FED. RD. DIV. NO.	STATE PROJECT NO.		SHEET NO.
6	PTF 2022(045)		1
STATE	STATE DIST.	COUNTY	
TEXAS	AUS	TRAVIS	
CONT.	SECT.	JOB	HIGHWAY NO.
1186	01	091	FM 969

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL PROJECT NUMBER

PTF 2022(045)

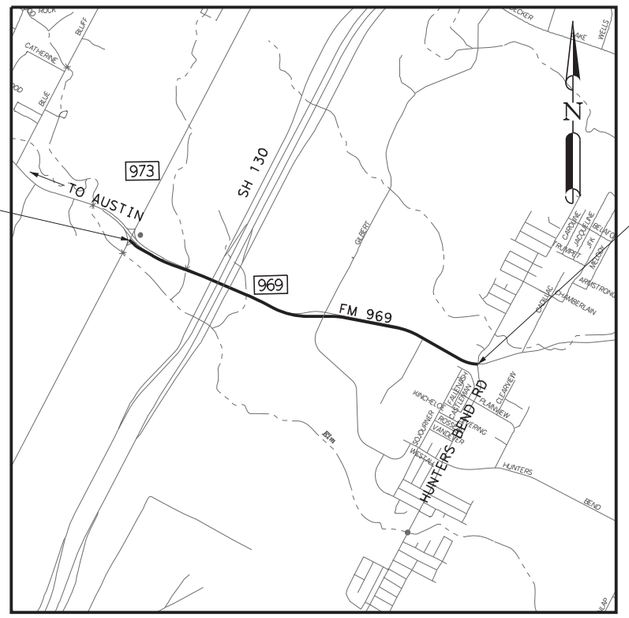
CSJ 1186-01-091

ROADWAY = 9,724.29 FT
BRIDGE = 46 FT
TOTAL = 9,770.29 FT

NET LENGTH OF PROJECT = 9770.29 FT = 1.850 MI

TRAVIS COUNTY
FM 969

LIMITS: FROM FM 973 TO HUNTERS BEND RD
FOR THE CONSTRUCTION OF WIDENING ROADWAY CONSISTING OF GRADING, BASE, ASPHALT PAVEMENT, STRUCTURES, METAL BEAM GUARD FENCE, SIGNING, AND PAVEMENT MARKINGS



BEGIN PROJECT
CSJ: 1186-01-091
℄ FM 969 STA 329+55.92
RM: 452+00.0138
MP: 15,746
DFO:

END PROJECT
CSJ: 1186-01-091
℄ FM 969 STA 427+26.21
RM: 454+00.335
MP: 17,940
DFO:

LOCATION MAP NOT TO SCALE

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROADS: NONE

FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL (WEST OF SH 130)
MAJOR COLLECTOR (EAST OF SH 130)

DESIGN SPEED = 60 MPH (FM 969)
= 35 MPH (CROSS STREETS)

A.D.T. = 20,000 (2017)
= 33,700 (2047)

PLACE REQUIRED SIGNS IN ACCORDANCE WITH STANDARD SHEETS BC(1)-14 THRU BC(12)-14 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES."

FINAL PLANS

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

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/29/2021

HORIZONTAL CONTROL
ALL BEARINGS AND COORDINATES SHOWN ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE (4203), NORTH AMERICAN DATUM 1983 (NAD 83), 1993 ADJUSTMENT. COORDINATES AND DISTANCES ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES USING THE RECIPROCAL COMBINED SCALE FACTOR 1.00005.

VERTICAL CONTROL
VERTICAL CONTROL IS REFERENCED TO THE NORTH AMERICAN DATUM OF 1988 (NAVD 88), 1995/1996 ADJUSTMENT

ALL CURVE DATA IS BASED UPON ARC DEFINITION.

TDLR INSPECTION REQUIRED

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

LJA Engineering, Inc.
FRN - F-1386

Texas Department of Transportation

CORRECT: 6/29/2021
LJA ENGINEERING
(TBPE FIRM REG. F-1386)

SUBMITTED FOR LETTING: 6/29/21
David Greear
TRAVIS COUNTY PUBLIC WORKS DIRECTOR

RECOMMENDED FOR LETTING: 8/4/2021
DocuSigned by: Darryl W. Hollandi, P.E.
DISTRICT DESIGN ENGINEER

SUBMITTED FOR LETTING: 8/4/2021
DocuSigned by: Jason R Carrasco P.E.
AREA ENGINEER

APPROVED FOR LETTING: 8/5/2021
DocuSigned by:
DIRECTOR OF TRANSPORTATION, PLANNING & DEVELOPMENT

INDEX OF SHEETS

GENERAL

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL STANDARDS *

REMOVAL PLAN

ROADWAY DETAILS

ROADWAY STANDARDS *

RETAINING WALL DETAILS

DRAINAGE

DRAINAGE STANDARDS

TRAFFIC SIGNAL PLANS

TRAFFIC SIGNAL STANDARDS *

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

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

_____, PE 7/21/2021

MAEN A. HOURANI — DATE

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE WITH # HAVE BEEN SELECTED BY DEREK BOHLS OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

_____, PE 7/21/2021

DEREK T. BOHLS — DATE

COUNTY OF TRAVIS
STATE OF TEXAS
1850

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
INDEX OF SHEETS

SHEET 1 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		2
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

7/21/2021
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INDEX OF SHEETS, CONT'D

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

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

_____, PE 7/21/2021
MAEN A. HOURANI DATE

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE WITH # HAVE BEEN SELECTED BY DEREK BOHLS OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

_____, PE 7/21/2021
DEREK T. BOHLS DATE

COUNTY OF TRAVIS STATE OF TEXAS 1839

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
INDEX OF SHEETS

SHEET 2 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		3
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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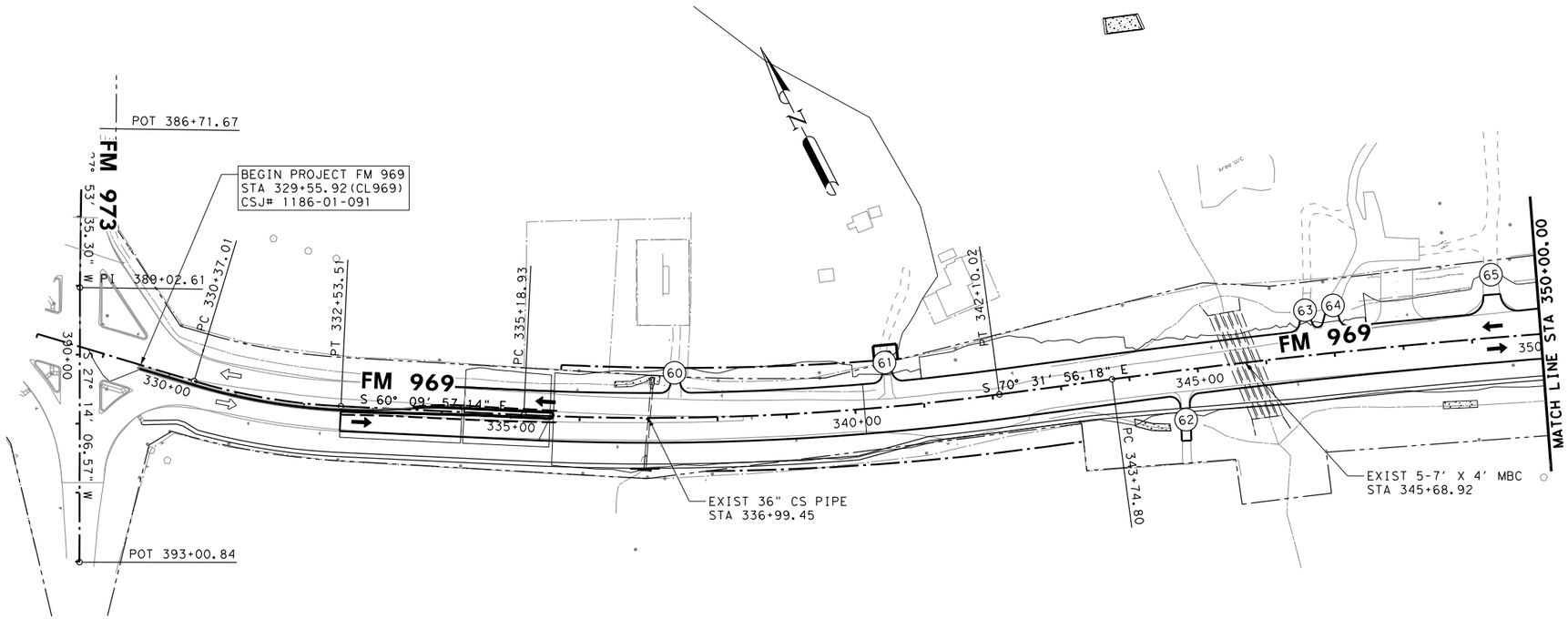

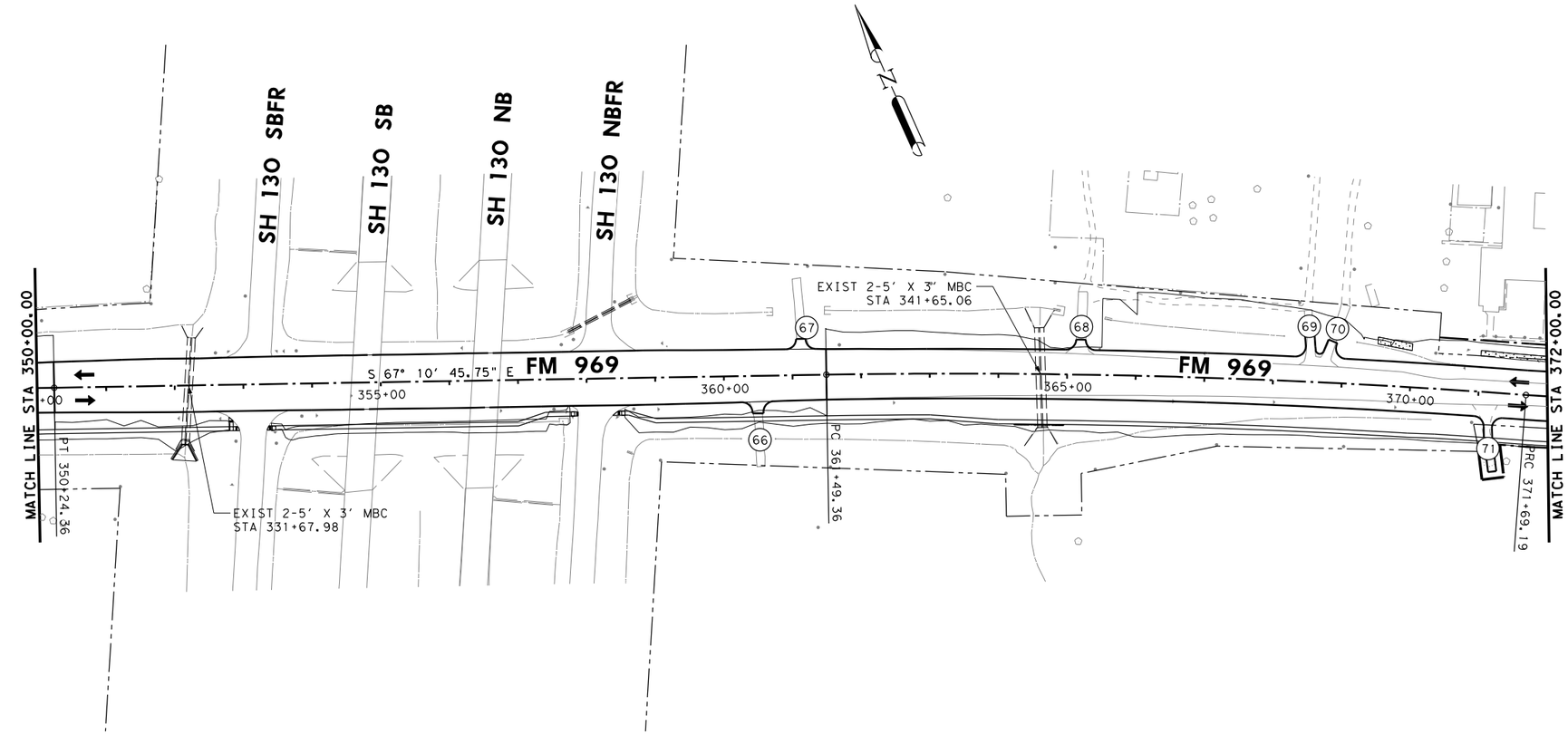

0' 100' 200'
SCALE IN FEET

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- PROPOSED CONST. EASEMENT
- EXISTING PLANIMETRICS
- (X) DRIVEWAY NUMBER

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation
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LJA Engineering, Inc.
FRN - F-1386

FM 969
PROJECT LAYOUT

SHEET 1 OF 3

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		4
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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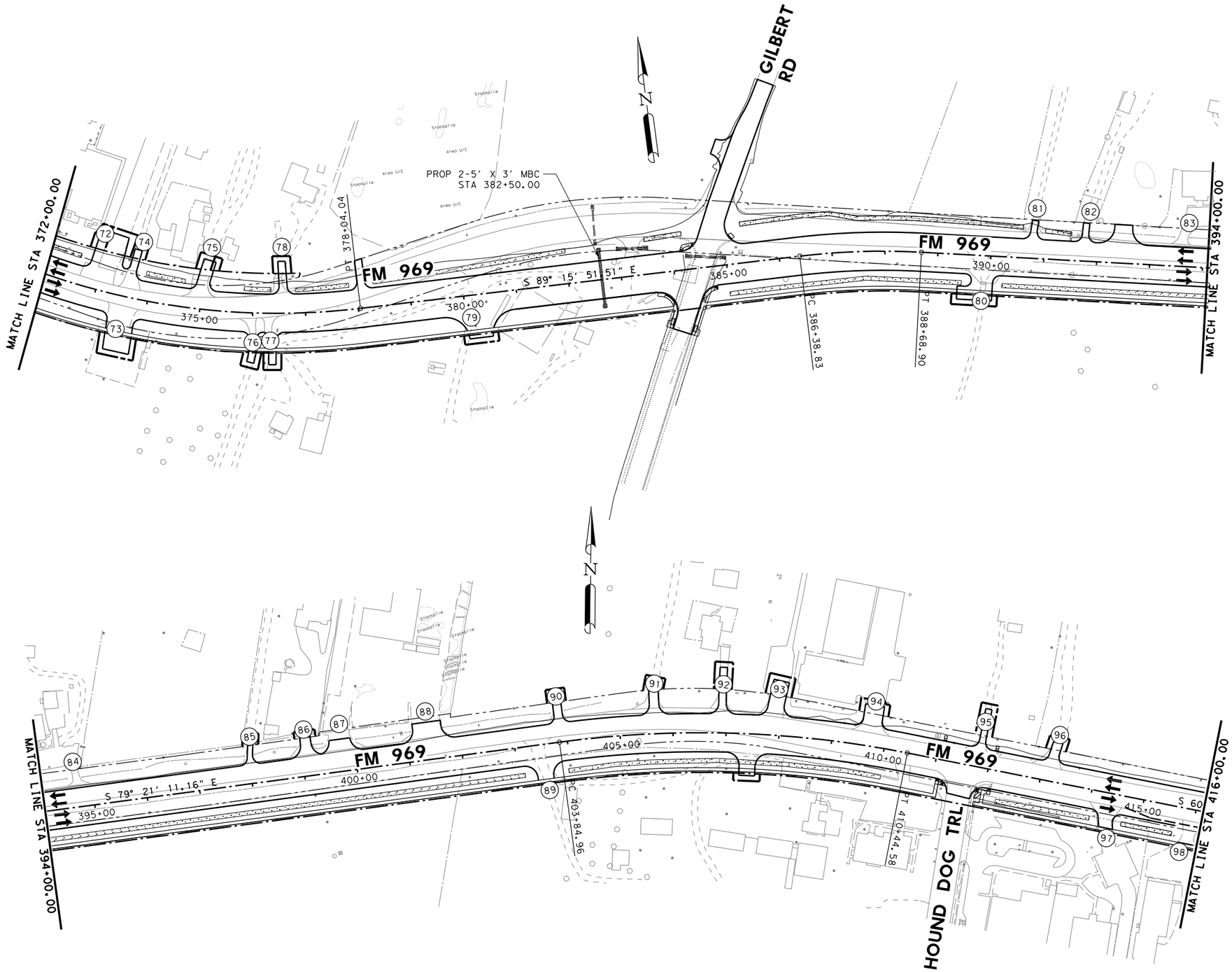

0' 100' 200'
SCALE IN FEET

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- PROPOSED CONST. EASEMENT
- EXISTING PLANIMETRICS
- (X) DRIVEWAY NUMBER

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
PROJECT LAYOUT

SHEET 2 OF 3

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		5
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
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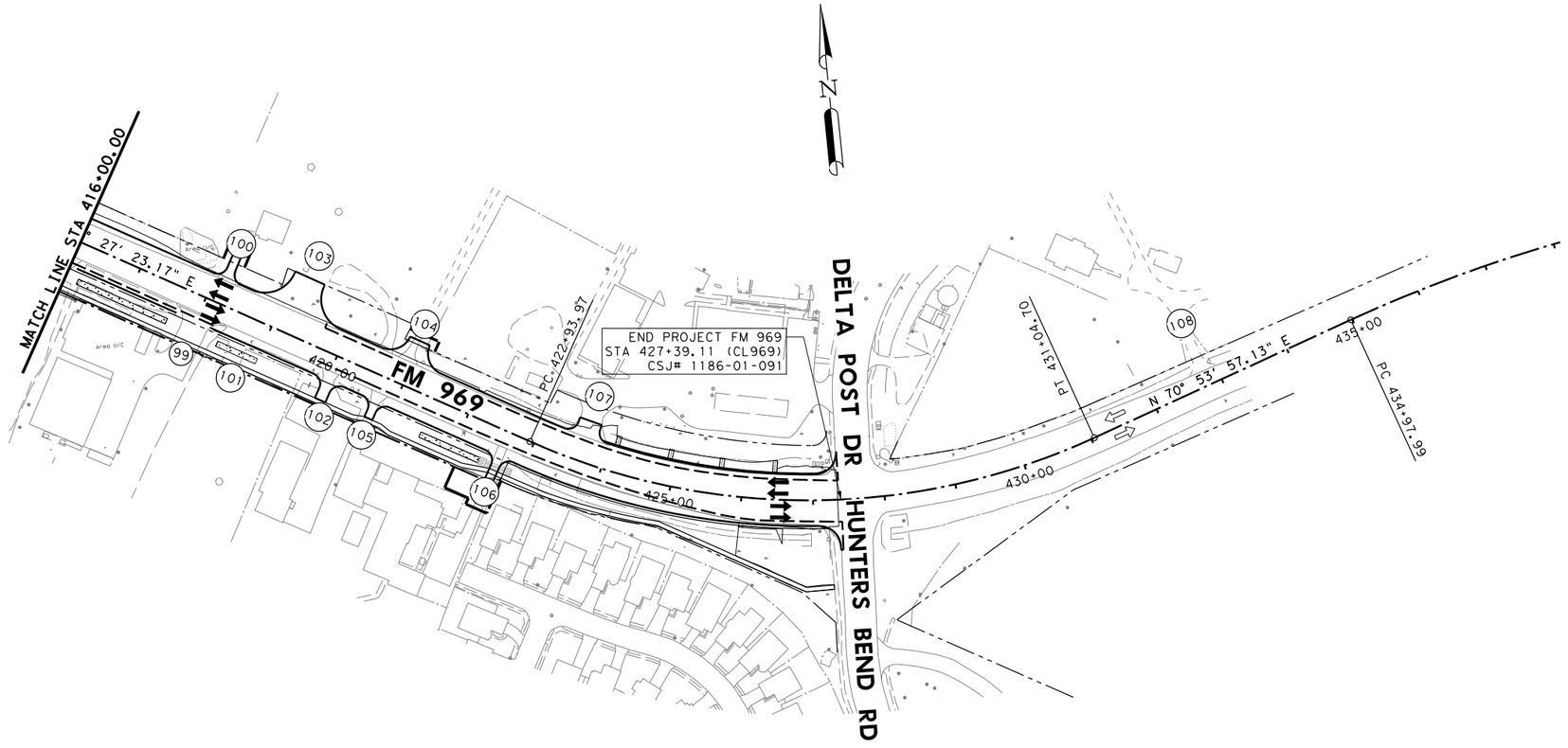

0′ 100′ 200′
SCALE IN FEET

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- PROPOSED CONST. EASEMENT
- EXISTING PLANIMETRICS
- (X) DRIVEWAY NUMBER

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation
© 2020

LJA Engineering, Inc.
FRN - F-1386

FM 969
PROJECT LAYOUT

SHEET 3 OF 3

DESIGN BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		6
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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F.M. 969

ENGINEER'S BASELINE F.M. 969 CURVE DATA

PI NORTHING	= 10,068,050.42
PI EASTING	= 3,156,101.54
PI STATION	= 331+45.81
DELTA	= 14° 04′ 22" (LT)
DEGREE OF CURVE	= 06° 30′ 00"
TANGENT	= 108.80′
LENGTH	= 216.50′
RADIUS	= 881.47′
CHORD BEARING	= S 53° 07′ 46" E
CHORD	= 215.96′
PC STATION	= 330+37.01
PT STATION	= 332+53.51

F.M. 969

ENGINEER'S BASELINE F.M. 969 CURVE DATA

PI NORTHING	= 10,067,691.88
PI EASTING	= 3,156,726.73
PI STATION	= 338+65.42
DELTA	= 10° 21′ 59" (LT)
DEGREE OF CURVE	= 01° 30′ 00"
TANGENT	= 346.49′
LENGTH	= 691.09′
RADIUS	= 3,819.72′
CHORD BEARING	= S 65° 20′ 57" E
CHORD	= 690.15′
PC STATION	= 335+18.93
PT STATION	= 342+10.02

F.M. 969

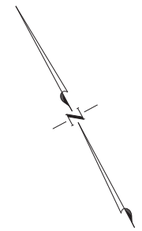
ENGINEER'S BASELINE F.M. 969 CURVE DATA

PI NORTHING	= 10,067,413.21
PI EASTING	= 3,157,515.07
PI STATION	= 346+99.67
DELTA	= 03° 21′ 10" (RT)
DEGREE OF CURVE	= 00° 30′ 58"
TANGENT	= 324.87′
LENGTH	= 649.56′
RADIUS	= 11,100.00′
CHORD BEARING	= S 68° 51′ 21" E
CHORD	= 649.47′
PC STATION	= 343+74.80
PT STATION	= 350+24.36

F.M. 969

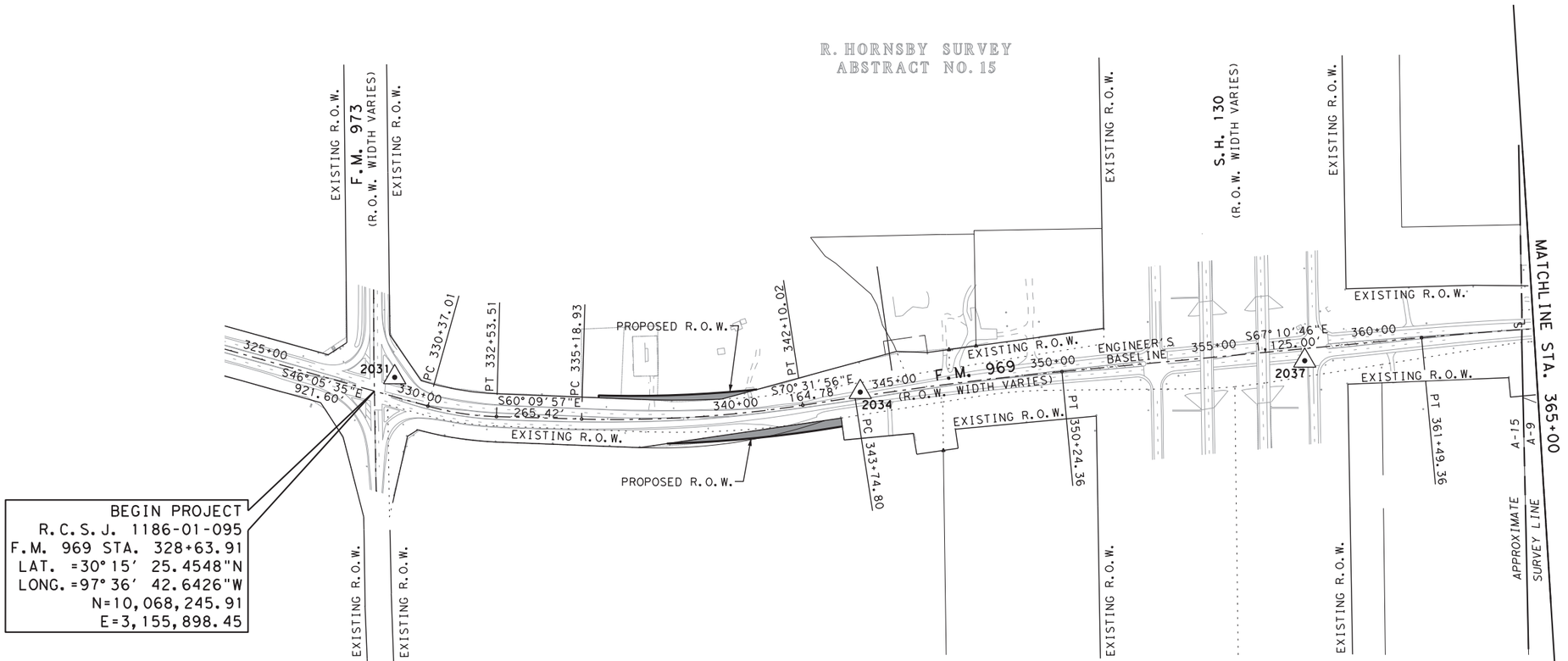
ENGINEER'S BASELINE F.M. 969 CURVE DATA

PI NORTHING	= 10,066,652.97
PI EASTING	= 3,159,321.79
PI STATION	= 366+59.63
DELTA	= 05° 15′ 51" (RT)
DEGREE OF CURVE	= 00° 30′ 58"
TANGENT	= 510.27′
LENGTH	= 1,019.83′
RADIUS	= 11,100.00′
CHORD BEARING	= S 64° 32′ 50" E
CHORD	= 1,019.47′
PC STATION	= 361+49.36
PT STATION	= 371+69.19



200′ 0′ 200′ 400′

SCALE 1" = 200′ 22"X34"
SCALE 1" = 400′ 11"X17"



NOTES:

1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983, 1993 ADJUSTMENT, NORTH AMERICAN VERTICAL DATUM 88 (NAVD 88). ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00005. UNITS: U.S. SURVEY FEET.
2. PROPOSED RIGHT-OF-WAY BASELINE MAY NOT MATCH PROPOSED CONSTRUCTION BASELINE OR AS-BUILT BASELINE DUE TO DESIGN CHANGES.
3. 2012 PLANIMETRICS SHOWN HEREON PROVIDED BY TxDOT.

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY MULTIPLE GPS OBSERVATIONS (RTN) IN SEPTEMBER 2020 AND IS CORRECTLY SHOWN HEREON.

11-12-2020

McGRAY & McGRAY
LAND SURVEYORS, INC.
TBPELS SURVEY FIRM # 10095500
3301 HANCOCK DRIVE #6
AUSTIN, TEXAS 78731
(512) 451-8591
www.mcgray.com

Texas Department of Transportation

FM 969
FM 973 TO
DELTA POST DRIVE

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.				HIGHWAY NO.
6	TEXAS					FM 969
STATE DIST.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
14	TRAVIS	CCSJ	1186	01	091	7
		RCSJ	1186	01	095	

SURVEY CONTROL POINTS - SURFACE COORDINATES

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
2031	10,068,254.04	3,155,974.54	467.86	SET 5/8" I.R. W/ TxDOT CAP
2034	10,067,528.04	3,157,230.51	452.57	SET 5/8" I.R. W/ TxDOT CAP
2037	10,066,959.46	3,158,496.92	442.95	SET 5/8" I.R. W/ TxDOT CAP

CONTROL
SHEET 1 OF 3

F.M. 969

ENGINEER'S BASELINE F.M. 969 CURVE DATA

PI NORTHING	= 10,066,652.97
PI EASTING	= 3,159,321.79
PI STATION	= 366+59.63
DELTA	= 05° 15' 51" (RT)
DEGREE OF CURVE	= 00° 30' 58"
TANGENT	= 510.27'
LENGTH	= 1,019.83'
RADIUS	= 11,100.00'
CHORD BEARING	= S 64° 32' 50" E
CHORD	= 1,019.47'
PC STATION	= 361+49.36
PT STATION	= 371+69.19

F.M. 969

ENGINEER'S BASELINE F.M. 969 CURVE DATA

PI NORTHING	= 10,066,260.41
PI EASTING	= 3,160,057.47
PI STATION	= 374+92.78
DELTA	= 27° 20' 57" (LT)
DEGREE OF CURVE	= 04° 18' 29"
TANGENT	= 323.59'
LENGTH	= 634.85'
RADIUS	= 1,330.01'
CHORD BEARING	= S 75° 35' 23" E
CHORD	= 628.84'
PC STATION	= 371+69.19
PT STATION	= 378+04.04

F.M. 969

ENGINEER'S BASELINE F.M. 969 CURVE DATA

PI NORTHING	= 10,066,260.41
PI EASTING	= 3,160,057.47
PI STATION	= 374+92.78
DELTA	= 27° 20' 57" (LT)
DEGREE OF CURVE	= 04° 18' 29"
TANGENT	= 323.59'
LENGTH	= 634.85'
RADIUS	= 1,330.01'
CHORD BEARING	= S 75° 35' 23" E
CHORD	= 628.84'
PC STATION	= 371+69.19
PT STATION	= 378+04.04

F.M. 969

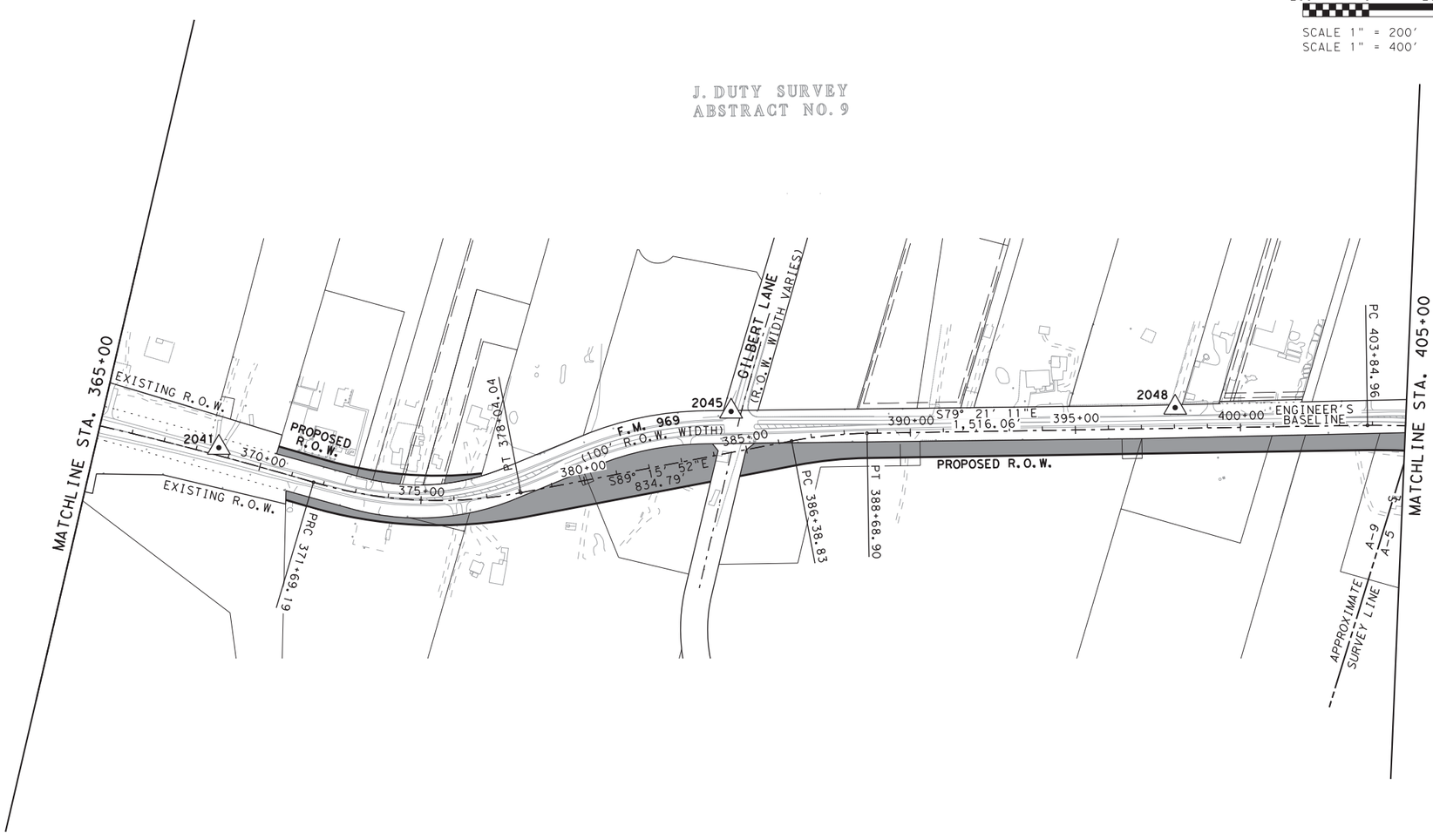
ENGINEER'S BASELINE F.M. 969 CURVE DATA

PI NORTHING	= 10,066,244.05
PI EASTING	= 3,161,331.07
PI STATION	= 387+54.15
DELTA	= 09° 54' 40" (RT)
DEGREE OF CURVE	= 04° 18' 29"
TANGENT	= 115.32'
LENGTH	= 230.07'
RADIUS	= 1,330.00'
CHORD BEARING	= S 84° 18' 31" E
CHORD	= 229.78'
PC STATION	= 386+38.83
PT STATION	= 388+68.90

200' 0' 200' 400'

SCALE 1" = 200' 22"X34"
SCALE 1" = 400' 11"X17"

J. DUTY SURVEY
ABSTRACT NO. 9



SURVEY CONTROL POINTS - SURFACE COORDINATES				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
2041	10,066,573.08	3,159,512.00	447.70	SET ½" I.R. W/ MCGRAY CAP
2045	10,066,369.96	3,161,054.21	451.76	SET ½" I.R. W/ MCGRAY CAP
2048	10,066,111.88	3,162,374.28	448.66	SET ½" I.R. W/ MCGRAY CAP

CONTROL
SHEET 2 OF 3

NOTES:

1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983, 1993 ADJUSTMENT, NORTH AMERICAN VERTICAL DATUM 88 (NAVD 88). ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00005. UNITS: U.S. SURVEY FEET.
2. PROPOSED RIGHT-OF-WAY BASELINE MAY NOT MATCH PROPOSED CONSTRUCTION BASELINE OR AS-BUILT BASELINE DUE TO DESIGN CHANGES.
3. 2012 PLANIMETRICS SHOWN HEREON PROVIDED BY TxDOT.

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY MULTIPLE GPS OBSERVATIONS (RTN) IN SEPTEMBER 2020 AND IS CORRECTLY SHOWN HEREON.

STATE OF TEXAS REGISTERED CHRIS CONRAD 5623 PROFESSIONAL LAND SURVEYOR

11-12-2020

McGRAY & McGRAY
LAND SURVEYORS, INC.
TBPELS SURVEY FIRM # 10095500
3301 HANCOCK DRIVE #6
AUSTIN, TEXAS 78731
(512) 451-8591
www.mcgray.com

Texas Department of Transportation

FM 969
FM 973 TO
DELTA POST DRIVE

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.				HIGHWAY NO.
6	TEXAS					FM 969
STATE DIST.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
14	TRAVIS	CCSJ	1186	01	091	8
		RCSJ	1186	01	095	

F.M. 969

ENGINEER'S BASELINE F.M. 969 CURVE DATA
PI NORTHING = 10,065,881.15
PI EASTING = 3,163,261.47
PI STATION = 407+17.79
DELTA = 18° 53' 48" (RT)
DEGREE OF CURVE = 02° 51' 53"
TANGENT = 332.83'
LENGTH = 659.62'
RADIUS = 2,000.00'
CHORD BEARING = S 69° 54' 17" E
CHORD = 656.63'
PC STATION = 403+84.96
PT STATION = 410+44.58

F.M. 969

ENGINEER'S BASELINE F.M. 969 CURVE DATA
PI NORTHING = 10,064,888.16
PI EASTING = 3,165,013.46
PI STATION = 427+25.58
DELTA = 48° 38' 40" (LT)
DEGREE OF CURVE = 06° 00' 00"
TANGENT = 431.61'
LENGTH = 810.73'
RADIUS = 954.92'
CHORD BEARING = S 84° 46' 43" E
CHORD = 786.60'
PC STATION = 422+93.97
PT STATION = 431+04.70

F.M. 969

ENGINEER'S BASELINE F.M. 969 CURVE DATA
PI NORTHING = 10,064,888.16
PI EASTING = 3,165,013.46
PI STATION = 427+25.58
DELTA = 48° 38' 40" (LT)
DEGREE OF CURVE = 06° 00' 00"
TANGENT = 431.61'
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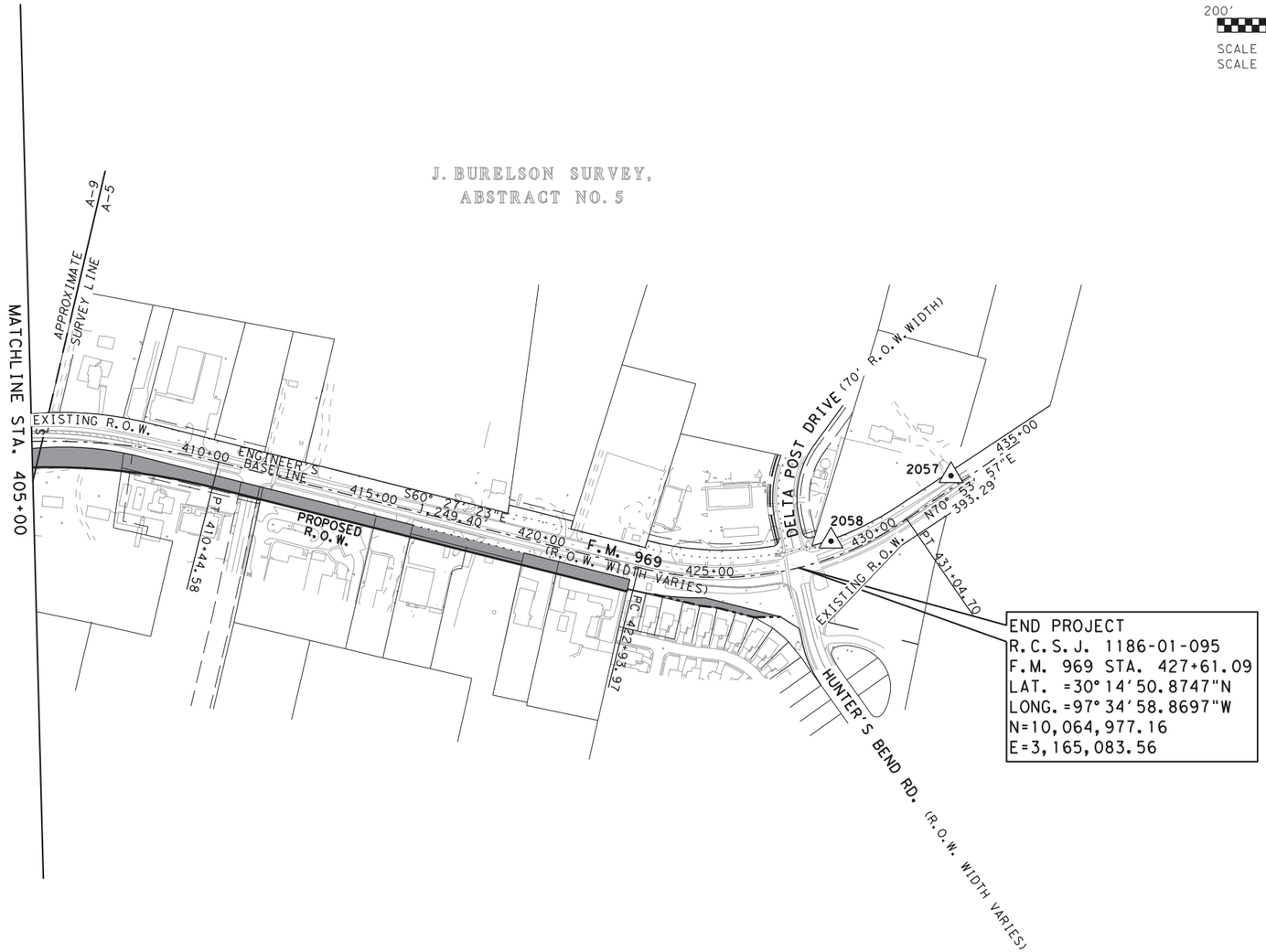
RADIUS = 954.92'
CHORD BEARING = S 84° 46' 43" E
CHORD = 786.60'
PC STATION = 422+93.97
PT STATION = 431+04.70

200' 0' 200' 400'

SCALE 1" = 200' 22"X34"
SCALE 1" = 400' 11"X17"



SURVEY CONTROL POINTS - SURFACE COORDINATES				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
2058	10,199,028.22	3,222,138.88	576.80	SET 5/8" I.R. W/ TxDOT CAP
2057	10,202,170.13	3,221,807.35	607.17	SET 5/8" I.R. W/ TxDOT CAP

CONTROL
SHEET 3 OF 3

NOTES:

1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983, 1993 ADJUSTMENT, NORTH AMERICAN VERTICAL DATUM 88 (NAVD 88). ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00005. UNITS: U.S. SURVEY FEET.
2. PROPOSED RIGHT-OF-WAY BASELINE MAY NOT MATCH PROPOSED CONSTRUCTION BASELINE OR AS-BUILT BASELINE DUE TO DESIGN CHANGES.
3. 2012 PLANIMETRICS SHOWN HEREON PROVIDED BY TxDOT.

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY MULTIPLE GPS OBSERVATIONS (RTN) IN SEPTEMBER 2020 AND IS CORRECTLY SHOWN HEREON.

STATE OF TEXAS
REGISTERED
CHRIS CONRAD
5623
PROFESSIONAL
LAND SURVEYOR

11-12-2020

McGRAY & McGRAY
LAND SURVEYORS, INC.
TBPELS SURVEY FIRM # 10095500
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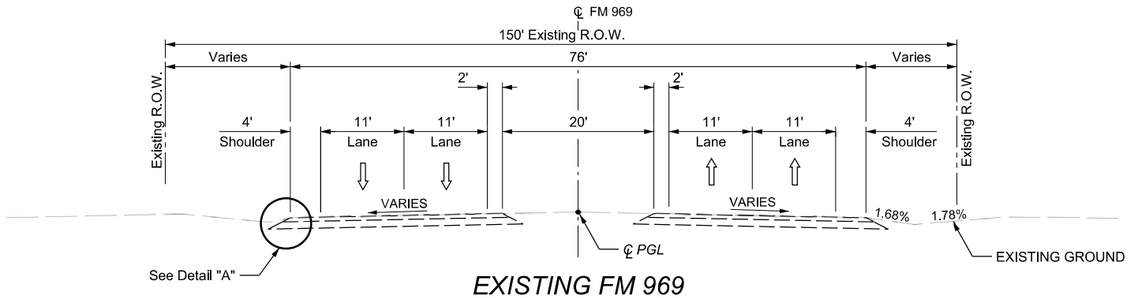
AUSTIN, TEXAS 78731
(512) 451-8591
www.mcgray.com

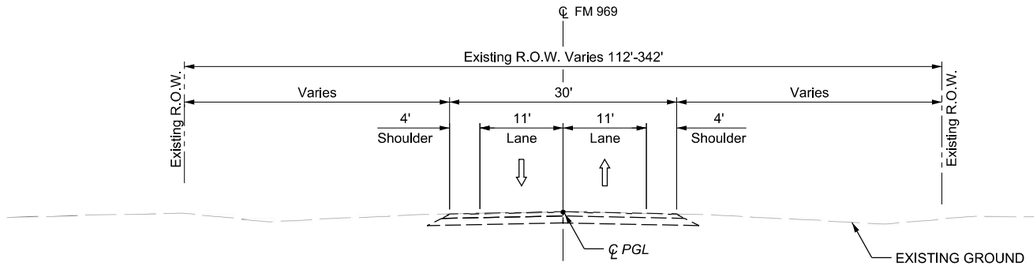
Texas Department of Transportation

FM 969
FM 973 TO
DELTA POST DRIVE

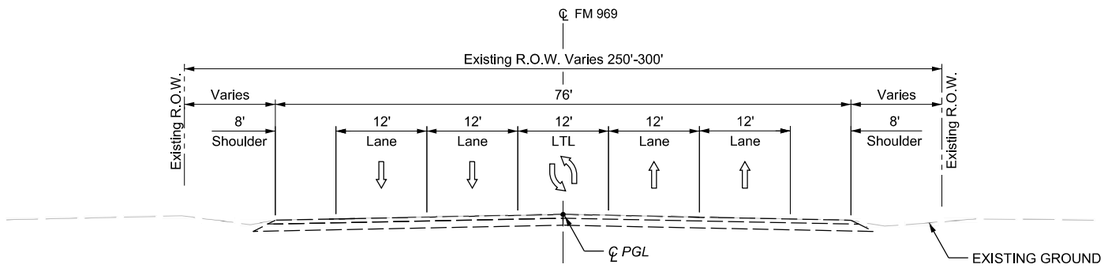
FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.				HIGHWAY NO.
6	TEXAS					FM 969
STATE DIST.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
14	TRAVIS	CCSJ	1186	01	091	9
		RCSJ	1186	01	095	



EXISTING FM 969
Sta 329+55.92 to Sta 338+37



Existing FM 969
Sta 338+37 to Sta 348+00
Sta 363+00 to Sta 373+00
Sta 385+00 to Sta 403+00



Existing FM 969
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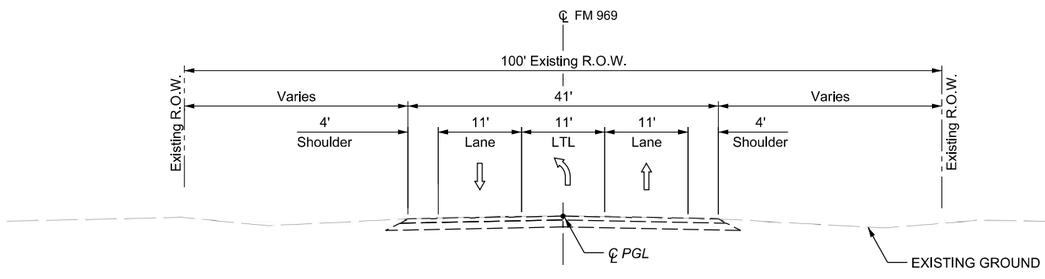

Existing FM 969
Sta 373+00 to Sta 385+00

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

LJA Engineering, Inc.
FRN - F-1386

FM 969
TYPICAL SECTIONS
EXISTING

SCALE:

SHEET 1 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		10
DRAWN BY:	STATE	DIST. NO.	COUNTY	
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CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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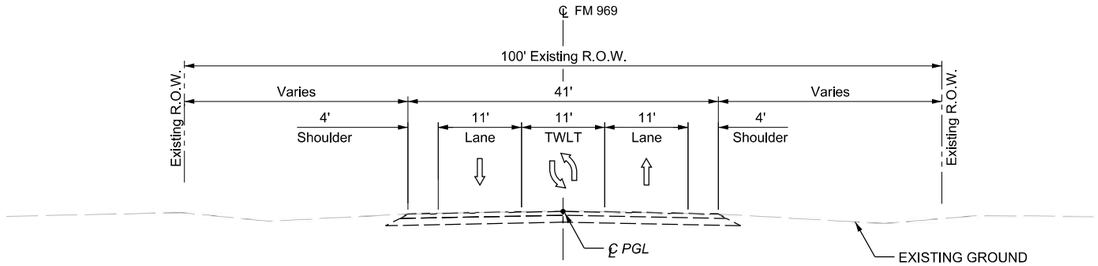

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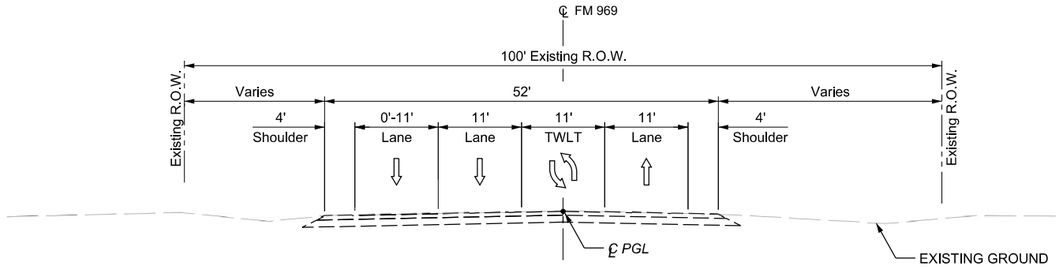

Existing FM 969
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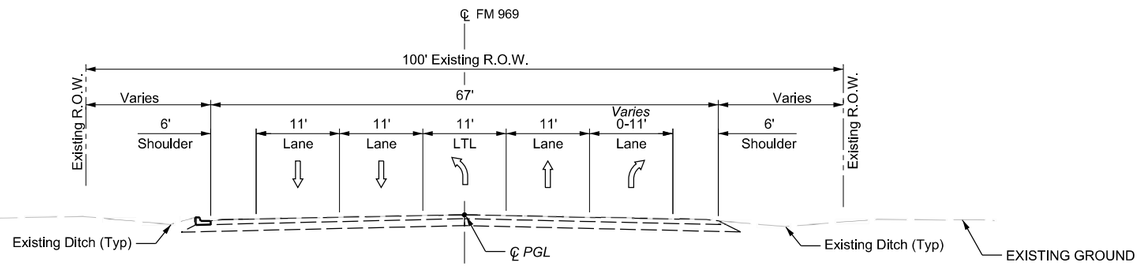
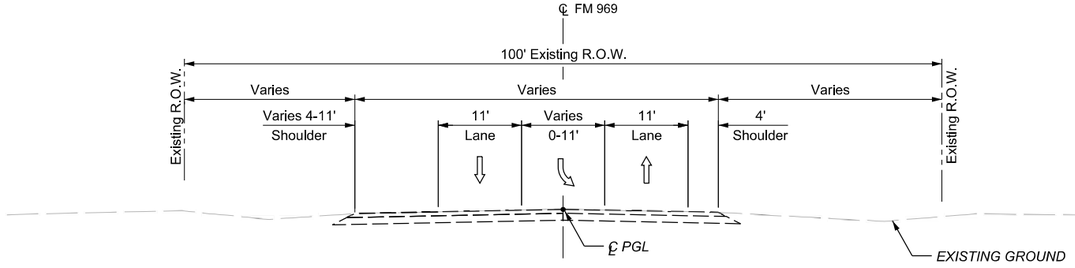


Existing FM 969
STA 423+80 to STA 427+00



Existing FM 969
Sta 427+00 to 427+39

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COUNTY OF TRAVIS
1839
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FM 969
TYPICAL SECTIONS
EXISTING

SCALE:

SHEET 2 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
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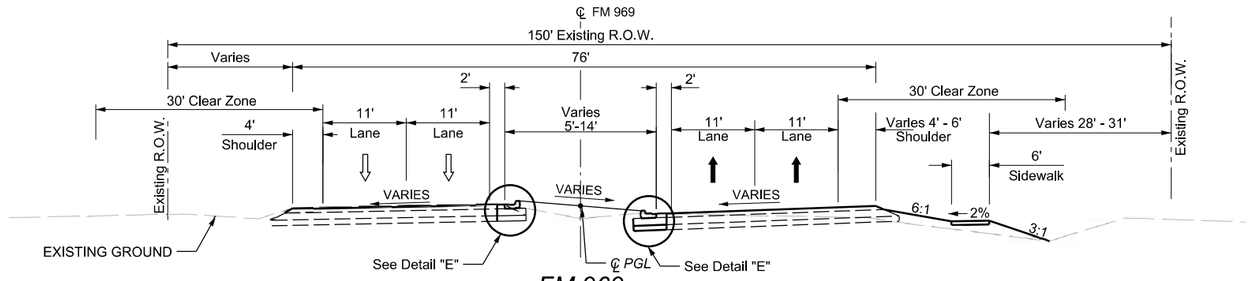
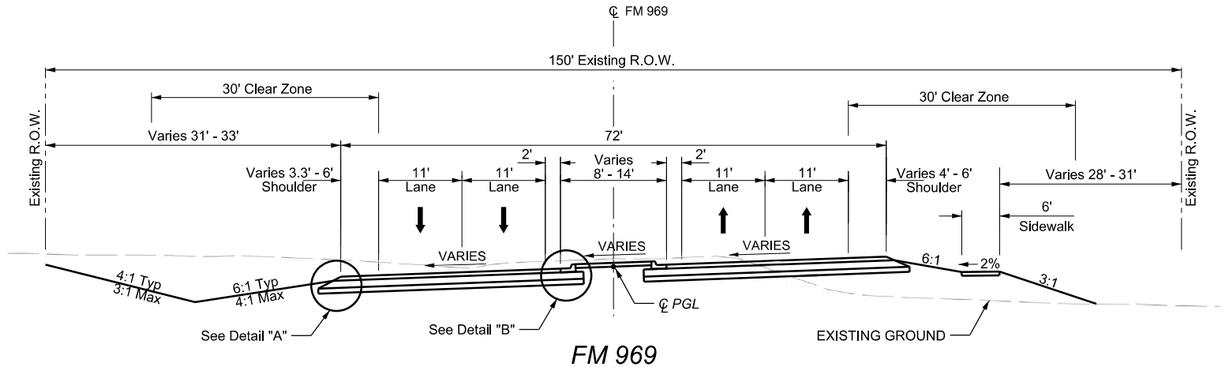


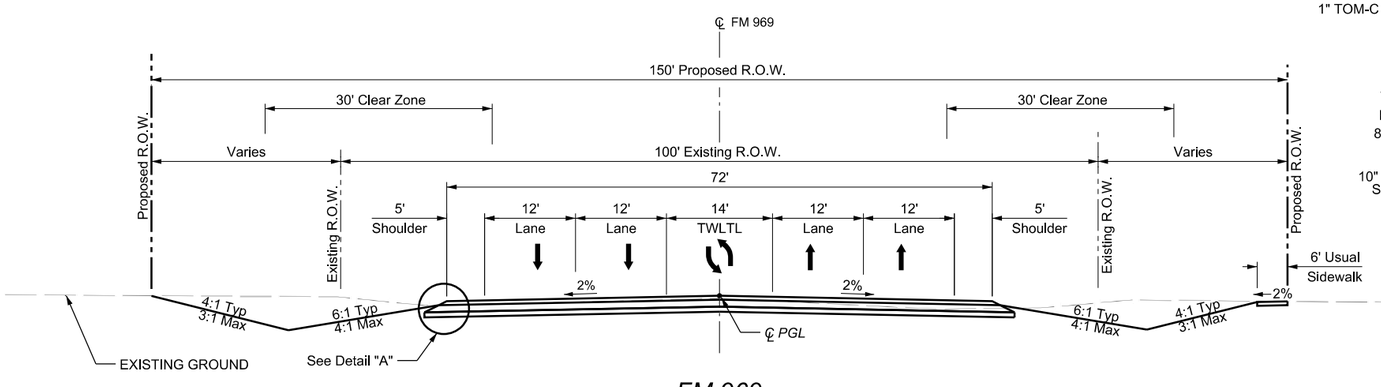
FM 969

Sta 332+53.51 to Sta 335+66.44



FM 969

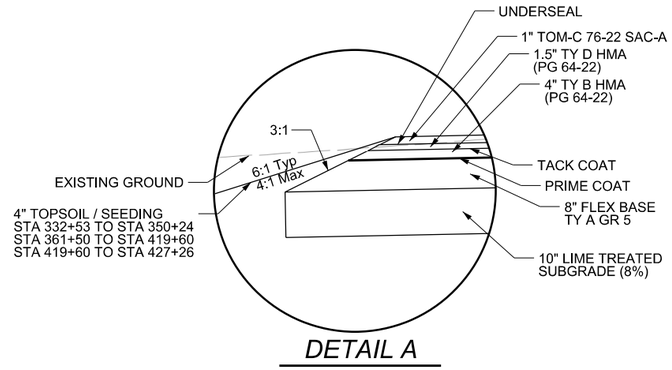
Sta 332+53.51 to Sta 335+80



FM 969

Sta 335+80 to Sta 350+24

Sta 361+50 to 419+60



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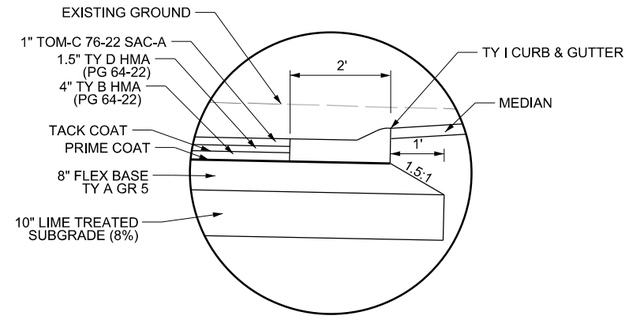

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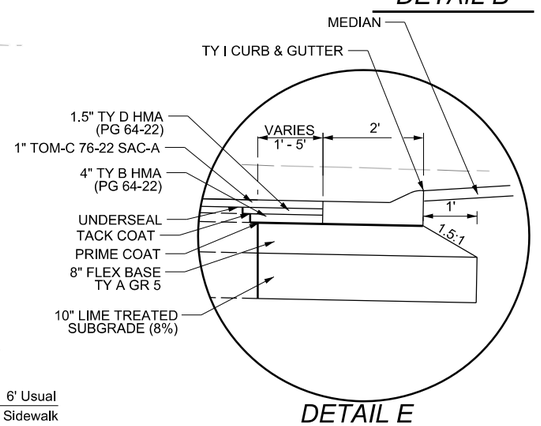

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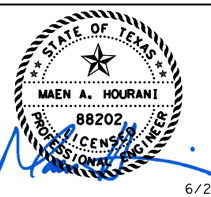

6/25/2021

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
TYPICAL SECTIONS
PROPOSED

SCALE:

SHEET 1 OF 2

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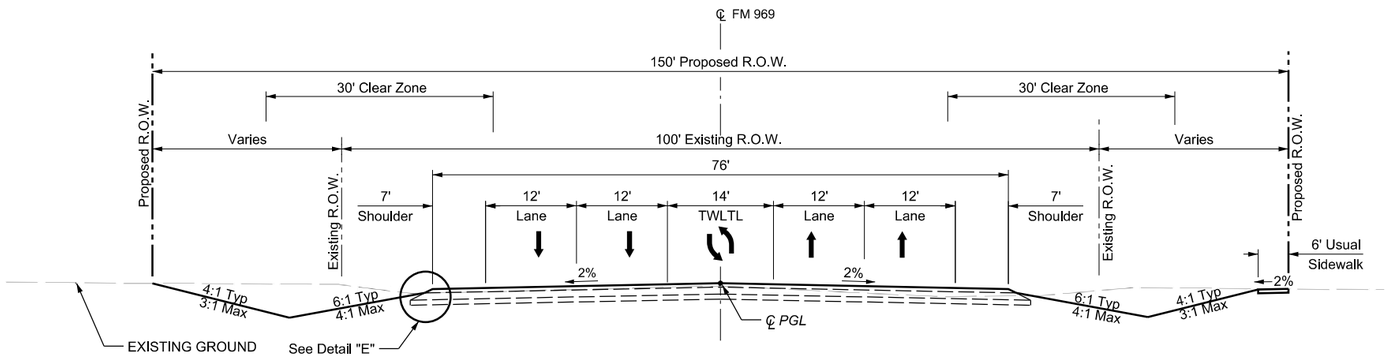
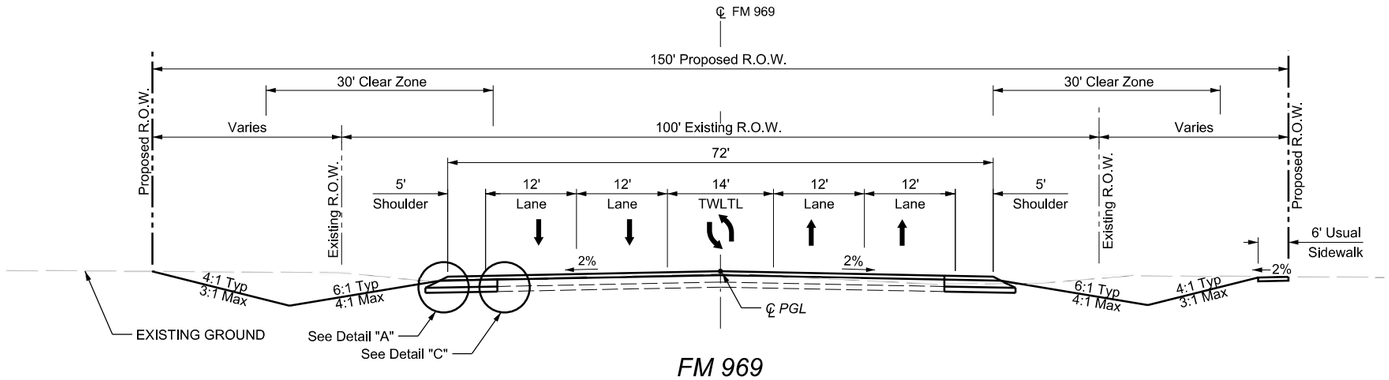


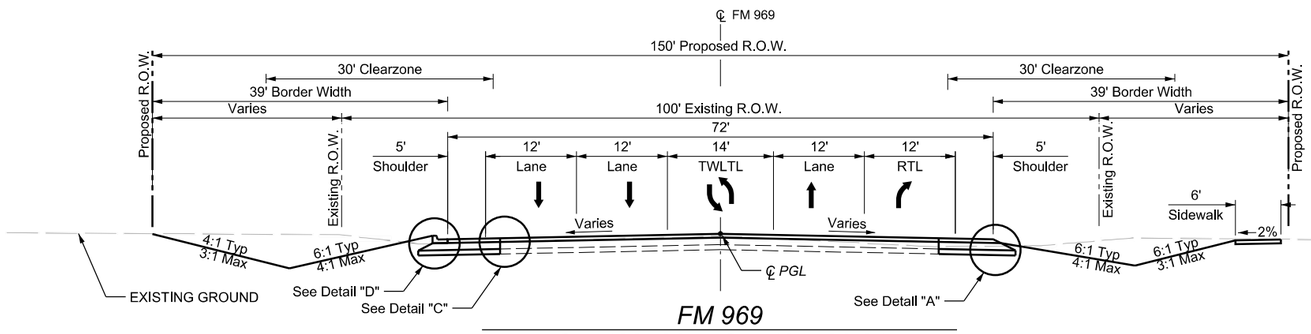
FM 969

Sta 350+24 to Sta 361+50



FM 969

Sta 419+60 to Sta 423+80



FM 969

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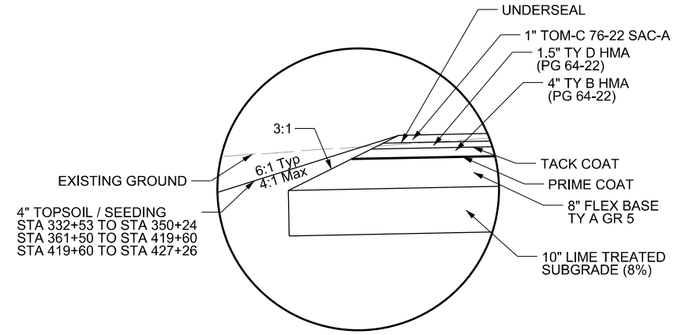

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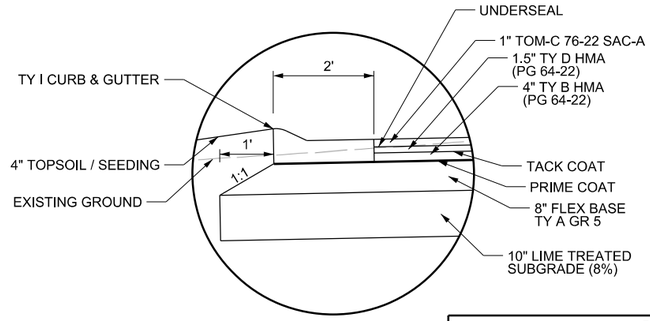

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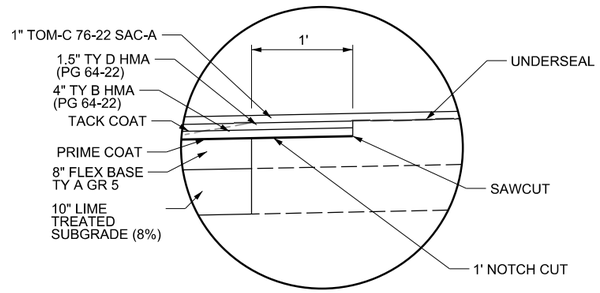

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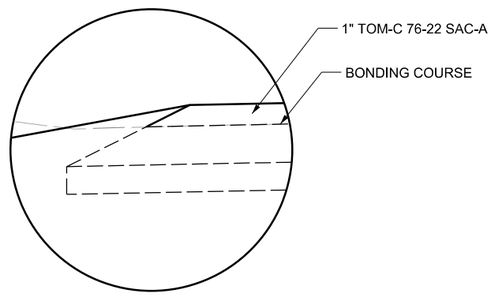

DETAIL E

STATE OF TEXAS
MAEN A. HOURANI
88202
PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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FM 969
TYPICAL SECTIONS PROPOSED

SCALE:

SHEET 2 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
	6	PTF 2022(045)		13
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GENERAL NOTES: Version: May 7, 2021

Item	Description	**Rate
**204	**Sprinkling**	
	(Dust)	30 GAL/CY
	(Item 132)	30 GAL/CY
	(Item 247)	30 GAL/CY
**210	**Rolling (Flat Wheel)**	
	(Item 247)	1 HR/200 TON
	(Item 316)	1 HR/6000 SY
**210	**Rolling (Tamping and Heavy Tamping)**	1 HR/200 CY
**210	**Rolling (Lt Pneumatic Tire)**	
	(Item 132)	1 HR/500 CY
	(Item 247)	1 HR/200 TON
	(Item 316 - Seal Coat)	1 HR/6000 SY
	(Item 316 - Two Course)	1 HR/3000 SY
247	**Flexible Base (CMP IN PLC)**	132 LB/CF
310	**Prime Coat**	0.20 GAL/SY
314	**Emulsified Asphalt Treatment (SS-1 or MS-2)**	0.30 GAL/SY
316	**Underseals Asphalts (Multi Option)**	0.20 GAL/SY
	Surface Treatments	
	Seal Coat	
	Grade 4	
	Asphalt	0.38 GAL/SY
	Aggregate	1 CY/120 SY
	Grade 5	
	Asphalt	0.32 GAL/SY
	Aggregate	1 CY/150 SY
	Two Course Surface Treatment	
	Asphalt 1st Application	0.28 GAL/SY
	Asphalt 2nd Application	0.24 GAL/SY
	Aggregate 1st Application Grade 4	1 CY/110 SY
	Aggregate 2nd Application Grade 4	1 CY/130 SY
340/3078,341/3076, 344/3077	**Dense-Graded Hot-Mix Asphalt and Superpave**	110 LB/SY/IN
342/3079	**Permeable Friction Course (PFC)**	
	Aggregate	84.6 LB/SY/IN
	Asphalt	5.4 LB/SY/IN
346/3080	**Stone-Matrix Asphalt**	113 LB/SY/IN
347/3081	**Thin Overlay Mixtures (TOM) - Surface**	
	Asphalt	7.0 LB/SY/IN
	Aggregate (SAC B)	106.0 LB/SY/IN
	Aggregate (SAC A)	109.0LB/SY/IN
350	**Microsurfacing**	25 LB/SY
3084	**Bonding Course**	0.09 GAL/SY
3085	**UnderSeal Course**	0.20 GAL/SY
	Tack Coat	0.08 GAL/SY

** For Informational Purposes Only

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

North Austin Susana.Ceballos@txdot.gov
North Austin Shane.Swimm@txdot.gov

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

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

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

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.

If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the work, if required.

The roadbed will be free of organic material prior to placing any section of the pavement structure.

Equip all construction equipment used in roadway work with highly visible omnidirectional flashing warning lights.

Intelligent Transportation Systems (ITS) Infrastructure may exist within the limits of this project and that the system must remain operational throughout construction. The exact location of ITS Infrastructure is not known. Contact the TxDOT Area Engineer's or Inspection Team's Office for the location(s) at least 48 hours before commencing any work that might affect present ITS Infrastructure. Use caution if working in these areas to avoid damaging or interfering with existing facilities. Repair any damage to this system within 8 hours of occurrence at no cost to the Department. In the event of system damage, notify TxDOT/CTECC at (512) 974-0883 within one hour of occurrence. Failure of the Contractor to repair damage to any infrastructure that conveys any corridor information to TxDOT/CTECC will result in the Contractor being billed for the full cost of emergency repairs.

Provide a smooth, clean sawcut along the existing asphalt pavement structure, as directed. Consider subsidiary to the pertinent Items.

Construct all manholes/valves to final pavement elevations prior to the placement of final surface. If the manholes/valves are going to be exposed to traffic, place temporary asphalt around the manhole/valve to provide a 50:1 taper. The asphalt taper is subsidiary to the ACP work.

Supply litter barrels in enough numbers at locations as directed to control litter within the project. Consider subsidiary to pertinent Items.

Use a self-contained vacuum broom to sweep the roadway and keep it free of sediment as directed. The contractor will be responsible for any sweeping above and beyond the normal maintenance required to keep fugitive sediment off the roadway as directed by the Engineer.

Damage to existing pipes and SET's due to Contractor operations will be repaired at Contractor's expense.

All locations used for storing construction equipment, materials, and stockpiles of any type, within the right of way, will be as directed. Use of right of way for these purposes will be restricted to those locations where driver sight distance to businesses and side street intersections is not obstructed and at other locations where an unsightly appearance will not exist. The Contractor will not have exclusive use of right of way but will cooperate in the use of the right of way with the city/county and various public utility companies as required.

Coordinate and obtain approval for all bridgework over existing roadways.

During evacuation periods for Hurricane events the Contractor will cooperate with Department for the restricting of Lane Closures and arranging for Traffic Control to facilitate Coastal Evacuation Efforts.

ITEM 5 – CONTROL OF THE WORK
Place construction stakes at intervals of no more than 100 ft. This work is subsidiary.

Provide a 72 hour advance email notice to AUS_Locate@TxDOT.gov to request illumination, traffic signal, ITS, or toll equipment utility locates. Provide AUS_Locate@TxDOT.gov an electronic pdf of as-builts within 21 calendar days of illumination, traffic signal, ITS, or toll equipment being placed into operation. As-built shall include GPS coordinates of manholes and junction boxes. Include final version of RFI's and revised plan sheets.

Precast Alternate Proposals.
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.

Electronic Shop Drawing Submittals:
Submit electronic shop drawing submittals according to the current Guide to Electronic Shop Drawing Submittal https://www.txdot.gov/business/resources/specifications/shop-drawings.html (TxDOT.gov Business > Resources - General > Shop Drawings). Pre-approved producers can be found online at TxDOT.gov > Business > Resources - Material Producer List. Use the following contact list for all submittals that are not required to be sent to Bridge Division and to copy the Engineer for all submittals to the Bridge Division.

Submittal Contact List

North Austin	Susana.Ceballos@txdot.gov	AUS_NA-ShopReview@txdot.gov
South Austin	Michelle.RomageChambers@txdot.gov	AUS_SA-ShopReview@txdot.gov

Alignment and Profile.
Unless shown in the plans, profile and alignment data for roadways being overlaid or widened are for design verification only. Provide survey and construct the roadway in accordance with the typical section. Bid items and data may be provided to adjust cross slope and super elevations.

ITEM 6 - CONTROL OF MATERIALS
Give a minimum of 1 business day notice for materials, which require inspection at the Plant.

For structures with paint containing hazardous materials, provide locations of paint removal 60 days prior to begin removal.

The area designated as the potential habitat for the Houston Toad will not be allowed as a source for embankment unless approved by the Engineer. The general area is Bastrop County north of the Colorado River and east of SH 95 unless provided in the plans.

For removal, tie, or tap of asbestos concrete (AC) pipe, contact TxDOT and the local utility company 60 days prior to performing the work. Expose the AC pipe to provide a minimum of 1 ft. of clearance around the top and sides. A minimal amount of soil may remain around the AC pipe to avoid disturbance. The local utility company will be responsible for the demo notice to DSHS and removal of the AC pipe. Tie or tap into existing AC pipe may require removing an entire section of pipe from collar to collar and replacement of pipe with new pipe using existing bid items.

ITEM 7 – LEGAL RELATIONS AND RESPONSIBILITIES
TxDOT will coordinate with TDLR regarding pedestrian elements and sidewalks. The contractor will procure and provide all permits, licenses, and inspections; pay all charges, fees, and taxes regarding TDLR rules governing industrialized housing and buildings.

Roadway closures during key dates and/or special events are prohibited. See notes for Item 502 for the key dates and/or special events.

Refer to the Environmental Permits, Issues and Commitments (EPIC) plan sheets for additional requirements and permits.

When any abandoned well is encountered, cease construction operations in this area and notify the Engineer who will coordinate the proper plugging procedures. A water well driller licensed in the State of Texas must be used to plug a well.

Erosion control and stabilization measures must be initiated immediately in portions of the site where construction activities have temporarily ceased and will not resume for a period exceeding 14 calendar days. Track all exposed soil, stockpiles, and slopes. Tracking consists of operating a tracked vehicle or equipment up and down the slope, leaving track marks perpendicular to the direction of the slope. Re-track slopes and stockpiles after each rain event or every 14 days, whichever occurs first. This work is subsidiary.

Perform maintenance of vehicles or equipment at designated maintenance sites. Keep a spill kit on-site during fueling and maintenance. This work is subsidiary.

Maintain positive drainage for permanent and temporary work for the duration of the project. Be responsible for any items associated with the temporary or interim drainage and all related maintenance. This work is subsidiary.

Suspend all activities near any significant recharge features, such as sinkholes, caves, or any other subterranean openings that are discovered during construction or core sampling. Do not proceed until the designated Geologist or TCEQ representative is present to evaluate and approve remedial action.

Locate aboveground storage tanks kept on-site for construction purposes in a contained area as to not allow any exposure to soils. The containment will be sized to capture 150% of the total capacity of the storage tanks.

PSL in Edwards Aquifer Recharge and Contributing Zone.
Obtain written approval from the Engineer for all on or off right of way PSLs not specifically addressed in the plans. Provide a signed SW3P sketch of the location 30 business days prior to use of the PSL. Include a list of materials, equipment and portable facilities that will be stored at the PSL.

PSL in USACE Jurisdictional Area.
Do not initiate activities in a PSL associated with a U.S. Army Corps of Engineers (USACE) jurisdictional area that have not been previously evaluated by the USACE as part of the permit review of this project. Such activities include, 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 jurisdictional area includes all waters of the U.S. including wetlands or associated wetlands affected by activities associated with this project. Special restrictions may be required for such work. Consult with the USACE regarding activities, including PSLs that have not been previously evaluated by the USACE. Provide the Department with a copy of all USACE coordination and approvals before initiating activities.

Proceed with activities in PSLs that do not affect a USACE jurisdictional area if self-determination has been made that the PSL is non-jurisdictional or proper clearances have been obtained in USACE jurisdictional areas or have been previously evaluated by the USACE as part of the permit review of this project. Document any determinations that PSL activities do not affect a USACE jurisdictional area. Maintain copies of PSL determinations for review by the Department or any regulatory agency. The Contractor must document and coordinate with the USACE, if required, before any excavation material hauled from or embankment material hauled into a USACE jurisdictional area by either (1) or (2) below.

1. **Restricted Use of Materials for the Previously Evaluated Permit Areas.** 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 Standard Specification Item 110, Excavation is used for permanent or temporary fill within a USACE jurisdictional area;
    b. suitable embankment from within the USACE jurisdictional area is used as fill within a USACE evaluated area;
    c. Unsuitable excavation or excess excavation that is disposed of at an approved location within a USACE evaluated area.

2. **Contractor Materials from Areas Other than Previously Evaluated Areas.** Provide the Department with a copy of all USACE coordination and approvals before initiating any activities in a jurisdictional 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. Standard Specification Item 132, Embankment is used for temporary or permanent fill within a USACE jurisdictional area;
    b. Unsuitable excavation or excess excavation that is disposed of outside a USACE evaluated area.

Work over or near Bodies of Water (Lakes, Rivers, Ponds, Creeks, etc.).
Keep on site a universal spill kit adequate for the body of water and the work being performed. Debris is not allowed to fall into the ordinary high-water level (OHWL). Debris that falls into the OHWL must be removed at the end of each work day. Debris that falls into the floodway must be removed at the end of each work week or prior to a rain event. Install and maintain traffic control devices to maintain a navigable corridor for water traffic, except during bridge demo and beam placement. This work is subsidiary.

Temporary fill or crossings require TxDOT approval and will be in accordance with the environmental requirements. Provide 60-day advance email notice, including a sketch of the proposed work, prior to placing temporary fill or crossing.

DSHS Asbestos and Demolition Notification.
Complete and provide the Texas Department of State Health Services (DSHS) notification form to the Engineer and email to AUS_BRG_Notify@txdot.gov at least 30 calendar days prior to

bridge removal or renovation for each phase or step of work. Notify the Engineer via email of any changes to the work start and end dates.

Migratory Birds and Bats.
Migratory birds and bats may be nesting within the project limits and concentrated on roadway structures such as bridges and culverts. Remove all old and unoccupied migratory bird nests from any structures, trees, etc. between September 16 and February 28. Prevent migratory birds from re-nesting between March 1 and September 15. Prevention shall include all areas within 25 ft. of proposed work. All methods used for the removal of old nesting areas and the prevention of re-nesting must be submitted to TxDOT 30 business days prior to begin work. This work is subsidiary.

If active nests are encountered on-site during construction, all construction activity within 25 ft. of the nest must stop. Contact the Engineer to determine how to proceed.

Amphibian and Aquatic Reptile BMPs.
Unless absence of the species can be demonstrated, assume presence in suitable habitat and implement the following BMPs. Absence can only be demonstrated using TPWD-approved survey efforts (contact TPWD for minimum survey protocols for species and project site conditions).

1. For projects within existing right-of-way (ROW) when work is in water or will permanently impact a water feature and potential habitat exists for the target species complete the following:
   a) Contractors will be advised of potential occurrence of Woodhouse's toad and Strecker's chorus frog in the project area, and to avoid harming the species if encountered.
   b) Minimize impacts to wetland, temporary and permanent open water features, including depressions, and riverine habitats.
   c) Maintain hydrologic regime and connections between wetlands and other aquatic features.
   d) Use barrier fencing to direct animal movements away from construction activities and areas of potential wildlife-vehicle collisions in construction areas directly adjacent, or that may directly impact, potential habitat for the target species.
   e) Apply hydromulching and/or hydroseeding in areas for soil stabilization and/or revegetation of disturbed areas where feasible. If hydromulching and/or hydroseeding are not feasible due to site conditions, using erosion control blankets or mats that contain no netting, or only contain loosely woven natural fiber netting is preferred. Plastic netting should be avoided to the extent practicable.
   f) Project specific locations (PSLs) proposed within state-owned ROW should be located in uplands away from aquatic features.
   g) When work is directly adjacent to the water, minimize impacts to shoreline basking sites (e.g., downed trees, sand bars, exposed bedrock) and overwinter sites (e.g., brush and debris piles, crayfish burrows) where feasible.

   h) Avoid or minimize disturbing or removing downed trees, rotting stumps, and leaf litter, which may be refugia for terrestrial amphibians, where feasible.
   i) If gutters and curbs are part of the roadway design, where feasible install gutters that do not include the side box inlet and include sloped (i.e. mountable) curbs to allow small animals to leave roadway. If this modification to the entire curb system is not possible, install sections of sloped curb on either side of the storm water drain for several feet to allow small animals to leave the roadway. Priority areas for these design recommendations are those with nearby wetlands or other aquatic features.
2. For projects that require acquisition of additional ROW and work within that new ROW is in water or will permanently impact a water feature, implement a – i above plus j – l below, where applicable:
   j) For sections of roadway adjacent to wetlands or other aquatic features, install wildlife barriers that prevent climbing. Barriers should terminate at culvert openings in order to funnel animals under the road. The barriers should be of the same length as the adjacent feature or 80 feet long in each direction, or whichever is the lesser of the two.
   k) For culvert extensions and culvert replacement/installation, incorporate measures to funnel animals toward culverts such as concrete wingwalls and barrier walls with overhangs.
   l) When riprap or other bank stabilization devices are necessary, their placement should not impede the movement of terrestrial or aquatic wildlife through the water feature. Where feasible, biotechnical streambank stabilization methods using live native vegetation or a combination of vegetative and structural materials should be used.

Terrestrial Reptile BMPs.
- Apply hydromulching and/or hydroseeding in areas for soil stabilization and/or revegetation of disturbed areas where feasible. If hydromulching and/or hydroseeding are not feasible due to site conditions, utilize erosion control blankets or mats that contain no netting or contain loosely woven, natural fiber netting is preferred. Plastic netting should be avoided to the extent practicable.
- For open trenches and excavated pits, install escape ramps at an angle of less than 45 degrees (1:1) in areas left uncovered. Visually inspect excavation areas for trapped wildlife prior to backfilling.
- Inform contractors that if reptiles are found on project site allow species to safely leave the project area.
- Avoid or minimize disturbing or removing downed trees, rotting stumps, and leaf litter where feasible.
- Contractors will be advised of potential occurrence in the project area, and to avoid harming the species if encountered.
- Avoid harvester ant mounds in the selection of Project Specific Locations (PSLs) where feasible.

Bird BMPs.

In addition to complying with the Migratory Bird Treaty Act (MBTA) perform the following BMPs:

- Prior to construction, perform daytime surveys for nests including under bridges and in culverts to determine if they are active before removal. Nests that are active should not be disturbed.
- Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season;
- Avoid the removal of unoccupied, inactive nests, as practicable;
- Prevent the establishment of active nests during the nesting season on TxDOT owned and operated facilities and structures proposed for replacement or repair;
- Do not collect, capture, relocate, or transport birds, eggs, young, or active nests without a permit.

Bat BMPs.
All bat surveys and other activities that include direct contact with bats shall comply with TPWD-recommended white-nose syndrome protocols located on the TPWD Wildlife Habitat Assessment Program website under "Project Design and Construction".

The following survey and exclusion protocols should be followed prior to commencement of construction activities. For the purposes of this document, structures are defined as bridges, culverts (concrete or metal), wells, and buildings.

- For activities that have the potential to impact structures, cliffs or caves, or trees; a qualified biologist will perform a habitat assessment and occupancy survey of the feature(s) with roost potential as early in the planning process as possible or within one year before project letting.
- For roosts where occupancy is strongly suspected but unconfirmed during the initial survey, revisit feature(s) at most four weeks prior to scheduled disturbance to confirm absence of bats.
- If bats are present or recent signs of occupation (i.e., piles of guano, distinct musky odor, or staining and rub marks at potential entry points) are observed, take appropriate measures to ensure that bats are not harmed, such as implementing non-lethal exclusion activities or timing or phasing of construction.
- Exclusion devices can be installed by a qualified individual between September 1 and March 31. Exclusion devices should be used for a minimum of seven days when minimum nighttime temperatures are above 50°F AND minimum daytime temperatures are above 70°F. Prior to exclusion, ensure that alternate roosting habitat is available in the immediate area. If no suitable roosting habitat is available, installation of alternate roosts is recommended to replace the loss of an occupied roost. If alternate roost sites are not provided, bats may seek shelter in other inappropriate sites, such as buildings, in the surrounding area. See "Additional Bat BMPs" below for recommended acceptable methods for excluding bats from structures.

- If feature(s) used by bats are removed as a result of construction, replacement structures should incorporate bat-friendly design or artificial roosts should be constructed to replace these features, as practicable.
- Large hollow trees, snags (dead standing trees), and trees with shaggy bark should be surveyed for colonies and, if found, should not be disturbed until the bats are no longer occupying these features. Post-occupancy surveys should be conducted by a qualified biologist prior to tree removal from the landscape.
- Retain mature, large diameter hardwood forest species and native/ornamental palm trees where feasible.
- In all instances, avoid harm or death to bats. Bats should only be handled as a last resort and after communication with TPWD.

Additional Bat BMPs.

- Bat surveys of structures should include visual inspections of structural fissures (cracked or spalled concrete, damaged or split beams, split or damaged timber railings), crevices (expansion joints, space between parallel beams, spaces above supports piers), and alternative structures (drainage pipes, bolt cavities, open sections between support beams, swallow nests) for the presence of bats.
- Before excluding bats from any occupied structure, bat species, weather, temperature, season, and geographic location must be incorporated into any exclusion plans to avoid unnecessary harm or death to bats. Winter exclusion must entail a survey to confirm either, 1) bats are absent or 2) present but active (i.e. continuously active – not intermittently active due to arousals from hibernation).
- Avoid using materials that degrade quickly, like paper, steel wool or rags, to close holes.
- Avoid using products or making structural modifications that may block natural ventilation, like hanging plastic sheeting over an active roost entrance, thereby altering roost microclimate.
- Avoid using chemical and ultrasonic repellents.
- Avoid use of silicone, polyurethane or similar non-water-based caulk products.
- Avoid use of expandable foam products at occupied sites.
- Avoid the use of flexible netting attached with duct tape.
- In order to avoid entombing bats, exclusion activities should be only implemented by a qualified individual. A qualified individual or company should possess at least the following minimum qualifications:
  - Experience in bat exclusion (the individual, not just the company).
  - Proof of rabies pre-exposure vaccinations.
  - Demonstrated knowledge of the relevant bat species, including maternity season date range and habitat requirements.
  - Demonstrated knowledge of rabies and histoplasmosis in relation to bat roosts.

- Contact TPWD for additional resources and information to assist in executing successful bat exclusions that will avoid unnecessary harm or death in bats.

Vegetation BMPs.

- Minimize the amount of vegetation cleared. Removal of native vegetation, particularly mature native trees and shrubs should be avoided to the greatest extent practicable. Wherever practicable, impacted vegetation should be replaced with in-kind on-site replacement/restoration of native vegetation.
- To minimize adverse effects, activities should be planned to preserve mature trees, particularly acorn, nut or berry producing varieties. These types of vegetation have high value to wildlife as food and cover.
- It is strongly recommended that trees greater than 12 inches in dbh that are removed be replaced. TPWD's experience indicates that for ecologically effective replacement, a ratio of three trees for every one (3:1) lost should be provided to the extent practicable either on-site or off-site. Trees less than 12 inches dbh should be replaced at a 1:1 ratio.
- Replacement trees should be of equal or better wildlife quality than those removed and be regionally adapted native species.
- When trees are planted, a maintenance plan that ensures at least an 85 percent survival rate after three years should be developed for the replacement trees.
- The use of any non-native vegetation in landscaping and revegetation is discouraged. Locally adapted native species should be used.
- The use of seed mix that contains seeds from only locally adapted native species is recommended.
- Avoid vegetation clearing activities during the general bird nesting season, March through August, to minimize adverse impacts to birds.

Tree and Brush Trimming and Removal.
Work will be conducted September 16 thru February 28. Work conducted outside this timeframe will require a bird survey. Submit a survey request to TxDOT 30 business days prior to begin work.

No extension of time or compensation will be granted for a delay or suspension due to the above bird, bat and tree/brush requirements.

Law Enforcement Personnel.
Submit charge summary and invoices using the Department forms.

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

No payment will be made for law enforcement personnel needed for moving equipment or payment for drive time to/from the event site. A minimum number of hours is not guaranteed. Payment is for work performed. If the Contractor has a field office, provide an office location for a supervisory officer when event requires a supervising officer. This work is subsidiary.

A maximum combined rate of $70 per hour for the law enforcement personnel and the patrol vehicle will be allowed. Any scheduling fee is subsidiary per Standard Specification 502.4.2.

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

Alterations to the cancellation and maximum rate must be approved by the Engineer or pre-determined by official policy of the officers governing authority.

ITEM 8 – PROSECUTION AND PROGRESS
Electronic versions of schedules will be saved in Primavera P6 format.

A CPM schedule in Primavera format and a PSSR is required. Use software fully compatible with Primavera P6.

The road-user cost liquidated damages are $2,093.00 per day.

ITEM 100 - PREPARING RIGHT OF WAY
Prep ROW must not begin until accessible trees designated for preservation have been protected, items listed in the EPIC have been addressed, and SW3P controls installed in accessible areas.

Backfill material will be Type B Embankment using ordinary compaction.

Follow Item 752.4 Work Methods and Item 752 general notes when removing or working on or near trees and brush.

Unless shown otherwise in the plans or a designated non-mow area, perform trimming or removal for areas within 30 ft. of edge of pavement under construction. Trim or remove to provide minimum of 5 ft. of horizontal clearance and 7 ft. of vertical clearance for the following: sidewalks, paths, guard fence, rails, signs, object markers, and structures. Trim to provide a minimum of 14 ft. vertical clearance under all trees. This work is subsidiary.

ITEM 110 – EXCAVATION
The Engineer will define unsuitable material.

ITEM 132 – ALL EMBANKMENT
At no time will the retaining wall backfill material exceed the adjacent embankment operation by more than one lift. At no time will the embankment adjacent to the retaining wall backfill

exceed the wall backfill by any elevation. Embankment placed over the area of MSE backfill must meet the same backfill requirements for the type specified under Item 423.

The Engineer will define unsuitable material. Material which the Contractor might deem to be unsuitable due to moisture content will not be considered unsuitable material.

Prior to begin embankment of existing area, correct or replace unstable material to a depth of 6 in. below existing grade. Embankment areas will be inspected prior to beginning work.

Rock or broken concrete produced by the project is allowed in earth embankments. The size of the rock or broken concrete will not exceed the layer thickness requirements in Section 132.3.4., "Compaction Methods." The material will not be placed vertically within 5 ft. of the finished subgrade elevation.

Embankment placed vertically within 5 ft. of the finished subgrade elevation or within the edges of the subgrade and treated with lime, cement, or other calcium based additives must have a sulfate content less than 3000 ppm. Allow 5 business days for testing. Treatment of sulfate material 3000 ppm to 7000 ppm requires 7 days of mellowing and continuous water curing, in accordance TxDOT guidelines for Treatment of Sulfate-Rich Soils and Bases in Pavement Structures (9/2005). Material over 7000 ppm is not allowed.

ITEM 160 - TOPSOIL
Off-site topsoil will have a minimum PI of 25.

No Sandy Loam allowed.

Obtain approval of the actual depth of the topsoil sources for both on-site and off-site sources. Construct topsoil stockpiles of no more than five (5) feet in height.

It is permissible to use topsoil dikes for erosion control berms within the right of way, as directed.

Seed or track slopes within 14 days of placement.

Salvage topsoil from sites of excavation and embankment. Maximum salvage depth is 6 inches.

Windrowing of topsoil obtained from the Right of Way (ROW) is not allowed.

ITEM 168 – VEGETATIVE WATERING
Water all areas of project to be seeded or sodded.

Maintain the seedbed in a condition favorable for the growth of grass. Watering can be postponed immediately after a rainfall on the site of ½ inch or greater, but will be resumed before the soil dries out. Continue watering until final acceptance.

Vegetative watering rates and quantities are based on ¼ inch of watering per week over a 3-month watering cycle. The actual rates used and paid for will be as directed and will be based on prevailing weather conditions to maintain the seedbed.

Obtain water at a source that is metered (furnish a current certification of the meter being used) or furnish the manufacturer's specifications showing the tank capacity for each truck used. Notify the Engineer, each day that watering takes place, before watering, so that meter readings or truck counts can be verified.

ITEM 247 - FLEXIBLE BASE
The layer thickness will be 4 in. to 6 in. unless shown on the plans. Placing in a single layer is allowed when total thickness of base is 8 in. or less. When placed in multiple layers, compact the bottom and middle layers to at least 95% and 98% of the maximum dry density, respectively. When placed in a single layer or the final layer, compact to at least 100%.

Correction of subgrade soft spots is subsidiary.

Complete per plans the subgrade, ditches, slopes, and drainage structures prior to the placement of base.

Do not use a vibratory roller to compact the material directly on top of a drainage structure .

ITEM 260 thru 276
Use ordinary compaction for subgrade treatment.

Three weeks prior to treatment, provide a sample of soil or flexible base to be treated.

ITEM 260 - LIME TREATMENT (ROAD-MIXED)
Apply **28** pounds per square yard.

For sulfate content greater than 3000 ppm, mix in an additional 4.0% points above optimum moisture after initial mixing and prior to mellow.

If the sulfate content is greater than 7000 ppm, do not treat. Undercut the unsuitable material to the depth per bid item for lime treatment and replace unsuitable material in accordance with Item 110. Payment will be made in accordance with Item 110.

ITEM 300s – SURFACE COURSES AND PAVEMENTS
Asphalt season is May 1 thru September 15. Emulsified Asphalt season is April 1 thru October 15. The latest work start date for asphalt season is August 1.

If an under seal is not provided, furnish a tack coat. Apply tack coat at 0.08 GAL/SY (residual). Apply non-tracking tack coat using manufacturer recommend rates.

ITEM 310 – PRIME COAT
Apply blotter material to all driveways and intersections. This work is subsidiary.

When Multi Option is allowed, provide EC 30 or AE-P. MC 30 is not allowed in Travis County.

Rolling to ensure penetration is required.

ITEM 340/3078 THRU 348/3082 - HOT-MIX ASPHALT PAVEMENT
Core holes may be filled with an Asphaltic patching material meeting the requirements of DMS-9203 or with SCM meeting requirements of DMS-9202.

Install transverse butt joints with 50 ft. H: 1 in. V transition from the new ACP to the existing surface. Install a butt joint with 24 in. H: 1 in. V transition from the new ACP to a driveway, pullout or intersection. Saw cut the existing pavement at the butt joints. This work is subsidiary.

Use a device to create a maximum 3H:1V notched wedge joint on all longitudinal joints of 2 in. or greater. This work is subsidiary.

Prior to milling, core the existing pavement to verify thickness. This work is subsidiary.

Ensure placement sequence to avoid excess distance of longitudinal joint lap back not to exceed one day's production rates.

Submit any proposed adjustments or changes to a JMF before production of the new JMF.

Tack every layer. Do not dilute tack coat. Apply it evenly through a distributor spray bar.
Provide a minimum transition of 10' for intersections, 10' for commercial driveways, and 6' for residential driveways unless otherwise shown on the plans.
Irregularities will require the replacement of a full lane width using an asphalt paver. Replace the entire sublot if the irregularities are greater than 40% of the sublot area.

Lime or an approved anti-stripping agent must be used when crushed gravel is utilized to meet a SAC "A" requirement.

When using RAP or RAS, include the management methods of processing, stockpiling, and testing the material in the QCP submitted for the project. If RAP and RAS are used in the same mix, the QCP must document that both of these materials have dedicated feeder bins for each recycled material. Blending of RAP and RAS in one feeder bin or in a stockpile is not permitted.

Asphalt content and binder properties of RAP and RAS stockpiles must be documented when recycled asphalt content greater than 20% is utilized.

No RAS is allowed in surface courses.

Department approved warm-mix additives is required for all surface mix application when RAP is used. Dosage rates will be approved during JMF approval.

The Hamburg Wheel Test will have a minimum rut depth of 3mm.

ITEM 340/3078 & 341/3076 - DENSE-GRADED HOT-MIX ASPHALT
Use the SGC for design and production testing of all mixtures. Design all Dense-Graded Type D mixtures as a surface mix, maximum 15% RAP and no RAS.

When using substitute binders, mold specimens for mix design and production at the temperature required for the substitute binder used to produce the HMA.

The Hamburg Wheel minimum number of passes for PG 64 or lower is reduced to 7,000. The Engineer may accept Hamburg Wheel test results for production and placement if no more than 1 of the 5 most recent tests is below the specified number of passes and the failing test is no more than 2,000 passes below the specified number of passes.

ITEMS 347/3081 - THIN OVERLAY MIXTURES (TOM)
For SAC A, blending SAC B aggregate with an RSSM greater than the SAC A rating or 10, whichever is greater, is prohibited.

When using a Thermal Imaging System follow the Weather Condition requirements for When Not Using a Thermal Imaging System.

Produce mixture with a Department approved WMA additive or process to facilitate compaction when the haul distance is greater than 40 miles or when the air temperature is 70°F and falling. WMA processes such as water or foaming processes are not allowed under these circumstances.

ITEM 416 - DRILLED SHAFT FOUNDATIONS
Stake all Foundations, for approval, before beginning drilling operations.

Calculate the vertical signal head clearance before placing any signal pole foundation.

For mast-arm signal and strain pole anchor bolts, set two in tension and two in compression.

Obtain approval of placement prior to placing concrete.

Remove spoils from a flood plain at the end of each work day.

ITEM 420, 423, 424 & 462 - STRUCTURES
Bridge Vertical Clearance and Traffic Handling
Notify TxDOT project staff and the local bridge engineer 10 business days prior to the following: change in vertical clearance, placing beams/girders over traffic, opening or removing traffic from a bridge or portion of a bridge, and completion of bridge work. This requirement includes bridge class culverts. Provide vertical clearance for all structures (including signal mast arms, span wires, and overhead sign bridge structures) within the project limit. Submit information and notices to local bridge engineer at AUS_BRG_Notify@txdot.gov.

ITEM 420 – CONCRETE SUBSTRUCTURES

Do not use PMDF in areas where a "Free Joint" is indicated in the plans.

Check the sign plans for locations of clearance signs and brackets on structures, which will require inserts in the pre-stressed beams.

Where Retaining Walls are integral parts of the abutment header, do not place the abutment cap prior to backfilling the wall and the abutment area up to the elevation of the bottom of the abutment cap.

Mass placements are defined as placements with a least dimension greater than or equal to 5 ft., or designated elsewhere on the plans.
The "H" values shown on Bridge Layouts are estimated column heights. Calculate the actual column heights based on field conditions.

Perform work during good weather unless otherwise directed. If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by the weather, the Contractor is responsible for all costs associated with repairs/replacement.

Upon completion of the structure, stencil the National Bridge Inventory (NBI) number (structure number) using black paint and 4 in. tall numbers at 4 locations designated by TxDOT. This work is subsidiary.

Bonding agents are required at construction joints. Do not use membrane curing for structural concrete as defined in Item 421, Table 8.

Remove all loose Formwork and other Materials from the floodplain or drainage areas daily.

ITEM 432 - RIPRAP
Mow strip riprap will be 4 in. and all other riprap will be 5 in. unless otherwise shown on the plans or in the pay items. Mow strip for cable barrier may be placed monolithically with the barrier foundations if using concrete in accordance with Item 543. Fiber reinforcement is not allowed except in mow strip for cable barrier if foundation and mow strip are placed monolithically.

Saw-cut existing riprap then epoxy 12 in. long No. 3 or No. 4 bars 6 in. deep at a maximum spacing of 18 in. in each direction to tie new riprap to existing riprap. This work is subsidiary.

For cement-stabilized riprap, provide Type A Grade 5 flexible base. Compressive strengths for Item 247 are waived.

SGT approach taper, paid using mow strip item, shall be installed using concrete, flexible base coated with SS-1 at a rate of 0.12 GAL/SY, or HMA Type B/C/D. Placement shall be ordinary compaction and does not require placement using an asphalt paver.

ITEM 460 - CORRUGATED METAL PIPE

Field adjust pipe end to maintain the necessary slope. Field cutting of pipe end is allowed. Coat all field cuts with asphalt paint. Cut ditches to grade before laying pipe.

ITEM 462 - CONCRETE BOX CULVERTS AND DRAINS

Either precast or cast in place are allowed at the discretion of the contractor.

ITEM 465 – JUNCTION BOXES, MANHOLES, AND INLETS
Maintain drainage at curb inlets until the final roadway surface is placed.

For inlets not placed in roadway, construct cast-in-place reinforced concrete apron as shown in the standards. This work is subsidiary.

Backfill shall use cohesionless material per Item 400 or flowable fill if width between structure and extent of excavation is 2 ft. or less. This is subsidiary.

ITEM 466 - HEADWALLS AND WINGWALLS
Remove all loose formwork and materials from the waterway at the end of each work week or prior to a rain event. Debris that falls into the waterway must be removed at the end of each work day. Upon completion of the structure, stencil the National Bridge Inventory (NBI) number (structure number) using black paint and 4 in. tall numbers at 4 locations designated by TxDOT. This work is subsidiary.

ITEM 467 - SAFETY END TREATMENT
Field adjust pipe end to maintain the necessary slope. Field cutting of pipe end is allowed. Coat all metal field cuts or exposed reinforcement with asphalt paint.

ITEM 496 - REMOVING STRUCTURES
Submit a demolition plan to the Engineer. Have the plan signed and sealed by a licensed professional engineer when the structure will continue to accommodate traffic after removal has begun and the removal impacts any part of the structure below the deck or riding surface. If applicable, the plan must detail requirements for meeting the U.S. Army Corps of Engineers' Section 404 Permit. The demolition plan must detail handling of roadway and waterway traffic. Waterway traffic must be maintained at all times unless a closure is approved by the Engineer.

No debris is allowed to fall into a body of water. Debris that falls into the water must be removed at the end of each work day. Debris that falls into the floodway must be removed at the end of each work week or prior to a rain event.

ITEM 502 - BARRICADES, SIGNS, AND TRAFFIC HANDLING

Table 1

Roadway	Limits	Allowable Closure Time
IH 35	All (1 lane closed)	9 P to 5 A
IH 35	All (2 lanes closed, see allowable work below)	9 P to 5 A
IH 35	All (2 lanes closed, all work)	11 P to 5 A
SH 45	US 183 to SH130	8 P to 5 A

LP 1	William Cannon to Parmer Lane	8 P to 5 A
US 183	SH 29 to FM 1327	8 P to 5 A
SH 71	SH 130 to IH 35	8 P to 5 A
SH 71	SH 304 to Tahitian Drive	8 P to 5 A
SH 71	US 290 W to RM 3238	8 P to 5 A
US 290 W	IH 35 to Nutty Brown Rd	8 P to 5 A
US 290 E	IH 35 to SH 95	8 P to 5 A
FM 734	FM 1431 to US 290 E	8 P to 5 A
US 79	IH 35 to Bus 79 in Taylor	8 P to 5 A
RM 1431	Lohmans Ford Rd to IH 35	8 P to 5 A
SH 29	LP 332 western terminus to SH 130	8 P to 5 A
SH 80	Charles Austin to River Road	8 P to 5 A
RM 2222	All	8 P to 5 A
RM 620	All	8 P to 5 A
RM 2244	All	8 P to 5 A
SPUR 69	All	8 P to 5 A
LP 360	All	8 P to 5 A
LP 343	All	8 P to 5 A
LP 275	All	8 P to 5 A
FM 1325	All	8 P to 5 A
All	Within 200' of a signalized intersection	9 P to 5 A
All	All (Full Closure, see allowable work below)	11 P to 4 A

Table 3 (Mobile Operations)

Roadway	Allowable Sun Night thru Fri Noon	Allowable Sat thru Sun Morn
Within Austin City Limits	10 A to 2 P and 7 P to 6 A	7 P to 10 A
Outside Austin City Limits	9 A to 3 P and 7 P to 7 A	6 P to 11 A
IH 35 main lanes	10 P to 5 A	9 P to 9 A
AADT over 50,000	8 P to 6 A	8 P to 10 A

For roadways without defined allowable closure times, nighttime lane closures will be allowed from 7 P to 6 A. Unless stated, daytime or Friday night lane closures will not be allowed and one lane in each direction will remain open at all times for all roadways.

Two lanes closed on IH 35 allowed to begin at 9 P for main lane (shoulder work not included) hotmix overlay or pavement repair operations (does not include bridge joint work).

Full closures only allowed Friday night thru Monday morning for bridge beam installation, bridge demolition, or OSB truss removal/installation. Full closures only allowed for roadways with frontage roads or if a designated detour route is provided in the plans.

No closures will be allowed on the weekends, working day prior, and working day after the National Holidays defined in the Standard Specifications, Good Friday, and Easter weekend. Closures the Sunday of the Super Bowl will not be allowed from 1 P to 11 P. No closures will be allowed on Friday and the weekends for projects within 20 miles of Formula 1 at COTA, ACL Fest, SXSW, ROT Rally, UT home football games (includes games not on a Friday or

weekend), sales tax holiday, Dell Match Play (includes Thursday) or other special events that could be impacted by the construction. All lanes will be open by noon of the day before these special events.

To account for directional traffic volumes, begin and end times of closures may be shifted equally by the Engineer. The closure duration will remain. Added compensation is not allowed.

Submit an emailed request for a lane closure (LCN) to TxDOT. The email will be submitted in the format provided. Receive concurrence prior to implementation. Submit a cancellation of lane closures a minimum of 18 hours prior to implementation. Blanket requests for extended periods are not allowed. Max duration of a request is 2 weeks prior to requiring resubmittal.

Provide 2 hour notice prior to implementation and immediately upon removal of the closure.

For roadways listed in Table 1: Submit the request 96 hours prior to implementation.

For roadways not listed in Table 1: Submit the request a minimum of 48 hours prior to the closure and by the following deadline immediately prior to the closure: 11A on Tuesday or 11A on Friday.

For all roadways: Submit request for traffic detours and full roadway closures 168 hours prior to implementation. Submit request for nighttime work 96 hours to implementation date.

Cancellations of accepted closures (not applicable to full closures or detours) due to weather will not require resubmission in accordance with the above restrictions if the work is completed during the next allowable closure time.

Closures that conflict with adjacent contractor will be prioritized according to critical path work per latest schedule. Conflicting critical path or non-critical work will be approved for first LCN submitted. Denial of a closure due to prioritization or other reasons will not be reason for time suspension, delay, overhead, etc.

Cover, relocate or remove existing signs that conflict with traffic control. Install all permanent signs, delineation, and object markers required for the operation of the roadway before opening to traffic. Use of temporary mounts is allowed or may be required until the permanent mounts are installed or not impacted by construction. Maintain the temporary mounts. This work is subsidiary.

Meet with the Engineer prior to lane closures to ensure that sufficient equipment, materials, devices, and workers will be used. Take immediate action to modify traffic control, if at any time the queue becomes greater than 20 minutes. Have a contingency plan of how modification will occur. Consider inclement weather prior to implementing the lane closures. Do not set up traffic control when the pavement is wet.

Place a 28-inch cone, meeting requirements of BC (10), on top of foundations that have protruding studs. This work is subsidiary.

Edge condition treatment types must be in accordance with the TxDOT standard. Installation and removal of a safety slope is subsidiary.

To determine a speed limit or an advisory speed limit, submit a request to TxDOT 60 business days prior to manufacture of the sign.

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

ITEM 504 - FIELD OFFICE AND LABORATORY
All labs and offices will include cleaning at least once a week. The cleaning will include sweeping and mopping of floors, cleaning the toilet and lavatory, and emptying wastebaskets. Space heaters are not considered adequate heating.

Projects with more than 500 CY of structural class concrete, 5000 SY of Class P concrete, and/or 2000 CY of non-structural concrete will include a concrete testing facility. Provide a structure with at least 200 sq. ft. of gross floor area in room 8 ft. high. The structure will include the laboratory equipment and all other related items to perform the contract-controlling test procedures.

Projects with HMAC, furnish a Type D structure for the Engineer's exclusive use. The structure will include high speed internet service with WIFI signal, one desk, two chairs, and one file cabinet. Provide a minimum of three 120-volt circuits with 20-amp breakers and at most two grounded convenience outlets per circuit.

ITEM 506 - TEMPORARY EROSION, SEDIMENTATION, AND ENV CONTROLS
Install, maintain, remove erosion, sedimentation and environmental control measures in areas of the right of way utilized by the contractor that are outside the limits of disturbance required for construction. Permanently stabilize the area. This work is subsidiary.

ITEM 508 – CONSTRUCTING DETOURS
Detour typical section must match the adjacent roadway section, unless shown on the plans.

Flexible base will be Type A Grade 5 placed using ordinary compaction. Base compressive strengths are waived for roadways not listed in Item 502, Table 1.

ITEM 512 – PORTABLE TRAFFIC BARRIER
In lieu of a crash cushion, place 25:1 Class C concrete transition where PTB terminates adjacent to existing concrete barrier. Installation and removal will be paid using Item 512.

Any increase in temporary barrier quantities that occur due to Contractor changes in the sequence of work or the traffic control plan will not be paid.

ITEM 528, 531, & 536 – MISCELLANEOUS CONSTRUCTION
Reinforcement will be in accordance with Item 432.3.1 unless shown on the plans. Fiber reinforcement is not allowed. Class A and B Concrete are allowed to use Coarse Aggregate Grades 1-8. Expansion joints will be placed every 40 ft. Expansion joints must be 1" wide asphalt board and flush with the surface. The bottom of the joint shall be at half the depth of the concrete. Sidewalk cross slope must not exceed 1.5%.

Unless shown on the plans or in the pay items, all concrete will be 5 in. thick and have 2 in. sand, base, or RAP bedding. Furnish base meeting the requirement for any type or grade in accordance with Item 247. Base compressive strengths are waived. RAP must be 100% passing a 1 in. sieve. Bedding must be placed using ordinary compaction.

If roots are encountered verify with the Engineer prior to accommodating or removing 2 in. diameter or larger roots. Root removal must be in accordance with Item 752.4.2. Roots may remain in the bedding or base. For improvements within 6 in. of a root, the concrete thickness may be reduced by 1 in. and the bedding increased by 1 in. to minimize impacts to the roots. Adjust bedding and surface profile to provide a 1 in. bedding cushion around the roots. The surface profile may be adjusted to the extent allowed by ADA. This work is subsidiary.

ITEM 530 – INTERSECTIONS, DRIVEWAYS, AND TURNOUTS
Notify property owners a minimum of 48 hr. in advance of beginning work on their driveway. Provide a list of each notification and contact prior to each closure. Only close driveways for reconstruction if duration and alternate access are approved. Install and maintain material across a work zone as temporary access. Temporary access must not have grade breaks that exceed 8%. This work is subsidiary.

Grade breaks must not exceed 8%. Sidewalk crossing slope will be 1.5% and 5 ft. wide with width reduction in approved locations.

For ACP or SURF TREAT, the pavement structure will match the adjacent roadway unless detailed on the plans. HMA, including surface, may use a maximum allowable amount of 40% RAP and 5% RAS for private driveways, public driveways for 2-lane roadways or smaller, and turnouts. Blending of 2 or more sources is allowed. Furnish base meeting the requirement for any type or grade in accordance with Item 247. Compressive strengths for flexible base are waived. Base must be placed using ordinary compaction.

For CONC, the pavement structure will be 6 in. thick and have 3 in. base bedding unless detailed on the plans. Furnish base meeting ACP or SURF TREAT requirements. Class A concrete is required and may use Coarse Aggregate Grades 1-8. Expansion joints will be placed every 20 ft.

Expansion joints will be constructed as detailed in the latest TxDOT Concrete Curb and Curb and Gutter Standard. Reinforcement will be in accordance with concrete riprap for Item 432.3.1., unless specified on the plans.

ITEM 540, 542, & 544 - METAL BEAM GUARD FENCE AND GUARDRAIL END TREATMENTS
Furnish round timber posts for guard fence. Steel posts for low fill culverts are subsidiary. Stake the locations for approval prior to installation. Adjust the limits of the fence to meet field conditions. Install delineators before opening the road to traffic.

Retain all materials. Contractor may reuse all existing materials that are structurally sound and dent free. All reused material shall be from this project and in compliance with current standards. Structurally sound rust spots with the largest dimension of 4 in. may be cleaned and repaired in accordance with 540.3.5. Contractor may punch or field drill holes in the metal rail element to accommodate post spacing. Additional holes for splice or connections are not allowed. The holes shall be spaced in accordance with the latest standard and shall not be closer than the minimum spacing shown on the current standard.

Remove, replace, and install mow strip block out material. Construct new block outs and backfill unused block outs with class B concrete. This work is subsidiary.

Repair of mow strip damage, not caused by contractor negligence, and installation of new mow strip will be paid with appropriate bid items. Backfill and shoulder up of area around fence and mow strip will be paid using embankment item.

ITEM 545 - CRASH CUSHION ATTENUATORS
Use a coring machine or saw cut to remove the mounting hardware/bolts from the existing pavement. Cutting the hardware flush with the surface is not allowed. Refill voids in accordance with the pavement specification. This work is subsidiary.

ITEM 600s & 6000s – ITS, LIGHTING, SIGNING, MARKINGS, AND SIGNALS
Meet the requirements of the NEC, Texas MUTCD, TxDOT standards, and TxDOT Standard Specifications. Notify the Engineer if existing elements to remain do not meet code or specification.

Contractor shall provide all service, equipment and material required to provide a functional item and interface with existing equipment and software.

For signal shop contact Charles Vaughn Jr (Charles.Vaughn@txdot.gov) and Douglas Turner (Douglas.L.Turner@txdot.gov).

Use the TxDOT provided form to submit an electrical, illumination, and signal checklist prior to request for signal activation or a punch list.

Provide a 7 day advance email notice to the Engineer to request illumination or traffic signal punch list inspection.

Provide a 14 day advance email notice to the Engineer with signal technician contact information and signal locations prior to working or assuming operations of illumination or traffic signal.

Provide a 60 day advance email notice to the Engineer to request signal timing if timing is not provided in the plans.

Provide a 180 day advance email notice to the Engineer for equipment to be provided by TxDOT.

Prior to relief of maintenance, a Test Period is required for signals and ITS equipment in accordance with Item 680.3.1.8. Response time to reported trouble calls shall be less than 2 hours. Complete repairs within 24 hours. Notify the Engineer and maintain a logbook in the controller cabinet of each trouble call. Do not clear the error log in the conflict monitor without approval.

Maintain the existing ITS equipment and HUB buildings operational during construction. ITS downtime is allowed from 12A to 4A. Downtime is restricted to one time per HUB or equipment.

Definitions of abbreviations used to designate ITS equipment, material, etc. can be provided by the Engineer.

ITEM 618 - CONDUIT
Fit PVC and HDPE conduit terminations with bell ends.

Shift the locations of conduit and ground boxes to accommodate field conditions.

Install conduit not exceeding 2 feet in any direction from a straight line. Install conduit at a minimum depth of 2 ft. below finished grade. Installation of the conduit by jacking or boring method will be at a depth of at least 1 ft. below subgrade.

Install a high tension, non-metallic pull rope in all conduit runs. Cap all empty conduit using standard weather tight conduit caps. This work is subsidiary.

Use a coring device when drilling holes through concrete structures.

Structurally mounted junction boxes will be as shown on the plans. When used for traffic signal installations, these boxes will be 12" x 12" x 8". This work is subsidiary.

When using existing conduit, ensure that all conduits have bushings and cleaned of dirt, mud, grease, and other debris. Re-strap existing or relocated conduit per the specification. This work is subsidiary. Abandon existing underground conduit that is unusable is allowed if all conductors are removed. Replacement conduit will be paid using the existing bid items.

ITEM 620 - ELECTRICAL CONDUCTORS
Provide 10 amp time delay fuses.

For Flashing Beacons (Item 685) and Pedestal Poles (Item 687), provide single-pole breakaway disconnects.

Install a minimum size 8 AWG equipment grounding conductor (EGC) in all conduits including loop detectors and traffic signal cables. Payment and the size of the EGC will be in accordance with standard ED (3)-14 note 12.

Permanently mark "illumination" on the luminaire conductors installed inside a traffic signal pole. Make the marks easily visible from the hand hole.

ITEM 624 – GROUND BOXES
Aggregate for fill under the box will be crushed, have a maximum size of 2 in., minimum size of ½ in., and requirements per Item 302 are waived.

ITEM 628 – ELECTRICAL SERVICES
Contact the utility company upon execution of contract and prior to the pre-construction meeting to make arrangements for all work and materials provided by the utility company. Contact AUS_Business_Services@txdot.gov for account approval and information. Accounts shall be placed in the name of TxDOT.

ITEM 644 – SMALL ROADSIDE SIGN ASSEMBLIES
Triangular slip base that use set screws to secure the post will require 1 of the set screws to penetrate the post by drilling a hole in the post at the location of the screw. All set screws shall be treated with anti-seize compound.

ITEM 658 – DELINEATOR AND OBJECT MARKER ASSEMBLIES
Installation and maintenance of portable CTB reflectors will be subsidiary to the barrier.

ITEM 662 - WORK ZONE PAVEMENT MARKINGS
Notify the Engineer at least 24 hours in advance of work for this item.

Maintain removable and short term markings daily. Remove within 48 hours after permanent striping has been completed.

Item 668 is not allowed for use as Item 662.

ITEM 666 - RETROREFLECTORIZED PAVEMENT MARKINGS
Notify the Engineer at least 24 hr. before beginning work.

Place longitudinal markings nightly for IH 35 main lanes or roadways with AADT greater than 100,000. Use of temporary flexible reflective roadway marker tabs is subsidiary and at the Contractor's option. Replace missing or damaged tabs nightly. If using tabs, place longitudinal markings weekly by 5 AM Friday for all weekday work and by 5 AM Monday for all weekend work. Failure to maintain tabs or place longitudinal markings by deadline will require nightly placement of longitudinal markings.

Place longitudinal markings no later than 7 calendar days after placement of the surface for roadways with AADT greater than 20,000.
When the raised portion of a profile marking is placed as a separate operation from the pavement marking, the raised portion must be placed first then covered with TY I.

When using black shadow to cover existing stripe apply a non-retroreflective angular abrasive bead drop. The marking color shall be adjusted to resemble the pavement color. If Item 677 is not used prior to placement of black shadow, scrape the top of the marking with a blade or large piece of equipment unless surface is a seal coat. The scraping of the marking is subsidiary.

ITEM 677 - ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS
Dispose of removed materials and debris at locations off the right of way.

Elimination using a pavement marking will not be allowed in lieu of methods listed in specification.

Remove pavement markings on concrete surfaces by a blasting method. Flail milling will be allowed when total quantity of removal on concrete surfaces is less than 1000 ft.

Strip seal is only method allowed on seal coat surface unless project includes placement of a new surface. If total quantity of removal on a seal coat surface is less than 2000 ft., elimination using a pavement marking is allowed if a test section is approved by the Engineer. Test section shall demonstrate the thermo marking color matches the existing pavement color.

Remove pavement markings outside the limits of the new surface by a blasting method.

Use a TRAIL or a non-retroreflective paint to cover stripe remnants that remain after elimination. The test requirements for these materials are waived. The paint color shall be adjusted to resemble the existing pavement color. Installation and maintenance is subsidiary.

ITEM 680 - HIGHWAY TRAFFIC SIGNALS
Luminaire arms shall be aligned with the signal head support. If multiple signal head supports, the luminaire arm shall be aligned with the support over the higher volume roadway.

Install 250W EQ LED illumination fixtures as shown in the plans. Test in accordance with Item 616. This work is subsidiary

Furnish all materials and install signs mounted on the traffic signal wire, traffic signal poles, mast arms, and pedestal pole assemblies. Remove all conflicting signs and sign foundations when signal is placed into operation. This work is subsidiary.

Use a Vulcan swinger sign mounting bracket or equivalent for all signs mounted on span wires.

Place the traffic signal into operation after the traffic signal and stripe have been completed. The signal shop will be present to program the controller and assist with detection setup. Have a

qualified technician and a representative from the controller supplier on the project site to place the traffic signals in operation.

If shown on the plans, install the Emergency Response Detection equipment supplied by the City.

Upon removal, contact signal shop to stockpile a maximum of 4 signal poles and mast arms that meet the current TxDOT standards at the Austin District Headquarters located at 7901 North IH 35, 78753. If signal shop declines receipt of material, Contractor will be responsible for disposal.

For city operated signals, the city may assist in determining how the detector loop lead-in cables are to be connected, and will also program the controller for operation, the video detection, hook up the conflict monitor, detector units and other equipment, and turn on the controller.

ITEM 682 – VEHICLE AND PEDESTRIAN SIGNAL HEADS
Install signal head attachments so the wiring to each passes from the signal pole through the attachment hardware to the signal head. Use UV rated tie wraps.

Traffic signal heads will be aluminum unless otherwise shown on the plans. Back plates will be black aluminum.

Provide louvers, which have five vanes with a black finish on inside surfaces when required. Fasten a hardware cloth screen, securely, with ⅝" or smaller mesh size to the front face of each louver to prevent bird nesting.

Use the four point mounting system (TY A) for signal heads, except in cases of skewed or vertical heads when (TY B) will be used.

ITEM 684 – TRAFFIC SIGNAL CABLES
For each cable run, coil an extra 2 ft. of cable in each steel pole and 5 ft. in the controller cabinet.

Provide a separate multi-conductor signal cable (14 AWG) inside pedestal poles and mast-arm signal poles from the terminal strip to each signal head as shown on the plans.

ITEM 686 - TRAFFIC SIGNAL POLE ASSEMBLIES (STEEL)
Provide and install damping plates on all mast arms 40 ft. or greater. For mast arms less than 40 ft., refer to SMA and DMA vibration notes for guidance. This work is subsidiary.

When luminaires are installed on mast arm poles, install a separate terminal strip in the signal pole access compartment. Provide a 10-amp time-delay fuse for traffic signal poles with luminaires.

ITEM 687 – PEDESTAL POLE ASSEMBLIES
Verify the required pole height prior to ordering material.

ITEM 688 - PEDESTRIAN DETECTORS AND VEHICLE LOOP DETECTORS
Test all loops in accordance with the FHWA loop detector handbook.
Install vehicle loops prior to placement of roadway surface.

For work within the city limits of Austin, notify COA (512) 974-4099 and TxDOT 21 days prior to loop installation. Install quadrapole layout for presence detectors within city limits of Austin.

For replacement of existing loops, replacement of damaged or missing conduit from the vehicle loop detector to the ground box will be measured and paid by overrun of loop detector bid item.

Removal of damaged ground boxes at end of lead in cable is subsidiary to the new ground box.

Test period for the pedestrian detectors shall be in accordance with item 680.3.1.8.

Pedestrian push buttons will be mounted at 42 in. above the walking surface and have permanent type signs within the detector unit (9 in. x 12 in. sign and push button station on signal poles and 5 in. x 7 in. sign and push button station on pedestrian poles), which explains their purpose and indicates which crosswalk signal is actuated. Provide speech walk message as shown in the plans or per Engineer.

ITEM 3084 – BONDING COURSE
The minimum application rates are listed in Table BC. Miscellaneous Tack is allowed for use with dense-graded Type B HMA. If a tack bid item is not provided, use bonding course item.

The target shear bond strengths are listed in Table BCS. The informational test cores shall be taken once a shift for first 5 lots of placement or a change to placement method of bonding course, bonding material, or hot mix material. The remaining informational test cores shall be taken once every 3 lots for surface mix. Informational tests are not required for non-surface mix beyond the first 5 lots unless there is a change to placement method of bonding course, bonding material, or hot mix material. Results from these informational tests will not be used for specification compliance.

Table BC

Material	Minimum Application Rate (gal. per square yard)
TRAIL – Emulsified Asphalt	0.06
TRAIL – Hot Asphalt	0.12
Spray Applied Underseal Membrane	0.10

Table BCS (For Informational Tests)

Material	Target Shear Bond Strength (Tex-249-F psi)
SMA – Stone-Matrix Asphalt	60.0
PFC – Permeable Friction Course	N/A
All Other Materials	40.0

ITEM 3085 – UNDERSEAL COURSE
The minimum application rates are listed in Table UC. The target shear bond strengths are listed in Table UCS. The informational test cores shall be taken once a shift for first 5 lots of placement or a change to placement method of bonding course, bonding material, or hot mix material. The remaining informational test cores shall be taken once every 3 lots for surface mix. Informational tests are not required for non-surface mix beyond the first 5 lots unless there is a change to placement method of bonding course, bonding material, or hot mix material. Results from these informational tests will not be used for specification compliance.

Table UC

Material	Minimum Application Rate (gal. per square yard)
TRAIL – Hot Asphalt	0.15
Spray Applied Underseal Membrane	0.20
Seal Coat – Tier II emulsion	0.25
Seal Coat – Tier II asphalt	0.23

Table UCS

Material	Minimum Shear Strength (psi)
SMA – Stone-Matrix Asphalt	60.0
PFC – Permeable Friction Course	40.0
All Other Materials	40.0

ITEM 6000s – ITS
Provide an email notice 180 days in advance for DMS signs and 120 days in advance for other items to AUS_Signal-Shop@txdot.gov to obtain TxDOT provided material from 7901 North IH 35, 78753.

Maintain the existing equipment and HUB buildings operational during construction. Network downtime is allowed from 12A to 4A. Downtime is restricted to one time per HUB or equipment.

Definitions of abbreviations used to designate ITS equipment, material, etc. can be provided by the Engineer.

ITEM 6001 – PORTABLE CHANGEABLE MESSAGE SIGN
Provide 2 PCMS. Provide a replacement within 12 hours. PCMS will be available for traffic control, event notices, roadway conditions, service announcements, etc.

Place PCMS 10 calendar days prior to begin work stating "Road Work Begin Soon, Contact 832-7000 For Info".

Place PCMS at time of LCN request. Place the PCMS at the expected end of queue caused by the closure. When the closure is active, revise the message to reflect the actual condition during the closure, such as "RIGHT LN CLOSED XXX FT".

ITEM 6185 – TRUCK MOUNTED ATTENUATOR AND TRAILER ATTENUATOR
The TMA/TA used for installation/removal of traffic control for a work area will be subsidiary to the TMA/TA used to perform the work.

The contractor will be responsible for determining if one or more operations will be ongoing at the same time to determine the total number of TMA/TA required for the work. TMA/TAs paid by the day is full compensation for all worksite locations during an entire day.

TMA/TAs used to protect damaged attenuators will be paid by the day using the force account item for the repair.

ITEM 6306 - VIDEO IMAGING VEHICLE DETECTION SYSTEM (VIVDS)
Install the VIVDS cameras onto the mast arms with the attachment mechanisms provided with the camera system. Install the VIVDS detection zones as directed. Have qualified personnel on site at the time of the signal turn-on to assist with the installation of detection zones. If the camera locations shown in the plans do not allow for proper sight of the proposed detection zones, relocate the cameras as needed and as directed. Place the traffic signal cable (TY A) (3-conductor) (16 AWG) in continuous and separate runs from each VIVDS camera to the controller. This work is subsidiary.

Aim and adjust the cameras, install the cables and VIVDS cards into the controller cabinet and complete any other necessary work to bring the traffic signal into operation.

Provide a Video Processor System (VPS) that can provide up to thirty-two detector outputs to the controller from up to eight camera/video processor units (C/VPU). Route the detector outputs through the Bus Interface Unit (BIU) or approved product, which replaces the functions of the BIU. Field of view for each C/VPU will provide a minimum of thirty-two virtual detection zones for vehicle detection.

Install all cables necessary to provide complete VIVDS operation. Provide a minimum of 10 cables to direct connect the notebook to the VIVDS port.

Phase red and green load switch outputs from up to sixteen phases of a NEMA TS2 Type 2 controller will be provided as inputs to the VPU for use with internal detector extend/delay timing functions. The C/VPU will be able to condition the detector outputs and detection zones based on the state of the associated phase number and color.

The serial communication port on the front of the VPU will be a DB-9 RS-232 connector. Supply a package that will operate with Windows XP and NT and provide the functionality defined in both sections 7.0 and 8.0 in both a direct connect and remote communications mode. The software resident in the VPU and the personal computer will be capable of transmitting and receiving all information needed for zone set up, monitoring vehicle detection by viewing

flashing detection zone overlays, and uploading/downloading and interrogating all stored data within the VPU. Remote communications with the VCU will be possible with the addition of external communication devices (modem, Codec, etc.) using the RS-232 and video output ports on the front of the VPU.

The VPU operational software will be stored internally in flash memory and be capable of being updated without the removal and replacement of memory devices.
All surge protection will be din rail mounted.

ITEM 6306 - VIDEO IMAGING VEHICLE DETECTION SYSTEM
Required Items:

Spec. Item	Description	Not Required	Required	State Supplied
2.6	REMOTE COMMUNICATIONS LINK		**X**	
5.0	VIVDS PROCESSOR UNIT		**1**	
6.0	CAMERA ASSEMBLY		**X**	
7.0	FIELD COMMUNICATION LINK			
	6 Twisted-Pair Cable / 18 AWG	**X**		
	Coaxial Cable w/Three (3) 16 AWG CNDRS		**X**	
	Fiber Optic Cable	**X**		
8.0	VIVDS SET-UP SYSTEM			
	Field PC	**X**		
	Field Software for District Shop laptops		**X**	
	Field Video Monitor /Ea. Inter.		**X**	
9.0	TEMPORARY USE AND RETESTING	**X**		
10.0	OPERATION FROM CENTRAL CONTROLLER			
	Workstation Computer & Peripherals	**X**		
	Central Control Software		**X**	
11.0	INSTALLATION AND TRAINING			
	Eight (8) Hours		**X**	
	Sixteen (16) Hours	**X**		

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1186-01-091 **DISTRICT** Austin **COUNTY** Travis
HIGHWAY FM 969

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	100-6002	PREPARING ROW	STA	95.500	
	104-6009	REMOVING CONC (RIPRAP)	SY	669.000	
	104-6015	REMOVING CONC (SIDEWALKS)	SY	248.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	115.000	
	105-6008	REMOVING STAB BASE AND ASPH PAV (6")	SY	43,332.000	
	110-6001	EXCAVATION (ROADWAY)	CY	38,580.000	
	132-6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	21,844.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	88,805.000	
	164-6023	CELL FBR MLCH SEED(PERM)(RURAL)(CLAY)	SY	44,405.000	
	164-6029	CELL FBR MLCH SEED(TEMP)(WARM)	SY	22,205.000	
	164-6031	CELL FBR MLCH SEED(TEMP)(COOL)	SY	22,167.000	
	168-6001	VEGETATIVE WATERING	MG	1,780.000	
	169-6006	SOIL RETENTION BLANKETS (CL 2) (TY F)	SY	88,805.000	
	169-6007	SOIL RETENTION BLANKETS (CL 2) (TY G)	SY	60.000	
	247-6041	FL BS (CMP IN PLC)(TYA GR1-2)(FNAL POS)	CY	14,509.000	
	260-6009	LIME TRT (EXST MATL)(10")	SY	66,572.000	
	260-6016	LIME (HYD, COM, OR QK(SLURRY))	TON	3,000.000	
	310-6001	PRIME COAT (MULTI OPTION)	GAL	12,791.000	
	347-6001	TOM (ASPHALT) PG 76-22	TON	207.000	
	347-6002	TOM-C (AGGREGATE) SAC-A	TON	3,998.000	
	416-6002	DRILL SHAFT (24 IN)	LF	1,480.000	
	416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	73.000	
	416-6034	DRILL SHAFT (TRF SIG POLE) (48 IN)	LF	66.000	
	420-6029	CL C CONC (CAP)	CY	84.000	
	420-6074	CL C CONC (MISC)	CY	115.000	
	420-6156	CL C CONC (WEBWALL)	CY	53.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	878.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	48.000	
	432-6024	RIPRAP (STONE COMMON)(DRY)(12 IN)	CY	101.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	29.000	
	450-6052	RAIL (HANDRAIL)(TY F)	LF	116.000	
	460-6005	CMP (GAL STL 36 IN)	LF	28.000	
	462-6008	CONC BOX CULV (5 FT X 4 FT)	LF	14.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	476.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	785.000	
	464-6017	RC PIPE (CL IV)(18 IN)	LF	200.000	
	464-6033	RC PIPE (ARCH)(CL III)(DES 4)	LF	1,088.000	
	465-6018	INLET (COMPL)(PCO)(4FT)(LEFT)	EA	1.000	
	466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	1.000	
	467-6191	SET (TY I)(S= 5 FT)(HW= 7 FT)(4:1) (C)	EA	1.000	
	467-6254	SET (TY I)(S= 7 FT)(HW= 6 FT)(4:1) (C)	EA	2.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1186-01-091 **DISTRICT** Austin **COUNTY** Travis
HIGHWAY FM 969

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	467-6359	SET (TY II) (18 IN) (RCP) (4: 1) (P)	EA	14.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	4.000	
	467-6391	SET (TY II) (24 IN) (RCP) (4: 1) (P)	EA	18.000	
	467-6439	SET (TY II) (36 IN) (CMP) (3: 1) (C)	EA	1.000	
	467-6555	SET (TY II) (DES 4) (RCP) (6: 1) (P)	EA	32.000	
	480-6001	CLEAN EXIST CULVERTS	EA	4.000	
	496-6004	REMOV STR (SET)	EA	5.000	
	496-6007	REMOV STR (PIPE)	LF	356.000	
	496-6041	REMOV STR (LARGE)	EA	2.000	
	496-6042	REMOV STR (SMALL)	EA	2.000	
	496-6043	REMOV STR (SMALL FENCE)	LF	4,726.000	
	496-6050	REMOV STR (DRIVEWAY CULVERT)	EA	15.000	
	500-6001	MOBILIZATION	LS	1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	8.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	952.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	952.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	200.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	200.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	8,470.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	8,470.000	
	508-6001	CONSTRUCTING DETOURS	SY	2,575.000	
	512-6104	PCTB FUR&INSTL(F-SHAPE OR SNGL SLP)TY1	LF	5,970.000	
	512-6105	PCTB MOVE&RESET(F-SHAPE OR SNGL SLPTY1	LF	5,790.000	
	512-6106	PORT CTB REMOVE(F-SHAPE OR SNGL SLP)TY1	LF	5,970.000	
	529-6007	CONC CURB & GUTTER (TY I)	LF	1,699.000	
	530-6004	DRIVEWAYS (CONC)	SY	1,021.000	
	530-6005	DRIVEWAYS (ACP)	SY	4,942.000	
	531-6002	CONC SIDEWALKS (5")	SY	6,539.000	
	531-6004	CURB RAMPS (TY 1)	EA	19.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	350.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	1.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	971.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA	1.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	2.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	3.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	33.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	40.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	40.000	
	560-6001	MAILBOX INSTALL-S (TWG-POST) TY 1	EA	9.000	
	560-6002	MAILBOX INSTALL-D (TWG-POST) TY 1	EA	3.000	
	560-6003	MAILBOX INSTALL-M (TWG-POST) TY 1	EA	1.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1186-01-091 **DISTRICT** Austin **COUNTY** Travis
HIGHWAY FM 969

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	2,562.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	670.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF	2,100.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	697.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	150.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA	11.000	
	628-6188	ELC SRV TY D 120/240 070(NS)SS(E)SP(O)	EA	2.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	24.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	2.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA	2.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)	EA	1.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA	2.000	
	644-6034	IN SM RD SN SUP&AM TYS80(1)SA(U-1EXT)	EA	1.000	
	644-6035	IN SM RD SN SUP&AM TYS80(1)SA(U-2EXT)	EA	2.000	
	644-6068	RELOCATE SM RD SN SUP&AM TY 10BWG	EA	14.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	32.000	
	658-6099	INSTL OM ASSM (OM-2Z)(WFLX)GND	EA	81.000	
	662-6001	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	LF	580.000	
	662-6002	WK ZN PAV MRK NON-REMOV (W)4"(DOT)	LF	695.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF	30,053.000	
	662-6012	WK ZN PAV MRK NON-REMOV (W)8"(SLD)	LF	1,906.000	
	662-6016	WK ZN PAV MRK NON-REMOV (W)24"(SLD)	LF	344.000	
	662-6017	WK ZN PAV MRK NON-REMOV (W)(ARROW)	EA	2.000	
	662-6029	WK ZN PAV MRK NON-REMOV(W)(WORD)	EA	2.000	
	662-6031	WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)	EA	14.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	40,719.000	
	662-6043	WK ZN PAV MRK NON-REMOV (Y)(MED NOSE)	EA	125.000	
	662-6048	WK ZN PAV MRK REMOV (REFL) TY I-C	EA	80.000	
	662-6050	WK ZN PAV MRK REMOV (REFL) TY II-A-A	EA	518.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	4,070.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	1,418.000	
	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	31.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	23.000	
	666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	5,430.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	18,418.000	
	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	2,354.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	21,319.000	
	672-6007	REFL PAV MRKR TY I-C	EA	474.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	818.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	17,003.000	
	677-6003	ELIM EXT PAV MRK & MRKS (8")	LF	1,949.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1186-01-091 **DISTRICT** Austin **COUNTY** Travis
HIGHWAY FM 969

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	230.000	
	677-6017	ELIM EXT PAV MRK & MRKS (SYMBOL)	EA	21.000	
	680-6002	INSTALL HWY TRF SIG (ISOLATED)	EA	2.000	
	680-6004	REMOVING TRAFFIC SIGNALS	EA	2.000	
	682-6001	VEH SIG SEC (12")LED(GRN)	EA	25.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	7.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	25.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	5.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	25.000	
	682-6049	BACKPLATE W/REFL BRDR(4 SEC)	EA	2.000	
	682-6050	BACKPLATE W/REFL BRDR(5 SEC)	EA	5.000	
	682-6060	BACKPLATE W/REFL BRDR(3 SEC)	EA	18.000	
	684-6009	TRF SIG CBL (TY A)(12 AWG)(4 CONDR)	LF	240.000	
	684-6028	TRF SIG CBL (TY A)(14 AWG)(2 CONDR)	LF	5,189.000	
	684-6031	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	LF	9,311.000	
	684-6033	TRF SIG CBL (TY A)(14 AWG)(7 CONDR)	LF	1,324.000	
	684-6049	TRF SIG CBL (TY A)(16 AWG)(3 CONDR)	LF	2,701.000	
	686-6033	INS TRF SIG PL AM(S)1 ARM(32')	EA	1.000	
	686-6039	INS TRF SIG PL AM(S)1 ARM(36')LUM	EA	1.000	
	686-6045	INS TRF SIG PL AM(S)1 ARM(44')	EA	1.000	
	686-6047	INS TRF SIG PL AM(S)1 ARM(44')LUM	EA	2.000	
	686-6055	INS TRF SIG PL AM(S)1 ARM(50')LUM	EA	3.000	
	687-6001	PED POLE ASSEMBLY	EA	19.000	
	687-6002	PEDESTRIAN PUSH BUTTON POLE	EA	20.000	
	688-6001	PED DETECT PUSH BUTTON (APS)	EA	20.000	
	740-6004	ANTI - GRAFFITI COATING(PERMNENT-TY II)	SF	7,955.000	
	3076-6001	D-GR HMA TY-B PG64-22	TON	13,401.000	
	3076-6048	D-GR HMA TY-D PG76-22	TON	6,221.000	
	3076-6066	TACK COAT	GAL	12,188.000	
	3084-6001	BONDING COURSE	GAL	197.000	
	3085-6001	UNDERSEAL COURSE	GAL	11,131.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	28.000	
	6027-6008	GROUND BOX (PREPARE)	EA	6.000	
	6185-6002	TMA (STATIONARY)	DAY	180.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	60.000	
	6306-6005	VIVDS CNTRL SOFTWARE	EA	2.000	
	6412-6001	PORTABLE ROADWAY ILLUMINATION	DAY	90.000	
	7000-6001	REML & DISPL DRIFTWOOD & DEBRIS	CY	20.000	
	7251-6001	Subsurface Util Locate (Outside Rdbed)	EA	10.000	
	7251-6002	Subsurface Util Locate (Within Rdbed)	EA	5.000	
	18	EROSION CONTROL MAINTENANCE	LS	1.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1186-01-091 **DISTRICT** Austin **COUNTY** Travis
HIGHWAY FM 969

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	18	SAFETY CONTINGENCY	LS	1.000	
		LAW ENFORCEMENT	LS	1.000	

SUMMARY OF REMOVAL ITEMS

REMOVAL SHEET NO	LOCATION	104 6009 REMOVING CONC (RIPRAP) SY	104 6015 REMOVING CONC (SIDEWALKS) SY	104 6017 REMOVING CONC (DRIVEWAYS) SY	105 6008 REMOVING STAB BASE AND ASPH PAV (6") SY	496 6004 REMOV STR (SET) EA	496 6007 REMOV STR (PIPE) LF	496 6041 REMOV STR (LARGE) EA	496 6042 REMOV STR (SMALL) EA	496 6043 REMOV STR (SMALL FENCE) LF	496 6050 REMOV STR (DRIVEWAY CULVERT) EA	542 6001 REMOVE METAL BEAM GUARD FENCE LF	542 6002 REMOVE TERMINAL ANCHOR SECTION EA	544 6003 GUARDRAIL END TREATMENT (REMOVE) EA
1	BEGIN TO STA 339+00				3139					325				
2	STA 339+00 TO STA 350+00				6907					556				
3	STA 350+00 TO STA 361+00				199									
4	STA 361+00 TO STA 372+00		53		6462									
5	STA 372+00 TO STA 383+00				5917		63	2						
6	STA 383+00 TO STA 394+00				7090	4	293			1018	3	490		2
7	STA 394+00 TO STA 405+00				4132					1099	7			
8	STA 405+00 TO STA 416+00				6584					1190				
9	STA 416+00 TO STA 427+00	669	195	115	2896	1			2	538	5	430		1
10	STA 427+00 TO END				6							51	1	
	PROJECT TOTALS	669	248	115	43332	5	356	2	2	4726	15	971	1	3

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PROFESSIONAL ENGINEER
STATE OF TEXAS
6/25/2021

COUNTY OF TRAVIS
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1839

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
SUMMARY OF QUANTITIES

SHEET 1 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		16
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS (PHASE 1)

TCP SHEET NO	LOCATION	508 6001	512 6104	545 6019	662 6001	662 6004	662 6012	662 6016	662 6034	662 6048	662 6050	677 6001	677 6003	677 6007	677 6017
		CONSTRUCTING DETOURS	PCTB FUR&INSTL(F-SHAPE OR SNGL SLP)TY1	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	WK ZN PAV MRK NON-REMOV (W)8"(SLD)	WK ZN PAV MRK NON-REMOV (W)24"(SLD)	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	WK ZN PAV MRK REMOV (REFL) TY I-C	WK ZN PAV MRK REMOV (REFL) TY II-A-A	ELIM EXT PAV MRK & MRKS (4")	ELIM EXT PAV MRK & MRKS (8")	ELIM EXT PAV MRK & MRKS (24")	ELIM EXT PAV MRK & MRKS (SYMBOL)
		SY	LF	EA	LF	LF	LF	LF	LF	EA	EA	LF	LF	LF	EA
1	BEGIN TO STA 339+00	1975	1520	4	180	780	125	34	2000	18	25	480	335	45	2
2	STA 339+00 TO STA 350+00	600	700	1		350			290		8				
3	STA 350+00 TO STA 361+00														
4	STA 361+00 TO STA 372+00														
5	STA 372+00 TO STA 383+00														
6	STA 383+00 TO STA 394+00														
7	STA 394+00 TO STA 405+00														
8	STA 405+00 TO STA 416+00														
9	STA 416+00 TO STA 427+00														
10	STA 427+00 TO END														
	PHASE 1 TOTALS	2575	2220	5	180	1130	125	34	2290	18	33	480	335	45	2

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS (PHASE 1 CONT.)

TCP SHEET NO	LOCATION	6185 6002	6412 6001
		TMA (STATIONARY)	PORTABLE ROADWAY ILLUMINATION
		DAY	DAY
1	BEGIN TO STA 339+00		
2	STA 339+00 TO STA 350+00		
3	STA 350+00 TO STA 361+00		
4	STA 361+00 TO STA 372+00		
5	STA 372+00 TO STA 383+00		
6	STA 383+00 TO STA 394+00		
7	STA 394+00 TO STA 405+00		
8	STA 405+00 TO STA 416+00		
9	STA 416+00 TO STA 427+00		
10	STA 427+00 TO END		
	PHASE 1 TOTALS	30	30

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FRN-F-1386

FM 969
SUMMARY OF QUANTITIES

SHEET 2 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		17
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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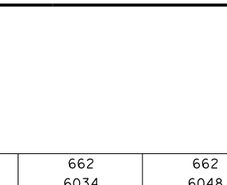
SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS (PHASE 2)

TCP SHEET NO	LOCATION	512 6104	512 6105	545 6003	545 6019	662 6001	662 6002	662 6004	662 6012	662 6017	662 6029	662 6043	662 6016	662 6031	662 6034	662 6048
		PCTB FUR&INSTL(F-SHAPE OR SNGL SLP)TY1	PCTB MOVE&RESET(F-SHAPE OR SNGL SLPTY1	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	WK ZN PAV MRK NON-REMOV (W)4"(DOT)	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	WK ZN PAV MRK NON-REMOV (W)8"(SLD)	WK ZN PAV MRK NON-REMOV (W)(ARROW)	WK ZN PAV MRK NON-REMOV(W) (WORD)	WK ZN PAV MRK NON-REMOV (Y)(MED NOSE)	WK ZN PAV MRK NON-REMOV (W)24"(SLD)	WK ZN PAV MRK NON-REMOV (W) 36"(YLD TRI)	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	WK ZN PAV MRK REMOV (REFL) TY I-C
		LF	LF	EA	EA	LF	LF	LF	LF	EA	EA	EA	LF	EA	LF	EA
1	STA 317+00 TO STA 328+00							90	60	1	1					2
2	STA 328+00 TO STA 339+00		365	1		70	215	1170	170	1	1		55	7	2424	2
3	STA 339+00 TO STA 350+00		955	3				1930							2680	
4	STA 350+00 TO STA 361+00							950	555	4	4	2	92		2940	16
5	STA 361+00 TO STA 372+00		900	1	2			1750							3200	
6	STA 372+00 TO STA 383+00	360			4			900							1080	
7	STA 383+00 TO STA 394+00	1230			3											
8	STA 394+00 TO STA 405+00	960			2											
9	STA 405+00 TO STA 416+00	660			5			1435					22		1635	
10	STA 416+00 TO STA 427+00	540			7	110		1400	200	1	1	110			1370	10
11	STA 427+00 TO END							26	26			13			26	1
	PHASE 2 TOTALS	3750	2220	5	23	180	215	9651	1011	7	7	125	169	7	15355	31

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS (PHASE 2 CONT.)

TCP SHEET NO	LOCATION	662 6050	677 6001	677 6003	677 6007	677 6017	6185 6002	6185 6005	6412 6001
		WK ZN PAV MRK REMOV (REFL) TY II-A-A	ELIM EXT PAV MRK & MRKS (4")	ELIM EXT PAV MRK & MRKS (8")	ELIM EXT PAV MRK & MRKS (24")	ELIM EXT PAV MRK & MRKS (SYMBOL)	TMA (STATIONARY)	TMA (MOBILE OPERATION)	PORTABLE ROADWAY ILLUMINATION
		EA	LF	LF	LF	EA	DAY	DAY	DAY
1	STA 317+00 TO STA 328+00		40			4			
2	STA 328+00 TO STA 339+00	30	860			7			
3	STA 339+00 TO STA 350+00	34	1670						
4	STA 350+00 TO STA 361+00	37	1840	800	70	6			
5	STA 361+00 TO STA 372+00	40	2570						
6	STA 372+00 TO STA 383+00	14	1315						
7	STA 383+00 TO STA 394+00								
8	STA 394+00 TO STA 405+00								
9	STA 405+00 TO STA 416+00	21	600		25				
10	STA 416+00 TO STA 427+00	17	1565						
11	STA 427+00 TO END		35		35				
	PHASE 2 TOTALS	193	10495	800	130	17	60	60	60



6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS
1839

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
SUMMARY OF QUANTITIES

SHEET 3 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		18
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS (PHASE 3)

TCP SHEET NO	LOCATION	502 6001	512 6104	512 6105	512 6106	545 6003	545 6005	545 6019	662 6001	662 6002	662 6004	662 6012	662 6016	662 6017	662 6029	662 6031
		BARRICADES, SIGNS AND TRAFFIC HANDLING	PCTB FUR&INSTL(F-SHAPE OR SNGL SLP)TY1	PCTB MOVE&RESET(F-SHAPE OR SNGL SLPTY1	PORT CTB REMOVE(F-SHAPE OR SNGL SLP)TY1	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	WK ZN PAV MRK NON-REMOV (W)4"(DOT)	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	WK ZN PAV MRK NON-REMOV (W)8"(SLD)	WK ZN PAV MRK NON-REMOV (W)24"(SLD)	WK ZN PAV MRK NON-REMOV (W)(ARROW)	WK ZN PAV MRK NON-REMOV(W) (WORD)	WK ZN PAV MRK NON-REMOV(W) 36"(YLD TRI)
		MO	LF	LF	LF	EA	EA	EA	LF	LF	LF	LF	LF	EA	EA	EA
1	BEGIN TO STA 339+00			210		3	3		80		1620	250		2	2	7
2	STA 339+00 TO STA 350+00			660		5	5				2200					
3	STA 350+00 TO STA 361+00									480	2200	422	86			
4	STA 361+00 TO STA 372+00			750		5	5				2200					
5	STA 372+00 TO STA 383+00			675		6	6				2200					
6	STA 383+00 TO STA 394+00			345		5	5				2200		33			
7	STA 394+00 TO STA 405+00			390		4	6	2			2200					
8	STA 405+00 TO STA 416+00			360			7	7			2200		22			
9	STA 416+00 TO STA 427+00			180			3	3	140		2240	98				
10	STA 427+00 TO END										12					
	PHASE 3 TOTALS	8		3570	5970	28	40	12	220	480	19272	770	141	2	2	7
	PROJECT TOTALS	8	5970	5790	5970	33	40	40	580	695	30053	1906	344	2	2	14

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS (PHASE 3 CONT.)

TCP SHEET NO	LOCATION	662 6034	662 6048	662 6050	677 6001	677 6003	677 6007	677 6017	6001 6001	6185 6002	6185 6005	6412 6001
		WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	WK ZN PAV MRK REMOV (REFL) TY I-C	WK ZN PAV MRK REMOV (REFL) TY II-A-A	ELIM EXT PAV MRK & MRKS (4")	ELIM EXT PAV MRK & MRKS (8")	ELIM EXT PAV MRK & MRKS (24")	ELIM EXT PAV MRK & MRKS (SYMBOL)	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)	PORTABLE ROADWAY ILLUMINATION
		LF	EA	EA	LF	LF	LF	EA	DAY	DAY	DAY	DAY
1	BEGIN TO STA 339+00	3150	8	40	813	814						
2	STA 339+00 TO STA 350+00	2200	23	28	310							
3	STA 350+00 TO STA 361+00	4400		55	4905		55	2				
4	STA 361+00 TO STA 372+00	2300		29								
5	STA 372+00 TO STA 383+00	2200		28								
6	STA 383+00 TO STA 394+00	2200		28								
7	STA 394+00 TO STA 405+00	2200		28								
8	STA 405+00 TO STA 416+00	2200		28								
9	STA 416+00 TO STA 427+00	2200		28								
10	STA 427+00 TO END	24										
	PHASE 3 TOTALS	23074	31	292	6028	814	55	2				
	PROJECT TOTALS	40719	80	518	17003	1949	230	21	28	180	60	90

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FRN - F-1386

FM 969
SUMMARY OF QUANTITIES

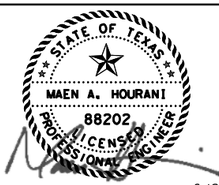
DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		19
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

SUMMARY OF ROADWAY ITEMS

RDWY P&P SHEET NO	LOCATION	100 6002	110 6001	132 6003	247 6366	260 6016	260 6009	310 6001	347 6001	347 6002	432 6045	450 6052	529 6007	530 6004	530 6005	531 6002	531 6004	540 6001
		PREPARING ROW	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY B)	FL BS (CMP IN PLC) (TY A GR 5) (FNAL POS)	LIME (HYD, COM, OR QK (SLURRY))	LIME TRT (EXST MATL) (10")	PRIME COAT (MULTI OPTION)	TOM (ASPHALT) PG 76-22	TOM-C (AGGREGATE) SAC-A	RIPRAP (MOW STRIP) (4 IN)	RAIL (HANDRAIL) (TY F)	CONC CURB & GUTTER (TY I)	DRIVEWAYS (CONC)	DRIVEWAYS (ACP)	CONC SIDEWALKS (5")	CURB RAMPS (TY 1)	MTL W-BEAM GD FEN (TIM POST)
		STA	CY	CY	CY	TON	SY	GAL	TON	TON	CY	LF	LF	SY	SY	SY	EA	LF
1	BEGIN TO STA 339+00	6.5	2850	479	636	132	2932	557	11	211		43	1226		38	629	1	
2	STA 339+00 TO STA 350+00	11	5253	524	2093	435	9660	1834	24	467					455	735		
3	STA 350+00 TO STA 361+00	11	2654	496	48	10	217	41	26	505					42	691	5	
4	STA 361+00 TO STA 372+00	11	7426	1485	2001	416	9239	1753	23	447		73			303	730		
5	STA 372+00 TO STA 383+00	11	6525	2893	2093	435	9666	1833	24	467				604	1206	755		
6	STA 383+00 TO STA 394+00	11	3612	10219	2170	435	9657	1974	24	466			153		554	759	7	
7	STA 394+00 TO STA 405+00	11	1760	3578	2092	435	9650	1835	24	467					811	730		
8	STA 405+00 TO STA 416+00	11	4526	608	2108	435	9653	1863	24	467				279	838	726	6	
9	STA 416+00 TO STA 427+00	11	3974	1562	1233	259	5734	1072	25	481	19		296	138	695	762		350
10	STA 427+00 TO END	1			35	8	164	29	2	20	1		24			22		
PROJECT TOTALS		95.5	38580	21844	14509	3000	66572	12791	207	3998	20	116	1699	1021	4942	6539	19	350

SUMMARY OF ROADWAY ITEMS, CONT.

RDWY P&P SHEET NO	LOCATION	540 6006	544 6001	560 6001	560 6002	560 6003	3076 6001	3076 6048	3076 6066	3084 6001	3085 6001	7251 6001	7251 6002
		MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	MAILBOX INSTALL-S (TWG-POST) TY 1	MAILBOX INSTALL-D (TWG-POST) TY 1	MAILBOX INSTALL-M (TWG-POST) TY 1	D-GR HMA TY-B PG64-22	D-GR HMA TY-D PG76-22	TACK COAT	BONDING COURSE	UNDERSEAL COURSE	SUBSURFACE UTIL LOCATE (OUTSIDE RDBED)	SUBSURFACE UTIL LOCATE (WITHIN RDBED)
		EA	EA	EA	EA	EA	TON	TON	GAL	GAL	GAL	EA	EA
1	BEGIN TO STA 339+00						506	328	460		676		
2	STA 339+00 TO STA 350+00			1			1968	727	1790		1498		
3	STA 350+00 TO STA 361+00						45	787	40	187			
4	STA 361+00 TO STA 372+00						1882	695	1710	10	1422		
5	STA 372+00 TO STA 383+00			1	3	1	1969	726	1790		1496		
6	STA 383+00 TO STA 394+00			1			1967	725	1790		1494		
7	STA 394+00 TO STA 405+00						1965	727	1790		1498		
8	STA 405+00 TO STA 416+00			3			1966	726	1790		1439		
9	STA 416+00 TO STA 427+00	1	1	3			1104	748	1002		1542		
10	STA 427+00 TO END		1				29	32	26		66		
PROJECT TOTALS		1	2	9	3	1	13401	6221	12188	197	11131	10	5



6/29/2021

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
SUMMARY OF QUANTITIES

DESIGN BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		20
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

6/29/2021
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SUMMARY OF DRAINAGE ITEMS

DRAINAGE SHEET NO	LOCATION	432 6001	432 6002	432 6024	460 6005	462 6008	464 6003	464 6005	464 6017	464 6033	465 6018	466 6101
		RIPRAP (CONC) (4 IN)	RIPRAP (CONC) (5 IN)	RIPRAP (STONE COMMON) (DRY) (12 IN)	CMP (GAL STL 36 IN)	CONC BOX CULV (5 FT X 4 FT)	RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	RC PIPE (CL IV) (18 IN)	RC PIPE (ARCH) (CL III) (DES 4)	INLET (COMPL) (PC O) (4FT) (LEF T)	HEADWALL (CH - PW - O) (DIA= 36 IN)
		CY	CY	CY	LF	LF	LF	LF	LF	LF	EA	EA
1	BEGIN TO STA 339+00	7		13	28		40				1	1
2	STA 339+00 TO STA 350+00	17	40				40					
3	STA 350+00 TO STA 361+00		8	24		14						
4	STA 361+00 TO STA 372+00	26		64			152			230		
5	STA 372+00 TO STA 383+00	98							200	566		
6	STA 383+00 TO STA 394+00	232					194					
7	STA 394+00 TO STA 405+00	159						67				
8	STA 405+00 TO STA 416+00	136						596				
9	STA 416+00 TO STA 427+00	203					50	122		292		
10	STA 427+00 TO END											
	PROJECT TOTALS	878	48	101	28	14	476	785	200	1088	1	1

SUMMARY OF DRAINAGE ITEMS CONT.

DRAINAGE SHEET NO	LOCATION	467 6191	467 6254	467 6359	467 6363	467 6391	467 6439	467 6555	480 6001	7000 6001
		SET (TY I) (S= 5 FT) (HW= 7 FT) (4:1) (C)	SET (TY I) (S= 7 FT) (HW= 6 FT) (4:1) (C)	SET (TY II) (18 IN) (RCP) (4: 1) (P)	SET (TY II) (18 IN) (RCP) (6: 1) (P)	SET (TY II) (24 IN) (RCP) (4: 1) (P)	SET (TY II) (36 IN) (CMP) (3: 1) (C)	SET (TY II) (DES 4) (RCP) (6: 1) (P)	CLEAN EXIST CULVERTS	REML & DISPL DRIFTWOOD & DEBRIS
		EA	EA	EA	EA	EA	EA	EA	EA	CY
1	BEGIN TO STA 339+00			2			1		1	
2	STA 339+00 TO STA 350+00		2	2					1	20
3	STA 350+00 TO STA 361+00	1							1	
4	STA 361+00 TO STA 372+00			2				4	1	
5	STA 372+00 TO STA 383+00				4			16		
6	STA 383+00 TO STA 394+00			6						
7	STA 394+00 TO STA 405+00					2				
8	STA 405+00 TO STA 416+00					10				
9	STA 416+00 TO STA 427+00			2		6		12		
10	STA 427+00 TO END									
	PROJECT TOTALS	1	2	14	4	18	1	32	4	20

STATE OF TEXAS
MAEN A. HOURANI
88202
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7/21/2021

COUNTY OF TRAVIS STATE OF TEXAS 1839

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FM 969
SUMMARY OF QUANTITIES

SHEET 6 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		21
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

SUMMARY OF TRAFFIC SIGNAL ITEMS

LOCATION	416 * 6030	416 6032	416 6034	618 6046	618 6047	620 6008	620 6009	620 6010	624 6010	628 6188	680 6004	680 6002	682 6001	682 6002	682 6003	682 6004
	DRILL SHAFT (TRF SIG POLE) (24 IN)	DRILL SHAFT (TRF SIG POLE) (36 IN)	DRILL SHAFT (TRF SIG POLE) (48 IN)	CONDT (PVC) (SCH 80) (2")	CONDT (PVC) (SCH 80) (2") (BORE)	ELEC CONDR (NO. 8) INSULATED	ELEC CONDR (NO. 6) BARE	ELEC CONDR (NO. 6) INSULATED	GROUND BOX TY D (162922) W/APRON	ELC SRV TY D 120/240 070(NS)SS(E) SP(O)	REMOVING TRAFFIC SIGNALS	INSTALL HWY TRF SIG (ISOLATED)	VEH SIG SEC (12")LED(GRN)	VEH SIG SEC (12")LED(GRN ARW)	VEH SIG SEC (12")LED(YEL)	VEH SIG SEC (12")LED(YEL ARW)
	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA
SH 130 SBFR	17			489	60		217		1							
SH 130 NBFR	12			503	55		315		1							
GILBERT ROAD	23	29	44	1280		1250	25	20	4	1	1	1	14	5	14	3
HOUND DOG TRAIL	6	44	22	290	555	850	140	130	5	1	1	1	11	2	11	2
PROJECT TOTALS	58	73	66	2562	670	2100	697	150	11	2	2	2	25	7	25	5

* CONTRACTOR INFO ONLY - INCLUDED IN BID ITEM 687-6001

SUMMARY OF TRAFFIC SIGNAL ITEMS CONT.

LOCATION	682 6005	682 6060	682 6049	682 6050	684 6009	684 6028	684 6031	684 6033	684 6049	686 6033	686 6039	686 6045	686 6047
	VEH SIG SEC (12")LED(RED)	BACKPLATE W/ REFL BRDR (3SEC)	BACKPLATE W/ REFL BRDR (4SEC)	BACKPLATE W/ REFL BRDR (5SEC)	TRF SIG CBL (TY A)(12 AWG)(4 CONDR)	TRF SIG CBL (TY A)(14 AWG)(2 CONDR)	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	TRF SIG CBL (TY A)(14 AWG)(7 CONDR)	TRF SIG CBL (TY A)(16 AWG)(3 CONDR)	INS TRF SIG PL AM(S)1 ARM(32')	INS TRF SIG PL AM(S)1 ARM(36')LUM	INS TRF SIG PL AM(S)1 ARM(44')	INS TRF SIG PL AM(S)1 ARM(44')LUM
	EA	EA	EA	EA	LF	LF	LF	LF	LF	EA	EA	EA	EA
SH 130 SBFR						1278	1298						
SH 130 NBFR						1501	1511						
GILBERT ROAD	14	9	2	3	160	1300	3568	882	1342		1		1
HOUND DOG TRAIL	11	9		2	80	1110	2934	442	1359	1		1	1
PROJECT TOTALS	25	18	2	5	240	5189	9311	1324	2701	1	1	1	2

SUMMARY OF TRAFFIC SIGNAL ITEMS CONT.

LOCATION	686 6055	687 6001	687 6002	688 6001	690 ** 6001	690 ** 6009	690 6029	690 ** 6033	690 6036	690 6040	690 6066	6027 6008	6306 6005
	INS TRF SIG PL AM(S)1 ARM(50')LUM	PED POLE ASSEMBLY	PEDESTRIAN PUSH BUTTON POLE	PED DETECT PUSH BUTTON (APS)	REMOVAL OF CONDUIT	REMOVAL OF CABLES	INSTALL OF SIGNAL RELATED SIGNS	REMOVAL OF TRAFFIC SIGNAL POLE FND	INSTALL OF FND FOR GROUND MNT CABINETS	INSTALL OF CONTROL CABINET(GRND MNT)	INSTALL OF LUMINAIRE HEAD	GROUND BOX (PREPARE)	VIVDS CNTRL SOFTWARE
	EA	EA	EA	EA	LF	LF	EA	LF	EA	EA	EA	EA	EA
SH 130 SBFR		3	4	4							2	3	
SH 130 NBFR		2	2	2							2	3	
GILBERT ROAD	2	8	8	8	863	6387	6	4	1	1	4		1
HOUND DOG TRAIL	1	6	6	6	845	3376	8	2	1	1	2		1
PROJECT TOTALS	3	19	20	20	1708	9763	14	6	2	2	10	6	2

** CONTRACTOR INFO ONLY - INCLUDED IN BID ITEM 680-6004

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7/21/2021

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LJA Engineering, Inc.
FRN - F-1386

FM 969
SUMMARY OF QUANTITIES

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		22
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

SUMMARY OF PAVEMENT MARKING ITEMS

PAVEMENT MARKINGS SHEET NO	LOCATION	658 6099	666 6300	666 6303	666 6036	666 6048	666 6054	666 6078	666 6312	666 6315	672 6007	672 6009
		INSTL OM ASSM (OM-2Z)(WFLX) GND	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	REFL PAV MRK TY I (W)(ARROW)(100MIL)	REFL PAV MRK TY I (W)(WORD)(100MIL)	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
		EA	LF	LF	LF	LF	EA	EA	LF	LF	EA	EA
1	BEGIN TO STA 339+00	3	290	1118					100	1278	14	38
2	STA 339+00 TO STA 350+00	10	556	2202					560	2216	26	54
3	STA 350+00 TO STA 361+00	10	672	2228	1037	438	12	12		2866	77	151
4	STA 361+00 TO STA 372+00	7	1100	2206			2		560	2201	59	67
5	STA 372+00 TO STA 383+00	10	844	2201	481		3	1	230	2504	68	102
6	STA 383+00 TO STA 394+00	10	530	2054	688	408	5	3	60	3336	61	143
7	STA 394+00 TO STA 405+00	13	558	2197					540	2197	28	56
8	STA 405+00 TO STA 416+00	5	480	1971	381	354	3	1	304	1996	46	70
9	STA 416+00 TO STA 427+00	13	390	2206	1463		6	6		2705	94	137
10	STA 427+00 TO END		10	35	20	218				20	1	
PROJECT TOTALS		81	5430	18418	4070	1418	31	23	2354	21319	474	818

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FRN - F-1386

FM 969
SUMMARY OF QUANTITIES

SHEET 8 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		23
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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SUMMARY OF SIGNING ITEMS

SIGN LAYOUT SHEET NO	LOCATION	644 6001	644 6004	644 6007	644 6030	644 6033	644 6034	644 6035	644 6068	644 6076
		IN SM RD SN SUP&AM TY10BWG(1)SA (P)	IN SM RD SN SUP&AM TY10BWG(1)SA (T)	IN SM RD SN SUP&AM TY10BWG(1)SA (U)	IN SM RD SN SUP&AM TYS80(1)SA(T)	IN SM RD SN SUP&AM TYS80(1)SA(U)	IN SM RD SN SUP&AM TYS80(1)SA(U -1EXT)	IN SM RD SN SUP&AM TYS80(1)SA(U -2EXT)	RELOCATE SM RD SN SUP&AM TY 10BWG	REMOVE SM RD SN SUP&AM
		EA	EA	EA	EA	EA	EA	EA	EA	EA
1	BEGIN TO STA 339+00	3							2	2
2	STA 339+00 TO STA 350+00	3		1						5
3	STA 350+00 TO STA 361+00	8	2			1	1	2		3
4	STA 361+00 TO STA 372+00	3							2	7
5	STA 372+00 TO STA 383+00	2								1
6	STA 383+00 TO STA 394+00	2		1		1				4
7	STA 394+00 TO STA 405+00								5	
8	STA 405+00 TO STA 416+00	2			1					5
9	STA 416+00 TO STA 427+00	1							5	5
10	STA 427+00 TO END									
	PROJECT TOTALS	24	2	2	1	2	1	2	14	32

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FM 969
SUMMARY OF QUANTITIES

SHEET 9 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		24
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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SUMMARY OF EROSION CONTROL ITEMS

SW3P SHEET NO	LOCATION	160 6003	164 6023	164 6029	164 6031	*166 6002	168 6001	169 6006	**169 6007	506 6002	506 6011	506 6020	506 6024	506 6038	506 6039
		FURNISHING AND PLACING TOPSOIL (4")	CELL FBR MLCH SEED(PERM)(RURAL)(CLAY)	CELL FBR MLCH SEED(TEMP)(WARM)	CELL FBR MLCH SEED(TEMP)(COOL)	FERTILIZER	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 2) (TY F)	SOIL RETENTION BLANKETS (CL 2) (TY G)	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
		SY	SY	SY	SY	TON	MG	SY	SY	LF	LF	SY	SY	LF	LF
1	BEGIN TO STA 339+00	3605	1803	902	902	0.3	73	3605						499	499
2	STA 339+00 TO STA 350+00	16311	8156	4078	4080	1.1	327	16311		131	131			1313	1313
3	STA 350+00 TO STA 361+00	6937	3469	1735	1735	0.5	139	6937		56	56			471	471
4	STA 361+00 TO STA 372+00	19040	9520	4760	4760	1.2	381	19040		340	340			956	956
5	STA 372+00 TO STA 383+00	11069	5535	2768	2683	0.7	222	11069		63	63			1423	1423
6	STA 383+00 TO STA 394+00	9546	4773	2387	2432	0.6	191	9546		30	30			1042	1042
7	STA 394+00 TO STA 405+00	7840	3920	1960	1960	0.5	157	7840		90	90			1011	1011
8	STA 405+00 TO STA 416+00	6795	3398	1699	1699	0.5	136	6795		60	60			992	992
9	STA 416+00 TO STA 427+00	7028	3514	1757	1757	0.5	141	7028		182	182			763	763
10	STA 427+00 TO END	634	317	159	159	0.1	13	634							
	AS DIRECTED BY ENGINEER								60			200	200		
	PROJECT TOTALS	88805	44405	22205	22167	6	1780	88805	60	952	952	200	200	8470	8470

* SUBSIDIARY ITEM-FOR CONTRACTOR'S INFORMATION ONLY

** ITEM 169 6007 TO BE DIRECTED BY ENGINEER

STATE OF TEXAS
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FM 969
SUMMARY OF QUANTITIES

SHEET 10 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		25
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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FM 969				
STATION	ITEM 110 6001		ITEM 132 6003	
	EXCAVATION (ROADWAY)		EMBANKMENT (FINAL)(ORD COMP)(TY B)	
	STA (CY)	ACCMLTD (CY)	STA (CY)	ACCMLTD (CY)
329+50.00	0	0	0	0
330+00.00	152.7	152.7	0	0
330+50.00	95.8	248.5	5.2	5.2
331+00.00	82.5	331	5.3	10.5
331+50.00	75.2	406.2	2.9	13.4
332+00.00	67	473.2	7.2	20.6
332+50.00	66.6	539.8	7	27.6
333+00.00	101.1	640.9	3.5	31.1
333+50.00	139.6	780.5	1.2	32.3
334+00.00	142	922.5	3.5	35.8
334+50.00	166.4	1088.9	6.1	41.9
335+00.00	200.7	1289.6	5.2	47.1
335+50.00	189.8	1479.4	11	58.1
336+00.00	183.5	1662.9	27.3	85.4
336+50.00	202.2	1865.1	49.4	134.8
337+00.00	193.1	2058.2	116.3	251.1
337+00.81	0	2058.2	0	251.1
337+50.00	239.5	2297.7	111.6	362.7
338+00.00	276.4	2574.1	58.2	420.9
338+50.00	275.4	2849.5	57.5	478.4
339+00.00	294.2	3143.7	53.2	531.6
339+50.00	284.3	3428	57.5	589.1
340+00.00	206.6	3634.6	75.2	664.3
340+50.00	171.3	3805.9	51	715.3
341+00.00	268.1	4074	5.7	721
341+50.00	367.8	4441.8	0.1	721.1
342+00.00	414.9	4856.7	1.4	722.5
342+50.00	373	5229.7	4.7	727.2
343+00.00	321.3	5551	3.5	730.7
343+50.00	322.3	5873.3	8.7	739.4
344+00.00	317.8	6191.1	26.9	766.3
344+50.00	256.9	6448	25.4	791.7
345+00.00	209.2	6657.2	12.6	804.3
345+50.00	206.6	6863.8	6.8	811.1
345+68.92	0	6863.8	0	811.1
346+00.00	194.5	7058.3	7.8	818.9
346+50.00	183.3	7241.6	7.9	826.8
347+00.00	166.1	7407.7	5.7	832.5
347+50.00	154.3	7562	39.8	872.3
348+00.00	150	7712	66.4	938.7
348+50.00	157.4	7869.4	42.5	981.2
349+00.00	233.6	8103	21.4	1002.6
349+50.00	413.6	8516.6	16.7	1019.3
350+00.00	389.6	8906.2	15.8	1035.1
350+50.00	160.3	9066.5	18.2	1053.3
351+00.00	69.8	9136.3	17.9	1071.2
351+50.00	71.7	9208	16.3	1087.5
352+00.00	72.5	9280.5	47.3	1134.8
352+20.33	0	9280.5	0	1134.8
352+50.00	72.6	9353.1	42.5	1177.3
353+00.00	133	9486.1	2.6	1179.9
353+50.00	139.7	9625.8	0	1179.9
354+00.00	79.6	9705.4	8.6	1188.5
354+50.00	73	9778.4	13.7	1202.2

FM 969				
STATION	ITEM 110 6001		ITEM 132 6003	
	EXCAVATION (ROADWAY)		EMBANKMENT (FINAL)(ORD COMP)(TY B)	
	STA (CY)	ACCMLTD (CY)	STA (CY)	ACCMLTD (CY)
355+00.00	73.1	9851.5	16.1	1218.3
355+50.00	73	9924.5	24.7	1243
356+00.00	73.2	9997.7	29	1272
356+50.00	73.3	10071	33.6	1305.6
357+00.00	73.3	10144.3	39.5	1345.1
357+50.00	73.1	10217.4	42.8	1387.9
358+00.00	139.6	10357	21.6	1409.5
358+50.00	160.8	10517.8		1409.5
359+00.00	94.2	10612	14.7	1424.2
359+50.00	72.7	10684.7	26.6	1450.8
360+00.00	71.7	10756.4	47	1497.8
360+50.00	83.7	10840.1	35.1	1532.9
361+00.00	85.6	10925.7	3.6	1536.5
361+50.00	148.6	11074.3	4.5	1541
362+00.00	225.9	11300.2	2.4	1543.4
362+50.00	261.9	11562.1	1.5	1544.9
363+00.00	303.9	11866	0.1	1545
363+50.00	316.5	12182.5	0.1	1545.1
364+00.00	313.2	12495.7	6.2	1551.3
364+50.00	320.4	12816.1	6.1	1557.4
364+61.55	0	12816.1		1557.4
365+00.00	307.3	13123.4	1.2	1558.6
365+50.00	376	13499.4	9.2	1567.8
366+00.00	440.6	13940	95.6	1663.4
366+50.00	426.5	14366.5	213.3	1876.7
367+00.00	418.6	14785.1	255.6	2132.3
367+50.00	386	15171.1	272.2	2404.5
368+00.00	374.8	15545.9	202.5	2607
368+50.00	549.4	16095.3	84.2	2691.2
369+00.00	583.3	16678.6	39.2	2730.4
369+50.00	323.8	17002.4	84.5	2814.9
370+00.00	224.9	17227.3	92	2906.9
370+50.00	278.3	17505.6	28.4	2935.3
371+00.00	326.9	17832.5	14.6	2949.9
371+50.00	349.4	18181.9	32.6	2982.5
372+00.00	346.9	18528.8	56.8	3039.3
372+50.00	343	18871.8	77.6	3116.9
373+00.00	349.1	19220.9	84.4	3201.3
373+50.00	353.3	19574.2	61.7	3263
374+00.00	348	19922.2	45.5	3308.5
374+50.00	359.5	20281.7	38.1	3346.6
375+00.00	372.9	20654.6	30.9	3377.5
375+50.00	401	21055.6	42.2	3419.7
376+00.00	452.1	21507.7	28.9	3448.6
376+50.00	442.8	21950.5	18.5	3467.1
377+00.00	426.2	22376.7	57.5	3524.6
377+50.00	446.5	22823.2	89.6	3614.2
378+00.00	443.6	23266.8	100.7	3714.9
378+50.00	399.2	23666	118.5	3833.4
379+00.00	325.4	23991.4	146.6	3980
379+50.00	218	24209.4	184.7	4164.7
380+00.00	130	24339.4	196.8	4361.5

LJA Engineering, Inc.
FRN - F-1386

FM 969
EARTHWORK SUMMARY

SHEET 1 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		26
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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FM 969				
STATION	ITEM 110 6001		ITEM 132 6003	
	EXCAVATION (ROADWAY)		EMBANKMENT (FINAL) (ORD COMP) (TY B)	
	STA (CY)	ACCMLTD (CY)	STA (CY)	ACCMLTD (CY)
380+50.00	89.9	24429.3	218.7	4580.2
381+00.00	82	24511.3	252.8	4833
381+50.00	79.7	24591	279.8	5112.8
382+00.00	64	24655	351.7	5464.5
382+50.00	51.5	24706.5	410.9	5875.4
382+63.03	0	24706.5	0	5875.4
383+00.00	63.5	24770	410	6285.4
383+50.00	84.6	24854.6	366	6651.4
384+00.00	206.7	25061.3	361.2	7012.6
384+50.00	205.8	25267.1	432.2	7444.8
385+00.00	98.9	25366	468.7	7913.5
385+50.00	141.5	25507.5	434.8	8348.3
386+00.00	178.8	25686.3	395.2	8743.5
386+50.00	171.7	25858	354.5	9098
387+00.00	127.3	25985.3	326.2	9424.2
387+50.00	97.5	26082.8	305.2	9729.4
388+00.00	104.1	26186.9	284.8	10014.2
388+50.00	92.9	26279.8	292.7	10306.9
389+00.00	76.3	26356.1	306.7	10613.6
389+50.00	71.6	26427.7	316.8	10930.4
390+00.00	69.8	26497.5	306.3	11236.7
390+50.00	68.9	26566.4	314.4	11551.1
391+00.00	67.1	26633.5	333.7	11884.8
391+50.00	62.2	26695.7	308.3	12193.1
392+00.00	72.4	26768.1	244.6	12437.7
392+50.00	75.6	26843.7	193.4	12631.1
393+00.00	68.2	26911.9	172.9	12804
393+50.00	83.7	26995.6	146.3	12950.3
394+00.00	96.6	27092.2	122.6	13072.9
394+50.00	100.5	27192.7	126.1	13199
395+00.00	110.1	27302.8	127.2	13326.2
395+50.00	99.4	27402.2	113.7	13439.9
396+00.00	86.8	27489	124.9	13564.8
396+50.00	77.9	27566.9	143.7	13708.5
397+00.00	67.7	27634.6	156.8	13865.3
397+50.00	72.2	27706.8	177.9	14043.2
398+00.00	65.5	27772.3	208.7	14251.9
398+50.00	70.8	27843.1	210.3	14462.2
399+00.00	71.8	27914.9	191.8	14654
399+50.00	68.9	27983.8	182.3	14836.3
400+00.00	76.6	28060.4	180.4	15016.7
400+50.00	79.4	28139.8	183.9	15200.6
401+00.00	77.7	28217.5	194.7	15395.3
401+50.00	69	28286.5	191.5	15586.8
402+00.00	70	28356.5	164.7	15751.5
402+50.00	79.7	28436.2	161.1	15912.6
403+00.00	78.1	28514.3	179.9	16092.5
403+50.00	70	28584.3	162.6	16255.1
404+00.00	76.1	28660.4	135.2	16390.3
404+50.00	94.7	28755.1	137.5	16527.8
405+00.00	136	28891.1	125.5	16653.3

FM 969				
STATION	ITEM 110 6001		ITEM 132 6003	
	EXCAVATION (ROADWAY)		EMBANKMENT (FINAL) (ORD COMP) (TY B)	
	STA (CY)	ACCMLTD (CY)	STA (CY)	ACCMLTD (CY)
405+50.00	147.5	29038.6	99.4	16752.7
406+00.00	118.9	29157.5	80.7	16833.4
406+50.00	112.9	29270.4	57.1	16890.5
407+00.00	121.2	29391.6	33.5	16924
407+50.00	163	29554.6	14.3	16938.3
408+00.00	229.2	29783.8	1.1	16939.4
408+50.00	289.7	30073.5	0.2	16939.6
409+00.00	342.9	30416.4	0.2	16939.8
409+50.00	359.8	30776.2	0.2	16940
410+00.00	338.8	31115	2.2	16942.2
410+50.00	303.3	31418.3	25.1	16967.3
411+00.00	279.4	31697.7	46.6	17013.9
411+50.00	212.6	31910.3	40	17053.9
412+00.00	136.8	32047.1	28.1	17082
412+50.00	148.6	32195.7	19.1	17101.1
413+00.00	169.7	32365.4	9.5	17110.6
413+50.00	166.8	32532.2	3.4	17114
413+96.12	144.1	32676.3	6.2	17120.2
414+00.00	11.2	32687.5	0.8	17121
414+50.00	180.9	32868.4	7	17128
415+00.00	206.7	33075.1	3.6	17131.6
415+50.00	206.4	33281.5	4.4	17136
416+00.00	214.2	33495.7	5	17141
416+50.00	202.1	33697.8	9.5	17150.5
417+00.00	211.2	33909	11.1	17161.6
417+34.98	162.7	34071.7	3.8	17165.4
417+50.00	69.4	34141.1	0.8	17166.2
418+00.00	283.6	34424.7	40	17206.2
418+50.00	272	34696.7	232.9	17439.1
419+00.00	196.7	34893.4	377.4	17816.5
419+50.00	194.8	35088.2	309.4	18125.9
420+00.00	196.2	35284.4	126.5	18252.4
420+50.00	176.1	35460.5	1.5	18253.9
421+00.00	147.6	35608.1	9.7	18263.6
421+39.03	108	35716.1	12.4	18276
421+50.00	31.4	35747.5	3.4	18279.4
422+00.00	144.7	35892.2	17.5	18296.9
422+50.00	135.3	36027.5	39.7	18336.6
423+00.00	110.1	36137.6	108.4	18445
423+50.00	119.1	36256.7	89.8	18534.8
424+00.00	149.5	36406.2	29.6	18564.4
424+50.00	138.9	36545.1	44.7	18609.1
425+00.00	123	36668.1	46.9	18656
425+03.60	8.9	36677	3.1	18659.1
425+50.00	120.1	36797.1	27.9	18687
426+00.00	166.4	36963.5	9.2	18696.2
426+50.00	164.2	37127.7	1.4	18697.6
427+00.00	127.3	37255	0.4	18698

GILBERT RD				
STATION	ITEM 110 6001		ITEM 132 6003	
	EXCAVATION (ROADWAY)		EMBANKMENT (FINAL) (ORD COMP) (TY B)	
	STA (CY)	ACCMLTD (CY)	STA (CY)	ACCMLTD (CY)
8+50.00	0	0	0	0
9+00.00	57.2	57.2	0	0
9+50.00	80.8	138	0.9	0.9
10+00.00	59.8	197.8	7.9	8.8
10+50.00	40.6	238.4	18.9	27.7
11+00.00	213.4	451.8	17.8	45.5
11+50.00	284.5	736.3	188.3	233.8
12+00.00	156.6	892.9	886.2	1120
12+50.00	93.1	986	1106.4	2226.4
13+00.00	92.2	1078.2	647.9	2874.3
13+50.00	155.7	1233.9	257.2	3131.5
14+00.00	90.3	1324.2	11.8	3143.3

LJA Engineering, Inc.
FRN - F-1386

FM 969
EARTHWORK SUMMARY

SHEET 2 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		27
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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EXHIBIT C

PHASE 1

PHASE 1 CONSISTS OF CONSTRUCTING TEMPORARY PAVEMENT ALONG FM 969 FROM STA 329+49 TO STA 346+00.EXISTING LANE CONFIGURATION WILL BE MAINTAINED FROM 346+00 TO END OF THE PROJECT.

1. PLACE TRAFFIC CONTROL DEVICES AND ADVANCE WARNING SIGNS AS SHOWN IN PLANS. TRAFFIC CONTROL DEVICES AND ADVANCE WARNING SIGNS SHALL BE IN COMPLIANCE WITH THE CURRENT TMUTCD, BC AND TCP STANDARDS.

2. PLACE TEMPORARY EROSION CONTROL DEVICES AS SHOWN IN THE PLANS, AND AS APPROVED BY THE ENGINEER, PRIOR TO BEGINNING ANY OTHER WORK.

3. CONSTRUCT TEMPORARY PAVEMENT AS SHOWN IN THE PLANS IN ACCORDANCE WITH TCP(2-1)-18 & TCP(2-4)-18.

   TEMP. PAVEMENT LOCATIONS
   A. STA 329+49 TO 338+38 - MEDIAN
   B. STA 330+55 TO 335+50 - RT SHOULDER
   C. STA 338+92 TO 345+87 - LT SHOULDER

4. CONSTRUCT TEMPORARY PAVEMENT FOR RIGHT SHOULDER PRIOR TO SETTING BARRIER AND INSTALLING WORK ZONE PAVEMENT MARKINGS AS SHOWN IN THIS PHASE. WORK SHALL BE PERFORMED DURING NIGHTTIME OPERATIONS USING TCP(2-4A).

PHASE 2

WORK IN THIS PHASE WILL BE COMPLETED IN 2 STEPS. STEP 1 LIMITS ARE FROM BEGINING OF PROJECT TO STA 405+00. STEP 2 LIMITS ARE FROM STA 405+00 TO END OF PROJECT. STEP 1 TO BE COMPLETED BEFORE WORK IN STEP 2 TO BEGIN UNLESS APPROVED BY ENGINEER. DESCRIPTION OF EACH STEP IS PROVIDED BELOW.

PHASE 2 STEP 1:

PHASE 2 STEP 1 CONSISTS OF CONSTRUCTING PAVEMENT ALONG THE SOUTH SIDE FROM STA 335+66 TO STA 350+24 AND FROM STA 361+49 TO STA 405+00.TWO-WAY TRAFFIC WILL BE MAINTAINED AND TRAFFIC WILL BE SHIFTED TO THE NORTH SIDE OF THE ROAD. CONTRACTOR SHALL COMPLETE PHASE 1 AND PHASE 2 STEP 1 BEFORE BEGIN PHASE 2 STEP 2. CONTRACTOR SHALL NOT BEGIN PHASE 2 STEP 2 WORK UNTIL 4/1/2022.

1. PLACE TRAFFIC CONTROL DEVICES AND ADVANCE WARNING SIGNS AS SHOWN IN PLANS. TRAFFIC CONTROL DEVICES AND ADVANCE WARNING SIGNS SHALL BE IN COMPLIANCE WITH THE TMUTCD, BC AND TCP STANDARDS.

2. PLACE TEMPORARY EROSION CONTROL DEVICES AS SHOWN IN THE PLANS, AND AS APPROVED BY THE ENGINEER, PRIOR TO BEGINNING ANY OTHER WORK.

3. CONSTRUCT SIDEWALK AND PROPOSED DITCH IMPROVEMENTS ON SOUTH SIDE OF FM 969 AS SHOWN IN THE PLANS.

4. CONSTRUCT PERMANENT PAVEMENT, DRIVEWAYS, AND DRIVEWAY CULVERTS ON SOUTH SIDE OF FM 969 FROM STA 335+66 TO STA 350+24 AND FROM STA 361+49 TO STA 405+00. LEAVE OFF 1" TOM WHERE APPLICABLE. PLACE 0"-2" LEVEL-UP AS DIRECTED BY THE ENGINEER. MAINTAIN POSITIVE DRAINAGE IN TEMPORARY DITCHES AS SHOWN IN THE PLANS.

5. ADJUST SIGNAL HEADS AT SH 130 TO MATCH TRAFFIC. ADJUST SIGNAL TIMING & PHASING AS DIRECTED BY TXDOT. INSTALL PROPOSED SIGNALS AT GILBERT ROAD AND HOUND DOG TRAIL. ADJUST SIGNALS TIMINGS & PHASING AS DIRECTED BY TXDOT.

6. WASTEWATER AND WATER UTILITY ADJUSTMENTS (DONE BY OTHERS) WILL BE PERFORMED CONCURRENT TO STEP 1 OF THIS PHASE FROM STA 405+77 TO STA 425+04. UTILITY WORK MUST BE COMPLETED PRIOR TO CONTRACTOR STARTING PHASE 2 STEP 2. A SHORT DESCRIPTION OF THE UTILITY ADJUSTMENTS PROVIDED BELOW.

   A. WASTEWATER
   - STA 405+77 TO STA 411+61: RELOCATE EXISTING FORCE MAIN TO NEW EASEMENT.
   - STA 414+74 TO STA 425+04: RELOCATE EXISTING SEWER CLOSER TO NEW ROW.
   - STA 425+02: RELOCATE EXISTING CROSSING.

   B. WATER
   - STA 411+40: EXTEND EXISTING CASING.
   - STA 415+11: RELOCATE EXISTING CROSSING.
   - STA 417+54: RELOCATE EXISTING CROSSING.

PHASE 2 (CONTINUED)

PHASE 2 STEP 2:

PHASE 2 STEP 2 CONSISTS OF CONSTRUCTING PAVEMENT ALONG THE SOUTH SIDE FROM STA 405+00 TO STA 427+26.TWO-WAY TRAFFIC WILL BE MAINTAINED AND TRAFFIC WILL BE SHIFTED TO THE NORTH SIDE OF THE ROAD.

1. PLACE TRAFFIC CONTROL DEVICES AND ADVANCE WARNING SIGNS AS SHOWN IN PLANS. TRAFFIC CONTROL DEVICES AND ADVANCE WARNING SIGNS SHALL BE IN COMPLIANCE WITH THE TMUTCD, BC AND TCP STANDARDS.

2. PLACE TEMPORARY EROSION CONTROL DEVICES AS SHOWN IN THE PLANS, AND AS APPROVED BY THE ENGINEER, PRIOR TO BEGINNING ANY OTHER WORK.

3. CONSTRUCT SIDEWALK AND PROPOSED DITCH IMPROVEMENTS ON SOUTH SIDE OF FM 969 AS SHOWN IN THE PLANS.

4. CONSTRUCT PERMANENT PAVEMENT, DRIVEWAYS, AND DRIVEWAY CULVERTS ON SOUTH SIDE OF FM 969 FROM STA 405+00 TO STA 427+26. LEAVE OFF 1" TOM WHERE APPLICABLE. PLACE 0"-2" LEVEL-UP AS DIRECTED BY THE ENGINEER. MAINTAIN POSITIVE DRAINAGE IN TEMPORARY DITCHES AS SHOWN IN THE PLANS.

5. ADJUST SIGNAL HEADS AT SH 130 TO MATCH TRAFFIC. ADJUST SIGNAL TIMING & PHASING AS DIRECTED BY TXDOT. INSTALL PROPOSED SIGNALS AT GILBERT ROAD AND HOUND DOG TRAIL. ADJUST SIGNALS TIMINGS & PHASING AS DIRECTED BY TXDOT.

PHASE 3

PHASE 3 CONSISTS OF CONSTRUCTING PAVEMENT ALONG THE NORTH SIDE OF FM 969. TRAFFIC WILL BE SHIFTED ONTO NEW PAVEMENT CONSTRUCTED IN PHASE 2 FROM FM 973 TO HUNTERS BEND RD.

1. PLACE TRAFFIC CONTROL DEVICES AND ADVANCE WARNING SIGNS AS SHOWN IN PLANS. TRAFFIC CONTROL DEVICES AND ADVANCE WARNING SIGNS SHALL BE IN COMPLIANCE WITH THE TMUTCD, BC AND TCP STANDARDS.

2. PLACE TEMPORARY EROSION CONTROL DEVICES AS SHOWN IN THE PLANS, AND AS APPROVED BY THE ENGINEER, PRIOR TO BEGINNING ANY OTHER WORK.

3. CONSTRUCT PROPOSED DITCH IMPROVEMENTS ON NORTH SIDE OF FM 969 AS SHOWN IN THE PLANS.

4. ADJUST SIGNAL HEADS AT GILBERT RD AND HOUND DOG TRAIL. ADJUST TIMING & PHASING AS DIRECTED BY TXDOT.

5. CONSTRUCT PERMANENT PAVEMENT, DRIVEWAYS, AND DRIVEWAY CULVERTS ON NORTH SIDE OF FM 969 FROM FM 973 TO STA 348+97 AND FROM STA 361+49 TO HUNTERS BEND RD. PLACE 0"-2" LEVEL-UP AS DIRECTED BY THE ENGINEER. PERFORM LEVEL-UP PRIOR TO WIDENING AT STA 419+26. AFTER LEVEL-UP IS FINISHED PLACE UNDERSEAL ACROSS THE ENTIRE WIDTH OF ROADWAY.

6. USE DAILY LANE CLOSURES DURING OFF-PEAK HOURS AS SHOWN IN TCP(3-1) TO PLACE LEVEL-UP, UNDERSEAL, AND FINAL 1" TOM. PLACE FINAL 1" TOM FROM FM 973 TO HUNTERS BEND RD AND PERMANENT STRIPING. PLACE PERMANENT STRIPING AS SOON AS PRACTICAL AFTER THE MINIMUM WAITING PERIOD SHOWN IN THE GENERAL NOTES.

7. PLACE STRIPING, SIGNING, DELINEATION AND ALL OTHER APPURTENANCES REQUIRED TO COMPLETE FM 969 AND ALL CROSS STREETS TO THE FINAL CONFIGURATION SHOWN IN THE SIGNING & STRIPING PLANS. OPEN ALL ROADWAYS TO TRAFFIC AS DIRECTED.

8. PERFORM FINAL CLEANUP OPERATIONS AND COMPLETE ALL PUNCHLIST ITEMS. LEAVE ADVANCE WARNING SIGNS IN PLACE UNTIL SIGN REMOVAL IS APPROVED IN WRITING BY THE ENGINEER.

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
8/4/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
TRAFFIC CONTROL PLAN

NARRATIVE

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		28
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE / RESET		L	L	R	R	S	S
															MOVE/ RESET	FROM LOC. #	N	W	N	W	N	W
1	PHASE 1	1 OF 10	FM 969 EASTBOUND LEFT	STA 329+50.15	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
2	PHASE 1	1 OF 10	FM 969 WESTBOUND LEFT	STA 331+91.36	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
3	PHASE 1	1 OF 10	FM 969 WESTBOUND LEFT	STA 334+73.08	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
4	PHASE 1	1 OF 10	FM 969 WESTBOUND LEFT	STA 338+65.02	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
5	PHASE 1	2 OF 10	FM 969 WESTBOUND RIGHT	STA 345+99.57	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
6	PHASE 2	2 OF 11	FM 969 EASTBOUND RIGHT	STA 335+35.71	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'			X	1					1	
7	PHASE 2	3 OF 11	FM 969 EASTBOUND RIGHT	STA 344+04.03	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'			X	2					1	
8	PHASE 2	3 OF 11	FM 969 EASTBOUND RIGHT	STA 345+42.90	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'			X	3					1	
9	PHASE 2	3 OF 11	FM 969 EASTBOUND RIGHT	STA 349+93.07	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'			X	4					1	
10	PHASE 2	5 OF 11	FM 969 EASTBOUND RIGHT	STA 361+49.36	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'			X	5					1	
11	PHASE 2	5 OF 11	FM 969 EASTBOUND RIGHT	STA 370+50.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
12	PHASE 2	5 OF 11	FM 969 EASTBOUND RIGHT	STA 371+86.30	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
13	PHASE 2	6 OF 11	FM 969 EASTBOUND RIGHT	STA 372+46.20	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
14	PHASE 2	6 OF 11	FM 969 EASTBOUND RIGHT	STA 374+38.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
15	PHASE 2	6 OF 11	FM 969 EASTBOUND RIGHT	STA 375+27.70	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
16	PHASE 2	6 OF 11	FM 969 EASTBOUND RIGHT	STA 376+98.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
17	PHASE 2	7 OF 11	FM 969 EASTBOUND RIGHT	STA 386+14.80	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
18	PHASE 2	7 OF 11	FM 969 EASTBOUND RIGHT	STA 389+12.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
19	PHASE 2	7 OF 11	FM 969 EASTBOUND RIGHT	STA 390+68.90	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
20	PHASE 2	8 OF 11	FM 969 EASTBOUND RIGHT	STA 402+69.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
21	PHASE 2	8 OF 11	FM 969 EASTBOUND RIGHT	STA 404+10.21	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
22	PHASE 2	9 OF 11	FM 969 EASTBOUND RIGHT	STA 410+69.90	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
23	PHASE 2	9 OF 11	FM 969 EASTBOUND RIGHT	STA 412+48.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
24	PHASE 2	9 OF 11	FM 969 EASTBOUND RIGHT	STA 413+68.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
25	PHASE 2	9 OF 11	FM 969 EASTBOUND RIGHT	STA 415+02.20	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
26	PHASE 2	9 OF 11	FM 969 EASTBOUND RIGHT	STA 415+32.50	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
27	PHASE 2	10 OF 11	FM 969 EASTBOUND RIGHT	STA 416+65.30	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
28	PHASE 2	10 OF 11	FM 969 EASTBOUND RIGHT	STA 417+25.30	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
29	PHASE 2	10 OF 11	FM 969 EASTBOUND RIGHT	STA 419+14.60	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
												TOTALS	24		5							

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

FOR DEFINITIONS SEE CRASH CUSHION ATTENUATOR CHART AT
http://crossroads/org/des/Crash_Cushion_Attenuator_Chart_w_Categorization.pdf

CRASH CUSHION SUMMARY SHEET

FILE:	DN: TxDOT	CK:		CK:
© TxDOT 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		
	AUS	TRAVIS		
	FEDERAL AID PROJECT			SHEET NO.
	PTF 2022(045)			29

LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE / RESET		L	L	R	R	S	S
															MOVE/ RESET	FROM LOC. #	N	W	N	W	N	W
30	PHASE 2	10 OF 11	FM 969 EASTBOUND RIGHT	STA 419+44.85	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
31	PHASE 2	10 OF 11	FM 969 EASTBOUND RIGHT	STA 421+40.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
32	PHASE 2	10 OF 11	FM 969 EASTBOUND RIGHT	STA 422+00.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
33	PHASE 2	10 OF 11	FM 969 EASTBOUND RIGHT	STA 423+27.27	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X								1	
34	PHASE 3	1 OF 10	FM 969 WESTBOUND RIGHT	STA 335+57.70	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	6					1	
35	PHASE 3	1 OF 10	FM 969 WESTBOUND RIGHT	STA 336+77.40	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X	X							1	
36	PHASE 3	1 OF 10	FM 969 WESTBOUND RIGHT	STA 337+96.95	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X	X							1	
37	PHASE 3	2 OF 10	FM 969 WESTBOUND RIGHT	STA 339+76.70	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X	X							1	
38	PHASE 3	2 OF 10	FM 969 WESTBOUND RIGHT	STA 341+20.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	7					1	
39	PHASE 3	2 OF 10	FM 969 WESTBOUND RIGHT	STA 346+00.80	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	8					1	
40	PHASE 3	2 OF 10	FM 969 WESTBOUND RIGHT	STA 347+90.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	9					1	
41	PHASE 3	2 OF 10	FM 969 WESTBOUND RIGHT	STA 348+80.72	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X	X							1	
42	PHASE 3	4 OF 10	FM 969 WESTBOUND RIGHT	STA 361+73.90	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	10					1	
43	PHASE 3	4 OF 10	FM 969 WESTBOUND RIGHT	STA 364+74.40	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X	X							1	
44	PHASE 3	4 OF 10	FM 969 WESTBOUND RIGHT	STA 365+64.40	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X	X							1	
45	PHASE 3	4 OF 10	FM 969 WESTBOUND RIGHT	STA 367+75.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X	X							1	
46	PHASE 3	4 OF 10	FM 969 WESTBOUND RIGHT	STA 369+58.80	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	11					1	
47	PHASE 3	5 OF 10	FM 969 WESTBOUND RIGHT	STA 374+22.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	12					1	
48	PHASE 3	5 OF 10	FM 969 WESTBOUND RIGHT	STA 374+52.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	13					1	
49	PHASE 3	5 OF 10	FM 969 WESTBOUND RIGHT	STA 375+52.70	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	14					1	
50	PHASE 3	5 OF 10	FM 969 WESTBOUND RIGHT	STA 376+12.35	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	15					1	
51	PHASE 3	5 OF 10	FM 969 WESTBOUND RIGHT	STA 377+14.80	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	16					1	
52	PHASE 3	6 OF 10	FM 969 WESTBOUND RIGHT	STA 383+74.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	17					1	
53	PHASE 3	6 OF 10	FM 969 WESTBOUND RIGHT	STA 385+18.55	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	18					1	
54	PHASE 3	6 OF 10	FM 969 WESTBOUND RIGHT	STA 389+94.30	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	19					1	
55	PHASE 3	6 OF 10	FM 969 WESTBOUND RIGHT	STA 392+26.00	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X	X							1	
56	PHASE 3	6 OF 10	FM 969 WESTBOUND RIGHT	STA 392+86.80	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X	X							1	
57	PHASE 3	7 OF 10	FM 969 WESTBOUND RIGHT	STA 395+27.40	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X	X							1	
58	PHASE 3	7 OF 10	FM 969 WESTBOUND RIGHT	STA 397+37.60	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'	X	X							1	
												TOTALS	15	25	14							

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

FOR DEFINITIONS SEE CRASH CUSHION ATTENUATOR CHART AT
http://crossroads/org/des/Crash_Cushion_Attenuator_Chart_w_Categorization.pdf

CRASH CUSHION SUMMARY SHEET

FILE:	DN: TxDOT	CK:		CK:
© TxDOT 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		
	AUS	TRAVIS		
	FEDERAL AID PROJECT			SHEET NO.
	PTF 2022(045)			30

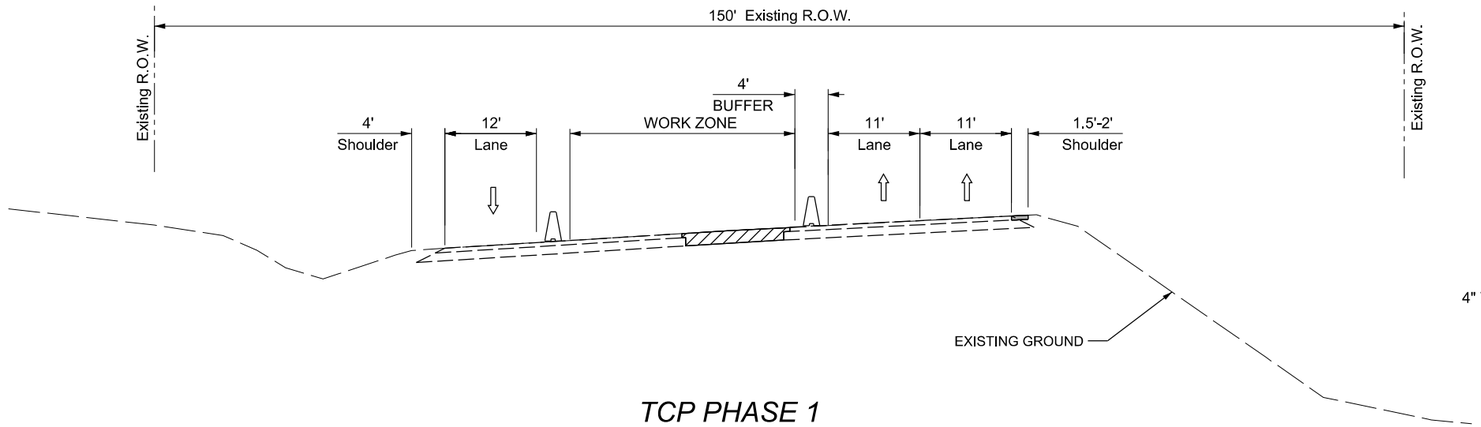
LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE / RESET		L	L	R	R	S	S
															MOVE/ RESET	FROM LOC. #	N	W	N	W	N	W
59	PHASE 3	7 OF 10	FM 969 WESTBOUND RIGHT	STA 402+22.10	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	20					1	
60	PHASE 3	7 OF 10	FM 969 WESTBOUND RIGHT	STA 403+42.20	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	21					1	
61	PHASE 3	7 OF 10	FM 969 WESTBOUND RIGHT	STA 404+35.30	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	22					1	
62	PHASE 3	7 OF 10	FM 969 EASTBOUND RIGHT	STA 404+95.80	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	23					1	
63	PHASE 3	8 OF 10	FM 969 WESTBOUND RIGHT	STA 408+48.47	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	24					1	
64	PHASE 3	8 OF 10	FM 969 WESTBOUND RIGHT	STA 409+08.89	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	25					1	
65	PHASE 3	8 OF 10	FM 969 WESTBOUND RIGHT	STA 410+44.58	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	26					1	
66	PHASE 3	8 OF 10	FM 969 WESTBOUND RIGHT	STA 410+74.58	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	27					1	
67	PHASE 3	8 OF 10	FM 969 WESTBOUND RIGHT	STA 412+44.72	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	28					1	
68	PHASE 3	8 OF 10	FM 969 WESTBOUND RIGHT	STA 412+74.75	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	29					1	
69	PHASE 3	8 OF 10	FM 969 WESTBOUND RIGHT	STA 413+70.52	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	30					1	
70	PHASE 3	9 OF 10	FM 969 WESTBOUND RIGHT	STA 417+60.62	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	31					1	
71	PHASE 3	9 OF 10	FM 969 WESTBOUND RIGHT	STA 418+81.73	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	32					1	
72	PHASE 3	9 OF 10	FM 969 WESTBOUND RIGHT	STA 419+11.49	TL-3	UNI	N/A	N/A	PRECAST TRAFFIC BARRIER	24"	32"	40'		X	X	33					1	
												TOTALS		14	14							

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

FOR DEFINITIONS SEE CRASH CUSHION ATTENUATOR CHART AT
http://crossroads/org/des/Crash_Cushion_Attenuator_Chart_w_Categorization.pdf

CRASH CUSHION SUMMARY SHEET

FILE:	DN: TxDOT	CK:		CK:
© TxDOT 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		
	AUS	TRAVIS		
	FEDERAL AID PROJECT			SHEET NO.
	PTF 2022(045)			31



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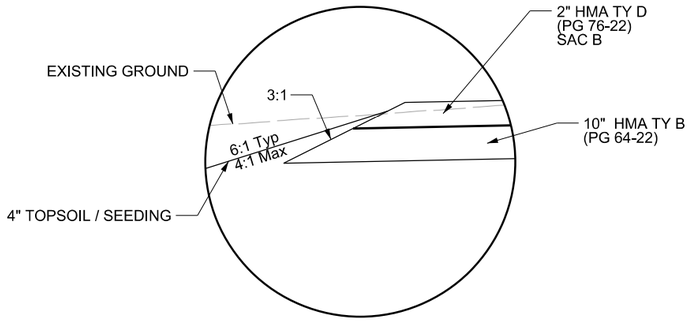
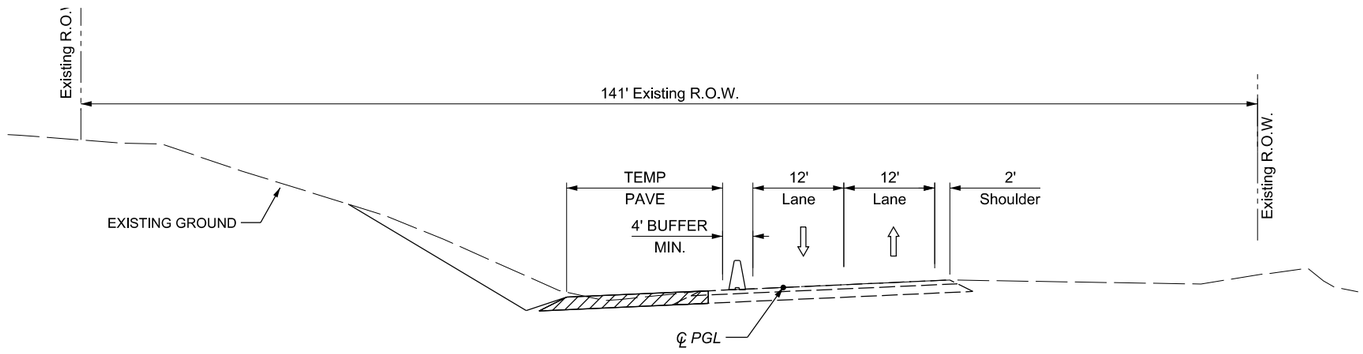
Sta 329+50.00 to 338+38.00



TEMP PAVEMENT DETAIL



TCP PHASE 1
Sta 338+93.00 to 346+00.00

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation
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LJA Engineering, Inc.
FRN - F-1386

FM 969
TCP TYPICALS

PHASE 1

SCALE: NTS

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		32
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

6/25/2021
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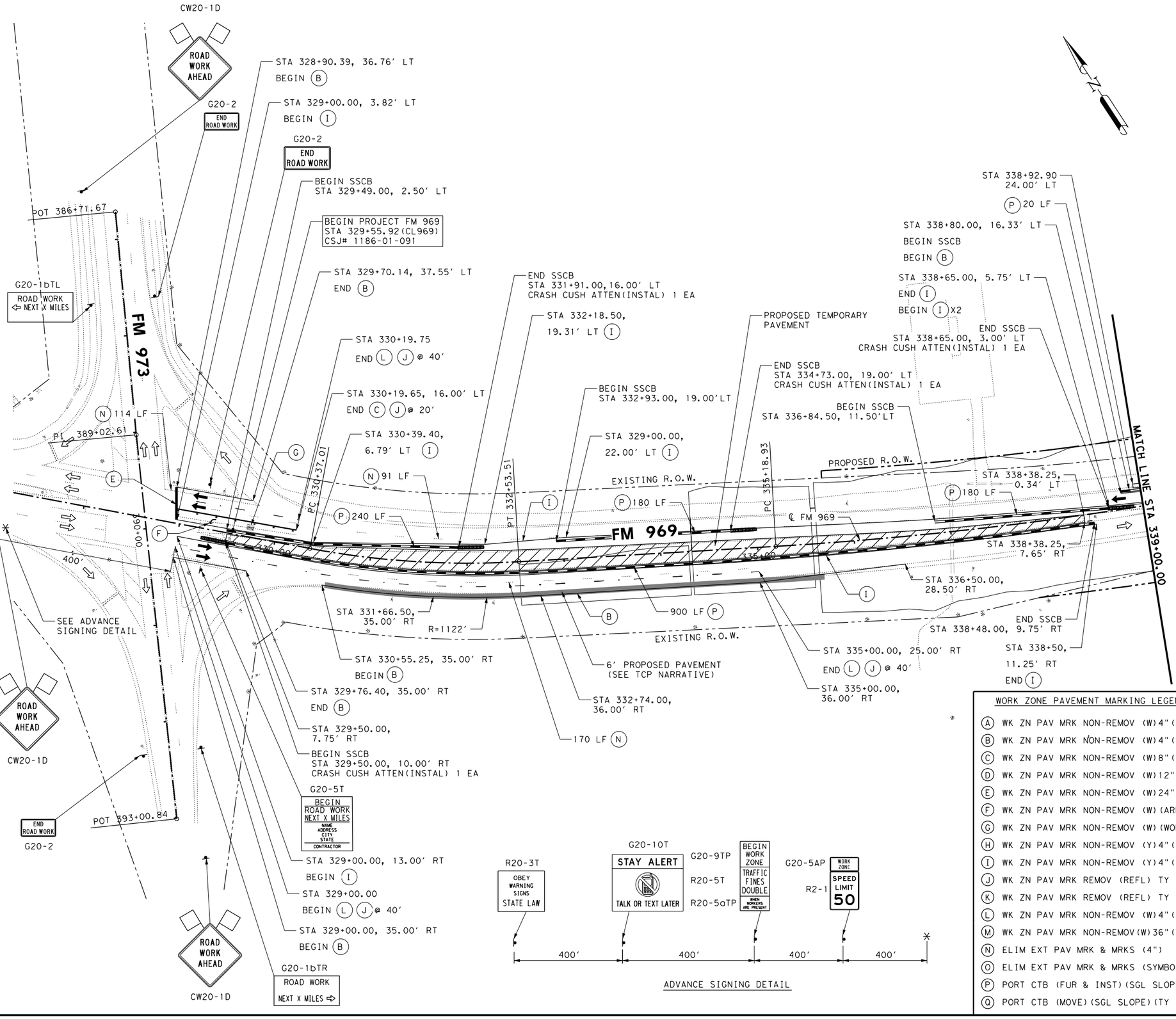

0' 50' 100'
SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation
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LJA Engineering, Inc.
FRN - F-1386

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

FM 969
TRAFFIC CONTROL PLAN
PHASE 1
BEGIN TO STA 339+00

SHEET 1 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		33
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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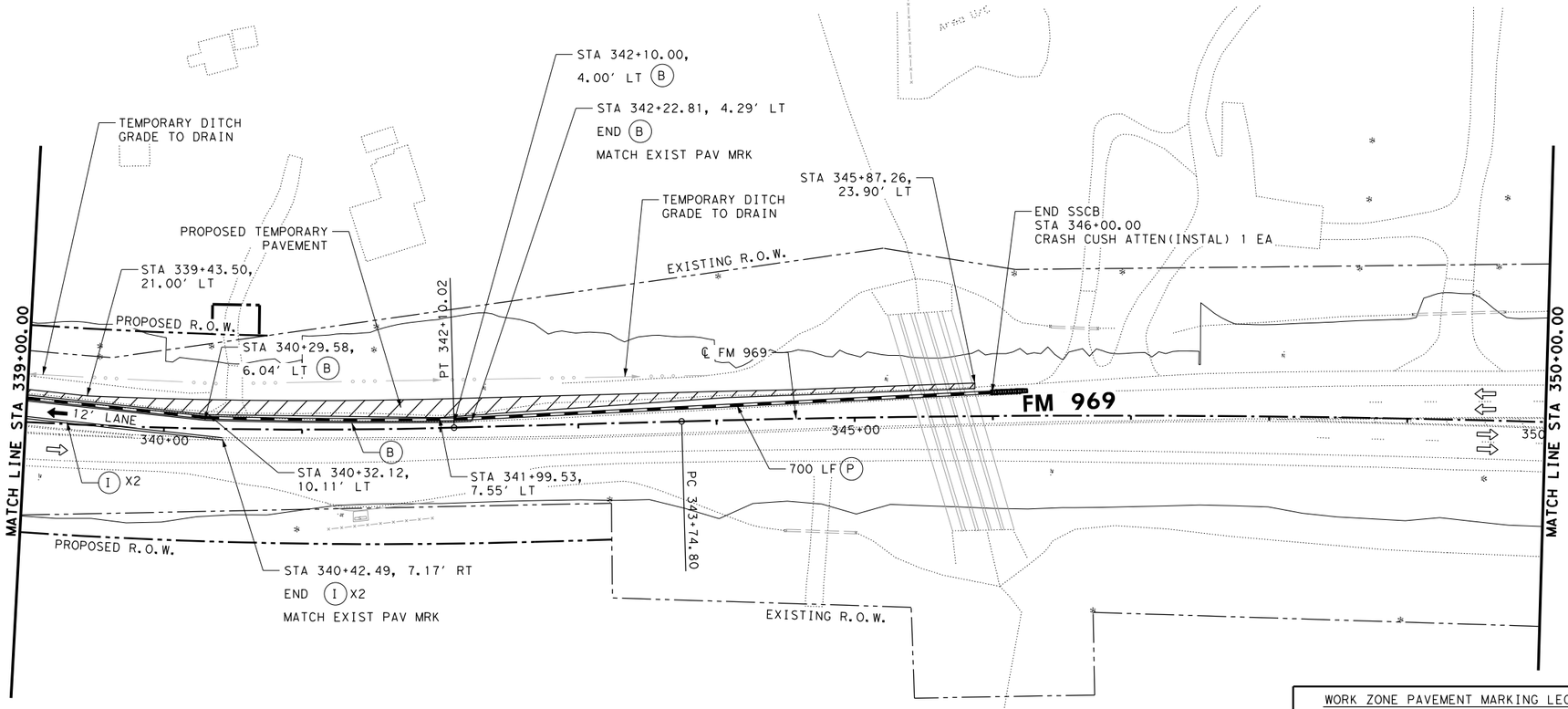

0' 50' 100'
SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS
1839

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
TRAFFIC CONTROL PLAN
PHASE 1
STA 339+00 TO STA 350+00

SHEET 2 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		34
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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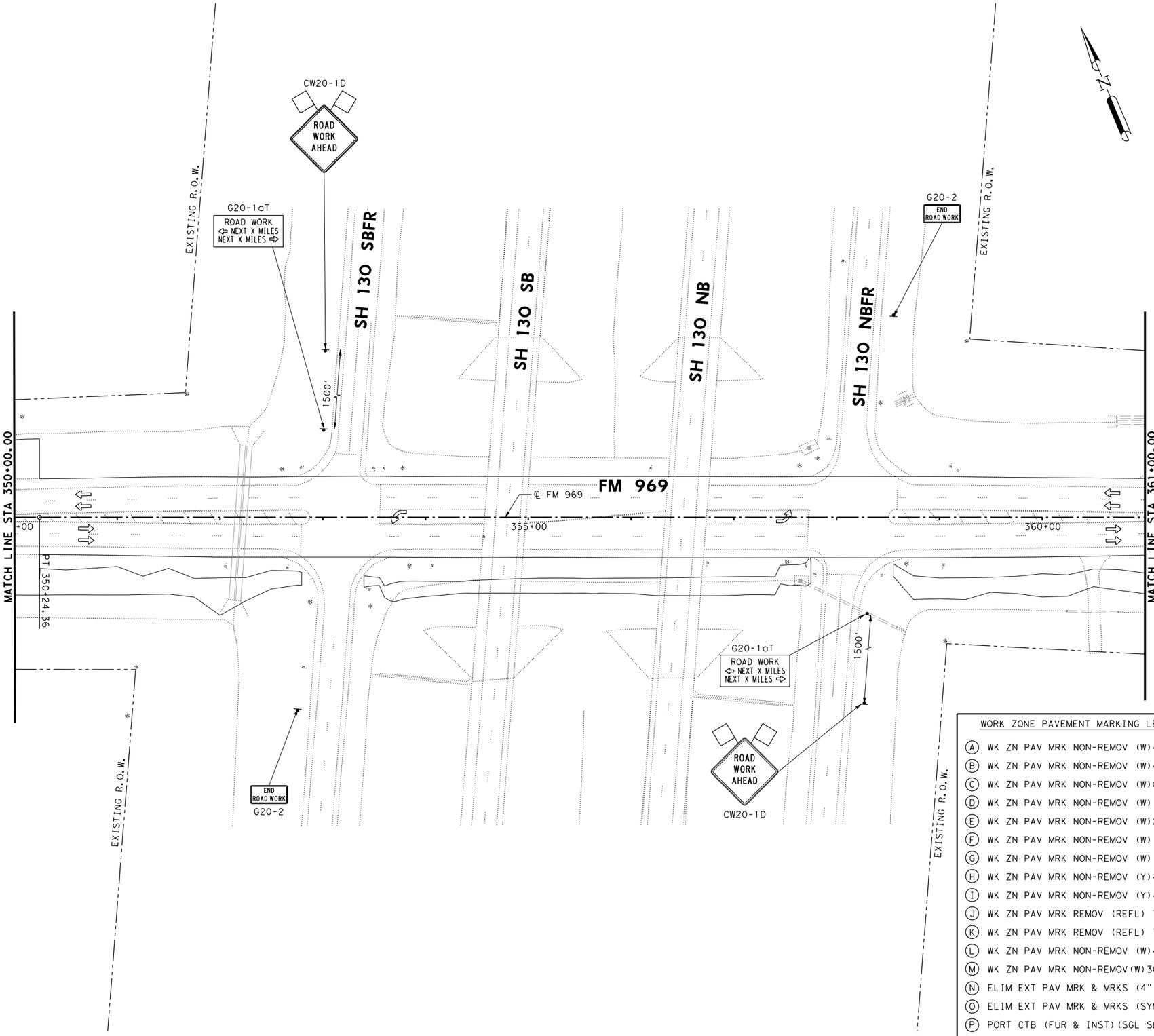

0' 50' 100'

SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

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- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
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- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
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- (N) ELIM EXT PAV MRK & MRKS (4")
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- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
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STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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FM 969
TRAFFIC CONTROL PLAN
PHASE 1
STA 350+00 TO STA 361+00

SHEET 3 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		35
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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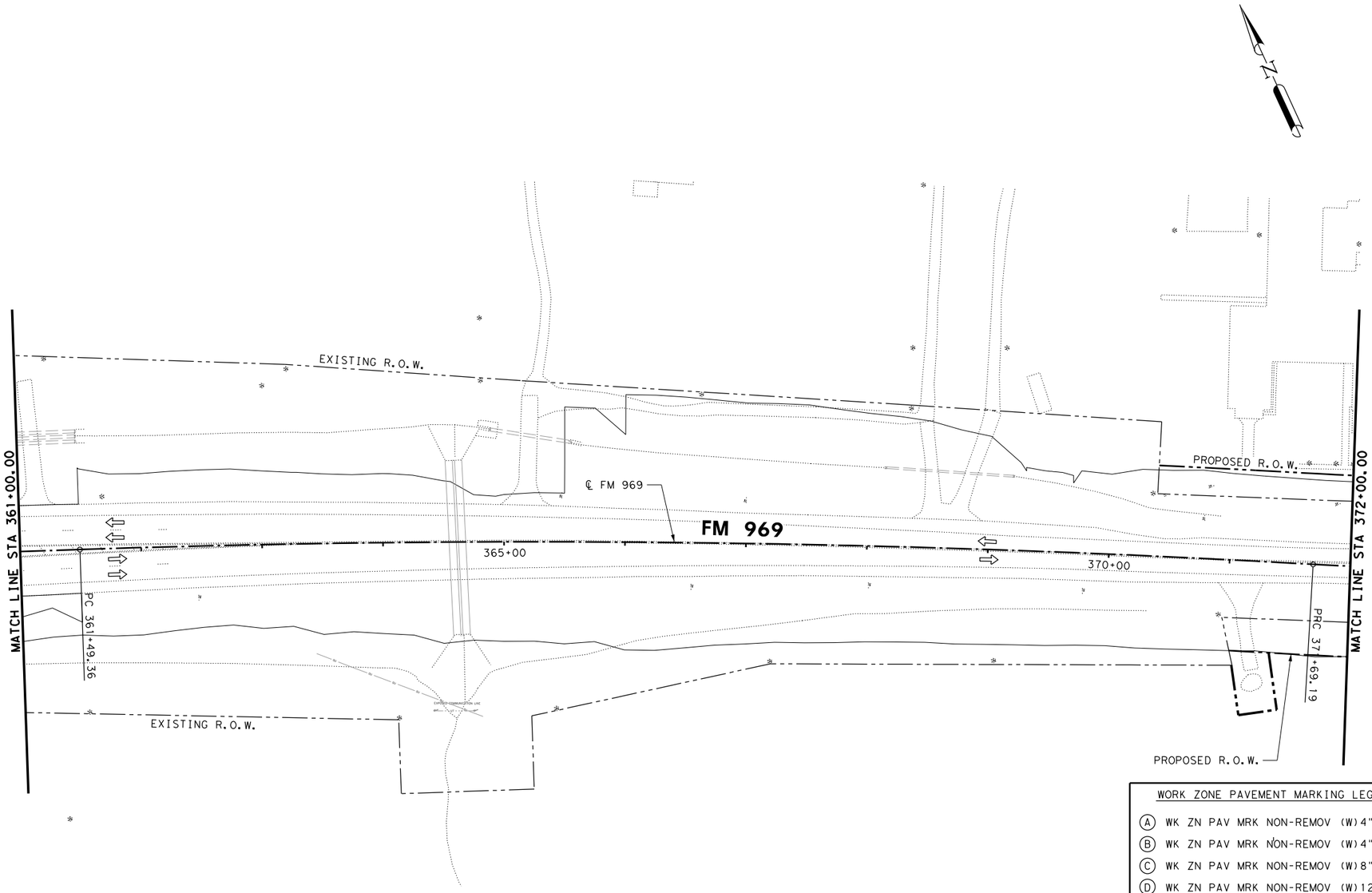

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SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
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- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
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- (N) ELIM EXT PAV MRK & MRKS (4")
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- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
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6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
TRAFFIC CONTROL PLAN
PHASE 1
STA 361+00 TO STA 372+00

SHEET 4 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		36
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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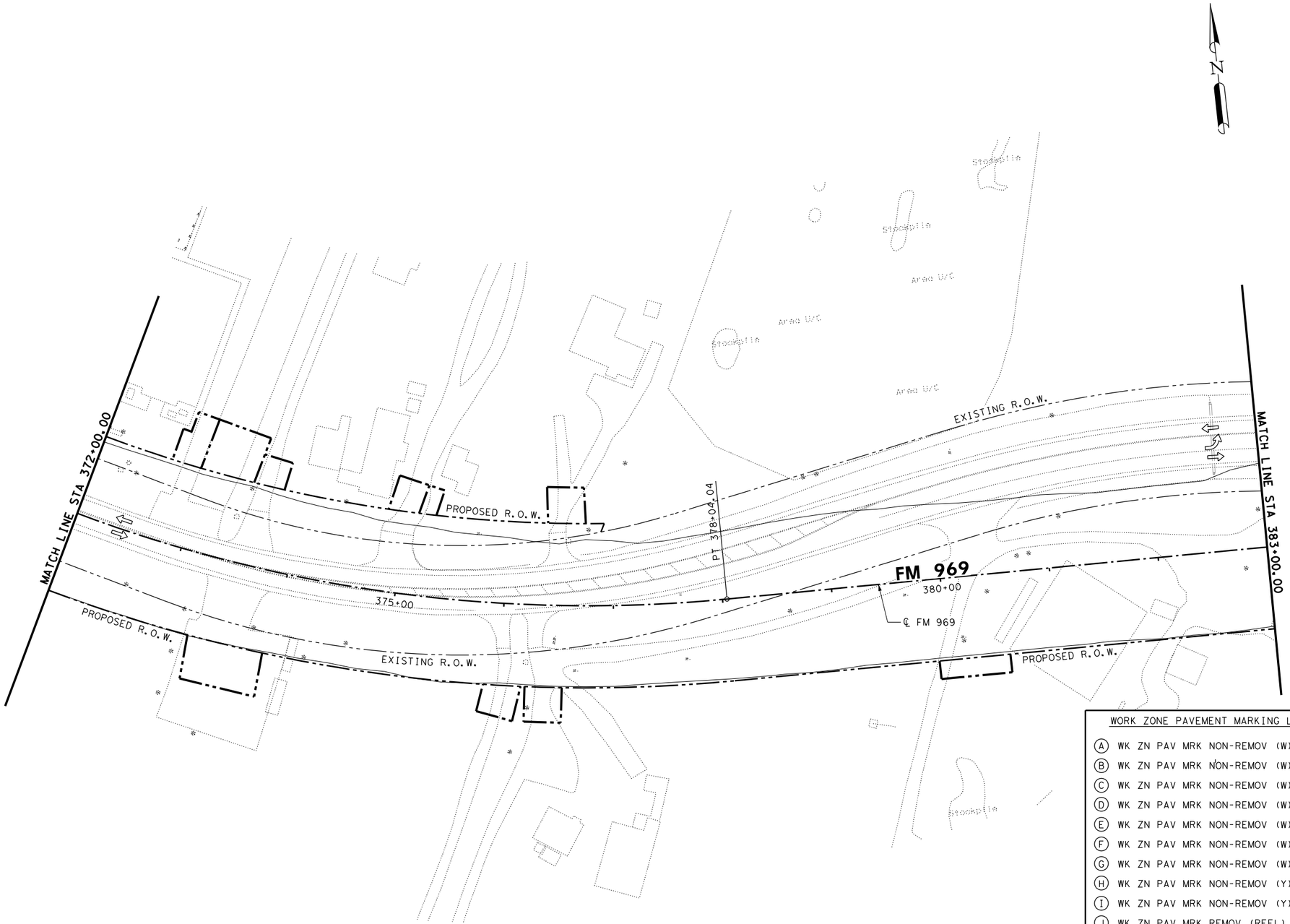

0′ 50′ 100′
SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
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- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
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6/25/2021

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STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
TRAFFIC CONTROL PLAN PHASE 1
STA 372+00 TO STA 383+00

SHEET 5 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		37
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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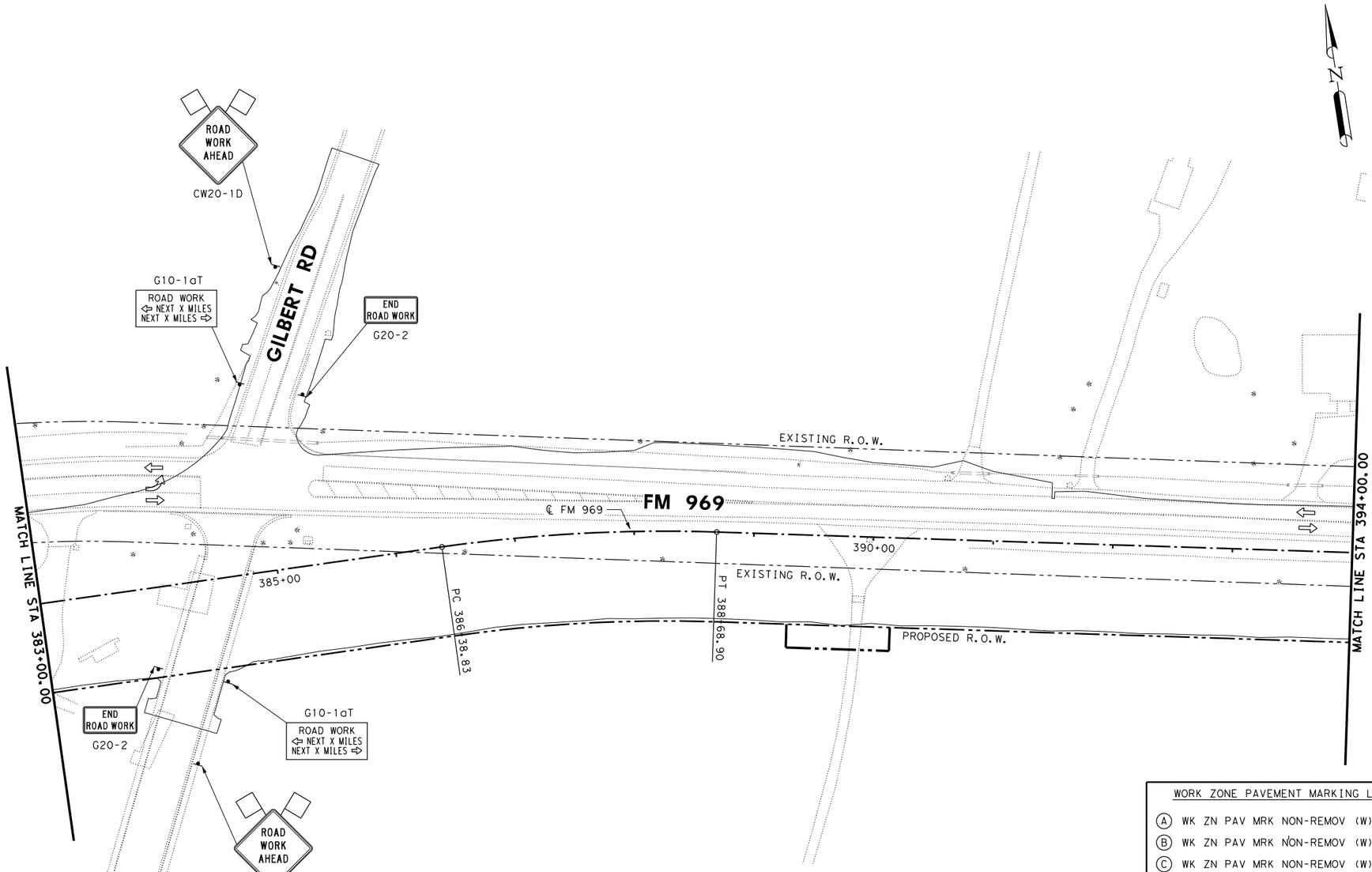

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SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
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- FLAGGER
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- TY III BARRICADE
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NOTES:
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- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
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LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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FM 969
TRAFFIC CONTROL PLAN
PHASE 1
STA 383+00 TO STA 394+00

SHEET 6 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		38
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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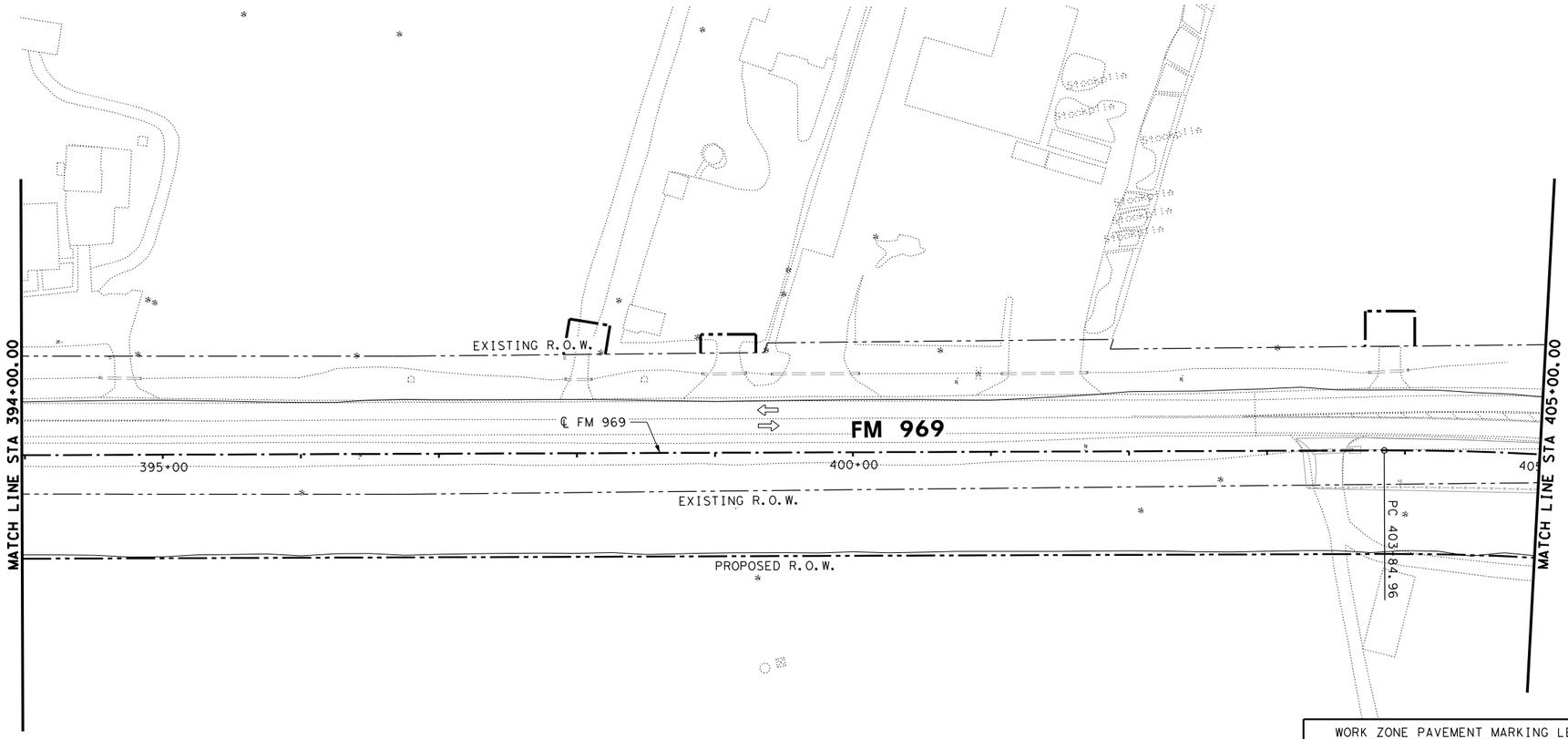

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SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
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- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
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- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
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PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN-F-1386

FM 969
TRAFFIC CONTROL PLAN
PHASE 1
STA 394+00 TO STA 405+00

SHEET 7 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		39
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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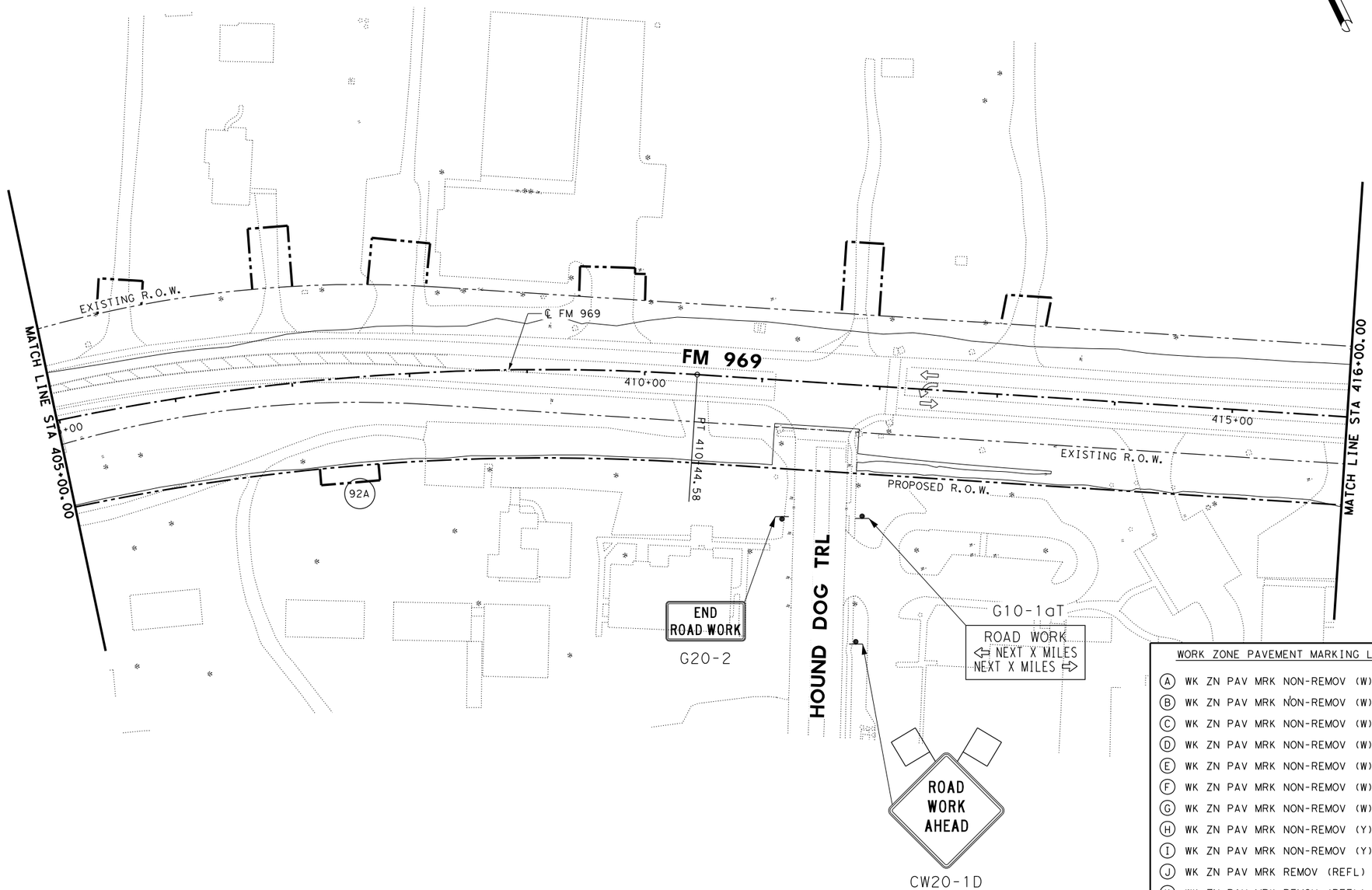

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SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
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- FLASHING ARROW BOARD
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- PROPOSED R.O.W.
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FM 969
TRAFFIC CONTROL PLAN
PHASE 1
STA 405+00 TO STA 416+00

SHEET 8 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		40
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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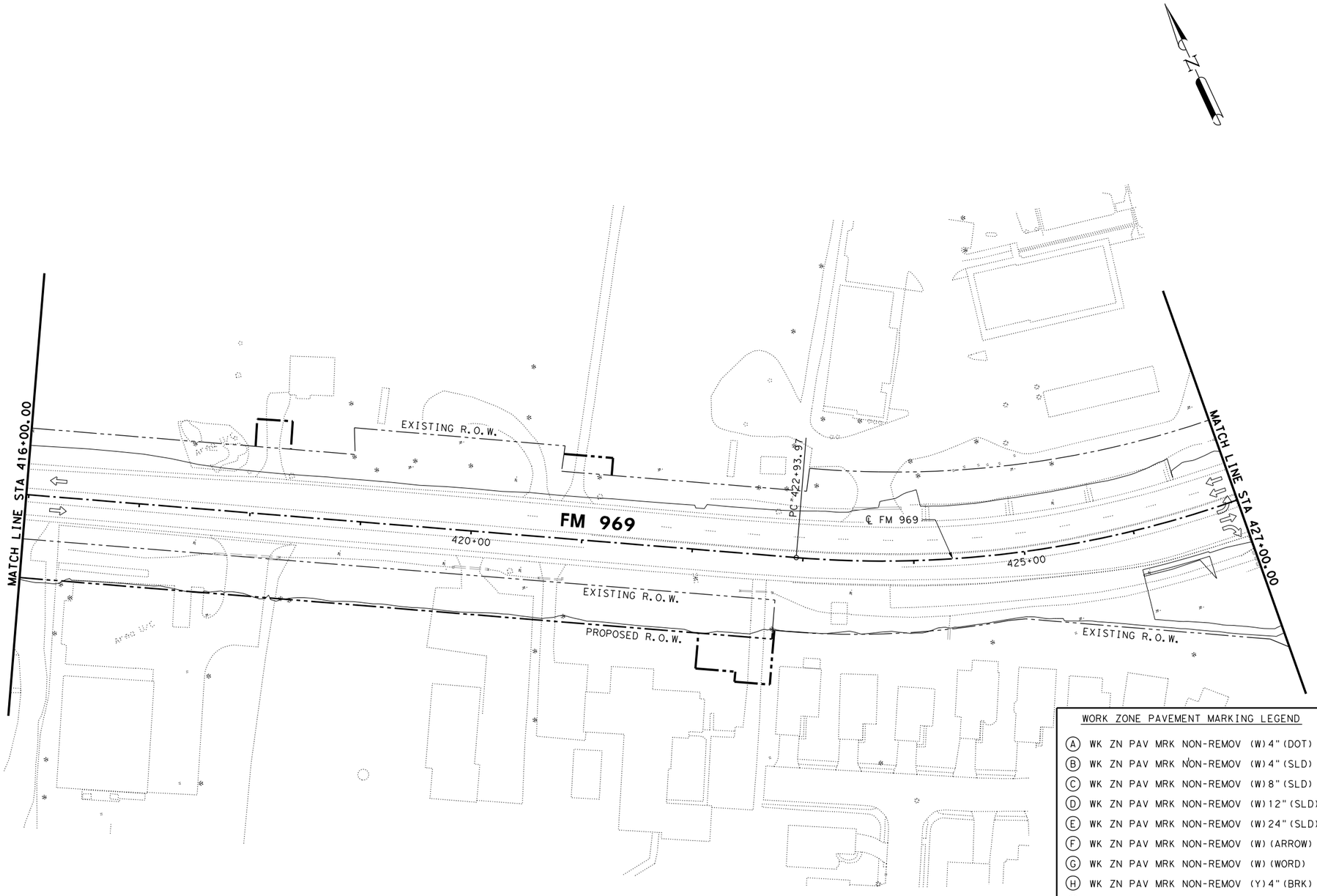

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SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
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- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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LJA Engineering, Inc.
FRN-F-1386

FM 969
TRAFFIC CONTROL PLAN
PHASE 1
STA 416+00 TO STA 427+00

SHEET 9 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		41
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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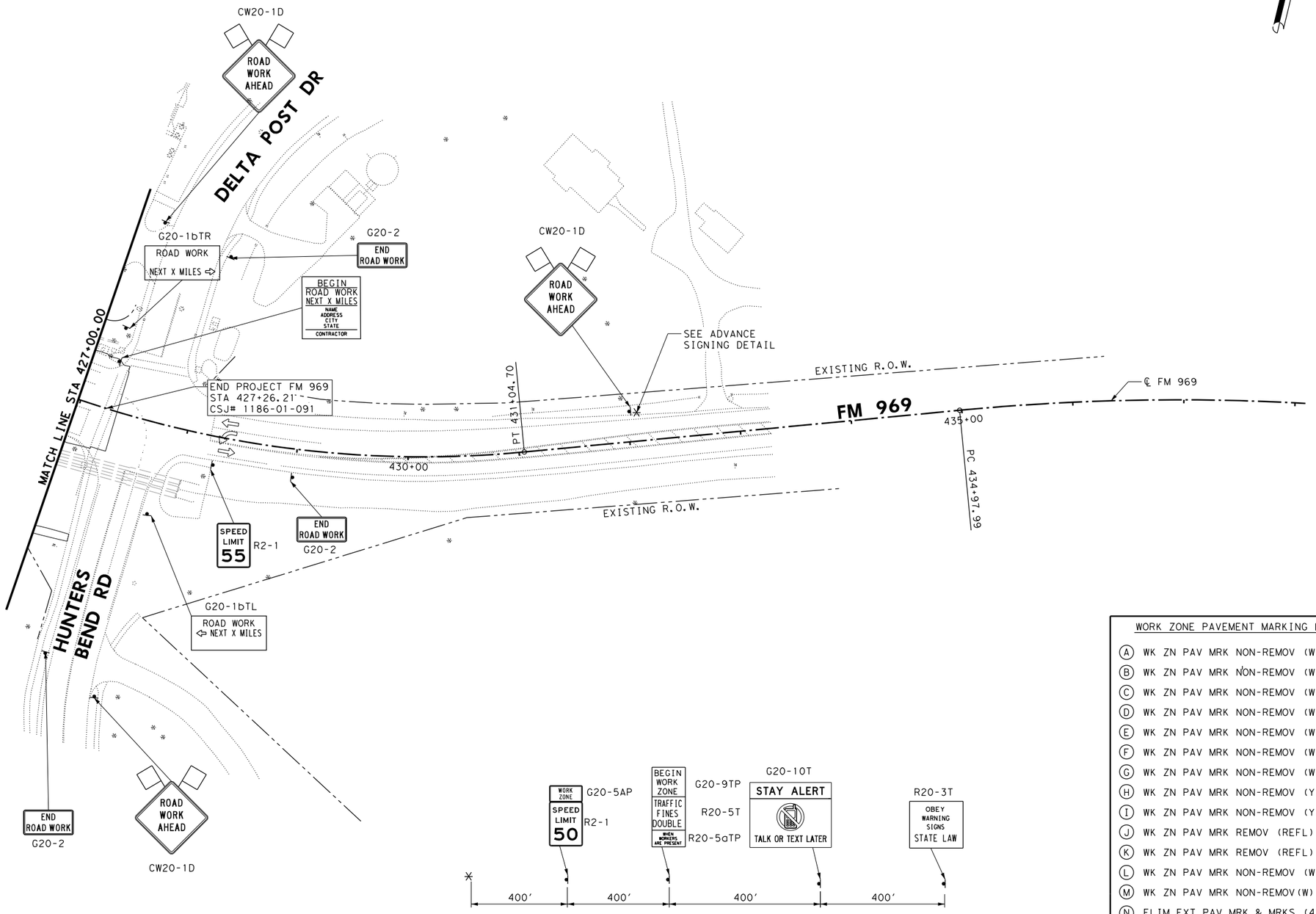

ADVANCE SIGNING DETAIL

0' 50' 100'

SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
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LICENSED
PROFESSIONAL ENGINEER
6/25/2021

LJA Engineering, Inc.
FRN - F-1386

FM 969
TRAFFIC CONTROL PLAN PHASE 1
STA 427+00 TO END

SHEET 10 OF 10

DESIGN BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		42
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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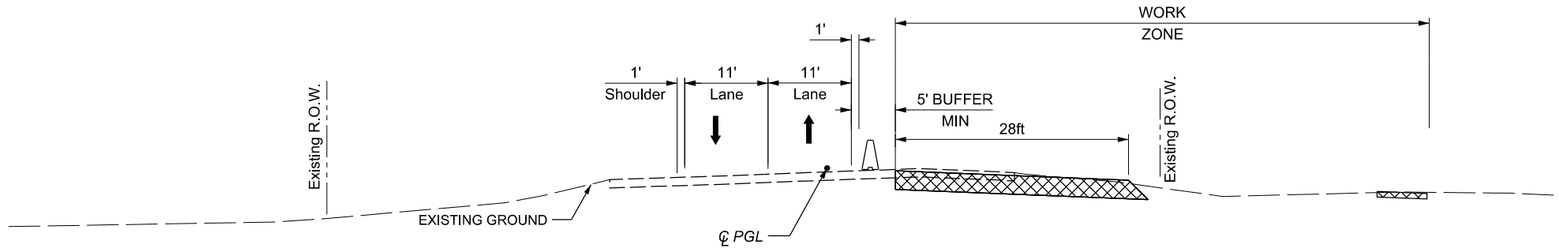
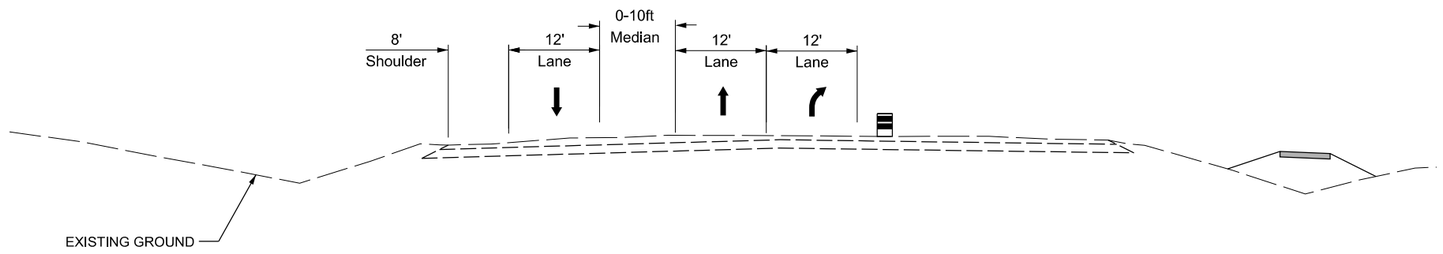
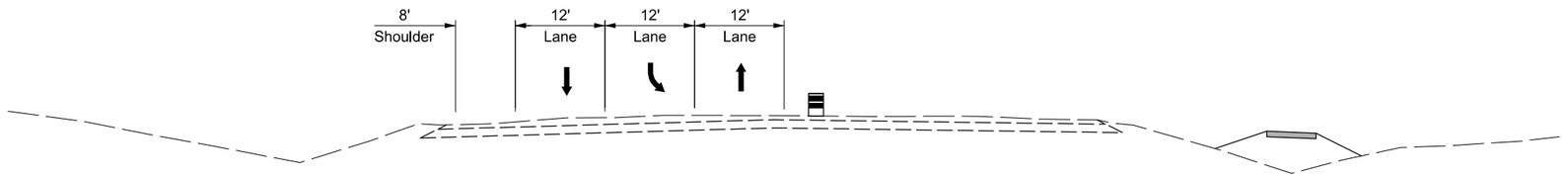


TCP PHASE 2
Sta 335+67.00 to Sta 350+24.00



TCP PHASE 2
Sta 350+24.00 TO STA 352+70.00



TCP PHASE 2
Sta 353+55.00 TO STA 355+15.00

LJA Engineering, Inc.
FRN - F-1386

FM 969
TCP TYPICALS

PHASE 2
SCALE: NTS
SHEET 1 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		43
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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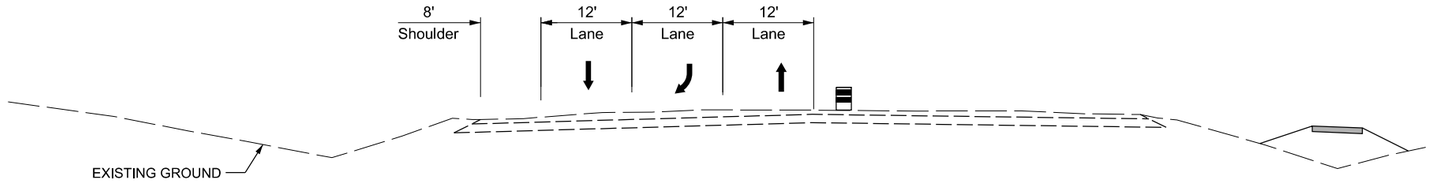

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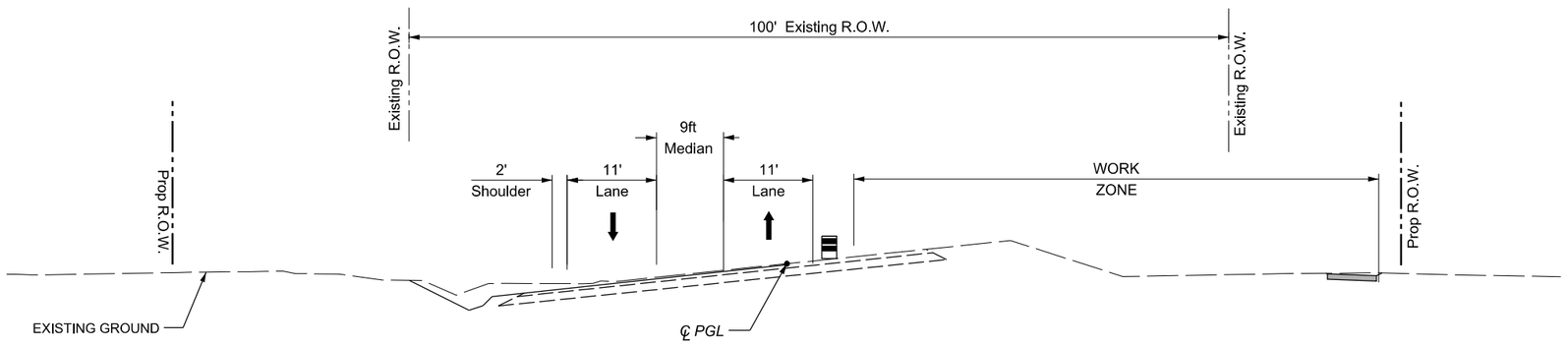

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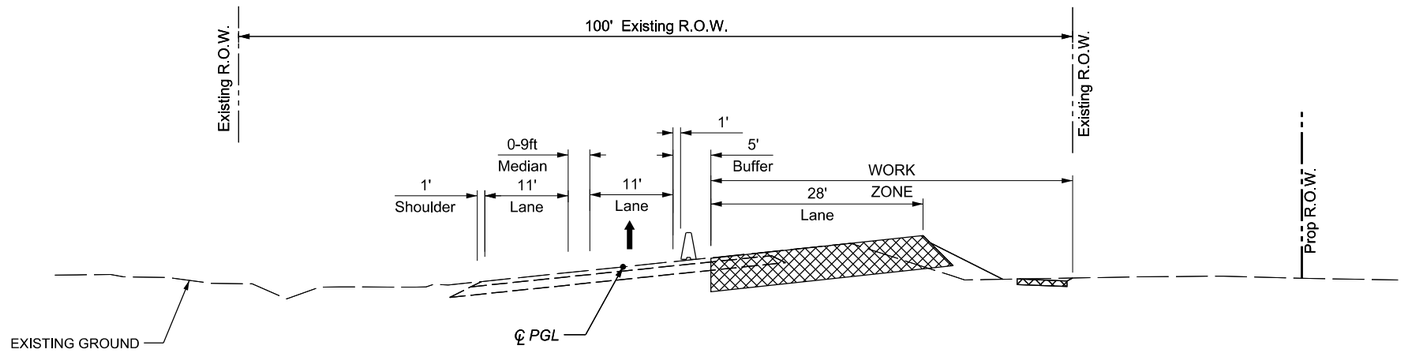
Sta 358+58.00 to Sta 360+60.00



TCP PHASE 2
Sta 360+60.00 to Sta 419+36.00

STATE OF TEXAS
MAEN A. HOURANI
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PROFESSIONAL ENGINEER
6/25/2021

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FM 969
TCP TYPICALS

PHASE 2
SCALE: NTS
SHEET 2 OF 2

DESIGN BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		44
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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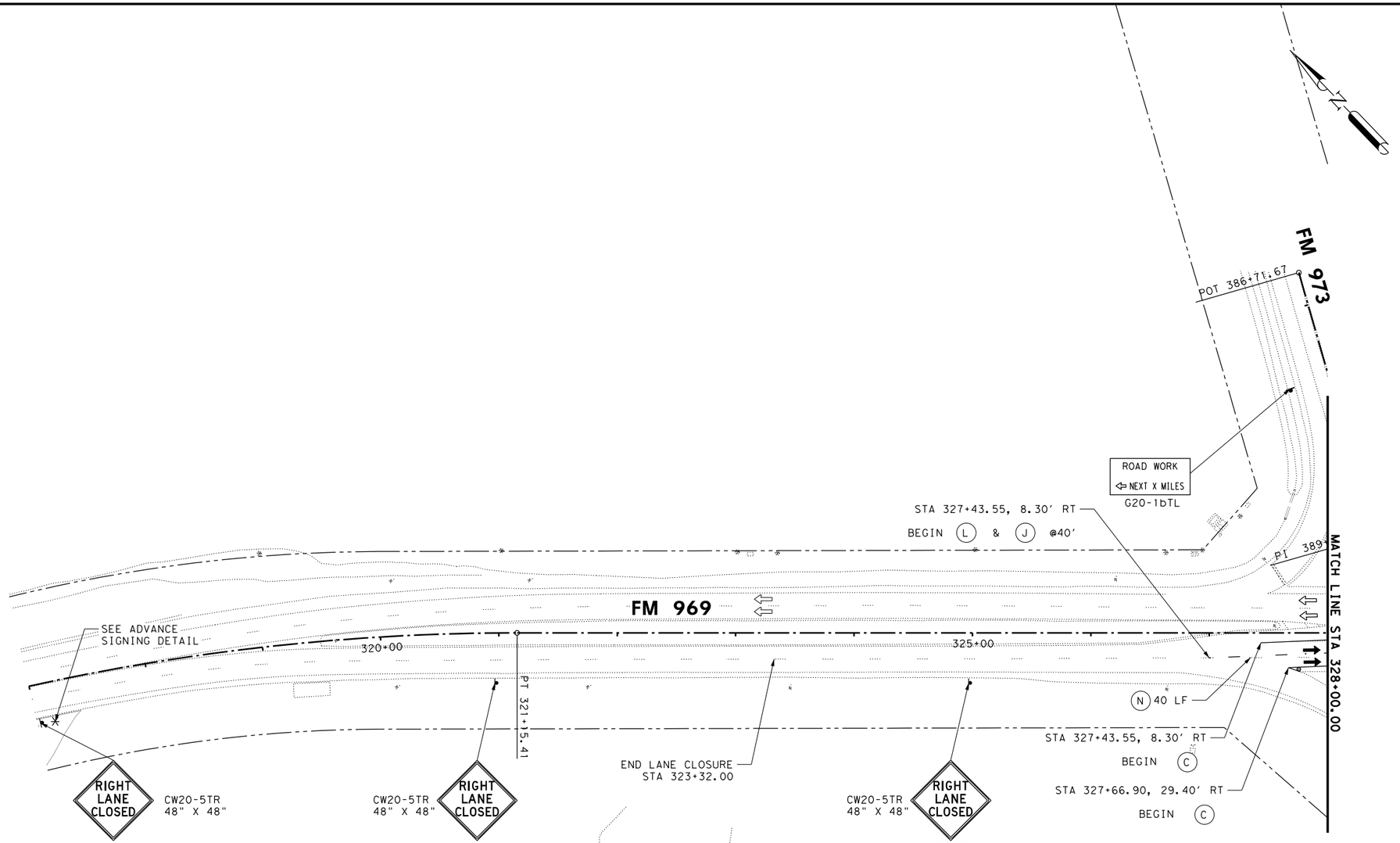

ADVANCE SIGNING DETAIL

0' 50' 100'

SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED PROFESSIONAL ENGINEER
6/25/2021

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STATE OF TEXAS

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FM 969
TRAFFIC CONTROL PLAN PHASE 2
STA 317+00 TO STA 328+00

SHEET 1 OF 11

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
SW	6	PTF 2022(045)		45
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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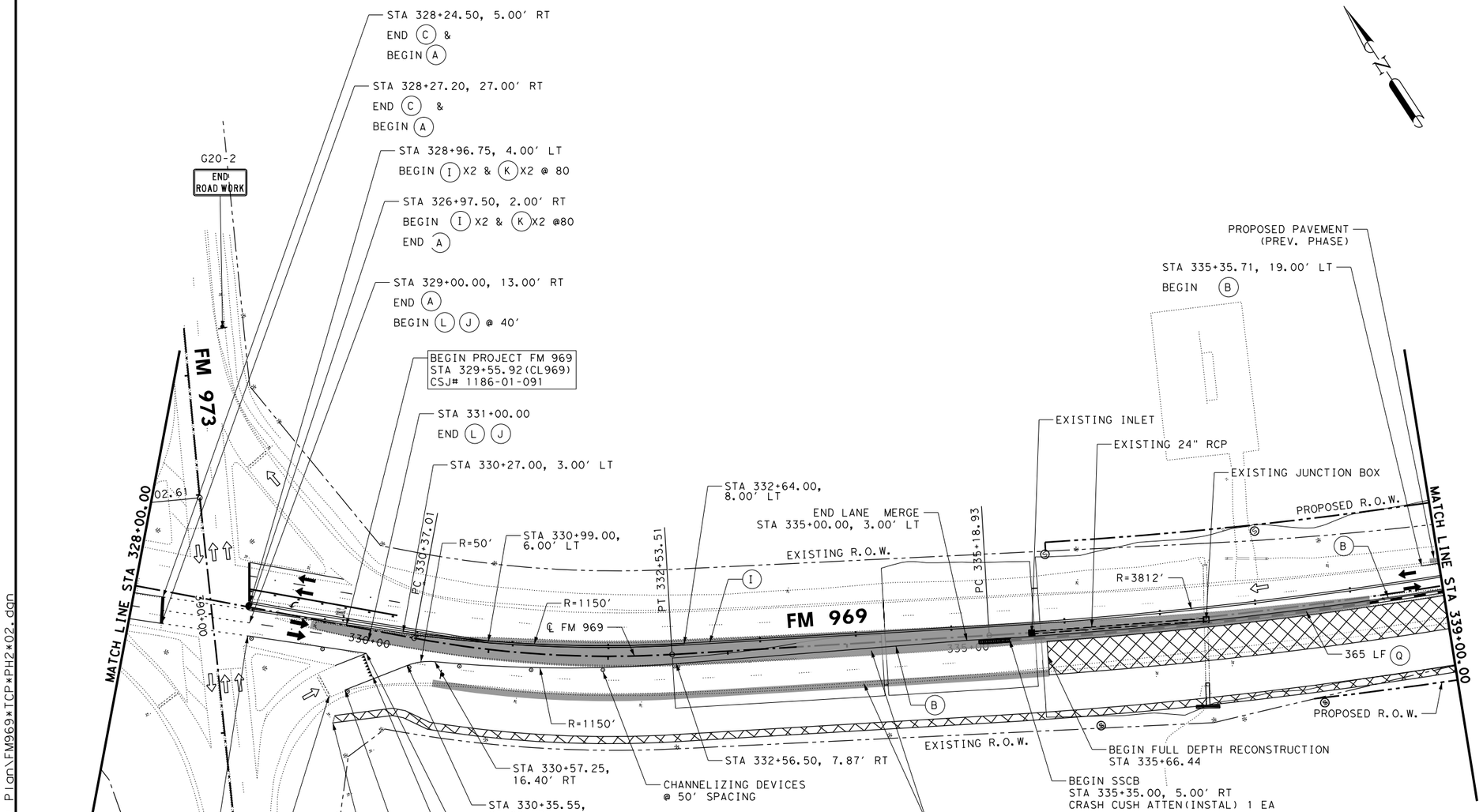

0' 50' 100'
SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
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- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
1892
STATE OF TEXAS

LJA Engineering, Inc.
FRN - F-1386

FM 969
TRAFFIC CONTROL PLAN
PHASE 2
STA 328+00 TO STA 339+00

SHEET 2 OF 11

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
SW	6	PTF 2022(045)		46
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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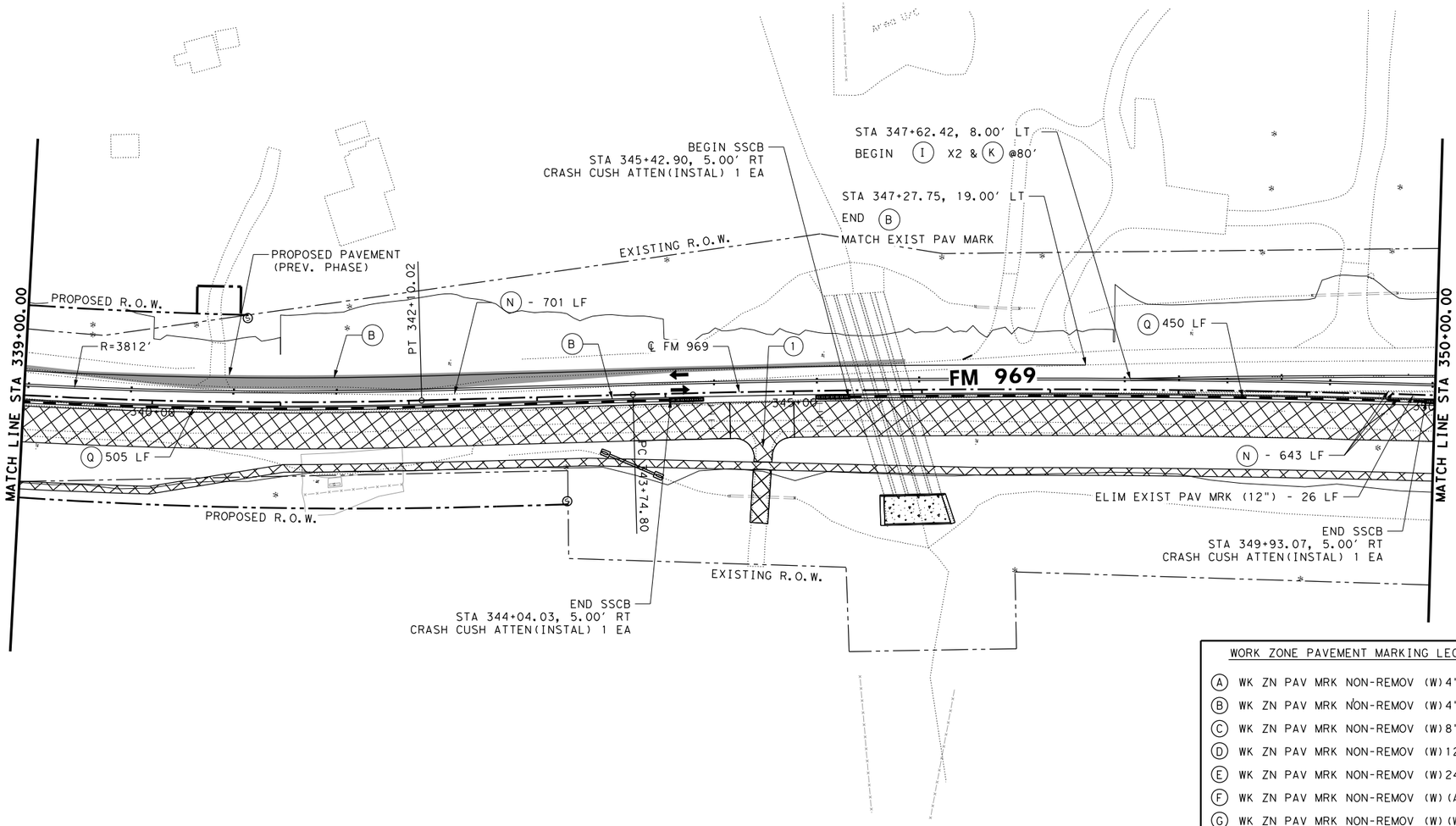

0' 50' 100'
SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
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WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
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- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
TRAFFIC CONTROL PLAN
PHASE 2
STA 328+00 TO STA 339+00

SHEET 3 OF 11

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		47
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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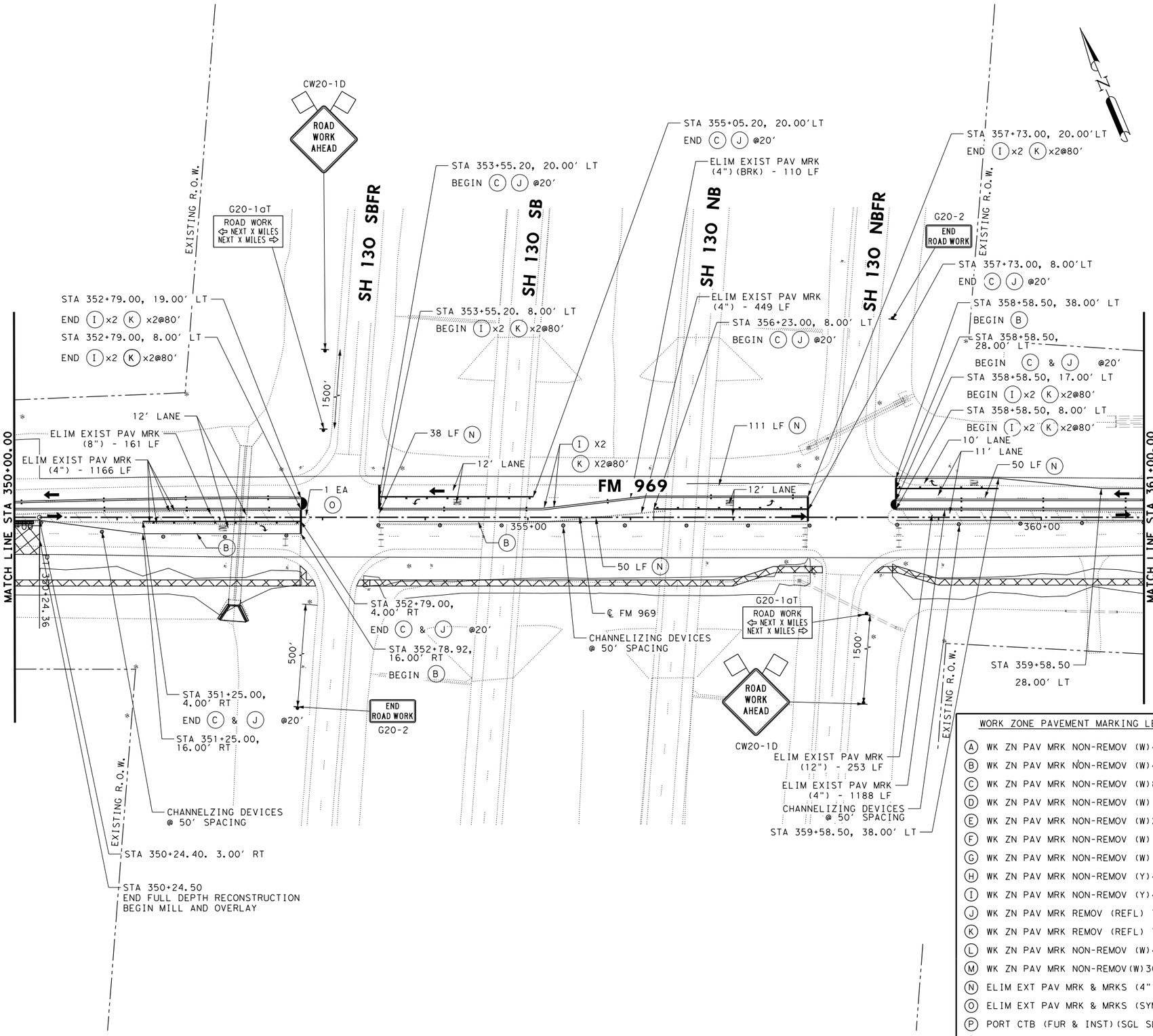

0' 50' 100'
SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
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WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
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- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
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- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
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- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
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- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

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6/25/2021

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STATE OF TEXAS
1865

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FM 969
TRAFFIC CONTROL PLAN
PHASE 2
STA 350+00 TO STA 361+00

SHEET 4 OF 11

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
SW	6	PTF 2022(045)		48
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

6/25/2021
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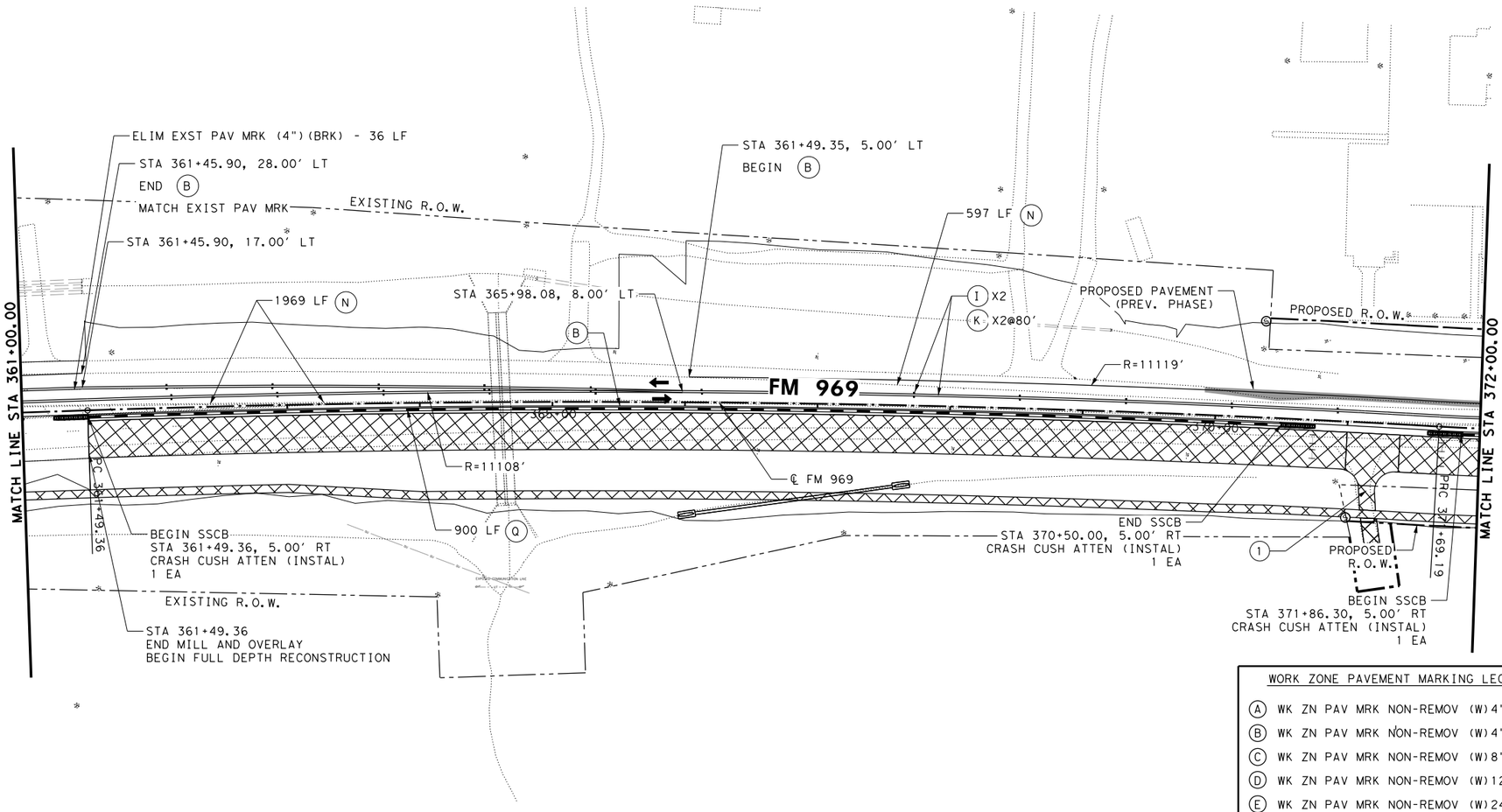

0' 50' 100'
SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

NOTES:

(1) CULVERT CONSTRUCTION THIS PHASE (SEE DRAINAGE PLAN FOR DETAILS).

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN-F-1386

FM 969
TRAFFIC CONTROL PLAN
PHASE 2
STA 361+00 TO STA 372+00

SHEET 5 OF 11

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
SW	6	PTF 2022(045)		49
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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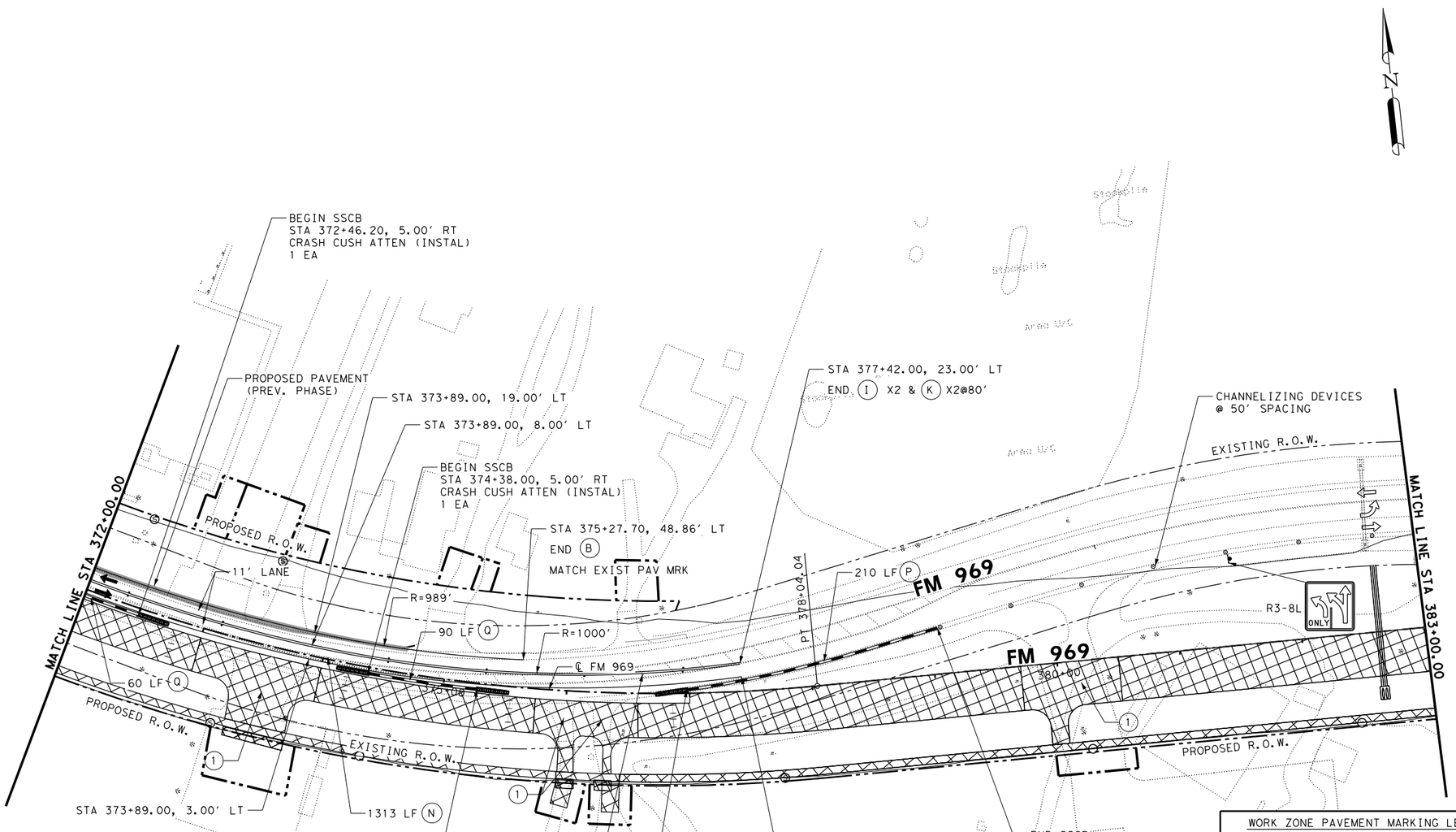

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

NOTES:

(1) CULVERT CONSTRUCTION THIS PHASE (SEE DRAINAGE PLAN FOR DETAILS).

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

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MAEN A. HOURANI
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PROFESSIONAL ENGINEER
6/25/2021

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STATE OF TEXAS

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FM 969
TRAFFIC CONTROL PLAN
PHASE 2
STA 372+00 TO STA 383+00

SHEET 6 OF 11

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
SW	6	PTF 2022(045)		50
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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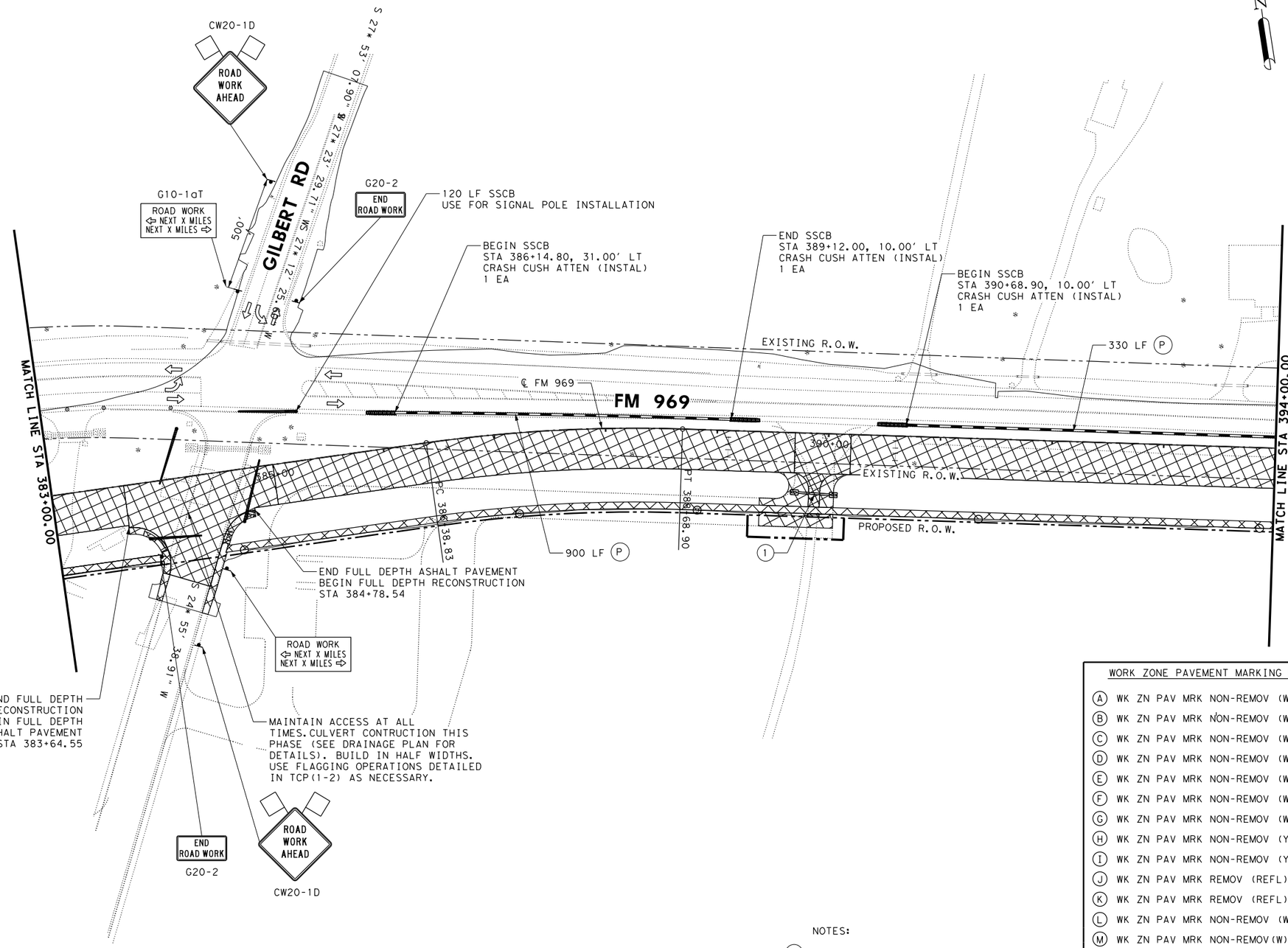

0′ 50′ 100′
SCALE IN FEET

N

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11′ TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

NOTES:

(1) CULVERT CONSTRUCTION THIS PHASE (SEE DRAINAGE PLAN FOR DETAILS).

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FM 969
TRAFFIC CONTROL PLAN PHASE 2
STA 383+00 TO STA 394+00

SHEET 7 OF 11

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
SW	6	PTF 2022(045)		51
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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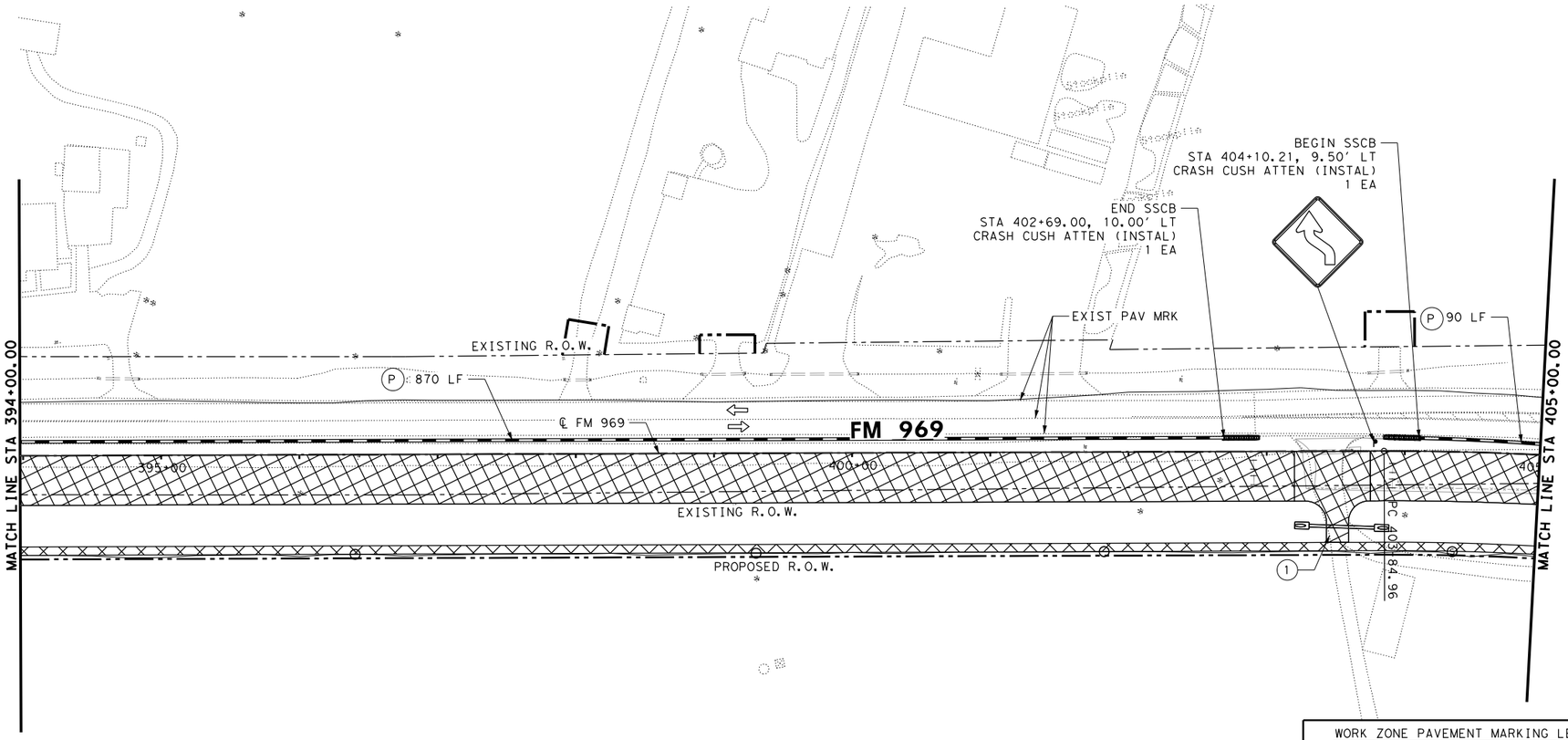

0′ 50′ 100′
SCALE IN FEET

N

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11′ TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

NOTES:

(1) CULVERT CONSTRUCTION THIS PHASE (SEE DRAINAGE PLAN FOR DETAILS).

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

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FM 969
TRAFFIC CONTROL PLAN
PHASE 2
STA 394+00 TO STA 405+00

SHEET 8 OF 11

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
SW	6	PTF 2022(045)		52
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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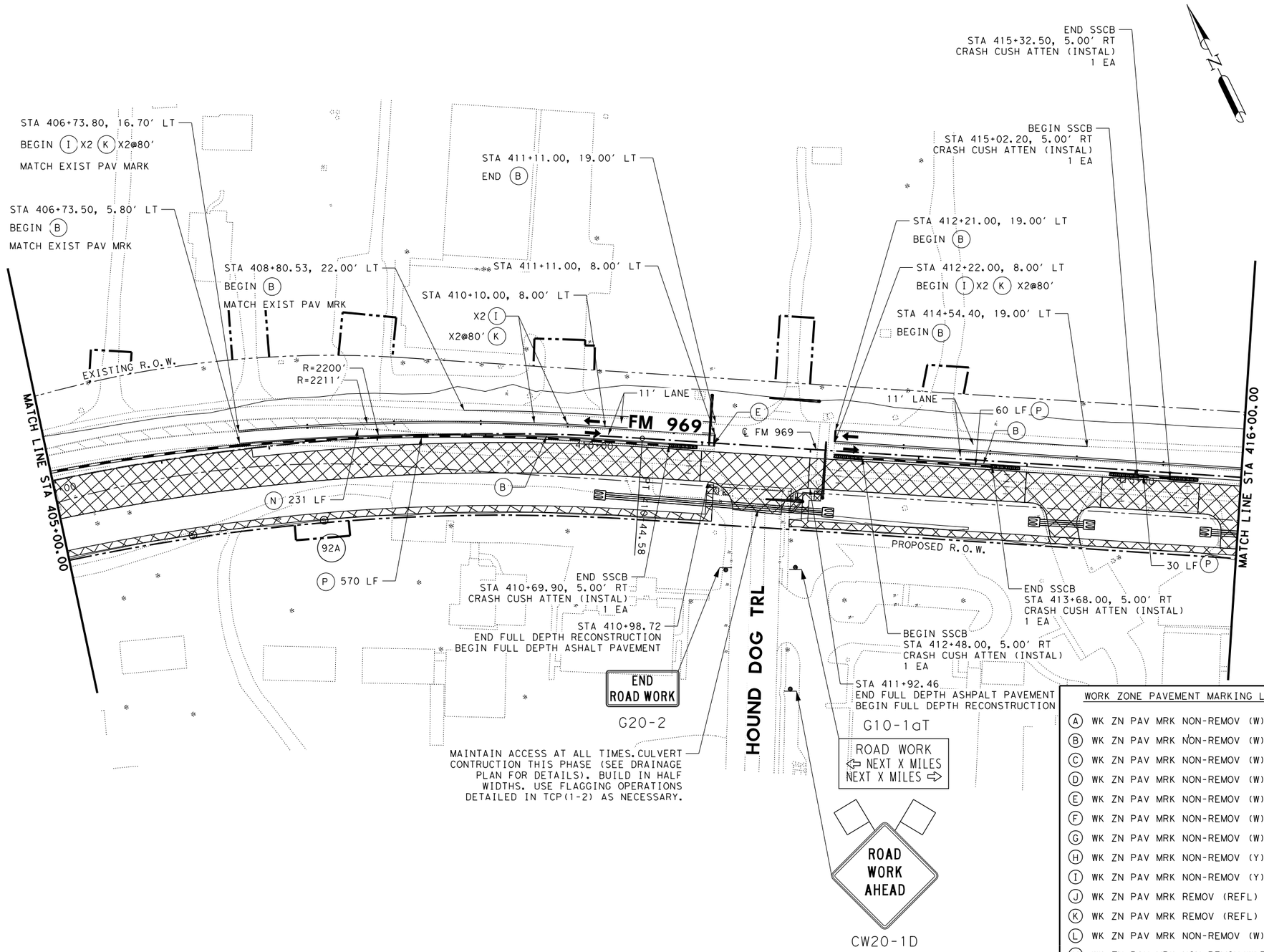

0′ 50′ 100′
SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. COORDINATE ACCESS TO SCHOOL [illegible] PROPERTIES WITH TXDOT AND SCHOOL DISTRICT. ING.
3. MINIMUM 11′ TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

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1892

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WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

FM 969
TRAFFIC CONTROL PLAN
PHASE 2
STA 405+00 TO STA 416+00

SHEET 9 OF 11

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
SW	6	PTF 2022(045)		53
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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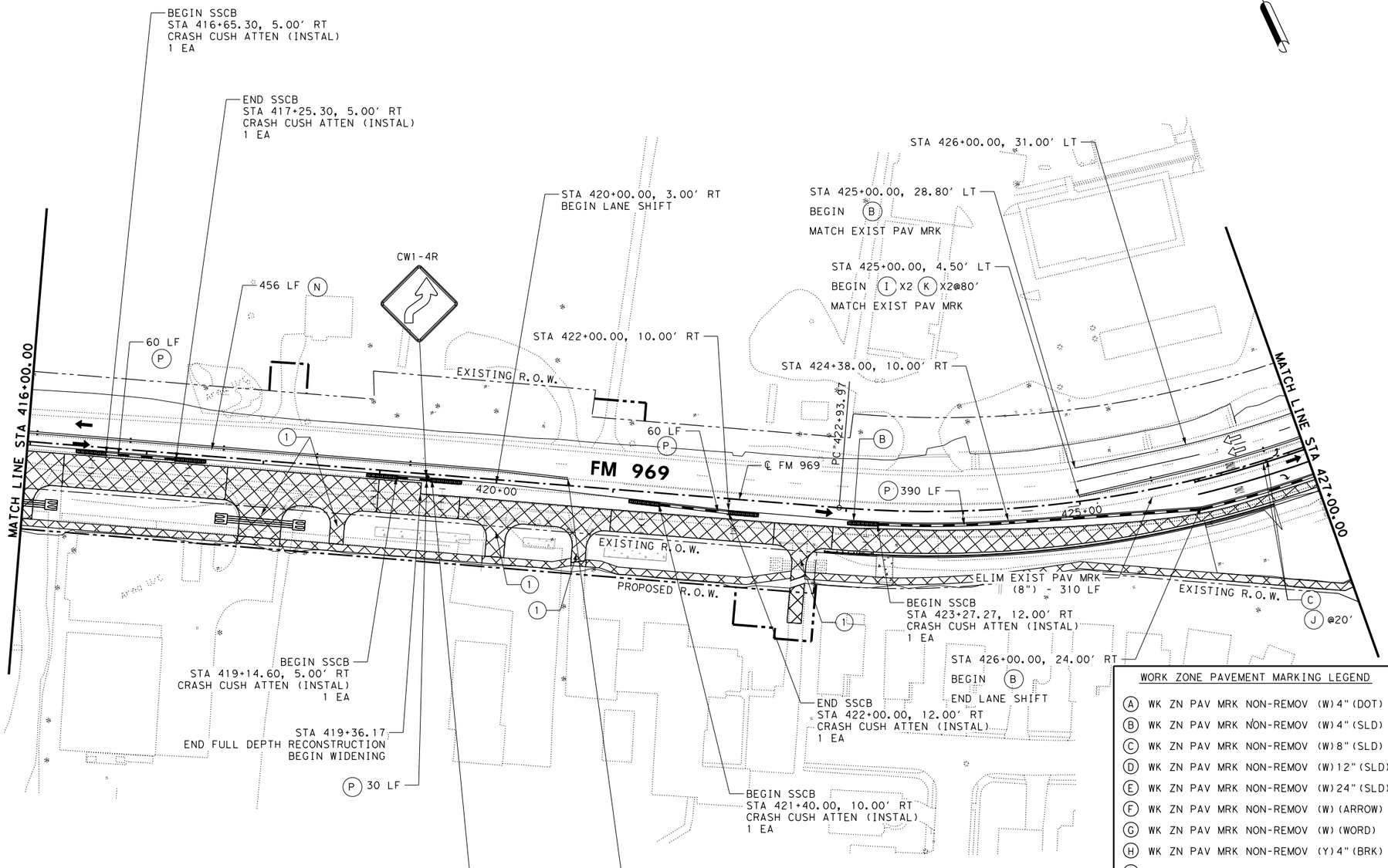

NOTES:

(1) CULVERT CONSTRUCTION THIS PHASE (SEE DRAINAGE PLAN FOR DETAILS).

0' 50' 100'

SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

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FM 969
TRAFFIC CONTROL PLAN PHASE 2
STA 416+00 TO STA 427+00

SHEET 10 OF 11

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
SW	6	PTF 2022(045)		54
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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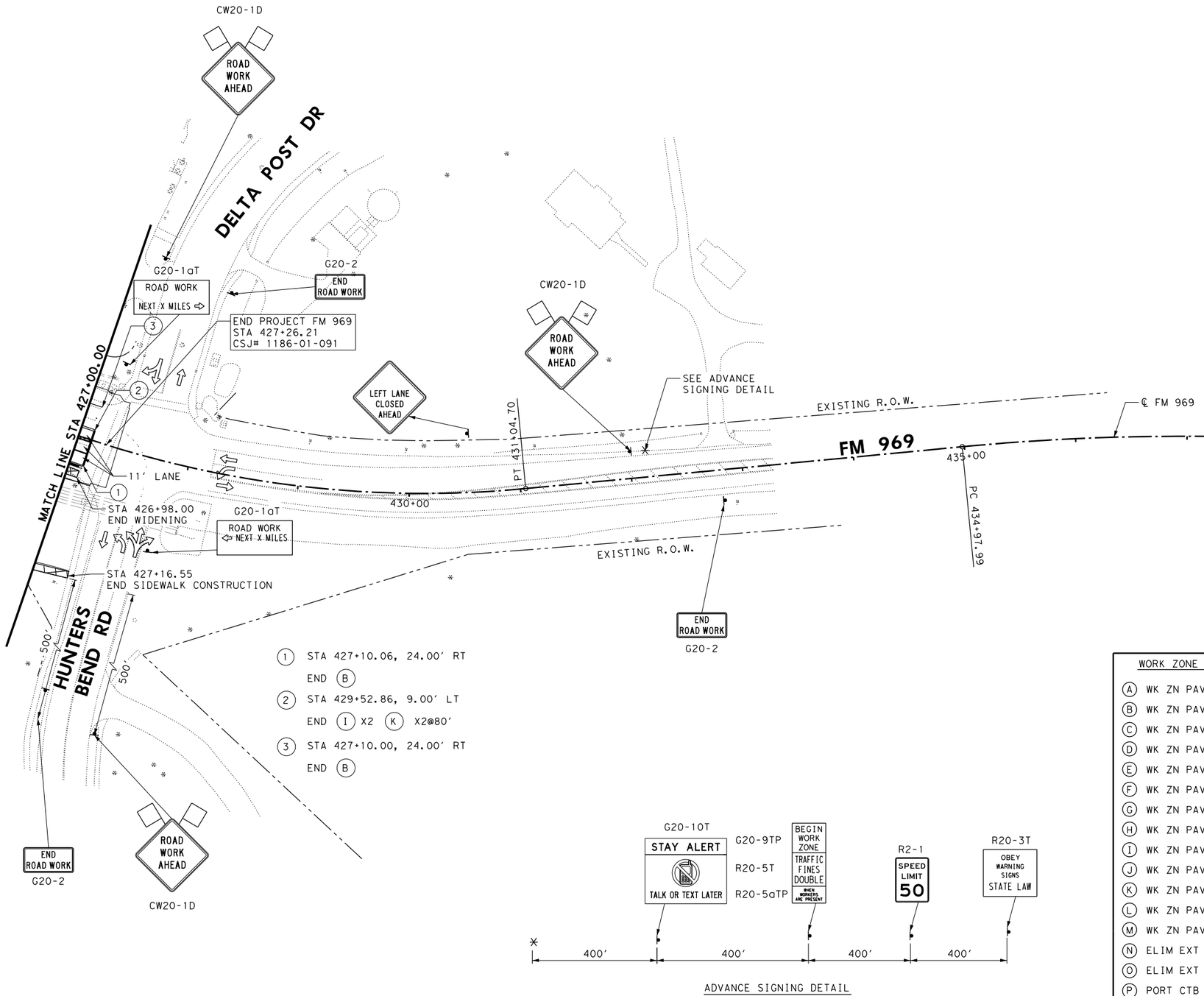

ADVANCE SIGNING DETAIL

0' 50' 100'

SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

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6/25/2021

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FM 969
TRAFFIC CONTROL PLAN
PHASE 2
STA 427+00 TO END

SHEET 11 OF 11

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
SW	6	PTF 2022(045)		55
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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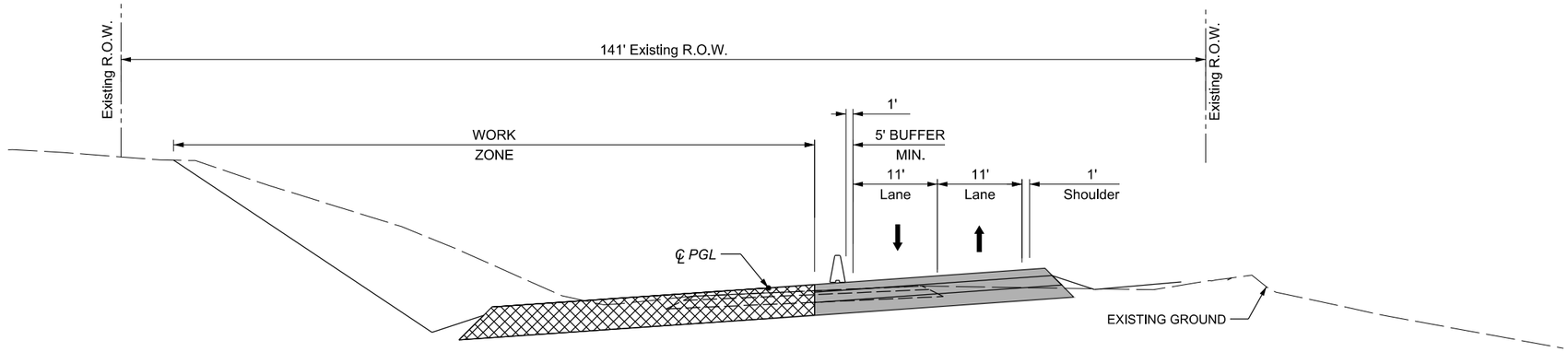
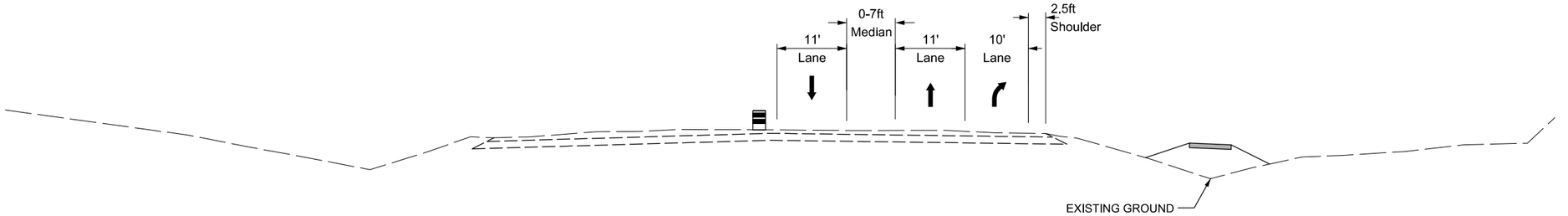


TCP PHASE 3
Sta 335+65.00 to 349+00.00



TCP PHASE 3
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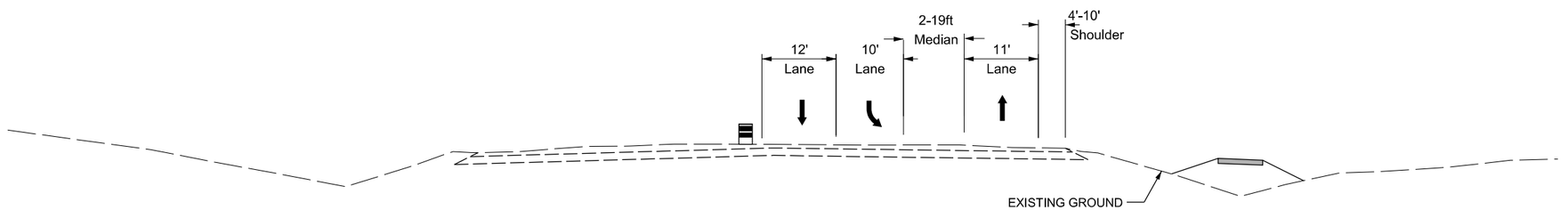

TCP PHASE 3
Sta 353+55.00 TO STA 355+50.00

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MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
TCP TYPICALS

PHASE 3
SCALE: NTS
SHEET 1 OF 2

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		56
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

6/25/2021
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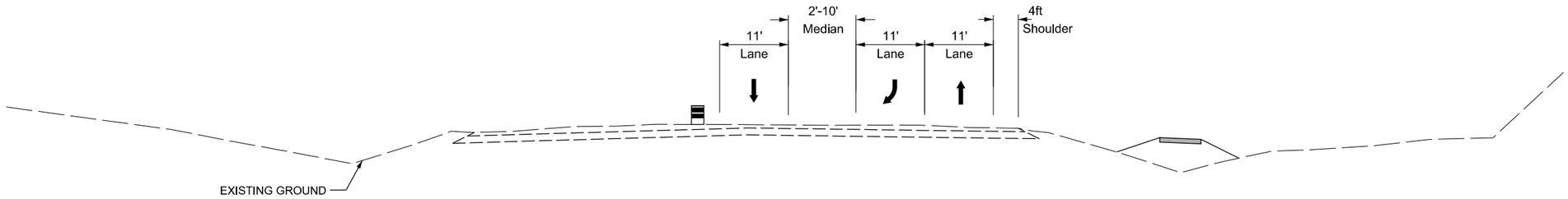

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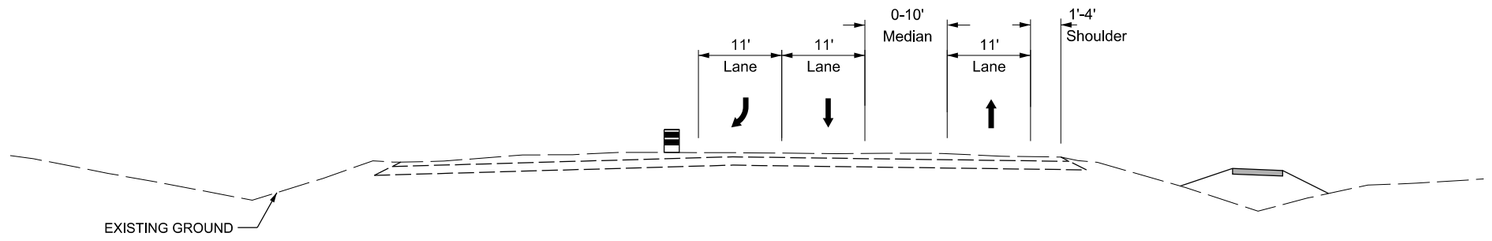

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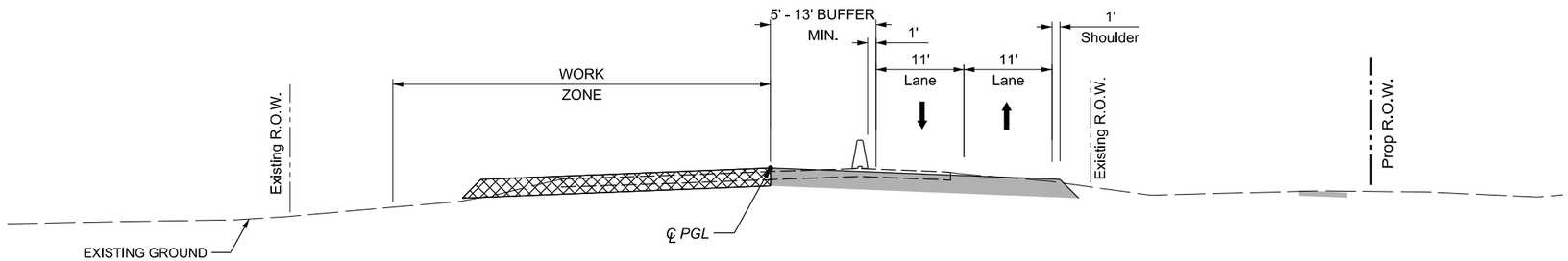

TCP PHASE 3
Sta 361+49.00 to Sta 419+21.00

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6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

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FRN - F-1386

FM 969
TCP TYPICALS

PHASE 3
SCALE: NTS
SHEET 2 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		57
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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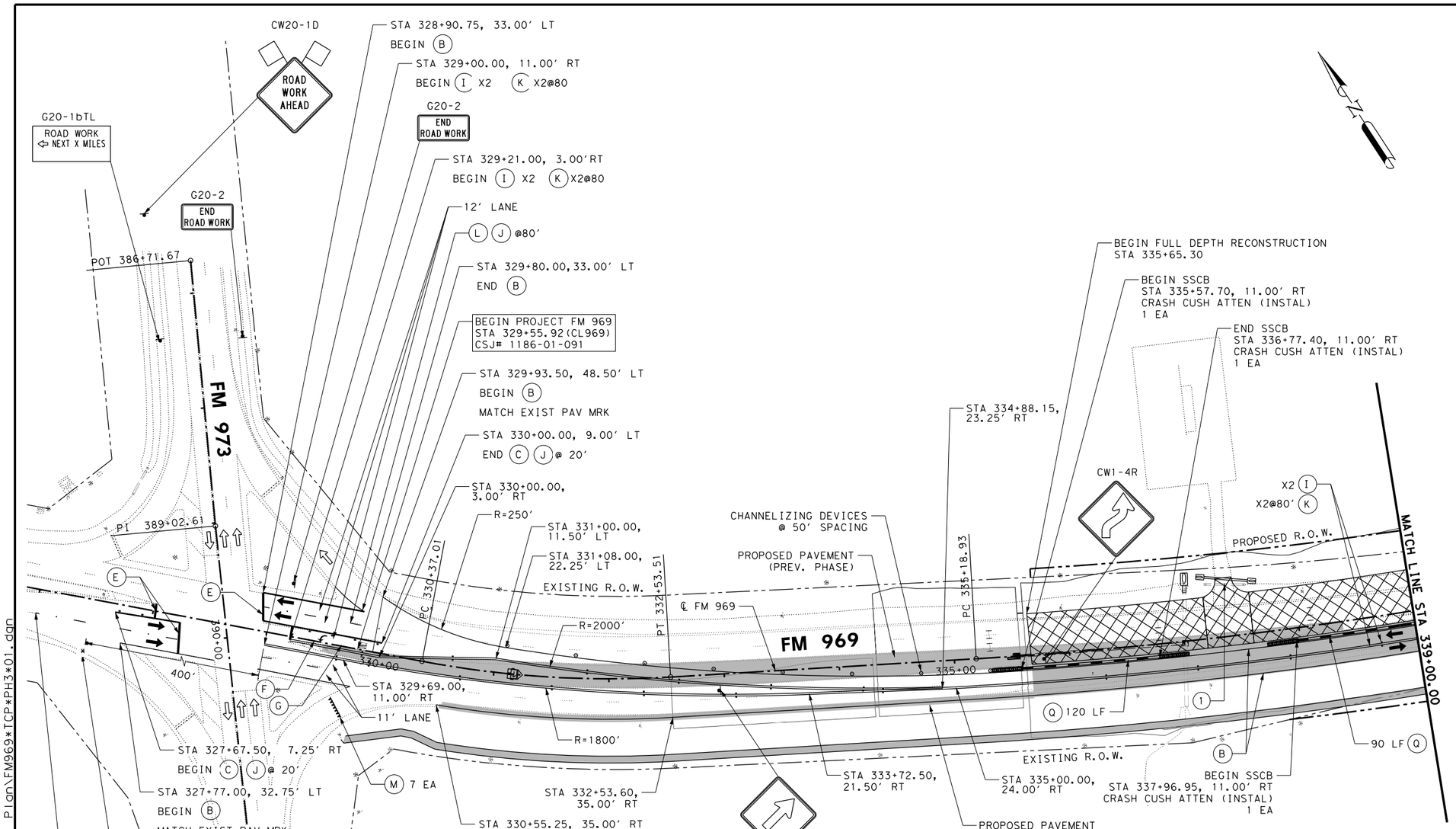

ADVANCE SIGNING DETAIL

NOTES:

(1) CULVERT CONSTRUCTION THIS PHASE (SEE DRAINAGE PLAN FOR DETAILS).

0' 50' 100'

SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:

1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
88202
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PROFESSIONAL ENGINEER

6/25/2021

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STATE OF TEXAS

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FM 969
TRAFFIC CONTROL PLAN
PHASE 3
BEGIN TO STA 339+00

SHEET 1 OF 10

DESIGN BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		58
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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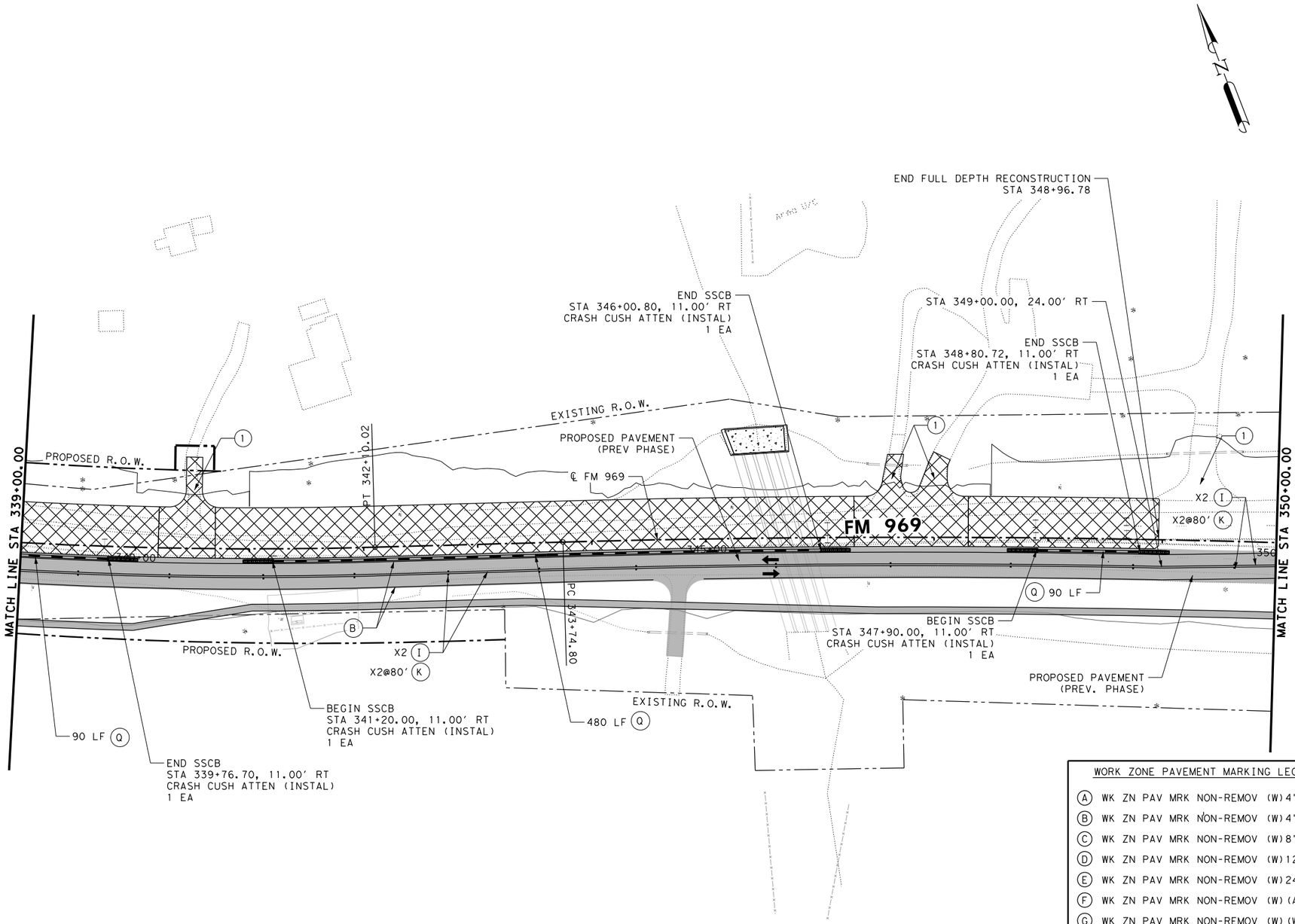

0' 50' 100'
SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

NOTES:

(1) CULVERT CONSTRUCTION THIS PHASE (SEE DRAINAGE PLAN FOR DETAILS).

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

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FM 969
TRAFFIC CONTROL PLAN
PHASE 3
STA 339+00 TO STA 350+00

SHEET 2 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		59
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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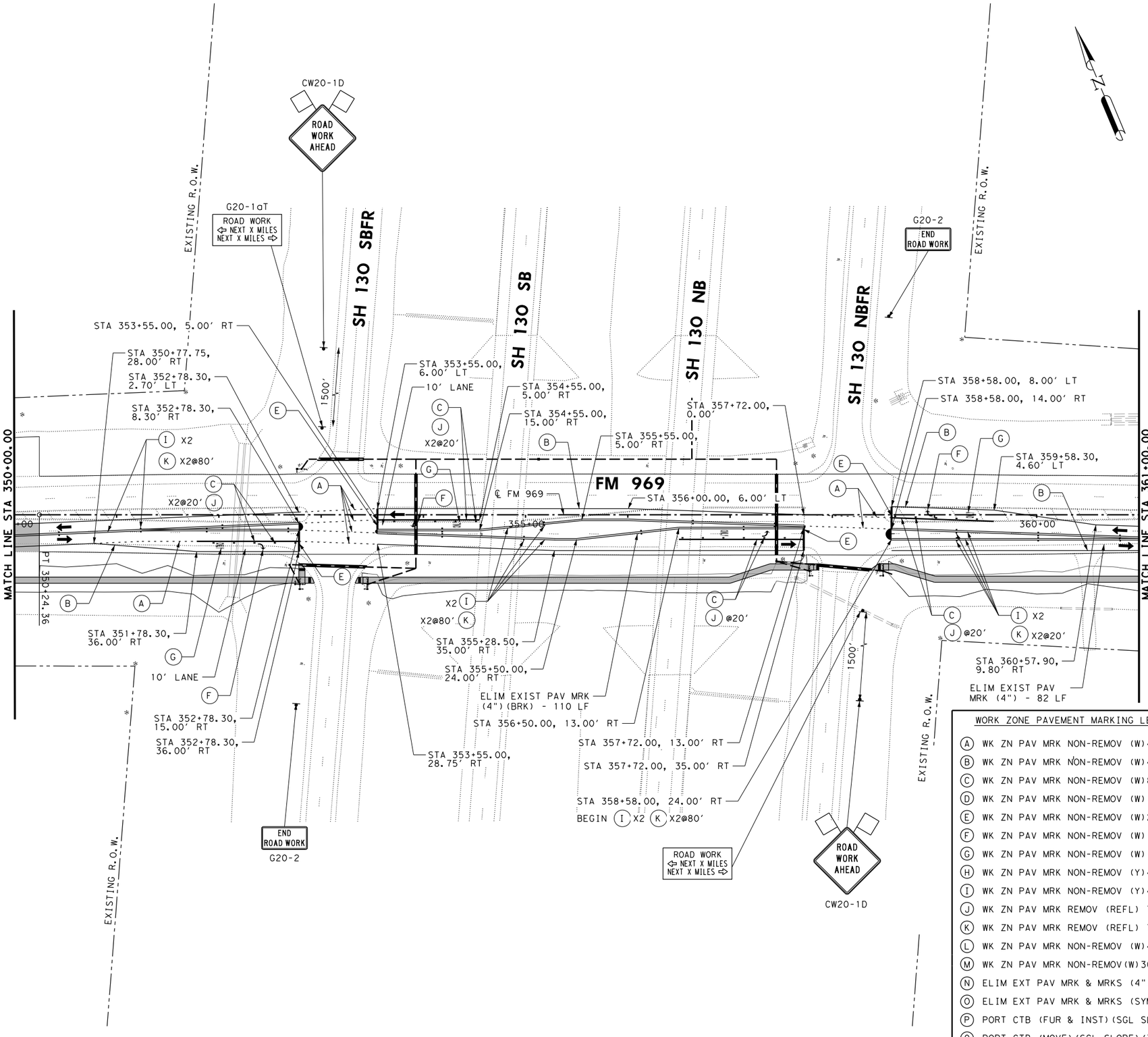

0' 50' 100'
SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

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88202
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6/25/2021

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FM 969
TRAFFIC CONTROL PLAN PHASE 3
STA 350+00 TO STA 361+00

SHEET 3 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		60
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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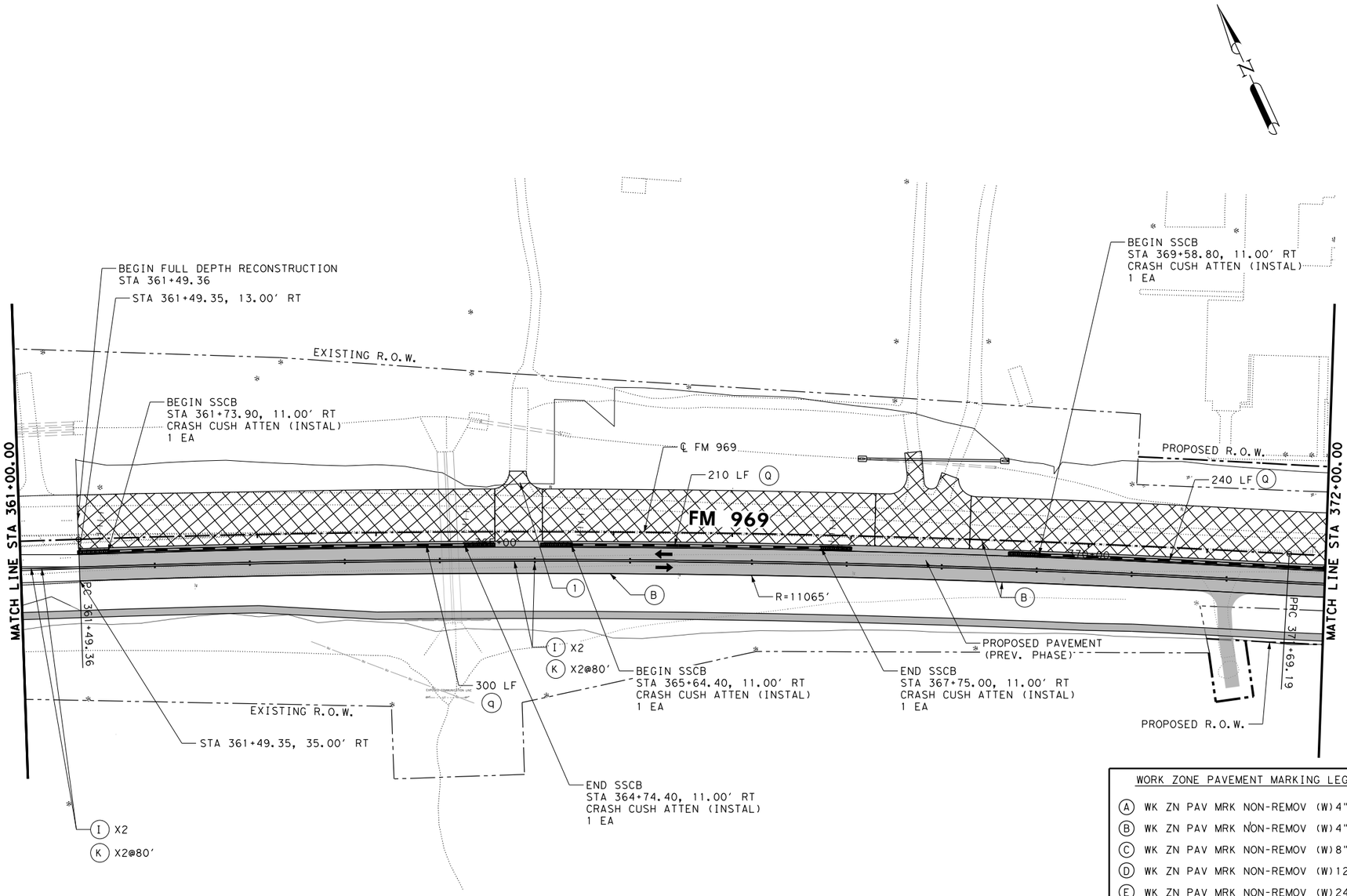

NOTES:

(1) CULVERT CONSTRUCTION THIS PHASE (SEE DRAINAGE PLAN FOR DETAILS).

0' 50' 100'

SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

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6/25/2021

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FM 969
TRAFFIC CONTROL PLAN
PHASE 3
STA 361+00 TO STA 372+00

SHEET 4 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		61
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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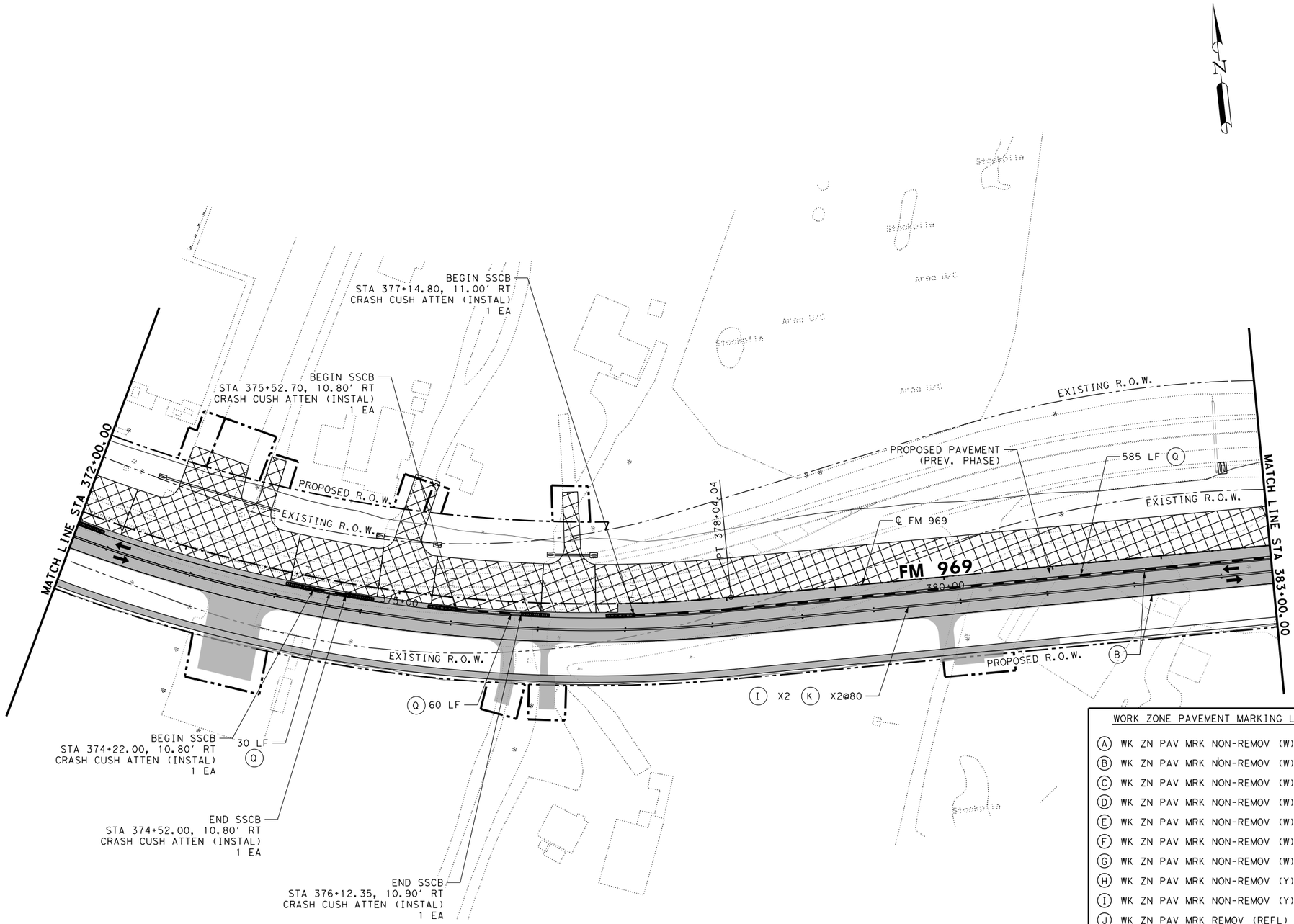

0′ 50′ 100′
SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11′ TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

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6/25/2021

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FM 969
TRAFFIC CONTROL PLAN
PHASE 3
STA 372+00 TO STA 383+00

SHEET 5 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		62
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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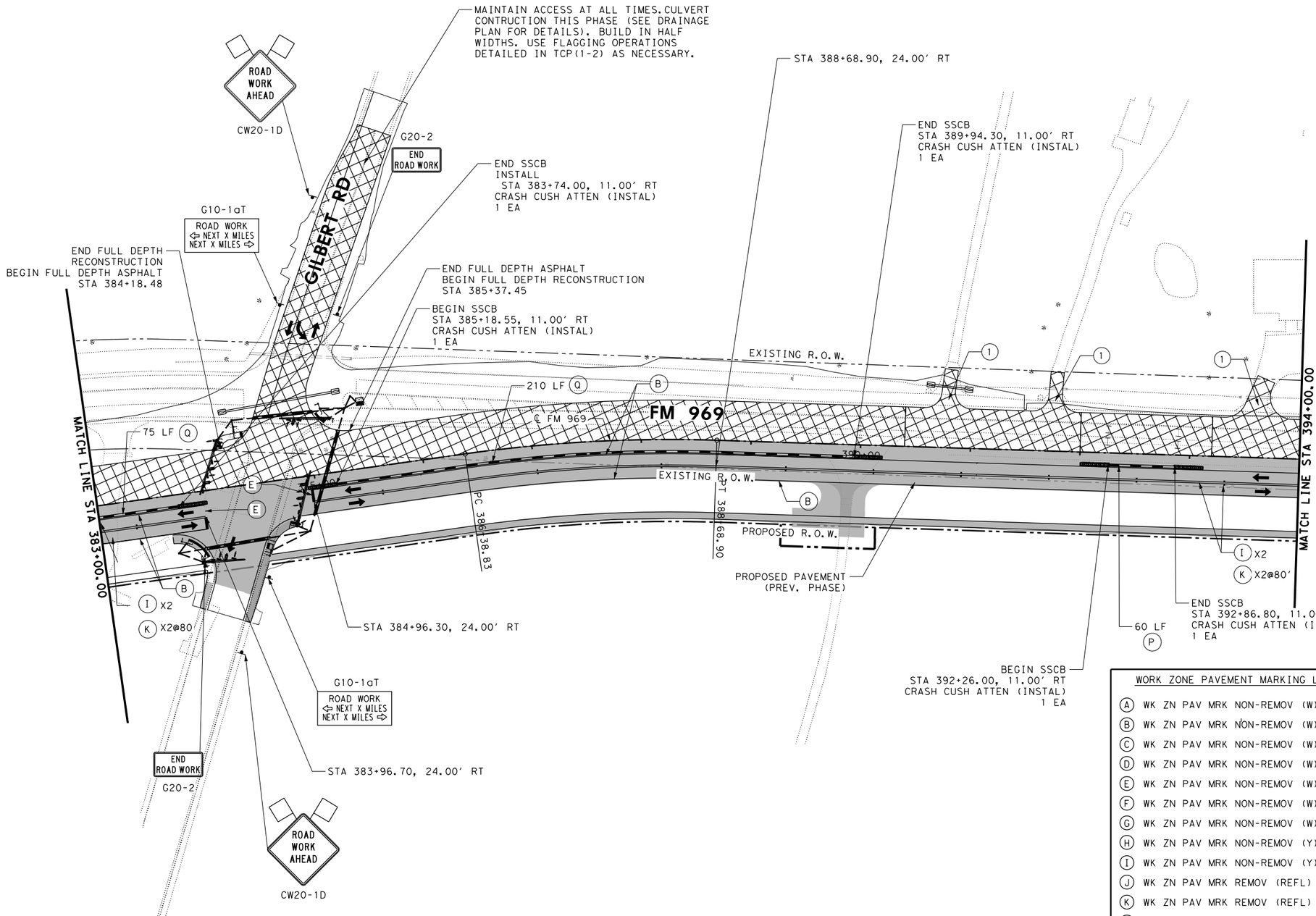

0′ 50′ 100′

SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11′ TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

NOTES:

(1) CULVERT CONSTRUCTION THIS PHASE (SEE DRAINAGE PLAN FOR DETAILS).

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

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FM 969
TRAFFIC CONTROL PLAN PHASE 3
STA 383+00 TO STA 394+00

SHEET 6 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		63
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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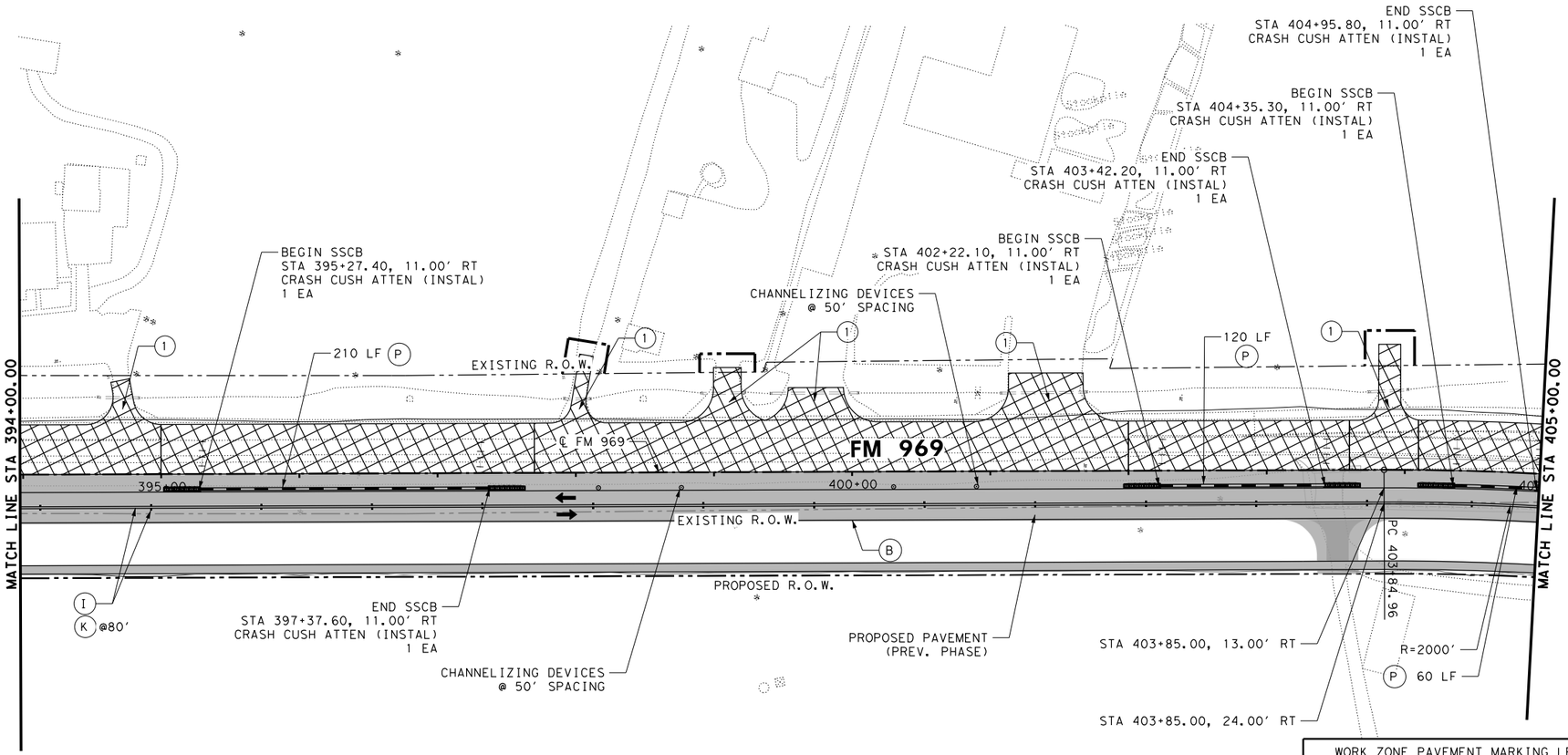

NOTES:

(1) CULVERT CONSTRUCTION THIS PHASE (SEE DRAINAGE PLAN FOR DETAILS).

0' 50' 100'

SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11' TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
- (C) WK ZN PAV MRK NON-REMOV (W)8"(SLD)
- (D) WK ZN PAV MRK NON-REMOV (W)12"(SLD)
- (E) WK ZN PAV MRK NON-REMOV (W)24"(SLD)
- (F) WK ZN PAV MRK NON-REMOV (W)(ARROW)
- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS
1865

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FM 969
TRAFFIC CONTROL PLAN
PHASE 3
STA 394+00 TO STA 405+00

SHEET 7 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		64
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
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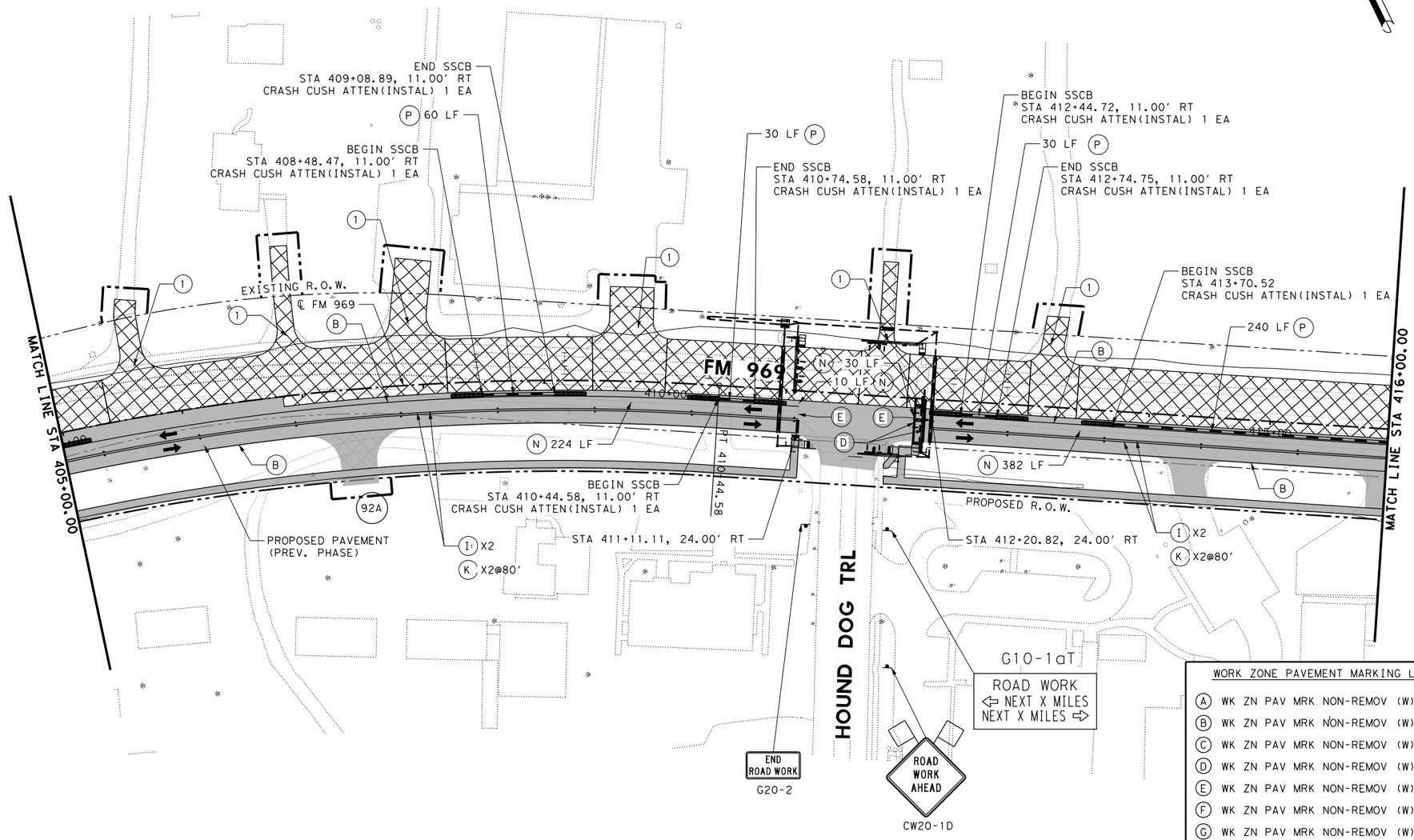

0′ 50′ 100′
SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
3. MINIMUM 11′ TRAVEL LANES UNLESS OTHERWISE NOTED.
4. CULVERT TO BE CONSTRUCTED IN PHASES TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES. (SEE DRAINAGE PLAN FOR DETAILS)

NOTES:

(1) CULVERT CONSTRUCTION THIS PHASE (SEE DRAINAGE PLAN FOR DETAILS).

WORK ZONE PAVEMENT MARKING LEGEND

- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
- (B) WK ZN PAV MRK NON-REMOV (W)4"(SLD)
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- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
- (M) WK ZN PAV MRK NON-REMOV(W)36"(YLD TRI)
- (N) ELIM EXT PAV MRK & MRKS (4")
- (O) ELIM EXT PAV MRK & MRKS (SYMBOL)
- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
- (Q) PORT CTB (MOVE)(SGL SLOPE)(TY 1)

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FM 969
TRAFFIC CONTROL PLAN
PHASE 3
STA 405+00 TO STA 416+00

SHEET 8 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		65
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
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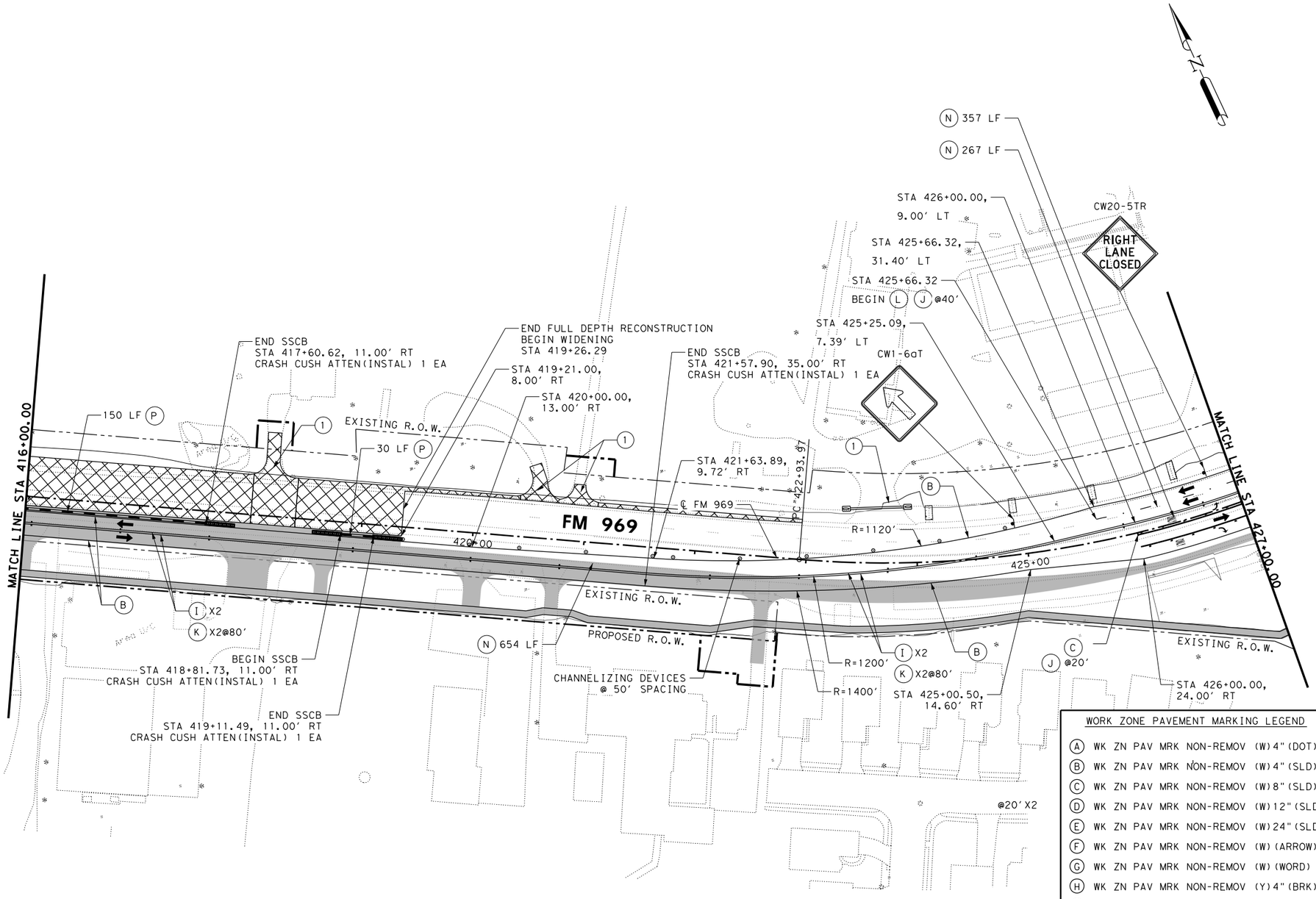

0' 50' 100'

SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
- SINGLE SLOPE CONCRETE BARRIER(SSCB)
- FLAGGER
- FLASHING ARROW BOARD
- TY III BARRICADE
- EXISTING ROW
- PROPOSED R.O.W.
- PROPOSED CONSTRUCTION EASEMENT
- EXISTING TRAFFIC ARROWS
- PROPOSED TRAFFIC ARROWS
- CRASH CUSHION

NOTES:
1. MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
2. SEE BC(1-12) STNDS. FOR ADVANCE SIGNING SPACING.
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- (A) WK ZN PAV MRK NON-REMOV (W)4"(DOT)
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- (G) WK ZN PAV MRK NON-REMOV (W)(WORD)
- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
- (I) WK ZN PAV MRK NON-REMOV (Y)4"(SLD)
- (J) WK ZN PAV MRK REMOV (REFL) TY I-C
- (K) WK ZN PAV MRK REMOV (REFL) TY II-A-A
- (L) WK ZN PAV MRK NON-REMOV (W)4"(BRK)
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- (N) ELIM EXT PAV MRK & MRKS (4")
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- (P) PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)
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FM 969
TRAFFIC CONTROL PLAN
PHASE 3
STA 416+00 TO STA 427+00

SHEET 9 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		66
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
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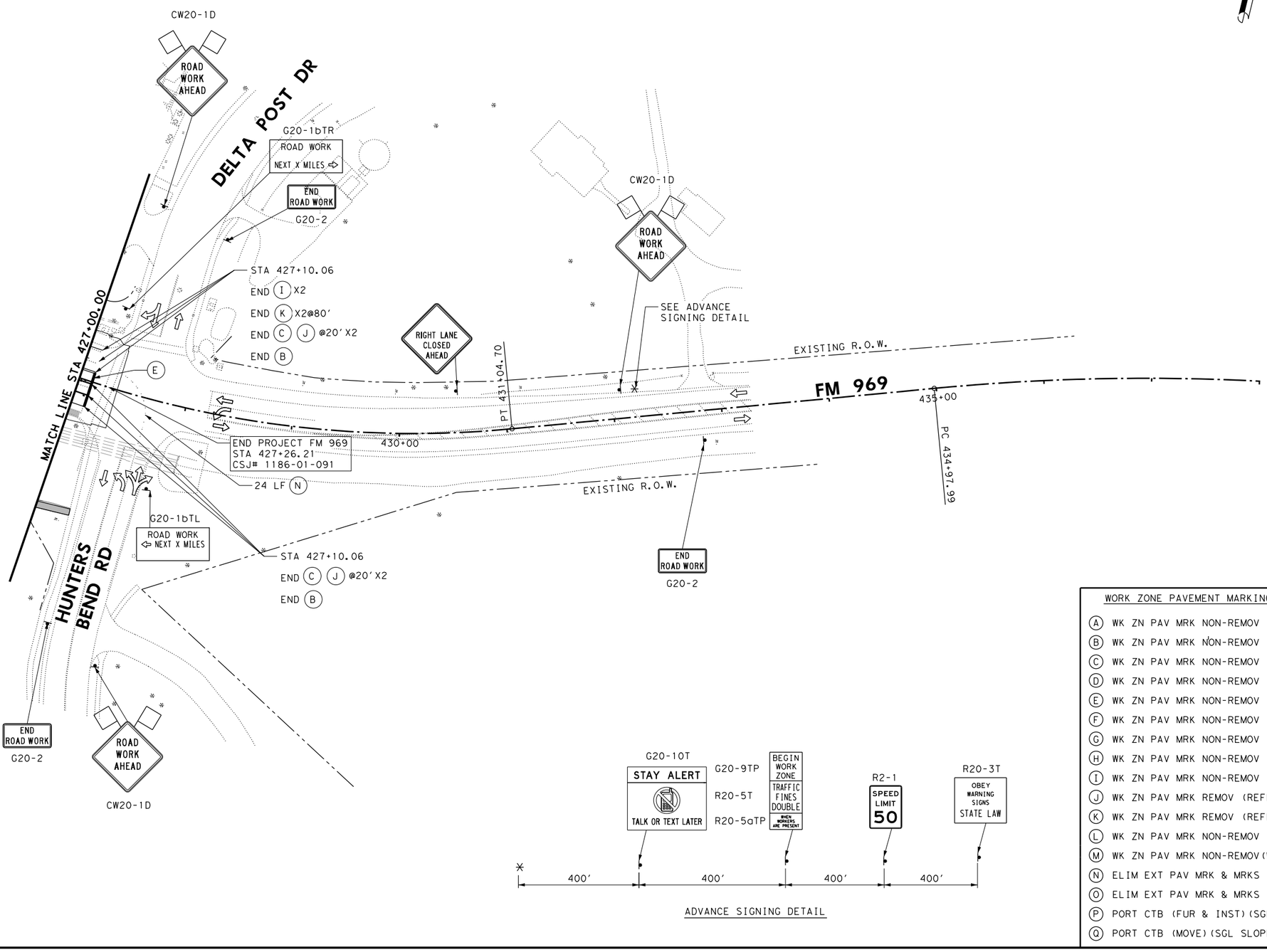

ADVANCE SIGNING DETAIL

0' 50' 100'

SCALE IN FEET

LEGEND

- PROPOSED PAVEMENT & SIDEWALK CONSTRUCTION (THIS PHASE)
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT CONSTRUCTION (PREV. PHASE)
- CHANNELIZING DEVICE
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- (H) WK ZN PAV MRK NON-REMOV (Y)4"(BRK)
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FM 969
TRAFFIC CONTROL PLAN PHASE 3
STA 427+00 TO END

SHEET 10 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		67
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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REVISIONS 4-03 7-13	1186	01	091	FM 969
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21	AUS	TRAVIS		68

DATE:
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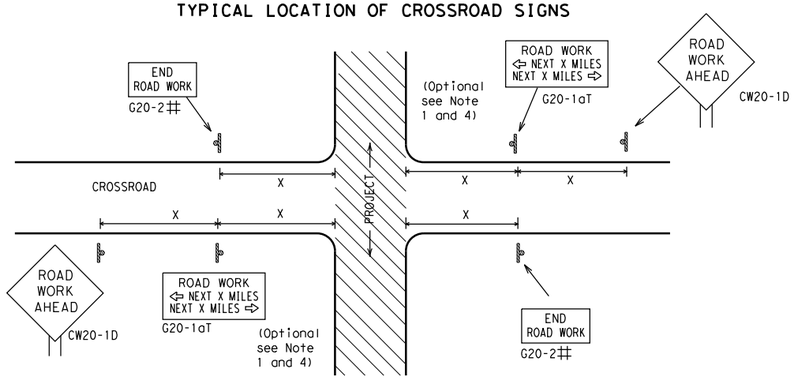
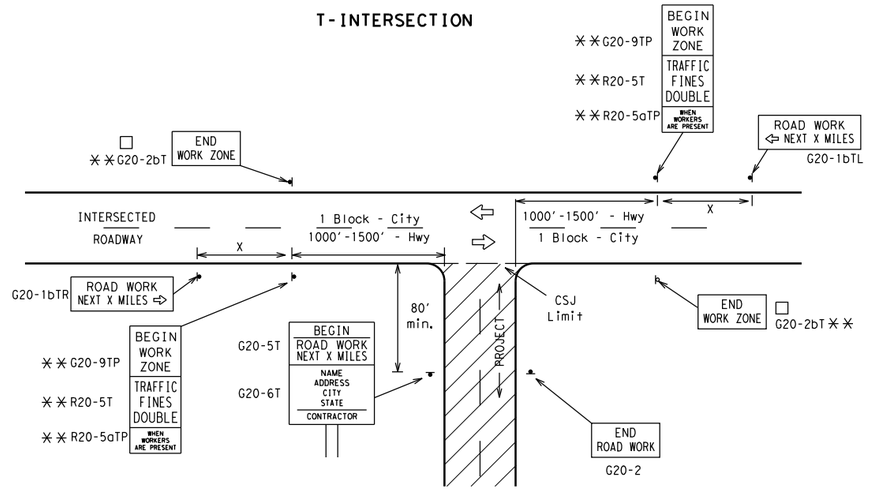
TYPICAL LOCATION OF CROSSROAD SIGNS



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]

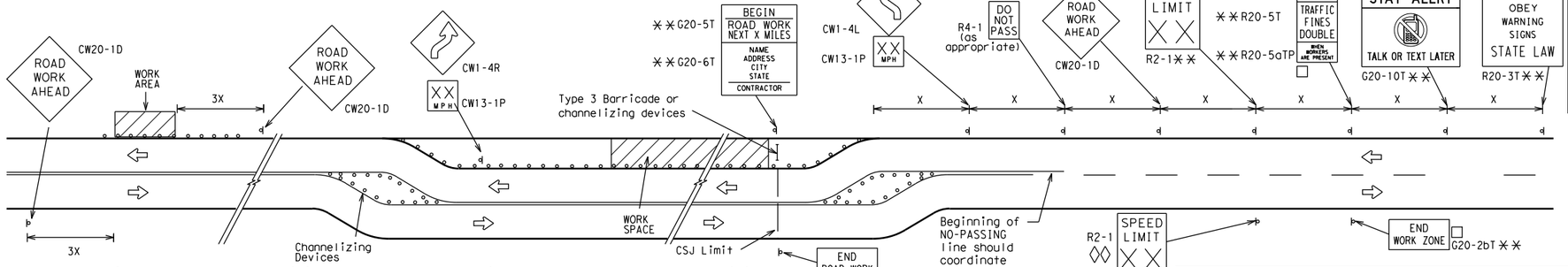
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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.

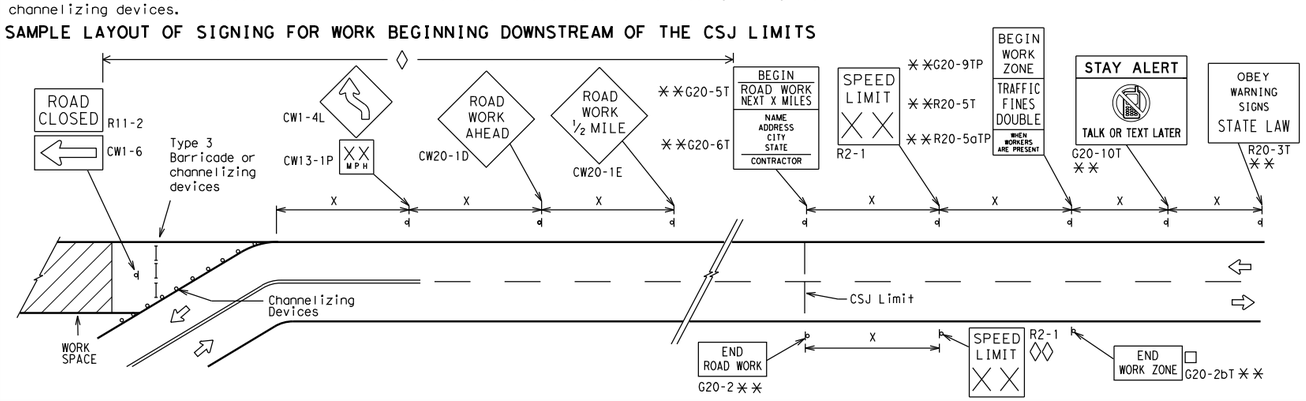
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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.

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Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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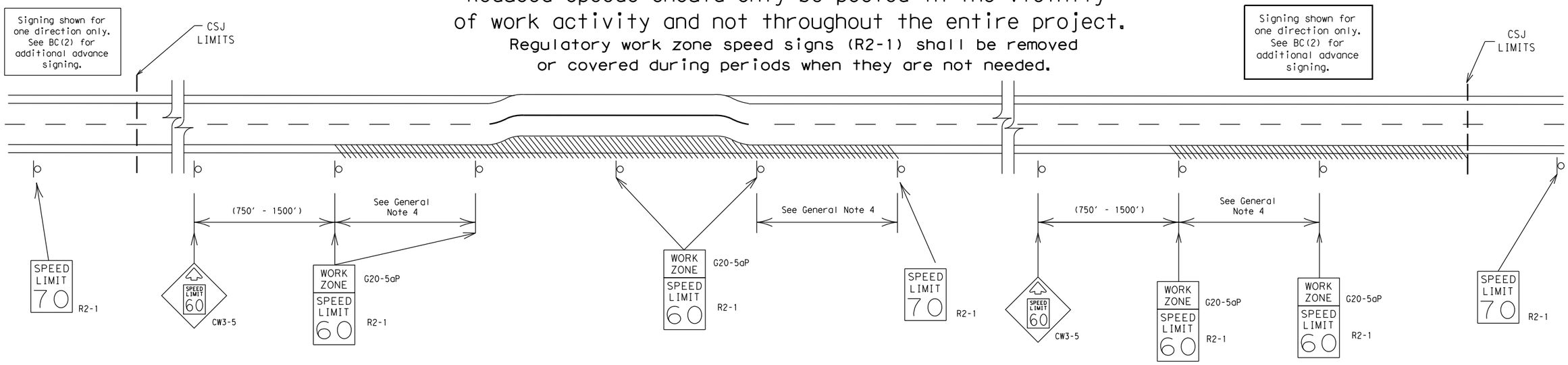
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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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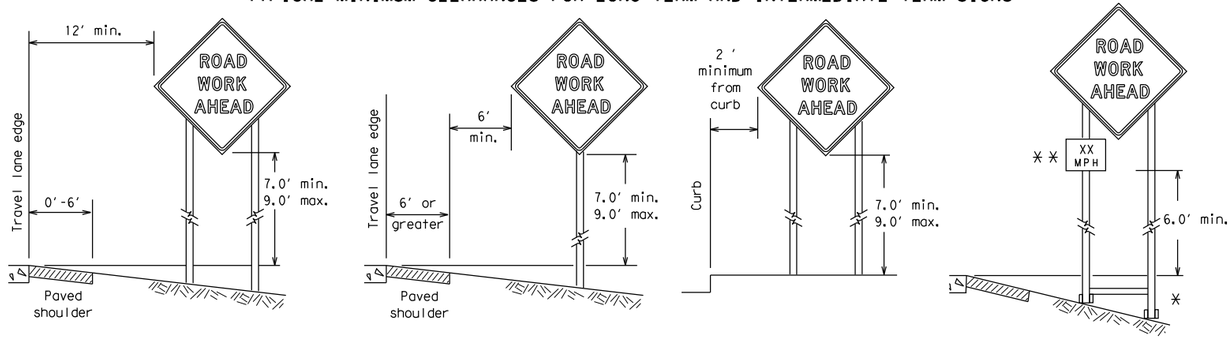
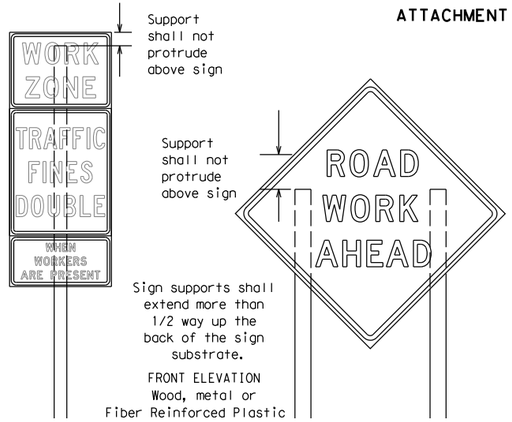
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

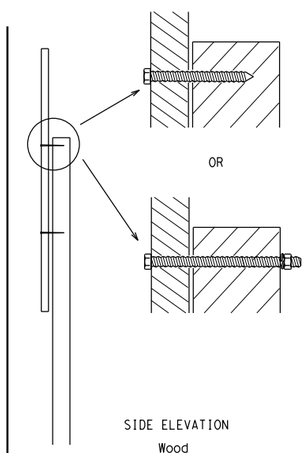


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ 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





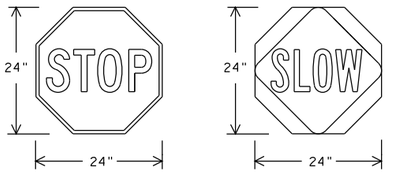
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.



Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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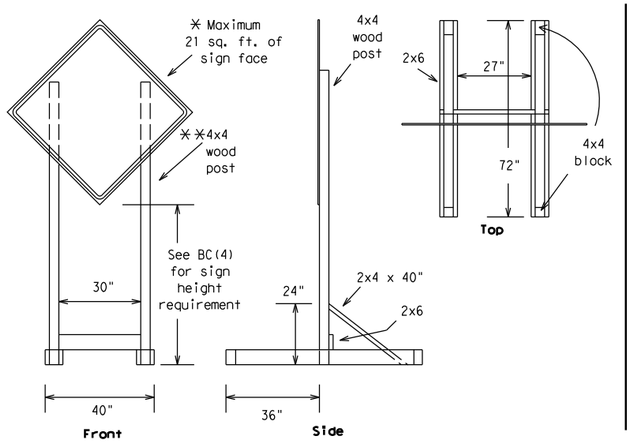
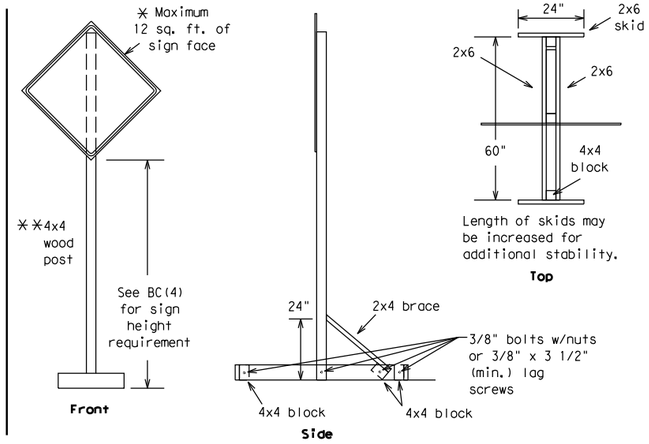
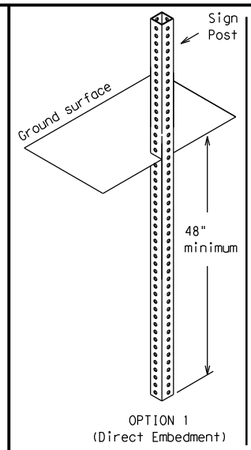
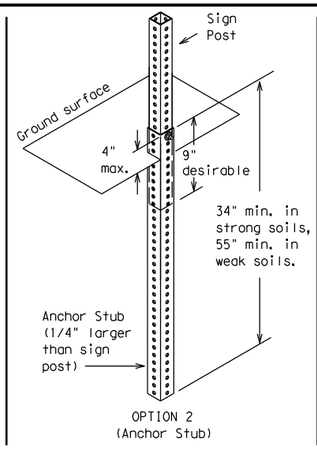


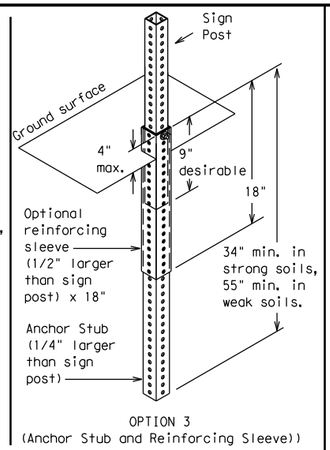


SKID MOUNTED WOOD SIGN SUPPORTS

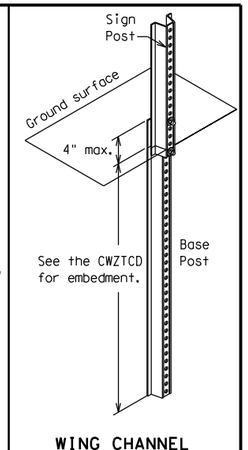
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







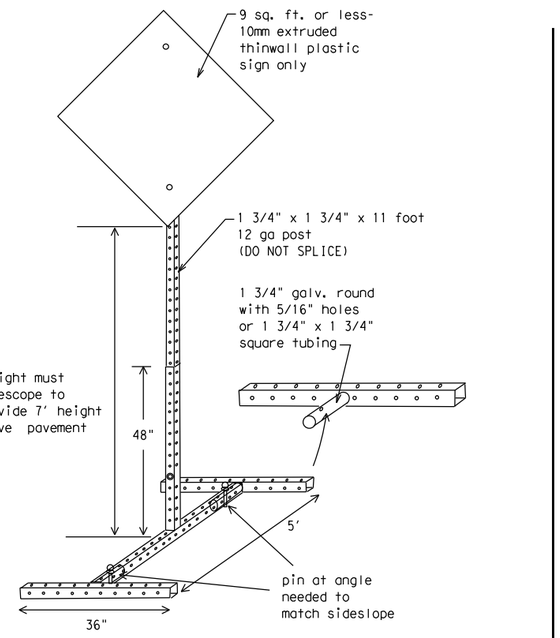
PERFORATED SQUARE METAL TUBING

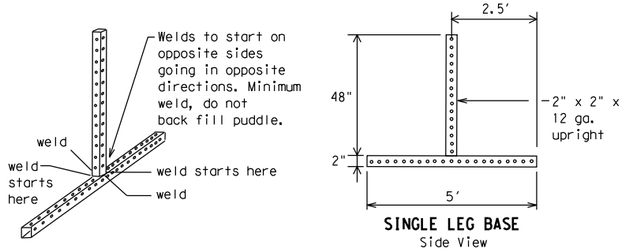


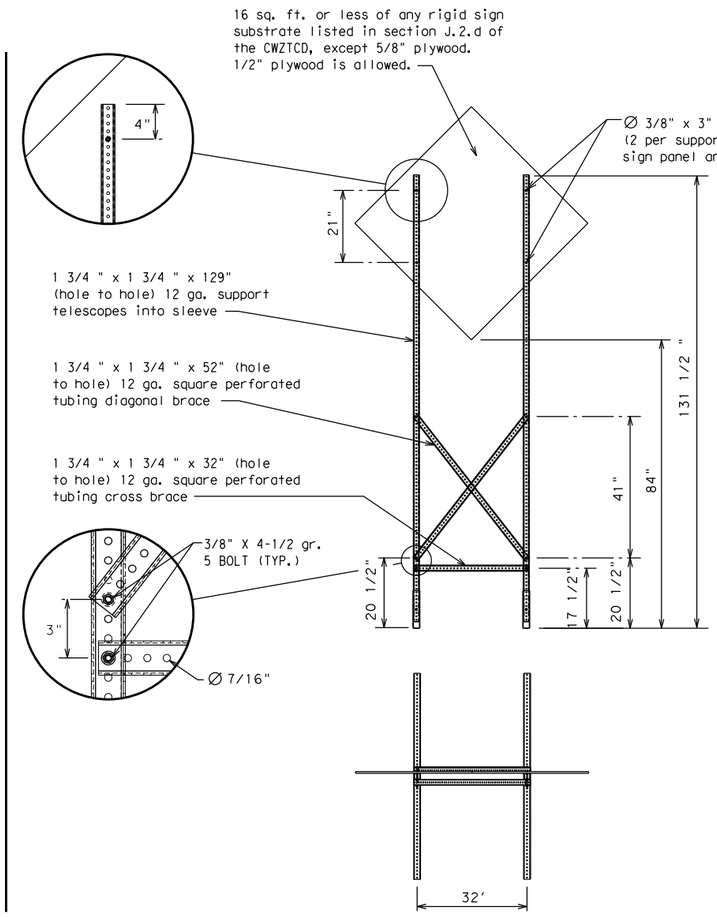
WING CHANNEL
Lap-splice/base bolted anchor

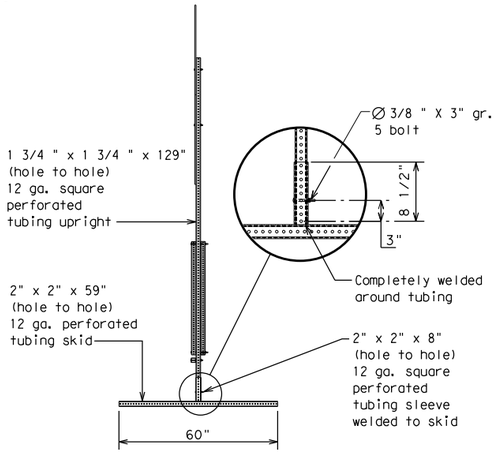
GROUND MOUNTED SIGN SUPPORTS

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









SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

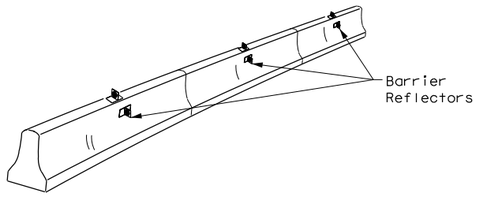
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	AUS	TRAVIS		73

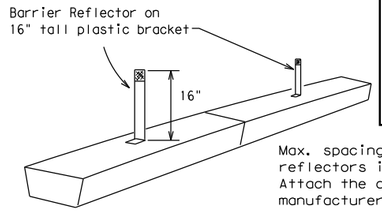
DATE:
FILE:

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.



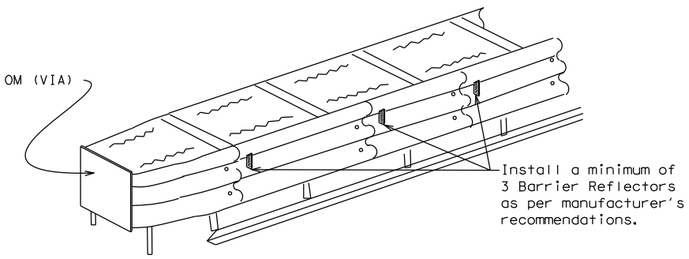
CONCRETE TRAFFIC BARRIER (CTB)

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)



DELINEATION OF END TREATMENTS

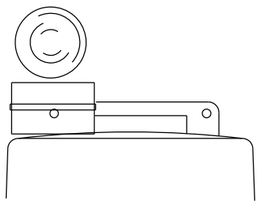
LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

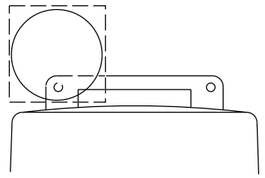
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

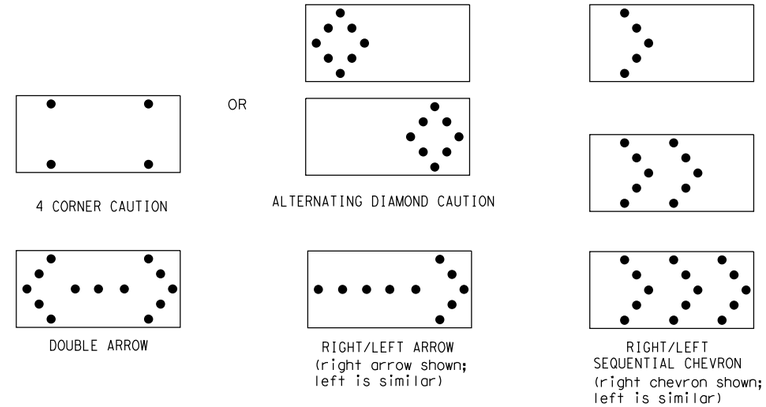
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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	1186	01	091	FM 969
9-07 8-14	DIST	COUNTY		SHEET NO.
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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

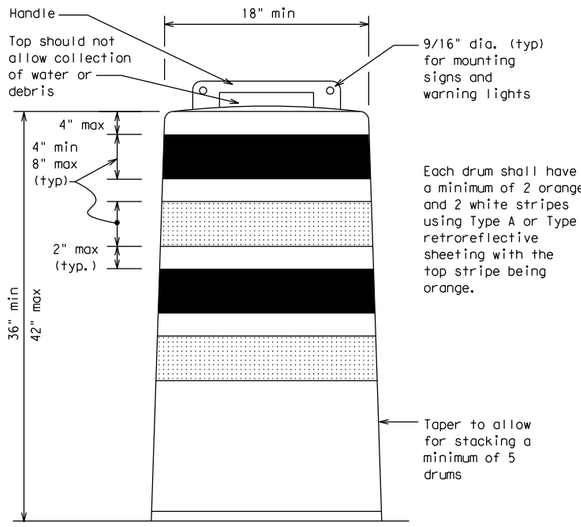
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

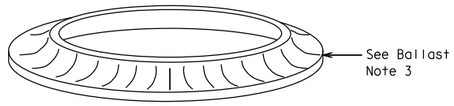
RETROREFLECTIVE SHEETING

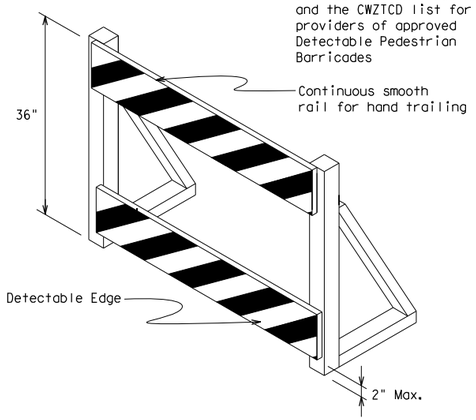
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

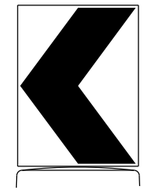




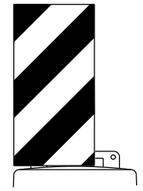


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	1186	01	091	FM 969
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	AUS	TRAVIS		75
7-13				

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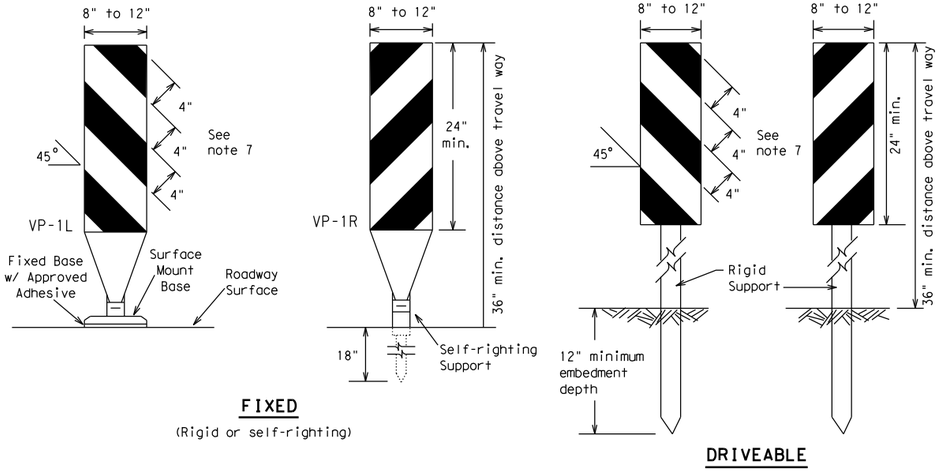


FIXED
(Rigid or self-righting)

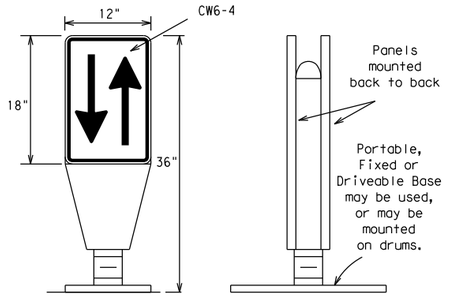
DRIVEABLE

(Rigid or self-righting)

PORTABLE

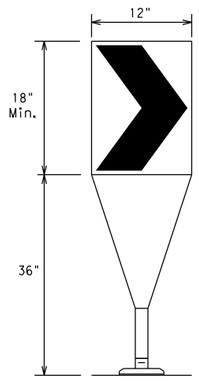
VERTICAL PANELS (VPs)

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.



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



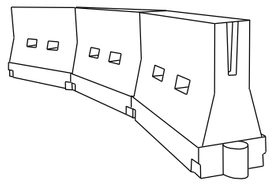
Fixed Base w/ Approved Adhesive
(Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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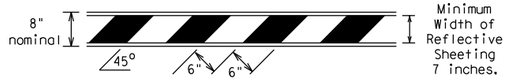
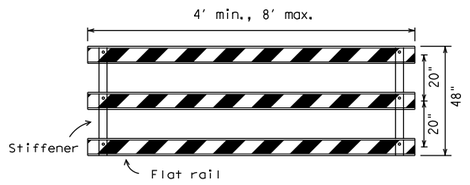
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



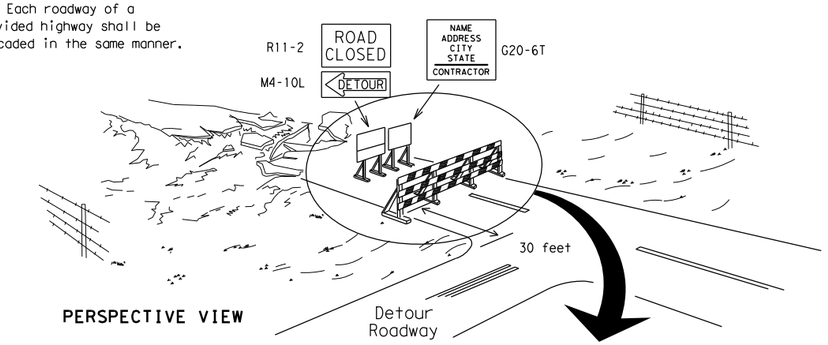
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

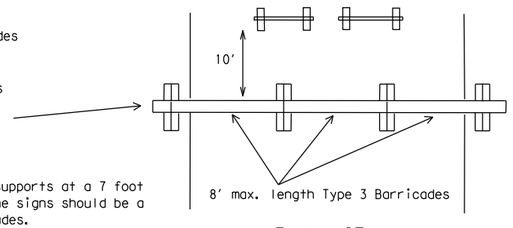
TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

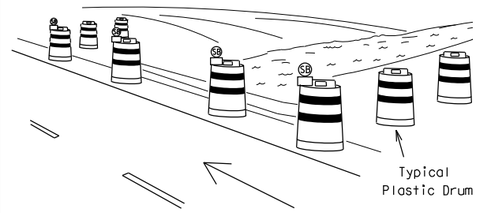
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

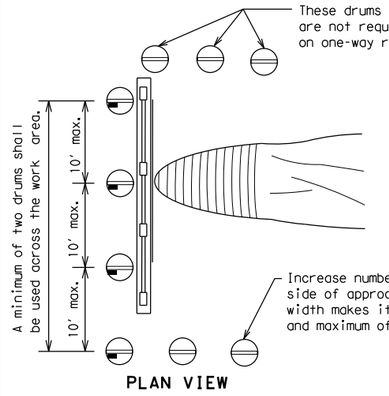
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

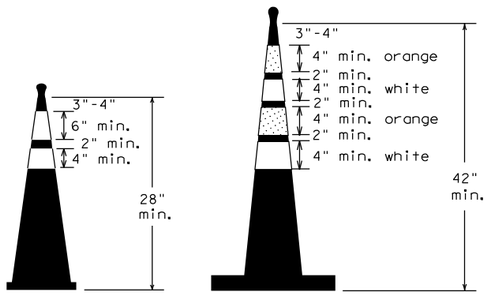
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



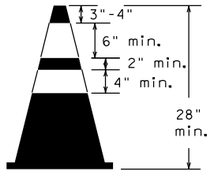
LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

PLAN VIEW

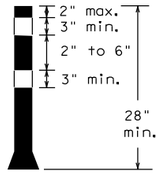
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

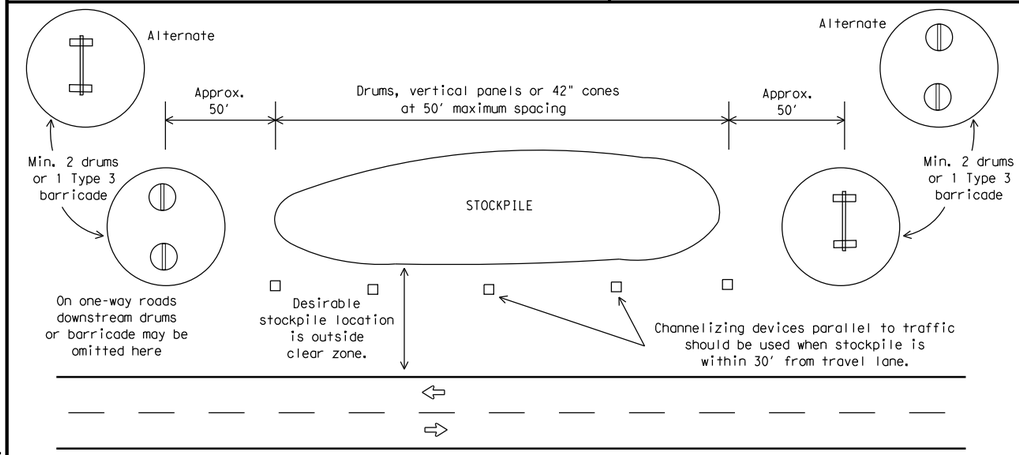


Tubular Marker

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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

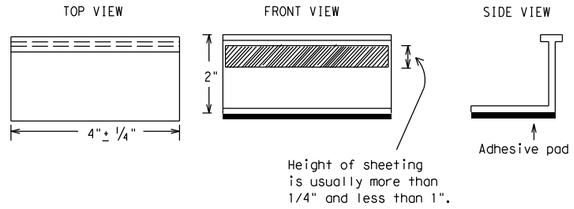
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

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Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

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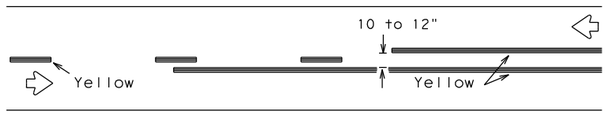
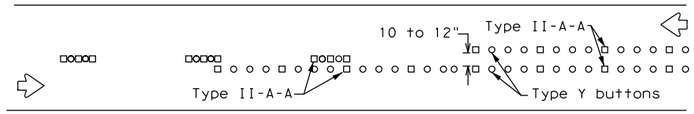
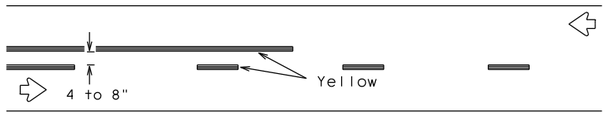
PAVEMENT MARKING PATTERNS



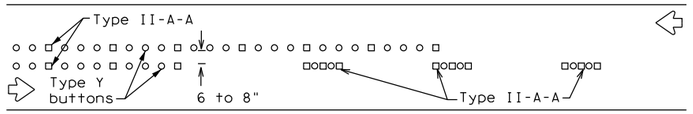
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



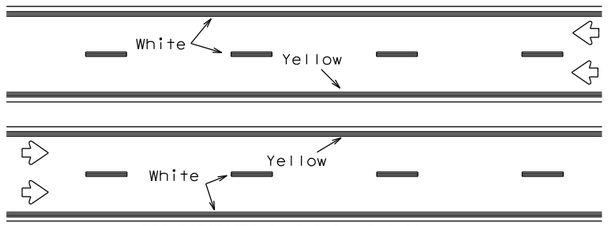
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



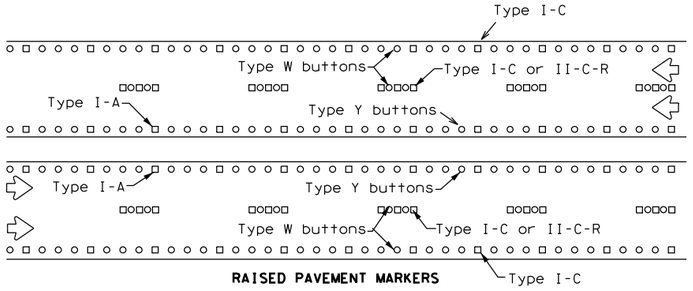
RAISED PAVEMENT MARKERS - PATTERN B

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

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



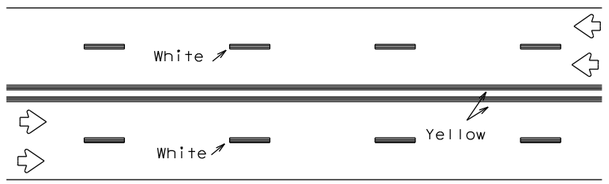
REFLECTORIZED PAVEMENT MARKINGS



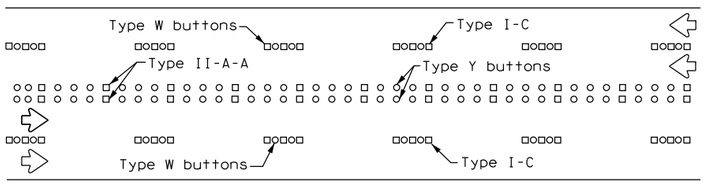
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



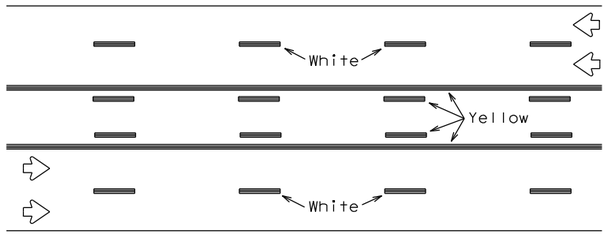
REFLECTORIZED PAVEMENT MARKINGS



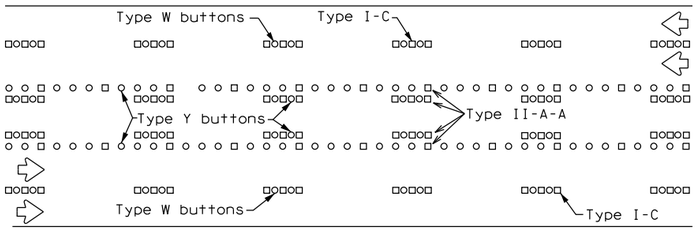
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

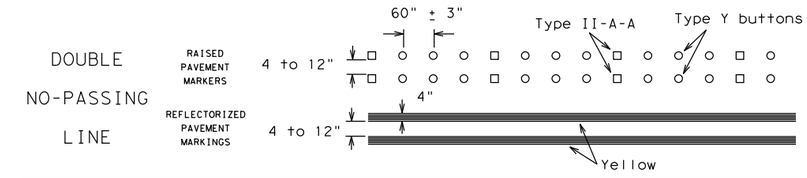
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

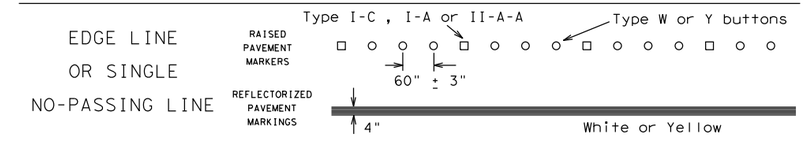
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

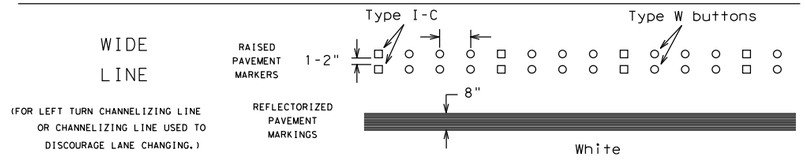


EDGE LINE OR SINGLE NO-PASSING LINE



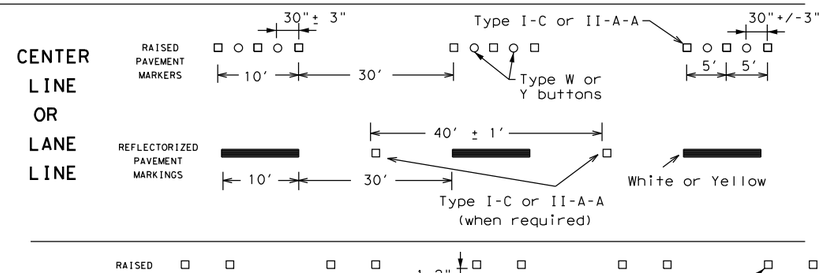
WIDE LINE

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

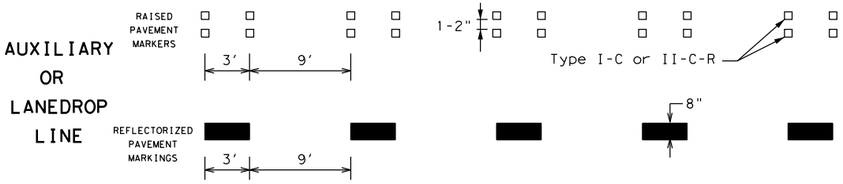


BROKEN LINES

CENTER LINE OR LANE LINE

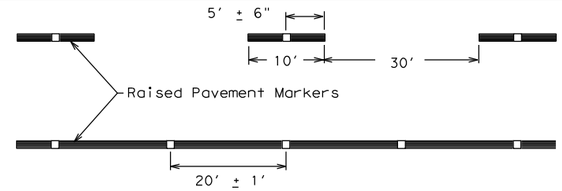


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

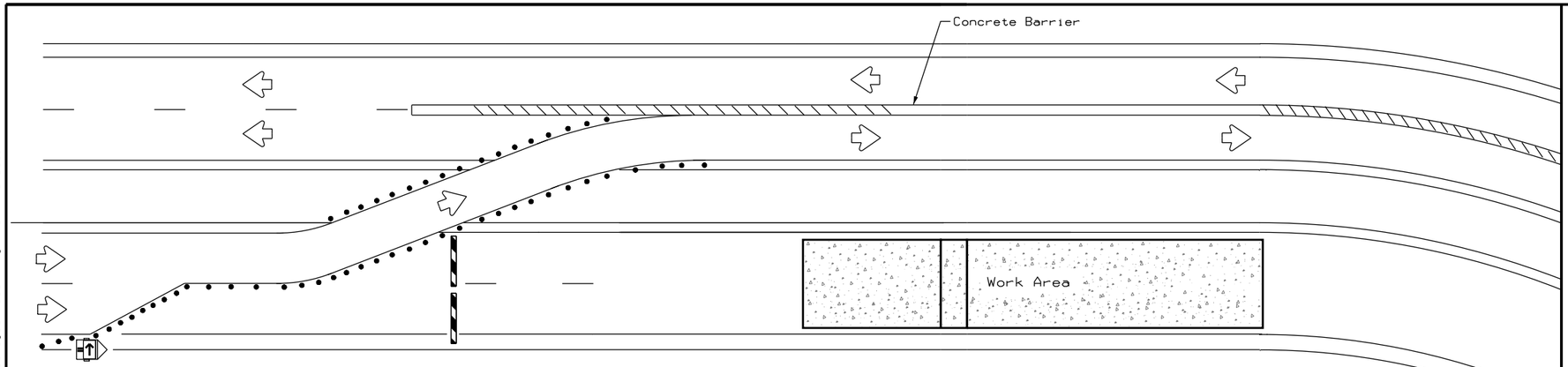
Texas Department of Transportation

Traffic 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	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		79



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.

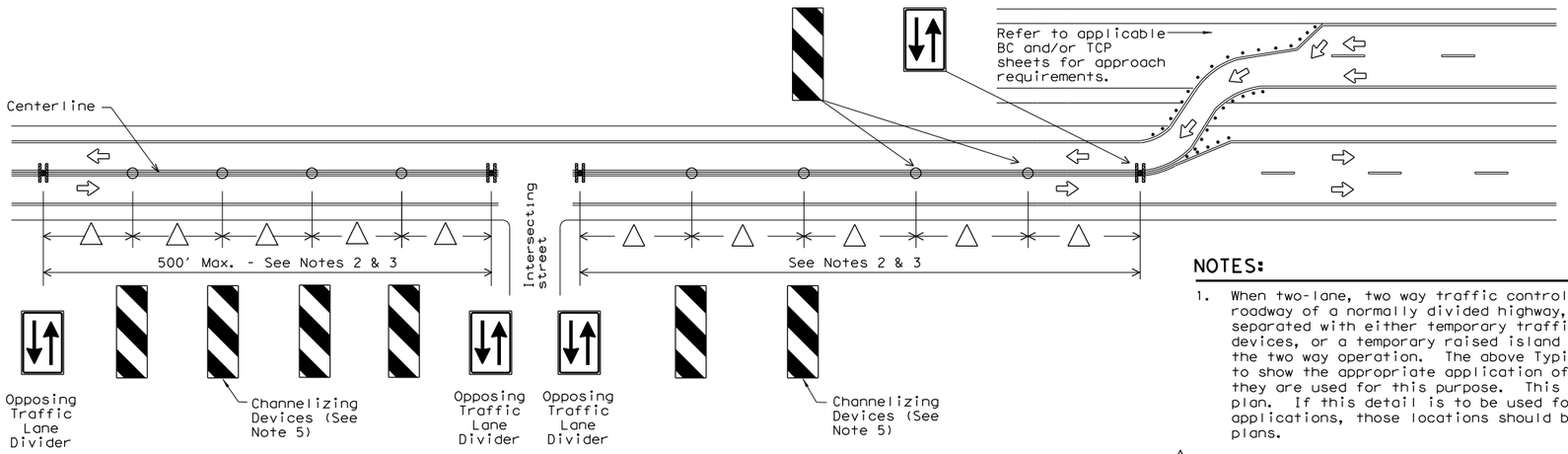
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

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	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		80

110

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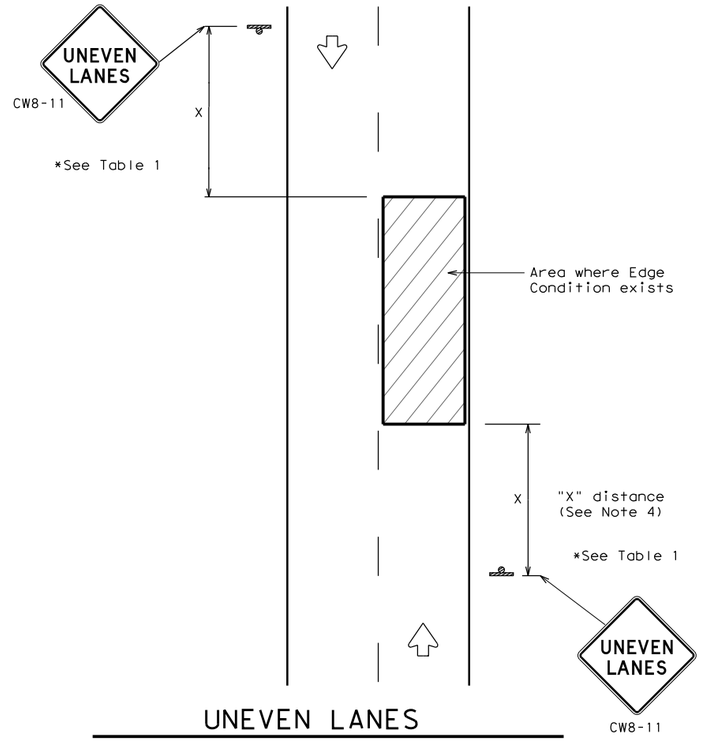
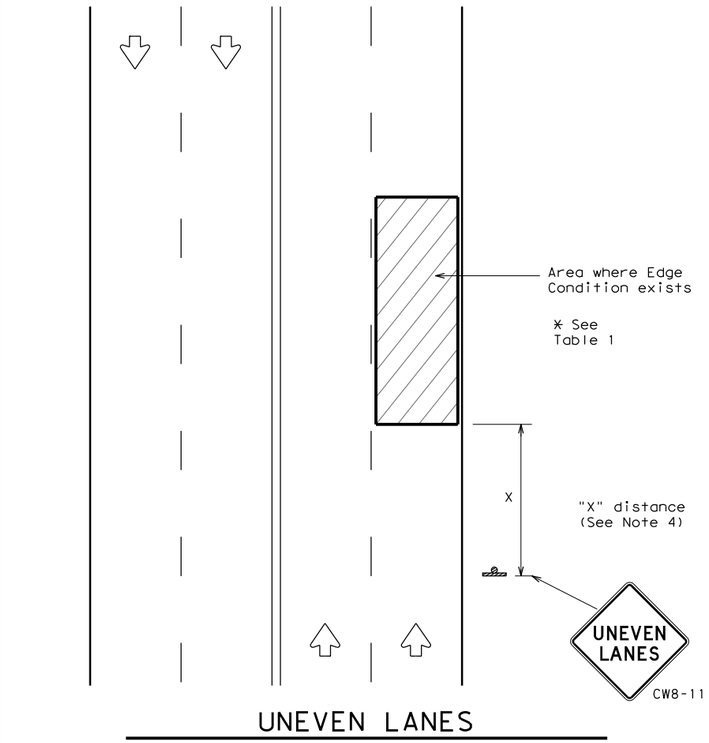
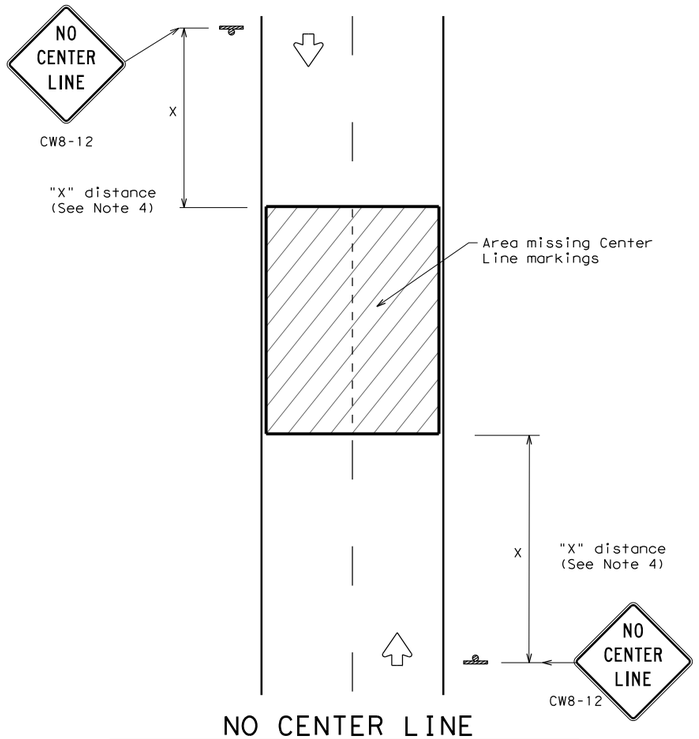


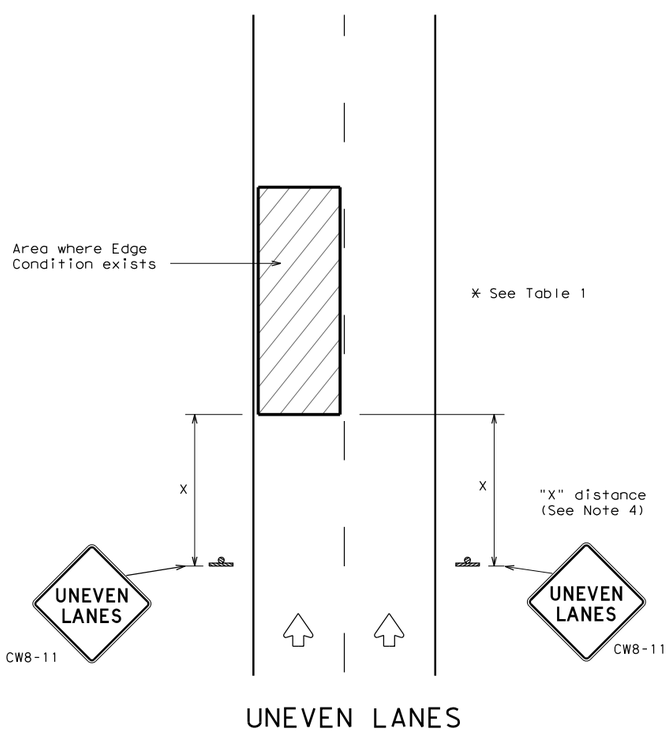
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

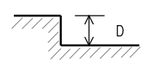
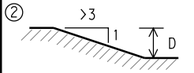
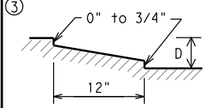
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

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

TABLE 1

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	AUS	TRAVIS		81

DATE:
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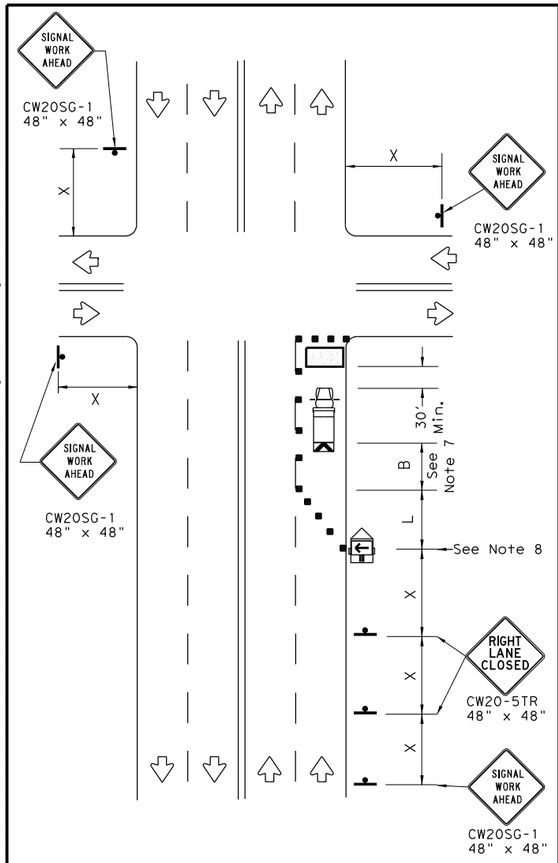
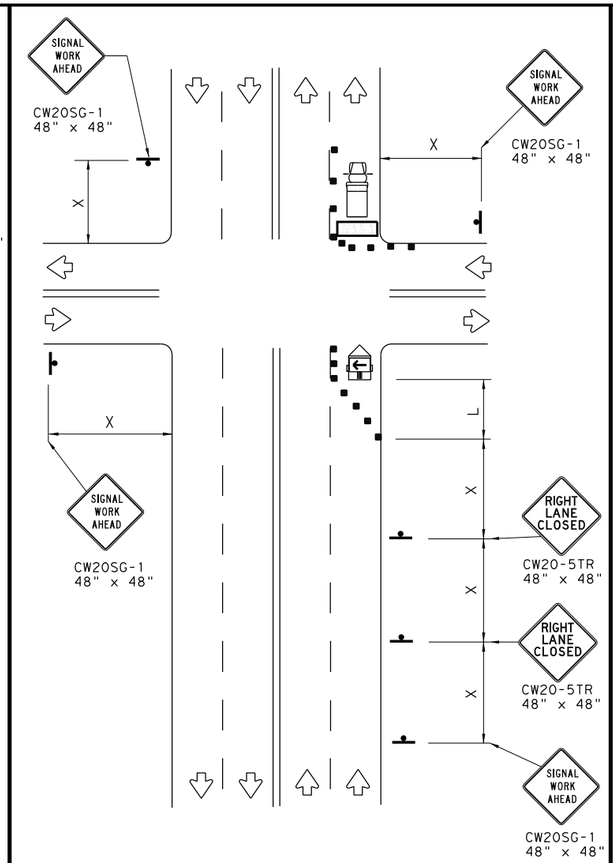


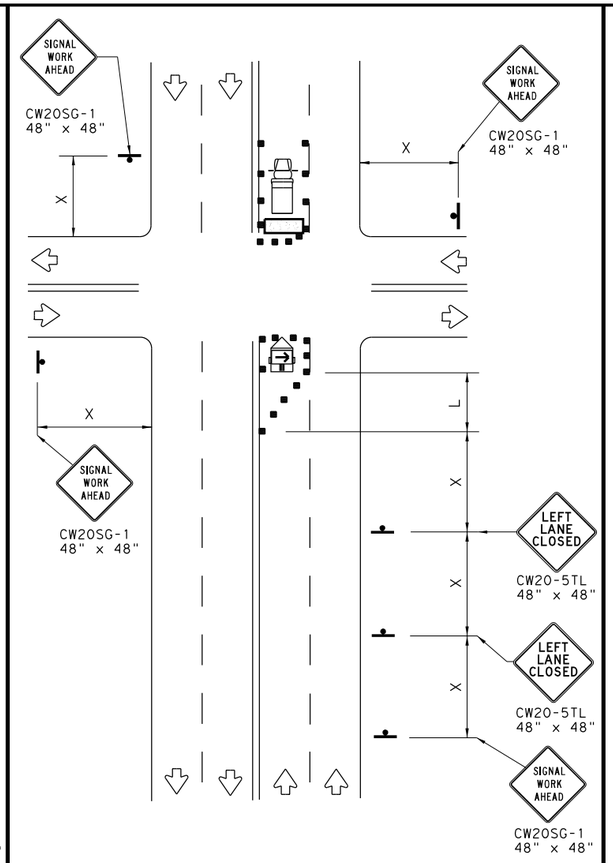
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



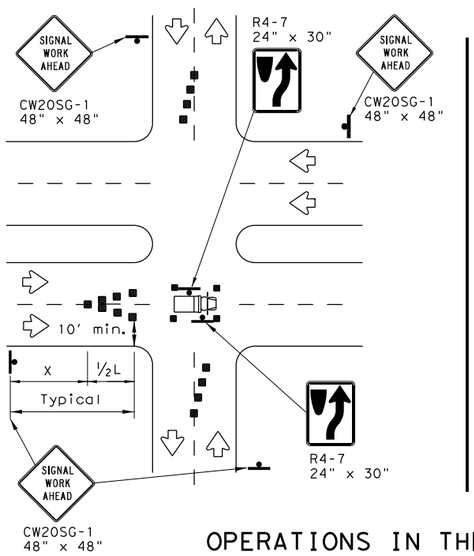
FAR SIDE RIGHT LANE CLOSURE

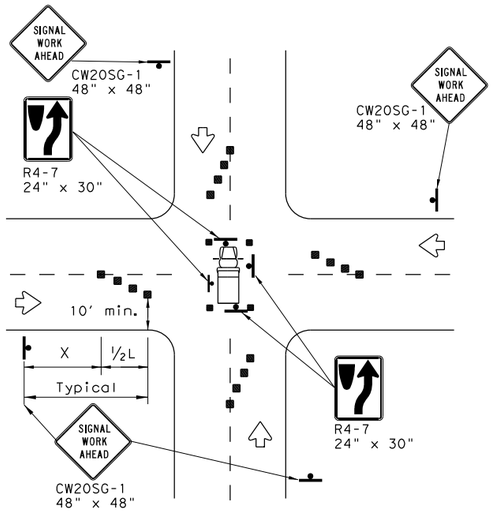
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY





OPERATIONS IN THE INTERSECTION

SHORT DURATION

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)

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	AUS	TRAVIS		82

DATE:
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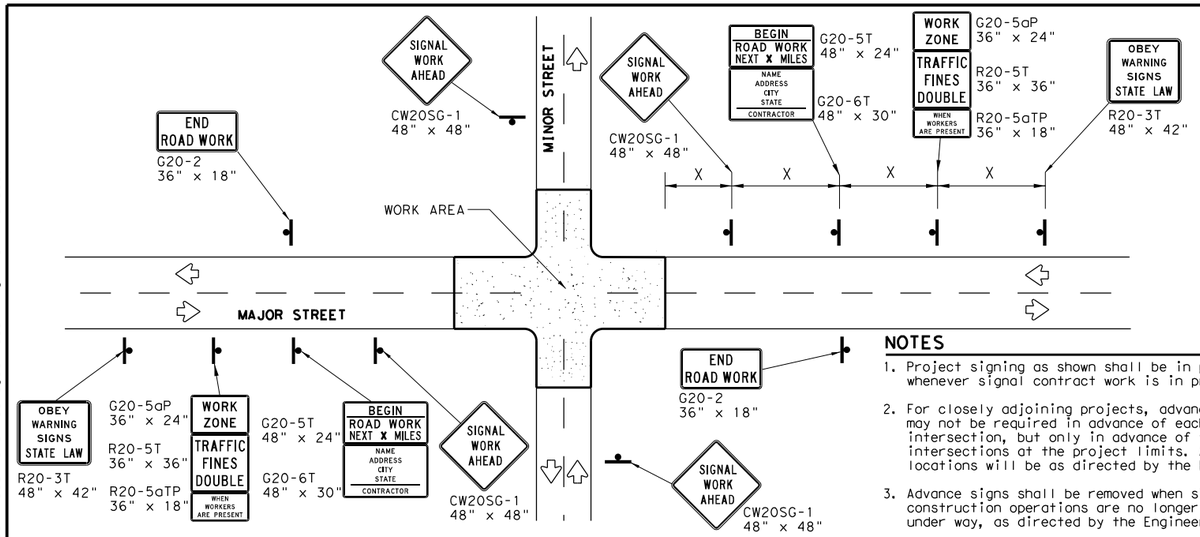


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

DURATION OF WORK

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

SIGN MOUNTING HEIGHT

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

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night without damaging the sign sheeting. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

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

SIGN SUPPORT WEIGHTS

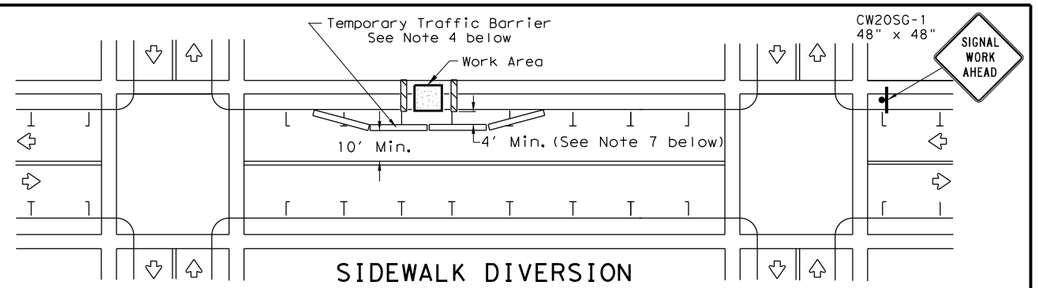
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support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

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

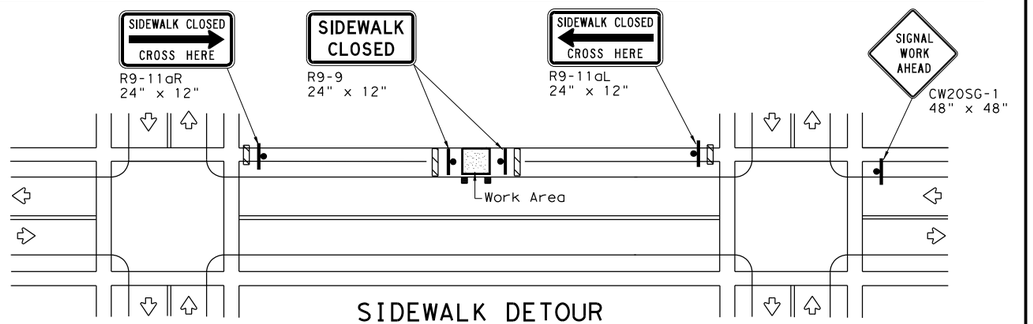
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

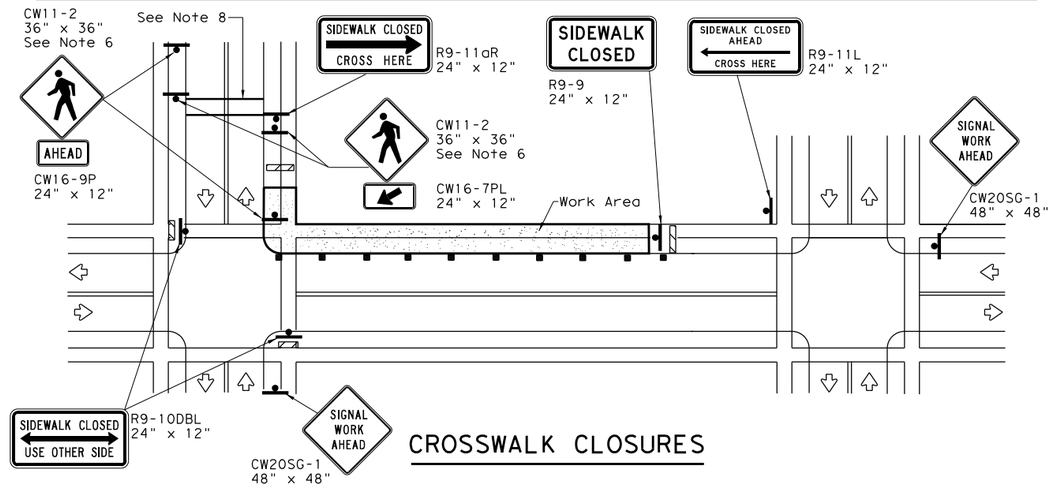
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

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

SHEET 2 OF 2

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	AUS	TRAVIS		83

DATE:
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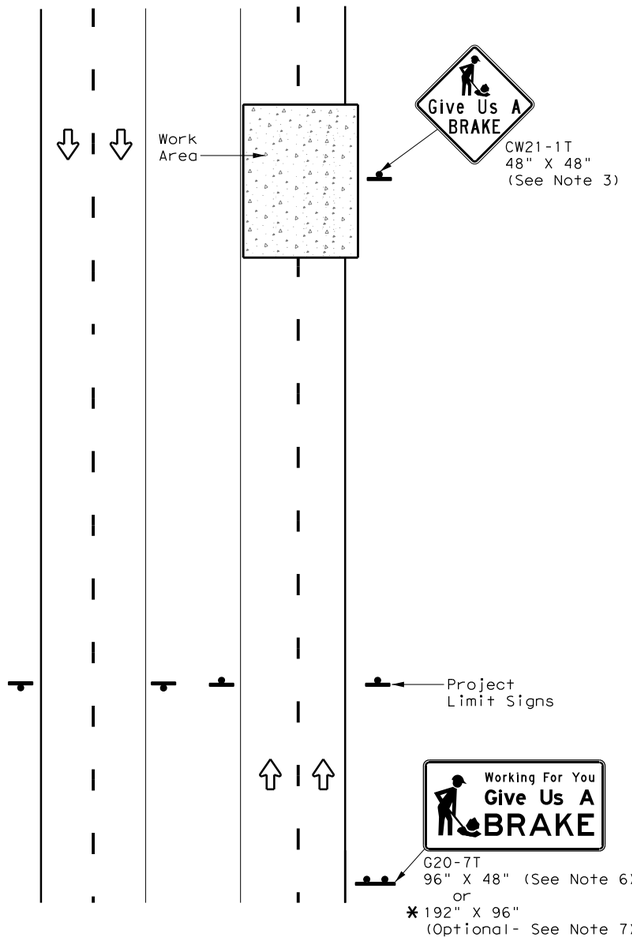
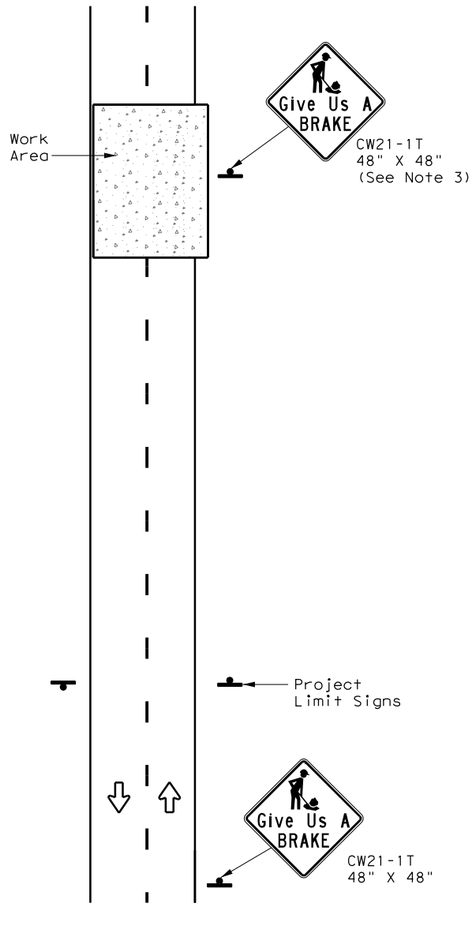


DIVIDED HIGHWAY



UNDIVIDED HIGHWAY

SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

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

SUMMARY OF LARGE SIGNS

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

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

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

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

GENERAL NOTES

1. See BC and SMD sheets for additional sign support details.
2. Sign locations shall be approved by the Engineer.
3. For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.
4. Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.
5. Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
6. The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.
7. The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:
   Item 636 - Aluminum Signs
   Item 647 - Large Roadside Sign Supports and Assemblies.
   Item 416 - Drilled Shaft Foundations
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
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8-96 3-03	AUS	TRAVIS		84

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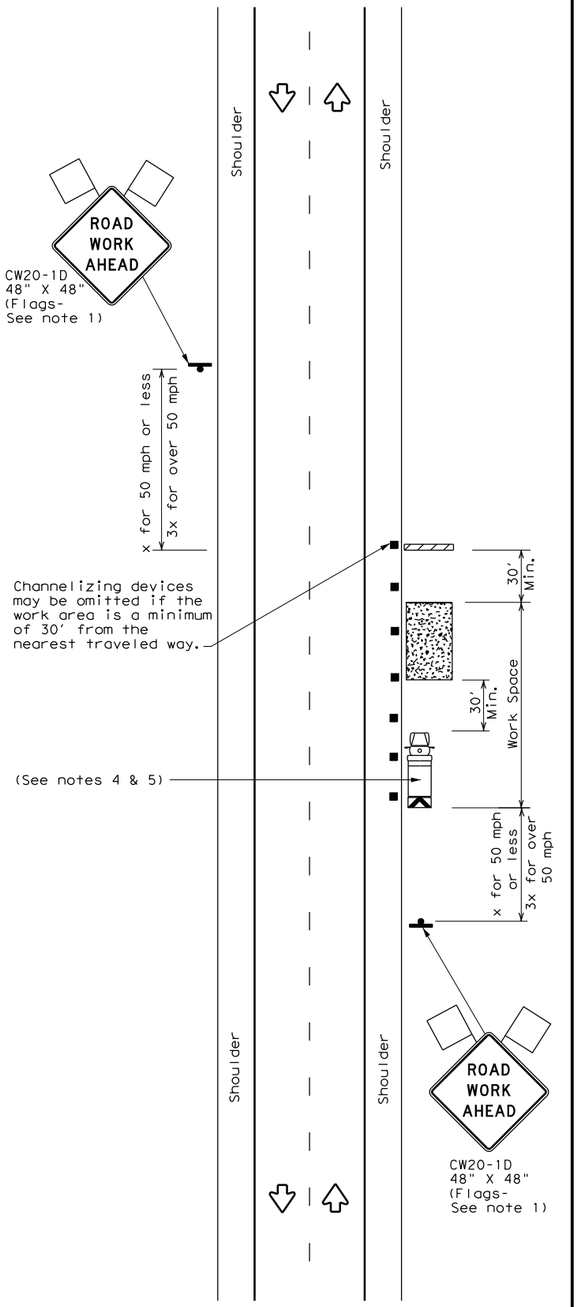
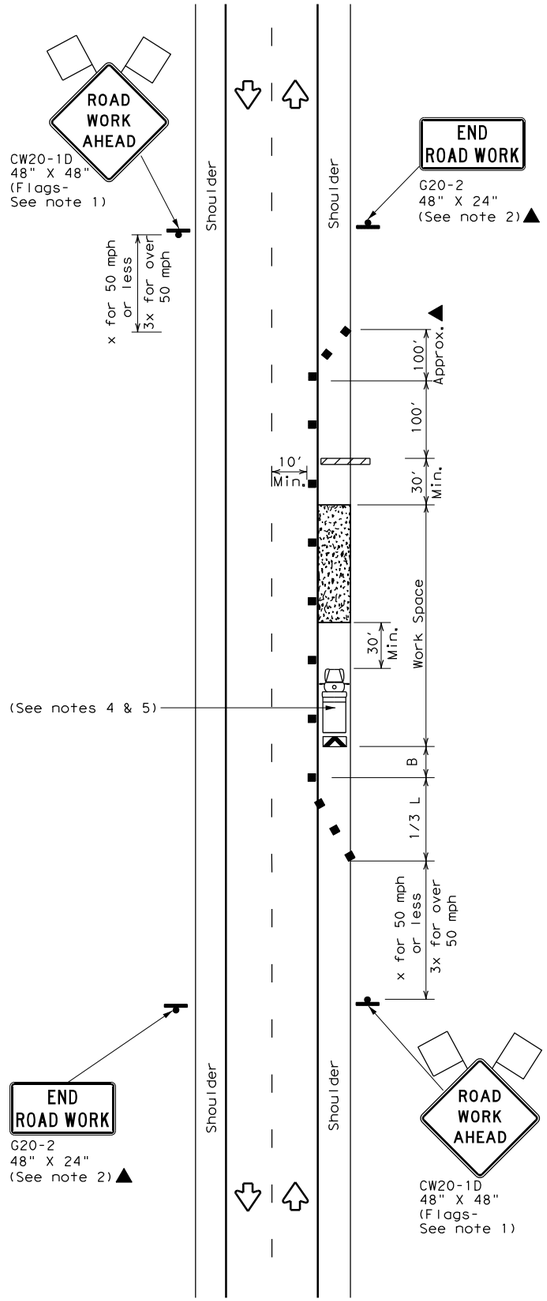


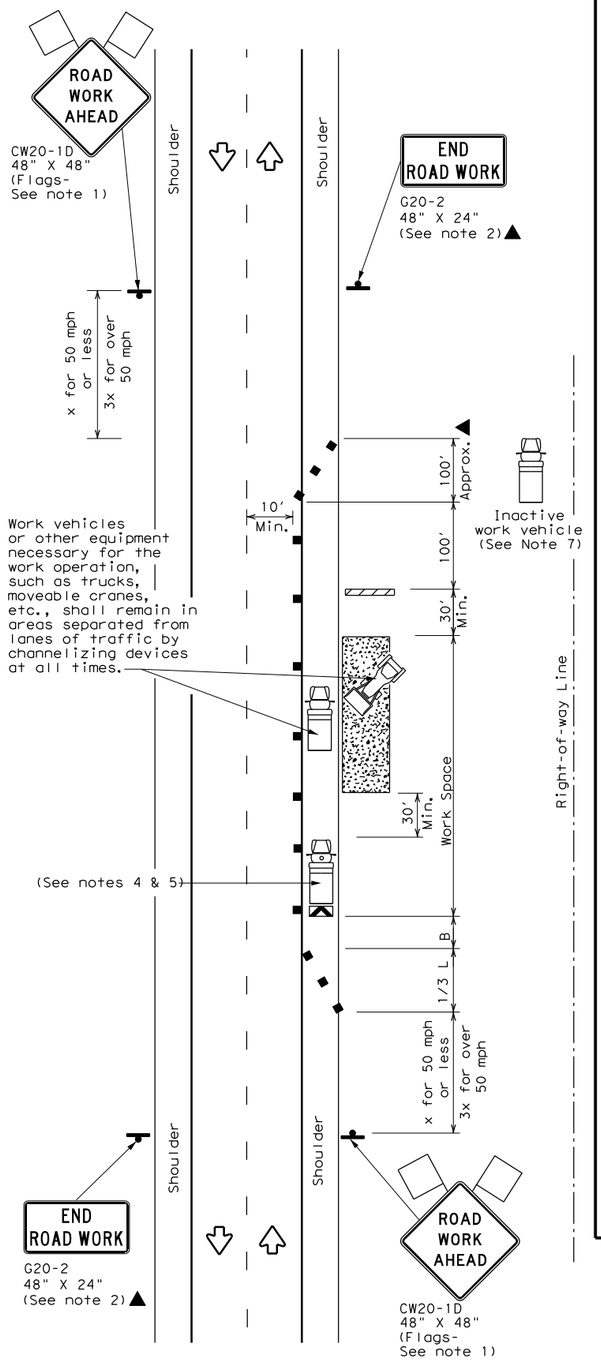
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW21-1D "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
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8-95 2-12	AUS	TRAVIS		85
1-97 2-18				

DATE:
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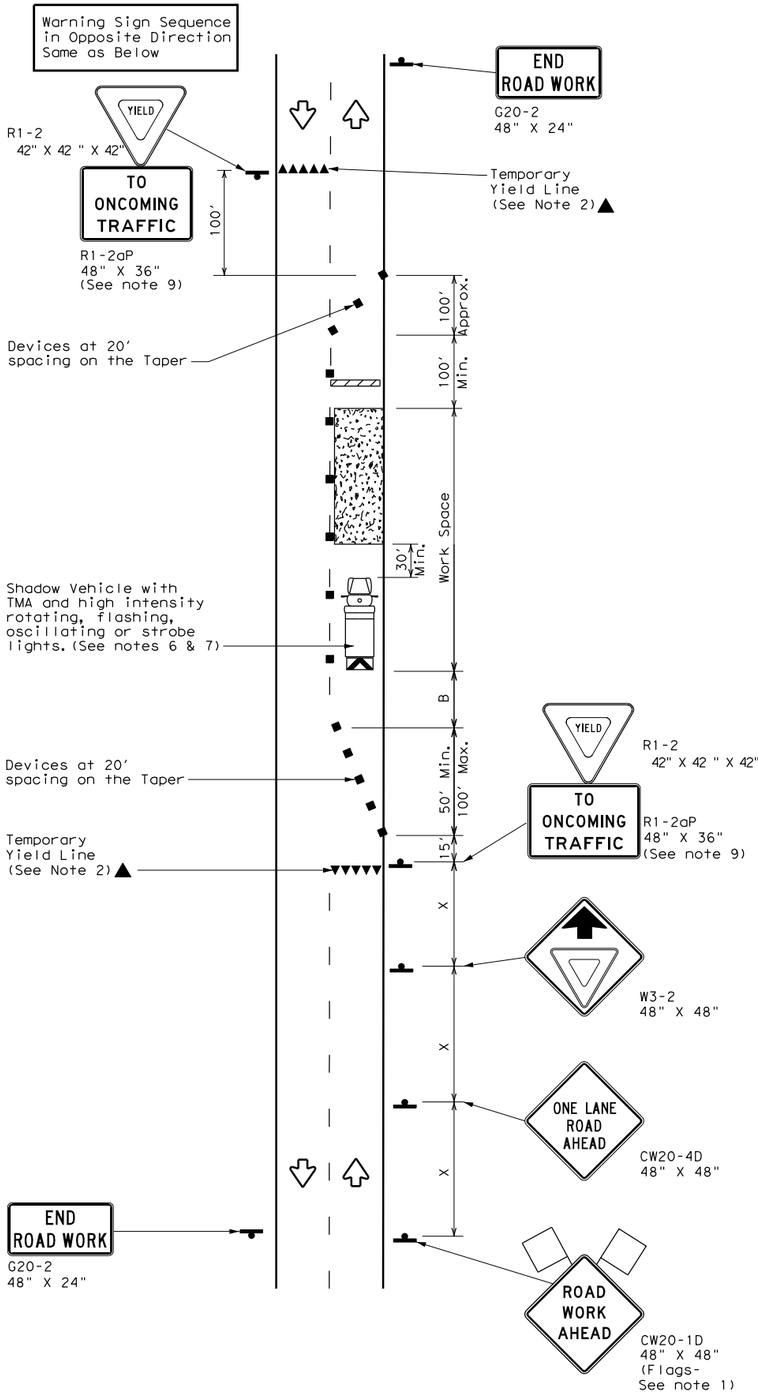
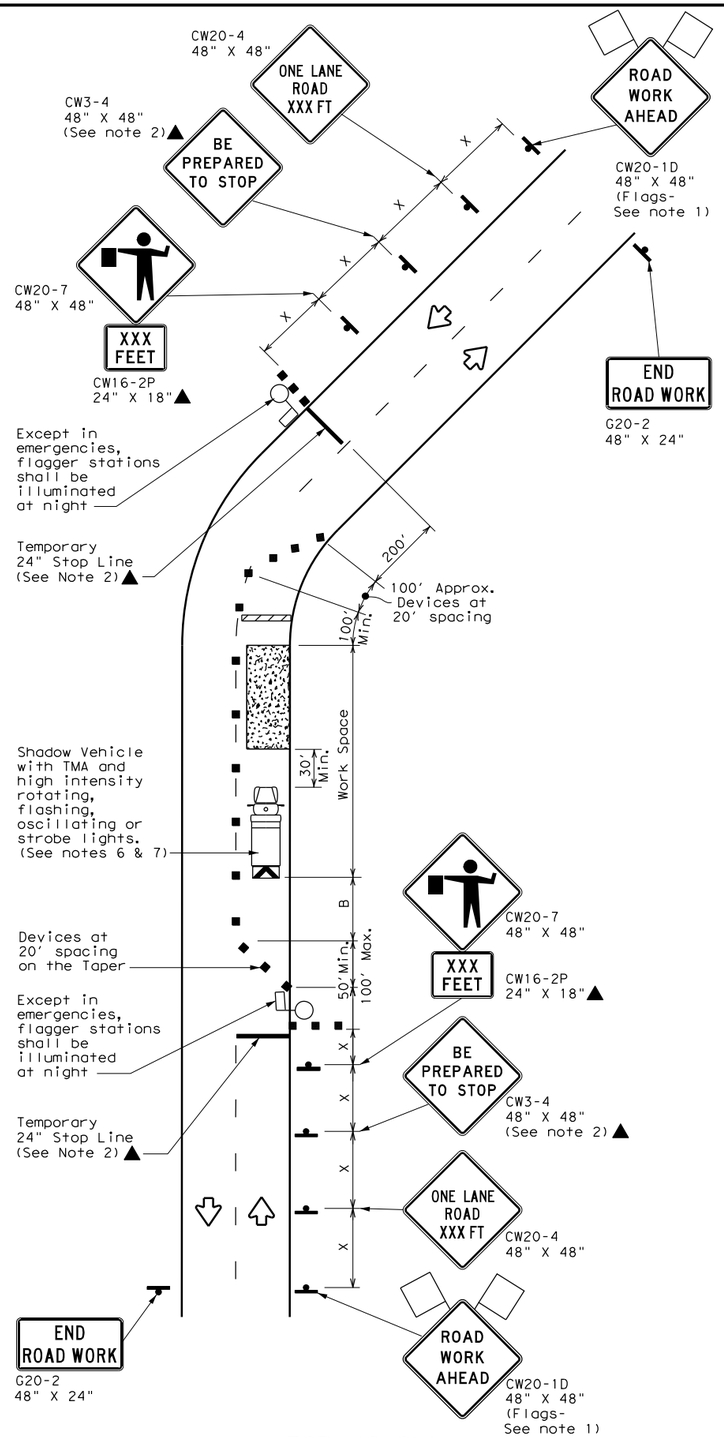


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

LEGEND

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	AUS	TRAVIS		86

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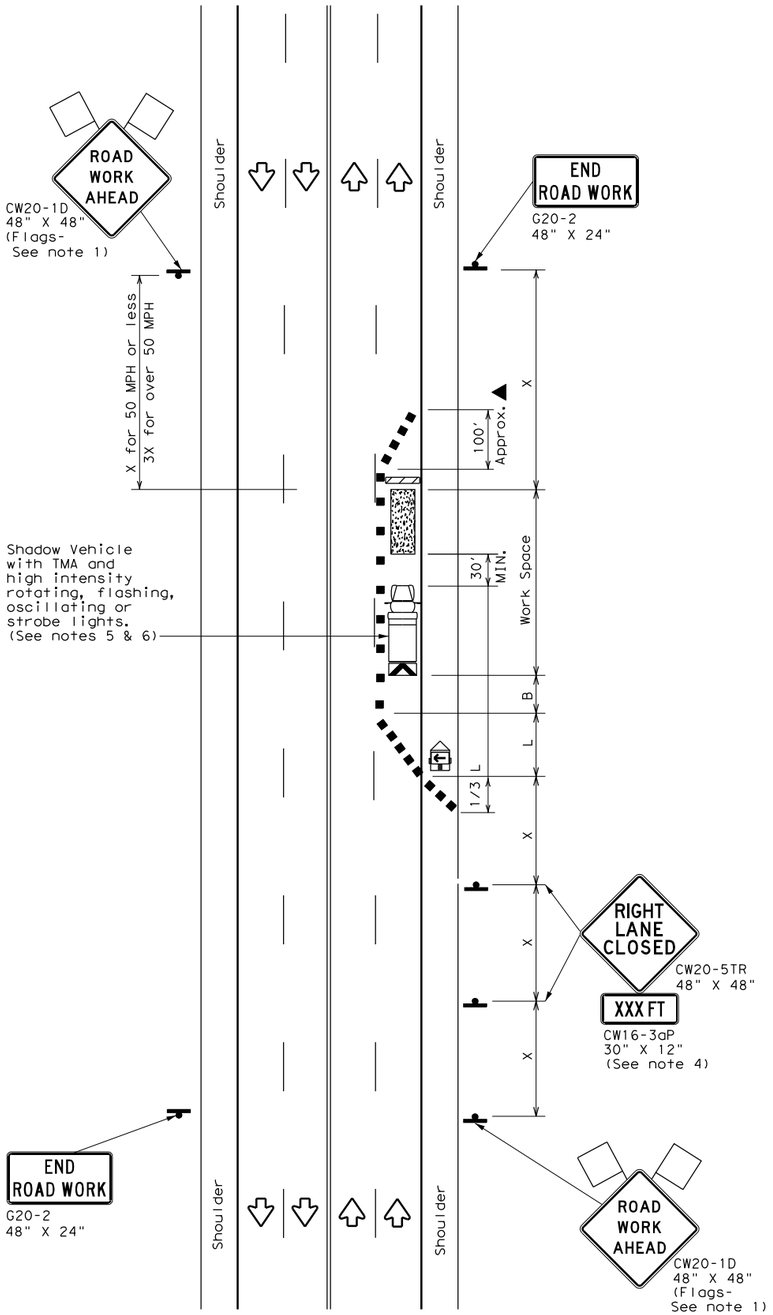
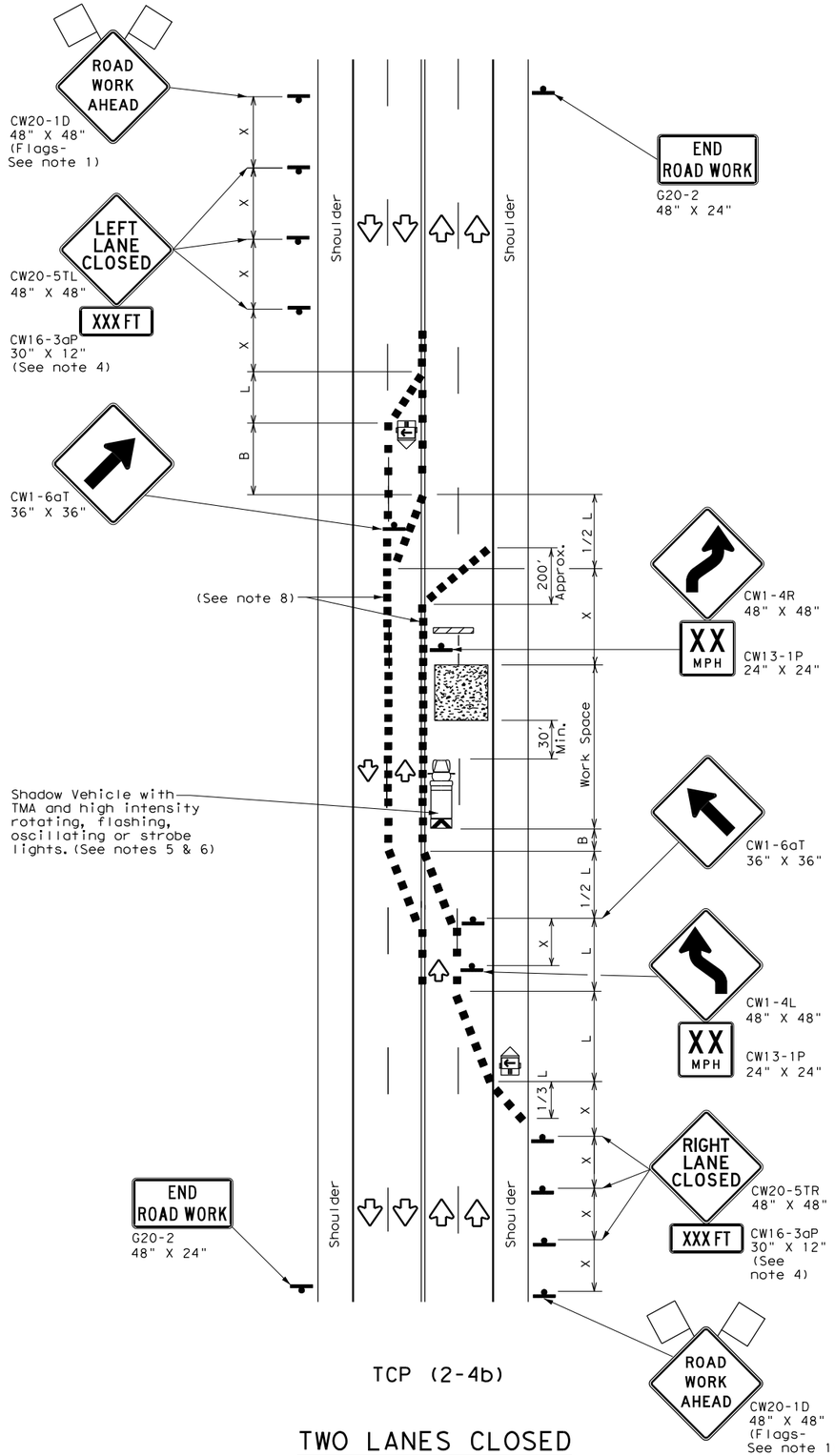


TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-4a)

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

TCP (2-4b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(2-4)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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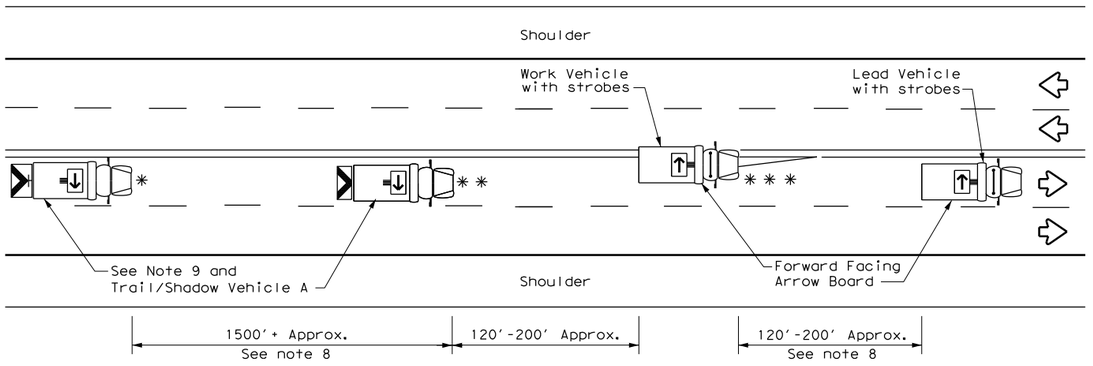
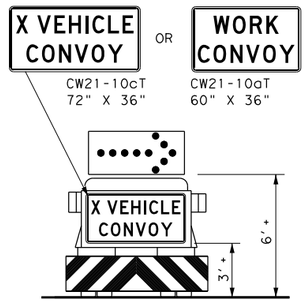


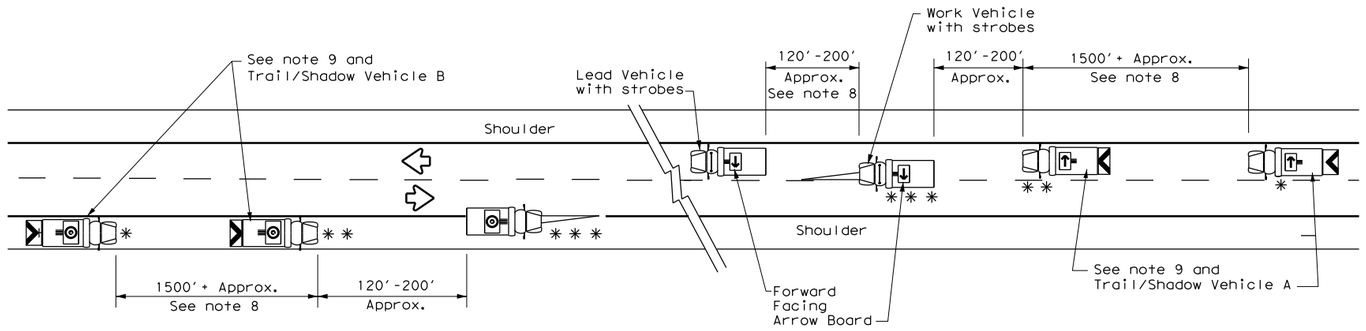
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

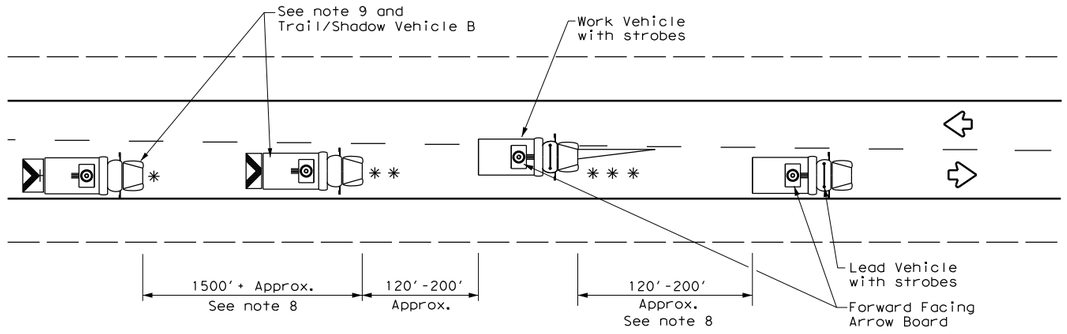


WORK ON SHOULDER

WORK ON TRAVEL LANE

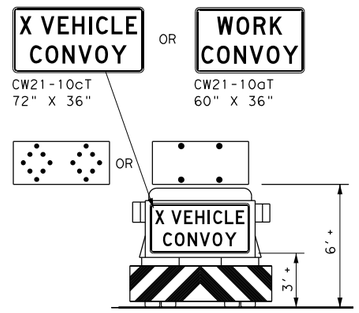
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

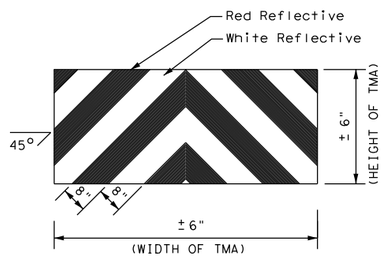
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	AUS	TRAVIS		88
1-97				

DATE:
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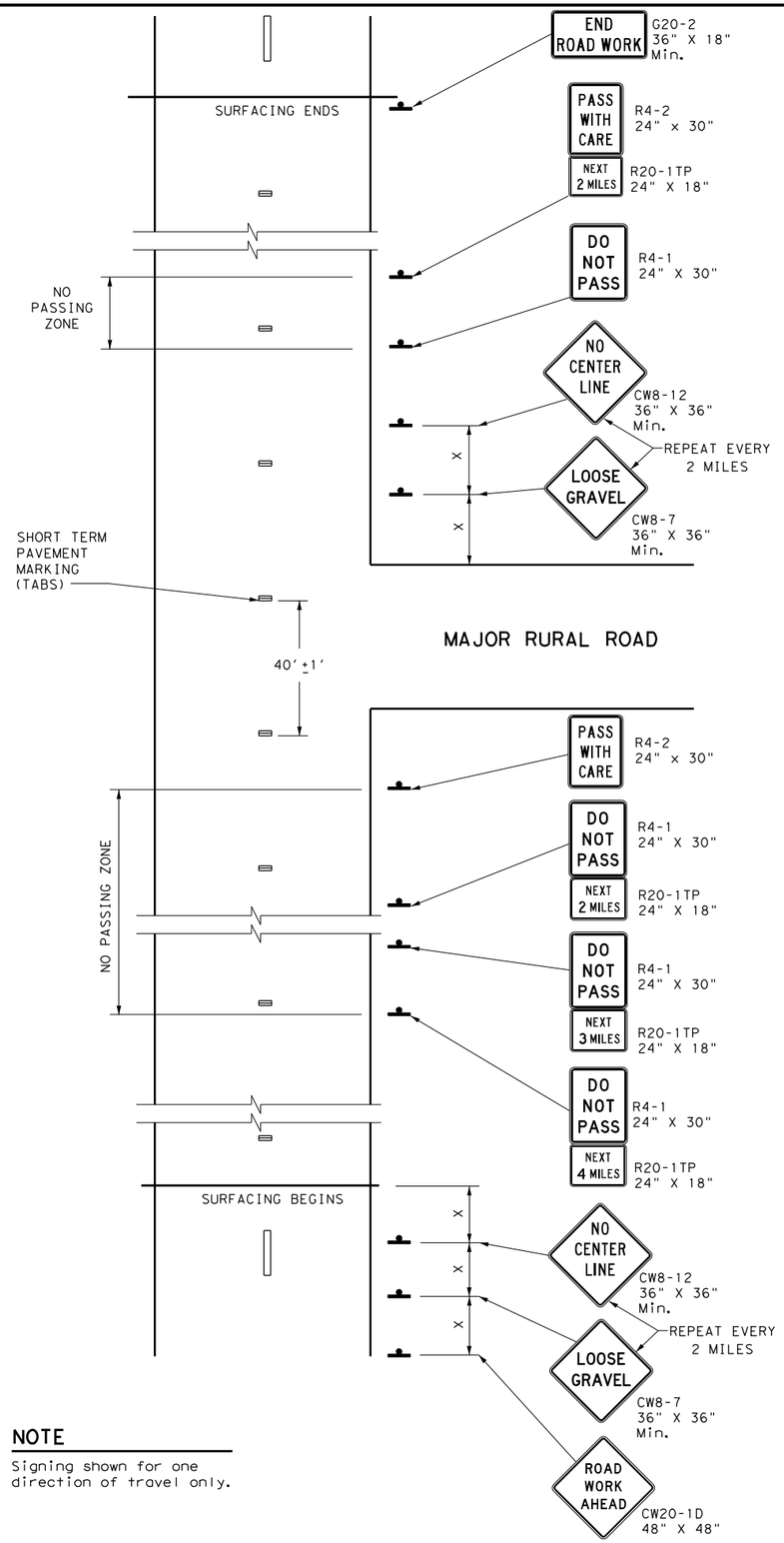
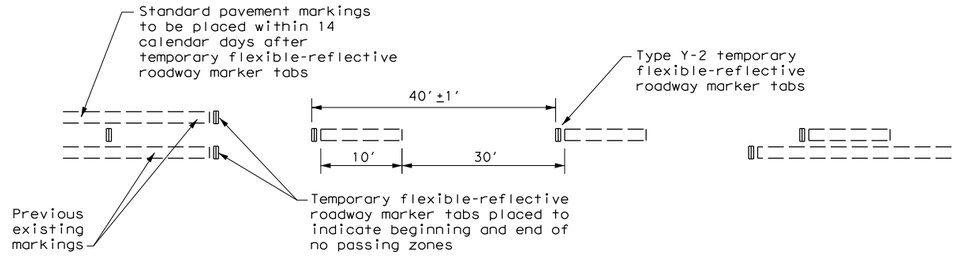


NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

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

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

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

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

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

"NO CENTER LINE" SIGN (CW8-12)

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

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

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

"LOOSE GRAVEL" SIGN (CW8-7)

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

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

PAVEMENT MARKINGS

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

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

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

COORDINATION OF SIGN LOCATIONS

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

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

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

* Conventional Roads Only

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

FILE: tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
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4-92 4-98	DIST	COUNTY		SHEET NO.
1-97 7-13	AUS	TRAVIS		89

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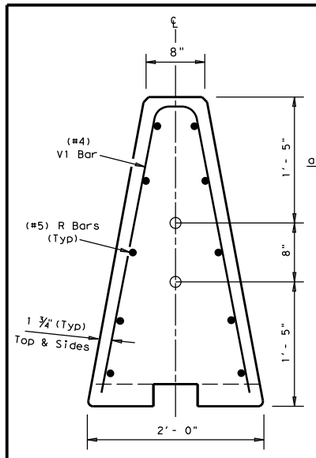
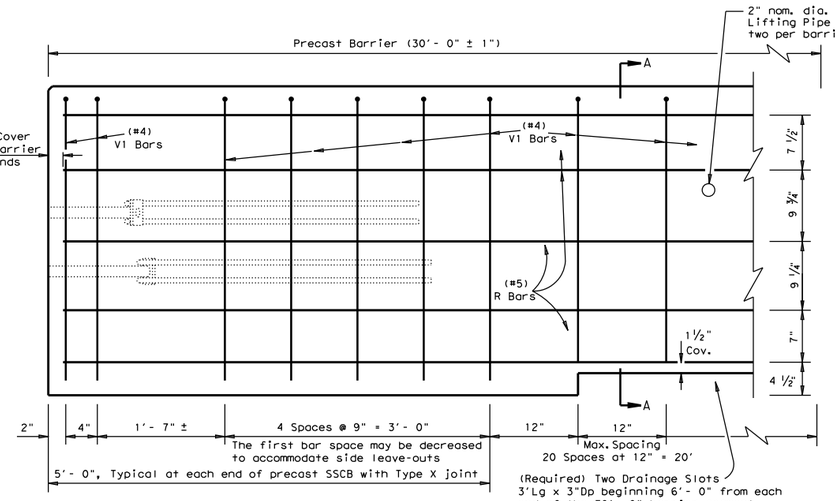


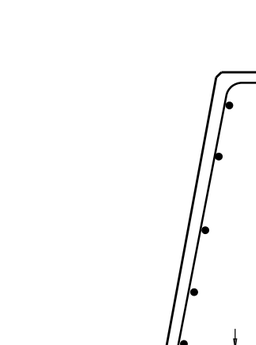
End View Precast Barrier

Pipe locations for Joint Type X connection



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

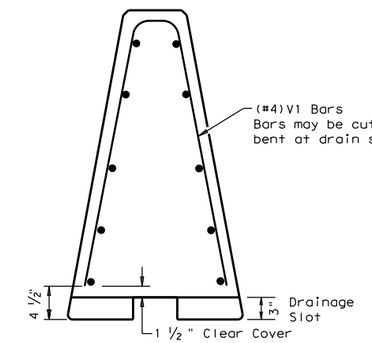
Showing reinforcement for Joint Connection (Type X)



V1 Bar

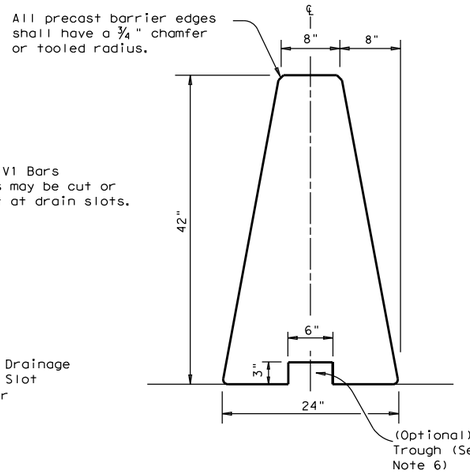
#4 Rebar

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



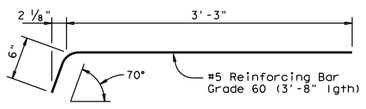
Section A-A

Steel Placement at (Required) Drainage Slots



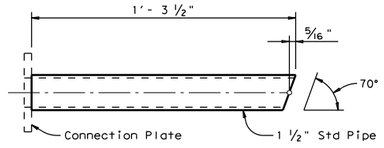
Single Slope Concrete Traffic Barrier

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



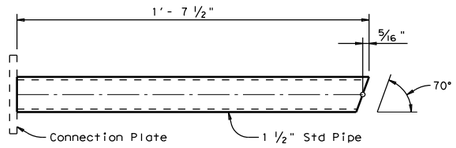
DEFORMED BAR ANCHOR DETAILS

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



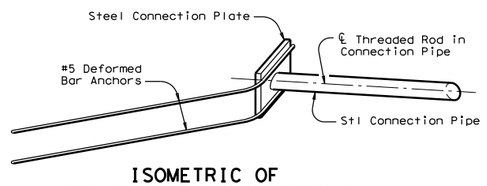
UPPER CONNECTION PIPE DETAILS

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



LOWER CONNECTION PIPE DETAILS

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

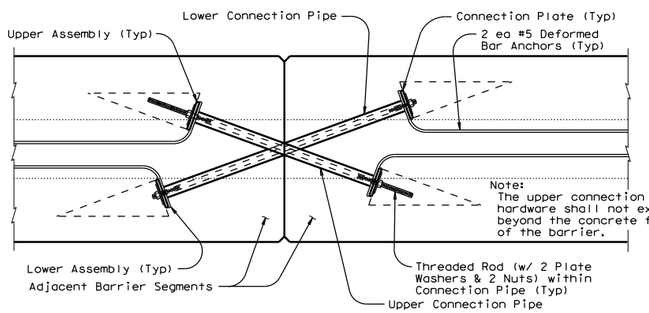


ISOMETRIC OF TYPICAL WELDED ASSEMBLY

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

General Notes

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



TYPE X JOINT INSTALLATION DETAIL

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

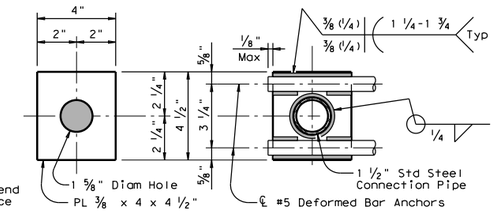
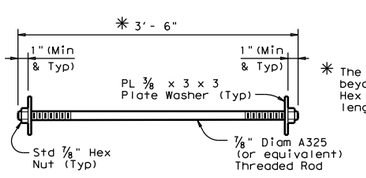


PLATE DIMENSIONS | WELDING DETAILS

CONNECTION PLATE DETAILS

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

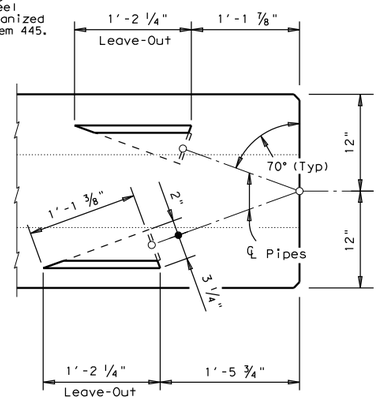


✳ The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.

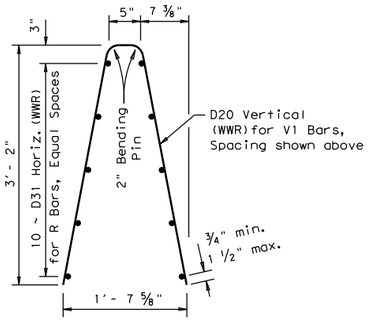
CONNECTION BOLT OR THREADED ROD DETAIL

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

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



BARRIER PLAN AT JOINT



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

(WWR) General Notes

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

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1)

SSCB(2)-10

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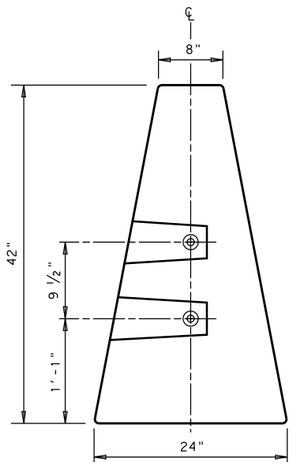
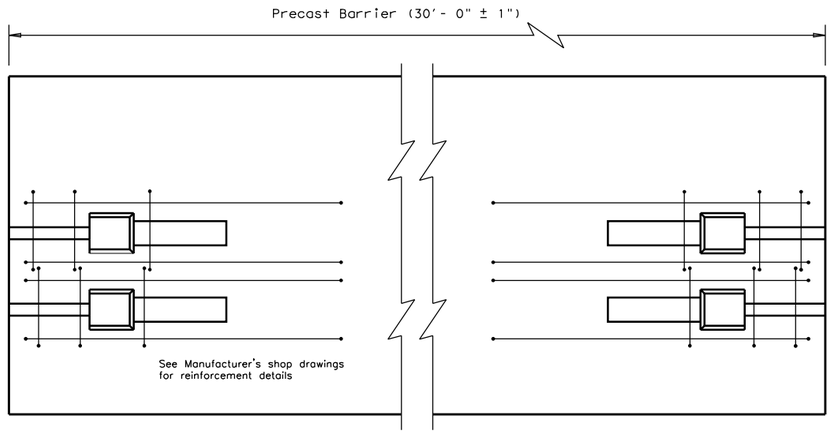
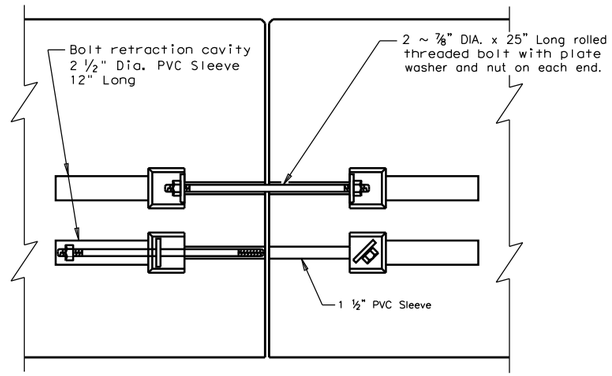


END VIEW
"QUICK-BOLT" POCKET LOCATIONS

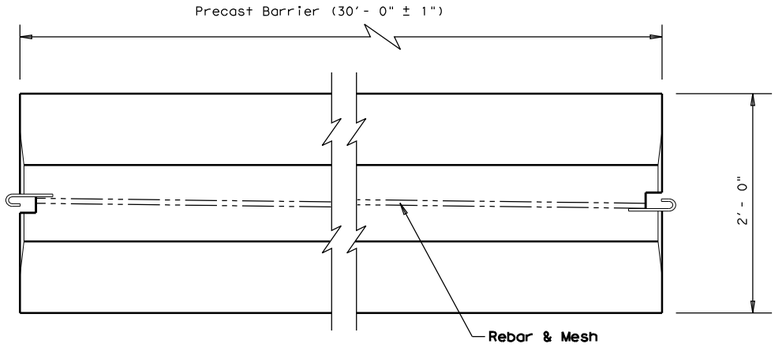


ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details

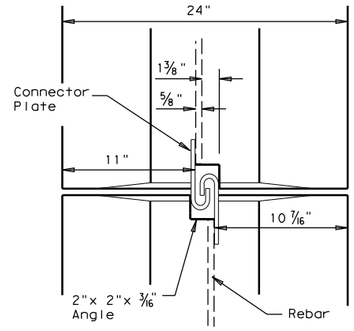


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

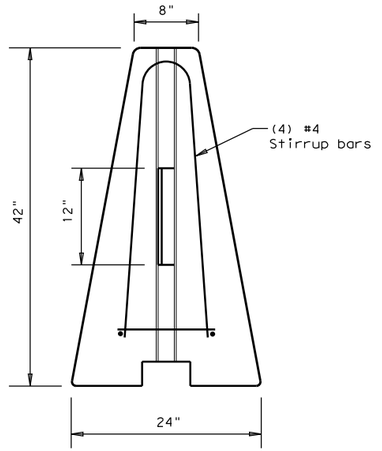
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



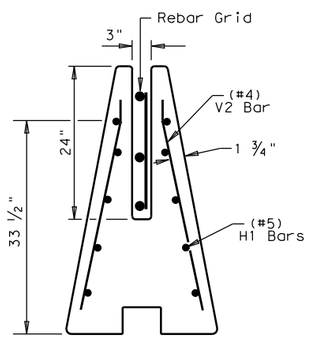
END VIEW

Proprietary Joint Connections (SSCB)

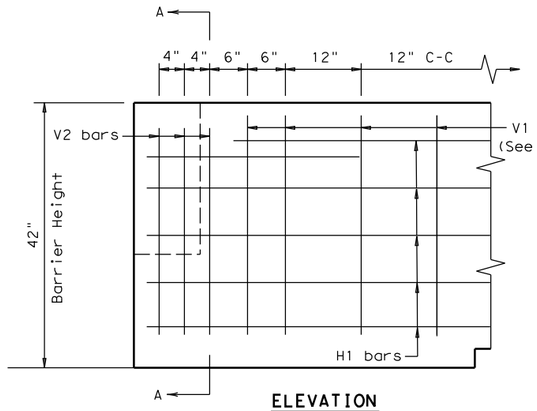
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

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

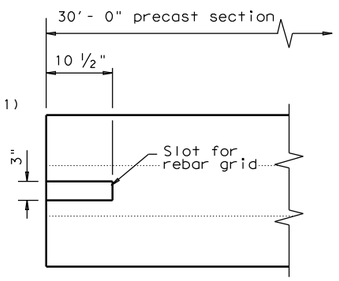
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



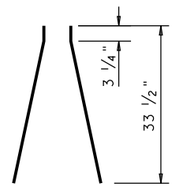
SECTION A-A
Showing (Type R) Rebar Grid



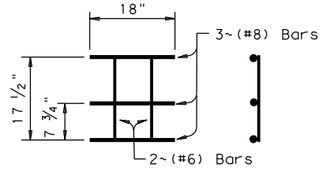
ELEVATION
V1 Bars (See Sheet 1)



TOP VIEW
JOINT CONNECTION
Typical at both ends of barrier segment



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



WELDED REBAR GRID

Joint Connection (Type R)

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1)

SSCB(2)-10

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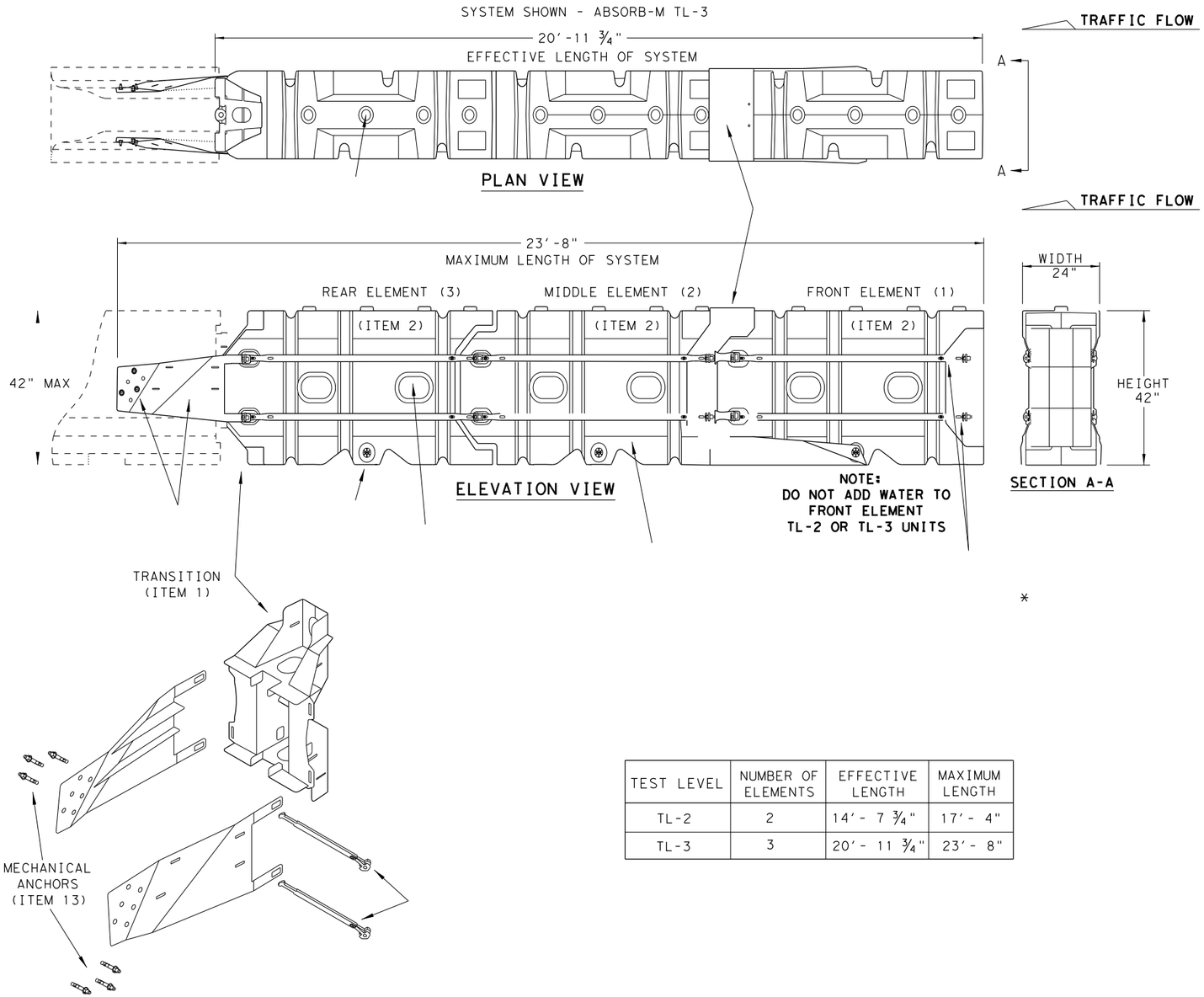


TEST LEVEL	NUMBER OF ELEMENTS	EFFECTIVE LENGTH	MAXIMUM LENGTH
TL-2	2	14'- 7 3/4"	17'- 4"
TL-3	3	20'- 11 3/4"	23'- 8"

GENERAL NOTES

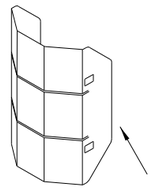
1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. THE ABSORB-M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

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

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE

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



NOSE PLATE

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

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

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

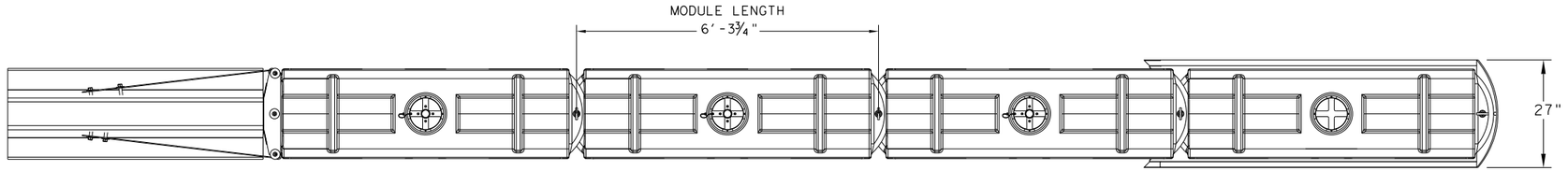
SACRIFICIAL

Texas Department of Transportation — Design Division Standard

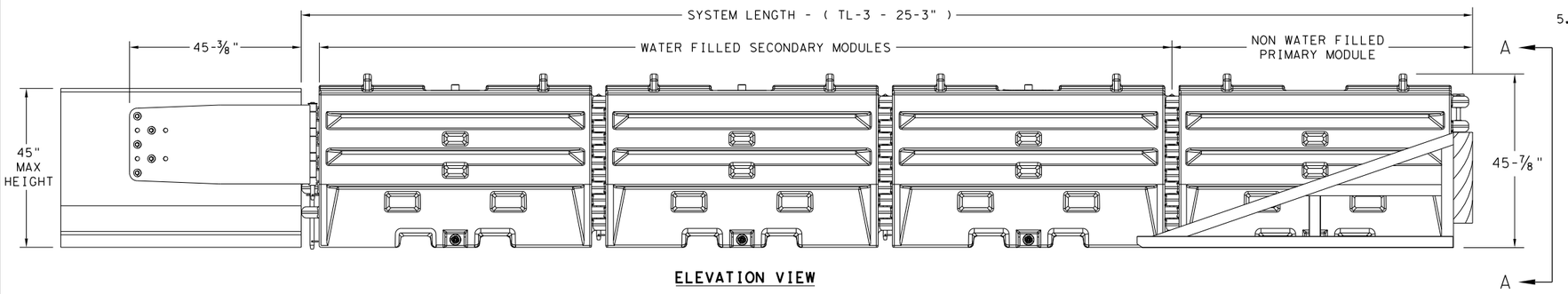
LINDSAY TRANSPORTATION SOLUTIONS
CRASH CUSHION
(MASH TL-3 & TL-2)
TEMPORARY - WORK ZONE
ABSORB(M)-19

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
REVISIONS	CONT	SECT	JOB	HIGHWAY
	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		92

DATE:
FILE:



PLAN VIEW



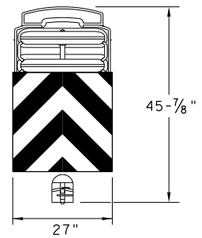
ELEVATION VIEW

GENERAL NOTES

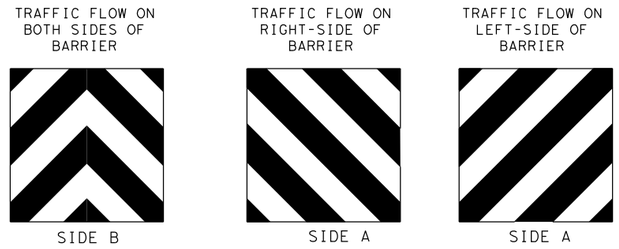
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO THE GROUND AND CAN BE INSTALLED ON CONCRETE, ASPHALT, GRAVEL OR COMPACTED SOIL.
3. MAXIMUM PERMISSIBLE CROSS SLOPE IS 8° (DEGREES) (14%).
4. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
5. THE SLED SYSTEM CAN BE ATTACHED TO:

- CONCRETE BARRIER, TEMPORARY OR PERMANENT, 45" MAXIMUM HEIGHT
- STEEL BARRIER
- PLASTIC BARRIER
- CONCRETE BRIDGE ABUTMENTS
- W-BEAM GUARD RAIL
- THRIE BEAM GUARD RAIL

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

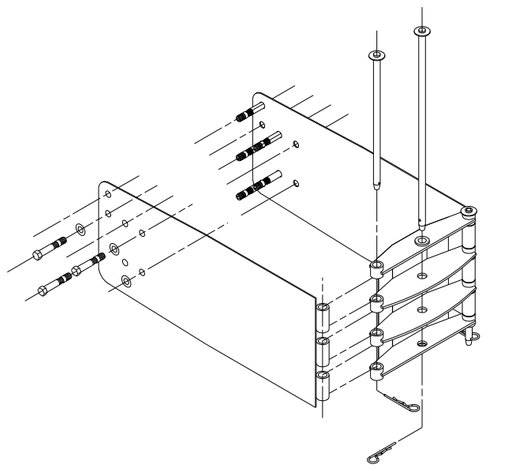


SECTION A-A



NOSE SHEETING PANEL DELINEATION

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



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

NOTE:
SEE MANUFACTURER'S INSTALLATION MANUAL FOR FURTHER DETAILS.

TRANSITION OPTIONS
SLED TRANSITION TO CONCRETE TRAFFIC BARRIER (TEMPORARY OR PERMANENT)
SLED TRANSITION TO STEEL TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO PLASTIC TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO W-BEAM OR THRIE BEAM GUARD RAIL (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO CONCRETE BRIDGE ABUTMENT

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

SACRIFICIAL

BILL OF MATERIAL

PART NUMBER	DESCRIPTION	QTY: TL-3
45131	TRANSITION FRAME, GALVANIZED	1
45150	TRANSITION PANEL, GALVANIZED	2
45147-CP	TRANSITION SHORT DROP PIN W/ KEEPER PIN, GALVANIZED	2
45148-CP	TRANSITION LONG DROP PIN W/ KEEPER PIN, GALVANIZED	1
45050	ANCHOR BOLTS	9
12060	WASHER, 3/4" ID X 2" OD	9
45044-Y	SLED YELLOW WATER FILLED MODULE	3
45044-YH	SLED YELLOW "NO FILL" MODULE	1
45044-S	CIS (CONTAINMENT IMPACT SLED), GALVANIZED	1
45043-CP	T-PIN W/ KEEPER PIN	4
18009-B-I	FILL CAP W/ "DRIVE BY" FLOAT INDICATOR	3
45033-RC-B	DRAIN PLUG	3
45032-DPT	DRAIN PLUG REMOVAL TOOL	1

Texas Department of Transportation

Design Division Standard

SLED
CRASH CUSHION
TL-3 MASH COMPLIANT
(TEMPORARY, WORK ZONE)
SLED-19

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
©TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		93

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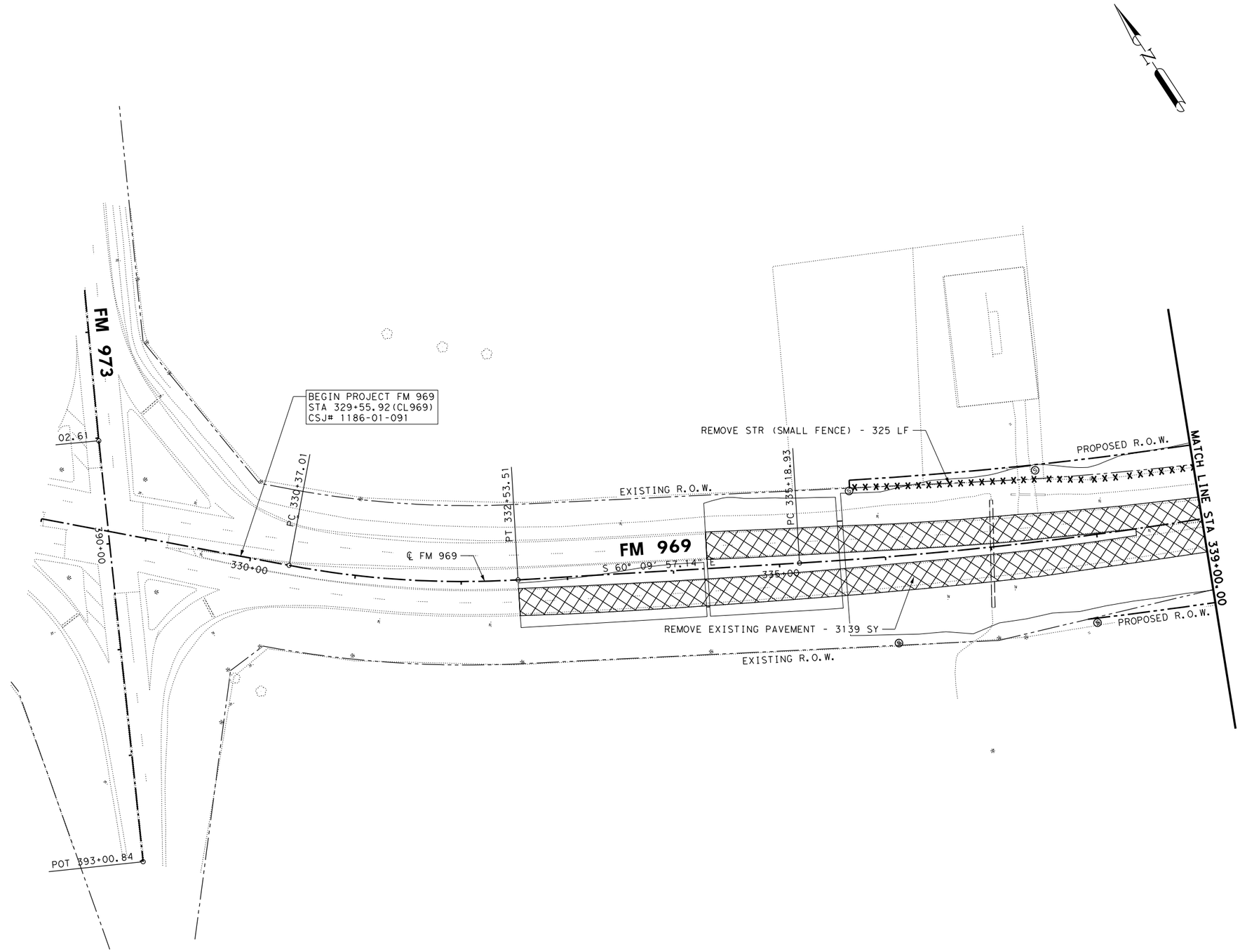
SCALE IN FEET



LEGEND

- EXISTING R.O.W.
- PROPOSED CONST. EASEMENT
- REMOVE EXISTING PAVEMENT
- REMOVE EXISTING RIPRAP
- x x x x x REMOVE STRUCTURE

NOTES:

1. REFER TO TRAFFIC CONTROL PLAN SHEETS FOR CONSTRUCTION PHASING.

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
REMOVAL LAYOUT

BEGIN TO STA 339+00

SHEET 1 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		94
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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SCALE IN FEET

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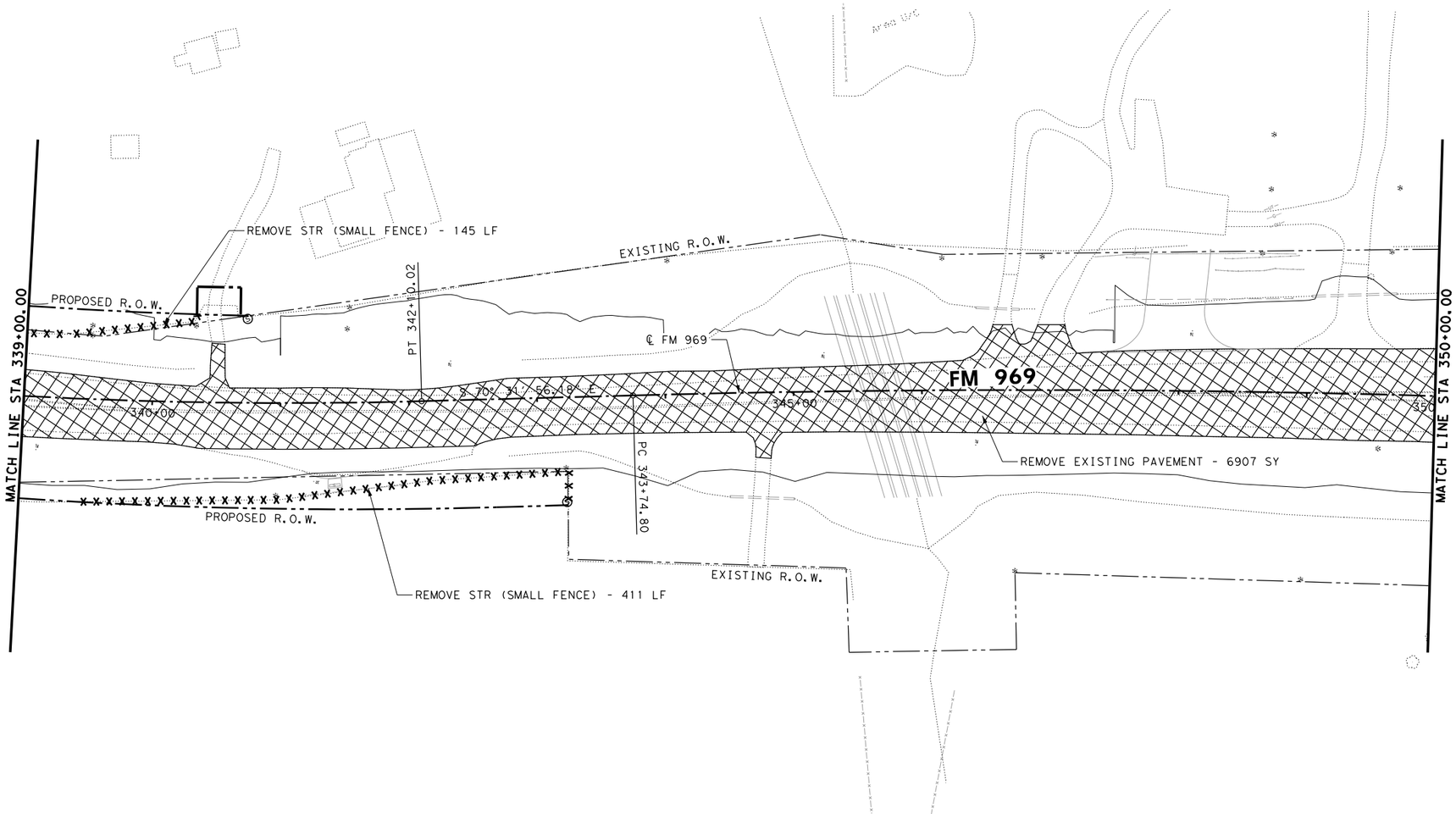
LEGEND

- EXISTING R.O.W.
- PROPOSED CONST. EASEMENT
- REMOVE EXISTING PAVEMENT
- REMOVE EXISTING RIPRAP
- X X X X X REMOVE STRUCTURE



NOTES:

1. REFER TO TRAFFIC CONTROL PLAN SHEETS FOR CONSTRUCTION PHASING.

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STA 339+00 TO STA 350+00

SHEET 2 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
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DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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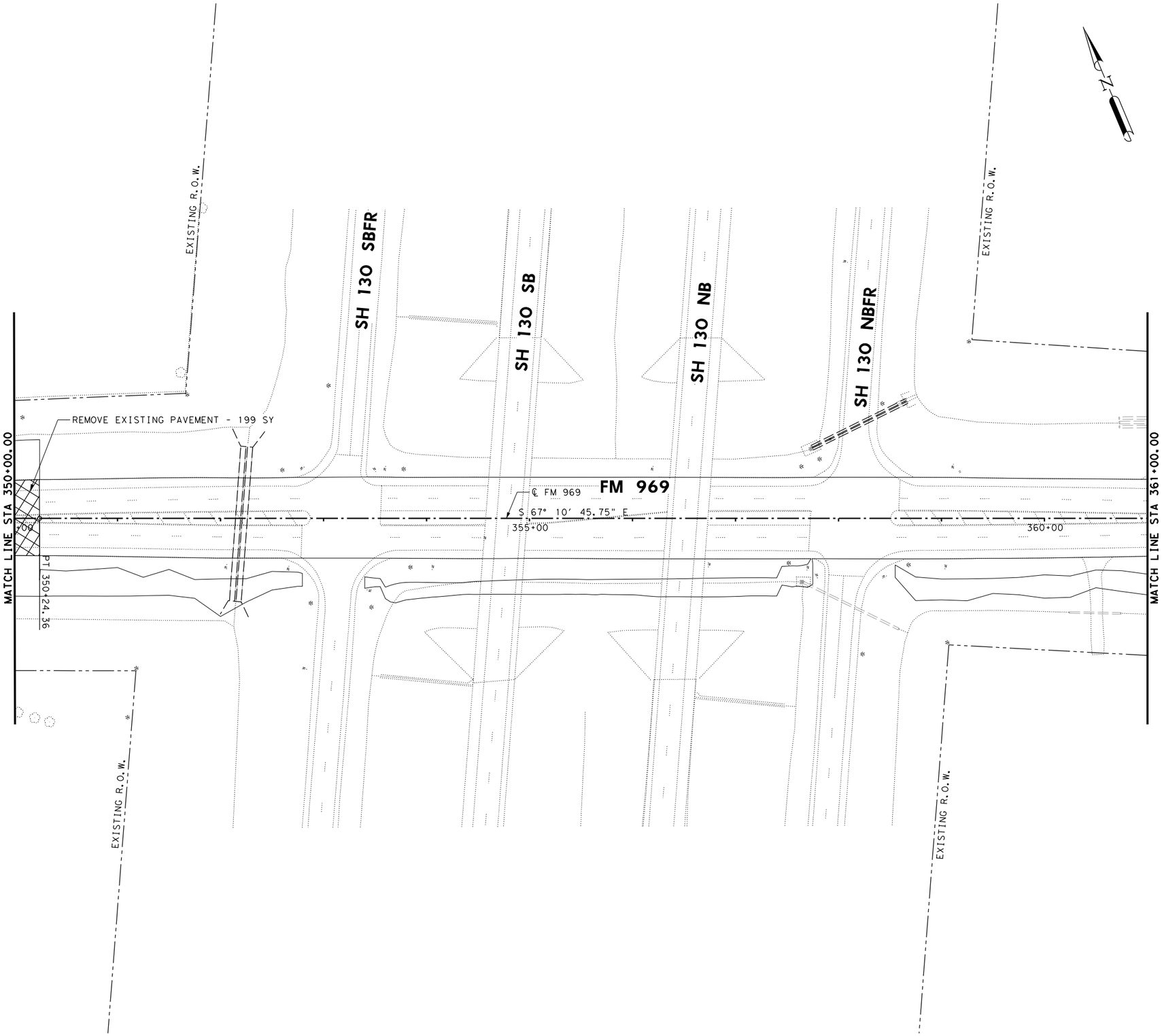
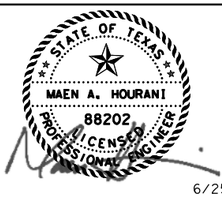


NOTES:

1. REFER TO TRAFFIC CONTROL PLAN SHEETS FOR CONSTRUCTION PHASING.



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FM 969
REMOVAL LAYOUT

STA 350+00 TO STA 361+00

SHEET 3 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
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CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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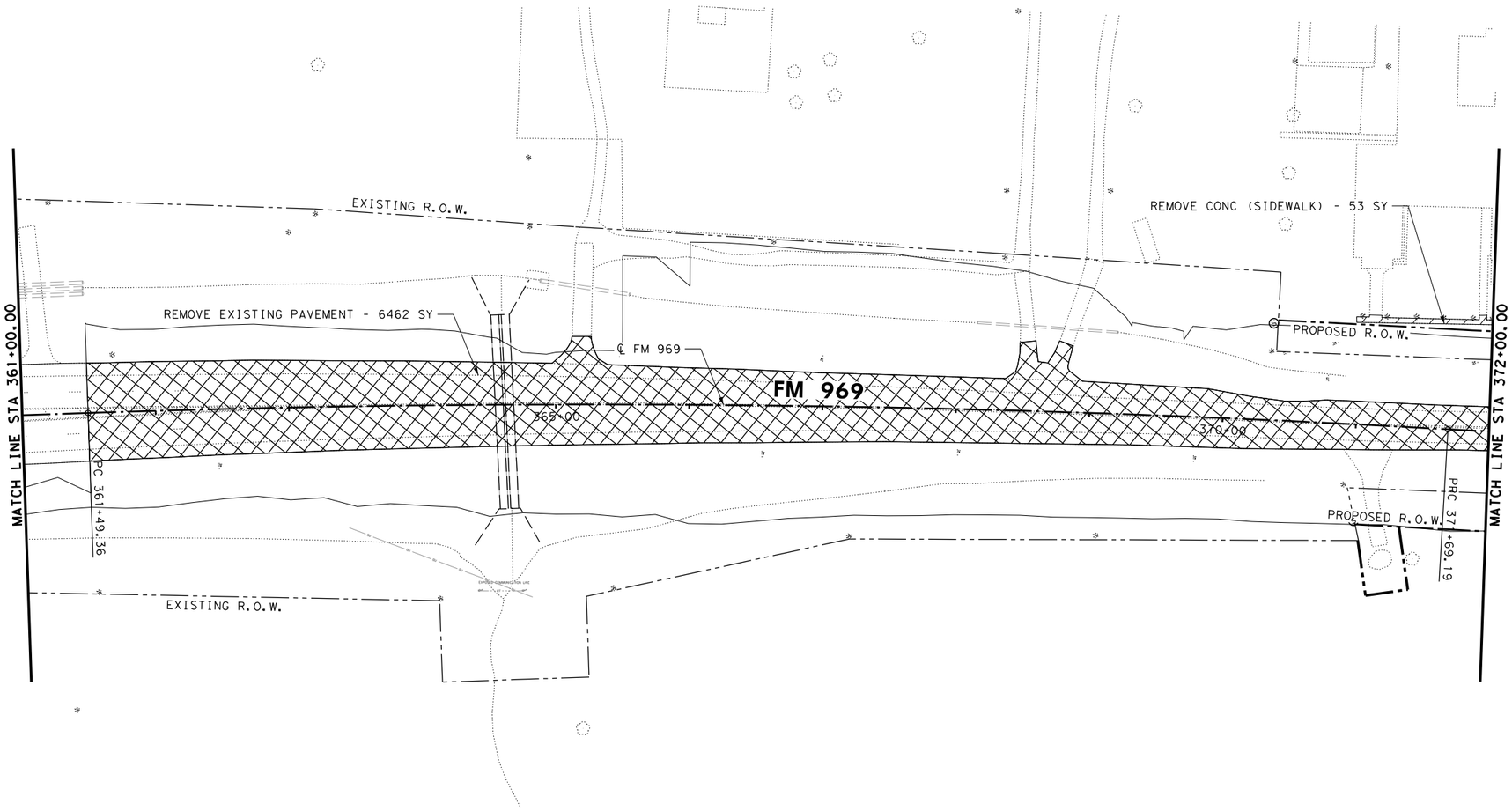

LEGEND

- EXISTING R.O.W.
- PROPOSED CONST. EASEMENT
- REMOVE EXISTING PAVEMENT
- REMOVE EXISTING RIPRAP
- X X X X X REMOVE STRUCTURE

NOTES:

1. REFER TO TRAFFIC CONTROL PLAN SHEETS FOR CONSTRUCTION PHASING.

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STA 361+00 TO STA 372+00

SHEET 4 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
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CM	TX	AUS	TRAVIS	
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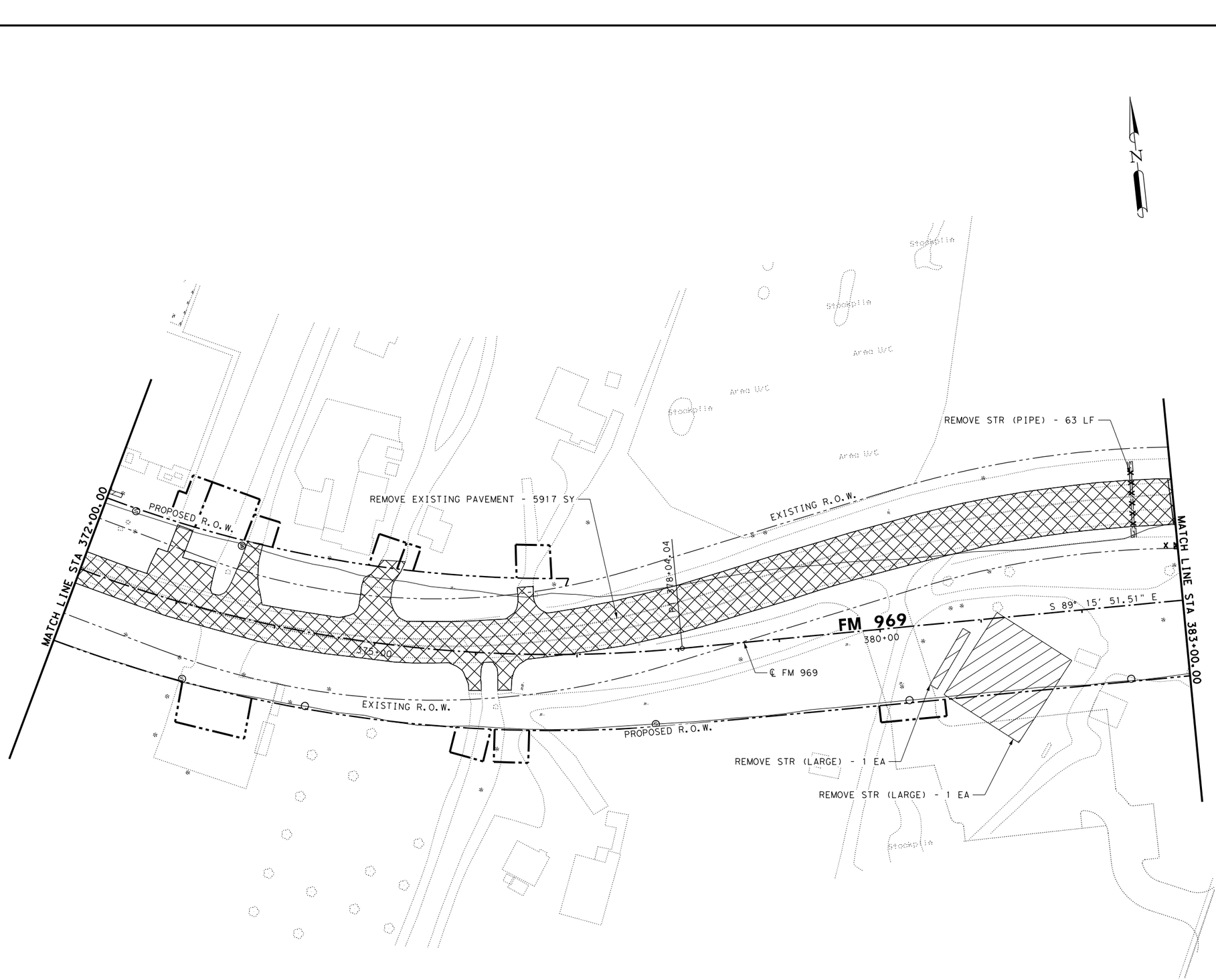
LEGEND

- EXISTING R.O.W.
- PROPOSED CONST. EASEMENT
- REMOVE EXISTING PAVEMENT
- REMOVE EXISTING RIPRAP
- X X X X X REMOVE STRUCTURE

NOTES:

1. REFER TO TRAFFIC CONTROL PLAN SHEETS FOR CONSTRUCTION PHASING.



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REMOVAL LAYOUT

STA 372+00 TO STA 383+00

SHEET 5 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
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CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
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SCALE IN FEET

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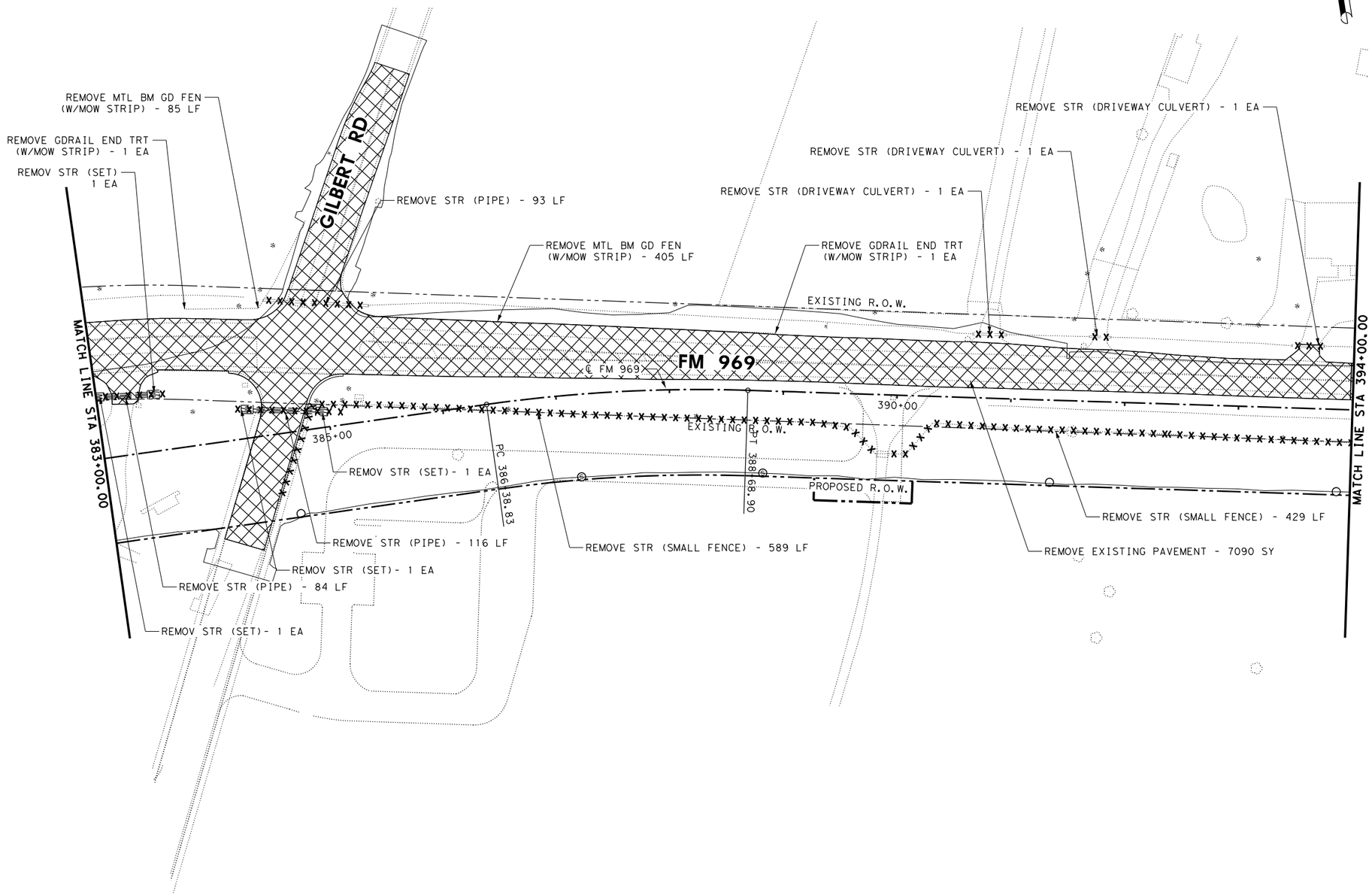
LEGEND

- EXISTING R.O.W.
- PROPOSED CONST. EASEMENT
- REMOVE EXISTING PAVEMENT
- REMOVE EXISTING RIPRAP
- X X X X X REMOVE STRUCTURE

NOTES:

1. REFER TO TRAFFIC CONTROL PLAN SHEETS FOR CONSTRUCTION PHASING.



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STA 383+00 TO STA 394+00

SHEET 6 OF 10

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CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
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LEGEND

- EXISTING R.O.W.
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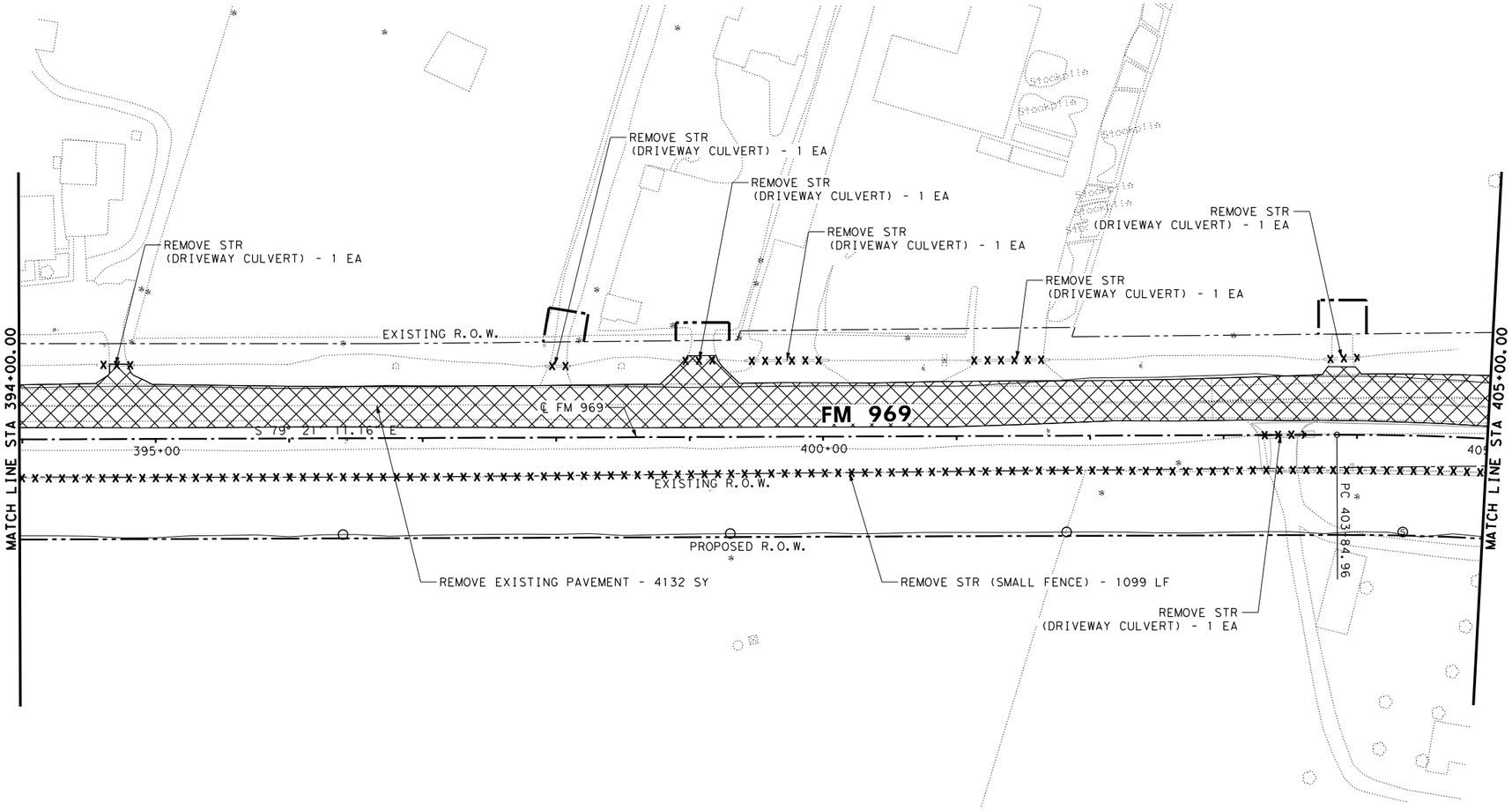
- REMOVE EXISTING PAVEMENT
- REMOVE EXISTING RIPRAP
- x x x x x REMOVE STRUCTURE



NOTES:

1. REFER TO TRAFFIC CONTROL PLAN SHEETS FOR CONSTRUCTION PHASING.

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REMOVAL LAYOUT

STA 394+00 TO STA 405+00

SHEET 7 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
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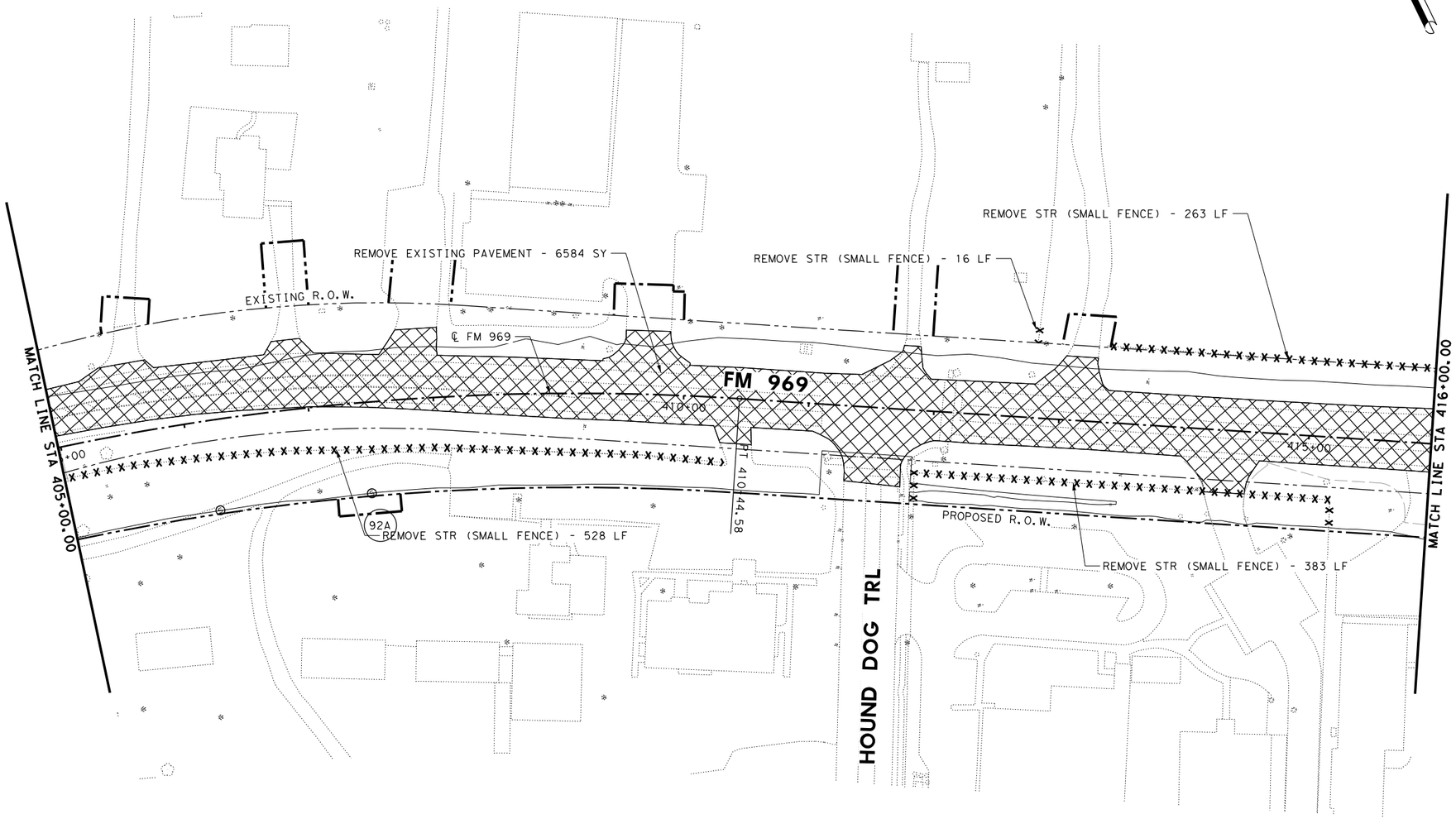

LEGEND

- EXISTING R.O.W.
- PROPOSED CONST. EASEMENT
- REMOVE EXISTING PAVEMENT
- REMOVE EXISTING RIPRAP
- X X X X X REMOVE STRUCTURE

NOTES:

1. REFER TO TRAFFIC CONTROL PLAN SHEETS FOR CONSTRUCTION PHASING.

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STA 405+00 TO STA 416+00

SHEET 8 OF 10

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DRAWN BY:	STATE	DIST. NO.	COUNTY	
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SCALE IN FEET

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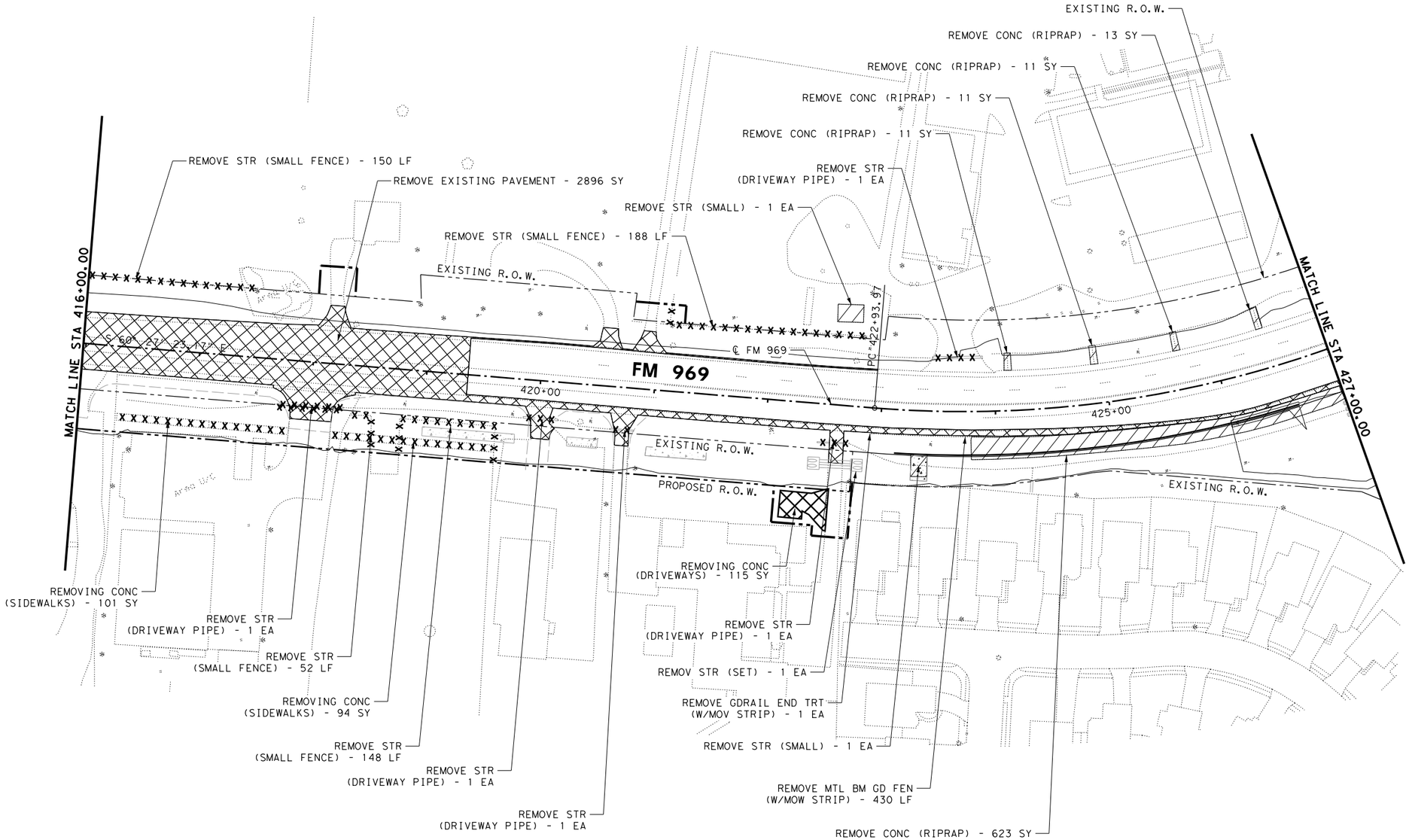
LEGEND

- EXISTING R.O.W.
- PROPOSED CONST. EASEMENT
- REMOVE EXISTING PAVEMENT
- REMOVE EXISTING RIPRAP
- REMOVE STRUCTURE

NOTES:

1. REFER TO TRAFFIC CONTROL PLAN SHEETS FOR CONSTRUCTION PHASING.



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STA 416+00 TO STA 427+00

SHEET 9 OF 10

DESIGN BY:	FED. RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
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CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
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SCALE IN FEET

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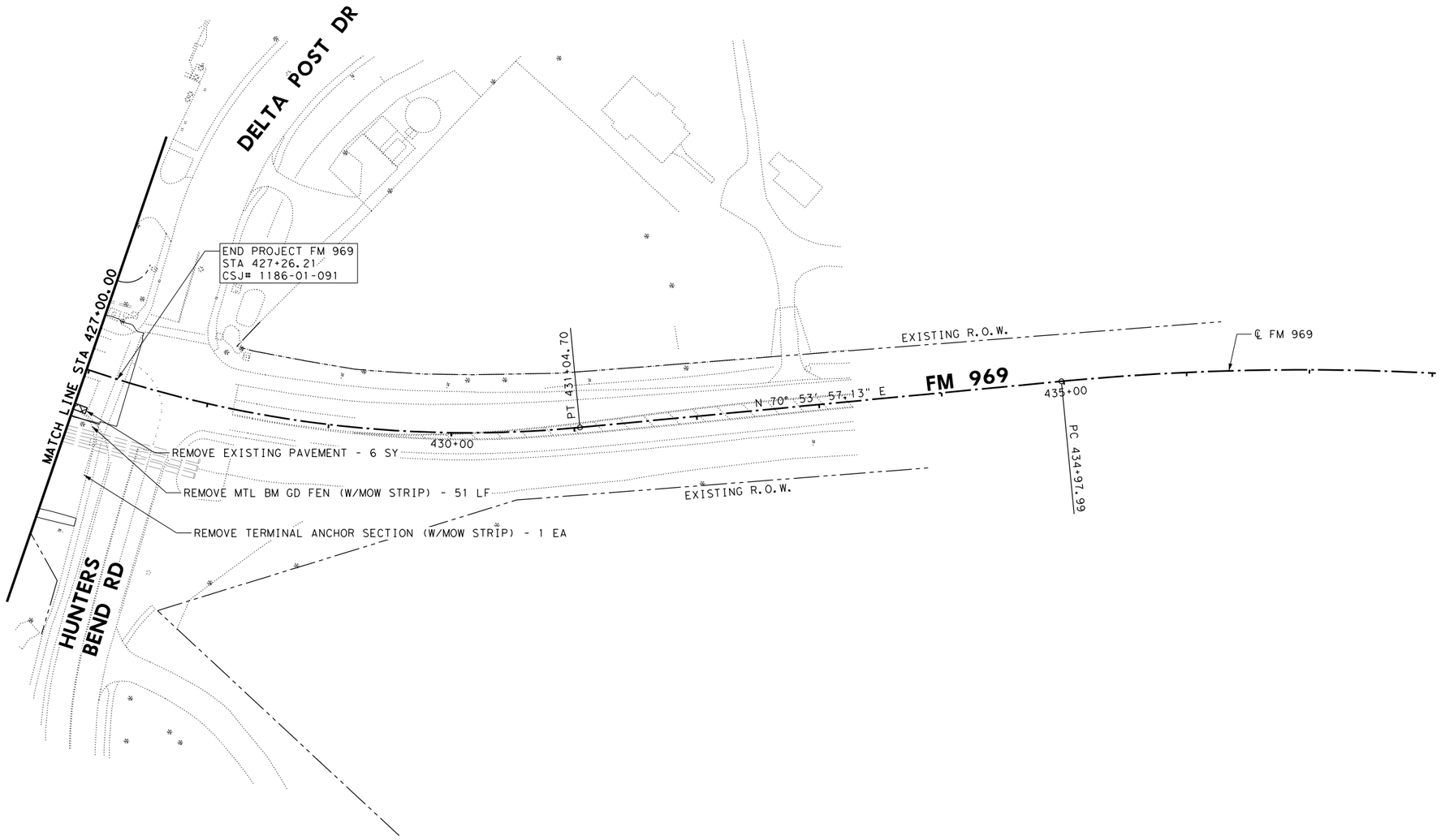
LEGEND

- EXISTING R.O.W.
- PROPOSED CONST. EASEMENT
- REMOVE EXISTING PAVEMENT
- REMOVE EXISTING RIPRAP
- x x x x x REMOVE STRUCTURE

NOTES:

1. REFER TO TRAFFIC CONTROL PLAN SHEETS FOR CONSTRUCTION PHASING.



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COUNTY OF TRAVIS STATE OF TEXAS

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LJA Engineering, Inc.
FRN - F-1386

FM 969
REMOVAL LAYOUT

STA 427+00 TO END

SHEET 10 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		103
DRAWN BY:	STATE	DIST. NO.	COUNTY	
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CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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℄ FM 969

Project: FM 969
Subject:
Job No. 969 Operator: SW
Date: Wednesday January 31, 2018 12:57 pm

SYSTEM FIX 4 ASEC 2 BEAR PRI 0 RED NE STA 2 FILE: '969CL'

* 1 DESCRIBE CHAIN CL969

Chain CL969 contains:
CUR CL969-1 CL1001 CUR CL969-2 CUR CL969-3 CUR CL969-4 CUR CL969-5 CUR CL969-6-
CUR CL969-7 CUR CL969-8 CUR CL969-9 CUR CL969-10 CUR CL969-11 CUR CL969-12 CUR-
CL969-13 CUR CL969-14 CUR CL969-15 CUR CL969-16 CUR CL969-17 CUR CL969-18 CUR -
CL969-19

Beginning chain CL969 description

		Curve Data				
Curve CL969-1						
P.I. Station		217+26.91	N	10,075,315.0179	E	3,147,685.7975
Delta	=	31° 14′ 49.45"	(RT)			
Degree	=	3° 15′ 00.58"				
Tangent	=	492.9800				
Length	=	961.4008				
Radius	=	1,762.8600				
External	=	67.6330				
Long Chord	=	949.5308				
Mid. Ord.	=	65.1341				
P.C. Station		212+33.93	N	10,075,512.8632	E	3,147,234.2596
P.T. Station		221+95.33	N	10,074,911.6463	E	3,147,969.2064
C.C.			N	10,073,898.1970	E	3,146,526.7793
Back	= S	66° 20′ 20.21" E				
Ahead	= S	35° 05′ 30.76" E				
Chord Bear	= S	50° 42′ 55.49" E				

Course from PT CL969-1 to CL1001 S 35° 05′ 30.76" E Dist 774.6727

Point CL1001 N 10,074,277.7849 E 3,148,414.5575 Sta 229+70.00

Course from CL1001 to PC CL969-2 S 32° 35′ 30.76" E Dist 661.2226

		Curve Data				
Curve CL969-2						
P.I. Station		238+22.44	N	10,073,559.5810	E	3,148,873.7246
Delta	=	29° 53′ 49.47"	(LT)			
Degree	=	7° 59′ 59.89"				
Tangent	=	191.2159				
Length	=	373.7149				
Radius	=	716.2000				
External	=	25.0867				
Long Chord	=	369.4895				
Mid. Ord.	=	24.2377				
P.C. Station		236+31.23	N	10,073,720.6859	E	3,148,770.7259
P.T. Station		240+04.94	N	10,073,471.2546	E	3,149,043.3182
C.C.			N	10,074,106.4680	E	3,149,374.1450
Back	= S	32° 35′ 30.76" E				
Ahead	= S	62° 29′ 20.23" E				
Chord Bear	= S	47° 32′ 25.50" E				

Course from PT CL969-2 to PC CL969-3 S 62° 29′ 20.23" E Dist 161.4272

		Curve Data				
Curve CL969-3						
P.I. Station		243+33.69	N	10,073,319.3994	E	3,149,334.8919
Delta	=	6° 41′ 09.28"	(LT)			
Degree	=	2° 00′ 00.73"				
Tangent	=	167.3208				
Length	=	334.2619				
Radius	=	2,864.5000				
External	=	4.8826				
Long Chord	=	334.0723				
Mid. Ord.	=	4.8743				
P.C. Station		241+66.37	N	10,073,396.6882	E	3,149,186.4914
P.T. Station		245+00.63	N	10,073,259.9140	E	3,149,491.2817
C.C.			N	10,075,937.2757	E	3,150,509.6602
Back	= S	62° 29′ 20.23" E				
Ahead	= S	69° 10′ 29.52" E				
Chord Bear	= S	65° 49′ 54.88" E				

Course from PT CL969-3 to PC CL969-4 S 69° 10′ 29.52" E Dist 718.1212

		Curve Data				
Curve CL969-4						
P.I. Station		253+93.12	N	10,072,942.6202	E	3,150,325.4610
Delta	=	13° 52′ 55.72"	(RT)			
Degree	=	4° 00′ 01.35"				
Tangent	=	174.3643				
Length	=	347.0210				
Radius	=	1,432.2600				
External	=	10.5746				
Long Chord	=	346.1728				
Mid. Ord.	=	10.4971				
P.C. Station		252+18.75	N	10,073,004.6097	E	3,150,162.4879
P.T. Station		255+65.77	N	10,072,843.3400	E	3,150,468.8010
C.C.			N	10,071,665.9195	E	3,149,653.2951
Back	= S	69° 10′ 29.52" E				
Ahead	= S	55° 17′ 33.80" E				
Chord Bear	= S	62° 14′ 01.66" E				

Course from PT CL969-4 to PC CL969-5 S 55° 17′ 33.80" E Dist 574.1734

		Curve Data				
Curve CL969-5						
P.I. Station		263+30.73	N	10,072,407.7871	E	3,151,097.6485
Delta	=	29° 50′ 00.00"	(RT)			
Degree	=	8° 00′ 01.10"				
Tangent	=	190.7812				
Length	=	372.9025				
Radius	=	716.1700				
External	=	24.9757				
Long Chord	=	368.7042				
Mid. Ord.	=	24.1340				
P.C. Station		261+39.95	N	10,072,516.4149	E	3,150,940.8127
P.T. Station		265+12.85	N	10,072,235.5327	E	3,151,179.6598
C.C.			N	10,071,927.6718	E	3,150,533.0369
Back	= S	55° 17′ 33.80" E				
Ahead	= S	25° 27′ 33.80" E				
Chord Bear	= S	40° 22′ 33.80" E				

Course from PT CL969-5 to PC CL969-6 S 25° 27′ 33.80" E Dist 245.8757

		Curve Data				
Curve CL969-6						
P.I. Station		268+98.57	N	10,071,887.2711	E	3,151,345.4692
Delta	=	13° 54′ 55.56"	(LT)			
Degree	=	4° 59′ 59.93"				
Tangent	=	139.8430				
Length	=	278.3098				
Radius	=	1,145.9200				
External	=	8.5014				
Long Chord	=	277.6263				
Mid. Ord.	=	8.4388				
P.C. Station		267+58.72	N	10,072,013.5339	E	3,151,285.3547
P.T. Station		270+37.03	N	10,071,779.1708	E	3,151,434.1843
C.C.			N	10,072,506.1320	E	3,152,319.9946
Back	= S	25° 27′ 33.80" E				
Ahead	= S	39° 22′ 29.36" E				
Chord Bear	= S	32° 25′ 01.58" E				

Course from PT CL969-6 to PC CL969-7 S 39° 22′ 29.36" E Dist 795.3790

		Curve Data				
Curve CL969-7						
P.I. Station		279+68.83	N	10,071,058.8773	E	3,152,025.3101
Delta	=	5° 27′ 07.43"	(LT)			
Degree	=	1° 59′ 59.09"				
Tangent	=	136.4217				
Length	=	272.6375				
Radius	=	2,865.1500				
External	=	3.2460				
Long Chord	=	272.5347				
Mid. Ord.	=	3.2423				
P.C. Station		278+32.41	N	10,071,164.3329	E	3,151,938.7654
P.T. Station		281+05.05	N	10,070,962.1215	E	3,152,121.4830
C.C.			N	10,072,981.9580	E	3,154,153.5620
Back	= S	39° 22′ 29.36" E				
Ahead	= S	44° 49′ 36.79" E				
Chord Bear	= S	42° 06′ 03.08" E				

Course from PT CL969-7 to PC CL969-8 S 44° 49′ 36.79" E Dist 865.3550

		Curve Data				
Curve CL969-8						
P.I. Station		292+07.72	N	10,070,180.0655	E	3,152,898.8274
Delta	=	4° 44′ 35.52"	(RT)			
Degree	=	0° 59′ 59.74"				
Tangent	=	237.3126				
Length	=	474.3541				
Radius	=	5,729.9900				
External	=	4.9122				
Long Chord	=	474.2187				
Mid. Ord.	=	4.9079				
P.C. Station		289+70.41	N	10,070,348.3771	E	3,152,731.5298
P.T. Station		294+44.76	N	10,069,998.4965	E	3,153,051.6343
C.C.			N	10,066,308.9227	E	3,148,667.5916
Back	= S	44° 49′ 36.79" E				
Ahead	= S	40° 05′ 01.27" E				
Chord Bear	= S	42° 27′ 19.03" E				

Course from PT CL969-8 to PC CL969-9 S 40° 05′ 01.27" E Dist 255.3442

		Curve Data				
Curve CL969-9						
P.I. Station		299+78.97	N	10,069,589.7682	E	3,153,395.6167
Delta	=	32° 33′ 26.90"	(LT)			
Degree	=	5° 59′ 59.09"				
Tangent	=	278.8681				
Length	=	542.6475				
Radius	=	954.9700				
External	=	39.8843				
Long Chord	=	535.3762				
Mid. Ord.	=	38.2853				
P.C. Station		297+00.10	N	10,069,803.1315	E	3,153,216.0519
P.T. Station		302+42.75	N	10,069,506.5664	E	3,153,661.7838
C.C.			N	10,070,418.0422	E	3,153,946.7040
Back	= S	40° 05′ 01.27" E				
Ahead	= S	72° 38′ 28.18" E				
Chord Bear	= S	56° 21′ 44.72" E				

Course from PT CL969-9 to PC CL969-10 S 72° 38′ 28.18" E Dist 987.7280

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 3

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		104
DRAWN BY:	STATE	DIST. NO.	COUNTY	
MD	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

6/25/2021
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Curve Data

Curve CL969-10

P.I. Station	316+81.04	N	10,069,077.4467	E	3,155,034.5614
Delta =	26° 32′ 52.73" (RT)				
Degree =	3° 00′ 00.00"				
Tangent =	450.5564				
Length =	884.9330				
Radius =	1,909.8600				
External =	52.4260				
Long Chord =	877.0380				
Mid. Ord. =	51.0253				
P.C. Station	312+30.48	N	10,069,211.8726	E	3,154,604.5256
P.T. Station	321+15.41	N	10,068,764.9915	E	3,155,359.1731
C.C.		N	10,067,388.9974	E	3,154,034.7089

Back = S 72° 38′ 28.18" E
Ahead = S 46° 05′ 35.45" E
Chord Bear = S 59° 22′ 01.81" E

Course from PT CL969-10 to PC CL969-11 S 46° 05′ 35.45" E Dist 921.5985

Curve Data

Curve CL969-11

P.I. Station	331+45.81	N	10,068,050.4236	E	3,156,101.5422
Delta =	14° 04′ 21.69" (LT)				
Degree =	6° 29′ 59.99"				
Tangent =	108.7990				
Length =	216.5031				
Radius =	881.4740				
External =	6.6891				
Long Chord =	215.9593				
Mid. Ord. =	6.6387				
P.C. Station	330+37.01	N	10,068,125.8743	E	3,156,023.1559
P.T. Station	332+53.51	N	10,067,996.2970	E	3,156,195.9220
C.C.		N	10,068,760.9487	E	3,156,634.4472

Back = S 46° 05′ 35.45" E
Ahead = S 60° 09′ 57.14" E
Chord Bear = S 53° 07′ 46.29" E

Course from PT CL969-11 to PC CL969-12 S 60° 09′ 57.14" E Dist 265.4151

Curve Data

Curve CL969-12

P.I. Station	338+65.42	N	10,067,691.8787	E	3,156,726.7330
Delta =	10° 21′ 59.04" (LT)				
Degree =	1° 30′ 00.00"				
Tangent =	346.4925				
Length =	691.0935				
Radius =	3,819.7200				
External =	15.6832				
Long Chord =	690.1513				
Mid. Ord. =	15.6191				
P.C. Station	335+18.93	N	10,067,864.2555	E	3,156,426.1614
P.T. Station	342+10.02	N	10,067,576.4011	E	3,157,053.4163
C.C.		N	10,071,177.7452	E	3,158,326.4368

Back = S 60° 09′ 57.14" E
Ahead = S 70° 31′ 56.18" E
Chord Bear = S 65° 20′ 56.66" E

Course from PT CL969-12 to PC CL969-13 S 70° 31′ 56.18" E Dist 164.7756

Curve Data

Curve CL969-13

P.I. Station	346+99.67	N	10,067,413.2128	E	3,157,515.0720
Delta =	3° 21′ 10.43" (RT)				
Degree =	0° 30′ 58.24"				
Tangent =	324.8737				
Length =	649.5620				
Radius =	11,100.0000				
External =	4.7532				
Long Chord =	649.4693				
Mid. Ord. =	4.7511				
P.C. Station	343+74.80	N	10,067,521.4854	E	3,157,208.7715
P.T. Station	350+24.36	N	10,067,287.2114	E	3,157,814.5158
C.C.		N	10,057,056.0796	E	3,153,509.4093

Back = S 70° 31′ 56.18" E
Ahead = S 67° 10′ 45.75" E
Chord Bear = S 68° 51′ 20.96" E

Course from PT CL969-13 to PC CL969-14 S 67° 10′ 45.75" E Dist 1,125.0006

Curve Data

Curve CL969-14

P.I. Station	364+26.71	N	10,066,743.3140	E	3,159,107.0938
Delta =	2° 51′ 45.46" (RT)				
Degree =	0° 30′ 58.24"				
Tangent =	277.3483				
Length =	554.5812				
Radius =	11,100.0000				
External =	3.4644				
Long Chord =	554.5235				
Mid. Ord. =	3.4633				
P.C. Station	361+49.36	N	10,066,850.8828	E	3,158,851.4554
P.T. Station	367+03.94	N	10,066,623.1124	E	3,159,357.0411
C.C.		N	10,056,619.7510	E	3,154,546.3489

Back = S 67° 10′ 45.75" E
Ahead = S 64° 19′ 00.29" E
Chord Bear = S 65° 44′ 53.02" E

Course from PT CL969-14 to PC CL969-15 S 64° 19′ 00.29" E Dist 435.8960

Curve Data

Curve CL969-15

P.I. Station	374+28.44	N	10,066,309.1158	E	3,160,009.9662
Delta =	24° 29′ 11.42" (LT)				
Degree =	4° 18′ 28.63"				
Tangent =	288.6073				
Length =	568.4023				
Radius =	1,330.0000				
External =	30.9534				
Long Chord =	564.0865				
Mid. Ord. =	30.2494				
P.C. Station	371+39.84	N	10,066,434.1969	E	3,159,749.8722
P.T. Station	377+08.24	N	10,066,303.0880	E	3,160,298.5106
C.C.		N	10,067,632.7979	E	3,160,326.2885

Back = S 64° 19′ 00.29" E
Ahead = S 88° 48′ 11.71" E
Chord Bear = S 76° 33′ 36.00" E

Course from PT CL969-15 to PC CL969-16 S 88° 48′ 11.71" E Dist 672.1577

Curve Data

Curve CL969-16

P.I. Station	385+16.78	N	10,066,286.2011	E	3,161,106.8737
Delta =	9° 27′ 00.54" (RT)				
Degree =	3° 28′ 20.90"				
Tangent =	136.3817				
Length =	272.1448				
Radius =	1,650.0000				
External =	5.6268				
Long Chord =	271.8364				
Mid. Ord. =	5.6076				
P.C. Station	383+80.40	N	10,066,289.0496	E	3,160,970.5217
P.T. Station	386+52.54	N	10,066,261.0038	E	3,161,240.9075
C.C.		N	10,064,639.4095	E	3,160,936.0603

Back = S 88° 48′ 11.71" E
Ahead = S 79° 21′ 11.16" E
Chord Bear = S 84° 04′ 41.44" E

Course from PT CL969-16 to PC CL969-17 S 79° 21′ 11.16" E Dist 1,723.1211

Curve Data

Curve CL969-17

P.I. Station	407+08.49	N	10,065,881.1545	E	3,163,261.4657
Delta =	18° 53′ 47.99" (RT)				
Degree =	2° 51′ 53.24"				
Tangent =	332.8315				
Length =	659.6180				
Radius =	2,000.0000				
External =	27.5051				
Long Chord =	656.6326				
Mid. Ord. =	27.1319				
P.C. Station	403+75.66	N	10,065,942.6471	E	3,162,934.3641
P.T. Station	410+35.28	N	10,065,717.0403	E	3,163,551.0227
C.C.		N	10,063,977.0782	E	3,162,564.8524

Back = S 79° 21′ 11.16" E
Ahead = S 60° 27′ 23.17" E
Chord Bear = S 69° 54′ 17.17" E

Course from PT CL969-17 to PC CL969-18 S 60° 27′ 23.17" E Dist 1,249.3959

Curve Data

Curve CL969-18

P.I. Station	427+16.29	N	10,064,888.1622	E	3,165,013.4642
Delta =	48° 38′ 39.70" (LT)				
Degree =	6° 00′ 00.23"				
Tangent =	431.6079				
Length =	810.7309				
Radius =	954.9197				
External =	93.0102				
Long Chord =	786.6001				
Mid. Ord. =	84.7550				
P.C. Station	422+84.68	N	10,065,100.9817	E	3,164,637.9735
P.T. Station	430+95.41	N	10,065,029.3978	E	3,165,421.3096
C.C.		N	10,065,931.7437	E	3,165,108.8302

Back = S 60° 27′ 23.17" E
Ahead = N 70° 53′ 57.13" E
Chord Bear = S 84° 46′ 43.02" E

Course from PT CL969-18 to PC CL969-19 N 70° 53′ 57.13" E Dist 393.2889

Curve Data

Curve CL969-19

P.I. Station	436+89.33	N	10,065,223.7476	E	3,165,982.5331
Delta =	11° 08′ 56.13" (RT)				
Degree =	2° 47′ 14.03"				
Tangent =	200.6334				
Length =	400.0000				
Radius =	2,055.6522				
External =	9.7678				
Long Chord =	399.3692				
Mid. Ord. =	9.7216				
P.C. Station	434+88.70	N	10,065,158.0941	E	3,165,792.9457
P.T. Station	438+88.70	N	10,065,251.5035	E	3,166,181.2374
C.C.		N	10,063,215.6171	E	3,166,465.6190

Back = N 70° 53′ 57.13" E
Ahead = N 82° 02′ 53.25" E
Chord Bear = N 76° 28′ 25.19" E

==========

Ending chain CL969 description

STATE OF TEXAS
MAEN A. HOURANI
88202
PROFESSIONAL ENGINEER
LICENSED
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation
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FRN-F-1386

FM 969
HORIZONTAL ALIGNMENT DATA

SHEET 2 OF 3

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		105
DRAWN BY:	STATE	DIST. NO.	COUNTY	
MD	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

6/25/2021
6:45:13 PM
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℄ FM 973

```
Copyright: (c) 2012 Bentley Systems, Incorporated. All rights reserved.
Project:      FM 969
Subject:
Job No.       969              Operator: SW
Date:         Wednesday  January 31, 2018   1:04 pm

SYSTEM FIX 4 ASEC 2 BEAR PRI 0 RED NE STA 2 FILE: '973CL'


*        1   DESCRIBE CHAIN FM973

Chain FM973 contains:
 97301 97302 97303

Beginning chain FM973 description
================================================================================

Point 97301           N  10,068,526.2131 E   3,156,045.7008 Sta      386+71.67

Course from 97301 to 97302 S 27° 53' 35.30" W Dist 230.9358

Point 97302           N  10,068,322.1071 E   3,155,937.6635 Sta      389+02.61

Course from 97302 to 97303 S 27° 14' 06.57" W Dist 398.2369

Point 97303           N  10,067,968.0204 E   3,155,755.4129 Sta      393+00.84

================================================================================
Ending chain FM973 description
```

℄ GILBERT RD

```
Copyright: (c) 2012 Bentley Systems, Incorporated. All rights reserved.
Project:      FM 969
Subject:
Job No.       969              Operator: SW
Date:         Wednesday  January 31, 2018   1:05 pm

SYSTEM FIX 4 ASEC 2 BEAR PRI 0 RED NE STA 2 FILE: 'GILBERTCL'


*        1   DESCRIBE CHAIN GILBERT

Chain GILBERT contains:
 GR100 GR101 GR102

Beginning chain GILBERT description
================================================================================

Point GR100           N  10,066,460.3416 E   3,161,134.0423 Sta       10+00.00

Course from GR100 to GR101 S 27° 12' 25.56" W Dist 112.1442

Point GR101           N  10,066,360.6051 E   3,161,082.7691 Sta       11+12.14

Course from GR101 to GR102 S 24° 55' 38.91" W Dist 557.7162

Point GR102           N  10,065,854.8446 E   3,160,847.7080 Sta       16+69.86

================================================================================
Ending chain GILBERT description
```

℄ RETAINING WALL 01

```
Beginning chain RW01 description
Feature: Geom_Centerline
================================================================================

Point RW011           N  10,065,089.1698 E   3,164,580.7340 Sta       10+00.00

Course from RW011 to PC RW01_3 S 60° 27' 23.17" E Dist 43.9730

                                Curve Data
                               *----------*
Curve RW01_3
P.I.  Station                    12+85.79  N      10,064,948.2497  E      3,164,829.3683
Delta          =          27° 21' 42.86" (LT)
Degree         =           5° 46' 03.11"
Tangent        =                241.8198
Length         =                474.4129
Radius         =                993.4197
External       =                 29.0085
Long Chord     =                469.9176
Mid. Ord.      =                 28.1855
P.C.  Station                    10+43.97  N      10,065,067.4874  E      3,164,618.9897
P.T.  Station                    15+18.39  N      10,064,939.0441  E      3,165,071.0128
C.C.                                       N      10,065,931.7437  E      3,165,108.8302
Back         = S  60° 27' 23.18" E
Ahead        = S  87° 49' 06.04" E
Chord Bear   = S  74° 08' 14.61" E

================================================================================
Ending chain RW01 description
```

CROSS SLOPE TRANSITION TABLE

FM 969 - CROSS SLOPE DATA		
STATION	X-SLOPE	
	LT	RT
332+53.51	-5.0% M.E.	+5.0% M.E.
333+75	-5.0%	+5.0%
335+55	-3.7%	+3.7%
341+74	-3.7%	+3.7%
344+53	-1.5%	+1.5%
350+24.36	-1.5% M.E.	+1.5% M.E.
361+49.36	-1.0% M.E.	+1.0% M.E.
363+30	-2.0%	+2.0%
370+45	-2.0%	+2.0%
372+08	-6.0%	+6.0%
377+51	-6.0%	+6.0%
385+46	+5.8%	-5.8%
386+64	+5.4%	-5.4%
390+19	-2.0%	-2.0%
401+03	-2.0%	-2.0%
404+58	+5.4%	-5.4%
409+76	+5.4%	-5.4%
413+31	-2.0%	-2.0%
419+89	-2.0%	-2.0%
423+73	-6.0%	+6.0%

STATE OF TEXAS
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FRN - F-1386

FM 969
HORIZONTAL ALIGNMENT DATA

SHEET 3 OF 3

DESIGN BY:	FED. RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		106
DRAWN BY:	STATE	DIST. NO.	COUNTY	
MD	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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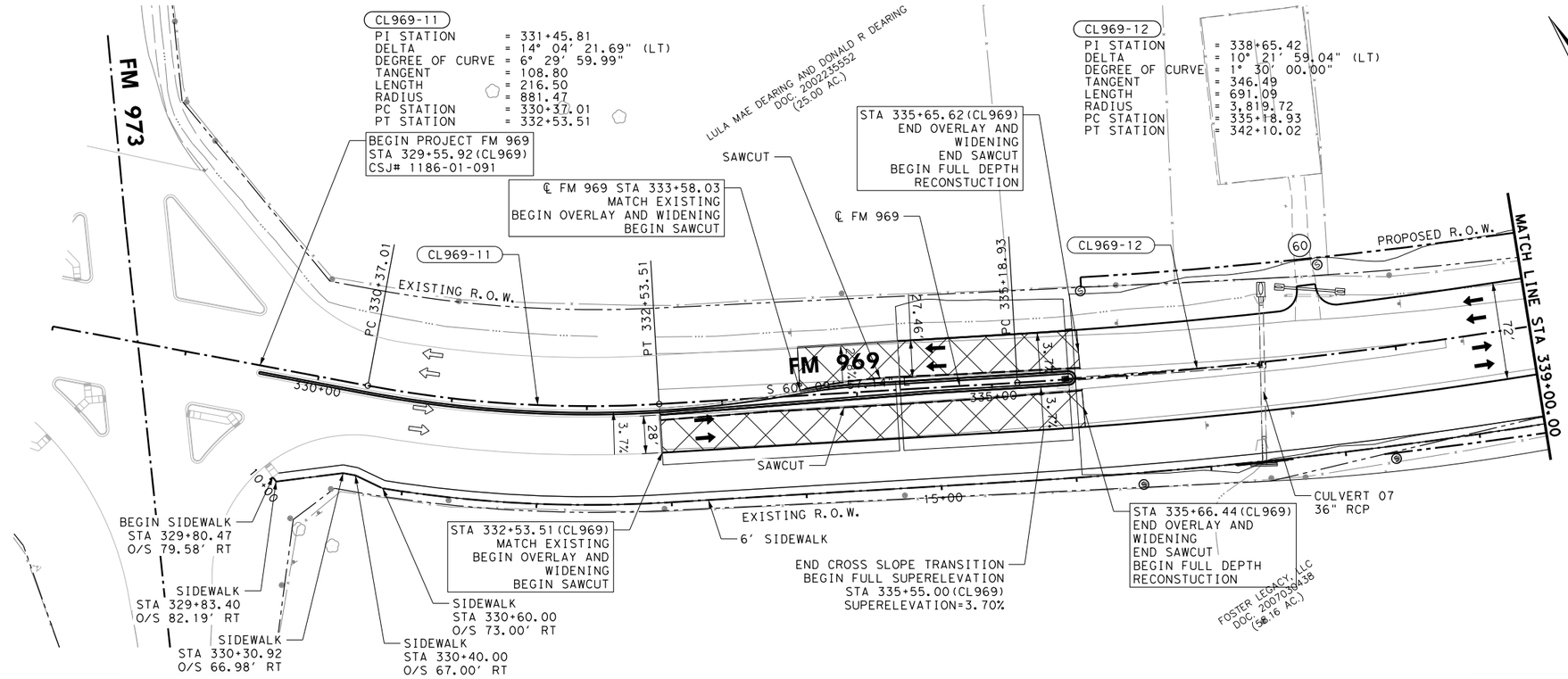

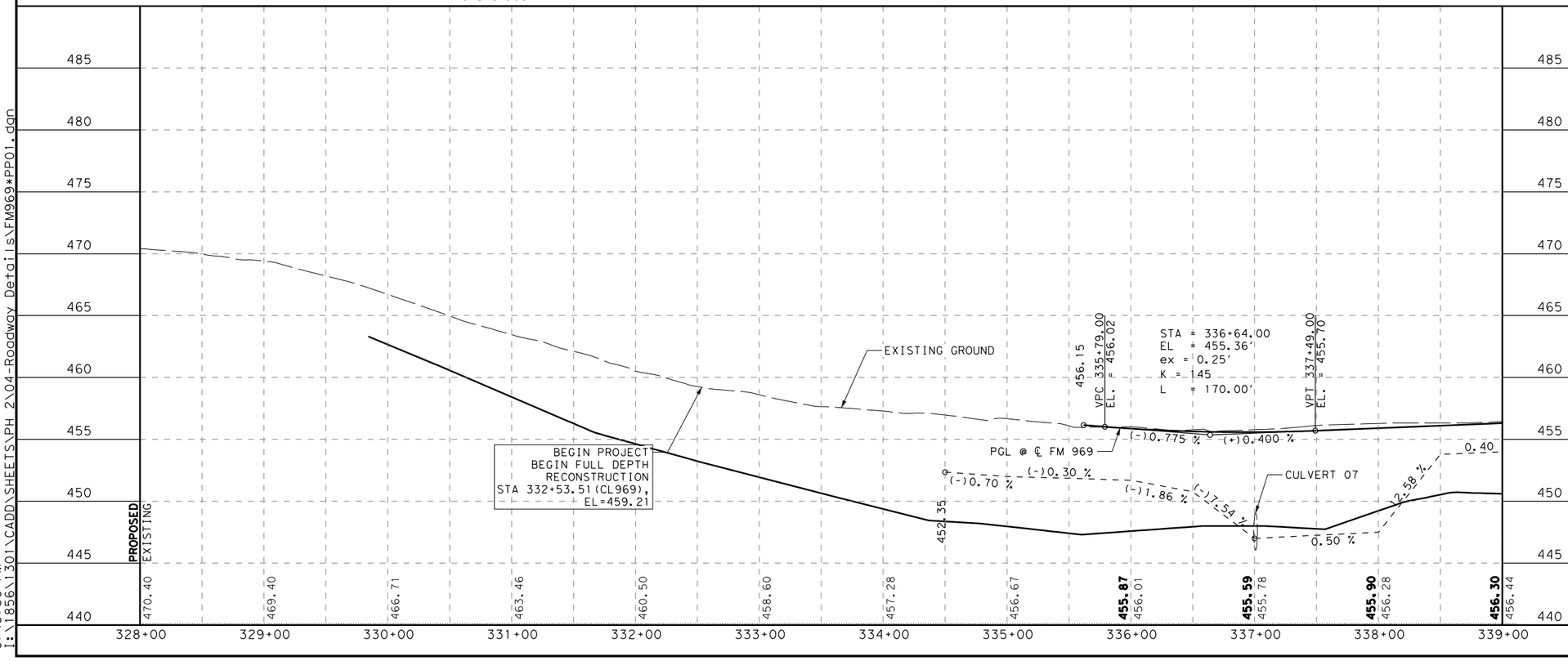

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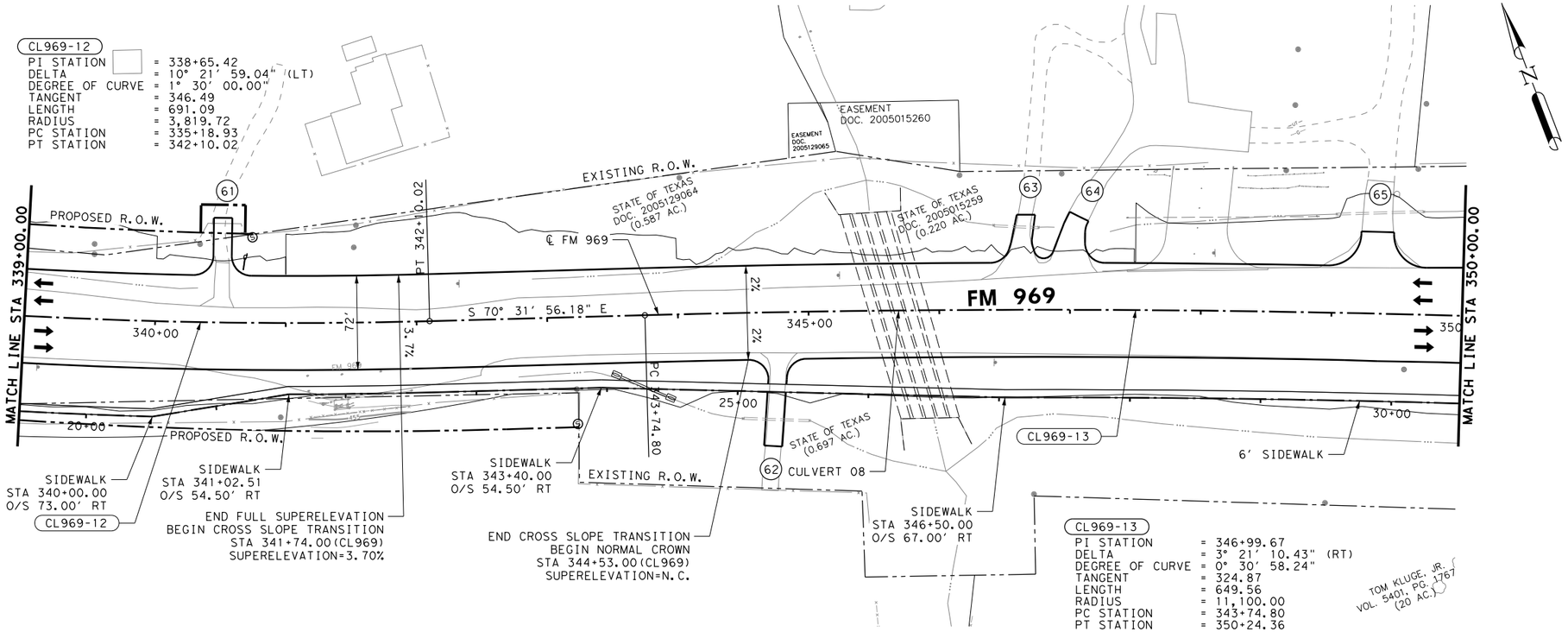
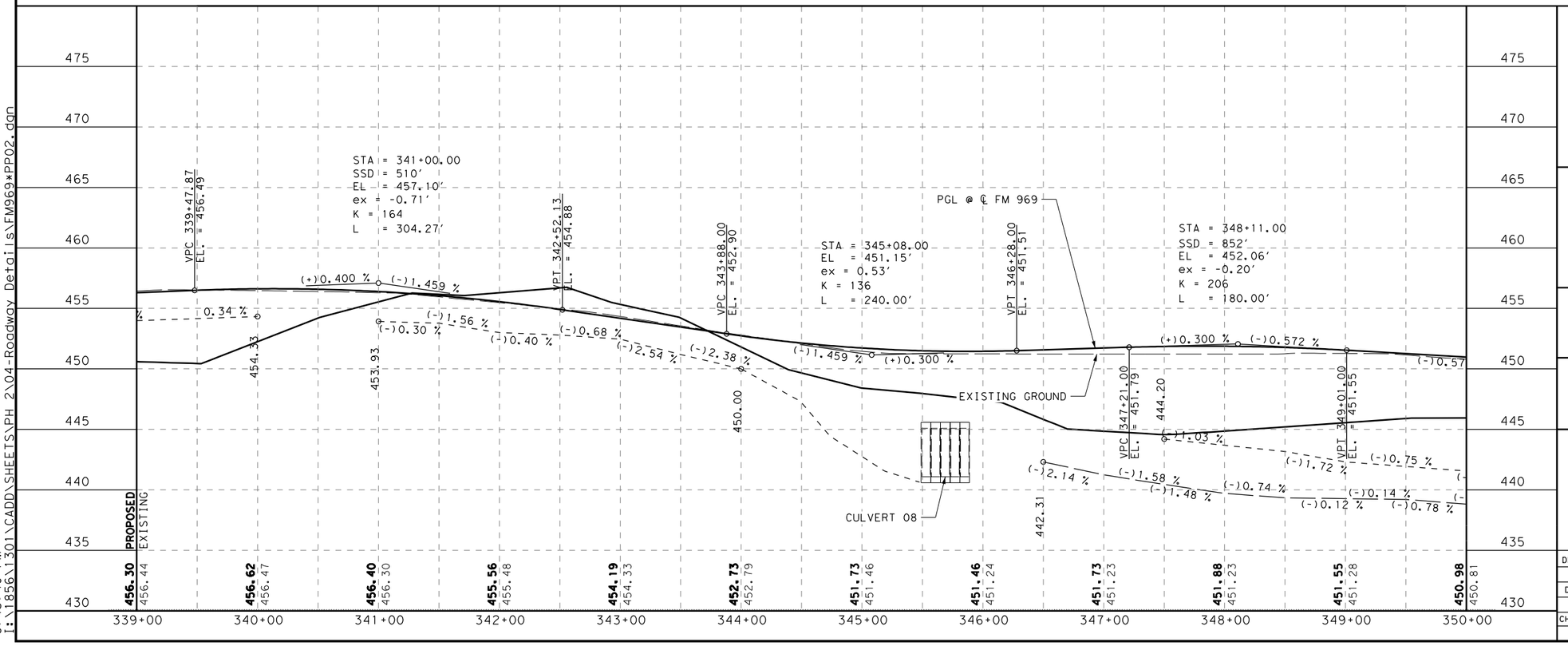
FM 969
ROADWAY PLAN & PROFILE

BEGIN TO STA 339+00

SHEET 1 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		107
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969





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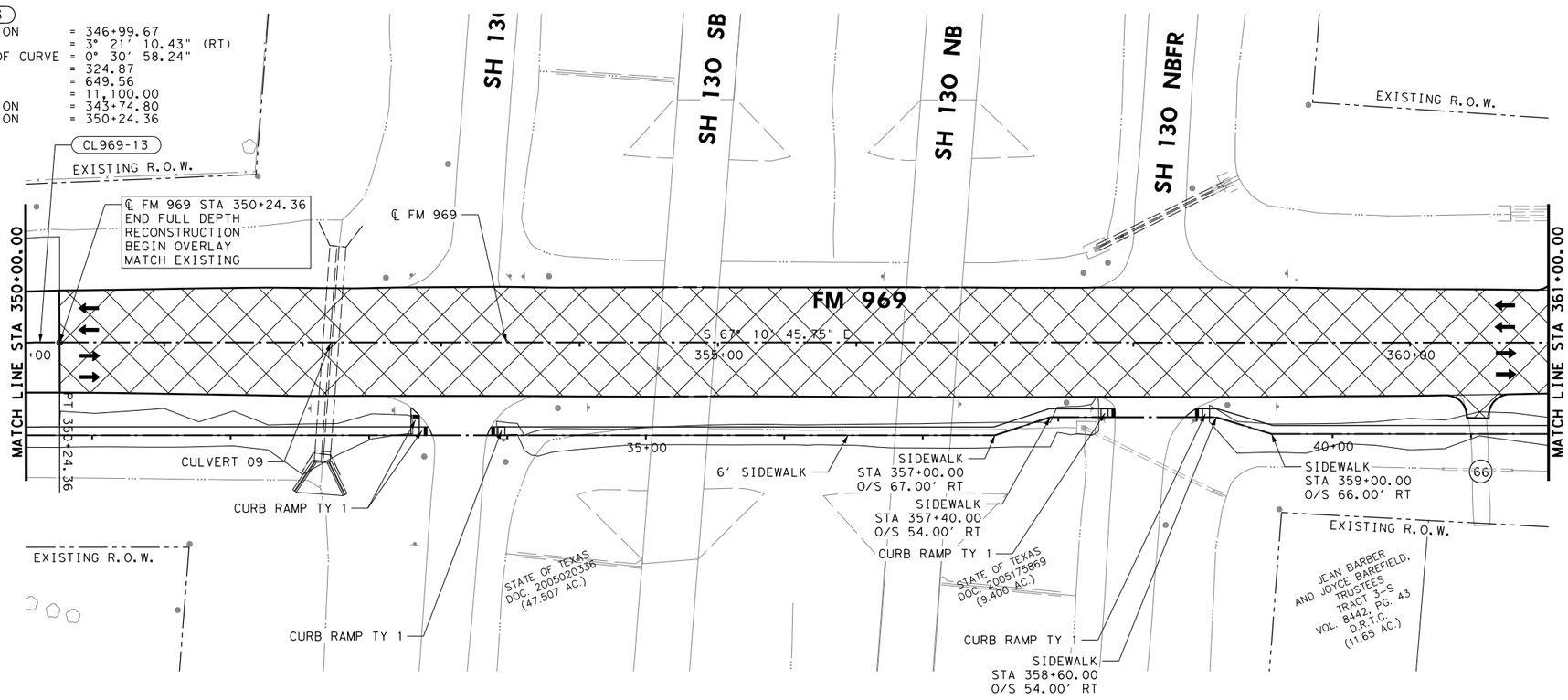
FM 969
ROADWAY PLAN & PROFILE

STA 339+00 TO STA 350+00

SHEET 2 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		108
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

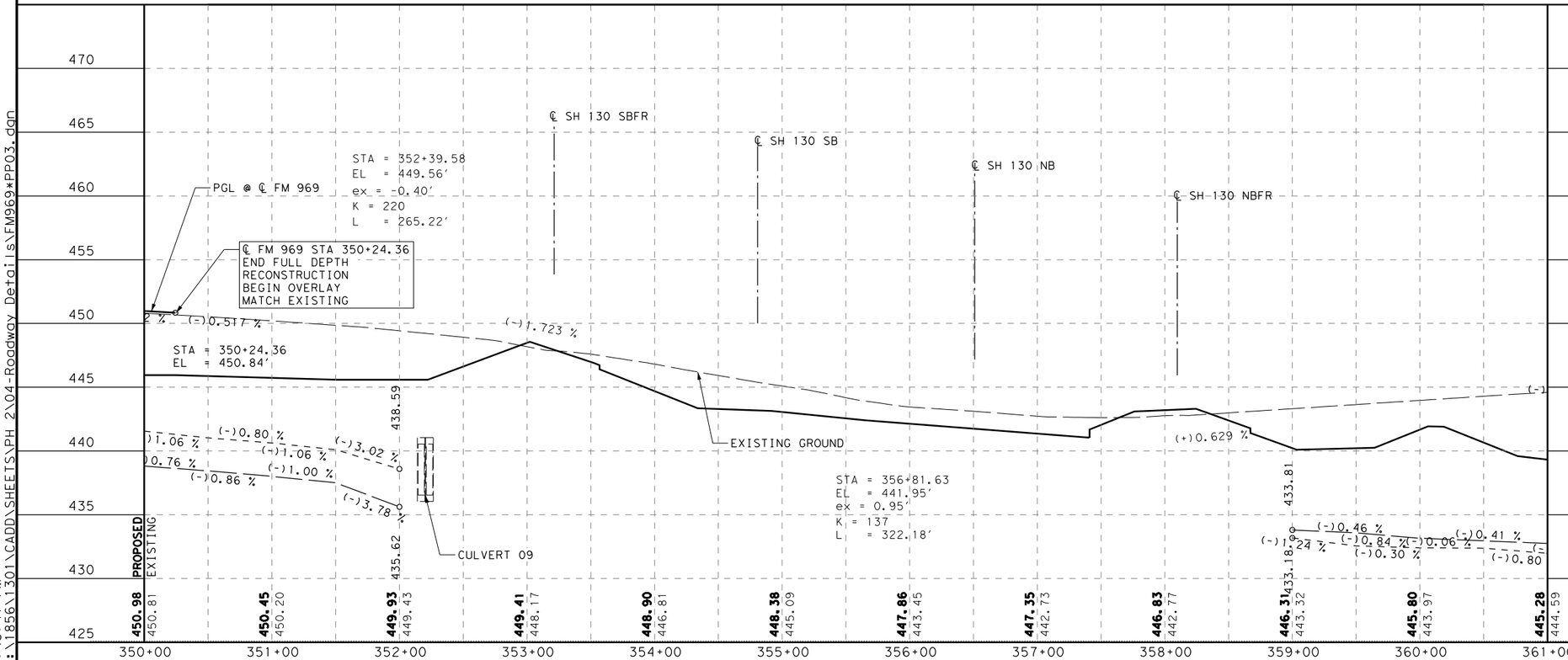
CL969-13
PI STATION = 346+99.67
DELTA = 3° 21' 10.43" (RT)
DEGREE OF CURVE = 0° 30' 58.24"
TANGENT = 324.87
LENGTH = 649.56
RADIUS = 11,100.00
PC STATION = 343+74.80
PT STATION = 350+24.36



HORZ 0' 50' 100'
VERT 0' 5' 10'
SCALE IN FEET

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- PROPOSED OVERLAY AREA
- PROPOSED CONST. EASEMENT
- PROPOSED SAWCUT
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- CL969-X — CURVE NAME
- (X) — DRIVEWAY NUMBER
- DITCH PROFILE LEFT
- DITCH PROFILE RIGHT



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FM 969
ROADWAY PLAN & PROFILE

STA 350+00 TO STA 361+00

SHEET 3 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		109
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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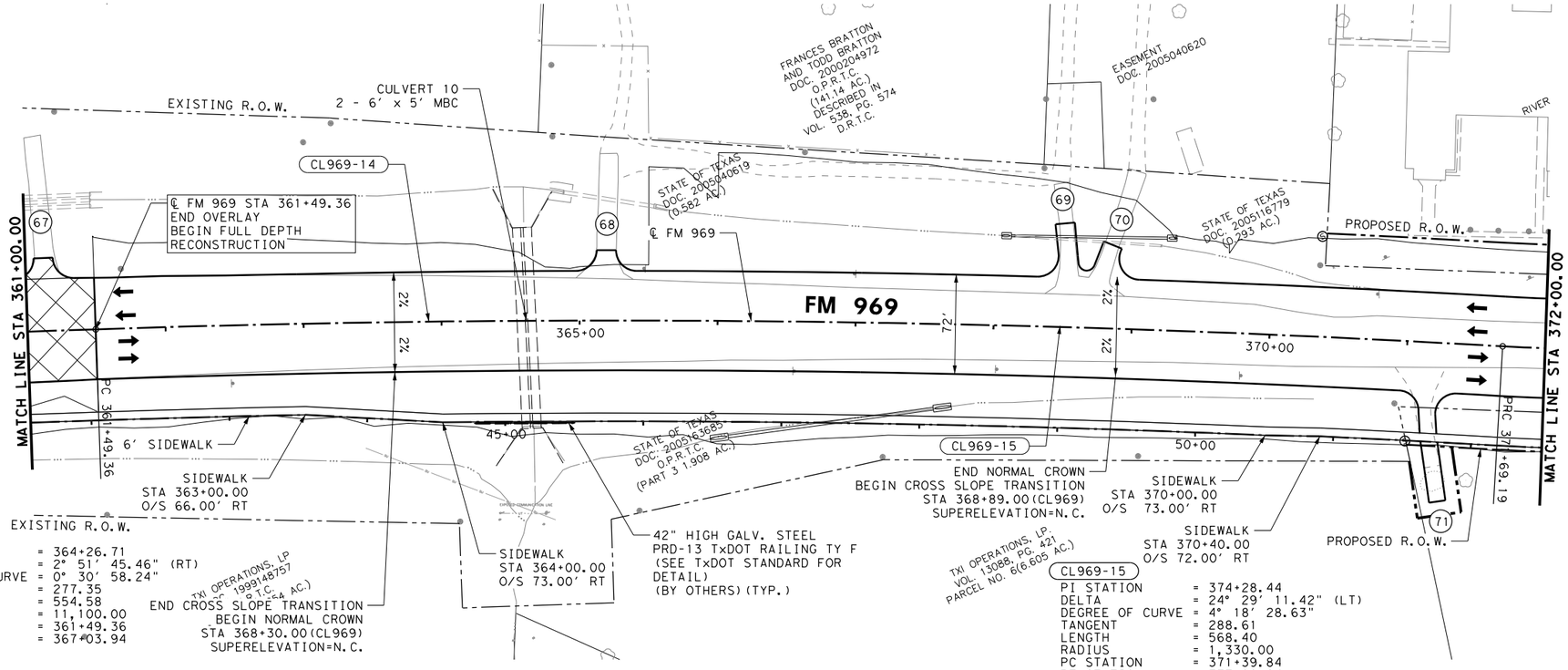
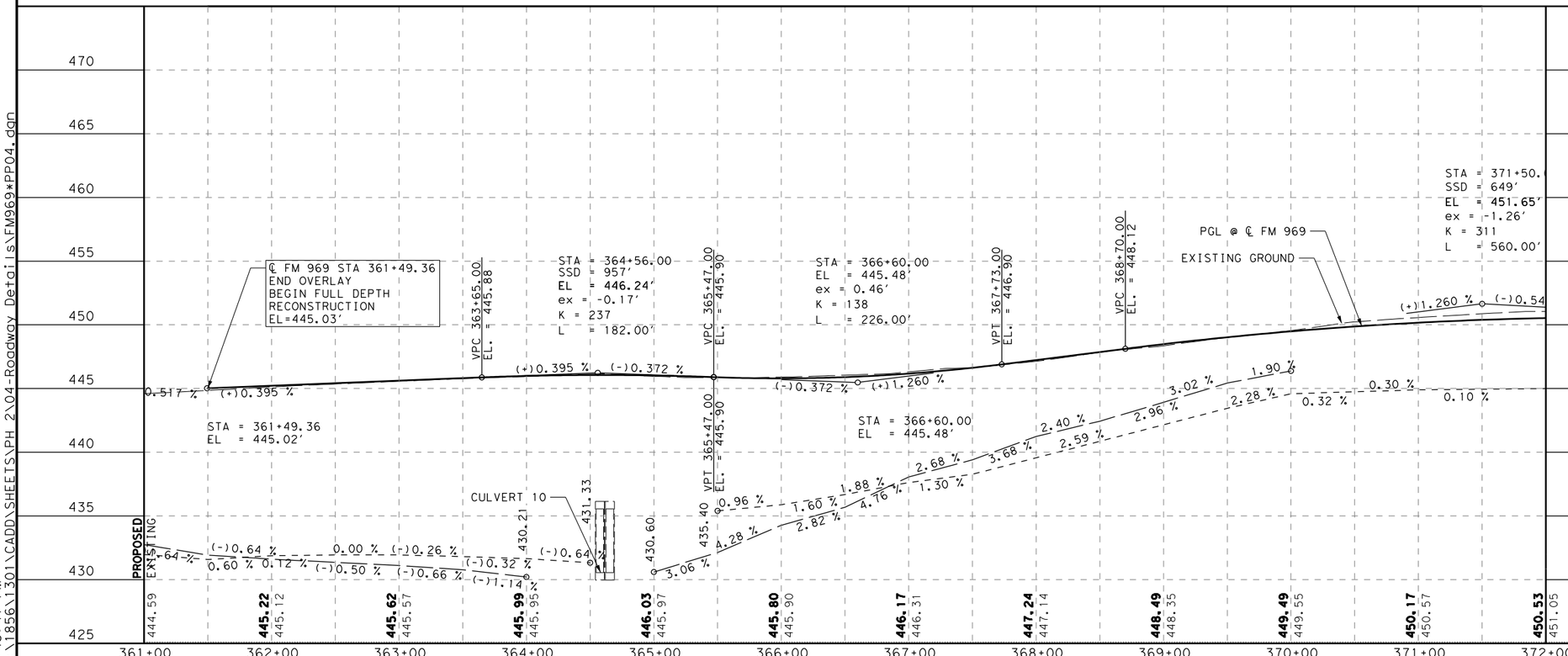


CL969-14

PI STATION	= 364+26.71
DELTA	= 2° 51′ 45.46" (RT)
DEGREE OF CURVE	= 0° 30′ 58.24"
TANGENT	= 277.35
LENGTH	= 554.58
RADIUS	= 11,100.00
PC STATION	= 361+49.36
PT STATION	= 367+03.94

CL969-15

PI STATION	= 374+28.44
DELTA	= 24° 29′ 11.42" (LT)
DEGREE OF CURVE	= 4° 18′ 28.63"
TANGENT	= 288.61
LENGTH	= 568.40
RADIUS	= 1,330.00
PC STATION	= 371+39.84
PT STATION	= 377+08.24



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FM 969
ROADWAY PLAN & PROFILE

STA 361+00 TO STA 372+00

SHEET 4 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		110
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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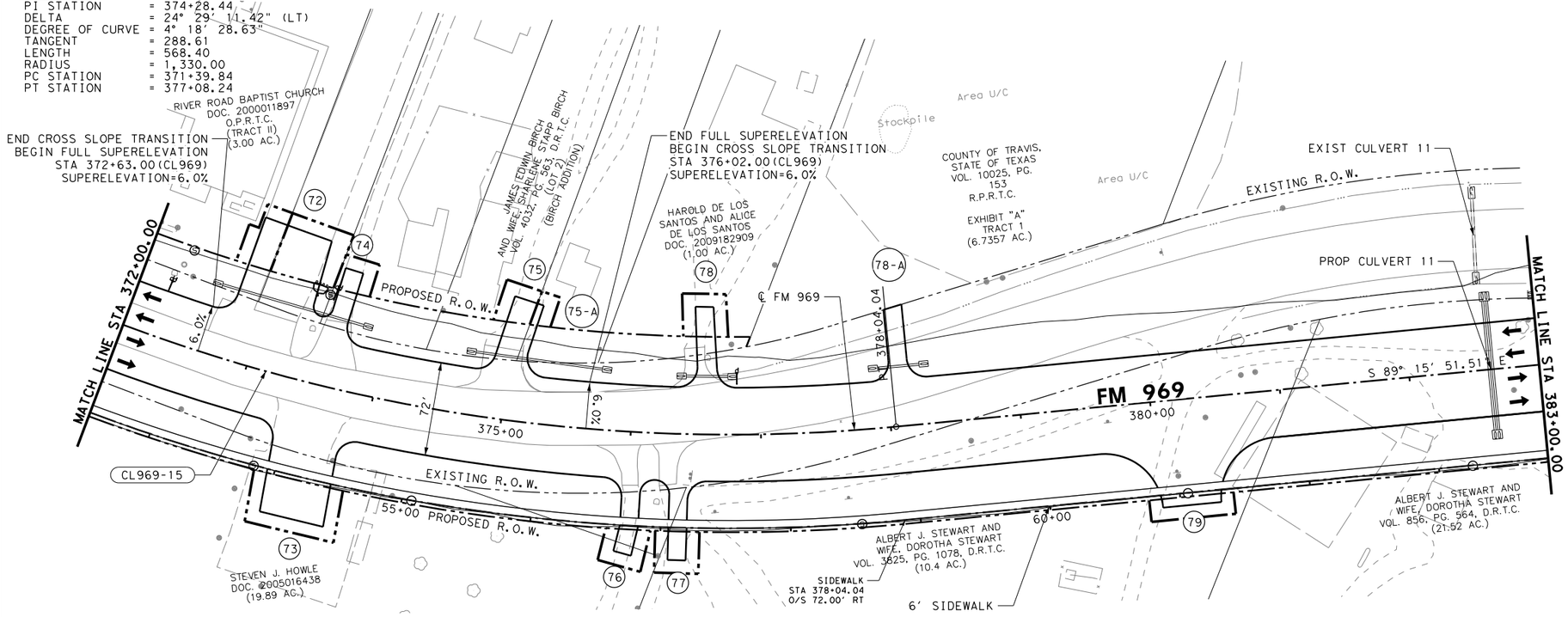
CL969-15
PI STATION = 374+28.44
DELTA = 24° 29' 11.42" (LT)
DEGREE OF CURVE = 4° 18' 28.63"
TANGENT = 288.61
LENGTH = 568.40
RADIUS = 1,330.00
PC STATION = 371+39.84
PT STATION = 377+08.24

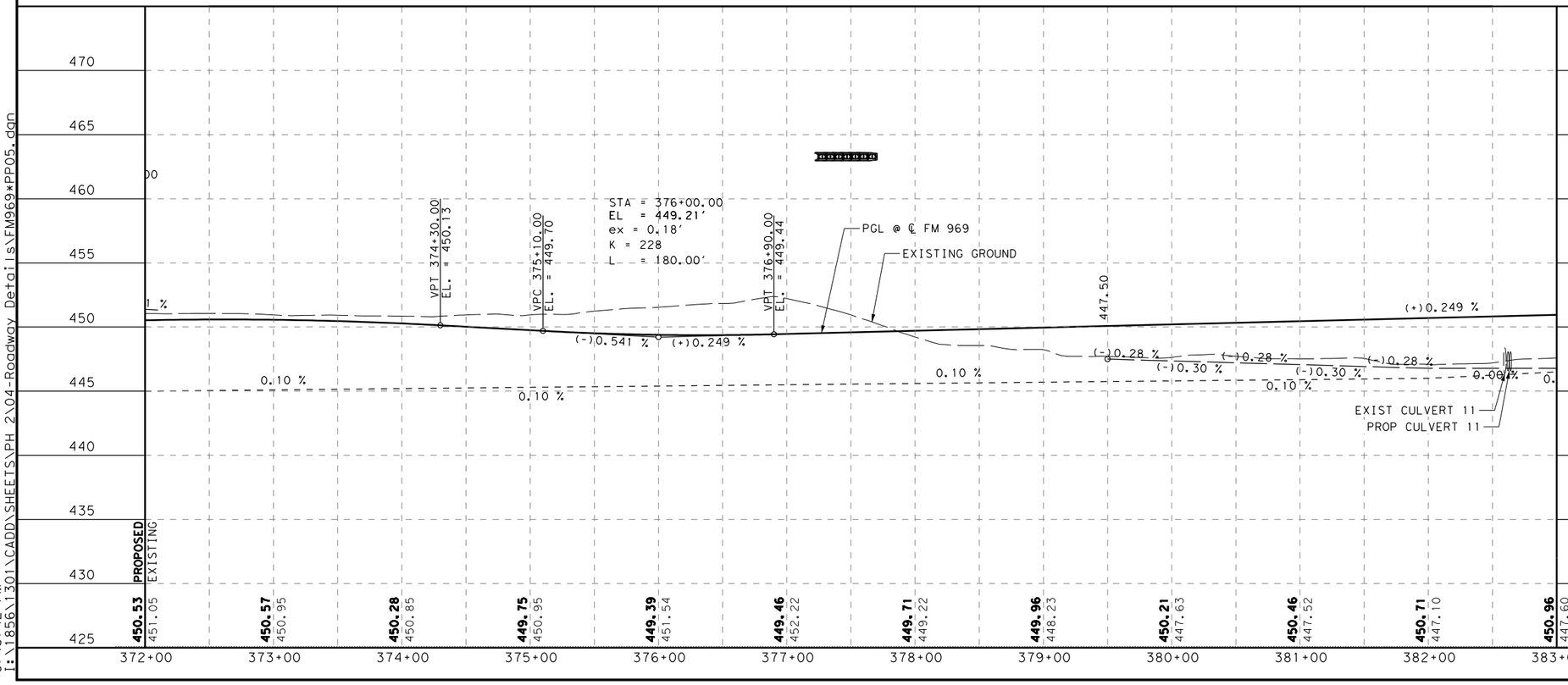


HORZ 0' 50' 100'
VERT 0' 5' 10'
SCALE IN FEET

N

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- PROPOSED OVERLAY AREA
- PROPOSED CONST. EASEMENT
- PROPOSED SAWCUT
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- CL969-X — CURVE NAME
- (X) — DRIVEWAY NUMBER
- DITCH PROFILE LEFT
- DITCH PROFILE RIGHT



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FM 969
ROADWAY PLAN & PROFILE

STA 372+00 TO STA 383+00

SHEET 5 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		111
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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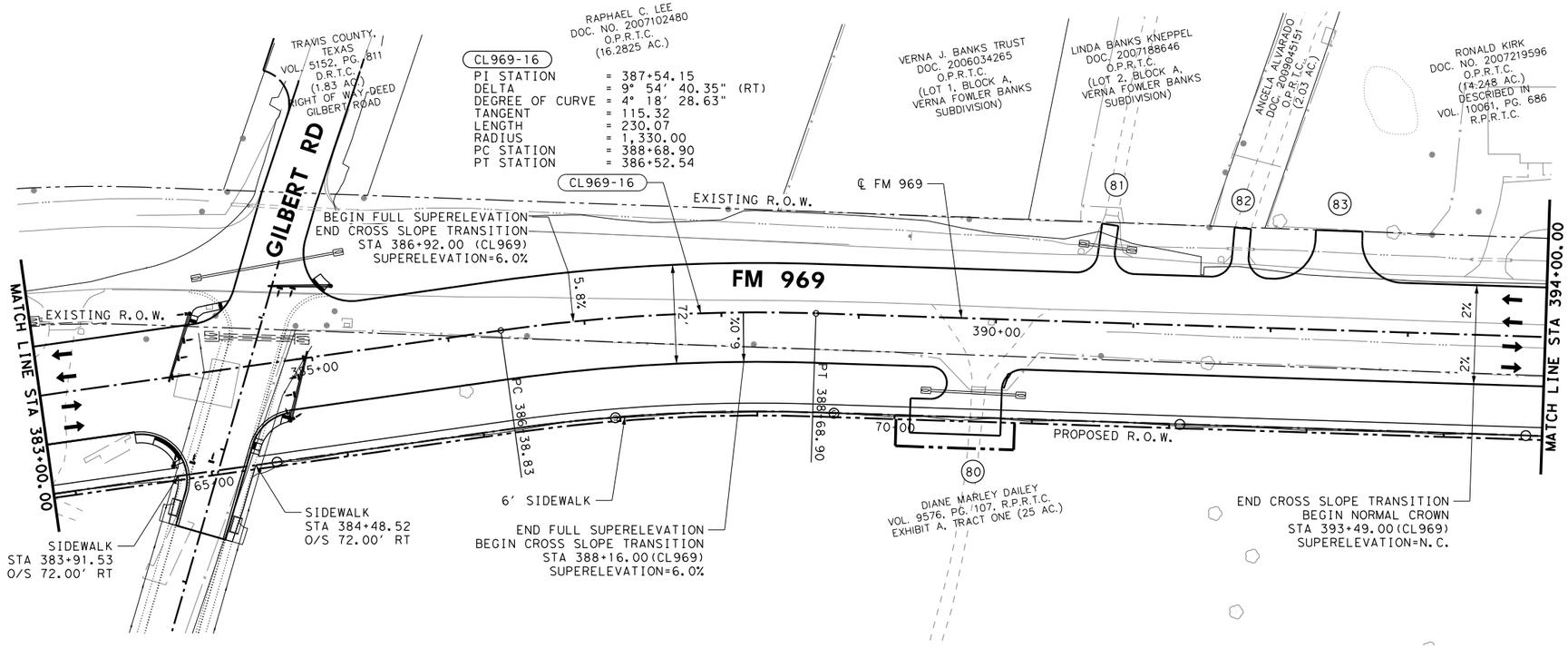

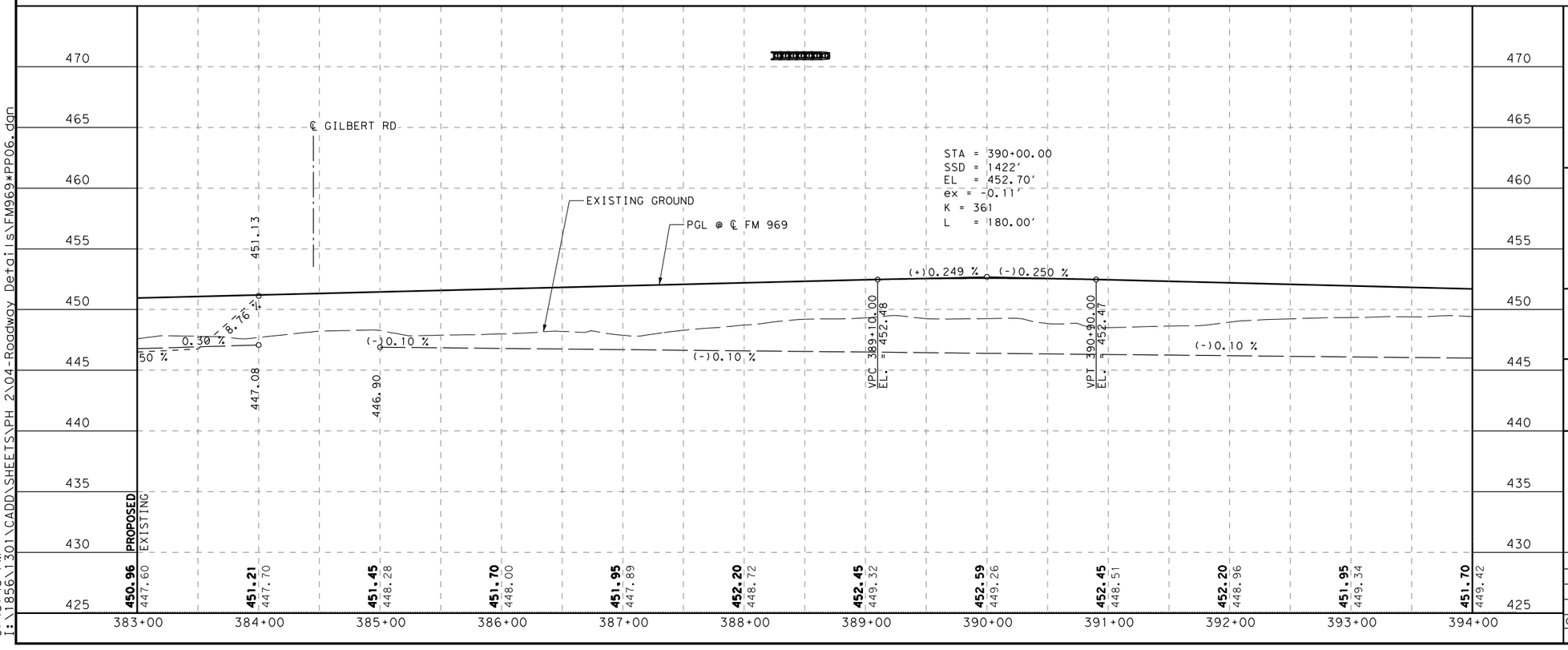

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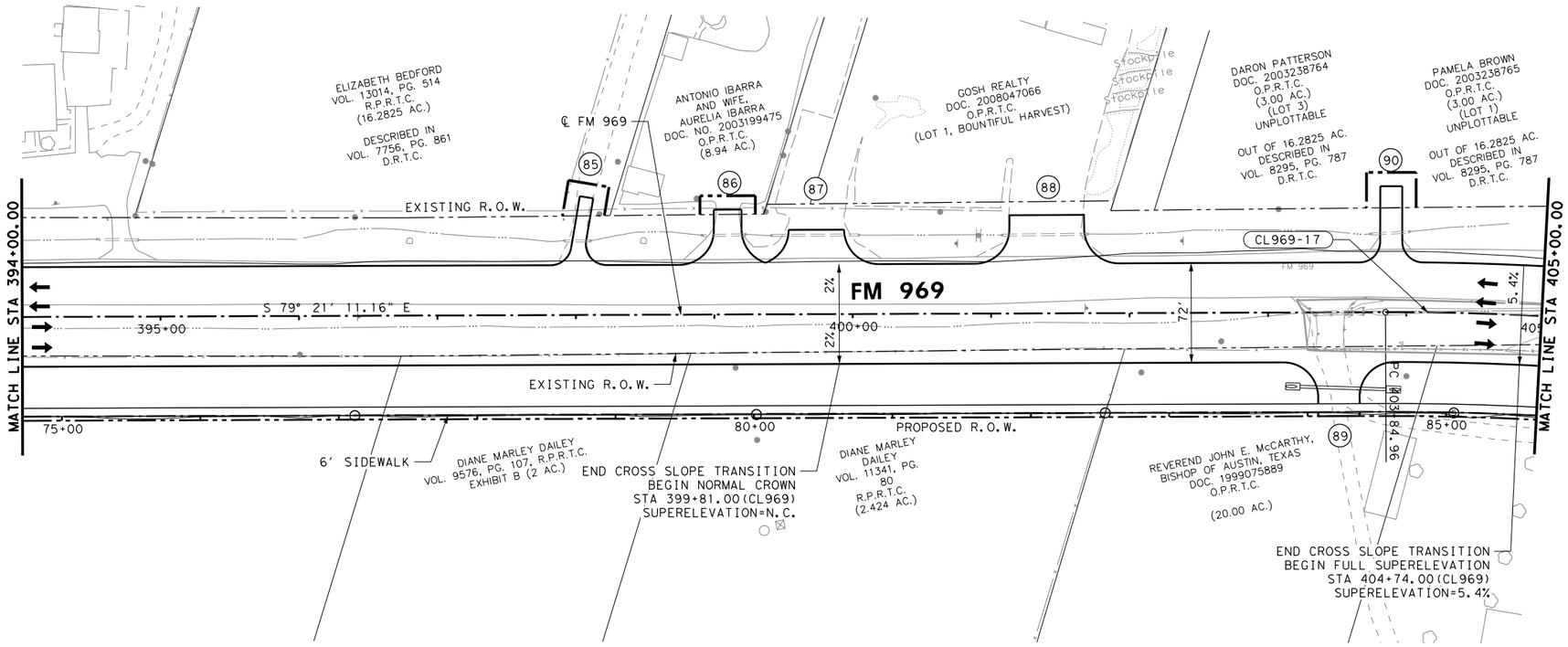
STA 383+00 TO STA 394+00

SHEET 6 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		112
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969



HORZ 0′ 50′ 100′
VERT 0′ 5′ 10′
SCALE IN FEET

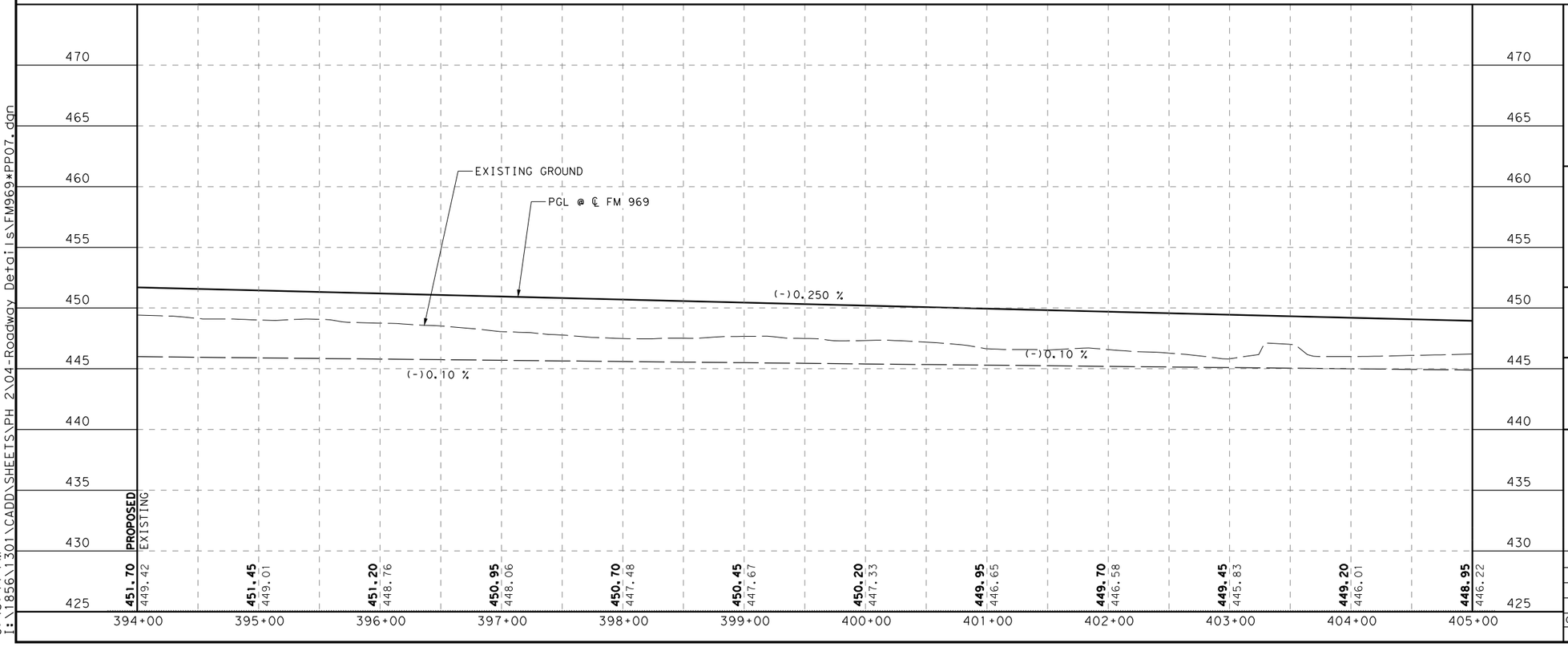
N

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- PROPOSED OVERLAY AREA
- PROPOSED CONST. EASEMENT
- PROPOSED SAWCUT
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- (CL969-X) CURVE NAME
- (X) DRIVEWAY NUMBER
- DITCH PROFILE LEFT
- DITCH PROFILE RIGHT

CL969-17

PI STATION	= 407+08.51
DELTA	= 18° 53′ 47.99" (RT)
DEGREE OF CURVE	= 2° 51′ 53.24"
TANGENT	= 332.83
LENGTH	= 659.62
RADIUS	= 2,000.00
PC STATION	= 403+75.68
PT STATION	= 410+35.30



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FM 969
ROADWAY PLAN & PROFILE

STA 394+00 TO STA 405+00

SHEET 7 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		113
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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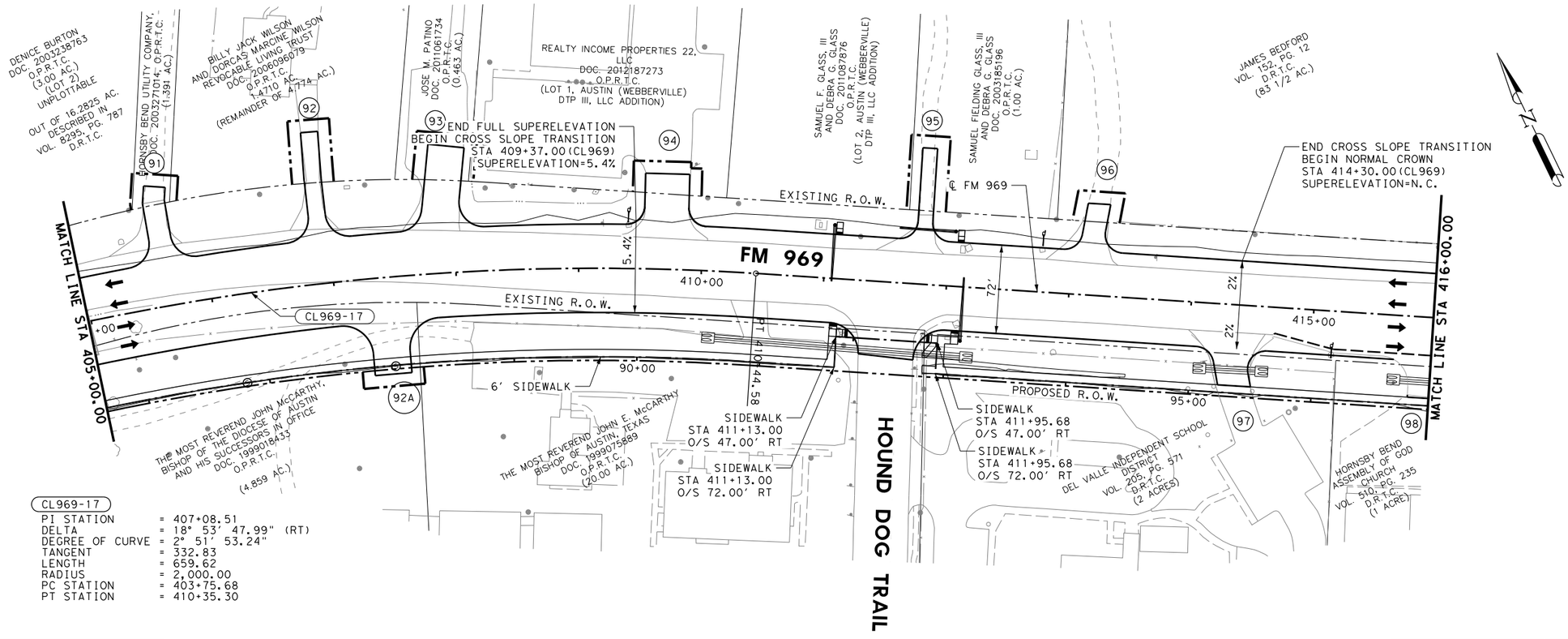


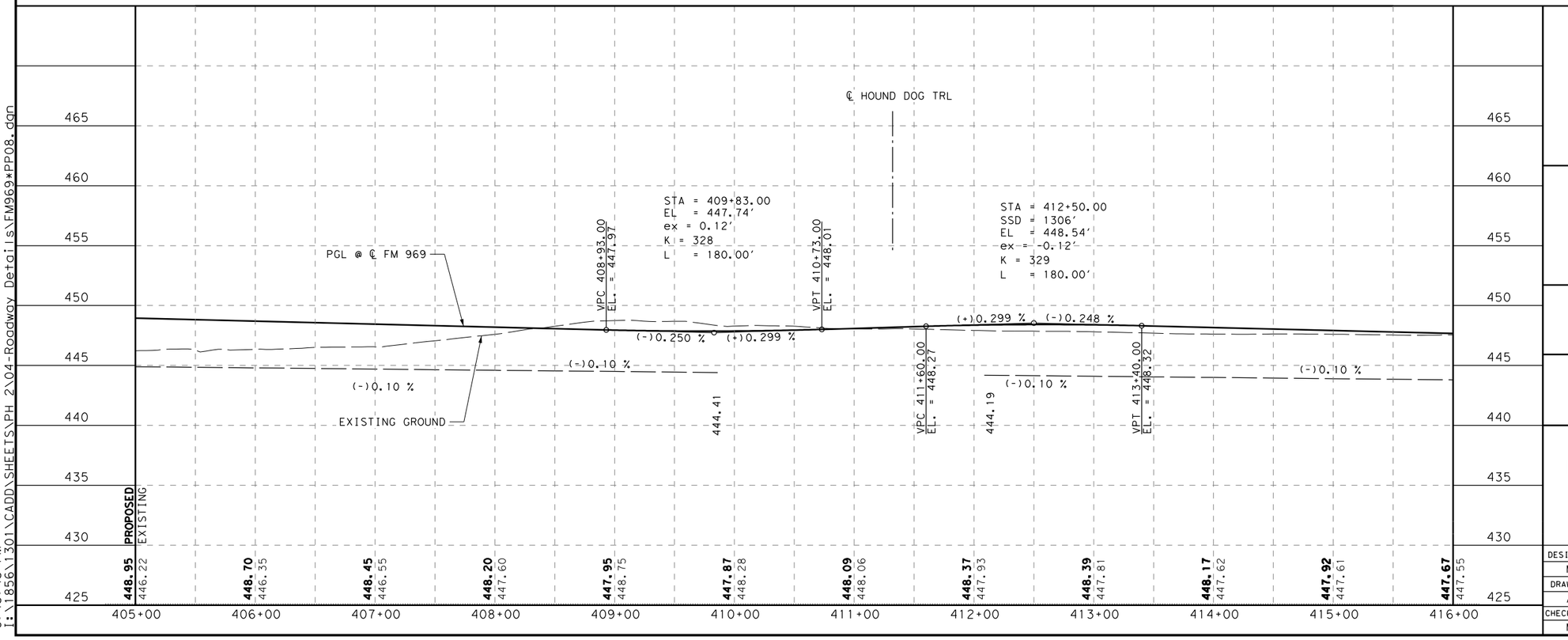
CL969-17

PI STATION	=	407+08.51
DELTA	=	18° 53' 47.99" (RT)
DEGREE OF CURVE	=	2° 51' 53.24"
TANGENT	=	332.83
LENGTH	=	659.62
RADIUS	=	2,000.00
PC STATION	=	403+75.68
PT STATION	=	410+35.30

HORZ 0' 50' 100'
VERT 0' 5' 10'
SCALE IN FEET

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- PROPOSED OVERLAY AREA
- PROPOSED CONST. EASEMENT
- PROPOSED SAWCUT
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- (CL969-X) CURVE NAME
- (X) DRIVEWAY NUMBER
- DITCH PROFILE LEFT
- DITCH PROFILE RIGHT



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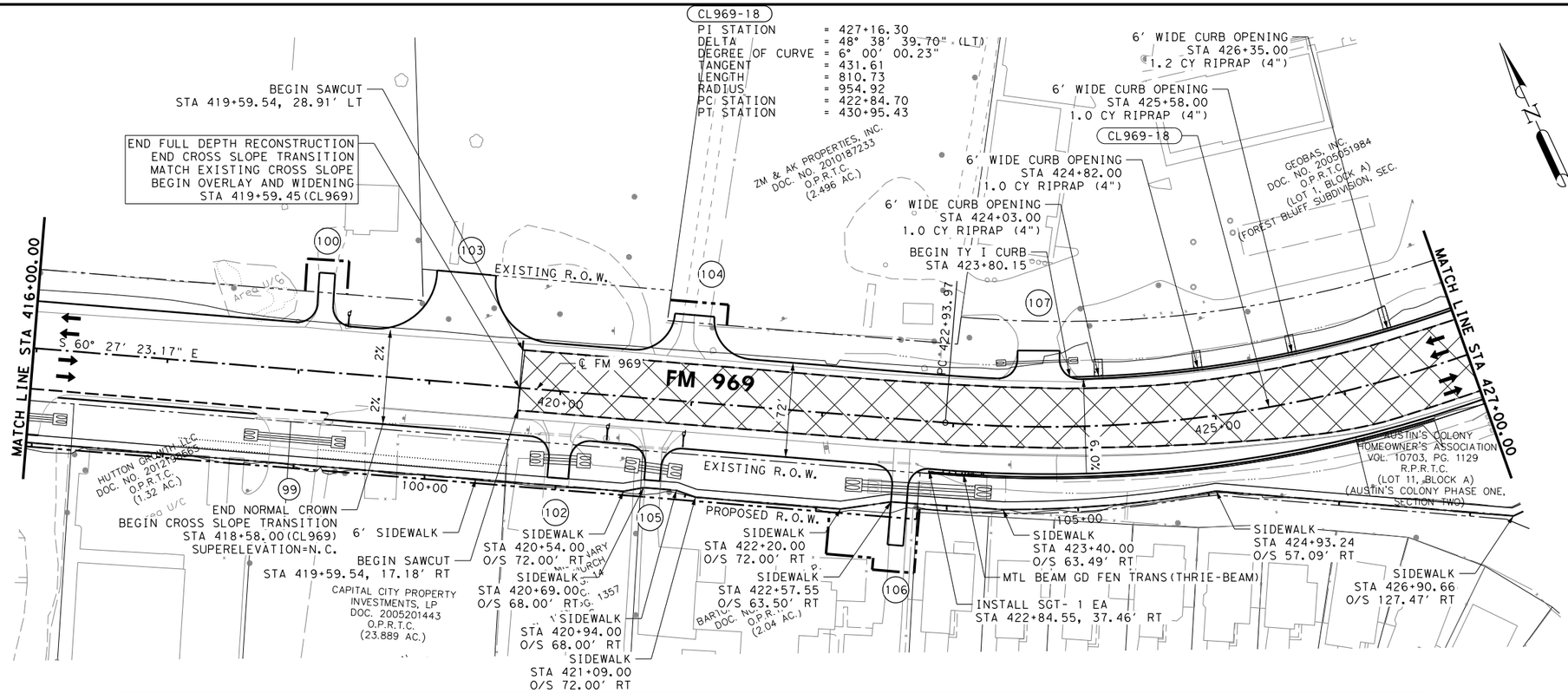
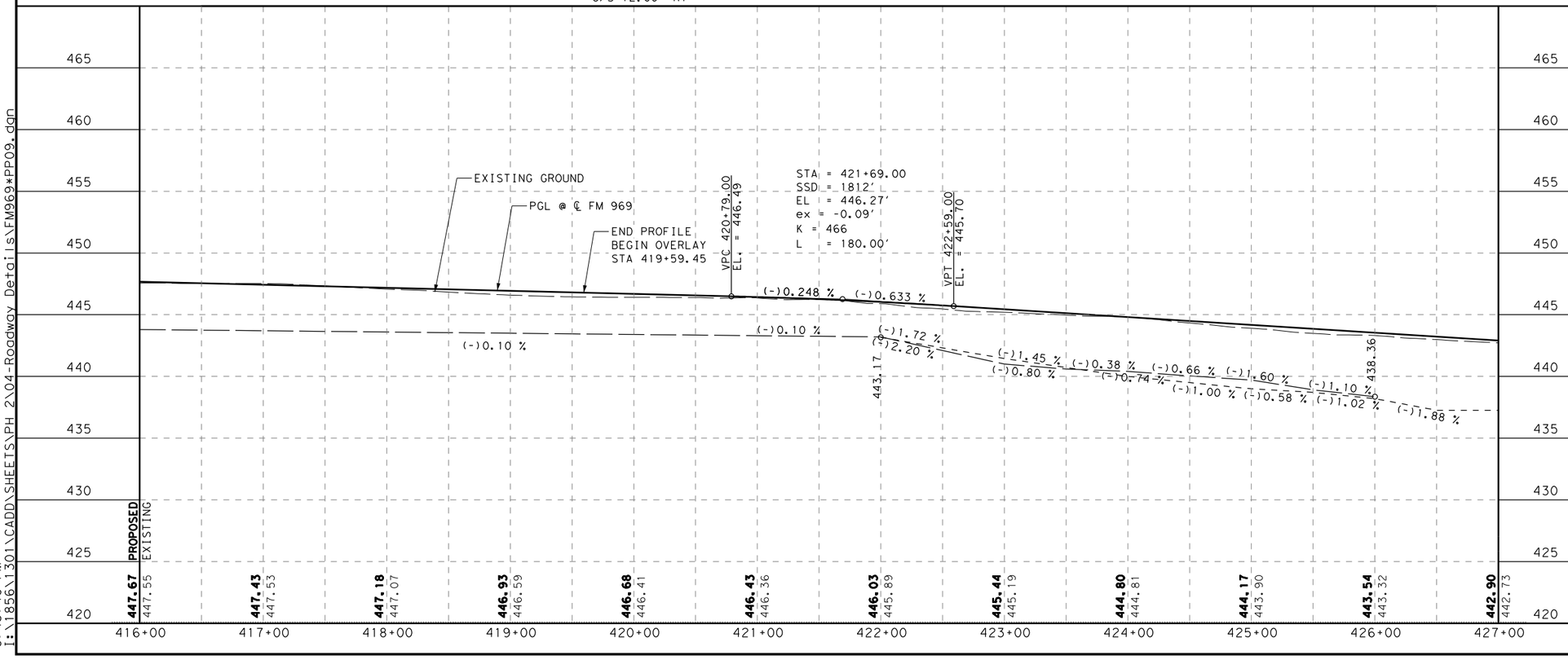
FM 969
ROADWAY PLAN & PROFILE

STA 405+00 TO STA 416+00

SHEET 8 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		114
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969





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FM 969
ROADWAY PLAN & PROFILE

STA 416+00 TO STA 427+00

SHEET 9 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		115
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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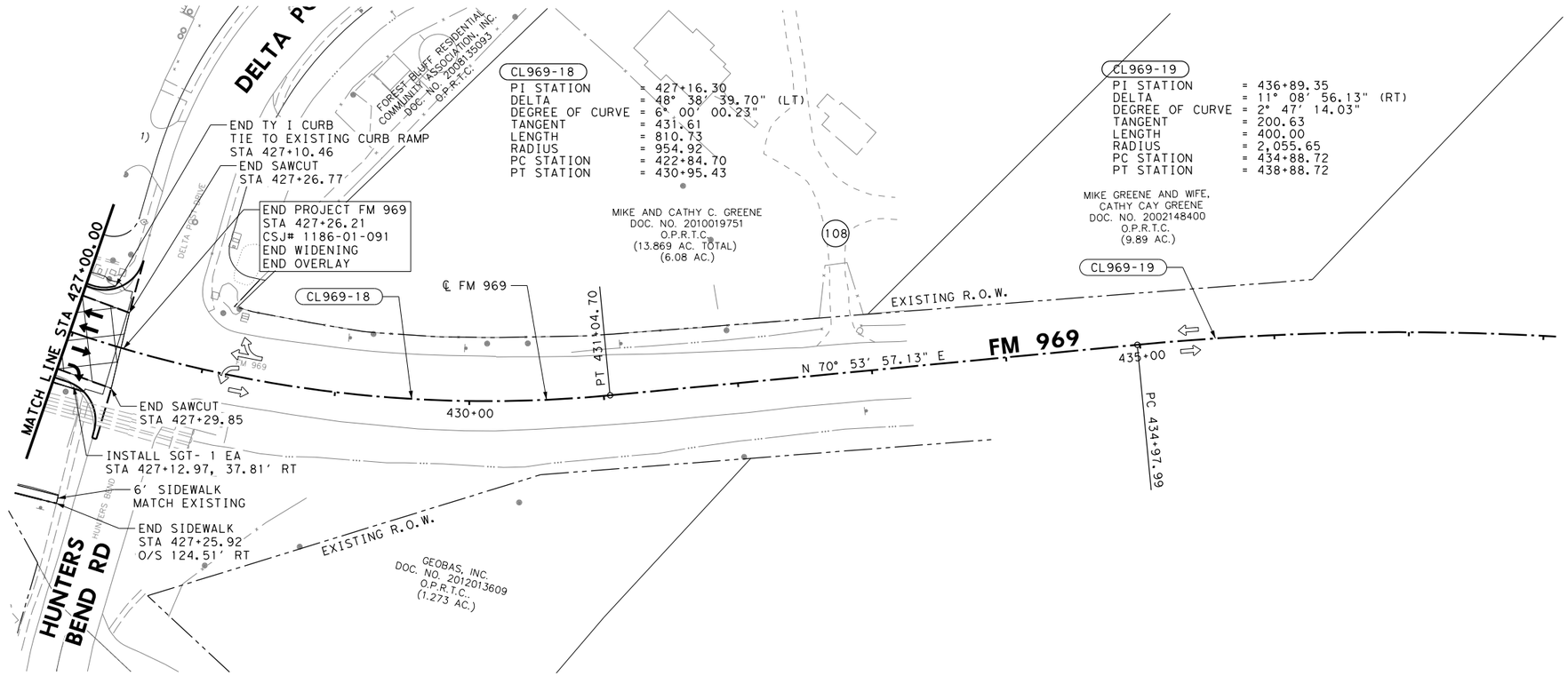

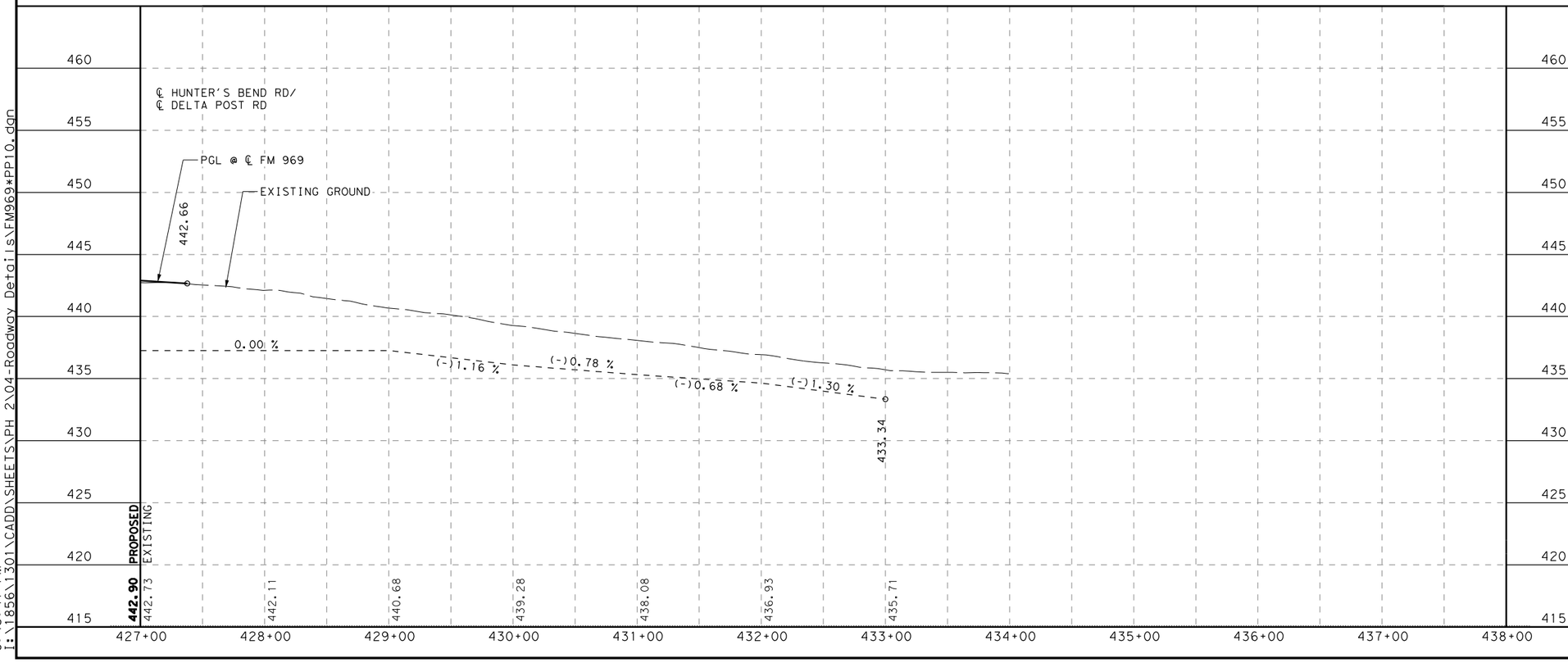

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FM 969
ROADWAY PLAN & PROFILE

STA 427+00 TO END

SHEET 10 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		116
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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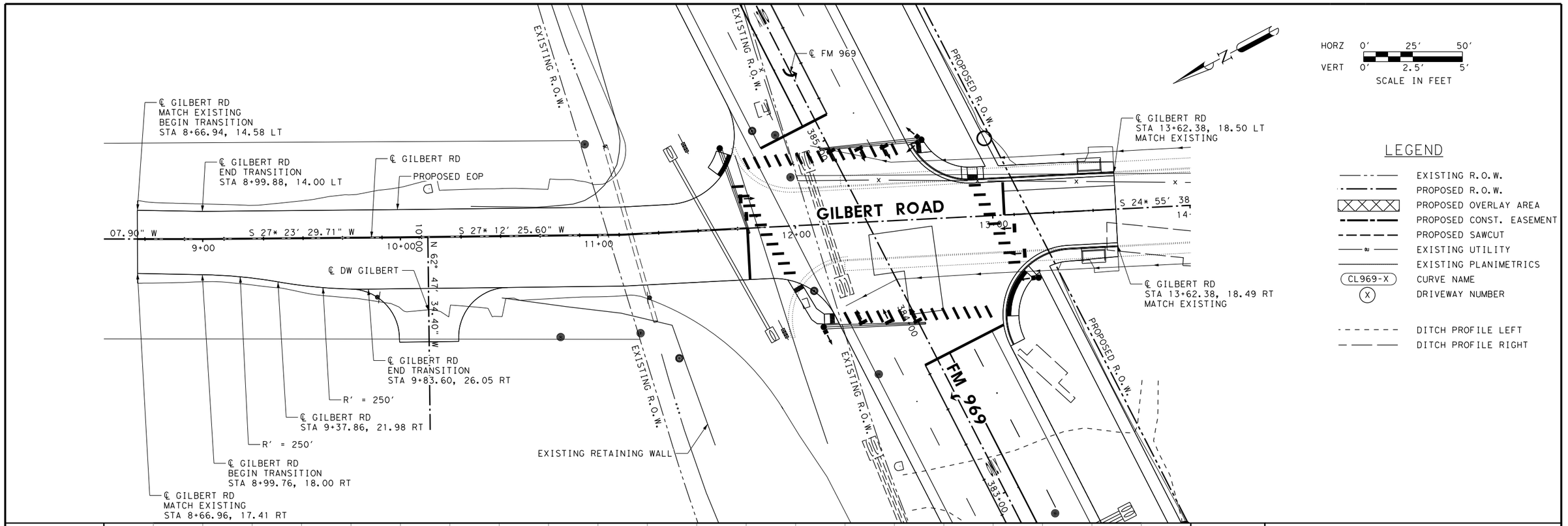

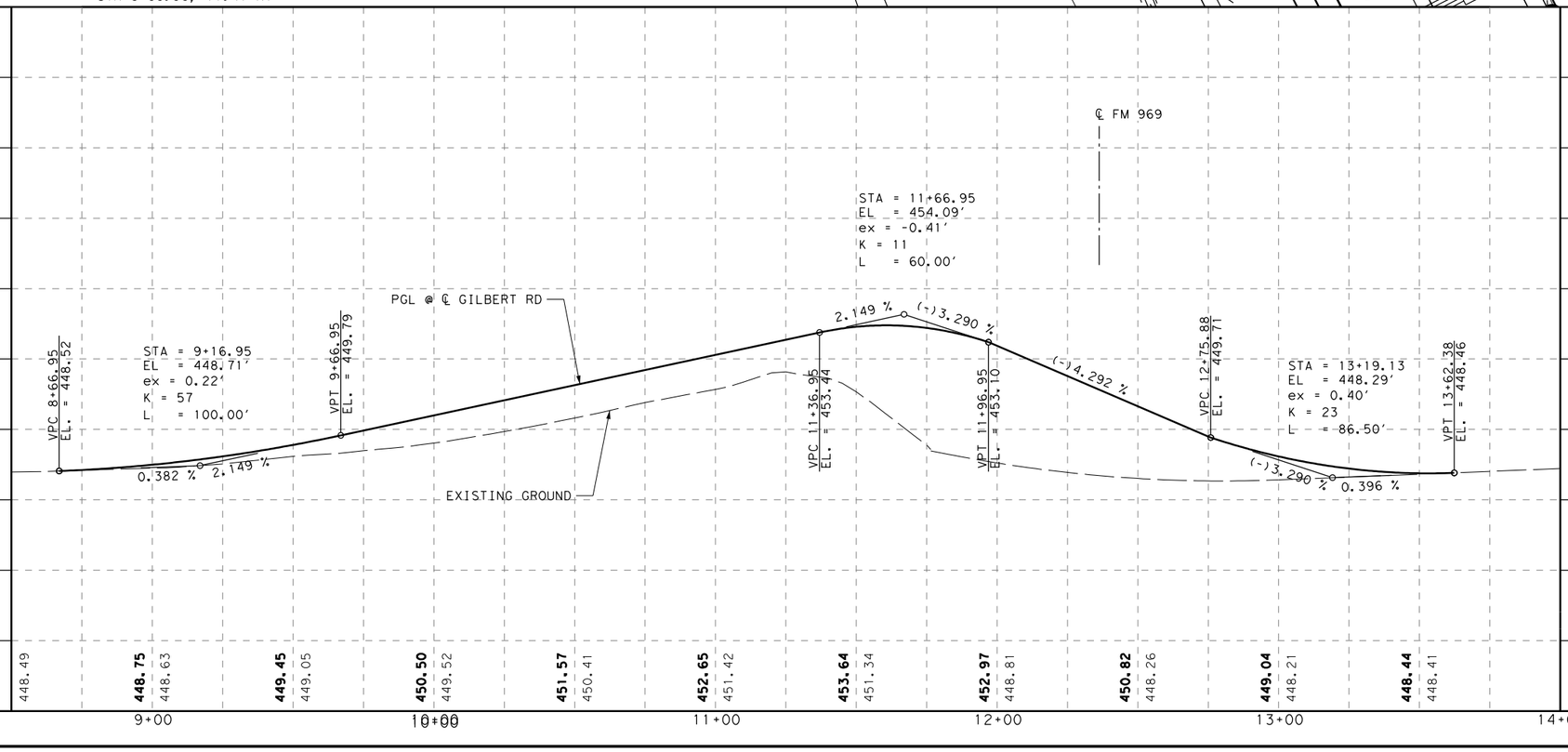

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FM 969
GILBERT RD PLAN & PROFILE

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		117
DRAWN BY:	STATE	DIST. NO.	COUNTY	
MD	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

6/25/2021
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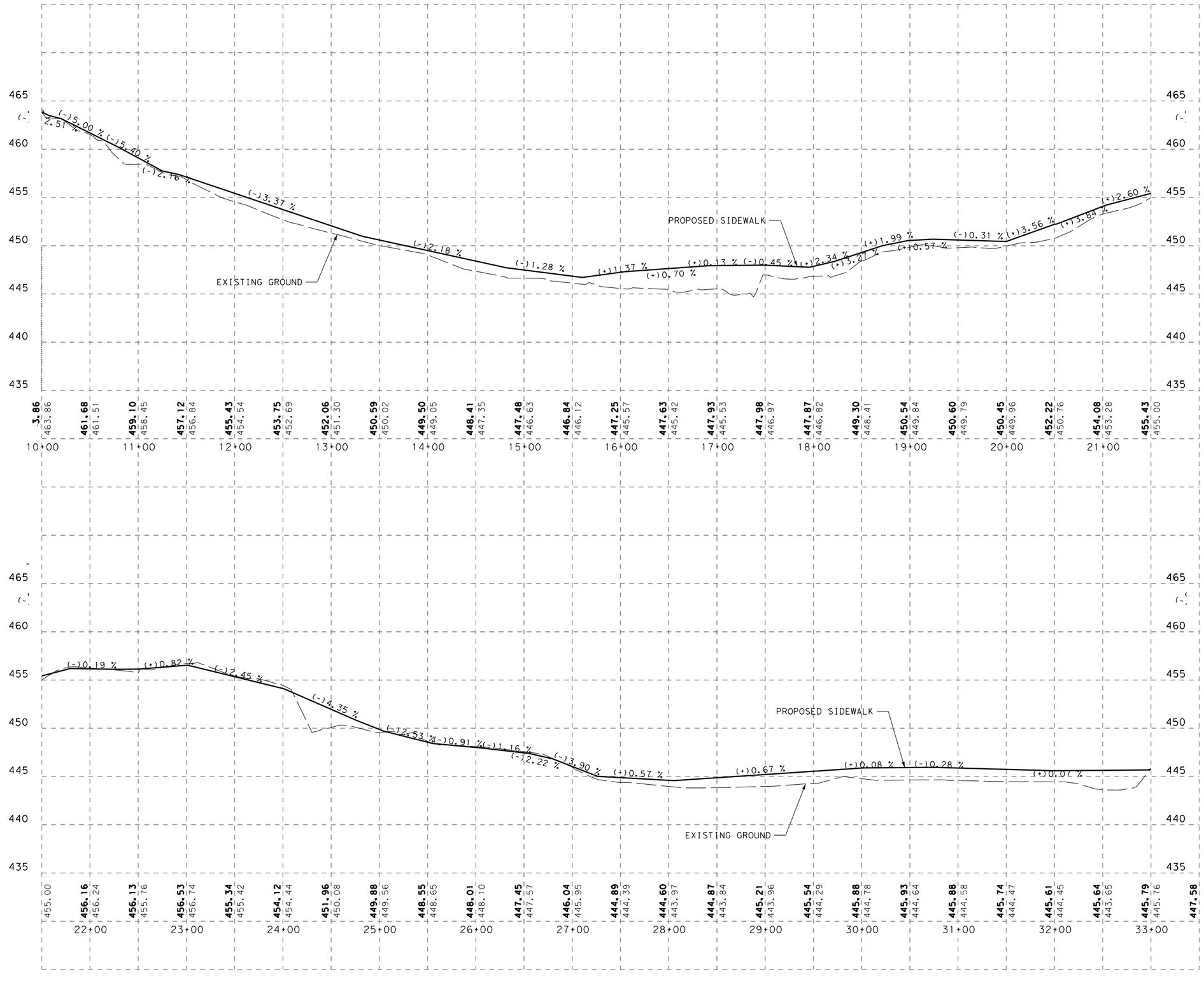

HORZ 0′ 50′ 100′
VERT 0′ 5′ 10′
SCALE IN FEET

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FM 969
SIDEWALK PROFILE

SHEET 1 OF 5

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		118
DRAWN BY:	STATE	DIST. NO.	COUNTY	
MD	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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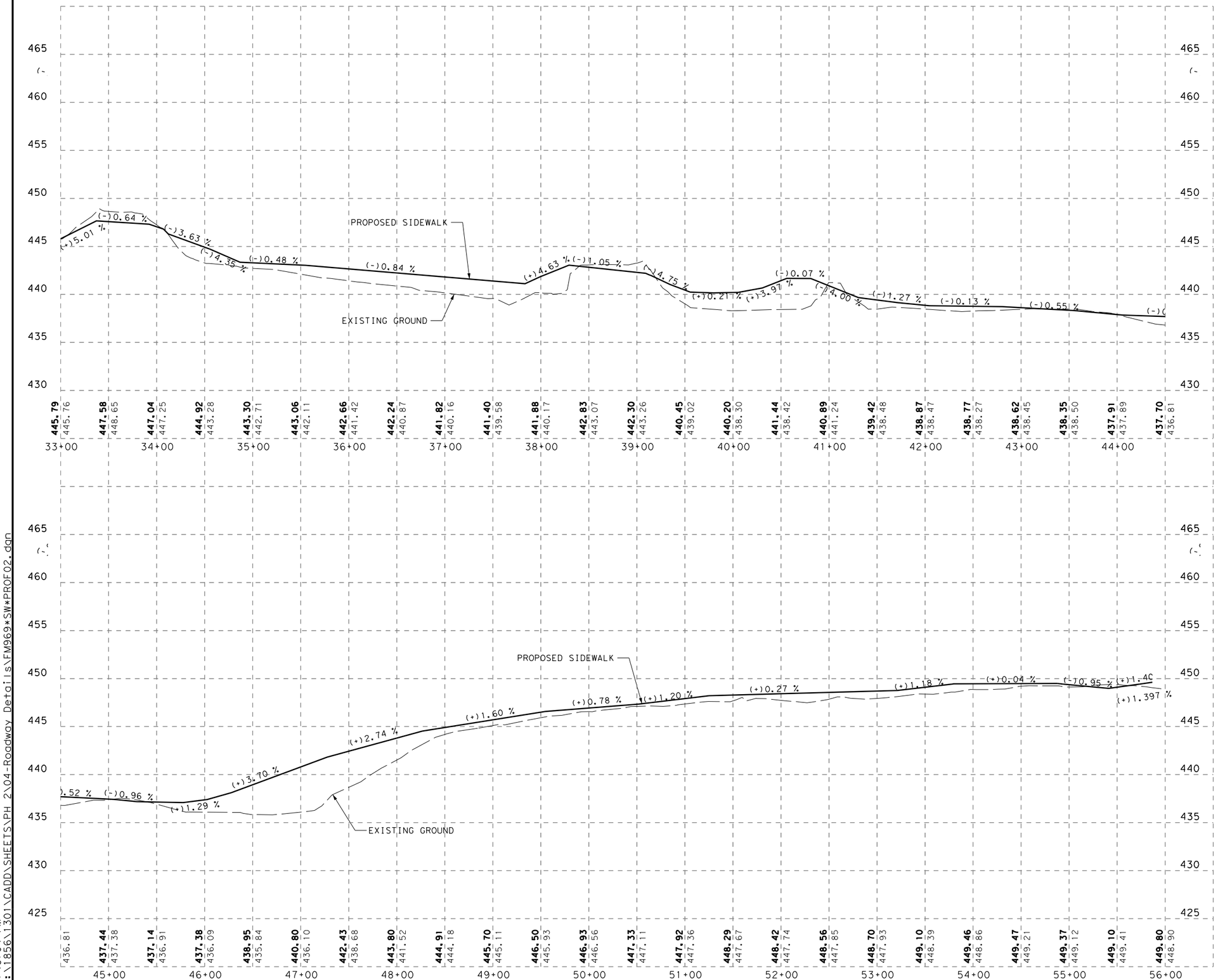

HORZ 0' 50' 100'
VERT 0' 5' 10'
SCALE IN FEET

STATE OF TEXAS
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88202
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6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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LJA Engineering, Inc.
FRN - F-1386

FM 969
SIDEWALK PROFILE

SHEET 2 OF 5

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		119
DRAWN BY:	STATE	DIST. NO.	COUNTY	
MD	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

6/25/2021
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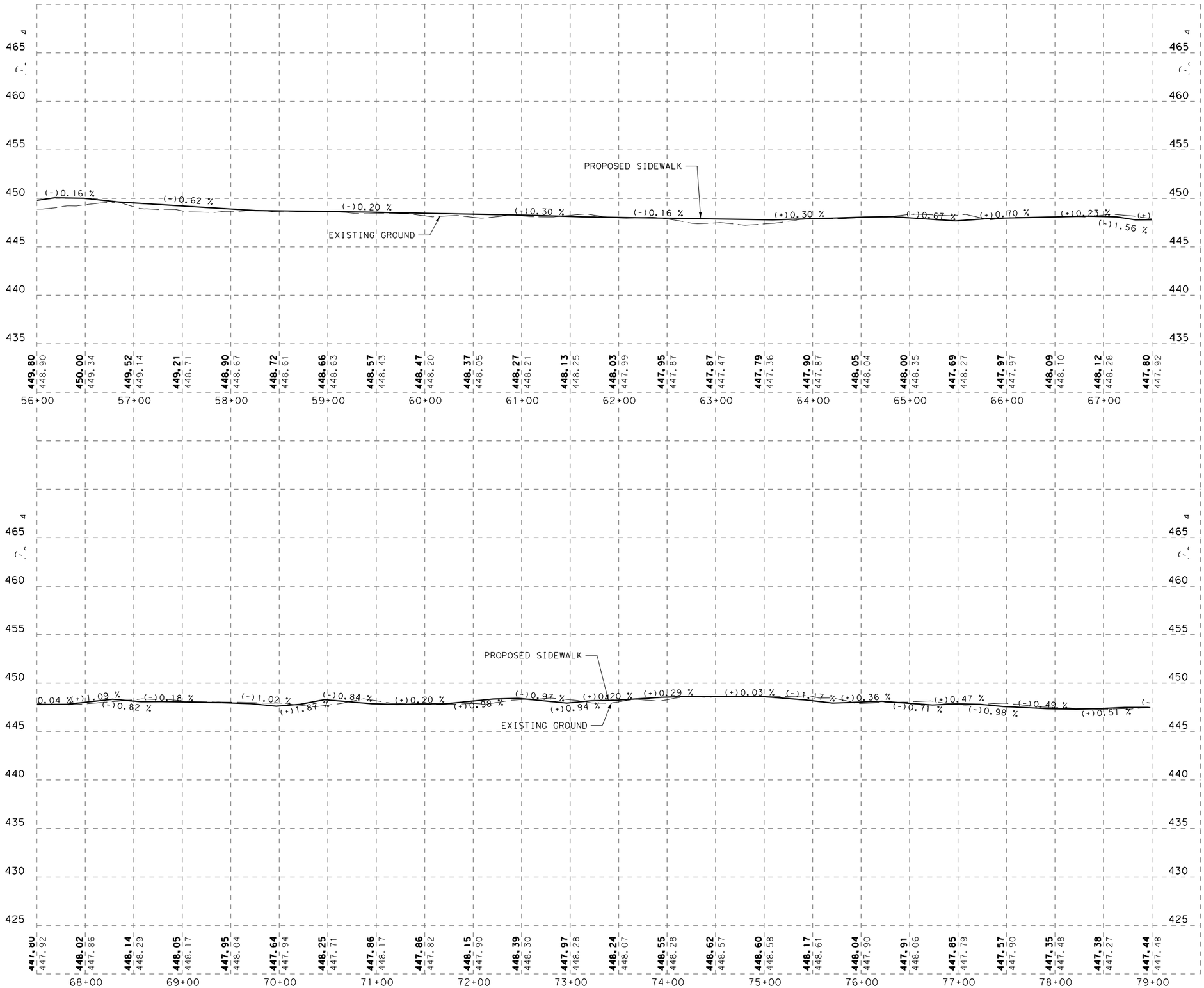

HORZ 0′ 50′ 100′
VERT 0′ 5′ 10′
SCALE IN FEET

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
SIDEWALK PROFILE

SHEET 3 OF 5

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		120
DRAWN BY:	STATE	DIST. NO.	COUNTY	
MD	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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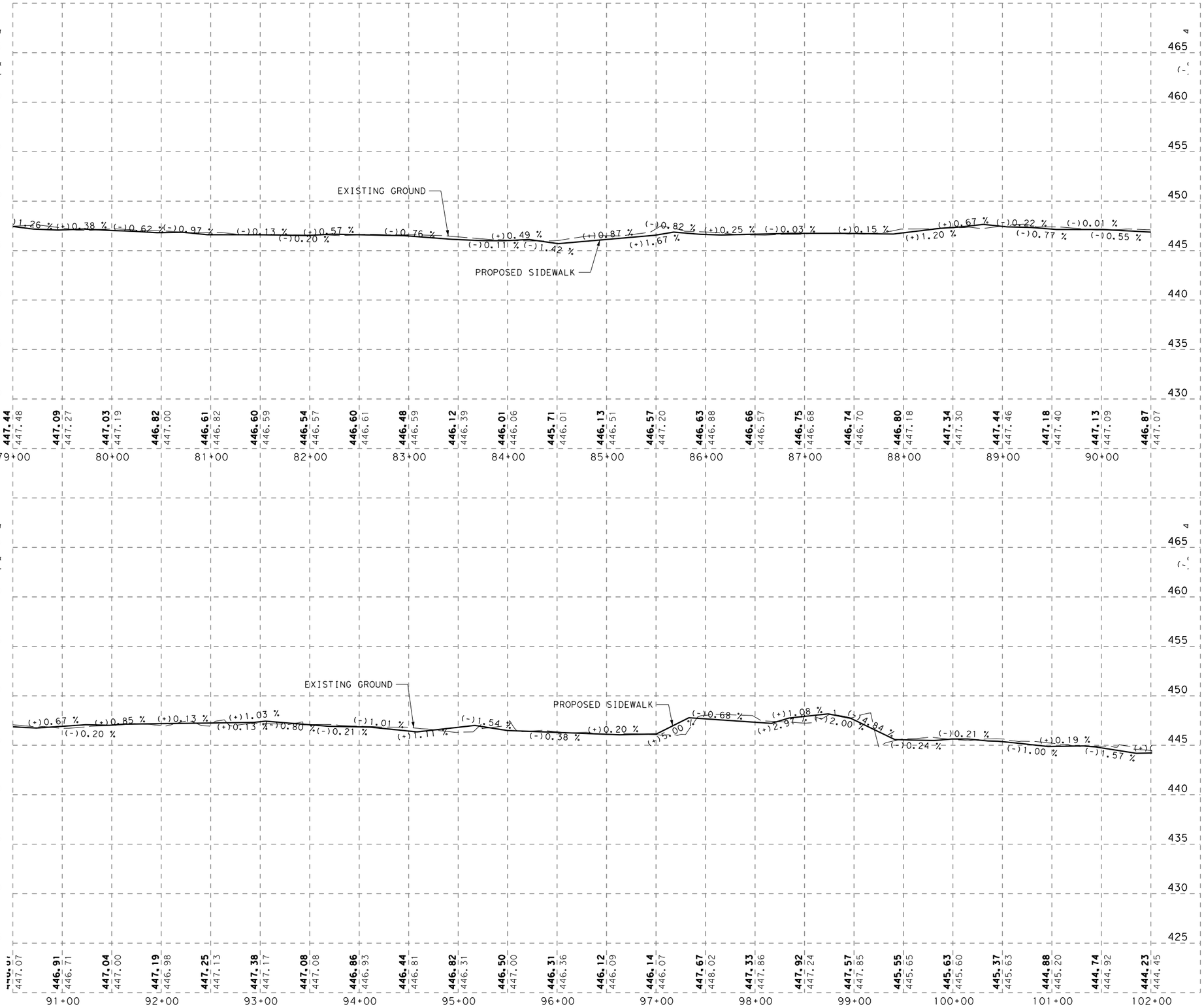

HORZ 0′ 50′ 100′
VERT 0′ 5′ 10′
SCALE IN FEET

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

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FM 969
SIDEWALK PROFILE

SHEET 4 OF 5

DESIGN BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		121
DRAWN BY:	STATE	DIST. NO.	COUNTY	
MD	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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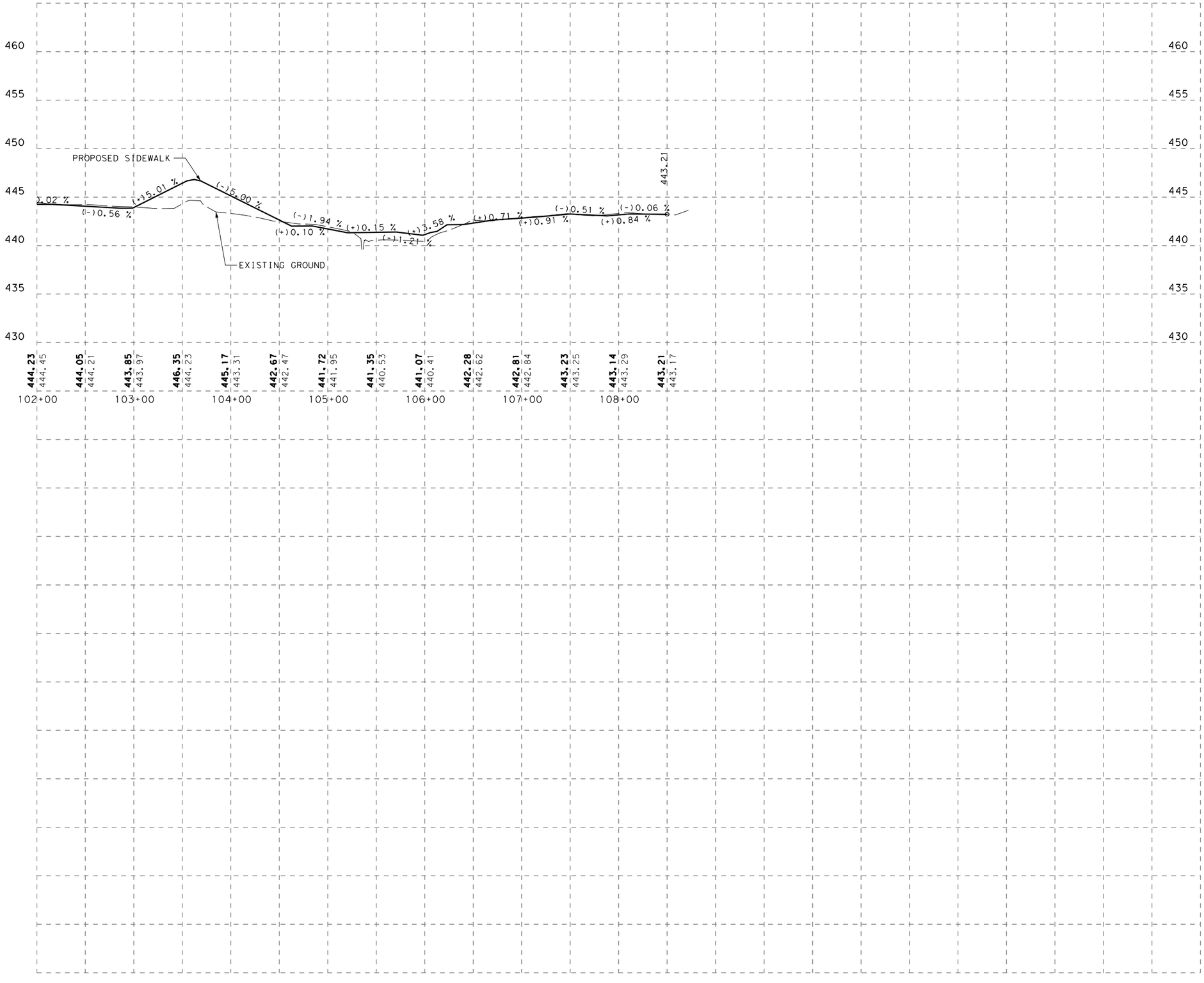

HORZ 0′ 50′ 100′
VERT 0′ 5′ 10′
SCALE IN FEET

STATE OF TEXAS
MAEN A. HOURANI
88202
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PROFESSIONAL ENGINEER

6/25/2021

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STATE OF TEXAS

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FM 969
SIDEWALK PROFILE

SHEET 5 OF 5

DESIGN BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		122
DRAWN BY:	STATE	DIST. NO.	COUNTY	
MD	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

6/25/2021
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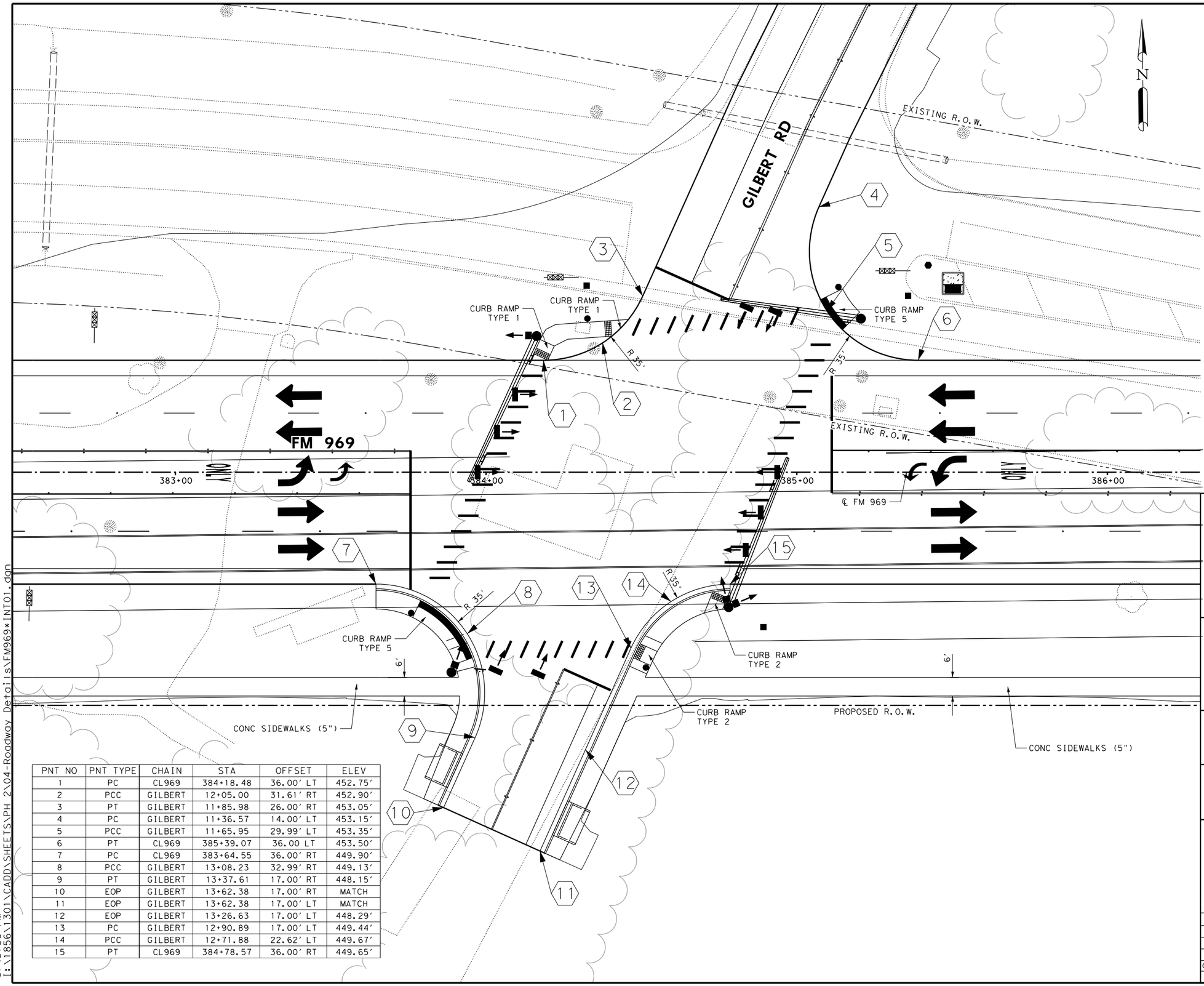

SCALE: 1" = 30'

30 15 0 30

LEGEND

- EXISTING R.O.W.
- PROPOSED CONST. EASEMENT
- PROPOSED SAWCUT
- EXISTING PLANIMETRICS
- EXISTING CONTOUR
- PROPOSED CONTOUR
- (X) POINT NUMBER

NOTES:

1. SEE PLAN AND PROFILE SHEETS FOR FURTHER INFORMATION.
2. POINTS SHOWN ARE AT CRITICAL POINTS (PC,PT, ETC.) UNLESS OTHERWISE NOTED.
3. STATIONS, OFFSETS, AND RADII ARE MEASURED FROM EDGE OF PAVEMENT AND LIP OF GUTTER.

PNT NO	PNT TYPE	CHAIN	STA	OFFSET	ELEV
1	PC	CL969	384+18.48	36.00' LT	452.75'
2	PCC	GILBERT	12+05.00	31.61' RT	452.90'
3	PT	GILBERT	11+85.98	26.00' RT	453.05'
4	PC	GILBERT	11+36.57	14.00' LT	453.15'
5	PCC	GILBERT	11+65.95	29.99' LT	453.35'
6	PT	CL969	385+39.07	36.00 LT	453.50'
7	PC	CL969	383+64.55	36.00' RT	449.90'
8	PCC	GILBERT	13+08.23	32.99' RT	449.13'
9	PT	GILBERT	13+37.61	17.00' RT	448.15'
10	EOP	GILBERT	13+62.38	17.00' RT	MATCH
11	EOP	GILBERT	13+62.38	17.00' LT	MATCH
12	EOP	GILBERT	13+26.63	17.00' LT	448.29'
13	PC	GILBERT	12+90.89	17.00' LT	449.44'
14	PCC	GILBERT	12+71.88	22.62' LT	449.67'
15	PT	CL969	384+78.57	36.00' RT	449.65'

STATE OF TEXAS
MAEN A. HOURANI
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6/25/2021

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STATE OF TEXAS

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FRN - F-1386

FM 969
GRADING PLAN
GILBERT ROAD

SHEET 1 OF 3

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		123
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	090	FM 969

6/25/2021
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PNT NO	PNT TYPE	CHAIN	STA	OFFSET	ELEV
1	EOP	CL969	409+57.74	77.77' LT	MATCH
2	EOP	CL969	409+70.51	77.73' LT	MATCH
3	EOP	CL969	409+87.84	77.81' LT	MATCH
4	EOP	CL969	409+87.95	64.61' LT	452.02'
5	PC	CL969	409+88.07	50.81' LT	451.38'
6	PCC	CL969	409+92.38	40.33' LT	450.87'
7	PT	CL969	410+02.69	36.00' LT	450.81'
8	PC	CL969	411+58.68	36.00' LT	449.46'
9	PCC	CL969	411+69.28	40.39' LT	449.46'
10	PT	CL969	411+73.68	51.00' LT	449.63'
11	EOP	CL969	411+73.68	81.00' LT	450.18'
12	EOP	CL969	411+73.68	111.00' LT	MATCH
13	EOP	CL969	411+79.68	111.00' LT	MATCH
14	EOP	CL969	411+85.68	111.00' LT	MATCH
15	EOP	CL969	411+85.68	81.00' LT	450.01'
16	PC	CL969	411+85.68	51.00' LT	449.51'
17	PCC	CL969	411+90.07	40.39' LT	449.30'

PNT NO	PNT TYPE	CHAIN	STA	OFFSET	ELEV
18	PT	CL969	412+00.68	36.00' LT	449.15'
19	PC	CL969	412+93.06	36.00' LT	448.45'
20	PCC	CL969	413+02.98	39.75' LT	448.40'
21	PT	CL969	413+07.94	49.13' LT	448.32'
22	EOP	CL969	413+09.54	61.92' LT	448.28'
23	EOP	CL969	413+11.10	74.70' LT	MATCH
24	EOP	CL969	413+20.21	74.70' LT	MATCH
25	EOP	CL969	413+29.28	74.70' LT	MATCH
26	PC	CL969	413+26.55	52.86' LT	448.12'
27	PCC	CL969	413+30.19	41.07' LT	448.14'
28	PC	CL969	411+07.00	36.00' RT	449.83'
29	PCC	HOUNDD	10+42.00	29.86' RT	449.62'
30	PT	HOUNDD	10+59.07	22.95' RT	MATCH
31	EOP	HOUNDD	10+60.90	0'	MATCH
32	PC	HOUNDD	10+62.70	21.77' LT	MATCH
33	PCC	HOUNDD	10+44.77	29.45' LT	449.16'
34	PT	HOUNDD	10+37.81	47.70' LT	449.31'

SCALE: 1" = 30'

30 15 0 30

LEGEND

- EXISTING R.O.W.
- PROPOSED CONST. EASEMENT
- PROPOSED SAWCUT
- EXISTING PLANIMETRICS
- EXISTING CONTOUR
- PROPOSED CONTOUR
- (X) POINT NUMBER

NOTES:

1. SEE PLAN AND PROFILE SHEETS FOR FURTHER INFORMATION.
2. POINTS SHOWN ARE AT CRITICAL POINTS (PC,PT, ETC.) UNLESS OTHERWISE NOTED.
3. STATIONS, OFFSETS, AND RADII ARE MEASURED FROM EDGE OF PAVEMENT AND LIP OF GUTTER.

EXISTING R.O.W.

CURB RAMP TYPE 1

CURB RAMP TYPE 1

FM 969

410+00 411+00 412+00 413+00

℄ FM 969

PT 410+44.58

R25'

R25'

EXISTING R.O.W.

CURB RAMP TYPE 1

CURB RAMP TYPE 1

PROPOSED R.O.W.

HOUND DOG TRAIL

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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FRN - F-1386

FM 969
GRADING PLAN
HOUND DOG TRAIL

SHEET 2 OF 3

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		124
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	090	FM 969

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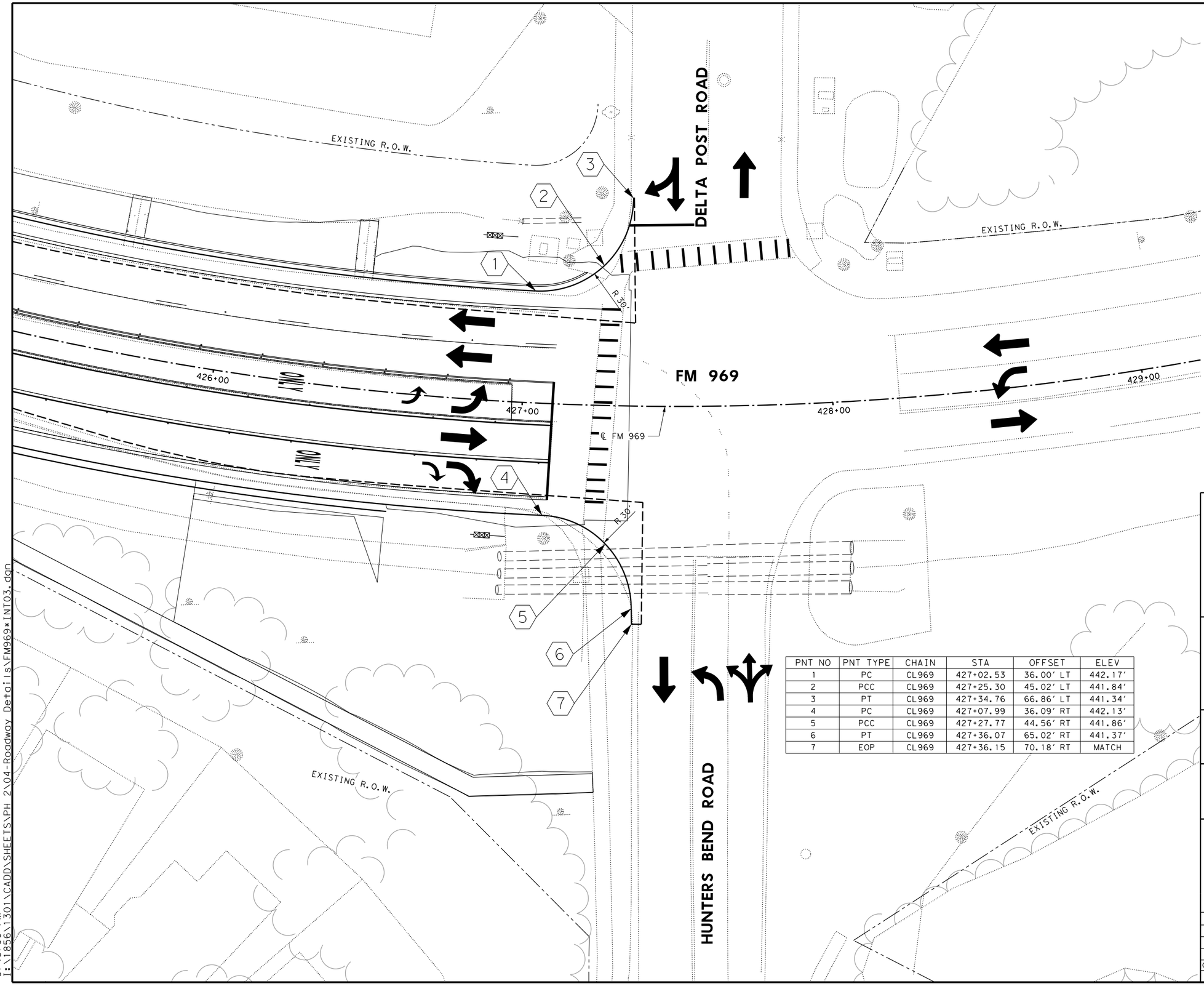

SCALE: 1" = 30'

30 15 0 30

LEGEND

- EXISTING R.O.W.
- PROPOSED CONST. EASEMENT
- PROPOSED SAWCUT
- EXISTING PLANIMETRICS
- EXISTING CONTOUR
- PROPOSED CONTOUR
- (X) POINT NUMBER

NOTES:

1. SEE PLAN AND PROFILE SHEETS FOR FURTHER INFORMATION.
2. POINTS SHOWN ARE AT CRITICAL POINTS (PC,PT, ETC.) UNLESS OTHERWISE NOTED.
3. STATIONS, OFFSETS, AND RADII ARE MEASURED FROM EDGE OF PAVEMENT AND LIP OF GUTTER.

PNT NO	PNT TYPE	CHAIN	STA	OFFSET	ELEV
1	PC	CL969	427+02.53	36.00' LT	442.17'
2	PCC	CL969	427+25.30	45.02' LT	441.84'
3	PT	CL969	427+34.76	66.86' LT	441.34'
4	PC	CL969	427+07.99	36.09' RT	442.13'
5	PCC	CL969	427+27.77	44.56' RT	441.86'
6	PT	CL969	427+36.07	65.02' RT	441.37'
7	EOP	CL969	427+36.15	70.18' RT	MATCH

STATE OF TEXAS
MAEN A. HOURANI
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6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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FRN-F-1386

FM 969
GRADING PLAN
HUNTERS BEND ROAD

SHEET 3 OF 3

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		125
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	090	FM 969

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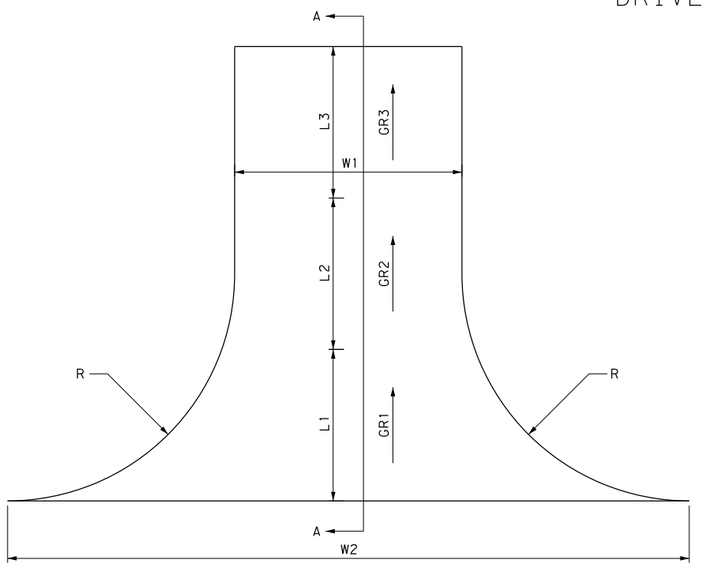
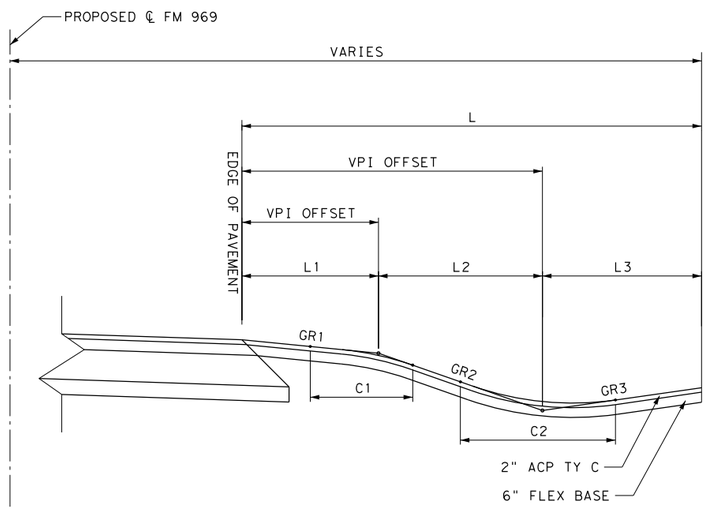
DRIVEWAY SUMMARY TABLE

DRIVEWAY NO. OR NAME	P&P SHEET NO.	℄ SH 969 STATION	OFFSET	PROP WIDTH @ ROADWA	PROP WIDTH @ ROW	ACP DRWY AREA	CONC. DRWY AREA	PROP RADIUS (R)	OVERALL LENGTH (L)	LENGTH (L1)	LENGTH (L2)	LENGTH (L3)	GRADE (G1)	GRADE (G2)	GRADE (G3)	C1		C2		MAILBOX ASSEMBLIES	COMMENTS
																ELEVATION	CURVE LENGTH	ELEVATION	CURVE LENGTH		
				(FT)	(FT)	(SY)	(SY)	(FT)	(FT)	(FT)	(FT)	(FT)	%	%	%	(FT)	(FT)	(FT)	(FT)		
DW 60		337+39.43	LT	44.2	14.0	38		15	17.00	2.50	11.50	3.00	-3.70	-7.79	-5.72	454.48	5.00	453.58	6.00		
DW 61		340+51.00	LT	44.2	14.0	80		15	44.00	3.00	4.50	36.50	-2.70	4.00	7.65	455.45	6.00	455.63	3.00		
DW 62		344+77.09	RT	44.1	14.0	107		15	66.50	SEE DRIVEWAY PROFILE SHEETS											
DW 63		346+62.85	LT	40.4	14.0	76		15/7.5	37.00	3.00	31.00	3.00	-2.50	-8.50	-0.01	449.86	6.00	447.23	6.00		
DW 64		347+00.48	LT	46.9	16.0	93		7.5/15	36.50	3.00	31.00	2.50	-2.00	-8.10	-1.23	449.93	6.00	447.42	5.00		
DW 65		349+34.07	LT	75.5	25.0	104		25	26.50	SEE DRIVEWAY PROFILE SHEETS											
DW 66		360+48.98	RT	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		NO CHANGES EXPECTED AT THIS TIME
DW 67		361+13.00	LT	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		NO CHANGES EXPECTED AT THIS TIME
DW 68		365+19.39	LT	43.9	14.0	35		15	15.00	3.50	10.50	1.00	-2.00	-0.03	-3.02	445.19	7.00	445.19	2.00		
DW 69		368+54.07	LT	36.7	14.0	56		15/6	39.35	5.00	29.00	5.35	-2.00	3.96	1.61	447.11	10.00	448.26	10.00		
DW 70		368+77.01	LT	36.4	14.0	30		6/15	26.00	5.00	15.53	5.47	-2.00	4.00	-0.36	447.38	10.00	448.00	10.00		
DW 71		371+16.49	RT	42.0	12.0	85		15	69.65	SEE DRIVEWAY PROFILE SHEETS											
DW 72		373+08.00	LT	81.4	54.0	486		15	76.00	5.00	65.33	5.67	-6.00	2.00	-0.63	448.10	10.00	449.41	10.00		
DW 73		373+59.73	RT	79.3	50.0	224		15	60.15	SEE DRIVEWAY PROFILE SHEETS											
DW 74		373+60.52	LT	39.9	14.0	106		15	56.00	5.00	45.24	5.76	-5.00	5.08	-0.12	448.02	10.00	449.77	2.00		
DW 75		375+00.49	LT	54.8	23.2	161		15	38.00	4.00	33.00	1.00	-5.00	-6.00	4.00	447.36	8.00	449.00	2.00		
DW 75-A		375+56	LT	47.7	14.0	72		15	68.00	5.00	29.00	34.00	-6.00	7.22	-0.21	447.04	10.00	449.14	10.00		
DW 76		376+02.64	RT	35.7	14.0	65		15/8	40.00	SEE DRIVEWAY PROFILE SHEETS											
DW 77		376+37.95	RT	38.1	14.0	69		8/15	54.00	SEE DRIVEWAY PROFILE SHEETS											
DW 78		376+57.96	LT	44.7	13.8	111		15	62.00	5.00	51.61	5.39	-5.00	5.00	-3.12	447.04	8.00	448.07	4.00		
DW 78-A		378+10.00	LT	44.2	14.0	98		15	55.73	4.00	49.08	2.65	-5.67	4.33	-0.48	447.47	8.00	449.59	5.00		
DW 79		380+23.04	RT	135.0	48.6	325		45	45.58	SEE DRIVEWAY PROFILE SHEETS											
DW GILBERT		10+02.11 (GILBERT)	RT	79.0	30.0	120.0		25	51.00	29.00	17.00	5.00	-3.00	-8.00	-1.12	450.19	6.00	448.83	10.00		
GILBERT RD		384+53.45	LT																		
DW 80		389+79.59	RT	82.4	52.5	148		15	60.00	SEE DRIVEWAY PROFILE SHEETS											
DW 81		390+69.00	LT	42.0	12.0	59		15	36.00	4.00	30.00	2.00	-2.85	-7.90	-6.29	451.78	5.00	449.45	3.00		
DW 82		391+77.42	LT	42.0	12.0	98		15	36.00	4.00	30.00	2.00	-3.00	-7.50	-4.05	451.55	5.00	449.30	3.00		
DW 83		392+47.59	LT	94.0	34.0	181		30	36.48	2.50	27.87	6.11	-1.42	-10.32	-0.61	451.54	5.00	448.66	7.00		
DW 85		398+07.95	LT	40.4	9.8	114		15	49.50	3.00	43.00	3.50	-2.95	-7.50	-0.01	450.43	6.00	447.20	7.00		

DRIVEWAY DETAILS



DRIVEWAY (N.T.S.)



SECTION A-A

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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FRN - F-1386

FM 969
DRIVEWAY DETAILS

SHEET 1 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		126
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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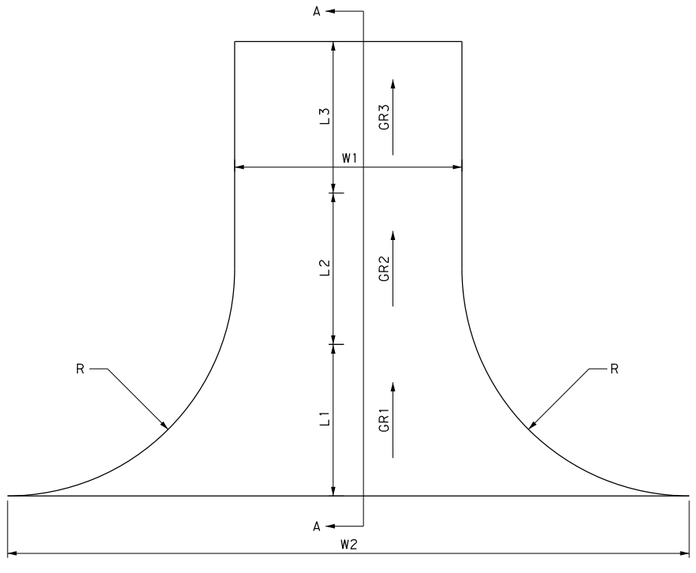
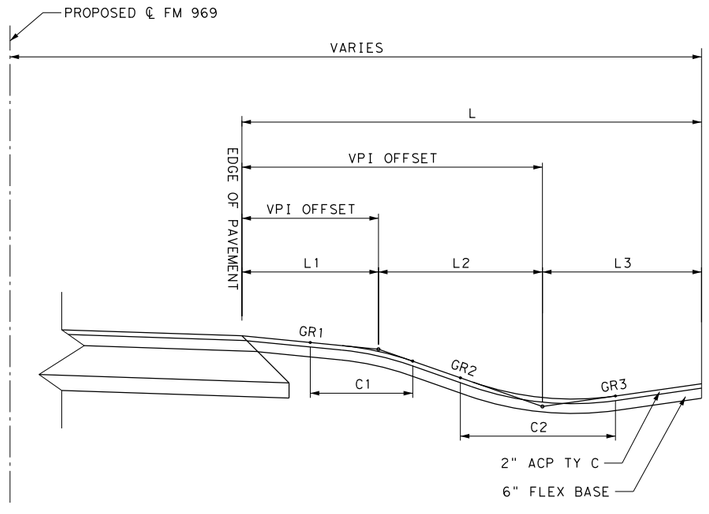
DRIVEWAY SUMMARY TABLE

DRIVEWAY NO. OR NAME	P&P SHEET NO.	℄ SH 969 STATION	OFFSET	PROP WIDTH @ ROADWA	PROP WIDTH @ ROW	ACP DRWY AREA	CONC. DRWY AREA	PROP RADIUS (R)	OVERALL LENGTH (L)	LENGTH (L1)	LENGTH (L2)	LENGTH (L3)	GRADE (G1)	GRADE (G2)	GRADE (G3)	C1		C2		MAILBOX ASSEMBLIES	COMMENTS
																ELEVATION	CURVE LENGTH	ELEVATION	CURVE LENGTH		
				(FT)	(FT)	(SY)	(SY)	(FT)	(FT)	(FT)	(FT)	(FT)	%	%	%	(FT)	(FT)	(FT)	(FT)		
DW 83		392+47.59	LT	94.0	34.0	181		30	36.48	2.50	27.87	6.11	-1.42	-10.32	-0.61	451.54	5.00	448.66	7.00		
DW 85		398+07.95	LT	40.4	9.8	114		15	49.50	3.00	43.00	3.50	-2.95	-7.50	-0.01	450.43	6.00	447.20	7.00		
DW 86		399+09.93	LT	62.0	20.0	135		25	36.00	3.00	29.00	4.00	-3.00	-7.69	-5.39	450.23	5.00	447.99	6.00		
DW 87		399+73.97	LT	82.0	40.0	240		25	22.00	4.00	14.00	4.00	-3.00	-8.00	-1.28	450.08	5.00	448.96	7.00		
DW 88		401+40.40	LT	104.0	54.0	65		25	35.00	2.50	28.50	4.00	-1.30	-6.23	0.96	450.35	5.00	448.58	8.00		
DW 89		403+51.03	RT	80.1	30.0	109		25	37.00	4.00	27.50	5.50	-5.90	-8.00	-0.72	448.22	5.00	446.02	6.00		
DW 90		403+89.20	LT	45.8	15.9	143		15	55.00	SEE DRIVEWAY PROFILE SHEETS											
DW 91		405+69.35	LT	57.4	17.5	156		20	62.00	SEE DRIVEWAY PROFILE SHEETS											
DW 92		406+93.61	LT	53.5	14.0	245		20	88.00	SEE DRIVEWAY PROFILE SHEETS											
DW 92-A		407+42.34	RT	81.0	30.0	172		25	42.50	3.50	35.50	3.50	-5.39	2.64	1.01	446.22	7.00	7.00	447.15		
DW 93		407+97.90	LT	69.8	29.6	179		20	68.00	SEE DRIVEWAY PROFILE SHEETS											
DW 94		409+70.51	LT	65.5	36.0	115		15	42.00	SEE DRIVEWAY PROFILE SHEETS											
DW 94-A		410+45	RT	54.2	24.0	111		15	75.00	5.00	31.00	3.00	-5.12	3.26	-0.57	445.84	10.00	446.78	6.00		
HOUND DOG TRAIL		411+54.33	RT							SEE DRIVEWAY PROFILE SHEETS											
DW 95		411+79.68	LT	42.0	12.0	90		15	75.00	SEE DRIVEWAY PROFILE SHEETS											
DW 96		413+20.21	LT	48.4	18.0		102	15	39.00	3.00	34.50	1.50	-2.00	-7.65	-2.44	447.96	6.00	445.32	5.00		
DW 97		414+39.09	RT	57.7	26.0		0	15	33.00	2.50	11.50	19.00	-3.00	-3.19	-0.37	447.31	5.00	446.94	6.00		
DW 98		415+91.52	RT	80.0	30.0	150		25	33.00	5.00	20.00	8.00	-2.90	-3.54	-0.37	446.85	5.00	446.14	5.00		
DW 99		418+01.51	RT	86.0	36.0		0	25	33.00	5.00	22.00	6.00	-1.20	6.80	-0.79	446.42	10.00	447.91	8.00		
DW 101		418+67.57	RT	42.0	12.0	64		15	33.00	4.00	20.00	9.00	-2.95	-3.06	0.93	446.20	5.00	445.59	6.00		
DW 102		420+03.31	RT	46.0	16.0	52		15	33.00	4.00	16.00	13.00	-1.80	-7.50	0.63	446.28	8.00	445.08	8.00		
DW 103		419+21.52	LT	135.0	45.0	336		45	47.90	2.50	37.02	8.38	-2.09	-6.56	-1.06	446.07	5.00	443.65	7.00		
DW 104		420+92.63	RT	90.0	30.0	143		30	30.00	2.50	27.50		-3.31	-5.72		445.17	5.00				
DW 105		420+75.03	LT	42.0	12.0		91	15	15.50	2.50	11.50	1.50	-4.00	-6.36	-3.23	445.14	5.00	444.41	3.00		
DW 106		422+63.55	RT	42.0	12.0		88	15	65.50	SEE DRIVEWAY PROFILE SHEETS											
DW 107		423+64.54	LT	63.0	32.0		0	15	22.00	18.00	4.00		-5.00	1.26		442.06	8.00				

DRIVEWAY DETAILS



DRIVEWAY (N.T.S.)



SECTION A-A

STATE OF TEXAS
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88202
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PROFESSIONAL ENGINEER
6/25/2021

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1839
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FM 969
DRIVEWAY DETAILS

SHEET 2 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		127
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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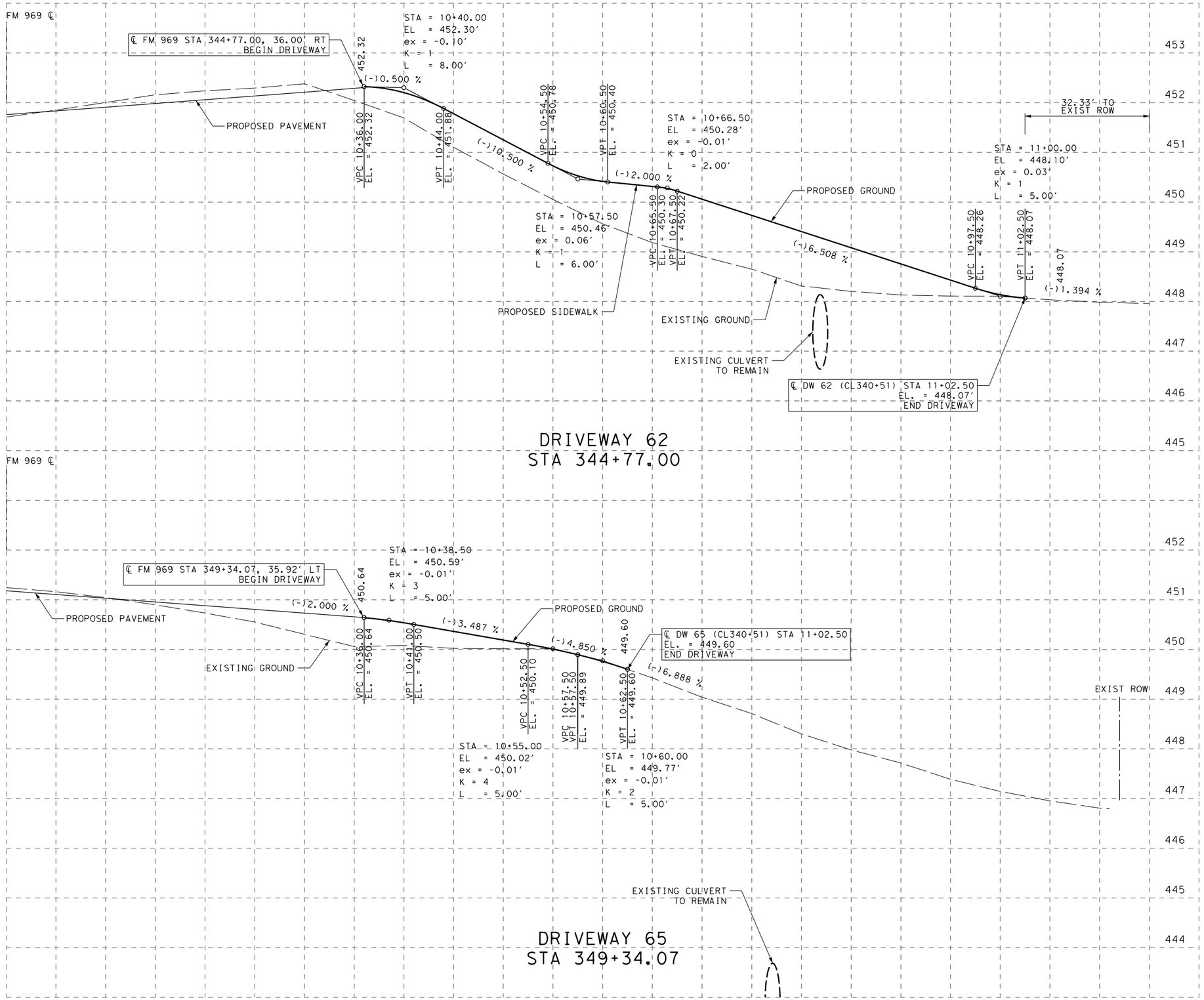
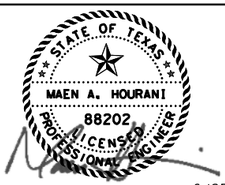


DRIVEWAY 62
STA 344+77.00

DRIVEWAY 65
STA 349+34.07

HORZ 0' 5' 10'
VERT 0' 1' 2'
SCALE IN FEET



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DRIVEWAY PROFILES

SHEET 1 OF 8

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		128
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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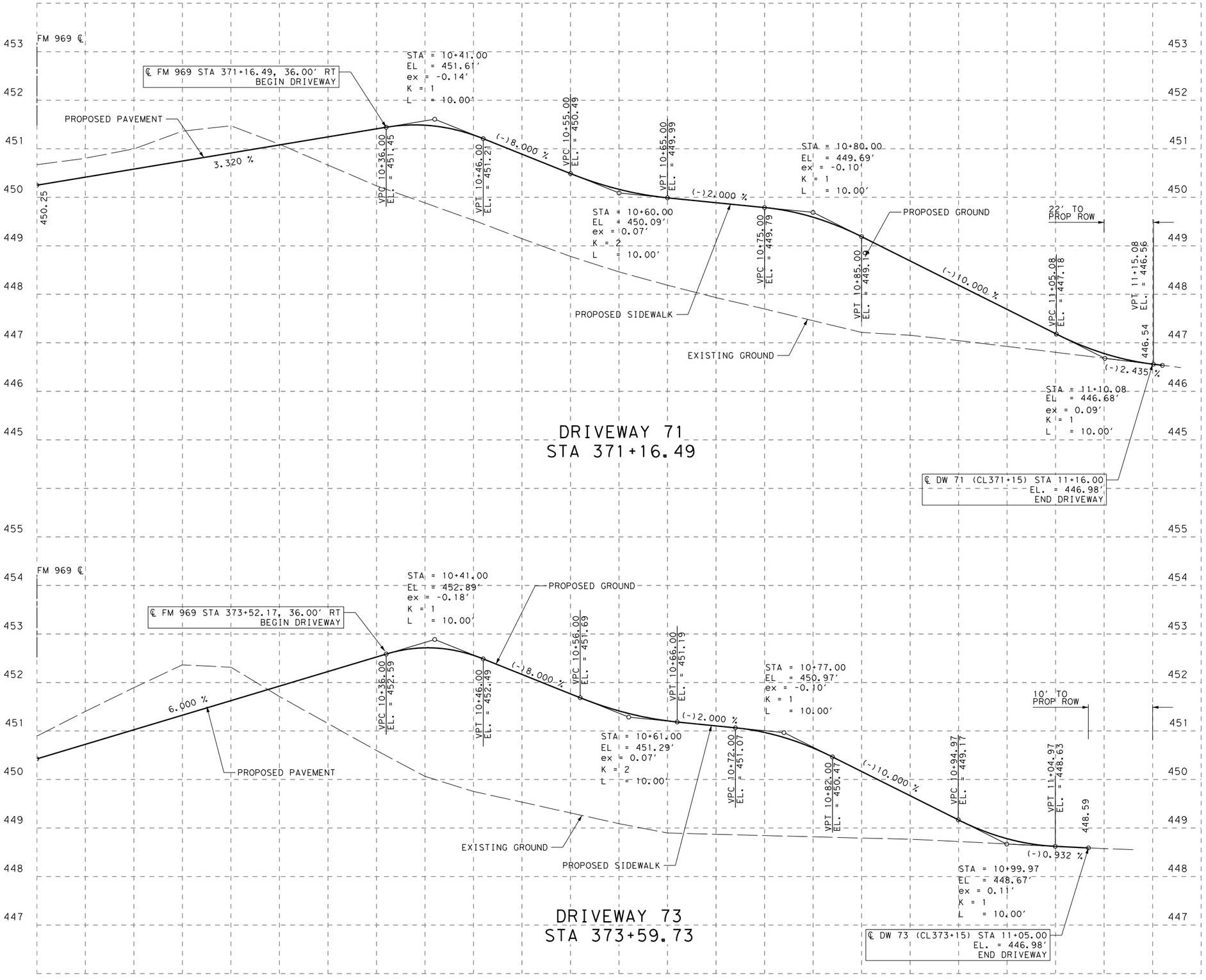

HORZ 0' 5' 10'
VERT 0' 1' 2'
SCALE IN FEET

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SHEET 2 OF 8

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		129
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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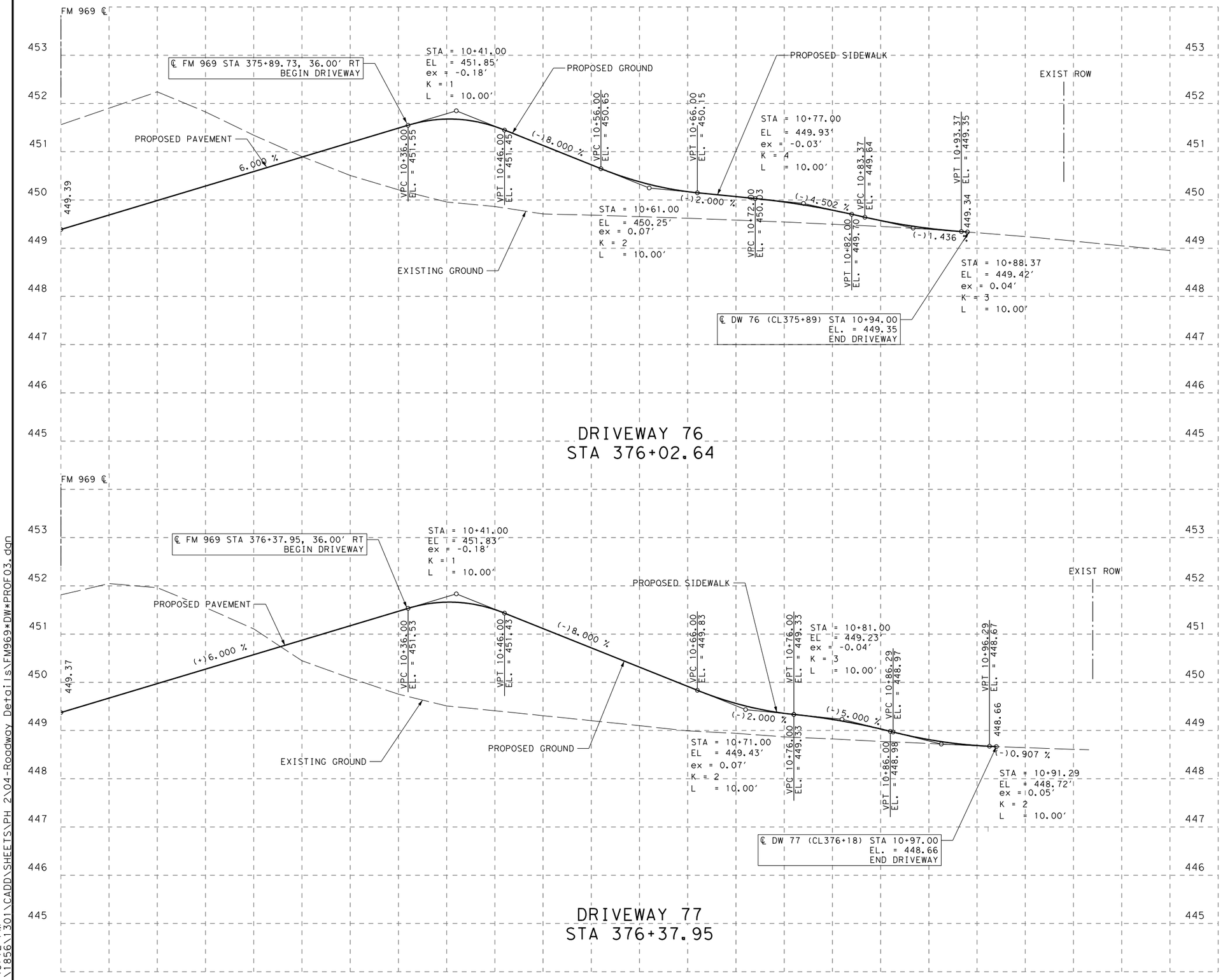

DRIVEWAY 76
STA 376+02.64

DRIVEWAY 77
STA 376+37.95

HORZ 0' 5' 10'
VERT 0' 1' 2'
SCALE IN FEET

STATE OF TEXAS
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DRIVEWAY PROFILES

SHEET 3 OF 8

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		130
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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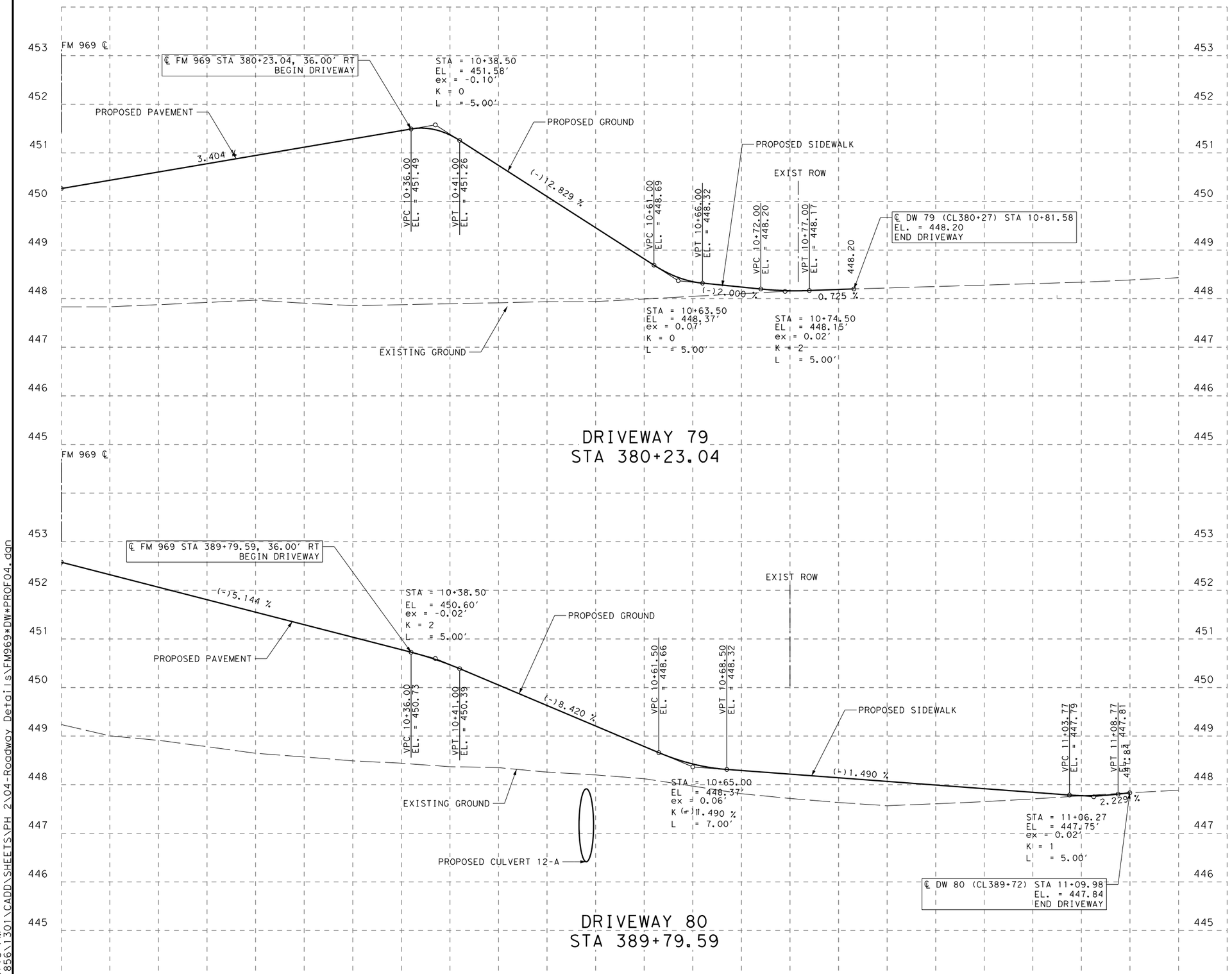

HORZ 0' 5' 10'
VERT 0' 1' 2'
SCALE IN FEET

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SHEET 4 OF 8

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		131
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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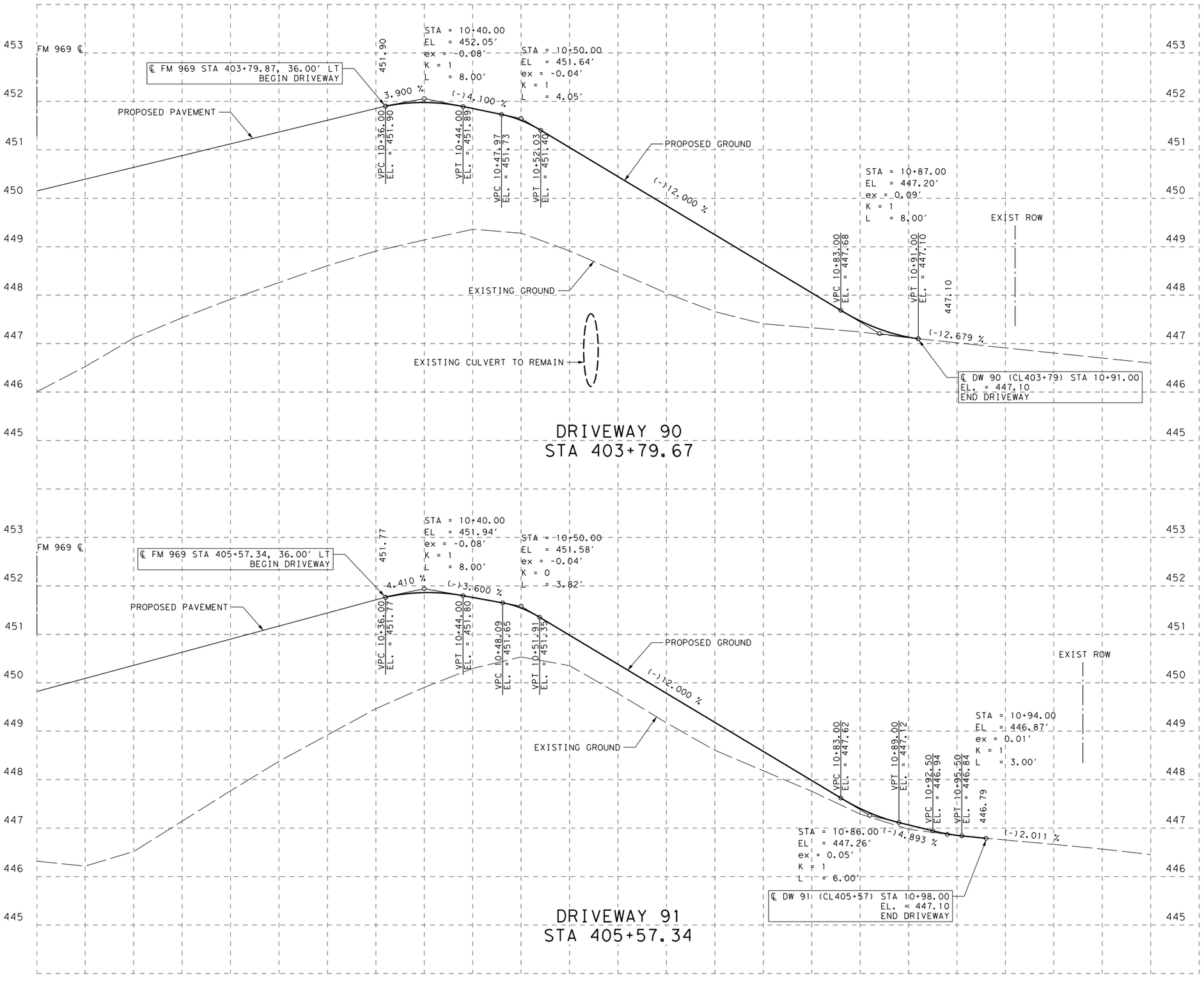

HORZ 0' 5' 10'
VERT 0' 1' 2'
SCALE IN FEET

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SHEET 5 OF 8

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		132
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
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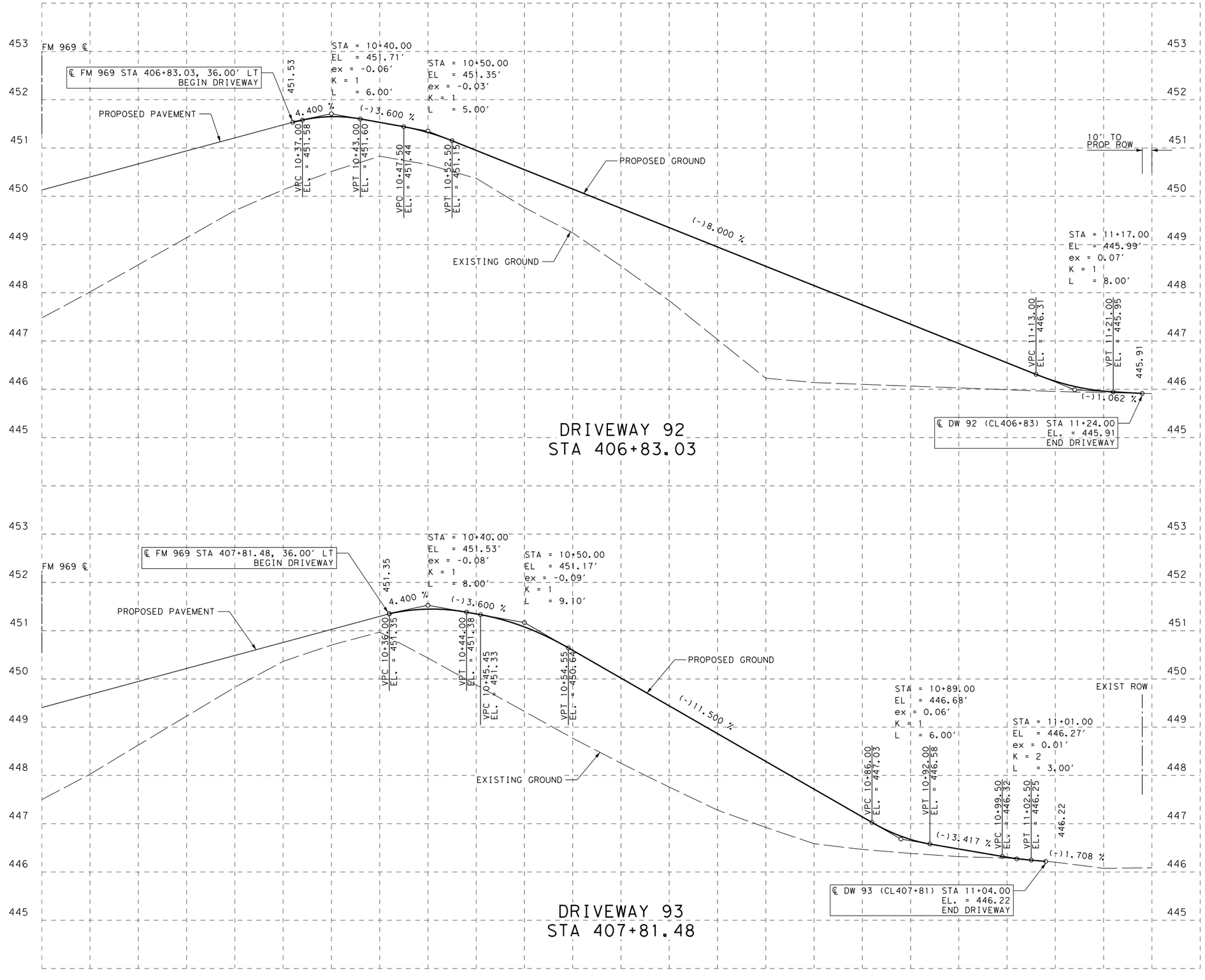

DRIVEWAY 92
STA 406+83.03

DRIVEWAY 93
STA 407+81.48

HORZ 0' 5' 10'
VERT 0' 1' 2'
SCALE IN FEET

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SHEET 6 OF 8

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		133
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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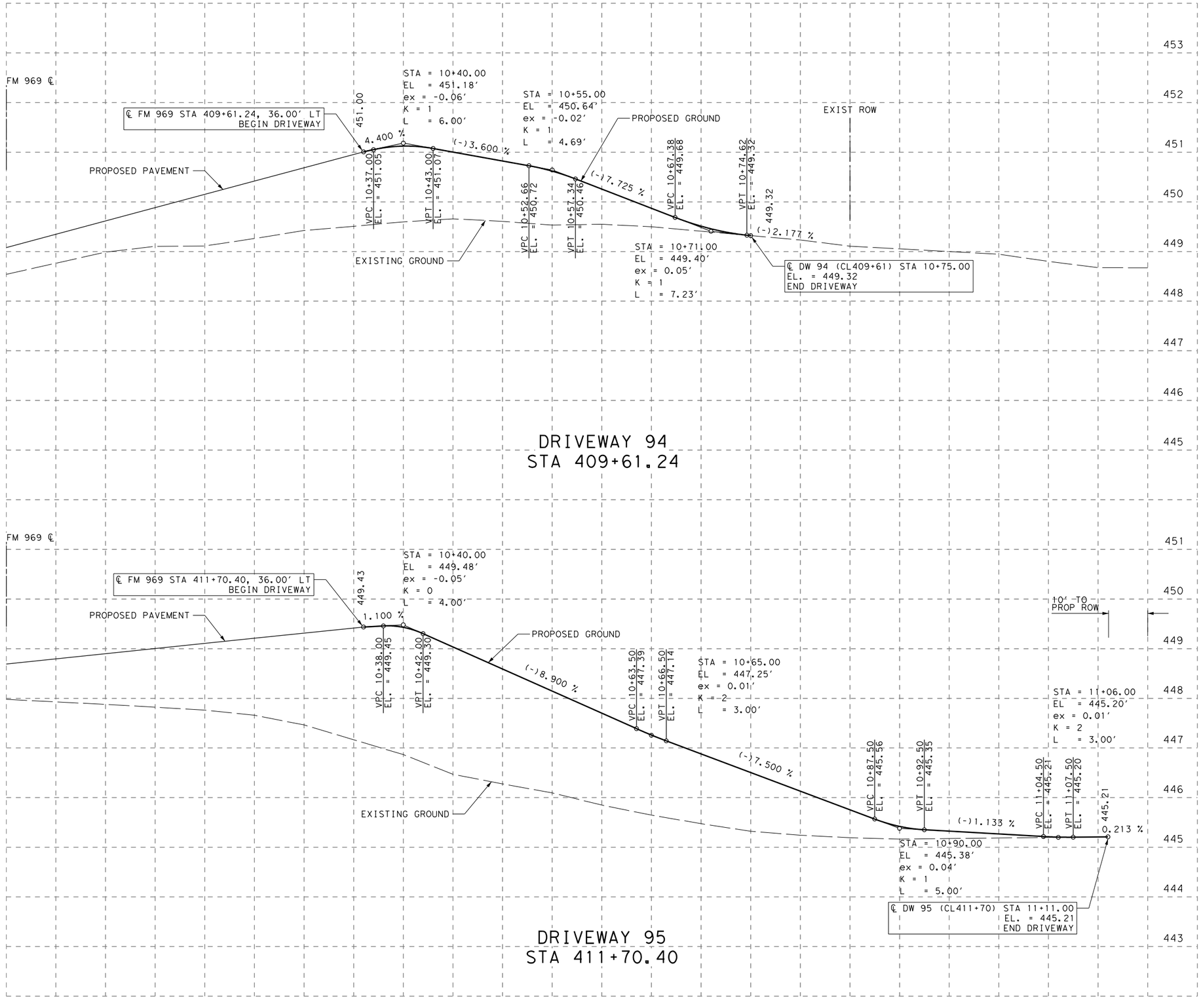

HORZ 0' 5' 10'
VERT 0' 1' 2'
SCALE IN FEET

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DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		134
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
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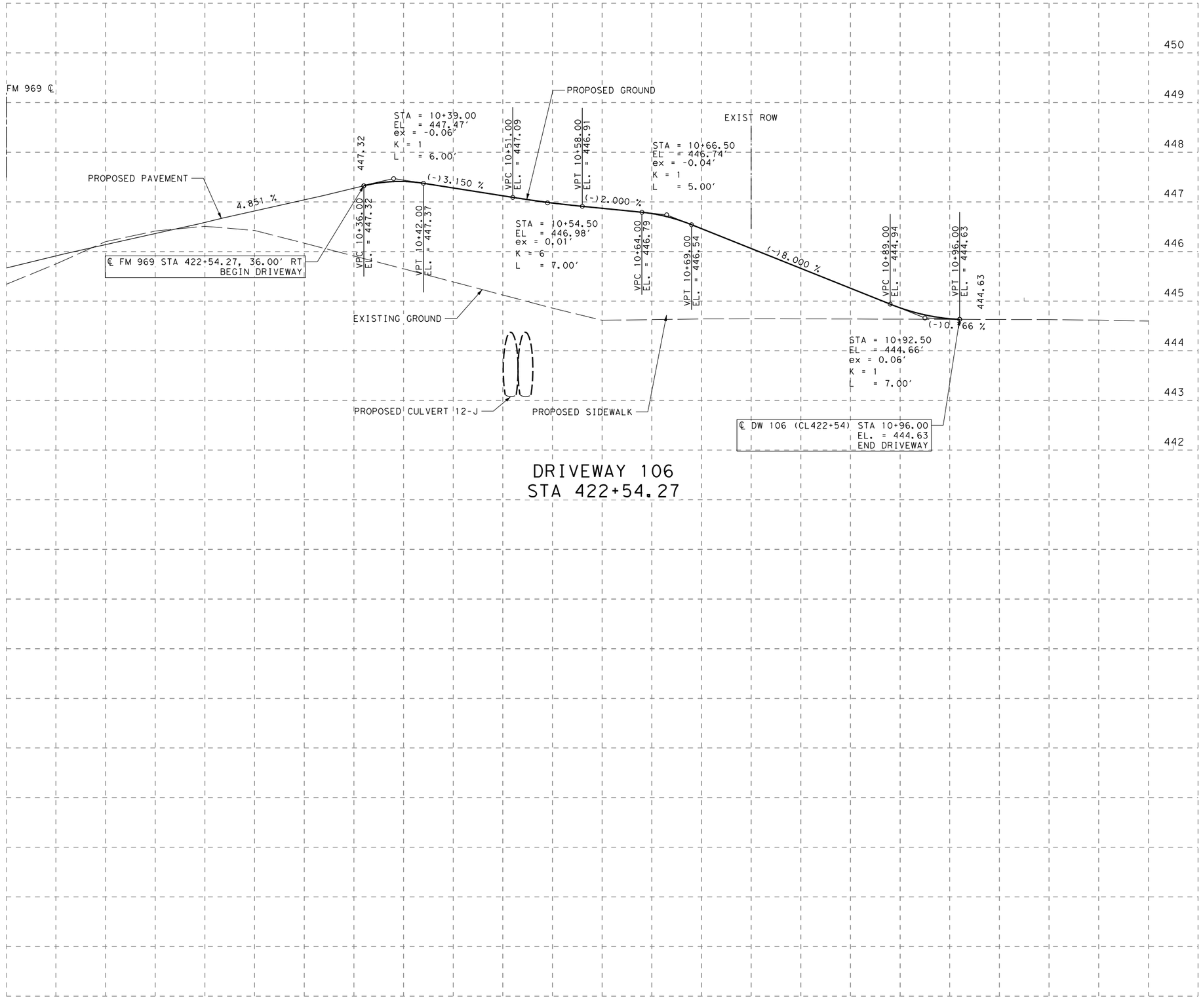

DRIVEWAY 106
STA 422+54.27

HORZ 0' 5' 10'
VERT 0' 1' 2'
SCALE IN FEET

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DRIVEWAY PROFILES

SHEET 8 OF 8

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		135
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
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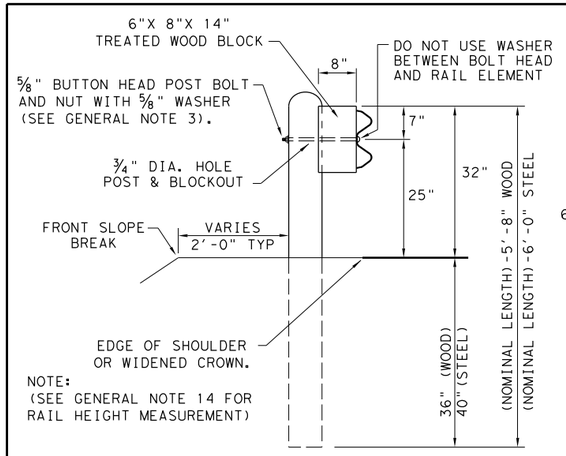
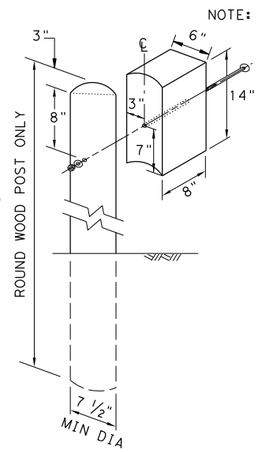
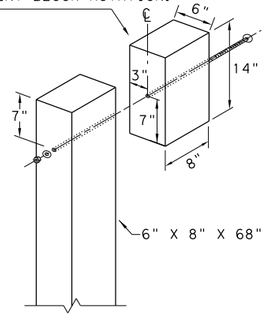


TYPICAL POST PLACEMENT

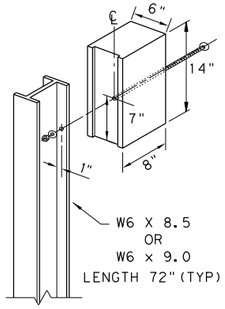


WOOD BLOCK TO ROUND WOOD POST

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

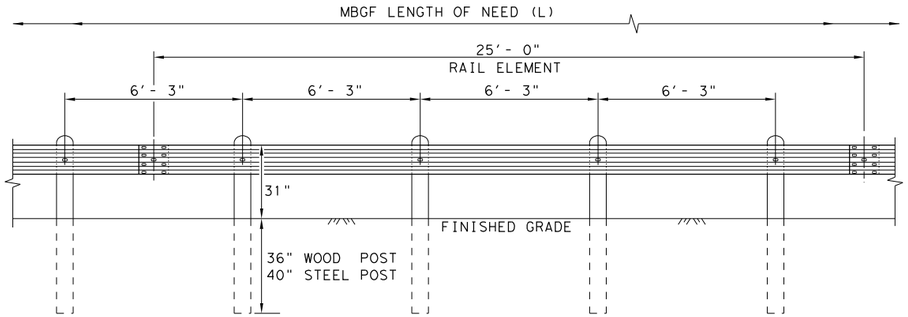


WOOD BLOCK TO RECTANGULAR WOOD POST



ROUTED WOOD BLOCK TO I-BEAM STEEL POST

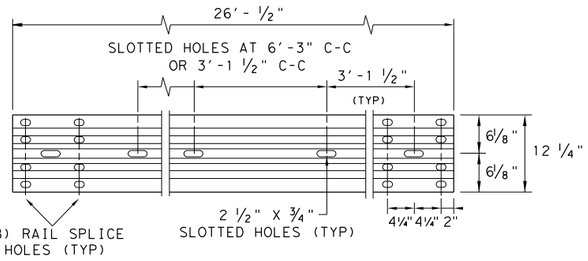
NOTE: ✳✳ "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



ELEVATION
MID-SPAN RAIL SPLICE

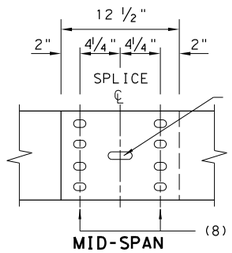
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)

DIRECTION OF TRAFFIC



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

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



MID-SPAN RAIL SPLICE DETAIL

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

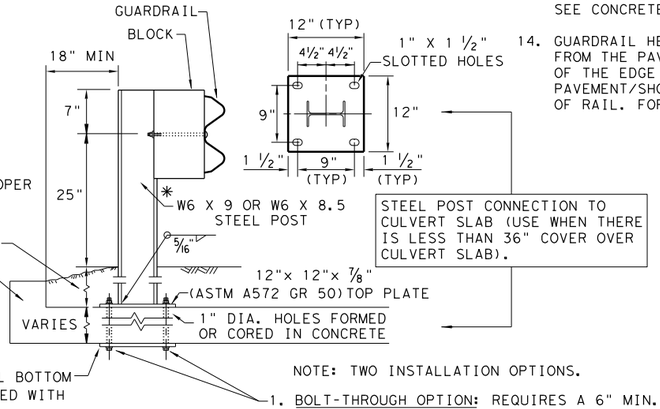
NOTE:
FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECCESSED NUT.

SPLICE BOLT LENGTH — VARIES
FBB01 = 1 ¼"
FBB02 = 2"
⅝"

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

BUTTON HEAD BOLT

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

GENERAL NOTES

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

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

Texas Department of Transportation — Design Division Standard

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

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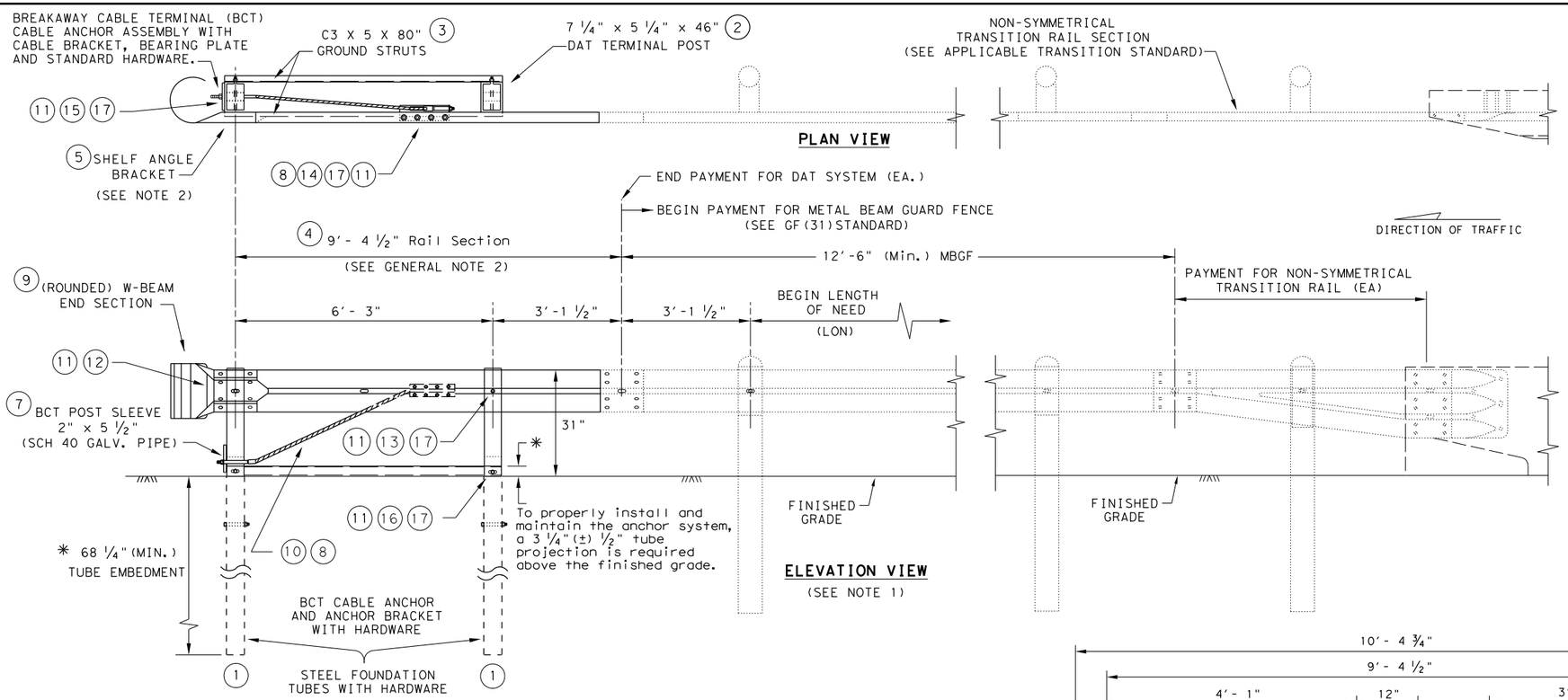


DOWNSTREAM ANCHOR TERMINAL (DAT)

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

GENERAL NOTES

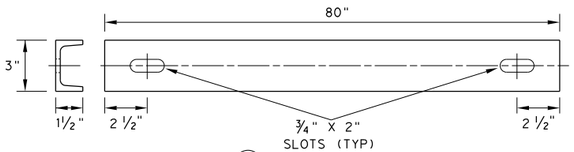
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN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

MOW STRIP INSTALLATION

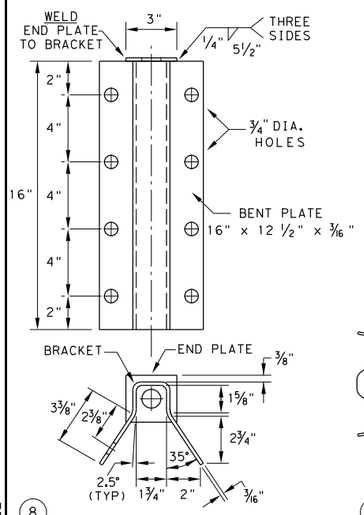
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

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

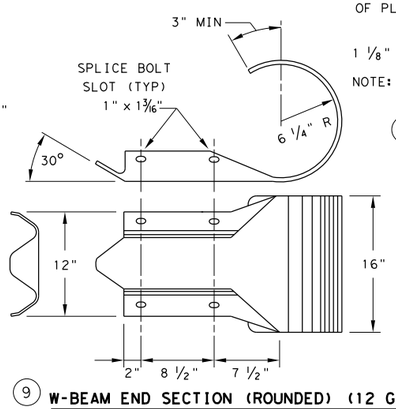
(4) **TERMINAL RAIL ELEMENT FOR DAT**



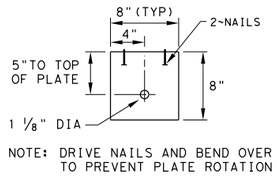
(3) **CHANNEL STRUT**
C3 X 5 X 80", GRADE A36



(8) **GUARDRAIL ANCHOR BRACKET**

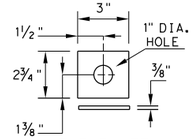


(9) **W-BEAM END SECTION (ROUNDED) (12 GA.)**

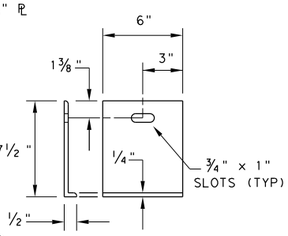


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

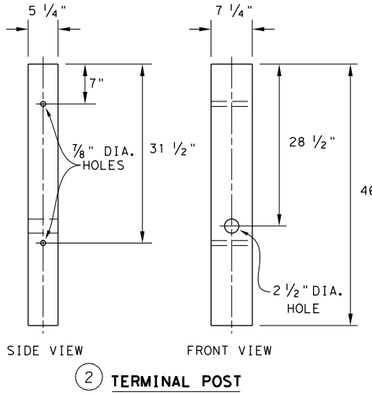
(6) **BEARING PLATE**
8"x 8"x 5/8" R



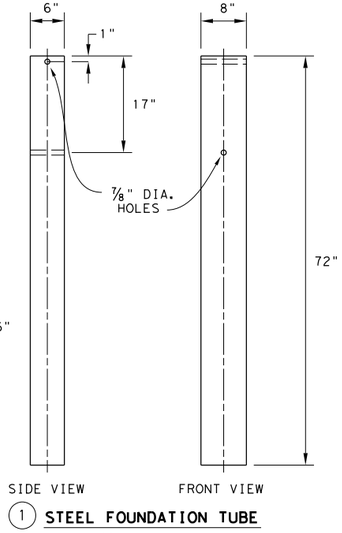
END PLATE



(5) **SHELF ANGLE BRACKET**



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



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

Texas Department of Transportation — Design Division Standard

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

GF(31)DAT-19

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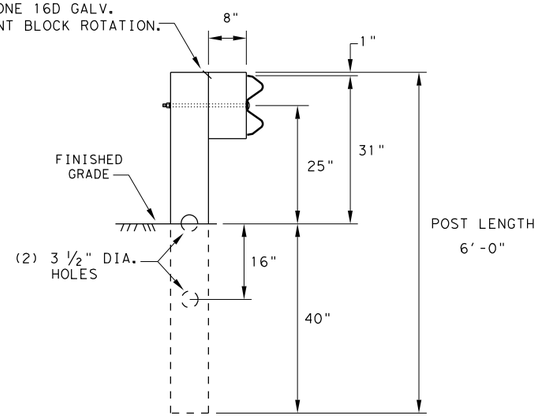
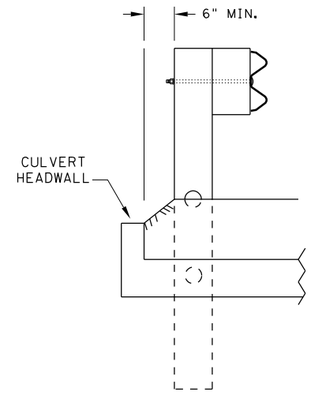


RECTANGULAR CRT POST (6"X 8" X 6' LONG)

(6) CRT REQUIRED
SEE ELEVATION DETAIL FOR LOCATIONS



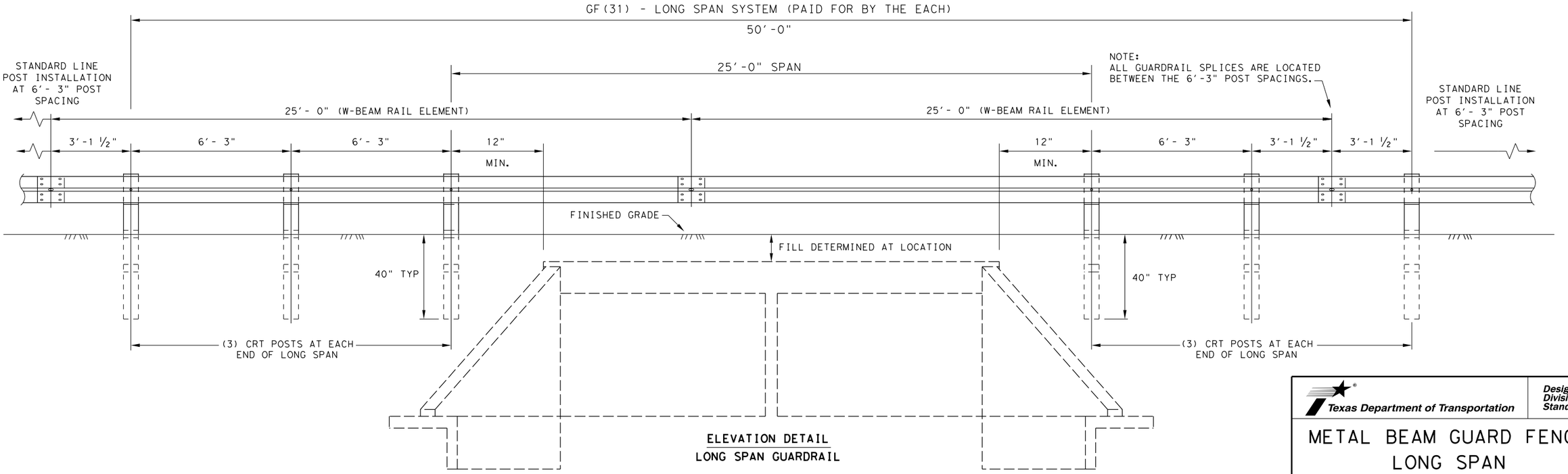
LATERAL OFFSET BETWEEN THE GUARDRAIL AND THE CULVERT HEADWALL

GENERAL NOTES

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

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

DIRECTION OF TRAFFIC



ELEVATION DETAIL
LONG SPAN GUARDRAIL

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE LONG SPAN TL-3 MASH COMPLIANT

GF(31)LS-19

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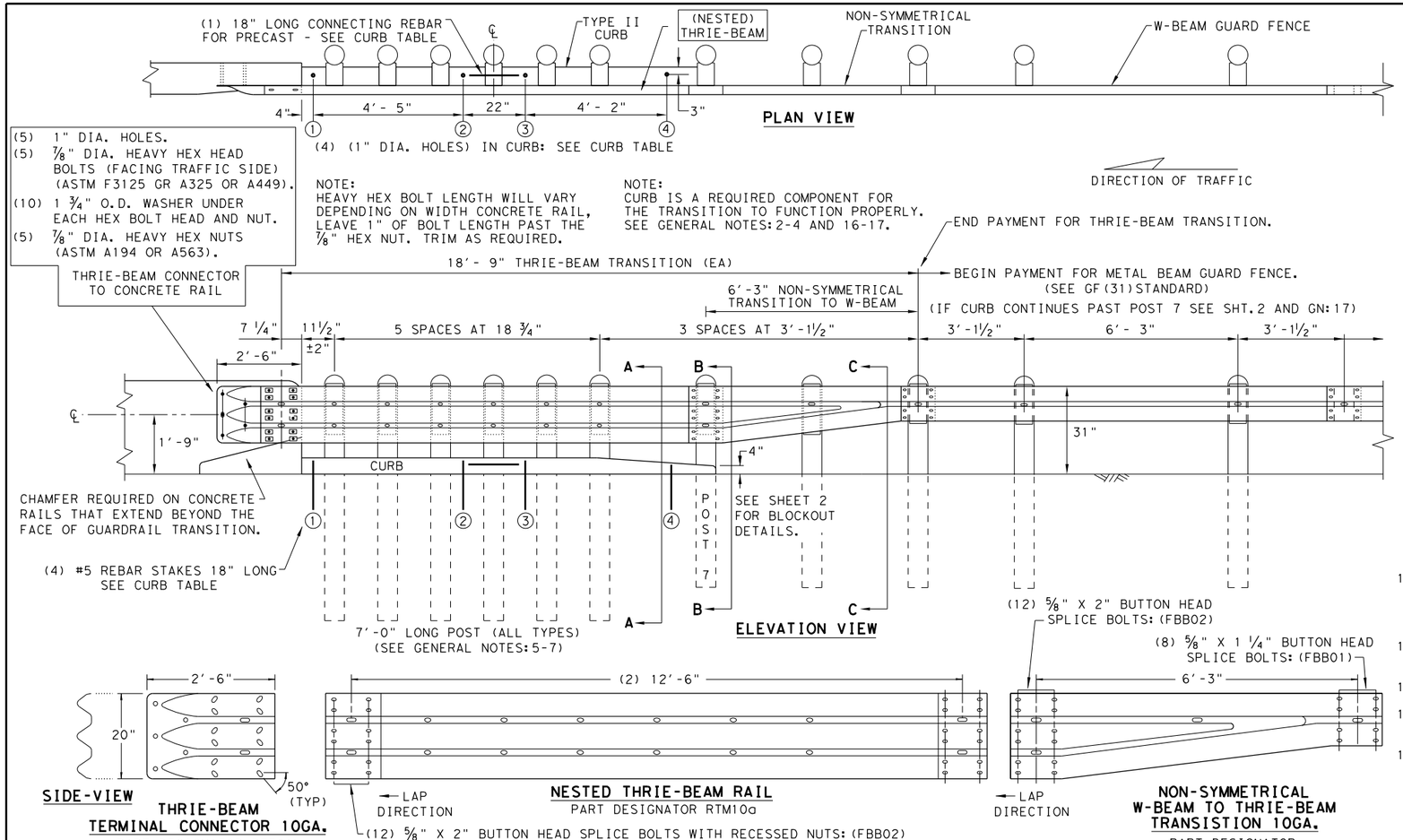
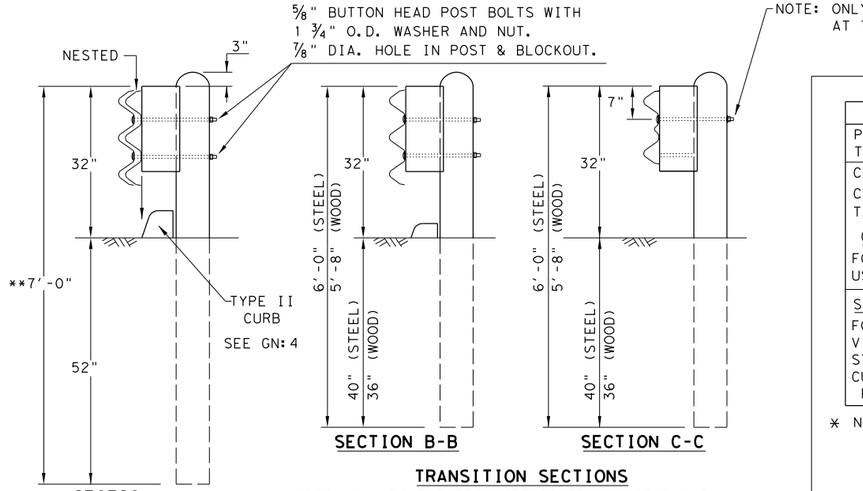
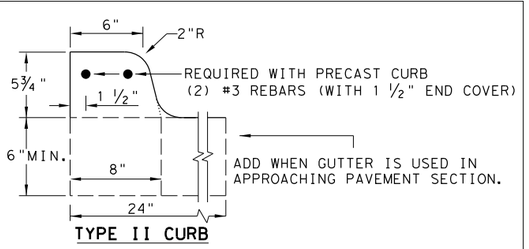




THRIE-BEAM TERMINAL - CURB TABLE
PRECAST CURB FULL LENGTH EQUALS 12'- 2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.
CURB (1) LENGTH 5'- 8" CURB (2) LENGTH 6'- 6" TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7
CONNECTING PRECAST CURB SECTIONS (1) & (2): FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB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



TYPE II CURB

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

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

TYPE II CURB DETAILS

GENERAL NOTES

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

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation

Design Division Standard

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

GF(31)TR TL3-20

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DISCLAIMER:
THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

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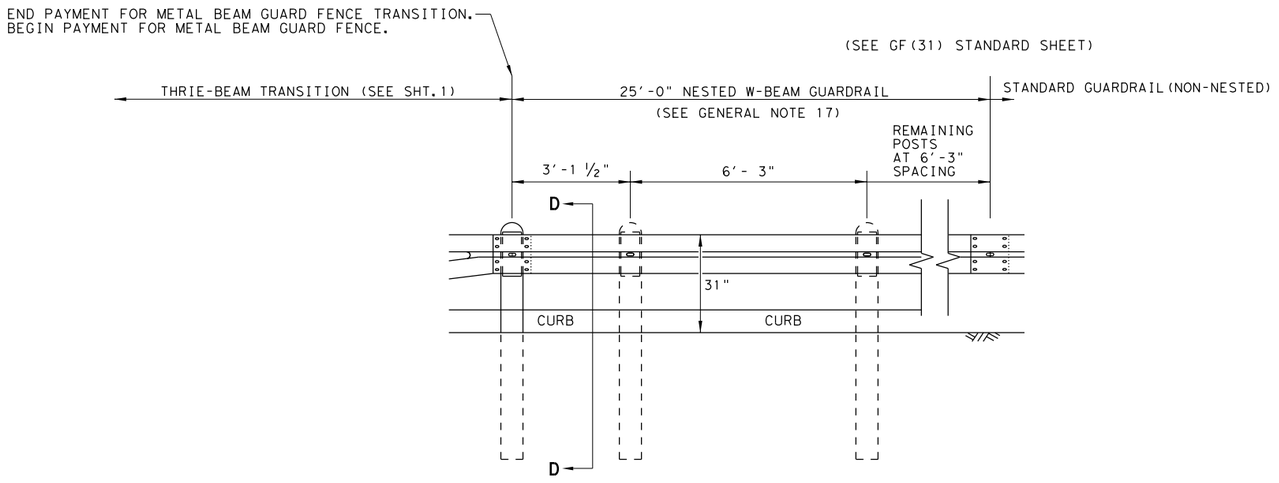
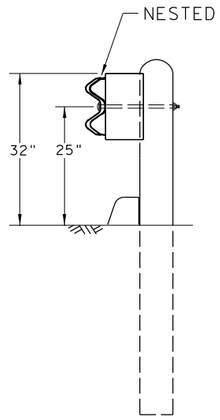
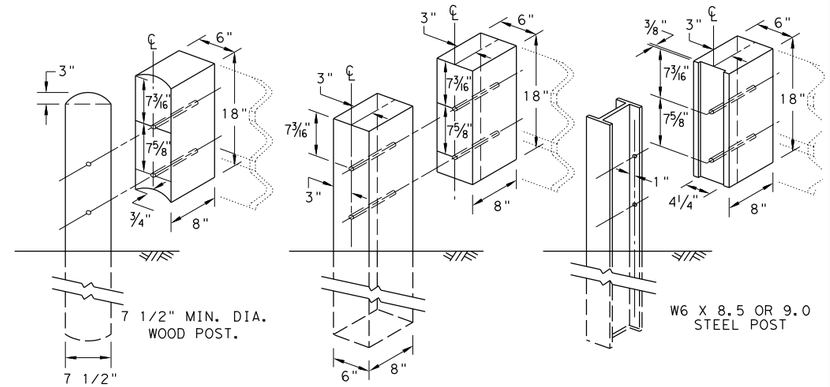
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

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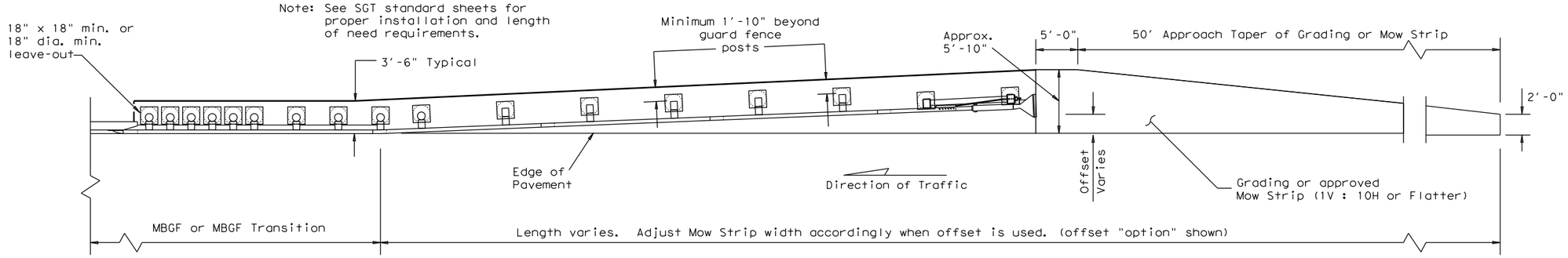
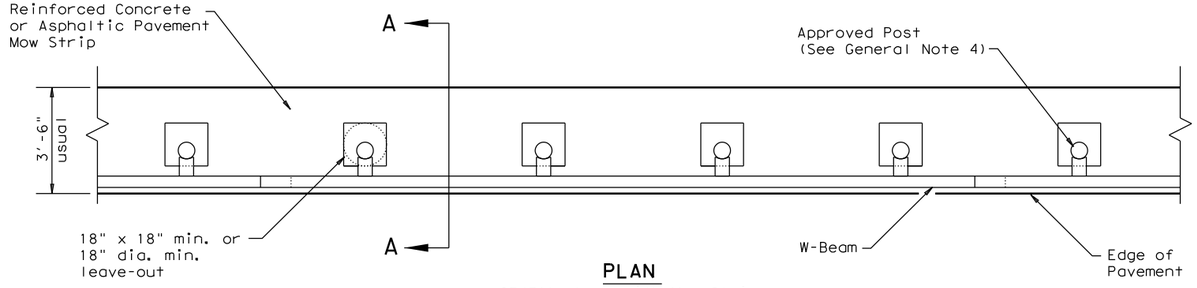
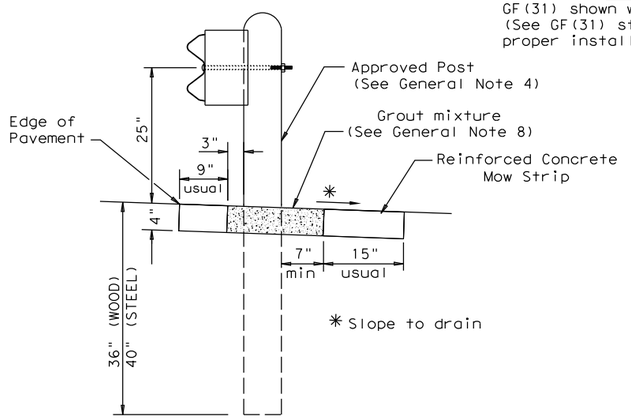


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



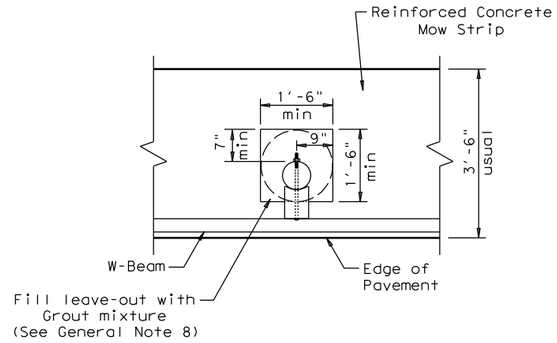
PLAN

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



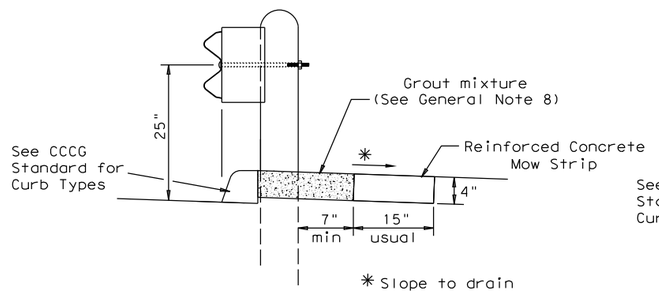
SECTION A-A

Typical



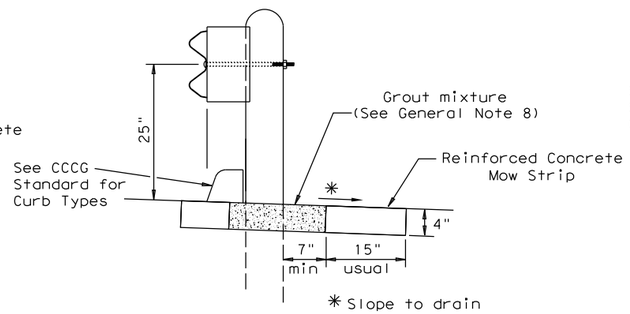
MOW STRIP DETAIL

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



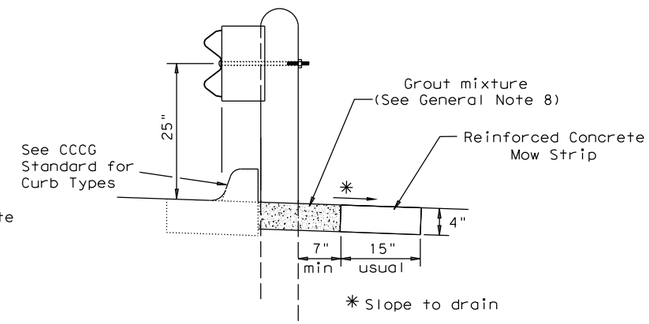
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

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

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

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

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

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		141

DATE:
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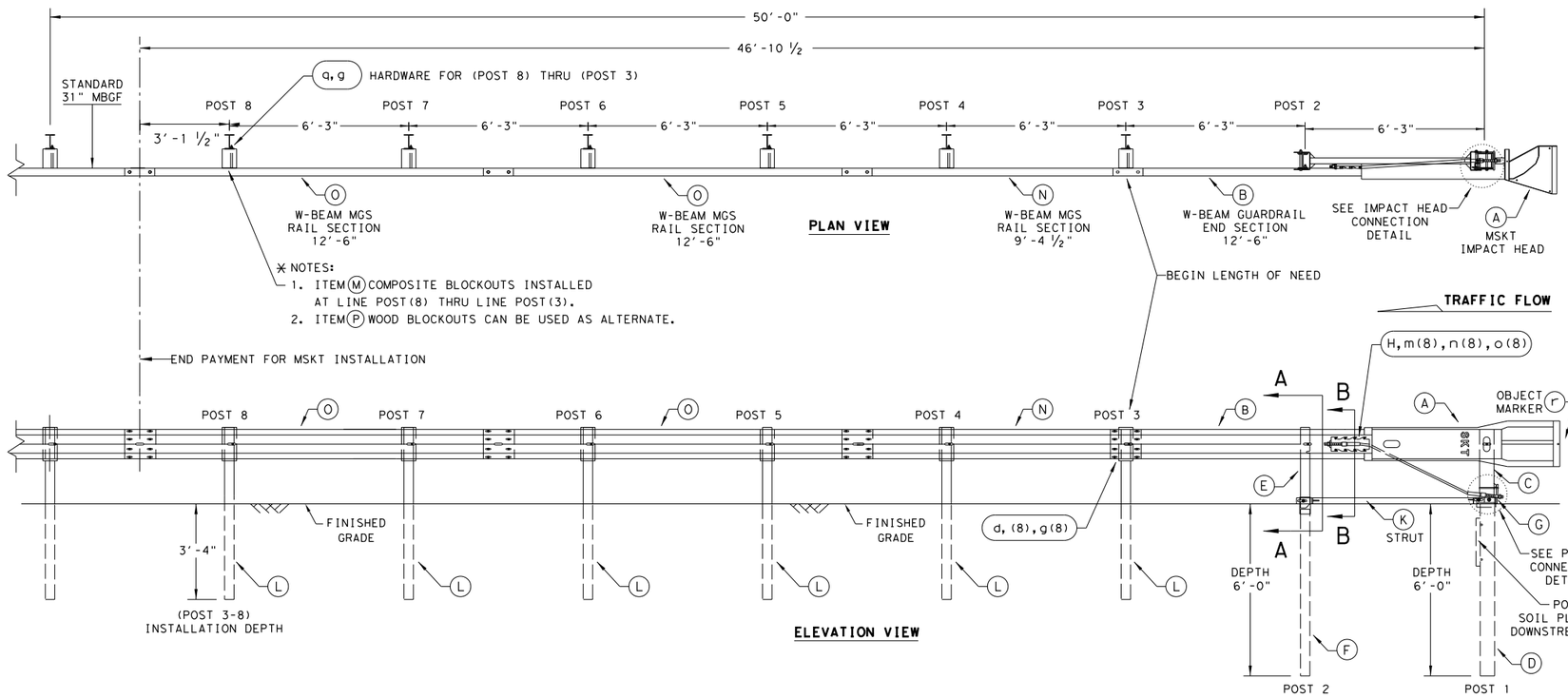


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.

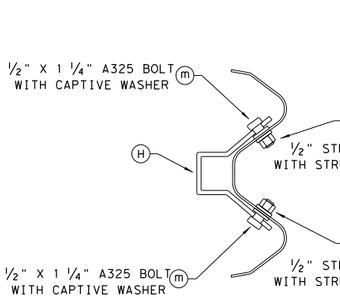
GENERAL NOTES

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.

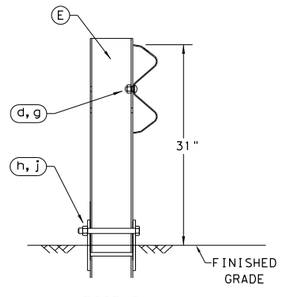
SEE NOTES: ✳

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

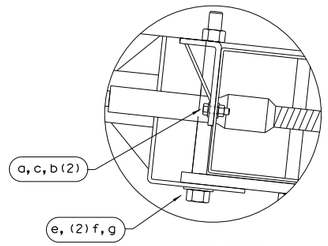
ALTERNATIVE ITEMS NOT SHOWN. ✳✳
✳ ITEM(P) 8" WOOD-BLOCKOUT
✳✳ ITEM(Q) 25'GUARD FENCE PANEL



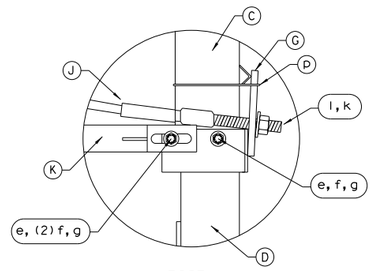
SECTION B-B
ANCHOR BRACKET



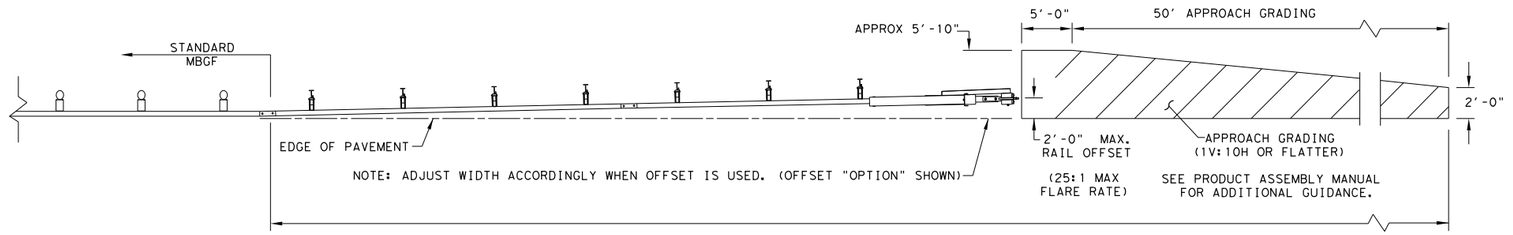
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

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

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

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT(12S)31-18

FILE: sgt12s3118.dgn	DN:TxDOT	CK:KM	DW:VP	CK:CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
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	DIST	COUNTY		SHEET NO.	
	AUS	TRAVIS		142	

DATE:
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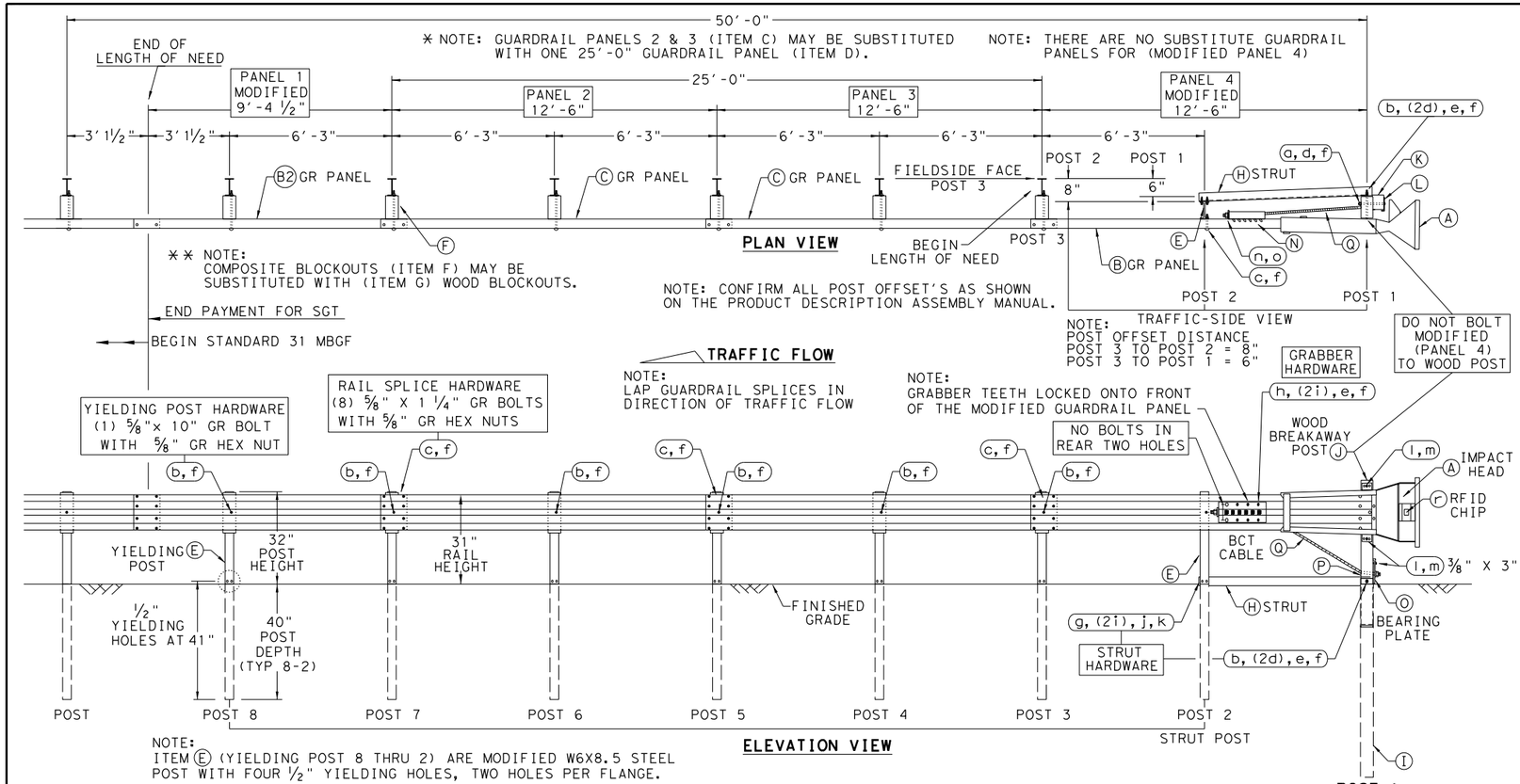
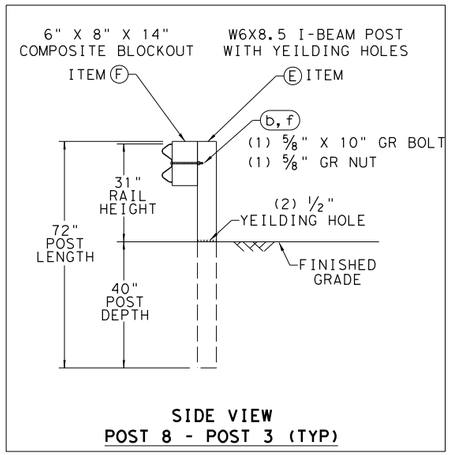


GENERAL NOTES

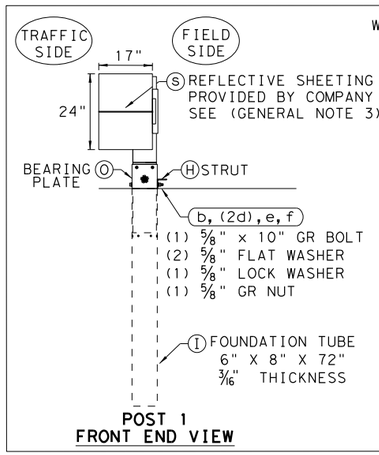
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

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

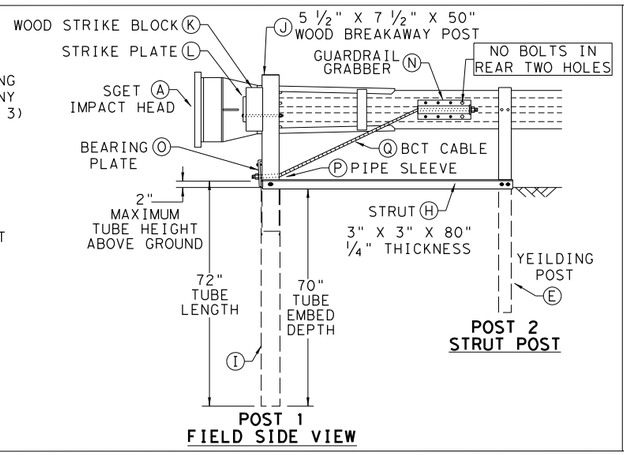
ALTERNATIVE ITEMS
NOTE: SEE PLAN VIEW
* D
** G



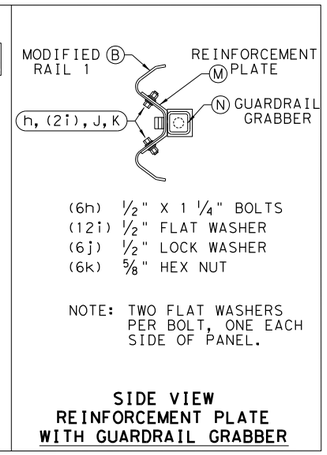
SIDE VIEW
POST 8 - POST 3 (TYP)



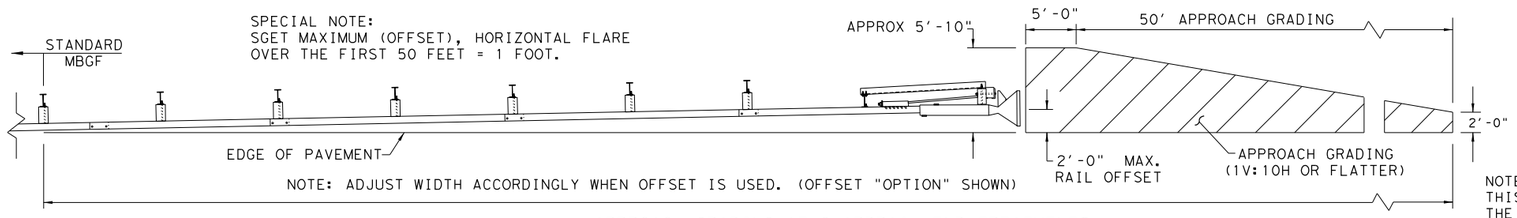
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW
POST 2
STRUT POST



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation
Design Division Standard

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

FILE: sgt15320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP		
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY		
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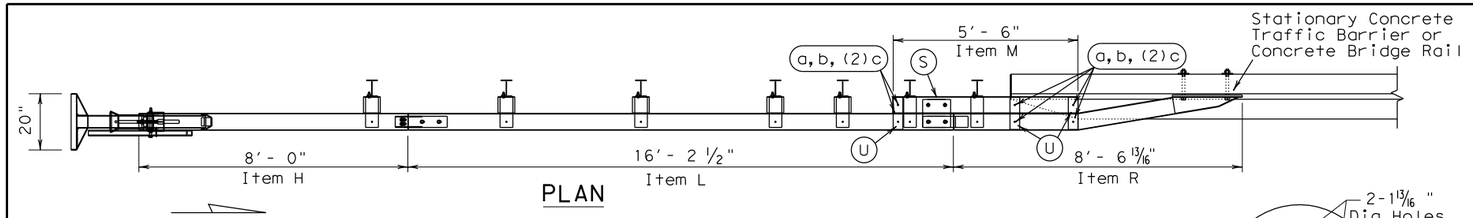
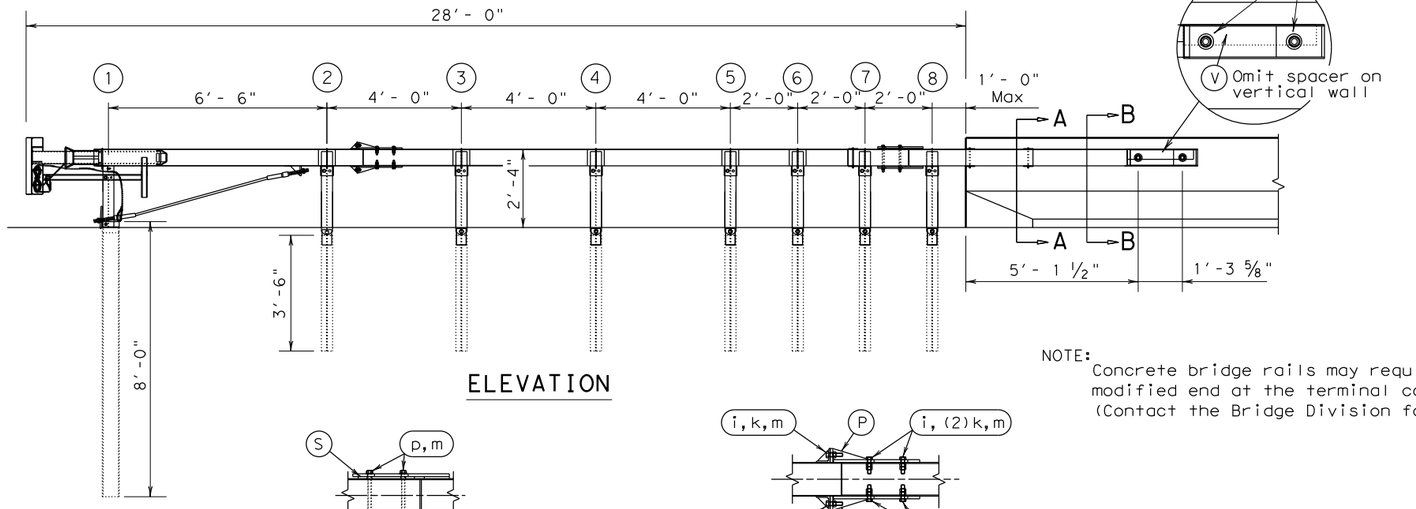


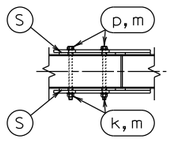
PLAN

Direction of Traffic

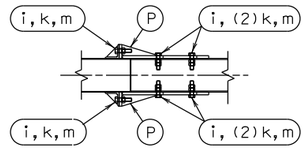


ELEVATION

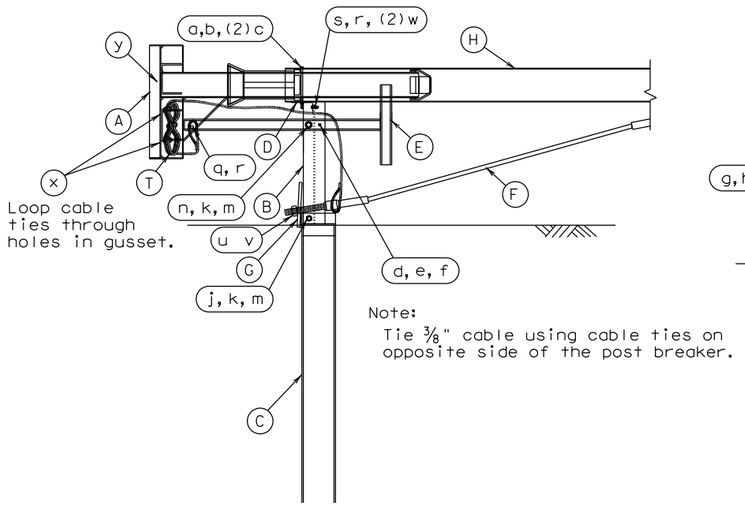
NOTE:
Concrete bridge rails may require a modified end at the terminal connection. (Contact the Bridge Division for details.)



SPLICE PLATE DETAIL

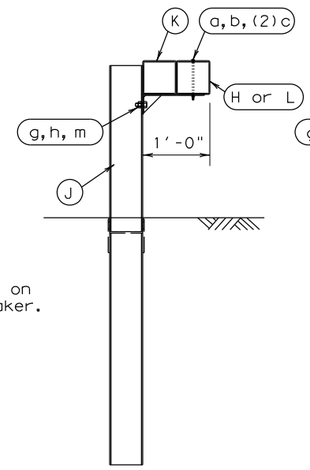


END SPLICE PLATE DETAIL

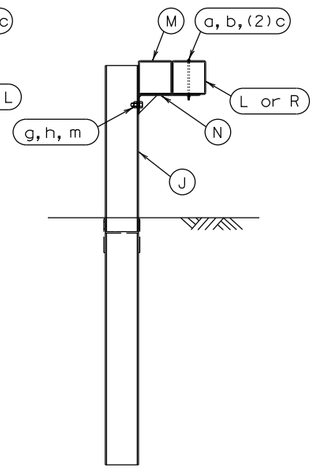


Note:
Tie ⅜" cable using cable ties on opposite side of the post breaker.

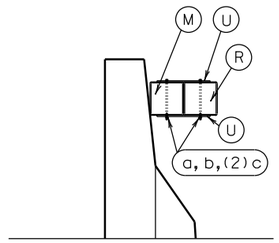
POSTS 1
IMPACT HEAD DETAIL



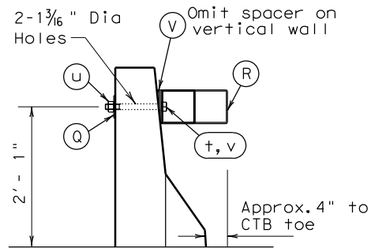
POSTS 2 THRU 6



POSTS 7 & 8



SECTION A-A



SECTION B-B

GENERAL NOTES

1. For specific information regarding installation and technical guidance of the system, contact: Road Systems, Inc., at (330)346-0721. 3616 Old Howard County Airport. Big Springs, TX 79720
2. Due to the Single-Sided design, the BEAT-SSCC is not appropriate for use at locations where backside hits towards the rigid concrete barrier are possible, e.g. In gore areas, or in narrow median locations where backside opposite direction hits are likely.
3. All bolts, nuts, cable assemblies, cable anchors, bearing plate, tubing, post, impact heads, and other steel components shall be galvanized, unless otherwise noted.
4. The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
5. When site conditions permit, posts may be driven. The lower section of post #1 should not be driven with the upper post section attached. If posts are placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
6. If rock excavation is encountered, see manufacturer's installation booklet for installation recommendations.
7. Post shall not be set full depth in concrete.
8. The appropriate connection of the SSCC to the stationary rigid structure is a critical component to insure proper performance of the system. The length of the 1" bolts used to attach the system to the rigid structure will vary with the wall thickness and will need to be determined in the field.
9. The approach area in front of the SSCC and the area within the system itself shall be free of fixed obstacles greater than 4 inches in height and have a fill slope or a cut slope of 1V:10H or flatter.
10. Unless otherwise shown in the plans, SSCC rail placed in the vicinity of curbs shall be blocked out so that the face of curb is located directly below the face of rail. The steel posts shall be installed at the proper ground elevation above the gutter pan or roadway surface. Curbs located along or in front of the SSCC system shall not be greater than 4 inches in height.
11. An object marker shall be installed on the front of the impact head as detailed on D & OM(VIA).

ITEM	QTY	DESCRIPTION
A	1	Box-Beam Impact Head
B	1	Upper End Post (A1) W6 x 9 x 1′-9 ½" LG.
C	1	Lower End Post (A4) W6 x 15 x 8′-0" LG.
D	1	Support Bracket (B1) L4 x 2 x 4" LG.
E	1	Post Breaker (A2) Welded TS2 x 2 x ¼"
F	1	Cable Anchor Assembly
G	1	Cable Anchor Bearing Plate
H	1	End Tube Rail (A5) x 8′-0" LG.
J	7	Steel Breakaway Post W6 x 9 x 6′-0" LG.
K	5	Support Bracket w/ Blockout (A9) TS6 x 6 w/ Bent PL.
L	1	Second Rail (A11) x 16′-2 ½" LG.
M	1	Transition Blockout (A6) x 5′-6" LG.
N	2	Trans. Support Bracket (A10) ⅜" Bent PL. w/ Gusset
P	2	End Section Splice Plate (A3) - Detail Below
Q	2	1" Square Washer (B10) PL 4 x 4 x ¼"
R	1	Anchor Rail (A13) x 8′-6 13/16 "LG.
S	2	Splice Plate (A12) PL 10 x 10 x ⅜" Detail Below
T	1	⅜" GALV. Cable x 20′-0" (A14)
U	6	Tie Plate (C10) PL 11 ½" x 3 ½"x 3/16"
V	1	Spacer (D10) (OMIT ON VERTICAL WALL)
		HARDWARE
a	14	5/16" x 7 ½" Hex Bolt (A449)
b	14	5/16" Hex Nut
c	28	5/16" Washer
d	1	¼" x 3" Hex Bolt (A449)
e	1	¼" Hex Nut
f	1	¼" Washer
g	7	⅝" x 1 ½" Bolt (A307)
h	7	⅝" Recess Nut
i	8	⅝" x 2" Hex Bolt (A325 or A449)
j	1	⅝" x 8" Hex Bolt (A325 or A449)
k	18	⅝" Hex Nut
m	25	⅝" Washer
n	1	⅝" x 3" Hex Bolt (A325 or A449)
p	4	⅝" x 9" Hex Bolt (A325 or A449)
q	1	½" x 5" Hex Bolt (A325 or A449)
r	2	½" Hex Nut
s	1	½" x 2" Hex Bolt (A307, A325 or A449)
t	2	1" x 10"Hex Bolt(A325 or A449)(Length Varies w/Wall Sect)
u	4	1" Hex Nut (2H Heavy Hex Nut)
v	4	1" Washer Structural Washer
w	2	½" Washer
x	2	Cable Tie
y	1	Object Marker

Texas Department of Transportation

Design Division Standard

ROAD SYSTEMS INC CRASH CUSHION (BEAT)

SSCC-16

FILE: sscc16.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
©TxDOT April 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 968
REVISED 03,2016 (VP)	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		144

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DATE:
FILE:

Note: Transition requirement, When a single sided transition section is required, see the MBGF transition standards for the proper installation.

3360G 5/8"x1 1/4" H.G.R. Bolt and 3340G Nuts
9852A 6"x3" Strut
984G side Pl 10 Ga both sides
9915A Spacer Channel w/hole for Cable ass'y. facing Post (2)
31G 12 Ga
Begin M.B.G.F. Length of need
19261G 1/2" Plate both sides
130A 10 Ga Slotted w/steel plate at Post (4)
19259G Washers (typ)
Rail is lapped such that over-sections face away from the nose (typ)
End payment for CAT(EA), begin payment for Metal Thrie-Beam Guard Fence(LF)
Thrie-Beam (Nested-2 each side) rail (12 gauge)
End payment for Metal Thrie-Beam Guard Fence (LF)
*Change splice lap direction for uni-directional application
*Traffic
Median Barrier
Bracket A ℄ 9606A
983G Nose Plate 10 Ga
3360G 5/8"x1 1/4" H.G.R. Bolt and 3340G Nuts
Traffic
31G 12 Ga
3275G 3/8" Rod & 4252G 4-Nuts w/2 4258G Wash
99216 Tube
3395G Splice Bolts (typ)
19259G Washers (typ)
130A 10 Ga Slotted w/steel plate at Post (4)
3000G
701A
9G
21G
"W" beam to Thrie-Beam transition rail (12 gauge) 974G
Spacer Bracket Attachment Options:
(1) 2-5/8"x 15" post bolts 3550G through the barrier with rectangular washers 3320G
(2) 8 Expansion bolts 4406G to attach 2 brackets to the barrier (No bracket attachment to thrie-beam is required).
5/8"x 2" H.G.R. Splice Bolts 3400G & Nuts 3340G

PLAN VIEW

31'-3" Front Section | 12' 6" End Section | 18'-9" Transition Section

6'-3" | 6'-3" | 6'-3" | 6'-3" | 6'-3" | 6'-3" | 6'-3" | 3'-1½" | 3'-1½" | 3'-1½" | 3'-1½" | 3'-1½"

782G 5/8" Plate
19271G Pipe Sleeve
3380G 5/8"x1½" Large Hex Hd Bolt & 3340G Nuts
3360G 5/8"x1 1/4" H.G.R. splice Bolts and 3340G Nuts
3177B 18"x18" (2) Object markers
Pipe 705G Sleeve
2'-3"
5" Ground Line
782G
3000G
3910G 2-1" Hex Nuts & 3900G 1-1" Washer each end of 3000G
705G Pipe Sleve (inserted into Post)
740G 6'x8" Tube (typ) at all Wood Posts
766G 1/4" Plate (typ) at all Wood Posts
3320G (typ)
Rail ℄
3910G Double Nut at each end for locking
3012G 3/4" Cable Assembly
9852A 6"x3" Strut
3320G Washer PL 1 3/4" x 3/16" x 3" Lg
See Thrie-Beam Terminal Connection Detail 980G
10"
Option (1) above 2-15" thru Bolts 3550G with rectangular washers 3320G
5/8"x Ⓑ H.G.R. Bolts & Nuts (Typ.) (See table below)

ELEVATION VIEW

Note:
There are no Rail to Post attachments for Posts (3), (5), & (6)

3650G 5/8"x 25" H.G.R. Post Bolt & 3340G Nut w/2 3320G Washers
3100B Wood Block
9916A Sleeve
705G Pipe inserted in Post
782G 5/8" Plate
9852A Strut
766G Soil Plate
3497G 5/8"x 9½" Large Hex Hd Bolt & 3340G Nut w/2 3300G Washer
3075B Wood Post (notched)
3478G 5/8"x 7½" Hex Hd Bolt and 3340G Nut
740G 6"x8"x4'-6" Tube

SECTION A-A (1)

3101B Wood Block
Toe nail
3360G 5/8"x 1 1/4" H.G.R. Bolt and 3340G Nut (typ)
705G Pipe inserted in Post
3074B Wood Post
766G Soil Plate

SECTION B-B (2)

3101B Wood Block
3' - 6" Minimum (typ)
4640G 5/8"x 24" Hex Hd Bolt & 3340G Nut w/2 3300G Wash
3497G 5/8"x 9½" Hex Hd Bolt and 3340G Nut
3074B Wood Post
3478G 5/8"x 7½" Hex Hd Bolt and 3340G Nut
740G 6"x8"x4'-6" Tube
7/8" x 2 1/2" slotted holes for 5/8" bolts (typical)

SECTION C-C (3) & (5)

4470G 5/8"x 8" Hex Hd Bolt & 3340G Nut for 19261G Plates, Post 4 only
9921G 6"x8" Tube located 4" down from top of Wood Post
3101B Wood Block
3395G Splice Bolt & 3340G Nut w/2 19259G Wash (typ)
For Post (4) only
3263G 3/8"x 2" Lag Screws & 4257G Wash
3074B Wood Post
766G Soil Plate

SECTION E-E (4) & (6)

Note:
3395G Splice Bolts are used to allow telescoping action

5/8" Dia.
5/8"-11 Threads
1" Unthreaded
1 3/4"

3395G SPLICE BOLT

3275G 3/8" Rod w/4 4252G Nuts and 2 4258G Lock Washers
Lockwashers
3/8" Hex Nut

SECTION D-D

Steel Plate on Slotted 10 Ga Rail at Post (4)

DETAIL 1

Post to be refitted in field as approved by the Engineer
Varies with curb type (approx 6 1/2" for Type II Curb & Gutter)
4"max
28"
6 1/4"
21"
3'-6"
Post Length
Width of plate reduced in the field at curb locations as approved by the Engineer
4'-6" Tube

TYPICAL CURB PLACEMENT

21G W-Beam Guardrail
8" 8" 8"
Toe nail
9G W-Beam GR
14"
1'-9"
3650G
3340G
3320G
3101B
4062B
3'-8"

POSTS (7) (8)

Ⓐ 8"
Nested Thrie-Beam both sides at Posts (10) (11) & (12) only
22"
1'-9"
2'-7"
3'-4"

SECTION F-F
Post (9) (10) (11) & (12)

9½"
3" 3½" 3"
1¼"
7/8" x 2½" slotted holes for 5/8" bolts (typical)
2¾"
4"
7 3/16"
7 5/8"
3 3/16"
5"
3/4"
1¼"
9606A

BRACKET "A" DETAILS
AT C.T.B. (1" ACP Key-in)
1/4" steel plate or section of rectangular tubing with flanges welded on to the satisfaction of the Engineer

Post	Ⓐ Block Width	Product Code	Ⓑ Post Bolt Length	Product Code
9	6 ½"	3409B	24"	3640G
10	5 ½"	3408B	22"	3620G
11	4 ½"	3407B	20"	3600G
12	3 ½"	3406B	18"	3580G

** Modifications (as approved by the Engineer) in bracket design will be required for other barrier configurations.

SHEET 1 OF 2

Texas Department of Transportation

Design Division Standard

TRINITY HIGHWAY ENERGY ABSORPTION CRASH CUSHION (CONCRETE BARRIER)

CATCB(1)-17

FILE: catcb17.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
©TxDOT: 1997	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED 03,2016 VP REVISED 03,2017 KM	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		144A

SACRIFICIAL

DATE:
FILE:

CATCB FRONT SECTION (POSTS 1 THRU 6)

BILL OF MATERIAL

Mfr Code #	QTY	DESCRIPTION
983G	1	Nose Plate (10 Ga)
984G	2	Side Plate (10 Ga)
31G	2	"W" Beam 12 Ga x 13'-6 1/2"
130A	2	"W" Beam 10 Ga x 13'-6 1/2"
9852A	1	Channel Strut x 6'-6"
740G	6	Steel Foundation Tube
766G	6	Soil Plate 18"x 24"
3075B	1	Wood Post 5 1/2" x 7 1/2" (Notched) (Post 1)
3074B	5	Wood Post 5 1/2" x 7 1/2"(Post 2-6)
3100B	2	Wood Block 5 1/2" x 7 1/2"(Post 1)
3101B	10	Wood Block 5 1/2" x 7 1/2"(Post 2-6)
9916A	1	Sleeve (Post 1)
9915A	1	Spacer Channel (Post 2)
9921G	2	Steel Tube (Posts 4 & 6)
19271G	1	Pipe Sleeve (Post 1)
705G	1	Pipe Sleeve (Post 2)
19261G	2	Post Plate (Post 4)
782G	1	Bearing Plate (Post 1)
3012G	1	Cable Assembly(Posts 1 to 2)
3275G	2	3/8" Restraint Rod(Post 3 & 5)
19259G	32	Plate Washer (Posts 4 & 6)

HARDWARE

3263G	4	3/8" x 2" Lg Lag Screw
4252G	8	3/8" Hex Nut
4258G	4	3/8" Lock Washer
4257G	4	3/8" Flat Washer
3320G	4	Rectangular Washer
3395G	32	5/8" x 1 3/4" H.H. Splice Bolt
3650G	2	5/8" x 25" Lg H.G.R. Bolt
4640G	8	5/8" x 24" Lg H.H. Bolt
3478G	13	5/8" x 7 1/2" Lg H.H. Bolt
3380G	8	5/8" x 1 1/2" Lg H.H. Bolt
3360G	16	5/8" x 1 1/4" Lg H.G.R. Bolt
3340G	85	5/8" H.G.R. Nut
3300G	8	5/8" Flat Washer
3497G	6	5/8" x 9 1/2" Lg H.H. Bolt
3910G	4	1" Hex Nut
3900G	2	1" Flat Washer

CATCB GUARDRAIL TERMINAL END SECTION (POSTS 7 & 8)

BILL OF MATERIAL

Mfr Code #	QTY	DESCRIPTION
4064B	2	Wood Post 5 1/2" x 7 1/2" x 6'
3101B	4	Wood Block 5 1/2" x 7 1/2"
21G	1	"W" Beam Guard Rail (12 Ga)
9G	1	"W" Beam Guard Rail (12 Ga)
701A	1	Bracket
782G	1	Bearing Plate
705G	1	Pipe Sleve
3000G	1	Cable Assembly
3320G	2	Rectangular Washer

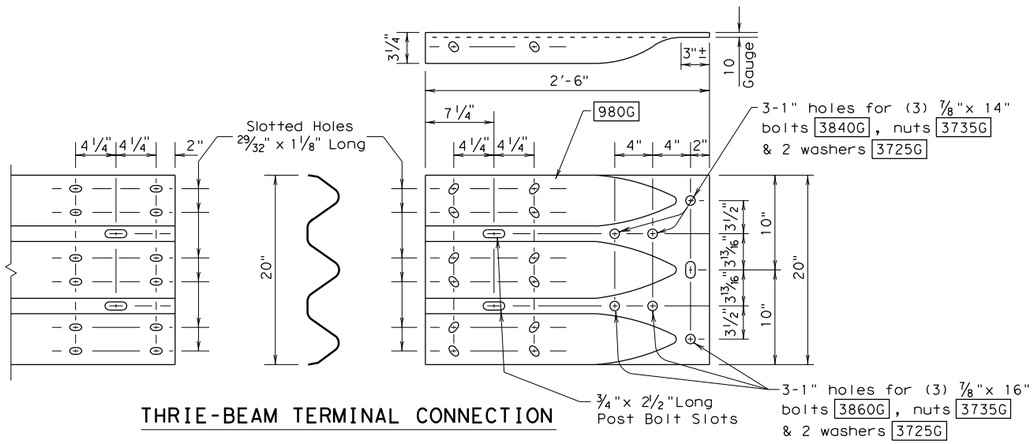
HARDWARE		
3360G	24	5/8" x 1 1/4" H.G.R. Splice Bolt
3400G	4	5/8" x 25" H.G.R. Post Bolt
3380G	8	5/8" x 1 1/2" Hex Hd Bolt
3340G	28	5/8" H.G.R. Nut
3300G	8	5/8" Washer
3910G	4	1" Hex Nut
3900G	2	1" Washer

CATCB TRANSITION SECTION (POST 9 THRU END SHOE)

BILL OF MATERIAL

	Mfr Code #	QTY	DESCRIPTION
	211G	4	Thrie beam 12'-6"(12 Ga)
	974G	2	Trans panel 6'-3"(12 Ga)
	980G	2	Special Thrie beam end shoe
	3078B	3	Wood Post 6"x 8"x 6', (Posts11&12)
	3320G	20	Rectangular Washer
	3340G	62	5/8" H.G.R. Nut
	3400G	52	5/8" x 2" Splice Bolt
	3406B	2	22 1/2" Block 6"x 3 1/2" (Post 12)
	3407B	2	22 1/2" Block 6"x 4 1/2" (Post 11)
	3408B	2	22 1/2" Block 6"x 5 1/2" (Post 10)
	3409B	2	22 1/2" Block 6"x 6 1/2" (Post 9)
	3412B	1	Wood Post 6"x 8"x 6', (Posts 9)
*	3560G	2	5/8" x 16" Bolt
*	4406G	8	5/8" x 3 3/4" Expansion Bolts w/Nuts
	3580G	2	5/8" x 18"Post Bolt (Post 12)
	3600G	2	5/8" x 20"Post Bolt (Post 11)
	3620G	2	5/8" x 22"Post Bolt (Post 10)
	3640G	2	5/8" x 24"Post Bolt (Post 9)
	3725G	12	7/8" Washer (End Shoe Bolts)
	3735G	6	7/8" Hex Nuts (End Shoe Bolts)
	3840G	3	7/8" x 14" Hex Bolt (End Shoe)
	3860G	3	7/8" x 16" Hex Bolt (End Shoe)
	9606A	2	Spacer Bracket
	Delineation		
	3177B	2	Object Marker 18"x 18" (Cut to fit)
	Optional Hardware for Single Slope Barrier-42"		
	3640G	2	5/8" x 24" Bolt
	4896G	6	7/8" x 24" Hex Bolt (End Shoe)

* Expansion or through bolts may be used with optional bracket installation.



THRIE-BEAM TERMINAL CONNECTION

GENERAL NOTES

1. For specific information regarding installation and technical guidance of the system, contact: Trinity Highway at 1(888)323-6374. 70 W. Madison St. Suite 2350. Chicago, IL 60602
2. Crown will be widened to accommodate the CAT system. The crown should extend at least 3 feet beyond the inside face of rail. The ground line at posts should be an extension of the roadway surface crown.
3. All bolts, nuts, washers, cable assemblies, cable anchors, post tubes, backup plates, and soil plates shall be galvanized.
4. The exposed end segment of an "End Section" should be evaluated as a potential obstacle in the determination of the need of MBGF for the opposing direction of traffic.
5. For placement at curb sections, the height from gutter pan to post bolt will be 21", and the front section shall be flared (See Detail 2).
6. The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
7. Either 6"- 8" or 5 1/2"x 7 1/2" wood blocks may be used at posts 1 thru 8 as supplied by the manufacturer.
8. If a "single sided" transition section is required for the attachment to a rigid concrete rail, see the MBGF transition standards for the proper installation.
9. Object markers shall be installed on the front of the terminal as detailed on the D&OM(VIA).

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Texas Department of Transportation

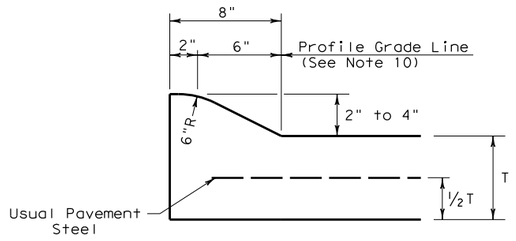
Design Division Standard

TRINITY HIGHWAY ENERGY ABSORPTION CRASH CUSHION (CONCRETE BARRIER)

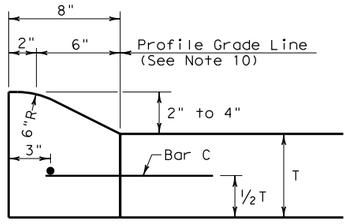
CATCB(1)-17

FILE: catcb17.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED 03,2016 VP REVISED 03,2017 KM	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		144B

DATE:
FILE:



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



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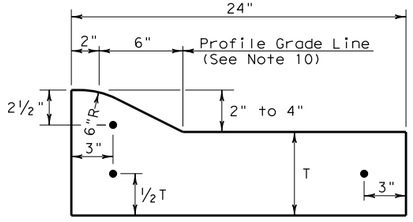
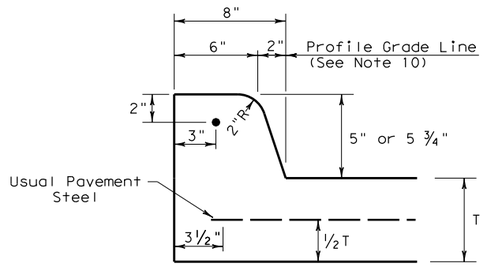
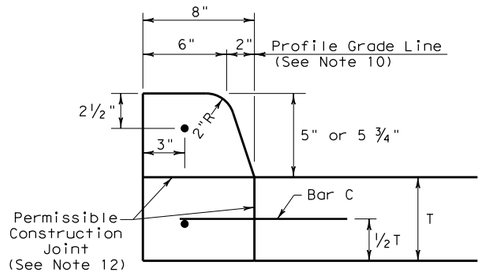


TYPE I CURB AND GUTTER
2" - 4" HEIGHT



TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



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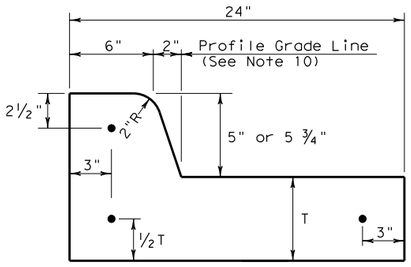
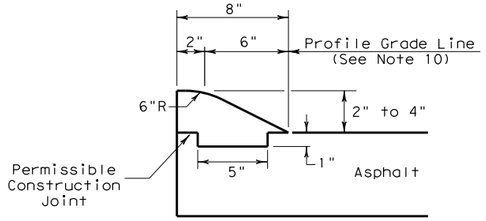
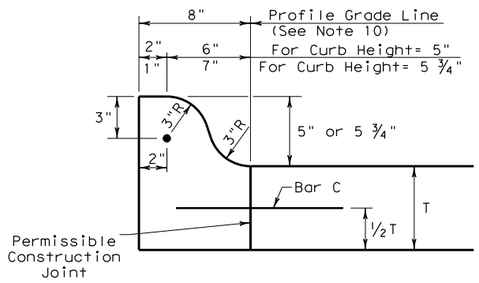


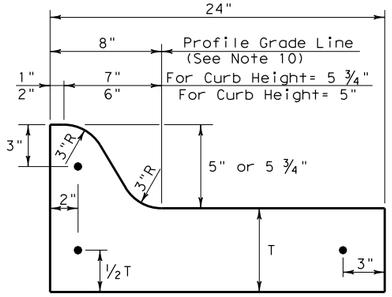
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



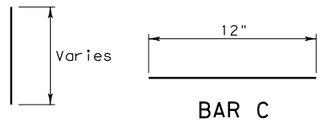
TYPE III CURB (KEYED)
2" - 4" HEIGHT



TYPE IIa CURB
5" - 5 ¾" HEIGHT

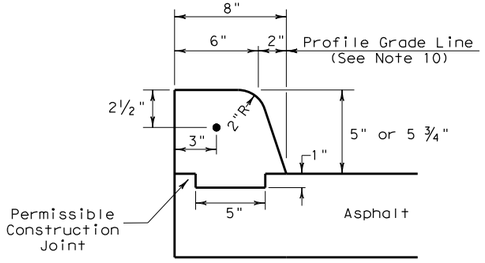


TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

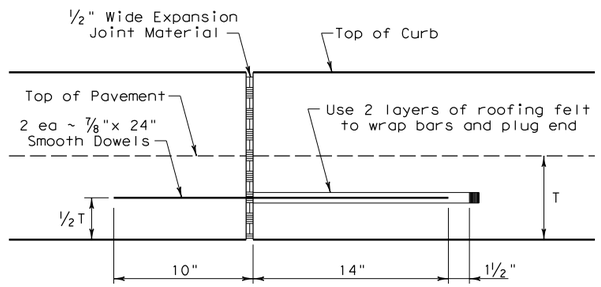


BAR B

BAR C

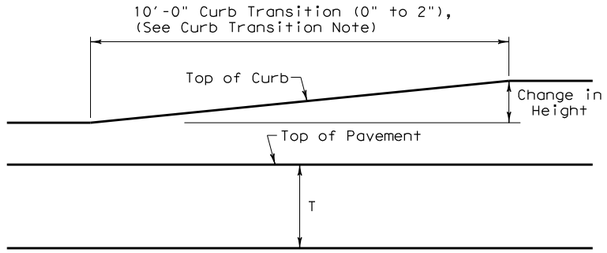


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



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 the 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 used as needed to support curb reinforcing steel during concrete placement.

Texas Department of Transportation

Design Division Standard

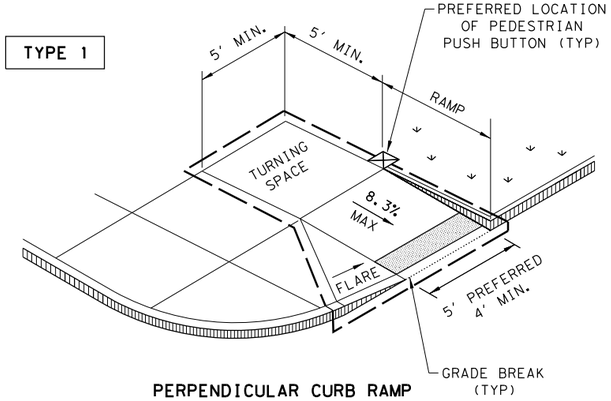
CONCRETE CURB AND CURB AND GUTTER

CCCG-21

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: SS	CK: KM
©TxDOT: FEBRUARY 2021 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		145

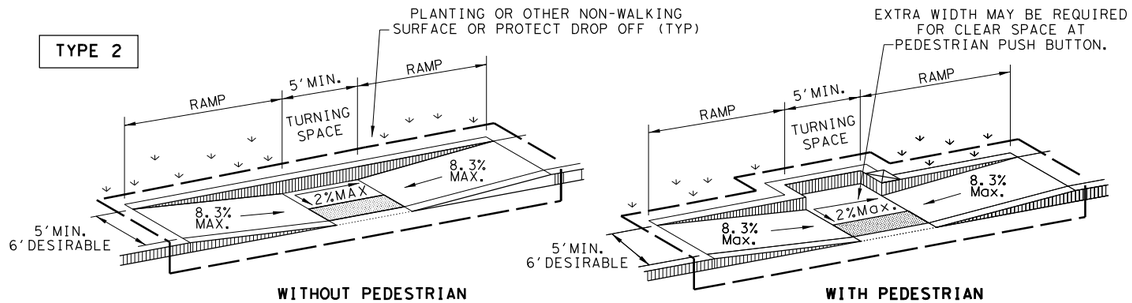
DATE:
FILE:

TYPE 1



PERPENDICULAR CURB RAMP

TYPE 2

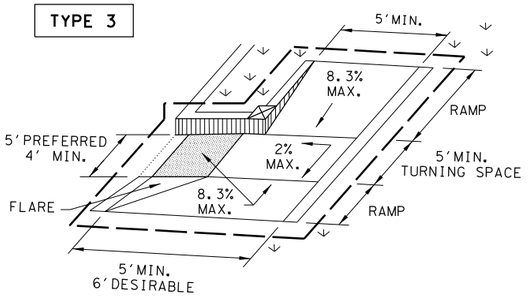


WITHOUT PEDESTRIAN PUSH BUTTON

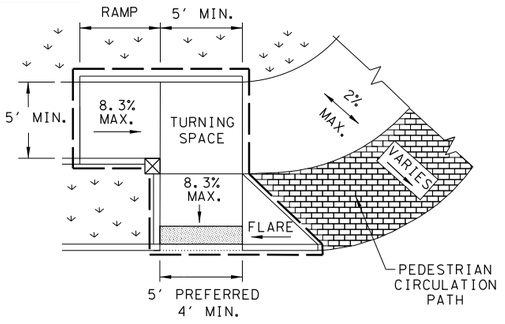
WITH PEDESTRIAN PUSH BUTTON

PARALLEL CURB RAMP

TYPE 3

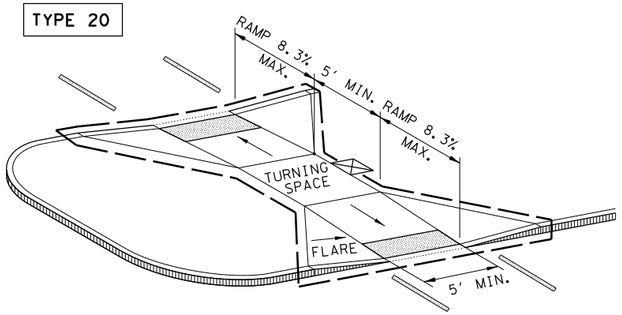


TYPE 6



COMBINATION CURB RAMPS

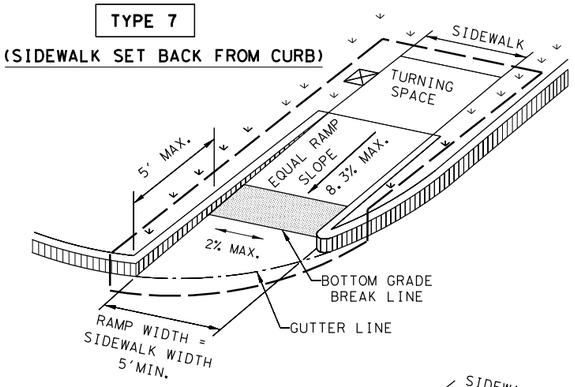
TYPE 20



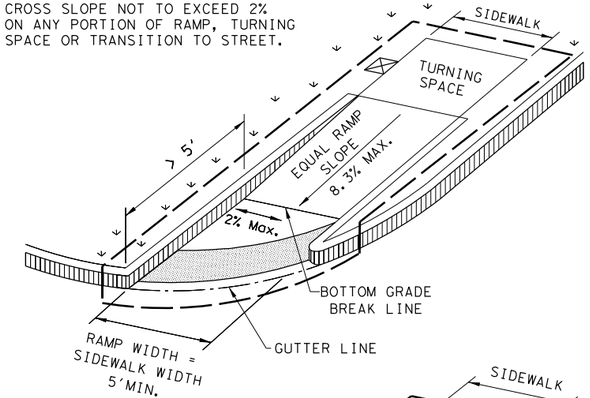
CURB RAMPS AT MEDIAN ISLANDS

TYPE 7

(SIDEWALK SET BACK FROM CURB)

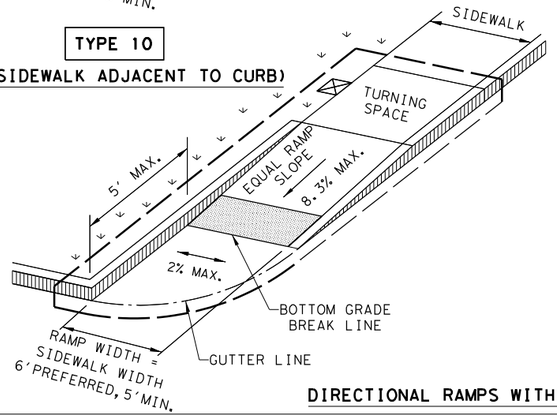


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.

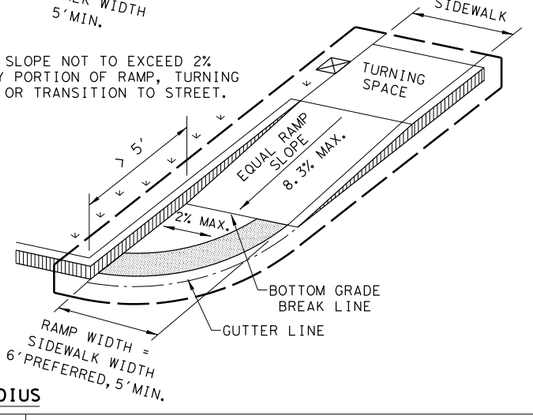


TYPE 10

(SIDEWALK ADJACENT TO CURB)

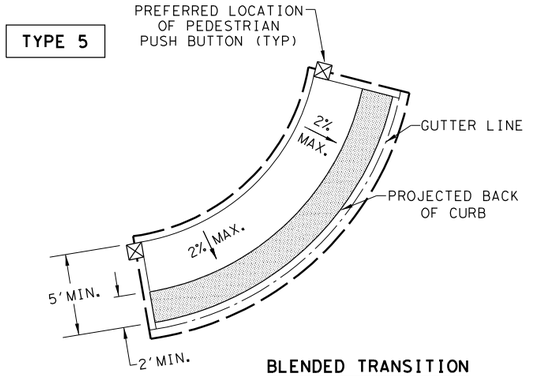


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



DIRECTIONAL RAMPS WITHIN RADIUS

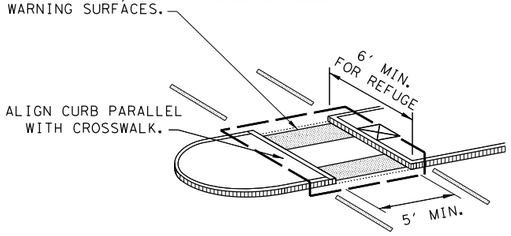
TYPE 5



BLENDED TRANSITION
(FLUSH LANDING)

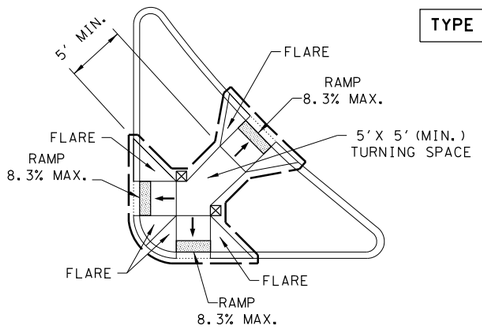
TYPE 21

INSTALL DETECTABLE WARNING SURFACE AT EACH END OF THE CUT-THROUGH RAMP WITH A MINIMUM 2' USUAL SIDEWALK SURFACE BETWEEN. IF MEDIAN IS LESS THAN 6' WIDE, ELIMINATE DETECTABLE WARNING SURFACES.



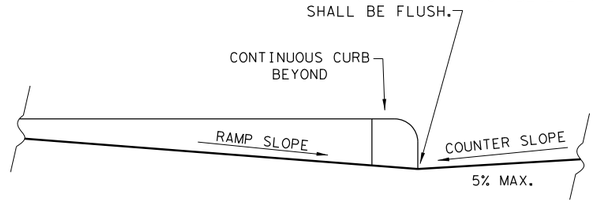
NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS

BOTTOM GRADE BREAK OF CURB RAMP WILL NORMALLY BE AT GUTTER LINE. SURFACE SLOPES AT GRADE BREAKS SHALL BE FLUSH.



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

NOTES / LEGEND:

SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DETECTABLE WARNING SURFACE

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
REVISED 08, 2005	DIST	COUNTY		SHEET NO.
REVISED 06, 2012	AUS	TRAVIS		146
REVISED 01, 2018				

DATE:
FILE:

GENERAL NOTES

CURB RAMPS

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5′. Where the sidewalk is adjacent to the back of curb, a 6′ sidewalk width is desirable. Where a 5′ sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4′ for short distances. 5′x 5′ passing areas at intervals not to exceed 200′ are required.
5. Turning Spaces shall be 5′x 5′ minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4′x 4′ wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6′ wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5′x 5′ landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicalble standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

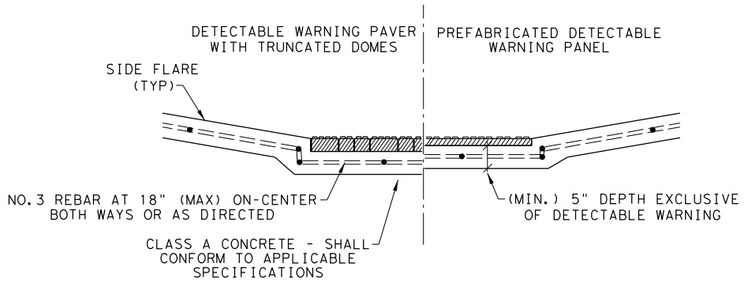
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

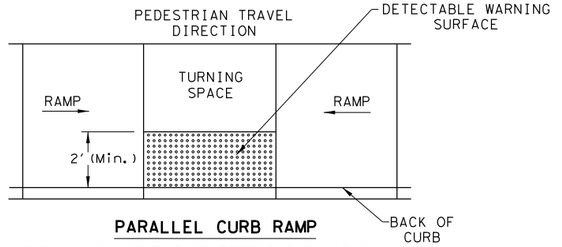
SIDEWALKS

27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.

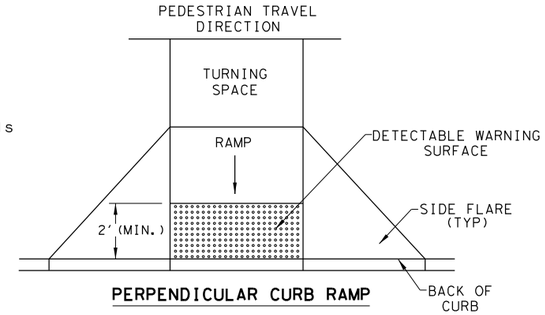


SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

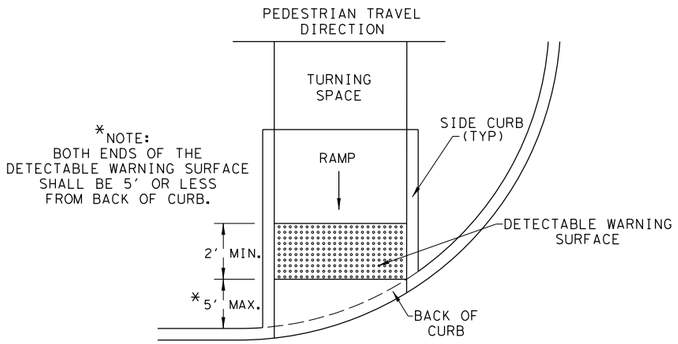
DETECTABLE WARNING SURFACE DETAILS



PARALLEL CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.



PERPENDICULAR CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



DIRECTIONAL CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

Texas Department of Transportation

Design Division Standard

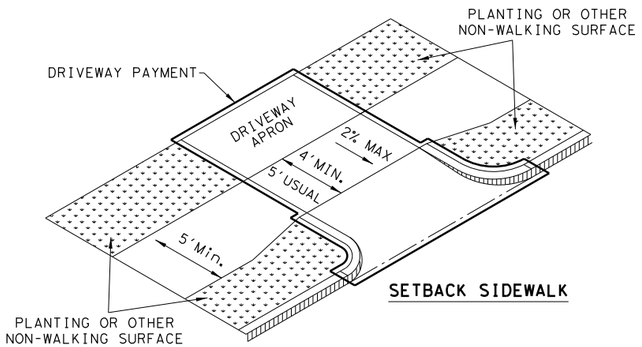
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

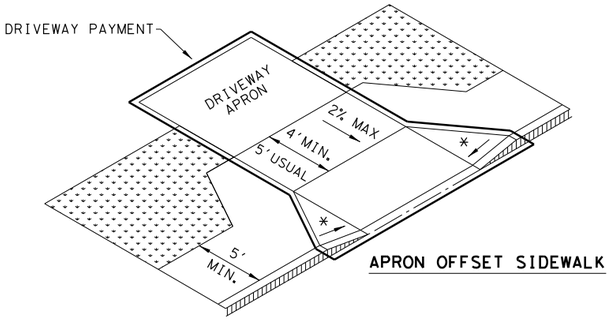
FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG	
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1186	01	091		FM 969	
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY			SHEET NO.	
	AUS	TRAVIS			147	

DATE:
FILE:

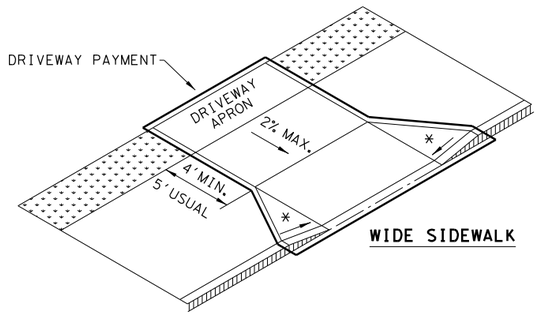
SIDEWALK TREATMENT AT DRIVEWAYS



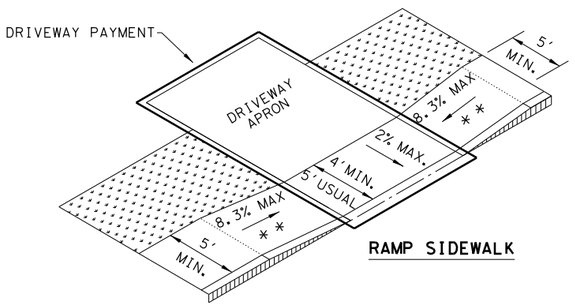
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

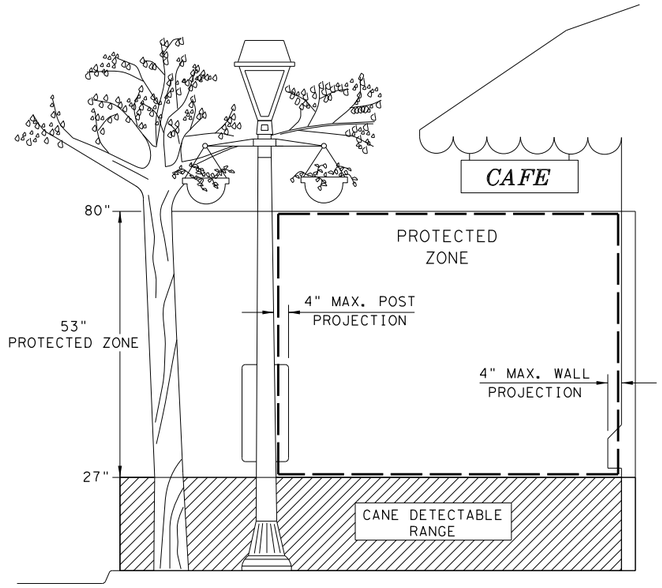


RAMP SIDEWALK

NOTES:

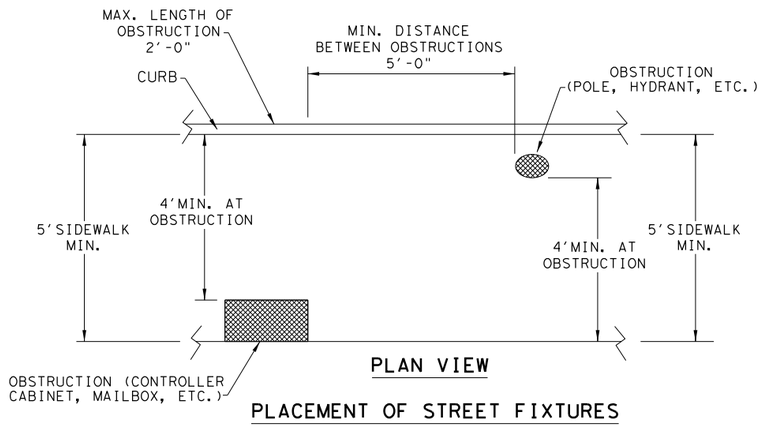
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.



PROTECTED ZONE

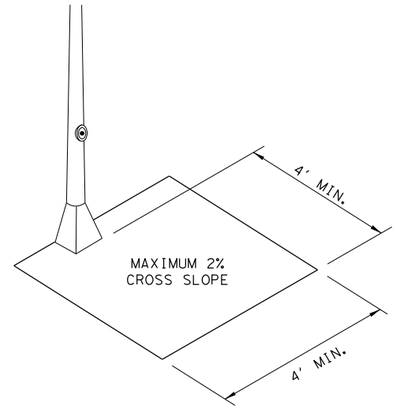
NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



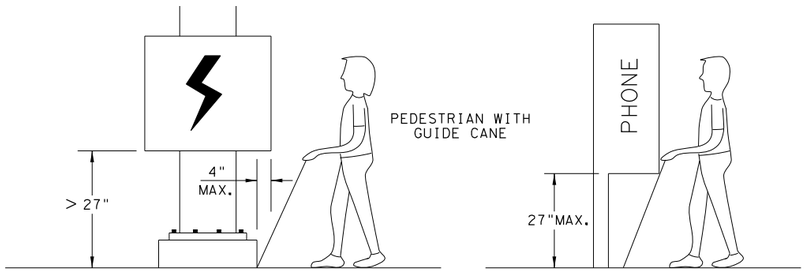
PLAN VIEW

PLACEMENT OF STREET FIXTURES

NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



WHEN AN OBSTRUCTION OF A HEIGHT GREATER THAN 27" FROM THE SURFACE WOULD CREATE A PROTRUSION OF MORE THAN 4" INTO THE PEDESTRIAN CIRCULATION AREA, CONSTRUCT ADDITIONAL CURB OR FOUNDATION AT THE BOTTOM TO PROVIDE A MAXIMUM 4" OVERHANG.

PROTRUDING OBJECTS OF A HEIGHT ≤ 27" ARE DETECTABLE BY CANE AND DO NOT REQUIRE ADDITIONAL TREATMENT.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

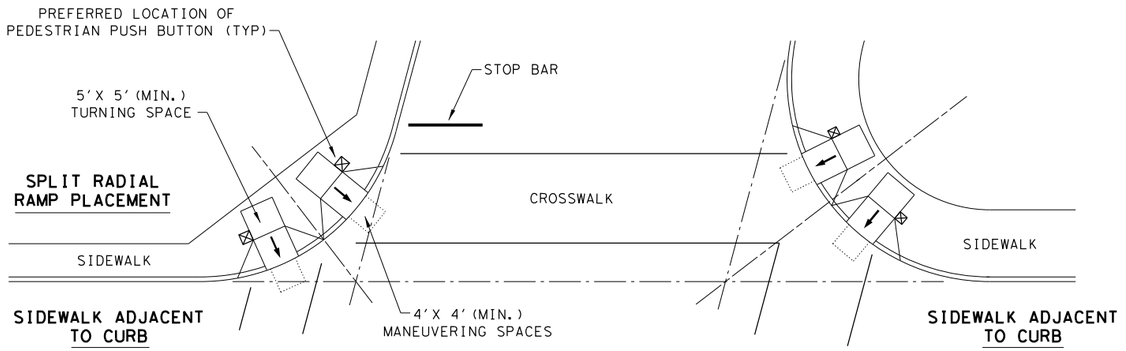
PED-18

FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS	1186	01	091		FM 969
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY			SHEET NO.
	AUS	TRAVIS			148

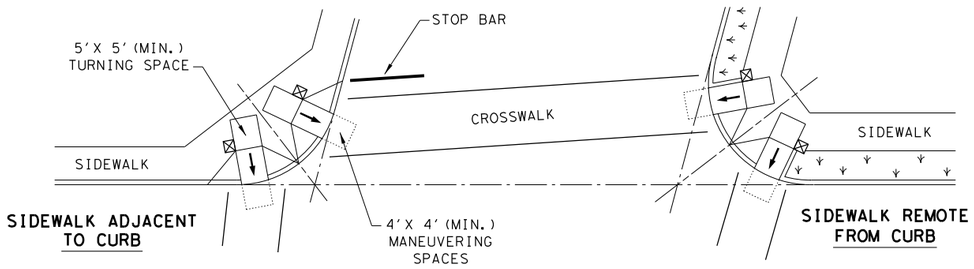
DATE:
FILE:

TYPICAL CROSSING LAYOUTS

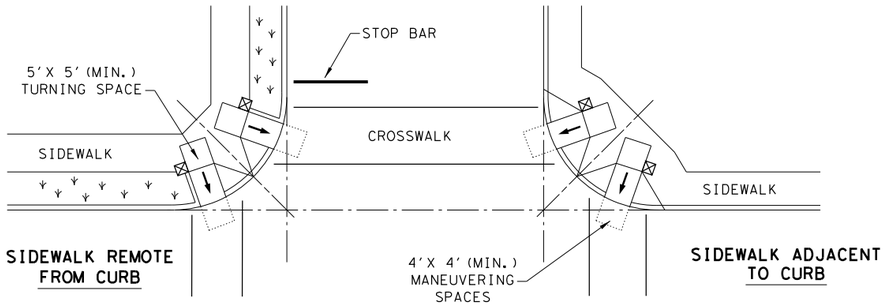
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



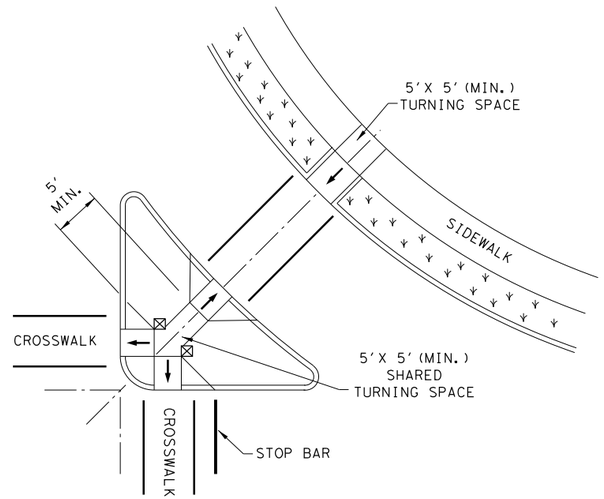
SKEWED INTERSECTION WITH "LARGE" RADIUS



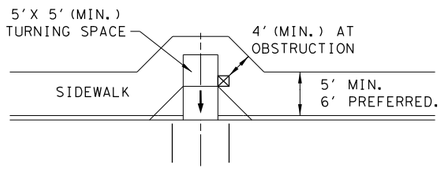
SKEWED INTERSECTION WITH "SMALL" RADIUS

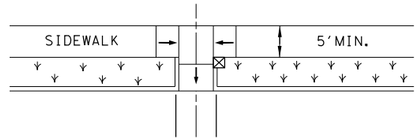


NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND





MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ☒

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

Texas Department of Transportation

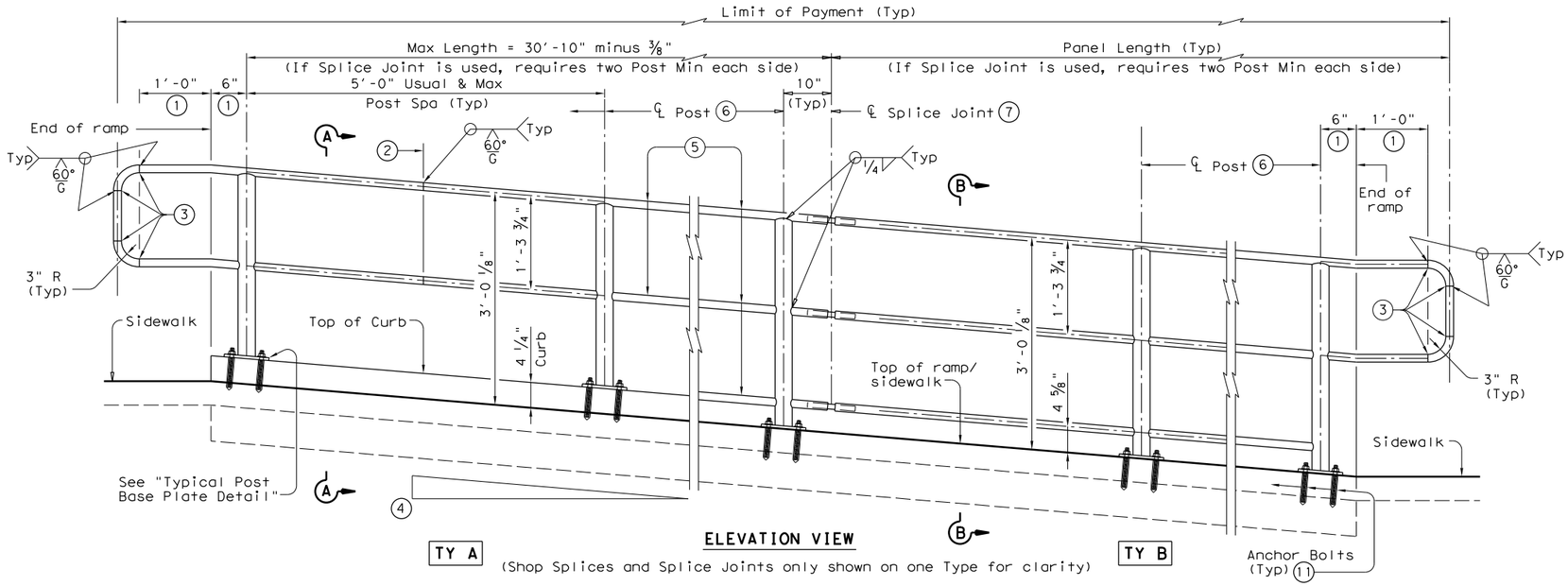
Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

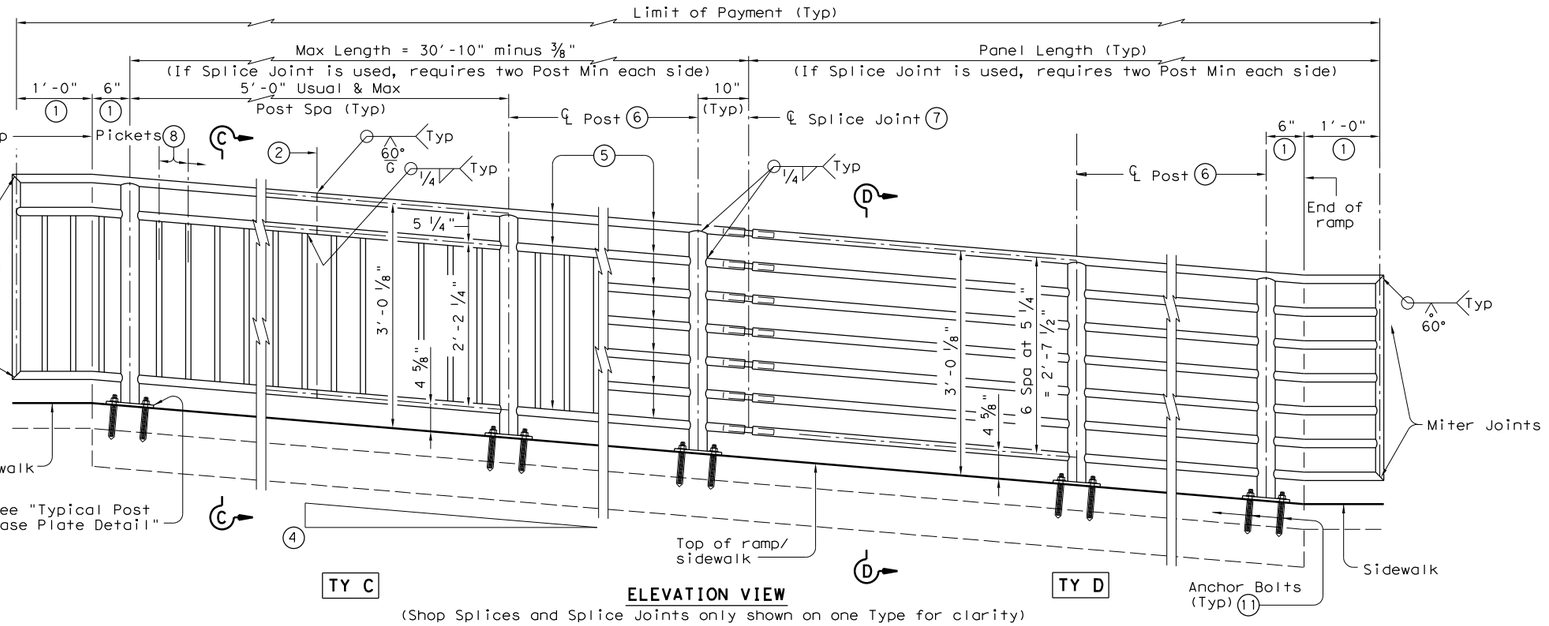
FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
	CONT	SECT	JOB		HIGHWAY
REVISIONS	1186	01	091		FM 969
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY			SHEET NO.
	AUS	TRAVIS			149

DATE:
FILE:



ELEVATION VIEW

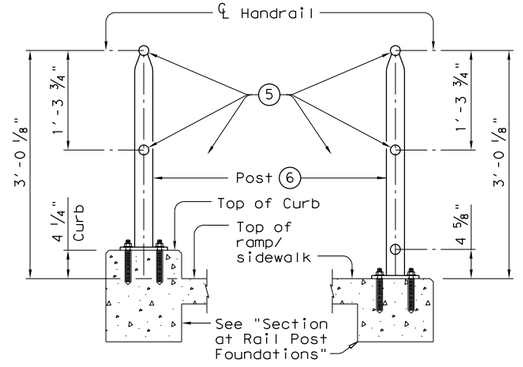
(Shop Splices and Splice Joints only shown on one Type for clarity)



ELEVATION VIEW

(Shop Splices and Splice Joints only shown on one Type for clarity)

RECOMMENDED USAGE (9)(10)	
Dropoff Height/ Condition	Recommended Rail Options
< 30" dropoff	TY A, TY B, TY C, or TY D
≥ 30" dropoff, or along Bike Path	TY E or TY F

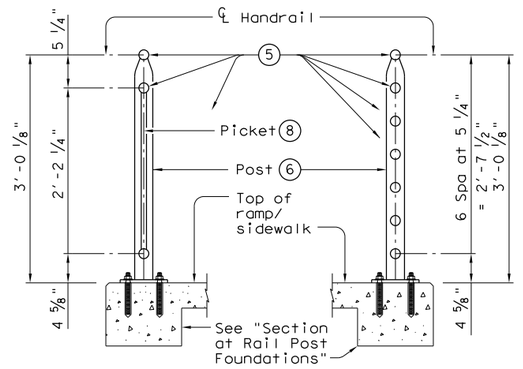


SECTION A-A

(Showing Handrail **TY A**)

SECTION B-B

(Showing Handrail **TY B**)



SECTION C-C

(Showing Handrail **TY C**)

SECTION D-D

(Showing Handrail **TY D**)

1. Parallel to ground.
2. One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
3. Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
4. See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.
5. 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.
6. 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.
7. See "Handrail Fabrication Details" for Splice Joints.
8. ℄ ⅝" Dia. Round Bar equal spacing at 4 ½" Max. Plumb all pickets.
9. When needed for accessibility (grade > 5 percent) or as needed for pedestrian safety.
10. Not to be used on bridges.
11. See "General Notes" for anchor bolt information.

SHEET 1 OF 3

Texas Department of Transportation

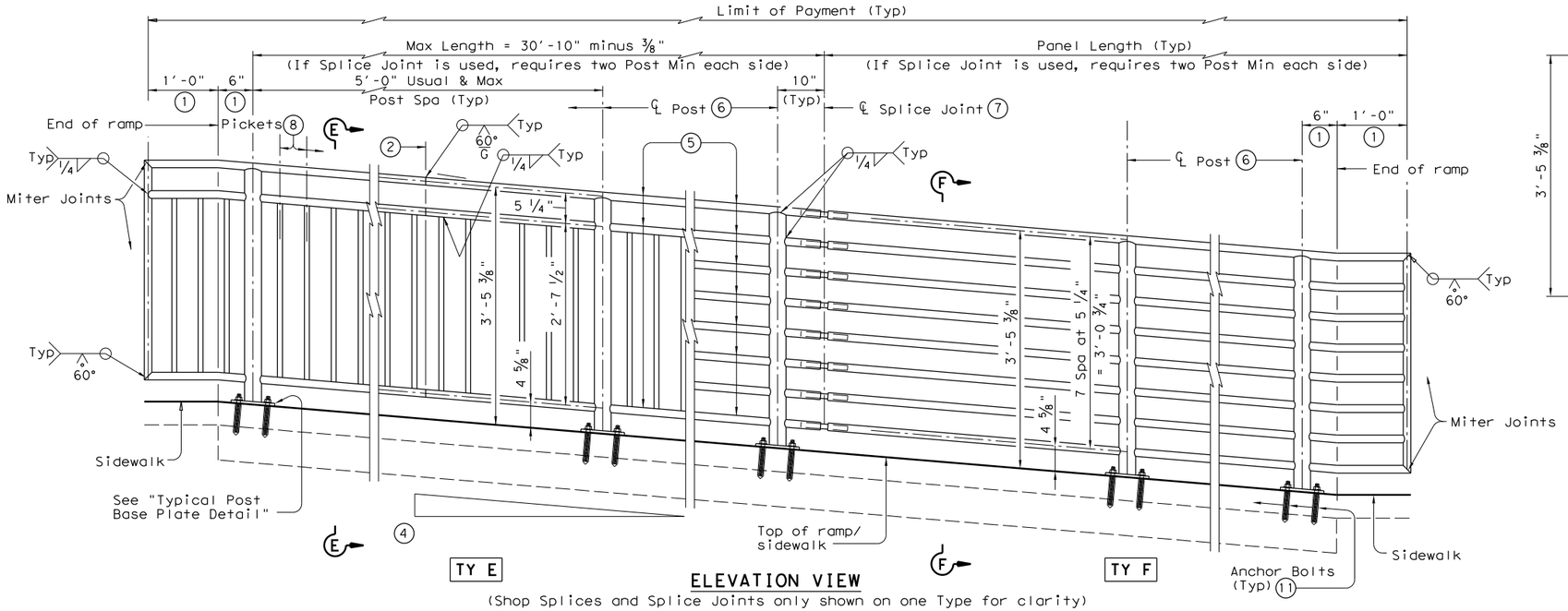
Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

PRD-13

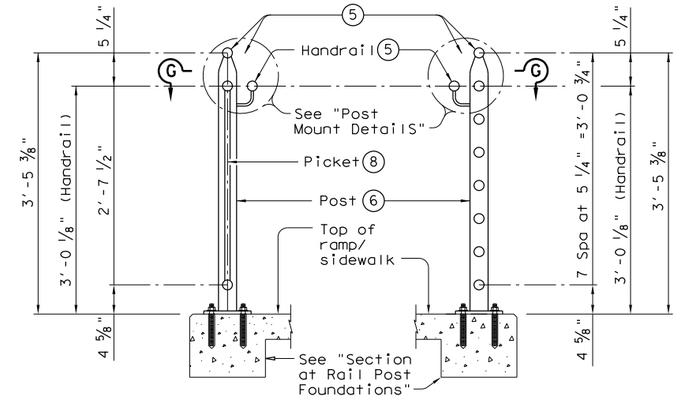
FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
©TxDOT Decmeber 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED MAY, 2013 (VP)	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		150

DATE:
FILE:



ELEVATION VIEW

(Shop Splices and Splice Joints only shown on one Type for clarity)

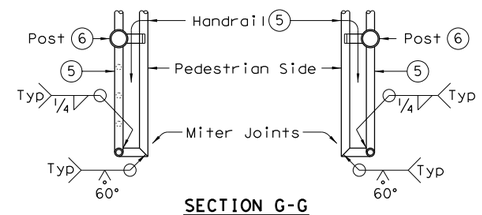


SECTION E-E

(Showing Handrail **TY E**)

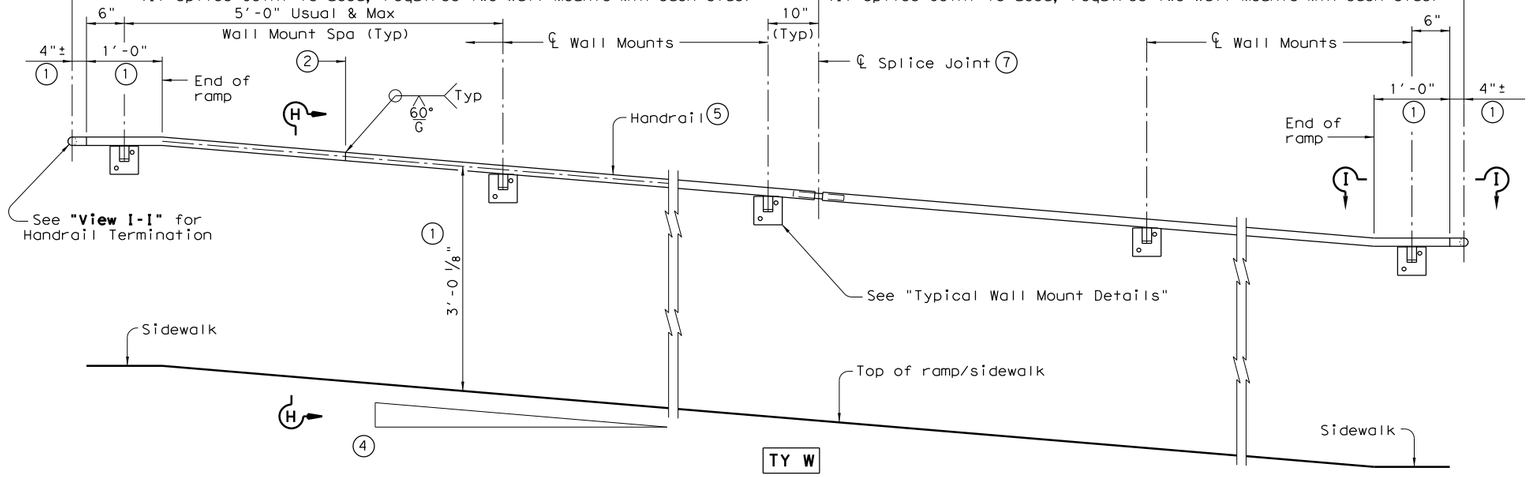
SECTION F-F

(Showing Handrail **TY F**)

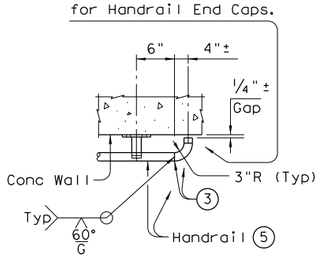


SECTION G-G

(Showing Handrail Termination)

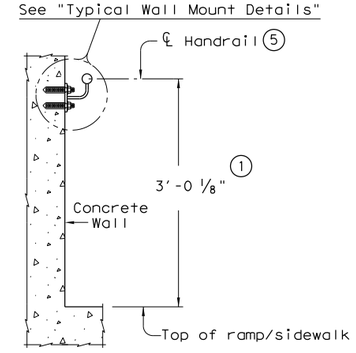


ELEVATION VIEW



VIEW I-I

(Showing Handrail Termination)



SECTION H-H

(Showing Handrail **TY W**)

1. Parallel to ground.
2. One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
3. Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
4. See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.
5. 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.
6. 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.
7. See "Handrail Fabrication Details" for Splice Joints.
8. ℄ 5/8" Dia. Round Bar equal spacing at 4 ½" Max. Plumb all pickets.
11. See "General Notes" for anchor bolt information.

Texas Department of Transportation

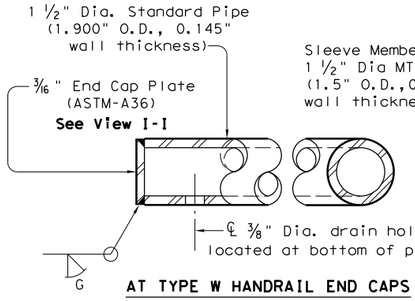
Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

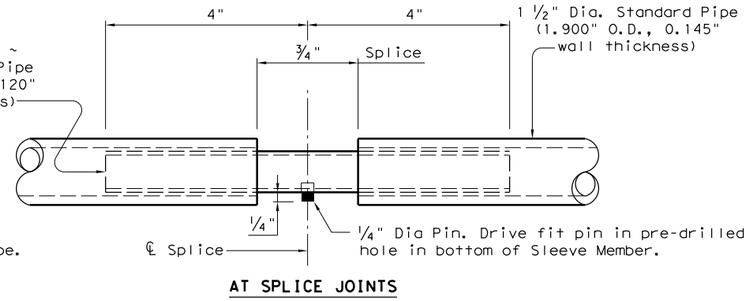
PRD-13

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
©TxDOT December 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED MAY, 2013 (VP)	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		151

DATE:
FILE:

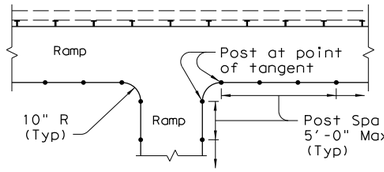


AT TYPE W HANDRAIL END CAPS

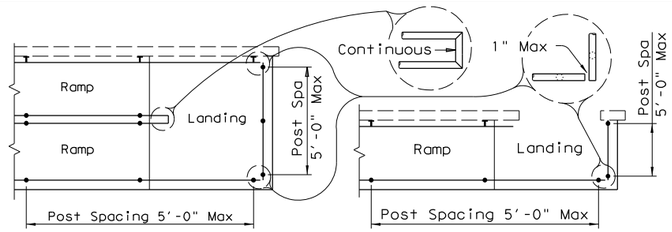


AT SPLICE JOINTS

HANDRAIL FABRICATION DETAILS



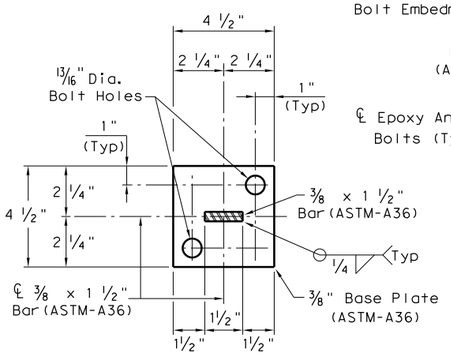
RAMP INTERSECTION



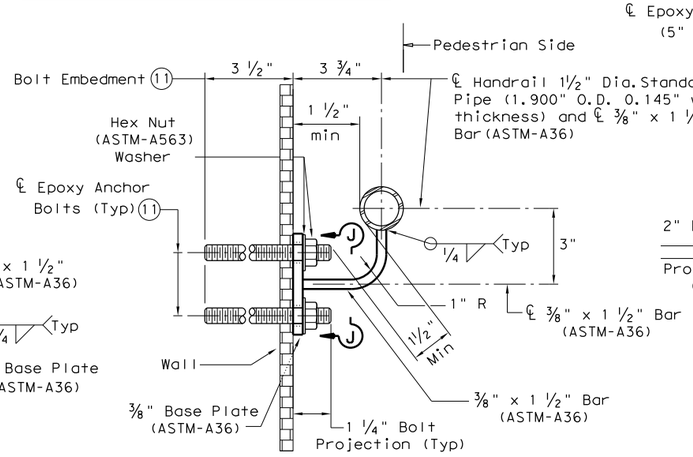
MULTI-LEVEL RAMP

SINGLE-LEVEL RAMP

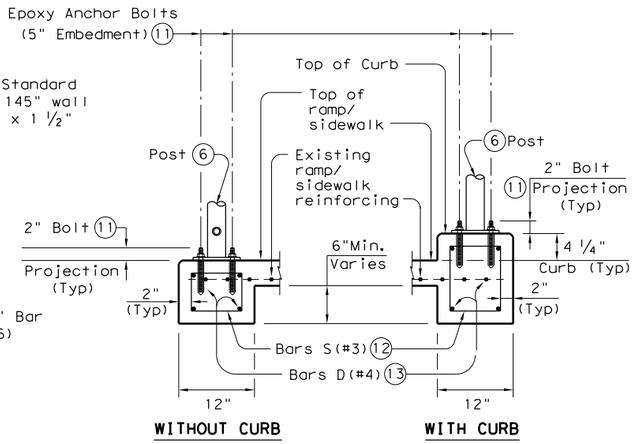
PLAN SHOWING RAIL AT RAMP CONDITIONS



SECTION J-J
(Anchor Bolts not shown for clarity)



SECTION AT WALL MOUNT



SECTION AT RAIL POST FOUNDATIONS

TYPICAL WALL MOUNT DETAILS

GENERAL NOTES

Designed according to ADAAG, Texas Accessibility Standards, Uniform Building Code, and AASHTO LRFD Specifications.

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

Pipe will conform to ASTM-A53 Grade B or A500 Grade B. Steel plates and steel bars will conform to ASTM-A36. Mechanical tubing (MT) will conform to ASTM A513 Grade 1015 or higher. Galvanize all steel components except reinforcing steel unless noted otherwise.

Concrete for foundations will be in accordance with Item 531 "Sidewalks". All reinforcing steel must be Grade 60. Bar laps, where required, will be as follows: Uncoated ~ #4 = 1'-5" Epoxy coated ~ #4 = 2'-1"

When the plans require painted steel, follow the requirements for painting galvanized steel in Item 446, "Cleaning and Painting Steel". Sleeve Members will receive galvanization and only get field painted after installation unless directed otherwise by Engineer.

Epoxy Anchor bolts for wall mount and post base plate will be ⅝" Dia. ASTM A36 threaded rods with one hex nut and one hardened steel washer at each bolt. ⅝" Dia. threaded rod embedment depth for wall mounts is 3 ½" and embedment depth for post base plate is 5".

Embed threaded rods into concrete with a Type III (Class C) epoxy meeting the requirements of DMS-6100, "Epoxies and Adhesives". Mix and dispense adhesive with the manufacturer's static mixing nozzle/dual cartridge system. Core drill holes (percussion drilling not permitted).

At the contractor's option the post base plate anchor bolts may be cast with the Ramp/Sidewalk (See Cast-in-Place Anchor Bolt Options).

Optional cast-in-place anchor bolts will be ⅝" Dia ASTM A307 Grade A bolts (or A36 threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer at each bolt. Embedment depth of cast-in-place bolt will be 8" for post base plate.

Handrails and any wall or other surface adjacent to them will be free of any sharp or abrasive elements.

Submit shop drawings to the Engineer unless otherwise noted. For curved handrail applications, fabricate the handrail to the curve if radius is less than 600 ft. Shop drawings are required when rail is fabricated to the curve.

For all handrails, erection drawings will be submitted to the Engineer for approval to ensure proper installation.

Drawings will show handrail mount locations with bolts setting, spacing, ramp slope, and/or splice joint locations, and handrail lengths with identification showing where each handrail goes on the layout.

Payment for concrete sidewalks or curb ramps will be paid for in accordance with Item 531 "Sidewalks".

Payment for all items shown is to be included in unit price bid in accordance with Item 450 "Railing" of the type specified.

All exposed edges will be rounded or chamfered to approximately ⅛" by grinding.

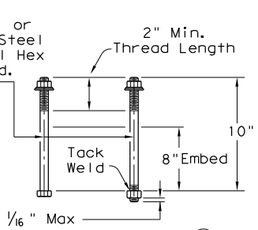
(5) 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp/sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.

(6) 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). Plumb all posts. See "Post Mount Detail" for crimping and trimming post to fit the diamenter of top rail. Provide holes as needed in post for galvanizing drainage and venting.

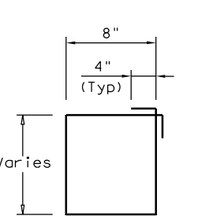
(11) See "General Notes" for anchor bolt information.

(12) Bars S(#3) spaced at 12" Max (Spaced 3" from outside edge of overall length of Ramp/Sidewalk).

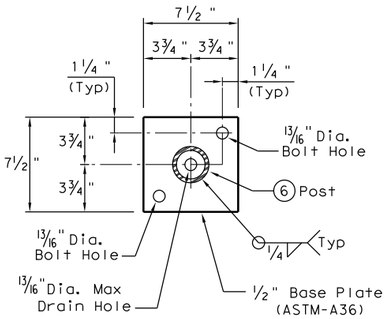
(13) Provide 1 ½" end cover to Bars D(#4) from outside edge of overall length of Ramp/Sidewalk.



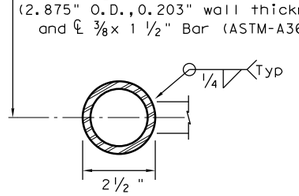
CAST-IN-PLACE ANCHOR BOLT OPTIONS
(Used for Post Base Plate only)



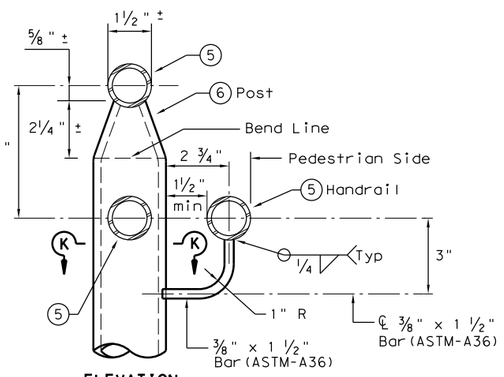
BARS S (#3)



TYPICAL POST BASE PLATE DETAIL



SECTION K-K



ELEVATION

POST MOUNT DETAILS

SHEET 3 OF 3

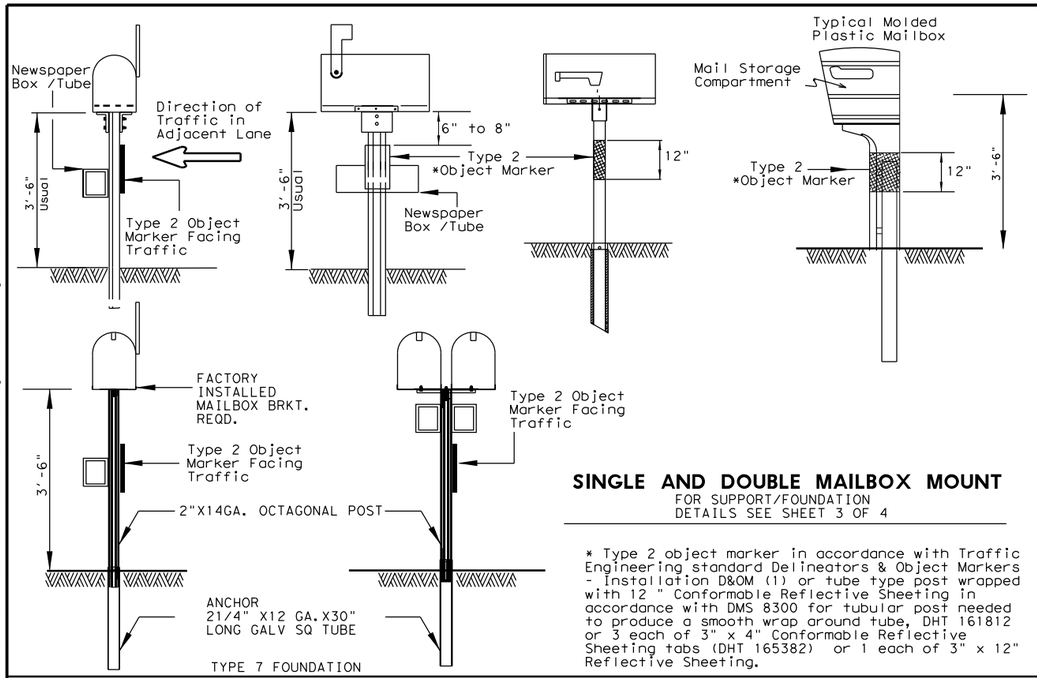
Texas Department of Transportation

Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

PRD-13

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
©TxDOT December 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
REVISED MAY, 2013 (VP)	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		152



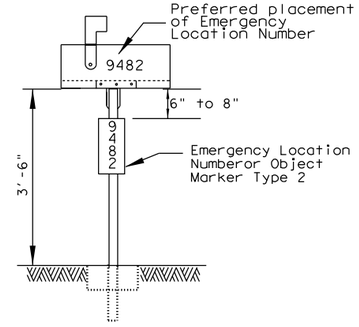
SINGLE AND DOUBLE MAILBOX MOUNT

FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4

* Type 2 object marker in accordance with Traffic Engineering standard Delineators & Object Markers - Installation D&OM (1) or tube type post wrapped with 12 " Conformable Reflective Sheeting in accordance with DMS 8300 for tubular post needed to produce a smooth wrap around tube, DHT 161812 or 3 each of 3" x 4" Conformable Reflective Sheeting tabs (DHT 165382) or 1 each of 3" x 12" Reflective Sheeting.

Note: Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Pedestrian Facilities Curb ramps standard *PED-XX for pedestrian facilities.

*PED-XX: XX is the standard year for example PED- 12 , PED-13,etc.



PLACEMENT OF EMERGENCY LOCATION NUMBER

Location Number shall be placed on: 1. A yellow, type A plate with class 1 flat surface reflective sheeting in accordance with DMS 8600. The color of numbers shall be black. or 2: A green or blue plate with white numbers attached to post beside the object marker. Other contrasting color configuration, as approved , may be used. (Use Same type plate as used for the type 2 Object Marker. Recommended sign size is 6" by 15")

TYPICAL MAILBOX SIZE				LIGHT WEIGHT MATERIAL	
				SHEET METAL	**PLASTIC
SIZE	LENGTH	WIDTH	HEIGHT	MAXIMUM WEIGHT	
	INCHES			POUNDS	
SMALL	19 1/2	6	7	5	5
MEDIUM	22 1/2	8	11 1/2	7	7
LARGE	23 1/2*	11 1/2*	13 1/2*	10	10

* Maximum allowed dimensions for mailbox
** Excluding Molded Plastic on 4 X 4 Post

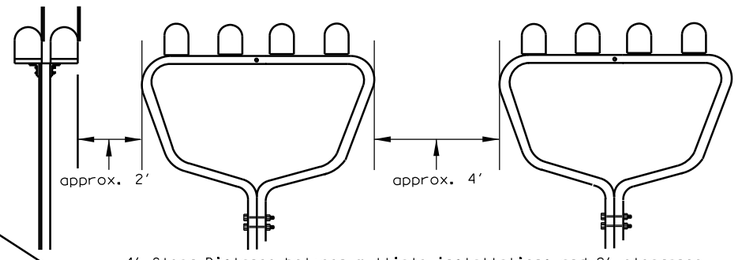
LOCKABLE ARCHITECTURAL MAILBOX SIZE (INCHES)					
VIEW	TOP	BOTTOM	FRONT SIDE	BACK SIDE	WEIGHT
SIDE	18	15	18.3	15	(POUNDS)
BACK	11 1/2	11 1/2		15	22.4

SEE TOP RIGHT CORNER OF SHEET 2 OF 4

MAILBOX SIZES

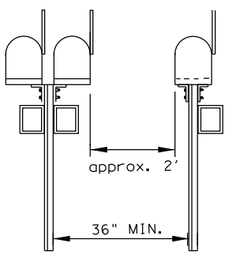
Mailboxes shall be made of light weight sheet metal or light weight plastic. Lockable architectural mailboxes shall meet the requirements of the above table.

Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.



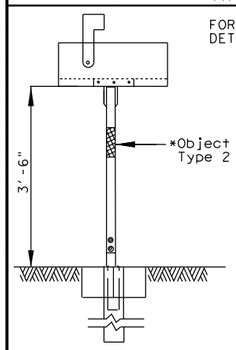
4' Clear Distance between multiple installations and 2' clearance between double or single installations and the multiple installation. DHT #'s 164116 or 149339.

MULTIPLE MAILBOX PLACEMENT

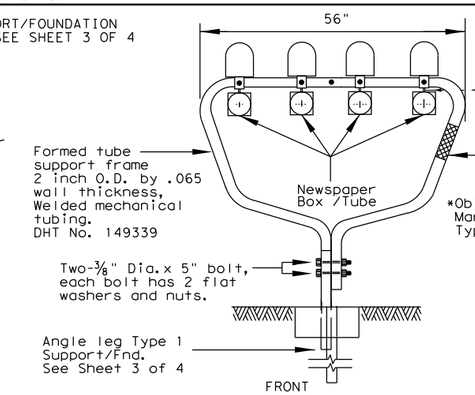


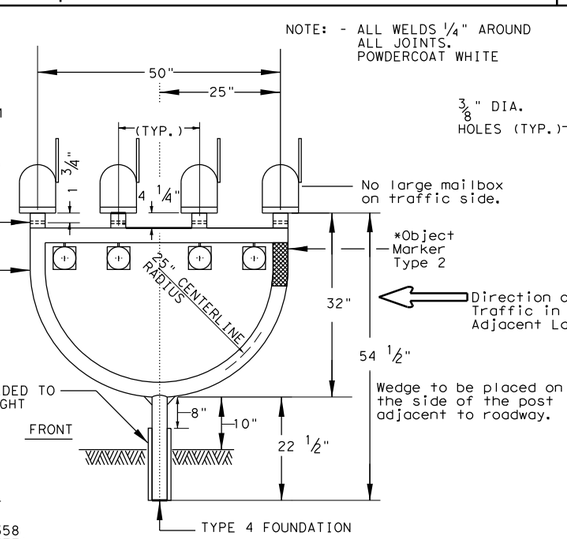
Clear Distance between single or double mounted posts. (Normally when 3 or more mailboxes are in one location, a multiple support is used).

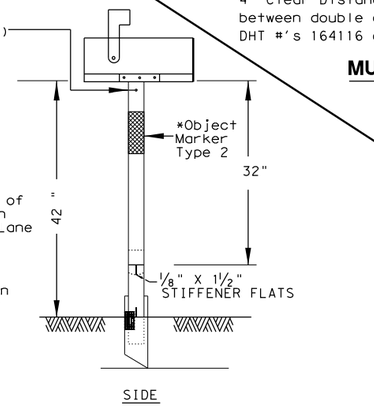
SINGLE & DOUBLE MAILBOX PLACEMENT

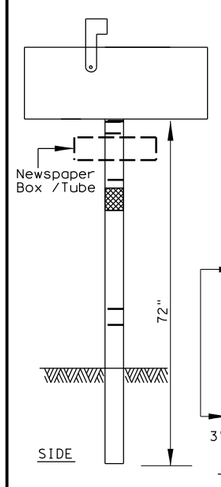


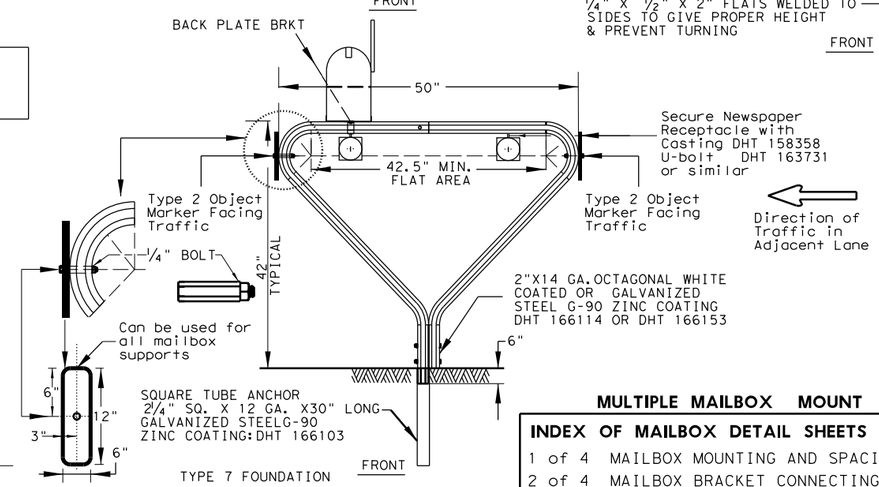
FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4











DOUBLE AND MULTIPLE MAILBOX MOUNT

FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4
FOR DHT NUMBERS SEE SHEET 4 OF 4

MULTIPLE MAILBOX MOUNT

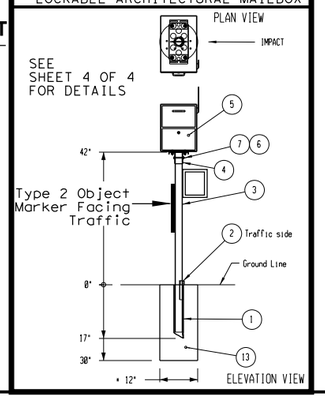
INDEX OF MAILBOX DETAIL SHEETS

NEWSPAPER RECEPTACLE

A light weight receptacle for newspaper delivery can be attached to mailbox posts as shown on this page if the receptacle:

- Does not touch the mailbox.
- Does not present a hazard to traffic or delivery of the mail.
- Does not extend beyond the front of the mailbox.
- Does not display advertising, except the publication title.
- Newspaper receptacles on separate supports are prohibited.

LOCKABLE ARCHITECTURAL MAILBOX



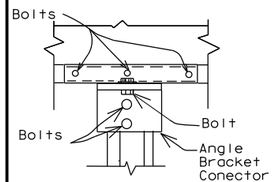
SHEET 1 OF 4

Texas Department of Transportation — Maintenance Division Standard

MAILBOX MOUNTING AND SPACING

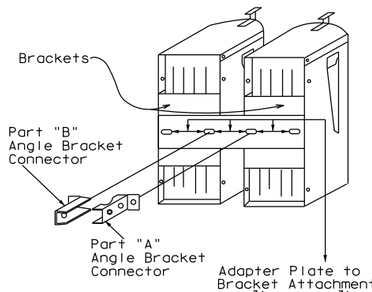
MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK: JEO	DW:	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS: Added additional newspaper receptacle for double mailbox support	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		153



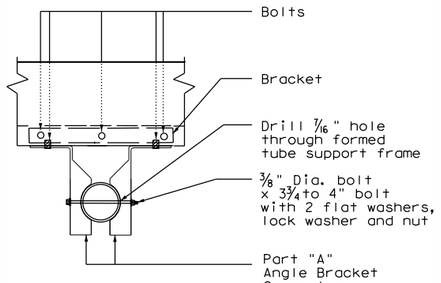
For bolt sizes see details below for "SMALL MAILBOX" and "MEDIUM AND LARGE MAILBOXES"

SINGLE MAILBOX

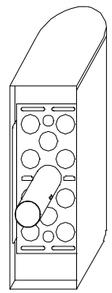


(Not permitted for Large Mailboxes)

DOUBLE MAILBOX

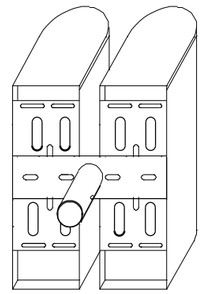


MULTIPLE MAILBOX



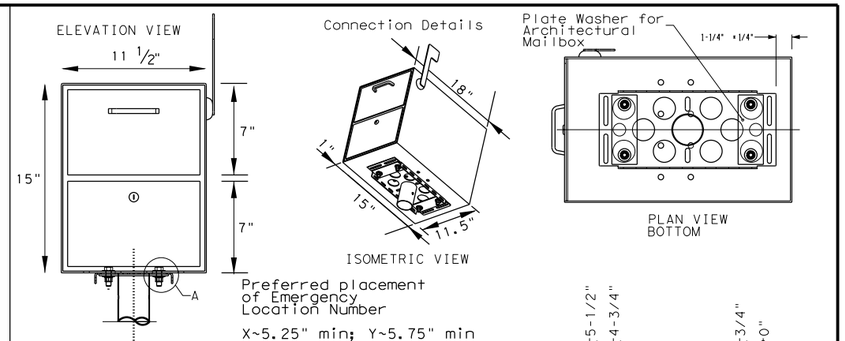
To be used with 2 3/8" OD RR or thinwall Steel posts.

WELDED SINGLE MAILBOXBRACKET

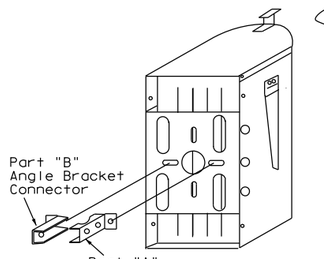


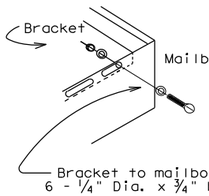
To be used with thinwall Steel posts. Not to be used with RR posts.

WELDED DOUBLE MAILBOX BRACKET WITHADAPTER PLATE



LOCKABLE ARCHITECTURAL MAILBOX CONNECTION DETAILS



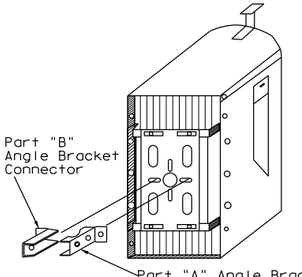


Bracket to mailbox attachment:
6 - 1/4" Dia. x 3/4" bolt w/ 2 flat washers and nut per each bolt.

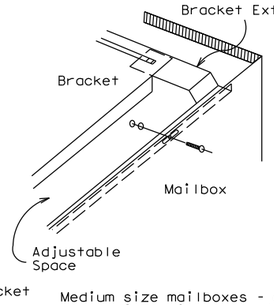
Angle to bracket attachment:
2 - 3/8" Dia. x 3/4" bolt with 2 flat washers, lock washer and nut per each bolt.

Angle to
2 - 3/8" Dia. x 2 1/2" bolt with 2 flat washers, lock washer and nut per each bolt.

SMALL MAILBOX



Use both Parts "A" and "B" Angle Bracket Connectors for Winged Channel Posts



Bracket to mailbox attachment:
6 - 1/4" Dia. x 3/4" bolt w/2 flat washers and nut per each bolt.

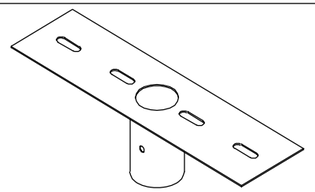
Bracket to bracket extension attachment:
2 - 1/4" Dia. x 3/4" carriage bolt w/ flat washer, lock washer and nut per bolt (4 bolts required if 2 bracket extensions are used).

Angle to bracket attachment:
2 - 3/8" Dia. x 3/4" bolt w/2 flat washers, lock washer and nut per each bolt.

Angle to mailbox support attachment:
2 - 3/8" Dia. x 2 1/2" bolt w/2 flat washers, lock washer, and nut per each bolt.

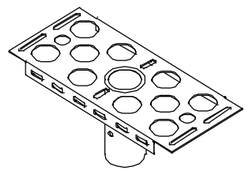
Medium size mailboxes - one extension bracket
Large size mailboxes - two extension brackets

MEDIUM AND LARGE MAILBOXES



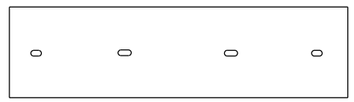
DHT 162323

For use with galvanized thinwall steel posts DHT # 143426 or powder-coated thinwall steel post DHT # 162911.



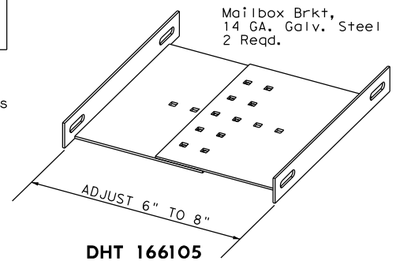
DHT 161443

For use with RCR post DHT # 161442 or galvanized thinwall steel post DHT # 143426 or powder-coated thinwall steel post. DHT # 162911.

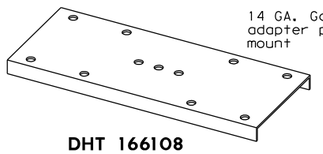


DHT #3789

Used for mounting two Mailboxes on the same post.

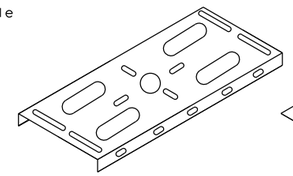


DHT 166105



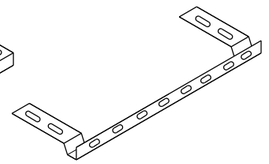
14 GA. Galv. Steel adapter plate for double mount

DHT 166108



DHT 148939

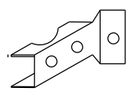
Mailbox Bracket



DHT 148938

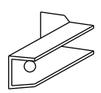
Used for extending 6" wide bracket to attach larger mailboxes.

Bracket Extension



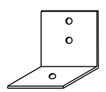
DHT 159489

Part "A" Angle Bracket Connector



DHT 159490

Part "B" Angle Bracket Connector



DHT 2917

Angle Bracket For Temporary Mailbox

HARDWARE AT TXDOT REGIONAL WAREHOUSES

Brackets and adapter plate shown in this section should be available to the Contractor when stated elsewhere in plans or specifications.

See Table of Applicable DHT Numbers on sheet 4 of 4 for DHT description and unit of measure.

GENERAL NOTES

1. Connecting hardware detailed on this sheet is for the hardware that the Department stocks at the Regional Warehouses. This hardware is available to the contractor only when so stated elsewhere in the plans or specification.
2. Hardware for mounting mailboxes to the support/foundation furnished by industry should be used when shown on the Maintenance Divisions "Approved Products List." Only mailbox hardware that have been crash tested in accordance with NCHRP Report 350, will be on the approved list.
3. Hardware furnished by industry shall be erected in accordance with the manufacturer's recommendation.
4. Bracket and bracket extension shall be constructed of 14 gauge galvanized steel sheet metal.
5. The angles, brackets and adapter plates shall be constructed of 12 gauge galvanized steel sheet metal.
6. Items with evidence of damage to the galvanized coating or wet storage stains (white rust) will not be accepted.

Texas Department of Transportation

Maintenance Division Standard

MAILBOX BRACKET CONNECTING DETAILS

MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
©TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS ADDED DHT 163730	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		154

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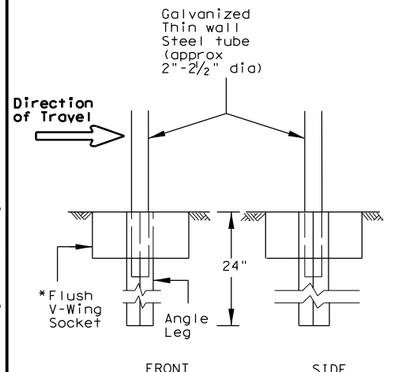
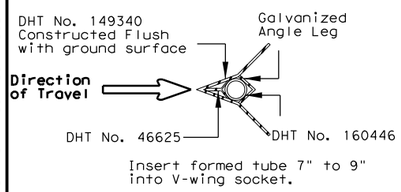
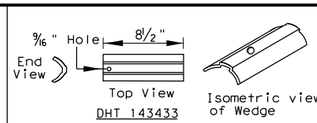




TYPE 1 SUPPORT/FOUNDATION

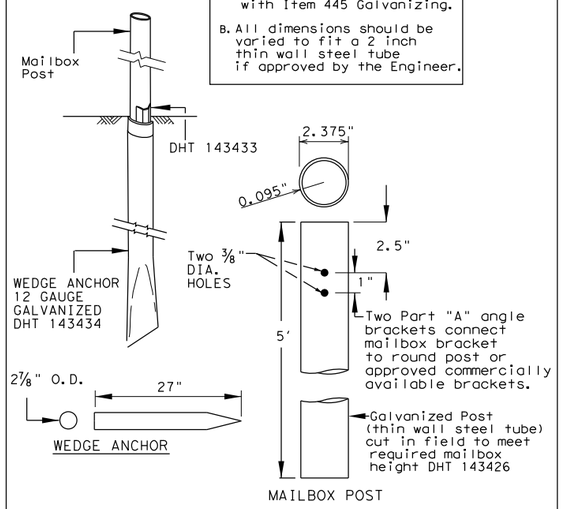
THIN WALL STEEL TUBE w/ V-LOC ANCHORAGE



NOTES FOR TYPE 2 SUPPORT/FOUNDATION

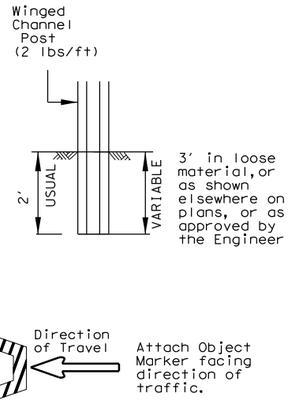
A. Galvanize steel support foundation in accordance with Item 445 Galvanizing.

B. All dimensions should be varied to fit a 2 inch thin wall steel tube if approved by the Engineer.



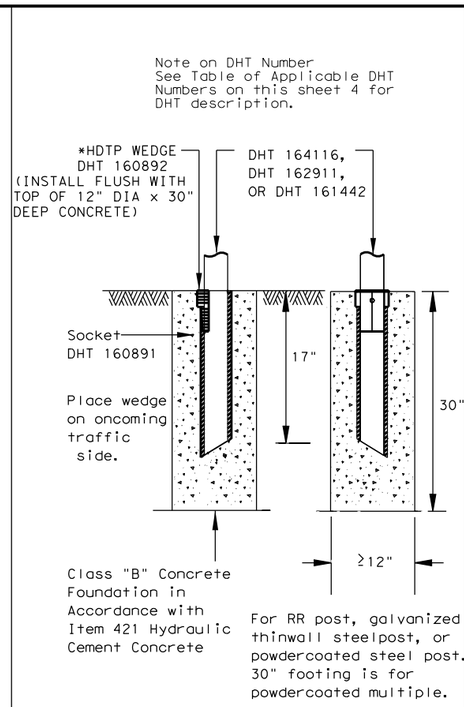
TYPE 2 SUPPORT/FOUNDATION

THIN WALL STEEL TUBE w/ WEDGE ANCHOR SYSTEM



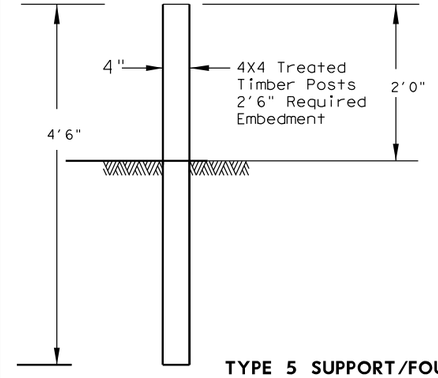
TYPE 3 SUPPORT/FOUNDATION

WINGED CHANNEL POST



TYPE 4 SUPPORT/FOUNDATION

FOR WHITECOATED STEEL POST, MULTIPLE POST, AND RECYCLED RUBBER.

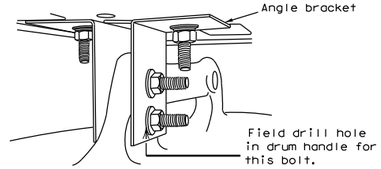


TYPE 5 SUPPORT/FOUNDATION

FOR ONE PIECE MOLDED PLASTIC MAILBOX

ONE PIECE MOLDED PLASTIC MAILBOXES

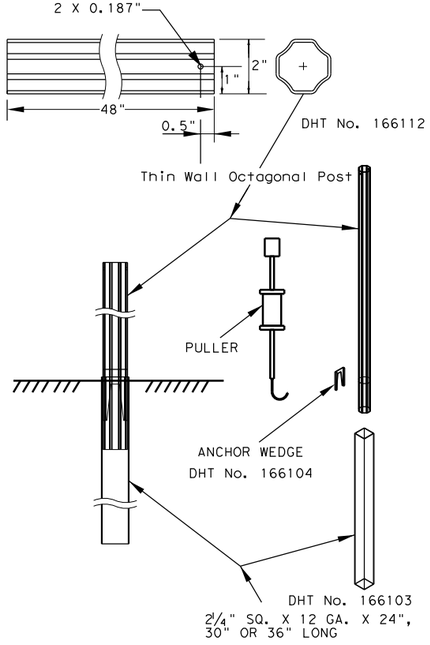
Molded Plastic Mailboxes shall be installed on 4"x4" treated timber posts only. The use of steel pipe or structural tubing in place of timber post is prohibited.



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

TYPE 6 TEMPORARY MAILBOX SUPPORT

CONNECTION DETAIL



TYPE 7 MAILBOX SUPPORT/FOUNDATION

CONNECTION DETAIL

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

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- SP = Single 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
- Ty 7 = Wedge Anchor

Type of Bracket
- AB = Angle Bracket.
- TB = 2.375" Tube Bracket

DOUBLE AND LARGE MAILBOXES MUST BE ON STEEL POST.

*HDTP: High density thermoplastic polyesters

GENERAL NOTES

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. type 1, 2, 3, 4 or 7 supports or foundation can be used for single or double mailbox installations. The RCR post should be used only for a single installation with a small mailbox. The Type 5 support/foundation is used for the single molded plastic mailbox. The Type 4 support/foundation is used for the 2.375" O.D. RR post, thin wall steel post, and white multiple mailbox post.
4. The Type 1 or type 7 support/foundation can be used for a multiple mailbox mount.
5. The Type 4 support should be used with thin wall steel pipe for the medium, large and double mailbox installations.
6. 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.

SHEET 3 OF 4

Texas Department of Transportation

Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
©TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		155

LOCKABLE ARCHITECTURAL MAILBOX

SINGLE-MOUNT INSTALLATION PARTS			
#	PART NAME	PART/DHT #	QTY
1	SOCKET, TYPE 4 FOUNDATION	160891	1
2	WEDGE FOR TYPE 4 FOUNDATION	160892	1
3	THIN-WALL WHITE STEEL TUBE 2.375 OD	162911	1
4	BRACKET FOR ATTACHING MAILBOX	161443	1
5	ARCHITECTURAL MAILBOX	SEE NOTE	1
6	NUT, 5/16" HEX	NUT, 5/16" HEX	1
7	BOLT, 5/16 X 3 HEX	GRADE 5	1
8	PLATE WASHER FOR ARCHITECTURAL MAILBOX	SEE SEE SHEET 2	2
9	WASHER, 3/8 FLAT		8
10	WASHER, 3/8 LOCK		4
11	NUT, 3/8 HEX		4
12	BOLT, 3/8 X 1-1/4 HEX	GRADE 5	4
13	CONCRETE, CLASS B (2000 PSI)		1

LOCKABLE ARCHITECTURAL MAILBOX DETAILS

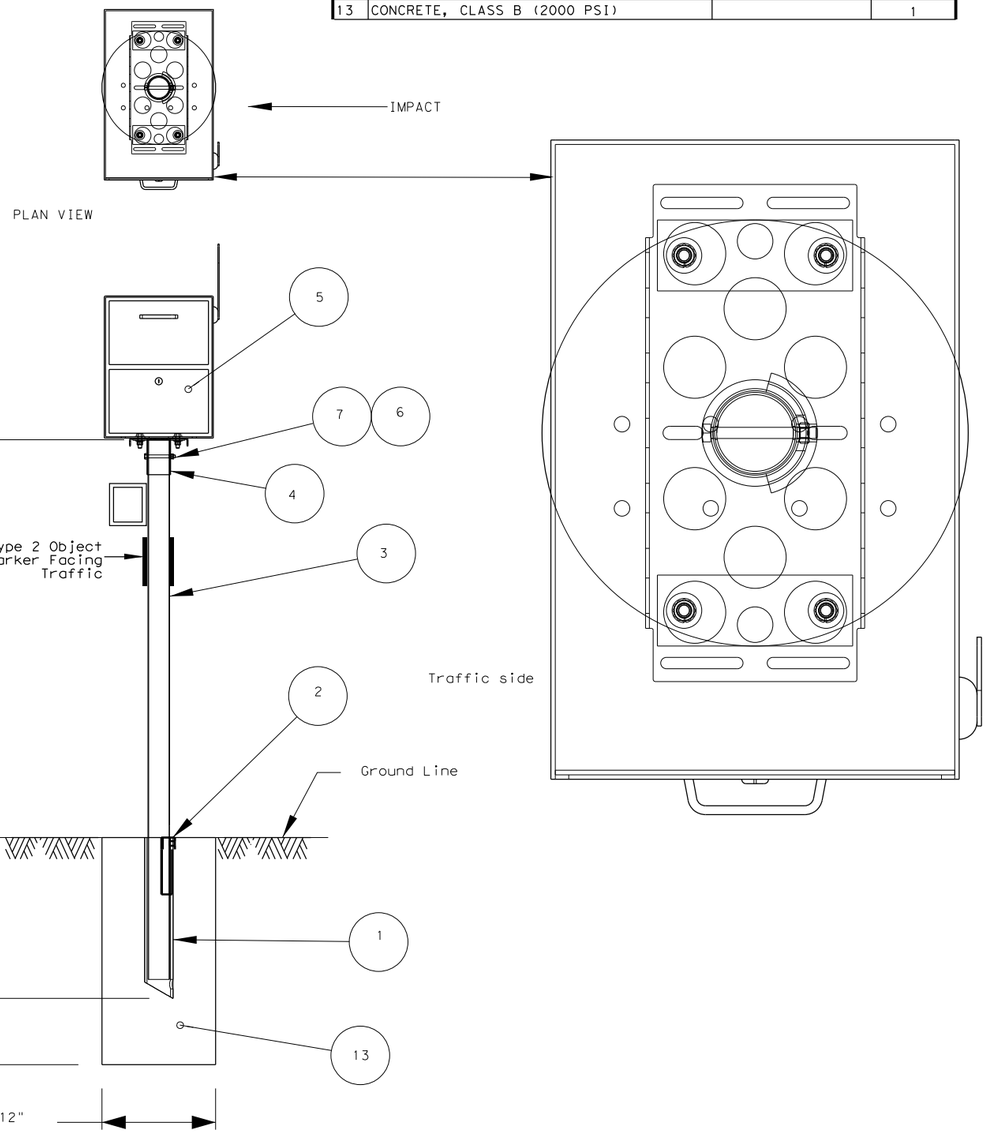


TABLE OF APPLICABLE DHT NUMBERS	
DHT NUMBER	DESCRIPTION
	FOUNDATIONS
46625	WEDGE FOR V-WING SOCKET FOR TYPE 1 FOUNDATION
149340	V-WING SOCKET FOR TYPE 1 FOUNDATION
143433	WEDGE FOR TYPE 2 FOUNDATION
143434	ANCHOR FOR TYPE 2 FOUNDATION
166103	ANCHOR FOR TYPE 7 FOUNDATION
160891	SOCKET FOR TYPE 4 FOUNDATION
160892	WEDGE FOR TYPE 4 FOUNDATION
166104	WEDGE FOR TYPE 7 FOUNDATION
	POSTS
4289	WINGED CHANNEL MAILBOX POST
149339	MULTIPLE MAILBOX POST (GALVANIZED TUBING)
164116	MULTIPLE MAILBOX POST (WHITE COATED)
166114	MULTIPLE MAILBOX POST (WHITE COATED OCTAGONAL)
166153	MULTIPLE MAILBOX POST (GALVANIZED OCTAGONAL)
161442	RECYCLED RUBBER POST. FOR SMALL MAILBOX ONLY
143426	THIN-WALL GALVANIZED STEEL TUBE 2.375" OUTER DIAMETER
162911	THINWALL WHITE STEEL TUBE 2.375" OUTER DIAMETER
166152	SINGLE OR DOUBLE THIN-WALL MAILBOX POST GALVANIZED 2" OCTAGONAL
166112	SINGLE OR DOUBLE THIN-WALL MAILBOX POST WHITECOATED 2" OCTAGONAL
	REFLECTIVE SHEETING
161812	REFLECTIVE SHEETING FOR EMERGENCY LOCATION NUMBER PANEL
	CONNECTING HARDWARE
2917	ANGLE BRACKET USED FOR TEMPORARY MAILBOX SUPPORT
166105	BRACKET FOR SINGLE MOUNTING OF MAILBOXES (MOUNTING KIT)
3789	PLATE FOR DOUBLE MOUNTING OF MAILBOXES
166108	BRACKET FOR DOUBLE MOUNTING OF MAILBOXES (MOUNTING KIT)
166111	BRACKET FOR MULTIPLE MOUNTING OF MAILBOXES (MOUNTING KIT)
148939	BRACKET FOR ATTACHING SMALL OR MEDIUM SIZE MAIL BOX
148938	EXTENDER TO BRACKET FOR ATTACHING LARGE MAILBOX
159489	ANGLE BRACKET PART A
159490	ANGLE BRACKET PART B
162323	BRACKET FOR DOUBLE MOUNTING OF MAILBOXES ON THINWALL STEEL POST, GALVANIZED OR POWDERCOATED.
161443	BRACKET FOR ATTACHING MAILBOX TO RECYCLED RUBBER POST AND TO MULTIPLE WHITE MAILBOX POST
158358	CASTING (NEWSPAPER RECEPTACLE BRACKET)
163731	U-BOLT (NEWSPAPER RECEPTACLE BRACKET)
160698	BOLT;HEX HEAD, GALV;3/8"DIA X 3/4"L HD, W/2-FLAT WASHERS
163750	BOLT;HEX HEAD, GALV;3/8" X 1-1/2, 16 NC, W/WASHERS
160701	BOLT;HEX HEAD, GALV;3/8"DIA X 2-1/2"L, HD, W/2-FLAT WASHERS
163730	BOLT;HEX HEAD, GALV;3/8" X 3-1/2", NC, W/NUT, 2 FLAT WASHERS
160699	BOLT;HEX HEAD, GALV;3/8"DIA X 3-3/4"L HD, W/2-FLAT WASHERS
160700	BOLT;HEX HEAD, GALV;3/8"DIA X 4"L HD, W/2-FLAT WASHERS

Texas Department of Transportation — Maintenance Division Standard

DHT NUMBERS TABLE

MB-15(1)

FILE:MB14(1).DGN	DN:	CK:	DW:	CK:
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REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		156

DATE:
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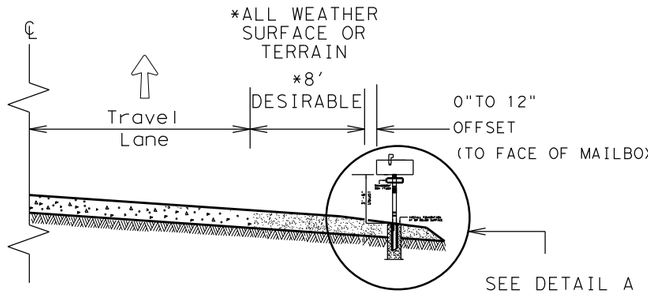
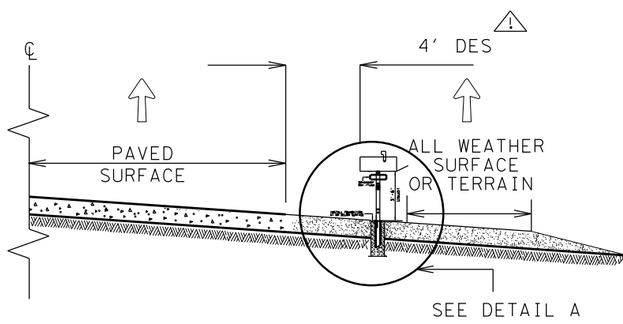
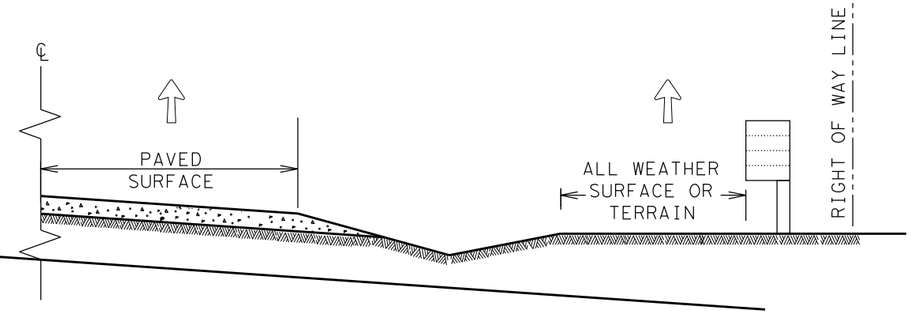


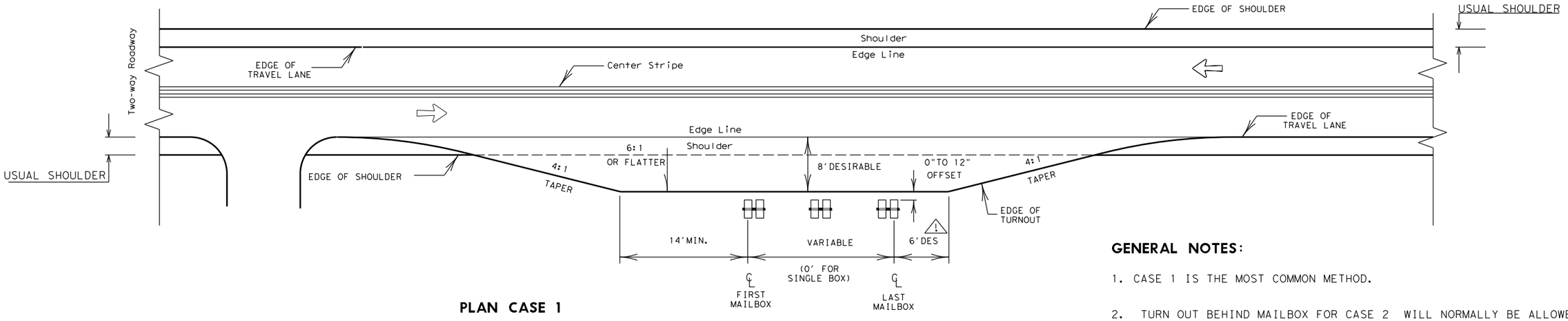
CASE 1. OFF TRAVEL WAY DELIVERY



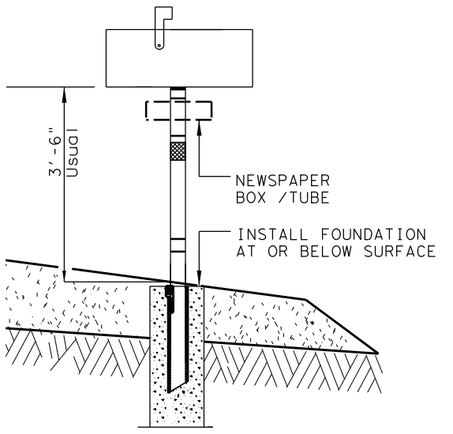
CASE 2. BACK SIDE DELIVERY



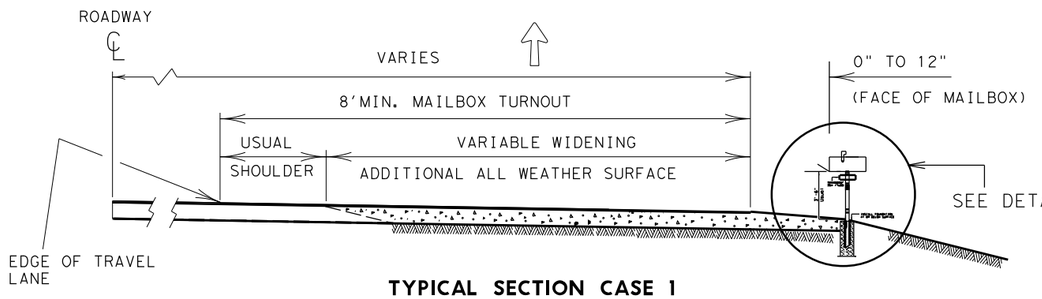
CASE 3. DELIVERY NEAR RIGHT OF WAY LINE



PLAN CASE 1



DETAIL A



TYPICAL SECTION CASE 1

MAIL DELIVERY VEHICLE TRAVEL DIRECTION

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. IF THE NUMBER OF MAILBOXES EXCEEDS FOUR, A COMMUNITY MAIL BOX SHOULD BE ENCOURAGED AT THESE LOCATIONS.

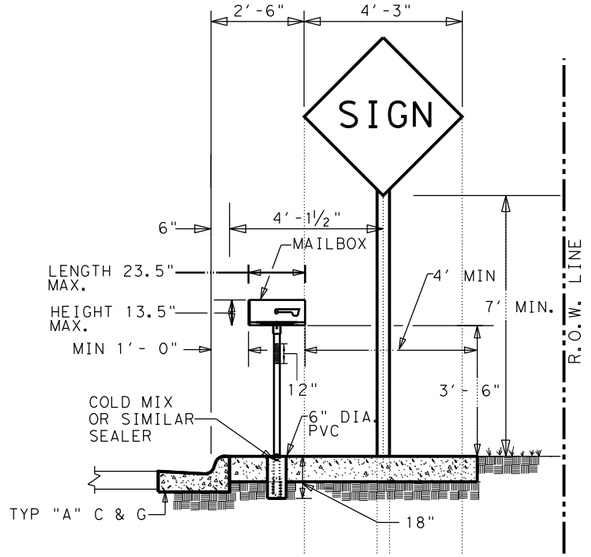
Texas Department of Transportation

Maintenance Division Standard

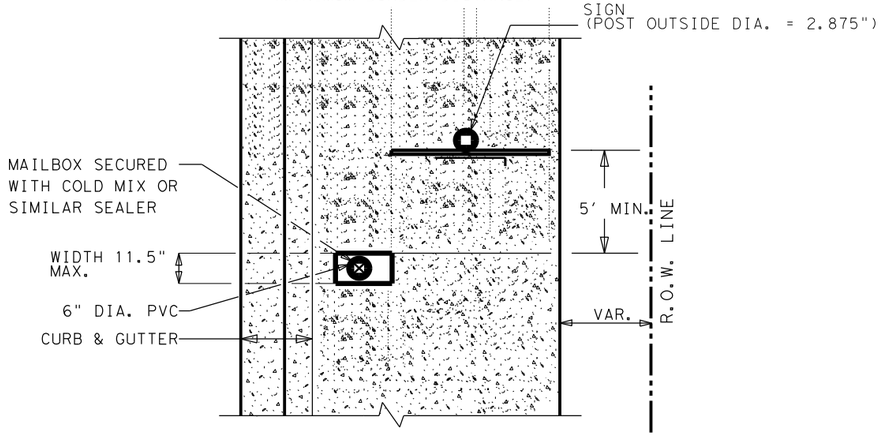
Guideline

MAILBOX SIDE ROAD PLACEMENT AND TURNOUTS
MB-14(2)

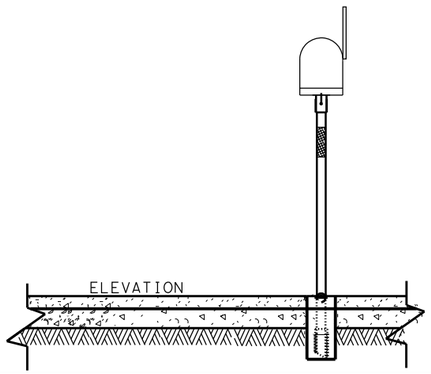
FILE: MB14(2).DGN	DN: JEO		CK:	DW: JEO		CK:	
© TxDOT MAY 2014	CONT	SECT	JOB		HIGHWAY		
REVISIONS DECEMBER 2012-NEW TXDOT TITLE BLOCK	1186	01	091		FM 969		
	DIST	COUNTY				SHEET NO.	
	AUS	TRAVIS				157	

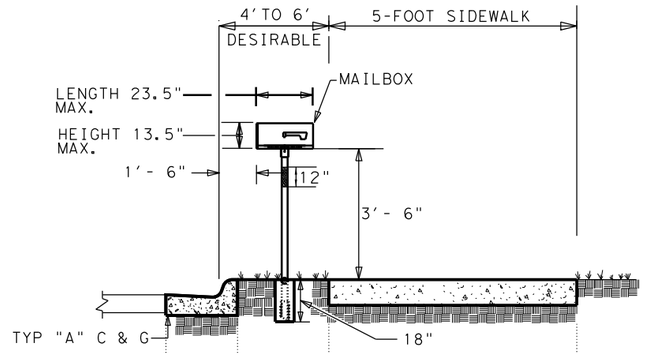


MAILBOX SIDEWALK INSTALLATION RELATIVE TO ANY OTHER OBSTRUCTION SUCH AS A SIGN
(MINIMUM BORDER DISTANCE)

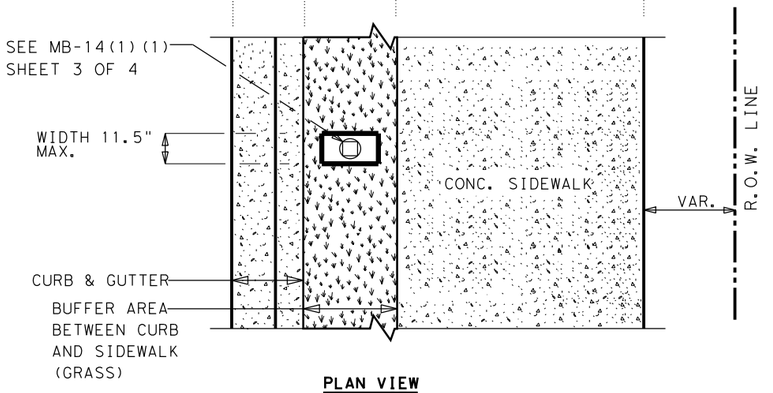


PLAN VIEW





MAILBOX SIDEWALK INSTALLATION
(DESIRABLE BORDER DISTANCE)



PLAN VIEW

SHEET 2 OF 3

Texas Department of Transportation | Maintenance Division Standard

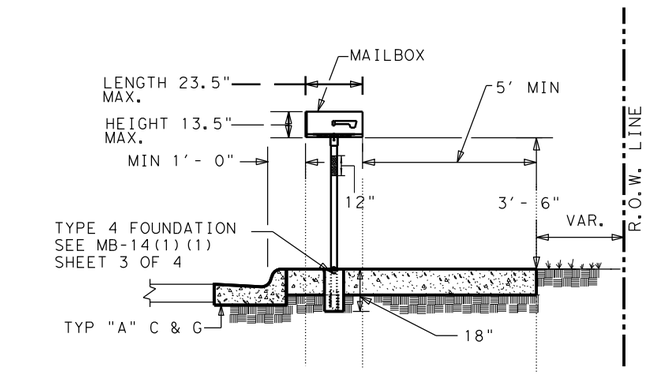
SINGLE MAILBOX PLACEMENT BEHIND CURBS WITH OR WITHOUT SIDEWALKS

MB-14(2A)

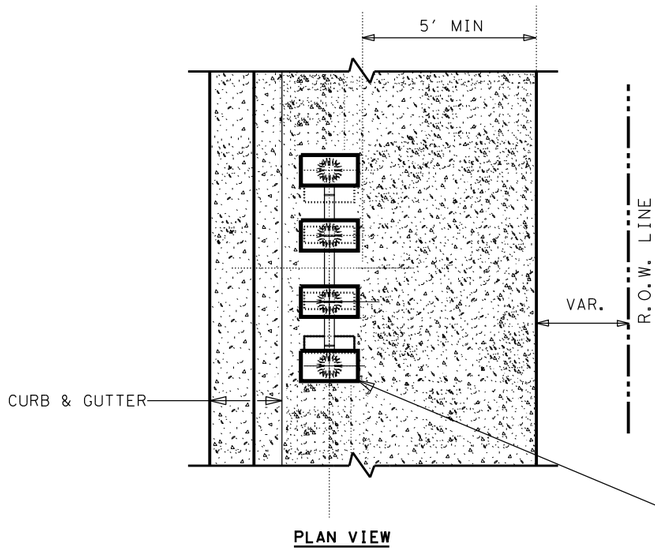
FILE: MB-14(2A)	DN:	CK:	DW:	CK:
© TxDOT MAY 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		158

DATE:
FILE:

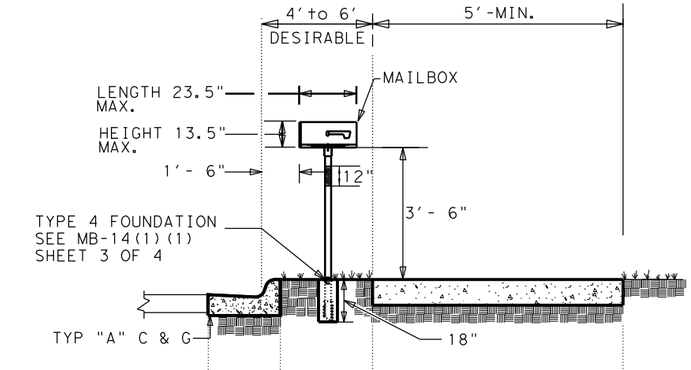
DATE:
FILE:



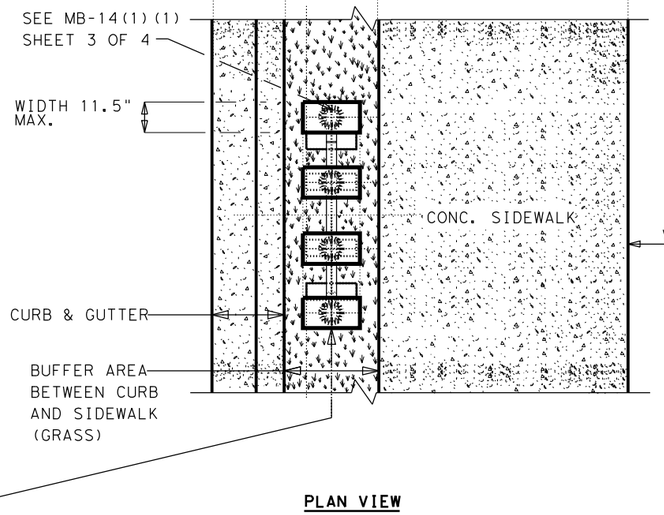
MAILBOX SIDEWALK INSTALLATION RELATIVE TO ANY OTHER OBSTRUCTION SUCH AS A SIGN
(MINIMUM BORDER DISTANCE)



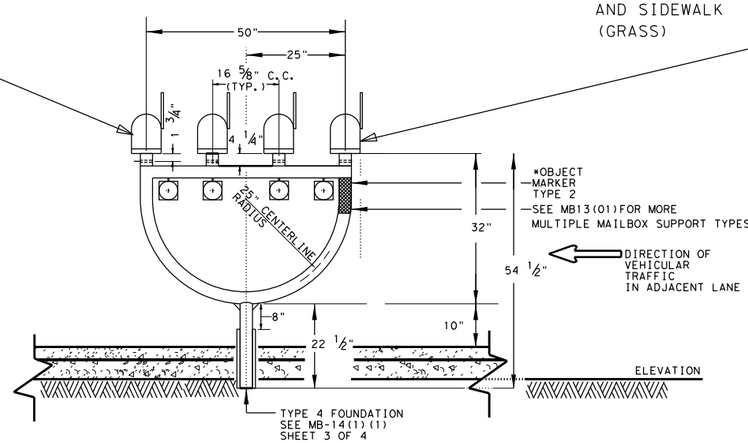
PLAN VIEW



MAILBOX SIDEWALK INSTALLATION
(DESIRABLE BORDER DISTANCE)



PLAN VIEW



SHEET 3 OF 3

Texas Department of Transportation

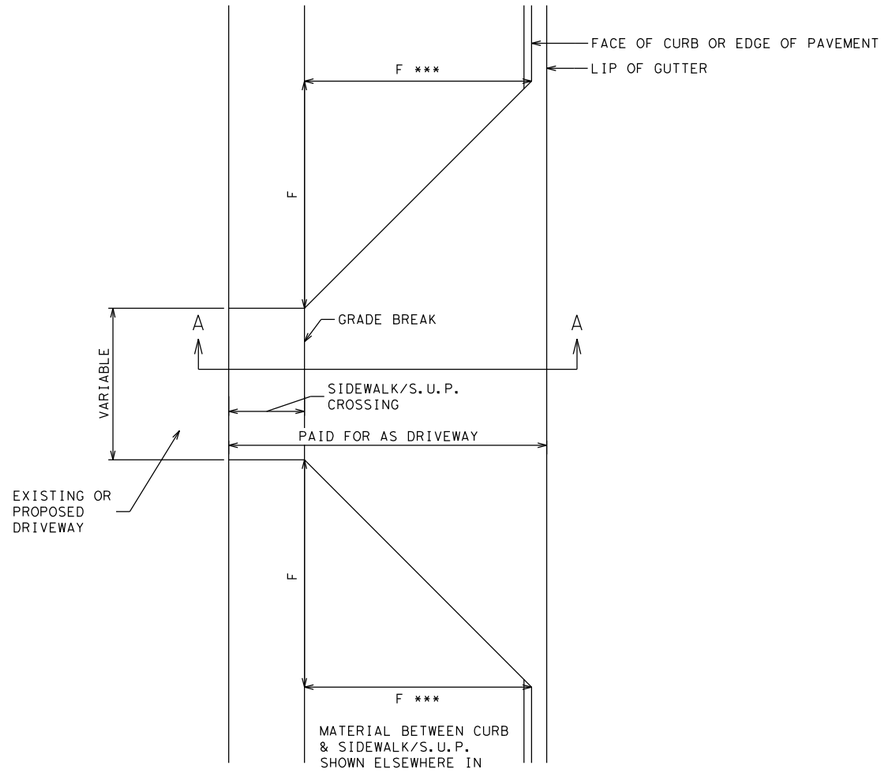
Maintenance Division Standard

MULTIPLE MAILBOX PLACEMENT BEHIND CURBS WITH OR WITHOUT SIDEWALKS

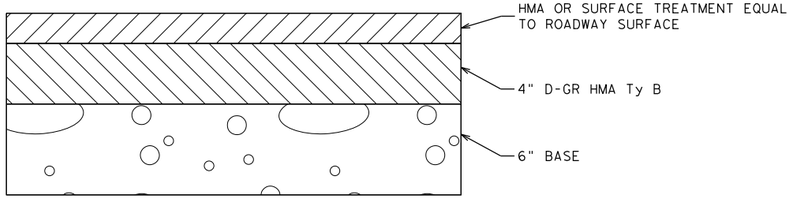
MB-14(2B)

FILE: MB-14(2A)	DN:	CK:	DW:	CK:
© TxDOT MAY 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		159

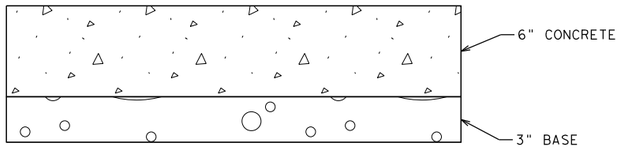
*** THIS DIMENSION MAY BE REDUCED TO KEEP WORK WITHIN THE ROW.



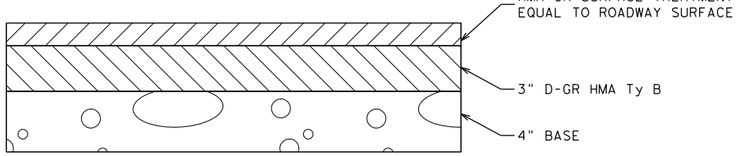
DRIVEWAY PLAN



HMA OR SURFACE TREATEMENT - COMMERCIAL

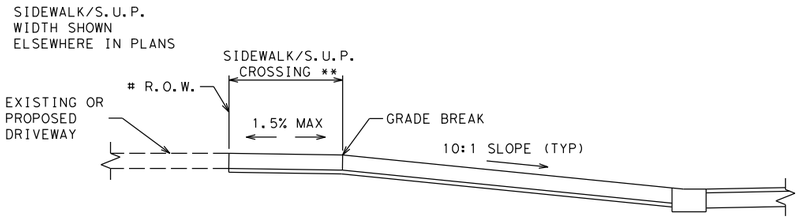


CONCRETE - ALL DRIVEWAY TYPES



HMA OR SURFACE TREATMENT - FARM/RANCH/RESIDENTIAL

FLARE	FARM/RANCH	RESIDENTIAL	COMMERCIAL
"F" (FT)	25	15	25



ACTUAL TIE-IN SHOWN ELSEWHERE IN PLANS OR AS DIRECTED

DRIVEWAY WITH GUTTER SECTION A-A

ENSURE GRADE BREAK DOES NOT EXCEED 8% UNLESS OTHERWISE DIRECTED. PROVIDE ABSOLUTE MINIMUM SIDEWALK CROSSING WIDTH OF 4' FOR DRIVEWAYS WIDTH OF 20' OR LESS

** LOCATE SIDEWALK CROSSING TO ALIGN WITH ADJACENT SIDEWALK

GENERAL NOTES

PROVIDE EXPANSION 20 FT C-C FOR WIDTH OR LENGTH OVER 25 FT. EXPANSION JOINT PER AUS STANDARD FOR SIDEWALK (MCPSWMD).

REINFORCEMENT WILL BE IN ACCORDANCE WITH ITEM 432.3.1 USING NO. 3 OR NO. 4 BARS.

FIBER REINFORCEMENT IS NOT ALLOWED. CLASS A CONCRETE IS ALLOWED TO USE COARSE AGGREGATE GRADES 1-8.

IN LIEU OF PFC OR TOM, SURFACE SHALL BE 1.5" D-GR HMA Ty D. IF SURFACE IS A MULTIPLE COURSE SURFACE TREATEMENT, ALL COURSES MUST BE PLACED ON DRIVEWAY.

BLADE LAY HMA IS ALLOWED.

FURNISH BASE MEETING THE REQUIREMENTS FOR ANY TYPE OR GRADE IN ACCORDANCE WITH ITEM 247. BASE COMPRESSIVE STRENGTHS ARE WAIVED.

THE BASE UNDER THE CONCRETE MAY BE REPLACED WITH CONCRETE AT A RATIO OF 3 INCHES OF BASE EQUALS 2 INCHES OF CONCRETE.

IF ROOTS ARE ENCOUNTERED VERIFY WITH THE ENGINEER PRIOR TO ACCOMMODATING OR REMOVING 2 IN. DIAMETER OR LARGER ROOTS. ROOT REMOVAL MUST BE IN ACCORDANCE WITH ITEM 752.4.2. ROOTS MAY REMAIN IN THE BASE. FOR IMPROVEMENTS WITHIN 6 IN. OF A ROOT, THE CONCRETE THICKNESS MAY BE REDUCED BY 1 IN. AND THE BASE INCREASED BY 1 IN. TO MINIMIZE IMPACTS TO THE ROOTS. ADJUST BASE AND SURFACE PROFILE TO PROVIDE A 1 IN. BASE CUSHION AROUND THE ROOTS. THE SURFACE PROFILE MAY BE ADJUSTED TO THE EXTENT ALLOWED BY ADA. THIS WORK IS SUBSIDIARY.

Texas Department of Transportation

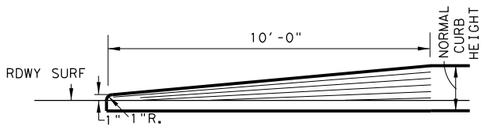
Austin District Standard

DRIVEWAYS

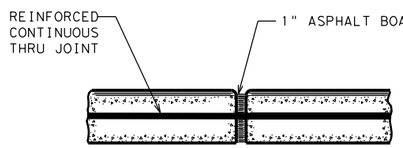
DW-20 (AUS)

FILE: dw-20.dgn	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
01/16: SHEET CREATED 04/19: APPROVED 05/20: TABLE REVISED & GN ADDED	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		160

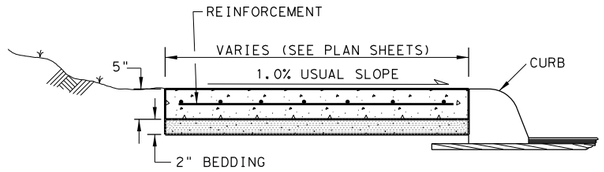
DATE: $DATE$ $TIME$
FILE: $FILE$



TRANSITION FOR CONCRETE CURB ENDS



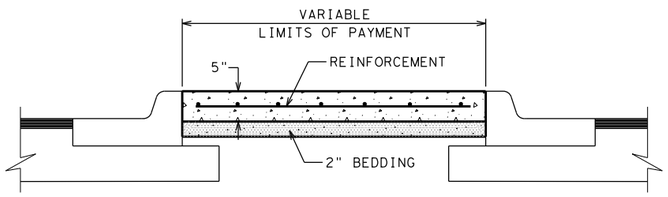
EXPANSION JOINT DETAIL



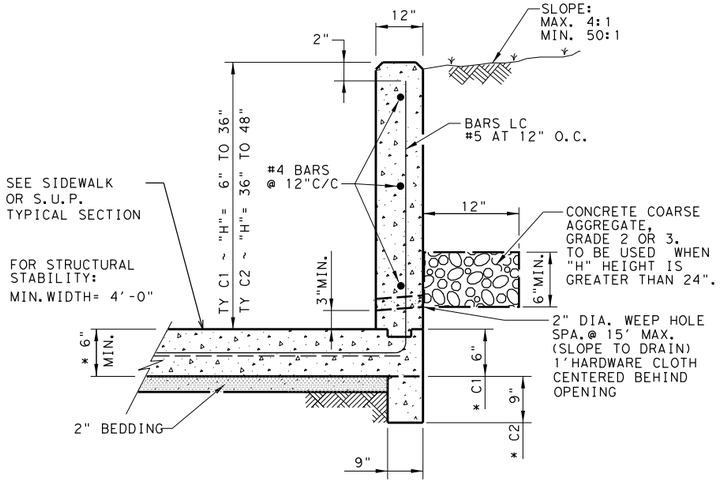
SIDEWALK & SHARED USE PATH (S.U.P.) TYP. SECT.

SIDEWALK OR S.U.P. EXPANSION JOINTS ARE TO BE AT A MAX. SPACING OF 40' AND COINCIDE WITH THE CURB EXPANSION JOINTS.

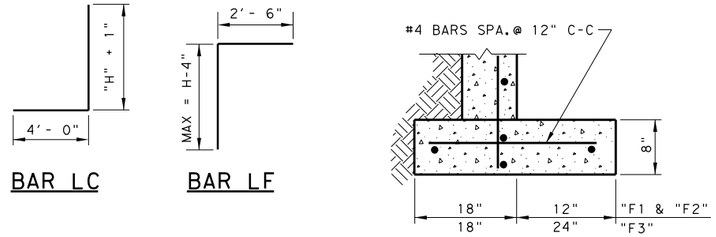
NOTE: TOOLED OR SAWED CONTRACTION JOINTS ARE NOT ALLOWED.



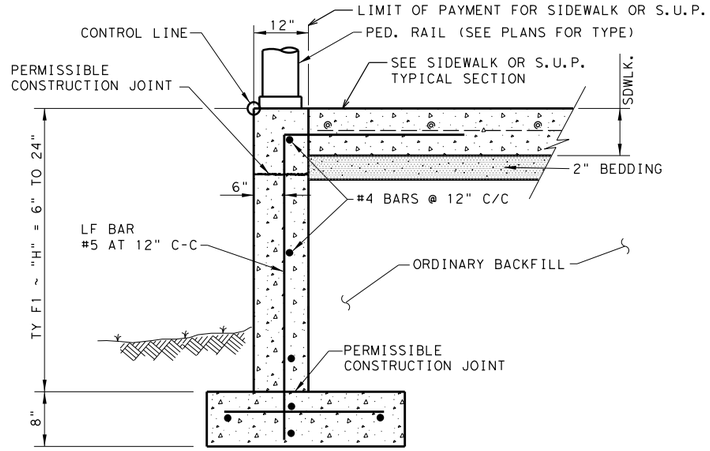
RIPRAP MEDIAN DETAIL



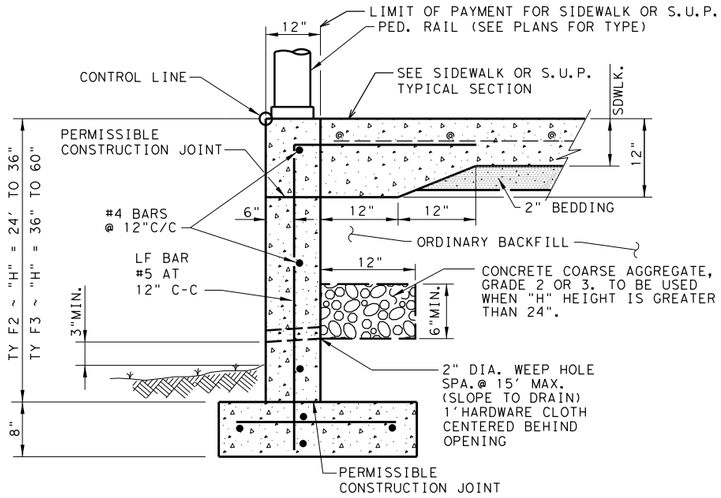
CONC CURB (TY C1) & (TY C2)



FOOTING DETAIL



CONC CURB (TY F1)‡



CONC CURB (TY F2) & (TY F3)‡

SIDEWALK, SHARED USE PATH, AND MEDIAN NOTES

Reinforcement will be in accordance with Item 432.3.1. Fiber reinforcement is not allowed. Class A and B Concrete are allowed to use Coarse Aggregate Grades 1-8.

Bedding may be sand, base, or RAP bedding. Furnish base meeting the requirement for any type or grade in accordance with Item 247. Base compressive strengths are waived. RAP must be 100% passing a 1 in. sieve. Bedding must be placed using ordinary compaction.

If roots are encountered verify with the Engineer prior to accommodating or removing 2 in. diameter or larger roots. Root removal must be in accordance with Item 752.4.2. Roots may remain in the bedding or base. For improvements within 6 in. of a root, the concrete thickness may be reduced by 1 in. and the bedding increased by 1 in. to minimize impacts to the roots. Adjust bedding and surface profile to provide a 1 in. bedding cushion around the roots. The surface profile may be adjusted to the extent allowed by ADA. This work is subsidiary.

CONCRETE CURB NOTES:
All Concrete, including adjacent sidewalk or S.U.P., shall be Class "C".
All Reinforcing Steel shall be Grade 60.
Minimum 4' sidewalk width for CONC CURB (TYPES C1 & C2).

‡ Until the sidewalk is complete, lateral support for the "F" curbs will be required.

ALL WORK SHOWN BEYOND TYPICAL SIDEWALK, S.U.P., AND PED RAIL IS SUBSIDIARY.

DESIGN SOIL PARAMETERS:
Soil Unit Wt.= 120 pcf
Phi = 30 Degrees
Cohesion = 50 psf
Min. PI = 15
Max. PI = 30
SURCHARGE:
TYPE F CURB q = 2' Adjacent to sidewalk
Max. slope behind TYPE C Curb = 4:1
Min. Factor of Safety against sliding is 1.5.
Designed in accordance with current AASHTO Standards and Interim Specifications.

NOT TO SCALE

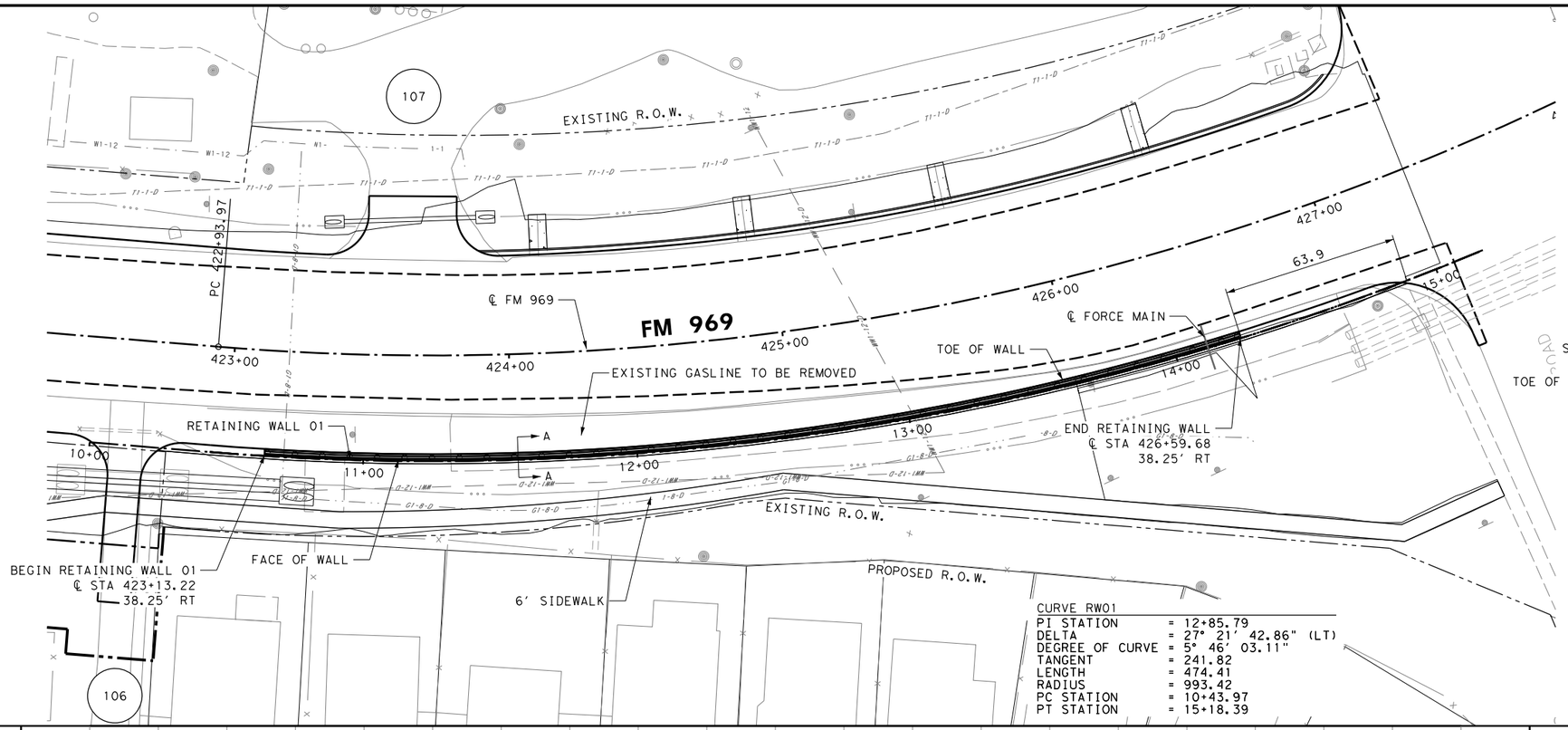
Texas Department of Transportation | Austin District Standard

MISCELLANEOUS CURB, PATH, SIDEWALK, AND MEDIAN DETAILS

MCPSWMD-19 (AUS)

FILE: mcpswmd-19.dgn	CONT	SECT	JOB	HIGHWAY
REVISIONS 04/19: APPROVED	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		161

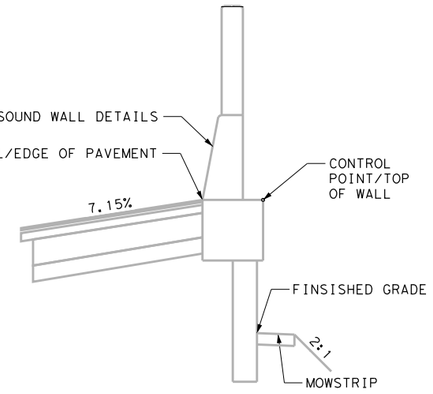
DATE: $DATE$ $TIME$
FILE: $FILE$



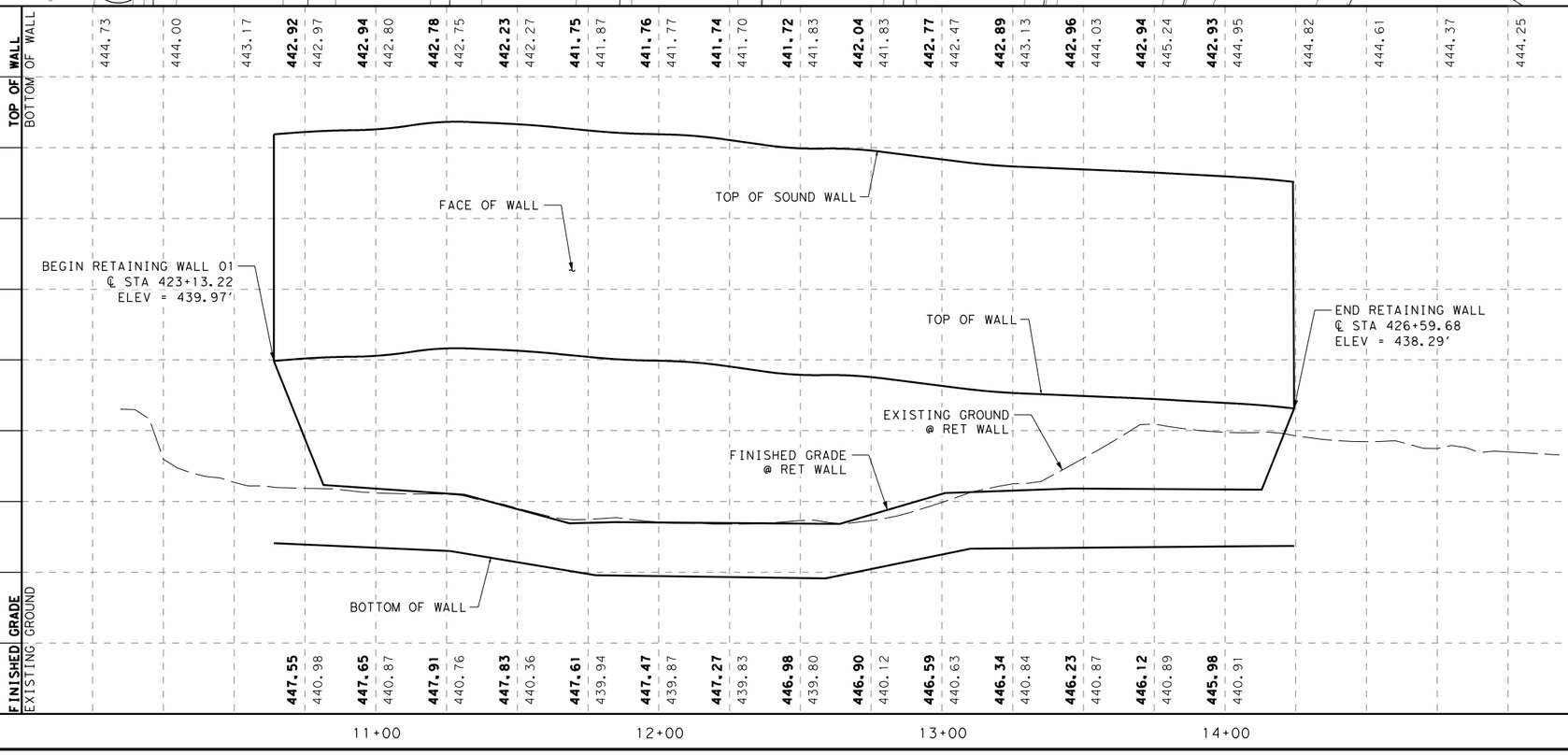
CURVE RW01

PI STATION	= 12+85.79
DELTA	= 27° 21' 42.86" (LT)
DEGREE OF CURVE	= 5° 46' 03.11"
TANGENT	= 241.82
LENGTH	= 474.41
RADIUS	= 993.42
PC STATION	= 10+43.97
PT STATION	= 15+18.39

HORZ 0' 25' 50'
VERT 0' 2.5' 5'
SCALE IN FEET



TYPICAL SECTION A-A



TAPANKUMAR PATEL
119211
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
6/29/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation
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LJA Engineering, Inc.
FRN-F-1386

FM 969
RETAINING WALL

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AM	6	PTF 2022(045)		162
DRAWN BY:	STATE	DIST. NO.	COUNTY	
MD	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

6/29/2021
9:47:03 AM
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SUMMARY OF SOUND WALL QUANTITIES

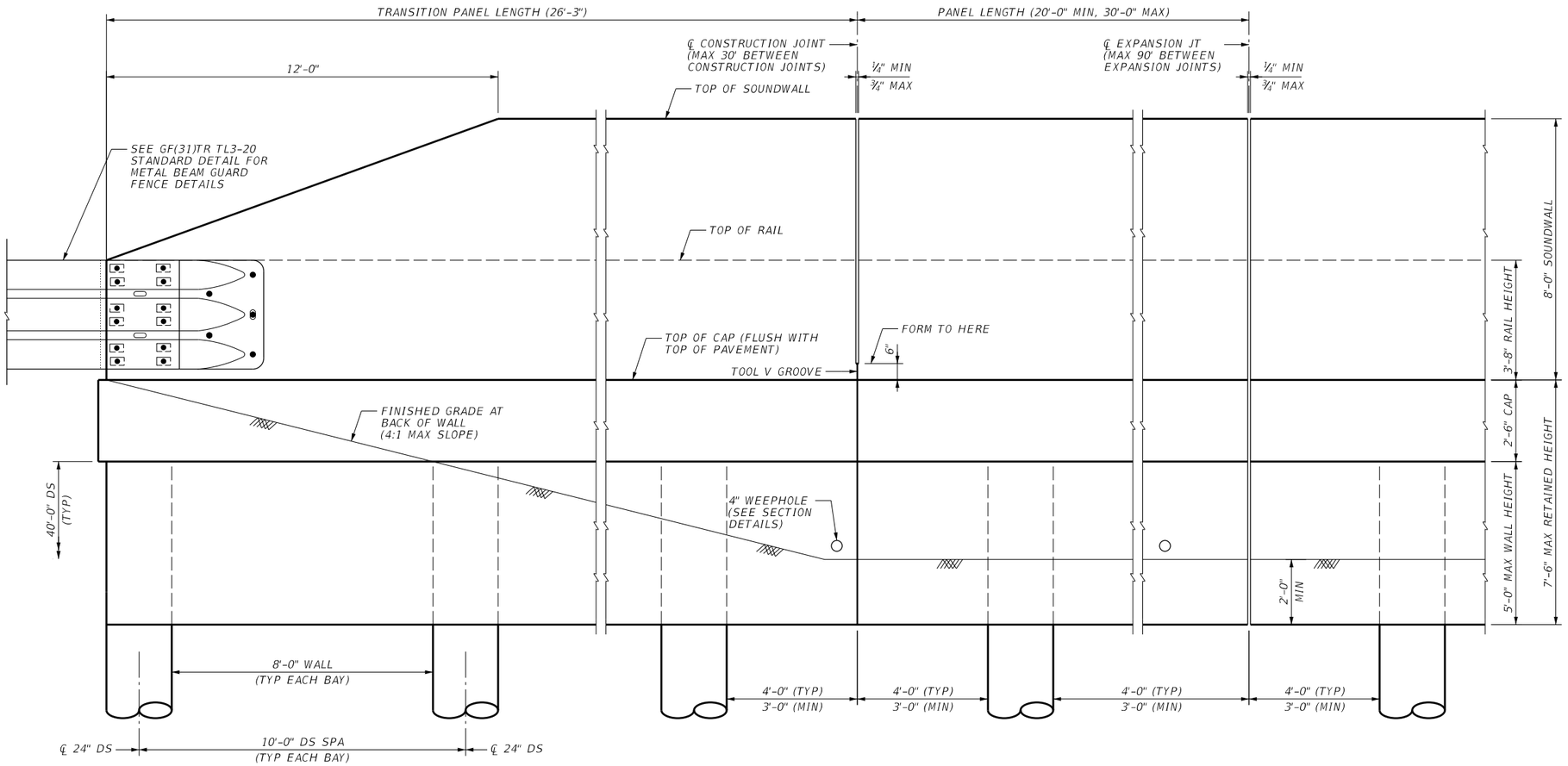
ITEM	416	420	420	420	432	740
DESCRIPTION CODE	6002	6029	6074	6156	6045	6004
ITEM DESCRIPTION	DRILL SHAFT (24 IN)	CL C CONC (CAP)	CL C CONC (MISC) *	CL C CONC (WEBWALL)	RIPRAP (MOW STRIP)(4 IN)	ANTI - GRAFFITI COATING(PERMNENT-TY II) **
	LF	CY	CY	CY	CY	SF
SOUND WALL & RETAINING WALL	1480	83.5	114.5	53.0	9.0	7955
TOTAL	1480	83.5	114.5	53.0	9.0	7955

* RAIL AND SOUND WALL CONCRETE ABOVE THE CAP

** APPLY ANTI-GRAFFITI COATING TO FRONT AND BACK FACES OF CONRETE WALL AND RAIL

GENERAL NOTES:

1. SEE SHEET 3 FOR CONSTRUCTION AND MATERIAL NOTES.
2. SEE SOUND WALL AESTHETIC DETAILS FOR ADDITIONAL INFORMATION ON FORMLINER AND AESTHETICS.



ELEVATION

SCALE: 1/4"=1'-0"

STATE OF TEXAS
TAPANKUMAR PATEL
119211
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
SOUND WALL DETAILS

SCALE HORIZONTAL: AS SHOWN

SHEET 1 OF 3

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
TP	6	PTF 2022(045)		163
DRAWN BY:	STATE	DIST. NO.	COUNTY	
RH	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
EM	1186	01	091	FM 969

6/25/2021
6:47:43 PM
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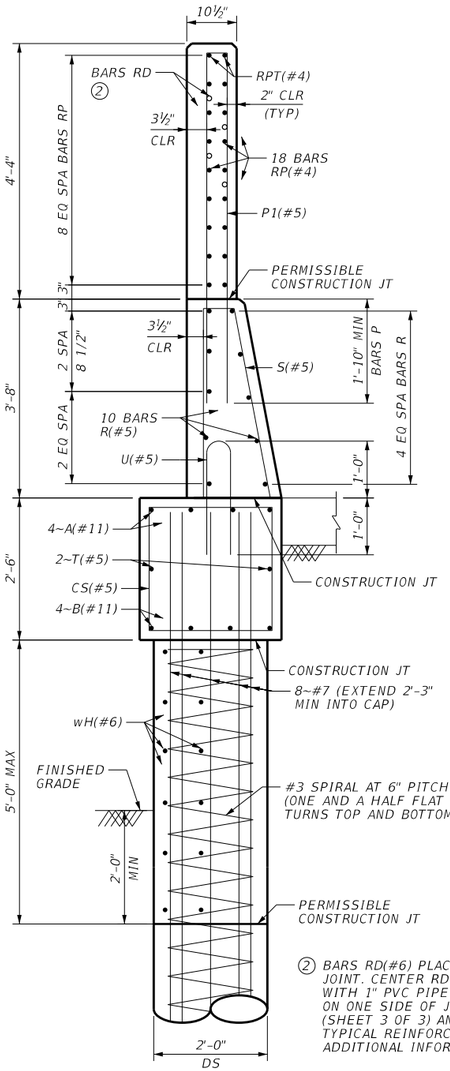
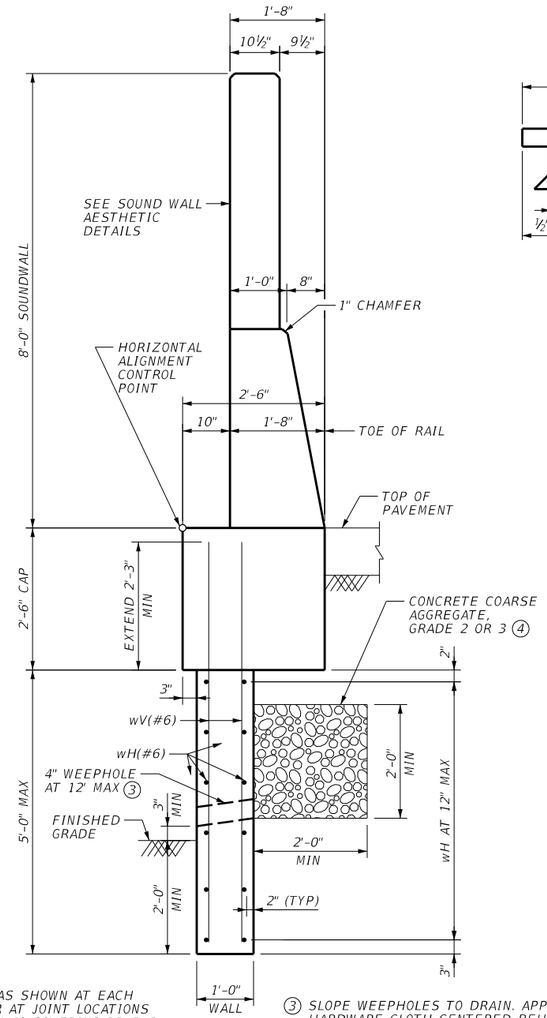




② BARS RD(#6) PLACED AS SHOWN AT EACH JOINT. CENTER RD BAR AT JOINT LOCATIONS WITH 1" PVC PIPE SCH 40 COVERING RD BAR ON ONE SIDE OF JOINT. SEE BAR RD DETAIL (SHEET 3 OF 3) AND ELEVATION SHOWING TYPICAL REINFORCING DETAIL FOR ADDITIONAL INFORMATION

③ SLOPE WEEPHOLES TO DRAIN. APPLY 1' HARDWARE CLOTH CENTERED BEHIND OPENING.

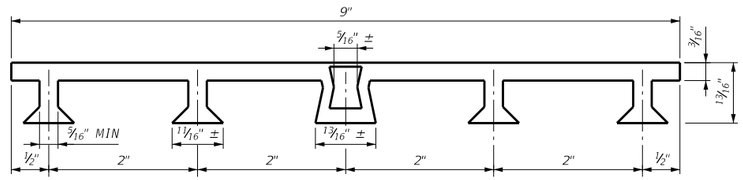
④ CRUSHED BLAST FURNACE SLAG, RECYCLED CRUSHED HYDRAULIC CEMENT CONCRETE OR COMBINATION THEREOF IS NOT ALLOWED.

SECTION AT COLUMN/DS

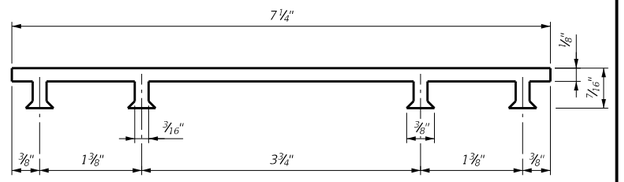
SCALE: ⅜"=1'-0"

SECTION AT WEB WALL

SCALE: ⅜"=1'-0"

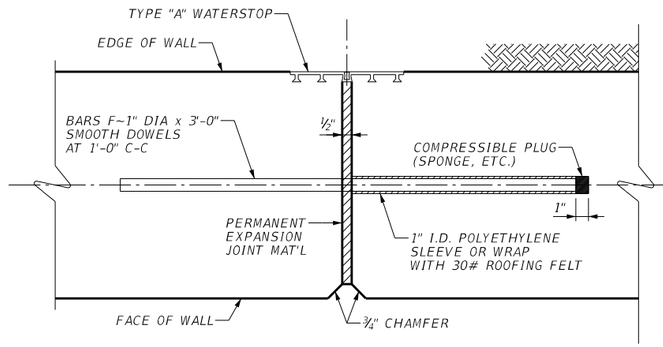


PVC WATERSTOP TYPE "A"

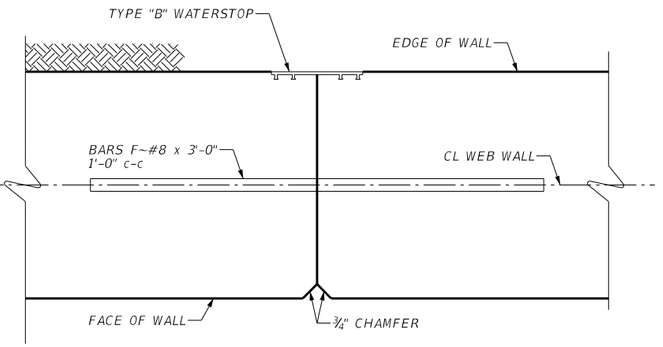


PVC WATERSTOP TYPE "B"

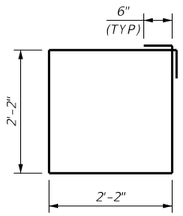
NOTE: DIMENSIONS AND SHAPES MAY VARY SLIGHTLY DEPENDING ON MANUFACTURER.



EXPANSION JOINT



CONSTRUCTION JOINT



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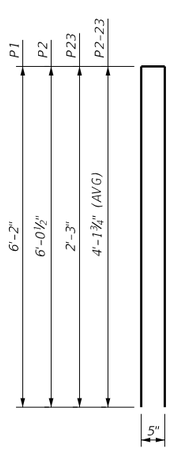
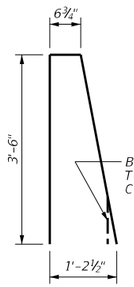
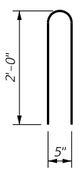


BARS P



BARS S



BARS wU

STATE OF TEXAS
TAPANKUMAR PATEL
119211
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969

SOUND WALL DETAILS

SCALE HORIZONTAL: AS SHOWN

SHEET 2 OF 3

DESIGN BY:	FED. RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
TP	6	PTF 2022(045)		164
DRAWN BY:	STATE	DIST. NO.	COUNTY	
RH	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
EM	1186	01	091	FM 969

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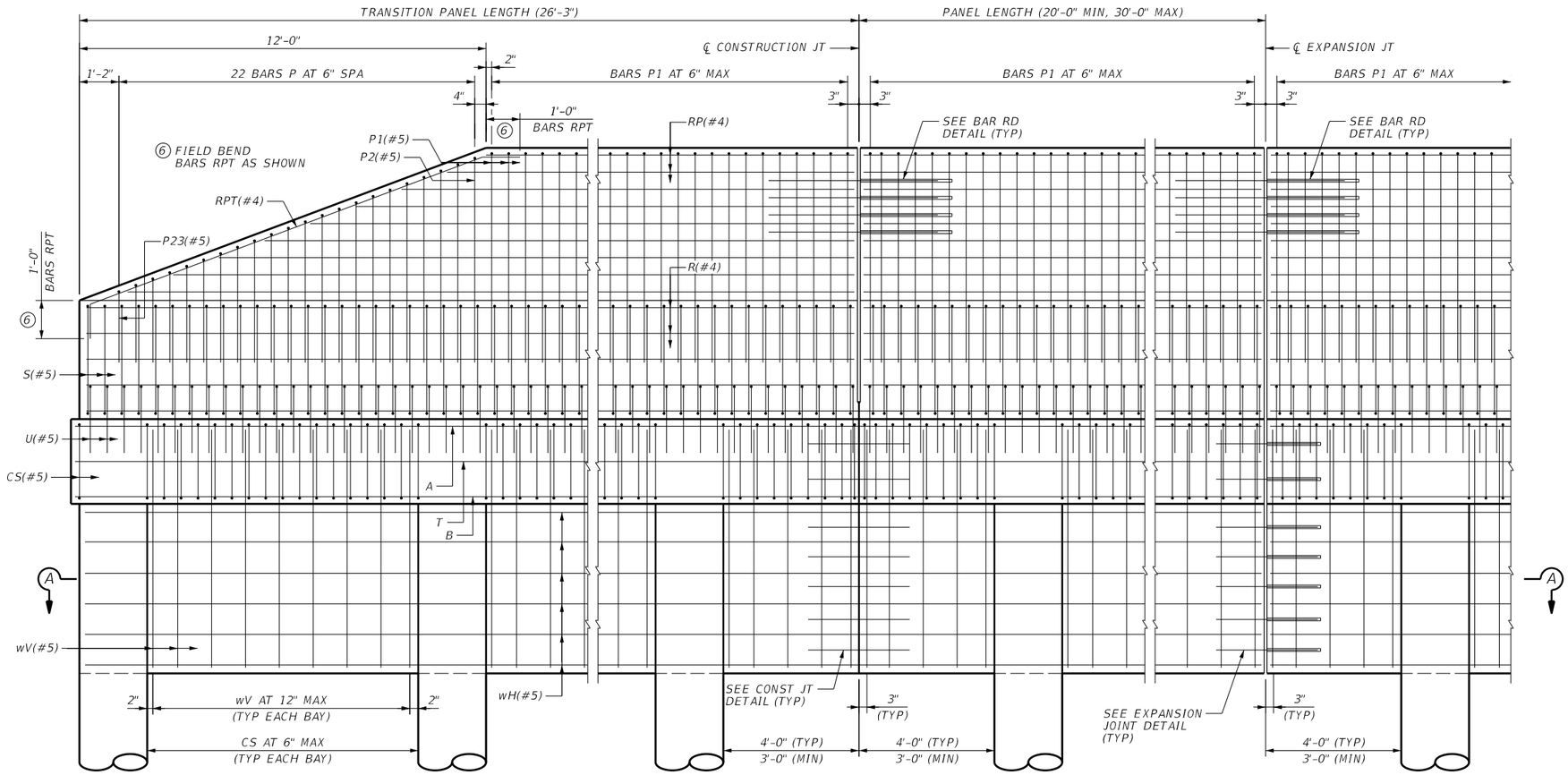
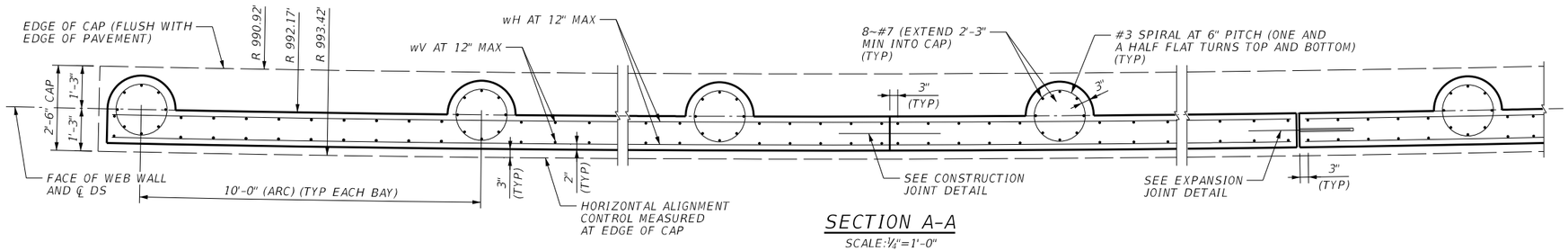


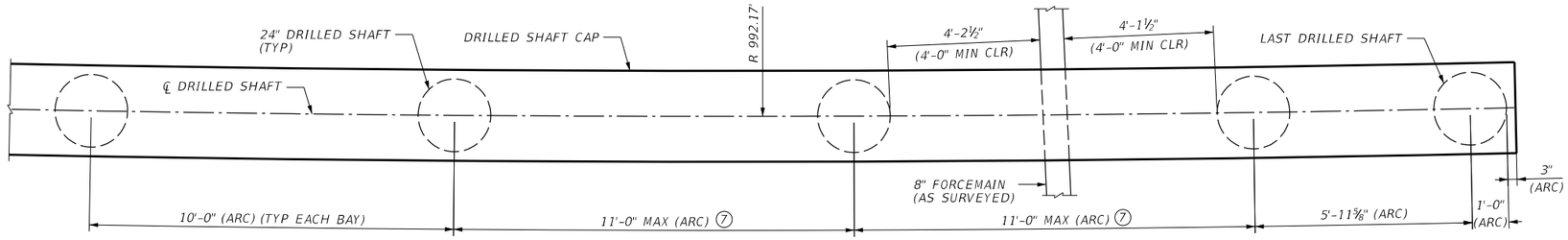
ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

(SHAFT AND COLUMN REINF NOT SHOWN FOR CLARITY)
SCALE: 1/4"=1'-0"



SECTION A-A

SCALE: 1/4"=1'-0"



SHAFT SPACING AT FORCEMAIN CROSSING

SCALE: 1/4"=1'-0"

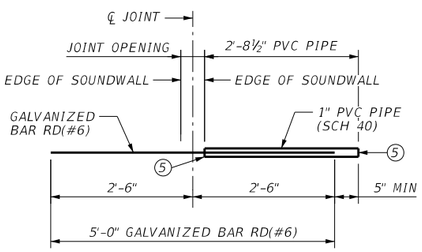
⑦ 11-0" MAX DRILLED SHAFT SPACING IS ONLY PERMITTED WITHIN THE LAST 3 SPANS (AS SHOWN)

CONSTRUCTION NOTES:

1. THE BACK OF RAILING MUST BE VERTICAL UNLESS SHOWN OTHERWISE ON PLANS OR APPROVED BY THE ENGINEER.
2. FIELD VERIFY LOCATION OF UTILITIES PRIOR TO CONSTRUCTION.
3. PLACE EXPANSION JOINTS AT 90'-0" MAX SPACING.
4. SEE SOUND WALL AESTHETIC DETAILS FOR ADDITIONAL INFORMATION.

MATERIAL NOTES:

1. ALL STEEL COMPONENTS EXCEPT REINFORCING MUST BE GALVANIZED UNLESS SHOWN OTHERWISE ON PLANS.
2. USE CLASS "C" CONCRETE (f'c = 3,600 psi)
3. ALL REINFORCING STEEL MUST BE GRADE 60.



BAR RD(#6), 1" PVC PIPE (SCH 40) AND ASSEMBLY DETAIL

⑤ ENDS OF 1" PVC PIPE MUST BE TAPED OFF TO PREVENT CONCRETE OR MORTAR FROM SEEPING IN.

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COUNTY OF TRAVIS STATE OF TEXAS

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SOUND WALL DETAILS

SCALE HORIZONTAL: AS SHOWN

SHEET 3 OF 3

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
TP	6	PTF 2022(045)		165
DRAWN BY:	STATE	DIST. NO.	COUNTY	
RH	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
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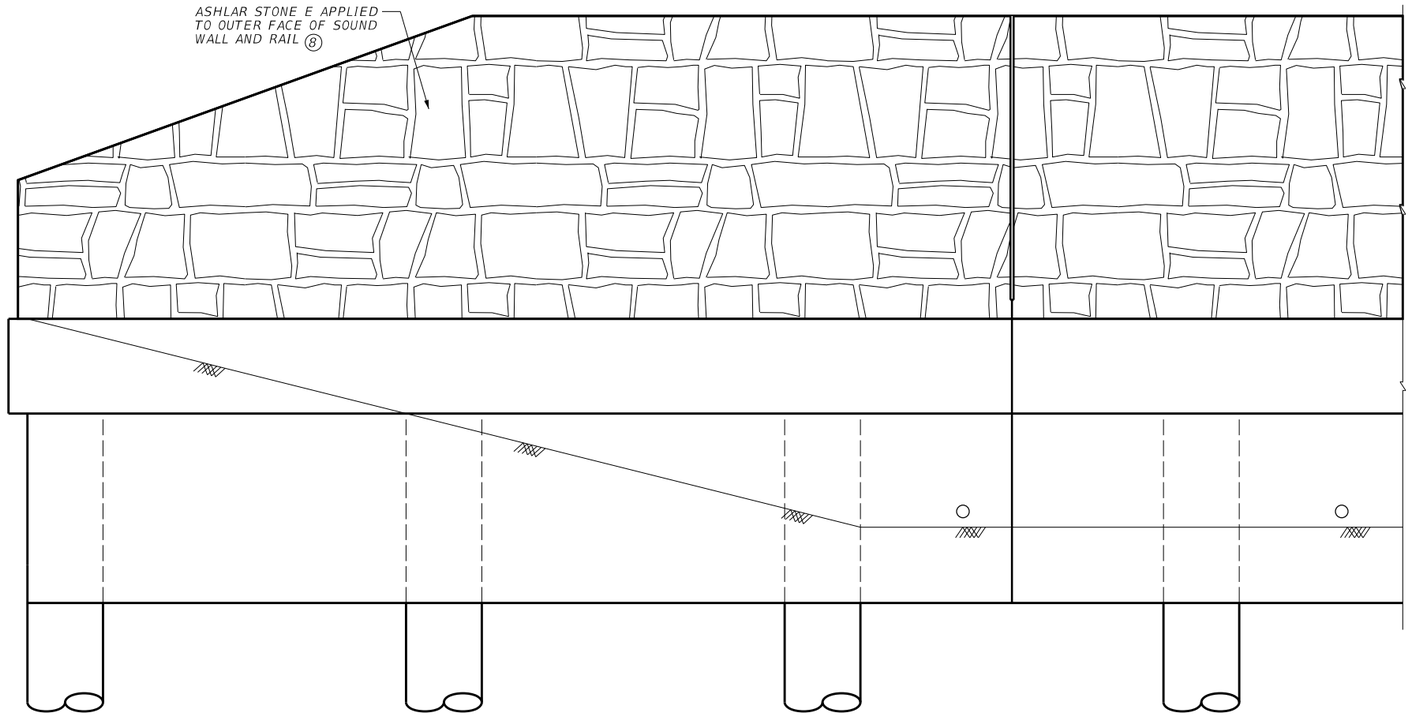
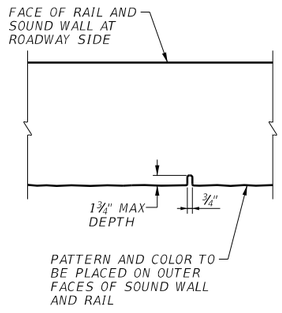


FORMLINER PATTERN LAYOUT

SCALE: 1/4"=1'-0"

(8) SCOTT SYSTEM INC FORMLINER NUMBER 167 "ASHLAR STONE E" OR APPROVED EQUAL. FORMLINER PATTERN SHOWN IS FOR ILLUSTRATIVE PURPOSES ONLY AND IS NOT NECESSARILY REPRESENTATIVE OF THE ACTUAL FORMLINER PATTERN APPEARANCE.



SECTION VIEW

GENERAL NOTES:

1. ARCHITECTURAL CONCRETE TREATMENT IS SUBSIDIARY TO THE SOUND WALL FOR PAYMENT.
2. APPLY THE FORMLINER PATTERN TO THE OUTER FACE OF SOUND WALL AND RAIL ONLY (OPPOSITE THE ROADWAY).
3. THE FORMLINER MUST RELEASE WITHOUT LEAVING PIECES OF LINER MATERIAL ON THE CONCRETE AND WITHOUT PULLING OR BREAKING CONCRETE FROM THE TEXTURED SURFACE. USE FORM RELEASE AGENTS RECOMMENDED BY THE MANUFACTURER. FORMLINERS THAT HAVE, IN THE OPINION OF THE ENGINEER, BECOME DAMAGED OR WORN WILL BE REPLACED BY THE CONTRACTOR. REPLACEMENT COST OF FORMLINERS IS CONSIDERED INCIDENTAL TO THE WORK AND WIL NOT ENTITLE THE CONTRACTOR TO ADDITIONAL COMPENSATION.
4. CONSTRUCT A TEST PANEL AT LEAST TEN DAYS IN ADVANCE OF STARTING CONSTRUCTION OF THE TEXTURED CONCRETE SURFACES. THE PANEL MUST MEET REQUIREMENTS OF THE PLANS AND SPECIFICATIONS AND REQUIRES APPROVAL OF THE ENGINEER BEFORE ANY CONSTRUCTION FORMLINERS MAY BE ORDERED OR USED. THE TEXTURED PORTION OF THE PANEL MUST BE AT LEAST 4'-0" BY 4'-0" WITH A REPRESENTATIVE UNTEXTURED SURROUNDING SURFACE. IF ORDERED BY THE ENGINEER, ADDITIONAL TEST PANELS MUST BE CONSTRUCTED AND FINISHED UNTIL A SATISFACTORY CONCRETE SURFACE TEXTURE IS OBTAINED. THE TEST PANEL WILL THEN BE THE STANDARD OF COMPARISON FOR THE PRODUCTION CONCRETE SURFACE TETURE. IF REQUIRED BY THE ENGINEER, A NEW TEST PANEL MUST BE BUILT TO DEMONSTRATE ACCEPTABILITY OF ANY PROPOSED CHANGE IN CONSTRUCTION METHOD.
6. AREAS SHOWN TO RECEIVE SURFACE TEXTURE THAT DOES NOT EXHIBIT THE SURFACE SPECIFIED MUST BE TOOLED OR REPLACED AT THE CONTRACTOR'S EXPENSE SO AS TO EXHIBIT THE SPECIFIED FINISH.

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SOUND WALL AESTHETIC DETAILS

SCALE HORIZONTAL: AS SHOWN

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
TP	6	PTF 2022(045)		166
DRAWN BY:	STATE	DIST. NO.	COUNTY	
RH	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
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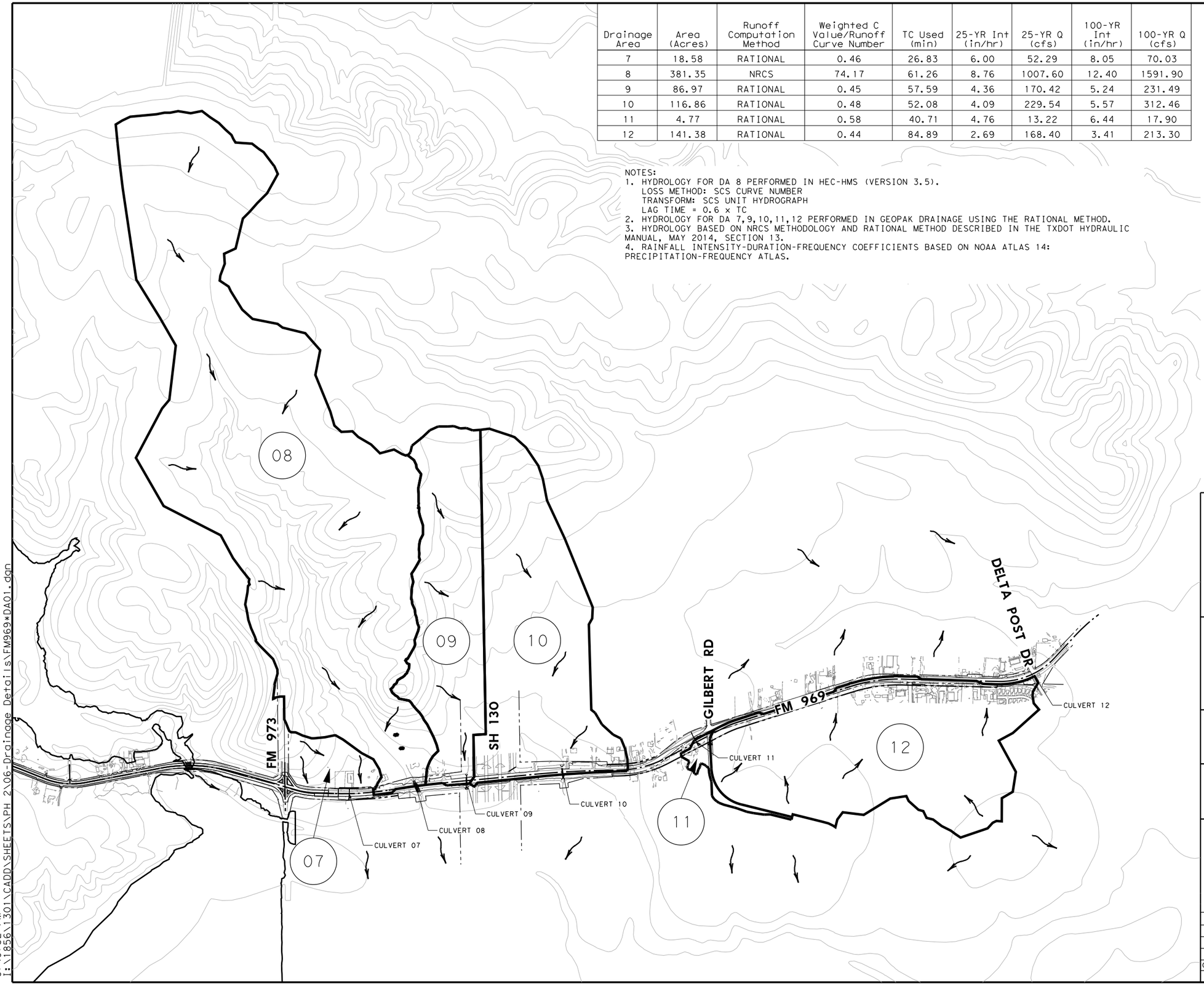
Drainage Area	Area (Acres)	Runoff Computation Method	Weighted C Value/Runoff Curve Number	TC Used (min)	25-YR Int (in/hr)	25-YR Q (cfs)	100-YR Int (in/hr)	100-YR Q (cfs)
7	18.58	RATIONAL	0.46	26.83	6.00	52.29	8.05	70.03
8	381.35	NRCS	74.17	61.26	8.76	1007.60	12.40	1591.90
9	86.97	RATIONAL	0.45	57.59	4.36	170.42	5.24	231.49
10	116.86	RATIONAL	0.48	52.08	4.09	229.54	5.57	312.46
11	4.77	RATIONAL	0.58	40.71	4.76	13.22	6.44	17.90
12	141.38	RATIONAL	0.44	84.89	2.69	168.40	3.41	213.30

NOTES:
1. HYDROLOGY FOR DA 8 PERFORMED IN HEC-HMS (VERSION 3.5).
   LOSS METHOD: SCS CURVE NUMBER
   TRANSFORM: SCS UNIT HYDROGRAPH
   LAG TIME = 0.6 x TC
2. HYDROLOGY FOR DA 7,9,10,11,12 PERFORMED IN GEOPAK DRAINAGE USING THE RATIONAL METHOD.
3. HYDROLOGY BASED ON NRCS METHODOLOGY AND RATIONAL METHOD DESCRIBED IN THE TXDOT HYDRAULIC MANUAL, MAY 2014, SECTION 13.
4. RAINFALL INTENSITY-DURATION-FREQUENCY COEFFICIENTS BASED ON NOAA ATLAS 14: PRECIPITATION-FREQUENCY ATLAS.



SCALE: 1" = 1200'

1200 600 0 1200

LEGEND

XX — DRAINAGE AREA NUMBER

EXISTING ROW

PROPOSED ROW

100-YR FLOODPLAIN

DRAINAGE AREA BOUNDARY

FLOW DIRECTION ARROW

FLOW PATH

N

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DRAINAGE AREA MAP

SHEET 1 OF 1

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DB	6	PTF 2022(045)		167
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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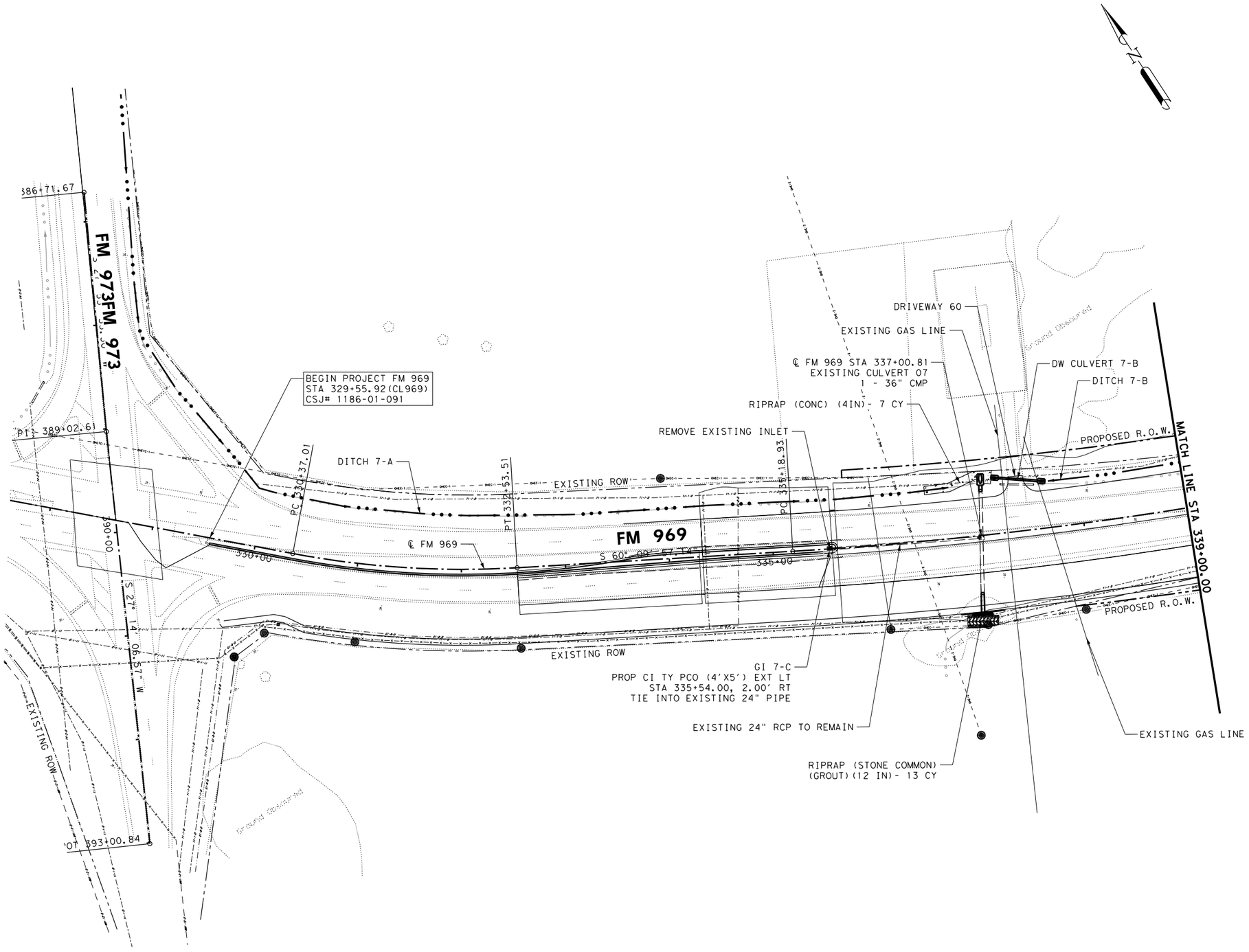

0′ 50′ 100′
SCALE IN FEET

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

NOTES:

1. REFER TO DRIVEWAY & SIDEWALK PIPE SUMMARY SHEET OR CROSS CULVERT LAYOUT SHEETS FOR CULVERT ELEVATIONS AND INFORMATION.
2. ALL STATIONS/OFFSETS ARE TO THE TOP OF BACK OF CURB FOR INLETS AND CENTER OF MANHOLE/GRATE FOR MANHOLES AND GRATES.
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DRAINAGE PLAN

BEGIN TO STA 339+00

SCALE:

SHEET 1 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		168
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
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BY	1186	01	091	FM 969

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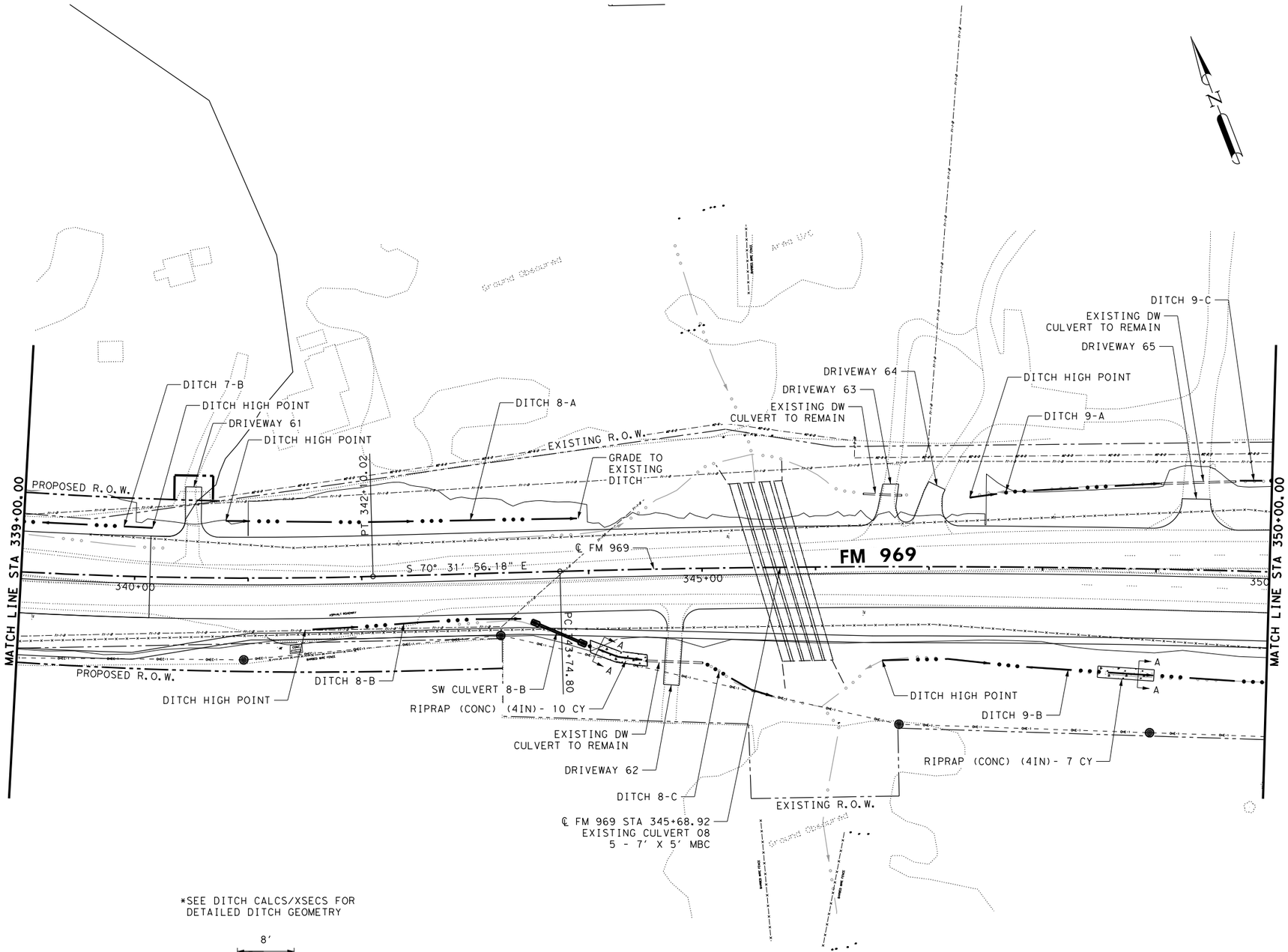

0' 50' 100'

SCALE IN FEET

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

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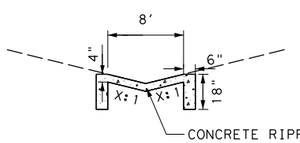
*SEE DITCH CALCS/XSECS FOR DETAILED DITCH GEOMETRY



SECTION A-A

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STA 339+00 TO STA 350+00

SHEET 2 OF 10

DESIGN BY:	FED. RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		169
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
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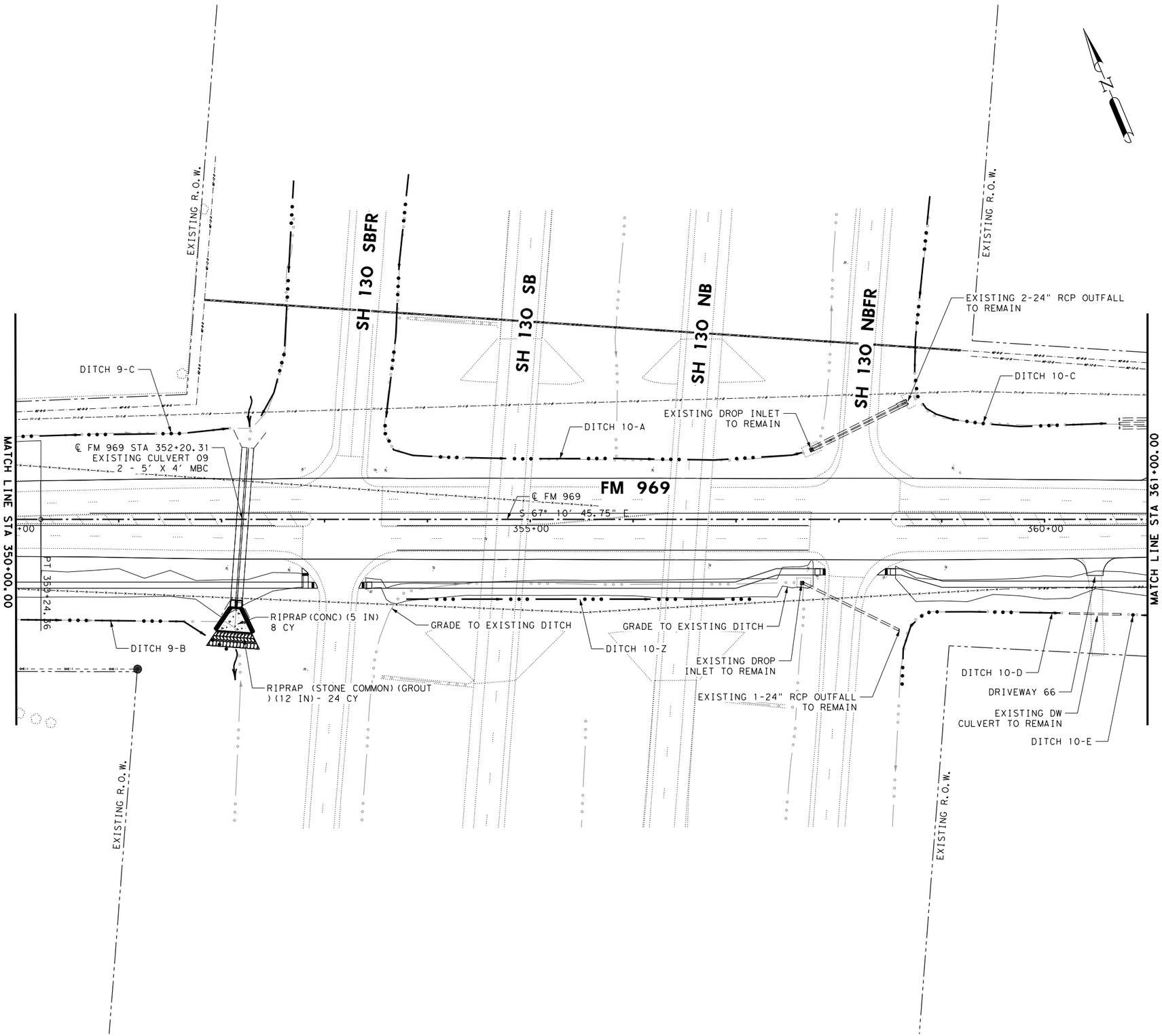

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SCALE IN FEET

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

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DRAINAGE PLAN

STA 350+00 TO STA 361+00

SHEET 3 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		170
DRAWN BY:	STATE	DIST. NO.	COUNTY	
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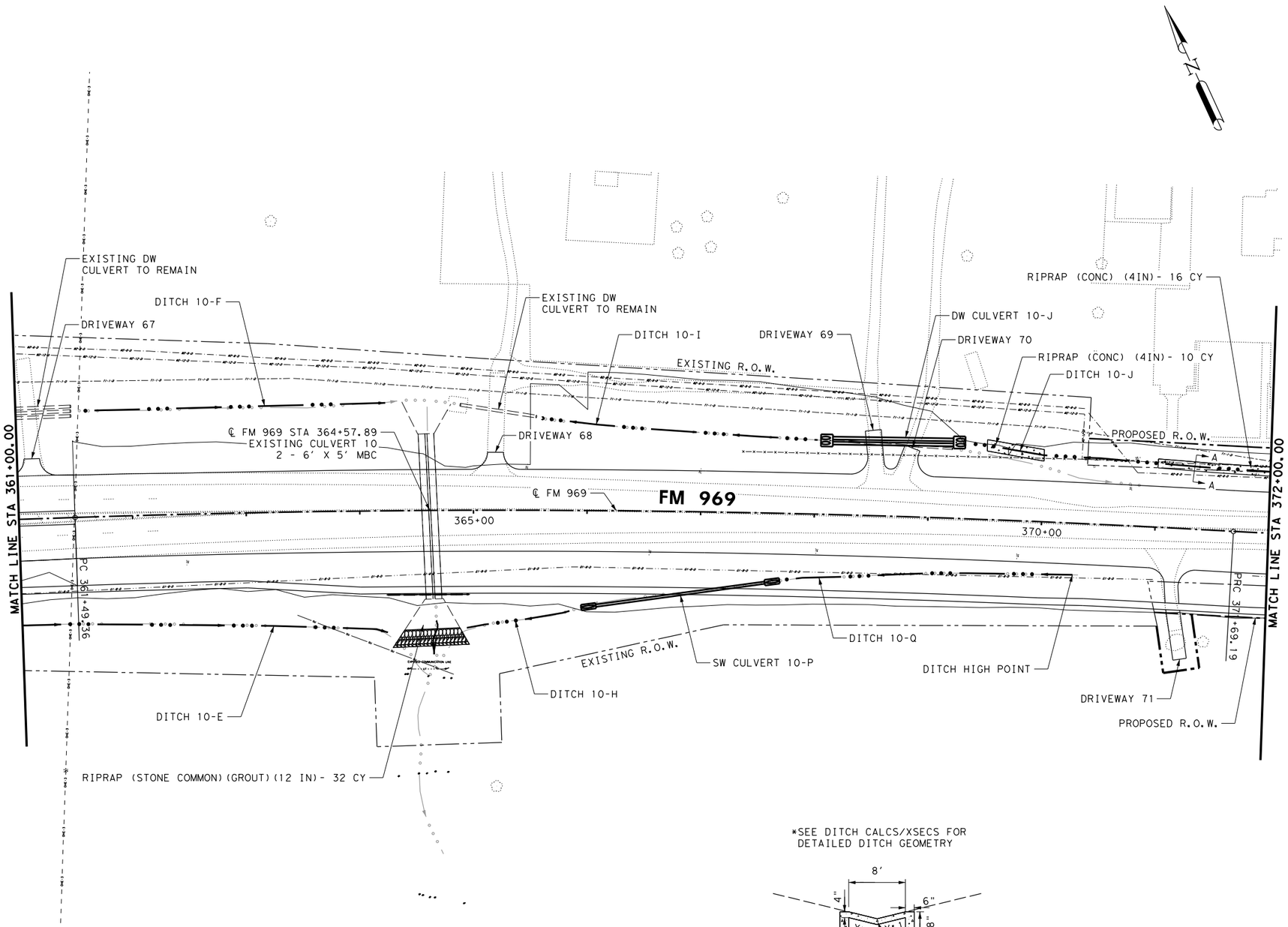
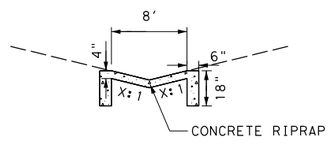


*SEE DITCH CALCS/XSECS FOR DETAILED DITCH GEOMETRY



SECTION A-A

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

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STA 361+00 TO STA 372+00

SHEET 4 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		171
DRAWN BY:	STATE	DIST. NO.	COUNTY	
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BY	1186	01	091	FM 969

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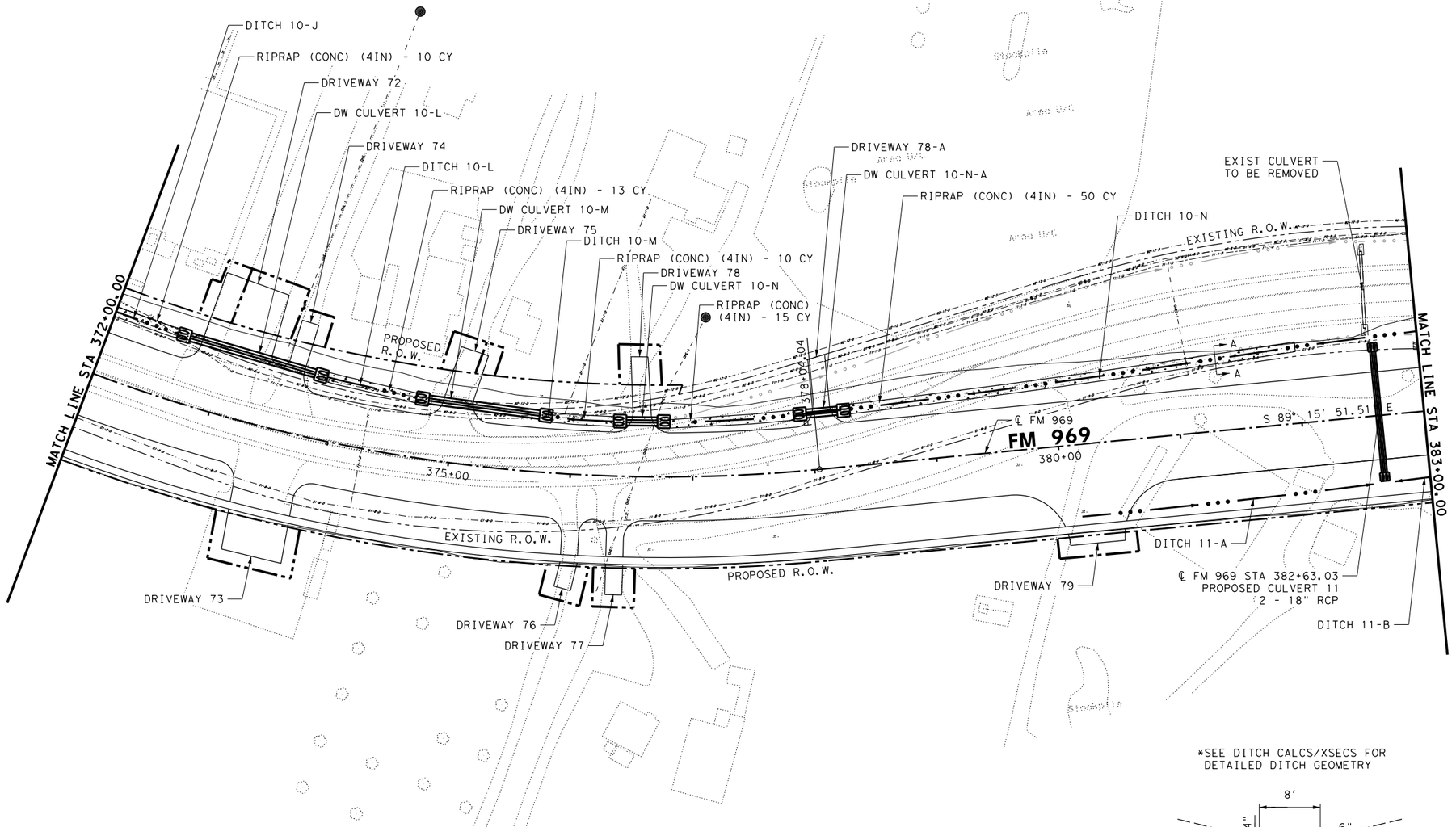

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

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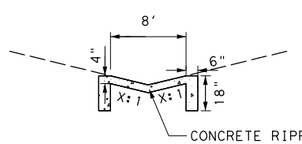
*SEE DITCH CALCS/XSECS FOR DETAILED DITCH GEOMETRY



SECTION A-A

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DRAINAGE PLAN

STA 372+00 TO STA 383+00

SHEET 5 OF 10

DESIGN BY:	FED. RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		172
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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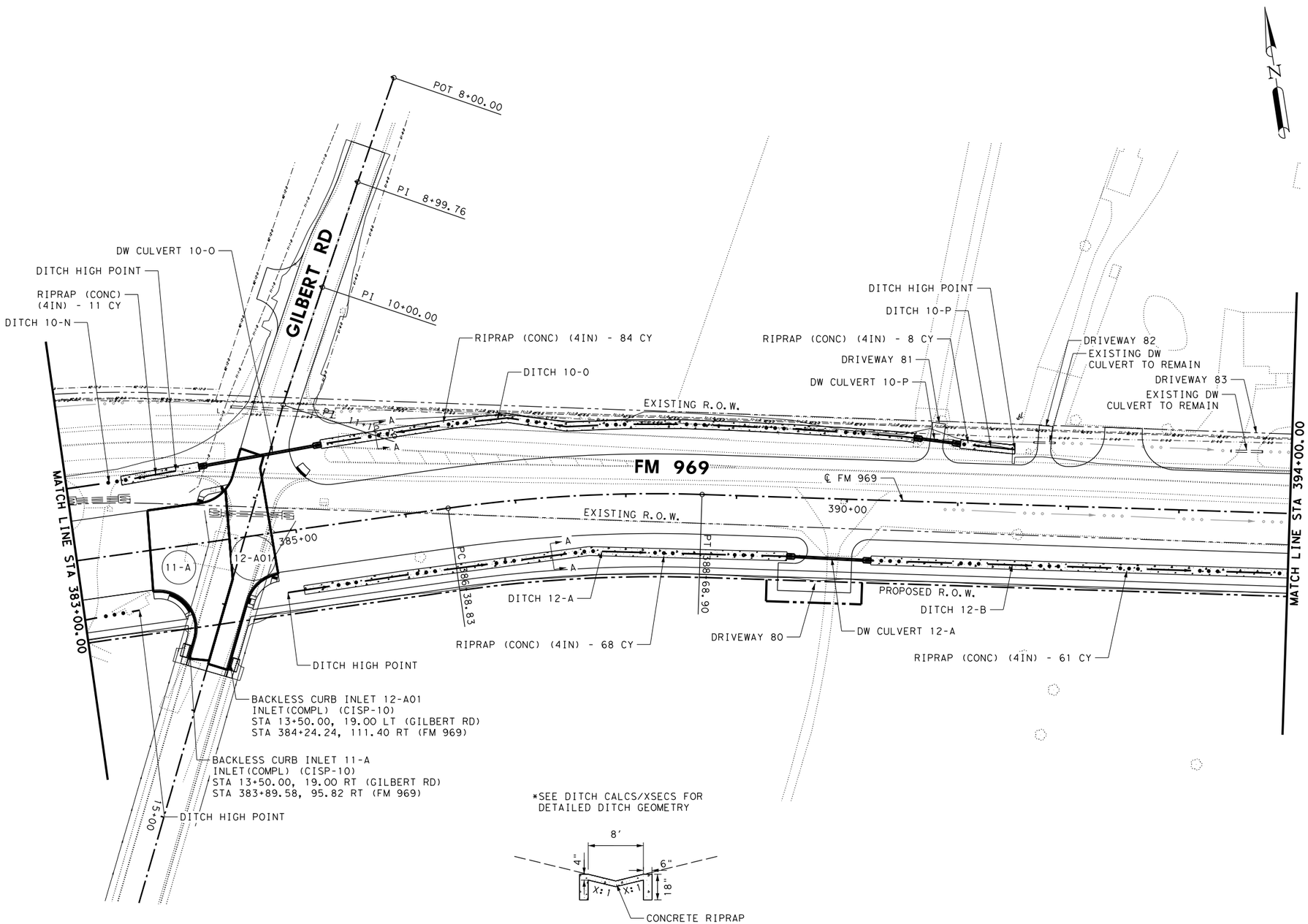
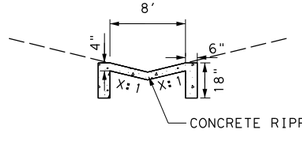


*SEE DITCH CALCS/XSECS FOR DETAILED DITCH GEOMETRY



SECTION A-A

0' 50' 100'
SCALE IN FEET

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LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

NOTES:

1. REFER TO DRIVEWAY & SIDEWALK PIPE SUMMARY SHEET OR CROSS CULVERT LAYOUT SHEETS FOR CULVERT ELEVATIONS AND INFORMATION.
2. ALL STATIONS/OFFSETS ARE TO THE TOP OF BACK OF CURB FOR INLETS AND CENTER OF MANHOLE/GRATE FOR MANHOLES AND GRATES.
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DRAINAGE PLAN

STA 383+00 TO STA 394+00

SHEET 6 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		173
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
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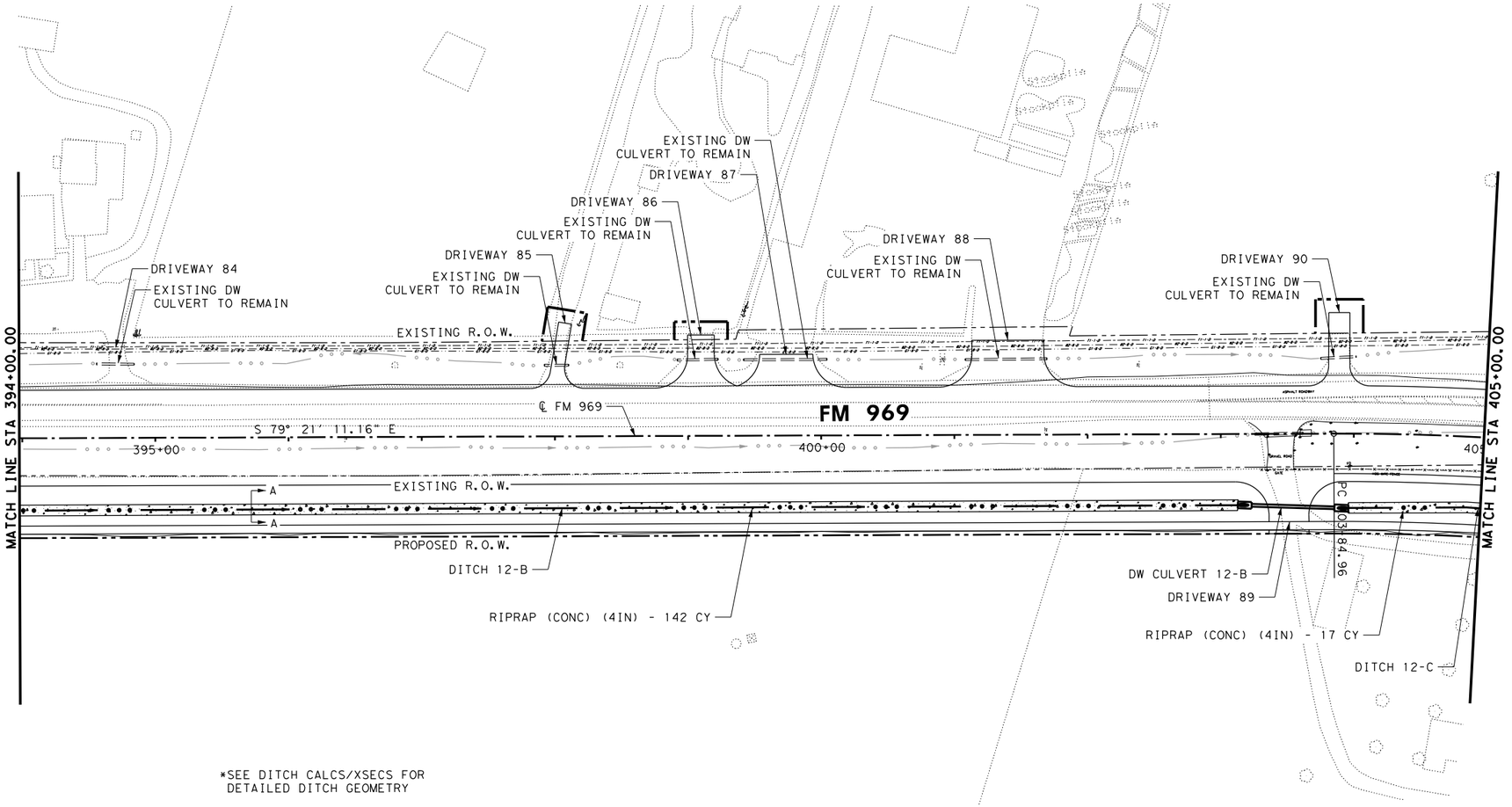
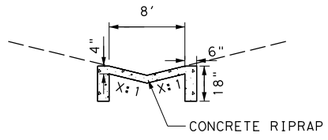
SCALE IN FEET



*SEE DITCH CALCS/XSECS FOR
DETAILED DITCH GEOMETRY



SECTION A-A

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

NOTES:

1. REFER TO DRIVEWAY & SIDEWALK PIPE SUMMARY SHEET OR CROSS CULVERT LAYOUT SHEETS FOR CULVERT ELEVATIONS AND INFORMATION.
2. ALL STATIONS/OFFSETS ARE TO THE TOP OF BACK OF CURB FOR INLETS AND CENTER OF MANHOLE/GRATE FOR MANHOLES AND GRATES.
3. REFER TO STORM SEWER PROFILE SHEET FOR ADDITIONAL INFORMATION.
4. FOR DETAILED DITCH INFORMATION, REFER TO DITCH CALCULATIONS SHEETS AND CROSS SECTIONS.
5. REFER TO ROADWAY PLAN & PROFILE SHEETS FOR DITCH PROFILES

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
DRAINAGE PLAN

STA 394+00 TO STA 405+00

SHEET 7 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		174
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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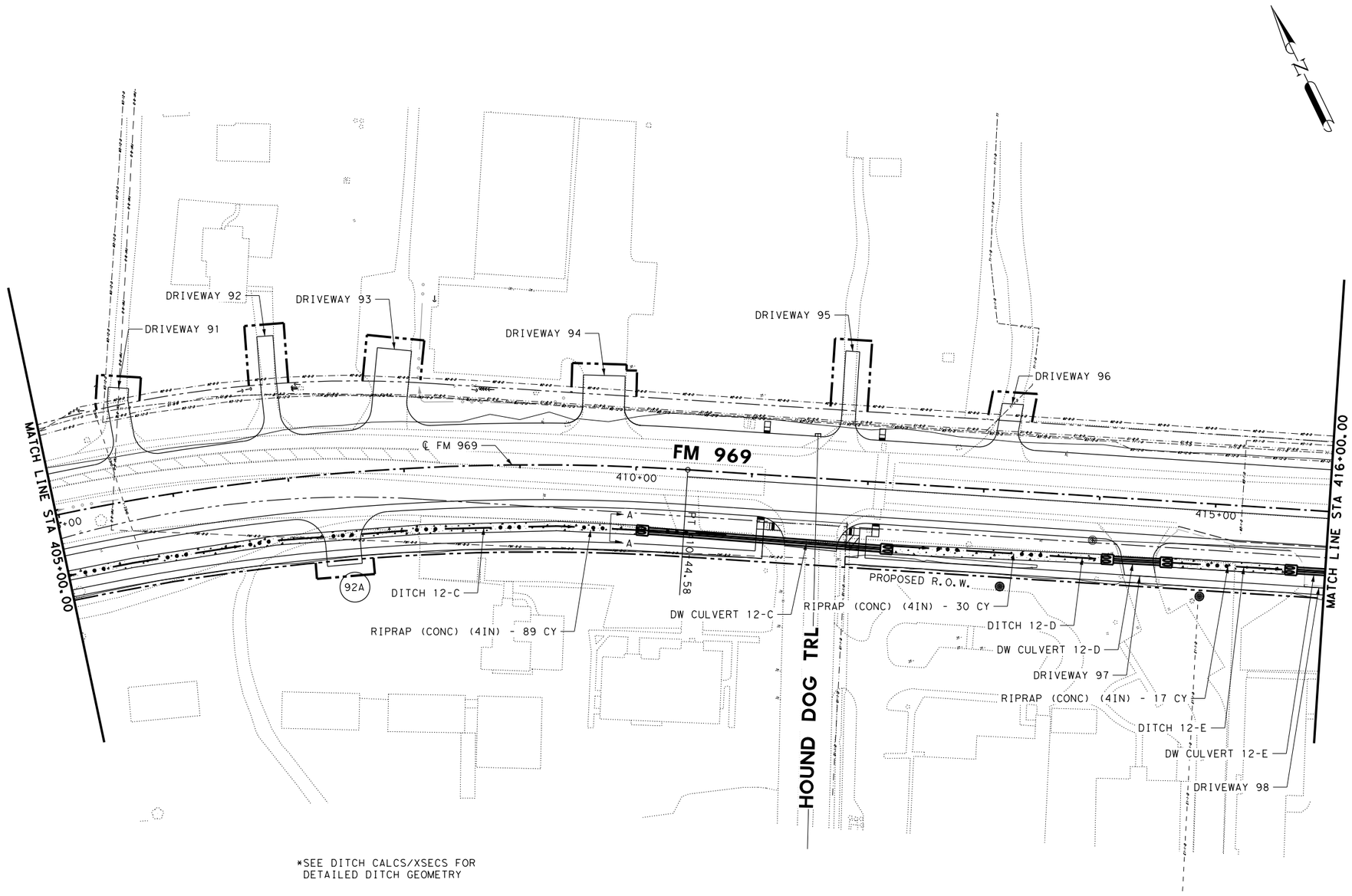
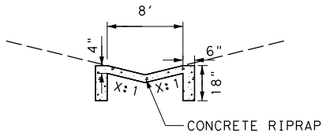
0′ 50′ 100′
SCALE IN FEET



*SEE DITCH CALCS/XSECS FOR DETAILED DITCH GEOMETRY



SECTION A-A

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

NOTES:

1. REFER TO DRIVEWAY & SIDEWALK PIPE SUMMARY SHEET OR CROSS CULVERT LAYOUT SHEETS FOR CULVERT ELEVATIONS AND INFORMATION.
2. ALL STATIONS/OFFSETS ARE TO THE TOP OF BACK OF CURB FOR INLETS AND CENTER OF MANHOLE/GRATE FOR MANHOLES AND GRATES.
3. REFER TO STORM SEWER PROFILE SHEET FOR ADDITIONAL INFORMATION.
4. FOR DETAILED DITCH INFORMATION, REFER TO DITCH CALCULATIONS SHEETS AND CROSS SECTIONS.
5. REFER TO ROADWAY PLAN & PROFILE SHEETS FOR DITCH PROFILES

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
DRAINAGE PLAN

STA 405+00 TO STA 416+00

SHEET 8 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		175
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

6/25/2021
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0′ 50′ 100′
SCALE IN FEET

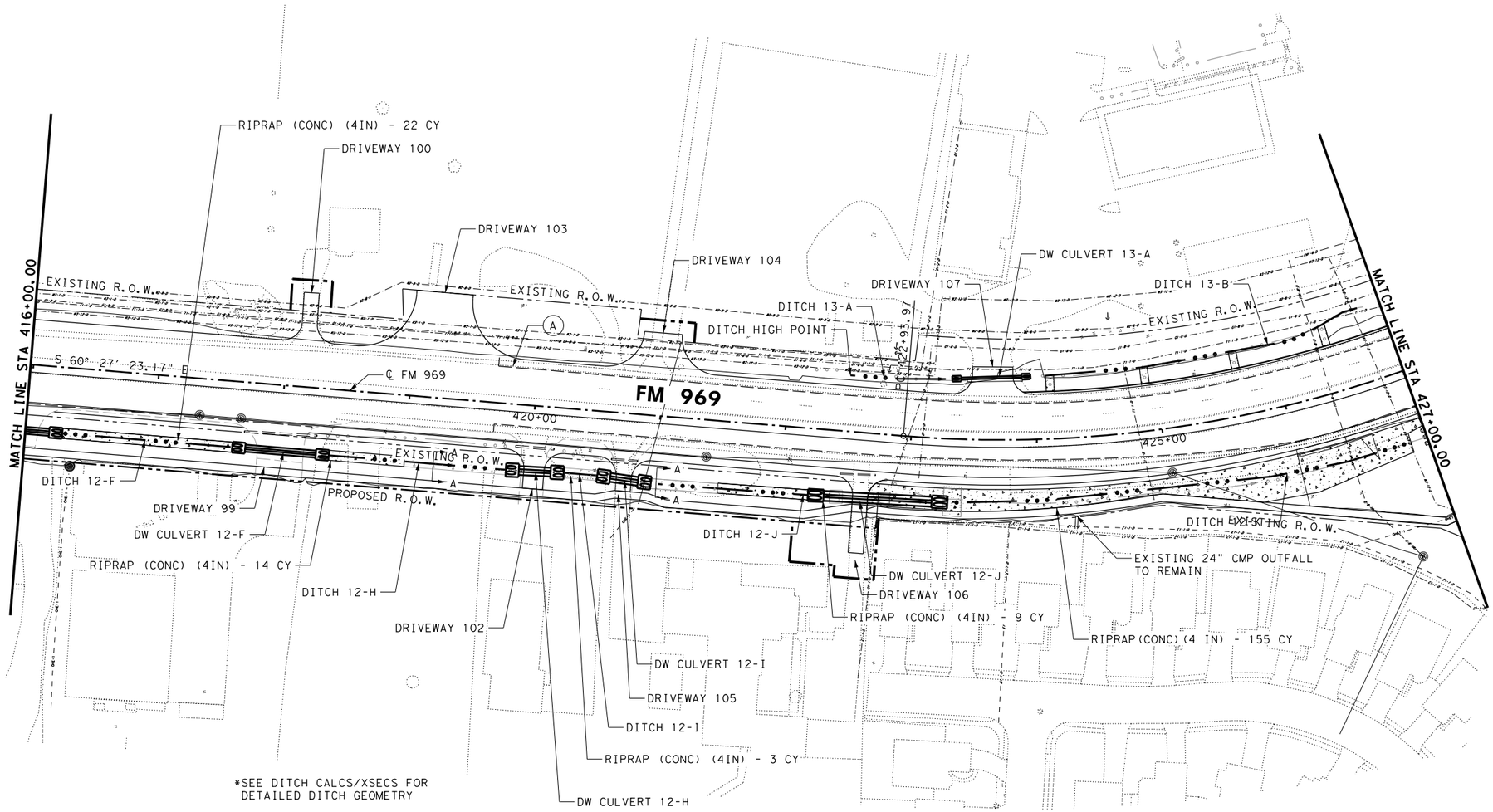
N

LEGEND

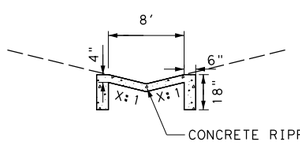
- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

NOTES:

1. REFER TO DRIVEWAY & SIDEWALK PIPE SUMMARY SHEET OR CROSS CULVERT LAYOUT SHEETS FOR CULVERT ELEVATIONS AND INFORMATION.
2. ALL STATIONS/OFFSETS ARE TO THE TOP OF BACK OF CURB FOR INLETS AND CENTER OF MANHOLE/GRATE FOR MANHOLES AND GRATES.
3. REFER TO STORM SEWER PROFILE SHEET FOR ADDITIONAL INFORMATION.
4. FOR DETAILED DITCH INFORMATION, REFER TO DITCH CALCULATIONS SHEETS AND CROSS SECTIONS.
5. REFER TO ROADWAY PLAN & PROFILE SHEETS FOR DITCH PROFILES



*SEE DITCH CALCS/XSECS FOR DETAILED DITCH GEOMETRY



SECTION A-A

STATE OF TEXAS
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PROFESSIONAL ENGINEER
6/25/2021

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FM 969
DRAINAGE PLAN

STA 416+00 TO STA 427+00

SHEET 9 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		176
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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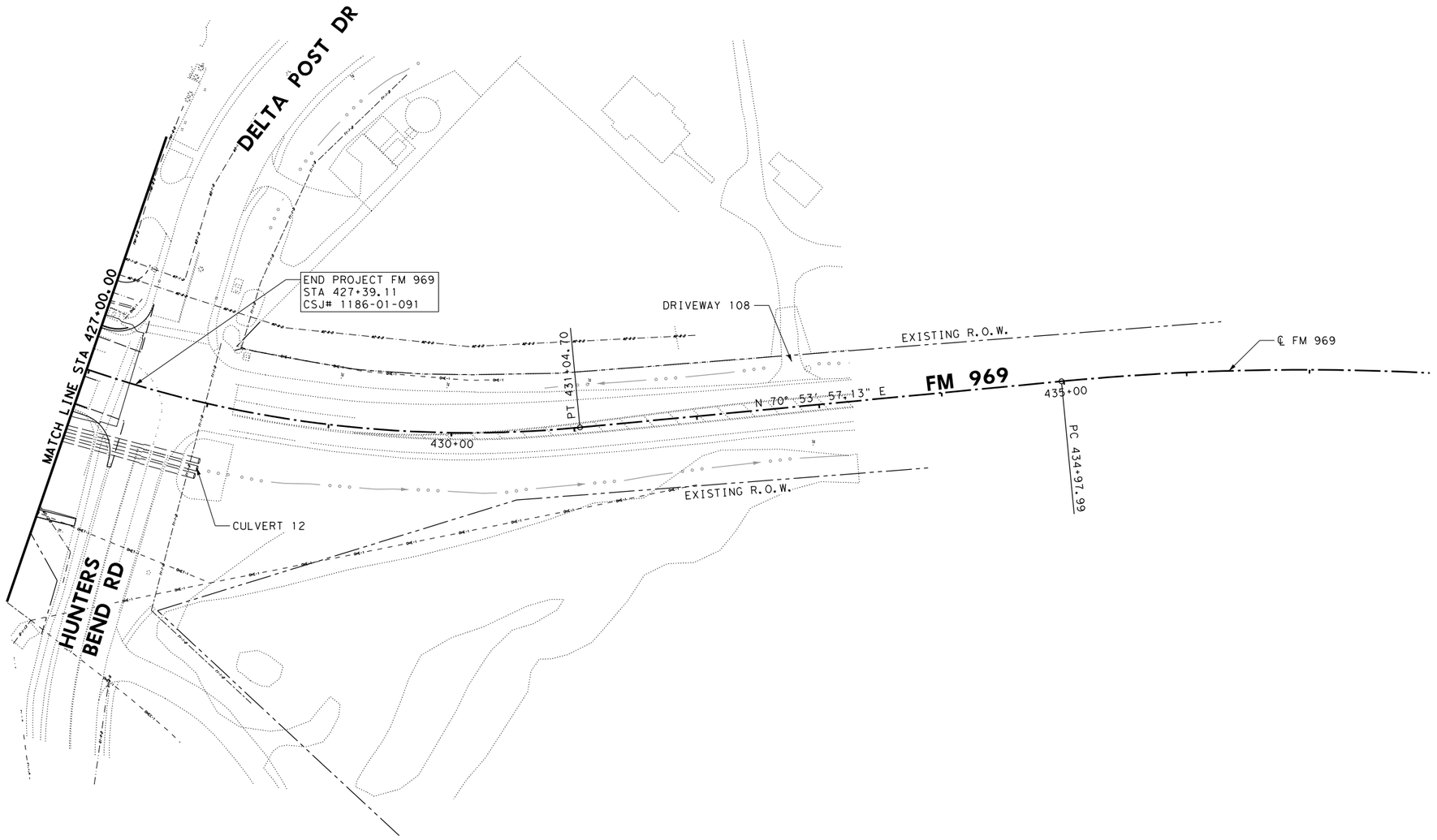
SCALE IN FEET

N



LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

NOTES:

1. REFER TO DRIVEWAY & SIDEWALK PIPE SUMMARY SHEET OR CROSS CULVERT LAYOUT SHEETS FOR CULVERT ELEVATIONS AND INFORMATION.
2. ALL STATIONS/OFFSETS ARE TO THE TOP OF BACK OF CURB FOR INLETS AND CENTER OF MANHOLE/GRATE FOR MANHOLES AND GRATES.
3. REFER TO STORM SEWER PROFILE SHEET FOR ADDITIONAL INFORMATION.
4. FOR DETAILED DITCH INFORMATION, REFER TO DITCH CALCULATIONS SHEETS AND CROSS SECTIONS.
5. REFER TO ROADWAY PLAN & PROFILE SHEETS FOR DITCH PROFILES

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
DRAINAGE PLAN

STA 427+00 TO END

SHEET 10 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		177
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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AREA COMPUTATIONS

AREA ID	AREA (ac)	AREA TIME OF CONC (min)	AREA TIME OF CONC USED (min)	AREA C-VALUE	AREA 5 YR INTENSITY (in/hr)	AREA 5 YR DISCHARGE (cfs)	AREA 10 YR INTENSITY (in/hr)	AREA 10 YR DISCHARGE (cfs)	AREA 25 YR INTENSITY (in/hr)	AREA 25 YR DISCHARGE (cfs)	AREA 100 YR INTENSITY (in/hr)	AREA 100 YR DISCHARGE (cfs)
11-A	0.17	2.50	10.00	0.90	7.06	1.07	7.99	1.21	9.27	1.41	11.67	1.77
12-A01	0.13	2.50	10.00	0.90	7.06	0.80	7.99	0.91	9.27	1.05	11.67	1.33
GI 7-C	1.84	10.00	10.00	0.90	5.99	9.93	7.05	11.68	8.38	13.89	10.74	17.81

10 YEAR ON GRADE INLET AND SAG CONFIGURATION DATA

INLET ID	INLET CHAIN	INLET STATION	INLET OFFSET	INLET TYPE	INLET PROFILE TYPE	INLET DISCHARGE (cfs)	INLET CAPACITY (cfs)	INLET BYPASS NODE	INLET BYPASS FLOW (cfs)	INLET BYPASS MAX (cfs)	INLET LONGITUDINAL SLOPE (ft/ft)	INLET LENGTH: (ft)
11-A	GILBERTRD	13+53.00	19.00	Curb	On Grade	1.21	1.21	0.00	0.00	0.50	2.00	9.50
12-A01	GILBERTRD	13+53.00	-19.00	Curb	On Grade	0.91	0.91	0.00	0.00	0.50	2.00	9.50
GI 7-C	FM 969	335+54.00	2.00	Curb	On Grade	7.25	4.36	0.00	2.89	2.17	0.74	9.50

GUTTER N	GUTTER DEPRESSION: (ft)	TC ELEVATION: (ft)	REQUIRED LENGTH: (ft)	GRATE AREA: (SF)	GRATE PERIMETER: (ft)	COMPUTED INLET POND DEPTH (ft)	INLET MAX POND DEPTH (ft)	COMPUTED INLET POND WIDTH (ft)	INLET MAX POND WIDTH (ft)
0.016	0.25	448.57	9.43	n/a	n/a	0.14	0.50	6.82	9.25
0.016	0.25	448.57	8.01	n/a	n/a	0.12	0.50	6.12	9.25
0.016	0.25	453.49	23.77	n/a	n/a	0.29	1.50	14.41	17.00

100 YEAR ON GRADE INLET AND SAG CONFIGURATION DATA

INLET ID	INLET CHAIN	INLET STATION	INLET OFFSET	INLET TYPE	INLET PROFILE TYPE	INLET DISCHARGE (cfs)	INLET CAPACITY (cfs)	INLET BYPASS NODE	INLET BYPASS FLOW (cfs)	INLET BYPASS MAX (cfs)	INLET LONGITUDINAL SLOPE (ft/ft)
11-A	GILBERTRD	13+53.00	19.00	Curb	On Grade	1.77	1.68	0.00	0.09	0.53	2.00
12-A01	GILBERTRD	13+53.00	-19.00	Curb	On Grade	1.33	1.32	0.00	0.00	0.50	2.00
GI 7-C	FM 969	335+54.00	2.00	Curb	On Grade	11.05	5.47	0.00	5.58	3.31	0.74

INLET LENGTH: (ft)	GUTTER N	GUTTER DEPRESSION: (ft)	TC ELEVATION: (ft)	REQUIRED LENGTH: (ft)	GRATE AREA: (SF)	GRATE PERIMETER: (ft)	COMPUTED INLET POND DEPTH (ft)	INLET MAX POND DEPTH (ft)	COMPUTED INLET POND WIDTH (ft)	INLET MAX POND WIDTH (ft)
9.50	0.016	0.25	448.57	11.70	n/a	n/a	0.16	0.50	7.86	9.25
9.50	0.016	0.25	448.57	9.93	n/a	n/a	0.14	0.50	7.06	9.25
9.50	0.016	0.25	453.49	30.05	n/a	n/a	0.34	0.50	16.87	9.25

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
INLET COMPUTATIONS

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MD	6	PTF 2022(045)		178
DRAWN BY:	STATE	DIST. NO.	COUNTY	
MD	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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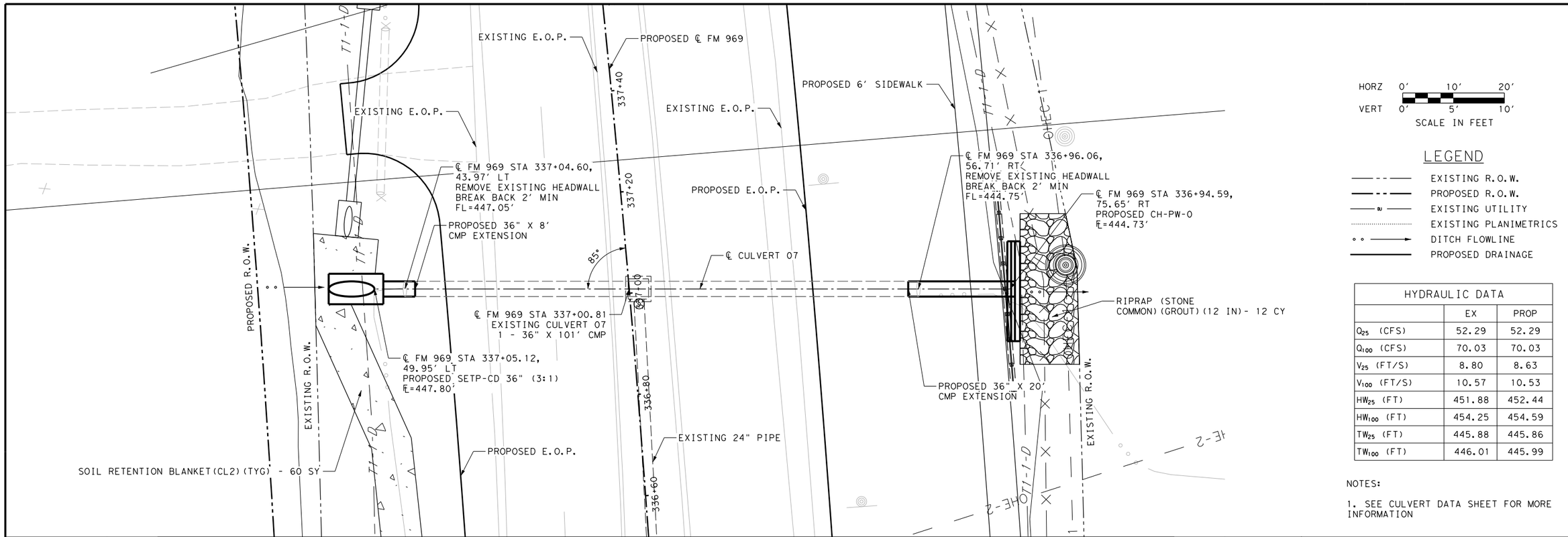


HORZ 0' 10' 20'
VERT 0' 5' 10'
SCALE IN FEET

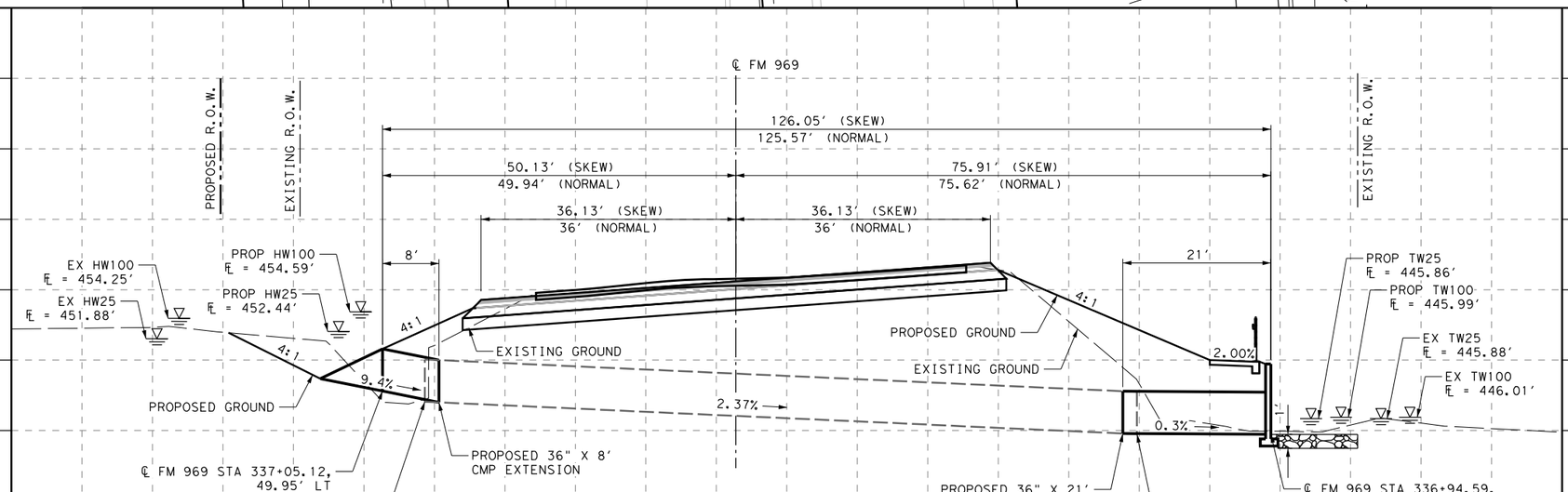
LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

HYDRAULIC DATA		
	EX	PROP
Q_{25} (CFS)	52.29	52.29
Q_{100} (CFS)	70.03	70.03
V_{25} (FT/S)	8.80	8.63
V_{100} (FT/S)	10.57	10.53
HW_{25} (FT)	451.88	452.44
HW_{100} (FT)	454.25	454.59
TW_{25} (FT)	445.88	445.86
TW_{100} (FT)	446.01	445.99

NOTES:

1. SEE CULVERT DATA SHEET FOR MORE INFORMATION



CULVERT 07
STA 336+99.45
EXISTING 36" X 101' CMP
EXISTING FW-0 UPSTREAM & DOWNSTREAM
EXTEND 8' UPSTREAM & 21' DOWNSTREAM
PROPOSED SETP-CD(3:1) UPSTREAM & CH-PW-0 DOWNSTREAM

STATE OF TEXAS
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PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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FRN-F-1386

FM 969
CULVERT 7

SHEET 1 OF 5

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		179
DRAWN BY:	STATE	DIST. NO.	COUNTY	
JT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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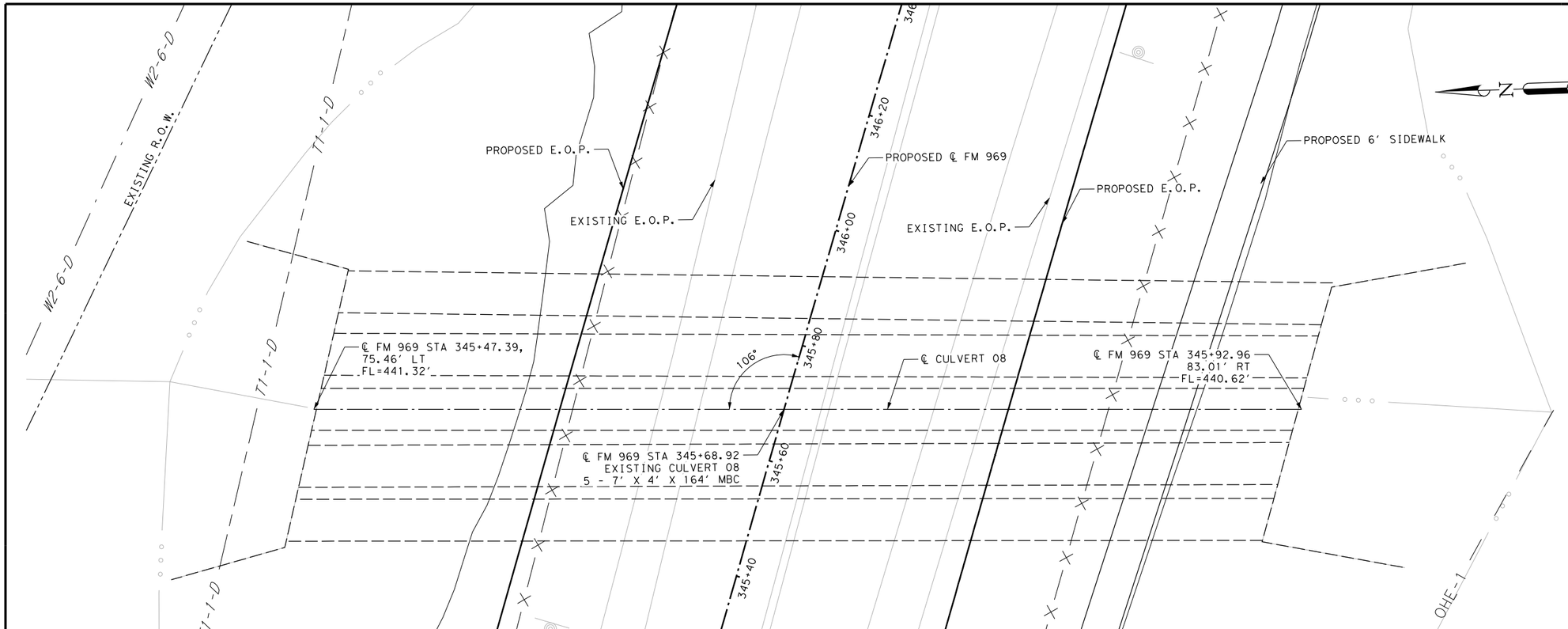


HORZ 0' 10' 20'
VERT 0' 5' 10'
SCALE IN FEET

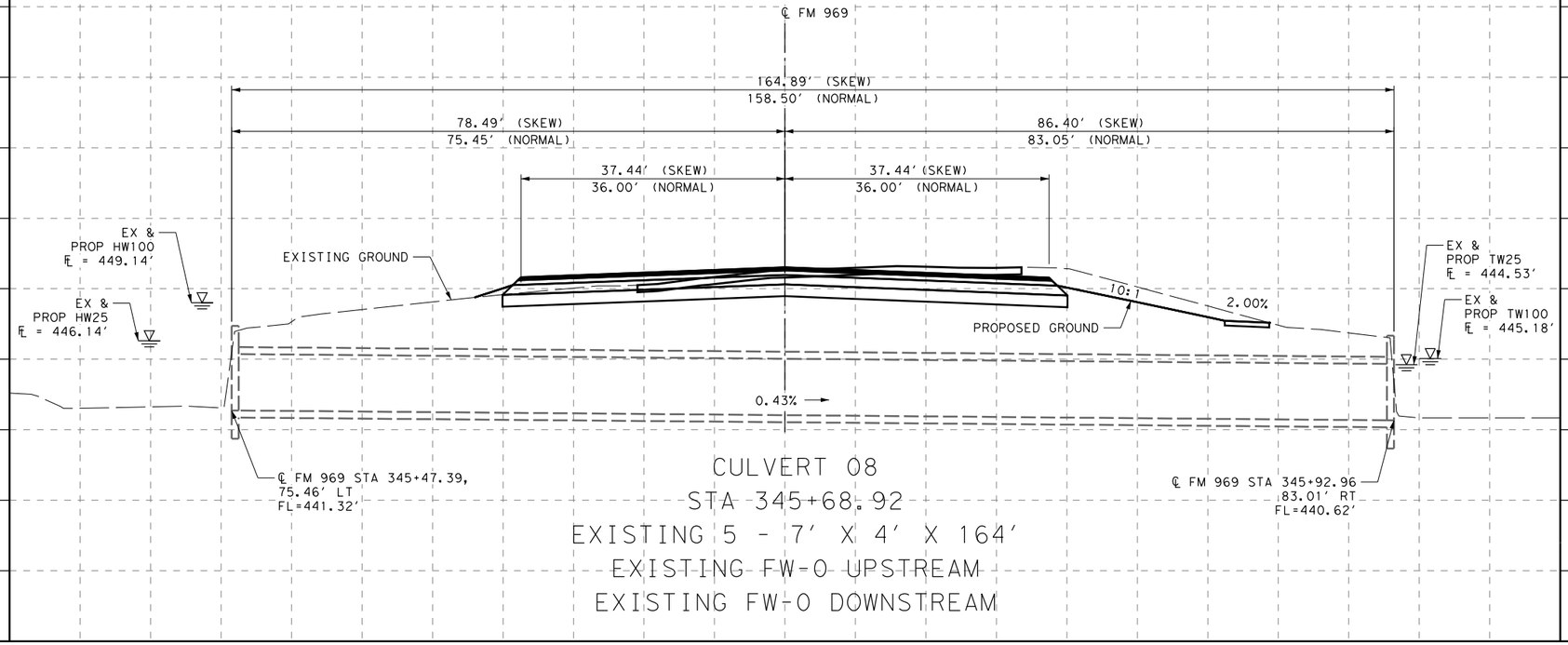
LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

HYDRAULIC DATA		
	EX	PROP
Q_{25} (CFS)	1007.60	1007.60
Q_{100} (CFS)	1591.90	1591.90
V_{25} (FT/S)	7.36	7.36
V_{100} (FT/S)	11.37	11.37
HW_{25} (FT)	446.14	446.14
HW_{100} (FT)	449.14	449.14
TW_{25} (FT)	444.53	444.53
TW_{100} (FT)	445.18	445.18

NOTES:

1. SEE CULVERT DATA SHEET FOR MORE INFORMATION
2. PAINT NBI NUMBER IN ACCORDANCE WITH PSN(AUS) STANDARD. THIS WORK IS SUBSIDIARY TO ITEM 467.



CULVERT 08
STA 345+68.92
EXISTING 5 - 7' X 4' X 164'
EXISTING FW-0 UPSTREAM
EXISTING FW-0 DOWNSTREAM

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
6/29/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
CULVERT 8

SHEET 2 OF 5

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.	SHEET NO.
DB	6	PTF 2022(045)	180
DRAWN BY:	STATE	DIST. NO.	COUNTY
JT	TX	AUS	TRAVIS
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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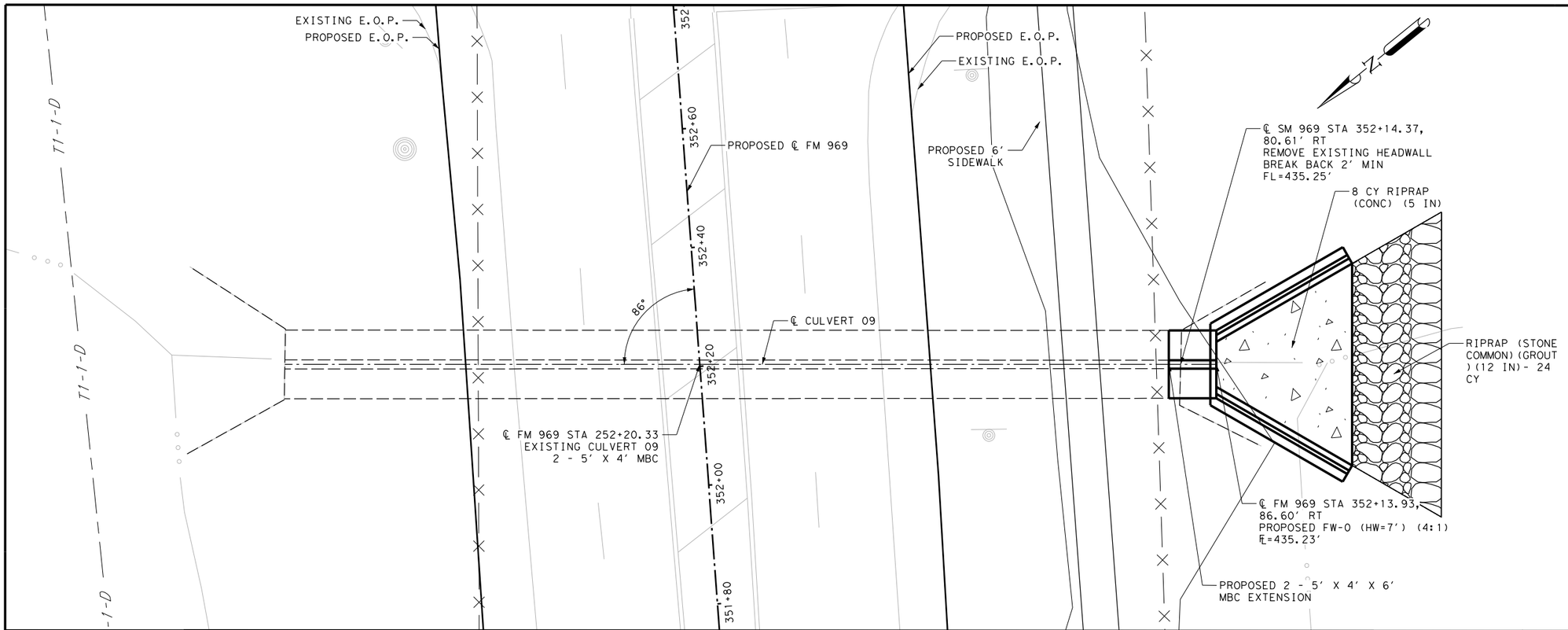


HORZ 0' 10' 20'
VERT 0' 5' 10'
SCALE IN FEET

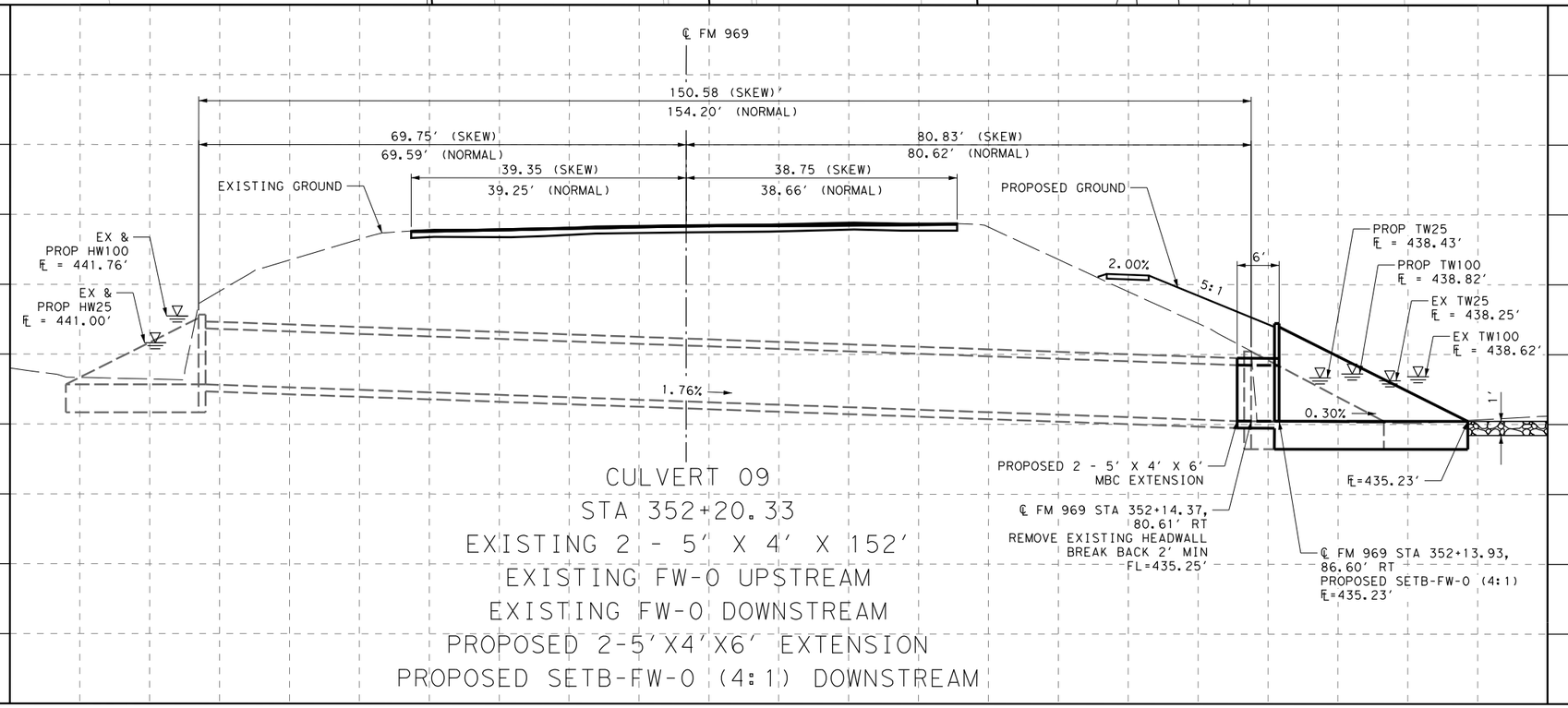
LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

HYDRAULIC DATA		
	EX	PROP
Q_{25} (CFS)	170.42	170.42
Q_{100} (CFS)	231.49	231.49
V_{25} (FT/S)	13.60	5.33
V_{100} (FT/S)	14.66	14.19
HW_{25} (FT)	441.00	441.00
HW_{100} (FT)	441.76	441.76
TW_{25} (FT)	438.25	438.43
TW_{100} (FT)	438.62	438.82

NOTES:

1. SEE CULVERT DATA SHEET FOR MORE INFORMATION



CULVERT 09
STA 352+20.33
EXISTING 2 - 5' X 4' X 152'
EXISTING FW-0 UPSTREAM
EXISTING FW-0 DOWNSTREAM
PROPOSED 2-5'X4'X6' EXTENSION
PROPOSED SETB-FW-0 (4:1) DOWNSTREAM

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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FRN-F-1386

FM 969
CULVERT 9

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		181
DRAWN BY:	STATE	DIST. NO.	COUNTY	
JT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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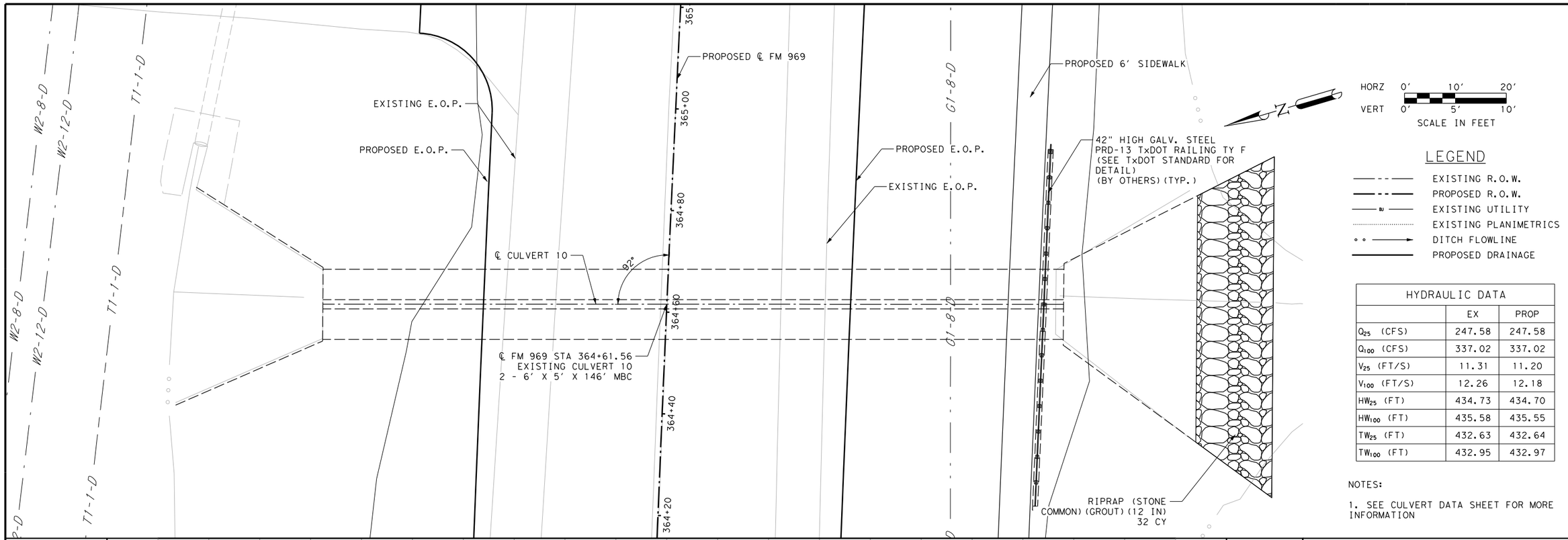


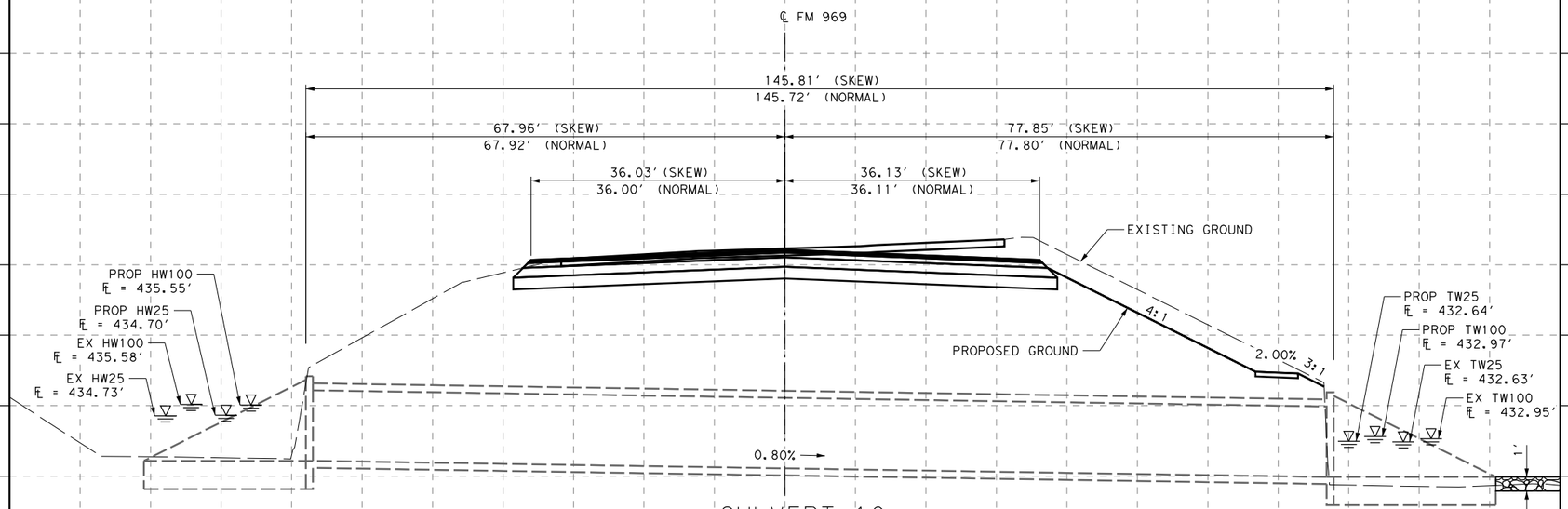
LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

HYDRAULIC DATA		
	EX	PROP
Q_{25} (CFS)	247.58	247.58
Q_{100} (CFS)	337.02	337.02
V_{25} (FT/S)	11.31	11.20
V_{100} (FT/S)	12.26	12.18
HW_{25} (FT)	434.73	434.70
HW_{100} (FT)	435.58	435.55
TW_{25} (FT)	432.63	432.64
TW_{100} (FT)	432.95	432.97

NOTES:

1. SEE CULVERT DATA SHEET FOR MORE INFORMATION



CULVERT 10
STA 364+61.57
EXISTING 2 - 6' X 5' X 146'
EXISTING FW-0 UPSTREAM
EXISTING FW-0 DOWNSTREAM

STATE OF TEXAS
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6/25/2021

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STATE OF TEXAS
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FM 969
CULVERT 10

SHEET 4 OF 5

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		182
DRAWN BY:	STATE	DIST. NO.	COUNTY	
JT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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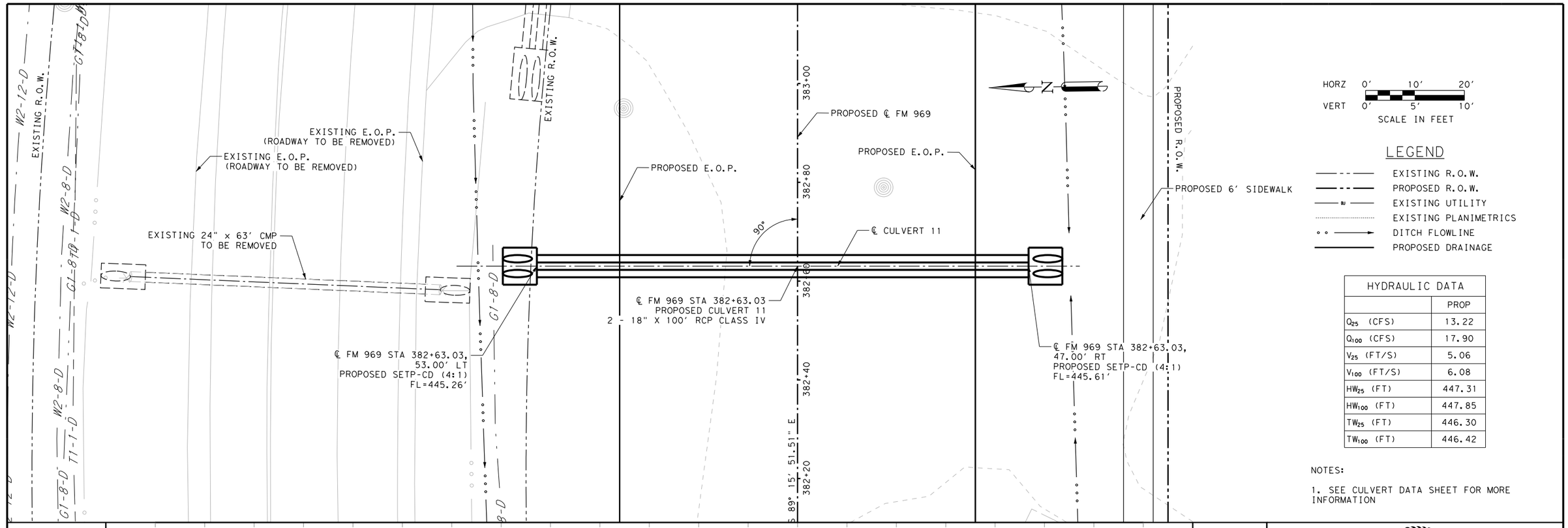


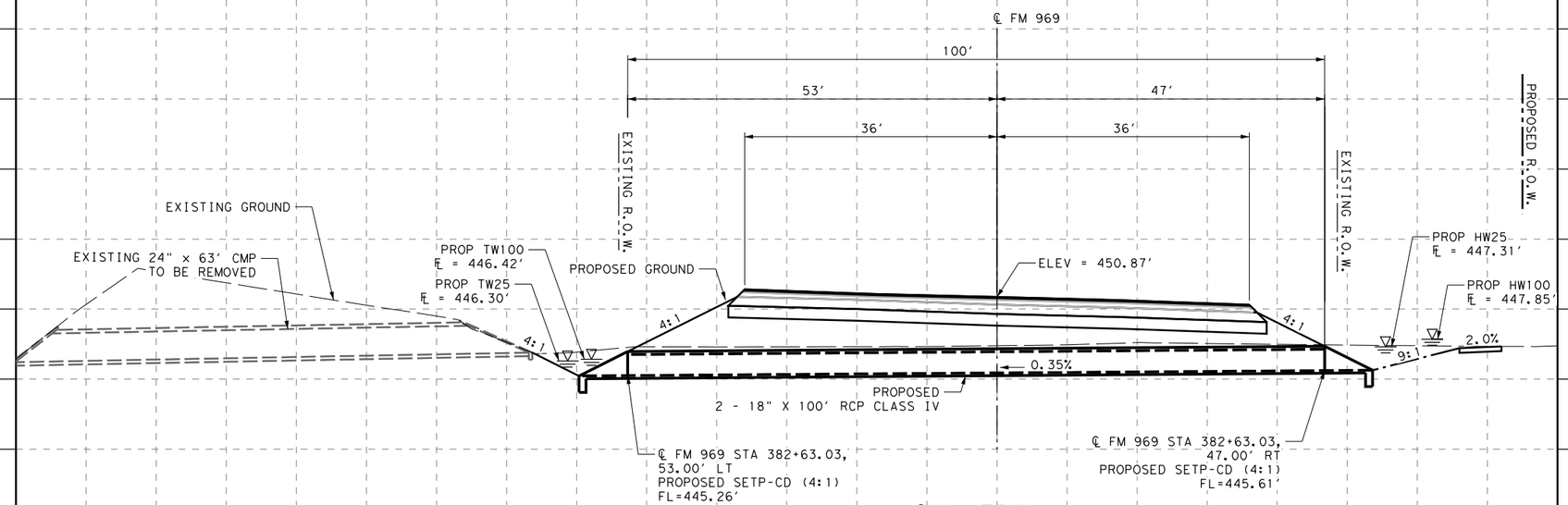
LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING UTILITY
- EXISTING PLANIMETRICS
- DITCH FLOWLINE
- PROPOSED DRAINAGE

HYDRAULIC DATA	
	PROP
Q_{25} (CFS)	13.22
Q_{100} (CFS)	17.90
V_{25} (FT/S)	5.06
V_{100} (FT/S)	6.08
HW_{25} (FT)	447.31
HW_{100} (FT)	447.85
TW_{25} (FT)	446.30
TW_{100} (FT)	446.42

NOTES:

1. SEE CULVERT DATA SHEET FOR MORE INFORMATION



CULVERT 11
STA 382+63.03
PROPOSED 2 - 18" X 100' RCP (CLASS IV)
SETP-CD (4:1) LT & RT

DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
7/21/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation
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LJA Engineering, Inc.
FRN-F-1386

FM 969
CULVERT 11

SHEET 5 OF 5

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		183
DRAWN BY:	STATE	DIST. NO.	COUNTY	
JT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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CULVERT 7 HYDRAULIC DATA	
MATERIAL	CORRUGATED STEEL
SHAPE	CIRCULAR
ENTRANCE	PROJECTING
PROFILE	STRAIGHT
DESIGN EVENT	25-YEAR
DESIGN DISCHARGE (CFS)	52.29
100-YR DISCHARGE (CFS)	70.03
n VALUE	0.024
PIPE DIAMETER (IN)	36
CULVERT SPAN (FT)	--
CULVERT RISE (FT)	--
NUMBER OF BARRELS	1.00
INLET STATION	0.00
INLET ELEVATION (FT)	447.05
BROKEN BACK STATION	--
BROKEN BACK ELEVATION (FT)	--
OUTLET STATION	101.05
OUTLET ELEVATION (FT)	444.75
TOTAL CULVERT LENGTH (FT)	101.05
CULVERT SLOPE 1 (FT/FT)	0.0228
CULVERT SLOPE 2 (FT/FT)	--
ANALYSIS FOR DESIGN EVENT	
TAILWATER ELEVATION (FT)	445.88
Q PER BARREL (CFS)	52.29
MAX HEADWATER ELEVATION (FT)	454.76
CALC. HEADWATER ELEVATION (FT)	451.88
HEADWATER DEPTH (FT)	4.83
CONTROL	INLET
OUTLET VELOCITY (FT/S)	8.80
DISCHARGE OVER THE ROAD (CFS)	0.00
ANALYSIS FOR 100-YEAR STORM EVENT	
TAILWATER ELEVATION (FT)	446.01
Q PER BARREL (CFS)	70.03
CALC. HEADWATER ELEVATION (FT)	454.25
HEADWATER DEPTH (FT)	7.20
CONTROL	INLET
OUTLET VELOCITY (FT/S)	10.57
DISCHARGE OVER THE ROAD (CFS)	0.00

CULVERT 8 HYDRAULIC DATA	
MATERIAL	CONCRETE
SHAPE	BOX
ENTRANCE	FW
PROFILE	STRAIGHT
DESIGN EVENT	25-YEAR
DESIGN DISCHARGE (CFS)	1179.80
100-YR DISCHARGE (CFS)	1593.40
n VALUE	0.012
PIPE DIAMETER (IN)	--
CULVERT SPAN (FT)	7.00
CULVERT RISE (FT)	4.00
NUMBER OF BARRELS	5.00
INLET STATION	0.00
INLET ELEVATION (FT)	441.36
BROKEN BACK STATION	--
BROKEN BACK ELEVATION (FT)	--
OUTLET STATION	164.89
OUTLET ELEVATION (FT)	440.84
TOTAL CULVERT LENGTH (FT)	164.89
CULVERT SLOPE 1 (FT/FT)	0.0031
CULVERT SLOPE 2 (FT/FT)	--
ANALYSIS FOR DESIGN EVENT	
TAILWATER ELEVATION (FT)	444.62
Q PER BARREL (CFS)	235.96
MAX HEADWATER ELEVATION (FT)	450.09
CALC. HEADWATER ELEVATION (FT)	447.11
HEADWATER DEPTH (FT)	5.75
CONTROL	INLET
OUTLET VELOCITY (FT/S)	3.03
DISCHARGE OVER THE ROAD (CFS)	0.00
ANALYSIS FOR 100-YEAR STORM EVENT	
TAILWATER ELEVATION (FT)	445.05
Q PER BARREL (CFS)	318.68
CALC. HEADWATER ELEVATION (FT)	449.01
HEADWATER DEPTH (FT)	7.65
CONTROL	INLET
OUTLET VELOCITY (FT/S)	3.42
DISCHARGE OVER THE ROAD (CFS)	0.00

CULVERT 9 HYDRAULIC DATA	
MATERIAL	CONCRETE
SHAPE	BOX
ENTRANCE	FW
PROFILE	STRAIGHT
DESIGN EVENT	25-YEAR
DESIGN DISCHARGE (CFS)	170.42
100-YR DISCHARGE (CFS)	231.49
n VALUE	0.012
PIPE DIAMETER (IN)	--
CULVERT SPAN (FT)	5.00
CULVERT RISE (FT)	4.00
NUMBER OF BARRELS	2.00
INLET STATION	0.00
INLET ELEVATION (FT)	437.82
BROKEN BACK STATION	--
BROKEN BACK ELEVATION (FT)	--
OUTLET STATION	151.64
OUTLET ELEVATION (FT)	435.04
TOTAL CULVERT LENGTH (FT)	151.64
CULVERT SLOPE 1 (FT/FT)	0.0183
CULVERT SLOPE 2 (FT/FT)	--
ANALYSIS FOR DESIGN EVENT	
TAILWATER ELEVATION (FT)	438.25
Q PER BARREL (CFS)	85.21
MAX HEADWATER ELEVATION (FT)	448.81
CALC. HEADWATER ELEVATION (FT)	441.00
HEADWATER DEPTH (FT)	3.19
CONTROL	INLET
OUTLET VELOCITY (FT/S)	13.60
DISCHARGE OVER THE ROAD (CFS)	0.00
ANALYSIS FOR 100-YEAR STORM EVENT	
TAILWATER ELEVATION (FT)	438.62
Q PER BARREL (CFS)	115.75
CALC. HEADWATER ELEVATION (FT)	441.76
HEADWATER DEPTH (FT)	3.94
CONTROL	INLET
OUTLET VELOCITY (FT/S)	14.66
DISCHARGE OVER THE ROAD (CFS)	0.00

CULVERT 10 HYDRAULIC DATA	
MATERIAL	CONCRETE
SHAPE	BOX
ENTRANCE	FW
PROFILE	STRAIGHT
DESIGN EVENT	25-YEAR
DESIGN DISCHARGE (CFS)	229.54
100-YR DISCHARGE (CFS)	312.46
n VALUE	0.012
PIPE DIAMETER (IN)	--
CULVERT SPAN (FT)	6.00
CULVERT RISE (FT)	5.00
NUMBER OF BARRELS	2.00
INLET STATION	0.00
INLET ELEVATION (FT)	431.09
BROKEN BACK STATION	--
BROKEN BACK ELEVATION (FT)	--
OUTLET STATION	145.81
OUTLET ELEVATION (FT)	429.95
TOTAL CULVERT LENGTH (FT)	145.81
CULVERT SLOPE 1 (FT/FT)	0.0079
CULVERT SLOPE 2 (FT/FT)	--
ANALYSIS FOR DESIGN EVENT	
TAILWATER ELEVATION (FT)	432.55
Q PER BARREL (CFS)	114.77
MAX HEADWATER ELEVATION (FT)	445.40
CALC. HEADWATER ELEVATION (FT)	434.55
HEADWATER DEPTH (FT)	3.46
CONTROL	INLET
OUTLET VELOCITY (FT/S)	11.06
DISCHARGE OVER THE ROAD (CFS)	0.00
ANALYSIS FOR 100-YEAR STORM EVENT	
TAILWATER ELEVATION (FT)	432.87
Q PER BARREL (CFS)	156.23
CALC. HEADWATER ELEVATION (FT)	435.35
HEADWATER DEPTH (FT)	4.26
CONTROL	INLET
OUTLET VELOCITY (FT/S)	12.04
DISCHARGE OVER THE ROAD (CFS)	0.00

NOTES:

1. ANALYSIS ON CULVERTS 7, 9 & 10 PERFORMED USING HY-8 (VERSION 7.50) CULVERT HYDRAULIC ANALYSIS PROGRAM. ANALYSIS ON CULVERT 8 PERFORMED USING HEC-RAS (VERSION 4.1.0).
2. TW ELEVATIONS ESTABLISHED USING OUTFALL CHANNEL GEOMETRY.
3. MAXIMUM HW ELEVATIONS FOR THE DESIGN YEAR ARE BASED ON THE ROADWAY ELEVATION WHERE INNUNDATION WOULD OCCUR. 100-YR HEADWATER ELEVATIONS WERE CHECKED TO ENSURE THAT NO STRUCTURES WERE THREATENED ON ADJACENT PROPERTIES.

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
CULVERT CALCULATIONS EXISTING CONDITIONS

SHEET 1 OF 2

DESIGN BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		184
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

6/25/2021
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CULVERT 7 HYDRAULIC DATA	
MATERIAL	CORRUGATED STEEL
SHAPE	CIRCULAR
ENTRANCE	SET
PROFILE	BROKEN BACK
DESIGN EVENT	25-YEAR
DESIGN DISCHARGE (CFS)	52.29
100-YR DISCHARGE (CFS)	70.03
n VALUE	0.024
PIPE DIAMETER (IN)	36
CULVERT SPAN (FT)	--
CULVERT RISE (FT)	--
NUMBER OF BARRELS	1.00
INLET STATION	0.00
INLET ELEVATION (FT)	447.80
BROKEN BACK STATION 1	8.00
BROKEN BACK ELEVATION 1 (FT)	447.05
BROKEN BACK STATION 2	105.05
BROKEN BACK ELEVATION 2 (FT)	444.75
OUTLET STATION	126.05
OUTLET ELEVATION (FT)	444.73
TOTAL CULVERT LENGTH (FT)	126.05
CULVERT SLOPE 1 (FT/FT)	0.0938
CULVERT SLOPE 2 (FT/FT)	0.0237
CULVERT SLOPE 3 (FT/FT)	0.0010
ANALYSIS FOR DESIGN EVENT	
TAILWATER ELEVATION (FT)	445.86
Q PER BARREL (CFS)	52.29
MAX HEADWATER ELEVATION (FT)	454.59
CALC. HEADWATER ELEVATION (FT)	452.44
HEADWATER DEPTH (FT)	4.64
CONTROL	INLET
OUTLET VELOCITY (FT/S)	8.63
DISCHARGE OVER THE ROAD (CFS)	0.00
ANALYSIS FOR 100-YEAR STORM EVENT	
TAILWATER ELEVATION (FT)	445.99
Q PER BARREL (CFS)	70.03
CALC. HEADWATER ELEVATION (FT)	454.59
HEADWATER DEPTH (FT)	6.79
CONTROL	INLET
OUTLET VELOCITY (FT/S)	10.53
DISCHARGE OVER THE ROAD (CFS)	0.00

CULVERT 8 HYDRAULIC DATA	
MATERIAL	CONCRETE
SHAPE	BOX
ENTRANCE	FW
PROFILE	STRAIGHT
DESIGN EVENT	25-YEAR
DESIGN DISCHARGE (CFS)	1179.80
100-YR DISCHARGE (CFS)	1593.40
n VALUE	0.012
PIPE DIAMETER (IN)	--
CULVERT SPAN (FT)	7.00
CULVERT RISE (FT)	4.00
NUMBER OF BARRELS	5.00
INLET STATION	0.00
INLET ELEVATION (FT)	441.36
BROKEN BACK STATION	--
BROKEN BACK ELEVATION (FT)	--
OUTLET STATION	164.89
OUTLET ELEVATION (FT)	440.84
TOTAL CULVERT LENGTH (FT)	164.89
CULVERT SLOPE 1 (FT/FT)	0.0031
CULVERT SLOPE 2 (FT/FT)	--
ANALYSIS FOR DESIGN EVENT	
TAILWATER ELEVATION (FT)	444.62
Q PER BARREL (CFS)	235.96
MAX HEADWATER ELEVATION (FT)	450.09
CALC. HEADWATER ELEVATION (FT)	447.11
HEADWATER DEPTH (FT)	5.75
CONTROL	INLET
OUTLET VELOCITY (FT/S)	3.03
DISCHARGE OVER THE ROAD (CFS)	0.00
ANALYSIS FOR 100-YEAR STORM EVENT	
TAILWATER ELEVATION (FT)	445.05
Q PER BARREL (CFS)	318.68
CALC. HEADWATER ELEVATION (FT)	449.01
HEADWATER DEPTH (FT)	7.65
CONTROL	INLET
OUTLET VELOCITY (FT/S)	3.42
DISCHARGE OVER THE ROAD (CFS)	0.00

CULVERT 9 HYDRAULIC DATA	
MATERIAL	CONCRETE
SHAPE	CIRCULAR
ENTRANCE	FW
PROFILE	BROKEN BACK
DESIGN EVENT	25-YEAR
DESIGN DISCHARGE (CFS)	170.42
100-YR DISCHARGE (CFS)	231.49
n VALUE	0.012
PIPE DIAMETER (IN)	--
CULVERT SPAN (FT)	5.00
CULVERT RISE (FT)	4.00
NUMBER OF BARRELS	2.00
INLET STATION	0.00
INLET ELEVATION (FT)	437.82
BROKEN BACK STATION	148.58
BROKEN BACK ELEVATION (FT)	435.25
OUTLET STATION	154.58
OUTLET ELEVATION (FT)	435.23
TOTAL CULVERT LENGTH (FT)	154.58
CULVERT SLOPE 1 (FT/FT)	0.0173
CULVERT SLOPE 2 (FT/FT)	0.0030
ANALYSIS FOR DESIGN EVENT	
TAILWATER ELEVATION (FT)	438.43
Q PER BARREL (CFS)	85.21
MAX HEADWATER ELEVATION (FT)	448.81
CALC. HEADWATER ELEVATION (FT)	441.00
HEADWATER DEPTH (FT)	3.19
CONTROL	INLET
OUTLET VELOCITY (FT/S)	5.33
DISCHARGE OVER THE ROAD (CFS)	0.00
ANALYSIS FOR 100-YEAR STORM EVENT	
TAILWATER ELEVATION (FT)	438.82
Q PER BARREL (CFS)	115.74
CALC. HEADWATER ELEVATION (FT)	441.77
HEADWATER DEPTH (FT)	3.95
CONTROL	INLET
OUTLET VELOCITY (FT/S)	14.19
DISCHARGE OVER THE ROAD (CFS)	0.00

CULVERT 10 HYDRAULIC DATA	
MATERIAL	CONCRETE
SHAPE	BOX
ENTRANCE	FW
PROFILE	STRAIGHT
DESIGN EVENT	25-YEAR
DESIGN DISCHARGE (CFS)	229.54
100-YR DISCHARGE (CFS)	312.46
n VALUE	0.012
PIPE DIAMETER (IN)	--
CULVERT SPAN (FT)	6.00
CULVERT RISE (FT)	5.00
NUMBER OF BARRELS	2.00
INLET STATION	0.00
INLET ELEVATION (FT)	431.06
BROKEN BACK STATION	--
BROKEN BACK ELEVATION (FT)	--
OUTLET STATION	144.00
OUTLET ELEVATION (FT)	429.96
TOTAL CULVERT LENGTH (FT)	144.00
CULVERT SLOPE 1 (FT/FT)	0.0076
CULVERT SLOPE 2 (FT/FT)	--
ANALYSIS FOR DESIGN EVENT	
TAILWATER ELEVATION (FT)	432.57
Q PER BARREL (CFS)	114.77
MAX HEADWATER ELEVATION (FT)	445.34
CALC. HEADWATER ELEVATION (FT)	434.52
HEADWATER DEPTH (FT)	3.46
CONTROL	INLET
OUTLET VELOCITY (FT/S)	10.98
DISCHARGE OVER THE ROAD (CFS)	0.00
ANALYSIS FOR 100-YEAR STORM EVENT	
TAILWATER ELEVATION (FT)	432.88
Q PER BARREL (CFS)	156.23
CALC. HEADWATER ELEVATION (FT)	435.32
HEADWATER DEPTH (FT)	4.26
CONTROL	INLET
OUTLET VELOCITY (FT/S)	11.92
DISCHARGE OVER THE ROAD (CFS)	0.00

CULVERT 11 HYDRAULIC DATA	
MATERIAL	CONCRETE
SHAPE	CIRCULAR
ENTRANCE	SET
PROFILE	STRAIGHT
DESIGN EVENT	25-YEAR
DESIGN DISCHARGE (CFS)	13.22
100-YR DISCHARGE (CFS)	17.90
n VALUE	0.012
PIPE DIAMETER (IN)	18
CULVERT SPAN (FT)	--
CULVERT RISE (FT)	--
NUMBER OF BARRELS	2.00
INLET STATION	0.00
INLET ELEVATION (FT)	446.75
BROKEN BACK STATION	--
BROKEN BACK ELEVATION (FT)	--
OUTLET STATION	102.00
OUTLET ELEVATION (FT)	446.36
TOTAL CULVERT LENGTH (FT)	102.00
CULVERT SLOPE 1 (FT/FT)	0.0038
CULVERT SLOPE 2 (FT/FT)	--
ANALYSIS FOR DESIGN EVENT	
TAILWATER ELEVATION (FT)	447.40
Q PER BARREL (CFS)	6.61
MAX HEADWATER ELEVATION (FT)	450.32
CALC. HEADWATER ELEVATION (FT)	448.45
HEADWATER DEPTH (FT)	1.70
CONTROL	OUTLET
OUTLET VELOCITY (FT/S)	5.06
DISCHARGE OVER THE ROAD (CFS)	0.00
ANALYSIS FOR 100-YEAR STORM EVENT	
TAILWATER ELEVATION (FT)	447.52
Q PER BARREL (CFS)	8.95
CALC. HEADWATER ELEVATION (FT)	448.96
HEADWATER DEPTH (FT)	2.21
CONTROL	OUTLET
OUTLET VELOCITY (FT/S)	6.08
DISCHARGE OVER THE ROAD (CFS)	0.00

NOTES:

1. ANALYSIS ON CULVERTS 7, 9, 10 & 11 PERFORMED USING HY-8 (VERSION 7.50) CULVERT HYDRAULIC ANALYSIS PROGRAM. ANALYSIS ON CULVERT 8 PERFORMED USING HEC-RAS (VERSION 4.1.0).
2. TW ELEVATIONS ESTABLISHED USING OUTFALL CHANNEL GEOMETRY.
3. MAXIMUM HW ELEVATIONS FOR THE DESIGN YEAR ARE BASED ON THE ROADWAY ELEVATION WHERE INNUNDATION WOULD OCCUR. 100-YR HEADWATER ELEVATIONS WERE CHECKED TO ENSURE THAT NO STRUCTURES WERE THREATENED ON ADJACENT PROPERTIES.

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN-F-1386

FM 969
CULVERT CALCULATIONS
PROPOSED CONDITIONS

SHEET 2 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		185
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

6/25/2021
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FM 969 DITCH 7 CALCULATIONS

UPSTREAM			DOWNSTREAM			BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW 10-YR (4)	SLOPE	NORMAL DEPTH	VELOCITY	SHEAR STRESS	FREEBOARD	COMMENTS
STATION	LEFT OR RIGHT	FLOWLINE ELEVATION	STATION	LEFT OR RIGHT	FLOWLINE ELEVATION												
(ft)		(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(f/s)	(lbs/ft^2)	(ft)	
334+00	LT	454.13	334+50	LT	453.00	0.00	4.0	6.0	2.69	0.033	3.00	0.023	0.48	2.59	0.33	2.21	
334+50	LT	453.00	335+00	LT	452.00	0.00	4.0	6.0	2.64	0.033	5.00	0.020	0.60	2.81	0.36	2.04	
335+00	LT	452.00	335+50	LT	451.80	0.00	4.0	6.0	2.08	0.033	7.00	0.004	0.92	1.67	0.11	1.17	
335+50	LT	451.80	336+00	LT	451.60	0.00	4.0	6.0	1.73	0.033	9.00	0.004	1.01	1.78	0.12	0.72	
336+00	LT	451.60	336+50	LT	450.17	0.00	4.0	6.0	2.15	0.033	12.00	0.029	0.78	4.00	0.68	1.37	
336+50	LT	450.17	337+00	LT	447.00	0.00	3.0	3.0	4.91	0.012	14.00	0.063	0.59	13.36	1.11	4.32	2
337+50	LT	450.00	337+00	LT	447.00	0.00	3.0	3.0	6.02	0.012	16.00	0.060	0.63	13.52	1.11	5.39	2
338+00	LT	452.40	337+50	LT	451.00	0.00	4.0	6.0	2.38	0.033	5.00	0.028	0.56	3.18	0.48	1.81	
338+50	LT	452.60	338+00	LT	452.40	0.00	4.0	6.0	2.18	0.033	4.00	0.004	0.74	1.45	0.09	1.44	
339+00	LT	452.85	338+50	LT	452.60	0.00	4.0	6.0	2.18	0.033	3.00	0.005	0.64	1.47	0.10	1.54	
339+50	LT	453.80	339+00	LT	452.85	0.00	4.0	6.0	2.13	0.033	2.00	0.019	0.43	2.18	0.25	1.70	
340+00	LT	454.00	339+50	LT	453.80	0.00	4.0	6.0	1.38	0.033	1.00	0.004	0.44	1.03	0.05	0.94	

FM 969 DITCH 8 CALCULATIONS

UPSTREAM			DOWNSTREAM			BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW 10-YR (4)	SLOPE	NORMAL DEPTH	VELOCITY	SHEAR STRESS	FREEBOARD	COMMENTS
STATION	LEFT OR RIGHT	FLOWLINE ELEVATION	STATION	LEFT OR RIGHT	FLOWLINE ELEVATION												
(ft)		(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(f/s)	(lbs/ft^2)	(ft)	
341+00	LT	453.93	341+50	LT	453.65	0.00	3.0	6.0	1.08	0.033	1.00	0.006	0.43	1.19	0.07	0.65	
341+50	LT	453.65	342+00	LT	453.00	0.00	3.0	6.0	1.26	0.033	2.00	0.013	0.48	1.95	0.19	0.78	
342+00	LT	453.00	342+50	LT	452.80	0.00	4.0	6.0	1.01	0.033	3.00	0.004	0.67	1.35	0.08	0.34	
342+50	LT	452.80	343+00	LT	452.46	0.00	4.0	6.0	0.90	0.033	4.00	0.007	0.67	1.77	0.14	0.23	
343+00	LT	452.46	343+50	LT	451.19	0.00	4.0	6.0	1.55	0.033	5.00	0.025	0.57	3.07	0.44	0.98	
343+50	LT	451.19	344+00	LT	449.80	0.00	4.0	6.0	2.21	0.033	6.00	0.028	0.60	3.32	0.51	1.61	
341+50	RT	455.46	342+00	RT	455.14	0.00	6.0	3.0	1.14	0.033	1.00	0.006	0.42	1.25	0.08	0.72	
342+00	RT	455.14	342+50	RT	454.27	0.00	6.0	3.0	1.24	0.033	1.00	0.017	0.35	1.81	0.18	0.89	
342+50	RT	454.27	343+00	RT	452.82	0.00	6.0	3.0	1.02	0.033	2.00	0.029	0.41	2.62	0.36	0.60	
343+00	RT	452.82	343+50	RT	451.55	0.00	6.0	3.0	1.20	0.033	2.00	0.025	0.42	2.50	0.33	0.78	
343+50	RT	451.23	344+00	RT	450.07	0.00	6.0	3.0	1.94	0.033	2.00	0.023	0.43	2.41	0.30	1.52	
344+00	RT	450.07	344+50	RT	442.71	0.00	3.0	3.0	6.56	0.012	2.00	0.119	0.25	10.42	0.89	6.31	2
344+50	RT	442.71	345+00	RT	441.88	0.00	3.0	3.0	5.41	0.033	3.00	0.0168	0.62	2.58	0.31	4.79	

FM 969 DITCH 9 CALCULATIONS

UPSTREAM			DOWNSTREAM			BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW 10-YR (4)	SLOPE	NORMAL DEPTH	VELOCITY	SHEAR STRESS	FREEBOARD	COMMENTS
STATION	LEFT OR RIGHT	FLOWLINE ELEVATION	STATION	LEFT OR RIGHT	FLOWLINE ELEVATION												
(ft)		(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(f/s)	(lbs/ft^2)	(ft)	
347+50	LT	444.19	348+00	LT	443.68	0.00	5.0	5.0	3.13	0.033	2.00	0.010	0.48	1.73	0.15	2.65	
348+00	LT	443.68	348+50	LT	443.17	0.00	4.0	4.0	3.54	0.033	3.00	0.010	0.61	2.02	0.19	2.93	
348+50	LT	443.17	349+00	LT	442.31	0.00	4.0	4.0	4.40	0.033	4.00	0.017	0.62	2.64	0.32	3.78	
349+00	LT	442.31	350+00	LT	441.56	0.00	4.0	4.0	4.95	0.033	5.00	0.007	0.78	2.04	0.18	4.17	
350+00	LT	441.56	350+50	LT	441.03	0.00	4.0	4.0	4.80	0.033	9.00	0.011	0.91	2.70	0.29	3.89	
350+50	LT	441.03	351+00	LT	440.63	0.00	4.0	4.0	4.74	0.033	12.00	0.008	1.07	2.61	0.26	3.67	
351+00	LT	440.63	351+50	LT	440.10	0.00	4.0	4.0	5.18	0.033	16.00	0.011	1.13	3.12	0.36	4.05	
351+50	LT	440.10	352+00	LT	438.59	0.00	4.0	4.0	6.63	0.033	19.00	0.030	0.99	4.81	0.90	5.64	
346+50	RT	442.31	347+00	RT	441.86	0.00	3.0	4.0	0.90	0.033	1.00	0.009	0.44	1.50	0.12	0.46	
347+00	RT	441.86	347+50	RT	440.71	0.00	3.0	4.0	3.19	0.033	1.00	0.023	0.37	2.14	0.25	2.82	
347+50	RT	440.71	348+00	RT	439.71	0.00	3.0	4.0	4.42	0.033	2.00	0.020	0.49	2.42	0.29	3.94	
348+00	RT	439.71	348+50	RT	439.34	0.00	3.0	4.0	3.49	0.033	2.00	0.007	0.59	1.66	0.13	2.91	
348+50	RT	439.34	349+00	RT	439.28	0.00	3.0	4.0	3.25	0.012	3.00	0.001	0.66	1.99	0.02	2.60	1
349+00	RT	439.28	349+50	RT	439.21	0.00	3.0	4.0	3.00	0.012	3.00	0.001	0.63	2.14	0.03	2.37	1
349+50	RT	439.21	350+00	RT	438.82	0.00	3.0	4.0	2.47	0.033	4.00	0.008	0.75	2.02	0.17	1.71	
350+00	RT	438.82	350+50	RT	438.44	0.00	3.0	4.0	2.44	0.033	4.00	0.008	0.76	2.00	0.17	1.68	
350+50	RT	438.44	351+00	RT	438.01	0.00	3.0	4.0	3.00	0.033	5.00	0.009	0.80	2.22	0.21	2.20	
351+00	RT	438.01	351+50	RT	437.51	0.00	3.0	4.0	3.34	0.033	5.00	0.010	0.78	2.34	0.23	2.55	
351+50	RT	437.51	352+00	RT	435.94	0.00	3.0	4.0	4.92	0.033	5.00	0.031	0.63	3.60	0.59	4.29	

COMMENTS:
1. DITCHES CONCRETE LINED DUE TO LOW VELOCITY.
2. CHANNEL LINING APPLIED DUE TO HIGH SHEAR STRESS.
3. LOW VELOCITY DUE TO LOW FLOW IN DITCH.

NOTES:
1. DITCH HYDRAULICS CALCULATED USING MANNING'S EQUATION.
2. THE NEED FOR CHANNEL PROTECTION/ LINING IS DETERMINED BASED ON SHEAR STRESS.
3. ALL DRAINAGE FACILITIES ARE CHECKED FOR THE 1% AEP TO EXAMINE WHERE OVERFLOW (IF ANY) WOULD TRAVEL AND TO ENSURE NO SIGNIFICANT ADVERSE IMPACTS RESULT DUE TO THE PROJECT.
4. DITCH FLOWS CALCULATED USING SUBSETS OF LARGER DRAINAGE AREAS. CALCULATION INTENSITY USED IS 7.99 IN/HR. REQUIRED INTENSITY IS 5.841 IN/HR (ATLAS 14).

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
DITCH CALCULATIONS

SHEET 1 OF 5

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		186
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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FM 969 DITCH 10 (LEFT) CALCULATIONS

UPSTREAM			DOWNSTREAM			BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW 10-YR(4)	SLOPE	NORMAL DEPTH	VELOCITY	SHEAR STRESS	FREEBOARD	COMMENTS
STATION	LEFT OR RIGHT	FLOWLINE ELEVATION	STATION	LEFT OR RIGHT	FLOWLINE ELEVATION												
(ft)		(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(f/s)	(lbs/ft^2)	(ft)	
365+50	LT	435.40	364+62	LT	431.23	26.00	3.0	3.0	9.03	0.033	34.00	0.046	0.30	4.21	0.82	8.73	
366+00	LT	435.88	365+50	LT	435.40	0.00	4.0	6.0	6.84	0.033	34.00	0.010	1.40	3.44	0.41	5.44	
366+50	LT	436.68	366+00	LT	435.88	0.00	4.0	6.0	8.22	0.033	33.00	0.016	1.26	4.14	0.62	6.96	
367+00	LT	437.62	366+50	LT	436.68	0.00	4.0	6.0	8.50	0.033	32.00	0.019	1.21	4.36	0.69	7.29	
367+50	LT	438.27	367+00	LT	437.62	0.00	4.0	6.0	7.83	0.033	32.00	0.013	1.30	3.80	0.52	6.53	
368+00	LT	439.57	367+50	LT	438.27	0.00	4.0	6.0	7.64	0.033	31.00	0.026	1.13	4.89	0.89	6.51	
369+50	LT	443.09	368+00	LT	439.57	0.00	4.0	6.0	6.95	0.033	31.00	0.023	1.15	4.70	0.82	5.80	
370+00	LT	444.59	369+50	LT	443.09	0.00	4.0	6.0	4.73	0.012	31.00	0.030	0.75	10.99	0.68	3.98	2
370+50	LT	444.75	370+00	LT	444.59	0.00	4.0	6.0	2.71	0.033	30.00	0.003	1.65	2.21	0.16	1.07	
371+00	LT	444.90	370+50	LT	444.75	0.00	4.0	6.0	3.38	0.033	26.00	0.003	1.58	2.08	0.14	1.80	
371+50	LT	444.95	371+00	LT	444.90	0.00	4.0	6.0	3.72	0.012	28.00	0.001	1.37	3.00	0.04	2.35	1
372+00	LT	445.00	371+50	LT	444.95	0.00	4.0	6.0	3.50	0.012	28.00	0.001	1.37	3.00	0.04	2.13	1
372+50	LT	445.05	372+00	LT	445.00	0.00	4.0	6.0	3.39	0.012	27.00	0.001	1.35	2.98	0.04	2.04	1
374+00	LT	445.20	372+50	LT	445.05	0.00	4.0	6.0	3.38	0.012	27.00	0.001	1.35	2.98	0.04	2.03	1
374+50	LT	445.25	374+00	LT	445.20	0.00	4.0	6.0	2.92	0.012	26.00	0.001	1.33	2.95	0.04	1.59	1
375+50	LT	445.35	374+50	LT	445.25	0.00	4.0	6.0	2.62	0.012	26.00	0.001	1.33	2.95	0.04	1.29	1
376+00	LT	445.40	375+50	LT	445.35	0.00	4.0	6.0	2.01	0.012	25.00	0.001	1.31	2.92	0.04	0.70	1
377+00	LT	445.50	376+00	LT	445.40	0.00	4.0	6.0	1.60	0.012	25.00	0.001	1.31	2.92	0.04	0.29	1
377+50	LT	445.55	377+00	LT	445.50	0.00	4.0	6.0	1.71	0.012	24.00	0.001	1.29	2.89	0.04	0.42	1
378+00	LT	445.60	377+50	LT	445.55	0.00	4.0	6.0	1.91	0.012	24.00	0.001	1.29	2.89	0.04	0.62	1
378+50	LT	445.65	378+00	LT	445.60	0.00	4.0	6.0	2.05	0.012	23.00	0.001	1.27	2.86	0.04	0.78	1
379+00	LT	445.70	378+50	LT	445.65	0.00	4.0	6.0	2.24	0.012	23.00	0.001	1.27	2.86	0.04	0.97	1
379+50	LT	445.75	379+00	LT	445.70	0.00	4.0	6.0	2.47	0.012	23.00	0.001	1.27	2.86	0.04	1.20	1
380+00	LT	445.80	379+50	LT	445.75	0.00	4.0	6.0	2.74	0.012	22.00	0.001	1.25	2.83	0.04	1.49	1
380+50	LT	445.85	380+00	LT	445.80	0.00	4.0	6.0	3.05	0.012	22.00	0.001	1.25	2.83	0.04	1.80	1
381+00	LT	445.90	380+50	LT	445.85	0.00	4.0	6.0	3.13	0.012	21.00	0.001	1.23	2.79	0.04	1.91	1
381+50	LT	445.95	381+00	LT	445.90	0.00	4.0	6.0	2.73	0.012	21.00	0.001	1.23	2.79	0.04	1.50	1
382+00	LT	446.01	381+50	LT	445.95	0.00	4.0	6.0	3.09	0.012	20.00	0.001	1.16	2.95	0.04	1.93	1
382+50	LT	446.26	382+00	LT	446.01	0.00	4.0	6.0	3.13	0.033	20.00	0.005	1.30	2.36	0.20	1.83	
383+00	LT	446.51	382+50	LT	446.26	0.00	4.0	6.0	3.04	0.033	5.00	0.005	0.77	1.67	0.12	2.27	
383+50	LT	446.90	383+00	LT	446.51	0.00	4.0	6.0	2.89	0.033	4.00	0.008	0.66	1.86	0.16	2.24	
384+00	LT	447.00	383+50	LT	446.90	0.00	4.0	6.0	2.81	0.012	3.00	0.002	0.52	2.23	0.03	2.29	1
385+50	LT	447.30	384+00	LT	447.00	0.00	4.0	6.0	3.58	0.012	2.00	0.002	0.45	2.01	0.03	3.13	1
386+00	LT	447.40	385+50	LT	447.30	4.00	4.0	6.0	1.62	0.012	2.00	0.002	0.22	1.77	0.02	1.40	1
386+50	LT	447.50	386+00	LT	447.40	4.00	4.0	6.0	0.83	0.012	2.00	0.002	0.22	1.77	0.02	0.60	1
387+00	LT	447.67	386+50	LT	447.50	4.00	4.0	6.0	0.84	0.012	2.00	0.003	0.19	2.14	0.03	0.65	1
387+50	LT	447.77	387+00	LT	447.67	4.00	4.0	4.0	1.13	0.012	2.00	0.002	0.23	1.80	0.02	0.90	1
388+00	LT	447.87	387+50	LT	447.77	4.00	6.0	4.0	1.20	0.012	2.00	0.002	0.22	1.77	0.02	0.98	1
388+50	LT	447.97	388+00	LT	447.87	4.00	6.0	4.0	1.30	0.012	1.00	0.002	0.15	1.41	0.02	1.15	1
389+00	LT	448.07	388+50	LT	447.97	4.00	6.0	4.0	1.37	0.012	1.00	0.002	0.15	1.41	0.02	1.22	1
389+50	LT	448.17	389+00	LT	448.07	4.00	6.0	4.0	1.22	0.012	1.00	0.002	0.15	1.41	0.02	1.07	1
390+00	LT	448.27	389+50	LT	448.17	4.00	6.0	4.0	1.00	0.012	1.00	0.002	0.15	1.41	0.02	0.86	1
390+50	LT	448.37	390+00	LT	448.27	4.00	6.0	4.0	0.70	0.012	1.00	0.002	0.15	1.41	0.02	0.55	1
391+00	LT	448.52	390+50	LT	448.37	4.00	6.0	4.0	0.57	0.012	1.00	0.003	0.14	1.58	0.02	0.44	1
391+50	LT	448.62	391+00	LT	448.52	0.00	6.0	4.0	1.01	0.012	1.00	0.002	0.34	1.69	0.02	0.67	1

COMMENTS:
1. DITCHES CONCRETE LINED DUE TO LOW VELOCITY.
2. CHANNEL LINING APPLIED DUE TO HIGH SHEAR STRESS.
3. LOW VELOCITY DUE TO LOW FLOW IN DITCH.

NOTES:
1. DITCH HYDRAULICS CALCULATED USING MANNING'S EQUATION.
2. THE NEED FOR CHANNEL PROTECTION/ LINING IS DETERMINED BASED ON SHEAR STRESS.
3. ALL DRAINAGE FACILITIES ARE CHECKED FOR THE 1% AEP TO EXAMINE WHERE OVERFLOW (IF ANY) WOULD TRAVEL AND TO ENSURE NO SIGNIFICANT ADVERSE IMPACTS RESULT DUE TO THE PROJECT.
4. DITCH FLOWS CALCULATED USING SUBSETS OF LARGER DRAINAGE AREAS. CALCULATION INTENSITY USED IS 7.99 IN/HR. REQUIRED INTENSITY IS 5.841 IN/HR (ATLAS 14).

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
DITCH CALCULATIONS

SHEET 2 OF 5

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		187
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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FM 969 DITCH 10 (RIGHT) CALCULATIONS

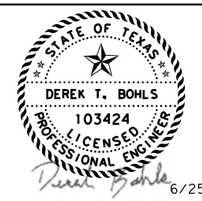
UPSTREAM			DOWNSTREAM			BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW 10-YR (4)	SLOPE	NORMAL DEPTH	VELOCITY	SHEAR STRESS	FREEBOARD	COMMENTS
STATION	LEFT OR RIGHT	FLOWLINE ELEVATION	STATION	LEFT OR RIGHT	FLOWLINE ELEVATION												
(ft)		(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(f/s)	(lbs/ft²)	(ft)	
354+50	RT	442.18	354+00	RT	443.22	0.00	4.0	4.0	1.48	0.033	7.00	0.021	0.73	3.26	0.46	0.75	
355+00	RT	441.35	354+50	RT	442.18	0.00	4.0	4.0	1.12	0.033	8.00	0.017	0.80	3.09	0.40	0.32	
355+50	RT	440.73	355+00	RT	441.35	0.00	4.0	4.0	1.71	0.033	8.00	0.012	0.85	2.78	0.32	0.86	
356+00	RT	440.22	355+50	RT	440.73	0.00	4.0	4.0	1.83	0.033	9.00	0.010	0.92	2.66	0.28	0.91	
356+50	RT	439.61	356+00	RT	440.22	0.00	4.0	4.0	1.92	0.033	9.00	0.012	0.89	2.84	0.33	1.03	
357+00	RT	438.96	356+50	RT	439.61	0.00	4.0	4.0	2.14	0.033	10.00	0.013	0.91	2.99	0.36	1.23	
357+50	RT	438.47	357+00	RT	438.96	0.00	4.0	4.0	2.41	0.033	10.00	0.010	0.97	2.68	0.28	1.44	
365+50	RT	432.13	365+00	RT	430.34	3.00	4.0	4.0	4.71	0.033	2.00	0.035	0.20	2.57	0.37	4.51	
366+00	RT	434.48	365+50	RT	432.13	0.00	4.0	4.0	4.09	0.033	2.00	0.046	0.39	3.22	0.55	3.70	
368+00	RT	441.22	366+00	RT	434.48	0.00	4.0	4.0	3.21	0.033	2.00	0.033	0.42	2.85	0.42	2.79	
368+50	RT	443.13	368+00	RT	441.22	0.00	4.0	5.0	3.16	0.033	2.00	0.038	0.39	2.91	0.45	2.77	
369+00	RT	443.89	368+50	RT	443.13	0.00	6.0	6.0	2.13	0.033	2.00	0.015	0.42	1.94	0.19	1.72	
369+50	RT	444.59	369+00	RT	443.89	0.00	6.0	6.0	2.17	0.033	2.00	0.014	0.42	1.87	0.18	1.75	
370+00	RT	445.16	369+50	RT	444.59	0.00	6.0	6.0	2.20	0.033	1.00	0.011	0.34	1.45	0.12	1.86	
370+50	RT	445.93	370+00	RT	445.16	0.00	6.0	6.0	2.00	0.033	1.00	0.016	0.32	1.64	0.15	1.68	
371+00	RT	447.00	370+50	RT	445.93	0.00	6.0	6.0	1.66	0.033	1.00	0.021	0.30	1.84	0.20	1.35	

FM 969 DITCH 11 CALCULATIONS

UPSTREAM			DOWNSTREAM			BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW 10-YR (4)	SLOPE	NORMAL DEPTH	VELOCITY	SHEAR STRESS	FREEBOARD	COMMENTS
STATION	LEFT OR RIGHT	FLOWLINE ELEVATION	STATION	LEFT OR RIGHT	FLOWLINE ELEVATION												
(ft)		(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(f/s)	(lbs/ft²)	(ft)	
380+00	RT	447.90	380+50	RT	447.68	5.80	6.0	6.0	0.53	0.033	1.00	0.004	0.17	0.85	0.04	0.36	
380+50	RT	447.68	381+00	RT	447.53	4.80	6.0	6.0	0.86	0.033	2.00	0.003	0.31	0.96	0.05	0.55	
381+00	RT	447.53	381+50	RT	447.22	0.00	6.0	9.0	1.07	0.033	3.00	0.006	0.52	1.46	0.10	0.54	
381+50	RT	447.22	382+00	RT	447.03	0.00	6.0	9.0	1.14	0.033	4.00	0.004	0.65	1.27	0.07	0.49	
382+00	RT	447.03	382+50	RT	446.85	0.00	6.0	9.0	1.21	0.033	5.00	0.004	0.71	1.34	0.08	0.50	
382+50	RT	446.85	382+63	RT	446.78	0.00	6.0	9.0	1.26	0.033	6.00	0.006	0.69	1.67	0.12	0.57	
383+00	RT	446.90	382+63	RT	446.78	0.00	6.0	9.0	1.26	0.033	6.00	0.003	0.77	1.35	0.08	0.49	
383+50	RT	447.05	383+00	RT	446.90	8.50	6.0	6.0	1.06	0.033	5.00	0.003	0.40	1.16	0.06	0.66	

COMMENTS:
1. DITCHES CONCRETE LINED DUE TO LOW VELOCITY.
2. CHANNEL LINING APPLIED DUE TO HIGH SHEAR STRESS.
3. LOW VELOCITY DUE TO LOW FLOW IN DITCH.

NOTES:
1. DITCH HYDRAULICS CALCULATED USING MANNING'S EQUATION.
2. THE NEED FOR CHANNEL PROTECTION/ LINING IS DETERMINED BASED ON SHEAR STRESS.
3. ALL DRAINAGE FACILITIES ARE CHECKED FOR THE 1% AEP TO EXAMINE WHERE OVERFLOW (IF ANY) WOULD TRAVEL AND TO ENSURE NO SIGNIFICANT ADVERSE IMPACTS RESULT DUE TO THE PROJECT.
4. DITCH FLOWS CALCULATED USING SUBSETS OF LARGER DRAINAGE AREAS. CALCULATION INTENSITY USED IS 7.99 IN/HR. REQUIRED INTENSITY IS 5.841 IN/HR (ATLAS 14).



6/25/2021

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
DITCH CALCULATIONS

SHEET 3 OF 5

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		188
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

6/25/2021
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FM 969 DITCH 12 CALCULATIONS																	
UPSTREAM			DOWNSTREAM			BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW 10-YR (4)	SLOPE	NORMAL DEPTH	VELOCITY	SHEAR STRESS	FREEBOARD	COMMENTS
STATION	LEFT OR RIGHT	FLOWLINE ELEVATION	STATION	LEFT OR RIGHT	FLOWLINE ELEVATION												
(ft)		(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(f/s)	(lbs/ft^2)	(ft)	
385+00	RT	446.90	385+50	RT	446.85	0.00	6.0	16.0	1.15	0.012	2.00	0.001	0.38	1.29	0.01	0.77	1
385+50	RT	446.85	386+00	RT	446.79	0.00	6.0	13.0	1.02	0.012	3.00	0.001	0.45	1.57	0.02	0.57	1
386+00	RT	446.79	386+50	RT	446.74	0.00	6.0	11.5	1.24	0.012	5.00	0.001	0.58	1.70	0.02	0.66	1
386+50	RT	446.74	387+00	RT	446.69	0.00	6.0	13.0	1.62	0.012	9.50	0.001	0.71	1.96	0.02	0.91	1
387+00	RT	446.69	387+50	RT	446.64	0.00	6.0	10.0	1.23	0.012	8.00	0.001	0.71	1.96	0.02	0.52	1
387+50	RT	446.64	388+00	RT	446.59	0.00	6.0	7.0	1.51	0.012	9.50	0.001	0.82	2.15	0.03	0.69	1
388+00	RT	446.59	388+50	RT	446.54	0.00	6.0	7.0	1.84	0.012	9.50	0.001	0.82	2.15	0.03	1.02	1
388+50	RT	446.54	389+00	RT	446.49	0.00	6.0	7.0	1.57	0.012	9.50	0.001	0.82	2.15	0.03	0.75	1
389+00	RT	446.49	389+50	RT	446.45	0.00	5.0	10.0	1.52	0.012	9.50	0.001	0.81	1.91	0.02	0.71	1
389+50	RT	446.45	390+00	RT	446.40	0.00	5.0	6.0	1.34	0.012	9.50	0.001	0.88	2.24	0.03	0.46	1
390+00	RT	446.40	390+50	RT	446.35	0.00	5.0	6.0	1.92	0.012	9.50	0.001	0.88	2.24	0.03	1.04	1
390+50	RT	446.35	391+00	RT	446.30	0.00	5.0	5.0	1.57	0.012	10.75	0.001	0.95	2.36	0.03	0.62	1
391+00	RT	446.30	391+50	RT	446.25	0.00	4.0	7.0	1.61	0.012	12.00	0.001	0.96	2.37	0.03	0.65	1
391+50	RT	446.25	392+00	RT	446.20	0.00	4.0	6.0	1.87	0.012	13.50	0.001	1.04	2.50	0.03	0.83	1
392+00	RT	446.20	392+50	RT	446.15	0.00	4.0	6.0	2.36	0.012	15.00	0.001	1.08	2.57	0.03	1.28	1
392+50	RT	446.15	393+00	RT	446.10	0.00	4.0	5.0	1.83	0.012	16.50	0.001	1.17	2.70	0.04	0.66	1
393+00	RT	446.10	393+50	RT	446.05	0.00	4.0	4.0	2.17	0.012	18.00	0.001	1.26	2.83	0.04	0.91	1
393+50	RT	446.05	394+00	RT	446.00	0.00	4.0	4.0	2.57	0.012	18.50	0.001	1.27	2.85	0.04	1.30	1
394+00	RT	446.00	394+50	RT	445.95	0.00	5.0	2.0	2.68	0.012	19.00	0.001	1.36	2.93	0.04	1.32	1
394+50	RT	445.95	395+00	RT	445.90	0.00	5.0	2.0	2.73	0.012	19.00	0.001	1.36	2.94	0.04	1.37	1
395+00	RT	445.90	395+50	RT	445.85	0.00	5.0	3.0	2.43	0.012	19.00	0.001	1.29	2.86	0.04	1.14	1
395+50	RT	445.85	396+00	RT	445.80	0.00	5.0	3.0	2.23	0.012	19.00	0.001	1.29	2.86	0.04	0.94	1
396+00	RT	445.80	396+50	RT	445.75	0.00	5.0	3.0	2.31	0.012	19.00	0.001	1.29	2.86	0.04	1.02	1
396+50	RT	445.75	397+00	RT	445.70	0.00	5.0	4.0	2.12	0.012	19.00	0.001	1.23	2.79	0.04	0.89	1
397+00	RT	445.70	397+50	RT	445.65	0.00	5.0	4.0	1.94	0.012	19.00	0.001	1.23	2.79	0.04	0.71	1
397+50	RT	445.65	398+00	RT	445.60	4.00	4.0	4.0	1.76	0.012	19.00	0.001	0.90	2.79	0.04	0.86	1
398+00	RT	445.60	398+50	RT	445.55	4.00	4.0	4.0	1.69	0.012	19.00	0.001	0.90	2.79	0.04	0.79	1
398+50	RT	445.55	399+00	RT	445.50	4.00	4.0	4.0	2.02	0.012	19.00	0.001	0.90	2.79	0.04	1.12	1
399+00	RT	445.50	399+50	RT	445.45	5.00	4.0	4.0	1.52	0.012	19.00	0.001	0.83	2.74	0.04	0.69	1
399+50	RT	445.45	400+00	RT	445.40	5.00	4.0	4.0	1.63	0.012	19.00	0.001	0.83	2.74	0.04	0.80	1
400+00	RT	445.40	400+50	RT	445.35	6.00	4.0	4.0	1.44	0.012	19.00	0.001	0.78	2.69	0.04	0.67	1
400+50	RT	445.35	401+00	RT	445.30	7.00	4.0	4.0	1.33	0.012	19.00	0.001	0.73	2.64	0.03	0.60	1
401+00	RT	445.30	401+50	RT	445.25	8.00	4.0	4.0	1.35	0.012	19.00	0.001	0.68	2.59	0.03	0.67	1
401+50	RT	445.25	402+00	RT	445.20	8.00	4.0	4.0	1.29	0.012	19.00	0.001	0.68	2.59	0.03	0.61	1
402+00	RT	445.20	402+50	RT	445.15	9.00	4.0	4.0	1.45	0.012	19.00	0.001	0.65	2.54	0.03	0.81	1
402+50	RT	445.15	403+00	RT	445.10	10.00	4.0	4.0	1.42	0.012	20.50	0.001	0.64	2.56	0.03	0.78	1
403+00	RT	445.10	403+50	RT	445.05	12.00	4.0	4.0	1.15	0.012	22.00	0.001	0.61	2.52	0.03	0.54	1
403+50	RT	445.05	404+00	RT	445.00	14.00	4.0	4.0	1.49	0.012	25.00	0.001	0.60	2.54	0.03	0.89	1
404+00	RT	445.00	404+50	RT	444.95	13.00	4.0	4.0	1.71	0.012	26.25	0.001	0.64	2.66	0.04	1.08	1
404+50	RT	444.95	405+00	RT	444.90	12.00	4.0	4.0	2.16	0.012	27.50	0.001	0.69	2.71	0.04	1.47	1
405+00	RT	444.90	405+50	RT	444.85	10.00	4.0	4.0	1.86	0.012	27.50	0.001	0.75	2.81	0.04	1.11	1

COMMENTS:
1. DITCHES CONCRETE LINED DUE TO LOW VELOCITY.
2. CHANNEL LINING APPLIED DUE TO HIGH SHEAR STRESS.
3. LOW VELOCITY DUE TO LOW FLOW IN DITCH.

NOTES:
1. DITCH HYDRAULICS CALCULATED USING MANNING'S EQUATION.
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4. DITCH FLOWS CALCULATED USING SUBSETS OF LARGER DRAINAGE AREAS. CALCULATION INTENSITY USED IS 7.99 IN/HR. REQUIRED INTENSITY IS 5.841 IN/HR (ATLAS 14).

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
DITCH CALCULATIONS

SHEET 4 OF 5

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		189
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

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FM 969 DITCH 12 CALCULATIONS

UPSTREAM			DOWNSTREAM			BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW 10-YR (4)	SLOPE	NORMAL DEPTH	VELOCITY	SHEAR STRESS	FREEBOARD	COMMENTS
STATION	LEFT OR RIGHT	FLOWLINE ELEVATION	STATION	LEFT OR RIGHT	FLOWLINE ELEVATION												
(ft)		(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(f/s)	(lbs/ft²)	(ft)	
406+00	RT	444.80	406+50	RT	444.75	0.00	6.0	8.0	1.92	0.012	27.50	0.001	1.19	2.76	0.04	0.73	1
406+50	RT	444.75	407+00	RT	444.70	0.00	6.0	8.0	2.00	0.012	27.50	0.001	1.19	2.76	0.04	0.81	1
407+00	RT	444.70	407+50	RT	444.65	0.00	6.0	6.0	2.06	0.012	27.50	0.001	1.26	2.86	0.04	0.80	1
407+50	RT	444.65	408+00	RT	444.60	0.00	6.0	6.0	2.44	0.012	27.50	0.001	1.26	2.86	0.04	1.18	1
408+00	RT	444.60	408+50	RT	444.55	0.00	6.0	6.0	2.74	0.012	27.50	0.001	1.26	2.86	0.04	1.48	1
408+50	RT	444.55	409+00	RT	444.50	0.00	6.0	6.0	2.77	0.012	27.50	0.001	1.26	2.86	0.04	1.51	1
409+00	RT	444.50	409+50	RT	444.45	0.00	6.0	6.0	2.85	0.012	27.50	0.001	1.26	2.86	0.04	1.59	1
409+50	RT	444.45	410+00	RT	444.40	0.00	6.0	6.0	2.67	0.012	27.50	0.001	1.26	2.86	0.04	1.41	1
410+00	RT	444.40	410+50	RT	444.35	0.00	6.0	7.0	2.78	0.012	27.50	0.001	1.23	2.81	0.04	1.55	1
410+50	RT	444.35	411+00	RT	444.30	0.00	6.0	6.0	2.58	0.012	27.50	0.001	1.26	2.86	0.04	1.32	1
411+00	RT	444.30	412+00	RT	444.20	0.00	6.0	4.0	2.91	0.012	27.50	0.001	1.36	2.99	0.04	1.55	1
412+00	RT	444.20	412+50	RT	444.15	0.00	6.0	4.0	2.97	0.012	29.50	0.001	1.39	3.04	0.04	1.58	1
412+50	RT	444.15	413+00	RT	444.10	0.00	6.0	4.0	2.87	0.012	29.50	0.001	1.39	3.04	0.04	1.48	1
413+00	RT	444.10	413+50	RT	444.05	0.00	6.0	4.0	2.83	0.012	29.50	0.001	1.39	3.04	0.04	1.44	1
413+50	RT	444.05	414+00	RT	444.00	0.00	6.0	5.0	2.73	0.012	29.75	0.001	1.35	2.98	0.04	1.38	1
414+00	RT	444.00	414+50	RT	443.95	0.00	6.0	4.0	2.93	0.012	30.00	0.001	1.40	3.06	0.04	1.53	1
414+50	RT	443.95	415+00	RT	443.90	0.00	6.0	5.0	2.51	0.012	30.00	0.001	1.35	2.99	0.04	1.16	1
415+00	RT	443.90	415+50	RT	443.85	0.00	6.0	5.0	2.40	0.012	30.00	0.001	1.35	2.99	0.04	1.05	1
415+50	RT	443.85	416+50	RT	443.75	0.00	6.0	3.0	2.35	0.012	29.75	0.001	1.46	3.12	0.04	0.89	1
416+50	RT	443.75	417+00	RT	443.70	0.00	6.0	4.0	3.89	0.012	29.50	0.001	1.39	3.04	0.04	2.50	1
417+00	RT	443.70	417+50	RT	443.65	0.00	6.0	4.0	4.29	0.012	29.50	0.001	1.39	3.04	0.04	2.90	1
417+50	RT	443.65	418+50	RT	443.55	4.00	4.0	4.0	4.23	0.012	29.50	0.001	1.11	3.14	0.04	3.12	1
418+50	RT	443.55	419+00	RT	443.50	5.00	4.0	4.0	2.73	0.012	32.00	0.001	1.08	3.17	0.05	1.65	1
419+00	RT	443.50	419+50	RT	443.45	10.00	4.0	3.0	2.78	0.012	34.00	0.001	0.86	3.05	0.04	1.92	1
419+50	RT	443.45	420+00	RT	443.20	10.00	4.0	3.0	3.03	0.012	36.50	0.005	0.57	5.38	0.15	2.46	1
420+00	RT	443.20	420+50	RT	443.00	11.00	4.0	4.0	2.37	0.012	39.00	0.004	0.59	4.92	0.12	1.78	1
420+50	RT	443.00	421+00	RT	442.79	10.00	4.0	4.0	2.11	0.012	39.00	0.004	0.61	5.14	0.13	1.50	1
421+00	RT	442.79	421+50	RT	442.40	10.00	4.0	4.0	1.95	0.012	39.00	0.008	0.52	6.28	0.21	1.44	
421+50	RT	442.40	422+50	RT	441.42	10.00	3.0	6.0	0.98	0.033	39.00	0.010	1.28	2.09	0.59	-0.30	
422+00	RT	442.17	423+00	RT	440.66	0.00	4.0	4.0	2.67	0.033	42.00	0.015	1.52	4.53	0.70	1.15	
423+00	RT	440.66	423+50	RT	439.92	0.00	2.0	3.0	2.59	0.033	43.50	0.015	1.86	5.00	0.80	0.72	
423+50	RT	439.92	424+00	RT	439.41	6.00	2.0	2.0	2.84	0.033	45.00	0.010	2.23	4.53	0.63	0.61	
424+00	RT	439.41	424+50	RT	439.21	6.00	2.0	2.0	2.26	0.033	45.00	0.004	2.64	3.23	0.30	-0.38	
424+50	RT	439.21	425+00	RT	438.98	3.00	2.0	2.0	2.74	0.033	45.00	0.005	2.59	3.35	0.33	0.15	
425+00	RT	438.98	425+50	RT	438.74	2.00	2.0	2.0	2.93	0.033	45.00	0.005	2.57	3.40	0.34	0.36	
425+50	RT	438.74	426+00	RT	438.43	9.00	2.0	2.0	4.36	0.033	45.00	0.006	2.44	3.79	0.43	1.93	
426+00	RT	438.43	426+50	RT	437.75	3.00	2.0	6.0	5.16	0.033	45.00	0.014	1.60	4.41	0.65	3.57	

FM 969 DITCH 13 CALCULATIONS

UPSTREAM			DOWNSTREAM			BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW 10-YR (4)	SLOPE	NORMAL DEPTH	VELOCITY	SHEAR STRESS	FREEBOARD	COMMENTS
STATION	LEFT OR RIGHT	FLOWLINE ELEVATION	STATION	LEFT OR RIGHT	FLOWLINE ELEVATION												
(ft)		(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(f/s)	(lbs/ft²)	(ft)	
422+00	LT	443.28	422+50	LT	441.00	0.00	4.0	6.0	2.48	0.033	1.50	0.045	0.33	2.82	0.45	2.15	
422+50	LT	441.00	423+00	LT	440.00	0.00	4.0	6.0	2.52	0.033	2.00	0.020	0.42	2.24	0.26	2.10	
423+00	LT	440.00	424+00	LT	439.10	0.00	4.0	6.0	3.20	0.033	3.00	0.009	0.57	1.83	0.16	2.63	
424+00	LT	439.10	424+50	LT	438.70	0.00	4.0	6.0	2.83	0.033	4.00	0.008	0.65	1.88	0.16	2.18	
424+50	LT	438.70	425+00	LT	438.40	0.00	4.0	6.0	2.70	0.033	5.00	0.006	0.75	1.79	0.14	1.95	
425+00	LT	438.40	425+50	LT	438.10	0.00	4.0	6.0	2.94	0.033	5.00	0.006	0.75	1.79	0.14	2.19	
425+50	LT	438.10	426+00	LT	437.45	0.00	4.0	6.0	3.95	0.033	5.00	0.013	0.65	2.39	0.26	3.30	
426+00	LT	437.45	426+50	LT	437.30	0.00	4.0	6.0	3.55	0.033	5.00	0.003	0.85	1.38	0.08	2.70	
426+50	LT	437.30	427+00	LT	437.13	0.00	4.0	10.0	3.92	0.033	5.00	0.003	0.73	1.33	0.08	3.19	

COMMENTS:
1. DITCHES CONCRETE LINED DUE TO LOW VELOCITY.
2. CHANNEL LINING APPLIED DUE TO HIGH SHEAR STRESS.
3. LOW VELOCITY DUE TO LOW FLOW IN DITCH.

NOTES:
1. DITCH HYDRAULICS CALCULATED USING MANNING'S EQUATION.
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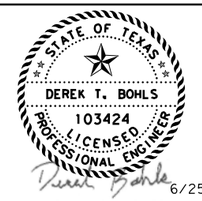

6/25/2021

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
DITCH CALCULATIONS

SHEET 5 OF 5

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		190
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

6/25/2021
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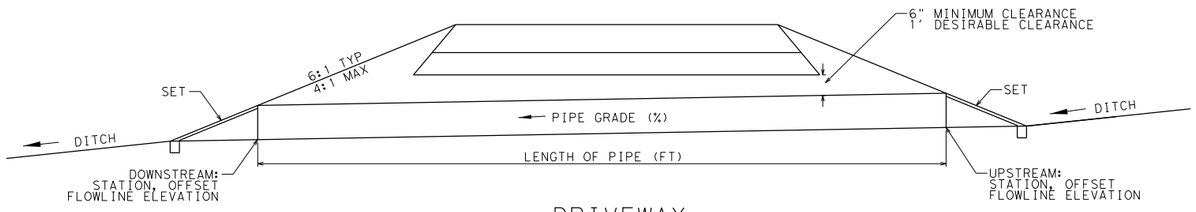
DRWY NO.	PIPE NAME	DRAINAGE LAYOUT SHEET	LENGTH OF CULVERT (FT)	NUMBER OF BARRELS	RCP SIZE (IN)	SET TYPE	FM 969 UPSTREAM STA	UPSTREAM OFFSET (FT)	UPSTREAM FLOWLINE	UPSTREAM SET SLOPE (X:1)	FM 969 DOWNSTREAM STA	DOWNSTREAM OFFSET (FT)	DOWNSTREAM FLOWLINE	DOWNSTREAM SET SLOPE (X:1)	CULVERT GRADE (%)	OVERTOP ELEV (FT)	10-YR DESIGN STORM		
																	DISCHARGE (CFS)	HW	TW
60	DW CULVERT 7-B	1 OF 10	40	1	18	SETP-PD	337+61.79	-45.82	450.59	4	337+21.99	-53.38	448.50	4	5.25%	453.47	5.00	451.95	448.90
N/A	SW CULVERT 8-B	2 OF 10	40	1	18	SETP-PD	343+54.25	46.09	451.00	4	343+90.71	62.72	450.00	4	2.74%	453.3	2.00	451.79	450.25
N/A	SW CULVERT 10-P	4 OF 10	152	1	18	SETP-PD	367+58.60	61.23	441.00	4	366+07.30	83.82	434.50	4	4.30%	443.28	2.00	441.81	434.89
69	DW CULVERT 10-J	4 OF 10	115	2	DES 4 (ARCH)	SETP-PD	369+24.61	-66.87	443.09	4	368+10.30	-65.05	439.57	4	3.08%	447.45	31.00	445.07	440.39
72/74	DW CULVERT 10-L	5 OF 10	115	2	DES 4 (ARCH)	SETP-PD	373+82.21	-52.37	445.25	4	372+62.38	-54.24	445.10	4	0.13%	448.09	27.00	447.52	446.57
75	DW CULVERT 10-M	5 OF 10	100	2	DES 4 (ARCH)	SETP-PD	375+77.30	-46.53	445.33	4	374+77.30	-47.59	445.28	4	0.05%	447.56	26.00	447.55	446.73
78	DW CULVERT 10-N	5 OF 10	34	2	DES 4 (ARCH)	SETP-PD	376+75.60	-45.13	445.48	4	376+40.40	-45.11	445.44	4	0.11%	447.45	25.50	447.40	446.88
78-A	DW CULVERT 10-N-A	5 OF 10	34	2	DES 4 (ARCH)	SETP-PD	378+27.10	-46.05	445.69	4	377+92.71	-46.18	445.59	4	0.29%	447.73	23.00	447.50	446.97
GILBERT	DW CULVERT 10-O	6 OF 10	100	1	18	SETP-PD	385+27.05	-72.83	447.25	4	384+27.13	-68.90	447.05	4	0.20%	452.9	2.50	448.21	447.58
80	DW CULVERT 12-A	6 OF 10	64	1	18	SETP-PD	389+53.24	53.42	445.83	4	390+17.23	54.65	445.60	4	0.36%	448.2	9.50	448.20	446.51
81	DW CULVERT 10-P	6 OF 10	30	1	18	SETP-PD	390+03.21	-54.61	448.28	4	390+64.72	-56.85	448.40	4	0.20%	450.6	1.00	448.93	448.41
89	DW CULVERT 12-B	7 OF 10	67	1	24	SETP-PD	403+28.14	53.74	444.90	4	403+80.10	55.52	444.65	4	0.48%	448.19	22.00	448.17	445.23
92A	DW CULVERT 12-C-A	8 OF 10	45	2	24	SETP-PD	407+19.54	53.40	444.68	4	407+65.78	53.87	444.63	4	0.11%	447.04	27.50	446.98	445.90
HOUND	DW CULVERT 12-C	8 OF 10	205	2	24	SETP-PD	410+14.50	56.76	444.30	4	412+16.78	57.00	444.16	4	0.07%	447.67	27.50	446.93	445.43
97	DW CULVERT 12-D	8 OF 10	45	2	24	SETP-PD	414+12.81	53.47	443.99	4	414+57.80	52.88	443.94	4	0.11%	446.93	30.00	446.36	445.47
98	DW CULVERT 12-E	8 OF 10	48	2	24	SETP-PD	415+71.19	52.45	443.83	4	416+19.19	52.48	443.78	4	0.10%	446.44	29.75	446.32	445.49
99	DW CULVERT 12-F	9 OF 10	61	2	24	SETP-PD	417+70.79	52.40	443.63	4	418+31.79	52.58	443.57	4	0.10%	447.2	29.50	446.07	444.68
102	DW CULVERT 12-H	9 OF 10	30	2	DES 4 (ARCH)	SETP-PD	419+89.10	52.39	442.56	6	420+19.09	51.50	442.53	6	0.10%	445.38	39.00	445.13	443.69
105	DW CULVERT 12-I	9 OF 10	27	2	DES 4 (ARCH)	SETP-PD	420+61.83	51.77	442.95	6	420+88.79	53.33	442.83	6	0.45%	445.66	39.00	445.52	443.45
106	DW CULVERT 12-J	9 OF 10	89	2	DES 4 (ARCH)	SETP-PD	422+22.00	53.00	441.42	6	423+31.00	50.75	435.58	6	5.36%	447.09	45.00	444.98	436.83
107	DW CULVERT 13-A	9 OF 10	50	1	18	SETP-PD	422+87.15	-48.13	440.63	4	423+89.83	-50.19	440.42	4	0.20%	442.28	2.00	441.40	440.97



DRIVEWAY
SECTION
NTS

NOTES:
1. SEE DITCH CALCULATIONS FOR MORE INFORMATION REGARDING PARALLEL CULVERT DESIGN AND CHECK FLOWS.
2. PARALLEL CULVERT HYDRAULICS CALCULATED USING HY-8 VERSION 7.50.
3. ALL DRAINAGE FACILITIES ARE CHECKED FOR THE 1% AEP TO EXAMINE WHERE OVERFLOW (IF ANY) WOULD TRAVEL AND TO ENSURE NO SIGNIFICANT ADVERSE IMPACTS RESULT DUE TO THE PROJECT.

STATE OF TEXAS
DEREK T. BOHLS
103424
LICENSED
PROFESSIONAL ENGINEER
7/21/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
DRIVEWAY & SIDEWALK PIPE SUMMARY

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
DB	6	PTF 2022(045)		191
DRAWN BY:	STATE	DIST. NO.	COUNTY	
PT	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

7/21/2021
11:43:03 AM
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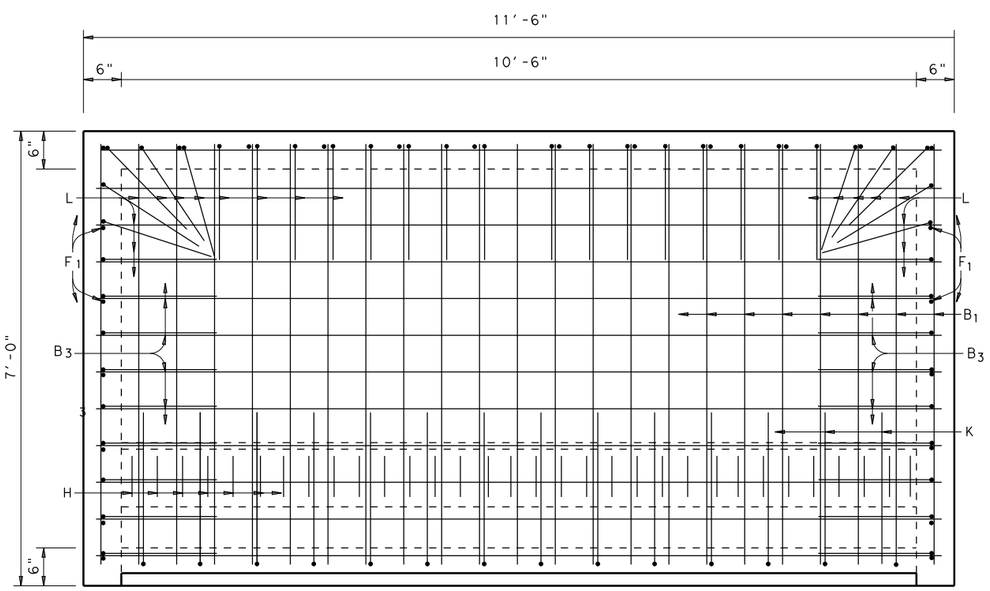
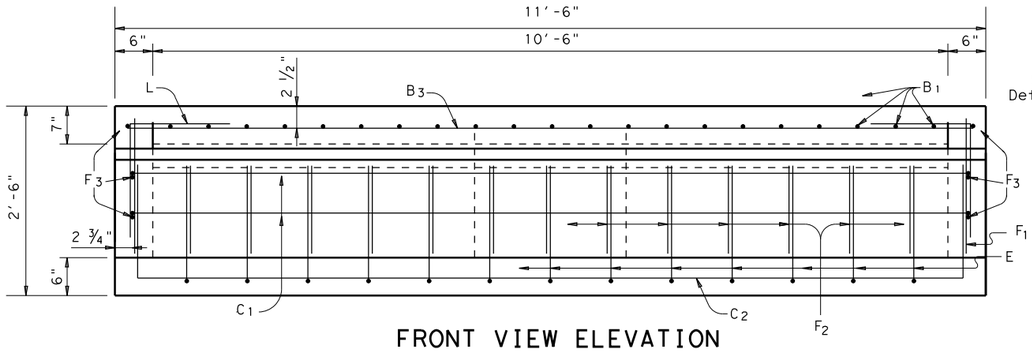
FILE: ...\BacklessInlet.dgn
DATE: 6/25/2021 6:50:45 PM

LEVELS DISPLAYED
PATH:

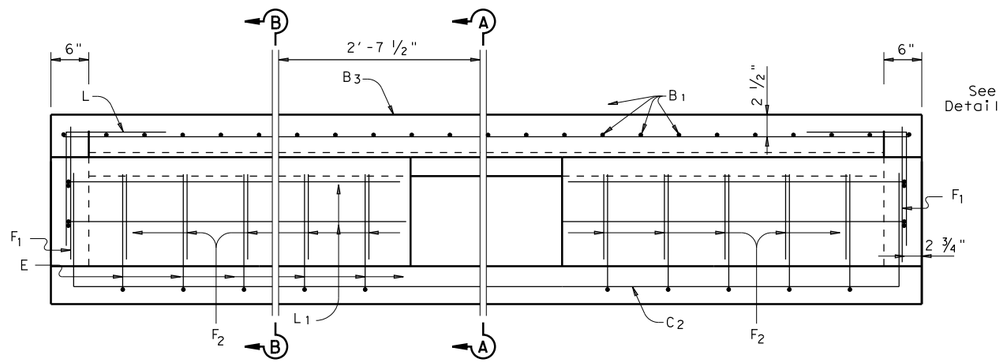


PLAN

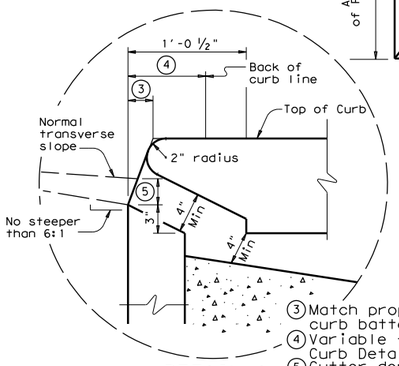
(1) Unless shown otherwise on sheet all clear cover shall be 3".



FRONT VIEW ELEVATION

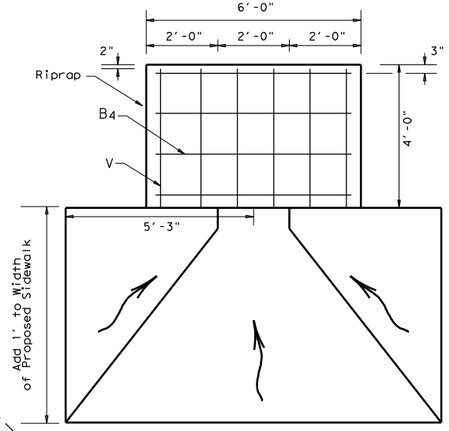


BACK VIEW ELEVATION

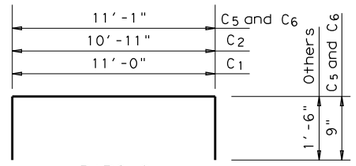


DETAIL A

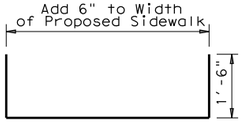
(3) Match proposed curb batter
(4) Variable ~ see Curb Details
(5) Gutter depression to be determined by the Engineer



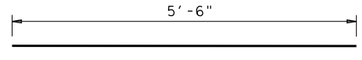
GRADE TO DRAIN INVERT DETAIL



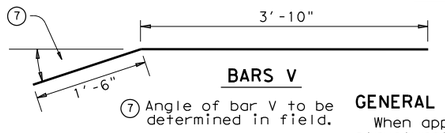
BARS C



BARS E

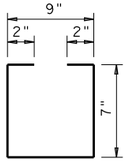


BARS B4

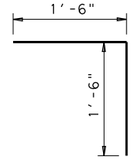


BARS V

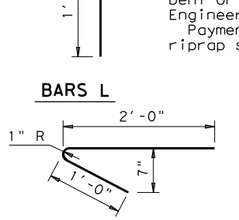
(7) Angle of bar V to be determined in field.



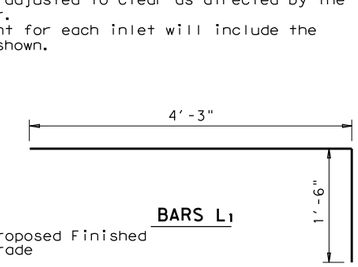
BARS H



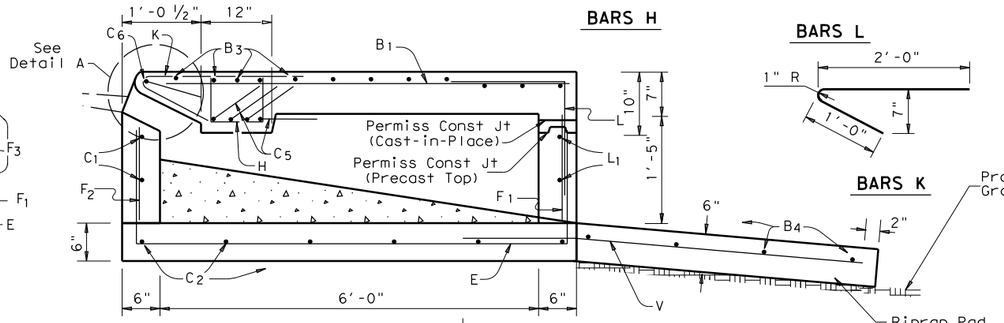
BARS L



BARS K

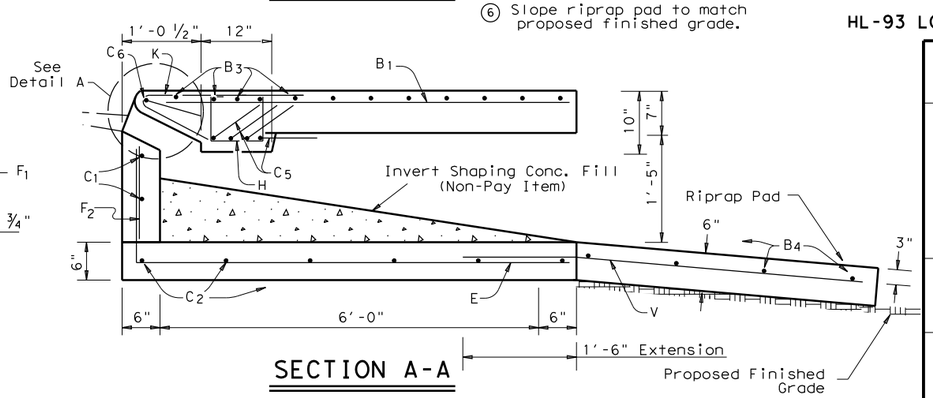


BARS L1



SECTION B-B

(6) Slope riprap pad to match proposed finished grade.



SECTION A-A

REINF STEEL

Bar	Size	Spacing
B_1	#4	6"
B_3	#4	6"
B_4	#4	14"
C_{1-2}	#4	12"
C_5	#6	(2)
C_6	#4	(2)
E	#4	12"
F_{1-3}	#4	12"
H	#4	6"
K	#4	9"
L	#4	6"
L_1	#4	8"
V	#4	11"

(2) As shown

GENERAL NOTES:

When approved, precast inlets with equivalent structural capacity may be furnished. Sealed engineering calculations and drawings shall be submitted for approval prior to construction.

Shop drawings will not be required.

In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.

Payment for each inlet will include the riprap shown.

HL-93 LOADING

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

LJA Engineering, Inc.
FRN - F-1386

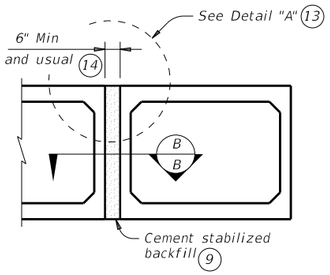
BACKLESS CURB INLET

NOT TO SCALE

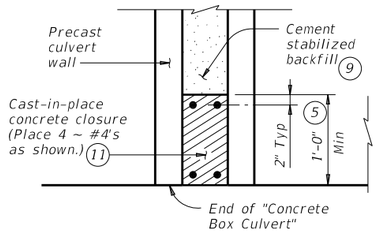
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969
DIST	COUNTY		SHEET NO.
AUS	TRAVIS		192

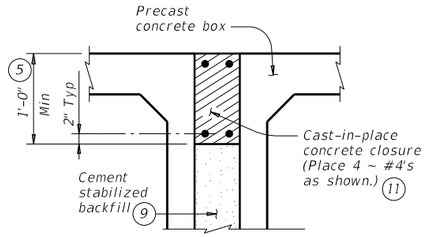
DATE:
FILE:



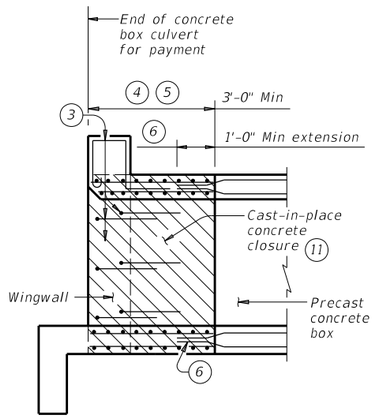
MULTIPLE UNIT PLACEMENT



SECTION B-B

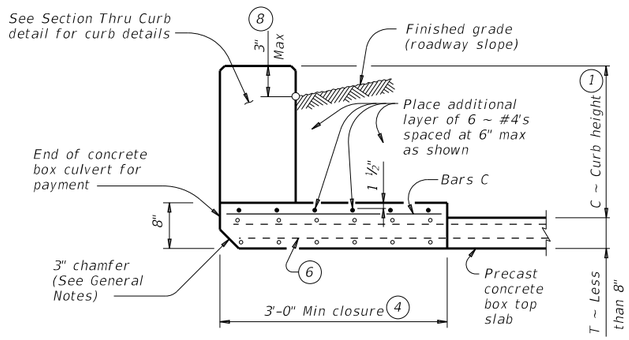


DETAIL "A" (13)

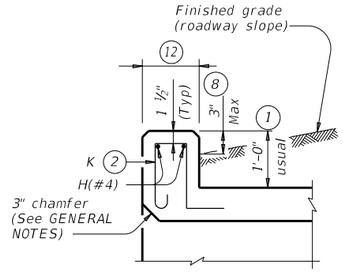


WINGWALL CONNECTION

(Also applies to safety end treatment.)

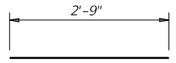


SECTION THRU TOP SLABS LESS THAN 8"

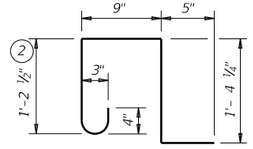


SECTION THRU CURB

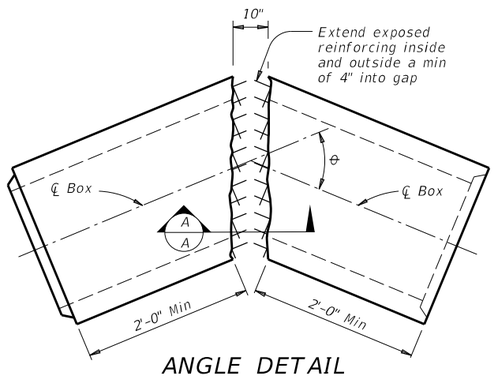
QUANTITIES PER FOOT OF CURB (10)	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY



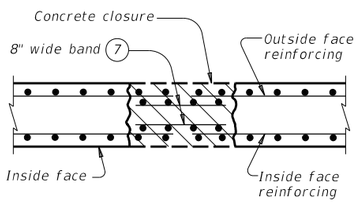
BARS C (#4)
(Spa = 1'–0" Max)



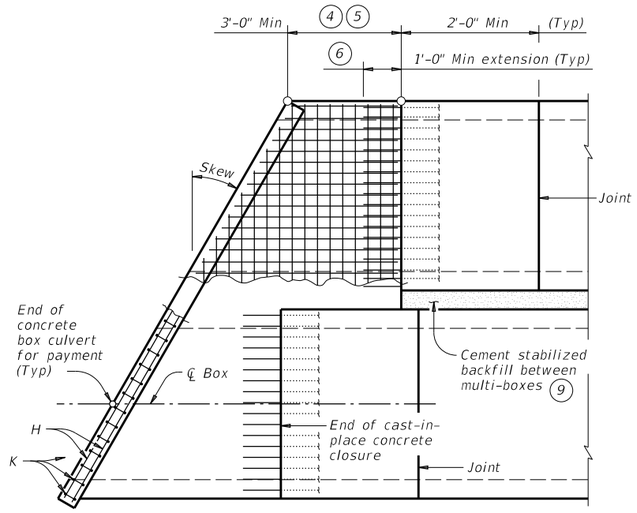
BARS K (#4)
(Spa = 1'–0" Max)
(Length = 4'–2")



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi–box placement.)

1. 0" Min to 5'–0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail, or curbs taller than 1'–0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631–CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2. For curbs less than 1'–0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

3. Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.

4. Provide a 3'–0" Min cast–in–place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast–in–place closure flush with the inside and outside faces of the precast box section.

5. For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'–0" Min cast–in–place closure in the top slab, bottom slab, and exterior wall. See Section B–B detail when interior walls are cast full length.

6. Extend precast box reinforcing a minimum of 1'–0" into concrete closure (Typ).

7. Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.

8. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

9. Cement stabilized backfill between boxes is considered part of the box culvert for payment.

10. All curb concrete and reinforcing is considered part of the box culvert for payment.

11. Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.

12. 1'–0" typical. 2'–3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.

13. For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".

14. This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement.
Provide Class C concrete (f'c = 3,600 psi) for the closures.
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bars dimensions are out–to–out of bars.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: scpmdsts-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		193

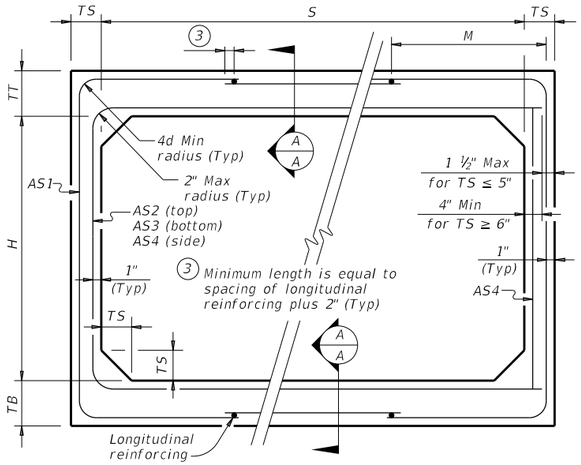
DATE:
FILE:

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
5	2	8	7	6	< 2	–	0.19	0.27	0.18	0.14	0.19	0.19	0.17	6.0
5	2	6	6	6	2 < 3	44	0.22	0.20	0.16	0.14	–	–	–	5.1
5	2	6	6	6	3 – 5	44	0.16	0.14	0.14	0.14	–	–	–	5.1
5	2	6	6	6	10	36	0.15	0.14	0.14	0.14	–	–	–	5.1
5	2	6	6	6	15	36	0.20	0.18	0.18	0.14	–	–	–	5.1
5	2	6	6	6	20	36	0.26	0.23	0.24	0.14	–	–	–	5.1
5	2	6	6	6	25	36	0.33	0.29	0.29	0.14	–	–	–	5.1
5	2	6	6	6	30	36	0.39	0.34	0.35	0.14	–	–	–	5.1
5	3	8	7	6	< 2	–	0.19	0.31	0.21	0.14	0.19	0.19	0.17	6.6
5	3	6	6	6	2 < 3	45	0.18	0.24	0.19	0.14	–	–	–	5.7
5	3	6	6	6	3 – 5	36	0.14	0.17	0.16	0.14	–	–	–	5.7
5	3	6	6	6	10	36	0.14	0.16	0.17	0.14	–	–	–	5.7
5	3	6	6	6	15	35	0.16	0.21	0.22	0.14	–	–	–	5.7
5	3	6	6	6	20	35	0.21	0.27	0.28	0.14	–	–	–	5.7
5	3	6	6	6	25	35	0.26	0.34	0.34	0.14	–	–	–	5.7
5	3	6	6	6	30	35	0.31	0.41	0.41	0.14	–	–	–	5.7
5	4	8	7	6	< 2	–	0.19	0.33	0.24	0.14	0.19	0.19	0.17	7.2
5	4	6	6	6	2 < 3	45	0.16	0.27	0.22	0.14	–	–	–	6.3
5	4	6	6	6	3 – 5	45	0.14	0.19	0.18	0.14	–	–	–	6.3
5	4	6	6	6	10	36	0.14	0.18	0.18	0.14	–	–	–	6.3
5	4	6	6	6	15	35	0.14	0.23	0.24	0.14	–	–	–	6.3
5	4	6	6	6	20	35	0.17	0.30	0.31	0.14	–	–	–	6.3
5	4	6	6	6	25	35	0.21	0.37	0.38	0.14	–	–	–	6.3
5	4	6	6	6	30	35	0.25	0.44	0.45	0.14	–	–	–	6.3
5	5	8	7	6	< 2	–	0.19	0.35	0.26	0.14	0.19	0.19	0.17	7.8
5	5	6	6	6	2 < 3	45	0.14	0.29	0.24	0.14	–	–	–	6.9
5	5	6	6	6	3 – 5	45	0.14	0.21	0.20	0.14	–	–	–	6.9
5	5	6	6	6	10	45	0.14	0.19	0.20	0.14	–	–	–	6.9
5	5	6	6	6	15	36	0.14	0.24	0.25	0.14	–	–	–	6.9
5	5	6	6	6	20	35	0.15	0.31	0.32	0.14	–	–	–	6.9
5	5	6	6	6	25	35	0.18	0.38	0.39	0.14	–	–	–	6.9
5	5	6	6	6	30	35	0.21	0.46	0.47	0.14	–	–	–	6.9

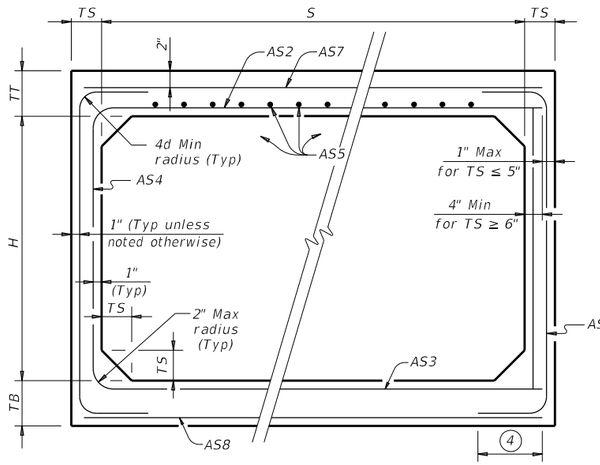
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

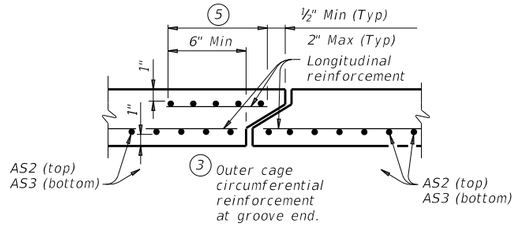
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

5'-0" SPAN

SCP-5

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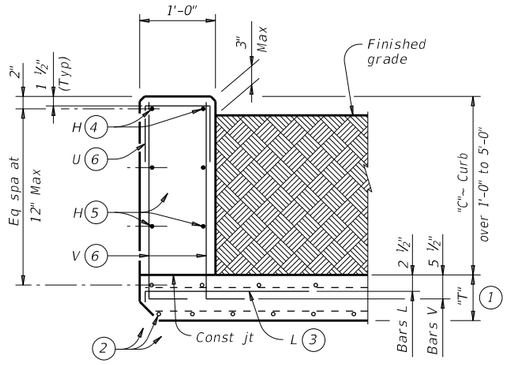
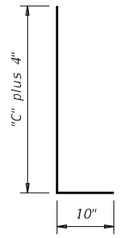
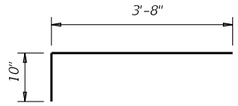


TYPICAL SECTION

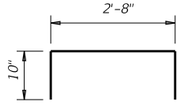
Used for curbs over 1'-0" to 5'-0"



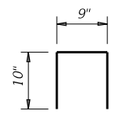
BARS V (#5) (6)
Spaced at 12" Max



BARS L (#5) (3)
Spaced at 12" Max



OPTIONAL BARS L (#5) (3) (7)
Spaced at 12" Max



BARS U (#4) (6)
Spaced at 12" Max

(1) "T" is equal to the culvert top slab thickness. For precast boxes with slabs less than 8" thick, see SCP-MD standard for additional details.

(2) Adjust normal culvert slab bars as necessary to clear obstructions.

(3) Place bars L as shown. Tilt hook as necessary to maintain cover.

(4) Place normal culvert curb bars H(#4) as shown. Adjust as necessary to clear obstructions.

(5) Additional bars H(#4) as required to maintain 12" Max spacing.

(6) Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" Max. Adjust length of bars V as necessary to maintain clear cover.

(7) Optional bars L are to be used only for precast box culverts with 3'-0" closure pour.

(8) Quantities shown are for Contractor's information only. Quantities are per linear foot of curb length. The value in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).

TABLE OF ESTIMATED CURB QUANTITIES (8)

Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'-0"	0.037	10.4
1'-6"	0.056	14.5
2'-0"	0.074	15.6
2'-6"	0.093	18.0
3'-0"	0.111	19.0
3'-6"	0.130	21.3
4'-0"	0.148	22.4
4'-6"	0.167	24.8
5'-0"	0.185	25.9

CONSTRUCTION NOTES:

Adjust reinforcing steel as necessary to provide 1 ¼" cover.

For vehicle safety, top of the curb must not project more than 3" above the finished grade.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

Provide Class "C" concrete (f'_c = 3,600 psi) minimum for curbs.

Provide bar laps, where required, as follows:

- Uncoated or galvanized ~ #4 = 1'-8" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

These extended curb details have sufficient strength to allow for future retrofit of Type T631 or T631LS railing. These details are suitable for use with PR11, PR22 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T631 or T631LS railing, use the T631-CM standard.

This Curb is considered as part of the Box Culvert for payment.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

Texas Department of Transportation

Bridge Division Standard

EXTENDED CURB DETAILS

FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

ECD

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Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
Culvert 9 (STA 352+20.33) (Rt)	2 ~ 5'x 4'	9'	SCP-5	SETB-FW-0	0°	4:1	6"	6"	0.250'	4.500'	16.667'	9.623'	19.245'	N/A	30.745'	4.4	0.1	8.5	N/A

NOTES:
Skew = 0° on SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standard sheets;
30° maximum for safety end treatment

SL:1 = Horizontal : 1 Vertical
- Side slope at culvert for flared or straight wingwalls.
- Channel slope for parallel wingwalls.
- Slope must be 3:1 or flatter for safety end treatments.

T = Box culvert top slab thickness. Dimension can be found on the applicable box culvert standard sheet.

U = Box culvert wall thickness. Dimension can be found on the applicable box culvert standard sheet.

C = Curb height

See applicable wing or end treatment standard sheets for calculations of Hw, A, B, Lw, Ltw, Atw, and Total Wingwall Area.

Hw = Height of wingwall

A = Distance from face of curb to end of wingwall (not applicable to parallel or straight wingwalls)

B = Offset of end of wingwall (not applicable to parallel or straight wingwalls)

Lw = Length of longest wingwall.

Ltw = Length of culvert toewall (not applicable when using riprap apron)

Atw = Length of anchor toewall (applicable to safety end treatment only)
Total Wingwall Area = Wingwall area in sq. ft. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

(1) Round the wall heights shown to the nearest foot for bidding purposes.

(2) Concrete volume shown is for box culvert curb only. For curbs using the Box Culvert Rail Mounting Details (RAC) standard sheet quantities shown must be increased by a factor of 2.25. If Class S concrete is required for the top slab of the culvert, also provide Class S concrete for the curb. Curb concrete is considered part of the Box Culvert for payment.

(3) Concrete volume shown is total of wings, footings, culvert toewall (if any), anchor toewalls (if any) and wingwall toewalls. Riprap aprons, culverts, and curb quantities are not included.

(4) Regardless of the type of culvert shown on this sheet, the Contractor has the option of furnishing cast-in-place or precast culverts unless otherwise shown elsewhere on the plans. If the Contractor elects to provide culverts of a different type than those shown on this sheet, it is the Contractor's responsibility to make the necessary adjustments to the dimensions and quantities shown.

SPECIAL NOTE:

This sheet is a supplement to the box culvert standards. It is to be filled out by the culvert specifier and provides dimensions for the construction of the box culvert wingwalls and safety end treatments.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

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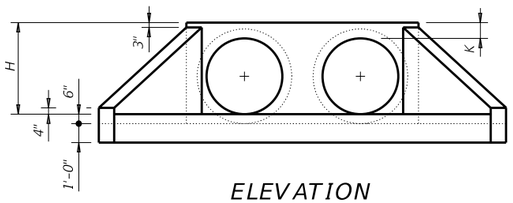
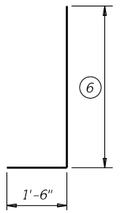
TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	Values for One Pipe						Values to be Added for Each Addt'l Pipe		
		W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	X and W	Reinf (Lbs)	Conc (CY) (1)
2:1	12"	4' – 7 ½"	2' – 6"	2' – 10"	3' – 3 ¼"	88	0.6	1' – 9"	20	0.2
	15"	5' – 5 ¾"	2' – 9 ½"	3' – 4"	3' – 10 ¼"	103	0.7	2' – 2"	24	0.3
	18"	6' – 4 ¼"	3' – 1"	3' – 10"	4' – 5"	124	0.9	2' – 8"	32	0.3
	21"	7' – 2 ¾"	3' – 4 ½"	4' – 4"	5' – 0"	143	1.1	3' – 1"	43	0.4
	24"	8' – 2 ½"	3' – 9 ½"	4' – 10"	5' – 7"	164	1.3	3' – 7"	50	0.5
	27"	9' – 1"	4' – 1"	5' – 4"	6' – 2"	179	1.5	3' – 11"	56	0.6
	30"	9' – 11 ½"	4' – 4 ½"	5' – 10"	6' – 8 ¾"	203	1.7	4' – 4"	65	0.8
	33"	10' – 10"	4' – 8"	6' – 4"	7' – 3 ¾"	224	2.0	4' – 8"	71	0.9
	36"	11' – 8 ¼"	4' – 11 ½"	6' – 10"	7' – 10 ¾"	249	2.2	5' – 1"	81	1.0
	42"	13' – 5 ¼"	5' – 6 ½"	7' – 10"	9' – 0 ½"	298	2.8	5' – 10"	97	1.3
	48"	15' – 9"	6' – 1 ½"	9' – 4"	10' – 9 ¼"	360	3.8	6' – 7"	117	1.7
	54"	17' – 5 ¾"	6' – 8 ½"	10' – 4"	11' – 11 ¼"	427	4.5	7' – 6"	151	2.1
	60"	19' – 2 ¾"	7' – 3 ½"	11' – 4"	13' – 1"	481	5.3	8' – 3"	174	2.5
	66"	20' – 11 ½"	7' – 10 ½"	12' – 4"	14' – 3"	544	6.2	8' – 9"	194	2.9
	72"	22' – 8 ½"	8' – 5 ½"	13' – 4"	15' – 4 ¾"	601	7.1	9' – 4"	213	3.3
3:1	12"	6' – 3"	2' – 6"	4' – 3"	4' – 11"	118	0.8	1' – 9"	22	0.2
	15"	7' – 5"	2' – 9 ½"	5' – 0"	5' – 9 ¼"	137	1.1	2' – 2"	28	0.3
	18"	8' – 6 ¾"	3' – 1"	5' – 9"	6' – 7 ¾"	170	1.3	2' – 8"	37	0.5
	21"	9' – 8 ¾"	3' – 4 ½"	6' – 6"	7' – 6"	195	1.6	3' – 1"	48	0.6
	24"	11' – 0"	3' – 9 ½"	7' – 3"	8' – 4 ½"	227	2.0	3' – 7"	58	0.7
	27"	12' – 2"	4' – 1"	8' – 0"	9' – 2 ¾"	251	2.3	3' – 11"	67	0.8
	30"	13' – 4"	4' – 4 ½"	8' – 9"	10' – 1 ¼"	293	2.7	4' – 4"	77	1.0
	33"	14' – 5 ¾"	4' – 8"	9' – 6"	10' – 11 ¾"	318	3.1	4' – 8"	84	1.2
	36"	15' – 7 ¾"	4' – 11 ½"	10' – 3"	11' – 10"	351	3.5	5' – 1"	96	1.4
	42"	17' – 11 ½"	5' – 6 ½"	11' – 9"	13' – 6 ¾"	432	4.5	5' – 10"	119	1.7
	48"	21' – 1 ¾"	6' – 1 ½"	14' – 0"	16' – 2"	537	6.1	6' – 7"	146	2.3
	54"	23' – 5 ½"	6' – 8 ½"	15' – 6"	17' – 10 ¾"	630	7.3	7' – 6"	186	2.9
	60"	25' – 9 ¼"	7' – 3 ½"	17' – 0"	19' – 7 ½"	719	8.7	8' – 3"	219	3.4
	66"	28' – 1"	7' – 10 ½"	18' – 6"	21' – 4 ¼"	811	10.1	8' – 9"	242	3.9
	72"	30' – 4 ¾"	8' – 5 ½"	20' – 0"	23' – 1 ¼"	924	11.7	9' – 4"	272	4.4
4:1	12"	7' – 10 ¾"	2' – 6"	5' – 8"	6' – 6 ½"	148	1.1	1' – 9"	24	0.3
	15"	9' – 4"	2' – 9 ½"	6' – 8"	7' – 8 ½"	181	1.5	2' – 2"	32	0.4
	18"	10' – 9 ½"	3' – 1"	7' – 8"	8' – 10 ¼"	221	1.9	2' – 8"	42	0.5
	21"	12' – 2 ¾"	3' – 4 ½"	8' – 8"	10' – 0"	260	2.3	3' – 1"	57	0.7
	24"	13' – 9 ½"	3' – 9 ½"	9' – 8"	11' – 2"	301	2.8	3' – 7"	67	0.9
	27"	15' – 3"	4' – 1"	10' – 8"	12' – 3 ¾"	334	3.3	3' – 11"	77	1.0
	30"	16' – 8 ¼"	4' – 4 ½"	11' – 8"	13' – 5 ¾"	385	3.8	4' – 4"	89	1.3
	33"	18' – 1 ¾"	4' – 8"	12' – 8"	14' – 7 ½"	425	4.5	4' – 8"	101	1.4
	36"	19' – 7"	4' – 11 ½"	13' – 8"	15' – 9 ¼"	472	5.1	5' – 1"	115	1.7
	42"	22' – 5 ¾"	5' – 6 ½"	15' – 8"	18' – 1"	583	6.5	5' – 10"	141	2.1
	48"	26' – 6 ¼"	6' – 1 ½"	18' – 8"	21' – 6 ¾"	730	8.9	6' – 7"	175	2.8
	54"	29' – 5"	6' – 8 ½"	20' – 8"	23' – 10 ¼"	875	10.7	7' – 6"	226	3.6
	60"	32' – 3 ¾"	7' – 3 ½"	22' – 8"	26' – 2"	996	12.7	8' – 3"	264	4.3
	66"	35' – 2 ½"	7' – 10 ½"	24' – 8"	28' – 5 ¾"	1,140	14.9	8' – 9"	300	4.9
	72"	38' – 1 ¼"	8' – 5 ½"	26' – 8"	30' – 9 ½"	1,297	17.3	9' – 4"	334	5.6
6:1	12"	11' – 2"	2' – 6"	8' – 6"	9' – 9 ¾"	224	1.9	1' – 9"	28	0.4
	15"	13' – 2 ¼"	2' – 9 ½"	10' – 0"	11' – 6 ½"	268	2.5	2' – 2"	37	0.5
	18"	15' – 2 ½"	3' – 1"	11' – 6"	13' – 3 ¼"	330	3.2	2' – 8"	50	0.7
	21"	17' – 2 ¾"	3' – 4 ½"	13' – 0"	15' – 0 ¼"	387	3.9	3' – 1"	69	0.9
	24"	19' – 4 ½"	3' – 9 ½"	14' – 6"	16' – 9"	453	4.8	3' – 7"	80	1.2
	27"	21' – 4 ¾"	4' – 1"	16' – 0"	18' – 5 ¾"	512	5.7	3' – 11"	96	1.4
	30"	23' – 5 ¼"	4' – 4 ½"	17' – 6"	20' – 2 ½"	593	6.7	4' – 4"	110	1.7
	33"	25' – 5 ½"	4' – 8"	19' – 0"	21' – 11 ¼"	675	7.8	4' – 8"	127	2.0
	36"	27' – 5 ¾"	4' – 11 ½"	20' – 6"	23' – 8"	735	9.0	5' – 1"	144	2.3
	42"	31' – 6 ¼"	5' – 6 ½"	23' – 6"	27' – 1 ½"	922	11.5	5' – 10"	179	3.0
	48"	37' – 3 ½"	6' – 1 ½"	28' – 0"	32' – 4"	1,191	15.9	6' – 7"	231	4.0
	54"	41' – 4 ¼"	6' – 8 ½"	31' – 0"	35' – 9 ½"	1,424	19.2	7' – 6"	300	5.0
	60"	45' – 4 ¾"	7' – 3 ½"	34' – 0"	39' – 3"	1,631	22.9	8' – 3"	353	6.0

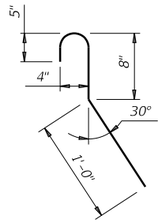


ELEVATION

(Showing dimensions.)



BARS V



BARS CL

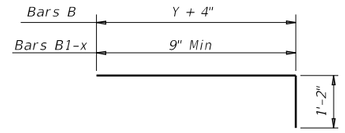
(Length = 2'-5")

TABLE OF (5) REINFORCING STEEL

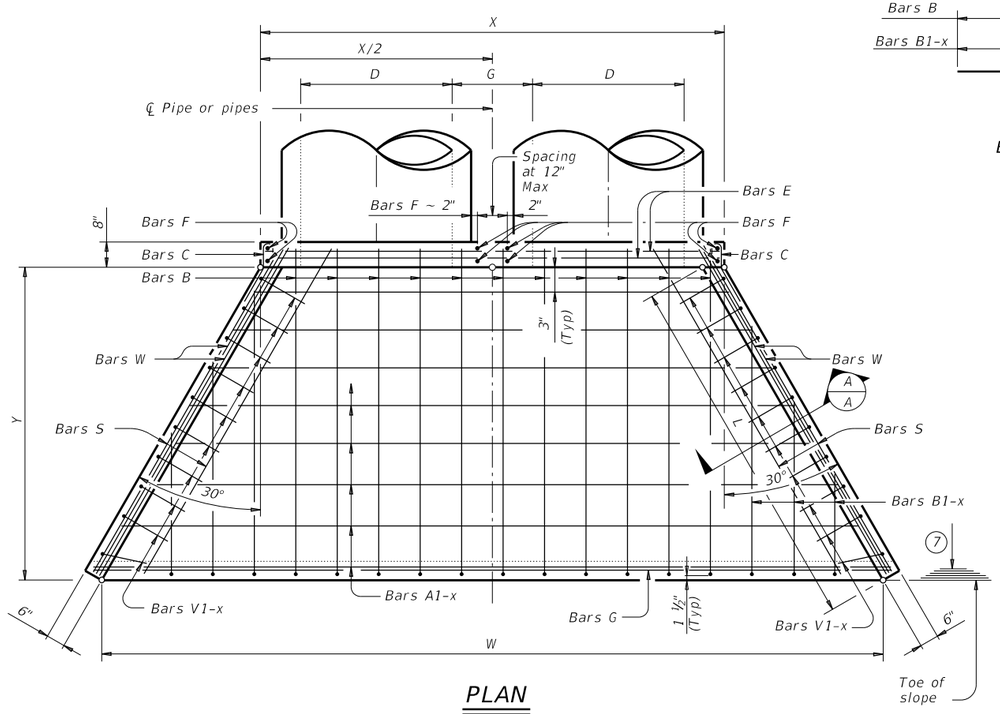
Bar	Size	Spa	No.
A	#4	1' – 0"	~
B	#3	1' – 6"	~
C	#4	1' – 0"	~
D	#3	1' – 0"	~
E	#5	~	4
F	#5	~	~
G	#3	~	2
S	#4	~	6
V	#4	1' – 0"	~
W	#5	~	4

TABLE OF CONSTANT DIMENSIONS

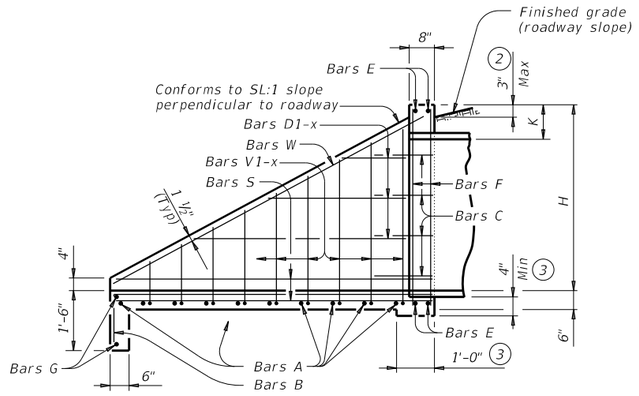
Dia of Pipe (D)	G	K (4)	H
12"	0' – 9"	1' – 0"	2' – 0"
15"	0' – 11"	1' – 0"	2' – 3"
18"	1' – 2"	1' – 0"	2' – 6"
21"	1' – 4"	1' – 0"	2' – 9"
24"	1' – 7"	1' – 0"	3' – 0"
27"	1' – 8"	1' – 0"	3' – 3"
30"	1' – 10"	1' – 0"	3' – 6"
33"	1' – 11"	1' – 0"	3' – 9"
36"	2' – 1"	1' – 0"	4' – 0"
42"	2' – 4"	1' – 0"	4' – 6"
48"	2' – 7"	1' – 3"	5' – 3"
54"	3' – 0"	1' – 3"	5' – 9"
60"	3' – 3"	1' – 3"	6' – 3"
66"	3' – 3"	1' – 3"	6' – 9"
72"	3' – 4"	1' – 3"	7' – 3"



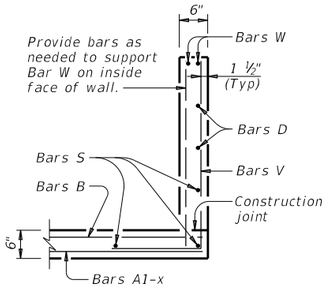
BARS B and B1-x



PLAN



TYPICAL WING ELEVATION



SECTION A-A

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(2) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(3) Provide a 1'-0" footing as shown where required to maintain 4" minimum cover for pipes.

(4) Dimensions shown are usual and maximum.

(5) Quantities shown are for one structure end only (one headwall).

(6) Min Length = $6" + 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right)$

Max Length = $12 \times H - 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right) - 1"$

(7) Lengths of wings based on SL:1 slope along this line.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Do not mount bridge rails of any type directly to these culvert headwalls.

This standard may not be used for wall heights, H, exceeding the values shown.

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS WITH FLARED WINGS FOR 0° SKEW PIPE CULVERTS

CH-FW-0

FILE: chfw00se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		197

DATE:
FILE:

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing length (Two~Wings) (3)	
					Bars J1		Bars J2			
Maximum Wingwall Height Hw (9)	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'- 8"	1'- 9"	1'- 3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'- 2"	2'- 0"	1'- 6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'- 8"	2'- 3"	1'- 9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'- 2"	2'- 6"	2'- 0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'- 8"	2'- 9"	2'- 3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'- 2"	3'- 0"	2'- 6"	9"	#7	6"	#5	6"	162.29	0.721

TABLE OF WING WALL REINFORCING (Two~Wings)

Bar	Size	No.	Spa
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

TABLE OF ESTIMATED ANCHOR TOEWALL QUANTITIES

Bar	Size	No.	Spa
K	#4	~	1'-0"
N	#5	6	~
OL	#4	6	~
Reinf (Lb/Ft)			9.82
Conc (CY/Ft)			0.074

(1) Extend Bars P 3'-0" Min into bottom slab of box culvert.

(2) Adjust to fit as necessary to maintain 1 1#2" clear cover and 4" Min between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by Lw.

(4) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, extend construction joints or grooved joints, oriented in the direction of flow, across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B is not required.

(6) At Contractor's option, end the culvert toewall flush with wingwall toewall. Adjust reinforcing as needed.

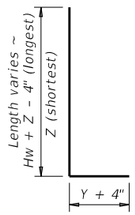
(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extend Curb Details (ECD) standard sheet.

(8) For vehicle safety, reduce curb heights, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

(9) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

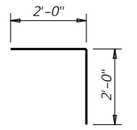
TABLE OF MAXIMUM WING HEIGHTS (9)

Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"

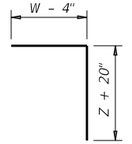


BARS J1

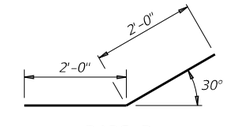
BARS V



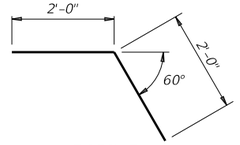
BARS L



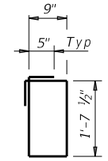
BARS J2



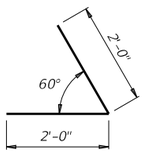
BARS D



BARS R



BARS K
(Length = 5'-5")



BARS OL

WING DIMENSION CALCULATIONS:

Hw = H + T + C - 0.250' (9)
A = (Hw - 0.333') (SL)
B = (A) (tan (30°))
Lw = (A) ÷ cos (30°))

For cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)
For precast culverts:
Ltw = (N) (2U + S) + (N - 1) (0.500')

Lc = (Ltw) - (2U)
Atw = (Lc) + (2B)
Total Wingwall Area (two wings ~ SF) = (Hw + 0.333') (Lw)

Hw = Height of wingwall (feet)
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)

See applicable box culvert standard for H, S, T, and U values.
See Table of Maximum Wall Heights for limits on Hw.

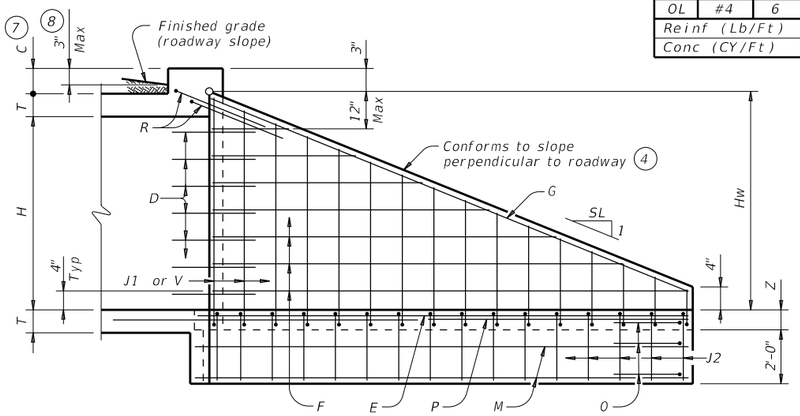
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
Provide Class "C" concrete (f`c = 3,600 psi).
Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".
Provide pipe runners and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts and nuts.
Provide ASTM A36 steel plates.
Galvanize all steel components, except reinforcing unless required elsewhere in the plans, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".
For optional adhesive anchors, install adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing adhesive, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Provide anchorage rods that are clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

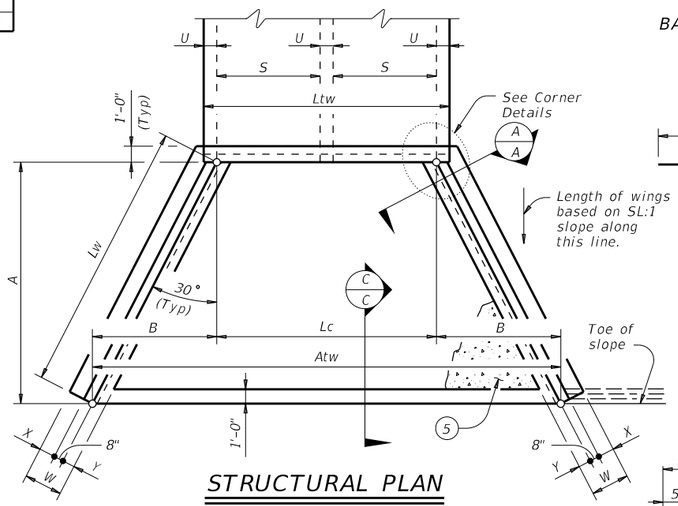
Designed according to AASHTO LRFD Bridge Design Specifications.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
All bolts, nuts, washers, brackets, angles, and pipe runners are considered parts of the safety end treatment for payment.
The quantities for pipe runners, reinforcing steel, and concrete, resulting from the formulas given herein are for Contractor's information only.
See the Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.

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



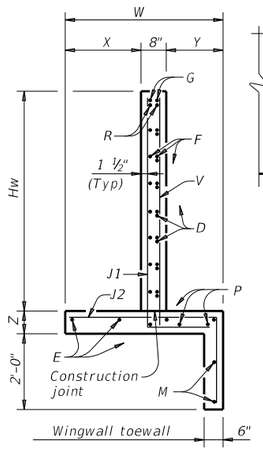
INSIDE ELEVATION OF WINGWALL

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

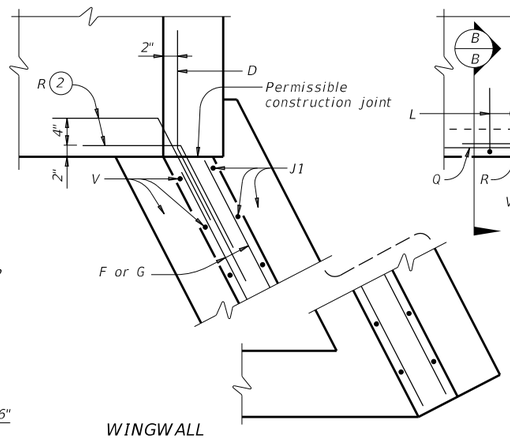


STRUCTURAL PLAN

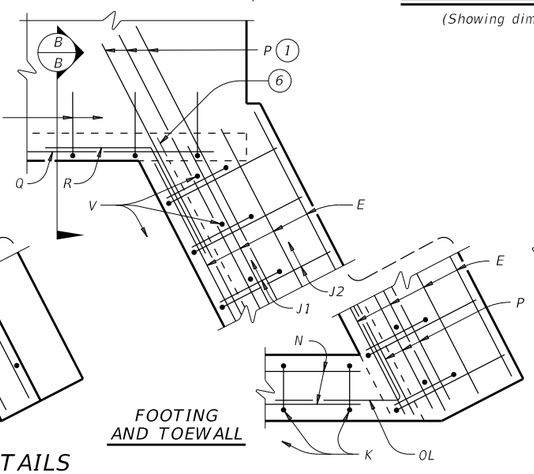
(Showing dimensions.)



SECTION A-A



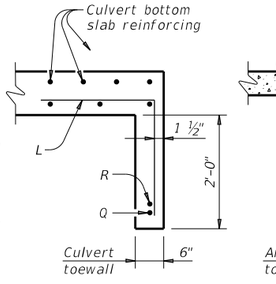
WINGWALL



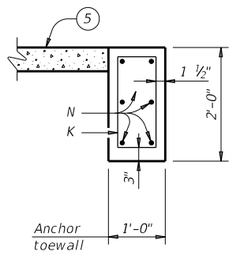
FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and culvert toewall reinforcing not shown for clarity.)



SECTION B-B (5)



SECTION C-C

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	AUS	TRAVIS		198

DATE:
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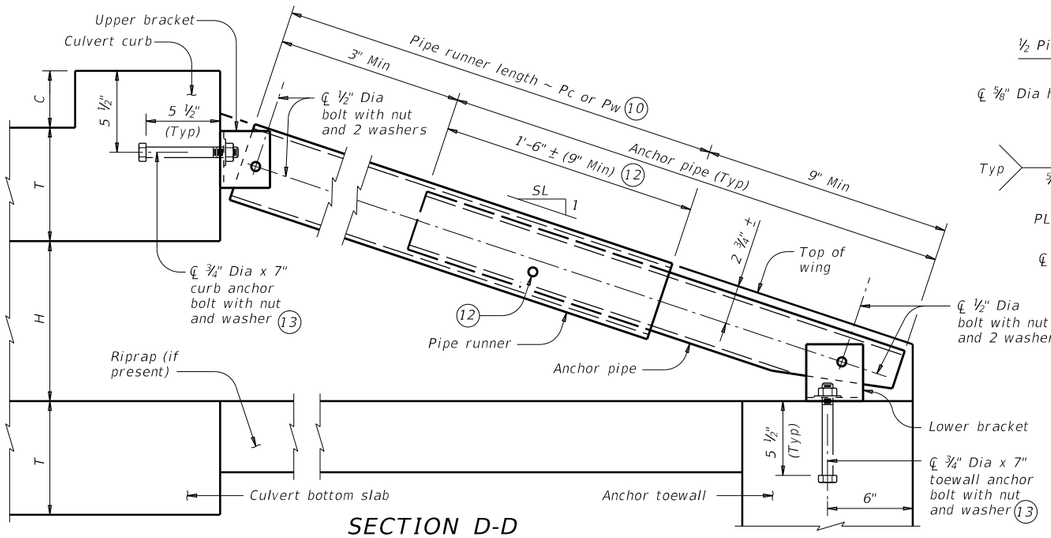
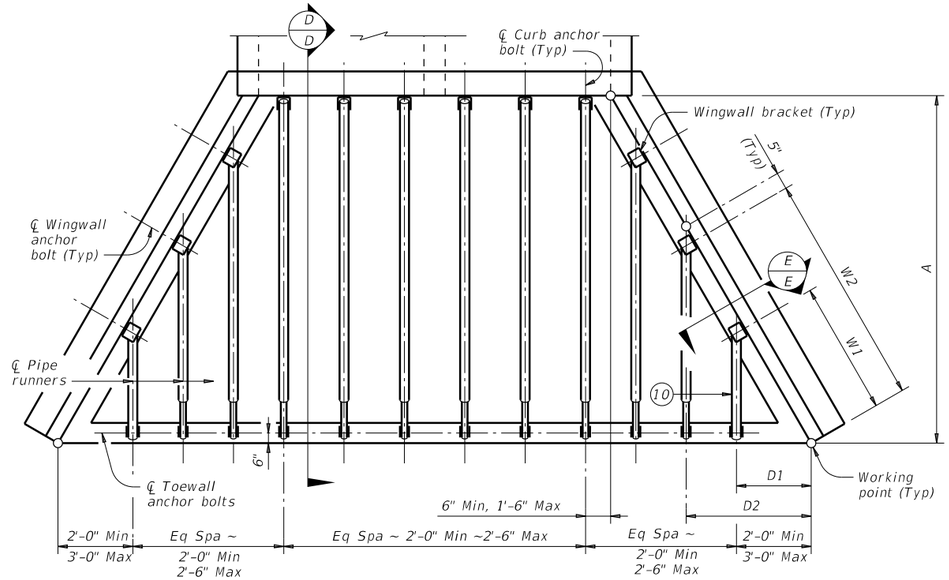
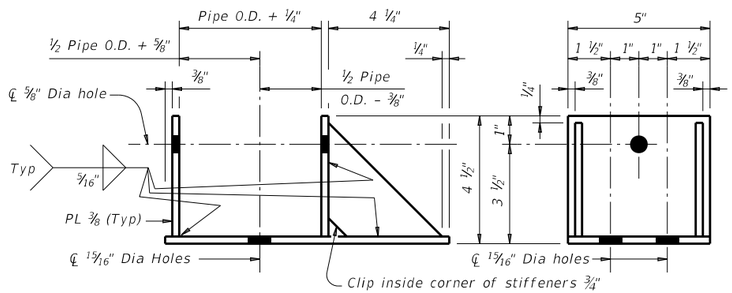


SECTION D-D

(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)

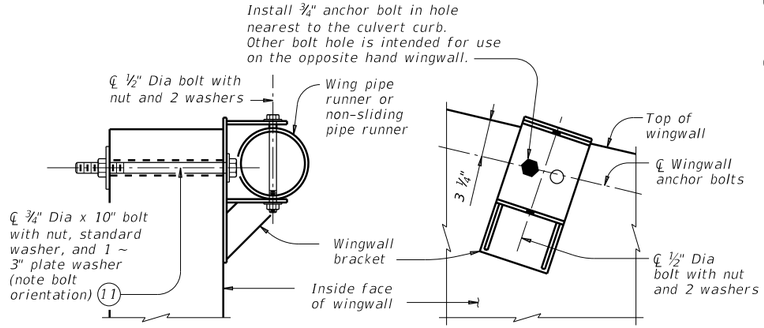


PIPE RUNNER PLAN



ELEVATION

SIDE VIEW



SECTION E-E

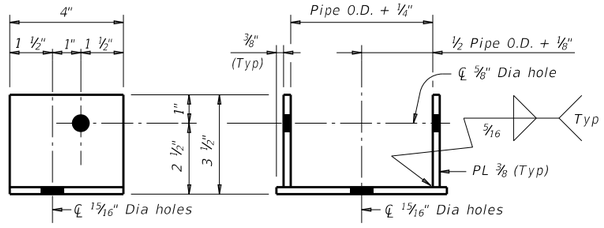
(Showing installed bracket.)

ELEVATION

(Showing installed bracket normal to wall. Pipe not shown for clarity.)

Note: Match wingwall bracket to the upper curb bracket size.

WINGWALL BRACKET DETAILS



SIDE VIEW

ELEVATION

Note: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, to the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER SIZES

Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(10) If pipe runner length (Pw) is 1'-9" or less replace the normal pipe runner and anchor pipe with a single non-sliding pipe runner. See Non-Sliding Pipe Runner Details for additional information.

(11) At Contractor's option, ⅞" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(12) After installation of pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

(13) At Contractor's option, an adhesive anchor may be used. Provide ¾" Dia adhesive anchors that meet the requirements of ASTM A307 Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 ½". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use.

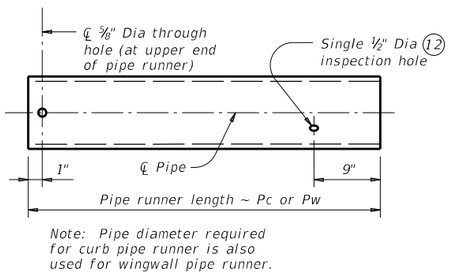
PIPE RUNNER DIMENSION CALCULATIONS:

Wn = (2.000) (Dn) - (0.416')
Pwn = (Dn) (K2) - (2.063')
Pw1 Non-Sliding Pipe Runner (If required) = (D1) (K2) - (0.563')
Pc = (A) (K1) - (1.688')

Wn = Distance from working point to centerline anchor bolt measured along bottom inside face of wing (feet)
Dn = Distance from working point to centerline pipe runner measured along outside face of anchor toewall (feet)
Pw = Wingwall pipe runner length (feet)
Pc = Curb pipe runner length (feet)
K = Constant values for use in formulas

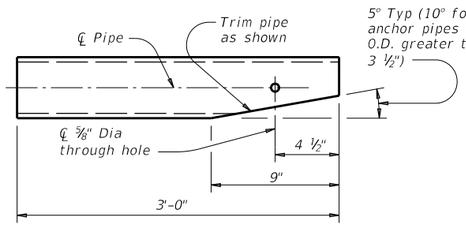
Slope SL:1	K1		K2
3:1	~ 1.054	~	1.826
4:1	~ 1.031	~	1.785
6:1	~ 1.014	~	1.756

n = Wing pipe runner number

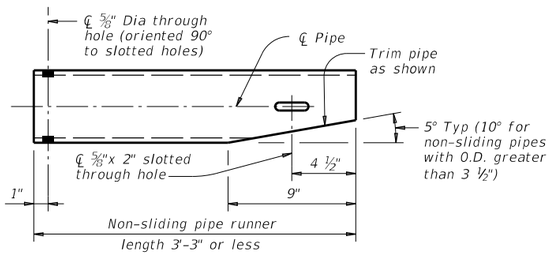


Note: Pipe diameter required for curb pipe runner is also used for wingwall pipe runner.

PIPE RUNNER DETAILS



ANCHOR PIPE DETAILS



Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

NON-SLIDING PIPE RUNNER DETAILS

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

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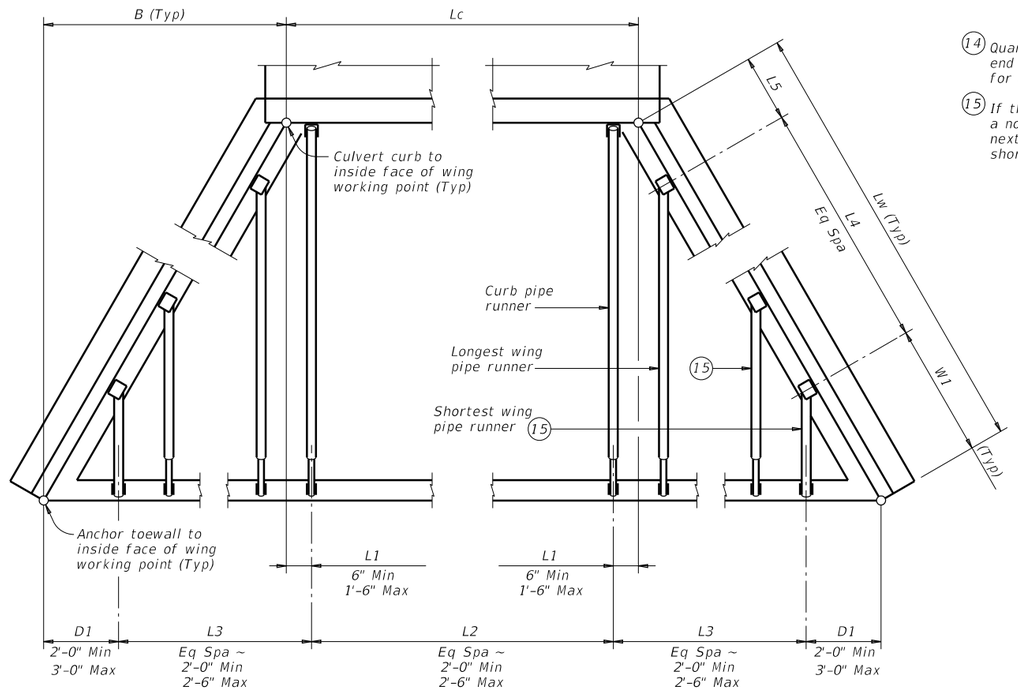
	AUS	TRAVIS		199

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (14)	Lc (Ft)	L1 (Ft)	L2 No. Spa	L2 Spa at (Ft)	L2 Overall Length (Ft)	D1 (Ft)	L3 No. Spa	L3 Spa at (Ft)	L3 Overall Length (Ft)	W1 (Ft)	L4 No. Spa	L4 Spa at (Ft)	L4 Overall Length (Ft)	L5 (Ft)	Curb Pipe Runner (Pc) No.	Curb Pipe Runner (Pc) Length (Ft)	Longest Wing Pipe Runner (Pw) (Ft)	Shortest Wing Pipe Runner (Pw) (Ft)	Non-Sliding Wing Pipe Runner (if applicable) (Ft)	Curb, Wing, and/or Non-Sliding Pipe Runners Size (3",4" or 5")	Curb, Wing, and/or Non-Sliding Pipe Runners Total Length (14) (Ft)	3'-0" Anchor Pipe Size (2",3" or 4")	3'-0" Anchor Pipe Total Length (14) (Ft)
Culvert 9 (STA 352+20.33) (Rt)	11.500'	0.500'	5	2.100'	10.500'	3.000'	3	2.374'	7.123'	5.583	2	4.748'	9.497'	4.165'	6	15.500'	11.771'	3.292'	N/A	4"	138.188'	3"	36.000'



PIPE RUNNER LAYOUT

(14) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(15) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner as the shortest.

SPECIAL NOTE:

This tabular sheet is to be filled out by the culvert specifier and provides information for the construction details and quantities of pipe runners.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, all dimensions must be verified by the Contractor in the field prior to fabrication of the safety end treatment components.

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/30/2021

SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

SETB-FW-0

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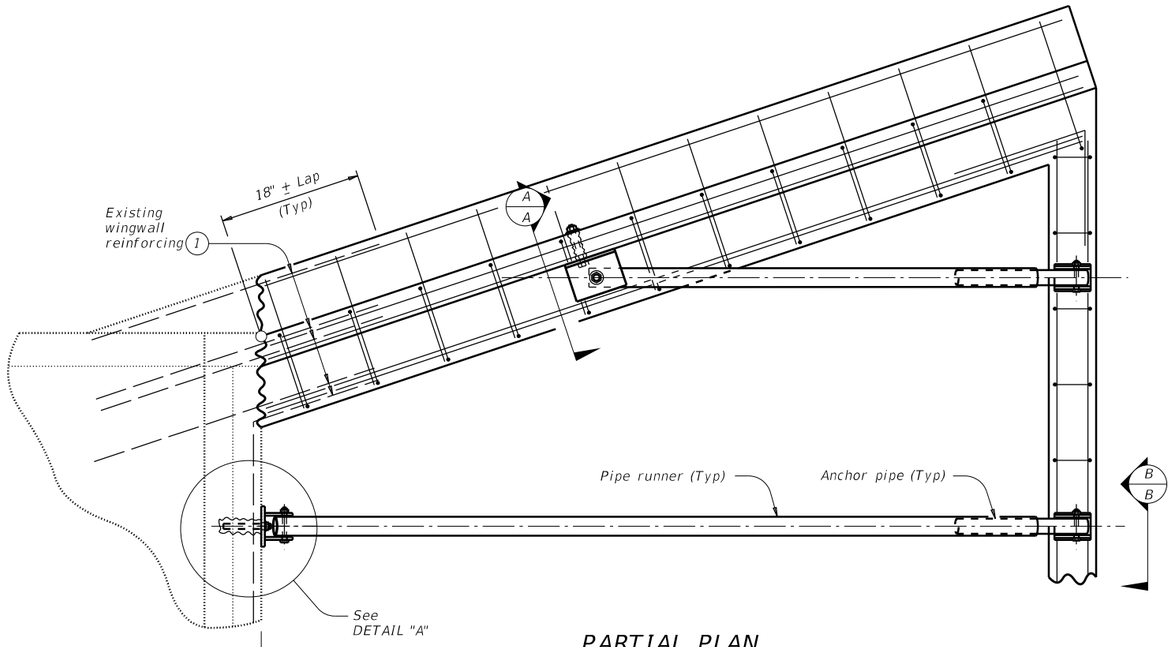
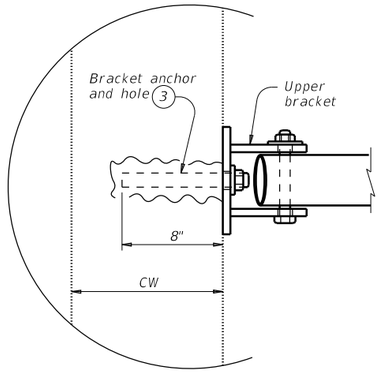
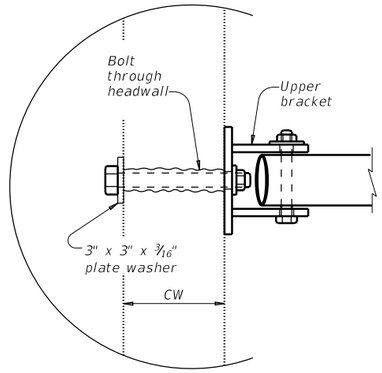


PARTIAL PLAN

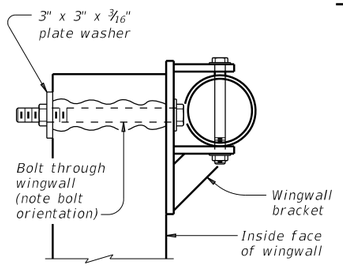


For CW greater than 8"

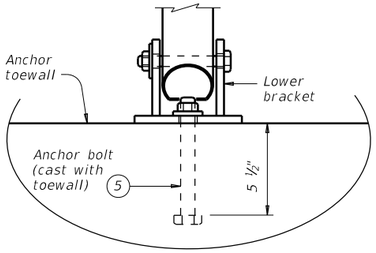


For CW 8" and less

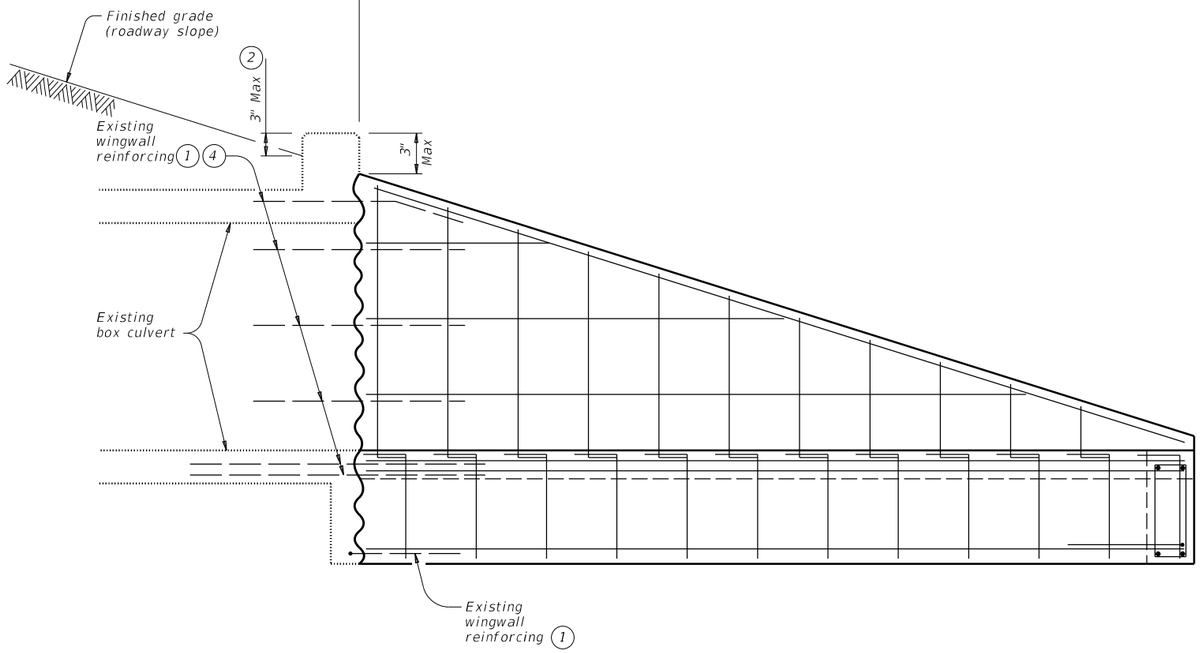
DETAIL "A"



SECTION A-A



SECTION B-B



ELEVATION

(1) Clean and straighten existing reinforcing to lap with new reinforcing as shown. The Engineer may require additional dowels to lap with the new reinforcing if the existing reinforcing is damaged or is not suitably located to lap with new reinforcing. These additional dowels must be #5 x 2'-0".

(2) For vehicle safety, reduce curb height, if necessary to provide a maximum 3" projection above finished grade. No quantity changes or additional compensation will be allowed for this work.

(3) Provide 3/4" Dia adhesive anchors that meet the requirements of ASTM A307 Gr A fully threaded rod with one hex head nut and one hardened steel washer. Embed threaded rods into curb, wingwall, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 8". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use.

(4) If required, embed wingwall anchor dowels into existing box culvert using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 8".

(5) At Contractor's option, adhesive anchors may be used. Provide 3/4" Dia adhesive anchors that meet the requirements of ASTM A307 Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 8". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use.

MATERIAL NOTES:

Install epoxy adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing epoxy, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Anchorage bars or bolts must be clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

Use these details in conjunction with the SETB standard sheets.

Shorten reinforcing Bars D, M, P, and R when utilizing existing reinforcing, as shown. If required, add dowels to lap with new reinforcing, as shown. No increase or decrease to the pay quantities is permitted for these adjustments in the reinforcing steel or concrete quantities.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

RETROFIT DETAILS FOR EXISTING BOX CULVERTS

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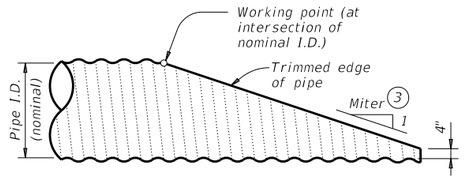
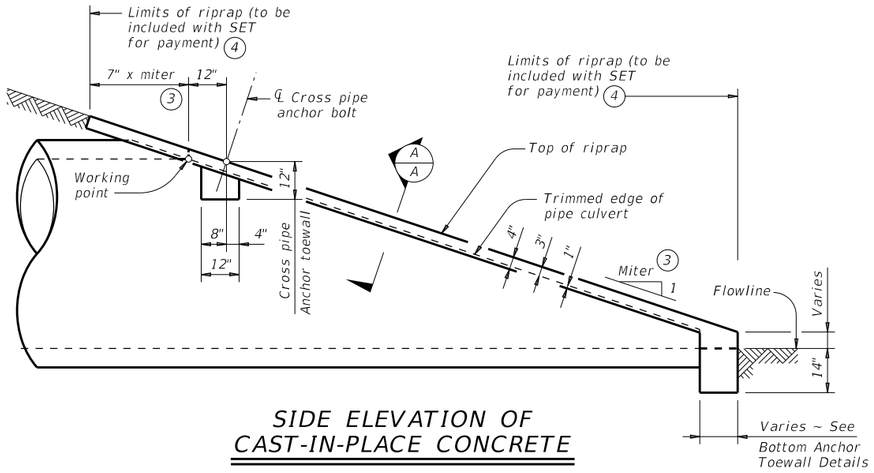


NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

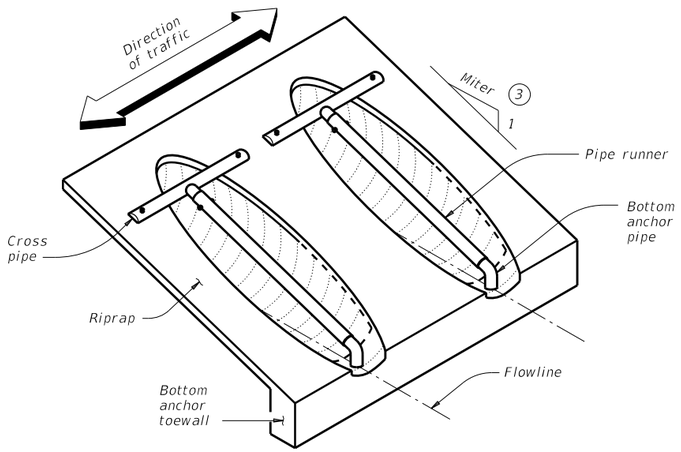
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert.
Details of reinforced concrete pipe (RCP) culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert.
Details of corrugated metal pipe (CMP) culvert
are similar. Pipe runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1) (2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1' – 7"	3' – 5"	N/A	N/A	N/A	5' – 10"	N/A	N/A	N/A	8' – 1"	N/A	N/A	N/A	12' – 9"
27"	1' – 8"	3' – 8"	N/A	N/A	5' – 5"	6' – 11"	N/A	N/A	7' – 7"	9' – 7"	N/A	N/A	11' – 11"	14' – 11"
30"	1' – 10"	3' – 11"	N/A	N/A	6' – 4"	8' – 0"	N/A	N/A	8' – 9"	11' – 0"	N/A	N/A	13' – 8"	17' – 0"
33"	1' – 11"	4' – 2"	6' – 2"	6' – 5"	7' – 3"	9' – 1"	8' – 6"	8' – 10"	10' – 0"	12' – 5"	13' – 3"	13' – 9"	15' – 5"	19' – 2"
36"	2' – 1"	4' – 5"	6' – 11"	7' – 3"	8' – 2"	10' – 2"	9' – 6"	9' – 11"	11' – 2"	13' – 10"	14' – 9"	15' – 3"	17' – 2"	21' – 3"
42"	2' – 4"	4' – 11"	8' – 6"	8' – 10"	9' – 11"	12' – 4"	11' – 7"	12' – 0"	13' – 6"	16' – 8"	17' – 9"	18' – 5"	20' – 8"	25' – 7"
48"	2' – 7"	5' – 5"	10' – 1"	10' – 5"	11' – 9"	N/A	13' – 7"	14' – 2"	15' – 10"	N/A	20' – 9"	21' – 6"	24' – 2"	N/A
54"	3' – 0"	5' – 11"	11' – 8"	12' – 1"	N/A	N/A	15' – 8"	16' – 3"	N/A	N/A	23' – 10"	24' – 8"	N/A	N/A
60"	3' – 3"	6' – 5"	13' – 3"	N/A	N/A	N/A	17' – 9"	N/A	N/A	N/A	26' – 10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always required	Always required

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10' – 0"
4" STD	4.500"	4.026"	19' – 8"
5" STD	5.563"	5.047"	34' – 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT Roadway Design Manual.

(3) Miter = slope of mitered end of pipe culvert.

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(5) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

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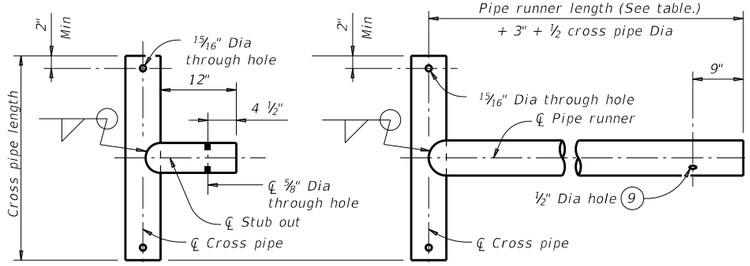
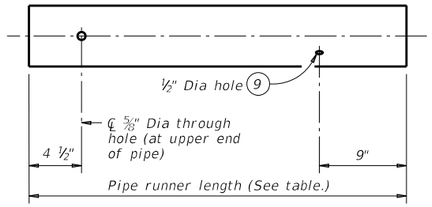


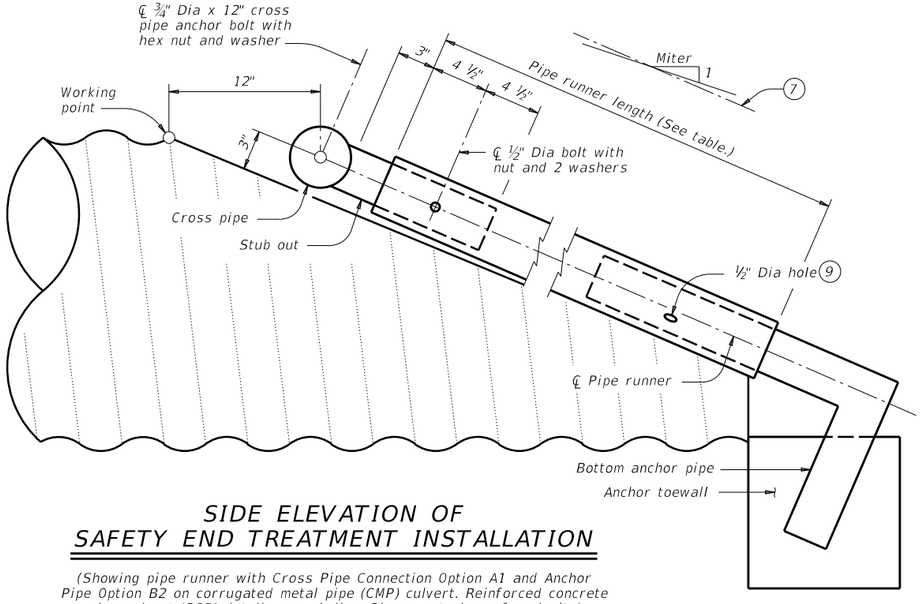
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



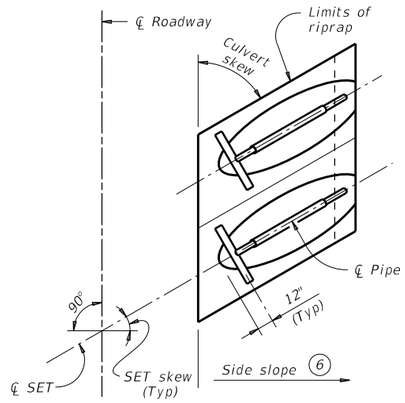
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

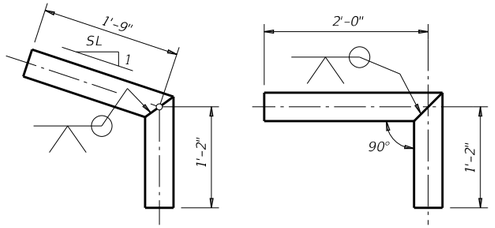


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)

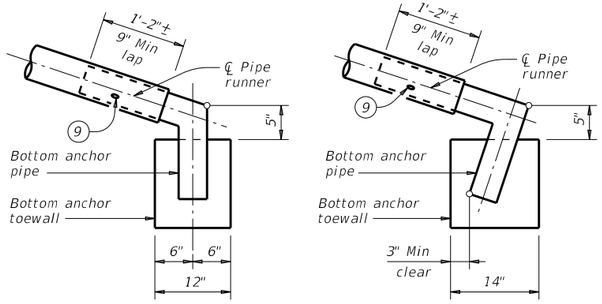


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

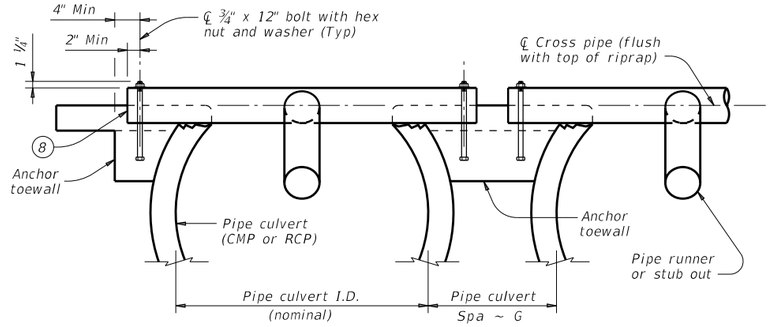
BOTTOM ANCHOR PIPE DETAILS (10)



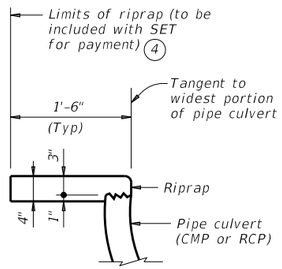
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Recommended values of side slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.

(8) Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1/2" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.

Payment for riprap and toewall is included in the price bid for each safety end treatment.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

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	AUS	TRAVIS		203

DATE:
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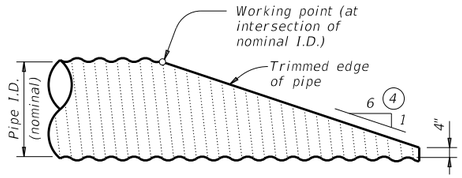
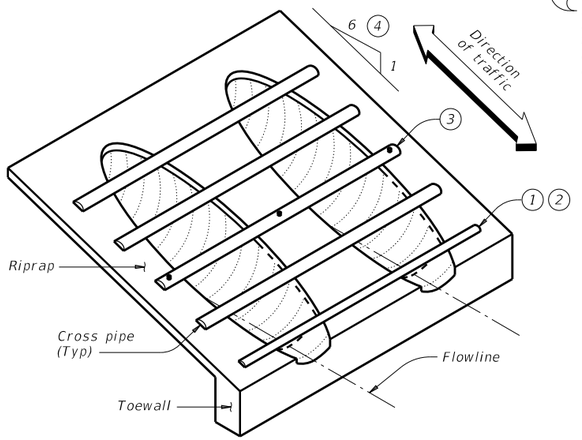


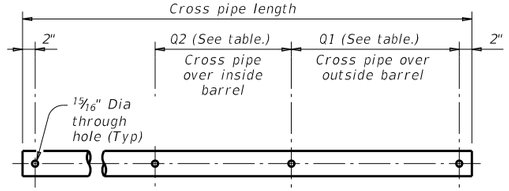
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

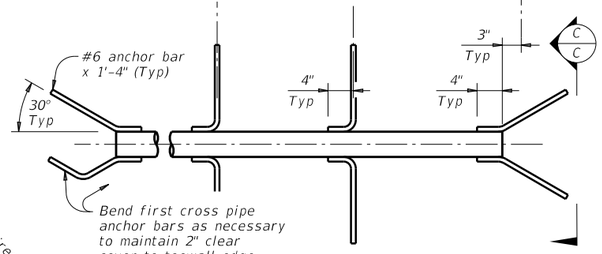
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



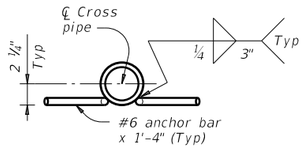
ISOMETRIC VIEW OF TYPICAL INSTALLATION



PIPE WITH BOLTED ANCHOR

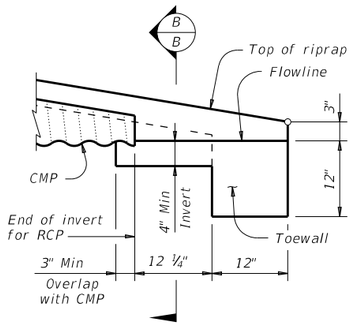


PIPE WITH ANCHOR BARS



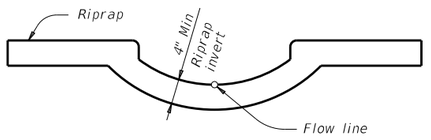
SECTION C-C

CROSS PIPE DETAILS



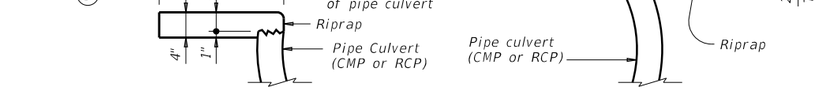
DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)

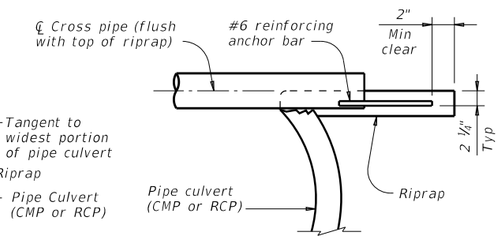


SECTION B-B

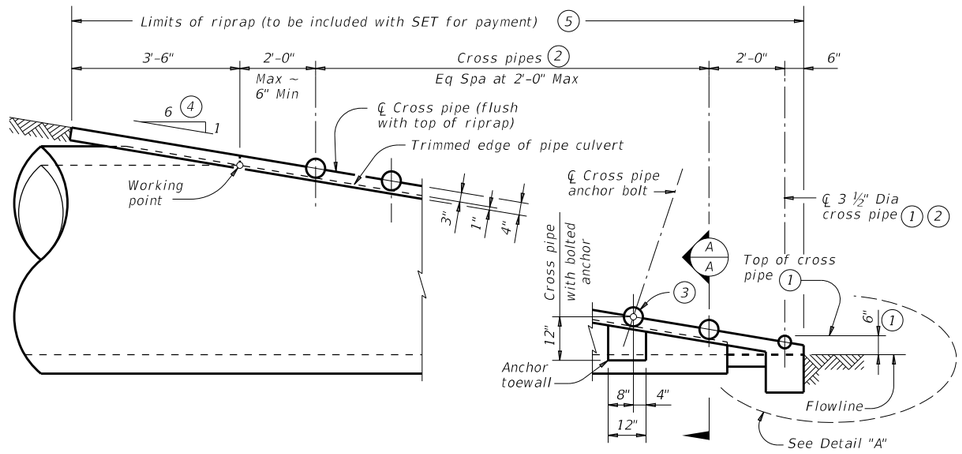
(Cross pipes not shown for clarity.)



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

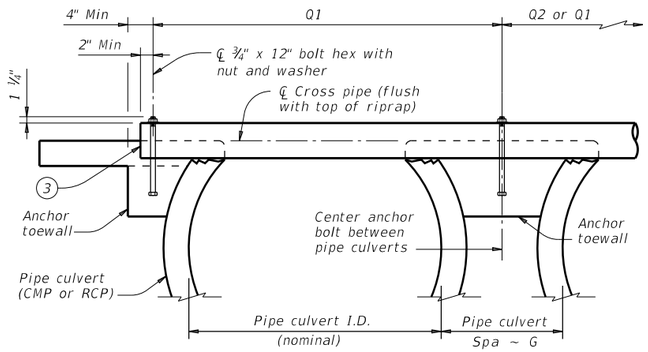


SHOWING CROSS PIPE WITH ANCHOR BAR



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"		
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	3 or more pipe culverts	3 1/2" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

(3) Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

(5) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA PIPE CULVERTS TYPE II ~ PARALLEL DRAINAGE

SETP-PD

FILE: setppdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
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	AUS	TRAVIS		204

DATE:
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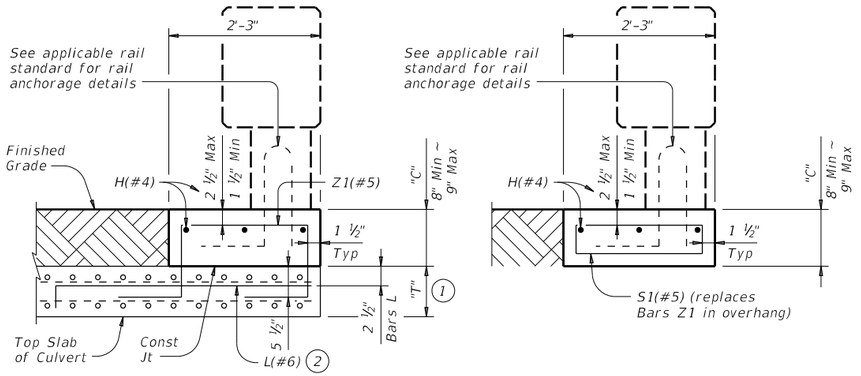
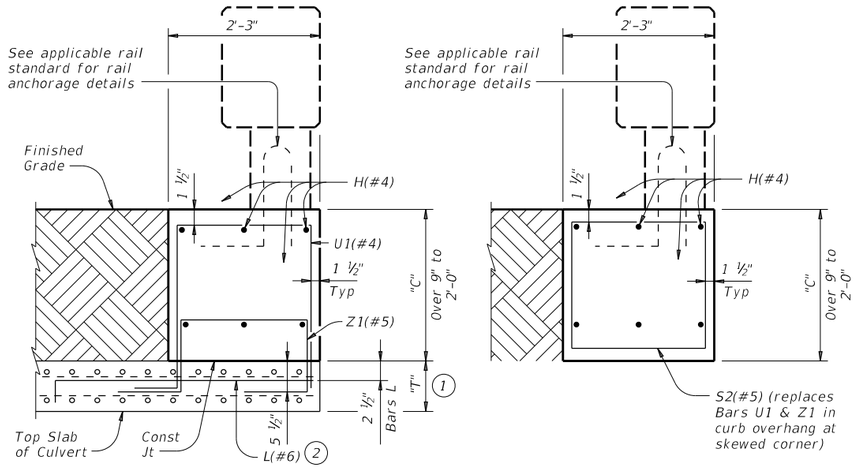


SECTION A-A SECTION B-B

TYPE 1 CURB

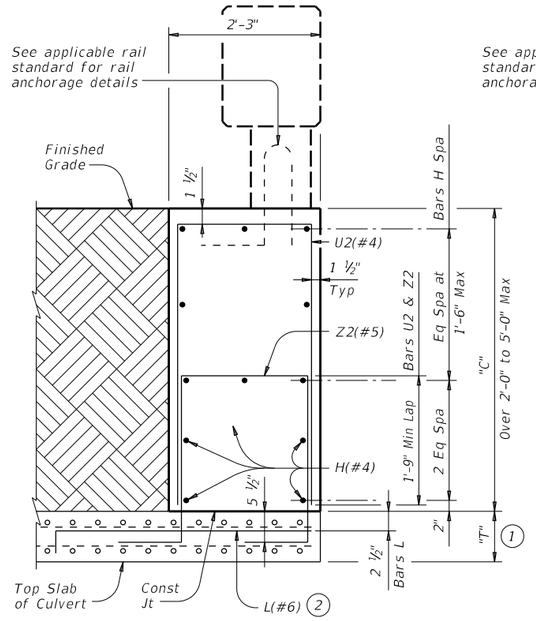
Used for curbs from 8" to 9" (Showing "C" = 9"). Showing T223 Rail, other rails similar. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC standard.



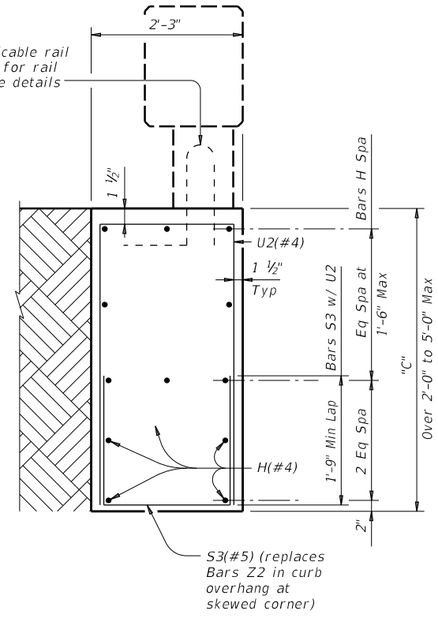
SECTION A-A SECTION B-B

TYPE 2 CURB

Used for curbs over 9" to 2'-0" (Showing "C" = 2'-0"). Showing T223 Rail, other rails similar. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC standard.



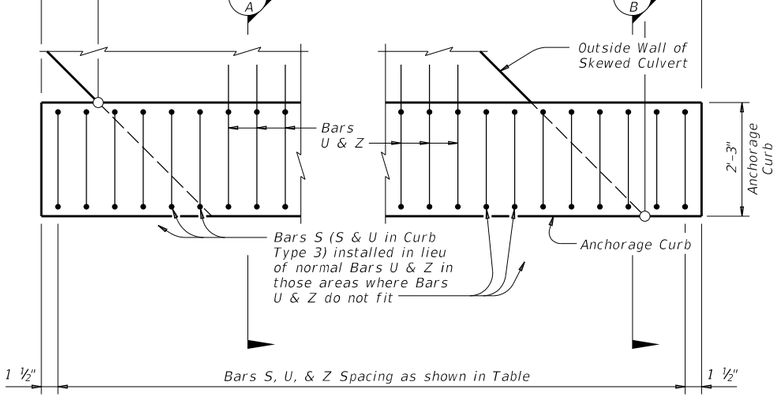
SECTION A-A



SECTION B-B

TYPE 3 CURB

Used for curbs over 2'-0" to 5'-0" (Showing "C" = 4'-0"). Showing T223 Rail, other rails similar. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC standard.



TYPICAL CURB PLAN

Showing typical installation on skewed culvert. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC standard.

TABLE OF REINFORCING SPACING

Curb Height "C"	Section Type	Bars S, U, & Z Spa
8" to 9"	1	12"
Over 9" to 2'-0"	2	9"
Over 2'-0" to 3'-0"	3	7"
Over 3'-0" to 5'-0"	3	5"

TABLE OF ESTIMATED QUANTITIES (4)

Curb Height "C"	Section Type	Reinf Steel (Lb/LF)	Class "C" Concrete (CY/LF)
8"	1	21.5	0.056
9"	1	21.5	0.063
1'-0"	2	29.7	0.083
1'-6"	2	30.6	0.125
2'-0"	2	31.5	0.167
3'-0"	3	44.6	0.250
4'-0"	3	56.8	0.333
5'-0"	3	60.0	0.417

(1) "T" is equal to the culvert top slab thickness. For Precast Boxes with slabs less than 8" thick, see SCP-MD Standard for additional details.

(2) Tilt Bars L hook as necessary to maintain cover.

(3) Optional Bars L are to be used only for Precast Box Culverts with 3'-0" closure pours.

(4) Quantities shown are for Contractor's information only. Quantities are per Linear Foot of curb length. The values for each section type in table can be interpolated for intermediate values of Curb Height, "C".

CONSTRUCTION NOTES:

When using this anchorage curb, omit normal culvert curb reinforcing bars K and H shown on the culvert standard sheets.

For vehicle safety, the top of the curb must be flush with the finished grade.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Galvanize all reinforcing steel if required elsewhere.

Provide bar laps, where required, as follows:
Uncoated or galvanized ~ #4 = 1'-11"

Provide Class "C" concrete (f'c=3,600 psi). Provide Class "C" (HPC) concrete if shown elsewhere in the plans.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

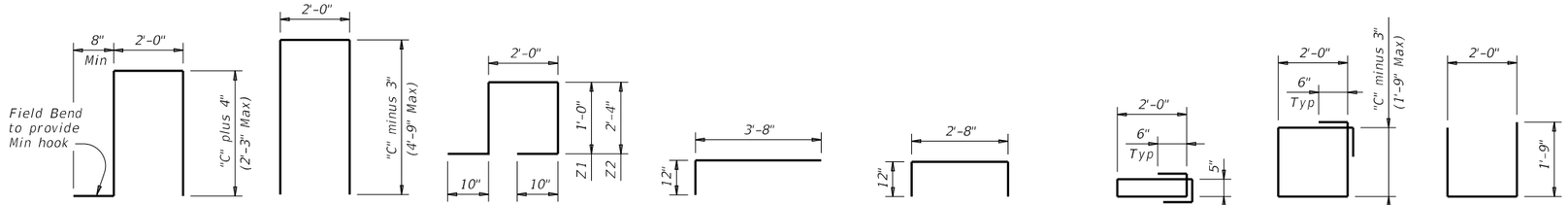
The rail anchorage curb details have sufficient strength for use with all standard rail types.

See appropriate rail standard for approved design speed restrictions, notes and details not shown.

This anchorage curb is considered part of the Box Culvert for payment.

These details are for use with curbs that are 8" to 5'-0" tall only. Curb heights that are less than or greater than those shown will require special design.

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



BARS U1 (#4) BARS U2 (#4) BARS Z (#5) BARS L (#6) (2) Spaced at 6" Max OPTIONAL BARS L (#6) (3) (2) Spaced at 6" Max BARS S1 (#5) BARS S2 (#5) BARS S3 (#5)

SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

RAIL ANCHORAGE CURB
BOX CULVERT RAIL MOUNTING DETAILS
(CURBS 8" TO 5'-0" TALL ONLY)

RAC

FILE: racste01-20.dgn	DN: GAF	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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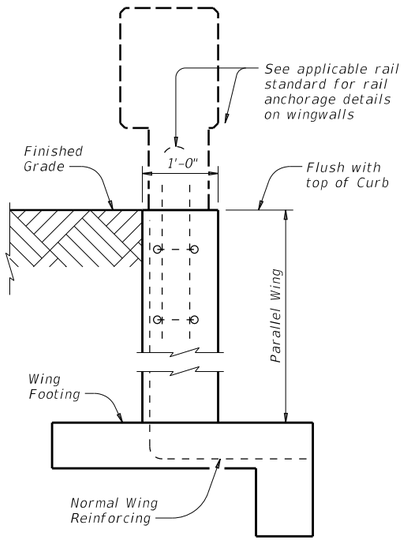
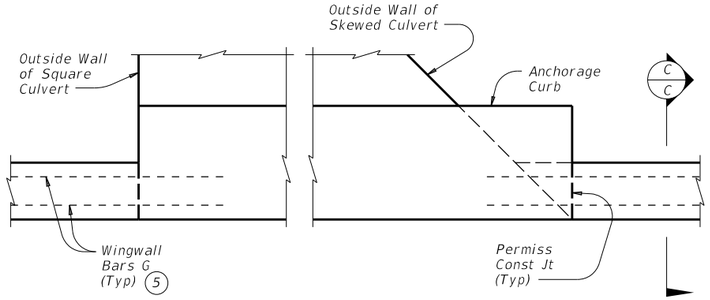


SECTION C-C



TYPICAL CURB PLAN

Curb reinforcing and footings not shown for clarity

INSTALLATION AT PARALLEL CULVERT WINGWALLS

See culvert wingwall standard for bars and details not shown.

(5) Bars G (#5), as identified on the PARALLEL WINGS PW standard sheet, must extend 1'-6" into the Anchorage Curb similar to that shown for a normal culvert curb.

Texas Department of Transportation

Bridge Division Standard

RAIL ANCHORAGE CURB

BOX CULVERT
RAIL MOUNTING DETAILS
(CURBS 8" TO 5'-0" TALL ONLY)

RAC

FILE: racste01-20.dgn	DN: GAF	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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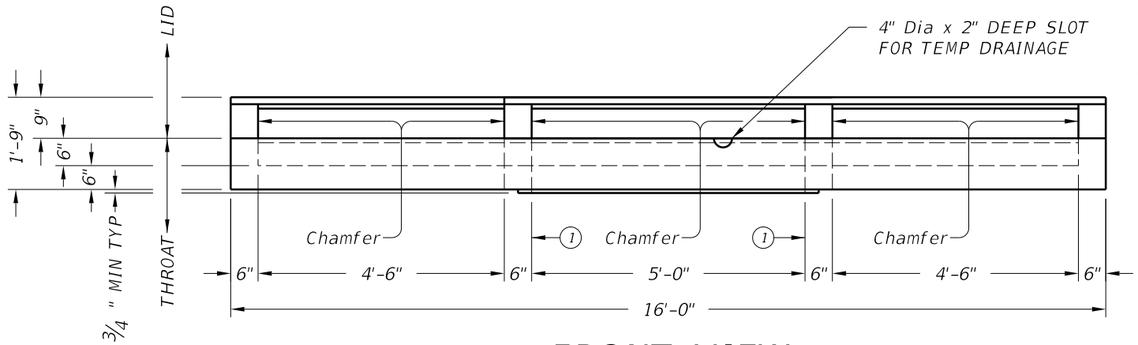
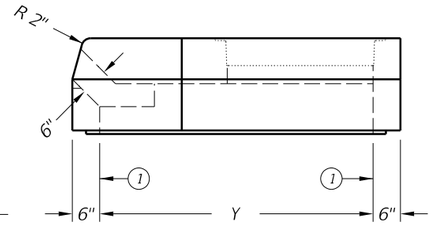
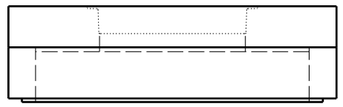


FRONT VIEW

(SHOWING LEFT AND RIGHT EXTENSIONS)

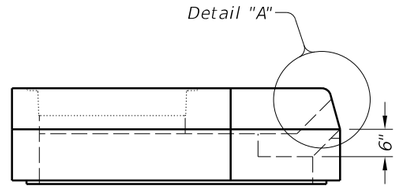


RIGHT VIEW



REAR VIEW

(EXTENSIONS NOT SHOWN)

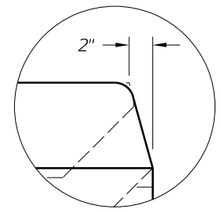


LEFT VIEW

(1) Matches inside face of wall of precast base or riser below inlet.

PLAN VIEW

(SHOWING LEFT AND RIGHT EXTENSIONS)



DETAIL "A"

HS20 LOADING

Texas Department of Transportation

Bridge Division Standard

PRECAST CURB INLET OUTSIDE ROADWAY

PCO

FILE: prestd03-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
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DATE:
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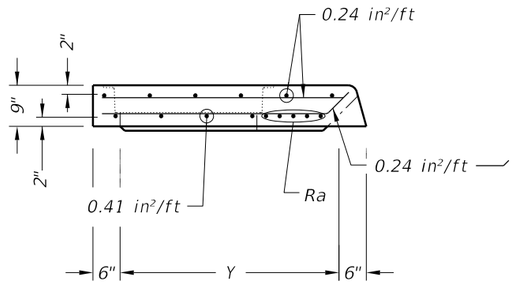
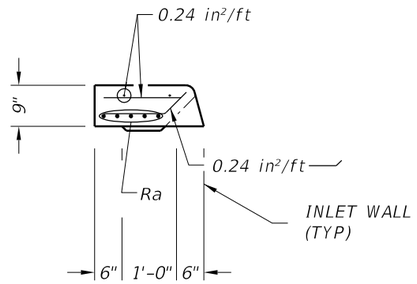
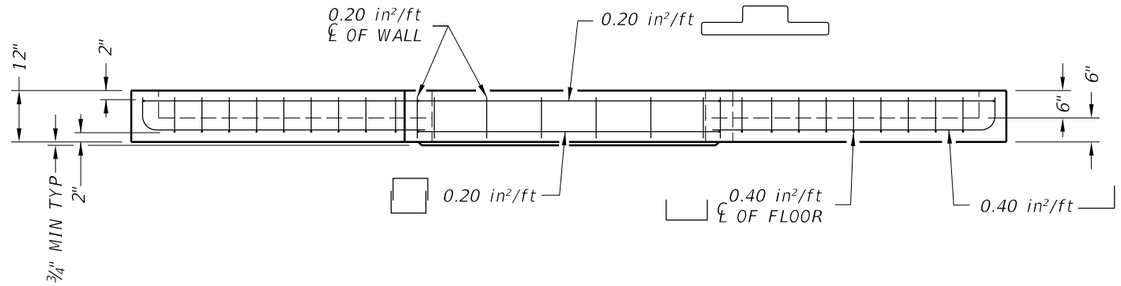


LID SECTION A-A

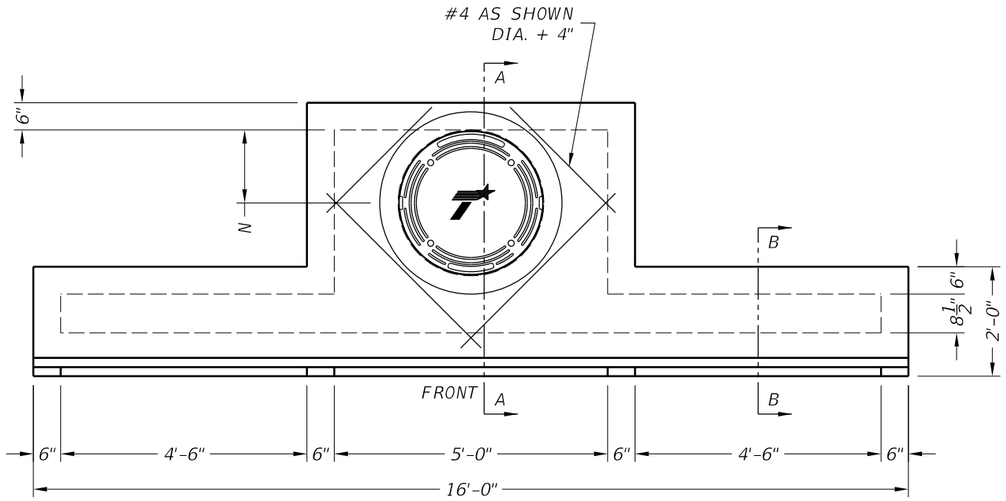


LID SECTION B-B



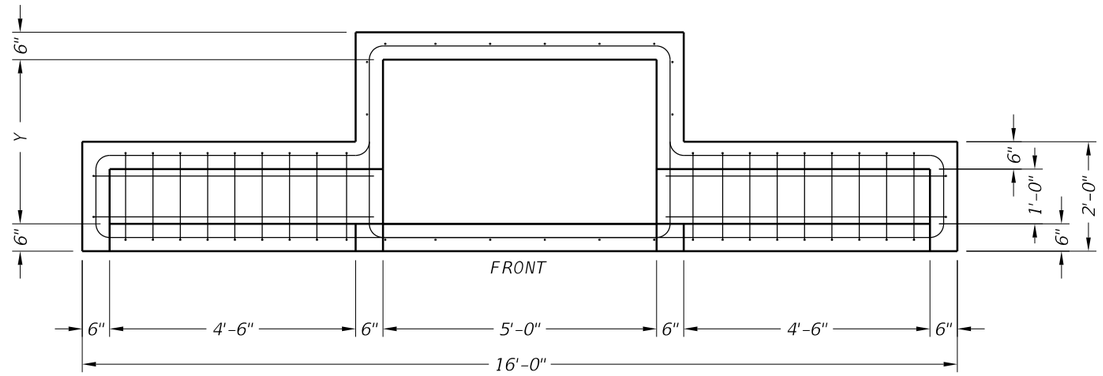
THROAT ELEVATION VIEW

(SHOWING LEFT AND RIGHT EXTENSIONS)



LID PLAN VIEW

(SHOWING LEFT AND RIGHT EXTENSIONS)



THROAT PLAN VIEW

(SHOWING LEFT AND RIGHT EXTENSIONS)

SIZE(Y)	N	MH DIA*	Ra
3'	9"	18"	(4) #5 Additional
4'	16"	32"	(4) #5 Additional
5'	16"	32"	(4) #5 Additional
6'	16"	32"	(4) #5 Additional

* Nominal ring and cover size.

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Extensions may be right, left, both or none. Provide extensions as specified elsewhere in the plans.
4. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾". Lid may employ a butt joint with dowels at the Contractor's option.
5. Provide lifting devices in conformance with Manufacturer's recommendations.
6. Provide cast iron solid cover, unless noted otherwise elsewhere in the plans.
7. Chamfer vertical edges of inlet lid ¾" as shown in Front View, sheet 1.

INSTALLATION NOTES:

1. Inlet throat and lid are not intended for direct traffic. Do not place in roadway.
2. Seal tongue and groove joints and butt joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.

GENERAL NOTES:

1. Designed according to ASTM C913.
2. Open area of main throat = 360 sq in. Open area of one extension throat = 324 sq in.
3. Payment for inlet is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, size, and extension placement. Extensions are subsidiary to inlet.

Cover dimensions are clear dimensions, unless noted otherwise.

HS20 LOADING

Texas Department of Transportation

Bridge Division Standard

PRECAST CURB INLET OUTSIDE ROADWAY

PCO

FILE: prestd03-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		208

14-XXX-0-XXXX-XX-XXX

4" minimum

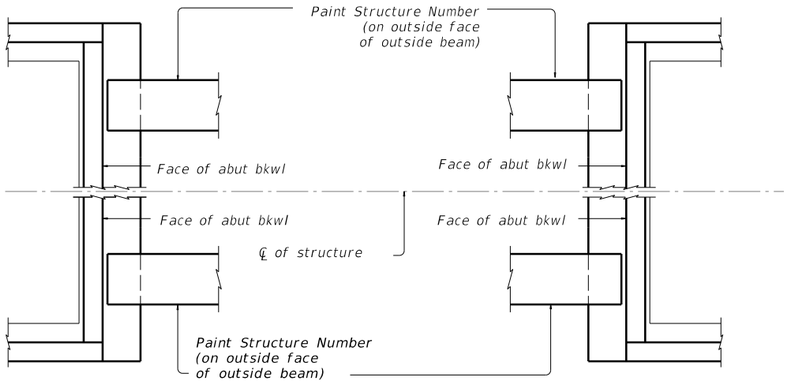
District designation | County designation | Placeholder | Control | Section | Structure number

PAINTED STRUCTURE NUMBER LEGEND

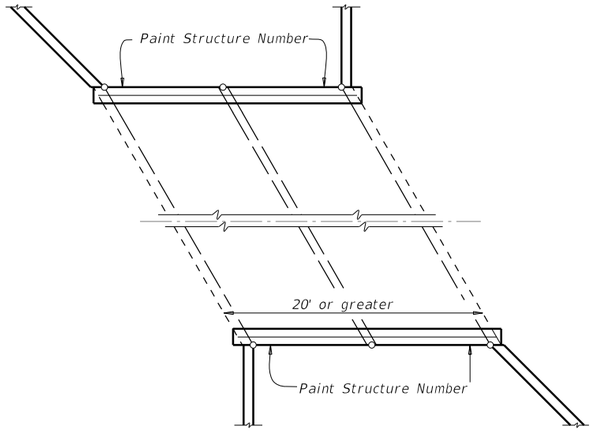
14-XXX-0-XXXX-XX-XXX

- District designation
  14 = Austin District
- County designation
- Placeholder required for national inventory purposes
- Control
- Section
- Structure number

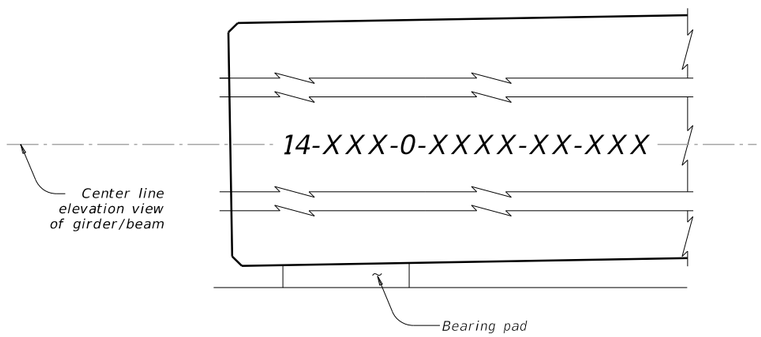
011 = Bastrop
016 = Blanco
027 = Burnet
028 = Caldwell
087 = Gillespie
106 = Hays
144 = Lee
150 = Llano
157 = Mason
227 = Travis
246 = Williamson



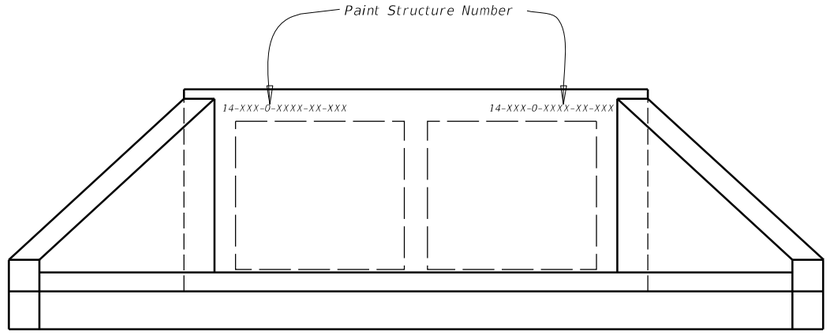
AT BRIDGE LOCATIONS



AT CULVERT LOCATIONS



ELEVATION VIEW DETAIL



ELEVATION VIEW DETAIL

GENERAL NOTES:

Permanently mark each structure with the painted structure number in accordance with the plans.

Each Structure shall have 4 (four) Structure numbers painted per structure.

Painting structure number work will not be measured or paid for directly but will be considered subsidiary to other pertinent items.

MATERIAL:

Provide black, lead free, CFC free, and CFHC free paint that is water proof, weather resistant, and dries instantly on all surfaces without smearing, smudging, or rippling

Texas Department of Transportation

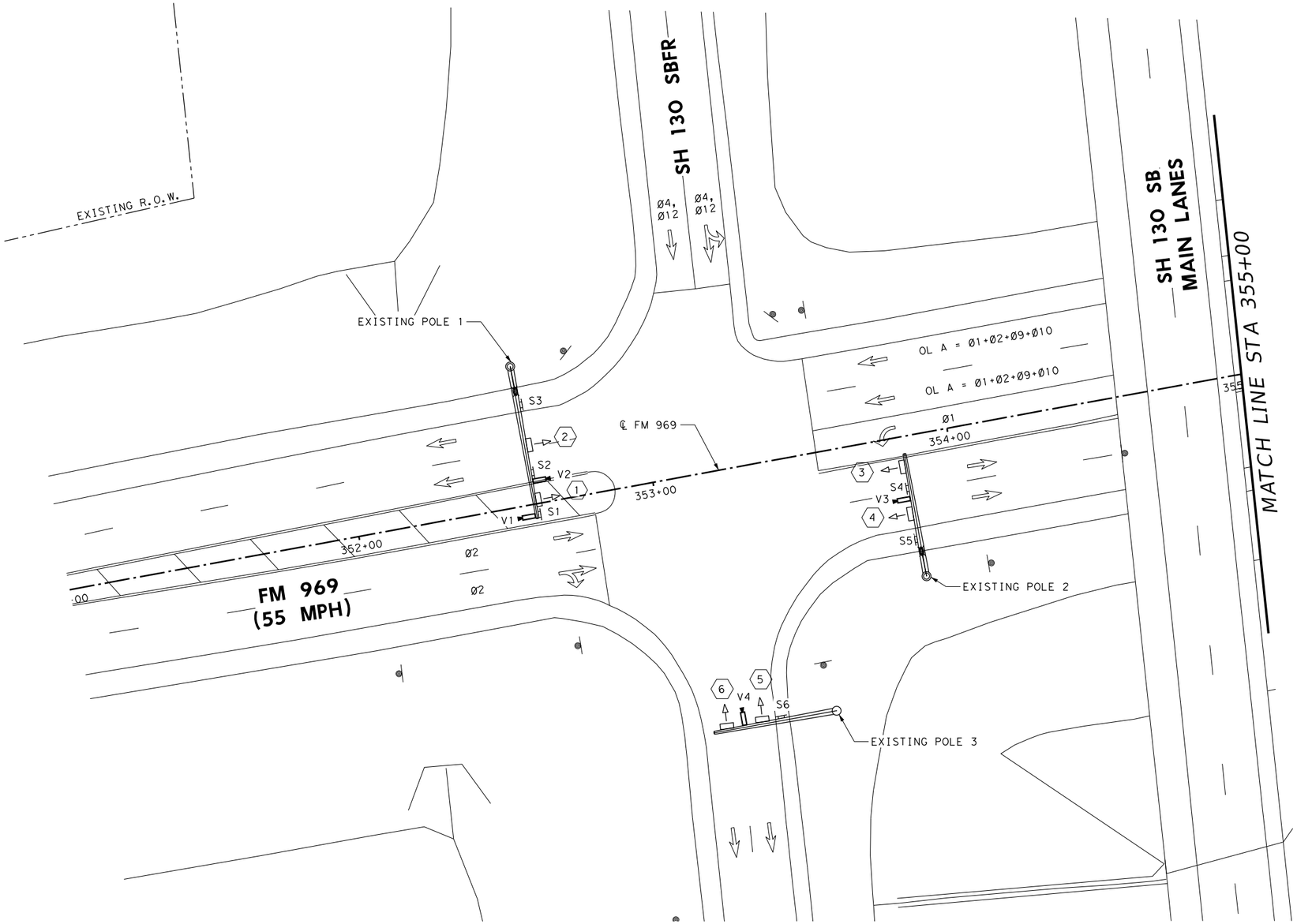
Austin District Standard

PAINTING STRUCTURE NUMBERS

PSN-19 (AUS)

FILE: psn-19.dgn	CONT	SECT	JOB	HIGHWAY
	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		209

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



LEGEND

- EXIST TRAFFIC SIGNAL POLE
- EXIST TRAFFIC SIGNAL CONTROLLER
- EXIST HORIZONTAL SIGNAL HEAD
- EXIST VERTICAL SIGNAL HEAD
- EXIST TRAFFIC SIGNAL MAST ARM
- EXIST LUMINAIRE
- EXIST SIGN ON MAST ARM
- EXIST PULL BOX
- EXIST VIDEO DETECTION
- EXIST PEDESTRIAN SIGNAL HEAD
- EXIST PEDESTRIAN PUSH BUTTON
- DIRECTION OF TRAFFIC
- (#) SIGNAL HEAD #

SCALE: 1" = 40'

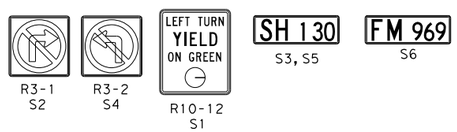
40 20 0 40

EXISTING SIGNAL SCHEDULE

R Y G — ONE WAY, 3 SECTION HORIZONTAL SIGNAL HEAD 2, 3, 4, 5, 6

R Y ←Y G G — ONE WAY, 5 SECTION HORIZONTAL SIGNAL HEAD 1

EXISTING SIGNS



R3-1 S2 — R3-2 S4 — R10-12 S1 — SH 130 S3, S5 — FM 969 S6

NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL EXISTING SIGNAL EQUIPMENT TO REMAIN.

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MAEN A. HOURANI
88202
LICENSED
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6/25/2021

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STATE OF TEXAS
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FRN - F-1386

TRAFFIC SIGNAL MODIFICATION PLANS

EXISTING INTERSECTION CONDITIONS

FM 969 AT SH 130 SBFR

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		210
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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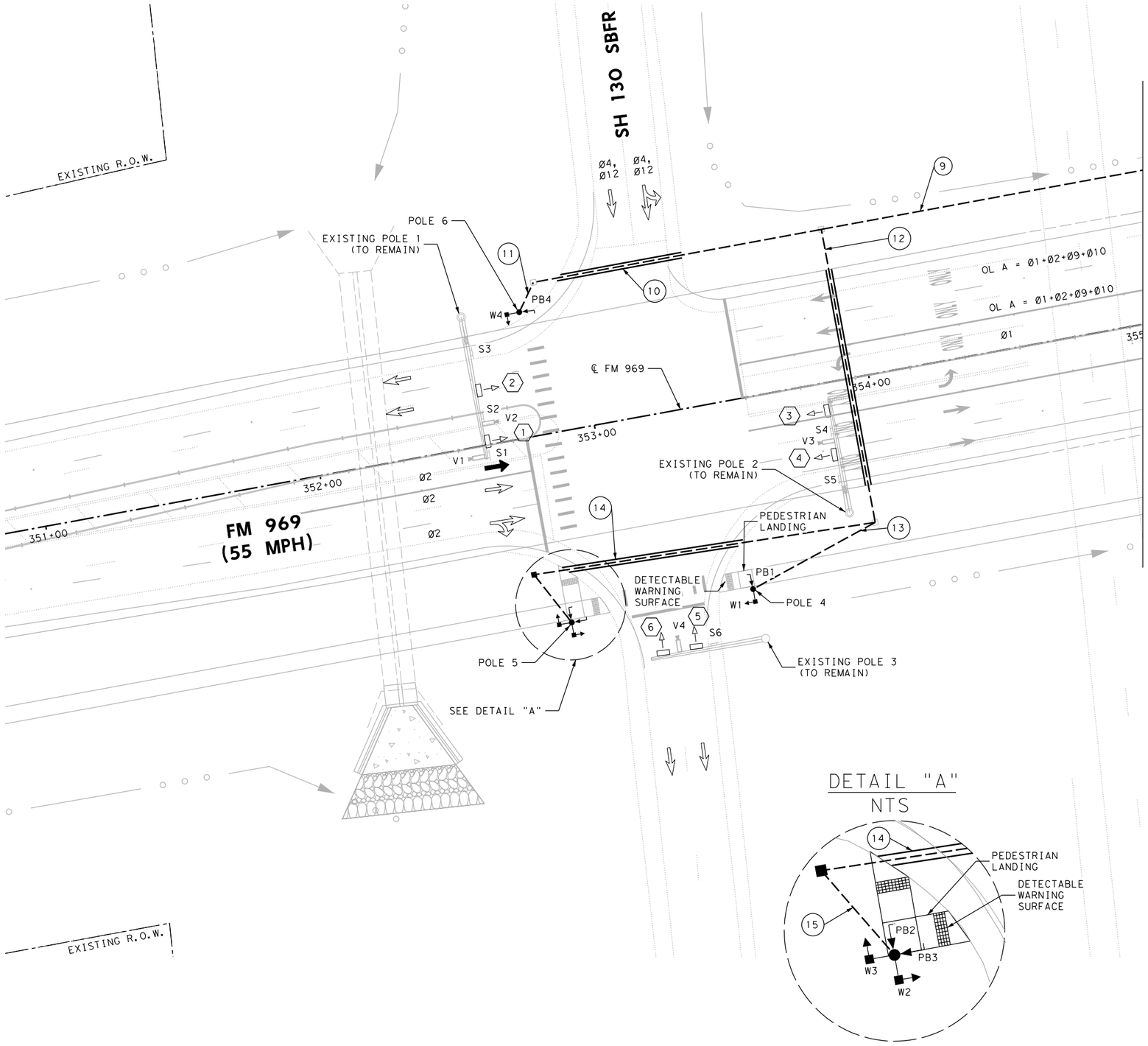

DETAIL "A"
NTS

LEGEND

- PROP TRAFFIC SIGNAL POLE
- PROP PEDESTAL POLE
- PROP TRAFFIC SIGNAL CONTROLLER
- PROP TRAFFIC SIGNAL MAST ARM
- PROP LUMINAIRE
- PROP HORIZONTAL SIGNAL HEAD
- PROP VERTICAL SIGNAL HEAD
- PROP SIGN ON MAST ARM
- PROP VIDEO DETECTION CAMERA
- PROP PEDESTRIAN SIGNAL HEAD
- PROP PEDESTRIAN PUSH BUTTON
- PROP PULL BOX (TY D)
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- PROP ELECTRICAL SERVICE
- SIGNAL HEAD #
- DIRECTION OF TRAFFIC

SCALE: 1" = 40'

40 20 0 40

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6/25/2021

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STATE OF TEXAS

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TRAFFIC SIGNAL MODIFICATION PLANS

PROPOSED INTERSECTION CONDITIONS

FM 969 AT SH 130 SBFR

SHEET 1 OF 1

DESIGN BY:	FED. RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		211
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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POLE AND CONTROLLER LOCATION (FM 969 BASELINE)			
POLE NO.	STATION	OFFSET	DESCRIPTION
1	EXISTING	EXISTING	EXISTING SIGNAL POLE AND MAST ARM TO REMAIN
2	EXISTING	EXISTING	EXISTING SIGNAL POLE AND MAST ARM TO REMAIN
3	EXISTING	EXISTING	EXISTING SIGNAL POLE AND MAST ARM TO REMAIN
4	**353+45.37**	**68.04' RT**	**PROP 10' PEDESTAL POLE, ATTACH W1 & PB1**
5	**352+79.23**	**68.05' RT**	**PROP 10' PEDESTAL POLE, ATTACH W2, PB2, W3 & PB3**
6	**352+80.86**	**44.74' LT**	**PROP 10' PEDESTAL POLE, ATTACH W4 & PB4**

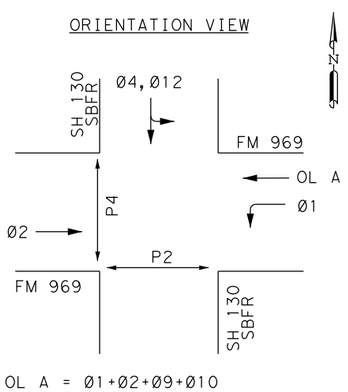
SUMMARY OF CONDUITS AND CABLES - FM 969 AT SH 130 SBFR							
RUN NO.	CONDUIT				PED. SIGNAL		GROUND
	TRENCH	LENGTH	BORE	LENGTH	2/C	5/C	#6 AWG
	2"		2"		#14 AWG	#14 AWG	(BARE)
9	1	120			4	4	
10	1	105			1	1	
11	1	12			1	1	1
12	1	107			3	3	
13	1	55			3	3	1
14	1	65	1	60	1	1	1
15	1	25			2	2	1
TOTAL		489		60	1258	1258	217

CNDR. COLOR	CABLE 1 POLE 4 TO CNTRL 5 CONDR	CABLE 2 POLE 4 TO CNTRL 2 CONDR	CABLE 3 POLE 5 TO CNTRL 5 CONDR	CABLE 4 POLE 5 TO CNTRL 2 CONDR	CABLE 5 POLE 5 TO CNTRL 5 CONDR	CABLE 6 POLE 5 TO CNTRL 2 CONDR	CABLE 7 POLE 6 TO CNTRL 5 CONDR	CABLE 8 POLE 6 TO CNTRL 2 CONDR
BLACK	W1 W PHASE Ø2	PB1 PHASE Ø2	W2 W PHASE Ø2	PB2 PHASE Ø2	W3 W PHASE Ø4	PB3 PHASE Ø4	W4 W PHASE Ø4	PB4 PHASE Ø4
WHITE	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON
RED	SPARE		SPARE		SPARE		SPARE	
GREEN	SPARE		SPARE		SPARE		SPARE	
ORANGE	W1 DW PHASE Ø2		W2 DW PHASE Ø2		W3 DW PHASE Ø4		W4 DW PHASE Ø4	

INSIDE POLES	14 AWG	
	2/C	5/C
POLE 1		
POLE 2		
POLE 3		
POLE 4	5'	10'
POLE 5	10'	20'
POLE 6	5'	10'
TOTAL	20'	40'

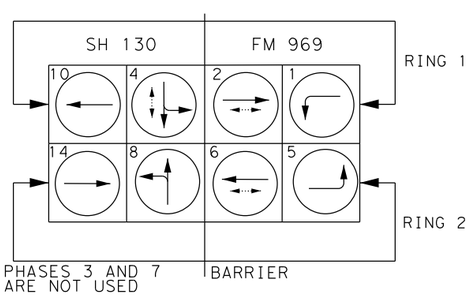
INTERSECTION PHASING

ORIENTATION VIEW



OL A = Ø1+Ø2+Ø09+Ø10

PHASING DIAGRAM

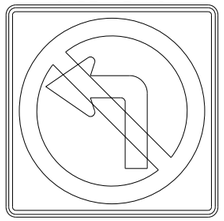


PHASES 3 AND 7 ARE NOT USED

PEDESTRIAN PHASE

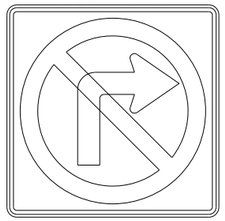
SIGN SCHEDULE

EXISTING SIGNS S4 (TO BE REMAIN)



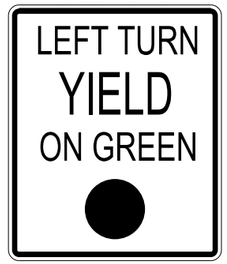
R3-2 36"x36"

EXISTING SIGNS S2 (TO BE REMAIN)



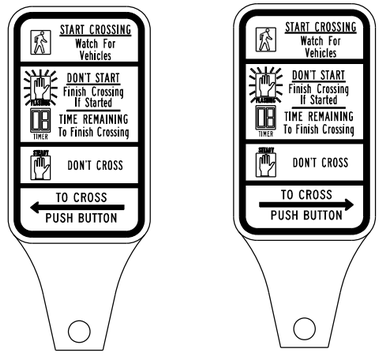
R3-1 36"x36"

EXISTING SIGNS S1 (TO BE REMAIN)



R10-12 30"x36"

PROPOSED ACCESSIBLE PEDESTRIAN SIGNALS



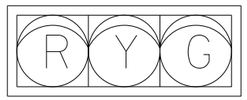
R10-3e(L) PB2, PB4

R10-3e(R) PB1, PB3

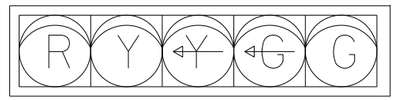
EXISTING SIGNS S6 (TO REMAIN)

EXISTING SIGN S3, S5 (TO REMAIN)

SIGNAL SCHEDULE

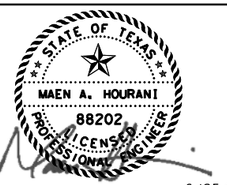


EXISTING ONE WAY, 3 SECTION HORIZONTAL SIGNAL HEAD 2,3,4,5,6 (EXIST TO REMAIN)



EXISTING ONE WAY, 5 SECTION HORIZONTAL SIGNAL HEAD 1 (TO BE REMAIN)

PROPOSED PEDESTRIAN SIGNALS W1, W2, W3, W4



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FRN - F-1386

TRAFFIC SIGNAL MODIFICATION PLANS

TRAFFIC SIGNAL DETAILS

FM 969 AT SH 130 SBFR

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		212
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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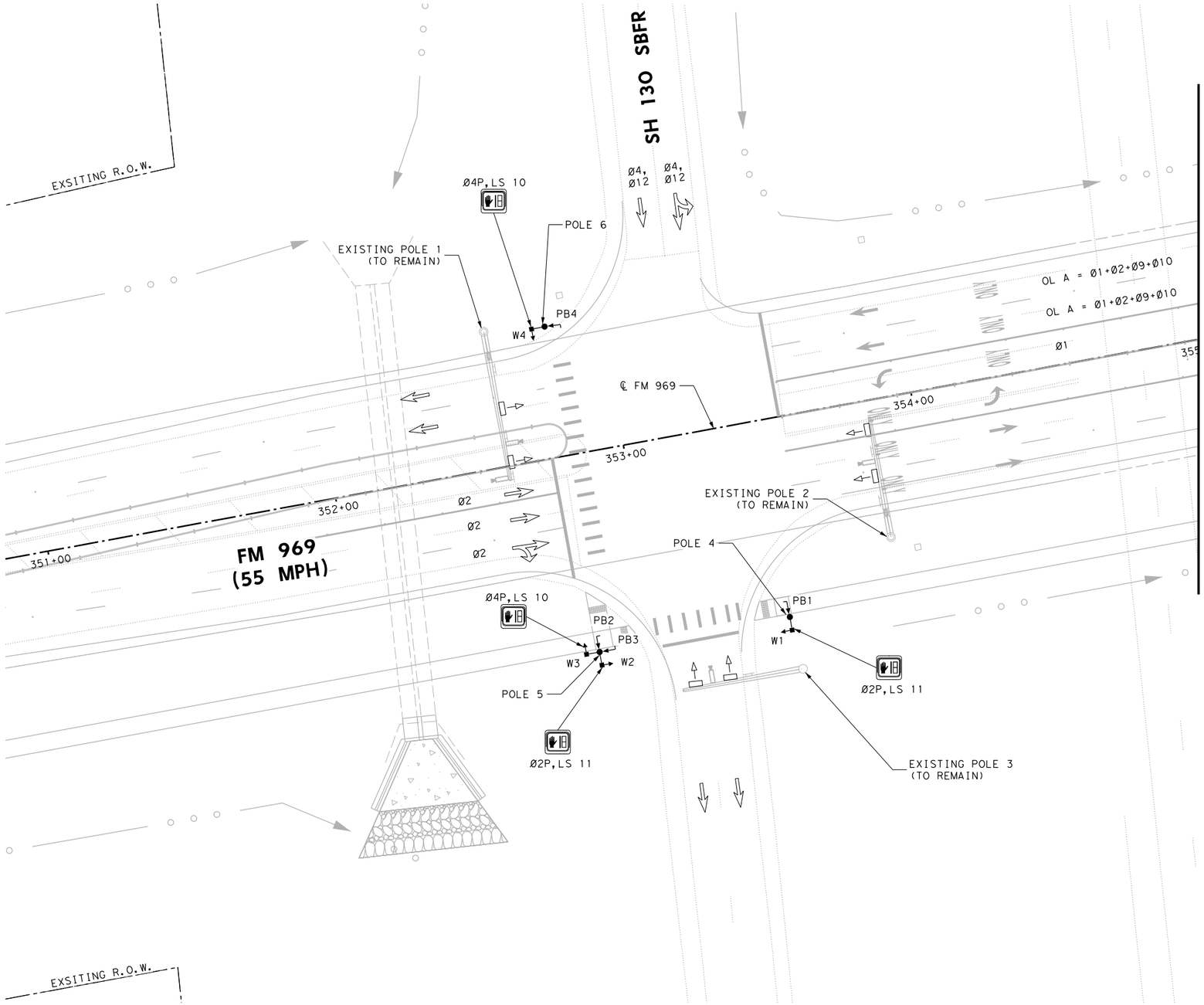

LEGEND

- PROP TRAFFIC SIGNAL POLE
- PROP PEDESTAL POLE
- PROP TRAFFIC SIGNAL CONTROLLER
- PROP TRAFFIC SIGNAL MAST ARM
- PROP LUMINAIRE
- PROP HORIZONTAL SIGNAL HEAD
- PROP VERTICAL SIGNAL HEAD
- PROP SIGN ON MAST ARM
- PROP VIDEO DETECTION CAMERA
- PROP PEDESTRIAN SIGNAL HEAD
- PROP PEDESTRIAN PUSH BUTTON
- PROP PULL BOX (TY D)
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- PROP ELECTRICAL SERVICE
- SIGNAL HEAD #
- DIRECTION OF TRAFFIC

SCALE: 1" = 40'

40 20 0 40

FM 969 AT SH 130 SBFR

APS UNIT #	ACKNOWLEDGEMENT DEFAULT "WAIT"	EXTENDED PRESS MESSAGE	WALK PHASE MESSAGE
		WAIT TO CROSS (STREET NAME) AT (CROSS STREET NAME)"	(STREET NAME) WALK SIGN IS ON TO CROSS, (STREET NAME)"
PB1	YES	130 AT 969	AUSTRALIAN TONE
PB2	YES	130 AT 969	AUSTRALIAN TONE
PB3	YES	969 AT 130	AUSTRALIAN TONE
PB4	YES	969 AT 130	AUSTRALIAN TONE

STATE OF TEXAS
MAEN A. HOURANI
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PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS
1839

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TRAFFIC SIGNAL MODIFICATION PLANS

APS/LOAD SWITCH INFORMATION

FM 969 AT SH 130 SBFR

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		213
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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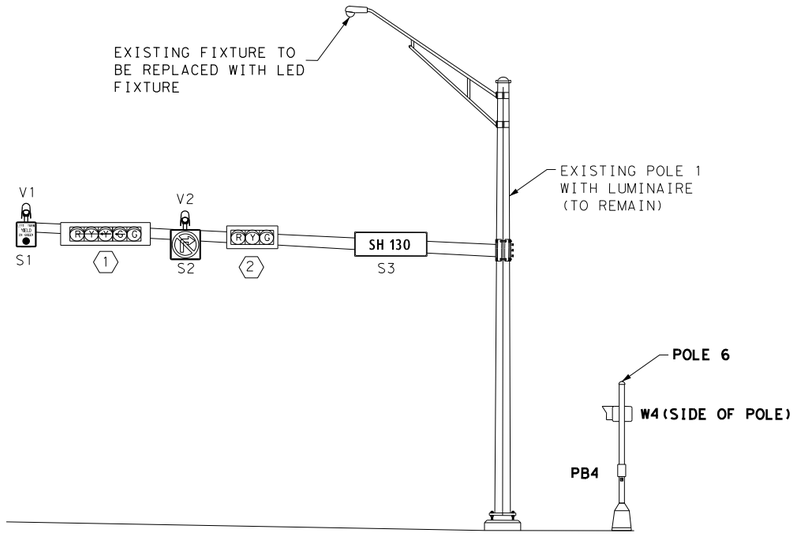
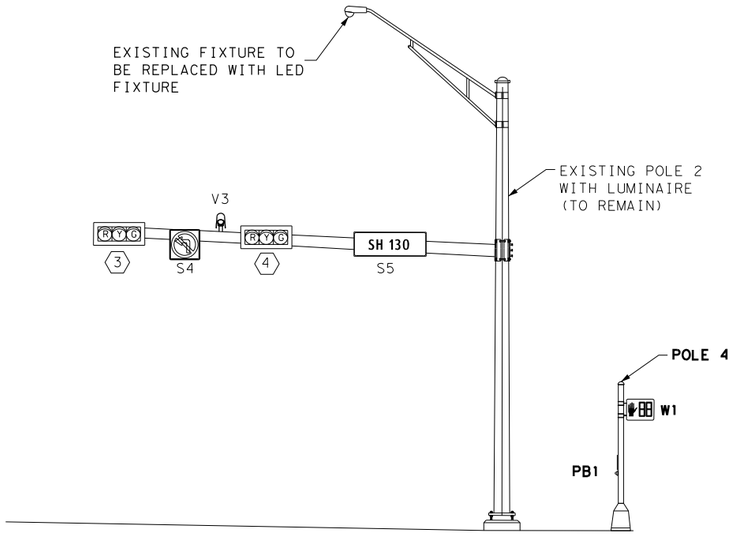
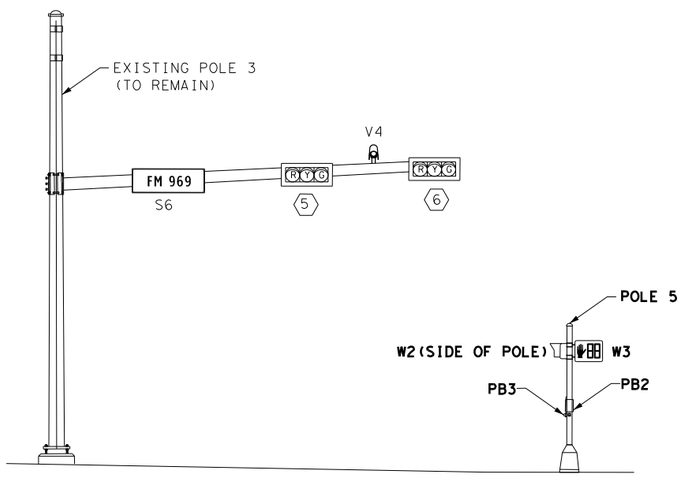


LOOKING WEST ON FM 969
NOT TO SCALE



LOOKING EAST ON FM 969
NOT TO SCALE



LOOKING SOUTH ON SH 130
NOT TO SCALE

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TRAFFIC SIGNAL MODIFICATION PLANS

SIGNAL ELEVATION

FM 969 AT SH 130 SBFR

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		214
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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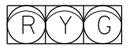
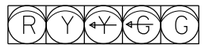
EXISTING SIGNAL SCHEDULE



ONE WAY, 3 SECTION
HORIZONTAL SIGNAL HEAD
1, 2, 3, 4, 6



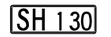
ONE WAY, 5 SECTION
HORIZONTAL SIGNAL HEAD 5

EXISTING SIGNS

R3-1
S5

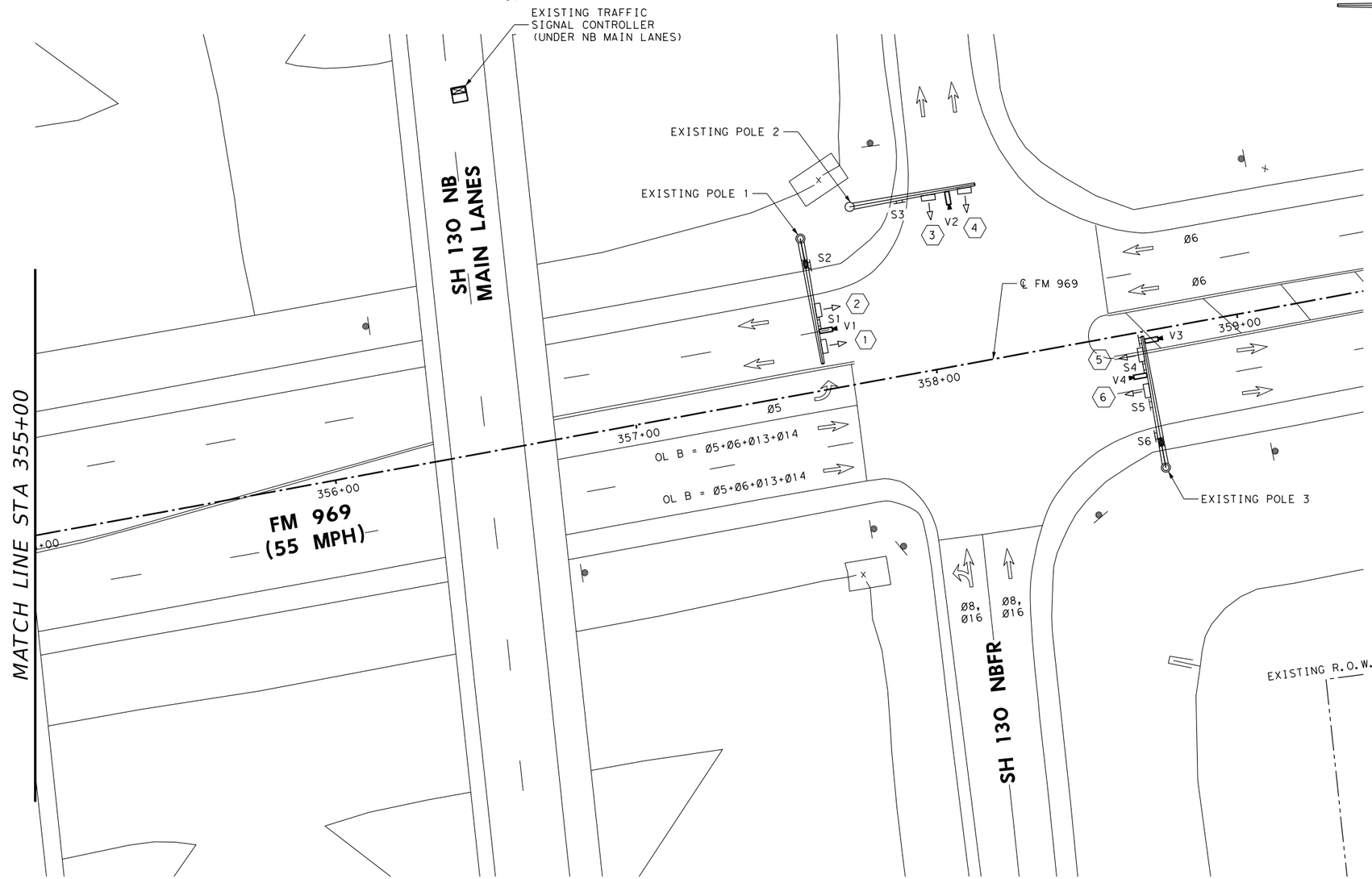
R3-2
S1

R10-12
S4



S2, S6

S3



NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL EXISTING SIGNAL EQUIPMENT TO REMAIN.

LEGEND

- EXIST TRAFFIC SIGNAL POLE
- EXIST TRAFFIC SIGNAL CONTROLLER
- EXIST HORIZONTAL SIGNAL HEAD
- EXIST VERTICAL SIGNAL HEAD
- EXIST TRAFFIC SIGNAL MAST ARM
- EXIST LUMINAIRE
- EXIST SIGN ON MAST ARM
- EXIST PULL BOX
- EXIST VIDEO DETECTION
- EXIST PEDESTRIAN SIGNAL HEAD
- EXIST PEDESTRIAN PUSH BUTTON
- DIRECTION OF TRAFFIC
- SIGNAL HEAD #

SCALE: 1" = 40'

40 20 0 40

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TRAFFIC SIGNAL
MODIFICATION PLANS
EXISTING INTERSECTION CONDITIONS
FM 969 AT SH 130 NBFR

SHEET 1 OF 1

DESIGN BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		215
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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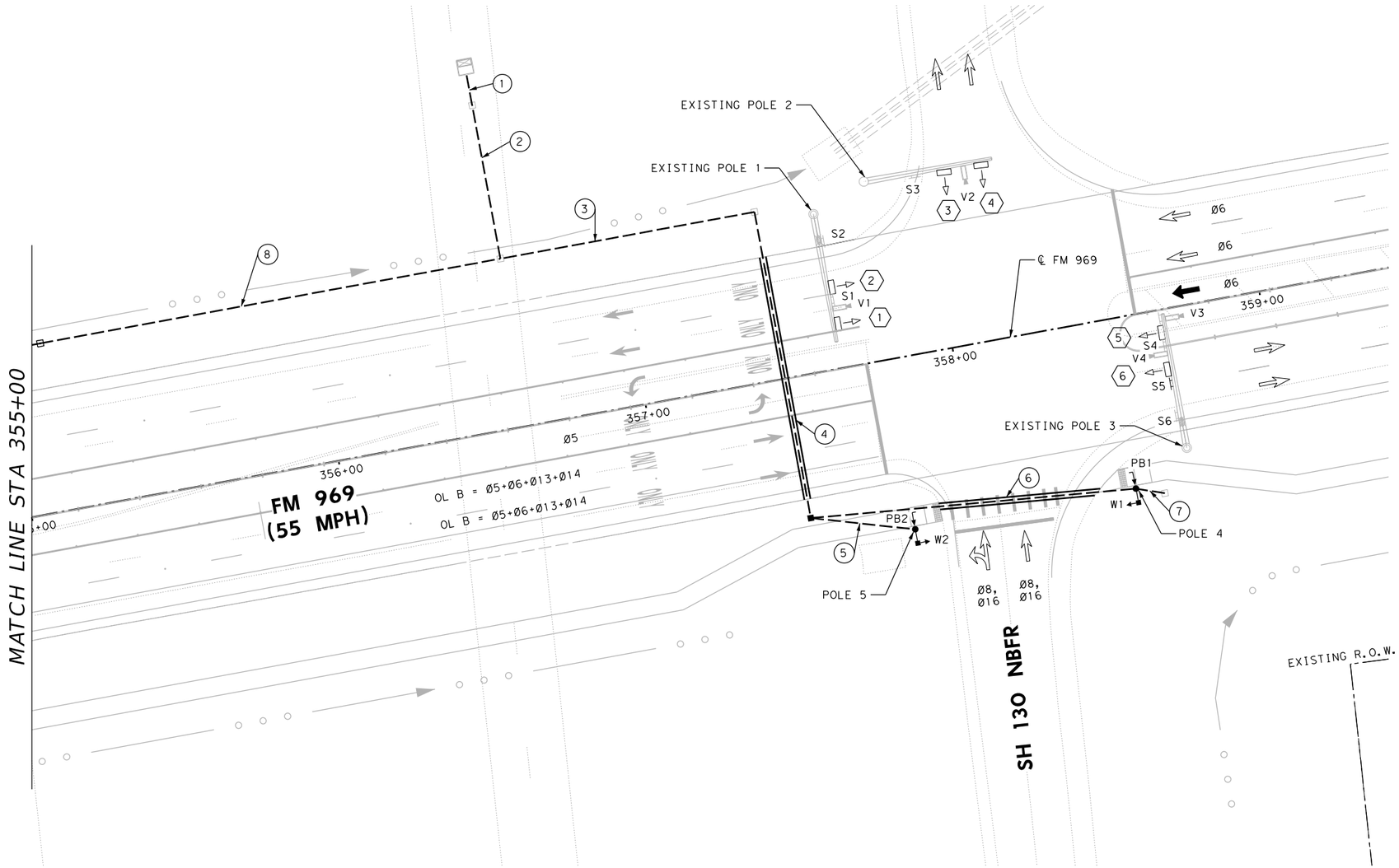

LEGEND

- PROP TRAFFIC SIGNAL POLE
- PROP PEDESTAL POLE
- PROP TRAFFIC SIGNAL CONTROLLER
- PROP TRAFFIC SIGNAL MAST ARM
- PROP LUMINAIRE
- PROP HORIZONTAL SIGNAL HEAD
- PROP VERTICAL SIGNAL HEAD
- PROP SIGN ON MAST ARM
- PROP VIDEO DETECTION CAMERA
- PROP PEDESTRIAN SIGNAL HEAD
- PROP PEDESTRIAN PUSH BUTTON
- PROP PULL BOX (TY D)
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- PROP ELECTRICAL SERVICE
- SIGNAL HEAD #
- DIRECTION OF TRAFFIC

SCALE: 1" = 40'

40 20 0 40

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TRAFFIC SIGNAL
MODIFICATION PLANS
PROPOSED INTERSECTION CONDITIONS
FM 969 AT SH 130 NBFR

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		216
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
6:55:20 PM
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POLE AND CONTROLLER LOCATION (FM 969 BASELINE)			
POLE NO.	STATION	OFFSET	DESCRIPTION
1	EXISTING	EXISTING	EXISTING SIGNAL POLE AND MAST ARM TO REMAIN
2	EXISTING	EXISTING	EXISTING SIGNAL POLE AND MAST ARM TO REMAIN
3	EXISTING	EXISTING	EXISTING SIGNAL POLE AND MAST ARM TO REMAIN
4	**358+49.66**	**55.05' RT**	**PROP 10' PEDESTAL POLE, ATTACH W1 & PB1**
5	**357+77.74**	**55.09' RT**	**PROP 10' PEDESTAL POLE, ATTACH W2 & PB2**

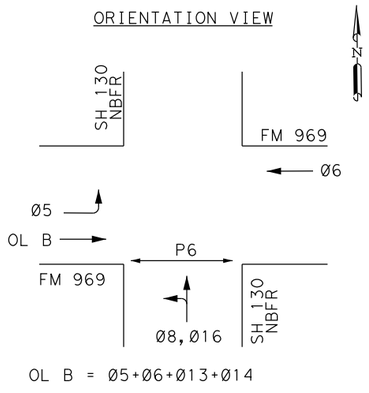
SUMMARY OF CONDUITS AND CABLES - FM 969 AT SH 130 NBFR							
RUN NO.	CONDUIT				PED. SIGNAL		GROUND
	TRENCH	LENGTH	BORE	LENGTH	2/C	5/C	#6 AWG
	2"		2"		#14 AWG	#14 AWG	(BARE)
1	1	10			6	6	
2	1	50			6	6	
3	1	83			2	2	
4	1	100			2	2	
5	1	40			1	1	1
6	1	55	1	55	1	1	1
7	1	15			1	1	1
8	1	150			4	4	1
TOTAL		503		55	1491	1491	315

CNDR. COLOR	CABLE 1 POLE 4 TO CNTRL 5 CONDR	CABLE 2 POLE 4 TO CNTRL 2 CONDR	CABLE 3 POLE 5 TO CNTRL 5 CONDR	CABLE 4 POLE 5 TO CNTRL 2 CONDR
BLACK	W1 W PHASE Ø6	PB1 PHASE Ø6	W2 W PHASE Ø6	PB2 PHASE Ø6
WHITE	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON
RED	SPARE		SPARE	
GREEN	SPARE		SPARE	
ORANGE	W1 DW PHASE Ø6		W2 DW PHASE Ø6	

INSIDE POLES	14 AWG	
	2/C	5/C
POLE 1		
POLE 2		
POLE 3		
POLE 4	5'	10'
POLE 5	5'	10'
TOTAL	10'	20'

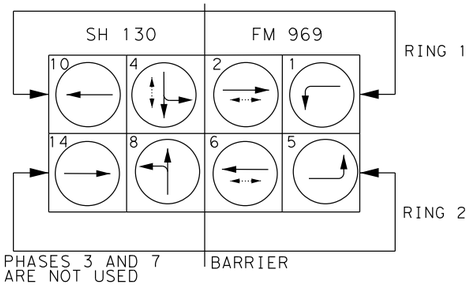
INTERSECTION PHASING

ORIENTATION VIEW



OL B = Ø5+Ø6+Ø13+Ø14

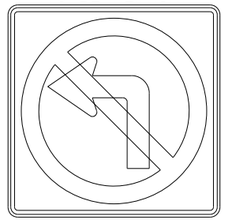
PHASING DIAGRAM



PEDESTRIAN PHASE

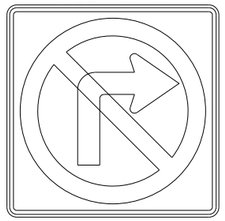
SIGN SCHEDULE

EXISTING SIGNS S1 (TO BE REMAIN)



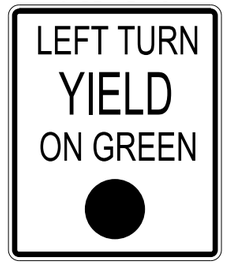
R3-2 36"x36"

EXISTING SIGNS S5 (TO BE REMAIN)



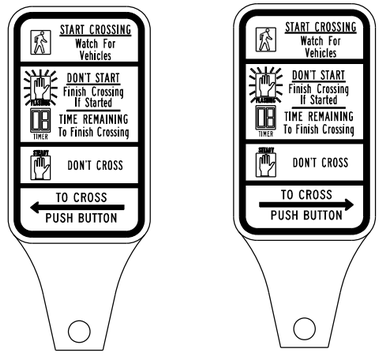
R3-1 36"x36"

EXISTING SIGNS S4 (TO BE REMAIN)



R10-12 30"x36"

PROPOSED ACCESSIBLE PEDESTRIAN SIGNALS



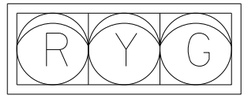
R10-3e(L) PB2

R10-3e(R) PB1

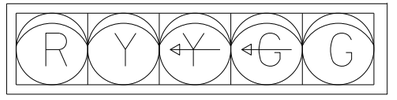
EXISTING SIGNS S3 (TO REMAIN)

EXISTING SIGN S2,S6 (TO REMAIN)

SIGNAL SCHEDULE



EXISTING ONE WAY, 3 SECTION HORIZONTAL SIGNAL HEAD 1,2,3,4,6 (EXIST TO REMAIN)



EXISTING ONE WAY, 5 SECTION HORIZONTAL SIGNAL HEAD 5 (TO BE REMAIN)

PROPOSED PEDESTRIAN SIGNALS W1,W2

MAEN A. HOURANI 88202 LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
6/25/2021

COUNTY OF TRAVIS STATE OF TEXAS 1839

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

TRAFFIC SIGNAL MODIFICATION PLANS

TRAFFIC SIGNAL DETAILS

FM 969 AT SH 130 NBFR

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		217
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
6:55:22 PM
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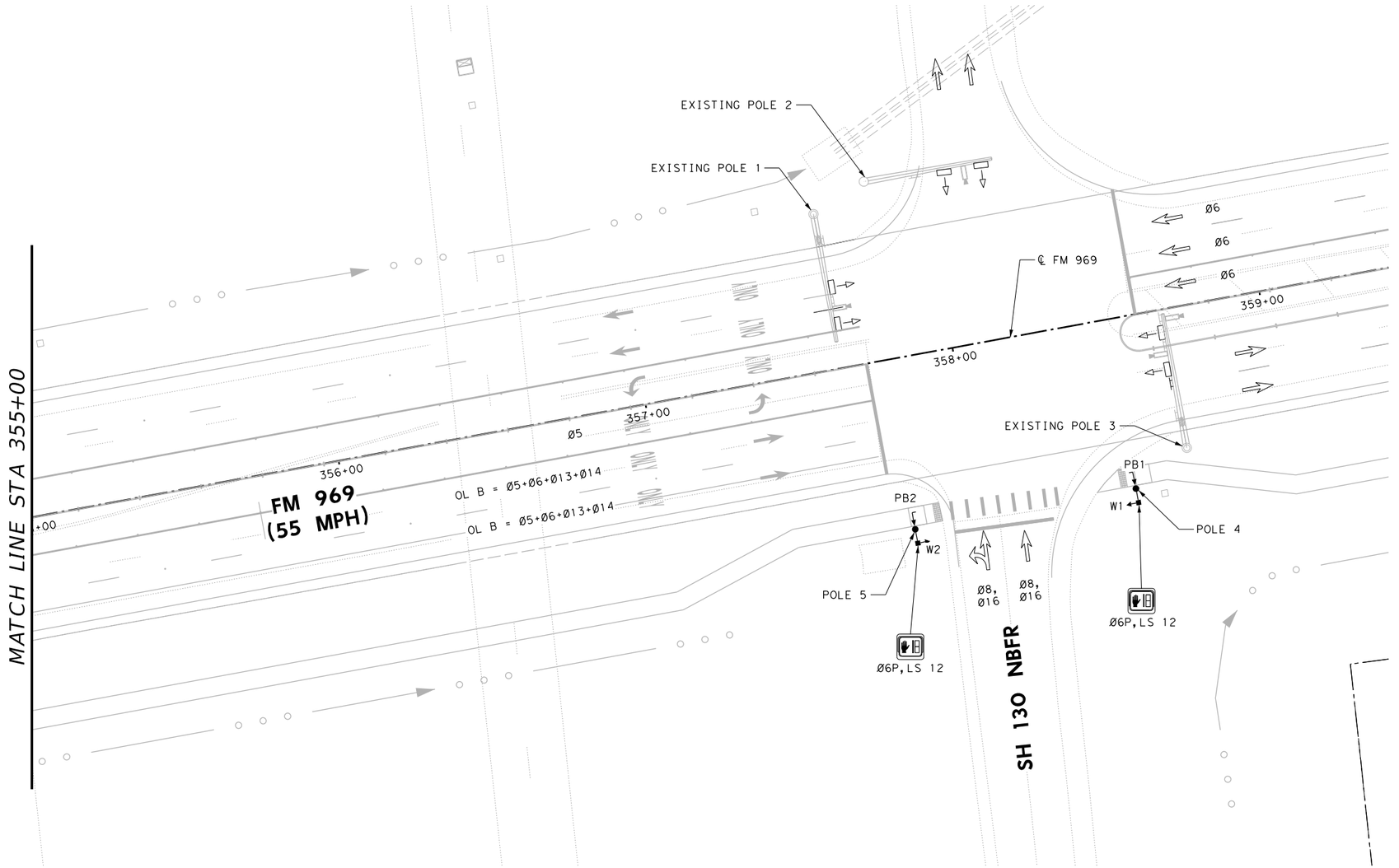

LEGEND

- PROP TRAFFIC SIGNAL POLE
- PROP PEDESTAL POLE
- PROP TRAFFIC SIGNAL CONTROLLER
- PROP TRAFFIC SIGNAL MAST ARM
- PROP LUMINAIRE
- PROP HORIZONTAL SIGNAL HEAD
- PROP VERTICAL SIGNAL HEAD
- PROP SIGN ON MAST ARM
- PROP VIDEO DETECTION CAMERA
- PROP PEDESTRIAN SIGNAL HEAD
- PROP PEDESTRIAN PUSH BUTTON
- PROP PULL BOX (TY D)
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- PROP ELECTRICAL SERVICE
- SIGNAL HEAD #
- DIRECTION OF TRAFFIC

SCALE: 1" = 40'

40 20 0 40

FM 969 AT SH 130 NBFR

APS UNIT #	ACKNOWLEDGEMENT DEFAULT "WAIT"	EXTENDED PRESS MESSAGE	WALK PHASE MESSAGE
		WAIT TO CROSS (STREET NAME) AT (CROSS STREET NAME)"	(STREET NAME) WALK SIGN IS ON TO CROSS, (STREET NAME)"
PB1	YES	130 AT 969	AUSTRALIAN TONE
PB2	YES	130 AT 969	AUSTRALIAN TONE

STATE OF TEXAS
MAEN A. HOURANI
88202
PROFESSIONAL ENGINEER
LICENSED
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

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TRAFFIC SIGNAL MODIFICATION PLANS

APS/LOAD SWITCH INFORMATION

FM 969 AT SH 130 NBFR

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		218
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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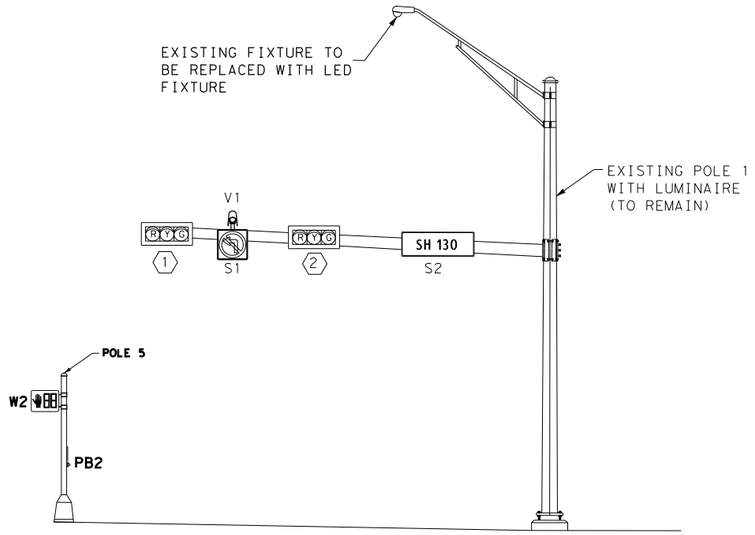
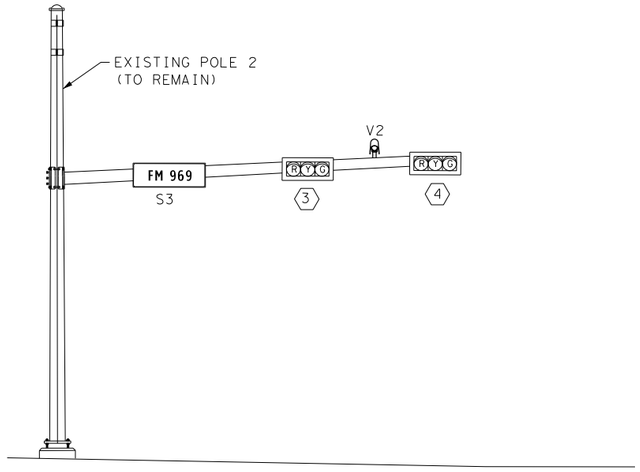
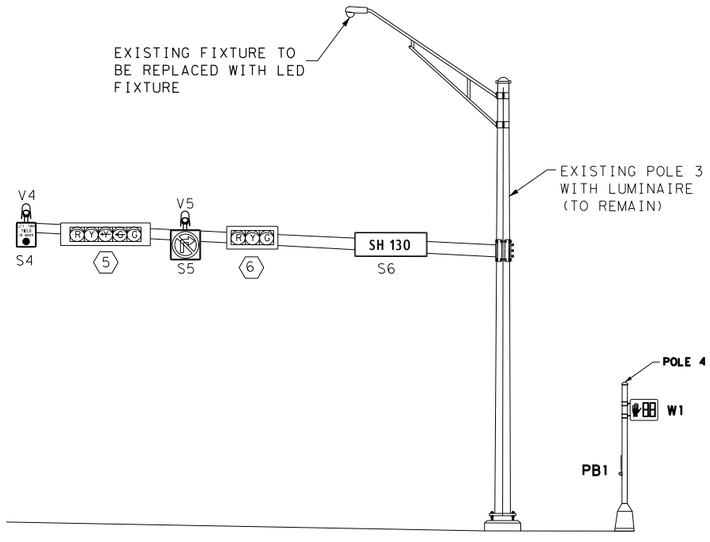


LOOKING WEST ON FM 969
NOT TO SCALE



LOOKING NORTH ON SH 130
NOT TO SCALE



LOOKING EAST ON FM 969
NOT TO SCALE

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TRAFFIC SIGNAL MODIFICATION PLANS

SIGNAL ELEVATIONS

FM 969 AT SH 130 NBFR

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
BY	6	PTF 2022(045)		219
DRAWN BY:	STATE	DIST. NO.	COUNTY	
BY	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
BY	1186	01	091	FM 969

6/25/2021
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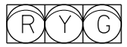
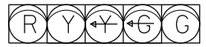
EXISTNG SIGNAL SCHEDULE



EXISTING ONE WAY, 3 SECTION
HORIZONTAL SIGNAL HEAD
1, 2, 5, 7



EXISTING ONE WAY, 5 SECTION
HORIZONTAL SIGNAL HEAD 6

EXISTING ONE WAY, 4 SECTION
HORIZONTAL SIGNAL HEAD
4, 10

EXISTING ONE WAY, 5 SECTION
HORIZONTAL SIGNAL HEAD 11

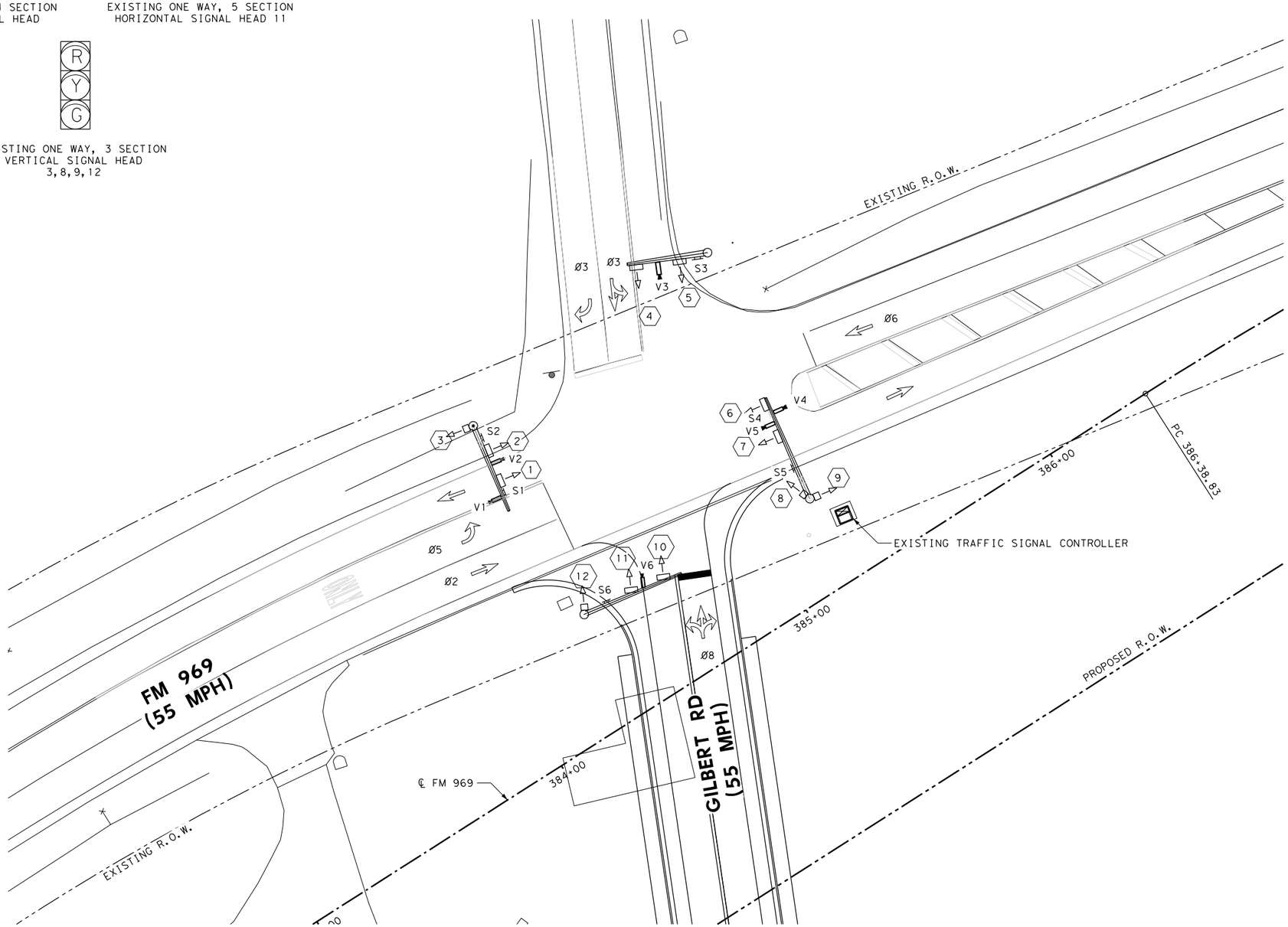
EXISTING ONE WAY, 3 SECTION
VERTICAL SIGNAL HEAD
3, 8, 9, 12

EXISTING SIGNS

R10-12
S1, S4

S2, S5

S3, S6



LEGEND

- EXIST TRAFFIC SIGNAL POLE
- EXIST TRAFFIC SIGNAL CONTROLLER
- EXIST HORIZONTAL SIGNAL HEAD
- EXIST VERTICAL SIGNAL HEAD
- EXIST TRAFFIC SIGNAL MAST ARM
- EXIST LUMINAIRE
- EXIST SIGN ON MAST ARM
- EXIST PULL BOX
- EXIST VIDEO DETECTION
- EXIST PEDESTRIAN SIGNAL HEAD
- EXIST PEDESTRIAN PUSH BUTTON
- DIRECTION OF TRAFFIC
- SIGNAL HEAD #

SCALE: 1" = 40'

40 20 0 40

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

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STATE OF TEXAS

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TRAFFIC SIGNAL
MODIFICATION PLANS
EXISTING INTERSECTION CONDITIONS
FM 969 AT GILBERT ROAD

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		220
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

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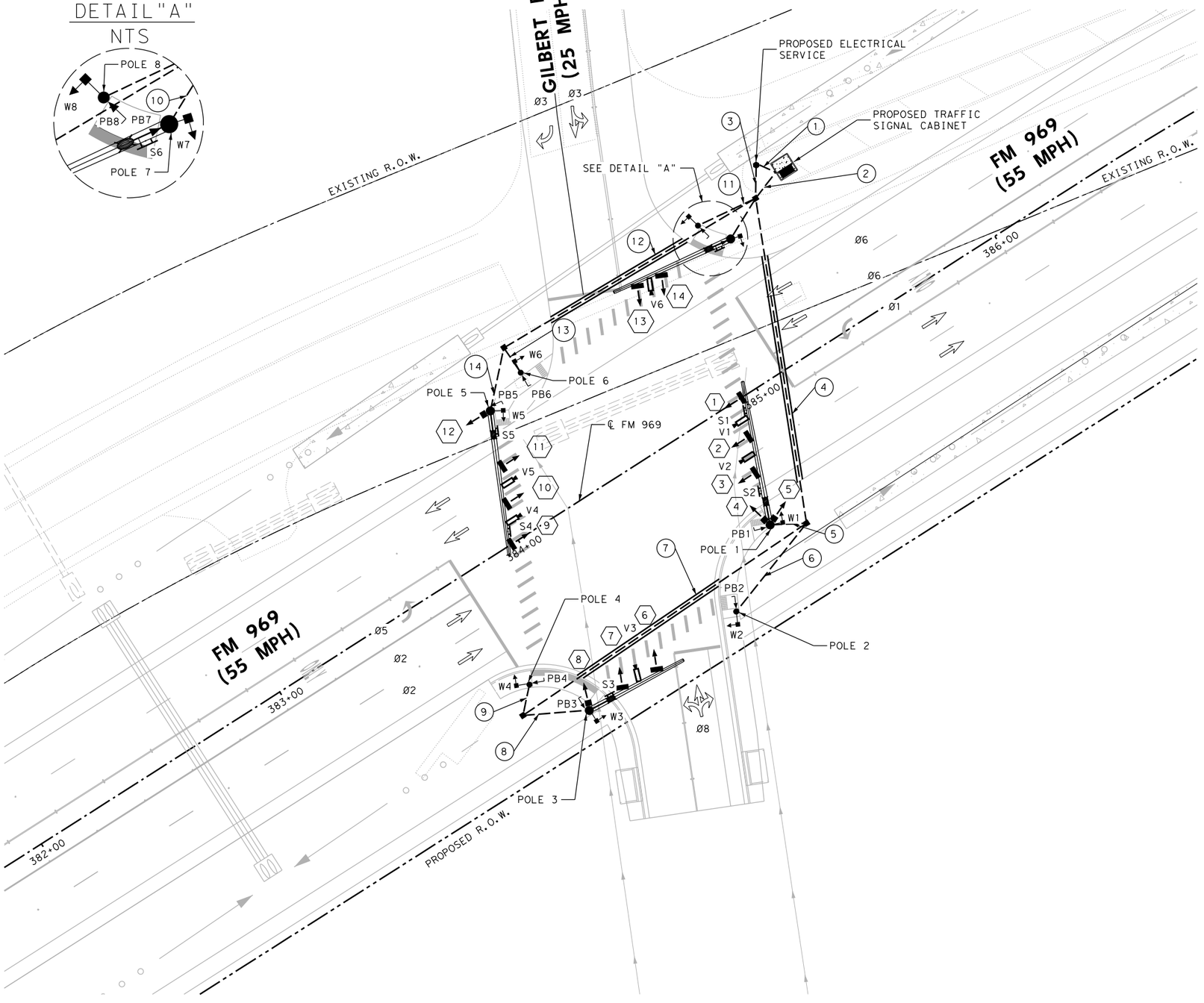
DETAIL "A"
NTS



LEGEND

- PROP TRAFFIC SIGNAL POLE
- PROP PEDESTAL POLE
- PROP TRAFFIC SIGNAL CONTROLLER
- PROP TRAFFIC SIGNAL MAST ARM
- PROP LUMINAIRE
- PROP HORIZONTAL SIGNAL HEAD
- PROP VERTICAL SIGNAL HEAD
- PROP SIGN ON MAST ARM
- PROP VIDEO DETECTION CAMERA
- PROP PEDESTRIAN SIGNAL HEAD
- PROP PEDESTRIAN PUSH BUTTON
- PROP PULL BOX (TY D)
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- PROP ELECTRICAL SERVICE
- SIGNAL HEAD #
- DIRECTION OF TRAFFIC

SCALE: 1" = 40'

40 20 0 40

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TRAFFIC SIGNAL
MODIFICATION PLANS
PROPOSED INTERSECTION CONDITIONS
FM 969 AT GILBERT ROAD

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		221
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

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CABLE TERMINATION CHART

CNDR. COLOR	CABLE 1 POLE 1 TO CONTRL 7 CONDR	CABLE 2 POLE 1 TO CONTRL 5 CONDR	CABLE 3 POLE 1 TO CONTRL 5 CONDR	CABLE 4 POLE 1 TO CONTRL 5 CONDR	CABLE 5 POLE 1 TO CONTRL 5 CONDR	CABLE 6 POLE 1 TO CONTRL 5 CONDR	CABLE 7 POLE 1 TO CONTRL 2 CONDR	CABLE 8 POLE 2 TO CONTRL 5 CONDR	CABLE 9 POLE 2 TO CONTRL 2 CONDR	CABLE 10 POLE 3 TO CONTRL 7 CONDR
BLACK	SH 1 Y PHASE 05	SH 2 Y PHASE 02	SH 3 Y PHASE 02	SH 4 Y PHASE 06	SH 5 Y PHASE 03	W1 DW PHASE 08	PB1 W PHASE 08	W2 DW PHASE 02	PB2 W PHASE 02	SH 6 Y PHASE 03
WHITE	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON
RED	SH 1 R PHASE 05	SH 2 R PHASE 02	SH 3 R PHASE 02	SH 3 R PHASE 06	SH 3 R PHASE 03	SPARE		SPARE		SH 4 R PHASE 03
GREEN	SH 1 G PHASE 05	SH 2 G PHASE 02	SH 3 G PHASE 02	SH 3 G PHASE 06	SH 3 G PHASE 03	SPARE		SPARE		SH 4 G PHASE 03
ORANGE	SH 1 Y ARW PHASE 05	SPARE	SPARE	SPARE	SPARE	W1 W PHASE 08		W2 W PHASE 06		SH 4 G ARW PHASE 03
BLUE	SH 1 G ARW PHASE 05	SPARE	SPARE	SPARE	SPARE					SPARE
WHITE/ BLACK	SPARE	SPARE	SPARE	SPARE	SPARE					SPARE

CNDR. COLOR	CABLE 11 POLE 3 TO CONTRL 7 CONDR	CABLE 12 POLE 3 TO CONTRL 5 CONDR	CABLE 13 POLE 3 TO CONTRL 5 CONDR	CABLE 14 POLE 3 TO CONTRL 2 CONDR	CABLE 15 POLE 4 TO CONTRL 5 CONDR	CABLE 16 POLE 4 TO CONTRL 2 CONDR	CABLE 17 POLE 5 TO CONTRL 7 CONDR	CABLE 18 POLE 5 TO CONTRL 5 CONDR	CABLE 19 POLE 5 TO CONTRL 5 CONDR	CABLE 20 POLE 5 TO CONTRL 5 CONDR
BLACK	SH 7 Y PHASE 03	SH 8 Y PHASE 03	W3 DW PHASE 02	PB3 W PHASE 02	W4 DW PHASE 03	PB4 W PHASE 03	SH 9 Y PHASE 01	SH 10 Y PHASE 06	SH 11 Y PHASE 06	SH 12 Y PHASE 02
WHITE	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON
RED	SH 1 R PHASE 03	SH 6 R PHASE 03	SPARE		SPARE		SH 7 R PHASE 01	SH 8 R PHASE 06	SH 9 R PHASE 06	SH 10 R PHASE 02
GREEN	SH 1 G PHASE 03	SH 6 G PHASE 03	SPARE		SPARE		SH 7 G PHASE 01	SH 8 G PHASE 06	SH 9 G PHASE 06	SH 9 G PHASE 02
ORANGE	SH 1 Y ARW PHASE 05	SPARE	W3 W PHASE 02		W4 W PHASE 03		SH 7 Y ARW PHASE 01	SPARE	SPARE	SPARE
BLUE	SH 1 G ARW PHASE 05	SPARE					SH 7 G ARW PHASE 01	SPARE	SPARE	SPARE
WHITE/ BLACK	SPARE	SPARE					SPARE	SPARE	SPARE	SPARE

CNDR. COLOR	CABLE 21 POLE 5 TO CONTRL 5 CONDR	CABLE 22 POLE 5 TO CONTRL 2 CONDR	CABLE 23 POLE 6 TO CONTRL 5 CONDR	CABLE 24 POLE 6 TO CONTRL 2 CONDR	CABLE 25 POLE 7 TO CONTRL 7 CONDR	CABLE 26 POLE 7 TO CONTRL 5 CONDR	CABLE 27 POLE 7 TO CONTRL 5 CONDR	CABLE 28 POLE 7 TO CONTRL 2 CONDR	CABLE 29 POLE 8 TO CONTRL 5 CONDR	CABLE 30 POLE 8 TO CONTRL 2 CONDR
BLACK	W5 DW PHASE 03	PB5 W PHASE 03	W6 DW PHASE 06	PB6 W PHASE 06	SH 13 Y PHASE 08	SH 14 Y PHASE 08	W7 DW PHASE 06	PB7 W PHASE 06	W8 DW PHASE 08	PB8 W PHASE 08
WHITE	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON
RED	SPARE		SPARE		SH 11 R PHASE 08	SH 12 R PHASE 08	SPARE		SPARE	
GREEN	SPARE		SPARE		SH 11 G PHASE 08	SH 12 G PHASE 08	SPARE		SPARE	
ORANGE	W5 W PHASE 03		W6 W PHASE 06		SH 11 G ARW PHASE 08	SPARE	W8 W PHASE 06		W7 W PHASE 08	
BLUE					SPARE	SPARE				
WHITE/ BLACK					SPARE	SPARE				

POLE AND CONTROLLER LOCATION (FM 969 BASELINE)

POLE NO.	STATION	OFFSET	DESCRIPTION
1	384+78.06	43.41' RT	PROP 30' SIGNAL POLE, ATTACH 50' MAST ARM WITH LUMINAIRE, ATTACH SH1, SH2, SH3, SH4, SH5, V1, V2, W1 & PB1
2	384+51.45	62.83' RT	PROP 10' PEDESTAL POLE, ATTACH W2 & PB2
3	383+88.85	64.37' RT	PROP 30' SIGNAL POLE, ATTACH 36' MAST ARM WITH LUMINAIRE, ATTACH SH6, SH7, SH8, V3, W3 & PB3
4	383+75.87	45.30' RT	PROP 10' PEDESTAL POLE, ATTACH W4 & PB4
5	384+16.26	43.81' LT	PROP 30' SIGNAL POLE, ATTACH 50' MAST ARM WITH LUMINAIRE, ATTACH SH9, SH10, SH11, SH12, V4, V5, W5 & PB5
6	384+32.61	59.43' LT	PROP 10' PEDESTAL POLE, ATTACH W6 & PB6
7	385+20.65	49.40' LT	PROP 30' SIGNAL POLE, ATTACH 44' MAST ARM WITH LUMINAIRE, ATTACH SH13, SH14, V6, W7 & PB7
8	385+13.42	59.60' LT	PROP 10' PEDESTAL POLE, ATTACH W8 & PB8
	385+50.29	60.38' LT	PROPOSED TRAFFIC SIGNAL CONTROLLER
	385+42.32	66.59' LT	PROPOSED ELECTRICAL SERVICE

SUMMARY OF CONDUITS AND CABLES - FM 969 AT GILBERT ROAD

RUN NO	CONDUIT				POWER/GROUND		SIGNAL			LUMINAIRE	VIVDS	
	TRENCH		BORE		#6 AWG (INS)	#6 AWG (BARE)	#14 AWG			NO. 8 XHHW	*3/C-#16	COAXIAL
	LENGTH	2"	LENGTH	2"			7/C	5/C	2/C			
1	10	1			2	1						
2	15	1				1				8		
3	15	2					3	19	8		6	6
4	39	2	81	2			2	10	4	4	3	3
5	20	2					1	5	1	2	2	2
6	45	1						1	1			
7	70	3	60	3			1	4	2	2	1	1
8	25	2					1	3	1	2	1	1
9	15	1						1	1			
10	20	2						3	1	2	1	1
11	25	1						1	1			
12	50	3	55	3			1	5	2	2	2	2
13	15	1						1	1			
14	25	2					1	4	1	2	2	2
TOTAL		773'		507'	20'	25'	313'	1640'	706'	696'	512'	512'

INSIDE ARMS	14 AWG		VIVDS	
	7/C	5/C	3/C-#16	COAXIAL
POLE 1 (50' MAST ARM)				
HEAD 1	46'			
HEAD 2		32'		
HEAD 3		20'		
HEAD 4		0'		
HEAD 5		0'		
V1			38'	38'
V2			26'	26'
POLE 3 (36' MAST ARM)				
HEAD 6	27'			
HEAD 7	14'			
HEAD 8		0'		
V3			20'	20'
POLE 5 (50' MAST ARM)				
HEAD 9	48'			
HEAD 10		28'		
HEAD 11		16'		
HEAD 12		0'		
V4			36'	36'
V5			24'	24'
POLE 7 (44' MAST ARM)				
HEAD 13	36'			
HEAD 14		27'		
V6			32'	32'
TOTAL	171'	123'	176'	176'

INSIDE POLES	14 AWG			VIVDS		LUMINAIRE
	7/C	5/C	2/C	3/C-#16	COAXIAL	4/C#12
POLE 1	40'	170'	5'	80'	80'	40'
POLE 2		10'	5'			
POLE 3	40'	70'	5'	40	40'	40
POLE 4		10'	5'			
POLE 5	40'	130'	5'	80'	80'	40'
POLE 6		10'	5'			
POLE 7		70'	5'	40'	40'	40'
POLE 8		10'	5'			
TOTAL	120'	480'	40'	240'	240'	160'

STATE OF TEXAS
MAEN A. HOURANI
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6/25/2021

COUNTY OF TRAVIS
1839
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

TRAFFIC SIGNAL MODIFICATION PLANS

TRAFFIC SIGNAL DETAILS

FM 969 AT GILBERT ROAD

SHEET 1 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		222
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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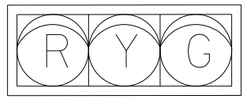
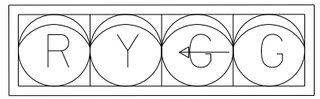
I:\1856\1301\CADD\SHEETS\PH 2\09-Traffic Items\FM969*SIGDET03.dgn

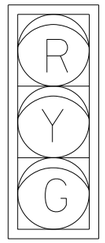
SIGNAL SCHEDULE



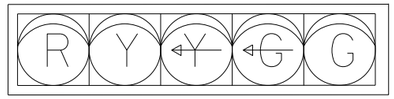
ONE WAY, 3 SECTION
HORIZONTAL SIGNAL HEAD
2,3,10,11,14



ONE WAY, 4 SECTION
HORIZONTAL SIGNAL HEAD
6,13

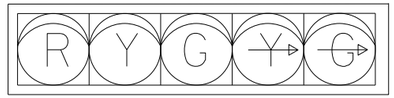


ONE WAY, 3 SECTION
VERTICAL SIGNAL HEAD
4,5,8,12



ONE WAY, 5 SECTION
HORIZONTAL SIGNAL HEAD
1,9

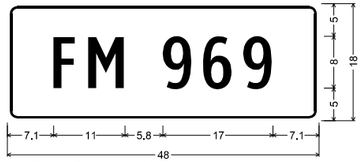
PROPOSED PEDESTRIAN
SIGNALS
W1-W8



ONE WAY, 5 SECTION
HORIZONTAL SIGNAL HEAD 7

SIGN SCHEDULE

S3, S6



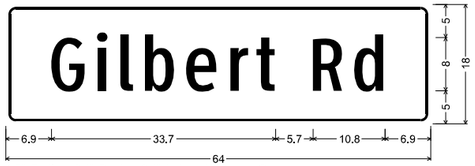
1.5" Radius, 0.4" Border, 0.4" Indent, White on Green;
[FM 969] ClearviewHwy-2-W;
Table of letter and object lefts.

F	M	9	6	9
7.1	12.5	23.9	30.2	36.3

S1, S4

R10-12
30"x36"

S2, S5

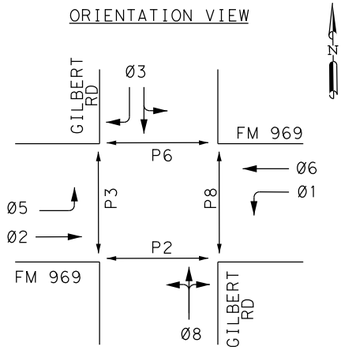


1.5" Radius, 0.4" Border, 0.4" Indent, White on Green;
[Gilbert Rd] ClearviewHwy-2-W;
Table of letter and object lefts.

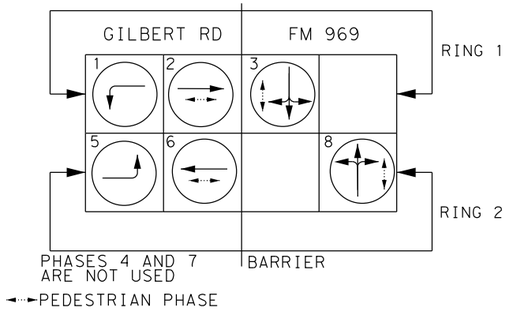
G	i	l	b	e	r	t	R	d
6.9	13.8	17.3	21.0	27.3	33.9	37.7	46.3	52.6

INTERSECTION PHASING

ORIENTATION VIEW



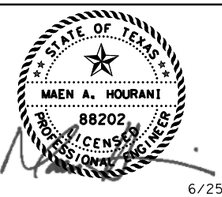
PHASING DIAGRAM



PROPOSED ACCESSIBLE
PEDESTRIAN SIGNALS

R10-3e(L)
PB1, PB3, PB5, PB7

R10-3e(R)
PB2, PB4, PB6, PB8



6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS
1839

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LJA Engineering, Inc.
FRN - F-1386

TRAFFIC SIGNAL MODIFICATION PLANS

TRAFFIC SIGNAL DETAILS

FM 969 AT GILBERT ROAD

SHEET 2 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		223
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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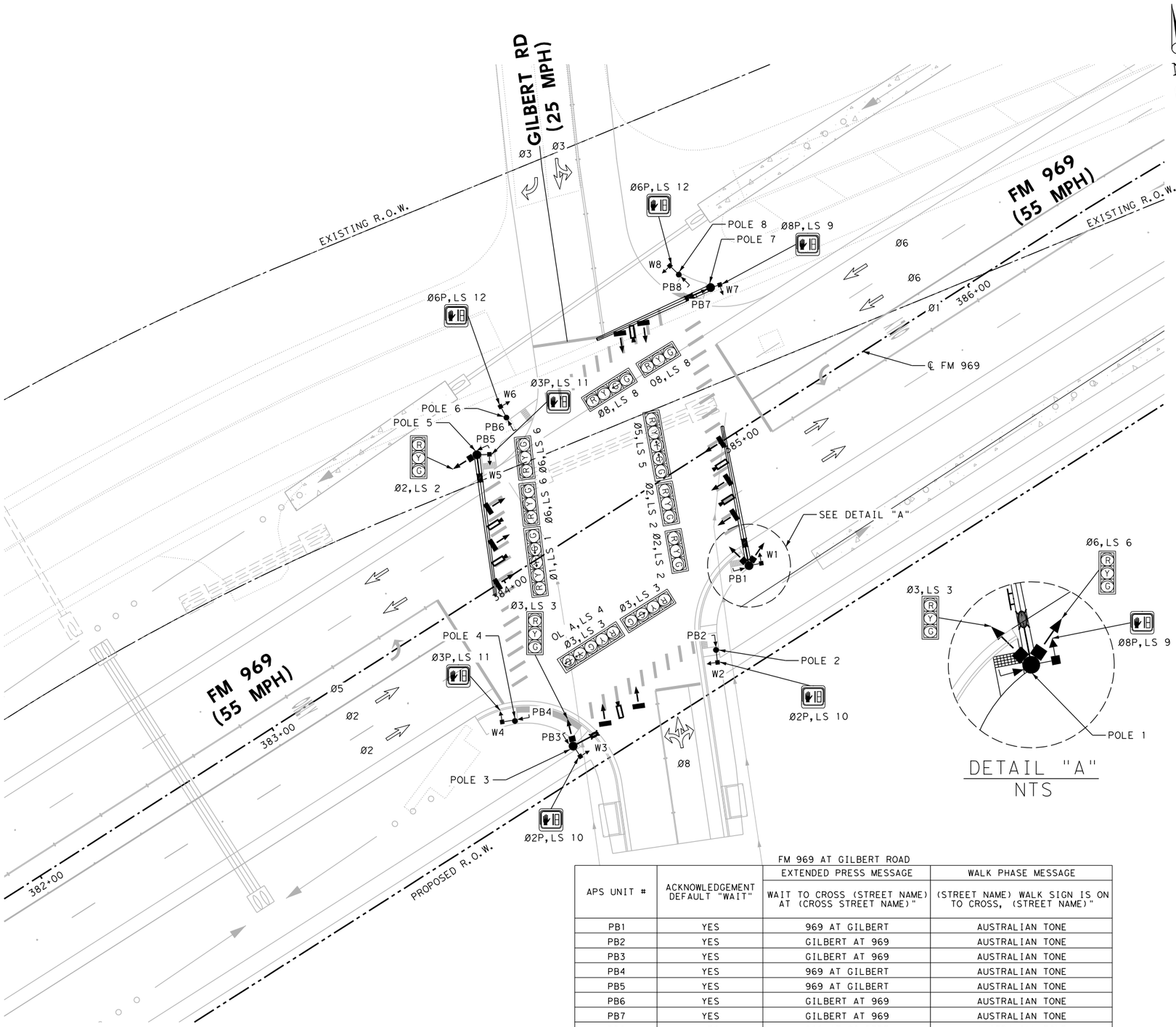

DETAIL "A"
NTS

FM 969 AT GILBERT ROAD

APS UNIT #	ACKNOWLEDGEMENT DEFAULT "WAIT"	EXTENDED PRESS MESSAGE	WALK PHASE MESSAGE
		WAIT TO CROSS (STREET NAME) AT (CROSS STREET NAME)"	(STREET NAME) WALK SIGN IS ON TO CROSS, (STREET NAME)"
PB1	YES	969 AT GILBERT	AUSTRALIAN TONE
PB2	YES	GILBERT AT 969	AUSTRALIAN TONE
PB3	YES	GILBERT AT 969	AUSTRALIAN TONE
PB4	YES	969 AT GILBERT	AUSTRALIAN TONE
PB5	YES	969 AT GILBERT	AUSTRALIAN TONE
PB6	YES	GILBERT AT 969	AUSTRALIAN TONE
PB7	YES	GILBERT AT 969	AUSTRALIAN TONE
PB8	YES	969 AT GILBERT	AUSTRALIAN TONE

LEGEND

- PROP TRAFFIC SIGNAL POLE
- PROP PEDESTAL POLE
- PROP TRAFFIC SIGNAL CONTROLLER
- PROP TRAFFIC SIGNAL MAST ARM
- PROP LUMINAIRE
- PROP HORIZONTAL SIGNAL HEAD
- PROP VERTICAL SIGNAL HEAD
- PROP SIGN ON MAST ARM
- PROP VIDEO DETECTION CAMERA
- PROP PEDESTRIAN SIGNAL HEAD
- PROP PEDESTRIAN PUSH BUTTON
- PROP PULL BOX (TY D)
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- PROP ELECTRICAL SERVICE
- SIGNAL HEAD #
- DIRECTION OF TRAFFIC

SCALE: 1" = 40'

40 20 0 40

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN-F-1386

TRAFFIC SIGNAL MODIFICATION PLANS

APS/LOAD SWITCH INFORMATION

FM 969 AT GILBERT ROAD

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		224
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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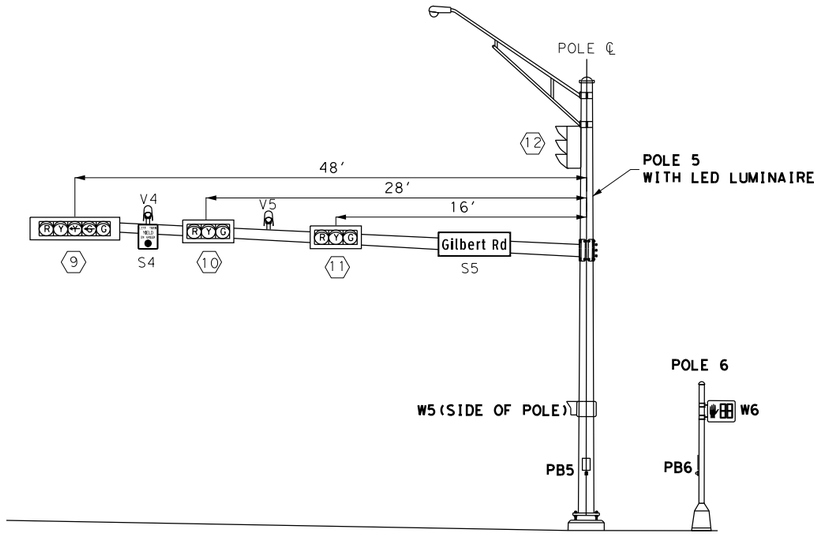
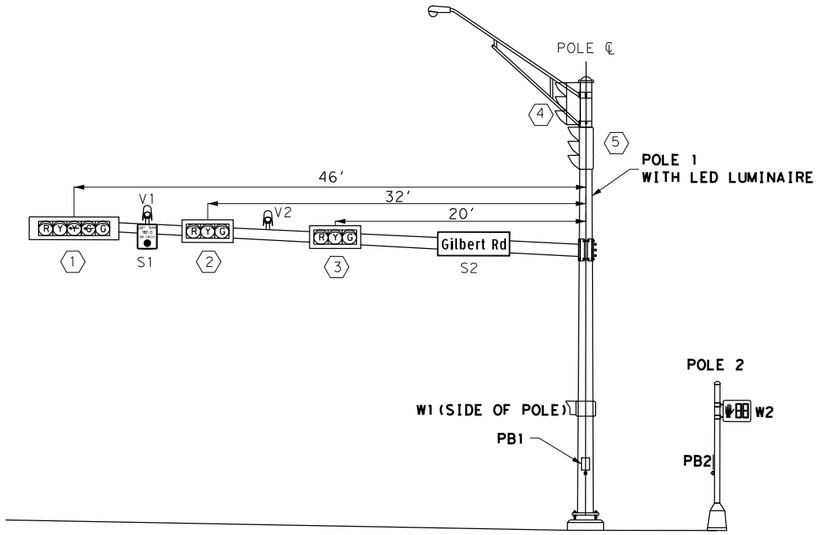
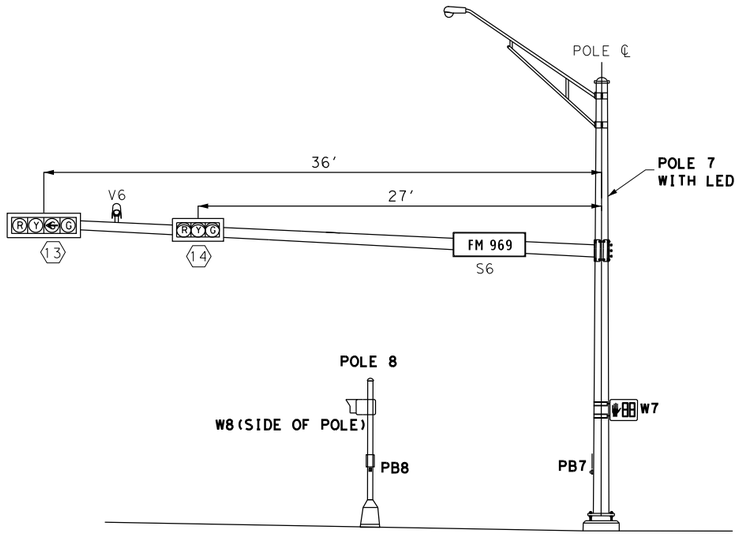


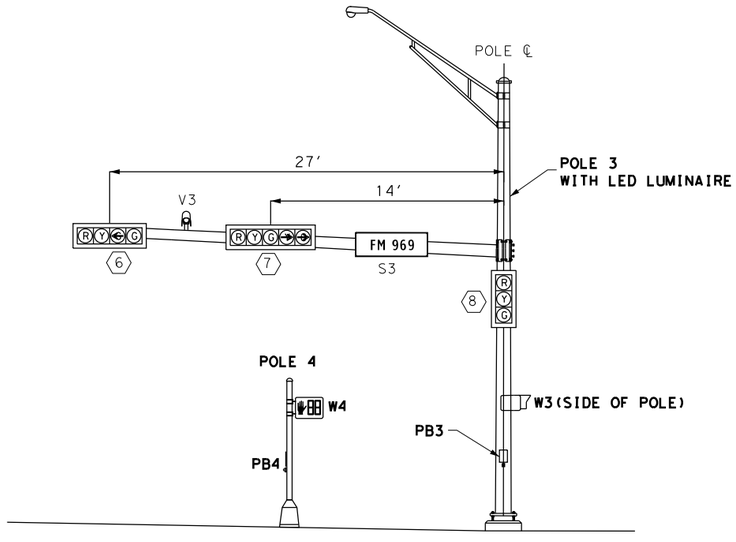
LOOKING WEST ON FM 969
NOT TO SCALE



LOOKING EAST ON FM 969
NOT TO SCALE



LOOKING NORTH ON GILBERT
NOT TO SCALE



LOOKING SOUTH ON GILBERT RD
NOT TO SCALE

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS STATE OF TEXAS

Texas Department of Transportation

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FRN - F-1386

TRAFFIC SIGNAL MODIFICATION PLANS

SIGNAL ELEVATIONS

FM 969 AT GILBERT ROAD

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		225
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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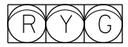
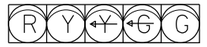
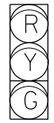
EXISTING SIGNAL SCHEDULE



ONE WAY, 3 SECTION
HORIZONTAL SIGNAL HEAD
2, 4, 5, 7, 8, 9



ONE WAY, 5 SECTION
HORIZONTAL SIGNAL HEAD
1, 6



ONE WAY, 3 SECTION
VERTICAL SIGNAL HEAD 3

PB2, PB4

PB1, PB3

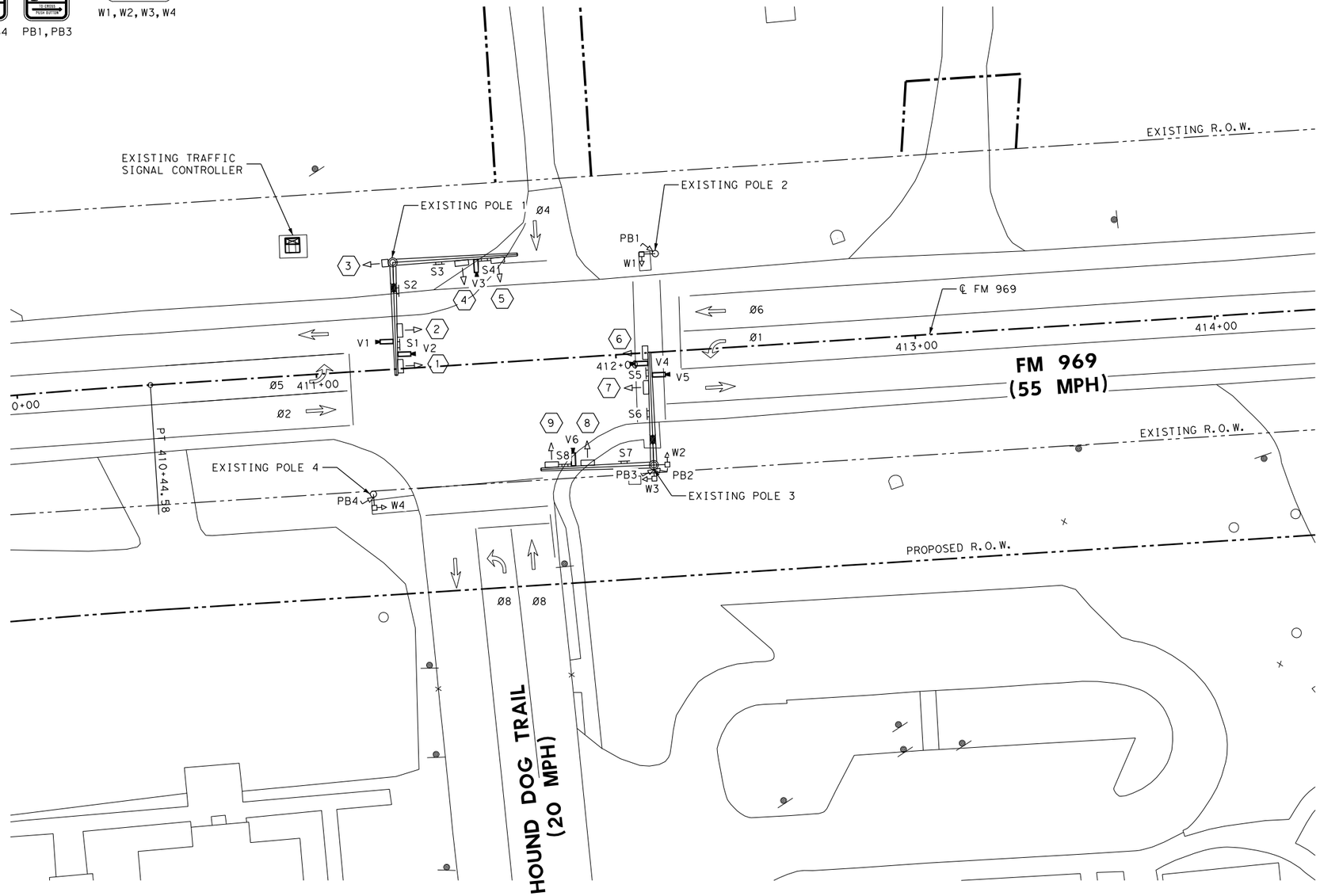
W1, W2, W3, W4

EXISTING SIGNS

S1, S4, S5, S8

S2, S6

S3, S7



LEGEND

- EXIST TRAFFIC SIGNAL POLE
- EXIST TRAFFIC SIGNAL CONTROLLER
- EXIST HORIZONTAL SIGNAL HEAD
- EXIST VERTICAL SIGNAL HEAD
- EXIST TRAFFIC SIGNAL MAST ARM
- EXIST LUMINAIRE
- EXIST SIGN ON MAST ARM
- EXIST PULL BOX
- EXIST VIDEO DETECTION
- EXIST PEDESTRIAN SIGNAL HEAD
- EXIST PEDESTRIAN PUSH BUTTON
- DIRECTION OF TRAFFIC
- SIGNAL HEAD #

SCALE: 1" = 40'

40 20 0 40

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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FRN-F-1386

TRAFFIC SIGNAL MODIFICATION PLANS

EXISTING INTERSECTION CONDITONS

FM 969 AT HOUND DOG TRAIL

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		226
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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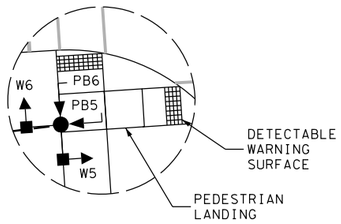
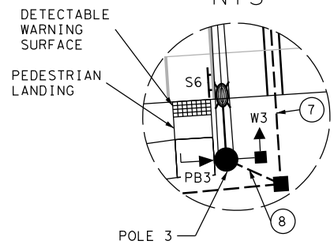
DETAIL "B"

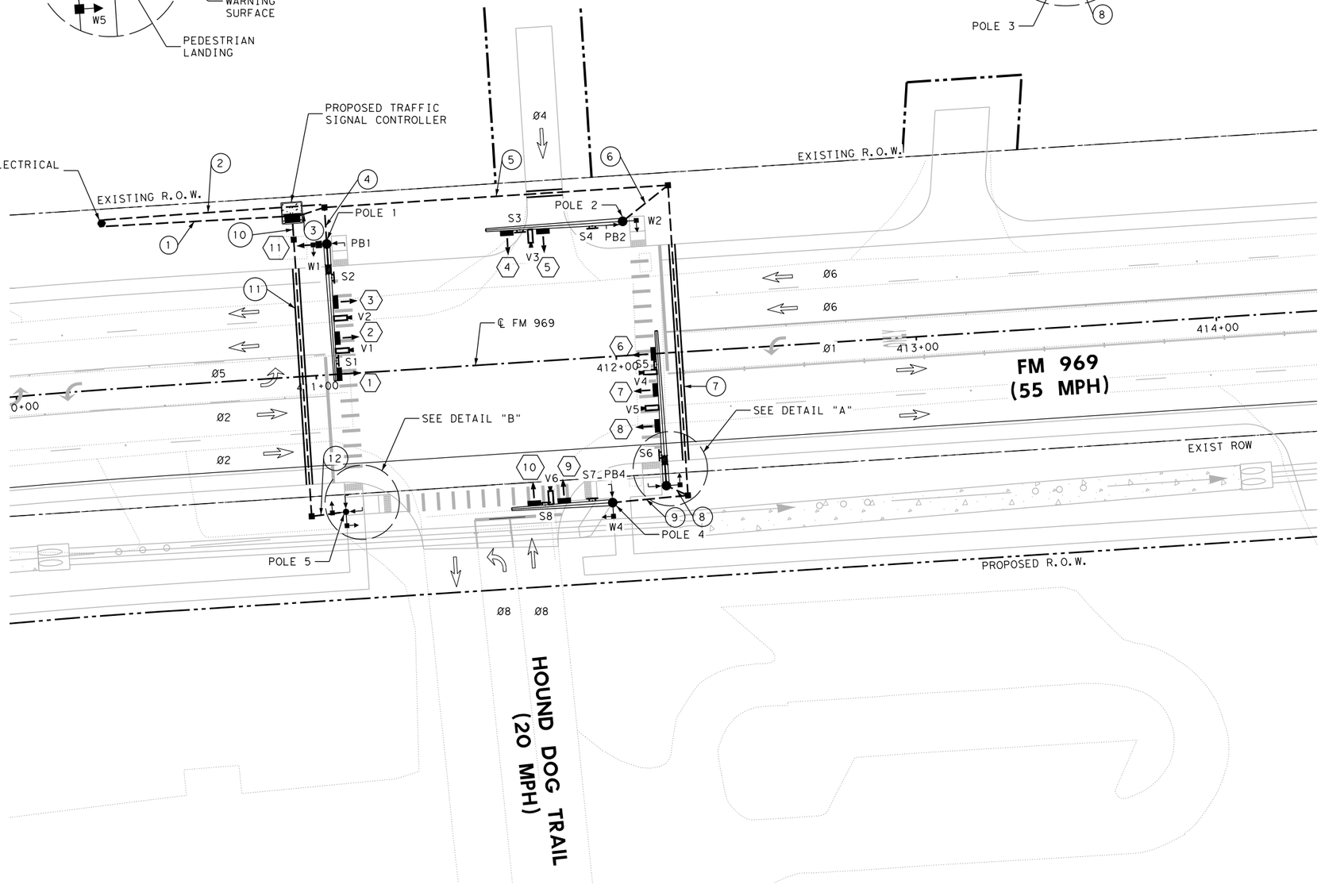
NTS



DETAIL "A"

NTS





LEGEND

- PROP TRAFFIC SIGNAL POLE
- PROP PEDESTAL POLE
- PROP TRAFFIC SIGNAL CONTROLLER
- PROP TRAFFIC SIGNAL MAST ARM
- PROP LUMINAIRE
- PROP HORIZONTAL SIGNAL HEAD
- PROP VERTICAL SIGNAL HEAD
- PROP SIGN ON MAST ARM
- PROP VIDEO DETECTION CAMERA
- PROP PEDESTRIAN SIGNAL HEAD
- PROP PEDESTRIAN PUSH BUTTON
- PROP PULL BOX (TY D)
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- PROP ELECTRICAL SERVICE
- SIGNAL HEAD #
- DIRECTION OF TRAFFIC

SCALE: 1" = 40'

40 20 0 40

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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FRN - F-1386

TRAFFIC SIGNAL
MODIFICATION PLANS
PROPOSED INTERSECTION CONDITIONS
FM 969 AT HOUND DOG TRAIL

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		227
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

6/25/2021
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CABLE TERMINATION CHART

CNDR. COLOR	CABLE 1 POLE 1 TO CONTRL 7 CONDR	CABLE 2 POLE 1 TO CONTRL 5 CONDR	CABLE 3 POLE 1 TO CONTRL 5 CONDR	CABLE 4 POLE 1 TO CONTRL 5 CONDR	CABLE 5 POLE 1 TO CONTRL 5 CONDR	CABLE 6 POLE 1 TO CONTRL 2 CONDR	CABLE 7 POLE 2 TO CONTRL 5 CONDR	CABLE 8 POLE 2 TO CONTRL 5 CONDR	CABLE 9 POLE 2 TO CONTRL 5 CONDR	CABLE 10 POLE 2 TO CONTRL 2 CONDR	CABLE 11 POLE 3 TO CONTRL 7 CONDR	CABLE 12 POLE 3 TO CONTRL 5 CONDR	CABLE 13 POLE 3 TO CONTRL 5 CONDR	CABLE 14 POLE 2 TO CONTRL 5 CONDR	CABLE 15 POLE 2 TO CONTRL 2 CONDR	CABLE 16 POLE 4 TO CONTRL 5 CONDR	CABLE 17 POLE 4 TO CONTRL 5 CONDR	CABLE 18 POLE 4 TO CONTRL 5 CONDR	CABLE 19 POLE 4 TO CONTRL 2 CONDR	CABLE 20 POLE 5 TO CONTRL 5 CONDR	CABLE 21 POLE 5 TO CONTRL 2 CONDR	CABLE 22 POLE 5 TO CONTRL 5 CONDR	CABLE 23 POLE 5 TO CONTRL 2 CONDR
BLACK	SH 1 Y PHASE 01	SH 2 Y PHASE 06	SH 3 Y PHASE 06	SH 11 Y PHASE 02	W1 DW PHASE 04	PB1 W PHASE 04	SH 4 Y PHASE 08	SH 5 Y PHASE 08	W2 DW PHASE 06	PB2 W PHASE 06	SH 6 Y PHASE 05	SH 7 Y PHASE 02	SH 8 Y PHASE 02	W3 DW PHASE 08	PB3 W PHASE 08	SH 9 Y PHASE 04	SH 10 Y PHASE 04	W4 DW PHASE 02	PB4 W PHASE 02	W5 DW PHASE 02	PB5 W PHASE 02	W6 DW PHASE 04	PB6 W PHASE 04
WHITE	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON
RED	SH 1 R PHASE 01	SH 2 R PHASE 06	SH 3 R PHASE 06	SH 11 R PHASE 02	SPARE		SH 4 R PHASE 08	SH 5 R PHASE 08	SPARE		SH 6 R PHASE 05	SH 7 R PHASE 02	SH 8 R PHASE 02	SPARE		SH 9 R PHASE 04	SH 10 R PHASE 04	SPARE		SPARE		SPARE	
GREEN	SH 1 G PHASE 01	SH 2 G PHASE 06	SH 3 G PHASE 06	SH 11 G PHASE 02	SPARE		SH 4 G PHASE 08	SH 4 G PHASE 08	SPARE		SH 6 G PHASE 05	SH 7 G PHASE 02	SH 8 G PHASE 02	SPARE		SH 9 G PHASE 04	SH 10 G PHASE 04	SPARE		SPARE		SPARE	
ORANGE	SH 1 Y ARW PHASE 01	SPARE	SPARE	SPARE	W1 W PHASE 04		SPARE	SPARE	W2 W PHASE 06		SH 6 Y ARW PHASE 05	SPARE	SPARE	W3 W PHASE 08		SPARE	SPARE	W4 W PHASE 02		W5 W PHASE 02		W6 W PHASE 04	
BLUE	SH 1 G ARW PHASE 01	SPARE	SPARE	SPARE			SPARE	SPARE			SH 6 G ARW PHASE 05	SPARE	SPARE			SPARE	SPARE						

POLE AND CONTROLLER LOCATION (FM 969 BASELINE)

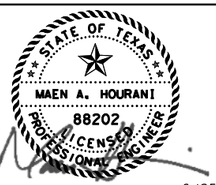
POLE NO.	STATION	OFFSET	DESCRIPTION
1	411+08.57	43.50' LT	PROP 30' SIGNAL POLE, ATTACH 44' MAST ARM WITH LUMINAIRE, ATTACH SH1,SH2,SH3,SH11,V1,V2,W1 & PB1
2	412+08.25	44.66' LT	PROP 19' SIGNAL POLE, ATTACH 44' MAST ARM, ATTACH SH4,SH5,V3,W2 & PB2
3	412+16.08	44.04' RT	PROP 30' SIGNAL POLE, ATTACH 50' MAST ARM WITH LUMINAIRE, ATTACH SH6,SH7,SH8,V4,V5,W3 & PB3
4	411+97.89	48.50' RT	PROP 19' SIGNAL POLE, ATTACH 32' MAST ARM, ATTACH SH9,SH10,V6,W4 & PB4
5	411+09.21	45.84' RT	PROP 10' PEDESTAL POLE, ATTACH W5,PB5,W6 & PB6
	410+97.69	53.54' LT	PROPOSED TRAFFIC SIGNAL CONTROLLER
	410+34.58	55.24' LT	PROPOSED ELECTRICAL SERVICE

SUMMARY OF CONDUITS AND CABLES - FM 969 AT HOUND DOG TRL

RUN NO	LENGTH	CONDUIT		POWER/GROUND		SIGNAL			LUMINAIRE	VIVDS	
		TRENCH	BORE	#6 AWG (INS)	#6 AWG (BARE)	#14 AWG			NO. 8 XHHW	*3/C-#16	COAXIAL
		2"	2"			7/C	5/C	2/C			
1	65	1		2	1						
2	75	1			1				4		
3	10	2				2	15	6	4	6	6
4	15	2				1	4	1	2	2	2
5	120		2			1	9	4	2	4	4
6	25	1					3	1		1	1
7	110		2			1	6	2	2	3	3
8	10	2				1	3	1	2	2	2
9	30	1					3	1		1	1
10	10	1					2	2			
11	95		1				2	2			
12	15	1					2	2			
TOTAL		290'	555'	130'	140'	275'	2385'	1080'	850'	975'	975'

INSIDE POLES	14 AWG			VIVDS		LUMINAIRE
	7/C	5/C	2/C	3/C-#16	COAXIAL	4/C#12
POLE 1	40'	130'	5'	80'	80'	40'
POLE 2		60'	5'	25'	25'	
POLE 3	40'	70'	5'	80'	80'	40'
POLE 4		60'	5'	25'	25'	
POLE 5		20'	10'			
TOTAL	80'	340'	30'	210'	210'	80'

INSIDE ARMS	14 AWG		VIVDS	
	7/C	5/C	3/C-#16	COAXIAL
POLE 1 (44' MAST ARM)				
HEAD 1	43'			
HEAD 2		31'		
HEAD 3		20'		
HEAD 11		0'		
V1			35'	35'
V2			25'	25'
POLE 2 (44' MAST ARM)				
HEAD 4		38'		
HEAD 5		26'		
V3			30'	30'
POLE 3 (50' MAST ARM)				
HEAD 6	44'			
HEAD 7		32'		
HEAD 8		20'		
V4			38'	38'
V5			26'	26'
POLE 4 (32' MAST ARM)				
HEAD 9		16'		
HEAD 10		26'		
V6			20'	20'
TOTAL	87'	209'	174'	174'



6/25/2021

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

TRAFFIC SIGNAL MODIFICATION PLANS

TRAFFIC SIGNAL DETAILS

FM 969 AT HOUND DOG TRAIL

SHEET 1 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.	SHEET NO.
AQ	6	PTF 2022(045)	228
DRAWN BY:	STATE	DIST. NO.	COUNTY
AQ	TX	AUS	TRAVIS
CHECKED BY:	CONTROL	SECTION	JOB / HIGHWAY NO.
RS	1186	01	091 / FM 969

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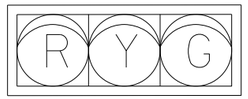
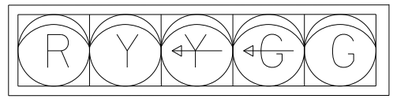
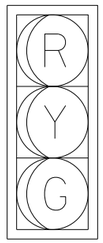
SIGNAL SCHEDULE



ONE WAY, 3 SECTION
HORIZONTAL SIGNAL HEAD
2, 3, 4, 5, 7, 8, 9, 10



ONE WAY, 5 SECTION
HORIZONTAL SIGNAL HEAD
1, 6

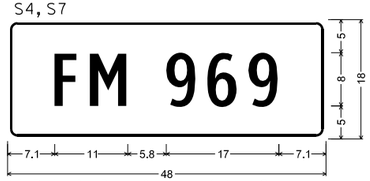


ONE WAY, 3 SECTION
VERTICAL SIGNAL HEAD 11

PROPOSED PEDESTRIAN
SIGNALS
W1-W6

SIGN SCHEDULE

S4, S7



1.5" Radius, 0.4" Border, 0.4" Indent, White on Green;
[FM 969] ClearviewHwy-2-W;
Table of letter and object lefts.

F	M	9	6	9
7.1	12.5	23.9	30.2	36.3

S1, S3, S5, S8

R10-12
30"x36"

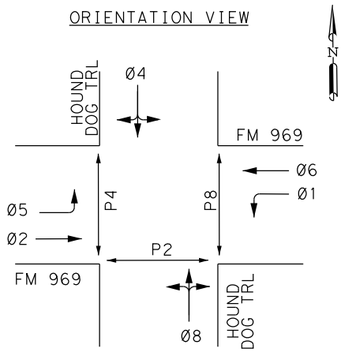
S2, S6

1.5" Radius, 0.4" Border, 0.4" Indent, White on Green;
[Hound Dog Trl] ClearviewHwy-2-W;
Table of letter and object lefts.

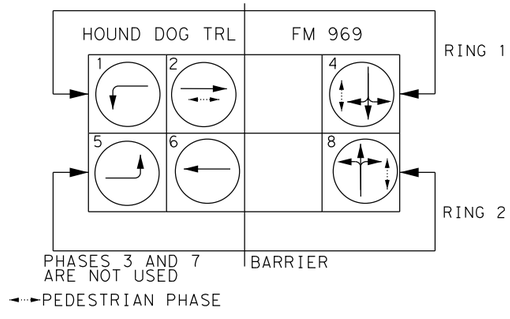
H	o	u	n	d	D	o	g	T	r	l
7.3	13.8	20.6	27.1	33.5	44.2	50.7	57.3	67.5	73.3	77.8

INTERSECTION PHASING

ORIENTATION VIEW

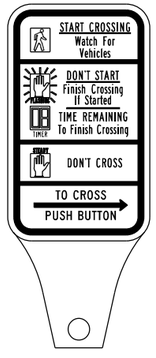


PHASING DIAGRAM



PROPOSED ACCESSIBLE
PEDESTRIAN SIGNALS

R10-3e(L)
PB1, PB2, PB3, PB5



R10-3e(R)
PB4, PB6

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS
1839

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LJA Engineering, Inc.
FRN - F-1386

TRAFFIC SIGNAL MODIFICATION PLANS

TRAFFIC SIGNAL DETAILS

FM 969 AT HOUND DOG TRAIL

SHEET 2 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		229
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

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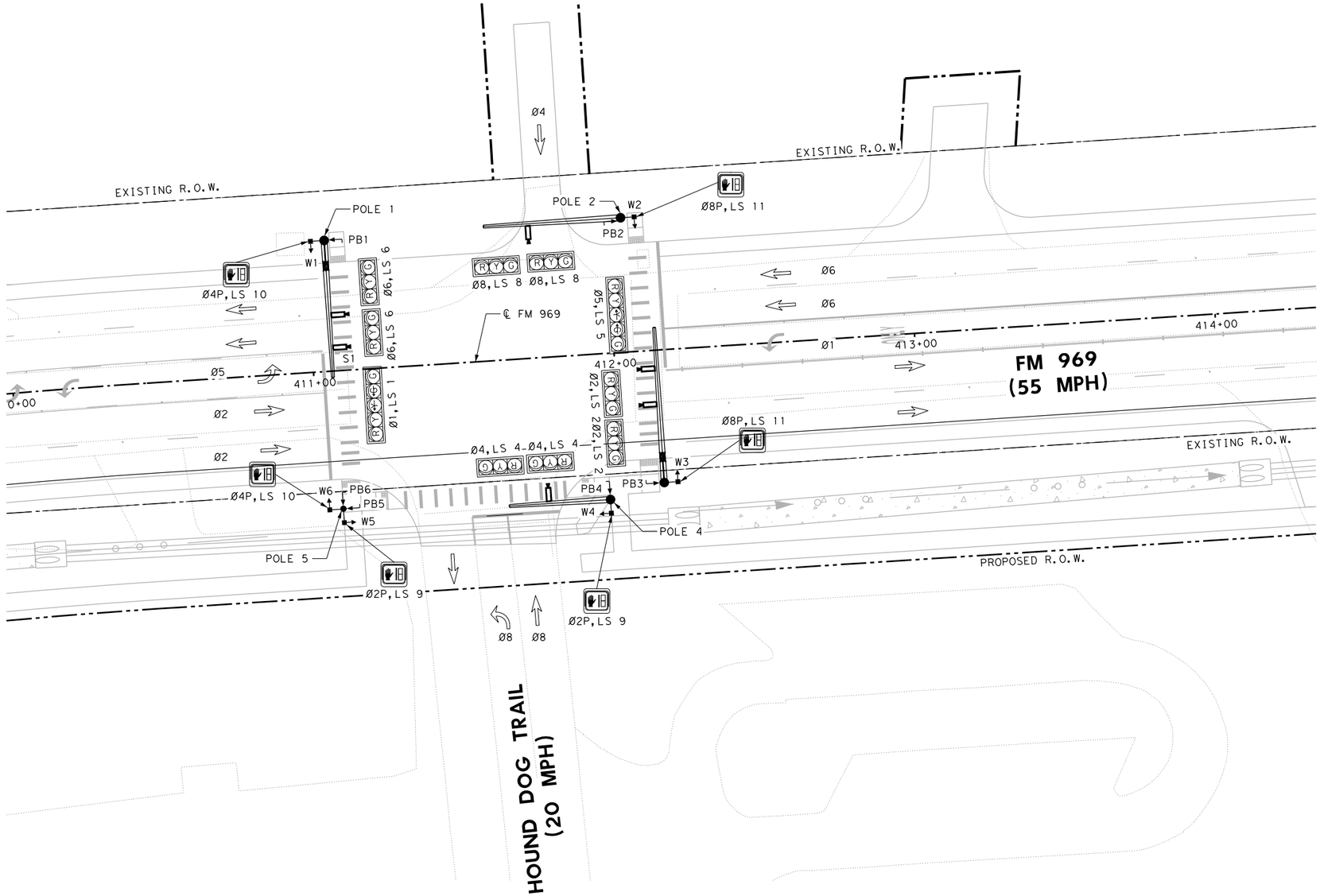
FM 969 AT HOUND DOG TRAIL

APS UNIT #	ACKNOWLEDGEMENT DEFAULT "WAIT"	EXTENDED PRESS MESSAGE	WALK PHASE MESSAGE
		WAIT TO CROSS (STREET NAME) AT (CROSS STREET NAME)"	(STREET NAME) WALK SIGN IS ON TO CROSS, (STREET NAME)"
PB1	YES	969 AT HOUND DOG	AUSTRALIAN TONE
PB2	YES	969 AT HOUND DOG	AUSTRALIAN TONE
PB3	YES	969 AT HOUND DOG	AUSTRALIAN TONE
PB4	YES	HOUND DOG AT 969	AUSTRALIAN TONE
PB5	YES	HOUND DOG AT 969	AUSTRALIAN TONE
PB6	YES	969 AT HOUND DOG	AUSTRALIAN TONE



LEGEND

- PROP TRAFFIC SIGNAL POLE
- PROP PEDESTAL POLE
- PROP TRAFFIC SIGNAL CONTROLLER
- PROP TRAFFIC SIGNAL MAST ARM
- PROP LUMINAIRE
- PROP HORIZONTAL SIGNAL HEAD
- PROP VERTICAL SIGNAL HEAD
- PROP SIGN ON MAST ARM
- PROP VIDEO DETECTION CAMERA
- PROP PEDESTRIAN SIGNAL HEAD
- PROP PEDESTRIAN PUSH BUTTON
- PROP PULL BOX (TY D)
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- PROP ELECTRICAL SERVICE
- SIGNAL HEAD #
- DIRECTION OF TRAFFIC

SCALE: 1" = 40'

40 20 0 40

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

LJA Engineering, Inc.
FRN - F-1386

TRAFFIC SIGNAL MODIFICATION PLANS

APS/LOAD SWITCH INFORMATION

FM 969 AT HOUND DOG TRAIL

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		230
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

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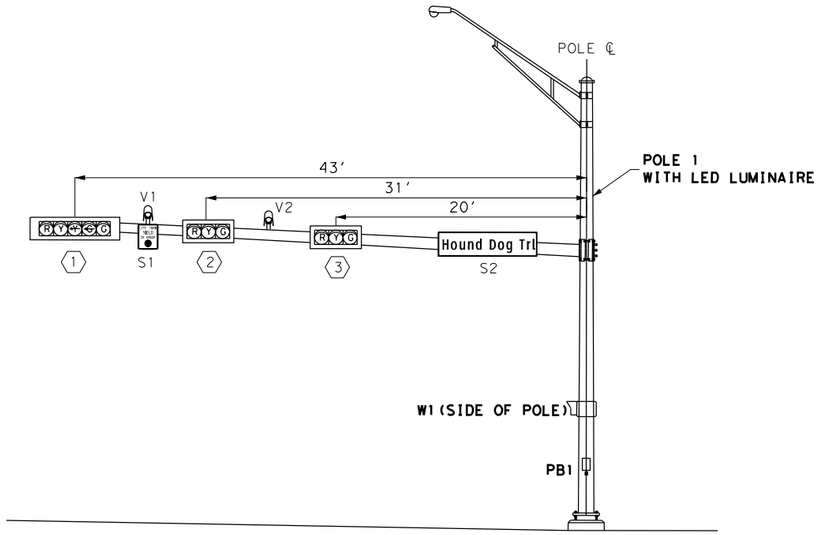
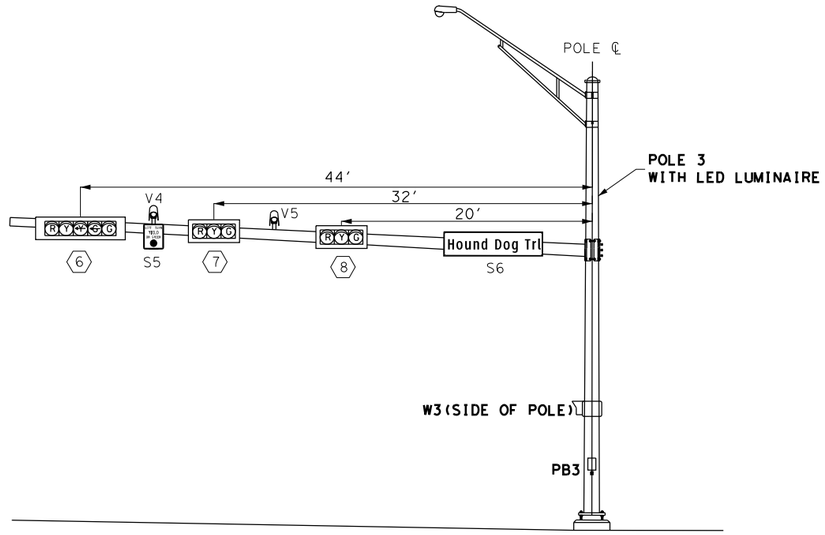
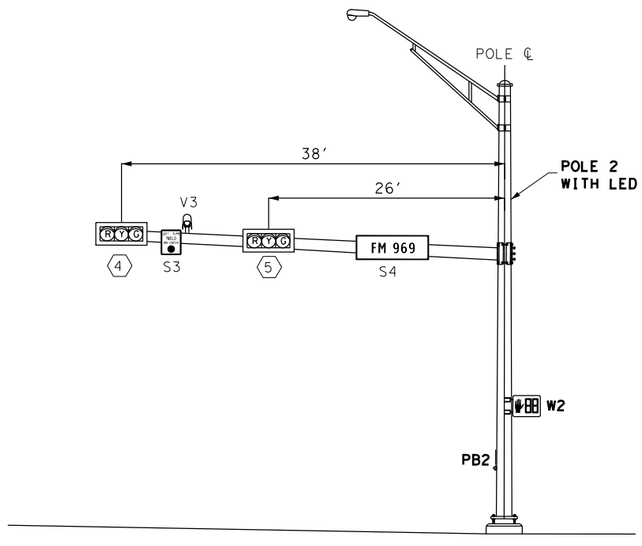


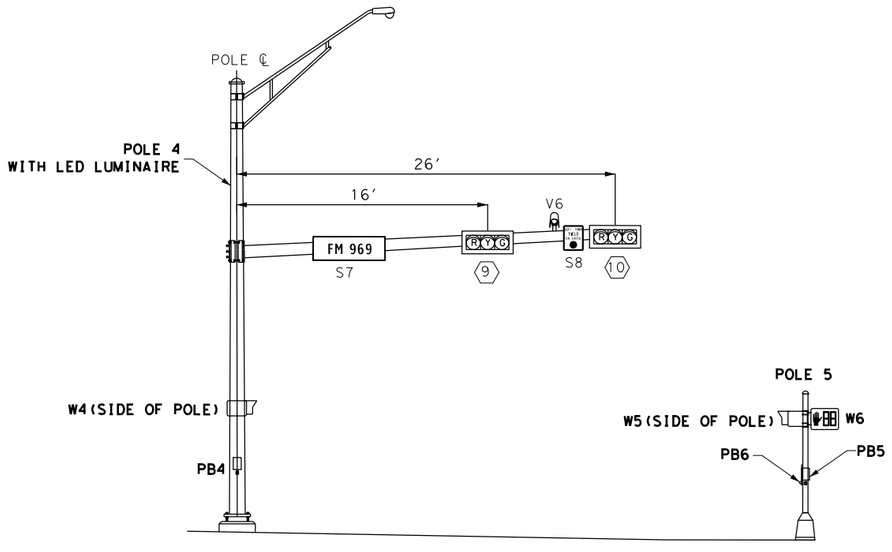
LOOKING WEST ON FM 969
NOT TO SCALE



LOOKING EAST ON FM 969
NOT TO SCALE



LOOKING NORTH ON HOUND DOG TRL
NOT TO SCALE



LOOKING SOUTH ON HOUND DOG TRL
NOT TO SCALE

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6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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TRAFFIC SIGNAL MODIFICATION PLANS

SIGNAL ELEVATIONS

FM 969 AT HOUND DOG TRAIL

SHEET 1 OF 1

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
AQ	6	PTF 2022(045)		231
DRAWN BY:	STATE	DIST. NO.	COUNTY	
AQ	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
RS	1186	01	091	FM 969

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DATE:
FILE:

GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

FILE:	ed1-14.dgn	DN:	CK:	DW:	CK:
© TxDOT	October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS		1186	01	091	FM 969
		DIST	COUNTY		SHEET NO.
		AUS	TRAVIS		232

ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.
2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.
3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.
4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.
11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.
12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.
4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.
5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

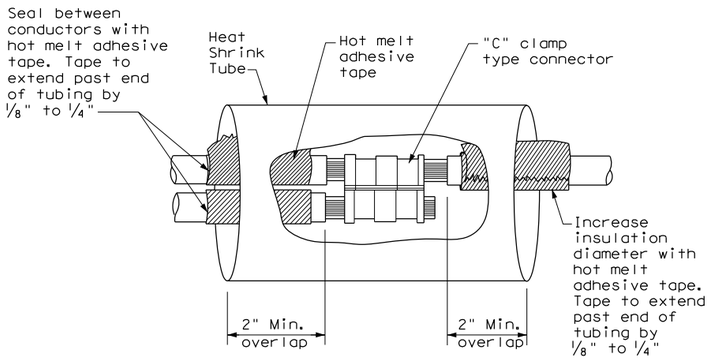
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

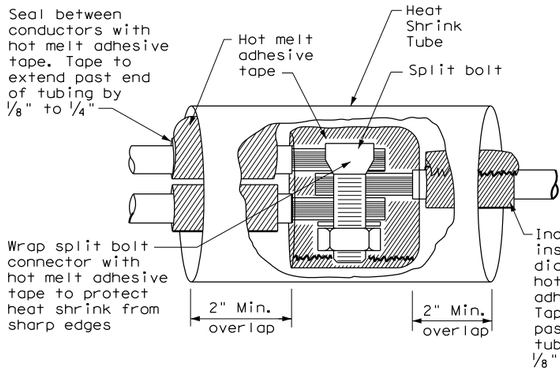
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

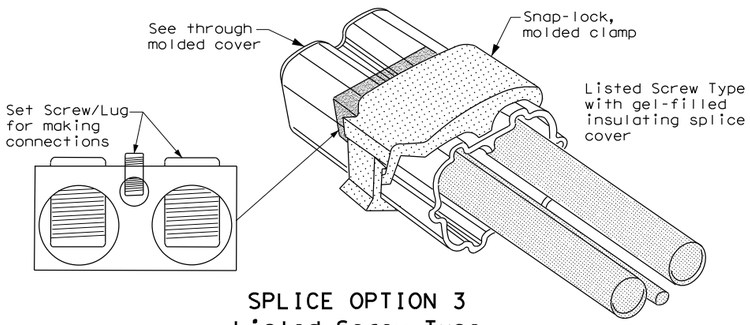
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
2. Do not place ground rods in the same drilled hole as a timber pole.
3. Install ground rods so the imprinted part number is at the upper end of the rod.
4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

FILE:	ed3-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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		DIST	COUNTY		SHEET NO.
		AUS	TRAVIS		233

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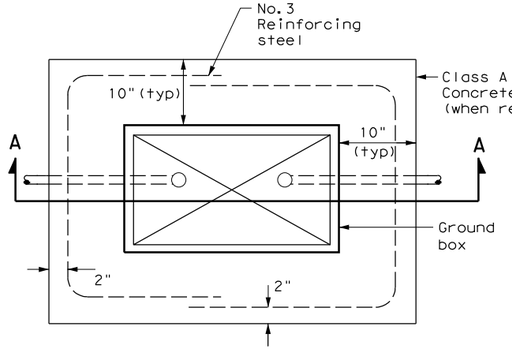
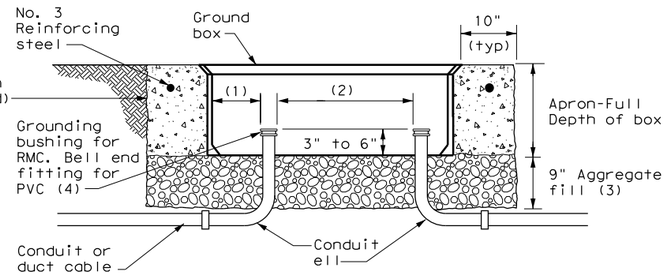


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

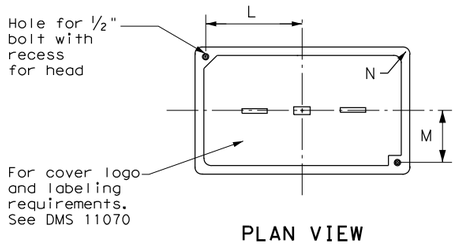
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

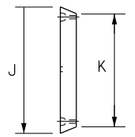
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

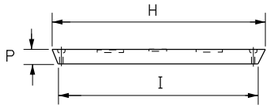
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



END



SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."

2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.

2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.

3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.

4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.

5. Temporarily seal all conduits in the ground box until conductors are installed.

6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.

7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.

8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.

10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

ED(4)-14

FILE: ed4-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		234

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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
Gilbert Rd	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	
Hound Dog Tr	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	

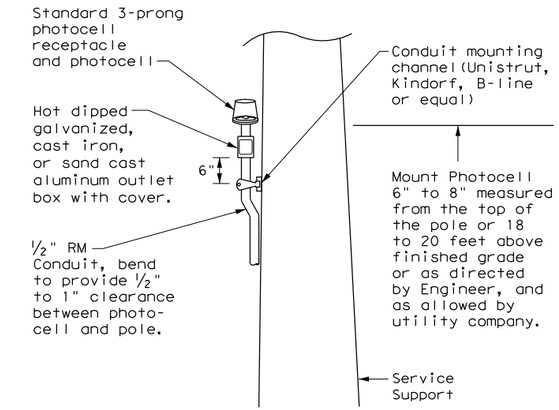
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** 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.

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/20

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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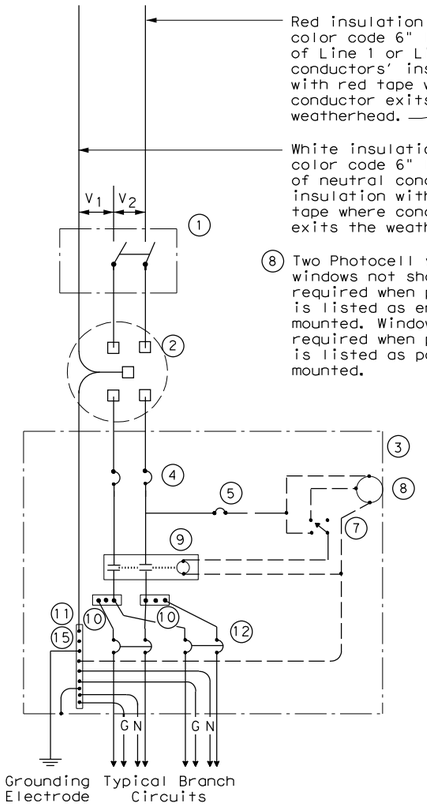
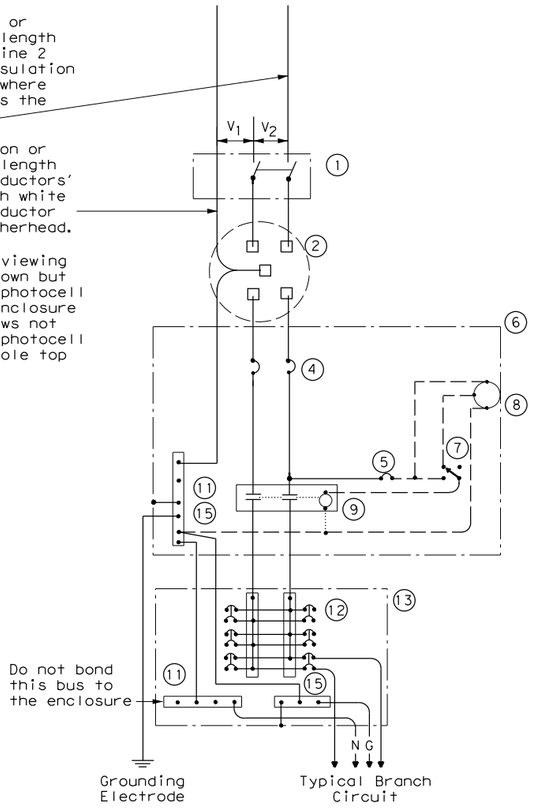
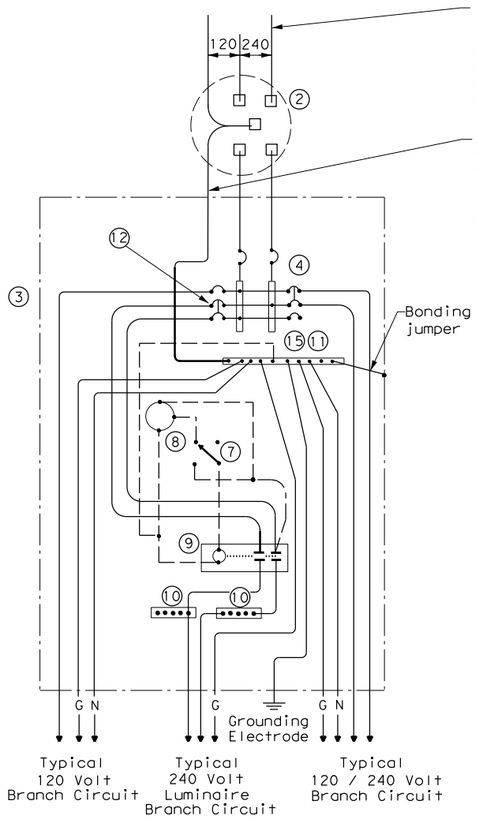


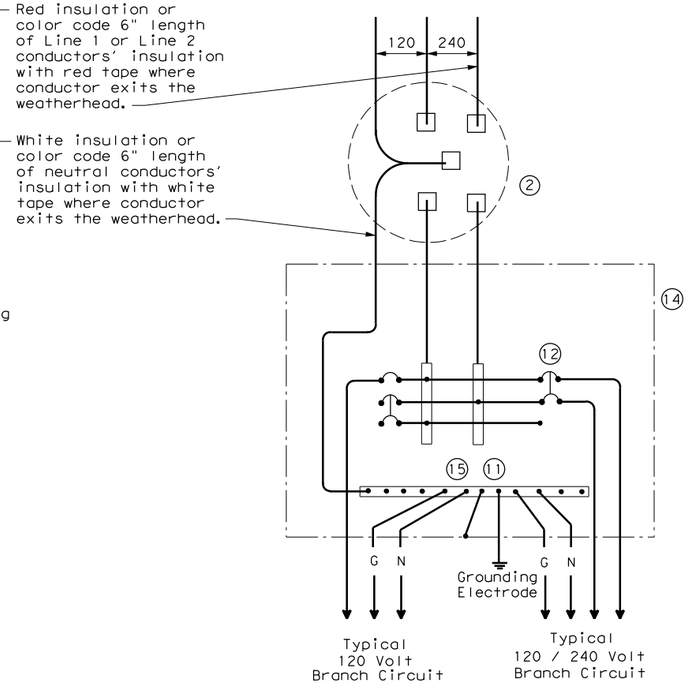
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
———	Power Wiring
- — - —	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

FILE: ed6-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		236

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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

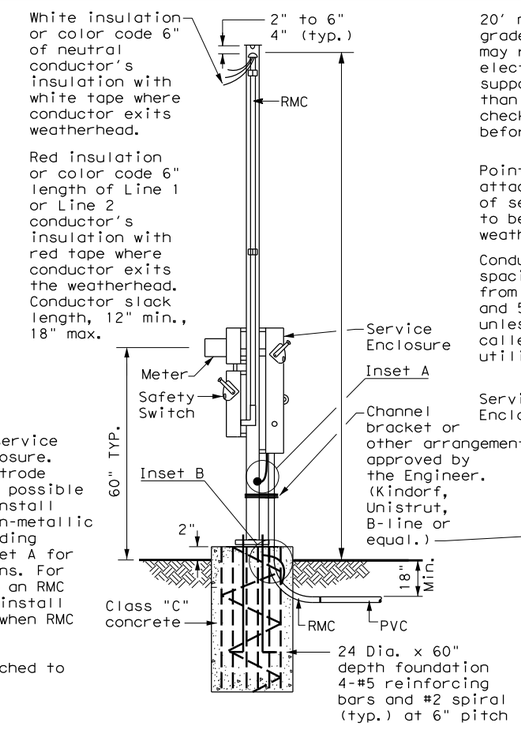
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

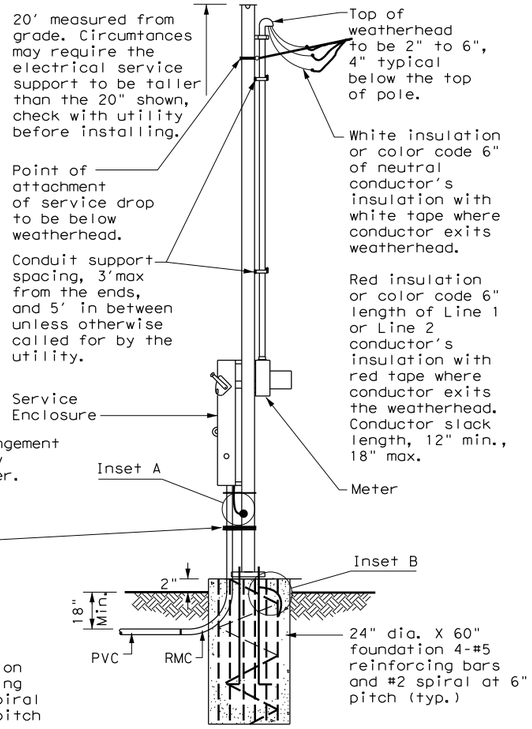
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

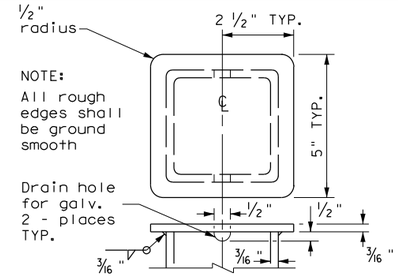


WITH SAFETY SWITCH

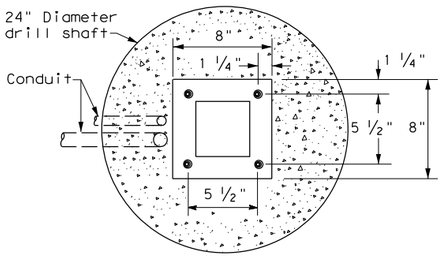


WITHOUT SAFETY SWITCH

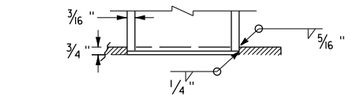
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

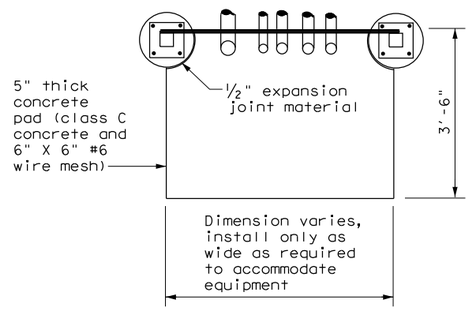


BASE PLATE DETAIL



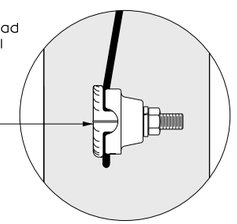
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



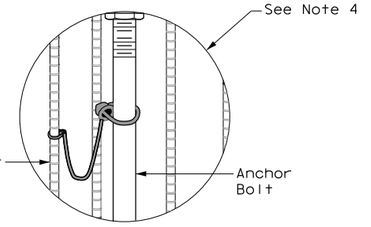
TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

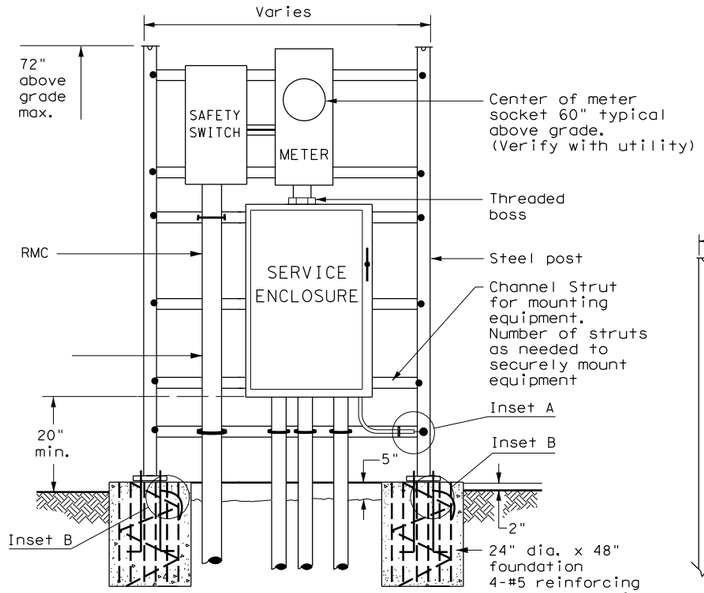


FRONT VIEW

INSET A

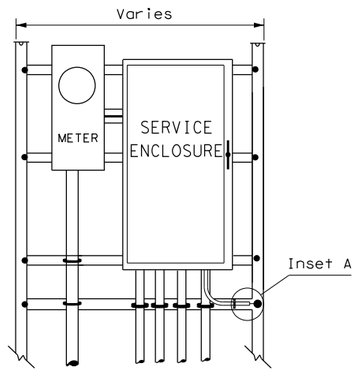


INSET B



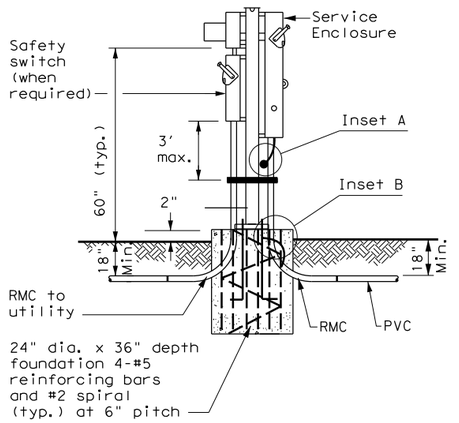
WITH SAFETY SWITCH

FRONT VIEW

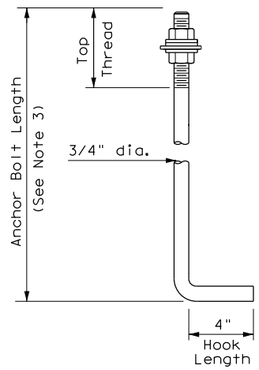


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		237

71G

DATE:
FILE:

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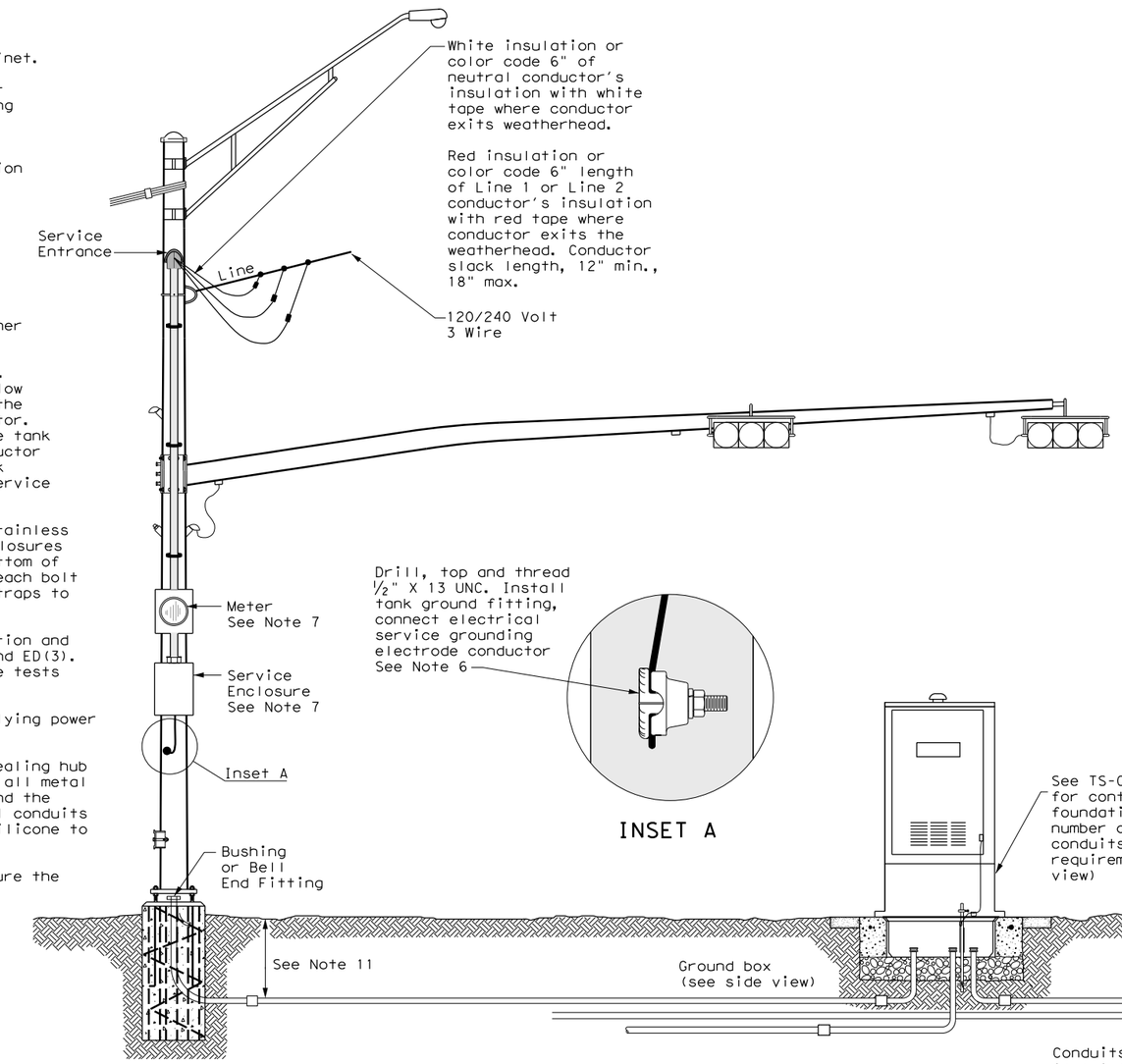
TRAFFIC SIGNAL NOTES

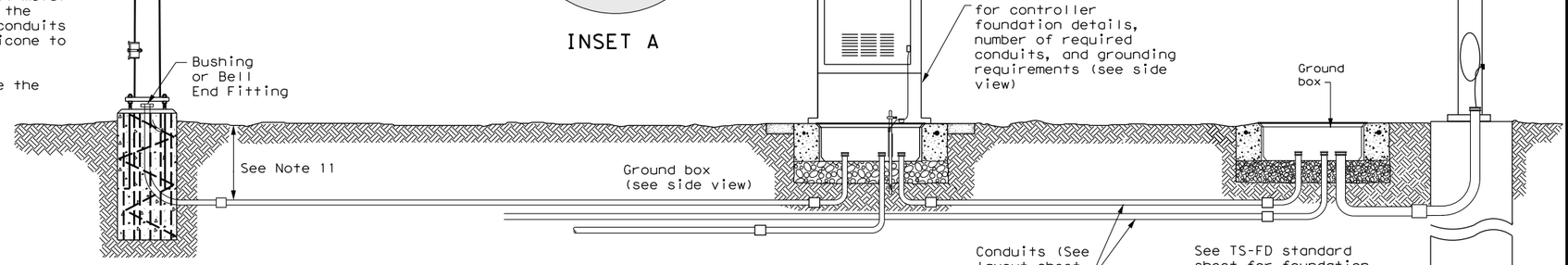
1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material and construction sections of Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test installed roadway luminaires for proper operation as a part of the associated traffic signal system test.
4. If internally illuminated street name signs are approved for use, ground the fixture to the pole with a 12 AWG green XHHW conductor.
5. Bond anchor bolts to rebar cage in two locations using #3 bars or 6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TXDOT standard TS-FD for further details.
6. Drill and tap signal poles for ½ in. X 13 UNC tank ground fitting. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Connect the electrical service grounding electrode conductor to the tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole with stainless steel bands. Ensure bands are a minimum width of ¾ in. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole for attaching conduit.
8. Conduct pull tests and insulation resistance tests on all illumination and power conductors as required in Item 620 "Electrical Conductors" and ED(3). To prevent electronics damage, do not conduct insulation resistance tests on traffic signal cables after termination.
9. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
10. Terminate conduits entering the top of enclosures with a conduit-sealing hub or threaded boss such as meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Bond the grounding bushing to the ground bus with a bonding jumper. Seal all conduits entering enclosures with duct seal or expanding foam. Do not use silicone to seal conduit ends.
11. For all conduits, ensure the burial depth is a minimum of 18". Ensure the minimum burial depth for conduit placed under a roadway is 24".



SIGNAL POLE WITH SERVICE

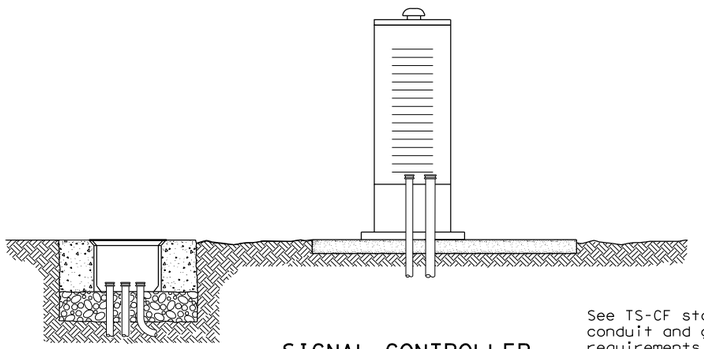
Type T electrical service mounted on signal pole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

INSET A



SIGNAL CONTROLLER FRONT VIEW

SIGNAL POLE



SIGNAL CONTROLLER SIDE VIEW

See TS-CF standard for conduit and grounding requirements. See layout sheets for ground box locations and any additional conduits that are required.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(8)-14

FILE: ed8-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
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71H

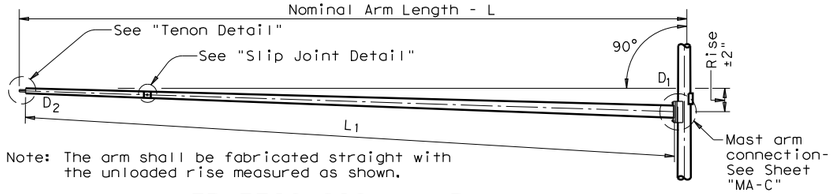
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
24	12.0	9.3	8.6	7.8	.239	13.0	10.0	9.2	8.3	.239	36-A
28	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
32	13.0	10.3	9.6	8.8	.239	14.0	11.0	10.2	9.3	.239	36-A
36	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
40	14.0	11.3	10.6	9.8	.239	16.0	13.0	12.2	11.3	.239	36-B
44	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2	.239	1'-11"	31.0	9.5	3.5	.239	1'-10"
36	35.0	10.0	5.1	.239	2'-0"	35.0	10.0	3.5	.239	1'-11"
40	39.0	10.5	5.1	.239	2'-3"	39.0	11.0	3.5	.239	2'-1"
44	43.0	11.0	5.1	.239	2'-8"	43.0	11.5	4.0	.239	2'-3"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)

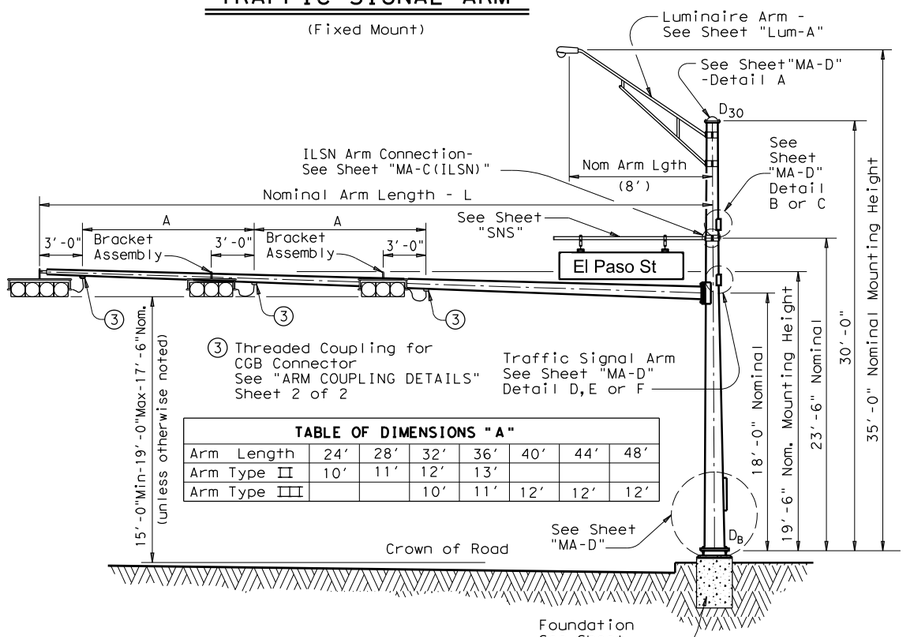


TABLE OF DIMENSIONS "A"

Arm Length	24'	28'	32'	36'	40'	44'	48'
Arm Type II	10'	11'	12'	13'			
Arm Type III			10'	11'	12'	12'	12'

STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-100		20S-100		20-100	
24	24L-100		24S-100		24-100	
28	28L-100		28S-100		28-100	
32	32L-100		32S-100		32-100	1
36	36L-100	1	36S-100		36-100	
40	40L-100		40S-100		40-100	
44	44L-100	2	44S-100		44-100	1

Traffic Signal Arms (1 per pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 CGB connector		1 Bracket Assembly and 2 CGB Connectors		2 Bracket Assemblies and 3 CGB Connectors	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100	1	32III-100	
36			36II-100		36III-100	1
40					40III-100	
44					44III-100	3

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	3

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

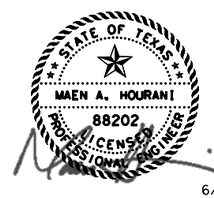
Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3'-4"	
1 ¾"	3'-10"	1
2"	4'-3"	4

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

SHEET 1 OF 2



6/25/2021

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY (100 MPH WIND ZONE)

SMA-100(1)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
11-99
1-12

CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969

DIST	COUNTY	SHEET NO.
AUS	TRAVIS	239

123A

DATE:
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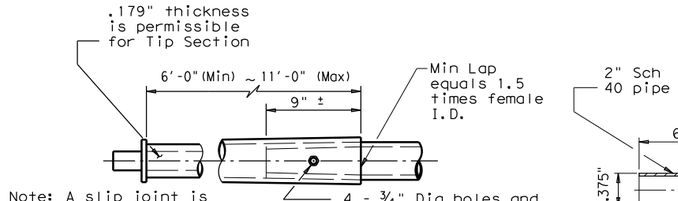
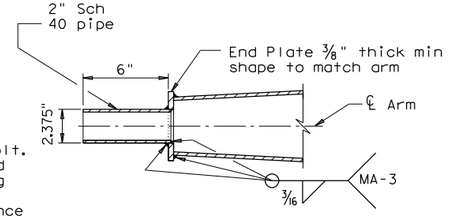
FILE:



SLIP JOINT DETAIL



TENON DETAIL

VIBRATION WARNING

Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

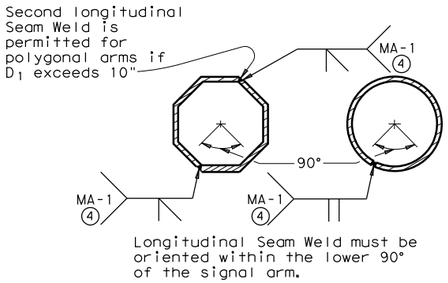
If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backpates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

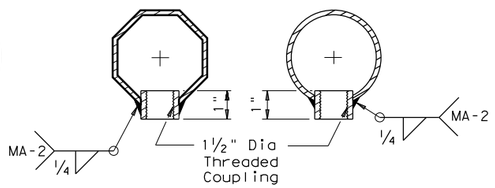
Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL

④ 60% Min. penetration
100% pemetration within 6" of circumferential base welds.



ARM COUPLING DETAILS

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 100 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(100 MPH WIND ZONE)

SMA-100(2)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
1-12

CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969
DIST	COUNTY		SHEET NO.
AUS	TRAVIS		240

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DATE:
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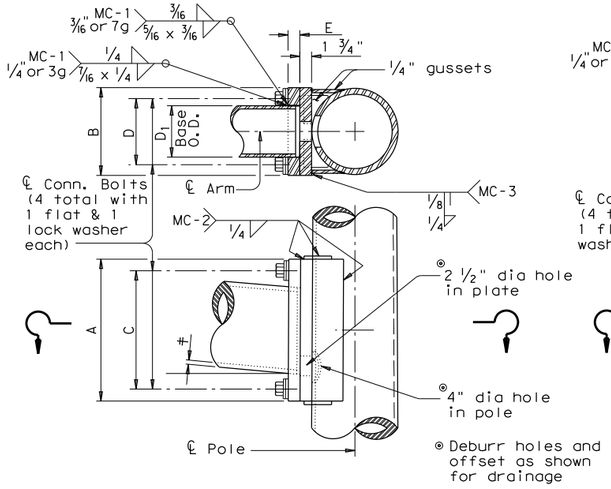
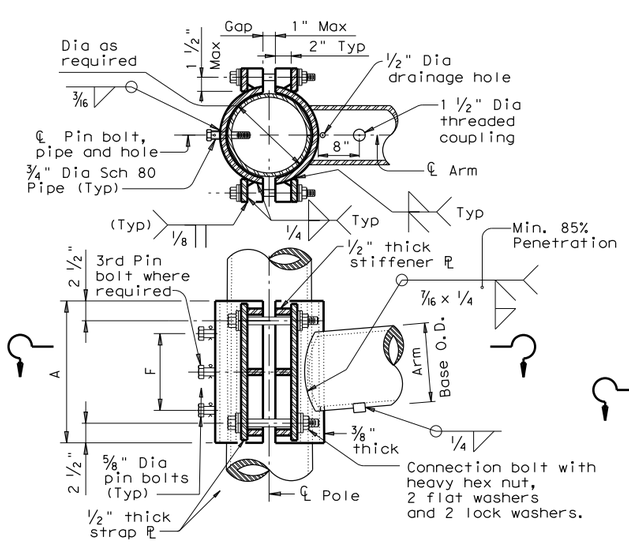
ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	B in.	C in.	D in.	E in.	CONN BOLT DIA in.
6.5	.179	12	9	9	6	1 ¾	1
7.5	.179	13	9	10	6	1 ¾	1
8.0	.179	14	10	11	7	2	1 ¼
9.0	.179	16	11	13	8	2	1 ¼
9.5	.179	17	12	14	9	2	1 ¼
9.5	.239	18	12	15	9	2	1 ¼
10.0	.239	18	12	15	9	2	1 ¼
10.5	.239	18	13	15	10	3	1 ½
11.0	.239	18	13	15	10	3	1 ½



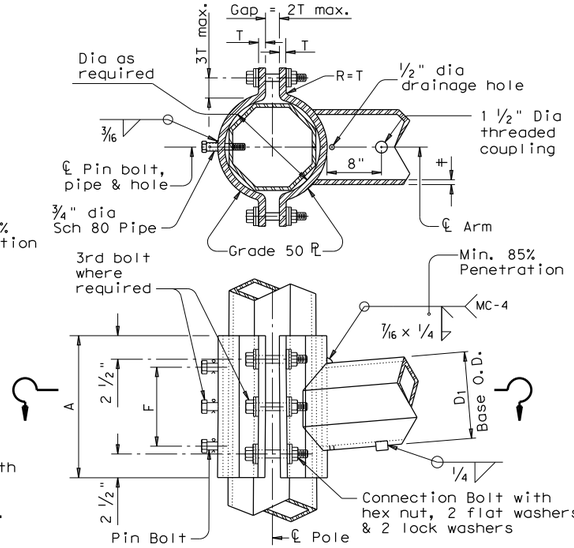
FIXED MOUNT DETAIL 1

ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 ¼	3	5/8
9.5	.239	18	12	4	1 ¼	3	5/8
10.0	.239	18	12	4	1 ¼	3	5/8



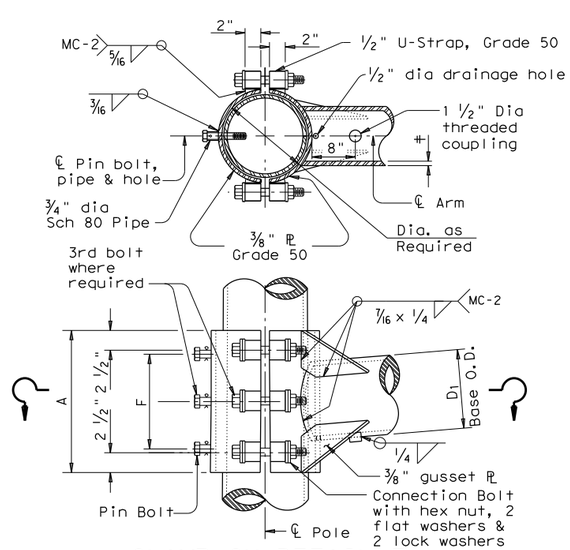
CLAMP-ON DETAIL 1

ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	F in.	T in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
7.0	.179	12	6	¾	4	¾	2	5/8
7.5	.179	14	8	¾	4	¾	2	5/8
8.0	.179	14	8	¾	4	¾	2	5/8
9.0	.179	16	10	⅞	4	1	2	5/8
10.0	.179	18	10	⅞	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8

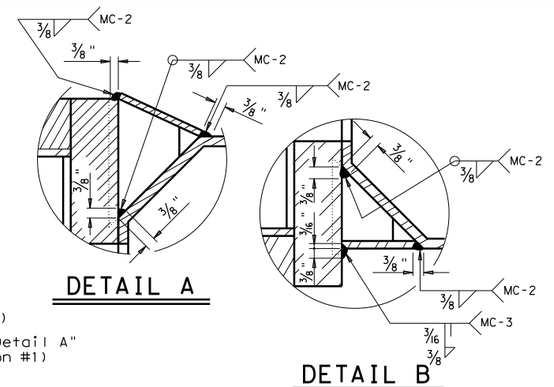


CLAMP-ON DETAIL 2

ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8

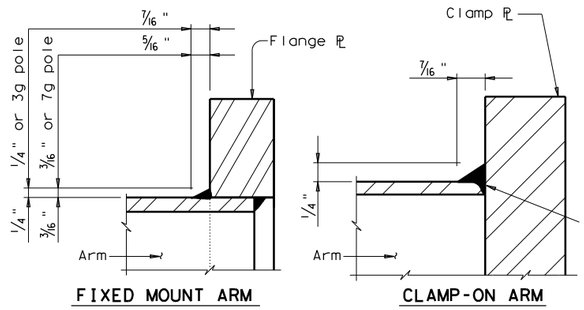


CLAMP-ON DETAIL 3



DETAIL A

DETAIL B



ARM BASE WELD DETAILS

ARM SIZE D_1 in.	ARM SIZE ∓ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8

MATERIALS

Round Shafts or Polygonal Shafts ①	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 ②
Plates ①	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 or A449, except where noted
Pin Bolts	ASTM A325
Pipe ①	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

① ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

② ASTM A1011 SS Gr.50 material shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 ½" wide vertical slotted hole shall be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and ¾" dia pipe shall have 5/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a ¾" dia hole for each pin bolt. An 11/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

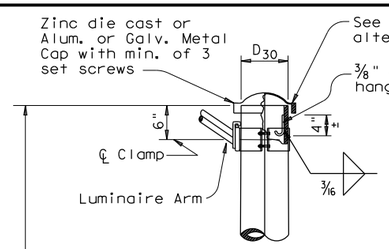
MAST ARM CONNECTIONS

MA-C-12

REVISIONS	DN: MS	CK: JSY	DW: MMF	CK: JSY
5-96	CONT	SECT	JOB	HIGHWAY
5-09	1186	01	091	FM 969
1-12	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		241

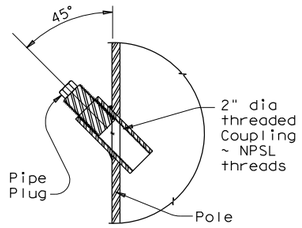
126A

DATE:
FILE:

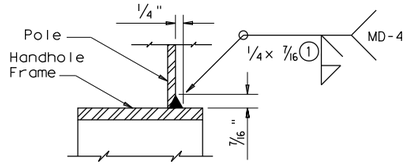


DETAIL A

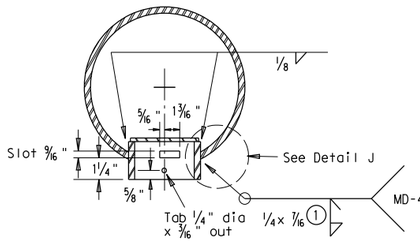
(for pole with luminaire)



POLE COUPLING DETAIL

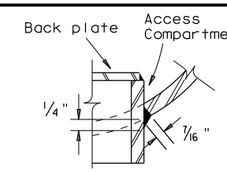


DETAIL G

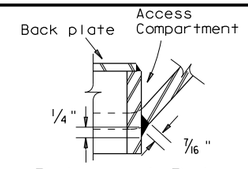


SECTION X-X

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.

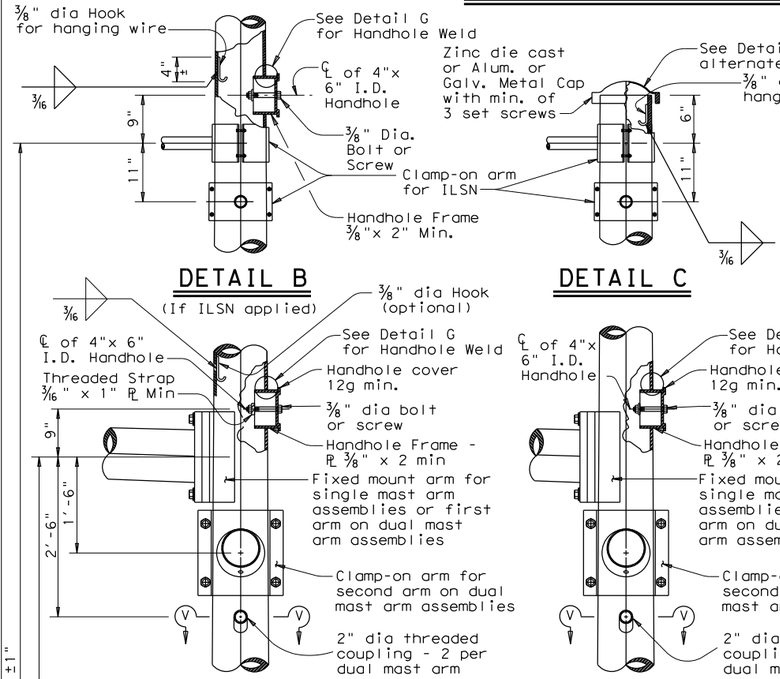


Round Pole



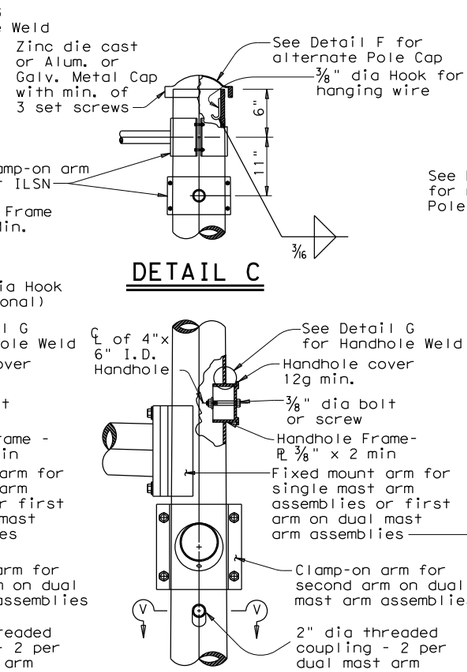
Polygonal Pole

DETAIL J



DETAIL B

(If ILSN applied)



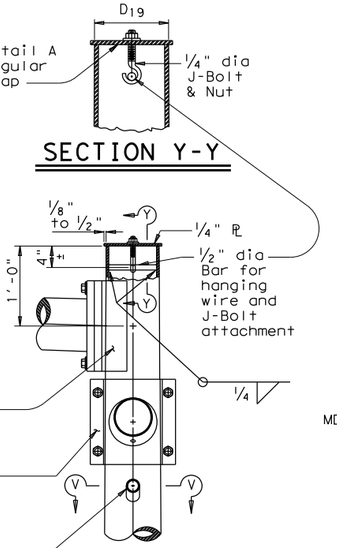
DETAIL C

DETAIL D

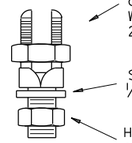
(for 30' pole with luminaire and ILSN sign)

DETAIL E

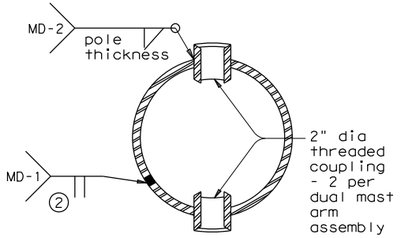
(for 24' pole with ILSN sign and no luminaire)



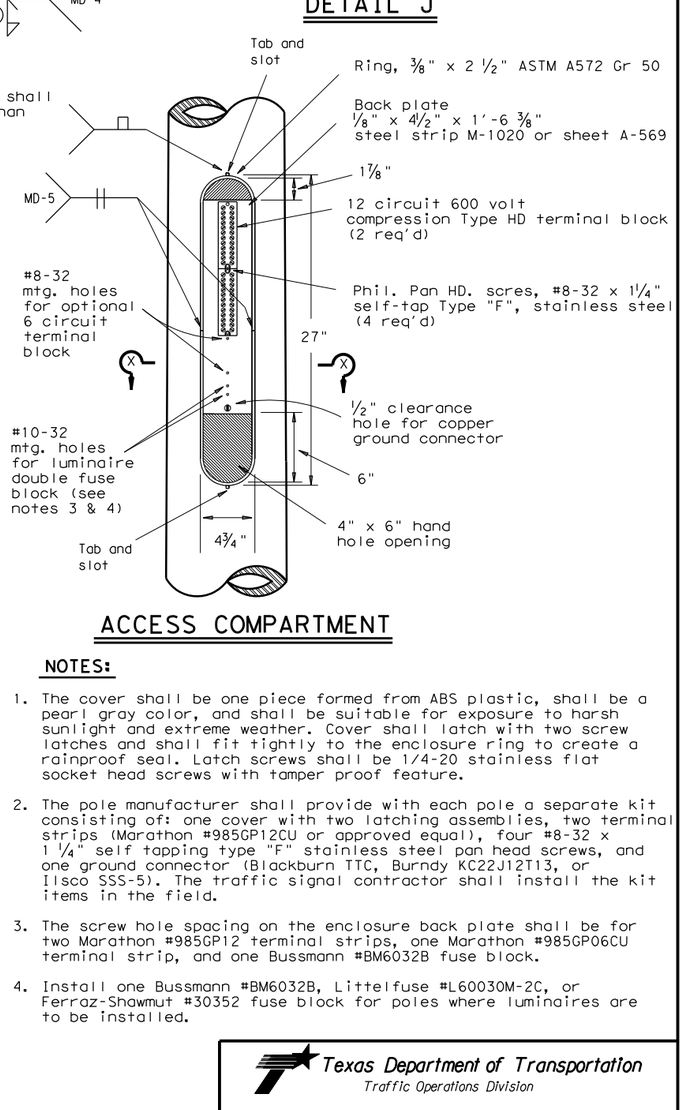
SECTION Y-Y



COPPER GROUND CONNECTOR



SECTION V-V

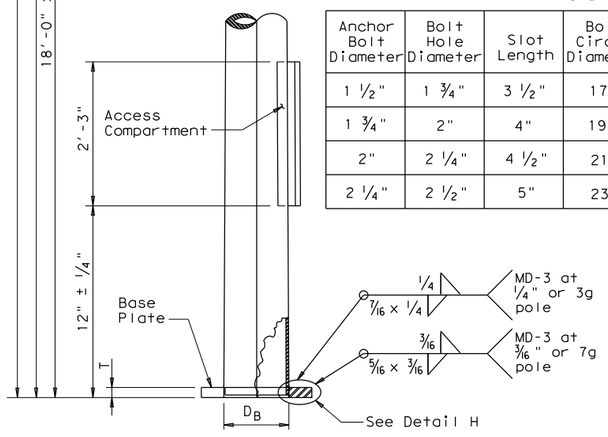


ACCESS COMPARTMENT

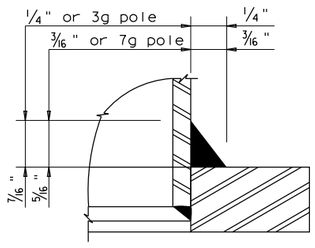
NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

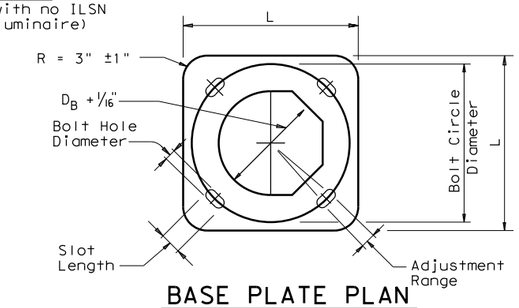
Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base ℞ Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



POLE ELEVATION



DETAIL H



BASE PLATE PLAN

(1) 85% Min. penetration

(2) 60% Min. penetration 100% pemetration within 6" of circumferential base welds.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS

MA-D-12

DN: MS	CK: JSY	DW: FDN	CK: CAL

REVISIONS
8-99
1-12

CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969
DIST	COUNTY		SHEET NO.
AUS	TRAVIS		242

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DATE:
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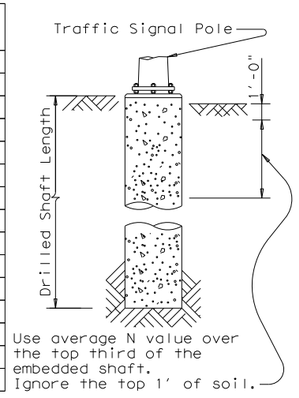
FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft ④, ⑤, ⑥			ANCHOR BOLT DESIGN ①				FOUNDATION DESIGN LOAD ②		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'



NOTES:

① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

FOUNDATION SUMMARY TABLE ③

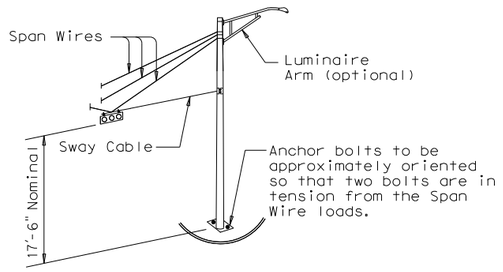
LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH ⑥ (FEET)				
				24-A	30-A	36-A	36-B	42-A
SB SH 130 POLE 4	10	24-A	1	5.7				
SB SH 130 POLE 5	10	24-A	1	5.7				
SB SH 130 POLE 6	10	24-A	1	5.7				
NB SH 130 POLE 4	10	24-A	1	5.7				
NB SH 130 POLE 5	10	24-A	1	5.7				
GILBERT RD POLE 3	10	36-A	1			13.2		
GILBERT RD POLE 2	10	24-A	1	5.7				
GILBERT RD POLE 4	10	24-A	1	5.7				
GILBERT RD POLE 6	10	24-A	1	5.7				
GILBERT RD POLE 7	10	36-B	1				15.2	
GILBERT RD POLE 8	10	24-A	1	5.7				
HOUND DOG TR POLE 1	10	36-B	1				15.2	
HOUND DOG TR POLE 2	10	36-B	1				15.2	
HOUND DOG TR POLE 4	10	36-A	1			13.2		
HOUND DOG TR POLE 5	10	24-A	1	5.7				
TOTAL DRILLED SHAFT LENGTHS				57.0		26.4	45.6	

ANCHOR BOLT & TEMPLATE SIZES

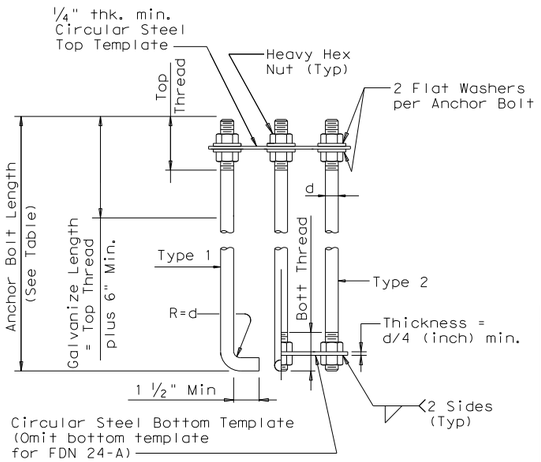
BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

⑦ Min dimensions given, longer bolts are acceptable.

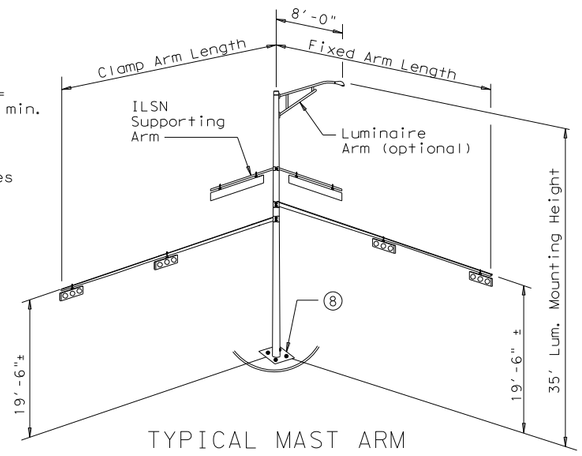
EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



TYPICAL STRAIN POLE ASSEMBLY



ANCHOR BOLT ASSEMBLY



TYPICAL MAST ARM ASSEMBLY

⑧ Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.

FOUNDATION DETAILS

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

DN: MS	CK: JSY	DW: MAO/MMF	CK: JSY/TEB

REVISIONS: 5-96, 11-99, 1-12

CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969
DIST	COUNTY		SHEET NO.
AUS	TRAVIS		243

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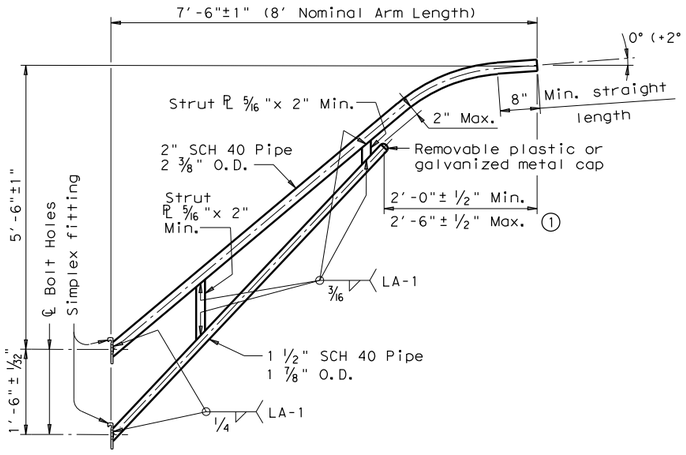
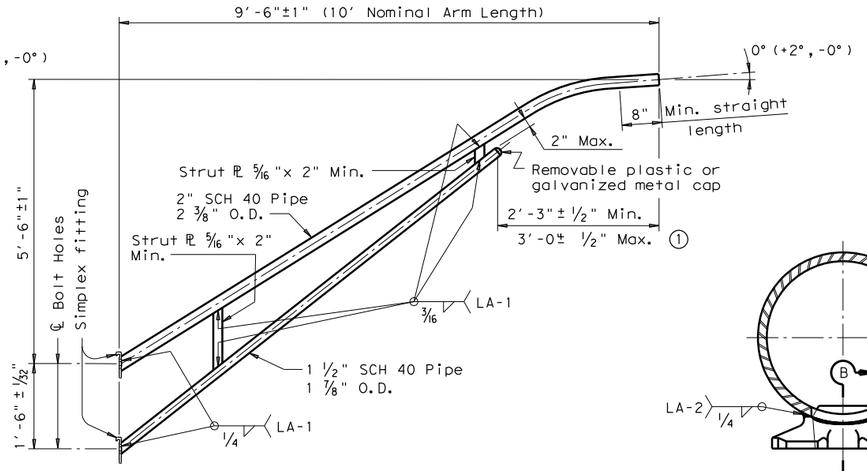
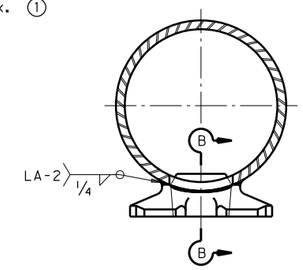


8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM



DIRECT ATTACHMENT DETAIL

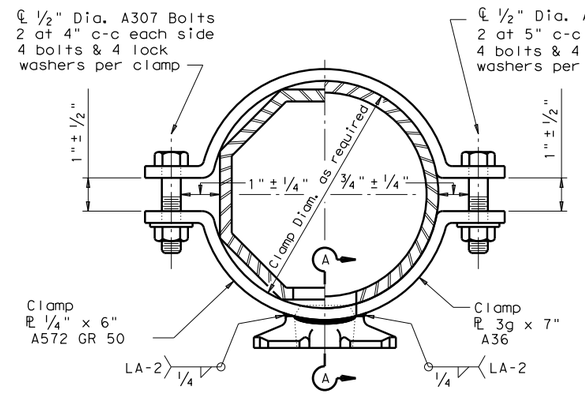
MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr.65-35 or A148 Gr.80-50, A576 Gr.1021 (3), or A36 (Arm only)
Arm Pipes	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50 (4), or A1011 HSLAS-F Gr.50 (4)
Arm Strut Plates (2)	ASTM A36, A572 Gr.50 (4), or A588
Misc.	ASTM designations as noted

(1) Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

(2) Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

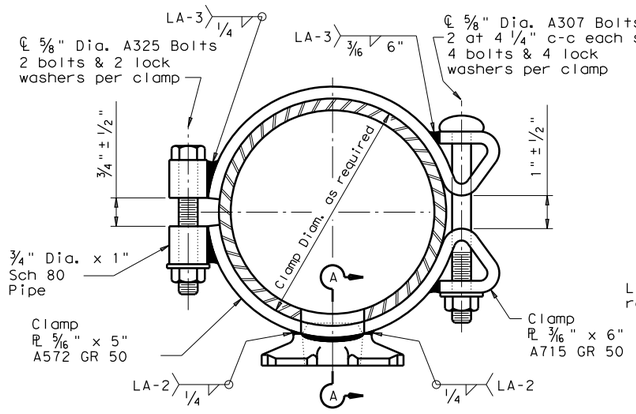
(3) A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

(4) ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.



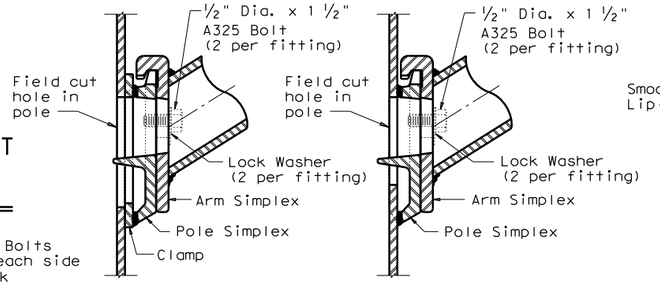
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



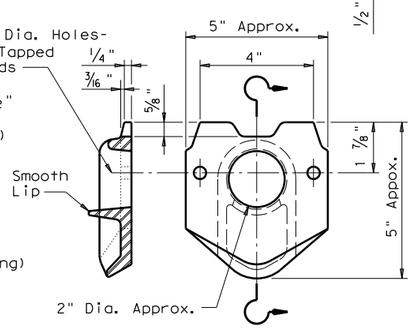
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)

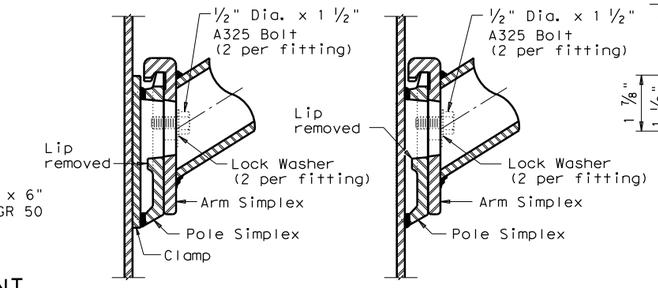


UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING



POLE SIMPLEX DETAIL

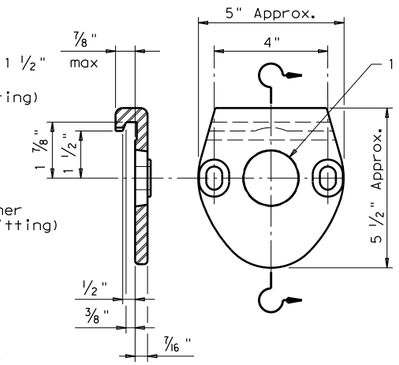


LOWER SIMPLEX FITTING

SECTON A-A

LOWER SIMPLEX FITTING

SECTON B-B



ARM SIMPLEX DETAIL

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absense of specified Fabricaton tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES

ARM DETAILS

LUM-A-12

DN: LEH	CK: JSY	DW: LTT	CK: TEB

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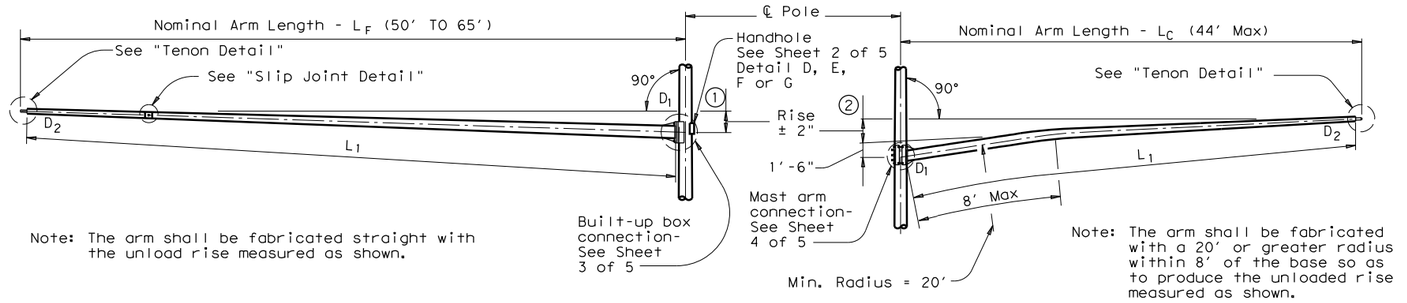
1-12

CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969

DIST	COUNTY	SHEET NO.
AUS	TRAVIS	244

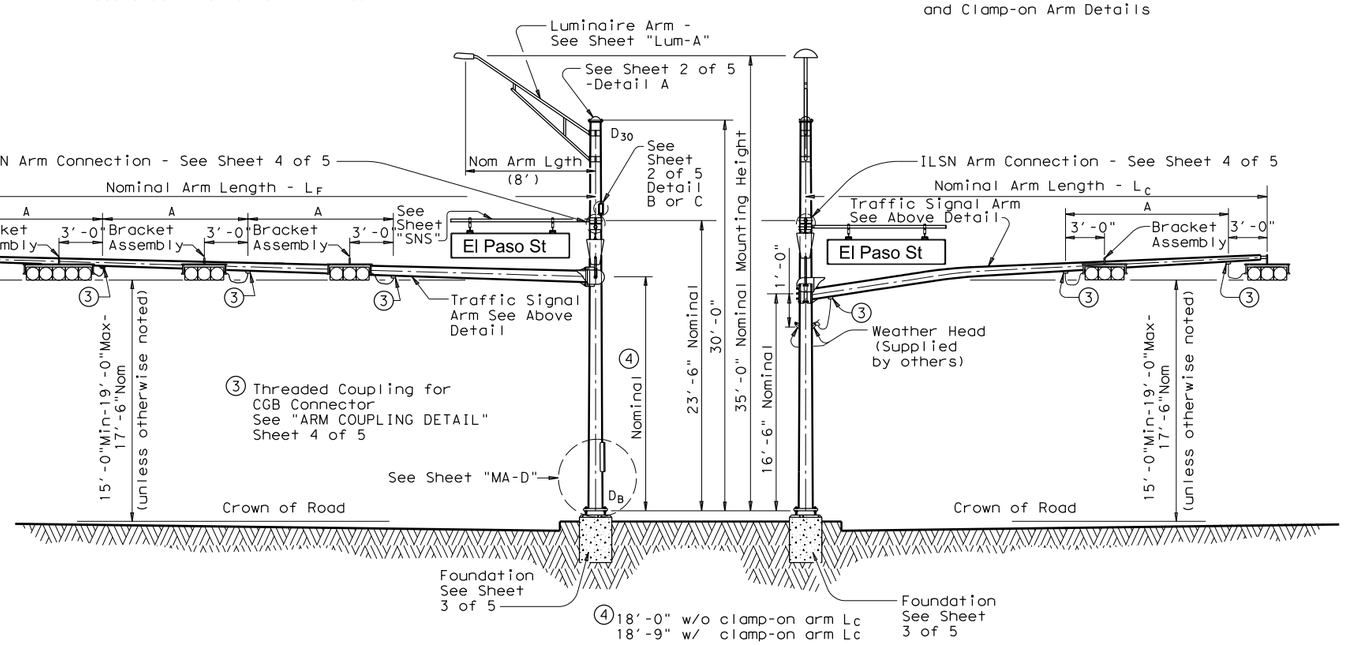


FIXED MOUNT TRAFFIC SIGNAL ARM

① See Sheet 3 of 5 for Arm Rise

CLAMP-ON TRAFFIC SIGNAL ARM (IF REQUIRED)

② See Sheet 4 of 5 for Arm Rise and Clamp-on Arm Details

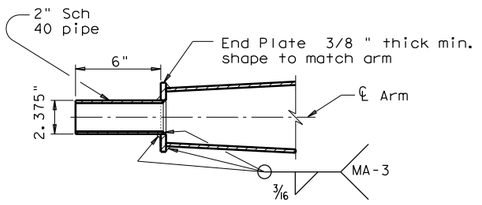


ELEVATION
(Showing fixed mount arm)

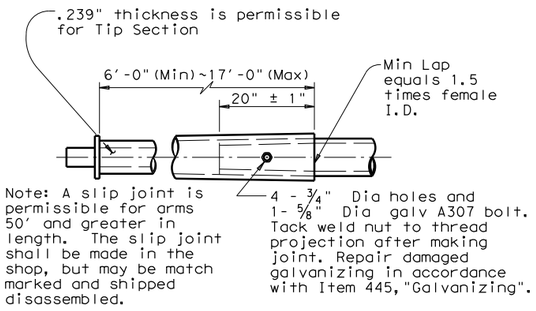
STRUCTURE ASSEMBLY

ELEVATION
(Showing clamp-on arm)

TABLE OF DIMENSIONS "A"										
Arm Length	24'	28'	32'	36'	40'	44'	50'	55'	60'	65'
Arm Type II	10'	11'	12'	13'						
Arm Type III			10'	11'	12'	12'				
Arm Type IV							12'	12'	12'	12'



TENON DETAIL



SLIP JOINT DETAIL (FIXED MOUNT ARM)

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed can be either 100 mph or 80 mph plus a 1.3 gust factor. If clamp-on traffic signal is required, designs are based on an arm included angle of 90 degrees or more. Angles of less than approximately 75 degrees will require a special design.

Poles are designed to support one 8'-0" luminaire arm, two 9'-0" internally lighted street name (ILSN) signs and two traffic signal arms with limited length combinations.

Each arm with its related attachment is shown below

Arm	Equivalent DL ⑤	WL EPA ⑤⑥
8' Luminaire Arm	Luminaire 60 lbs	1.6 sq ft
9' ILSN Arm	Sign 85 lbs	11.5 sq ft
50' to 65' Fixed Mount Arm	Signal Loads 310 lbs	52 sq ft
Up to 44' Clamp-on Arm	Signal Loads 180 lbs	32.4 sq ft

⑤ Equivalent dead load plus horizontal wind load applied at the end of arm except ILSN arm, which applied 4.5' from the centerline of the pole.

⑥ Effective projected area (actual area times drag coefficient) for the application of horizontal wind load.

Except as noted in Sheet 1 thru 5 of 5, other details not covered shall refer to Standard Sheet "MA-D" for pole details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Material, fabrication tolerances, and shipping practices shall also meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing" after fabrication.

Deviations from the details and dimensions shown herein require submission of shop drawings in accordance with the Item 441, "Steel Structures". Alternate designs are not acceptable.

Installation of damping plate for the long mast arm is not recommended.

Provision of the bracket assembly used to support the traffic signal heads shall be under the direction of the Engineer for approval.

Design also conforms to NCHRP Report 412 for fatigue resistance except that there are no stiffeners at the base plate. TxDOT is conducting tests to determine if stiffeners at the base plate will or will not result in optimal performance; depending upon the results of the tests, poles may need a retrofit to ensure optimal fatigue performance.

DATE:
FILE:

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)
LMA(1)-12

Sheet 1 of 5

DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT

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CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969
DIST	COUNTY		SHEET NO.
AUS	TRAVIS		245

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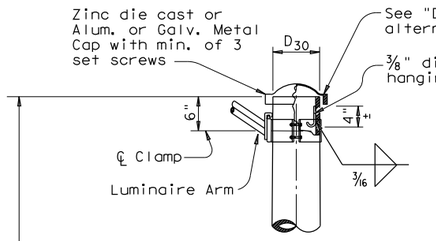
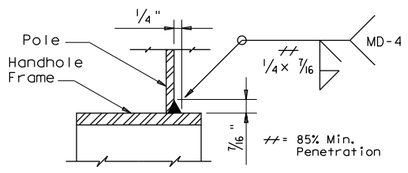
DATE:
FILE:

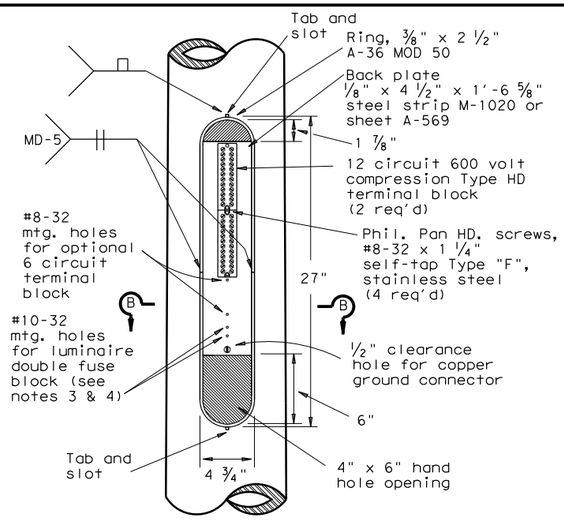


DETAIL A

(for pole with luminaire)



DETAIL H

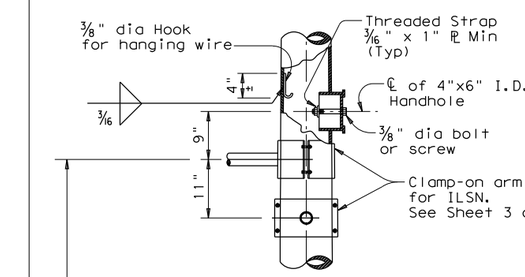


ACCESS COMPARTMENT

MATERIALS	
Round Shafts or Polygonal Shafts (7)	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 (8)
Plates (7)	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325, or A449 except where noted
Pin Bolts	ASTM A325
Pipe (7)	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

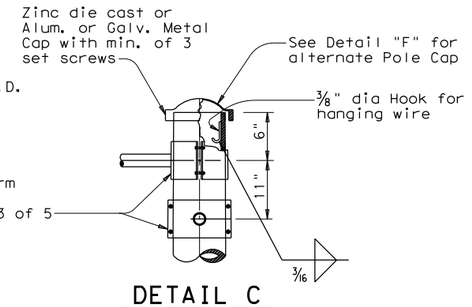
(7) ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F, or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

(8) ASTM A1011 SS Gr.50 shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

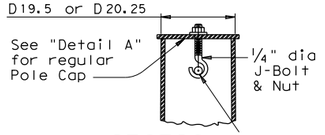


DETAIL B

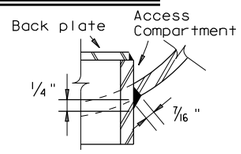
(If ILSN applied)



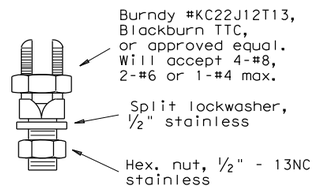
DETAIL C



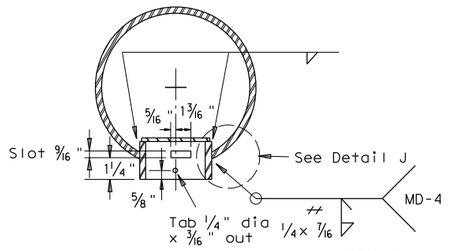
SECTION Y-Y



DETAIL J



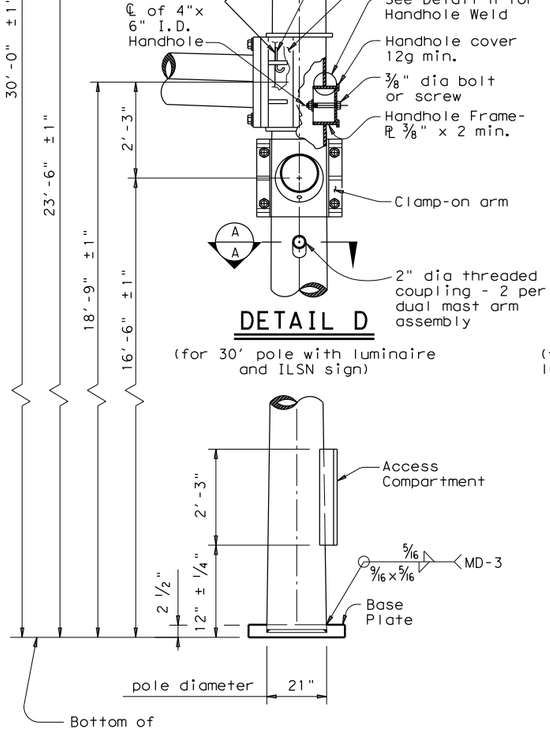
COPPER GROUND CONNECTOR



SECTION B-B

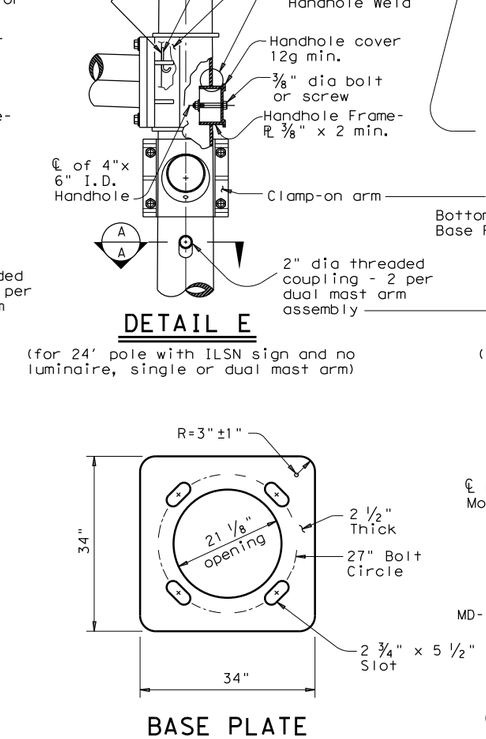
// = 85% Min. Penetration

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.



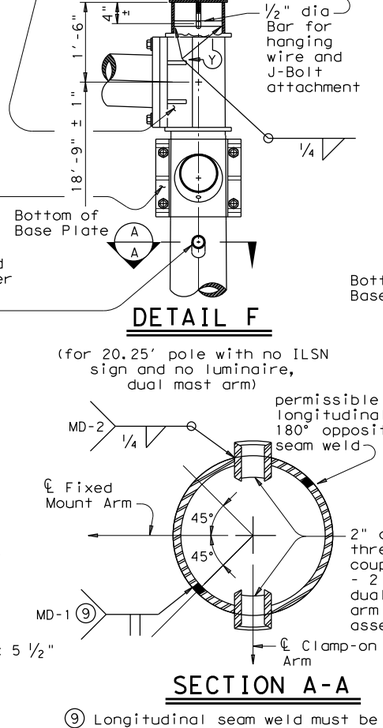
DETAIL D

(for 30' pole with luminaire and ILSN sign)



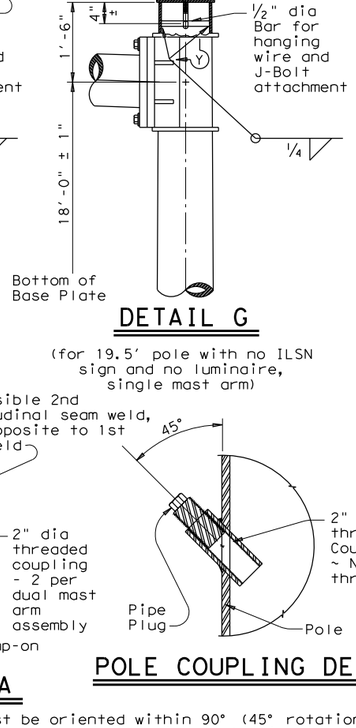
DETAIL E

(for 24' pole with ILSN sign and no luminaire, single or dual mast arm)



DETAIL F

(for 20.25' pole with no ILSN sign and no luminaire, dual mast arm)

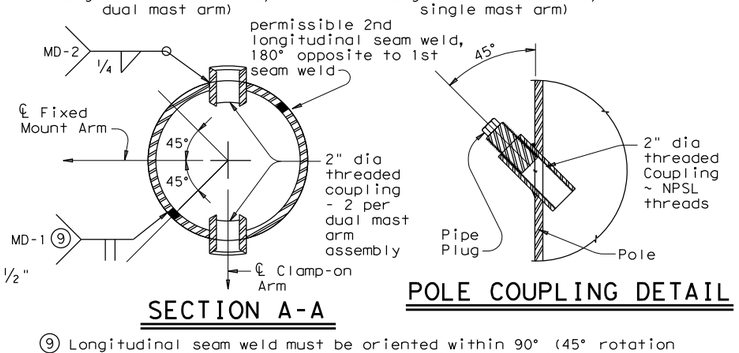


DETAIL G

(for 19.5' pole with no ILSN sign and no luminaire, single mast arm)

POLE ELEVATION

BASE PLATE



SECTION A-A

POLE COUPLING DETAIL

(9) Longitudinal seam weld must be oriented within 90° (45° rotation each side) along the fixed mount arm. 60% min penetration required, 100% penetration within 6" of circumferential base weld.

ACCESS COMPARTMENT NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

Sheet 2 of 5

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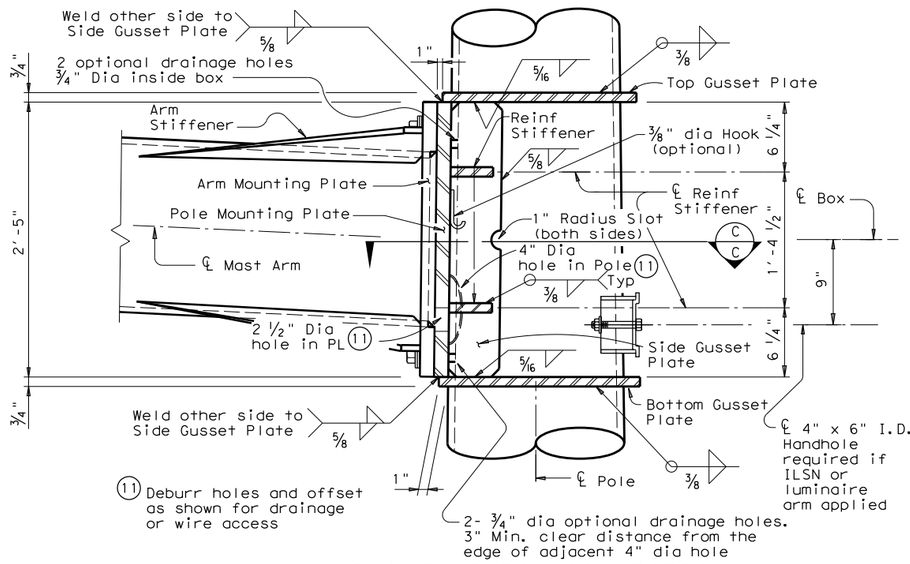
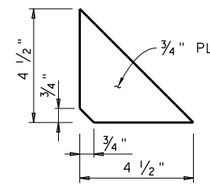
1186	01	091	FM 969
DIST	COUNTY		SHEET NO.
AUS	TRAVIS		246

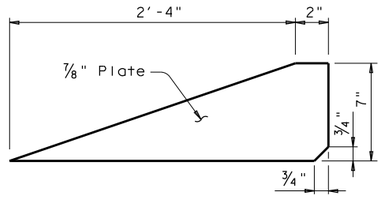
131B



BUILT-UP BOX CONNECTION

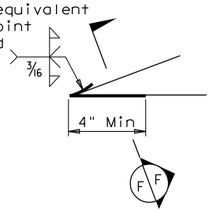


REINFORCING STIFFENER



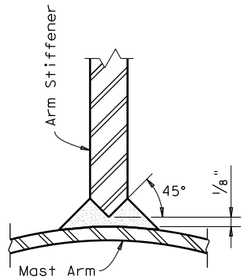
ARM STIFFENER
(Cut to match arm inclination and taper)

Provide Detail shown in SECTION F-F or equivalent 100% complete joint penetration weld from both sides.



Only 4" length at tip of Arm Stiffener requires a complete joint penetration weld. Smooth weld radius to connect Stiffener. Only a fillet weld is required for the remaining weld length.

DETAIL "K"



SECTION F-F

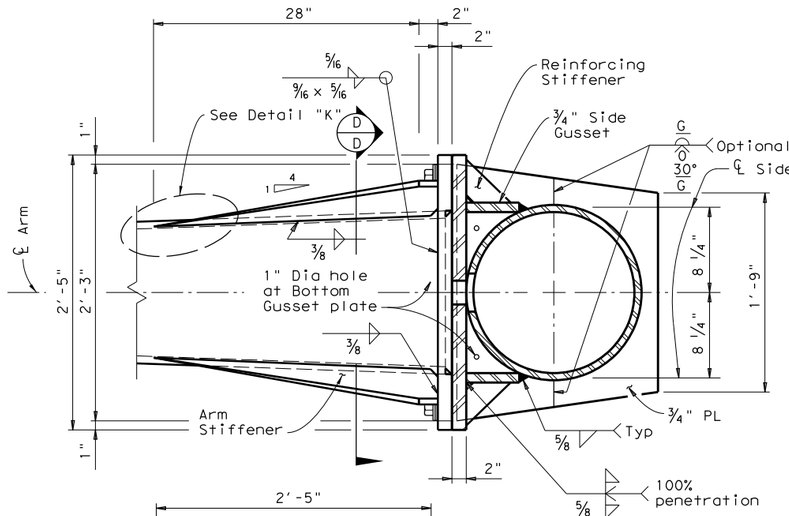
Fixed Mount Arm L_F	ROUND POLES (13)					Foundation Type
	D_B	$D_{19.5}$ or $D_{20.25}$	D_{24}	D_{30}	(12) thk	
ft.	in.	in.	in.	in.	in.	
50', 55' 60', 65'	21.0	18.2	17.6	16.8	.3125	48-A

Fixed Mount Arm L_F	ROUND ARMS (13)				
	L_1	D_1	D_2	(12) thk	Rise
ft.	ft.	in.	in.	in.	
50	49	18.5	11.7	.3125	3'- 3"
55	54	18.5	11.0	.3125	3'- 7"
60	59	18.5	10.3	.3125	3'-11"
65	64	18.5	9.6	.3125	4'- 4"

D_B = Pole Base O.D.
$D_{19.5}$ = Pole Top O.D. with no Luminaire and no ILSN (single mast arm)
$D_{20.25}$ = Pole Top O.D. with no Luminaire and no ILSN (dual mast arm)
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L_F = Fixed Arm Length

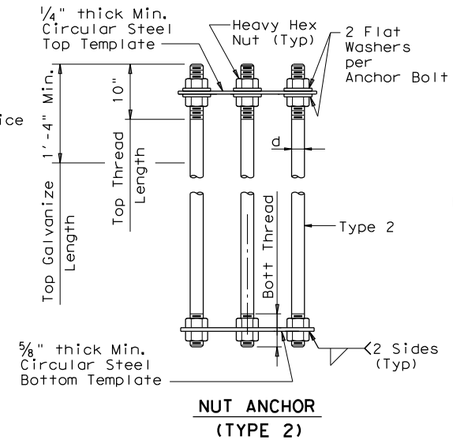
(12) Thickness shown is minimum, thicker materials may be used.

(13) Shaft profile 16-sided or 18-sided is considered to be equivalent to round section.



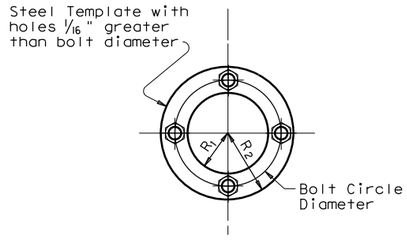
SECTION C-C

SECTION D-D



NUT ANCHOR
(TYPE 2)

ANCHOR BOLT ASSEMBLY



TEMPLATE DETAIL

ANCHOR BOLT & TEMPLATE SIZE						
Bolt Dia in.	Length ‡	Top Thread	Bottom Thread	Bolt Circle	R_2	R_1
2 1/2"	5'-2"	10"	6 1/2"	27"	16"	11"

‡ Min dimension given, longer bolts are acceptable.

FOUNDATION DESIGN TABLE													
FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		DRILLED SHAFT LENGTH-ft (16), (17), (18)			ANCHOR BOLT DESIGN (14)				FOUNDATION DESIGN LOAD (15)		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
48-A	48"	20 #9	#4 at 6"	21.9	19.5	14.7	2 1/2"	55	27"	2	490	10	50' to 65' Mast arm assembly.

SEE SHEET "TS-FD" FOR ADDITIONAL DETAILS.

(14) Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

(15) Foundation Design Loads are the allowable moments and shears at the base of the structure.

(16) Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

(17) If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

(18) Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

GENERAL NOTES:

Built-up Box Connection: For the welded arm-to-pole connection as a build-up box configuration illustrated here is an example only, fabricators are required to submit a shop drawing of box connection for approval. The drawing shall specify the details of each box element, welds of arm-to-pole connection, arm-to-plate socket connection, and arm rise creation. Specify the proper location of drain holes along the pole. 2 1/2" dia hole in the pole mounting plate and 4" dia hole in the pole need to be aligned for wiring access or drainage. Arm stiffeners cut to match arm inclination and taper shall also be included.

The deviation from flat for either arm or pole mounting plate shall not exceed 1/32 in., which is measured along the center of mounting plate to a radial distance of 13.5 in. The deformed-from-flat connection between arm and pole mounting plates shall not be allowed if the center of both mounting plates cannot contact directly.

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

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TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

Sheet 3 of 5 LMA(3)-12

DN: JSY	CK: ARC	DW: TGG	CK: JSY

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CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969
DIST	COUNTY		SHEET NO.
AUS	TRAVIS		247

131C

DATE:
FILE:

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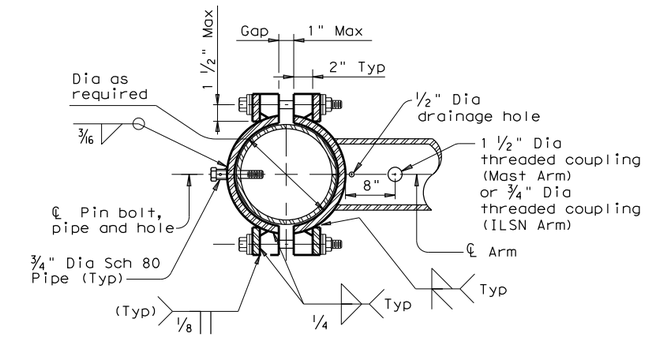
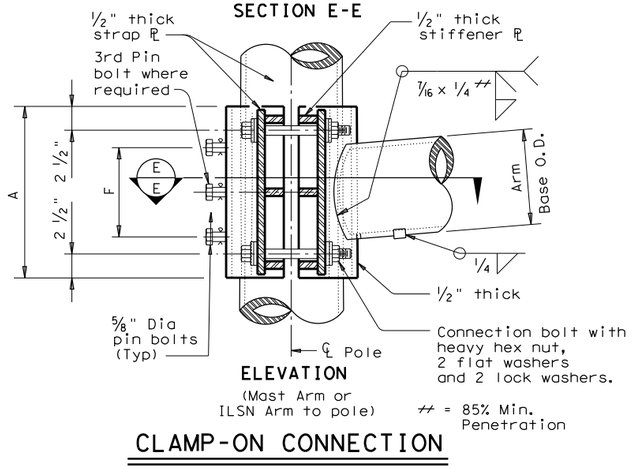


SECTION E-E



ELEVATION
(Mast Arm or ILSN Arm to pole)

= 85% Min. Penetration

CLAMP-ON CONNECTION

80 MPH WIND

Clamp-on Arm Lc	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	thk (12)	Rise	L_1	D_1	D_2	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-1"	31.0	9.0	3.5	.179	2'-0"
36	35.0	9.5	4.6	.179	2'-4"	35.0	10.0	3.5	.179	2'-1"
40	39.0	9.5	4.1	.239	2'-8"	39.0	9.5	3.5	.239	2'-3"
44	43.0	10.0	4.1	.239	2'-11"	43.0	10.0	3.5	.239	2'-6"

100 MPH WIND

Clamp-on Arm Lc	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	thk (12)	Rise	L_1	D_1	D_2	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2	.239	1'-11"	31.0	9.5	3.5	.239	1'-10"
36	35.0	10.0	5.1	.239	2'-0"	35.0	10.0	3.5	.239	1'-11"
40	39.0	10.5	5.1	.239	2'-3"	39.0	11.0	3.5	.239	2'-1"
44	43.0	11.0	5.1	.239	2'-8"	43.0	11.5	4.0	.239	2'-3"

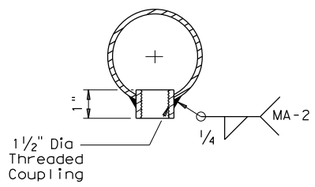
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
Lc = Clamp-on Arm Length

(12) Thickness shown is minimum, thicker materials may be used.

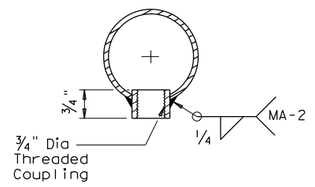
CLAMP-ON ARM CONNECTION

ILSN Arm Size		A	F	4 Conn. Bolts	⅝" Dia. Pin Bolts
Sch 40 pipe Dia	Thick			Dia	No.
in.	in.	in.	in.	in.	ea
3	.216	10	4	¾	2

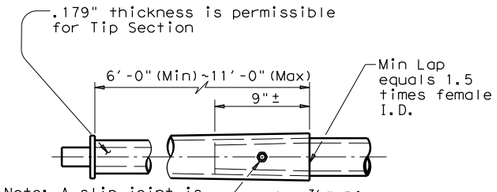
Mast Arm Size		A	F	4 Conn. Bolts	⅝" Dia. Pin Bolts
Base Dia	Thick			Dia	No.
in.	in.	in.	in.	in.	ea
6.5	.179	12	6	1	2
7.5	.179	14	8	1	2
8.0	.179	14	8	1	2
9.0	.179	16	10	1	2
9.5	.179	18	12	1 ¼	3
9.5	.239	18	12	1 ¼	3
10.0	.239	18	12	1 ¼	3
10.5	.239	18	12	1 ¼	3
11.0	.239	18	12	1 ¼	3
11.5	.239	18	12	1 ¼	3



ARM COUPLING DETAIL



ILSN ARM COUPLING DETAIL

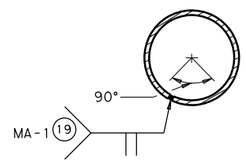


Note: A slip joint is permissible for arms 40' and greater in length. The slip joint shall be made in the shop, but may be match marked and shipped disassembled.

SLIP JOINT DETAIL (CLAMP-ON ARM)

Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL

(19) Longitudinal Seam Weld must be oriented within the lower 90° of the signal arm.
60% Min penetration
100% penetration within 6" of circumferential base welds.

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies or ILSN arm support. For a clamp-on mast arm, a maximum 1 ½" wide vertical slotted hole may be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1". For an ILSN arm, a 1 ½" diameter hole shall be cut in the front clamp plate for wire access. A matched hole shall be field drilled through the pole to provide wire access after arm is oriented. Deburr both holes.

Where duplicate parts occur on a detail, welds shown for part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces. Pin bolts shall be ASTM A325 with threads excluded from the shear plane. Pin bolt and ¾" diameter pipe shall have 3/16" diameter holes for a ⅛" diameter galvanized cotter pin. Back clamp plate shall be furnished with a ¾" diameter hole for each pin bolt. An 11/16" diameter hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT)
(80 AND 100 MPH WIND ZONE)

Sheet 4 of 5 — LMA(4)-12

DN: JK	CK: GRB	DW: FDN	CK: CAL

REVISIONS
4-20-01
1-12

CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969

DIST	COUNTY	SHEET NO.
AUS	TRAVIS	248

131D

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FILE:

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Shipping Parts List

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed arm connection bolts and washers, and any additional hardware listed in the table.

Nominal Arm Length	30' Poles with Luminaire: See note above plus: one (or two if ILSN attached) small hand hole, clamp-on simplex		24' Poles with ILSN: See note above plus one small hand hole		19.50' (Single Mast Arm) 20.25' (Dual Mast Arm) Poles with no Luminaire and no ILSN: See note above	
Single Mast Arm						
Lf ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50	50L	3	50S		50	
55	55L	1	55S		55	
60	60L		60S		60	
65	65L		65S		65	

Dual Mast Arm

Lf ft.	Lc ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50	20	5020L		5020S		5020	
	24	5024L		5024S		5024	
	28	5028L		5028S		5028	
	32	5032L		5032S		5032	
	36	5036L		5036S		5036	
	40	5040L		5040S		5040	
	44	5044L		5044S		5044	
55	20	5520L		5520S		5520	
	24	5524L		5524S		5524	
	28	5528L		5528S		5528	
	32	5532L		5532S		5532	
	36	5536L		5536S		5536	
	40	5540L		5540S		5540	
	44	5544L		5544S		5544	
60	20	6020L		6020S		6020	
	24	6024L		6024S		6024	
	28	6028L		6028S		6028	
	32	6032L		6032S		6032	
	36	6036L		6036S		6036	
	40	6040L		6040S		6040	
	44	6044L		6044S		6044	
65	20	6520L		6520S		6520	
	24	6524L		6524S		6524	
	28	6528L		6528S		6528	
	32	6532L		6532S		6532	
	36	6536L		6536S		6536	
	40	6540L		6540S		6540	
	44	6544L		6544S		6544	

Foundation Summary Table **

Location Ident.	Avg. N Blow/ft.	No. Each	Drill Shaft *** Length (feet)
			48-A
GILBERT RD POLE 1	10	1	21.9
GILBERT RD POLE 5	10	1	21.9
HOUND DOG TR POLE 3	10	1	21.9
Total Drill Shaft Length			65.7

Shipping Parts List

Traffic Signal Arms (Fixed Mount) (1 per pole)
Ship each arm with listed equipment attached

Nominal Arm Length	Type IV Arm (4 Signals) 3 Bracket Assembly and 4 CGB Connectors	
ft.	Designation	Quantity
50	50IV	3
55	55IV	
60	60IV	
65	65IV	

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	3

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Traffic Signal Arms (80 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 1 Bracket Assembly and 3 CGB connectors, and 1 clamp w/bolts and washers		Type III Arm (3 Signals) 2 Bracket Assembly and 4 CGB connectors, and 1 clamp w/bolts and washers	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80			
32			32II-80		32III-80	
36			36II-80		36III-80	
40					40III-80	
44					44III-80	

Traffic Signal Arms (100 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached

Nominal Arm	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 1 Bracket Assembly and 3 CGB connectors, and 1 clamp		Type III Arm (3 Signals) 2 Bracket Assembly and 4 CGB connectors, and 1 clamp	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100		36III-100	
40					40III-100	
44					44III-100	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
2 1/2 "	5' - 3"	3

Each anchor bolt assembly consists of the following: Top and bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers and 4 nut anchor devices (type 2) per Standard Drawing "TS-FD". Templates may be removed for shipment.

Notes

** Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

*** Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

Abbreviations
Lf= Fixed Arm Length
Lc= Clamp-on Arm Length (44' Max.)

STATE OF TEXAS
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88202
LICENSED
PROFESSIONAL ENGINEER
02/09/2021

Texas Department of Transportation
Traffic Operations Division

LONG MAST ARM ASSEMBLY PARTS LIST

LMA(5)-12

Sheet 5 of 5

DN: JK	CK: GRB	DW: FDN	CK: CAL

REVISIONS
4-20-01
1-12

CONT	SECT	JOB	HIGHWAY
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AUS	TRAVIS		249

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131E

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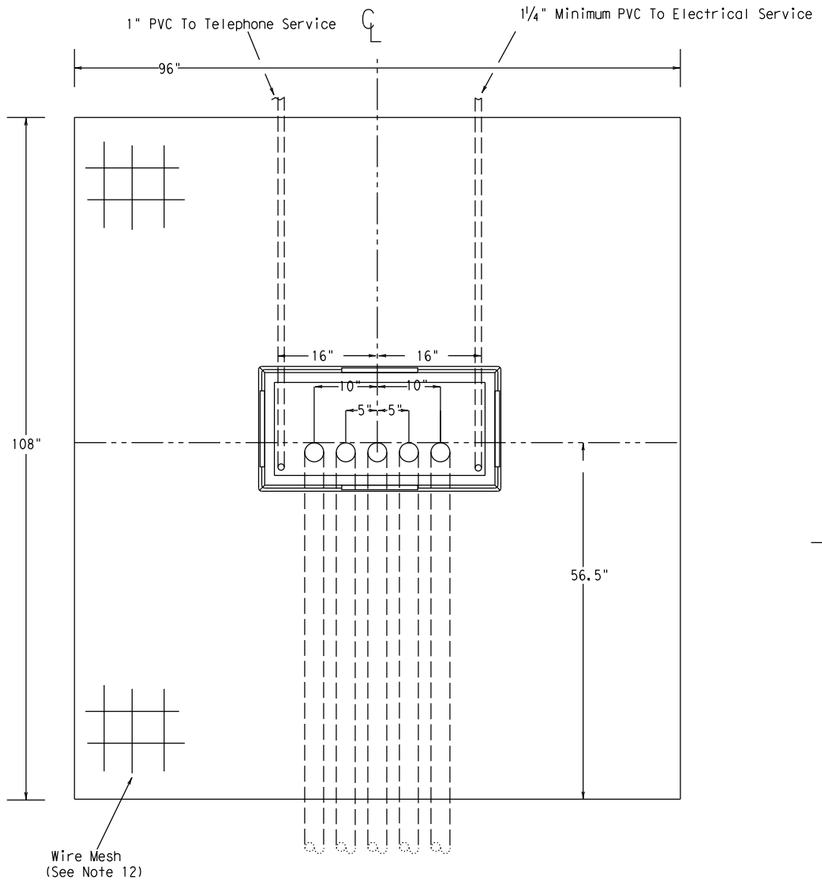
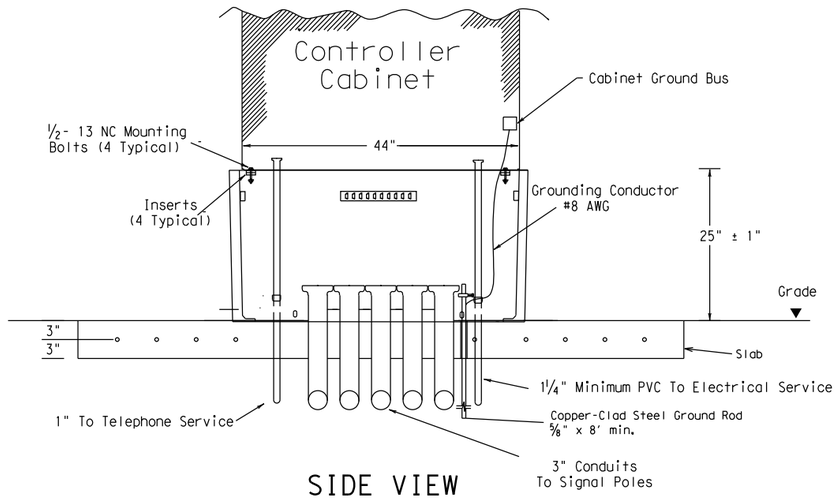
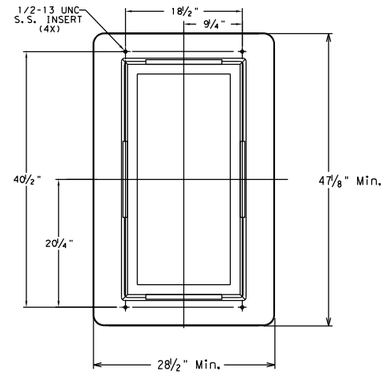
TOP VIEW
(Slab & Base)





SIDE VIEW
(Slab & Base)



CABINET BASE

TRAFFIC SIGNAL CONTROLLER BASE:

1. Provide a traffic signal controller base (cabinet base) manufactured of polymer concrete material consisting of calcareous and siliceous stone; glass fibers and thermoset polyester resin. The polymer concrete cabinet base must be reinforced on the inside of the cabinet base with fiberglass matting. Provide one of the following bases: Armorcast Part # A6001848X24, Quazite Model # PG3048Z709, or other as approved by TxDOT Traffic Operation Division.
2. The polymer concrete material must have a minimum compressive strength of 10,300 pounds per square inch (psi), minimum flexural strength of 3600 psi, and minimum shear strength of 3600 psi.
3. The polymer concrete cabinet base must conform to the dimensions shown and must accommodate a standard TxDOT basemount cabinet.
4. Supply the cabinet base with four ½"-13 UNC stainless steel inserts for attachment of the cabinet to the base. Inserts must withstand a minimum torque of 50 ft-lb and a minimum straight pull out strength of 750 lbs.
5. Provide the cabinet base with 4 cable racks mounted one on each side of the base 2" to 7 " from the top edge of the base. Unless approved otherwise, cable racks must be 1-1/2 x ⅝ x ⅛ inch steel channel with eight T-slots spaced at 1-1/2 inches. The cable racks must easily accommodate the insertion of tie wraps to attach field wiring to the racks to serve as strain relief. Secure cable racks to the base using ½"-13 UNC stainless steel screws and inserts.
6. The cabinet base, when secured to the concrete slab with controller cabinet attached, must withstand a minimum wind load of 125 mph or a 850 lb force applied at 49" above the bottom of the base without causing the base or cabinet to come out of their anchored position or cause any permanent deformation. The manufacturer must supply certification by an independent testing laboratory or sealed by a Texas Licensed Professional Engineer. Provide the cabinet base with hardware for attachment to a concrete slab.
7. The traffic signal base must be permanently marked either by impress or by permanent ink with the manufacturer's model number and name or logo.
8. Seal the base to the concrete with a silicone caulk bead and fastened to the slab per manufacturer's instructions.

CONCRETE SLAB:

9. Traffic signal controller pad must be a portland cement concrete slab poured in place, must conform to the dimensions shown, and must be level.
10. Bond a #8 AWG copper ground wire and an 8 ft ground rod bonded to the reinforcing mesh by a suitable UL Listed clamp and terminated to the cabinet grounding bus for the purpose of providing a local ground for the electrical grounding conductor. The electrical grounding conductor specified in Item 680-3.A.4 is required and must be terminated to the cabinet ground bus.
11. Install a PVC sleeve to prevent the ground rod from direct embedment in the slab.
12. Provide welded wire mesh 6X6-W2.9 X W2.9 for reinforcement. Provide joints and splices in the mesh with a minimum 6-inch overlap. Center the mesh between top and bottom and provide a minimum 3 inch cover on the edges.
13. Provide Class B concrete minimum for the slab in accordance with Item 421. Construct the slab in accordance with Item 531.

CONDUITS:

14. Stub up and run 3-inch conduits through the slab to the various traffic signal poles and ground boxes as shown on the layouts. Install the number of conduits as shown on layouts plus two additional 3 inch conduits for future use. Terminate the conduits with a bushing between 2 and 4-inches above the slab.
15. Extend conduits for future use at least 18-inches from the edge of the slab, terminate underground with a coupling, and cap and seal so that the seal can be removed without damaging the coupling. This must also apply to unused telephone conduit.
16. Stub up two separate conduits through the slab from the electrical and telephone services. Run the conduit for the electrical feed directly to the electrical service enclosure. Run the conduit for the telephone line directly to the telephone service, usually located on the same pole as the electrical service. Telephone must not under any circumstance share a conduit with any other function.
17. Terminate electric and telephone conduits above the slab with a coupling. After the base is installed, extend the conduits above the top of the base and secure to the base using a steel one-hole strap or similar suitable substitute.

CONTROLLER CABINET:

18. Anchor the controller cabinet to the base using four stainless steel 1/2-13 NC bolts.
19. The silicone caulk bead specified in Item 680.3.B must be RTV 133.

PAYMENT:

20. Bid TS-CF as subsidiary to Item 680.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL CONTROLLER CABINET BASE AND PAD

TS-CF-04

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

12-04 REVISIONS

CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY	SHEET NO.
AUS	TRAVIS	250

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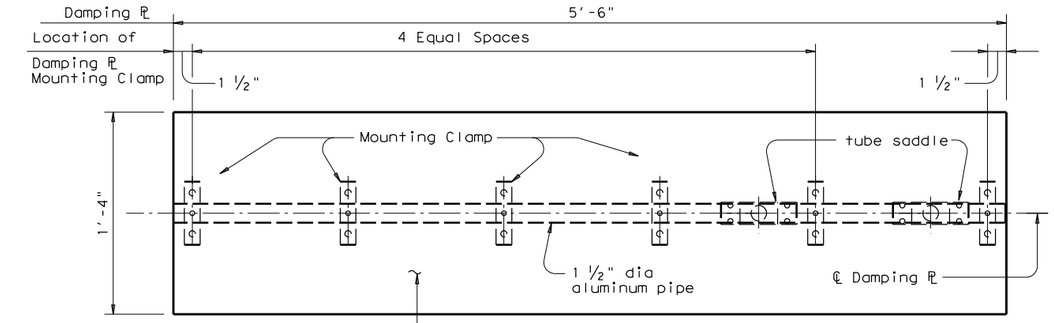
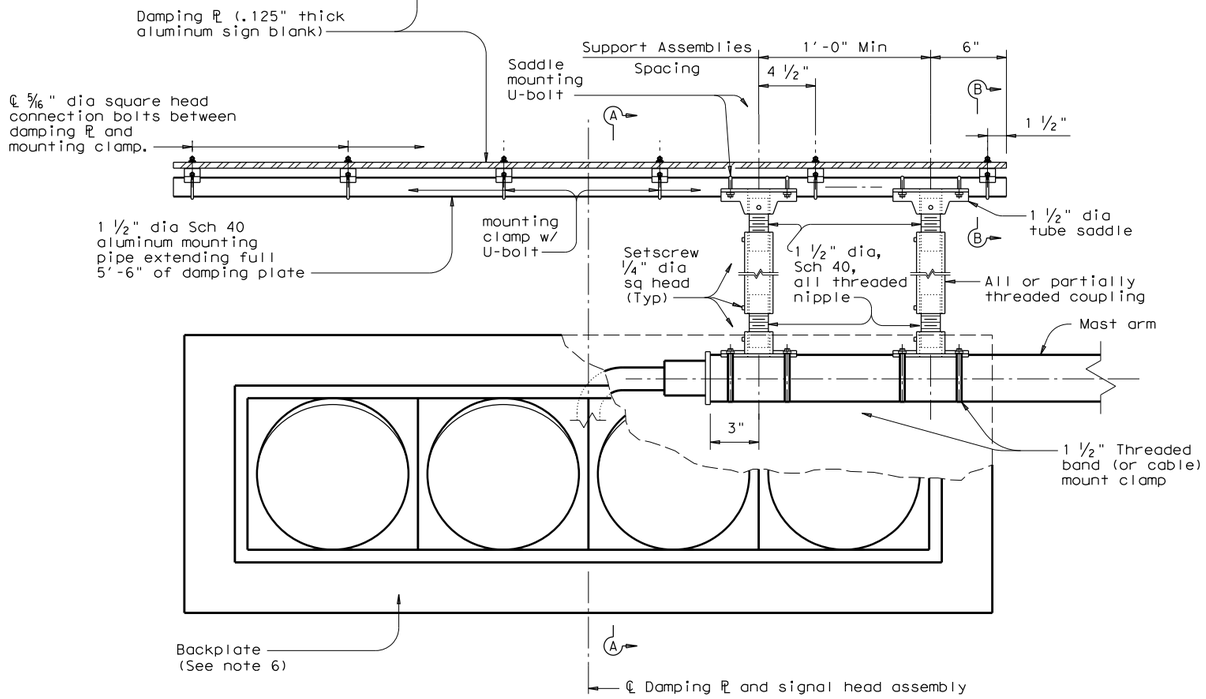


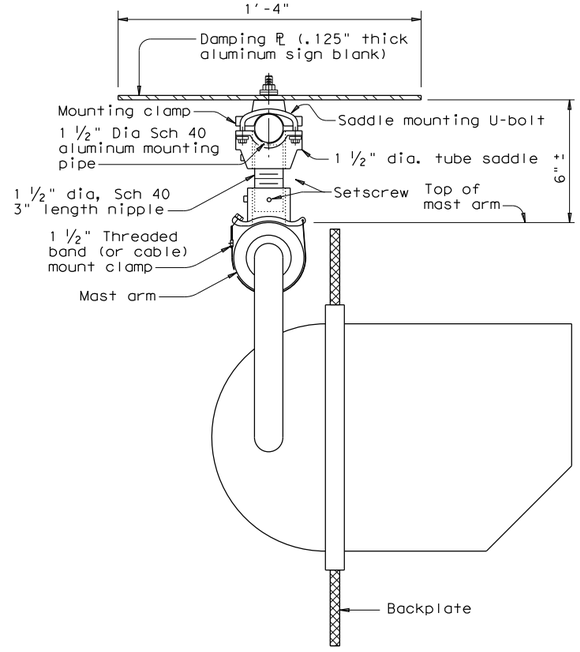
PLAN



ELEVATION

DAMPING PLATE MOUNTING DETAILS

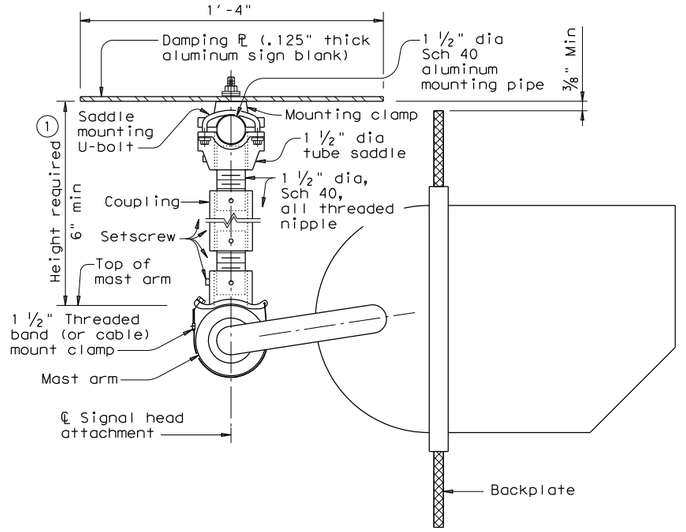
(Showing alternate placement of signal head)



SECTION A-A

(Showing standard placement of signal head)

(Mounting clamp U-bolt is not shown for clarity)

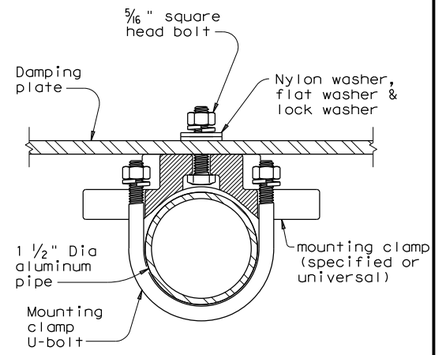


SECTION A-A

(Showing alternate placement of signal head)

(Mounting clamp U-bolt is not shown for clarity)

① Recommended supporting assemblies to achieve required height for horizontal section heads			
Height required	One nipple each length	Two nipples each length plus	One coupling each length
6"-6 ¾"	3"	-	-
7"-8 ½"	4"	-	-
9"-10 ½"	6"	-	-
11"-15 ½"	-	4"	5"
16"-24"	-	6"	10"



SECTION B-B

(Showing damping plate attachment)

GENERAL NOTES:

1. In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.

2. Aluminum sign blank for damping plate will conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle will be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling will be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and u-bolt assemblies will conform to Standard sheet SMD(GEN). U-bolts for saddle mounting will have a minimum yield strength of 36 ksi.

3. Damping plate will be mounted horizontally. Position centerline of damping plate to align with centerline of mast arm or horizontal signal head assembly. Vertical clearance between signal head (with or without backing plate) and bottom of damping plate will be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.

4. Unless stipulated by the manufacturers, all steel parts will be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".

5. Contractor will verify applicable field dimensions before the installation.

6. Backplates are optional for traffic signals. When backplates are used, Backplates will have a 2-inch fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 "Sign Face Materials." See Sheet TS-BP-20 for backplate details.

Texas Department of Transportation

Traffic Safety Division Standard

MAST ARM DAMPING PLATE DETAILS

MA-DPD-20

FILE: ma-dpd-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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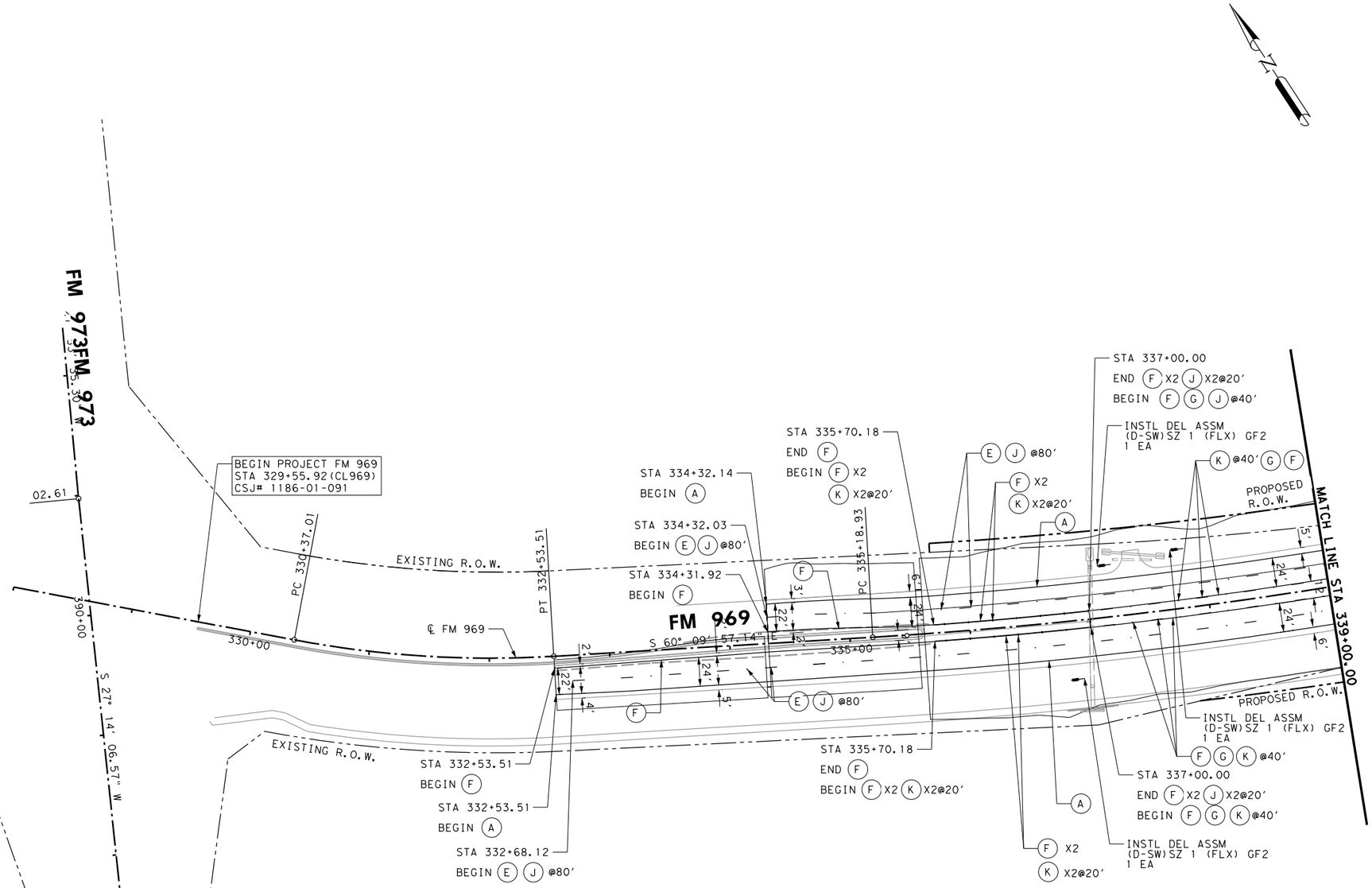
REVISIONS	1186	01	091	FM 969
4-20	DIST	COUNTY		SHEET NO.
6-20	AUS	TRAVIS		251



0' 50' 100'
SCALE IN FEET

LEGEND

- (A) REFL PAV MRK TY I & II(W)4"(SLD)(100 MIL)
- (B) REFL PAV MRK TY I & II(W)8"(SLD)(100 MIL)
- (C) REFL PAV MRK TY I & II(W)12"(SLD)(100 MIL)
- (D) REFL PAV MRK TY I & II(W)24"(SLD)(100 MIL)
- (E) REFL PAV MRK TY I & II(W)4"(BRK)(100 MIL)
- (F) REFL PAV MRK TY I & II(Y)4"(SLD)(100 MIL)
- (G) REFL PAV MRK TY I & II(Y)4"(BRK)(100 MIL)
- (H) REFL PAV MRK TY I & II (W) (ARROW)
- (I) REFL PAV MRK TY I & II (W) (WORD)
- (J) REFL PAV MRKR TY I-C
- (K) REFL PAV MRKR TY II-A-A
- (L) REF PAV MRK TY I & II (W) 36" (YLD TRI) (100MIL)
- (M) REF PAV MRKR TY II-C-R

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation
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LJA Engineering, Inc.
FRN - F-1386

FM 969
PAVEMENT MARKINGS

BEGIN TO STA 339+00

SHEET 1 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		252
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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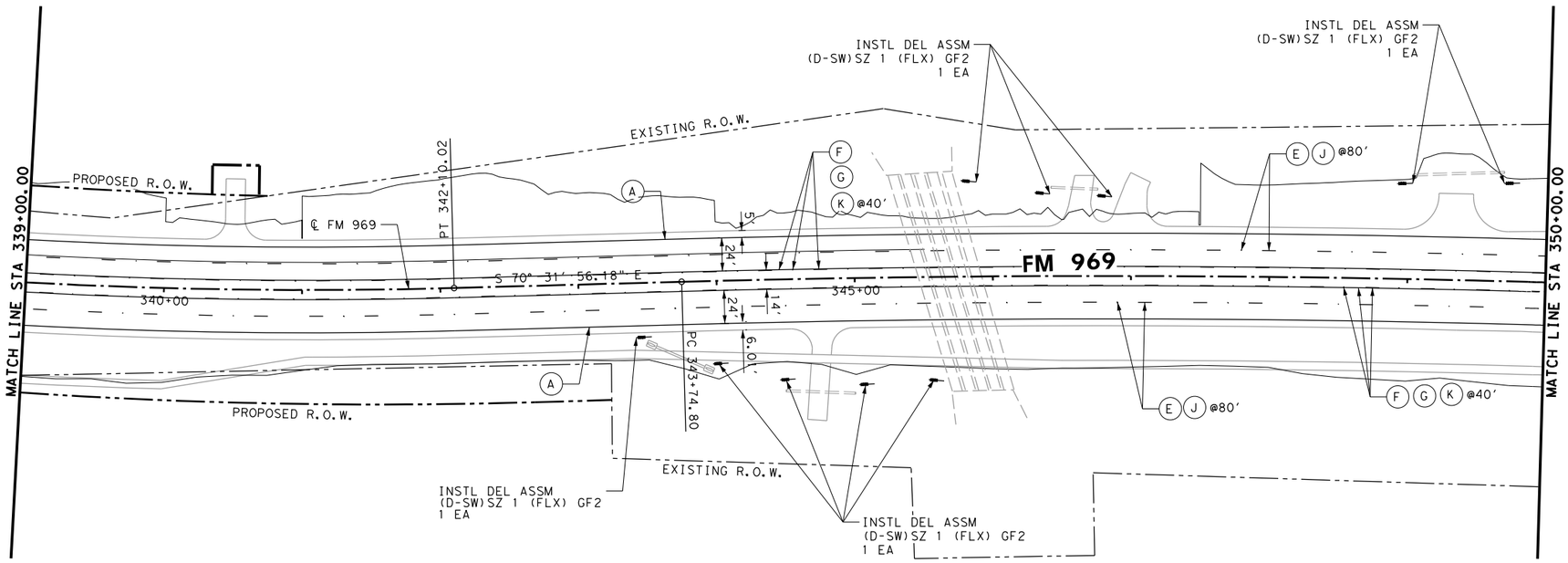

0' 50' 100'
SCALE IN FEET

N

LEGEND

- Ⓐ REFL PAV MRK TY I & II(W)4"(SLD)(100 MIL)
- Ⓑ REFL PAV MRK TY I & II(W)8"(SLD)(100 MIL)
- Ⓒ REFL PAV MRK TY I & II(W)12"(SLD)(100 MIL)
- Ⓓ REFL PAV MRK TY I & II(W)24"(SLD)(100 MIL)
- Ⓔ REFL PAV MRK TY I & II(W)4"(BRK)(100 MIL)
- Ⓕ REFL PAV MRK TY I & II(Y)4"(SLD)(100 MIL)
- Ⓖ REFL PAV MRK TY I & II(Y)4"(BRK)(100 MIL)
- Ⓗ REFL PAV MRK TY I & II (W) (ARROW)
- Ⓘ REFL PAV MRK TY I & II (W) (WORD)
- Ⓙ REFL PAV MRKR TY I-C
- Ⓚ REFL PAV MRKR TY II-A-A
- Ⓛ REF PAV MRK TY I & II (W) 36" (YLD TRI) (100MIL)
- Ⓜ REF PAV MRKR TY II-C-R

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
PAVEMENT MARKINGS

STA 339+00 TO STA 350+00

SHEET 2 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		253
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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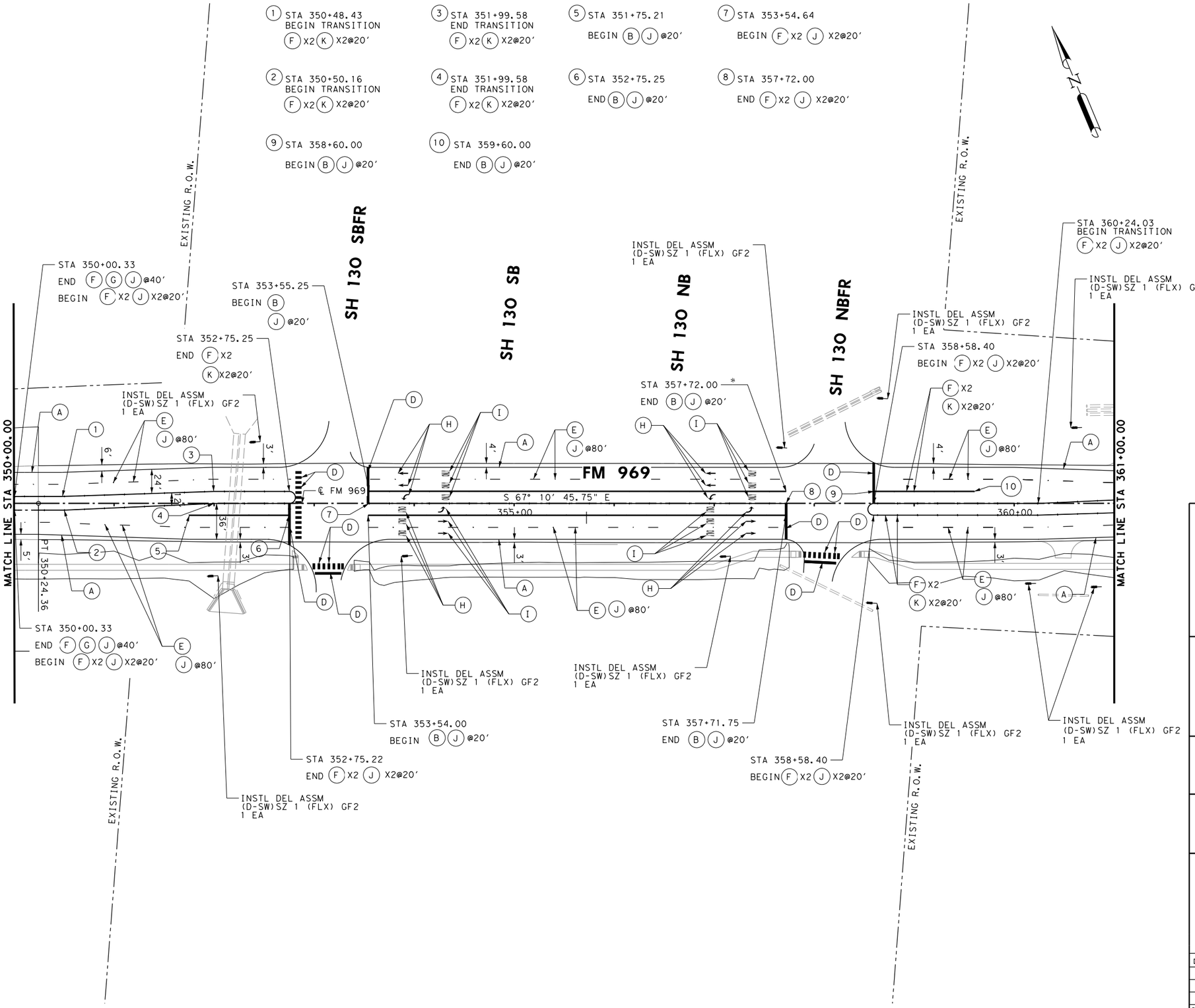

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SCALE IN FEET

LEGEND

- (A) REFL PAV MRK TY I & II(W)4"(SLD)(100 MIL)
- (B) REFL PAV MRK TY I & II(W)8"(SLD)(100 MIL)
- (C) REFL PAV MRK TY I & II(W)12"(SLD)(100 MIL)
- (D) REFL PAV MRK TY I & II(W)24"(SLD)(100 MIL)
- (E) REFL PAV MRK TY I & II(W)4"(BRK)(100 MIL)
- (F) REFL PAV MRK TY I & II(Y)4"(SLD)(100 MIL)
- (G) REFL PAV MRK TY I & II(Y)4"(BRK)(100 MIL)
- (H) REFL PAV MRK TY I & II (W) (ARROW)
- (I) REFL PAV MRK TY I & II (W) (WORD)
- (J) REFL PAV MRKR TY I-C
- (K) REFL PAV MRKR TY II-A-A
- (L) REF PAV MRK TY I & II (W) 36" (YLD TRI) (100MIL)
- (M) REF PAV MRKR TY II-C-R

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STA 350+00 TO STA 361+00

SHEET 3 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		254
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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SCALE IN FEET

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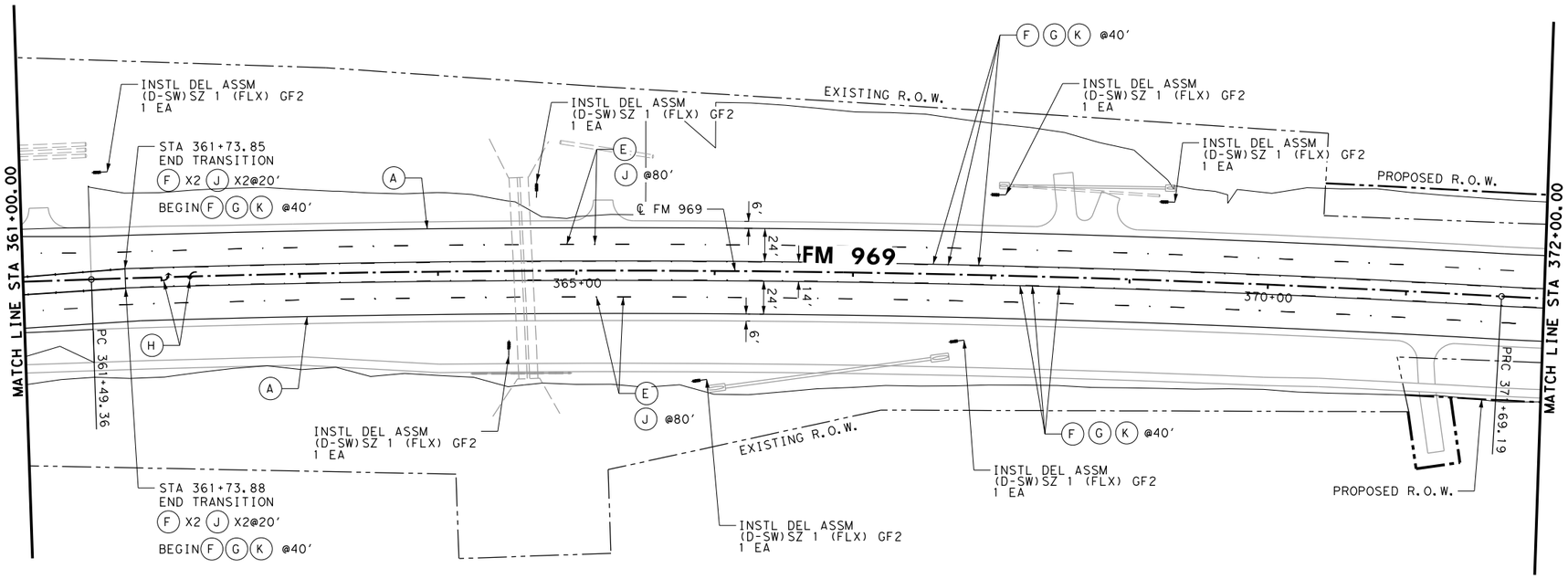

LEGEND

- (A) REFL PAV MRK TY I & II(W)4"(SLD)(100 MIL)
- (B) REFL PAV MRK TY I & II(W)8"(SLD)(100 MIL)
- (C) REFL PAV MRK TY I & II(W)12"(SLD)(100 MIL)
- (D) REFL PAV MRK TY I & II(W)24"(SLD)(100 MIL)
- (E) REFL PAV MRK TY I & II(W)4"(BRK)(100 MIL)
- (F) REFL PAV MRK TY I & II(Y)4"(SLD)(100 MIL)
- (G) REFL PAV MRK TY I & II(Y)4"(BRK)(100 MIL)
- (H) REFL PAV MRK TY I & II (W) (ARROW)
- (I) REFL PAV MRK TY I & II (W) (WORD)
- (J) REFL PAV MRKR TY I-C
- (K) REFL PAV MRKR TY II-A-A
- (L) REF PAV MRK TY I & II (W) 36" (YLD TRI) (100MIL)
- (M) REF PAV MRKR TY II-C-R

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FM 969
PAVEMENT MARKINGS

STA 361+00 TO STA 372+00

SHEET 4 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		255
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
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CH	1186	01	091	FM 969

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SCALE IN FEET

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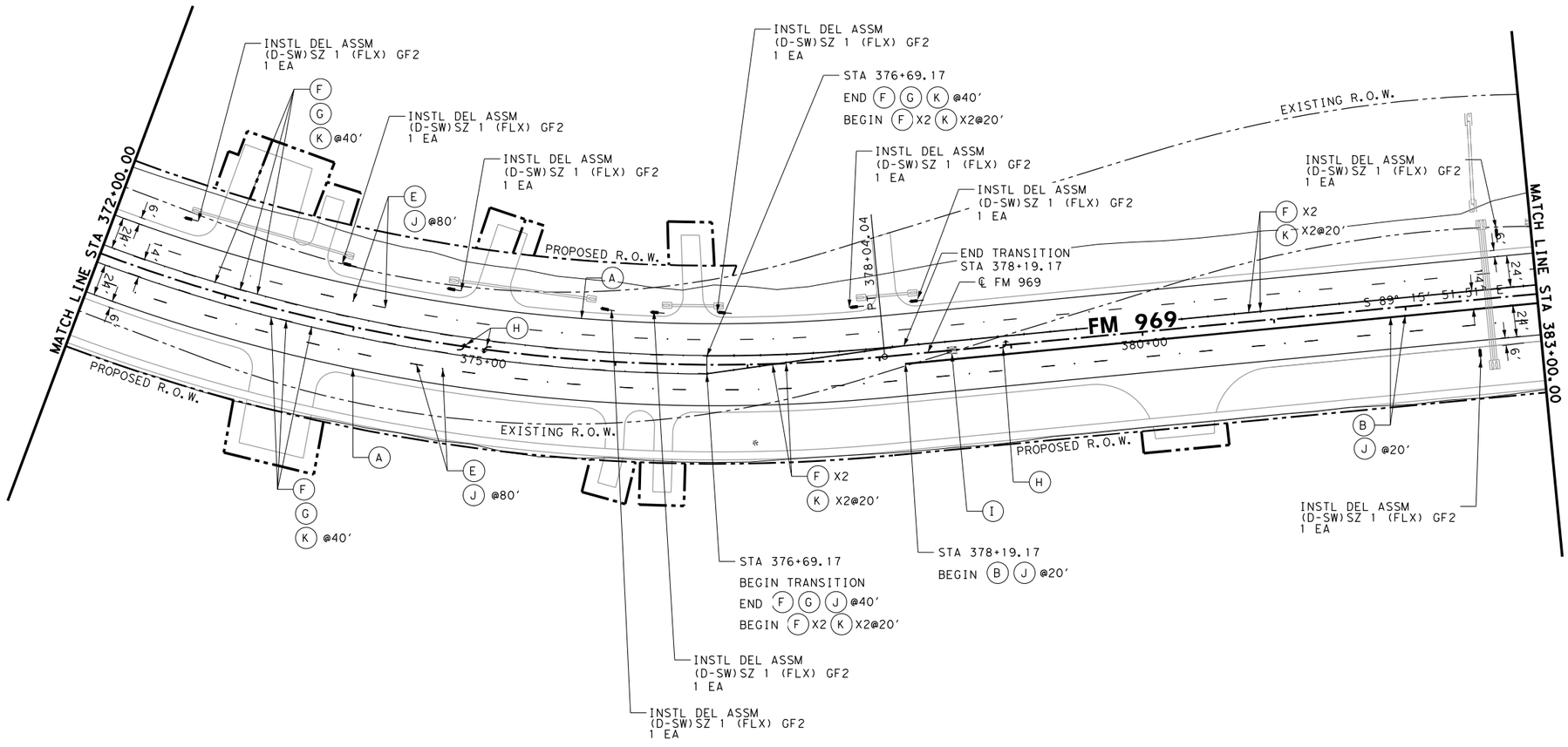
LEGEND

- (A) REFL PAV MRK TY I & II(W)4"(SLD)(100 MIL)
- (B) REFL PAV MRK TY I & II(W)8"(SLD)(100 MIL)
- (C) REFL PAV MRK TY I & II(W)12"(SLD)(100 MIL)
- (D) REFL PAV MRK TY I & II(W)24"(SLD)(100 MIL)
- (E) REFL PAV MRK TY I & II(W)4"(BRK)(100 MIL)
- (F) REFL PAV MRK TY I & II(Y)4"(SLD)(100 MIL)
- (G) REFL PAV MRK TY I & II(Y)4"(BRK)(100 MIL)
- (H) REFL PAV MRK TY I & II (W) (ARROW)
- (I) REFL PAV MRK TY I & II (W) (WORD)
- (J) REFL PAV MRKR TY I-C
- (K) REFL PAV MRKR TY II-A-A
- (L) REF PAV MRK TY I & II (W) 36" (YLD TRI) (100MIL)
- (M) REF PAV MRKR TY II-C-R



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FM 969
PAVEMENT MARKINGS

STA 372+00 TO STA 383+00

SHEET 5 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		256
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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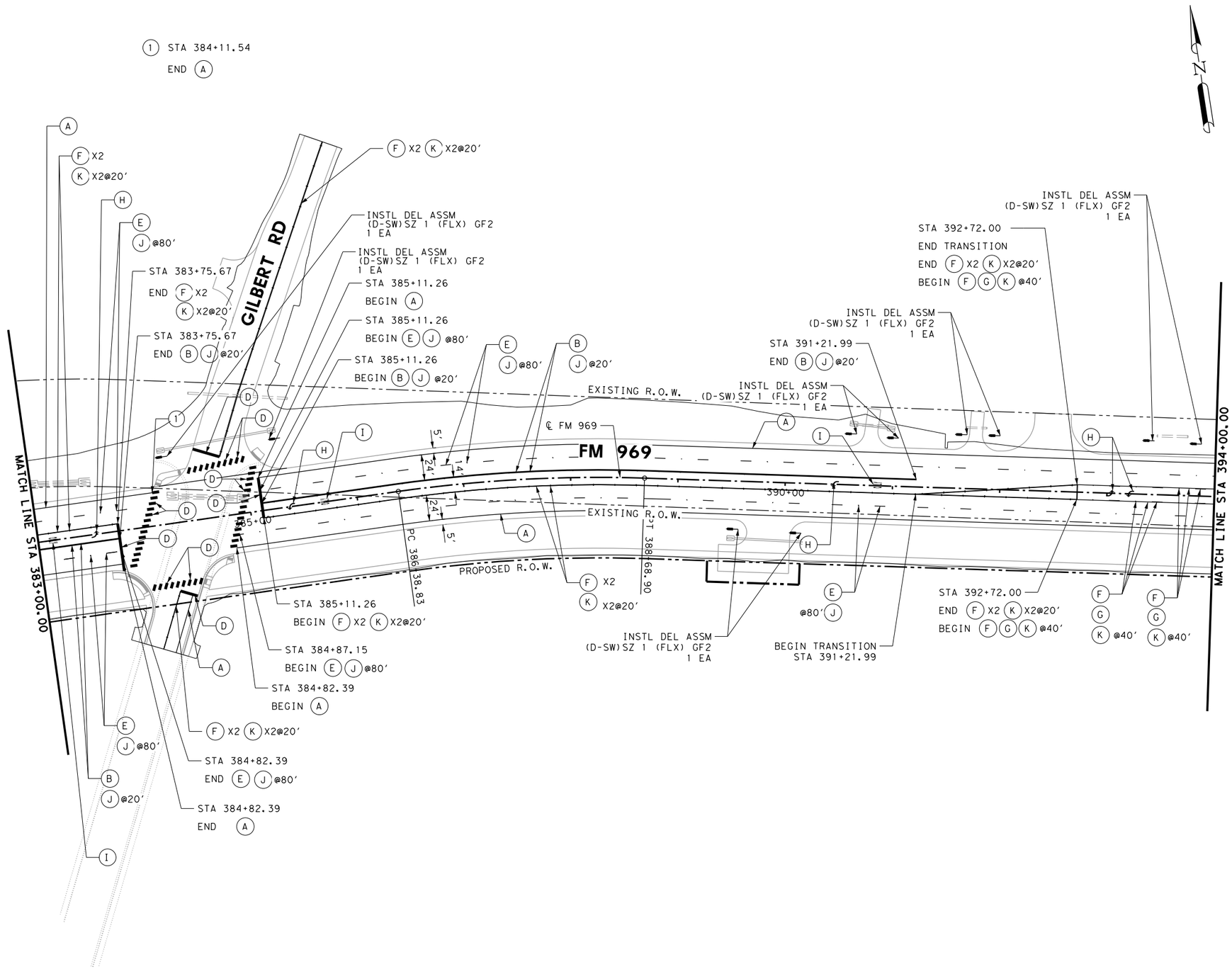

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SCALE IN FEET

LEGEND

- (A) REFL PAV MRK TY I & II(W)4"(SLD)(100 MIL)
- (B) REFL PAV MRK TY I & II(W)8"(SLD)(100 MIL)
- (C) REFL PAV MRK TY I & II(W)12"(SLD)(100 MIL)
- (D) REFL PAV MRK TY I & II(W)24"(SLD)(100 MIL)
- (E) REFL PAV MRK TY I & II(W)4"(BRK)(100 MIL)
- (F) REFL PAV MRK TY I & II(Y)4"(SLD)(100 MIL)
- (G) REFL PAV MRK TY I & II(Y)4"(BRK)(100 MIL)
- (H) REFL PAV MRK TY I & II (W) (ARROW)
- (I) REFL PAV MRK TY I & II (W) (WORD)
- (J) REFL PAV MRKR TY I-C
- (K) REFL PAV MRKR TY II-A-A
- (L) REF PAV MRK TY I & II (W) 36" (YLD TRI) (100MIL)
- (M) REF PAV MRKR TY II-C-R

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FM 969
PAVEMENT MARKINGS

STA 383+00 TO STA 394+00

SHEET 6 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		257
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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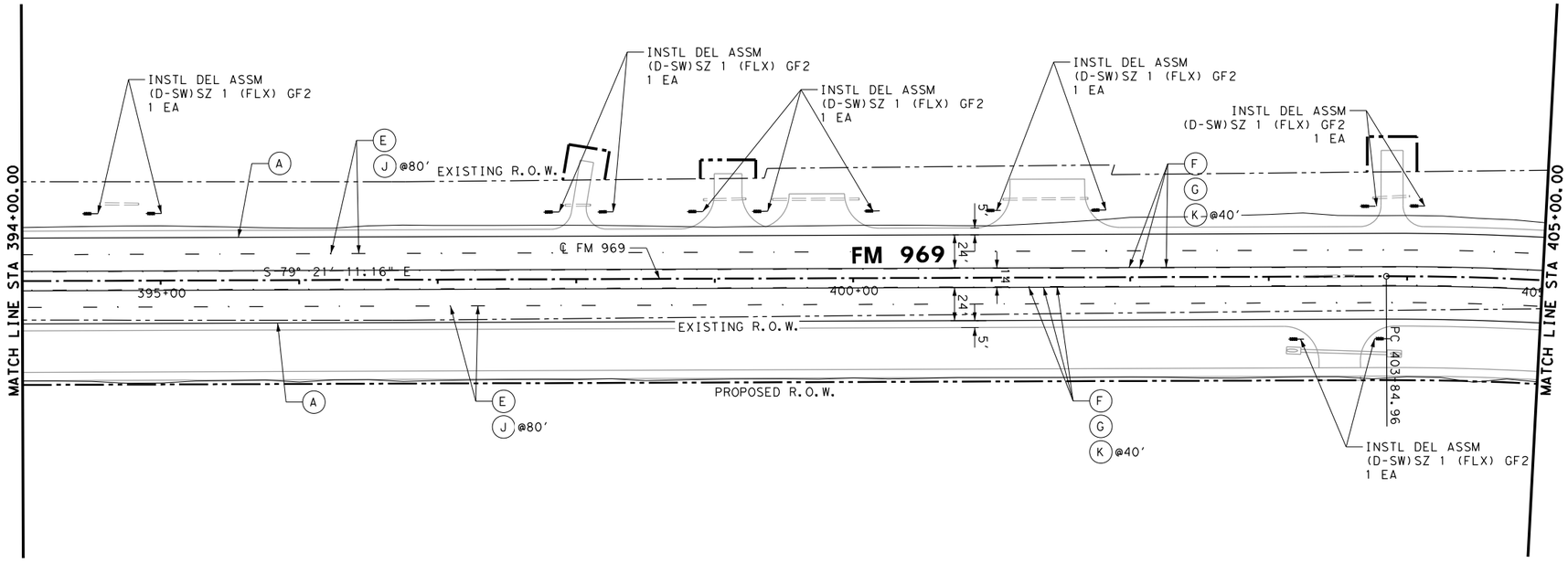
0′ 50′ 100′
SCALE IN FEET

N

LEGEND

- (A) REFL PAV MRK TY I & II(W)4"(SLD)(100 MIL)
- (B) REFL PAV MRK TY I & II(W)8"(SLD)(100 MIL)
- (C) REFL PAV MRK TY I & II(W)12"(SLD)(100 MIL)
- (D) REFL PAV MRK TY I & II(W)24"(SLD)(100 MIL)
- (E) REFL PAV MRK TY I & II(W)4"(BRK)(100 MIL)
- (F) REFL PAV MRK TY I & II(Y)4"(SLD)(100 MIL)
- (G) REFL PAV MRK TY I & II(Y)4"(BRK)(100 MIL)
- (H) REFL PAV MRK TY I & II (W) (ARROW)
- (I) REFL PAV MRK TY I & II (W) (WORD)
- (J) REFL PAV MRKR TY I-C
- (K) REFL PAV MRKR TY II-A-A
- (L) REF PAV MRK TY I & II (W) 36" (YLD TRI) (100MIL)
- (M) REF PAV MRKR TY II-C-R



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FM 969
PAVEMENT MARKINGS

STA 394+00 TO STA 405+00

SHEET 7 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		258
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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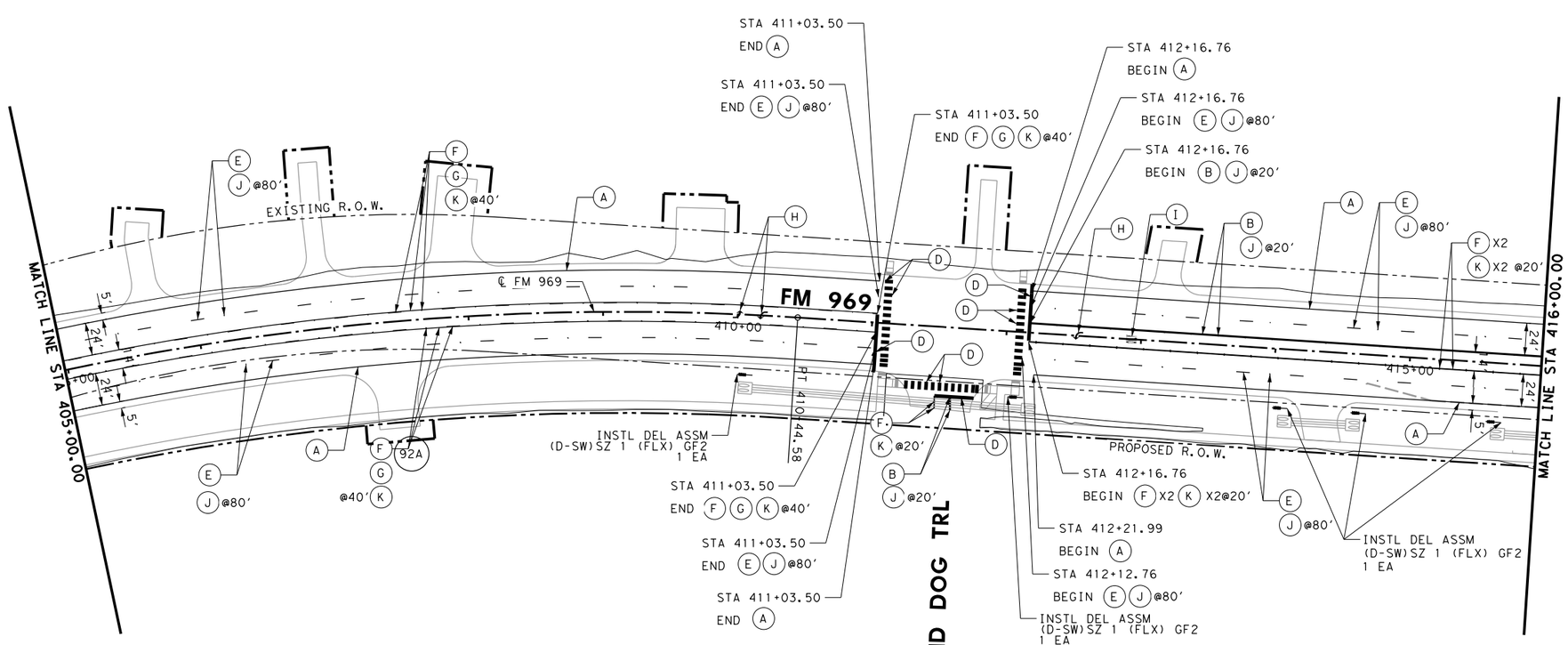
SCALE IN FEET



LEGEND

- Ⓐ REFL PAV MRK TY I & II(W)4"(SLD)(100 MIL)
- Ⓑ REFL PAV MRK TY I & II(W)8"(SLD)(100 MIL)
- Ⓒ REFL PAV MRK TY I & II(W)12"(SLD)(100 MIL)
- Ⓓ REFL PAV MRK TY I & II(W)24"(SLD)(100 MIL)
- Ⓔ REFL PAV MRK TY I & II(W)4"(BRK)(100 MIL)
- Ⓕ REFL PAV MRK TY I & II(Y)4"(SLD)(100 MIL)
- Ⓖ REFL PAV MRK TY I & II(Y)4"(BRK)(100 MIL)
- Ⓗ REFL PAV MRK TY I & II (W) (ARROW)
- Ⓘ REFL PAV MRK TY I & II (W) (WORD)
- Ⓙ REFL PAV MRKR TY I-C
- Ⓚ REFL PAV MRKR TY II-A-A
- Ⓛ REF PAV MRK TY I & II (W) 36" (YLD TRI) (100MIL)
- Ⓜ REF PAV MRKR TY II-C-R

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6/25/2021

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FRN - F-1386

FM 969
PAVEMENT MARKINGS

STA 405+00 TO STA 416+00

SHEET 8 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		259
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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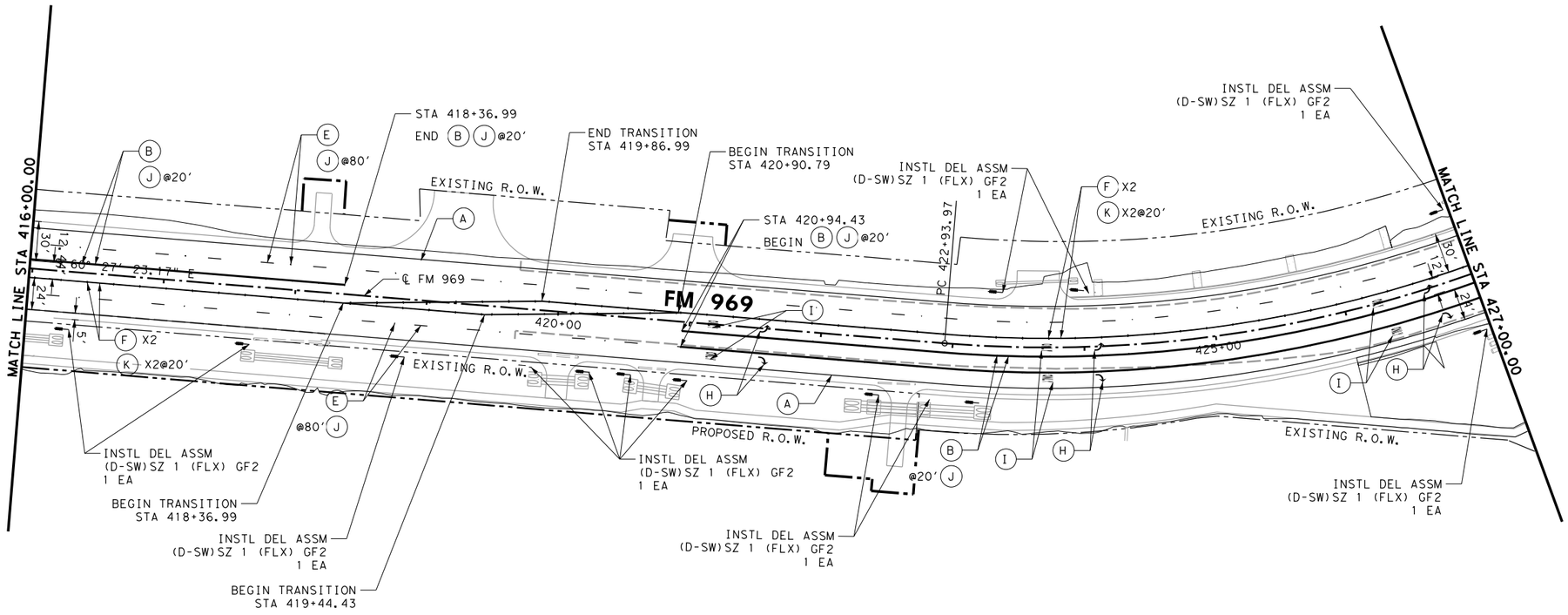
SCALE IN FEET

LEGEND

- (A) REFL PAV MRK TY I & II(W)4"(SLD)(100 MIL)
- (B) REFL PAV MRK TY I & II(W)8"(SLD)(100 MIL)
- (C) REFL PAV MRK TY I & II(W)12"(SLD)(100 MIL)
- (D) REFL PAV MRK TY I & II(W)24"(SLD)(100 MIL)
- (E) REFL PAV MRK TY I & II(W)4"(BRK)(100 MIL)
- (F) REFL PAV MRK TY I & II(Y)4"(SLD)(100 MIL)
- (G) REFL PAV MRK TY I & II(Y)4"(BRK)(100 MIL)
- (H) REFL PAV MRK TY I & II (W) (ARROW)
- (I) REFL PAV MRK TY I & II (W) (WORD)
- (J) REFL PAV MRKR TY I-C
- (K) REFL PAV MRKR TY II-A-A
- (L) REF PAV MRK TY I & II (W) 36" (YLD TRI) (100MIL)
- (M) REF PAV MRKR TY II-C-R



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FM 969
PAVEMENT MARKINGS

STA 416+00 TO STA 427+00

SHEET 9 OF 10

DESIGN BY:	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		260
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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SCALE IN FEET

N

LEGEND

- (A) REFL PAV MRK TY I & II(W)4"(SLD)(100 MIL)
- (B) REFL PAV MRK TY I & II(W)8"(SLD)(100 MIL)
- (C) REFL PAV MRK TY I & II(W)12"(SLD)(100 MIL)
- (D) REFL PAV MRK TY I & II(W)24"(SLD)(100 MIL)
- (E) REFL PAV MRK TY I & II(W)4"(BRK)(100 MIL)
- (F) REFL PAV MRK TY I & II(Y)4"(SLD)(100 MIL)
- (G) REFL PAV MRK TY I & II(Y)4"(BRK)(100 MIL)
- (H) REFL PAV MRK TY I & II (W) (ARROW)
- (I) REFL PAV MRK TY I & II (W) (WORD)
- (J) REFL PAV MRKR TY I-C
- (K) REFL PAV MRKR TY II-A-A
- (L) REF PAV MRK TY I & II (W) 36" (YLD TRI) (100MIL)
- (M) REF PAV MRKR TY II-C-R

(1) STA 427+24.90
END (A)

DELTA POST DR

STA 427+10.33
END (E) (J) @20′

STA 427+09.88
END (F) X2 (K) X2@20′

STA 427+09.65
END (B) (J) @20′

(D)

(D)

END PROJECT FM 969
STA 427+26.21
CSJ# 1186-01-091

(I)

MATCH LINE STA 427+00.00

(D)

(D)

STA 427+09.41
END (B) (J) @20′

STA 427+09.07
END (A)

HUNTERS BEND RD

EXISTING R.O.W.

℄ FM 969

FM 969

N 70° 53′ 57.13" E

PT 431+04.70

430+00

435+00

PC 434+97.99

EXISTING R.O.W.

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FM 969
PAVEMENT MARKINGS

STA 427+00 TO END

SHEET 10 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		261
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

6/25/2021
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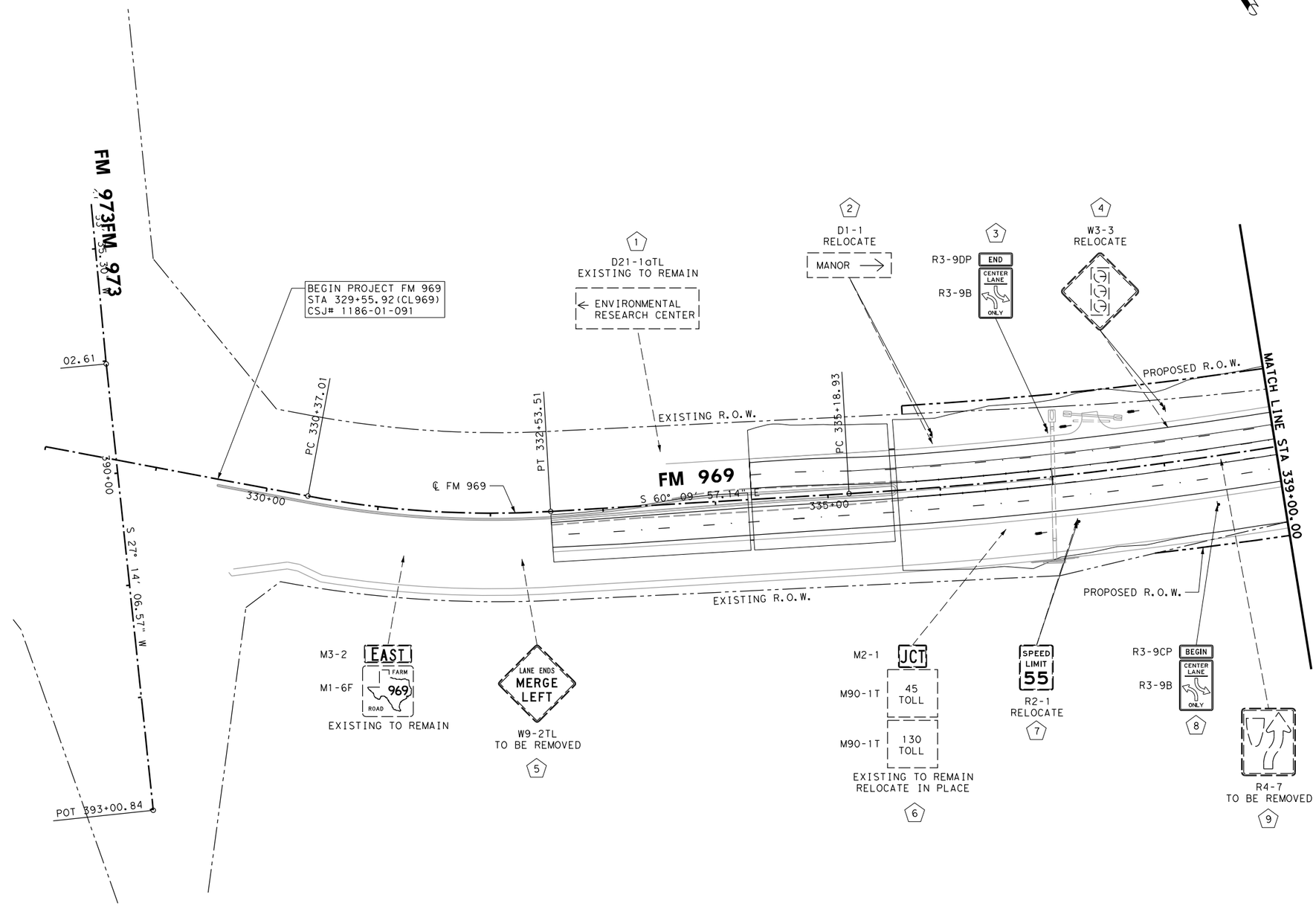
SCALE IN FEET

LEGEND
- PROPOSED SMALL SIGN
- SMALL SIGN ASSEMBLY
- OBJECT MARKER



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Texas Department of Transportation

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FRN - F-1386

FM 969
SIGN LAYOUTS

BEGIN TO STA 339+00

SHEET 1 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		262
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

6/25/2021
6:58:49 PM
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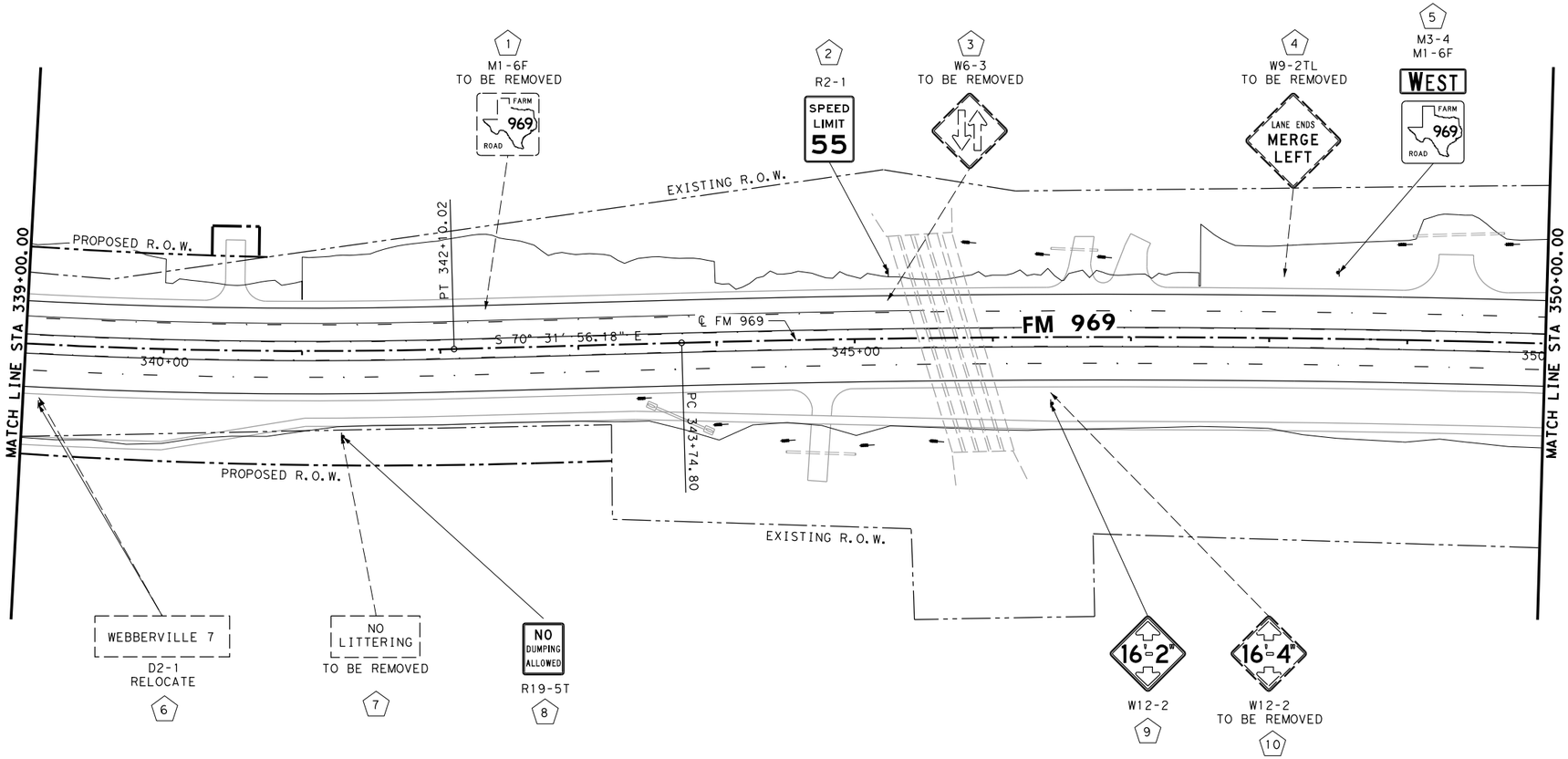
0′ 50′ 100′
SCALE IN FEET

N

LEGEND

- PROPOSED SMALL SIGN
- SMALL SIGN ASSEMBLY
- OBJECT MARKER



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FM 969
SIGN LAYOUTS

STA 339+00 TO STA 350+00

SHEET 2 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		263
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

6/25/2021
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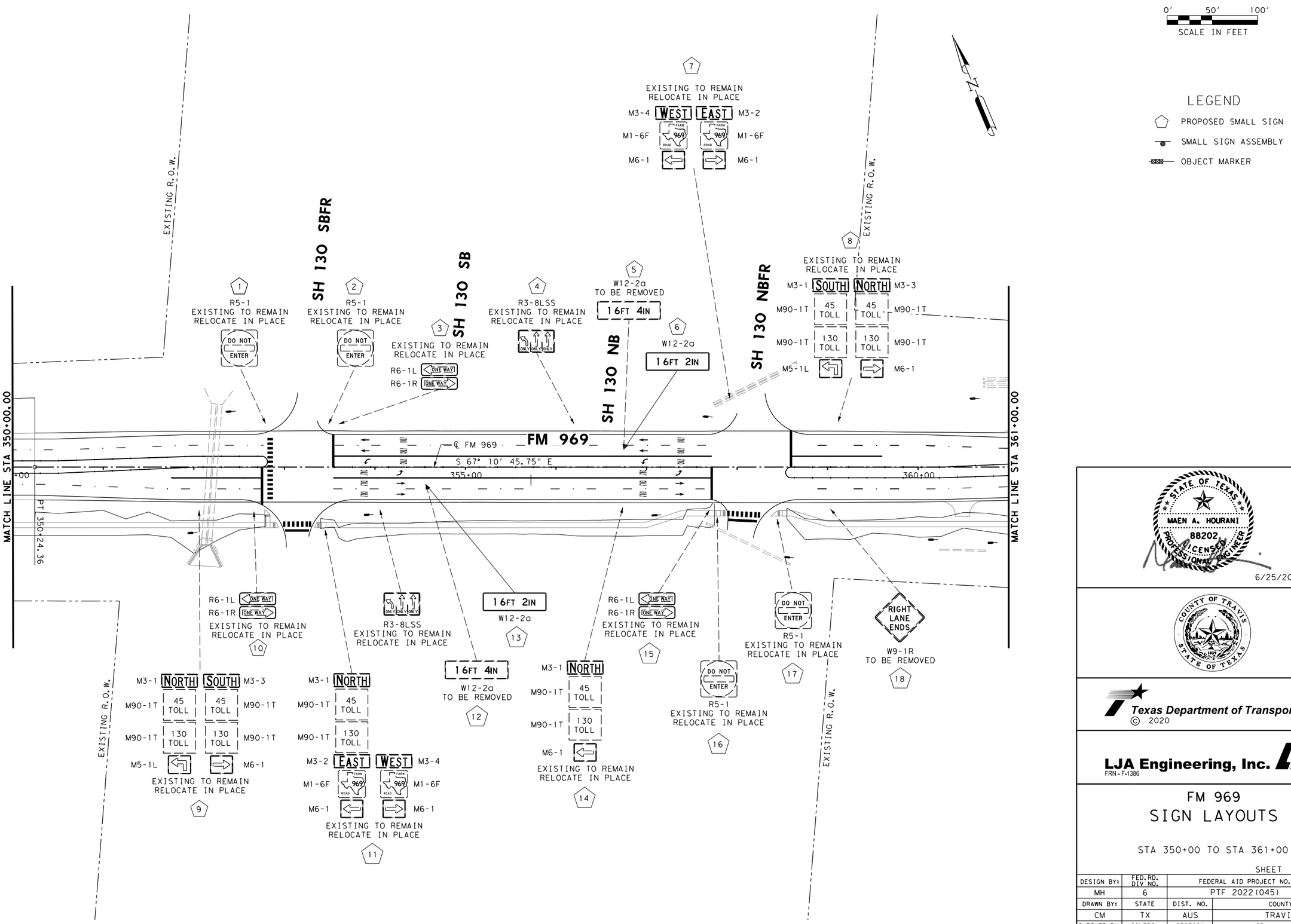

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6/25/2021

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FM 969
SIGN LAYOUTS

STA 350+00 TO STA 361+00

SHEET 3 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		264
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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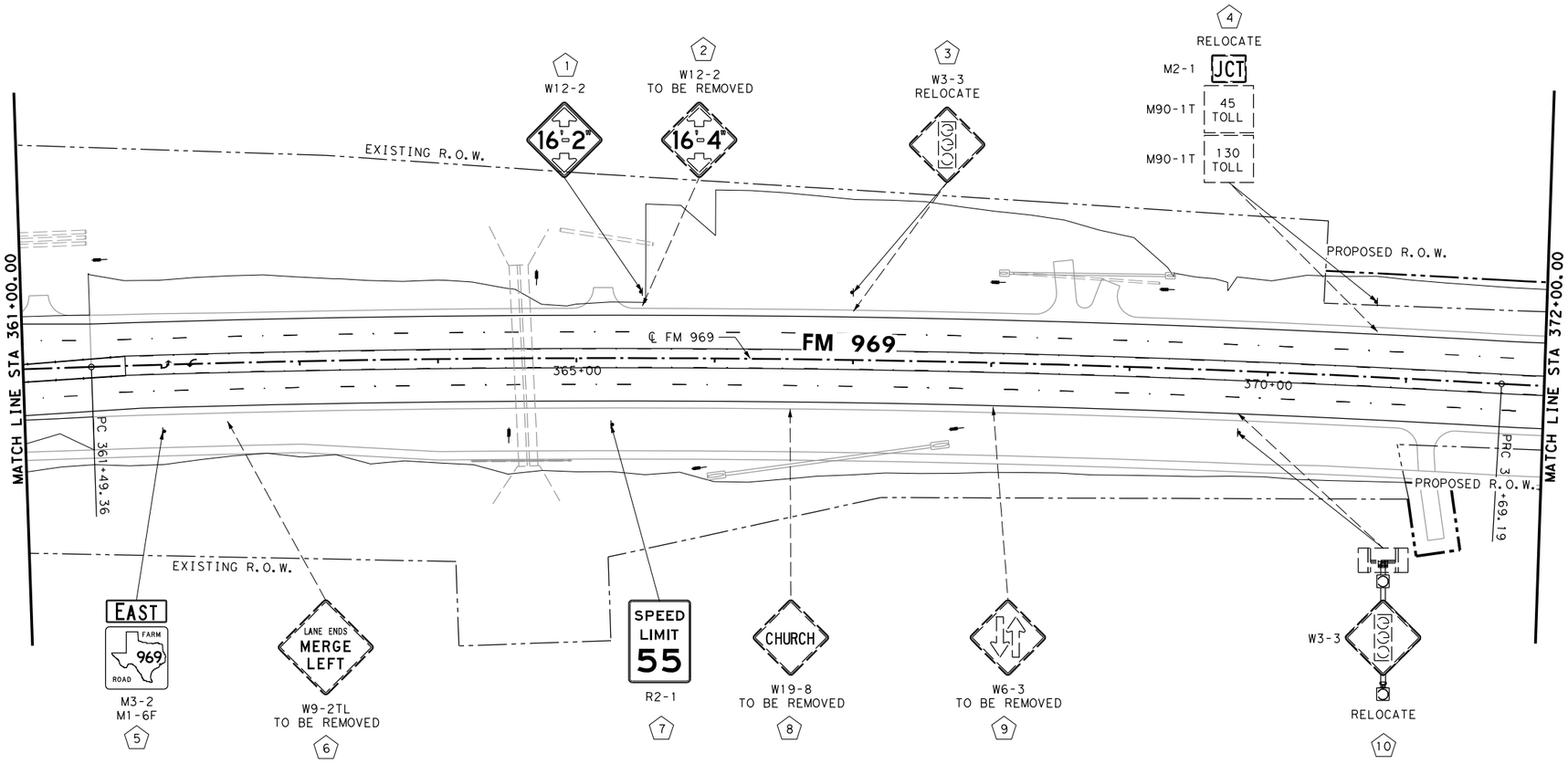
SCALE IN FEET

N

LEGEND

- PROPOSED SMALL SIGN
- SMALL SIGN ASSEMBLY
- OBJECT MARKER



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LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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FM 969
SIGN LAYOUTS

STA 361+00 TO STA 372+00

SHEET 4 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		265
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

6/25/2021
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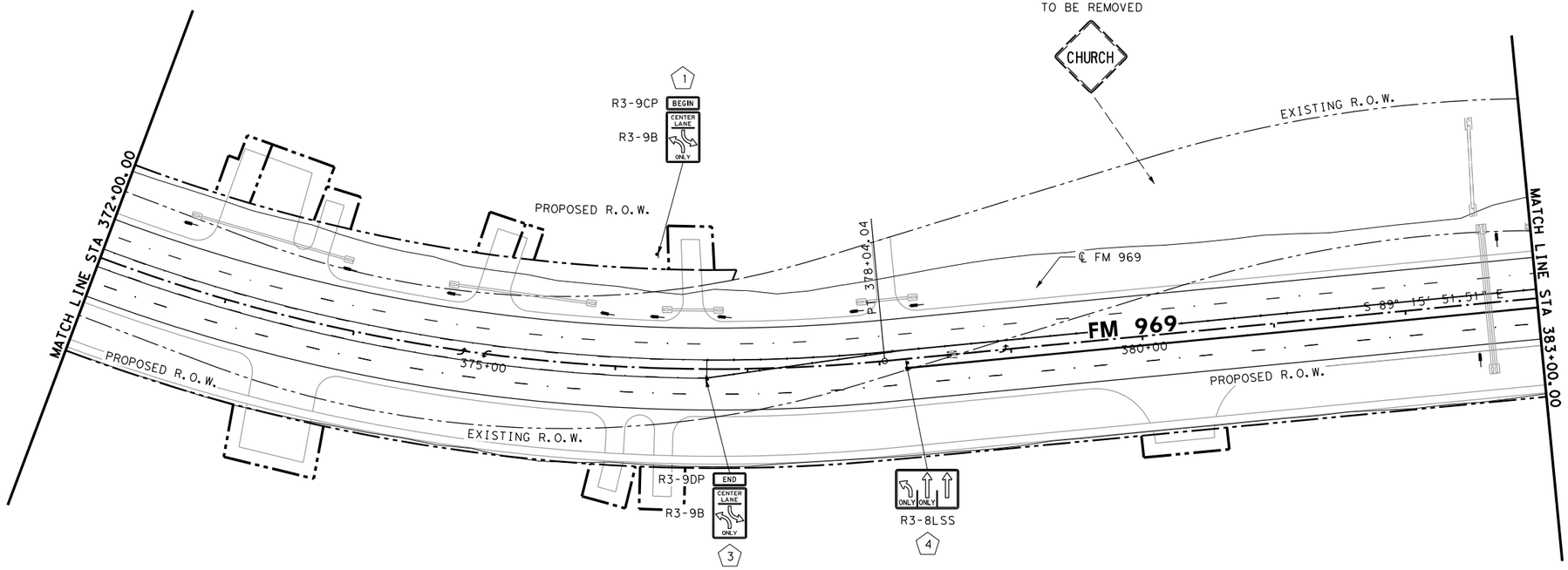
SCALE IN FEET

N

LEGEND

- PROPOSED SMALL SIGN
- SMALL SIGN ASSEMBLY
- OBJECT MARKER



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SHEET 5 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		266
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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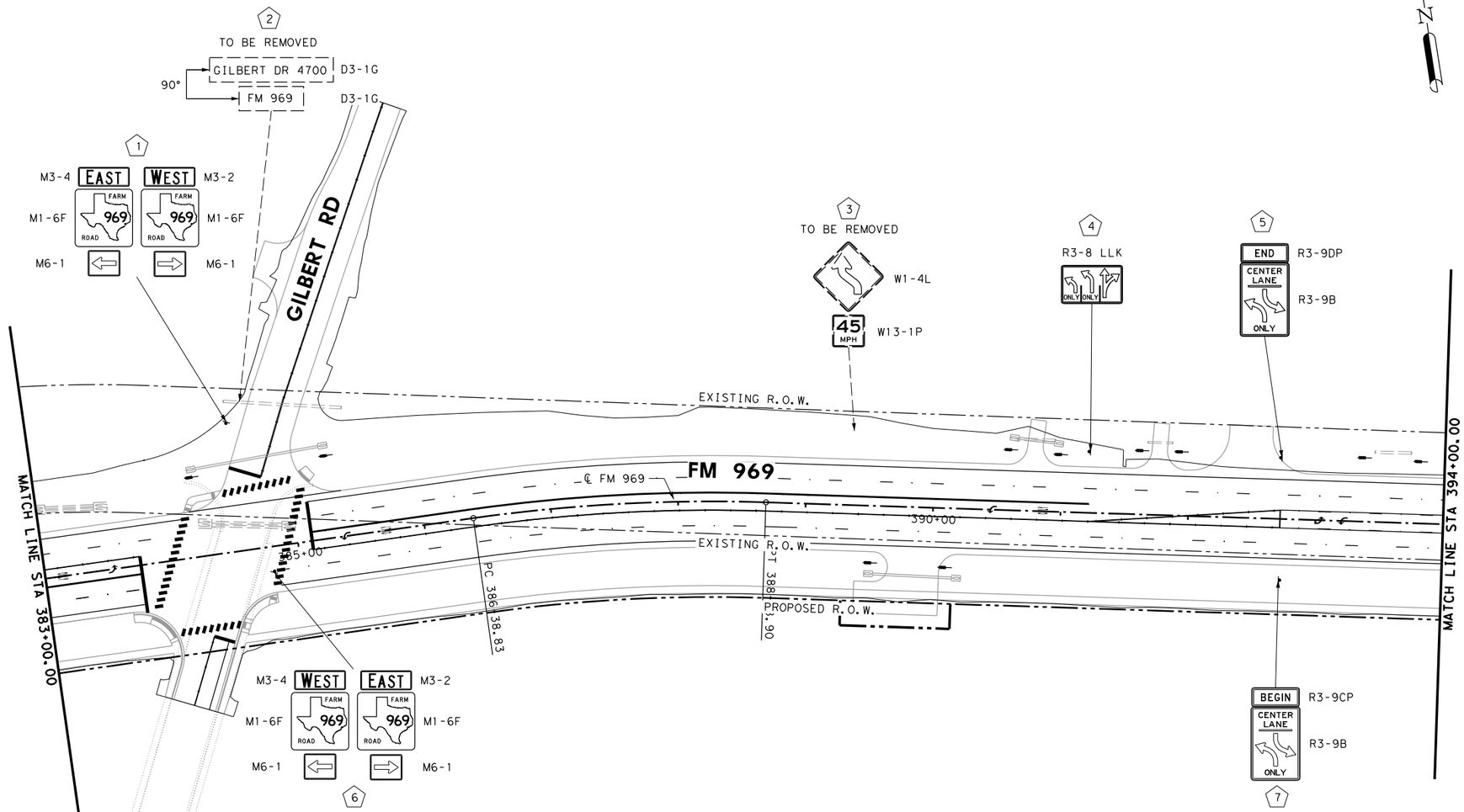
0′ 50′ 100′
SCALE IN FEET

N

LEGEND
- PROPOSED SMALL SIGN
- SMALL SIGN ASSEMBLY
- OBJECT MARKER



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SHEET 6 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		267
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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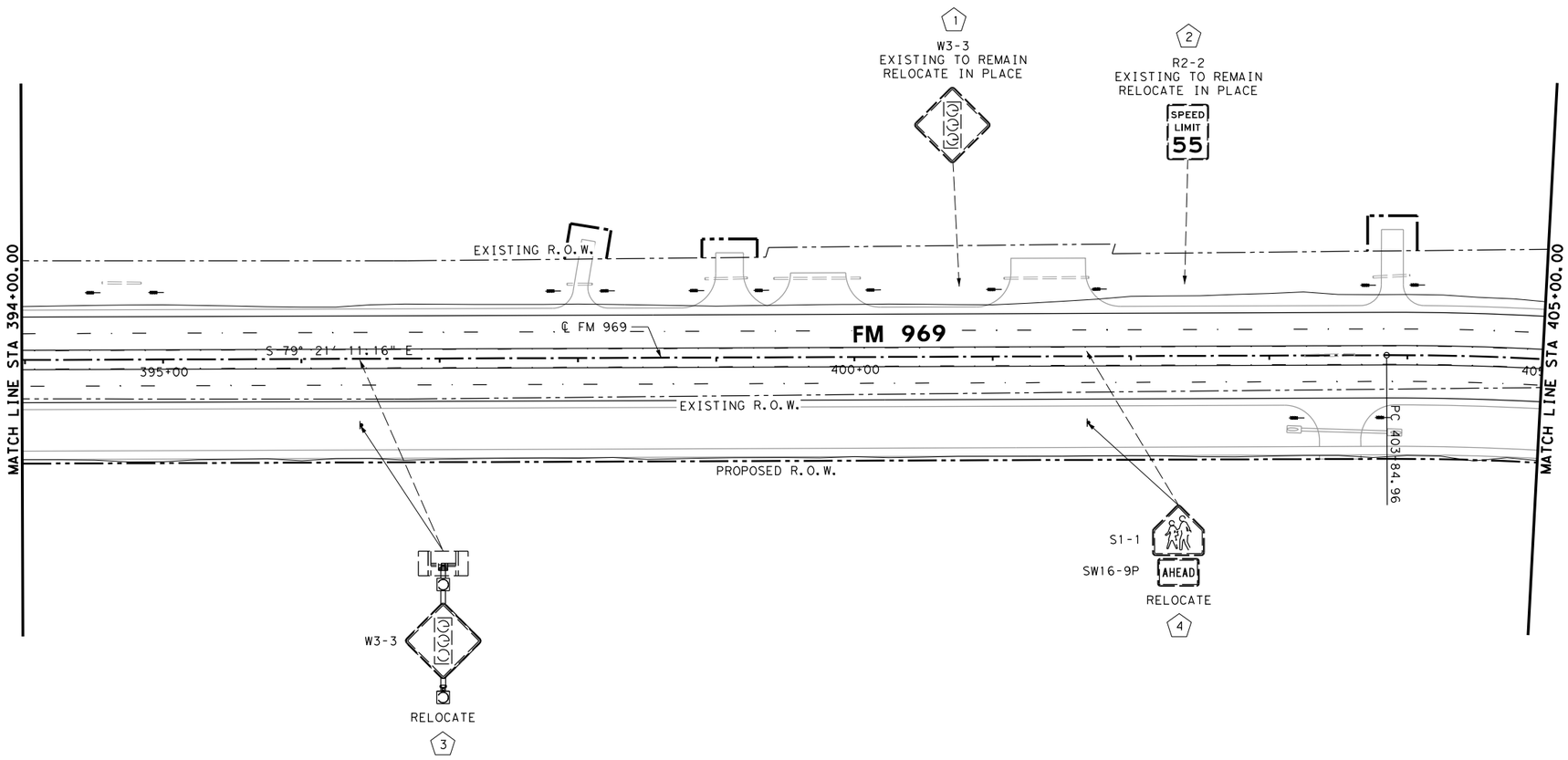
0′ 50′ 100′
SCALE IN FEET

N

LEGEND

- PROPOSED SMALL SIGN
- SMALL SIGN ASSEMBLY
- OBJECT MARKER



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STA 394+00 TO STA 405+00

SHEET 7 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		268
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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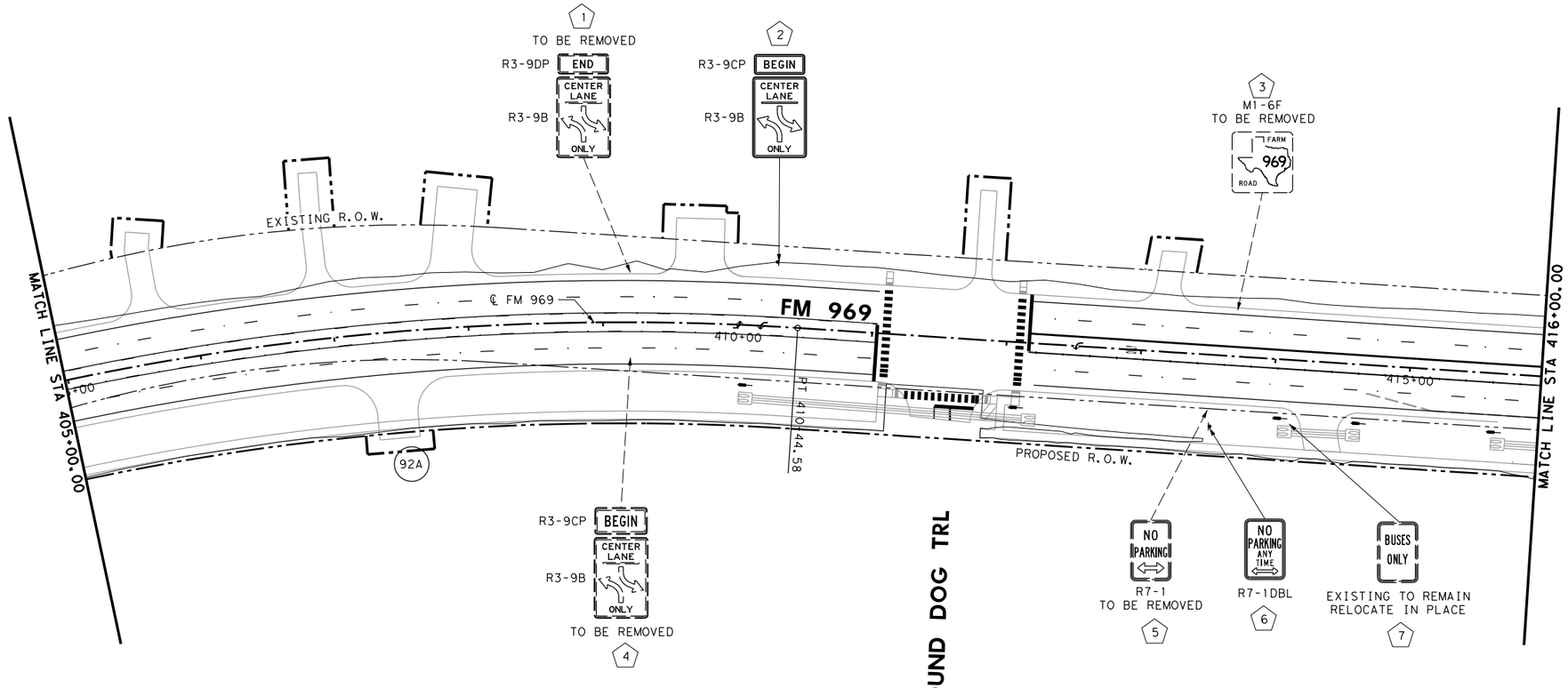
0′ 50′ 100′
SCALE IN FEET

LEGEND
- PROPOSED SMALL SIGN
- SMALL SIGN ASSEMBLY
- OBJECT MARKER



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STA 405+00 TO STA 416+00

SHEET 8 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		269
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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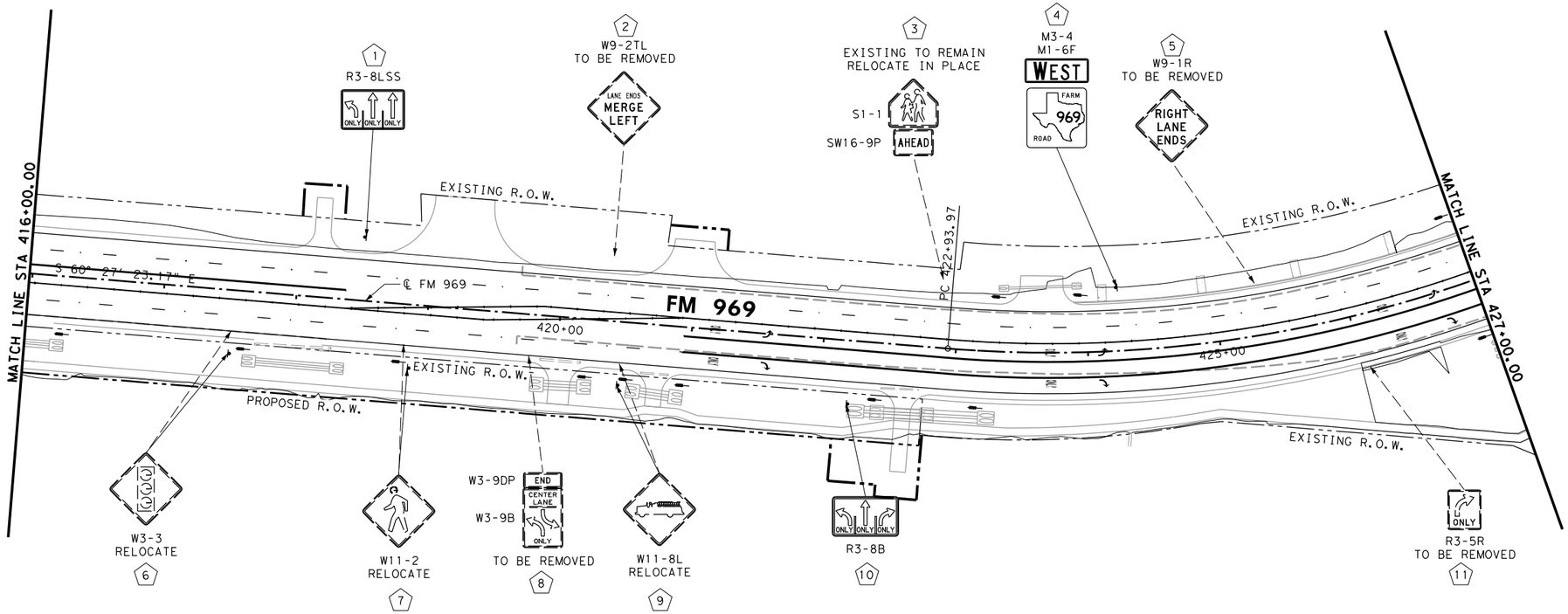
0′ 50′ 100′
SCALE IN FEET

N

LEGEND

- PROPOSED SMALL SIGN
- SMALL SIGN ASSEMBLY
- OBJECT MARKER



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STA 416+00 TO STA 427+00

SHEET 9 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		270
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

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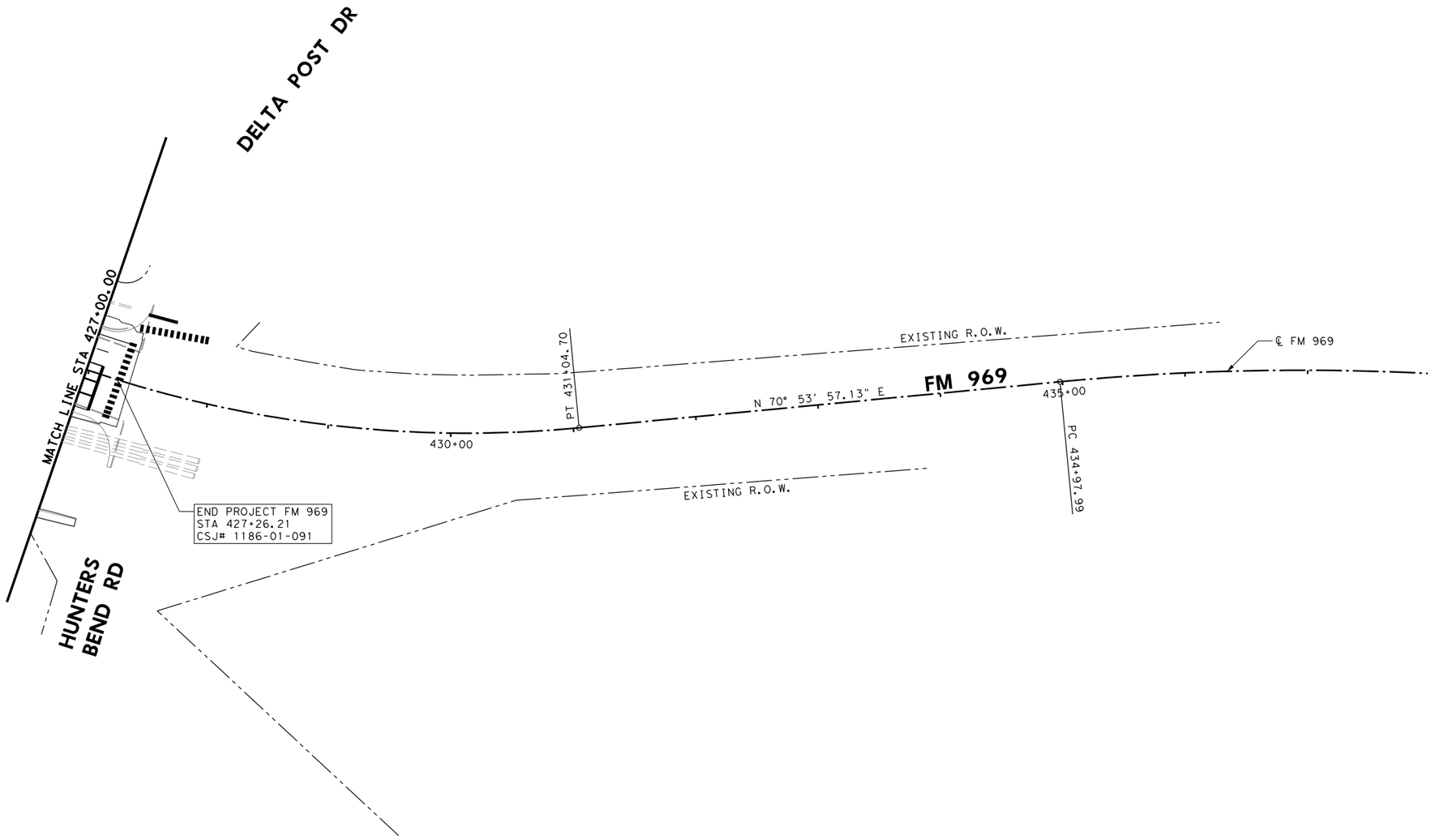
0′ 50′ 100′
SCALE IN FEET

N

LEGEND

- PROPOSED SMALL SIGN
- SMALL SIGN ASSEMBLY
- OBJECT MARKER



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STA 427+00 TO END

SHEET 10 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		271
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO	SIGN NO.	SIGN NOMENCLATURE	SIGN TEXT	DIM.	ALUMINUM TYPE A	ALUMINUM TYPE G	Post Type	Posts	Anchor Type	Mounting Designation
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	(1 or 2)	UA = Univer-Conc UB = Univer-Bolt SA = Slip-Conc WS = Wedge Steel WP = Wedge Plastic	P = Prefab. "Plain" T = Prefab. "T" U = Prefab. "U"	1 EXT or 2EXT = # of Ext. BM = Extruded Wind Beam WC = 1.12 #/ft Wing Chan. EXAL = Extruded Aluminum
1	1	D21-1GTL	ENVIRONMENTAL RESEARCH CENTER	x24	*		10BWG	1	SA	P	
	2	D1-1	MANOR	x18	*						
	3	R3-9DP	END	30x12	*		10BWG	1	SA	P	
		R3-9B	CENTER LANE (TURN) ONLY	24X36	*						
	4	W3-3	SIGNAL AHEAD (W/ FLASHING LIGHTS)								
	5	W9-2TL							RELOCATE		
	6	M2-1	JCT	21X15	*		10BWG	1	SA	P	
		M90-1T	45 TOLL	24X24	*				TO BE REMOVED		
		M90-1T	130 TOLL	24X24	*		10BWG	1	SA	P	
	7	R2-1	SPEED LIMIT 55								
	8	R3-9CP	BEGIN	30X12	*		10BWG	1	SA	P	
		R3-9B	CENTER LANE (TURN) ONLY	24X36	*						
	9	R4-7									
2	1	M1-6F	FARM ROAD 969	30X36	*		10BWG	1	SA	P	
	2	R2-1	SPEED LIMIT 55								
	3	W6-3									
	4	W9-2TL	LANE ENDS MERGE LEFT								
	5	M3-4	WEST	24X12	*		10BWG	1	SA	P	
		M1-6F	FARM ROAD 969	24X24	*						
	6	D2-1	WEBBERVILLE 7		*						
	7		NO LITERING								
	8	R19-5T	NO DUMPING ALLOWED	24X30	*		10BWG	1	SA	U	
	9	W12-2	16'-2"	36x36	*		10BWG	1	SA	P	
	10	W12-4	16'-4"								
3	1	R5-1	DO NOT ENTER	36x36	*		10BWG	1	SA	P	
	2	R5-1	DO NOT ENTER	36x36	*		10BWG	1	SA	P	
	3	R6-1L	ONE WAY	54x18	*		10BWG	1	SA	P	
		R6-1R	ONE WAY	54x18	*						
	4	R3-8LSS	ONLY	x30	*						
	5	W12-2o	16FT 4IN				10BWG	1	SA	T	
	6	W12-2o	16FT 2IN	84X24	*		S80	1	SA	U	
	7	M3-4	WEST	24X12	*						
		M1-6F	FARM ROAD 969	24X24	*						
		M6-1	(DIRECTIONAL ARROW LEFT)	21x15	*						
		M3-2	EAST	24X12	*						
		M1-6F	FARM ROAD 969	24X24	*						
		M6-1	(DIRECTIONAL ARROW RIGHT)	21x15	*						
	8	M3-1	SOUTH	24X12	*						
		M90-1T	45 TOLL	24X24	*		S80	1	SA	U	2EXT
		M90-1T	130 TOLL	24X24	*						
		M5-1L		21x15	*						
	9	M3-1	NORTH	24X12	*						
		M90-1T	45 TOLL	24X24	*						
		M90-1T	130 TOLL	24X24	*						
		M5-1L		21x15	*						
		M3-3	SOUTH	24X12	*						
		M90-1T	45 TOLL	24X24	*						
		M90-1T	130 TOLL	24X24	*						
		M6-1		21x15	*						
	10	R6-1L	ONE WAY	54x18	*		10BWG	1	SA	P	
		R6-1R	ONE WAY	54x18	*						
	11	M3-1	NORTH	24X12	*		S80	1	SA	U	1EXT
		M90-1T	45 TOLL	24X24	*						
		M90-1T	130 TOLL	24X24	*						
		M3-2	EAST	24X12	*						
		M1-6F	FARM ROAD 969	24X24	*						
		M6-1		21x15	*						
		M3-4	WEST	24X12	*						
		M1-6F	FARM ROAD 969	24X24	*						
		M6-1		21x15	*						
	12	W12-2o	16FT 4 IN				TO BE REMOVED				
	13	W12-2o	16FT 2IN	84X24	*		10BWG	1	SA	T	
	14	M3-1	NORTH	24X12	*		10BWG	1	SA	P	
		M90-1T	45 TOLL	24X24	*						
		M90-1T	130 TOLL	24X24	*						
		M6-1		21x15	*						
	15	R6-1L	ONE WAY	54x18	*		10BWG	1	SA	P	
		R6-1R	ONE WAY	54x18	*						
	16	R5-1	DO NOT ENTER	36x36	*		10BWG	1	SA	P	
	17	R5-2	DO NOT ENTER	36x36	*		10BWG	1	SA	P	
	18	W9-1R	RIGHT LANE ENDS								

NOTES: 1. EXISTING SIGN TO BE RELOCATED IN PLACE
2. EXISTING SIGN TO BE RELOCATED

ALUMINUM SIGN BLANKS (TYPE A)

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

Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.

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MAEN A. HOURANI
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6/25/2021

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1959
STATE OF TEXAS

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FM 969
SMALL SIGN SUMMARY

SHEET 1 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		272
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
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SUMMARY OF SMALL SIGNS

PLAN SHEET NO	SIGN NO.	SIGN NOMENCLATURE	SIGN TEXT	DIM.	ALUMINUM TYPE A	ALUMINUM TYPE G
4	1	W12-2	16'-2"	36x36	*	
	2	W12-2	16'-4"			
	3	W3-3	SIGNAL AHEAD (W/ FLASHING LIGHTS)			
	4	M2-1	JCT			
		M90-1T	45 TOLL			
		M90-1T	130 TOLL			
	5	M1-6F	FARM ROAD 969	24X24	*	
		M3-4	EAST	24X12	*	
	6	W-2TL	LANE ENDS MERGE LEFT			
	7	R2-1	SPEED LIMIT 55	30X36	*	
	8	W19-8	CHURCH			
	9	W6-3				
	10	W3-3	SIGNAL AHEAD (W/ FLASHING LIGHTS)			
5	1	R3-9CP	BEGIN	30X12	*	
		R3-9B	CENTER LANE (TURN) ONLY	24X36	*	
	2	W19-8	CHURCH			
	3	R3-9DP	END	30x12	*	
		R3-9B	CENTER LANE (TURN) ONLY	24X36	*	
	4	R3-8LSS	ONLY	X30	*	
6	1	M3-4	EAST	24X12	*	
		M1-6F	FARM ROAD 969	24X24	*	
		M6-1		21x15	*	
		M3-2	WEST	24X12	*	
		M1-6F	FARM ROAD 969	24X24	*	
		M6-1		21x15	*	
	2	D3-1G	GILBERT DR 4700			
		D3-1G	FM 969			
	3	W1-4L				
		W13-1P	45 MPH			
	4	R3-8LLK	ONLY	X30	*	
	5	R3-9DP	END	30x12	*	
		R3-9B	CENTER LANE (TURN) ONLY	24X36	*	
	6	M3-4	WEST	24X12	*	
		M1-6F	FARM ROAD 969	24X24	*	
		M6-1		21x15	*	
		M3-2	EAST	24X12	*	
		M1-6F	FARM ROAD 969	24X24	*	
		M6-1		21x15	*	
	7	R3-9CP	BEGIN	30X12	*	
		R3-9B	CENTER LANE (TURN) ONLY	24X36	*	
7	1	W3-3	SIGNAL AHEAD (W/ FLASHING LIGHTS)			
	2	R2-2	SPEED LIMIT 55			
	3	W3-3	SIGNAL AHEAD (W/ FLASHING LIGHTS)			
	4	S1-1				
		SW16-9P	AHEAD			
8	1					
	2	R3-9CP	BEGIN	30X12	*	
		R3-9B	CENTER LANE (TURN) ONLY	24X36	*	
	3	M1-6F	FARM ROAD 969			
	4	R3-9CP	BEGIN			
		R3-9B	CENTER LANE (TURN) ONLY			
	5	R7-1	NO PARKING			
	6	R7-1DBL	NO PARKING ANYTIME	12X18	*	
	7		BUSES ONLY	72X48	*	
9	1	R3-8LSS	ONLY	X30	*	
	2	W9-2TL	LANE ENDS MERGE LEFT			
	3	S1-1				
		SW16-9P	AHEAD			
	4	M1-6F	FARM ROAD 969	24X24	*	
		M3-4	WEST	24X12	*	
	5	W9-1R	RIGHT LANE ENDS			
	6	W3-3	SIGNAL AHEAD (W/ FLASHING LIGHTS)			
	7	W11-2				
	8	W3-9DP	END			
		W3-9B	CENTER LANE (TURN) ONLY			
	9	W11-8L				
	10	R3-8B	ONLY	X30	*	
	11	R3-5R	(TURN) ONLY			

Post Type
FRP = Fiberglass
TWT = Thin-Wall
10BWG = 10 BWG
S80 = Sch 80

Posts (1 or 2)

Anchor Type
UA = Univer-Conc
UB = Univer-Bolt
SA = Slip-Conc
WS = Wedge Steel
WP = Wedge Plastic

XXXXX (X) XX (X-XXXX)

Mounting Designation
P = Prefab. "Plain"
T = Prefab. "T"
U = Prefab. "U"

1 EXT or 2EXT = # of Ext.
BM = Extruded Wind Beam
WC = 1.12 #/ft Wing Chan.
EXAL = Extruded Aluminum

NOTES: 1. EXISTING SIGN TO BE RELOCATED IN PLACE
2. EXISTING SIGN TO BE RELOCATED

ALUMINUM SIGN BLANKS (TYPE A)

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

Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.

STATE OF TEXAS
MAEN A. HOURANI
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LICENSED
PROFESSIONAL ENGINEER
6/25/2021

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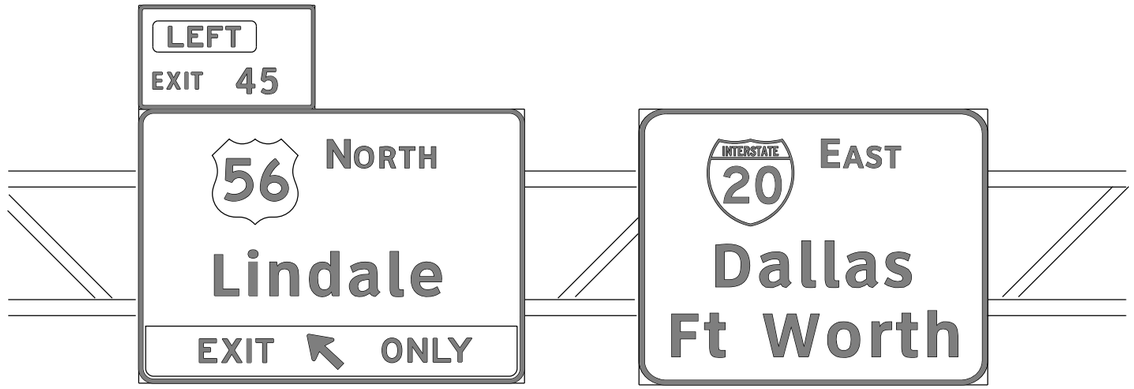
FM 969
SMALL SIGN SUMMARY

SHEET 2 OF 2

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		273
DRAWN BY:	STATE	DIST. NO.	COUNTY	
CM	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
CH	1186	01	091	FM 969

REQUIREMENTS FOR OVERHEAD AND LARGE GROUND-MOUNTED SIGNS

TYPICAL EXAMPLES



GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign summary sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Black legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod, or F).
   White legend shall use the Clearview Alphabet.
   The following Clearview fonts shall be used to replace the existing white FHWA lettering, 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. 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 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 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 need not be trimmed or rounded if fabricated from an extruded material.
7. Sign substrate for ground-mounted signs shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative. Sign substrate for overhead signs shall be any material that meets DMS-7110. Exit Number Panels attached above the parent sign shall be made with the same substrate and sheeting as the parent sign.
8. Mounting details of attachments to parent sign face are shown on Standard Plan Sheet TSR(5). Mounting details of exit number panels above parent sign are shown in the "SMD series" Standard Plan Sheets.
9. Background sheeting shall be applied to the substrate per sheeting manufacturer's recommendations. Sheeting will not be allowed to bridge the horizontal gap between panels.
10. Cut all legend, symbols, borders, and direct applied sign attachments at panel joints.

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/

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE B OR C SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM

Texas Department of Transportation

Traffic Operations Division Standard

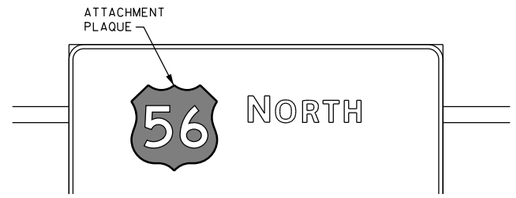
TYPICAL SIGN REQUIREMENTS

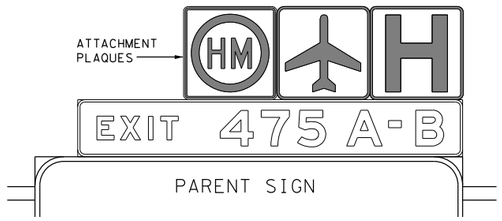
TSR(1)-13

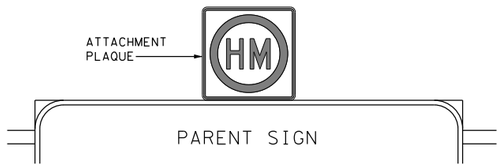
FILE: tsr1-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AUS	TRAVIS		274

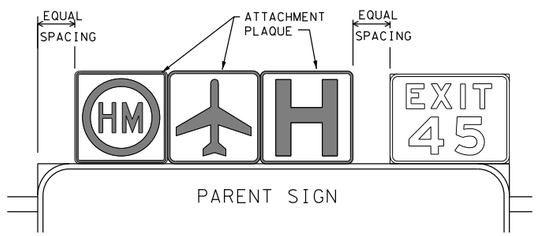
DATE:
FILE:

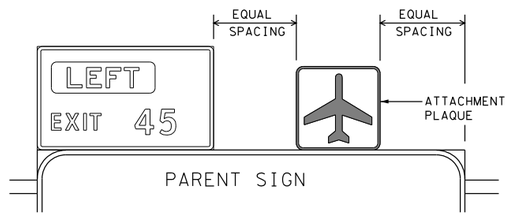
REQUIREMENTS FOR ATTACHMENTS TO OVERHEAD AND LARGE GROUND MOUNTED SIGNS











TYPICAL EXAMPLES

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

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B OR C SHEETING

GENERAL NOTES

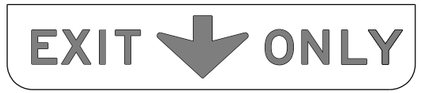
1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Route Marker legends (ie. IH, US, SH and FM shields) shall use the Federal 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 and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to white background sheeting, or combination thereof.
7. Route markers and other attachments within the parent sign face shall be direct applied unless otherwise specified in the plans. Attachments not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
8. General Service Plaques shall be 0.080 inch thick and Routing Plaques shall be 0.100 inch thick.
9. The priority for Routing Plaques shall be (left to right) Hazardous Material, Airport then Hospital. See examples for mounting location.
10. Mounting details of attachments to parent signs face are shown on Standard Plan Sheet TSR(5). Mounting details of sign plaque attachments above and below parent sign are shown in the "SMD series" Standard Plan Sheets.
11. Plaques shall be horizontally centered at the top of the parent sign. If an exit number panel exists, the plaque shall be centered between the edge of the parent sign and the edge of the exit number panel. The plaque may be placed above the exit number panel when there is insufficient space.

TYPICAL EXAMPLES

REQUIREMENTS FOR EXIT ONLY AND LEFT EXIT PANELS

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

SHEETING REQUIREMENTS FOR OVERHEAD EXIT PANELS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLUORESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND	BLACK	ACRYLIC NON-REFLECTIVE FILM



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). Individual panel sizes shown in the plans may be adjusted to fit actual parent sign sizes if necessary.
2. Exit Panel legend shall use the Federal Highway Administration (FHWA)Standard Highway Alphabets E Series.
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 shall be applied by screening process or cut-out acrylic non-reflective black film to yellow background sheeting, or combination thereof.
5. Exit Only and Left Exit panels within the parent sign face shall be direct applied unless otherwise specified in the plans. Panels not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
6. Mounting details of Exit Only and Left Exit panel attachments to parent signs face are shown on Standard Plan Sheet TSR(5).

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(2)-13

FILE: tsr2-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	1186	01	091	FM 969
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9-08	AUS	TRAVIS		275

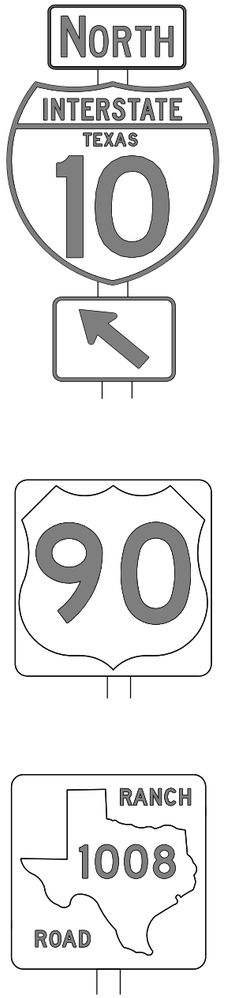
DATE:
FILE:

2

DATE:
FILE:

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

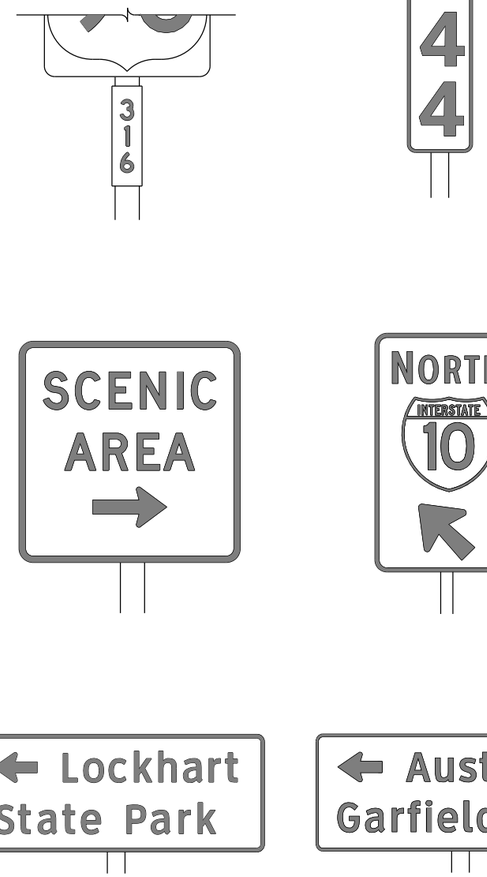
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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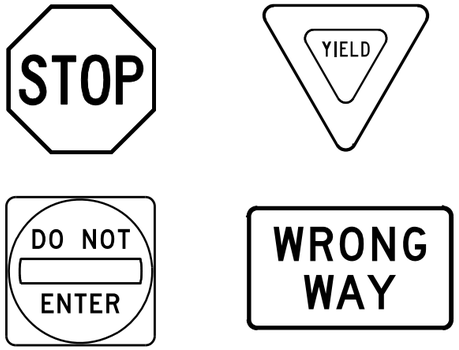
REVISIONS	1186	01	091	FM 969
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AUS	TRAVIS		276

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

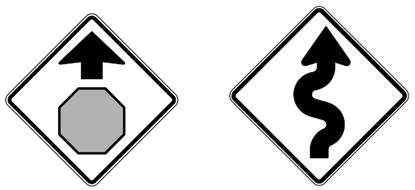
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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
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12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AUS	TRAVIS		277

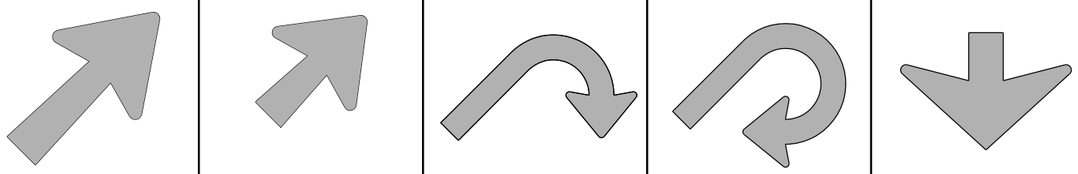
DATE:
FILE:

4

DATE:
FILE:

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

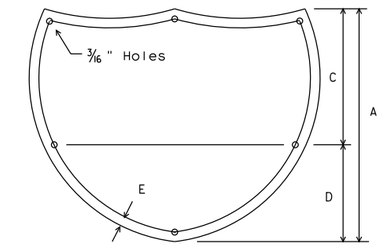
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

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

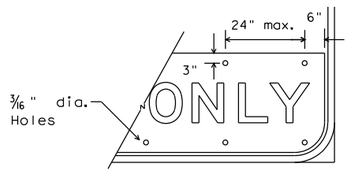
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

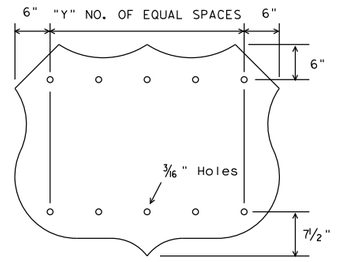


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

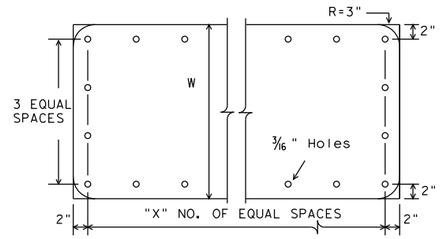


EXIT ONLY PANEL



U.S. ROUTE MARKERS

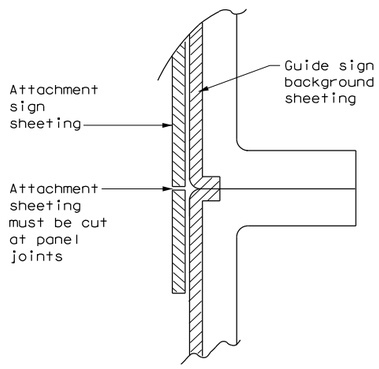
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



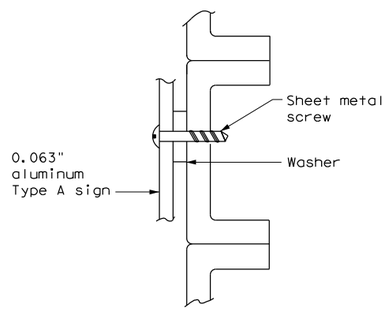
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

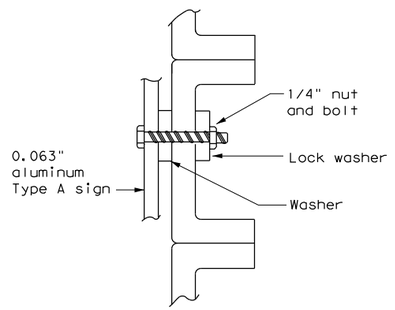
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT



NUT/BOLT ATTACHMENT

NOTE:

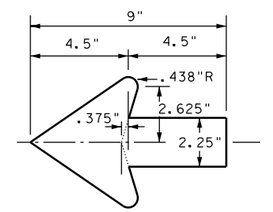
1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

NOTE:

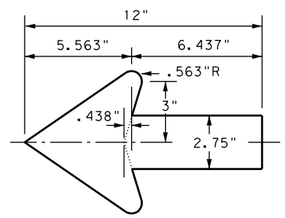
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

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
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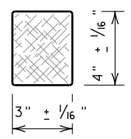
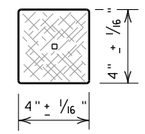
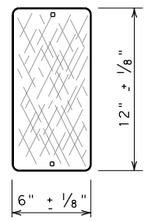
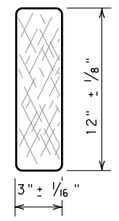
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AUS	TRAVIS		278

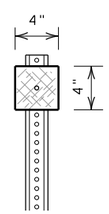
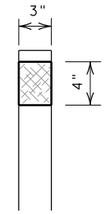
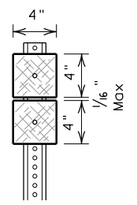
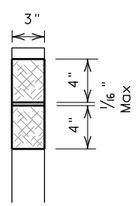
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			

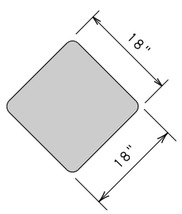
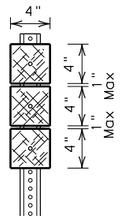
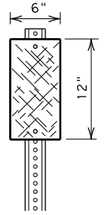
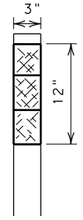
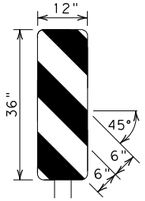
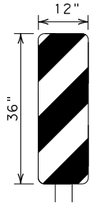
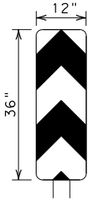
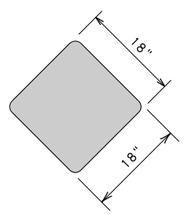
NOTE

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.

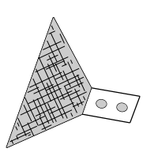
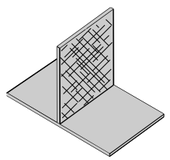
DELINEATORS

DEVICE	SINGLE		DOUBLE	
				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

BARRIER REFLECTORS (BRF)

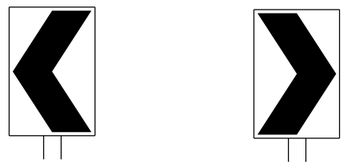
	GF1	GF2	CTB
DEVICE			

1. Barrier reflectors shall meet the requirements of DMS 8600.
2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.

SHEETING	Yellow, White, Red
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.

CHEVRONS

DEVICE



W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE

1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE

W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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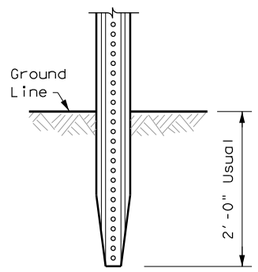
REVISIONS	1186	01	091	FM 969
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	AUS	TRAVIS		279

DATE:
FILE:

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

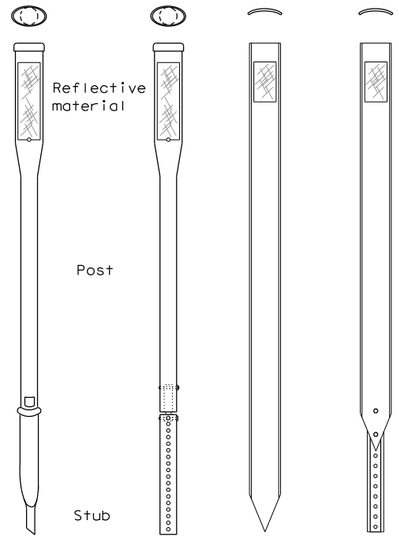


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

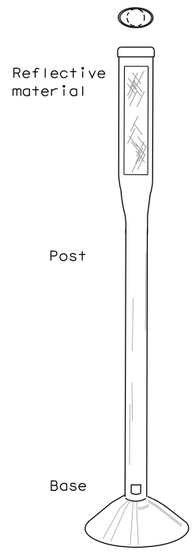
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



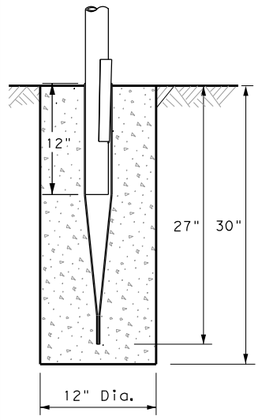
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

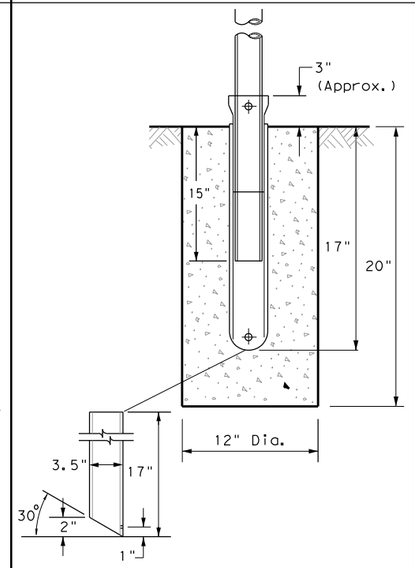
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

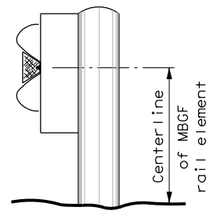
NOTE

1. Install per manufacturer's recommendations.

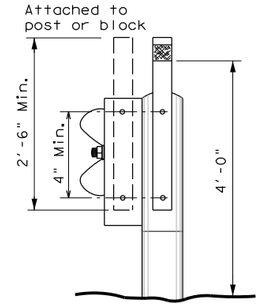
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

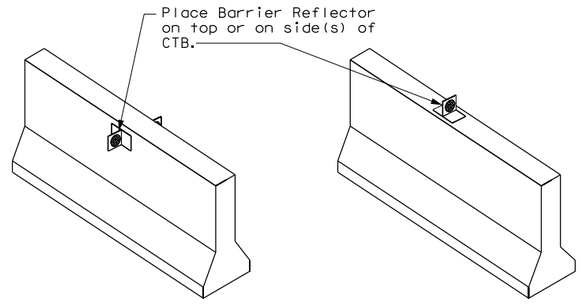
GF1



GF2



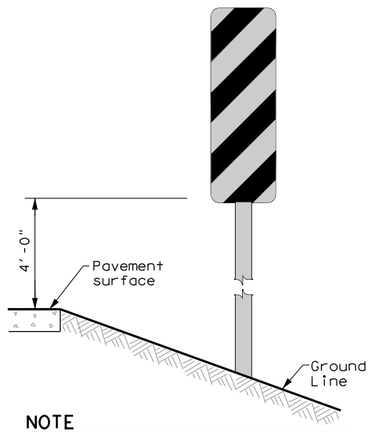
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

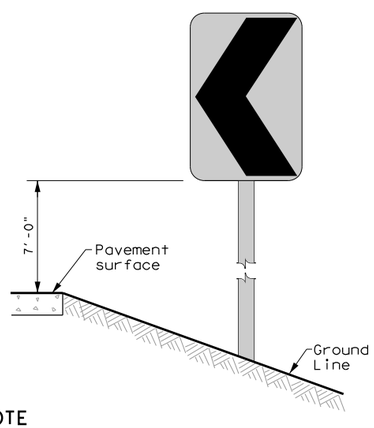
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

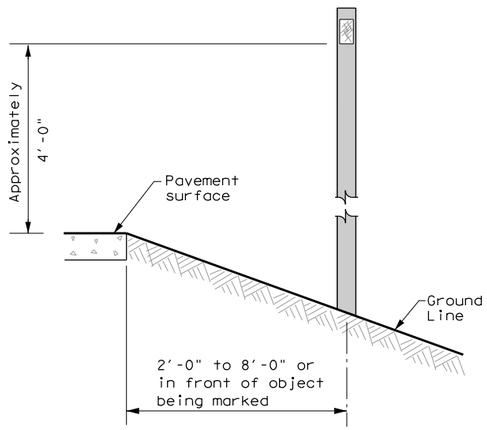
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

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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20B

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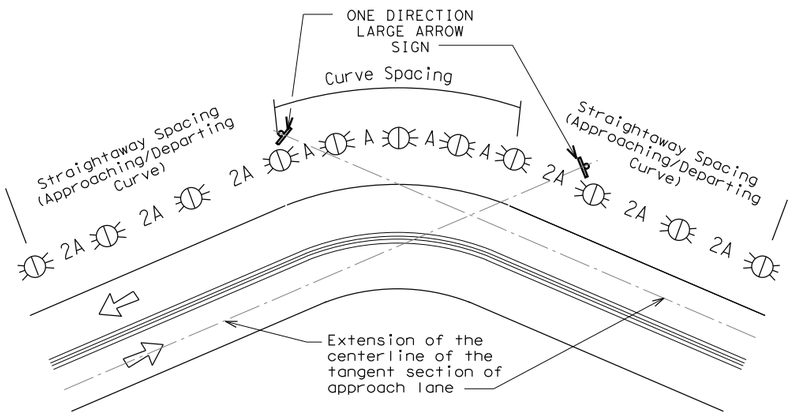
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

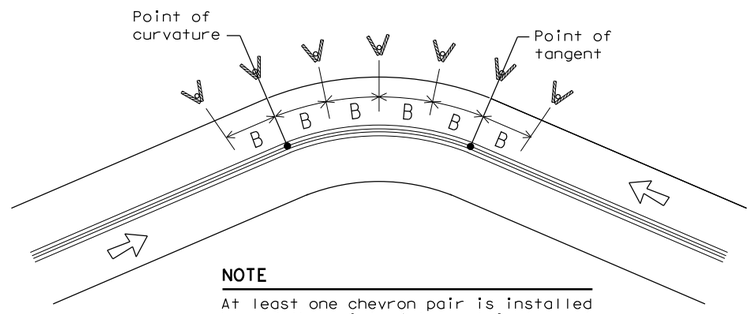
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	——
2	2865	160	320	——
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

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8-15 7-20	AUS	TRAVIS		281

DATE:
FILE:

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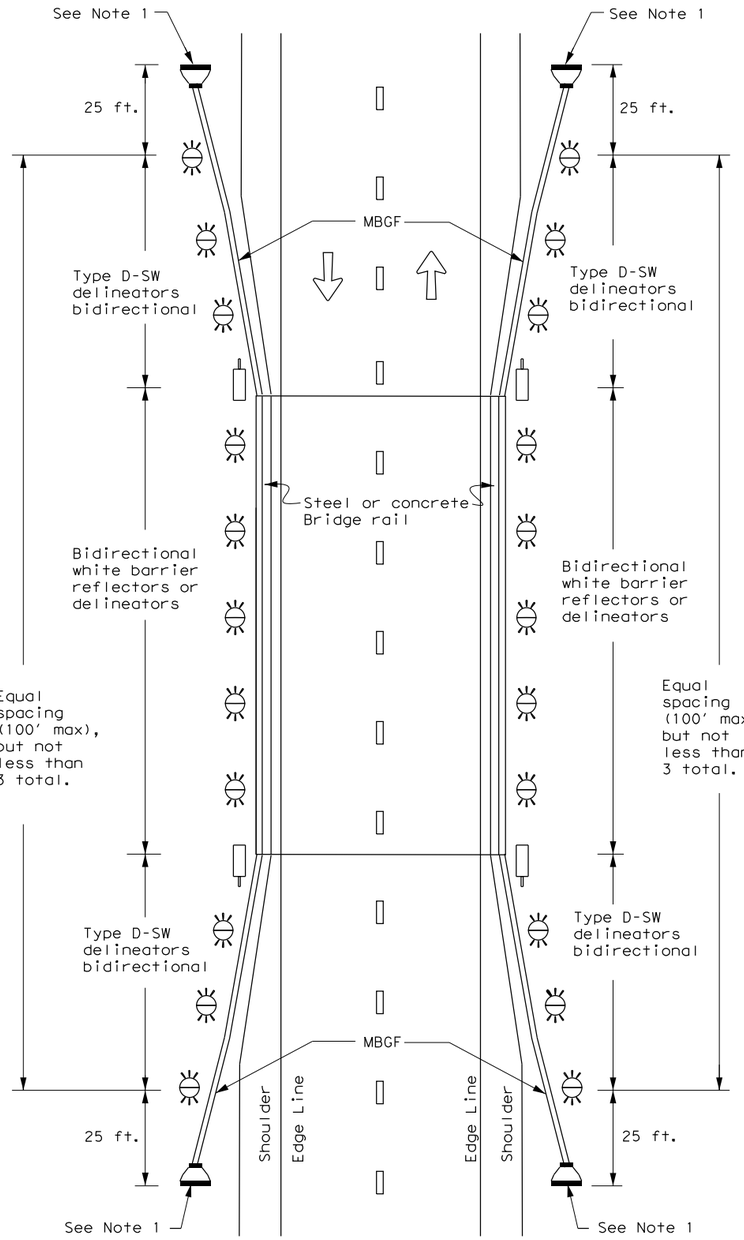
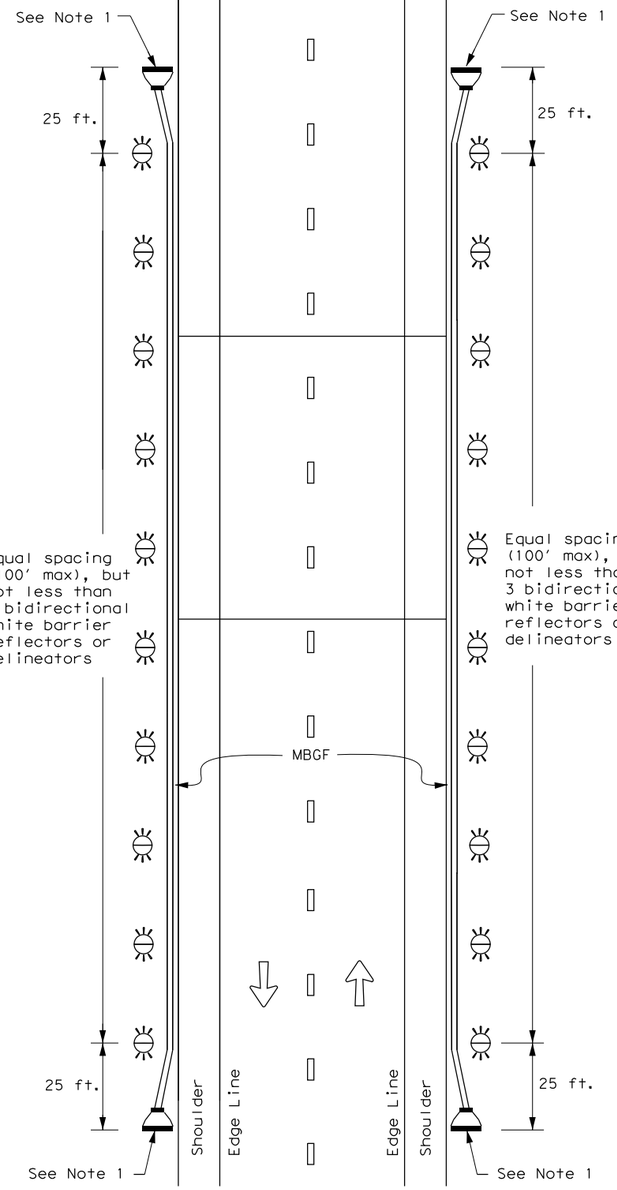
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

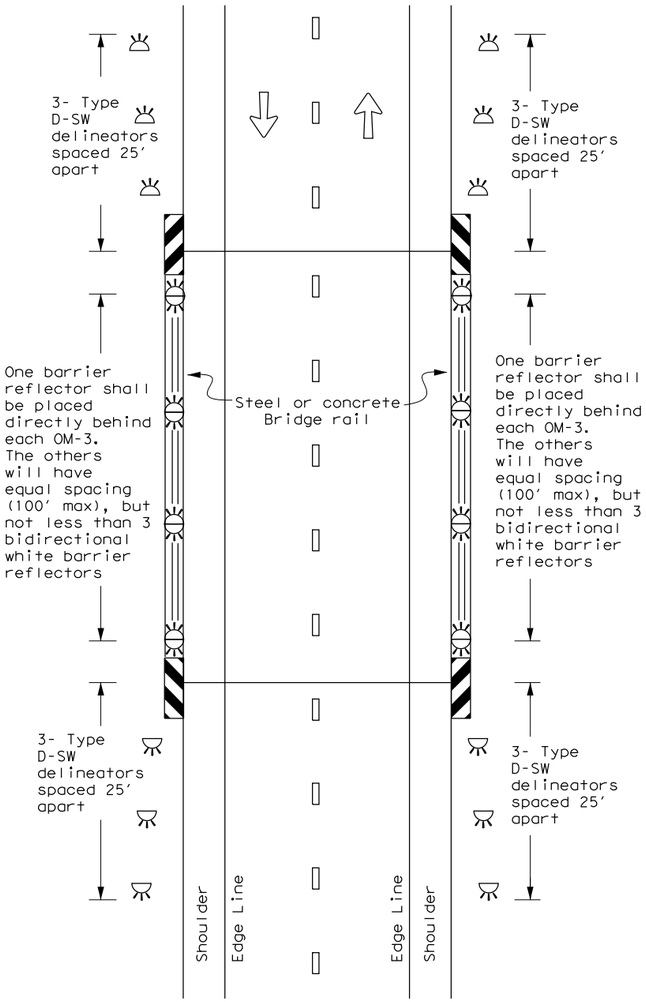
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

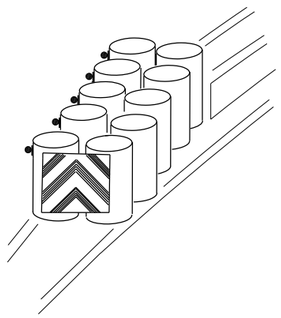
Traffic Safety Division Standard

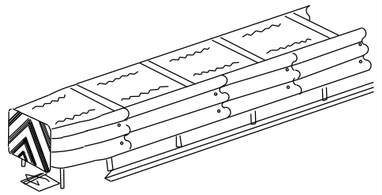
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

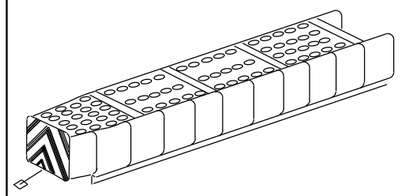
D & OM(5)-20

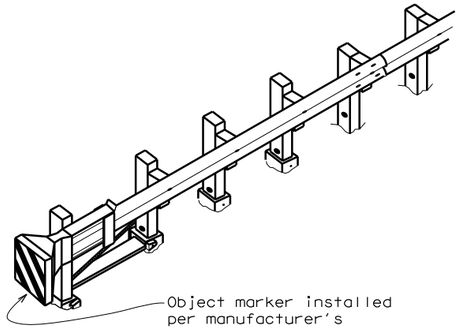
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
7-20	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		282

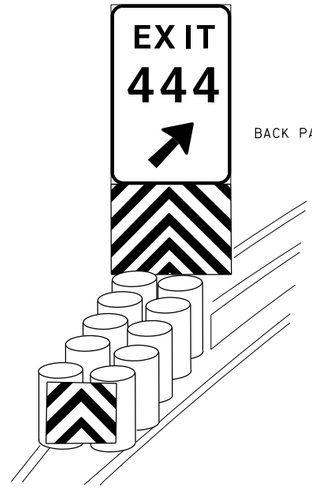
20E

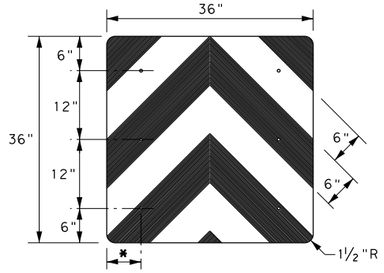


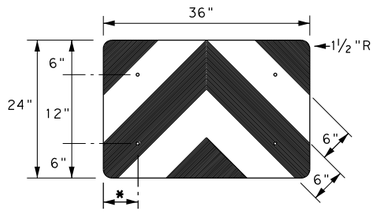




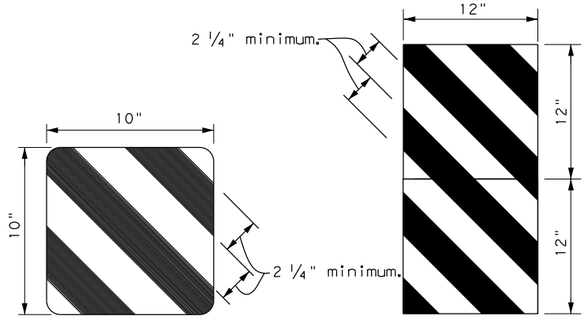




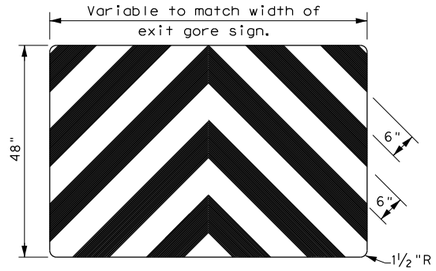


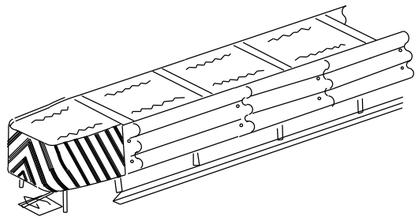


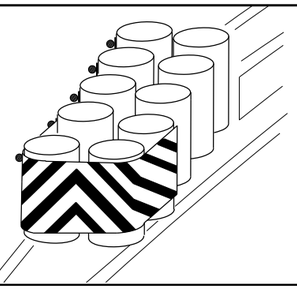
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

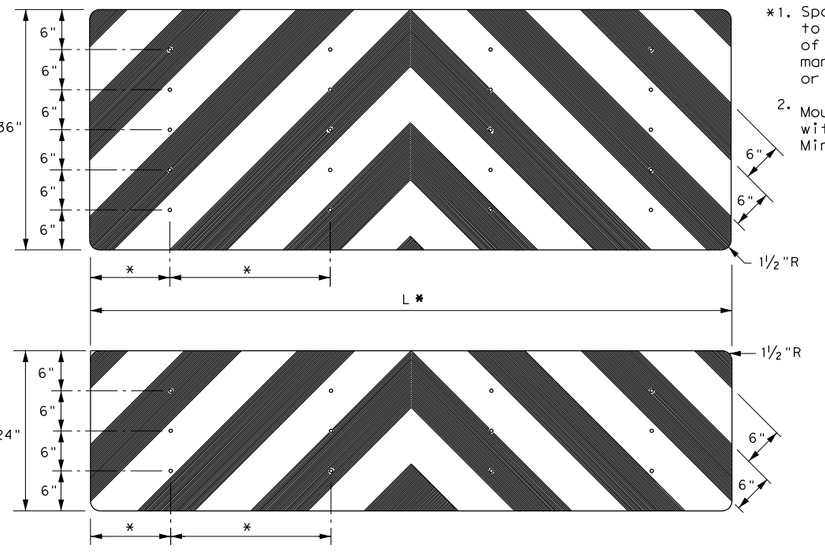


OBJECT MARKERS SMALLER THAN 3 FT^2









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

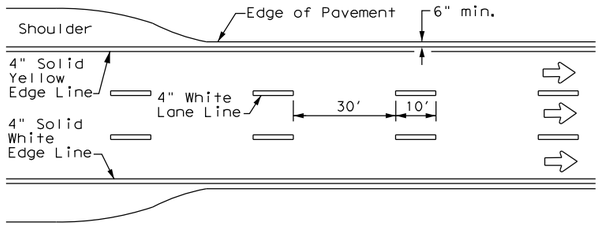
DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

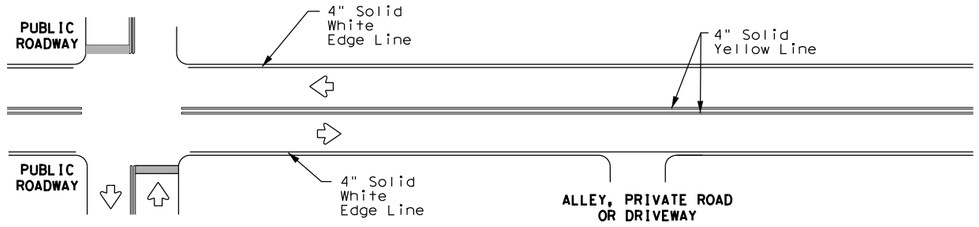
FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	AUS	TRAVIS		283
4-98 7-20				

20G

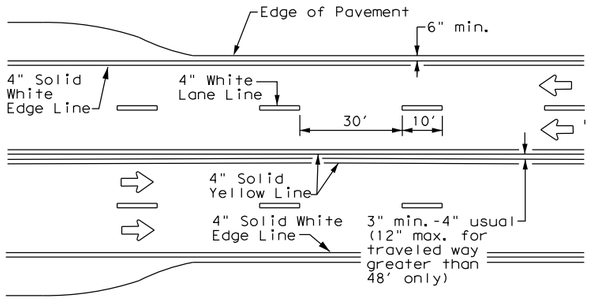
DATE:
FILE:



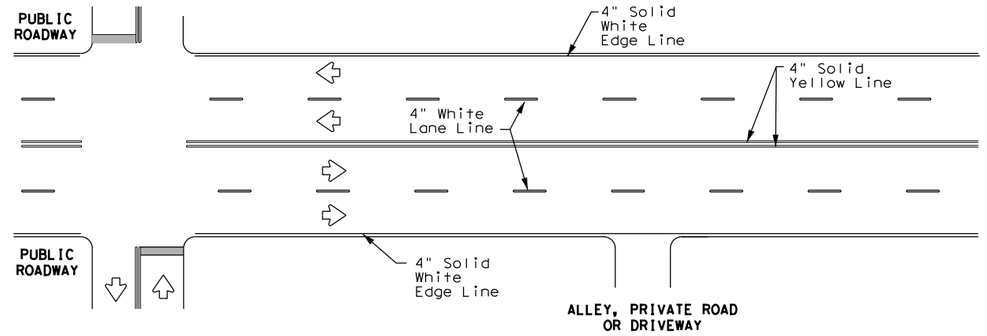
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



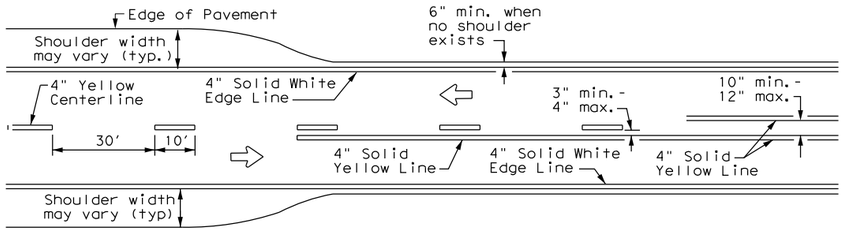
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



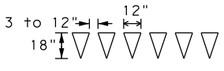
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



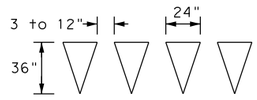
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

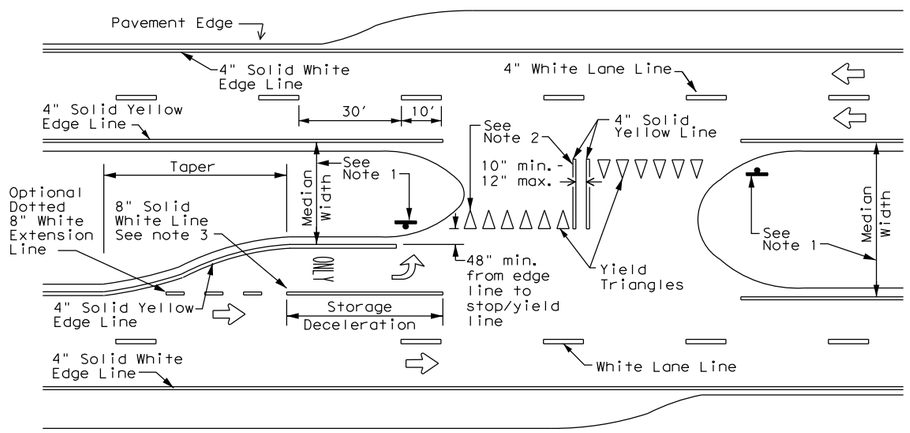


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

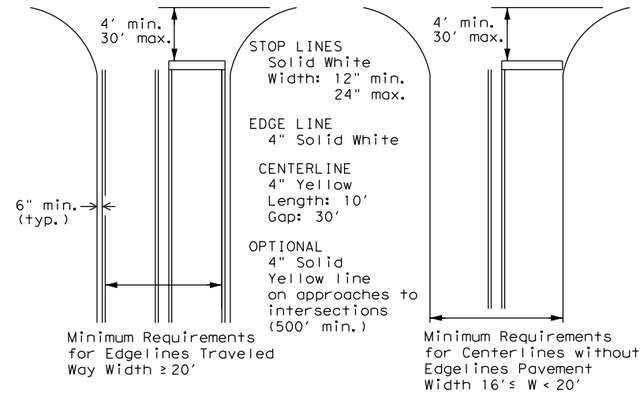
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

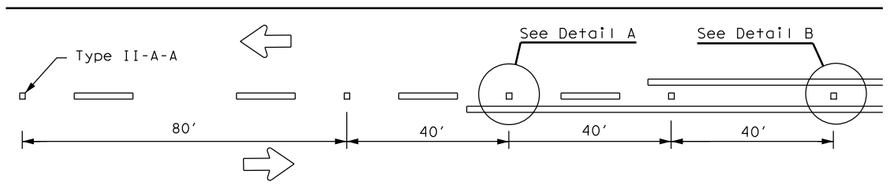
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	1186	01	091	FM 969
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	AUS	TRAVIS		284

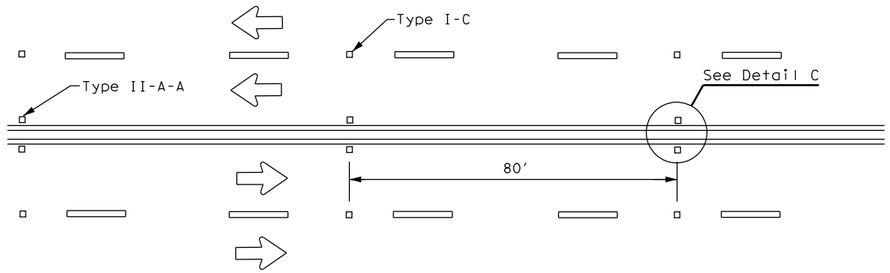
22B

DATE:
FILE:

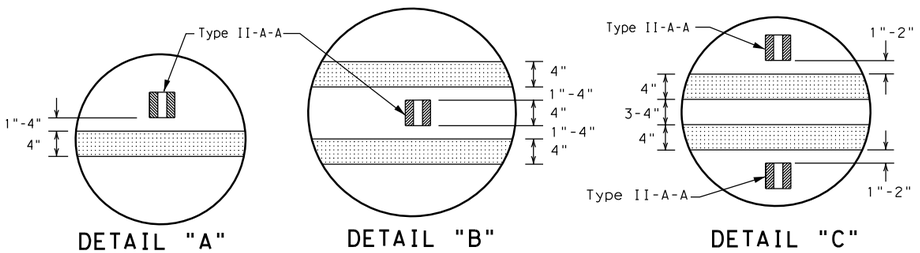
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



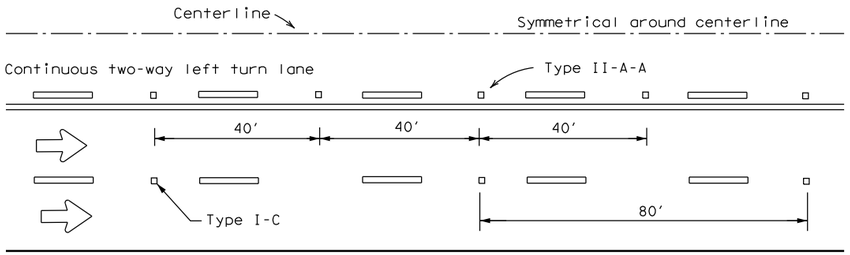
CENTERLINE FOR ALL TWO LANE ROADWAYS



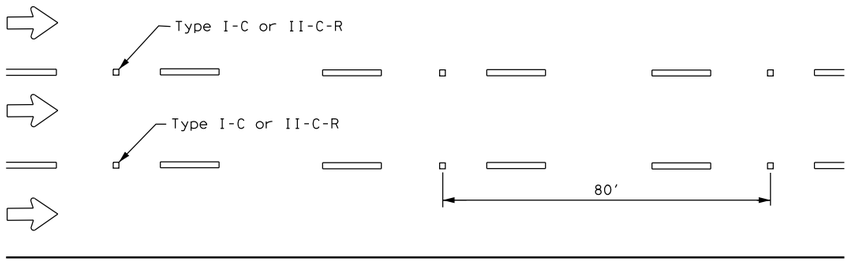
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" DETAIL "B" DETAIL "C"



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

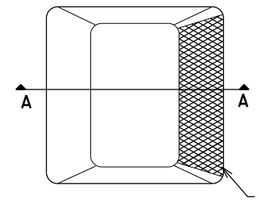


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

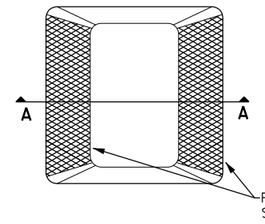
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

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

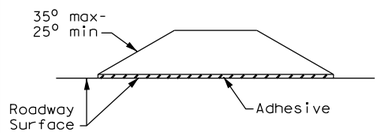
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

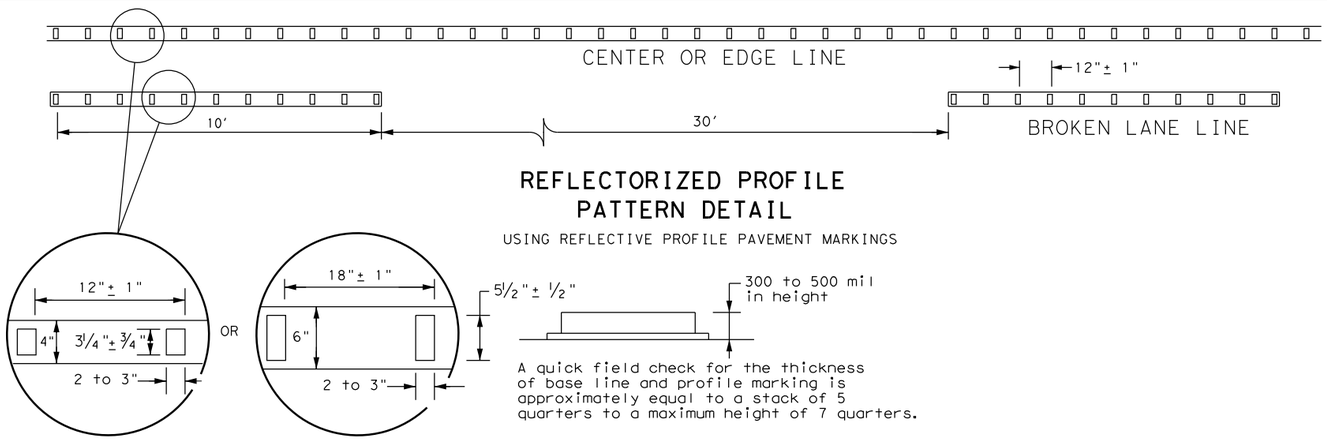


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

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 in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

Texas Department of Transportation

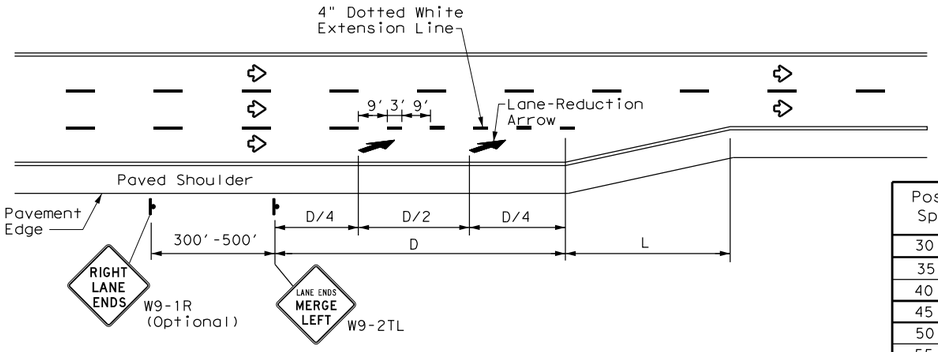
Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		285

22B

DATE:
FILE:



LANE REDUCTION

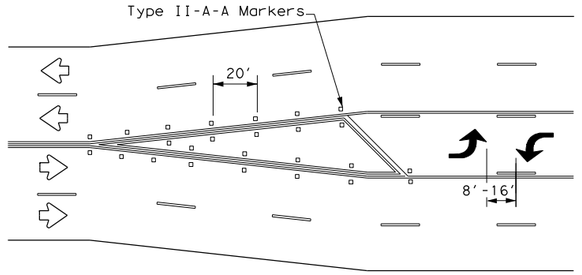
Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

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 W9-1R "RIGHT LANE ENDS" 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.

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.

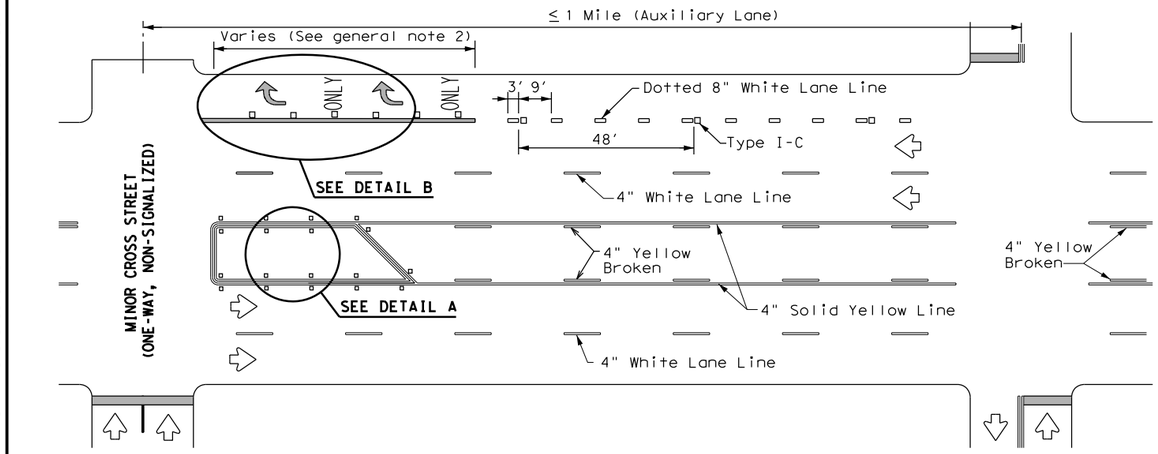


A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

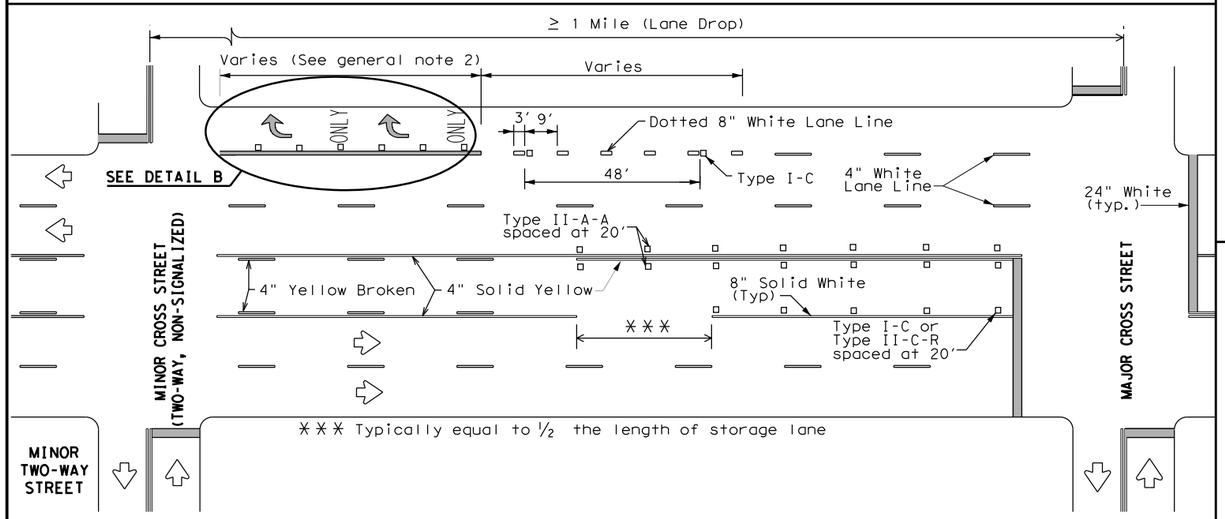
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

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

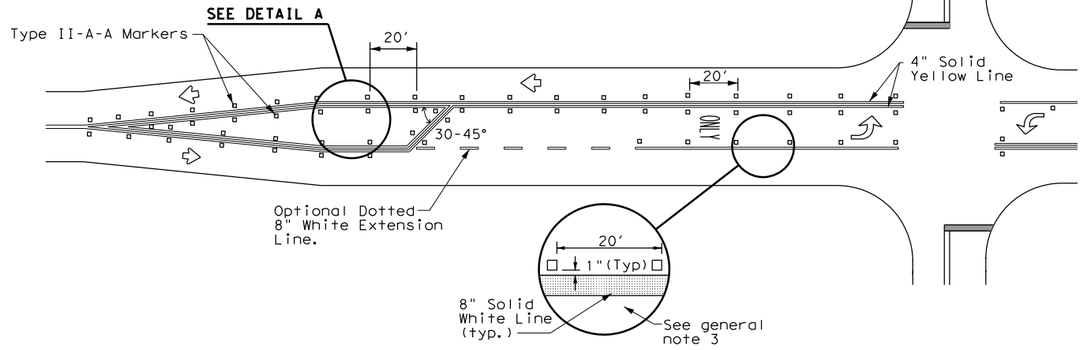
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



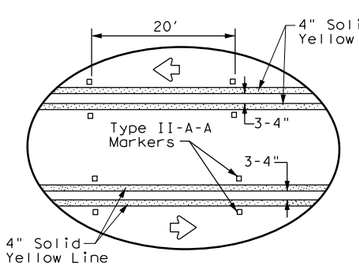
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



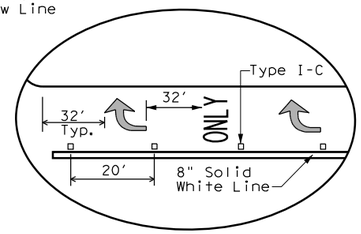
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



DETAIL A



DETAIL B

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-20

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	AUS	TRAVIS		286
3-03 6-20				

22D

DATE:
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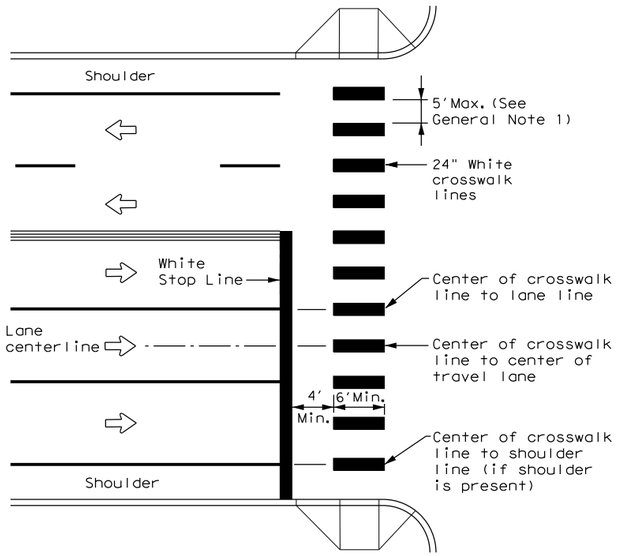


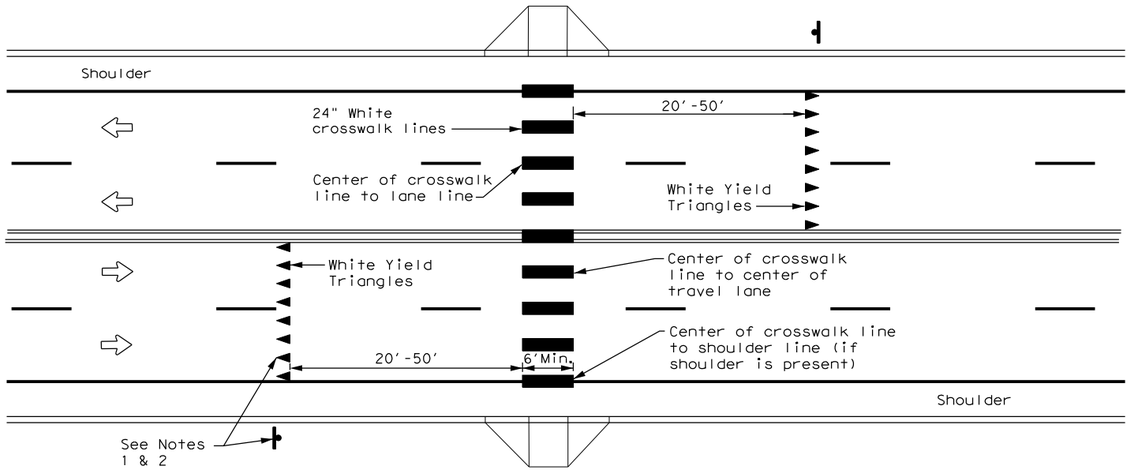
HIGH-VISIBILITY LONGITUDINAL CROSSWALK
AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar/Yield Triangles and Crosswalk shall be approved by the Engineer in the field.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



UNSIGNALIZED MID BLOCK HIGH-VISIBILITY
LONGITUDINAL CROSSWALK

NOTES

1. Use yield triangles with "Yield Here to Pedestrians" signs at unsignalized mid block crosswalks.
2. Use stop bars with "Stop Here on Red" signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

PM(4)-20

FILE: pm4-20.dgn	DN:	CK:	DW:	CK:
© TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		287

220

DATE:
FILE:

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

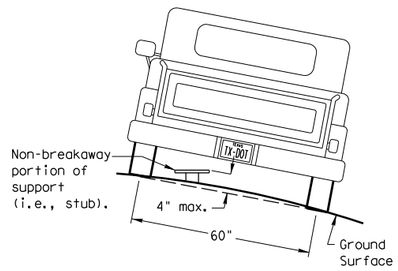
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

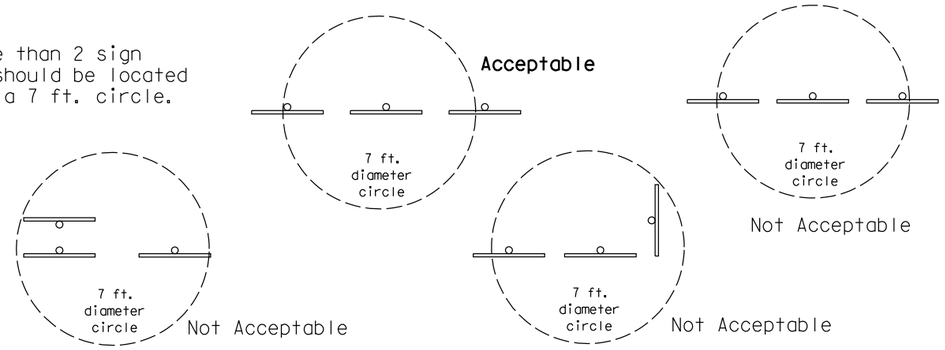
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



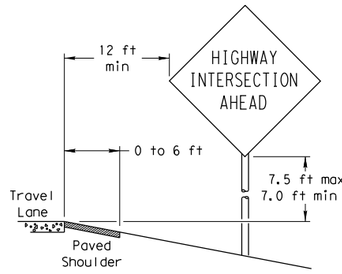
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



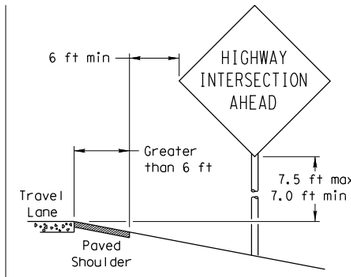
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

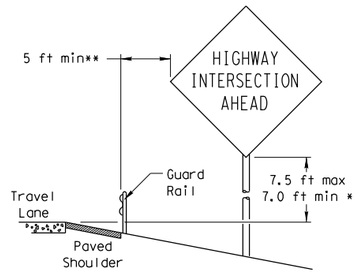
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



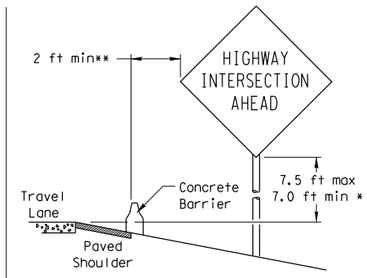
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

BEHIND BARRIER



BEHIND GUARDRAIL

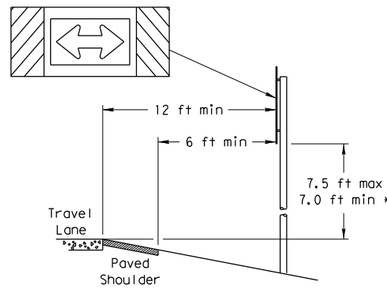


BEHIND CONCRETE BARRIER

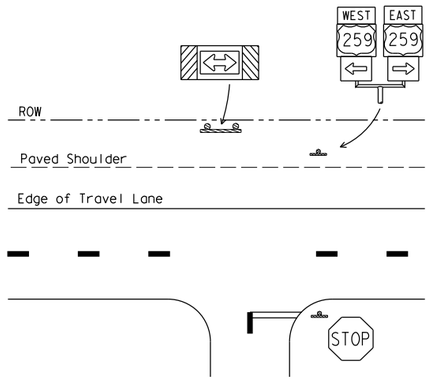
**BEHIND GUARDRAIL

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

T-INTERSECTION



When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

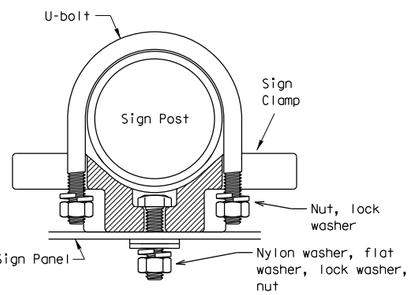
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

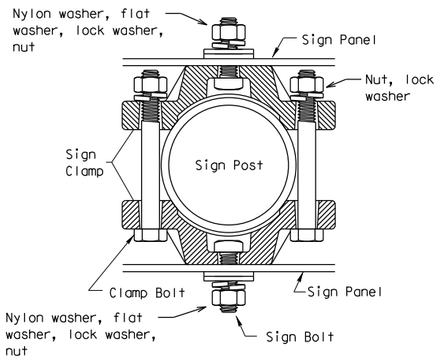
The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



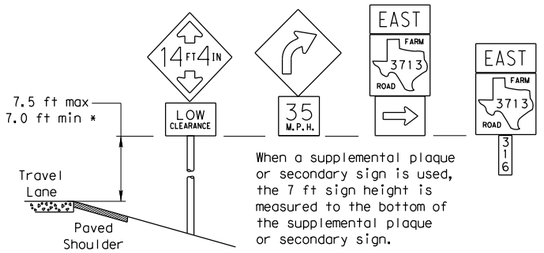
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

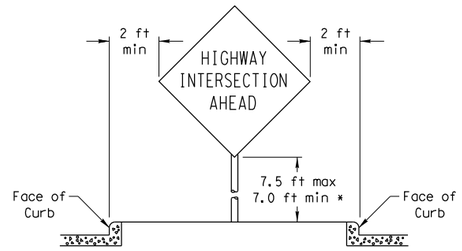
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



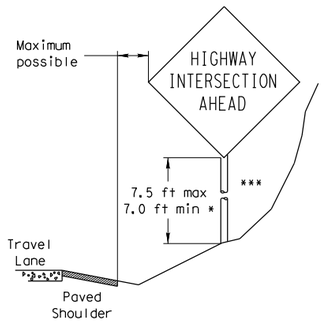
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

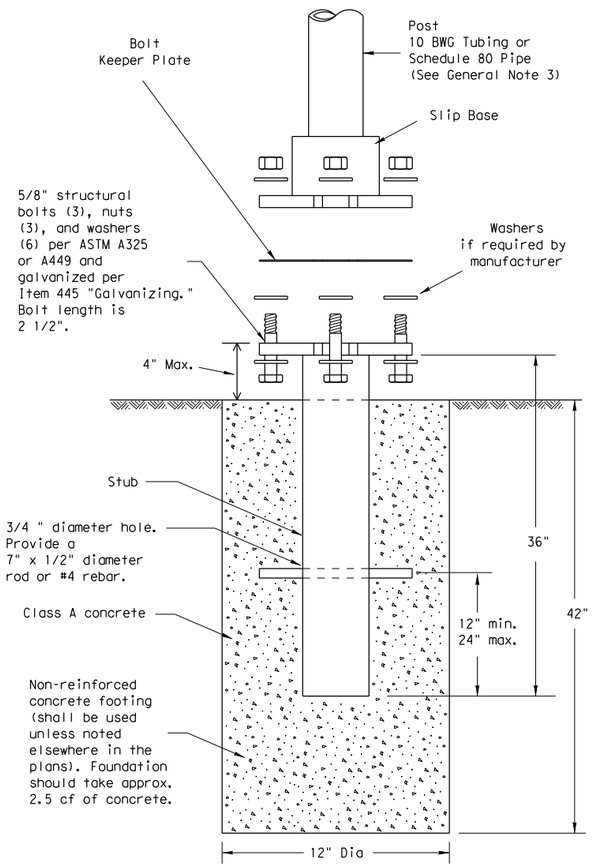
REVISIONS
9-08

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

CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969

DIST	COUNTY	SHEET NO.
AUS	TRAVIS	288

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.

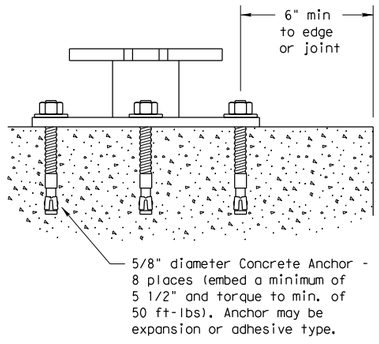
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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

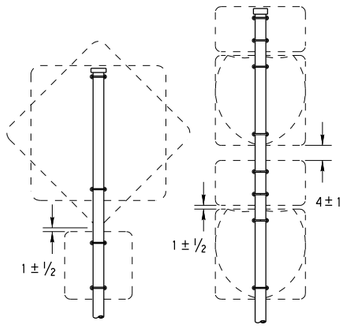
SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08 REVISIONS			

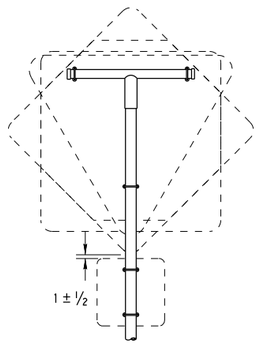
CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969

DIST	COUNTY	SHEET NO.
AUS	TRAVIS	289

DATE:
FILE:



SM RD SGN ASSM TY XXXXX(1)XX(P)



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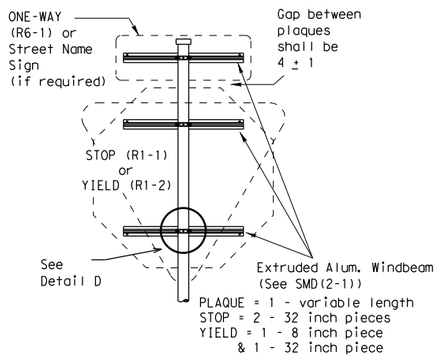

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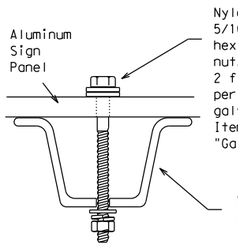
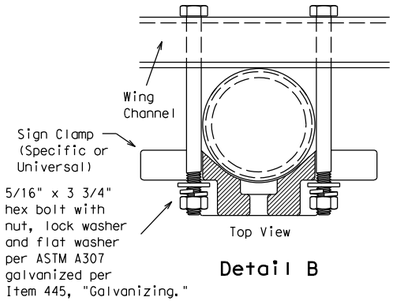
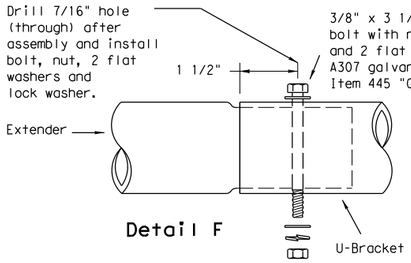


Detail A

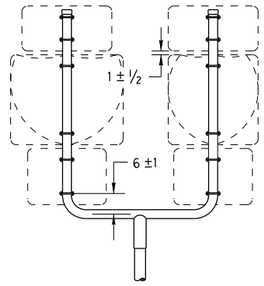


Detail B

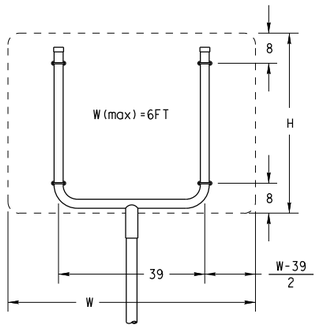


Detail F

Splices shall only be allowed behind the sign substrate.



SM RD SGN ASSM TY XXXXX(1)XX(U)



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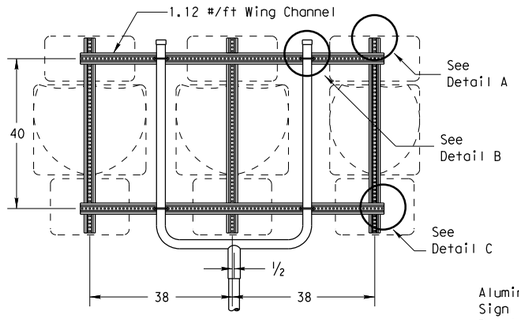
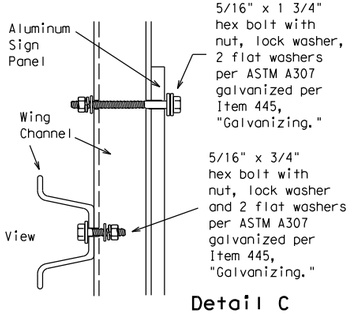
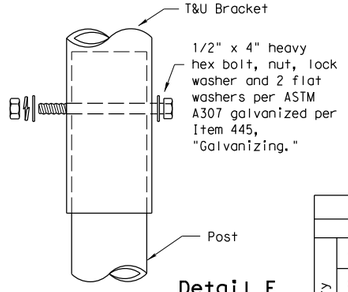


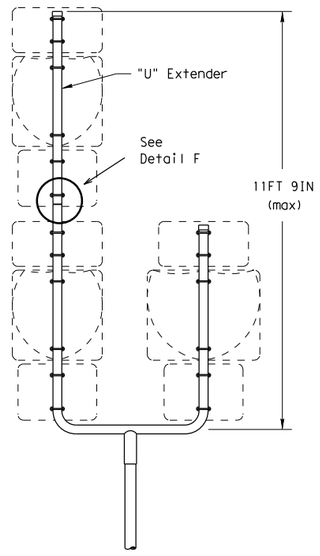
SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)



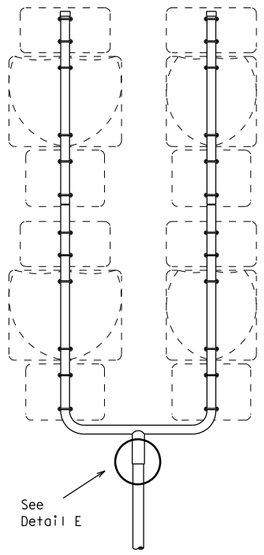
Detail C



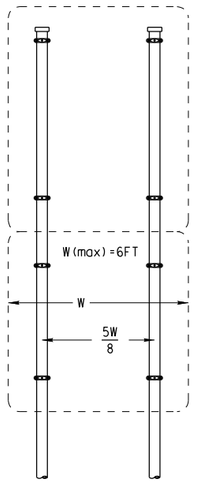
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

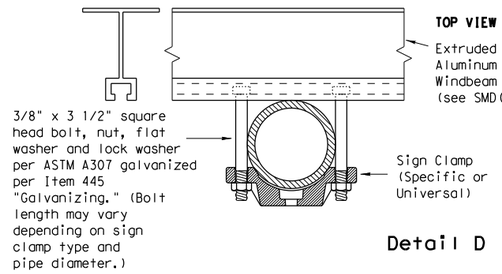


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

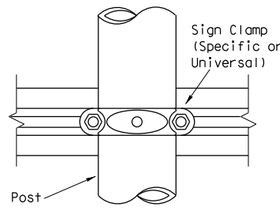


SM RD SGN ASSYM TY XXXXX(2)XX(P)

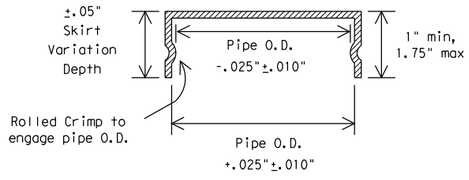
SIDE VIEW



Detail D



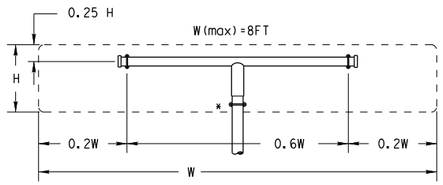
FRICTION CAP DETAIL



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.



SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

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

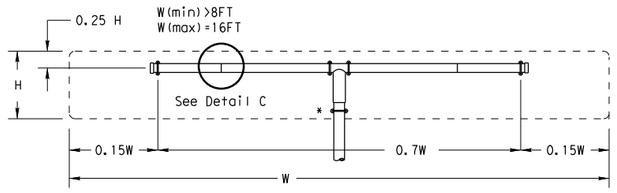
CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969

DIST	COUNTY	SHEET NO.
AUS	TRAVIS	290

9-08 REVISIONS

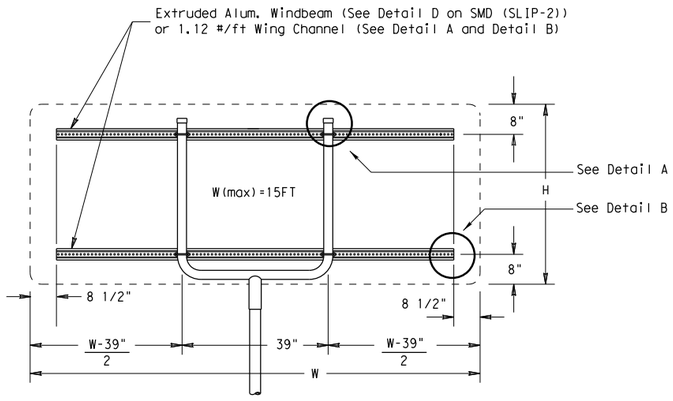
DATE:
FILE:

DATE:
FILE:

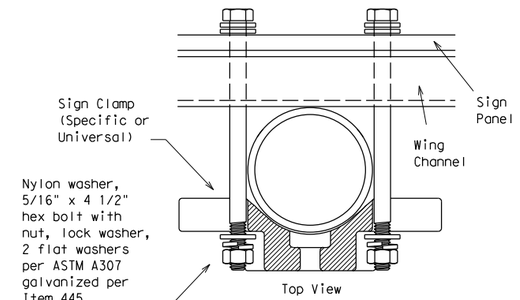


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

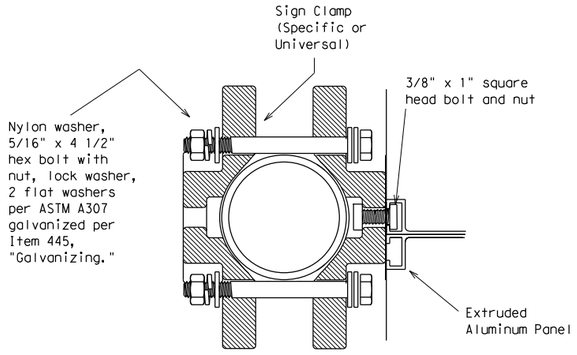
(* - See Note 12)



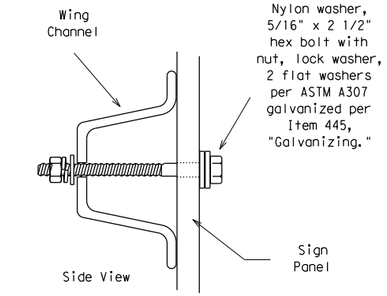
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



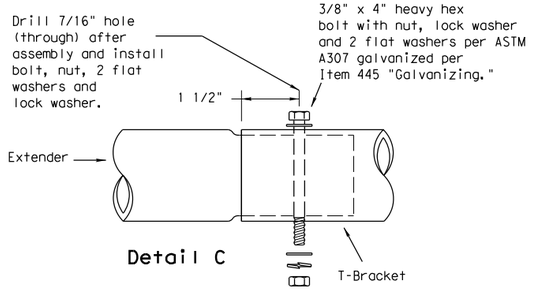
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

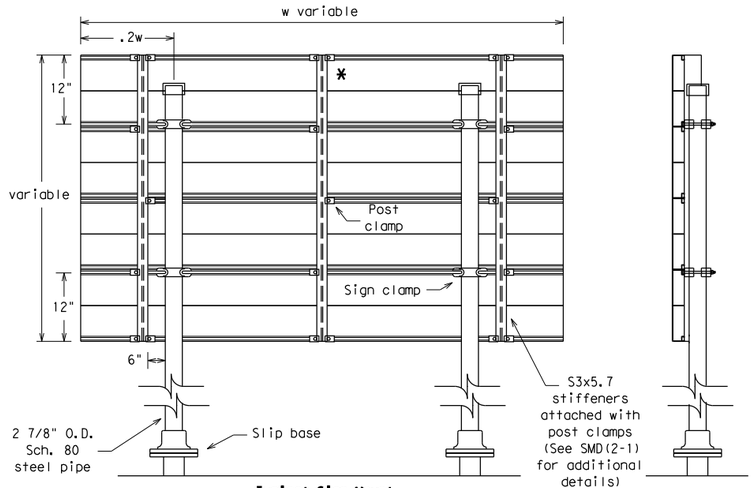


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

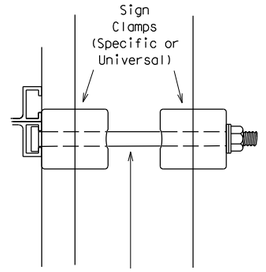


Typical Sign Mount

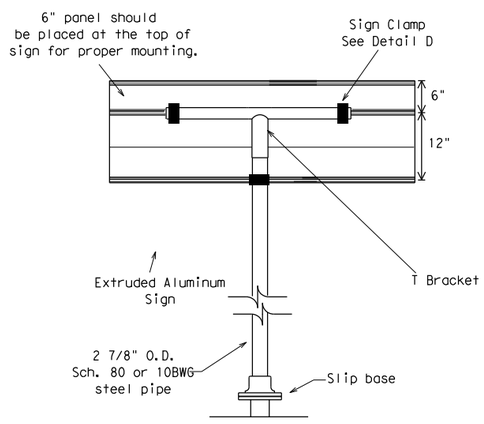
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

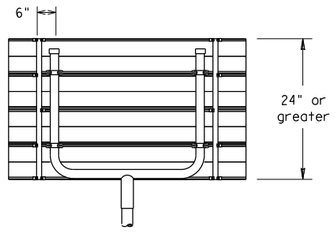
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. See table above.
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Sign blanks shall be the sizes and shapes shown on the plans.
11. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

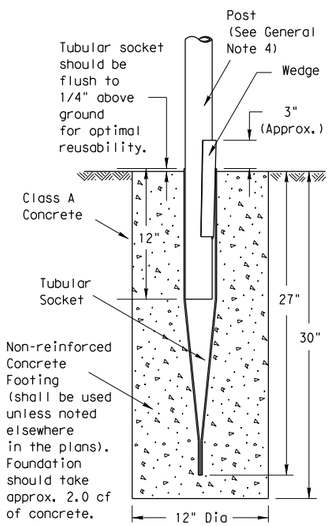
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969
DIST	COUNTY		SHEET NO.
AUS	TRAVIS		291

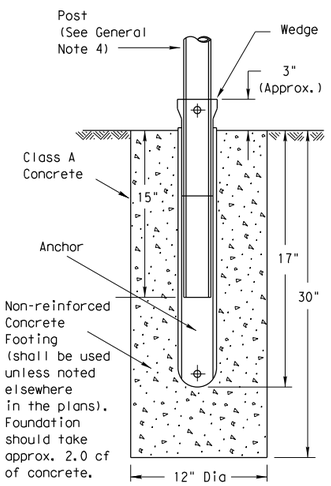
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

Wedge Anchor Steel System



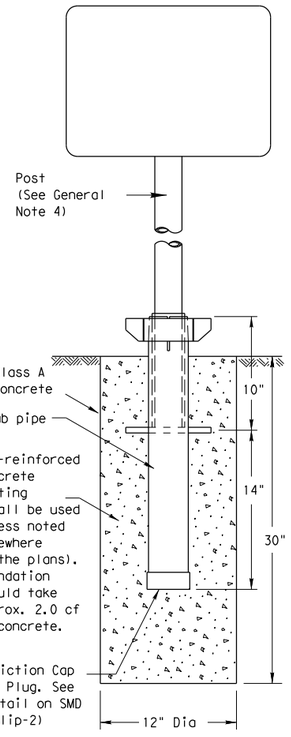
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

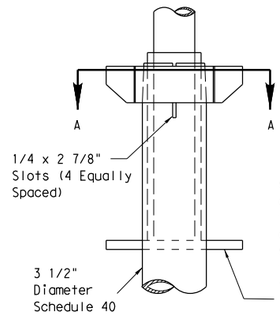


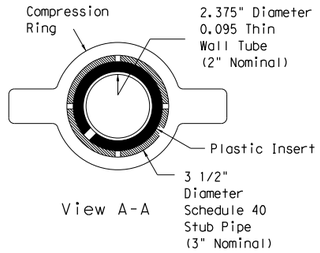
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post



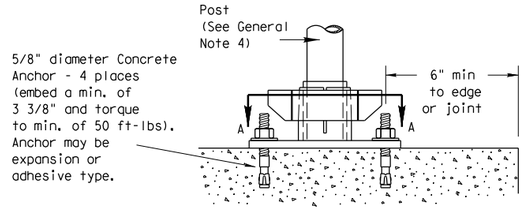
SM RD SGN ASSM TY TWT(X)UA(P)



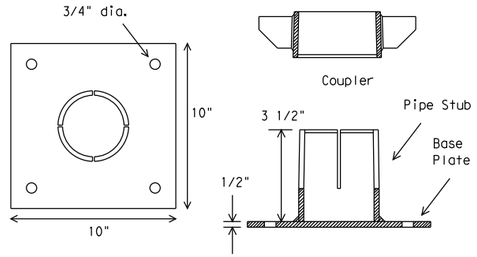


View A-A

Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

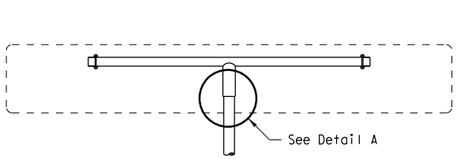


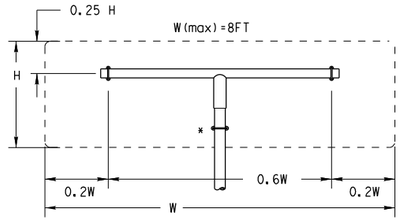
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



SM RD SGN ASSM TY TWT(X)UB(P)

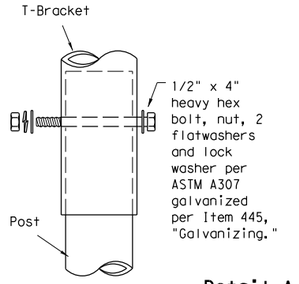
Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)

(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations.
Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   Other steels may be used if they meet the following:
   55,000 PSI minimum yield strength
   70,000 PSI minimum tensile strength
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

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

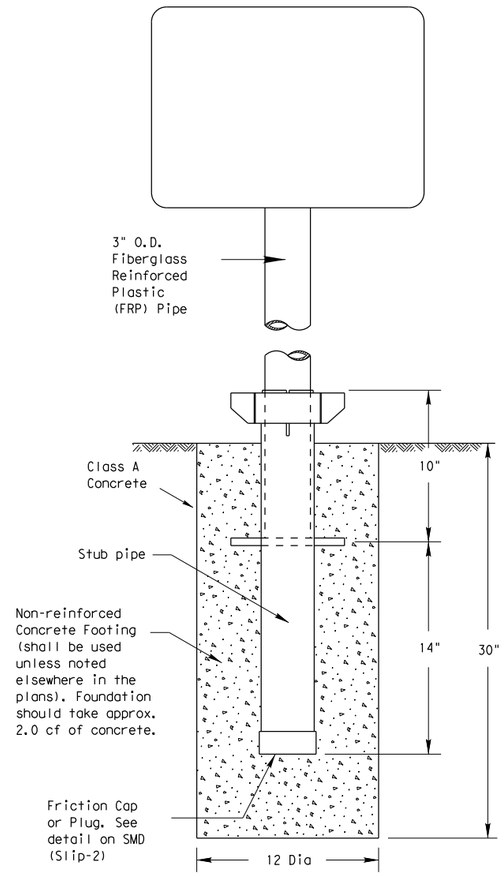
REVISIONS
9-08

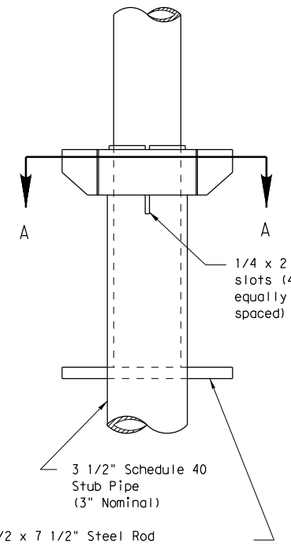
CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969
DIST	COUNTY		SHEET NO.
AUS	TRAVIS		292

26E

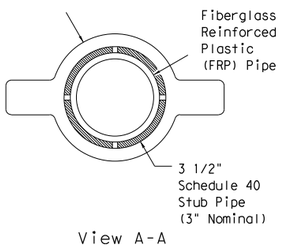
DATE:
FILE:

Universal Anchor System with Fiberglass Reinforced Plastic (FRP) Post



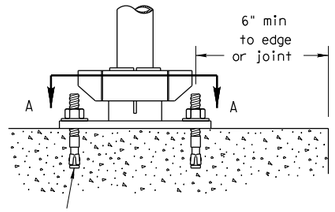


1/2 x 7 1/2" Steel Rod
Acts as a "stop" for the sign post and prevents stub from turning in the foundation.



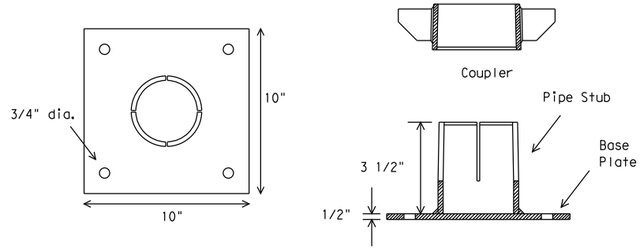
View A-A

SM RD SGN ASSM TY FRP(X)UA(P)



Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.

BOLT-DOWN DETAILS



SM RD SGN ASSM TY FRP(X)UB(P)

GENERAL NOTES:

1. FRP sign supports for a single type sign support may be used for signs up to and including 16 square feet. Dual post installation may be used for signs up to and including 32 square feet.
2. All nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing."
3. See the Traffic Operations Division website for detailed drawings of sign clamps. The website address is: http://www.txdot.gov/publications/traffic.htm

FRP POST REQUIREMENTS

1. Materials shall conform to the requirements of Departmental Material Specification DMS-4410 and will be furnished in a yellow or gray color as specified elsewhere in the plans.
2. Thickness of FRP sign support is 0.125" + 0.031", - 0.0".
3. FRP sign supports are prequalified by the Traffic Operations Division. Prequalification procedures are obtained by writing:
   Texas Department of Transportation
   Traffic Operations Division
   125 East 11th Street
   Austin, Texas 78701-2483

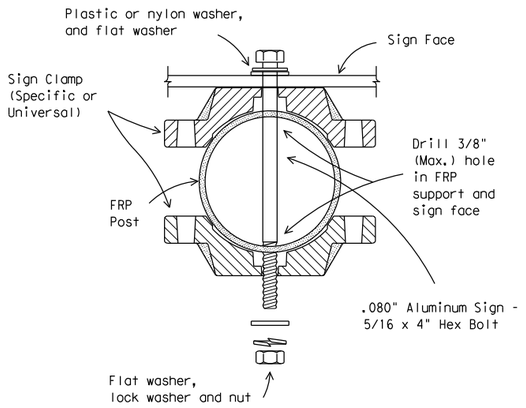
UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURES

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Insert base post in foundation hole to depths shown and fill hole with concrete. Cut base post from bottom and ensure a minimum of 18" embedment if installed in solid rock.
4. Level and plumb the base post with coupler using a torpedo level and let concrete set a minimum of 4 days, unless otherwise directed by Engineer. Bottom of base post slots shall be above the concrete footing.
5. Attach sign to FRP post.
6. Insert sign post into base post. Lower until the post comes to rest on the steel rod.
7. Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
8. Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

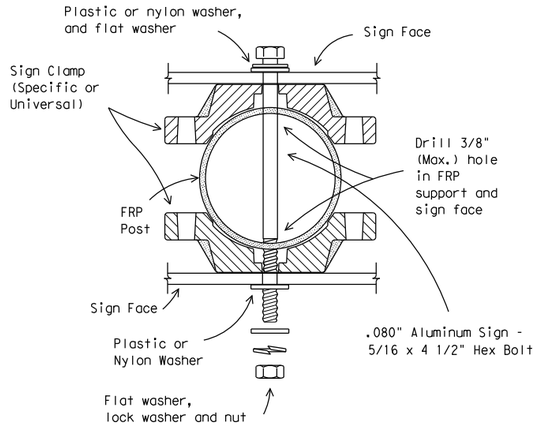
BOLT DOWN SIGN SUPPORT

1. Position base plate with coupler on existing concrete.
2. Drill holes into concrete and insert the 5/8" diameter bolts with wedge anchors, and tighten nuts.
3. Attach sign to FRP post.
4. Insert bottom of sign post into pipe stub.
5. Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
6. Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

Typical Sign Mounting Detail for FRP Support with Single Sign



Typical Sign Mounting Detail for FRP Support with Back-to-Back Signs



Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS UNIVERSAL ANCHOR SYSTEM WITH FRP POST

SMD(FRP)-08

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

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
1186	01	091	FM 969

DIST	COUNTY	SHEET NO.
AUS	TRAVIS	293

DATE:
FILE:

...\FM969*sw3p*NAR.dgn
6/25/2021

SITE DESCRIPTION

PROJECT LIMITS: FM 969: LIMITS FROM FM 3177 TO 0.108 MI EAST OF FM 973

PROJECT DESCRIPTION: FOR THE CONSTRUCTION OF THE REHABILITATION OF AN EXISTING ROAD CONSISTING OF REHABILITATION OF ROADWAY, ADD TWO WAY LEFT TURN LANE AND SHOULDERS.

MAJOR SOIL DISTURBING ACTIVITIES:

SOIL DISTURBING ACTIVITIES WILL INCLUDE PREPARING RIGHT OF WAY, GRADING, EXCAVATION AND EMBANKMENT, FLEX BASE, EXCAVATION AND BACKFILL OF STRUCTURES, EROSION AND SEDIMENT CONTROLS, AND TOPSOIL WORK.

TOTAL PROJECT AREA: 30.8 ACRES

TOTAL AREA TO BE DISTURBED: 27.7 ACRES

WEIGHTED RUNOFF COEFFICIENT (AFTER CONSTRUCTION): 0.74

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

THE EXISTING SOIL IS COMPOSED MAINLY OF:
TRAVIS SOILS WITH SLOPES RANGING FROM 1 TO 5 %
TRAVIS GRAVELLY SOILS WITH SLOPES RANGING FROM 1 TO 8 %
AND TINN CLAY WITH SLOPES RANGING FROM 0 TO 1 %
GROUND COVER INCLUDE NATIVE GRASSES MAKING UP APPROXIMATELY 50 % OF THE PROJECT AREA.

NAME OF RECEIVING WATERS:

WATER FLOWS FROM THE PROJECT IN GRASS LINED DITCHES GENERALLY FROM WEST TO EAST, ULTIMATELY OUTFALLING INTO ELM CREEK AND TRIBUTARIES TO ELM CREEK. ELM CREEK OUTFALLS INTO THE COLORADO RIVER SEGMENT 1428.

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

- T TEMPORARY SEEDING
- P PERMANENT PLANTING, SODDING, OR SEEDING
- P MULCHING
- P SOIL RETENTION BLANKET
- ___ BUFFER ZONES
- P PRESERVATION OF NATURAL RESOURCES

OTHER: DISTURBED AREAS ON WHICH CONSTRUCTION ACTIVITY HAS CEASED (TEMPORARILY OR PERMANENTLY) SHALL BE STABILIZED WITHIN 14 DAYS UNLESS ACTIVITIES ARE SCHEDULED TO RESUME WITHIN 21 DAYS.

STRUCTURAL PRACTICES:

- T SEDIMENT CONTROL FENCES (TEMPORARY)
- ___ HAY BALES
- T ROCK FILTER DAMS (TEMPORARY)
- ___ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- ___ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- ___ DIVERSION DIKE AND SWALE COMBINATIONS
- ___ PIPE SLOPE DRAINS
- ___ PAVED FLUMES
- T ROCK BEDDING AT CONSTRUCTION EXIT (TEMPORARY)
- ___ TIMBER MATTING AT CONSTRUCTION EXIT
- ___ CHANNEL LINERS
- ___ SEDIMENT TRAPS
- ___ SEDIMENT BASINS
- ___ STORM INLET SEDIMENT TRAP
- ___ STONE OUTLET STRUCTURES
- ___ CURBS AND GUTTERS
- P STORM SEWERS
- ___ VELOCITY CONTROL DEVICES

OTHER:

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

1. INSTALL SEDIMENT CONTROL FENCE AND ROCK BERMS, PREPARE RIGHT OF WAY.
2. PREPARE SUBGRADE, PLACE FLEX BASE, EXTEND CULVERTS. INSTALL STORM SEWERS, CONSTRUCT BRIDGES, PLACE DRIVEWAY PIPES, AND GRADE DITCHES.
3. PLACE SURFACE ASPHALT.
4. WHEN ALL CONSTRUCTION ACTIVITY IS COMPLETE AND THE SITE IS STABILIZED AND APPROVED BY THE ENGINEER, REMOVE ALL TEMPORARY STRUCTURAL CONTROLS AND RESEED ANY AREAS DISTURBED BY THEIR REMOVAL.

STORM WATER MANAGEMENT:

ROADWAY RUNOFF WILL BE CARRIED THROUGH GRASS LINED CHANNELS AND STORM SEWERS. THE CHANNELS AND STORM SEWERS WILL CARRY THE OFF SITE DRAINAGE AND THE ROADWAY RUNOFF. THE WATER WILL FOLLOW EXISTING DRAINAGE PATTERNS TO ELM CREEK.

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE:

ALL EROSION AND SEDIMENT CONTROLS WILL BE MAINTAINED IN GOOD WORKING ORDER. WHEN IT IS DETERMINED BY THE ENGINEER THAT REPAIRS ARE NEEDED, IT SHALL BE DONE AT THE EARLIEST DATE POSSIBLE BUT NO LATER THAN SEVEN CALENDAR DAYS AFTER THE SURROUNDING EXPOSED GROUND HAS DRIED SUFFICIENTLY TO PREVENT FURTHER DAMAGE FROM HEAVY EQUIPMENT. THE AREAS ADJACENT TO CREEKS AND DRAINAGEWAYS SHALL HAVE PRIORITY FOLLOWED BY DEVICES PROTECTING CULVERTS.

INSPECTION:

AN INSPECTION WILL BE PERFORMED EACH WEEK ON THE SAME DESIGNATED DAY. RAINFALL SHALL BE MEASURED USING A FREEZE PROOF GAUGE LOCATED ON THE PROJECT SITE. AN INSPECTION AND MAINTENANCE REPORT WILL BE MADE BY THE ENGINEER FOLLOWING EACH INSPECTION WITH THE FINDINGS OF THE INSPECTION. THE CONTROLS SHALL BE REPAIRED OR REVISED BY THE CONTRACTOR BASED ON THE FINDINGS OF THE INSPECTION.

WASTE MATERIALS:

ANY TRASH OR DEBRIS SHALL BE COLLECTED, SHREDDED AND HAULED TO A SANITARY LANDFILL OR SITE AS APPROVED BY THE ENGINEER. OPEN BURNING WILL NOT BE PERMITTED.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):

IN THE EVENT OF A SPILL WHICH MAY BE HAZARDOUS, THE TxDOT SPILL COORDINATOR SHALL BE CONTACTED WITHIN 24 HOURS AT 512-832-7067 AND TCEQ AT (512)339-2929 -- (8 TO 5 M THRU F) OR THE 24 HR SPILL RESPONSE HOTLINE 1-800-832-8224.
REPORTABLE QUANTITIES (RQ):
(RQ) FOR PETROLEUM/HYDROCARBON LIQUIDS: 25 GAL - ON LAND
(RQ) FOR PETROLEUM/HYDROCARBON LIQUIDS: "CREATING A SHEEN" - ON WATER

SANITARY WASTE:

ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATIONS BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

OFFSITE VEHICLE TRACKING:

- X HAUL ROADS DAMPENED FOR DUST CONTROL
- X LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- X EXCESS DIRT ON ROAD REMOVED DAILY
- X STABILIZED CONSTRUCTION ENTRANCE

OTHER: EXCESS DIRT ON THE ROAD SHALL BE BROOMED AS NEEDED OR AS DIRECTED BY THE ENGINEER.

REMARKS:

DISPOSAL AREAS, STOCKPILES AND HAUL ROADS SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE AND CONTROL THE AMOUNT OF SEDIMENT THAT MAY ENTER RECEIVING WATERS. DISPOSAL AREAS SHALL NOT BE LOCATED IN ANY WETLAND, WATERBODY OR STREAMBED.
CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS SHALL BE CONSTRUCTED BY THE CONTRACTOR IN A MANNER TO MINIMIZE THE RUNOFF OF POLLUTANTS.
ALL WATERWAYS SHALL BE CLEARED AS SOON AS PRACTICAL OF TEMPORARY EMBANKMENT, TEMPORARY BRIDGES, MATTING, FALSEWORK, PILING, DEBRIS OR OTHER OBSTRUCTIONS PLACED DURING CONSTRUCTION OPERATIONS THAT ARE NOT A PART OF THE FINISHED WORK.

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

02/10/2021

FM 969
TXDOT
STORM WATER POLLUTION PREVENTION PLAN (SW3P)

Texas Department of Transportation

FED.RD. DIV.NO.			SHEET NO.
6			294
STATE	DIST.	COUNTY	
TEXAS	AUS	TRAVIS	
CONT.	SECT.	JOB	HIGHWAY NO.
1186	01	091	FM 969

DATE: 6/25/2021
FILE: ...\epic.dgn

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☒ No Permit Required
☐ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.

2.

3.

4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☒ Temporary Vegetation	☒ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☒ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☒ Mulch Filter Berm and Socks	☒ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☒ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ Required Action

Action No.

1. All revegetation will, to the extent practicable, use only native species. Upon completion of earthwork activities, disturbed areas would be reseeded according to TXDOT specifications and in compliance with EO 13112 where applicable.

2. For Vegetations Best Management Pratices, refer to Item 7 in the General Notes under Vegetation BPMs.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☐ No Action Required ☒ Required Action

Action No.

1. For Amphibian and Aquatic Reptile Best Management Pratices, refer to Item 7 in the General Notes.
2. For Terrestial Reptile Best Management Pratices, refer to Item 7 in the General Notes.
3. For Bird Best Management Pratices, refer to Item 7 in the General Notes.
4. For Bat Best Management Pratices, refer to Item 7 in the General Notes.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1. Obtain approval of Water Pollution Abatement Plan or Concurrence that a WPAP is not Required.
2. Coordinate with the Floodplain Administrator.
3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☐ No Action Required ☒ Required Action

Action No.

1. Obtain Approval of Water Pollution Abatement Plan or Concurrence that a WPAP is not required.
2. Coordinate with the Floodplain Administrator.
3.

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
03/10/2021

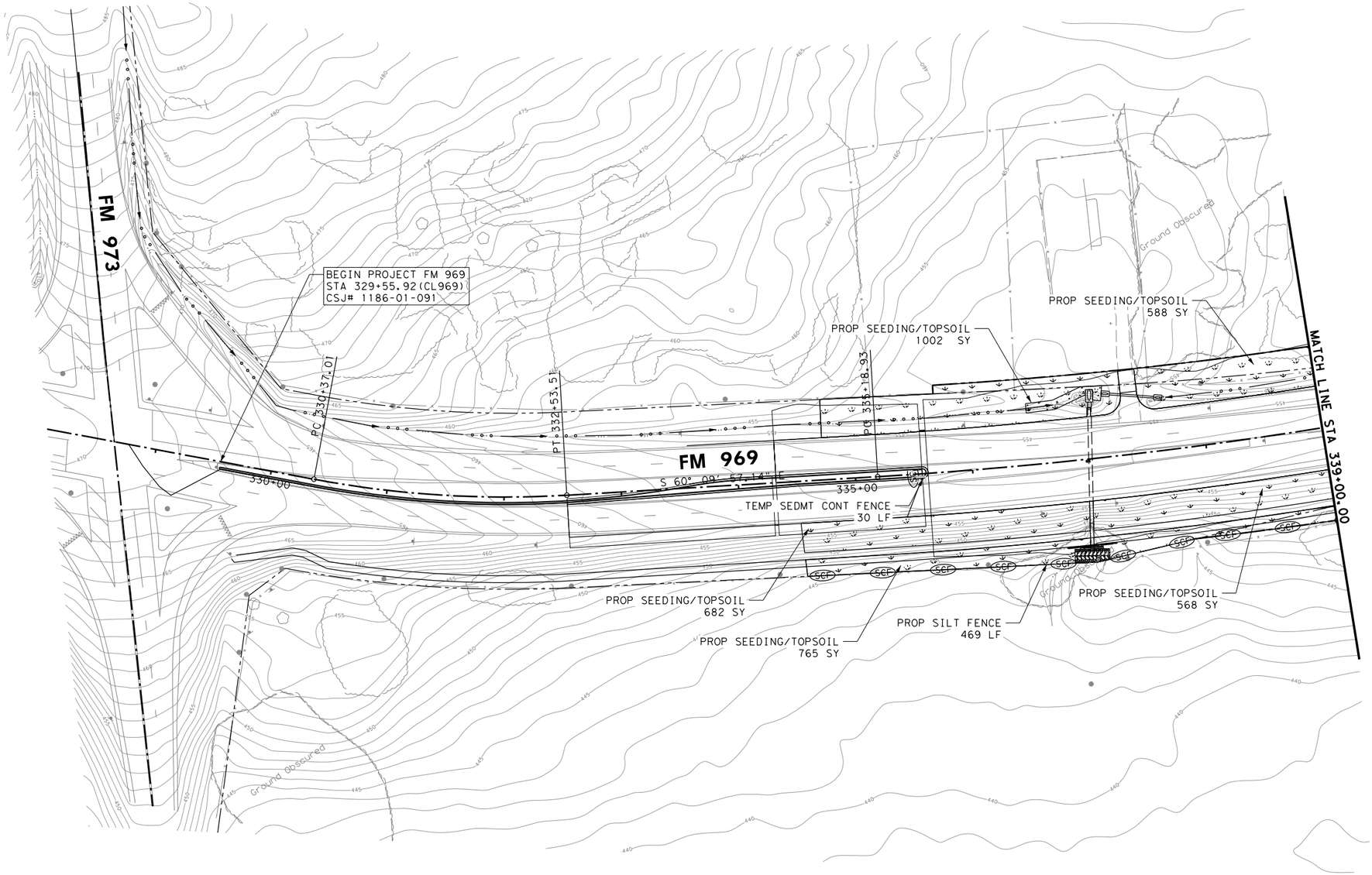
Texas Department of Transportation

Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
© TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
12-12-2011 (DS)	DIST	COUNTY		SHEET NO.
05-07-14 ADDED NOTE SECTION IV.	AUS	TRAVIS		295
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.				



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SCALE IN FEET

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LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- SEEDING/TOPSOIL/SOIL RETENTION BLANKET
- STONE RIPRAP
- DITCH FLOWLINE

NOTES:

1. TERMINATE SILT FENCE RUNS INTO A "J" HOOK AT BEGINNING AND ENDING OF SILT FENCE RUNNING PARALLEL TO FM 969.
2. SEE GENERAL NOTES REGARDING BEST MANAGEMENT PRACTICE FOR AMPHIBIAN AND AQUATIC REPTILES, TERRESTRIAL REPTILES, BIRDS, BATS AND VEGETATION.

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER

6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
EROSION CONTROL PLAN

BEGIN TO STA 339+00

SHEET 1 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		296
DRAWN BY:	STATE	DIST. NO.	COUNTY	
BR	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

6/25/2021
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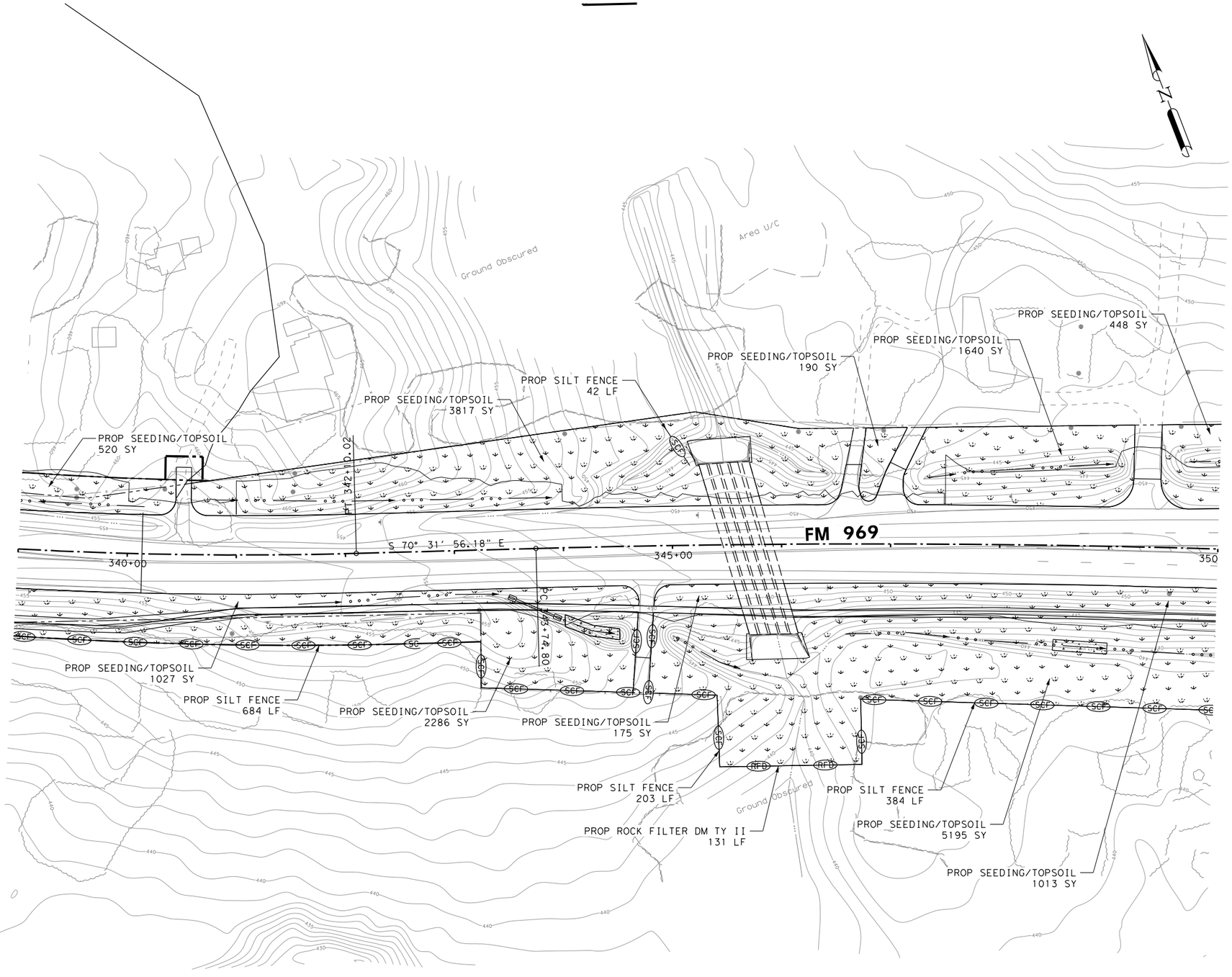

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SCALE IN FEET

LEGEND

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STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS
1839

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
EROSION CONTROL PLAN

STA 339+00 TO STA 350+00

SHEET 2 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		297
DRAWN BY:	STATE	DIST. NO.	COUNTY	
BR	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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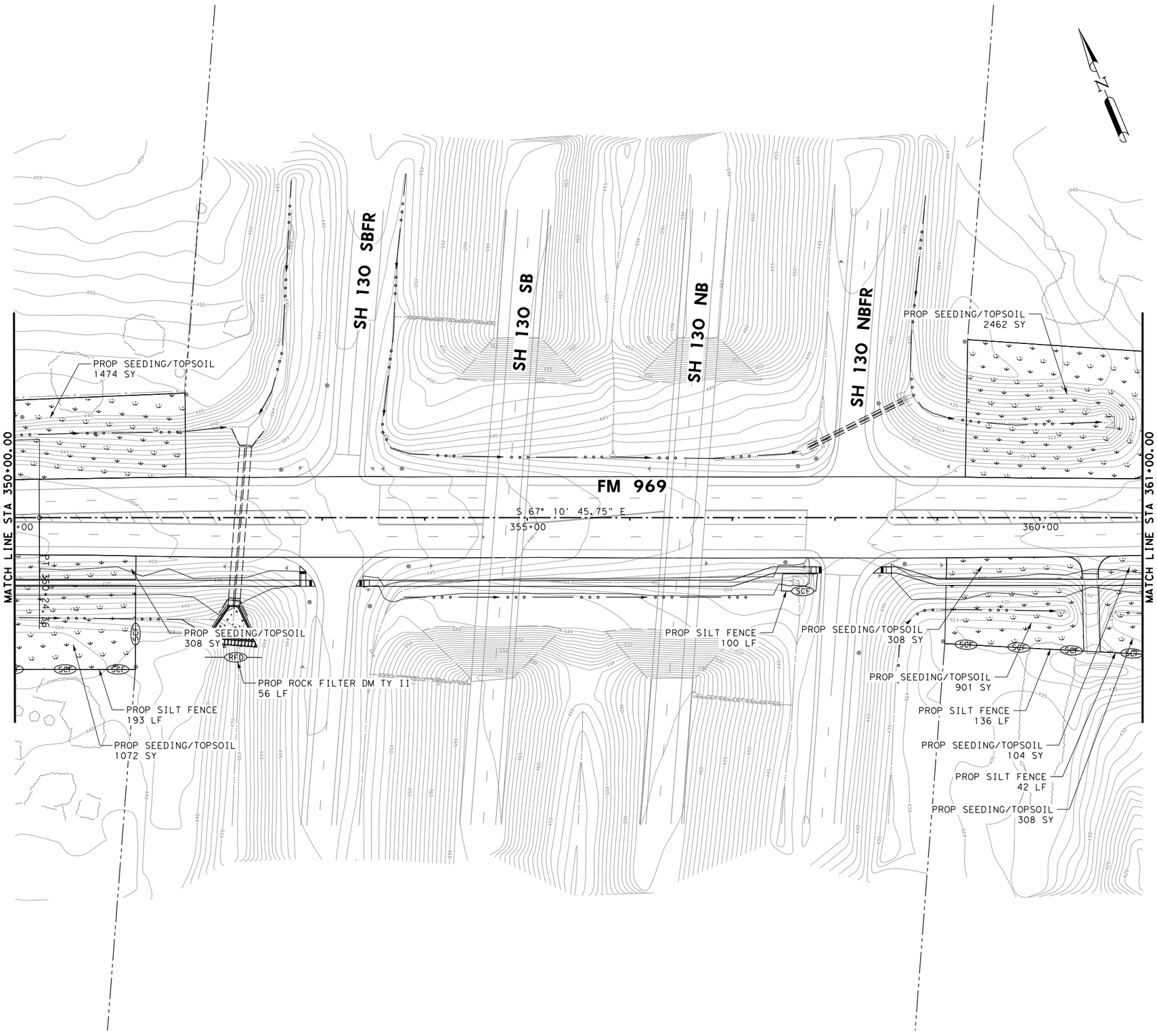

0′ 50′ 100′
SCALE IN FEET

LEGEND

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STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

Texas Department of Transportation

LJA Engineering, Inc.
FRN - F-1386

FM 969
EROSION CONTROL PLAN

STA 350+00 TO STA 361+00

SHEET 3 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		298
DRAWN BY:	STATE	DIST. NO.	COUNTY	
BR	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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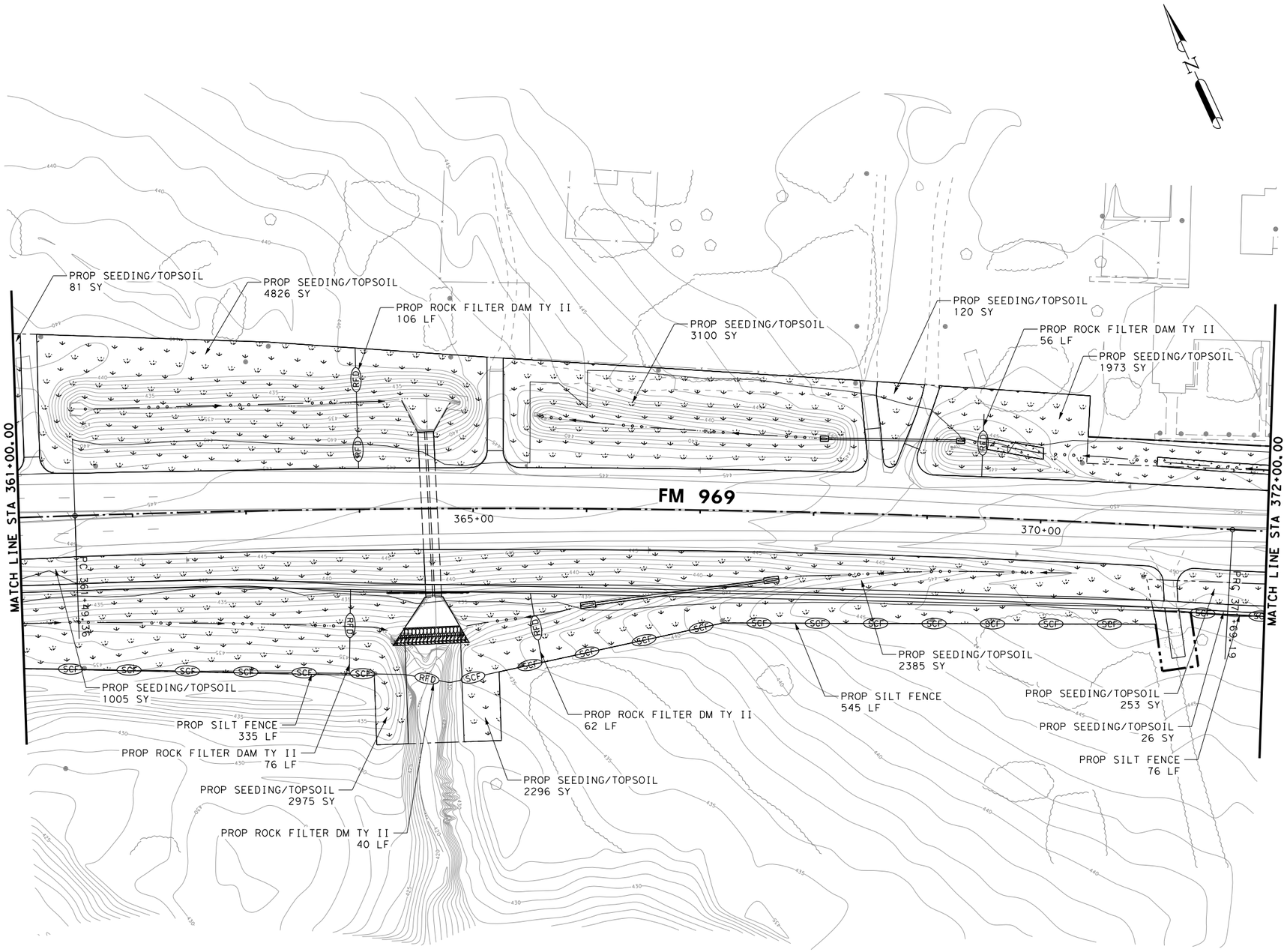

LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- SEEDING/TOPSOIL/SOIL RETENTION BLANKET
- STONE RIPRAP
- DITCH FLOWLINE

NOTES:

1. TERMINATE SILT FENCE RUNS INTO A "J" HOOK AT BEGINNING AND ENDING OF SILT FENCE RUNNING PARALLEL TO FM 969.
2. SEE GENERAL NOTES REGARDING BEST MANAGEMENT PRACTICE FOR AMPHIBIAN AND AQUATIC REPTILES, TERRESTRIAL REPTILES, BIRDS, BATS AND VEGETATION.

STATE OF TEXAS
MAEN A. HOURANI
88202
LICENSED
PROFESSIONAL ENGINEER
6/25/2021

COUNTY OF TRAVIS
STATE OF TEXAS

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FM 969
EROSION CONTROL PLAN

STA 361+00 TO STA 372+00

SHEET 4 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		299
DRAWN BY:	STATE	DIST. NO.	COUNTY	
BR	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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LEGEND

- SCF — SEDIMENT CONTROL FENCE
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- SEEDING/TOPSOIL/SOIL RETENTION BLANKET
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MATCH LINE STA 372+00.00

MATCH LINE STA 383+00.00

FM 969

372+00

375+00

380+00

S 89° 15' 51.51" E

Stockpile

Area U/C

PROP SEEDING/TOPSOIL 318 SY

PROP SEEDING/TOPSOIL 19 SY

PROP SEEDING/TOPSOIL 488 SY

PROP ROCK FILTER DAM TY II 39 LF

PROP SEEDING/TOPSOIL 540 SY

PROP ROCK FILTER DAM TY II 24 LF

PROP SILT FENCE 643 LF

PROP SEEDING/TOPSOIL 5976 SY

PROP SEEDING/TOPSOIL 459 SY

PROP SILT FENCE 144 LF

PROP SEEDING/TOPSOIL 48 SY

PROP SEEDING/TOPSOIL 726 SY

PROP SILT FENCE 225 LF

PROP SEEDING/TOPSOIL 75 SY

PROP SEEDING/TOPSOIL 70 SY

PROP SEEDING/TOPSOIL 1160 SY

PROP SILT FENCE 355 LF

PROP SEEDING/TOPSOIL 118 SY

PROP SEEDING/TOPSOIL 973 SY

PROP SEEDING/TOPSOIL 99 SY

PROP SILT FENCE 28 LF

PROP SILT FENCE 28 LF

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FM 969
EROSION CONTROL PLAN

STA 372+00 TO STA 383+00

SHEET 5 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		300
DRAWN BY:	STATE	DIST. NO.	COUNTY	
BR	TX	AUS	TRAVIS	
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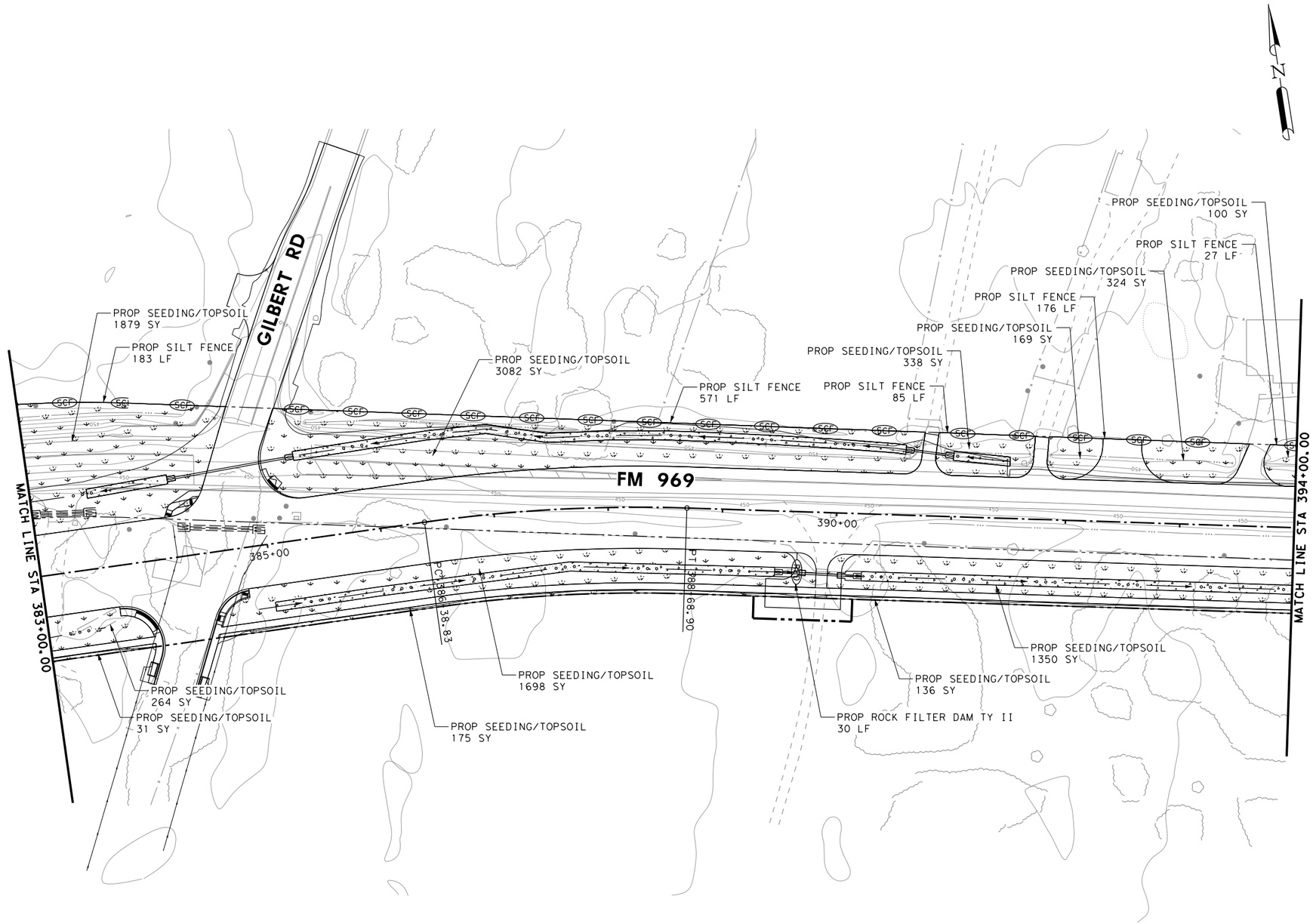

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SCALE IN FEET

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LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- SEEDING/TOPSOIL/SOIL RETENTION BLANKET
- STONE RIPRAP
- DITCH FLOWLINE

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FM 969
EROSION CONTROL PLAN

STA 383+00 TO STA 394+00

SHEET 6 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		301
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BR	TX	AUS	TRAVIS	
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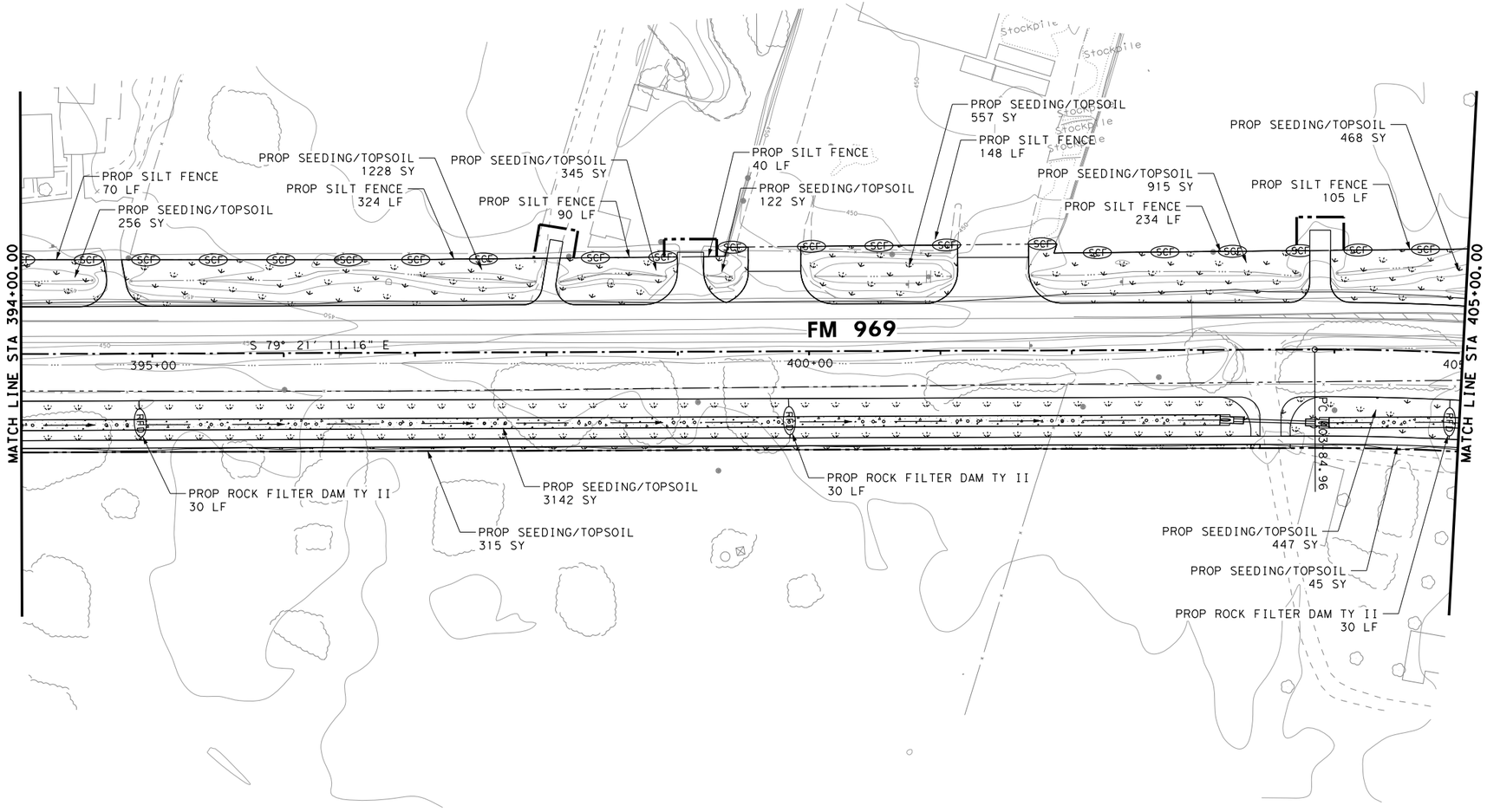

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SCALE IN FEET

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LEGEND

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- SEEDING/TOPSOIL/SOIL RETENTION BLANKET
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FM 969
EROSION CONTROL PLAN

STA 394+00 TO STA 405+00

SHEET 7 OF 10

DESIGN BY:	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
MH	6	PTF 2022(045)		302
DRAWN BY:	STATE	DIST. NO.	COUNTY	
BR	TX	AUS	TRAVIS	
CHECKED BY:	CONTROL	SECTION	JOB	HIGHWAY NO.
MH	1186	01	091	FM 969

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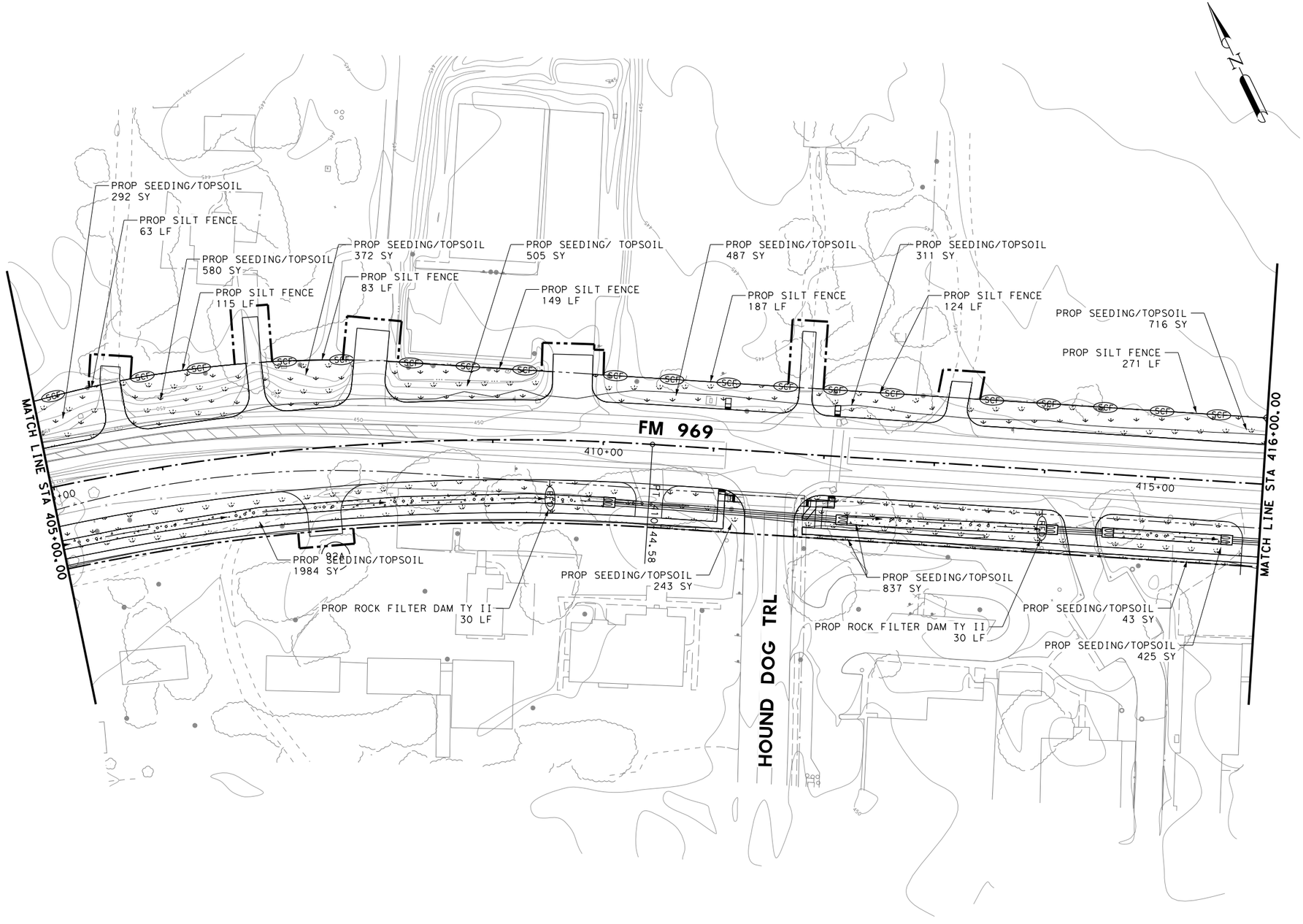

LEGEND

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- RFD — ROCK FILTER DAM
- SEEDING/TOPSOIL/SOIL RETENTION BLANKET
- STONE RIPRAP
- DITCH FLOWLINE

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FM 969
EROSION CONTROL PLAN

STA 405+00 TO STA 416+00

SHEET 8 OF 10

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MH	6	PTF 2022(045)		303
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BR	TX	AUS	TRAVIS	
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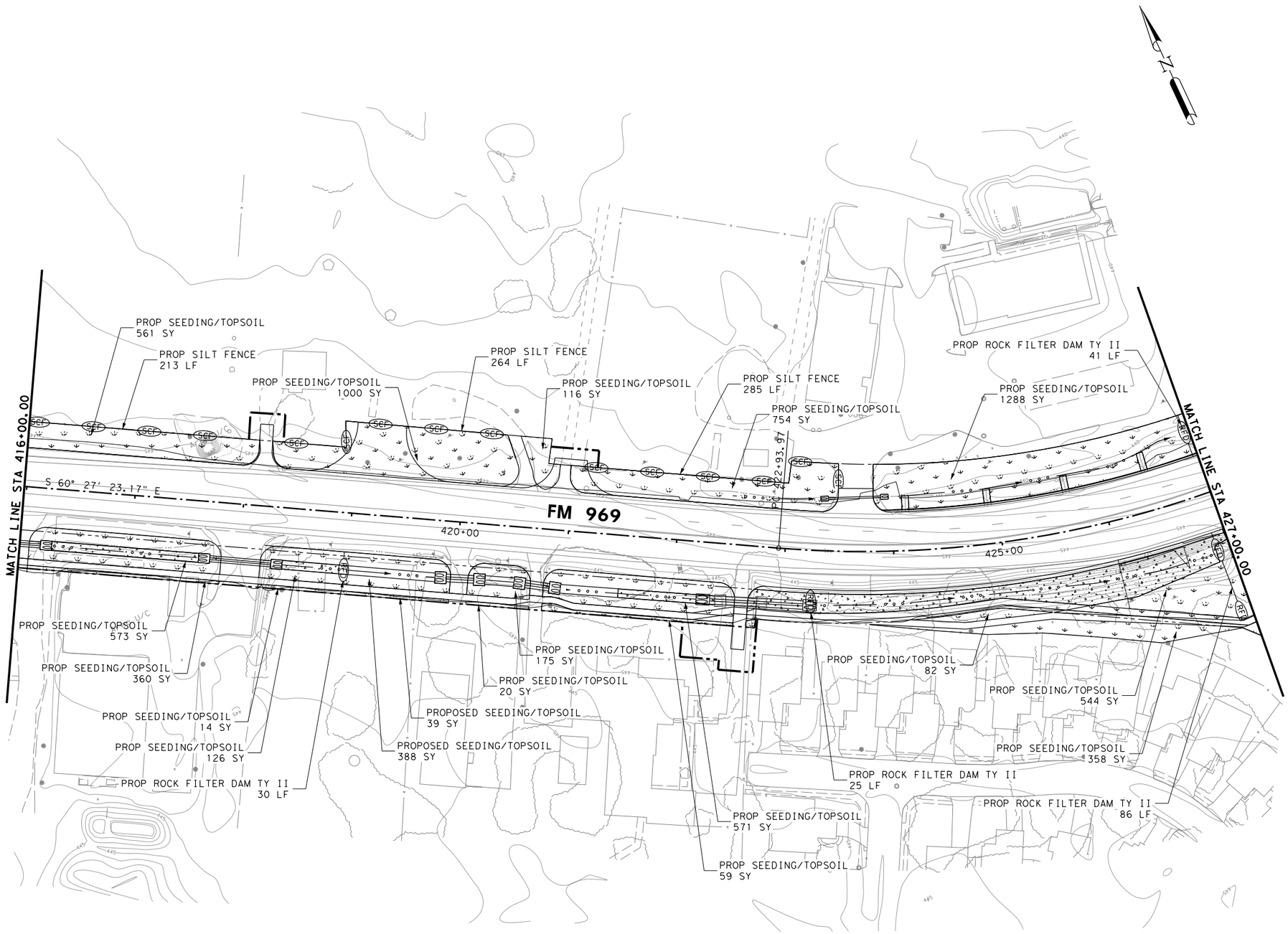

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SCALE IN FEET

LEGEND

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6/25/2021

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FM 969
EROSION CONTROL PLAN

STA 416+00 TO STA 427+00

SHEET 9 OF 10

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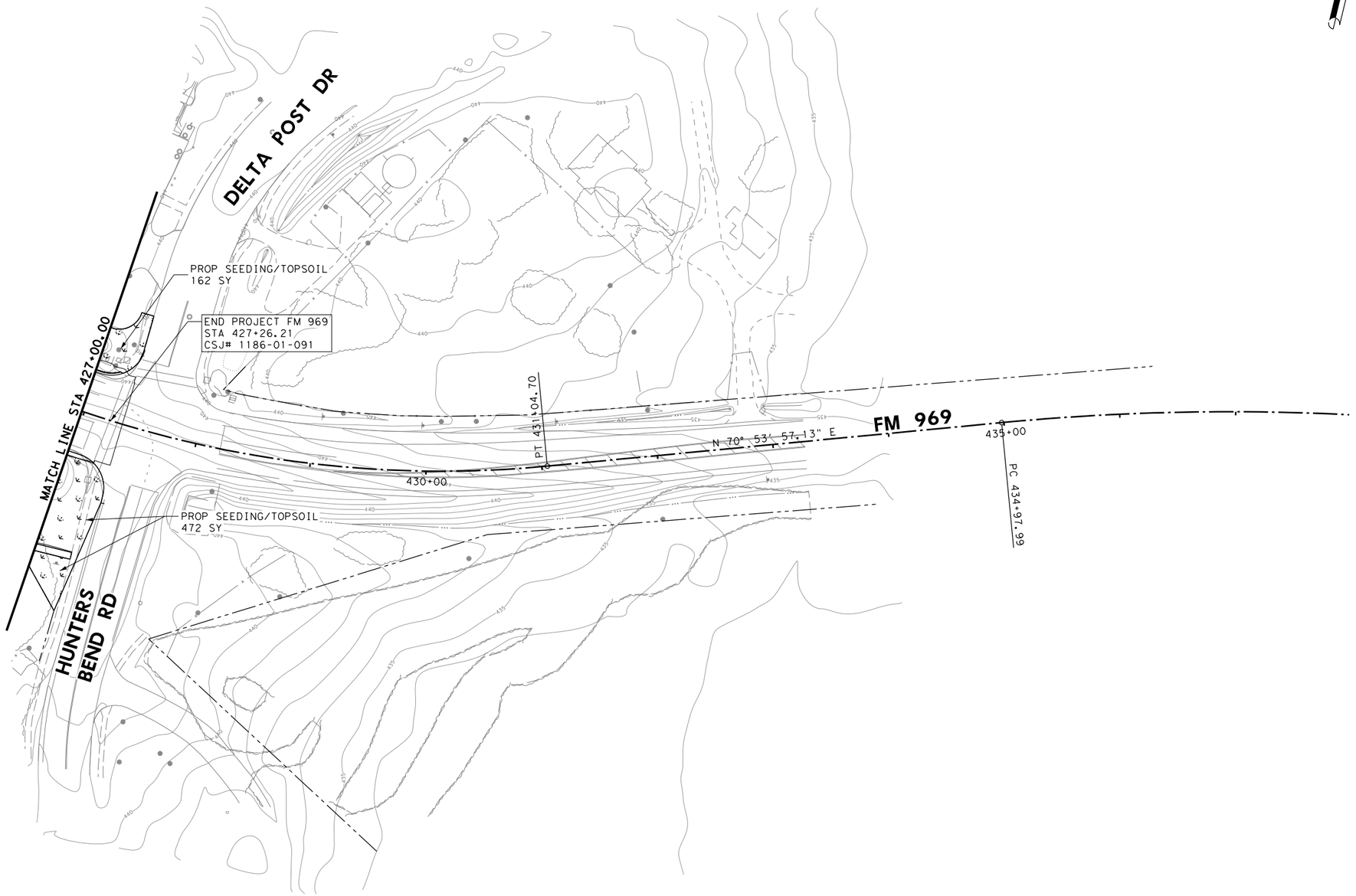

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SCALE IN FEET

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LEGEND

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FM 969
EROSION CONTROL PLAN

STA 427+00 TO END

SHEET 10 OF 10

DESIGN BY:	FED.RD. DIV NO.	FEDERAL AID PROJECT NO.		SHEET NO.
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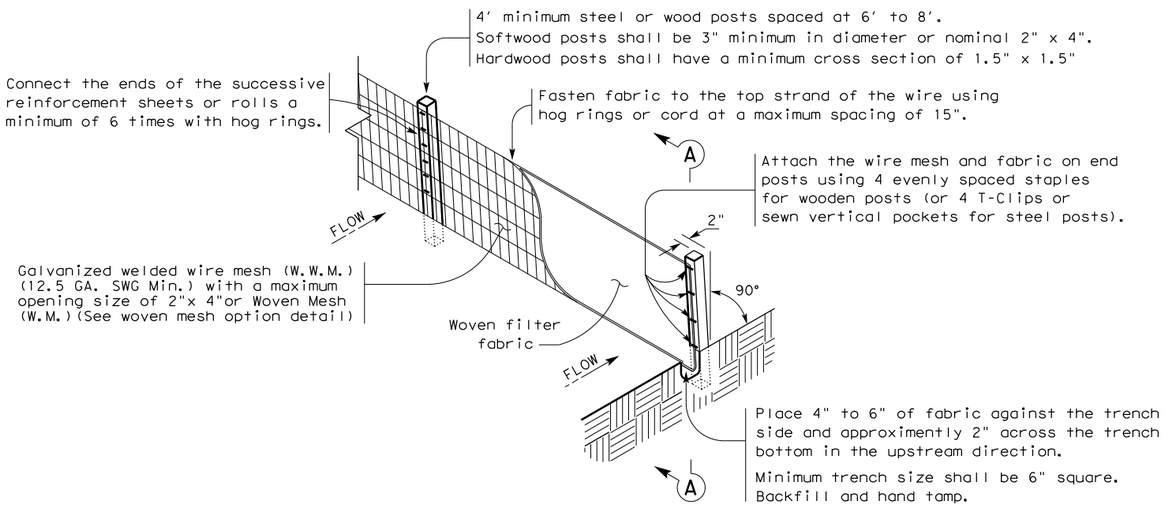
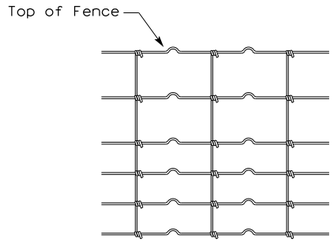
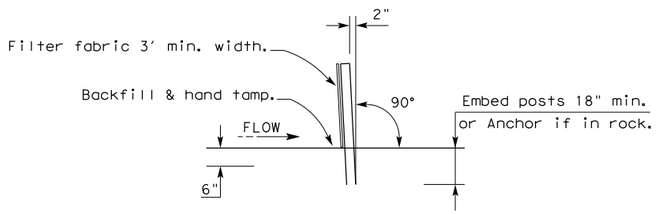


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

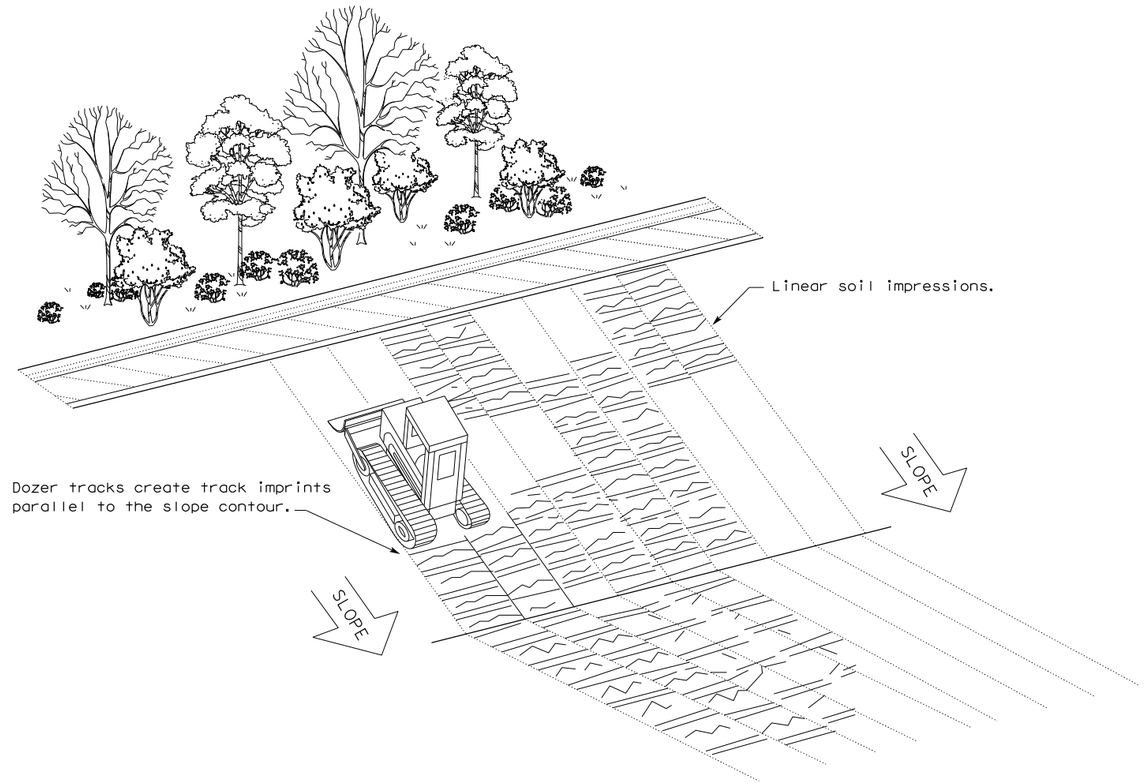
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1186	01	091	FM 969	
	DIST	COUNTY		SHEET NO.	
	AUS	TRAVIS		306	

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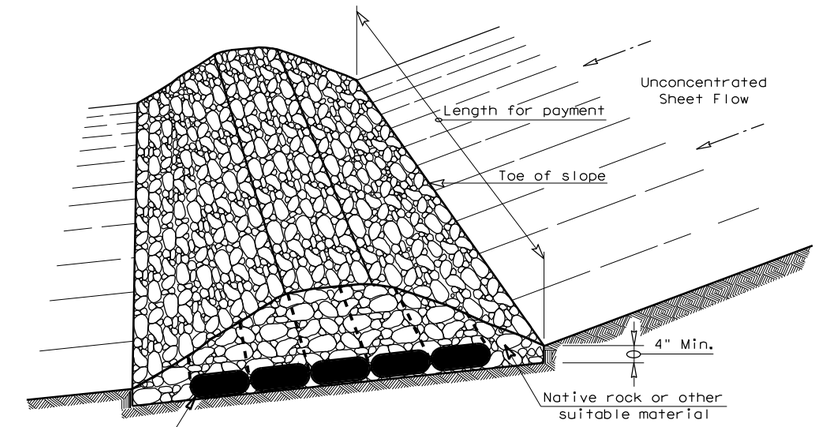
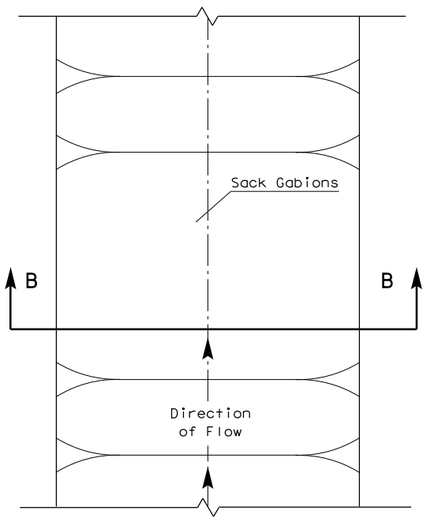
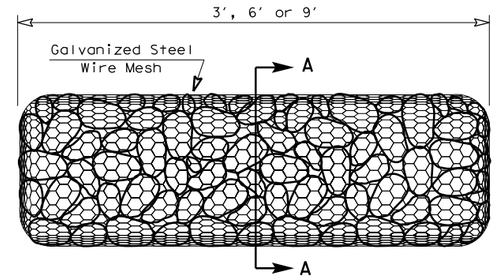


FILTER DAM AT TOE OF SLOPE

RFD1

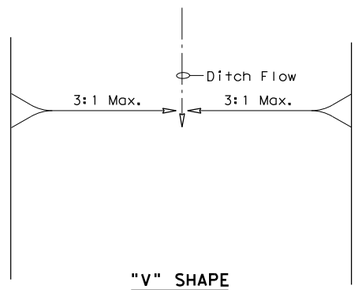


PLAN VIEW



TYPE 4 (SACK GABIONS)

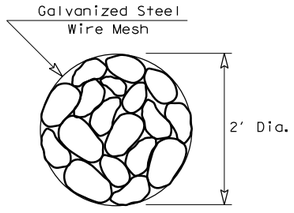
RFD4



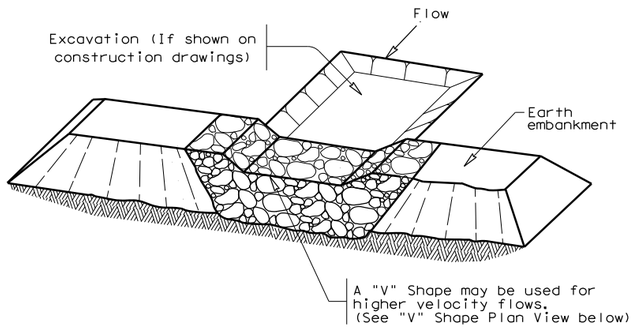
"V" SHAPE
PLAN VIEW

¾" Dia.
Rebar Stakes

SECTION B-B

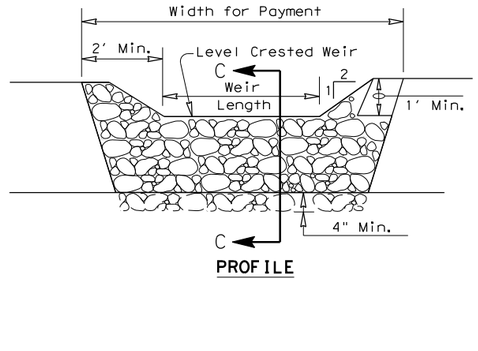


SECTION A-A

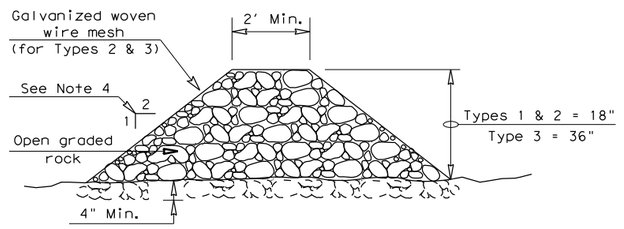


FILTER DAM AT SEDIMENT TRAP

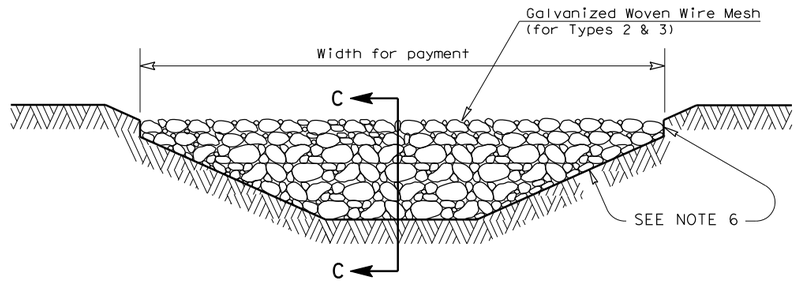
RFD1 — OR — RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3
Type 4 Rock Filter Dam — RFD4

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS		
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REVISIONS	1186	01	091	FM 969		
	DIST	COUNTY		SHEET NO.		
	AUS	TRAVIS		307		

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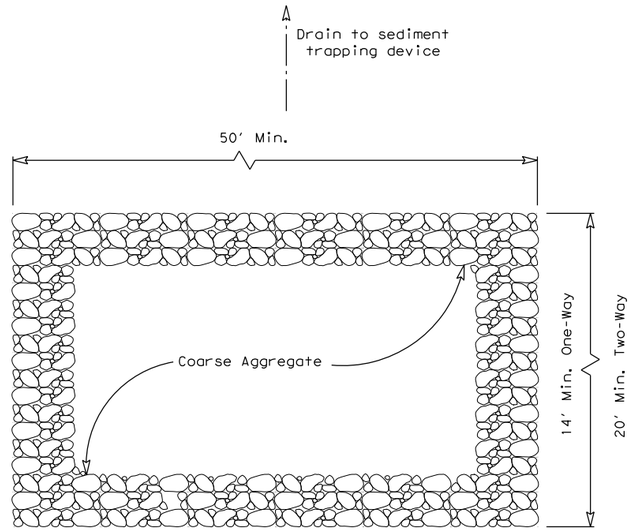
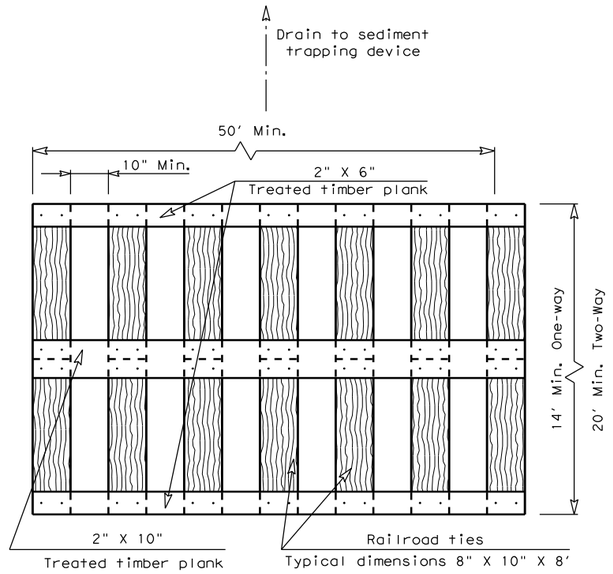
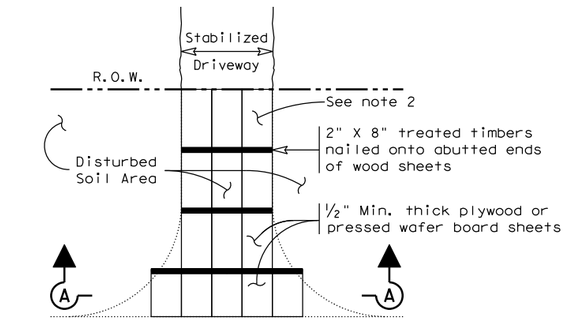


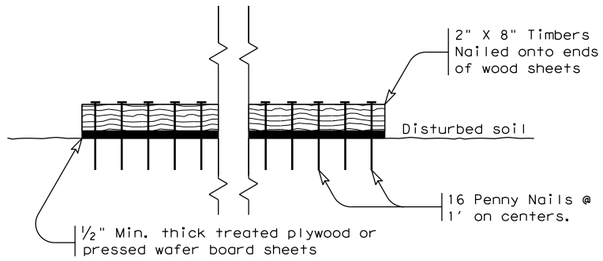
PLAN VIEW



PLAN VIEW



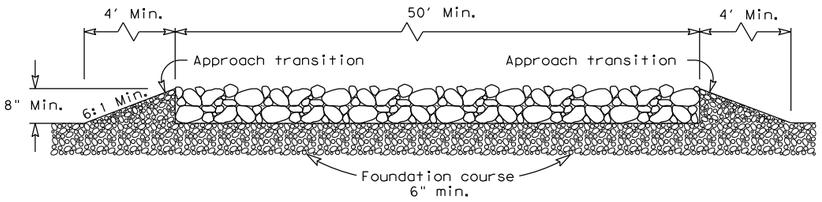
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

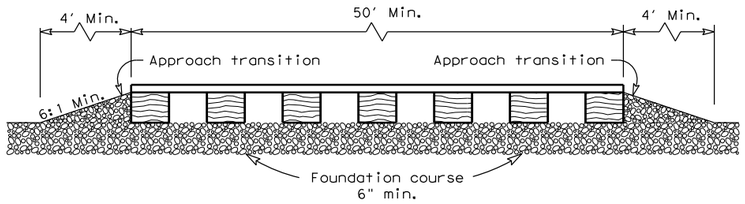
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50′.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50′.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	1186	01	091	FM 969
	DIST	COUNTY		SHEET NO.
	AUS	TRAVIS		308