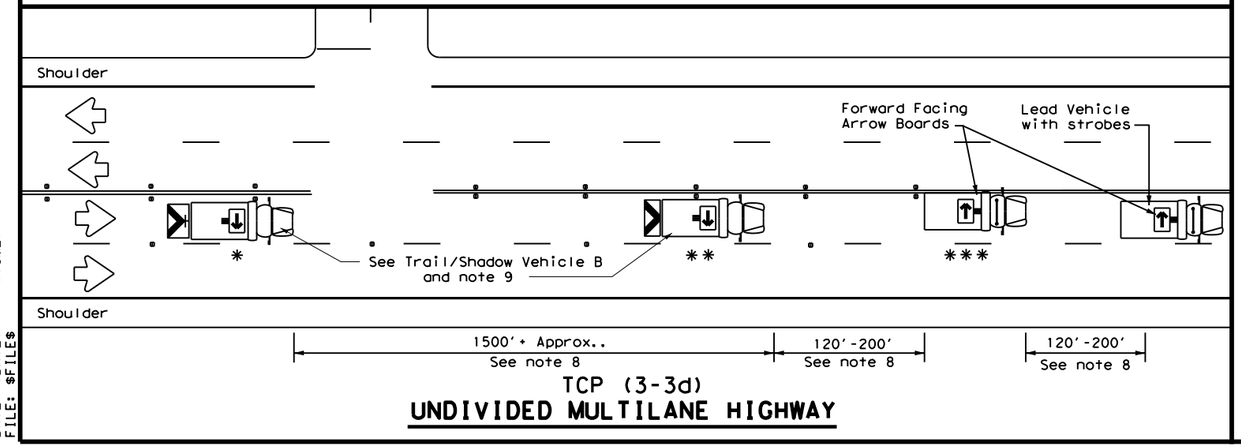
TCP (3-3b)

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



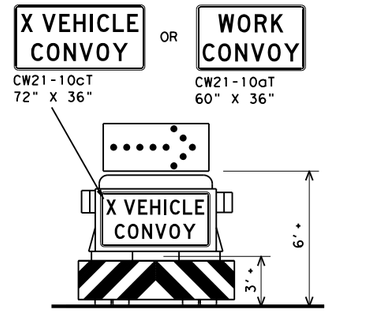
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



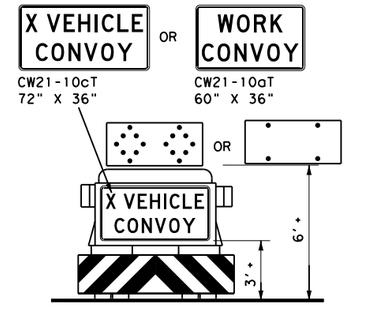
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



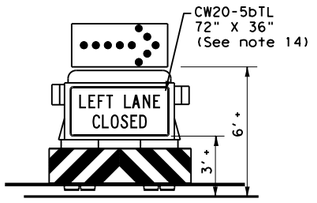
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

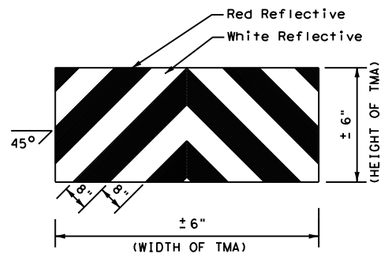


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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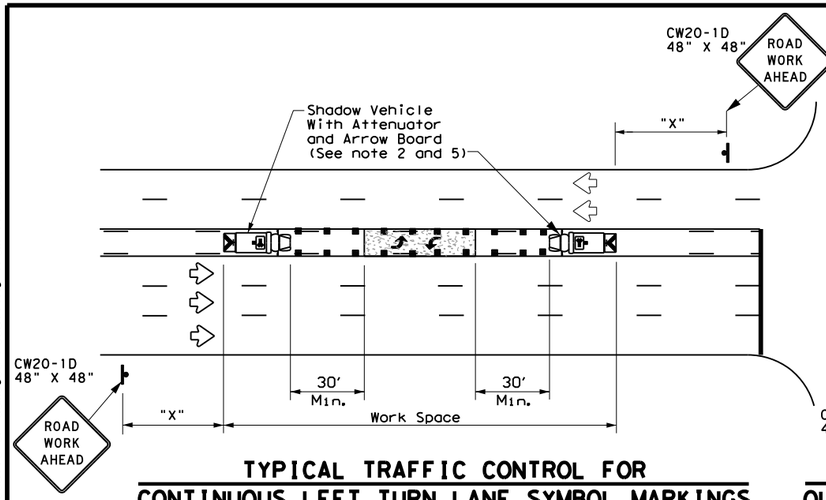
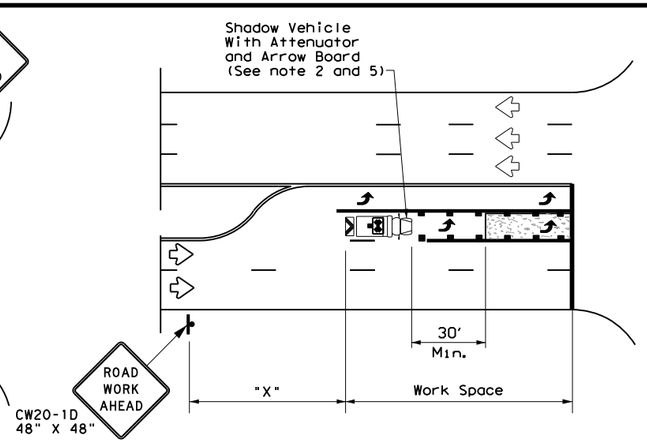
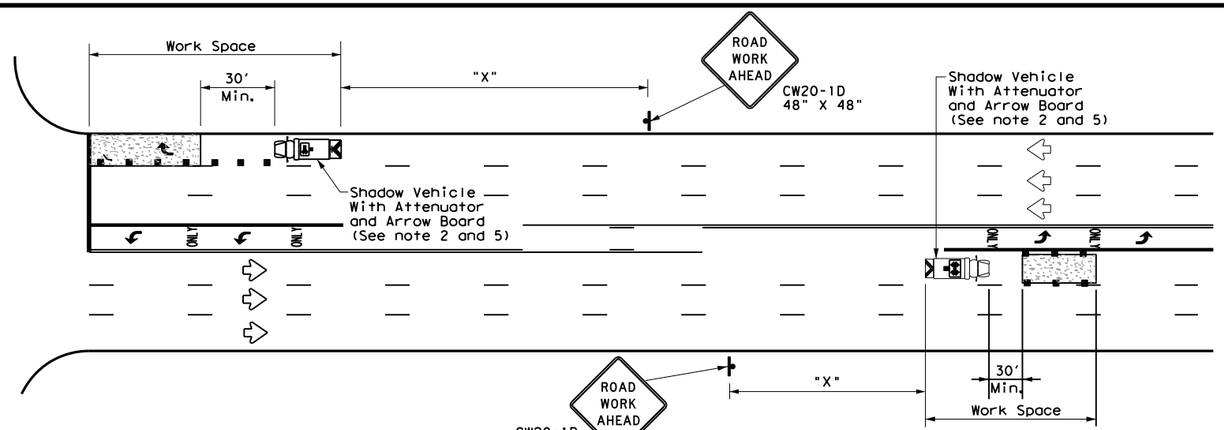
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	HOU	WALLER		55
1-97 7-14				



TYPICAL TRAFFIC CONTROL FOR
CONTINUOUS LEFT TURN LANE SYMBOL MARKINGS

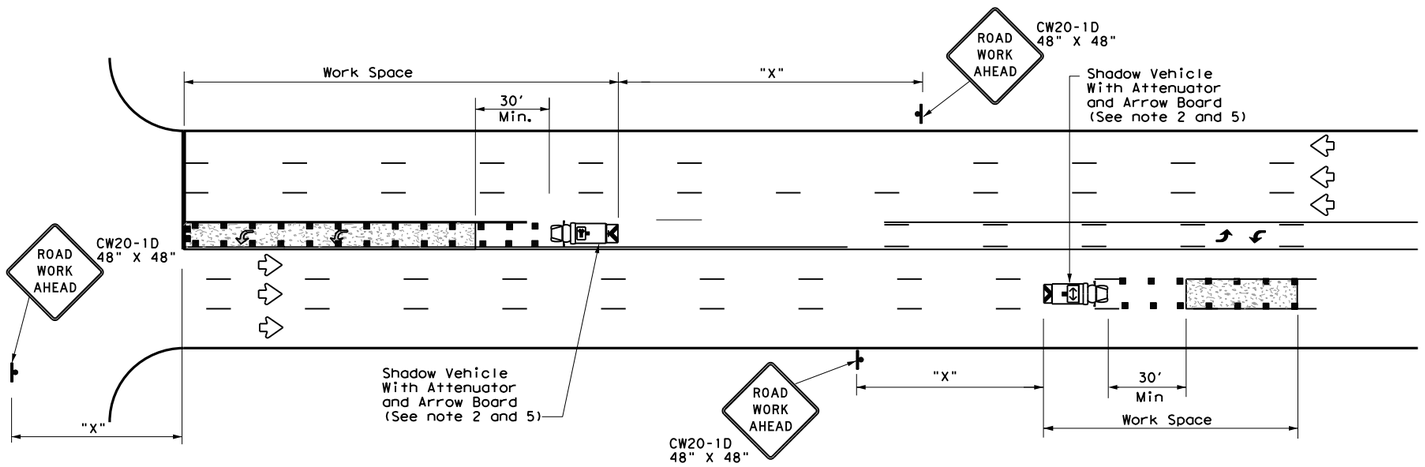


TYPICAL TRAFFIC CONTROL FOR
OUTSIDE DUAL LEFT TURN LANE SYMBOL MARKINGS



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

DATE: $DATE$ $TIME$
FILE: $FILE$

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'

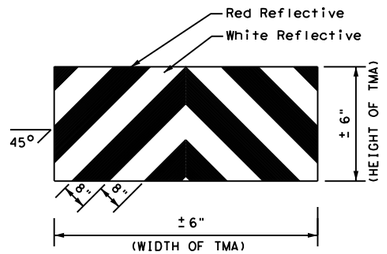
* Conventional Roads Only

** 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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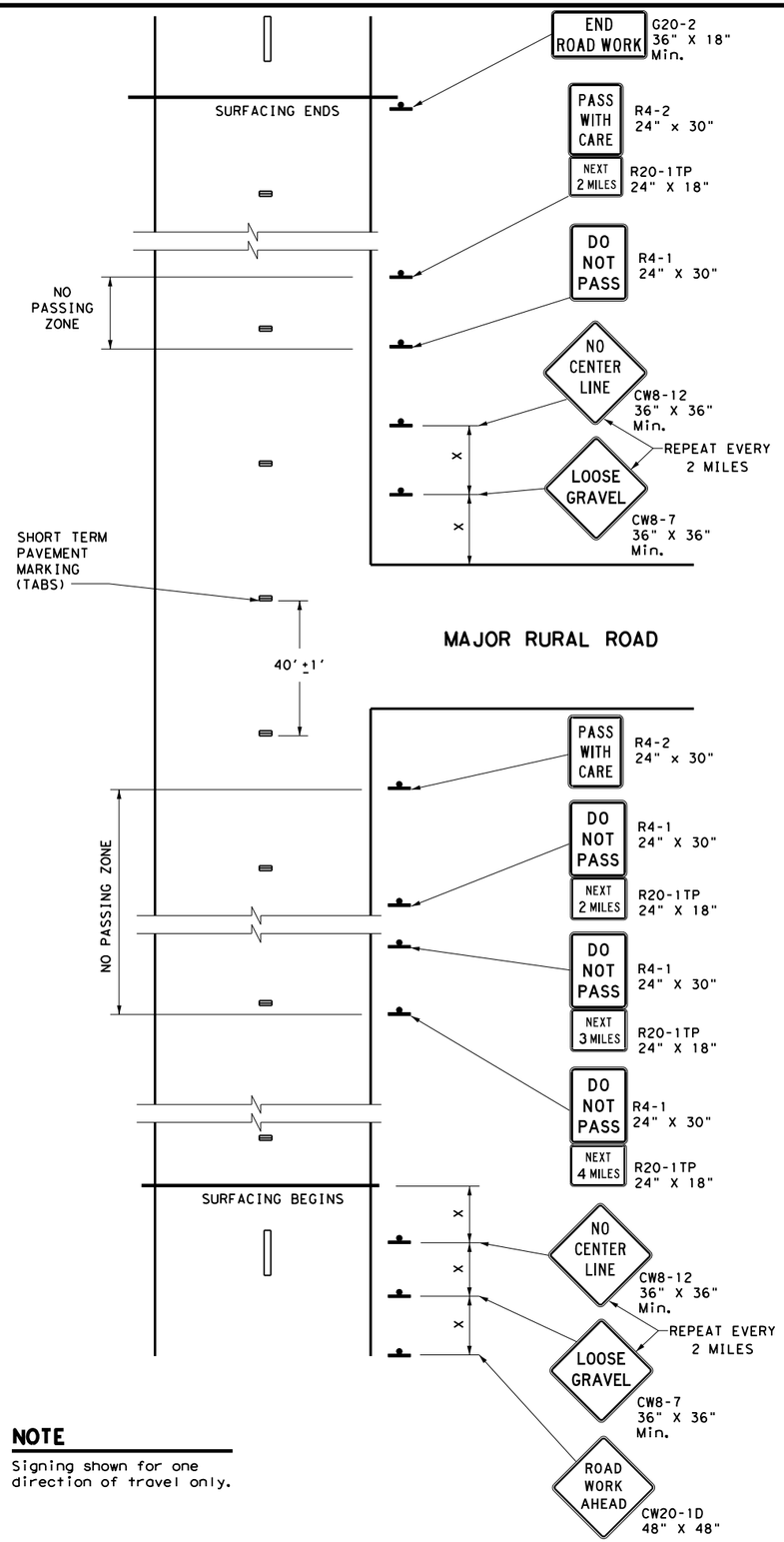
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		56

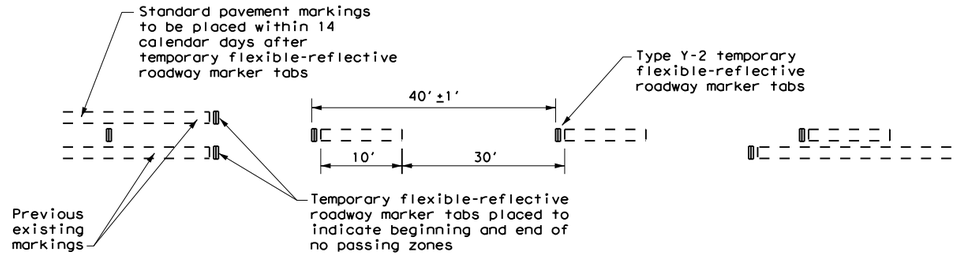
178



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
REVISIONS	0523	02	051	FM 362
4-92 4-98	DIST	COUNTY		SHEET NO.
1-97 7-13	HOU	WALLER		57

210

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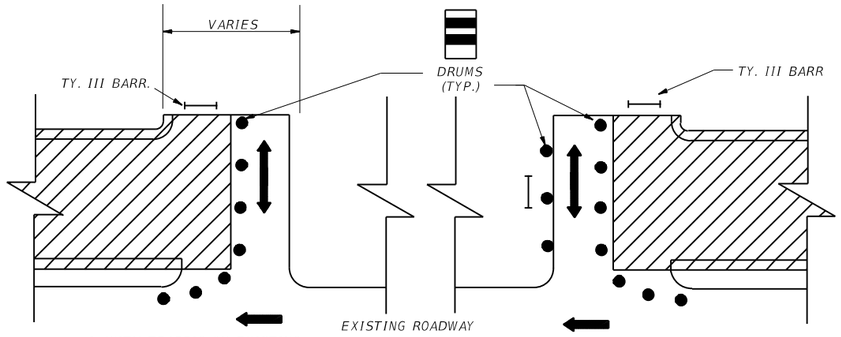
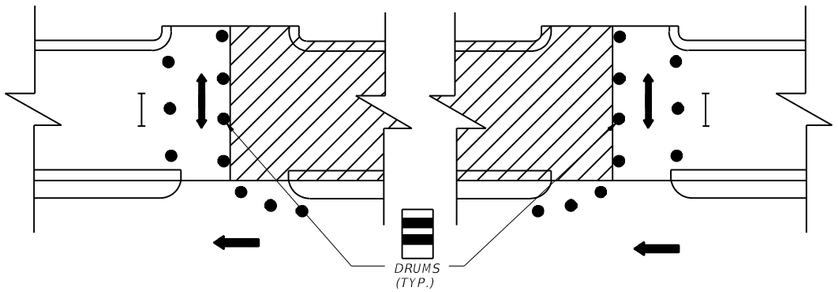
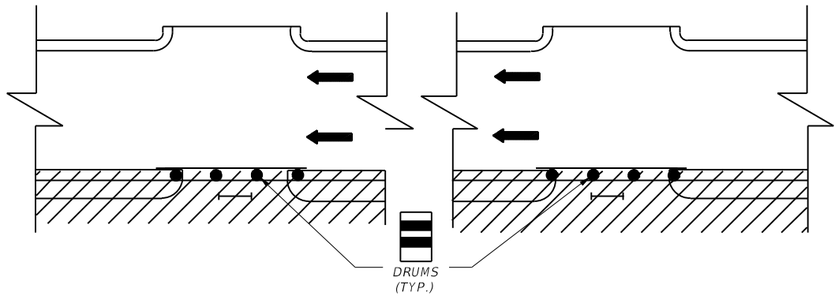


1) WITH TRAFFIC ON EXISTING
BUILD ONE-HALF OF DRIVE.

2) BUILD OTHER HALF OF DRIVE



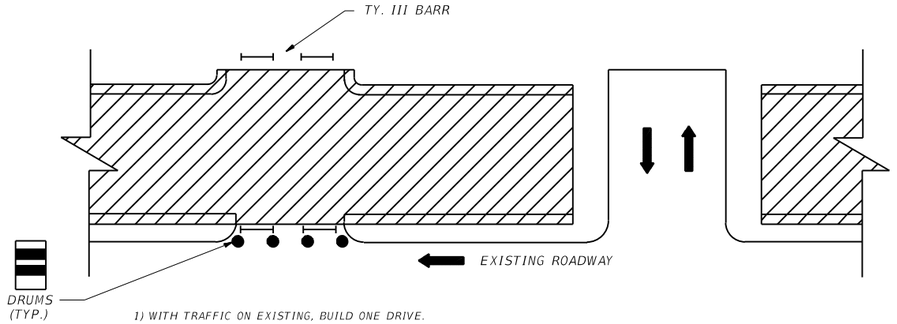
2) BUILD OTHER HALF OF DRIVE



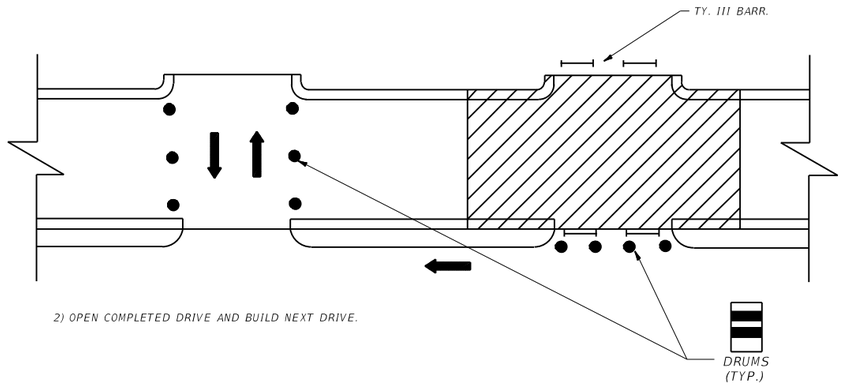
3) OPEN DRIVE

4) AFTER TRAFFIC MOVES TO NEW ROADWAY,
BUILD REMAINING CURB.

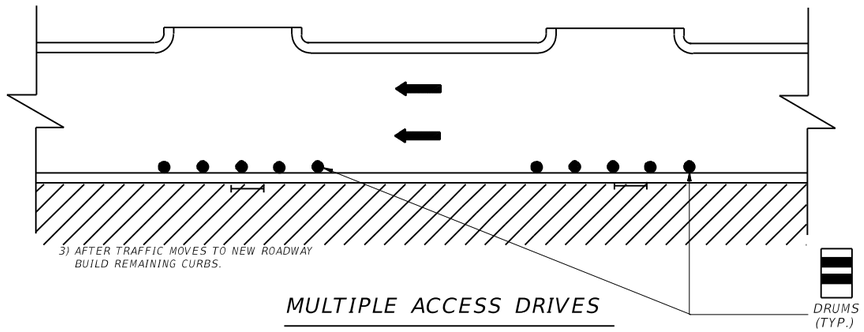
SINGLE ACCESS DRIVES



1) WITH TRAFFIC ON EXISTING, BUILD ONE DRIVE.



2) OPEN COMPLETED DRIVE AND BUILD NEXT DRIVE.



3) AFTER TRAFFIC MOVES TO NEW ROADWAY
BUILD REMAINING CURBS.

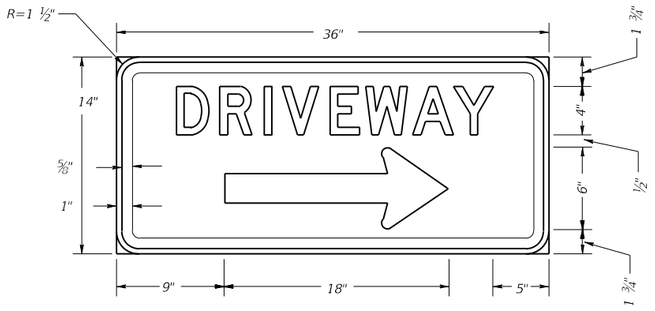
MULTIPLE ACCESS DRIVES

Texas Department of Transportation
Houston District

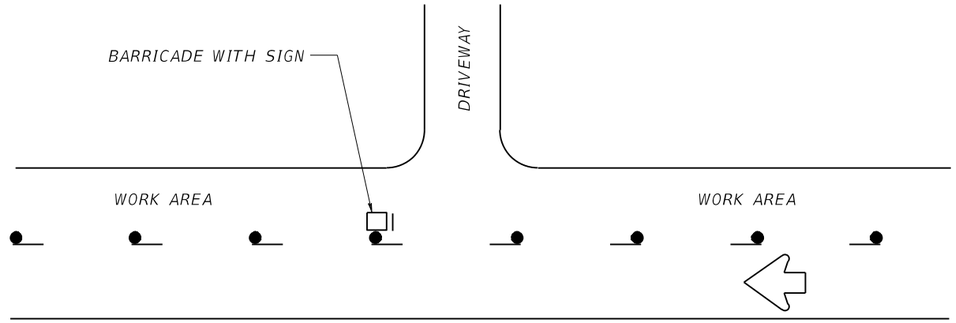
CONSTRUCTION SEQUENCE FOR MISCELLANEOUS DRIVES

CSMD TC8010-2020

FILE: STDH29.DGN	DN:	CK:	DW:	CK:
©TxDOT 2020	CONT	SECT	JOB	HIGHWAY
	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		58



LETTERS: WHITE
BORDER: WHITE
BACKGROUND:BLUE



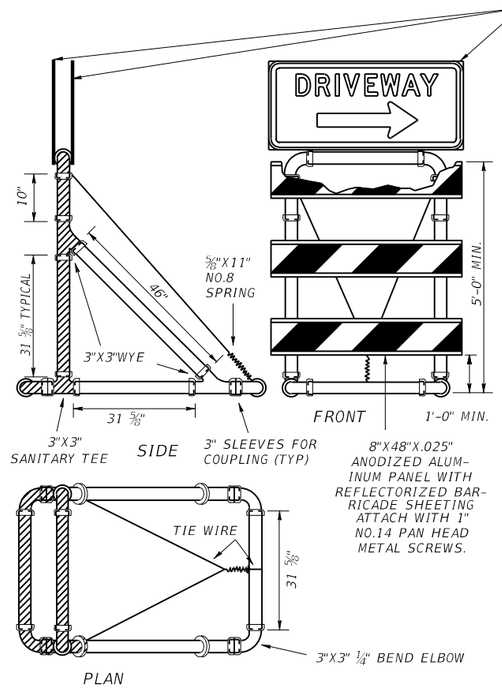
TYPICAL LOCATION OF DRIVEWAY SIGN

TYPE III PVC BARRICADES TYPICAL DESIGN DETAILS

MAY BE USED AT THE OPTION OF THE CONTRACTOR.

NOTES:

1. ALL PIPE SHALL BE POLYVINYL CHLORIDE (PVC) PRESSURE RATED PIPE SDR 21 OR SDR 26 ASTM D2241.
2. JOINT FITTINGS MAY BE PVC-ASTM D2665 OR ACRYLONITRILE BUTADIENE STYRENE (ABS) ASTM D2661 (DRAINAGE WASTE AND VENT).
3. ALL PIPE AND FITTINGS SHALL BE WHITE.
4. ALL JOINTS SHALL BE FREE TO SEPARATE UPON VEHICLE IMPACT.
5. CROSS HATCHED CONDUIT TO BE TIED TOGETHER WITH ROPE THREADED INTO PIPE INTERIOR. USE 3/16" NO. 6 SOLID BRAIDED NYLON OR EQUIVALENT.
6. A FIXED FRANGIBLE PAVEMENT CONNECTION IS PREFERRED. SAND BAGS MAY BE SUBSTITUTED.



CONSTRUCTION SIGN NOTES

MATERIALS

CONSTRUCTION SIGNS SHALL BE MADE FROM APPROVED FIBERGLASS OR HIGH IMPACT PLASTIC AS PRIMARY MATERIALS.

SIGN SHEETING

REFLECTORIZED SIGN SHALL BE CONSTRUCTED OF RETRO REFLECTIVE SHEETING MEETING THE COLOR AND REFLECTIVITY REQUIREMENTS OF MATERIAL SPECIFICATIONS, DMS-8300.

TYPE C SHEETING SHALL BE USED FOR THIS APPLICATION.

SIGN LETTERS

ALL SIGNS LETTERING SHALL BE CLEAR, OPEN ROUNDED TYPE CAPITAL LETTERS AS APPROVED BY AND AS PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION. SIGNS AND LETTERING SHALL BE OF FIRST CLASS WORKMANSHIP EQUIVALENT TO THAT OF THE DEPARTMENT'S STANDARD SIGNS.

Texas Department of Transportation
Houston District

DRIVEWAY SIGNING

DS TC8020-04

FILE: STDH30.DGN	DN:	CK:	DW:	CK:
©TxDOT 2004	CONT	SECT	JOB	HIGHWAY
	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		59

1 STA 10+70

3 STA 11+00

4 STA 11+60

5 STA 12+05

10 STA 13+56

YIELD R1-2 36x36x36

DO NOT STOP ON TRACKS R8-8 24x30

W1-7 48x24

6 STA 12+15

9 STA 13+56

8 STA 13+05

STOP R1-1 36x36

SOUTH FARM 362 ROAD M3-3 24x12, M1-6F 24x24

2 STA 10+85

TO M4-5 24x12, 290 M1-4 30x24, M6-3 21x15

WEST BUSINESS 290 M3-4 24x12, M4-3 24x12, M1-4 30x24, M6-1 21x15

EAST BUSINESS 290 M3-2 24x12, M4-3 24x12, M1-4 30x24, M6-1 21x15

7 STA 13+05

Hempstead Houston D1-2 96x30

11 STA 14+30

R R W10-1 36 DIA

12 STA 15+65

SPEED LIMIT 35 R2-1 36x48

SPEED LIMIT 45 R2-1 36x48

13 STA 15+65

14 STA 18+25

W3-3 48x48

16 STA 20+65

JCT M2-1 21x15, BUSINESS M4-3 24x12, 290 M1-4 30x24

DOUBLE

15 STA 19+30

STOP FOR SCHOOL BUS LOADING OR UNLOADING R19-1T 48x60

17 STA 25+60

Don't Mess With Texas UP TO $2000 FINE FOR LITTERING R19-6aT 48x30

SINGLE

1 REMOVE EXIST TERMINAL ANCHOR SECTION & 25 LF MBGF
PROP 1 DAT & 37.5 LF MBGF

2 REMOVE 50 LF RAIL
PROP 50 LF T631 RAIL

3 REMOVE EXIST 62.5 LF MBGF & TERMINAL ANCHOR SECTION
PROP 112.5 LF MBGF (50' RADIUS - SEE NOTE 1),
1 SGT & 4" RIPRAP MOW STRIP (8 CY)

4 REMOVE EXIST TERMINAL ANCHOR SECTION & 50 LF MBGF
PROP 1 SGT, 25 LF MBGF (20' RADIUS, SEE NOTE 1)
& 4" RIPRAP MOW STRIP (4 CY)

5 REMOVE 50 LF RAIL
PROP 56.13 LF T631 RAIL

6 REMOVE EXIST 25 LF MBGF, 1 SGT & 90 LF RIPRAP MOW STRIP
PROP 25 LF MBGF, 1 SGT & 4" RIPRAP MOW STRIP (4 CY)

STA 10+30.00
BEG PROJECT
BEG PVMT MRKS

STA 10+53
BEG DBL (I) & (K)

STA 11+55
END DBL (I) & (K)

STA 12+25
BEG DBL (I) & (K)

STA 13+40
END DBL (I) & (K)

STA 14+30
BEG (H), (I) & (K)

STA 14+45
BEG EDGELINE RUMBLE STRIPS

STA 24+05
END (H) & (I)
BEG (H)

EXISTING ROW

BUSINESS US 290

EXISTING TXDOT ROW
EXISTING UPRR ROW

UNION PACIFIC RR

DBL (I)

@40' C-C (K)

10' (H) @40' C-C

@80' C-C (K)

(G)

S 2° 07' 55.87" E

15+00

20+00

25+00

8' SHLDR

12' LANE

12' LANE

8' SHLDR

℄ FM 362

ASPH DRWY

DIRT/ GRAVEL DRWY

MATCH LINE STA 16+00.00 ℄ FM 362

MATCH LINE STA 27+00.00 ℄ FM 362

LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

(#) PROPOSED SMALL SIGN NUMBER

PROPOSED SMALL SIGN

TRAFFIC DIRECTION

INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)

INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)

INSTL OM ASSM (OM-2Y)(WC)GND

INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)

LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY

PROPOSED MAILBOX

NOTES

1. VERIFY RADIUS IN FIELD PRIOR TO FABRICATION.

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

08/14/23

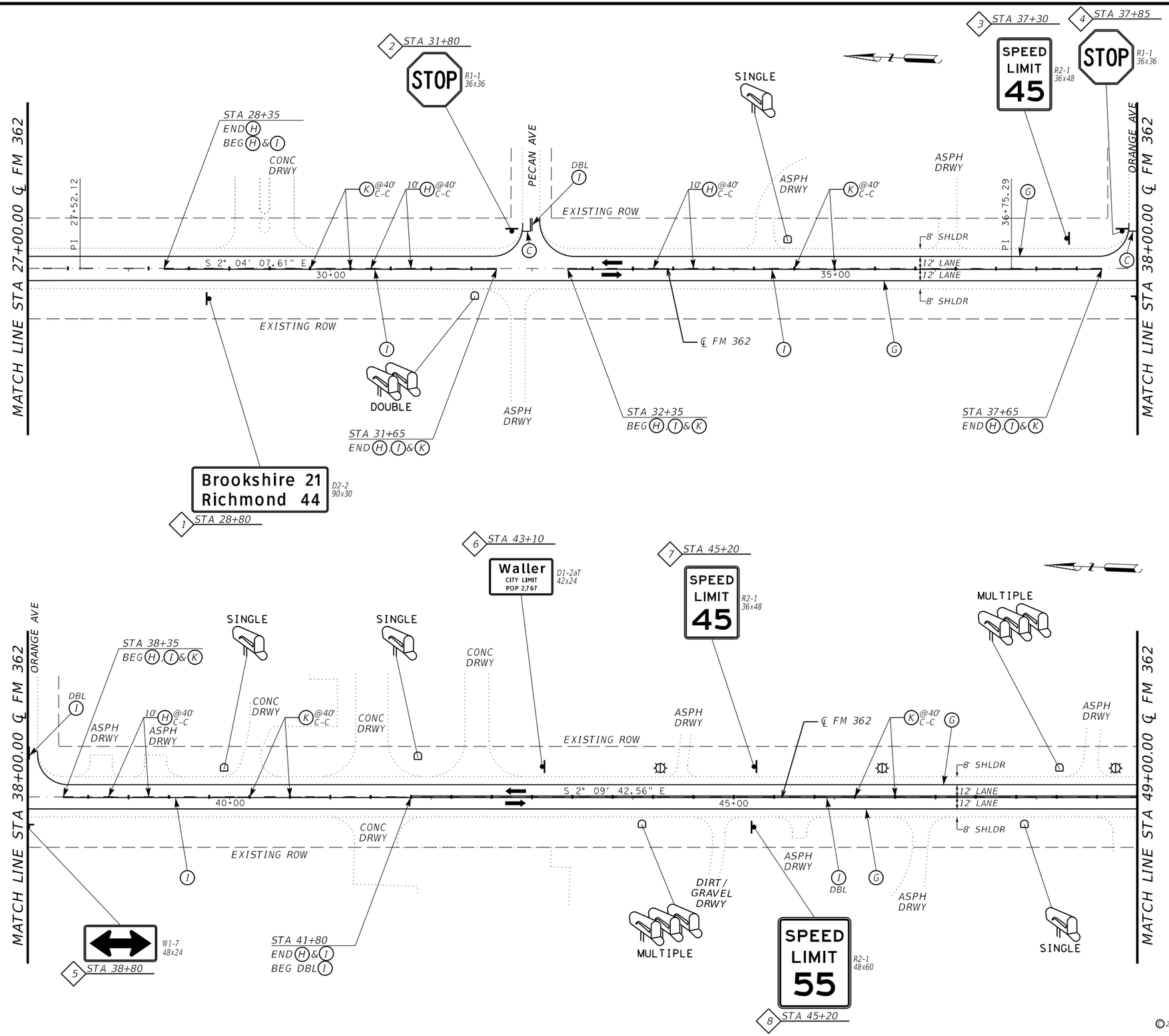
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
BEG PROJECT TO STA 27+00.00

SHEET 1 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		60



LEGEND

- Ⓐ REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- Ⓑ REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- Ⓒ REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- Ⓓ REFL PAV MRK TY I (W)(ARROW)(100MIL)
- Ⓔ REFL PAV MRK TY I (W)(WORD)(100MIL)
- Ⓕ REFL PAV MRK TY I (W)(RR XING)(100MIL)
- Ⓖ 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-C
- Ⓚ REFL PAV MRK TY II-A-A

◇# PROPOSED SMALL SIGN NUMBER

PROPOSED SMALL SIGN

TRAFFIC DIRECTION

INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)

INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)

INSTL OM ASSM (OM-2Y)(WC)GND

INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)

LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY

PROPOSED MAILBOX

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

06/20/23

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 27+00.00 TO STA 49+00.00

SHEET 2 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		61

PI STATION = 57+03.86
DELTA = 44° 41' 48.96" (RT)
DEGREE OF CURVE = 3° 49' 10.99"
TANGENT = 616.68
LENGTH = 1,170.16
RADIUS = 1,500.00
PC STATION = 50+87.18
PT STATION = 62+57.35

STA 51+10.55
BEG 2" PLANING
BEG SEAL COAT
BEG 1 ½" ACP OVERLAY
BEG CENTERLINE RUMBLE STRIPS

QUAIL HOLLOW ST

℄ FM 362

EXISTING ROW

DIRT/ GRAVEL DRWY

@40' C-C

8' SHLDR
12' LANE
12' LANE
8' SHLDR

55+00

S 2° 09' 42.56" E
50+00

PC 50+87.18

DBL

DIRT/ GRAVEL DRWY

SINGLE

DIRT/ GRAVEL DRWY

SINGLE

MATCH LINE STA 49+00.00 ℄ FM 362

MATCH LINE STA 60+00.00 ℄ FM 362

60

W1-2R 36x36
45 MPH
W13-1P 18x18

1 STA 49+80

3 STA 63+75

W1-2L 36x36
45 MPH
W13-1P 18x18

REMOVE EXIST 1 MBGF THRIE BEAM TRANS.,
75 LF MBGF & 1 SGT
PROP 1 MBGF THRIE BEAM TRANS.,
75 LF MBGF & 1 SGT

MOUND CREEK

EXIST T203 RAIL TO REMAIN

@40' C-C

8' SHLDR
12' LANE
12' LANE
8' SHLDR

14' SHLDR
12' LANE
12' LANE
14' SHLDR

65+00

S 42° 32' 06.40" W

0+00

℄ FM 362

EXISTING ROW

EXISTING ROW

PT 62+57.35

DBL

ASPH DRWY

SINGLE

STA 67+52.84
BEG EXIST APPR SLAB
END 2" PLANING
END SEAL COAT
END 1 ½" ACP OVERLAY

STA 69+89.16
END EXIST APPR SLAB
BEG 2" PLANING
BEG SEAL COAT
BEG 1 ½" ACP OVERLAY

MOUND CREEK

BRIDGE MAY ICE IN COLD WEATHER
W8-13aT 48x48

REMOVE EXIST 1 MBGF THRIE BEAM TRANS.,
125 LF MBGF & 1 SGT
PROP 1 MBGF THRIE BEAM TRANS.,
125 LF MBGF & 1 SGT

2 STA 64+00

MATCH LINE STA 60+00.00 ℄ FM 362

MATCH LINE STA 71+00.00 ℄ FM 362

LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

◇# PROPOSED SMALL SIGN NUMBER

PROPOSED SMALL SIGN

TRAFFIC DIRECTION

INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)

INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)

INSTL OM ASSM (OM-2Y)(WC)GND

INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)

LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY

PROPOSED MAILBOX

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

08/14/23

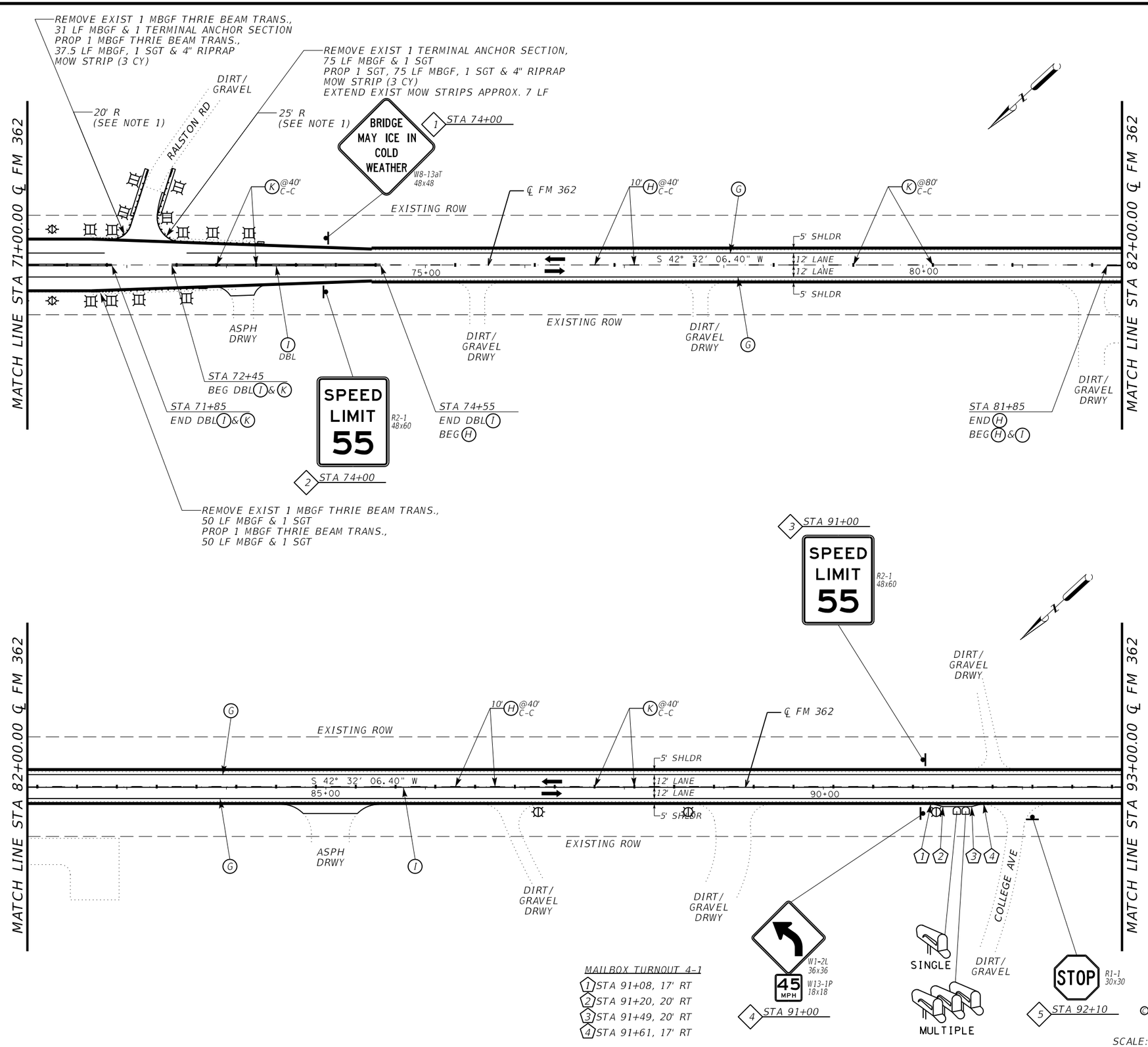
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 49+00.00 TO STA 71+00.00

SHEET 3 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		62



MAILBOX TURNOUT 4-1

1. STA 91+08, 17' RT
2. STA 91+20, 20' RT
3. STA 91+49, 20' RT
4. STA 91+61, 17' RT

LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- (#) PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

NOTES

1. VERIFY RADIUS IN FIELD PRIOR TO FABRICATION.

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

06/20/23

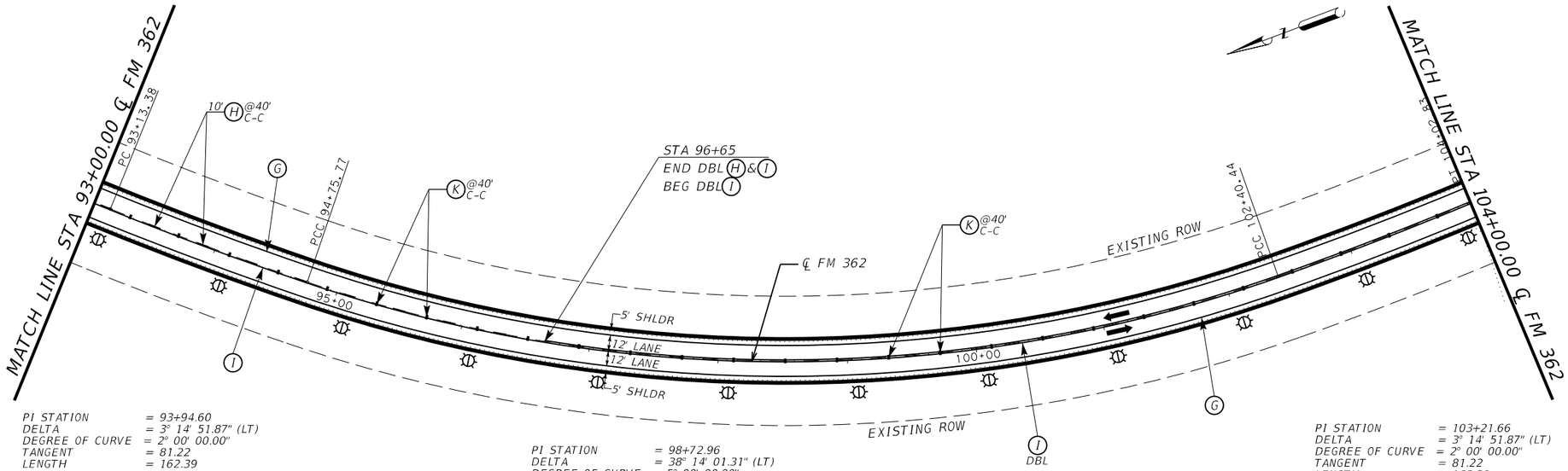
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 71+00.00 TO STA 93+00.00

SHEET 4 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		63



PI STATION = 93+94.60
DELTA = 3° 14' 51.87" (LT)
DEGREE OF CURVE = 2° 00' 00.00"
TANGENT = 81.22
LENGTH = 162.39
RADIUS = 2,864.79
PC STATION = 93+13.38
PT STATION = 94+75.77

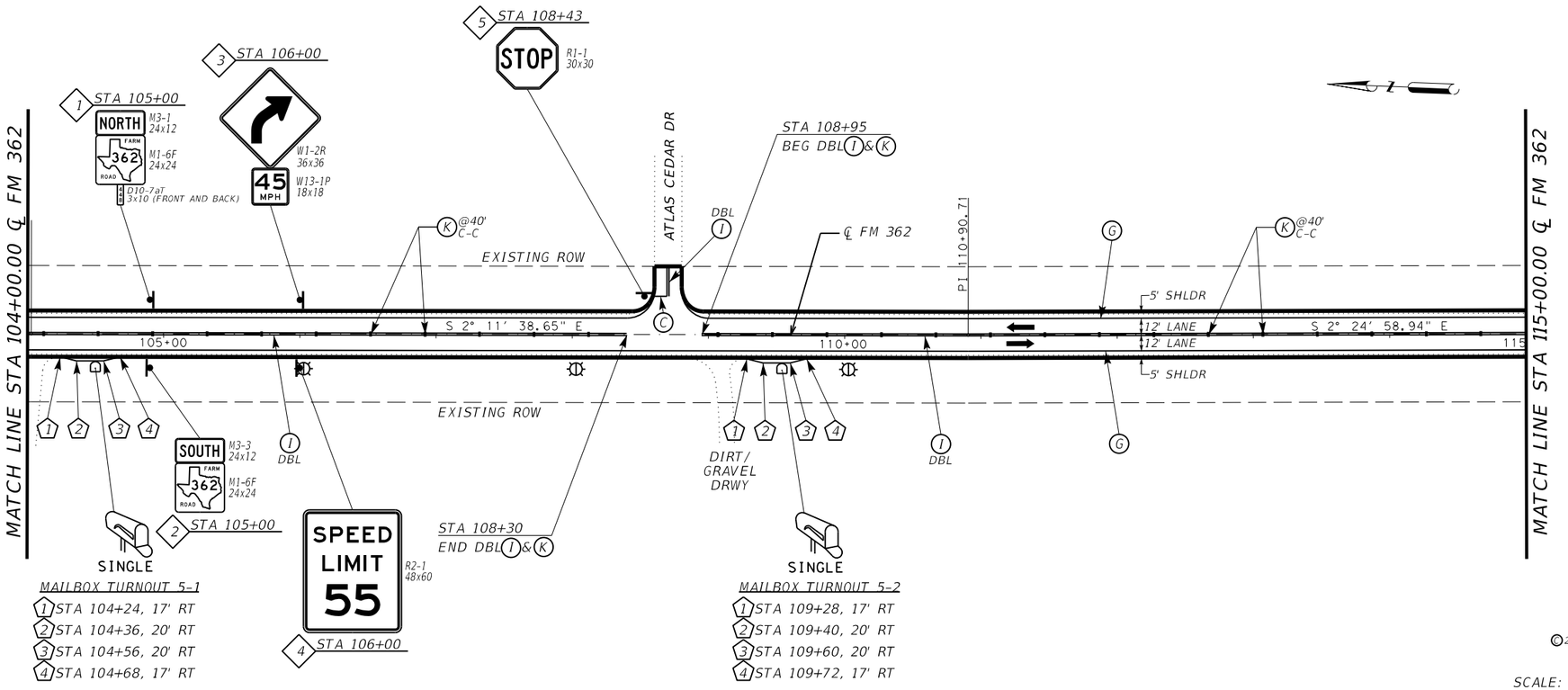
PI STATION = 98+72.96
DELTA = 38° 14' 01.31" (LT)
DEGREE OF CURVE = 5° 00' 00.00"
TANGENT = 397.19
LENGTH = 764.67
RADIUS = 1,145.92
PC STATION = 94+75.77
PT STATION = 102+40.44

PI STATION = 103+21.66
DELTA = 3° 14' 51.87" (LT)
DEGREE OF CURVE = 2° 00' 00.00"
TANGENT = 81.22
LENGTH = 162.39
RADIUS = 2,864.79
PC STATION = 102+40.44
PT STATION = 104+02.83

LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

◇# PROPOSED SMALL SIGN NUMBER
PROPOSED SMALL SIGN
TRAFFIC DIRECTION
INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
INSTL 0M ASSM (0M-2Y)(WC)GND
INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
PROPOSED MAILBOX



SINGLE
MAILBOX TURNOUT 5-1
1 STA 104+24, 17' RT
2 STA 104+36, 20' RT
3 STA 104+56, 20' RT
4 STA 104+68, 17' RT

SINGLE
MAILBOX TURNOUT 5-2
1 STA 109+28, 17' RT
2 STA 109+40, 20' RT
3 STA 109+60, 20' RT
4 STA 109+72, 17' RT

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED
PROFESSIONAL ENGINEER

Robert S. Bissett Jr.
06/20/23

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

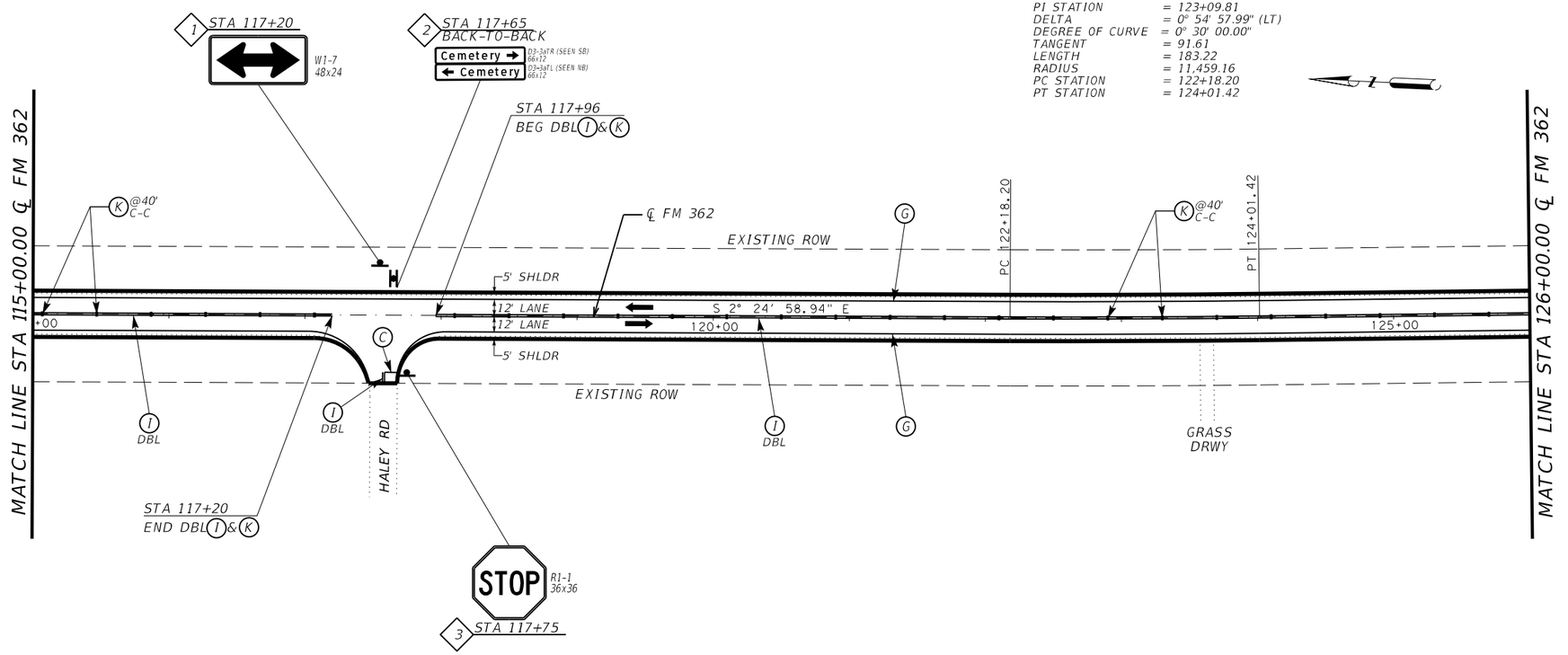
FM 362
STA 93+00.00 TO STA 115+00.00

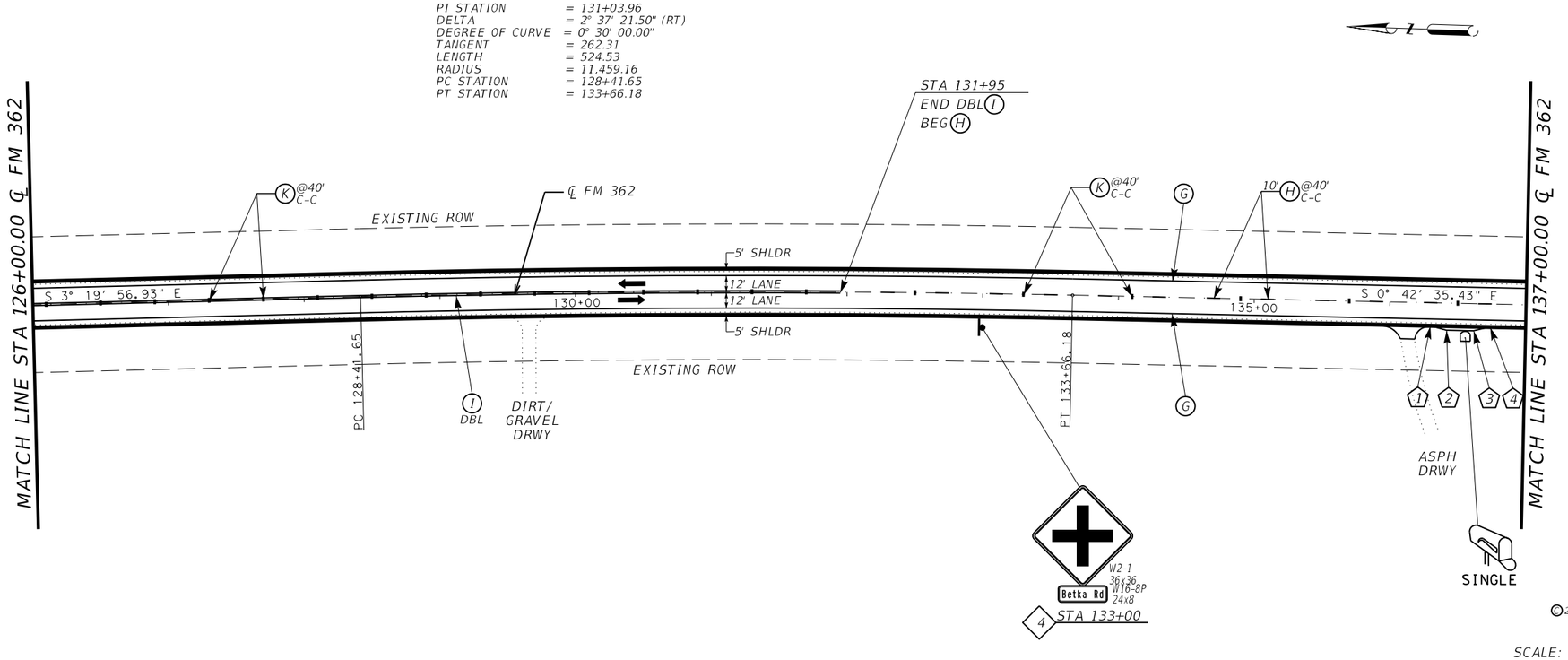
SHEET 5 OF 20

Texas Department of Transportation

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		64





LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- # PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

06/20/23

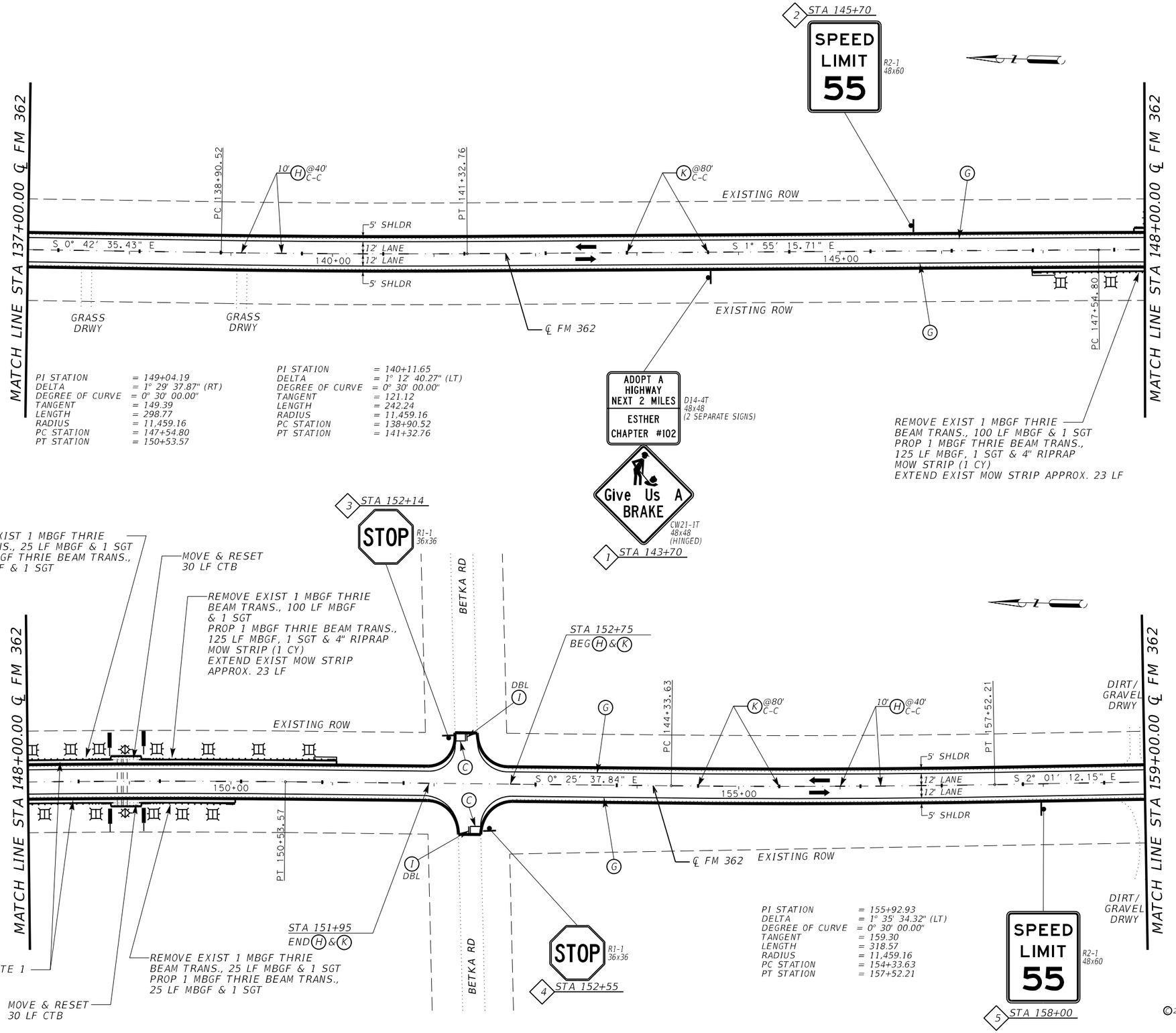
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 115+00.00 TO STA 137+00.00

SHEET 6 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		65



LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- (#) PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

NOTES

1. EXCAVATE A MAXIMUM 6" OF SOIL BETWEEN EDGE OF PAVEMENT AND HEADWALL/MOW STRIP. REPLACE WITH A MAXIMUM 6" OF ASB (ITEM 292). REFER TO "MISCELLANEOUS DETAILS" SHEET FOR FURTHER DETAILS.

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED
PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

06/20/23

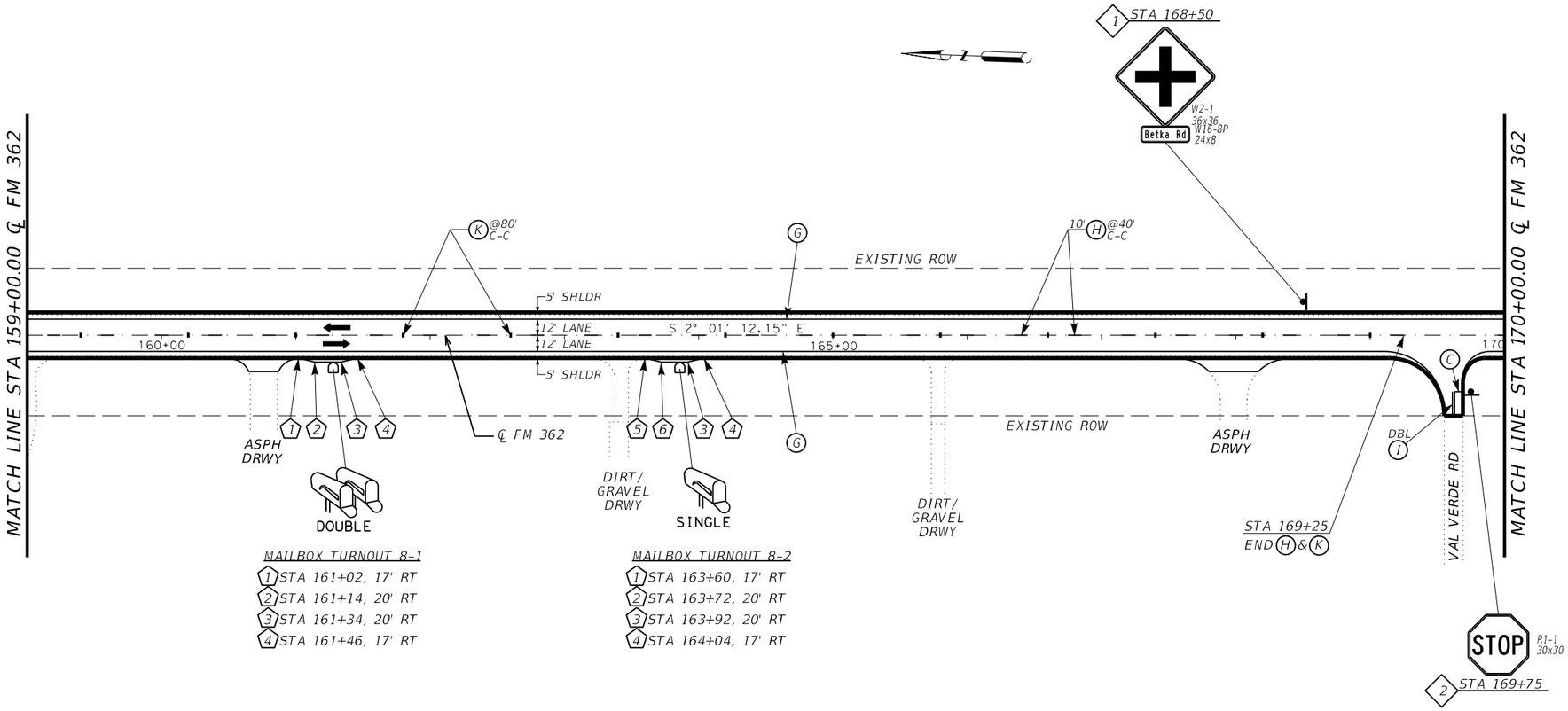
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

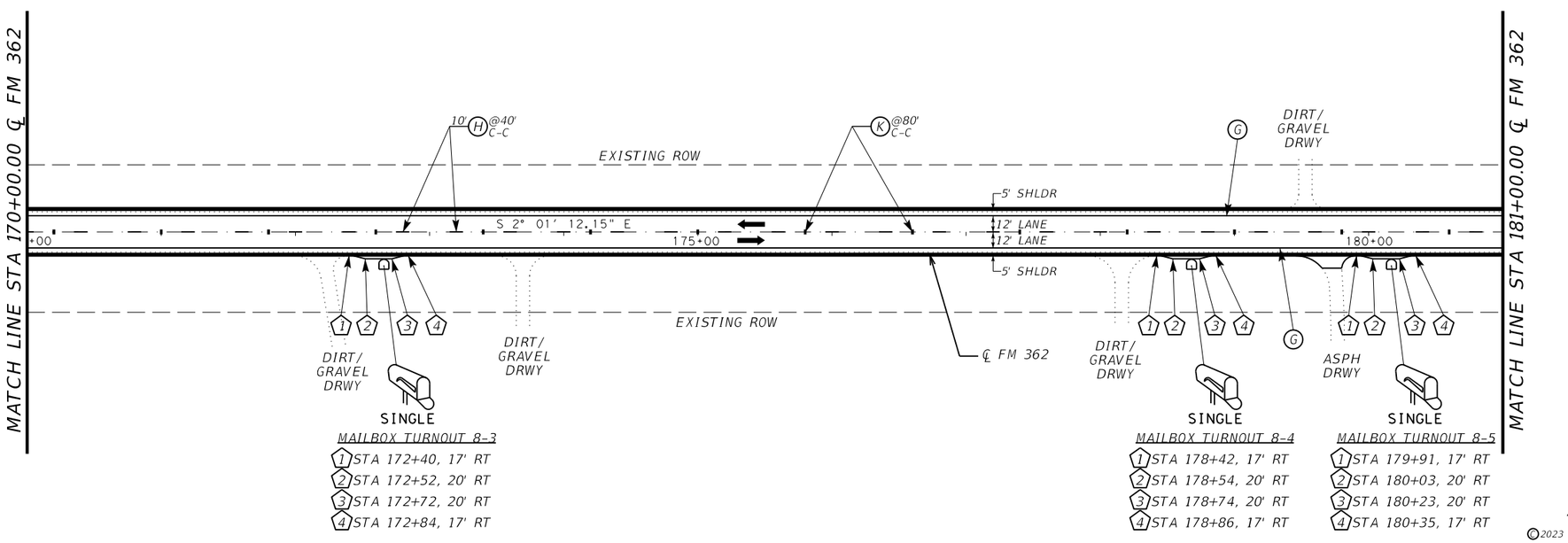
FM 362
STA 137+00.00 TO STA 159+00.00

SHEET 7 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		66





LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- (#) PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

STATE OF TEXAS
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Robert S. Bissett Jr.

06/20/23

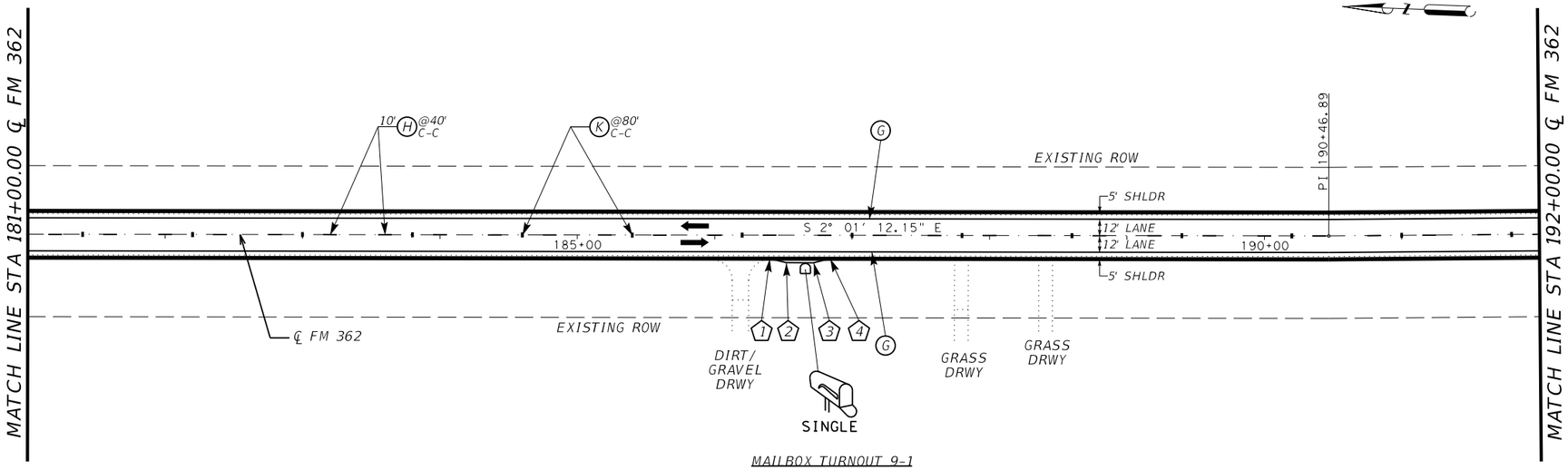
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 159+00.00 TO STA 181+00.00

SHEET 8 OF 20

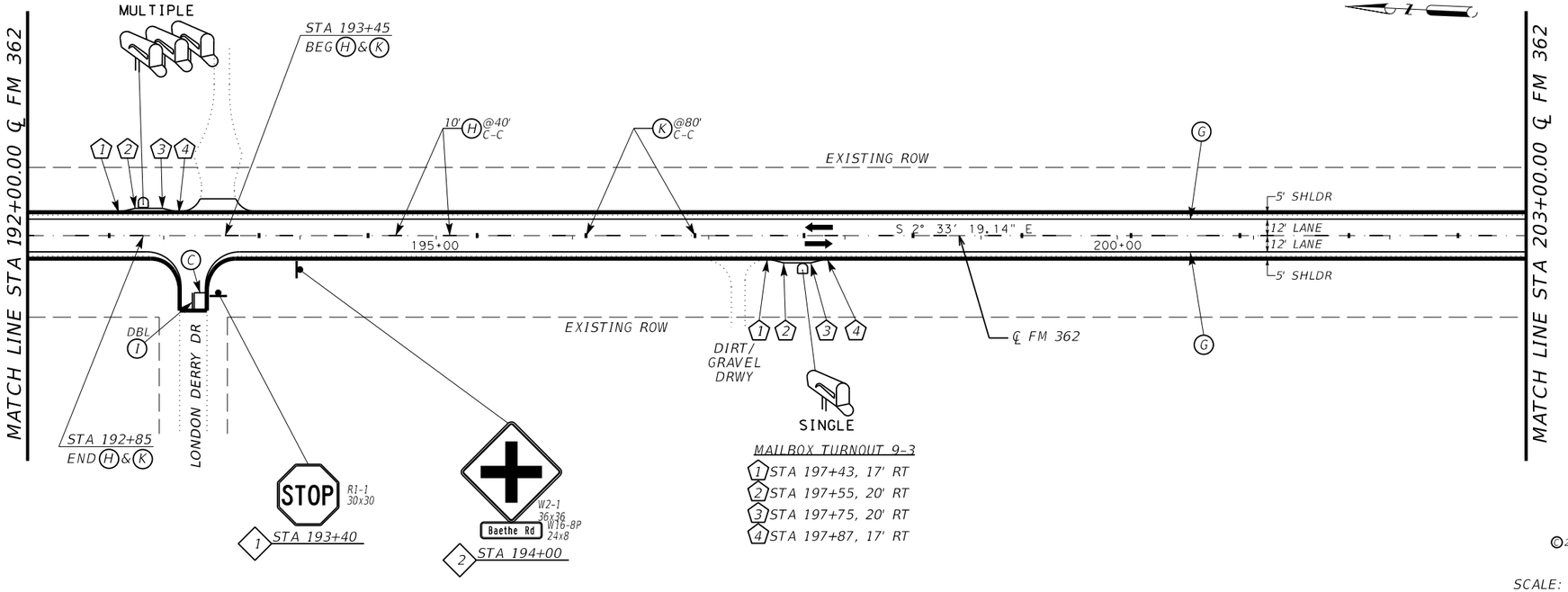
SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		67



MAILBOX TURNOUT 9-1

1. STA 186+40, 17' RT
2. STA 186+52, 20' RT
3. STA 186+72, 20' RT
4. STA 186+84, 17' RT



MAILBOX TURNOUT 9-2

1. STA 192+67, 17' LT
2. STA 192+79, 20' LT
3. STA 192+99, 20' LT
4. STA 193+11, 17' LT

MAILBOX TURNOUT 9-3

1. STA 197+43, 17' RT
2. STA 197+55, 20' RT
3. STA 197+75, 20' RT
4. STA 197+87, 17' RT

LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- ◇ # PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

STATE OF TEXAS
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06/20/23

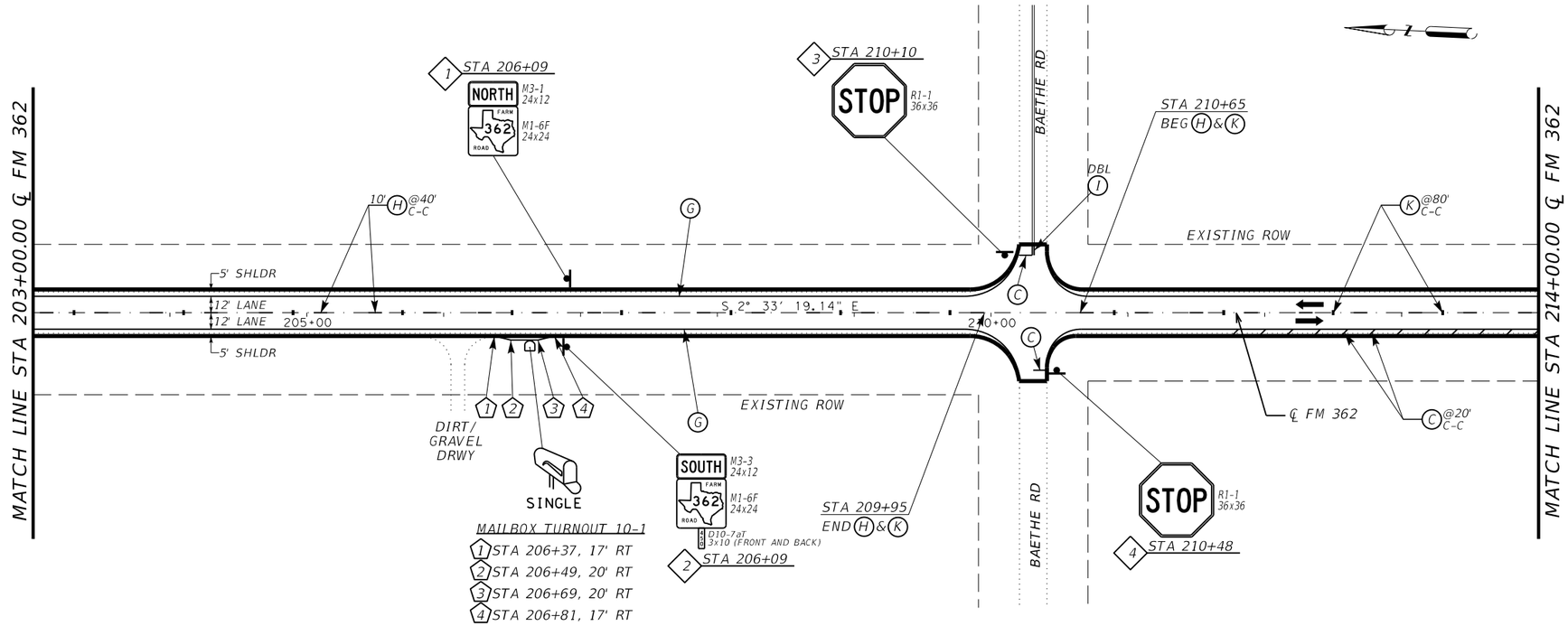
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 181+00.00 TO STA 203+00.00

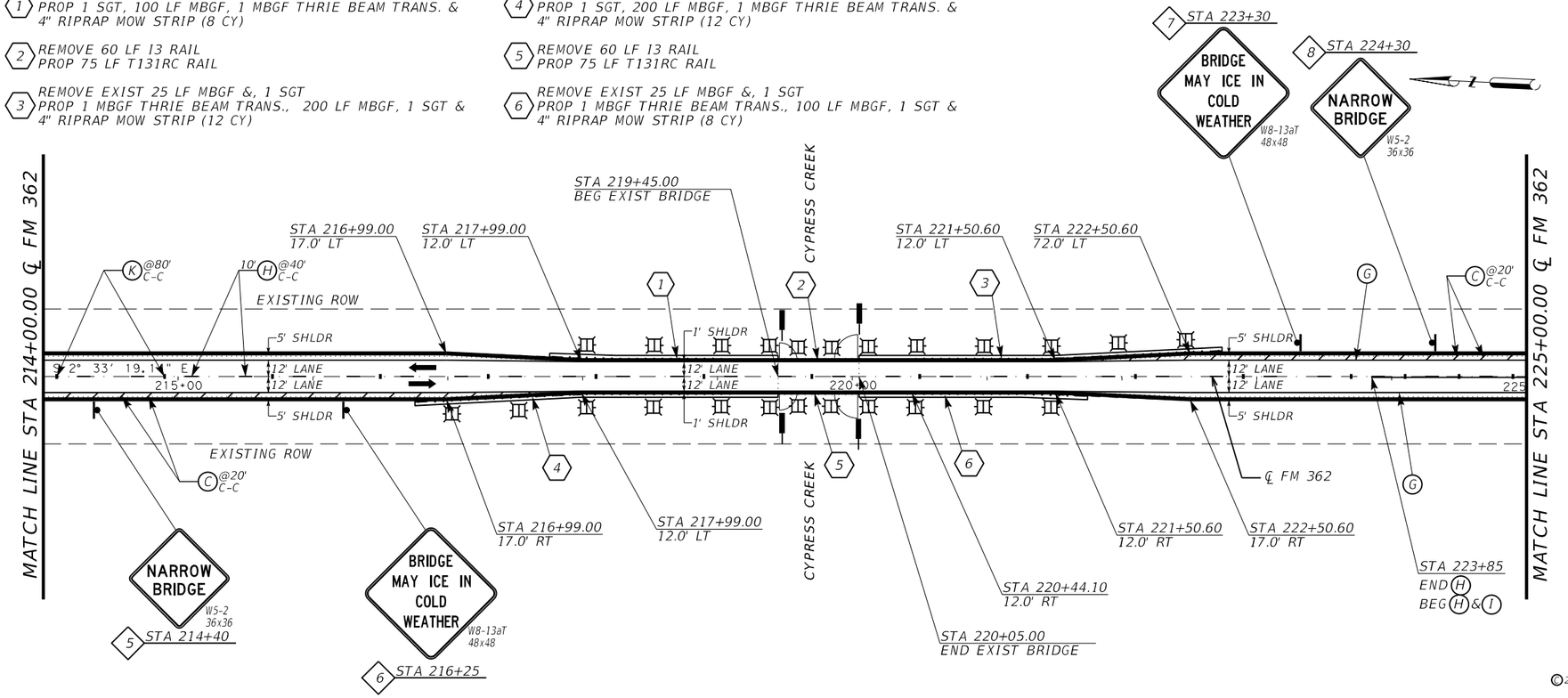
SHEET 9 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		68



1. REMOVE EXIST 1 SGT & 25 LF MBGF
   PROP 1 SGT, 100 LF MBGF, 1 MBGF THRIE BEAM TRANS. & 4" RIPRAP MOW STRIP (8 CY)
2. REMOVE 60 LF I3 RAIL
   PROP 75 LF T131RC RAIL
3. REMOVE EXIST 25 LF MBGF &, 1 SGT
   PROP 1 MBGF THRIE BEAM TRANS., 200 LF MBGF, 1 SGT & 4" RIPRAP MOW STRIP (12 CY)
4. REMOVE EXIST 1 SGT & 25 LF MBGF
   PROP 1 SGT, 200 LF MBGF, 1 MBGF THRIE BEAM TRANS. & 4" RIPRAP MOW STRIP (12 CY)
5. REMOVE 60 LF I3 RAIL
   PROP 75 LF T131RC RAIL
6. REMOVE EXIST 25 LF MBGF &, 1 SGT
   PROP 1 MBGF THRIE BEAM TRANS., 100 LF MBGF, 1 SGT & 4" RIPRAP MOW STRIP (8 CY)



SCALE: 1"=100'

LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- (#) PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

NOTES

1. USE TCP LONG TERM ON-LANE TWO-WAY CONTROL TCP(2-8)-23 (MOD) FOR WINGWALL, RAIL & MBGF REPLACEMENT AT CYPRESS CREEK.
2. REFER TO SHEETS 99-110 FOR INFORMATION ON THE WINGWALL REPLACEMENT IN THE SOUTHEST CORNER OF THE CYPRESS CREEK BRIDGE AS WELL AS RETROFITTING THE BRIDGE RAIL WITH TYPE T131RC(MOD).

STATE OF TEXAS
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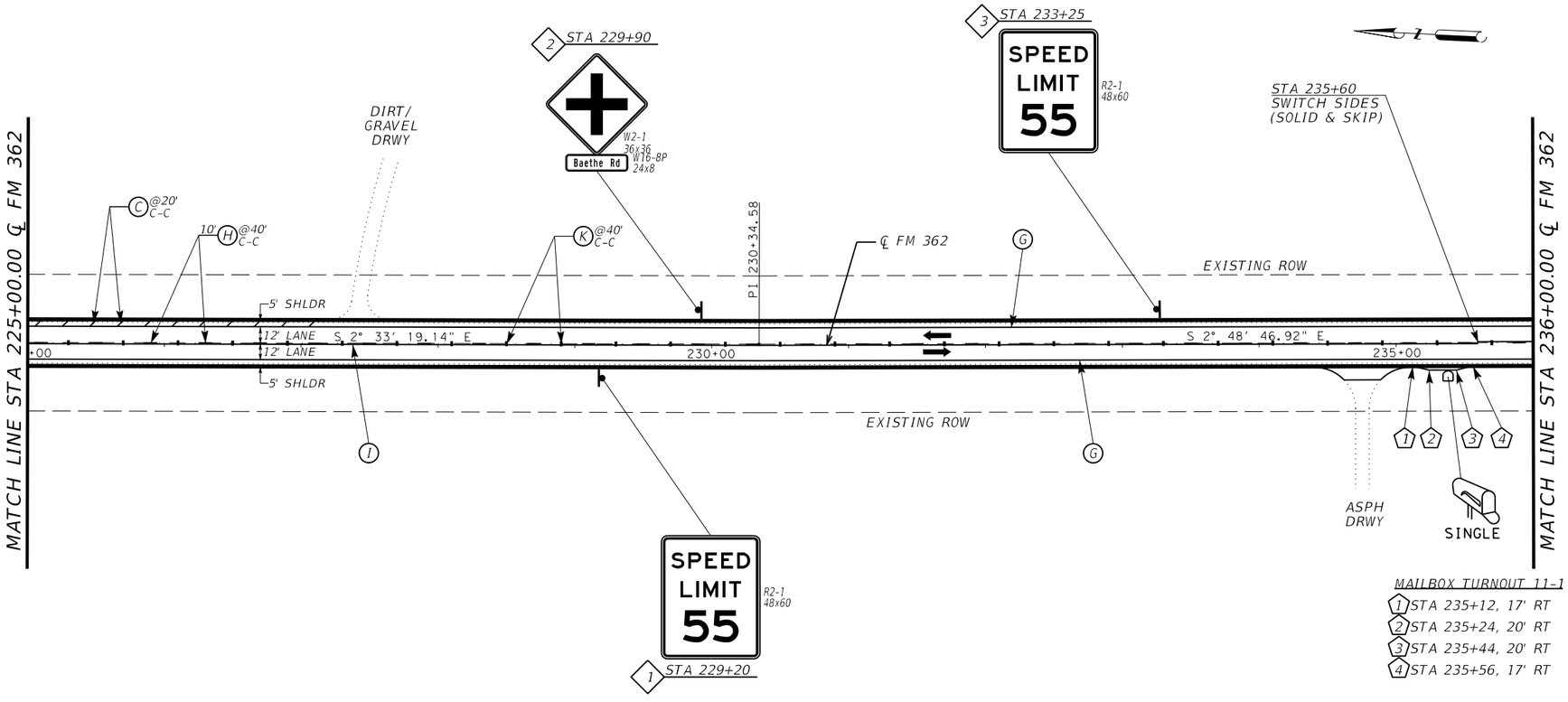
Robert S. Bissett Jr.
08/14/23

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 203+00.00 TO STA 225+00.00

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		69



LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- (#) PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

STATE OF TEXAS
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Robert S. Bissett Jr.
06/20/23

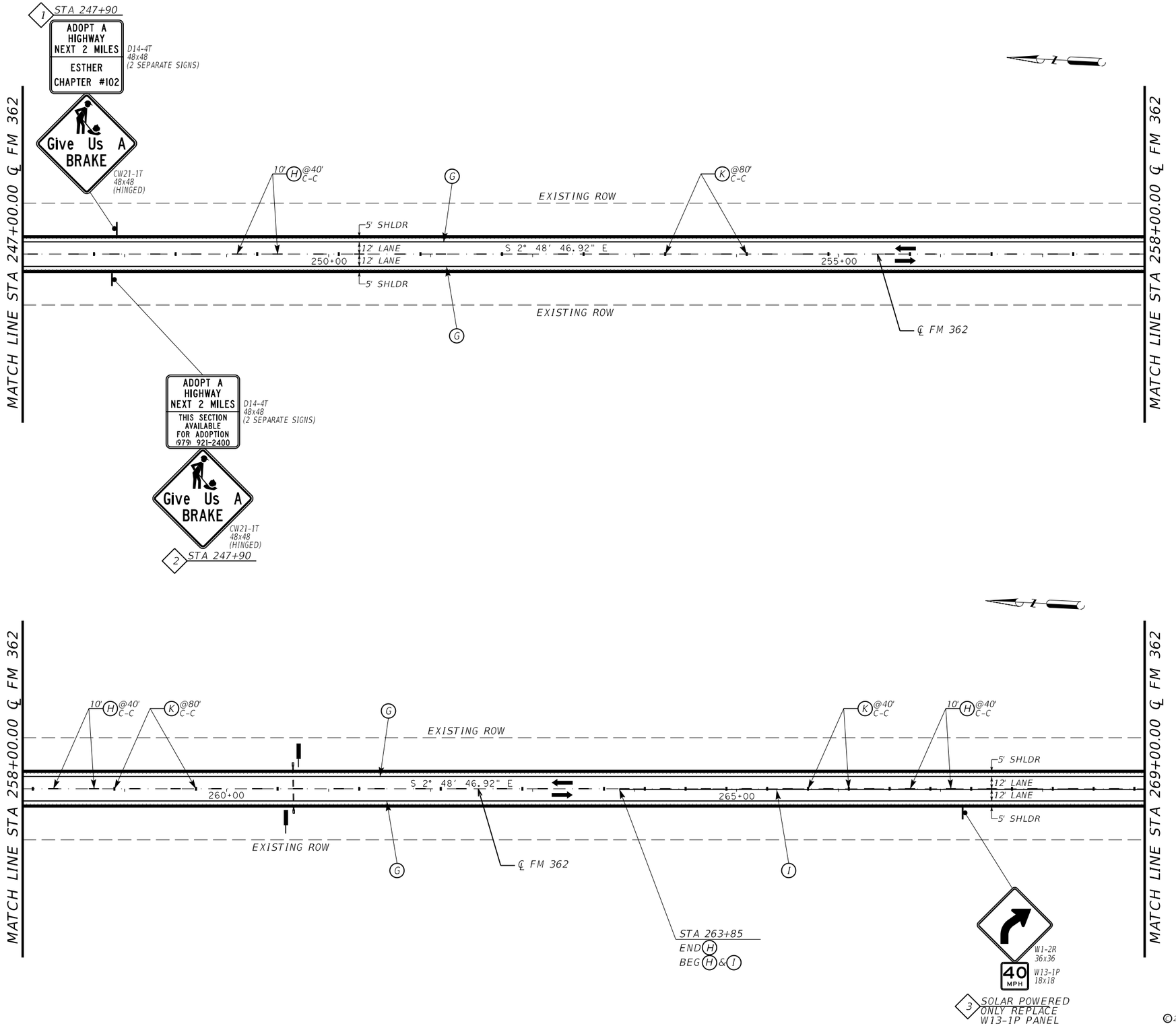
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 225+00.00 TO STA 247+00.00

SHEET 11 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		70



LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- (#) PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

06/20/23

ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 247+00.00 TO STA 269+00.00

SHEET 12 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		71

MAILBOX TURNOUT 13-1
1 STA 270+42, 17' LT
2 STA 270+54, 20' LT
3 STA 270+74, 20' LT
4 STA 270+86, 17' LT

MAILBOX TURNOUT 13-2
1 STA 271+17, 17' LT
2 STA 271+29, 20' LT
3 STA 271+49, 20' LT
4 STA 271+61, 17' LT

MAILBOX TURNOUT 13-3
1 STA 272+92, 17' LT
2 STA 273+04, 20' LT
3 STA 273+24, 20' LT
4 STA 273+36, 17' LT

SINGLE
DOUBLE
DOUBLE
DIRT/ GRAVEL DRWY
DIRT/ GRAVEL DRWY
DIRT/ GRAVEL DRWY
DIRT/ GRAVEL DRWY
10' (H) @40' C-C
(K) @40' C-C
EXISTING ROW
EXISTING ROW
MATCH LINE STA 269+00.00 ℄ FM 362
270+00
S 2° 48' 46.92" E
275+00
℄ FM 362
PCC 274+11.04
PCC 274+80.12
4 STA 276+30
STOP R1-1 30x30
3
2
G
A
C
5
6
1
5' SHLDR
12' LANE
12' LANE
5' SHLDR
ROCHEN RD
280+00
MATCH LINE STA 280+00.00 ℄ FM 362
STA 274+90
END (H), (I) & (K)
STA 276+10
BEG DBL (I) & (K)
(I) DBL
(K) @40' C-C
SPEED LIMIT 55 R2-1 48x60
1 STA 272+70

PI STATION = 274+45.59
DELTA = 2° 45' 47.35" (RT)
DEGREE OF CURVE = 4° 00' 00.00"
TANGENT = 34.55
LENGTH = 69.08
RADIUS = 1,432.39
PC STATION = 274+11.04
PT STATION = 274+80.12

PI STATION = 279+56.78
DELTA = 84° 55' 29.95" (RT)
DEGREE OF CURVE = 11° 00' 00.00"
TANGENT = 476.66
LENGTH = 772.05
RADIUS = 520.87
PC STATION = 274+80.12
PT STATION = 282+52.16

SOLAR POWERED LED CHEVONS BACK-TO-BACK
W1-8R 30x36
W1-8L 30x36
2 STA 274+23
3 STA 275+54
5 STA 276+79
6 STA 278+02

1 SOLAR POWERED LED CHEVONS BACK-TO-BACK EXISTING TO REMAIN

8 SOLAR POWERED ONLY REPLACE W13-1P PANEL
W1-2L 36x36
40 MPH W13-1P 18x18

STA 282+40
BEG (H), (I) & (K)
7 STA 280+60
STOP R1-1 36x36
DBL (I)
(I) DBL
(K) @40' C-C
STA 281+30
END DBL (I) & (K)
ROCHEN RD
MATCH LINE STA 280+00.00 ℄FM 362
+00
PCC 282+52.16
PT 283+21.24
DIRT/ GRAVEL DRWY
GRASS DRWY
EXISTING ROW
EXISTING ROW
S 87° 38' 17.73" W
285+00
℄ FM 362
5' SHLDR
12' LANE
12' LANE
5' SHLDR
290+00
10' (H) @40' C-C
MATCH LINE STA 291+00.00 ℄ FM 362

PI STATION = 282+86.71
DELTA = 2° 45' 47.35" (RT)
DEGREE OF CURVE = 4° 00' 00.00"
TANGENT = 34.55
LENGTH = 69.08
RADIUS = 1,432.39
PC STATION = 282+52.16
PT STATION = 283+21.24

LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- # PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

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08/14/23

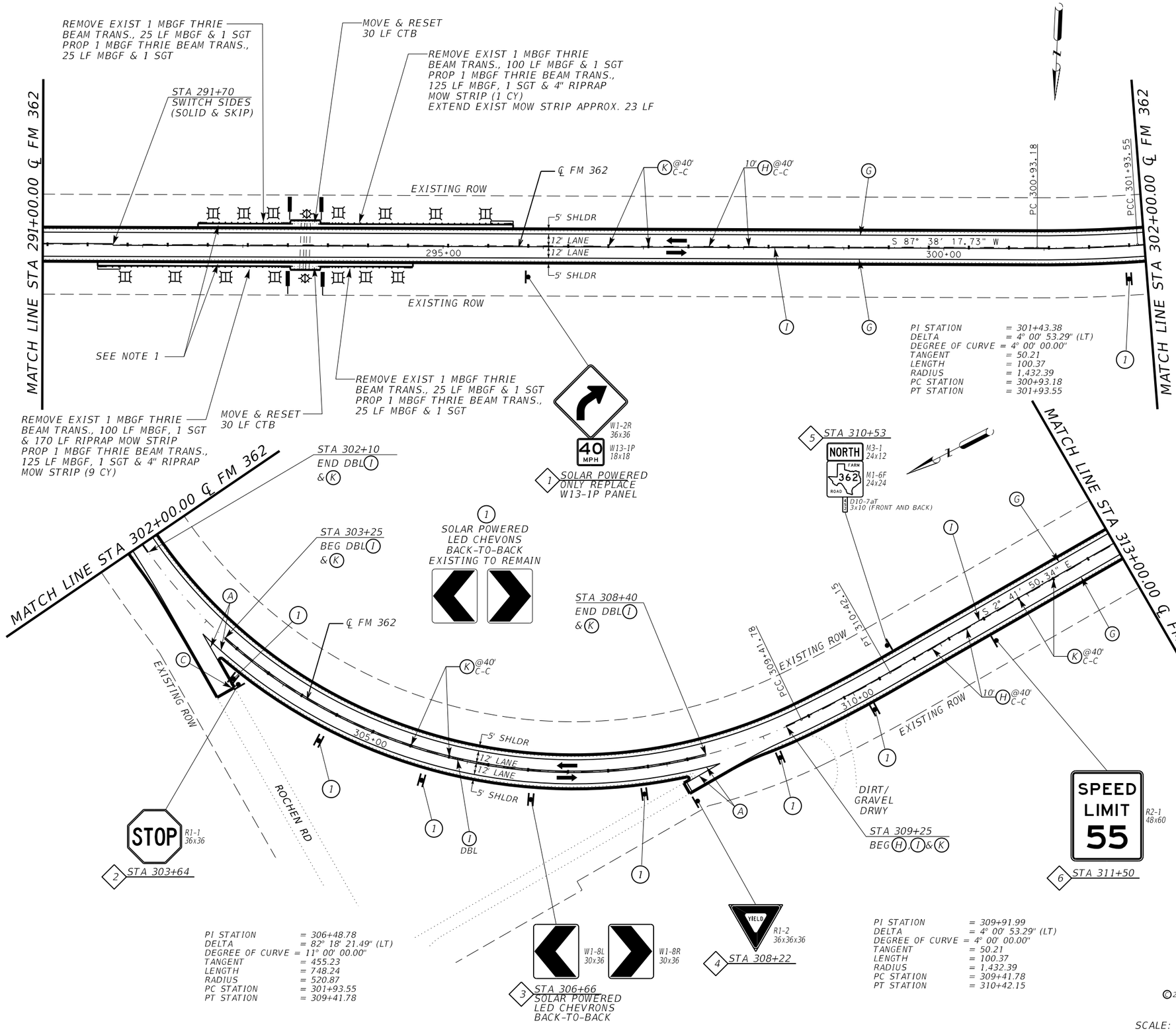
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 269+00.00 TO STA 291+00.00

SHEET 13 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		72



LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- # PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

NOTES

1. EXCAVATE A MAXIMUM 6" OF SOIL BETWEEN EDGE OF PAVEMENT AND HEADWALL/MOW STRIP. REPLACE WITH A MAXIMUM 6" OF ASB (ITEM 292). REFER TO "MISCELLANEOUS DETAILS" SHEET FOR FURTHER DETAILS.

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Robert S. Bissett Jr.

08/14/23

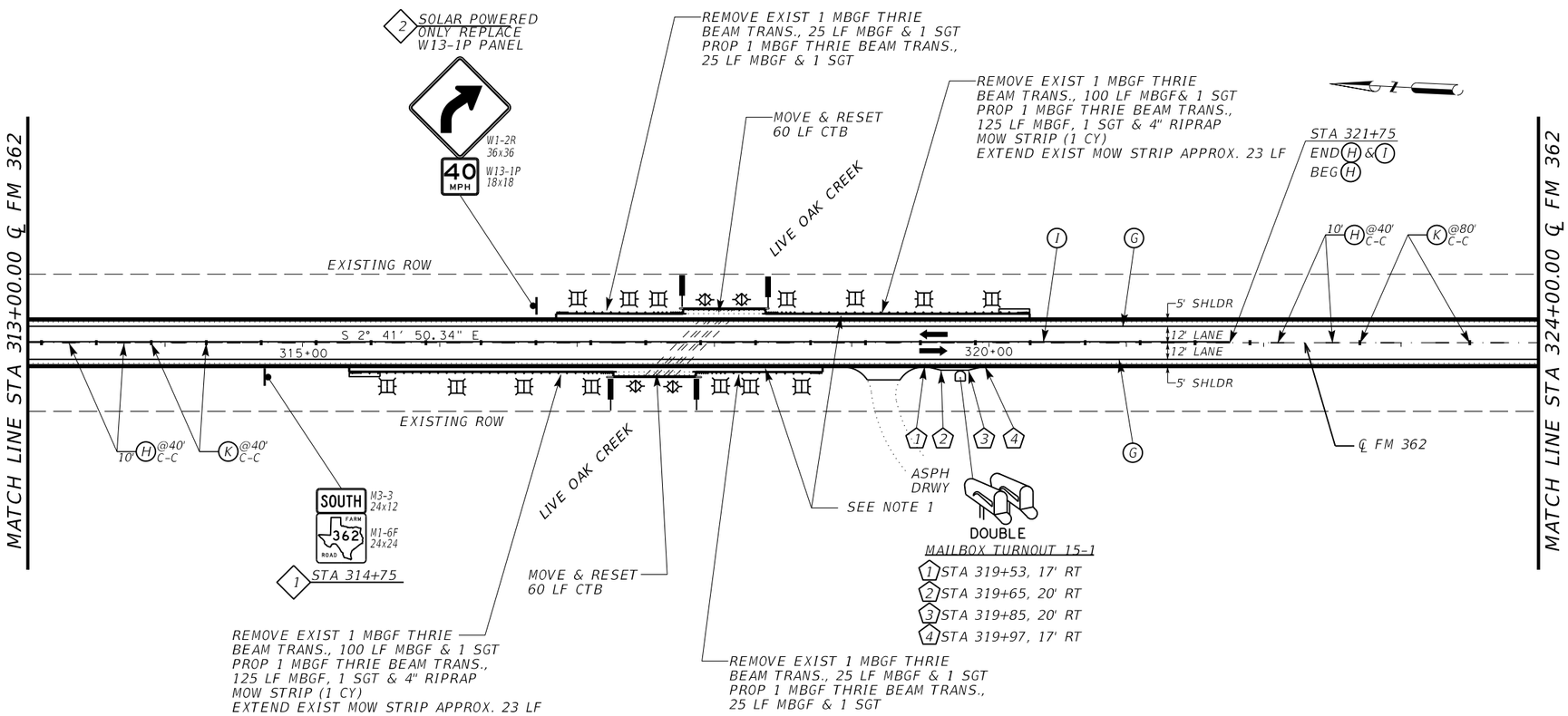
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

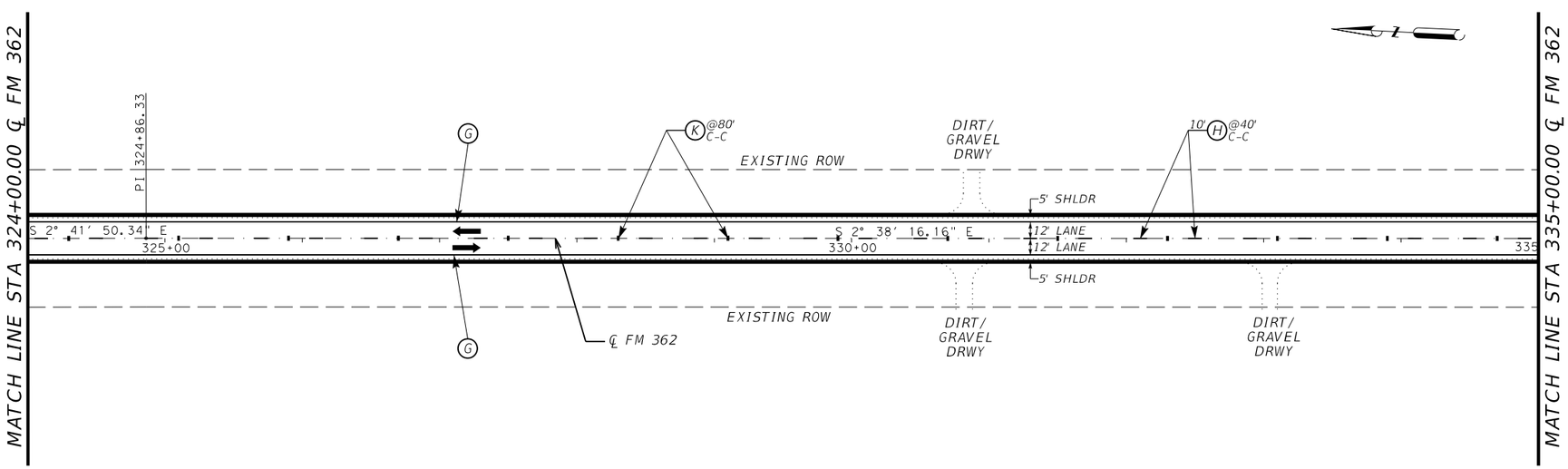
FM 362
STA 291+00.00 TO STA 313+00.00

SHEET 14 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		73





LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- (#) PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL 0M ASSM (0M-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

NOTES

1. EXCAVATE A MAXIMUM 6" OF SOIL BETWEEN EDGE OF PAVEMENT AND HEADWALL/MOW STRIP. REPLACE WITH A MAXIMUM 6" OF ASB (ITEM 292). REFER TO "MISCELLANEOUS DETAILS" SHEET FOR FURTHER DETAILS.

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

06/20/23

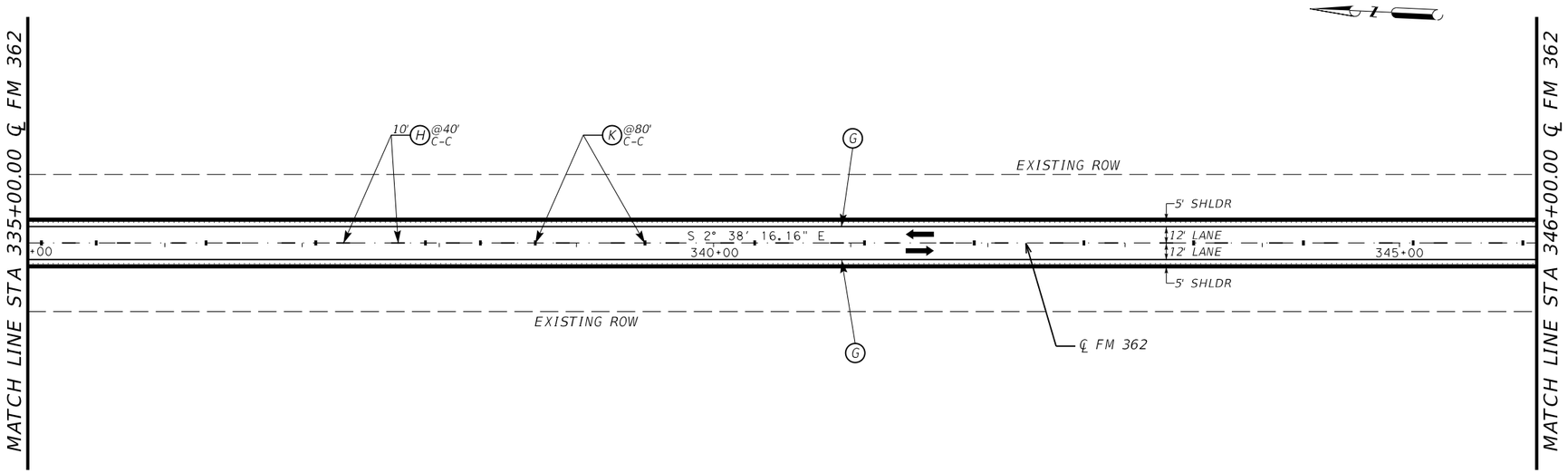
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

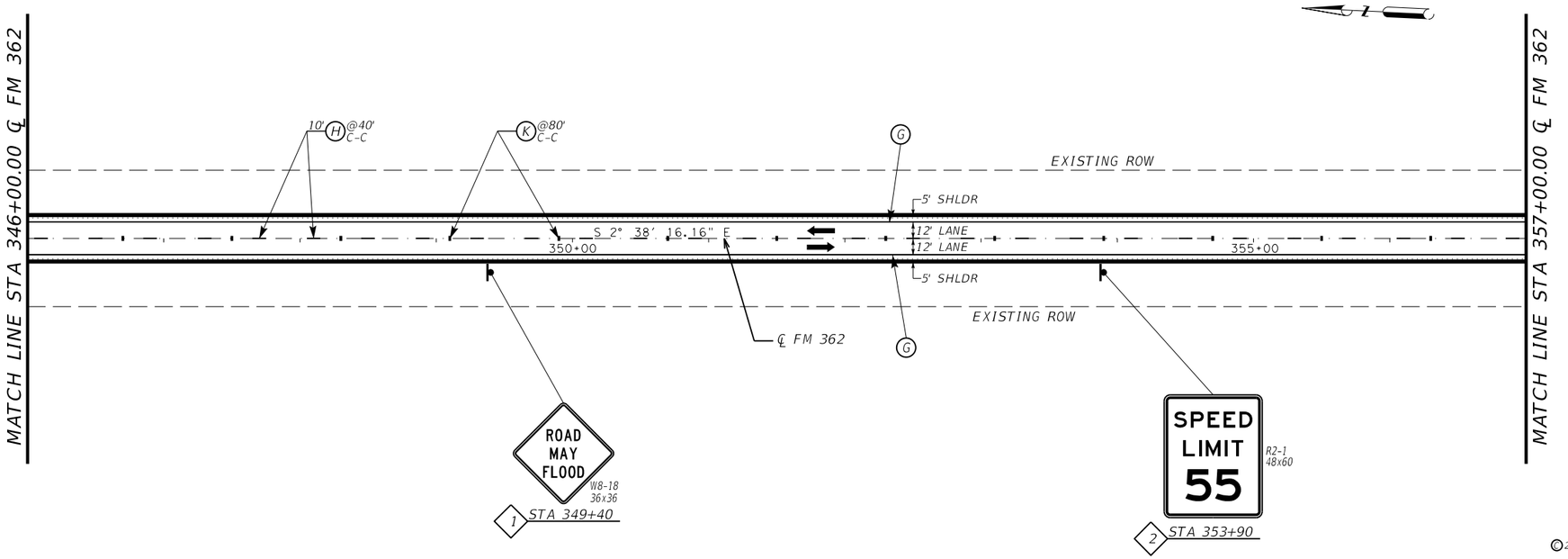
FM 362
STA 313+00.00 TO STA 335+00.00

SHEET 15 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		74





LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
- (C) REFL PAV MRK TY I (Y)24"(SLD)(100MIL)
- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- ◇ # PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

STATE OF TEXAS
ROBERT S. BISSETT, JR.
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REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

06/20/23

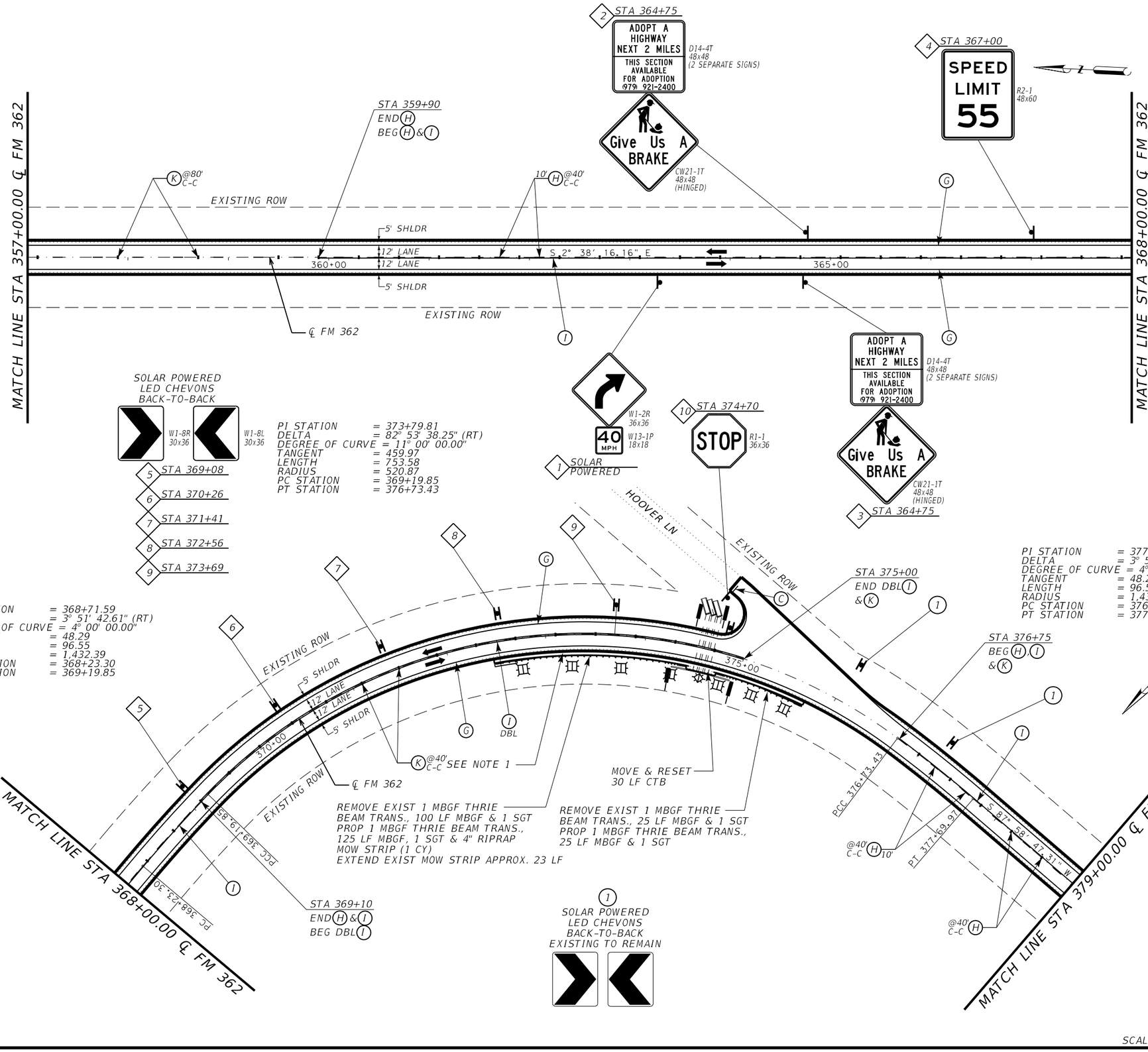
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 335+00.00 TO STA 357+00.00

SHEET 16 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		75



LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
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- (D) REFL PAV MRK TY I (W)(ARROW)(100MIL)
- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
- (G) RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)
- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
- (I) RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)
- (J) REFL PAV MRK TY I-C
- (K) REFL PAV MRK TY II-A-A

- (#) PROPOSED SMALL SIGN NUMBER
- PROPOSED SMALL SIGN
- TRAFFIC DIRECTION
- INSTL DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)
- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

NOTES

1. EXCAVATE A MAXIMUM 6" OF SOIL BETWEEN EDGE OF PAVEMENT AND HEADWALL/MOW STRIP. REPLACE WITH A MAXIMUM 6" OF ASB (ITEM 292). REFER TO "MISCELLANEOUS DETAILS" SHEET FOR FURTHER DETAILS.

STATE OF TEXAS
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79703
REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

07/25/23

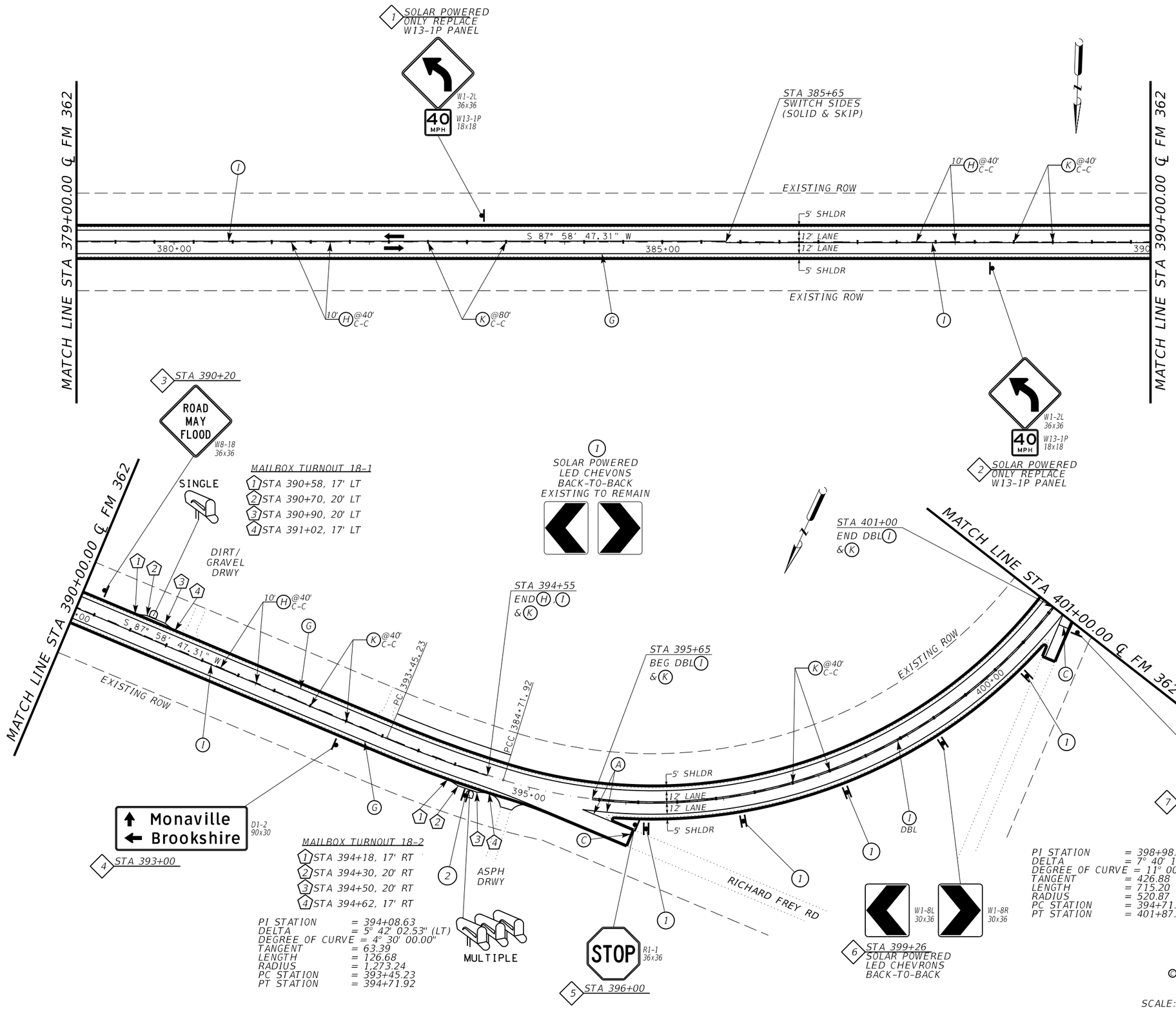
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 357+00.00 TO STA 379+00.00

SHEET 17 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		76



LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
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- (J) REFL PAV MRK TY I-C
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- INSTL OM ASSM (OM-2Y)(WC)GND
- INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
- LIMITS OF 2" PLANING, SEAL COAT & 1 ½" ACP OVERLAY
- PROPOSED MAILBOX

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

08/14/23

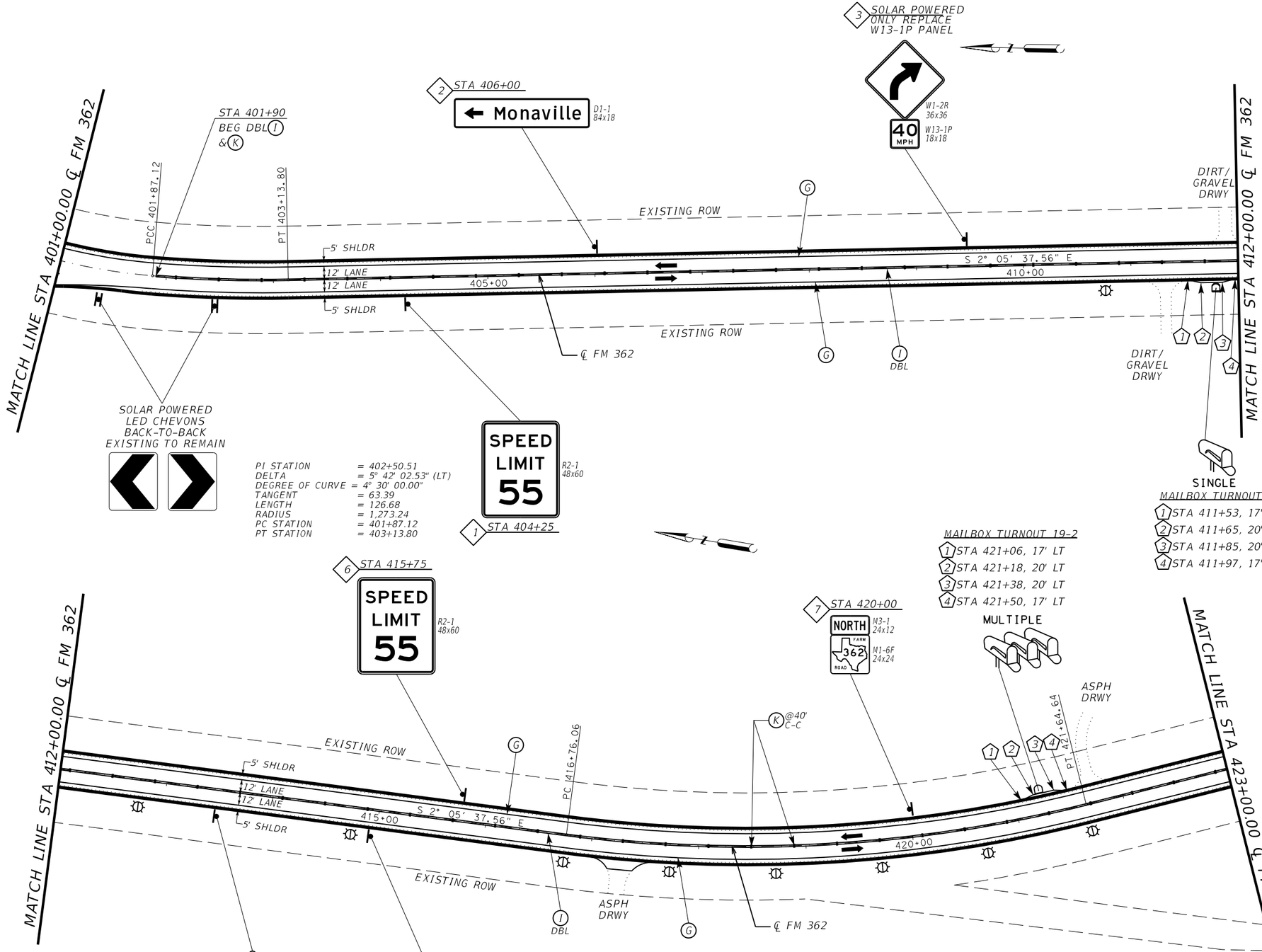
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 379+00.00 TO STA 401+00.00

SHEET 18 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		77



LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
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- (E) REFL PAV MRK TY I (W)(WORD)(100MIL)
- (F) REFL PAV MRK TY I (W)(RR XING)(100MIL)
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- (H) RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)
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- PROPOSED MAILBOX

STATE OF TEXAS
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Robert S. Bissett Jr.
06/20/23

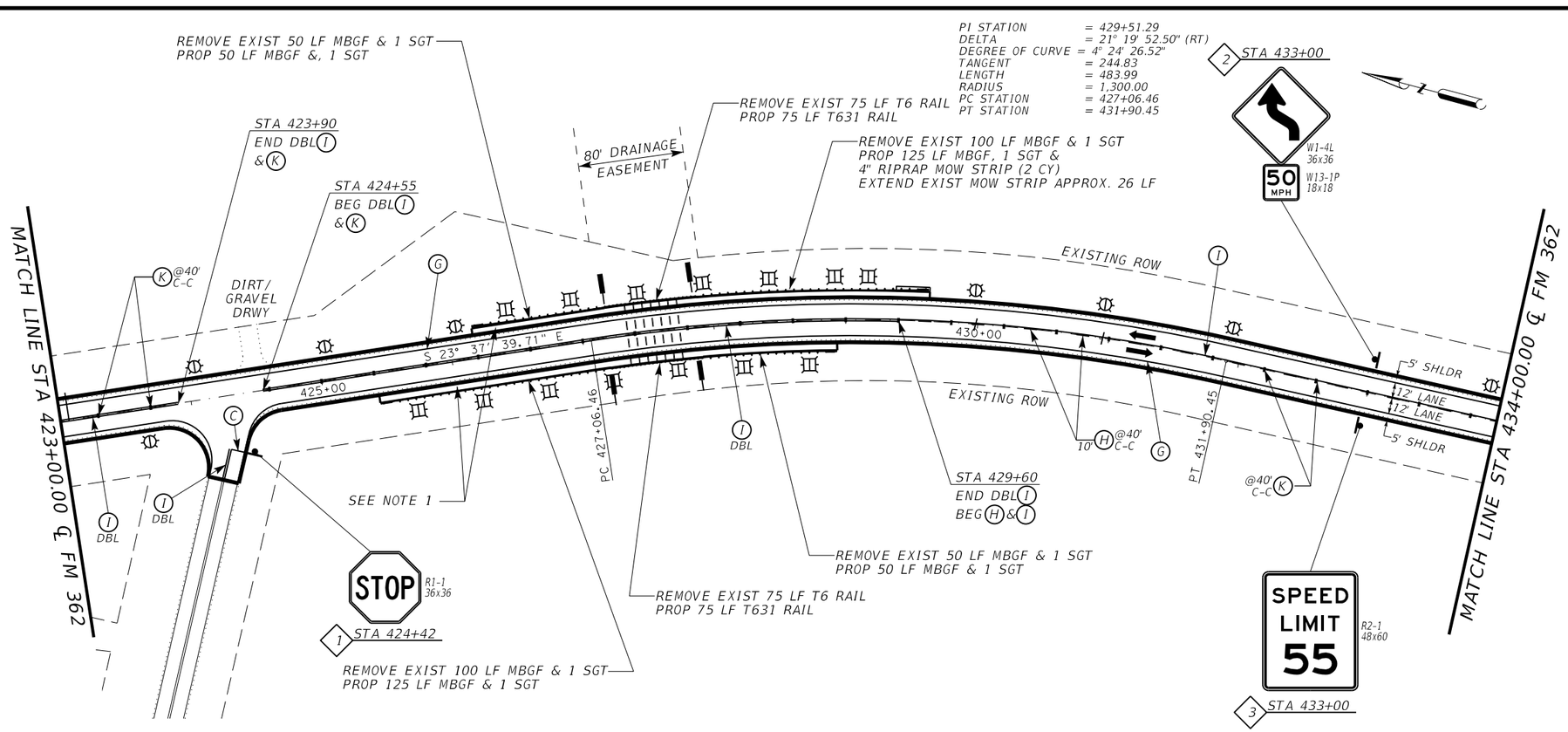
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

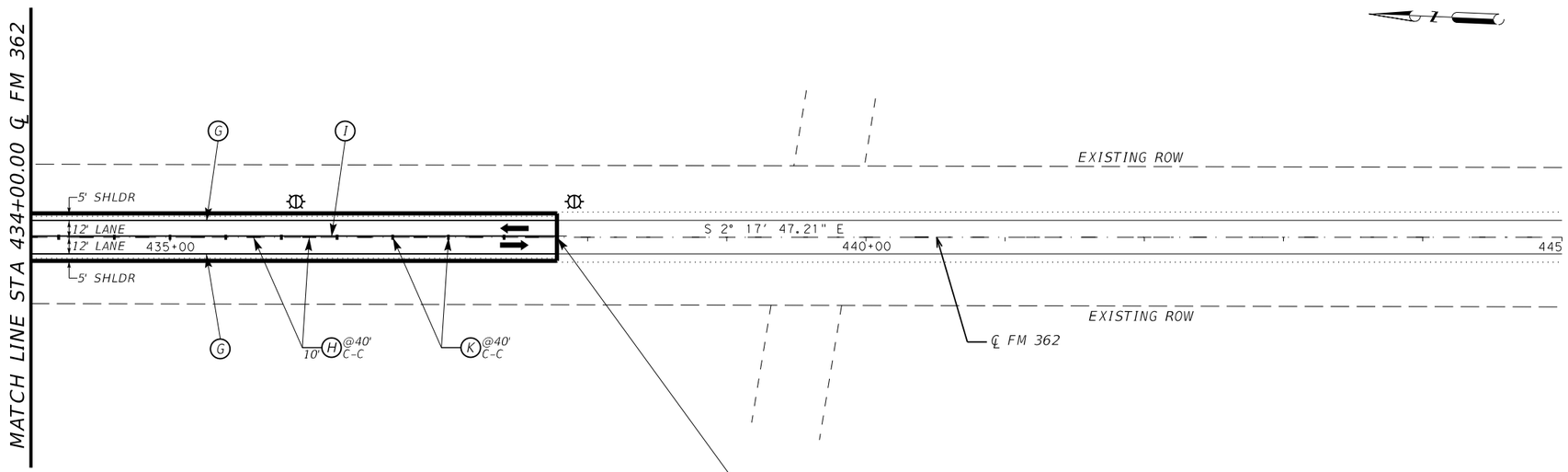
FM 362
STA 401+00.00 TO STA 423+00.00

SHEET 19 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		78





LEGEND

- (A) REFL PAV MRK TY I (W)8"(SLD)(100MIL)
- (B) REFL PAV MRK TY I (W)12"(SLD)(100MIL)
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LIMITS OF 2" PLANING,
SEAL COAT & 1 ½" ACP OVERLAY

PROPOSED MAILBOX

NOTES

1. EXCAVATE A MAXIMUM 6" OF SOIL BETWEEN EDGE OF PAVEMENT AND HEADWALL/MOW STRIP. REPLACE WITH A MAXIMUM 6" OF ASB (ITEM 292). REFER TO "MISCELLANEOUS DETAILS" SHEET FOR FURTHER DETAILS.

STATE OF TEXAS
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Robert S. Bissett Jr.
06/20/23

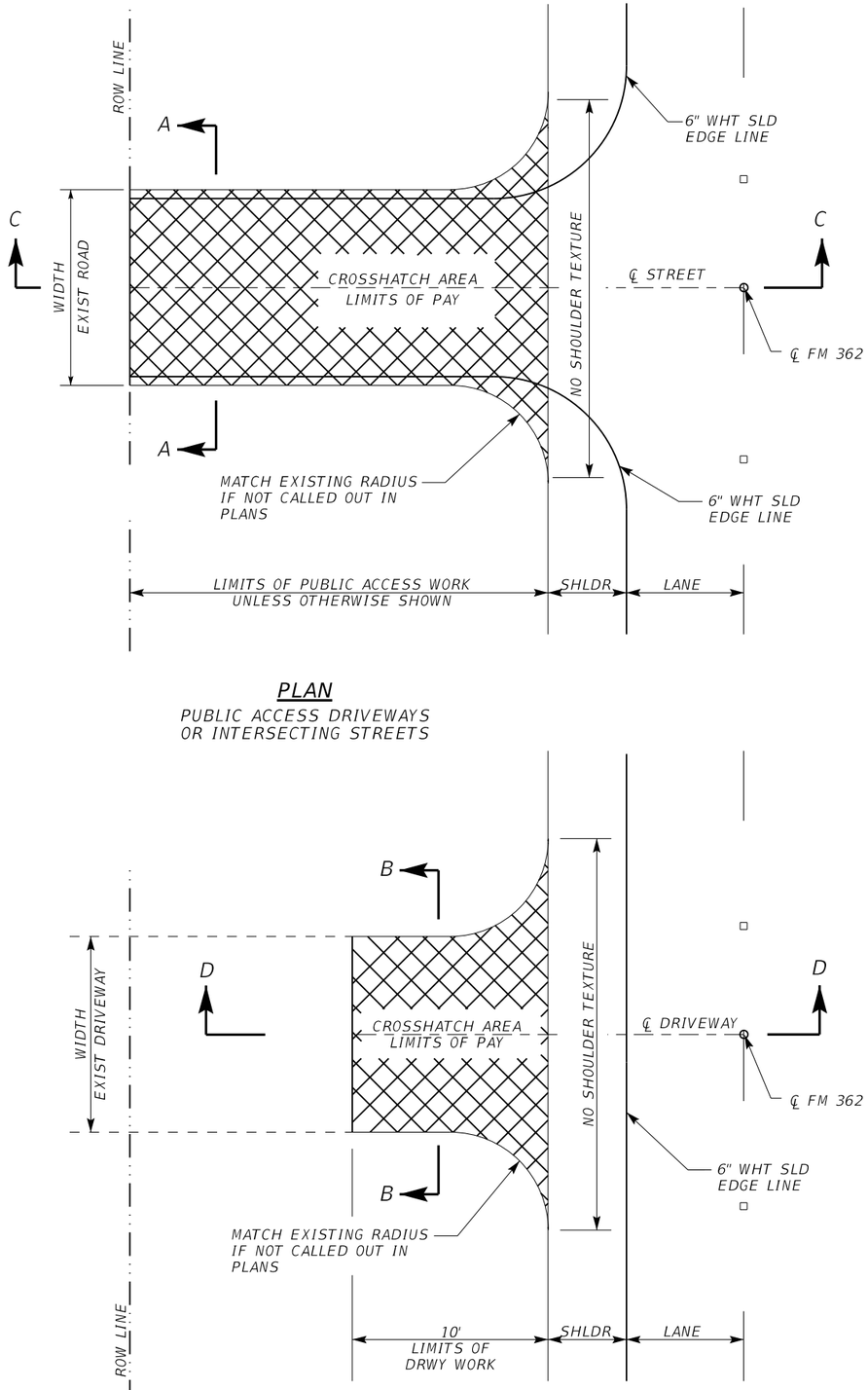
ROADWAY, SIGNING & PAVEMENT MARKING LAYOUT

FM 362
STA 423+00.00 TO STA 437+78.00

SHEET 20 OF 20

SCALE: 1"=100'

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		79

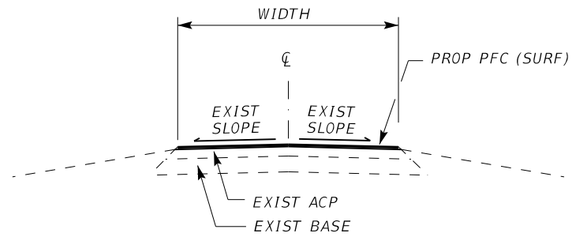


PLAN

PUBLIC ACCESS DRIVEWAYS
OR INTERSECTING STREETS

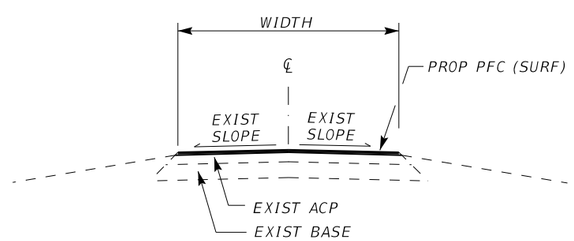
PLAN

PRIVATE DRIVEWAYS



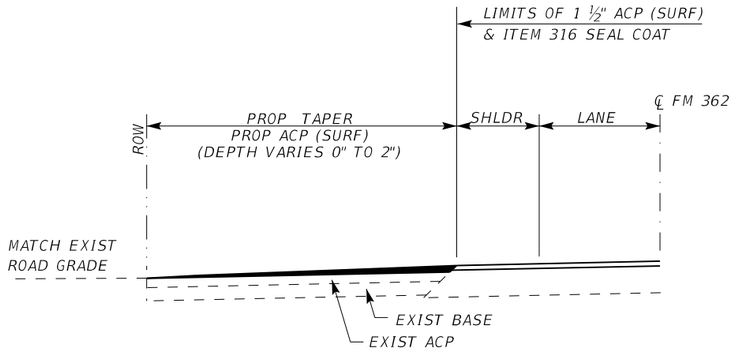
SECTION A-A

EXIST ACP STREET

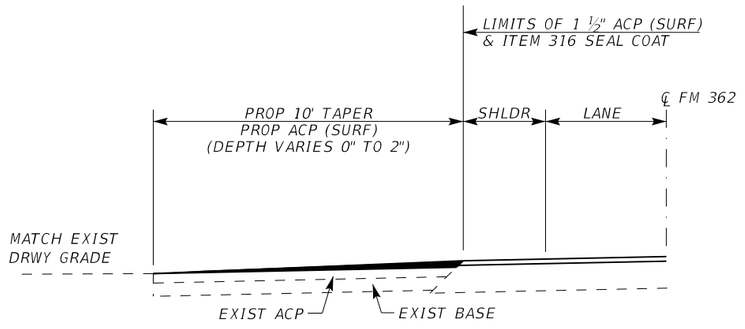


SECTION B-B

EXIST ACP DRIVEWAY



SECTION C-C



SECTION D-D

NOTES:

1. A PUBLIC ACCESS DRIVEWAY INCLUDES ALL APPROACHES TO A STATE HIGHWAY FROM COUNTY OR CITY MAINTAINED ROADS AND STREETS, AND APPROACHES TO SCHOOLS, CHURCHES, CEMETERIES AND OTHER PUBLIC PLACES OR BUILDINGS OF A LIKE CHARACTER.

2. AT EXISTING DIRT/GRAVEL DRIVEWAYS, PLACE FLEXIBLE BASE AT A 6:1 TAPER TO SHOULDER UP THE ROADWAY EDGE WHERE INSUFFICIENT MATERIAL EXISTS AS DIRECTED. THIS WORK SHALL BE PAID FOR UNDER ITEM 247.

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED
PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

06/20/23

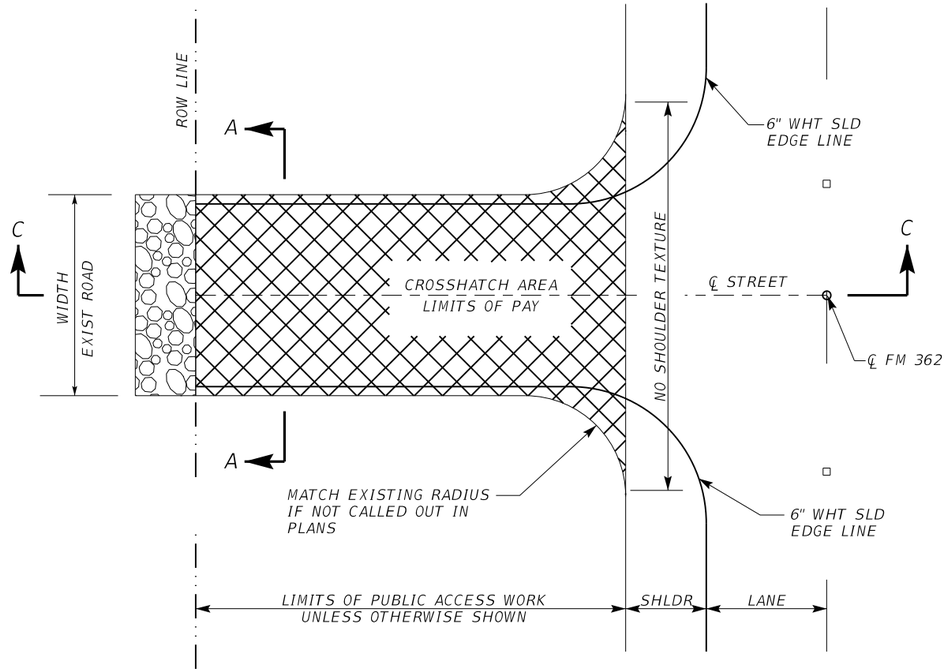
ROADWAY & DRIVEWAY DETAILS

Texas Department of Transportation

N.T.S.

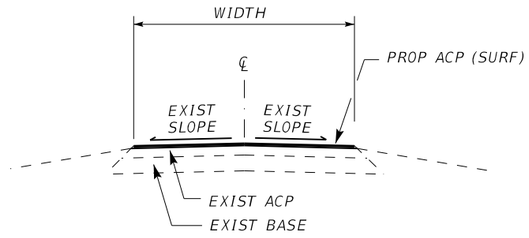
SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		80



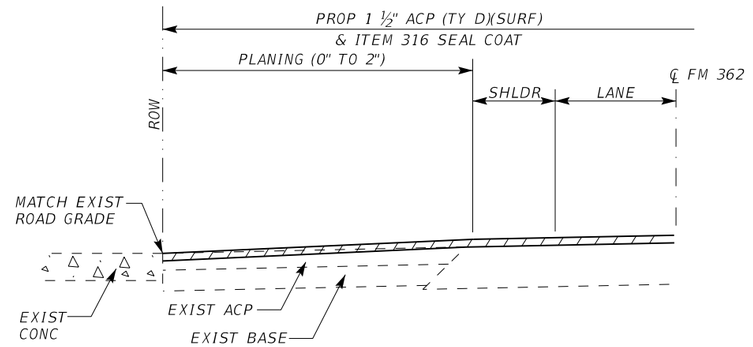
PLAN

PUBLIC ACCESS DRIVEWAYS
OR INTERSECTING STREETS



SECTION A-A

EXIST ACP STREET



SECTION C-C

NOTES:

1. FOR USE AT PUBLIC ACCESS DRIVEWAYS OR INTERSECTING STREETS WHEN PAVEMENT OUTSIDE OF RIGHT-OF-WAY IS CONCRETE WITH ACP TAPER WITHIN THE RIGHT-OF-WAY.

2. A PUBLIC ACCESS DRIVEWAY INCLUDES ALL APPROACHES TO A STATE HIGHWAY FROM COUNTY OR CITY MAINTAINED ROADS AND STREETS, AND APPROACHES TO SCHOOLS, CHURCHES, CEMETERIES AND OTHER PUBLIC PLACES OR BUILDINGS OF A LIKE CHARACTER.

3. AT EXISTING DIRT/GRAVEL DRIVEWAYS, PLACE FLEXIBLE BASE AT A 6:1 TAPER TO SHOULDER UP THE ROADWAY EDGE WHERE INSUFFICIENT MATERIAL EXISTS AS DIRECTED. THIS WORK SHALL BE PAID FOR UNDER ITEM 247.

STATE OF TEXAS
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Robert S. Bissett Jr.

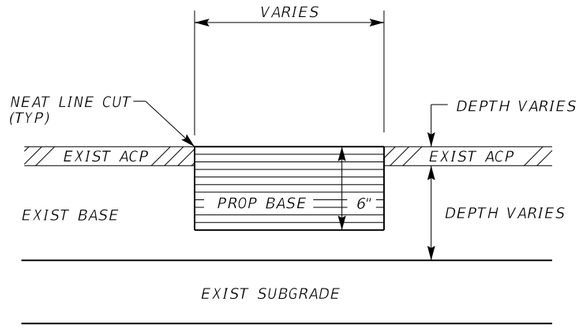
06/20/23

ROADWAY & DRIVEWAY DETAILS

N.T.S.

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		81

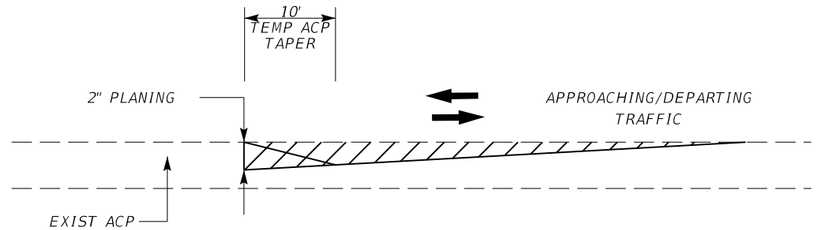


FULL DEPTH BASE REPAIR DETAIL

ITEM 351

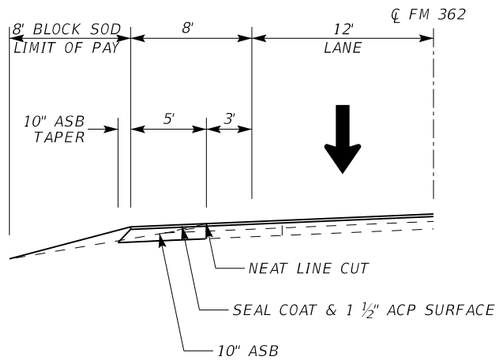
NOTES:

1. THE BASE WILL MEET THE MIX REQUIREMENTS OF ITEM 3076-6003 D-GR HMA TY-B PG64-22 (EXEMPT).
2. NEAT LINE CUT IS SUBSIDIARY TO PAY ITEM 351.

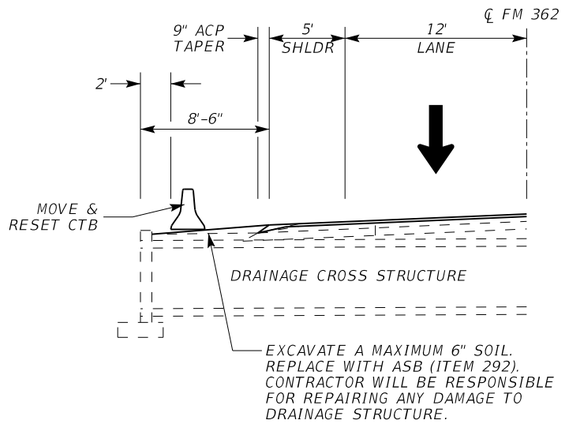


TEMPORARY PAVEMENT TRANSITION DETAIL

PLACE A TEMPORARY ACP TAPER AT ALL LOCATIONS WHERE A DROPOFF EXISTS AT THE END OF DAY AS DIRECTED BY THE ENGINEER. REMOVE TAPER PRIOR TO THE ACP OVERLAY. THE PLACEMENT AND REMOVAL OF THE TAPER IS CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS.



DETAIL FOR MAILBOX TURNOUTS



DETAIL FOR SPACE BETWEEN EDGE OF PAVEMENT AND HEADWALL/MOW STRIP

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
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PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

06/20/23

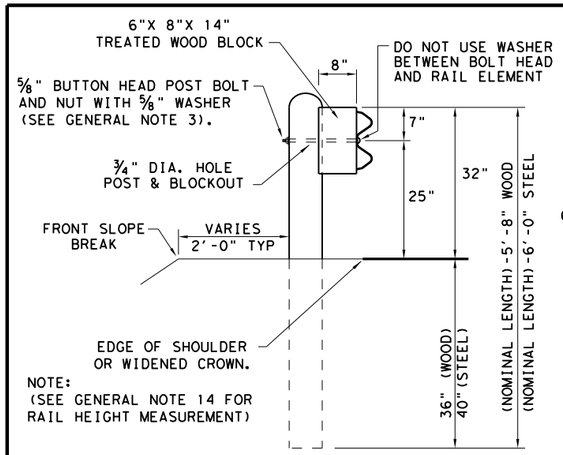
MISCELLANEOUS DETAILS

Texas Department of Transportation

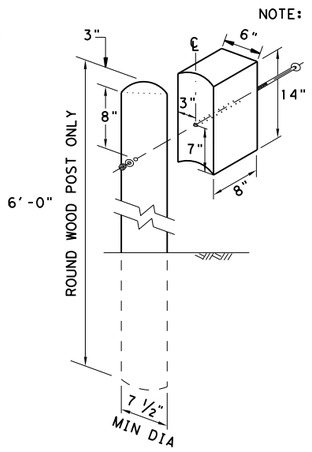
NTS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		82

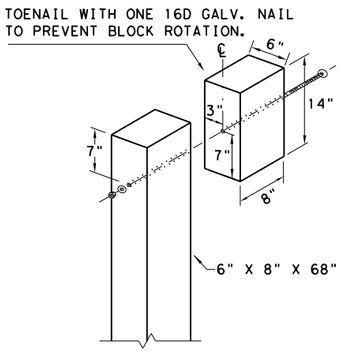


TYPICAL POST PLACEMENT

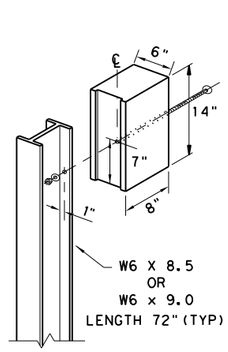


WOOD BLOCK TO ROUND WOOD POST

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

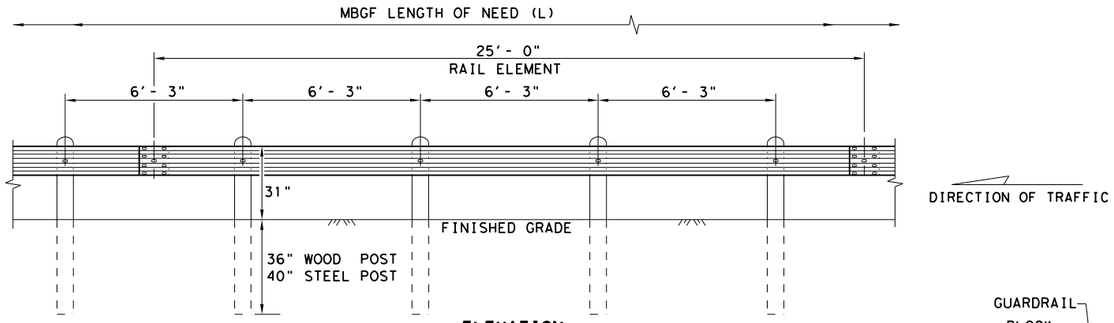


WOOD BLOCK TO RECTANGULAR WOOD POST



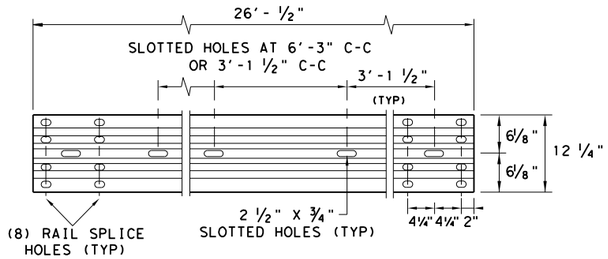
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



ELEVATION
MID-SPAN RAIL SPLICE

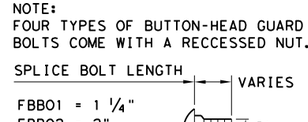
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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

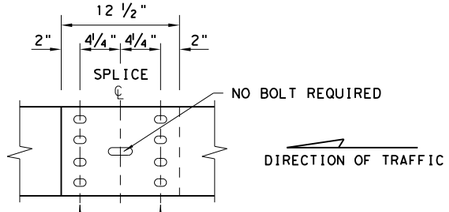
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

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



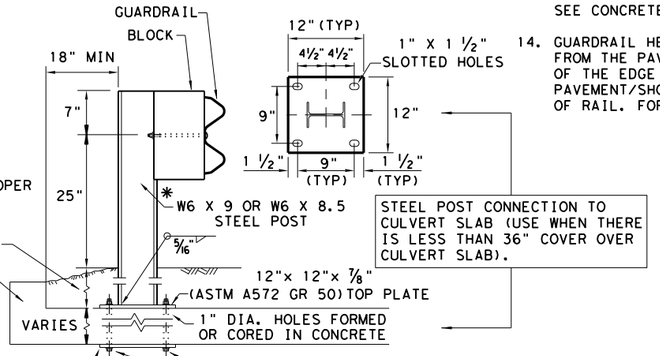
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		83

DATE: $DATE$
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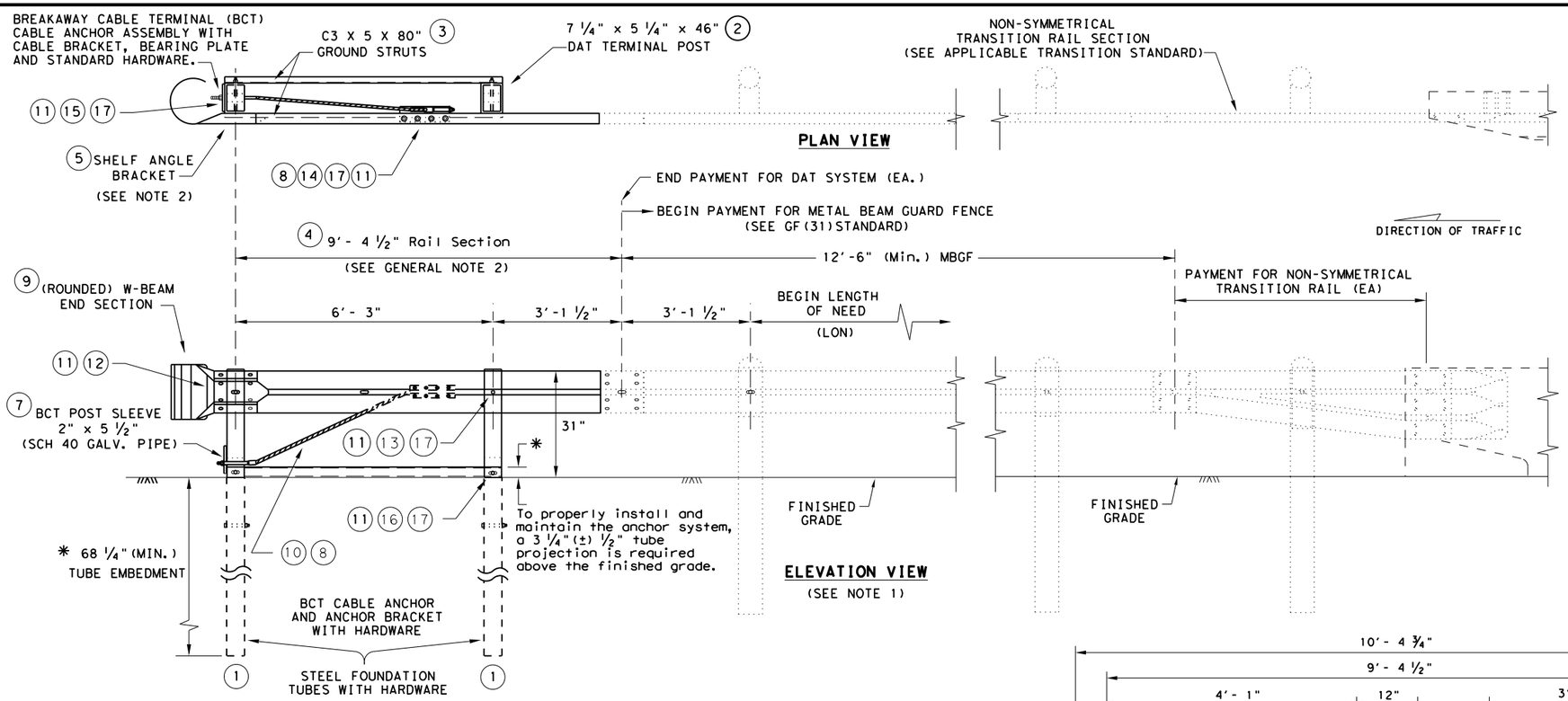


DOWNSTREAM ANCHOR TERMINAL (DAT)

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

GENERAL NOTES

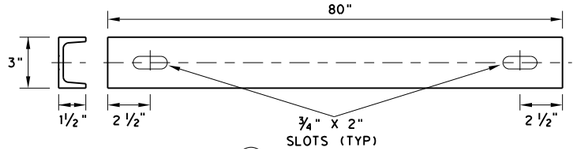
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 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

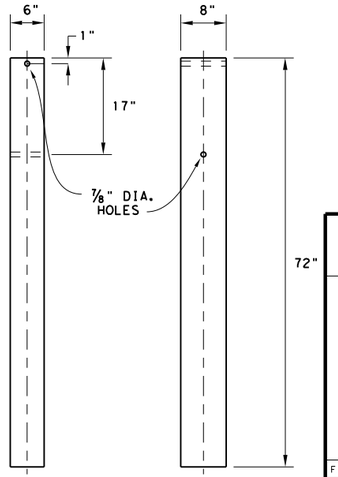
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(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

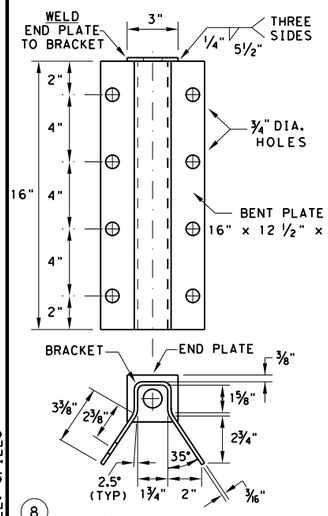
(4) TERMINAL RAIL ELEMENT FOR DAT



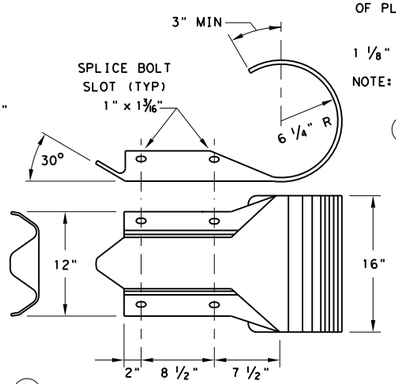
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



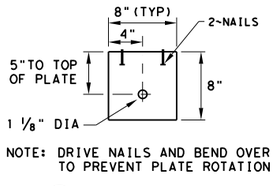
(1) STEEL FOUNDATION TUBE
6"x 8"x 1/8" x 72" STEEL TUBE



(8) GUARDRAIL ANCHOR BRACKET

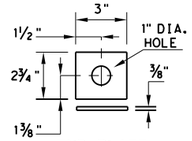


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

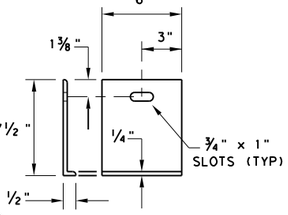


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

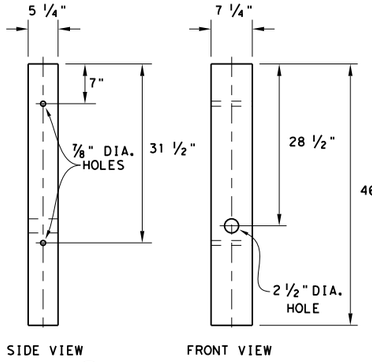
(6) BEARING PLATE
8"x 8"x 5/8" R



END PLATE



(5) SHELF ANGLE BRACKET



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

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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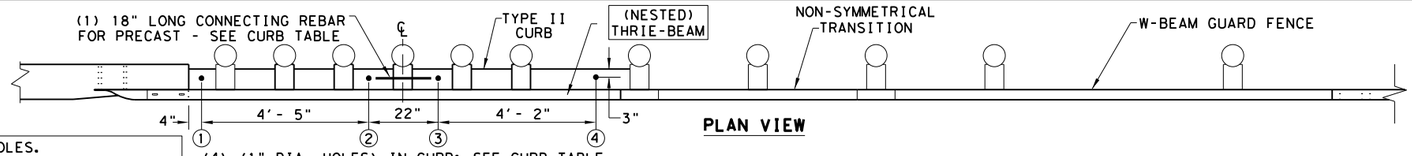
	HOU	WALLER		84



PLAN VIEW

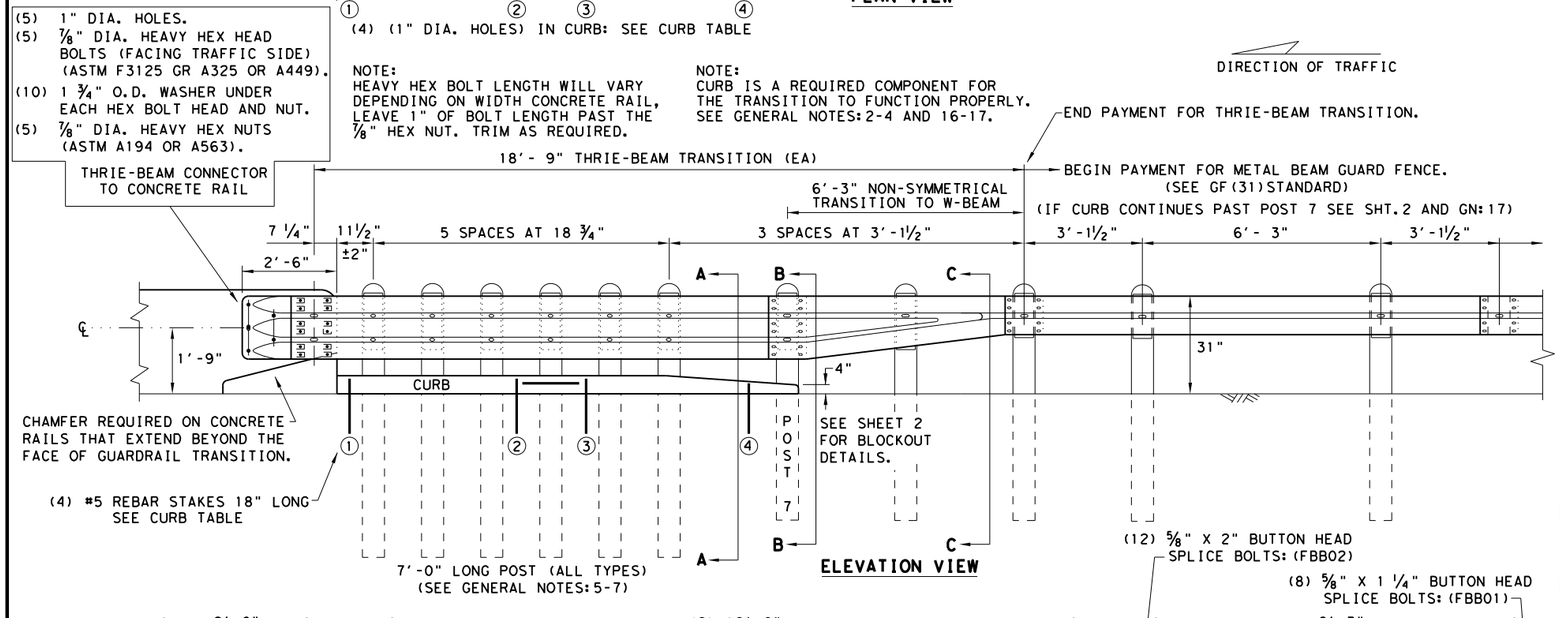
(4) (1" DIA. HOLES) IN CURB: SEE CURB TABLE

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

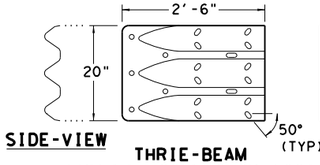
NOTE:
HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL, LEAVE 1" OF BOLT LENGTH PAST THE ⅞" HEX NUT. TRIM AS REQUIRED.

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

DIRECTION OF TRAFFIC

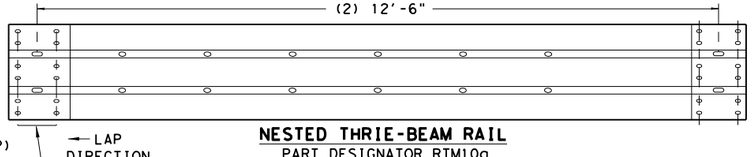


ELEVATION VIEW

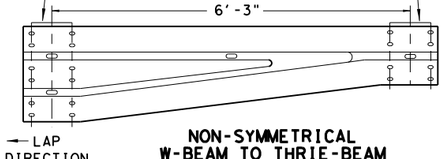


SIDE-VIEW

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



NESTED THRIE-BEAM RAIL
PART DESIGNATOR RTM10a

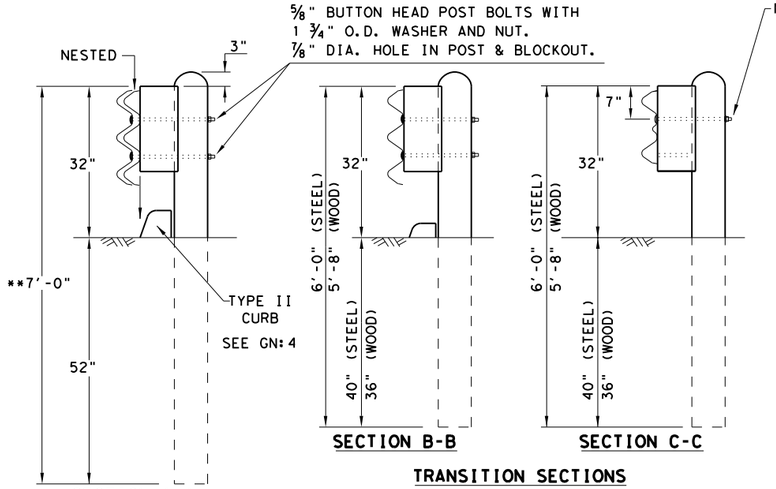


NON-SYMMETRICAL W-BEAM TO THRIE-BEAM TRANSITION 10GA.
PART DESIGNATOR
RWT02a OR RWT02b

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

PLATE WASHER INSTRUCTIONS

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



SECTION A-A

SECTION B-B

SECTION C-C

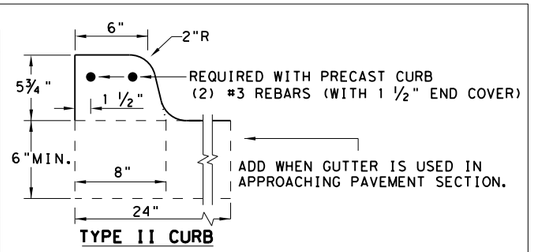
TRANSITION SECTIONS

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

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

THRIE-BEAM TERMINAL - CURB TABLE

PRECAST CURB FULL LENGTH EQUALS 12'- 2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.
CURB (1) LENGTH 5'- 8" CURB (2) LENGTH 6'- 6" TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7 CONNECTING PRECAST CURB SECTIONS (1) & (2): FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB END. USE (1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS.
SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *: FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND ½" BELOW TOP OF CURB. FILL HOLES WITH APPROVED GROUT MIXTURE.



TYPE II CURB

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

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

TYPE II CURB DETAILS

GENERAL NOTES

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

HIGH-SPEED TRANSITION

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trtl320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0523	02	051	FM 362	
	DIST	COUNTY		SHEET NO.	
	HOU	WALLER		85	

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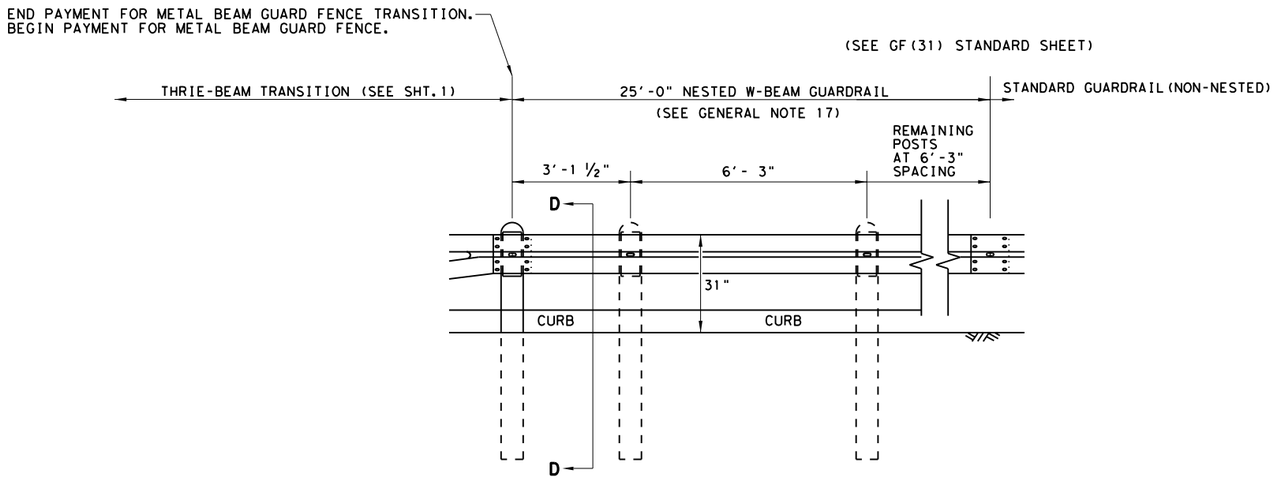
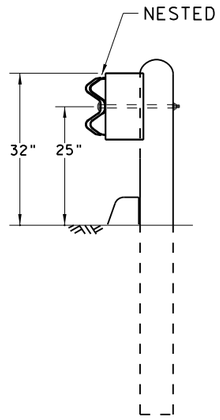
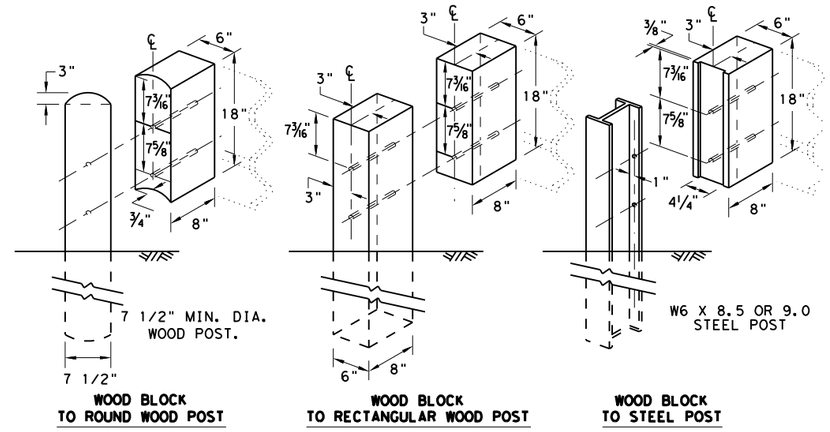
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG		
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0523	02	051		FM 362	
	DIST	COUNTY			SHEET NO.	
	HOU	WALLER			86	

DATE: $DATE$
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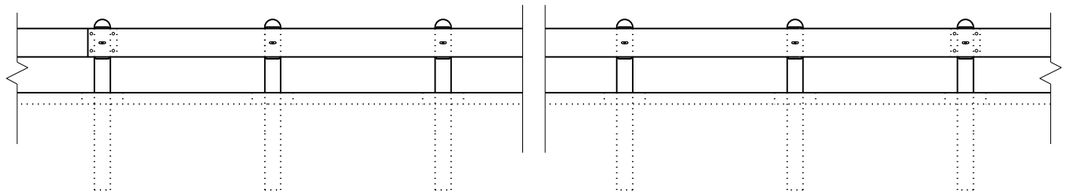
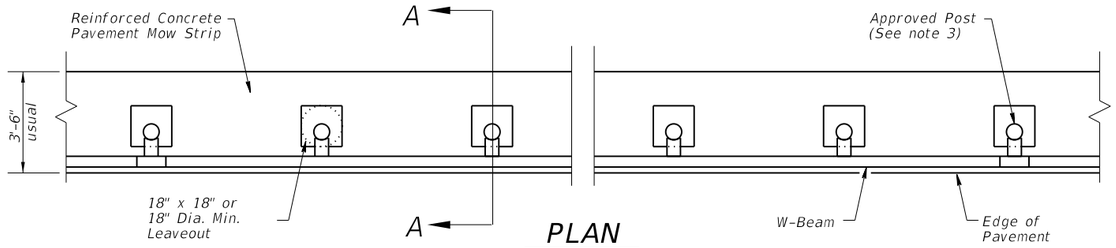
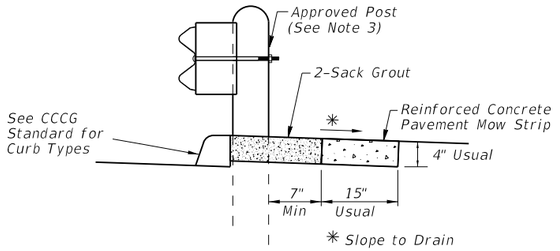


ELEVATION

TRAFFIC

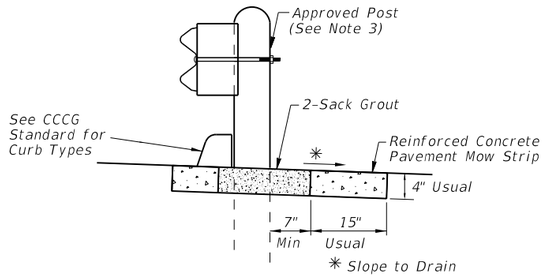


PLAN



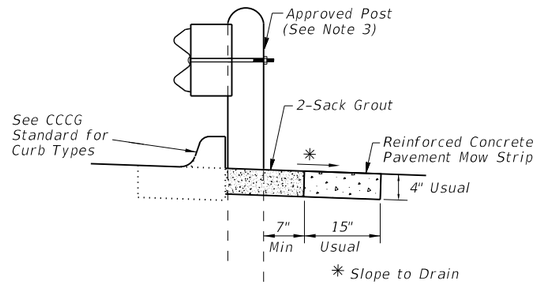
CURB OPTION (1)

Shown at Curbed Location



CURB OPTION (2)

Curb Shown on Top of Mow Strip



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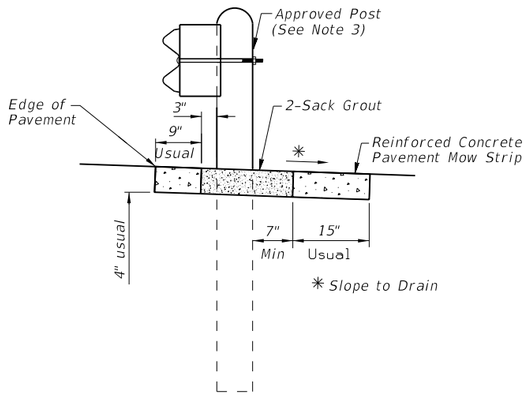
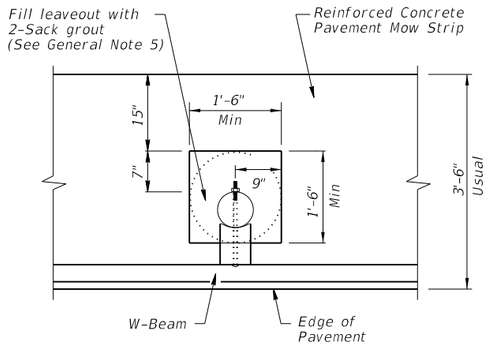


SECTION A-A

Typical



MOW STRIP DETAIL

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

GENERAL NOTES

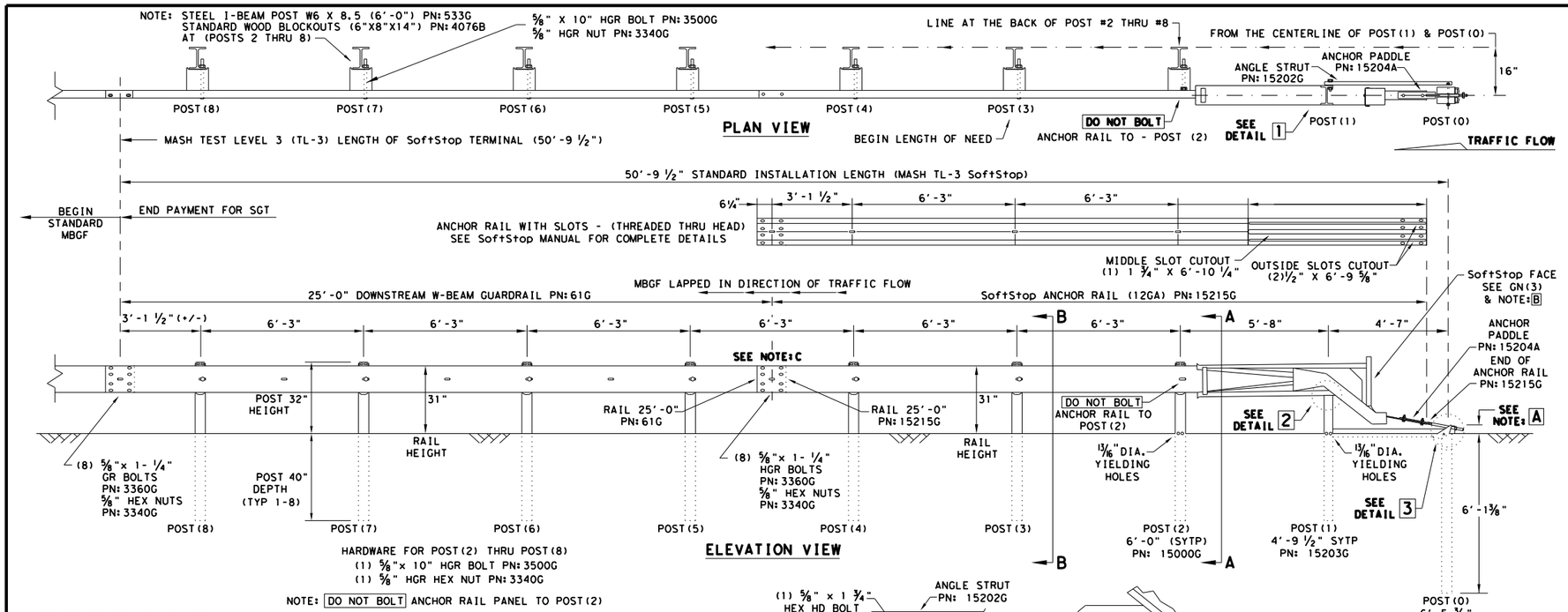
1. Place concrete riprap mow strips at all Metal Beam Guard Fence locations, and in accordance with Item 432, "Riprap". Use Class B Concrete, reinforced with No. 3 bars spaced at 18 in. centers each direction and 2 in. below the surface.
2. Provide a minimum of 7 in. leave out behind the post. Do not 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.

Texas Department of Transportation
Houston District

MOW STRIP

MS

FILE: STDE5.DGN	DN:	CK:	DW:	CK:
©TxDOT 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
03/15 2014 SPECS	DIST	COUNTY		SHEET NO.
	HOU	WALLER		87



GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP	
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0523	02	051	FM 362	
	DIST	COUNTY		SHEET NO.	
	HOU	WALLER		88	

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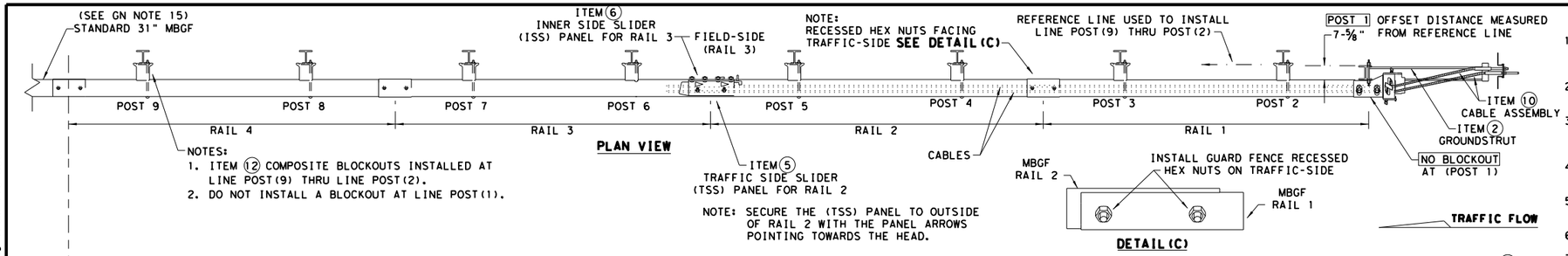

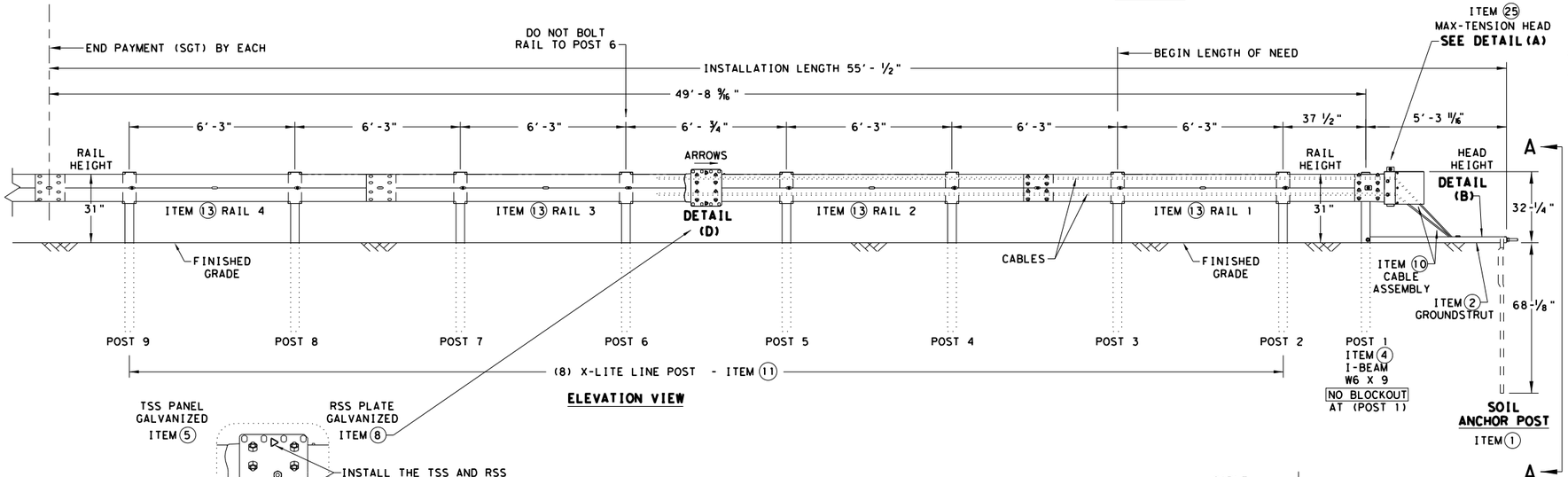

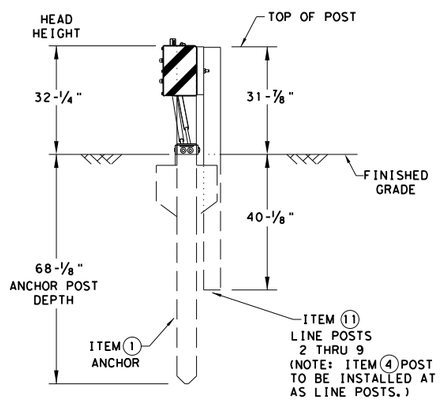

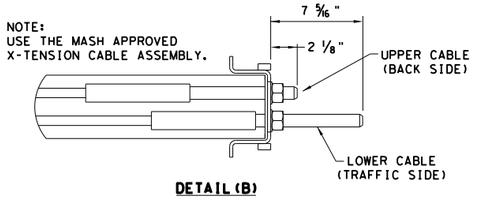

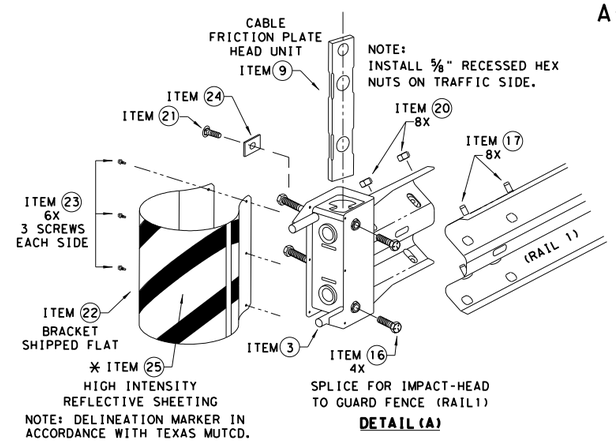

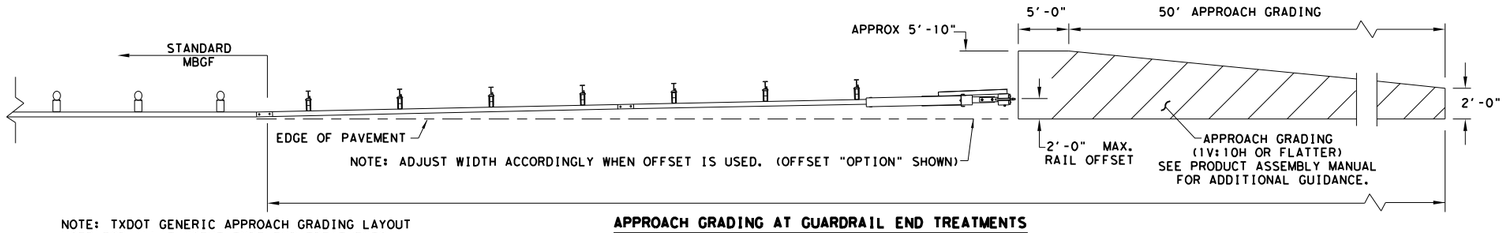

GENERAL NOTES

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

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	⅝" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	¾" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	⅝" X 1 ¼" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	⅝" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	⅝" WASHER F436 STRUCTURAL MGAL	2
20	4001116	⅝" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	⅝" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	¼" X ¾" 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	0523	2	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		89

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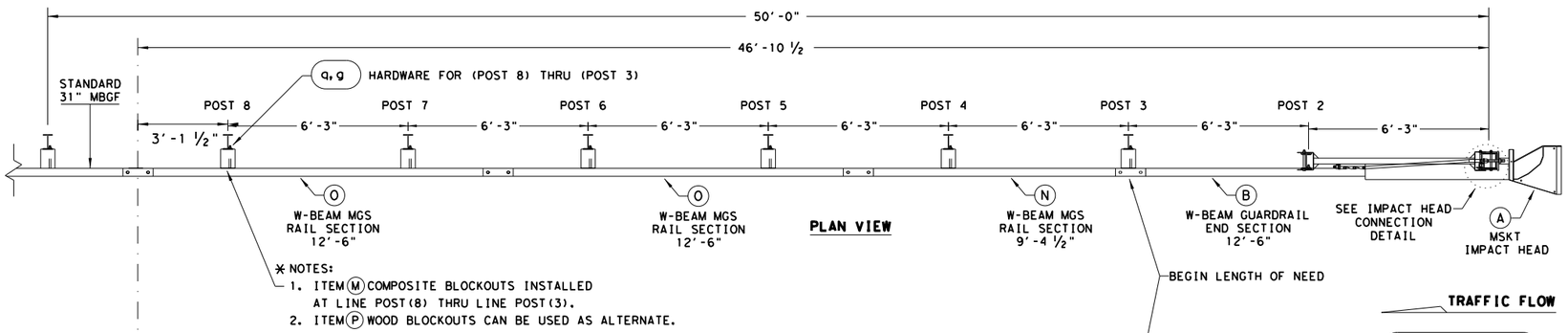


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.

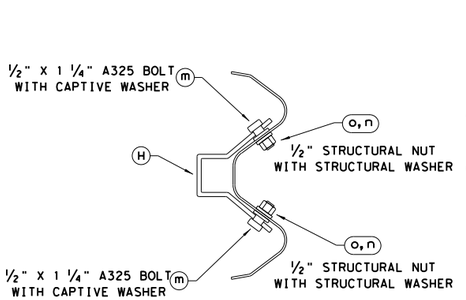
GENERAL NOTES

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

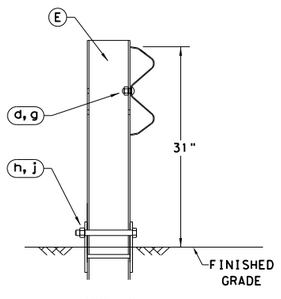
ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	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 9/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

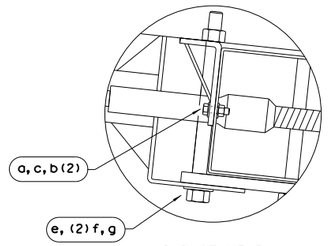
ALTERNATIVE ITEMS NOT SHOWN. **
* ITEM(P) 8" WOOD-BLOCKOUT
** ITEM(Q) 25'GUARD FENCE PANEL



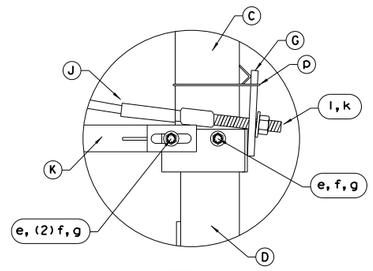
SECTION B-B
ANCHOR BRACKET



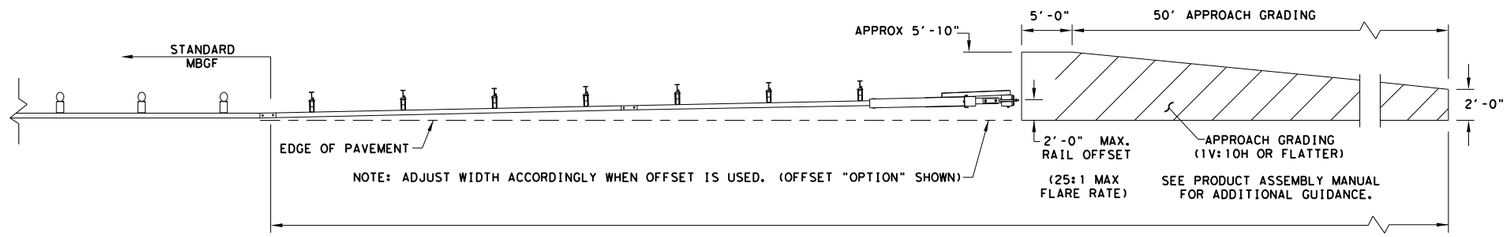
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



TRAFFIC FLOW

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

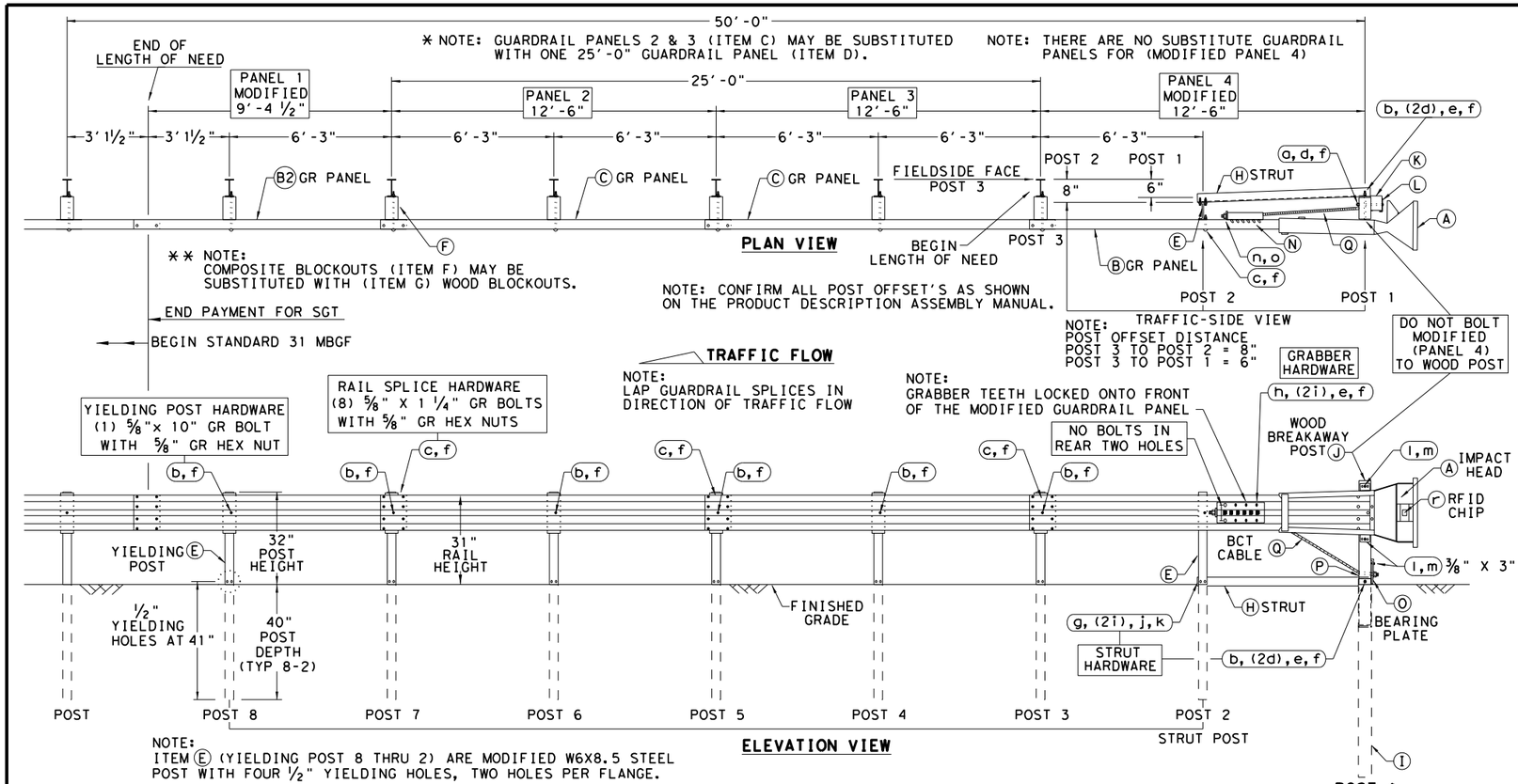
Texas Department of Transportation

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	0523	02	051	FM 362	
	DIST	COUNTY		SHEET NO.	
	HOU	WALLER		90	

DATE: $DATE$
FILE: $FILE$

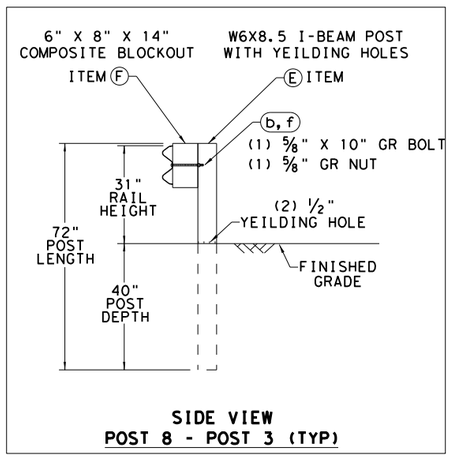


GENERAL NOTES

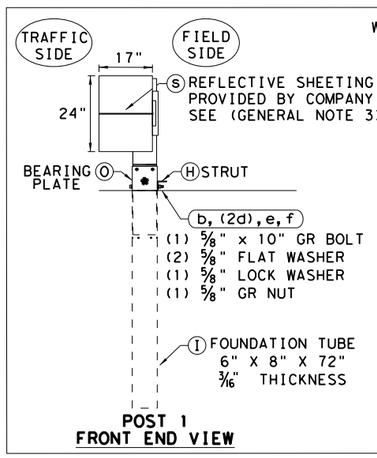
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

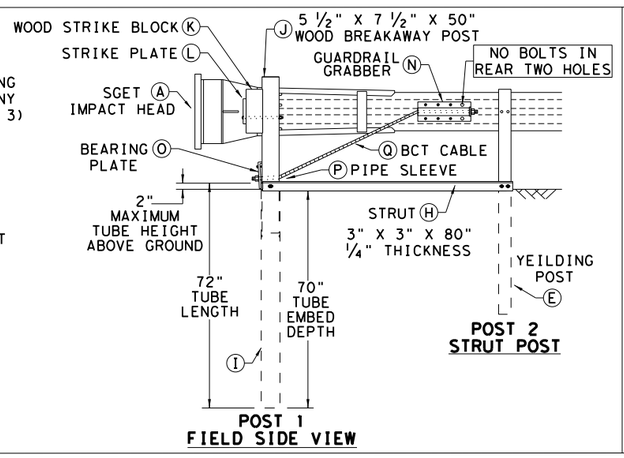
ALTERNATIVE ITEMS
* D
** G
NOTE: SEE PLAN VIEW



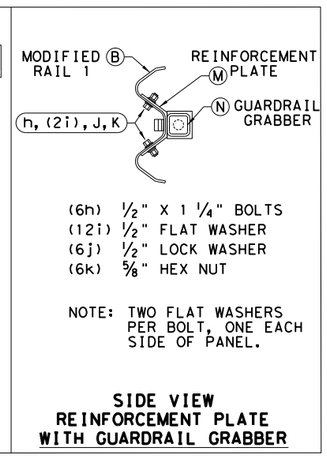
SIDE VIEW
POST 8 - POST 3 (TYP)



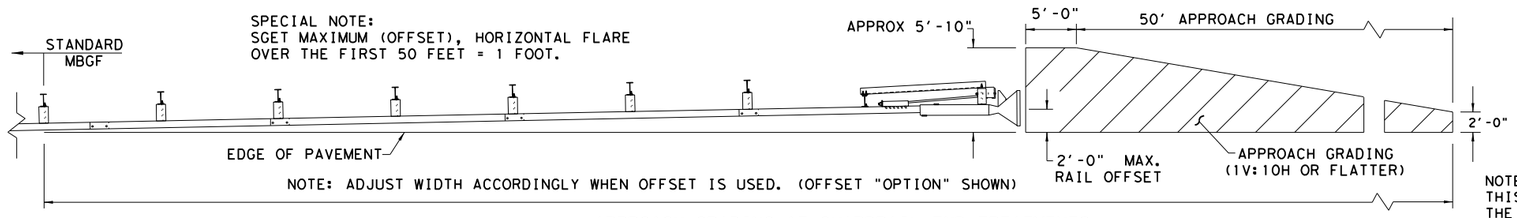
POST 1
FRONT END VIEW



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	0523	02	051	FM 362		
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	HOU	WALLER		91		

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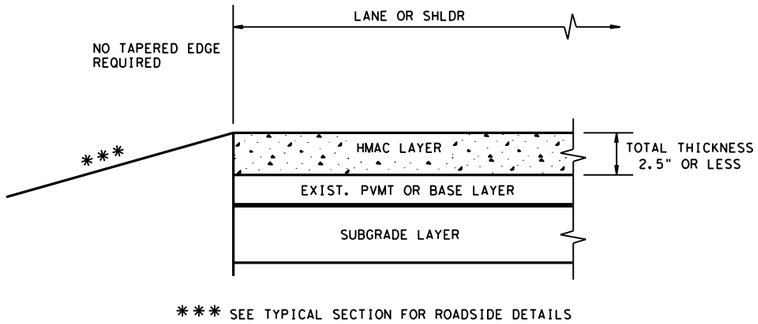
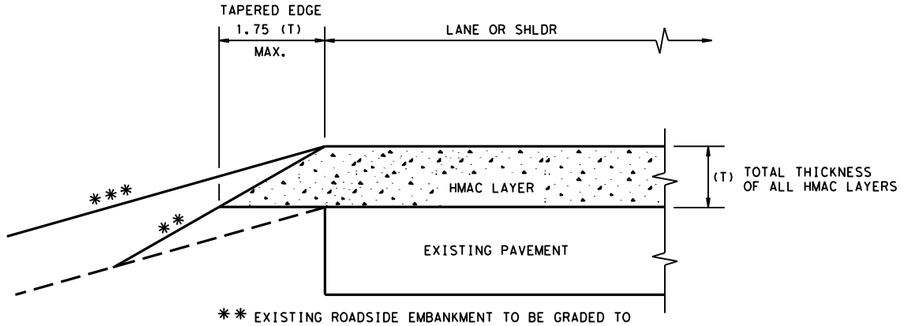


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

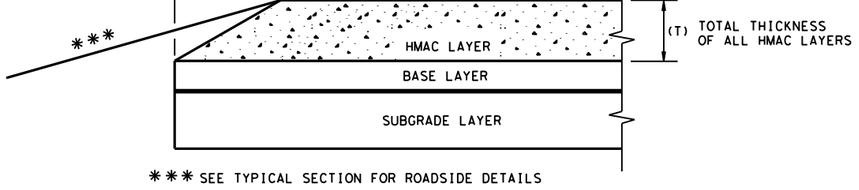
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



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

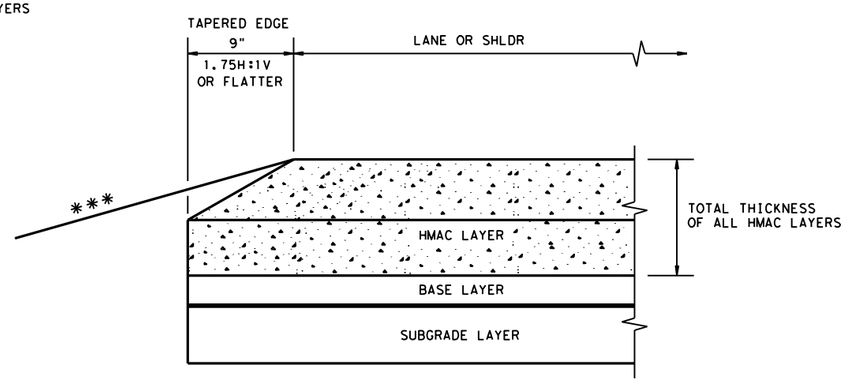
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

(NOT TO SCALE)

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

TAPERED EDGE DETAILS HMAC PAVEMENT

TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	52	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		92

DATE: $DATE$
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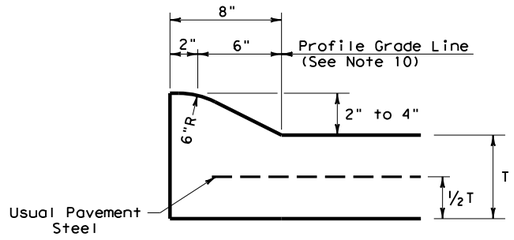
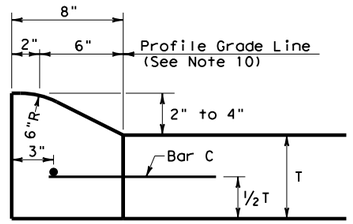


TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



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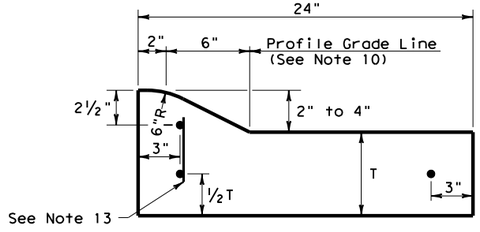
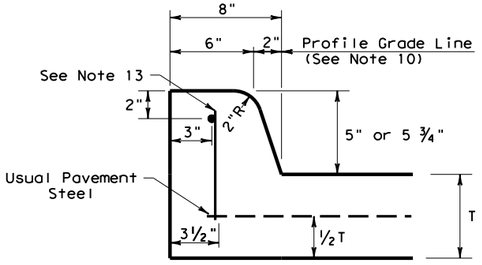


TYPE I CURB AND GUTTER
2" - 4" HEIGHT



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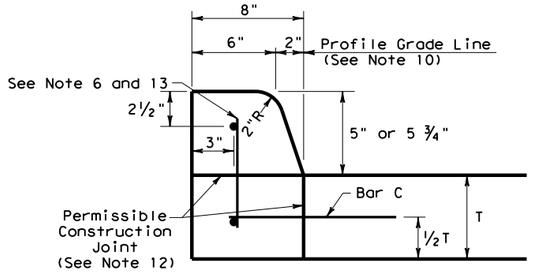
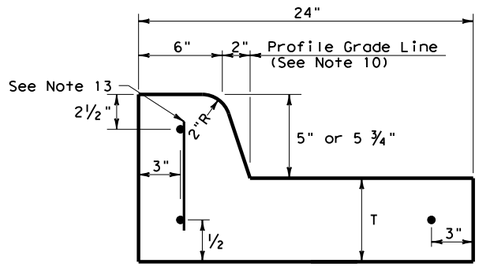
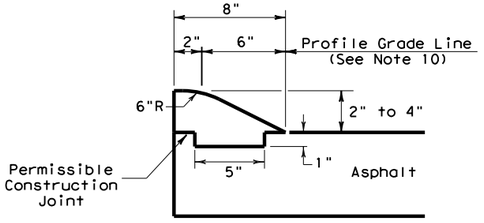
5" - 5 ¾" HEIGHT



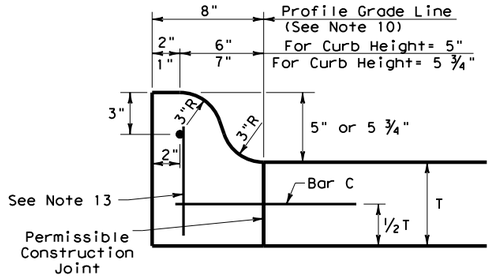
TYPE II CURB
5" - 5 ¾" HEIGHT



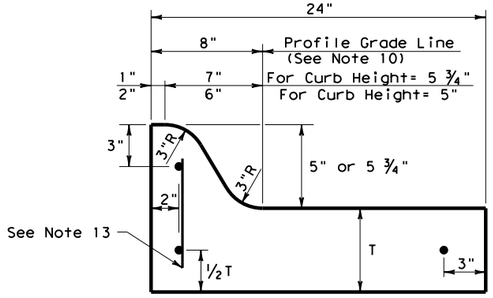
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



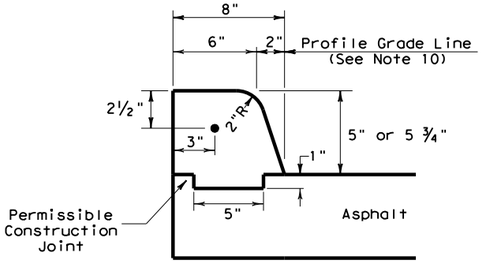
TYPE III CURB (KEYED)
2" - 4" HEIGHT



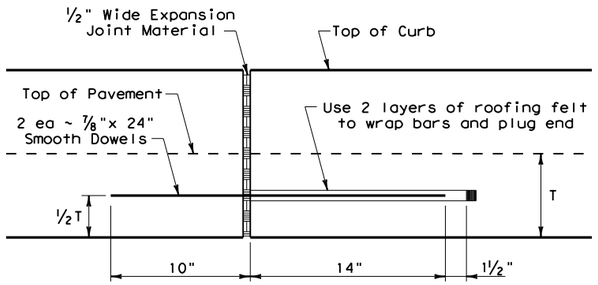
TYPE IIa CURB
5" - 5 ¾" HEIGHT



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

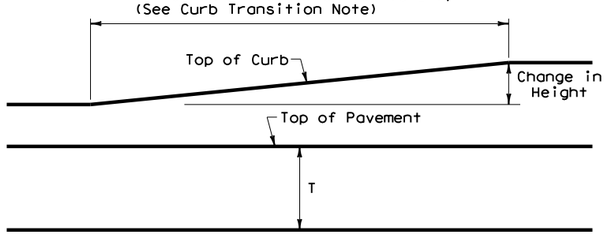


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

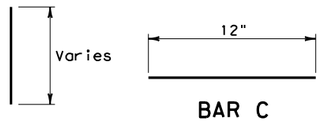
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

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



BAR B

BAR C

Texas Department of Transportation

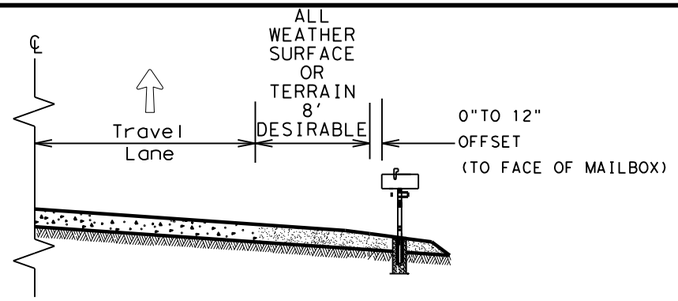
Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

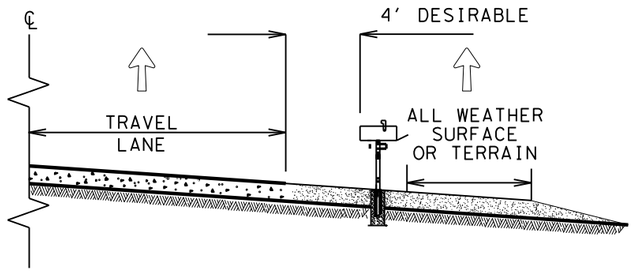
CCCG-22

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: CS	CK: KM
© TxDOT: JUNE 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		93

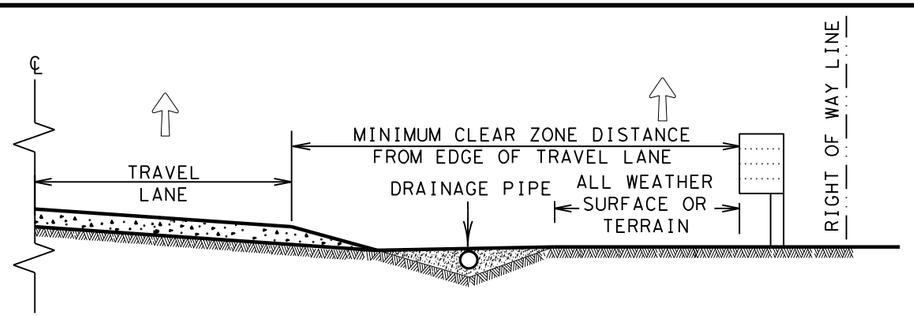
DATE: $DATE$
FILE: $FILE$



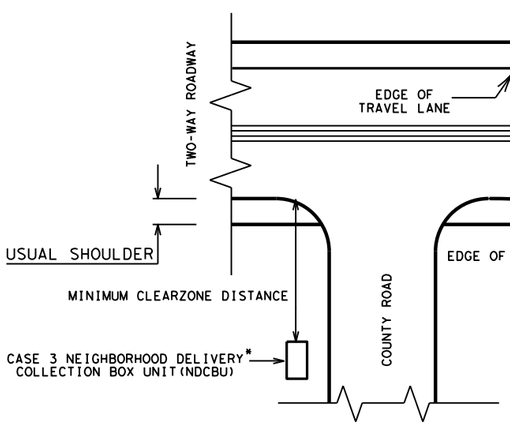
CASE 1. OFF TRAVEL WAY DELIVERY

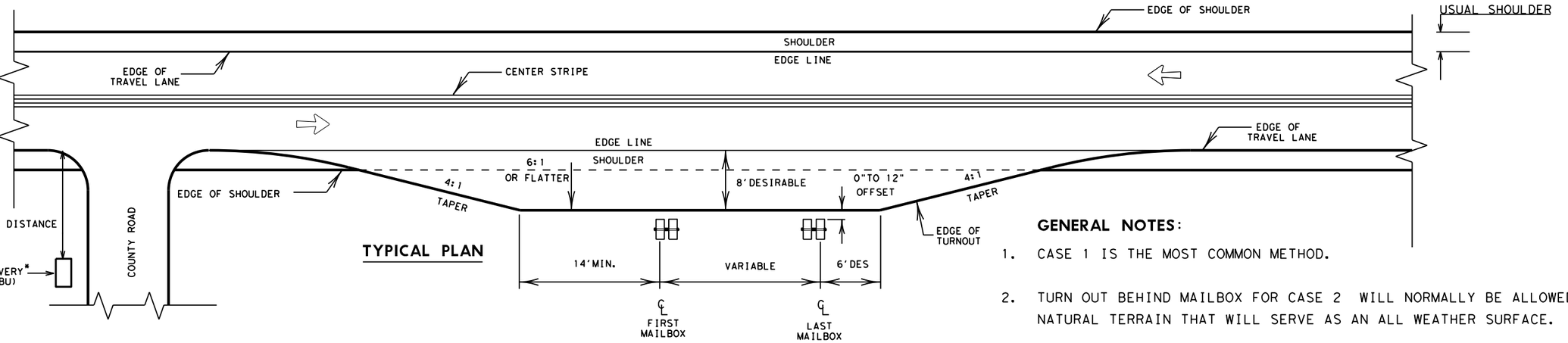


CASE 2. BACK SIDE DELIVERY

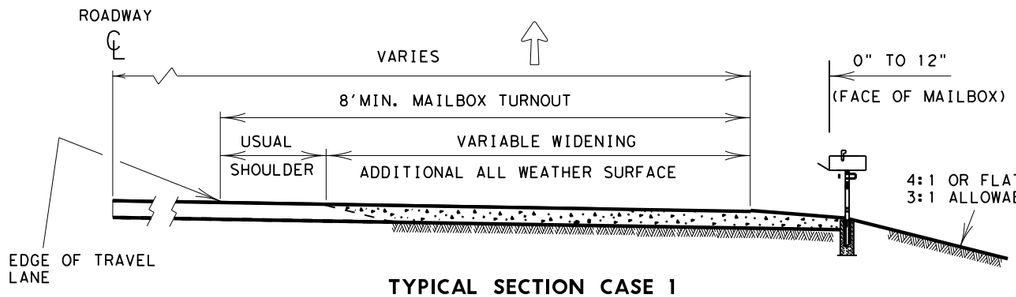


CASE 3. DELIVERY NEAR RIGHT OF WAY LINE





TYPICAL PLAN



TYPICAL SECTION CASE 1

GENERAL NOTES:

1. CASE 1 IS THE MOST COMMON METHOD.
2. TURN OUT BEHIND MAILBOX FOR CASE 2 WILL NORMALLY BE ALLOWED FOR NATURAL TERRAIN THAT WILL SERVE AS AN ALL WEATHER SURFACE.
3. ALL WEATHER DRIVEWAYS FOR CASE 3 MAILBOXES LOCATED AT THE RIGHT OF WAY LINE SHOULD NORMALLY BE PLACED IN CONJUNCTION WITH COUNTY ROADS OR OTHER CONNECTING COMMUNITY ROADS OR STREETS. WHEN 3 OR MORE MULTI-RACKS ARE ANTICIPATED, THE USE OF AN NDCBU IS RECOMMENDED. ONLY RURAL PATRONS LOCATED ON STATE MAINTAINED HIGHWAYS MAY HAVE A MAILBOX OR NDCBU SLOT ON TXDOT RIGHT OF WAY.

*NDCBU MAY BE INSTALLED ON COUNTY ROAD ROW WITH APPROVAL OF COUNTY.

MAIL DELIVERY VEHICLE TRAVEL DIRECTION

Texas Department of Transportation

Maintenance Division Standard

Guideline

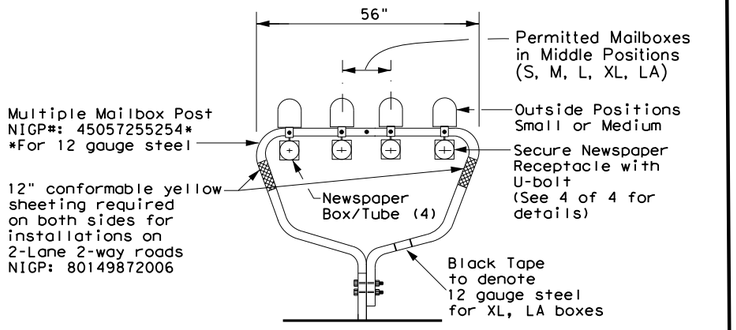
MAILBOX SIDE ROAD PLACEMENT AND TURNOUTS

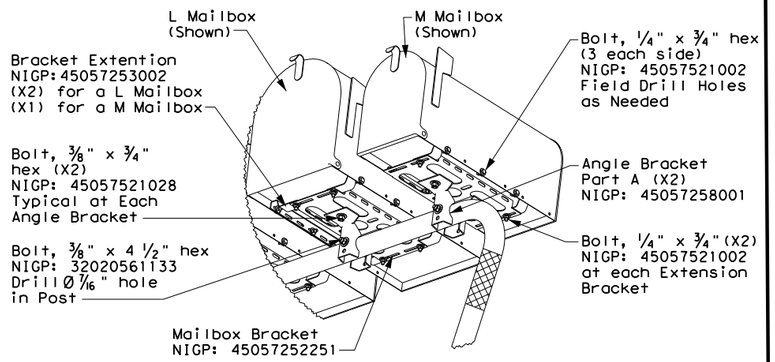
MBP(1)-22

FILE: MBP-22.DGN	DN: VS	CK:	DW: VS	CK:
© TxDOT OCTOBER 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 12/2012 5/2014	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		94

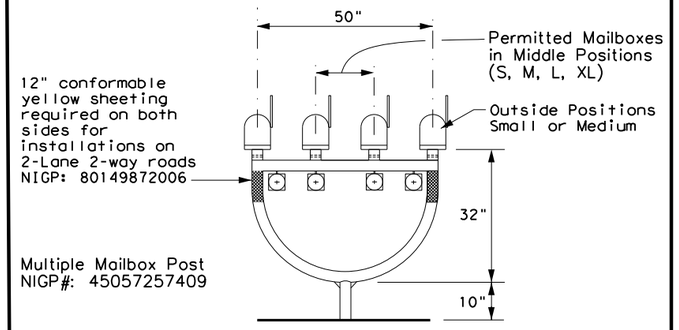
DATE: $DATE$ $TIME$
FILE: $FILE$

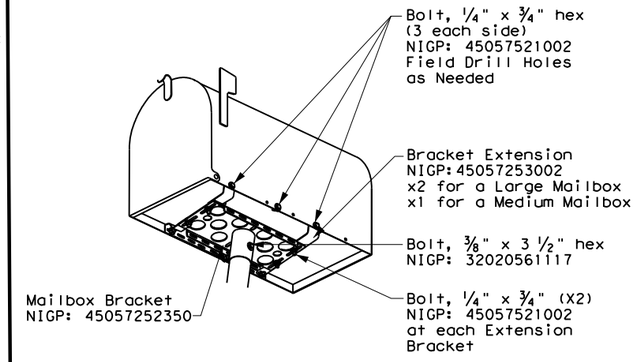
TYPE 1 - MULTIPLE





TYPE 4 - MULTIPLE





MAILBOX SIZES

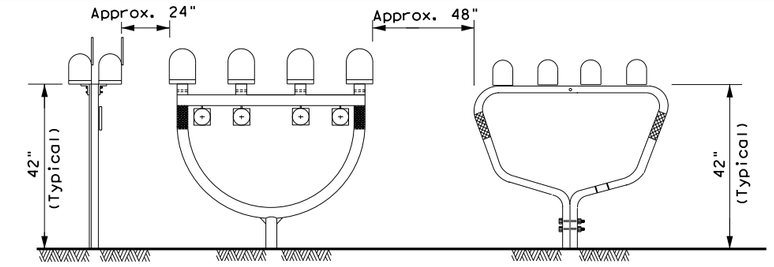
MAILBOX SIZE	TYPICAL DIMENSIONS			MAX **
	LENGTH	WIDTH	HEIGHT	WEIGHT
SMALL	19 1/2"	6"	7"	6 LBS
MEDIUM	22 1/2" *	8" *	11 1/2" *	8 LBS
LARGE	23 1/2"	11 1/2"	13 1/2"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 1/2"	15"	23 LBS

* See Note 1.
** Excluding Molded Plastic on 4 X 4 Post

GENERAL NOTES:

1. Dimensions shown (length, width, and height) are typical, not maximums. However, anytime a medium size mailbox is mounted on a single/double mount or on the outside position on a multi mount, the dimensions shown are maximums.
2. Mailboxes shall be made of light weight sheet metal or light weight plastic. Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.

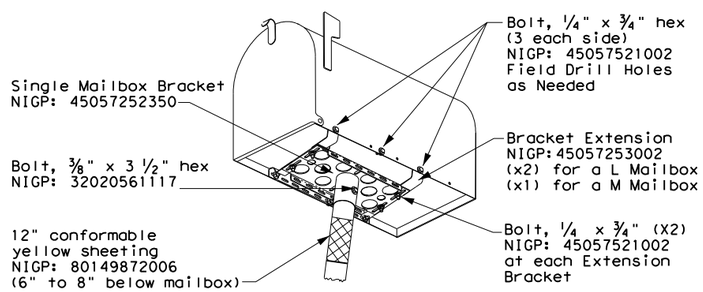
TYPICAL INSTALLATION MEASUREMENTS

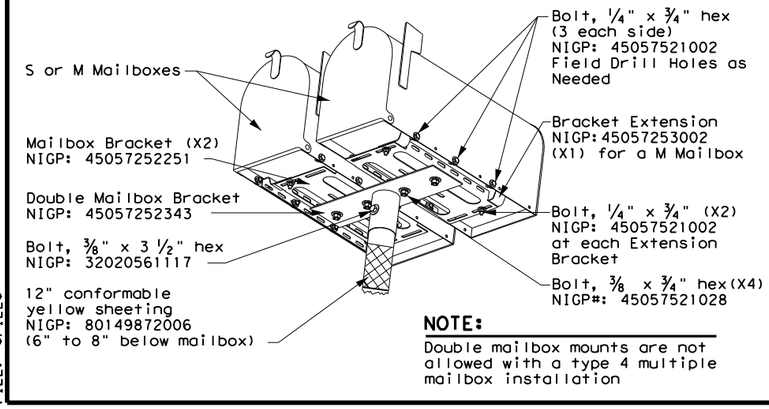


NOTE:

Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Design Standard sheets PED-Pedestrian Facilities Curb Ramps.

TYPE 2 and 4 - SINGLE/DOUBLE

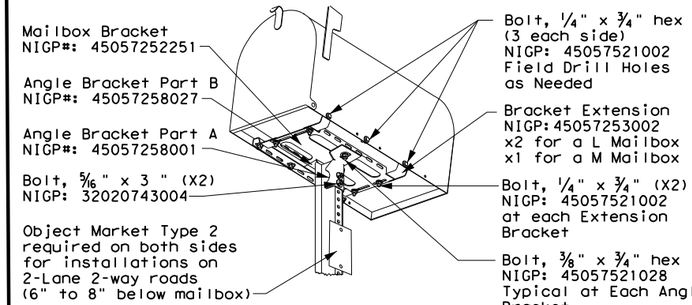


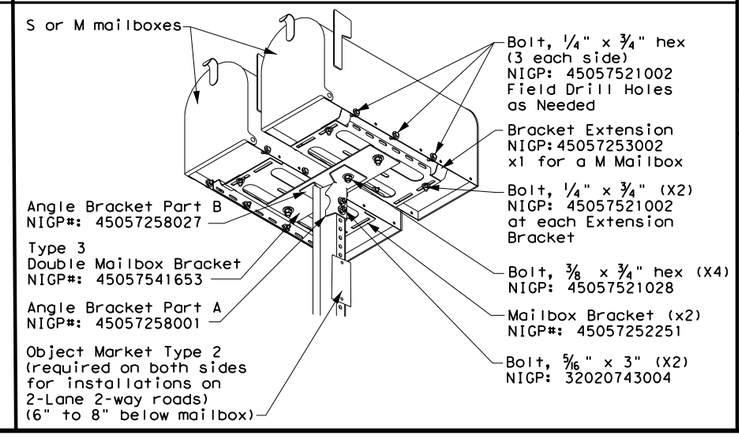


NOTE:

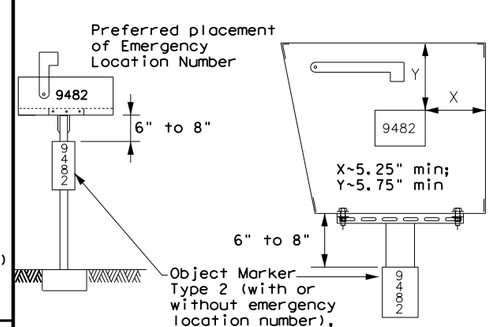
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

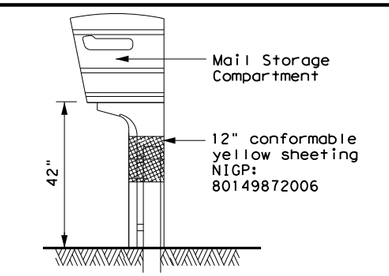


NOTES:

1. Location numbers are provided by homeowner. Minimum size 1" height.
2. Location number is typically placed on the mailbox in a contrasting color.
3. Black numbers may be placed on the Type 2 object marker if the numbers cannot be placed on the mailbox.
4. Alternatively, a green or blue plate with white numbers attached may be mounted below the object marker. Other contrasting color configuration, as approved, may be used.
5. See 3 of 4 for Foundation details.
6. See 4 of 4 for Hardware details.

SHEET 1 OF 4

TYPE 5



Typical Molded Plastic Mailbox

Texas Department of Transportation — Maintenance Division Standard

MAILBOX MOUNTING AND ASSEMBLY

MB(1)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		95

DATE: $DATE$ $TIME$
FILE: $FILE$

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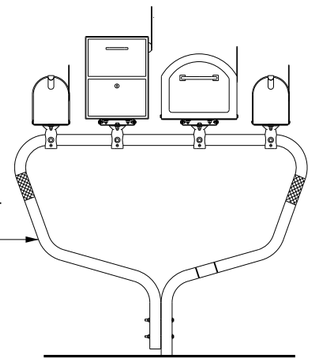
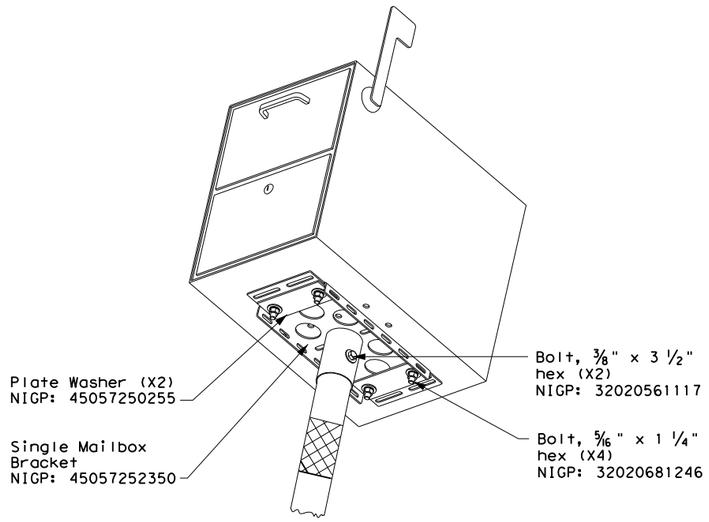
DATE: $DATE$ $TIME$
FILE: $FILE$

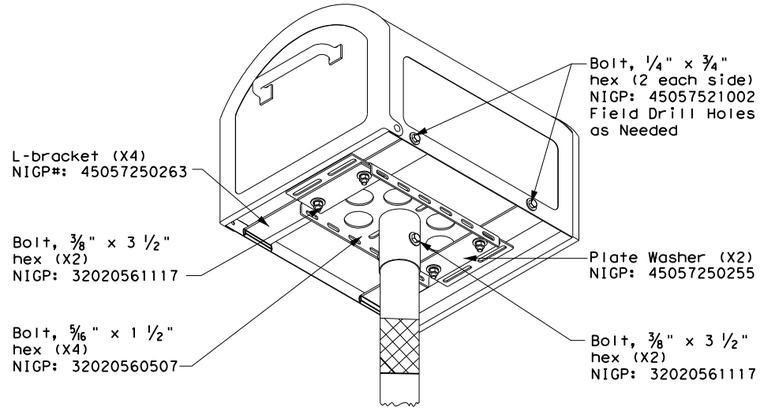
TYPE 1- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX

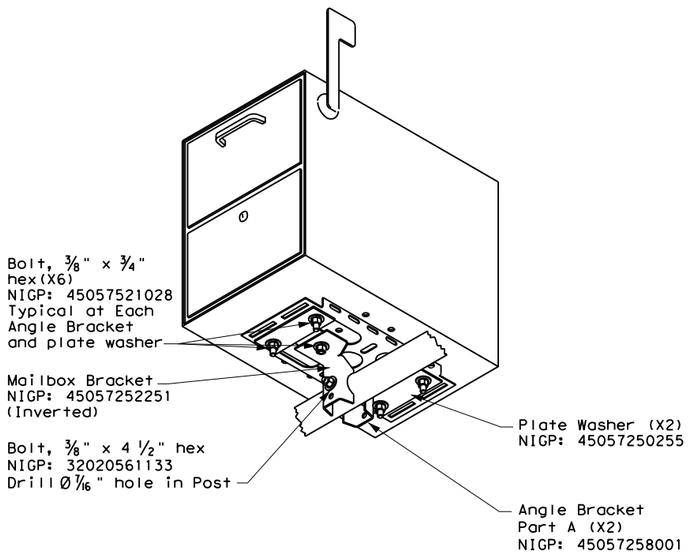


TYPE 2/4 - SINGLE XL MAILBOX

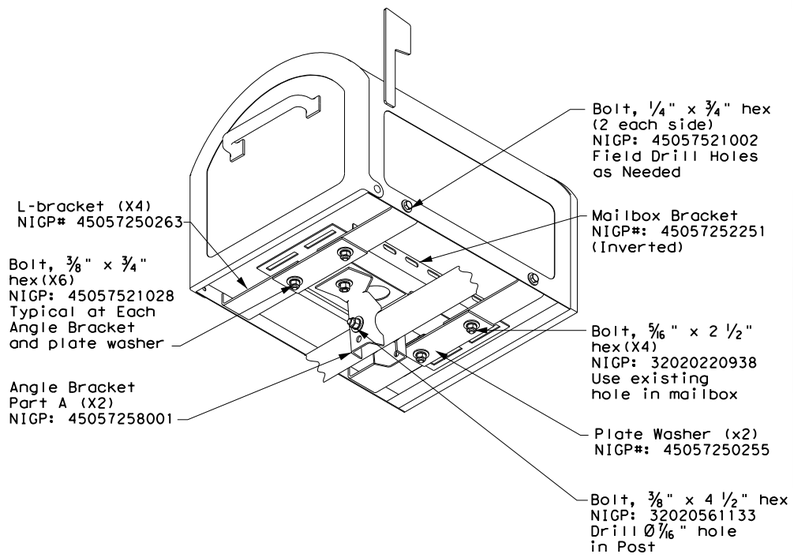


NOTE:
Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

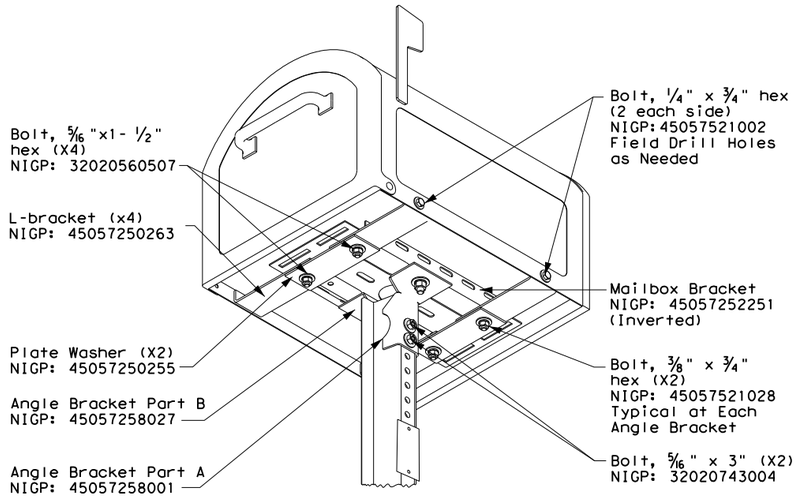
TYPE 1 MULTI – LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI – XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



Texas Department of Transportation — Maintenance Division Standard

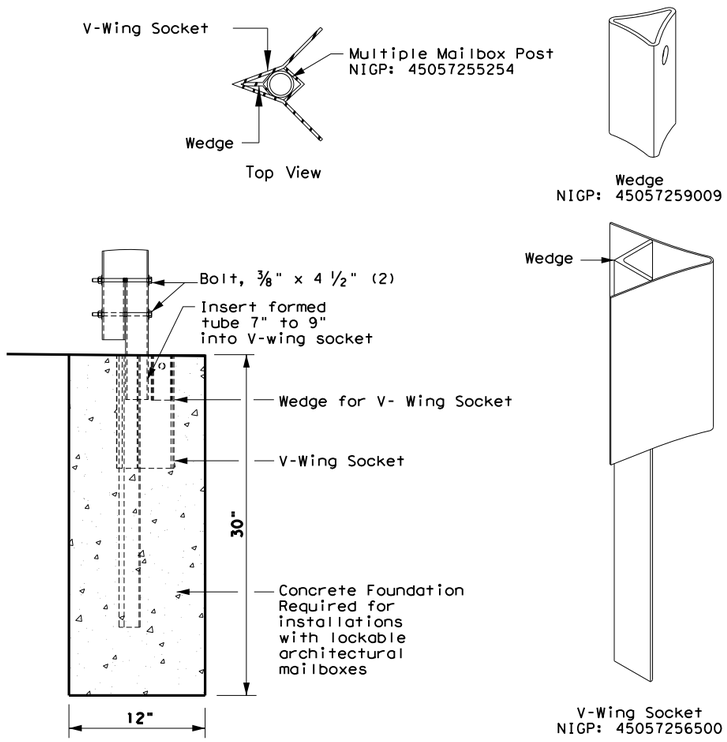
XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

MB(2)-21

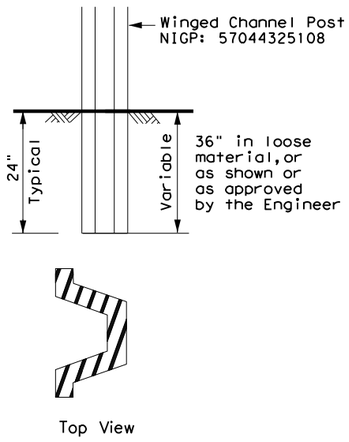
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		96

TYPE 1 - SUPPORT/FOUNDATION

Thin Wall Tube w/ V-LOC Anchorage



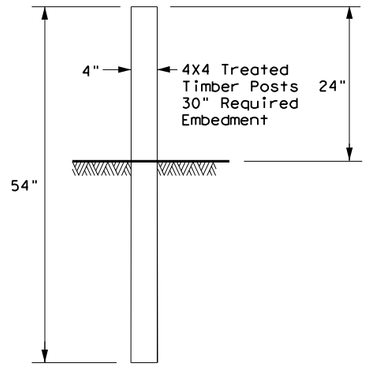
TYPE 3 - SUPPORT/FOUNDATION



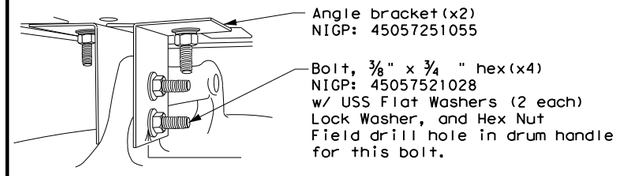
NOTES:

1. Attach Object Marker (OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



TYPE 6 - TEMPORARY MAILBOX SUPPORT



Plastic Drum NIGP: 55093383655
Rubber Collar NIGP: 55093387102

NOTES:

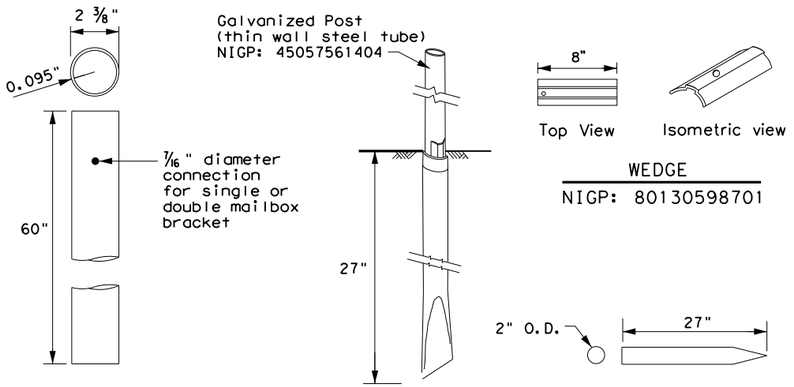
1. Place on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
2. Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

GENERAL NOTES:

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition, only on Type 1, Type 2, and Type 4

TYPE 2 - SUPPORT/FOUNDATION

Thin Wall Steel Tube w/Wedge Anchor System

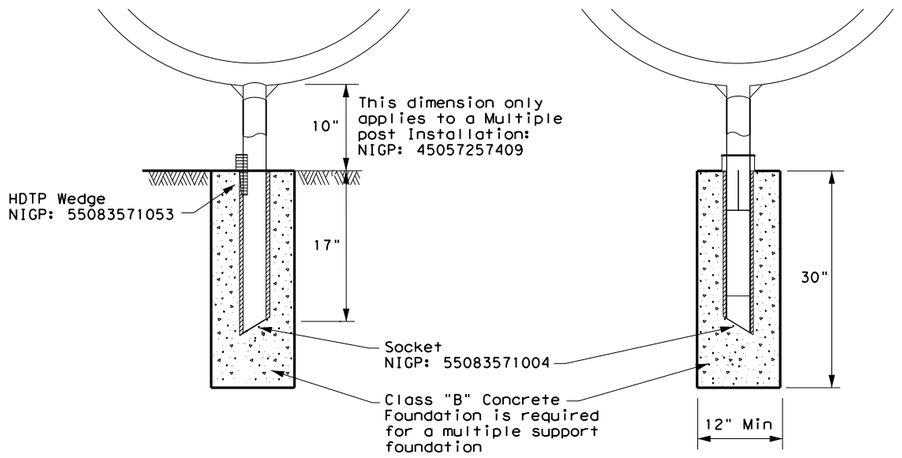


MAILBOX POST

WEDGE ANCHOR
NIGP: 80130238407

TYPE 4 - SUPPORT/FOUNDATION

Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



SHEET 3 OF 4

Texas Department of Transportation

Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB(3)-21

FILE: MB-21.dgn	DN:	CK:	DW:	CK:
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REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		97

DATE: $DATE$ $TIME$
FILE: $FILE$

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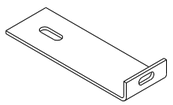
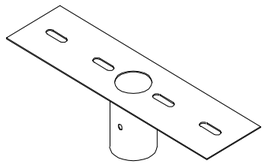
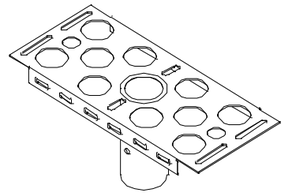
TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP #	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: SS, SM, MM	S, M, L, XL, or LA	SS, SM, or MM	Outside Position: S or M Inside Position: S, M, L, or XL	Molded Plastic	S, or M
Mailbox Post NIGP #	45057255254 (Galvanized Multiple)	45057561404 (Thin Walled Gavanize)	57044325108 (Wing Channel Post)	45057561107 (Thin walled white powder coated) 45057561057 (Recycled Rubber Post: S or M only)	45057561107 (Thin Walled White Powder Coated)	45057257409 (White Powder Coated Multiple)	4x4 Timber	Construction Barrel
Post and Mailbox Hardware NIGP #	45057259009 (Wedge) 45057256500 (V-Wing Socket) 45057253002 (Bracket Extension) 45057252251 (Mailbox Bracket) 45057258001 (Part A Angle Bracket x2) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	80130598701 (Wedge) 80130238407 (Wedge Anchor) 45057253002 (Bracket Extension) 45057252343 (Double MB Bracket) 45057252350 (S. Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket forXL x4)	45057541653 (Type 3 Double Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057253002 (Bracket Extension) 45057258001 (Part A Angle Bracket) 45057258027 (Part B Angle Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057252350 (Single Mailbox Bracket) 45057253002 (Bracket Extension) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252343 (Double Mount Bracket) 45057252251 (Mailbox Bracket x2)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252350 (Single Mount Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	None	45057251055 Angle Bracket (x2)
Foundation Used	Class B Concrete (Required for LA Mailboxes)	Class B Concrete (Required for LA Mailboxes)	None	Class B Concrete (not used with recycled rubber post, required for LA Mailboxes)	Class B Concrete (not required)	Class B Concrete	None	None



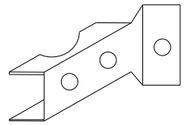
NIGP: 45057250263
L-Bracket x4 for
XL sized mailboxes



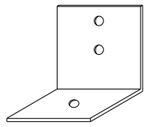
NIGP: 45057252343
Double Mailbox Bracket
For Type 2 and Type 4
double mount



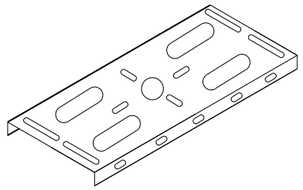
NIGP: 45057252350
Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



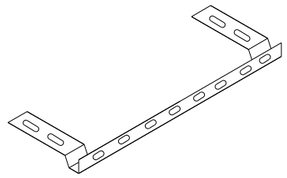
NIGP: 45057258001
Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



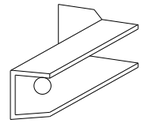
NIGP: 45057251055
Type 6 Angle Bracket
(2 per mailbox)



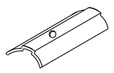
NIGP: 45057252251
Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



NIGP: 45057253002
Bracket Extension
Use 1 for a medium Mailbox
Use 2 for a Large Mailbox



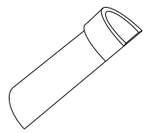
NIGP: 45057258027
Part "B" Angle Bracket
For Type 3 single
and double



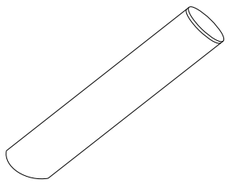
NIGP: 80130598701
Wedge for Type 2

NIGP: 45057250255
Plate Washer for Architecural
and XL Mailboxes

NIGP: 45057541653
Type 3 double mailbox bracket

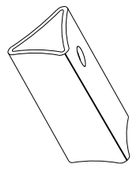


NIGP: 55083571053
Type 4 Mailbox Wedge

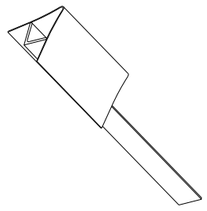


NIGP: 55083571004
Type 4 Mailbox Socket

NIGP: 80130238407
Type 2 Wedge Anchor



NIGP: 45057259009
Wedge for Type 1 V-wing Socket



NIGP: 45057256500
V-wing Socket for
Type 1 Foundation

NIGP #	OBJECT MARKERS AND CONFORMABLE SHEETING
55008311759	Type 2 OM 4"x4" (3 Needed) for Type 3 Wing Channel Post
55008312906	Type 2 OM 6"x12" (1 needed) for Type 3 Wing Channel Post
80149872006	12" Conformable Reflective Yellow Sheeting for Flexible Posts

NOTES:

1. Type 2 object marker in accordance with Traffic Engineering Standard Delineators & Object Markers.
2. A light weight receptacle for newspaper delivery can be attached to mailbox posts if the receptacle does not touch the mailbox, present a hazard to traffic or delivery of the mail, extend beyond the front of the mailbox, or display advertising, except the publication title.

BID CODES FOR CONTRACTS

MB-(X) ASSM TY (XXX) (X)

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- MP = Molded Plastic

Type of Post
- WC = Winged Channel Post
- RR = Recycled Rubber
- TWW = Thin Walled White Tubing
- TWG = Thin Walled Galvanized Tubing
- TIM = Timber

Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post

Texas Department of Transportation — Maintenance Division Standard

NIGP PARTS LIST AND COMPATIBILITY

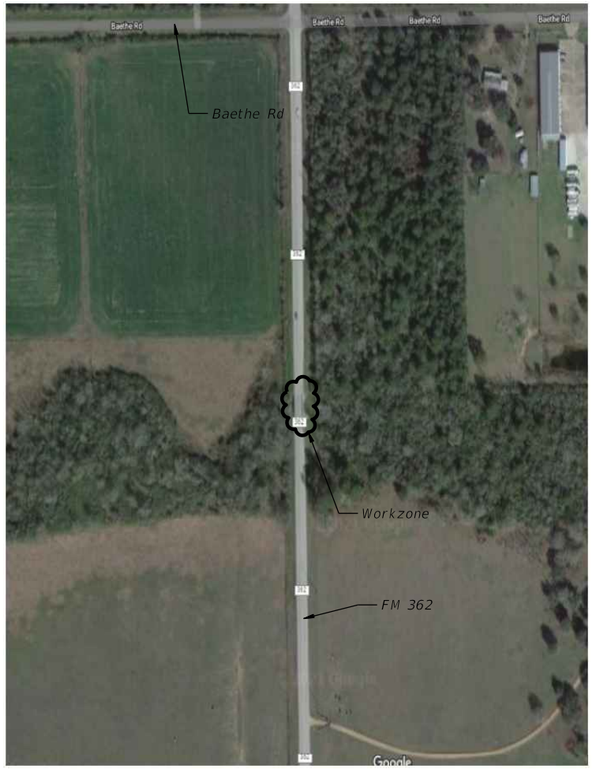
MB(4)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		98

DATE: $DATE$ $TIME$
FILE: $FILE$

TABLE OF ESTIMATED QUANTITIES				
	ITEM	DESCRIPTION	UNIT	QUANTITY
(1)	429-6011	CONC STR REPR(REMOV AND REPL WINGWALL)	CY	1.34

(1) Existing Wingwall to be Removed is Approx. 0.72 CY.



BRIDGE LOCATION

FM 362 between Baethe Rd and Rochen Rd

BRIDGE LOCATION

Workzone ~ Abutment 3 (Southeast corner)

SOUTHEAST WINGWALL PHOTO

Looking Norh

SOUTHEAST WINGWALL PHOTO

Looking South ~ August 2020

STATE OF TEXAS
AN YAN
114660
LICENSED PROFESSIONAL ENGINEER

An Yan, P.E.
10/29/2021

Texas Department of Transportation

Houston District (Bridge)

BRIDGE WINGWALL REPLACEMENT

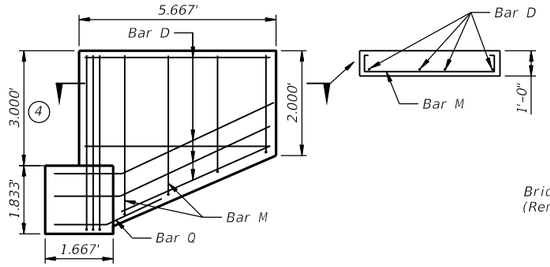
NBI: 12-237-0523-02-018

FM 362 OVER CYPRESS CREEK BRIDGE

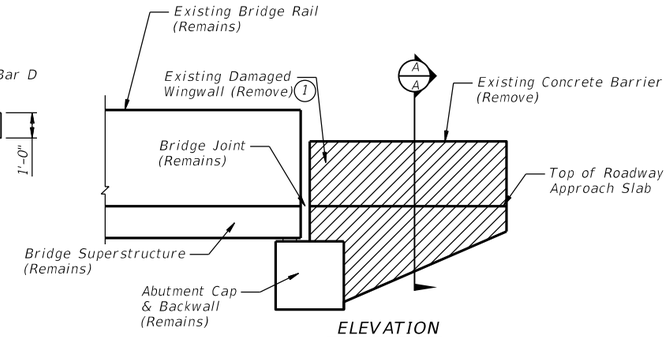
CSJ 0523-02-051

FILE: FM362@Spring Creek.dgn	DN: AY	CK: MEC	DW: VNC	CK: AY
©TxDOT 10/27/2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		99

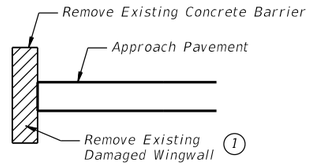
DATE:
FILE:



EXISTING WINGWALL DETAILS

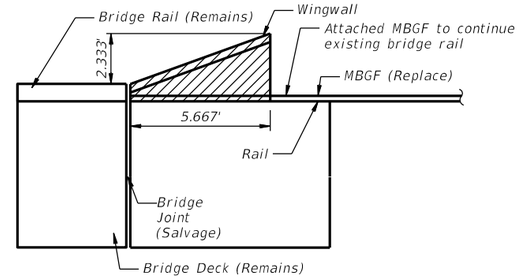


ELEVATION

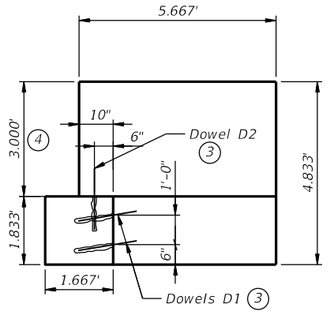


SECTION A-A

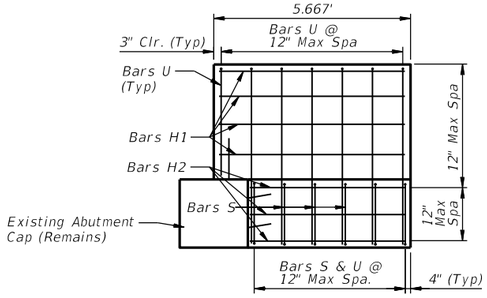
WINGWALL REMOVAL



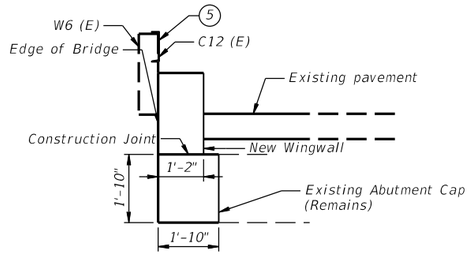
PLAN VIEW



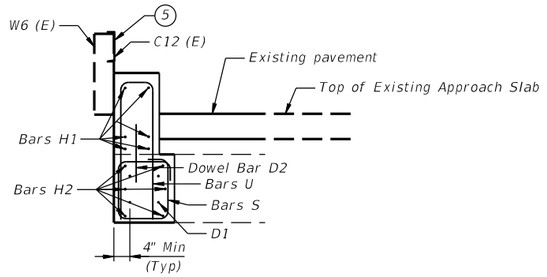
ELEVATION VIEW
DOWEL DETAILS



ELEVATION VIEW
REINFORCING DETAILS

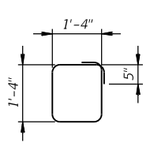


SECTION VIEW
OVERALL DIMENSIONS & LIMITS

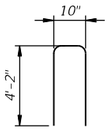


SECTION VIEW
REINFORCING DETAILS

REPLACEMENT WINGWALL



BAR S
Length = 6'-2"



BAR U
Length = 9'-2"

1. Remove existing wingwall. Cut and grind reinforcement flush. Paint ends of reinfrocement with two coats of zinc-rich paint conforming to Item "Galvenizing"
2. Repair Abutment Cap (See sheet 4)
3. Embed Dowel Bars D1 and D2 6" with approved Type III Class C epoxy anchoring system. Follow manufacturer's directions for installing the epoxied anchor bars. Place Dowel Bars D1 and D2 as shown.
4. Contractor to Verify. Match Existing Conditions.
5. The existing steel rail shall be removed and reinstalled as needed.

GENERAL NOTES

Wall, rail, and approach pavement removal, disposal, excavation, shoring, and backfill is considered subsidiary to the repair.
Provide CSB for all areas excavated beneath the approach pavement and behind the new wingwall.
Refer to applicable rail standard for replacement rail on top of wingwall. Rail anchorage is not shown on these details.
Existing bridge joint is to be salvaged and reused.
Refer to BAS-C standard for replacement approach pavement and reinforcing. Match existing thickness.
Protect completed repair from traffic until the concrete reaches specified strength.
Reinforcing details are shown measured outside to outside of bar.
Reinforcing steel quantities are for contractor's information only.

MATERIAL NOTES

Provide Class "C" Concrete (f'c = 3,600psi)
Provide Grade 60 Reinforcing Steel

ESTIMATED REINFORCING QUANTITITES
PER WINGWALL

BAR	NO	SIZE	LENGTH	WEIGHT
D1	4	# 6	1'-6"	10
D2	1	# 6	2'-0"	4
H1	6	# 6	5'-4"	48
H2	6	# 6	4'-6"	41
S	6	# 4	6'-2"	25
U	7	# 5	9'-2"	67
TOTAL REINF STEEL			LB	195

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10/29/2021

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Houston District (Bridge)

BRIDGE WINGWALL REPLACEMENT

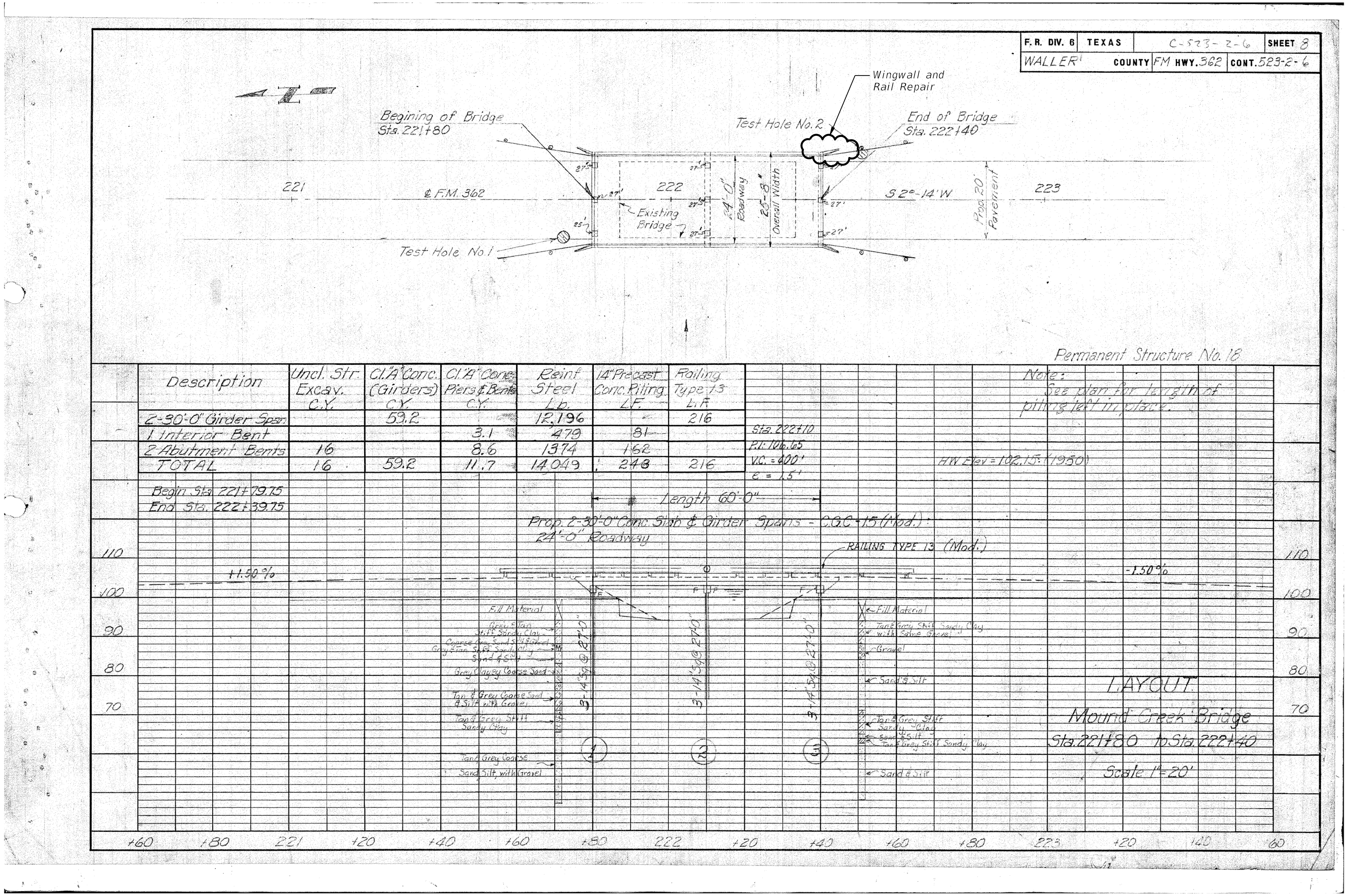
NBI: 12-237-0523-02-018

FM 362 OVER CYPRESS CREEK BRIDGE

CSJ 0523-02-051

FILE: FM362@Spring Creek.dgn	DN: AY	CK: MEC	DW: VNC	CK: AY
©TxDOT 10/28/2021	CONT.	SECT.	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
	DIST.	COUNTY		SHEET NO.
	HOU	WALLER		100

DATE:
FILE:



F.R. DIV. 6 TEXAS C-523-2-6 SHEET 8
WALLER COUNTY FM HWY. 362 CONT. 523-2-6
Wingwall and Rail Repair
Begining of Bridge Sta. 221+80
Test Hole No. 2
End of Bridge Sta. 222+40
221
℄ F.M. 362
222
Existing Bridge
24'-0" Roadway
25'-8" Overall Width
S 2°-14' W
Prop. 20' Pavement
223
Test Hole No. 1
Permanent Structure No. 18
Note: See plan for length of piling left in place.
Sta. 222+10
P.I. 106.165
V.C. = 400'
e = 1.5'
H.W. Elev. = 102.15 (1950)
Begin Sta. 221+79.75
End Sta. 222+39.75
Length 60'-0"
Prop. 2-30'-0" Conc. Slab & Girder Spans - C.G.C.-15 (Mod.): 24'-0" Roadway
RAILING TYPE 13 (Mod.)
+1.50%
-1.50%
Fill Material
Sand & Silt
LAYOUT
Mound Creek Bridge
Sta. 221+80 to Sta. 222+40
Scale 1" = 20'
+60 +80 221 +20 +40 +60 +80 222 +20 +40 +60 +80 223 +20 +40 +60

Description	Uncl. Str. Excav. C.Y.	Cl. "A" Conc. (Girders) C.Y.	Cl. "A" Conc. Piers & Bents C.Y.	Reinf. Steel Lb.	14" Precast Conc. Piling L.F.	Railing Type 13 L.F.
2-30'-0" Girder Span		59.2		12,196	-	216
1 Interior Bent			3.1	479	81	
2 Abutment Bents	16		8.6	1374	162	
TOTAL	16	59.2	11.7	14049	243	216

BRIDGE LAYOUT

Showing Repair Workzones

SHEET 3 OF 6

Texas Department of Transportation

Houston District (Bridge)

BRIDGE AS-BUILT DRAWINGS

NBI: 12-237-0523-02-018

FM 362 OVER CYPRESS CREEK BRIDGE

CSJ 0523-02-051

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REVISIONS	0523	02	051	FM 362
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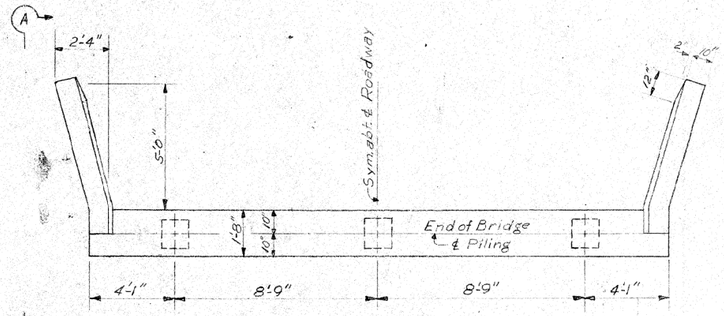
	HOU	WALLER		101

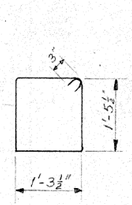
The Seal Appearing on This Sheet Covers Only Repair Details and Not the Original Design.

DATE:
FILE:

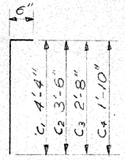
F. R. DIV. 6	TEXAS	C-523-2-6	SHEET /3
WALLER COUNTY	FM. HWY. 362	CONT. 523-2-6	



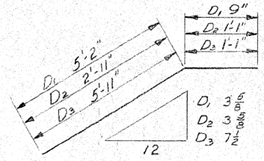
PLAN



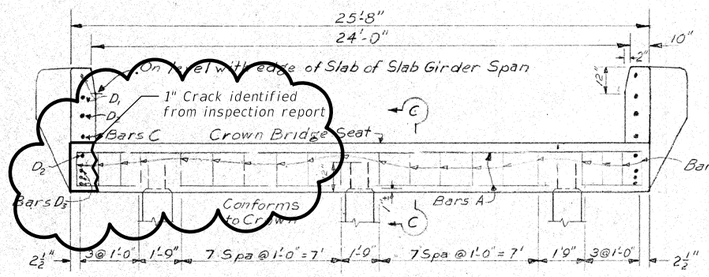
BARS B



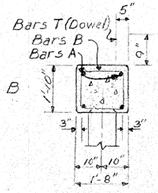
BARS C



BARS D



ELEVATION



SECTION C-C

NOTE: See Layout Sheets for size, type, and length of piles

BILL OF REINFORCING STEEL					
BAR	NO.	SIZE	SPACE	LENGTH	WEIGHT
A	4	#10	~	25'-4"	436
B	24	#3	Shown	6'-0"	54
C1	8	#5	Shown	4'-10"	40
C2-4	6	#5	Shown	3'-2"	20
D1	6	#5	~	5'-11"	37
D2	2	#5	~	4'-0"	8
D3	6	#5	~	7'-0"	44
T	12	#8	2'-0"±	1'-6"	48
TOTAL				Lb.	687

ESTIMATED QUANTITIES		
Concrete Class "A"	C.Y.	4.3
Reinforcing Steel	Lb.	687
Unclassified Structure Excav.	C.Y.	8.

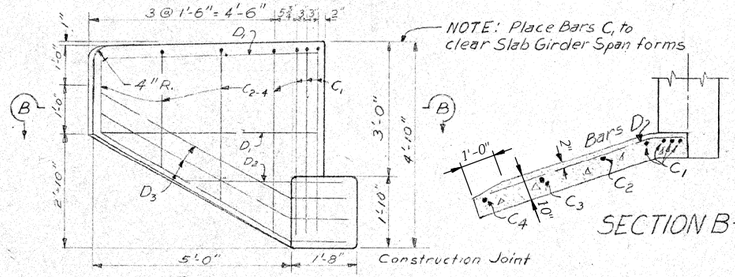
GENERAL NOTES

Designed for use with 30'-0" Concrete Slab and Girder Span 24'-0" Roadway, H15 loading in accordance with A.A.S.H.O. 1949 Standard Specifications as amended by T.H.D. Supplement No. 1.

All concrete shall be Class "A". Chamfer exposed corners ¾" except as otherwise noted.

Dimensions relating to reinforcing steel are to centers of bars.

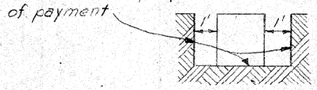
Each pile shall be driven to a minimum resistance equal to the average calculated load of 22 Tons per pile.



VIEW A-A

NOTE: Place Bars C, to clear Slab Girder Span forms

SECTION B-B



EXCAVATION DIAGRAM

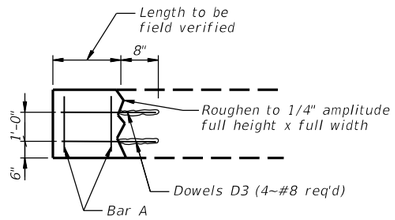
NOTE: Abutment wingwalls are to be poured after the adjoining girder span has been completed.

ABUTMENT BENT
FOR CONCRETE SLAB AND GIRDER SPAN
24'-0" ROADWAY 9" CURB

.AND SERVICE ROADS SHEET 3

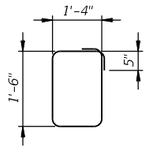
DATE:
FILE:

ESTIMATED REINFORCING QUANTITITES				
BAR	NO	SIZE	LENGTH	WEIGHT
A	2	# 4	6'-6"	9
D3	4	# 8	1'-8"	18
TOTAL REINF STEEL			LB	27



ELEVATION VIEW
DOWEL DETAILS

ABUTMENT CAP REPAIR (2)



BAR A (#4)

CAP REPAIR NOTES

1. Remove all unsound concrete using a chipping hammer. Patch all damaged area according to Specification Item 429. Restore the cap to its original lines. See estimated quantities table for estimated repair areas.
2. Embed dowel bars D3 with 8" approved type III class C epoxy anchoring system. Follow manufacturer's directions for installing the epoxied anchor bars. Place dowel bars D3 as shown w/ minimum 4" edge distance.
3. All epoxy injection and installation shall be performed by a contractor who is a certified applicator of the materials chosen. Epoxy shall conform to special Specification Item 5381 "Epoxy & Adhesives" Concrete repair shall conform to Specification Item 429.

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10/29/2021

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Texas Department of Transportation | Houston District (Bridge)

BRIDGE AS-BUILT DRAWINGS

NBI: 12-237-0523-02-018

FM 362 OVER CYPRESS CREEK BRIDGE

CSJ 0523-02-051

FILE: FM362@Spring Creek.dgn	DN: AY	CK: MEC	DW: VNC	CK: AY
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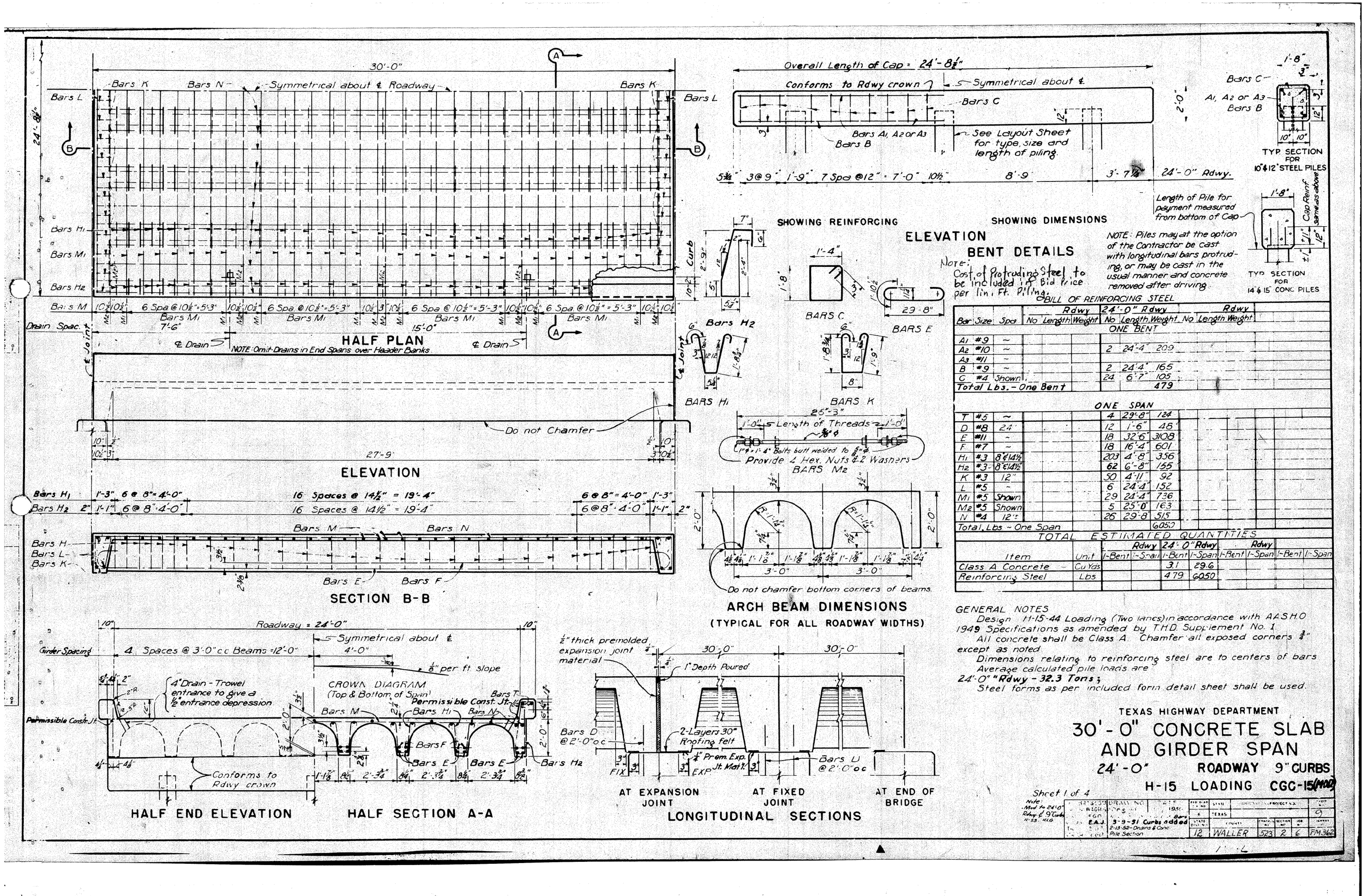
REVISIONS	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		102



BILL OF REINFORCING STEEL

Bar	Size	Spa	Rdwy No	Rdwy Length	Rdwy Weight	24'-0" Rdwy No	24'-0" Rdwy Length	24'-0" Rdwy Weight	Rdwy No	Rdwy Length	Rdwy Weight
ONE BENT											
A1	#9	~									
A2	#10	~				2	24'-4"	209			
A3	#11	~									
B	#9	~				2	24'-4"	165			
C	#4	Shown				24	6'-7"	105			
Total Lbs.-One Bent								479			
ONE SPAN											
T	#5	~				4	29'-8"	124			
D	#8	24"				12	1'-6"	48			
E	#11	~				18	32'-6"	3108			
F	#7	~				18	16'-4"	601			
H1	#3	8" & 14½"				203	4'-8"	356			
H2	#3	8" & 14½"				62	6'-8"	155			
K	#3	12"				50	4'-11"	92			
L	#5	~				6	24'-4"	152			
M1	#5	Shown				29	24'-4"	736			
M2	#5	Shown				5	25'-0"	163			
N	#4	12"				26	29'-8"	515			
Total, Lbs ~ One Span								6050			

TOTAL ESTIMATED QUANTITIES

Item	Unit	Rdwy 1-Bent	Rdwy 1-Span	24'-0" Rdwy 1-Bent	24'-0" Rdwy 1-Span	Rdwy 1-Bent	Rdwy 1-Span	1-Bent	1-Span
Class A Concrete	Cu Yds			3.1	29.6				
Reinforcing Steel	Lbs			479	6050				

GENERAL NOTES

Design H-15-44 Loading (Two lanes) in accordance with AASHO 1949 Specifications as amended by T.H.D. Supplement No. 1.

All concrete shall be Class A. Chamfer all exposed corners ¾" except as noted.

Dimensions relating to reinforcing steel are to centers of bars.

Average calculated pile loads are:

24'-0" Rdwy - 32.3 Tons;

Steel forms as per included form detail sheet shall be used.

SLAB SPAN DETAILS ~ 26.208' SPAN

SHEET 5 OF 6

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An Yan P.E.
10/29/2021

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Houston District (Bridge)

BRIDGE AS-BUILT DRAWINGS
NBI: 12-237-0523-02-018
FM 362 OVER CYPRESS CREEK BRIDGE

CSJ 0523-02-051

FILE: FM362@Spring Creek.dgn	DN: AY	CK: MEC	DW: VNC	CK: AY
©TxDOT 10/27/2021	CONT 0523	SECT 02	JOB 051	HIGHWAY FM 362
REVISIONS	DIST HOU	COUNTY WALLER		SHEET NO. 103

DATE:
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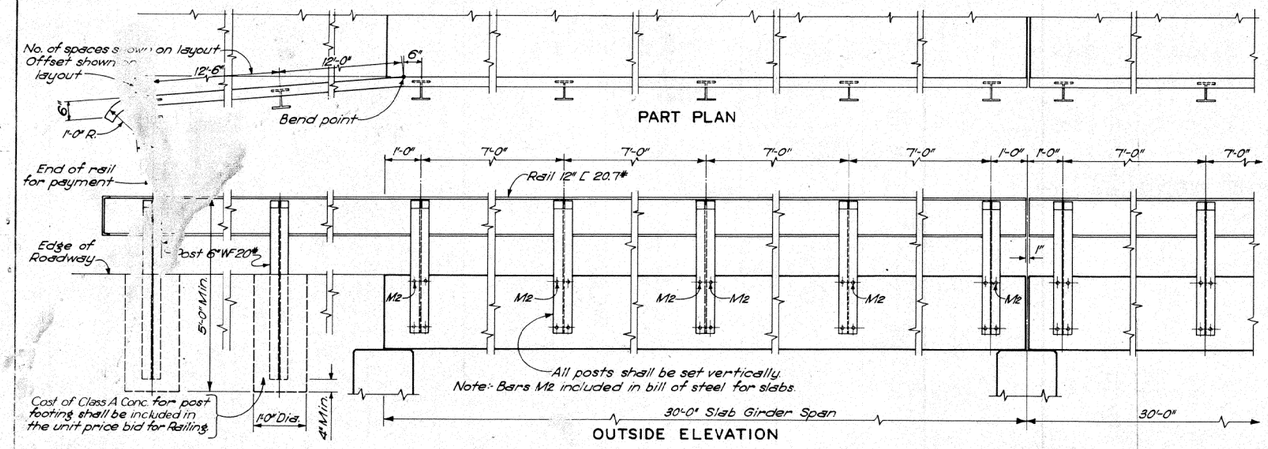

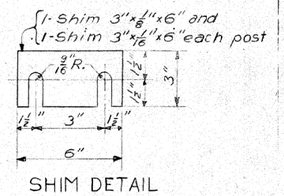

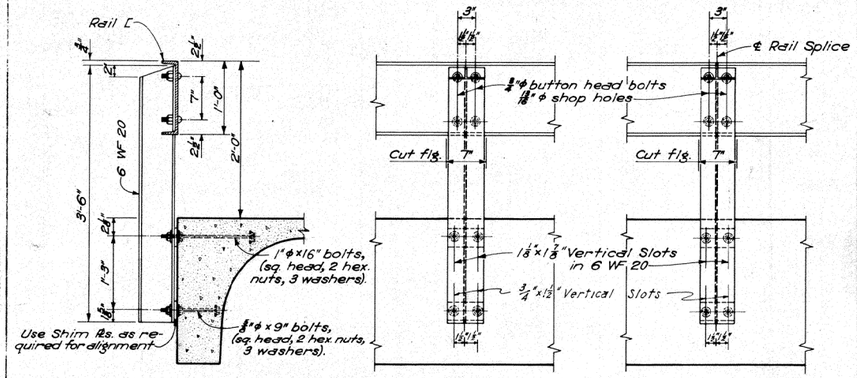

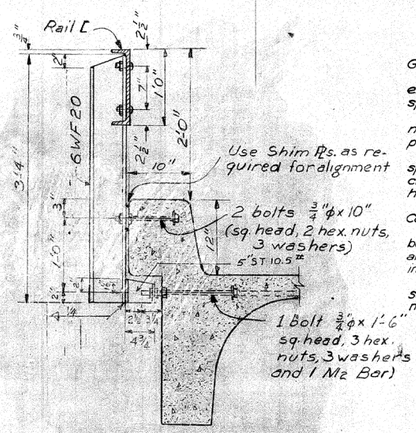

GENERAL NOTES:-

Rail sections shall be of span length except on end spans where rail shall be spliced at the first span post.

All anchorage provisions, including bolts, nuts, washers, and shim Rs are considered parts of the railing, except as noted.

At posts where railing channel is spliced, provide ½" opening between ends of channel, tighten ¾" ϕ bolts, back off one-half turn on nut, and burr threads.

This railing is for use with 30'-0" Concrete Slab and Girder Spans only.

Rail post anchor bolts, nuts and washers shall be cadmium coated by the Udylite Process in accordance with A.S.T.M. Specification A165 or Galvanized in accordance with A.S.T.M. Spec. 153-47 T.

If the metal railing is properly cleaned by sandblasting or pickling, the shop coat of paint may be applied by spray.

TEXAS HIGHWAY DEPARTMENT

RAILING

TYPE 13 (MOD.)

Dn: T.E.G.D.	Drawing	Date
Ck Dn: T.E.G.D.	Original	May 1950
Dw: T.E.G.D.	Rev. 7-25-50	Note:
Ck Dw:	Rev. Galv. Note 1-11-51	
Tr: Z.C.F.	(Rev. 9-51, Paint Note)	
Ck Tr:		

14

12 WALLER 523 2 6 FM362

SLAB SPAN DETAILS ~ 25' SPAN

SHEET 6 OF 6

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10/29/2021

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Houston District (Bridge)

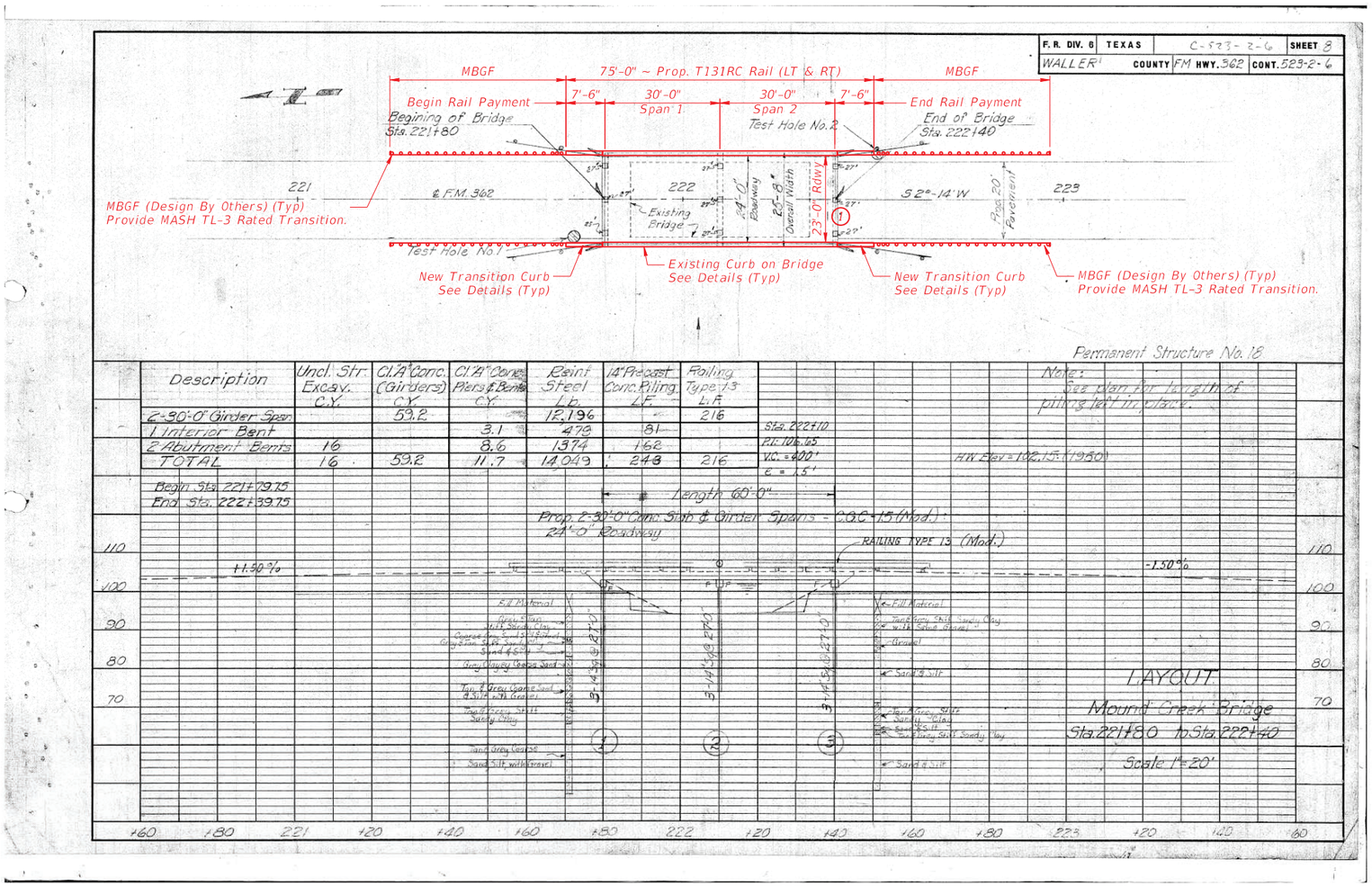
BRIDGE AS-BUILT DRAWINGS

NBI: 12-237-0523-02-018

FM 362 OVER CYPRESS CREEK BRIDGE

CSJ 0523-02-051

FILE: FM362@Spring Creek.dgn	DN: AY	CK: MEC	DW: VNC	CK: AY
©TxDOT 10/27/2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		104



Description	Uncl. Str. Excav. C.Y.	Cl. "A" Conc. (Girders) C.Y.	Cl. "A" Conc. Piers & Bents C.Y.	Reinf. Steel Lb.	14" Precast Conc. Piling L.F.	Railing Type 13 L.F.
2-30'-0" Girder Span		59.2		12,196		216
1 Interior Bent			3.1	479	81	
2 Abutment Bents	16		8.6	1374	162	
TOTAL	16	59.2	11.7	14,049	243	216

BRIDGE LAYOUT

SHOWING LIMITS OF RAIL REPLACEMENT

SATALITE VIEW OF BRIDGE

FM 362 AT CYPRESS CREEK / MOUND CREEK
0.2 MILE SOUTH OF BAETHE RD.
LAT: 30° 0' 12.73" N
LONG: 95° 56' 33.39" W

TABLE OF ESTIMATED QUANTITIES			
ITEM	DESCRIPTION	UNIT	QUANTITY
451-6004	RETROFIT RAIL (TY T131RC)	LF	150

① Revised Roadway Width = 23'-0".
Approximate Distance at Narrowest Point
Located at Thrie-Beam Attachment.

STREET VIEW OF BRIDGE

LOOKING NORTH ~ MAY 2016

BACK VIEW OF EXISTING RAIL

LOOKING SOUTHEAST ~ AUGUST 2020

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10/29/2021

SHEET 1 OF 2

Texas Department of Transportation
Houston District Bridge

BRIDGE RAIL RETROFIT LAYOUT

FM 362 CYPRESS CREEK BRIDGE
NBI: 12-237-0523-02-018

CSJ 0523-02-051

FILE: rlstd034-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: MAS
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		105

DATE:
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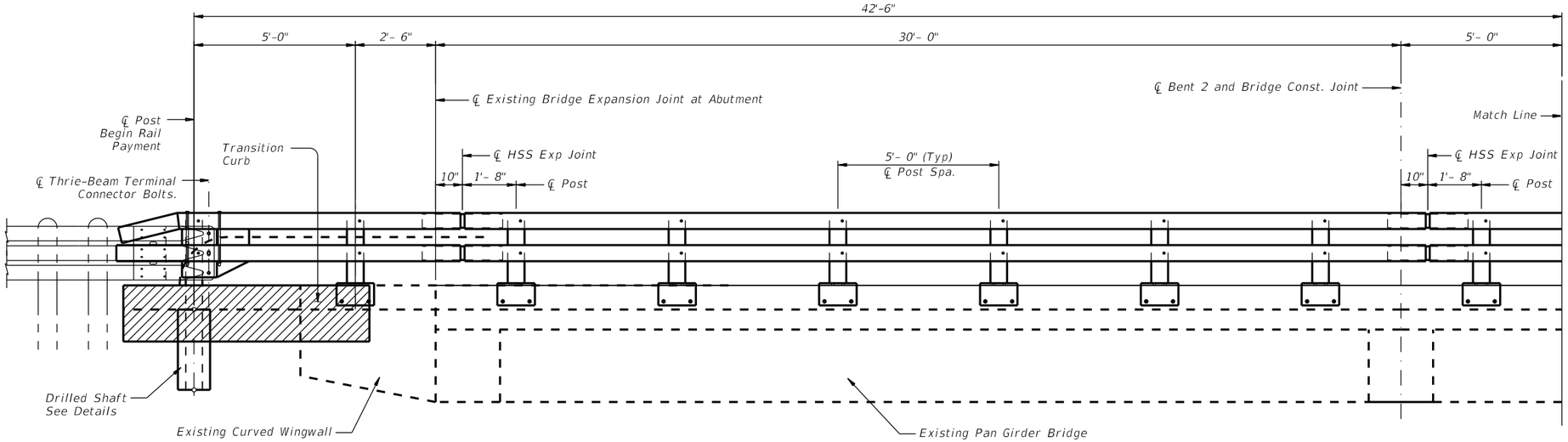

T131RC RAIL LAYOUT ~ ELEVATION VIEW

LEFT & RIGHT SIDE OF BRIDGE

DATE:
FILE:

SHEET 2 OF 2

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10/29/2021

Texas Department of Transportation

Houston District Bridge

BRIDGE RAIL RETROFIT LAYOUT

FM 362 CYPRESS CREEK BRIDGE
NBI: 12-237-0523-02-018

CSJ 0523-02-051

FILE: rlstd034-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: MAS
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		106

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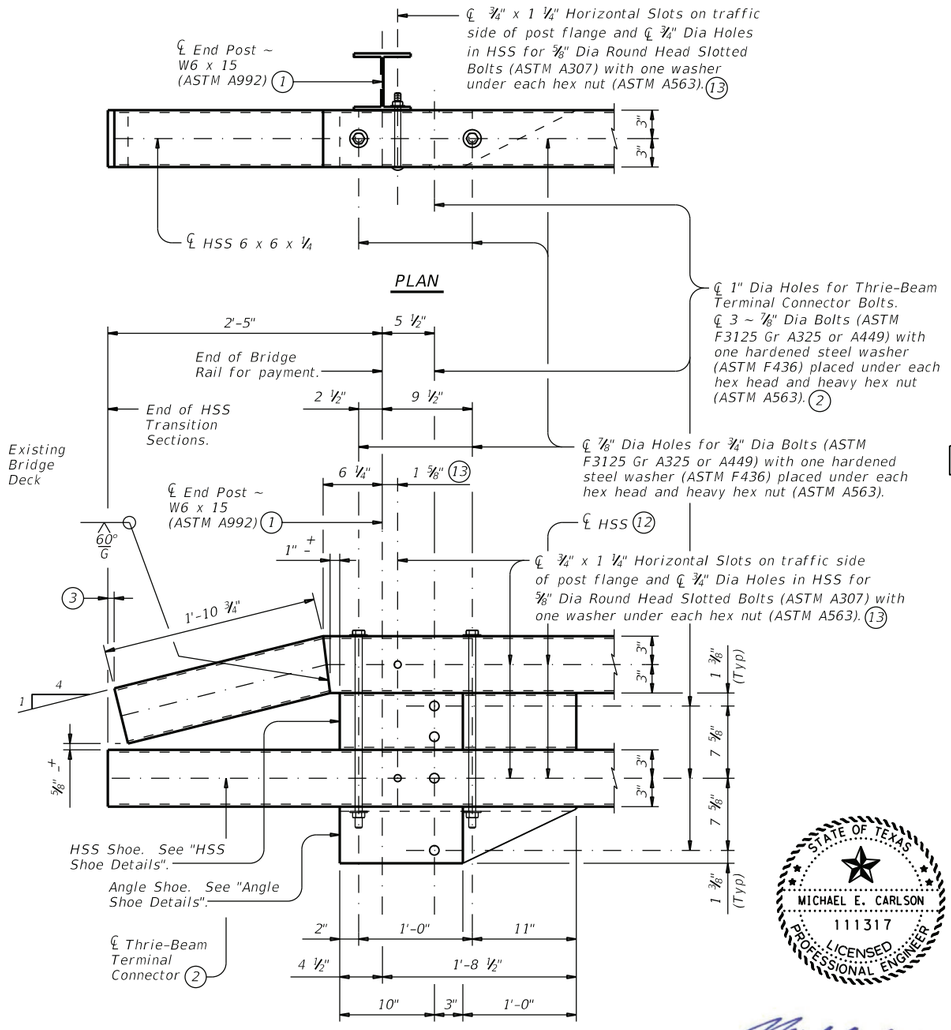

ROADWAY ELEVATION

HSS TRANSITION SECTION END DETAILS

Thrie-Beam Terminal Connector not shown for clarity.

(1) Post length = Top of rail elevation minus bottom of drilled shaft elevation.

(2) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach the appropriate Metal Beam Guard Fence Transitions or Downstream Anchor Terminal to the bridge rail using 3 bolts as shown, and extend along the embankment.

(3) Top HSS can be shorter than bottom HSS ⅝" plus or minus.

(12) HSS 6 x 6 x ¼ (ASTM A1085 or A500 Gr C).

(13) May be placed on either side of W6 x 15 web.

CONSTRUCTION NOTES:

Field verify dimensions before commencing work and ordering materials.

Provide Type VIII epoxy mortar under post base plates if gaps larger than 1/16" exist.

One shop splice per rail member section is permitted with minimum 85 percent penetration.
The weld may be square groove or single vee groove.

Round or chamfer exposed edges of HSS rail, rail post and plate to approximately 1/16" by grinding.

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

Submit erection drawings showing panel lengths, splice locations, post placement, anchor bolt locations and adhesive anchor test data to demonstrate pullout strength to the Engineer for approval. Shop drawings are not required.

MATERIAL NOTES:

Galvanize all metal components of steel rail system.

Provide Grade 60 reinforcing steel.

Provide Class "C" concrete. As an alternate, provide Class "K" concrete, or a Type A-2 or Type C concrete repair material per DMS-4655 "Concrete Repair Materials". Do not use Type "B" (Ultra-Rapid) concrete repair materials.

Anchor bolts must be ¾" Dia ASTM A193 Gr B7 or ASTM A449 fully threaded rods with one heavy hex nut and one hardened steel washer (ASTM F436) each. Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into concrete curb using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 6 ¾". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 30 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

GENERAL NOTES:

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

Rail anchorage details shown on this guide may require modification for select structure types.

See "Section A-A" for limits on existing overlay/seal coats thickness based on existing curb height.

This rail is to be paid for as "Retrofit Rail (Ty T131RC)" under Item 451 "Retrofit Railing".

Average weight with no overlay: 55 plf (9" Curbs)

Cover dimensions are clear dimensions, unless noted otherwise.

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10/29/2021

Texas Department of Transportation

Bridge Division Standard

BRIDGE RAIL RETROFIT T131RC RAIL ON CURBS

FM 362 CYPRESS CREEK BRIDGE

NBI: 12-237-0523-02-018

CSJ 0523-02-051

TYPE T131RC(MOD)

FILE: rlstd034-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: MAS
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REVISIONS	0523	02	051	FM 362
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	HOU	WALLER		107

DATE:
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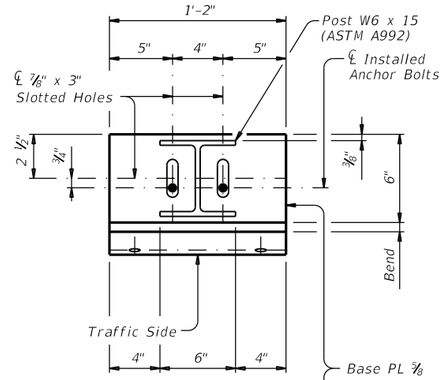
(6) Match existing bridge curb face on traffic side of transition curb. Transition curb 6" x 1'-6" taper will remain vertical.

(10) ℄ HSS Expansion Joint or ℄ HSS Splice Joint as required.

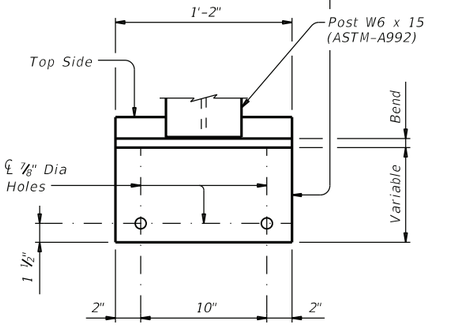
(12) HSS 6 x 6 x ¼ (ASTM A1085 or A500 Gr C).

(13) May be placed on either side of W6 x 15 web.

(14) Place HSS Expansion Joints in rail at every slab Expansion Joint. For Expansion and Splice Joints openings, use the greater of 1" or (slab opening plus ½").

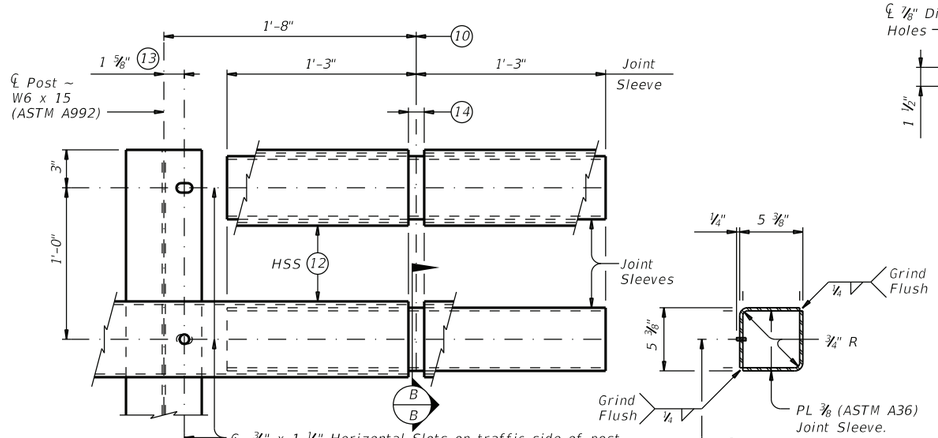


TOP VIEW



FRONT VIEW

BASE PLATE DETAILS



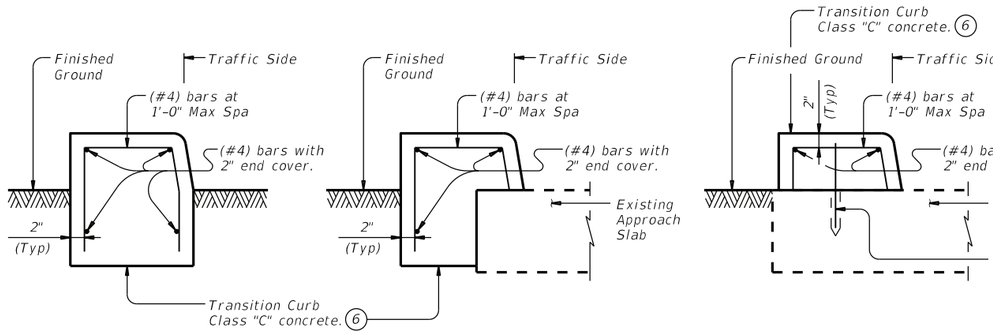
TYPICAL POST CONNECTION AND SPLICE DETAIL FOR HSS

Showing post with HSS and HSS splice.

SECTION B-B

Showing typical joint sleeve.

NOTE TO THE CONTRACTOR:
THERE IS NO INDICATION OF AN EXISTING APPROACH SLAB ON THIS BRIDGE.
VARIOUS DETAILS HAVE BEEN INCLUDED BELOW IN THE EVENT AN APPROACH SLAB IS DISCOVERED.
CONTRACTOR SHALD VERIFY BEFORE ORDERING MATERIALS.



WITH NO APPROACH SLAB

WITH PARTIAL WIDTH APPROACH SLAB

WITH FULL OR ALMOST FULL WIDTH APPROACH SLAB

(#4) anchor bars spaced longitudinally along new curb at 1'-6" Max (Spaced 3" longitudinally from outside edge). Embed (#4) anchor bars with a Type III Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment is 5". Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

EXAMPLES OF TRANSITION CURB SECTIONS

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SHEET 2 OF 4

Texas Department of Transportation

Bridge Division Standard

BRIDGE RAIL RETROFIT T131RC RAIL ON CURBS

FM 362 CYPRESS CREEK BRIDGE

NBI: 12-237-0523-02-018

CSJ 0523-02-051

TYPE T131RC(MOD)

FILE: rlstd034-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: MAS
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REVISIONS	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		108

DATE:
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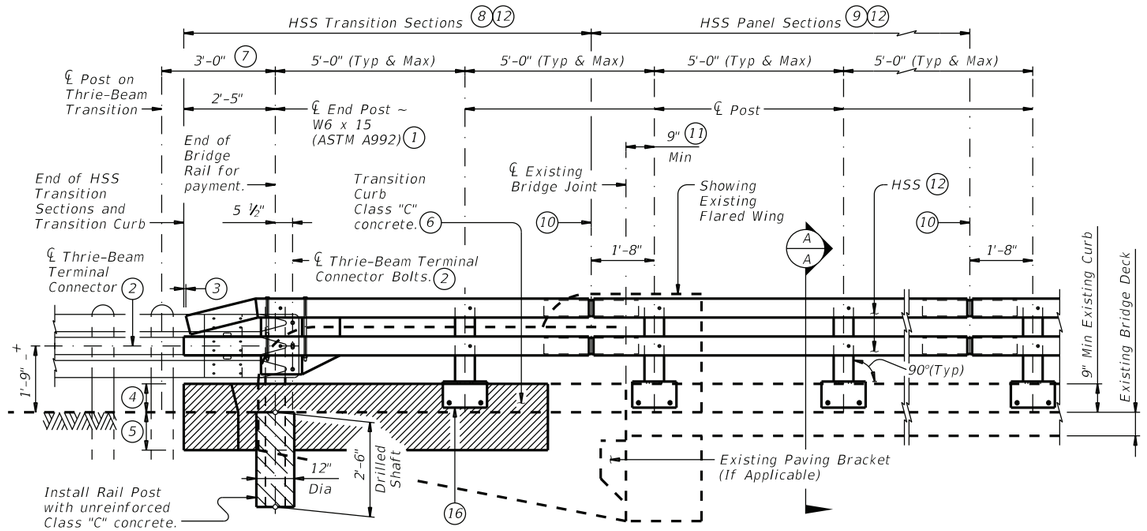
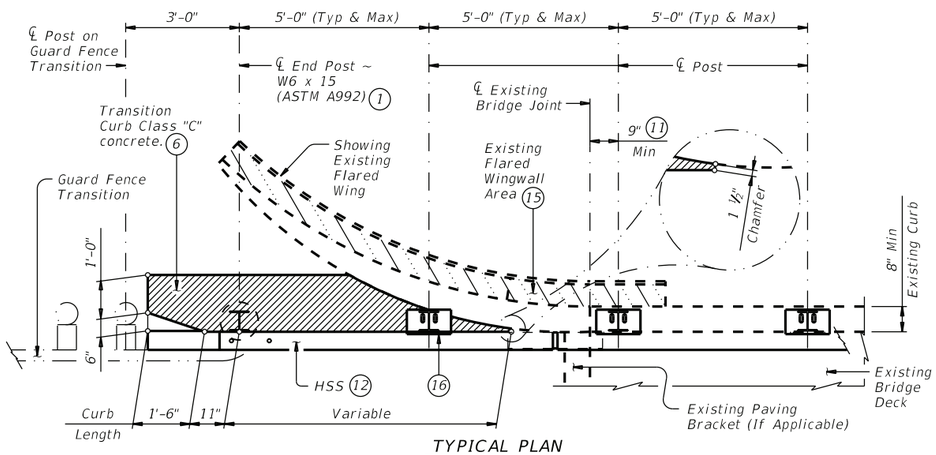


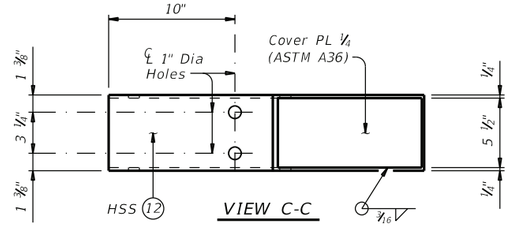
TYPICAL ROADWAY ELEVATION

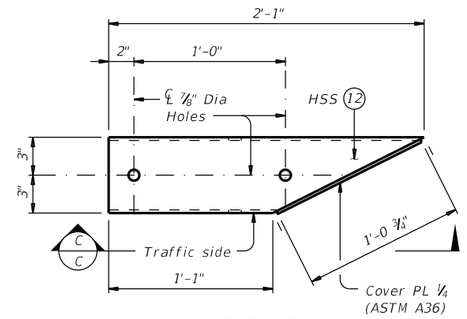


TYPICAL PLAN

EXAMPLE "C" RETROFIT WITH FLARED WING

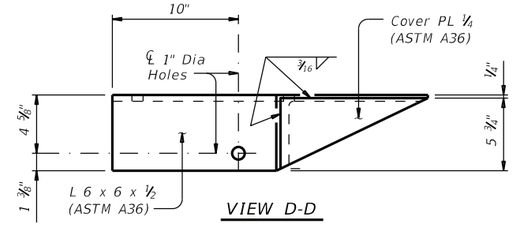
(Showing 9" high and 8" wide curbs, higher and wider curbs similar)

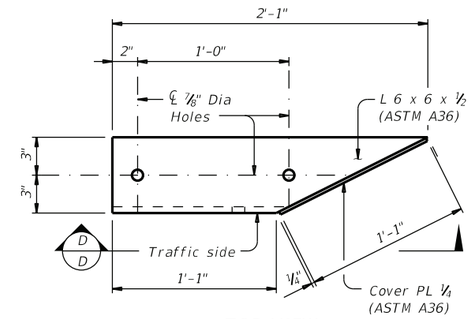




TOP VIEW

HSS SHOE DETAILS





TOP VIEW

ANGLE SHOE DETAILS

Angle Shoe shown is detailed for one side only, other side similar. For other side shoe must be built for opposite hand.

(1) Post length = Top of rail elevation minus bottom of drilled shaft elevation.

(2) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". The appropriate Metal Beam Guard Fence Transitions or Downstream Anchor Terminal must be attached to the bridge rail and extended along the embankment.

(3) Top HSS can be shorter than bottom HSS ⅝" plus or minus.

(4) Match existing bridge curb height.

(5) Cast transition curb 1'-0" into soil or top of concrete approach slab. Remove any asphaltic concrete or mow strip if present.

(6) Match existing bridge curb face on traffic side of transition curb. Transition curb 6" x 1'-6" taper will remain vertical.

(7) Showing first post for a TL-3 rated guard fence transition. First post for a TL-2 rated guard fence transition or a guard fence downstream anchor terminal is 4'-4 ¾".

(8) HSS Transition Sections must have one soil mounted end post embedded in an unreinforced, Class "C" concrete drilled shaft as shown, and a minimum of one curb mounted post per transition section.

(9) HSS Panel Sections must have a minimum of three posts and a maximum of eight posts per panel section.

(10) ℄ HSS Expansion Joint or ℄ HSS Splice Joint as required.

(11) Use 9" minimum for both expansion joints and construction/controlled joints.

(12) HSS 6 x 6 x ¼ (ASTM A1085 or A500 Gr C).

(15) Remove all existing structure area from top of existing curb. Cut and grind flush all existing reinforcing extending from top of existing curb and paint ends with two coats of zinc-rich paint conforming to the Item "Galvanizing".

(16) When post is mounted to the transition curb on flared wings as shown, transition curb must be supported laterally by the existing wingwall/curb.

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Texas Department of Transportation

Bridge Division Standard

BRIDGE RAIL RETROFIT
T131RC RAIL ON CURBS
FM 362 CYPRESS CREEK BRIDGE
NBI: 12-237-0523-02-018

CSJ 0523-02-051

TYPE T131RC(MOD)

FILE: rlstd034-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: MAS
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REVISIONS	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		109

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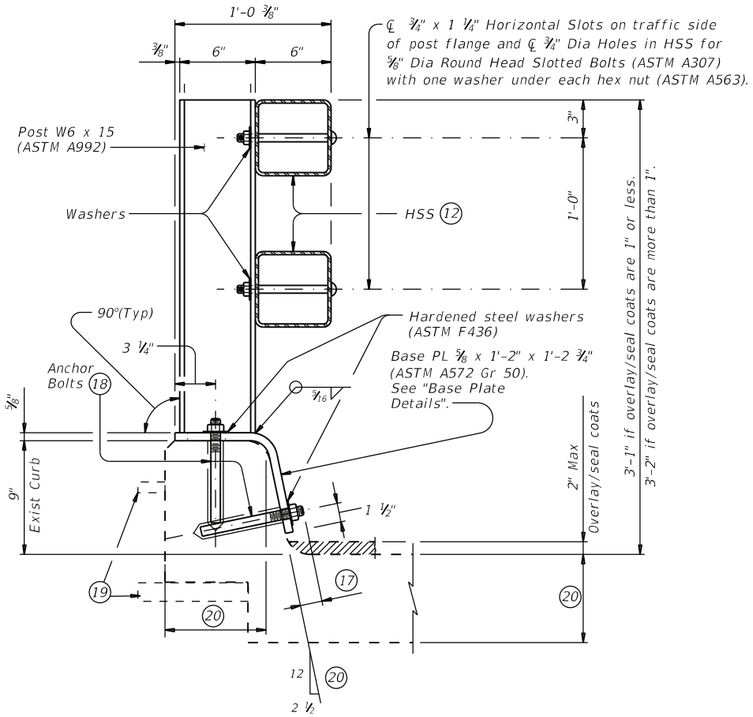
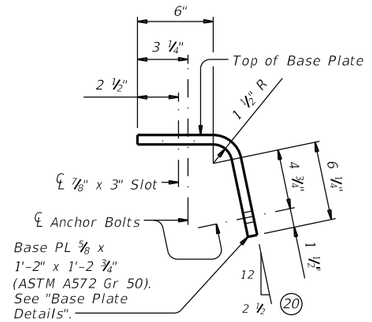


SECTION A-A OF 9" HIGH CURBS

(Showing example of 8" Min width curb, wider curbs similar)



9" HIGH CURB BASE PLATE DETAIL

(12) HSS 6 x 6 x 1/4 (ASTM A1085 or A500 Gr C).

(17) 1 3/4" Bolt Projection (Typ).

(18) See "Material Notes" for anchor Bolt information.

(19) Remove existing railing (including posts), cut and grind anchor bolts flush and paint ends with two coats of zinc-rich paint conforming to the Item "Galvanizing".

(20) See elsewhere in plans for dimensions (curb width and height, slab and overlay thickness). Slope of curb may differ from what is shown. Adjust base plate as necessary to conform to curb face geometry.

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Bridge Division Standard

BRIDGE RAIL RETROFIT
T131RC RAIL ON CURBS
FM 362 CYPRESS CREEK BRIDGE
NBI: 12-237-0523-02-018

CSJ 0523-02-051

TYPE T131RC(MOD)

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REVISIONS	0523	02	051	FM 362
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	HOU	WALLER		110

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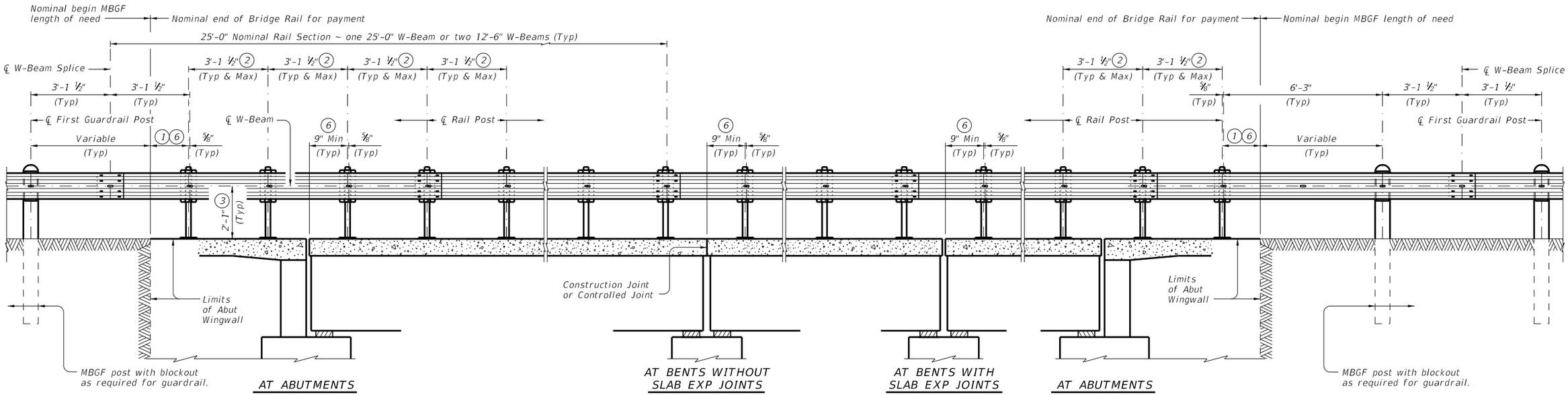
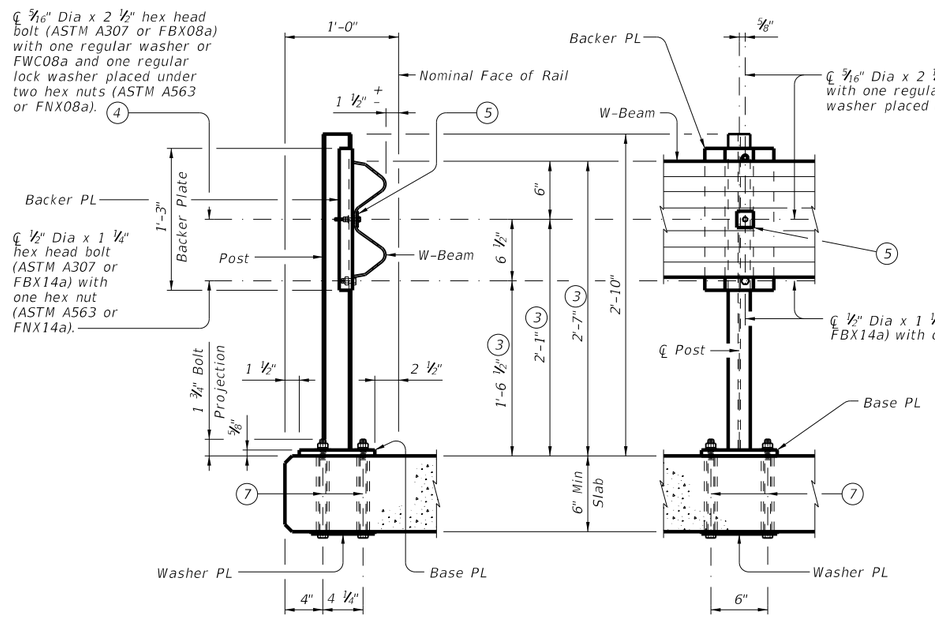


ROADWAY ELEVATION OF RAIL

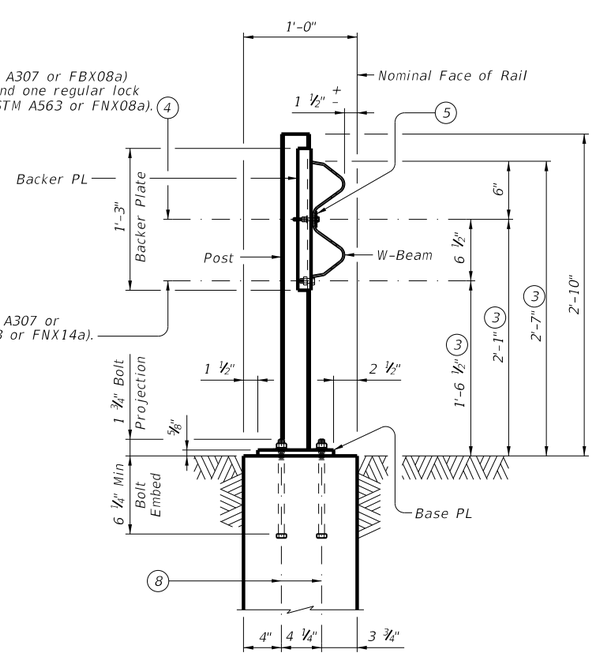
Showing without overlay.



RAIL SECTION — TRAFFIC SIDE RAIL VIEW

RAIL DETAILS ON BRIDGE SLAB

Showing without overlay.



RAIL SECTION ON ABUTMENT WINGWALL

Showing without overlay.

(1) 9" Min, 5'-9" Max

(2) Maintain 3'-1 ½" Rail Post spacing wherever possible for use with nominal 25'-0" or 12'-6" W-Beam sections. Symmetry of post spacing on both sides and along the structure is not necessary.

(3) Increase 2" for structures with overlay.

(4) Tighten the first hex nut by hand until the top and bottom edges of the W-Beam engage the Backer Plate (Backer Plate should be snug against the post). Then tighten hex nut one revolution with wrench and secure with the second hex nut.

(5) PL ⅛ x 1 ¾ x 1¾ with ⅞ Dia Hole centered in PL (ASTM A36). Square Guardrail Washer (FWR01).

(6) The post nearest to a slab joint or end of structure may be shifted up to 9" in order to satisfy the minimum offset dimension. Drill a new ¾" Dia hole on the centerline of W-beam for shifted post. Paint hole with two coats of zinc-rich paint conforming to the Item "Galvanizing". All other posts must remain on the typical spacing.

(7) ℄ ⅞" Dia formed holes for ℄ ⅝" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack welded for each threaded rod. See "Cast-In-Place & Formed Hole Anchor Bolt Options".

(8) ℄ ⅝" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack welded for each threaded rod. See "Cast-In-Place & Formed Hole Anchor Bolt Options".

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T631

FILE:	DN: TxDOT	CK: AES	DW: JTR	CK: AES
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REVISIONS	0523	02	051	FM 362
07/2020: Allowing 9'-4 ½" or 6'-3" W-Beam sections. 03/2023: MBGF Notes.	DIST	COUNTY		SHEET NO.
	HOU	WALLER		111

DATE: $DATE$ $TIME$
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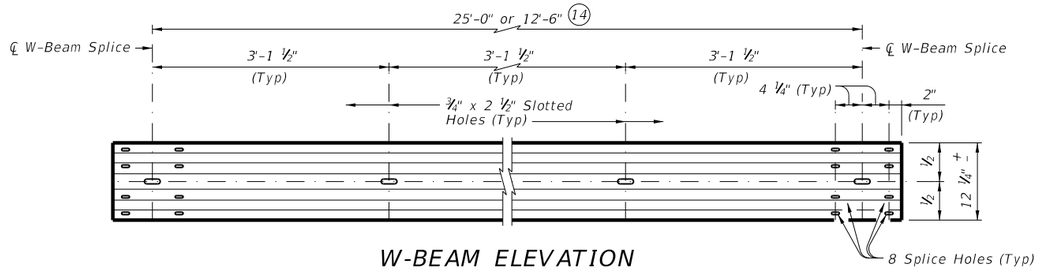
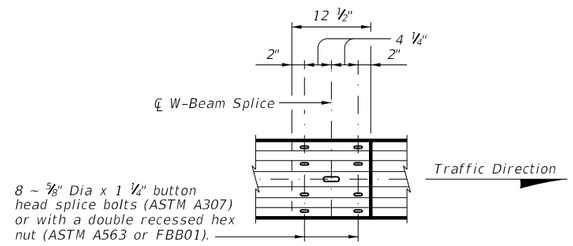
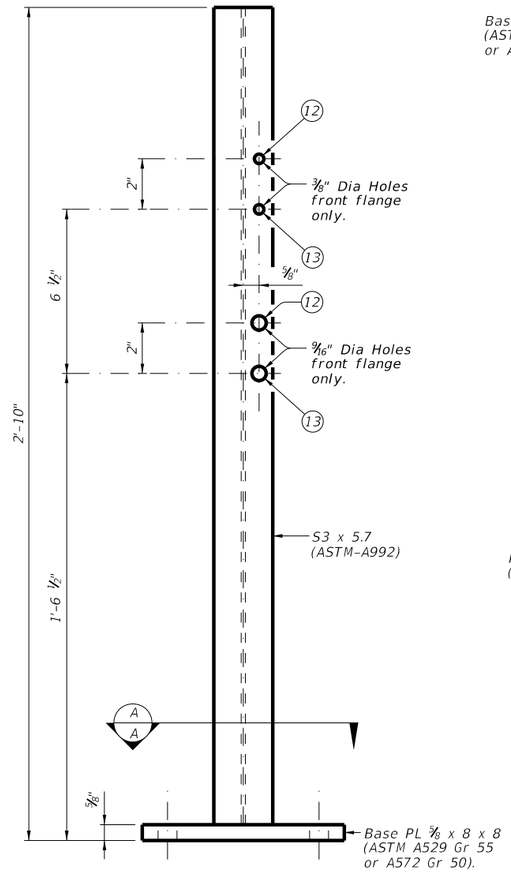


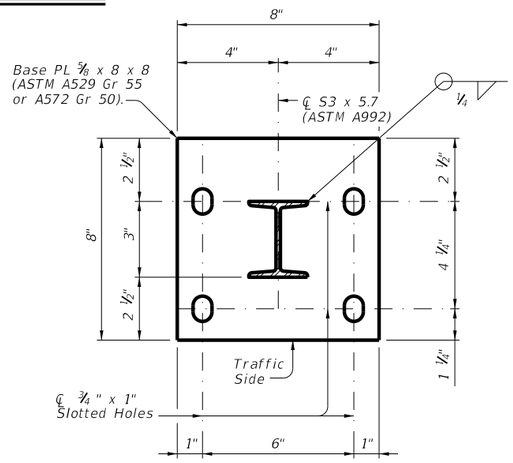
W-BEAM ELEVATION



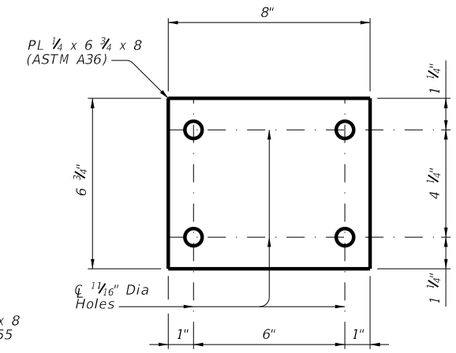
W-BEAM SPLICE ELEVATION



POST ELEVATION

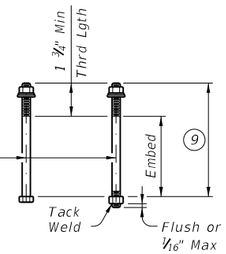


SECTION A-A



WASHER PLATE DETAIL

℄ ⅝" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack welded for each threaded rod.



CAST-IN-PLACE & FORMED HOLE ANCHOR BOLT OPTIONS (10)

(9) See "Rail Details On Bridge Slab" and/or "Rail Section On Abutment Wingwall".

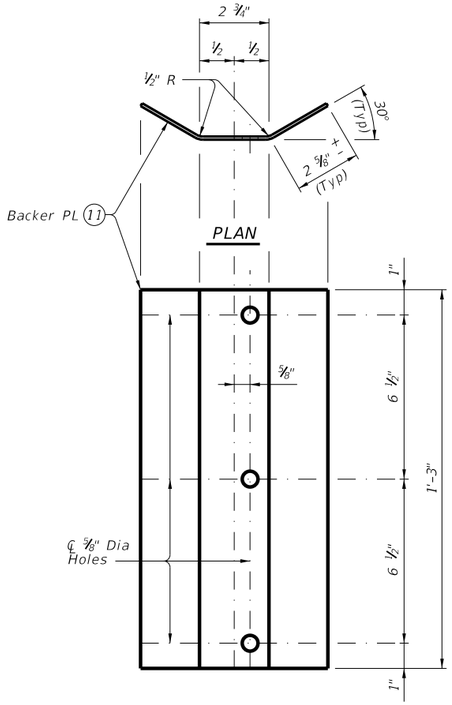
(10) See "Material Notes" for anchor bolt information.

(11) Backer PL ⅛ x 8 x 1'-3" (ASTM A1011 CS or SS Gr 33, or A1008 CS or SS Gr 33 (11 Gage acceptable)).

(12) Used for structures with overlay.

(13) Used for structures without overlay.

(14) At the nominal end of the bridge rail for payment, one 9'-4 ½" or 6'-3" W-beam section is permitted in order to achieve the required W-Beam splice location on the MBGF.



BACKER PLATE

MBGF AND END TREATMENT NOTES:

This traffic railing must be anchored by metal beam guard fence (MBGF) and guard fence end treatments. Determine MBGF length of need in accordance with the Roadway Design Manual, unless otherwise specified. The minimum MBGF length of need required for anchoring the railing is 25' of MBGF plus the appropriate end treatment installed tangent to the primary roadway.

CONSTRUCTION NOTES:

Face of rail post must be plumb unless otherwise approved by the Engineer. Post must be perpendicular to adjacent roadway grade. Use epoxy mortar under post base plates if gaps larger than 1/16" exist.

Fully anchored guardrail must be attached to each end of rail. A metal beam guard fence transition is not used with this rail.

At the Contractor's option anchor bolts may be an adhesive anchor system. See "Material Notes".

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

It is recommended to show a Rail Layout with rail posts and W-beam splices. Fabricator must submit erection drawings to the Engineer for approval.

Round or chamfer exposed edges of rail post and backer plate to approximately 1/16" by grinding.

Shop drawings are not required for this rail.

MATERIAL NOTES:

Galvanize all steel components.

Anchor bolts for base plate must be ⅝" Dia ASTM F3125 Gr A325 or A449 bolts (or ASTM A193 Gr B7 or F1554 Gr 105 threaded rods with one tack welded heavy hex nut each) with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements.

Optional adhesive anchorage system must be ⅝" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements. Embed fully threaded rod into slab and/or abutment wingwall using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4 ¾". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 8 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing."

W-beam must 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" (Nominal) lengths and a single rail element of 9'-4 ½" or 6'-3" (Nominal) length. W-Beam must have slotted holes at 3'-1 ½".

Some part numbers from the "Task Force 13" Guide to Standardized Highway Barrier Hardware have been furnished for quick reference.

GENERAL NOTES:

This railing has been successfully evaluated by full-scale crash test to meet MASH TL-3 criteria. This railing can be used for speeds of 50 mph and greater.

This rail is designed to deflect approximately 4' to 4'-6" as it contains and redirects the errant vehicle. This rail may not be installed on top of or behind curbs that project above finished grade, on bridges with expansion joints providing more than 5" movement, on retaining walls, or on grade separations and interchanges.

Repairs to impact-damaged post and base plate unit are not permitted. Replace all impact-damaged posts with a new post and base plate unit.

Average weight of railing with no overlay: 20 plf total.

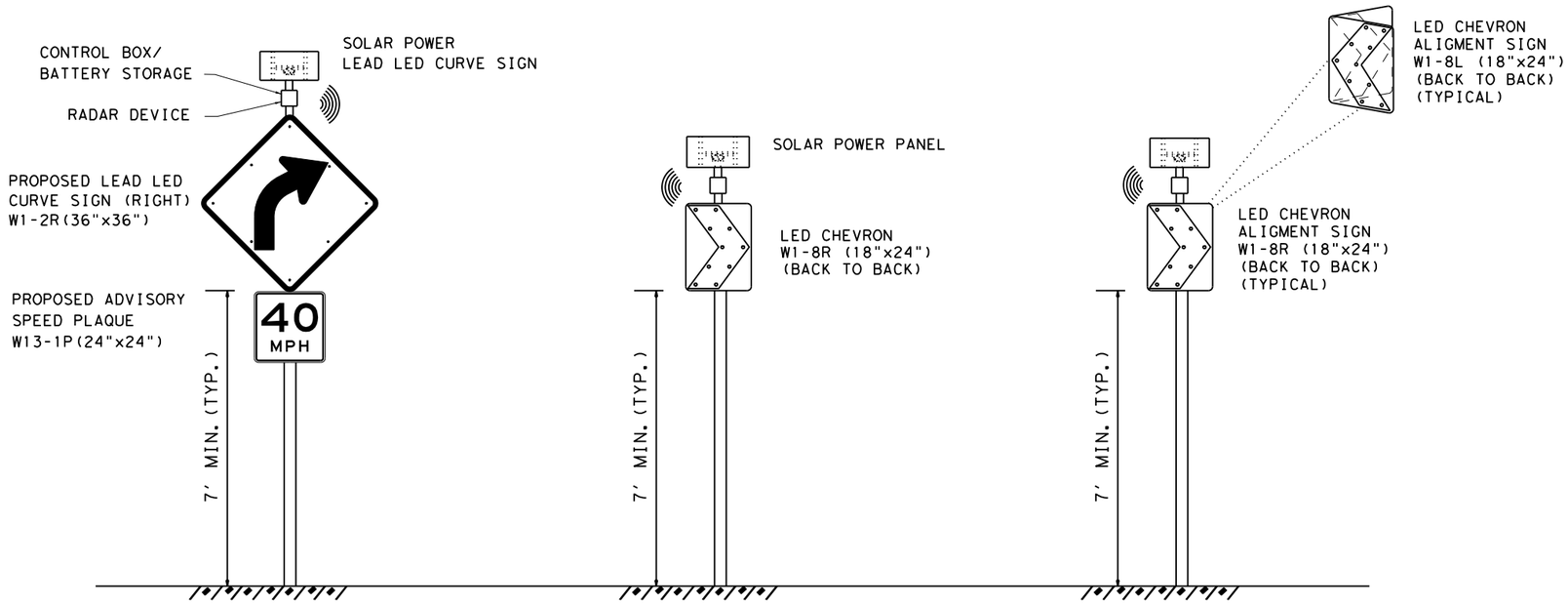
SHEET 2 OF 2

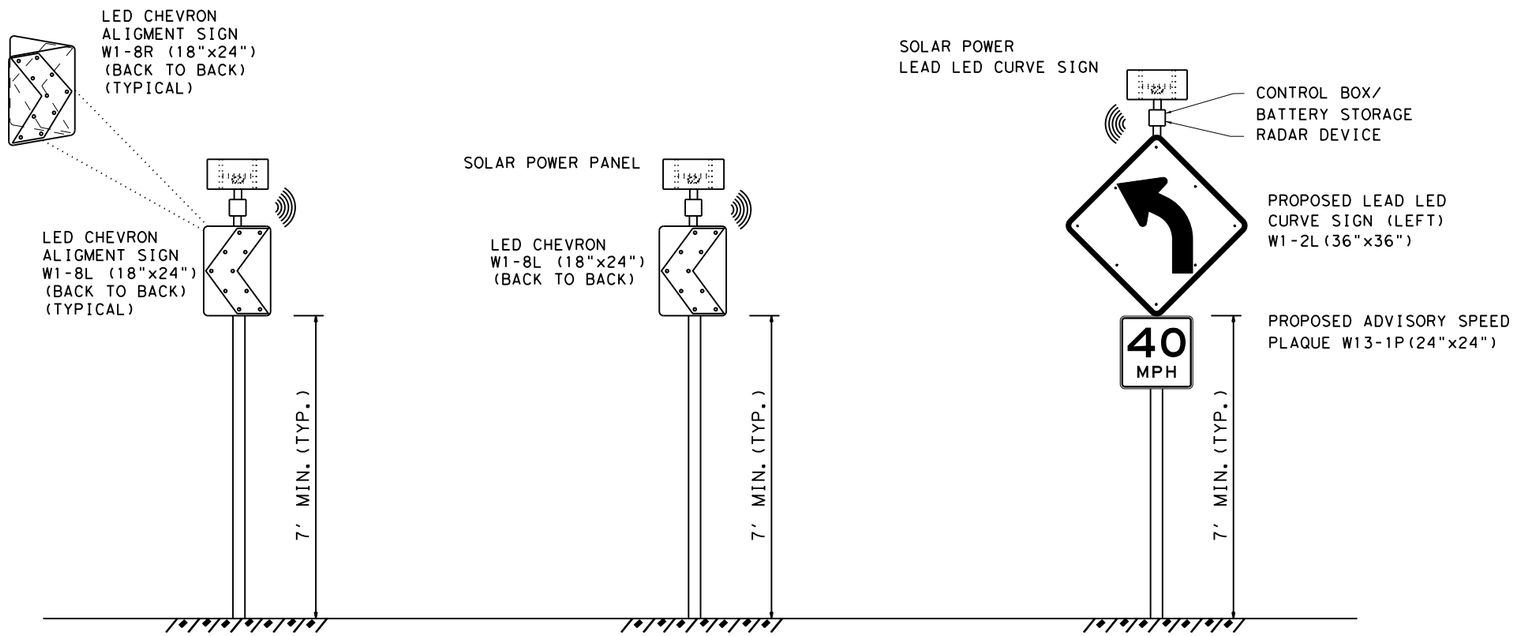
Texas Department of Transportation | Bridge Division Standard

TRAFFIC RAIL

TYPE T631

FILE:	DN: TxDOT	CK: AES	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
07/2020: Allowing 9'-4 ½" or 6'-3" W-Beam sections. 03/2023: MBGF Notes.	DIST	COUNTY		SHEET NO.
	HOU	WALLER		112





STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED
PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

07/25/23

SOLAR POWER LED CHEVRON SIGN DETAIL

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		113

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		0523	02	051	FM 362
		DIST	COUNTY		SHEET NO.
		HOU	WALLER		114

DATE: $DATE$ $TIME$
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DATE: $DATE$ $TIME$
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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	

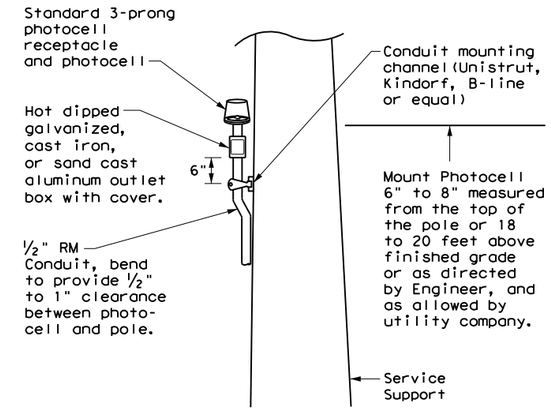
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** 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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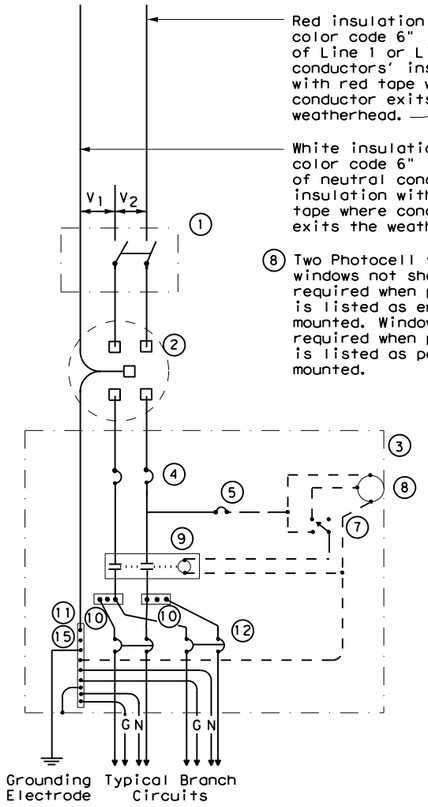
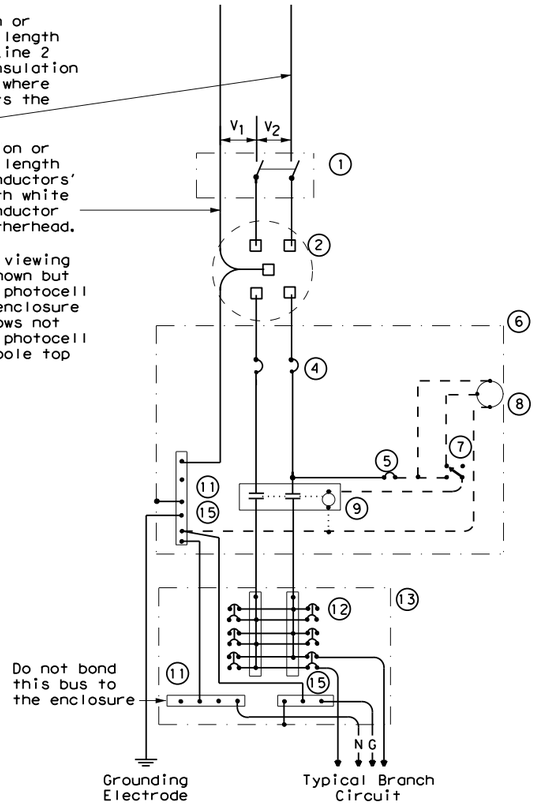
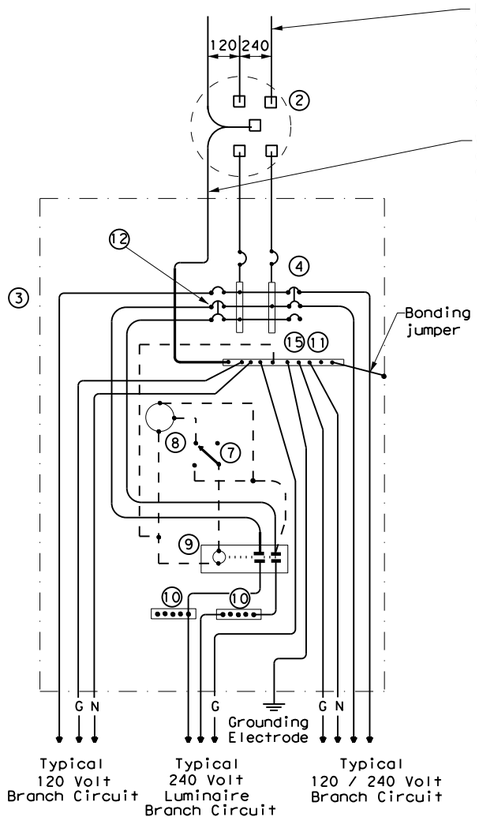
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		115



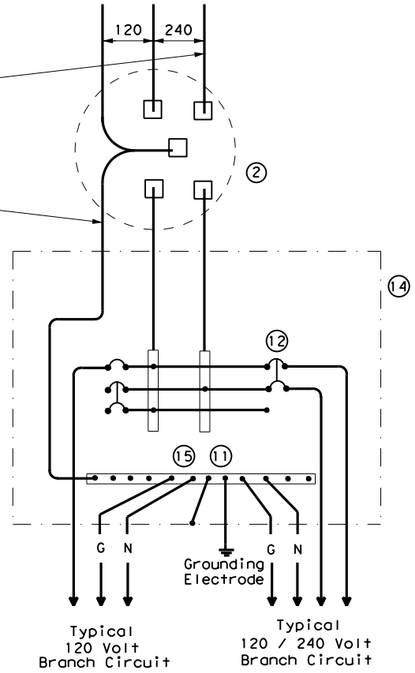
SCHEMATIC TYPE A
THREE WIRE



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

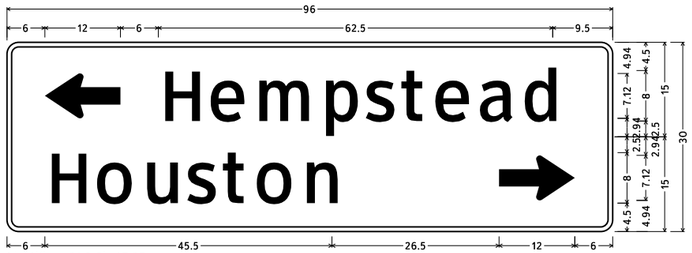
ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

FILE: ed6-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		116

71F

DATE: $DATE$ $TIME$
FILE: $FILE$



Identifier : D1-2 8in LT-RT;
1.88" Radius, 0.75" Border, White on Green;
Standard Arrow Custom 12.00" X 7.13" 180°; [Hempstead] ClearviewHwy-3-W specified length;
1.88" Radius, 0.75" Border, White on Green;
[Houston] ClearviewHwy-3-W specified length; Standard Arrow Custom 12.00" X 7.13" 0°;
Table of widths and spaces.

	←		H		e		m		p		s		t		e		a		d	
6.00	12.00	6.00	5.47	2.03	5.33	2.08	8.36	2.22	5.24	1.49	4.61	1.22	3.44	1.62	5.34	1.71	5.38	1.72	5.24	9.50

	H		o		u		s		t		o		n		→	
6.00	5.47	2.03	5.60	2.04	4.97	1.80	4.61	1.22	3.44	1.62	5.61	2.03	5.06	26.50	12.00	6.00

SIGN NO. 7: STA 13+05; SHEET 1 OF 21

Identifier : D2-2 8in;
1.88" Radius, 0.75" Border, White on Green;
[Brookshire] ClearviewHwy-3-W specified length; [21] ClearviewHwy-3-W specified length;
1.88" Radius, 0.75" Border, White on Green;
[Richmond] ClearviewHwy-3-W specified length; [44] ClearviewHwy-3-W specified length;
Table of widths and spaces.

	B		r		o		o		k		s		h		i		r		e
6.00	5.47	1.85	3.30	1.44	5.60	1.72	5.60	2.03	5.06	1.04	4.61	1.90	5.06	2.16	1.72	2.16	3.30	1.45	5.33

	2		1	
7.80	4.93	1.26	3.21	6.00

	R		i		c		h		m		o		n		d		4		4	
6.00	5.38	1.81	1.72	1.86	4.88	1.72	5.06	2.36	8.36	1.91	5.60	2.04	5.06	2.00	5.24	10.50	5.69	1.12	5.69	6.00

SIGN NO. 1: STA 28+80; SHEET 2 OF 21

Identifier : I-2aT 8in;
1.50" Radius, 0.75" Border, White on Green;
[Waller] ClearviewHwy-5-W-R specified length;
[CITY LIMIT] ClearviewHwy-3-W;
[POP 2,767] ClearviewHwy-3-W;
Table of widths and spaces.

	W		a		l		l		e		r	
6.00	7.93	0.98	4.47	1.50	1.93	1.34	1.93	1.11	4.44	1.59	2.78	6.00

	C		I		T		Y
10.58	2.17	0.63	0.54	0.60	1.91	0.32	2.31

	L		I		M		I		T	
2.37	1.53	0.64	0.54	0.87	2.47	0.88	0.55	0.59	1.92	10.58

	P		O		P
10.72	1.95	0.64	2.51	0.76	1.95

	2		,		7		6		7	
2.33	1.84	0.60	0.69	0.49	1.87	0.59	1.97	0.51	1.86	10.72

SIGN NO. 6: STA 43+10; SHEET 2 OF 21

Identifier : D14-4T;
3.00" Radius, 1.00" Border, White on Blue;
[ADOPT A] C; [HIGHWAY] C; [NEXT 2 MILES] C;
[ESTHER] C; [CHAPTER #102] C specified length;
Table of widths and spaces.

	A		D		O		P		T
11.15	3.13	0.84	2.74	0.84	2.89	1.05	2.74	0.84	2.50

	A	
5.00	3.13	11.15

	H		I		G		H		W		A		Y	
12.26	2.74	1.05	0.70	1.06	2.73	1.05	2.74	0.84	3.75	0.28	3.13	0.28	3.13	12.26

	N		E		X		T		2
3.33	2.74	1.05	2.50	0.84	2.93	0.57	2.50	5.00	2.73

	M		I		L		E		S	
5.00	3.25	1.05	0.70	1.05	2.50	0.85	2.50	0.84	2.74	3.33

	E		S		T		H		E		R	
13.93	2.50	0.85	2.73	0.85	2.50	0.84	2.74	1.05	2.50	0.84	2.74	13.93

	C		H		A		P		T		E		R
3.00	2.73	0.79	2.74	0.79	3.12	0.79	2.74	0.79	2.50	0.79	2.50	0.79	2.73

	#		1		0		2	
5.00	3.80	0.99	1.01	0.99	2.89	0.79	2.73	3.00

SIGN NO. 1: STA 143+70; SHEET 7 OF 21
SIGN NO. 1: STA 247+90; SHEET 12 OF 21

Identifier : W16-8P;
1.50" Radius, 0.38" Border, 0.38" Indent, Black on Yellow;
[Betka Rd] B specified length;
Table of widths and spaces.

	B		e		t		k		a
2.00	1.69	1.00	1.69	0.74	1.32	1.11	1.69	0.77	1.69

	R		d	
4.00	1.69	0.92	1.69	2.00

SIGN NO. 4: STA 133+00; SHEET 6 OF 21
SIGN NO. 1: STA 168+50; SHEET 8 OF 21

Identifier : W16-8P;
1.50" Radius, 0.38" Border, 0.38" Indent, Black on Yellow;
[Baethe Rd] B specified length;
Table of widths and spaces.

	B		a		e		t		h		e
4.00	1.69	0.81	1.69	0.89	1.69	0.61	1.32	0.91	1.69	0.88	1.69

	R		d	
4.00	1.69	0.75	1.69	4.00

SIGN NO. 2: STA 194+00; SHEET 9 OF 21
SIGN NO. 2: STA 229+90; SHEET 11 OF 21

ROBERT S. BISSETT, JR.
79703

Robert S. Bissett Jr.
09/01/23

GUIDE SIGN DETAILS

SHEET 1 OF 2

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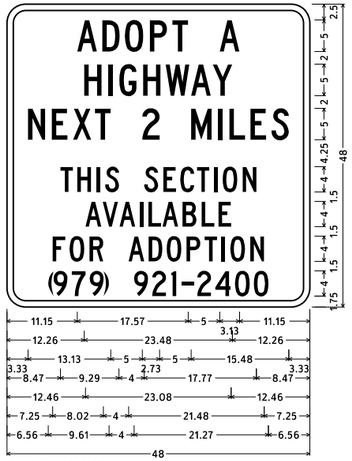
CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		117



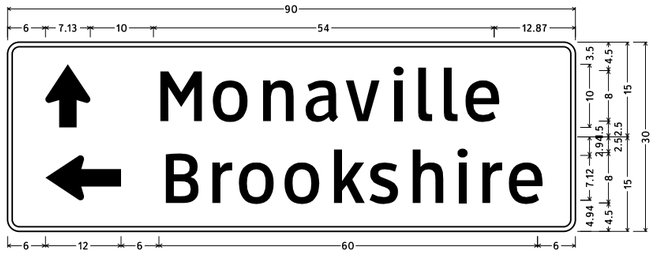
Identifier : D14-4T;
3.00" Radius, 1.00" Border, White on Blue;
[ADOPT A] C; [HIGHWAY] C; [NEXT 2 MILES] C;
[THIS SECTION] C; [AVAILABLE] C;
[FOR ADOPTION] C; [(979) 921-2400] C;
Table of widths and spaces.

11.15	A 3.13	0.84	D 2.74	0.84	O 2.89	1.05	P 2.74	0.84	T 2.50

5.00	A 3.13	11.15

12.26	H 2.74	1.05	I 0.70	1.06	G 2.73	1.05	H 2.74	0.84	W 3.75	0.28	A 3.13	0.28	Y 3.13	12.26		
3.33	N 2.74	1.05	E 2.50	0.84	X 2.93	0.57	T 2.50	5.00	2 2.73							
5.00	M 3.25	1.05	I 0.70	1.05	L 2.50	0.85	E 2.50	0.84	S 2.74	3.33						
8.47	T 2.00	0.67	H 2.19	0.84	I 0.56	0.85	S 2.18									
4.00	S 2.19	0.84	E 2.00	0.68	C 2.19	0.45	T 2.00	0.68	I 0.56	0.84	O 2.31	0.85	N 2.18	8.47		
12.46	A 2.50	0.23	Y 2.43	0.23	A 2.50	0.68	I 0.56	0.84	L 2.00	0.23	A 2.50	0.67	B 2.19	0.84	L 2.00	0.68	E 2.00	12.46
7.25	F 2.00	0.68	O 2.31	0.84	R 2.19											
4.00	A 2.50	0.68	D 2.18	0.68	O 2.31	0.84	P 2.19	0.68	T 2.00	0.67	I 0.56	0.85	O 2.31	0.84	N 2.19	7.25
6.56	I 0.84	0.00	9 2.19	0.68	7 2.19	0.67	9 2.19	-0.00	) 0.85							
4.00	9 2.18	0.68	2 2.19	0.84	1 0.81	0.84	- 2.00	0.46	2 2.18	0.68	4 2.44	0.67	O 2.32	0.67	O 2.31	6.56

SIGN NO. 2: STA 247+90; SHEET 12 OF 21
SIGN NO. 2: STA 364+75; SHEET 17 OF 21
SIGN NO. 3: STA 364+75; SHEET 17 OF 21



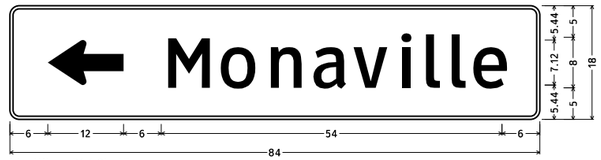
Identifier : D1-2 8in UP-LT;
1.88" Radius, 0.75" Border, White on Green;
Standard Arrow Custom 10.00" X 7.13" 90°; [Monaville] ClearviewHwy-3-W specified length;
1.88" Radius, 0.75" Border, White on Green;
Standard Arrow Custom 12.00" X 7.13" 180°; [Brookshire] ClearviewHwy-3-W specified length;
Table of widths and spaces.

6.00	↑ 7.13	10.00	M 6.59	2.04	o 5.60	2.03	n 5.07	1.98	a 5.38	1.31	v 5.52	1.44	i 1.72	2.17	l 2.26	1.80	l 2.26	1.49	e 5.34	12.87						

6.00	← 12.00

6.00	B 5.47	1.75	r 3.30	1.37	o 5.61	1.62	o 5.61	1.92	k 5.07	0.98	s 4.61	1.80	h 5.06	2.06	l 1.71	2.06	r 3.30	1.37	e 5.33	6.00						

SIGN NO. 4: STA 393+00; SHEET 18 OF 21



Identifier : D1-1 8in LT;
1.50" Radius, 0.50" Border, White on Green;
Standard Arrow Custom 12.00" X 7.13" 180°; [Monaville] ClearviewHwy-3-W specified length;
Table of widths and spaces.

6.00	← 12.00

6.00	M 6.60	2.03	o 5.61	2.03	n 5.06	1.99	a 5.38	1.31	v 5.51	1.44	i 1.72	2.17	l 2.26	1.81	l 2.26	1.49	e 5.33	6.00								

SIGN NO. 2: STA 406+00; SHEET 19 OF 21

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED
PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

09/01/23

GUIDE SIGN DETAILS

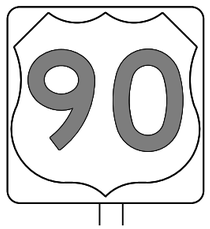
SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		118

DATE: $DATE$ $TIME$
FILE: $FILE$

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

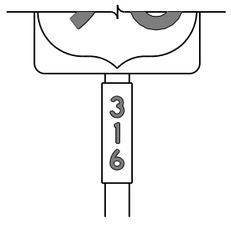
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING

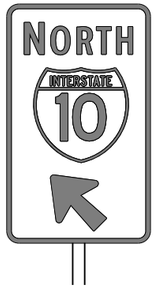


TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING





TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

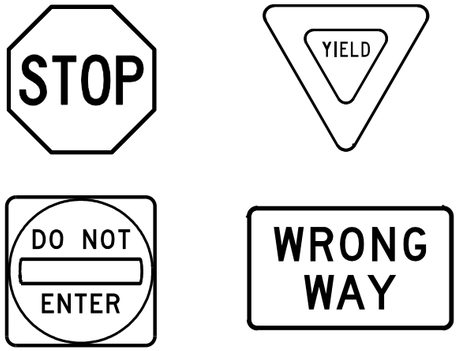
FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	WALLER		119

DATE: $DATE$
FILE: $FILE$

$TIME$

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

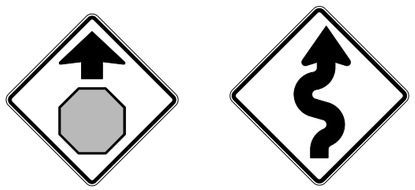
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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

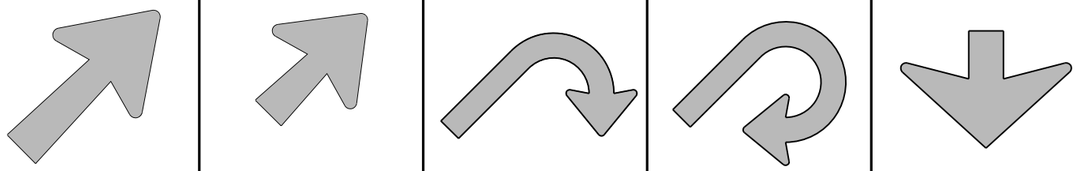
TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	WALLER		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

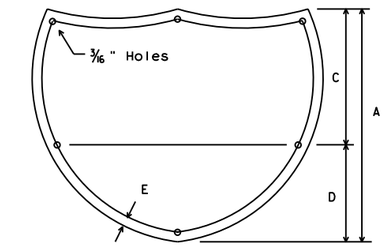
NOTE

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.

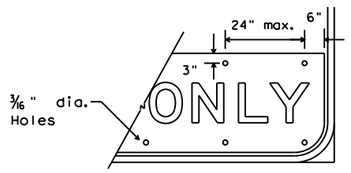
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

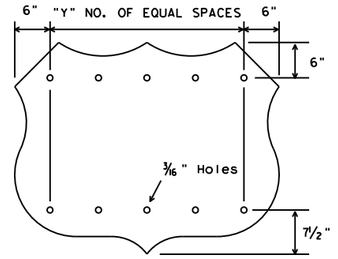


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

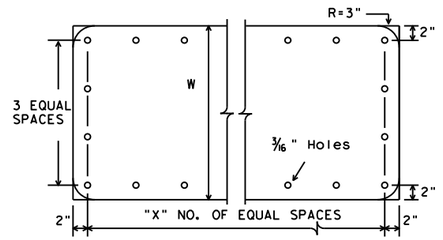


EXIT ONLY PANEL



U.S. ROUTE MARKERS

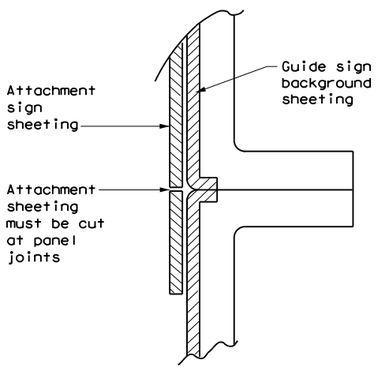
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



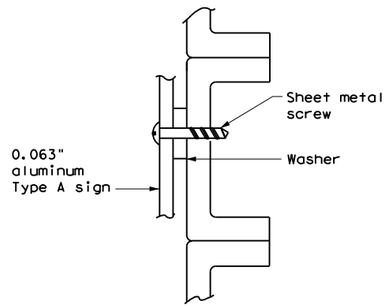
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

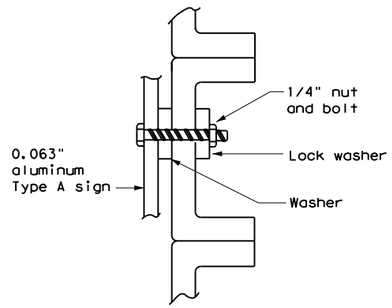
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT



NUT/BOLT ATTACHMENT

NOTE:

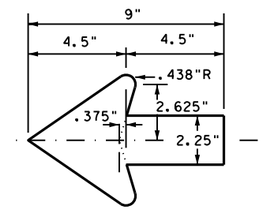
1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

NOTE:

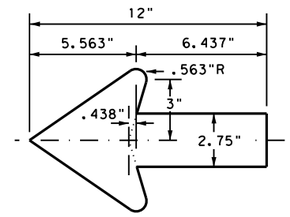
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

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

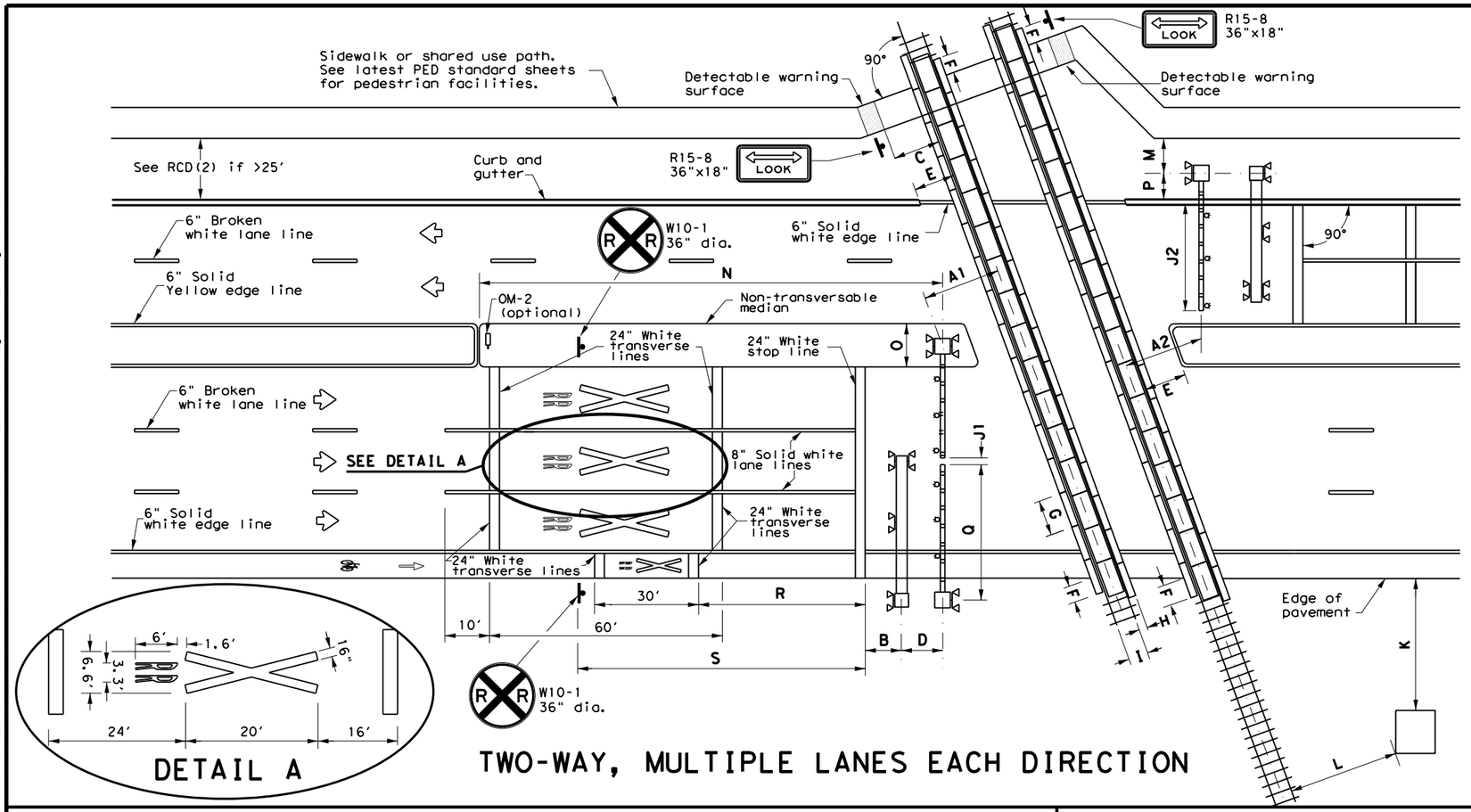
Traffic Operations Division Standard

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	0523	02	051	FM 362
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	WALLER		121

DATE: $DATE$ $TIME$
FILE: $FILE$



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.

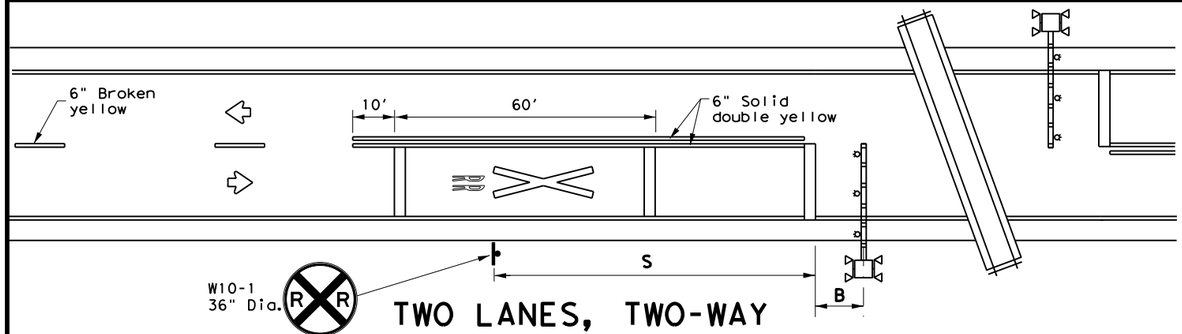
O: Width of median for RR gate assembly: 8'-6" minimum, 10' typical when using median gates. NOTE: Center of gate mast minimum 4'-3" from face of curb.

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.



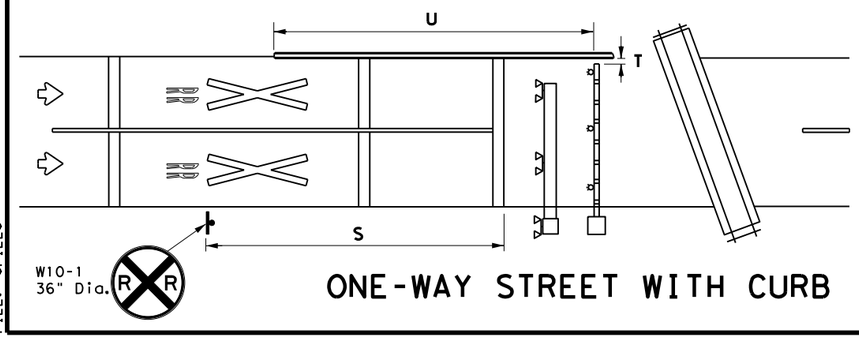
TWO LANES, TWO-WAY

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	
	Sign
	Object Marker
	Traffic Flow
	Cantilever
	Gate Assembly
	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.

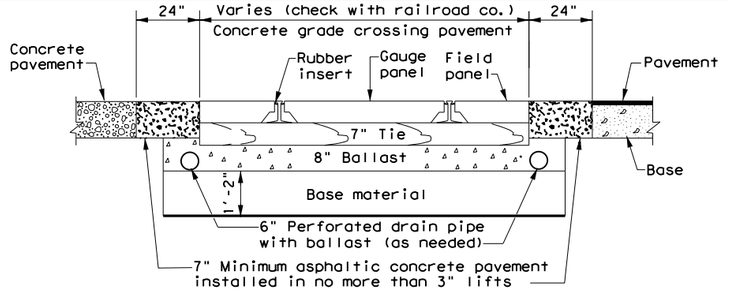


ONE-WAY STREET WITH CURB

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

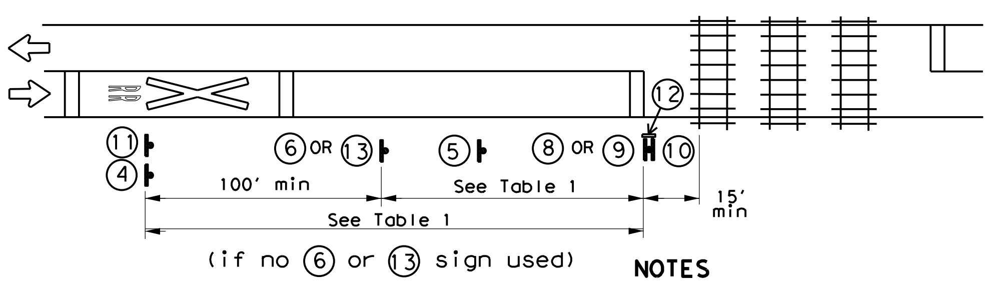
Traffic Safety Division Standard

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
REVISIONS	0523	02	051	FM 362
2-16	DIST	COUNTY		SHEET NO.
11-22	HOU	WALLER		122

DATE: $DATE$ $TIME$
FILE: $FILE$

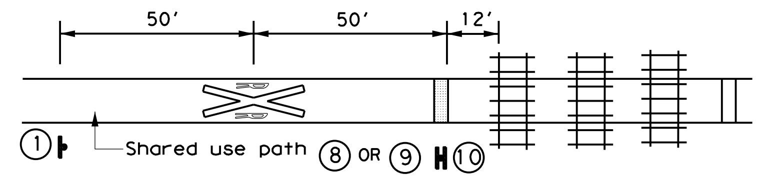
DATE: $DATE$ $TIME$
FILE: $FILE$



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.

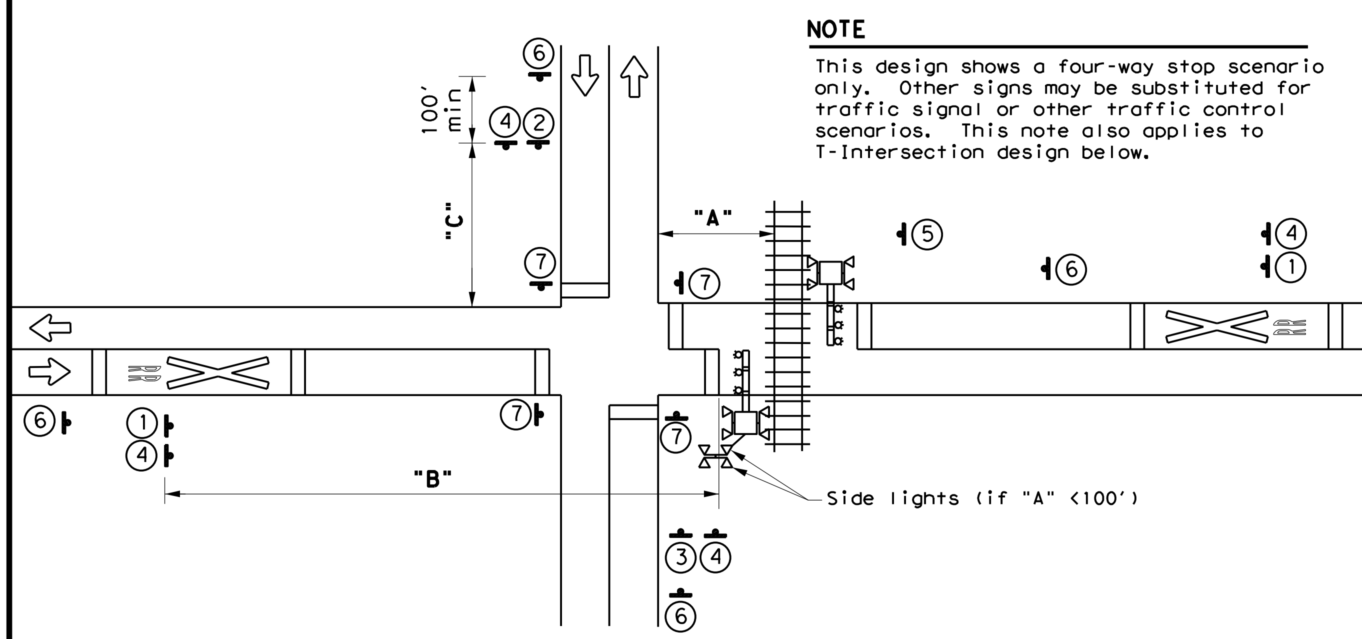
PATHWAY CROSSING

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.

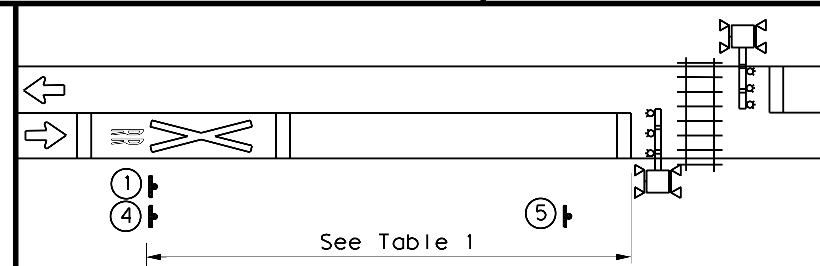


NOTE

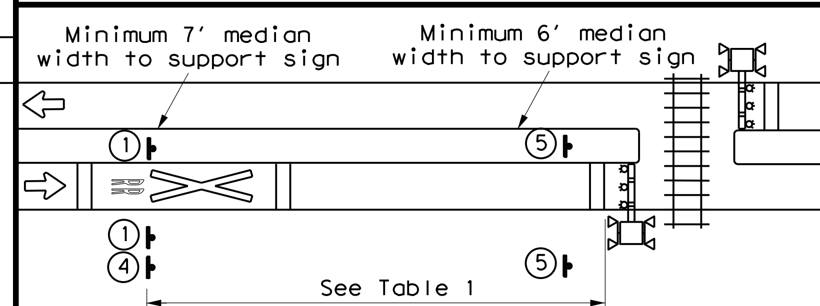
This design shows a four-way stop scenario only. Other signs may be substituted for traffic signal or other traffic control scenarios. This note also applies to T-Intersection design below.

	"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.

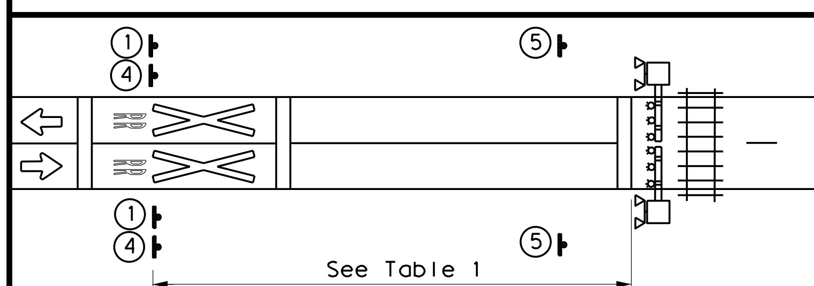
GRADE CROSSING NEAR A PARALLEL STREET



TWO-WAY

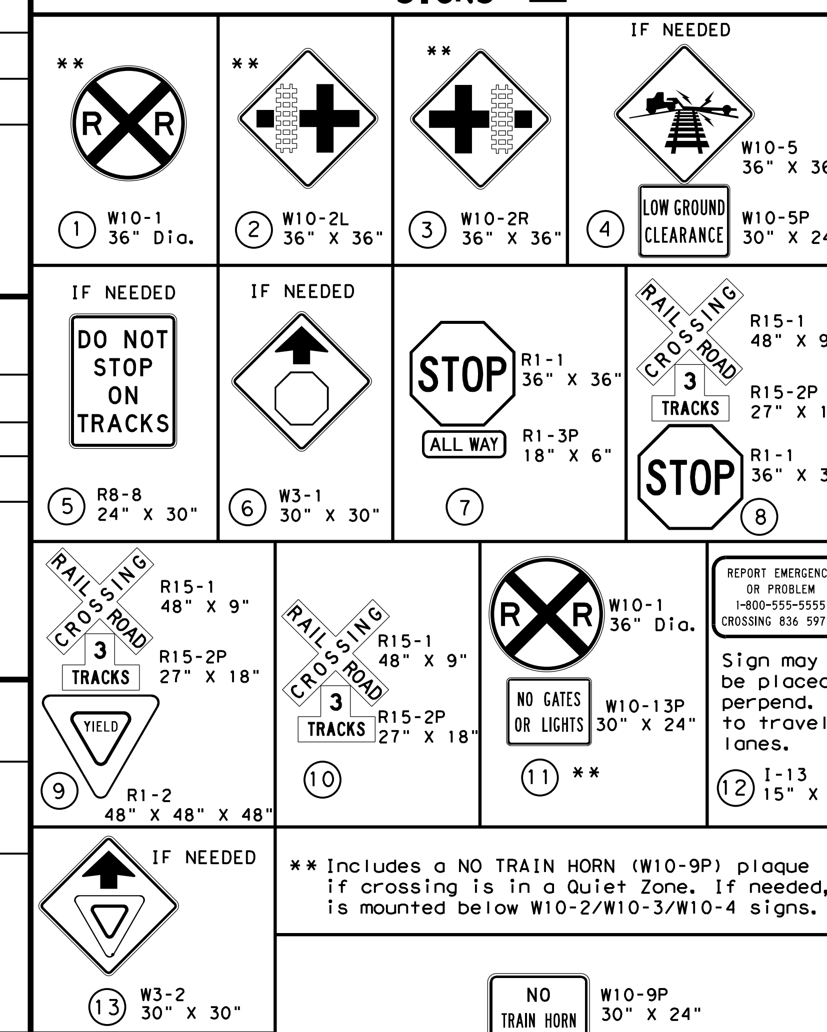


TWO-WAY WITH MEDIAN



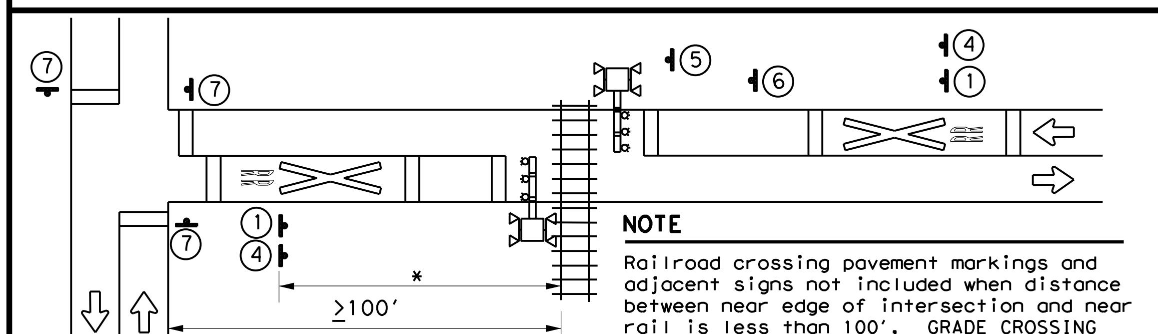
ONE-WAY

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.

NO TRAIN HORN W10-9P 30" X 24"

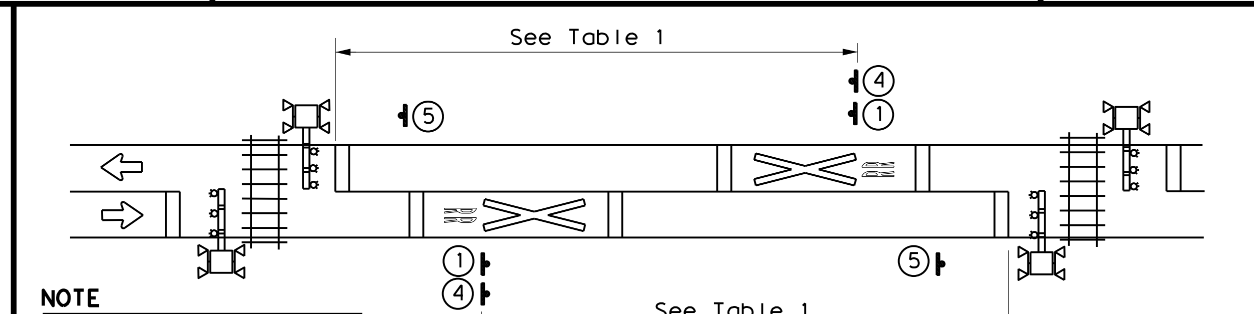


*Use Table 1 if sufficient space exists.

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

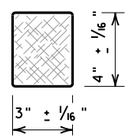
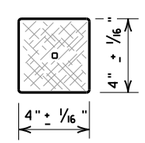
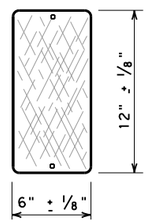
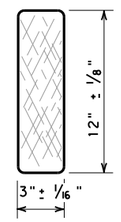
Texas Department of Transportation | Traffic Safety Division Standard

RAILROAD CROSSING DETAILS SIGNING & STRIPING

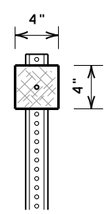
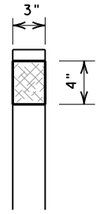
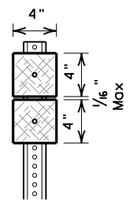
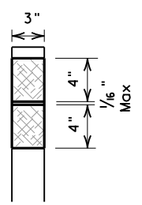
RCD(2)-22

FILE: rcd2-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
2-16 11-22	DIST		COUNTY	SHEET NO.
	HOU		WALLER	123

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

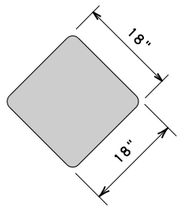
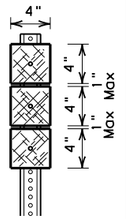
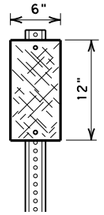
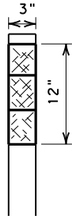
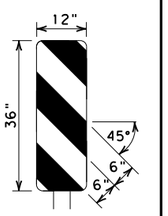
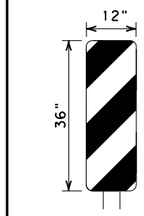
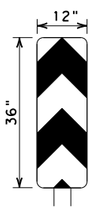
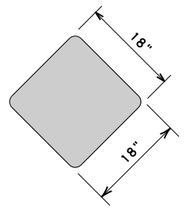
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

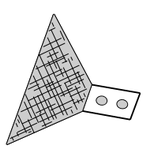
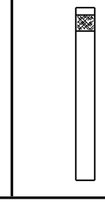
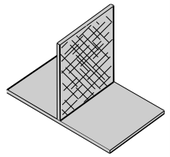
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

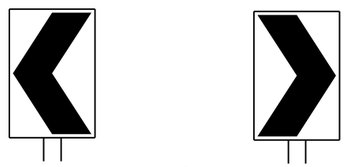
OBJECT MARKERS

	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

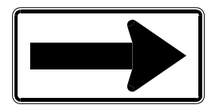
BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE	 W1-8			
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	
NOTE	1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies). 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).			

ONE DIRECTION LARGE ARROW

DEVICE	 W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	HOU	WALLER		124

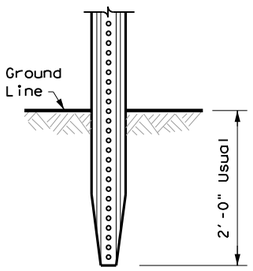
20A

DATE: $DATE$ $TIME$
FILE: $FILE$

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

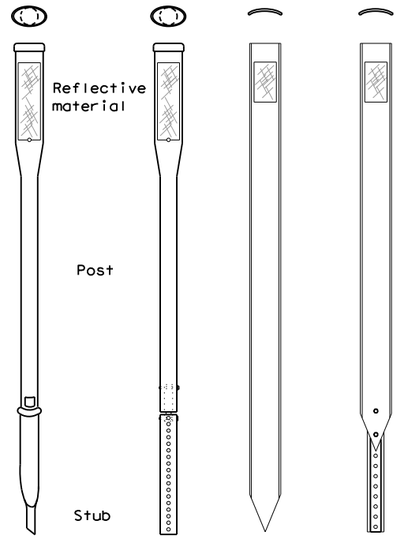


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

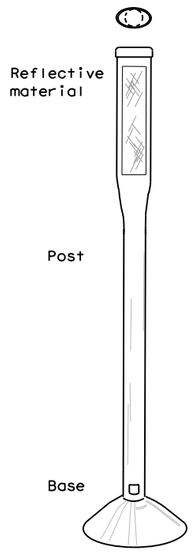
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



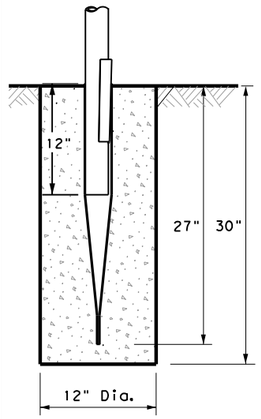
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

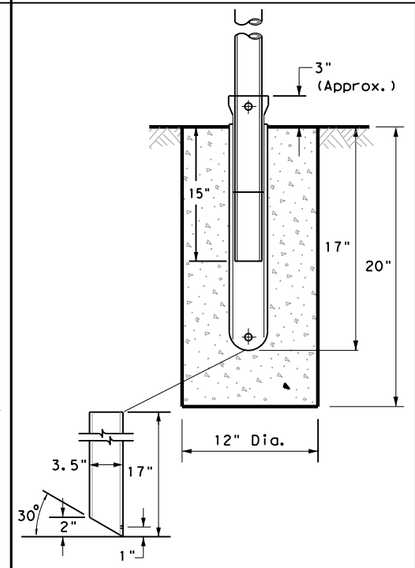
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

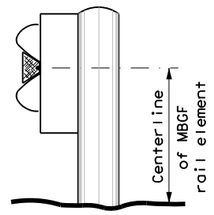
NOTE

1. Install per manufacturer's recommendations.

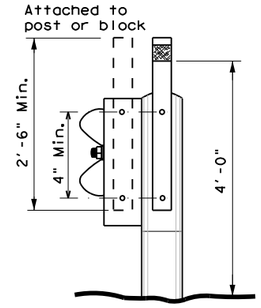
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

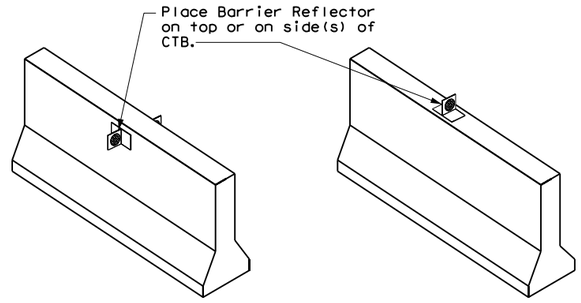
GF1



GF2



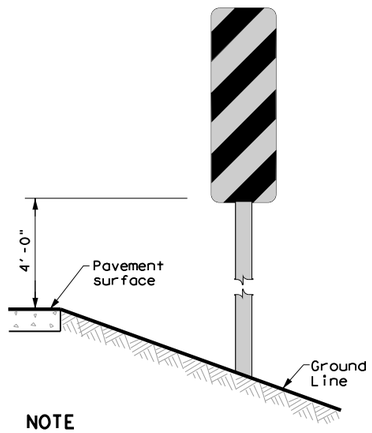
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

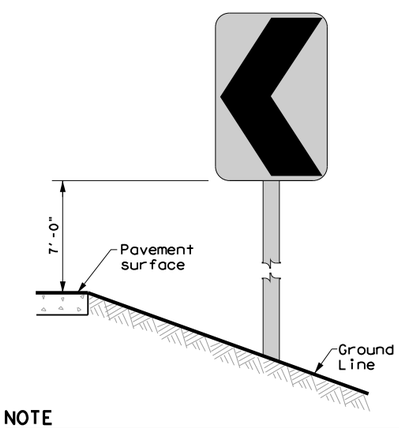
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

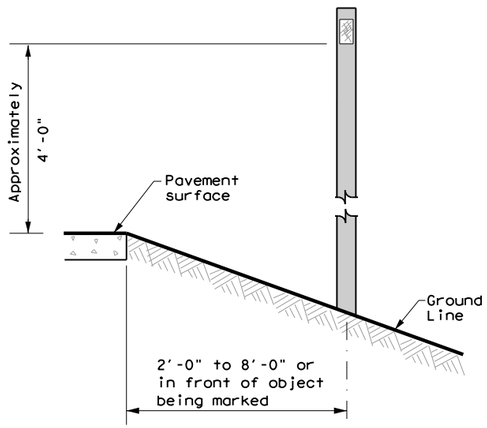
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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REVISIONS	0523	02	051	FM 362
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4-10 7-20	HOU	WALLER		125

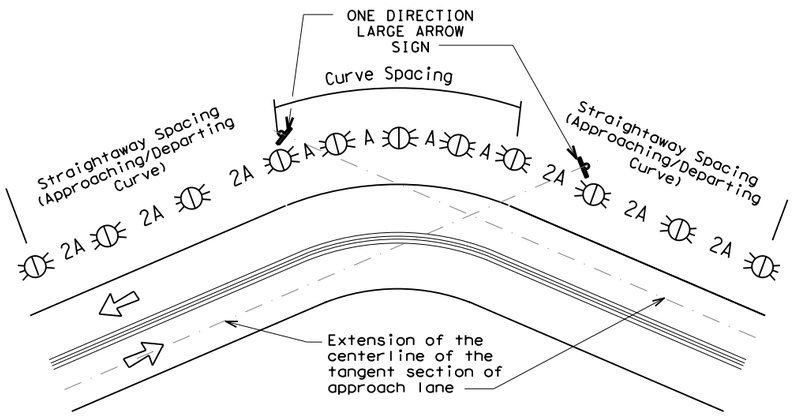
20B

DATE: $DATE$ $TIME$
FILE: $FILE$

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

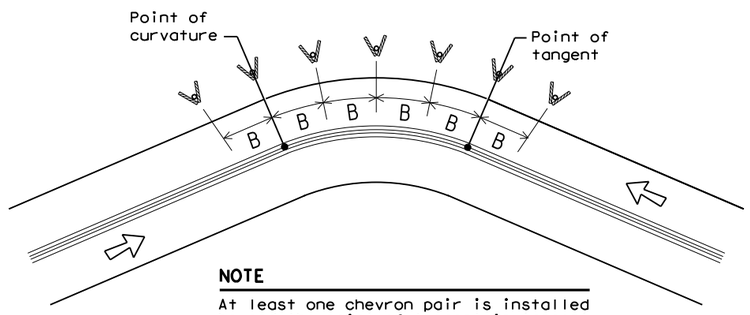
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	——
2	2865	160	320	——
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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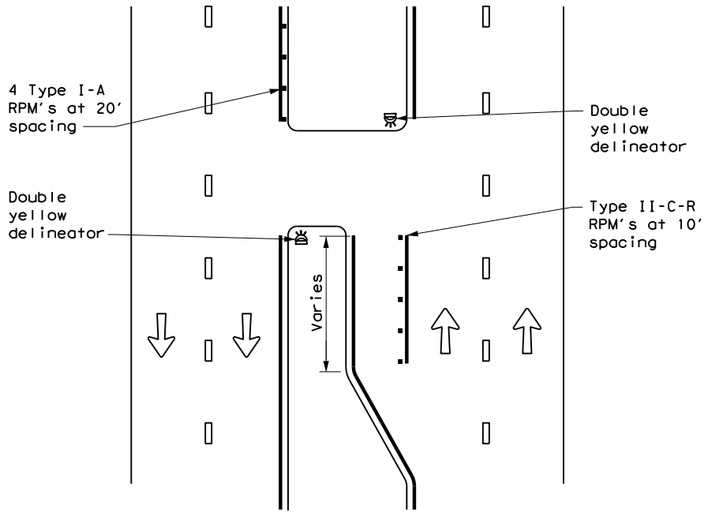
REVISIONS	0523	02	051	FM 362
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	HOU	WALLER		126

20C

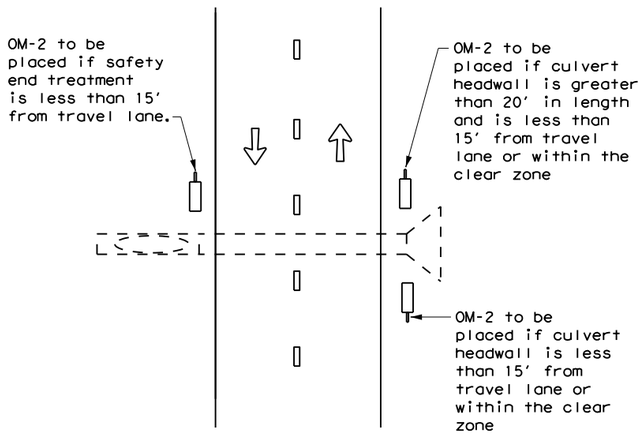
DATE: $DATE$ $TIME$
FILE: $FILE$

CROSSOVERS



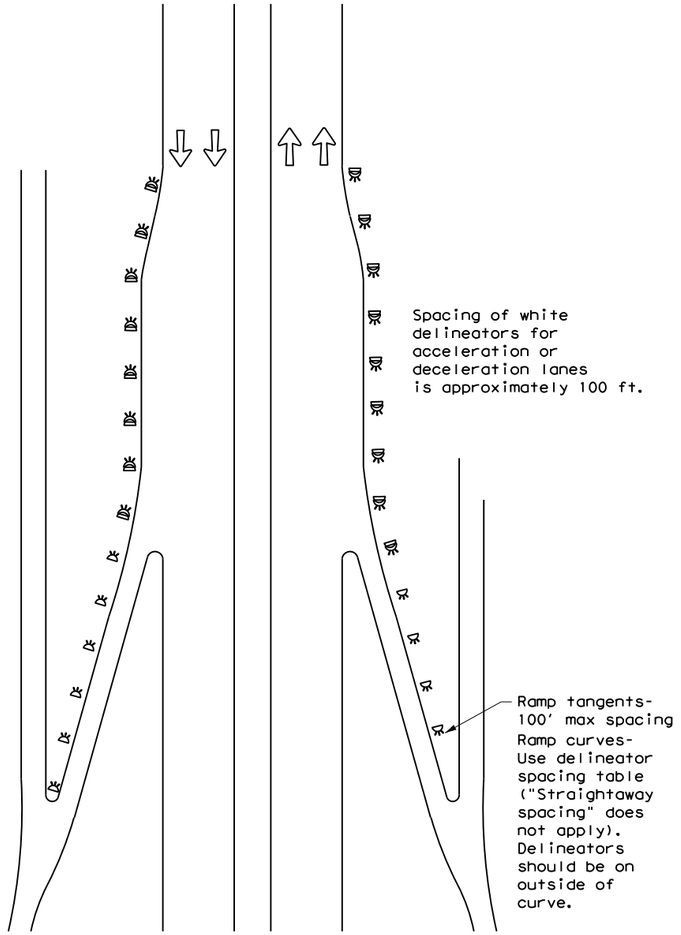
DETAIL 1

FOR CULVERTS WITHOUT MBGF



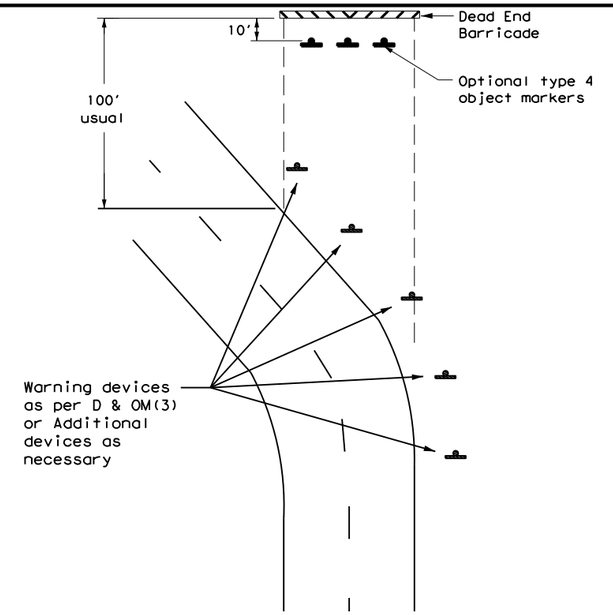
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



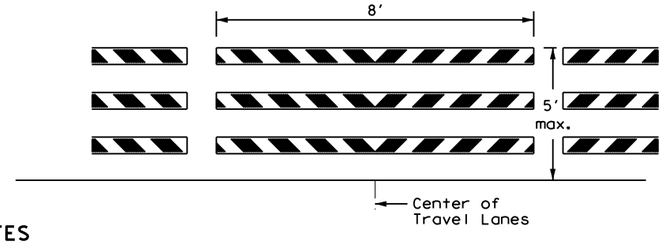
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

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DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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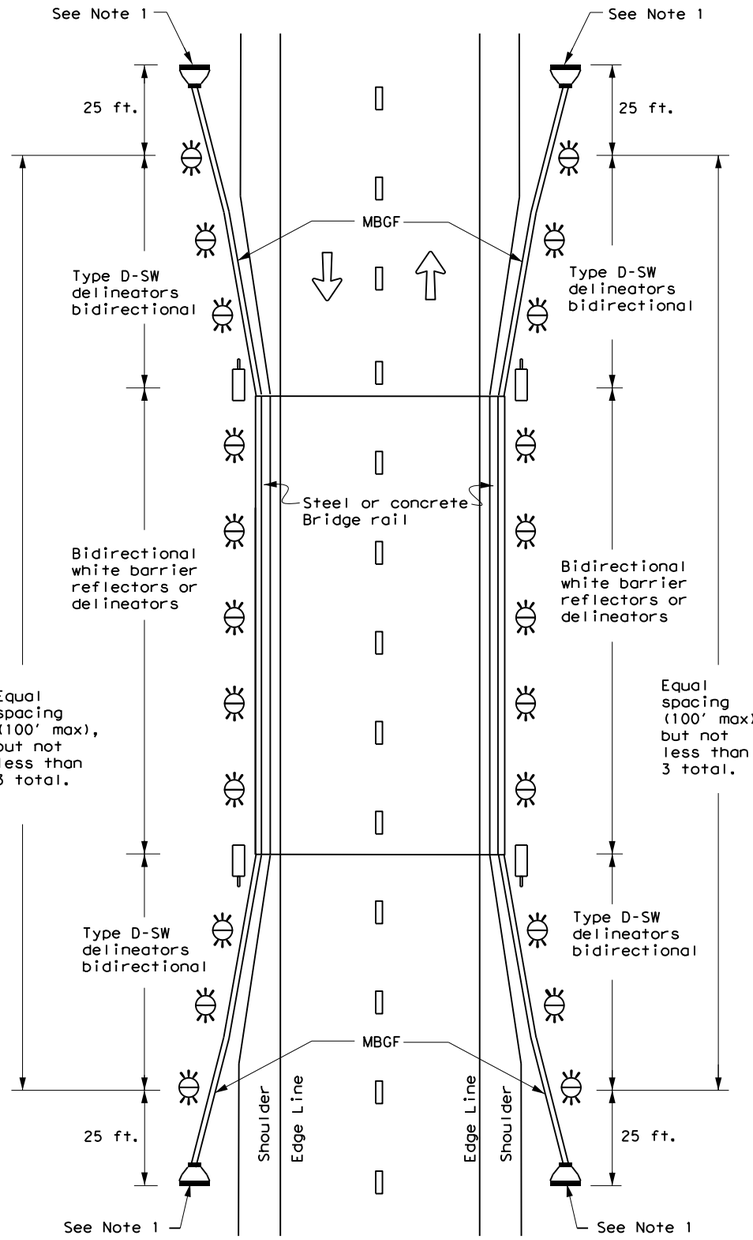
REVISIONS	0523	02	051	FM 362
3-15	DIST	COUNTY		SHEET NO.
7-20	HOU	WALLER		127

20D

DATE: $DATE$ $TIME$
FILE: $FILE$

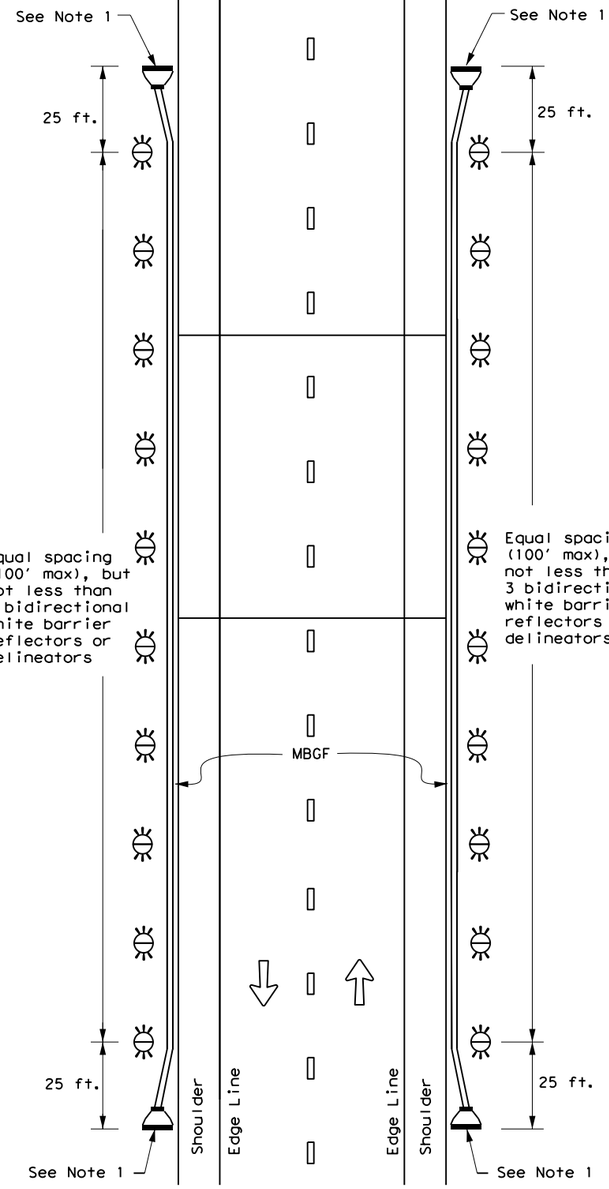
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

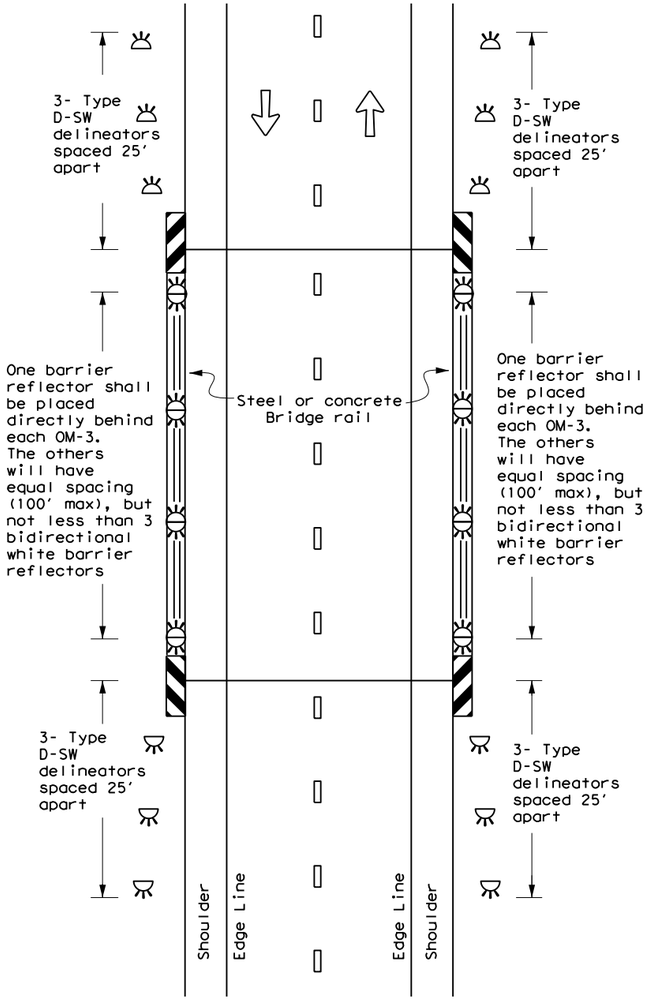
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

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
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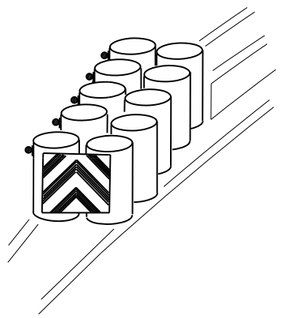
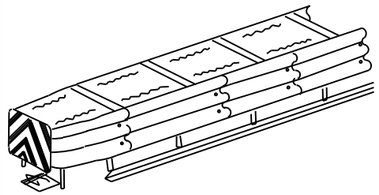
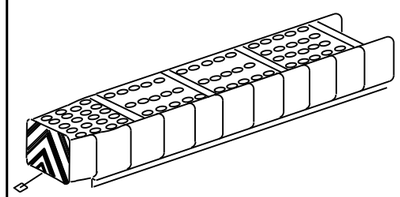
REVISIONS	0523	02	051	FM 362
7-20	DIST	COUNTY		SHEET NO.
	HOU	WALLER		128

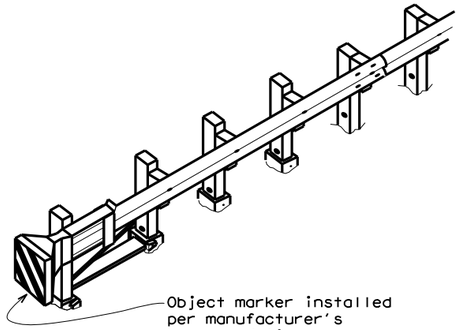
20E

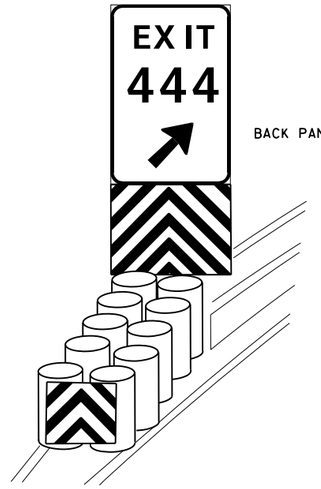
DATE: $DATE$ $TIME$
FILE: $FILE$

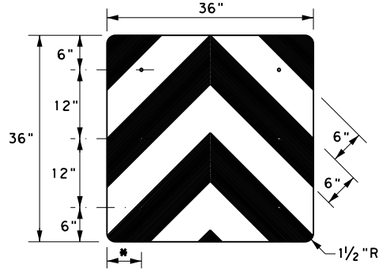


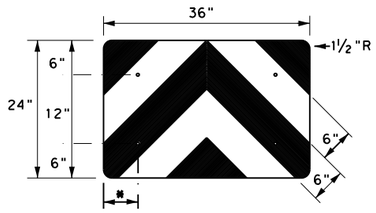




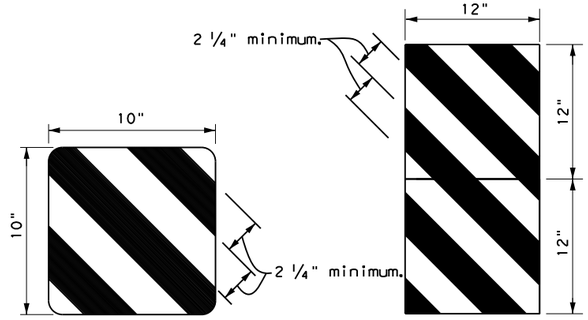




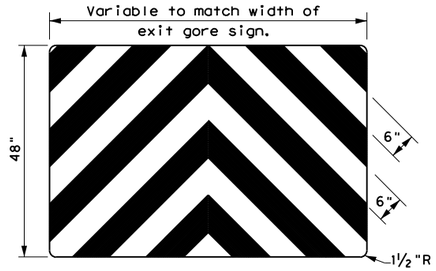


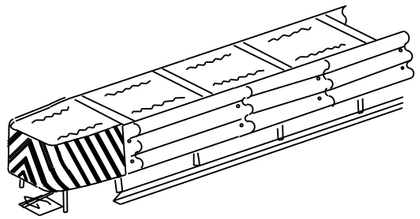


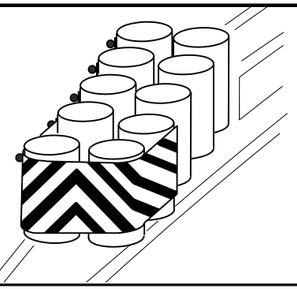
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

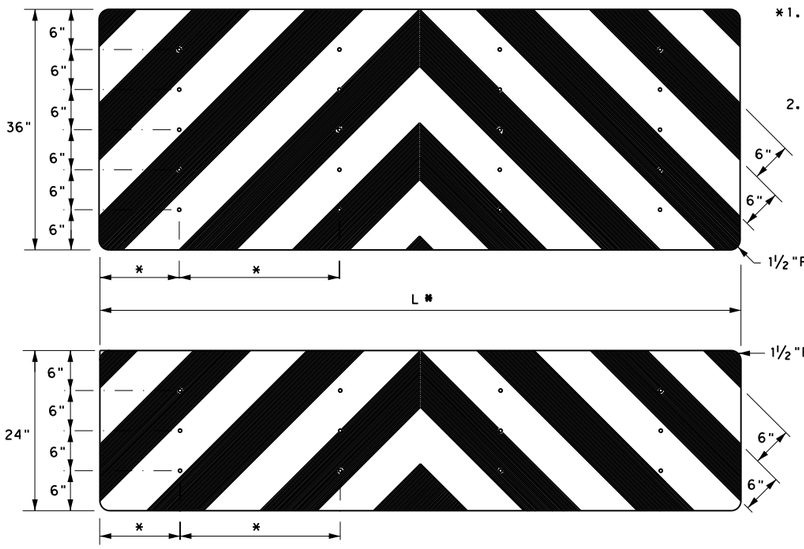


OBJECT MARKERS SMALLER THAN 3 FT^2









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

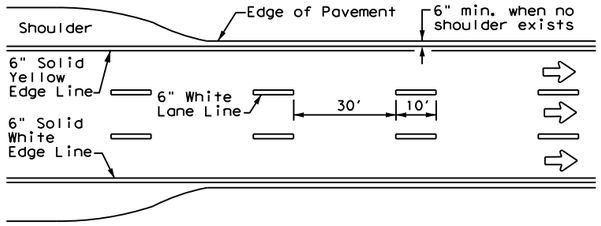
DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

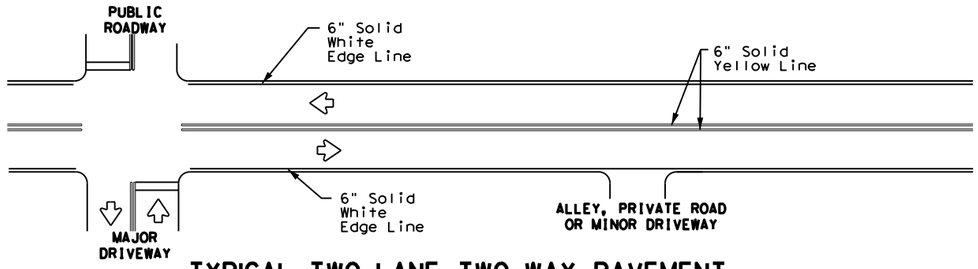
FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	HOU	WALLER		129
4-98 7-20				

20G

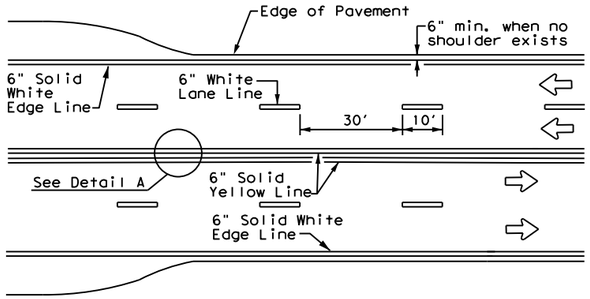
DATE: $DATE$ $TIME$
FILE: $FILE$

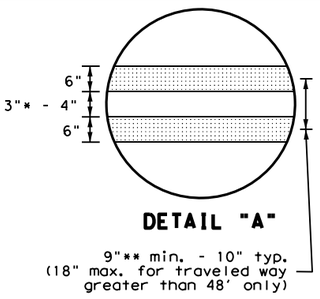


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

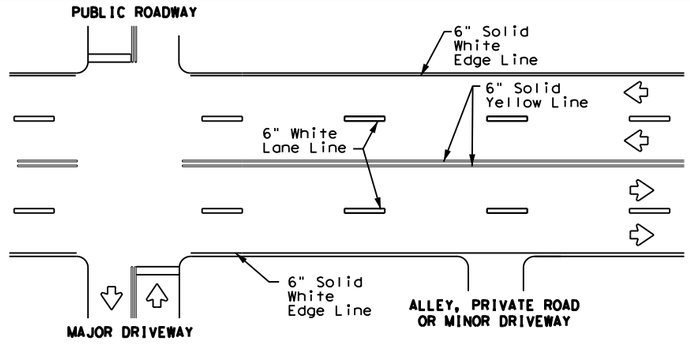




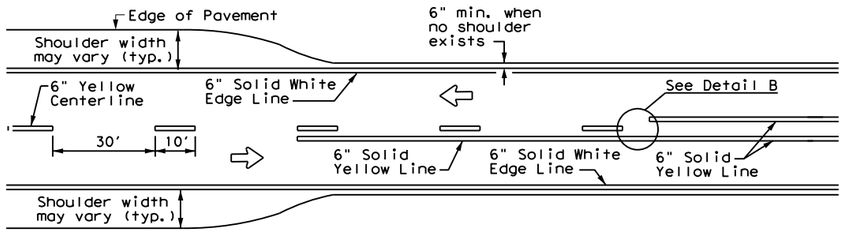
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

* 2" minimum for restripe projects when approved by the Engineer.

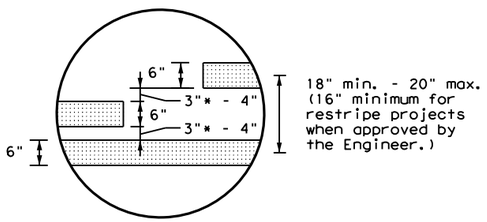
** 8" minimum for restripe projects when approved by the Engineer.



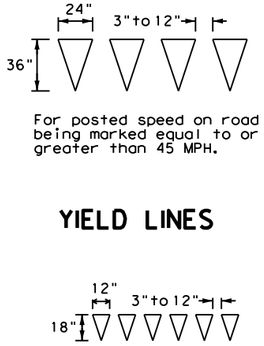
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

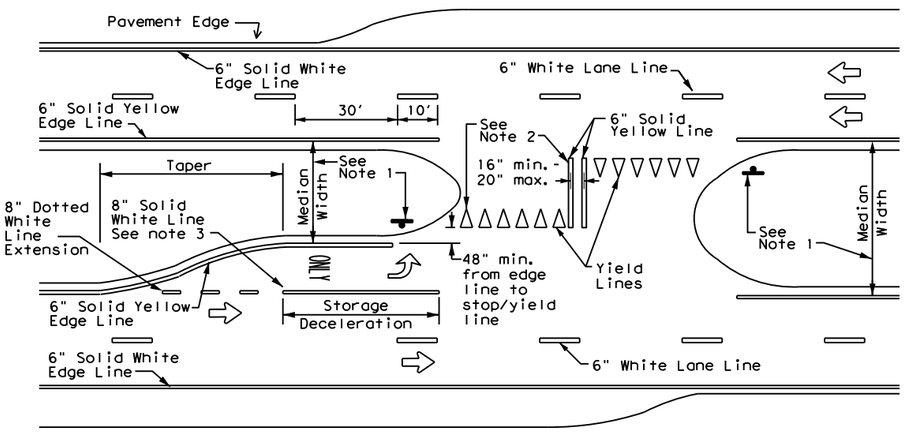


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



* 2" minimum for restripe projects when approved by the Engineer.





FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

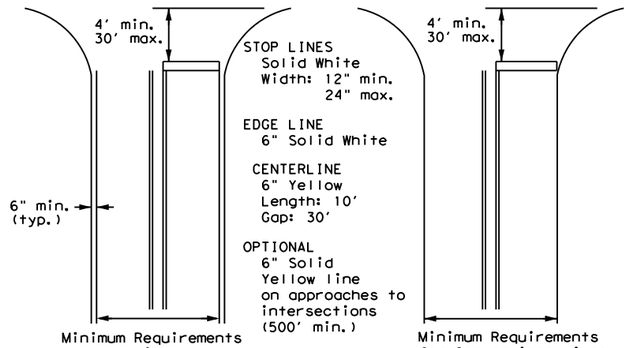
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling 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

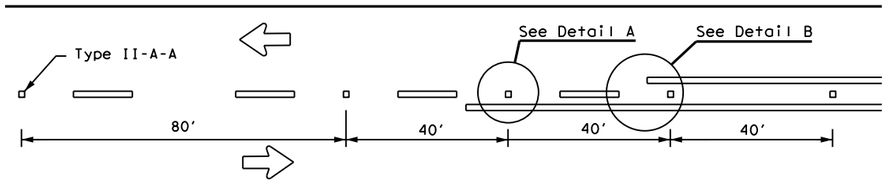
PM(1)-22

FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
11-78 8-00 6-20	DIST	COUNTY		SHEET NO.
8-95 3-03 12-22	HOU	WALLER		130
5-00 2-12				

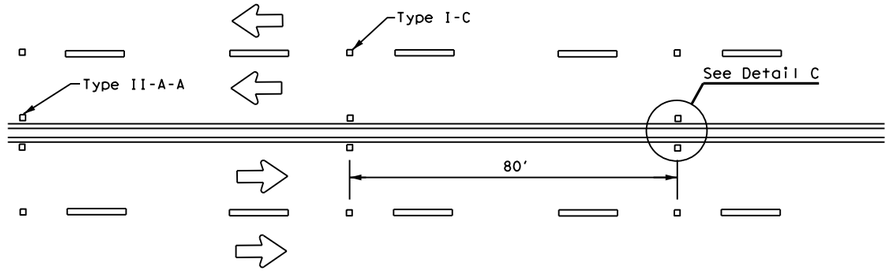
22A

DATE: $DATE$ $TIME$
FILE: $FILE$

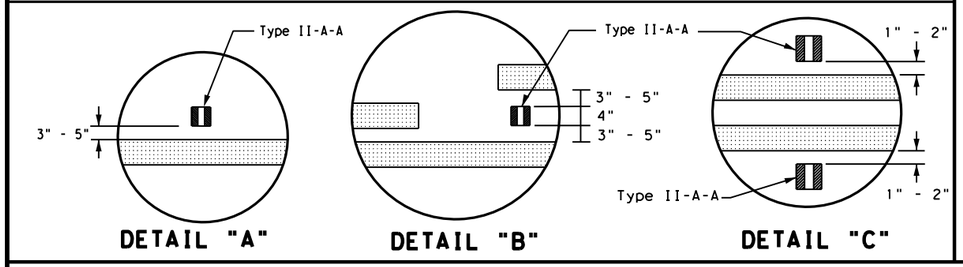
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

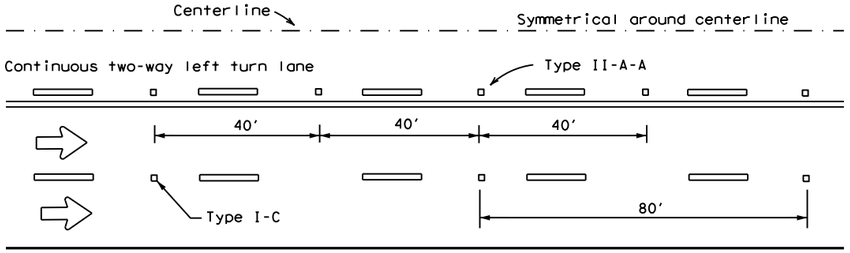


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

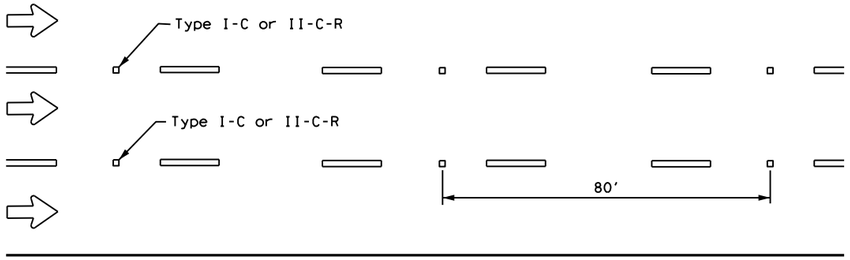


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



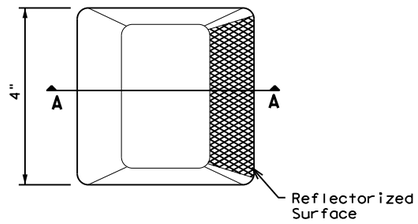
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

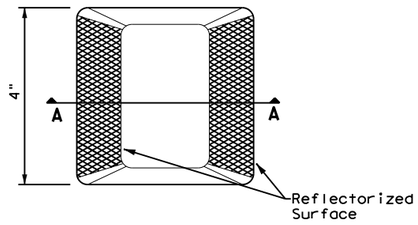
See Note 3.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

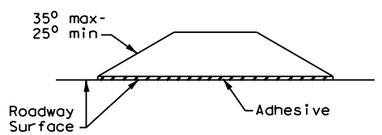
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

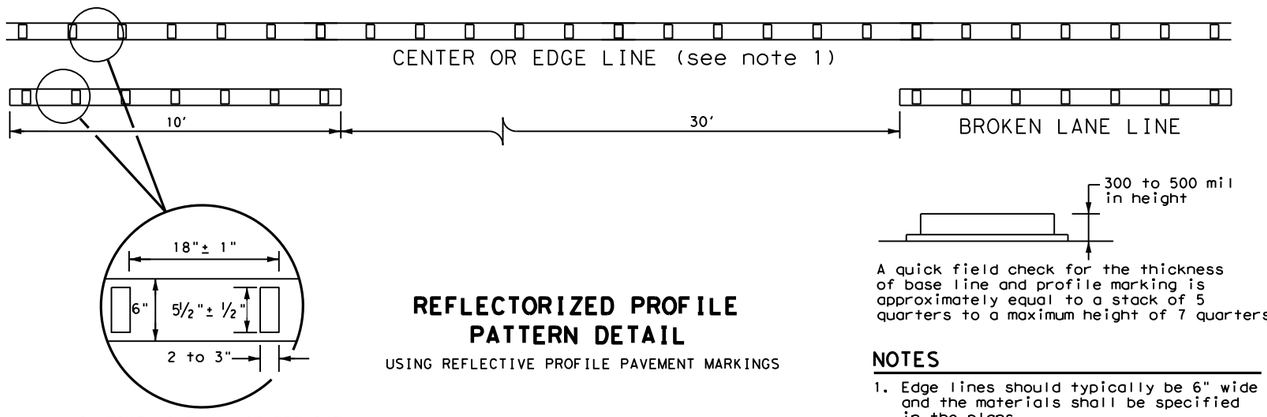


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

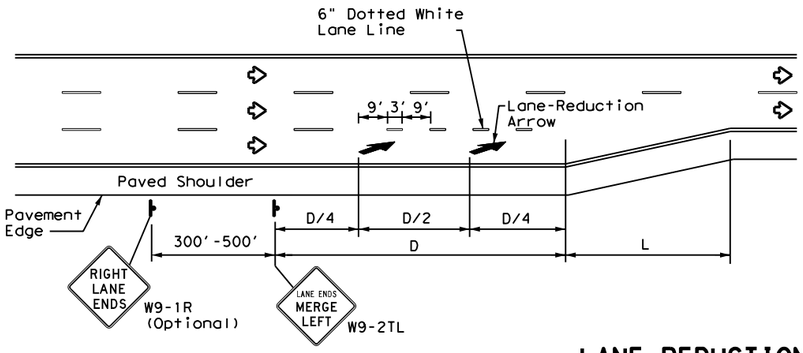
Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		131

22B

DATE: $DATE$ $TIME$
FILE: $FILE$



LANE REDUCTION

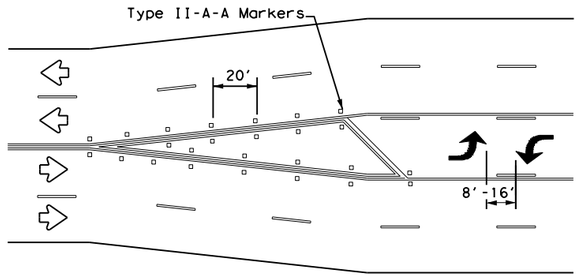
NOTES

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.

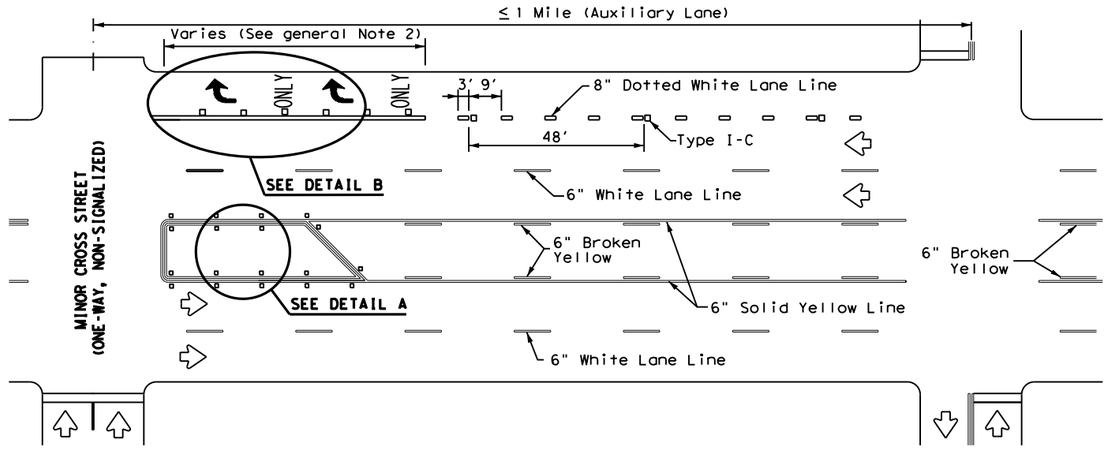


A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

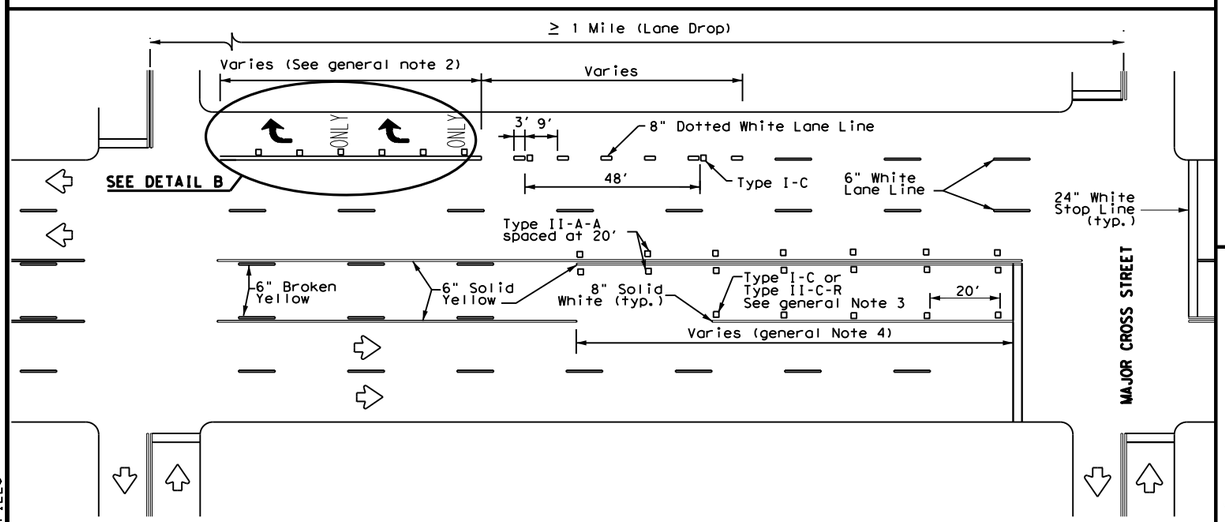
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

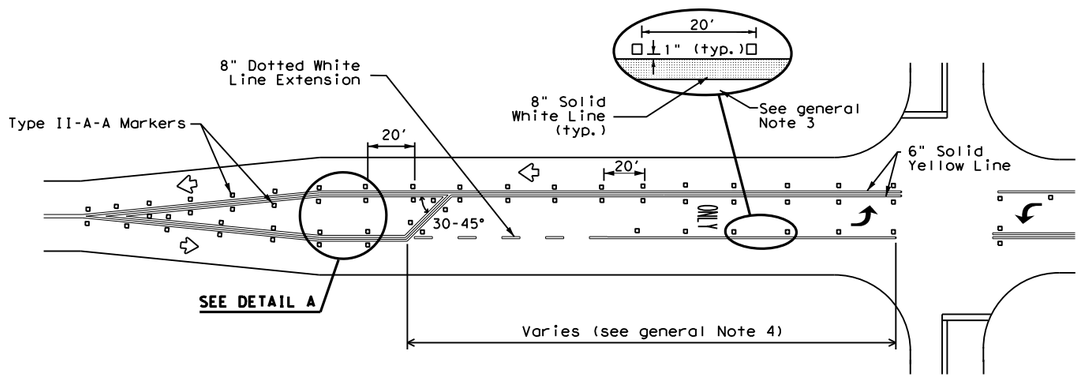
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



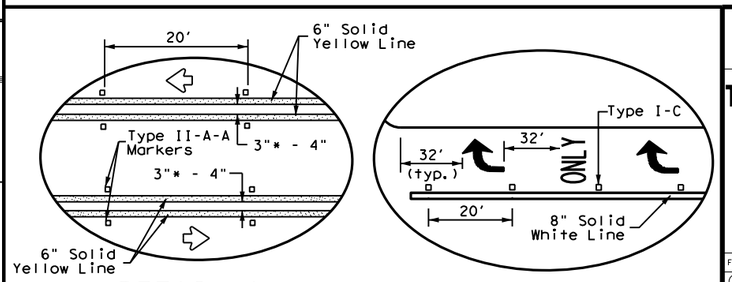
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



* 2" minimum allowed for restripe projects when approved by the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

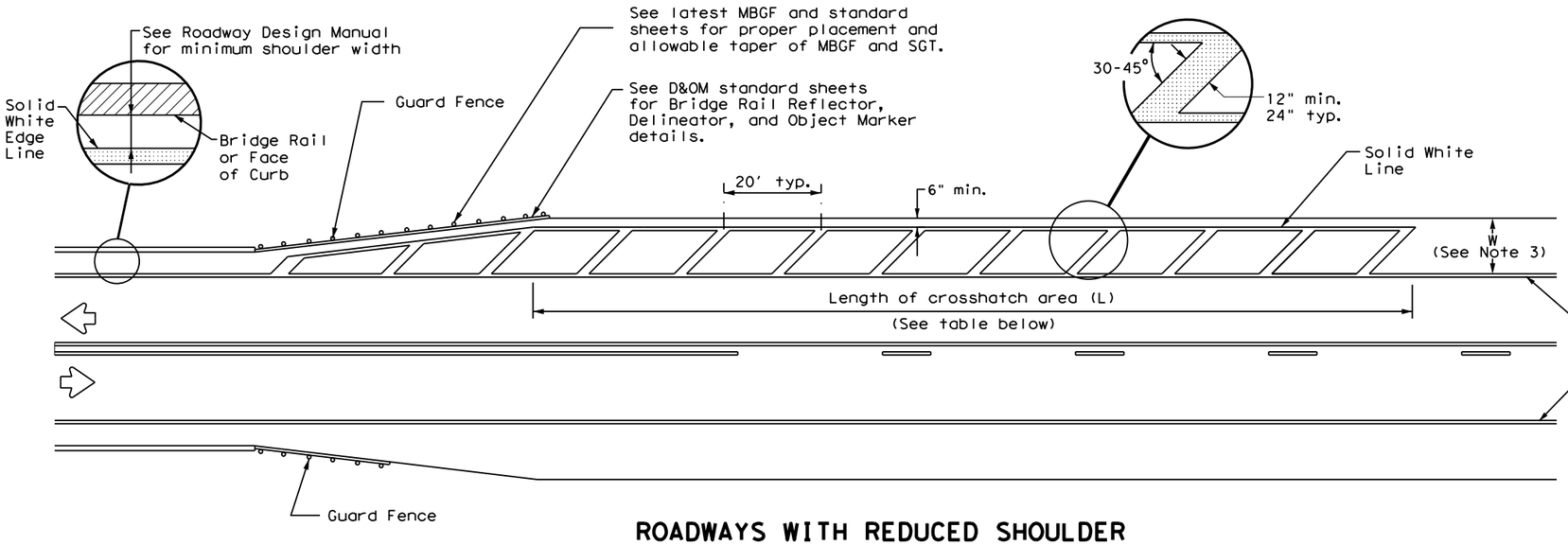
TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-22

FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 3-03 6-20 5-00 2-10 12-22 8-00 2-12	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		132

22C

DATE: $DATE$ $TIME$
FILE: $FILE$



ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT

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 4 inches from the bridge rail or face of curb or 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions.
2. No-passing zone on bridge approach is optional. If used, the no-passing zone shall be a minimum 500 feet long from the beginning of the bridge.
3. The crosshatching should be required if the shoulder width in advance of the bridge is 4 feet or wider and a reduction of at least 3 feet in shoulder width across the bridge occurs.
4. On divided highways, review both the right and left shoulder widths for the need for narrow bridge pavement markings.

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.

CROSSHATCH LENGTH (L)	
Posted Speed (MPH)	L (ft)
30	300 ft
35	
40	
45	
50	500 ft
55	
60	
65	
70	
75	

Texas Department of Transportation

Traffic Safety Division Standard

PAVEMENT MARKINGS FOR ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT

PM(5)-22

FILE: pm5-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		133

22E

DATE: $DATE$ $TIME$
FILE: $FILE$

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

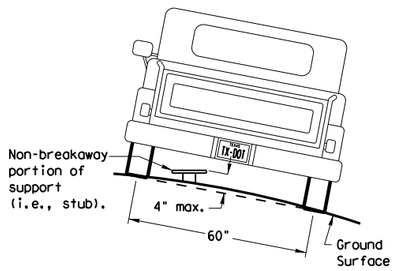
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

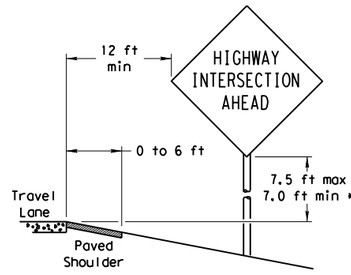
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

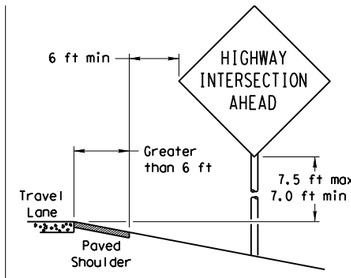
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

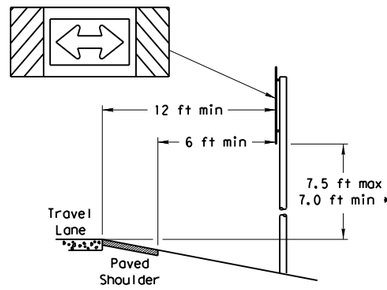
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



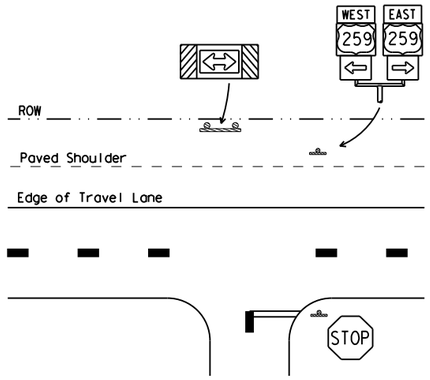
GREATER THAN 6 FT. WIDE

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.

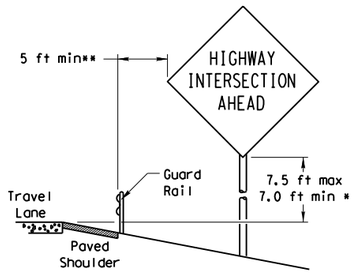
T-INTERSECTION



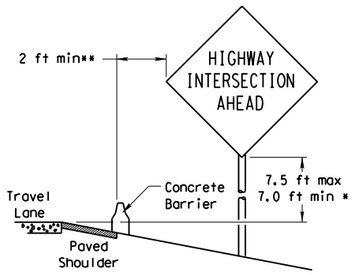
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



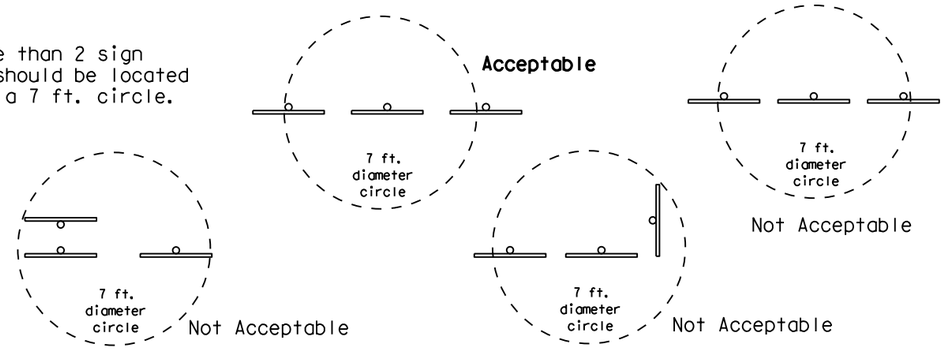
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

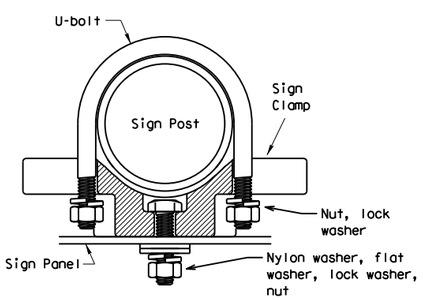
**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

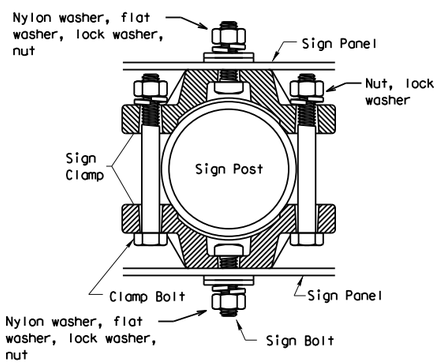


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

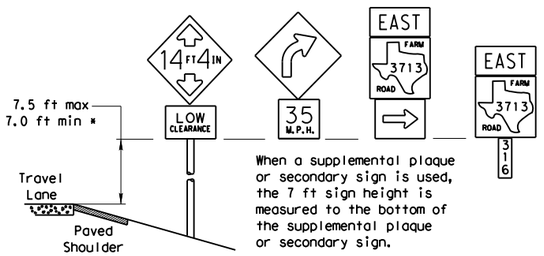
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



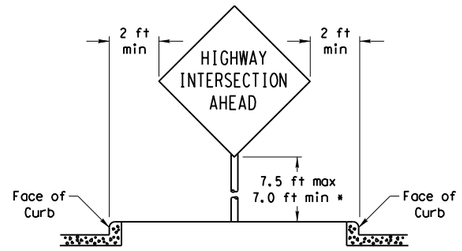
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



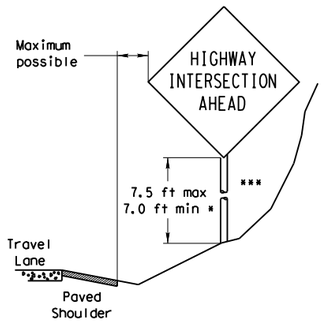
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

* 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

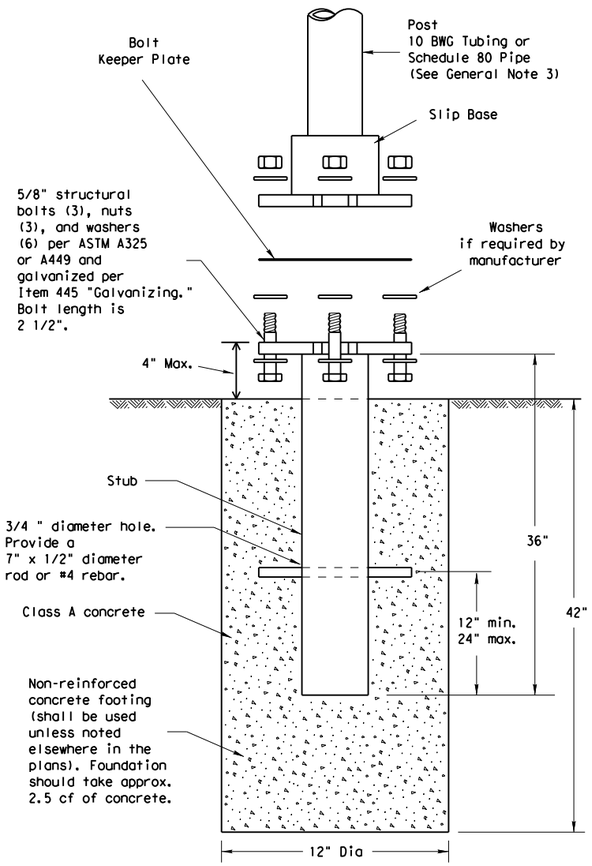
REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362

DIST	COUNTY	SHEET NO.
HOU	WALLER	134

DATE: $DATE$ $TIME$
FILE: $FILE$

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.

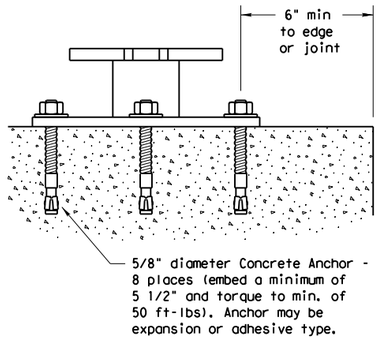
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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

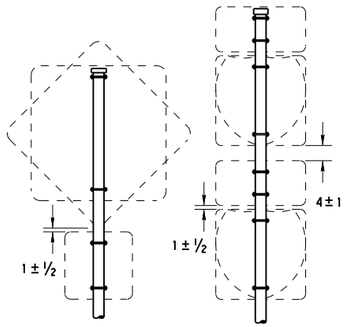
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

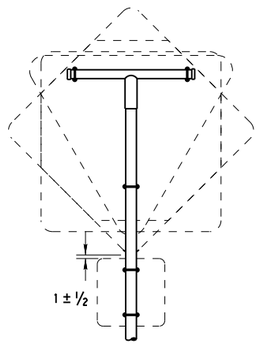
CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362

DIST	COUNTY	SHEET NO.
HOU	WALLER	135

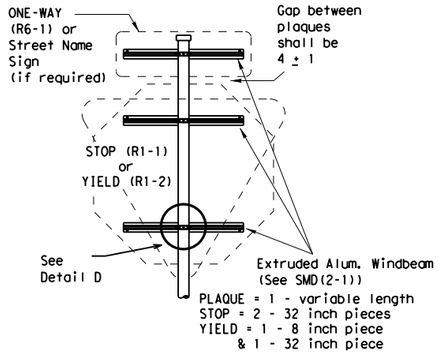
DATE: $DATE$ $TIME$
FILE: $FILE$



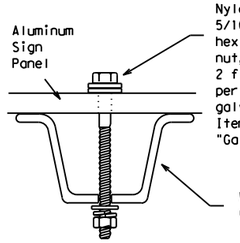
SM RD SGN ASSM TY XXXXX(1)XX(P)



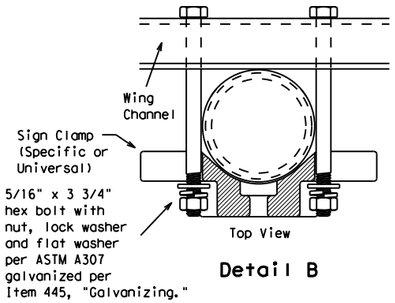
SM RD SGN ASSM TY XXXXX(1)XX(T)



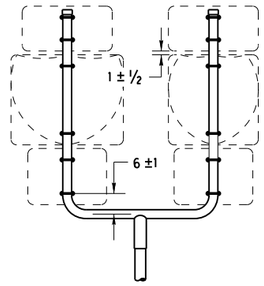
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



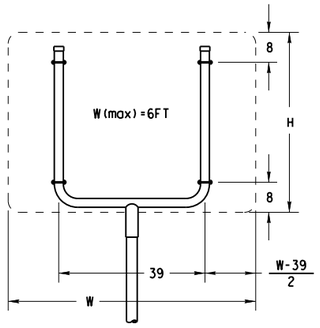
Detail A



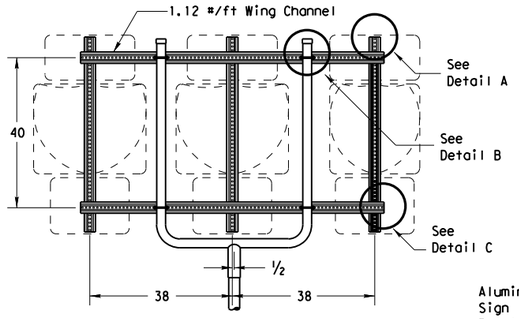
Detail B



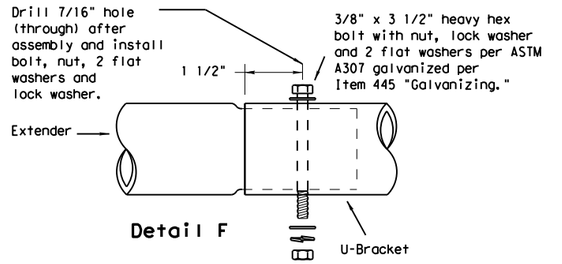
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

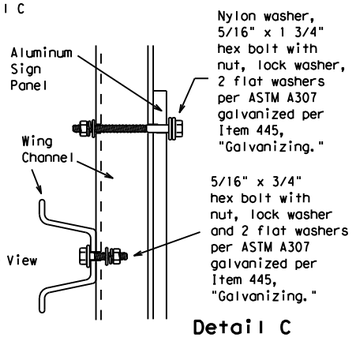


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

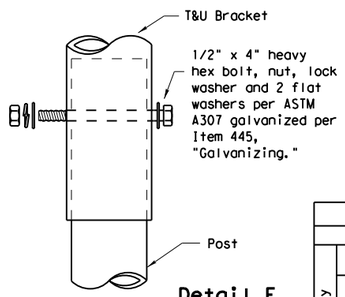


Detail F

Splices shall only be allowed behind the sign substrate.



Detail C



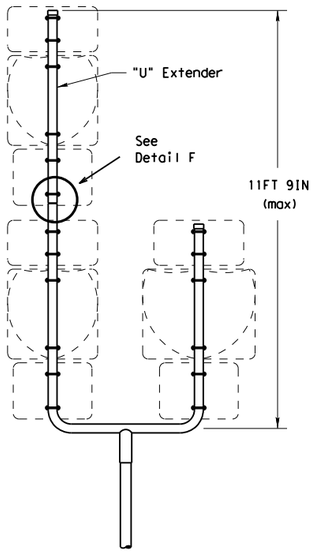
Detail E

GENERAL NOTES:

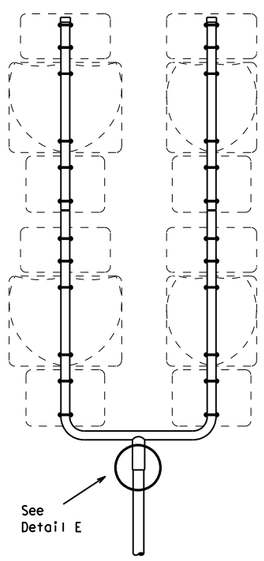
1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

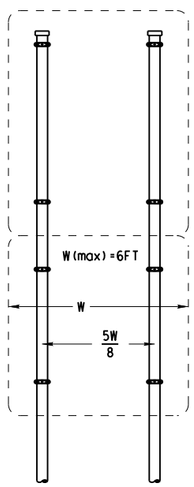
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.



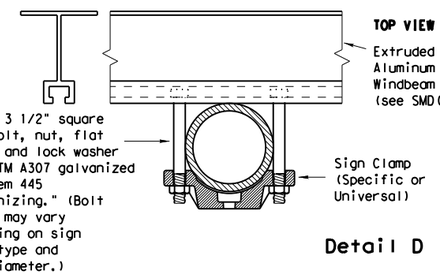
SM RD SGN ASSM TY S80(1)XX(U-1EXT)



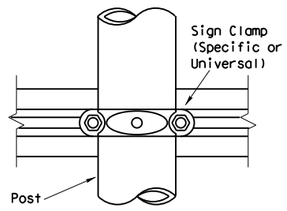
SM RD SGN ASSM TY S80(1)XX(U-2EXT)



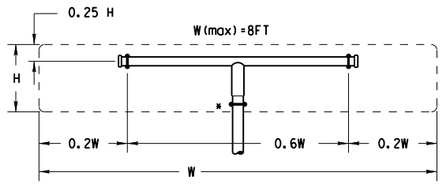
SM RD SGN ASSYM TY XXXXX(2)XX(P)



Detail D



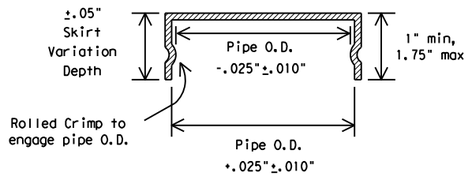
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)



All dimensions are in english unless detailed otherwise.

SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

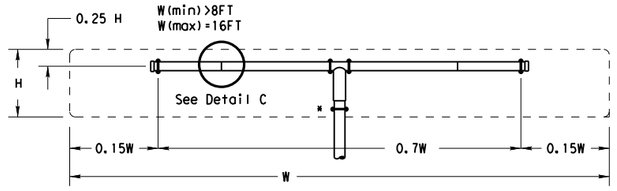
DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT

9-08 REVISIONS

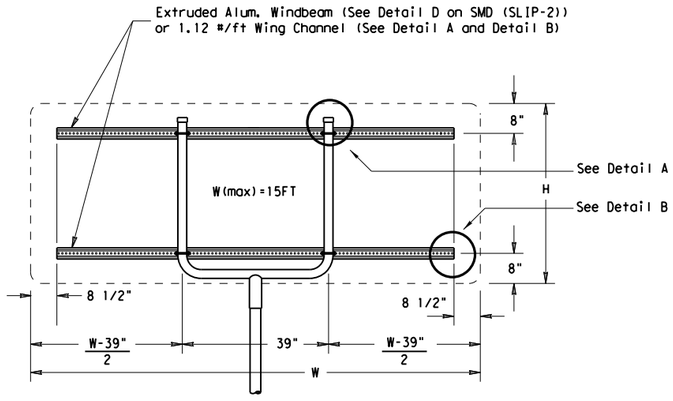
CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362

DIST	COUNTY	SHEET NO.
HOU	WALLER	136

DATE: $DATE$ $TIME$
FILE: $FILE$



SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



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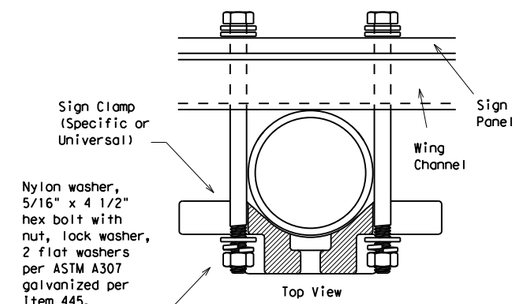
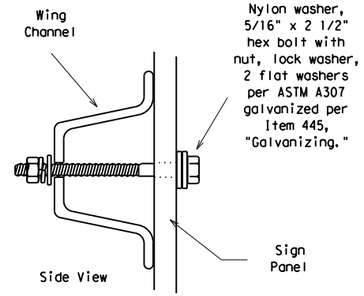
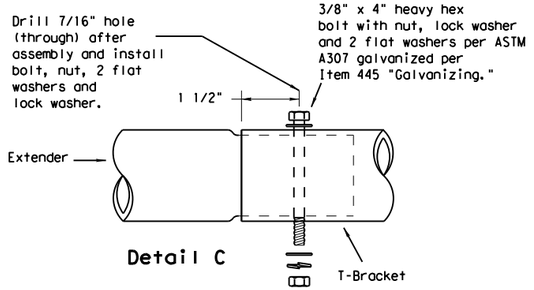


Top View

Detail A



Detail B



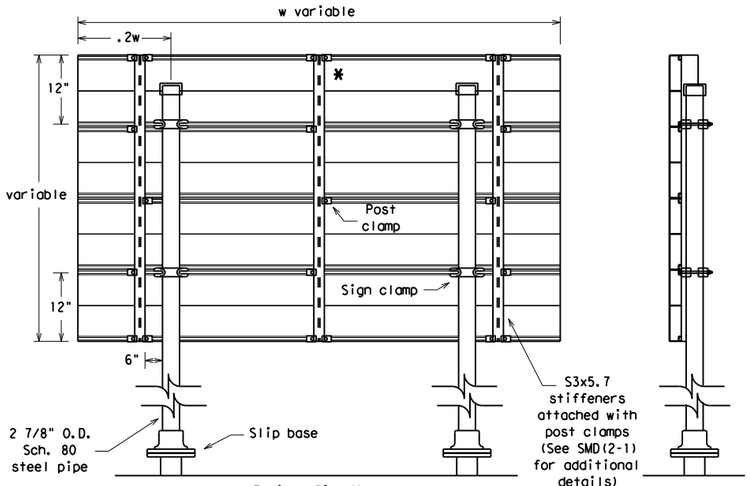
Detail C

Splices shall only be allowed behind the sign substrate.

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.

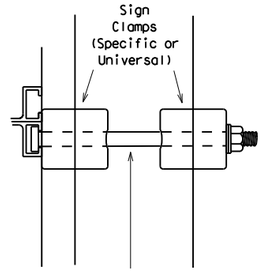


Typical Sign Mount

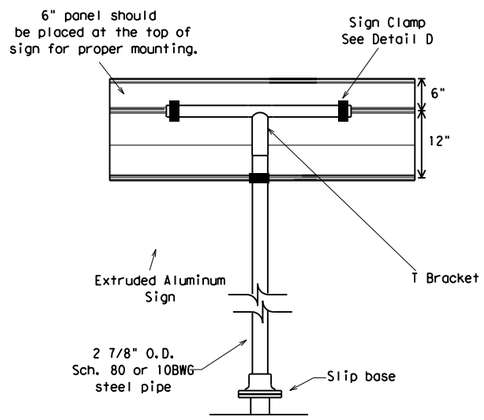
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

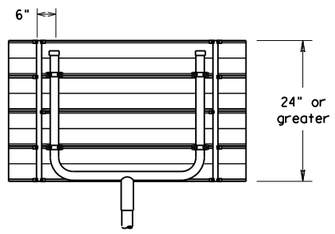
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

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

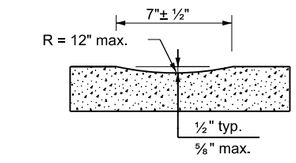
REVISIONS
9-08

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

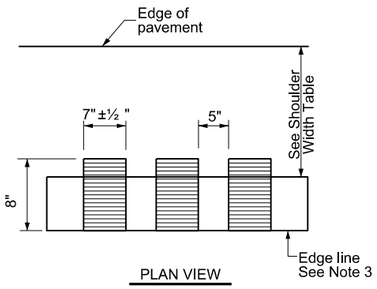
CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		137

DATE: $DATE$ $TIME$
FILE: $FILE$

DATE: $DATE$ $TIME$
FILE: $FILE$

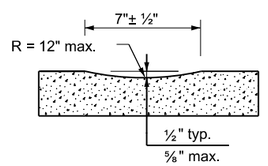


PROFILE VIEW
OPTION 1

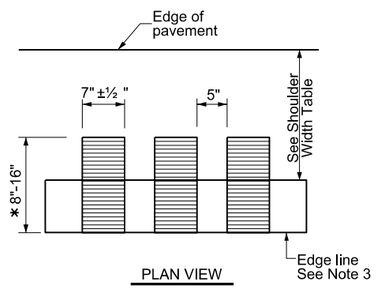


PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



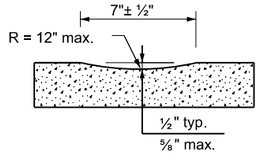
PROFILE VIEW
OPTION 2



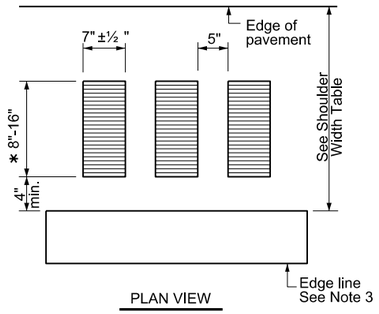
PLAN VIEW

∗ This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



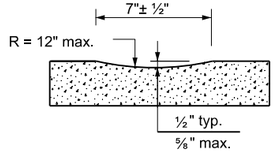
PROFILE VIEW
OPTION 3



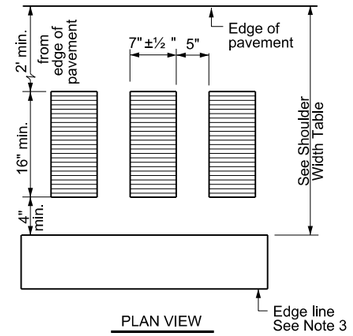
PLAN VIEW

∗ This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

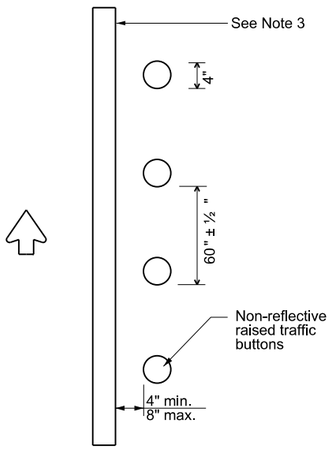


PROFILE VIEW
OPTION 4



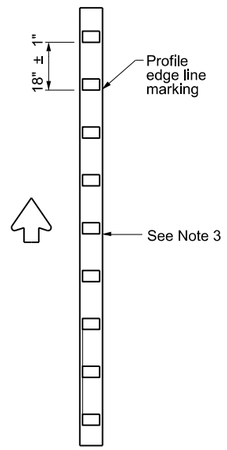
PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



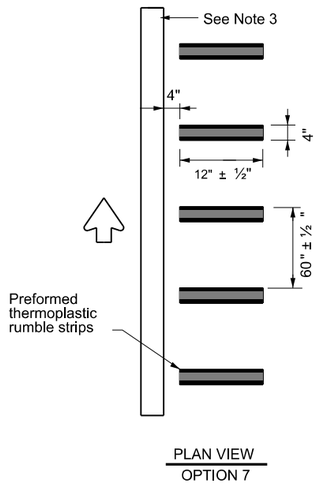
PLAN VIEW
OPTION 5

RAISED EDGE LINE
(Rumble Strips)



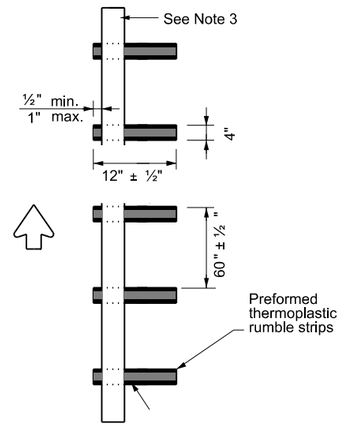
PLAN VIEW
OPTION 6

PROFILE EDGE LINE MARKINGS
(Rumble Strips)



PLAN VIEW
OPTION 7

PREFORMED THERMOPLASTIC EDGE LINE
(Rumble Strips)



PLAN VIEW
OPTION 8

PREFORMED THERMOPLASTIC EDGE LINE
(Rumble Strips)

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5, 6 or 8	Option 1, 2, 3 5, 6 or 7	Option 2, 4, 5 6 or 7

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) and FPM(1) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the Shoulder Width Table below for determining what options may be used for edge line rumble strips.
5. Breaks in edge line rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections, or driveways with high usage of large trucks when installed on conventional highways.
6. Rumble strips shall not be placed across exit or entrance ramps, acceleration or deceleration lanes, crossovers, gore areas, or intersections with other roadways.
7. Consideration should be given to noise levels when edgeline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

9. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
10. Pavement markings can be applied over milled shoulder rumble strips to create an edge line rumble strip.

WHEN INSTALLING RAISED OR PROFILE EDGE LINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edge line when used as a rumble strip. The color of the button should match the color of the adjacent edge line marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.
15. Raised profile thermoplastic markings used as edge lines may substitute for buttons.

Texas Department of Transportation

Traffic Safety Division Standard

EDGE LINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23

FILE: rs(2)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
10-13 1-23	DIST	COUNTY		SHEET NO.
	HOU	WALLER		138

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DATE: $DATE$ $TIME$
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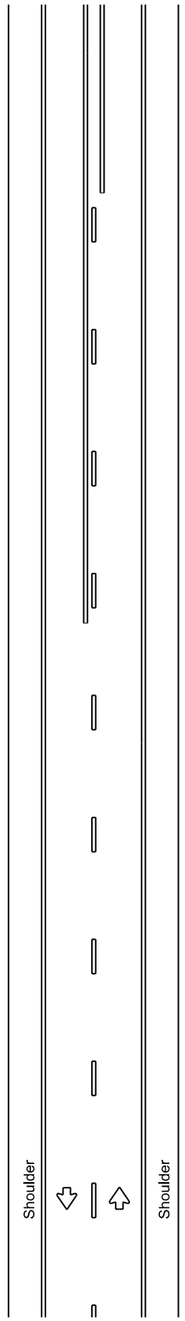
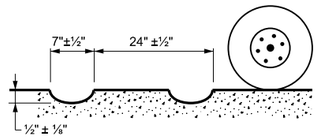
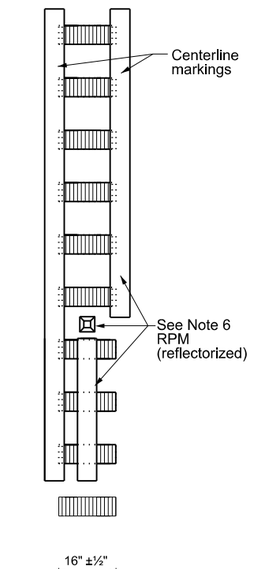
CENTERLINE RUMBLE STRIPS

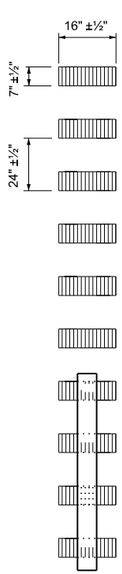


TWO LANE TWO-WAY HIGHWAYS



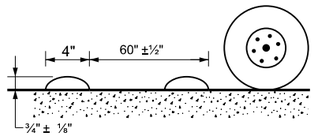
PROFILE VIEW



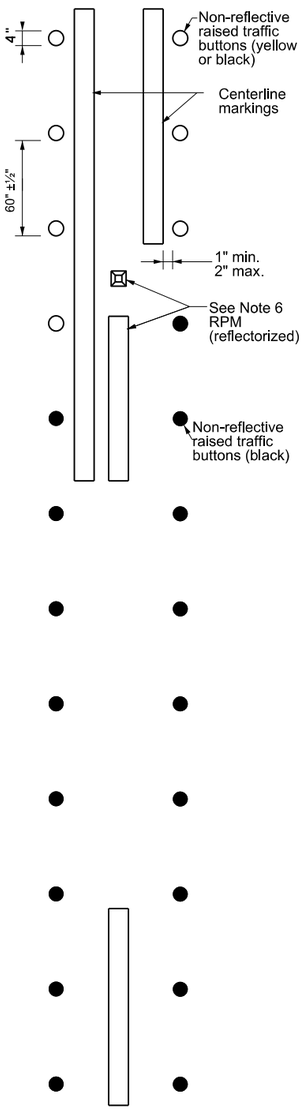


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

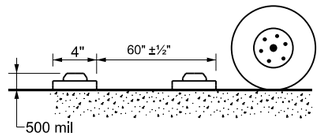


PROFILE VIEW

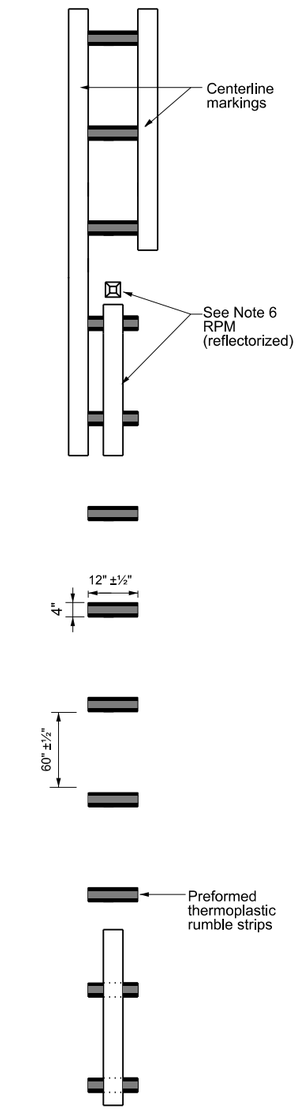


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

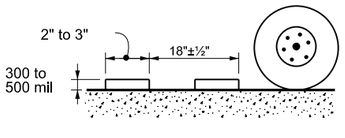


PROFILE VIEW

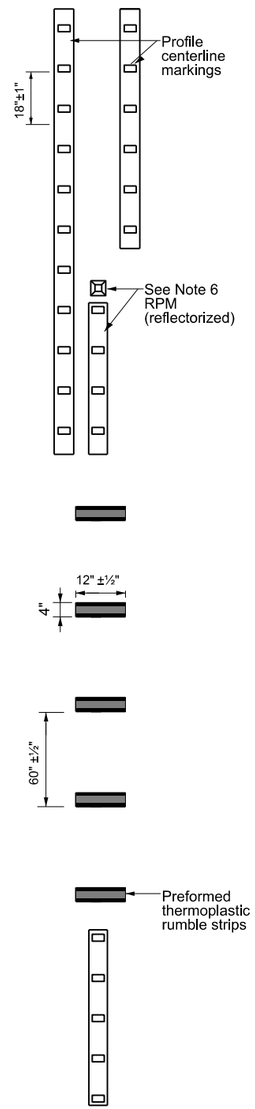


PLAN VIEW
OPTION 3

PREFORMED THERMOPLASTIC RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC RUMBLE STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edge line rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections or driveways with high usage of large trucks.
6. Use standard sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.
12. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING EDGE LINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

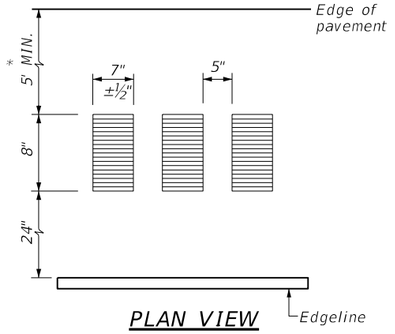
13. See standard sheet RS(2).

Texas Department of Transportation

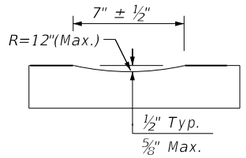
Traffic Safety Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23

FILE: rs(4)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0523	02	051	FM 362
10-13	DIST	COUNTY		SHEET NO.
1-23	HOU	WALLER		139



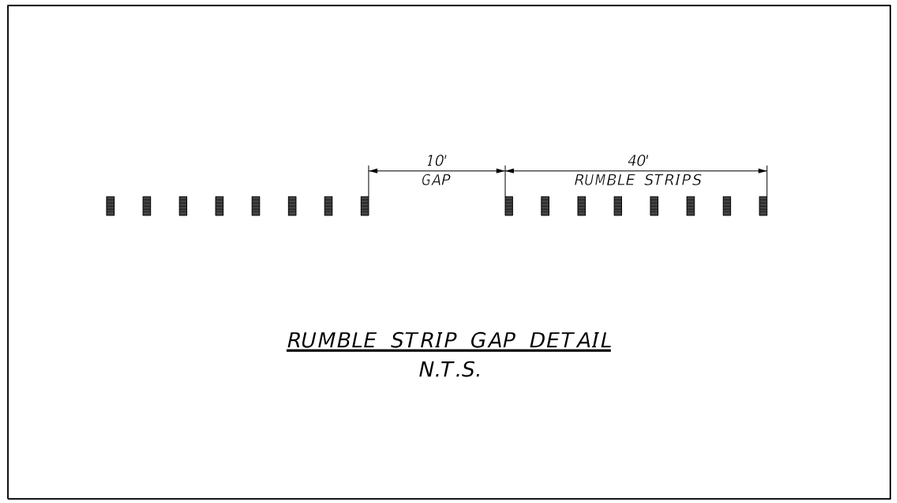
PLAN VIEW



PROFILE VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

* RESERVED FOR BICYCLES



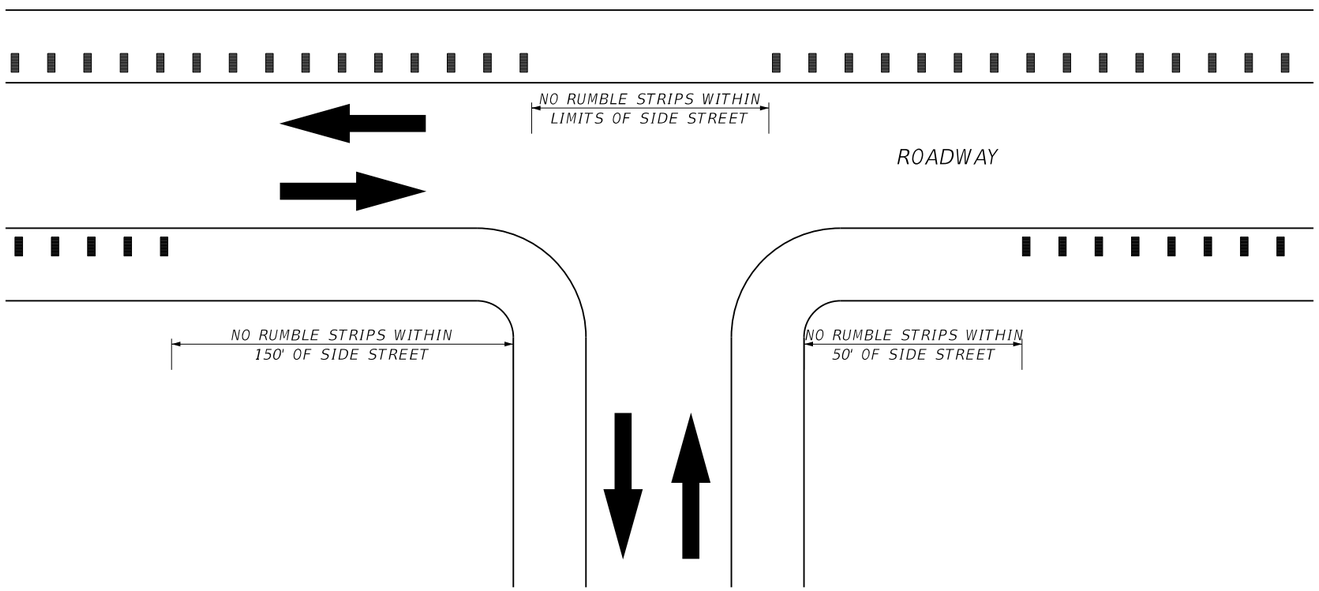
RUMBLE STRIP GAP DETAIL
N.T.S.

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. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

3. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
4. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
5. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
6. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.



INTERSECTION DETAIL

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

06/20/23

EDGELINE RUMBLE STRIPS DETAILS

N.T.S.

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0523	02	051	FM 362
DIST	COUNTY		SHEET NO.
HOU	WALLER		140

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.: 743148J
Crossing Type: At-Grade
RR Company Operating Track at Crossing: Union Pacific Railroad Company (UPRR)
RR Company Owning Track at Crossing: UPRR
RR MP: 35.760
RR Subdivision: Eureka
City: Waller
County: Waller
CSJ at this Crossing: 0523-02-051
Latitude: 30°03'28.90"N
Longitude: 95°56'01.90"W

Scope of Work, including any TCP, to be performed by State Contractor:

1) Pavement Markings and Guardrail Replacement
2) TCP(1-1)-18 and TCP(2-1)-18
3) Railroad and Contractor flaggers will coordinate with lane closures in vicinity of railroad.
4) 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: 3

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: 800-848-8715
Location: DOT 743148J
RR Milepost: 35.760
Subdivision: Eureka

RRD Review Only

Initials: _____
Date: 10/16/23

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	0523	02	051		FM 362	
		DIST	COUNTY			SHEET NO.	
		HOU	WALLER			141	

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	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		142

DATE: $DATE$ $TIME$
FILE: $FILE$

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	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO.
	HOU	WALLER		143

DATE: $DATE$ $TIME$
FILE: $FILE$

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 all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept at the appropriate TxDOT Area Office.

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):
0523-02-051

1.2 PROJECT LIMITS:
From: BU 290H

To: 0.25 Miles South of Davis Road

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 30.0583° (N) ,(Long) 95.9339° (W)

END: (Lat) 29.9570° (N) ,(Long) 95.9584° (W)

1.4 TOTAL PROJECT AREA (Acres): 996

1.5 TOTAL AREA TO BE DISTURBED (Acres): 0.308

1.6 NATURE OF CONSTRUCTION ACTIVITY:
Base repair, planing, seal coat, ACP overlay, rumble strips, signing & pavement markings.

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Katy-Hockley-Gessner	Loamy surface textures and clayey subsoil horizons

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
N/A	N/A

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
- ☐ 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
Mound Creek	Mound Creek (Segment 1009F)
Snake Creek	No Info Available
Live Oak Creek	No Info Available

* 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: _____
- ☐ Other: _____

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED
PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

06/20/23

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			144
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	WALLER	
CONT.	SECT.	JOB	HIGHWAY NO.
0523	02	051	FM 362

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
N/A		

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
- ☐ 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
N/A		

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 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 .

2.9 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3.

STATE OF TEXAS
ROBERT S. BISSETT, JR.
79703
REGISTERED PROFESSIONAL ENGINEER

Robert S. Bissett Jr.

06/20/23

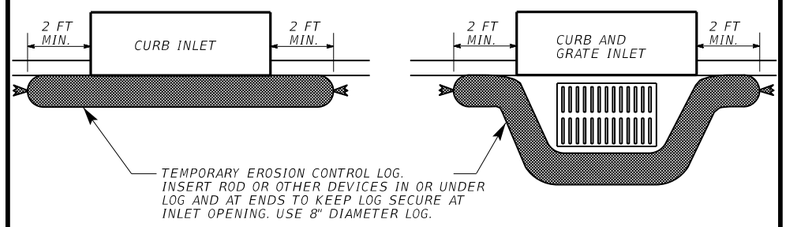
STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			145
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	HIGHWAY NO.
0523	02	051	FM 362

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 ¼" 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

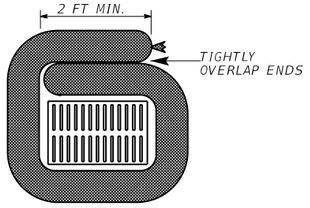
The trap should be cleaned when the capacity has been reduced by ½ or the sediment has accumulated to a depth of 1', whichever is less.

REQUIRED ITEMS:

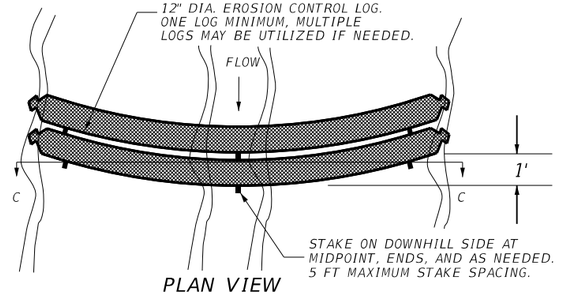
- ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8") LF
- ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12") LF
- ITEM 506-6043 BIODEG EROSN CONT LOGS (REMOVE) LF

DROP INLETS AND OTHER LOCATIONS
12" DIAMETER LOGS

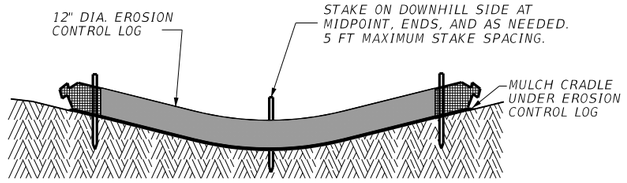
ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL)(12")



DROP INLETS

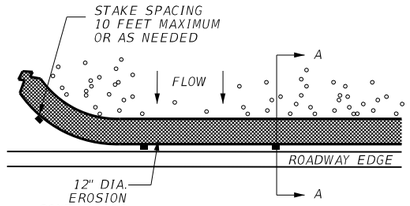


PLAN VIEW

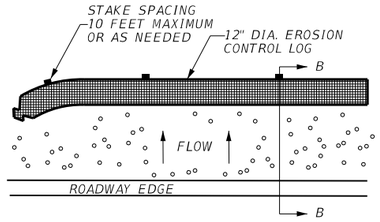


SECTION C-C

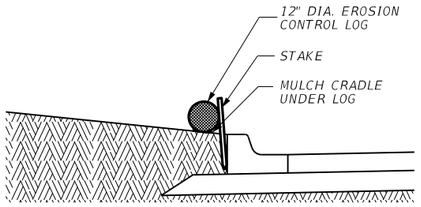
DRAINAGE SWALE OR DITCH



PLAN VIEW

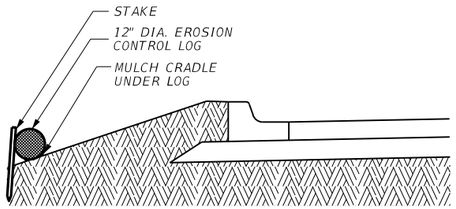


PLAN VIEW



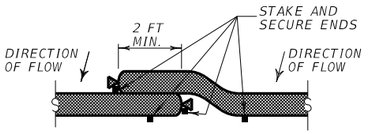
SECTION A-A

SLOPE TO ROADWAY EDGE

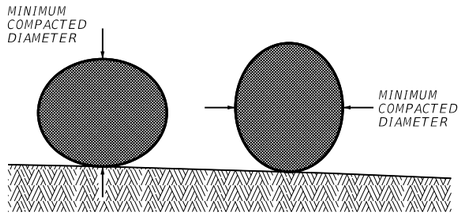


SECTION B-B

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	CONT	SECT	JOB	HIGHWAY
REVISIONS 3/15 MINOR CORRECTIONS	0523	02	051	FM 362
	DIST	COUNTY		SHEET NO
	HOU	WALLER		146

TYPE OF WORK — ITEMS AND REQUIREMENTS FOR EACH TYPE OF WORK

SODDING	PERMANENT SEEDING	TEMPORARY SEEDING	Reference Item 161, 162, 164, 166, 168 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown. Use latest Houston District, Special Provisions for those items indicated.		
	✓		**161-6017 COMPOST MANUF TOPSOIL (BIP)(4") SY**	APPLICATION RATE Item 161.2.1. Compost Manufactured Topsoil (CMT)	Item 161.2. Materials. Submit quality control (QC) documentation to the Engineer. Compost producer's STA certification must be dated to meet STA requirements (certification must be within 30 or 90 days per STA requirements). Lab analysis performed by an STA-certified lab must be dated within 30 days before delivery of the compost.
✓			**162-6002 BLOCK SODDING SY**	GRASS SPECIES Item 162.2. Materials. Common Bermuda (Cynodon Dactylon)	Item 162.2.1. Block Sod. Use block palletized or roll type sod. **REMOVE PLASTIC BACKING FROM ROLL TYPE SOD.** Place sod within 48 hours of delivery to site. No exceptions. Place sod with joints alternating on each row to prevent continuous joint lines. Peg sod as needed with wood pegs to hold sod in place. Pegging sod is subsidiary to Item 162.
	✓		**164-6066 DRILL SEEDING(PERM)(WARM OR COOL) SY** Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH / SEED MIX March, April, May, June, July, August, September, October: Hulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre November, December, January, February, Unhulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre Oats (Avena sativa) - 72.0 lbs PLS/acre Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre	PLS (Pure Live Seed) Provide documentation of PLS requirements per Item 164.2.1. CONSTRUCTION. Cultivate the area to a depth of 4 inches before placing the seed unless otherwise directed. When performing permanent seeding after an established temporary seeding, cultivate the seedbed to a depth of 4 inches or mow the area before placement of the permanent seed. Plant the seed and place the straw or hay mulch after the area has been completed to lines and grades as shown on the plans. Drill Seeding. Plant seed or seed mixture uniformly over the area shown on the plans at a depth of 1/4 to 1/3 inch using a cultipacker(turfgrass) type seeder. Plant seed along the contour of the slopes. Use broadcast seeding method where site conditions prevent drill seeding method. Broadcast Seeding. Distribute the dry seed or dry seed mixture uniformly over the areas shown on the plans using hand or mechanical distribution on top of soil.
	✓		**164-6052 BROADCAST SEED(PERM)(SPECIAL MIX) SY** Item 164.1. Description Provide and install seeding as shown on District Standard		
		✓	**164-6051 DRILL SEED(TEMP)(WARM OR COOL) SY** Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH / SEED MIX March, April, May, June, July, August, September, October: Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre November, December, January, February, Oats (Avena sativa - 72.0 lbs PLS/acre	
		✓	**164-6009 BROADCAST SEED(TEMP)(WARM) SY** Item 164.1. Description Provide and install seeding as shown on District Standard		
	✓	✓	**162-6003 STRAW OR HAY MULCH SY**	APPLICATION RATE Immediately after planting the seed or seed mixture, apply straw or hay mulch uniformly over the seeded area. Apply straw or hay mulch at 2 tons per acre. Use tacking agent with straw or hay mulch as described on this sheet.	Use straw or hay mulch in conformance with Article 162.2.5, "Mulch." Use biodegradable tacking agents only applied at a rate in accordance with manufacturer's recommendations. Use the following products or an approved equal(see note this sheet): Conweb/Contac Guar Gum, Profile Products Corporation, (307) 655-9565, Ramtec/Procol/Viscol Guar Gum, Ramtec Corporation, (800) 366-1180
✓	✓	✓	**166-6001 FERTILIZER AC** Item 166.2. Materials Use fertilizer as shown on District Standard	APPLICATION RATE Deliver and evenly distribute fertilizer at a rate of 4000 lbs/acre.	Use a **NON-CHEMICAL** fertilizer which meets all the following criteria: (1) BRAND NAME must be registered with the Texas State Chemist as a commercial fertilizer. (2) Meets USEPA guidelines for unrestricted use. (3) Derived from biological sources such as, but not limited to: sewage sludge, manures, vegetation, etc. (4) In granular form and essentially dust free. Submit proof of registration and nutrient source to Engineer. Use the following products or an approved equal(see note this sheet): Sigma, SIGMA AgriScience, 281-851-6749 Sustanite-standard grade, Automation Nation, Inc., 713-675-4999 Milorganite, MMSD, 800-287-9645 Agricultural Organic P/L, Ag Org, INC., 713-523-4396
✓	✓	✓	**168-6001 VEGETATIVE WATERING MG**	APPLICATION RATE Item 168.3 Construction. 6000 gallons/acre per working day x 20 consecutive working days = 120,000 gallons total/acre	Begin watering immediately after installation of seed or sod. Replace, fertilize, and water any seed or sod in poor condition due to the failure to apply the specified amount of water within the time allowed at no expense to the Department.

SEQUENCE OF WORK

BLOCK SOD	PERMANENT SEEDING	TEMPORARY SEEDING
1. FERTILIZER 2. CULTIVATE SOIL (ITEM 162.3) 3. SOD 4. VEGETATIVE WATERING	1. FERTILIZER 2. COMPOST MANUFACTURED TOPSOIL 3. CULTIVATE SOIL (ITEMS 164.3 AND 161.3.1) 4. PERMANENT SEEDING 5. STRAW OR HAY MULCH 6. VEGETATIVE WATERING	1. FERTILIZER 2. CULTIVATE SOIL (PER ITEM 164.3) 3. TEMPORARY SEEDING 4. STRAW OR HAY MULCH 5. VEGETATIVE WATERING

Texas Department of Transportation

HOUSTON DISTRICT

FERTILIZER, SEED, SOD, STRAW, COMPOST, AND WATER

FSSSCW-15

REVISIONS
10/2014 UPDATED TO 2014 SPECS 3/2015 MINOR CORRECTIONS 3/2023 ADDED SHEET ABBREVIATION

FILE: OCT 2014

ORIGINAL:

FED DIV	STATE	PROJECT NUMBER			SHEET
6	TEXAS				147
DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
12	WALLER	0523	02	051	FM 362

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 the TxDOT SWP3 Summary Sheets, SWP3 Binder Template, and Form 2118.

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: Dec 22, 2022
FILE:

Version 2.2

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	0523	02	051	FM 362
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	HOU	Waller		148